Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-1	SPM	0	0	0	0	It is suggested that by referring to the SREX SPM, the terms and notes on confidence levels and agreement be given in a box form in the SPM for ease of reading and understanding. [Government of China]	Taken into account; while not in an SPM box, uncertainty terminology is now explained in two detailed footnotes. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1)
SPM-2	SPM	0	0	0	0	The language is not friendly or accessible to non-professional readers, especially those from non-English-speaking countries. It is suggested to make linguistic improvements to such texts as in Line 26-27, Page 14 and Line 34-35, Page 15. [Government of China]	Noted; improving readability has been a focus of the revisions of the SPM for the Final Draft. However, the assessment statements elevated to the SPM and their formulations need to be 100% consistent with the underlying assessment.
SPM-3	SPM	0	0	0	0	Please note the understanding of "positive feedback" as enforcing power in colloquial language and, therefore, avoid usage of this expression whereever possible to simplify reading. This statements especially applies to the section on "Climate Processes and Feedbacks, starting on page 9, line 44. If the term is used in a non-colloquial way, please add explanation at least in a sub-clause (this is done in some cases.) [Government of Germany]	Reject. This is explained in the Glossary as part of the entry for "Climate Feedback".
SPM-4	SPM	0	0	0	0	The concept of the Earth' energy budget (RF, energy uptake, energy balance, etc.) should be explained early on in the SPM, or at the latest when they are first. Comprehension of these concepts and terms is the basis for the understanding of the report. The introduction to section 3 (Drivers of Climate Change) would be suitable. For "Energy Budget" the text of the TS, TFE 4, page 26, line 14-21 could be used. [Government of Germany]	Noted; the text introducing the drivers section has been revised. The term radiative forcing is specifically explained in a detailed footnote in the driver section. However, given the space limitation in this Summary for Policymakers, we refrained from providing any text-book like parts. The reader is referred to the Technical Summary and the underlying Chapters for more details.
SPM-5	SPM	0	0	0	0	The concepts and terms of "equilibrum climate sensivity as well as "climate feedbacks" should be explained. The text in the TS, in TFE 6, page 47 could be used. [Government of Germany]	Reject. Both terms are included in the Glossary. More details on the concepts can be found in the Technical Summary and the underlying Chapters.
SPM-6	SPM	0	0	0	0	To facilitate the use of the SPM, a table of content should be prepended to the text. [Government of Germany]	Editorial, layout.
SPM-7	SPM	0	0	0	0	This is a good first draft but I judge that it is in need of some major modifications. The difficulties span a lack of consistency both in style and content. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Noted
SPM-8	SPM	0	0			There is a huge amout of very interesting science in this summary, but in my view it is too long, too dense, and too complex. It is difficult to find the right balance, and clearly the scientific accuracy is key, but neverthess the sheer amount of numbers and facts is likely to weaken the impact rather than strenghten is. For example, the AR4 draft of the SPM was 15 pages, now it is 26. I argue that this summary needs to be shorter and simpler. It is also difficult to quickly find what is confirming AR4, what is new, and what is contradicting. If the decision is not to simplify, then one approach might be to include a one page summary of the SPM at the beginning, in very simple words, that explains the conclusions to a lay person in three minutes. I feel that every person should be able to pick up this report and in a few minutes should get the main message of it, and know what is new. [Reto Knutti, Switzerland]	Noted
SPM-9	SPM	0	0			Somewhere, a comparison of the SRES and RCP scenarios should be provided. Otherwise, the impression will arise, that temperature projections have significantly decreased. Moreover, it is important to provide relations between the now three different reference times (preindustrial, 1990, 1986-2005). Otherwise, the same problem of comparison between AR4 and AR5 will arise. [Urs Neu, Switzerland]	Noted; a detailed comparison between climate projections using SRES vs RCP scenarios is given in the Technical Summary, Box TS.6 and in Chapter 12 of the underlying report.
SPM-10	SPM	0				I think it might be useful to include some discussion and a working definition (for the purposes of IPCC) of preindustrial climate. The term "early-industrial" is introduced into the observed climate sections, but if policy makers are supposed to work with targets relative to pre-industrial (e.g. 2 deg C global mean annual temperature change), then IPCC really needs to supply relevant reference periods with which to compare. [Timothy Carter, Finland]	Noted; the term pre-industrial is defined in the Glossary. Different reference periods have been included in the Chapter 12 assessment of climate projections (Tables 12.2 and 12.3) and offsets are being referred to in Table TS.1. Some offsets have also been included in footnote (a) of Table SPM.2

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SPM-11	SPM	0				Related to my separate comment about defining the pre-industrial period, it is also very important that other commonly used reference periods be compared for key metrics. Thus, it would be very helpful indeed to have a table of observed global mean annual temperatures (as well as regionally averaged temperatures and precipitation for the SREX regions, for use in the atlas and Chapter 14 tables) covering a number of the most commonly used reference periods. These should include at least: 1986-2005 (used in this report); 1961-1990; 1971-2000; 1981-2000 (used in AR4) and 1981-2010 (already used in many countries nowadays). This is a minimum set, but something more comprehensive (e.g. all 30-year and 20-year non-overlapping averages going right back through the instrumental record) could, I am sure, be provided out of Chapter 2. Then a reduced version with values for some essential periods could be included in this SPM. This information is useful for calculating offsets for comparison with earlier IPCC assessments and for comparing alternative baseline periods used in impact studies. [Timothy Carter, Finland]	Partly taken into account; see response to comment SPM-10. Different reference periods have been included in the Chapter 12 assessment of climate projections (Tables 12.2 and 12.3) and offsets are being referred to in Table TS.1. In addition, a range of trend estimates over different time periods is given in Chapter 2,
SPM-12	SPM	0				Today, the optimal approach for sea ice projections is not clear, although one notes that these 18 methods should have a credible underlying physical basis in order to increase their reliability (12.50, line 17). Add: because the models CMIP3 and CMIP5 and RCP models lacks sufficient data on changes in sea ice volume. (I suggest to put this idea at this chapter.) [CELSO COPSTEIN WALDEMAR, BRAZIL]	Noted; unclear what change is requested in the SPM. See revisions in Projections section TS.5.
SPM-13	SPM	0				Consider to put this idea at this chapter:Arctic sea ice is a key indicator of the state of global climate because of both its sensitivity to warming and its role in amplifying climate change. Accelerated melting of the perennial sea ice cover has occurred since the late 1990s, which is important to the pan-Arctic region, through effects on atmospheric and oceanic circulations, the Greenland ice sheet, snow cover, permafrost, and vegetation. Such changes could have significant ramifications for global sea level, the ocean thermohaline circulation, native coastal communities, and commercial activities, as well as effects on the global surface energy andmoisture budgets, atmospheric and oceanic circulations, and geosphere-biosphere feedbacks. However, a system-level understanding of critical Arctic processes and feedbacks is still lacking. Maslowski, W., J. C. Kinney, M. Higgins and A. Roberts (2012), The future of Arctic sea ice, Annual Review of Earth and Planetary Sciences, 40, 625-654, doi: 10.1146/annurev-earth-042711-105345 [CELSO COPSTEIN WALDEMAR, BRAZIL]	Noted; Changes in Arctic Sea Ice are prominently highlighted in the SPM sections on Observations, Understanding and Projections of Climate Change. For more details on the assessment of observed changes see Chapter 4 of WGI AR5
SPM-14	SPM	0				Many studies confirm the importance of the Arctic in global climate evolution, including mechanisms that could cause abrupt climate change (e.g., Overpeck et al. 2005). Similarly, a warming Arctic climate appears to affect the rate of melt of the Greenland ice sheet (Rignot & Kanagartnam 2006, van de Wal et al. 2008, Rennermalm et al.2009),Northern Hemisphere permafrost (Smith et al. 2005) . from: Maslowski, W., J. C. Kinney, M. Higgins and A. Roberts (2012), The future of Arctic sea ice, Annual Review of Earth and Planetary Sciences, 40, 625-654, doi: 10.1146/annurev-earth-042711-105345 [CELSO COPSTEIN WALDEMAR, BRAZIL]	see response to comment SPM-13
SPM-15	SPM	0				However, this satellite-derived measure of warming in the Arctic provides only aerial diagnostics (i.e., two dimensional) in contrast to the measure of total Arctic sea ice volume (i.e., three dimensional), which would require knowledge of sea ice–thickness distribution in space and time. from Maslowski, W., J. C. Kinney, M. Higgins and A. Roberts (2012), The future of Arctic sea ice, Annual Review of Earth and Planetary Sciences, 40, 625-654, doi: 10.1146/annurev-earth-042711-105345 [CELSO COPSTEIN WALDEMAR, BRAZIL]	see response to comment SPM-13
SPM-16	SPM	0				There are many Arctic climatic processes that are omitted from, or poorly represented in, most current-generation GCMs. These processes include the following: oceanic eddies, tides, fronts, buoyancy-driven coastal and boundary currents, cold halocline, dense water plumes and convection, double diffusion, surface/bottom mixed layer, sea ice–thickness distribution, concentration, deformation, drift and export, fast ice, snow cover, melt ponds and surface albedo, atmospheric loading, clouds and fronts, ice sheets/caps and mountain glaciers, permafrost, river runoff, and air–sea ice–land interactions and coupling. Maslowski, W., J. C. Kinney, M. Higgins and A. Roberts (2012), The future of Arctic sea ice, Annual Review of Earth and Planetary Sciences, 40, 625-654, doi: 10.1146/annurev-earth-042711-105345 [CELSO COPSTEIN WALDEMAR, BRAZIL]	see response to comment SPM-13

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-17	SPM	0				Diagnosing the sources of simulation uncertainty is difficult because polar systems are tremendously complex, involving a myriad of geospheric, biospheric, and anthropospheric interactions at many scales. This presents difficulties in understanding sources of uncertainty,whether it derives from the nature of regional interactions, global interconnectivity, or models. Maslowski, W., J. C. Kinney, M. Higgins and A. Roberts (2012), The future of Arctic sea ice, Annual Review of Earth and Planetary Sciences, 40, 625-654, doi: 10.1146/annurev-earth-042711-105345 [CELSO COPSTEIN WALDEMAR, BRAZIL]	see response to comment SPM-13
SPM-18	SPM	0				A frontice on abbreviations and acronyms would be helpful, especially for policy makers. [James [Jim] Crawford, United States of America]	Noted; the Final Report will include a list of acronyms.
SPM-19	SPM	0				IN GENERAL SPM is very well written and provides a useful summary of the report. It contains the most important information and is accessible to educated audiences form a variety of fields. The figures are clear and the tables understandable. I suggest to include a table on the various levels of confidence and plrobability (percentage) that I did not see in this summary. Probably it's somewhere else in the report, but I think it's worth to incude a table here too. [Luisa Cristini, United States]	Taken into account; while not in an SPM table, uncertainty terminology is now explained in two detailed footnotes. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1)
SPM-20	SPM	0				Usage of low confidence: In several places in the SPM, "low confidence" is used in sentences where the existence of observed trends or projected changes are noted or implied, but where the details of those trends or changes are not presented, with the assignment of low confidence used as justification. This usage explicitly conveys less information than is available, and we feel that alternatives should be considered, particularly given the importance of this available information for risk management. The clearest example of such usage is the bullet on page 15, lines 53-54: "There is low confidence in model projections of Southern Hemisphere sea ice extent for the end of the 21st century. {12.4.6, Figure 12.28}" See also, for example, page 4, lines 10-12 and 14-15, page 12, lines 33-34 and page 14, lines 19-20. In the example quoted here, it is clear that model projections of SH sea ice extent exist, but it is not clear whether there is low confidence in them because projected changes are not consistent in magnitude and/or sign across models, or because there are spatial differences across models, or because projected changes are consistent across models but there is low confidence in the models themselves, etc. For observations, the finding on observed large-scale trends in droughts on page 4 lines 10-12 does provide reasons for the assignment of low confidence, but the nature of those trends are not presented. Increases in the observed frequency and/or intensity of drought are implied in the framing of Table SPM.1, and potentially could be presented in the textual findings on drought on page 4. An example usage that we feel is going in the right direction can be found on page 15, lines 15-16: "...but there is low confidence that the central Pacific type of El Nino will become more frequent in a warmer climate. {14.4}" This formulation presents a direction of change while also communicating low confidence in the conclusion. Finally, for all such findings it is not clear whether assignments of "very low confidence" were considered. The assignment of "low confidence" to a finding implies that associated evidence and agreement is strong enough to exceed the threshold of "very low confidence." If this is not intended, assignments of "very low confidence" should be considered (as "very high confidence" is used elsewhere in the document), especially where no information is given on the nature of associated trends or changes. [Christopher Field, United States of America]	Noted. We agree with the reviewer in that providing more information is generally useful if more information can be given. Most of the statements in the revised draft of the SPM do now give additional details regarding the basis for the low confidence assessment. However, expanding the SPM to include more details needs to be carefully balanced with the desire to provide a short and concise SPM of interest to policymakers. Finally regarding low confidence vs. very low confidence, we note that the statements elevated to the SPM need to be fully based and supported by underlying assessment.
SPM-21	SPM	0				I think the SPM is well written and has a good structure. I also think the authors have done a good job in aggregating detailed information. But in some cases I feel that the number of bullets may be reduced. I also have a couple of general remarks regarding relevance to policymakers: 1) I suggest that some more mitigation relevant material is inlcuded; e.g. calculated emission paths for achieving various stabillization levels (including a better explanation of the RCPs. 2) some more focus on the role of short-lived components vs LLGHGs. [Jan Fuglestvedt, Norway]	Noted; a concise description of RCPs are described in Box SPM.1. Mitigation and emission pathways will be assessed in detail by WGIII. Short lived forcers are explicitly called out in the drivers section.
SPM-22	SPM	0				The attribution to human emissions of « more than half » of the observed increase in global average surface temperature since the 1950s is insufficiently substantiated and inadequately related to experimental facts. I would no longer argue if « roughly one tenth » would replace « more than half » in sentences of SPM like SPM 6 3-4 and SPM 10 8-9. « More than half » actually is contradicted by observations and data analyses for the reasons developed throughout this report as well as in my Report On the AR5 FOD, hereafter referenced as ROFOD. [François Gervais, France]	Reject; there is a whole Chapter in the underlying report (Chapter 10) which provides the substance supporting the comprehensive and robust assessment finding presented in the SPM.
SPM-23	SPM	0				Cont. – In my comment 2 44 34-36 of ROFOD, I recommended to compare UAH satellite temperatures and	Noted. As the reviewer states, both data sets referred

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						sea surface temperatures of Fig. 2.19 Top as well, with yearly CO2 growth rates in Fig. 2.20b because there is a close resemblance of both data sets. I suggested superposing them in a same figure for the sake of clarity and further comparison. If one considers the temperature peak of 1998 for example, there is a clear lag of a few months between both curves. Instantaneous growth rates of CO2, viz. d(CO2)/dt, are found to FOLLOW temperature, like in ice core data but not at the same time scale. What emerges is the following picture : more CO2 released from the oceans after a warmer year, and less (up to 4.3 times less according to AR5, even 6.1 less if one considers the CO2 Mauna Loa data) after a cold year, in recent records. [François Gervais, France]	to are in fact part of Chapter 2 of the underlying assessment. It is up to the discretion of the authors of that Chapter to consider comments, to assess their validity, and how, if at all, to implement these recommended changes. No action for SPM. .
SPM-24	SPM	0				Cont. – This observation suggests minimizing the anthropogenic CO2 fraction remaining in air after natural exchanges to at least 1/4 of the increase observed at Mauna Loa. 1/4 of Mauna Loa data corresponds to ~ 1/10th of the anthropogenic emissions. This means that mitigation, viz. cutting the CO2 emissions by a factor of x is expected to have an impact on the composition of the atmosphere of x/10. I recommend that this remark should be made explicitly clear in SPM because policymakers have to be conscious that any effort at mitigation will have an impact divided by 10. [François Gervais, France]	Noted. SPM needs to be based on underlying comprehensive assessment of the scientific literature. No action.
SPM-25	SPM	0				Cont. – Unfortunately, my recommendation of superposing d(CO2)/dt and temperature curves, discussing the correlation and causation as well, has been ignored in AR5 SOD. This would have added enlightening arguments and I do not understand why the recommendation has been ignored. Note however that the recommendation appears to be relevant since in the meantime, O. Humlum, K. Stordahl, J.E. Solheim, Global & Planetary Change (2012) doi : http://dx.doi.org/10.1016/j.gloplacha.2012.08.008 have published exactly the same observation, correlation and suggestion. [François Gervais, France]	Noted. It is up to the discretion of the authors of that Chapter to consider comments, to assess their validity, and how, if at all, to implement these recommended changes. No action for SPM.
SPM-26	SPM	0				Cont. – O. Humlum et al conclude : « 2. Changes in global atmospheric CO2 are lagging about 11-12 months behind changes in global sea surface temperature. 3. Changes in global atmospheric CO2 are lagging 9.5-10 months behind changes in global air surface temperature. 4. Changes in global atmospheric CO2 are lagging about 9 months behind changes in global lower troposphere temperature. » More important, they also conclude : « 5. Changes in ocean temperatures appear to explain a substantial part of the observed changes in atmospheric CO2 since January 1980. 6. CO2 released from anthropogene sources apparently have little influence on the observed changes in atmospheric CO2, and changes in atmospheric CO2 are not tracking changes in human emissions ». [François Gervais, France]	SPM needs to be based on underlying comprehensive assessment of the scientific literature. Individual studies can't be cited in the SPM. No action.
SPM-27	SPM	0				Cont. – I am afraid that to continue to ignore such a key and crucial set of observations and correlations will be qualified as cherry picking and will disqualify the entire AR5 report. I have checked that the authors of AR5 display a preference to cite their own work or those of their coauthors in the past throughout FOD and SOD. But even if they do not recognize a clear correlation in a work of non-IPCC authors, nor a likely causation, they should at least discuss it. They should definitely not ignore it, especially when it is recommended by a reviewer, if they still want to comply with the scientific method. [François Gervais, France]	Reviewer does not provide evidence for his claims. Note that it is up to the discretion of the authors of that Chapter to consider comments, to assess their validity, and how, if at all, to implement these recommended changes. No action for SPM.
SPM-28	SPM	0				Cont. – There is another way to confirm the relatively small anthropogenic fraction of CO2 remaining in the atmosphere after action of carbon sinks which emerges from the observations above. I encourage the IPCC AR5 authors to check that the delta of C13/C12 ratio of –8 permil reported in Fig. TS.3 points to an anthropogenic CO2 fraction in the atmosphere of only ~ 5-6 %, ~ 20 ppm in other words. Such a low level means ~ 0.5 ppm (0.5/390 ~ 0.1 %) of residue of additional anthropogenic CO2 remaining in the atmosphere each year. It is important to note that this value is consistent with the low annual increase found after a cold year like 1991, the cold being due to the Pinatubo volcanic eruption. [François Gervais, France]	SPM needs to be based on underlying comprehensive assessment of the scientific literature. No action for SPM.
SPM-29	SPM	0				Cont. – If the (390 – 315)/315 = 24 % increase observed at Mauna Loa would be solely due to burning fossil fuels which show a delta of –26 permil according to the literature on this topic, one would expect a delta of –12 permil, not –8 permil which is observed. [François Gervais, France]	SPM needs to be based on underlying comprehensive assessment of the scientific literature. No action for SPM.
SPM-30	SPM	0				Cont. – Such a low level of anthropogenic CO2 residue in the atmosphere, and the recommended reduction of consecutive forcing in the RCP8.5 to the level of 0.0025 W/m2 per year already suggested in ROFOD (see arguments developed there), is compatible with climatic observations. The natural variability is quantified by the recovery of the Earth since the last Maunder minimum for example described by S.I. Akasofu (Natural Science 2 (2010) 1211) still not cited and discussed in AR5 SOD in spite of the recommendation of the reviewer in ROFOD, added to multi-decadal oscillations deduced from a Fourier analysis of HadCruT	SPM needs to be based on underlying comprehensive assessment of the scientific literature. Individual studies can't be cited in the SPM. No action.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						temperature data, as done by N. Scafetta (J. Atmospheric & Solar-Terrestrial Physics 71 (2009) 1916). This paper is also ignored in the AR5 SOD in spite of the recommendation of the reviewer in ROFOD. [François Gervais, France]	
SPM-31	SPM	0				Cont. – Scafetta found a number of resonances that he compared with the ones corresponding to the motion of the sun with respect to the barycenter of the solar system. He points towards an almost perfect coincidence of the frequencies of the various resonance peaks. The probability that these coincidences be fortuitous is near zero. The main resonance reported by Scafetta corresponds to a ~ 60 years-period oscillation. This is explicitly discussed by A. Mazzarella, N. Scafetta, Theor. Appl. Climatol, DOI 10.1007/s00704-011-0499-4, and by C. Loehle and N. Scafetta, Open Atmospheric Science Journal 5 (2011) 74. [François Gervais, France]	SPM needs to be based on underlying comprehensive assessment of the scientific literature. Individual studies can't be cited in the SPM. No action.
SPM-32	SPM	0				Cont. – This 60 years-period sinusoid is not a surprise. Several previous papers noted the presumably same oscillation with a similar time dependence and period in various proxies e.g. temperature (Box 2.2 Fig. 1 Bottom in this SOD), length of the day, AMO, PDO, ENSO, JISAO indices, GMSL trend reproduced in Fig. 3.14 in this SOD, and even in fishing productivity, see Klyashtorin, L.B. and A.A. Lyubushin, Cyclic Climatic Change and Fish Productivity, Ed. G.D. Sharp, VNIRO, Moscow (2007). See also Swanson K.L., Tsonis A.A., Geophys. Res. Lett. 36 (2009) LO6711, Schlesinger, M.E., N. Ramankutty, Nature 367 (1994) 723, Loehle, C., Ecological modelling 171 (2004) 433, Zhen Shan, L., Sun Xian, Meteorol Atmos. Phys. 95 (2007) 115. This short list is not exhaustive. [François Gervais, France]	SPM needs to be based on underlying comprehensive assessment of the scientific literature. Individual studies can't be cited in the SPM. No action.
SPM-33	SPM	0				Please avoid using 'but' in sentences - it disqualifies the previous statement. Remove qualifying info if possible, or present another way. Ie. Pg 5 line 8-9. There is very high confidence that globally, glaciers continue to shrink and lose mass. (if necessary include following). There is less agreement on rates of mass loss. [Government of Australia]	Accepted; but has been replaced in the sentence referred to.
SPM-34	SPM	0				Use human instead of anthropogenic throughout. [Government of Australia]	Reject; both terms used. Term is in the Glossary.
SPM-35	SPM	0				Provide explanation of the time frames used throughout - ie why 1986-2005, - why has this changed from 1960-1990? What time frame are near term and long term projections, how are they defined? This could be done as a table in new section 'info to help understand the SPM' [Government of Australia]	Reject; given the space constraints no extended introductory material could be added. See Chapter 12 for more details.
SPM-36	SPM	0				One thing that seems to be given short shrift in the SPM is atmospheric circulation changes e.g. widening of the tropics, Walker Circulation weakening, poleward shift in mid-latitude jets etc. There have been hundreds of papers on those topics over the past 7 years that have increased our understanding and can be linked to subtropical drying. There perhaps isn't any room for it, but the current dot points that are included in the SPM projections section (changes in tropical cyclones and extratropical cyclones) seem a strange choice under the heading 'atmospheric circulation' [Government of Australia]	Noted; SPM must rely on the assessment provided in the underlying Chapters.
SPM-37	SPM	0				Narrative The current SPM reads as an abridged version of a Technical Summary. The SPM simply pulls out some of the key scientific findings from the various chapters as dot points. It lacks an associated integrating narrative, both within individual sections and overall, that summarises the science and, to the extent possible, makes clear the implications for policy makers for the future. Users of the previous SPMs have strongly indicated that for AR5 it should be written in plain English and easily understandable. This should be an overriding goal of the SPM. The structure should therefore blend observations, attribution and projections around components of climate to form that narrative rather than separate those into out-of-context statements. This should be structured to aid interpretation of observations and promote understanding of the attribution and projections as a whole, rather than disconnecting them. Including a table of contents would make it easier to access information of interest. As a suggestion, the thematic structure could follow: • How to use the SPM (detailed in a further comment – could be an appendix) – Key terms and metrics used – Discussion of confidence and likelihood – Discussion of the new RCP scenarios and CMIP5 models • Summary of key findings	Reject; we strongly prefer the SPM being organized according to the underlying assessment report as the SPM must rely on the assessment provided in the underlying Chapters.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						– The information currently presented in the shaded boxes could be rewritten and pulled together as a 1 page summary. • Carbon and biogeochemical cycles • Atmosphere – Observations – Process understanding – Attribution – Projections • Radiative Forcing breakout box • Oceans – Observations – Process understanding – Attribution – Projections • Cryosphere – Observations – Process understanding – Attribution – Projections • Cross-cutting discussion of palaeoclimate information • Cross-cutting discussion on sea level rise • Cross-cutting discussion on the water cycle • Cross-cutting discussion on extremes events • Model evaluation • Commitment, irreversibility and tipping points • What needs to be done to resolve the main policy-relevant uncertainties identified in the AR5 [Government of Australia]	
SPM-38	SPM	0				How to use the SPM guide The SPM requires a more reader-friendly 'how to use the SPM' guide that provides a simple explanation of essential terms. This could be presented as an introductory statement (separate to the actual SPM) or as an appendix. This will allow policy makers to easily read and correctly interpret the information presented in the SPM. This guide could indicate what the SPM covers and who it is for. Initially, key terms such as climate variability, climate change (UNFCCC v IPCC definition), climate forcing, feedback mechanisms and greenhouse gases (both long-lived/well mixed (one term should be used through the entire report) and short-lived) should be explained. Baseline periods should also be explained as they are critical to understanding the SPM and move around significantly within the report. The concepts of confidence and likelihood are essential to understanding the SPM and must be clearly explained. The new RCPs represent a significant change from AR4 and will be a key issue for policy makers to understand. The introduction needs to include a clear explanation of what the RCPs are, how they relate to emission scenarios and the previous SRES scenarios, how they should be used by policy makers and reality of meeting any one of the RCPs. For example, the SPM focuses on RCPs 2.6 and 8.5 – are these the likely RCPs or are the mid range RCPs more relevant to policy makers? This discussion could also introduce the new CMIP5 model runs. It would be useful to have an FAQ on the RCPs within the report with an indication in the SPM of where this additional information is located. [Government of Australia]	Taken into account; SPM introduction has been substantially revised; uncertainty terminology is introduced in a para with two detailed footnotes; a new box has been added introducing the RCPs; results for all RCPs are now provided in the time series figures, though not in the maps due to space limitation. maps for all four RCPs are provided in the Technical Summary.
SPM-39	SPM	0				Technical language There are many examples throughout the SPM where technical terms are used that may not be readily understood by policy makers. Examples include a 'in a zonal mean sense' (p.3), 'dependencies of inferred trends on the index choice' (p.4), 'astronomically driven trends of summer insolation and temperatures' (p.7), 'Secular trends of total solar irradiance' (p.8), 'El Niño and La Niña-induced teleconnection patterns over the extra-tropical Northern Hemisphere' (p.15), and 'ocean thermosteric sea level rise to continue for centuries to millennia' (p.16). Transient climate response and equilibrium climate sensitivity should be used though be	Noted; improving readability has been a focus of the revisions of the SPM for the Final Draft. However, the assessment statements elevated to the SPM and their formulations need to be 100% consistent with the underlying assessment. We thus needed to find a balance between simplifying language and remaining consistent with the underlying assessment. TCR and

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						clearly explained. There are often too many complex numbers included in the text with the meaning and importance of the statements lost. It is cumbersome to have numbers within the text statements; it makes them hard to read and often confusing. Numbers could instead be inserted into tables. [Government of Australia]	ECS are in the Glossary of the WGI AR5.
SPM-40	SPM	0				Figures Figures are the most important part of the SPM, they will be replicated most widely, and provide the best opportunity to convey complex information to the most people. They are very complicated at the moment. You should be able to grasp the content of a figure within 30 seconds of viewing it. Breaking up the figures would help (and allow the thematic structure suggested to be followed). Making them easy to cut and paste into presentations would also be useful. Another consideration is how the figures print in greyscale. Please include clear figure heading for all figures. [Government of Australia]	Noted; a substantial amount of time and effort has gone into revising the SPM figures. We think our now 9 figures do meet all these criteria.
SPM-41	SPM	0				In many places, the SPM is still very difficult to read and understand. More attempt should be made to use plain language and provide the necessary contextual information for policy-makers to understand the findings. The authors may also wish to review the titles of the sections of the SPM to ensure that they are explicit and easily understood by policymakers. [Government of Canada]	Noted; improving readability has been a focus of the revisions of the SPM for the Final Draft. However, the assessment statements elevated to the SPM and their formulations need to be 100% consistent with the underlying assessment. We thus needed to find a balance between simplifying language and remaining consistent with the underlying assessment. TCR and ECS are in the Glossary of the WGI AR5.
SPM-42	SPM	0				The RCPs represent a major departure from past IPCC assessments as the basis for future climate change projections. The new approach is not sufficiently well described in the SPM. Although it may not be strictly a WGI issue, the WGI report is being completed first and therefore this is the place where the new scenario process will need to be explained. Sufficient space should be dedicated to conveying the overall SSP - RCP approach schematically, as well as detailed information on changes in RF, and in atmospheric GHGs and aerosols, and LUC for each of the RCPs (i.e. something similar to what was produced on pages 10-11 of the Synthesis Report of the TAR). [Government of Canada]	Noted: the RCP scenarios are now introduced in a new, concise box in the SPM (box SPM.1). A detailed comparison between climate projections using SRES vs RCP scenarios is given in the Technical Summary, Box TS.6 and in Chapter 12 of the underlying report. However, the reviewer is right, the underlying assumptions for the scenarios are outside the remit of WGI and the scenarios as such have not been assessed by WGI AR5
SPM-43	SPM	0				This SPM does not present sufficient information about short-lived climate forcers. This was a topic identified by governments as being of particular interest. There is no mention of black carbon in the entire SPM in contrast to the keen interest of governments in understanding what advances have been made in relation to the contribution of this forcing agent to climate change. The text on page 38 of the Technical Summary, lines 24-30 are highly relevant for policy-makers and could be brought into the SPM. In general, we would flag that terminology with respect to short-lived climate forcers needs to be consistently used and well defined in the SPM and throughout the report (long-lived GHGs, well mixed GHGs, short-lived GHGs, near term climate forcers etc.). [Government of Canada]	Taken into account. Section 3 "Drivers of Climate Change" and the corresponding figure SPM.4 have been substantially revised. Figure SPM.4 now also presents individual contributions from short lived climate forcers.
SPM-44	SPM	0				We greatly appreciate the consistent treatment of uncertainty throughout AR5, but the current explanation of the uncertainty terminology is insufficient for the SPM. Similar to past assessment reports, a box in the SPM explaining the treatment of uncertainty is recommended. To the extent possible, the SPM should provide the necessary information for readers to interpret the findings, and include references to more detailed explanations where appropriate. [Government of Canada]	Taken into account; while not in an SPM box, uncertainty terminology is now explained in two detailed footnotes. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1)
SPM-45	SPM	0				Sections called "carbon and other biogeochemical cycles/quantities" do not report on other biogenic elements or cycles (i.e. N…) but are limited to pH i.e. Ocean acidification (which is related to the carbonate system). Titles need to be modified accordingly to their content [European Union]	Reject; the title reflects the assessment provided in WGI AR5.
SPM-46	SPM	0				It would help reader, if terms used to describe the degree of certainty in key findings is explained in a box, or equivalent, as was done in the SREX SPM. [Government of Finland]	Taken into account; while not in an SPM box, uncertainty terminology is now explained in two detailed footnotes. In addition, a new box on the treatment of uncertainty in the AR5 has been added to

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							the Technical Summary (see Box TS.1)
SPM-47	SPM	0				The use of only recent periods (i.e. 1981-2010, 1961-1990 in Fig SPM.1 / 1986-2005 in Fig SPM.5) for defining the evolution of anomalies artificially attenuates the feeling about the amplitude of the past and future climate change. There are good reasons for choosing these reference periods, therefore we just suggest to add on the relevant figures an horizontal line showing the best estimate, if any, of the corresponding value for the pre-industrial period (or the end of the XIX Century). As an example, on Fig SPM.1e), this horizontal line should highlight the -0.66°C observed increase in temperature. Such additional information is not necessary in the "technical Chapters" and it would require a huge amount of work. In SPM, it would definetely help in better assessing the importance of observed and projected changes. [Government of France]	Noted. We appreciate the fact that providing anomalies relative to preindustrial is of importance. However, this turns out to be difficult for many quantities due to severe data limitations from the preindustrial (or even early industrial) period. Even for quantities where data is available, simply adding up observed and projected changes is not straightforward due to effects from model biases or effects from natural internal variability. The value for a preindustrial (1850-1900) offset for global mean surface temperature has been added to footnote (a) of Table SPM.2.
SPM-48	SPM	0				Need for the table presenting the different levels of certainty [Government of France]	Taken into account; while not in an SPM box, uncertainty terminology is now explained in two detailed footnotes. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1)
SPM-49	SPM	0				Try to make links, whenever it is possible, to concrete emissions and actions [Government of France]	Unclear what is requested -- no action.
SPM-50	SPM	0				have a more concrete vision of the contribution of retroactions (feedback from carbon cycle) when talking about forcing (section 3 especially, but also 5) [Government of France]	Unclear what is requested -- no action.
SPM-51	SPM	0				Better illustrate the links between emissions and concentrations, and their dynamic aspects. [Government of France]	Unclear what is requested -- no action.
SPM-52	SPM	0				Adding a point on the levels of current and past anthropogenic emissions (and their accuracy, evolution, etc) could help making a concrete link with concentrations and radiative forcing. Policies are dealing with this parameter. [Government of France]	Noted. Cumulated carbon emissions are part of the SPM in the Sections on Observations and Projections, and are now presented in the newly added Figure SPM.9
SPM-53	SPM	0				The paragraph headings are different from the name of report chapters. The sequential organization isn't the same between this summary and the "technical summary" and the titles of report. For example, we find "atmosphere observation" for one and "atmosphere and surface" more far. Why the sea level observation is a specific paragraph after the cryosphere and it's treated in the chapter "Observation : ocean" in the report. idem for "clouds ans aerosol" and "Climate processes". This induces difficulties for the reader. [Government of France]	Noted. The SPM narrative closely follows narrative of the WGI contribution to AR5, as does the Technical Summary. We don't think a 100% consistency between subtitles in SPM and TS is either practical or useful.
SPM-54	SPM	0				We do not always understand the logic of highlighting one certain paragraph in each section. In general, it seems that statements are highlighted which the authors found important, and that are at a higher level than the rest of the paras in the section. Please revise the highlighting of paras in the SPM. We suggest the following criteria: 1) para summarizes the section or provides info at a higher level than the remaining paras. 2) para containes the most important message of the section. [Government of Germany]	Taken into account. We have tried to homogenize the status of the highlighted statements.
SPM-55	SPM	0				The figures will be very important for outreach. They should be simple without diluting the scientific content. An informed layperson should understand the basic messages without reading the text. [Government of Germany]	Noted; a substantial amount of time and effort has gone into revising the SPM figures. We think our now 9 SPM figures do meet these criteria.
SPM-56	SPM	0				The use of scientific jargon should be strictly avoided. All scientific terms should be supported by simple explanations and whereever possible short definitions in the text for non-experts. At least all expressions used in the SPM and TS should be explained in the Glossary. A footnote should be added to the SPM informing the reader that all important expressions are explained in the Glossary. [Government of Germany]	Reject -- many terms are explained in the WGI AR5 Glossary. There is no room to add explanations of all scientific terms in this SPM of the WGI AR5 report. A general footnote to remind reader about the Glossary is not considered useful and needed.
SPM-57	SPM	0				Much of the information both in the text and the graphics on the chance in climate parameters is given wrt the	noted; Relevant text and graphics now include a

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						reference level 1986-2005. The information needed by policy makers is however the change since pre-industrial conditions. This is one major flaw of this report. Under UNFCCC, countries have agreed to limit warming to below 2 degree C compared to the pre-industrial level. IPCC (across working groups) should respond to the clear policy need from UNFCCC and give information on the climate state for this reference level. This might not be possible for all variables, but comparison to pre-industrial should be the the norm, not the exception. This statement applies to the entire report. [Government of Germany]	listing of the offsets required to compare the changes reported in AR5 with pre-industrial, and other previously used reference periods. See for example, Table SPM 2, note (a).
SPM-58	SPM	0				Throughout the whole WGI report where possible, reference should be made to preidustrial levels. Make sure the presentation of temperature changes is consistent with the presentation if the other Working groups so that references to impacts and mitigation scenarios can be made. [Government of Germany]	noted; Relevant text and graphics now include a listing of the offsets required to compare the changes reported in AR5 with pre-industrial, and other previously used reference periods. See for example, Table SPM 2, note (a). Temperature projections are assessed by the WGI experts and WGs II and III will be basing their assessment on the WGI assessment
SPM-59	SPM	0				Please explain the choice of the interval boundaries for the ranges, and the for associated uncertainty, if possible in the text. At least provide references where this information can be found in text. Are the choices comparable to AR4? This information is relevant costal protection in the case of SLR. See also our comment on section 12.4.1.2 in chapter 12 [Government of Germany]	Unclear which part of the SPM this comment refers to -- no action.
SPM-60	SPM	0				Fig. SPM.7: Are the contributions from from ice-sheet dynamical changes and anthropogenic land water storage reallly independent of the scenario? [Government of Germany]	No, they are dependent on scenario, but there is currently no scientific basis to assess these contributions by scenario. This is now clearly stated in footnote (b) of Table SPM.2
SPM-61	SPM	0				Fig. SPM.7: The grey shading and the mean in the left parts of the graph look different from the mean values over 2081-2100. It might be clear to experts, that this is due to averaging different time periods (?correct?), but for non-experts it looks very strange. Please explain carefully or improve the figure. [Government of Germany]	Accepted. The figure has been simplified and now is limited to the time series plots. The caption now explains the vertical bars specifically: "The assessed likely ranges for the mean over the period 2081−2100 for all RCP scenarios are given as colored vertical bars, with the corresponding median value given as a horizontal line"
SPM-62	SPM	0				There are many different reference periods, e.g. 1986-2005, 1971-2000, 1981-2000, 1961-1990, 1961-1990, 1979-2000. It is not possible to compare all this information and to get a general understanding for the trends and changes in this variety of periods. [Government of Germany]	The SPM must be relying on the assessment in the underlying report. Harmonization of reference years in the SPM is not possible in all instances due to the fact that the scientific evidence assessed in the Chapters varies strongly regarding data availability, length of records etc.
SPM-63	SPM	0				RCP scenarios are very important to estimate future climate change. However, the new scenarios are not familiar with policy makers and may not be easy to understand. Therefore, it should be clearly explained for policy makers what RCP scenario is and what RCP 2.6, 4.5, 6.0 and 8.5 stand for. Additionally, the roles of WGs are also important to be clarified to policy makers, for example, by indicating (possibly in Foreword or Preface) that WG1 utilizes RCP scenarios as a given for projection and WG3 assess those scenarios including their feasibility. [Government of Japan]	Accepted. A new box on the RCPs has been included (new Box SPM.1)
SPM-64	SPM	0				The AR5 has obviously made progress since AR4 as described in SPM; however, it would be better to indicate that there are still uncertainties and there are still some important scientific challenges in the field of climate change (for example, as shown in TS.6: Key Uncertainties, Chapt1. FAQ 1). In order for policy makers to make appropriate decisions, it is important to show not only the latest findings but also its limitations in SPM. [Government of Japan]	Noted. As the reviewer correctly points out, our approach was to provide an extended section on key uncertainties in the WGI AR5 as part of the Technical Summary rather than to add all of these important though often technical details in the severely space-limited SPM.
SPM-65	SPM	0				Overall, the structure of SPM should be more in line with the TS. In this version, the sequence of articles does not correspond to that of the subsections of TS and therefore the reader has difficulties referring to corresponding information. [Government of Japan]	Noted. The SPM narrative closely follows narrative of the WGI contribution to AR5, as does the Technical Summary. We don't think a 100% consistency

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							between subtitles in SPM and TS is practical or useful.
SPM-66	SPM	0				The characteristics of SRES scenarios and RCPs, and the differences between them should be summarized in SPM or TS to help decision makers to understand the continuity of IPCC assessment reports, since IPCC assessments reports have provided the scientific basis to the global warming countermeasures. [Government of Japan]	Accepted. A new box on the RCPs has been included (new Box SPM.1)
SPM-67	SPM	0				The level of confidence is determined based on the author teams' qualitative judgments. On the other hand the degree of certainty is determined based on the quantitative scale such as probability. In the AR5, both the level of confidence and the degree of certainty are described using calibrated languages defined in Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties (2010, IPCC). Since it could be concerned that the policy makers may not be familiar with the difference between two above-mentioned terms and the calibrated language, it would be desired to include relevant clear explanations regarding these matters in the SPM to help policy makers' understanding. [Government of Japan]	Taken into account; while not in an SPM table, uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1)
SPM-68	SPM	0				The whole chapter needs to be rigorously edited to make the relevance clear to a non-technical audience without referring to the underlying chapters. At the moment it does not provide a particulalrly useful or accessible summary for policy makers [Government of New Zealand]	Noted.
SPM-69	SPM	0				Given that this is a summary for policymakers it may be necessary to define some of the terms and spell out acronyms at the first use as many will read this as a stand-alone document without access to the underlying report including the glossary. Specific examples are covered in the comments below. [Government of New Zealand]	The underlying WGI AR5 does include a extended Glossary and list of acronyms. Given the limited space available and the summary character of this document, it is not feasible to introduce all the technical terms in the SPM, in addition to the Glossary.
SPM-70	SPM	0				In the draft SPM most of the key findings start the sentence with explaining the level of certainty and confidence. We feel that this make the sentences less readable and therefore propose that this classification is placed in parentheses at the end of the sentences or separately in the left margin clearly linked to the section it describes. [Government of NORWAY]	Reject. The WGI approach has and will be in the AR5 to firmly embed the uncertainty terminology in the text. In cases where it is beneficial for the readability of a statement, the confidence assessment (not the likelihood) is provided at the end of the statement, in parentheses.
SPM-71	SPM	0				We want to stress the importance of clear and understandable language in the SPM. It is important that stakeholders, (such as politicians, government experts, journalists, industry and other stakeholders) who want to go beyond media reporting to read what the scientists are really saying, understands the SPM. [Government of NORWAY]	Noted
SPM-72	SPM	0				We suggest that, for every thematic section of the SPM, bullet points are placed in falling order according to policy-relevance (without splitting up closely thematically related bullet points). [Government of NORWAY]	The SPM is closely following the narrative of the WGI AR5 report. We prefer this to the proposed listing of bullets according to policy-relevance (which would certainly be extremely difficult to get agreement on)
SPM-73	SPM	0				The draft SPM refers extensively to different level of certainty and confidence. It is very important that the meaning of these classifications is clear for the reader. A study by the University of Illinois has shown that people assigned lower likelihood values to the IPCC's descriptors in AR4 compared to what the IPCC actually meant. The researchers suggested that the IPCC consider including the associated range of probabilities whenever a probability descriptor is used, rather than only publishing a key to the terminology. We support this recommendation. However, we see that it might be a challenge to do so. As a minimum you should include the two diagrams from SPM SREX Box 2 in the introduction section of this SPM. See our comment to page 2 line 22. [Government of NORWAY]	Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1)
SPM-74	SPM	0				Is it possible to harmonize the reference years for many of the observations? E.g. on page 3, line 21-25 there is a reference to temperature increases relative to 1901-2012 and 1979-2012, while it is stated on page 10, line 9 that human activities have caused temperature change since the 1950s. Further, on page 17, line 33-37 the warming in 2300 is related to the timespan 1986-2005. Please go through the SPM and see if there is a	Reject. The SPM must be based on the underlying report. Harmonization of reference years SPM is not possible due to the fact that the scientific evidence assessed in the Chapters is not on harmonized

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						possibility to harmonize the reference years for which temperature increases, ice melting, sea level rise etc. are referenced to. [Government of NORWAY]	reference years.
SPM-75	SPM	0				We ask you to consider to address short-lived climate forcers and tipping points in the SPM. [Government of NORWAY]	Noted. Short-lived climate forcers are covered in the SPM, e.g., in Section SPM.3 Drivers of Climate Change, most importantly in Figure SPM.4. Abrupt climate change (or "tipping points" -- the term is not being used in the SPM) is being discussed in the context of AMOC and Sea Level Changes in the projections Section of the SPM, Section 5.
SPM-76	SPM	0				Please consider to include a last page in the SPM that lists all the abbreviations and definitions of the key most technical terms (such as climate sensitivity, radiative forcing, natural variability, zonal mean, etc.) used in the SPM. You should also consider including simple explanations of some of the specific met./ocean./hydro. terms/prosesses used throughout the SPM (such as paleoclimate, cryosphere, troposphere, stratosphere, monsoon, El Nino/La Nina, tropical belt, jet streams, polar vortex, tropical cyclones, subtropical gyres, acidification, permafrost etc.) [Government of NORWAY]	Reject. The underlying WGI AR5 does include a extended Glossary and list of acronyms. Given the limited space availed and the Summary character of this document, it is not feasible to introduce all the technical terms in the SPM, in addition to the Glossary.
SPM-77	SPM	0				Annex 1 (atlas) contains data and maps of the 18 sub-continental-scale regions -and the world-, computed from GCM of the Coupled Model Intercomparison Project Phase 5 (CMIP5). The large database that supports this atlas has the consistency necessary for comparative analyzes that can highlight or put the focus on certain regions. Thus, it is suggested that an analysis of this type can lead to some conclusions about which regions or group of regions can be identified with higher -or lower- changes in temperature and precipitation. If the data to analyze the changes don't allow figures in absolute values, they can allow to identify regions on the planet where the changes are relative bigger than in others. The results from this analysis could be part of some information in SPM, fulfilling the original idea for the AR5 to improve the treatment of regional information. [Government of Spain]	Thank you. The SPM needs to be fully based and consistent with the underlying Chapters. It thus can not include an analysis based on the data underlying Annex I that is not included in the underlying report.
SPM-78	SPM	0				The document uses repeatedly the concept of Radiative Forcing (RF), although it is not explained in the text (only in a 4 lines foot note). RF is a physical magnitude difficult to understand outside the scientific community, and so it is not appropriate for the purpose of this report: a Summary for Policy Makers. It is recommended either to further explain its meaning so that a wider public may understand it or, alternatively, replace it, where it appears, by a more accessible word/expression or sentence that could give an idea of its relevance and implications. [Government of Spain]	Radiative forcing is defined in the WGI AR5 Glossary and the concept is explained in detail in the underlying Chapters (in particular Chapter 8). We appreciate the importance of the term/concept and thus include a targeted footnote briefly summarizing the most important facts about Radiative forcing. We feel that this approach is warranted, considering that the concept and term have been used in all previous IPCC assessment reports.
SPM-79	SPM	0				Trends in different variables are mostly expressed throughout the document as absolute magnitudes in physical units. For the purpose of this document it would be advisable to try to use relative magnitudes (%), especially in the case of some variables (e.g. heat content, biogeophysical variables...) that policy makers and general public are not used to quantify. [Government of Spain]	Noted. The reporting of trends in the SPM varies not only depending on the variable of interest but also on the assessment presented in the underlying report.
SPM-80	SPM	0				General comment: RCP are used continuously in the document, but very little text is devoted to describe them. It is recommended to further explain them and introducing a new Table showing the main rationale behind each RCP. [Government of Spain]	Accepted. A new box on the RCPs has been included (new Box SPM.1)
SPM-81	SPM	0				It is important that the SPM provides a clear and lucid message for policy-makers. Statements should, as much as possible, while still maintaining scientific correctness, map on policy foci and be possible to take in without necessarily needing to turn to the underlying chapters to complete the information. (Chapter references are certainly needed nevertheless.) [Government of Sweden]	Noted.
SPM-82	SPM	0				As written, the SPM is not accessible to a policymaker or general population audience. Additional prose should be added to present a narrative that genuinely explains the Physical Science Basis. In addition, please consider defining critical vocabulary (within the SPM such that it stands alone) that may be obtuse to target readership but that represents pivotal concepts underpinning the case for human-induced climate change. This is an opportunity for IPCC to improve upon what has been done in the past – to reach the intended	Noted. Improving the narrative has been a focus of the revisions towards the Final Draft. Regarding critical vocabulary the reader is referred to the WGI AR5 Glossary given the limited space available in the SPM.

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						audience(s) more effectively. [Government of United States of America]	
SPM-83	SPM	0				The word 'attribution' is formally defined in the Glossary, yet it (and variations thereof) appears to also be used colloquially at times in this Technical Summary (e.g. TS-10 Line 40; TS-18 Line 2). An alternative word(s) or phrasing should be used in such instances. [Government of United States of America]	Note: comment refers to TS, not SPM. Taken into account. However, TS language also needs to reflect the language used in the underlying chapters. Thus "attributed to" is still used for example in the TS drivers section in line with Chapter 8
SPM-84	SPM	0				As written, the SPM is not accessible to a policymaker or general population audience. Additional prose should be added to present a narrative that genuinely explains the Physical Science Basis. In addition, please consider defining critical vocabulary (within the SPM such that it stands alone) that may be obtuse to target readership but that represents pivotal concepts underpinning the case for human-induced climate change. This is an opportunity for IPCC to improve upon what has been done in the past – to reach the intended audience(s) more effectively. [Government of United States of America]	Noted. Improving the narrative has been a focus of the revisions towards the Final Draft. Regarding critical vocabulary the reader is referred to the WGI AR5 Glossary given the limited space available in the SPM.
SPM-85	SPM	0				There is an inconsistent presence of 'likelihood' and/or 'confidence' classifications in the bullets throughout the SPM. Some statements (e.g., SPM-5, line 23-35; SPM-12, line 38-39) have no classifications at all, despite therir content beign similar to that of other statements that have classifications. [Government of United States of America]	Statements in the SPM and the assessed uncertainty must be fully based on the underlying assessment of the scientific evidence in the Chapters. Improving consistency across Chapters has been a focus of the revisions towards the Final Draft.
SPM-86	SPM	0				Both sections, 'Summary for Policy Makers' and 'Technical Summary', provide relevant information on near-term climate change covering different aspects that are described in detail in Chapter 11. [Government of United States of America]	Noted.
SPM-87	SPM	0				The SPM should be checked for consistency in terms of style, terms, use of dates (ka, kya, CE), and how uncertainty is referenced. [Government of United States of America]	Noted, copy editor.
SPM-88	SPM	0				Although this is a reasonable first SPM draft we suggest that more could be done to make it more accessible to policymakers and more general readers. In summary we suggest that it is shortened, and written more as a narrative rather than as a series of facts; that instead of following the chapter order of the report it is structured around the kinds of questions policymakers raise. The interesting facts the policy maker wants to know are, if present at all, buried in unnecessary detail. All too often it uses technical language but it should be accessible to the non-specialist. It also often leaves the reader to infer the significance of the statements it makes - it needs to set factual statements in context better. For example in section on 'key metrics' section, page 11 2nd para - what does 1000 PgC relate to in terms of total emissions? There are also a number of detailed points on style and content that would help make it more accessible. These are outlined in the following points. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. While not shortened, the accessibility to policymakers has been a focus of the revisions towards the Final Draft. However, the SPM needs to be fully based on the underlying assessment in the WGI Chapters and thus we prefer to follow in the SPM closely the narrative in the WGI AR5.
SPM-89	SPM	0				On structure - instead of having the SPM directly follow the structure of the underlying chapters, We suggest re-structuring it as follows: 1. How the climate has changed/is changing 2. How is the climate likely to change in the future 3. Why are these changes happening 4. How do we measure and project climate change. The language needs to be more precise (for example in several places it refers to 'in the last 3 decades' - the language needs to be such that it can be read in 3 or 4 years time and mean the same thing). Essentially, it needs to be much less full of jargon and much more targeted to non-specialists. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. The SPM needs to be fully based on the underlying assessment in the WGI Chapters and thus we prefer to follow in the SPM closely the narrative in the WGI AR5. Avoiding jargon has been a focus of the revisions towards the Final Draft.
SPM-90	SPM	0				The SPM makes no reference to geoengineering, despite this being part of the AR5's remit. Conclusions relating to geoengineering should be included. Currently the only reference is to the need for negative emissions but more should be said on solar radiation management as well as the wider implications of carbon dioxide removal (negative emissions). We recommend that the following lines are included: "Theory, model studies and observations suggest that some Solar Radiation Management (SRM) methods, if realisable, could substantially offset a global temperature rise and some of its effects" (Chapter 7, p.7, l.49-50); "SRM would produce an inexact compensation for the RF by greenhouse gases" (Ch.7, p.6, l.4); "Numerous side effects and risks from SRM have been identified" (Ch.7, p.6, l.10). Also, if the definition given in FAQ7.3 is the agreed IPCC AR5 definition for geo-engineering this should be included here. Suitable text would be Chapter 6, page 72, lines 19-26. A definition of CDR is also needed. Follow this with text from Chap 6, page 5, lines 52-55:	Accepted. A extensive bullet on Geoengineering has been included in the SPM revisions. The topic "Geoengineering" was and is extensively covered in the underlying Draft Chapters.

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						"The level of scientific knowledge is....low and uncertainties are very large." It should also be stated that this SPM only considers effects on the carbon cycle; impacts and costs are dealt with in AR5 WG II and WG III. [Government of United Kingdom of Great Britain & Northern Ireland]	
SPM-91	SPM	0				Other issues are not dealt with well - SLCF, metrics and ocean acidification - see later comments. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted.
SPM-92	SPM	0				Figures and diagrams - eg SPM.1 - are based on anomalies, rather than absolute changes. We suggest the non specialist would understand absolute values more easily. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted.
SPM-93	SPM	0				Most of the SPM is written from a global average perspective. A more regional emphasis and detail would be useful for policy makers, both in terms of observed changes and future projections - the current statements about regional changes are too broad to be useful. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted.
SPM-94	SPM	0				In several places the SPM indicates that specific findings are an update on AR4, but doesn't say how they differ from the previous findings. It needs to do so in order for these statements to have value and for comparisons to be made between the two reports - we suggest you add this information (i.e. what is new). [Government of United Kingdom of Great Britain & Northern Ireland]	Accepted. This has been a focus of the revisions towards the Final Draft.
SPM-95	SPM	0				Confidence statements need to be explained somewhere up-front (this could be taken from previous IPCC reports - for example, the SREX). There seems to be inconsistency between when confidence statements are used and when they are not used. Thus, there needs to be a clear statement up-front concerning why and when they are used and why and when not. For example, page 5 para 3 on Greenland Ice Sheet has a confidence statement but para 5 and 6 on Arctic and Antarctic sea-ice don't. [Government of United Kingdom of Great Britain & Northern Ireland]	Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1). Statements in the SPM and the assessed uncertainty must be fully based on the underlying assessment of the scientific evidence in the Chapters.
SPM-96	SPM	0				There appears to be no explanation of what the grey-brown boxes are for - am guessing that they are the authors' interpretation of highlights for policy-makers, [Government of United Kingdom of Great Britain & Northern Ireland]	Accepted. An explanation of they highlighted boxes has been added in the introduction.
SPM-97	SPM	0				The RCPs need to be fully explained somewhere. If possible, a look-up table with what they mean in terms of forcing and temperature. [Government of United Kingdom of Great Britain & Northern Ireland]	Accepted. A new box on the RCPs has been included (new Box SPM.1)
SPM-98	SPM	0				Referring to our comment on the whole report and most importantly, a 1986-2005 baseline is used. The baseline most relevant for policymakers is pre-industrial. Ideally the SPM should use this baseline, or at least contain information on how to make the conversion. Also, 1986-2005 is a different baseline from AR4's. The change needs a clear explanation. [Government of United Kingdom of Great Britain & Northern Ireland]	noted; Relevant text and graphics now include a listing of the offsets required to compare the changes in temperature reported in AR5 with pre-industrial (1850-900 for the CMIP5 models), and other previously used reference periods. However, we do not intend to repeat all the end of century projections for the 10-year AR4 averaging period 2090-2099 as for the AR5, we have decided to stick to 20-year average periods. Furthermore, complete comparability is limited by the transition from CMIP3 to CMIP5 and from SRES to RCP scenarios.
SPM-99	SPM	0				Table SPM 1 provides a useful update on changes in understanding of likelihood since AR4. This isn't reflected well in the text - in places it says that a finding is an update on AR4, but doesn't say how. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. However, Table SPM.1 is special in the sense that it summarizes the assessment of climate extremes from observations, detection/attribution, to projections, which had been recently assessed by IPCC in the Special Report SREX. Working out differences between SREX and the AR5 was felt to be crucial. This would however not be that useful for other parts of the assessment where the AR4 was the last IPCC reference point from more than 6 years ago.

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SPM-100	SPM	0				There should be stronger messages about confidence in the evidence base (not just what models do well, but also what we are more confident about now). [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. However, SPM must be fully based on the underlying reports and the uncertainty assessment presented.
SPM-101	SPM	0				There is an apparent assumption in the SPM that those reading the document have knowledge of the abbreviations used which are not in common use in policy groups outside the IPCC process. To make the SPM readable, climate science community specific abbreviations must be avoided. [Government of United Kingdom of Great Britain & Northern Ireland]	The underlying WGI AR5 does include an extended Glossary and list of acronyms. We prefer not to add additional list for the SPM only.
SPM-102	SPM	0				There is a need for a translation of the IPCC's understanding of uncertainty terms for a lay audience, perhaps as an annex. [Government of United Kingdom of Great Britain & Northern Ireland]	Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-103	SPM	0				On air quality - the summaries pay little attention to 'air quality' (non-long lived GHG pollutants in this context), which is surprising. Recent incorporation of air pollution science into earth system models has expanded their process descriptions to include the key roles of reactive nitrogen in both carbon sequestration through fertilisation and ozone formation and the relationship between ozone's direct impact on plant growth reducing carbon sequestration. [Government of United Kingdom of Great Britain & Northern Ireland]	Accepted. The assessment findings on air quality issues have been considered in the revisions towards the Final Draft of the SPM.
SPM-104	SPM	0				Need to include something on the role of short-lived climate forcers in reducing future climate change, and, if possible, in relation to timing of reductions on rate of temperature change. This is of direct policy relevance. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. Short-lived climate forcers are covered in the SPM, e.g., in Section SPM.3 Drivers of Climate Change, most importantly in Figure SPM.4. The possible role in reducing climate change is part of the scenarios used to project climate change. More information on scenarios and future projections in the SPM is given in Section 5 of the SPM as well as in the newly added SPM Box.1 on the RCP scenarios.
SPM-105	SPM	0				An explicit statement on 21st century RF and its uncertainty (as represented in CMIP5 models for example) could be added to section 3 or 5, consistent with Fig. SPM.5. [Tim Johns, United Kingdom of Great Britain & Northern Ireland]	Taken into account. This is included in the newly added SPM Box.1 on the RCP scenarios.
SPM-106	SPM	0				Congratulation to this excellent SOD of the SPM. [Fortunat Joos, Switzerland]	Thank you.
SPM-107	SPM	0				The long-term consequences of anthropogenic carbon emissions are not highlighted sufficiently. Carbon emissions affect the atmosphere, ocean and land biogeochemistry and climate over millennia. There are a range of paper in the literature that discuss the long-term, and partly irreversible consequences of current emissions. [Fortunat Joos, Switzerland]	Noted. Long-term consequences and irreversibility due to carbon emissions are now more prominently included in the SPM, based on Chapter 12's assessment of the literature.
SPM-108	SPM	0				Ocean acidification and the irreversible perturbation in ocean pH and saturation state and pCO2 in the surface and at depth are not sufficiently addressed, despite requests from several governments in the scoping processes to include OA [Fortunat Joos, Switzerland]	Noted. Ocean acidification and the changes in surface ocean pH are prominently highlighted in two of the 9 SPM figures and in corresponding bullets in both the observations and the projections sections of the SPM.
SPM-109	SPM	0				The SPM and the whole report represent a tremendous effort from the team of authors, who should be congratulated for producing such a thorough and comprehensive assessment. I have only made a small number of comments on the SPM, on issues that I think need to be addressed in revisions to make it more relevant to policy makers and less open to misinterpretation. [David Karoly, Australia]	Noted.
SPM-110	SPM	0				The SPM should include an estimate of the uncertainty in global warming projections for RCP8.5 due to carbon cycle feedbacks. The concentration-driven simulations do not include the positive feedback of temperature on the carbon cycle {6.4.2.1}, so likely underestimate future climate change from anthropogenic emissions consistent with the RCP concentrations. This is particularly relevant for the upper 95% bound for the uncertainty ranges for the higher RCPs from the CMIP5 models, which appears to be based on the concentration driven results and appears not to include the effects of the carbon cycle feedback described on SPM-17, lines 1-4. The ES of Chapter 12 (12-6, lines 14-17) provides a best estimate additional warming of 0.2C for RCP8.5 due to carbon cycle feedbacks with a larger increase of ?? to the 95% upper bound of global	Taken into account. SPM text in the projection section and figure caption clearly state that these projections are based on the concentration-driven CMIP5 runs. A paragraph discussing the resulting differences when compared to AR4 has been included. However, the ranges requested by the reviewer are not available from the underlying WGI AR5 assessment and thus can't be presented in the SPM as the SPM needs to

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						warming for RCP8.5, which could estimated from SCMs and the emission driven CMIP5 simulations. Alternatively, the additional global warming for the emission driven simulations could be estimated from the transient response to cumulative emissions SPM-11, lines 32-33 and the carbon cycle feedback SPM-17, lines 1-4. This would allow an easier comparison of the global warming projections for a high emission scenario between the AR5 and the AR4. [David Karoly, Australia]	be fully based on the assessment in the underlying report. The SPM can not include new assessments that are not part of the WGI AR5 Chapters.
SPM-111	SPM	0				The SPM overemphasises the role of CMIP5 in our understanding of climate. While, of course, CMIP5 is an important input, the assessment often neglects other studies and models not included in that project. The IPCC should assess climate literature in its entirety. Suggest that the basis statements in the SPM relying on CMIP5 be broadened. [HAROON KHESHGI, United States of America]	Reject. The reviewer does not provide any scientific evidence for his claim of neglecting of "other studies and models". The assessments of, e.g., Quantification of Climate System Response or the relationship of temperature change and cumulative CO2 emissions (Figure SPM.9), to just mention two examples, are based on much wider evidence than just CMIP5 models.
SPM-112	SPM	0				The criteria for defining likelihood of trends and confidence level (very high, low….) are not clear through out the report. In IPCC 2012, Guidance note (Mastrandrea et al.) also does not say clearly whether the robustness was decided based on the number of papers available on the topic or the class of journal or the publisher of the journal/impact factor of the journal or the number of samples/number of years/the reputation of group reporting the measurements etc.? [Umesh Kulshrestha, India]	Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1)
SPM-113	SPM	0				The SPM is the most critical chapter in the AR5. It is also the only chapter that is likely to be read by most people outside of the climate science community. It is, therefore, critical that this chapter be readable and understandable by lay persons. To that end, I first suggest that the SPM be read and edited by several lay people, drawn from different backgrounds. I believe that the text can be obscure and difficult to understand by even intelligent people, if they are unfamiliar with the jargon of climate change. I suggest having a glossary of acronyms, including brief clarifications of some critical terms, such as the qualitative difference between alternative Representative Concentration Pathways (RCP's). For example, the average reader may not understand the qualitative difference between RCP 2.6 and RCP 8.5. The users of the AR5 SPM need to have a ready reference to which they can go to understand terms with which they are unfamiliar. [Julian Levy, U.S.A.]	The underlying WGI AR5 does include both, an extended Glossary and a list of acronyms.
SPM-114	SPM	0				The AR5 does an excellent job of quantifying confidence with respect to those aspects of climate that have been studied. But, it fails to give a good perspective on those aspects of climate that have not been studied. Additionally, the SPM does not provide a clear picture of what areas of climate science deserve priorty funding for futher study. Therefore, within the SPM, I suggest adding a section describing major areas requiring additional research and/or clarification. This section would assist policymakers and the press in placing the overall conclusions of the AR5 into perspective. It would also assist policymakers in defining where future funding would do the most good in resolving outstanding climate change issues. For example, Chapter 9, page 9-24, lines 14-17 state, "In summary, there remain significant errors in the model simulation of clouds. It is very likely that these errors contibute significantly to the uncertainties in estimates of cloud feedbacks . . . and consequently in the climate change projections reported in Chapter 12." This statement should be brought forward to the SPM because it highlights a weakness in the effort that might be resolved with additional funding. [Julian Levy, U.S.A.]	Noted. The SPM needs to be fully based on the assessment in the underlying report. The SPM can not include new assessments that are not part of the WGI AR5 Chapters. It is not within the mandate of the IPCC to point towards areas of climate science that deserve priority funding as this would be policy-prescriptive.
SPM-115	SPM	0				The conclusions of AR5 are built upon the assumption that projected climate changes do not alter the climatic processes modeled. There is no mention of the possibility that anything more than a small perturbation to the climate could alter climatic processes as we currently understand them. It should be mentioned that we assume that climatic processes, as we understand them today, will continue in the future--even if there are changes in emissions and climatic variables. As a corollary, the AR5 should mention that if those processes are altered in a significant way, the conclusions of AR5 could be invalidated. [Julian Levy, U.S.A.]	Reject -- physical and biogeochemical feedback processes are a crucial part of the climate system, included in the current generation of climate models, and assessed in the underlying report.
SPM-116	SPM	0				This chapter is exceptionally poor. It fails to comply with directives to be inclusive, it ignores a natural climate force that can account for most if not all of the observations that you end up blaming on anthropogenic forces, and the claims in this chapter are based on climate models that do not simulate all climate forces with 100% accuracy. This chapter also lacks integrity because it fails to mention the caveats associated with incomplete	Noted -- unclear which Chapter the reviewer refers to. No action.

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						climate models. [John McLean, Australia]	
SPM-117	SPM	0				As it stands, the text is a very dry read- being largely a set of bullet points, eah with a large number of figures. This is not helped by including the uncertainty ranges in the text. I am not sure how best to remedy this, except a bit of narrative might help the flow (thought the summary is already quite long and putting the figues with uncertainties in tables, noting that this is where the uncertainty ranges are included. Alternatively, the ranges could be given as footnotes, though this would mean some prettry torrid footnotes. I would only give the uncertainty ranges for key quantities where the uncertainty is large relative to the change. In many quantities, I would not go further than 2 significant figures. [John Mitchell, United Kingdom]	Reject. Uncertainties are a key component of this assessment and a central part of the assessment conclusions. We prefer to provide estimates of uncertainties alongside with central estimates.
SPM-118	SPM	0				I presume in the final version there will be an appendix which defines the likelihood and confidence levels. [John Mitchell, United Kingdom]	Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-119	SPM	0				I think the SPM needs significant reorganization. I'm a climate scientist, and even my eyes were glazing over from the seemingly endless lines of bullets starting "it is likely" or "it is virtually certain". I doubt that non-specialists will read very far into this summary. I think that it needs to be much more of a narrative. Rereading it, the orange highlighted sentences are well done and are much, much more readable than the bullets. One way to extensively reorganize would be to collect those orange highlighted sections, tie them together, and get a two or three page text. Then turn all the bullets into an appendix to the SPM or even merge the bullets into the technical summary. I don't know if this is the solution, but something needs to be done. What is in this draft is not very readable. [Daniel Murphy, United States of America]	Noted; improving readability has been a focus of the revisions of the SPM for the Final Draft. Emphasis has been put on the narrative provided in the highlighted statements. However, the assessment statements elevated to the SPM and their presentation need to be fully consistent with the underlying assessment. We thus needed to find a balance between narrative, simpler, less technical language and remaining consistent with the underlying assessment.
SPM-120	SPM	0				The new layout of the SPM is great, I like the synthesis and that it presents a 'story' rather than just following the chapters. Congratulations to the authors. In terms of editing style, I would urge the authors to adopt the WG3 approach to the SPM in which all the paragraphs/sections are numbered (as in AGU journals) because then the layout and referencing is really much easier - especially in digital form. [Michael Prather, United States of America]	Thanks, noted.
SPM-121	SPM	0				Congratulations to the writing team that did a great job in general. The structure of the SPM allows to inform in a clear and concise manner without repetition on the science of climate change and the most recent literature. [Klaus Radunsky, Austria]	Thanks you.
SPM-122	SPM	0				It is strongly suggested to use the same level of uncertainty with respect to information related to possible climate changes, in particular with respect to changes of temperature and sea level rise as well as any changes in ocean aciditiy. Otherwise the reader would be confused. The range of change should be chosen such that there is a high level of confidence that the expected change will fall into the given range because more robust information is needed for the policy level. If the authors feel that different levels of uncertainty should be presented that would also be welcome provided that for all those parameters the same levels of uncertainty are provided. [Klaus Radunsky, Austria]	Comment unclear, no action. The confidence levels reported are a result of the assessment and for scientific reasons might differ between different quantities. It's not possible to simply use "the same level of uncertainty".
SPM-123	SPM	0				There are statements in the SPM that CC is related to human activities (eg., shaded section p8 and p10 and statement on p11, line 31). However, these statements are "soft" in comparison to wording in other parts of the overall WGI document. For example, Ch. 1's Exec. Summary: "scientific knowledge has continued to… strengthen the basis for human activities being the primary driver in climate change". Some wording in the Tech. Summary is also stronger than in the SPM. Perhaps the consensus nature of the SPM has contributed to its being "softened". Use of certain phrases, such as "anthropogenic emissions", contribute a softening touch. The SPM is a document for policy makers. Would it not be better to use "human caused" instead of anthropogenic throughout the SPM? Policy makers will understand human caused; many will likely be confused by anthropogenic (some other words in SPM that are "common English to IPCCers" may also cause confusion). I found very few direct, upfront statements such as 'human activities are the primary CC driver' in the SPM. The shaded statement on p8 seems to bury the fact that "it is virtually certain that this [net energy uptake] is caused by human activities" (sentence 2). The p17, 2nd shaded box is an upfront remark. It would be helpful to have policy makers see this upfront; not on p17 (also see last of my SPM comments). [herman	Noted. We think the SPM formulation accurately reflect the underlying comprehensive assessment. However, improving readability and clarity in formulations has been a focus of the revisions of the SPM for the Final Draft.

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						sievering, United States of America]	
SPM-124	SPM	0				Might an Executive Summary that succinctly and specifically summarizes the SPM for policy makers (PMs) be a good idea? I'm not sure what constraints IPCC has regarding this idea. Yet, I'm convinced that the many highly impressive conclusions in the SPM (eg., 22 shaded boxes) will not be fully appreciated by PMs, or their staff personnel, without some sort of shorter synthesis document. A carefully crafted Executive Summary of 3-4 pages length just ahead of the SPM would make for much better understanding and positive response by PMs across the globe. A short Exec. Summary that accounts for some of the points in the further SPM comments below (besides 100s of other helpful comments about the SPM) would provide significantly better communication of WG1's conclusions to PMs and their staffs -- especially to designated CC staffers who would be drawn into reading more of the full WG1 report. [herman sievering, United States of America]	Noted. The improving readability has been a focus of the revisions of the SPM for the Final Draft. Emphasis in the revisions has been placed on the narrative provided in the highlighted statements which should, in principle, summarize the key conclusions in the SPM.
SPM-125	SPM	0				The SPM could benefit from a table that gives definition to the terms virtually certain, very likely, etc. and also to levels of confidence. Without this table in the SPM, policy makers (their staffs more specifically) will not, in most cases, be able to distinguish the meaning of these terms? The Table 1.1 (Ch. 1, p16) does this for likelihood terms. Such definitions could be inserted at p2, line 20. (The sentence at line 20 caused a "policy maker groan" when I saw the word "probabilistically".) [herman sievering, United States of America]	Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1)
SPM-126	SPM	0				Throughout the SPM there is little indication that observations match what was predicted by earlier ARs (eg., shaded statement on p3 about Trop and Strat T). Warming of the Trop against cooling of the Strat was predicted in earlier work. Perhaps the authors want AR5 to stand alone. Yet, where recent observations bear out earlier predictions or observations, they lend great strength and should be mentioned. [herman sievering, United States of America]	Noted. Yes, the SPM should mostly stand alone, still reference to earlier reports is made in a number of instances. However, limited space prevents from repeating all earlier assessment results when providing the AR5 key conclusions.
SPM-127	SPM	0				Many of the terms in the SPM are opaque to policy makers. Examples include "rates of change" in reference to ~50 year periods, and even "long-lived". More generally the SPM would benefit from being more nearly self contained, for example in text definitions with pointers to the glossary, and more clear distinctions between where words are used in a technical sense or in the vernacular. (perhaps by bolding?) At present, the draft SPM reads as if it was written by scientists for scientists, not by scientists for policy makers. In general, the structure and utility of the SPM would be greatly enhanced if a section based on likelihood and confidence was added. A paragraph discussing the phenomena which were very likely and high confidence would complement the current "by topic" arrangement and allow policy makers to quickly grasp the new take home points. [Leonard Smith, United Kingdom]	Noted. Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-128	SPM	0				Anomalies are not always clearly defined as such, ideally the magnitude of the systematic error should be made clear, in any event failing to make clear each and every instance where it has been suppressed would open the report to charges of misrepresenting the strength of evidence (regarding model quality). Phases like "more realism", and new processes which are now "included" would be of more value if tempered with information on when (space, time, and lead time) the related phenomena are NOT realistically simulated. [Leonard Smith, United Kingdom]	Noted. Consistent reporting of anomalies including their assessed uncertainties has been a focus of the revisions of the SPM.
SPM-129	SPM	0				"Projections" the continued distinction projections and predictions is unfortunate but likely unavoidable. All predictions are, of course, conditional on something, and thus projections are predictions; granted there is some advantage in making this clear by using a different word for long lead time (50+ year) predictions. What needs to be explained more clearly is that in the short lead time (< 20 years) where the choice of which RCP is conditioned on no longer impacts the "projection". In time, the short timescale climate model output will become predictions, this pathway allowed for today. In particular, language with hinders this transition should be avoided now. [Leonard Smith, United Kingdom]	Noted. The SPM adopts the concepts and terminology presented in the Chapters dedicated to future predictions/predictability and projections.
SPM-130	SPM	0				It would be useful to clarify the extent to which "low confidence in A" implies "high confidence in not A" explicitly. As the text stands, there are numerous occasions where it can be misread to say that low confidence in A implies low risk of A. [Leonard Smith, United Kingdom]	Noted. We try to keep the Chapter formulations as close as possible to (and always consistent with) the Chapter formulations and assessment.

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SPM-131	SPM	0				The authors are to be commended for their hard work on the SPM. I will offer only a few key comments here, which I hope will be helpful in communicating the results. [Susan Solomon, United States of America]	Thanks.
SPM-132	SPM	0				The treatment of the Earth's cold regions, in particular the Antarctic cryosphere has improved hugely since the AR4 report. I focussed on issues regarding the Antarctic but found it difficult to fault the analysis as presented here. The auhtors should be congratulated. [Michael Sparrow, United Kingdom of Great Britain & Northern Ireland]	Noted, thanks.
SPM-133	SPM	0				1. It would be useful for the target audience of the SPM to include a one page summary (e. g., through a table) of the differences between the main findings in AR4 and AR5. 2. I strongly recommend to add also a very short summary with the central messages or core statements to the SPM. This summary should contain correspondingly: lines 36-39@SPM-2, lines 2-4@SPM-8, lines 8-11@SPM-10, lines 51-52@SPM-11, 23-25@SPM-17. [Oliver Stebler, Switzerland]	Noted. We have tried to highlight important differences from this assessment to the previous WGI AR4 assessment, but felt this was not useful in all instances given the severe space limitation in the SPM. The narrative is now better supported by a series of overarching assessment conclusions highlighted in shaded boxed statements.
SPM-134	SPM	0				I recommend to shorten the length of the SPM wherever possible (final length should be in the order of the SPM of AR4). [Oliver Stebler, Switzerland]	Noted.
SPM-135	SPM	1	0	1	0	Note that the header of this report indicates that it is a "First Order Draft" yet it is "Second Order Draft" [Government of Kenya]	Reject. It is the First Order Draft of the SPM, distributed with the Second Order Draft of the WGI contribution to AR5.
SPM-136	SPM	1	0	1	25	The introduction should more clearly outline what the SPM covers. Where it says it adds to the findings of the AR4 - make it clear how. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. Rather than expanding the introduction, we now introduce the main sections of the Summary for Policymakers with a brief chapeau in italics. In addition, the narrative is now better supported by a series of overarching assessment conclusions highlighted in shaded boxed statements.
SPM-137	SPM	1	1	1	1	This part contains common remarks from the view point of the main target group of this summary: the policy maker. Although the information is potentially very relevant to a policy maker, the scientific and condensed information makes the policy relevance unclear. The Netherlands is of the opinion that the current version of the summary should be made more relevant to its target group by adjusing the language and organising the information in a more comprehensible way. In a introductory text you may draw the attention to the existence of a glossary It would help to explain the structure of the SPM at the start of the summary. We suggest to add an explanation of the layout why, e.g., pages 2 and 3 first contain an italic text, then text in a colored box, colored box again, and then conclusions summarized in bullets. Little attention is paid to other GHGs than CO2. We understand that CO2 is dominant, but we still consider it policy relevant to pay more attention to other GHG. No attention is paid to two topics that we deem highly policy-relevant: tipping points and geoengineering. We would like to see summary statements on these two topics in the SPM. The uncertainty terminology is very important, but quite abstract ('virtually certain', 'likely', etc.). It should be considered to summarize the guidance note in a box, or by a footnote as was done for AR4. Please give the conclusions (the texts with brown background) a number. The summary contains many different reference years and periods. This is confusing and prohibits a proper conmparison of different conclusions; some might say 'fuzzy mathematics'. We understand that these numbers are related to available datasets and chosen statistics, but we suggest the use of a more restricted	Noted. The introduction explains the purpose of the different text components. The brief chapeau text in italics have been revised and should now help guide the reader through the SPM. In addition, the narrative is now better supported by a series of overarching assessment conclusions highlighted in shaded boxed statements. On the specific comments - GHGs other than CO2 are now given more emphasis and explicitly mentioned in the observations and drivers sections. - A summary of the assessment of Geoengineering is now included (final bullet of SPM). Tipping points are discussed (though the term is not used) in the section on "Climate Stabilization, Climate Change Commitment and Irreversibility" - Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1). - reference periods have been harmonized to the extent possible, but differences remain for different quantities, methodologies etc.

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						set of reference years and periods. [Government of Netherlands]	
SPM-138	SPM	1	1	26	13	This chapter as well as all the others need thorough editing and proofreading for the occasional typos s well as use of acronyms (before being explained). [Dora Marinova, Australia]	Noted. Copy edit is part of the pre-publication process. The full WGI report will include a list of Acronyms commonly used in the WGI report.
SPM-139	SPM	1	4	1	4	It should be possible to read this section on its own. As it stands, the terms used to describe the levels of confidence or probability are unclear (e.g. what is medium or low confidence? what is virtually certain?) [Dora Marinova, Australia]	Noted. Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-140	SPM	1	21			"when possible, probabilistically". I would say ""when possible, providing a calibrated uncertainty statement" --> If the word probabilistically is used so early in the text, it should also be stated in what context probabilistically should be interpreted. Are probabilities used in a Bayesian sense or more in a Frequentist sense (as e.g. in weather and seasonal forecasting)? [Christof Appenzeller, Switzerland]	Reject. Text is consistent with the text in the IPCC AR5 Uncertainty Guidance Note.
SPM-141	SPM	1		24		General comment:1/ (An idea which is no more applicable at this stage but might be considered in a future document) Sentences that start with " It is (un)likely, There is high (medium, low) confidence and the like" make poor reading. What is important is to explain is that errors on observed quantities and climate predictions must be supplemented by probability statements .ie. confidence intervals. This is found in the footnote 5 at the bottom of page SPM-3. We suggest to put this at the forefront with the explanation as to why nothing is certain with 100% probability (natural variability in atmosphere and ocean, difficulty to observe things etc…). Once this is done, suppress all the " It is (un)likely, There is high (medium, low) confidence and the like" . One could define in probability terms high-medium-low confidence and add simply a color code to the beginning of sentences (high confidence-blue, medium confidence-green, low confidence-red). 2/ It is also desirable to help distinguish between observational errors that can be quantified (the present climate) and model errors (the future climate) that cannot. In fact all the information required in this respect for the policymakers is present in the introduction, Chapter 1. 3/ Policymakers need numbers but will only remember and use a few of them. On the other hand it is very important that they understand the basics of climate science and its limitations. The policymakers should know what we know very well about the climate system and what we don't know very well. This is missing. As Watson (the co-discoverer of DNA) said knowing why is more important than learning what. The policymakers need to know why. It will help them to understand why funding of climate research is so important and why quantifying the prediction uncertainties in the report is so difficult. [Government of France]	Noted.
SPM-142	SPM	1		26		Overall treatment of the scientific uncertainties is adequate in this SPM, BUT (!) the overall treatment of the scientific certainties and near-certainties is grossly inadequate. This SPM gives a rather misleading assessment of the current state of the science, and conveys the impression that the science is much less certain and developed than it really is - and as such is a major failing of the text. Another major failing of the SPM is its concentration on the two extreme RCPs at the expense of the two more plausible intermediate RCPs. [Government of Australia]	Noted. We did try to be present the WGI assessment of the science basis of climate change in a balanced, accurate way. We hope the revised SPM meets these expectations better. We have expanded the scenario coverage and now also include RCPs 4.5 and 6.0 in a number of places, most notably in the time series Figure SPM.6.
SPM-143	SPM	1		26		21. This paragraph refers to the entire "Summary for the policy makers". As detailed above, the Report is built from fraudulent pseudo-scientific constructs based on the AGW dogma, containing no science. Therefore, any conclusions and recommendations presented in this chapter have no scientific backing, and should be expressly ignored. The corrected Summary for policy makers should thus read "There is nothing wrong with our climate. We have no climate problem, and need no solutions for this climate problem. All of the currently implemented solutions to the alleged climate problem should be revoked, effective immediately. We are sorry for defrauding the general public in the previous Reports we have produced so far." [Igor Khmelinskii, Portugal]	Noted. No scientific evidence provided in support of the suggested changes -- no action.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-144	SPM	1		26		22. This paragraph refers to the entire Report. As amply demonstrated above, the current draft Report is a fraudulent pseudo-scientific construct based on the AGW dogma, adopted uncritically and never questioned. Its climate projections and predictions have no scientific backing and can't be used as a justification for any type of public policies. Similarly, all of the public policies implemented as the result of previous Reports have no scientific backing and should be immediately and entirely revoked and discontinued. [Igor Khmelinskii, Portugal]	Noted. No proposal for revisions -- no action.
SPM-145	SPM	1		26		23. This paragraph refers to the entire Report. The body of the research that the Report pseudo-scientifically presents as "proof" of the AGW hypothesis is constituted by the primary and direct fraud of the IPCC climate models and general research approach, and by the secondary and indirect fraud of the most of the remaining research that uses these models in the interpretation of climate data, for climate predictions, and in discussing development scenarios for the humanity and for the natural systems. The only research that may be valid as regards to facts (but never as regards their interpretation, because the interpretation is based on fundamentally wrong models) is the research studying current consequences of the climate change. However, this research is non-scientific in its motivation, aiming to provide "proof" for the AGW hypothesis by presenting corroborating evidence (which is a logically impossible task - see Paragraph 3), and largely irrelevant. That because no action humanity might feasibly take could revert the natural phenomena that we are not the cause of in the first place. The Report and the body of research it reviews are therefore a waste of public funds and a scientific fraud. [Igor Khmelinskii, Portugal]	Noted. No proposal for revisions -- no action.
SPM-146	SPM	1		26		24. This paragraph refers to the entire report, containing final notes for the reader who is not well-versed in the philosophy of science, and should be read in conjunction with all of the previous paragraphs of my Review. Note that I did not need to read the entire draft Report, nor enter into details of each Chapter, in order to understand whether or not the Report is scientifically valid. This is because I am able to produce the judgement of the fraudulent character of this and other previous Climate Reports based on their failure to implement the Scientific Method and question the AGW hypothesis. The AGW hypothesis is commonly implemented in the form of one or more climate models that are being used to interpret current and past experimental results and make predictions about future climate. In order to attribute the recent global warming to greenhouse gas emissions, and thus to human activities, these models have been specifically tuned, by introducing positive climate feedbacks. The draft Report discusses climate models in its Chapter 9, therefore Chapter 9 would be the logical place to implement the Scientific Method and question the validity of the climate models and thus the validity of the AGW hypothesis. Reading through Chapter 9 and its list of references, I find that no such questioning had been done, and no papers that question the validity of climate models have been discussed. By failing to implement the Scientific Method, the authors of Chapter 9 have confirmed their status of pseudo-scientists, having transformed their Chapter into an exercise in dogmatic propaganda. Its fraudulent character is evident from the ease with which these authors could have rejected the AGW hypothesis, same as I had in the present Review. Thus, based on the fraudulent science of Chapter 9, the entire Climate Report looses any connection to the objective reality, becoming a pseudo-scientific construct based on the AGW dogma. Indeed, there may be no Science if one chooses to ignore the Scientific Method, as the Report authors do. Without the Scientific Method, they are limited to the pseudo-scientific and logically faulty search of evidence that "confirms" their AGW hypothesis, stalling the scientific progress and insulting the general public in their expectations of obtaining scientifically valid climate predictions, instead of the climate fraud that over the years of its existence has been, and now once more is being, produced by the IPCC. [Igor Khmelinskii, Portugal]	Noted. No proposal for revisions -- no action.
SPM-147	SPM	1		26		Text should be screened for technical wording which can not be expected to be known by policy makers. Furthermore acronyms should be explained again when not used within the previous few pages. [Christoph Ritz, Switzerland]	Noted. Final WGI AR5 report will include a Glossary for technical terms and a list of Acronyms.
SPM-148	SPM	1		26		The whole chapter is based on a qualitative scale of assessment (virtually certain, very likely, likely, more likely than not, unlikely) and on a scale of the level of confidence (very high, high, medium, low). However, there is not definition for these scales, leaving out any possible try to quantify the scale of effect or impact assessed nor the level of confidence estimated. I believe these must be at least indicated as available in a footnote or annex and explain how they were derived and applied. [Sergiu Dov ROSEN, Israel]	Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1). Note that the likelihood language provides a quantitative assessment.

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SPM-149	SPM	1			26	An exciting SPM, many interesting new results shining through and several clear advances. I find it a bit hard to read in some places. For example, the Arctic and Antarctic sea ice are firsts observed early on, and then explained in terms of detection and attribution halfway through and then projected. I wonder (but that might be overly radical) if now that detection and attribution results extend to so many variables it mightnt be worth merging it into the observed text (SPM only of course!) so that readers could learn about the cause of trends right away rather than pages later. It might be challenging to manage it that way though - but it would have benefits for readers. [Gabriele Hegerl, United Kingdom]	Noted. We prefer to stick to the current outline going from Observations to Understanding to Projections which is fully in line with the structure of the underlying report.
SPM-150	SPM	1			26	I used the AR4 SPM in some classes. The students always have a hard time to track down the uncertainty language and remember it. I wonder if it would be worth adding the percentages to key statements (eg the bold ones). I know that would also be unheard of but I remember some papers and presentations at the uncertainty meeting that suggested that this would really help. The present draft doesnt seem to have the uncertainty language easily visible anywhere...(did I miss it?) [Gabriele Hegerl, United Kingdom]	Uncertainty terminology is now explained in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-151	SPM	1			26	A subject that isnt mentioned but that I suspect needs to be mentioned is the slow recent warming rates compared to the fast ones in the 90s. There is good material in the d+a chapter and I am sure others, even though in many ways its not useful to discuss such short trends, it might be worth mentioning if only to say that short term trends are noisy. Also there is an excellent box on the last 20yrs in the TS, maybe worth promoting some key statements into the SPM [Gabriele Hegerl, United Kingdom]	Partly accept. The recent slowing of warming and its understanding is now highlighted in the Section on Understanding Climate Change, Model Evaluation and D&A. The observed changes is and was discussed in the observations section of the SPM.
SPM-152	SPM	1				To distinguish between the scientific meaning and the UNFCC's political redefinition, strongly recommend adding a footnote defining: "Herein 'global warming' is defined as an increase in increasing average near surface temperature without attribution. Attribution is distinguished by "anthropogenic global warming" or "natural global warming". [David L. Hagen, United States of America]	Reject. In the SPM (and throughout the entire WGI report) we clearly separate observed changes from causes of observed changes as evidenced by the structure of the SPM (and the underlying report).
SPM-153	SPM	1				Overall, the SPM is very nicely done. It hits most of the key points in very clear language that should be accessible to the intended audience. [Dian Seidel, United States of America]	Thank you.
SPM-154	SPM	2	1	2	24	The introduction of the SPM should highlight the elements that are totally new wrt AR4. Alternatively, or in addition, this could be done (more extensively) in Chapter 1 [Government of France]	Noted. Chapter 1 of WGI AR5 indeed highlights in a new Table some of the key assessments and where they can be found in the WGI AR5.
SPM-155	SPM	2	1	2	24	We think that the introduction should focus more on describing the background for the WGI report and the lay-out of the summary (eg. Use of text in italics, text in grey boxes). Any wording suggesting conclusions (eg. "evidence", "strengthened") should be left for the other sections in the SPM. [Government of NORWAY]	Accepted. Text revised accordingly.
SPM-156	SPM	2	1	19	3	I had hoped that the IPCC had learned from the devastating published review of their past procedures and results and that the IPCC promise to become more objective and inclusive in authorship and approach would be achieved with this report. The credibility of IPCC has been so badly damaged by the findings of the review panel and by Climategate that the only way it could become credibile in the scientific world was to become an objective scientific body and present all data on all issues, not just biased selected data and invalid model studies. I really hoped that IPCC could become a truly respected scientific body, not just a political expedient. Thus, I am sadly disappointed in this report--it bases conclusions on very incomplete evidence, totally ignores huge volumes of relevant data that doesn't support favored conclusions, includes highly biased opinions and scenarios that are contrary to available physical evidence, excludes many of the world's leading experts, and projects a kind of fairlyland atmosphere where preconceived conclusions trump relevant evidence. This report does nothing to generate credibility in the real scientific world and the general population. [Don Easterbrook, United States of America]	Noted. No proposal for revisions -- no action.
SPM-157	SPM	2	1			Introduction: It would be helpful if this section included a short summary of the key findings and conclusions in the TS, as a narrative pointing to the rest of the report. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. The narrative is now hopefully better supported with the series of overarching assessment conclusions highlighted in shaded boxed statements.
SPM-158	SPM	2	1			If you think where the majority of people who pick up the entire report will start, the first section of the SPM is probably where they will start to read. Section 1 of the SPM should be full of the most important scientific facts not text about special reports and scenarios. Think about all the people who will stop after reading a page or two. They should be targeted on the FIRST page. I understand the rationale for putting procedural text here,	Reject. We prefer to start the SPM with the "procedural text", providing the context in which this SPM needs to viewed. A series of overarching assessment conclusions is highlighted in shaded

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						but it needs to be moved somewhere else. [Daniel Murphy, United States of America]	boxed statements throughout the SPM.
SPM-159	SPM	2	2	2	6	This paragraph is confused. You seem to have made a lot of "observations" which show what we all know already, that the climate is "changing", but "evidence" that you can explain it seems to be dependent on "simulations", and "projections" neither of which constitute "evidence" unless they are capable of successful future prediction [Vincent Gray, New Zealand]	Reject. The paragraph simply list what evidence is used in the assessment of past and future climate change. Evidence as summarized in the IPCC Uncertainty Guidance Note for AR5 includes, e.g., mechanistic understanding, theory, data, models, expert judgment.
SPM-160	SPM	2	3	2	3	The term new "evidence" is disputable when applied to projections, the more so as, in some cases (e.g. Precipitation) there is less confidence or different conclusions wrt AR4. Findings could be more appropriate for projections. [Government of France]	Reject. We think evidence is perfectly fine for results from models as it is for data. Evidence as summarized in the IPCC Uncertainty Guidance Note for AR5 includes, e.g., mechanistic understanding, theory, data, models, expert judgment.
SPM-161	SPM	2	3	2	6	"new evidence of" should read "..new information that informs our understanding of", or similar. Consider fragmenting sentence. It is not really possible to present evidence for projected future climate change. [Government of Australia]	Reject. We think evidence is perfectly fine for results from models as it is for data. Evidence as summarized in the IPCC Uncertainty Guidance Note for AR5 includes, e.g., mechanistic understanding, theory, data, models, expert judgment.
SPM-162	SPM	2	3	2	6	To reduce prejudice, add at the end of the first paragraph of the Summary for Policymakers: “Evidence that global CO2 concentrations, temperature and sea level are not increasing as rapidly as originally projected, and that other effects of global warming may not prove as damaging as had been thought, is also evaluated.” Reason: The IPCC is now seen as political rather than scientific, and as promoting an extremist viewpoint rather than objectively weighing the evidence in the reviewed literature and data. It should be seen to be making every effort – especially in the Summary for Policymakers – to discuss both sides. Example: Temperature has not risen for 16 years. In the past 60 years, covering full cooling and warming phases of the ocean oscillations, warming has occurred at a rate equivalent to 1.2 K/century: yet AR4, as the mean central estimate on all six SRES emissions scenarios, projected warming of 2.8 K/century to 2100. The implausibility of the key warming projection in AR4 should now be discussed. [Christopher Monckton of Brenchley, United Kingdom]	Reject. This paragraph provides merely an introduction to the SPM. The assessment of observations of recent climate change are discussed in Section 2 of the SPM. Section 4 of the SPM then covers the Understanding of the climate system and its recent changes.
SPM-163	SPM	2	3	2	11	We recommend to add an information about the background of the Assessment Report as it was done for AR4 "…describes progress in understanding of the human and natural drivers of climate change…." [Government of Germany]	Reject. The drivers are implicitly included in the current statement "presents new evidence of past and projected future climate change from many independent scientific studies"
SPM-164	SPM	2	3	2	24	Overall, the introduction section would benefit from further consideration of its scope. Currently, the introduction includes information on the report's purpose, how the evidence for the report compares to previous reports, methodological background for the findings, and how the SPM should be interpreted by readers. Information on the RCPs or Line 8 referring to how the body of evidence since the AR4 has changed could possibly be placed in the main text in order to keep the introduction clear and concise. [Government of Canada]	Accepted. Text revised accordingly and the discussion of the RCPs has been moved to the Section on Projections.
SPM-165	SPM	2	4	2	4	Insert"and evaluation" between' studies' and 'ranging' [Government of Benin]	Sentence has been revised to "many independent scientific analyses ranging from"
SPM-166	SPM	2	4	2	4	We suggest writing the total number of studies that form the basis for WG1, instead of using the term "many" (line 4). [Government of NORWAY]	Reject. This number is not known exactly and not useful information here in the SPM.
SPM-167	SPM	2	4	2	6	Second instance of the word "from": The English idiom is "from to". The "to" clause is lacking. [James [Jim] Crawford, United States of America]	copy edit
SPM-168	SPM	2	4	2	6	"ranging from" is ungrammatical without a subsequent "to". Suggest replacing with "including" [Government of New Zealand]	copy edit
SPM-169	SPM	2	5	2	6	"theoretical studies on climate processes and simulations using climate models" do NOT provide evidence	Reject. We think the term "evidence" is perfectly fine

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						under any circumstances. Surely you know that models provide no evidence; they merely produce predictions based on their input and what they are programmed to do. Whether those predictions are validated/confirmed is up to the user. [John McLean, Australia]	to be used for results from models as it is for data. Evidence as summarized in the IPCC Uncertainty Guidance Note for AR5 includes, e.g., mechanistic understanding, theory, data, models, expert judgment.
SPM-170	SPM	2	5	2	6	The warming that "has been particularly marked since the 1970s" is consistent with what one would expect from about 30 years of dominance of ENSO conditions on the El Nino side of absolutely neutral (ie. SOI=0). The Pacific Climate Shift, not mentioned in this report but mentioned several times in 4AR, marked the switch in ENSO conditions from those dominated by the La Nina side of absolutely neutral to those dominated by the El Nino side. (Refer Trenberth, K.E. (1990), Guilderson, T.P. and Schrag, D.P. (2006), Trenberth, K.E. (1996), Trenberth K.E. and Carron, J.M. (2000), and Trenberth et al (2002) - "Evolution of El Nino–Southern Oscillation and global atmospheric surface temperatures"). Warming is therefore consistent with natural forces. [John McLean, Australia]	[Comment probably refers to page 3, lines 5/6 rather than page 2 as indicated by the reviewer] Noted. Statement is about observed changes and no mention is made of causes in this section "Observed Changes in the Climate System". Section 4 of the SPM covers the Understanding of the climate system and its recent changes
SPM-171	SPM	2	5	2	6	As you should know, global coverage of temperature data prior to 1950 was poor and has very wide error margins, therefore discussing anything "since 1850" is very unwise and unprofessional. [John McLean, Australia]	[Comment probably refers to page 3, lines 5/6 rather than page 2 as indicated by the reviewer] Reject. SPM statement is firmly based on the comprehensive and robust assessment presented in the underlying report in Chapter 2.
SPM-172	SPM	2	6			Briefly state the evidence right here while you still have the reader's attention. Omit or relegate to the end the next two paras, which deal with process, not substance. [Stephen E Schwartz, United States of America]	Noted. Unclear which evidence the reviewer would like to see stated here -- no action.
SPM-173	SPM	2	8	2	8	Please clarify specifically how evidence from the AR4 "has further strengthened". Please clarify also whether this sentence should be referring to the strengthening of the "evidence" for the AR4 or the "conclusions" of the AR4. If referring to the evidence, then this sentence seems somewhat duplicative of the paragraph above (pg. 2, lines 3-6). [Government of Canada]	Sentence has been deleted.
SPM-174	SPM	2	8	2	8	In some cases "evidence" has not strengthened wrt AR4 (e.g. Precipitation cf p 3 mine 33). [Government of France]	Sentence has been deleted.
SPM-175	SPM	2	8	2	8	Meaningless statement: The evidence of what has strengthened? E.g. climate change, drivers, impacts, ... or knowledge base? [Government of Germany]	Sentence has been deleted.
SPM-176	SPM	2	8	2	8	This sentence is out of place. If included it should be much later [Government of United Kingdom of Great Britain & Northern Ireland]	Sentence has been deleted.
SPM-177	SPM	2	8	2	8	Evidence did NOT form the basis of the IPCC 4AR. There was no credible evidence, only the assertions from climate modellers who seem to believe the output of their models when other chapters of the report showed us that the models could not be accurate. The basis of the 4AR was mere speculation. [John McLean, Australia]	Noted. No action.
SPM-178	SPM	2	8	2	8	To restore scientific rigor, the sentence “The evidence that formed the basis for the IPCC Fourth Assessment Report (AR4) has further strengthened” must be rewritten or deleted. Reason: It is not made explicit which “evidence” has “strengthened”, and to what degree, and there is no mention of the key evidence which has weakened. Example: After 16 years without global warming, and after a decade throughout which the rate of sea-level rise has been slowing, these two key indicators have weakened, and the Summary for Policymakers should be honest enough to say so. [Christopher Monckton of Brenchley, United Kingdom]	Sentence has been deleted.
SPM-179	SPM	2	8	2	8	The assertion that evidence for AR4 "has further strengthened" is not completely justified. While many lines of evidence are now stronger, some are not, and that should be acknowledged in the SPM. Chapter 2, in particular, identifies several areas in which uncertainties have grown, understanding is less certain, and evidence is weaker. It's important that the SPM not be misleading on this key point about the non-monotonic nature of scientific advances. [Dian Seidel, United States of America]	Sentence has been deleted.
SPM-180	SPM	2	8	2	8	"the evidence ... has strengthened" - I dont know what this means. The evidence for what? If it is for the effect of human activity on climate, then indeed I believe it has strengthened on the whole, but there are areas where it has not [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Sentence has been deleted.

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SPM-181	SPM	2	8	2	8	What does "The evidence … has further strengthened" mean? Evidence of what? [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	Sentence has been deleted.
SPM-182	SPM	2	8	2	11	"Evidence" of past change in climate is all very convincing, but you have no evidence at all of future change of climate. [Vincent Gray, New Zealand]	Sentence has been deleted.
SPM-183	SPM	2	8	2	11	To ensure balance and restore scientific credibility, the mention of the SREX report on extreme weather should be followed by the following new sentence: “The report found ‘medium evidence and high agreement that long-term trends in normalized losses have not been attributed to natural or anthropogenic climate change ... The absence of an attributable climate change signal in losses also holds for flood losses.’” Reason: It is appropriate to state the principal conclusions of cited reports even when those conclusions do not endorse the alarmist message that the IPCC – rightly or wrongly – has sought to convey. The SREX report concluded that it is not yet possible to attribute extreme-weather losses to anthropogenic influence on the climate, and the Summary for Policymakers should be honest enough to say so. [Christopher Monckton of Brenchley, United Kingdom]	Reference to SREX has been deleted.
SPM-184	SPM	2	8	2	12	"Further strengthened" has no context - evidence for 'what' has further strengthened - for a continued human influence on climate? In a summary for non scientists, even the introduction should provide the conclusions at the top, reverse pyramid style. The phrase 'the evidence' is very imprecise, evidence for what? [Government of Australia]	Sentence has been deleted.
SPM-185	SPM	2	8			Wording not quite right as it sounds as if it's the SAME evidence - "has been further" sounds like new evidence has been added [William Ingram, United Kingdom]	Sentence has been deleted.
SPM-186	SPM	2	8			Refer this statement to a Table (max. length of one page) with the differences between the main findings in AR4 and AR5. [Oliver Stebler, Switzerland]	Sentence has been deleted.
SPM-187	SPM	2	9	2	11	Delete the three lines or modify : because not every SREX results are considered as granted (see table SPM-1) or final ; some 2012 results are used also. [Government of France]	Paragraph has been deleted.
SPM-188	SPM	2	9	2	11	There have been several papers regarding attribution of extreme weather and climate events after the cut-off dates for the SREX that should also serve as a basis for this assessment. We assume that they are included and that the cut-off dates for this assessment also is valid for papers that treat extreme weather and climate events. Please consider to make this clearer and we recommend that you also consider to mention the cut-off dates for literature to be considered for AR5 (Submitted; 31 July 2012 and Accepted; 15 March 2013). [Government of NORWAY]	Paragraph has been deleted. The WGI AR5 does indeed consider papers published after the SREX cut-off date for published papers.
SPM-189	SPM	2	9	2	11	Delete the three lines which are not useful and misleading : SREX results are not considered as granted, as shown by table SPM-1 [Michel Petit, France]	Paragraph has been deleted.
SPM-190	SPM	2	11	2	11	The SREX is the first IPCC report treating extreme events and non-linearities which could lead to consequences in a time correponding to a normal political cycle (less than five years), it should be more emphasized in the policy maker text as it addresses events which could occur during the mandate of the reader. [Christian Muller, Belgium]	Paragraph has been deleted. SREX result are included in the WGI AR5, see e.g., the summary across assessment reports provided in Table SPM.1
SPM-191	SPM	2	12	2	18	Emissions scenarios have moved from ‘parts per million CO2e’ to ‘watts per sq metre’. This is good and means that projections are no longer metric dependant. But I think it needs a little explanation, especially for negotiators who have to turn this into emissions limits etc (ie how many tonnes of CO2 do we have remaining before we hit a 4.5Wm2 target? A paragraph in the SPM explaining the change may help. [Government of New Zealand]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-192	SPM	2	13	0		Refers to "a new set of emissions scenarios". The RCPs are not, in the first instance, emissions scenarios. [Government of United Kingdom of Great Britain & Northern Ireland]	Agree, text revised. The RCP discussion has moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-193	SPM	2	13	1	18	There's no reference given for more detail on the RCPs, and not really enough summary detail given here - in terms of what levels of emissions give rise to the different values of radiative forcing, or what these mean in	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						terms of temperature rise. Might be helpful to summarise the different RCPs and their genesis in a stand-alone box. [Government of United Kingdom of Great Britain & Northern Ireland]	Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-194	SPM	2	13	2	15	The reader needs to be told whether the IPCC has developed the RCPs and planned and supervised the CMIP 5 process or whether, as inferred, the IPCC has just assessed peer-reviewed research based on model comparisons etc undertaken through non-IPCC mechanisms. [Government of Australia]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-195	SPM	2	13	2	15	RCPs have been not just been used in a wide range of models of different kinds not just those contained in CMIP5. Suggest removing reference to CMIP5 (delete "carried…CMIP5).") [HAROON KHESHGI, United States of America]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-196	SPM	2	13	2	16	Representative Concentration Pathways (RCP) >> Representative Concentration Pathways (RCPs) to be consistent with what follows [Cathy Clerbaux, France]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-197	SPM	2	13	2	18	Concepts of emissions and forcing need to be made plainer. If it is significant enough to mention this point in the introduction, then it should be significant enough to mention why the change was made, or why its important to know that the scenarios have changed. Some more SPM-reader-friendly explanation of 'radiative forcing' is needed in the footnote. The RF concept is arcane and the explanation given in the footnote largely unintelligible outside the radiation community-especially the bit about holding temperatures fixed. [Government of Australia]	The paragraph has been moved. The concept of radiative forcing is now more comprehensively introduced at the start of Section 3 of the SPM "Drivers of Climate Change". The footnote introducing the term radiative forcing has also been revised and clarified.
SPM-198	SPM	2	13	2	18	Per Canada's overarching comments on the SPM as a whole, it is very important that greater explanation of the RCPs be included in order to help the reader understand the SPM. A box and/or a graphic is highly recommended, as well as a reference to where the readers can find a more fulsome description of the RCP approach and changes in forcing for various drivers over time. [Government of Canada]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-199	SPM	2	13	2	18	At the beginning of this paragraph, the RCPs are described as "emission scenarios". Although the four selected RCPs were generated initially from emission scenarios, the RCPs themselves are not scenarios of emissions. The RCPs will need to be consistently described throughout the AR5, and this is the first place these words are appearing so this is critical. They could be simply referred to as 'scenarios' in this sentence (delete 'emissions'). [Government of Canada]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-200	SPM	2	13	2	18	RCPs need more explanations and possibly a detailed Box referred in the Chapter 1 [Government of France]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-201	SPM	2	13	2	18	The expression "emission scenarios" is misleading, because the RCPs are not just emission, but socio-economic scenarios. Please delete the word "emission". [Government of Germany]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-202	SPM	2	13	2	18	The meaning of RCPs should be explained briefly. Perhaps add a table with the most important keywords of the storylines, so that it becomes clear what the RCPs mean in practice. The way they are presented do not give any feeling of what they are. [Government of Netherlands]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-203	SPM	2	13	2	18	The SPM would benefit from a better explanation of the importance of the RCP and the connection/improvements to the former stabilization scenarios used in the AR4 SYR. We suggest a separate box explaining this and why the new scenarios have been developed and used and their implications. [Government of NORWAY]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-204	SPM	2	13	2	18	The RCP approach needs further explanation - how were they generated, and how this approach differs from the old A1, B1 etc. scenarios approach of earlier assessment reports. Suggest a concise explanatory box or	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new

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						an annex. In addition to making clear the new approach, we need to know whether the RCP numbers 2.6, 4.5, 6.0 and 8.5 are RF values relative to now, or absolute. Although this information is likely to be available elsewhere, a brief summary here would help the intended policymaker audience. For the policymaker it would be more helpful to give the temperature range that RCPs relate to, rather than their forcing values. [Government of United Kingdom of Great Britain & Northern Ireland]	Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-205	SPM	2	13	2	18	The description of the RCPs is not accurate, and no reference for the description is given. For example: a) concentration pathways are scenarios but not emission scenarios. The RCPs are not all mitigation scenarios. The RCPs span the full range of radiative forcing associated with emission scenarios published in the peer-reviewed literature at the time of the development of the RCPs. Descriptions of the RCPs should be drawn from the literature about their development (e.g. van Vuuren et al. 2011, Climatic Change 109:5-31) [HAROON KHESHGI, United States of America]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-206	SPM	2	13	2	18	To make explicit the magnitude and sign of any revisions to central climate-change projections compared with previous Assessment Reports, projections on all six original SRES emissions scenarios should be added to the new RCP projections. Reason: In the AR5 draft the goalposts have been moved by the introduction of scenarios incompatible with the original SRES scenarios. Yet governments need to have a clear idea of how fast the models' key projections are changing, and in which direction. For backward compatibility, projections similar to those in Fig. 10.26 of the Fourth Assessment Report should be made under each of the six original scenarios: and, this time, the source and output data for the graphs encapsulating the projections should be made available. [Christopher Monckton of Brenchley, United Kingdom]	Reject. The comparison between SRES and RCPs scenarios as well as the comparison between projections from the CMIP5 and CMIP3 ensembles is comprehensively covered in the underlying report, e.g., Chapter 12 and the Technical Summary. The SPM, however, will focus on the newest set of scenarios as used in the latest CMIP5 efforts.
SPM-207	SPM	2	13	2	18	Should make clear that the RCPs are specifically used for the future projections, and need to add comments on how the historical simulations differ to previous CMIP exercises. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-208	SPM	2	13			A set … was used. They are both singular. [James [Jim] Crawford, United States of America]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-209	SPM	2	14	2	14	Should read 'Coupled Model Intercomparison...' [Government of Australia]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-210	SPM	2	14	2	14	The 'C' in 'CMIP' stands for 'Coupled' not 'Coordinated' [Ian Simmonds, Australia]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-211	SPM	2	15	2	15	Should they be described as mitigation scenarios? Do all RCPs include mitigations? e.g. RCP8.5 is described in the TS (p.52, line 20) as 'the non-mitigation RCP8.5'. [Government of Australia]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-212	SPM	2	15	2	15	The RCPs itself are not "mitigation scenarios" (e.g., Moss et al. 2010, Nature 463). They were set up to span the range of available mitigation and reference scenarios and as well known, also span the SRES-space. While the 2.6 does align itself with considerable mitigation compared to available reference scenarios, a scenario is a "mitigation" one when it falls under a set reference scenario. Considering Chapter 12, RCPs are not clearly stamped as "mitigation scenarios either" in the text, apart from the Chapter's executive summary. [Government of Sweden]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-213	SPM	2	15	2	15	RCP6 and RCP8.5 are not mitigation scenarios [Fortunat Joos, Switzerland]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new

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							Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-214	SPM	2	15	2	16	The RCPs were chosen to meet particular levels of radiative forcing in 2100 without consideration of particular policies. Initially, one integrated assessment model ran each RCP, including whatever was needed in terms of energy mix and land use change to reach that radiative forcing. The RCPs were not designed to include policy. Policies will be introduced into the scenarios being developed through Shared Policy Assumptions. [Kristie Ebi, United States of America]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-215	SPM	2	15	2	16	The RCPs are not necessarily mitigation scenarios, as at least some pathways (e.g., RCP8.5) can be "no-climate policy" scenarios as well. Please consider adjusting this wording. [Christopher Field, United States of America]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-216	SPM	2	15	2	16	to add colored text between brackets: 21st century climate (realated) policies [Nedal Katbeh-Bader, Palestine]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-217	SPM	2	15	2	18	Not all of the RCPs are mitigation scenarios. RCP8.5 does not consider mitigation policies. [Timothy Carter, Finland]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-218	SPM	2	15	2	18	To make it easy to understand by policy makers, there should be an explanation to link the levels of Government intervention and the four RCP scenarios (RCP2.6, to RCP 8.5). [Government of United Kingdom of Great Britain & Northern Ireland]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-219	SPM	2	16	2	16	to add colored text between brackets: from the no-climate (realated) policy [Nedal Katbeh-Bader, Palestine]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-220	SPM	2	16	2	17	Explain in a more general wording the meaning of radiative forcing F28and the range of RCPs. [Government of Germany]	The paragraph has been moved. The concept of radiative forcing is now more comprehensively introduced in Section 3 of the SPM "Drivers of Climate Change". The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-221	SPM	2	16	2	18	This sentence could be read as implying that the RCPs span the entire range of year-2100 radiative forcing values in the literature, which would not be accurate. Please consider revision to clarify this point. [Christopher Field, United States of America]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-222	SPM	2	16			Is this intended to read "… no-climate-policy..."? [James [Jim] Crawford, United States of America]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-223	SPM	2	16			This wording & punctuation definitely means a policy of no climate [William Ingram, United Kingdom]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-224	SPM	2	17	2	17	Footnote 3: definition of radiative forcing. A less technical description is recommended here in the SPM. If the	The footnote has been removed. The concept of

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						footnote were to begin with the words "radiative forcing describes..." (rather than is defined as)….then there would be no need to use a formal, technical definition. [Government of Canada]	radiative forcing is now introduced more comprehensively and in simpler terms in Section 3 of the SPM "Drivers of Climate Change". Radiative forcing is also defined in the WGI Glossary.
SPM-225	SPM	2	17	2	17	In footnote 3 it is mentioned that for determining RF surface and tropospheric temperatures and state variables are fixed at the unperturbed values. Is it explained somewhere (e.g. in the glossary) to what situation 'unperturbed values' refers? [Government of Netherlands]	The footnote has been removed. The concept of radiative forcing is now introduced more comprehensively and in simpler terms in Section 3 of the SPM "Drivers of Climate Change". Radiative forcing is also defined in the WGI Glossary.
SPM-226	SPM	2	17	2	17	We suggest that you include an easy to grasp explanation that shows the link between radiative forcing and temperature. You should include similar language as used in AR4 SPM WGI at page 2 including the second footnote which is easier to understand. [Government of NORWAY]	The concept of radiative forcing is now introduced more comprehensively and in simpler terms in Section 3 of the SPM "Drivers of Climate Change". Radiative forcing is also defined in the WGI Glossary.
SPM-227	SPM	2	17	2	17	The four RCPs span the range of year-2100 radiative forcing values …' I find this wording ambiguous and unclear. Can this be stated more clearly? [Ian Simmonds, Australia]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-228	SPM	2	17	26	13	The Representative Concentration Pathways are poorly explained in the SPM, in particular the assumptions underlying each scenario. For example, the extremely ambitious level of global action assumed in RCP2.6 is not clearly articulated (apart from an obscure reference to 'sustained globally negative emissions' on page 17, line 7). There is no comparison between the RCPs and our current trajectory to allow policy makers to select an appropriate RCP. Figures 5, 6 and 7 in the SPM depict projections for only RCP2.6 and RCP8.5, seemingly providing more weight to these RCPs than the other RCPs. It must be made absolutely clear in the SPM what assumptions are being made when policymakers select a particular RCP upon which to base policy responses. [Government of Australia]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-229	SPM	2	17			There would normally be no space between "W" and "m". ---- Likewise in footnote 4. [James [Jim] Crawford, United States of America]	copy edit
SPM-230	SPM	2	17			The footnote defining RF seems far too technical for a SPM. I would suggest something like: "Radiative Forcing (RF) is a measure of the change in energy within the climate system. Positive forcing tends to warm the Earth surface while negative forcing tends to cool it. In this report, radiative forcing values are expressed in Watts per square meter (W m-2)." [Government of United States of America]	The footnote has been removed. The concept of radiative forcing is now introduced more comprehensively and in simpler terms in Section 3 of the SPM "Drivers of Climate Change". Radiative forcing is also defined in the WGI Glossary.
SPM-231	SPM	2	17			Obscure. It seems to say (on 3rd reading) that the values for radiative forcing in the year 2100 in the literature are restricted to 2.6-8.5 W/m2, which I'm sure is untrue - worst-case methane-clathrate release studies, & geoengineering studies, for example [William Ingram, United Kingdom]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-232	SPM	2	18	2	18	The policy makers should understand from the very beginning how to interpret the 2,5,..8,5 used to label the 4 RCPs. This labelling in terms of RF might be understood as implying that the RF is imposed to any modelling using this RCP I suggest to add the following sentence :"They provide the climate modelers with concentration pathways used to compute radiation forcing which may differ from the one calculated by the reference model and used as an identifier of each of the 4 RCPs ." [Michel Petit, France]	The RCP discussion has been revised and moved to the Chapeau of the Projections section and to the new Box SPM.1: Representative Concentration Pathways (RCPs)
SPM-233	SPM	2	20	2	21	It will not be good enough to just mention this complex and contentious terminology and then refer readers to an internal IPCC Guidance Note. The concept and the terminology need to be explained succinctly up front in the SPM. [Government of Australia]	Accepted. The paragraph introducing the consistent treatment of uncertainties in the assessment of WGI has been revised and expanded. In addition, the terms used to describe evidence/agreement, confidence or likelihood levels are introduced in two new footnotes thus following the approach taken in

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							WGI AR4 SPM.
SPM-234	SPM	2	20	2	21	Per Canada's overarching comments on the SPM as a whole, it is recommended that a box explaining the treatment of uncertainties be added to the SPM. In this more fulsome explanation, there is a useful line of text that could be drawn on from Chp. 1 page 15 lines 49-51, which states: "A finding that includes a probabilistic measure of uncertainty does not require explicit mention of the level of confidence associated with that finding if the level of confidence is high or very high. This is a concession to (stylistic clarity and) readability." [Government of Canada]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-235	SPM	2	20	2	21	Understanding of IPCC language is essential for the understanding of the SPM. Insert the text of TS page 3 from line 27 to 32 as well as figure 1 and table 1 of AR5 uncertainty guidance note (or the respective figure in AR5, chapter 1). [Government of Germany]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-236	SPM	2	20	2	21	In footnote 4, the following sentence should be added to clarify the use of additional terms (in particularly, the use of "extremely likely" on page SPM-10 line 8 and 43) to represent likelihood in this report: “Note that additional terms (extremely likely – 95-100% probability, more likely than not – >50-100% probability, and extremely unlikely – 0-5% probability) may be used in this report when appropriate, as written in Mastrandrea et al. (2010).” [Government of Japan]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-237	SPM	2	20	2	21	This statement about the degree of certainty is not clear for policy makers, particularly the use of the word probabilistically. Reword [Government of New Zealand]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-238	SPM	2	20	2	21	It might be helpful to give a more detailed overview of what the different confidence assessments mean and how they are arrived at (perhaps in a stand-alone box?). So, please include a short description of the qualitative level of conference here, e.g. what does it mean for “virtually certain”, “likely”, very likely”. In each chapter, these qualitative confidence statements are present only in their respective Executive Summaries. However, there was no link with the detailed information and no justification of why these level of confidence statements were down. [Government of United Kingdom of Great Britain & Northern Ireland]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-239	SPM	2	20	2	21	These are all speculations about the future. There is no evidence that any of them are successful [Vincent Gray, New Zealand]	Reject. This paragraph solely introduces the terminology used to describe the degree of certainty in key findings.
SPM-240	SPM	2	20	2	21	To provide a fair scientific assessment of the difficulties in making reliable climate projections in the very long term, the Summary for Policymakers should contain a clear statement similar to §14.2.2.2 of AR4 explaining the impact of the fact that the climate object is, mathematically speaking, chaotic. Reason: Lorenz (1936), in the celebrated paper that founded chaos theory, concluded that because the climate behaves as a chaotic object the reliable long-term prediction of future climate states was not available by any method. Example: Predicting the future evolution of a chaotic object demands knowledge of the initial values of its defining parameters to a precision which, in the climate object is and will always be unattainable. Accordingly, it is not possible even on a global scale reliably to predict the future evolution of the climate object in response to a perturbation such as our adding CO2 to the atmosphere. A fortiori, difficulties in regional-scale prediction will be greater still, and the Summary for Policymakers should say so. [Christopher Monckton of Brenchley, United Kingdom]	Reject. This paragraph solely introduces the terminology used to describe the degree of certainty in key findings. The assessment of future projections of climate change is presented in Section 5 of the SPM.
SPM-241	SPM	2	20	2	21	To provide policymakers with a mature assessment of the difficulties in reliable long-term prediction of future climate states, the Summary for Policymakers should admit that probability density functions are still more problematic than simple central estimates flanked by error-bars. Reason: Because the climate behaves as a chaotic object, even establishing a reliable, century-long simple central estimate flanked by error bars is not possible. A fortiori, providing projections by way of probability-density functions is impossible, since PDFs require more information than estimates flanked by error-bars, not	Reject. This paragraph solely introduces the terminology used to describe the degree of certainty in key findings. The assessment of future projections of climate change is presented in Section 5 of the SPM.

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						less. In general, the IPCC follows the modelers in claiming too much certainty for its conclusions. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-242	SPM	2	20		21	Strike this para; give as footnote at first use. Don't waste reader's attention with such detail at the top of the document. [Stephen E Schwartz, United States of America]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-243	SPM	2	20			Possibility to insert here the the table with the different levels of certainty [Government of France]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-244	SPM	2	20			The authors shoud consider including a box giving quantitative definitions of the IPCC calibrated uncertainty and confidence language [Government of United States of America]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-245	SPM	2	21	2	21	You cannot expect that SPM readers will search for the Guidance notes to look up the meanings of probabilistic and confidence levels. Thus, they should absolutely be explained in footnote 4. [Urs Neu, Switzerland]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-246	SPM	2	21	2	22	We suggest that you consider to include a general sentence describing uncertainty and the relation to risk in the introduction of the SPM. [Government of NORWAY]	Reject. Risk is not assessed in WGI AR5. Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-247	SPM	2	21	2	25	Where is any mention of the trend since the end of 1996? Surely the readers should be told that there's been no statistically significant warming. [John McLean, Australia]	[Comment probably refers to page 3, lines 21-25 rather than page 2 as indicated by the reviewer] Taken into account. Statement has been substantially revised and expanded. A 2nd paragraph now presents warming rate over the past 15 years in addition to the robust multi-decadal warming.
SPM-248	SPM	2	21			Insert, "…and, when, possible, probabilistically ON A LIKELIHOOD SCALE." or something similar to indicate that the quantitative uncertainty is stated in terms of 'likelihood'. [Government of United States of America]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1).
SPM-249	SPM	2	22	2	22	The draft SPM refers extensively to different level of certainty and confidence. Hence it will be important that the meaning of these classifications is visible early in the text to make it clear for the reader how these classifications are made. We propose that the diagrams including the captions from SPM SREX Box 2 "treatment of uncertainty", based on the uncertainty guidance, is included in the introduction of this SPM on page 2 line 22. Together with the sentence "A level of confidence is expressed using five qualifiers: very low, low, medium, high, and very high.". We feel that it is not enough to refer to this in a footnote. Another alternative might be to include the whole Box SPM 2 from SREX as an individual page, but then it should be in the beginning of this SPM. [Government of NORWAY]	Uncertainty terminology is now explained in a more comprehensive paragraph and in two detailed footnotes in the SPM. In addition, a new box on the treatment of uncertainty in the AR5 has been added to the Technical Summary (see Box TS.1). The Technical Summary does repeat the figure from the Uncertainty Guidance Note. We prefer not to repeat it again in the SPM.
SPM-250	SPM	2	23	2	24	The term "substantive paragraphs" is confusing - as many important synthesis statements do not include	The introduction to the SPM has been revised and

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						references to chapter sections. This paragraph should also explain what the italicized statements are (syntheses of section as a whole?) as well as the shaded statements (key new insights since the AR4?). [Government of Canada]	now explains the function of the highlighted boxed statements, the brief chapeau text in italics. We thus hope that it will now be clear what is referred to as "substantive paragraph", i.e., the paragraphs providing the assessment from WGI AR5.
SPM-251	SPM	2	23	2	25	This is a disappointing distortion of what the HadCRUT3 and HadSST2 data actually shows, The two sets of data were consistent until 1980, at which time the HadCRUT3 data diverged on the high side from the HadSST2 data. Does that mean an error in the HadCRUT3 data? Has anyone proved that it's not? (And this is not to say that the fault lies in HadCRUT3 data processing; any errors could well be upstream.) [John McLean, Australia]	[Comment probably refers to page 3, lines 23-25 rather than page 2 as indicated by the reviewer] Noted. SPM statement is firmly based on the comprehensive and robust assessment presented in the underlying report in Chapter 2.
SPM-252	SPM	2	23		24	Strike this para; give as footnote at first use. Don't waste reader's attention with such detail at the top of the document. [Stephen E Schwartz, United States of America]	Reject. We think this is an important component of the SPM, supporting the traceability of all substantive SPM statements. It has successfully been used in the WGI AR4 SPM.
SPM-253	SPM	2	28	7	18	For the findings that were already addressed in AR4, a graph showing how uncertainty has evolved would be useful for policy makers. It could document (different colour code) the uncertainties for new items wrt AR4. [Government of France]	The direct comparison of assessment findings between reports is difficult if not impossible. For some climate variables, different aspects have been assessed, and the revised guidance note on uncertainties has been used for the SREX and AR5. It would thus be misleading to provide such an evolution for all statements. However, for some key statements, where there has been a clear revision to the scientific assessment since AR4, this is now highlighted in the SPM
SPM-254	SPM	2	28	7	18	The observations section might benefit from an upfront description/assessment of types of observations, global coverage and quality and how this impacts on the various confidence assessments of observed changes (i.e. that there might be only low or medium confidence because there are limited obs, rather than due to disagreement between different obs or a lack of trend), and would help give a clearer picture on what is well observed and what is less well observed. [Government of United Kingdom of Great Britain & Northern Ireland]	Opening chapeau to the observation section has been revised, and includes an introduction to the range and types of observations.
SPM-255	SPM	2	28			cut “system”: Climate System will be examined in parts 3 and 4 [Government of France]	reject, this section contains a broad range of observations from across the climate system
SPM-256	SPM	2	28			This section says climate system - the system has always included composition and land-surface and I think it still does. These topics are missing here and later in biogeochemistry - please include here or somewhere or admit this is not the climate system. [Michael Prather, United States of America]	reject, 'climate system' accurately covers the components addressed in this section, and does not infer a complete coverage across all components of the climate system. Changes in land surface are outside the scope of WGI
SPM-257	SPM	2	29	2	29	It's necessary to start with a brief definition of the climate system and to indicate what the changes in the system rely on, Proposal : The system that determines the climate called" climate system" consists of five (5) components: the atmosphere, the hydrosphere (including oceans), the cryosphere, the biosphere and the lithosphere. Observation of changes in the climate system relies therefore on the behaviour of these compoments. [Government of Benin]	Opening chapeau to the observation section has been revised, and refers to key components of the climate system.
SPM-258	SPM	2	30	2	30	We suggest re-phrasing like this: "Observations show widespread changes in the atmosphere across the globe and over time." [Government of NORWAY]	Opening chapeau has been significantly revised.
SPM-259	SPM	2	30	2	30	"across spatial and temporal scales" --> this statement (for changes of the state of the atmosphere) should be more specific, as it is the case later in the same paragraph for other components of the climate system. [Masa KAGEYAMA, France]	Opening chapeau has been significantly revised.
SPM-260	SPM	2	30	2	30	I suggest "Widespread long-term changes in the atmosphere are observed regionally and globally". [David	Opening chapeau has been significantly revised.

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						Parker, United Kingdom of Great Britain & Northern Ireland]	
SPM-261	SPM	2	30	2	30	Please clarify what range of spatial and temporal scales [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	Opening chapeau has been significantly revised.
SPM-262	SPM	2	30	2	32	We suggest re-phrasing like this: "There is strong evidence of physical and biogeochemical changes in the oceans during the past forty years." [Government of NORWAY]	Opening chapeau has been significantly revised. Biochemical changes in the ocean no longer explicitly mentioned.
SPM-263	SPM	2	30	2	32	"Widespread", "Strong" and "Important" are all rather subjective. Not easy to find better words though. [Albert Klein Tank, Netherlands]	Opening chapeau has been significantly revised. Subjective language has been avoided.
SPM-264	SPM	2	30	2	34	Tense changes across the paragraph, with the "are observed" in the first sentence suggesting current observations, not historic. To make the paragraph consistent, the tense could be "have been", or "are being" if the other sentences in the paragraph had a parallel construction. [Kristie Ebi, United States of America]	noted
SPM-265	SPM	2	30	2	34	This paragraph unnecessarily avoids describing the sign of the changes. For example only 'changes' in snow and ice are summarised. Stating the direction of the change is not an attempt at attribution. The AR4 summary stands alone and so should the AR5. Wile this is clarified in the box, each paragraph in the SPM is likely to be quoted and should stand alone [as a general point]. [Government of Australia]	Opening chapeau has been significantly revised. Specific changes no longer mentioned in what is meant to be a broad, introductory chapeau.
SPM-266	SPM	2	30	2	34	Widespread changes in the atmosphere are observed'...what time frame? (next sentence gives much more info about oceans). Shouldnt this be clear that it is about trends that have continued since the Fourth Assessment? [Government of New Zealand]	Opening chapeau has been significantly revised. Specific changes no longer mentioned in what is meant to be a broad, introductory chapeau.
SPM-267	SPM	2	30	2	34	This para is an odd mixture of a list of things which have changed, which policy makers don't really need to know (they want to know if things have warmed/ cooled/ shrunk/grown/ got wetter/ got drier, not just "changed") and a definition of paleoclimate archives. Suggest deletion. [Government of United Kingdom of Great Britain & Northern Ireland]	Chapeau is meant to provide an introduction to the section, with specific changes addressed in the subsequent statements.
SPM-268	SPM	2	30	2	34	The periods you quote are ridiculously short and many of the observations are dubious. It is absurd to conclude that they are unusual on a geological scale [Vincent Gray, New Zealand]	reject, comment not substantiated.
SPM-269	SPM	2	30	2	34	To put the IPCC's observational findings into perspective, it should make clear at the outset that the physical and biogeochemical state of the oceans and the extent and volume of snow and ice has changed throughout their history; that the changes of the past 40 years are not unprecedented; and that the changes are not necessarily harmful. Reason: The wording in the draft to the effect that the hydrosphere and cryosphere have "changed during the past 40 years" or "changed over the latter half of the 20th century" leaves the impression that the changes are unprecedented or at least unusual, when in truth we do not have to this day any adequately long or spatially well-resolved time series for mean sea level, mean oceanic acid-base balance; Arctic or Antarctic land-ice or sea-ice extent or volume; or Northern-Hemisphere snow-cover extent. [Christopher Monckton of Brenchley, United Kingdom]	Opening chapeau has been significantly revised. Specific changes no longer mentioned in what is meant to be a broad, introductory chapeau. Details on specific changes, and available paleo context, are found in the subsequent statements.
SPM-270	SPM	2	30	2	34	To draw policymakers' attention to the uncertainties surrounding the IPCC's projections, it is necessary to explain that since even today's measurements of key climate indicators are problematic the difficulty in establishing what took place in the paleoclimate is still greater. Reason: Paleoclimate reconstructions are subject to large uncertainties and are less capable of providing definitive indications of the likely future evolution of today's climate than IPCC Assessment Report have been willing to admit. In particular, the quantitative information they provide is uncertain. [Christopher Monckton of Brenchley, United Kingdom]	reject, statements stemming from Chapter 5 of the WGI AR5 are clearly using the IPCC uncertainty and confidence language.
SPM-271	SPM	2	30	2	34	This paragraph includes statements on changes in the atmosphere, oceans, and cryosphere, but no statements on changes in land surface variables (beside snow). This seems incomplete (e.g. statements on soil moisture and streamflow droughts would be relevant). [Sonia Seneviratne, Switzerland]	Opening chapeau has been significantly revised. Specific changes no longer mentioned in what is meant to be a broad, introductory chapeau. The need to produce a short, and concise SPM means that not all quantities can be reported across all sections.

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SPM-272	SPM	2	30		34	Took me a while to realize that this is the introduction - can you rephrase to clarify you are talking not about results but data/inputs? [Gabriele Hegerl, United Kingdom]	Opening chapeau has been significantly revised
SPM-273	SPM	2	32	2	32	"snow and ice" - should this be "northern hemisphere snow and ice" - I would say in general that the handling of the different behaviour of arctic and antarctic sea ice is rather poor in the SPM, especially as this is such a high profile issue. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Opening chapeau has been significantly revised. Specific changes no longer mentioned in what is meant to be a broad, introductory chapeau.
SPM-274	SPM	2	32	2	33	Changes in the cryosphere over the 'latter half of the 20th century' are mentioned. Changes over the first decade of the 21th century would also be merited. [Government of Netherlands]	Opening chapeau has been significantly revised. Specific changes no longer mentioned in what is meant to be a broad, introductory chapeau.
SPM-275	SPM	2	32	2	34	add after 'have changed' 'mostly decreased', see SPM Page5 lines 1 to 39 [Government of Germany]	Opening chapeau has been significantly revised. Specific changes no longer mentioned in what is meant to be a broad, introductory chapeau.
SPM-276	SPM	2	32			snow & ice are not "parts" of the cryosphere: they are all of it! "aspects"? [William Ingram, United Kingdom]	Opening chapeau has been significantly revised. Specific changes no longer mentioned in what is meant to be a broad, introductory chapeau.
SPM-277	SPM	2	33	2	33	The expression "paleoclimate archives" should be explained (maybe as "records of past climates") [Luisa Cristini, United States]	reject, 'Paleo archives' is a term that should be familiar to the policy makers.
SPM-278	SPM	2	33	2	33	Noting that there have been important changes to the cryosphere over the latter half of the 20th century leaves a reader wondering what has happened in the 12 years of the 21st century. If this statement would hold true for the last 60 years, reporting on that timeframe is recommended. [Government of Canada]	Opening chapeau has been significantly revised. Specific changes no longer mentioned in what is meant to be a broad, introductory chapeau.
SPM-279	SPM	2	33	2	34	Paleo climate archives … of years' seems to be not a very informative sentence, without mentioning what this specifically means in terms of statements that can be made on natural and anthropogenic influence on climate change. [Government of Netherlands]	Opening chapeau has been significantly revised. Details on paleo context provided where available in the subsequent statements.
SPM-280	SPM	2	33	2	34	The importance of this information is not clear.(If the point is that new paleoclimate information has improved climate system knowledge since AR4, we suggest rephrasing, for example: "Ice cores and other paleoclimatic archives have improved our knowledge about the range of naturally driven changes in the climate system over millions of years." [Government of NORWAY]	Opening chapeau has been significantly revised. Details on paleo context provided where available in the subsequent statements.
SPM-281	SPM	2	33			Overstated. Paleoclimate archives are quantitative, but not directly information about the climate system per se (as opposed to the biosphere, geology, &c) [William Ingram, United Kingdom]	Reject comment. Note that wording has been revised as a result of significant revision to the opening chapeau.
SPM-282	SPM	2	34	2	34	to delete colored text between brackets: of (naturally driven) changes [Nedal Katbeh-Bader, Palestine]	Opening chapeau has been significantly revised.
SPM-283	SPM	2	34	2	34	A number of archives cited or implicilty used in the paleo chapter and elswhere use paleo records with annual (tree rings) or decadal (salt marsh) resolution. The radiocarbon calibration curve (implicit in many of the cited paleo-studies) uses annual layered records of various types (lakes, marginal seas, growth layers). [Mark Siddall, United Kingdom]	Opening chapeau has been significantly revised. Details on paleo context provided where available in the subsequent statements.
SPM-284	SPM	2	34			Paleoclimate archives provide interannual to decadal records also, not just centuries & longer. [Government of United States of America]	Opening chapeau has been significantly revised. Details on paleo context provided where available in the subsequent statements.
SPM-285	SPM	2	36	2	36	This is the first sentence of interest to a policy maker - it seems odd that it should restate the AR4 conclusion; instead it should state an AR5 conclusion. [Government of United Kingdom of Great Britain & Northern Ireland]	Statement has been revised
SPM-286	SPM	2	36	2	36	The CRU tells us that there has been no statistically significant warming for almost 16 years. This is only slightly shorter than the period of general warming that started in the late 1970s. In total we've only observed warming in the first half of the last 32 years. That's hardly "unequivocal" or anything to get excited about. [John McLean, Australia]	Statement is from the AR4. In order to focus on the assessment findings of the AR5, we no longer repeat the earlier AR4 findings here.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-287	SPM	2	36	2	36	This is a problematic sentence. What is "unequivocal"? Is it the increase in temp. Or is it the attribution of this to anthropogenic emissions? [Henning Rodhe, Sweden]	Statement is from the AR4. In order to focus on the assessment findings of the AR5, we no longer repeat the earlier AR4 findings here.
SPM-288	SPM	2	36	2	38	give some concrete examples for the 'many changes' [Government of Germany]	Statement has been revised, so that 'many changes' in the second sentence clearly refers to the changes listed in the first sentence, and seen in Figures SPM 1 and 2.
SPM-289	SPM	2	36	2	39	I disagree with the conclusion of unequivocal. The only thing that is really unequivocal is the CO2 concentration. For global temperature this really is not the case. First as it now shown in chapter 2, warming between 1910-1940 was similar to the more recent warming period. Then if we go back a little further it's far from clear whether global temperature is now higher than 1000 years ago. Multiproxy reconstructions still have lots of problems and I don't think any of them can be regarded as solid at this moment (this includes the one from Loehle that skeptics prefer). The real uncertainties around such reconstructions are huge and prevent drawing strong conclusions. If we go further back in time we had the Holocene Thermal Maximum when in Greenland it was warmer than it is now. During the last interglacial it was warmer than now and sea levels were higher. [Marcel Crok, The Netherlands]	Unequivocal' Statement is from the AR4 and is supported by a comprehensive scientific assessment. Note that In order to focus on the assessment findings of the AR5, we no longer repeat the earlier AR4 findings here.
SPM-290	SPM	2	36	2	39	The authors should consider adding that "reduced measurement bias" supports stronger conclusions. [Government of United States of America]	These details are provided where appropriate for the individual quantities in the statements that follow. See for example, the statement on ocean warming.
SPM-291	SPM	2	36	2	39	It is impossible to measure the average temperature of the earth's surface,which would require random placement of thermometers over the entire earth's surface, let alone the "climate system" which means the entire atmosphere,.so you cannot tell whether either is "warming" The claim that the whole lot is warming "unequivocally" fs therefore without scientific or observational foundation and is thus more the nature of a political slogan or a religious belief than a scientically established conclusion. Also you do not state over what period tuis "warming" is supposed to be happening. Then, according to the unreliable "Mean Global Surface Temperature Anomaly" there ishas been no warming for the past ten years. How "unequivocal" is that? [Vincent Gray, New Zealand]	reject, 'Unequivocal' Statement is from the AR4 and is supported by a comprehensive scientific assessment. Note that In order to focus on the assessment findings of the AR5, we no longer repeat the earlier AR4 findings here. Revised boxed statement in AR5 includes time scale "since 1950".
SPM-292	SPM	2	36	2	39	This statement about stronger confidence of 'unprecedented' changes is not supported by the evidence. In fact there is less confidence in the paleo data, see for example the paper by statisticians McShane and Wyner (“proxies do not predict temperature significantly better than random series”). See sec 5.3.5.2 on limitations and uncertainties. [Paul Matthews, United Kingdom]	Overarching boxed statement has been revised. Details on the paleo context are provided in the subsequent statements for each quantity.
SPM-293	SPM	2	36	2	39	The AR4 statement that warming is unequivocal was based strictly on the instrumental record and did not include paleoclimatic information. Here you are mixing the two yet referring back to AR4, which is not consistent with what we said then. I suggest you move the reference to AR4 to the next highlighted statement on page 3, lines 3-6, to keep like with like. [Susan Solomon, United States of America]	Unequivocal' Statement from the AR4 is no longer repeated here in order to focus on the assessment findings of the AR5.
SPM-294	SPM	2	36	2	39	Use of the words 'significant' and 'unusual' may cause difficulties since their meaning is unclear, as is the reference to 'many changes'. Can you clarify? You may also want to consider whether this statement merits a highlighted spot. The paragraph immediately above it on page 2, lines 30-34 has a number of clearer statements. You may want to merge the two and delete some parts. [Susan Solomon, United States of America]	Statement has been revised - 'significant' no longer used. Subsequent bullets provide paleo context where available to support this overarching boxed statement.
SPM-295	SPM	2	36	2	40	This SPM will likely be the single most read document in the entire IPCC report. There is absolutely a history of referencing previous assessment findings in a summary box like this, but statements like this that highlight key findings should emphasize what we know first and foremost. This statement, however, does not do that. It passes off assessment to the AR4 and concludes that recent updates "give further support." Instead, this statement should emphasize what the scientific community does in fact know first and foremost, and then reference that this builds upon the assessment of the AR4 but strengthens it. A strong statement should read that "multiple lines of independent evidence, including....., demonstrate that warming of the climate system is unequivocal. This was concluded in AR4 and is further strengthened/supported by new observations, etc." [William Anderegg, United States of America]	Statement has been revised to focus on the key assessment findings of the AR5.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-296	SPM	2	36			Is the intent here to indicate "longer-term data sets"? [James [Jim] Crawford, United States of America]	Statement has been revised
SPM-297	SPM	2	36			"unequivocal" is a high charged term that is almost never used by Physicists regarding science. Strongly recommend rewriting this to use another term. "Global warming" is often used as an equivocation between meaning "the global temperatuSe is increasing" and "anthropogenic forcing is causing the global temperature to increase" as politically defined by the UNFCC. Strongly recommend providing an explanation near the front of this section for policy makers explicitly distinguishing these terms and issues. [David L. Hagen, United States of America]	Statement has been revised to focus on the key assessment findings of the AR5.
SPM-298	SPM	2	36			May I respectfully suggest start the discussion of findings with changes in atmospheric composition, ghg's, aerosols, which are not only drivers of change of the physical climate but are themselves changes in the chemical climate of the planet that are more confidently known, and more confidently attributed to human activity. Then get into changes in the physical climate. This ordering also follows more logically the cause and effect train. [Stephen E Schwartz, United States of America]	Intention of the current structure is to first report the observed changes in the climate system, before the assessment of drivers of climate change is provided. The detection and attribution section then makes the link between the observed changes, and drivers of these changes.
SPM-299	SPM	2	36			Lead the discussion of atmospheric composition with new findings about atmos composition, specifically that atmospheric amounts of CO2 and other ghg's have continued to increase. [Stephen E Schwartz, United States of America]	Preference is to maintain the existing ordering. We think it would be misleading to present a 'cause and effect' argument without the necessary assessment which comes later in the detection and attribution section.
SPM-300	SPM	2	36			Suggest do not start with talking about what was in AR4. Start with new findings. Invert the sentence to read: New observations, longer data sets, and more paleoclimate information give further support to the conclusion reached in AR4 that warming of the climate system is unequivocal. . [Stephen E Schwartz, United States of America]	Statement has been revised to focus on the key assessment findings of the AR5.
SPM-301	SPM	2	36			"warming of the climate system is unequivocal". As Robert Charlson has been pointing out recently, the term "warming" is very ambiguous. Does the statement mean "it is unequivocal that there has been an increase in global mean surface temperature" or does it mean "it is unequivocal that there has been an increase in the flux of longwave radiant energy that is incident upon the surface and that thereby warms the climate system"? Attention should be paid to this ambiguity throughout. I am pretty sure it is the former that is meant. But the latter is even more unequivocal. [Stephen E Schwartz, United States of America]	Unequivocal' Statement from the AR4 is no longer repeated here in order to focus on the assessment findings of the AR5.
SPM-302	SPM	2	37	2	37	Suggest change to "...information since AR4 give further support for..." [Government of New Zealand]	Statement has been revised to focus on the key assessment findings of the AR5.
SPM-303	SPM	2	37	2	37	Consider to replace "further" with "stronger" [Government of NORWAY]	Statement has been revised
SPM-304	SPM	2	37	2	37	I think confidence has to be "higher" or "lower" rather than "stronger" [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	Statement has been revised
SPM-305	SPM	2	37	2	39	The statement "many changes …..are ….unprecedented on time scales of decades to many hundreds of thousands of years is completely false. The same climatic changes that have occurred during the past century have occurred many, many times at all time scales (decades, centuries, millenia). Atmospheric and oceantemperature measurements, historical observations, isotope data from ice cores, glacial fluctuations, tree ring measurements, pollen changes, ocean sediments, and many other records of past climatic changes demonstrate many climate changes at all time scales (see peer-reviewed summary in Easterbrook, 2011, Evidence-based Climate Science, Elsevier Inc). This is supposed to be a scientific document and such false statements have no place in a document like this. [Don Easterbrook, United States of America]	reject, statement is based on the comprehensive assessment given in chapter 5 of the WGI AR5.
SPM-306	SPM	2	37	2	39	Should the "confidence" referred to at the beginning of this sentence use the calibrated terminology? It is confusing when the term confidence is used outside of this terminology, particularly for such an important statement. [Government of Canada]	statement has been revised
SPM-307	SPM	2	37	2	39	Consider to replace "Confidence is stronger" with "There is more evidence and higher agreement". Rationale: This gives a better understanding of what is the meaning of confidence. Please consider to include "recent"	statement has been revised

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						between "many" and "changes" to distinguish recent observation from historic changes in climate. [Government of NORWAY]	
SPM-308	SPM	2	37	2	39	This report shows no evidence whatsoever that the observations were not in accord with what one would expect from about 30 years of dominance of ENSO conditions on the El Nino side of absolutely neutral (ie. SOI=0) [John McLean, Australia]	reject; see assessment in chapters 2 and 10.
SPM-309	SPM	2	37	2	39	awkward sentence [John Mitchell, United Kingdom]	noted and revised
SPM-310	SPM	2	37	2	39	To render the wording more neutral and scientifically credible, the words “Confidence is stronger that many changes that are observed consistently across components of the climate system are significant, unusual or unprecedented on times scales of decades to many hundreds of thousands of years” should be deleted. Reason: Since there has been no warming since the previous Assessment Report, there is manifestly no observational evidence to support the offending sentence. The only potential adverse consequence of CO2 enrichment that does not follow from warming is a putative alteration of the acid-base balance of the oceans: however, no global time series of sufficient length or steric resolution to draw any conclusion is yet available. Therefore the offending sentence, scientifically speaking, is fiction. [Christopher Monckton of Brenchley, United Kingdom]	reject, the statement is correct regardless of the observed warming trend over the past 10 - 15 years.
SPM-311	SPM	2	38	2	38	Delete the first two commas [Kristie Ebi, United States of America]	noted - copy edit
SPM-312	SPM	2	38	2	38	Consider deleting the word "unusual" as it introduces a level of ambiguity that is inconsistent with the effort that has been placed in developing rigorous language to explain change. [Government of Canada]	"unusual" is maintained here in the boxed statement. Subsequent statements provide further details on the paleo context when available.
SPM-313	SPM	2	38			The commas are not needed. [James [Jim] Crawford, United States of America]	noted - copy edit
SPM-314	SPM	2	38			The statement that the observed changes are unusual or unprecedented strictly is a detection statement that does not belong here. [Reto Knutti, Switzerland]	reject, this statement can be supported on the basis of the observed records and paleoclimate archives.
SPM-315	SPM	2	39	2	39	The expression "last decade" lacks precision. Does it mean the last multiple of 10 years (I.e. 2001 to 2010)? Does it mean the ten years prior to when the text was written (late 2011? Early 2012?). Does it mean the ten years leading up to the publishing of the report (which would be unlikely given that it was stated in the drafts)? Always specify the period in question in order to remove any ambiguity and uncertainty. [John McLean, Australia]	comment seems misplaced.
SPM-316	SPM	2	39			Can language that is more specific than "Many hundreds of thousands of years" be used? I.e., What is “many” ? [Government of United States of America]	statement is intended as an overarching key message, and has been revised to "decades to millennia". Subsequent statements provide further details on the paleo context when available.
SPM-317	SPM	2				The first conclusion of the SPM should address climate forcing factors: The concentrations of anthropogenic, long-lived greenhouse gases (LLGHG's) in the atmosphere have continued to rise unabated and the climate forcing that they will cause in the future will be very large if this continues. Here, "very large" will be ca 8.5 W/m^2 by the year 2100, which would be a significant fraction to the total greenhouse effect (GHE) of 150 W/m^2 and thus would be expected to cause observable and even dangerous climatic changes. 8.5 W/m^2 is also substantially larger than the positive forcing that had to have occurred at the end of the last ice age (that is determined to be +6.5 +/- 1.5 W/m^2). The small but clearly observable changes of the climate system over the past few decades are consistent with the present-day net forcing of ca. +1.5 W/m^2. Larger and much more obvious climatological and meteorological changes can be expected in the future if the atmospheric concentrations of LLGHG's are allowed to continue to increase. Inasmuch as the lifetimes of LLGHG's are measured in centuries, the climatic changes that these would cause in the future are not quickly reversible. [Robert Charlson, United States of America]	Intention of the current structure is to first report the observed changes in the climate system, before the assessment of drivers of climate change is provided. The detection and attribution section then makes the link between the observed changes, and drivers of these changes.
SPM-318	SPM	2				Please provide a brief introduction to the meaning of radiative forcing in the executive summary, and possibly highlight or display a 'screamer' showing the approximate formula for calculating the ground temperature increase due radiative forcing increase. [Andrejs Vanags, United States of America]	radiative forcing does not occur until section C of the SPM, and here the term is introduced using a footnote (footnote 8).

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SPM-319	SPM	3	1	3	1	We feel that the lowermost panel in the Box 2.2, Figure 1 (Chapter 2, page 153) gives a very good visualization of temperature changes and propose that you consider including this in this section of the SPM. [Government of NORWAY]	The concept for the figures elevated to the AR5 SPM is to show multiple lines of evidence. The figure proposed by the reviewer includes only a single temperature dataset. The revised figure in the SPM (Figure 1) includes 3 datasets, and is therefore a much more robust and compelling figure.
SPM-320	SPM	3	1	3	1	"Atmosphere" This is a strange header particularly as it does not correspond to the classifications given in Figure SPM.1 - part of what is in this section is, according to SPM.1, land and ocean. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Atmosphere is an appropriate title for this section. Figure SPM1 has been revised, and is now focused on global surface temperature.
SPM-321	SPM	3	1	3	1	There is a major stylistic difference between the subsections in the observations section, in how quantitative they are. Only one of the atmosphere bullets is quantitative, all of the cryosphere ones are, and none of the paleo ones are. I would say that the "cryosphere" section should be used as an example of how it should be, and all bullets should be quantitative wherever possible. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Section and sub-sections have been substantially revised. Quantified changes are given where available from the underlying chapter assessments, and where these changes are considered policy-relevant. Note that the observed changes in the cryosphere are generally measured over a shorter satellite era, and quantified rates of change can be provided with high confidence in these instances.
SPM-322	SPM	3	1			I would have preferred to see the increase of CO2 mentioned in the beginning of this section. After all, this is the most extraordinary "Atmospheric Observation" and the most undisputable sign of "global change". [Henning Rodhe, Sweden]	Intention of the current structure is to first report the observed changes in the climate system, before the assessment of drivers of climate change is provided. The detection and attribution section then makes the link between the observed changes, and drivers of these changes.
SPM-323	SPM	3	3	3	3	To correct an incomplete and misleading statement, the words “Widespread warming is observed from the surface of the Earth throughout the troposphere” should be replaced by the following: “Warming of ~0.6 K has been observed over the past 60 years, but this rate of warming is within natural variability, though an anthropogenic component may be present. No warming has been observed since the Third Assessment Report was published in 2001: indeed, there has been no statistically significant global warming for 16 years.” Reason: The warming observed since 1900 is well within natural variability. Warming at a rate equivalent to 4 K/century was observed in central England in the 70 years 1695-1735 during the recovery of solar activity after the Maunder Minimum: historical evidence suggests this rate may have been global. It is important not to mislead policymakers: therefore, the fact that there has been no warming since the two previous Assessment Reports must be made explicit. The statement that “Widespread warming is observed” when it has not been observed for 16 years is calculated to deceive. [Christopher Monckton of Brenchley, United Kingdom]	reject, reviewer does not provide a substantive scientific basis for his claims. Warming trend over the past 15 years is provided explicitly in a subsequent bullet.
SPM-324	SPM	3	3	3	3	To correct an incomplete and misleading statement, the words “and cooling is identified in the stratosphere” should be replaced by the following: “During the period of lower-troposphere and surface warming from the beginning of satellite observations in 1979 until late in 2001, the stratosphere cooled. However, the stratospheric cooling ceased in 2001.” Reason: The statement that “cooling is identified in the stratosphere”, when there has been no such cooling for well over a decade, is calculated to deceive. If the IPCC is to earn back some of the credibility it has lost, it must take exaggerated care to be precise, particularly in the Summary for Policymakers, which will be read largely by people with little scientific experience or knowledge of the underlying data. [Christopher Monckton of Brenchley, United Kingdom]	reject, reviewer does not provide scientific evidence supporting his claim
SPM-325	SPM	3	3	3	4	The expression "cooling is identified in the stratosphere" should misleading and should be explained [Luisa Cristini, United States]	stratosphere cooling no longer mentioned in this boxed statement, but appears in a specific statement in the subsequent bullets.
SPM-326	SPM	3	3	3	4	The sentence is awkward; suggest changing "observed" to "occurring" [Kristie Ebi, United States of America]	statement is revised
SPM-327	SPM	3	3	3	4	Most of this paragraph focuses on the near surface warming, it is slightly confusing that you introduce information about the stratosphere and then come back to the near surface temperature in the two last	stratosphere cooling no longer mentioned in this boxed statement, but appears in a specific statement

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						sentences. Hence we propose that the information about the stratosphere is sufficiently treated in page 2 line 27 or at least it could be a separate sentence at the end of this shaded paragraph. [Government of NORWAY]	in the subsequent bullets.
SPM-328	SPM	3	3	3	4	Footnote: The phrasing of line 3-4 is not intuitive: "The upper endpoint of the uncertainty interval has a 95% likelihood of exceeding the value that is being estimated…" Perhaps a more clear phrasing would be: "There is a 5% chance of the number being estimated exceeding the upper endpoint of the uncertainty interval..." [Government of United States of America]	Noted. Formulation seems ok to us -- no change.
SPM-329	SPM	3	3	3	4	It seems to me that it could be confusing to talk about stratospheric cooling without saying here that this is what is expected as a result of GHG increase--so accompanying surface warming. [Michael MacCracken, United States of America]	stratosphere cooling no longer mentioned in this boxed statement, but appears in a specific statement in the subsequent bullets.
SPM-330	SPM	3	3	3	4	Widespread warming throughout the troposphere and cooling in the stratosphere is identified since when? [Susan Solomon, United States of America]	stratosphere cooling no longer mentioned in this boxed statement, but appears in a specific statement in the subsequent bullets.
SPM-331	SPM	3	3	3	44	Please provide an explanation why the global mean temperature has not increased from 1998 until recent years, while the concentrations of greenhouse gases have increased considerably in the same period. [Government of Netherlands]	The rate of warming over the past 15 years is assessed in a specific bullet. An explanation of this recent trend is provided in the relevant section of detection and attribution.
SPM-332	SPM	3	3		4	"observed" yet "identified" - if a distinction is meant I don't know what: clarify. If not, use "observed" both times. [William Ingram, United Kingdom]	statement revised
SPM-333	SPM	3	3			Replace 'from the surface of the Earth' with 'at the surface of the Earth and' [Government of Australia]	statement revised
SPM-334	SPM	3	4	3	4	"near-surface" should probably be hyphenated [Timothy Carter, Finland]	copy edit
SPM-335	SPM	3	4	3	4	Your claim that you have measured "globally averaged" near surface: temperature is untrue. In order to do so it would be necessary to distribute thermometers randomly over the entire surface of the earth, including oceans deserts and forests. The "global surface temperature anomaly" which you quote is very far from such a scientifically based system as it consists of multiple averages based on unrepresentative samples from non standardized condions which have very large uncertainties and biases whic greatly exceed the supposed :warming,: and are never estimated. [Vincent Gray, New Zealand]	reject, see comprehensive assessment provide in Chapter 2.
SPM-336	SPM	3	4	3	5	May be better as 'have increased since at least the beginning of the 20th century..' [Susan Solomon, United States of America]	statement revised
SPM-337	SPM	3	4	3	6	The statement "Each of the last three decades has been significantly warmer than all preceding decades since 1850" is completely contradicted by NOAA temperature data (see peer-reviewed data in Easterbrook, 2011, Evidence-based Climate Science, Elsevier Inc) which clearly shows that the decade of the 1930's was the warmest of the century. NOAA confirms that 82% of all maximum records were set prior to 1960 (prior to the accelerated growth of human CO2 emissions) 372,989 daily high temperatures have been recorded in the US since 1895. 84% of them were set when CO2 was below 0.035%. Therefore you cannot legitimately make the claim in the statement above! [Don Easterbrook, United States of America]	Statement has been revised and is fully consistent with the underlying Chapter 2 assessment. It now reads "Each of the last three decades has been warmer than all preceding decades since 1850 and the first decade of the 21st century has been the warmest". This is also supported by the revised Figure SPM.1
SPM-338	SPM	3	4	3	6	This discussion ignores the substantial natural fluctuation contributing to stronger warming from 1970s through 1990s but the highly publicized little warming since the mid 1990s. I recommend distinguishing between the temperature magnitude and the rate of warming. E.g. [David L. Hagen, United States of America]	The rate of warming over the past 15 years is assessed in a specific bullet, and compared to the rate over a longer term period.
SPM-339	SPM	3	4	3	6	Recommend restating: “Globally averaged near surface temperatures have increased since the beginning of the 20th century with each of the last three decades being significantly warmer than the preceding decades since 1850 and the Little Ice Age. Natural fluctuations contributed to a stronger warming rate from the 1970s through the mid 1990s, and for the little warming since then.” [David L. Hagen, United States of America]	reject, proposed wording is not coming from the comprehensive chapter assessment. Causes of warming are addressed in the section on Detection and Attribution.
SPM-340	SPM	3	4			This will read a bit smoother if hyphens are used as follows: "Globally-averaged near-surface…". [James [Jim] Crawford, United States of America]	copy edit
SPM-341	SPM	3	5	3	6	Clarify whether this line is intended to say that the decades of 80-90, 90-00 and 00-10 are all > decades	Statement has been expanded, and is now clearly

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						between 1850-1980 OR that 00-10>90-00>80-90>all decades between 1850-1980? [Government of Canada]	supported by figure SPM 1, panel a.
SPM-342	SPM	3	5	3	6	Please consider to include information that all of the 10 warmest years have occurred since 1997 with 2010 and 2005 as the warmest ref. the results from chapter 2.4.3 described at page 33 line 44 - page 34 line 2. We expect that these results will be updated up to the finalization of AR5. [Government of NORWAY]	We believe the current statement regarding the first decade of the 21st century contains this important information, and this information for individual years can be seen in SPM figure 1.
SPM-343	SPM	3	5	3	6	It is unclear, from this sentence, whether each of the last three decades is also warmer than the preceding one in sequence. Specifically, "Each of the last three decades' --- does this mean 1981-1990, 1991-2000, 2001-2010 or 1983-1992, 1993-2002, 2003-2012. Or 1980-89, 90-99, 2000-09 or what? [Government of United Kingdom of Great Britain & Northern Ireland]	Statement has been expanded, and is now clearly supported by figure SPM 1, panel a.
SPM-344	SPM	3	5	3	6	The last sentence ("Each of the last three decades ..") seems to be inconsistent with a finding of chapter 10 which says: The trend in global mean temperature since 1998 is not significantly different from zero (Executive Summary, page 10-3, line 50, 51). [Klaus Radunsky, Austria]	reject, not inconsistent. Warming has slowed, but not cooled. See SPM figure 1, panel (a) which highlights this nicely.
SPM-345	SPM	3	5			There should be a comma after "century". [James [Jim] Crawford, United States of America]	copy edit
SPM-346	SPM	3	5			“since the 1970”: “between 1970 and 1998 would be more precise” [Government of France]	statement has been revised
SPM-347	SPM	3	6	3	6	Suggest a change to "…preceding decades since at least 1850" [Government of Australia]	reject, Chapter assessment based on data extending back until 1850. See SPM figure 1, a.
SPM-348	SPM	3	6	3	6	Is it possible to include "virtually certain" in parenthesis at the end of this shaded paragraph? [Government of NORWAY]	shaded paragraph has been revised, and uses calibrated uncertainty language resulting from the underlying chapter assessment.
SPM-349	SPM	3	6	3	8	The paragraphs should start with the conclusion of policy interest, which are the two findings, not "the mean regional pattern of sea surface salinity has been enhanced" [Government of United Kingdom of Great Britain & Northern Ireland]	comment appears to be for page 4, line 46. Relevant statement has been substantially revised
SPM-350	SPM	3	6			Shouldn't there be some mention, either here or later in the section, that there has been a recent slowdown in warming, but this is not inconsistent with a long term warming trend? [Government of United Kingdom of Great Britain & Northern Ireland]	The rate of warming over the past 15 years is assessed in a specific bullet, and compared to the rate over a longer term period.
SPM-351	SPM	3	9	3	18	These very long captions are quite unwieldy, throughout the report. [James [Jim] Crawford, United States of America]	Figures and captions have been substantially revised. Note however that figures need to be stand-alone to avoid being misinterpreted, and therefore captions must accurately provide all necessary detail.
SPM-352	SPM	3	9	3	18	Given the update of the AR5 historical drought assessment compared to the AR4 (which focused on the change in the global area affected by droughts), Figure 1 of the recent article by Sheffield et al. (2012, Nature) would seem relevant for this summary figure. Reference: Sheffield, J., E.F. Wood, and M. Roderick, 2012, Nature, 491, 435-438, doi:10.1038/nature11575. [Sonia Seneviratne, Switzerland]	Figures 1 and 2 (previously fig 1) have been revised and now focus on a smaller selection of key quantities.
SPM-353	SPM	3	9	5	45	Figure SPM.1 (on SPM-20) consists of 8 panels: a) through h). When the Figure SPM.1 is referred in the text of SPM, it (just says "see Figure SPM.1", and it) does not say which one(s). Specifying which panel(s) is desirable. [Government of Japan]	Figures 1 and 2 (previously fig 1) have been revised and now focus on a smaller selection of key quantities. Referencing from the text to specific panels has been improved.
SPM-354	SPM	3	9			Figure SPM.1: If showing Arctic sea ice extent, please show Antarctic sea ice extent as well. It is really important for the IPCC to be seen to be impartial and unbiased in its assessment of the evidence. Perhaps the annual minima could be shown one on top of the other as a stacked time series, which would also demonstrate that the recent Arctic loss outweighs the Antarctic gain. [Stephen Smith, United Kingdom of Great Britain & Northern Ireland]	Figure focuses on the robust, long term record of Arctic sea ice, for which is of the highest policy relevance. Changes in Antarctic sea ice are clearly assessed in a bulleted statement.
SPM-355	SPM	3	10	3	10	"global" - two of the presented statistics are not global and I wonder whether it would be better to present the annual trends in total sea-ice cover, rather than selecting the Arctic - or at least, including Antarctic on the same plot. A more minor query is that it is unclear to me why the sea level plot starts negative [Keith Shine,	Figure focuses on the robust, long term record of Arctic sea ice, which is of the highest policy relevance. Changes in Antarctic sea ice are clearly assessed in a

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						United Kingdom of Great Britain and Northern Ireland]	bulleted statement. Revised caption for SPM Fig 2 (d) explains the plotting procedure for the sea level curve.
SPM-356	SPM	3	10			The different datasets may be assembled independently but the underlying data is not. If they were fully independent then the total uncertainty would be much smaller. Suggest to remove "independently". [Reto Knutti, Switzerland]	Caption revised (see SPM fig 2).
SPM-357	SPM	3	11	3	12	"…change in a large-scale quantity from the atmosphere, the cryosphere, the land, or the ocean." [David Parker, United Kingdom of Great Britain & Northern Ireland]	Caption revised (see SPM fig 2).
SPM-358	SPM	3	12	3	12	Suggest change to "overlap in time" [Government of New Zealand]	Caption revised (see SPM fig 2).
SPM-359	SPM	3	13	3	14	It is unclear why these reference periods are all different. Possible to harmonize? [Albert Klein Tank, Netherlands]	Reference periods are consistent with the underlying chapter assessments, and are unchanged to support the chapter based SPM statements for these quantities.
SPM-360	SPM	3	14	3	14	Why is a 13-year running mean used here. I suppose the explanation is only to be found in the original source paper (I didn't find it in the core chapters), but if this appears in the SPM, it is possible that the question will be raised. [Timothy Carter, Finland]	Running mean no longer used for the SPM version of this figure (SPM fig 2, panel a).
SPM-361	SPM	3	14	3	14	The panels in figure SPM-1 show some observational details that may be confusing to the reader. In particular panel c contain observational information outside the uncertainty range, implying a larger uncertainty than anticipated in the figure caption. We understand that not all details can be captured in the figure caption, but it should at least explain the outlyers in this panel. [Government of Netherlands]	Figure revised (see SPM figs 1 and 2).
SPM-362	SPM	3	14	3	14	Insert "Northern Hemisphere" before "March-April". [David Parker, United Kingdom of Great Britain & Northern Ireland]	statement revised
SPM-363	SPM	3	16	3	16	"… Chapters 2 and 4". [David Parker, United Kingdom of Great Britain & Northern Ireland]	copy edit
SPM-364	SPM	3	17	3	17	What does the "shaded range" represent? 90% interval? [Albert Klein Tank, Netherlands]	Uncertainties are as assessed in the underlying chapters.
SPM-365	SPM	3	17	3	17	I find "storms" unhelpful, as it doesnt convey useful information. The bullet starts on tropical cyclones, but storm could refer to anything from an individual cumulonimbus cloud to a very large mid-latitude depression. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	comment should be for page 4, line 17. Text is now removed, and tropical cyclones covered in SPM table 1.
SPM-366	SPM	3	21	3	21	land and ocean temperature data = atmospheric temperature data over land and ocean [Luisa Cristini, United States]	term used is "globally averaged combined land and ocean surface temperature data" and is consistent with terminology of chapter 2.
SPM-367	SPM	3	21	3	21	I cannot find how the 0.8 ºC rise has been estimated in the text of Chapter 2, it is not in section 2.4.3 [Geert Jan van Oldenborgh, Netherlands]	statement revised.
SPM-368	SPM	3	21	3	22	Remove 'when described by a linear trend'. Meaning of this is unclear and devalues previous statement. [Government of Australia]	This technical detail has been removed from the SPM
SPM-369	SPM	3	21	3	22	Please give ranges for the temperature increase, not only "about X°C". [Government of Germany]	statement revised
SPM-370	SPM	3	21	3	23	The decision to include two different long term warming trends in this paragraph is confusing and if these are retained, then some explanation is required in order for readers to understand why. In particular, (1) Why is the extra 15 years significant to report on and why is the amount of warming less than that over the period 1901-2010?; (2) Why were the particular dates 1886-1905 to 1986-2005 picked and not, for example, 1891-1910 vs. 1991-2010?; and (3) Why is a range of values given for the warming trend from early industrial to now and not for the warming trend over 1901-2010? Lacking this information, this paragraph remains unclear. [Government of Canada]	statement has been revised and now includes a single trend over the long term period 1901 - 2012
SPM-371	SPM	3	21	3	23	A comparison with pre-industrial, not just early-industrial, would be highly policy relevant. [Government of Denmark]	statement has been revised and no longer includes this comparison. A comparison to 1850 - 1900 is now

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							included in the notes for SPM table 2.
SPM-372	SPM	3	21	3	23	The addition of a pre-industrial proxy here is very welcome, given that policy documents usually talk about changes relative to pre-industrial, rather than the period 1986-2005. It would be good, if this continued throughout for key variables/findings. [Government of United Kingdom of Great Britain & Northern Ireland]	The warming between 1850 - 1900 to 1985 - 2005 is now included as a note to SPM table 2. This avoids including too many time frames in a single paragraph, which other review comments found problematic.
SPM-373	SPM	3	21	3	23	Figure SPM.1 does not actually show the combined SST/Land graph the text is referring to. The graphs are shown separately. [Government of United Kingdom of Great Britain & Northern Ireland]	See revised SPM figure 1.
SPM-374	SPM	3	21	3	25	Please avoid the use of more than one time frames in the one sentence. This paragraph refers to 5 separate time periods, making it very difficult to understand. Suggest that complex figures like this are presented in a table instead of in the text. [Government of Australia]	statement has been revised and now includes a single trend over the long term period 1901 - 2012
SPM-375	SPM	3	21	3	25	None of the statements in this paragraph can be linked to Fig SPM.1 although readers are referred to this Figure. No combined land and ocean temperature time series are shown in Fig SPM.1 nor can we see spatial warming patterns over the globe. Either the reference to Fig SPM.1 should be removed or appropriate text linking to Fig SPM.1 should be brought into this paragraph. [Government of Canada]	Paragraph has been revised. See also revised SPM figure 1.
SPM-376	SPM	3	21	3	25	We have several comments regarding time reference periods: 1) references should be consistent in AR5; 2) reference in previous IPCC-reports was pre-industrial, comparison to AR4 should be provided. (What is early-industrial in comparison to pre-industrial?) 3) In addition, for IPCC to be policy-relevant, the UNFCCC-decision regarding the 2°C limit wrt to pre-industrial levels should be considered. [Government of Germany]	Taken into account. Consistent reporting of anomalies including their assessed uncertainties has been a focus of the revisions of the SPM. However, this is not always possible as the reference periods do depend on the availability of data, length of records etc. for the underlying assessment in the Chapters. We do note, however, that observed temperature changes for additional reference periods are now given in footnote a of Table SPM.2. The term "early industrial" is indeed unclear and is no longer used in the SPM.
SPM-377	SPM	3	21	3	25	Section 2-Atmosphere Observation: These relates to observed changes in the global combined land and ocean temperature over the period of 1901-2010. It is considered essential that the AR5 does take a note of the recent literature relating to observational records published in this regard and reflects it in the SPM. It should indicate average increase/decrease in observed temperature for the decade of the end of the 20th century and first decade of the 2000-2010 and subsequent-decades. The recent literatures indicated below show a hiatus in warming: Easterling, D. R., and M. F. Wehner (2009), Is the climate warming or cooling?, Geophys. Res. Lett., 36, L08706, doi:10.1029/2009GL037810. Meehl, G. A., et al., 2011: Model-based evidence of deep-ocean heat uptake during surface-temperature hiatus periods, Nature Climate Change, 1, 360–364 (2011), doi:10.1038/nclimate1229 Solomon, S. et al., 2010: Contributions of Stratospheric Water Vapor to Decadal Changes in the Rate of Global Warming Science 327, 1219 . DOI: 10.1126/science1182488 [Government of India]	Statement has been added which addresses trends in GMST over the past 15 years.
SPM-378	SPM	3	21	3	25	Atmosphere Observations. 'The global combined land and ocean temperature data show an increase of about 0.8°C over the period 1901–2010 and about 0.5°C over the period 1979–2010 when described by a linear trend.' a. Question 1: Could you indicate the statistical significance level of such linear trends? b. Question 2: Could you provide additional information when using nonlinear trends compared to linear estimations? [Government of Morocco]	1) Statement has been revised, and includes link to footnote 3 which describes the statistical confidence for the trends given. 2) This level of detail would be too much for a summary document, but can be found in the underlying chapter and supplementary material to chapter 2.
SPM-379	SPM	3	21	3	25	Even US weather stations are rarely capable of measuring temperature to better than one degree and it is simply ridiclous to quote figires that are subhect to huge uncertainties to one or even two decimals of a degree. Weather forecasters just anever use decomals and most of their claims are considered approximate. The figures you quote are so small they do not establsh a claim for a significant warming. Also, the amounts are so small that their consequences are undetectable. [Vincent Gray, New Zealand]	reject, see comprehensive assessment provided in Chapter 2.
SPM-380	SPM	3	21	3	25	It would be extremely helpful for consistency across the entire AR5, particularly the links with WGIII, if the	The warming between 1850 - 1900 to 1985 - 2005 is

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						authors of WGI could provide a number for the global mean warming from the (ill-defined) "pre-industrial period" to the reference period of 1986-2005. The pre-industrial climate (and the time period this refers to) is ill-defined, but nonetheless used in large parts of the impacts and mitigation literature, so providing an authoritative (if qualified) number (including perhaps a purposeful definition of the time period used for this number) would be very, very constructive and help connect WGI to the issues of concern in WGII and III. "Early-industrial" I'm afraid doesn't quite satisfy this need. Vice versa, NOT providing a number for this key quantity will only lead to continued problems and misinterpretations further down the track. Adding such information in a footnote to Table SPM.2 would be another, additional, helpful step. [Andy Reisinger, New Zealand]	now included as a note to SPM table 2.
SPM-381	SPM	3	21	3	25	The dates over which trends are calculated are different from those in Ch 2, Section 2.4.3 which go up to 2011. It doesn't seem to make sense to only go to 2005. This is quite an important monitoring figure for policy makers trying to design policy to keep global temperatures within 2 degrees of pre-industrial temperatures and so the values and their uncertainty needs to be clearly stated. [Kate Willett, United Kingdom]	statement has been revised, and is consistent with the underlying chapter assessment
SPM-382	SPM	3	21	3	45	The dot points in the Atmosphere Observations section talk about trends over various periods (when described by a linear trend). However, there also needs to be some commentary included in the SPM about the fact that temperatures have effectively had zero trend since around 1998, and possible reasons for this (e.g. as discussed in Meehl et al, 2011). This needs to be addressed because the lack of an increasing trend is very evident from figures included in other Chapters (e.g. Figures 1.4 and 1.5, TFE.3 Figure 1 middle (TS-79)). It is also clear in these figures that while temperatures from around 1998 may lie within the bounds of earlier projected changes, they are fairly uniformly close to the lower bounds. These facts need to be commented on because otherwise other less informed commentators are likely to seize on them as a reason for inaction. [The reference is Meehl, G. A., et al. (2011), Model-based evidence of deep-ocean heat uptake during surface-temperature hiatus periods, Nat. Clim. Change,1(7), 360–364, doi:10.1038/nclimate1229.] [Government of Australia]	Statement has been added which addresses trends in GMST over the past 15 years. Possible influences on this trend are addressed in the section on detection and attribution. See also a new comprehensive technical box on the 'hiatus' that has been added to the Technical Summary (Box TS.3)
SPM-383	SPM	3	21			The word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". By the end of the sentence it seems clear the former is meant: make it clear by changing it to e.g. "global-mean" [William Ingram, United Kingdom]	statement revised
SPM-384	SPM	3	22	3	22	Although this is mentioned elsewhere, it isn't apparent at this point in the SPM that the reason for showing trends over the non-standard period 1979-2011 is because this coincides with the period of continuous satellite observations. A footnote to this effect would probably be needed here. [Timothy Carter, Finland]	statement revised - 1979 -2011 trend no longer reported in the SPM
SPM-385	SPM	3	22	3	22	The warming from 1886-1905 (early-industrial) to 1986-2005 is 0.66 [0.60 to 0.72] °C. It is not clear what this sentence adds to this paragraph and the change of baselines/time periods is confusing. [Government of Australia]	The warming between 1850 - 1900 to 1985 - 2005 is now included as a note to SPM table 2.
SPM-386	SPM	3	22	3	22	The wording "…when described by a linear trend" is too technical for a non-scientific audience and should be better explained if significant or removed. [Government of Canada]	this technical detail has been removed
SPM-387	SPM	3	22	3	22	Trends in Ch2 now run to 2011 instead of 2010. We need to update the E.S. of Ch2 too. [Albert Klein Tank, Netherlands]	all statements have been updated based on final chapter drafts.
SPM-388	SPM	3	22	3	22	Change 2010 to 2011 (or even 2012 if available). [David Parker, United Kingdom of Great Britain & Northern Ireland]	all statements have been updated based on final chapter drafts.
SPM-389	SPM	3	22	3	23	The dataset used to calculate these values should be referenced (e.g. HADCRUT4) as other global temperature datasets result in different rates of temperature rise. [Government of United Kingdom of Great Britain & Northern Ireland]	Trends are calculated based on 3 datasets (see SPM Figure 1).This level of detail is provided in the chapter.
SPM-390	SPM	3	22	3	23	The warming from 1886–1905 (early-industrial) to 1986–2005 is 0.66 [0.60 to 0.72] °C5 (see Figure SPM.1).' This does not give the reader important information after the first sentence of this paragraph. Especially since the years (dates) do not match with the ones in the sentence before, there is no possibility of comparing something. Suggest to delete this sentence. [Line van Kesteren, the Netherlands]	statement has been revised. The warming between 1850 - 1900 to 1985 - 2005 is now included as a note to SPM table 2.
SPM-391	SPM	3	22	3	23	The modelling chapters seem to have settled on 0.60 K for the difference early-industrial (estimated by 1850-	The warming between 1850 - 1900 to 1985 - 2005 is

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						1900) to 1986-2005 because 1886-1905 could be biased low due to the eruptions of the Krakatau, Santa Maria and other volcanoes in this period. Is it possible to quote this interval and error margin here? [Geert Jan van Oldenborgh, Netherlands]	now included as a note to SPM table 2.
SPM-392	SPM	3	22		23	The sentence on the longer trend is confusing - the trend seems to decrease but that's just because a linear trend probably will fit less well over that long period. I'd drop it the figure shows it better anyway [Gabriele Hegerl, United Kingdom]	statement and figure has been revised
SPM-393	SPM	3	23	3	23	An explanation for the choice of these 20-year periods for comparison would be helpful already here. Clearly, they have been adopted as 20-year periods, a century apart, with the latter being used as a reference period in the AR5 for projections into the future (cf. footnote 8) [Timothy Carter, Finland]	Statement has been revised, and these periods are no longer reported here. The warming between 1850 - 1900 to 1985 - 2005 is now included as a note to SPM table 2.
SPM-394	SPM	3	23	3	23	Footnote 5. The description of the uncertainty interval is confusing. Please rephrase. [Kristie Ebi, United States of America]	comment does not provide specific suggestions.
SPM-395	SPM	3	23	3	23	Footnote 5: Reference of the footnote is unclear as well as the text in the footnote itself. Uncertainty language should be used in a clear and consistent manner in the whole report and explained at an early stade. How is the interval justified? [Government of Germany]	Noted. Two additional footnotes have been added to the SPM to clarify the uncertainty terminology used in IPCC AR5 for levels of confidence and likelihoods.
SPM-396	SPM	3	23	3	23	Reference is made to Figure SPM.1, but from this figure it is not clearly visible how much the temperature of the two mentioned 20 year periods differs (in Figure SPM.1 land surface and sea surface temperature anomalies are shown as time series in panel e) and f), but no information is e.g. given on averages over 20 year periods). [Government of Netherlands]	statement and figure has been revised
SPM-397	SPM	3	23	3	23	We feel that it is important that you also include information about the rate of change for global temperature per decade and how this has changed. [Government of NORWAY]	rates of change are given in a new second bullet.
SPM-398	SPM	3	23	3	23	to delete colored text between brackets: is 0.66 ({0.60-0.72}), it is adviceable to use one figure and delete ranges for simplicity and to avoid confusion, this is applicable for then whole document. [Nedal Katbeh-Bader, Palestine]	reject, governments expect to have these uncertainty ranges provided.
SPM-399	SPM	3	23			Should the footnote be placed beside these square brackets or beside the first use of the uncertainty terminology on p. 3 line 27? Either way, where it is now (beside the degC symbol) does not make the link clearly to what is explained in the footnote. The explanation for the square brackets in the footnote is also difficult to follow. [Government of Canada]	exact location of footnote can be revised during copyedit. It relates to the ranges, no the uncertainty terminology.
SPM-400	SPM	3	23			Why is the 'modern' time frame stopped at 2005? A more relevant and current comparison would be between 1880-1901 (still early industrial) vs 1990-2011 [Government of United States of America]	Statement has been revised, and these periods are no longer reported here. The warming between 1850 - 1900 to 1985 - 2005 is now included as a note to SPM table 2.
SPM-401	SPM	3	23			While it will sometimes be useful to have a best estimate as well as a range, it probably makes better sense to put the range first even when the best estimate is a useful one (in the sense that the range is fractionally small), as here. In my opinion it would be more readable to omit the best estimate when it is the intuitive one (the middle of the range) - saying clearly of course that not giving an explicit one implies it is the middle of the range. Of course that would not work for any cases without a best estimate, but I haven't seen any. [William Ingram, United Kingdom]	reject, reporting of a best estimate, and its uncertainty intervals is the normal approach which the governments are familiar with.
SPM-402	SPM	3	24	3	24	The "greater" warming in mid-to-high latitude regions" would seem to be not least a Northern Hemisphere feature and could be considered to be indicated more clearly. [Government of Sweden]	statement revised and emphasizes now the key point that warming has been experienced almost over the entire globe. Spatial pattern to warming can be seen in revised SPM figure 1.
SPM-403	SPM	3	24	3	25	"Greater" is a comparative word calling for "than" something to follow "regions". [James [Jim] Crawford, United States of America]	statement revised and emphasizes now the key point that warming has been experienced almost over the entire globe. Spatial pattern to warming can be seen in revised SPM figure 1.

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SPM-404	SPM	3	24	3	25	Please replace 'generally greater over land than oceans and greater in mid-to-high latitude regions' with 'generally greater over land than the oceans and greater in mid-to-high latitude regions than low-latitude regions' [Government of Australia]	statement revised and emphasizes now the key point that warming has been experienced almost over the entire globe. Spatial pattern to warming can be seen in revised SPM figure 1.
SPM-405	SPM	3	24	3	25	Is this statement true for mid and high latitudes of the SH? [Susan Solomon, United States of America]	statement revised and emphasizes now the key point that warming has been experienced almost over the entire globe. Spatial pattern to warming can be seen in revised SPM figure 1.
SPM-406	SPM	3	24			Insert the word "over" before "ocean" to remove any possibility of ambiguity of air temperature and water temperature. [James [Jim] Crawford, United States of America]	statement revised and emphasizes now the key point that warming has been experienced almost over the entire globe. Spatial pattern to warming can be seen in revised SPM figure 1.
SPM-407	SPM	3	25	3	25	Consider to add "non-significant" trend since 1998 which is policy relevant. [Albert Klein Tank, Netherlands]	Statement has been added which addresses trends in GMST over the past 15 years.
SPM-408	SPM	3	25	3	25	Suggest adding "than in tropical regions" to the end of this sentence. As written, the comparison is not clear. [Dian Seidel, United States of America]	statement revised and emphasizes now the key point that warming has been experienced almost over the entire globe. Spatial pattern to warming can be seen in revised SPM figure 1.
SPM-409	SPM	3	27	3	27	Please define troposphere and lower stratosphere. [Government of Australia]	we don't consider a definition of these well understood terms is required.
SPM-410	SPM	3	27	3	27	What means "globally", Should it be understood as averaged over all geographic locations ? What about the altitude ? Is it the average over all altitudes in the troposphere ? [Government of France]	Unnecessary technical detail. See chapter assessment for this detail.
SPM-411	SPM	3	27	3	27	Perhaps mention why lower stratospheric cooling is supposed to be significant. Not obvious to non scientists. [Government of United Kingdom of Great Britain & Northern Ireland]	In this observations section of the SPM we strictly report measured/observed changes. For further detailed understanding of what these changes mean for the climate system, the reader is referred to the underlying chapter assessment.
SPM-412	SPM	3	27	3	27	What means "globally", Should it be understood as averaged over all geographic locations ? What about the altitude ? Is it the average over all altitudes in the troposphere ? Is it everywhere ? [Michel Petit, France]	Unnecessary technical detail. See chapter assessment for this detail.
SPM-413	SPM	3	27	3	27	I appreciate that a great deal of thought and debate has gone into the words. However 'virtually certain' may mean different things to different people. [Ian Simmonds, Australia]	Virtually certain" is defined in footnote 1 of the SPM.
SPM-414	SPM	3	27	3	27	Terms like 'virtually certain', 'likely', etc are used in the SPM. I can see the wisdom of not actually quantifying their meaning in the SPM, as the relevant reader will have a broad understanding as to what they mean. Having said that, I believe there is a good argument for presenting the quantitative definitions here, albeit in an abbreviated form. The definitions presented in Table 1 (1-16-40) could be given at this stage in the SPM. [Ian Simmonds, Australia]	All likelihood and confidence terms are defined in footnotes 1 and 2 of the SPM.
SPM-415	SPM	3	27	3	28	It may not be clear to many readers why stratospheric cooling is being reported. Understanding the significance of this result requires considerable knowledge since it does not fit into the 'warming story' even though the result is consistent with expectations under GHG forcing. Suggest at minimum mentioning that this result is consistent with patterns expected under GHG forcing. Revision to FAQ 2.1 to include mention of stratospheric cooling would be helpful and FAQ2.1 could then be referenced here. [Government of Canada]	In this observations section of the SPM we strictly report measured/observed changes. For further detailed understanding of what these changes mean for the climate system, the reader is referred to the underlying chapter assessment.
SPM-416	SPM	3	27	3	28	Cooling in the stratosphere might be confusing to non-expert readers. Better to give a brief explanatory note about what is implied by the stratospheric cooling in the context of global warming caused by increase in carbon dioxide. [Government of Japan]	In this observations section of the SPM we strictly report measured/observed changes. For further detailed understanding of what these changes mean for the climate system, the reader is referred to the underlying chapter assessment.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-417	SPM	3	27	3	28	Figure SPM.1 clearly shows constant stratospheric temperatures since the mid 1990s. This is not mentioned and explained in the text, which I think is an omission. [Guus Velders, Netherlands]	This detail is discussed in the Chapter 2 assessment.
SPM-418	SPM	3	27	3	29	Does the medium confidence statement here refer only to the first sentence of this bullet and not to the changes described in the previous bullet? The previous bullet does not include confidence assignments, and the reference to "these changes" in "rates of these changes" could be unclear given the discussion of rates of change that also occurs in the previous bullet. It also might be helpful to indicate more explicitly whether medium confidence applies to the assignment of "virtually certain" in the first sentence. [Christopher Field, United States of America]	Statement has been revised.
SPM-419	SPM	3	27	3	29	"at best medium confidence" - "at best" should not be used in front of a defined uncertainty term. Either is it medium confidence, or it is the scale below that. [Government of Australia]	Statement has been revised.
SPM-420	SPM	3	27	3	29	If the message you try to communicate is that the warming/cooling is virtually certain but there is medium confidence to the rates of the warming/cooling. The whole paragraph could be more clear if the second sentence starts with "However, the rates of the warming and cooling.....". Furthermore the words "and their vertical structure" is confusing since the sign of the changes in troposphere and stratosphere is opposite. Probably the best way would be to delete "and their vertical structure". The wording "at best medium confidence" might be confusing, as it can be interpreted as actually lower than medium confidence. [Government of NORWAY]	Statement has been revised.
SPM-421	SPM	3	27	3	29	There is some ambiguity in this bullet whether this also includes the statement for the warming of the surface. The second sentence clearly fits for the global troposphere and the stratosphere but not for the surface (as clear in the Chap 2 executive summary). This ambiguity may be clarified by adding a statement in the previous bullet for surface temperature warming. [SYLVIE JOUSSAUME, France]	Statement has been revised.
SPM-422	SPM	3	27	3	29	The combined use of "virtually certain" and “medium confidence” is an example of the policy maker confusion that may be caused by these terms – ties to 3rd SPM remark above. They need to be defined in a way that PMs (& their staffs) can understand. The use of "There is at best..." sounds very negative; is it not better to simply have the confidence stated and not prefaced with "at best"? This may be the only confidence stated in SPM prefaced with a comment. [herman sievering, United States of America]	Statement has been revised.
SPM-423	SPM	3	27	3	44	These are merely the opinions of biased "experts". They are not based on scientific studies. [Vincent Gray, New Zealand]	reject, comment lacks any substantive basis.
SPM-424	SPM	3	27		29	I am a bit surprised that you give the trop/strat trend since the middle of the century. Isnt the satellite period much better observed with much less uncertainties - I can see that that one should be virtually certain …I see the statement in the ES of ch2, so probably this query should go there - but are we really just as confident in the period 1950 to satellites as afterwards?? [Gabriele Hegerl, United Kingdom]	Statement is based on the comprehensive chapter assessment.
SPM-425	SPM	3	27			Again, the word "globally" used here has 2 opposite potential meanings, "averaged over the globe" & "everywhere over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	Unnecessary technical detail. See chapter assessment for this detail.
SPM-426	SPM	3	27			Please provide an explanation for the stratospheric cooling (one sentence) which is not a well-known phenomena for lay audiences. [Oliver Stebler, Switzerland]	In this observations section of the SPM we strictly report measured/observed changes. For further detailed understanding of what these changes mean for the climate system, the reader is referred to the underlying chapter assessment.
SPM-427	SPM	3	27			define probabilities associated with these terms. Also define difference between likely and medium confidence. I realise that footnote 4 refers to these definitions, but I feel a separate box with definitions, such as used in the SREX report, would be useful for the reader. [Conor Sweeney, Ireland]	All likelihood and confidence terms are defined in footnotes 1 and 2 of the SPM.
SPM-428	SPM	3	28	3	29	Suggest this sentence be deleted as it is rather technical for policymakers. The space could be used instead to explain why stratospheric cooling is expected and consistent with GHG forcing. The qualifier "at best" is also confusing for readers who are trying to understand the confidence level for this finding. [Government of Canada]	The sentence provides important detail. "at best" has been removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-429	SPM	3	28	3	29	The conclusion "at best medium confidence" is biased. Section 2.4.4, lines 29 - 31 state low confidence in the details of the upper air temperature trends. In addition, the summary in 2.4.5 (lines 3 to 14, page 39) state low confidence to medium confidence for a variety of air layers. We therefore suggest changing "at best medium confidence" to "low to medium confidence" reflecting the uncertainty in a more balanced way consistent with the scientific findings and the subsequent interpretation in the main text. See also our comments for this chapter (page 39, lines 3 to 6). [Government of Netherlands]	Statement has been revised, and is now m ore specific.
SPM-430	SPM	3	28	3	29	Suggest that the end of this sentence should change to '…and their vertical structure through the atmosphere.' for clarity. [Government of United Kingdom of Great Britain & Northern Ireland]	Statement has been revised
SPM-431	SPM	3	28	3	29	I have made a number of comments on section 2.4.4, related to its failure to draw on reanalysis data and its inadequate discussion of satellite data, and the in-my-view over-pessimistic nature of some conclusions. The tropospheric "atmosphere" panel of Fig SPM.1 shows quite considerable agreement among the estimates shown, so "at best medium confidence" seems a bit harsh as regards this rate of change. If one discounts the dark-blue outlier in the stratospheric panel, that rate of change looks quite consistent also, insofar as a "rate of change" is well defined for such variability. But perhaps the text as given here in the SPM has to stay as it is, given the tenor of section 2.4.4. [Adrian Simmons, United Kingdom]	Concluding statements are based on the comprehensive chapter assessment. See chapter for discussion and assessment on the different types of data etc.
SPM-432	SPM	3	28	3	29	I am not very comfortable with this statement. At least since 1979, trends in cooling are reasonably well characterized in the lower stratosphere in my view. If your concern re vertical structure is for the upper stratosphere, that is probably not necessary to state in an SPM, although it merits discussion in the main text. Why 'at best'? Please clarify. [Susan Solomon, United States of America]	Statement has been revised, and is based on the comprehensive assessment given in chapter 2.
SPM-433	SPM	3	28			I'd drop 'at best' [Gabriele Hegerl, United Kingdom]	Statement has been revised, and is now more specific.
SPM-434	SPM	3	28			"at best" doesn't sound impartial. Perhaps leave out, and just say There is medium confidence. [Conor Sweeney, Ireland]	Statement has been revised, and is now more specific.
SPM-435	SPM	3	30	3	30	To ensure scientific balance, add the following bullet point: "* In the past 60 years (covering a complete warming and cooling cycle of the ocean oscillations), the observed rate of global warming, expressed as a linear trend, was equivalent to 1.2 K/century." Reason: The IPCC has been predicting 3 K/century for the 21st century. Given the much slower observed rate of warming, the IPCC needs to explain how its far higher predicted rate will occur, and when the first signs of it will become evident. [Christopher Monckton of Brenchley, United Kingdom]	The section includes a warming trend for the period 1951 - 2012.
SPM-436	SPM	3	30	3	30	To give a more complete picture of temperature trends, add the following bullet point: "The maximum rate of warming that persisted for more than a decade since global surface-temperature records began in 1850 was 0.17 K/decade, equivalent to 1.7 K/century. That rate occurred from 1860-1880, 1910-1940 and 1976-2001." Reason: It is significant that the greatest supra-decadal warming rate observed since global records began is little more than half the mean 21st-century warming rate predicted by the IPCC. It is also significant that the rapid warming from 1976-2001 was not unprecedented, having occurred twice before during the instrumental record. On the earlier two occasions, the human influence on climate was negligible, suggesting that our influence on the third period of warming may similarly have been small. Failure to discuss points such as this in the Summary for Policymakers is calculated to mislead the readers. [Christopher Monckton of Brenchley, United Kingdom]	reject, reviewer provides no substantial basis to support his claims and proposed bullet. The revised version of SPM Figure 1 gives a complete record of annual and decadal average trends since 1850.
SPM-437	SPM	3	31	3	31	We suggest that you insert the word "mean" after global to separate this from the discussion about heavy precipitation. [Government of NORWAY]	Statement has been revised
SPM-438	SPM	3	31	3	31	to define the colored term between brackets: is (low) prior to 1950 and (medium)... [Nedal Katbeh-Bader, Palestine]	All likelihood and confidence terms are defined in footnotes 1 and 2 of the SPM.
SPM-439	SPM	3	31	3	32	Is the incomplete data coverage the reason for the medium confidence after 1950, the low confidence prior to 1950 or both? [Government of Canada]	Statement has been revised
SPM-440	SPM	3	31	3	32	Consider restructuring the sentence for clarity: Confidence in global precipitation change over land is low prior to 1950 because of incomplete data coverage, and medium afterwards. [Government of Denmark]	Statement has been revised

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-441	SPM	3	31	3	32	Atmosphere Observations. 'Confidence in global precipitation change over land is low prior to 1950 and medium afterwards because of incomplete data coverage.' Question: Can we replace 'incomplete data coverage' by 'incomplete data coverage and/or lower quality data'? [Government of Morocco]	Term has been revised to "data insufficiency".
SPM-442	SPM	3	31	3	32	We suggest to remove the medium confidence in this sentence. The reason is that the underlying text (2.5.1.1) and figure 2.28 do not justify a medium confidence qualification. See also our comment for the specific paragraph of this chapter (page 41, lines 14-50). [Government of Netherlands]	reject, statement is based on the comprehensive assessment given in chapter 2.
SPM-443	SPM	3	31	3	33	It's refreshing to see AR5 revise a conclusion of AR4. The summary is also good. [Marcel Crok, The Netherlands]	noted
SPM-444	SPM	3	31	3	33	The order of the sentences would be better inverted to first indicate the conclusion and then the level of confidence in it. [Government of Australia]	statement has been revised
SPM-445	SPM	3	31	3	33	In the early discussion on atmospheric observations with the global mean change in precip ~ 0, do we want to add, that there is evidence for increasing amplitude of variations (dry areas getting dryer, wet getting wet), e.g. from recent salinity data? This is picked up later, but is an important point. [Government of Australia]	evidence based on salinity data is picked up in the next section "ocean"
SPM-446	SPM	3	31	3	33	Why does this text only focus on land? Can a comparable statement about voer-cean precipitation be made? [Government of United States of America]	evidence for changes in precipitation over the ocean based on salinity data is picked up in the next section "ocean"
SPM-447	SPM	3	31	3	33	The phrasing here makes it seem like incomplete coverage is the problem in the latter period whereas I would assume it was a greater problem in the first period.[And in next sentence, "data" is plural, so should be indicate.] Regarding the second sentence, it seems to me that when one is changing the conclusion, one needs to indicate why--in this case, the wet areas are getting wetter and the dry areas drier, so it is hard to understand on precipitation why anything is being said about the total of two very different results. I'd suggest dividing this comment, and say most wet areas are getting wetter and most dry areas drier, or something similar. [Michael MacCracken, United States of America]	statement has been revised
SPM-448	SPM	3	31	3	40	Suggest rephrasing, shortening and combining these two bullet points because they are both about precipitation, while making clear the different findings relating to global mean and regional findings: "On a global scale, data indicate little change in mean precipitation. This conclusion differs from previous assessments because.. (include the explanation - is it due to more complex models/better understanding of the system or other reasons?). In the mid- and higher latitudes of the northern hemisphere, data show an overall increase in precipitation from 1900 - 2100 (low confidence, due to much uncertainty about data records for the early 20th century). In the mid-latitudes of the southern hemisphere, there is not enough data to define long-term changes. In the tropics, precipitation has likely increased over the last decade." [Government of NORWAY]	statement has been revised into a single bullet
SPM-449	SPM	3	31	3	40	The lack of quantification here seems amiss [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	statement is consistent with the underlying chapter assessment.
SPM-450	SPM	3	31	3	40	Rainfall levels have remained static but there is no mention of rainfall patterns here (it does appear in modeling section). Is it not important to discuss precipitation frequency and intensity when discussing amount? (Amount is my assumption tho only "precip. data" is mentioned, not what "data" - this should be clarified; not clear as it stands.) [herman sievering, United States of America]	Statement focusses on the policy relevant quantity of rainfall amount. Subsequent bullet addresses changes in high intensity (extreme) rainfall events.
SPM-451	SPM	3	31	3	40	Figure 2.28 is referenced twice. It would be useful to have it included. [Conor Sweeney, Ireland]	Space in the SPM is limited for figures, and therefore this figure has not been included.
SPM-452	SPM	3	31	3	44	The statements on precipitation and circulation features are not reflected in the highlighted text-parts of this section. [Government of Netherlands]	Noted. Highlighted statements are intended to summarize the key policy-relevant findings of each section, and may not be inclusive of everything covered in that section.
SPM-453	SPM	3	31			Consider merging the bullet points from the start of lines 31 and 35 into one point. Also, the line that starts with "Precipitation data indicates...", was not discussed in the text and differs from the first paragraph in	statement has been revised into a single bullet

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						section 2.5.1.2 [Government of United States of America]	
SPM-454	SPM	3	31			Again, the word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	Statement has been revised
SPM-455	SPM	3	32	3	32	The "incomplete" could be misinterpreted as it conveys scarcity rather than "work-not-yet-done". Another formulation could be considered. [Government of Sweden]	Statement has been revised
SPM-456	SPM	3	32	3	33	The average reader will not remember what was concluded in previous assessments; therefore it should be specified how the new conclusion differs from previous ones. [Government of Canada]	Statement has been revised and no longer makes reference to the previous assessment.
SPM-457	SPM	3	32	3	33	"little change" does not give an information about the direction of the change, this should be added [Government of Germany]	Statement has been revised
SPM-458	SPM	3	32	3	33	It would be helpful to include what the previous assessments indicated. [Government of New Zealand]	Statement has been revised and no longer makes reference to the previous assessment.
SPM-459	SPM	3	32	3	33	We are not sure what is meant by this reference to "a revision since previous assessments" and whether it gives a balanced presentation of the development. Is this a revision of the findings in WG4 SPM? Overall trends in global precipitation were as far as we know not presented in AR4 SPM or TS. The focus was on the regional changes which seem to be the case in AR5 also. In Ch. 3.3.2 AR4 the conclusions about global mean trends were not clear eg. referring to not a significant trend and table 3.4 AR4 refer to numbers with both positive and negative sign. We would propose that you rather consider using language which also includes the changes in the regional distribution of the precipitation which it seems to be support for, ref. the next bullet. Consider to change the sentence to something like: "Precipitation data indicates little change in the global mean since 1900 although it has been observed changes in geographical distribution of the precipitation." If the revision is connected to the language in AR4 Ch. 3 this can be further explained in Ch. 2 AR5. [Government of NORWAY]	Statement has been revised and no longer makes reference to the previous assessment.
SPM-460	SPM	3	32	3	33	Precipitation data indicate a smaller increase in the global mean since 1901 than suggested in previous assessments, rather than no increase. This comment follows from comments I have made on Chapter 2. [David Parker, United Kingdom of Great Britain & Northern Ireland]	Statement has been revised and no longer makes reference to the previous assessment.
SPM-461	SPM	3	32			"Confidence in global precipitation change over land is low prior to 1950 and medium afterwards...." --> confidence in what property of global precipitation change? And is global precipitation change better understood over ocean than over land? I would delete the sentence and simply state "Precipitation data indicates little change in the global mean since 1900, although confidence is low because of much uncertainty in the data ….. [Christof Appenzeller, Switzerland]	Statement has been revised. Evidence for changes in precipitation over the ocean based on salinity data is picked up in the next section "ocean"
SPM-462	SPM	3	33	3	33	A revision from previous assessments, yes but it should be clear here in what way are the statements revised or different now. [Government of United Kingdom of Great Britain & Northern Ireland]	Statement has been revised and no longer makes reference to the previous assessment.
SPM-463	SPM	3	33	3	33	A revision in which direction [Jeffrey Obbard, Singapore]	Statement has been revised and no longer makes reference to the previous assessment.
SPM-464	SPM	3	35	3	36	Put before the " mid-latitude", "obervational data in" [Government of Benin]	statement has been revised
SPM-465	SPM	3	35	3	36	not clear. Write "from 1900 to 2010" or "over the period 1900-2010" [Government of France]	statement has been revised
SPM-466	SPM	3	35	3	37	It appears this is trying to be overly conservative by not also including changes in precipitation since mid-century. [Kristie Ebi, United States of America]	statement has been revised, and includes an assessment for the period since 1950
SPM-467	SPM	3	35	3	37	Suggest information included on trends since 1950 or 1970 where relevant. [Government of Australia]	statement has been revised, and includes an assessment for the period since 1950
SPM-468	SPM	3	35	3	37	Given the low confidence in precipitation records before 1950 it would make much more sense to make a statement about the trends since 1950 with medium confidence. [Geert Jan van Oldenborgh, Netherlands]	statement has been revised, and includes an assessment for the period since 1950
SPM-469	SPM	3	35	3	40	Here too much detail is provided which obscures the overall summary that there is no global trend in precipitation since 1900. [Marcel Crok, The Netherlands]	statement has been revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-470	SPM	3	35	3	40	This paragraph is essentially describing zonal changes in rainfall, that is, global changes by latitude. This is not made clear to the reader. As a result, the current wording under-represents evidence for rainfall changes at the regional (but not zonal) level. For example, declining winter-time rainfall in the southern hemisphere midlatitudes, which has been well-studied and is well-described. This is confusing the non-experts, who may have well described (confidence medium to high) rainfall changes within their locale. So the point of scale needs to be explained, perhaps with the caveat of stronger evidence for regional changes in some regions. The subsequent section that states that zonal shifts in circulation are likely is at odds with the point here as it stands. [Government of Australia]	bullets on precipitation have been simplified into a single revised statement.
SPM-471	SPM	3	35	3	40	Need precipitation trends since 1951 as used in the later part of the SPM on page 10, lines 47 and 52 [Albert Klein Tank, Netherlands]	statement has been revised, and includes an assessment for the period since 1950
SPM-472	SPM	3	35	3	40	It might be useful to provide more insights in the trends of precipitation for the period 1950 to 2010 or similar periods as have been addressed in lines 21 to 25 on the same page addressing changes in temperatures. [Klaus Radunsky, Austria]	statement has been revised, and includes an assessment for the period since 1950
SPM-473	SPM	3	35		40	The paragraph on precipitation changes does not match well with the model evaluation paragraph, the attribution paragraph and the projection paragraph. I would find it much more helpful if it would emphasize the same zonal patterns or wet wetter/dry dryer patterns that the two later sections emphasize on. Also, low confidence in precipitation change from 1900 is not helpful for the attribution section (which focuses on the post 1950 data largely) and then comes up with medium confidence on attribution while the model evaluation section talks to some extent about 'limited evidence'. This is one of these cases where I think it would help to have the whole obverved precip from observation to attribution in one place. not in the TS or chapters but in the SPM - but at the minimum, these paragraphs should be better fitted and support each other [Gabriele Hegerl, United Kingdom]	statement has been revised, and includes an assessment for the period since 1950
SPM-474	SPM	3	37	3	37	Suggest delete "temporal"."Long-term" already indicates time. [Government of New Zealand]	statement has been revised
SPM-475	SPM	3	37	3	37	If the insufficient evidence is related to lack of data records it may be easier to understand if you say that directly e.g.: "The observation records is insufficient to define a long-term ..." [Government of NORWAY]	statement has been revised
SPM-476	SPM	3	38	3	38	"mid-latitudes AND HIGH LATITUDES"? [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	statement has been revised
SPM-477	SPM	3	38	3	39	The statement is true for some seasons. A time series analysis in East Africa shows increases in some seasons and decreases in others. Also the use of the term" precipitation " for tropical areas may be confusing given that precipitation takes several forms yet in the tropical world only precipitation in the form of "rain" is known. [Government of Kenya]	SPM can not go in to this level of regional detail. See comprehensive assessment in chapter 2.
SPM-478	SPM	3	38	3	40	The level of confidence associated with the "likely" assignment in this sentence is somewhat unclear, given the discussion of low confidence earlier in the same paragraph. If confidence in the increase in tropical precipitation is high or very high, it would be useful to more clearly separate this statement from the previous statements to avoid confusion, perhaps simply by making it the first sentence of the current bullet, or by making it a subsequent bullet. [Christopher Field, United States of America]	statement has been revised
SPM-479	SPM	3	38	3	40	…reversing the drying trend… - is this true noting Page 10, lines 51-52. [Government of Australia]	this wording has been removed from the revised statement.
SPM-480	SPM	3	39	3	39	Change "over the last decade" to "over the last two decades" - a change I have also suggested to Chapter 2. [David Parker, United Kingdom of Great Britain & Northern Ireland]	this wording has been removed from the revised statement.
SPM-481	SPM	3	41	3	41	It is striking that regional changes in precipitation are highlighted but not regional temperature changes. [Kristie Ebi, United States of America]	Revised temperature bullet emphasizes that almost the entire globe has experienced warming, and further regional patterns of temperature change can be seen in SPM figure 1.
SPM-482	SPM	3	41			Please, add one bullet point to report the increase of absolute moistening of the atmosphere following conclusions of TS and Ch. 2. [Government of Finland]	Proposed bullet has not been added. SPM needs to focus on the most policy relevant information to avoid becoming too detailed and lengthy.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-483	SPM	3	42	2	44	Please consider to use more understandable terms than "zonal mean sense, circulation features and polar vortex". Suggest rephrasing to something like: "It is likely that large-scale atmospheric wind systems have moved towards the poles since the 1970s. Examples are widening of the tropical belt, poleward shift of storm tracks and jet streams and contraction of the polar vortex." Please consider to give a layman description of tropical belt, storm tracks, jet streams and polar vortex in footnotes. [Government of NORWAY]	bullet has been removed
SPM-484	SPM	3	42	3	42	Explain zonal -- global latitude bands? That such shifts are likely is at odds with the statement of low to no confidence of changes in the mid latitudes and southern hemisphere. The previous point may overstate the uncertainty in some regionally specific rainfall studies. [Government of Australia]	bullet has been removed
SPM-485	SPM	3	42	3	42	Phrase 'in a zonal mean sense' is technical and should be re-phrased using plain English. [Government of Australia]	bullet has been removed
SPM-486	SPM	3	42	3	42	It would be better to express this as a confidence statement - medium confidence - rather than a likelihood statement [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet has been removed
SPM-487	SPM	3	42	3	43	Change to "…have moved poleward in both hemispheres" [Government of Australia]	bullet has been removed
SPM-488	SPM	3	42	3	44	The changes in these phenomena are difficult for readers to understand in terms of weather patterns, extremes, etc. Suggest explaining further. The term "zonal mean sense" on line 42 is also too technical. [Government of Canada]	bullet has been removed
SPM-489	SPM	3	42	3	44	Does the "likely" qualification apply to the whole bullet or only the first part before the colon? Please clarify. [Government of Canada]	bullet has been removed
SPM-490	SPM	3	42	3	44	The sentence should precise that it relates only to the Antarctic polar vortex, since {2.7} mentions the uncertainty in the Arctic vortex trend. [Government of France]	bullet has been removed
SPM-491	SPM	3	42	3	44	Do the data support this conclusion for both northern and southern hemispheres? After reading section 2.7 of the underlying report, it is still not clear. [Government of New Zealand]	bullet has been removed
SPM-492	SPM	3	42	3	44	The statement in the executive summary of chapter 2 on the fact that some trend features in atmospheric cicrculation have been offset by more recent changes (chap 2-5, lines 35 to 38) seems to be important to report in the SPM. [SYLVIE JOUSSAUME, France]	bullet has been removed
SPM-493	SPM	3	42	3	44	Bullet 5: "in a zonal mean sense" - what does this mean?! And what, if anything, does it mean to a PM?? Clarity is needed on this point. [herman sievering, United States of America]	bullet has been removed
SPM-494	SPM	3	42			The term "zonal mean" is jargon. Suggest that an alternate phrasing be used in the SPM and that the term be added to the glossary, since it is used elsewhere in the report. [Government of United States of America]	bullet has been removed; No new Glossary entry for "Zonal mean"
SPM-495	SPM	3	42			'zonal mean sense' is jargon - is there a less technical way to say this in the SPM, perhaps 'in terms of a [or 'the'] zonal mean' [Government of United Kingdom of Great Britain & Northern Ireland]	bullet has been removed
SPM-496	SPM	3	43	3	43	Care is needed with the terminology. For many non-technical SPM readers, the 'tropical belt' means that part of the globe lying between the Tropics of Cancer and Capricorn and that has not changed. [Government of Australia]	bullet has been removed
SPM-497	SPM	3	44	3	44	polar vortex should be explained and could be changed to "polar vortices" to include reference to both polar vortices. [Government of Australia]	bullet has been removed
SPM-498	SPM	3	44	3	44	Explain the term "polar vortex" in the Glossary [Government of Germany]	bullet has been removed; No new Glossary entry for "Polar Vortex"
SPM-499	SPM	3	44	3	44	Does the finding on the polar vortex refer to both hemispheres or the Northern Hemisphere only (cf. Chapter 2.7, page 66, line 39, where the references focus on the NH polar vortex). [Government of Sweden]	bullet has been removed
SPM-500	SPM	3	44	3	44	The polar vortices have contracted in both hemispheres. [David Parker, United Kingdom of Great Britain & Northern Ireland]	bullet has been removed

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-501	SPM	3	44	3	44	Which polar vortex? If this refers to the Arctic, it should say so. If the Antarctic is different, it should also say so. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	bullet has been removed
SPM-502	SPM	3	46	3	46	The Summary for Policymakers does not appear to contain any references to fires, whether natural and/or anthropogenic, as signifcant positive feedback to warming. Draught and heat wave-triggered fires (such as in Russia 2010 and Texas 2012) constitute signifcant feedbacks to warming, as indicated by reports by Munich Re-Insurance and papers by Hansen et al (2012) and Trenbert et al. (2012). According to Bowman et al. 2009 (Fire in the Earth System, Science, 324:481-484) above 2 Gt Carbon are released annually by fires. The role of fire in releasing CO2 to the atmosphere appears to be greatly underestimated, as both natural and human-triggered fire regimes dominate subtropical regimes over large parts of the continents (Australia, India, Africa). (Bowman et al., 2009; Westerling et al., 2006. Science 313, 940 (2006); Lohman et al., 2007. Science 316, 376; Page et al., 2002. Nature 420, 61 'Spreading Like Wildfire—Tropical Forest Fires in Latin America and the Caribbean: Prevention, Assessment and Early Warning. Forsyth et al. 2008. Sci. 50, 3; Scott and Glasspool, 2006). [Andrew Glikson, Australia]	Noted. Fires and their potential feedbacks on climate are not a central part of the WGI assessment and thus not part of the SPM either. WGII AR5 might provide a more detailed assessment.
SPM-503	SPM	3	46	3	46	The Summary for Policymakers does not appear to contain any references to fires, whether natural and/or anthropogenic, as significant positive feedback to warming. Drought and heat wave-triggered fires (such as in Russia 2010 and Texas 2012) constitute significant feedbacks to warming, as indicated by reports by Munich Re-Insurance and papers by Hansen et al (2012) and Trenbert et al. (2012). According to Bowman et al. 2009 (Fire in the Earth System, Science, 324:481-484) above 2 Gt Carbon are released annually by fires. The role of fire in releasing CO2 to the atmosphere appears to be greatly underestimated, as both natural and human-triggered fire regimes dominate subtropical regimes over large parts of the continents (Australia, India, Africa). (Bowman et al., 2009; Westerling et al., 2006. Science 313, 940 (2006); Lohman et al., 2007. Science 316, 376; Page et al., 2002. Nature 420, 61 'Spreading Like Wildfire—Tropical Forest Fires in Latin America and the Caribbean: Prevention, Assessment and Early Warning. Forsyth et al. 2008. Sci. 50, 3; Scott and Glasspool, 2006). [Government of Australia]	Noted. Fires and their potential feedbacks on climate are not a central part of the WGI assessment and thus not part of the SPM either. WGII AR5 might provide a more detailed assessment.
SPM-504	SPM	3	46	3	46	"Changes" Does this mean "increases in frequency"? The word changes is unhelpful for policy makers [Government of New Zealand]	revised statements are combined into a single bullet, such that the "changes" are explained in the subsequent sentences, and within Table SPM1.
SPM-505	SPM	3	46	3	48	I find the wording here misleading. There are no trends in cyclones and floods. No clear trends in heatwaves and droughts. These are the important events that policy makers think about when AR5 talks about 'extreme events'. The only 'extreme events' for which there is evidence of a change is an increse in the number of warm days and a decrease in the number of cold days. This hardly something you should call an extreme event. So please be far more specific here. [Marcel Crok, The Netherlands]	revised bullet clearly links to the observed trends in the subsequent sentences, and further detail provided in SPM table 1.
SPM-506	SPM	3	46	3	48	Atmosphere Observations. ‘Changes in many extreme weather and climate events have been observed, but the level of confidence in these changes varies widely depending on type of extreme and regions considered. Overall the most robust global changes are seen in measures of temperature {FAQ 2.2, 2.6} (see Table SPM.1).’ Comment: It may be useful to indicate here the whole list of such extreme weather and climate events. [Government of Morocco]	To avoid duplication, the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-507	SPM	3	46	3	48	At last some commonsense. Measurementt of "extreme events is so crude and the past record so unreliable tht it is currently impossible to judge whether they are worse or better [Vincent Gray, New Zealand]	reject, see SPM table 1.
SPM-508	SPM	3	46	3	48	This is a very broad statement. Is it useful as a highlighted statement, or is it likely to be misinterpreted? 'Changes in many extreme weather and climate events have been observed' would probably be the way it would be quoted, and that does not seem to be what the underlying paragraphs would support as a highlight summary. Can you support a statement like "Confidence has strengthened that warm extremes have increased over at least the past 50 years. Trends in heavy precipitation extremes have also been documented in some but not all regions, and there is low confidence in large-scale trends in droughts or tropical cyclones." [Susan Solomon, United States of America]	revised bullet (no longer highlighted) includes specific details on temperature and precipitation extremes, and links to SPM table 1 where the full listing of extremes is provided.
SPM-509	SPM	3	46	4	12	Moving the statement about extreme events to the beginning of the section would mean all the key findings on temperature could be placed together, which would make for a more logical flow. Similar comment for precipitation. [Kristie Ebi, United States of America]	reject, structure follows that of the underlying chapter assessment.

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SPM-510	SPM	3	46			What is a "weather event" and how does it differ from a "climate event"? Is not weather event sufficient throughout, and if not, then clearly explain how a weather event differes from a climate event (how they are distingusihed in practice). [Leonard Smith, United Kingdom]	wording is consistent with the 2012 IPCC special report on extreme events.
SPM-511	SPM	3	47	3	47	To increase accuracy, between the two sentences in this paragraph add the following sentence: “There are insufficient data to establish that the frequency, intensity and duration of extreme-weather events have increased globally.” Reason: This sentence reflects the conclusion of the SREX report on extreme-weather events. [Christopher Monckton of Brenchley, United Kingdom]	reject, reviewer has incorrectly summarized the conclusions of the SREX report.
SPM-512	SPM	3	47	3	48	To ensure honesty, after the sentence that reads “Overall the most robust global changes are seen in measures of temperature”, add the following: “However, globally there has been no statistically-significant warming for 16 years. Such periods of stasis are not unprecedented, but they constrain the long-run rate of warming, which remains below earlier projections.” Reason: The IPCC must be seen to deal with the long-running failure of the Earth’s surface to warm at anything like the previously-predicted rate. [Christopher Monckton of Brenchley, United Kingdom]	reject, reviewer fails to substantiate the relevance of his proposed statement in the context of this bullet on extreme weather and climate events.
SPM-513	SPM	3	48	3	48	To clearly distinguish changes in extremes from general long-term changes in average conditions, we propose that the wording is changed to "… changes associated with extremes are seen in measures of temperature." [Government of NORWAY]	bullet has been substantially revised.
SPM-514	SPM	3	48			The wording of Footnote 5 on uncertainty may be confusing to some readers. The authors should consider adopting a a different approach that might better serve the needs of policy makers. Perhaps a small diagram would be helpful here. [Government of United States of America]	Noted. Two additional footnotes have been added to the SPM to clarify the uncertainty terminology used in IPCC AR5 for levels of confidence and likelihoods.
SPM-515	SPM	3	48			Again, the word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "everywhere over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	statement revised
SPM-516	SPM	3	49			Figure SPM.3 The solar contribution may be highly understated by using the PMOD team's analysis while ignoring the ACRIM team's analysis. Alternative reconstructions of the ACRIM Gap in TSI measurements finds that the solar contribution may form 15%, 50% or 60% of the warming. See Nicola Scafetta (2011) [David L. Hagen, United States of America]	Figure SPM 3 (revised to SPM 4) is based on the comprehensive chapter assessment.
SPM-517	SPM	3	50	3	55	In footnote, the "probabilty" figures are no more than guesswork supplied by biased "experts" They have no basis in scientifically establshed statistical studies [Vincent Gray, New Zealand]	reject, reviewer fails to substantiate his claims.
SPM-518	SPM	3	51	3	52	I would understand the likelyhood of exceeding the upper endpoint as being 5% and of being lower than the lower endpoint as also being 5% [Ingeborg Levin, Germany]	Noted.
SPM-519	SPM	3				Figure SPM1: I understand that to fully understand the legend one has to read the full Chapter but as it is the SPM whouldn't it be possible to explain this in an easier/less technical way? [Cathy Clerbaux, France]	Figure has been completely revised. See figures SPM 1 and 2.
SPM-520	SPM	3				Footnote 5 first refers to "expected … likelihood" but then just to "likelihood"s. I cannot imagine any difference is meant. (If it is, it need expanding.) So replace "is expected to have" by "has" [William Ingram, United Kingdom]	Reject -- Suggested change does not improve text
SPM-521	SPM	3				Footnote 5 refers to "likelihood" with no indication that this is a technical term with complex implications. Of course this is no place for a review of Bayesian versus frequentist interpretations, but since it is aimed at policy-makers (& is something an outsider might well wonder about the precise meaning of and the assumptions made to derive it) there should be a clear indication that it is a technical term with technical implications, & where they can go for an accessible explanation if they want it. [William Ingram, United Kingdom]	Noted. Two additional footnotes have been added to the SPM to clarify the uncertainty terminology used in IPCC AR5 for levels of confidence and likelihoods.
SPM-522	SPM	3				Footnote 5 - what is meant by "best estimate"? I think a policy-maker would assume "most likely value", i.e. the MLE, but if I were deriving them I would calculate medians of the likelihood distribution. This needs to be clear. (For all I know this even varies from case to case, in which case clarification is seriously needed, whether it is to acknowledge explicitly that they are inconsistently defined, or to note ones that don't fit the general rule, or indicate each one where the issue arises - of course in many cases there will be no	Best estimate is the term proposed by the experts in the WGI AR5 author team and applied throughout the underlying report. No change.

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						difference.) [William Ingram, United Kingdom]	
SPM-523	SPM	3				Footnote 5 - should policy-makers be told that uncertainty ranges don't in general add (in fact the uncertainty range for a sum cannot be more than the sum of the ranges & is usually less)? I'm sure it's more technical than they want, but without, might some get confused by uncertainties apparently reducing at higher levels? [William Ingram, United Kingdom]	Noted. No changes made.
SPM-524	SPM	3				Some acknowledgement needs to be made here of the slowing of warming over the last 15 years or so. [Paul Matthews, United Kingdom]	New bullet has been added which provides observed trend in GMST from 1998 - 2012.
SPM-525	SPM	3				Figure SPM.1: Please explain the color of the individual lines in the diagrams, please do not use background color for the diagram in order to avoid perception biases with diagram colors, please introduce vertical grid lines in the background (for "1850", "1900", etc.) to improve visual alignment, please improve vertical visual separation of "Atmosphere", "Cryosphere", etc. Panel d: I recommend to show the time-series of the sea-ice extent for all months – not only JAS (i. e., cycle plot). Panels e and f: Please reduce to one diagram (i. e., global combined land and ocean temperature) to reduce chapter length and to be consistent with the description of these two panels in the text (descprition mainly refers to combined land and ocean temperature). [Oliver Stebler, Switzerland]	Figure has been completely revised. See figures SPM 1 and 2.
SPM-526	SPM	3				Perhaps mention that the last 10+ years have shown no trend in temperature. [Conor Sweeney, Ireland]	New bullet has been added which provides observed trend in GMST from 1998 - 2012.
SPM-527	SPM	4	1	4	1	Suggest change to "overall annual number". [Government of New Zealand]	Taken into account. Text changed to just "number of warm days"
SPM-528	SPM	4	1	4	2	The word "has" is not needed in either of two places since the time of interest is past. [James [Jim] Crawford, United States of America]	copy edit
SPM-529	SPM	4	1	4	2	Among the general public it appears to exist some confusion as regards the difference between long-term changes in average conditions and changes in extreme events. This sentence might add to this confusion since it could easily be interpreted as if changes in the number of cold days and nights are not connected to extreme events. We propose to include the relevant definition of "cold days/cold nights" and "warm days/warm nights" as footnotes. If the definitions used is the same as in SREX, the footnotes would read; "Days where maximum temperature, or nights where minimum temperature, falls below the 10th percentile, where the respective temperature distributions are generally defined with respect to the 1961-1990 reference period." and "Days where maximum temperature, or nights where minimum temperature, exceeds the 90th percentile, where the respective temperature distributions are generally defined with respect to the 1961-1990 reference period.", respectively. These definitions should also be included in Annex III, "Glossary". [Government of NORWAY]	By combining into a single bullet, we believe it is clear that hot/cold days/nights are considered as extreme events; We have added new Glossary entries for "Cold days / cold nights" and "Warm days / warm nights".
SPM-530	SPM	4	1	4	4	Using a likelihood scale for number and a confidence scale for length in the same dot-point is potentially confusing. [Government of Australia]	revised bullet avoids this potential confusion.
SPM-531	SPM	4	1	4	4	It is relevant to know what has happened in the period before 1951 (e.g. the first half of the 20th century), to be able to view the period 1951-2010 in more (historical) perspective. [Government of Netherlands]	Reject, data on extreme events is often insufficient to provide a robust longer term assessment. Similarly for the SREX, focus was given to trends since 1950.
SPM-532	SPM	4	1	4	4	Why is 1951 the start date here vs. 1971, 1980, 1993, etc. in other places? We know why. Yet, some CC "skeptics" pick on IPCC's consideration of differing date ranges when discussing data. Is it possible to have a paragraph upfront that, in general way (for PMs), explains why differing date ranges are inevitable? [herman sievering, United States of America]	Where relevant, details have been added when shorter term periods are used (e.g. 'satellite era' etc.).
SPM-533	SPM	4	1	4	17	These are merely the opinions of biased "experts". They are not based on scientific studies. [Vincent Gray, New Zealand]	reject, reviewer fails to substantiate his claims.
SPM-534	SPM	4	1	4	17	I recommend to provide only Table SPM.1 here in order to shorten the chapter and to reduce redundance between text and Table. [Oliver Stebler, Switzerland]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
							table 1.
SPM-535	SPM	4	1			It is very likely that the overall number of cold days and nights has decreased and the overall number of [Cathy Clerbaux, France]	comment does not require a response
SPM-536	SPM	4	1			2 warm days and nights has increased : suggestion to reverse the order of this sentence 1/warmer days/night and 2/cooler [Cathy Clerbaux, France]	reject, reviewer fails to provide a reasoning of her suggested revision.
SPM-537	SPM	4	1			" …what we consider today as cold days… what we consider today as warm…" [Government of France]	Reject, The reference period for the definition of these extreme events varies between studies.
SPM-538	SPM	4	1			What is intended by"cold nights ...on a global scale."? This concept needs to be clarly defined. [Leonard Smith, United Kingdom]	Reject, governments will be familiar with these terms, used extensively in the 2012 IPCC special report on extreme events. See also box 2.4 of chapter 2.
SPM-539	SPM	4	2	4	4	There is medium confidence that the length of warm spells, including heat waves, has increased globally since the middle of the 20th century (see Table SPM.1).' Most people would not know the difference between a heat wave and a warm spell so suggest to delete heat wave since it is a warm spell but in the summer season or add (IN SUMMER SEASON) between brackets rigth after heat waves in the sentence. NB from the glossary: Period of several consecutive High temperature days/nights using a fixed or percentile-based threshold. Can be classified within just the summer season (heat waves) or can define any unusually warm period at any time of the year. [Line van Kesteren, the Netherlands]	reject, wording is consistent with underlying chapter assessment, and cited literature on this topic; New Glossary entry introduced for "Warm spell".
SPM-540	SPM	4	2			Sometimes, it's difficult to make the link between examples and the values presented in the summary and information given in the chapters. Some changes in formulation can be avoided e.g. : avoid to write "between 1951 and 2010" here and, in Chapter 2 of the report "since 1950". [Government of France]	noted. All statements have been checked for consistency with final draft of the chapters.
SPM-541	SPM	4	2			The phrase "on the global scale" is totally unclear - well, I have just had a 5-minute argument with the colleagues who happen to be in the room with me about what it should mean, what it could be intended to mean in general, & what it is intended to mean here. They think here it is intended to mean "over most of the globe" - I just feel I can't tell. It clearly needs replacing with something clear, e.g. "over most land" [William Ingram, United Kingdom]	Unnecessary technical detail. See chapter assessment for this detail.
SPM-542	SPM	4	3	4	3	Suggest that "warm spell" be included in glossary (similar to SREX, where both heat wave and warm spell were defined). [Government of Canada]	both heat wave and warm spell are included in the WGI AR5 glossary.
SPM-543	SPM	4	3			What exactly is a “heat wave” ? [Government of United States of America]	both heat wave and warm spell are including in the WGI AR5 glossary
SPM-544	SPM	4	3			Again, the word "globally" used here has 2 opposite potential meanings, "averaged over the globe" & "everywhere over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	statement has been removed. See SPM table 1.
SPM-545	SPM	4	4	4	4	is sea ice cover reducing in all seasons? Please clarify. [Susan Solomon, United States of America]	comment appear to be for Page 5, line 4. Bulleted statement in the section 'cryosphere' clearly states that sea ice has decreased in every season.
SPM-546	SPM	4	6	4	7	The first sentence states the obvious and contains no meaningful information (without the second sentence). The first section would be better deleted. [Government of Australia]	sentence has been revised.
SPM-547	SPM	4	6	4	7	Examples of regions that have experienced heavy precipitation events, would be more informative. [Government of Benin]	The SPM can not provide a complete listing of regional details for all quantities. The revised statement highlights North America, because confidence is highest in this region.
SPM-548	SPM	4	6	4	7	Atmosphere Observations. ‘There have been statistically significant trends in the number of heavy precipitation events in some regions.’ Comment: Given the importance of heavy precipitation events on the population, it may be useful to mention here these regions (names, wetter or drier? etc.). [Government of Morocco]	The SPM can not provide a complete listing of regional details for all quantities. The revised statement highlights North America, because confidence is highest in this region.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-549	SPM	4	6	4	7	Statistically significant trends in some regions - would be helpful to say which [Government of United Kingdom of Great Britain & Northern Ireland]	The SPM can not provide a complete listing of regional details for all quantities. The revised statement highlights North America, because confidence is highest in this region.
SPM-550	SPM	4	6	4	8	I disagree although I admit that my best evidence is based on an EGU presentation and not a peer reviewed paper. The most complete analysis I have seen is one of Demetris Koutsoyiannis for the EGU 2011 conference. Unfortunately there is no peer reviewed publication yet. The analysis is available at http://itia.ntua.gr/getfile/1124/2/documents/2011EGU_DailyRainMaxima_Pres.pdf They analysed over 3000 time series with at least 100 years of data. Especially in the alleged anthropgenic era (since 1970) there is no trend at all. This is really the most global picture we have right now in my opinion. AR5 could and probably will ignore this because it is not peer reviewed. On the other hand one could why such a global analysis hasn't been done and published yet. Now AR5 bases itself on regional analyses which in my opinion are inconclusive. [Marcel Crok, The Netherlands]	Statement is based on the comprehensive chapter assessment. See chapter for cited literature.
SPM-551	SPM	4	6	4	8	Define heavy precipitation event - could be confused for extreme seasonal rainfall for example. Suggest description that captures timescale adequately rather than using distributional thresholds. [Government of Australia]	Prefer to avoid this technical detail here, given the reader can turn to the recent 2012 IPCC special report on extreme events for these definitions. See also box 2.4 of chapter 2.
SPM-552	SPM	4	6	4	8	At line 6 it is mentioned that in some regions there are statistical significant trends in the number of heavy precipitation events. In line 7 it is indicated that it is likely that there are more regions showing an increase in the number of heavy precipitation events then regions showing a decrease since 1950. It is unclear whether the regions that are indicated in this sentence "It is ... since 1950" are a subset of the regions referred to by 'some regions' in line 6. This would be most logical, since in the sentence 6 it is indicated that statistically significant trends occur in some regions. Please reformulate sentences 7-8 to avoid confusion. [Government of Netherlands]	sentence has been revised.
SPM-553	SPM	4	6	4	8	It would be informative to identify those regions for the reader with statisically significant trends. [Klaus Radunsky, Austria]	The SPM can not provide a complete listing of regional details for all quantities. The revised statement highlights North America, because confidence is highest in this region.
SPM-554	SPM	4	6	4	12	There needs to be a definition of heavy precipitation events. Is this defined in terms of intensity-duration, a quantity falling within a specific period (e.g. 24 or 60 hours) or based on changes in the distribution of rainfall amounts? If the latter what period is used (1 day? 5day?). Likewise, how is drought in this context defined - is it meteorological, hydrological, agricultural or socio-economic drought? These definitions are important because the policy actions required will vary depending on how the heavy precipitation events or drought are defined. [Government of United Kingdom of Great Britain & Northern Ireland]	Prefer to avoid this technical detail here, given the reader can turn to the recent 2012 IPCC special report on extreme events for these definitions. See also box 2.4 of chapter 2.
SPM-555	SPM	4	7	4	8	The metric for reporting these changes in heavy precipitation events (in Table SPM 1) seems weak. The result that there are increases in heavy precipitation events in more regions than there are decreases, hinges in part on the definition of a region. What regions are compared here? Are they directly comparable in size and/or character, and does counting them constitute a robust measure of comparison to attach a likelihood statement to? For instance, couldn't this be expressed in terms of the number of land grid boxes in which increases/decreases/no change are observed? Or are ocean grid boxes also included (apparently not specified)? [Timothy Carter, Finland]	See chapter assessment for this level of detail. Wording is also consistent with SPM statements from the 2012 IPCC SREX report.
SPM-556	SPM	4	7	4	8	This sentence on heavy precipitation events is a little confusing to read. Suggest rewording, e.g., "Since 1950, it is likely that the number of regions having experienced an increase in the number of heavy precipitation events is greater than the number of regions having experienced a decrease." [Government of Canada]	statement has been revised.
SPM-557	SPM	4	10	4	12	An explanation of why this confidence has changed from the SREX, published so recently, would be particularly helpful. Is it that different metrics are being assessed (as the language is slightly different from the SREX SPM), that different authors are assessing the confidence differently, or that there has been a fundamental new changes in the available data and information available? [William Anderegg, United States of America]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1. As footnote to table explains, there can be various reasons for changes in the assessment

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							findings between reports, and the details in such cases are explained in the underlying chapter.
SPM-558	SPM	4	10	4	12	Perhaps simply "…due to difficulties in describing and adequately observing drought, from region to region and over time." [Government of Australia]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-559	SPM	4	10	4	12	The sentence might be misinterpreted as referring to generally drier conditions, and not to extreme events. In chapter 2 executive summary page 5 line 20-21 these reasons for the low confidence statement are linked to "dryness (lack of rain)" not "drought". In order to be consistent please consider to use "dryness (lack of rain)", and make it clearer that it is associated with an extreme event by including "extreme dryness (lack of rain)". [Government of NORWAY]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-560	SPM	4	10	4	12	This is also a revision of AR4 and SREX. See next para where this is indicated for tropical cyclones (and footnote d in Table SPM.1) [Albert Klein Tank, Netherlands]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-561	SPM	4	10	4	12	I am not convinced that the assessment of "low confidence" is totally justified for observed changes in droughts (although I agree with this assessment regarding global-scale changes in droughts, it may be possible to indicate "medium confidence" for drought trends in some regions, see also IPCC SREX). As assessed in the IPCC SREX (see in particular chapter 3, Seneviratne et al. 2012), although there is low confidence in drought trends in several regions, there are nonetheless a number of regions that are consistently identified as having experienced either drying (southern Europe, West Africa) or wetting (central North America, northwestern Australia) trends independently of the index or datasets' choice. As recently discussed in Seneviratne (2012, Nature), the location of these regions is confirmed even in the more recent analysis of Sheffield et al. (2012), which evaluated the sensivitiy of historical drought trends to different input datasets and model parameterizations. It would be important to distinguish between the _low confidence_ in global trends vs _medium confidence_ in some regional trends. References: 1) Seneviratne, S.I., N. Nicholls, D. Easterling, C.M. Goodess, S. Kanae, J. Kossin, Y. Luo, J. Marengo, K. McInnes, M. Rahimi, M. Reichstein, A. Sorteberg, C. Vera, and X. Zhang, 2012: Changes in climate extremes and their impacts on the natural physical environment. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. 2) Seneviratne, S.I, Nature, 491, 338-339. 3) Sheffield, J., E.F. Wood, and M. Roderick, 2012, Nature, 491, 435-438, doi:10.1038/nature11575. [Sonia Seneviratne, Switzerland]	Revised SPM table 1 includes an additional "likely" changes in drought for some regions (listed in a footnote to the table).
SPM-562	SPM	4	10		12	Is the drought a backpeddle since AR4 - if yes state.. [Gabriele Hegerl, United Kingdom]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1. As footnote to table explains, there can be various reasons for changes in the assessment findings between reports, and the details in such cases are explained in the underlying chapter.
SPM-563	SPM	4	10			The phrase "large-scale" is totally unclear without context. (I think the sentence that followed was just enough context in its previous use, line 42 of page 2.) Replace by what it means (I guessed "sub-continental", but then the inconsistency doesn't make sense) [William Ingram, United Kingdom]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-564	SPM	4	10			Why should geographical inconsistency affect one's confidence in trends? Do the inconsistencies extend to "small" scales, whatever they are - if so say so - or is the actual meaning that there are inconsistent (which I guess means of opposite sign - if so say so: if not say what is meant) trends which we can be confident about, & this reduces confidence about a generic or underlying or forced effect? If so, why - the poleward shifts	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.

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						mentioned on the previous page must be expected to give trends of opposite sign in different geographical locations, as would, more locally, other more local shifts. There may be good sense underlying this sentence, but it's impossible for the reader to know. [William Ingram, United Kingdom]	
SPM-565	SPM	4	11	4	11	Phrase 'dependencies of inferred trends on the index choice' is technical and should be re-phrased using plain English [Government of Australia]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-566	SPM	4	11			This is jargon: "dependencies of inferred trends on the index choice." Can clearer wording be found? [Government of United States of America]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-567	SPM	4	14	4	14	It is not clear what the "reported long-term changes" are. Is the source of the reported changes the AR4 or another source? Please clarify. [Government of Canada]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-568	SPM	4	14	4	14	insert "(>40 years)" after "any reported long-term changes". [Government of Germany]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-569	SPM	4	14	4	14	Typo "data provide..." [Government of New Zealand]	copy edit
SPM-570	SPM	4	14	4	17	Yes, this is a revision from the AR4, but the AR4 also carefully distinguished between tropical cyclines and coastal high water surges from storms, which in many senses are much more important to the impacts of climate change. Some acknowledgement of this, including synthesis that draws upon recent advances such as the Grinstead et al 2012 PNAS paper constructing Atlantic storm surges back to 1923, would be very important. Perhaps more important, however, is to incorporate in and provide the full information provided from Table SPM.1 here in that there is "low confidence" in increases in tropical cyclone activity. The current table presents this, but the text should here as well. [William Anderegg, United States of America]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-571	SPM	4	14	4	17	This is a very negative way of saying something very positive. The evidence is stronger than suggested here. I would say there is high evidence that there is no long term trend in either the frequency or the intensity of cyclones. [Marcel Crok, The Netherlands]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-572	SPM	4	14	4	17	Reading this bullet in isolation, it is not clear whether the assignment of low confidence means that observed trends exist but are assigned low confidence, or that there is, for example, high confidence that no trends have been observed. The framing of Table SPM.1 implies that there is an observed increase in tropical cyclone activity for which there is low confidence. Clarifying this point in the text on page 4 would be very useful. In addition, it would be useful to present a confidence assignment with the last sentence describing increases in the intensity of the strongest storms in the Atlantic (it is not clear what "robust" means here). [Christopher Field, United States of America]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1, which includes a specific statement for the North Atlantic.
SPM-573	SPM	4	14	4	17	Significance of findings for Atlantic storms should be clarified. Paragraph notes "data provides low confidence that any long-term changes are robust", then notes that "increases in the intensity of the strongest storms in the Atlantic appear robust". If there is an exception (or not) to the first statement this should be clearly stated. [Government of Australia]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1, which includes a specific statement for the North Atlantic.
SPM-574	SPM	4	14	4	17	Atmosphere Observations. 'Tropical cyclone data provides low confidence that any reported long-term changes are robust, after accounting for past changes in observing capabilities. This is a revision from previous IPCC Assessments Reports, but consistent with the SREX. Over the satellite era, increases in the intensity of the strongest storms in the Atlantic appear robust (see Table SPM.1). {2.6.3}'. Question: How about the frequency of the strongest storms in the Atlantic Ocean? [Government of Morocco]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1, which includes a specific statement for the North Atlantic.

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SPM-575	SPM	4	14	4	17	It seems to be a contradiction between the first and last sentence (many will think that 30 years also is long term). Consider if this finding would be clearer if you start the bullet point with the last sentence about the last 30 year period. Since the first sentence seems to refer to a longer period and it is may be a lack of observational data before the satellite era. Would it be correct to say something like: "It is a robust finding that the intensity of the strongest storms in the Atlantic has increased since xxxx (the beginning of the 1970s) based on satellite data."? And then you can follow up with the message in the first two sentences about the longer trends than the satellite era. [Government of NORWAY]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1, which includes a specific statement for the North Atlantic.
SPM-576	SPM	4	14	4	17	Suggest that the final sentence of this paragraph is put up front. We are otherwise undermining the credibility of the observations (particularly in the Atlantic) due to the change in types of observation globally throughout the latter half of the 21st century. [Government of United Kingdom of Great Britain & Northern Ireland]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1, which includes a specific statement for the North Atlantic.
SPM-577	SPM	4	14	4	17	It might be helpful to specifically address the important satellite era date range at the close of the paragraph called for in the previous remark. [herman sievering, United States of America]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1.
SPM-578	SPM	4	14			This phrasing makes it sounds as if no conclusions about cyclones could be robust. If true, please clarify. [Government of New Zealand]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1, which includes a specific statement for the North Atlantic.
SPM-579	SPM	4	15	4	16	Suggest further explaining the difference in the current finding from previous reports. [Government of Canada]	These differences were comprehensively explained in the SREX report, and don't warrant repeating here.
SPM-580	SPM	4	15	4	16	The document would be more effective as a stand alone document if the nature of the previous IPCC assertion was stated. Currently the statement is likely to raise the question and will require non-expert readers to refer to the previous IPCC report. [Government of United Kingdom of Great Britain & Northern Ireland]	Revise SPM table 1 now includes assessed findings from the previous SREX and AR4 reports.
SPM-581	SPM	4	16	4	16	Page 3, line 33 referred to "previous assessments." A consistent approach will be helpful to readers. Also, page 2, lines 9-11 states the SREX is the basis of the assessment for extreme weather and climate events, so the SPM does not have to highlight changes from the AR4 in this area. [Kristie Ebi, United States of America]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1. Revised SPM table 1 now includes assessed findings from the previous SREX and AR4 reports.
SPM-582	SPM	4	16	4	16	Include start year of satellite era as this will not be known to all. [Government of Australia]	revised to "since 1970". See table SPM 1.
SPM-583	SPM	4	16	4	16	Please introduce what the satellite era means. When did it start? '70's is mentioned later in line 24, page 5. Better mention it earlier. [Government of Netherlands]	revised to "since 1970". See table SPM 1.
SPM-584	SPM	4	16	4	16	Please be more specific about what is meant by "over the satellite era" [Government of New Zealand]	revised to "since 1970". See table SPM 1.
SPM-585	SPM	4	16	4	16	"satellite era" is used without specific definition. This is slightly inconsistent with the remainder of the document which gives date range for satellite information (1971 to 2011 is used elsewhere in the SPM). [Government of United Kingdom of Great Britain & Northern Ireland]	revised to "since 1970". See table SPM 1.
SPM-586	SPM	4	16	4	17	This statement is misleading as the trend disappears if we look back further. The sole reason for this trend could be that cyclone activity in the Atlantic was relatively low in the 70-ies and early 80-ies. [Marcel Crok, The Netherlands]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1. Statements in the table are based on the underlying comprehensive chapter assessments.
SPM-587	SPM	4	16	4	17	Please provide the dates for the satellite era. Should robust be italicized as it appears to be a confidence statement? [Kristie Ebi, United States of America]	revised to "since 1970". See table SPM 1.
SPM-588	SPM	4	16	4	17	The sentence is ambiguous as to whether the robustness derives from the satellite data or from the period	revised to "since 1970". See table SPM 1.

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						studied. [Government of Australia]	
SPM-589	SPM	4	16	4	17	It is not clear what is meant by "satellite era" - suggest supplementing this with a more concrete timeframe. [Government of Canada]	revised to "since 1970". See table SPM 1.
SPM-590	SPM	4	16	4	17	Check that the sentence “Over the satellite…” is fully consistent with SPM 11 line 20 [Government of France]	revised to "since 1970". See table SPM 1.
SPM-591	SPM	4	16	4	17	The phrase "appear robust" should be replaced with calibrated language provided in Uncertainty Guidance Notes to communicate the degree of uncertainty in a manner consistent with other findings. [Government of Japan]	see revised wording in SPM table 1.
SPM-592	SPM	4	16	4	17	Is it possible to complement this statement about intensity of storms in the Atlantic about trends observed in the Pacific? [Government of Netherlands]	This level of regional detail cannot be provided in the SPM. See underlying chapter assessment.
SPM-593	SPM	4	16	4	17	Can a confidence or probability level be included in this sentence, regarding the observed increases in intensity of the strongest storms in the Atlantic appearing to be robust? [Government of United Kingdom of Great Britain & Northern Ireland]	see SPM table 1.
SPM-594	SPM	4	16	4	17	Over the satellite era, increases in the intensity of the strongest storms in the Atlantic appear robust (see Table SPM.1).' 'Appear robust'? Is this less robust than 'is robust'? Suggest to leave out 'normal' language quantifying the confidence but to use only the quantified uncertainty language according to the Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties. [Line van Kesteren, the Netherlands]	see revised wording in SPM table 1.
SPM-595	SPM	4	16	4	17	This line refers to changes in the "intensity" of Atlantic storms. "Storm intensity" does not occur in the glossary, and the general reader might not know whether you are referring to wind speed (ie pressure gradient), rainfall rate, or both. I suggest you add a brief explanation in parentheses, e.g. " ... increases in the intensity (wind speed and rainfall rate) of the strongest storms ..." [David Wratt, New Zealand]	see revised wording in SPM table 1.
SPM-596	SPM	4	17	4	17	Is this about cyclones or extra tropical storms ? The ref table SPM 1 does not say anything on the atlantic. [Government of France]	To avoid duplication, bullet has been removed, and the complete listing of extreme events considered in this SPM are comprehensively addressed in SPM table 1, which includes a specific statement for Tropical cyclones in the North Atlantic.
SPM-597	SPM	4	17			Replace the term "appear robust" with something more rigorous using the appropriate IPCC terminology. [Government of Canada]	see revised wording in SPM table 1.
SPM-598	SPM	4	17			Using the term "robust" instead of a 'confidence' or 'likelihood' framing is inconsistent. "Robust" seems to mean medium- to-high confidence. [Government of United States of America]	see revised wording in SPM table 1.
SPM-599	SPM	4	20	4	24	It is very helpful with this table pointing out the differences from AR 4 [Government of Sweden]	noted, and table has been further refined.
SPM-600	SPM	4	21	4	21	What is the definition of a "human influence" on the trend? [Kristie Ebi, United States of America]	see revised wording in the caption to SPM table 1.
SPM-601	SPM	4	21	4	21	Could Table SPM.1 be quantitative? [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	do not see this as being feasible or useful in a concise summary table.
SPM-602	SPM	4	22	4	22	…for which there is an observed late-20th century trend. Note that this is not the case for drought or cyclones which are included in the Table. [Government of Australia]	see revised wording in the caption to SPM table 1.
SPM-603	SPM	4	23	4	23	"revised" - it would be helpful if the "sign" of the revision could be indicated, as it is of equal interest if evidence has weakened as if evidence has strengthened [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	As the footnote to the table explains, it is difficult to compare the assessment findings between reports for several reasons. In the revised version of the table, we have included the assessment findings from the SREX and AR4, but do not attempt to identify a "sign" of any revision due to the reasons described in the footnote.
SPM-604	SPM	4	23		27	To this (non-native speaker) it sounds like you are talking about a monotonic trend which I know you don’t.	comment seems misplaced. Cannot provide a

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						rephrase? [Gabriele Hegerl, United Kingdom]	response.
SPM-605	SPM	4	27		56	This section omits the key finding that the rate of increase in ocean heat content is proportional to the increase in surface temperature. This is discussed in Chapter 13 (pages 26-27). This is a key finding of recent research. It has major implications for understanding the dynamics of climate change on the decadal to centennial scale. I suggest an additional bullet here, folowing the second bullet, as follows: The rate of increase in ocean heat content over the past fifty years is found, by observation and in climate models, to be proportional to the increase in global temperature. This finding implies that transfer of heat energy to the ocean acts in parallel to longwave radiant heat transfer to space in offsetting the warming forcing of incremental greenhouse gases, leading to a transient climate sensitivity pertinent to climate response to perturbation on a time scale of multiple decades) that is less than the so-called equilibrium sensitiivty. The time constant for achieving steady state for this transient sensitivity is about 5-10 years, whereas that for the so-called equilibrium sensitivity is about 500 years. Alternatively such a bullet might go under "Understanding the climate system and its recent changes", page SPM 8. In any event in my opinion this is a major recent advance in observations and understanding that needs to be highlighted in the SPM. It has major policy implications. [Stephen E Schwartz, United States of America]	Noted. While the revised SPM does not specifically highlight the mentioned proportionality between surface temperature and ocean heat content, observed ocean heat content changes are very prominently highlighted (Figure SPM.2) and the causes for the upper ocean warming discussed as part of Section 4, Understanding, Subsection Detection/Attribution. In addition, the key role of the ocean for the estimated energy budget of the Earth is highlighted in the SPM. (Note that the new Figure SPM.9 graphically presents the near-linear relationship between global mean temperature change and cumulative emissions.)
SPM-606	SPM	4	27			It is suggested to include some information related to ocean acidification given the great relevance of this topic and given that this topic has also been addressed under "Long-term Projections: Carbon and Other Biogeochemical Cycles".. [Klaus Radunsky, Austria]	Ocean acidification is addressed in the Section 'Carbon and other biogeochemical quantities'
SPM-607	SPM	4	29	4	29	Why is it important to highlight independent observational systems and datasets? That was assumed for atmospheric observations. [Kristie Ebi, United States of America]	sentence has been revised
SPM-608	SPM	4	29	4	29	It seems to me that "virtually certain" is getting abused in a number of places--when the text should simply indicate that a change has occurred. Is there really a plausible alternative? If not, don't use this mushy term. [Michael MacCracken, United States of America]	Reject, this is a quantitative term (from the IPCC uncertainty guidance terminology), and results here from the comprehensive chapter 3 assessment
SPM-609	SPM	4	29	4	30	The oceans may have warmed since 1971 as a result of the 1978-1998 warm period, but what about the rest of the century. This statement without the rest of the century is totally meaningless--ocean temperatures during the global cooling that occurred from 1945 to 1977 were cooler. Ignoring this fact renders the IPCC suspect high suspect of distortion of what actually happened. [Don Easterbrook, United States of America]	Statement has been expanded, and now includes the period from the 1870s to 1971.
SPM-610	SPM	4	29	4	31	"upper ocean has warmed since 1971" sounds like it wasn't warming before then, when really it's just that the data set this statement is based on begins in 1971. It would be clearer to say 'since at least the observed/evaluated period beginning in 1971." [Alice Alpert, United States of America]	Statement has been expanded, and now includes the period from the 1870s to 1971.
SPM-611	SPM	4	29	4	31	Why does this key finding box have a highlighted calibrated uncertainty language while all previous boxes do not? More importantly, the second clause of this summary is too vague. I believe the authors are trying to express the very important concept that the majority of the energy imbalance in Earth's radiation budget has gone into warming of the oceans, but the statement could easily be misinterpreted as ocean warming has been the dominant cause of the energy imbalance (incorrectly inverting the causality). This would be a major misinterpretation of the synthesis, so I suggest clarifying this statement would greatly help. [William Anderegg, United States of America]	Many key findings in the revised SPM contain calibrated uncertainty language. The second clause has been removed, and the overall statement revised.
SPM-612	SPM	4	29	4	31	Global energy content needs further clarification or simplification for the SPM. [Government of Australia]	Term has been removed.
SPM-613	SPM	4	29	4	31	The sentence on the fact that ocean warming dominates the change in global energy content should be strengthened, add sentence from para 40-44. [Government of Germany]	Sentence has been removed from the shaded box, and this topic is addressed in the subsequent bullets.
SPM-614	SPM	4	29	4	31	Clarify that the global energy content includes the ocean and the atmosphere [Government of New Zealand]	Term has been removed.
SPM-615	SPM	4	29	4	31	To take due account of measurement uncertainties, delete " it is virtually certain that the upper ocean has	reject, statement is based on the comprehensive

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						warmed since 1971, and that ocean warming dominates the change in the global energy content" and substitute "it is not known to what extent the upper ocean has warmed since 1971, or what fraction of the change in the global energy content ocean warming represents." Reason: The 3000+ Argo bathythermograph buoys show very little ocean warming since they were first deployed. They are the most comprehensive measure of upper-ocean temperature available, but they are equivalent to taking a single temperature and salinity profile at one location in Lake Superior less than once a year. Previous expendable bathythermographs also showed little warming until a correction for an imagined cooling bias was introduced. Before that, haphazard measurements were taken by passing ships. The data are altogether inadequate to allow any "virtually certain" conclusion about ocean temperatures.H40 [Christopher Monckton of Brenchley, United Kingdom]	assessment provided in chapter 3.
SPM-616	SPM	4	29	4	44	Why should a policymaker care that 90% of the energy has gone into the ocean or that ocean warming dominates the change in the energy content. There is no need to assign a number to this here if a broader statement would be more useful and clearer to more people who are likely to read the SPM, leaving the technical information to the chapters as appropriate. Some non-experts might wonder if this means we shouldn't care about atmospheric warming, which would of course be incorrect. You may want to consider something like: 'Improved observations clearly demonstrate that energy has gone into the global ocean. Because this ocean warming has occurred at the same time as global atmospheric warming,it is clear that an external source of energy is affecting the climate system rather than redistribution of energy. [Susan Solomon, United States of America]	Noted. Text has been revised. However, we think the fact that the ocean has dominated the change in energy stored in the climate system, including the quantitative information, is very policy relevant information (as confirmed by review comments received from governments)
SPM-617	SPM	4	29	4	44	Why should a policymaker care that 90% of the energy has gone into the ocean or that ocean warming dominates the change in the energy content. There is no need to assign a number to this here if a broader statement would be more useful and clearer to more people who are likely to read the SPM, leaving the technical information to the chapters as appropriate. Some non-experts might wonder if this means we shouldn't care about atmospheric warming, which would of course be incorrect. You may want to consider something like: 'Improved observations clearly demonstrate that energy has gone into the global ocean. Because this ocean warming has occurred at the same time as global atmospheric warming,it is clear that an external source of energy is affecting the climate system rather than redistribution of energy. [Susan Solomon, United States of America]	Noted. Text has been revised. However, we think the fact that the ocean has dominated the change in energy stored in the climate system, including the quantitative information, is very policy relevant information (as confirmed by review comments received from governments)
SPM-618	SPM	4	29	4	55	Results marred by too much biased opinion on highly inaccute highly variable figures only available over a very recent period [Vincent Gray, New Zealand]	no response required. Reviewer fails to provide any substantive basis for his claims.
SPM-619	SPM	4	30	4	30	May be better as 'has warmed since at least 1971' [Susan Solomon, United States of America]	statement revised.
SPM-620	SPM	4	30	4	31	The "global energy content" is almost certainly dominated by the hot core of the earth. [James [Jim] Crawford, United States of America]	Term has been removed.
SPM-621	SPM	4	30	4	31	The phrasing here is more technical and vague ("change in the global energy content") than that used on lines 40-41 to convey the same point. Suggest the phrasing from lines 40-41 be used so that this line is rewritten as "…upper ocean has warmed since 1971 and that this accounts for more than 90% of the extra energy stored by the earth since then". [Government of Canada]	Sentence has been removed from the shaded box, and this topic is addressed comprehensively in the subsequent bullets.
SPM-622	SPM	4	30			Again, the word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". It looks to me as if the first is meant, but I don't think it will be generally plain to the intended readership [William Ingram, United Kingdom]	Term has been removed.
SPM-623	SPM	4	33	4	33	Suggest change to "The largest warming trend is found..." [Government of New Zealand]	statement revised
SPM-624	SPM	4	33	4	34	It appears strange to have a low accuracy for the near ocean surface increase whereas 3 digits are given for 700 m. Would it also be possible to give previously the surface atmospheric warming per decade to better compare atmopshere and ocean? [SYLVIE JOUSSAUME, France]	statement revised
SPM-625	SPM	4	33	4	35	It is not clear whether the numbers in the first two sentences of the paragraph are related to the global ocean or not. [Government of Germany]	statement revised
SPM-626	SPM	4	33	4	35	The two values >0.1°C and <0.01°C are ambiguous. What is meant ? According to figures it should be nearly	statement "exceeds 0.1°C per decade" is correct as

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						equal, slightly above 0.1 and nearly equal and slightly below 0.01°C. [SYLVIE JOUSSAUME, France]	written , and does not appear to be ambiguous.
SPM-627	SPM	4	33	4	38	Consistency of reported trends and uncertainty intervals. This section uses change per decade and no uncertainty. A choice needs to be made on the reporting of all trends and uncertainties in SPM so that they are consistently presented. It is appreciated that uncertainty intervals are not always able to be provided, and some uncertainties are better defined while others are structural. Nonetheless, it is a fact that some sub-disciplines within the overall science are more inclined to provide quantified uncertainty estimates on observations than others. It is also a fact that the provision of quantified uncertainty ranges by convention in some sub-disciplines does not necessarily reflect the true state of knowledge or lack of knowledge. Hence a consistent treatment on whether to provide intervals across the SPM needs to be made, as well as an explanation or treatment for any inability to provide those (for global-mean temperature for example). [Government of Australia]	Consistency in reporting trends and uncertainty intervals is achieved to the extent possible, based on the underlying chapter assessments.
SPM-628	SPM	4	33	4	38	The text below may be difficult to follow. Can the information be presented in a more orderly fashion? "Globally, between 1971 and 2010 the largest rate of warming is found near the sea surface with the warming trend decreasing in relation to depth (>0.1°C per decade in the upper 75 m to about 0.015°C per decade by 700 m). It is likely that the deep ocean has warmed below 3000 m and that at depths beyond 4000 m warming has occurred at a rate of <0.01°C per decade since the 1990s. Regionally it is very likely that the Southern Ocean has warmed throughout the full ocean depth since the 1990s, at a rate of about 0.03°C per decade." [Government of United States of America]	statement has been revised.
SPM-629	SPM	4	33	4	44	The two paragraphs could be reorganised as they now both consider global and regional (esp Southern Ocean) warming. Considering global aspects in one and Southern Ocean in the other could add clarity. [Government of Sweden]	Both statements have been revised. Southern ocean now only addressed in first bullet.
SPM-630	SPM	4	33	4	44	This section includes two bullets that contain very similar statements about warming in the Southern Ocean (SO). This topic seems to be more appropriate for the first bullet, which is about ocean warming—the second bullet is about the extra energy due to warming. Section 3.2.4 talks only about warming in the SO, not about extra energy. Hence if the comment about the SO is to be retained in the second bullet here, contentshould be added to section 3.2. For example, based on section 3.2.2 (p.8, lines 27-39), would it be possible to include a statement like: "It is likely that increased ocean heat content at the poles can account for X% of the increased ice melt in the Arctic and Antarctic"? [Government of United States of America]	Both statements have been revised. Southern ocean now only addressed in first bullet.
SPM-631	SPM	4	33		44	These 2 points rather overlap. If they are both kept in, & both separate, the last sentence of the 2nd should be shifted to the 1st [William Ingram, United Kingdom]	Both statements have been revised. Southern ocean now only addressed in first bullet.
SPM-632	SPM	4	33		56	Include a sentence saying "The most recent estimate of the heat flux into the ocean is 0,6 W/m2 (from the ARGO buoys)". [Terje Wahl, Norway]	reviewer does not provide a reasoning for this proposed inclusion.
SPM-633	SPM	4	34	4	34	It is suggested that the observations that the global warming was slowing down over the past dozen years be added to the text describing the global warming, that is, the following sentence be inserted after “2010”, which reads: “It is likely that the global averaged surface temperature and global upper ocean heat content show little increase or even negative trend since 2000”. Also, the following sentence be inserted in Line 49, Page 5, which reads: “It is likely that rising rate of the global mean sea level since 2000 is smaller than that in the earlier 1990s [Figure 3.13]”. [Government of China]	a bullet describing the trend in GMST over the past 15 years has been added to the 'atmosphere' section.
SPM-634	SPM	4	34	4	35	To allow for the near-total absence of temperature sampling in the deep oceans, delete “It is likely that the deep ocean has warmed below 3000 m depth since the 1990s.” Reason: The frequency and steric distribution of ocean temperature sampling at depth is altogether inadequate to allow any conclusion to be drawn about changes in deep-ocean temperature. The conclusion is in any event greatly complicated by lack of knowledge of variability in subsea volcanic activity, which heats the deep ocean directly. Furthermore, given that the ocean is ~1100 times denser than the atmosphere, it seems implausible that over as short a period as 40 years any appreciable warming of the deep ocean attributable to anthropogenic warming of the atmosphere could have occurred. [Christopher Monckton of Brenchley, United Kingdom]	reject, statement is based on the comprehensive assessment provided in chapter 3.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-635	SPM	4	34	4	36	The two sentences describing deep ocean warming should be merged and thought given to what message policy-makers need to take home here. There is a likelihood statement for the warming below 3000 m but no rate given, and then no likelihood given for the warming below 4000 m but a rate given. This is confusing. [Government of Canada]	These sentences have been revised.
SPM-636	SPM	4	35	4	35	"The global ocean has warmed.." This needs an associated confidence statement. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	Sentence has been revised.
SPM-637	SPM	4	35	4	37	From here on (lines 35-37), warming is reported for the time period since the 1990s. It is relevant to be informed about the period before the 1990s, since in the previous line (line 33-34) the reported time period was 1971 to 2010. [Government of Netherlands]	Revised opening shaded statement for this section clearly indicates that sufficient deep ocean observations are only available since the 1990's
SPM-638	SPM	4	35			This statement lacks a confidence / likelihood categorization: "The global ocean has warmed at a rate of <0.01 C per decade below 4000m over this time interval." This is particularly important to classify given the lack of observations at these depths. [Government of United States of America]	statement has been revised.
SPM-639	SPM	4	35			“The global ocean has warmed...” is there a measure of confidence associated with this statement? [Conor Sweeney, Ireland]	statement has been revised.
SPM-640	SPM	4	36	4	37	Has the Souther Ocean warmed at the same rate at all depths? [Luisa Cristini, United States]	statement has been revised.
SPM-641	SPM	4	36	4	37	It would be helpful to have a box with a rationale for why particular regional findings are reported throughout the SPM. Are the most robust findings highlighted? Those different from the AR4? In this case, why the results for the Southern Ocean? [Kristie Ebi, United States of America]	revised statement now makes it clear why the Southern Ocean, and North Atlantic are highlighted.
SPM-642	SPM	4	36	4	38	It is over-interpreting the data (as in Figures 3.1 and 3.3) to imply a ‘per decade’ warming trend from the fact that the second decade was warmer than the first. [Government of Australia]	per decade rates no longer reported in SPM for the deep ocean.
SPM-643	SPM	4	37	4	37	"throughout the full ocean depth" is an awkward statement. [Government of Australia]	statement revised
SPM-644	SPM	4	40	4	40	This begs the question of the source of that extra energy. [Kristie Ebi, United States of America]	statement has been revised. "extra energy" no longer used.
SPM-645	SPM	4	40	4	40	‘accumulated’ would be better than ‘stored’ to help avoid the implication that the IPCC is already assuming what it is seeking to demonstrate, ie that the planet has warmed. [Government of Australia]	Not clear how these two terms lead to different implications.
SPM-646	SPM	4	40	4	41	Lay readers of this statement might think that it's a good thing that the ocean is taking up a lot of heat. I suggest a statement like "although the ocean has stored 90% of the extra energy between 1971 and 2010, it will not continue to store the extra energy at such a rate in the future." [Alice Alpert, United States of America]	Rejected. Future projections are not part of this section on observed changes.
SPM-647	SPM	4	40	4	41	Consider moving the sentence "Warming of the ocean accounts for more than 90% of the extra energy stored by the Earth between 1971 and 2010." into the 1 st para of the section highlighted in brown (l 29-31). [Government of Germany]	first paragraph has been revised.
SPM-648	SPM	4	40	4	43	Again, are the information in the first two sentences related to the global ocean or not? [Government of Germany]	statement has been revised. Wording seems to be clear that this is referring to the large-scale global ocean.
SPM-649	SPM	4	40	4	43	To verify the math, some consideration should be given to the missing ocean heat implied in the statement that “Upper ocean (0-700 m) heat content very likely increased at a rate between 74[43 to 105] x 1012 W and 137 [120 to 154] x 1012 W for the relatively well-smapled 40-year period from 1971 to 2010.” Reason: Assuming 361.132 x 1012 m ocean surface area, the IPCC’s estimated 74-137 x 1012 W represents 0.2-0.4 W m–2 stored in the upper ocean. The atmospheric concentration of CO2, which represents 70% of all greenhouse forcings, rose from 326.1 µatm in Jan 1971 to 390.7 µatm in Jan 2011. Over that period, overlooking the cooling effect of aerosol particulates, the additional energy retained within the coupled Earth/atmosphere system as a result of greenhouse gases was thus (10/7)[5.35 ln(390.7 / 326.1)] = 1.381 W m–2, of which the IPCC regards nine-tenths, or 1.243 W m–2 as stored in the oceans, which represent 70.8% of the Earth’s surface, giving 1.75 W m–2 in the oceans, or approximately six times the IPCC’s value for the upper ocean alone. [Christopher Monckton of Brenchley, United Kingdom]	Reject. Statement is based on the comprehensive assessment provided in chapter 3. In addition, Box 13.1: "The Global Energy Budget" in Chapter 13 provides an summary of the changes in the energy budget.

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SPM-650	SPM	4	40	4	44	While the statement that 90% of extra energy is going into the oceans is useful, the remainder of the point does not appear to add value, beyond that captured in the dot point above. Without an explanation of the utility of the energy budget to the attribution science, it is unclear that readers of the SPM will be able to interpret this section. [Government of Australia]	Taken into account. Paragraph has been revised and numbers have been deleted to make it more useful. The energy budget point is being prominently highlighted in the key statement in the SPM section on "Understanding", Subsection "Quantification of Climate System Responses"
SPM-651	SPM	4	40	4	44	The number 74 x 10^12 W may convey little meaning to policy makers. Can the authors express this fact in some way that will give a sense of the importance of the change? [Government of United States of America]	Taken into account. Paragraph has been revised to be more useful. "Watts" numbers have been deleted. We now report the linear trend in ocean heat content in unit of "Joules".
SPM-652	SPM	4	40	4	44	This is a key finding, but as presented it may be difficult for policymakers to grasp its importance and context. For example, the abbreviation "W" may be obscure, and the reader is given no help in assessing he importance of the rate of increase in ocean heat content. [Government of United States of America]	Taken into account. Paragraph has been revised to be more useful. "Watts" numbers have been deleted. We now report the linear trend in ocean heat content in unit of "Joules".
SPM-653	SPM	4	41	4	41	Please replace 'at a rate' by 'with an amount' since a 40 year period is considered, and not a (year or decadal) rate is reported. [Government of Netherlands]	statement has been revised. However, note that the unit 'W' was correctly referred to as a rate.
SPM-654	SPM	4	41	4	42	What is the meaning of the two brackets qualifying the limits of an incertitude range ? Brackets with the very same figures are quoted on chapter 3, lines 1 and 2 of page 9, as uncertainties on particular estimates. The figures 74 and 137 quoted In Chapter 3 executive summary as the limits of the uncertainties range are the mean value of those estimates. What is the rationale behind this statement ? [Government of France]	To the extent possible, the approach to quantifying uncertainty has been made consistent across the SPM. See footnote 3.
SPM-655	SPM	4	41	4	42	What is the meaning of the two brackets qualifying the limits of an incertitude range ? Brackets withn the very same figures are quoted on chapter 3, lines 1 and 2 of page 9, as uncertainties on particular estimates. The figures 74 and 137 quoted In Chapter 3 executive summary as the limits of the uncertainties range are the mean value of those estimates. What is the rationale behind this statement ? [Michel Petit, France]	To the extent possible, the approach to quantifying uncertainty has been made consistent across the SPM. See footnote 3.
SPM-656	SPM	4	41	4	42	Unclear sentence: "Uper ocean … heat content … increased at a rate between 74 …W and 137 … W for the … 40 year period ..." is confusing. Does it mean "increased from 74 to 137 W during the 40 years from 1971 to 2010"? [Christoph Ritz, Switzerland]	statement has been revised
SPM-657	SPM	4	41		42	Providing a range of ranges makes no sense! I cannot guess what is going on: if there is something sensible going on it needs to be explained - but my suspicion is that for this summary number only one range will make sense. Also, it reads absurdly to quote numbers to 2 or 3 significant figures & then give ranges indicating 2 of these do not apply. Where the range is a significant fraction of the best guess, the range must come first, & indeed it probably is clearer if it always does [William Ingram, United Kingdom]	statement has been revised
SPM-658	SPM	4	43	4	43	The statement on warming below 4000 m was made in the previous paragraph. [Kristie Ebi, United States of America]	statement has been revised
SPM-659	SPM	4	43	4	44	If there has been warming below 4000 m globally, isn't it obvious that there has been warming below 1000 m in the Southern Ocean? [James [Jim] Crawford, United States of America]	statement has been revised. Southern Ocean now addressed only in first bullet of this section.
SPM-660	SPM	4	43	4	44	This information seems to repeat what is in the paragraph above and could be deleted. [Government of Canada]	statement has been revised.
SPM-661	SPM	4	43	4	44	Reading the addition 'in spite of sparse sampling', one would like to know what robust conclusions can be inferred from the fact that warming has been observed globally below 4000 m and below 1000 m in the Southern Ocean. Some reformulation is required, e.g. Observations suggest, although sparsely sampled, that warming also takes place globally below 4000 m and below 1000 m in the Southern Ocean. The sentence may even be redundant, Warming of the deep ocean has been addressed in the previous conclusion. [Government of Netherlands]	statement has been revised.
SPM-662	SPM	4	43	4	44	The term "in spite of" in line 44 may not be well understood. Suggest rephrasing the sentence "although only sparse sampling has occurred, warming has also been observed globally below 4000m and below 1000m in	statement has been revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						the Southern Ocean" [Government of New Zealand]	
SPM-663	SPM	4	43	4	44	This sentence seems redundant. The discussion has moved from warming rate (previous para) to heat content (lines 40-43) and then goes back to warming. Suggest delete, or amalgamate with previous para. Aren't deep ocean observations very limited and if so, not sure that this is conveyed sufficiently. Also, not sure the use of 'in spite of' is appropriately neutral, maybe instead something like: while sampling is of the deep ocean is sparse, warming has been observed globally …. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised.
SPM-664	SPM	4	44	4	44	Delete reference to Figure SPM-1 which does not illustrate the sentence [Government of France]	statement has been revised.
SPM-665	SPM	4	44	4	44	in spite might not be the right wording here, suggest something in line with "but sampling number is still low" [Government of Sweden]	statement has been revised.
SPM-666	SPM	4	44	4	44	Delete reference to Figure SPM-1 which does not illustrate the sentence [Michel Petit, France]	statement has been revised.
SPM-667	SPM	4	44			Why add the qualifier "in spite of sparse sampling"? That relates to confidence, not to whether the warming has occurred. [James [Jim] Crawford, United States of America]	statement has been revised.
SPM-668	SPM	4	46	4	46	The word 'enhanced' (ie increased in value) may confuse without an explanation or alternative language such as 'sharper gradients' or 'increased contrasts'. [Government of Australia]	subsequent sentence provided adequate explanation for what is meant by 'enhanced'.
SPM-669	SPM	4	46	4	46	The meaning of the word 'enhanced' is not clear, suggest change to 'amplified', as in the Technical Summary. [Government of United Kingdom of Great Britain & Northern Ireland]	subsequent sentence provided adequate explanation for what is meant by 'enhanced'.
SPM-670	SPM	4	46	4	46	Replace "has been enhanced" by "has become more distinct". Reason: It is not clear at first glance what "enhancement" of a pattern means. The proposed alternative might be clearer. [Urs Neu, Switzerland]	subsequent sentence provided adequate explanation for what is meant by 'enhanced'.
SPM-671	SPM	4	46	4	49	It is not clear to policy makers why this change in the salinity distribution would matter to them. It should be explicitly stated that salinity in the ocean is connected to the global hydrologic cycle, which also affects precipitation on land. [Alice Alpert, United States of America]	This information comes together in the section on Detection and Attribution, where the global hydrological cycle is addressed.
SPM-672	SPM	4	46	4	49	As with the rest of the dot points in this section, why is this one being presented in the SPM? If the answer is that surface salinity is a good proxy for rainfall changes and monitoring changes to the hydrological cycle, that should be captured for SPM readers, including the importance of the evidence in an attribution context. This point highlights the limitation of the current structure of the SPM for non-experts, there is very little interpretative value added to the SPM currently. [Government of Australia]	This information comes together in the section on Detection and Attribution, where the global hydrological cycle is addressed.
SPM-673	SPM	4	46	4	49	Ocean Observations. 'It is very likely that the mean regional pattern of sea surface salinity has been enhanced since the 1960s: saline surface waters in the evaporation-dominated mid-latitudes have become more saline, while the relatively fresh surface waters in rainfall-dominated tropical and polar regions have become fresher. {3.3.2, Figure 3.4, FAQ 3.3}'. Question: The relatively fresh surface waters have become fresher. This applies the most to which regions (tropical or polar)? [Government of Morocco]	Statement has been revised. Specific regions no longer called out.
SPM-674	SPM	4	46	4	49	This text discusses effects of evaporation and rainfall on ocean sainity, but what about cryospheric melt? Can a statement about that be made? [Government of United States of America]	Revised statement has focused on the general large scale pattern, and therefore not specifically addressed the role of cryospheric melt in the polar regions, although this is covered in the comprehensive Chapter 3 assessment.
SPM-675	SPM	4	46	6	33	It is quoted: "It is very likely that the mean regional pattern of sea surface salinity has been enhanced since the 1960s: etc." In his turn, in page SPM 6, lines 30 to 33 it is quoted that is very high confidence that an acidification and a pH decreasing of seawater is evident. As many people understand, or believe, that salinity is opposite to acidity, it could be difficult for them to realize that the both sea parameters are increasing at the same time. In this sense, a brief and concise explanation on the technical differences between both concepts could be considered by the IPCC publishers, and inserted in the form of a paragraph or a phrase in the text of the SPM, and if possible, also in Chapter 3.3 and 3.8. [Government of Chile]	The subsequent sentence explains what is meant by 'enhanced' - salinity increasing in some regions, and decreasing in others, so that there should not be any confusion with the acidification occurring in the global ocean at the same time.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-676	SPM	4	48	4	48	Is the expression "rainfall-dominated polar regions" correct? [Government of Germany]	Statement has been revised. Specific regions no longer called out.
SPM-677	SPM	4	48	4	48	Replace 'have become fresher." with "…have become less saline." [Christoph Ritz, Switzerland]	We prefer to stick closely with the wording of the chapter 3 assessment.
SPM-678	SPM	4	48	4	48	This needs some qualification, e.g. the subpolar North Atlantic has become more saline recently. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	This level of regional details in contained in the Chapter 3 assessment, but not elevated to the level of the SPM.
SPM-679	SPM	4	51	4	55	re. 'evidence of variability in major ocean circulation systems on time scales of years to decades' . This is a cumbersome concept and could be much more clearly written with the layperson in mind.' Also: 'There is no evidence for decadal trends in the transports of the Atlantic Meridional Overturning Circulation (AMOC), and the Antarctic Circumpolar Current' - is this because reliable data have shown this to be the case, or because of a paucity of obs data? This needs to be made clear. [Government of United Kingdom of Great Britain & Northern Ireland]	Statement has been removed. Not considered crucial for the SPM.
SPM-680	SPM	4	51	4	55	More explanation would be necessary, this apparently means that the warm currents like the Gulf Stream are stable while tropical currents are affected, the text should state what are the influences of these phenomena on global climate. The fact that there is no effect of the current warming on the "gulf stream" situation is in contradiction with some catastrophic scenarios predicting a sudden ice age in the Northern Atlantic. [Christian Muller, Belgium]	Statement has been removed. Not considered crucial for the SPM.
SPM-681	SPM	4	51		55	I have a hard time figuring out what I am learning from this paragraph. Please revisit and maybe shorten [Gabriele Hegerl, United Kingdom]	Statement has been removed. Not considered crucial for the SPM.
SPM-682	SPM	4	51			"evidence for variability" actually means "evidence that it is possible to vary". I expect "evidence for strong variability" or "evidence for strong variation" is meant [William Ingram, United Kingdom]	Statement has been removed. Not considered crucial for the SPM.
SPM-683	SPM	4	52	4	52	Explain 'ocean gyres' and why this is important. [Government of Australia]	Statement has been removed. Not considered crucial for the SPM.
SPM-684	SPM	4	52	4	52	Could you explain what suptropical gyres is? [Government of NORWAY]	Statement has been removed. Not considered crucial for the SPM.
SPM-685	SPM	4	52			It seems very unlikely that policy makers will be familiar with the word gyres. [James [Jim] Crawford, United States of America]	Statement has been removed. Not considered crucial for the SPM.
SPM-686	SPM	4	54			What is meant by the term "transports" as used in "transports of the AMOC"? If this is an important point for policymakers, then they need to understand what it means. [Government of New Zealand]	Statement has been removed. Not considered crucial for the SPM.
SPM-687	SPM	4	54			Did the authors intend to say "transport volumes?" And what does “decadal trends” mean? [Government of United States of America]	Statement has been removed. Not considered crucial for the SPM.
SPM-688	SPM	5	1	5	6	Cherry picking. You choose the Arctic but not the Antarctic where ice mass is increasing. No actual temperature measurementa are ever made so changes may be due to changes in the temperature of ocean currents or in the amount of precipitation. Arctic ice has fluctuated in the past whjen we did not have the sophisticated measurement syrtems. There is evidence that Arctic ice size fluctuates [Vincent Gray, New Zealand]	reviewer comment is unclear as he seems to be confusing sea ice with ice sheet mass terminology. In any case, the reviewer will see that we now refer to both Arctic and Antarctic sea ice changes in the revised opening paragraph to this section.
SPM-689	SPM	5	1			Discussion needs to be made of changes in tropical glaciers (e.g. Vuille et al., 2008, doi:10.1016/j.earscirev.2008.04.002) [Ken Takahashi, Perú]	reject, space is limited in the SPM and we cannot go into this level of regional detail. We focus on the policy relevant message of world-wide retreat of glaciers. See Chapter 4 assessment for regional details.
SPM-690	SPM	5	3	5	6	Cryosphere Observations. ‘More comprehensive and improved observations strengthen the evidence that the ice sheets are losing mass, glaciers are shrinking globally, sea ice cover is reducing in the Arctic, and snow cover is decreasing and permafrost is thawing in the Northern Hemisphere. Ice is being lost from many of the components of the cryosphere, although there are significant regional differences in the rates of loss. {4.2–4.6,	This level of detail is generally not given specifically for other observed quantities. The opening chapeau for section B 'observations' talks generally of the increase in measurements from remote sensing and

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						Table 4.1}'. Question: Would it be possible to indicate here that such evidence has been strengthened mostly by satellite data or in-situ observations? [Government of Morocco]	ground based observations.
SPM-691	SPM	5	3	5	6	This summary seems to selectively eliminate the trends that run contrary to those expected form warming: (specifically, Antarctic sea ice increase, and mass gain in East Antarctica). It is important that these should be included in this summary. [Government of United States of America]	Revised statement now addressed changes in Antarctic Sea Ice. Not considered useful to separate ice loss from the East and West Antarctic ice sheets in this opening statement, because the important message is the overall net loss. Regional components to this loss from Antarctica are addressed in the subsequent bullets.
SPM-692	SPM	5	3	5	6	For Arctic sea ice, the regime shift from perennial ice to seasonal ice dominated with associated albedo change is the most important transformation across the Arctic Ocean. This key point is missed here. [Government of United States of America]	Noted. Key message of the SPM focusses on the loss in annual sea ice extent, which is supported by SPM figure 2, and is a central theme running through the observations, detection and attribution, and projection sections of the SPM
SPM-693	SPM	5	3	5	39	Why is there no mention on glacier loss in the Himalayas? This area holds a significant volume of ice and the impacts of loss have implication for a large population. It was also a point of contention in AR4. We note that a soon-to-be-published DFID-funded systematic review concludes that when the most robust methods of analysis are used (mass-balance), the data on loss of mass is consistent across the Himalaya chain. NB, we are happy to share this report with you now or as soon as it is published, as you might require). We are concerned that the SPM seems to ignore Himalayan glaciers and whilst accepting the political sensitivity of this associated with AR4, we consider that every effort should be made to cover the ground. [Government of United Kingdom of Great Britain & Northern Ireland]	Space is limited in the SPM and we cannot go into this level of regional detail. Glaciers of Greenland, tropical glaciers etc., are equally important from an impacts perspective. We focus on the policy relevant message of world-wide retreat of glaciers. See Chapter 4 assessment for regional details. The SPM should not be used as a location to respond on contentious issues arising from the previous reports.
SPM-694	SPM	5	3	5	39	To provide perspective, the Summary for Policymakers should indicate the sea-level rise equivalents of the observed or inferred ice-mass losses, and also the percentages of total ice mass represented by the losses. Reason: Ice mass losses expressed in Gigatonnes are calculated to cause alarm that may be inappropriate once it is borne in mind that 400 Gt ice melt is equivalent to just 0.1 mm sea-level rise. Examples: 210-371 Gt yr–1 ice loss in Greenland is equivalent to 0.5-0.9 mm yr–1 sea-level rise, and Antarctic ice loss of 65-112 Gt yr–1 is equivalent to 0.2-0.3 mm yr–1 sea-level rise, which, considering the very large volume of ice in the Antarctic, is a minuscule fraction of a percentage point each year. [Christopher Monckton of Brenchley, United Kingdom]	The required conversion factor to sea level equivalent has now been added (footnote 4).
SPM-695	SPM	5	3	5	39	To provide perspective, the shortness of the record should be emphasized, and observations from the early 20th century should be mentioned. Reason: Monitoring of Arctic sea-ice extent by satellite only began in 1979, not quite a third of a century ago, and there is some evidence that the beginning of satellite monitoring coincided with an Arctic sea-ice maximum. Numerous reports from early in the 20th century, when temperatures in the North Atlantic are known to have been higher than the present, indicate that sea-ice extent in the Arctic may have been less then than today. Example: A report by the US Meteorological Service in 1922 found an unprecedented ice-melt in the Arctic. [Christopher Monckton of Brenchley, United Kingdom]	All bulleted statements in this section clearly identify the time period from which any reported trends have been calculated.
SPM-696	SPM	5	4	5	4	It is important to mention the Antarctic sea ice increase in this opening summary. Otherwise, it reads like consolidated evidence for warming rather than an objective description of what has actually been observed. [Government of Australia]	statement has been revised.
SPM-697	SPM	5	4	5	4	Phrasing here is quite awkward. Both sea ice and snow cover extent are decreasing. [Michael MacCracken, United States of America]	statement has been revised.
SPM-698	SPM	5	4	5	4	Snow cover is only decreasing in spring and summer, not in autumn and winter. [Geert Jan van Oldenborgh, Netherlands]	statement has been revised.
SPM-699	SPM	5	4			What exactly doe it mean to say "Glaciers are shrinking?" Is area decreasing, or mass? Or is velocity increasing? And are these trends occurring since when? 1970? More recently for Antarctica? [Government of	statement has been revised to use the more specific term "losing mass".

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						United States of America]	
SPM-700	SPM	5	4			Again, the word "globally" used here has 2 opposite potential meanings, "averaged over the globe" & "everywhere over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	term has been removed.
SPM-701	SPM	5	8	5	8	Need to make clear whether or not "glaciers" is meant to include ice caps and ice sheets as well. [Robert Larter, United Kingdom]	Bullet now specifies 'excluding glaciers on the periphery of the ice sheets'. See further details given in Chapter 4.
SPM-702	SPM	5	8	5	11	For this to be meaningfull to anyone other than a glaciologist, the total mass should be given to put the rate in context. [James [Jim] Crawford, United States of America]	To place this information into the policy relevant context of sea level change, the required conversion factor to sea level equivalent has now been added (footnote 4).
SPM-703	SPM	5	8	5	11	Has the 'continuing' glacier shrinkage been accelerating since 2003? [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised.
SPM-704	SPM	5	8	5	21	Rates of change need to be standard for all variables across the SPM where the time period permits, variously total linear trend, trend per decade and trend per year are used. [Government of Australia]	Consistency in reporting trends is achieved to the extent possible, based on the underlying chapter assessments.
SPM-705	SPM	5	8	5	21	Please consider to include this information in percent as well as in metric tonns/yr in order to illustrate the extent of the loss. [Government of NORWAY]	To place this information into the policy relevant context of sea level change, the required conversion factor to sea level equivalent has now been added (footnote 4).
SPM-706	SPM	5	8	5	21	Some changes in trends in the cryosphere over very short periods are quoted, presumably because of the advent of new satellite datasets. However, such short period changes would not normally receive this kind of attention (e.g., in hurricanes? In temperatures? In storms?), so to a policymaker it is not clear why this is being done. Please clarify or change. [Susan Solomon, United States of America]	Noted. The length of the periods reported reflects the scientific assessment in the underlying Chapter and the availability of good quality data.
SPM-707	SPM	5	8	5	39	Much biased estimates on lmited data. where surface temperatures are rarely measured and sometimes affected by oceans or precipitation changes. The increase in Arctic ice and the extent of some glaciers seems neglected and historical perspective ignored. All this has certainly happened before. [Vincent Gray, New Zealand]	reviewer provides no substantive basis for his claims.
SPM-708	SPM	5	8			Typically, a summary section does not introduce new qualifying language or conclusions. The very high confidence concerning global glacier mass loss is not explicitly stated in section 4.3. P. 23, line 26 states, "...Figure 4.11 shows likely glacier mass losses in all 19 regions..." and p. 25, lines 30-31, state, "...sea level contribution rates from glaciers have very likely gradually increased since about 1985." [Government of United States of America]	Statement is consistent with the final draft of Chapter 4.
SPM-709	SPM	5	8			Since when are the glaciers continuing to lose mass? Since AR4? Since the LIA? The authors should consider using more explicit language, such as, "… globally, glacier mass has decreased during the 21st Century and thus has continued trends of the late 20th Century." [Government of United States of America]	Taken into account. Paragraph has been revised and is now explicit about the referenced time periods cited.
SPM-710	SPM	5	8			Again, the word "globally" used here has 2 opposite potential meanings, "averaged over the globe" & "everywhere over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	wording has been revised.
SPM-711	SPM	5	9	5	9	"…less agreement on the rates of mass loss". Clarify the spatial scale of the lack of agreement about rates of glacier mass loss. Is this meant to be a statement about 'global rate of glacier mass loss' or lack of agreement about rates of loss within different regions. There may be fundamental reasons for rates to be different in different regions, therefore, the lack of agreement across regions may not be surprising. [Government of Canada]	statement has been revised, and focusses on the key message of world-wide retreat of glaciers.
SPM-712	SPM	5	9	5	10	remove 'based on independent methods': this doesn't add any meaning to sentence [Government of Australia]	statement revised
SPM-713	SPM	5	9	5	11	The wording "since 2003" is not entirely clear. Are the time-windows included in this interval (2003-preset) or does it refer to publications date? Please clarify. [Andrew Ferrone, Germany]	statement revised

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-714	SPM	5	9	5	11	The phrase "based on different time windows since 2003" seems incomprehensible to readers, and more clearly and easily understandable expression should be used to represent the two time period, i.e. 2005-2009 and 2003-2009. [Government of Japan]	statement revised
SPM-715	SPM	5	9	5	11	There is an inconsistency in the 2 ranges of values given for the global glacier mass loss since, according to chapter 4, page 4, lines 4 to 6, the first number is without glaciers aroung the periphery of ice sheets whereas the second number is with those. According to chapt 4, the 210 estimate should be replaced by the 251 estimate. [SYLVIE JOUSSAUME, France]	statement has been revised and is consistent with the final draft of Chapter 4.
SPM-716	SPM	5	9			The word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". By the end of the sentence it is clear the former is meant, but make it clear by changing it to e.g. "global-mean" [William Ingram, United Kingdom]	wording has been revised.
SPM-717	SPM	5	10	5	10	The quantities of glacier masss loss as mentioned in this sentence seem to belong to different categories (210 excludes peripheral glaciers of the ice-sheets, while 371 includes these glaciers) and therefore they shouldn't be compared by mentioning the difference in the time-window only [Table 4.5; ES chapter 4; p. 4; l.4-6] [Government of Germany]	statement has been revised and is consistent with the final draft of Chapter 4.
SPM-718	SPM	5	10	5	11	remove ' based on different time windows since 2003' ; this is confusing and doesn't add meaning. [Government of Australia]	statement has been revised
SPM-719	SPM	5	10	5	11	The phrase "different time windows" is confusing. Add details on duration of records as is commonly presented elsewhere in the SPM. [Government of Canada]	statement has been revised
SPM-720	SPM	5	10	5	11	please clarify the different time ranges: once since 2003, the other one since 2005. [Government of Germany]	statement has been revised
SPM-721	SPM	5	10	5	11	…based on different time windows since 2003 and depending on the inclusion or exclusion of glaciers around periphery of ice sheets. [David Parker, United Kingdom of Great Britain & Northern Ireland]	statement has been revised
SPM-722	SPM	5	10	5	19	In each of these three bullets (lines 10, 15, 19), the glacier mass loss is expressed in Gt/yr, but it would be useful to frame this in terms of a % loss/decade if at all possible. Otherwise, it's unclear if these numbers are large or small. [Government of United States of America]	To place this information into the policy relevant context of sea level change, the required conversion factor to sea level equivalent has now been added (footnote 4).
SPM-723	SPM	5	10			The low end of the range apparently excludes the peripheral glaciers and the high end includes those glacier. This means that the width of the range is due not only to differences in the time window, as the sentence argues, but also to the particular sets of glaciers in the aggregate. [Government of United States of America]	statement has been revised and is consistent with the final draft of Chapter 4.
SPM-724	SPM	5	10			For policy makers, this unit needs to be defined or spelled out: Gt yr-1 [Government of United States of America]	To place this information into the policy relevant context of sea level change, the required conversion factor to sea level equivalent has now been added (footnote 4).
SPM-725	SPM	5	13	5	14	The statement that "the Greenland Ice Sheet has lost mass since the early 1990s" may well be true, but what about pre-1990? Temperature records show that Greenland was warmer in the l930s than since 1990 and ice was undoubtedly also lost then. However, during the 1945 to 1977 global cooling the ice sheet grew. Leaving out this higihly significant data is scientifically dishonest because the IPCC statement implies that the Greenland Ice Sheet is continually losing ice, rather than fluctuating between gains and losses. Because the warm climate of the 1930s occurred prior to the sharply increased human CO2 emisson, Greenland doesn't prove anything about the cause of global warming--if anything it shows the these changes are natural and have nothing to do with CO2! [Don Easterbrook, United States of America]	Reviewer fails to cite evidence to support his claims.
SPM-726	SPM	5	13	5	15	Although the findings are interesting it's absurd to mention the numbers for such a short period. Or asked differently: would you have mentioned trends over such a short period if Greenland had gained ice in that period? [Marcel Crok, The Netherlands]	revised bullet is based on longer time periods, although still limited to the satellite based records.
SPM-727	SPM	5	13	5	15	Is there a reason why these timeframes were chosen? These trends would be even more clear if they compared the periods 1993-2004 with 2005-2010. [Government of Canada]	statement has been revised, and no longer uses overlapping time periods

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-728	SPM	5	13	5	15	What is the level of confidence that ice mass loss in Greenland/Antarctic is accelerating? And, what are the implications for sea level rise and is this reflected in recent sea level rise? [Government of United Kingdom of Great Britain & Northern Ireland]	Confidence has been applied to the revised statements. To place this information into the policy relevant context of sea level change, the required conversion factor to sea level equivalent has now been added (footnote 4).
SPM-729	SPM	5	13	5	15	It could be informative to give readers an impression of what these numbers mean, e.g. through a relation to corresponding sea level rise, or even as a fraction of the whole ice sheet mass. This could possibly be done in a footnote. [Urs Neu, Switzerland]	To place this information into the policy relevant context of sea level change, the required conversion factor to sea level equivalent has now been added (footnote 4).
SPM-730	SPM	5	14	5	15	This can be re-worded to have more impact. For example: "The trend in ice loss from Greenland has increased since 1993. On average the rate of loss from 1993 to 2010 was approximately 123 gigatons per year. However, this rate is largely reflective of an increased rate of ice loss of 228 gigatons per year starting in 2005." More generally, many of the key findings would benefit from being expressed more like a story with context. [Government of United States of America]	statement has been revised and is consistent with the final draft of Chapter 4.
SPM-731	SPM	5	15	5	15	To illustrate the difference in the mass-loss mechanisms of the GIS and the WAIS it could be useful to add here: As the mass budget method shows, the actual partitioning of iceloss is about 60% surface mass balance (i.e. runoff) and 40% glacier discharge [4.4.2.2.1] [Government of Germany]	This is considered too much technical detail for the level of the SPM. See the technical summary, and detailed chapter assessment.
SPM-732	SPM	5	15	5	21	use Pg instead of Gt (as in all other chapters) [Ingeborg Levin, Germany]	To place this information into the policy relevant context of sea level change, the required conversion factor to sea level equivalent has now been added (footnote 4).
SPM-733	SPM	5	17	5	21	The statement that "the Antarctic Ice Sheet is currently losing ice" is contrary to well documented data. Some ice has been lost in the West Antarctic Penisula, but this is NOT the main ice sheet (the East Antarctic Ice Sheet)! The next statement contradicts the topic sentence in this paragraph--"East Antarctica is likely to have experienced a small gain in mass." Since the East Antarctic ice sheet is many times large than the small glaciers on the West Antarctic Peninsula, how can the Antarctic Ice Sheet be "losing mass?" Very bad conclusion! [Don Easterbrook, United States of America]	reject, reviewers provides no substantive basis to support his claims. See comprehensive assessment given in Chapter 4.
SPM-734	SPM	5	18			Why the Antarctic ice loss value as 65 Gt yr-1 while this quantity does not appear in chapter 4, 4.4.2 ? [Government of France]	statement has been revised and is consistent with the final draft of Chapter 4.
SPM-735	SPM	5	21	5	21	It would be helpful to have a brief statement of why the gain in mass. [Kristie Ebi, United States of America]	statement has been revised, and now focusses on the policy relevant finding of overall net loss from Antarctica.
SPM-736	SPM	5	21	5	21	To illustrate the difference in the mass-loss mechanisms of the GIS and the WAIS it could be useful to add here: Antarctic long term changes in grounded ice mass are almost entirely explained by increasing glacier speed [4.4.2.3.1] [Government of Germany]	This is considered too much technical detail for the level of the SPM. See the technical summary, and detailed chapter assessment.
SPM-737	SPM	5	23	5	23	Ambiguous: sounds like each season has had less ice than the last. Reword, perhaps starting with 'For each season…' [Government of Australia]	statement has been revised
SPM-738	SPM	5	23	5	23	The first sentence on Arctic sea ice decrease would deserve an assessment. [SYLVIE JOUSSAUME, France]	statement has been revised
SPM-739	SPM	5	23	5	23	"decreased in all four seasons" would be clearer than "decreased in every season", which might be misinterpreted as a season-by-season decrease over the course of several decades. [Dian Seidel, United States of America]	statement has been revised
SPM-740	SPM	5	23	5	24	ambiguous- trend in every season (over a number of years, which is what I think it is intended to mean) or a trend in every season in every year? [John Mitchell, United Kingdom]	statement has been revised
SPM-741	SPM	5	23	5	27	The topic sentence claims "the average decadal extent of Arctic sea ice has decreased in every season since…..1979" That may very well be true since 1979 to 1998 was warmer, but what about before 1979? Sea ice expanded during the 1945 to 1977 global cooling (while CO2 emissons were sharply increasing). [Don	Reject, reviewer cites no substantive basis to support his claims. See SPM figure 2b, and chapter 4 for detailed longer term assessment.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						Easterbrook, United States of America]	
SPM-742	SPM	5	23	5	27	Why is there no characterisation of the confidence regarding arctic sea ice loss? [Government of Australia]	statement has been revised
SPM-743	SPM	5	23	5	27	Information on the rate of change, similar to that presented previously for mass balance of the Greenland Ice Sheet, would be useful here. [Government of Canada]	rate of change is included
SPM-744	SPM	5	23	5	27	Updated with information from 2012 [Government of NORWAY]	has been updated for 2012
SPM-745	SPM	5	23	5	27	Section 4.2.2 Regarding sea ice, this section coverage narrowly emphasizes limited results primarily from a couple of individual authors, and does cover extensive results that represent the science and advances from the overall sea ice research community. Thus it is not robust. [Government of United States of America]	The underlying chapter 4 assessment has been carefully revised to ensure a comprehensive and robust treatment of the scientific literature. This includes the addition of additional datasets in all analyses, and supplementary material to the chapter which provides further comparison of the underlying datasets.
SPM-746	SPM	5	23	5	27	Whilst this is a draft, not referencing the 2012 Arctic sea-ice minima here makes this section already out-of-date. [Government of United Kingdom of Great Britain & Northern Ireland]	has been updated for 2012
SPM-747	SPM	5	23	5	27	This section of summary highlights only the arctic and antarctic ice melting with a general comment on northern hemispheric snow melt. I feel that it will be more relevant to mention the fate of specific cryospheres e.g. Himalayan as part of summary. [Umesh Kulshrestha, India]	Space is limited in the SPM and we cannot go into this level of regional detail. We focus on the policy relevant message of net changes in the different components of the cryosphere. See Chapter 4 assessment for regional details..
SPM-748	SPM	5	23	5	27	Reference to Arctic Ice Cover [Jeffrey Obbard, Singapore]	don't understand the comment
SPM-749	SPM	5	23	5	35	Confidence levels are missing from these bullets and this contrasts withe the other bullets in this sub-section [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Bullets have all been revised based on final draft of chapter 4.
SPM-750	SPM	5	23	23	27	Could this be updated in view of the 2012 record sea ice minimum extent ? [Government of France]	has been updated for 2012
SPM-751	SPM	5	23			The wording here (“The average decadal extent... has decreased in every season") is potentially confusing. [Government of United States of America]	wording has been revised.
SPM-752	SPM	5	23			"has decreased" is of course true, but it will also have increased. I expect something like "has had a substantial downward trend" is meant [William Ingram, United Kingdom]	Statement clearly refers to an overall trend, given in the second part of the sentence.
SPM-753	SPM	5	24	5	25	Data from 2012 should be included in this estimate. [Thierry Fichefet, Belgium]	has been updated for 2012
SPM-754	SPM	5	24	5	25	This text refers the reader to Fig SPM.1 for an illustration of the statements made here but there is no way to use Fig SPM.1 to that end, as only summer sea ice changes are shown in Fig SPM.1 and no trend is given for summer changes. [Government of Canada]	Bullet has been revised, and highlights that the most rapid decrease has occurred in Summer, providing a direct link to the summer time series shown in SPM figure 2b
SPM-755	SPM	5	24	5	25	The overall decrease in sea ice extent over the period 1979–2011 has been 3.9 [3.7 to 4.1] % per decade with larger changes occurring in summer and autumn (see Figure SPM.1).' Suggest to use uncertainty language is this statement to quantify the uncertainty. [Line van Kesteren, the Netherlands]	statement has ben revised.
SPM-756	SPM	5	25	5	26	"There is robust evidence of a decline in ice thickness …": The authors might want to reconsider whether thickness measurements are sufficient to be declared "robust". [Government of United States of America]	Due to space limitations in the SPM, the sentence on ice thickness has been removed.
SPM-757	SPM	5	26	5	26	What do you mean by "overall"? Be more specific. I guess that this number refers to the central Arctic basin? [Thierry Fichefet, Belgium]	Due to space limitations in the SPM, the sentence on ice thickness has been removed.
SPM-758	SPM	5	26	5	26	should read winter "ice" thickness [Ingeborg Levin, Germany]	Due to space limitations in the SPM, the sentence on ice thickness has been removed.
SPM-759	SPM	5	26	5	27	Provide an uncertinty range for the statement "mean winter thickness has about halved …" Is the uncertainty	Due to space limitations in the SPM, the sentence on

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						too large for such a quantitative estimate? [Government of United States of America]	ice thickness has been removed.
SPM-760	SPM	5	26	5	27	Provide error bar for "mean winter thickness has about halved …" [Government of United States of America]	Due to space limitations in the SPM, the sentence on ice thickness has been removed.
SPM-761	SPM	5	26	5	27	The overall mean winter thickness has about halved between 1980 and 2009. {4.2.2}' Is it not necessary to use uncertainty language is this statement to quantify the uncertainty? [Line van Kesteren, the Netherlands]	Due to space limitations in the SPM, the sentence on ice thickness has been removed.
SPM-762	SPM	5	27	5	27	Pls add: {4.2.4}, because the findings on 'ice-thickness' are more explicitly mentioned in 4.2.4 and derived from fig. 4.7(b) in this subchapter [Government of Germany]	Due to space limitations in the SPM, the sentence on ice thickness has been removed.
SPM-763	SPM	5	28			Add:"The mean annual cycle of arctic sea ice volume over the 1979 -2011 period ranges from 28,700 km3 in April to 12,300 km3 in September. Monthly averaged ice volume for September 2012 was 3,400 km3. This value is 72% lower than the mean over this period, 80% lower than the maximum in 1979. [CELSO COPSTEIN WALDEMAR, BRAZIL]	Due to space limitations in the SPM, statements on sea ice thickness and volume have been removed.
SPM-764	SPM	5	28			Add :(Figure SPM.1). Add a figure: the latest Figure from http://psc.apl.washington.edu/wordpress/wp-content/uploads/schweiger/ice_volume/BPIOMASIceVolumeAnomalyCurrentV2_CY.png, also found as Figure 2 at http://psc.apl.washington.edu/wordpress/research/projects/arctic-sea-ice-volume-anomaly/. The title is "Total Arctic sea ice volume from PIOMAS showing the volume of the mean annual cycle, the current year, 2010 (the year of previous September volume minimum), and 2007 (the year of minimum sea ice extent in September). Shaded areas indicate one and two standard deviations from the mean." [CELSO COPSTEIN WALDEMAR, BRAZIL]	Figures included in the SPM must be based on a carefully underlying assessment in the relevant chapter.
SPM-765	SPM	5	29	5	30	NOAA has confirmed that Antarctic sea ice has increased since 1979 and is now higher than any previous period of record. The IPCC statement seems to attempt to minimize that fact. [Don Easterbrook, United States of America]	Reject, the statement provided is quantitative, and based on the comprehensive underlying assessment given in Chapter 4.
SPM-766	SPM	5	29	5	30	This should be combined with the earlier statemenst about mass of the ice sheet in Antarctic, along with a brief statement about how mass could be lost while extent could increase. [Kristie Ebi, United States of America]	Reviewer seems to be confusing changes in ICE SHEET mass, with changes in SEA ICE extent. The underlying causes to these changes are discussed in the chapter assessment.
SPM-767	SPM	5	29	5	30	This point highlights the difficulty of presenting the SPM along the chapter structure rather than thematically. Without a comment on the extent that processes are understood, and on consistency with global/regional warming this statement could be quite confusing. [Government of Australia]	Reader should not be confused, because hey can simply turn to the section on Detection and Attribution where the underlying causes (and understanding of the relevant processes) are discussed. Alternatively, the cited chapter sections could be turned to for these details.
SPM-768	SPM	5	29	5	30	This statement could look confusing to a non-informed reader, since the statement at line 17-21 inform on ice-losses. Perhaps it is wise to explicitly make a remark that a loss of ice-mass does not necessarily imply a loss of ice extent. [Government of Netherlands]	Reviewer seems to be confusing changes in ICE SHEET mass, with changes in SEA ICE extent. The underlying causes to these changes are discussed in the chapter assessment.
SPM-769	SPM	5	29	5	30	By 'extent', presumably this means surface area coverage only. Do we know anything about the thickness of this ice? My understanding is that the surface area AND volume of sea ice lost in the Arctic is far greater than that gained in the Antarctic. We need to avoid creating the misleading impression that the Antarctic in some way counterbalances what is going on in the Arctic. [Government of United Kingdom of Great Britain & Northern Ireland]	Opening shaded box to the cryosphere section attempts to avoid this impression, by emphasizing a "small increase' for the Antarctica.
SPM-770	SPM	5	29	5	30	True, but it is also important to mention that there are major regional differences in the trend, e.g. a significant decrease in the Bellingshausen Sea. [Robert Larter, United Kingdom]	statement has been revised
SPM-771	SPM	5	29	5	30	Reference to Arctic Ice Cover [Jeffrey Obbard, Singapore]	don't understand the comment
SPM-772	SPM	5	29	5	30	Observations of Antarctic sea ice extent show a small but significant increase by 1.4 [1.2 to 1.6] % per decade between 1979 and 2011. {4.2.3}' Suggest to use uncertainty language is this statement to quantify the uncertainty. [Line van Kesteren, the Netherlands]	statement has been revised

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-773	SPM	5	29	5	31	Data from 2012 should be included in this estimate. [Thierry Fichefet, Belgium]	has been updated for 2012
SPM-774	SPM	5	29	5	32	"significantly" needs to be quantified [Ingeborg Levin, Germany]	statement has been revised
SPM-775	SPM	5	29			Calling the increase in Antarctic sea ice extent "small" seems like a rather subjective evaluation: see review comment below regarding Ch. 4, p. 45, line 50. [Ian Eisenman, United States of America]	The change is small relative to the changes observed in the Arctic. This is clear from the figures shown in Chapter 4.
SPM-776	SPM	5	29			On observations of Antarctic sea ice extent: to parallel the Arctic sea ice paragraph above, is there anything that can be said about whether extent has increased in every season? There are a couple of papers addressing whaling records, and early 1970s satellite records. [Government of United States of America]	This information is provided in the comprehensive Chapter 4 assessment, but is not considered crucial detail to elevate to the level of the SPM, given space limitations in this document.
SPM-777	SPM	5	29			Does "significant" mean "statistically significant"? If so, make this clear (& give at least the confidence level). If not, say e.g. "substantial" to avoid confusion. [William Ingram, United Kingdom]	statement has been revised
SPM-778	SPM	5	32	5	33	The sentence lets believe that satellite observations exist over the past 90 years. It should be rewritten in order to clearly limit the trend over the past 90 years to in-situ observations and mention that both satellite and in-situ observations confirm this trend over the last 4 decades. [Government of France]	statement has been revised
SPM-779	SPM	5	32	5	33	The graph shown in SPM.1 is NH springtime snow cover extent. Isn't Spring is the only season showing marked snow cover reduction. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised, and now emphasizes the loss in spring, and highlighting that there have been no months showing a statistically significant increase.
SPM-780	SPM	5	32	5	33	Misleading claim. Rutgers GSL data shows winter snow cover has not decreased. [Paul Matthews, United Kingdom]	statement has been revised, and now emphasizes the loss in spring, and highlighting that there have been no months showing a statistically significant increase.
SPM-781	SPM	5	32	5	33	The statement "Both satellite and in-situ observations show significant reductions in the Northern Hemisphere snow cover extent over the past 90 years" is formally incorrect, as satellite data do not show reductions over the past 90 years. It could be stated that in-situ data show reductions over the past 90 years, and that the satellite data provide confirmation (and better coverage?) for the past 30 or more years, or the bullet point could be more substantially reworded. [Adrian Simmons, United Kingdom]	statement has been revised
SPM-782	SPM	5	32	5	35	To take account of recent satellite data on Northern-Hemisphere snow cover extent, the draft should make plain that over the period of satellite coverage (before which the data are insufficient and unreliable and the anthropogenic influence was small) there has been no trend in fall or winter Northern-Hemisphere snow cover extent, with the downtrend (chiefly attributable to the period before 1990) confined to spring snow cover extent only. Reason: Data from the Rutgers Snow and Ice Lab show that there was a zero trend in fall snow-cover extent; a statistically-insignificant increase in winter extent; and a decline in spring extent only. Example: In 2010, Northern-Hemisphere winter snow cover extent reached a maximum greater than in any year since the satellite record began. [Christopher Monckton of Brenchley, United Kingdom]	statement has been revised, and now emphasizes the loss in spring, and highlighting that there have been NO months showing a statistically significant increase.
SPM-783	SPM	5	32	5	35	This bullet should say something about SH snow cover, even if little is known. As is, one might think it never snows south of the equator. [Dian Seidel, United States of America]	Chapter assessment concludes that evidence is too limited to make any statement regarding changes in the SH. Not considered useful to elevate this conclusion to the SPM
SPM-784	SPM	5	32	5	35	Like the sea ice statement, plaese add seasonality to this statement: snow cover has not decreased in the growing season (autumn and winter), only in the melting season (spring and summer). [Geert Jan van Oldenborgh, Netherlands]	statement has been revised, and now emphasizes the loss in spring, and highlighting that there have been NO months showing a statistically significant increase.
SPM-785	SPM	5	33			What about snow cover trends in other seasons? [Government of United States of America]	statement has been revised, and now emphasizes the loss in spring, and highlighting that there have been NO months showing a statistically significant increase.
SPM-786	SPM	5	34	5	34	Provide error bar for "around 8%" [Government of United States of America]	statement has been revised

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SPM-787	SPM	5	34	5	35	Snow cover decreased most in spring when the average extent decreased by around 8% over the period 1970–2010 compared with the period 1922–1970. {4.5.2, Figure 4.19, Figure 4.20}' Suggest to use uncertainty language is this statement to quantify the uncertainty. [Line van Kesteren, the Netherlands]	statement has been revised
SPM-788	SPM	5	37	5	37	wording: ..that annual mean surface temperatures over permafrost regions in the NH have increased by up to 3oC during the past .. [Fortunat Joos, Switzerland]	bullet has been revised
SPM-789	SPM	5	37	5	39	Is there a finding on melting of the permafrost as a result? [Kristie Ebi, United States of America]	bullet has been revised to include policy relevant information on permafrost thickness and extent.
SPM-790	SPM	5	37	5	39	This statement is unclear in its implication. What does "up to" mean? It reads like it's saying that there is high confidence in the maximum observed value, but does such a statement quailify to be in the SPM? Is the maximum increase in permafrost a fair metric, since the "high confidence" seems to indicate more understanding about permafrost than actually exists? [Sarvesh Garimella, United States of America]	bullet has been revised.
SPM-791	SPM	5	37	5	39	The magnitude of temperature change given for permafrost temperatures needs to be reviewed. Comments have been submitted for Chapter 4, section 4.6.2 that suggest there may be errors related to these findings. Some of the rates presented in Table 4.7 are not in agreement with those in the literature, which for the most part have been up to only about 2°C over the last 3 decades in the northern hemisphere (where records are long enough to examine trends over this period). The literature quoted in chapter 4 and also the SWIPA report (by AMAP) summarizes change in permafrost temperature as typically between 0.5 and 2°C over the last 3 decades for the northern hemisphere. It is suggested that a similar statement be utilized here. Suggest also that it is important to give the range and explain that the magnitude of change varies spatially. [Government of Canada]	bullet has been revised and no longer includes a magnitude of warming because this was not considered a policy relevant statement. Revised bullet does clearly indicated that rates of warming vary spatially. See underlying chapter assessment for these details.
SPM-792	SPM	5	37	5	39	Can anything be said here about the methane emissions that would result from permafrost thaw and how these would be a positive feedback, exacerbating climate forcing? [Government of United Kingdom of Great Britain & Northern Ireland]	This information is given in the projections section 'Carbon and other biogeochemical cycles'.
SPM-793	SPM	5	37	5	39	It would be good to add a sentence on permafrost thawing and degradation from chapter 4. [SYLVIE JOUSSAUME, France]	bullet has been revised to include policy relevant information on permafrost thickness and extent.
SPM-794	SPM	5	37	5	39	There is a problem with the magnitude of change given for permafrost temperatures. This may be partly due to errors in section 4.6.2 as some of the rates presented in Table 4.7 are not in agreement with those in the literature as for the most part the changes have been up to only about 2°C over the last 3 decades in the northern hemisphere (where records are long enough to examine trends over this period). The literature quoted in chapter 4 and also the SWIPA report summarizes change in permafrost temperature as typically between 0.5 and 2°C over the last 3 decades for the northern hemisphere. It is suggested that similar statement be utilized. It is also important to give the range and add a statement that the magnitude of change varies spatially. See comments on Ch 4 for more details [Sharon Smith, Canada]	bullet has been revised and no longer includes a magnitude of warming because this was not considered a policy relevant statement. Revised bullet does clearly indicated that rates of warming vary spatially. See underlying chapter assessment for these details.
SPM-795	SPM	5	37			"up to 3°C" describes only the maximum. What is the range of possible warming? [Government of United States of America]	bullet has been revised and no longer includes a magnitude of warming because this was not considered a policy relevant statement. Revised bullet does clearly indicated that rates of warming vary spatially. See underlying chapter assessment for these details.
SPM-796	SPM	5	37			Can anything be said about permafrost area, in addition to average temperature? (See pg. 16, line 5, or TS-8 line 34) [Government of United States of America]	bullet has been revised to include policy relevant information on permafrost thickness and extent.
SPM-797	SPM	5	40	5	40	It could be useful to add a bullet-point regarded to 'River and Lake ice', because readers might be quite familiar with this issue due to their own experience [4.5.5] [Government of Germany]	Not considered a broad enough issue to be elevated to the level of the SPM, given space limitations in this document. See underlying chapter assessment for details on this topic.
SPM-798	SPM	5	42	5	42	What can be said about regional variation? [Government of United Kingdom of Great Britain & Northern Ireland]	Space is limited in the SPM and we therefore focus here on the global mean sea level, and leave the

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							discussion of regional variability to the underlying, comprehensive chapter assessment.
SPM-799	SPM	5	42	5	42	Reader would expect SLR section to be following or integrated with Ocean Observations? [Albert Klein Tank, Netherlands]	The approach taken here is to first report the observed changes in the components that contribute to sea level rise, e.g., ocean heat, cryosphere components, before reporting the observed change in Sea level.
SPM-800	SPM	5	42	5	52	I suggest that the total change in SL is given, not only the rates of change. [Jan Fuglestvedt, Norway]	revised section now provides the total change over the time period 1901 - 2010, in addition to rates of change during this period.
SPM-801	SPM	5	42	5	52	The section related to sea Level Observation could be considered as part of Ocean Observations, and then shifted. [Government of Benin]	The approach taken here is to first report the observed changes in the components that contribute to sea level rise, e.g., ocean heat, cryosphere components, before reporting the observed change in Sea level.
SPM-802	SPM	5	42	5	52	This section could be made clearer with respect to the causes of the seal level rise. In the executive summary of Chapter 13, page 3, line 4-6 it is stated; "The primary contributors to global averaged sea level change are the expansion/contraction of the ocean as it warms/cools and the transfer of water to/from the ocean/land, particularly from glaciers and ice sheets.". Please consider including this information. [Government of NORWAY]	This important information is contained in the section 'detection and attribution of climate change'. It is located in this section, because it draws on more information than strictly observations.
SPM-803	SPM	5	42	5	52	There is some concern with the hand-off and redundancy between chapter 3 and chapter 13 on sea - level change. For instance, the sea-level observations section on SPM-5 probably should have a reference to chapter 13 for context. There also probably should be be short write-up on sea-level in the "Near-Term Projections: on SPM-12. [Government of United States of America]	Noted - this section makes reference to chapters 3, 5, and 13. The revised SPM figure 8 includes a time series of projected sea level rise throughout the 21st century.
SPM-804	SPM	5	42	5	52	Need to add a bullet or two, explaining the relative contribution to SLR of thermal expansion, melt water, etc. [Government of United Kingdom of Great Britain & Northern Ireland]	This important information is contained in the section 'detection and attribution of climate change'. It is located in this section, because it draws on more information than strictly observations.
SPM-805	SPM	5	44	5	44	add after uneqivocal "and virtually certain", to follow the recommandations for expressing confidence in chapter 1 [Government of Germany]	Statement has been revised. Note that assessed findings can be written as a statement of fact, in which case the likelihood qualifier is not required.
SPM-806	SPM	5	44	5	44	"unequivocal" is undefined by and not included in the IPCC document for Consistent Treatment of Uncertainties. [Government of United States of America]	Statement has been revised. Note that assessed findings can be written as a statement of fact, in which case the likelihood qualifier is not required.
SPM-807	SPM	5	44	5	45	It is not clear why "Unequivocal" has been used to describe sea level rise but not for example that the upper ocean has warmed - both examples are based on direct measurements. [Government of Australia]	Statement has been revised. Note that assessed findings can be written as a statement of fact, in which case the likelihood qualifier is not required.
SPM-808	SPM	5	44	5	45	Sea Level Observations. 'It is unequivocal that global mean sea level is rising as is evident from tide gauge records and satellite data (see Figure SPM.1)'. Question: Would it be useful to mention here that such evidence has been strengthened mostly by tide gauge records or satellite data? [Government of Morocco]	Statement has been revised.
SPM-809	SPM	5	44	5	45	To provide historical perspective, delete the sentence "It is unequivocal that global mean sea level is rising as is evident from tide gauge records and satellite data", and substitute "Global mean sea level has been rising since at least 1850, but rates of increase since 1993 may be no greater than those observed from 1930-1950." Reason: The current draft of the highlighted paragraph on sea level does not provide a proper historical perspective. In the Summary for Policymakers, highlighted paragraphs in particular must be presented in a balanced manner. It is very far from clear that there has been any significant acceleration in the rate of sea-level rise as a result of recent anthropogenic warming.	reject, revised bullets are correct and consistent with the underlying chapter assessment. Second bullet addresses rates between 1920 and 1950.

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						Example: In 2011-12, sea level actually fell. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-810	SPM	5	44	5	52	Tide gauge measurements with modern measurement equioment with GPS levelling show no evidence of sea level change over the past ten years in places like Australia, New Zealand or the Pacific islands. Judgements based on older less reliable measurements affected by hurricanes and tsunamis and by changes in both the land and in th local harbours give spurious indications of change. Satellite measurements have levelled out and are influenced by ocean oscillations. [Vincent Gray, New Zealand]	reviewer cites no substantive evidence to support his claims.
SPM-811	SPM	5	44			over what period? [Gabriele Hegerl, United Kingdom]	statement has been revised
SPM-812	SPM	5	46	5	46	Please add the information on the total SLR since pre-industrial levels. [Government of Germany]	revised bullet provides total sea level rise since 1900, consistent with time series shown in SPM figure 2d.
SPM-813	SPM	5	47	5	47	If a range is kept, the text should state '1.4 and 2.0 mm' [Government of Australia]	copy edit
SPM-814	SPM	5	47	5	47	Replace 'mean rate of increase' by 'mean rate of increase of the GMST (global mean sea level)' [Government of Netherlands]	statement has been revised
SPM-815	SPM	5	47	5	48	The reference year 1993 seems arbitary here. It would help to indicate why this particular year was chosen in this context. [Andrew Ferrone, Germany]	Revise opening shaded box now highlights that 1993 is the start of the satellite data used for sea level measurements. This information is also given in caption for SPM figure 2d.
SPM-816	SPM	5	47	5	48	Do the mentioned lower and upper estimates (1.4 to 2.0 mm yr^-1 for 20th century; Note: the - sign is missing in the text; and 2.7 and 3.7 mm yr^-1 for the period since 1993) also refer to the 90% uncertainty interval endpoints, as mentioned in footnote5 on page SPM-3? [Government of Netherlands]	consistency in reporting trends has been checked, and the footnote remains valid unless otherwise stated.
SPM-817	SPM	5	47	5	48	Suggest change to "... between 1.4 and 2.0 mm yr-1" [Government of New Zealand]	copy edit
SPM-818	SPM	5	47	5	48	It would be helpful to give more precise time periods here especially to qualify 'since 1993' As stated it is unclear whether this is period runs to present, 2010, 2012, or whenever, or even to the end of the 20th century? [Government of United Kingdom of Great Britain & Northern Ireland]	Statements have been revised and time periods are now precise
SPM-819	SPM	5	47	5	49	Please present the total sea level rise over the 20th century in this section. I have always wondered why mm/year was the only rate presented in reports, as it is a particularly unhelpful metric for risk assessment and usefulness to policy makers. Where appropriate, it would be incredibly helpful to present average rates as cm/decade. Also, clarification of why the 1930-1950 rates were similarly high would be helpful. [William Anderegg, United States of America]	revised section now provides the total change over the time period 1901 - 2010, in addition to rates of change during this period.
SPM-820	SPM	5	47	5	49	The IPCC graph shows a very constant sea level rise of 160mm from 1900 to 2000, an average of 1.6 mm/year. During some short periods the rate of rise varied from -3 mm/yr to +3 mm/year but overall was remarkably constant for the century. Thus, the expected sea level rise from 2000 to 2100 is about the same, i.e., 160 mm (about 6 inches), a far cry from claims of rapidly increasing rise of sea level to the 5-20 feet by 2100 claimed by CO2 advocates. There is no evidence whatsoever that this sea level rise rate will change significantly in the coming century (models are NOT evidence and not substitute for real data!). [Don Easterbrook, United States of America]	reviewer cites no substantive evidence to support his claims.
SPM-821	SPM	5	47	5	49	Rates of change need to be standard for all variables across the SPM where the time period permits, variously total linear trend, trend per decade and trend per year are used. It would be more useful to have a single figure given for sea level rise rather than a range. [Government of Australia]	The reporting of trends is consistent to the extent possible, but is determined in some instances by the underlying chapter assessments, and literature assessed therein.
SPM-822	SPM	5	47	5	49	Statement "It is likely that rates of increase were similar to the latter between 1930 and 1950." should be referenced to {3.7.6} and context/an explanation given for changes in the rate of increase. [Government of Australia]	Here in the observations section the approach is generally to restrict the statements strictly to the reporting of observed changes, without getting into the details associated with explaining these changes. This information in generally found in the section 'detection and attribution of climate change' or in the underlying chapter assessment.

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SPM-823	SPM	5	47	5	49	Improve clarity by adding words:… of global mean sea level after ...the mean rate of increase [Government of Finland]	statement has been revised.
SPM-824	SPM	5	47	5	49	The numbers of SLR as given under this bullet-point are not fully consistent with those mentioned in the Executive Summary of chapter 13; p. 13-5; line 26-28 and those mentioned in chapter 13.2.2 (p. 13-13, line 38; p.13-14, line 20) [Government of Germany]	statements have been revised and are consistent with the final draft of the underlying chapters.
SPM-825	SPM	5	47	5	49	The statement about period between 1930 and 1950 must be motivated in the text to make this Summary for policymakers self explanatory. The sentence is unclear, explain what 'latter' refers to; is it to the 'latter range'? The first sentence is misleading. It names two mean rates of increase which come from different measuring methodologies. The first range comes from tide gauge data. Considering analysis of the stations by Holgate (2007), and update them up to 2011 (see PMSL website for data), all series show very linear behavior. If any, some decelerations are seen. The second range comes from satellite data. These cover the range 1993-2011. All presentations on the Internet are linear. None of the specialized agencies present a trend with acceleration. By putting these two ranges in one sentence, acceleration is suggested to the reader. Note: the series of Church and White (2011) is a mixture of tide gauge data and satellite information (it is in fact model output) . If a quadratic curve is fitted through their data from the inflexion point 1930 to 2009, the acceleration parameter is statistically non-significant. Thus none of the three types of global sea level approximations show accelerations (i.e. a positive second derivative in math terms), from 1930 onwards. In conclusion: data from different origins should not mixed in one sentence. To continue with the second sentence: it is unclear how the series from two or three origins are mixed in this sentence. We suggest to explicitly name the three different sources and their mean rates/ yes or no acceleration. [Government of Netherlands]	statement has been revised and now includes an important sentence regarding the consistency of tide-gauge and altimetry data regarding the higher rate of change since 1993.
SPM-826	SPM	5	47	5	49	Please add what the total sea level rise (not just the rate) has been since 1993 and preferably also since pre-industrial times. This is important e.g. in order to set the information on page 7 line13-18 in perspective [Government of NORWAY]	revised section now provides the total change over the time period 1901 - 2010, in addition to rates of change during this period.
SPM-827	SPM	5	47	5	49	The numbers and uncertainty language here are not consistent with Ch. 13. (But they ARE consistent with Ch. 3, so those two chapters need to be reconciled). [Government of United States of America]	statements have been revised and are consistent with the final draft of the underlying chapters.
SPM-828	SPM	5	47	5	49	Might be better phrasing to say the rate has been variable with some periods of accelerated rise, between 1930 -1950 and then again more recently [Government of United Kingdom of Great Britain & Northern Ireland]	Wording is consistent with underlying chapter assessment
SPM-829	SPM	5	47	5	49	An explanation should be provided, both here and in chapter, as to why the rise in sea level appears to have accelerated in 1993. If you don't account for it readers will question why no explanation appears and draw their own conclusions. [John McLean, Australia]	Here in the observations section the approach is generally to restrict the statements strictly to the reporting of observed changes, without getting into the details associated with explaining these changes. This information in generally found in the section 'detection and attribution of climate change' or in the underlying chapter assessment.
SPM-830	SPM	5	47	5	49	To remove a false claim of near-certainty, delete the sentence "It is virtually certain that over the 20th century the mean rate of increase was between 1.4 to 2.0 mm yr–1, and between 2.7 and 3.7 mm yr–1 since 1993." Replace it with the following: "Tide-gauges suggest that over the 2oth century sea level rose 1.4-2.0 mm yr–1. The apparent increase to 2.7-3.7 mm yr–1 from 1993 may in part be an artefact of the change to satellite altimetry in that year." Reason: Sea level is sufficiently complex that claims of "virtual certainty" for rates of sea-level rise are unacceptable. Examples: Issues such as tectonic subduction, variations in the length of the day, and isostatic recovery following the end of the Younger Dryas cooling event are among those that complicate sea-level measurement. [Christopher Monckton of Brenchley, United Kingdom]	reject, revised statement clearly highlights the consistency of tide-gauge and altimetry data regarding the higher rate of change since 1993.
SPM-831	SPM	5	47			virtually certain is very strong for a sea level increase documented over the entire 20th century (not that it increased but you give a range that iosnt all that wide). I find that surprising. [Gabriele Hegerl, United Kingdom]	statement has been revised, and virtually certain now clearly associated with the acceleration in the rate of GMSL rise over the last two centuries.
SPM-832	SPM	5	48	5	48	Explanation for the acceleration of sea level rise since 1993 was uncertain in AR4. It would be good here to	Here in the observations section the approach is

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						add the result from chapter 3 (Chap 3, page 29, lines 15-16 and page 32, lines 14-15) that it is likely due to multidecadal oscillation. Same comment for the executive summary for Chap 3. [SYLVIE JOUSSAUME, France]	generally to restrict the statements strictly to the reporting of observed changes, without getting into the details associated with explaining these changes. This information in generally found in the section 'detection and attribution of climate change' or in the underlying chapter assessment.
SPM-833	SPM	5	48	5	48	to correct: yr to: yr-1 [Nedal Katbeh-Bader, Palestine]	copy edit
SPM-834	SPM	5	48	5	49	There is no context for the reader to understand why the period 1930-1950 is referred to. What happened between 1950-1993 then? If trends farther back in time are to be referred to, then an overall 'story' story should be told, not just selected time periods. [Government of Canada]	Statement is intended to emphasize that the most recent rates of GMSL rise are not unprecedented over the last century, but the important policy relevant message as highlighted in the revised shaded opening paragraph is that the overall current centennial rate of rise is unusually high when viewed in the context of the last two millennia.
SPM-835	SPM	5	48	5	49	The sentence "It is likely …." is very unclear, better repeat here the number of increase. [Ingeborg Levin, Germany]	statement has been revised
SPM-836	SPM	5	48	5	49	There are two possibilities to explain the recent, relatively high rate of SLR measured by satellites. It could be (A) a response to global warming or (B) a result of natural internal variability of sea level. Let us look soberly at the evidence with respect to both: (A) Global warming. 1. According to the best tide gauge data compilation we have (that of Church and White), the rate of SLR during the past twenty years is unprecedented since records began. This is supported further by Ray and Douglas (2011). 2. There is good physical reasons to expect that global warming will increase the rate of sea-level rise. Warmer global surface temperatures mean that continental ice melts faster and that heat penetrates at a faster rate into the ocean. 3. Quantitatively, the present rate of SLR of ~3 mm/year is predicted by process models, as chapter 13 finds: "The sum of model-based contributions shows an increase in rate from 1990, as also observed ..." Note this is predicted by models that run free and thus do not predict the phase of any internal oscillation like AMO or PDO; in the models the high rate is due to climate forcing, not internal variability. Note that in the models, as in the data, the most recent rates are unprecedented in a hundred years (Fig. 13.4). 4. The high rate of SLR during the altimeter era also exactly fits in the observed correlation between sea-level and global temperature that has held well since 1870, the data period covered by the Church & White data. The correlation is well-documented in the peer-reviewed literature (Rahmstorf 2007a, Vermeer & Rahmstorf 2009) and highly statistically significant (P = 0.002, Rahmstorf 2007b). It is, frankly, very surprising that an IPCC assessment of observed sea-level rise in the context of global warming does not even discuss the observed correlation between the observed rate of rise and observed global warming, despite the relevant Science paper (Rahmstorf 2007a) being the most-cited paper on sea level since the AR4, with over 300 citations. If IPCC has reasons to dismiss the observed correlation, then those should be discussed, but simply ignoring prominent published evidence is highly inappropriate. (B) Natural variability. 1. Different tide gauge data show inconsistent decadal variability in the rates of SLR. This is not surprising, given the uncertainties in estimating global sea-level rise from sparse tide gauge data and the fact that the time derivative of any “noisy” time series will be much more noisy still. 2. The current evidence strongly suggests that most of the internal variability in many tide gauge data sets reflects a spatial undersampling problem – i.e. it describes variability at the locations of the tide gauges, but not in the true global mean sea level – see detailed discussion in Rahmstorf et al. 2012 and references cited	opening shaded box to this section now includes a clear statement that the current rate of GMSL rise is unusually high in the context of the past two millennia, drawing upon the assessment given in chapter 3, 5, and 13. Further detail and explanations of the causes to this acceleration are provided in the underlying chapter assessments.

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						therein. Mechanisms like wind forcing can strongly alter sea-levels at coastlines without being able to change global-mean sea level. The methodologically by far best, and least noisy, attempt at reconstructing global mean sea level from limited tide gauge data is that of Church and White, which does *not* show rates similar to the altimeter rate during 1930-1950 despite the contrary claim in the draft IPCC paragraph. The uncertainty ranges shown in Fig. 3.14 of the altimeter and of the C&W data during 1930-1950 do not overlap. 3. The nature and causes of any sea-level variability unrelated to global temperature changes are not well understood. The paragraph here only provides hand-waiving arguments mentioning the AMO and PDO, but provides no statistical evidence for a significant correlation between GMSL and either of these modes. The AMO has its largest positive peak between 1950-1960 when rates of SLR in Fig. 3.14 are especially low, so the AMO does not fit the sea-level signal. Even if an effect of AMO and PDO on sea level reconstructions exists, it is most likely because these regional (!) modes affect regional sea level, which projects on the global mean of tide gauge reconstructions as an artifact of poor sampling. Note that the AMO shows little if any projection on global mean temperature (Knight et al. 2006, Delworth et al. 2000, Mann and Emanuel 2005) so it is unclear how it would affect global sea level. Likewise, the PDO index by its definition has global mean SST subtracted so is not a global variability pattern. 4. In particular, since we have neither a statistical correlation nor a physical mechanism for what might drive multidecadal GMSL variability, it is not understood what phase it might be in and whether natural variability would have worked to enhance or reduce the rate of sea-level rise since 1993. It is thus pure speculation whether natural variability might have added to the recent high rates, or in fact prevented even higher rates that we would have observed without internal variability. No scientific basis whatsoever is presented for the view that natural variability has enhanced the recent rates. In summary: the claim that the global rate of sea-level rise was likely similarly high in 1930-1950 as it is today is ill-founded (the best sea-level data show the contrary), and the claim that recent high rates are (partly) due to natural decadal variability are completely unfounded. One cannot help but wonder whether double standards are at play here – if there were no statistical correlation of global warming and sea level rise, no physical understanding of a mechanism for how global warming might affect GMSL, and no knowledge whether it might currently enhance or reduce SLR, would the IPCC authors have concluded that the “recent high rates of SLR are likely due to global warming”? I doubt it. So how could this be concluded for decadal variability? Based on a sober look at the evidence, in contrast we must come to the following conclusions, which I recommend as chapter 3 SPM conclusions: 1. Recent high rates of sea-level rise since 1993 are likely unprecedented since at least the 19th Century. (That at least is the case in Ray and Douglas 2011 and Church and White 2011 according to Fig. 3.14; I have not had a chance to look at Jevrejeva 2012 but assume it is based on the questionable “virtual station method” of their earlier papers, which produces lots of spurious variability. These unprecedented high rates since 1993 are also supported by both process-based and semi-empirical models.) 2. Consideration of the physical mechanisms, the fact that they are correctly modelled as well as the strong and highly statistically significant observed correlation of global temperature with global sea-level rise since 1880 makes it very likely that recent high rates of sea-level rise since 1993 are largely a result of global warming. In addition, from the evidence in chapter 13 we can draw the conclusion that the 20th Century SLR is likely unprecedented since at least 2,000 years (Fig. 13.3a and further evidence, some of it already in the AR4). References Rahmstorf, S., 2007a. A semi-empirical approach to projecting future sea-level rise. Science. 315, 368-370. Rahmstorf, S., 2007b. Response to comments on "A semi-empirical approach to projecting future sea-level rise". Science. 317. Rahmstorf, S., et al., 2012. Testing the Robustness of Semi-Empirical Sea Level Projections. Climate Dynamics. 39, 861-875.	

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						Vermeer, M., Rahmstorf, S., 2009. Global Sea Level Linked to Global Temperature. Proceedings of the National Academy of Science of the USA. 106, 21527-21532. [Stefan Rahmstorf, Germany]	
SPM-837	SPM	5	48			Correct the sign in y^1 to y^-1. [David L. Hagen, United States of America]	copy edit
SPM-838	SPM	5	48			Where it says ' yr 1 ', it must say ' yr-1 '. [JAVIER MARTIN-VIDE, SPAIN]	copy edit
SPM-839	SPM	5	49	5	49	Is there a finding on rates of increase since 1950? That finding is highly policy relevant. [Kristie Ebi, United States of America]	Statement is intended to emphasize that the most recent rates of GMSL rise are not unprecedented over the last century, with reference to the period 1920 - 1950. Not clear why a rate for the period since 1950 would be particularly policy relevant. In any case, the full time series since 1900 can be seen in SPM figure 2d.
SPM-840	SPM	5	49	5	49	Additonal information should be added to 'explain' (or rather, 'comment on') this similarity of the rates of increase between 1930 and 1950 and the period since 1993. [Government of Netherlands]	Statement is intended to emphasize that the most recent rates of GMSL rise are not unprecedented over the last century, but the important policy relevant message as highlighted in the revised shaded opening paragraph is that the overall current centennial rate of rise is unusually high when viewed in the context of the last two millennia.
SPM-841	SPM	5	51	5	51	How is extreme sea level defined? [Kristie Ebi, United States of America]	bullet has been removed. See SPM table 1. See WGI AR5 glossary for this definition.
SPM-842	SPM	5	51	5	51	Explain "extreme sea level". This will mean different things to different readers (e.g., extremely high or extremely low, etc.). [Government of Canada]	bullet has been removed. See SPM table 1. See WGI AR5 glossary for this definition.
SPM-843	SPM	5	51	5	52	It is said that extreme sea levels have increased since 1970 because of rising mean sea levels. But extreme sea levels problems occur on scales of meters while rising mean sea levels have risen by cms over the period. So the sentence is strongly disputable. The increased storm frequency may be the cause of rise of extreme sea levels. And the increased storm frequency results from global warming. [Government of France]	bullet has been removed. See SPM table 1. No attribution of the causes of the increase in extreme sea level are provided in the SPM.
SPM-844	SPM	5	51	5	52	This statement, as formulated, is doubtful. The formulation should, as a minimum, be closer to that of Chapter 3 page 32, 3.7.5. which ignores storminess etc. or that of chapter 13. Note that it is difficult to reconcile the statement as it is, with increasing intensity of tropical and extra tropical cyclones in the Atlantic leading to higher surges. Sea level is addressed in many parts of the report, and this challenges consistency. [Government of France]	bullet has been removed. See SPM table 1. No attribution of the causes of the increase in extreme sea level are provided in the SPM.
SPM-845	SPM	5	51	5	52	The likely judgement does not appear in 3.7.5 but rather in 3.7.6 separate from justification for this judgement. Furthermore, the definition in 3.7.5 of extreme sea level as "evidence of changes in extreme sea level independent of changes in storminess but related to changes in mean sea level" seem almost a circular (how could extreme sea level not be related to global sea level if the primary cause -- storm surge -- is removed?). Given the seemingly weak basis and unclear definition, I suggest that this be either omitted from the SPM or better buttressed in Chapter 3 and defined (what is extreme sea level) in the SPM. [HAROON KHESHGI, United States of America]	bullet has been removed. See SPM table 1. No attribution of the causes of the increase in extreme sea level are provided in the SPM. See section 3.7.5 for revised assessment, and WGI AR5 glossary for definition of extreme sea level used in this report.
SPM-846	SPM	5	51	5	52	This sentence has no understandable causality [Ingeborg Levin, Germany]	bullet has been removed. See SPM table 1.
SPM-847	SPM	5	51	5	52	To make a qualitative point quantitative, after “It is likely that extreme sea levels have increased since 1970, and this is mainly caused by rising mean sea level”, add the following sentence: “Sea level has risen by 0.1 m since 1970.” Reason: Storm surges are unlikely to be very much more serious as a result of a mean sea-level rise of only 0.1 m. This rate of increase, within natural variability, is too little to cause significant additional damage. One might with advantage omit all reference to this very limited influence on extreme storm surges. [Christopher Monckton of Brenchley, United Kingdom]	bullet has been removed. See SPM table 1. No attribution of the causes of the increase in extreme sea level are provided in the SPM.

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SPM-848	SPM	5	51			This second bullet might be too general and lead to misguided regional policy. It might be better to paraphrase 3.7.5 lines 38-42 about the increase in extremes being related to mean sea level change but regional extremes being also related to climate variations like ENSO... [Government of United States of America]	bullet has been removed. See SPM table 1. No attribution of the causes of the increase in extreme sea level are provided in the SPM.
SPM-849	SPM	5	51			Suggest that the term "extreme sea levels" be defined in the SPM [Government of United States of America]	see WGI AR5 glossary for this definition.
SPM-850	SPM	5	53	5	53	I think it would be important to add a bullet on the climate contributions to sea level rise. This was an issue in AR4 and a table was given (AR4, SPM table 1) and it seems strange that nothing is said in AR5 more especcially as an advance has been made on this as mentioned in chapter 13 (page 3, lines 34-44). [SYLVIE JOUSSAUME, France]	This important information is contained in the section 'detection and attribution of climate change'. It is located in this section, because it draws on more information than strictly observations.
SPM-851	SPM	5				Table SPM 1: the structure is fully supported. In particular the information on revised assessments since AR4, SREX and the explanations therof. [Klaus Radunsky, Austria]	noted
SPM-852	SPM	6	1	6	36	Observation of Carbon and other biochemical quantities could be transferred in part 3-4 [Government of France]	statements in this section contain observations, and therefore are appropriately located
SPM-853	SPM	6	1	6	36	I can accept that 'biogeochemical' can be used to cover atmospheric chemistry and composition, but there is nothing here on this. I think that this is only carbon cycle and thus too limited. The later section 3 Drivers of Climate Change does not cover this either. Changes in abundance of CH4 and N2O from enhanced anthropogenic emissions should be noted here - in parallel with the CO2. [Michael Prather, United States of America]	section has been revised, and now includes information on CH4 and N2O.
SPM-854	SPM	6	3	6	3	Early to mid Holocene: precise dates, as these are probably not known outside the community of paleoclimatologists [Masa KAGEYAMA, France]	comment seems to relate to page 7, line 3. In any case, the wording has been removed.
SPM-855	SPM	6	3	6	5	The stated 40% and 10% increase in CO2 are meaningless--40% of nothing is still nothing! A much more meaningful numer is the actual increase of the amount of atmospheric CO2. The real increase in CO2 is a mere 0.009% since 1945, not enough to cause any significant global warming! [Don Easterbrook, United States of America]	reviewer provides no substantive basis for his claims.
SPM-856	SPM	6	3	6	5	This summary sounds as if greenhouse gases, when emitted, go straight into the ocean and land -- which is, of course, not true. It is important for policymakers to understand the lag between emissions and sequestration, as well as whether the rate is constant across all atmospheric and oceanic concentrations. [Kristie Ebi, United States of America]	opening statement has been significantly expanded and revised.
SPM-857	SPM	6	3	6	5	A certainty estimate on observed increases in CO2 would be consistent with the rest of the section. [Government of Australia]	Sentence is written as a statement of fact, so does not require the use of an uncertainty term. See introduction to the SPM where this approach is outlined.
SPM-858	SPM	6	3	6	5	The two sentences in the summary need to be re-written and re-ordered to remove the impression that the anthropogenic carbon has gone straight into the land and ocean without passing through the atmosphere. [Government of Australia]	opening statement has been significantly expanded and revised.
SPM-859	SPM	6	3	6	5	Need a likelihood term for this statement. [Government of Australia]	Sentence is written as a statement of fact, so does not require the use of an uncertainty term. See introduction to the SPM where this approach is outlined.
SPM-860	SPM	6	3	6	5	Observation of Carbon and Other Biogeochemical Quantities. 'More than half of the total carbon emitted by human activities has been taken up by the ocean and the land since 1750. The remainder has caused an increase in the atmospheric CO2 concentration by over 40% since 1750, and by about 10% since 1990. {6.3, Table 6.1, Figure 6.8}'. Comment: In this section summary, it may be useful to add that 'oceanic uptake of anthropogenic CO2 has resulted in gradual acidification of seawater evidenced by a decreasing pH in surface waters'. [Government of Morocco]	this information is contained in the final bullet of this section.
SPM-861	SPM	6	3	6	5	ocean acidification is a significant negative impact. The relative negative and positive impacts of absorption of	this information is maintained in the final bullet of this

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						carbon in the ocean and the land needs to be be more clearly articulated in this section and throughout the summary document. [Government of New Zealand]	section, and has not been elevated to the opening paragraph.
SPM-862	SPM	6	3	6	5	We suggest including information about the magnitude of pH reduction caused by anthropogenic CO2 in the text, to highlight this important effect of CO2 emissions [Government of NORWAY]	this information is maintained in the final bullet of this section, and has not been elevated to the opening paragraph.
SPM-863	SPM	6	3	6	5	The relative rise in CO2 concentration is stated for different time periods making comparison between the two difficult. Also the end point of the two time periods used is not clearly defined. So, is there a better way of wording the last of the two sentences in the box? Could be confused as meaning that 10% of the 40% (and so 4%) has happened since 1750 when presumably we're talking about a quarter of the increase (so 10%) since 1750 happening since 1990. [Government of United Kingdom of Great Britain & Northern Ireland]	Taken into account. Paragraph, and in fact the entire Section on Carbon and other biogeochemical quantities, has been substantially revised to provide the reader with a clearer, more consistent summary of these observed changes.
SPM-864	SPM	6	3	6	5	These statements are correct but do they merit a headline? Are they relevant for policymakers as they stand? [Susan Solomon, United States of America]	opening statement has been significantly expanded and revised.
SPM-865	SPM	6	3	6	5	This needs an associated confidence statement. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	Sentence is written as a statement of fact, so does not require the use of an uncertainty term. See introduction to the SPM where this approach is outlined.
SPM-866	SPM	6	3	6	12	change paras for logical reasons, start with para in current text at lines 7-12 [Government of Germany]	opening statement has been significantly expanded and revised.
SPM-867	SPM	6	3	6	12	There is a complete mismatch between measurements of atmospheric carbon dioxide, which take place almost exclusively over the ocean, and emissioms, which take place almost exclusively over land surfaces, This means that there is no scientifically observed relationship btween them. The figures in this section ar therefore subject to unknown inaccuracy [Vincent Gray, New Zealand]	reviewer provides no substantive basis for his claims. Statements in this section are based on the comprehensive assessment provided by chapters 2,3,5, and 6.
SPM-868	SPM	6	3	6	33	There is a semantic issue here that could unnecessarily create or permit confusion. Have more than half (lines 3-5) of _anthropogenic_ emissions of CO2 (selectively) been taken up by ocean and land? Or is it simply that an amount of atmospheric CO2 (origin unspecified) equal to more than half of anthropogenic emissions has been taken up? Presumably it is the latter, but that is not literally what the text states. Similar concerns attach to lines 9-12, line 25, and line 30. [Government of United States of America]	statements in this section have been substantially revised.
SPM-869	SPM	6	3		36	Very interesting - it is hard to see in places if you talk about the entire carbon cycle or CHANGES in it. I think you do the latter would benefit from clarifying… [Gabriele Hegerl, United Kingdom]	statements in this section have been substantially revised.
SPM-870	SPM	6	3			"more than half" could be anyhting from half to all. About X% might be better, since we know that number very well. [Reto Knutti, Switzerland]	statement has been revised, and wording 'more than half' removed.
SPM-871	SPM	6	3			Begin with a statement on the observed increase in CO2 [Henning Rodhe, Sweden]	statement has been revised.
SPM-872	SPM	6	4	6	4	Over 40% is ambiguous. It seems rather about 40 % (390 ppm in 2011 and 278 ppm pre-industrial) or even can be approximated to 40 % ? [SYLVIE JOUSSAUME, France]	wording has been revised.
SPM-873	SPM	6	4			and throughout. "concentration". Strictly concentration is amount per volume. The pertinent quantity is mixing ratio because, as pressure changes, mixing ratio is conserved, whereas concentration changes as gas expands or contracts with pressure. We all know this; so it is a question of whether to loosely use the term "concentration" or be more precise and use "mixing ratio". I can see an argument for staying with "concentration" as that is what the public thinks of. But if you choose to do this, I suggest a footnote at first use, and perhaps a glossary entry explaining that the term concentration is used in this Assessment Report to denote the amount of a trace gas (or other substance) per amount of air (not volume). Then you have dealt with the issue. [Stephen E Schwartz, United States of America]	concentration' is a term which the policymakers are familiar with, and thus is maintained in this summary for policymakers; No new Glossary entry for "Concentration"
SPM-874	SPM	6	5	6	5	"and by about 10% since 1990". I don't think this helps the policy maker; suggest deletion. 10% of what? Is the author trying to say the rate of increase has changed? If so, say so. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised

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SPM-875	SPM	6	7	6	7	The line suggest that cement production is estimated on the basis of energy statistics? Should this not be cement production statistics? It is not clear whether these data include CO2 process emissions from cement, steel and other sectors. [European Union]	statement has been revised - note also the ordering of bullets has been modified in t his section.
SPM-876	SPM	6	7	6	8	This sentence is awkward and hard to decode. I suggest the following rephrasing: "CO2 emissions from fossil fuel combustion and cement production, as estimated from energy statistics… " Also, while the footnote defining the unit is helpful, it might be more so if the unit could be put into some sort of context for policy makers. [Government of United States of America]	statement has been revised - note also the ordering of bullets has been modified in t his section.
SPM-877	SPM	6	7	6	9	Include the total CO2 emissions from fossil fuel and land use [Luisa Cristini, United States]	statements have been revised and bullet specifies total anthropogenic CO2 emissions.
SPM-878	SPM	6	7	6	9	Do the categories 'fossil fuel combustion, cement production, deforestation and other land use change' cover all anthropogenic CO2 emission sources? Or is a small reformulation required . Replace 'have released' (at lines 7-8) by 'have cumulatively released' [Government of Netherlands]	statements have been revised and bullet specifies total anthropogenic CO2 emissions.
SPM-879	SPM	6	7	6	12	Too many numbers in the sentences - can info be presented in a table instead? [Government of Australia]	statements have been revised and reordered for clarity.
SPM-880	SPM	6	7	6	12	Consider to tabulate this information together with information on page 11 line 31-33 about CO2 emissions and temperature increase, including the separation about sources and sinks in the atmosphere, terrestrial and the ocean. Can be linked e.g. to figure SPM 2, or separate table. We also propose that the word "only" is deleted from line 9. [Government of NORWAY]	we consider this important information to be presented in bulleted statements. However, statements have been revised and reordered for clarity.
SPM-881	SPM	6	7	6	12	This section overlaps significantly with SPM-7 lines 39-41 [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Both sections have been substantially revised.
SPM-882	SPM	6	7	6	36	Rates of change need to be standard for all variables across the SPM where the time period of observations permits, variously total linear trend, trend per decade and trend per year are used. Here total changed from the start of the industrial period is provided with uncertainty intervals. For total budgets, expression of percentage change would be useful. [Government of Australia]	Time periods for trends have been homogenized to the extent possible, but must remain consistent to the underlying chapter assessment, and literature assessed therein.
SPM-883	SPM	6	8	6	8	(and footnote) The footnote explanation of equivalence is confusing. Better to just explain that 1Pg = 1Gt and they both = 10^15 g. Or elaborate a bit further to explain both ‘Giga’ and ‘tonne’. [Government of Australia]	Noted. We prefer to keep the comprehensive footnote as we think all the information is useful for the conversion.
SPM-884	SPM	6	8	6	8	Please consider to use GtC instead of PgC as this is a more common term for policymakers. This applies to subsequent sections and if adopted the use of footnote might be omitted. [Government of NORWAY]	Reject. Usage of Pg is consistent with SI unit system and consistently used in the underlying report and the relevant chapters.
SPM-885	SPM	6	8	6	8	Footnote 6: The non-specialist reader might not know what a Gigatonne is, but would probably understand "1 Billion tonnes". I suggest adding this to the footnote, e.g. "1 Petagram of carbon = 1 PgC = …=1 Gigatonne of carbon = 1 GtC = 1 Billion tonnes of carbon." [David Wratt, New Zealand]	Noted. We prefer to keep the footnote as is.
SPM-886	SPM	6	8	6	28	Peta-grams are unnatural units when emissions are measured in tonnes, and certainly unfamiliar to policy makers. [James [Jim] Crawford, United States of America]	Reject. Usage of Pg is consistent with SI unit system and consistently used in the underlying report and the relevant chapters.
SPM-887	SPM	6	8	36		The 100 to 260 from land use change & the -60 to -140 from undisturbed ecosystems rather cancel: it might clearer to discuss them together - certainly if the estimates are significantly anti-correlated, as I guess they may well be, so that the combined uncertainty is less than one might expect. [William Ingram, United Kingdom]	statement has been revised
SPM-888	SPM	6	8			GtC must be consistently (and directly without footnote) used instead of PgC. GtC is more familiar to policy makers, and conventions of a specific research field need not be followed unless there is a critical difference or necessity, [Government of Japan]	Reject. Usage of Pg is consistent with SI unit system and consistently used in the underlying report and the relevant chapters. The conversion should be straightforward with the footnote included.
SPM-889	SPM	6	9	6	9	The word “only” in “…, only 240…” might cause an implication of value judgment, since some people could feel that differently and would prefer using “as much as” instead. We suggest deleting the adjective “only,” so	statement has been revised

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						that the sentence would show a purely scientific statement. [Government of Japan]	
SPM-890	SPM	6	9	6	9	Suggest removal of the word 'only', this suggest that not much of the released carbon remains in the atmosphere - 240 PgC is ~45% of 545 PgC and is significant. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised
SPM-891	SPM	6	9	6	9	"only" - I am not quite sure what the "only" is meant to convey. That "only" is the prime driver of anthropogenic climate change! [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	statement has been revised
SPM-892	SPM	6	9			"only"; suggest strike. Should be clear from the numbers that it is only a fraction of the emitted. [Stephen E Schwartz, United States of America]	statement has been revised
SPM-893	SPM	6	10	6	10	to add colored text between brackets: {230-250} PgC (eqivalent to 880 Gt CO2), as a matter of clarification. [Nedal Katbeh-Bader, Palestine]	conversion is provided in the footnote
SPM-894	SPM	6	10	6	11	If a number as precise as 390ppm is quoted for CO2 concentration in 2011, then words such as "mean near-surface" need to be added before "atmospheric CO2 concentration" in line 10, as CO2 values vary geographically and seasonally in the troposphere, and the "age of air" in the stratosphere means that values there may locally be quite a few ppm lower. [Adrian Simmons, United Kingdom]	Reject. Wording is consistent with the wording in the underlying assessment -- number given is global annual mean taken from Chapter 2. Figure SPM.3 (previously Figure SPM.2) presents the actual data from two specific locations.
SPM-895	SPM	6	11	6	11	Footnote 7: As ppm and ppb are not defined exclusively for GHGs, we suggest to make this defintion more general, by using simply "gas" instead of "greenhouse gas". [Andrew Ferrone, Germany]	footnote revised
SPM-896	SPM	6	11	6	11	To standardize scientific notation, remove references to “ppm” and replace them with “µatm” or “µbar”. Reason: The term “ppm” does not make it explicit whether the concentration is measured by volume or by mass (hence a footnote has had to be included). Also, it is clearer to express partial pressure as a fraction (in the present instance millionths) of the standard atmospheric pressure, and this convention is increasingly used in the scientific literature. [Christopher Monckton of Brenchley, United Kingdom]	Reject. Footnote explains what ppm refers to. SPM uses ppm consistent with the underlying Chapter assessment.
SPM-897	SPM	6	11	6	11	There is ambiguity here as to whether these numbers refer to global means, as the accompanying figure is for two individual stations. According to the NOAA website, 390 ppbv underestimates the 2011 Mauna Loa value [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Noted. Wording is consistent with the wording in the underlying assessment -- number given is global annual mean taken from Chapter 2. Figure SPM.3 (previously Figure SPM.2) presents the actual data from two specific locations.
SPM-898	SPM	6	11			And Footnote 7, & further on, & any chapters that do the same! "ppm (parts per million) or ppb (parts per billion, 1 billion = 1,000 million) is the ratio of the number of greenhouse gas molecules to the total number of molecules of dry air." is of course horribly untrue. In reality "ppm" is either ppmm or ppmv, and should always be explicitly so written to avoid the possibility of horrible confusion by someone from outside that particular field – but here more than ever! [William Ingram, United Kingdom]	Noted. Footnote explains what ppm refers to. SPM uses ppm consistent with the underlying Chapter assessment.
SPM-899	SPM	6	13	6	13	same as comment 2, but for last interglacial. It is important that the large audience this chapter is aimed at is clear about the timescales covered by palaeoclimate information [Masa KAGEYAMA, France]	comment seems to be for page 7, line 13. Revised bullet (now in sea level section) includes a definition of 'last interglacial'
SPM-900	SPM	6	13	6	18	Explain how long ago was the last interglacial period, and how does this compare to "centennial to millennial variations of likely less than 25 cm"? What is meant by "centennial to millennial variations" - are these the variations within the last century to millenium? [Government of Germany]	comment seems to be for page 7, line 13. Revised bullet (now in sea level section) includes a definition of 'last interglacial', and wording has been clarified.
SPM-901	SPM	6	15			Fig SPM 2 has dropped all other composition changes. I think this weakens the total evidence for humans driving the GHG changes and atmosphere overall. Some of the other GHG's modern record (since 1950) can be plotted on SPM-2 without hurting the plot. Also the straight Keeling plot (shown here) has been shown so many times that it is trite and hardly worth the SPM. For the CO2 record, I like the pCO2 and pH, but the O2 record should be added as obvious evidence of fossil fuel. If the purpose is to implicate anthropogenic, the show more gases: N2O, CH4, and one HFC. [Michael Prather, United States of America]	Figure is intended as a simple and effective illustration of the evidence for increasing CO2 in the atmosphere and ocean, and the impact on ocean pH.
SPM-902	SPM	6	17	6	17	is it possible to be more precise than stating "the last FEW thousans years"? [Masa KAGEYAMA, France]	comment seems to be for page 7, line 17. statement has been removed.

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SPM-903	SPM	6	21	6	21	The sentence concerning the datasets is not needed in the SPM. [Kristie Ebi, United States of America]	Reject. For traceability it is crucial that the reader knows that all details regarding these datasets are assessed in the underlying report.
SPM-904	SPM	6	25	6	25	Is this statement strictly correct? Has there been discrimination between anthropogenic and natural CO2 in the ocean uptake? [Government of Netherlands]	Yes, statement is correct and based on the underlying assessment of the scientific literature.
SPM-905	SPM	6	25	6	25	It seems unlikely that the oceans are taking up ALL of the anthropogenic carbon, I would suggest the addition of "a proportion of" to the text. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised and now gives an estimated uptake by the ocean.
SPM-906	SPM	6	25	6	25	to delete colored text between brackets: taking up (anthropogenic) CO2, since the ocean is taking both natural and anthropogenic CO2. [Nedal Katbeh-Bader, Palestine]	Reject. While it is correct that the ocean is taking up both natural and anthropogenic CO2, this statement is specifically a about the anthropogenic perturbation of the ocean.
SPM-907	SPM	6	25	6	25	This sentence seems not necessary [Gunnar Myhre, Norway]	statement has been revised
SPM-908	SPM	6	25	6	28	Should mention that uptake of anth CO2 perturbs surface and deep ocean. E.g.: " .. carbon dioxide from the atmosphere, perturbing the state of the ocean at the surface and at depth." It is important to note that the perturbation includes the deep ocean as well. For example, this has implication for irreversibility and ocean acidification [Fortunat Joos, Switzerland]	Noted. It seems to us that "carbon taken up by the global ocean" is clear.
SPM-909	SPM	6	25	6	28	To restore correct use of scientific terms, the statement that “there is very high confidence that oceanic uptake of anthropogenic CO2 has resulted in gradual acidification of seawater evidenced by a decreasing pH in surface waters at a rate of between 0.015 and 0.024 per decade since the early 1980s” should be altered to remove the term “acidification”, and the caption in Fig. SPM.2 should similarly be altered to replace the word “acidity” with “alkalinity”. Reason: The pH of the oceans has been estimated at 7.8-8.2. The oceans, therefore, are pronouncedly alkaline, since a neutral pH is 7.0. At a rate of 0.1-0.2 pH units per century, it might take as much as a millennium to render the oceans barely acid, and a further millennium or two before the oceans became as acid as rainwater at a pH of 5.4, even if one supposed that the buffering of the oceans as the flow over rocks would not be sufficient to maintain approximate homeostasis in ocean pH. [Christopher Monckton of Brenchley, United Kingdom]	Reject. 'ocean acidification' is an established term widely used in the scientific literature. It clearly points out the direction of change rather than the absolute state. It has a well defined meaning as outlined in the WGI AR5 Glossary.
SPM-910	SPM	6	25	6	30	Its not clear, given the current organization of the SPM, that it is appropriate to refer to anthropogenic CO2 in these two paragraphs in advance of the discussion around attribution. Suggest reviewing and revising. [Government of Canada]	The quantification of anthropogenic CO2 in the ocean is considered part of the observational evidence as it is derived from observations of ocean properties and thus assessed in Chapters 3 and 6 of WGI AR5. The methods used are distinctly different from the Detection and Attribution methodologies used in the Chapter 10 assessment. Note that there is no attempt made in this section to link these observed changes to changes in climate, but to anthropogenic CO2 emissions.
SPM-911	SPM	6	25			"anthropogenic". This seems to be first use of "anthropogenic"; might define. [Stephen E Schwartz, United States of America]	This term should be familiar to the policy-makers, and does not require a definition at this level. See glossary of the WGI AR5 if details are needed.
SPM-912	SPM	6	25			"anthropogenic carbon dioxide". Strictly speaking it is hard to keep track of "anthropogenic" carbon dioxide because of exchanges of CO2 among reservoirs. The quantity referred to is really "incremental" CO2. You might argue on the basis of 14C that it is anthropogenic, but there is rapid isotope dilution. I guess I would prefer "incremental" where you have explained that the increment is due to emissions of CO2 from fossil fuel combustion and land use changes. The concept of incremental CO2 is very valuable, for example Figure 7.3 of AR4. [Stephen E Schwartz, United States of America]	Reject. The SPM usage of the term is consistent with the usage in the underlying chapter assessment and in the scientific literature (see Chapters 3 and 6 for details).
SPM-913	SPM	6	26	6	26	Here a statement on the increase of global anthropogenic carbon content increase of the oceans is made for the period 1994-2010. What about the ocean uptake of the non-anthropogenic carbon content? Is it	This is being discussed in Chapter 3, Section 3.8.1.2 Changes in the Oceanic Inventory of Anthropogenic

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						considered as constant? [Government of Netherlands]	Carbon Dioxide
SPM-914	SPM	6	26			Again, the word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". It is unclear from this sentence which is meant, though the next implies it was "global-mean" - make this explicit here. [William Ingram, United Kingdom]	It seems clear that 'global ocean' refers to a global mean.
SPM-915	SPM	6	27	6	27	Provide the best estimate for 1994 if available. [Government of Australia]	statement has been revised.
SPM-916	SPM	6	27	6	27	Just reporting the data is not as helpful to readers as providing some text to ensure readers get the take home message. So here, it would help to add to the end of the sentence, a phrase saying: "…in 2010, indicating increased uptake of carbon by the ocean". [Government of Canada]	statement has been revised.
SPM-917	SPM	6	27	6	27	Why is a range quoted in one case, but a single number in the other? [Government of Sweden]	statement has been revised
SPM-918	SPM	6	27	6	27	Would be helpful if a most likely value could also be given for 1994 (as for 2010) [Ingeborg Levin, Germany]	statement has been revised
SPM-919	SPM	6	27	6	27	I found this ambiguous, The second sentence says "high confidence increase from 1994 to 2010" and then this sentence quotes a 1994 value. Is this the increase relative to some pre-industrial level? Line 35 mentions 1750 in the context of natural ecosystems, but as written it is not clear whether the reader can compare the line 35 value of 150 PgC with the values given on line 27 [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	statement has been revised
SPM-920	SPM	6	28	6	28	Suggest moving the text from lines 35-36 here so that the information about ocean sinks and land sinks is together. Then readers can see that these sinks are taking up about the same amounts of carbon. [Government of Canada]	ordering and wording of bullets in this section have been substantially revised.
SPM-921	SPM	6	30	6	30	What can be said about regional variation? [Government of United Kingdom of Great Britain & Northern Ireland]	There is not space in the SPM to go into regional variation for every reported global mean observation or projection. See underlying chapter assessment where this details is provided, including figures.
SPM-922	SPM	6	30	6	30	to delete colored text between brackets: uptake of (anthro pogenic) CO2, for the same reason in the previous comment. [Nedal Katbeh-Bader, Palestine]	Reject. This statement is specifically a about the anthropogenic CO2 perturbation of the ocean.
SPM-923	SPM	6	30	6	30	This does not need to be framed as a confidence statement, since it is based in fundamental chemistry that is not in doubt. Would it be better as "Well-established chemistry dictates that oceanic uptake of CO2 results in gradual….." [Susan Solomon, United States of America]	Noted. The statement has been revised to "it is very likely that". It refers to the actual observed changes in the ocean, not the theoretical fact that adding CO2 decreases the pH.
SPM-924	SPM	6	30	6	33	CO2 in the oceans exchanges with the atmosphere depending on temperature. Thus, during periods of ocean warming (as claimed by IPCC), much more CO2 is emitted to the atmosphere than is taken in from the 0.008% increase in atmospheric CO2. Thus, such a small increase in atmospheric CO2 is incapable of significantly increasing oceanic CO2 and making it more acidic. [Don Easterbrook, United States of America]	reviewer provides no substantive basis for his claims. See comprehensive underlying chapter assessment and literature cited therein on ocean acidification.
SPM-925	SPM	6	30	6	33	Readers would be helped by having some context for understanding this rate of change in pH. Is this unusual? [Government of Canada]	Taken into account. Statement has been revised to provide the necessary context and to highlight the significance of such small pH changes. We have added a footnote explaining pH in simple terms.
SPM-926	SPM	6	30	6	33	Please give the absolute pH-values for undisturbed conditions and the current value, not only the change rates. [Government of Germany]	The change is most relevant here. Statement has been revised to better highlight the significance of such small pH changes. Added a footnote explaining pH in simple terms.
SPM-927	SPM	6	30	6	33	We propose to also include information about total change in pH caused by anthropogenic CO2, not only the rate of change. [Government of NORWAY]	The change is most relevant here. Statement has been revised to better highlight the significance of such small pH changes. We have added a footnote explaining pH in simple terms.

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SPM-928	SPM	6	30	6	33	It might be helpful to explain what this change in pH means in practical terms for policy makers. [Government of United States of America]	Taken into account. We have added a footnote explaining pH in simple terms.
SPM-929	SPM	6	30	6	33	Need to put these changes in context of previous pH levels. Would be useful to include information on pH levels over the past 600 years and how today's levels compare. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. The recent change is most relevant here. But the statement has been revised to better highlight the significance of such small pH changes. We have added a footnote explaining pH in simple terms.
SPM-930	SPM	6	30	6	33	It is wrong to assume that the pH of the ocean is uniform. There are parts which currently emit carbon dioxide and are presumably saturated, without evident harm to the local flora and fauna. Increased dissolved carbon doxide would merely increase these areas, encouraging creatures that benefit, and adaption by evolution for others [Vincent Gray, New Zealand]	statement does not claim that pH of the ocean is uniform.
SPM-931	SPM	6	30	6	33	Ocean pH neither influences nor influenced by climate so remove this paragraph. It belongs in something like a UNEP report about the consequences of elevated atmospheric CO2. [John McLean, Australia]	This section is on observed changes in carbon and other biogeochemical quantities. The observed changes in ocean uptake of CO2, and resulting impacts on ocean pH, are important in the overall understanding of changes in the climate system, and understanding the drivers of those changes.
SPM-932	SPM	6	30	6	36	Are the rates of uptake constant across time and carbon concentrations? Particularly, is the ocean continuing to absorb CO2 at the same rate? [Kristie Ebi, United States of America]	statements have been revised, and now reports only the total change in pH since the beginning of the industrial era. See SPM figure 3 for time series.
SPM-933	SPM	6	30			is the word gradual needed? [Government of United States of America]	sentence has been revised.
SPM-934	SPM	6	31	6	31	"between" is confusing. Does the range of results pertain to the global mean pH change, or does it describe spatial variations in the rate of pH change? [Dian Seidel, United States of America]	statements have been revised, and now reports only the total change in pH since the beginning of the industrial era. See SPM figure 3 for time series.
SPM-935	SPM	6	32	6	32	Move the text '(see Figure SPM.2)', which is now at line 32, directly after 'acidification of seawater' at line 31, since the figure shows pH measurements of seawater, not of surface waters. [Government of Netherlands]	statement has been revised.
SPM-936	SPM	6	35	6	35	What is the trend? [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised. Unclear why reviewer considers a trend (presumably a rate of change) would be useful.
SPM-937	SPM	6	35	6	35	Does the 150 PgC for natural terrestrial ecosystems refer to 2010 ? [SYLVIE JOUSSAUME, France]	statement revised - now states 2011.
SPM-938	SPM	6	35	6	36	Here the mean is sitting outside the range of probable values "accumulated 150 [60-140] PgC". [Government of Australia]	statement has been corrected based on final chapter drafts.
SPM-939	SPM	6	35	6	36	Natural terrestrial ecosystems are mentioned, but how about those modified by human activities? Mentioning one requires mentioning the other too. [Government of Germany]	statement now revised and expanded.
SPM-940	SPM	6	35	6	36	Why is only the accumulation term natural terrestrial ecosystems highlighted? We suggest to mention the four most important terms in Table 6.1, and relate them to the atmospheric increase. The amount mentioned (150 PgC) is beyond the indicated range [60 to 140]. In chapter 6, page 20, line 18, this term is 150 PgC +/- 90PgC. Therefore, 140 should be changed to 240 PgC. [Government of Netherlands]	statement has been corrected and revised based on final chapter drafts.
SPM-941	SPM	6	35	6	36	How can the best estimate value, 150 PgC, of accumulated carbon be outside the 90 % uncertainty interval [60 to 140] values? Please consider to explain the reasons for how natural systems (which are generally considered as in balance) accumulates carbon (for example is it because of climate change or fertilization?). [Government of NORWAY]	statement has been corrected and revised based on final chapter drafts.
SPM-942	SPM	6	35	6	36	does 'affected by land use change' mean natural ecosystems being degraded or cut down? Presumably we're talking about land use changes that are primarily negative rather than positive, so why the euphemistic language? [Government of United Kingdom of Great Britain & Northern Ireland]	statement now revised and expanded.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-943	SPM	6	35	6	36	Either the mean (i.e. 150) or the range (60-140) must be wrong [Ingeborg Levin, Germany]	statement has been corrected based on final chapter drafts.
SPM-944	SPM	6	35			Delete "Natural" at the beginning of the line. This is not used in the underlying chapter - see Chapter 6, page 6-20, line 18. [Government of New Zealand]	statement now revised and expanded.
SPM-945	SPM	6	36	6	36	Again for consistency with earlier bullets, the year of this accumulation should be indicated. 2010? [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	statement revised - now states 2011.
SPM-946	SPM	6	37	6		add additional para: The interaction between the carbon cycle, the nitrogen cycle and the climate becomes increasingly important for global change. Rational results of chapters {6.1.3& 6.4.6} [Government of Germany]	Government does not provide a compelling reason why this paragraph should be included. 'Global change' is very vague terminology.
SPM-947	SPM	6	39	7	18	The palaeo-climate section might benefit from some graphics to illustrate the long-term variations and put current climatic indicators in context [Government of United Kingdom of Great Britain & Northern Ireland]	The revised structure of the SPM places the statements concerning paleo-climate directly into the relevant bullet on observed changes. We believe this provides a much clearer context for the observed recent changes, without the need for additional figures.
SPM-948	SPM	6	39	7	18	The method of presenting dates varies considerably in this section using years CE, years BP and early-mid Holocene. A consistent approach would offer much greater clarity. [Government of United Kingdom of Great Britain & Northern Ireland]	Consistency has been achieved for the revised statements.
SPM-949	SPM	6	39			retrospective instead of “perspective”? [Government of France]	title was correct, however is no longer used in the new structure.
SPM-950	SPM	6	39			Long term perspectives: Nothing is said about fundamental CO2 temperature-climate relationship seen in the geological record [Government of United States of America]	Opening shaded statement for the section 'carbon and other biogeochemical cycles' includes this information.
SPM-951	SPM	6	39			Part of this paleo section is strictly about detection and belongs to the detection and attribution section. [Reto Knutti, Switzerland]	revised statements have taken care to avoid straying into detection and attribution.
SPM-952	SPM	6	39			This information from paleclimatic records seems very polcy relevant, e.g. on the Medieval Cliamte Anomaly. [Klaus Radunsky, Austria]	noted, and we believe the revised structure has improved this further.
SPM-953	SPM	6	41	6	41	"Analyses of a number of" can easily be deleted. [Kristie Ebi, United States of America]	statement revised.
SPM-954	SPM	6	41	6	43	What about the southern hemisphere? If paleoclimatic records are not available, there should be reference to this for the reader to understand the omission. [Government of Canada]	SPM focusses on the robust findings from the Northern Hemisphere. See underlying chapter assessment for further details, including from the Southern Hemisphere.
SPM-955	SPM	6	41	6	43	Long-Term Perspective from Paleoclimatic Records. ‘Analyses of a number of independent paleoclimatic archives provide a multi-century perspective of Northern Hemisphere temperature and indicate that 1981–2010 was very likely the warmest 30-year period of the last 800 years. {5.3.5}’. The question (in this section summary) is whether or not the 1981–2010 was the warmest 30-year period throughout different regions of the Northern Hemisphere. [Government of Morocco]	See underlying chapter assessment for this level of regional detail.
SPM-956	SPM	6	41	6	43	This main conclusion based on paleo climatic data does not seem very convincing when it refers to 'only' the last 800 years. Isn’t there any news on earlier records worth mentioning in the summary? [Government of Netherlands]	revised statement now extends to cover the last 1400 years.
SPM-957	SPM	6	41	6	43	Page 9 of the AR4 SPM has the following box: 'Palaeoclimatic information supports the interpretation that the warmth of the last half century is unusual in at least the previous 1300 years. The last time the polar regions were significantly warmer than present for an extended period (about 125,000 year ago), reductions in polar ice volume led to 4 to 6 m of sea level rise. So there are a few questions about the new box here: why 800 instead of 1300 years, why a 30 year period instead of half a century from recent records, and why no reference to the equivalent reduction in polar ice volume (particularly as we're currently seeing extensive melt).	Taken into account. The revised statement now reads: "Analyses of paleoclimate archives indicate that in the Northern Hemisphere, the period 1983–2012 was very likely the warmest 30-year period of the last 800 years (high confidence) and likely the warmest 30-year period of the last 1400 years (medium

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						[Government of United Kingdom of Great Britain & Northern Ireland]	confidence)". This is consistent with the underlying Chapter assessment. The statement concerning sea level rise during the last interglacial has been moved to the section "Sea Level".
SPM-958	SPM	6	41	6	43	This claim is contradicted by so many studies that all you can honestly state is that it is a matter of debate whether temperatures were higher in those times. [John McLean, Australia]	Reviewer fails to cite evidence to support his claims. See comprehensive assessment provided in Chapter 5.
SPM-959	SPM	6	41	6	48	Whoever wrote this nonsense obviously did not bother to read the voluminous literature on this issue. Recently published data shows conclusively that the Medieval Warm Period was slightly warmer than present and was global in extent (there are several thousand peer reviewed publications with conclusive data showing this). Several different lijnes of data not only show consistently higher temperatures during the Medieval warm period but also demonstrate that is was global, not just regional. Greenland ice core data and global glacial fluctuations demonstrate that all but the last few millenia of the past 10,000 years was 1-3 degrees C warmer than present. The 1981-2010 was NOT the warmest 30 year period of the past 1300--it wasn't even the warmest 30 year period of this century (see NOAA and satellite temp records). IPCC could improve its very shaky credibility in the scientific world by employing writers who bother to actually read the literature. [Don Easterbrook, United States of America]	Reviewer fails to cite evidence to support his claims. See comprehensive assessment provided in Chapter 5.
SPM-960	SPM	6	41	6	48	Genuine globally averaged temperatures cannot be measured. These comcuisions are based on highly inaccurate methods for which inaccuracies and biases are far greater than the increases claimed. The period covered is very small on a geological scale and the estimates by the biased experts are worthless [Vincent Gray, New Zealand]	Reviewer fails to provide a substantive basis for his claims.
SPM-961	SPM	6	41	6	48	To restore credibility, delete “Analyses of a number of independent paleoclimatic archives provide a multi-century perspective of Northern Hemisphere temperature and indicate that 1981-2010 was very likely the warmest 30-year period of the last 800 years. There is medium confidence that in the Northern Hemisphere 1981-2010 was the warmest 30-year period of the last 1300 years. There is high confidence that the Medieval Climate Anomaly, about 900 to 1400 CE, shows inconsistent temperature changes across seasons and regions, in contrast to the widespread temperature increase of the late 20th century.” Delete references to medium confidence that glacier recessions and sea-ice extents are unusual in 2000 years. Reason: This and succeeding comments list 450 papers on proxy surface temperature reconstructions by many methods from many regions showing the medieval warm period as real, global, and warmer than today. The IPCC departs from the literature on proxies and unduly favors papers based on modeling. Examples: The following are examples of general temperature reconstructions, most of them global, that indicate the extent of the medieval warm period. Bard, E. 2002. Climate shock: Abrupt changes over millennial time scales. Physics Today 55(12): 32-38. Bell, B. and Menzel, D.H. 1972. Toward the observation and interpretation of solar phenomena. AFCRL F19628-69-C-0077 and AFCRL-TR-74-0357, Air Force Cambridge Research Laboratories, Bedford, MA, pp. 8-12. Broecker, W.S. 2001. Was the Medieval Warm Period global? Science 291: 1497-1499. Bürger, G. 2010. Clustering climate reconstructions. Climate of the Past Discussions 6: 659–679. Cook, E.R. and Kairiukstis, L.A. 1990. Methods of Dendrochronology: Applications in the Environmental Sciences. Kluwer, Dordrecht, The Netherlands. Dergachev, V.A. and Raspopov, O.M. 2010a. Reconstruction of the Earth‘s surface temperature based on data of deep boreholes, global warming in the last millennium, and long-term solar cyclicity. Part 1. Experimental data. Geomagnetism and Aeronomy 50: 383–392. Dergachev, V.A. and Raspopov, O.M. 2010b. Reconstruction of the Earth‘s surface temperature based on data of deep boreholes, global warming in the last millennium, and long-term solar cyclicity. Part 2. Experimental data analysis. Geomagnetism and Aeronomy 50: 393–402. Esper, J. and Frank, D. 2009. The IPCC on a heterogeneous Medieval Warm Period. Climatic Change 94: 267-273 Fritts, H.C. 1976. Tree Rings and Climate. Academic Press, London, UK. Loehle, C. 2004. Climate change: detection and attribution of trends from long-term geologic data. Ecological	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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						Modelling 171: 433-450. McIntyre, S. and McKitrick, R. 2005. Hockey sticks, principal components and spurious significance. Geophysical Research Letters 32 L03710. Soon, W. and Baliunas, S. 2003. Proxy climatic and environmental changes of the past 1000 years. Climate Research 23 (2): 89-110. Wanner, H., Beer, J., Butikofer, J., Crowley, T.J., Cubasch, U., Fluckiger, J., Goosse, H., Grosjean, M., Joos, F., Kaplan, J.O., Kuttel, M., Muller, S.A., Prentice, I.C., Solomina, O., Stocker, T.F., Tarasov, P., Wagner, M., and Widmann, M. 2008. Mid- to Late Holocene climate change: an overview. Quaternary Science Reviews 27: 1791–1828. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-962	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in the Northern Hemisphere are given below. Bond, G. and Lotti, R. 1995. Iceberg discharges into the North Atlantic on millennial time scales during the last glaciation. Science 267: 1005–1010. Bond, G., Kromer, B., Beer, J., Muscheler, R., Evans, M.N., Showers, W., Hoffmann, S., Lotti-Bond, R., Hajdas, I., and Bonani, G. 2001. Persistent solar influence on North Atlantic climate during the Holocene. Science 294: 2130–2136. Bond, G., Showers, W., Cheseby, M., Lotti, R., Almasi, P., deMenocal, P., Priore, P., Cullen, H., Hajdas, I., and Bonani, G. 1997. A pervasive millennial-scale cycle in North Atlantic Holocene and Glacial climate. Science 278: 1257–1266. Brohan, P., Kennedy, J., Harris, I., Tett, S.F.B., and Jones, P.D. 2006. Uncertainty estimates in regional and global observed temperature changes: a new dataset from 1850. Journal of Geophysical Research 111: 10.1029/2005JD006548. Bürger, G. 2010. Clustering climate reconstructions. Climate of the Past Discussions 6: 659-679. Butikofer, J. 2007. Millennial Scale Climate Variability During the Last 6000 Years—Tracking Down the Bond Cycles. Diploma thesis, University of Bern, Bern, Switzerland. Christiansen, B. and Ljungqvist, F.C. 2012. The extra-tropical Northern Hemisphere temperature in the last two millennia: reconstructions of low-frequency variability. Climate of the Past 8: 765-786. D'Arrigo, R., Wilson, R. and Jacoby, G., 2006: On the long-term context for late 20th century warming. Journal of Geophysical Research 111: D3, D03103. Denton, G.H. and Karlen, W. 1973. Holocene climatic variations—their pattern and possible cause. Quaternary Research 3: 155–205. Hong, Y.T., Hong, B., Lin, Q.H., Shibata, Y., Zhu, Y.X., Leng, X.T., and Wang, Y. 2009a. Synchronous climate anomalies in the western North Pacific and North Atlantic regions during the last 14,000 years. Quaternary Science Reviews 28: 840–849. Hong, B., Liu, C., Lin, Q., Yasuyuki, S., Leng, X., Wang, Y., Zhu, Y., and Hong, Y. 2009b. Temperature evolution from the δ18O record of Hami peat, Northeast China, in the last 14,000 years. Science in China Series D: Earth Sciences 52: 952–964. Isono, D., Yamamoto, M., Irino, T., Oba, T., Murayama, M., Nakamura, T., and Kawahata, H. 2009. The 1500-year climate oscillation in the mid-latitude North Pacific during the Holocene. Geology 37: 591–594. Loehle, C. 2009. A mathematical analysis of the divergence problem in dendroclimatology. Climatic Change 94: 233–245. Ljungqvist, F.C. 2010. A new reconstruction of temperature variability in the extra-tropical northern hemisphere during the last two millennia. Geografiska Annaler 92A: 339–351. Ljungqvist, F.C., Krusic, P.J., Brattstrom, G. and Sundqvist, H.S. 2012. Northern Hemisphere temperature patterns in the last 12 centuries. Climate of the Past 8: 227-249. Mayewski, P.A., Rohling, E.E., Stager, J.C., Karlen, W., Maasch, K.A., Meeker, L.D., Mann, M.E., Woodruff, J.D., Donnelly, J.P. and Zhang, Z. 2009. Atlantic hurricanes and climate over the past 1,500 years. Nature	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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						460: 880-883. Meyerson, E.A., Gasse, F., van Kreveld, S., Holmgren, K., Lee-Thorp, J., Rosqvist, G. Rack, F., Staubwasser, M., Schneider, R.R., and Steig, E.J. 2004. Holocene climate variability. Quaternary Research 62: 243–255. McIntyre, S. and McKitrick, R. 2003. Corrections to the Mann et al. (1998) proxy data base and Northern Hemispheric average temperature series. Energy and Environment 14: 751–771. Moberg, A., Sonechkin, D.M., Holmgren, K., Datsenko, N.M., and Karlen, W. 2005. Highly variable Northern Hemisphere temperatures reconstructed from low- and high-resolution proxy data. Nature 433: 613–617. Oppo, D. 1997. Millennial climate oscillations. Science 278: 1244–1246. Rayner, N.A., Brohan, P., Parker, D.E., Folland, C.K., Kennedy, J.J., Vanicek, M., Ansell, T., and Tett, S.F.B. 2006. Improved analyses of changes and uncertainties in marine temperature measured in situ since the mid-nineteenth century: the HadSST2 dataset. Journal of Climate 19: 446–469. Richter, T.O., Peeters, F.J.C. and van Weering, T.C.E. 2009. Late Holocene (0-2.4 ka BP) surface water temperature and salinity variability, Feni Drift, NE Atlantic Ocean. Quaternary Science Reviews 28: 1941-1955. Trouet, V., Esper, J., Graham, N.E., Baker, A., Scourse, J.D. and Frank, D.C. 2009. Persistent positive North Atlantic Oscillation mode dominated the Medieval Climate Anomaly. Science 324: 78-80. Wanner, H. and Butikofer, J. 2008. Holocene Bond cycles: real or imaginary? Geografie-Sbornik CGS 113: 338–350. Wanner, H., Beer, J., Butikofer, J., Crowley, T., Cubasch, U., Fluckiger, J., Goosse, H., Grosjean, M., Joos, F., Kaplan, J.O., Kuttel, M., Muller, S., Pentice, C., Solomina, O., Stocker, T., Tarasov, P., Wagner, M., and Widmann, M. 2008. Mid to late Holocene climate change—an overview. Quaternary Science Reviews 27: 1791–1828. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-963	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in the Arctic are given below. Benner, R., Benitez-Nelson, B., Kaiser, K. and Amon, R.M.W. 2004. Export of young terrigenous dissolved organic carbon from rivers to the Arctic Ocean. Geophysical Research Letters 31: 10.1029/2003GL019251. Besonen, M.R., Patridge, W., Bradley, R.S., Francus, P., Stoner, J.S. and Abbott, M.B. 2008. A record of climate over the last millennium based on varved lake sediments from the Canadian High Arctic. The Holocene 18: 169-180. Bonnet, S., de Vernal, A., Hillaire-Marcel, C., Radi, T. and Husum, K. 2010. Variability of sea-surface temperature and sea-ice cover in the Fram Strait over the last two millennia. Marine Micropaleontology 74: 59-74 Comiso, J.C., Wadhams, P., Pedersen, L.T. and Gersten, R.A. 2001. Seasonal and interannual variability of the Odden ice tongue and a study of environmental effects. Journal of Geophysical Research 106: 9093-9116. Deser, C., Walsh, J.E. and Timlin, M.S. 2000. Arctic sea ice variability in the context of recent atmospheric circulation trends. Journal of Climatology 13: 617-633. Divine, D., Isaksson, E., Martma, T., Meijer, H.A.J., Moore, J., Pohjola, V., van de Wal, R.S.W. and Godtliebsen, F. 2011. Thousand years of winter surface air temperature variations in Svalbard and northern Norway reconstructed from ice-core data. Polar Research 30: 10.3402/polar.v30i0.7379 Drinkwater, K.F. 2006. The regime shift of the 1920s and 1930s in the North Atlantic. Progress in Oceanography 68: 134-151. Gonzalez-Rouco, F., von Storch, H. and Zorita, E. 2003. Deep soil temperature as proxy for surface air-temperature in a coupled model simulation of the last thousand years. Geophysical Research Letters 30: 10.1029/2003GL018264. Goulden, M.L., Wofsy, S.C., Harden, J.W., Trumbore, S.E., Crill, P.M., Gower, S.T., Fries, T., Daube, B.C., Fan, S., Sutton, D.J., Bazzaz, A. and Munger, J.W. 1998. Sensitivity of boreal forest carbon balance to soil	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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SPM-964	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in Greenland are given below. Alley, R.B., Meese, D.A., Shuman, C.A., Gow, A.J., Taylor, K.C., Grootes, P.M., White, J.C.W., Ram, M., Waddington, E.D., Mayewski, P.A., and Zielinski, G.A. 1993. Abrupt increase in Greenland snow accumulation at the end of the Younger Dryas event. Nature 362: 527–529. Andresen, C.S., Bjorck, S., Bennike, O., and Bond, G. 2004. Holocene climate changes in southern Greenland: evidence from lake sediments. Journal of Quaternary Science 19: 783–793. Christiansen, H.H. 1998. 'Little Ice Age' navigation activity in northeast Greenland. The Holocene 8: 719-728. Chylek, P., Box, J.E. and Lesins, G. 2004. Global warming and the Greenland ice sheet. Climatic Change 63: 201-221. Chylek, P., Dubey, M.K, and Lesins, G. 2006. Greenland warming of 1920-1930 and 1995-2005. Geophysical Research Letters 33: L11707. Comiso, J.C., Wadhams, P., Pedersen, L.T. and Gersten, R.A. 2001. Seasonal and interannual variability of the Odden ice tongue and a study of environmental effects. Journal of Geophysical Research 106: 9093-9116. Dahl-Jensen, D., Mosegaard, K., Gundestrup, N., Clow, G.D., Johnsen, S.J., Hansen, A.W. and Balling, N. 1998. Past temperatures directly from the Greenland Ice Sheet. Science 282: 268-271. Dansgaard, W., Johnsen, S.J., Gundestrup, N., Clausen, H.B. and Hammer, C.U. 1975. Climatic changes, Norsemen and modern man. Nature 255: 24-28. Groton, CT. Vinther, B.M., Jones, P.D., Briffa, K.R., Clausen, H.B., Andersen, K.K., Dahl-Jensen, D., and Johnsen, S.J. 2010. Climatic signals in multiple highly resolved stable isotope records from Greenland.	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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SPM-965	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in Iceland are given below. Axford, Y., Geirsdottir, A., Miller, G.H., and Langdon, P.G. 2009. Climate of the Little Ice Age and the past 2000 years in northeast Iceland inferred from chironomids and other lake sediment proxies. Journal of Paleolimnology 41: 7–24. Bianchi, G.G. and McCave, I.N. 1999. Holocene periodicity in North Atlantic climate and deep-ocean flow south of Iceland. Nature 397: 515–517. Bradwell, T., Dugmore, A.J. and Sugden, D.E. 2006. The Little Ice Age glacier maximum in Iceland and the North Atlantic Oscillation: evidence from Lambatungnajokull, southeast Iceland. Boreas 35: 61-80. Hanna, E., Jonsson, T., Olafsson, J. and Valdimarsson, H. 2006. Icelandic coastal sea surface temperature records constructed: Putting the pulse on air-sea-climate interactions in the Northern North Atlantic. Part I: Comparison with HadISST1 open-ocean surface temperatures and preliminary analysis of long-term patterns	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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SPM-966	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in North America are given below. Arseneault, D. and Payette, S. 1997. Reconstruction of millennial forest dynamics from tree remains in a subarctic tree line peatland. Ecology 78: 1873-1883. Balling Jr., R.C., Cerveny, R.S. and Idso, C.D. 2002. Does the urban CO2 dome of Phoenix, Arizona contribute to its heat island? Geophysical Research Letters 28: 4599-4601. Barclay, D.J., Wiles, G.C. and Calkin, P.E. 2009. Tree-ring crossdates for a first millennium AD advance of Tebenkof Glacier, southern Alaska. Quaternary Research 71: 22-26. Barron, J.A., Heusser, L.E., and Alexander, C. 2004. High resolution climate of the past 3,500 years of coastal northernmost California. In Proceedings of the Twentieth Annual Pacific Climate Workshop, edited by S.W. Starratt and N.L. Blumquist, 13–22. U.S. Geological Survey. Bond, G., Kromer, B., Beer, J., Muscheler, R., Evans, M.N., Showers, W., Hoffmann, S., Lotti-Bond, R., Hajdas, I. and Bonani, G. 2001. Persistent solar influence on North Atlantic climate during the Holocene. Science 294: 2130-2136. Brunelle, A., Minckley, T.A., Blissett, S., Cobabe, S.K. and Guzman, B.L. 2010. A ~8000 year fire history from an Arizona/Sonora borderland cienega.Journal of Arid Environments 24: 475-481. Brush, G.S. 2001. Natural and anthropogenic changes in Chesapeake Bay during the last 1000 years. Human and Ecological Risk Assessment 7: 1283-1296. Bunbury, J. and Gajewski, K. 2012. Temperatures of the past 2000 years inferred from lake sediments, southwest Yukon Territory, Canada. Quaternary Research 77: 355-367 Byrne, R., Ingram, B.L., Starratt, S., Malamud-Roam, F., Collins, J.N., and Conrad, M.E. 2001. Carbon-isotope, diatom, and pollen evidence for late Holocene salinity change in a brackish marsh in the San Francisco estuary. Quaternary Research 55: 66–76. Calkin, P.E., Wiles, G.C. and Barclay, D.J. 2001. Holocene coastal glaciation of Alaska. Quaternary Science Reviews 20: 449-461. Campbell, C. 2002. Late Holocene lake sedimentology and climate change in southern Alberta, Canada. Quaternary Research 49: 96-101. Changnon, S.A. 1999. A rare long record of deep soil temperatures defines temporal temperature changes and an urban heat island. Climatic Change 42: 531-538. Clegg, B.F., Clarke, G.H., Chipman, M.L., Chou, M., Walker, I.R., Tinner, W., and Hu, F.S. 2010. Six millennia of summer temperature variation based on midge analysis of lake sediments from Alaska. Quaternary Science Reviews 29: 3308–3316. Cronin, T.M., Dwyer, G.S., Kamiya, T., Schwede, S., and Willard, D.A. 2003. Medieval Warm Period, Little Ice Age and 20th century temperature variability from Chesapeake Bay. Global and Planetary Change 36: 17–29.	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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SPM-968	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in Russia and central Asia are given below. Chen, F.-H., Chen, J.-H., Holmes, J., Boomer, I., Austin, P., Gates, J.B., Wang, N.-L., Brooks, S.J., and Zhang, J.-W. 2010. Moisture changes over the last millennium in arid central Asia: A review, synthesis and comparison with monsoon region. Quaternary Science Reviews 29: 1055–1068. Demezhko, D. Yu. and Shchapov, V.A. 2001. 80,000 years ground surface temperature history inferred from the temperature-depth log measured in the superdeep hole SG-4 (the Urals, Russia). Global and Planetary	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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						Change 29: 167-178. Esper, J., Cook, E.R. and Schweingruber, F.H. 2002. Low-frequency signals in long tree-ring chronologies for reconstructing past temperature variability. Science 295: 2250-2253. Esper, J., Schweingruber, F.H. and Winiger, M. 2002. 1300 years of climatic history for Western Central Asia inferred from tree-rings. The Holocene 12: 267-277. Esper, J., Frank, D.C., Wilson, R.J.S., Buntgen, U., and Treydte, K. 2007. Uniform growth trends among central Asian low- and high-elevation juniper tree sites. Trees—Structure and Function 21: 141–150. Hiller, A., Boettger, T. and Kremenetski, C. 2001. Medieval climatic warming recorded by radiocarbon dated alpine tree-line shift on the Kola Peninsula, Russia. The Holocene 11: 491-497. Krenke, A.N. and Chernavskaya, M.M. 2002. Climate changes in the preinstrumental period of the last millennium and their manifestations over the Russian Plain. Isvestiya, Atmospheric and Oceanic Physics 38: S59-S79. Naurzbaev, M.M. and Vaganov, E.A. 2000. Variation of early summer and annual temperature in east Taymir and Putoran (Siberia) over the last two millennia inferred from tree rings. Journal of Geophysical Research 105: 7317-7326. Panin, A.V. and Nefedov, V.S. 2010. Analysis of variations in the regime of rivers and lakes in the Upper Volga and Upper Zapadnaya Dvina based on archaeological-geomorphological data. Water Resources 37: 16-32Park, J. 2011. Schoell, M. 1978. Oxygen isotope analysis on authigenic carbonates from Lake Van sediments and their possible bearing on the climate of the past 10,000 years. In: Degens, E.T. (Ed.) The Geology of Lake Van, Kurtman. The Mineral Research and Exploration Institute of Turkey, Ankara, Turkey, pp. 92-97. Vaughan, D.G., Marshall, G.J., Connolley, W.M., King, J.C. and Mulvaney, R. 2001. Devil in the detail. Science 293: 177-179. Voronina, E., Polyak, L., De Vernal, A. and Peyron, O. 2001. Holocene variations of sea-surface conditions in the southeastern Barents Sea, reconstructed from dinoflagellate cyst assemblages. Journal of Quaternary Science 16: 717-726. Watkins, A.B. and Simmonds, I. 2000. Current trends in Antarctic sea ice: The 1990s impact on a short climatology. Journal of Climate 13: 4441-4451. Xiong, F.S., Meuller, E.C. and Day, T.A. 2000. Photosynthetic and respiratory acclimation and growth response of Antarctic vascular plants to contrasting temperature regimes. American Journal of Botany 87: 700-710. Yang, B., Wang, J., Brauning, A., Dong, Z. and Esper, J. 2009. Late Holocene climatic and environmental changes in arid central Asia. Quaternary International 194: 68-78. Yoon, H.I., Park, B.-K., Kim, Y. and Kang, C.Y. 2002. Glaciomarine sedimentation and its paleoclimatic implications on the Antarctic Peninsula shelf over the last 15,000 years. Palaeogeography, Palaeoclimatology, Palaeoecology 185: 235-254. Yuan, X. and Martinson, D.G. 2000. Antarctic sea ice extent variability and its global connectivity. Journal of Climate 13: 1697-1717. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-969	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in India and Pakistan are given below. Kar, R., Ranhotra, P.S., Bhattacharyya, A. and Sekar B. 2002. Vegetation vis-à-vis climate and glacial fluctuations of the Gangotri Glacier since the last 2000 years. Current Science 82: 347-351. Oppo, D.W., Rosenthal, Y. and Linsley, B.K. 2009. 2,000-year-long temperature and hydrology reconstructions from the Indo-Pacific warm pool. Nature460: 1113-1116. von Rad, U., Schulz, H., Riech, V., den Dulk, M., Berner, U. and Sirocko, F. 1999. Multiple monsoon-controlled breakdown of oxygen-minimum conditions during the past 30,000 years documented in laminated sediments	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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						off Pakistan. Palaeogeography, Palaeoclimatology, Palaeoecology 152: 129-161. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-970	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in China are given below. Bao, Y., Brauning, A. and Yafeng, S. 2003. Late Holocene temperature fluctuations on the Tibetan Plateau. Quaternary Science Reviews 22: 2335-2344. Chu, G., Sun, Q., Gu, Z., Rioual, P., Liu, Q., Wang, K., Han, J., and Liu, J. 2009. Dust records from varved lacustrine sediments of two neighboring lakes in northeastern China over the last 1400 years. Quaternary International 194: 108–118. Chu, G., Liu, J., Sun, Q., Lu, H., Gu, Z., Wang, W. and Liu, T. 2002. The 'Mediaeval Warm Period' drought recorded in Lake Huguangyan, tropical South China. The Holocene 12: 511-516. De'er, Z. 1994. Evidence for the existence of the medieval warm period in China. Climatic Change 26: 289-297. Esper, J., Shiyatov, S.G., Mazepa, V.S., Wilson, R.J.S., Graybill, D.A. and Funkhouser, G. 2003. Temperature-sensitive Tien Shan tree ring chronologies show multicentennial growth trends. Climate Dynamics 21: 699-706. Fairbridge, R.W. 2001. Six millennia in Chinese peats, relating to planetary-solar-luniterrestrial periodicities: a comment on Hong, Jiang, Liu, Zhou, Beer, Li, Leng, Hong and Qin. The Holocene 11: 121–122. Ge, Q., Zheng, J., Fang, X., Man, Z., Zhang, X., Zhang, P., and Wang, W.-C. 2003. Winter half-year temperature reconstruction for the middle and lower reaches of the Yellow River and Yangtze River, China, during the past 2000 years. The Holocene 13: 933–940. Ge, Q.S., Zheng, J.-Y., Hao, Z.-X., Shao, X.-M., Wang, W.-C., and Luterbacher, J. 2010. Temperature variation through 2000 years in China: An uncertainty analysis of reconstruction and regional difference. Geophysical Research Letters 37: 10.1029/2009GL041281. Ge, Q.S., Zheng, J.Y., and Liu, J. 2006. Amplitude and rhythm of winter half-year temperature change in eastern China for the past 2000 years. Advances in Climate Change Research 2: 108–112. Gong, G. and Chen, E. 1980. On the variation of the growing season and agriculture. Scientia Atmospherica Sinica 4: 24-29. Hong, Y.T., Jiang, H.B., Liu, T.S., Zhou, L.P., Beer, J., Li, H.D., Leng, X.T., Hong, B. and Qin, X.G. 2000. Response of climate to solar forcing recorded in a 6000-year δ18O time-series of Chinese peat cellulose. The Holocene 10: 1-7. Hong, B., Liu, C.-Q., Lin, Q.-H., Yasuyuki, S., Leng, X.-T., Wang, Y., Zhu, Y.-X., and Hong, Y.-T. 2009. Temperature evolution from the δ18O record of Hani peat, Northeast China, in the last 14000 years. Science in China Series D: Earth Sciences 52: 952–964. Liu, J., Storch, H., Chen, X., Zorita, E., Zheng, J., and Wang, S. 2005. Simulated and reconstructed winter temperature in the eastern China during the last millennium. Chinese Science Bulletin 50: 2872–2877. Liu, Y., An, Z.S., Linderholm, H.W., Chen, D.L., Song, M.H., Cai, Q.F., Sun, J.S. and Tian, H. 2009. Annual temperatures during the last 2485 years in the mid-eastern Tibetan Plateau inferred from tree rings. Science in China Series D Earth Science 52: 348-359. Ma, Z., Li, H., Xia, M., Ku, T., Peng, Z., Chen, Y. and Zhang, Z. 2003. Paleo-temperature changes over the past 3000 years in eastern Beijing, China: A reconstruction based on Mg/Sr records in a stalagmite. Chinese Science Bulletin 48: 395-400. Man, M.Z. 1998. Climate in Tang Dynasty of China: discussion for its evidence. Quaternary Sciences 1: 20-30. Man, Z. 1990. Study on the cold/warm stages of Tang Dynasty and the characteristics of each cold/warm stage. Historical Geography 8: 1-15. Man, Z. 2004. Climate Change in Historical Period of China. Shandong Education Press, Ji'nan, China.	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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						Paulsen, D.E., Li, H.-C. and Ku, T.-L. 2003. Climate variability in central China over the last 1270 years revealed by high-resolution stalagmite records. Quaternary Science Reviews 22: 691-701. Qian, W. and Zhu, Y. 2002. Little Ice Age climate near Beijing, China, inferred from historical and stalagmite records. Quaternary Research 57: 109-119. Sheng, F. 1990. A preliminary exploration of the warmth and coldness in Henan Province in the historical period. Historical Geography 7: 160-170. Wang, S.W. and Gong, D.Y. 2000. The temperature of several typical periods during the Holocene in China. The Advance in Nature Science 10: 325-332. Wang, L., Rioual, P., Panizzo, V.N., Lu, H., Gu, Z., Chu, G., Yang, D., Han, J., Liu, J. and Mackay, A.W. 2012. A 1000-yr record of environmental change in NE China indicated by diatom assemblages from maar lake Erlongwan. Quaternary Research 78: 24-34. Wen, H. and Wen, H. 1996. Winter-Half-Year Cold/Warm Change in Historical Period of China. Science Press, Beijing, China. Wu, H.Q. and Dang, A.R. 1998. Fluctuation and characteristics of climate change in temperature of Sui-Tang times in China. Quaternary Sciences 1: 31-38. Xu, H., Hong, Y., Lin, Q., Hong, B., Jiang, H. and Zhu, Y. 2002. Temperature variations in the past 6000 years inferred from δ18O of peat cellulose from Hongyuan, China. Chinese Science Bulletin 47: 1578-1584. Yafeng, S., Tandong, Y. and Bao, Y. 1999. Decadal climatic variations recorded in Guliya ice core and comparison with the historical documentary data from East China during the last 2000 years. Science in China Series D-Earth Sciences 42 Supp.: 91-100. Yang, B., Kang, X.C., and Shi, Y.F. 2000. Decadal climatic variations indicated by Dulan tree-ring and comparison with other proxy data in China of the last 2000 years. Chinese Geographical Science 10: 193–201. Yang, B., Braeuning, A., Johnson, K.R. and Yafeng, S. 2002. General characteristics of temperature variation in China during the last two millennia. Geophysical Research Letters 29: 10.1029/2001GL014485. Zhang, D.E. 1994. Evidence for the existence of the Medieval Warm Period in China. Climatic Change 26: 293–297. Zhang, P.Z., Cheng, H., Edwards, R.L., Chen, F.H., Wang, Y.J., Yang, X.L., Liu, J., Tan, M., Wang, X.F., Liu, J.H., An, C.L., Dia, Z.B., Zhou, J., Zhang, D.Z., Jia, J.H., Jin, L.Y., and Johnson, K.R. 2008. A test of climate, sun, and culture relationships from an 1810-year Chinese cave record. Science 322: 940–942. Zhang, Q.-B., Cheng, G., Yao, T., Kang, X. and Huang, J. 2003. A 2,326-year tree-ring record of climate variability on the northeastern Qinghai-Tibetan Plateau. Geophysical Research Letters 30: 10.1029/2003GL017425. Zhou, XJ. 2011. The characteristics and regularities of the climate change over the past millennium in China. Chinese Science Bulletin 56: 2985. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-971	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in Japan are given below. Aono, Y. and Saito, S. 2010. Clarifying springtime temperature reconstructions of the medieval period by gap-filling the cherry blossom phenological data series at Kyoto, Japan. International Journal of Biometeorology 54: 211–219. Billings, W.D. and Bliss, L.C. 1959. An alpine snowbank environment and its effects on vegetation, plant development and productivity. Ecology 40: 388–397. Daimaru, H., Ohtani, Y., Ikeda, S., Okamoto, T., and Kajimoto, T. 2002. Paleoclimatic implication of buried peat layers in a subalpine snowpatch grassland on Mt. Zarumori, northern Japan. Catena 48: 53–65. Kitagawa, H. and Matsumoto, E. 1995. Climate implications of δ13C variations in a Japanese cedar (Cryptomeria japonica) during the last two millennia. Geophysical Research Letters 22: 2155–2158.	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						Kudo, G. 1991. Effects of snow-free period on the phenology of alpine plants inhabiting snow patches. Arctic and Alpine Research 23: 436–443. Sakaguchi, Y. 1983. Warm and cold stages in the past 7600 years in Japan and their global sea level changes and the ancient Japanese history. Bulletin of Department of Geography, University of Tokyo 15: 1–31. Treydte, K.S., Frank, D.C., Saurer, M., Helle, G., Schleser, G.H. and Esper, J. 2009. Impact of climate and CO2 on a millennium-long tree-ring carbon isotope record. Geochimica et Cosmochimica Acta 73: 4635-4647. Yamada, K., Kamite, M., Saito-Kato, M., Okuno, M., Shinozuka, Y., and Yasuda, Y. 2010. Late Holocene monsoonal-climate change inferred from Lakes Ni-no-Megata and San-no-Megata, northeastern Japan. Quaternary International 220: 122–132. Yamanaka, H. 1979. Nivation hollows on the southeast slope of Mt Onishi, Iide Mountains, northeast Japan. Annals of the Tohoku Geographical Association 31: 36–45. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-972	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in Africa are given below. Ambrose, S.H. and DeNiro, M.J. 1989. Climate and habitat reconstruction using stable carbon and nitrogen isotope ratios of collagen in prehistoric herbivore teeth from Kenya. Quaternary Research 31: 407-422. Bond, G., Showers, W., Cheseby, M., Lotti, R., Almasi, P., deMenocal, P., Priore, P., Cullen, H., Hajdas, I., and Bonani, G. 1997. A pervasive millennial-scale cycle in North Atlantic Holocene and Glacial climate. Science 278: 1257–1266. Bond, G., Showers, W., Elliot, M., Evans, M., Lotti, R., Hajdas, I., Bonani, G., and Johnson, S. 1999. The North Atlantic's 1–2 kyr Climate Rhythm: Relation to Heinrich Events, Dansgaard/Oeschger Cycles, and the Little Ice Age. In Mechanisms of Global Climate Change at Millennial Scales, edited by P.U. Clark, R.S. Webb, and L.D. Keigwin, 35–58. Washington, DC: American Geophysical Union. Buntgen, U., Frank, D.C., Nievergelt, D. and Esper, J. 2006. Summer temperature variations in the European Alps, A.D. 755-2004. Journal of Climate 19: 5606-5623. COHMAP Members. 1988. Climatic changes of the last 18,000 years: Observations and model simulations. Science 241: 1043–1052. Delegue, A.M., Fuhr, M., Schwartz, D., Mariotti, A. and Nasi, R. 2001. Recent origin of large part of the forest cover in the Gabon coastal area based on stable carbon isotope data. Oecologia 129: 106-113. DeMenocal, P., Ortiz, J., Guilderson, T., and Sarnthein, M. 2000. Coherent high- and low-latitude climate variability during the Holocene warm period. Science 288: 2198–2202. Elenga, H., Maley, J., Vincens, A. and Farrera, I. 2004. Palaeoenvironments, palaeoclimates and landscape development in Central Equatorial Africa: A review of major terrestrial key sites covering the last 25 kyrs. In: Battarbee, R.W., Gasse, F. and Stickley, C.E. (Eds.) Past Climate Variability through Europe and Africa. Springer, pp. 181-196. Elenga, H., Schwartz, D. and Vincens, A. 1994. Pollen evidence of Late Quaternary vegetation and inferred climate changes in Congo. Palaeogeography, Palaeoclimatology, Palaeoecology 109: 345-356. Elenga, H., Schwartz, D., Vincens, A., Bertraux, J., de Namur, C., Martin, L., Wirrmann, D. and Servant, M. 1996. Diagramme pollinique holocene du Lac Kitina (Congo): mise en evidence de changements paleobotaniques et paleoclimatiques dans le massif forestier du Mayombe. Compte-Rendu de l'Academie des Sciences, Paris, serie 2a: 345-356. Esper, J., Cook, E.R. and Schweingruber, F.H. 2002. Low-frequency signals in long tree-ring chronologies for reconstructing past temperature variability. Science 295: 2250-2253. Esper, J., Frank, D., Buntgen, U., Verstege, A., Luterbacher, J. and Xoplaki, E. 2007. Long-term drought severity variations in Morocco. Geophysical Research Letters 34: 10.1029/2007GL030844. Giresse, P., Maley, J. and Brenac, P. 1994. Late Quaternary palaeoenvironments in Lake Barombi Mbo (West	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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						Cameroon) deduced from pollen and carbon isotopes of organic matter. Palaeogeography, Palaeoclimatology, Palaeoecology 107: 65-78. Gasse, F. and Van Campo, E. 1994. Abrupt post-glacial climate events in West Asia and North Africa monsoon domains. Earth and Planetary Science Letters 126: 435–456. Giresse, P., Maley, J. and Kossoni, A. 2005. Sedimentary environmental changes and millennial climatic variability in a tropical shallow lake (Lake Ossa, Cameroon) during the Holocene. Palaeogeography, Palaeoclimatology, Palaeoecology 218: 257-285. Holmgren, K., Lee-Thorp, J.A., Cooper, G.R.J., Lundblad, K., Partridge, T.C., Scott, L., Sithaldeen, R., Talma, A.S. and Tyson, P.D. 2003. Persistent millennial-scale climatic variability over the past 25,000 years in Southern Africa. Quaternary Science Reviews 22: 2311-2326. Holmgren, K., Tyson, P.D., Moberg, A. and Svanered, O. 2001. A preliminary 3000-year regional temperature reconstruction for South Africa. South African Journal of Science 97: 49-51. Huffman, T.N. 1996. Archaeological evidence for climatic change during the last 2000 years in southern Africa. Quaternary International 33: 55-60. Keigwin, L.D. 1996. The Little Ice Age and Medieval Warm Period in the Sargasso Sea. Science 274: 1504–1507. Kondrashov, D., Feliks, Y. and Ghil, M. 2005. Oscillatory modes of extended Nile River records (A.D. 622-1922). Geophysical Research Letters 32: doi:10.1029/2004 GL022156. Lamb, H., Darbyshire, I. and Verschuren, D. 2003. Vegetation response to rainfall variation and human impact in central Kenya during the past 1100 years. The Holocene 13: 285-292. Maley, J. and Brenac, P. 1998. Vegetation dynamics, paleoenvironments and climatic changes in the forests of western Cameroon during the last 28,000 years B.P. Review of Palaeobotany and Palynology 99: 157-187. Ngomanda, A., Jolly, D., Bentaleb, I., Chepstow-Lusty, A., Makaya, M., Maley, J., Fontugne, M., Oslisly, R. and Rabenkogo, N. 2007. Lowland rainforest response to hydrological changes during the last 1500 years in Gabon, Western Equatorial Africa. Quaternary Research 67: 411-425. Nguetsop, V.F., Servant-Vildary, S. and Servant, M. 2004. Late Holocene climatic changes in west Africa, a high resolution diatom record from equatorial Cameroon. Quaternary Science Reviews 23: 591-609. Nicholson, S.E. 1980. Saharan climates in historic times. In: Williams, M.A.J. and Faure, H. (Eds.) The Sahara and the Nile, Balkema, Rotterdam, The Netherlands, pp. 173-200. Reynaud-Farrera, I., Maley, J. and Wirrmann, D. 1996. Vegetation et climat dans les forets du Sud-Ouest Cameroun depuis 4770 ans B.P.: analyse pollinique des sediments du Lac Ossa. Compte-Rendu de l'Academie des Sciences, Paris, serie 2a 322: 749-755. Tyson, P.D., Karlén, W., Holmgren, K. and Heiss, G.A. 2000. The Little Ice Age and medieval warming in South Africa. South African Journal of Science 96: 121-126. Verschuren, D., Laird, K.R. and Cumming, B.F. 2000. Rainfall and drought in equatorial east Africa during the past 1,100 years. Nature 403: 410-414. Vincens, A., Schwartz, D., Bertaux, J., Elenga, H. and de Namur, C. 1998. Late Holocene climatic changes in Western Equatorial Africa inferred from pollen from Lake Sinnda, Southern Congo. Quaternary Research 50: 34-45. Vincens, A., Schwartz, D., Elenga, H., Reynaud-Farrera, I., Alexandre, A., Bertauz, J., Mariotti, A., Martin, L., Meunier, J.-D., Nguetsop, F., Servant, M., Servant-Vildary, S. and Wirrmann, D. 1999. Forest response to climate changes in Atlantic Equatorial Africa during the last 4000 years BP and inheritance on the modern landscapes. Journal of Biogeography 26: 879-885. Wirrmann, D., Bertaux, J. and Kossoni, A. 2001. Late Holocene paleoclimatic changes in Western Central Africa inferred from mineral abundance in dated sediments from Lake Ossa (Southwest Cameroon). Quaternary Research 56: 275-287. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-973	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling.	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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						Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in South America are given below. Abbott, M.B., Binford, M.W., Brenner, M. and Kelts, K.R. 1997. A 3500 14C yr high resolution record of water-level changes in Lake Titicaca. Quaternary Research 47: 169-180. Binford, M.W., Kolata, A.L, Brenner, M., Janusek, J.W., Seddon, M.T., Abbott, M. and Curtis. J.H. 1997. Climate variation and the rise and fall of an Andean civilization. Quaternary Research 47: 235-248. Bird, B.W., Abbott, M.B., Vuille, M., Rodbell, D.T., Stansell, N.D. and Rosenmeier, M.F. 2011. A 2,300-year-long annually resolved record of the South American summer monsoon from the Peruvian Andes. Proceedings of the National Academy of Sciences USA 108: 8583-8588. Bracco, R., del Puerto, L., Inda, H., Panario, D., Castineira, C. and Garcia-Rodriguez, F. 2011. The relationship between emergence of mound builders in SE Uruguay and climate change inferred from opal phytolith records. Quaternary International 245: 62-73. Brohan, P., Kennedy, J.J., Harris, I., Tett, S.F.B., and Jones, P.D. 2006. Uncertainty estimates in regional and global observed temperature changes: A new data set from 1850. Journal of Geophysical Research 111: 10.1029/2005JD006548. Chepstow-Lusty, A.J., Bennett, K.D., Fjeldsa, J., Kendall, A., Galiano, W. and Herrera, A.T. 1998. Tracing 4,000 years of environmental history in the Cuzco Area, Peru, from the pollen record. Mountain Research and Development 18: 159-172. Chepstow-Lusty, A., Frogley, M.R., Bauer, B.S., Bush, M.B. and Herrera, A.T. 2003. A late Holocene record of arid events from the Cuzco region, Peru. Journal of Quaternary Science 18: 491-502. Chepstow-Lusty, A. and Winfield, M. 2000. Inca agroforestry: Lessons from the past. Ambio 29: 322-328. Cioccale, M.A. 1999. Climatic fluctuations in the Central Region of Argentina in the last 1000 years. Quaternary International 62: 35-47. Eichler, A., Brutsch, S., Olivier, S., Papina, T., and Schwikowski, M. 2009. A 750-year ice core record of past biogenic emissions from Siberian boreal forests. Geophysical Research Letters 36: 10.1029/2009GL038807. Escobar, J., Curtis, J.H., Brenner, M., Hodell, D.A. and Holmes, J.A. 2010. Isotope measurements of single ostracod valves and gastropod shells for climate reconstruction: Evaluation of within-sample variability and determination of optimum sample size. Journal of Paleolimnology 43: 921-938. Figueroa-Rangel, B.L., Willis, K.J. and Olvera-Vargas, M. 2010. Cloud forest dynamics in the Mexican neotropics during the last 1300 years. Global Change Biology 16: 1689-1704. Fletcher, M.-S. and Moreno, P.I. 2012. Vegetation, climate and fire regime changes in the Andean region of southern Chile (38°S) covaried with centennial-scale climate anomalies in the tropical Pacific over the last 1500 years. Quaternary Science Reviews 46: 46-56. Hansen, B.C.S., Seltzer, G.O. and Wright Jr., H.E. 1994. Late Quaternary vegetational change in the central Peruvian Andes. Palaeogeography, Palaeoclimatology, Palaeoecology 109: 263-285. Haug, G.H., Gunther, D., Peterson, L.C., Sigman, D.M., Hughen, K.A. and Aeschlimann, B. 2003. Climate and the collapse of Maya civilization. Science 299: 1731-1735. Haug, G.H., Hughen, K.A., Sigman, D.M., Peterson, L.C. and Rohl, U. 2001. Southward migration of the intertropical convergence zone through the Holocene. Science 293: 1304-1308. Jenny, B., Valero-Garces, B.L., Urrutia, R., Kelts, K., Veit, H., Appleby, P.G. and Geyh, M. 2002. Moisture changes and fluctuations of the Westerlies in Mediterranean Central Chile during the last 2000 years: The Laguna Aculeo record (33°50'S). Quaternary International 87: 3-18. Kang, S.C., Mayewski, P.A., Qin, D., Yan, Y., Zhang, D., Hou, S., and Ren, J. 2002. Twentieth century increase of atmospheric ammonia recorded in Mount Everest ice core. Journal of Geophysical Research 107: 10.1029/2001JD001413. Kellerhals, T., Brutsch, S., Sigl, M., Knusel, S., Gaggeler, H.W., and Schwikowski, M. 2010. Ammonium concentration in ice cores: A new proxy for regional temperature reconstruction? Journal of Geophysical Research 115: 10.1029/2009JD012603. Magillian, F.J. and Goldstein, P.S. 2001. El Niño floods and culture change: A late Holocene flood history for the Rio Moquegua, southern Peru. Geology 29: 431-434. Mauquoy, D., Blaauw, M., van Geel, B., Borromei, A., Quattrocchio, M., Chambers, F.M. and Possnert, G. 2004. Late Holocene climatic changes in Tierra del Fuego based on multiproxy analyses of peat deposits. Quaternary Research 61: 148-158. McDermott, F., Mattey, D.P. and Hawkesworth, C. 2001. Centennial-scale Holocene climate variability	

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						revealed by a high-resolution speleothem δ18O record from SW Ireland. Science 294: 1328-1331. Neukom, R., Luterbacher, J., Villalba, R., Kuttel, M., Frank, D., Jones, P.D., Grosjean, M., Wanner, H., Aravena, J.-C., Black, D.E., Christie, D.A., D'Arrigo, R., Lara, A., Morales, M., Soliz-Gamboa, C., Srur, A., Urritia, R. and von Gunten, L. 2011. Multiproxy summer and winter surface air temperature field reconstructions for southern South America covering the past centuries. Climate Dynamics 37: 35-51. Rebolledo, L., Sepulveda, J., Lange, C.B., Pantoja, S., Bertrand, S., Hughen, K., and Figueroa, D. 2008. Late Holocene marine productivity changes in Northern Patagonia-Chile inferred from a multi-proxy analysis of Jacaf channel sediments. Estuarine, Coastal and Shelf Science 80: 314–322. Rein, B., Luckge, A. and Sirocko, F. 2004. A major Holocene ENSO anomaly during the Medieval period. Geophysical Research Letters 31: 10.1029/2004GL020161. Seltzer, G. and Hastorf, C. 1990. Climatic change and its effect on Prehispanic agriculture in the central Peruvian Andes. Journal of Field Archaeology 17: 397-414. Sepulveda, J., Pantoja, S., Hughen, K.A., Bertrand, S., Figueroa, D., Leon, T., Drenzek, N.J., and Lange, C. 2009. Late Holocene sea-surface temperature and precipitation variability in northern Patagonia, Chile (Jacaf Fjord, 44°S). Quaternary Research 72: 400–409. Thompson, L.G., Mosley-Thompson, E., Dansgaard, W. and Grootes, P.M. 1986. The Little Ice Age as recorded in the stratigraphy of the tropical Quelccaya ice cap. Science 234: 361-364. Thompson, L.G., Davis, M.E., Mosley-Thompson, E. and Liu, K.-B. 1988. Pre-Incan agricultural activity recorded in dust layers in two tropical ice cores. Nature 307: 763-765. Villalba, R. 1994. Tree-ring and glacial evidence for the Medieval Warm Epoch and the 'Little Ice Age' in southern South America. Climatic Change 26: 183-197. von Gunten, L., Grosjean, M., Rein, B., Urrutia, R. and Appleby, P. 2009. A quantitative high-resolution summer temperature reconstruction based on sedimentary pigments from Laguna Aculeo, central Chile, back to AD 850. The Holocene 19: 873-881 Webster, D. 2002. The Fall of the Ancient Maya. Thames and Hudson, London, UK. Wells, L.E. 1990. Holocene history of the El Niño phenomenon as recorded in flood sediments of northern coastal Peru. Geology 18: 1134-1137. Wright Jr., H.E. 1984. Late glacial and Late Holocene moraines in the Cerros Cuchpanga, central Peru. Quaternary Research 21: 275-285. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-974	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period in Antarctica are given below. Bertler, N.A.N., Mayewski, P.A. and Carter, L. 2011. Cold conditions in Antarctica during the Little Ice Age -- Implications for abrupt climate change mechanisms. Earth and Planetary Science Letters 308: 41-51. Budner, D. and Cole-Dai, J. 2003. The number and magnitude of large explosive volcanic eruptions between 904 and 1865 A.D.: Quantitative evidence from a new South Pole ice core. In: Robock, A. and Oppenheimer, C. (Eds.) Volcanism and the Earth's Atmosphere, Geophysics Monograph Series 139: 165-176. Caillon, N., Severinghaus, J.P., Jouzel, J., Barnola, J.-M., Kang, J. and Lipenkov, V.Y. 2003. Timing of atmospheric CO2 and Antarctic temperature changes across Termination III. Science 299: 1728-1731. Castellano, E., Becagli, S., Hansson, M., Hutterli, M., Petit, J.R., Rampino, M.R., Severi, M., Steffensen, J.P., Traversi, R. and Udisti, R. 2005. Holocene volcanic history as recorded in the sulfate stratigraphy of the European Project for Ice Coring in Antarctica Dome C (EDC96) ice core. Journal of Geophysical Research 110: 10.1029/JD005259. Comiso, J.C. 2000. Variability and trends in Antarctic surface temperatures from in situ and satellite infrared measurements. Journal of Climate 13: 1674-1696. Cook, A.J. and Vaughan, D. 2009. Overview of areal changes of the ice shelves on the Antarctic Peninsula over the past 50 years. The Cryosphere Discussions 3: 579–630.	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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						Cook, E., Palmer, J., and D'Arrigo, R. 2002. Evidence for a Medieval Warm Period in a 1100-year tree-ring reconstruction of past austral summer temperatures in New Zealand. Geophysical Research Letters 29: 10.1029/2001GL014580. Domack, E.W., Leventer, A., Dunbar, R., Taylor, F., Brachfeld, S. and Sjunneskog, C. 2000. Chronology of the Palmer Deep site, Antarctic Peninsula: A Holocene palaeoenvironmental reference for the circum-Antarctic. The Holocene 11: 1-9. Doran, P.T., Priscu, J.C., Lyons, W.B., Walsh, J.E., Fountain, A.G., McKnight, D.M., Moorhead, D.L., Virginia, R.A., Wall, D.H., Clow, G.D., Fritsen, C.H., McKay, C.P. and Parsons, A.N. 2002. Antarctic climate cooling and terrestrial ecosystem response. Nature advance online publication, 13 January 2002 (DOI 10.1038/nature710). Goosse, H., Masson-Delmotte, V., Renssen, H., Delmotte, M., Fichefet, T., Morgan, V., van Ommen, T., Khim, B.K. and Stenni, B. 2004. A late medieval warm period in the Southern Ocean as a delayed response to external forcing. Geophysical Research Letters 31: 10.1029/2003GL019140. Hall, B. 2007. Late-Holocene advance of the Collins Ice Cap, King George Island, South Shetland Islands. The Holocene 17: 1253–1258. Hall, B.L. and Denton, G.H. 1999. New relative sea-level curves for the southern Scott Coast, Antarctica: evidence for Holocene deglaciation of the western Ross Sea. Journal of Quaternary Science 14: 641-650. Hall, B.L. and Denton, G.H. 2002. Holocene history of the Wilson Piedmont Glacier along the southern Scott Coast, Antarctica. The Holocene 12: 619-627. Hall, B.L., Hoelzel, A.R., Baroni, C., Denton, G.H., Le Boeuf, B.J., Overturf, B. and Topf, A.L. 2006. Holocene elephant seal distribution implies warmer-than-present climate in the Ross Sea. Proceedings of the National Academy of Sciences USA 103: 10,213-10,217. Hall, B.L., Koffman, T., and Denton, G.H. 2010. Reduced ice extent on the western Antarctic Peninsula at 700–907 cal. yr B.P. Geology 38: 635–638. Hemer, M.A. and Harris, P.T. 2003. Sediment core from beneath the Amery Ice Shelf, East Antarctica, suggests mid-Holocene ice-shelf retreat. Geology 31: 127-130. Indermuhle, A., Monnin, E., Stauffer, B. and Stocker, T.F. 2000. Atmospheric CO2 concentration from 60 to 20 kyr BP from the Taylor Dome ice core, Antarctica. Geophysical Research Letters 27: 735-738. Khalil, M.A.K. and Rasmussen, R.A. 1999. Atmospheric methyl chloride. Atmospheric Environment 33: 1305-1321. Khim, B-K., Yoon, H.I., Kang, C.Y. and Bahk, J.J. 2002. Unstable climate oscillations during the Late Holocene in the Eastern Bransfield Basin, Antarctic Peninsula. Quaternary Research 58: 234-245. Krinner, G. and Genthon, C. 1998. GCM simulations of the Last Glacial Maximum surface climate of Greenland and Antarctica. Climate Dynamics 14: 741-758. Kwok, R. and Comiso, J.C. 2002. Spatial patterns of variability in Antarctic surface temperature: Connections to the South Hemisphere Annular Mode and the SouthernOscillation. Geophysical Research Letters 29: 10.1029/2002GL015415. Lamb, H.H. 1965. The early medieval warm epoch and its sequel. Palaeogeography, Palaeoclimatology, Palaeoecology 1: 13-37. Leventer, A. and Dunbar, R.B. 1988. Recent diatom record of McMurdo Sound, Antarctica: Implications for the history of sea-ice extent. Paleoceanography 3: 373-386. Leventer, A., Domack, E.W., Ishman, S.E., Brachfeld, S., McClennen, C.E. and Manley, P. 1996. Productivity cycles of 200-300 years in the Antarctic Peninsula region: Understanding linkage among the sun, atmosphere, oceans, sea ice, and biota. Geological Society of America Bulletin 108: 1626-1644. Lu, Z., Rickaby, R.E.M., Kennedy, H., Kennedy, P., Pancost, R.D., Shaw, S., Lennie, A., Wellner, J. and Anderson, J.B. 2012. An ikaite record of late Holocene climate at the Antarctic Peninsula. Earth and Planetary Science Letters 325-326: 108-115. McDermott, F., Mattey, D.P. and Hawkesworth, C. 2001. Centennial-scale Holocene climate variability revealed by a high-resolution speleothem ð18O record from SW Ireland. Science 294: 1328-1331. Monnin, E., Indermühle, A., Dällenbach, A., Flückiger, J., Stauffer, B., Stocker, T.F., Raynaud, D. and Barnola, J.-M. 2001. Atmospheric CO2 concentrations over the last glacial termination. Nature 291: 112-114. Näslund, J.O., Fastook, J.L and Holmlund, P. 2000. Numerical modeling of the ice sheet in western Dronning Maud Land, East Antarctica: impacts of present, past andfuture climates. Journal of Glaciology 46: 54-66. Noon, P.E., Leng, M.J. and Jones, V.J. 2003. Oxygen isotope (ð18O) evidence of Holocene hydrological	

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						changes at Signy Island, maritime Antarctica. The Holocene 13: 251-263. Petit, J.R., Jouzel, J., Raynaud, D., Barkov, N.I., Barnola, J.-M., Basile, I., Bender, M., Chappellaz, J., Davis, M., Delaygue, G., Delmotte, M., Kotlyakov, V.M., Legrand, M., Lipenkov, V.Y., Lorius, C., Pepin, L., Ritz, C., Saltzman, E. and Stievenard, M. 1999. Climate and atmospheric history of the past 420,000 years from the Vostok ice core, Antarctica. Nature 399: 429-436. Schaefer, J., Denton, G., Kaplan, M., Putnam, A., Finkel, R., Barrell, D.J.A., Andersen, B.G., Schwartz, R., Mackintosh, A., Chinn, T., and Schluchter, C. 2009. High-frequency Holocene glacier fluctuations in New Zealand differ from the northern signature. Science 324: 622–625. Smith, R.C., Ainley, D., Baker, K., Domack, E., Emslie, S., Fraser, B., Kennett, J., Leventer, A., Mosley-Thompson, E., Stammerjohn, S. and Vernet M. 1999. Marine ecosystem sensitivity to climate change. BioScience 49: 393-404. Strelin, J., Casassa, G., Rosqvist, G., and Holmlund, P. 2008. Holocene glaciations in the Ema Glacier valley, Monte Sarmiento Massif, Tierra del Fuego. Palaeogeography, Palaeoclimatology, Palaeoecology 260: 299–314. Sun, L., Xie, Z. and Zhao, J. 2000. A 3,000-year record of penguin populations. Nature 407: 858. Thompson, D.W.J. and Solomon, S. 2002. Interpretation of recent Southern Hemisphere climate change. Science 296: 895-899. Thompson, D.W.J. and Wallace, J.M. 2000. Annular modes in extratropical circulation, Part II: Trends. Journal of Climate 13: 1018-1036. Williams, M.B., Aydin, M., Tatum, C. and Saltzman, E.S. 2007. A 2000 year atmospheric history of methyl chloride from a South Pole ice core: Evidence for climate-controlled variability. Geophysical Research Letters 34: 10.1029/2006GL029142. Yoshida, Y., Wang, Y.H., Zeng, T. and Yantosea, R. 2004. A three-dimensional global model study of atmospheric methyl chloride budget and distributions. Journal of Geophysical Research 109: 10.1029/2004JD004951. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-975	SPM	6	41	6	48	To restore lost credibility, the IPCC must make a less partisan and more impartial appraisal of the extensive peer-reviewed literature from all parts of the world establishing by a variety of proxy temperature reconstructions that the medieval warm period was real, was global, and was warmer than the present. In this and succeeding comments, some 450 papers inconsistent with the IPCC's current draft are presented. Reason: The IPCC's conclusion that today's temperatures are greater than those of the medieval warm period is inconsistent with the preponderance of the published literature on temperature proxies and relies too heavily on modeling. Examples: Some papers indicating the reality, extent, and magnitude of the medieval warm period worldwide during the "Little Medieval Warm Period" are given below. Baedke, S.J. and Thompson, T.A. 2000. A 4700-year record of lake level and isostasy for Lake Michigan. Journal of Great Lakes Research 26: 416–426. Barron, J.A. and Bukry, D. 2007. Solar forcing of Gulf of California climate during the past 2000 yr suggested by diatoms and silicoflagellates. Marine Micropaleontology 62: 115–139. Bartholy, J., Pongracz, R., and Molnar, Z. 2004. Classification and analysis of past climate information based on historical documentary sources for the Carpathian Basin. International Journal of Climatology 24: 1759–1776. Black, D.E., Abahazi, M.A., Thunell, R.C., Kaplan, A., Tappa, E.J., and Peterson, L.C. 2007. An 8-century tropical Atlantic SST record from the Cariaco Basin: Baseline variability, twentieth-century warming, and Atlantic hurricane frequency. Paleoceanography 22: 10.1029/2007PA001427. Blundell, A. and Barber, K. 2005. A 2800-year palaeoclimatic record from Tore Hill Moss, Strathspey, Scotland: the need for a multi-proxy approach to peat-based climate reconstructions. Quaternary Science Reviews 24: 1261–1277. Büntgen, U., Esper, J., Frank, D.C., Nicolussi, K., and Schmidhalter, M. 2005. A 1052-year tree-ring proxy for Alpine summer temperatures. Climate Dynamics 25: 141–153. Cage, A.G. and Austin, W.E.N. 2008. Seasonal dynamics of coastal water masses in a Scottish fjord and their potential influence on benthic foraminiferal shell geochemistry. In: Austin, Cage, A.G. and Austin, W.E.N. 2010. Marine climate variability during the last millennium: The Loch Sunart record, Scotland, UK. Quaternary Science Reviews: 10.1016/j.quascirev.2010.01.014.	Noted. The statement in the SPM is fully based on the comprehensive and robust assessment of the scientific literature provided in the underlying report, in particular Chapter 5. We do appreciate the reviewer providing his non-comprehensive list of papers.

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						Carrara, P.E., Trimble, D.A., and Rubin, M. 1991. Holocene treeline fluctuations in the northern San Juan Mountains, Colorado, U.S.A., as indicated by radiocarbon-dated conifer wood. Arctic and Alpine Research 23: 233–246. Chen, J., Wan, G., Zhang, D.D., Chen, Z., Xu, J., Xiao, T., and Huang, R. 2005. The 'Little Ice Age' recorded by sediment chemistry in Lake Erhai, southwest China. The Holocene 15: 925–931. Chuine, I., Yiou, P., Viovy, N., Seguin, B., Daux, V., and Le Roy Ladurie, E. 2004. Grape ripening as a past climate indicator. Nature 432: 289–290. D'Arrigo, R., Mashig, E., Frank, D., Jacoby, G., and Wilson, R. 2004. Reconstructed warm season temperatures for Nome, Seward Peninsula, Alaska. Geophysical Research Letters 31: 10.1029/2004GL019756. D'Arrigo, R., Mashig, E., Frank, D., Wilson, R., and Jacoby, G. 2005. Temperature variability over the past millennium inferred from Northwestern Alaska tree rings. Climate Dynamics 24: 227–236. Dean, J.S. 1994. The Medieval Warm Period on the southern Colorado Plateau. Climatic Change 25: 225–241. Eronen, M., Zetterberg, P., Briffa, K.R., Lindholm, M., Merilainen, J., and Timonen, M. 2002. The supra-long Scots pine tree-ring record for Finnish Lapland: Part 1, chronology construction and initial inferences. The Holocene 12: 673–680. Fleitmann, D., Burns, S.J., Neff, U., Mudelsee, M., Mangini, A., and Matter, A. 2004. Palaeoclimatic interpretation of high-resolution oxygen isotope profiles derived from annually laminated speleothems from Southern Oman. Quaternary Science Reviews 23: 935–945. Gray, S.T., Graumlich, L.J., Betancourt, J.L., and Pederson, G.T. 2004. A tree-ring based reconstruction of the Atlantic Multidecadal Oscillation since 1567 A.D. Geophysical Research Letters 31: 10.1029/2004GL019932. Helama, S., Lindholm, M., Timonen, M., Merilainen, J., and Eronen, M. 2002. The supra-long Scots pine tree-ring record for Finnish Lapland: Part 2, interannual to centennial variability in summer temperatures for 7500 years. The Holocene 12: 681–687. Holmgren, K., Karlen, W., Lauritzen, S.E., Lee-Thorp, J.A., Partridge, T.C., Piketh, S., Repinski, P., Stevenson, C., Svanered, O., and Tyson, P.D. 1999. A 3000-year high-resolution stalagmite-based record of paleoclimate for northeastern South Africa. The Holocene 9: 295–309. Holmgren, K., Tyson, P.D., Moberg, A., and Svanered, O. 2001. A preliminary 3000-year regional temperature reconstruction for South Africa. South African Journal of Science 99: 49–51. Holzhauser, H., Magny, M., and Zumbuhl, H.J. 2005. Glacier and lake-level variations in west-central Europe over the last 3500 years. The Holocene 15: 789–801. Keigwin, L.D. 1996. The Little Ice Age and Medieval Warm Period in the Sargasso Sea. Science 274: 1504–1508. Ku, T.L. and Li, H.C. 1998. Speleothems as high-resolution paleoenvironment archives: Records from northeastern China. Proceedings of the Indian Academy of Science (Earth and Planetary Science) 107: 321–330. Loehle, C. 2004. Climate change: detection and attribution of trends from long-term geologic data. Ecological Modelling 171: 433–450. Luckman, B.H. and Wilson, R.J.S. 2005. Summer temperatures in the Canadian Rockies during the last millennium: a revised record. Climate Dynamics 24: 131–144. Meyer, G.A., Wells, S.G., and Jull, A.J.T. 1995. Fire and alluvial chronology in Yellowstone National Park: climatic and intrinsic controls on Holocene geomorphic processes. Geological Society of America Bulletin 107: 1211–1230. Munroe, J.S. 2003. Estimates of Little Ice Age climate inferred through historical rephotography, Northern Uinta Mountains, U.S.A. Arctic and Alpine Research 35: 489–498. O'Neil, J.R., Clayton, R.N., and Mayeda, T. 1969. Oxygen isotope fractionation in divalent metal carbonates. Journal of Chemical Physics 51: 5547–5558. Pederson, J.L. 2000. Holocene paleolakes of Lake Canyon, Colorado Plateau: paleoclimate and landscape response from sedimentology and allostratigraphy. Geological Society of America Bulletin 112: 147–158. Petersen, K.L. 1994. A warm and wet Little Climatic Optimum and a cold and dry Little Ice Age in the southern Rocky Mountains, U.S.A. Climatic Change 26: 243–269. Pla, S. and Catalan, J. 2005. Chrysophyte cysts from lake sediments reveal the submillennial winter/spring climate variability in the northwestern Mediterranean region throughout the Holocene. Climate Dynamics 24: 263–278.	

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						Richey, J.N., Poore, R.Z., Flower, B.P., and Quinn, T.M. 2007. 1400 yr multiproxy record of climate variability from the northern Gulf of Mexico. Geology 35: 423–426. Richey, J.N., Poore, R.Z., Flower, B.P., Quinn, T.M., and Hollander, D.J. 2009. Regionally coherent Little Ice Age cooling in the Atlantic Warm Pool. Geophysical Research Letters 36: 10.1029/2009GL040445. Saenger, C., Cohen, A.L., Oppo, D.W., Halley, R.B., and Carilli, J.E. 2009 . Surface-temperature trends and variability in the low-latitude North Atlantic since 1552. Nature Geoscience 2: 492–495. Sharma, S., Mora, G., Johnston, J.W., and Thompson, T.A. 2005. Stable isotope ratios in swale sequences of Lake Superior as indicators of climate and lake level fluctuations during the Late Holocene. Quaternary Science Reviews 24: 1941–1951. Siklosy, Z., Demeny, A., Szenthe, I., Leel-Ossy, S., Pilet, S., Lin, Y., and Shen, C.-C. 2009. Reconstruction of climate variation for the last millennium in the Bukk Mountains, northeast Hungary, from a stalagmite record. Quarterly Journal of the Hungarian Meteorological Service 113: 245–263. Silenzi, S., Antonioli, F., and Chemello, R. 2004. A new marker for sea surface temperature trend during the last centuries in temperate areas: Vermetid reef. Global and Planetary Change 40: 105–114. Tinner, W., Lotter, A.F., Ammann, B., Condera, M., Hubschmied, P., van Leeuwan, J.F.N., and Wehrli, M. 2003. Climatic change and contemporaneous land-use phases north and south of the Alps 2300 BC to AD 800. Quaternary Science Reviews 22: 1447–1460. Weckstrom, J., Korhola, A., Erasto, P., and Holmstrom, L. 2006. Temperature patterns over the past eight centuries in Northern Fennoscandia inferred from sedimentary diatoms. Quaternary Research 66: 78–86. Yang, B., Kang, X., Brauning, A., Liu, J., Qin, C., and Liu, J. 2010. A 622-year regional temperature history of southeast Tibet derived from tree rings. The Holocene 20: 181–190. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-976	SPM	6	42	6	45	It will be confusing for policy makers to reads consecutive sentences referring the same temperature record using the terms "very likely" and "medium confidence". This also highlights the importance of a box in the SPM that explains how confidence and uncertainty are addressed. [Government of Canada]	Statements are consistent with use of the uncertainty language. See footnotes 1 and 2 for improved explanation of the confidence and uncertainty terminology.
SPM-977	SPM	6	42	6	46	When reading it, the first bullet starting with "medium confidence" over the past 1300 years tends to weaken the" likely" statement of the past 800 years in the orange box (page 6, lines 42). It may even appear as a contradiction, if care is not taken enough of the different time periods. This is due to the separation of these 2 sentences in 2 different bullets and does appear so in the Chap 5 executive summary. Either add also to "was also the warmest 30 year period of the last 1300 years" or put this sentence at the end of the bullet to ease understanding. [SYLVIE JOUSSAUME, France]	Statements now appear together in the opening shaded box to the section "atmosphere".
SPM-978	SPM	6	43	6	46	The time period 'last 800 years' at the highlighted statement in line 43 is not mentioned in the statement at lines 45-48. Only a statement on the warmest 30-year period (although with medium confidence) in the last 1300 years is made. So the high-lighted conclusion at lines 41-43 is not completely covered in the subsequent statements. [Government of Netherlands]	statements have now been merged into the corresponding section on observed changes in the Atmosphere.
SPM-979	SPM	6	45	6	46	There is medium confidence that in the Northern Hemisphere 1981–2010 was the warmest 30-year period of the last 1300 years.' Suggest to assign a likelihood statement to this 'medium confidence'. If so, it would e possible to compare this with the 'very likely' in the previous paragraph. [Line van Kesteren, the Netherlands]	statement has been revised.
SPM-980	SPM	6	45	6	48	For the intended audience there may be benefit to defining 'Common Era' where the CE abbreviation is used. [Government of United Kingdom of Great Britain & Northern Ireland]	This terminology has been removed from the revised SPM
SPM-981	SPM	6	45	6	48	Should the Little Ice Age also be mentioned in this paragraph? [Government of United Kingdom of Great Britain & Northern Ireland]	Not considered crucial to have this information elevated to the SPM. See chapter 5 for these details.
SPM-982	SPM	6	45	6	48	This is very difficult for me to understand [Ingeborg Levin, Germany]	statement has been revised.
SPM-983	SPM	6	45	6	48	The Medieval Climate Anomaly is discussed. For PMs, it might be useful to have a brief footnote stating the causes of this Anomaly. [herman sievering, United States of America]	statement has been revised.
SPM-984	SPM	6	45			Although the medieval climate anomaly is mentioned, there is no mention of the subsequent greater and more extreme climate anomaly: the little ice age. Please provide a descripton of this cold climatic extreme. [Andrejs	Not considered crucial to have this information elevated to the SPM. See chapter 5 for these details.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						Vanags, United States of America]	
SPM-985	SPM	6	46	6	47	This is an inappropriate level of detail for an SPM; policy-makers don't need a tutorial about historical climate. Better to say something like "The widespread temperature increase of the late 20st century is unique in the last x00 years" [Government of United Kingdom of Great Britain & Northern Ireland]	We believe this level of detail is important on a topic that has previously led to considerable debate
SPM-986	SPM	6	46	6	47	The statement of 'high confidence' in 'inconsistent' changes is scientifically meaningless and should be removed. [Paul Matthews, United Kingdom]	statement has been revised.
SPM-987	SPM	6	46	6	48	Its should be explained in this section that Northern Hemisphere represents a temperature average that is hemispheric in its extent. This allows the explanation of the Medieval Climate Anomaly to be understandable. Suggest expand point to clarify seasonality and spatial extent of warming in comparison to the 20th century more clearly. Further, the intent of the message ('we are confident that there is inconsistency') is confusing. The sentence needs to be inverted and related more directly back to lines 45-46 or alternatively the whole dot point needs to be re-ordered and re-written. This point is regularly confused in the public discourse and wording here should be entirely unambiguous. [Government of Australia]	statement has been revised.
SPM-988	SPM	6	46	6	48	It is not easy to understand the message in this sentence. [Government of Finland]	statement has been revised.
SPM-989	SPM	6	46	6	48	This discussion of the Medieval Climate Anomaly refers to temperature changes being "inconsistent" across seasons and regions. I suggest "inconsistent" is not the right word. Perhaps "shows temperature changes varied across regions and seasons, in contrast to the widespread temperature increase of the late 20th century" would be better. [David Wratt, New Zealand]	statement has been revised.
SPM-990	SPM	6	46			As a non-expert in this area, I'm used to "Mediaeval Warm Period" or "Mediaeval Warm Anomaly". Obviously these terms are misleading in that we now know it wasn't that warm, but it might be clearer for policy-makers no better informed than me to add something like "(sometimes called Mediaeval Warm Period)". [William Ingram, United Kingdom]	Terminology is defined in the glossary to the WGI AR5.
SPM-991	SPM	6	47	6	47	Given the uncertainties in the proxies I don't think this level of detail is warranted. [Marcel Crok, The Netherlands]	Statement is consistent with the comprehensive assessment provided by chapter 5.
SPM-992	SPM	6	47	6	47	Wording could be misleading: "inconsistent temperature changes"? inconsistent with what? Maybe use "irregular" instead. [Government of Germany]	statement has been revised.
SPM-993	SPM	6	47	6	47	It is not explained what is meant by 'inconsistent temperature changes across seasons and regions' and what implications this has for the discussions on the widespread temperature increase of the late 20th century. [Government of Netherlands]	statement has been revised.
SPM-994	SPM	6	47	6	47	Explain what CE means, or use a different abbreviation [Government of NORWAY]	This terminology has been removed from the revised SPM
SPM-995	SPM	6	47			The term "inconsistent" may connote unreliability, hence the authors should consider replacing this with language that conveys in a neutral way the concept that temperature anomalies were not spatially coherent. [Government of United States of America]	statement has been revised.
SPM-996	SPM	6	48	6	48	"late 20st century" should be "late 20th century" (typo) [Government of Japan]	copy edit
SPM-997	SPM	6	48	6	48	A statement at the end of this bullet on past extremes such as megadroughts and floods would important (chap 5, page 4, lines 47-55). [SYLVIE JOUSSAUME, France]	In considering the full range of reviewer comments, and the need to keep the SPM as concise as possible, the proposed additional statements have not been added.
SPM-998	SPM	6	48			For 20st read 20th [Government of Denmark]	copy edit
SPM-999	SPM	6	48			Typo: not "20st century", but "20th century" [Government of New Zealand]	copy edit
SPM-1000	SPM	6	49	6	49	Comment pertaining to Footnote 6 (immedaitely after line 49). The text seems to imply that CO2 is the only way we can get a Pg of carbon. Of course, there is methane, etc. Perhaps reword something like '… 3.76 GtCO2 converts to …'. (The conversion presented in this manner appears in a number of places in the	Noted.

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						Assesment (eg. Footnote 5 on page TS-14).) [Ian Simmonds, Australia]	
SPM-1001	SPM	6	50			Both footnotes are appropriate. Might also give conversion: An increase in atmospheric CO2 mixing ratio of 1 ppm corresponds approximately to an increase of 2.12 PgC, although Michael Prather objects to this: Prather, M. J., C. D. Holmes, and J. Hsu (2012), Reactive greenhouse gas scenarios: Systematic exploration of uncertainties and the role of atmospheric chemistry, Geophys. Res. Lett., 39, L09803, doi:10.1029/2012GL051440. [Stephen E Schwartz, United States of America]	Noted.
SPM-1002	SPM	6				Figure SPM.2: I recommend to avoid background color (see also Figure SPM.1) and to omit one x-axis. Second panel: The reference of the y-axes to the corresponding time-series should visually be enhanced. [Oliver Stebler, Switzerland]	noted, all figures have been considerably revised.
SPM-1003	SPM	7	1	7	2	The statement that "near-global recession of glacier length is unusual in the context of the last two millenia" is contrary to direct physical evidence shown by glacial moraines that indicate ice fluctuation back and forth over this time period. [Don Easterbrook, United States of America]	Reject - This is exactly the point that the statement is making! *In contrary to what we are now seeing, there is no "near-global recession" seen from the paleo evidence. In any case, this sentence has been removed from the SPM in response to other comments and restructuring.
SPM-1004	SPM	7	1	7	2	Can we define what is meant here by unusual, i.e. which direction is it unusual? [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been removed from the SPM
SPM-1005	SPM	7	1	7	5	The language in this point is difficult to interpret. Early to mid Holocene needs to be defined and the phrase 'astronomically driven trends of summer insolation' is technical and should be re-phrased using plain English. [Government of Australia]	statement has been removed from the SPM
SPM-1006	SPM	7	1	7	5	Suggest revising this paragraph to clarify the message. The first sentence is unclear. What is consistent with reconstructed surface-temperature anomalies? Can the message here be made clearer (i.e., that the unusual retreat of glaciers is consistent with the unusual recent warming)? The second sentence will also not be understood by most readers. [Government of Canada]	statement has been removed from the SPM
SPM-1007	SPM	7	1	7	5	We propose that you explain closer the relation between current day glacier retreat and reconstruced surface temperatures anomalies and astronomically driven trends in summer insolation and temperatures. It is unclear to us what "consistent" means in this context. [Government of NORWAY]	statement has been removed from the SPM
SPM-1008	SPM	7	1	7	5	The use of glacier length recession is of debatable value, as it is the volume or mass of the ice contained that is more important - this is particularly the case for mountain glaciers where snout recession or apparent surging can be very misleading in terms of the amount of ice stored. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been removed from the SPM
SPM-1009	SPM	7	1	7	18	It would be helpful to put these findings into context. Providing statements such as glaciers are larger now than in the mid-Holocene suggest there is nothing to worry about. The statement on the rate of sea level change is helpful to understand the paleoclimate findings. [Kristie Ebi, United States of America]	statement has been removed from the SPM
SPM-1010	SPM	7	1	7	18	More unreliable estimates from biased experts plus more absence of a geological perspective [Vincent Gray, New Zealand]	Reviewer fails to provide a substantive basis for his claims.
SPM-1011	SPM	7	2	7	5	We don't understand this sentence fully. What is the intention? Which astronomically driven trends are meant? [Government of Germany]	statement has been removed from the SPM
SPM-1012	SPM	7	2	7	5	For the intended audience there may be benefit to defining early - mid Holocene. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been removed from the SPM
SPM-1013	SPM	7	2	7	5	How this is consistent with astronomical trends could be clarified here. i.e. what would be expected from these trends. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been removed from the SPM
SPM-1014	SPM	7	2	7	5	Delete"...consistent with...." to end. This is an unnecessary level of detail [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been removed from the SPM

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SPM-1015	SPM	7	3	7	3	It may be useful to include a timescale for the early to mid-Holocene to guide the reader. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been removed from the SPM
SPM-1016	SPM	7	3	7	3	Many policy makers likely ignore the word holocene. Give dates or relate to last deglaciation. [Michel Petit, France]	statement has been removed from the SPM
SPM-1017	SPM	7	3	7	5	This sentence is confusing; we read it as if gletcher size is consistent with astronomically driven trends. How does that compare with the above statement that glacier recession is unusual, and the how does it compare with SPM-11 line 6-7 that human influences are the like cause for reduction in glaciers? [Government of Denmark]	statement has been removed from the SPM
SPM-1018	SPM	7	3	7	5	To make this statement on the early-to-mid Holocene more informative to policy makers, it should be given more explanation (e.g. giving more climate information on this period (drier climate etc.), and explaining what is meant with the consistency with trends of summer insulation and temperatures, in relation also to the effects of anthropogenic indices climate change in the present era). See also next comment on lines 8-11. [Government of Netherlands]	statement has been removed from the SPM
SPM-1019	SPM	7	3			it may be useful to give an estimate in years, instead/as well as "early-to-mid Holocene" [Conor Sweeney, Ireland]	statement has been removed from the SPM
SPM-1020	SPM	7	4	7	4	modify to read: " astronomically driven, millennial-scale trends .." to be more accurate [Fortunat Joos, Switzerland]	statement has been removed from the SPM
SPM-1021	SPM	7	4	7	5	“and that…” :unclear [Government of France]	statement has been removed from the SPM
SPM-1022	SPM	7	4	7	5	These lines contain text incomprehensible to the policymaker: ".. astronomically driven summer insulation .."? [Government of Netherlands]	statement has been removed from the SPM
SPM-1023	SPM	7	4	7	5	re-word please - "astronomically driven trends of summer insolation and temperatures in both hemispheres' could be expressed in plainer language, given the non-specialist audience [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been removed from the SPM
SPM-1024	SPM	7	4	7	5	The last two lines of the paragraph might be unclear for non experts, and the sentence is very long. Maybe amend: ".This is consistent with the astronomically driven decreasing long-term trends of summer insolation and temperatures in both hemispheres over the Holocene" [Urs Neu, Switzerland]	statement has been removed from the SPM
SPM-1025	SPM	7	4			Mid-Holocene… Indicate dates [Government of France]	statement has been removed from the SPM
SPM-1026	SPM	7	7	7	7	It is suggested to use a different wording for "modern seas ice loss" in this chapter on paleoclimatic records. Does this refer to sea ice loss identified since 1970 or since the last 30 years or something else? [Klaus Radunsky, Austria]	statement has been revised
SPM-1027	SPM	7	7	7	11	It would help if similar phrasing was used in this paragraph compared to the previous one. For example, early-mid Holocene is used in paragraph 1 (lines 1-5) while here (lines 7-11) the dates 8,000 - 6,5000 years before present are given. Are these dates early-mid Holocene as in paragraph 1, or is this meant to refer to a slightly different time period? Also, the Holocene should be noted as the current inter-glacial period as reference to the 'last interglacial' is given on line 13. Also, in the first sentence (line 7), what time frame does 'modern' refer to? [Government of Canada]	statement has been revised
SPM-1028	SPM	7	7	7	11	Do you want to say here that the ice extent was lower 6500 and 8000 years ago compared to the late 1990s? Why do you want to compare with late 20th century levels and not 2007 and 2012 minimum extent? We find that the more interesting information is how far back you have to go in order to exceed the lowest extent observed. Please consider to re-write. [Government of NORWAY]	statement has been revised and shortened
SPM-1029	SPM	7	7	7	11	This paragraph is pretty clunky and could do with re-drafting [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised and shortened
SPM-1030	SPM	7	7			Suggest "recent sea ice loss" not "modern sea ice loss" unless there is a scientific reason for using "modern" [Government of New Zealand]	statement has been revised

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SPM-1031	SPM	7	8	4	10	Sentence difficult to read for the target audience. Suggestion for simplification "Summer sea ice cover …. was reduced compared to late 20th century levels both ..." by "Summer sea ice cover … was lower than in the 20th century both ..." [Christoph Ritz, Switzerland]	statement has been revised
SPM-1032	SPM	7	8	7	8	'context' would be better than 'perspective'. [Government of Australia]	preference is to use the wording given in the underlying chapter assessment
SPM-1033	SPM	7	8	7	8	re-word please - "are anomalous in the perspective of at least the last two millennia" say instead "are unprecedented in the last two millennia" [Government of United Kingdom of Great Britain & Northern Ireland]	preference is to use the wording given in the underlying chapter assessment
SPM-1034	SPM	7	8	7	11	Replace 'reduced compared to' with 'less than' on Line 9. Overall, this last sentence in this paragraph will not be understood by most readers and should be revised. [Government of Canada]	statement has been revised and shortened
SPM-1035	SPM	7	8	7	11	In this statement concerning the summer sea ice cover 8000-6500 yr. BP as compared to the late 20th century levels 'increased summer insulation' is put forward as a potential common explanatory factor. But what does that mean for the influence of anthropogenic induced warming for the current period? What is the actual message that one wants to deliver/suggest with this statement to policy makers and public? Please be clearer on context, content and meaning of this statement to prevent confusion or misinterpretation. [Government of Netherlands]	statement has been revised and shortened
SPM-1036	SPM	7	9	7	10	Replace '... reduced compared ...' with '... was less than late 20th century levels ...' and 'higher' or 'larger' would be better than 'increased'. [Government of Australia]	statement has been revised and shortened
SPM-1037	SPM	7	9			The timing of the Arctic sea ice minimum is actually perhaps 10 to 6.5 ka, or even 5 ka. And data are regional so it should say "in parts of the Arctic Ocean." [Government of United States of America]	statement has been revised and shortened
SPM-1038	SPM	7	10	7	11	Reduced sea ice at the mid Holocene is consistent with astronomically driven summer insolation in the Northern Hemisphere: is it also consistent with models ? Could chap 9 state on this with chap 5 ? [SYLVIE JOUSSAUME, France]	statement has been revised and shortened
SPM-1039	SPM	7	10	7	11	Add at the end of the last sentence of the paragraph "at that time", to be clearer. And devide the last sentence into two parts: "... along East Greenland. This is consistent..." [Urs Neu, Switzerland]	statement has been revised and shortened
SPM-1040	SPM	7	10			"along" seems superfluous; suggest it is deleted [Government of New Zealand]	statement has been revised and shortened
SPM-1041	SPM	7	11	4	11	"summer insolation " is not a common word for policy makers. [Christoph Ritz, Switzerland]	statement has been revised and shortened
SPM-1042	SPM	7	11	7	12	The amount of sea level change during the last interglacial period has been numbered as likely 4 to 6 m in AR4. Now it is given as 6 to 10 m 'with high confidence'. This change is considerable and should absolutely be mentioned and explained in a sentence, something like "This elevation is higher than the 4 to 6 m mentioned in AR4 and is established by more comprehensive studies of paleo records now including effects of coastal uplift due to glacier melt." Put the first sentence and the corresponding explanation in a separate paragraph, since the content is different from the rest of the paragraph dealing with rate of change. [Urs Neu, Switzerland]	statement has been revised
SPM-1043	SPM	7	13	7	13	For an SPM readership, the timing of 'the last interglacial period' needs to be defined. [Government of Australia]	statement has been revised
SPM-1044	SPM	7	13	7	13	Suggest change to ..."the last interglacial period, 125,000 years ago, ..." [Government of New Zealand]	statement has been revised
SPM-1045	SPM	7	13	7	13	I suggest that for the non-specialist reader you specify an actual time interval here, as many will not know how long ago the "last interglacial period" occurred. e.g. "… during the last interglacial period (130,000 to 116,000 years ago)". [David Wratt, New Zealand]	statement has been revised
SPM-1046	SPM	7	13	7	14	Define when was the last interglacial period which is addressed here. [Government of France]	statement has been revised
SPM-1047	SPM	7	13	7	18	Comparison with the observed rise over the 20th century and relative *rates* of change would be useful for this dot point in an SPM context. [Government of Australia]	statement has been revised
SPM-1048	SPM	7	13	7	18	Please provide approximate dates for the last interglacial. Also, please add information about how much warmer it was during the last interglacial period. This is the obvious question readers will ask when reading the	statement has been revised

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						sea level was so much higher. [Government of Canada]	
SPM-1049	SPM	7	13	7	18	Explain the geological terms and time periods for non-experts: interglacial period ./. past millenium./. last few thousand years [Government of Germany]	statement has been revised
SPM-1050	SPM	7	13	7	18	Here there are two statements in one bullet, which combined suggest that we are on the road towards the same situation as during the last interglacial. Either make the suggestion explicit or separate the 2 statements. Line 16: fluctuations instead of variations is a better term. Indicate when 'last interglacial period' occurred (relevant information for policy makers and public). [Government of Netherlands]	statement has been revised
SPM-1051	SPM	7	13	7	18	We reiterate that it is important to include total sea level rise from pre-industrial upto today on SPM page 5, line 47-49, in order for this information to become more meaningful. [Government of NORWAY]	total sea level rise from 1901 to 2010 has now been provided.
SPM-1052	SPM	7	13	7	18	It is not universally agreed that “Longer term trends of sea level change during the last few thousand years were about 10 times smaller than the trend during the 20th century. {3.7, 5.6, 13.2" [Government of United States of America]	statement has been revised
SPM-1053	SPM	7	13	7	18	This is a very long-winded paragraph. Suggest say instead "The trend during the 20th century is 10 times bigger than the trend during the previous few thousand years." [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised based on numerous comments.
SPM-1054	SPM	7	13	7	18	Chap 5 and 13 need to agree on this and not disagree in their chapters. See my comments 1-7. Please give to both chapters. Also, as detailed in these chapter 13 comments, I think it is a mistake to ignore the implications of the LIG for the future and the AIS. It is hard to imagine that there is no change we could loose many meters of the WAIS and EAIS in coming centuries, after the Earth warms well beyond the level that apparently generated a 6-10m sea level rise that had to have included signficant AIS retreat (and not just the WAIS). Remember that the 6-10m LIG sea level rise only had a small thermosteric component and that the GIS probably only contributed 2m. I'm not pushing you to attach high confidence to all this, but policy-makers really deserve to know what is now becoming quite mainstream in the science community. Ditto for rates of sea level rise that could exceed 1m/100 years. Note it and note that confidence is low if you feel you have to, but don't ignore it. It's just not possible to say with any confidence that it's impossible or even very unlikely. [Jonathan Overpeck, United States of America]	statement has been revised and is consistent with the final draft of Chapters 5 and 13.
SPM-1055	SPM	7	13	7	18	These estimates of Eemian sea level rise are higher than in AR4 - that should probably be noted, and if practical, the reasons stated. [Susan Solomon, United States of America]	statement has been revised and now explicitly notes the change from the AR4.
SPM-1056	SPM	7	14	7	18	This part of the bullet is a bit hard to read: for what time length is 25 cm ? Should not the last sentence come just after the last millenium ? There is no assessment in the last sentence ? [SYLVIE JOUSSAUME, France]	statement has been revised. Sentence referring to 25 cm variation has been removed from the SPM
SPM-1057	SPM	7	14			What time period does "current" refer to in "current global mean sea level change"? If it is the past 20 years, then is this consistent with the conclusion that 1930-1950 had a similar rate of change? Given that the last sentence implies that during the last few thousand years, rates of change were less than 2 cm (order of magnitude less than 20th century), the penultimate sentence could also be more clear: what time period does the paleo data refer to that shows 25 cm centennial variations? [Government of United States of America]	statement has been revised based on numerous comments.
SPM-1058	SPM	7	15	7	16	What is the relevance of the sentence regarding centennial to millennial variations of likely less than 25 cm? We're not presenting a present day rate of change in this para to which we can compare the 25cm. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised. Sentence referring to 25 cm variation has been removed from the SPM
SPM-1059	SPM	7	15	7	17	The figure of 25 cm per century or millenium is difficult to compare to the observations of presesent SSL rises (section Sea Level Observations). I would help if a e.g. a footnote would put this figure into context, such as to faciliate the understanding that the observations of present changes are exceptional. [Andrew Ferrone, Germany]	statement has been revised. Sentence referring to 25 cm variation has been removed from the SPM
SPM-1060	SPM	7	15	7	18	I have difficulty understanding what is meant here. A centennial change of 25 cm would not be 10 times less than the 20th century trend. Also, does the last sentence need a likelihood assignment? [Susan Solomon, United States of America]	statement has been revised. Sentence referring to 25 cm variation has been removed from the SPM
SPM-1061	SPM	7	16	7	16	"Centennial to millennial variations" is not clear. Would it not be clearer to write " variations on century to	statement has been revised.

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						millenium time scales" ? [Government of France]	
SPM-1062	SPM	7	16	7	16	Why do you mention 25 cm, is this the current SLR wrt to pre-industrial levels? [Government of Germany]	statement has been revised. Sentence referring to 25 cm variation has been removed from the SPM
SPM-1063	SPM	7	16	7	16	"Centennial to millennial variations" is not clear. Would it not be clearer to write " variations on century to millenium time scales" ? [Michel Petit, France]	statement has been revised.
SPM-1064	SPM	7	16	7	17	For clarification, consider adding "during the holocene" after "likely less than 25 cm" [Government of Denmark]	statement has been revised. Sentence referring to 25 cm variation has been removed from the SPM
SPM-1065	SPM	7	17	7	17	What is meant by 'longer term trends of sea level change'? Is the (estimated) 'average global sea-level change per century' not taken as a reference for comparing the rate of sea-level change in a historical time-period with the trend during the 20th century? [Government of Netherlands]	statement has been revised.
SPM-1066	SPM	7	17	7	18	The sentence is ambiguous as to whether ‘trends’ here is intended to mean ‘total change’ or ‘rate of change’. [Government of Australia]	statement has been revised.
SPM-1067	SPM	7	17	7	18	To remove a false statistical interpretation, delete the sentence “Longer-term trends of sea level change during the last few thousand years were about 10 times smaller than the trend during the 20th century.” Reason: Fluctuations over the short term will generally be greater than trends over the longer term, regardless of the causes of the fluctuations: therefore the cited sentence misleads by its implication that the order-of-magnitude difference between short-run and long-run trends is unusual, and should either be heavily qualified or preferably deleted. [Christopher Monckton of Brenchley, United Kingdom]	statement has been revised to improve clarity.
SPM-1068	SPM	7	17	7	18	Since this bullet starts talking about the "last interglacial" would it be possible to say anything about how the current trend compares to trends during the last interglacial? [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Does not seem that adding information on the rates of sea level rise during the last interglacial would add policy-relevance to this bullet. See Chapter 5 for this level of detail.
SPM-1069	SPM	7	17	7	18	Every other statement here includes a statement about confidence. The last sentence does not. [Mark Siddall, United Kingdom]	statement has been removed.
SPM-1070	SPM	7	18			One-tenth' is more widely understood than '10 times smaller' [Government of Australia]	statement has been removed.
SPM-1071	SPM	7	22	7	22	To make this section more policy relevant, ranges for both the abundance-based and the emission-based radiative forcings should be presented (see also Figure 8.17c). [Government of Netherlands]	Reject. We prefer to keep this section short and to focus on the most policy relevant numbers which we consider to be emission-based estimate of radiative forcing.
SPM-1072	SPM	7	22	7	22	Chapter 8 discusses, at length, different definitions of forcing and favours the adjusted forcing. I was slightly surprised that no mention of this changing framework was represented in the SPM [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Taken into account. The introduction text in italics to the this section of the SPM has been expanded providing now more background information on the concept of radiative forcing. It now also includes a footnote specifically referring to the changes in the RF concept and the consideration of rapid adjustments to perturbations in the AR5.
SPM-1073	SPM	7	22	8	44	section 3 "drivers of climate change" and figure SPM.3: This figure shows the impact of land use change but this result is not further discussed in the text, and I think it should. On the other hand, volcanic forcing is discussed in the text but not shown on the figure. It would be good if the text and the figure could be made consistent. The reader should not be lost by wondering what some items are shown on the figure but not discussed or vice versa, this is a crucial topic. [Masa KAGEYAMA, France]	Reject. We prefer not to repeat each individual entry presented in the figure also in the text given the severe space limitations in the SPM. Radiative forcing from volcanic eruptions is not included in the figure due to it's sporadic nature and the fact that it is small compared to other forcings. This is now specifically mentioned in the figure caption.
SPM-1074	SPM	7	22	8	47	Stratospheric water vapour is taken up in Figure SPM.3 (on SPM-22). It was not included in the similar Figure in AR4 as a forcing agent. However, it is not mentioned in any paragraph of SPM. Perhaps it should be explained in the text, for example, in Section 3 (Drivers of Climate Change) of SPM. [Government of Japan]	Taken into account. Stratospheric water vapour is now specifically referred to when discussing the radiative forcing from CH4 emissions.

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SPM-1075	SPM	7	22	10	3	Part 3 could be: "Understanding the Climate system and its recent change" , beginning by "Carbon and other biogeochemical" extracted from SPM6, then "drivers" and finally "processes and feedbacks", [Government of France]	Reject. We prefer the structure with Section 3 "Drivers" and Section 4 "Understanding". This is consistent with the underlying report.
SPM-1076	SPM	7	22			Section 3. Drivers of Climate Change: I think it is important to stress that the presentation of drivers in section 3 is backward looking (or historic). The distinction between a backward looking (relevant to attribution and understanding) and a forward looking perspective (relevant to policymaking) is stressed in chapter 8. While the historic perspective is clear from figure SPM.3 itself, I think it should also be more clear in the text. [Jan Fuglestvedt, Norway]	Taken into account. The introduction text in italics to the this section of the SPM has been expanded providing now more background information on the concept of radiative forcing, also highlighting that RF is for the industrial era, i.e., 1750 to 2011.
SPM-1077	SPM	7	22			Section 3: Since the title of this section is "Drivers of Climate Change" one would also expect some information about drivers in a forward looking perspective. I suggest that the authors consider whether a forward looking perspective could be included here; i.e. how much the various components contribute to warming after emissions today. That would show short-lived warming effect of BC, short-lived cooling effects of sulfate, and long-lived effects of N2O, SF6 etc. It would also show the very different time profile of the response to CO2 and the long lifetime of the perturbation; which I think are very important points to make. [Jan Fuglestvedt, Norway]	Rejected. The future evolution of drivers is part of the scenario used to project future climate change and thus part of the future projections section. In addition, a new box on the RCP scenarios has now been included.
SPM-1078	SPM	7	22			Drivers of climate change: Should there be a bullet point about the level of cumulative CO2 emissions that may lead to a 2 degree temperature rise above pre-industrial, and the timing/rate of GHG emissions reductions needed to stand a chance of limiting the rise to 2 degrees? [Government of United Kingdom of Great Britain & Northern Ireland]	Taken into account. The assessment of specific climate targets and corresponding cumulative CO2 emissions is being discussed in the climate projections section in the SPM, in particular the section on climate stabilization.
SPM-1079	SPM	7	22			Sec 3 and 4 are misleading because they make no mention of natural climate variation. [Paul Matthews, United Kingdom]	Comment is incorrect, both Sections 3 and 4 do account for (and mention) natural factors. However, in the revisions more emphasis has been put on the natural climate variability, particularly in Section 4. Understanding.
SPM-1080	SPM	7	22			Section 3: To make this section more policy relevant, ranges for both the abundance-based and the emission-based radiative forcings should be presented (see also Figure 8.17c). [Twan van Noije, Netherlands]	Reject. We prefer to keep this section short and to focus on the most policy relevant numbers which we consider to be emission-based estimate of radiative forcing.
SPM-1081	SPM	7	24	7	24	To ensure scientific precision and neutrality, in the sentence "Natural and anthropogenic drivers cause imbalances in the Earth's energy budget", delete "imbalances" and insert "changes". Reason: The atmosphere is bounded by outer space above and the ocean heat-sink below, suggesting that powerful homeostasis is likely. Indeed, reconstructions of global mean surface temperatures over the past 64 million years (e.g. Zachos et al., 2001) and over the past 750 million years (e.g. Scotese, 1999) suggest that temperatures have not varied by more than 3% (8 K) in absolute terms. In such circumstances, the word "imbalances" is not scientifically plausible. [Christopher Monckton of Brenchley, United Kingdom]	Reject. The statement is correct as is and fully supported by the underlying assessment.
SPM-1082	SPM	7	24	7	25	For non-experts is better to add qualifiers here such as warming and cooling, e.g.: "The strongest anthropogenic drivers are changes in greenhouse gas concentrations (causing warming) and aerosols (predominantly causing cooling)." [Government of Netherlands]	Taken into account. We now explicitly state that positive RF leads to warming, negative RF leads to cooling.
SPM-1083	SPM	7	24	7	25	Even though later on it is mentioned that aerosols have a negative forcing (do policymakers know what that means?), to avoid misunderstanding I think it useful to add qualifiers here such as warming and cooling, e.g.: "The strongest anthropogenic drivers are changes in greenhouse gas concentrations (causing warming) and aerosols (predominantly causing cooling)." [Bart Verheggen, Netherlands]	Taken into account. We now explicitly state that positive RF leads to warming, negative RF leads to cooling.
SPM-1084	SPM	7	24	7	26	Both "Natural and anthropogenic drivers" are mentioned, but only anthropogenic drivers noted. Clouds still constitute the greatest overall uncertainty. Recommend inserting: "Clouds are the greatest natural drivers." and "uncertainties of aerosol and cloud forcings remain high". [David L. Hagen, United States of America]	Taken into account in the revisions. Clouds and related uncertainties are now explicitly mentioned in the context of aerosol and their interactions with clouds in the first highlighted key statement. Note that we now introduce the main sections of the Summary

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							for Policymakers with a brief chapeau in italics which provide, context but no longer contain assessment conclusions.
SPM-1085	SPM	7	24	7	26	Proposed revision: "Natural and anthropogenic drivers cause imbalances in the Earth's energy budget. The strongest anthropogenic drivers are changes in greenhouse gas concentrations and aerosols. Clouds are the greatest natural drivers. These are being quantified in more detail, but the uncertainties of aerosol and cloud forcings remain high." [David L. Hagen, United States of America]	Taken into account in the revisions. Clouds and related uncertainties are now explicitly mentioned in the context of aerosol and their interactions with clouds in the first highlighted key statement. Note that we now introduce the main sections of the Summary for Policymakers with a brief chapeau in italics which provide, context but no longer contain assessment conclusions.
SPM-1086	SPM	7	24	7	32	Sheer speculation based on an absurd misinterpretation of the earth's energy supply, distorted to pretend that it is entirely comtrolled by radiation exchanges, The earth's energy is receved by the sun only by day. The absorbed heat is used by all organisms, partly removed by convection and evaporation and the remainder radiated to the exhaust (space)_ from the earth, and the heated atmosphere. There is no evidenec that the so-called :greenhouse gases" play any part in this and models basd on your theory cannot currently improve on conventional weather forecasters [Vincent Gray, New Zealand]	Noted. Reviewer provides no scientific evidence supporting his claims and makes no concrete proposals how to revise the text. No action.
SPM-1087	SPM	7	25	7	25	after "anthropogenic drivers" insert "at global scales". A large body of literature suggests that land cover change can exert important influences at local scales (including both radiative and non-radiative effects), and indeed this is mentioned in the Technical Summary (TS-4 lines 37-38, citing section 2.4.3) which is good to see. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Text has been revised. Comment no longer applies.
SPM-1088	SPM	7	25	7	25	CO2 as the most important GHG should be highlighted by changing the text: "... changes in CO2 and other greenhouse gas .." [Fortunat Joos, Switzerland]	Text has been revised. Changes in CO2 as the largest contributor to net radiative forcing is now specifically mentioned in the first highlighted key statement of this section.
SPM-1089	SPM	7	25	7	26	Modify the sentence to separate the 2 messages : « These can now be quantified in more detail. Among the drivers, the uncertainties of the forcing associated with aerosols remain high. [Government of France]	Text has been revised. Aerosol and their interactions with clouds, and associated uncertainties, are now prominently highlighted in the first coloured key statement of this SPM section.
SPM-1090	SPM	7	26	7	26	What about uncertainties in the forcings associated with greenhouse gas emissions? Why focus only on aerosols? [Kristie Ebi, United States of America]	Text has been revised. Uncertainties of all drivers is part of Figure SPM.4
SPM-1091	SPM	7	26	7	26	Change to - 'these can now be quantified in more detail. The uncertainties of the forcing associated with aerosols remain high' [Government of Australia]	Text has been revised. Aerosol and their interactions with clouds, and associated uncertainties, are now prominently highlighted in the first coloured key statement of this SPM section.
SPM-1092	SPM	7	26	7	26	Aerosols should be explained briefly to non-experts, possibly as simply as "small airborne particles that affect radiative forcing directly or indirectly through cloud processes". You may consider including this as a half sentence or as a footnote. [Government of NORWAY]	Reject. Aerosols is part of the WGI AR5 Glossary.
SPM-1093	SPM	7	28	7	28	We suggest to change "Globally, CO2 is the strongest' to 'Globally, changes in atmospheric CO2 concentration is the strongest' [Government of Netherlands]	Text has been revised. Comment no longer applies.
SPM-1094	SPM	7	28	7	28	We propose that you consider including "anthropogenic" before "CO2". As this do not become clear before the end of the next sentence. [Government of NORWAY]	Text has been revised. The first sentence of the paragraph now mentions "anthropogenic forcing".
SPM-1095	SPM	7	28	7	28	It would be helpful to repeat the statement about CO2 being the strongest driver of climate change in the paleo section [Government of United States of America]	SPM structure has been slightly revised. The paleoclimate records subsection in the observations section has been removed. The paleo-evidence is now being presented as part of the observations sections of the individual quantities

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SPM-1096	SPM	7	28	7	29	To increase scientific precision, the statement “Globally, CO2 is the strongest driver of climate change compared to other changes in the atmospheric composition, and changes in surface conditions” should be rewritten “Globally, in recent decades, increases in the atmospheric concentration of CO2 have proven more influential as forcers of global warming than increases in the concentration of other greenhouse gases.” Reason: Some papers (e.g. Murphy et al., 2009) have shown the negative aerosol forcing as being equal to the entire CO2 forcing in recent decades. The redrafted sentence ensures accuracy even if this is so. [Christopher Monckton of Brenchley, United Kingdom]	Text has been revised. The statement is now more specific about the timescales: "The increase in the atmospheric concentration of CO2 since 1750 makes the largest contribution to net radiative forcing, and has also made the largest contribution to the increased anthropogenic forcing in every decade since the 1960s."
SPM-1097	SPM	7	28	7	29	To add useful detail, insert after “changes in surface conditions” the new sentence “CO2 is thought to represent ~70% of all greenhouse-gas forcings.” Reason: The IPCC’s 2001 report estimated that some 70-80% of all greenhouse-gas forcings were attributable to CO2 alone. The 2007 report was less explicit, but analysis of Table 10.26 on p. 803 indicates that the models on which the IPCC’s central projections for the present century are predicated were assuming a 70% contribution from CO2. [Christopher Monckton of Brenchley, United Kingdom]	Noted. The details about the individual contributions to the total forcing as assessed in the WGI AR5 are given in the subsequent paragraphs and in Figure SPM.4
SPM-1098	SPM	7	28	7	30	Here it is stated that the relative contribution of CO2 "far outweighs the contributions from natural drivers". However, the concepts of "anthropogenic" and "natural" drivers have not yet been clearly identified in the SPM (nor are these concepts particularly clear later in this section). Suggest reviewing and revising. [Government of Canada]	Text has been revised. The individual drivers are now specifically mentioned in this paragraph rather than referring to "anthropogenic" or "natural" drivers as groups.
SPM-1099	SPM	7	28	7	31	This important conclusion, about which much debate exists, should be included in the conclusion on page two line 36-39, in order reach more readers. [Government of Netherlands]	Rejected. The Paragraph on page 2 discusses observations of climate change. This section quantifies drivers of climate change in terms of radiative forcing. We want to keep this distinction.
SPM-1100	SPM	7	28	7	32	The claim that CO2 "by far outweighs the contribution from natural drivers" is not demonstrated by any real physical evidence in this report. Thus, to make this claim is meaningless. Geologic data shows very conclusively that there have been at least 25 periods of global warming in the past 500 years and many far more intense periods of global warming in the past 15,000 years, long before any significant increase in atmospheric CO2. (see peer reviewed evidence in Easterbrook, 2011, Evidence-based Climate Science). Before making such claims, IPCC needs to demonstrate (with real data, not models) that CO2 can cause global warming. [Don Easterbrook, United States of America]	Text has been revised. The statement is now more specific about the timescales: "The increase in the atmospheric concentration of CO2 since 1750 makes the largest contribution to net radiative forcing, and has also made the largest contribution to the increased anthropogenic forcing in every decade since the 1960s." The statement is supported by the comprehensive assessment provided in the underlying Chapters. See also Figure SPM.4 in support of the conclusion.
SPM-1101	SPM	7	28	7	32	The claim that CO2 "far outweighs the contributions from natural drivers" is not demonstrated by any real evidence in this report. Geologic evidence from ice cores, glacial fluctuations, and other temp measurements shows virtually no correlation between climate changes and CO2, whereas the evidence shows very strong correlation with solar and oceanic variations. Thus, this claim is unsubstantiated and without merit. [Don Easterbrook, United States of America]	Text has been revised. The statement is now more specific about the timescales: "The increase in the atmospheric concentration of CO2 since 1750 makes the largest contribution to net radiative forcing, and has also made the largest contribution to the increased anthropogenic forcing in every decade since the 1960s." The statement is supported by the comprehensive assessment provided in the underlying Chapters. See also Figure SPM.4 in support of the conclusion.
SPM-1102	SPM	7	28	7	32	The report does not mention the likely effects of the extreme rise rate of CO2 (>2 ppm/year), the fastest recorded for the Cainozoic, for destabilization of the ice sheets and permafrost, heat waves and related fires. Thus, whereas the absolute level of GHGs can be correlated with temperatures in the paleo-record (i.e. Holocene Optimum, Emian, Pliocene, Miocene), the extreme rise rate may acceleate these processes and positive feedbacks. [Andrew Glikson, Australia]	Noted. The text referred to the rate of CO2 concentration increase being unprecedented for at least the last 20000 years. Note that this text about the rate of change in the concentrations of well mixed GHGs has been moved and is now explicitly highlighted in the key statement in section 2, subsection "Carbon and other biogeochemical quantities" of the SPM.

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SPM-1103	SPM	7	28	7	32	*Over the last century* CO2 is the strongest driver [Government of Australia]	Text has been revised. The statement is now more specific about the timescales.
SPM-1104	SPM	7	28	7	32	The specific reference to changes in atmospheric CO2 since the 1980s makes more sense if reference is made to Fig SPM.3 for this paragraph, since the Figure uses the time period since 1980 to illustrate changes in drivers of climate change. Suggesting adding the Fig reference in. [Government of Canada]	Accepted. Reference to now Figure SPM.4 added.
SPM-1105	SPM	7	28	7	32	Drivers of Climate Change. 'Globally, CO2 is the strongest driver of climate change compared to other changes in the atmospheric composition, and changes in surface conditions. Its relative contribution has further increased since the 1980s and by far outweighs the contributions from natural drivers. CO2 concentrations and rates of increase are unprecedented in the last 800,000 years and at least 20,000 years, respectively. Other drivers also influence climate on global and particularly regional scales.' Comment: In this subsection summary, it may be useful to mention the other drivers of climate change, such as the long-lived greenhouse gases CH4 and N2O, ozone, land use change, stratospheric water vapor, and aerosols. [Government of Morocco]	Reject. The statement highlighted for this section must in our view focus on the key conclusion from the section. All other drivers are mentioned in the subsequent paragraphs and presented in Figure SPM.4.
SPM-1106	SPM	7	28	7	32	Please clarify how CO2 rates in its effects compared with other greenhouse gases such as methane. [Government of New Zealand]	Taken into account. This can now be clearly seen from Figure SPM.4 and derived from the revised bullets in this SPM section.
SPM-1107	SPM	7	28	7	41	CO2 discussion: Rates of increase are mentioned in the shaded box, but not discussed in the three bullets below box. The acceleration in the rate over the last decade (rate of change of CO2) is a critical point; it shows how poorly we are doing at controlling CO2 emissions. It would be helpful to have, in the shaded box, a comparison of the rate over past ~20,000 yrs. (up to 1750) with that of last 10-20 yrs. (& drop mention of 800,000 yr. rate). A 4th bullet below this box dedicated to rates of change would be helpful, both to non-CC scientists as well as to PMs. [herman sievering, United States of America]	Text has been revised. Note that this text about the rate of change in the concentrations of well mixed GHGs has been moved and is now part of the key statement in section 2, subsection "Carbon and other biogeochemical quantities" of the SPM.
SPM-1108	SPM	7	28			Typo: delete "the" before "atmospheric" [Government of New Zealand]	Text has been revised. Comment no longer applies.
SPM-1109	SPM	7	28			Again, the word "globally" used here has 2 opposite potential meanings, "averaged over the globe" & "everywhere over the globe". In this case, I think either is true, suggesting it doesn't mean anything much anyway. [William Ingram, United Kingdom]	Text has been revised. Comment no longer applies.
SPM-1110	SPM	7	29	7	30	The relative contribution of CO2 has not increased since the 1980s, according to figure 8.6. The text should be changed accordingly. See also our comment on chapter 8 (pages 18, line 57 to page 9 line 2). [Government of Netherlands]	Comment is incorrect. Chapter 8 and Figure 8.6 clearly show that the relative contribution of CO2 to the total forcing has increased since the 1980s.
SPM-1111	SPM	7	29	7	30	Natural drivers' would benefit from being defined. [Government of United Kingdom of Great Britain & Northern Ireland]	Text has been revised. The individual drivers are now specifically mentioned in this paragraph rather than referring to "anthropogenic" or "natural" drivers as groups.
SPM-1112	SPM	7	29	7	30	This statement is unsustainable and frankly an embarrassment. You have no evidence whatsoever that it outweighs the contributions from natural drivers because the climate models that you rely on for this claim fail to completely and accurately simulate all natural climate forces, which logically means that you have no clear idea of how much they contribute. [John McLean, Australia]	Reviewer provides no scientific evidence in support of his claims. Nevertheless, text has been revised and the statement is now more specific about the timescales it applies to.
SPM-1113	SPM	7	29	7	30	The shift in the ENSO in 1976 can account for the observations that you describe earlier in this chapter. Your failure to mention it is both dishonest and in flagrant breech of the IPCC "procedures" document twice directs you to include different ideas. The fact that the predictive modelling of the ENSO is poor is no excuse for your failure. [John McLean, Australia]	Reviewer provides no scientific evidence in support of his claims. No concrete proposal for text revisions made -- No action.
SPM-1114	SPM	7	29	7	30	To take account of the fact that natural drivers of temperature change have prevailed over anthropogenic influences over the past 16 years, rewrite "Its relative contribution has further increased since the 1980s and by far outweighs the contributions from natural drivers" to read "Its relative contribution has continued to increase since the 1980s, but it has not proven strong enough to outweigh natural cooling influences over the past decade and a half, though it is expected to outweigh such influences over the longer term." Reason: Since there has been no global warming for 16 years, the unqualified statement that the contribution	Text has been revised. Paragraph now discusses explicitly the contributions to radiative forcing rather than more generally the role of "drivers".

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						from CO2 “far outweighs the contributions from natural drivers” will not be taken seriously. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-1115	SPM	7	29	7	32	The second sentence talks about CO2 increases since the 1980s outweighing contributions from natural drivers...shouldnt this be clearly about anthropogenic sources and natural sources? It reads ambiguously in its present form. [Government of New Zealand]	Text has been revised. Paragraph now discusses explicitly contributions to net radiative forcing rather than more generally the role of "drivers".
SPM-1116	SPM	7	30	7	30	What means "by far outweighs", is it possible to better specify this statement? [Government of Germany]	Text has been revised. Comment no longer applies
SPM-1117	SPM	7	30	7	30	Insert "including variations in solar irradiation" after "natural drivers" - otherwise one would think this comparison is constrained to "other changes in the atmospheric composition, and changes in surface conditions", as in the previous sentence. [Government of Germany]	Text has been revised. The individual drivers are now specifically mentioned in this paragraph rather than referring to "anthropogenic" or "natural" drivers as groups.
SPM-1118	SPM	7	30	7	30	to add colored text between brackets: and by far (anthropogenic CO2) outweighs [Nedal Katbeh-Bader, Palestine]	Text has been revised. Comment no longer applies
SPM-1119	SPM	7	30	7	30	to add colored text between brackets: period (before 1951). [Nedal Katbeh-Bader, Palestine]	Text has been revised. Comment no longer applies
SPM-1120	SPM	7	30	7	30	Here, or somewhere nearby, "natural drivers" should be defined and listed. Some would argue CO2 is a natural driver, and the SPM needs to be clearer on this point. [Dian Seidel, United States of America]	Text has been revised. The individual drivers are now specifically mentioned in this paragraph rather than referring to "anthropogenic" or "natural" drivers as groups.
SPM-1121	SPM	7	30	7	31	Unclear sentence. Change to CO2 concentrations are unprecedented in the last 800,000 years. The rates of increase observed are unprecedented in at least the last 20,000 years. It would also be useful to give the ppm changes to help clarify what 'range of variability' means. [Government of Australia]	Text has been revised. Note that this text about the rate of change in the concentrations of well mixed GHGs has been moved and is now part of the key statement in section 2, subsection "Carbon and other biogeochemical quantities" of the SPM.
SPM-1122	SPM	7	30	7	31	Make the sentence easier to read. Suggestion: "CO2 concentrations are unprecedented in the last 800'000 years and rates of increase for at least 20'000 years. [Christoph Ritz, Switzerland]	Text has been revised. Note that this text about the rate of change in the concentrations of well mixed GHGs has been moved and is now part of the key statement in section 2, subsection "Carbon and other biogeochemical quantities" of the SPM.
SPM-1123	SPM	7	31	7	31	Is there a reason for "at least" when it comes to the reference to the last 20,000 year, but not to the reference to the last 800,000 years. The availability of data records in respective case would seem to suggest that "at least" is appropriate in both cases. [Government of Sweden]	Text has been revised. Note that this text about the rate of change in the concentrations of well mixed GHGs has been moved and is now part of the key statement in section 2, subsection "Carbon and other biogeochemical quantities" of the SPM.
SPM-1124	SPM	7	31	7	32	Should this be 'in some regions'? There is limited evidence that regional drivers produce regional responses so the statement 'particularly regional scales' seems too strong. Apart from black carbon in South Asia and ozone depletion in mid to high latitudes of the southern hemisphere, evidence for regional responses to regional forcing is very limited. May be better to drop this clause. [Susan Solomon, United States of America]	Accepted. Sentence has been deleted.
SPM-1125	SPM	7	31			It would be helpful to know a little about the "other drivers". Suggest expand a little "Other drivers, e.g. x, y, z, also influence climate….” [Government of New Zealand]	Sentence has been deleted. Note, however, that the individual drivers are now specifically mentioned in this paragraph rather than referring to "anthropogenic" or "natural" drivers as groups.
SPM-1126	SPM	7	31			Confusing to state that "other drivers also ... on global and regional scales". Since it is already stated earlier in this paragraph that CO2 is the largest driver, why not just specifically mention a few of the other secondary drivers and state them? e.g. aerosols, land use, etc. or just leave this out since figure SPM.3 shows the different drivers and their magnitudes. [Government of United States of America]	Sentence has been deleted. Note, however, that the individual drivers are now specifically mentioned in this paragraph rather than referring to "anthropogenic" or "natural" drivers as groups.
SPM-1127	SPM	7	32	7	32	What are "particularly regional scales"? [Sarvesh Garimella, United States of America]	Sentence has been deleted.

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SPM-1128	SPM	7	32			Again, the phrase "on global ... scales" is unclear. My guess is that here it is intended to mean "in the global mean", but whatever it means needs to said clearly. [William Ingram, United Kingdom]	Sentence has been deleted.
SPM-1129	SPM	7	34	7	34	Since CH4 belongs to the category of shorter lived greenhouse gases in the atmosphere, the term "long-lived "is not applicable for this gas. Correct in Table 2.1 of the main report (Chapter 2: Atmosphere and Surface). [Government of Benin]	Text has been revised, long-lived is no longer used here. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1130	SPM	7	34	7	34	Is CH4 considered a long-lived greenhouse gas in AR5? Can you clarify for policy makers, what gases are considered "long-lived" and "short-lived"? The term "well-mixed" is also used in the caption for Fig SPM.3. As per Canada's overall comments on the SPM, these terms need to be explained and used consistently throughout. [Government of Canada]	Text has been revised, long-lived is no longer used here. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1131	SPM	7	34	7	34	Suggest further explaining or providing examples of the "multiple lines of evidence" that contribute to this finding. [Government of Canada]	Text has been revised and evidence supporting the statement is now specifically mentioned. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1132	SPM	7	34	7	34	Please add the definition of chemical species like "CH4", "N2O" in the Glossary (as done for "CO2"). [Government of Germany]	New entries introduced for "Methane (CH4)" and "Nitrous oxide (N2O)"
SPM-1133	SPM	7	34	7	34	replace "long-lived greenhouse gases" with "concentrations in the atmosphere of long-lived greenhouse gases" [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	Text has been revised, long-lived is no longer used here. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1134	SPM	7	34	7	37	Fluorinated greenhouse gases (both those cover by the Kyoto-protocol and CFCs and other gases regulated by the Montreal protocol) should be included here. Please consider to include them. [Government of NORWAY]	Radiative forcing from CFC and other gases regulated by the Montreal Protocol are summarized in Figure SPM.4. Paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1135	SPM	7	34	7	37	The 125% of methane increase needs to be teased out; what are the drivers that have caused it? It is not enough to give policy makers a drastic figure without any insight as to what is happening there. [Dora Marinova, Australia]	Contributions to changes in radiative forcing from CH4 concentrations changes are summarized in Figure SPM.4. Paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1136	SPM	7	34	7	37	The only reference here to other gases should give more absolute numbers, either in abundance (ppb) or in RF (W/m2). Thu of % increase above the previous glacial-interglacial range is weak and doe not really give useful information. [Michael Prather, United States of America]	The statement has been revised and now gives the %-change compared to pre-industrial. This is, we believe, is the key number relevant for the SPM. Note that the paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1137	SPM	7	34	7	41	A footnote, or some other way, on the relative increases from the pre-industrial to date would add clarity to policy-makers, as the latter changes are crucial to understanding the man-made climate forcing. [Government of Sweden]	Taken into account. The statement has been revised an now gives the %-change compared to pre-industrial. This is, we believe, is the key number relevant for the SPM. Note that the paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1138	SPM	7	34	7	41	Unclear whether the values quoted here are global-means or not - Bullet starting at line 39 is presumably referring to Mauna Loa [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Both paragraphs referred to by the reviewer have been revised and the second paragraph is supported by a Figure SPM.3 (previously SPM.2) which presents the atmospheric CO2 record from both Mauna Loa and South Pole. Note that both paragraphs have been

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							moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1139	SPM	7	34	7	46	The absence of information over land surfaces maks all these figures dubious. But there is no evidence that they affect the climate. [Vincent Gray, New Zealand]	Comment about "the absence of land surfaces" unclear. No proposal for revisions of text. No action. Note that the first two paragraphs referred to here have been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities. The third paragraph has been deleted.
SPM-1140	SPM	7	34	8	44	See general comment above. Need consistency throughout the report and in particular with Chapter 8 which refers to WMGHG and NTCFs, not long-lived GHGs and short-lived GHGs. [Government of United Kingdom of Great Britain & Northern Ireland]	Taken into account and implemented in most instances. Note that the first two paragraphs referred to here have been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities. The third paragraph has been deleted.
SPM-1141	SPM	7	34	8	44	Would be good to see something about the role of water vapour (tropospheric and stratospheric) included in this section. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. Note that the first two paragraphs referred to here have been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities. The third paragraph has been deleted.
SPM-1142	SPM	7	34			"long-lived greenhouse gases" are listed here. Chapter 8 talks about "well-mixed greenhouse gases" (WMGHGs) and "near term climate forcers" (NTCFs). The different terminologies are a bit confusing when there is no definition of "long-lived" in this section of the SPM. Might be useful to include the definition from TS-22, lines 17 to 19. [Government of New Zealand]	Text has been revised, long-lived is no longer used here. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1143	SPM	7	35	7	36	Make sentence easier to read: "There is …. that CO2 now exceeds by 30%, CH4 by 125%, N20 by 8% the range …..during the past ... [Christoph Ritz, Switzerland]	Sentence has been shortened to make it clearer. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities
SPM-1144	SPM	7	35	7	37	The second sentence in this bullet is difficult to read and understand. Suggest revising for clarity. [Government of Canada]	Sentence has been shortened to make it clearer. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities
SPM-1145	SPM	7	36	7	36	Insert 'the' in "during the past 800,000 years" [Urs Neu, Switzerland]	Accepted. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities and this particular sentence has been moved into the leading key statement of that section.
SPM-1146	SPM	7	36	7	37	Explain why ice cores produce values averaged over many years [Luisa Cristini, United States]	This specific part of the sentence has been deleted. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities
SPM-1147	SPM	7	36	7	37	remove - 'noting that ice cores typically produce values averaged over many years' [Government of Australia]	Accepted. This specific part of the sentence has been deleted. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities
SPM-1148	SPM	7	36	37		"noting that" seems clumsy to me. I can't think of a clearly good way of making the point, but "with the caveat that" at least removes the grammatical problem & makes the nature of the clause to come clearer in advance. "though" would be grammatically simpler but too string in my opinion. [William Ingram, United Kingdom]	This specific part of the sentence has been deleted. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities
SPM-1149	SPM	7	36			What is "range of variability" intended to mean? My guess is "maxima", but it needs to be said clearly. [William	Taken into account. The statement has been revised

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						Ingram, United Kingdom]	an now gives the %-change compared to pre-industrial. Note that the paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1150	SPM	7	36			"exceed the range of variability over the last 800 000 years". I think this statement is asking for trouble. CO2 preindustrial was 280 ppm; present, 390 or so; LGM was 190 or so. So maybe the statement is strictly correct. But I think a more powerful statement would be that the increase from 280 to 390 exceeds the increase from LGM to preindustrial of 190 to 280. That gives a better context. Or maybe both. [Stephen E Schwartz, United States of America]	Taken into account. The statement has been revised an now gives the %-change compared to pre-industrial. Note that the paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1151	SPM	7	37	7	37	It am not convinced that Table 6.1 and Figure 6.8 are most adapted reference to this bullet since they exhibit fluxes of carbon and not concentrations. Moreover, they were already quoted for SPM page 6, lines 11 and 12. [SYLVIE JOUSSAUME, France]	Noted. In the revised SPM we no longer refer to specific Figure and Tables from the underlying report, but provide the relevant section numbers only. Note that the paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1152	SPM	7	37	7	37	I guess it is meant "provide" instead of "produce" [Ingeborg Levin, Germany]	This specific part of the sentence has been deleted. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities
SPM-1153	SPM	7	39	7	40	Rephrase the sentence as follows: Since the beginning of systematic measurements of CO2 in 1958, annual mean concentrations have constantly increased---------- [Government of Benin]	Reject -- no clear improvement. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities
SPM-1154	SPM	7	39	7	41	CO2 may have increased, but 24% of nothing is still nothing! The actual increase in the amount of CO2 in the atmosphere over this period is only 0.008%, not enough to cause any significant climate change. [Don Easterbrook, United States of America]	Reviewer fails to provide scientific evidence for his claims. No specific request for revision -- No action. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities
SPM-1155	SPM	7	39	7	41	This statement is expressed as a general statement. Figure SPM.2 illustrates (in the upper panel) the two measurement series which are at the basis of this statement. How representative are the two monitoring stations (Mauna Loa, South Pole) for this general statement of atmospheric annual mean CO2-concentration? [Government of Netherlands]	Atmospheric CO2 is considered a well-mixed greenhouse gas and thus the two stations from which data are presented are considered representative on the hemispheric and global scale; see the underlying assessment for further details. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1156	SPM	7	39	7	41	To ensure perspective, after the sentence stating that mean CO2 concentration has increased by a quarter since 1958 add the following: “For comparison, the atmospheric concentration of CO2 was not less than 30% in the Neoproterozoic era; it is thought to have been 0.03% at the start of the industrial revolution in 1750; it is now 0.04%; and, in the absence of significant mitigation, it is expected to reach 0.07% by 2100.” Reason: The dolomitic limestones that were deposited in the Neoproterozoic could not have formed unless the partial pressure of CO2 was at least 0.3 atm. Since then, formation first of dolomites, then of amagnesic limestones, then of gypsum, then of calcifying organisms has reduced the atmospheric concentration to perhaps its lowest point in the past billion years. [Christopher Monckton of Brenchley, United Kingdom]	Reject. We prefer to give the concentration of CO2 and its changes in units of ppm, consistent with the underlying report. We don't see the relevance of the Neoproterozoic era CO2 values here in the context of the current concentrations and concentrations over the past century to millennia in the SPM of IPCC WGI AR5. Future projections will be dealt with in the projections section of the SPM. Note that this paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1157	SPM	7	39	7	41	Suggest also giving % change since "pre-industrial", to answer the question of how close we are to a doubling (100% change). The 24% change since 1958 is less meaningful, as it is pinned to a year that is only	Taken into account. The statement has been revised an now gives the %-change compared to pre-

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						signficant from a research perspective (start of monitoring), not from an Earth system perspective. [Dian Seidel, United States of America]	industrial. The %-change since 1958 is now directly linked to the longer term change since 1750. Note that the paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1158	SPM	7	39			This is plainly wrong. "systematic measurements' includes also the firn and ice-core record, which did begin after 1958, but goes much further back. What is the purpose of trying to memorialize the Mauna Loa record? This is not SPM material. [Michael Prather, United States of America]	Statement has been revised to now more precisely refer to "systematic atmospheric measurement". Figure SPM.3 (previously SPM.2) shows both the Mauna Loa and South Pole atmospheric CO2 records. Note that the paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1159	SPM	7	40	7	41	I am also not convinced that reference to Table 6.1 and Figure 6.8 should be quoted here, but rather Figure 6.3. [SYLVIE JOUSSAUME, France]	Noted. In the revised SPM we no longer refer to specific Figure and Tables from the underlying report, but provide the relevant section numbers only. Note that the paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1160	SPM	7	40			It should be noted that 24% higher than 1958 means about 40% higher than pre-industrial! [Andreas Sterl, Netherlands]	Taken into account. The statement has been revised an now gives both the %-change compared to pre-industrial and %-change since 1958 is directly linked. Note that the paragraph has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities.
SPM-1161	SPM	7	43	7	44	This sentence should be clarified to reflect something along the lines of "concentrations of long-lived greenhouse gases have continued to increase since the AR4 cut-off in 2005" or something similar. Otherwise the 2005-2011 period appears rather confusing and arbitrary. [William Anderegg, United States of America]	Paragraph has been deleted from the SPM.
SPM-1162	SPM	7	43	7	44	Yes, CO2 did increase from 2005 to 2011, but during that time global temperature decreased! Thus, there is no correlation between temperature and CO2! [Don Easterbrook, United States of America]	Paragraph has been deleted from the SPM.
SPM-1163	SPM	7	43	7	44	Why is this not a statement of fact (i.e. "Atmospheric concentrations……further increased" vs. "It is virtually certain that…")? The lines above (39-41) do not use any likelihood language and just state that concentrations have increased. [Government of Canada]	Paragraph has been deleted from the SPM.
SPM-1164	SPM	7	43	7	44	"It is virtually certain that atmospheric concentrations of long-lived greenhouse gases further increased from 2005 to 2011." Have expectations been different? Or has the recent increase of GHG been exceptionally strong? [Government of Germany]	Paragraph has been deleted from the SPM.
SPM-1165	SPM	7	43	7	45	It is unclear why the decades are reported separately. [Kristie Ebi, United States of America]	Paragraph has been deleted from the SPM.
SPM-1166	SPM	7	43	7	46	Please add possible explanations for why the CH4 trend ceased and why it is raising again. [Government of NORWAY]	Paragraph has been deleted from the SPM.
SPM-1167	SPM	7	43	7	46	Again, a pretty clunky paragraph and the message it's conveying is not entirely clear - why the reference to 2005 - 2011, is it because the rate of emissions has increased over this timeframe compared to past emission rates? If so it doesn't read quite right. [Government of United Kingdom of Great Britain & Northern Ireland]	Paragraph has been deleted from the SPM.
SPM-1168	SPM	7	43	7	46	to delete the whole paragraph, as accountability on such short period of time is questionable. [Nedal Katbeh-Bader, Palestine]	Accepted. Paragraph has been deleted from the SPM.
SPM-1169	SPM	7	43			Can anything be said simply about the other GHGs? Eg, halocarbons, SF6, Montreal Gases, etc… [Government of United States of America]	Paragraph has been deleted from the SPM.
SPM-1170	SPM	7	43			Again, give numbers here, not just a weak statement that they increased. The other option (better) is to put	Paragraph has been deleted from the SPM. Note that

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						these numbers (CO2 also) into the observed changes in the climate system under the biogeochemistry section. [Michael Prather, United States of America]	the preceding three paragraphs have been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities as suggested by the reviewer.
SPM-1171	SPM	7	44	7	44	Replace 'mole fractions' with 'concentrations' or other simpler terminology. [Government of Canada]	Paragraph has been deleted from the SPM.
SPM-1172	SPM	7	44	7	44	Please replace "mole fractions" by "concentrations", which is easier to understand and does not change the message. [Government of Germany]	Paragraph has been deleted from the SPM.
SPM-1173	SPM	7	44	7	44	Jargon - 'mole fraction' is f introduced here and it is another way to express concentration. There ought to be an explanation as to what this is but it would be better not to use it at all. [Government of United Kingdom of Great Britain & Northern Ireland]	Paragraph has been deleted from the SPM.
SPM-1174	SPM	7	44	7	44	For this audience it would replace "mole fraction" by "concentration" [Christoph Ritz, Switzerland]	Paragraph has been deleted from the SPM.
SPM-1175	SPM	7	44	7		Please consider to replace "mole fractions" with "concentrations". [Government of NORWAY]	Paragraph has been deleted from the SPM.
SPM-1176	SPM	7	44			Few will understand the term 'mole fractions' [Government of Australia]	Paragraph has been deleted from the SPM.
SPM-1177	SPM	7	44			"mole fraction". I applaud the authors for recognizing mole fraction. However, the quantity is "mixing ratio"; the unit is "mole fraction." (mixing ratio of CO2 might equally be expressed as mass fraction.) Saying that the mole fraction is increasing is like saying the number of kilograms is increasing where you mean to say that the mass is increasing. In the big picture it doesn't matter all that much, but you might as well get it right. [Stephen E Schwartz, United States of America]	Paragraph has been deleted from the SPM.
SPM-1178	SPM	7	45	7	45	Better use the word "similar" instead of "comparable" [Ingeborg Levin, Germany]	Paragraph has been deleted from the SPM.
SPM-1179	SPM	7	45	7	46	Adding a sentence to explain why CH4 concentration behave like that would be helpful and better illustrate the dynamic aspect of the links between emissions and concentrations [Government of France]	Paragraph has been deleted from the SPM.
SPM-1180	SPM	7	45	7	46	Any explanation for the flattening and then rise of CH4 in the record? This is most interesting from a policy point of view. [Government of United Kingdom of Great Britain & Northern Ireland]	Paragraph has been deleted from the SPM.
SPM-1181	SPM	7	45	7	46	Formulation is unclear in specifying that the statement on renewed increase after near-stabilization in CH4 only applies to the global annual mean CH4 (as correct in the sentence before for N2O and CO2). Regionally CH4 might well not have stabilized and the amount ot renewed increase might also depend on the region. see also next comment [Michiel van Weele, Netherlands]	Paragraph has been deleted from the SPM.
SPM-1182	SPM	7	45	7	46	I doubt that the interannual varaiability in CH4 in the last decade is the most important message to give to policy makers in the SPM. Probably a better statement on CH4 evolution for the SPM would be: On average the CH4 annual global-mean growth rate has continued to decline since the 1980s, caused by a reduction in the average annual emission growth and a closer balance between annual CH4 sources and sinks. (see also CH6 p6.4 lines 16-18 [Michiel van Weele, Netherlands]	Paragraph has been deleted from the SPM.
SPM-1183	SPM	7	48	8	44	The values presented in the figure SPM.3 on the radiative forcing by land-use change are explained nowhere. One can guess that they come from a change in the Earth's surface albedo (as emissions from land-use change are likely to be covered by the values on radiative forcing by CO2 and other gases) ; this should be explained. [Government of France]	Taken into account. Revised Figure now lists this term as "Albedo change due to land use"
SPM-1184	SPM	7	49	7	54	I think the figure caption to SPM.3 should make clear which components and effects that are not included (e.g. BC on snow and contrails) and which are lumped together. [Jan Fuglestvedt, Norway]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing are now listed. The caption has been expanded.
SPM-1185	SPM	7	49	7	54	Fig. SPM.3: a) We would prefer the former classification of CH4, N2O and others instead of "other WMGHG"; b) We propse to include the RF-values; c) "Land use change" should be explained; d) In a footnote it should be mentioned which processes are included in "Aerosols impact on clouds". [Government of Germany]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing

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							to radiative forcing are now listed. The caption has been expanded.
SPM-1186	SPM	7	49			Figure SPM.3: For the other WMGHGs also show the individual radiative forcing contributions from CH4, N2O and halocarbons. [Twan van Noije, Netherlands]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing are now listed. The caption has been expanded.
SPM-1187	SPM	7	49			Figure SPM.3: For the direct radiative forcing from aerosols, also show the individual contributions from sulphate, black carbon, organic carbon, nitrate and mineral dust. [Twan van Noije, Netherlands]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing are now listed. The caption has been expanded.
SPM-1188	SPM	7	50	7	50	A footnote, to define Radiative Forcing in layman's terms, would be useful in connection with the Fig. SPM.3 caption. Comments above suggest other ways of improving the information on RCPs though. [Government of United Kingdom of Great Britain & Northern Ireland]	Taken into account. Footnote added with an explanation of the concept of radiative forcing in less technical terms. A new RCP box has been added to the SPM.
SPM-1189	SPM	7	50	7	50	These are not "successive" periods, just increasingly long periods, all starting in 1750. [Dian Seidel, United States of America]	Text has been revised accordingly.
SPM-1190	SPM	7	50	7	51	Remove the word "successive", since the given time periods are not successive but overlapping. Also the order of mentioning should be reversed to match top-down appearance in the Figure (start with 1750-2011). [Government of Germany]	Text has been revised. Figure has been clarified.
SPM-1191	SPM	7	50	53		There is medium confidence in attributing the precip increase in NH mid-high lat since 1950 to human activities. A statement on this change in precip should be added to Page 3, atmosphere observations. [Government of Germany]	Unclear how this comment relies to the text it is referred to in the SPM section on drivers. Nevertheless, precipitation changes over land are spelled out in the SPM section on Observed Changes. The assessment of Detection/Attribution of changes is presented in the SPM section on "Understanding".
SPM-1192	SPM	7	51	7	52	I would urge that "well-mixed" be replaced by "long-lived" in this figure caption. In the (otherwise excellent) figure itself, the label "Other WMGHG" should be changed to "Other LLGHG". Note that "long-lived" is used much more than "well-mixed" to describe these gases throughout the WG1 report, and in particular "long-lived" is what is used in line 34 of this very page of the SPM. These GHGs are not particularly well mixed, and I have made several comments relating to Chapter 8 (nos. 235-239 in particular) on this point. [Adrian Simmons, United Kingdom]	Reject. Figure is based on and consistent with the terminology used in Chapter 8 of the underlying report.
SPM-1193	SPM	7	52	7	52	"stratospheric" is misspelled---without "r". [Government of Japan]	Figure caption has been revised. Comment no longer applies.
SPM-1194	SPM	7	52			Suggest expanding the caption of Figure SPM.3 to note that estimates for aerosols are divided into direct impacts and impacts on clouds. This will make the figure easier to understand. [Government of Canada]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing, including aerosols and the cloud adjustments due to aerosols, are now listed explicitly. The caption has been expanded.
SPM-1195	SPM	7				Figure SPM.3: I recommend to avoid background color (see also Figure SPM.1). In order to enhance visual communication I recommend the following modifications: 1. Text in the left column: Separate "Forcing agent" in "Anthropogenic" (i e., "CO2", "Other WMGHG", etc.) and "Natural" (i. e., "Solar"); left-justify all text elements to increase readability; use "Total Net Human Activities" instead of "Total Anthrop.". 2. Use dots instead of bars. 3. Do not use tick marks at the end of the RF ranges. 4. If possible: Add uncertainty ranges also for other time periods. 5. Add numbers of average RF to individual data points. 6. Add vertical grid lines for 2 and 2.5Wm-2. 7. Reduce line strength of grid lines. [Oliver Stebler, Switzerland]	The figure has been substantially revised graphically. Some of the comments made by the reviewer have been incorporated.

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SPM-1196	SPM	8	0	11		Section 4 'understanding the climate system and its recent changes' is disparate and generally doesn't hang together well. As a suggestion, the section 'detection and attribution of cc' could follow the section on observations. This could then be followed by the section on projections, then evaluation of models could come at the end. This structure would form more of a coherent story for policymakers. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. We prefer to keep the Detection and Attribution subsection as part of the SPM section on Understanding. However, we have revised the section to improve the flow in this section, in particular the 2nd subsection "Quantification of Climate System Responses" (formerly "Climate Processes and Feedbacks").
SPM-1197	SPM	8	0			Another para should be added on SRM, which should be defined, followed with a few sentences summarising section 7.7.4 "Synthesis" (page 7-57 line 58 to page 7-58 line 17) [Government of United Kingdom of Great Britain & Northern Ireland]	Taken into account. A paragraph summarizing the WGI AR5 assessment of methods to counter climate change (Geoengineering; SRM and CDR) has been added at the end of the SPM section on Projections
SPM-1198	SPM	8	1	8	1	"from observations" is redundant and can be deleted. [Kristie Ebi, United States of America]	Text has been revised.
SPM-1199	SPM	8	1	8	1	The first sentence is, although grammatically correct, hard to read, because it is not clear which words stick together. Might be solved by changing the beginning as "From observations there is consistent evidence of ...." [Urs Neu, Switzerland]	Text has been revised.
SPM-1200	SPM	8	1	8	2	This sentence makes no sense within a stand alone SPM and highlights the need for an upfront explanations of the concepts required. The aim of the SPM should be readability to a non expert. [Government of Australia]	Text has been revised and readability should have improved.
SPM-1201	SPM	8	1	8	2	This statement could be considered misleading. The only way of observationally determining the 'net energy uptake' of the Earth System is by satellite measurement of the TOA shortwave and long-wave radiation fluxes and this cannot yet be done with sufficient accuracy to even determine the sign of the Earth radiation balance, let alone its magnitude. While it has been inferred as a balance term from energy storage estimates for the atmosphere and ocean, it is bordering on misrepresentation to imply that 'the net energy uptake of the Earth System' has been determined by 'consistent evidence from observations'. [Government of Australia]	Sentence has been revised to avoid potential for mentioned misinterpretation. It now read "Total anthropogenic radiative forcing is positive, and has led to a net uptake of energy by the climate system". In addition, the introductory text provided in the Chapeau to this section now clarifies that "RF is estimated based on in-situ and remote observations, properties of greenhouse gases and aerosols, and calculations using numerical models representing observed processes."
SPM-1202	SPM	8	1	8	2	The first sentence is difficult to understand. One suggestion to improve clarity would be to add at the end: "...that is, more energy is coming into the system than is leaving." [Government of Canada]	Text has been revised to improve clarity.
SPM-1203	SPM	8	1	8	2	The first sentence is difficult to understand for policy makers: cause and effect remain unclear. Is it possible to simplify the sentence? [Government of Germany]	Text has been revised to improve clarity.
SPM-1204	SPM	8	1	8	2	Sentence needs clarifying. [Government of New Zealand]	Text has been revised to improve clarity.
SPM-1205	SPM	8	1	8	2	We suggest that you re-organize this sentence to something like. "There is a net energy uptake in the Earth System due to an imbalance in the energy budget, this is confirmed by consistent evidence from observations." [Government of NORWAY]	Text has been revised.
SPM-1206	SPM	8	1	8	2	Your statement is naïve. The energy budget is never balanced - not on a diurnal scale, not on a monthly scale, and not on an annual scale. [John McLean, Australia]	Noted. No concrete proposal for revisions, no action.
SPM-1207	SPM	8	1	8	4	This statement is quite clear, climate change to date is due to human activities (primarily anthropogenic emissions) and that natural forcing has contributed only a small fraction to the climate change resulting from the imbalance in the Earth's energy balance. What is not discussed (and needs to be) is the likely impact of potential changes in natural forcings. For example, what would happen to the climate if the Earth were to enter a period of increased volcanic eruptions? Or, a change in the solar output? Again, as with my comments above, the purpose of such discussion would be to help readers, and, in particular, the policymaker readers, to place these conclusions into perspective and to help them direct funding to the areas of research most likely to lead to fruitful results. [Julian Levy, U.S.A.]	Changes in total solar irradiance and volcanic forcing are now explicitly mentioned as part of this first highlighted statement in the SPM section on Drivers. This section focuses on radiative forcing and thus impacts are not considered here.
SPM-1208	SPM	8	1	8	5	Use of terms like "virtually certain" and "very high confidence" have no meaning when any opposing evidence	Noted. The uncertainty terminology used in IPCC AR5

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						isn't included. This isn't science--you need to demonstrate conclusions with real data, not "consensus" or "discarding any negative evidence so yours must be true." [Don Easterbrook, United States of America]	is explained in detail in an IPCC Guidance Note, summarized in the Technical Summary, Box TS.1, and briefly introduced in the SPM. The quantification of uncertainties is integral part of the assessment and can be found in the underlying report. No concrete proposal for revisions, no action.
SPM-1209	SPM	8	1	8	5	This important conclusion, which is subject to intense debate, should be highlighted in the conclusion on page 2 line 36-39, to make it more pronounced. The term 'due to' in line 1 suggests causality. Should 'due to' not be replaced by 'leading to', or 'resulting in'? In addition, this text-block is closely connected to the highlighted text-block at line 28-32 of page SPM-7. We suggest to merge both conclusions. [Government of Netherlands]	Text has been revised taking the comment into account. We prefer to keep the discussion of radiative forcing in the SPM section on drivers in contrast to merging it with observations. Note that the text block from page 7 has been moved to Section Observations, Subsection Carbon and Other Biogeochemical Quantities
SPM-1210	SPM	8	1	8	5	The "Energy Budget" Is a joke.. The energy of the earth or at any place on it is never :"balanced" and the figures given in the diagram are all complex averages from skewed variability distributions of poorly characterised averages., Your current version even ventures to give (unbelievabe) uncertainties which immediately cast doubt on any supposed "surplus". Your models are thus calculating a supposed increase above a moving target. The model does not show what happens when the energy is received by day only in variable amounts on varying surfaces, and it omits the enrgy which is used to make life possible on earth.or what really happens to it before the residue is radiated outwards [Vincent Gray, New Zealand]	Noted. Reviewer provides no scientific evidence supporting his claims and makes no concrete proposals how to revise the text. No action.
SPM-1211	SPM	8	1	8	5	This statement is very strong but needs further clarification. Which time period does it refer to? It is only valid over several decades. Second, why virtually certain caused by human activities when the attribution of surface warming is only extremely likely? Even if it the statement is plausible, I don't think we have nearly as many studies on the energy budget as we have on surface warming. Third, "caused" is problematic as it may imply caused 100%, which is never is. I suggest "dominated" or something quantitative, e.g. at least half. [Reto Knutti, Switzerland]	Taken into account. Statement has been substantially revised to improve clarity, disentangle cause and effect, and to avoid potential ambiguities with other parts of the assessment.
SPM-1212	SPM	8	1	8	5	To increase precision, rewrite "There is consistent evidence from observations of a net energy uptake of the Earth System due to an imbalance in the energy budget. It is virtually certain that this is caused by human activities, primarily by the increase in CO2 concentrations. There is very high confidence that natural forcing contributes only a small fraction to this imbalance." to read "Observations indicate that the rate of radiant-energy dissipation to space has slowed. It is virtually certain that much of this is caused by human activities, primarily by the increase in CO2 concentrations. Short-term natural forcing has offset the warming effect of this change in the past decade and a half and may do so for another two decades, but is likely to be close to zero in the long term." Reason: The term "energy imbalance" is imprecise. Also, there has been no warming for 16 years and it is possible that natural forcings may remain sufficiently net-negative over the coming decades to inhibit net warming. [Christopher Monckton of Brenchley, United Kingdom]	Statement has been substantially revised to improve clarity. Note that this section summarizes the assessment of changes in radiative forcing. Changes in atmospheric temperature as suggested by the reviewer are discussed in the SPM section on "Observed Changes", attribution to causes is discussed in the SPM section on "Understanding"
SPM-1213	SPM	8	1	8	5	To ensure internal consistency, delete the sentence "There is very high confidence that natural forcing contributes only a small fraction to this imbalance." Reason: Later, the Summary for Policymakers makes the (not well justified) assertion that up to 1.4 K global warming ought in theory to have occurred since the mid-20th century as a result of our influence on climate, even though only 0.6 K warming was observed over the period. Given that the estimated negative forcing from the direct and indirect effects of anthropogenic particulate aerosols has now (rightly) been reduced, a net-negative natural forcing of some magnitude is implicit in the IPCC's current high-end estimate of the quantum of anthropogenic warming over the period, which must accordingly be countervailing the energy "imbalance" to a substantial degree. [Christopher Monckton of Brenchley, United Kingdom]	Reject. Reviewer does not provide scientific evidence supporting his claim which btw is inconsistent with the comprehensive detection/attribution assessment in Chapter 10 (see, e.g., Figure TS.10 for a summary).
SPM-1214	SPM	8	1	8	5	It is a little difficult to trace this statement back through chapter 8. Also, while interesting to experts, the significance of the energy imbalance would be difficult to make clear to non-experts. Another option you may want to consider is to provide a separate short section drawing together several different types of observations - covering the energy imbalance, ocean heat uptake, and atmospheric warming, which would allow you to	Noted. Statement has been substantially revised to improve clarity and to increase traceability.

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						make the point that this provides limits on aerosol RF and on the commitment to future warming in the pipeline. [Susan Solomon, United States of America]	
SPM-1215	SPM	8	1		44	Its not everywere clear what timeperiod you talk about (a lot seems to be since preindustrial but couldn't really find) [Gabriele Hegerl, United Kingdom]	Taken into account. Statement has been substantially revised and reference period is now explicitly given.
SPM-1216	SPM	8	1			Net energy uptake over what time period? And if there is a possibility that natural forcing has been negative, the last part should be rephrased to state "at most a small fraction, and possibly an offset" or something of the sort. [Government of United States of America]	Taken into account. Statement has been substantially revised and reference period is now explicitly given.
SPM-1217	SPM	8	2	8	2	To which word does the expression "this is caused" refer? Is it the energy imbalance or the energy uptake? please simplify. [Government of Germany]	Taken into account. Statement has been revised and "caused by human activities" has been deleted.
SPM-1218	SPM	8	2	8	3	"It is virtually certain that this is caused by human activities, primarily by the increase in CO2 concentrations. There is very high confidence that natural forcing contributes only a small fraction to this imbalance..." If human influence on the energy budget is "VIRTUALLY CERTAIN", this would imply that natural influences are smaller. Why is there only VERY HIGH CONFIDENCE in this statement? [Government of Germany]	Paragraph has been revised. Revision includes now all factual statements.
SPM-1219	SPM	8	2	8	4	In this sentence, we suggest including "(99-100 probability)" after the words "virtually certain" because this is such a key statement. [Government of NORWAY]	Paragraph has been revised. Revision includes now all factual statements.
SPM-1220	SPM	8	2	8	4	Absolutely and categorically false. This is the kind of statement I'd expect from lobbyists, not scientists. As stated above the known characteristics of the ENSO can account for the observed change and by any rational assessment this is a far more likely cause of the observations described earlier in this SPM. In mid 1976 ENSO conditions shifted from being predominantly on the La Nina side of absolutely neutral (SOI=0) to being predominantly on the El Nino side of absolutely neutral and they remained this way until about 2009. (References for that shift: Trenberth, K.E. (1990), Guilderson, T.P. and Schrag, D.P. (2006), Trenberth, K.E. (1996), Trenberth K.E. and Carron, J.M. (2000), and Trenberth et al (2002) - "Evolution of El Nino–Southern Oscillation and global atmospheric surface temperatures") (I shouldn't have to remind you that the ENSO is a continuum rather than the three distinct steps that it is sometimes portrayed as being.) The well-recognised characteristics of El Nino conditions (c.f. La Nina conditions) are a strengthened Hadley Circulation, which brings warm air to the mid latitudes, and precipitation patterns that favour some regions and are detrimental to others.(References re Hadley Circulation - Quan, X-W et al (2004), and Wang, C. (2002) "Atmospheric Circulation Cells Associated with the El Nino–Southern Oscillation".) I remind you of your obligation to include different points of view. [John McLean, Australia]	Reject. This section covers the changes in "Drivers of Climate Change" and focuses on changes in radiative forcing, not changes in temperature or other climate variables. The role of ENSO on the atmospheric temperature is being considered as part of the SPM section on "Understanding the Climate System and its Recent Changes".
SPM-1221	SPM	8	2	8	4	I recommend to add these two sentences also to page SPM-2, line 39 (see comment no. 1 about short summary for SPM). [Oliver Stebler, Switzerland]	Noted. Statements have been substantially revised. We prefer to keep the assessment of drivers in the SPM section on drivers.
SPM-1222	SPM	8	3	8	3	Insert "atmospheric" before "CO2 concentration". [Government of Germany]	Take into account in the revised statement.
SPM-1223	SPM	8	3	8	3	"natural forcing" could be explicit: for instance, "i.e. variations in solar activity" could be inserted in this sentence. What about volcanic forcing? Should it be mentionned here and included explicitely on Figure SPM.3? [Masa KAGEYAMA, France]	Taken into account. Changes in total solar irradiance and volcanic forcing are now explicitly mentioned as part of this first highlighted statement in the SPM section on Drivers.
SPM-1224	SPM	8	3	8	3	Maybe change "natural forcing contributes" to "natural forcings contribute" (because there are several independent ones) [Urs Neu, Switzerland]	Statement has been revised to now explicitly mention changes in total solar irradiance and volcanic forcing rather than lumping them together as "natural forcing".
SPM-1225	SPM	8	3	8	5	Need to define 'natural forcings'. [Government of United Kingdom of Great Britain & Northern Ireland]	Taken into account. Statement has been revised to now explicitly mention changes in total solar irradiance and volcanic forcing rather than lumping them together as "natural forcing".
SPM-1226	SPM	8	5	8	44	All these figures are from your unbelievable climate models, which ignore or downplay all the chief influences	Reject. Reviewer does not provide scientific evidence

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						on the climate established by over 200 years of meteorologicak science. It is not enough just to have :confidence" The whole system has to be shown to be more effective than what is available now from the weather forercasters.Simulation of the past and forecasts for the far future are not enough. . [Vincent Gray, New Zealand]	supporting his claims. We refer the reviewer to the comprehensive assessment provided in the underlying report.
SPM-1227	SPM	8	6	8	44	This section on climate forcers is very technical and is not presented with the policymaker in mind. Need to set the numbers in context. Suggest they are presented as proportions of the total forcing rather than as numbers. [Government of United Kingdom of Great Britain & Northern Ireland]	Section has been substantially revised in order to improve clarity and readability. The context providing Chapeau text in italics has been expanded to better guide the reader through the section. We prefer to give the total forcing numbers as assessed in the underlying report.
SPM-1228	SPM	8	7	8	7	I support the assessment of low confidence in drought trends. The literature is indeed inconclusive on this matter. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Comment seems to be misplaced here in the SPM section on drivers. The assessment of droughts changes from WGI AR5 is summarized in Table SPM.1
SPM-1229	SPM	8	7	8	7	Instead of "RF" please write "radiative forcing" [Government of Germany]	Reject. The abbreviation RF for radiative forcing is introduced at the first mention of radiative forcing and used consistently thereafter, except for the coloured highlight statements.
SPM-1230	SPM	8	7	8	7	The uncertainty range seems to differ slightly from the uncertainty range (black intervals) in Fig. SPM.3 [Government of Germany]	Noted. Numbers in text and in figure SPM.4 have been updated to be consistent with the underlying Chapter 8 assessment.
SPM-1231	SPM	8	7	8	7	insert fullstop after "(see Figure SPM.3)" [Masa KAGEYAMA, France]	Text has been revised.
SPM-1232	SPM	8	7	8	7	Should read "The total anthropogenic radiative forcing (RF) in 2011 has a best estimate … [Ingeborg Levin, Germany]	Taken into account. Introductory Chapeau text to Section "Drivers" now clarifies that "All RF values are for the industrial era, defined here as 1750 to 2011, unless otherwise indicated."
SPM-1233	SPM	8	7	8	7	Add point at the end of the sentence. The time period to which the RF refers should be mentioned, e.g. "anthropogenic RF 1750-2011" [Urs Neu, Switzerland]	Taken into account. Introductory Chapeau text to Section "Drivers" now clarifies that "All RF values are for the industrial era, defined here as 1750 to 2011, unless otherwise indicated."
SPM-1234	SPM	8	7	8	7	define RF (it is only defined in the figure caption): "The …. radiative forcing (RF) …" I recommend to introduce acronymes in general again when not used for many pages. [Christoph Ritz, Switzerland]	Taken into account. Footnote added with an explanation of the concept of radiative forcing. Radiative forcing is also part of the WGI AR5 Glossary.
SPM-1235	SPM	8	7	8	10	This rather big increase in the forcings since AR4 is in my opinion the biggest "news" of AR5. However, the consequences of this news are not given in the SPM: more forcing with the same amount of warming means that estimates of climate sensitivity should be reduced. It is therefore very unlikely that the likely range for climate sensitivity is still the same. [Marcel Crok, The Netherlands]	Noted. The WGI AR5 assessment of climate sensitivity is being presented in Section 4, Subsection "Quantification of Climate System Responses".
SPM-1236	SPM	8	7	8	10	Seeing the exectutive summary of Chapter 7 of the present draft, the wording "a better understanding of aersols" seems too strong. We suggest changing to "advances in the understanding of climat-relevant aersol properties". [Andrew Ferrone, Germany]	Statement has been revised. Comment no longer applies.
SPM-1237	SPM	8	7	8	10	Consider elevating parts of this paragraph to the shaded box as it represents a significant advancement since the AR4. [Government of Canada]	Taken into account. Highlighted statement has been revised.
SPM-1238	SPM	8	7	8	10	For which moment in time do the RF's apply (2011)? [Government of Netherlands]	Taken into account. Introductory Chapeau text to Section "Drivers" now clarifies that "All RF values are for the industrial era, defined here as 1750 to 2011,

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							unless otherwise indicated."
SPM-1239	SPM	8	7	8	10	The sentence is very long and difficult to read. Please consider to stop after ".... understanding of aerosols." Rationale; this convey the main message better. [Government of NORWAY]	Taken into account. Paragraph has been revised and sentences been shortened.
SPM-1240	SPM	8	7	8	10	It would be helpful to give the numeric values for the changes in forcing from WMGHGs and aerosols. For example: "The total anthropogenic RF for 2011 has a best estimate of 2.40 [1.80 to 3.00] W m–2 (see Figure SPM.3). This is 50% higher (0.7 W m–2) compared to previous assessment for 2007. Part of the increase (0.2 W m–2) is due to continued increase in the concentrations of the green house gases between 2007 and 2011. The dominant component (0.5 W m–2) is due to a better understanding of aerosols which led to less negative estimates of aerosol RF (and not due to any specific changes in aerosol concentrations)". Also, check the 50% number. From table 8.7, the AR4 values is 1.7, not 1.6, implying more like 40%. [Government of United States of America]	Statements has been revised. We decided to stick to only report the percentage change compared to AR4. Number has been revised to 44%.
SPM-1241	SPM	8	7	8	10	This RF statement needs more explanations and a thorough check. I doubt this is accurate and so well constrained. The implication would be that climate sensitivity is less than 2K to be consistent with the observed warming, and the projections and models would be inconsistent with that since they all have much larger sensitivities. It is absolutely ciritical that the SPM and the underlying report have a discussion of the consistency of the different lines of evidence: forcing, sensitivity and TCR from obs, and from models, projected warming, sea level, energy budget, etc. [Reto Knutti, Switzerland]	Taken into account. This consistency in the assessment across WGI AR5 was a priority in the revisions of the SPM, the TS and the underlying Chapters. The new highlighted statement in the SPM Section on "Understanding", subsection "Quantification of Climate System Responses" reflects this consistency in the assessment.
SPM-1242	SPM	8	7	8	10	To make the central mathematics of climate sensitivity inferred from observed temperature change plausible, reverify the [1.8,3.0] W m–2 anthropogenic radiative forcing (for clarity the term should be spelled out in full). Reason: Most anthropogenic radiative forcing is thought to have occurred since 1950. Accordingly, a sub-centennial-scale climate-sensitivity parameter ~0.4 K W–1 m2 should be applied, for fewer than half of equilibrium feedbacks will have acted. Accordingly, the implicit interval of anthropogenic warming expected since 1750 is [0.7, 1.2] K. Warming since 1750, as a linear trend on the Central England Temperature Record (latitudinally and, in the period of overlap with the global instrumental record, observationally a good proxy for global mean warming), was 0.9 K. The IPCC's implicit [0.7, 1.2] K interval thus implies that ~100% of post-1750 warming was anthropogenic. If so, the IPCC should say so. Otherwise, it should reduce the lower bound of the anthropogenic radiative forcing interval. [Christopher Monckton of Brenchley, United Kingdom]	Statement has been revised, numbers have been verified, and Final Draft SPM provides the numbers as assessed in the underlying report (Chapter 8). Note that the estimate of Equilibrium Climate Sensitivity presented in the SPM and comprehensively assessed in the underlying WGI AR5 reports is based on multiple independent lines of evidence, not a single temperature record. The reviewer is referred to the SPM section on Understanding the Climate System and its Recent Changes for more details about the attribution of observed changes to causes, and, for an overview of the ECS assessment to the Technical Summary, TFE.6: Climate Sensitivity and Feedbacks.
SPM-1243	SPM	8	7	8	13	Use of three significant figures implies a precision of 1 part in 1000, which is unlikely with the large data spreads. [James [Jim] Crawford, United States of America]	In order to be consistent with the assessment of Chapter 8 in the underlying report, the SPM reports the precision given there.
SPM-1244	SPM	8	7	8	23	Somewhere, it needs to be made clear that the RF values presented in these paragraphs are for the 1750-2011 time period. [Government of Canada]	Taken into account. Introductory Chapeau text to Section "Drivers" now clarifies that "All RF values are for the industrial era, defined here as 1750 to 2011, unless otherwise indicated."
SPM-1245	SPM	8	7	8	38	"RF" is one of the abbreviations that ought to be in a listing at the front of the SPM. [James [Jim] Crawford, United States of America]	Reject. The abbreviation RF for radiative forcing is introduced at the first mention of radiative forcing and used consistently thereafter, except for the coloured highlight statements.
SPM-1246	SPM	8	7	8	39	SPM. Section 3. Drivers of Climate Change. The text, based on RF reasons, is difficult to understand outside the scientific community. Please try to further explain the meaning of RF in order to reach a wider audience as mention in previous general comment for SPM [Government of Spain]	Taken into account. Footnote added with an explanation of the concept of radiative forcing that uses less technical language. Radiative forcing is also part of the WGI AR5 Glossary.
SPM-1247	SPM	8	7	8	39	In line 7, it says total "anthropogenic RF". Be consistent and spell it out when it is referring to anthropogenic	Taken into account. This is now clearly noted in the

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						and when it is referring to natural radiative forcing throughout the bullets [Government of Sweden]	revised Figure SPM.4, though not added to the text except for the summary statements on total anthropogenic (in order to separate from total) radiative forcing.
SPM-1248	SPM	8	7	8	44	This whole section requires the radiative flux and radiative forcing be properly explained and interpreted first. Suggest structural change. [Government of Australia]	Taken into account. The introduction text in italics to the this section of the SPM has been expanded providing now more background information on the concept of radiative forcing. It now also includes a footnote specifically referring to the changes in the RF concept and the consideration of rapid adjustments to perturbations in the AR5. Radiative forcing is also part of the WGI AR5 Glossary.
SPM-1249	SPM	8	7	8	44	Radiative forcing should be explained here more clearly in this section. [Government of Netherlands]	Taken into account. The introduction text in italics to the this section of the SPM has been expanded providing now more background information on the concept of radiative forcing. It now also includes a footnote specifically referring to the changes in the RF concept and the consideration of rapid adjustments to perturbations in the AR5. Radiative forcing is also part of the WGI AR5 Glossary.
SPM-1250	SPM	8	7	8	44	The new consept of adjusted forcing (AF) is not mentioned in the SPM, but should be. AF includes all the forcing mechanisms whereas the RF concept is unable to quantify several mecanisms. [Gunnar Myhre, Norway]	Taken into account. The introduction text in italics to the this section of the SPM has been expanded providing now more background information on the concept of radiative forcing. It now also includes a footnote specifically referring to the changes in the RF concept and the consideration of rapid adjustments to perturbations in the AR5. Radiative forcing is also part of the WGI AR5 Glossary.
SPM-1251	SPM	8	7	9	7	Needs to be said that these are all relative to 1750 [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Taken into account. Introductory Chapeau text to Section "Drivers" now clarifies that "All RF values are for the industrial era, defined here as 1750 to 2011, unless otherwise indicated."
SPM-1252	SPM	8	7			Explain RF or even add a comment why global average radiative forcing is so central [Christof Appenzeller, Switzerland]	Taken into account. The introduction text in italics to the this section of the SPM has been expanded providing now more background information on the concept of radiative forcing. It now also includes a footnote specifically referring to the changes in the RF concept and the consideration of rapid adjustments to perturbations in the AR5. Radiative forcing is also part of the WGI AR5 Glossary.
SPM-1253	SPM	8	7			Please consider adding a bullet to cite the forcing from short lived climate forcing agents, ie CH4, trop O3, HFCs, and black carbon. They are nearly invisible here. These agents separately and as a group have high visibility in the science and policy commnunities and play a prominent role in mitigation discussions. This is a valuable way that IPCC could contribute to the discussion in a relevant but policy neutral way. [David Fahey, United States of America]	Taken into account. The figure SPM.4 has been substantially revised and now also presents individual contributions from short lived climate forcers. The corresponding text paragraphs have also been revised as proposed by the reviewer, e.g., now including one paragraph each on the CH4, halocarbons, in addition to the revised paragraph on short lived climate forcers.
SPM-1254	SPM	8	7			The concept of radiative forcing needs to be explained before it is referred to in text as RF. [Government of	Taken into account. The introduction text in italics to

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						Australia]	the this section of the SPM has been expanded providing now more background information on the concept of radiative forcing. It now also includes a footnote specifically referring to the changes in the RF concept and the consideration of rapid adjustments to perturbations in the AR5. Radiative forcing is also part of the WGI AR5 Glossary.
SPM-1255	SPM	8	7			Add 'it is virtually certain that the total anthropogenic RF > 0', or something to that effect. [Government of Australia]	Taken into account. This is now the first sentence in the highlighted statement of the SPM section on "Drivers of Climate Change"
SPM-1256	SPM	8	7			I am not so sanguine as you and the authors of the aerosol forcing chapter that the aerosol forcing is better constrained than at AR4. Note for example Haerter GRL 09 argue that uncertainty in forcing by sulfate aerosol alone is 1.0 W m-2 against default value of -1.9 W m-2. Haerter, J. O., E. Roeckner, L. Tomassini, and J.-S. von Storch (2009), Parametric uncertainty effects on aerosol radiative forcing, Geophys. Res. Lett., 36, L15707, doi:10.1029/2009GL039050. [Stephen E Schwartz, United States of America]	Noted. Please note that the comprehensive assessment as presented in the underlying report and summarized in the WGI AR5 SPM is based on multiple lines of evidence drawing from many studies.
SPM-1257	SPM	8	7			The acronym "RF" should be spelt out here, as it is the first time it appears in the body of the text - it is previously defined in a footnote and in a figure caption. [Adrian Simmons, United Kingdom]	Taken into account. The abbreviation RF for radiative forcing is now introduced at the first mention of radiative forcing in this section and used consistently thereafter, except in the coloured highlight statement where we prefer to spell it out again.
SPM-1258	SPM	8	9	8	9	'reduced estimates of the negative RF by aerosols' might be more intelligible to the SPM reader than 'less negative estimates of aerosol RF'. [Government of Australia]	Sentence has been revised as suggested.
SPM-1259	SPM	8	9	8	9	Insert "due" in "but also due to", otherwise the reference is not clear (could also refer to 'which led to...', which is misleading) [Urs Neu, Switzerland]	Sentence has been revised. Comment no longer applies.
SPM-1260	SPM	8	10	8	10	Is the GHG RF due to increased concentrations or due to changes in the rate of RF from GHG? [Kristie Ebi, United States of America]	Taken into account. Sentence has been revised to clarify that what is meant is the "growth in most GHG concentrations"
SPM-1261	SPM	8	12	8	12	A footnote listing the well-mixed GHGs would be helpful. [Kristie Ebi, United States of America]	Taken into account. List is provided in the revised paragraph and also included in the revised Figure SPM.4 (formerly SPM.3).
SPM-1262	SPM	8	12	8	12	Although well known to the community, the expression "well mixed" greenhouse gases is not understabable for non-experts, please add a simpler wording like "long-lived", see wording in the TS, page 26, line 26. [Government of Germany]	SPM needs to be consistent with the terminology introduced and used in the underlying assessment report. Well-mixed GHG is part of the WGI AR5 Glossary.
SPM-1263	SPM	8	12	8	12	should read. …greenhouse gases in 2011 is estimated… [Ingeborg Levin, Germany]	Taken into account. Introductory Chapeau text to Section "Drivers" now clarifies that "All RF values are for the industrial era, defined here as 1750 to 2011, unless otherwise indicated."
SPM-1264	SPM	8	12	8	14	To be consistent with SPM page 7 line 34 and 43 please use "long-lived" instead of well-mixed. [Government of NORWAY]	SPM needs to be consistent with the terminology introduced and used in the underlying assessment report (here chapter 8). Well-mixed GHG is part of the WGI AR5 Glossary.
SPM-1265	SPM	8	12	8	14	It would be useful to bring forward the finding on the positive message that CFC control has been helpful from the TS3.2 lines 44 on. There will always be a 3rd most potent GHG the issue is the absolute forcing of the individual gases increases or decreasing. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. We prefer to not comment on the specific policies in the WGI SPM.

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SPM-1266	SPM	8	12	8	14	Also mention the individual RF contributions from CH4, N2O and halocarbons. [Twan van Noije, Netherlands]	Taken into account. Both figure SPM.4 hand the revised text now mention CH4 and halocarbons separately. N2O is spelled out in Figure SPM.4.
SPM-1267	SPM	8	12			It would be particularly helpful and policy relevant to provide the CO2-e values for the RF values given. I think these are 473 [458 to ??] ppm CO2-e from the NOAA AGGI web site. [David Karoly, Australia]	Noted. But we prefer to focus this section on changes in RF. The atmospheric CO2 concentration and the change since pre-industrial times are given in Section "Observations". See also the new Figure SPM.3.
SPM-1268	SPM	8	12			"well-mixed" should be changed to "long-lived". See the previous comment but one, and many others. This would also fit better with the start of the next bullet point, which begins "Short-lived greenhouse gases …" [Adrian Simmons, United Kingdom]	SPM needs to be consistent with the terminology introduced and used in the underlying assessment report (here chapter 8). Well-mixed GHG is part of the WGI AR5 Glossary.
SPM-1269	SPM	8	13	8	13	Suggest replacing "component causing a positive RF" with "component causing a warming effect (i.e. positive forcing agent"). This is easier to understand and still consistent with terminology in Fig SPM.3. [Government of Canada]	Text has been revised. Comment no longer applies. The introductory Chapeau text now clarifies upfront that "Positive RF leads to a warming, negative RF to a cooling" therefore this is not repeated here.
SPM-1270	SPM	8	13			Problably CO2 is only the strongest globally, but not necessarily everywhere. [Reto Knutti, Switzerland]	Text has been revised. Comment no longer applies.
SPM-1271	SPM	8	16	8	16	A footnote listing the short-lived GHGs would be helpful. [Kristie Ebi, United States of America]	Taken into account. Short lived drivers are included in the revised Figure SPM.4 (formerly SPM.3).
SPM-1272	SPM	8	16	8	16	Short-lived GHGs (plural) are mentioned but only ozone is then discussed. This will be confusing. As the issue of short-lived climate forcers is very topical, clarity here is important. If a statement is made about the contribution of SLCFs to RF, then be clear what substances are included in the statement. It would help if methane's RF were listed separately in Fig SPM.3. Is this possible? [Government of Canada]	Taken into account. The figure SPM.4 has been substantially revised and now also presents individual contributions from short lived climate forcers.
SPM-1273	SPM	8	16	8	16	Which other gases except for ozone are subsumed here by "short-lived" greenhouse gases? There is no such category in Figure SPM.3. Methane seems to be subsumed under "WMGHG". The best would be to change "short-lived greenhouse gases" to "ozone", since the mentioned Figure 8.8 only refers to ozone. [Government of Germany]	Taken into account. The figure SPM.4 has been substantially revised and now also presents individual contributions from short lived climate forcers.
SPM-1274	SPM	8	16	8	16	Which greenhouse gasses are considered short-lived in this report? The current activities on short-lived gases and particles that affect RF merits at least one conclusion that brings together all relevant contributions quantitatively. It should be mentioned that these constituents are not evenly distributed It should include the notion that these constituents also negatively impact water availability (BC on snow and ice), biomass production (ozone), health and the lifetime of goods and production factors. [Government of Netherlands]	Taken into account. The figure SPM.4 has been substantially revised and now also presents individual contributions from short lived climate forcers.
SPM-1275	SPM	8	16	8	16	Total RF due to changes in ALL short-lived GHGs could be a useful statistic to have, rather than broken down by gas. Particularly as the opening statement says that the contribution of SLGs is substantial. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. Information on short-lived drivers has been expanded in the SPM, in particular by revising Figure SPM.4 which now presents individual contributions from short lived climate forcers.
SPM-1276	SPM	8	16	8	18	The first sentence of the paragraph seems too general, while the second sentence regards only ozone. It would be relevant to specify the RF of further short-lived species. Short-lived GHG as well as other near-term climate forcers such as black carbon are highly policy relevant. [Government of Denmark]	Taken into account. The figure SPM.4 has been substantially revised and now also presents individual contributions from short lived drivers. While the SPM text still only provides a summary, the Figure SPM.4 provides the quantitative information for all individual drivers.
SPM-1277	SPM	8	16	8	18	Please consider to list the group of greenhouse gases regarded as short-lived. We take note that the references only show to Ozone and Stratospheric water vapor. [Government of NORWAY]	Taken into account. The figure SPM.4 has been substantially revised and now also presents individual contributions from short lived climate forcers.
SPM-1278	SPM	8	16	8	18	The recent return to increase in the ozone trend should be brought out here.(TS53-54) [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. We do not consider this of primary relevance in the context of the SPM section on "Drivers of Climate

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
							Change"
SPM-1279	SPM	8	18	8	18	The error-bar in Figure SPM.3 (on page SPM-22) for Stratospheric Ozone should run from [-0.25 to +0.05] W m-2. In the figure it appears to run from [-0.25 to -0.05] W m-2 instead. [Government of Netherlands]	Noted. Numbers in text and in figure SPM.4 have been updated to be consistent with the underlying Chapter 8 assessment.
SPM-1280	SPM	8	20	8	20	A footnote listing the aerosols would be helpful. [Kristie Ebi, United States of America]	Taken into account. The figure SPM.4 has been substantially revised and now also presents individual contributions from aerosols
SPM-1281	SPM	8	20	8	20	Suggest adding to end of first sentence: "..including both direct effects and impacts on clouds." [Government of Canada]	Taken into account in the revision of Figure SPM.4 (formerly Figure SPM.3). The figure presents both direct and indirect effect from cloud adjustments due to aerosols in separate rows.
SPM-1282	SPM	8	20	8	20	The total RF from aerosols differs from the corresponding values in Chapter 7, page 5, line 16. What is the difference? [Government of Germany]	Noted. Numbers in text and in figure SPM.4 have been updated to be consistent with the underlying Chapter 7 and 8 assessments.
SPM-1283	SPM	8	20	8	23	Make explicit that this is considerably lower than the AR4 estimate of -1.3 W/m2. [Marcel Crok, The Netherlands]	The fact that forcing estimates from aerosols have been reduced in the AR5 is explicitly stated in the first regular paragraph of the Section on "Drivers of Climate Change". We see no added value in repeating this here by providing the AR4 central estimate. This is also not done for any of the other forcings either and thus is consistent throughout this section of the SPM.
SPM-1284	SPM	8	20	8	23	Please specify that the RF given here is a sum of RFari (aerosol-radiation interactions) and RFaci (aeorsol-cloud interactions). [Andrew Ferrone, Germany]	Taken into account. The figure SPM.4 has been substantially revised and now also presents individual contributions from aerosols. In addition, the caption to Figure SPM.4 has been expanded and now provides much more detail.
SPM-1285	SPM	8	20	8	23	Missing from this paragraph is any discussion of why the estimate of total aerosol forcing is so much less negative than in the AR4. Assuming this has some linkage to estimates of black carbon forcing, this issue is of a lot of interest to policymakers and making messages as clear as possible should be the aim. It may not be because of black carbon forcing estimates at all, but if nothing is said, then this statement will be open to interpretation. [Government of Canada]	Noted. We prefer to not go into this rather technical discussion in the SPM, but refer the interested reader to the Technical Summary, Section TS.3.3, and the comprehensive assessment in Chapters 7 and 8.
SPM-1286	SPM	8	20	8	23	Could it be clarified that the uncertartainty in RF arises mainly from tropospheric aerosols. [Government of Finland]	Noted. Terminology is consistent with the underlying Chapters. For the SPM, we felt that the proposed change was not necessary as the subsequent paragraph specifically mentions "stratospheric aerosols".
SPM-1287	SPM	8	20	8	23	Please simplify language. Please specify the processes included in the total RF from aerosols, If the indirect aerosol forcing effect is included, this should be clearly mentioned. [Government of Germany]	Taken into account. Text has been revised. Figure SPM.4 has been substantially revised and now also presents individual contributions from aerosols. In addition, the caption to Figure SPM.4 has been expanded and now provides much more detail.
SPM-1288	SPM	8	20	8	23	Also give the ranges for the direct and indirect RF from aerosols, and for the direct RF give the ranges for the individual components, including sulphate and black carbon. [Government of Netherlands]	Taken into account. Text has been revised. Figure SPM.4 has been substantially revised and now also presents individual contributions from aerosols. Consequently the caption to Figure SPM.4 has been expanded and now provides much more detailed explanations.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-1289	SPM	8	20	8	23	To diminish a transparent fudge-factor, substantially reduce both the negative magnitude of the radiative forcing from aerosols and, in the sentence "The uncertainty in the aerosol contribution dominates the overall net uncertainty in RF, but there is high confidence that aerosols have offset part of the forcing caused by the well-mixed greenhouse gases", the confidence level. Reason: The increase in particulate-aerosol emissions in Asia has largely been offset by a very substantial reduction in such emissions in the West via clean-air laws. Furthermore, even the sign of the aerosol contribution is unknown. It has long been apparent that the negative aerosol contribution has become a convenient fudge-factor allowing an unwarrantable increase in climate sensitivity inferred from observational temperature change. [Christopher Monckton of Brenchley, United Kingdom]	Reject. The reviewer does not provide scientific evidence supporting his claims. Statements in the SPM must be fully consistent with the assessment presented in the underlying Chapters and generally rely on multiple lines of evidence from many studies rather than individual studies.
SPM-1290	SPM	8	20	8	23	To take account of the latest research on the cosmic-ray influence over aerosol nucleation and cloud condensation, delete "but there is high confidence that the effect is too weak to have any significant climatic influence during a solar cycle or over the last century." Reason: From 1925-1995, peaking in ~1960, there was a 70-year period of solar activity that came close to being a Grand Maximum. Pinker et al. (2005) noted a substantial decrease in cloud cover from 1983-2001, which may well have contributed a substantial proportion of the warming over that period. Studies by Svensmark et al., now widely replicated throughout the literature, demonstrate that the small direct solar forcing is amplified approximately sevenfold by the cosmic-ray effect, which he has recently been able to explain completely by molecular-level chemical equations. [Christopher Monckton of Brenchley, United Kingdom]	Reject. Statements in the SPM must be fully consistent with the assessment presented in the underlying Chapters and generally rely on multiple lines of evidence from many studies rather than relying on individual studies as cited by the reviewer.
SPM-1291	SPM	8	20	8	23	Also give the ranges for the direct and indirect RF from aerosols, and for the direct RF give the ranges for the individual components, including sulphate and black carbon. [Twan van Noije, Netherlands]	Taken into account. Text has been revised. Figure SPM.4 has been substantially revised and now also presents individual contributions from aerosols. Consequently the caption to Figure SPM.4 has been expanded and now provides much more detailed explanations.
SPM-1292	SPM	8	20	8	27	Some considerations on types of aerosols (black carbon, sulphur particulates etc.) should be included here. [Government of NORWAY]	Taken into account. Text has been revised. Figure SPM.4 has been substantially revised and now also presents individual contributions from aerosols. Consequently the caption to Figure SPM.4 has been expanded and now provides much more detailed explanations.
SPM-1293	SPM	8	20	12	18	Regarding Aerosol forcing and feedbacks. This covers multiple pages and lines: basic info is SPM 8, lines 20-24, SPM 9 lines 52-53. The radiative forcing (Sect 3) is reduced but likely to be negative (which is fine) and this is used as an explanation for some observed variations in temperature change and also in the outlook if we have underestimated potential aerosol emissions. However, in the section on climate processes and feedbacks (p.9 line 52) it goes on to say that aerosol – climate feedbacks are ~ 0 (presumably capturing indirect effects?) and this leads to potential confusion and begs questions that the GHG contributions have been greater than the total contributions to warming (SPM 10, line 28 after Fig SPM.4 and the discussion on near term projections). [Government of Australia]	Text has been revised. Section "Climate processes and feedbacks" has been largely rewritten and is now focusing on "Quantification of Climate System Responses"
SPM-1294	SPM	8	20			Is the aerosol RF quoted the direct radiation component and the contribution through clouds? This is not clear from the text and I don't see in the chapters (7 or 8) where the combined error is reported. [Government of United States of America]	Taken into account. Text has been revised. Figure SPM.4 has been substantially revised and now also presents individual contributions from aerosols (direct aerosol effect, cloud adjustments due to aerosols). Consequently the caption to Figure SPM.4 has been expanded and now provides much more detailed explanations.
SPM-1295	SPM	8	20			This uncertainty range is too narrow. [Henning Rodhe, Sweden]	Noted. Numbers in text and in figure SPM.4 have been updated to be consistent with the underlying

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							assessment in the WGI AR5. The central estimate and uncertainty range have been revised.
SPM-1296	SPM	8	22	8	22	To be consistent with SPM page 7, line 34 and 43 please use "long-lived" instead of well-mixed. [Government of NORWAY]	SPM needs to be consistent with the terminology introduced and used in the underlying assessment report (here chapter 8). Well-mixed GHG is part of the WGI AR5 Glossary.
SPM-1297	SPM	8	22	8	22	"aerosols have offset part of the forcing caused by the well-mixed greenhouse gases". When? [Masa KAGEYAMA, France]	Taken into account. Introductory Chapeau text to Section "Drivers" now clarifies that "All RF values are for the industrial era, defined here as 1750 to 2011, unless otherwise indicated."
SPM-1298	SPM	8	22	8	22	Explain the acronym here "WMGHG" = well-mixed greenhouse gases, as it shows up in Figure SPM3 [Ingeborg Levin, Germany]	Figure has been revised. Comment no longer applies.
SPM-1299	SPM	8	23	8	23	Sections 7.5.1 and 7.5.2 should be added [Gunnar Myhre, Norway]	Accepted.
SPM-1300	SPM	8	25	8	25	For clarity, it probably needs to read 'aerosols from volcanoes is well understood'. [Government of Australia]	Text has been revised and now explicitly refers to "stratospheric volcanic aerosols"
SPM-1301	SPM	8	25	8	25	Please add "natural" so that the sentence reads: "The RF of natural stratospheric aerosols is well understood...". Your statement does not hold for geo-engineering SRM approaches. [Government of Germany]	Text has been revised and now explicitly refers to "stratospheric volcanic aerosols"
SPM-1302	SPM	8	25	8	26	No strong evidence has been presented for "a large impact on the climate for … decades after volcanic eruptions" in general. Pinatubo produced a detectable cooling of around 0.5K in global-mean surface temperature for a year, and much less thereafter - the e-folding time for stratospheric aerosols for tropical eruptions is around one year. Only the most extreme volcanic eruptions are perhaps candidates for a "large impact on the climate ... for decades". More is said in comments 240, 246, 287 and 300 above. Some evidence is quoted for a decadal effect via oceanic changes, but it is not demonstrated that the effect on climate is "large" and chapter 8 notes that observations are lacking and that the mechanism is not well understood. So I suggest simply changing "for years to decades" to "for some years" in the lines of the SPM in question. In view of the oceanic evidence, "and possibly decades" maybe could be added, though I would not be in favour. Please also compare with what is written in lines 20 to 24 of page SPM-12. [Adrian Simmons, United Kingdom]	Changed to "for some years" as suggested by the reviewer.
SPM-1303	SPM	8	25	8	27	Not all/many readers will know right away the significance of stratospheric aerosols. Suggest some revision to this paragraph as follows: "Stratospheric aerosols from volcanic eruptions can have a large impact on the climate from years to decades after eruptions. The RF from such aerosols is well understood." [Government of Canada]	Text has been revised and now explicitly refers to "stratospheric volcanic aerosols"
SPM-1304	SPM	8	25	8	27	Move this natural forcing mechanism after all anthropogenic forcing mechansims [Gunnar Myhre, Norway]	Accepted. The paragraph comes now just before the paragraph discussing RF due to changes in total solar irradiance over the industrial period.
SPM-1305	SPM	8	25	8	27	This section really underestimates the importance of volcanoes to climate change over the past 50 yrs. If one looks at the average RF over the 1990s then volcanoes are a big part. Indeed, if one averages RF over the 1951-2000 period then CO2 is +1.0 W/m2 and volcanoes are -0.4 W/m2 (see Fig A5 of Prather, Penner, Fuglestvedt, ...Lowe, Stott, ... GRL, 2009 L05707.) This is an important piece of the 'last 50-year forcing' that is missing here. [Michael Prather, United States of America]	Noted. Statements in the SPM must be fully consistent with the assessment presented in the underlying Chapters and generally rely on multiple lines of evidence from many studies rather than relying on individual studies as cited by the reviewer.
SPM-1306	SPM	8	26	8	26	This source of the value given here is careful to state that it is due to stratospheric aerosols changes - these may, or may not be due to volcanic eruptions and more careful wording is needed [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Text has been revised and now explicitly refers to "stratospheric volcanic aerosols", consistent with the underlying Chapter assessment.
SPM-1307	SPM	8	26	8	27	The uncertainty range [-0.13 to -0.07] does not seem to refer to the underlying text in chapter 8. See our comment for this chapter (page 35, lines 5-6). [Government of Netherlands]	The numbers used in the SPM are directly taken from Chapter 8, Section 8.4.2 Volcanic Radiative Forcing,

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							Subsection 8.4.2.1 Introduction
SPM-1308	SPM	8	26			Does the impact really last for decades in some cases? [Government of Australia]	Changed to "for some years" as suggested by another reviewer.
SPM-1309	SPM	8	28	8	28	Insert a statement on the land use radiative forcing here (it is larger than the contrails RF), and also include mention of non-radiative effects of land use / land cover change on climate. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Reject. We don't see the added value by expanding the SPM with further details on land use radiative forcing. Details can be found in the underlying assessment. Note that the revised Figure SPM.4 now clarify the land use term to be "Albedo change due to land use"
SPM-1310	SPM	8	28	8	28	Include text on Land Use Change here. Please explain what is included in Land Use Change (is eg. ice extent included?), and why Land Use Change gives negative RF. [Government of NORWAY]	Reject. We don't see the added value by expanding the SPM with further details on land use radiative forcing. Details can be found in the underlying assessment. Note that the revised Figure SPM.4 now clarify the land use term to be "Albedo change due to land use"
SPM-1311	SPM	8	29	7	31	I think it is good that persistent contrails are mentioned here since this effect has received a lot of attention. But I wonder if the total effect of contrail and contrail-induced cirrus effect could also be presented, to be consistent with ES in chapter 7. This would require that AF vs RF is mentioned which perhaps could be done in a footnote. [Jan Fuglestvedt, Norway]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1312	SPM	8	29	8	29	Persistent contrails, from a by product of aviation'. Using 'from' suggests they are perhaps deliberate. [Government of United Kingdom of Great Britain & Northern Ireland]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1313	SPM	8	29	8	31	The second sentence here is not clear, nor is it clear why this information is being included. Why the focus on the diurnal temperature range? Why are regional effects mentioned for contrails and not for some other forcers with regional effects (e.g. aerosols)? Suggest deleting sentence 2 and using the space to explain to readers what contrails are and if they are captured somewhere in Fig SPM.3 because there is risk they will be matched to the RF for stratospheric H20, which appears in Fig SPM.3 but is not mentioned in the discussion on this page of forcing agents. [Government of Canada]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1314	SPM	8	29	8	31	The sentence differs from the corresponding sentence in chapter 7, page 23, lines 29-31: "…aviation contrails are very unlikely, at current levels of coverage, to have an observable effect on surface temperature or diurnal temperature range." We propose to add the phrase: "at current levels of coverage". Moreover we have some doubts, that in regions with high air traffic volume and thus frequent contrails and contrail cirrus no observable regional effects on surface temperature are produced. We assume, the sentence in chapter 7 is related to global averages, not to regional effects. Please check the statement. [Government of Germany]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1315	SPM	8	29	8	31	I suggest to remove the description of the tiny forcing from contrails. RF from land use change is substantially stronger and is not mentioned. [Gunnar Myhre, Norway]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1316	SPM	8	29	8	31	I have noted in my input to Chapter 7 that this value is not well justified [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1317	SPM	8	29			Can something be said about the RF of contrail-induced cirrus? [Government of United States of America]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1318	SPM	8	33	8	33	Use of the word "secular" in a summary written for an incredibly broad audience is not helpful here, as the vast majority of readers will not understand this. [William Anderegg, United States of America]	Taken into account. Sentence has been revised and "secular" has been deleted.
SPM-1319	SPM	8	33	8	33	Phrase 'Secular trends of total solar irradiance' is technical and should be re-phrased using plain English	Taken into account. Sentence has been revised and

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						[Government of Australia]	"secular" has been deleted.
SPM-1320	SPM	8	33	8	33	Replace 'secular trends' with 'estimates' (or "estimates of changes in") for clarity/ease of understanding. [Government of Canada]	Sentence has been revised and "secular" has been deleted.
SPM-1321	SPM	8	33	8	33	Please explain what secular trends are. [Government of Netherlands]	Sentence has been revised and "secular" has been deleted.
SPM-1322	SPM	8	33	8	33	"The estimate of secular trends… relies on…" (The trends themselves don't rely on proxies) [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	Sentence has been revised and "secular" has been deleted.
SPM-1323	SPM	8	33	8	34	It is mentioned that "Secular trends of total solar irradiance before the start of satellite observations" induce an RF of +0.04. However, this seems to be inconsistent with chapter 8.4.1.2. On page 8-32, line 9-10 is said "The best estimate gives a 7-year running mean RF between the minima of 1745 and 2008 of ~0.04 W m–2". Thus, the value of RF +0.04 includes the satellite era. Since in the satellite era "considering the last three solar minima PMOD values, between 1986 and 2008 there is a negative RF of –0.04 ± 0.02 W m–2" (page 8-31, lines 47-49), the RF before the start of satellite observations should be higher than +0.04, about +0.08 Wm-2. [Urs Neu, Switzerland]	Noted. Numbers in text and in figure SPM.4 have been updated to be consistent with the underlying assessment in the WGI AR5 report.
SPM-1324	SPM	8	33	8	35	"Secular" won't be understood by the policy-maker. Suggest instead "The trend in solar irradiance, derived from proxies before the start of satellite observations, is estimated to be...." [Government of United Kingdom of Great Britain & Northern Ireland]	Sentence has been revised and "secular" has been deleted.
SPM-1325	SPM	8	33	8	35	One might mention that there is still a low understanding of solar irradiance variations during the pre-satellite era. [Fortunat Joos, Switzerland]	Noted. Text now focuses on the changes over the industrial era only.
SPM-1326	SPM	8	33	8	38	The significance of the negative forcing from solar irradiance since 1978 is lost in this paragraph. It needs to be made clear that the data from 1978 (last 3 solar cycles) is captured in the estimate of RF for the time period 1750-2011 and not in that for 1750-1980 and that this is the reason for the smaller estimate of RF for the longer time period. Suggest concluding this paragraph by saying something like "the small cooling effect (negative RF) from 1978 is reflected in the lower RF value for solar forcing for the period 1750-2011 compared to 1750-1980." [Government of Canada]	Taken into account and text has been revised to clarify the role of solar irradiance changes to radiative forcing over the past decades.
SPM-1327	SPM	8	33	8	39	This text is so technical and loaded with numbers, that it is very difficult to comprehend. If the texts must this technical, we suggest adding a more understandable sentence several places in the SPM bullet points, starting with "This means that…", and in this specific case, "This means that solar radiation/energy contributes less to climate change than previously assessed by the IPCC." [Government of NORWAY]	Taken into account and text has been revised to clarify the role of solar irradiance changes to radiative forcing over the past decades.
SPM-1328	SPM	8	33	8	39	It would be useful to have a qualitative confidence statement about the estimated RF from solar irradiance. [Government of United States of America]	Noted. Statement and uncertainty terminology use in the SPM must be fully consistent with the assessment presented in the underlying Chapters
SPM-1329	SPM	8	33		39	Include a sentence saying "The solar activity was even lower in the century preceeding 1750". [Terje Wahl, Norway]	Noted. Text now focuses on the changes over the industrial era only.
SPM-1330	SPM	8	34	8	34	The RF estimate differs slightly from the values in chap. 8, p. 4, line 31. [Government of Germany]	Noted. Numbers in text and in figure SPM.4 have been updated to be consistent with the underlying assessment in the WGI AR5 report.
SPM-1331	SPM	8	34	8	34	“best RF estimate of +0.4 [-0.01 to 0.09] Wm-2 since 1750”: A slightly different range of -0.02 to 0.10 Wm-2 is given in TS (p. 19, line 25) and Chapter 8 (p. 32, line 10) [Natalie Krivova, Germany]	Noted. Numbers in text and in figure SPM.4 have been updated to be consistent with the underlying assessment in the WGI AR5 report.
SPM-1332	SPM	8	34	8	36	Please check the consistency of the given numerical data with the results reported in section 8.4.1. See our comment for this chapter (page 31, lines 48-52). [Government of Netherlands]	Noted. Numbers in text and in figure SPM.4 have been updated to be consistent with the underlying assessment in the WGI AR5 report.
SPM-1333	SPM	8	35	8	35	I strongly recommend to include a sentence to the RF since the maunder minimum, to avoid accusations of 'hiding stronger solar influence' by taking 1750 as a starting point. Thus, e.g. insert after the first sentence of	Noted. Text now focuses on the changes over the industrial era only.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						that paragraph "The RF from the solar minimum 1650-1700 (Maunder Minimum) to present is estimated to be 0.08-0.18 Wm-2". [Urs Neu, Switzerland]	
SPM-1334	SPM	8	36	8	36	The quoted change should be +0.04 [+0.06 to +0.02]. [Government of Australia]	Noted. Numbers in text and in figure SPM.4 have been updated to be consistent with the underlying assessment in the WGI AR5 report.
SPM-1335	SPM	8	37	8	37	'due to data of the last solar cycle' could warrant unpicking a bit more - implicit in this paragraph is an understanding by the reader of solar cycles [Government of United Kingdom of Great Britain & Northern Ireland]	Taken into account and text has been revised to clarify the role of solar irradiance changes to radiative forcing over the past decades.
SPM-1336	SPM	8	37			"of" -> "from" [William Ingram, United Kingdom]	Sentence has been revised.
SPM-1337	SPM	8	38			"has been" -> "was" [William Ingram, United Kingdom]	Sentence has been revised.
SPM-1338	SPM	8	41	8	43	The first part of the sentence differs from the corresponding sentence in chapter 7, page 44, lines 13-16: "Although there ist some evidence that ionization from cosmic rays may enhance aerosol necleation in the free troposphere…". We think this sentence in chapter 7 reflects better the remaining uncertainties. [Government of Germany]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1339	SPM	8	41	8	44	How can you have "high confidence" that this effect is weak when you produce no evidence that this is true and there is excellent correlation between cosmic ray incidence and could generation? [Don Easterbrook, United States of America]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1340	SPM	8	41	8	44	My reading of the literature is that cosmic rays enhance cloud nucleation but that the impact on cloud nucleation production is unknown. There is no confidence in the statement provided here - and more generally why this point deserves inclusion in the SPM is an open question re relevance. [Government of Australia]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1341	SPM	8	41	8	44	The two sentences could be argued to be inconsistent with each other with the last sentence likely to be disputed (notwithstanding the word 'robust') by a significant expert community. [Government of Australia]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1342	SPM	8	41	8	44	There are several terms used in this bullet that would need to be better explained for non-scientific readers: "cosmic rays", "aerosol nucleation", "cloud condensation nuclei" and "free troposphere". [Government of Canada]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1343	SPM	8	41	8	44	Explain the phenomena of "aerosol nucleation" and "cloud condensation nuclei production" in a more comprehensive way for non-experts. [Government of Germany]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1344	SPM	8	41	8	44	Worth an extra line to actually explain the RF effects of clouds? [Government of United Kingdom of Great Britain & Northern Ireland]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1345	SPM	8	41	8	44	It is intriguing to read your categorical dismissal of any role of Galactic Cosmic Rays on climate, expressed with, as you put it, "high confidence". The matter is, of course, an open research question and the work has not yet concluded. It is quite daring of you to declare high confidence in what the results of yet-to-be-completed experiments and analyses will be. But you should consider whether you really want to go so far out on the limb here. [Ross McKitrick, Canada]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1346	SPM	8	41	8	44	From lab studies it can be inferred that GCR can contribute to aerosol nucleation, but its contribution to atmospheric cloud condensation nuclei is far from clear, thus: "Cosmic rays enhance aerosol nucleation and POSSIBLY cloud condensation nuclei production in the free troposphere …" [Bart Verheggen, Netherlands]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1347	SPM	8	41		44	Cosmic rays. I applaud the forthright statement. [Stephen E Schwartz, United States of America]	Paragraph has been deleted in an attempt to shorten the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1348	SPM	8	41			"Cosmic rays enhance aerosol nucleation and cloud condensation nuclei production in the free troposphere" is	Paragraph has been deleted in an attempt to shorten

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						not justified by the science or by Chapter 7. "Cosmic rays may enhance aerosol nucleation in the free troposphere, which would tend to enhance CCN production" or "Cosmic rays may enhance aerosol nucleation in the free troposphere, which, if it had any effect on CCN production, would enhance it" would be fine (given the sentence continues to indicate this fairly certainly is too small to matter). [William Ingram, United Kingdom]	the SPM as it does not seem crucial for the overall SPM narrative.
SPM-1349	SPM	8	48	11	38	Arguably this section is the most important section in the Exec Summary and in the entire report. However as written, this section is influenced almost entirely by climate modeling activities and omits major new developments in understanding from the observational and conceptual sides. I highlight what I consider to be the most important of these in the next several comments. I urge the authors to include these major developments in understanding in the Exec Summary [Stephen E Schwartz, United States of America]	Comment is noted, and considered within the underlying chapter assessment. SPM is not the correct location to single out individual studies, and key messages must flow up from the underlying chapter assessment.
SPM-1350	SPM	8	48	11	38	As a major breakthrough in understanding I would single out especially the sort of thinking reflected in Held IM, Winton M, Takahashi K, Delworth T, Zeng F, Vallis GK (2010) Probing the Fast and Slow Components of Global Warming by Returning Abruptly to Preindustrial Forcing. J Climate 23:2418-2427. doi:10.1175/2009JCLI3466.1 which relates modeling to observations and thus lends valuable perspective to climate change over the industrial period. This advance in understanding is stated also in FOD, chapter 12, page 7, line 8: "If radiative forcing were stabilized, the fraction of realized warming at that point is around 85 ± 10% of the total, and is almost independent of the forcing scenario. Equilibrium is reached only after centuries to millennia" This finding is enormously important. It means that the great majority (75-95%) of the warming that is committed at any given time, under assumption of continued constant forcing, is realized at that time. This finding also leads to the concept and quantity, transient climate sensitivity, proportionality constant between increase in GMST and forcing and its utility as a quantifier of climate sensitivity pertinent to climate change on the multi-decade to century time scale. This finding is a consequence of recognition that Earth's radiation imbalance is rather small compared to GHG forcing. The finding is somewhat tentative because if aerosol forcing is offsetting a large fraction of GHG forcing, the imbalance is a much greater fraction of the forcing and the committed warming (for constant future forcing) is consequently greater. This finding also has major implications, again because forcing at any given time also includes aerosol forcing. If the forcing were to be maintained at its value at some time in the future, then that would require fossil fuel emissions to be essentially halted. At that point aerosol forcing would decrease greatly, absent some geoengineering to maintain it, and the temperature would rapidly increase. [Stephen E Schwartz, United States of America]	Comment is noted, and considered within the underlying chapter assessment. SPM is not the correct location to single out individual studies, and key messages must flow up from the underlying chapter assessment.
SPM-1351	SPM	8	48	11	38	Another major advance is the adjusted forcing concept. The finding, AF is 1.95 ± 0.9 (Chapter 8, p 3 line 9 of FOD; seems absent from SOD) is also a major advance, if correct. It brings uncertainty in forcing from a factor of 4 (0.6 to 2.4) to a factor of 2.7 [Stephen E Schwartz, United States of America]	Comment is noted, and considered within the underlying chapter assessment. SPM must focus on the key policy relevant findings as provided by the underlying chapters..
SPM-1352	SPM	8	48	11	38	Another major conceptual advance is the relation between temperature change and cumulative emitted CO2, only weakly dependent on temporal pattern of emissions. [Stephen E Schwartz, United States of America]	This topic is picked up in the final section of the SPM, including a new figure (Figure 9).
SPM-1353	SPM	8	48	11	38	Yet another major conceptual advance is the use of Green's function to determine climate system response to unit forcing applied for one year and then to convolve that with forcing to get response to arbitrary forcing, as advanced by Hansen et al ACP 2011. Perhaps it is premature to say that this approach will work, but it seems essential to get this on the table so that modeling groups will test their models against this approach. In principle it should work not just for temperature but for any climate system response, such as radiation, winds, precip. Relate to pattern scaling as described in Ch 12 [Stephen E Schwartz, United States of America]	Comment is noted, and considered within the underlying chapter assessment. SPM must focus on the key policy relevant findings as provided by the underlying chapters, and is not the correct location to be discussion potentially premature findings.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-1354	SPM	8	48			Section Understanding the Climate System and its Recent Changes: It would be useful to include a point in this section discussing the energy budget, perhaps a summary of section TFE.4 from the Technical Summary. [Government of United Kingdom of Great Britain & Northern Ireland]	The Earth's energy budget is now addressed in the headline statement under 'quantification of climate system responses'.
SPM-1355	SPM	8	50	8	50	Is it correct, that the combination of observations, theoretical studies and model simulation is proceeded in a quantitave wayonly? Please check. Suggestion to delete "quantitative" in this sentence. [Government of Germany]	sentence revised
SPM-1356	SPM	8	50	8	51	There is a great deal more to understanding the climate system, for example why focus on feedback processes and not parameterisations? This potentially gives artificial weight to some lines of evidence or processes over others. For the SPM, this could be stripped back to 'fundamental physics and chemistry combined with observations and numerical modelling' or something similar. [Government of Australia]	We believe current wording accurately captures the scope of the underlying chapter assessment.
SPM-1357	SPM	8	50	8	51	Replace" theoritical studies of feed back processes "by" theorical studies of key processes including feed back and non-linearities". [Government of Benin]	no change. Proposed language is too technical.
SPM-1358	SPM	8	50	8	51	To make explicit the central source of uncertainty in determining climate sensitivity, add after “theoretical studies of feedback processes” the clause “none of which is directly measurable”. Reason: In the IPCC’s method, temperature feedbacks are imagined to near-triple the relatively small direct warming caused by anthropogenic radiative forcings. For instance, the CO2 radiative forcing implies less than 1.2 K direct warming at a CO2 doubling: yet the models relied upon by the IPCC (2007, p. 298, box 10.2) imagine 3.26 K warming will have occurred at equilibrium, implying an overall feedback gain factor >2.8. This gain factor is essentially guesswork, and is near-certainly a very substantial exaggeration. Indeed, even the sign of the contribution from temperature feedbacks is unknown, and various studies (e.g. Lindzen & Choi, 2009, 2011; Spencer & Braswell, 2010,. 2011) have found it to be negative. [Christopher Monckton of Brenchley, United Kingdom]	Reject; Clause is not warranted. Statement makes it very clear that the reference here is to 'theoretical studies'.
SPM-1359	SPM	8	50	8	53	Your :"climate system" is incomplete. It should include the sun and the earth itself and it must include the fact that energy reception takes place only by day. It must also include the fate of the enrgy received, which includes its utilisation by living organisms, its transfer by conduction, latent heat, and departure of the residue to space by radiation from heated atmosphere at evry level as well as from the earth itself Thw WHOLE system is a heat engine with the sun as an energy source and space as the exhaust. Whether trace gases play a part in this system has not been established as it is swallowed up by the "chaos" of fluid behaviour which you claim to have eliminated, [Vincent Gray, New Zealand]	Don't understand what specifically the reviewer is requesting, and reviewer provides no evidence to support his claims.
SPM-1360	SPM	8	52	8	52	Move "to the incresase in greenhouse gas concentrations" to the end of the sentence. [David Parker, United Kingdom of Great Britain & Northern Ireland]	sentence revised
SPM-1361	SPM	8	52	8	53	I assume the detected changes are in a wider range of climate system components, although the sentence structure is confusing. [Kristie Ebi, United States of America]	sentence shortened for clarity.
SPM-1362	SPM	8				Figure SPM.3 is very much appreciated. Thanks to the authors for further improvements compared to similar figure in the past. [Klaus Radunsky, Austria]	noted.
SPM-1363	SPM	9	0	10		On pages 9-10, the section on feedbacks should cover all feedbacks - currently focuses on water vapour. The section could also cover other unquantified risks - e.g. geo-engineering. [Government of United Kingdom of Great Britain & Northern Ireland]	The focus of this section has been significantly revised, and now is entitled 'quantification of the climate system'.
SPM-1364	SPM	9	1	9	1	In this model evaluation section not only the confidence, but also the model quality should be mentioned since this is relevant. One example is the conclusion on lines 22-23. The models have medium quality, which is relevant information compared to the high confidence. We suggest the authors check the other conclusions in this section. [Government of Netherlands]	noted. Chapter assessment and summary statements have been carefully revised.
SPM-1365	SPM	9	1	9	38	There is abysmal correlation between IPCC previous climate predictions and actual measured temperatures. The IPCC models were off by a full degree in just the decade of 2000 to 2011! The IPCC models do not include data from ENSO and solar forcing, so they cannot be realistic. [Don Easterbrook, United States of America]	The comparison between recent observations and projections provided in earlier IPCC reports is critically addressed in Chapter 1 and the Technical summary.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-1366	SPM	9	1	9	39	A significant weakness is around the description of confidence gained about the climate models' ability to simulate the present climate (section 4). A figure or two should really be shown in this section 4, comparing models and observations for critical quantities (essentially bringing some figures from Chapter 9), showing how well the observed components of change in current climate are reproduced by climate models. This is the critical part to build confidence in climate projections. [Government of Australia]	Section has been significantly revised, based on improved quantitative assessment finding coming out of Chapter 9.
SPM-1367	SPM	9	1	9	39	" Evaluation of Climate Models" should constitute the part 4 with" Detection and Attributions of Climate Change" [Government of France]	Structure is consistent with the underlying report.
SPM-1368	SPM	9	1	9	39	The capability of climate models (or their derivatives) to project mean sea level change (in projection mode) should be addressed here (and in chapter 9) with reference to detailed discussion in chapter 13. The point seems to have been identified: see the place holder page 16 line 28, but not in the right place. Lines 25-29 refer to past global sea level rise only. [Government of France]	This is addressed in a revised headline statement in the sea level projection section.
SPM-1369	SPM	9	1	9	39	The understanding of this section would be improved if there was a little explanation of Coupled Model Intercomparison Projects (CMIP5 and CMIP3) as a first bullet point e.g. draw from Chapter 9 of the underlying report page 9-3, lines 27 to 36. Then, in particular, when the reader gets to the second to last bullet point (lines 31 to 34) the reference to CMIP5 and CMIP3 will make more sense. At the very least CMIP needs to be spelt out, rather than just use the acronym. [Government of New Zealand]	The preference of the authors is to leave the introduction of CMIP5 within the projection section. Here in the model evaluation section, and reference to CMIP has been avoided in the revised draft.
SPM-1370	SPM	9	1	9	39	Please consider to include the conclusion about the ability of climate models to reproduce the climate from Chapter 1. We also propose to add Chapter 1 Figure 1.4 updated with AR5 results to this section of the SPM. A combination of Chapter 1, Figure 1.4 and Chapter 1, Figure 1.16 is preferred. [Government of NORWAY]	For the reasons discussed in Chapter 1, the comparison between climate models used in passed assessments and recent observed climate is not straight-forward. This discussion is therefore located within the technical summary.
SPM-1371	SPM	9	1	9	39	In AR1 was a Chapter entitled "Validation of climate models" In the First Draft of AR2 was a similar Chapter. I commented at the time that since no attempt at genuine validation was being attempted, the Title was inapropriate. To my surprise, you agreed with me, and in the next Draft you not only altered the title to "Evaluation of climate models" but you also changed the word ":validation": to :"evaluation" no less than fifty times throughout the Chapter, Since then, the word "validation" has been forbidden. Not only that, you also banned the use of the word "prediction: and replaced it by the word :"projection": All this is an admission that none of your models are capable of "climate prediction. All you get are "projecftions" where you have to believe the initial assumptions before you take any notice of them. "Validation" would require an extensive series of tests to discover the predictive capahilities of the models in all circumstances for which they are to be used, to a satisfacory level of accuracy. Not only has this never been done, there has, up to now, been no discussion on how it may be done. Because of this it is possble to assert that the models should not be used for forecasts until it has been done. You have chosen the lesser procedure of :Evaluation: which essentilly relies on educated guesses made by the modellists themselves, who have a conflict of interest in the matter, and therefore should not be believed, .. [Vincent Gray, New Zealand]	the unsubstantiated claims of the reviewer are noted. No action required.
SPM-1372	SPM	9	1	9	39	This subchapter only mentions the advances in climate modeling. An 'evaluation', however, should also mention the still existing most important shortcomings of models (clouds, regional patterns, atmospheric circulation, etc.). I strongly recommend to add one or two corresponding paragraphs, and a sentence in the leading box, to avoid (legitimate) criticism of onesided evaluation. [Urs Neu, Switzerland]	noted. Section has been significantly revised, and now also includes the most policy relevant shortcomings of the models.
SPM-1373	SPM	9	1	9	40	The section on model performance is very positive, a para could be added on areas where model performanc can be improved, drawing on Chapter 9, page 4, lines 51-57, also identifying the most important uncertainties. This would improve the balance of the presentation. [Government of Germany]	noted. Section has been significantly revised, and now also includes the most policy relevant shortcomings of the models.
SPM-1374	SPM	9	1	9	40	This section could do with an up-front summary description of the model evaluation process (including what CMIP5 is, and how models have improved since CMIP3) to provide the context for the confidence assessments of predictive capability [Government of United Kingdom of Great Britain & Northern Ireland]	Section has been significantly revised. Bullets should provide an improved explanation of the reasoning (context) for the confidence in each case. The preference of the authors is to leave the introduction of CMIP5 within the projection section.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-1375	SPM	9	1	9	40	This section on evaluation of climate models tells us what they do well - but a more interesting question for policymakers is what they don't do. Which processes are not represented and what the consequences of this are? For example, there remain some important weaknesses that operate at regional levels (for instance the skill in predicting the South Asian monsoon) and it would be useful for the report to flag the areas where more work is urgently required [Government of United Kingdom of Great Britain & Northern Ireland]	noted. Section has been significantly revised, and now also includes the most policy relevant shortcomings of the models. Headline statement for this section now specifically addresses regional climate
SPM-1376	SPM	9	1	9	41	The section on Evaluation of Climate Models needs a dot point included about the implications of the uncertainties inherent in climate models (that are discussed in detail in Chapters 9,11 and 12 in particular). Suggest including as a dot point at the end of this section wording along the lines of the para taken from Chapter 12 p 74 (36-39) that "There are inevitable uncertainties around future external forcings, and the climate systems response to them, further complicated by internally-generated variability. These uncertainties make the use of multiple scenarios and models a standard choice if we are to assess and characterise them, describing a wide range of possible future evolutions of the Earth's climate." [Government of Australia]	The use of multiple scenarios etc., are introduced in the section on climate projections, including a new box on the RCP scenarios.
SPM-1377	SPM	9	1			Section "Evaluation of Climate Models": The listing given in this chapter is biased towards those points were clear advances in models have been made since AR4. In order to give a more balanced overview also points were no or minor progress has been achieved should be included. We thus suggest to add the following point "Although progress has been made in the representation of aerosols and their interactions with radiation and clouds in global climate models since AR4, these processes remain one of the largest source of uncertainty in the respresentation of current and future climate. {7.4}" [Andrew Ferrone, Germany]	noted. Section has been significantly revised, and now also includes the most policy relevant shortcomings of the models.
SPM-1378	SPM	9	1			Section: Evaluation of Climate Models. The word "realistic" is used throughout this section (as in chapter 9) but is not well defined. Does it refer to agreement with observations or to the mechanisms of the physical processes, or both? In general a time and spatial scale should be referred to whenever "realistic" is used to describe consistency with observations. In addition, it would be useful to clarify the quantitative limit of consistency (for example, 1K of global mean temperature) or note specifically that "realism" is a qualitatively judged property. [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	Care has been taken in the revised draft to avoid undefined words such as "realistic", and provide more quantitative statements where possible.
SPM-1379	SPM	9	1			Could "realistic" be defined in the Glossary? [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	Care has been taken in the revised draft to avoid undefined words such as "realistic", and provide more quantitative statements where possible.
SPM-1380	SPM	9	1			Where models are deemed to "realistically simulate the trend", the error in the absolute values should also be included. [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	Care has been taken in the revised draft to avoid undefined words such as "realistic", and provide more quantitative statements where possible.
SPM-1381	SPM	9	2	9	3	include - 'There is high confidence that climate models provide realistic representations of the climate system. [Government of Australia]	Headline statement has been significantly revised.
SPM-1382	SPM	9	3	9	3	change - 'more realistic representation' instead of 'more realism in the representation' [Government of Australia]	Headline statement has been significantly revised, and following other review comments, the word 'realism' has been removed.
SPM-1383	SPM	9	3	9	3	The use of "realism" here is difficult to understand. Consider clarifying. [Government of Canada]	Care has been taken in the revised draft to avoid undefined words such as "realistic", and provide more quantitative statements where possible.
SPM-1384	SPM	9	3	9	3	What does "quantities" mean? Does it mean "variables" or "parameter"? (compare comment line12/6-12/8) [Government of Germany]	Headline statement has been significantly revised, and the word 'quantities' removed.
SPM-1385	SPM	9	3	9	3	Is "realism" the correct word? Should it be "accuracy"? [Government of United Kingdom of Great Britain & Northern Ireland]	Care has been taken in the revised draft to avoid undefined words such as "realistic", and provide more quantitative statements where possible.
SPM-1386	SPM	9	3	9	3	"more realism" is a highly subjective expression. Replace it with an objective and accurate quantification. [John McLean, Australia]	Care has been taken in the revised draft to avoid undefined words such as "realistic", and provide more quantitative statements where possible.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-1387	SPM	9	3	9	5	The models have improved? This could be stated much more simply, and could include a statement on the veracity of models (in a planetary forcing/attribution context) from ar4. That is, the models were well developed for these purposes at the time of ar4 and have improved in many aspects since that time. This currently reads in a way that lends less weight to previous modelling studies than it ought to. [Government of Australia]	headline statement has been significantly revised.
SPM-1388	SPM	9	3	9	5	Evaluation of Climate Models. 'Development of climate models has resulted in more realism in the representation of many quantities and aspects of the climate system, including large scale precipitation, Arctic sea ice, ocean heat content, extreme events, and the climate effects of stratospheric ozone.' Question: In this section summary, would it be possible to summarize how this evaluation of climate models varies on a regional scale? [Government of Morocco]	headline statement has been significantly revised, and regional details have been added.
SPM-1389	SPM	9	3	9	5	"More realism"...does this mean the models more accurately reflect reality or there is improved understanding about uncertainties? [Government of New Zealand]	Care has been taken in the revised draft to avoid undefined words such as "realistic", and provide more quantitative statements where possible.
SPM-1390	SPM	9	3	9	5	Please consider to include temperature among the list of parameters mentioned here. [Government of NORWAY]	headline statement has been significantly revised, and now focuses on temperature.
SPM-1391	SPM	9	3	9	5	To introduce some realism, delete "Development of climate models has resulted in more realism in the representation of many quantities and aspects of the climate system, including large-scale precipitation, Arctic sea ice, ocean heat content, extreme events, and the climate effects of stratospheric ozone", and insert "Climate models are inherently incapable of making reliable, very-long-term predictions of the future evolution of the complex, non-linear, chaotic climate object. Initial parameters are unknown to a sufficient resolution or precision. For example, models failed to predict the recent 16-year stasis in global warming. Major processes such as temperature feedbacks are unmeasurable and insufficiently understood." Reason: The obsession with models is imprudent given their inescapable limitations. Models can be and have been tweaked to reproduce past climate changes but, on the whole, have been – and will probably always be – incapable of making reliable predictions for more than a week or two ahead. [Christopher Monckton of Brenchley, United Kingdom]	Reviewer fails to provide a substantive basis for his claims.
SPM-1392	SPM	9	3	9	5	adding "The ability of climate models to simulate historical climate, its variability, and its change, has improved in many, though not all, important respects relative to the previous generation of models featured in the AR4." (from chapter 9 page 3 line 3-4) [Zong-Ci Zhao, China]	headline statement has been significantly revised, and now focuses on temperature.
SPM-1393	SPM	9	3	9	39	"realism, realistic, realistically" are very vague terms that can be (mis)interpreted in many ways . Please define (e.g. compares with observation within XX %, consistent with the range of observational estimates,…). As used, these terms weaken the text. [Eric Guilyardi, France]	Care has been taken in the revised draft to avoid undefined words such as "realistic", and provide more quantitative statements where possible.
SPM-1394	SPM	9	3			Totally unclear - does "representation" mean formulation or simulation or both? [William Ingram, United Kingdom]	statement revised
SPM-1395	SPM	9	4	9	4	Is it justified to suggest that also for large scale precipitation modeling has resulted in more realism? The second bullet at line 15 it is e.g. suggested that the model results and the observed trends still have an imperfect match. Moreover, In Chapter 9 ((see section 9.6.1.1, line 49) it is concluded that "Compared with CMIP3, the CMIP5 median precipitation is slightly higher in most regions; however, there is no systematic change in agreement with observations between the two ensembles". This seems to contradict this conclusion. [Government of Netherlands]	headline statement has been significantly revised.
SPM-1396	SPM	9	4	9	4	"Climate models have improved further since AR4 with regards to many important quantities and aspects of the climate system, in particular the simulation of precipitation". In Chapter 9 it is concluded that "Compared with CMIP3, the CMIP5 median precipitation is slightly higher in most regions;however, there is no systematic change in agreement with observations between the two ensembles" contradicting the precipitation statement (9.6.,1.1 p.9-61, l.49) [Geert Jan van Oldenborgh, Netherlands]	headline statement has been significantly revised.
SPM-1397	SPM	9	4			The predictions of Arctic sea ice extent seem to dramatically underestimate the observed sea ice loss. Modify, balance the statement. [Government of France]	headline statement has been significantly revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-1398	SPM	9	5			Why is this list selected? "including large scale precipitation, Arctic sea ice, ocean heat content, extreme events, and the climate effects of stratospheric ozone" --> I would delete this sentence [Christof Appenzeller, Switzerland]	headline statement has been significantly revised.
SPM-1399	SPM	9	7	8	16	This says in fact that the models are in good agreement with each other, but not particularly good agreement with observations, thus not warranting an assessment of high confidence in the results. [James [Jim] Crawford, United States of America]	Statement has been revised, and now makes a clearer statement comparing the models to the observed warming since 1950.
SPM-1400	SPM	9	7	9	7	Explain external forcing with specific examples, solar, volcanic etc. [Government of Australia]	sentence revised
SPM-1401	SPM	9	7	9	7	remove - 'coupled' [Government of Australia]	sentence revised
SPM-1402	SPM	9	7	9	7	The attributive adjective "coupled" sounds too restrictive and could be removed because climate models that can provide realistic responses to external forcing include AGCMs and RCMs, but not limited to CGCMs. [Government of Japan]	sentence revised
SPM-1403	SPM	9	7	9	7	Should this be temperature responses rather than just responses? [Government of United Kingdom of Great Britain & Northern Ireland]	sentence revised
SPM-1404	SPM	9	7	9	7	Given the rest of the paragraph, this statement appears to concern global to continental scale. Maybe it should be precised in this first sentence of the paragraph. [Masa KAGEYAMA, France]	paragraph is significantly revised and focused entirely on large scale.
SPM-1405	SPM	9	7	9	8	Can the term "external forcing" be clarified with an example, i.e. ".. external forcing, such as …" [Government of Finland]	sentence revised
SPM-1406	SPM	9	7	9	8	The expression "external forcing" will not be understood by non-experts. [Government of Germany]	sentence revised
SPM-1407	SPM	9	7	9	8	Please specify the period. This conclusion is not correct for an undetermined period. [Government of Netherlands]	sentence revised
SPM-1408	SPM	9	7	9	8	What does "realistic" mean and how do we know? This is a strong statement, especially given the implication it is external forcing in general. The evidence cited in chpts 9,10,11,12 seems to be based largely on simulation of recent climate and internal climate variations. [John Mitchell, United Kingdom]	Care has been taken in the revised draft to avoid undefined words such as "realistic", and provide more quantitative statements where possible.
SPM-1409	SPM	9	7	9	10	A discussion of models to reproduce palaeoclimates and responses to volcanic forcings could be included. [Government of Australia]	Focus in this section is primarily on changes over the 20th century.
SPM-1410	SPM	9	7	9	10	We would like to see a clearer argumentation why very high confidence is applied to external forcing. Does this include aerosol (direct and indirect) effects? If so, aerosol responses very greatly between models that we cannot understand high confidence would apply. In addition, this conclusion refer to the figures 11.3 and 12.2, which have nothing to do with global temperatures. [Government of Netherlands]	Statement has been revised, and now makes a clearer statement comparing the models to the observed warming since 1950.
SPM-1411	SPM	9	7	9	10	Here and in Chapter 9 you claim to have "very high confidence" that models provide a realistic response to GHG forcing. But then you go on to say that they don't do very well on precipitation. And in Chapter 9 you admit that the models are significantly off regarding warming in the tropical troposphere, namely that they predict far more warming than has been observed, and you have no explanation why. And Figure 1.4 shows that all the models from past assessments over-predicted warming of surface temperatures over the past 10-20 years. And there is no assessment of the ability of models to get the spatial pattern of trends correct over land, but the published evidence (McKitrick and Tole 2012, cited in Ch 9) shows the models as a whole do very poorly at this. In light of all this, how can you claim to have very high confidence in the validity of the models' representation of the climatic response to GHG's? [Ross McKitrick, Canada]	Statement has been revised, and now makes a more specific statement comparing the models to the observed warming since 1950.
SPM-1412	SPM	9	7	9	10	The problem is that your separation of external forces and internal variability is false. The ENSO involves ocean heat and the ocean is heated by solar radiation, an external force. Changes in the ENSO cause changes in cloud cover, which means changes in solar irradiance, which is another external force. [John McLean, Australia]	Statement has been revised, and now makes a more specific statement comparing the models to the observed warming since 1950.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-1413	SPM	9	7	9	10	To remove absurdity, delete “There is very high confidence that coupled climate models provide realistic responses to external forcing. This is evident from simulations of the surface temperature on continental and larger scales, and the global-scale surface temperature increase over the historical period, especially the last fifty years.” Reason: The climate is chaotic and hence inherently unpredictable; the values of initial parameters are unknown; and not one of the temperature feedbacks that contribute two-thirds of all model-predicted warming can be measured directly. None of the models predicted there would be no warming for 16 years. Claiming“very high confidence” that the models are realistic on the basis of hindcasting, when forecasting has proven so inept, is mere rodomontade. It is now time for the IPCC to admit the limitations of the models. [Christopher Monckton of Brenchley, United Kingdom]	Reviewer fails to provide a substantive basis for his claims. Based on a number of review comments, this revised paragraph now explicitly addresses the warming trend over the past 10 to 15 years.
SPM-1414	SPM	9	7	9	10	How can you assign very high confidence to the response to exterinal forcing (which reads as if it includes aerosols) when the aerosol responses very so greatly between models (half of which implement an indirect aerosol effect and half do not!), and the trends over the last 50 years are different from the observed one ranging from a factor two underestimation (CSIRO MK3.6.0, MRI CGCM3) to a factor two overestimation (IPSL CM5A LR, BNU ESM, CanESM2BCC CSM1.1, CCSM4)? See also Fig. 11.33, which show the observation almost outside the CMIP5 ensemble at the end. [Geert Jan van Oldenborgh, Netherlands]	Statement has been revised, and now makes a more specific statement comparing the models to the observed warming since 1950.
SPM-1415	SPM	9	7	9	10	Please add a bullet discussing how the temperature rise over the last 10, 15 or 20 years fits in the model simulations, attributing differences to forcings (solar, aerosol, GHG) and internal variability (ENSO, weather). [Geert Jan van Oldenborgh, Netherlands]	Paragraph has been revised, and now discusses the temperature trend over the past 10 to 15 years.
SPM-1416	SPM	9	7	9	22	Repeated use of "realistic responses", "realistically simulate", "simulate realistically" without any definition of what these phrases might mean - see my comment 1 on Chapter 9 Executive summary. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	Care has been taken in the revised draft to avoid undefined words such as "realistic", and provide more quantitative statements where possible.
SPM-1417	SPM	9	7	10	3	These statements are unsustainable and lack integrity unless you can demomstrate that climate models simulate all natural forces with 100% accuracy. If you can't do that then these statements should be deleted. [John McLean, Australia]	Reviewer fails to provide a substantive basis for his claims.
SPM-1418	SPM	9	7		8	This is massively over-sold as written. The natural reading is that every number in a climate change simulation is realistic, which you know is totally untrue. Qualify to something justifiable, e.g. "qualitatively plausible responses of means over large enough space & time scales", or combine with the following sentence. [William Ingram, United Kingdom]	Statement has been revised, and now makes a more specific statement comparing the models to the observed warming since 1950.
SPM-1419	SPM	9	7		8	"There is very high confidence that coupled climate models provide realistic responses to external forcing." I question the logic and the statement. The simulation of a realistic temperature in no way supports a realistic sensitivity to forcing. Furthermore, how accurate does the simulation of temperature have to be? As shown by Mauritsen the range of global mean surface temperature in CMIP5 models, about 2.5 K, exceeds the increment over the 20th century, about 0.8 K, by a factor of 3 or so. Given all the discussion of how the climate sensitivity might change in a changing climate (with change well less than the 2.5 K spread among the CMIP5 models) there is a strong burden to support a statement that models whose base temperature ranges over that amount would have the same sensitivity or a sensitivity that resembles that of actual Earth climate. At the least this needs to be discussed; perhaps there is an argument that can be raised to this effect, but it needs to be raised or else there needs to be a retreat on the statement. Mauritsen, T., et al. (2012), Tuning the climate of a global model, J. Adv. Model. Earth Syst., 4, M00A01, doi:10.1029/2012MS000154. [Stephen E Schwartz, United States of America]	Statement has been revised, and now makes a more specific statement comparing the models to the observed warming since 1950.
SPM-1420	SPM	9	7		10	It sounds like you are talking about large scale temperature here - as phrased it is too broad (models not everywhere realistic…) [Gabriele Hegerl, United Kingdom]	Statement has been revised, and now makes a more specific statement comparing the models to the observed warming since 1950.
SPM-1421	SPM	9	7			It is said that “There is very high confidence that coupled climate models provide realistic response to external forcing”. Is the word "coupled" added here on purpose ? The rise of the global temperature can be predicted	sentence revised. Aspects of the hydrological cycle are addressed in subsequent statements.

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						very simply with Energy Balance Models. The temperature rise is not a test for a coupled GCM. On the other hand the hydrological cycle is a test and there much progress remains to be done. [Government of France]	
SPM-1422	SPM	9	7			"There is very high confidencethat coupled climate models CAN provide realistic TEMPERATURE response..". The rationale behind adding the word CAN is that models simulating the 20th century changes to a certain degree have been tuned by aerosol forcing. The additon of the word TEMPERATURE is because changes in e.g. precipitation are less well modeled. [Henning Rodhe, Sweden]	Statement has been revised, and now makes a more specific statement comparing the models to the observed warming since 1950.
SPM-1423	SPM	9	8	9	10	This is semantic gymnastics. The models are tuned to replicate historical observations as accurately as possible; it is the tuning to align them that makes them "provide realistic responses". [John McLean, Australia]	Statement has been revised, and now makes a more specific statement comparing the models to the observed warming since 1950.
SPM-1424	SPM	9	8		9	I've already pointed out the obscurity of "global-scale", but here it's in addition to "continental and larger scales", which logically does imply it's smaller than continental-scale! Was "over the historical period" meant to contrast with another qualifier which has got left out? [William Ingram, United Kingdom]	sentence revised
SPM-1425	SPM	9	9	9	9	"fifty" or 50, as elsewhere? [Kristie Ebi, United States of America]	copy edit
SPM-1426	SPM	9	9	9	9	Please make clear which historical period is meant here. [Government of Netherlands]	sentence revised
SPM-1427	SPM	9	10	9	11	You should insert Figure 1.4 here as part of the summary, and discuss what it shows. [Ross McKitrick, Canada]	For the reasons discussed in Chapter 1, the comparison between climate models used in passed assessments and recent observed climate is not straight-forward. Without a full discussion of the caveats and details this figure is not useful. This discussion and figure is therefore located within the technical summary.
SPM-1428	SPM	9	12	8	16	Suggest ending the first sentence after the words "during the past 50 years". Then write the second sentence so it's easier for readers to understand, for example: "Although there is high agreement among models in this general pattern of precipitation change, there is only limited evidence that this pattern has been detected in observed trends." In the present form, it's unclear what the "this" is referring to in line 15. [Government of Canada]	statement on precipitation has been simplified and shortened.
SPM-1429	SPM	9	12	9	12	Change "but there is only" to "and there is". What is supposed to be meant by "only medium confidence"? [Sarvesh Garimella, United States of America]	statement on precipitation has been simplified and shortened. Confidence term has been removed.
SPM-1430	SPM	9	12	9	12	"The simulation of large-scale patterns of precipitation has improved since the AR4" However, in Chapter 9 it is concluded that "Compared with CMIP3, the CMIP5 median precipitation is slightly higher in most regions;however, there is no systematic change in agreement with observations between the two ensembles" contradicting the precipitation statement (9.6.,1.1 p.9-61, l.49). [Geert Jan van Oldenborgh, Netherlands]	statement has been revised, and addresses the fact that precipitation is not as well simulated at the regional scale.
SPM-1431	SPM	9	12	9	14	Change …'has improved since the AR4. There is medium confidence that models simulate realistic amounts of precipitation change on large spatial scales during the past 50 years. This is based on high agreement among models but limited evidence in observed trends.' Is 'limited evidence' accurate? Does the balance of observational evidence show the same relationship to what emerges from the models? [Government of Australia]	statement on precipitation has been simplified and shortened. Confidence term has been removed.
SPM-1432	SPM	9	12	9	15	Sentence is too long to be understood. Please revise. [Government of Germany]	statement on precipitation has been simplified and shortened.
SPM-1433	SPM	9	12	9	15	Can this be split into two sentences? I do not get the meaning. [Ingeborg Levin, Germany]	statement on precipitation has been simplified and shortened.
SPM-1434	SPM	9	12	9	16	The models have been improved, but still the agreement on the models cannot be matched with the observed results (med conf). This raises the question in what practical sense the models have improved? [Government of Netherlands]	The improvement has been seen in the simulation of large scale patterns. Revised statement addresses the fact that precipitation is not as well simulated at the regional scale.

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SPM-1435	SPM	9	12	9	16	It might be worth warning policy makers that rainfall is much more difficult to simulate than temperature- [John Mitchell, United Kingdom]	this is reflected in the headline statement for this section.
SPM-1436	SPM	9	12	9	16	This sounds like a result about detection and attribution rather than evaluation of climate models [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	language used in this statement has been revised.
SPM-1437	SPM	9	13	9	14	"amounts of precipitation increases in wet areas and precipitation decreases in dry areas" should be either "precipitation increases in wet areas and precipitation decreases in dry areas" or "amounts of precipitation increase in wet areas and precipitation decrease in dry areas" [Adrian Simmons, United Kingdom]	statement now simplified and shortened.
SPM-1438	SPM	9	15	9	15	The portion of the sentence starting from "but only---" seems to not be clearly understood, so it needs to be reworded. [Government of Benin]	statement now simplified and shortened.
SPM-1439	SPM	9	15			This sentence seems to talk about detection of anthropogenic or forced fingerprints and appears to contradict the later text on this. Again, bit awkard to have precip changes in so many places. [Gabriele Hegerl, United Kingdom]	language used in this statement has been revised.
SPM-1440	SPM	9	18	9	19	suggest wording change: '…the change to Arctic sea-ice extent. There is high confidence that they realistically simulate the observed trend….' [Government of Australia]	sea ice statement has been significantly revised
SPM-1441	SPM	9	18	9	20	Evaluation of climate models: "Very high confidence that climate models realistically simulate the annual cycle of artic sea-ice extent". Is this actually tuned for in models – is it a robust evaluation metric? [Government of Australia]	sea ice statement has been significantly revised and no longer refers to the annual cycle.
SPM-1442	SPM	9	18	9	20	We have 'high confidence' about simulation of Arctic sea ice extent yet we already believe that even the least conservative of the models has underestimated the amount of melting that is currently taking place. We may have high confidence that they simulate the cycle, but they seem to be missing something on modelling the trend of extent. [Government of United Kingdom of Great Britain & Northern Ireland]	sea ice statement has been significantly revised and is now more quantitative
SPM-1443	SPM	9	18	9	20	To remove an absurd claim, delete “There is very high confidence that climate models realistically simulate the annual cycle of Arctic sea-ice extent, and there is high confidence that they realistically simulate the trend in Arctic sea-ice extent over the past decades.” Reason: To be able to simulate the waxing and waning of Arctic sea ice with the seasons is so elementary that one does not require a coupled model to perform that task, which can be performed by a pocket calculator. And the “high confidence” that models can realistically simulate any past trend is simply silly. The question is whether models can reliably predict any future trend: and, given not only the short-term but also the multi-decadal variability of Arctic and Antarctic sea-ice extent, it is doubtful whether current models can predict those extents reliably. The models did not predict the growth in Antarctic sea-ice extent over recent decades. [Christopher Monckton of Brenchley, United Kingdom]	the point of the reviewers comment is not clear. Note that Antarctic Sea Ice is now addressed in the revised paragraph.
SPM-1444	SPM	9	18	9	20	It should be added that it is only a limited number of models that reproduce the Arctic sea ice trend and annual cycle realistically. [Gunnar Myhre, Norway]	sea ice statement has been significantly revised and is now more quantitative
SPM-1445	SPM	9	18	9	20	There is high interest in the difference between Arctic and Antarctic sea ice trends and I think a balancing bullet on the Antarctic is justified [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	A statement on Antarctic sea ice has been added.
SPM-1446	SPM	9	18		20	How about the Antarctic? [Gabriele Hegerl, United Kingdom]	A statement on Antarctic sea ice has been added.
SPM-1447	SPM	9	18		20	Both these sentences are ludicrously optimistic & completely unjustified by 9.4.3, which says nothing of the sort. [William Ingram, United Kingdom]	Comment is not specific and unsubstantiated.
SPM-1448	SPM	9	18			The statement that "models realistically simulate the trend in Arctic sea ice" may not square with observations, especially in light of the record-low extents observed in 2012. [Government of United States of America]	sea ice statement has been significantly revised based on underlying chapter assessment of the relevant literature.
SPM-1449	SPM	9	19	9	19	"high confidence" - I am surprised by this conclusion, as a non-expert in this particular area. Two papers I am aware of, by leading specialists in the area, seem to say something quite different. Wang and Overland (GRL, 10.1029/2012GL052868) state "While CMIP5 model mean sea ice extents are closer to observations than CMIP3, the rates of sea ice reduction in most model runs are slow relative to recent observations" and indeed	sea ice statement has been significantly revised based on underlying chapter assessment of the relevant literature.

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						say that the range is "rather discouraging". Similarly Stroeve et al (GRL 10.1029/2012GL052676) come up with an almost identical conclusion. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	
SPM-1450	SPM	9	19	9	20	I don't see a justification for "high confidence that they realistically simulate the trend in Arctic sea ice extent over the past decades". Instead I see in Fig. 9.24 a strong indication that CMIP5 models are still under-predicting the recent trend. Even if some models are simulating a trend as large as observed are they doing it for the right reason? For example are they warming too much globally in recent decades and that's why they are simulating a large enough trend in sea ice? In the text where this is discussed (Sect 9.4.3) the authors state that there is high confidence that the CMIP5 models capture the first-order behavior of the Arctic sea ice...particularly the seasonality and the trend... This means to me that the models have the general right idea about the trend (i.e., the sign), but not necessarily that they have the magnitude right. [Thomas Knutson, United States of America]	sea ice statement has been significantly revised based on underlying chapter assessment of the relevant literature.
SPM-1451	SPM	9	19	9	20	In view of Figure 9-24, chapter 9.3.4, the sentence "there is high confidence that they realistically simulate the trend in Arctic sea ice extent over the past decades" seems quite optimistic. Including the September minimum 2012, the probablility seems quite high, that models still underestimate trends of summer sea ice minimum extent. Maybe add at the end ", although they might still underestimate to a certain extent the decrease of summer minimum extent". [Urs Neu, Switzerland]	sea ice statement has been significantly revised based on underlying chapter assessment of the relevant literature.
SPM-1452	SPM	9	19	9	20	"high confidence that they realistically simulate the trend in Arctic sea ice extent over the past decades" However, one of the seminal papers on this field, Stroeve et al 2012, concludes that "Trends from most ensemble members and models nevertheless remain smaller than the observed value." and "Evaluation of thickness fields from CMIP5 (not shown) indicate that part of the explanation for the better representation of the observed September ice extent is that several of these models start the 20th century with rather thin winter ice cover, even though the winter extent is similar to that observed. For example, CanESM2 starts with only a 2 m winter ice cover as averaged over the Arctic Ocean so that although the winter extent is consistent with observations, summer extent is significantly underestimated." I.e., the agreement is not good, and when it is good it often is for the wrong reasons. [Geert Jan van Oldenborgh, Netherlands]	sea ice statement has been significantly revised based on underlying chapter assessment of the relevant literature.
SPM-1453	SPM	9	19	9	21	This statement is too strong. The magnitude of the CMIP5 multi-model mean trend in summer Arctic sea ice extent is close to the observed one up to 2005, but is significantly underestimated thereafter. [Thierry Fichefet, Belgium]	sea ice statement has been significantly revised based on underlying chapter assessment of the relevant literature.
SPM-1454	SPM	9	19			Models still underestimate the trend in Arctic sea ice. I'm not sure I would agree with "realistic" and "high confidence". [Reto Knutti, Switzerland]	sea ice statement has been significantly revised based on underlying chapter assessment of the relevant literature.
SPM-1455	SPM	9	22	9	23	Ocean Heat Content should be explained somewhere in the SPM. Further, is this statement a bit misleading since they are effectively forced to do so by conservation of energy requirements? [Government of Australia]	Ocean heat content is quite self explanatory. Statement has been expanded.
SPM-1456	SPM	9	22	9	23	Here (or on page 4) seems to miss one of the main advances since AR4 - the improvement in quality of upper ocean heat content analyses [John Mitchell, United Kingdom]	This is now mentioned in the ocean observation section.
SPM-1457	SPM	9	22	9	23	To remove a further absurd claim, delete “There is high confidence that many models simulate realistically the observed trend in ocean heat content.” Reason: For a start, measurements of ocean heat content lack sufficient precision, and particularly resolution, to allow any meaningful determination of the trend in ocean heat content, particularly at depth. Furthermore, “high confidence” that models tweaked to reproduce past trends are capable of reproducing those trends is a self-congratulatory instance of petitio principii. [Christopher Monckton of Brenchley, United Kingdom]	statement is revised and focusses on the upper ocean heat content, which is well measured.
SPM-1458	SPM	9	25	9	25	It is not entirely clear whether the reference to 'information' is referring to observations, rather than modelled data, in the context of this section on evaluation of climate models. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised and moved to the detection and attribution section.
SPM-1459	SPM	9	25	9	27	This sentence is long, difficult and confusing to read and should be reworded. [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been revised and moved to the detection and attribution section.
SPM-1460	SPM	9	25	9	29	This bullet is not well located in the evaluation of climate models and should be shifted in the sea level section	statement has been revised and moved to the

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						where it is missing (see my previous comment). [SYLVIE JOUSSAUME, France]	detection and attribution section.
SPM-1461	SPM	9	26	9	26	It is unclear what is meant by "within the uncertainties". [Kristie Ebi, United States of America]	statement has been revised and moved to the detection and attribution section.
SPM-1462	SPM	9	26	9	26	remove - 'now, within the uncertainties' [Government of Australia]	statement has been revised and moved to the detection and attribution section.
SPM-1463	SPM	9	26	9	26	The use of "within the uncertainties" is not consistent with how certainty has been conveyed throughout the SPM. Consider clarifying. [Government of Canada]	statement has been revised and moved to the detection and attribution section.
SPM-1464	SPM	9	28	9	28	I find this slightly misleading - the fact that the observations of components match the observation of the sum does not automatically imply that we can have confidence in modelling, and as Chapter 13 finds, the models reproduce only 70% of the observed 20th C sea-level rise. Hence, the great confidence that is assigned to models here is not fully justified. [Stefan Rahmstorf, Germany]	statement has been revised and moved to the detection and attribution section.
SPM-1465	SPM	9	31	9	33	Please be more specific and find a better expression for "well", e.g. "correctly"? [Government of Germany]	With the aim of shortening this section, this statement has been removed and extremes are no longer explicitly discussed here. See the IPCC SREX for a comprehensive treatment of extremes.
SPM-1466	SPM	9	31	9	33	To remove yet another absurd claim, delete “There is high confidence that the global distribution of temperature extremes is represented well by models. The observed warming trend of temperature extremes in the second half of the 20th century is well simulated.” Reason: Yet again there is a claim that hindsight is working well. Yet it is foresight that matters: and there is no admission of just how badly the models have failed to predict the failure of the world to warm at anything like the predicted rate. The central implausibility in current predictions is that, after an observed warming rate equivalent 1.2 K/century since 1950 and a period of 16 years without any warming at all, the models predict 3 K/century to 2100. [Christopher Monckton of Brenchley, United Kingdom]	With the aim of shortening this section, this statement has been removed and extremes are no longer explicitly discussed here. See the IPCC SREX for a comprehensive treatment of extremes.
SPM-1467	SPM	9	31	9	35	"… tend to simulate more intense and thus more realistic.." - the logic behind this sentence is not obvious to us. Why is more intense more realistic? Is it because it has been confirmed by observations then this should be mentioned. [Government of NORWAY]	With the aim of shortening this section, this statement has been removed and extremes are no longer explicitly discussed here. See the IPCC SREX for a comprehensive treatment of extremes.
SPM-1468	SPM	9	31		32	"well" is vague but stronger than is justified by Chapter 9, which just says "reasonably well" [William Ingram, United Kingdom]	With the aim of shortening this section, this statement has been removed and extremes are no longer explicitly discussed here. See the IPCC SREX for a comprehensive treatment of extremes.
SPM-1469	SPM	9	31		34	Ch10 has some scaling factors that are inconsistent with '1' - suggesting that the strength of the trend isnt right in the models used there - problem is that its not multimodel but might be worth doublecheck if the trend in the upper tail is really right in the models or might be a bit large [Gabriele Hegerl, United Kingdom]	With the aim of shortening this section, this statement has been removed and extremes are no longer explicitly discussed here. See the IPCC SREX for a comprehensive treatment of extremes.
SPM-1470	SPM	9	32	9	33	It is stated that “the observed warming trend of temperature extremes in the second half of the 20th century is well simulated". Min et al (2012, ERL, submitted) show that "The ensemble of RCMs significantly underestimates the observed trends over most of the North-Western European land surface." The ERA-40-driven RCMs are off by a factor two, the GCM-driven ones are much worse. [Government of Netherlands]	With the aim of shortening this section, this statement has been removed and extremes are no longer explicitly discussed here. See the IPCC SREX for a comprehensive treatment of extremes.
SPM-1471	SPM	9	32	9	33	"The observed warming trend of temperature extremes in the second half of the 20th century is well simulated" Min et al (2012, ERL, submitted) show that "The ensemble of RCMs significantly underestimates the observed trends over most of the North-Western European land surface." The ERA-40-driven RCMs are off by a factor two, the GCM-driven ones are much worse. There may be other articles that show better agreement, but here in Europe it is pretty bad. [Geert Jan van Oldenborgh, Netherlands]	With the aim of shortening this section, this statement has been removed and extremes are no longer explicitly discussed here. See the IPCC SREX for a comprehensive treatment of extremes.
SPM-1472	SPM	9	33	9	33	CMIP5 was defined only in the introduction on page SPM 2, line 14. It should be repeated [Christoph Ritz, Switzerland]	All reference to CMIP has been removed from this section. CMIP is introduced for the first time in the

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
							projections section
SPM-1473	SPM	9	33	9	33	Has CMIP been defined anywhere? [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	All reference to CMIP has been removed from this section. CMIP is introduced for the first time in the projections section
SPM-1474	SPM	9	33	9	34	Consider providing further information here on CMIP5 models or perhaps more appropriately in the introduction where they are first referenced. [Government of Canada]	All reference to CMIP has been removed from this section. CMIP is introduced for the first time in the projections section
SPM-1475	SPM	9	33	9	34	The expressions "CMIP3-models" and "CMIP5-models" are not clear. There is a short explanation on CMIP5, but CMIP3 is not explained. Suggestion for modification of the sentence: "There is medium confidence that CMIP5 models, analyzed in AR5, tend to simulate more intense and thus more realistic precipitation extremes than CMIP3 models, analyzed in AR4." [Government of Germany]	All reference to CMIP has been removed from this section. CMIP is introduced for the first time in the projections section
SPM-1476	SPM	9	33	9	34	Comparing CMIP5 with CMIP3 only is incomplete. "More realistic" can still be "represented poorly" in an absolute sense (in comparison to the "represented well" in the previous sentence). [Albert Klein Tank, Netherlands]	With the aim of shortening this section, this statement has been removed and extremes are no longer explicitly discussed here. See the IPCC SREX for a comprehensive treatment of extremes.
SPM-1477	SPM	9	33			There is medium confidence that CMIP5 models tend to simulate more intense and thus more realistic precipitation extremes than CMIP3 models. --> What is meant with "medium confidence" in this context? [Christof Appenzeller, Switzerland]	With the aim of shortening this section, this statement has been removed and extremes are no longer explicitly discussed here. See the IPCC SREX for a comprehensive treatment of extremes.
SPM-1478	SPM	9	34			Fig 9.37 should also be referenced [William Ingram, United Kingdom]	With the aim of shortening this section, this statement has been removed and extremes are no longer explicitly discussed here. See the IPCC SREX for a comprehensive treatment of extremes.
SPM-1479	SPM	9	36	9	36	More understandable wording might be ‘’extended into Earth System Models (ESMs) through incorporation of biogeochemical cycles’. [Government of Australia]	sentence revised and now part of headline statement.
SPM-1480	SPM	9	36	9	39	Suggest clarifying definition of Earth System Models (ESMs) in context of CMIP5 experimental design as models having a closed carbon cycle (Taylor et al., BAMS, 2012). There is high confidence that most ESMs (models with a closed carbon cycle) produce global land and ocean carbon over the latter part of the 20th century that are consistent with the range of observational estimates. {9.4} [Jasmin John, United States of America]	noted. This suggested has been included in the revised sentence which is now part of the headline statement.
SPM-1481	SPM	9	36	9	39	include changes in pH: "..produce global land and ocean carbon sinks and changes in pH over the latter .." [Fortunat Joos, Switzerland]	suggested wording in not consistent with underlying key message coming from the chapter 9 assessment.
SPM-1482	SPM	9	37	9	38	To remove yet another hindcasting claim, delete “There is high confidence that most ESMs [Earth system models] produce global land and ocean sinks over the latter part of the 20th century that are consistent with the range of observational estimates. Reason: Yet again, the question is not whether models can be or have been tweaked to reproduce past climatic changes but whether they are capable of reliably predicting future change. [Christopher Monckton of Brenchley, United Kingdom]	Reviewer fails to provide any substantive scientific basis for his comment.
SPM-1483	SPM	9	40	9	40	I am missing an assessment on model evaluation using the past as analysed in chapters 5 and 9. This is important for the confidence in models to simulate different climates. Moreover for the first time simulations have been done with the same models as the ones used for the future. [SYLVIE JOUSSAUME, France]	Focus in this section is primarily on the policy relevant changes over the 20th century.
SPM-1484	SPM	9	41			Please add a bullet to caution against taking model results too seriously at the local scale, e.g.,"Comparisons of observed with modelled trends at smaller than continental scales show that the CMIP5 simulates temperature trends reliably, but that precipitation trends are more often outside the ensemble than expected by natural variability and model spread. Compared to the global mean temperature rise, the pattern of temperature trends also does not show enough variability. {Box 11.2}" [Geert Jan van Oldenborgh,	We believe this concern is now addressed prominently in the revised headlines statement which talks about lower confidence on smaller spatial scales.

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						Netherlands]	
SPM-1485	SPM	9	42	10	3	I thought this section either needs to be re-titled (to clouds and aerosols) or needs to discuss other feedbacks as well. This section might also sit better after the attribution section so as to be together with the discussion of climate sensitivity. [Government of United Kingdom of Great Britain & Northern Ireland]	scope of section has been broadened and this is reflected in the new title "quantification of climate system responses".
SPM-1486	SPM	9	42			This section on climate processes and feedbacks is of high interest from a policy perspective, but the current section is very difficult to understand and the relevance of the particular feedbacks that were selected for this section are not properly explained. It would be helpful if: (1) the section could be simplified with plainer language throughout; (2) more contextual information could be provided to help readers understand feedbacks and their significance; and (3) more explanation could be provided on the variety of feedbacks, their operation on different timescales, and why particular feedbacks are summarized in this section. [Government of Canada]	scope of section has been broadened and this is reflected in the new title "quantification of climate system responses". Contents of the section has been heavily revised and we hope this provides clearly policy relevant messages.
SPM-1487	SPM	9	42			Suggest that the section on climate processes and feedbacks include surface albedo feedback. [Government of Canada]	comment has been considered, but within the new broader scope of this section we have focused on the key policy relevant messages.
SPM-1488	SPM	9	44	9	46	Feedback processes should be explained somewhere in the SPM and the statement 'various feedbacks associated with water vapour' should be explained. The third dot point in this section in describing the positive feedback between climate and the carbon cycle is successful. [Government of Australia]	scope of section has been broadened and new headline statement created.
SPM-1489	SPM	9	44	9	46	Climate Processes and Feedbacks. 'Various feedbacks associated with water vapour can now be quantified, and together they are assessed to be very likely positive and therefore to amplify climate changes. The net radiative feedback due to all cloud types is likely positive.' Comment: In this section summary, it might be helpful to distinguish between high and low clouds. [Government of Morocco]	Revised statement has been moved down to the paragraph level. We believe the statement is understandable without adding technical definitions regarding low and high clouds.
SPM-1490	SPM	9	44	9	50	more information on water vapour would be desirable; what do we know on its variability? Reference to FAQ 8.1 [Government of France]	Revised and expanded statement has been moved down to the paragraph level.
SPM-1491	SPM	9	44	9	50	To admit uncertainties fairly, delete "Various feedbacks associated with water vapour can now be quantified, and together they are assessed to be very likely positive and therefore to amplify climate changes. The net radiative feedback due to all cloud types is likely positive." Insert "The magnitude and sign of net temperature feedbacks is unknown. The inferred temperature stability of the past 64 Ma suggests that feedbacks are more likely to be somewhat net-negative than strongly net-positive." Reason: No feedback can be reliably quantified by measurement or theory. Though the Clausius-Clapeyron relation says the space occupied by the atmosphere can hold near-exponentially more water vapour as it warms, it does not say it must. The primary influence of clouds is in reflecting incoming radiation and providing shade during the day, rather than in retaining at night radiation that would otherwise escape. The cloud feedback is near-certainly negative: see e.g. Spencer & Braswell (2010. 2011). [Christopher Monckton of Brenchley, United Kingdom]	Reject; the reviewers proposed statement is inconsistent with the underlying expert chapter assessment.
SPM-1492	SPM	9	44	9	50	This is very interesting information. However, for the policymaker it would be even more informative to include comparision with the RF of the well mixed GHG. It might be even worth considering including the RF from feedback from water vapour in figure SPM.3 as a separate item. [Klaus Radunsky, Austria]	This information is contained in the previous section on the drivers of climate change.
SPM-1493	SPM	9	44	9	53	SPM. Section 4. Understanding the Climate System and its Recent Changes. Climate Processes and Feedbacks. The concept of clear-sky, cloud and aerosol-climate feedbacks has not been presented or explained previously. Many readers not belonging to the scientific climate community may not understand what it is said in the report in this respect. It is recommended to change these paragraphs in order to reach a wider audience or to remove them from the document [Government of Spain]	scope of section has been broadened and new headline statement created. Underlying paragraphs are now clearer and less technical.
SPM-1494	SPM	9	44	10	3	The language in all these conclusions is for experts and is too difficult to understand for policy makers. Please rephrase to make clear what you mean here. Feedbacks are a complex issue for non-experts. What is a positive or negative feedback? What is precisely meant with "amplifying climate change"? In addition: this is one of the locations where the role of aerosols is referred to. From the perspective of abatement policies it is striking that little attention is paid to the role of the various aerosols. This is also the case for other 'short living climate forcers' like black carbon, ozone and methane. [Government of Netherlands]	scope of section has been broadened and paragraphs are now clearer and less technical.

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SPM-1495	SPM	9	44			Define the word feedback in the climate context. [Government of France]	headline is substantially revised with new wording and focus.
SPM-1496	SPM	9	45	9	45	Qualifier is missing "therefore [likely?] to amplify [Government of United Kingdom of Great Britain & Northern Ireland]	headline is substantially revised with new wording and focus.
SPM-1497	SPM	9	45		46	Delete the sentence about likely positive feedback from clouds. There is too much scientific debate ongoing about this, and too wide error margins for Policymakers. [Terje Wahl, Norway]	Statement has moved to the subsequent paragraph. Reject reviewers suggestion - this statement is the result of the expert assessment.
SPM-1498	SPM	9	48	9	48	Very likely is too low for this feedback being positive, particularly since the very likely range (in the chapter) is 0.91 to 1.27, which differs greatly from zero. State here that the range here is very likely, and increase likelihood that the feedback is positive to virtually certain. [Government of Australia]	statement has been revised based on underlying chapter assessment.
SPM-1499	SPM	9	48	9	48	The terms "clear-sky" and "lapse rate" are not sufficiently explained and are too technical. Suggest revising. [Government of Canada]	technical details have been removed.
SPM-1500	SPM	9	48	9	48	Please explain "lapse rate" in the Glossary [Government of Germany]	technical details have been removed.
SPM-1501	SPM	9	48	9	48	"lapse rate" is not understood by most policy makers. [Christoph Ritz, Switzerland]	technical details have been removed.
SPM-1502	SPM	9	48	9	49	Given the reported 90% uncertainty interval for the net "clear-sky" feedback from water vapour and lapse rate changes, it appears that the assignment of "very likely" to the feedback being positive could be revised to "extremely likely." Per footnote 5, the lower endpoint of the uncertainty interval (0.91) has a 95% likelihood of being less than the value being estimated, so this implies at most a 5% likelihood of a lower value, including a zero or negative value. [Christopher Field, United States of America]	statement has been revised based on underlying chapter assessment.
SPM-1503	SPM	9	48	9	50	Under cloud processes and feedbacks the first dot point has the mean estimate as well as range for clear sky forcing, but the next line only the range is given for cloud feedbacks. Please provide the mean. [Government of Australia]	to reduce complication, the level of quantification has been reduced in this statement to focus on the key underlying message
SPM-1504	SPM	9	48	9	50	Does this refer to the “true” climate feedbacks or the range of model simulated feedbacks? The figures referred to in chapter 7 are model results, but the text could be parsed as being a model-independent statement. Is it appropriate to quote the water vapor feedback to the hundredth of a W/m2/K? The approximations made to assess climate feedbacks in the multimodel ensemble are larger than 1%. A suggestion on wording: I found the use of “very likely” for both water vapor feedback being positive and the range of modelled cloud feedbacks in the same sentence is confusing because one is confidently known, while the other is a large range. [Timothy Merlis, United States of America]	statement has been revised, and to reduce complication, the level of quantification has been reduced to focus on the key underlying message
SPM-1505	SPM	9	48	9	50	This is a summary for policymakers and these "bald" numbers will be quite meaningless unless placed in some kind of context. What are policymakers to deduce from these values? Maybe some kind of comment or footnote to demonstrate their effect on delta-T for doubling CO2 relative to the no-feedback case? [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	statement has been revised, and to reduce complication, the level of quantification has been reduced to focus on the key underlying message
SPM-1506	SPM	9	48	9	54	This seems too technical for the SPM. Explanation of radiative flux with reference to global warming or cooling would be useful. [Government of Australia]	statement has been revised, and to reduce complication, the level of quantification has been reduced to focus on the key underlying message
SPM-1507	SPM	9	49	9	49	Please explain what the 'clear sky; feedback is and why a different unit is used for indication than all other observations? [Government of Australia]	statement has been revised, and to reduce complication, the level of quantification has been reduced to focus on the key underlying message
SPM-1508	SPM	9	49	9	49	A major conclusion of chapter 7 is that the cloud feedback is likely positive and perhaps this should be stated. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	this statement has been added.
SPM-1509	SPM	9	49		50	Delete the last part of the sentence (on cloud feedback). [Terje Wahl, Norway]	statement has been revised, and to reduce complication, the level of quantification has been reduced to focus on the key underlying message

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SPM-1510	SPM	9	49			I would say "likely" rather than "very likely" for the cloud feedback ranges. [Henning Rodhe, Sweden]	statement has been revised, and to reduce complication, the level of quantification has been reduced to focus on the key underlying message
SPM-1511	SPM	9	50	9	50	To avoid misunderstanding, "+" should be inserted in front of 1.4, so that the line 50 reads "-0.2 to +1.4 Wm-2K-1." [Government of Japan]	statement has been revised, and to reduce complication, the level of quantification has been reduced to focus on the key underlying message
SPM-1512	SPM	9	50			Is the 1.4 W/(m^2*K) (+) or (-)? I.e.pleae check the sign. [Government of United States of America]	statement has been revised, and to reduce complication, the level of quantification has been reduced to focus on the key underlying message
SPM-1513	SPM	9	52	8	53	What is the aerosol-climate feedback? This is not a feedback that is well known to generalists and policy-makers. Why is it significant? Either some context will need to be added (including making clear what this is relative to the aerosol-cloud forcing effects) or the lines should be deleted, especially given that there is low confidence in the result in any case. [Government of Canada]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1514	SPM	9	52	9	53	This appears to contradict the conventional wisdom of the last two decades or so in which cooling was attributed to aerosols. [James [Jim] Crawford, United States of America]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1515	SPM	9	52	9	53	In order not to be confusing in comparison with SPM-8 l. 20, a description of the difference between RF and aerosol-climate feedback may be helpful [Government of Denmark]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1516	SPM	9	52	9	53	The fact that this statement concerns 'a limited number of modeling studies' and moreover is judged to be of 'low confidence', would make us hesitant to include it in this form in the SPM. What is the intended message? More study is needed to assess the aerosol-climate feedback. In addition, the different aerosol terms in radiative forcing are very difficult to discriminate and to understand. How does the aerosol-climate feedback relate to the total aerosol influence (as e.g. expressed in lines 7-10, lines 20-27 at page SPM-8) or to the aerosol-cloud term in figure SPM-3? [Government of Netherlands]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1517	SPM	9	52	9	53	'A limited number of modelling studies have quantified the aerosol-climate feedback as 0.0 [–0.2 to +0.2] W m–2 K–1 although with low confidence.' Is this really important enough to be highlighted in the SPM? [Government of United States of America]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1518	SPM	9	52	9	53	It would be good to add that there is a better understanding of processes associated to aerosols (chapter 7, page 3, lines 42-44). [SYLVIE JOUSSAUME, France]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1519	SPM	9	52	9	53	I expect that this feedback will not be familiar to the SPM reader, its conclusion is of low confidence and small magnitude, and I could not find a traceable account of this confidence level in 7.3.4 or 7.5.2. Suggest omitting from SPM, or including a discussion of what it is and what this means for the general reader. Perhaps there are more important feedbacks that are not included but should be? [HAROON KHESHGI, United States of America]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1520	SPM	9	52	9	53	So a feedback that most policymakers will not be familiar with, and that isnt explained here, is assessed to have a value of zero! I think this is a candidate for being deleted. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1521	SPM	9	52		53	Suggest strike sentence; adds little; detracts from strong findings in report. [Stephen E Schwartz, United States of America]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1522	SPM	9	52			The value cited here for the aerosol climate feedback seems not to be given in either of the sections listed. Hence the numbers appear to be inconsistent with the information in those sections. [Government of United States of America]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1523	SPM	9	52			what do you mean by aerosol climate feedback? [Gabriele Hegerl, United Kingdom]	Revised section now has a broader scope, and this

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							statement has been removed. It was considered less policy relevant in this context.
SPM-1524	SPM	9	53			Should refer to section 7.3.5.4 [Government of United States of America]	Revised section now has a broader scope, and this statement has been removed. It was considered less policy relevant in this context.
SPM-1525	SPM	9		9		Model weaknesses shown on chap. 9 are not mentioned in the SPM, such as the significant errors in the simulation of clouds that contribute to uncertainties in cloud feedbacks, the errors in the simulation of MJO and Indian monsoon, that most CMIP models overestimate the warming trend in the tropical troposphere, or that there are some substantial biases in simulating the trend in ocean heat content, etc. Adding few sentences on model weaknesses in the SPM may emphasise that climate models are the best tools available, that they simulate processes realistically but within uncertainties, so that they are not perfect. [Marie-Estelle Demory, United Kingdom of Great Britain & Northern Ireland]	noted. Section has been significantly revised, and now also includes the most policy relevant shortcomings of the models.
SPM-1526	SPM	10	1	10	3	Clarify whether 'modelling' in this sentence is referring to paleoclimate modeling only or also future climate modeling. Suggest also, for clarification purposes, adding to the end of this sentence the phrase "increasing the amount of emitted carbon that stays in the atmosphere." [Government of Canada]	statement has been moved, and merged into the section on projected changes in carbon and other biogeochemical cycles.
SPM-1527	SPM	10	1	10	3	This statement should be reflected in the highlighted conclusions in line 44-46 on page SPM-9 to make this section consistent. [Government of Netherlands]	statement has been moved, and merged into the section on projected changes in carbon and other biogeochemical cycles.
SPM-1528	SPM	10	1	10	3	Bullet should also cover feedbacks related to methane and nitrous oxide changes. There are clear links in the ice core record over the past 800 kyr and the few available studies also suggest a release of methane and N2O from land under global warming [Fortunat Joos, Switzerland]	We are limited by space in the SPM, and did not consider this a high priority policy relevant message.
SPM-1529	SPM	10	1	10	3	It would be very helpful to include some quantitative information on that feedback mechanism as well - even if the uncertainty is very large. Information might be added if climate models included such feedback mechanism or not. [Klaus Radunsky, Austria]	statement has been moved, and merged into the section on projected changes in carbon and other biogeochemical cycles.
SPM-1530	SPM	10	1	10	17	This conclusion is very well written and much easier to understand than the section in question; suggest using a writing style similar to this throughout [Government of United States of America]	comment page or line numbering seems misplaced. Cannot provide a response.
SPM-1531	SPM	10	1			There is no indication of confidence in this statement. [Government of New Zealand]	statement has been moved, and merged into the section on projected changes in carbon and other biogeochemical cycles.
SPM-1532	SPM	10	2	10	3	Need comma after "when climate warms…" [Government of United States of America]	copy edit
SPM-1533	SPM	10	3	10	3	storage capacities?' or 'carbon stores'? [Government of United Kingdom of Great Britain & Northern Ireland]	statement has been moved, and merged into the section on projected changes in carbon and other biogeochemical cycles.
SPM-1534	SPM	10	4			global feedback of biosphere deserve some lines : what do we know? [Government of France]	We are limited by space in the SPM, and did not consider this a high priority policy relevant message.
SPM-1535	SPM	10	6	10	6	"Detection and Attribution': is the name you have given to the process of guesswork by your paid experts which replces a proper scientific study based on genuine experiments.You think you can get away with using "correlation: which we all know can never prove causation, merely by changing the name [Vincent Gray, New Zealand]	Reviewer fails to substantiate his comment.
SPM-1536	SPM	10	6			Section on detection and attribution: For non-experts, information on detection and attribution is needed to explain, why the anthropogenic fingerprint is more difficult to detect and less certain over continents than in global average quantitites. Please add a short explanation to avoid misinterpretations. [Government of Germany]	Section has been significantly revised and we believe statements are easily understood by non experts. We consider information on fingerprinting etc. too technical for the SPM.
SPM-1537	SPM	10	6			Atmosphere Observations: Urban heat island (UHI) phenomenon shows a certain range of effects on the climate and temperature as described in 2.4.1.3 of Chapter 2: "it is concluded that it is likely that residual	Statements in this section focus on global to continental scale, where this effect is assessed to be

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						biases account for no larger than 10% of the warming trend globally and 25% regionally in rapidly developing regions." As an effect other than anthropogenic GHG effects, the UHI effect should also be listed in SPM, probably after P3L25. UHI might be an important bias especially in developing countries where cities could be urbanized in the future. [Government of Japan]	small.
SPM-1538	SPM	10	6			No mention is made of the possible contribution of industial pollution of the atmosphere to the global cooling in the 1950-1970's nor the contribution of clean air policies (aerosol reduction) to subsequent global warming, Please include a few paragraphs of discussion of the effects of these human activities on climate change [Andrejs Vanags, United States of America]	New statement in this section now addresses the cooling effects of aerosols and other anthropogenic factors. However, focus in this section is on the overall warming since 1951.
SPM-1539	SPM	10	8	10	8	This statement is clearly solely political in my opinion and cannot be justified by the science even if you accept everything that is claimed in this report. Given our low understanding of solar influence and natural variability, the uncertainties surrounding aerosols and clouds, the lack of skill of climate models, the lack of warming in the last 15 years while aerosol forcing has not increased, makes even a very likely statement in my opinion unwarranted. Personally I wouldn't go further than that anthropogenic greenhouse gases likely have contributed to some of the warming in the last 50 years. [Marcel Crok, The Netherlands]	The reviewer does not provide scientific evidence supporting his personal views which are noted, but this statement is based on the underlying expert assessment of the chapter team.
SPM-1540	SPM	10	8	10	8	The data in the main report do not demonstrate that it is "extremely likely" that human activities have caused increased global temperature. There are mountains of real physical evidence to the contrary that IPCC is ignoring. This isn't science, it's dogma. [Don Easterbrook, United States of America]	The reviewer does not provide scientific evidence supporting his personal views which are noted, but this statement is based on the underlying expert assessment of the chapter team.
SPM-1541	SPM	10	8	10	8	Extremely likely' is italicised however is not an IPCC defined likelihood term. This will be one of the most used statements from AR5 - what does extremely likely mean? It seems as if it should be classified as 'virtually certain'. [Government of Australia]	reject; please see IPCC uncertainty guidance note.
SPM-1542	SPM	10	8	10	8	The TAR and AR4 used the term 'most' in making similar statements about the anthropogenic influence on global warming. Here "more than half" is used. Switching phrases will be confusing when the main message seems to be that the likelihood statements has increased (from very likely to extremely likely). The Chp. 10 Executive Summary says "most (at least 50%)". Suggest that this phrasing be used here as well and be consistent in defining most as either greater than or equal to 50% or only greater than 50% (i.e. more than half). [Government of Canada]	The wording "more than half" is the assessed final draft wording of chapter 10, and is therefore used here. Statement is not directly comparable to the AR4 which was only considered the effect of greenhouse gas concentrations.
SPM-1543	SPM	10	8	10	8	AR4 states: "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations. It is likely that there has been significant anthropogenic warming over the past 50 years averaged over each continent (except Antarctica)". Does the wording "more than half" in AR5 mean the same quantity as "most" in AR? [Government of Germany]	The wording "more than half" is the assessed final draft wording of chapter 10, and is therefore used here. Statement is not directly comparable to the AR4 which was only considered the effect of greenhouse gas concentrations.
SPM-1544	SPM	10	8	10	8	Please use sentence from TS p 23, line 14 to 16: "...it is extremely likely that human activities (with very high confidence) have caused most (at least 50%) of the observed increase in global average temperatures since 1951." In addition, the expression "extremely likely" should be avoided in AR5. It is part of the agreed uncertainty language outlines in the AR5 Guidance Notes on Uncertainty, but only mentioned in a footnote. The more uncertainty expressions are used in AR5 the more diluted the messages become and we encourage the authors to stick to the 7 main agreed expressions for AR5, especially in regard to this very important statement. In addition, it is confusing for the reader to find likelihood terms that not are included in Chapter 1, please introduce all terms used in AR5 in Chapter 1." [Government of Germany]	The wording "more than half" is the assessed final draft wording of chapter 10. "Extremely likely" is a correct term to use, as stated in the IPCC guidance note on uncertainty.
SPM-1545	SPM	10	8	10	8	The "extremely likely" is associated with the "more than half" (or, as in Chapter 10, "most of"), it could be useful to also provide some information on what the fraction of anthropogenic influence is at the closest lower level of probability. Alternatively, an indication on what applies to warming the 1970 could be considered, as other indicators (same page, lines 41-45) are referenced to 1970. [Government of Sweden]	New paragraph added below the headline statement gives the full quantitative attribution of the warming since 1951. We don't consider further information is required.
SPM-1546	SPM	10	8	10	8	Is the conclusion that 'It is extremely likely that human activities have caused more than half of the observed increase in global ….temperature since the1950s' meant to be different from or the same as the AR4 finding that 'most of the warming…..'? If it is a revised level of attribution, this be noted in the text. [Government of United Kingdom of Great Britain & Northern Ireland]	Statement is not directly comparable to the AR4 which was only considered the effect of greenhouse gas concentrations.

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SPM-1547	SPM	10	8	10	8	"more than half" - hard to decode - I wanted to ask "how much more than half! Would it be better to say "at least half" rather than "more than half"? [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	The wording "more than half" is the assessed final draft wording of chapter 10.
SPM-1548	SPM	10	8	10	9	This "extremely likely" finding is an update from AR4's conclusion of "very likely". This should be highlighted, as it was on the key finding box on pg 10 of the AR4 WGI SPM. However, the "more than half" language is inconsistent with AR4 which concluded "most". I recommend striving for consistency in language with AR4, otherwise the casual reader might assume that confidence has gone up but that the scientific community has concluded that the anthropogenic contribution was actually *lower* than in the AR4. [William Anderegg, United States of America]	The wording "more than half" is the assessed final draft wording of chapter 10, and is therefore used here. Statement is not directly comparable to the AR4 which was only considered the effect of greenhouse gas concentrations.
SPM-1549	SPM	10	8	10	9	In this attribution statement, "more than half" is used instead of "most," which was used in the similar statements in the TAR and AR4. While Chapter 10 indicates that these terms are intended to be equivalent (using "most" as the main term in the executive summary), these are not necessarily interpreted as equivalent in common usage. If the SPM wording varies, one could interpret the statement here to mean that there has been an increase in the likelihood assignment but a decrease in the amount of warming attributed, which is not intended. We suggest making the wording consistent to avoid this confusion, with additional explanation as needed. [Christopher Field, United States of America]	The wording "more than half" is the assessed final draft wording of chapter 10, and is therefore used here. Statement is not directly comparable to the AR4 which was only considered the effect of greenhouse gas concentrations.
SPM-1550	SPM	10	8	10	9	“Extremely likely” refers to 95% possibility, while AR4 states that most of the observed increase in global average temperatures since the mid-20th century is very likely (namely, over 90% of possibility) due to the observed increase in anthropogenic greenhouse gas concentrations. Actually, in the above two statements extracted from AR5 and AR4 respectively, “extremely likely” and “very likely” are not describing exactly the same subject. In our view, in order to avoid misleading decision- or policy-makers, the report should explain the implications of this important conclusion and its difference with AR4 in terms of confidence levels in greater details. Otherwise, policy-makers may mistakenly believe that the AR5 conclusion on climate change attribution is simply an increase of confidence level to 95% (extremely likely) from 90% (very likely) in AR4. In addition, the present expression may mislead policymakers into thinking that it is the human activities conducted after 1950 that resulted in the most (more than 50%) observed average global surface temperature increase since the 1950s. it is recommended to add “since industrial revolution (1750)”after “human activities” in this sentence. [Government of China]	As highlighted by the reviewer, the statement here is not directly comparable to the AR4 which was only considered the effect of greenhouse gas concentrations. A newly added subsequent paragraph provides the clear quantitative basis for this statement.
SPM-1551	SPM	10	8	10	9	Somewhere (perhaps in the chapter if not here), an indication of how the quantitatve assessment of "extremeley likley" was arrived at, for example from the detection and attribution stasistical tests downrated to allow for model, observational shortcomings augmented by qualitative physical arguments concerning eg small recent trends in natural forcings, patterns of natrual variability etc. This is an important statement . [John Mitchell, United Kingdom]	A newly added subsequent paragraph provides the clear quantitative basis for this statement.
SPM-1552	SPM	10	8	10	9	To demonstrate proper scientific caution, in the sentence “It is extremely likely that human activities have caused more than half of the observed increase in global average surface temperature since the 1950s”, replace “extremely likely” with “possible”. Reason: Over a span as short as half a century, little more than the 0.3 K W–1 m2 zero-feedback climate-sensitivity parameter will have operated; and, if feedbacks are significantly net-negative over the short term, as Lindzen & Choi (2009 2011) find them to be, this parameter could be as low as 0.2 K W–1 m2. In that event, assuming 305 µatm CO2 concentration in 1950 and 392 µatm in 2012, warming attributable to CO2 alone would be 0.2[5.35 ln(392/305)] = 0.27 K, and, dividing by 0.7 to allow for other greenhouse gases, 0.38 K. If the aerosol negative forcing is as strong as the IPCC imagines, anthropogenic warming could have been less than 0.3 K: i.e., less than half of the 0.7 K warming since 1950. [Christopher Monckton of Brenchley, United Kingdom]	reject, reviewer provides no substantive basis for his claims. The statement is firmly rooted in the comprehensive underlying chapter assessment.
SPM-1553	SPM	10	8	10	9	The change in likelihood to extremely likely from AR4's very likely is important. Please provide a few sentences along the lines of what was done in AR4's SPM to indicate the rationale for this change and state that it is an advance on AR4. At that time, a key reason was longer and improved records which strengthened the statistics and had been tested with rigorous attribution analyses. [Susan Solomon, United States of America]	Statement is not directly comparable to the AR4 which was only considered the effect of greenhouse gas concentrations.
SPM-1554	SPM	10	8	10	10	This is fanciful nonsense because you ignore the well-recognised characteristics associated with ENSO	reject, reviewer provides no substantive basis for his

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						conditions on the El Nino side of absolutely neutral (ie. SOI = 0). [John McLean, Australia]	claims.
SPM-1555	SPM	10	8	10	11	This statement suggests that half of the observed increase on global temperature is not due to human activities, whereas in fact the best estimate of attribution is that human activities account for all the warming and a bit more (natural processes slightly cool the climate). The statement formulation needs to be re-thought to make clear that the best estimate we have is that human activities are responsible for all the warming since 1950. The likelihood can come in the follow up sentence, which should explain the best assessment of the contribution of natural and anthropogenic processes and the very likely range. This will be the key point of WGI report, and it is critical that the attribution is as clear and representative of the current understanding as it can be. [European Union]	reject, the statement is based on the careful underlying chapter assessment. To help clarify the basis for this statement, a new paragraph has been added which give the clear quantitative basis for this statement, including the uncertainties.
SPM-1556	SPM	10	8	10	11	It seems that the human contribution to the observed warming must be MUCH more than half, given the statement made ein Chapter 10, page 16, line 26/27: " We conclude that the greenhouse gas contribution to the observed warming of approximately 0.6 K over 1951–2010 was very likely between 0.6 and 1.4 K." Also, in AR4 it was stated that "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations". The sentence here as it stands sounds like a revision of the AR4 statement, which should be either explained or corrected. [Government of Germany]	reject, the statement is based on the careful underlying chapter assessment. To help clarify the basis for this statement, a new paragraph has been added which give the clear quantitative basis for this statement, including the uncertainties. Please also note that this statement is not directly comparable to the AR4 which was only considered the effect of greenhouse gas concentrations.
SPM-1557	SPM	10	8	10	11	Detection and Attribution of Climate Change.' It is extremely likely that human activities have caused more than half of the observed increase in global average surface temperature since the 1950s. There is high confidence that this has caused large-scale changes in the ocean, in the cryosphere, and in sea level in the second half of the 20th century. Some extreme events have changed as a result of anthropogenic influence.' Question: Would it be possible to indicate (in this section summary) how the impact of such human activities varies regionally? [Government of Morocco]	regional attribution is more difficult and is discussed in the underlying chapter assessment. Here in the SPM we focus on the global to continental scale assessment findings.
SPM-1558	SPM	10	8	10	11	Please include what the observed increase in global average surface temperature since 1950s is. The substitution of cryosphere with more specific terms (arctic sea ice, ice sheets, snow cover?) might enhance readability and make this sentence more precise. [Government of NORWAY]	A new paragraph has been added which give the clear quantitative basis for this statement, including the observed warming since 1950. Headline statement, and terms such as 'cryosphere' have been revised.
SPM-1559	SPM	10	8	10	11	This statement suggests that half of the observed increase on global temperature is not due to human activities, whereas in fact the best estimate of attribution is that human activities account for all the warming and a bit more (natural processes slightly cool the climate). The statement formulation needs to be re-thought to make clear that the best estimate we have is that human activities are responsible for all the warming since 1950. The likelihood can come in the follow up sentence, which should explain the best assessment of the contribution of natural and anthropogenic processes and the very likely range. This will be the key point of WGI report, and it is critical that the attribution is as clear and representative of the current understanding as it can be. [Corinne Le Quéré, United Kingdom of Great Britain & Northern Ireland]	reject, the statement is based on the careful underlying chapter assessment. To help clarify the basis for this statement, a new paragraph has been added which give the clear quantitative basis for this statement, including the uncertainties.
SPM-1560	SPM	10	8	10	11	This is a key conclusion of the whole report, but it is hard to decode and deeply unsatisfactory. I simply cannot tell if this is an increase in the confidence level relative to AR4, which talked about "most [of the warming] ... being very likely [due to human activity]". It is possible that "extremely likely ... that more than half" and ""very likely ... most" are the same way of saying the same thing and there has been no change in confidence level. I think it is essential that the new statement is keyed to the AR4 statement and it is clearly stated whether this is an upping of confidence or just a way of restating the same confidence level. We should leave policymakers with a clear message as to how understanding has changed (or not) rather than relying on them to decode statements and guess at the semantics of the use of words such as "most" (although they did the same thing to us, with the ambiguous wordings in the UNFCCC :-)) [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Statement is not directly comparable to the AR4 which was only considered the effect of greenhouse gas concentrations. To help clarify the basis for this statement, a new paragraph has been added which give the clear quantitative basis for this statement, including the uncertainties.
SPM-1561	SPM	10	8	10	11	As mentioned in my first SPM comment, the shaded box mentions human activities. However, the four bullets below it talk about "external forcing". This is too soft. The language needs to be changed so that it is clear "external forcing" means "human activities" (where it does so). This whole page could use editing so that	We have tried to improve the clarity of the wording used, while maintaining consistency with the underlying final draft of the chapters.

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						"human" is used in preference to "anthropogenic", "external" and other words regarding who's doing what. The SPM is for PMs and their staffs; not scientists. [herman sievering, United States of America]	
SPM-1562	SPM	10	8	10	11	Perhaps a better headline could be that there is now high confidence in the attribution not only of warming, but also of changes in the cryosphere, sea level, zonally averaged precipitation, water vapor changes, and even some heat waves and flooding events. This might fairly be called the first IPCC assessment in which the field has moved past attribution of warming to attribution of broader changes in the climate system, and perhaps this headline should reflect that. This would mean a merging with the later headline on lines 46-48. [Susan Solomon, United States of America]	Many of these things were already attributed in the AR4, but were not highlighted in the SPM at that time.
SPM-1563	SPM	10	8	10	11	I recommend to add these sentences also to page SPM-2, line 39 (see comment no. 1 about short summary for SPM).. [Oliver Stebler, Switzerland]	Short summary for the SPM is not
SPM-1564	SPM	10	8	10	11	It is a big improvement compared to AR4 to focus on human activities instead of on GHG only. [Bart Verheggen, Netherlands]	thanks and noted.
SPM-1565	SPM	10	8	19	8	It should be explained in the SPM where exactly the increased likelihood since AR4 comes from. This is very policy-relevant information. E.g., is it just the result of more model studies, or did the signal itself increase? In addition, we suggest to apply the formally approved likelihood terminology, instead of extremely likely. [Government of Netherlands]	[Comment page/line numbers seem incorrect, but we assume the reviewer is talking about the headline statement in the Detection/Attribution section] Please note that this statement is not directly comparable with AR4. Here we go beyond just the influence of greenhouse gases, and make a statement about overall human influence on the climate system. So it is incorrect to read this as an increased likelihood. Please also note that "extremely likely" is a term that is part of the IPCC AR5 uncertainty guidance document and thus has a clear quantified basis.
SPM-1566	SPM	10	8			Having said 'extremely likely … more than half', is it possible to provide a likelihood statement for a suitable higher fraction e.g., 75% of the warming? [Government of Australia]	this is not provided in the chapter assessment.
SPM-1567	SPM	10	8			"more than half" -> "most" [William Ingram, United Kingdom]	reject, chapter final draft wording is 'more than half'.
SPM-1568	SPM	10	8			This is an overstatement, and it is not correct as worded - I know of no work in WGI that assesses human activities with uncertainty and then maps onto greenhouse gases. If so, this work should be based on the WGIII assessment of what human activities are doing to GHG emissions and then a propagation of uncertainties into atmospheric composition. Making the simplistic assumption that all observed change is anthropogenic is simply not justified, nor supported by any useful literature in this assessment. Indeed the variability in the big 3 GHG over the recent Holocene is -at a minimum - the uncertainty in natural changes in GHG ("Centennial variations of up to 10 ppm CO2, 40 ppb CH4 and 10 ppb N2O occur throughout the late Holocene."). To assume that ALL change is anthropogenic for greenhouse gases is as bad as assuming that all change in climate is anthropogenic. The mathematical formalism used in D&A should be applied also to the GHG increase. The key is the uncertainty (100%+-10%) that then must be propagated through this current D&A. Chapter 11 discusses some of the uncertainties natural vs. anthropogenic emissions, there are others. [Michael Prather, United States of America]	To help clarify the basis for this statement, a new paragraph has been added which give the clear quantitative basis for this statement, including the uncertainties.
SPM-1569	SPM	10	9	10	9	Could very high confidence be used here? The way it is stated makes this compelling, as the alternative is that this warming has caused no changes, which is unsustainable. [Government of Australia]	"high confidence" is consistent with the underlying chapter assessment for each of the quantities listed here.
SPM-1570	SPM	10	9	10	9	Ambiguous what 'this' refers to: the total warming or the anthropogenic part? [Government of Australia]	statement has been revised.
SPM-1571	SPM	10	9	10	11	To retain some credibility, delete “There is high confidence that this has caused large-scale changes in the ocean, in the cryosphere, and in sea level in the second half of the 20th century. Some extreme events have changed as a result of anthropogenic influence.” Reason: It is not clear whether “this” refers to the total warming of 0.7 K since 1950 or to the anthropogenic fraction of warming since that year, which could be less than 0.3 K. Nor is it clear what “large-scale changes in	Statement has been revised based on numerous comments. Statement now more specific with regard to the changes that have been observed based on the underlying chapter assessment.

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						the ocean [and] in the cryosphere" are. And, since there is no evidence that sea level has risen any faster since 1950 than before 1950 (the change in the measurement method in 1993 having disturbed the record), one cannot say sea level has suffered "large-scale changes" since 1950. Furthermore, if anthropogenic warming has been less than 0.3 K, then its influence on extreme events will have been negligible. In any event, climate system changes as a result of cooling would be far more severe than changes driven by warming. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-1572	SPM	10	9			"Large -scale" is a very loose term [magnitude, geographic, hemispheric, global ???]. [James [Jim] Crawford, United States of America]	term has been removed
SPM-1573	SPM	10	9			The wording in the AR4 was a bit vague, but technically accurate: "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations." Note that 'anthropogenic' modifies 'greenhouse gas', not 'the observed increase'. This is technically correct as these greenhouse gases could be considered anthropogenic , but their increase is mostly anthropogenic, but cannot be considered exactly 100% so. [Michael Prather, United States of America]	statement is not directly comparable with AR4. Here we go beyond just the influence of greenhouse gases, and make a statement about overall human influence on the climate system.
SPM-1574	SPM	10	9			"this" should be changed to "they" or "human activities". Otherwise this text reads as if the increase in global-average surface temperature has caused all the other effects. Local surface temperature may be an intermediary, but not the global average. [Adrian Simmons, United Kingdom]	statement has been revised for consistency with the underlying chapter assessment.
SPM-1575	SPM	10	10	10	11	"Some extreme events have changed …" will be cited as a much stronger statement than is supportable. [James [Jim] Crawford, United States of America]	Statement is consistent and supported by the underlying chapter assessment.
SPM-1576	SPM	10	10	10	11	It is difficult to see what the clear anthropogenic signal could be in sea level rise. Or do you mean the linear increase only? None of the three types of reconstructions for global mean sea level rise show any acceleration after the inflexion point 1930. [Government of Netherlands]	statement has been revised and now specifically makes the link to change in global mean sea level.
SPM-1577	SPM	10	10	10	11	Append '…but a systematic global assessment remains to be conducted' to the final sentence in this box. [Government of United States of America]	statement is not needed. "some extremes" makes it clear that this is not a globally complete picture for all extreme types.
SPM-1578	SPM	10	10	10	11	Refer to Table SPM.1 for the type of extremes considered. [Albert Klein Tank, Netherlands]	agree, link has been added.
SPM-1579	SPM	10	10	10	11	Some extreme events … Would be helpful to get an example here. [Ingeborg Levin, Germany]	link is provided to SPM table 1 where this detail is provided.
SPM-1580	SPM	10	10	10	11	I believe that the "extreme events" that you are referring to are heatwaves, but your claim is baseless because heatwaves are caused by stationary or quasi-stationary pressure cells that happen to direct a stream of warm air to a particular region. IPCC 4AR described the 2003 European heatwave in these terms and pointed out, quite logically, that the heatwave then was exacerbated by reduced surface mositure. When the ENSO is moving warm air to the mid-latitudes and a pressure cell slow or stops, it is likely that a heatwave will occur. [John McLean, Australia]	Link is provided to SPM table 1, where details on the different types of extremes are provided, including the underlying chapter assessment regarding heat waves.
SPM-1581	SPM	10	10	10	11	Please state which extremes have changed as a result of anthropogenic influence. [Susan Solomon, United States of America]	link is provided to SPM table 1 where this detail is provided.
SPM-1582	SPM	10	10	10	11	Statement about "some extreme events" needs an associated confidence level. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	In the revised wording, high confidence is applied to this statement also. See SPM table 1 for confidence levels given to individual extreme types.
SPM-1583	SPM	10	10			"Under suitable circumstances" What are these? Either specify or delete. [Government of United States of America]	comment seems to be misplaced, no response possible.
SPM-1584	SPM	10	11	10	11	In view of its significance and potential sensitivity, this categorical statement needs to be made a bit more explicit and given a 'confidence' descriptor. [Government of Australia]	In the revised wording, high confidence is applied to this statement also. See SPM table 1 for confidence levels given to individual extreme types.
SPM-1585	SPM	10	11	10	11	It isn't extreme events that have changed (one by one), but their distribution, in a statistical sense. [Dian	Statement is intended as a general statement. For

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						Seidel, United States of America]	further detail the reader is referred to SPM Table 1, or the underlying chapter assessment.
SPM-1586	SPM	10	11			"Some extreme events have changed as a result of anthropogenic influence." This statement is vague. Suggest changing to "The risk of certain extreme events has changed as a result of anthropogenic influence.", to be reflective of the D&A literature. [Government of United States of America]	Statement is intended as a general statement. For further detail the reader is referred to SPM Table 1, or the underlying chapter assessment.
SPM-1587	SPM	10	11			Some extreme events have changed' doesn't make sense to me (sorry…) in what respect? [Gabriele Hegerl, United Kingdom]	Statement is intended as a general statement. For further detail the reader is referred to SPM Table 1.
SPM-1588	SPM	10	11			"reduction in glaciers" most naturally means fewer of them - but I suspect "reduction in the length & area of many glaciers" is meant [William Ingram, United Kingdom]	statement has been revised, and now talks of the 'retreat of glaciers'
SPM-1589	SPM	10	14	10	25	The ordinates in the small graphs in Figure SPM.4 are not always clear. For example, the temperature scales use T(K) which would be taken to mean Kelvin (absolute) temperature when the intent appears to be a temperature anomaly from some unstated reference. The "J" for Joules is rotated by 90 degrees in some ordinate labels. [James [Jim] Crawford, United States of America]	Figure has been revised and such graphical details improved.
SPM-1590	SPM	10	15	10	15	This Figure has no integrity unless you can demonstrate that climate models are 100% accurate for all climate forces. [John McLean, Australia]	Reviewer fails to provide any substantive scientific basis for his comment.
SPM-1591	SPM	10	18			For clarity add "extent" after "sea ice". Change "uptake" to "content" and then the caption matches the terminology in the figure i.e. OHC. [Government of New Zealand]	Caption has been significantly revised to improve clarity.
SPM-1592	SPM	10	22	10	22	5 to 95% confidence intervals? 5-95% confidence intervals are not one standard deviation; it would be helpful to explain. [Kristie Ebi, United States of America]	Caption has been significantly revised to improve clarity.
SPM-1593	SPM	10	22	10	22	Between "95%" and "for temperature" a word is missing. [Government of Germany]	Caption has been significantly revised to improve clarity.
SPM-1594	SPM	10	23	10	24	The sentence"For sea ice extent…" is to be improved in clarity. [Government of France]	Caption has been significantly revised to improve clarity.
SPM-1595	SPM	10	28	10	28	In the Figure caption of SPM4 the period is defined as 1950 - 2010. Here it is 1951-2010. This should be unified [Ingeborg Levin, Germany]	caption has been revised.
SPM-1596	SPM	10	28	10	29	Rephrase the sentence as follows: The greenhouse gas contribution to the global warming for the period 1951-2010 is in the range---------- [Government of Benin]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes.
SPM-1597	SPM	10	28	10	29	"The greenhouse gas contribution to the warming from 1951-2010 is in the range between 0.6 and 1.4 °C."is likely to mislead readers to thinking that it is the human activities since 1950 that resulted in warming since 1950. In fact, it is the cumulative emissions since industrialization that led to the warming by 0.6 and 1.4 °C during 1951-2010. It is suggested to refer to line 19, page18, Chapter 10 and reformulate the sentence into "it is 'likely' that anthropogenic forcing since the beginning of the Industrial Era (1750) has contributed to the warming from 1951-2010 in the range between 0.6 and 1.4 ℃. " [Government of China]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes. Revised wording should address the reviewers concern.
SPM-1598	SPM	10	28	10	29	Append '...and is counteracted by cooling contributions from other climate drivers and processes'. [Government of United States of America]	This is now covered in the revised and expanded statement.
SPM-1599	SPM	10	28	10	30	Some of the warming must then have been compensated. Should this not be a stated in a similar way in the same statement? [Arnoud Apituley, The Netherlands]	This is now covered in the revised and expanded statement.
SPM-1600	SPM	10	28	10	30	A brief explanation of the discrepancy between the GHG contribution and actual warming would be helpful. [Kristie Ebi, United States of America]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes.
SPM-1601	SPM	10	28	10	30	This needs more explanation and clarity for the SPM. The observed change is the result of multiple forcing factors. Policy makers will ask how the ghg contribution to warming can be greater than the total observed warming. The off-setting factors should be mentioned. Please also include a likelihood statement and indicate	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling

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						if the range is for just the land surface or the land and ocean surface. [Government of Australia]	effect of aerosols.
SPM-1602	SPM	10	28	10	30	The message of this paragraph is difficult to understand and needs to be clarified. At the end of the second sentence, to aid understanding, consider adding "which is the result of both warming and cooling influences" (assuming the message is that something is counteracting the warming effects of GHGs). Add 'global' before 'warming' where it appears in these two sentences. At the beginning of the paragraph, suggest also clarifying whether this GHG contribution is from well-mixed GHGs only or also includes ozone. [Government of Canada]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1603	SPM	10	28	10	30	It is stated that the GHG warming should be expected to be 0.6 to 1.4 degrees C from 1951 to 2010, which is very likely to be greater than the observed 0.6 degrees C. Its worth explaining here that this is specifically simulated warming attributable to GHG and the reasons why this range is likely to be greater than the observed change over the same period - is this due to the negative radiative forcing from aerosols or other factors? [European Union]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1604	SPM	10	28	10	30	Because of the shortness this important sentence can lead to misunderstandings. We propose to mention that other factors like aerosols exert a cooling effect. [Government of Germany]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1605	SPM	10	28	10	30	Statement is confusing for non-experts. It needs explanation that part of this warming has (very likely?) been masked by cooling from atmospheric aerosol particles, hence the total GHG contributing more than 100% of the observed warming over the time period. [Government of Netherlands]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1606	SPM	10	28	10	30	Please clarify other factors that are countering the warming effect of GHG, resulting in a lower total observed warming than the amount of GHG contributed warming. [Government of New Zealand]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1607	SPM	10	28	10	30	This bullet—specifically the idea of the greenhouse contribution to warming being greater than observed warming— is potentially confusing. What is the reason for the GHG contribution to warming (0.6-1.4 deg C) being larger than the actual warming (0.6 deg C)? Is this just due to uncertainty in translating RF to Delta T? Or is the negative forcing from aerosols sufficient enough to offset as much as 0.8 deg C? If so, perhaps a bullet point is warranted in this section that quantifies to cooling contribution of aerosols to offsetting the GHG warming. [Government of United States of America]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1608	SPM	10	28	10	30	Unclear. Of course 0.6-1.4 is greater than 0.6, so why does it say 'very likely'. I think I understand what this paragraph is trying to say, but think it could be worded more clearly. [Government of United Kingdom of Great Britain & Northern Ireland]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes.
SPM-1609	SPM	10	28	10	30	The meaning of this sentence is not clear without further explanation. This needs another sentence about the cooling contribution of aerosols, in the interest of clarity [Government of United Kingdom of Great Britain & Northern Ireland]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1610	SPM	10	28	10	30	I think this needs further explanation as to why the contribution can be greater than the observed trend. See Chapter 10, page 15, lines 36-39. [Albert Klein Tank, Netherlands]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1611	SPM	10	28	10	30	To remove a scientific absurdity, delete “The greenhouse gas contribution to the warming from 1951-2010 is in the range between 0.6 and 1.4 Cº. This is very likely greater than the total observed warming of approximately 0.6 Cº over the same period.” Reason: The 70-year period 1925-1995, peaking in ~1960, was very nearly a solar Grand Maximum. If climate sensitivity were anything like as high as the models are instructed to assume, the warming caused by the elevated solar activity would have persisted for two or three decades beyond 1960. Alternatively, if the solar influence is as small as the models posit, and if it is not amplified significantly by cosmic rays, then on any view it could not have caused as much as 0.8 Cº cooling since 1951, as is implied here. This sentence, and	Reviewer fails to provide any substantive scientific basis for his comment.

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						the underlying sub-chapter, appear to be a maladroit attempt to justify continued alarm about the climate in the absence of any evidence of warming at anything like the rate the models had predicted. It must go. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-1612	SPM	10	28	10	30	To retain scientific credibility, amend “Over every continent except Antarctica, anthropogenic influence has likely made a substantial contribution to surface temperature increases since the mid-20th century” to read “Over every region except Antarctica and central Africa, anthropogenic influence may have made some contribution to surface temperature increases since the mid-20th century.” Reason: The warming rate equivalent to <1.2 K/century since 1950 is well within the natural variability of the climate, particularly bearing in mind the possibility of a continuing recovery of global temperatures following the very cold weather of the Grand Minimum of 1645-1715. The existing sentence, therefore, is yet another overstatement and must be toned down. [Christopher Monckton of Brenchley, United Kingdom]	reject, statement as written is consistent with the underling chapter assessment. Reviewer fails to cite any scientific evidence to support his claim.
SPM-1613	SPM	10	28	10	30	When referring to chapter 10, it seems that this evaluation is mainly supported by one publication (Jones et al, 2012; an other estimate is included in this range). This makes this results weak to be highlighted in the SPM. The finding appears to be of “limited evidence” if we apply to it the uncertainty language of the IPCC guidance note and should either be cancelled from the SPM or the statement should be associated to a “low confidence”. The qualification “very likely” applied to the following statement should thus also be re-evaluated. [Serge PLANTON, France]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes.
SPM-1614	SPM	10	28	10	30	This statement needs some further explanation - otherwise readers would develop their own conclusions, e.g. this demonstrates that the models are poor in explaing the temperature change in the past. Or: models may predict too high future temperatures as well. In this context it would be helpful to include some explanation - and to identify the key uncertainties (e.g. climate sensitivity). [Klaus Radunsky, Austria]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1615	SPM	10	28	10	30	Without elaboration, this statement is very confusing - it sounds as though we cannot explain the observed warming because current theory indicates that we should have got more warming. I would add extra explanation here to make clear that this result is not a surprise, nor has it been for a number of assessments. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols. This should avoid the confusion referred to be the reviewer.
SPM-1616	SPM	10	28	10	30	This statement, focussing on the role of GHG, also improves upon AR4 by giving a range rather than a lower limit. However, it may need explanation that part of this warming has (very likely?) been masked by cooling from atmospheric aerosol particles, hence the total GHG contributing more than 100% of the observed warming over the time period. [Bart Verheggen, Netherlands]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1617	SPM	10	28	10	30	Would it be possible to add here that the reason the GHG contribution to the warming is very likely greater than the total observed warming is that cooling from anthropogenic aerosols has (very likely?) offset some of this warming ? While your expert reader will know this, some Policymakers might not. [David Wratt, New Zealand]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1618	SPM	10	28	10	43	Unless you can demonstrate that climate models are 100% accurate for all climate forces your statements are mere speculation and should be deleted or the serious reservations be approriately expressed. [John McLean, Australia]	Reviewer fails to provide any substantive scientific basis for his comment.
SPM-1619	SPM	10	28	11	38	Largely devoted to guesswork based on belief in your absurd model [Vincent Gray, New Zealand]	Reviewer fails to provide any substantive scientific basis for his comment.
SPM-1620	SPM	10	28			This sentence is difficult to understand : what is compared to what. [Government of France]	Statement has been significantly revised.
SPM-1621	SPM	10	28			that statement with range needs a likelyhood qualifyer (otherwise I'd be quite surprised) [Gabriele Hegerl, United Kingdom]	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including likelihood terminology.
SPM-1622	SPM	10	29	10	30	For clarity consider adding at the end of the sentence and explanation of how the GHG contribution can be greater than the warming, e.g. "with other anthropogenic forcings contributing much of the counter-acting cooling, and the effects of natural forcings and natural internal variability being small" The formulation is from	This statement has been significantly expanded and now provides a full attribution of the observed warming since 1951 to causes, including the cooling

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						Chapter 10, p. 18, l. 11-12. [Government of Denmark]	effect of aerosols.
SPM-1623	SPM	10	29			Change "This" to "It", again for clarity. [Adrian Simmons, United Kingdom]	copy edit
SPM-1624	SPM	10	32	10	32	"substantial"? please use a more quantitative statement to avoid lengthy discussions in Plenary. [Government of Germany]	This statement is linked to SPM figure 5, where quantitative information is provided.
SPM-1625	SPM	10	32	10	33	This point highlights the issue of retaining the chapter structure for the SPM. The attribution of regional temperature increases to every continent except Antarctica is disconnected from the observations that show significant temperature increases over those continents. As a stand-alone statement its ambiguous as to whether attribution is impossible over Antarctica and whether a trend exists or not. In terms of disconnectedness, discussion of changes in Antarctica overall (for example, ice mass over Antarctica and projections) would be more helpful if in one section/narrative, supporting a component-wise structure for SPM. [Government of Australia]	Statement has been expanded and now provides an explanation of the low confidence in Antarctica.
SPM-1626	SPM	10	32	10	33	This is a key message. Looking at the figure SPM4, which show real trends going out of the 5-95% limits of natural forcing in numerous place, why is the fact quoted as « likely » only ? [Government of France]	Statement is based on chapter assessment of all relevant information, and not only the results shown in SPM figure 5.
SPM-1627	SPM	10	32	10	33	A very brief explanation of why Antarctica is excluded would aid understanding here. [Government of United Kingdom of Great Britain & Northern Ireland]	Statement has been expanded and now provides an explanation of the low confidence in Antarctica.
SPM-1628	SPM	10	32			This reads as if Antarctica is observed to be an exception, rather than that the observations are lacking [William Ingram, United Kingdom]	Statement has been expanded and now provides an explanation of the low confidence in Antarctica.
SPM-1629	SPM	10	35	10	35	This is a very weak statement. [James [Jim] Crawford, United States of America]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1630	SPM	10	35	10	36	To be consistent with other statements, it would be helpful to be more precise (e.g. 1900 to 1950). [Kristie Ebi, United States of America]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1631	SPM	10	35	10	36	This is confusing as it could be interpreted by readers to mean that tropospheric aerosols have induced a warming. This is probably not the intent. [Government of Canada]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1632	SPM	10	35	10	39	This discussion needs to clarify what external and natural forcings are. [Government of Australia]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1633	SPM	10	35	10	39	2 different time periods, 2. sentence too long. [Government of Germany]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1634	SPM	10	35	10	39	What is meant by 'external forcing'? Is it the same is anthropogenic forcing? Is solar forcing included? Since it is also mentioned as natural forcing. [Government of Netherlands]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1635	SPM	10	35	10	39	Whereas solar variation is a clear external forcing it is not clear whether GHG or aerosols would be external forcers. Can this be briefly defined and explained here. [Government of United Kingdom of Great Britain & Northern Ireland]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1636	SPM	10	35	10	39	In the first statement for early 20th century warming, the order of citation of the external forcings can be quite sensitive to interpretation of this statement. According to Chap 10 (Page 18, lines 16-46), most studies tend to point to natural forcings, so it may be more appropriate to first list natural before anthropogenic forcings. This is reinforced by the second sentence that includes the first half of the century and states the role of natral forcing ! [SYLVIE JOUSSAUME, France]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1637	SPM	10	35	10	39	Strong statement that the observed warming cannot be explain in the models by the natural forcings, the last abnormal solar cycle should even have led to a temporary global cooling which was not observed . This very abnormal solar minimum is unfortunately to recent to be fully accounted for in the report. [Christian Muller, Belgium]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1638	SPM	10	35	10	39	The use of the adjectives "external", "internal", "natural" to describe forcings is confusing, as multiple adjectives apply to some forcings (actually, I liked the choice of the word "drivers" rather than "forcings", and	In order to focus on the key policy-relevant messages, this statement has been removed.

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						suggest using it in the SPM). To remedy this problem, either define the terms, or identify exactly which drivers fall into each category, or both. [Dian Seidel, United States of America]	
SPM-1639	SPM	10	35	10	44	The discussion of the attribution is disconnected from the description of the trend (detection) - hence the reader has no idea of the relative size of the signal in terms of attribution over the last 60 years compared with the previous 50, and is left with little or no context of the signal to noise ratio, which is important in judging whether the magnitude of the anthropogenic signal is large. Providing the estimated fraction of attribution in the overall change (in a given metric) has much less physical meaning for the SPM when the magnitude of the signal is separated out from that statement. [Government of Australia]	The SPM structure follows that of the underlying chapters. We do not think it is too difficult for the reader to consider these Detection and Attribution results in the context of the observed changes that have been reported only a few pages earlier.
SPM-1640	SPM	10	35	10	44	It seems the phrase "external forcing" is used differently in these two paragraphs. In the first paragraph it excludes anthropogenic forcing, in the second anthropogenic forcing is included. Suggest reviewing/clarifying. [Government of Canada]	The term "external forcing" has been replaced with 'anthropogenic forcings".
SPM-1641	SPM	10	35	10	44	The text mentions external forcing as well as natural and anthropogenic forcings. Specify that external forcing includes both natural and anthtropogenic forcings. [Government of Germany]	The term "external forcing" has been replaced with 'anthropogenic forcings".
SPM-1642	SPM	10	36	10	39	To reflect the models' limitations correctly, delete "Climate model simulations that include only natural forcings (volcanic eruptions and solar variations) can explain a substantial part of the pre-industrial inter-decadal temperature variability since 1400 but fail to explain more recent warming since 1950." Reason: The offending sentence, like similar statements in previous IPCC reports, is an instance of the fundamental Aristotelian logical fallacy of the argumentum ad ignorantiam, the fallacy of arguing from ignorance. It has no evidential value and, therefore, no place in a scientific document. Natural variability on its own is sufficient to explain all recent warming (though it is possible that some of that warming was anthropogenic). For instance, the central England temperature record shows warming at a rate equivalent to 4 K/century during the 40 years 1695-1735: yet the IPCC's very low estimate of solar forcing would render so large a warming impossible. Models underestimate natural variability. [Christopher Monckton of Brenchley, United Kingdom]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1643	SPM	10	36	10	39	To restore balance, amend "It is very likely that more than half of the ocean warming observed since the 1970s is caused by external forcing, mainly due to a combination of both anthropogenic forcing and volcanic eruptions" to read "Insofar as the ocean may have warmed since the 1970s, it is possible that some of the warming may have been caused by external forcing, such as anthropogenic and volcanic forcings." Reason: Measurements are inadequate to establish the extent or magnitude of ocean warming: even the 3000 ARGO bathythermograph buoys do no more than the equivalent of taking a single temperature and salinity profile in the whole of Lake Superior less than once a year. Furthermore, we do not have a sufficiently long data series to tell us whether or at what rate the ocean is warming, and there is no analysis of variability the considerable direct heating of the deep ocean caused by the 6000+ subsea volcanoes. This sentence is guesswork and should be deleted. [Christopher Monckton of Brenchley, United Kingdom]	statement has been revised and focuses on changes in the upper ocean.
SPM-1644	SPM	10	37	10	38	Suggest this sentence could be shortened by deleting the text "can explain a substantial……since 1400" as this is not expected to be particularly significant to policy-makers. The main message here should focus on the inability of models forced by natural forcings only to explain recent warming. [Government of Canada]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1645	SPM	10	37		38	"pre-industrial ... since 1400" confusing - replace with e.g. "… between 1400 and 1750" [William Ingram, United Kingdom]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1646	SPM	10	37			Does "substantial part" here refer to a substantial part of the temperature changes or a substantial part of the time interval. Multi-decade periods when the trends don't follow the models raise serious uncertainties. [James [Jim] Crawford, United States of America]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1647	SPM	10	37			I think that the word "substantial" should be deleted. [Henning Rodhe, Sweden]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1648	SPM	10	41	10	41	Clarify what 'ocean warming' refers to: top 500m? Whole depth? [Government of Australia]	statement focuses on changes in the upper ocean (above 700 m)
SPM-1649	SPM	10	41	10	42	This is very confusing. How are volcanic eruptions contributing to ocean warming? There is no anthropogenic	statement has been revised to avoid this confusion.

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						+ volcanoes in Fig SPM.4 so the reference to 'see Fig SPM.4 is not helpful and the text will need to be clearer in explaining what the intended message is here. [Government of Canada]	
SPM-1650	SPM	10	41	10	43	clarify the sentence : the first part evocates « external forcing » while « volcanic eruption is quoted in the second. [Government of France]	The term "external forcing" has been replaced with 'anthropogenic forcings".
SPM-1651	SPM	10	41	10	44	It is unclear how volcanic eruptions contribute to ocean warming. It is not clear from Figure SPM.4 or the underlying Chapter, why it is appropriate to include reference to 'volcanic eruptions' here unless it is intended to imply an off-setting role. If so, that needs to be made clear. [Government of Australia]	statement has been revised to avoid this confusion.
SPM-1652	SPM	10	41	10	44	Is thermal expansion is the only reason for the observed sea-level rise? There is nothing on land-ice melt from Greenland, glacier melt, etc.? [Government of United Kingdom of Great Britain & Northern Ireland]	New statements have been added which address the key contributors to sea level rise, and their attribution.
SPM-1653	SPM	10	41			It would be helpful to provide a sense of proportion between the anthropogenic and the volcanic influences [Government of New Zealand]	statement has been revised and no longer mentions volcanic influences.
SPM-1654	SPM	10	42			The magnitude of each anthropogenic forcing and volcanic eruptions must be indicated, or it would be misunderstood that volcanic eruptions contribute to warming in the same way as anthropogenic forcing. [Government of Japan]	statement has been revised and no longer mentions volcanic influences.
SPM-1655	SPM	10	42			Delete "due to" [William Ingram, United Kingdom]	copy edit
SPM-1656	SPM	10	43	10	43	Ambiguous what 'this' refers to: the total warming or the anthropogenic part?. [Government of Australia]	statement deleted.
SPM-1657	SPM	10	43	10	43	The expression "extremely likely" should be avoided in AR5. It is part of the agreed uncertainty language outlines in the AR5 Guidance Notes on Uncertainty, but only mentioned in a footnote. The more uncertainty expressions are used in AR5 the more diluted the messages become and we encourage the authors to stick to the 7 main agreed expressions for AR5, especially in regard to this very important statement. In addition, it is confusing for the reader to find likelihood terms that not are included in Chapter 1, please introduce all terms used in AR5 in Chapter 1." [Government of Germany]	reject, "extremely likely" has a defined quantitative meaning.
SPM-1658	SPM	10	43	10	44	The mean sea lever rise should be quantified. Is it significant enough to be characterized as a "large-scale change" (ref. box on line 8-11)? Please consider to make it clearer if "large-scale" is referred to horizontal extent or any other meaning of the word "large-scale". [Government of NORWAY]	Mean sea level rise is quantified in the observation section. New statements have been added in this section which address the key contributors to sea level rise, and their attribution.
SPM-1659	SPM	10	43	10	44	This statement is false and should be deleted. There is nothing to prevent the ENSO being the cause of warmer oceans and therefore of thermosteric sea level rise, in fact it is more plausible than your claim unless you can demonstrate that climate models are 100% accurate for all forces. [John McLean, Australia]	Reviewer fails to provide any substantive scientific basis for his comment.
SPM-1660	SPM	10	43	10	44	Isn't it virtually certain (not merely extremely likely) that thermal expansion is greater than zero? [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	Statement moved, and revised statements have been added in this section which address the key contributors to sea level rise, and their attribution.
SPM-1661	SPM	10	46	10	38	Explanation of 'intensified water cycle' is required for SPM. [Government of Australia]	Statement has been expanded and now provides more detail.
SPM-1662	SPM	10	46	10	46	"observations and their combination with climate model simulations" is ambiguous we may understand that you combine observations in climate models, do you mean "Combination of new observations and climate model simulations " ? [SYLVIE JOUSSAUME, France]	Statement has been significantly revised.
SPM-1663	SPM	10	46	10	48	Does "water cycle" here mean the "hydrologic cycle"? [James [Jim] Crawford, United States of America]	Statement has been expanded and now provides more detail.
SPM-1664	SPM	10	46	10	48	I disagree, models have too much problem with precipitation to make such claims, see Graeme Stephens' dreary state of precipitation in climate models paper in which it is shown that it rains twice too often and therefore also too light. [Marcel Crok, The Netherlands]	Statement has been expanded and now provides more detail. The reference to model simulations has been removed.
SPM-1665	SPM	10	46	10	48	It would be helpful to describe, for the lay-person, what an "intensified global water cycle" means. [Government of United States of America]	Statement has been expanded and now provides more detail.

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SPM-1666	SPM	10	46	10	48	This sentence is the wrong way around? It should read "New observations, consistent with an intensified global water cycle, can be combined with climate model simulations to permit the attribution of some changes in the water cycle since 1950 to anthropogenic influences." (It is the observations which are consistent with the intensified water cycle, not the attribution) [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	Statement has been expanded and now provides more detail.
SPM-1667	SPM	10	47	10	47	This conclusion is vague. To what is "taken together" referring to? What are "these patterns"? [Government of Netherlands]	Statement has been expanded and now provides more detail.
SPM-1668	SPM	10	47		48	What if anything does "global" mean, & why does it apply in 48 but not 47? For that matter, does "water cycle" mean anything to policymakers? [William Ingram, United Kingdom]	Statement has been significantly revised. We think the "global water cycle" is a term which the policy-maker is familiar with.
SPM-1669	SPM	10	48	10	48	To clarify, suggest slight revision to the second sentence to say "Taken together, these patterns indicate an intensified global water cycle consistent with expectations under a warmer climate." [Government of Canada]	Statement has been significantly revised.
SPM-1670	SPM	10	48	10	48	Please, explain term "an intensified global water cycle". [Government of Finland]	Statement has been expanded and now provides more detail.
SPM-1671	SPM	10	48	10	48	Do policymakers understand what "an intensified water cycle" is...I suspect not [Government of New Zealand]	Statement has been expanded and now provides more detail.
SPM-1672	SPM	10	48	10	48	What do you mean by "intensified global water cycle"? More evaporation?. Please re-write. We are also concerned that you write "consistent with .." on several places in the SPM. We think that what you write can be communicated better with; "leads to" or "are in accordance with" or "has been taken into account". We propose to re-write: Taken together, these patterns can be explained by ...." Generally we think that this shaded text should contain more factual and precise information from the underlying chapter. [Government of NORWAY]	Statement has been expanded and now provides more detail. "Consistent with" is no longer used in this instance.
SPM-1673	SPM	10	50	10	50	This sentence needs some attention - there is something missing! [Timothy Carter, Finland]	Statement has been revised and merged to provide a single clear statement on changes in the water cycle.
SPM-1674	SPM	10	50	10	50	The line needs re-wording to make clear what is meant (eg by replacing ‘for’ with ‘in’). [Government of Australia]	Statement has been revised and merged to provide a single clear statement on changes in the water cycle.
SPM-1675	SPM	10	50	10	51	Why mention both "atmospheric moisture content and tropospheric specific humidity"? It would suffice to use only the former. If there is some distinction intended, it is not apparent in the text as written. Also, is this statement applicable to the global-mean troposphere, or just some regions, and is it applicable to the stratosphere? I think I know the answers, but they won't be clear to non-experts. [Dian Seidel, United States of America]	Statement has been revised and merged to provide a single clear statement on changes in the water cycle.
SPM-1676	SPM	10	50	10	53	Moisture and specific humidity are not depicted in figure SPM-4. Replace zonal with large-scale, consistent with the main text. [Government of Netherlands]	reference to SPM figure 4 has been removed. Statement on zonal precipitation has been removed.
SPM-1677	SPM	10	50	10	53	The basis for medium confidence of zonal precipitation trends is unclear, since observations seem to lie outside the range of both natural-only and all-forcing scenarios. [Government of United States of America]	specific statement on zonal precipitation has been removed.
SPM-1678	SPM	10	50	10	53	It sounds somewhat contradictory to have a "medium confidence" to a statement that details the most important results emphasized in the orange box just above (lines 46 to 48). [SYLVIE JOUSSAUME, France]	Statement has been revised and merged to provide a single clear statement on changes in the water cycle.
SPM-1679	SPM	10	50	10	53	To reflect measurement uncertainties properly, delete “There is medium confidence for anthropogenic contributions to an increase in atmospheric moisture content and tropospheric specific humidity, and to changes in zonal precipitation patterns over land with reductions in low latitudes and increases in northern hemisphere mid to high latitudes since 1950.” Reason: Water vapor is not a well-mixed greenhouse gas. Its concentration is highly variable seasonally, latitudinally, and altitudinally. There is altogether insufficient information to establish whether the changes mentioned in this sentence have occurred at all, still less whether the changes are beyond natural variability. This is more guesswork and it should be deleted. [Christopher Monckton of Brenchley, United Kingdom]	Statement has been revised and merged to provide a single clear statement on changes in the water cycle.

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SPM-1680	SPM	10	50	10	53	This needs to be split in to two bullets as covering water vapour change and precipitation change in a single bullet is too much [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Statement has been revised and merged to provide a single clear statement on changes in the water cycle.
SPM-1681	SPM	10	50	10	53	I feel that there is a major problem in this section as it appears that attributions are being made of human activity to observations that are themselves of low confidence. So there is low confidence (SPM-3-36) that mid-late precip has increased and yet medium confidence that this is due to human activity? I am not sure where that leaves us. If precipitation has increased it is due to human acitivity, but it may not actually have increased?! Even worse, there is medium confidence that the tropical precip reduction is due to human activity but SPM-3-39 says that tropical precip has likely increased in the past decade. [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	specific statement on precipitation has been removed. Statement has been revised and merged to provide a single clear overarching statement on changes in the water cycle.
SPM-1682	SPM	10	50	10	53	This statement is not backed by Fig. SPM.4: For the band 30S-30N the figure clearly shows a sharp increase towards the end of the period (after 2000 or so), so there is no reduction in low latitudes. Furthermore, NH mid-high latitudes (30-60N) show an increase in the models, while obs show a sharp decrease after 2000. [Andreas Sterl, Netherlands]	specific statement on zonal precipitation has been removed.
SPM-1683	SPM	10	50	11	18	None of these statements have any credibility unless you can demonstrate that climate models are 100% accurate. The statement should either be deleted or the very significant caveat be explicitly stated. [John McLean, Australia]	Reviewer fails to provide any substantive scientific basis for his comment.
SPM-1684	SPM	10	51	10	51	Suggest splitting into two sentences - …. tropospheric specific humidity. There is medium confidence to changes in …' [Government of Australia]	Statement has been revised and merged to provide a single clear statement on changes in the water cycle.
SPM-1685	SPM	10	51	10	51	Replace 'zonal precipitation patterns' with 'regional precipitation patterns' [Government of Australia]	specific statement on zonal precipitation has been removed.
SPM-1686	SPM	10	51	10	51	Not many readers will know how tropospheric specific humidity is different that atmospheric moisture content. Suggest just referring to atmospheric moisture content in the SPM as this is easily grasped. [Government of Canada]	Statement has been revised and merged to provide a single clear statement on changes in the water cycle. Technical language has been avoided.
SPM-1687	SPM	10	51			It is suggested to include a definition for the term "tropospheric specific humidity" in the glossary. [Klaus Radunsky, Austria]	Statement has been revised and merged to provide a single clear statement on changes in the water cycle. Technical language has been avoided.
SPM-1688	SPM	10	52			"reductions in low latitudes" is over-simple & inconsistent with Fig SPM.4 [William Ingram, United Kingdom]	specific statement on zonal precipitation has been removed.
SPM-1689	SPM	10			36	Ambiguous - could be read as meaning that each of thse 3 is very likely to have contributed in part, or just that their sum is. [William Ingram, United Kingdom]	In order to focus on the key policy-relevant messages, this statement has been removed.
SPM-1690	SPM	10				Is it possible to give indicative information about the GHG emissions (in TeqCO2 or other unit) responsible for a 1°C rise of temperature ? (at last range). This could be helpful to read the section 5, p.17, line 3, data on carbone feedback. [Government of France]	In the section 'Quantification of climate system responses' we focus on the key policy relevant metrics of ECS, TCR, and TCRE.
SPM-1691	SPM	10				Figure SPM.4: 1. Please do not use diagram background color in order to improve visibility. 2. Do not use background color of individual diagrams (only use colored frames to describe indicators). 3. Please enhance contrast between "Observations" and "Simulations" in the individual diagrams (i. e., reduce line strength or contrast of "Observations"). 4. Enlarge entire Figure horizontally to improve legibility. 5. Do not use green color for background earth (color has here, in contrast to "Precipitation" diagrams, no meaning); use grey shades instead (in order to enhance contrast between fore- [i. e., diagrams] and background [i. e., earth map]). 6. Some x- and y-axes are missing tick marks. 7. Check indication of latitude bands in "Precipitation" (wrong labeling for "60°S-30°S"). [Oliver Stebler, Switzerland]	Figure has been revised considering these and other useful suggestions for improvement.
SPM-1692	SPM	11	0			Factual statements need to put into context better. For example in section on 'key metrics' section, page 11 2nd para - what does 1000 PgC relate to in terms of total emissions? [Government of United Kingdom of Great Britain & Northern Ireland]	Effort has been made in the revised draft to provide an improved narrative and context for all statements.
SPM-1693	SPM	11	0			On projections of global and regional climate change: The timescales for near-term and long-term projections are not defined in the text, though the implication is that they are up to c. 2050 and 2100, respectively.	comment seems misplaced. In any case, timescales are clearly noted for all projected ranges that are

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						[Government of United Kingdom of Great Britain & Northern Ireland]	given.
SPM-1694	SPM	11	1	11	1	"in part"? is associated with a probabilistic uncertainty qualifier: please use a more quantitative statement to avoid lengthy discussions in Plenary. [Government of Germany]	statement is removed, and merged into the single revised statement on changes in the global water cycle.
SPM-1695	SPM	11	1	11	2	Instead of "changes", it would be much better to be specific and say "increases" or decreases" as the case may be. [James [Jim] Crawford, United States of America]	statement is removed, and merged into the single revised statement on changes in the global water cycle.
SPM-1696	SPM	11	1	11	2	Disconnection between observed change and attribution hampers this point in terms of interpretation and clarity for SPM. [Government of Australia]	statement is removed, and merged into the single revised statement on changes in the global water cycle.
SPM-1697	SPM	11	1	11	21	This section, in particular, seems to intermix the ideas of liklihood and confidence. [James [Jim] Crawford, United States of America]	statements are all consistent with the underlying chapter assessment, and likelihoods are provided where appropriate.
SPM-1698	SPM	11	1	11	21	Some consistency in use of phrasing would be helpful here. By switching between 'anthropogenic forcing' and 'human influence' it may make some readers question whether or not these mean the same thing. Alternately, a footnote could be added to clarify that these terms are used as synonyms here. Importantly, the specific reference to 'increases in GHGs' in line 2 and use of anthropogenic forcing/human influences elsewhere in this section does make the reader wonder whether this is deliberate in terms of causes of salinity changes vs other observed changes. It might also be useful to clarify whether, in these detection and attribution studies, the roles of different anthropogenic forcers can be distinguished or whether readers are to understand that it is the net anthropogenic effect (warming and cooling factors) that can be detected. [Government of Canada]	We have noted this concern and in the revised draft aim for consistency in the terminology used. Note that the newly added statement in this section provides a full attribution of the observed warming since 1951 to causes, including the cooling effect of aerosols.
SPM-1699	SPM	11	2	11	2	Replace 10.3.2 into 10.4.2. [Government of Netherlands]	copy edit
SPM-1700	SPM	11	4	11	4	This statement appears weak given the dramatic reduction in Arctic sea ice, the physical and modelling consistency with the warming, and the strong attribution statement on anthropogenic warming fraction on p6. The converse, that anthropogenic forcing has had no contribution whatsoever is surely exceedingly unlikely. Does this sentence reflect some residual uncertainty as to whether the sea ice retreat is anthropogenically caused, or does it merely indicate that the climate models are presently insufficiently sophisticated so as to put the matter beyond doubt? [Government of Australia]	Statement has been revised based on final assessment of the underlying chapter, and likelihood is now reported as "very likely' for the period since 1979.
SPM-1701	SPM	11	4	11	4	Why is this conservative statement made about attribution for sea ice: It is likely that anthropogenic forcings have contributed to Arctic sea ice retreat (high confidence) 1950" compared with the statement on Ch. 10 p. 38 (line 3-4): "it is very likely that anthropogenic forcing is a major contributor to the observed decreases in Arctic sea ice." [Thomas Knutson, United States of America]	Statement has been revised based on final assessment of the underlying chapter, and likelihood is now reported as "very likely' for the period since 1979.
SPM-1702	SPM	11	4	11	4	This phrase is ridiculous in that it has no quantification. Absolutely, positively, there has been some effect--the statement just has to have some quantification. A better phrasing would be "It is likely that anthropogenic forcings have cause most of the Arctic sea ice retreat since 1950"--now that would be meaningful and very likely true. [Michael MacCracken, United States of America]	Statement has been revised based on final assessment of the underlying chapter, and likelihood is now reported as "very likely' for the period since 1979.
SPM-1703	SPM	11	4	11	4	Seems as a very vague statement. [Gunnar Myhre, Norway]	Statement has been revised based on final assessment of the underlying chapter, and likelihood is now reported as "very likely' for the period since 1979.
SPM-1704	SPM	11	4	11	4	"likely" - this seems strange to me, as SPM-9-19 says that there is a high confidence that CMIP5 models (with anthropogenic forcing) realistically simulate trends in Arctic sea-ice. Are these two bullets consistent with each other? [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	Statement has been revised based on final assessment of the underlying chapter, and likelihood is now reported as "very likely' for the period since 1979.
SPM-1705	SPM	11	4	11	6	Because of our low level of understanding of the processes involved and of the large uncertainties on the estimates of the internal variability sea ice extent in the Southern Ocean (see chapter 9), I consider that we	Statement regarding Antarctica has been revised based on the chapter assessment, and now

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						have low confidence too on the compatibility of the recent changes in sea ice extent in the Southern Ocean with internal variability. [Hugues Goosse, Belgium]	concludes "low confidence" in the scientific understanding of changes in sea ice in this region.
SPM-1706	SPM	11	4	11	6	The Antarctic sentence seems very awkward and ambiguous. The increase is self-evidently CONSISTENT with internal variability. The issue is whether it is ATTRIBUTABLE with any level of confidence to internal variability. Please see the recent paper Holland and Kwok (2012) 'Wind-driven trends in Antarctic sea ice drift' Nature Geoscience. [Government of Australia]	Statement regarding Antarctica has been revised based on the chapter assessment, and now concludes "low confidence" in the scientific understanding of changes in sea ice in this region.
SPM-1707	SPM	11	4	11	6	We question whether medium confidence is appropriate. Models are not very realistic in this region (cf Ch9), so it is hard to make a statement based on model results only. c) There are studies that propose that net increase is due to processes not included in the climate models that are used to underpin this statement, eg Bintanja et al (submitted, 2012): "Using observations and state-of-the-art climate modelling, we show here that sea ice expansion may instead be attributed to accelerated Antarctic ice sheet mass loss through basal shelf melting caused by warming adjacent subsurface ocean waters.", See also Swingedouw et al, GRL, 2008, doi:10.1029/2008GL034410. [Government of Netherlands]	Statement regarding Antarctica has been revised based on the chapter assessment, and now concludes "low confidence" in the scientific understanding of changes in sea ice in this region.
SPM-1708	SPM	11	4	11	6	Please change "consistent with" to "due to" or "can be explained by" [Government of NORWAY]	statement is revised.
SPM-1709	SPM	11	4	11	6	To increase scientific precision, replace the sentence “There is medium confidence that the observed small net increase in Antarctic sea ice extent is consistent with internal variability” with “There is medium confidence that the observed net increase in Antarctic sea ice extent over the past three decades – a net increase equivalent to almost half of the net loss of sea ice extent in the Arctic over the period – is consistent with internal variability.” Reason: If the gain in Antarctic sea ice were “small”, then the loss in Arctic sea ice would not be very great. It is better to demonstrate balance here. [Christopher Monckton of Brenchley, United Kingdom]	Statement regarding Antarctica has been revised based on the chapter assessment, and now concludes "low confidence" in the scientific understanding of changes in sea ice in this region. It is accurate to describe the gain in Antarctica as "small', and this is consistent with the assessment of Chapter 4.
SPM-1710	SPM	11	4	11	6	There is medium confidence that the observed small net increase in Antarctic sea ice extent is consistent with internal variability (see Figure SPM.4) a) The fact that the trend is significant means that it falls outside the natural variability on time scales shorter than the observed record (30 years). b) Models are not very realistic in this region (cf Ch9), so it is hard to make a statemrnt based on model results only. c) There are papers that propose that it is due to processes not included in the climate models that are used to underpin this statement, eg Bintanja et al (submitted, 2012): "Using observations and state-of-the-art climate modelling, we show here that sea ice expansion may instead be attributed to accelerated Antarctic ice sheet mass loss through basal shelf melting caused by warming adjacent subsurface ocean waters.", See also Swingedouw et al, GRL, 2008, doi:10.1029/2008GL034410 [Geert Jan van Oldenborgh, Netherlands]	Statement regarding Antarctica has been revised based on the chapter assessment, and now concludes "low confidence" in the scientific understanding of changes in sea ice in this region.
SPM-1711	SPM	11	6	11	8	Mixing likelihood and confidence statements in one finding is often confusing to policymakers. [Kristie Ebi, United States of America]	We try to avoid mixing within the same sentence.
SPM-1712	SPM	11	6	11	8	Complex sentence, with multiple level of certainty : could it be made clearer ? [Government of France]	statement has been revised and clarity improved.
SPM-1713	SPM	11	6	11	8	To increase scientific precision and restore balance, rewrite “Human influences are the likely cause for a substantial reduction in glaciers since the 1960s (high confidence), and reductions in snow cover and permafrost since the 1970s (medium confidence)” to read “Anthropogenic influences may have contributed since the 1960s to the reduction in some mountain glacier lengths that began in the 1880s, and to reductions in permafrost since the 1970s, but there has been no significant reduction in glacier lengths in most of Antarctica (where nearly all of the world’s 160,000+ glaciers are to be found), and no significant reduction in northern-hemisphere snow cover except during the spring.” Reason: The IPCC has consistently exaggerated the effects of warmer weather on the cryosphere. To avoid further embarrassment, it should tone down its claims and be more precise about them. Example: In 2010, winter snow cover extent in the Northern Hemisphere reached a high only exceeded on one occasion some 30 years previously. [Christopher Monckton of Brenchley, United Kingdom]	Reviewer fails to cite any scientific evidence to support his claim of exaggeration.
SPM-1714	SPM	11	10	11	11	To reflect the literature more accurately, replace “It is likely that anthropogenic forcings have contributed to the increased surface melt of Greenland since 2000” with “Greenland’s ice sheet may have thickened by 0.5 m except at the coastal fringes from 1992-2003, and may have thinned by 0.1-0.3 m in the decade since then, but, since there has been no global warming since 1998, the anthropogenic contribution to comparatively	It must be understood that the underlying chapter assessment is based on multiple lines of cited scientific evidence, and not the results of individual papers.

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						small loss of ice thickness in Greenland since 2003 must have been negligible." Reason: Johannessen et al. (2005) found that the mean thickness of a study area of land-based ice in Greenland had increased by >5 cm/year during each of the 12 years 1992-2003. Subsequent studies have shown some thinning of the ice sheet. On these data it is not safe to attribute any significant loss of ice thickness in Greenland to anthropogenic influences. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-1715	SPM	11	10			Again, some context is required. Does 'It is likely that anthropogenic forcings have contributed to the increased surface melt of Greenland …' mean there is some residual uncertainty that anthropogenic influences aren't to blame, or does this merely reflect the current climate models' inability to put the matter beyond doubt? Please say which it is. [Government of Australia]	This level of technical detail is provided in the underlying chapter assessment, and we focus here in the SPM on the key message.
SPM-1716	SPM	11	11	11	11	Why are two time frames 2000 and 1990 given? Please remove 'only'. [Government of Australia]	Dates and statement for Antarctic sea ice have been revised.
SPM-1717	SPM	11	11	11	12	"There is only low confidence of a human contribution to the observed loss of Antarctic ice sheet since 1990 due to limited scientific understanding of the processes involved" This is a surprising statement difficult to reconcile with NASA/GISS global temperature maps (http://data.giss.nasa.gov/gistemp/). These maps indicate that parts of Antarctica warmed by more than +4 degrees Celsius in 2012 relative to 1990. Since overall Antarctic warming constitutes an integral part of global warming, consistent with earlier statement of the SPM there exists a high confidence in the anthropogenic warming factor. [Andrew Glikson, Australia]	Statement is clear that the low confidence results from the low level of understanding in attributing the causes of mass loss in Antarctica.
SPM-1718	SPM	11	11	11	12	"There is only low confidence of a human contribution to the observed loss of Antarctic ice sheet since 1990 due to limited scientific understanding of the processes involved". This statement provides an example of how meaning and significance can be lost when detection information is separated from the attribution statement as you loss the finding the parts of Antarctic have seen significant mass loss. Are there any plausible and scientifically respectable explanations not involving human influences available? Say whether or not there are any. [Government of Australia]	The statement is clear that there is currently limited scientific understanding of the processes involved. It is inappropriate therefore in the SPM to go any further and provide a listing of "plausible" explanations as requested by the reviewer.
SPM-1719	SPM	11	11	11	12	To increase precision, replace "There is only low confidence of a human contribution to the observed loss of Antarctic ice sheet mass since 1990 due to limited scientific understanding of the processes involved", and with "There has been some loss of ice sheet mass in West Antarctica, notably in the Antarctic Peninsula, but Antarctica as a whole has cooled for 30 years and ice mass in East Antarctica has very likely increased." Reason: East Antarctica has cooled so sharply in recent decades that environmental damage owing to the cooling has been observed in some of the Antarctic glens (e.g. Doran et al., 2002). Recent attempts to maintain that East Antarctica has warmed and lost ice mass are based on questionable statistical techniques, including unduly imaginative interpolations of data over vast regions where no measurements have been taken. [Christopher Monckton of Brenchley, United Kingdom]	Regarding changes in temperature over Antarctica, the revised SPM provides a clear statement concerning the large observational uncertainties over Antarctica. It must be understood that the underlying chapter assessment is based on multiple lines of cited scientific evidence, and not the results of individual papers.
SPM-1720	SPM	11	11	11	14	Why only give results for the RCP8.5? This pathway represents the upper extreme of baseline scenarios (like the A1FI scenario in SRES) and by itself is not representative of either non-mitigation scenarios or scenarios more generally. Suggest listing results for all of the RCPs, or if space prevents then one of the middle scenarios. [HAROON KHESHGI, United States of America]	comment is misplaced with wrong page and/or line numbering. No response possible.
SPM-1721	SPM	11	11		12	Delete the sentence about Antarctic ice sheet. [Terje Wahl, Norway]	reviewer fails to provide any reasoning or substantive basis to support his comment.
SPM-1722	SPM	11	12	11	12	limited scientific understanding AND a lack of observations [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	limited scientific understanding is the overall reasoning.
SPM-1723	SPM	11	14	11	15	These points should be separated, with the temperature extremes point expanded to include reference to frequency of hot and cold extremes. [Government of Australia]	In order to shorten the overall length of this section, and avoid duplication, the statement on extremes has been removed. The opening headline statement directs the reader to SPM table 1, where full details on extremes are provided.
SPM-1724	SPM	11	14	11	16	The 2 first sentences of the paragraph are not water related issues and could fit elsewhere. [Government of France]	In order to shorten the overall length of this section, and avoid duplication, the statement on extremes has been removed. The opening headline statement

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							directs the reader to SPM table 1, where full details on extremes are provided.
SPM-1725	SPM	11	14	11	18	This is rather subjective. For example, the probability of observed heat waves is 1.0. Causality of specific incidents is intrinsically uncertain and will remain so. [James [Jim] Crawford, United States of America]	In order to shorten the overall length of this section, and avoid duplication, the statement on extremes has been removed. The opening headline statement directs the reader to SPM table 1, where full details on extremes are provided, including for heat waves.
SPM-1726	SPM	11	15	11	16	It is likely that human influence has substantially increased the probability of some observed heatwaves.' Only of heat waves (a warm spell in summer time)? Or also warm spells? [Line van Kesteren, the Netherlands]	In order to shorten the overall length of this section, and avoid duplication, the statement on extremes has been removed. The opening headline statement directs the reader to SPM table 1, where full details on extremes are provided.
SPM-1727	SPM	11	15	11	16	It is likely that human influence has substantially increased the probability of some observed heatwaves.' The spelling of heat wave changes throughout the SPM: in here 'heatwave', on page 12 l 39: heat-wave and on page 4 line 3: heat wave. Suggest to use heat wave in all cases. [Line van Kesteren, the Netherlands]	copy edit
SPM-1728	SPM	11	16	11	18	The statement "There is medium confidence that anthropogenic forcing has contributed to an increase in the frequency of heavy precipitation events over the second half of the 20th century over land regions with sufficient observational coverage. {10.6}". I suggest "high confidence" is more suitable. For example, NASA/GISS temperature maps ((http://data.giss.nasa.gov/gistemp/) indicate sea surface temperature rises in the Gulf of Mexico and the southwest Pacific (in both areas - annual temperatures rise 1950-2011: +0.2 to +1.0 degrees C) which are bound to result in enhancement of the hydrological cycle, increasing the rates of evaporation and precipitation in some areas. [Andrew Glikson, Australia]	In order to shorten the overall length of this section, and avoid duplication, the statement on extremes has been removed. The opening headline statement directs the reader to SPM table 1, where full details on extremes are provided. The chapter assessment (consistent with the SREX) remains 'medium confidence' for the attribution of heavy precipitation.
SPM-1729	SPM	11	16	11	18	Again, we have medium confidence that human activity has increased the frequency of heavy precipitation events and yet at SPM-4-6 rather less confidence in how widespread such changes are - are these statements consistent? Do the models represent the increases only where they are seen in the observations? [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	In order to shorten the overall length of this section, and avoid duplication, the statement on extremes has been removed. The opening headline statement directs the reader to SPM table 1, where full details on extremes are provided. The chapter assessment (consistent with the SREX) remains 'medium confidence' for the attribution of heavy precipitation. The statement on observed changes has been revised in this draft.
SPM-1730	SPM	11	16		18	This is considerably over-interpreted. It rests on a single paper which can only claims to “detect” a signal after being very selective with its smoothing of the (very limited) data available – and even then can detect only a contrafactual signal. This is not a summary of 10.6, which is much more cautious (though still more positive about that work than I think it should be: see my comments on 10-43, lines 43-4. [William Ingram, United Kingdom]	In order to shorten the overall length of this section, and avoid duplication, the statement on extremes has been removed. The opening headline statement directs the reader to SPM table 1, where full details on extremes are provided. The chapter assessment (consistent with the SREX) remains 'medium confidence' for the attribution of heavy precipitation.
SPM-1731	SPM	11	16			Replace "some observed heatwaves" with "some types of heatwaves" or "some types of observed heatwaves". [Terje Wahl, Norway]	reject, this would significantly change the meaning of the sentence. See SPM table 1.
SPM-1732	SPM	11	17	11	17	Please refer to the ‘… increase in the OBSERVED frequency…’. [Government of Australia]	In order to shorten the overall length of this section, and avoid duplication, the statement on extremes has been removed. The opening headline statement directs the reader to SPM table 1, where full details on extremes are provided. The chapter assessment (consistent with the SREX) remains 'medium confidence' for the attribution of heavy precipitation.
SPM-1733	SPM	11	20	11	20	remove - Consistent with SREX. [Government of Australia]	In order to shorten the overall length of this section,

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							and avoid duplication, the statement on extremes has been removed. The opening headline statement directs the reader to SPM table 1, where full details on extremes are provided, including a comparison with the SREX for all statements.
SPM-1734	SPM	11	20	11	20	Explain the acronym SREX [Ingeborg Levin, Germany]	In order to shorten the overall length of this section, and avoid duplication, the statement on extremes has been removed. The opening headline statement directs the reader to SPM table 1, where full details on extremes are provided, including a comparison with the SREX for all statements.
SPM-1735	SPM	11	20	11	21	Change into: there is high evidence that there is no trend in either frequency or intensity of global cyclones [Marcel Crok, The Netherlands]	See SPM table 1. 'Cyclone activity' is a defined term, and was used both in the SREX and AR4.
SPM-1736	SPM	11	20	11	22	Even if a tropical cyclone is not being intensified by higher ocean temperatures, that ocean temperatures are higher provides energy for tropical cyclones to higher latitudes, and so they can stay as intense to higher latitudes, putting more regions at risk of being struck by intense storms. [Michael MacCracken, United States of America]	Assessment of risk is outside the scope of WGI. Here we focus on cyclone activity, where the underlying chapter assessment is 'low confidence'.
SPM-1737	SPM	11	21	11	21	"between" should be "among", I think. [Dian Seidel, United States of America]	copy edit.
SPM-1738	SPM	11	25	11	25	The key metrics deserve to be high lighted in a box. [Arnoud Apituley, The Netherlands]	The preference of the authors is to avoid disrupting the flow of this short SPM document with boxes.
SPM-1739	SPM	11	25	11	38	In a narrative structure, these points would be close to the top of the SPM - connecting the evidence strands across observations, attribution and projections. Equilibrium climate sensitivity needs to be explained. [Government of Australia]	The revised structure now has some of these bullets relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1740	SPM	11	25	11	38	Please consider to explain the terms "equilibrium climate sensitivity" and "metrics" in order for policymakers to understand the messages. An alternative could be to include a page with abbreviations and definition of key terms used in the SPM at the end of the SPM. [Government of NORWAY]	The revised structure now has some of these bullets relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1741	SPM	11	25	11	38	This is a weak summary of the findings on GHG metrics and does not tell us anything beyond the existing IPCC meeting report on the subject. Important to include the following: Uncertainties in the value of a metric arise from its construction (requires value choices) and scientific uncertainties; The value of the absolute GWP is dependent on the background climate and will therefore change as this background state changes. (Ch.8, p.54, l.38-39); Value of GWP also dependent on CO2. [Government of United Kingdom of Great Britain & Northern Ireland]	In order to shorten and focus the SPM on the strong key messages, this statement on metrics has been removed.
SPM-1742	SPM	11	27	11	27	Please add an "almost certainly above' temperature rise value to this sentence. [Government of Australia]	Statement has been revised based on underlying chapter assessment. Note that the revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'.
SPM-1743	SPM	11	27	11	27	Please, explain "Equilibrium climate sensitivity". [Government of Finland]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1744	SPM	11	27	11	27	Bring precision to what is « equilibrium climate sensitivity » [Government of France]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.

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SPM-1745	SPM	11	27	11	27	The term "equilibrium climate sensitivity" is not understood by policy makers. Either explain in a footnote or use a box to explain what climate sensitivity means. [Government of Netherlands]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1746	SPM	11	27	11	27	to define the colored term between brackets: (equilibrium climate sensitivity) [Nedal Katbeh-Bader, Palestine]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1747	SPM	11	27	11	27	Shouldn't the sensitivity of 2 - 4.5°C be given relative to something (e.g. CO2 doubling) ? [Ingeborg Levin, Germany]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1748	SPM	11	27	11	28	Equilibrium climate sensitivity' requires definition and further explanation for the non-expert audience. Also, to say 'The most likely value is near 3 deg C' should be reworded to 'the mid-range value is 3 degrees'. [Government of United Kingdom of Great Britain & Northern Ireland]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined, and the statement has been revised based on the underlying chapter assessment.
SPM-1749	SPM	11	27	11	28	I think that the lower likely limit should be less than 2 and the lower very likely limit be below 1.5. The main reason for this is the reduced estimate of aerosol cooling and the increase in net forcing (now 2.4 W/m2 vs.1.6 in AR4). This change must imply a lower climate sensitivity. Otherwise the model simulations of the 20th century will not fit the observed temperature increase very well. [Henning Rodhe, Sweden]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The statement has been revised based on the underlying chapter assessment.
SPM-1750	SPM	11	27	11	29	"Climate sensitivity" is a phrase which the policy makers will not be familiar with. Is this retrospective or prospective? Sensitivity would normally be expressed as output over input. [James [Jim] Crawford, United States of America]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1751	SPM	11	27	11	29	By keeping the likely range for climate sensitivity the same as in earlier reports AR5 and this summary becomes logically inconsistent. Total anthropogenic forcing is greatly increased, the amount of warming is the same as in AR4, therefore estimates for climate sensitivity should be lowered. Some of the best observationally based studies like Aldrin 2012 come up with a central estimate of 1.6 C. This already below the likely range. Forster and Gregory 2006 also showed a central estimate of 1.6 C. Lindzen and Choi (2009/2011) suggest a climate sensitivity of less than 1 C. AR5 has no other choice than to lower the likely and the very likely ranges of their estimates for climate sensitivity. [Marcel Crok, The Netherlands]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The statement has been revised based on the underlying chapter assessment.
SPM-1752	SPM	11	27	11	29	Similar to the AR4, the term "equilibrium climate sensitivity" will require an explanation within the SPM. It is important that readers have enough information to understand these key metrics. Also, it is not readily clear whether this conclusion is the same as, consistent with, or different from the conclusion on the same topic in the AR4. The phrasing is slightly different which complicates understanding. Having this stated clearly would be useful. [Government of Canada]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined, and a direct comparison to the AR4 is provided.
SPM-1753	SPM	11	27	11	29	SPM. Section 4. Understanding the Climate System and its Recent Changes. Key Metrics Characterizing Anthropogenic Climate Change. The concept of Equilibrium climate sensitivity has not been presented or explained previously and it is needed to understand this paragraph. It is recommended to re-write this paragraph so that this piece of information may be useful to policy makers and general public. [Government of Spain]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1754	SPM	11	27	11	29	To reflect uncertainties in the sign and magnitude of net temperature feedbacks, replace “Equilibrium climate sensitivity is likely in the range 2 C° to 4.5 C°, and very likely above 1.5 C°. The most likely value is near 3 C°” with “Sensitivity to a doubling of atmospheric CO2 concentration where temperature feedbacks are net-zero is <1.2 C°. Some studies have estimated that sensitivity may be as low as 0.7 C°, implying net-negative feedbacks. Other studies assuming net-positive feedbacks estimate that equilibrium sensitivity is 2 C° to 4.5 C°. Data are insufficient to determine either the net impact of feedbacks – the major source of uncertainty – or	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The statement has been revised based on the underlying chapter assessment.

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						final climate sensitivity." Reason: Numerous studies are finding temperature feedbacks net-negative and climate sensitivity low. These studies are not adequately reflected in the IPCC's reports, which ought to take a more neutral and honest view of the increasing likelihood that climate sensitivity is nothing like as high as it has previously suggested. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-1755	SPM	11	27	11	29	These degrees centigrade are meaningless unless it is clearly stated that they are equilibrium surface warmings due to a doubling of CO2. Since SPM-9-48 started using "real" units, why could these climate sensitivities be stated in K/(W m-2)? It would be much clearer [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1756	SPM	11	27	11	29	The concept or meaning of 'equilibrium climate sensitivity' could could be explained prior to discussing it in the SPM [Andrejs Vanags, United States of America]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1757	SPM	11	27	11	33	Here you go again making claims that have no solid basis because you cannot prove that climate models are 100% accurate. [John McLean, Australia]	The reviewer fails to provide any substantive scientific basis to support his claims.
SPM-1758	SPM	11	27	11	38	This section on 'key metrics' is odd. We suggest separating these statements into different sections. What does the first paragraph in this section mean? [Government of United Kingdom of Great Britain & Northern Ireland]	The revised structure now has some of these statements relocated into an earlier section titled 'Quantification of climate system responses'.
SPM-1759	SPM	11	27		28	ECS has not been defined - & is not nearly as simple as it may seem (12-64,65) [William Ingram, United Kingdom]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1760	SPM	11	27			The concept of climate sensitity may not be known to all readers. A brief definition or explanation may be appropriate. [Government of Denmark]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1761	SPM	11	27			It is not clear from the current text that the equilibrium climate sensitivity quoted is for doubled CO2. Suggest that this be clarified. [Government of United States of America]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1762	SPM	11	27			The summary statement for TCR should be included here. It is at least as important as that for climate sensitivity. And the point needs to be made that the TCR assessment corresponds to the 5-95% of the CMIP5 models, which is the basis for interpreting the CMIP5 range for global temperature as likely. [Reto Knutti, Switzerland]	The revised structure now has some of these statements relocated into an earlier section titled 'Quantification of climate system responses'. This section includes a new statements on TCR.
SPM-1763	SPM	11	27			"Equilibrium sensitivity". The most likely value and range are stated but the quantity is not defined. Need to define as the increase in global mean surface temperature that would result from a sustained doubing of atmospheric CO2 when the climate system has fully responded to the doubling. And qualify that it is not a true equilibrium, but a steady state. [Stephen E Schwartz, United States of America]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1764	SPM	11	27			Here and throughout I recommend expressing sensitivity in systematic SI units as K (W m-2)-1, rather than as K for a CO2 doubling, given the uncertainty associated with forcing for CO2 doubling (See Andrews, 2012, for example); failing that, express as K (3.7 W m-2)-1, to be specific about the unit while retaining the numerical values that most people are accustomed to; or give both, so as to move toward systematic units. Andrews, T., Gregory, J. M., Webb, M. J. and Taylor, K. E. 2012. Forcing, feedbacks and climate sensitivity in CMIP5 coupled atmosphere-ocean climate models. Geophys. Res. Lett. 39, L09712. [Stephen E Schwartz, United States of America]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. Unit provided is consistent with underlying chapter assessment of ECS.
SPM-1765	SPM	11	27			perhaps a foot note explaining equilibrium climate sensitivity and/or pointing to the Glossary would be useful	The revised structure now has this statement

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						[Conor Sweeney, Ireland]	relocated into an earlier section titled 'Quantification of climate system responses'. The term ECS is now clearly defined.
SPM-1766	SPM	11	28	11	28	Given that the assignment of "very unlikely" already implies a probability range, it would be useful to consider choosing one temperature value (e.g., 6 or 7 degrees C) as the reference point for this statement. [Christopher Field, United States of America]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The statement has been revised based on the underlying chapter assessment.
SPM-1767	SPM	11	28	11	29	A distinction needs to be made between fast feedbacks (changes of water vapor, clouds and sea ice) and slow feedbacks (ice sheets, vegetation cover, GHG release from soils, tundra or ocean sediments) (Hansen et al. 2007, 2009). Pliocene calibrations by Pagani et al. 2010 suggest high slow-feedback climate sensitivy of 6 degrees C and higher. (High Earth-system climate sensitivity determined from Pliocene carbon dioxide concentrations. NATURE GEOSCIENCE j VOL 3 j JANUARY 2010 j www.nature.com/naturegeoscience) [Andrew Glikson, Australia]	Noted. Reviewer does not provide support for his suggestion. No action.
SPM-1768	SPM	11	29			It might be useful to add the qualifyer about long term ESS feedbacks here that's in the ES of ch12 (or the box) [Gabriele Hegerl, United Kingdom]	Noted. But we prefer not to add yet another sensitivity metric here in the SPM.
SPM-1769	SPM	11	30	11	30	Following the preceding dot point, it would be well worth while to include another dot point here on Transient Climate Sensitivity. [Government of Australia]	The revised structure now has some of these statements relocated into an earlier section titled 'Quantification of climate system responses'. This section includes a new statement on TCR.
SPM-1770	SPM	11	30			It is suggested to include the following additional language, building on text from the Techical Summary , page 27, lines 40 to 43 to: Independent estimates of radiative forcing, observed energy storage, and surface warming combine to give an energy budget for the Earth that is very likely closed, and is consistent with the best estimate of climate sensitivity. [Klaus Radunsky, Austria]	A statement similar to this is now given as the headline statement for the section 'Quantification of Climate System Responses'
SPM-1771	SPM	11	31	11	31	Another "anthropogenic" that should be replaced. [herman sievering, United States of America]	statement moved and revised.
SPM-1772	SPM	11	31	11	31	It would be helpful to clarify the meaning of "largely determines" [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. Statement has now been revised, and considerably expanded.
SPM-1773	SPM	11	31	11	32	If the long-lived GHGs were the dominant factor, then we should start to see mitigation as a result of the Montreal Protocol. [James [Jim] Crawford, United States of America]	Noted. No revision proposed. No action.
SPM-1774	SPM	11	31	11	32	At almost 4:1, 0.8 to 3.0 almost looks like guesswork. [James [Jim] Crawford, United States of America]	Statements are the result of comprehensive underlying chapter assessments.
SPM-1775	SPM	11	31	11	32	Unclear how this attribution statement relates to the one in lines 3-5 of page 6. [Government of Australia]	Don't understand the review comment. Neither statement referred to are attribution statements.
SPM-1776	SPM	11	31	11	32	Not sure if the first sentence in this para is necessary [Government of United Kingdom of Great Britain & Northern Ireland]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. A clear introduction to TCRE is considered necessary.
SPM-1777	SPM	11	31	11	33	Page 6, line 9 says 545 PgC have been released. Page 3, line 21 says global tempeatures have increased 0.8C since 1901. This suggests the warming per 1000 PgC will not be at the low range of 0.8C. [Kristie Ebi, United States of America]	Noted. Such an analysis s needs to take account of the stated uncertainties and caveats.
SPM-1778	SPM	11	31	11	33	it would be useful to have this information given also as PgC/degrees C if possible. [Government of Canada]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The unit provided is consistent with the underlying chapter assessment of TCRE.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-1779	SPM	11	31	11	33	The reader could be assisted to understand why "1000 PgC" is given as reference value. [Government of Finland]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. A clear introduction to TCRE is now provided, which provides the context for the 1000 PgC.
SPM-1780	SPM	11	31	11	33	To take account of observations and of the uncertainty in climate sensitivity, rewrite “The total amount of anthropogenic emissions of long-lived greenhouse gases largely determines the warming in the 21st century. The global mean warming per 1000 PgC is very likely between 0.8 Cº-3 Cº” to read “Though there has been no global warming in the 21st century, it is likely that anthropogenic emissions of long-lived greenhouse gases will cause some warming in the 21st century.” Reason: In the absence of recent warming and of any significant natural cooling to countervail against the anthropogenic warming influence, it must now be questioned whether climate sensitivity to any forcing is as large as the IPCC imagines. The absence of recent warming must be explicitly faced and mentioned, and its possible implications for climate sensitivity discussed. If the IPCC is to retain any credibility, it cannot simply ignore the failure of the climate to warm as the models had predicted. [Christopher Monckton of Brenchley, United Kingdom]	reject. Statement is based on the underlying expert assessment of the chapter.
SPM-1781	SPM	11	31	11	33	COMMENT A of a series. I have several comments on longer-term warming, cumulative carbon, commitments and irreversibility. I will indicate that set of comments with A, B, C....this is the first. The fact that warming is determined by cumulative carbon emissions is a very policy-relevant finding that merits much more attention. While it is also touched on later, I suggest moving several parts together and affording them more attention than present, see below under comments relating to SPM 13, 44-49. [Susan Solomon, United States of America]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The statement has been expanded and clarified. The issue of cumulative carbon, commitment and irreversibility is given considerable focus in the final section of the SPM, and a new figure has been added.
SPM-1782	SPM	11	31			"largely determines" this phrase needs to be unpacked if policy makers are to interpret the figure given in the following line correctly. Similarly "long-lived" in the same line. [Leonard Smith, United Kingdom]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The sentence has been revised.
SPM-1783	SPM	11	32	11	32	think you should say 'projected warming' [Government of United Kingdom of Great Britain & Northern Ireland]	reject, statement is correct as written.
SPM-1784	SPM	11	32	11	32	I guess 1000 PgC are emitted carbon ?"PgC emitted" should be added otherwise it could also be PgC in the atmopshere. [SYLVIE JOUSSAUME, France]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The sentence has been revised.
SPM-1785	SPM	11	32	11	32	Shouldn't it read "The global mean warming per additional 1000 PgC in the atmosphere ? [Ingeborg Levin, Germany]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The sentence has been revised.
SPM-1786	SPM	11	32	11	32	Use of the phrase "mean warming per 1000PgC" implies linearity. Instead, it would be preferable to write "The global mean warming resulting from cumulative anthropogenic emissions of 1000PgC is very likely between 0.8C-3C" [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The sentence has been revised and cumulative emissions are now clearly stated.
SPM-1787	SPM	11	32	11	33	Please specify if this increase is a transient or equilibrium response. Not clear from the context. [Andrew Ferrone, Germany]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The concept of TCRE is now clearly introduced.
SPM-1788	SPM	11	32	11	33	I think the sentence on 0.8 - 3 deg C warming per 1000 PgC is not of much use to the readers as it is now. This could be deleted. Alternatively, one could add more information about what this is telling us; how much carbon that is emitted up to now etc. [Jan Fuglestvedt, Norway]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. The concept of TCRE is

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
							now clearly introduced and sentence expanded.
SPM-1789	SPM	11	32	11	33	Check whether this should be 1000 PgC or 1 PgC (see Chapter 12, page 12-7, line 30 and 12-63 line 42) and for clarity add the equivalent in metric tons. [Government of New Zealand]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. Statement has been revised, and is consistent with the underlying chapter assessment.
SPM-1790	SPM	11	32	11	33	Unclear sentence. A second 1000 Pg would give a lower forcing than the first 1000 due to the logartithmic dependence. Do the values given represent equilibrium? [Henning Rodhe, Sweden]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. Statement has been revised.
SPM-1791	SPM	11	32			The stated uncetainty range associated with the global temperature increase from injection of 1000 PgC (a factor of 3.75) is much larger than that associated with an equilibrium doubling of atmospheric CO2 (line 27; a factor of 2.25). Where does this difference come from? [Government of United States of America]	Noted. Emissions are one step further up the process chain from Emissions to concentrations to forcing to climate change etc. Uncertainties in projected CO2 concentrations for a given emission are thus accounted for in the former.
SPM-1792	SPM	11	32			The statement is only valid for emissions up to 2000 PgC and until emissions peak. Use original wording in chapter 12 and Technical Summary. [Reto Knutti, Switzerland]	The revised structure now has this statement relocated into an earlier section titled 'Quantification of climate system responses'. Statement has been revised, and TCRE appropriately defined.
SPM-1793	SPM	11	35	11	35	Please explain what metrics are. [Government of Netherlands]	In order to shorten and focus the SPM on the strong key messages, this statement on metrics has been removed.
SPM-1794	SPM	11	35	11	36	Suggest repharsing: "Different metrics can be designed to quantify the contribtions to climate change of emissions of different substances with different residence times, and of …". [Andrew Ferrone, Germany]	In order to shorten and focus the SPM on the strong key messages, this statement on metrics has been removed.
SPM-1795	SPM	11	35	11	38	This sort of leaves the reader up in the air, especially since the only metric discussed in the little section starting at line 25, is temperature. [James [Jim] Crawford, United States of America]	In order to shorten and focus the SPM on the strong key messages, this statement on metrics has been removed.
SPM-1796	SPM	11	35	11	38	I think it would be better if the concept Global Warming Potetntial (GWP) is mentioned here. At least one could add "emission" before metric on line 35. [Jan Fuglestvedt, Norway]	In order to shorten and focus the SPM on the strong key messages, this statement on metrics has been removed.
SPM-1797	SPM	11	35	11	38	I also suggest that the authors of SPM consider including something more specific on GWP. E.g. the text at line 4-7 at page 22 in TS. [Jan Fuglestvedt, Norway]	In order to shorten and focus the SPM on the strong key messages, this statement on metrics has been removed.
SPM-1798	SPM	11	35	11	38	This paragraph lacks content e.g. because SLCF have not been introduced in the SPM. You should consider to include an explanation about short term decrease in the rate of temperature increase and the long term temperature stabilization in the SPM. With this as a background, the discussion of different choices of metrics for different purposes can better be addressed. [Government of NORWAY]	In order to shorten and focus the SPM on the strong key messages, this statement on metrics has been removed.
SPM-1799	SPM	11	35	11	38	I understand this bullet, because it is one of my speciality areas, but I believe most of the intended audience of the SPM will find it cryptic at best. I think direct mention of GWPs is essential here to give PMs at least a hint of what they are being told [Keith Shine, United Kingdom of Great Britain and Northern Ireland]	In order to shorten and focus the SPM on the strong key messages, this statement on metrics has been removed.
SPM-1800	SPM	11	35			This paragraph summarises 13 pages of analysis from Chapter 12. Paragraph does an excellent job of this but this is a VERY important issue for policy makers and I wonder if more could be said in the SPM? Most policy makers do not understand this issue well at all. Would it be possible to expand this to a section in its own right and/or include a box explaining what metrics, how they work, and the trade off between comparing short and long term impacts? [Government of New Zealand]	In order to shorten and focus the SPM on the strong key messages, this statement on metrics has been removed.

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SPM-1801	SPM	11	38	11	38	Why does the extent to which a metric is applied make a difference? [Kristie Ebi, United States of America]	In order to shorten and focus the SPM on the strong key messages, this statement on metrics has been removed.
SPM-1802	SPM	11	42	11	42	Add an explicit warning that “projections” should not be interpreted as "predictions". [Government of Netherlands]	More detail on scenarios provided in chapeau. This clearly indicates that what follows are not projections.
SPM-1803	SPM	11	42	11	42	Please explain how a projection actually is defined. For policy makers it will be very interesting to see the evolution of the CO2 concentration over time, compared to what was expected for the past scenario's and the effect of Kyoto. This could be added in one of the figures. This is not just a matter of working group III, but essential information for any SPM on climate change. [Government of Netherlands]	partly accept. While assessment of effects of past commitments such as Kyoto is not in the remit of WGI, a new box on RCPs now provides more information.
SPM-1804	SPM	11	42	11	42	The RCPs should be better explained in this section. Especially all the different assumptions for the various RCPs and how they connect to emission scenarios and stabilization temperatures, including the 2 degree target. [Government of NORWAY]	new box SPM.1 now included.
SPM-1805	SPM	11	42	11	42	I suggest changing this to 5. Projection of near-term global and regional climate change. I will suggest adding a new section 6 on mid-century and beyond below in comments A-H. [Susan Solomon, United States of America]	section structure changed by combining near-term and long-term.
SPM-1806	SPM	11	42	12	8	It is a little confusing that the section headings don't match between the near term and long term projection. It seems like the near term projections are fewer and more aggregated (e.g., Atmosphere, Ocean, Cryosphere). Is this significant (e.g., linked to ability to project in the near term, or not possible due to the timescale of different phenomena)? Suggest explaining if possible. [Government of Canada]	section structure changed by combining near-term and long-term.
SPM-1807	SPM	11	42	12	49	Are the implications of the varying levels of additional emissions from thawing permafrost factored in to the overall temperature rise etc for each of the scenarios? If not might be helpful to clarify that this would have an additional warming effect [Government of United Kingdom of Great Britain & Northern Ireland]	effects from permafrost are not included in RCP as evident in statement on permafrost (subsection on cryosphere projections)
SPM-1808	SPM	11	42	17	48	In general, the projections summary should highlight more climate risks (i.e. Low probability, high impact events and outcomes). These are particularly relevant to adaptation planning and the needs of WGII. Some examples will be noted below. [Government of Australia]	new subsection on Climate Stabilization, Climate Change Commitment and Irreversibility which includes low prob. events, e.g. mass loss from ice sheets.
SPM-1809	SPM	11	42	17	48	The structure of the SPM seems to flow from "past and recent" climate change, which leads to presenting short term projections after long term: considering that short term is new wrt AR4, and quite uncertain, it could be more appropriate to present long term projection first. See general comment above on RCPs. [Government of France]	short and long term now combined
SPM-1810	SPM	11	42	17	48	In general, the projections summary should highlight more climate risks (i.e. Low probability, high impact events and outcomes). These are particularly relevant to adaptation planning and the needs of WGII. Some examples will be noted below. [Penny Whetton, Australia]	new subsection on Climate Stabilization, Climate Change Commitment and Irreversibility which includes low prob. events, e.g. mass loss from ice sheets.
SPM-1811	SPM	11	42	17	48	The confidence of projections are based on the model agreements. CMIP5 provided about 56 models that came from about 23 model groups. It means that some models are not independent fully. Some models have very strong similarity. Therefore, when calculations presented the model agreements, it is not real independent model numbers. Here should mention this issue. [Zong-Ci Zhao, China]	this issue is part of the determination of likely ranges in CMIP5 model projections. This is now explained in footnote c of Table SPM.2
SPM-1812	SPM	11	42	17	49	These sections (including headings) refer to "near term" and "long-term" but these terms are not defined for the reader anywhere in the SPM. The first time "near-term" occurs is on line 1 of page SPM-12. I suggest you add an explanation (perhaps as a new bullet point ahead of line 1 of page SPM12) something like:"Projections of future changes are available for a range of time-scales. In this WG1 Summary for Policymakers the description "near-term projections" is used to refer to the period out to about 2035 (??) and "long-term" refers to projections beyond that time". Another alternative would be to include something like this as a footnote. [David Wratt, New Zealand]	terms specific to projections no longer in main text, except for footnote c in Table SPM.2 where it is specified.
SPM-1813	SPM	11	42			Regional scale : It could be interesting for policy makers to have a sub-paragraph describing more specificaly what can be said on long-term regional projections. [Government of France]	regional aspects covered in figure SPM.7.

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SPM-1814	SPM	11	42			Adding a short box describing RCPs and their meanings in terms of emissions, ambition, etc could help policymakers better link the findings of the following paragraphs to policy action. [Government of France]	box SPM.1 now provided
SPM-1815	SPM	11	43			The word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". Beside "regional" it seems clear the former is meant: make it clear by changing it to e.g. "global-mean" [William Ingram, United Kingdom]	"global" is the appropriate term for the title. More specific terms are used in the main text.
SPM-1816	SPM	11	44	11	44	Please remove - ' a hierarchy of' [Government of Australia]	"hierarchy" is an appropriate term to indicate the increasing level of complexity in the enumeration that follows.
SPM-1817	SPM	11	44	11	47	In this introduction, one could recall the improvements mentioned in section 4.1. [Government of France]	reject. this would be a duplication of a rather comprehensive text on model evaluation.
SPM-1818	SPM	11	44	11	47	To reflect the uncertainties inherent in climate modeling, add the following after the introductory sentence describing the hierarchy of climate models: "Since the climate behaves as a chaotic object. reliable centennial-scale prediction of future climate states is not possible by any method. Also, the spatial resolution, sampling frequency, and duration of the principal climatic inputs are insufficient to permit reliable modeling, and many processes – especially at sub-grid scale – are either insufficiently understood or not understood at all. Therefore, modeling will always be of limited value in climate prediction. Nor is it possible to overcome these defects by attempting probability distributions, which require more, not less, data than simple estimates flanked by error bars." Reason: Models have failed by their creators' own criterion: a stasis of 15 or more years' duration. Consequently, the IPCC's model-based approach must now be modified to reduce reliance on models. [Christopher Monckton of Brenchley, United Kingdom]	Suggested text has no scientific basis. Limits of predictability are important in short-term climate projections, including over 10-15 years. This is now addressed in the first bullet of subsection "Evaluation of Climate Models".
SPM-1819	SPM	11	44	11	53	This section is difficult to read because the models mentioned are not clear (quite abstract) for non-expert readers. Although the main conclusions in this section are readable and understandable, the sub-conclusions are not and use too much specific expert language. It requires quite some background knowledge for the policy maker (AR4, CMIP5, CIMP3). What is the precise message here? In additon, we suggest re-formulation fo this conclusion. See our comments for lines 49-52. [Government of Netherlands]	section revised by combining near-term and long-term, and adding clear headline statements for each subsection.
SPM-1820	SPM	11	44	17	48	This whole section is very long and the statements should be more specific. For example, under 'near-term projections: Atmosphere', paragraph 3, it is meaningless to the non-expert to say there will be increases in precipitation in areas that were wet during a specific time period and visa versa - need to say where these areas are. Could we include a map with the projections? Also, why use the 1986-2005 baseline? Pre-industrial would be much more useful for the policymaker. [Government of United Kingdom of Great Britain & Northern Ireland]	section revised by combining near-term and long-term, and adding clear headline statements for each subsection.
SPM-1821	SPM	11	46	11	46	Strictly 'project' would be more correct here than 'simulate'. Notwithstanding the increasing use of 'simulator' language in the modelling community, most of the SPM readership will read it in its dictionary sense of 'imitate' or 'reproduce'. [Government of Australia]	"simulation" is a widely used term and clear in this context.
SPM-1822	SPM	11	46	11	47	It needs to be explained how natural forcings vary among the scenarios used. If they don't, then that should be made clear as well. [Government of Canada]	statement revised
SPM-1823	SPM	11	49	11	49	For clarity spell out RCPs at the first usage such that the sentence would read "Projected climate change for the Representative Concentration Pathway scenarios (RCPs) is similar to AR4 when scenario differences are accounted for." [Government of New Zealand]	done
SPM-1824	SPM	11	49	11	49	The meaning of this sentence is unclear. [Government of United Kingdom of Great Britain & Northern Ireland]	statement revised
SPM-1825	SPM	11	49	11	49	The acronym RCP needs to be explained [Ingeborg Levin, Germany]	done
SPM-1826	SPM	11	49	11	49	RCP was defined on page SPM2 line 13. Refefine again [Christoph Ritz, Switzerland]	introduction revised. First occurrence of RCP here.
SPM-1827	SPM	11	49	11	49	"similar to AR4 when accounting for scenario differences". The meaning of this statement is very unclear. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	statement revised

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SPM-1828	SPM	11	49	11	50	Does the term "carbon cycle uncertainty" include the stability of methane? [Andrew Glikson, Australia]	this is not included in RCPs as evident in statement on permafrost (subsection on cryosphere projections)
SPM-1829	SPM	11	49	11	52	For clarity, suggest rewording sentence 1 to say "Projected climate change over the 21st century in the AR5 is similar to that in the AR4 when accounting for scenario differences between the RCP and SRES scenarios". Then this will need a footnote to provide at least a short explanation of how the scenarios differ (BAU vs mitigation etc.). Also, the second sentence is extremely confusing. Uncertainties for the high RCPs are lower than what? Than the low RCPs or the SRES scenario projections? Why are carbon cycle uncertainties not considered for only the high RCPs? Ch. 12 page 27 provides some insight into what is meant here. The text there says it the uncertainty range for the likely projected temp change that is lower for RCP8.5 (than for equivalent SRES scenarios) because carbon cycle feedbacks are not considered in the concentration driven RCPs. This clarifies what lines 49-52 are trying to say but still, it should be clarified whether carbon cycle feedbacks are ignored in the RCPs (i.e.'"not considered") or whether they built into the model response. [Government of Canada]	text revised and now mentions difference to SRES scenarios.
SPM-1830	SPM	11	49	11	52	We suggest to rephrase this conclusion. First, “projected climate change” is a term that does not refer to any process or variable in particular and is therefore meaningless. The next sentence claims a reduction in uncertainty, because a certain process (which is complex) has not been taken into account. This is a wrong line of reasoning. The uncertainty is still there, but the authors decided not to take a certain process into account. For reasons that are not clear. It also makes one wondering what the uncertainties would be if the process (carbon cycle) is included (as one would reasonably expect). Further, the word "thus" in line 52 is misplaced. The fact that the prediction of an old model equals that of a new one, is no proof for a better prediction of the future. Why is the similarity between the CMIP3 and CMIP5 simulations an automatic sign for 'increased confidence in projections' (for the RCPs?)? When a model is renewed/extended (increased complexity, newest insight), it could very well be the case that one would expect the new projections to be different from projections with the old model, and consider this dissimilarity of simulations as a sign of confidence. Likewise, when the outcomes of the new model are rather similar to those of the old model, there can be situations when this is considered as a sign that one has not yet fully captured the appropriate model relations in the new model (since one would have expected different outcomes to occur). I.e. one wouldn't be fully confident with the new model. This means that: 'thus increasing the confidence in projections' may not be true if based on comparisons with climatic patterns. [Government of Netherlands]	statement revised. "thus increasing confidence" deleted.
SPM-1831	SPM	11	49	11	53	RCPs need a separate explanation upfront in the SPM. And why they are different to AR4. [Government of Australia]	RCP now explained in box SPM.1
SPM-1832	SPM	11	49	11	53	The most interesting message from this bullet point is that the confidence in these projections has increased. We propose that you consider starting the bullet point with this information. [Government of NORWAY]	statement revised. "confidence" removed.
SPM-1833	SPM	11	49	11	53	This could do with unpicking, and relevant to an earlier comment above, a summary description of the RCPs could include how they differ/compare to SRES scenarios [Government of United Kingdom of Great Britain & Northern Ireland]	done
SPM-1834	SPM	11	49	12	4	It would be useful to have a figure or a table explaining the various Representative Concentration Pathways (RCP) so that the policy makers can make sense of the rest of the text. [Dora Marinova, Australia]	statement revised and box SPM.1 on RCPs added,.
SPM-1835	SPM	11	50	11	50	The statement that "uncertainties for the higher RCPs are lower because carbon cycle uncertainties are not considered" does not make sense. The uncertainties still exist, they are just not being quantified. Please re-word this sentence to say something like "Carbon cycle uncertainties have not been considered for the high RCPs and hence the ranges presented here do not capture the true uncertainty". Why are carbon cycle uncertainties ignored for higher RCPs? This seems a major step backwards from AR4, which did consider such uncertainties for all SRES marker scenarios. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	statement revised
SPM-1836	SPM	11	50	11	50	I think some more explanation is required of how the estimates of global surface temperature change by the end of the century given in Table SPM.2 differ from the estimates made in the AR4 (i.e. the grey uncertainty	Table SPM.2 revised and footnotes extended. In addition box SPM.1 on RCPs added.

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						bars to the right of the temperature graph in the AR4 SPM). In particular, how is the carbon cycle feedback being considered here, and how does this differ from the treatment in AR4? It isn't enough just to refer to the lower uncertainties. One might ask: "Why are the carbon cycle uncertainties not considered?" Conveying the difference in experimental setup of CMIP5 versus CMIP3 to a general audience in the SPM is going to be challenging. [Timothy Carter, Finland]	
SPM-1837	SPM	11	50	11	50	This is not clearly put, as it implies that carbon cycle uncertainties are not considered only in the high RCPs (they are also not considered in the lower ones). [Government of Australia]	statement revised.
SPM-1838	SPM	11	50	11	50	This sentence is a bit cryptic in the SPM, and could be misinterpreted. [Government of France]	statement revised.
SPM-1839	SPM	11	50	11	50	"Uncertainties for the high RCPs are lower because carbon cycle uncertainties are not considered." Please explain why C-cycle uncertainties are not considered in higher RCPs? [Government of Germany]	statement revised.
SPM-1840	SPM	11	50	11	50	The sentence needs clarification. "Uncertainties for the high RCPs are lower" THAN WHAT? One might read that the differences among model results would be smaller than those where carbon cycle uncertainties are considered. If that is the case, the draft sentence needs modification. [Government of Japan]	statement revised.
SPM-1841	SPM	11	50	11	50	This sentence seems to imply that the "high" RCPs were not simulated using interactive carbon cycle, whereas the "low" RCPs were. Is that true? Even if so, what is referred to here is not uncertainties, but estimated uncertainties [Government of United States of America]	statement revised.
SPM-1842	SPM	11	50	11	50	The fact that carbon cycle uncertainties are not considered may require some more explanation, more especcially as later, in SPM, page 17, lines 1 to 4, coupled carbon cycle-climate models indicate a range of carbon loss from land and ocean. [SYLVIE JOUSSAUME, France]	statement revised.
SPM-1843	SPM	11	50	11	50	"lower" than what? [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	statement revised.
SPM-1844	SPM	11	50	11	51	Uncertainties for the high RCPs are lower than the other RCP runs, or lower than the high emissions scenarios generated under the AR4? It's unclear from the current wording. [Government of United Kingdom of Great Britain & Northern Ireland]	statement revised.
SPM-1845	SPM	11	50			"Uncertainties for the high RCPs are lower because carbon cycle uncertainties are not considered." This sentence is difficult to understand. Lower to what? [Christof Appenzeller, Switzerland]	statement revised.
SPM-1846	SPM	11	50			The sentence regarding uncertainties is not clear and should be elaborated further. [Government of Denmark]	statement revised.
SPM-1847	SPM	11	50			"lower" than what? Low RCPs or AR4? [William Ingram, United Kingdom]	statement revised.
SPM-1848	SPM	11	50			"are lower"; than what? not clear. than for AR4? than for low RCP's? [Stephen E Schwartz, United States of America]	statement revised.
SPM-1849	SPM	11	51	11	51	"very similar to CMIP3". There is a need for a more nuanced statement here, capturing for example the uncertainties related to future aerosol forcing and response [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	this detail would be too technical for an SPM.
SPM-1850	SPM	11	51	11	52	I recommend to add this sentence also to page SPM-2, line 39 (see comment no. 1 about short summary for SPM). [Oliver Stebler, Switzerland]	reject. no duplication
SPM-1851	SPM	11	51	11	53	There is no casual link between increasing the complexity of the model and an increase in the confidence in the projections obtained with this model, thus we suggest repharsing" … model complexity, and an increase in the …". [Andrew Ferrone, Germany]	statement revised.
SPM-1852	SPM	11				There is no representation of the Chapter 11 near-term decadal predictions in the SPM, only near-term projections. Shouldt one summary comment be made? If so, the title of subsection 5 should be changed to include Predictions (as well as Projections). [Government of United States of America]	incorrect. bullet 1 in new-term subsection now moved to bullet 1 in revised subsection "Atmosphere: Temperature". Term "prediction" specifically mentioned.
SPM-1853	SPM	12	0			The discussion on precipitation changes is clumsy. It doesn't state what 'relatively' means – relative to what? – nor does it define what a heavy precipitation event is. With changes in precipitation potentially being the most	bullet completely reformulated and placed in new subsection "Atmosphere: Water Cycle".

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						critical part of climate change in terms of impacts, the summary is rather weak. [Government of United Kingdom of Great Britain & Northern Ireland]	
SPM-1854	SPM	12	1	12	1	Please define near-term. [Kristie Ebi, United States of America]	bullet removed.
SPM-1855	SPM	12	1	12	2	• Projections of near-term climate change depend little on differences in greenhouse gas and aerosol emissions within the range of the RCP scenarios.' If I understand well what is meant here is the committed climate change due to past emissions. Near-term climate change is mainly dependend on past emissions and less on future emissions. I would recommend explaining this in one sentence, like this it is not easy to inmediately understand what is meant here. [Line van Kesteren, the Netherlands]	bullet removed.
SPM-1856	SPM	12	1	12	4	Using the phrase 'depends little on' begs the question what the projections do depend on then. Suggest instead using phrasing such as "do not vary much for the range of RCPs as these scenarios project similar changes in GHGs and aerosols over the coming decades" (or something to that effect). This still requires some further explanation though to explain that over this time frame, global warming is largely a response to past forcings. Also, what is the message of the second sentence? Is the focus on the fact that cooling factors are reduced in the near term in the scenarios or is the take home message that all the RCPs are consistent in terms of how they simulate changes in these forcings? [Government of Canada]	bullet removed.
SPM-1857	SPM	12	1	12	4	You should consider including information about the assumptions about other air pollutants than aerosols in the RCP scenarios, e.g. ozone precursors. What about methane, which may also have a fast effect on temperature? Explain why aerosols are rapidly reduced in all of the scenarios. [Government of NORWAY]	bullet removed.
SPM-1858	SPM	12	1	12	4	Whereas the assumption of no major volcanic eruptions can be easily visualised; that of rapidly reducing anthropogenic aerosols can not. Is it possible to comment on the validity of this assumption. [Government of United Kingdom of Great Britain & Northern Ireland]	bullet removed.
SPM-1859	SPM	12	1	12	4	The projections of near-term climate change (e.g., the global mean surface air temperature) are based strongly on the assumption that anthropogenic aerosol emissions are rapidly reduced in the near future in all RCP scenarios. My general comment is how certain that we believe in this assumption. The changes of the concentrations of CH4, black carbon, sulfate and their impacts on climate response may be highly uncertain and depend on the energy and environmental policies. But this statement in the SPM seems to the policy makers that the near-term global mean temperature will definitely change no matter what policies to take in the future. [Shaojie Song, United States of America]	bullet removed.
SPM-1860	SPM	12	1	12	4	The fact that uncertainties in future aerosol emissions is one of the largest sources of uncertainty in near term climate projections, particularly on regional scales, is a key policy relevant conclusion from Chapter 11 and needs to be brought out more strongly in the SPM - i.e. needs a specific bullet point. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet removed.
SPM-1861	SPM	12	1	12	6	The expression "near-term" is used twice here before being only implicitly defined a couple lines later. "Near-term" and "long-term" should both be defined up front. [Government of United States of America]	bullet removed.
SPM-1862	SPM	12	1	12	8	Shaded paragraph states that confidence in near-term projections is often lower than in long-term ones; yet on lines 1-2 it is stated that near-term projections do not change much with RCP values. Can you put these two statements together and more explicitly explain why near term projections are less reliable? [Government of Canada]	headline statement changed.
SPM-1863	SPM	12	1	12	8	There should be more clarity, and the issue of decadal prediction/predictability should be addressed here: decadal prediction, near term projections and long term projections should be addressed. It is essential that decision makers appreciate the differences and the limited predictability. The text of the shaded box (lines 6 to 8) is not clear. [Government of France]	section structure changed by combining near-term and long-term.
SPM-1864	SPM	12	1	12	11	How is "near-term" defined? IT is important to qualify this against the reference to a "few decades" for the reader to understand the comparison of time frames. [Government of Canada]	section structure changed by combining near-term and long-term.
SPM-1865	SPM	12	1		2	"Projections of near-term climate change depend little on differences in greenhouse gas and aerosol emissions within the range of the RCP scenarios" Is this because the near term RCPs are so similar, or	bullet removed.

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						because near term changes are dominated by prior emissions? [Stephen E Schwartz, United States of America]	
SPM-1866	SPM	12	1			Suggest defining "near-term" at first usage. Is it the period 2016-2035 mentioned on line 13? [Government of New Zealand]	near-term only used in Table SPM.2 where it is defined in footnote c
SPM-1867	SPM	12	1			Something about 'Predictability" needs to be included here as a single bullet, it is an important issue for climate change over a decade: Predictability: There is a medium amount of evidence and agreement, based on model results, of the predictability of yearly to decadal averages of temperature both for the global average and for some geographical regions. The predictability associated with the specification of the initial state of the system decreases with time while that due to the externally forced component increases. It is likely that the predictability of the forced component is largest in tropical to middle latitudes and it is likely that of the internally generated component is largest for extra-tropical oceans and modest over extra-tropical land (Ch. 11 ES). [Michael Prather, United States of America]	section structure changed by combining near-term and long-term, and therefore more detailed explanation no longer needed.
SPM-1868	SPM	12	1			It is suggested to clarify in a footnote (or bracketed text) the term "near-term climate change" (next decades?) because it might be interpreted quite differently and the AR5 might be a document for reference for a long period of time. [Klaus Radunsky, Austria]	section structure changed by combining near-term and long-term.
SPM-1869	SPM	12	2			Is this assertion consistent with the findings of Shindell et al and UNEP that SLCF account for 30% of near-term warming? [Government of United States of America]	bullet removed.
SPM-1870	SPM	12	3	12	3	What is the confidence that emissions will be rapidly reduced in the near term? What are the consequences in projections if that assumption is not valid. [Kristie Ebi, United States of America]	bullet 1 of subsection "Atmosphere: Temperature" gives *medium confidence*.
SPM-1871	SPM	12	3	12	3	Add few words to justify the assumption that « anthropogenic aerosol emissions are rapidly reduced during the near term » [Government of France]	bullet removed.
SPM-1872	SPM	12	3	12	3	"the near term" needs to be defined [Ingeborg Levin, Germany]	now only used in Table SPM.2, where it is defined in footnote c.
SPM-1873	SPM	12	3	12	4	include …. Reduced during the near term (2016-2035). [Government of Australia]	bullet removed.
SPM-1874	SPM	12	3			Needs clarification of the effects if anthropogenic aerosol emissions are not rapidly reduced [William Ingram, United Kingdom]	bullet removed.
SPM-1875	SPM	12	3			"during the near term" clumsy & vague - omit or replace by "in the next decade" or whatever [William Ingram, United Kingdom]	bullet removed.
SPM-1876	SPM	12	4			A figure summarising the main information in Fig. 11.33 could be useful to visualise the points on near-term global mean temperature change. [Geert Jan van Oldenborgh, Netherlands]	reject. Too much complexity for SPM. Figure in TS.
SPM-1877	SPM	12	5			It is suggested to include the following additional language, building on text from the Techical Summary , page 36, lines 42 to 46: As various RCP scenarios do not produce discernable different climate change outcomes for approximately the next 30 years, adaptation strategies for such a time horizon do not depend on the emissions pathway. However as long-term climate change after mid-century is appreciably different across the RCPs, adaptation strategies will have to differ due to the different magnitudes of climate change from tha various mitigation actionsinherent in the RCPs. [Klaus Radunsky, Austria]	bullet removed. Suggested statement about adaptation strategies is outside the remit of WGI.
SPM-1878	SPM	12	6	12	6	The term "quantities" is not clear - suggest clarifying. [Government of Canada]	"quantities" kept as most general term.
SPM-1879	SPM	12	6	12	6	"provide an indication"? please use a more quantitative statement to avoid lengthy discussions in Plenary. [Government of Germany]	headline statement changed. Previous text in bullet following, and revised.
SPM-1880	SPM	12	6	12	6	"an indication of changes later" is a bit strange; rather, "projected to happen later" ? [SYLVIE JOUSSAUME, France]	headline statement changed. Previous text in bullet following, and revised.
SPM-1881	SPM	12	6	12	6	"the near term" needs to be defined [Ingeborg Levin, Germany]	headline statement changed. Previous text in bullet following, and revised.

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SPM-1882	SPM	12	6	12	8	This is actually a complex statement, since most people would believe that the far future is harder to predict than the near future. Indeed, this is a little like comparing apples with oranges since the nature of the near term predictions are diagnostically different to the far future, and hence the verification metrics are not directly comparable - the latter being more boundary condition dependent than initial condition dependent for example, and the impact of model data assimilation on the latter. [Government of Australia]	headline statement changed. Previous text in bullet following, and revised.
SPM-1883	SPM	12	6	12	8	three lines questionable: which quantities? The uncertainty is larger in the long term than for short term, due to variability plus trend [Government of France]	"quantities" kept as most general term.
SPM-1884	SPM	12	6	12	8	What does "quantities" mean? Does it mean "variables" or "parameter"? (compare comment page9 line3). The sentence "The confidence … is often assessed to be lower for the near-term than for later in the century" includes an important information for decision making. For a better understanding therefore it should be given the reasons for this issue. The message of these two sentences is not really clear. Moreover we guess, that most readers will not understand why the confidence in near-term projections is often assessed to be lower than for later 21st century. [Government of Germany]	"quantities" kept as most general term.
SPM-1885	SPM	12	6	12	8	Add why the confidence is assessed to be lower in the near term. We think that some important findings/results should be summarized in this shaded text. [Government of NORWAY]	revised text now in bullet following headline statement.
SPM-1886	SPM	12	6	12	8	I think this statement is confusing. How can we know more about the long term than about the short term? If we mean the forced trend then that it should be the opposite, because on the long run there may be additional uncertainties or feedbacks becoming important. If we mean the actual evolution of reality then the statement is correct, because the signal is not clearly emerging from noise. But the confidence in terms of undertstanding is still high. So I would not phrase this in terms of confidence but something like: "century, but the ability to predict changes in the near term is limited by internal climate variability, irrespective of model quality". To me this is a point that needs to be articulated more strongly, since often people argue that the projected changes have not happened, but in reality they simply don't understand the difference between a forced trend resulting from a model average and a single realization. As we go to more local projections and shorter timescales, this is getting more important (see e.g. Deser et al. 2012 Nature Climate Change). On a more general point, it is not clear in many cases whether the uncertainty ranges refer to the underlying forced trend or whether they include natural variability. This should be clarified. [Reto Knutti, Switzerland]	revised text now in bullet following headline statement. Difference between natural variability and forced changes now mentioned.
SPM-1887	SPM	12	6	12	8	This just seems too obscure to include in this way in the SPM. Please make the point more clearly. The types of changes are going to result in a significantly different climate for virtually all regions--and that is the point to be making. [Michael MacCracken, United States of America]	revised text now in bullet following headline statement.
SPM-1888	SPM	12	6	12	8	To reflect the restrictions on the utility of modeling imposed by the chaoticity of the climate object, rewrite “Projections of many quantities on the near-term horizon already provides an indication of changes later in the 21st century. The confidence in these projections is often assessed to be lower for the near-term than for later in the 21st century” to read “Near-term changes, such as the change from warming to the absence of warming in the late 1990s, do not necessarily provide an indication of changes later in the 21st century. The confidence in any projections of future climate states is necessarily lower for later in the 21st century than for the near-term.” Reason: The obtrusion of deterministic but inherently non-determinable bifurcations in the evolution over time of any object that behaves chaotically becomes more likely as time passes, reducing the reliability of forward projections. [Christopher Monckton of Brenchley, United Kingdom]	Suggested text has no scientific basis and is not sufficiently nuanced. Confidence or likelihood statements are given for all statements in the subsections, where possible.
SPM-1889	SPM	12	6	12	8	I don't find this statement to be very clear. Is this the most useful policy-relevant thing you can say about near-term warming as a headline statement? [Susan Solomon, United States of America]	revised text now in bullet following headline statement. Headline completely revised to cover findings from all subsections.
SPM-1890	SPM	12	6	12	8	I don't think it is the case that the confidence in the projection itself is lower for the nearer-term projections (cf ch11, p7, line 11-13 and others) - what is meant here is that although the uncertainty is increasing, in the long term the magnitude of the forced change will outweigh the change due to natural variability and thus be more visible. So this sentence should instead be something like "Confidence in the anthropogenically forced signal decreases with projection timescale; however, in the short term small changes may be obscured by natural fluctuations in the variable of interest. On longer timescales, although the uncertainty in the forced change	revised text now in bullet following headline statement. Headline completely revised to cover findings from all subsections.

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						itself may be greater, the magnitude becomes large enough for a consistent signal to be detected above natural variability. Therefore, confidence in a particular outcome (for example, global mean temperatures exceeding 2 degrees above pre-industrial) can be greater on longer timescales even though the absolute uncertainty range is wider." [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	
SPM-1891	SPM	12	6	13	14	reasoning should be given for not including short term sea level change [Mark Siddall, United Kingdom]	revised headline statement now includes changes in sea level.
SPM-1892	SPM	12	6		7	I don't know what this sentence is intended to mean. I think it means something like "Changes projected over the next few decades are largely in the same directions as changes projected later in the 21st century.", but it needs to be much clearer [William Ingram, United Kingdom]	now clarified in bullet 1 following revised headline statement.
SPM-1893	SPM	12	7	12	8	Why is there lower confidence in the near term? [Kristie Ebi, United States of America]	natural variability versus forced changes now explicitly mentioned in bullet 1 following revised headline statement.
SPM-1894	SPM	12	7	12	8	'The confidence in these projections...' needs explanation, as it's counter-intuitive. Some people might expect uncertainties associated with projections of the future to increase with time, so would be greater for the near-term than for later in the 21st century. I realise why the opposite might be the case, with the stronger anthropogenic signal as time progresses, but I think we need to make the distinction between modelling uncertainty and real-world uncertainty. [Government of United Kingdom of Great Britain & Northern Ireland]	natural variability versus forced changes now explicitly mentioned in bullet 1 following revised headline statement.
SPM-1895	SPM	12	7	12	8	The confidence in these projections is often assessed to be lower for the near-term than for later in the 21st century.' I do not understand why confidence in these projections for he near-future is lower than for later in the 21st century.. Please explain shortly. [Line van Kesteren, the Netherlands]	natural variability versus forced changes now explicitly mentioned in bullet 1 following revised headline statement.
SPM-1896	SPM	12	8	12	8	Say why the confidence is lower [Government of New Zealand]	natural variability versus forced changes now explicitly mentioned in bullet 1 following revised headline statement.
SPM-1897	SPM	12	8	12	8	Please provide reason for lower confidence in near-term projections. [Fortunat Joos, Switzerland]	natural variability versus forced changes now explicitly mentioned in bullet 1 following revised headline statement.
SPM-1898	SPM	12	8			"The confidence in these projections is often assessed to be lower for the near-term than for later in the 21st century." The reason behind this statement is that on short time scales, natural variability may be of the same magnitude or larger than the human contribution. This source of lower confidence in short term projections should be noted here. [Government of United States of America]	natural variability versus forced changes now explicitly mentioned in bullet 1 following revised headline statement.
SPM-1899	SPM	12	11	12	11	We strongly suggest to add the conclusion about the near-term projections of tropical cyclones and/or tropical/mid-latitude storms. It is very policy relevant to know the state of knowledge for the near-term, even if the trends indicate no significance. We suggest to apply lines 42-44 in chapter 11. See also our chapter 11 comments (page 38, lines 42-44). [Government of Netherlands]	comprehensive information about tropical cyclones in succinct form in Table SPM.1
SPM-1900	SPM	12	11	12	41	An initial definition of "near-term" would be appropriate here, and/or the terminology in the following bulleted statements to be revised (they now alternatively refer to a certain period or "the next few decades", "the next decades" or "the near term"). [Government of Sweden]	structure of section revised. Near-term defined in Table SPM.2, footnote c.
SPM-1901	SPM	12	11	12	45	Missing an important information about projected changes in tropical cyclones. Please compare chap. 11 p.6 line 50-51 "There is low confidence…in ...(TC) frequency and intensity to the mid -21st century" [Government of Germany]	comprehensive information about tropical cyclones in succinct form in Table SPM.1
SPM-1902	SPM	12	11	12	45	Section "Near-Term Projections:Atmosphere": The beginning of the section on Near-Term Projections (SPM-12) should include a statement that defines 'Near-Term'. Different terms such as 'period 2016-2035', 'next few years', and 'next few decades', appear in the text. According to the Executive Summary of Chapter 11, 'Near-Term' refers to future decades up to mid-century. Similar statement maybe included in the Summary for Policy Makers. [Government of United States of America]	structure of section revised. Near-term defined in Table SPM.2, footnote c.
SPM-1903	SPM	12	11	12	45	I am rapidly growing tired of your unsustainable claims based on the output of models that are virtually certain	Comment has no scientific basis. Ranges are reported

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						to not be 100% accurate. You are giving science a bad reputation. Delete these statements or explicitly state the significant uncertainities. [John McLean, Australia]	in all projections.
SPM-1904	SPM	12	11	12	48	The dot-points under these headings are much more about near-term climate PREDICTION rather than the IPCC concept of scenario-dependent PROJECTION. The section needs to be re-cast to clarify the distinction between 'projection' and 'prediction' and make clear that most of the statements are talking about the EXPECTED climate over coming decades based on consideration of both greenhouse/aerosol-scenario-based projections and consideration of the predictability of volcanoes, internal variability and the like. [Government of Australia]	structure of section revised and near-term and long term is now combined. "Prediction" is now mentioned in bullet 1 of subsection "Atmosphere: Temperature".
SPM-1905	SPM	12	11	12	48	Please provide more information about the radiative effects of short lived tracers. This information is needed by decision makers, given the current activities by UNEP, CCAC regarding these species. It is suggested to use a para from the TS on page 38, lines 24-30. [Government of Germany]	this is technical information which is too detailed for the SPM.
SPM-1906	SPM	12	11	13	13	"Near term projections" are very dangerous but you do your best to make them as wide as possble with doubtful liklihood Figures 1.4,1.5 1.11 and TS12 show that short tern projectios are poor for temperature ab sea level and Figure 1.7 shows that projections for methane are worthless. [Vincent Gray, New Zealand]	scenario assumptions (e.g. concentrations of CH4) must not be mixed with projections of physical variables.
SPM-1907	SPM	12	11	16	51	Please give explicit time periods for near-term projections (2016-2035?)(p. 12, lines 11,48, p.13, line 6), and long-term projections (2016- 2100?)(page 13, line 4 and various times more until p.16) [Government of Germany]	structure of section revised and near-term and long term is now combined.
SPM-1908	SPM	12	11			Subsection Near-term projections: Atmosphere: More information on the impacts of aerosols, such as black carbon, on warming trends should be included (cf. TS page 38 lines 24-30). [Government of Japan]	reject. impacts are not in the remit of WGI.
SPM-1909	SPM	12	11			A bullet point should be included summarising the projections of changes in air quality e.g. Section TS.5.3.1.8 [Government of United Kingdom of Great Britain & Northern Ireland]	a bullet on air quality is now provided in separate subsection.
SPM-1910	SPM	12	11			Some statement about the uncertainty in projecting reactive GHG needs to be in the SPM, the RCPs do not get us around this. Atmospheric Composition/Chemistry Uncertainty: Including uncertainties in projecting the chemically reactive greenhouse gases methane (CH4) and nitrous oxide (N2O) from RCP emissions gives a range in abundance pathways that is likely 30% larger than the range in RCP concentrations used to force the CMIP5 climate models. (Ch.11 ES) [Michael Prather, United States of America]	reject. detailed assessment on elements of RCPs is not in the remit of WGI.
SPM-1911	SPM	12	11			A definition of "Near-Term" may help clarity [Conor Sweeney, Ireland]	structure of section revised and near-term and long term is now combined.
SPM-1912	SPM	12	13	12	14	Footnote 8: Similar to AR4 SYR Table SPM.1 we suggest to add the following sentence: "To express the change relative to the period 1850-1899 (pre-inductrial) add XX°C." (XX being replace with the corresponding number). [Andrew Ferrone, Germany]	revised. Footnote now provided to permit comparison with other reference periods.
SPM-1913	SPM	12	13	12	14	To reflect the failure of past IPCC projections, rewrite "The global mean surface air temperature change for the period 2016-2035 relative to the reference period of 1986-2005 will likely be in the range 0.4 Cº-1.0 Cº (medium confidence)" to read "In 1990 the IPCC's First Assessment Report projected that in the 35 years to 2025 there would be 1 Cº warming, at a rate equivalent to 0.3 Cº/decade. Warming since 1990 has occurred at a rate equivalent to 0.14 Cº/decade, and this far lower rate is expected to continue to 2035." Reason: Since there has only been 0.3 Cº warming since 1990, it is extremely unlikely that warming to 2035 will be anything like the 1 Cº upper bound now envisaged by the IPCC – an upper bound that is itself less than the central projection of 1 Cº by 2025 that it made in 1990. If the IPCC is to retain any credibility, it must be explicit about its past over-projections of global warming. [Christopher Monckton of Brenchley, United Kingdom]	reject. comparison of observed warming with projected warming as assessed in earlier IPCC reports is provided in the TS.
SPM-1914	SPM	12	13	12	18	Too many probability clauses in this paragraph. It is almost impossible to see the consequences of the combined statements. [Arnoud Apituley, The Netherlands]	bullet completely revised.
SPM-1915	SPM	12	13	12	18	Mixing likelihood and confidence statements in one finding is often confusing to policymakers. [Kristie Ebi, United States of America]	it is important to provide an additional information on confidence in the special case of near-term projections.

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SPM-1916	SPM	12	13	12	18	Please indicate how much warming this would be as compared to preindustrial levels. [Government of Germany]	revised. Footnote now provided to permit comparison with other reference periods.
SPM-1917	SPM	12	13	12	18	Why is the reference period 1986-2005 chosen? Is it more adequate for near term projections than preindustrial level? [Government of Germany]	revised. Footnote now provided to permit comparison with other reference periods.
SPM-1918	SPM	12	13	12	18	Please add information, why the simulated warming is rather at the high end. Suggestion in italics: "There is robust evidence that collectively the RCPs represent the low end of future emissions scenarios for aerosols and other short-lived reactive gases. Aerosols offset part of the warming caused by the greenhouse gases. Therefore, it is more likely than not that actual warming ..." [Government of Germany]	statement deleted.
SPM-1919	SPM	12	13	12	18	Does this mean that you assume all short lived species to be cooling? It seems so as adding more of these emissions to the atmosphere would according to the text lower the temperature. Please clarify. [Government of NORWAY]	bullet revised. "short-lived" no longer mentioned in projections.
SPM-1920	SPM	12	13	12	18	Short-lived reactive gases' don't mean much to the average policy-maker. Can we say something like sulphates and other aerosols associated with fossil fuel burning creating a short-lived shielding effect? [Government of United Kingdom of Great Britain & Northern Ireland]	bullet revised. "short-lived" no longer mentioned in projections.
SPM-1921	SPM	12	13	12	18	It would be helpful to policy makers if the figure relative to a pre-industrial proxy was quoted here. [Government of United Kingdom of Great Britain & Northern Ireland]	revised. Footnote now provided to permit comparison with other reference periods.
SPM-1922	SPM	12	13	12	18	The short term warming range here is not taken directly taken from the RCP simulations, but is also taking into accoutn SRES and does some implicit model weighting (see chapter 11 ES, page 4 line 21ff). So it is strictly a prediction, not a projection, and does not correspond to what is shown in Fig. SPM.5, and this reference must be deleted. In my view it is critical to separate uncertainties conditional on scenarios (projections) and predictions. Historically WG1 always reported uncertainties conditional on scenarios, without questioning the scenarios. But now chapter 11 is taking a different approach. Several approaches can be defended, but it needs to be very clear whether the numbers take into account the fact that we believe the scenario range is wrong (in case we are prepared to go there). The first sentence here is a prediction, which in a strict sense is impossible in a WG1 assessment, because it requires an assumption of a scenario range and probabilities for scenarios, which we explicitly don't want to make. At minimum the first statement must include "based on the range of RCP/SRES/? scenarios" and must not refer to the figure. [Reto Knutti, Switzerland]	bullet revised. RCPs and observational constraints now mentioned.
SPM-1923	SPM	12	13	12	18	It would be more useful with shorter time periods for the near term changes. The same apply to the reference period and the reference period should be closer to current time. The interannual variability will be larger, but both over the reference period and 2016-2035 there is an important trend. [Gunnar Myhre, Norway]	reject. Time periods that are considered are the result of Ch11/Ch12 assessment.
SPM-1924	SPM	12	13	12	18	This statement is a little bit confusing to a non-expert. Is this much detail needed? Could you simply state that analysis suggests that the RCPs underestimate reflective aerosol content which contributes to cooling, and hence projected warming is more likely to lie at the low end of the RCP range? [Susan Solomon, United States of America]	bullet revised and shortened.
SPM-1925	SPM	12	13	12	18	It is absolutely essential to make clear to what extent this statement is scenario dependent, e.g. it assumes no major volcanic eruptions before or during 2016-35. The statement that warming will be more likely be closer to the lower bound is not only based on the evidence that RCPs represent the low end of future emissions scenarios for aerosols etc, so "Therefore" is misleading - see Chapter 9 Exec summary (page 5, lines 21-19). [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet revised. RCPs and observational constraints now mentioned.
SPM-1926	SPM	12	13	12	18	No mention is made to the possible decrease in global temperatures over the next thirty years due to conditions similar to the Dalton or perhaps Maunder Minimums (low sunspot number, see Livingston and Penn). The assesment of a 'likely' temperature increase of 0.4 to 1.0 deg C seems excessive and needs revision. [Andrejs Vanags, United States of America]	revised bullet with the latest assessment of temperature change from Ch11.
SPM-1927	SPM	12	13	13	13	For section on Near-term projections, suggest putting temperature change related metrics/statements together and precipitation together. Suggest keeping same overall structure as for following section on long-term projections. [Government of United Kingdom of Great Britain & Northern Ireland]	structure of section revised.

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SPM-1928	SPM	12	13		18	This is the most difficult paragraph to write. The projection here for 2016-2035 seems too high taking into account the currently observed global temperature trend and what is stated about PDO and AMO elsewhere in the report. It relies too much on climate models which we know have limitations in the near-term. Paragraph should be rewritten. A near term projection failure as in AR4 must be avoided. [Terje Wahl, Norway]	bullet revised .
SPM-1929	SPM	12	14	12	14	The reference period of present day is particular confusing in this statement, given the UNFCCC agreement related to temperature increase wrt to pre-industrial conditions. See also our general remark on the reference period above. [Government of Germany]	revised. Footnote now provided to permit comparison with other reference periods.
SPM-1930	SPM	12	14	12	14	Footnote 8: Define better the "the standard reference period", or coin it "a standard reference period". [Government of Sweden]	revised. Footnote now provided to permit comparison with other reference periods. Reference period for projections now mentioned in the chapeau of the entire section.
SPM-1931	SPM	12	14			A strong suggestion to change the reference period 1986–2005 to 1981-2010: Why did you decide not to use one of the standard intermediate reference periods defined by WMO, i.e. 1981-2010. This would make communication and comparison with other studies much easier. [Christof Appenzeller, Switzerland]	overlap with the start of the RCP simulations in 2006 needs to be avoided. Reference period is therefore chosen 1986-2005.
SPM-1932	SPM	12	15	12	17	Suggest adding word 'plausible' before "future emissions scenarios" to make clear the reference is to other, non-RCP scenarios. What are the 'short-lived reactive gases' that are referred to and is the reader to assume these also are generally negative forcers (thereby contributing to a lower actual warming)? [Government of Canada]	bullet revised.
SPM-1933	SPM	12	15	12	17	If the RCPs, collectively, represent the low end of future emissions scenarios for aerosols and SLCF and the actual warming is more likely than not to be closer to the lower bound of warming of 0.4C, and knowing that aerosols (collectively) cool, but SLCF (CH4, O3, etc) warm, does this mean the influence of aerosols is greater than that of SLCF? This does not seem to agree with Fig. SPM.3. [Government of United States of America]	bullet revised.
SPM-1934	SPM	12	15	12	18	The discrepancy of RCPs from actual emission paths for aerosols might cause concerns about the credibility of longer term projections. There need to be some remarks about how this could be reconciled with RCP-based long term warming projections presented in this report. [Government of Japan]	reject. detailed assessment on elements of RCPs is not in the remit of WGI.
SPM-1935	SPM	12	15	12	18	Does this statement take into account that the CO2 emissions on the other hand rather follow the highest CO2 scenarios? (e.g. Manning et al., 2010, Nature Geoscience; see also 2012 update of Global Carbon Project: http://www.globalcarbonproject.org/carbonbudget/index.htm). Reference: Manning, M.R., et al. 2010, Nature Geoscience, 3, 376-377. [Sonia Seneviratne, Switzerland]	bullet revised. RCP scenarios now mentioned, but no assessment with respect to current emissions.
SPM-1936	SPM	12	15	12	18	These two sentences are certainly correct. However, they are formulated in a way that makes it very hard to get to their essence. For a layman the meaning of “the RCPs represent the low end of future emission scenarios for aerosols” is probably not clear, and even less why this should lead to actual warming probably being closer to the lower bound of the warming range. Why not state clearly that most likely the RCPs severely overestimate future aerosol reductions, and that the extra cooling due to the aerosols will therefore lead to less warming than the models suggest? [Andreas Sterl, Netherlands]	bullet revised.
SPM-1937	SPM	12	15			What this says isn't quite what it means, is it? It means that they are not just at the low end of the plausible range, but implausibly concentrated there [William Ingram, United Kingdom]	revised bullet with the latest assessment of temperature change from Ch11.
SPM-1938	SPM	12	15			"represent the low end of future emissions scenarios for aerosols ... ". Is this a statement that the RCP's are underestimating such future emissions, and thus in some sense an assessment of the inaccuracy of RCP's? If so it should be a separate bullet. Then another bullet for the consequence of this assessment. [Stephen E Schwartz, United States of America]	bullet revised and specific statement deleted.
SPM-1939	SPM	12	16	12	16	"more likely than not" is not part of the AR5 uncertainty guidance. [Government of Germany]	no true, but bullet is revised and this likelihood expression is no longer used.
SPM-1940	SPM	12	16		18	This doesn’t sound quite logical - if the aerosol forcing were larger, wouldn’t the range shift, possibly widen but this sounds like its getting narrower! [Gabriele Hegerl, United Kingdom]	bullet revised.
SPM-1941	SPM	12	16			It is not clear what is meant by "short-lived reactive gases" and the wording may be confused with the term	"short-lived" no longer mentioned in projections.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						"short-lived climate forcers". [Government of Denmark]	
SPM-1942	SPM	12	16			Omit nonsensical "other" [William Ingram, United Kingdom]	bullet revised.
SPM-1943	SPM	12	16			Omit "reactive" which is relevant/true only in so far as it causes the previous sentence - but not very clear unless replaced by "greenhouse" [William Ingram, United Kingdom]	bullet revised.
SPM-1944	SPM	12	16			"Therefore," doesn't make sense without stating that these "aerosols and other short-lived reactive gases" have a net cooling effect [William Ingram, United Kingdom]	bullet revised.
SPM-1945	SPM	12	16			for aerosols and other short-lived reactive gases > remove "other" [Petra Seibert, Austria]	"short-lived" no longer mentioned in projections.
SPM-1946	SPM	12	17			Therefore, it is more likely than not that actual warming will be closer to the lower bound of 0.4°C than the upper bound of 1.0°C (medium confidence). --> two probability statements in one sentence are quite hard to understand. Can you reformulate this sentence and all other ones that have double probability statements. [Christof Appenzeller, Switzerland]	revised bullet with the latest assessment of temperature change from Ch11.
SPM-1947	SPM	12	19	12	19	I suggest inserting a paragraph pointing out that in the very near term (next few years / decade or so), natural internal variability is more important than the long-term anthropogenic forcing, so global temperatures are not expected to increase year-on-year even though a long-term warming trend is projected. Some years cooler than the previous ones are to be expected, even though the specific details of warmer / cooler years cannot be predicted. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	first bullet of section "Future global and regional climate change" now mentions natural variability vs. forced change. Statement on year-to-year variability is too detailed for SPM.
SPM-1948	SPM	12	19			Again, does "significant" mean "statistically significant"? If so, make this clear (& give at least the confidence level). If not, say e.g. "substantial" to avoid confusion. [William Ingram, United Kingdom]	comment refers to line 29. this bullet was removed.
SPM-1949	SPM	12	20	12	24	Please add a temperature interval in brackets instead of "several tenths of 1°C" [Government of NORWAY]	bullet removed.
SPM-1950	SPM	12	20	12	24	Other projected impacts of a major eruption include stratospheric warming (a much bigger signal than the surface temperature change) and ozone loss, and I think these are worth mentioning. [Dian Seidel, United States of America]	bullet removed.
SPM-1951	SPM	12	20	12	24	It is now clear that eruptions do not have to be of the size of Pinatubo to put significant aerosols in the stratosphere, and there has been a significant contribution to the relatively limited warming of the past decade compared to the prior one (a very important issue) due to eruptions previously thought to be too small to matter. Given the importance of decadal changes in temperature, I suggest that it is important to note this. It would also be important to note the possible importance of any radiative forcing agent that can change quickly - ie., volcanoes large and small, anthropogenic aerosol emissions, soot, tropospheric ozone. These could all affect future decadal warming rates, and an added bullet here would be appropriate and important. [Susan Solomon, United States of America]	bullet removed.
SPM-1952	SPM	12	20		24	This paragraph is too absolute in my view (also picked up by my group when we read ch11). I will comment on that in more detail there. But uncertainties sound too small [Gabriele Hegerl, United Kingdom]	bullet removed.
SPM-1953	SPM	12	22	12	22	Why should there be future reductions in solar irradiance? [Kristie Ebi, United States of America]	bullet removed.
SPM-1954	SPM	12	22	12	22	New dot point for Possible future reductions in solar irradiance, this is a different topic to volcanic eruptions. [Government of Australia]	bullet removed.
SPM-1955	SPM	12	22	12	24	The phrase "Possible future reductions" seems to suggest this is something humans could do. Therefore, suggest rephrasing: "Solar irradiance could be lower in the future than assumed in the scenarios [Question: are changes in SI included in the RCPs?]. Reductions in solar irradiance would……etc.". It would be helpful to add a final sentence to this paragraph to ensure the take-home message is received. Something like this: "Therefore, changes in natural forcers not included in the RCPs could reduce the projected near-term warming." [Government of Canada]	bullet removed.
SPM-1956	SPM	12	22	12	24	Clarify whether the "cooling" is a contribution, or net cooling. [Government of New Zealand]	bullet removed.
SPM-1957	SPM	12	23	12	23	Suggest removal of the negative symbol before 0.1°C, as the text already describes this as a cooling.	bullet removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						[Government of United Kingdom of Great Britain & Northern Ireland]	
SPM-1958	SPM	12	23	12	23	to correct: to exceed -0.1 to: (0.1) [Nedal Katbeh-Bader, Palestine]	bullet removed.
SPM-1959	SPM	12	23			Does the double negative work here? - 'such cooling is unlikely to exceed -0.1 degrees' does this actually represents a warming? [Government of Australia]	bullet removed.
SPM-1960	SPM	12	26	12	26	"more likely than not" is not part of the AR5 uncertainty guidance. [Government of Germany]	incorrect. revised bullet now in subsection "Atmosphere: Water Cycle".
SPM-1961	SPM	12	26	12	28	This short period for defining wet and dry regions seems strange. In particular, the reader may misinterpret 'relatively wet during 1986-2005' as relatively to other 20 year periods, rather than other regions. Please change 'are relatively wet' to 'were relatively wet during 1986-2005'. [Government of Australia]	revised bullet now in subsection "Atmosphere: Water Cycle".
SPM-1962	SPM	12	26	12	28	This short period for defining wet and dry regions seems strange (although I understand what is meant). In particular, the reader may misinterpret 'relatively wet during 1986-2005' as relatively to other 20 year periods, rather than other regions. [Penny Whetton, Australia]	revised bullet now in subsection "Atmosphere: Water Cycle".
SPM-1963	SPM	12	26	12	30	This paragraph is very confusing to read due to the verb tenses and reference to the 1986-2005 period. For example, on line 27, should this sentence read "that were relatively wet during 1986-2005"? [Government of Canada]	revised bullet now in subsection "Atmosphere: Water Cycle".
SPM-1964	SPM	12	26	12	30	This reference to regions AND seasons may be unclear. But the reference to seasons is interesting and raises one question for the observation chapter (2.5), which in the end gives the impression we know less about precipitation: is there no publication giving some confidence in observed reinforcement of seasonal contrasts in well observed (1951-2011) mid latitudes ? [Government of France]	revised bullet now in subsection "Atmosphere: Water Cycle".
SPM-1965	SPM	12	26	12	30	The phrasing "relatively wet/dry during 1986-2005" is confusing - relative to what? [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet revised.
SPM-1966	SPM	12	26		30	Based on comparisons of modeled and measd precip in AR4, Supplement to chapter 8 from CMIP3, I think there is a strong burden to show that precip is doing better in CMIP5 models than in CMIP3 models, where errors in annual precip in fairly large regions were frequently as great as 30 cm per year (sometimes more). I would like to see similar comparisons for the CMIP5 models in the present report before giving any credence to statements about changes in precip. I suggest burden on authors to show errors in modeled precip less than asserted changes. [Stephen E Schwartz, United States of America]	bullet 2 of subsection "Evaluation of climate models" provides information.
SPM-1967	SPM	12	26			Replace "are" with "were" when referring to the period 1986-2005. [Government of New Zealand]	bullet revised.
SPM-1968	SPM	12	27	12	27	to add colored text between brackets:and decrease (in mean precipitation) in regions….. [Nedal Katbeh-Bader, Palestine]	bullet revised.
SPM-1969	SPM	12	27			Change "are" to "were" since the reference is to 1986-2005. [James [Jim] Crawford, United States of America]	bullet revised.
SPM-1970	SPM	12	28	12	30	This is a curious use of 'likely'. Really what is being said is that the signal to noise ratio is higher on larger spatial scales - that is virtually certain not likely. In fact it is irrelevant that evidence for change in precipitation at small regional scales is unlikely, you would take whatever solid evidence presented itself in that context (i.e., its a significant result even if regional attribution is more difficult as a general rule). The statement currently reads that evidence for regional precipitation trends is less likely to be real, which does not seem to be the intention. [Government of Australia]	agree, but bullet revised.
SPM-1971	SPM	12	28			Same as line 27. [James [Jim] Crawford, United States of America]	bullet revised.
SPM-1972	SPM	12	29	12	29	The word zonal meaning is not clear. Thus this refer to climate zones? [European Union]	bullet revised, detail removed.
SPM-1973	SPM	12	32	12	32	Avoiding terms such as 'specific humidity' is recommended in this SPM. Can more general phrasing be found such as "….increases in the amount of moisture in the air, near the surface...." [Government of Canada]	agree. "specific humidity" no longer used.
SPM-1974	SPM	12	32	12	32	"specific humidity" : One can not expect the policy makers to know the difference between absolute, specific and relative humidity. [Christoph Ritz, Switzerland]	agree. "specific humidity" no longer used.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-1975	SPM	12	32	12	33	To reflect the scientific literature accurately, replace the sentence “Models project increases in evaporation in most regions” with “Models have tended to underestimate by two-thirds the rate of evaporation and the consequent countervailing global cooling effect in response to warmer weather. Evaporation is expected to increase with warming, but global net specific humidity is very likely to remain constant because precipitation will tend to increase to match the evaporation.” Reason: Wentz et al. (2007) report that, while models project a 2% increase in evaporation for each Kelvin of warming, the observed outturn has been closer to 6%/K. Since the IPCC projects an increase in precipitation as well as an increase in evaporation, it cannot safely be said that there will be a net increase in specific humidity. [Christopher Monckton of Brenchley, United Kingdom]	bullet revised and simplified.
SPM-1976	SPM	12	32	12	35	Is it possible to quantify the degree of consensus associated with the statement "models project increases in evaporation in most regions"? Indeed, is the statement even true? Don't many arid regions have projections of decreased (or equivocal, thanks to internal variability in short-term) precipitation and therefore decreased (or equivocal) evaporation? [Government of United States of America]	bullet removed.
SPM-1977	SPM	12	32			Does this refer to an increase in global average near-surface specific humidity? [Government of New Zealand]	bullet removed.
SPM-1978	SPM	12	34	12	35	"Natural internal variability will continue to have a major influence on all aspects of the water cycle."Will not increased evaporation under warmer climate play an important role? [Andrew Glikson, Australia]	this statement refers to the next few decades,.
SPM-1979	SPM	12	34			great would be more accurate than major [Government of France]	statement reformulated.
SPM-1980	SPM	12	35			Model robustness should be indicated in the maps where possible. [Reto Knutti, Switzerland]	revised: no reference to chapter figure.
SPM-1981	SPM	12	37	12	40	same comment than page 4 line 1" …what we consider today as cold days… what we consider today as warm…" [Government of France]	bullet reformulated.
SPM-1982	SPM	12	38	12	39	This hints at increased liklihood of heat waves, but does not come to the point. [James [Jim] Crawford, United States of America]	bullet reformulated. Heat waves explicitly mentioned in revised bullet on temperature extremes.
SPM-1983	SPM	12	38	12	40	The near-term projections are in particular policy relevant, especially concerning extremes. This conclusion about heat-waves must be drawn carefully and balanced. Although it is drawn on basis of CMIP5 ensembles, it is based on one study only. We therefore suggest to re-write this conclusion: “Models also indicate increases in the duration, intensity and spatial extent of heat-waves and warm spells for the near term. Future analyses should confirm the robustness of these increases.” [Government of Netherlands]	information on extreme events in near-term given in table SPM.1
SPM-1984	SPM	12	38			Again, it is impossible to know what "at the global scale" means: replace with something clear [William Ingram, United Kingdom]	bullet reformulated.
SPM-1985	SPM	12	42	12	45	It looks like this would fit better immediately following line 25 or line 31. [James [Jim] Crawford, United States of America]	bullet removed.
SPM-1986	SPM	12	42	12	45	If potential effects of future aerosol emissions, volcanic forcing, and landuse strongly affect heavy precipitation, how can one apply the likelihood 'likely'? In line 2-3 on this page it is namely mentioned that the RCP scenarios assume that there are no major volcanic eruptions and that anthropogenic aerosol emissions are rapidly reduced in the near term.How ‘likely’ are these assumptions? Or is the applied likelihood based on other arguments? [Government of Netherlands]	bullet removed.
SPM-1987	SPM	12	43			Again, it is impossible to know what "at the global scale" means: replace with something clear [William Ingram, United Kingdom]	bullet removed. "global scale" replaced by "over many land areas" in table SPM.1, footnote
SPM-1988	SPM	12	48	13	3	Missing information about salinity. Please compare chap.11 p.6 line 5-6: "There is medium confidencethat there will be increases in salinity on the tropical and (especially) subtropical Atlantic, and decreases in the western tropical Pacific over the next few decades." [Government of Germany]	reject. projected salinity changes are not of top relevance for SPM.
SPM-1989	SPM	12	50	12	51	Now that statement took some guts! It will certainly raise some eyebrows, and is much stronger than some of the much more cautious statements emanating from Chapter 12 on global mean temperature change by the end of the century (land and ocean), not to mention the statement on P13, L47 of this SPM, which in relation	bullet deleted.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						to RCP8.5 seems pretty lame! [Timothy Carter, Finland]	
SPM-1990	SPM	12	50	12	51	Why focusing only on the top 700 meter layer? Is it impossible to say something about the deeper ocean? If so, please say so. And mention how much warmer. [Government of Netherlands]	bullet deleted.
SPM-1991	SPM	12	50	12	51	A quantification and associated error bars would strengthen that statement [Eric Guilyardi, France]	bullet deleted.
SPM-1992	SPM	12	52	12	52	footnote 8: Much of the information both in the text and the graphics on the change in climate parameters is given wrt the reference level 1986-2005. The information needed by policy makers is however the change since pre-industrial conditions. This is one major flaw of this report. Under UNFCCC, countries have agreed to limit warming to below 2 degree C compared to the pre-industrial level. IPCC (across working groups) should respond to the clear policy need from UNFCCC and give information on the climate state for this reference level. This might not be possible for all variables, but we encourage the authors to compare to pre-industrial whenever possible. [Government of Germany]	revised. Footnote now provided to permit comparison with other reference periods.
SPM-1993	SPM	12	52	12	52	Footnote 8 (comments elsewhere are also relevant). That a different reference period (1980-99) was used in AR4 should be noted to aid comparison between the reports. [Government of United Kingdom of Great Britain & Northern Ireland]	revised. Footnote now provided to permit comparison with other reference periods.
SPM-1994	SPM	12		12		Elaborate a BOX giving a brief overview of the four (04) types of RCPs [Government of Benin]	done
SPM-1995	SPM	12				Considering the importance of the content of footnote 8, it should be placed much earlier part of the SPM, as footnotes tend to draw less attention of readers. [Government of Japan]	done: mentioned in the chapeau of this section.
SPM-1996	SPM	13	0			Because of the change to using 1986-2005 from pre-industrial, the message is unclear whether we are facing a 2C or 4C world! In fact the numbers seem more conservative than in AR4 but I doubt they are in reality. [Government of United Kingdom of Great Britain & Northern Ireland]	revised. Footnote now provided to permit comparison with other reference periods.
SPM-1997	SPM	13	1	13	1	Please explain AMOC in the Glossary. [Government of Germany]	Taken into account. Final report will include a list of acronyms and the WGI Glossary. "Meridional Overturning Circulation" is in the WGI AR5 Glossary.
SPM-1998	SPM	13	1	13	1	Please explain the term "AMOC". [Government of Netherlands]	bullet removed. Term spelled out in ocean subsection.
SPM-1999	SPM	13	1	13	3	On balance, this seems to say that the AMOC will increase, decrease or stay the same. [James [Jim] Crawford, United States of America]	bullet removed. Changes covered in ocean subsection.
SPM-2000	SPM	13	1	13	3	Does any part of the AR5 report provide estimate of the conditions and time frame at which AMOC may collapse? [Andrew Glikson, Australia]	bullet removed. Changes covered in ocean subsection.
SPM-2001	SPM	13	1	13	3	The point of this statement needs to be made clear - why is this relevant to the SPM? AMOC is defined on p.4 but may have been missed by the time a reader gets to this page. [Government of Australia]	bullet removed. Changes covered in ocean subsection.
SPM-2002	SPM	13	1	13	3	"AMOC", please spell out Atlantic Meridional Overturning Circulation. Is there a more well-known name for this circulation? If yes, please add it in brackets, also on page 4, line 54 [Government of NORWAY]	bullet removed. Changes covered in ocean subsection.
SPM-2003	SPM	13	1	13	3	This sentence is a bit odd, AMOC needs to be explained and perhaps one could write: "… is very uncertain. Also decades where this circulation increases can be expected." [Ingeborg Levin, Germany]	bullet removed. Changes covered in ocean subsection.
SPM-2004	SPM	13	1			Policy makers are not likely to know that AMOC is the Atlantic Meridional Overturning Circulation. It is also likely that they should be told the significance of this. [James [Jim] Crawford, United States of America]	bullet removed. Changes covered in ocean subsection.
SPM-2005	SPM	13	1			It is suggested to explain in bracketed text or in afoot note the abbreviataion AMOC (Atlantic Meridional Overturning). [Klaus Radunsky, Austria]	bullet removed. Changes covered in ocean subsection.
SPM-2006	SPM	13	2	13	2	Please check " …and decades when this circulation…" [Sai Ming Lee, Hong Kong, China]	bullet removed.
SPM-2007	SPM	13	4	13	4	Mention changes in ocean acidification: "It is very likely that ocean pH continues to decrease and that coastal upwelling regions and the Arctic ocean become increasingly corrosive toless stable for less stable forms of calcium carbonate. " [Fortunat Joos, Switzerland]	bullet on ocean acidification in subsection "Carbon and other biogeochemical cycles".

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SPM-2008	SPM	13	8	13	8	Suggest replace "loss of" with "decrease in" [Government of New Zealand]	bullet removed.
SPM-2009	SPM	13	8	13	9	The phrase "…continued…by 2016-2035…" does not make sense in this sentence. Suggest "…continued…through 2016-2035" if it is the case that these losses will continue beyond the near-term. [Government of Canada]	bullet removed.
SPM-2010	SPM	13	8	13	9	This statement may have too high a likelihood of continued loss of sea ice extent in the Arctic by 2016-2035. Suppose that natural variability has made a very substantial contribution to the recent accelerated loss of sea ice. Suppose that this natural variability then for a few decades operates in the opposite sense. Would it be possible to temporarily cause an increase in sea ice extent (2016-2035) relative to current (2012). While I acknowledge that this may not be a likely scenario, I wonder if we can set the odds at less than 10%? [Thomas Knutson, United States of America]	bullet removed.
SPM-2011	SPM	13	8	13	10	This section should include a reference to the record breaking 2012 arctic sea-ice minima, so will need updating. [Government of United Kingdom of Great Britain & Northern Ireland]	reject. This concerns observations, but single year will not be reported in the SPM.
SPM-2012	SPM	13	8	13	13	These percentages are for ice extent, not ice area (see difference in Chapter 4, page 8, lines 46-50). [Thierry Fichefet, Belgium]	bullet removed.
SPM-2013	SPM	13	8	13	13	Suggest including projected changes in glaciers and ice sheets in this paragraph. [Government of Canada]	bullet removed.
SPM-2014	SPM	13	8	13	13	Please add the reference period. [Government of Germany]	bullet removed.
SPM-2015	SPM	13	8	13	13	Please add from where the percentage decreases and increases are estimated. E.g. the Arctic sea ice is projected to decrease by 28% by 2016-2035 relative to YYYY. [Government of NORWAY]	bullet removed.
SPM-2016	SPM	13	8	13	13	This bullet needs to be rephrased in various ways. "Continued loss" sounds like a prediction of monotonic decreases, which is not what is expected, particularly noting large decadal variability in the Arctic. There is need to provide uncertainty ranges for the projected decreases in area etc, and to make clear these are based on raw (unassessed) model results. Properly, the raw model results should be replaced by an overall assessment, taking into account model weaknesses, of a likely range for Arctic sea ice area in 2016-35. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet removed.
SPM-2017	SPM	13	8	13	42	In the near term projections for the cryosphere the absence of any description of impact on Himalayan glaciers is startlingly obvious. There has been significant work since the AR4 was published and there should be some statement on our current understanding of a crucial cryosphere system whose changes have implications for such a large area and population. [Government of United Kingdom of Great Britain & Northern Ireland]	bullet removed.
SPM-2018	SPM	13	9	13	9	"reduction of permafrost at high latitude". Consequencs for methane release? [Andrew Glikson, Australia]	bullet removed.
SPM-2019	SPM	13	9	13	9	"reduction of permafrost at high latitude" will this have consequences for methane release? [Government of Australia]	bullet removed.
SPM-2020	SPM	13	9	13	10	These percentages come from the CMIP5 multi-model mean. This should be mentioned. Otherwise, the spread should be given. [Thierry Fichefet, Belgium]	bullet removed.
SPM-2021	SPM	13	9	13	13	The relevant section (11.3.4) from which the permafrost estimate comes is missing a source for those numbers. [Government of United States of America]	bullet removed.
SPM-2022	SPM	13	10	13	10	Decrease of Arctic Sea ice. Cosequences for increase in evaporation and southward migration of cold fronts and snow storms? [Andrew Glikson, Australia]	bullet removed.
SPM-2023	SPM	13	10	13	10	What will be the consequences of a decrease in Arctic Sea ice? [Government of Australia]	bullet removed.
SPM-2024	SPM	13	10	13	10	This remark applies to other conclusions too. The rational in the choice of RCPs in the main conclusions is not clear, and can be misleading. Here RCP4.5 is applied without reason, while in other conclusions other RCPs are separately highlighted. For balanced communication, it would be better to highlight the total range, either by mentioning the outliers RCP2.6 and RCP8.5, or by including all RCPs. If results from a specific RCP is highlighted, it should be made clear why this is done. [Government of Netherlands]	bullet removed.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-2025	SPM	13	10	13	10	28% and 6% reductions compared with what? TS p43, line 38 says: 'compared to the 1986–2005 reference period' whereas the sea-ice community talks of 1979-2000 averages - need to make that clear here, in the SPM. This is another example of the confusion caused by moving away from standard baseline(s) [Government of United Kingdom of Great Britain & Northern Ireland]	bullet removed.
SPM-2026	SPM	13	10	13	10	Is this value really for sea ice area, which is different from extent, since until now only extent has been mentioned. If it is area, the difference between area and extent should be explained (at least in a footnote) [Urs Neu, Switzerland]	bullet removed.
SPM-2027	SPM	13	10	13	10	Why are there no ranges given for the Arctic sea ice loss projections? [Dian Seidel, United States of America]	bullet removed.
SPM-2028	SPM	13	10	13	13	Please cite ranges (as in the other bullets) rather than central values to indicate the uncertainty. [Geert Jan van Oldenborgh, Netherlands]	bullet removed.
SPM-2029	SPM	13	10			Policy makers are not likely to know what RCP4.5 is. Suggest that a citation such as www.pik-potsdam.de/~mmalte/rcps/ be given. [James [Jim] Crawford, United States of America]	bullet removed.
SPM-2030	SPM	13	10			,same delay,? About 28%? [Government of France]	bullet removed.
SPM-2031	SPM	13	10			These numbers should have uncertainties [William Ingram, United Kingdom]	bullet removed.
SPM-2032	SPM	13	11	13	13	This sentence does not make clear for which projection period the indicatd deacrease is expected. [Andrew Ferrone, Germany]	bullet removed.
SPM-2033	SPM	13	12	13	12	What does 'decrease of permafrost' mean? Decrease of volume, of depth, of area, of temperature,... ? [Urs Neu, Switzerland]	bullet removed.
SPM-2034	SPM	13	12			If it varies, should it be caled permafrost? [James [Jim] Crawford, United States of America]	bullet removed.
SPM-2035	SPM	13	13	13	13	Please give uncertainty range for 18%. [Government of Netherlands]	bullet removed.
SPM-2036	SPM	13	13			Again, this numbers should have uncertainties [William Ingram, United Kingdom]	bullet removed.
SPM-2037	SPM	13	17	13	17	It would be unacceptable for a university student to claim that a consensus among models is somehow evidence so I am amazed that this is what you are trying to imply, even more so when there is no evidence that the models are 100% accurate for all climate forces. [John McLean, Australia]	all results are reported as ranges with uncertainties clearly indicated, both graphically and numerically.
SPM-2038	SPM	13	18			Again, "global" should be "global-mean" [William Ingram, United Kingdom]	reject. global annual mean is appropriate.
SPM-2039	SPM	13	21	13	21	I think a brief explanation of RCP2.6 and RCP8.5 needs to be given here. [Ingeborg Levin, Germany]	information now provided in Box SPM.1.
SPM-2040	SPM	13	24			Again, the word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	sentence removed.
SPM-2041	SPM	13	29	13	36	Figure SPM 6: We dont' understand panel c) where sea ice concentrations are given in percent. Also, what are the observed 15% sea ice concentration limits? [Government of Germany]	caption revised and reference to TS provided. Observations removed.
SPM-2042	SPM	13	29	13	41	Figure SPM.6 and Table SPM.2 are currently situated before they are introduced in the text. [Government of Canada]	copy edit will correct this.
SPM-2043	SPM	13	31	13	31	"sea ice concentration": shouldn't it be "sea ice coverage"? [Ingeborg Levin, Germany]	caption revised and reference to TS provided.
SPM-2044	SPM	13	32			Again, "global" should be "global-mean" [William Ingram, United Kingdom]	"global" removed from caption.
SPM-2045	SPM	13	44	13	44	Similar to Canada's comments on the near-term section, is important to clearly explain what is meant by "long-term". [Government of Canada]	structure of section revised. Near-term and long-term combined.
SPM-2046	SPM	13	44	13	44	"Long-term" is used here without a definition of what it means. This could be addressed by my earlier suggestion of explaining "short term" and "long-term" in either a bullet point or a footnote near the beginning on Page SPM 11 [David Wratt, New Zealand]	structure of section revised. Near-term and long-term combined.
SPM-2047	SPM	13	44	13	49	COMMENT B of a series. A key piece of highly policy-relevant science of the past few years has been the	partly accepted. Section not rearranged but

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						demonstration that cumulative carbon can be directly related to future warming. As many scientific papers have demonstrated, this implies that if the world wishes to avoid the political target of 2°C, or any other chosen future target, science can now place limits on the total amount of carbon that can be emitted in the future. This is not necessarily a 'very long term' or 'commitment' issue, since for the high end of emission scenarios this point could be reached by mid century. It also is useful to introduce this key result before talking about e.g. cryosphere and the oceans, since the levels of carbon that are reached in the next few decades will have a large role to play in how sea level rise evolves for many centuries, another highly policy relevant finding of recent research. This a fundamental point that should occur in the SPM before the discussion on 46-49, to ensure that the key aspects of the scientific fundamentals are communicated before presenting these rather specific RCP figures. I therefore suggest several changes to the structure of the rest of this section: namely, the section on long term projections, commitment, and stabilization should be moved up to here, and its title should be changed to 'Projections of the Earth's Climate by Mid-Century and Beyond: Climate Stabilization, Commitments, and Irreversibility'. See below for suggestions on what could usefully follow this. [Susan Solomon, United States of America]	cumulative emissions related to temperature is now in Fig. SPM.10.
SPM-2048	SPM	13	44	13	49	COMMENT C of a series. To begin the new proposed section, the following headline statement is one option: "There is now new scientific evidence that warming and related climate changes due to anthropogenic carbon dioxide emissions depend upon the total cumulative amount of carbon emitted by humankind. Past and present anthropogenic emissions of carbon dioxide can be expected to affect warming and related climate changes including sea level rise and ice sheet loss for more than a thousand years. Emissions of other anthropogenic greenhouse gases and aerosols are expected to contribute to climate changes over decades or centuries." [Susan Solomon, United States of America]	partly accepted. Section not rearranged but cumulative emissions related to temperature is now in Fig. SPM.10.
SPM-2049	SPM	13	44	13	54	The many different reference values for temperature changes (pre-industrial for the 2°C limit, 1986-2005 in AR5, 1990 in AR4 and earlier) make it extremely difficult for readers to compare values, and it is virtually certain, that readers will mix-up and mis-interprete these numbers. I really strongly recommend to find a common reference for such discussions (at least in the same section) or at least give the numbers also with respect the other reference(s), e.g. what does 2°C from preindustrial mean with respect to the 1986-2005 reference, so that readers are able to interprete the projections in relation to the 2°C from preindustrial value (and the same, respectively, for comparison to the values given in AR4). [Urs Neu, Switzerland]	addressed by merging near-term and long.-term into one section, and providing footnote that permits comparison with other reference periods.
SPM-2050	SPM	13	44	14	14	I think the RCP logic needs a better presentation. In addition to decribing the changes in climate for the various RCPs, somewhat more focus should be given to emission trajectories that are consistent with the various RCPs (in this section and not only at page 17). In other words, how can these levels be achieved. I think the presentation of this is TS in good; e.g. the TFE8, figure 1 c) is very useful. [Jan Fuglestvedt, Norway]	RCP now explained in box SPM.1
SPM-2051	SPM	13	44	17	48	COMMENT D of a series. After the new section header titled mid-century and beyond, climate stabilization, commitments, and irreversibility, significant rearrangement and editing of the paragraphs on pages 13 to 17 would be required. The excellent short statement on 11, 31-33 should also move here. The statement on lines 46-48 of page 13 is useful, and would be more useful if cumulative carbon allowable for warming is at these levels of confidence is also provided. All of this will be a significant but not excessive amount of work and I believe it will make for a much clearer and more useful report. It would allow all the cryosphere statements to then be gathered together, which would further provide an opportunity to state that while it is difficult to provide accurate numbers for sea level rise in a particular year (e.g., 2100), today's emissions will lead to ocean warming, ice loss, and associated sea level rise that ultimately will be larger (unless carbon emissions are negative). I think too much emphasis is often placed on the precise value of sea level rise for 2100. We understand the processes involved in sea level rise much better than we do their exact time scales, and that point is being lost. This has led to poor communication and unnecessary confusion over sea level projections. I will return to this point in a subsequent comment. [Susan Solomon, United States of America]	section structure revised.
SPM-2052	SPM	13	44	17	48	COMMENT E of a series. A new paragraph that should be added in the new section 6 that I am proposing could focus on the contributions to warming from increased tropospheric ozone, soot, etc. over coming decades and the 21st century based on the model projections, which may be relevant for policymakers seeking to understand the respective contributions of different agents to 21st century warming. [Susan Solomon, United States of America]	ozone mentioned to the extent air quality is concerned, in new subsection "Atmosphere: air quality".

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SPM-2053	SPM	13	44			Section: Long-Term Projections: please clarify timescale meant by "long term" [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	structure of section revised.
SPM-2054	SPM	13	45	13	49	To clarify the central long-term temperature projection, rewrite “For RCP4.5, 6.0 and 8.5, global mean surface air temperatures are projected to at least likely exceed 2 Cº warming with respect to pre-industrial by 2100, and about as likely as not to be above 2 Cº warming for RCP2.6” as follows: “For RCP4.5, 6.0 and 8.5 it is likely, and for RCP2.6 it is as likely as not, that global mean surface air temperatures will be more than 1 Cº warmer than today by 2100.” Reason: There has already been ~1 K warming compared with pre-industrial times. However, in the pre-industrial era temperatures were low thanks to the prolonged drop in solar activity during the 70 years of the Maunder Minimum (1645-1715); so the 1 K warming seen since 1750 may well be largely a continuing recovery in response to the rapid growth in solar activity since then (Hathaway, 1984). Example: The least-squares linear-regression trend on the Central England Temperature Record since 1750 is ~0.9 K. [Christopher Monckton of Brenchley, United Kingdom]	statement revised.
SPM-2055	SPM	13	46	13	46	Same comment as on Chapter 12, page 3, line 19: The current wording "... and about as likely as not to be above 2C warming for RCP2.6" seems to be at odds with the results provided in Table 12.2. In Table 2.12, the multi-model and global-mean warming is provided with maximally 1.0+-0.4C for the middle of the century and 1.0+-0.5 C for the end of the 21st century. In case of the 0.4 one-standard deviation case, and adding 0.6C warming for the 1986-2005 to preindustrial difference, this would result in the complete +-1std range being below 2C, i.e. a chance of exceeding 2C of only about 16% (assuming a normal distribution and 1std range reflecting a 68% range). In the case of the 0.5C std, the exceedance probability might be a bit higher. The point is however, that RCP2.6 with a multi-model mean warming of 1.6C seems to be better characterised with having a likely chance (>66%) of staying below 2C, than merely a (33% to 66%) "as likely as not" chance. A wording suggestion that would avoid to make a definite call on the exceedance probability of RCP2.6 would be to take the sentence from page 12-24, line 35, which says:"In the CMIP5 ensemble mean, global warming under RCP2.6 stays below 2C above preindustrial levels throughout the 21st century, clearly demonstrating the result of mitigation policies.". [Government of Germany]	statement revised and made more comprehensive providing information for 1.5°C, 2°C, and 4°C.
SPM-2056	SPM	13	46	13	46	Suggest change to "...the emissions scenario." [Government of New Zealand]	emissions now explicitly mentioned in headline statement.
SPM-2057	SPM	13	46	13	46	I suggest insertion of the word "projected", ie: "By mid-21st century, the PROJECTED rate of global warming …" [David Wratt, New Zealand]	"projected" not needed as the specific scenarios are mentioned in each bullet and thus information is contingent upon a scenario.
SPM-2058	SPM	13	46	13	48	the text is incosistent: By mid-21st century and…. to preindustrial by 2100. [Nedal Katbeh-Bader, Palestine]	headline replaced and content moved into bullet in revised formulation.
SPM-2059	SPM	13	46	13	49	Why are three RCPs grouped in their likelihood assessment of exceeding 2C in this statement? One would expect that the likelihood presented is for the lowest RCP, while the confidence/likelihood assessment for RCP 8.5 might be "extremely likely" or even "virtually certain". Presenting all three of these higher RCPs as just "at least likely" does not present key information to policy makers. [William Anderegg, United States of America]	headline replaced and content moved into bullet in revised formulation which is more comprehensive.
SPM-2060	SPM	13	46	13	49	If global mean surface air temperatures are projected to "very likely" exceed 2 degrees C warming above preindustrial by 2100 under one or more of RCP4.5, 6.0, or 8.5, it would be much clearer to state this separately, rather than using the phrase "at least likely." [Christopher Field, United States of America]	headline replaced and content moved into bullet in revised formulation which is more comprehensive.
SPM-2061	SPM	13	46	13	49	Taking the transient masking effect of aerosol into account (Figure SPM-3), cessation of sulphur emission would result in mean global temperatures exceeding 2 degrees C. The notion as if 2C has not as yet been reached therefore depends on continuing sulphur emission scenarios, which thereby in effect constitut unintended "geoengineering".This is acknowledged in TS-28/24 in the following terms: "If rapid reductions in sulphate aerosol are undertaken for improving air quality or as part of decreasing fossil fuel CO2 emissions, then there is medium confidence that this could lead to rapid near-term warming." [Andrew Glikson, Australia]	information in this section is limited to what CMIP5 simulations forced by the RCP scenarios provide.
SPM-2062	SPM	13	46	13	49	The transient masking effect of aerosols could be taken into account here (Figure SPM-3). This is acknowledged in TS-28/24 in the following terms: "If rapid reductions in sulphate aerosol are undertaken for	information in this section is limited to what CMIP5 simulations forced by the RCP scenarios provide.

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						improving air quality or as part of decreasing fossil fuel CO2 emissions, then there is medium confidence that this could lead to rapid near-term warming." [Government of Australia]	
SPM-2063	SPM	13	46	13	49	It is problematic that readers cannot readily see temperature change relative to pre-industrial on Fig SPM.5 even though this header uses pre-industrial as the reference period. The easiest fix might be to add text to the figure caption explaining how to estimate temp change relative to pre-industrial given temp change relative to 1986-2005 (e.g. add ~half a degree of warming). [Government of Canada]	footnote with this information is now added at the beginning of the entire section.
SPM-2064	SPM	13	46	13	49	Assessing scenarios on the basis of temperature increase over or below 2 degrees might be seen that IPCC recommends a specific scenario and the corresponding policy target. In order to maintain the neutrality of IPCC, it would be preferable to show the projected results of scenario with uncertainty ranges, just as described in Executive Summary of Chapt.12 (p3 L12-16). [Government of Japan]	mention of 2°C is policy relevant. Information is now moved to bullet and more information is provided (1.5°C, 2°C, and 4°C).
SPM-2065	SPM	13	46	13	49	states “For RCP4.5, 6.0 and 8.5 global mean surface temperature are projected to at least likely exceed 2C… by 2100 … and about as likely as not to be above 2C for RCP2.6”. However Table SPM.2 on page SPM-19 shows the projected temperature in 2100 from RCP4.5 to be 1.8 [1.0 – 2.6], and for RCP2.6 to be 1.0 [0.2-1.8]. Figure SPM 5 also seems to show this. This discrepancy is confusing. [Government of New Zealand]	headline statement replaced and information is moved into bullet which contains more information.
SPM-2066	SPM	13	46	13	49	The results pertaining to the different RCPs do differ by the 2100 (especially the 8.5 from the others) and a more differentiated information could be provided. [Government of Sweden]	information moved to bullet and made more comprehensive. Temperature ranges given for all RCPs in bullet and table SPM.2
SPM-2067	SPM	13	46	13	49	The phrasing here is unclear and confusing. I suggest "the projected rate of global warming being to be more strongly dependent on the scenario for greenhouse gas emissions" (noting that aerosol uncertainties are important long before mid-century). Also: "at least likely exceed 2C" is very confusing; "preindustrial" climate is ill-defined. Note finally that chapter 11 has some conclusions relevant to this point, and these need to be coordinated with Chapter 12. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	headline statement replaced and information is moved into bullet which contains more information.
SPM-2068	SPM	13	46	13	54	The use of the terms "very likely" and "likely" here, rather than confidence statements suggest that the authors have firm model-based or expert-elicitation based grounds (that can be quantitatively expressed) for using them (cf. Chapter 1, SOD, Table 1.1). However, the reporting here of the CMIP5 results is interesting, because the likelihood statement used is "likely", which implies 66% probability of being correct, whereas the uncertainty range used from the model runs is the 90% range (5-95%), which is associated with "very likely" in the uncertainty guidance. I find this apparent mixture of expert judgement and quantitative reporting of model outcomes to be confusing. [Timothy Carter, Finland]	headline statement replaced and information is moved into bullet which contains more information.
SPM-2069	SPM	13	46	13	54	Is the same "likely" verdict really attached to RCP 4.5 as to RCP 8.5? This seems excessively conservative, when warming under RCP 8.5 from the CMIP5 runs is given as 3.7 degC ± 0.7 (2.5,5.0) in Table 12.2. Here, the lowest model estimate from the large ensemble gives 2.5 degC w.r.t. 1986-2005, which is still 0.66 degC below the warming w.r.t. early-industrial (cf. SPM and chapter 2) and probably a little more still from pre-industrial. Surely this would merit, for unmitigated emissions, at least a "very likely" verdict? [Timothy Carter, Finland]	headline statement replaced and information is moved into bullet which contains more information.
SPM-2070	SPM	13	46	13	54	The warming shown in the box is relative to the preindustrial, while the text below the box is relative to the warming during 1986-2005, the inconsistency of which is likely to cause confusion. It is suggested to make them consistent. Moreover, SPM Figure 5 that the text corresponds to only gives the highest RCP8.5 scenario and the lowest RCP2.6 scenario. It is suggested that Figure 5 (a) (b) give the results of RCP4.5 and RCP6.0. The last sentence in the box gives the impression that only scenario RCP2.6 could meet 2℃. In fact, part of RCP4.5 still ranges below 2℃ as well, and still might meet 2℃. Furthermore, there is still a big space between RCP2.6 and RCP4.5. RCP2.6 is not necessarily the only choice. A clarification should be made in this connection. [Government of China]	headline statement replaced and information is moved into bullet which contains more information.
SPM-2071	SPM	13	46	13	54	This text suggest that it is as likely as not that RCP2.6. exceeds the 2 degrees C above pre-industrial by 2081-2020. This seems inconsistent with the evidence provided in Table 12.2. This indicates that for RCP2.6 a temperature increase between 0.5 and 1.5 C can be expected this century. With respect to pre-industrial this needs to be increased by 0.6 C (page 3 line 23, central value). This gives a range of 1.1 to 2.1 degree C. This suggests a probability of staying below a 2 C increase in the order of 84% (assuming a normal distribution).	headline statement replaced and information is moved into bullet which contains more information.

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						Hence it seems more correct to state that it is likely (being 66% or more) that with an RCP2.6 pathway temperatures stay below 2 degree C. [European Union]	
SPM-2072	SPM	13	46	14	14	Unless you can demonstrate that climate models are 100% accurate for all climate forces your statements are mere speculation and should be deleted or heavily qualified. [John McLean, Australia]	qualification is provided in terms of likelihood and ranges, as well as confidence, where appropriate.
SPM-2073	SPM	13	46			Is there a possibility to mention the highest and lowest rates of the scenarios ? [Government of France]	related information is provided in the SPM as cumulative emissions in subsection "Carbon and other biogeochemical cycles" and figure SPM.10 .
SPM-2074	SPM	13	46			This section compares temperatures to pre-industrial, whereas the near-term projection use 1986-2005 as a reference. If this is necessary, please note the difference. [Government of New Zealand]	structure of section revised.
SPM-2075	SPM	13	46			Please explicitly define the years used as the 'pre-industrial' baseline. In prior paragraphs both 1750 and 1850 CE have been used, and if so, provide please describe the reason for picking a date in the midst of a climatic anomaly (the litle ice age). It would be just as wrong to pick a reference point in the midst of the medieval climatic anomaly. Perhaps a better baseline would be prior to the medieval climatic anomaly, or during the transition from the medieval climatic anomaly to the little ice age. [Andrejs Vanags, United States of America]	pre-industrial defined in chapeau of section "Drivers of Climate Change".
SPM-2076	SPM	13	47	13	47	Lumping these RCPs together is unhelpful and potentially misleading. Likelihood of exceeding 2deg warming is much greater for RCP8.5 than for RCP4.5, so they should not be assigned a single confidence level. [Government of Australia]	headline statement replaced and information is moved into bullet which contains more information.
SPM-2077	SPM	13	47	13	47	Suggest removing "at least" from this sentence. The wording does not make sense, and this qualifier also cast doubt on the confidence level of the uncertainty term that was assigned here. . [Government of Canada]	headline statement replaced and information is moved into bullet which contains more information.
SPM-2078	SPM	13	47	13	48	I read 'likely' as meaning more than 50% and 'as likely as not' meaning 50/50. This may become slightly confused with the terminology used regarding uncertainty intervals throughout the IPCC reports. We're talking about the odds here, rather than the normal data confidence clarifications - perhaps need to use different wording here, to avoid confusion. Or perhaps they ARE using the uncertainty intervals and I'm mistaken. Either way, I feel this whole paragraph could be worded less confusingly. [Government of United Kingdom of Great Britain & Northern Ireland]	headline statement replaced and information is moved into bullet which contains more information.
SPM-2079	SPM	13	47	13	49	Both here and in the quoted Figure SPM.5, it will be necessary to explain the relationship between the pre-industrial and 1986-2005 baselines for temperature to avoid confusion on what the '2°C warming' actually means - how to you calculate a pre-industrial value from a 1986-2005 baseline? [Government of Australia]	this is now provided in a footnote at the beginning of section "Future global and regional climate change"
SPM-2080	SPM	13	47	13	49	It is proposed that an introduction to the SPM or a specific breakout box be included to explain the RCPs - how the work, how they are different to the SRES, what a pathway is as appose to a socio-economic scenario etc. [Government of Australia]	agreed. Box SPM.1 on RCP provided.
SPM-2081	SPM	13	47			Doesn't "likely" mean the same thing as "at least likely?" [Government of United States of America]	headline statement replaced and information is moved into bullet which contains more information.
SPM-2082	SPM	13	48	13	49	Is the statement with regard to RCP2.6 correct? How is it compatible with the information in lines 52-53? [Government of Germany]	headline statement replaced and information is moved into bullet which contains more information. Bullet on temperature change by 2081-2100 also updated.
SPM-2083	SPM	13	48	13	51	The reference period is nor the same at line 48 and line 51 [Government of France]	headline statement replaced and information is moved into bullet which contains more information. Different reference period mention at start of revised bullet.
SPM-2084	SPM	13	48			"as likely as not" sounds like a shot in the dark. [James [Jim] Crawford, United States of America]	headline statement replaced and information is moved into bullet which contains more information.
SPM-2085	SPM	13	51	13	52	Please add "increase" after "surface temperatures". The reason is that the reader very easily interpret the temperatures as absolute, despite the text between brackets. [Government of Netherlands]	done
SPM-2086	SPM	13	51	13	52	Please clarify what you mean by "the CO2 driven RCPs". Are all RCPs CO2 driven? What would be an	clarification is now provided in box SPM.1 describing

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						alternative to CO2 driven scenarios? [Government of NORWAY]	the RCP scenarios.
SPM-2087	SPM	13	51	13	54	It seems rather meaningless to say that the RCPs will be in the range of 0.2 to 4.8 deg. C [24:1] with 90% certainty. [James [Jim] Crawford, United States of America]	comment not correct. ranges of projections cannot be, and are not, combined across scenarios.
SPM-2088	SPM	13	51	13	54	This bullet indicates that the ranges presented are 5-95% uncertainty intervals originating from the CMIP5 models, for which high confidence is explicitly assigned in Table SPM.2. It is also indicated that these ranges are "likely" ranges, suggesting a possible "downgrading" of likelihood for the ranges as part of the assessment. If the 5-95% uncertainty intervals were taken on their own, they could potentially be the basis for "very likely" ranges. It may be beneficial to more explicitly indicate whether "downgrading" has occurred. [Christopher Field, United States of America]	requested information now provided in table SPM.2, footnote c.
SPM-2089	SPM	13	51	13	54	Suggest we need to add the word 'simulations' after climate models on line 52 to make clear the ranges are for the full range of simulations with all models, and not just the range of model means. Also, as the shaded box(lines 46-49) refers to temperature change from pre-industrial, it would help if the values in this paragraph also gave results from that perspective. This is especially important as the Copenhagen Accord target is 2C above pre-industrial. [Government of Canada]	bullet reformulated. Headline statement revised.
SPM-2090	SPM	13	51	13	54	Future projections of global warming will be very difficult to use unless a central value for temperature projections is provided. [European Union]	mean values and ranges provided in table SPM.2
SPM-2091	SPM	13	51	13	54	Considering the fact that several governments have already adopted certain SRES marker scenarios as a reference scenario for preparing their national plans to confront the climate change, comparing temperature ranges shown in this paragraph with those of SRES should be of high priority and importance. At least, preparing a graph that allows policymakers to compare the projections in this paragraph with projections in previous assessment reports (including AR4) would be appreciated (just like Figure SPM.5 of AR4 SYR SPM). Furthermore, some policy makers may not be familiar with the new RCP scenarios used in AR5. It would be beneficial for all readers that SPM provides briefly the basic information about RCP scenarios, such as the characteristics of RCP scenarios, differences of prerequisite of each RCP scenario and differences from SRES scenarios used in AR4. [Government of Japan]	simple comparison not possible at the SPM level as scenarios, models and reference periods are different from AR4. Information is technical and can be found in the TS. Box SPM.1 on RCP scenarios is provided.
SPM-2092	SPM	13	51	13	54	The best estimates of or other representative figures that summarize each range of RCPs should be given. [Government of Japan]	mean values and ranges provided in table SPM.2
SPM-2093	SPM	13	51	13	54	A footnote, or some other way, on the increases from the pre-industrial to date would add clarity to policy-makers, as the latter changes are crucial to understanding the temperature change projections viz. climate policy goals expressed in terms of temperature change. [Government of Sweden]	this is now provided in a footnote at the beginning of section "Future global and regional climate change"
SPM-2094	SPM	13	51	13	54	How should policy makers convert from 1986-2005 baseline to pre-industrial? The numbers on the range of global temperature changes that are projected under the CRPs is information that many in the policy community want to find quickly. It would be better to have these in a small table. [Government of United Kingdom of Great Britain & Northern Ireland]	this is now provided in a footnote at the beginning of section "Future global and regional climate change"
SPM-2095	SPM	13	51	13	54	Future projections of global warming will be very difficult to use unless a central value for temperature projections is provided. [Corinne Le Quéré, United Kingdom of Great Britain & Northern Ireland]	mean values and ranges provided in table SPM.2
SPM-2096	SPM	13	51	13	54	This might be be better in a Table [John Mitchell, United Kingdom]	because of the importance and frequent use of these projections they are provided in text, and more comprehensively in table SPM.2.
SPM-2097	SPM	13	51	13	54	To simplify and strengthen the presentation of projections on the various scenarios, take their mean: thus, after the sentence “Global-mean surface temperatures for 2081-2100 (relative to 1986-2005) for the CO2 concentration driven RCPs will likely be in the 5-95% range for the CMIP5 climate models, i.e., 0.2-1.8 Cº (RCP2.6), 1.0-2.6 Cº (RCP4.5), 1.3-3.2 Cº (RCP6.0), and 2.6-4.8 Cº (RCP8.5)” add the following: “The mean warming interval is thus [1.3, 3.1] Cº, with a central estimate in the region of 2.2 Cº. This is 0.6 Cº below the central estimate of 2.8 Cº taken as the average of the six SRES scenarios in the Fourth Assessment Report	reject. Ranges across scenarios cannot be combined. Scenario-specific projections are highly policy-relevant.

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						(2007)." Reason: The central estimate on the six SRES scenarios for 21st-century warming was 2.8 Cº. The fact that the new central estimate is significantly below this should be made explicit. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-2098	SPM	13	51	13	54	Is it a deliberate choice to use "likely" here rather than "medium confidence"? Given the epistemic nature of uncertainty about the correspondence of model projections with reality, would it make sense to use the qualitative rather than quantitative scale for this assertion? [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	revised to "likely in the range" which has a specific meaning for CMIP5 derived projections as explained in table SPM.2, footnote c.
SPM-2099	SPM	13	52	13	52	What does it imply if the CO2 concentration is likely in the 5-95% range of the CIMP5 models? Is the reference to the type of models necessary? [Government of Netherlands]	the projected temperatures are in the range, not the CO2 concentrations which are prescribed.
SPM-2100	SPM	13	52	13	52	The text here on the methodology to assess likely range is not clear and might better be left for the referenced sections. Suggest deleting "in the 5-95% range of the CMIP5 climate models, i.e.,", otherwise this should explain what 5-95% means and why this is likely. [HAROON KHESHGI, United States of America]	"5-95% range" deleted and explained in table SPM.2, footnote c.
SPM-2101	SPM	13	53	13	52	Should the reference be to Figure SPM.6 (not 5).? [Government of Canada]	no.
SPM-2102	SPM	13				Figure SPM.5: 1. Please avoid figure background color. 2. I suggest to reference all diagrams (panels) to only one x-axis and overall vertical grid lines (similar as Figure SPM.1). 3. Please check all tick marks (i. e., style and position). [Oliver Stebler, Switzerland]	copy edit issue. Final layout of figures to be determined
SPM-2103	SPM	13				Figure SPM.6: 1. It is generally recommended for thematic maps (of quantitative variables) to use an equal area projection so that phenomena per unit area are shown in correct proportion (e. g., Hammer projection). The chosen (compromise) projection, Robinson, is a balance between distorsions with the severe drawback to introduce a visualisation bias regarding polar regions with just the largest changes (at least for "average surface air temperature" and "average precipitation"). [See: Slocum, Terry A.; Robert B. McMaster, Fritz C. Kessler, Hugh H. Howard (2005). Thematic Cartography and Geographic Visualization (2nd ed.). Upper Saddle River, NJ: Pearson Prentice Hall. p. 166.; see also http://earthobservatory.nasa.gov/GlobalMaps/; see also http://earthobservatory.nasa.gov/resources/presentations/simmon_agu201112.pdf] 2. Please provide number of CMIP5 models also for panel c. 3. I suggest to avoid figure background color also here. [Oliver Stebler, Switzerland]	Robinson is the default for this assessment. Polar areas need to be visible on maps due to the amplitude of projected changes. Number of models will in panel c added.
SPM-2104	SPM	14	1	14	4	This sentence is written in a very technical way, which reduces its impact from a policy perspective. Suggest simplifying (e.g., "Globally, there is very high confidence that average land-surface air temperature will warm 1.5 more than global average ocean-surface temperature...."). [Government of Canada]	this statement is technical and is deleted.
SPM-2105	SPM	14	1			Again, "global" should be "global-mean" [William Ingram, United Kingdom]	this statement is technical and is deleted.
SPM-2106	SPM	14	2	14	3	Unclear what one standard deviation refers to: is it of model runs (which underestimates uncertainty) or likelihood? Suggest replacing with the likely range, otherwise further explaination is needed of what the s.d. refers to. [HAROON KHESHGI, United States of America]	this statement is technical and is deleted.
SPM-2107	SPM	14	3	14	3	New dot point for ..'There is very high confidence that the Arctic region ….. [Government of Australia]	this statement is technical and is deleted.
SPM-2108	SPM	14	3	14	3	Statement that Arctic will warm most rapidly must have qualifications e.g. about what time periods are being referred to. The Arctic has high decadal variability so we could easily see decades or even longer periods in which the Arctic warms least rapidly, or even cools. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	this statement is moved to the headline statement of this subsection.
SPM-2109	SPM	14	6	14	6	Reference here to "most places" is confusing as there is no sense of scale whereas in most other parts of the SPM there is reference to regional, global, etc. More precise terminology would help, if possible. [Government of Canada]	reject. More information on regions is available in the TS.
SPM-2110	SPM	14	6	14	8	To avoid stating the obvious, delete "It is virtually certain that, in most places, there will be more hot and fewer cold temperature extremes as global temperature increases. These changes are expected for events defined as extremes on both daily and seasonal timescales." Reason: The inclusion of this sentence reads like an attempt to make a meal of future temperature change	reject. Information on extreme climate events are policy-relevant.

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						and its consequences. Better to omit it. [Christopher Monckton of Brenchley, United Kingdom]	
SPM-2111	SPM	14	6	14	11	What do "most places"/"most regions" mean? More than 50% of area? 90%? [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	reject. More information on regions is available in the TS.
SPM-2112	SPM	14	7			Again, the word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	done: "mean" added.
SPM-2113	SPM	14	8			"magnitude" alone would be sufficient, or suppress the word "magnitude" [Government of France]	done: reformulated.
SPM-2114	SPM	14	9			"Although increases in the frequency, duration and magnitude of hot extremes are expected, occasional cold winter extremes will continue to occur" Suggest adding "albeit less frequently than at present" or similar wording to drive home the point about cold extremes. [Government of United States of America]	done: reformulated.
SPM-2115	SPM	14	10	17	14	There are a couple issues with this paragraph: (1) The second sentence says the largest decreases in pH will occur in the low and mid-latitudes and yet Fig SPM.6 seems to show the Arctic and higher latitudes with larger decreases; and (2)The final sentence of this paragraph should indicate how much of a change on ocean pH leads to surface waters becoming corrosive for less stable forms of calcium carbonate; based on the current wording, it seems unlikely that the statement as currently written is true for RCP 2.6. The concepts within the last sentence could also be better explained for non-technical readers. [Government of Canada]	comment wrongly placed. Refers to 17-10 to 17-14. Revised bullet now provides quantitative information for all scenarios and is less technical.
SPM-2116	SPM	14	11	14	11	It might be seen as more policy-neutral if the first 'is' were replaced by 'would be' with the 'will's in lines 12 and 13 became 'would'. [Government of Australia]	bullet deleted.
SPM-2117	SPM	14	11	14	11	The term "20-year maximum temperature event" might not be clear to some readers. [Dian Seidel, United States of America]	bullet deleted.
SPM-2118	SPM	14	11	14	14	This sounds much more scary than it really is. Consider Dallas with a hot continental climate. The 20 year extreme is only slightly more than 1 deg. C above the 10 year extreme, or abot 3.6 deg. C above the annual extreme. [ASHRAE Fundamentals Handbook] [James [Jim] Crawford, United States of America]	bullet deleted.
SPM-2119	SPM	14	11	14	14	This paragraph could be strengthened if it gave a similar statement for the mid-range RCPs. The SPM appears to focus on RCP2.6 and RCP8.5. [Government of Australia]	bullet deleted.
SPM-2120	SPM	14	11	14	14	It is suggested to delete the words that represent the scenario RCP8.5 seperately, such as "under RCP8.5 it is likely ... ", because RCP8.5, in fact, is a rather extreme scenario. The dangers as stressed in such an extreme scenario are far from reality, thus the scenario makes little sense. Moreover, scenarios RCP4.5 and RCP6.0, which are more factual, are neglected. The only comparison of RCP8.5 with RCP2.6 is not sufficient to justify the selection of RCP 2.6. The same deficiency is also found in line 17, page 17. [Government of China]	bullet deleted.
SPM-2121	SPM	14	11	14	14	An important but a very long sentence. Needs to be reformulated. Perhaps splitting it into two might enhance readability. [Government of Finland]	bullet deleted.
SPM-2122	SPM	14	11	14	14	In Long-Term Projections Temperature, mostly global temperature changes are mentioned, while non regions are specified. There is wording such as: "…most regions… Many regions….", But, which regions? Where? Specific regions should be named. [Government of Spain]	bullet deleted.
SPM-2123	SPM	14	11	14	14	Not policy-maker friendly - '20 year maximum temperature event'? By this do we mean a 1 in 20 year heat wave? Current reading is overly technical in its wording, and actually also could be read as meaning that 1 in 20 year cold snaps could become more frequent. [Government of United Kingdom of Great Britain & Northern Ireland]	bullet deleted.
SPM-2124	SPM	14	11	14	15	Long sentence: Split into two : " Under RCP8.5 …. year to annual event. What is currently …." [Christoph Ritz, Switzerland]	bullet deleted.
SPM-2125	SPM	14	11			Please clarify why a result is presented for RCP8.5, and not other scenarios. [Government of New Zealand]	bullet deleted.
SPM-2126	SPM	14	12	14	12	Please include examples of regions where temperature maxima will become more frequent. [Government of NORWAY]	bullet deleted.

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SPM-2127	SPM	14	12	14	13	"a 2 year to annual event" - in other words the weather would become violent and likely unsuitable for agriculture. [Andrew Glikson, Australia]	bullet deleted.
SPM-2128	SPM	14	14			Is there a year-event value/guideline on "exceedingly rare"? [Conor Sweeney, Ireland]	bullet deleted.
SPM-2129	SPM	14	17	14	17	This subheading could maybe be changed to "Long-Term Projections: tropical cyclones" to better reflect the dot points beneath it. [Government of Australia]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2130	SPM	14	17	14	17	The title does not correspond to the following text. "Long-term projections: storms" (or " ...: cyclones"; or " ...: storm frequency and intensity") would be more adequate. 'Atmospheric circulation' seems to point more to topics like storm track shifts, expansion of Hadley cell, NAO, weather patterns, rossby waves, etc. Unfortunately, all these topics are not discussed in the SPM although they contain on the one hand one of the most robust changes (poleward extension of Hadley cell with important consequences like storm track shifts, drying of near-subtropic regions), and on the other hand one of the most important difficulties of models (to simulate the atmospheric circulation and possible changes), which should not be 'hidden'. [Urs Neu, Switzerland]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2131	SPM	14	17	14	50	This summary seems incomplete in terms of projected mid latitude circulation changes. [Government of Australia]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2132	SPM	14	17			Section Long term projections: Atmospheric circulation: should this section contain a summary of expected changes to large-scale circulation features such at jet streams? [Government of United Kingdom of Great Britain & Northern Ireland]	not sufficient information available to elevate to SPM.
SPM-2133	SPM	14	17			The title of this section refers to "Atmospheric Circulation" but the bullet points refer only to tropical and extratropical cyclones. So if nothing is going to be said on storm tracks, jet streams or the Hadley Circulation, I suggest changing the title to "Long-Term Projections: Tropical and Extratropical Cyclones" [Adrian Simmons, United Kingdom]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2134	SPM	14	17			Section: Long Term Projections: Atmospheric Circulation. This section does not correspond to its name as it is about tropical and extratropical cyclones rather than circulation patterns. [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2135	SPM	14	18	14	50	Unless you can demonstrate that climate models are 100% accurate for all climate forces your statements are mere speculation and should be deleted or heavily qualified [John McLean, Australia]	Comment has no scientific basis. Ranges are reported in all projections.
SPM-2136	SPM	14	19	14	19	What does basin-scale projections mean? [Government of Australia]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2137	SPM	14	19	14	24	This conclusion is confusing. It is stated that "in general" there is low confidence in the trends of tropical cyclone frequency and intensity, while the most intense cyclones more likely than not increase substantially. The latter formulation implies high confidence in a substantial increase in the frequency. Putting this together, the conclusion becomes inconsistent. Moreover, section 11.3.2 does not address wind speed and rainfall rates. [Government of Netherlands]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2138	SPM	14	19	14	24	in line with comments on P12 lines 7-8 (above), this may need qualifying - i.e. The reason behind the uncertainty over projections decreasing rather than increasing over time, leading to be able to make a statement with more confidence when describing the frequency of events further into the future. [Government of United Kingdom of Great Britain & Northern Ireland]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2139	SPM	14	19	14	26	Why are summary statements about atmospheric circulation entirely about tropical cyclones? There are very important things to say about other aspects of atmospheric circulation. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	not sufficient information available to elevate to SPM.
SPM-2140	SPM	14	19	14	27	This whole section feels slightly misleading. Can we switch it around so that we're up front about the likely increase in both global mean tropical cyclone max wind speed and rainfall rates, but that the frequency of tropical cyclones is likely to remain unchanged or decrease (by how much? presumably a small amount) and that there's a generally low confidence in basin-scale projections of trends in cyclone frequency and intensity. [Government of United Kingdom of Great Britain & Northern Ireland]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.

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SPM-2141	SPM	14	19			The term "basin-scale" may be obscure to policy makers [Government of United States of America]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2142	SPM	14	21	14	21	" … global frequency of tropical cyclones…" What is a global frequency? Suggestion "globally averaged frequency". Similarely for "global precipitation", e.g. SPM 14 Line 38. and others. [Christoph Ritz, Switzerland]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2143	SPM	14	21			Again, the word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2144	SPM	14	22	14	23	To avoid a probably erroneous speculation, delete “concurrent with a likely increase in both global mean tropical cyclone maximum wind speed and rainfall rates.” Reason: The maximum wind speeds in tropical cyclones are driven chiefly by temperature differentials, which are expected to narrow with warmer weather. [Christopher Monckton of Brenchley, United Kingdom]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2145	SPM	14	23	14	23	"more likely than not" is not part of the AR5 uncertainty guidance. [Government of Germany]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2146	SPM	14	23	14	24	According to chap 1 "more likely than not" is not part of the AR5 uncertainty guidance [Government of Germany]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2147	SPM	14	23	14	24	To bring projections into line with observations and with theory, delete “The frequency of the most intense tropical cyclones is projected to more likely than not increase substantially in some basins”. Reason: Notwithstanding a warming of ~1 K over the past century and a half, there has been no trend in landfalling Atlantic hurricanes throughout the period. In the past two or three decades, there has been a decline in the frequency of the most intense tropical cyclones and typhoons, notwithstanding the warming over the period. The current draft is accordingly at odds with observation, and also with theory, which suggests that the temperature differentials that fuel extreme tropical cyclones will diminish as the world warms. [Christopher Monckton of Brenchley, United Kingdom]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2148	SPM	14	23			"more likely than not" doesn't sound much better. [James [Jim] Crawford, United States of America]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2149	SPM	14	24	14	24	Define "substantially" or delete. [HAROON KHESHGI, United States of America]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2150	SPM	14	26	14	26	This is the first time, extra tropical cyclones are mentioned. Has there been a change detected in the obs? [Government of Germany]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2151	SPM	14	26	14	26	This would seem to suggest a finding that the number of extra-tropical cyclones will decrease. If appropriate, please complement (would bring more comparability with the way of expressing on lines 23-24, same page). [Government of Sweden]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2152	SPM	14	26	14	27	This statement can only be read in conjunction with the previous one, and even then it is too vague. Use of "a few" to describe the percent change is unwise. Such terminology has been known to occupy Plenary delegates for hours if not days in defining what " a few" actually means! Surely some more precise language can be found here. [Timothy Carter, Finland]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2153	SPM	14	26	14	27	It would be preferable to avoid the phrase "a few," as this has quite different meanings in different languages. [Christopher Field, United States of America]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2154	SPM	14	26	14	27	Sentence with quite limited information considering relevancy of extra-tropical cyclones. Please, reconsider providing more information based on future projections of extra-tropical cyclones in chapters 12 and 14. [Government of Finland]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2155	SPM	14	26	14	27	2 lines questionable as they let suppose that the number will decrease; is it so sure? [Government of France]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2156	SPM	14	26	14	27	Somewhat confusing statement. What can be concluded? Does one expect that the global number of extra-	subsection deleted to due to general low confidence

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						tropical cyclones will decrease, but that a decrease of more than a few percent is unlikely? Please - if possible - be more specific. [Government of Netherlands]	here and the goal to shorten the SPM.
SPM-2157	SPM	14	26	14	27	To eliminate a further instance of systemic prejudice in the drafting, rewrite “It is unlikely that the global number of extra-tropical cyclones will decrease by more than a few percent due to global warming” to read “It is likely that the global frequency of extra-tropical cyclones will decrease by a few percent in response to global warming”. Reason: A reduction in extra-tropical cyclones – albeit small – is a good-news consequence of global warming, and should not be deliberately presented in a negative light. [Christopher Monckton of Brenchley, United Kingdom]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2158	SPM	14	26	14	27	How likely is an increase? [Andreas Sterl, Netherlands]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2159	SPM	14	26	14	27	It is unlikely that the global number of extra-tropical cyclones will decrease by more than a few percent due to global warming.' Does this mean it is likley to decrease a few percent? Or is it likley to remain unchanged (no increase nor decrease)? [Line van Kesteren, the Netherlands]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2160	SPM	14	26	14	27	A statement on the possibility of increases would be useful. [Geert Jan van Oldenborgh, Netherlands]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2161	SPM	14	27			"It is unlikely that the global number of extra-tropical cyclones will decrease by more than a few percent due to global warming." Is there a statement that can be made about a poleward shift of ETC? [Government of United States of America]	subsection deleted to due to general low confidence here and the goal to shorten the SPM.
SPM-2162	SPM	14	32	14	33	The assessment of high-latitude precipitation increase here as 'very likely' is in conflict with the regional Arctic summary in chapter 14, p.5 line 36 that states an increase as 'likely'. And both of these optimistic confidence levels are in conflict with the text in section 14.7.2 that clearly indicates significant model diversity that likely outweighs the ensemble mean. The authors should re-asses the degree of confidence that can be associated with this statement. [Government of United States of America]	headline statement is revised and now mentions "regional exceptions". High-latitude is more general than "Arctic" as indicated by the reference to figure SPM.7
SPM-2163	SPM	14	32	14	34	This statement is not complete. It is important to note that some mid-latitude regions are also consistently projected to shift from a humid to drier climate regime. This is particularly the case in Central and Eastern Europe (e.g. Seneviratne et al. 2006, Nature; Boe and Terray 2008, GRL). Omitting this statement may give the wrong impression that "wet regions are getting wetter, and dry regions are getting drier", although this is an oversimplification. In addition, it would be helpful to provide a corresponding statement for tropical regions (even if confidence is limited there). References: Seneviratne, S.I., D. Luethi, M. Litschi, and C. Schär, 2006, Nature, 443, 205-209; Boe, J., and L. Terray, 2008, GRL, 35, L05702, doi:10.1029/2007GL032417. [Sonia Seneviratne, Switzerland]	this subsection is substantially revised and now presents more regional detail.
SPM-2164	SPM	14	32	14	36	A summary of the equatorial zonal rainfall projections (large spread or lack of consensus) would be useful in the box. It would also be useful to give examples of these wet and dry areas. [Government of Australia]	equatorial Pacific now mentioned.
SPM-2165	SPM	14	32	14	36	The statement introduces regions. It would help to show how policy relevant variables (such as heavy precipitation, heat waves and storms) change for the different regions. This can be shown for two RCPs to maintain a clear overview. [Government of Netherlands]	this subsection focuses on the water cycle.
SPM-2166	SPM	14	32	14	36	It would be good to give examples of these wet and dry areas [Penny Whetton, Australia]	equatorial Pacific now mentioned, as well as some more regional information in following bullets.
SPM-2167	SPM	14	33	14	33	Please replace "arid and semi-arid" with "dry and semi-dry" [Government of NORWAY]	"arid" replaced
SPM-2168	SPM	14	33	14	34	It says: “Many regions in the mid-latitudes that are arid and semi-arid will likely experience less precipitation” which regions?, specific regions names should be specified. [Government of Spain]	reject. Regional specificity sufficient for SPM.
SPM-2169	SPM	14	33			"mid-latitudes" misleading - these are very broadly "subtropical": the dry regions between the ITCZ & the storm tracks (excluding ones that are dry because of altitude, e.g. Tibet, or rain shadow, e.g. the Pampas). I can't see any brief way of saying this clearly & correctly. I guess "many" was intended to gloss over the complication, but I do think the current text is misleading [William Ingram, United Kingdom]	revised headline statement, and more specific regional information in following bullets.

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SPM-2170	SPM	14	35			magnitude and geographical extent? [Government of France]	sentence removed.
SPM-2171	SPM	14	38	14	41	Why is range of sensitivities for RCP2.6 greater than for the other models combined? [Government of Australia]	bullet deleted because it is too technical for SPM.
SPM-2172	SPM	14	38	14	41	In the summary, would it not be best to present all temperatures in °C (here percent per degree Celsius instead of per Kelvin) [Peter Guttorp, United States of America]	bullet deleted because it is too technical for SPM.
SPM-2173	SPM	14	38	14	41	It is virtually certain that global precipitation will increase with global mean surface temperature (see Figure SPM.5). It is likely that the rate of increase of precipitation with temperature will be in the range 1–3% K–1, for scenarios other than RCP2.6. For RCP2.6 the range of sensitivities in the CMIP5 models is 0.5–4.0% K–1 at the end of the 21st century.' Why will there be an increase in global precipitation with global surface temperature? Until now we have not seen this while global mean surface temperature has been rising, please add an explantion why we did not detect an increase in global precipitation until now. [Line van Kesteren, the Netherlands]	bullet deleted because it is too technical for SPM.
SPM-2174	SPM	14	38			Again, "global" should be "global-mean" [William Ingram, United Kingdom]	bullet deleted because it is too technical for SPM.
SPM-2175	SPM	14	39			I think this needs either global-mean" repeated twice or - which actually I think would be clearer - "of precipitation with temperature" omitted so the more detailed words of the previous sentence clearly apply [William Ingram, United Kingdom]	bullet deleted because it is too technical for SPM.
SPM-2176	SPM	14	40	14	40	Change “range of sensitivities' to 'range of rate of precipitation increase' [Government of Netherlands]	bullet deleted because it is too technical for SPM.
SPM-2177	SPM	14	40	14	41	Shift to units of Kelvin appears odd and not helpful to policymakers. [Government of Australia]	bullet deleted because it is too technical for SPM.
SPM-2178	SPM	14	40	14	41	Please identify what the "K" stands for. [Government of Canada]	bullet deleted because it is too technical for SPM.
SPM-2179	SPM	14	40	14	41	Please explain the unit of the increase in precip (percentage per K): percentage of what? and wrt to current levels or pre-industrial? [Government of Germany]	bullet deleted because it is too technical for SPM.
SPM-2180	SPM	14	40	14	41	Why is Kelvin being used here, when we've been using C until now. Consistency is especially required in a policy-facing document. [Government of United Kingdom of Great Britain & Northern Ireland]	bullet deleted because it is too technical for SPM.
SPM-2181	SPM	14	40			Omit "of sensitivities" - very confusing as the word "sensitivity" last meant ECS [William Ingram, United Kingdom]	bullet deleted because it is too technical for SPM.
SPM-2182	SPM	14	41	14	41	The larger range for the RCP2.6 scenario could create the false and simplistic impression that a world in which mitigation is pursued aggressively is also a wetter one, with the upper bound of ppt increase being greater (4% per degree K) for this scenario than the others (3% per K), but yet we can see that the lower bound of RCP2.6 is lower than the others - so the spread due to modelling uncertainty is bigger, essentially. Can an explanation be given here, for the wider range, to avoid misleading messaging? [Government of United Kingdom of Great Britain & Northern Ireland]	bullet deleted because it is too technical for SPM.
SPM-2183	SPM	14	43	14	45	It is not clear what "relatively uncertain" means in the first sentence of this bullet. Does this mean that there is lower confidence in the "likely" assignment in the second sentence than in other likelihood assignments in this subsection? [Christopher Field, United States of America]	bullet deleted.
SPM-2184	SPM	14	43	14	45	Can the sentences be switched around in this paragraph so we're up front about the potential change and then qualify it with the statement about relative uncertainty compared with other aspects of the hydrological cycle? Also, this is a statement about the relative certainty rather than the absolute, which is what the IPCC uncertainty intervals should describe. [Government of United Kingdom of Great Britain & Northern Ireland]	bullet deleted.
SPM-2185	SPM	14	43			I think "Regional to global-scale" fairly clearly means "regional-scale upwards to the global mean", but could still be clarified [William Ingram, United Kingdom]	bullet deleted.
SPM-2186	SPM	14	44	14	45	Is this also true with "HITOP" models? [John Mitchell, United Kingdom]	bullet deleted.
SPM-2187	SPM	14	44	17	48	The long term projections are even wider and even more uncertain, but I suppose you are relying on the press and the activists who always chiiose the extreme values for their propaganda [Vincent Gray, New Zealand]	bullet deleted.

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SPM-2188	SPM	14	45	14	45	"when"=> "as" [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet deleted.
SPM-2189	SPM	14	45			Again, the word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	bullet deleted.
SPM-2190	SPM	14	47	14	50	This statement seems contrary to the grey box above - ie 'there will be less precipitation in arid and semi arid', contrasting to 'in some arid and semi arid regions extreme precipitation events will be very likely more intense and more frequent'. [Government of Australia]	bullet deleted and information on changes in extreme precipitation events incorporated in more concise form in bullet 2 of this subsection.
SPM-2191	SPM	14	47	14	50	what are "events" (first sentence) and how are they related to "storms" (second sentence)? [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet deleted and information on changes in extreme precipitation events incorporated in more concise form in bullet 2 of this subsection. "events" only used as "extreme precipitation events".
SPM-2192	SPM	14	47	14	50	The term "more intense" is again used here for storms, without a definition. See my previous comment for Page SPM4 lines 16-17. Again you might consider expanding the wording to " … a shift to more intense (stronger wind-speed and heavier rainfall rate) individual storms ..." [David Wratt, New Zealand]	bullet deleted and information on changes in extreme precipitation events incorporated in more concise form in bullet 2 of this subsection. Storms no longer mentioned.
SPM-2193	SPM	14	47			Again, the word "global" used here has 2 opposite potential meanings, "averaged over the globe" & "varying over the globe". It is completely unclear which is meant [William Ingram, United Kingdom]	bullet deleted.
SPM-2194	SPM	14	48	14	49	" fewer weak storms": ? [Government of France]	bullet deleted and information on changes in extreme precipitation events incorporated in more concise form in bullet 2 of this subsection. Storms no longer mentioned.
SPM-2195	SPM	14	48	14	49	We recommend that you make the sentence that describes storms into a separate bullet point after the bullet point that are linked to precipitation. [Government of NORWAY]	storms no longer mentioned in SPM.
SPM-2196	SPM	14	48	14	49	"Storms" would seem to be a term that is a bit "off". Suggest "heavy precipitation events" or suchlike, to be clearer. [Government of Sweden]	storms no longer mentioned in SPM.
SPM-2197	SPM	14	48		49	I don't think "storms", with its primary meaning "winds", is correct here (though it does mirror 12.4.5) : rain events are surely what is meant [William Ingram, United Kingdom]	storms no longer mentioned in SPM.
SPM-2198	SPM	14	49	14	50	Could more information be given on “some arid and semi-arid regions”? E.g. is this a considerable percentage of the arid and semi-arid regions? How can these regions be characterized (do they have specific features which evoke more intense and frequent extreme precipitation events) ? [Government of Netherlands]	bullet deleted and information on changes in extreme precipitation events incorporated in more concise form in bullet 2 of this subsection. Region better specified.
SPM-2199	SPM	14	49	14	50	This is a key finding that is important to include in the SPM. However it would be helpful if it somewhere, either in the SPM or in the report, is indicated examples of regions which are expected to experience more severe extreme precipitation. Please consider to replace "arid and semi-arid" with "dry and semi-dry". [Government of NORWAY]	bullet deleted and information on changes in extreme precipitation events incorporated in more concise form in bullet 2 of this subsection. Region better specified.
SPM-2200	SPM	14	51	14	51	We propose that Figure 10.27 (should probably be 12.27) in chapter 12 about return values and return periods is included at this point in the SPM. [Government of NORWAY]	reject. Such a figure (based on CMIP3) was already featured in the SREX and the information is not sufficiently different to warrant a figure in the SPM.
SPM-2201	SPM	14		15		The sections on phenomena and circulation in the SPM should link better maybe merge. Also are cyclones the only atmospheric circulation change mentioning? What about the annular modes? [Gabriele Hegerl, United Kingdom]	section on climate phenomena is eliminated because of its brevity. Some of the content incorporated into subsection "Atmosphere: Water Cycle".
SPM-2202	SPM	15	0			Surprised at the projections for September Arctic sea extent with the text emphasising the end of the century. I don’t believe the observational evidence supports this and I would also challenge the text on SPM-9 on the current skill of the models in this area. [Government of United Kingdom of Great Britain & Northern Ireland]	subsection "Cryosphere" now contains more specific projection on Arctic sea ice extent with specific information on model quality and confidence (bullet 2).
SPM-2203	SPM	15	1	15	1	The term "climate phenomena" may not be understood by decision makers. We are talking about large scale phenomena and oscillations. References to multidecadal oscillations are missing. [Government of France]	section on climate phenomena is eliminated because of its brevity. However term "climate phenomena" is

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
							part of the approved outline of WGI.
SPM-2204	SPM	15	1	15	1	I understand what is meant by climate phenomena and it's obvious once you dig into the detail, but is this the agreed terminology? It's quite vague until you read the detail. Couldn't they be called 'Large scale weather events' or some such? [Government of United Kingdom of Great Britain & Northern Ireland]	agreed terminology in approved WGI outline.
SPM-2205	SPM	15	1	15	3	"Climate phenomena" need to be defined. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	section on climate phenomena is eliminated because of its brevity. However term "climate phenomena" is part of the approved outline of WGI.
SPM-2206	SPM	15	1	15	36	Changes to ENSO and the AMOC appear out of context and disconnected in this structure of the SPM. It would be good if they were more closely linked to the observations in an attempt to provide interpretative value as to why these things are even included in an SPM. [Government of Australia]	section on climate phenomena is eliminated because of its brevity. Monsoon and ENSO incorporated in subsection on water cycle.
SPM-2207	SPM	15	1	15	36	only one section would be better, ENSO and AMOC belonging to the same type of phenomena: title:"oceanic phenomena" [Government of France]	section on climate phenomena is eliminated because of its brevity. Monsoon and ENSO incorporated in subsection on water cycle.
SPM-2208	SPM	15	1			It is suggested to explain the term "climate phenomena" in the glossary. [Klaus Radunsky, Austria]	"Climate" is in the WGI AR5 Glossary and phenomena is used in its ordinary meaning. Note that there is an entire Chapter in the WGI AR5 entitled "Climate Phenomena and their Relevance for Future Regional Climate Change" which clarifies the meaning of the term.
SPM-2209	SPM	15	3	15	3	Suggest better explaining or identifying what is meant by "Climate phenomena", as this term will not have meaning for non-scientists. The word "phenomenon" is also used in Table SPM.1, but to describe extreme weather/climate events, whereas in this section, it is being used to describe persistent and larger scale phenomena - this could be confusing. [Government of Canada]	section on climate phenomena is eliminated because of its brevity. "Phenomenon" now only used in column title of table SPM.1
SPM-2210	SPM	15	3	15	3	Please add after Climate phenomena "(like Monsoon, El Nino, etc.)" [Government of NORWAY]	section on climate phenomena is eliminated because of its brevity. Monsoon and ENSO incorporated in subsection on water cycle.
SPM-2211	SPM	15	3	15	4	uncertainties in physical understanding' is one reason that future projections are difficult. While the models are improving, it is likely that limits in computing power (the ability to model small time and space scales) still limit our ability to model phenomena. In addition, it is likely a physical characteristic of the complex system that multiple future states are equally plausible and, for some phenomena and/or regional specific projections, even of opposite sign. Improved understanding will deliver only so much. Hence the low confidence is a function of physical reality as well. This type of text gets extracted from reports such as the SPM and should more accurately address both reality and expectation in terms of what the science can deliver in the future. Additionally, the section then goes on to summarise very likely and likely changes, and it would be good to partition where likelihood and uncertainty lie as a general single point in the box. [Government of Australia]	section on climate phenomena is eliminated because of its brevity.
SPM-2212	SPM	15	3	15	6	Clarification of what "climate phenomena" means specifically in this context would be very helpful. Is this the same definition used in SREX or a more narrow definition? [William Anderegg, United States of America]	section on climate phenomena is eliminated because of its brevity. Monsoon and ENSO incorporated in subsection on water cycle.
SPM-2213	SPM	15	3	15	6	This conclusion is redundant. It does not say anything in particular, except that everything is uncertain. There is no practical information for policy makers. Either skip or become more specific. In addition, how must long-term projections be qualified in general if there is low confidence in many aspects? And how should near-term projections be qualified, if they have even lower confidence than long-term projections (see conclusion page 12, lines 6-8)? In the highlighted part of this statement it is indicated that projections in many aspects of these climate phenomena have low confidence. In the conclusions following this part (lines 8-19) this is only for the frequency of the central pacific type of El Nino (see line 15). [Government of Netherlands]	section on climate phenomena is eliminated because of its brevity. Monsoon and ENSO incorporated in subsection on water cycle.

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SPM-2214	SPM	15	3	15	19	In the box it says there's overall low confidence, but in the following paras projections are 'likely' and 'very likely'. This may raise bigger issues with respect to how the confidence and likelihood frameworks work side-by-side and I realise this is unlikely to be addressed at this late stage, but this could be confusing for a policymaker. [Government of United Kingdom of Great Britain & Northern Ireland]	section on climate phenomena is eliminated and headline statement removed.
SPM-2215	SPM	15	3	15	19	Unless you can demonstrate that climate models are 100% accurate for all climate forces your statements are mere speculation and should be deleted or heavily qualified [John McLean, Australia]	Comment has no scientific basis. Ranges are reported in all projections.
SPM-2216	SPM	15	4			"well simulated" is questionable or needs more explanations on the way by which the simulation is made [Government of France]	section on climate phenomena is eliminated and headline statement removed.
SPM-2217	SPM	15	5			A number of changes in phenomena are given as likely or very likely, which appears to be contradicting the overall assessment that there is low confidence. According to the uncertainty language guidance notes I believe this is not consistent. [Reto Knutti, Switzerland]	section on climate phenomena is eliminated and headline statement removed.
SPM-2218	SPM	15	6	15	6	It would be clearer to indicate that why projections can be robust when there is low confidence in modeling the phenomena. [Kristie Ebi, United States of America]	section on climate phenomena is eliminated and headline statement removed.
SPM-2219	SPM	15	8	15	8	Include high emission scenarios' names [Luisa Cristini, United States]	bullet reformulated and incorporated into subsection "Atmosphere: Water cycle"
SPM-2220	SPM	15	8	15	9	Typically reference has been to RCPs rather than traditional emissions scenarios. Here the terminology is for high emissions scenarios and the relationship to RCP's is unclear. [Government of United Kingdom of Great Britain & Northern Ireland]	bullet reformulated and incorporated into subsection "Atmosphere: Water cycle"
SPM-2221	SPM	15	8	15	9	From Chapter 14 - should read 'intensity and area of monsoons to increase' not just total rainfall [Government of United Kingdom of Great Britain & Northern Ireland]	bullet reformulated and incorporated into subsection "Atmosphere: Water cycle"
SPM-2222	SPM	15	8	15	9	The assessment of a very likely increase in global monsoon area and global monsoon total precipitation by the end of the 21st century (in high emission scenarios) seems overly confident. Has there been a detectable increase in these already? A significant trend was mentioned on Ch. 14, p. 10, but the period was relatively short (1979-2008) and I wonder whether this is truly detecting an anthropogenic change. The global monsoon considers both the land and oceanic components of the monsoon which seems a like an unconventional metric. This issue may need more scrutiny before acceptance of such high likelihood levels. [Thomas Knutson, United States of America]	bullet reformulated, likelihoods revised and no reference to specific emission scenario given. Bullet is incorporated into subsection "Atmosphere: Water cycle".
SPM-2223	SPM	15	8	15	11	Suggest putting the statement about the lengthening of the monsoon season up front and then qualifying the statement with the other information in the paragraph. It would be useful also to describe the changes in the global monsoon area and precipitation in lower emission scenarios as only presenting the high emission scenario likelihood alone makes interpretation very difficult. [Government of United Kingdom of Great Britain & Northern Ireland]	bullet reformulated, likelihoods revised and no reference to specific emission scenario given. Bullet is incorporated into subsection "Atmosphere: Water cycle".
SPM-2224	SPM	15	8			What on earth is a global monsoon? [William Ingram, United Kingdom]	agree. bullet reformulated and incorporated into subsection "Atmosphere: Water cycle".
SPM-2225	SPM	15	9	15	10	The monsoon onset and retreat dates could not be the same for different regions (Africa, India), unless the projection at regional scale is uncertain. [Government of Benin]	bullet reformulated and incorporated into subsection "Atmosphere: Water cycle"
SPM-2226	SPM	15	9	15	10	"become earlier" and "become later" is strange wording. Suggest the language in the underlying chapter is used (see Chapter 14, page 14-14, lines 33 and 34) where the wording is "come earlier" and "delay" respectively. A suggested alternative to "delay" would be "happen later" if this is thought to be clearer. The sentence would thus read "Monsoon onset dates are likely to come earlier or not to change much, and the monsoon retreat dates will very likely delay [or alternatively: happen later] [Government of New Zealand]	bullet reformulated and incorporated into subsection "Atmosphere: Water cycle"
SPM-2227	SPM	15	9	15	11	I think the statement on onset dates depends strongly on the definition of the onset and retreat of a monsoon season, which is not unique. Using another definition, observations in Southern Africa show the opposite up to now, Tadross et al. J.Clim. 2005, which was confirmed in the CMIP3 models (Shongwe et al, J.Climate 2009) but contradicts this statement. [Geert Jan van Oldenborgh, Netherlands]	revised statement is rather general and not specific to a region such as South Africa.

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SPM-2228	SPM	15	13	15	13	I suggest rewording " … very likely remains …" as " … will very likely remain …" [David Wratt, New Zealand]	done.
SPM-2229	SPM	15	13		16	Delete the last sentence in this bullet point. Low confidence statements should generally be avoided in SPM. [Terje Wahl, Norway]	reformulated. However, even low confidence statements are informative for policymakers, in particular when regional changes are concerned.
SPM-2230	SPM	15	14	15	16	There is no consensus on future central Pacific warming and CP El Nino and the confidence of this speculation is so low that it should be removed from the assessment. [Government of United States of America]	reformulated and reference to different ENSO types removed.
SPM-2231	SPM	15	14	15	16	Given the debate that exists on the very existence of a "central Pacific El Nino" (14.4.4) and the low confidence in ENSO projections, I would remove that statement from the SPM. IPCC is to provide an assessement, not to contribute to a debate by highlighting one side at the expense of the other. IPCC AR6 will be a better place to discuss this once the science is settled. [Eric Guilyardi, France]	reformulated and reference to different ENSO types removed.
SPM-2232	SPM	15	14	15	16	After reviewing the section, I don't think the assessment is justified. It is also slighly misquoted. Here is what was in Ch. 14: "There is medium confidence that • The intensity of central Pacific warming (CP El Niño) is likely to increase with increased greenhouse warming." Although the text and chain of logic are hard to follow, this seems to be based on a study looking at a selection of seven models. This finding needs some further scrutiny. Also I think the executive summary of Ch. 14 says that the confidence is low on this assessment (Ch. 14, p. 4, line 28-29) [Thomas Knutson, United States of America]	reformulated and reference to different ENSO types removed.
SPM-2233	SPM	15	15	15	15	Are there types of El Nino other than central Pacific? [Kristie Ebi, United States of America]	reformulated and reference to different ENSO types removed.
SPM-2234	SPM	15	15	15	16	Says "there is low confidence that the central Pacific type of El Niño will become more frequent" while the text in section 14.4.6 says "there is medium confidence that the intensity of central Pacific warming (CP El Niño) is likely to increase". The SPM should reflect what the main report says, but these two are different messages. This needs to be clarified. [Ken Takahashi, Perú]	reformulated and reference to different ENSO types removed.
SPM-2235	SPM	15	18	15	18	Please explain "teleconnection patterns". [Government of Canada]	bullet removed.
SPM-2236	SPM	15	18	15	18	"Teleconnection patterns" should be explained here or in the Glossary. An alternative could be to include a page with abbreviations and definition of key terms used in the SPM at the end of the SPM. [Government of NORWAY]	"Teleconnection patterns" is in the WGI Glossary. The term, however, is no longer used in the SPM.
SPM-2237	SPM	15	18	15	19	The literature referenced in 14.4 is noted but it is arguable whether there is sufficient basis for confidence. Teleconnections need to be explained and the meanings or implications of this projection stated. [Government of Australia]	bullet removed.
SPM-2238	SPM	15	18	15	19	What are teleconnection patterns? [Government of Netherlands]	bullet removed.
SPM-2239	SPM	15	18	15	19	What does this teleconnection issues actually mean for weather on the ground? At the moment this para is too abstract for policy-makers. [Government of United Kingdom of Great Britain & Northern Ireland]	bullet removed.
SPM-2240	SPM	15	18	15	19	Based on the material assessed in 14/4/3 and the associated uncertainties, I am not sure this statement on an eastward shift of ENSO teleconnections should sit in the SPM. [Eric Guilyardi, France]	bullet removed.
SPM-2241	SPM	15	18	15	19	I'm not convinced about this "likely" assessment that ENSO teleconnections patters will move eastward. I did a quick check on some of the underlying literature. Stevenson (2012, GRL) CMIP5 study concludes: "Atmospheric teleconnections also show differences between models where ENSO amplitude does and does not respond to climate change; in the former case El Nino/La Nina related sea level pressure anomalies strengthen with CO2 and in the latter they weaken and shift polewar and eastward." In any case, this assessment needs to be carefully scrutinized. [Thomas Knutson, United States of America]	bullet removed.
SPM-2242	SPM	15	18	15	19	What is the confidence in this statement? I think confidence is more appropriate than likelihood here. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet removed.
SPM-2243	SPM	15	18		19	Based on poor understanding of past El Nino variability and change (over holocene) are we really THAT	bullet removed.

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						confident in this? Very likely seems too strong [Gabriele Hegerl, United Kingdom]	
SPM-2244	SPM	15	18			"teleconnection patterns" is a very technical term. The effect should be elaborated. [Government of Denmark]	bullet removed.
SPM-2245	SPM	15	18			"teleconnection" is a specialised term that may not be understood by policymakers. The underlying Chapter (Chapter 14) doesn't help but we do note that "teleconnection" is included in the glossary. Some further explanation in the SPM would be helpful given that this issue is considered important enough to be included in the SPM. [Government of New Zealand]	bullet removed.
SPM-2246	SPM	15	18			Do policy-makers know what a teleconnection is? Even if so, does this statement convey anything useful for making policy? [William Ingram, United Kingdom]	bullet removed.
SPM-2247	SPM	15	22	15	36	Unless you can demonstrate that climate models are 100% accurate for all climate forces your statements are mere speculation and should be deleted or heavily qualified [John McLean, Australia]	Comment has no scientific basis. Ranges are reported in all projections.
SPM-2248	SPM	15	24	15	24	Include AMOC full name. Also earlier. [Luisa Cristini, United States]	done.
SPM-2249	SPM	15	24	15	24	Spell out AMOC again here (for policy makers) [Government of France]	done.
SPM-2250	SPM	15	24	15	24	Please spell out AMOC [Government of NORWAY]	done.
SPM-2251	SPM	15	24	15	25	The reading of this sentence "best estimate decrease in 2100 of about 20-30%" infers that that change will happen "in" 2100, or will the change happen "by" 2100? [Government of Canada]	reformulated
SPM-2252	SPM	15	24	15	25	We suggest to reformulate this conclusion: “It is very likely that the AMOC will weaken over the 21st century. There is however low confidence in the magnitude of the weakening, but it is unlikely that the decrease is less than 20% for the RCP4.5 scenario and less than 35% for the RCP8.5 scenario. It is unlikely that the AMOC wll collapse beyond the 21st century for the scenarios considered” . The reason for this change is motivated by Drijfhout et al. (2012). See our comments for chapter 12 (page 68, line 31 – 34) for more details. [Government of Netherlands]	AMOC now in two bullets with more specific information, including confidence level.
SPM-2253	SPM	15	24	15	25	To align the models’ projections with elementary celestial mechanics and physics, delete “It is very likely that the AMOC will weaken over the 21st century with a best-estimate decrease in 2100 of about 20-30% for the RCP4.5 scenario and 36-44% for the RCP8.5 scenario.” Reason: As Professor Karl Wunsch has pointed out, while the Earth rotates and the wind blows the AMOC will circulate. The comparatively small anthropogenic warming to be expected this century will scarcely influence either mean wind speeds, still less the rotation of the Earth, so the AMOC will not be much affected by warmer weather, though there may be a small effect from modest changes in salinity distribution. Furthermore, the offending sentence has the air of a political and not a scientific point. What is meant by “weaken”, and how is “weakening” objectively measured? If this point is to be retained at all (and deletion is recommended), it must be rewritten to answer these questions. [Christopher Monckton of Brenchley, United Kingdom]	comment has no scientific basis. statement is based on the analysis of the CMIP5 simulations . Now revised and levels of confidence is provided.
SPM-2254	SPM	15	24	15	27	I think it is worth bringing forth in this section somehow, however, that these "very unlikely" and "unlikely" are, in fact, non-zero probabilities. Mentioning that "very unlikely" means there still exists a 0-10% probability of this occurance and similarly "unlikely" as 0-33% probability would be very critical information to provide policy-makers. [William Anderegg, United States of America]	AMOC now in two bullets with more specific information, including confidence level.
SPM-2255	SPM	15	24	15	27	It would be good to spell out AMOC the first time you use it in this paragraph, and to give the climate significance of this forecast. [James [Jim] Crawford, United States of America]	done.
SPM-2256	SPM	15	24	15	27	To be consistent with the range of scenarios an estimate is also needed for the RCP2.6 scenario. [European Union]	will be provided when analysis ready.
SPM-2257	SPM	15	24	15	27	The acronym “AMOC” not defined [Government of Kenya]	done.
SPM-2258	SPM	15	24	15	27	Why is RCP2.6 not mentioned (as a lower boundary)? [Government of Netherlands]	will be provided when analysis ready.
SPM-2259	SPM	15	24	15	27	‘AMOC’ needs to be expanded again (first used on page 4, but a bit a bit hard to follow this through when reading) (Atlantic Meridional Overturning Circulation) [Government of New Zealand]	done.

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SPM-2260	SPM	15	24	15	27	What is meant by "best estimate"? Is this just based on raw model results - if so need to say. Also, I don't think we have sufficient confidence to say it is very unlikely the AMOC will undergo an abrupt transition especially as the statement says nothing about the amplitude of such a transition. I suggest it would be best to say there is low confidence in our ability to predict possible abrupt transitions. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	"best estimate" eliminated. Expanded into two bullets and "low confidence" added.
SPM-2261	SPM	15	24			Again, what is meant by "best estimate" - "most likely value" (MLE), median, or what? [William Ingram, United Kingdom]	"best estimate" eliminated.
SPM-2262	SPM	15	26	15	27	There is a reference here to "the scenarios considered" without an explanation of what scenarios these are. Would it be correct (and more informative) to say " … and it is unlikely that the AMOC would collapse beyond the 21st Century FOR THE EXTENDED RCP SCENARIOS" ? [David Wratt, New Zealand]	"considered scenarios" now refer to 21st century. Statement on post 21st century is kept more general and no scenarios are mentioned.
SPM-2263	SPM	15	29	15	31	The climate significance of this observation should be indicated. [James [Jim] Crawford, United States of America]	bullet deleted.
SPM-2264	SPM	15	30			If net evaporation "dominates" [something] in the subtropics, the text should indicate what dominates in the high latitudes. [James [Jim] Crawford, United States of America]	bullet deleted.
SPM-2265	SPM	15	31			Replace "fresher" with "less saline" to make the terminology in the paragraph consistent i.e. "more saline" in line 30 and "less saline" in line 31. [Government of New Zealand]	bullet deleted.
SPM-2266	SPM	15	32			the paragraph on acidification (p 17 line 10-14) would have a better place there [Government of France]	bullet deleted.
SPM-2267	SPM	15	33	15	36	theese 4 lines are not perfecty clear; are they necessary? [Government of France]	bullet deleted.
SPM-2268	SPM	15	33	15	36	What does ocean warming mean for the release of methane from methane clathrate deposits? [Government of Netherlands]	bullet deleted.
SPM-2269	SPM	15	33	15	36	The rate of the heat uptake increase with increasing RF/temperature increase. Is this good or bad news? Please clarify. Please add information about how oceanic uptake of CO2 is projected to change in the future (over the timespan that the heat uptake will increase with increased RF/atmospheric warming). Is it a limit to heat uptake/a point where the heat uptake will be reduced in the oceans as warming of the atmosphere reaches a certain level? [Government of NORWAY]	bullet deleted.
SPM-2270	SPM	15	34	15	35	The radiative forcing does not differ greatly for several decades, so the integral effect cannot. [James [Jim] Crawford, United States of America]	bullet deleted.
SPM-2271	SPM	15	34	15	36	For the non-expert audience it could be beneficial to explain what is meant by the 'ocean integrating the surface heat flux'. Could the word 'combining' be used instead? [Government of United Kingdom of Great Britain & Northern Ireland]	bullet deleted.
SPM-2272	SPM	15	34	15	36	The statement "Because…" seems to be about the near term and out of place here [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet deleted.
SPM-2273	SPM	15	39	16	7	Please mention what will happen to Greenland and Antartica, even if there will not be much change, or if uncertainties are high. [Government of Germany]	Greenland and Antarctica are relevant regarding sea level and long-term evolution of the climate system. Therefore they are mentioned in subsections "sea level" and "climate stabilization, ..."
SPM-2274	SPM	15	39	16	7	Unless you can demonstrate that climate models are 100% accurate for all climate forces your statements are mere speculation and should be deleted or heavily qualified [John McLean, Australia]	comment has no scientific basis. Uncertainties are assessed and communicated.
SPM-2275	SPM	15	39			There should be a discussion of the future of tropical glaciers (e.g. Vuille et al., 2008, doi:10.1016/j.earscirev.2008.04.002). [Ken Takahashi, Perú]	more generally, projection of glacier volume is now provided, and elevated to headline statement.
SPM-2276	SPM	15	41	15	41	Suggest this is 'virtually certain' considering (1) the unanimous modelling projections in CMIP3 and 5 (2) the level of physical understanding of high latitude processes including the regionally strong positive surface albedo feedback and (3) the observed sensitivity of Arctic ice and snow cover to warming of recent decades. [Government of Australia]	reject. due to the restricted number of models, the assessment is kept at this level.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-2277	SPM	15	41	15	44	This conclusions totally ignores past temperature fluctuations in the arctic, including Greenland, that show a very systematic and consistent pattern of 25-30 warm cycles and cool cycles. The IPCC assumes a linear upward warming trend and completely ignores the very excellent data showing that the Arctic undergoes warming and cooling cycles just like the rest of the world. By ignoring the data proving this, the "very likely" projection of only a warming trend completely misses the point and is not scientifically sound. [Don Easterbrook, United States of America]	reject. Statement is about Arctic sea ice changes for which quantitative detection and attribution studies are available.
SPM-2278	SPM	15	41	15	44	no mention of Antarctic or other aspects of cryosphere [Government of New Zealand]	Greenland and Antarctica are relevant regarding sea level and long-term evolution of the climate system. Therefore they are mentioned in subsections "sea level" and "climate stabilization, ...". Glaciers are now included as a new bullet and in the headline statement.
SPM-2279	SPM	15	41	15	44	Whilst this is a draft, not referencing the 2012 Arctic sea-ice minima here makes this section already out-of-date so must be updated. [Government of United Kingdom of Great Britain & Northern Ireland]	SPM does not refer to individual years.
SPM-2280	SPM	15	41			Given that models still underestimate the observed Arctic sea ice decline it might be useful to say something like "a decline significantly faster than projected by the models is possible". [Reto Knutti, Switzerland]	uncertainty is now given by medium confidence.
SPM-2281	SPM	15	42	15	44	For a non-expert, the series of conclusions need to be elucidated more clearly. How can you be so sure that the Arctic becomes ice free, while (1) there is low confidence in many climate phenomena (conclusion lines 3-6), and (2) low confidence in Greenland and Antarctica melting (conclusions page 16, line 37-42)? Perhaps scientifically correct, for a non-expert this conclusion sequence is not logical. [Government of Netherlands]	headline statement and bullet covering Arctic sea ice are revised. Level of confidence is indicated now.
SPM-2282	SPM	15	42			Once again, clarify which of the opposite potential meanings of "global" is meant [William Ingram, United Kingdom]	noted.
SPM-2283	SPM	15	43	15	44	Should the period be early autumn rather than late summer? [Government of Australia]	"late summer" replaced by "September"
SPM-2284	SPM	15	43	15	44	By what year or time frame is it likely there will be a nearly ice-free Arctic Ocean in late summer? Does the "within the 21st century" timeframe presented in the sentence above continue to apply to this sentence? [Government of Canada]	statement revised to be more specific (bullet 2)
SPM-2285	SPM	15	43	15	44	temperature greater than 2degC' or 'temperature of 2degC above present, or greater'? Bit of a difference, esp. when we've been saying that 2 degC is a signif temp when it comes to avoiding critical thresholds in the climate system. [Government of United Kingdom of Great Britain & Northern Ireland]	reference to 2°C deleted.
SPM-2286	SPM	15	43	15	44	Can we add, to the end of this para: 'with rate of reduction in ice linked to future atmospheric ghg concentration' as this appears to be the case, borne out by the following bullets, and feels significant enough to include here. [Government of United Kingdom of Great Britain & Northern Ireland]	reject. the link to GHG is not direct.
SPM-2287	SPM	15	43			"present" being 1986-2005? [Government of Denmark]	headline reformulated.
SPM-2288	SPM	15	43			Discussing "2C above present" is potentially confusing policymakers, who are accustomed to hearing "2C above pre-industrial . [Government of United States of America]	headline reformulated.
SPM-2289	SPM	15	46	15	47	These percentages come from the CMIP5 multi-model mean. This should be mentioned. Otherwise, the spread should be given. [Thierry Fichefet, Belgium]	multi-model mean now mentioned.
SPM-2290	SPM	15	46	15	48	Do the percentages here represent the model means? Please clarify. Also, reference to Figs SPM.5 and SPM.6 should follow the word September as only September sea ice conditions are illustrated in these Figs. [Government of Canada]	multi-model mean now mentioned.
SPM-2291	SPM	15	46	15	48	State the reference and target years for all the percentage changes. Eg. reduction in sea ice are projected for all scenarios and year-round, with reductions in sea ice up to 2100 by 39% relative to YYYY. [Government of NORWAY]	reference period now mentioned in chapeau to the entire section.
SPM-2292	SPM	15	46	15	48	The reference point for the percent reductions is missing. The 39% reduction probably refers to the 1986 -	reference period now mentioned in chapeau to the

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						2005 average. Thus add e.g. "... by the end of the century compared to 1986-2005". [Urs Neu, Switzerland]	entire section.
SPM-2293	SPM	15	46	15	48	Please cite ranges rather than central values to indicate the uncertainty. [Geert Jan van Oldenborgh, Netherlands]	mean given here in text, ranges evident from figure SPM.6b
SPM-2294	SPM	15	46	15	51	The original texts only quote projections by RCP 2.6 and RCP 8.5. It is suggested to quote projections by the other two emission scenarios at the same time. [Government of China]	in the SPM RCP2.6 and RCP8.5 are the default scenarios. Information for the ranges 2081-2100 resulting from the other scenarios is given in the figures.
SPM-2295	SPM	15	46	15	51	Neither of these bullets give a reference period for the quoted ice reductions. Need to establish baseline with which to compare this. 106 km2 is given as the threshold below which we consider the Arctic ice to have 'nearly vanished' but can we compare this with the present day extent, otherwise the lower figure may seem rather high. [Government of United Kingdom of Great Britain & Northern Ireland]	reference period now mentioned in chapeau to the entire section.
SPM-2296	SPM	15	46	15	51	The second bullet adds information to the first bullet by giving a likelihood. Suggest giving ranges in the second bullet for all 4 RCPs and a conversion between % and square kms. Emphsising only RCP 8.5, where it is representative of only the upper extreme of baseline scenarios, may be interpreted as being misleading. [HAROON KHESHGI, United States of America]	both RCP2.6 and February changes are provided.
SPM-2297	SPM	15	46	16	7	Discussions of sea-ice projections appear out of context to the reasons they are important such as feedbacks and ocean circulation. This should be drawn together in the SPM more clearly. [Government of Australia]	reject. these changes are logically placed in this subsection, while a general discussion on feedbacks would be out of place in the projection section.
SPM-2298	SPM	15	46	16	7	Please add the reference and target years for the percentage changes quoted. [Government of NORWAY]	reference period now mentioned in chapeau to the entire section.
SPM-2299	SPM	15	47	15	47	Suggest adding 'respectively' after '35%'. [Government of United Kingdom of Great Britain & Northern Ireland]	formulation as is seems clear.
SPM-2300	SPM	15	47			Ludicrously specific – we can't constrain these to 2 sf! [William Ingram, United Kingdom]	These are the reported multi-model means from CMIP5. The level of confidence is now added for clarification.
SPM-2301	SPM	15	50	15	50	It should be clarified what it meant by "vanish". Does this mean no more sea ice in September ever, or does it mean a single year reaching ice-free conditions in September, after which subsequent Septembers could still retain ice (presumably the latter, but the se of the word "vanish" might be misinterpreted as the former. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	no statement possible about inter-annual variability.
SPM-2302	SPM	15	50	15	51	SPM-5 does not show when the Arctic becomes ice free, in contrast to what the text claims. We strongly suggest to adjust figure 12.28, as this figure too does not directly show when the Arctic becomes ice free. On the contrary, it may give the wrong interpretation that the Arctic becomes ice free in February rather than in September. By a closer look, one will find different starting ice areas, but this leads to confusion. For communication purposes, we advice to change these figures and put the starting ice areas in the figures, so that not only the differences become more clear, but also ice free conditions are better illustrated. [Government of Netherlands]	figure adjusted to show absolute values and 10^6 km2 line.
SPM-2303	SPM	15	50	15	51	Is there no understanding of how thin the ice already is? The volume curves on sea ice are headed to a very low level this decade--it most certainly won't take RCP8.5 until the end of the century for this to occur. Someone is trusting models far more than observations--this condition might be met before AR5 Synthesis report comes out. This is WAY TOO CAUTIOUS. [Michael MacCracken, United States of America]	this section deals with projections only.
SPM-2304	SPM	15	50			Can the authors say anything about what possible dates for 10^6 km^2 level September sea ice might be seen? Given this September's drastic decline, a date well before the end of the century seems quite possible… [Government of United States of America]	statement revised. Now "before mid-century".
SPM-2305	SPM	15	51	15	51	This paragraph should include a statement on the likelihood of reaching an ice-free Arctic early, eg: "it is very unlikely that ice-free conditions will occur before [date]". [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	statement revised. Now "before mid-century".

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SPM-2306	SPM	15	51			Fig. SPM.5 shows the SIE anomaly Without knowing the current SIE one cannot see when the ice will have disappeared. Thus Fig. SPM.5 should display SIE, not its anomaly. [Andreas Sterl, Netherlands]	agree. figure adjusted to show absolute values and 10^6 km2 line.
SPM-2307	SPM	15	53	15	53	Replace "Southern Hemisphere" with "Antarctic" to be consistent with remainder of text. [Government of Australia]	done.
SPM-2308	SPM	15	53	15	54	Suggest that a sentence is included explaining why confidence is low in projections of Southern Hemisphere sea-ice. [Government of United Kingdom of Great Britain & Northern Ireland]	reject. information is provided in the TS.
SPM-2309	SPM	15	590	15	51	Elsewhere we have suggested that this type of statement is too conservative (or 'relaxed') in the light of recent observed changes and the improved performance of CMIP5 models [Government of United Kingdom of Great Britain & Northern Ireland]	this section deals with projections only.
SPM-2310	SPM	16	1	16	1	Change to "…will continue to decrease as …" [Government of Australia]	this formulation is chosen for the revised headline statement.
SPM-2311	SPM	16	1	16	3	Suggest including changes in glaciers and ice sheets in the paragraph too, particularly given their relevance to sea level rise (the next section). [Government of Canada]	glaciers now included. Ice sheets included where relevant for sea level and climate stabilization.
SPM-2312	SPM	16	1	16	7	In both paragraphs again the reference period is missing (see comment to SPM-15, line 46-48), add "compared to 1986-2005" after 'by the end of the 21st century" [Urs Neu, Switzerland]	default reference period now given in chapeau of section
SPM-2313	SPM	16	1			“global” again [William Ingram, United Kingdom]	sentence revised, "global" removed.
SPM-2314	SPM	16	5	16	7	The use of the term "near-surface" permafrost is confusing as it can be interpreted as complete loss of permafrost, whereas normally the models on which these statements are based are considering thawing in the upper 2-3 m of the ground and are therefore considering an increase in thaw depth over time rather than a decrease in permafrost extent. In other reports (e.g., SWIPA report by AMAP) the permafrost science community has avoided wording like this and instead used statements such as "models project that the upper 2 to 3 m of permafrost will thaw over X% of the area currently underlain by permafrost by XXXX". Something similar is suggested here. Corresponding changes will also be needed in the TS and underlying content in Chp 12. [Government of Canada]	near-surface is kept as more specific information is regionally very sparse or not available.
SPM-2315	SPM	16	5	16	7	Can we say anything about positive feedback, e.g. caused by methane released from thawed permafrost, and whether such feedbacks are included in the CMIP5? Technical Summary p51, 7-8 states 'The thawing of carbon in frozen soils constitutes a positive radiative forcing feedback that is missing in current coupled carbon-climate models projections.' Suggest putting words to this effect in the SPM too. [Government of United Kingdom of Great Britain & Northern Ireland]	potential release of methane is mentioned and quantified in subsection on carbon cycle. This section is strictly on cryosphere.
SPM-2316	SPM	16	5	16	7	Near-surface permafrost extent/area is confusing terminiology. No where in chapter 11 or 12 is "near-surface" defined. This is misleading terminology often interpreted as complete loss of permafrost. Normally the models on which these statements are based are considering thawing in the upper 2-3 m of the ground and are therefore considering an increase in thaw depth over time rather than a decrease in permafrost extent. In the permafrost chapter of the SWIPA report use of this terminology was avoided when refering to the results of these modelling studies. Instead statements such as "models project that the upper 2 to 3 m of permafrost will thaw over X% of the area currently under by permafrost by XXXX" were used.Similar terminology should be used in this report. See additional comments on chapter 11 and 12 [Sharon Smith, Canada]	near-surface is kept as more specific information is regionally very sparse or not available.
SPM-2317	SPM	16	5			“global” again [William Ingram, United Kingdom]	sentence revised, "global" removed.
SPM-2318	SPM	16	10	16	48	Since climate change at the regional scale is what is most relevant to policymakers, the authors should consider adding a bullet to “Long-Term Projections: Sea Level” which points out that regional sea level rise can be significantly larger than the global mean, as discussed in Section 13.6. [Government of United States of America]	agree. last bullet in revised subsection addresses this.
SPM-2319	SPM	16	10	16	48	COMMENT F of a series. Statements made in the AR4 regarding the possibility of larger sea level rise by 2100 not being excluded but that current scientific understanding is insufficient to evaluate the likelihood caused widespread confusion. If I could change just one thing in AR4, it would be to try communicate this point better. AR5 has an opportunity to improve, and I would suggest considering the following approach: 1)	agree. Two new bullets, explicitly stating different methodologies, should provide sufficient details on the assessment findings and remove remaining confusion.

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						emphasize the fact that there is nothing special about 2100, and that added carbon dioxide today will cause sea level to rise for many centuries 2) that there is uncertainty about how much ice sheet loss can happen in the near term due to rapid ice flow, but over the very long time scale the ice sheet loss is better understood, and carbon emissions today will contribute to that. I would then suggest changing the balance of information about 2100 sea level rise compared to other time scales. Giving numbers in the text on page 16, lines 31-35 in the current manner, and providing Figure SPM7 in its present form could compound the communication problems we had in AR4. Providing numbers and figures is reasonably seen by many readers as meaning we know these numbers extremely well - the fact that larger values cannot be excluded is lost due to such a presentation. [Susan Solomon, United States of America]	
SPM-2320	SPM	16	12	16	13	Please make sea level rise explicit instead of only referring to RCPs. [Government of Netherlands]	agree. headline changed accordingly.
SPM-2321	SPM	16	12	16	13	Nowhere in the report is there any explanation for the reported sudden acceleration in sea level in 1993. Until such time as that reason is convincingly demonstrated it is impossible to predict the future behaviour of that force. There is also no good reason to believe that the 1860-1990 rate of abot 1.3mm/year will be exceeded. I also note that the link between temperature and sea level is very tenous because sea level continued to rise at the same rate through periods without warming (eg. 1945-1976) as they did through periods when warming occurred. [John McLean, Australia]	statement now moved to first bullet and reason for this assertion is given.
SPM-2322	SPM	16	12	16	15	Are there sources other than thermal expansion and glacier melt that even have a chance to be significant factors? [James [Jim] Crawford, United States of America]	statement is revised. Contributions moved to bullet 1 and reformulated.
SPM-2323	SPM	16	12	16	15	Suggest this shaded paragraph also highlight the fact that larger values of sea level rise cannot be excluded (as stated on lines 40-42 of this page) [Government of Canada]	headline statement revised but quantitative information is in bullets.
SPM-2324	SPM	16	12	16	15	Please add quantitative information on the SLR that can be expected. [Government of Germany]	headline statement revised but quantitative information is in bullets.
SPM-2325	SPM	16	12	16	15	We propose that you consider to include some quantified information on sea level rise was included in this shaded text. [Government of NORWAY]	headline statement revised but quantitative information is in bullets.
SPM-2326	SPM	16	12	16	15	This paragraph referes to a time period of 1971-2010, however none of the text and figures referenced contain discussion of that specific time period. [Government of United States of America]	headline statement revised, time period, dictated by the availability of reliable observational information moved to bullet.
SPM-2327	SPM	16	12	16	15	To reflect uncertainties, rewrite “It is very likely that the rate of global mean sea level rise during the 21st century will exceed the rate observed during 1971-2010 for all RCP scenarios” as follows: “Accurate measurement of sea-level change by satellite altimetry has only been available since 1993, and has suggested a rate of sea-level rise of 0.3 m/century. Tide-gauges in use until that year showed a sea-level rise of ~0.2 m over the 20th century. The extent to which the apparent increase in the rate of sea-level rise is an artefact of the change in the measurement method is unknown. The reliable record is too short to allow definite projections: but thermosteric expansion and land-based ice loss will be likely to contribute to a continuing – though not necessarily increasing – rate of sea-level rise to 2100 and beyond.” Reason: The demonstrated propensity of models to exaggerate warming trends and their consequences compared with observation and the literature should be allowed for. [Christopher Monckton of Brenchley, United Kingdom]	reject. proposed statement has no scientific basis.
SPM-2328	SPM	16	12	16	48	Sea level rise over the past century has been remarkably constant at 1.6 mm/year. NOAA confirms that there has been no global warming for 16 years, so projecting a rate of 8-15 mm/yr over the last decade of the 21st century is totally unjustified. In fact, it's not only unjustified, it's absurd! [Don Easterbrook, United States of America]	reject. proposed statement has no scientific basis.
SPM-2329	SPM	16	13	16	13	…ocean thermal expansion and glacier melt are… [Government of Australia]	headline statement revised but quantitative information is in bullet 1.
SPM-2330	SPM	16	13	16	13	Please specify "glacier melt" [Government of Germany]	headline statement revised but quantitative information is in bullet1.

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SPM-2331	SPM	16	13	16	13	The reference time period mentioned in the highlighted 'conclusion' at line 13 is 1971-2010. The examples given in Figure SPM.7 and in line 31-35 on this page apparently take a different reference period, namely 1986 to 2005. I didn't check whether in chapter 13 at 13.5.1, Table 13.5, Fig. 13.8 and 13.9 1971-2010 has been taken as reference period. Please check. [Government of Netherlands]	1971-2010 consistent with assessment in, and Executive Summary of, chapter 13.
SPM-2332	SPM	16	13	16	14	That very likely claim seems a bit incongruent with Fig. SPM.7. If one adds the contributions of the ice sheets there, they are almost on a par with the glacier contribution. Given the large uncertainties, I don't how one can be 90% sure that the glacier contribution is indeed going to be larger than the ice sheet contribution. [Stefan Rahmstorf, Germany]	headline statement revised. Contributions mentioned in bullet 1 but no longer qualified.
SPM-2333	SPM	16	13	16	14	The meaning of the sentence "Together… " is very unclear. Are thermal expansion and glaciers the biggest individual contributions to projected global mean sea level rise, or is their sum? [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	headline statement revised.
SPM-2334	SPM	16	13			This should say "glacier melt". [James [Jim] Crawford, United States of America]	in bullet 1 "loss of mass of glaciers" is used.
SPM-2335	SPM	16	13			What is “Together” intended to mean? It should mean “added together” but this seems pointless & the figure shows it to be unnecessary for the sentence to be true. Omit or replace by something clear [William Ingram, United Kingdom]	headline statement revised. associated wording changed in bullet 1.
SPM-2336	SPM	16	18	16	28	In Fig SPM.7, it says: "regional mean sea level change" while the map is hardly regional as it is a globe map whereas, for instance, Mediterranean data is missing. [Government of Spain]	figure revised. map no longer shown.
SPM-2337	SPM	16	19	16	28	Your projections lack credibility unless you can demonstrate that climate models are 100% accurate for all climate forces (in which case why would we need more than one climate model?) [John McLean, Australia]	comment has no scientific basis. Uncertainties are assessed and communicated.
SPM-2338	SPM	16	23	16	23	Suggest deleting "based on recent studies" as it will raise questions as to why only some studies were included. [Kristie Ebi, United States of America]	caption revised. "based on recent studies" removed.
SPM-2339	SPM	16	24	16	25	To reflect a more balanced presentation of the scientific literature, and to reduce dependence upon models that have failed to predict key variables such as the rate of global warming correctly, either reduce the estimates of sea-level rise or include some reference to papers (e.g. Möerner passim) that suggest sea-level rise could be as little as 10-20 cm over the 21st century – if anything, rather below the rate of rise seen since the mid-19th century. Reason: Models that have been shown greatly to exaggerate predicted warming will also greatly exaggerate sea-level rise. Here as elsewhere throughout the report, the obsession with modeling should be replaced with a more mature and balanced consideration of the published scientific literature. It is notable that in each year during the past decade the decadal rate of sea-level rise has been declining, entirely contrary to the absurdly overblown projections of sea-level rise made by the models. [Christopher Monckton of Brenchley, United Kingdom]	comment has no scientific basis. Uncertainties are assessed and communicated.
SPM-2340	SPM	16	31	16	31	Based on the formal uncertainty treatment, it is not appropriate to apply likelihood when the confidence is medium. [Government of Netherlands]	medium confidence is indeed possible, even with likelihood quantification (see uncertainty guidance note, page 3: "Additionally, a finding that includes a probabilistic measure of uncertainty does not require explicit mention of the level of confidence associated with that finding if the level of confidence is “high” or “very high.”)
SPM-2341	SPM	16	31	16	34	The combination of a likelihood range and medium confidence level should give the authors pause to question whether this is really the most appropriate way of characterising their findings. Two reasons: likelihood statements are meant to convey a quantification of the probability of outcomes in the real world. If the authors have only medium confidence, are they sure that the likely range in the real world should be just the range resulting from current process-based models and not be wider than that? Essentially what you are saying is that the process-based models are correct and other models are not - but that seems to contradict the rather more nuanced and careful discussion of semi-empirical models found in chapter 13. If there is any possibility of semi-empirical models having any grain of truth in them, then the likely range of real outcomes must be	these issues are now addressed in bullet 2 by explicitly mentioning the different sources of information for the sea level ranges. Further, bullets 3 and 4 provide a detailed assessment of other methods to project sea level changes.

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						greater than the likely range that comes out of the process-based models. The second reason for my concern is that numerical ranges take on a life of their own, and I'm not convinced that decision-makers will take great note of the 'medium confidence' qualifier. The caveat should made stronger and clearer to ensure this does not get lost, especially in the SPM. [Andy Reisinger, New Zealand]	
SPM-2342	SPM	16	31	16	35	Subtle differences in wording can either convey that these likely ranges are statements about the probability of outcomes "in the real world," or probabilistic descriptors of results from this particular ensemble of model runs (in which there is medium confidence). If you mean the first interpretation, it would be helpful to indicate explicitly how these ranges are derived from the model results. For example, are they based on 5-95% ranges of model results as for temperature increase (page 13, lines 51-54)? Especially because confidence in the model ensemble producing SLR projections is lower than for the CMIP5 models producing temperature projections, it would be helpful to clarify the relationship between model results and the likely ranges presented here. [Christopher Field, United States of America]	bullets 2-4 now provide a more comprehensive summary of the assessment.
SPM-2343	SPM	16	31	16	35	The reference period of present day is particular confusing again in this statement, given the UNFCCC agreement related to temperature increase wrt to pre-industrial conditions. (See also our general remark on the reference period above.) [Government of Germany]	for consistency with other projections provided in this section, the default reference period is preferred.
SPM-2344	SPM	16	31	16	35	Please note that these results are based on physical models and do not include results from semi-empirical models. [Government of Germany]	sources for the projections are now given in revised bullet.
SPM-2345	SPM	16	31	16	35	Please add total sea level change in 2100 since pre-industrial times. Please make it clearer that you also do a temporal average over the time periods. As it is now it can be difficult to understand what the ranges are related to. You should also consider giving best estimates for the different scenarios. [Government of NORWAY]	for consistency with other projections provided in this section, the default reference period is preferred. Mean is given in table SPM.2
SPM-2346	SPM	16	31	16	35	Regarding sea level rise, there should be more detail regional approach specifying regional differences. [Government of Spain]	new bullet 6 added.
SPM-2347	SPM	16	31	16	35	Future projections of sea level rise will be very difficult to use unless a central value for temperature projections is provided. [Corinne Le Quéré, United Kingdom of Great Britain & Northern Ireland]	this information is in table SPM.2
SPM-2348	SPM	16	31	16	35	Do these results include any provision for the inability to be able to fully explain the 20th century increase? That is, is any adjustment made for that--or were techniques used to get these numbers that systematically underestimated the 20th century increase? [Michael MacCracken, United States of America]	by construction these are projections from 1986-2005.
SPM-2349	SPM	16	31	16	35	In the WG1-AR4 likelihoods could not be assigned to estimates of total SLR by 2100 and since then the range of estimates for SLR appearing in peer reviewed literature has increased significantly over the last five years. Also the estimates of SLR that have been derived by climate models based on RCPs as given here are only just becoming open to wider review in the science community. To assign a medium confidence for likely ranges at this stage seems rather presumptuous and a lack of recognition of epistemic uncertainty in science. [Martin Manning, New Zealand]	provided information is now more detailing the source for the projections in bullet 2 and the assessment on other methods to project sea level rise in bullets 3 and 4.
SPM-2350	SPM	16	31	16	35	For planning purposes, governments often need to adopt a 100-year strategy. Why are estimates of future SLR still being constrained to the next 87 years? Chapter 13 covers some aspects of ongoing change and this should be repeated in the SPM. [Martin Manning, New Zealand]	this section consistently provides information up to 2100. Some information for later times is provided in subsection "Climate stabilization ...".
SPM-2351	SPM	16	31	16	35	This summary of the likely ranges for SLR by 2081 - 2100 for different RCPs does not say anything about whether the uncertainty distribution is symmetric or asymmetric about those ranges. Given that much of the peer reviewed science literature on SLR in the last six years has given higher estimates for future SLR, it is important to indicate whether the LAs disagree with that literature, or if they agree that much of the remaining 0 - 34% of likelihood of outcome is on the high side of the range that has been specified. If a significant part of the remaining likelihood is on the low side then this should be linked to a corresponding statement in chapter 13 explaining why the average rate of sea level rise during the rest of this century can be less than the present rate. If most of the uncertainty is on the high side then a statement to that effect is important. This is not a trivial or pedantic issue because the present SPM statements give upper ends of likely ranges that are significantly less than those set in policy statements by several different governments. If the WG1-AR5 becomes a reason for some now discrediting those government positions, it can have a significant influence	the revised subsection now provides much more detail on the basis for the sea level projections. Methods yielding higher projections are also addressed in more detail.

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						on the long term planning necessary for adaptive approaches in coastal development strategies. Policymakers can, and often should, adopt a precautionary principle but when there are literally trillions of dollars of assets at risk on low lying land, the AR5 should not become used as an excuse for taking the risk. [Martin Manning, New Zealand]	
SPM-2352	SPM	16	31	16	35	This summary of SLR given here and in Figure SPM.7 does not cover the range that is shown in Figure 13.21. The standard that was set up in the 2010 IPCC Guidance Note for Lead Authors of the IPCC Fifth Assessment Report on Consistent Treatment of Uncertainties" was to provide information on the tails of distributions of key variables. This should be covered in the SPM and not just hidden in the chapters. [Martin Manning, New Zealand]	note that figure 13.21 has a different reference level for sea level than figure SPM.7 (SPM.8 revised).
SPM-2353	SPM	16	31	16	35	Very likely, but broader, ranges of SLR would be more valuable for risk assessment applications. Can these be given? [Penny Whetton, Australia]	the formation of the range is explained in table SPM.2, footnote d. It is a 5-95% model range, downgraded to "likely" to account for additional uncertainties and different levels of confidence.
SPM-2354	SPM	16	31	16	42	It says at line 41 that we cannot assess the probability of larger SLR. However, the previous dot point gave a 'likely' ranges of SLR, implying SLR outside that range has 33% probability, or 17% for SLR above the likely range (assuming that the 33% is evenly spread). Is the term likely used at line 31 meant to imply a confidence interval for the sea level rise projections? If not, the SLR figures may be better presented as a mean number with the 95% confidence interval ranges included in a table. [Government of Australia]	refer to table SPM.2, footnote d for details about the range.
SPM-2355	SPM	16	31	16	42	Lines 31-35 seem to be a bit contradictory with lines 37-42, as they address (likely) ranges and not lower/upper limits. Lines 37-42 should be in the first place part of evaluation of climate models. [Government of France]	refer to table SPM.2, footnote d for details about the range.
SPM-2356	SPM	16	31	16	42	Given the much higher rate of climate change projected for the 21st century compared to the rates of rise in the paleo record, it really seems surprising that the upper limits of the projected rises in sea level are so low. Regarding the sea level chapter and the statement that the statistical approaches are not considered because there is not a consensus, since when are results not presented just because there is not a near unanimous view that they are acceptable? That is no reason to be excluding results from consideration--the approach is drawn from the paleo record and just becuase the projections are higher than for global climate models that do not fully consider ice sheet dynamics does not seem a reason for the results to be excluded. It might at least be stated that statistical approaches tend to give results that are about twice the approaches that are being used for which there is also little confidence. [Michael MacCracken, United States of America]	the revised subsection now provides much more detail on the basis for the sea level projections. Methods yielding higher projections are also addressed in more detail.
SPM-2357	SPM	16	31	16	42	These two statements are contradictory in terms of the way they cover uncertainty in future SLR. If the second statement applies, and there is only low confidence in models of ice sheet dynamics, then how can there be an overall medium confidence for the sum of ice sheet loss together with the other causes of SLR. [Martin Manning, New Zealand]	the revised subsection now provides much more detail on the basis for the sea level projections. Methods yielding higher projections are also addressed in more detail in two separate, new bullets.
SPM-2358	SPM	16	31	16	42	For a reader it might be hard to understand, how it can be that the given ranges for sea level rise are deemed 'likely' although there is 'insufficient understanding for evaluating the probability of higher values' (in addition to low confidence in modeling ice sheet dynamics, and no consensus about semi-empirical model reliability)? If the given range is 'likely' (>66% probability) this means that the probability of higher values is estimated to be < 34% or less and thus must be known to a certain degree. This contradicts the 'insufficient understanding' statement (at least for 'ordinary' readers). Maybe here the quantitative likelihood specification is inappropriate, and 'medium confidence' as only uncertainty qualification might be more appropriate. [Urs Neu, Switzerland]	the revised subsection now provides much more detail on the basis for the sea level projections. Methods yielding higher projections are also addressed in more detail in two separate, new bullets.
SPM-2359	SPM	16	31	16	42	The likelihood and confidence statements given for SLR projections are logically inconsistent. Llines 31-35 give likely SLR ranges, but lines 38-42 state that one cannot give probabilities for values higher than these ranges. You cannot have both: EITHER you give a likely range, which means the probability of higher values is less than 33% (if so, say so, this is important!; i.e. "As a result, larger values for sea level rise cannot be excluded, but they are unlikely; however, current scientific understanding is insufficient for evaluating their probability in more detail."); OR if the authors feel they cannot make a judgement that higher values are in fact "unlikely", then frankly it is impossible and logically inconsistent to give a "likely" range for SLR. Chose one or the other. [Andy Reisinger, New Zealand]	the revised subsection now provides much more detail on the basis for the sea level projections. Methods yielding higher projections are also addressed in more detail in two separate, new bullets.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-2360	SPM	16	31	16	48	These statements have no credibility because climate models do not simulate all climate forces with 100% accuracy. Delete them or explicit state the very significant caveats. [John McLean, Australia]	comment has no scientific basis. Uncertainties are assessed and communicated.
SPM-2361	SPM	16	31	16	48	COMMENT G of a series. I suggest replacing several paragraphs with one here, ensuring that they are all kept together as one to avoid confusion: "Dynamical ice losses from Greenland and Antarctica are uncertain, and there is no consensus on the reliability of semi-empirical models that provide higher projections than models that provide simulations of these processes. As a result, sea level rise over the next century is uncertain. For the period 2081-2100, global mean sea level rise is likely to be in the range of .....[import text from page 16, lines 31-34 here]...but larger values of sea level rise cannot be excluded. There is higher confidence in eventual sea level rise than there is in estimates for a specific year such as 2100. There is high [very high? assessed by chapter authors] confidence that past carbon dioxide emissions would continue to cause sea level rise for many centuries even if emissions were to cease entirely by the end of the 21st century. It is likely that sea level will rise by 1-3 m by 2300 if CO2-equivalent concentrations of 700 ppm are reached in the 21st century, while 500 ppm of CO2-equivalent would likely lead to less than 1 m by 2300. [Susan Solomon, United States of America]	Information beyond 2100 now placed in last subsection "Climate stabilization ...", bullet 3 in order to have a consistent time frame for all projections.
SPM-2362	SPM	16	32	16	33	Explain in Fig. 7 why the difference between RCP 4.5 and 6 is so small so the reader do not have to go back to the underlying chapter [Government of Sweden]	this is a coincidence at 2100: RCP4.5 has stabilized, RCP6.0 will continue.
SPM-2363	SPM	16	32	16	35	This information would be better presented as table, there are too many numbers in the one sentence. Furthermore it is not clear how the additional figures for RCP8.5 for 2100 were calculated or the significance of these higher figures. Surely RCP4.5 and 6.0 may also have a high rate of rise in the last decade - why are not similar figures presented for them? Is 8 and 15 mm just added to the original numbers? (this should then be 0.56-0.97). This approach would not seem to make sense as some to the last decade rate rise would already be captured in the average for 2081-2100. [Government of Australia]	table SPM.2 provides requested information.
SPM-2364	SPM	16	33	16	33	It is not clear why two ranges of GSLR are specified for RCP8.5, rather than one range as for the other RCPs - also see comment below. [Government of United Kingdom of Great Britain & Northern Ireland]	because of the large slope in RCP8.5, the information at year 2100 is policy-relevant.
SPM-2365	SPM	16	33	16	34	The various numbers in brackets relating to RCP8.5 need unpacking and rewording, so that the message doesn't get confused or lost. Suggest, instead of using 2100 (as it's already used at the top of the para, for period 2081 to 2100) could use 'end of the 21st century'. [Government of United Kingdom of Great Britain & Northern Ireland]	prefer specific mention of time periods and time points in this bullet.
SPM-2366	SPM	16	33	16	34	What is the meaning of the part in brackets? I mean, what is said here? What is the difference between the statement in brackets and the statement in front of them? Where do the different numbers come from? [Andreas Sterl, Netherlands]	bullet revised and brackets incorporated in text.
SPM-2367	SPM	16	33			This likely range for sea level rise for RCP8.5 is probably based on the concentration driven simulations and hence likely underestimates the SLR for high emissions. Given that global warming for RCP emissions can be estimated, what is the increase in the SLR uncertainty range for emissiond riven RCP8.5? This is particularly policy relevant as the impacts are greater for higher SLR, so the upper bound of the uncertainty range needs to include all known factors, such as carbon cycle feebacks increasing warming. [David Karoly, Australia]	Taken into account. SPM text in the projection section and Table SPM.2 footnotes clearly states that projections are based on the concentration-driven CMIP5 runs and process-based models. However, the ranges requested by the reviewer are not available from the underlying WGI AR5 assessment in Chapter 13 and thus can't be presented in the SPM as the SPM needs to be fully based on the assessment in the underlying report. The SPM can not include new assessments that are not part of the WGI AR5 Chapters.
SPM-2368	SPM	16	37	16	37	Explain DYNAMICAL ice loss [Luisa Cristini, United States]	bullet revised. Word only used in headline in which it is specified.
SPM-2369	SPM	16	37	16	37	These projections' - clarify which projections. [Government of Australia]	reformulated.
SPM-2370	SPM	16	37	16	37	Please note that the dynicmal ice loss was not considered AR4: "Different from AR4, these projections include...". [Government of Germany]	agreed and mentioned in the headline statement.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-2371	SPM	16	37	16	39	This may include too much jargon to be comprehensible to a policymaker. Are "dynamical" and "process-based" the same thing, and are they mean to imply the alternative to "semi-empirical?" Maybe the text can be clarified a bit here. [Government of United States of America]	subsection revised and wording made clearer by having more bullets with less combination of different issues.
SPM-2372	SPM	16	37	16	42	It is recommended to be very clear in this paragraph how the estimation of SLR differs from the approach taken in the AR4 as this was a common discussion point. Suggest adding to end of sentence one that including dynamical ice loss is an advance since the AR4 (if appropriate) and then follow with statement about low confidence in the models. The second sentence should end with that point and not mix points about dynamic ice models and semi-empirical models. A third sentence should address the issue of higher projections with semi-empirical models beginning by explaining in simple terms what these are. For example: "Semi-empirical models of sea level rise, based on observed relationships between sea level and other atmospheric components, tend to give higher projections than process-based models. There is no consensus about the reliability of such models." [Government of Canada]	bullet revised. Content now in bullet 3 of revised subsection.
SPM-2373	SPM	16	37	16	42	Could the range for semi-empirical models be indicated in Figure SPM.7, or numbers given? [Government of Denmark]	reject. there is low agreement and no consensus about reliability, as detailed in bullet 4 of revised subsection.
SPM-2374	SPM	16	37	16	42	I don't disagree with this statemen (lines 37-42), but note that Ice loss from Antarctica is expected to have major implications for Northern Hemisphere sea level. Regression modeling I am aware of (Rahmstorf, 2007; Vermeer and Rahmstorf, 2009) suggests that by 2100 global sea level may rise by up to 1.94 m (references: Rahmstorf, S.,.2007:. A semi-empirical approach to projecting future sea-level rise. Science 315[5810], 368-370; Vermeer, M. and S. Rahmstorf,.2009:. Global sea level linked to global temperature. Proc.Natl.Acad.Sci. 106, 21527-21532.) [Michael Sparrow, United Kingdom of Great Britain & Northern Ireland]	reject. there is low agreement and no consensus about reliability, as detailed in bullet 4 of revised subsection.
SPM-2375	SPM	16	37	16	42	It says here that we cannot assess the probability of larger SLR. Previous dot point gave 'likely' ranges of SLR, implying SLR outside that range has 33% probability, or 17% for SLR above the likely range (assuming that the 33% is evenly spread). If this is a false conclusion, it should be explicity excluded. [Penny Whetton, Australia]	no further information can be given about the probability of the tails.
SPM-2376	SPM	16	38	16	38	There seems to be a mismatch regarded to the confidence levels. Here: However, there is low confidence in models of ice-sheet dynamics….In the Executive Summary (p. 13-4; line 23-14): …, because there is only medium confidence in the likely range of projected contributions from models of the ice sheet dynamics,... [Government of Germany]	corrected.
SPM-2377	SPM	16	38	16	39	In the description of semi-empirical models, it is not clear what is meant by "no consensus" and "reliability" in relationship to the calibrated uncertainty language used to describe process-based models. It would be preferable to use calibrated uncertainty language if possible in this description as well. "Very low confidence" is a possible option. [Christopher Field, United States of America]	revised wording. "no consensus " kept since this is important information that would be lost by using "very low confidence".
SPM-2378	SPM	16	38	16	39	The second sentence of the paragraph is unclear. Amend e.g.: "... semi-empirical models that give higher projections than those in the paragraph above, which refer to process-based models." [Urs Neu, Switzerland]	revised in new bullet.
SPM-2379	SPM	16	39	16	39	Change semi empirical and process, to 'based on statistical relationships' and 'physical modelling of processes' or similar. [Government of Australia]	reject. well-established terms.
SPM-2380	SPM	16	40	16	41	As Arctic ice is reduced, once Greenland becomes an island surrounded with open water melting of the ice cap would be enhanced, with likely rise in sea levels on the scale of meters, possibly reaching levels such as existed in the Emian (6-7 meters). [Andrew Glikson, Australia]	this would be too detailed information for the SPM.
SPM-2381	SPM	16	40	16	42	To restore balance, add the words “or smaller” to the sentence “As a result, larger or smaller values of sea level rise cannot be excluded, but current scientific understanding is insufficient.” Delete the rest of the sentence, “… for evaluating the probability of higher values”. Reason: The duration, reliability and steric resolution of ocean measurements are altogether insufficient to permit reliable modeling of the future behavior of the oceans in response to warmer weather worldwide. The absurd over-precision with which model outputs such as imagined sea-level rise are stated throughout this draft is calculated to mislead. [Christopher Monckton of Brenchley, United Kingdom]	this comment has no scientific basis and the request is inconsistent with the underlying assessment.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-2382	SPM	16	44	16	44	Is this really only "very likely"? My understanding is that even in RCP2.6 that temperatures continue to rise, oceans expand, and ice melts past 2100, meaning that this should be something along the lines of "virtually certain". [William Anderegg, United States of America]	agree. bullet revised and moved to subsection "Climate stabilization...".
SPM-2383	SPM	16	44	16	44	Explainn THERMOSTERIC [Luisa Cristini, United States]	word deleted, bullet revised and moved to subsection "Climate stabilization ..."
SPM-2384	SPM	16	44	16	48	To restore balance, delete “Global mean sea level rise will very likely continue beyond 2100, with ocean thermosteric sea-level rise to continue for centuries to millennia, unless global temperatures decline. The few available model results indicate global mean sea level rise by 2300 likely to be less than 1 m for greenhouse gas concentrations below 550 ppm CO2-equivalent scenario but rise as much as 1-3 m for concentrations above 700 ppm CO2-equivalent” and substitute “Sea level is likely to rise for as long as temperature rises, though the relations between radiative forcings, warming rates and sea-level rise are uncertain.” Reason: Models have consistently over-predicted warming rates based on rates of increase in greenhouse-gas concentrations. Therefore, they are over-predicting rates of sea-level rise in consequence of greenhouse-gas-driven warming. These extreme projections may be politically attractive and financially profitable to the IPCC, but they are not scientific and must be deleted. [Christopher Monckton of Brenchley, United Kingdom]	this comment has no scientific basis and the request is inconsistent with the underlying assessment.
SPM-2385	SPM	16	44	16	48	It is noted that this paragraph describes scenarios by their concentration level (500 ppm CO2e, 700ppm CO2e). However, all other paragraphs use the concept of the RCPs.It would be more userfriendly to follow the same metrics in this paragraph. A second best option would be explain those concentration levels and their relationship to RCPs in a footnote. [Klaus Radunsky, Austria]	this bullet is addressing changes beyond 2100, i.e. beyond the RCP time horizon.
SPM-2386	SPM	16	44			The third bullet on under Long-Term Projections: Sea Level on page SPM-16 says “Global mean sea level rise will very likely continue beyond 2100, … unless global temperatures decline.” Does this understate the level of confidence andis not this statment virtually certain? Section 13.5.2 states that “For increasing GMT, sea level is virtually certain to continue to rise beyond the year 2500 …”. [Government of United States of America]	agree. bullet revised and moved to subsection "Climate stabilization...". Likelihood level made consistent with ch13.
SPM-2387	SPM	16	44			This bullet completely ignores the semi-empirical model projections for SLR until 2300, e.g. Schaeffer et al., Nature Climate Change 2012. See my general comment on this - without a convincing reason, only the process-based modelling approach is deemed worth reporting. [Stefan Rahmstorf, Germany]	the assessment of semi-empirical models is now given in a new bullet of this subsection.
SPM-2388	SPM	16	45	16	45	"to continue" => "projected to continue" [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet revised and moved to subsection "Climate stabilization...".
SPM-2389	SPM	16	45	16	48	This statement needs qualification indicating that the ice sheet dynamics reporesentations for these analyses are not adequate--if this information is being passed along to a coastal manager or planner, it seems to me not giving a realistic probability of a 1 m rise being exceeded at some point in the future (paleo relationships suggest that the equilibrium rise is something like 10 m per degree (that is, no real polar ice with the global average temperature 4 C higher than at present), so this assurance of no more than one meter by 2300 seems to me far too confident a statement. [Michael MacCracken, United States of America]	bullet revised and moved to subsection "Climate stabilization...". confidence level now given.
SPM-2390	SPM	16	45			“global” again [William Ingram, United Kingdom]	bullet revised and moved to subsection "Climate stabilization...".
SPM-2391	SPM	16	46	16	48	"The few available model results indicate global mean sea level rise by 2300 likely to be less than 1 m for greenhouse gas concentrations below 500 ppm CO2-equivalent scenario" 500 ppm CO2 is higher than estimated miocene level, when sea levels were as high as 40 meters above pre-industrial. Taking ice sheet hysteresis lag effect into account, sea level would be on a trajectory toward tens of meters rise, whereas 700 ppm CO2 would lead toward Eocene-like conditions. [Andrew Glikson, Australia]	assessment is based on the contributions simulated by the models and clearly stated in the revised bullet now in subsection "Climate stabilization...".
SPM-2392	SPM	16	47	16	48	Please add an uncertainty qualification to this conclusion to be consistent with the rest of this bullet. [Government of Netherlands]	done, in the revised bullet now in subsection "Climate stabilization...".
SPM-2393	SPM	16	47	16	48	What's the rationale for returning to use of ppms instead of RCP scenarios (which includes concentrations, but is a measure of overall radiative forcing that results) - is it because the underlying research didn't use RCPs? It's a little confusing - could perhaps relate these figures, if kept, to their nearest equivalent respective RCP	this bullet is addressing changes beyond 2100, i.e. beyond the RCP time horizon.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						scenarios. [Government of United Kingdom of Great Britain & Northern Ireland]	
SPM-2394	SPM	16	47	16	48	The CO2-equivalent scenarios (500 and 700ppm, respectively) should be set in relation to the RCP scenarios, so that it is possible to relate to the 21st century projections. Please, try to use the same reference values if ever possible, or at least provide a comparison if two or more different kinds are used. [Urs Neu, Switzerland]	this bullet is addressing changes beyond 2100, i.e. beyond the RCP time horizon.
SPM-2395	SPM	16	49	16	49	It is recommended to add a bullet-point with regard to the limited understanding of regional SLR-projections [13.6; 13.8] [Government of Germany]	bullet on regional sea level rise is added.
SPM-2396	SPM	16	49	16	49	It is recommended to add a bullet-point with respect to the projections of storm surges and ocean wave dynamics [13.7.1-3] [Government of Germany]	this is mentioned in table SPM.1
SPM-2397	SPM	16	51	17	18	This section on carbon and biogeochemical cycles should be placed betwen projections temperature and water cycle (page 14, line 15) [Government of France]	reject. Same sequence as in section "Observations".
SPM-2398	SPM	16	51	17	18	We propose to include in this section that, by the end of this century, the average surface ocean pH could be lower than it has been for more than 20 million years (Chapter 3, page 37, line 34-37). [Government of NORWAY]	reject. Projections are not directly compared with observations or reconstructions in the SPM.
SPM-2399	SPM	16	51			In a section with 'biogeochemical' in it there should be something about chemistry? More importantly this is the best place to include the air quality assessment that must have something at the SPM level. Air Quality: There is high confidence that baseline surface ozone (O3) and the associated air quality will change over the 21st century, although projections across the RCP, SRES, and alternative scenarios for different regions range from –4 to +5 ppb by 2030 and –14 to +15 ppb by 2100. Baseline values are controlled by global emissions of ozone precursors, as well as climate change, and these differ most between the high-CH4 scenario RCP8.5 and the other low-CH4 scenarios. There is high confidence that near-term air quality (surface O3 and fine particulate matter (PM2.5)) will improve over North America and Europe under all RCPs except for O3 in RCP8.5 but will be degraded over Asia at least until mid-century under some scenarios. (Ch. 11 ES) [Michael Prather, United States of America]	in the revised SPM; a new subsection on air quality is included.
SPM-2400	SPM	16	52	16	52	Suggest a shaded finding box be added to this section addressing the key question of whether the land and ocean sinks are expected to continue to take up half the carbon emitted from human activities or weaken over time. Perhaps the header from page 17 lines 1-4 could be moved here. [Government of Canada]	headline statement is revised and ocean uptake, and acidification, are now mentioned.
SPM-2401	SPM	16	53	16	56	In order to understand these results, the reader really has to understand at least notionally how the land-use change scenarios differ across the RCPs. This is another reason why a good illustration of the RCPs is required somewhere in this SPM. If details about the LUC scenarios cannot be provided due to space constraints, then this sentence from Ch. 6 page 54 lines 18-19 might be useful: "It should not be assumed that there is a monotonic progression from 'low' to 'high' land use through the scenarios related to the radiative forcing of each scenario." [Government of Canada]	box with description of RCPs is now given; land-use is mentioned. More information on feedbacks are provided in bullet 2 of the revised section.
SPM-2402	SPM	16	53	16	56	Interesting to add more detail about the evolution of the sinks (levels, evolutions as regard today sinks, etc) [Government of France]	More information on feedbacks are provided in bullet 2 of the revised section.
SPM-2403	SPM	16	53	16	56	ocean acidification is a significant negative impact. The relative negative and positive impacts of absorption of carbon in the ocean and the land needs to be be more clearly articulated in this section. [Government of New Zealand]	ocean acidification is now mentioned in the revised headline statement.
SPM-2404	SPM	16	53	16	56	By saying that global land will become a net carbon sink for scenarios with decreasing areas of anthropogenic land-use, can we also make it clear what the role of socio-economics (i.e. Land use changes) and climate would have here? [Government of United Kingdom of Great Britain & Northern Ireland]	assessment of socio-economics is beyond the remit of WGI.
SPM-2405	SPM	16	53	17	4	It is somewhat difficult to understand the combined message of the bullet point and the following sentences. For example, a layman reader may easily get confused by statements "global land will be a net carbon sink", later on followed by result "a loss of carbon of 59 ... from the land". [Government of Finland]	headline statement is revised. Technical information on uptake sensitivities is removed from the SPM but a new separate bullet on feedbacks (bullet 2) is given.
SPM-2406	SPM	16	53	17	4	These two statements appear contradictory. Perhaps better explanation is required? [Government of United States of America]	headline statement is revised. Technical information on uptake sensitivities is removed from the SPM but a new separate bullet on feedbacks (bullet 2) is given.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
SPM-2407	SPM	16	53	17	4	The relationship between these two paragraphs is not clear. The first appears to suggest that land and ocean will be a sink in most scenarios but the second suggests that carbon will be lost from the land and sea providing a source. The difference between the modelling used to support each statement would benefit from being explained to clarify the apparent contrasts in the conclusions. [Government of United Kingdom of Great Britain & Northern Ireland]	headline statement is revised. Technical information on uptake sensitivities is removed from the SPM but a new separate bullet on feedbacks (bullet 2) is given.
SPM-2408	SPM	16	53			“global” again [William Ingram, United Kingdom]	statement revised.
SPM-2409	SPM	16	53			This statement seems to be at odds with the first lines on the next page (page SPM-17, lines 1-4). If the ocean is a net carbon sink, how then can it loose carbon? [Andreas Sterl, Netherlands]	headline statement is revised. Technical information on uptake sensitivities is removed from the SPM but a new separate bullet on feedbacks (bullet 2) is given.
SPM-2410	SPM	16	54	16	54	What is "anthropogenic land use"? A land use is by definition anthropogenic. Same confusion occurs in chapter 6. [Government of Canada]	anthropogenic deleted.
SPM-2411	SPM	16	54			Change "global" to "globally" [Government of New Zealand]	statement revised.
SPM-2412	SPM	16	54			“global” again [William Ingram, United Kingdom]	statement revised.
SPM-2413	SPM	16	55	16	56	Does the report take account of drought and heat-wave triggered fires as CO2-releasing positive feedbacks? [Andrew Glikson, Australia]	this feedback is not assessed in this SPM.
SPM-2414	SPM	16	55	16	56	Seems to be in contrast to SPM-17 l. 1-2? [Government of Denmark]	headline statement is revised. Technical information on uptake sensitivities is removed from the SPM but a new separate bullet on feedbacks (bullet 2) is given.
SPM-2415	SPM	16	55			The inclusion of land-use in the RCPs is potentially confusing: the RCPs are forcing trajectories that can be reached in a number of ways, so that climate modelers can use them to drive climate models at the same time as economists can demostrate different ways to meet the RCP using economic models... but defining land-use really limits the economics side (eg, the increase in land use in RCP2.6 comes from biofuel use, but what about massive dependence on CCS, nuclear, and conservation as an alternative?) [Government of United States of America]	RCPs are now explained in box SPM.1, but assessment of RCPs is beyond the remit of WGI.
SPM-2416	SPM	16	56	16	56	"project a source" is not clear. [Kristie Ebi, United States of America]	bullet revised.
SPM-2417	SPM	16	56	16	56	What is the reason for adding the statement “but some models project a source by 2100”. Is this an unlikely case? [Government of Netherlands]	improved formulation in revised bullet 1.
SPM-2418	SPM	16	56	16	56	By saying net land source by 2100, does this mean through decline of vegetation on land caused by climate change? [Government of United Kingdom of Great Britain & Northern Ireland]	bullet 1 revised. The release of carbon from land is due to the combined effect of climate change and land use change.
SPM-2419	SPM	16	56	16	56	meaning of "project a source" needs to be clarified. [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	bullet revised.
SPM-2420	SPM	16				Here and elsewhere, there is too much reporting about the two less plausible RCPs and too little reporting about the two more plausible RCPs, and in consequence the uncertainties are made to appear larger than they really are. [Government of Australia]	throughout the WGI report all scenarios are treated equally likely.
SPM-2421	SPM	16				Figure SPM.7: 1. Please avoid figure background color. 2. For comment on map projection see recommendations for Figure SPM.6. 3. I suggest to use the same color map as in Figure SPM.6 ("change in average surface air temperature"). 4. Check spelling of units used in the maps. [Oliver Stebler, Switzerland]	accepted: this will be a copy edit to bring all figures into a consistent graphical format.
SPM-2422	SPM	17	1	17	4	This statement is potentially confusing in the light of the prevous paragraph (page SPM-16 lines 53-56). It is stated that "the models indicate a loss of carbon …. per degree C warming" even though the previous paragraph stated that the land and ocean will probably remain carbon sinks. To avoid being misleading (and focussing on positive feedbacks while ignoring negative feedbacks), the statement on carbon losses per degree should be followed by a clarification that this implies a weakening sink as opposed to an actual net source. In fact, to be clearer, and to be consistent with page SPM-6 lines 7-36, the paragraph should say "....it	headline statement is revised. Technical information on uptake sensitivities is removed from the SPM but a new separate bullet on feedbacks (bullet 2) is given.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						is very likely that the current negative feedback between climate and the carbon cycle will become weaker in the 21st Century and beyond." [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	
SPM-2423	SPM	17	1	17	4	An explanation of feedbacks is required for the SPM. This point can be made more clearly in plain English. [Government of Australia]	new bullet 2 on feedbacks with less technical information.
SPM-2424	SPM	17	1	17	4	This shaded box is too technical for a key finding - suggest simplifying. Understanding the difference between carbon cycle feedbacks and carbon sinks would be helped by a general Box explaining feedbacks. Care should be taken to explain that although the previous paragraphs said the land and oceans are projected to continue to be sinks, the effect of positive climate-carbon cycle feedbacks will be to make those sinks weaker in time. [Government of Canada]	agree. Headline statement revised.
SPM-2425	SPM	17	1	17	4	Important information : detailling a bit more, and linking to anthropogenic emissions and radiative forcing, would be appreciate. [Government of France]	headline statement is revised. Technical information on uptake sensitivities is removed from the SPM. Adding radiative forcing here would complicate the message.
SPM-2426	SPM	17	1	17	4	Please improve clarity for non-experts and explain what this actually means. The TS is clearer: "The new CMIP5 models used in this report consistently estimate a positive feedback, i.e., reduced natural sinks or increased natural CO2 sources in response to future climate change." (page 51, lines 15-17) [Government of Germany]	headline statement is revised. Technical information on uptake sensitivities is removed from the SPM but a new separate bullet on feedbacks (bullet 2) is given.
SPM-2427	SPM	17	1	17	4	Please explain the implication of this [Government of New Zealand]	headline statement is revised and simplified.
SPM-2428	SPM	17	1	17	4	This shaded text can easily create the impression that both land and oceans during the 21.century will turn from being sinks to sources. This misinterpretation can arise since it is not mentioned that a projected increase in CO2 concentration in the atmosphere will have an opposite feedback effect to the feedback linked to climate change. This is clearly stated in Chapter 6, Section 6.4.2.1, page 51, lines 3-13 and line 34-40. We suggest that you either consider to rephrase or to at least include an additional sentence, something like; "The effect of land and ocean carbon concentration feedback will have an opposite and dominating effect.". Further the values of 59 and 17 PgC cannot be found neither in 6.4.2.1, nor in Figure 6.20, please check the reference. [Government of NORWAY]	headline statement is revised. Technical information on uptake sensitivities is removed from the SPM but a new separate bullet on feedbacks (bullet 2) is given.
SPM-2429	SPM	17	1	17	4	I suggest that these lines not be highlighted and the "very likely" statement be reconsidered. In looking at section 6.4.2.1, I was not able to find a designation of very likely to this conclusion. In section 6.4.6.2 it is discussed (page 64 line 19) that models do give terrestrial carbon-climate feedbacks of differing signs which suggests to me that conclusions regarding the sign of the climate feedback are of limited confidence. It is not clear if these contributions are much (any?) different than in previous assessments or are large compared to the size of the ocean carbon sink; if these are not the case, I do not see the reason to highlight? [HAROON KHESHGI, United States of America]	headline statement revised. new bullet 2 added on feedbacks in which only confidence level is given.
SPM-2430	SPM	17	1	17	48	Unless you can demonstrate that climate models are 100% accurate for all climate forces your statements are mere speculation. [John McLean, Australia]	comment has no scientific basis. Uncertainties are assessed and communicated.
SPM-2431	SPM	17	1		4	This paragraph would sound too strong if it were based on modelling only. But, earlier in the SPM the palaeo results are mentioned. Surely they play a role in the confidence attributed to this? [Gabriele Hegerl, United Kingdom]	headline statement revised. new bullet 2 added on feedbacks in which only confidence level is given.
SPM-2432	SPM	17	2	17	2	Change “loss of carbon” to 'loss of carbon to the atmosphere' . Could it also be indicated what this means in terms of increased atmospheric CO2 concentration? [Government of Netherlands]	headline statement revised.
SPM-2433	SPM	17	2	17	2	When it says the feedback in the carbon cycle is positive does this mean the climate heats up and the carbon cycle in some way accelerates? I read this as meaning that the inputs of carbon to land and ocean would increase as global climate changes. TS p49, 20-21 says 'reduced natural sinks or increased natural CO2 sources in response to future climate change' and explains the issue more clearly. Perhaps we could say that here. [Government of United Kingdom of Great Britain & Northern Ireland]	this is now clearly explained in bullet 2 of the revised subsection.
SPM-2434	SPM	17	2	17	3	The loss of carbon from land and ocean could use further explanation. [Kristie Ebi, United States of America]	this is now clearly explained in bullet 2 of the revised

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							subsection.
SPM-2435	SPM	17	2	17	4	The sentence can lead to misunderstandings. "A loss of carbon" seems to indicate rather a negative feedback than a positive one. [Government of Germany]	this is now clearly explained in bullet 2 of the revised subsection.
SPM-2436	SPM	17	2			Replace '... cycle is ...' with 'cycle will be ...' [Government of Australia]	revised bullet 2: description of feedback as such present tense is used, for the consequence future tense.
SPM-2437	SPM	17	6	17	6	Suggest add 'to be needed' at end of sentence. This is a statement about what mitigation would be required to be put in place, not what would 'follow'. [Government of Australia]	statement revised and "emission reduction ... is required" is used.
SPM-2438	SPM	17	6	17	7	Again "as likely as not" sounds llike a shot in the dark. --- Also, some qualification should be made on "negative emissions", such as whether this is a cedible expectation. [James [Jim] Crawford, United States of America]	This is the assessment of likelihood by the authors.
SPM-2439	SPM	17	6	17	7	This sentence needs to be reordered to make it understandable, and "will" needs to be replaced by "would" in order to avoid any suggestion of being policy-presecriptive. Suggested reordering of the sentence: "It is about as likely as not that sustained negative emissions globally would be required for this scenario". We note that the equivalent sentence in the underlying chapter would also need the same treatment i.e. Chapter 6, page 6-4, line 55. [Government of New Zealand]	Since sentence refers to specific scenario, "will" is appropriate.
SPM-2440	SPM	17	6	17	8	Suggest some revisions to this paragraph to make clear that to be consistent with RCP2.6 either sustained negative emissions or sustained emissions close to zero are required. This latter point is missing from the current text. Suggest the following revision: "For RCP2.6, it is about as likely as not that sustained globally negative emissions during the second half of the century will be required for this scenario. Some simulations require negative emissions and those that don't all have sustained global emissions close to zero. Therefore for RCP2.6, large reductions in CO2 emissions relative to present day are required." [Government of Canada]	focus is on the potential requirement of negative emissions for RCP2.6.
SPM-2441	SPM	17	6	17	8	What type of action are necessary to achieve a RCP scenario should be part of WG III. As such it should be deleted from WGI. If any inclusion is contemplated one should make clear that different emission scenarios exist, some with early action and thus with less need for negative emissions, some not. In that case it essential to describe what negative emissions are and how they come about, i.e. CCS and biomass. But overall this type of nuances are for WGIII, and as such we would recommend not to include them in WGI [European Union]	reject. this is reporting a result from the climate models and as such well placed in WGI.
SPM-2442	SPM	17	6	17	8	Large reductions in CO2 emissions relative to present day are projected is misleading, since it is rather an estimate of what would be required to reach this scenario than a projection. Something like" For RCP2.6 to become reality, large reductions in CO2 emissions relative to present day would be needed" would be better. [Government of Germany]	statement reformulated and "required" is used.
SPM-2443	SPM	17	6	17	8	This feels misleading with the present wording - need to say that reductions of CO2 emissions from natural sources are reduced and that these are feedbacks from the natural system, responding to elevated GHG emissions. [Government of United Kingdom of Great Britain & Northern Ireland]	bullet revised and feedbacks now dealt with in separate bullet.
SPM-2444	SPM	17	6	17	8	From what time point on, negative emissions are required? From today on? Or is this related to total emission amounts integrated over time (if yes over what time)? [Urs Neu, Switzerland]	bullet revised and time horizon given.
SPM-2445	SPM	17	7		42	I know people in the field talk about “negative emissions” all the time, but will it make sense to policy-makers? [William Ingram, United Kingdom]	"negative emissions" now explained as "net removal of CO2 from the atmosphere".
SPM-2446	SPM	17	7			“sustained” bit vague – how long? [William Ingram, United Kingdom]	RCPs and related projections only go to year 2100.
SPM-2447	SPM	17	7			“globally” fairly clear here but still better explicit [William Ingram, United Kingdom]	no change necessary.
SPM-2448	SPM	17	7			I wonder whether policymakers will feel at home with the notion of "globally negative emissions". Perhaps consideration could be given to replacing these words with something like "net extraction of carbon from the atmosphere". [Adrian Simmons, United Kingdom]	done.

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SPM-2449	SPM	17	9	17	9	Lines 16-18 should be moved here as this continues the discussion of carbon cycle feedbacks. [Government of Canada]	processes not considered by the RCP are best placed at the end of the subsection.
SPM-2450	SPM	17	10	17	14	Add statement on low latitude acidification changes, given their importance for impacts, e.g. on coral reefs. [Government of Australia]	revised bullet includes quantitative information for all scenarios. Impacts are in the remit of WGII.
SPM-2451	SPM	17	10	17	14	Some quantification of pH change and change in saturation horizon is needed here. [European Union]	done for pH, saturation horizon is too technical for the SPM.
SPM-2452	SPM	17	10	17	14	This bullet point should also give information about the expected magnitude of the pH reduction. An alternative would be to make it clear that the expected pH decrease in the future for RCP8.5 is much larger than the decrease experienced until now. [Government of NORWAY]	done.
SPM-2453	SPM	17	10	17	14	Mention changes in the deep ocean: "The volume of water that is not corrosive for less stable forms of calcium carbonate is projected to shrink from xy to xy-xz percent in the 21st century and across the range of RCPs" [Fortunat Joos, Switzerland]	changes in deep ocean are too detailed for the SPM.
SPM-2454	SPM	17	10	17	14	Undersaturation with respect to Aragonite is imminent in the Arctic [Fortunat Joos, Switzerland]	technical information appropriate for TS, where it is provided.
SPM-2455	SPM	17	10	17	14	Some quantification of pH change and change in saturation horizon is needed here. [Corinne Le Quéré, United Kingdom of Great Britain & Northern Ireland]	done for pH, saturation horizon is too technical for the SPM.
SPM-2456	SPM	17	10	17	14	To adopt the correct scientific nomenclature and depoliticize the draft, rewrite “Anthropogenic ocean acidification, evidenced by a decrease in ocean pH, is projected to continue worldwide over the 21st century in all RCPs. The largest decrease in pH is projected to occur in the warmer low and mid-latitudes. It is likely that surface waters in the Southern Ocean become corrosive for a less stable form of calcium carbonate by 2100, and even before the Arctic Ocean” to read “A small anthropogenic decrease in the alkalinity of the ocean (i.e., a decrease in pH) may be occurring, and may continue to occur over the 21st century. However, the sampling frequency, duration and steric resolution of ocean pH measurements on a global scale are insufficient to allow definite conclusions to be drawn.” Reason: The data are inadequate to draw the conclusions in the offending sentence. [Christopher Monckton of Brenchley, United Kingdom]	comment has no scientific basis. This section is about projections based on model simulations, not on observations.
SPM-2457	SPM	17	10	17	24	To increase the scientific precision of the draft, delete “Many aspects of climate change will persist for centuries even if concentrations of greenhouse gases are stabilized. This represents a substantial multi-century commitment created by human activities today. Insert “Most consequences of anthropogenic global warming will manifest themselves within a century of the forcings that triggered the warming. Some consequences will persist for many centuries, but will not be significant. For instance, half of the warming from a doubling of atmospheric CO2 concentration will occur within a century: the remainder will occur over 1-3 millennia, allowing plenty of time for adjustment.” Reason: Only the decadal- to centennial-scale changes caused by anthropogenic influences are likely to prove significant. Thereafter, changes will be smaller, and will be spread over such long timescales as to be harmless. [Christopher Monckton of Brenchley, United Kingdom]	comment refers to 17-23. comment has no scientific basis. Adjustment capacity will be assessed by WGII.
SPM-2458	SPM	17	10	17	24	To moderate an extreme projection, rewrite “Continuing greenhouse gas emissions beyond 2100 as in the RCP8.5 extension induces a total radiative forcing above 12 W m–2 by 2100 that leads to a warming of 8.7[5.0, 11.6] C° by 2300 relative to 1986-2005” to include projections for all four principal RCPs, not just the most extreme RCP, and reduce or delete the extreme and absurd warming projection. Reason: The draft’s emphasis on imagined negative effects of a warmer climate is here exemplified by a deliberate concentration only on the most extreme emissions scenario. Given the observed propensity of models greatly to overstate warming in response to a forcing, the temperature estimates should either be determined for all four principal RCPs, not just the most extreme RCP, or deleted altogether. The prediction given here is inconsistent with the homeostatic profile of temperature changes over the past 64 Ma, where absolute temperatures have varied by only 3%, or 8 K, either side of the long-run mean. [Christopher Monckton of Brenchley, United Kingdom]	comment refers to 17-34. bullet is removed in revised subsection.
SPM-2459	SPM	17	10			A drop in pH is not evidence for acidification, it is quantification (or measurement)! [William Ingram, United	projected pH changes now quantified for all RCPs.

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						Kingdom]	
SPM-2460	SPM	17	11		13	These 2 sentences rather contradict, or at least fail to make sense – why discuss the consequences where you have just apparently indicated they are least? [William Ingram, United Kingdom]	decrease in pH and level and propensity of corrosion are two different issues. bullet is revised.
SPM-2461	SPM	17	11			Not only Fig. SPM.5 but also SPM.6. [Andreas Sterl, Netherlands]	done in revised bullet.
SPM-2462	SPM	17	12	17	14	How can I see from Fig. SPM.6 that pH becomes corrosive? I can only see that it decreases, but to see that it becomes corrosive I would need the threshold value. [Andreas Sterl, Netherlands]	bullet revised: corrosion, or level of saturation, no longer mentioned.
SPM-2463	SPM	17	12			It might be difficult for readers to understand which geographic regions are described by the terms "warmer-low latitudes" and "mid-latitudes". Either other expressions are used or those terms need to be explained in the glossary or in a footnote. For low latitudes the following explanation can be found: Low latitude zones are characterized by a warmer climate. Parts of the low latitude zones have an equatorial climate. Other areas have tropical or sub-tropical climates. The low latitude zones include wetter areas as well as some desert areas. In the western hemisphere, Mexico, Florida, most of Brazil and most of Africa lie in the low latitude zones. In the eastern hemisphere, all of India, the Arabian Peninsula, Southeast Asia, Indonesia and the northern part of Australia are in the low latitude zones. Mid latitude: A point of latitude that is midway on a north-and-south line between two parallels. [Klaus Radunsky, Austria]	No new entries for "Low latitudes", "Mid-latitudes" and "High latitudes". Regional information removed from revised bullet.
SPM-2464	SPM	17	13	17	13	We propose to add an example for animals with a less stable form of calcium carbonate. [Government of Germany]	This is outside the remit of WGI.
SPM-2465	SPM	17	13	17	13	become corrosive for a less stable form of calcium. Please explain what this means. [Government of Netherlands]	statement removed in revised bullet.
SPM-2466	SPM	17	13	17	13	What less stable form of calcium carbonate is being referred to? The current language is too vague to be useful. It should be explained why it is relevant that the pH change is corrosive for calcium carbonate i.e. that this is harmful to marine organisms that form shells from this mineral. [Government of United Kingdom of Great Britain & Northern Ireland]	statement removed in revised bullet.
SPM-2467	SPM	17	13	17	13	Explicit the word corrosive, which might be understood as meaning the pH is less than 7. Box 6.5 seems irrelevant. [Michel Petit, France]	statement removed in revised bullet.
SPM-2468	SPM	17	13	17	13	I suggest that to be specific you add the word "aragonite" here - e.g. "… become corrosive for ARAGONITE (a less stable form of calcium carbonate) by 2100 …" [David Wratt, New Zealand]	statement removed in revised bullet.
SPM-2469	SPM	17	13			Corrosive? Inappropriate term. [Government of Australia]	statement removed in revised bullet.
SPM-2470	SPM	17	13			It is not clear what is meant by "corrosive for a less stable form of calcium carbonate". [Government of Denmark]	statement removed in revised bullet.
SPM-2471	SPM	17	13			For readability suggest replace "before" with "earlier" [Government of New Zealand]	statement removed in revised bullet.
SPM-2472	SPM	17	13			“less stable” than what? Anyway, have policy-makers any idea what calcium carbonate is or why they should care about it? (Might it explode once corroded?) [William Ingram, United Kingdom]	statement removed in revised bullet.
SPM-2473	SPM	17	16	17	17	This information could be added to the p17 box (line 1-4) and to the last part on irreversibility. Also, information for other scenario than RCP8,5 could prove useful to evaluate the importance of this issue [Government of France]	possibility, but current location preferred.
SPM-2474	SPM	17	16	17	18	Clarify if these carbon emissions from permafrost thaw are included within the estimates of carbon losses with warming given in the header. If this is an additional mechanism, not taken into account yet in models, then that should be made clear. Also worth clarifying is whether this statement applies only to the decomposition of previously frozen organic carbon (plant material etc.), or whether it is intended to capture release of methane from thawing methane hydrates as well. As the issue of methane hydrates is of interest, this distinction is important. A statement about the risk of carbon releases from this source should be included here.	more details are given in the TS.

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						[Government of Canada]	
SPM-2475	SPM	17	16	17	18	Given the very different GWPs (or GTPs) for CH4 and CO2, it would be informative to give a quantitative estimate of the RF resulting from the 33-400 PgC projected to be emitted as a result of thawing permafrost. Alternatively, these emissions could be expressed as CO2 equivalent emissions, so that methane is weighted higher. Presumably, the confidence of this estimate would be 'very low'. Upper and lower limits, at the very least, could be estimated assuming 100% emitted as CH4 vs 100% emitted as CO2. In any case, the point needs to be made that the question of whether this C is released as CH4 or CO2 is critically important to understanding the climate feedback from thawing permafrost. [Government of United States of America]	adding information on RF would be confusing in this subsection.
SPM-2476	SPM	17	16	17	18	This bullets need to be reworded as the emission values relate to CO2 and not to CH4. [Fortunat Joos, Switzerland]	soil carbon occurs in the two forms and a distinction is not given in section 6.4.3.
SPM-2477	SPM	17	16			The idiom is "confidence in". [James [Jim] Crawford, United States of America]	corrected.
SPM-2478	SPM	17	16			Should the "or" be "and" since losses through both are at issue? [James [Jim] Crawford, United States of America]	inclusive "or".
SPM-2479	SPM	17	17	17	17	"through CO2 or CH4 emissions to the atmosphere from thawing permafrost. Projections for 2100 range from 33 to over 400 PgC for RCP8.5". In view of estimates of carbon mass locked in permafrost and Arctic sediments (B. Wake, 2012. Permafrost ponds. Nature Climate Change 2, 487 doi:10.1038/nclimate1623), and the rate of atmospheric warming and CO2 rise, the latter being the fastest recorded in the Cainozoic, are these estimates rather conservative? [Andrew Glikson, Australia]	confidence level is lowered in the revised bullet.
SPM-2480	SPM	17	17	17	17	"through CO2 or CH4 emissions to the atmosphere from thawing permafrost. Projections for 2100 range from 33 to over 400 PgC for RCP8.5". In view of estimates of carbon mass locked in permafrost and Arctic sediments (B. Wake, 2012. Permafrost ponds. Nature Climate Change 2, 487 doi:10.1038/nclimate1623), and the rate of atmospheric warming and CO2 rise, the latter being the fastest recorded in the Cainozoic, are these estimates rather conservative? [Government of Australia]	confidence level is lowered in the revised bullet.
SPM-2481	SPM	17	17	17	17	Are both 33 and 400 PgC for RCP8.5? [Government of NORWAY]	range relates to RCP8.5
SPM-2482	SPM	17	17	17	17	Is 33 Pg also for RCP8.5 (i.e. the given range is for RCP8.5 only)? Or is it for the lowest RCP? [Urs Neu, Switzerland]	range relates to RCP8.5
SPM-2483	SPM	17	17			Is the "33" also for RCP8.5? [James [Jim] Crawford, United States of America]	range relates to RCP8.5
SPM-2484	SPM	17	18	17	18	Again on the topic of permafrost I think it needs to be made explicit that this feedback is NOT incorporated in the carbon cycles of CMIP3 or CMIP5 models. This is of key importance to decision makers, as it means that emissions scenarios shown in AR5 Working Groups I, II and III may overestimate the allowable emissions to meet policy goals. I strongly suggest adding a sentence in TS-21 line 18 and SPM-17 line 18 to say something like "Neither CH4 release from hydrates nor carbon release from melting permafrost are included in the CMIP5 models." [Stephen Smith, United Kingdom of Great Britain & Northern Ireland]	the word "additional" now precedes "carbon emissions" to indicate this. Bullet 1 of the subsection "Climate stabilization ..." mentions the lower budget explicitly.
SPM-2485	SPM	17	21	17	24	The term "commitment" may have a different interpretation in a policy sense. Consider better explaining the use of this term here. [Government of Canada]	now clarified as "Climate Change Commitment" in the title. The highlighted first paragraph in the revised section further clarifies that the term refers to a "multi-century commitment created by past, present and future emissions of CO2. We note that the term "Climate change commitment" is also explained the WGI AR5 Glossary.
SPM-2486	SPM	17	21	17	24	The term "commitment," that appears in the title (Line21) and chapeau paragraph (Line24) may to be deleted, altered and rephrased or footnoted with a definition. Otherwise, these parts do not make sense to the policy makers, who use the word in the common manner (i.e. "promise," "obligation," "pledge" with their domestic and international constituency/counterparts etc). In the corresponding parts of the underlying report (12.5.4),	now clarified as "Climate Change Commitment" in the title. The highlighted first paragraph in the revised section further clarifies that the term refers to a "multi-century commitment created by past, present and

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						"commitment" seems to have slightly different meaning: kinds of ineluctable slow and lagged (hysteresis) climate responses. [Government of Japan]	future emissions of CO2. We note that the term "Climate change commitment" is also explained the WGI AR5 Glossary.
SPM-2487	SPM	17	21	17	25	commitment in the policy climate change arena means a legal obligation of a Party(country) to reduce emissions. Therefore the term should be avoided here at least changed to "climate change commitment" and defined to exclude misunderstanding (definition is given in Chapter 1page 7 , lines 29 to 30. [Government of Germany]	now clarified as "Climate Change Commitment" in the title. The highlighted first paragraph in the revised section further clarifies that the term refers to a "multi-century commitment created by past, present and future emissions of CO2. We note that the term "Climate change commitment" is also explained the WGI AR5 Glossary.
SPM-2488	SPM	17	21	17	25	It is recommended to delete "commitment". The use of this word in the meaning as described in 12.5.2 is particular to climate change science and for people outside of the community including policymakers it is not easy to grasp its meaning correctly and often misleading. The word was not used in SPM of the WG1 AR4. The point of the headline statement is not so clear. Combining the two sentences, it sounds like that the present day climate change (0.7deg warming) will continue for multicentury period even if the concentration is stabilised at today's level. It is better to omit the second sentence. Then it gives an alarming message regarding almost irreversible nature of climate change after "stabilisation",in general. As another possibility,intenntion of this statement might be a concern about today's level of long-life GHGs' concentration. Namely, radiative forcing of LLGHG has already exceeded 2.6W/m2, so it will cause a warming perhaps about 2deg C, when aerosol coooling is eliminated. If this should be the case, please state it clearly. [Taroh Matsuno, Japan]	now clarified as "Climate Change Commitment" in the title. The highlighted first paragraph in the revised section further clarifies that the term refers to a "multi-century commitment created by past, present and future emissions of CO2". We note that the term "Climate change commitment" is also explained the WGI AR5 Glossary.
SPM-2489	SPM	17	21	17	48	Recommend that text is included on geo-engineering and its implications in this section. [Government of United Kingdom of Great Britain & Northern Ireland]	Taken into account. A paragraph summarizing the WGI AR5 assessment of methods to counter climate change (Geoengineering; SRM and CDR) has been added at the end of this SPM section.
SPM-2490	SPM	17	21	17	48	Also anything to add on the impact of reducing emissions of short-lived climate forcers. [Government of United Kingdom of Great Britain & Northern Ireland]	Section focuses on 2050 and beyond, particularly beyond 2100.
SPM-2491	SPM	17	21			controversial title : very long-term projections would be enough. Climate stabilisation is a questionable concept. [Government of France]	Subsection title uses elements of IPCC Panel approved title of Chapter 12.
SPM-2492	SPM	17	21			Are there some findings about mechanisms, cycles, etc, that are in other part of the report, that could help discussing the issue of irreversibility more precisely in this part ? [Government of France]	Comment ambiguous. The focus in this subsection is on consequences of anthropogenic influence.
SPM-2493	SPM	17	21			This seems to be a new and high-value-added part of the AR5 report - is this aspect of novelty in our knowledge quoted somewhere ? [Government of France]	The persistence of changes for many centuries is now also included in the headline statement of the entire section.
SPM-2494	SPM	17	21			Are there no simulation on how a +8°C world look like, in terms of extreme events, precipitation, that could fit in this part? [Government of France]	There are simulations available that go beyond the 21st century which also form the basis for the assessment presented here. However, there is not enough information available to thoroughly assess how an +8°C world look like. The assessment of most variables is limited to the 21st century for which a larger number of simulations are available.
SPM-2495	SPM	17	21			Long-Term Projections: It would be very policy relevant to also address long-term sea level rise in this part of the SPM - if no studies are available for the time being on this issue this gap should be indicated in the TS. [Klaus Radunsky, Austria]	Taken into account: information on long-term sea level change now moved from sea level subsection to here, and revised.
SPM-2496	SPM	17	23	17	23	Since the text here appears to be using 'climate change' in the UNFCCC rather than the IPCC sense, it would be prudent to spell out the point via 'Many aspects of anthropogenic climate change will persist…' [Government of Australia]	The proposed formulation is now used for the revised headline statement.

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SPM-2497	SPM	17	23	17	25	The multi-century "aspects of climate change" sound like a long duration transient. Is that intended, or is this about evolving to a new steady state? [James [Jim] Crawford, United States of America]	Revised statements now refers to the elimination of CO2 emissions: "even if emissions of GHG are stopped"
SPM-2498	SPM	17	23	17	25	The issue of scale of change with or without mitigation (or for stabilised and transient change) should be tackled in this box. Currently it is misleading as to the importance of mitigation (provided in a policy-neutral framework - for example this point is actually made in lines 17: 39-42 but should be in the box and stated clearly) [Government of Australia]	Warming targets, and hence Implicitly mitigation, are now mentioned in the revised headline statement. Note that the scientific assessment of climate change mitigation options is outside the remit of WGI and will be presented by IPCC WGIII.
SPM-2499	SPM	17	23	17	25	The chapeau paragraph here should more sufficiently reflect the chapeau paragraph of 12.5.4 in the underlying report (Chapter12, pg62, Line31-37) that seems to show an important finding relevant to long-term stabilization issues in international climate change negotiations, as reinforced by recently emerging findings (*). (*) For Example: T. Matsuno, K. Maruyama and J. Tsutsui “Stabilization of atmospheric carbon dioxide via zero emissions-----An alternative way to a stable global environment”. Part 1 and 2; In Proceedings of Japan Academy Ser. B, Vol. 88, No.7 (July, 2012),p 368-395. [Government of Japan]	The headline statement has been completely revised and amplified.
SPM-2500	SPM	17	23	17	25	This conclusion should be more specific. How robust is this conclusion? And what means 'many aspects'? This is a very vague term that must be avoided. Is there a possibility that aspects still even get worse, due to surprises not foreseen today? The wording 'persist' has another meaning. To what does the word 'this' refer to? Which commitment? We suggest skip the second sentence, since it does not refer to the previous sentence and commitment has not been specified. [Government of Netherlands]	The headline statement has been revised and more details are given.
SPM-2501	SPM	17	23	17	25	Perhaps an explanation is needed in the intro box to this section, suggesting why aspects of climate change will persist for centuries - e.g. Is this due to atmospheric residence times of GHGs or inertia in global energy policies even under an ambitious mitigation scenario, or a combination of both? Technical Summary explanatory boxes TFE 7 and 8 (carbon cycle and stabilisation) could be referred to here. [Government of United Kingdom of Great Britain & Northern Ireland]	We prefer to not add to much extra explanations in the highlighted statements. These headline statement need to be short and concise. Supporting information is given in the subsequent non-highlighted paragraphs.
SPM-2502	SPM	17	23	17	25	2nd shaded box: The statement regarding persistence of CC is very good (includes "human activities") and should be upfront somewhere. This is a critical point. Also, I would suggest "even if concentrations of greenhouse gases are successfully managed" rather than "stabilised" - who does the stabilisation? The oceans and land plants are doing their best. IPCC has made it ever more certain, over the past 22 years, that humans need to change behaviors. A statement that does not attribute stabilisation also does not indicate to PMs where effort is needed. [herman sievering, United States of America]	The headline statement has been extended and the link between emissions and committed climate change clarified ("multi-century commitment created by past, present and future emissions of CO2")
SPM-2503	SPM	17	23	17	25	I recommend to add this sentence also to page SPM-2, line 39 (see comment no. 1 about short summary for SPM). [Oliver Stebler, Switzerland]	Noted. Part of this sentence now also appears in the headline statement of the entire section "Future global and regional climate change".
SPM-2504	SPM	17	23	17	42	While this is a conclusion one comes to if one thinks in terms of CO2e with GWP-100, this does not have to be the case if one considers the gases separately as there is good potential to reduce methane, BC and tropospheric ozone forcing to reasonably low levels if fossil fuel usage is reduced enough to stabilize the CO2 concentration, so one may be able to bring conditions back more rapidly than if do lumped analysis with GWP-100. There is no question that the CO2 effect is very long, but not necessarily the other gases--and one may be able to pull CO2 back out of the atmosphere, so again, this statement is not quite as absolute as indicated. Lines 39-42 do suggest this, but a bit obtusely and a bit clearer statement would be helpful to give a sense of the importance of the nations also working to limit emissions of short-lived species. [Michael MacCracken, United States of America]	Noted. The paragraphs in this section have been substantially revised. However, while these paragraphs discussing long-term climate change, commitment and stabilization are focusing on CO2, we now also specifically mention the warming effect from non-CO2 forcings. When talking about irreversibility, the caveat of potentially sustained net negative emissions is clearly mentioned ("A large fraction of climate change is thus irreversible on a human time scale, except if net anthropogenic CO2 emissions were strongly negative over a sustained period.")
SPM-2505	SPM	17	23			This statement does not reflect what is in chapter 12. Of course changes will persist if the greenhous gas concentrations are stabilized. But that is trivial, it's simply stating that the response will remain as long as the	Taken into account. Paragraph has been revised to be consistent with the underlying report (Chapter 12).

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						forcing remains. And from that we can't conclude that this is caused by human activities today, because stable concentrations do not imply zero future emissions in the short term. Changes will even persist if CO2 emisssions are reduced to zero. This follows in a later bullet but the highlighted one is misleading and does not convey the message. Suggested wording: "Many aspects fo climate change will persist for many centuries even if CO2 emissions were set to zero. This represents a substantial multi century commitment created by human activities today. Additionally reducing aerosol emissions will contribute warming, and reducing short lived greenhouse gases will contribute a cooling." [Reto Knutti, Switzerland]	Part of the wording suggested by the reviewer has been adopted in the revised highlighted statement.
SPM-2506	SPM	17	27	17	27	"limit warming below 2C". See comment 13/46 above [Andrew Glikson, Australia]	Taken into account. Revised paragraph discussing climate targets and a cumulative CO2 budget now also specifically acknowledge the effects from non-CO2 forcings on these targets/budgets.
SPM-2507	SPM	17	27	17	27	Some explanation of the 2 degree 'target' should appear somewhere in the SPM. [Government of Australia]	Noted. Not sure what exactly would be needed as additional explanation. Note that there is climate targets are discussed in detail in, e.g., the Technical Summary, TFE.8
SPM-2508	SPM	17	27	17	28	What does "likey limit warming" mean? That more than 2/3 of the models with the emissinos indicated show global warming less than 2C? [Government of Germany]	Paragraph has been revised to clarify this likely statement and the connection between temperature change and cumulative emissions.
SPM-2509	SPM	17	27	17	29	We suggest to delete the first and second sentence of this paragraph from "Emission pathways to 13.1 PgCyr-1". The reasons for deletion are as follows: 1. The messages contained in these two sentences are not consistent with other key messages in SPM, especially paragraph from line 31-33 in SPM-11. In SPM-11 and also underlining report, it suggests that the total amount of emission determine the warming in 21st century. But the paragraph in SPM-17 seems to suggest a totally different and contradictory message that pathway and emission at specific years (e.g. 2020 and 2050) determine temperature increase. 2.The messages contained in these two sentences are not consistent with findings from underlining report and literatures. In underlining report and literatures (e.g. Rogelj et al 2011), the original finding is "In the set of scenarios considered, emission in 2020 and 2050 fall into range of 8.5-12.6 PgCyr-1 and 4.6-6.3 PgCyr-1". But in SPM, these findings were translated into a wrong statement of "...,emission cannot exceed 8.5-12.6 PgCyr-1 and 4.6-6.3 PgCyr-1 in year 2020 and year 2050". These two inference are very different and they are not equivalent at all. The original finding in literature is a cautious one, and the author noted correctly that this conclusion is only applicable to "set of scenarios considered". But the statement in SPM tends to apply it to all emission pathways consistent with 2 degree target and also assign a "likely" possibility to this statement. This is not in line with conclusion in Chapter 12 "since those ranges are based on a set of scenarios available in the literature the interpretation in terms of likelihood is difficult"; 3.The unit used in this paragraph is not consistent. Based on Chapter 12, the first and second sentence in this paragraph refer to all Kyoto gases but the range of 1000-1300 PgC only refer to carbon dioxide. The inconsistent use of unit in one paragraph may lead to confusion for policy makers. [Government of China]	Noted. Paragraph has been revised in line with the revisions to the underlying report, in particular Chapter 12. The basis of the assessment is specifically mentioned. The SPM statement now focuses on the cumulative emissions since preindustrial rather than on certain time windows. The linear relationship between temperature change and cumulative emissions is now one of the key highlights of the SPM and is also graphically presented in the new Figure SPM.9
SPM-2510	SPM	17	27	17	31	This type of information about emissions is needed earlier in the SPM. It would also be useful to say what is assumed about aerosols. [Jan Fuglestvedt, Norway]	Noted. Aerosol are part of the RCP scenarios. The RCPs are presented in the new Box SPM.1.
SPM-2511	SPM	17	27	17	31	Please connect these emission numbers with the RCPs to make them meaningful. [Government of Netherlands]	Taken into account. Paragraph has been substantially revised and focuses on the cumulative emissions since preindustrial rather than on certain time windows. The RCP simulations and numbers are presented as part of the new Figure SPM.9
SPM-2512	SPM	17	27	17	31	This paragraph needs to be written in context of current policy discussions on this area. There needs to be consistency throughout the report on units used - Gt or Pg. Policy discussions generally use Gt per year. [Government of United Kingdom of Great Britain & Northern Ireland]	Paragraph has been substantially revised and focuses on the cumulative emissions since preindustrial rather than on certain time windows. GtC / Gt C yr-1 are consistently used throughout the SPM.

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SPM-2513	SPM	17	27	17	31	This small paragraph on cumulative emissions and emission pathways to 2100 (as well as the irreversible warming aspect that follows) are extremely important and policy relevant, and while 90% of this SPM material is qualitatitively and even quantitatively very similar to AR4, this is new. I would argue that this deserves more space and a figure. [Reto Knutti, Switzerland]	Taken into account. The linear relationship between temperature change and cumulative emissions is now one of the key highlights of the SPM and is also graphically presented in the new Figure SPM.9
SPM-2514	SPM	17	27	17	31	In this para, two messages of different contents are given. It is recommended to split into two: Lines 27-middle of 29 and the rest starting from "The 2deg C temperature---" [Taroh Matsuno, Japan]	Paragraph has been substantially revised and the messages clarified.
SPM-2515	SPM	17	27	17	37	These two bullet point are very important, especially to policymakers. We propose that key messages from them are more elaborately communicated. The statements should also be supported by figures or tables that show emission from the scenarios (RCPs) together with projected temperature response. Relevant figure can be based on Box 1.2 Figure 3 and Figure 12.5. [Government of NORWAY]	Taken into account. The linear relationship between temperature change and cumulative emissions is now one of the key highlights of the SPM and is also graphically presented in the new Figure SPM.9
SPM-2516	SPM	17	27		28	The stabilization scenario implies continued aerosol forcing at present rate. If aerosol forcing becomes less as emissions are reduced, as is likely, then the required reduction in C emissions is greater. It is argued that carbon emissions would have to go essentially to zero not to exceed 2 K above preindustrial (Schwartz, 2010; 2012). . Why Hasn't Earth Warmed as Much as Expected? Schwartz S. E., Charlson R. J., Kahn R. A., Ogren, J. A., and Rodhe H., J. Climate 23, 2453-2464 (2010); doi: 10.1175/2009JCLI3461.1. Reply to "Comments on 'Why Hasn't Earth Warmed as Much as Expected?'" Schwartz S. E., Charlson R. J., Kahn R. A., Ogren, J. A., and Rodhe H. J. Climate. 25, 2200-2204 (2012). [Stephen E Schwartz, United States of America]	Noted.
SPM-2517	SPM	17	27			It seems odd for the science chapter to be discussing the timing of potential emission pathways to achieve 2 degrees: the rate of turnaround of emissions seems like a economic/policy decision (eg, why not higher emissions in 2020 and lower in 2050? Or vice versa?). This is tolerable windows analysis... seems like WGIII material ... (a better argument can be made for cumulative carbon targets being a WGI area for concern) [Government of United States of America]	Taken into account. Paragraph has been substantially revised and focuses on the cumulative emissions since preindustrial rather than on certain time windows.
SPM-2518	SPM	17	28	17	28	replace 'cannot' with 'must not' [Government of Australia]	Paragraph has been substantially revised. Comment no longer applies.
SPM-2519	SPM	17	28	17	28	cannot exceed has some policy-prescriptive sound to it. Suggest something like "Emission pathways that exceed 8.5-12.6… by 2050 are not compatible with likely limiting warming below… by 2100." [Government of Sweden]	Taken into account. Paragraph has been rewritten. New wording avoids potentially policy prescriptive tone.
SPM-2520	SPM	17	28	17	29	Please specify to what the median 2010 emissions refer to (the set of investigated mitigation scenarios?). [Government of Sweden]	Taken into account. Paragraph has been substantially revised and focuses on the cumulative emissions since preindustrial rather than on certain time windows.
SPM-2521	SPM	17	28			"cannot" is not the original wording the chapter. Warming is determined by cumulative emissions, so fundamentally we can't say anything about 2020 or 2050 without making assumptions about scenarios. What the underlying studies say is that the scenarios considered show emissions in that range, but that does not exclude other scenarios. Most of these scenarios are optimal scenarios. Scenarios with delay are more costly but some are still possible. Suggest using the original wording of the chapter [Reto Knutti, Switzerland]	Taken into account. Paragraph has been substantially revised and focuses on the cumulative emissions since preindustrial rather than on certain time windows.
SPM-2522	SPM	17	29	17	29	Should the word "anthropogenic" be added to "cumulative carbon emissions", that is, "cumulative anthropogenic carbon emissions"? [Government of Canada]	Taken into account. Text now refers to "cumulative CO2 emissions from all anthropogenic sources"
SPM-2523	SPM	17	29	17	29	Please use "2°C limit" insted of "2°C target" throughout the report, it is not a target, but an upper limit, as UNFCCC has decided that global T-rise should remain below ("limited to 2 degree warming..."). [Government of Germany]	Text revised. Sentence now mentions explicitly "limit to less than 2oC". However, "target" is used in the general context "for any given warming target".
SPM-2524	SPM	17	29	17	29	It would be useful to specify, perhaps as a footnote, the start year used for calculating cumulative carbon emissions. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. This information is included the new figure SPM.9 and in the corresponding figure caption.

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SPM-2525	SPM	17	29	17	31	As we note, it is not an integral quotation. In Chapter 12, this issue is stated in the section of “limitation and conclusion” to indicate that there are still uncertainties with the estimation of global cumulative emissions, as found between lines 55-57 of page 66, Chapter 12: “It is important to note that the cumulative budget constraint does not consider non-CO2 forcings. Also, since those ranges are based on a set of scenarios available in the literature the interpretation in terms of likelihood is difficult.” It is inappropriate for such an argument with much uncertainty to be cited as a key conclusion in the Summary for Policymakers. Therefore, it is proposed to take out relevant words from the Summary for Policymakers. If there is an insistence to have such elements reflected in the Summary for Policymakers, the representation must be integral, with an emphasis placed on the fact that it is an estimate with limitations and uncertainties, coupled with a quotation of lines 55-57, page 66, Chapter 12. [Government of China]	Taken into account. Paragraph has been substantially revised and focuses on the cumulative emissions since preindustrial rather than on certain time windows. The uncertainties are emphasized in the newly added Figure SPM.9.
SPM-2526	SPM	17	29	17	31	Similar comment as on Chapter 12, page 6, line 49ff.: The current wording "The 2C temperature target implies cumulative carbon emissions by 2100 to be below about 1000-1300PgC in the set of scenarios considered, of which about 545 [460 to 630] GtC were emitted by 2011" seems to be wrong or misleading for four reasons. (1) This budget calculation is NOT based on any "set of scenarios". The underlying language on page 12-66 explains how the 1000-1300 GtC number is derived, namely from the best-estimate range of TCRE of 1.5C to 2C warming. Thus, the number 1000-1300 GtC is hence NOT tied to a specific set of scenarios. (2) The 2C temperature target is NOT a target that concerns only the CO2-induced warming, but the total anthropogenically induced global warming. The TCRE however only refers to the CO2-induced warming, ignoring any additional warming by non-CO2 forcing agents. Thus, the real carbon budget in line with a 2C target will be lower than 1000-1300GtC, because of non-CO2 forcings (which will be positive in the future). This confusion between CO2-only induced warming and total warming is enforced by the placement of the sentence in the paragraph that starts with "Emission pathways that LIKELY limit warming... indicate that CO2 equiavalent emissions ....". COMMENT CONTINUED IN NEXT BOX. [Government of Germany]	Taken into account. The paragraph has been revised to ensure consistency with the underlying assessment in Chapter 12. The basis of the carbon budget assessment is now specifically mentioned as is the effect from considering non-CO2 forcings for the carbon budget. This is also graphically highlighted in the newly added Figure SPM.9 by showing results from both CO2-only and multi-gas RCP simulations.
SPM-2527	SPM	17	29	17	31	CONTINUED COMMENT FROM PREVIOUS BOX: (3) The previous sentences (as does the preambular text in the international communities agreements in Durban, 2011) refer to a "likely chance" of staying below 2C. This latter carbon budget however is derived from a BEST-ESTIMATE, hence implying only a 50:50% chance of staying below 2C. Here, unlike in Chapter 12, the words "below" are added, but this does not change the fact that the 1000-1300 PgC number is inconsistent with the LIKELY chance to stay below 2C. And lastly, (4) the provided timeframe "by 2100" is misleading given that the 2C temperature target is not defined only to apply over the 21st century, but as a limit not to exceed at any moment in time. Given the definition of the TCRE, the sentence would be more correct without specifying the timeframe "by 2100". Summa summarum, these four issues could be addressed by re-phrasing this sentence into something like (in line with a re-phrasing of the parallel section in Chapter 12, page 6, line 49ff.) : "In cumulative terms, 1000-1300GtC of carbon emissions would imply a best-estimate warming of 2C only due to the effect of CO2 emissions. For having a likely chance of staying below 2C and accounting for non-CO2 forcings, the cumulative carbon emission budget would be substantially lower than 1000-1300GtC, of which about 545 [460 to 630] PgC were emitted by 2011." Finally, ensure consistency of the 545 PgC number between Chapter 12 and here. [Government of Germany]	Taken into account. The paragraph has been revised to ensure consistency with the underlying assessment in Chapter 12. The basis of the carbon budget assessment is now specifically mentioned as is the effect from considering non-CO2 forcings for the carbon budget. This is also graphically highlighted in the newly added Figure SPM.9 by showing results from both CO2-only and multi-gas RCP simulations.
SPM-2528	SPM	17	29	17	31	The term "2 C temperature target" should be avoided in this report since this may be misunderstood as an indication that the IPCC reinforces/supports this particular political goal. Considering the role of IPCC to provide rigorous and balanced scientific information to policy makers, it is essential for the IPCC to keep its neutrality; therefore, the sentence is better being rephrased to address the above concern. [Government of Japan]	Noted. We agree that limiting the presentation in the SPM to on one specific target only (here 2oC warming) would be problematic (see the underlying chapters and the TS, in particular TFE.8 for a discussion). We thus expand the coverage of this topic in the SPM and add a new figure SPM.9 presenting more generally global mean temperature increase as a function of cumulative total global CO2 emissions.
SPM-2529	SPM	17	29	17	31	The second sentence here represents two important findings in AR5 together. One is that generally peak temperature rise is connected with cumulative carbon emissions for a class of scenarios with effectively zero-emissions, and the other is that particularly for the 2deg C peaking scenarios cumulative carbon emissions by 2100 is estimated as given in the draft. It is recommended to mention the first point as a general property	The basis of the carbon budget assessment is now specifically mentioned as is the effect from considering non-CO2 forcings for the carbon budget. This is also graphically highlighted in the newly added

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						separately from a specific case of 2degC limit. It must be reminded that the peak temperature-cumulative emissions relation reported here is deduced from experiments without non-CO2 GHGs, so that it cannot be applied to current real situation. [Taroh Matsuno, Japan]	Figure SPM.9 by showing results from both CO2-only and multi-gas RCP simulations.
SPM-2530	SPM	17	29			The following wording is suggested: Median 2010 emissions were 13.1 PgC yr-1. [Klaus Radunsky, Austria]	Paragraph has been substantially revised and focuses on the cumulative emissions since preindustrial rather than on certain time windows.
SPM-2531	SPM	17	30	17	30	1000-1300 PgC emitted since when? Industrialisation presumably, but this needs to be made clear. [Government of United Kingdom of Great Britain & Northern Ireland]	Noted. This information is included the new figure SPM.9 and in the corresponding figure caption.
SPM-2532	SPM	17	33	17	33	We presume that all scenarios will show "continuing GHG emissions beyond 2100", it suggests that this is only true for RCP8.5. [Government of Netherlands]	Paragraph has been deleted to shorten SPM.
SPM-2533	SPM	17	33	17	37	The reference period of present day is particular confusing again in this statement, given the UNFCCC agreement related to temperature increase wrt to pre-industrial conditions. (See also our general remark on the reference period above.) [Government of Germany]	Paragraph has been deleted to shorten SPM.
SPM-2534	SPM	17	33	17	37	The results of two experiments reported here appear to have no policy-relevance and it is better to omit them from SPM. If this para should remain, the second sentence regarding RCP 2.6 must be rewritten, something like: "Substantial reduction of emissions followed by sustained negaive emsissions (anthropogenic absorption) of CO2 beyond 2100 could keep--- ." It is needed for policymakers and people outside of climate change science community to explain what negative emissions mean. [Taroh Matsuno, Japan]	Paragraph has been deleted to shorten SPM. Sustained negative emissions are mentioned in the following paragraph in the context of committed climate change and irreversibility.
SPM-2535	SPM	17	33	17	42	What's the confidence inherent in both of these paragraphs? We're stretching modelling right out to 2300 after all. [Government of United Kingdom of Great Britain & Northern Ireland]	Paragraph has been deleted to shorten SPM.
SPM-2536	SPM	17	33		37	This sentence could use a likelyhood qualifyer as does the next paragraph [Gabriele Hegerl, United Kingdom]	Paragraph has been deleted to shorten SPM.
SPM-2537	SPM	17	34			Giving a best-guess value & then only in brackets a range much wider than the precision it's specified to reads as just silly! Give the range, & then the best guess in brackets [William Ingram, United Kingdom]	Paragraph has been deleted to shorten SPM.
SPM-2538	SPM	17	35	17	35	clarify: reduction of emissions alone, or is active uptake required? [Government of Australia]	Paragraph has been deleted to shorten SPM.
SPM-2539	SPM	17	35	17	37	"Substantial sustained reductions of emissions beyond 2100 could keep total radiation forcing below 2Wm-2". It is not clear at what stage would reductions commence. By 2100 under current warming trend much of Greenland and West Antarctic ice would melt, sea level rise on the scale of meters and large volumes of methane released from permafrost, raising RF above 2Wm-2. [Andrew Glikson, Australia]	Paragraph has been deleted to shorten SPM.
SPM-2540	SPM	17	35	17	37	"Substantial sustained reductions of emissions beyond 2100 could keep total radiation forcing below 2Wm-2". It is not clear at what stage would reductions commence. By 2100 under current warming trend much of Greenland and West Antarctic ice would melt and feedback process could raise RF above 2Wm-2. [Government of Australia]	Paragraph has been deleted to shorten SPM.
SPM-2541	SPM	17	35			“reductions” if we were on the 8.5 track, I assume – but not sure all readers will [William Ingram, United Kingdom]	Paragraph has been deleted to shorten SPM.
SPM-2542	SPM	17	35			“keep”!? “reduce” presumably meant [William Ingram, United Kingdom]	Paragraph has been deleted to shorten SPM.
SPM-2543	SPM	17	36	17	37	The statement here that the RCP2.6 extensions reduces warming (to 0.6 degrees C) seems in contradiction to the statement in the next sentence (paragraph below) that global average temperature remains approximately constant for many centuries, even after a cessation of emissions. The missing information that is needed to understand why global temperature reduces in the RCP2.6 extension is that in RCP2.6, net negative emissions are sustained after 2070 throughout the extension (Ch. 12 page 20). So this means that atmospheric CO2 concentrations will actually be lowered over time, to which global temperature will respond. Please add the pertinent info regarding the RCP2.6 extension. [Government of Canada]	Paragraph has been deleted to shorten SPM.
SPM-2544	SPM	17	39	17	39	What is meant by "scenarios driven by CO2 alone"? Does it mean that all other forcings are ignored? If so, mention this. And how does this relate to the RCP's? [Government of Netherlands]	Paragraph has been revised and a new figure SPM.9 has been added. The revisions clarify the non-CO2

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							vs. multi-gas RCP results.
SPM-2545	SPM	17	39	17	39	"For scenarios driven by carbon dioxide alone" - not clear what this means as a standalone sentence in the SPM. [Government of United Kingdom of Great Britain & Northern Ireland]	Paragraph has been revised and a new figure SPM.9 has been added. The revisions clarify the non-CO2 vs. multi-gas RCP results.
SPM-2546	SPM	17	39	17	40	"For scenarios driven by carbon dioxide alone, global average temperature is projected to remain approximately constant for many centuries following a complete cessation of emissions." What account is taken for carbon feedbacks from fires and methane release? [Andrew Glikson, Australia]	Paragraph has been revised and a new figure SPM.9 has been added. The revised SPM paragraph mentions the potential effects of non-CO2 forcings and methane release.
SPM-2547	SPM	17	39	17	40	Assumedly due to the carbon cycle remaining in net balance and CO2 concentration remaining constant in the atmosphere - should this be mentioned for clarity? [Government of United Kingdom of Great Britain & Northern Ireland]	This seems too detailed for the SPM. It is being discussed in the underlying report, Chapter 12.
SPM-2548	SPM	17	39	17	40	A complete cessation of emissions - on what timescale? [Government of United Kingdom of Great Britain & Northern Ireland]	Statement applies even for immediate cessation of emissions. No change.
SPM-2549	SPM	17	39	17	42	With all the use of "confidence" and liklihood assessments, the liklihood of stronly negative emissions during the 21st century cries out for an assessment of the liklihood with suppport of the assessment. [James [Jim] Crawford, United States of America]	Statement of fact, does not need a likelihood assigned (see IPCC AR5 Uncertainty Guidance Note)
SPM-2550	SPM	17	39	17	42	not clear: what are these scenarios? [Government of France]	Paragraph has been revised. The revisions, including the new Figure SPM.9, clarify the usage of non-CO2 vs. multi-gas RCP simulations.
SPM-2551	SPM	17	39	17	42	Cessation of emissions versus strongly negative net emissions is difficult to understand (readability) [Government of France]	Taken into account. Revised text speaks about emissions stop.
SPM-2552	SPM	17	39	17	42	does complete cessation of emissions halt further warming? Current drafting implies this. Won't there be some further increase locked in even after complete cessation of emissions? What is the period and magnitude? Is this section talking about just carbon dioxide, as it says in line 39, or about all GHG, as mentioned in line 42? Need to be consistent. [Government of New Zealand]	Taken into account. Paragraph has been revised to also give a time horizon for "temperatures remain approximately constant". Statement now refers specifically to CO2-induced warming.
SPM-2553	SPM	17	39	17	42	To restore balance, delete “For scenarios driven by carbon dioxide alone, global average temperature is projected to remain approximately constant for many centuries following a complete cessation of emissions. Thus a large fraction of climate change is largely irreversible on human time scales, except if net anthropogenic greenhouse gas emissions were strongly negative over a sustained period.” Insert “The atmospheric residence time of CO2 in the literature is ~7 years (first-order effect) and ~40 years (second-order effect). Accordingly, a gradually decreasing fraction of the warming caused by an increase in CO2 concentration will remain present for about half a century after the increase has ceased.” Reason: The persistence of CO2-driven warming is chiefly dependent upon the atmospheric residence time which – like much else – the IPCC has exaggerated compared with the literature. [Christopher Monckton of Brenchley, United Kingdom]	Reject. Reviewer fails to provide scientific evidence in support of his claims. Claims are in contradiction to the comprehensive assessment presented in the underlying report, e.g., Chapter 6 and 12.
SPM-2554	SPM	17	40	17	40	Consider to change "cessation" to "stop" [Government of NORWAY]	Accepted. Text changed.
SPM-2555	SPM	17	40	17	42	Another exception is if solar radiation management were successful; suggest that this be added as an exception. [HAROON KHESHGI, United States of America]	Noted. Methods to counter climate change, including both SRM and CDR, are now discussed in the final paragraph of the SPM.
SPM-2556	SPM	17	41	17	41	replace 'except if' with 'unless' [Government of Australia]	Current wording is consistent with underlying report.
SPM-2557	SPM	17	41	17	42	An additional information concerning the statement on negative net anthropogenic GHG emissions is needed. Please add: "However, no such option is available, and research on options to remove GHG from the atmosphere and the associated risks is in its infancy." [Government of Germany]	Noted. Methods to counter climate change, including both SRM and CDR, are now discussed in the final paragraph of the SPM.
SPM-2558	SPM	17	41	17	42	It is better to delete the clause "except if ---" . Readers do not shink of negative emissions in this context. Actually in the definition of "irreversibility" in 12.5.5.1 recovery is limited to "due to natural processes". [Taroh	We prefer to keep this part. It is important and consistent with the underlying report.

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						Matsuno, Japan]	
SPM-2559	SPM	17	42	17	42	replace 'were' with 'were to be' and define what strongly negative means. [Government of Australia]	Current wording is consistent with underlying report.
SPM-2560	SPM	17	44	17	45	The time horizon for the projection of the surface melting of the ice sheet is not specified. [Government of Benin]	Paragraph has been substantially revised and information about timescale ("complete loss of the Greenland Ice Sheet over a millennium or more") has been added.
SPM-2561	SPM	17	44	17	45	For readability suggest reordering the sentence as follows: "For global mean surface air temperature over 3.1 [1.9-4.6] °C above preindustrial, surface melting of the Greenland ice sheet is projected to exceed accumulation". [Government of New Zealand]	Paragraph has been substantially revised.
SPM-2562	SPM	17	44	17	48	This mixes concepts: inevitability of melting and reversibility of melting. Since melting is identified as "ongoing", and no mechanism has been identified to reduce temperatures, this paragraph does not hang together very well. [James [Jim] Crawford, United States of America]	Paragraph has been substantially revised and now starts with the potential irreversibility of mass loss.
SPM-2563	SPM	17	44	17	48	The beginning of this paragraph is confusing because we are already observing ice loss from the Greenland ice sheet at current amounts of global warming of less than 1degC. So some additional information seems required here. Is it that the models used to make these projections model warming sustained for very long periods of time? If so, saying that would help clarify the text. The phrase 'surface melting has long time scales' is not very clear. What does this mean? The second sentence should start by saying "complete loss of the GIS..." if that is what is meant, so the message is clearly that while complete disintegration of the ice sheet is not inevitable, some amount of decay may be irreversible. The statement that regrowth to most of the original volume is possible (line 47) seems at odds with the statement that significant decay may be irreversible (lines 48-49). If regrowth is only possible if global temperatures decline, some context is needed to make clear under what conditions that might occur and on what timeframes (e.g. human mitigation to achieve and sustain net negative emissions over time, or natural forcings). [Government of Canada]	Paragraph has been substantially revised. Text about potential regrowth has been deleted.
SPM-2564	SPM	17	44	17	48	[Particularly line 47.] Do any of the models show temperature declining any time soon? I'm not aware that any do. Suggest rewording to the reflect that under even the most ambitious GHG mitigation scenario we would expect partial loss of the Greenland ice sheet at some point over the next 300 years, and that the rate and extent of ice loss is linked to the ambition of mitigation. [Government of United Kingdom of Great Britain & Northern Ireland]	Paragraph has been substantially revised. Text about potential regrowth has been deleted.
SPM-2565	SPM	17	44	17	48	This seems terribly optimistic given that surface melting occurred for one day in 2012 with global average temperature at roughly 0.8 C. With ice quakes and flows into moulons warming the deep part of the ice sheet, the risk of significant loss of several meters worth of sea level equivalent seems more plausible than indicated here. I would also note that two-figure precision on this seems unjustified. [Michael MacCracken, United States of America]	Paragraph has been substantially revised. Text about potential regrowth has been deleted.
SPM-2566	SPM	17	44	17	48	To reflect reality, delete “Surface melting of the Greenland ice sheet is projected to exceed accumulation for global mean surface air temperature over 3.1[1.9, 4.6] C° above pre-industrial, leading to ongoing decay of the ice sheet. The loss of the Greenland ice sheet is not inevitable, because surface melting has long time scales and it might re-grow to most of its original volume if global temperatures decline. However, a significant decay of the ice sheet may be irreversible.” Insert “The Greenland ice sheet, amounting to some 5% of the Earth’s land-based ice, may decline in thickness if warming exceeds ~3 C°, and if that warming persists. However, surface melting has millennial timescales. Even the emission of all CO2 now locked in fossil fuel reserves would not cause a long enough warming to melt much of Greenland.” Reason: The IPCC had previously admitted that the timescale for melting Greenland ice is millennial: it must continue to admit this. [Christopher Monckton of Brenchley, United Kingdom]	Reject. Reviewer fails to provide scientific evidence in support of his claims. Claims are in contradiction to the comprehensive assessment presented in the underlying report, most importantly Chapters 4, 5 and 13.
SPM-2567	SPM	17	44			I find it unjustified how the study by Robinson et al (Nature Climate Change 2012) is excluded from the given temperature range and simply the old AR4 range is repeated, although Robinson et al arguably is methodologically the best of all studies so far. Other studies simply conclude the threshold is where the surface mass balance turns negative, but that is a simplistic assumption and not a result. At best it is an upper limit for the threshold. The key finding of Robinson et al is entirely plausible, namely that through ice flow, the	Paragraph has been substantially revised in line with the underlying report. The Robinson et al. study mentioned by the reviewer has been considered in the Chapter 13 assessment and contributes to the revised ranges presented in the current draft Chapter 13 and

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						ice sheet already gets drawn down if the SMB becomes negative over a large part of it, like one quadrant. The chapter provides no reason why we should not believe this, yet for no apparent reason that result is just not included in the uncertainty range. Why? [Stefan Rahmstorf, Germany]	SPM.
SPM-2568	SPM	17	45	17	48	This is confusing. The global temperature is expected to increase, so it will not be expected that the ice will recover. So what is the message here? [Government of Netherlands]	Paragraph has been substantially revised. Text about potential regrowth has been deleted.
SPM-2569	SPM	17	47	17	48	I think the use of "might" and "may" here is unfortunately rather vague and not helpful for synthesizing risk. [William Anderegg, United States of America]	Paragraph has been substantially revised. Text about potential regrowth has been deleted.
SPM-2570	SPM	17	47	17	48	In line with the Chapter (page 35 i.e.) the summary text needs to be more specific on the conditions under which regrowth is possible or irreversible i.e. in relation to cumulative emissions or emissions reductions required. [European Union]	Paragraph has been substantially revised. Text about regrowth has been deleted.
SPM-2571	SPM	17	47			Again, "global" [William Ingram, United Kingdom]	Noted.
SPM-2572	SPM	17	49	17	49	An additional bullet should highlight that carbon emissions cause irreversible changes in pH, pCO2, saturation both at the surface and in the deep ocean . [Fortunat Joos, Switzerland]	Taken into account in the SPM Projections section on "Carbon and other biogeochemical cycles"
SPM-2573	SPM	18	0			Table 1: the description of heavy precipitation events is too vague to be of value. [Government of United Kingdom of Great Britain & Northern Ireland]	Description has been revised
SPM-2574	SPM	18	1	18	18	please clarify: on what models are the projections for the next few decades are based. On RCP scenarios as well as the projections for the 21st century? [Government of Germany]	This information has been added to the caption.
SPM-2575	SPM	18	1	18	18	Unless you can demonstrate that climate models are 100% accurate for all climate forces your projections are mere speculation and should be deleted or heavily qualified. [John McLean, Australia]	Reviewer provides no scientific basis to support his claim.
SPM-2576	SPM	18	1	18	20	Again confidence levels of trends in extremes and attribution of extremes: To me it does not make sense that we would have higher confidence in changes in heat-extremes on daily timescales compared to those in longer timescales (heat wave, warm spells) See theoretical considerations described under comment 2. A few years ago the reason could have been a lack of studies focussing on longer timescales but this is now not the case anymore (see comment 2) [Dim Coumou, Germany]	The full underlying basis for the confidence levels are described in the underlying chapters. It is clear that there are considerably more limitations associated with the detection and attribution of heat waves compared to daily temperature extremes.
SPM-2577	SPM	18	3	18	4	It was stated on page SPM-11 line 50 that carbon cycle uncertainties are not considered for the higher RCPs. Therefore the level of confidence for the higher RCPs surely must be lower than for the lower RCPs. The use of "likely range" seems problematic if a key feedback is ignored for some scenarios but not others, as "likely" is being used inconsistently. At the very least this should be an explaination of this point in the notes below - but why not just include an estimate of the uncertainty including carbon cycle feedbacks for all RCPs, as was done for all SRES marker scenarios in AR4? [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Taken into account. Previous statement on SPM-11 was misleading. The revised draft (bullet 2 of section "Future global and regional climate change") now clarifies with regard to the comparability to AR4 that "Projected climate change based on RCPs is similar to AR4 after accounting for scenario differences. The overall spread of projections for the high RCPs is narrower than for comparable scenarios used in AR4 because in contrast to the SRES emission scenarios used in AR4, the RCPs used in AR5 are defined as concentration pathways and thus carbon cycle uncertainties affecting atmospheric CO2 concentrations are not considered in the concentration driven CMIP5 simulations. Simulated patterns of climate change in the CMIP5 models are very similar to CMIP3. {11.3.6, 12.3, 12.4, 12.4.9}"
SPM-2578	SPM	18	3	18	6	I am confused by the terminology here--some of the table entries are likelihood and some are about confidence. This seems very strange and mixed. Does low confidence mean "possible"? Where terms of likelihood are used, does this mean there is high confidence? [Michael MacCracken, United States of America]	Please refer to the IPCC guidance note on uncertainty for clarification on the terminology. The confidence/likelihood assessments are directly taken from the chapters in AR5 or earlier IPCC reports
SPM-2579	SPM	18	3	18	18	Table SPM.1: I congratulate the authors on the preparation of this table which is very comprehensive and overall effectively draws on the IPCC SREX material. I agree with most entries except with those for the	Assessment of drought has been revised, and now includes regional scale information.

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						historical drought trends (see also comment above). Since the entry for the drought projections is specifically on the regional scale, it would seem logical to use the same approach for the observed and attributed drought trends. In that case, the literature evidence rather points to _medium confidence_ in some regions (and _low confidence_ elsewhere), rather than _low confidence_ in all regions. Indeed, as assessed in the IPCC SREX (see in particular chapter 3, Seneviratne et al. 2012), although there is low confidence in drought trends in several regions, there are nonetheless a number of regions which are consistently identified as having experienced either drying (southern Europe, West Africa) or wetting (central North America, northwestern Australia) trends independently of the index or datasets' choice (since 1950). As recently discussed in Seneviratne (2012, Nature), the location of these regions is confirmed even in the more recent analysis of Sheffield et al. (2012), which evaluated the sensivitiy of historical drought trends to different input datasets and model parameterizations. It would be important to distinguish between the _low confidence_ in global trends vs _medium confidence_ in some regional trends. References: 1) Seneviratne, S.I., N. Nicholls, D. Easterling, C.M. Goodess, S. Kanae, J. Kossin, Y. Luo, J. Marengo, K. McInnes, M. Rahimi, M. Reichstein, A. Sorteberg, C. Vera, and X. Zhang, 2012: Changes in climate extremes and their impacts on the natural physical environment. In: Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation [Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.-K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.)]. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change. 2) Seneviratne, S.I, Nature, 491, 338-339. 3) Sheffield, J., E.F. Wood, and M. Roderick, 2012, Nature, 491, 435-438, doi:10.1038/nature11575. [Sonia Seneviratne, Switzerland]	
SPM-2580	SPM	18	4	18	4	In line 4 it is stated that phenomena are given in the table for which there is an observed trend in the late-20th century. However, such trends are not found for the last two phenomena in the table: drought and cyclones. We suggest to change the formulation in line 4. [Government of Netherlands]	caption has been revised.
SPM-2581	SPM	18	7	18	7	The use of the term "human contribution" doesn't seem to be defined here. I could agree when it means there is some contribution from the myriad of ways in which humans influence the environment and if "some" could mean anything larger than 0%. If it means that more than half of the observed trend is the result of anthropogenic greenhouse gases I disagree with all the very likely and virtually certain statements in the table. Uncertainties in this field are far too great in both the observations and the models to make such strong statements. [Marcel Crok, The Netherlands]	Statements regarding the human contribution to the observed changes are based on the comprehensive underlying chapter assessment.
SPM-2582	SPM	18	7	18	7	Please break the sentence appropriately to avoid confusion in reading the table: e.g. 'Warmer and fewer // cold days and nights// over most lands.' 'Warmer and more frequent // hot days and nights//over most land areas. ' [Government of Netherlands]	sentence structure has been revised.
SPM-2583	SPM	18	7	18	7	Shouldn't one replace ' Frequency (or proportion of total rainfall from heavy falls)' by 'Frequency (and/or proportion of total rainfall from heavy falls) '? [Government of Netherlands]	entry has been revised
SPM-2584	SPM	18	7	18	7	Concerning warm spells, please make clear why you apply medium confidence in the first column and likely in the second column? [Government of Netherlands]	Entry has been revised, and table footnote added which should provide this clarification.
SPM-2585	SPM	18	7	18	8	Table SPM.1: This table is a little hard to understand due to the mixing of likelihood and confidence statements in the table and the use of the word "likelihood" in the headers for each column. Suggest: (1) Adding a note of explanation about why a likelihood term is used for some assessed findings, but confidence is used for others; (2) In each of the column headers, changing "Likelihood" to "Assessment"; (3) Adding a note about the one item that is "not assessed" (e.g., was this due to insufficient evidence?). [Government of Canada]	column headers have been revised. The mixing of likelihood and confidence statements is unavoidable and is based on the underlying chapter assessment findings. Please see IPCC guidance note on uncertainty.
SPM-2586	SPM	18	7	18	8	The term "likelihood" in the heading of the columns does not fit with some terms in the table, like "medium confidence" or "low confidence". Therefore it would be helpfull to add in the heading both "likelihood/ confidence". [Government of Germany]	Column headers have been revised.
SPM-2587	SPM	18	7	19	7	Explain the acronym AOGCM [Ingeborg Levin, Germany]	see glossary
SPM-2588	SPM	18	9	18	10	Table SPM.1 In footnotes (a) and (b), what did AR4 say? [Government of United States of America]	AR4 and SREX findings have been added for all table entries.

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SPM-2589	SPM	18	9			Again, replace “at the global scale” with something clear [William Ingram, United Kingdom]	global scale is considered a clear and well used term.
SPM-2590	SPM	18	15	18	15	"There was also …" SREX or AR4? Please be explicite [Christoph Ritz, Switzerland]	AR4 and SREX findings have been added directly to all table entries.
SPM-2591	SPM	18	17	18	17	"… global trends are limited " include are [Christoph Ritz, Switzerland]	footnote has been removed
SPM-2592	SPM	18	17			Again, "global" [William Ingram, United Kingdom]	global scale is considered a clear and well used term.
SPM-2593	SPM	18		18		This is a very useful table. It includes the note that the likelihood assessment for 21st Century trends on extreme rainfall has strengthened since SREX. This is valuable point, but I did not see it in Chapter 12 [Government of Australia]	revised entry and footnote 'd' of the table makes it clear that such a direct comparison between the SREX and AR5 statement is not appropriate due to differences in the two assessments.
SPM-2594	SPM	18		18		Table SPM.1: Please see comments on this table for Technical Summary [Government of Germany]	noted
SPM-2595	SPM	18		18		This is a very useful table. It includes the note the likelihood assessment for 21st Century trends on extreme rainfall has strengthened since SREX. This is valuable point, but I did not see it in Chapter 12 [Penny Whetton, Australia]	revised entry and footnote 'd' of the table makes it clear that such a direct comparison between the SREX and AR5 statement is not appropriate due to differences in the two assessments.
SPM-2596	SPM	18				To the layman, the distinction between the last two columns is easily lost. It would help greatly if the diagram from http://www.pik-potsdam.de/~mmalte/rcps/ were inserted, with a few explanatory words, immediately before the table SPM.1 [James [Jim] Crawford, United States of America]	revised column titles should be clear to the layman
SPM-2597	SPM	18				Table SPM.1: Please consider to change the descriptive text for each phenomenon to make it clearer that it is extreme weather and climate events the table describes. See our comment to SPM page 4, line 1-2. [Government of NORWAY]	Table is intended to compare assessments, and therefore standard terminology is used which is to the extent possible consistent with the AR4 and SREX.
SPM-2598	SPM	18				Please consider to make a similar table as Table SPM.1 for the entire phenomenon (such as temperature, moisture, precipitation, salinity, arctic sea ice and Greenland ice sheet, etc.) that is treated in the SPM. [Government of NORWAY]	Such a table would be too large for the SPM.
SPM-2599	SPM	18				Table SPM.1 Several (five) of the bold-faced pieces of the table lack footnotes that clearly state how things have changed since AR4 and/or SREX: (1) Medium confidence in row 4 column 2; (2) medium confidence in row 5, column 3; (3+4) low confidence in row 7, columns 2 and 3; (5) medium confidence in row 7, column 5. If this is because there has been no change, perhaps it could be noted that silence implies no change. [Government of United States of America]	AR4 and SREX findings have been added for all table entries.
SPM-2600	SPM	18				tbl. 1 Regarding the relatively low confidence in future drought projections: It would be more precise to distinguish between the different types of drought. Because of high confidence in projections of increased evapotranspiration, there is high confidence in reduced soil moisture. Hence, the confidence in increased agricultural drought is higher than for hydrological drought. [Government of United States of America]	footnote has been added (h) which provides more detail on the underlying chapter assessment for drought.
SPM-2601	SPM	18				“Heavy precipitation events” - the “likely” for a trend is perhaps overstated, given the scarcity of data. The likelihood of a human contribution certainly is – I believe the only paper making such a claim is Min et al (2011), which has multiple serious flaws (see my comments on SPM-11, 16-18 & 10-43, 43-44). [William Ingram, United Kingdom]	Stated likelihoods and confidence levels are consistent with the underlying chapter assessment.
SPM-2602	SPM	18				With bold letters is indicated what has changed since AR4. I suggest also to mention in a footnote how the quantity was assessed in AR4 (as is done with SREX). [Guus Velders, Netherlands]	AR4 and SREX findings have been added for all table entries.
SPM-2603	SPM	19	1	19	1	Please add over what period the change is. [Government of Netherlands]	Temperature projections are relative to the reference period for 1986 - 2005. See SPM Table 2 (footnote a). The revised introductory Chapeau text to the entire SPM projections section now also clearly states that "Projections in this Summary for Policymakers are given relative to 1986–2005, unless otherwise stated."

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SPM-2604	SPM	19	1	19	2	The temperature ranges in this table seem to be based primarily on CMIP5 outputs, unlike in the AR4 where multiple sources, including expert judgement, were used to define the values. [Timothy Carter, Finland]	Yes. In AR5, the authors were confident to estimate a "likely" range from the information available from the CMIP5 based results. This step involves "expert judgment" as it did in AR4.
SPM-2605	SPM	19	1	19	2	The reference period of 1986-2005 should be added to the Table title to avoid any mistaken interpretation that these projections are relative to pre-industrial. A line could be added indicating what amount of warming should be added to obtain an estimate of projected warming relative to pre-industrial. [Government of Canada]	All projections presented in Table SPM.2 are relative to the reference period for 1986 - 2005 as indicate in footnote a to the Table. In addition, the revised introductory Chapeau text to the entire SPM projections section now also clearly states that "Projections in this Summary for Policymakers are given relative to 1986–2005, unless otherwise stated." Observed temperature changes for additional reference periods are also given in footnote a of Table SPM.2.
SPM-2606	SPM	19	1	19	2	There needs to be some clarification here about the reference years/periods for the information. For chage in SAT, are these relative to preindustrial or 1990 (they don't seem to be the change during the period indicated, which is another possible reading). For change in SLR, it says "Total SLR"--from when? Is this since preindustrial--as one would like it to be to be parallel to what negotiators are using for change in SAT, or is it from 1990 or during 20th century. What? [Michael MacCracken, United States of America]	All projections presented in Table SPM.2 are relative to the reference period for 1986 - 2005 as indicate in footnote a to the Table. In addition, the revised introductory Chapeau text to the entire SPM projections section now also clearly states that "Projections in this Summary for Policymakers are given relative to 1986–2005, unless otherwise stated." Observed temperature changes for additional reference periods are also given in footnote a of Table SPM.2.
SPM-2607	SPM	19	1	19	4	It is unclear how the results regarding temperature change relate to the results presented in Table 12.2. [European Union]	Table 12.2 of the SOD reports central estimate plus/minus 1 standard deviation, and the 5–95% ranges from the models' distribution. The ranges presented here are the 5-95% ranges from the CMIP5 ensemble, assessed to be likely ranges after accounting for additional uncertainties or different levels of confidence in models. This is explained in footnote (c) of the revised Table SPM.2
SPM-2608	SPM	19	1	19	12	It is a great relief to see that the intermediate time slices are represented here as well as the end of the century (unlike in AR4!). This is consistent with the Atlas information too, though I hope that can be revised to be represent changes in T and P for equivalent seasons (currently an inconsistency) so that all of these results can be brought together in a coherent way by people who may wish to make use of them. [Timothy Carter, Finland]	Noted. Global mean precipitation changes are not considered to be very useful to be included in this Table. Near term changes have been deleted to further focus the Table on mid- to long term time frames.
SPM-2609	SPM	19	1	19	12	Unless you can demonstrate that climate models are 100% accurate for all climate forces your projections are mere speculation and should be deleted or heavily qualified. [John McLean, Australia]	Reject. Reviewer fails to provide any scientific evidence in support of his claims. No action.
SPM-2610	SPM	19	1	19	12	Table SPM.2: It is extremely important that it is possible to compare these numbers with informations in AR4. Thus it has to be explained what the influence of the different reference period (1986-2005 instead of 1990) and the different scenarios (RCP instead of SRES) is. [Urs Neu, Switzerland]	Noted. Observed temperature changes for additional reference periods, including 1980-1999 as used in AR4, are now given in footnote a of Table SPM.2. Note that comparability with AR4 is reduced due to the difference in models and scenarios used. See Box TS.6 "The New RCP Scenarios and CMIP5 Models" for a discussion.
SPM-2611	SPM	19	1			Table SPM.2: replace square brackets with round ones. Square brackets in the WGI report signify a 90% confidence interval, whereas here you are describing likely ranges. [Andy Reisinger, New Zealand]	Taken into account: brackets have been removed and Table column header now explicitly mentions "likely range". Footnotes (c) and (d) explain further details.

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SPM-2612	SPM	19	5	19	6	The adoption of default reference period of 1986-2005 is an important change since AR4. This change is potentially confusing to those who are used to seeing numbers and projections relative to a "pre-industrial" baseline. Therefore, this change should be clearly highlighted at the outset. [Government of United States of America]	Footnote (a) in Table SPM.2 states that projections are relative to the reference period for 1986 - 2005. In addition, the revised introductory Chapeau text to the entire SPM projections section now also clearly states that "Projections in this Summary for Policymakers are given relative to 1986–2005, unless otherwise stated."
SPM-2613	SPM	19	5			It would help policymakers a lot if the esimated temperature rise (possibly including its uncertainty range) from preindustrial era to the period of 1986-2005 could be given in the figure caption. So the policymakers could see the total increase from preindustrial era to the end of this century. [Ilkka Savolainen, Finland]	Taken into account. Observed temperature changes for additional reference periods, including 1850-1900 as the CMIP5 model analogue to pre-industrial, are now given in footnote a of Table SPM.2.
SPM-2614	SPM	19	7	19	7	Include Atlantic Meridional Overturnig Circulation in full. [Luisa Cristini, United States]	Comment unclear. Atlantic Meridional Overturning Circulation is not part of Table SPM.2. No action.
SPM-2615	SPM	19	7	19	10	These sentences in the Table SPM.2 notes (beginning with "The contributions…" and ending with 'climate change") are not likely to be understood by most readers of the SPM. Can these sentences be put into plain language? What is it important to convey in order to properly interpret the data in the table? Is it that a constant amount was added to each scenario to account for these two things (dynamical ice sheet changes and anthropogenic land water storage)? [Government of Canada]	Taken into account. Footnote has been substantially expanded in order to provide more explanations and better guidance to the reader.
SPM-2616	SPM	19	10			Again, "global" [William Ingram, United Kingdom]	Noted.
SPM-2617	SPM	19		19		table 2. include separating lines between SAT and SRL info, and grouping date with appropriate level of confidence. Add extra column for range. [Government of Australia]	Taken into account. Table has been revised as suggested.
SPM-2618	SPM	19		19		Table SPM.2: Please see comments on this table for Technical Summary [Government of Germany]	TS comments says: "Table TS.1: Be specific how the likely uncertainty ranges were derived. Looking at Table 12.2, it seems that the multi-model mean is used plus two times the standard deviation. Clarify in the footnote" [Government of Germany] -- Table 12.2 of the SOD reports central estimate plus/minus 1 standard deviation, and the 5–95% ranges from the models' distribution. The ranges presented here are the 5-95% ranges from the CMIP5 ensemble, assessed to be likely ranges after accounting for additional uncertainties or different levels of confidence in models. This is explained in footnote (c) of the revised Table SPM.2
SPM-2619	SPM	19				Make reference to preindustrial level [Government of Germany]	Taken into account. Observed temperature changes for additional reference periods, including 1850-1900 as the CMIP5 model analogue to pre-industrial, are now given in footnote a of Table SPM.2.
SPM-2620	SPM	19				Table SPM.2: State the reference period in caption. The tablenote "anomalies calculated with respect to 1986-2005 does not fully clarify whether a 0.6 C offset is applied to the above tabled temperature numbers or not. [Government of Germany]	All projections presented in Table SPM.2 are relative to the reference period for 1986 - 2005 as indicate in footnote a to the Table. In addition, the revised introductory Chapeau text to the entire SPM projections section now also clearly states that "Projections in this Summary for Policymakers are given relative to 1986–2005, unless otherwise stated." Observed temperature changes for additional reference periods are also given in footnote a of Table SPM.2.
SPM-2621	SPM	19				Again, it makes no sense giving priority to best guesses when the range is much wider than the precision the	Noted.

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						best guess is quoted to [William Ingram, United Kingdom]	
SPM-2622	SPM	19				Table SPM.2. n/a needs to be explained in the footnotes. [Umesh Kulshrestha, India]	Taken into account. "n/a" is no longer used in the revised Table.
SPM-2623	SPM	19				Table SPM.2. Add a footnote explaining that the warming and sea level rise in RCP6.0 by 2046-65 are less than those in RCP4.5 owing to smaller anthropogenic forcings at that stage, as noted in Chapter 12. Otherwise readers may be mystified! [David Parker, United Kingdom of Great Britain & Northern Ireland]	Noted. New Box SPM.1 provides an overview of the RCP scenarios. It clarifies that the RCP naming is based on the 2100 radiative forcing levels, but does not give any information about the time evolution over the 21st century.
SPM-2624	SPM	19				Table SPM.2: Are the temperature and sea level ranges consistent - i.e. sea level has been assessed for the given temperature ranges? Just asking, because that was not the case in the equivalent AR4 table. I hope this mistake is not repeated. [Stefan Rahmstorf, Germany]	Yes. Both are based on the same scenarios. However, note that the sea level contributions from ice sheet dynamics and land water storage are treated in this assessment as scenario independent (see chapter 13).
SPM-2625	SPM	19				Table SPM.2: I see fundamental problems with the treatment and communication of uncertainties in future sea-level rise, which concern the SPM and of underlying chapter 13, and which I will try to explain below. 1. The draft provides only a "likely" range for future sea-level rise, unlike the AR4 which gave a “very likely” range. This is most directly evident when comparing the new Fig. 13.8 to the old Fig. 10.33 of the AR4, where the AR4 graph shows 5-95% ranges and the equivalent AR5 draft graph gives “likely” ranges. A key statement on this is found on page 51: “Our likely ranges are narrower, in order to be more useful, but they are consequently accompanied by lower confidence.” I am afraid this is a great misunderstanding of what is “useful” to users of the IPCC reports. I have a lot of contact with coastal managers, and I can assure you that a “likely” range is not what is needed in coastal planning. A "likely" range is basically useless for coastal planning since it implies a 17% chance of being exceeded (even if the range is accurate as such), which is an insufficient safety level for practical planning purposes. IPCC is refusing an important societal demand here. At the very least the report (including the SPM) should provide a "very likely" range, as it did in the AR4. Preferably also a “plausible upper limit”, like the US Army Corps of Engineers provides in its coastal guidance (2m by 2100). Different users have different levels of risk aversion - you might be happy with a 5% chance of your holiday house getting flooded, but not for critical infrastructure like a port, airport or nuclear power station, which also typically have the long planning horizons and life times that require sea level rise to be taken into account. 2. Quite apart from the lack of practical usefulness, I think the switch from very likely to likely is extremely bad from a public communications and transparency point of view. After the IAC review of IPCC the procedures should become more transparent, not less. This switch, however, obscures the fact that uncertainties are now much larger than presented in the AR4. Some people might even wonder whether this is in fact why this was done. The excuses for not providing a “very likely” range, found scattered around the chapter, sound rather flimsy and indeed just like excuses. The public is certainly not going to understand the subtleties, the media will simply compare the new range to the old range without qualification. But by the switch to “likely” range and a different time span of the projection (now 95 years, in the AR4 it was 105 years), this comparison is made difficult to misleading and the numbers are artificially brought down. 3. This practice obscures the rather large differences in the AR5 projections, which are in fact much higher than the AR4 projections for the same scenario. As stated on page 47 of Chapter 13, for A1B the old range was 21-48 cm, while the new likely range is 44-75 cm. This hardly overlaps with the old range and on average is almost twice as high. That really is a major finding of the AR5! For the same scenario you now expect almost double the sea level rise! In the interest of transparency, and since differences to the previous assessment are supposed to be highlighted, this should be prominently stated, including in the SPM. I propose the following SPM bullet: "Due to the explicit inclusion of ice dynamics and several other improvements, the expected future sea-level rise for a given emissions scenario is now assessed to be almost twice as high as the ranges reported in the AR4."	Rejected. The AR4 range in Fig 10.33 is a model spread only. They explicitly stated they were "not able to assess the likelihood". Thus the AR5 presentation of a likely range is an advance since the AR4. The Chapter 13 authors have extensively discussed the issues of a very likely range and an upper bound. Despite significant advances since the AR4 allowing the specification of a likely range in the AR5, they have come to the assessment that the science to specify a very likely range is not available in the scientific literature at the present. An upper bound requires the specification of a confidence value to accompany it. Such an upper bound would be in the upper tails of a PDF and we have insufficient knowledge to specify such a value and the associated confidence level.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						4. The report displays (again) in my view an unwarranted over-confidence in the process models. E.g. on page 50 (Ch. 13) , where the different approaches are compared, about process-based projections one merely finds the statement: “Confidence in this approach comes from our understanding of the modelled physical processes, the consistency of the models with wider physical understanding of those processes as elements of the climate system, the agreement of modelled and observed contributions, and the agreement of observed and modelled GMSL”. So basically all is perfect: we understand the processes and the models reproduce the past sea-level rise. One has to look elsewhere in the chapter to find more honest statements like: “Before we can project outflow over the 21st century with any confidence, we need to better simulate ice flow” (p.43) – so maybe the processes can’t be modelled so well after all? Or the fact that the sum of modelled processes accounts for only 70% of the observed 20th Century sea-level rise (p. 23). What if it will also account for only 70% of the 21st Century sea-level rise? Then the actual rise would end up 43% greater than the projection. Just for the fun of it: if you add 43% to the RCP4.5 projection range from Table 13.5 it becomes 59 – 102 cm. Now you’re right in the semi-empirical range shown in Table 13.6 for this scenario. I am not suggesting this is the “true answer”. But the “big picture” of this chapter is: process-based projections are now much higher than in the AR4, which goes a long way towards reconciling the discrepancy between process-based and semi-empirical projections. But unlike semi-empirical models, the process-based models still underestimate 20th Century sea-level rise. This “big picture” is rather well hidden. A cursory read of the chapter gives a completely different impression. 5. The uncertainties are now larger than they were in the AR4, but the public is given quite the opposite impression. The range for the highest emissions scenario is 58 +/- 16 cm. Who really believes that we can forecast sea-level rise for such a massive, unprecedented warming to within less than +/- 16 cm? I think the draft very seriously understates the true uncertainties that we have about future sea-level rise, and this is because of the switch to a “likely” range and shorter projection interval, the mentioned overconfidence in process models and thus the exclusion of semi-empirical models from the forecast range. The IPCC draft dismisses all the higher results from semi-empirical models on the grounds that "current scientific understanding is insufficient for evaluating the probability of higher values" (so it says in the SPM) - this is why these results are simply not included in the projected uncertainty range. This is illogical - I would have thought that if we’re uncertain about these models, then this logically is something within the current uncertainty. I think the semi-empirical models have their limitations (as the process models do) but they have a certain amount of credibility, e.g. via the validation studies mentioned. Just writing (p. 50) that “there is no consensus about the reliability of semi-empirical model projections” is no reason to exclude them, because the same can also be said about the process-based projections. Note for example that the "ice dynamics" contribution from Greenland and Antarctica included is scenario-independent - i.e. IPCC assumes it is going to be the same, regardless of whether we get 1 or 5 °C global warming! As if continental ice discharge does not care about warming ocean waters, loss of ice shelves, meltwater percolating down etc. That is clearly unrealistic (as is said in the chapter somewhere) and simply reflects that our understanding of these processes is so limited that simple ad-hoc assumptions are being used - but why should such assumptions and the semi-empirical mountain glacier melt estimates be included, but well-calibrated semi-empirical models of sea-level rise be excluded? I would strongly advocate that IPCC uses a more even-handed approach, that at the same time is more honest about the overall uncertainties that we still have about future sea level, and follows assessments like the US National Climate Assessment, the coastal guidance of the US Army Corps of Engineers or the recently published World Bank Report in presenting a blend or synthesis of both modelling approaches, as the overall uncertainty range. [Stefan Rahmstorf, Germany]	
SPM-2626	SPM	19				Table SPM.2 Please cite ranges and no central values. [Geert Jan van Oldenborgh, Netherlands]	Noted. In the revised Table SPM.2 both central estimates and likely ranges are given.
SPM-2627	SPM	19				Table SPM.2 must be reconsidered regarding the 2016-2035 SAT values. It is ok to present the values coming out from the CMIP5 models, but more text should then be added about whether or not the authors really believe in those projections. The reason being that important near-term effects are not included in the models.	Table SPM.2 has been revised. The 2016-2035 time window is no longer included.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						[Terje Wahl, Norway]	
SPM-2628	SPM	20	0			Figure SPM.1: This figure is useful for the SPM, but we have the following three comments: (1) Why is there no combined global land and sea surface temperature data set as in previous assessments? As the text on Page SPM-3 refers to the combined land and ocean temperature data, clearly this is still an important indicator and its omission from this Figure should be explained. (2) The ocean heat content panel gives units for the y axis in joules while the text on page 4 (line 42) that refers to this figure gives data for ocean heat content changes in watts (over a time period). Consistency in units would be better (or alternatively, a note could be added to the caption telling readers how the units are related). (3) The multiple datasets make the figure a little complex - suggest adding a legend or increased explanation for each panel to the figure itself to help ease understanding. [Government of Canada]	Global mean surface temperature is now provided in the new Figure 1. In what is now Figure 2, units are consistent with the underlying assessment. Figure 2 has been significantly revised to improve clarity, and includes fewer panels.
SPM-2629	SPM	20	0			Figure SPM.1. Vertical axis of each embedded graph could be projected by light dotted lines to the top/bottom figure horizontal axis and the start dates inserted. [Government of United Kingdom of Great Britain & Northern Ireland]	Figure has been completely redesigned, and now includes only 4 panels plotted using the same axis scale.
SPM-2630	SPM	20	1	20	1	It's fine that you show the decrease in Arctic sea ice here but then you should also show the max increase in Antarctic sea ice (which months show the max increase?). Otherwise you show a too unambiguous picture of the global climate. [Marcel Crok, The Netherlands]	As discussed in the assessment, there is low scientific understanding regarding the change in Antarctic sea ice. It would therefore be inappropriate to include this indicator at the same level as those chosen.
SPM-2631	SPM	20	1	20	1	Same critique as above applies to snow cover. Here you only show the results for spring while on a yearly basis there is no or hardly any trend (in October there is an increasing trend). See http://pielkeclimatesci.wordpress.com/2011/05/30/fall-winter-and-spring-northern-hemisphere-snow-cover-extent-from-the-rutgers-university-global-snow-lab/ [Marcel Crok, The Netherlands]	The title of this figure is "multiple observed indicators of a changing global climate". Therefore quantities are shown that are consistent with changes assessed and explained in the underlying chapters.
SPM-2632	SPM	20	1	20	3	Figure SPM.1 should include a timeseries of global surface temperature anomaly, as well as the land and ocean surface timeseries. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Please see new figure 1.
SPM-2633	SPM	20	1	20	3	The fonts at the axes of the individual panels and the titles are too small [Ingeborg Levin, Germany]	layout and content of figure has been significantly revised.
SPM-2634	SPM	20	1	20	5	The uncertainties are unbelievable when they are "available" so they are even greater when they are "not available". [Vincent Gray, New Zealand]	reviewer fails to provide any substantial scientific basis to support his claim.
SPM-2635	SPM	20	1	20	13	It is a bit confusing that some data series are given along with uncertainties (panels c, g and h) and the other panels not. Furthermore, panel c is the only one with a mathematical trend in it. The other series not. Please consider to make more consistent. [Government of Netherlands]	layout and content of figure has been significantly revised. Only four panels are now shown, all as annual trends and all with uncertainty information.
SPM-2636	SPM	20	1	20	13	Figure SPM1: It might be good to also have the very extensively used reference figure of global lmean surface air temperature. [SYLVIE JOUSSAUME, France]	Please see new figure 1.
SPM-2637	SPM	20	1	20	13	In this Figure you show indicators of a changing "global" climate, but the ice data is only from the Arctic. You should also show the Antarctic sea ice extent, for the interval for which it is available. [Ross McKitrick, Canada]	As discussed in the assessment, there is low scientific understanding regarding the change in Antarctic sea ice. It would therefore be inappropriate to include this indicator at the same level as those chosen.
SPM-2638	SPM	20	1	20	14	The figure is not easy to understand as data are presented as anomalies relative to different reference periods. It would be good to either refer them all to preidustrial levels or (as this would probably not be possible for all data) at least refer them all to one common period, e.g. today. [Government of Germany]	layout and content of figure has been significantly revised. Changes and anomalies are presented exactly as they are shown and assessed in the underlying chapters. We don't believe the choice of reference period has any impact on the readers ability to see the clear trends in these time series.
SPM-2639	SPM	20	1	20	15	subplot c, the symbols are distorted. Across all subplots the tick marks on the axes are not consistent [Mark Siddall, United Kingdom]	layout and content of figure has been significantly revised, and consistent plot window used.
SPM-2640	SPM	20	2	20	2	What is the basis of the observations of Arctic summer sea-ice extent back to ~1860. Shouldn't some uncertainty bars be shown? (also true for other panels) [Rowan Sutton, United Kingdom of Great Britain &	Revised figure is until 1900 only, and includes uncertainty information.

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						Northern Ireland]	
SPM-2641	SPM	20	2	20	3	Figure 1 is made cumbersome with the different timescales. I understand that it was laid out this way to compare different inicators, but maybe consider having individual x axes for each panel for clarity, usability, and citability. [Sarvesh Garimella, United States of America]	layout and content of figure has been significantly revised, and consistent plot window used.
SPM-2642	SPM	20	2	20	13	Adding numbers on the y-axis on the right-hand side of the figures would be helpful. [Kristie Ebi, United States of America]	layout and content of figure has been significantly revised, and consistent plot window used.
SPM-2643	SPM	20	2	20	13	For harmonization please add to all indicators "global" as it was done for g) "global sea level"; or to delete "global" also in g). It would be helpfull to add the latest year of observation for all indicators, because they are obviously different. [Government of Germany]	Layout and content of figure has been significantly revised. Supplementary material provides further details on the datasets used.
SPM-2644	SPM	20	5	20	13	No period of record is given for panel g. [Government of United States of America]	Layout and content of figure has been significantly revised. Caption now specifies the reference period used for the sea level time series, and supplementary material provides further details on the datasets used.
SPM-2645	SPM	20	5	20	13	Should the term "anomaly" be defined for policy makers? It is recommended also that term be added to the glossary, but a local definition would additionally be useful. [Government of United States of America]	we believe this is a commonly understood term.
SPM-2646	SPM	20	5	20	13	The figure caption should be revised to be easier to read. E.g. include the bold text: "Each line in the individual figures a) - h) represents …. large-scale quantities from… ." Does the policy maker understand " Large scale quantities"? Alternative " Averaged quantities" . // it is from a readers point not understadable, why in this figure three different reference periods are used.This is further confusing, as in the AR4 always 1961 - 1990 was used in the similar figure. [Christoph Ritz, Switzerland]	Caption and figure has been significantly revised.
SPM-2647	SPM	20	8	20	9	Some explanation is needed for the vertical axis of panel g). [Government of Finland]	Layout and content of figure has been significantly revised. Caption now specifies the reference period used for the sea level time series, and supplementary material provides further details on the datasets used.
SPM-2648	SPM	20	8		9	I trust the reference periods are to be harmonized for the SOD? [William Ingram, United Kingdom]	Changes and anomalies (and their reference periods) are presented exactly as they are shown and assessed in the underlying chapters. We don't believe the choice of reference period has any impact on the readers ability to see the clear trends in these time series.
SPM-2649	SPM	20	8			The mean sea level period (g) isn't given. [Government of France]	Layout and content of figure has been significantly revised. Caption now specifies the reference period used for the sea level time series, and supplementary material provides further details on the datasets used.
SPM-2650	SPM	20	9	20	9	Please explain "running mean" in Glossary. [Government of Germany]	caption has been revised and this term is no longer used.
SPM-2651	SPM	20	11			Just what does “uncertainties” mean here? [William Ingram, United Kingdom]	Uncertainties are shown as assessed in the underlying chapter. Supplementary material will be created for the final published report which will provide full details on the datasets and uncertainties shown in this figure.
SPM-2652	SPM	20	41	20	42	Fig. 11.7 has large regions of negative values, meaning initialized forecasts have worse skill. This is severely downplayed in the text, and should be given more visibility. [Government of United States of America]	Comment seems misplaced. Unclear how this comment applies to Figure SPM.1 -- no action.
SPM-2653	SPM	20		20		Figure 1 is too complex for introductory image. If a thematic approach is taken to redrafting the SPM, this figure could be broken up accordingly. It would also help to use consistent line size and graphics throughout - ie on snow cover - remove all x and o from the image - remove the dots from the sea-ice image, remove	layout and content of the figure has been significantly revised.

Comment No	Chapter	From Page	From Line	To Page	To Line	Comment	Response
						number of layers in ocean heat content figure. [Government of Australia]	
SPM-2654	SPM	20				Figure SPM.1: This figure should also include "averaged global mean surface temperature" It is difficult to understand why three different reference periods are used in the same figure and why it is not the same as in SPM.5. [Christof Appenzeller, Switzerland]	see new SPM figure 1. Reference periods used in this figure (now figure 2) are kept consistent with the underlying chapter versions of these panels. We don't believe the choice of reference period has any impact on the readers ability to see the clear trends in these time series.
SPM-2655	SPM	20				"anomaly" is a term that ought to be defined up front in the SPM since it is used in a somewhat uncommon sense. [James [Jim] Crawford, United States of America]	we believe this is a commonly understood term in this context.
SPM-2656	SPM	20				The distinction between the several lines in most of the panels is not clear. A legend for each panel is needed. [James [Jim] Crawford, United States of America]	layout and content of the figure has been significantly revised.
SPM-2657	SPM	20				The sea level rise from 1850 to 1950 has not been adequately treated in the text. [James [Jim] Crawford, United States of America]	The revised version of this figure begins at 1900, consistent with the clear statements regarding sea level rise provided in the SPM.
SPM-2658	SPM	20				The wide uncertainty band in panel h compromises the message. [James [Jim] Crawford, United States of America]	Uncertainties are shown as assessed in the underlying chapter.
SPM-2659	SPM	20				In panel b, for troposheric, read tropospheric [Government of Denmark]	panel has been removed from the revised version of this figure.
SPM-2660	SPM	20				Hopefully it is possible to include data points up to 2012 in later versions [Government of Denmark]	The time series are shown exactly as assessed in the underlying drafts of the chapters.
SPM-2661	SPM	20				The graph is quite busy. It may be considered to split it up. If the graph is not split, the time line on the x axis should be much clearer to read for the central panels. [Government of Denmark]	layout and content of the figure has been significantly revised.
SPM-2662	SPM	20				Figure SPM 1: It is necessary to add a legend to this figure or extend the caption significantly. It should be possible to read the figure without going into supplementary material to the report. [Government of NORWAY]	layout, content, and the caption of the figure have been significantly revised.
SPM-2663	SPM	20				FigureSPM-1 The very first figure for Policymakers is complicated and the figure captions are not as helpfulas they might be. (For starters, maybe the captions and scales should be on the right side?). [Government of United States of America]	layout, content, and the caption of the figure have been significantly revised.
SPM-2664	SPM	20				Figure SPM.1 The last 2 panels are supposed to be replots of the figures the chapter 3, but there seem to be 2 inconsistencies. Panel g, for global mean sea level has the blue, green and yellow bands overlapping after 1980 and that doesn't seem to occur in any of the Fig. 3.13 panels. Panel h for ocean heat content anomaly has a y-axis range from -100 to 150 just like the original Fig 3.2, but it is labelled 10^22 J while in Fig. 3.2 it is in ZJ (where 1ZJ=10^21 J). Which one is correct? I think the SPM is incorrect. Note that in Fig. SPM.4 the global OHC on the far right is in 10^22 J but the range is from -10 to 20. [Government of United States of America]	Please see revised version of this figure. For sea level, the data is exactly as assessed in the underlying chapter. However, there are some differences in the presentation of the data because we combine here the altimetry and tide gauge data onto a single plot starting at 1900. Units on the OHC plot have been corrected.
SPM-2665	SPM	20				Figure SPM1 Uncertainties are available (and should be included) fo rlland and sea surface temperatures (panels e and f) [Peter Guttorp, United States of America]	Please see new figure 1.
SPM-2666	SPM	20				Figure SPM.1 This figure differs from the 'multiple indicators' plot in the Technical Summary (Figure TS.1). It would make sense to ensure that the two are consistent. The virtue of this version is that it draws directly on the time series used in the chapters. However, it is less comprehensive which would seem to be a weakness. I would suggest a combined approach such that material from the chapters (as in SPM.1) is combined in a more comprehensive plot (as in TS.1) [John Kennedy, United Kingdom of Great Britain & Northern Ireland]	layout and content of the figure has been significantly revised. We have taken the approach of ensuring complete consistency with the time series shown and assessed in the underlying chapters.
SPM-2667	SPM	20				The caption incorrectly states that "Where available, uncertainties in the observations are indicated by a shaded range". Uncertainties are available (but not shown) for at least ERSST, HadSST3, CRUTEM4, and the Berkeley land temperature series. The diagram as it stands reflects different choices made in each chapter about how to protray uncertainty information. [John Kennedy, United Kingdom of Great Britain & Northern	Please see revised version of Figure 1 and 2.

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						Ireland]	
SPM-2668	SPM	20				Fig. SPM.1: The number of lines in this figure has increased from about 3 in AR4 to about 20. While it's nice to see the combined evidence, I think the message gets lost. One could consider dropping the OHC curve since it is implicit in the sea level. Further I propose to use the same color and linestyle for each dataset to make it the figure easier to digest, or even showing only a shaded band from min to max of all datasets (as in the AR4 attribution figure for example). Dots for every year are unnecessary. [Reto Knutti, Switzerland]	layout and content of the figure has been significantly revised.
SPM-2669	SPM	20				Figure SPM.1: The temperature axis annotations are not aligned with the tick marks on the axis in the graph forming part f of the figure (SST anomaly). [Robert Larter, United Kingdom]	layout and content of the figure has been significantly revised.
SPM-2670	SPM	20				Fig SPM1c is cherrypicked data (March April only), is misleadingly presented as an 'anomaly' and despite this does not even support the claim on page 5 of a significant reduction. [Paul Matthews, United Kingdom]	The title of this figure is "multiple observed indicators of a changing global climate". March- April snow cover is the quantity assessed in chapter 4 as showing a significant change. For all other months, there is no significant change.
SPM-2671	SPM	20				Fig 1. Suggest move land and sea temperature panels upward to be adjacent to troposphere temperature. Then ocean heat content; then sea level; finally snow cover and sea ice. Idea is to keep closely related panels proximate. [Stephen E Schwartz, United States of America]	layout and content of the figure has been significantly revised.
SPM-2672	SPM	20				Figure numbers here should correspond to panel labels. e.g. Figure 2.15 is panel e, but there is no way of knowing this. [Conor Sweeney, Ireland]	this is the standard approach to cross-referencing in an SPM.
SPM-2673	SPM	20				Figure SPM.1: This is a really nice figure but is it possible to make all anomalies relative to the mean of the same years, say for example all relative to the mean of 1981-2000? [Line van Kesteren, the Netherlands]	see new SPM figure 1. Reference periods used in this figure (now figure 2) are kept consistent with the underlying chapter versions of these panels. We don't believe the choice of reference period has any impact on the readers ability to see the clear trends in these time series.
SPM-2674	SPM	21	0			Figure SPM.2: Measurements of 'partial pressure of CO2 at the ocean surface' may not mean much to many readers. Suggest this indicator be better explained in the caption in terms of what it indicates about uptake of CO2 by the ocean. The two variables presented jointly in the bottom panel of this figure also makes it difficult to interpret - consider presenting separately if possible. [Government of Canada]	When read in combination with the text contained in the section on observed changes in carbon and other biogeochemical cycles, we believe the content and message of this figure to be clear.
SPM-2675	SPM	21	0			Figure SPM2. ESTOC needs to have a geographical location associated with it. (Eastern Atlantic?). Are the pCO2 and pH at HOT, BATS, and ESTOC separate measurements or is one part derived from the other? The variations in pCO2 and pH are so well matched they look to be from the same actual measurement data, whilst the caption suggests otherwise 'Multiple observed indicators...'. [Government of United Kingdom of Great Britain & Northern Ireland]	Figure has been revised and now includes geographical information for all datasets. Further details on the datasets will be provided in supplementary material to be created for the final published report.
SPM-2676	SPM	21	1	21	1	Is the unit of the pH axis correct, i.e. "total scale" [Ingeborg Levin, Germany]	label has been revised.
SPM-2677	SPM	21	1	21	1	It would be helpful to include another panel showing the recent rise in CO2 in the context of a longer time period (e.g. last 100kyrs) [Rowan Sutton, United Kingdom of Great Britain & Northern Ireland]	the preference of the authors is not to repeat this similar figure from the AR4.
SPM-2678	SPM	21	1	21	5	Both graphs conceal variability. The top one ignores figures over land and the bottom is grossly untepresentative. [Vincent Gray, New Zealand]	reviewer fails to provide any substantial scientific basis to support his claim.
SPM-2679	SPM	21	1	21	9	CO2 is clear of course. However, the variable pCO2 expressed in muatm, needs some explanation for the SPM reader. What is this indicator and why is it important? Furthermore, the plot of two variables in the lower panel, having two different y axes, is not easy to understand. Better: split into two panels. [Government of Netherlands]	When read in combination with the text contained in the section on observed changes in carbon and other biogeochemical cycles, we believe the content and message of this figure to be clear.
SPM-2680	SPM	21	1	21	9	In Figure SPM.2.Bottom, please explain the unit of partial pressure, microatmosphere (since it is an information for policemakers). The same for other units in this SPM, like PgC, etc. [Rubén D Piacentini, Argentina]	When read in combination with the text contained in the section on observed changes in carbon and other biogeochemical cycles, we believe the content and message of this figure to be clear.

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SPM-2681	SPM	21	4	21	4	Include Hawaii after Mauna Loa [Luisa Cristini, United States]	Dataset names have been replaced with geographical coordinates.
SPM-2682	SPM	21	4	21	4	Suggest adding to end of first sentence "and are considered representative of northern hemisphere and southern hemisphere atmospheric concentrations as CO2 is well mixed in the atmosphere". [Government of Canada]	Such text would go beyond the descriptive intention of a caption.
SPM-2683	SPM	21	8	21	9	There is no need to add that further details are in the underlying report. [Kristie Ebi, United States of America]	This is crucial, because many reviewers and readers want more details on the datasets.
SPM-2684	SPM	21	36	21	37	More reference should be made to black carbon in the Technical Summary, considering the fact that it should be an important message to policymakers that reductions of black carbon can have a cooling effect in the short term but not in the long term. [Government of Japan]	black carbon is included in SPM figure 4.
SPM-2685	SPM	21		21		Figure 2. Separate into two figures. 1. Atmosphere - change colours; South Pole and Mauna Loa data can't be identified when printed in greyscale. 2. Surface ocean - remove HOT, BATS and ETSOC info if possible. Unnecessary for SPM purposes to identify source of data. [Government of Australia]	Figure has been revised and dataset names replaced with geographical coordinates. Colour scheme has been revised.
SPM-2686	SPM	21		21		Lower figure: readibility would be improved if different colors would be used fo pCO2 and pH. [Government of Germany]	Colour scheme has been revised.
SPM-2687	SPM	21				Figure SPM.2: Suggestion to add "(Hawaii)" after Mauna Loa [Cathy Clerbaux, France]	Figure has been revised and dataset names replaced with geographical coordinates.
SPM-2688	SPM	21				Figure SPM.2. Horizontal gridlines might ease reading of the graph. [Government of Finland]	Colour scheme and plot details have been revised.
SPM-2689	SPM	21				Figure SPM 2: Please consider to add terrestrial measurements to make the picture complete. Add to the caption that PCO2 is the upper graphs and on the left axis, while pH measurements are the lower graphs and on right axis for the Surface Ocean panel. [Government of NORWAY]	Focus is on ocean as with figures on projections. Terrestrial measurements are not representative for larger regions as are oceanic measurements shown.
SPM-2690	SPM	21				Figure SPM.2: This figure contains very relevant information, but we feel that HOT, BATS and ESTOC is difficult to understand. We suggest that you instead use something like Hawaii Ocean, Bermuda Atlantic and Europe and explain this further in the figure caption. The significance of partial pressure of CO2 should also be explained. [Government of NORWAY]	Figure has been revised and dataset names replaced with geographical coordinates.
SPM-2691	SPM	21				Figure 2 Is "partial pressure of CO2 at the ocean surface" referring to the oceanic or the atmospheric side of that surface? [Government of United States of America]	This is clear when read in combination with the text contained in the section on observed changes in carbon and other biogeochemical cycles.
SPM-2692	SPM	21				Figure SPM.2 In the upper panel, the Mauna Loa data shows an annual cycle superimposed on the increase in CO2. Instead, in the lower panel, the annual cycle is removed from the HOTS, BATS and ESTOC but is in the original Fig. 3.17. It would be better if the two panels were consistent. If the annual cycle is removed in both atmosphere and ocean, the caption should state whether the quantity plotted is smoothed or an average. Also, although the two y-axis labels are somewhat offset it is not immediately obvious which lines are for pCO2 and pH. It might help to either by using a different line, symbol, or write it out. There is space. [Government of United States of America]	Technical details on the datasets will be added as supplementary material to the final published draft of the report. Layout of the bottom panel has been revised to provide clearer distinction between the pCO2 and pH time series.
SPM-2693	SPM	21				Fig. SPM.2: If this figure is kept I suggest simplifying it. Why do we need South Pole data? It does not add anything? Also the station data in the lower panel could all have the same color/style, without labels. But I'm not sure this figure is needed. The observed CO2 is obvious and well known, and for the ocean station data it's not obvious whether it's representative of anything large scale. [Reto Knutti, Switzerland]	Colour scheme and plot details have been revised. We believe it is important to maintain time series of CO2 from both hemispheres.
SPM-2694	SPM	21				Figure SPM.2. Use BATS back to 1983 and ESTOC back to 1994 if possible. [David Parker, United Kingdom of Great Britain & Northern Ireland]	Length of time series is consistent with the underlying plots shown in the chapter.
SPM-2695	SPM	21				pCO2/ph plot: The axis should not start from 1955 if no data until ~1990 the plots should be separated vertically to make it more clear which line corresponds with which vertical axis, or else a visual indicator included to separate the plots [Conor Sweeney, Ireland]	It is important that panels a and b use a consistent x-axis, so that the time-series can be directly compared.

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SPM-2696	SPM	22	0			SPM3: suggestion to add at least a note on RF due to volcano [Cathy Clerbaux, France]	Taken into account. The figure caption now specifically mentions that radiative forcing from volcanic eruptions is not included in the figure due to it's sporadic nature and the fact that it is small compared to other forcings.
SPM-2697	SPM	22	0			Figure SPM3: the light blue colours on this plot are difficult to see on a computer screen or printed out on paper. The text on the left-hand side is untidy and it's not obvious what the key showing time periods is trying to say. [Government of United Kingdom of Great Britain & Northern Ireland]	Figure has been substantially revised. Blue colors are now mostly avoided.
SPM-2698	SPM	22	1	22	1	Missing "linear contrails" as a forcing agent, e.g. a footnote could be helpfull to explain that the influence is very small. For clearness please add at the left side the words "anthropogenic" and "natural". [Government of Germany]	Figure has been substantially revised. The figure caption now specifically mentions that radiative forcing from contrails is not included in the figure due to the fact that it is small compared to other forcings.
SPM-2699	SPM	22	1	22	2	The AR4 version of Figure 3 is more useful and readable. Having 3 time periods for each bar isn't very useful, but having the actual numbers and certaintes on the figure would be helpful. [Sarvesh Garimella, United States of America]	Figure has been substantially revised, numbers have been added to the bars. In addition, the three time bars are now only given for the total anthropogenic radiative forcing. All other bars/numbers are presented for radiative forcing compared to 1750.
SPM-2700	SPM	22	1	22	5	It is confusing to have added together the forcings by light abosrbing aerosols and light scattering aerosols. Because they very independently, and are controlled separately, they should have a bar each, with uncertainties. In addition, their effects are very different and their geographical distributions are too. [Robert Charlson, United States of America]	Taken into account. The figure has been substantially revised. Individual components contributing to radiative forcing, including aerosols and the cloud adjustments due to aerosols, are now listed explicitly. The caption has been expanded.
SPM-2701	SPM	22	1	22	7	In Figure SPM.3. Bottom (small box), explain in the legend what means the positive and negative values of the "Radiative Forcing". [Rubén D Piacentini, Argentina]	Figure has been substantially revised. The inset figure has been deleted.
SPM-2702	SPM	22	1			Fig. SPM3: the following text on the left side of the figure could be moved to make it more clear which data it refers to - "Direct Aerosols Impact on Clouds" [Government of Australia]	Noted. The figure has been substantially revised. Individual components contributing to radiative forcing, including aerosols and the cloud adjustments due to aerosols, are now listed explicitly. The caption has been expanded.
SPM-2703	SPM	22	3	22	3	In the Fig SPM.3 caption, suggest adding the "(forcing agents)" after the word "drivers" in this sentence to link clearly to the heading in the figure. [Government of Canada]	Figure and caption have been substantially revised.
SPM-2704	SPM	22	3	22	7	We suggest to separate stratospheric and tropospheric ozone, since the current format indicates that all signals in the right part of the graph refer to troposphere and the left to the stratosphere. But since this is only true for ozone, both should be separated to avoid confusion. In addition, simplify the legend by showing 1750-2011 red bar, 1750-1980 orange bar, and 1750-1950 light orange bar. We also suggest to add the relative contributions from the other greenhouse gases, such as CH4, N2O, and halcarbons [Government of Netherlands]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing where it is no longer straightforward to separate tropospheric and stratospheric ozone RF. However, individual components contributing to radiative forcing are now listed explicitly. The three time bars are now only given for the total anthropogenic radiative forcing. All other bars/numbers are presented for radiative forcing compared to 1750.
SPM-2705	SPM	22	3	22	7	The time period for the main plot (i.e. for individual forcing agents) of radiative forcing of climate in Fig. SPM.3 is not specified in the caption. [Government of United Kingdom of Great Britain & Northern Ireland]	Figure has been substantially revised. The three time bars are now only given for the total anthropogenic radiative forcing. All other bars/numbers are presented for radiative forcing compared to 1750.
SPM-2706	SPM	22	3	22	7	Figure SPM3: very good to have the 3 periods ! [SYLVIE JOUSSAUME, France]	Figure has been substantially revised. The three time bars are now only given for the total anthropogenic radiative forcing. All other bars/numbers are

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							presented for radiative forcing compared to 1750.
SPM-2707	SPM	22	3	22	7	Figure SPM.3: The abbreviations used in the figure should be added in brackets in the figure caption, e.g. "stratospheric water vapour (stratospheric H2O)", etc. [Urs Neu, Switzerland]	Noted. We felt this was not really necessary.
SPM-2708	SPM	22	3	22	7	I *strongly* suggest that this figure be replaced with an equivalent figure shows forcings by emissions, rather than concentration. If this is supposed to be the summary for policy-makers, we should be presenting information that is as close to what policy makers want as possible. Policy-makers cannot control CO2, aerosols and ozone independently, rather they can control emissions, and so radiative forcing by emission will be far more useful. Indeed, forcing by sector would also be a big improvement. This is one case where continuity with previous SPMs is far less important than improving the clarity of the information. [Gavin Schmidt, United States of America]	Taken into account. Revised figure SPM.4 does present emission based radiative forcing by driver.
SPM-2709	SPM	22	3			Please consider having this graph professionally rendered. We can do far better in aesthetically and effectively displaying this information. Furthermore, please consider replacing this graph or adding simplified versions of Fig8.17a,c showing the primary forcing agents in 2011 and the relationship between emissions and forcing. The historical differences are of interest but clearly do not outweigh the component forcings when only one graph will be shown. This graph potentially will be seen and displayed by many thousands of people over the next 6-7 years, which is motivation to make it the best possible. [David Fahey, United States of America]	Taken into account. Revised figure SPM.4 does present emission based radiative forcing by driver. The three time bars are now given for the total anthropogenic radiative forcing only. All other bars/numbers are presented for radiative forcing compared to 1750.
SPM-2710	SPM	22	3			Please consider showing the short lived climate forcing agents, ie CH4, trop O3, HFCs, and black carbon in a graphical inset. The visibility of these quantitative forcings woud be valuable to scientists and policymakers alike. [David Fahey, United States of America]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing are now listed explicitly.
SPM-2711	SPM	22	3			Instead of “successive”, it would be better to use “different”. [Government of Spain]	Text has been revised accordingly.
SPM-2712	SPM	22	5	22	5	Please, include explanation for forcing agents included into "Land Use Change". [Government of Finland]	Taken into account. Revised Figure now lists this term as "Albedo change due to land use"
SPM-2713	SPM	22	5	22	5	"stratospheric" is misspelled---without "r". [Government of Japan]	Taken into account.
SPM-2714	SPM	22	5	22	5	Include "WMGHG" in the bracket before CH4, … [Ingeborg Levin, Germany]	Revised Figure SPM.4 no longer uses the abbreviation WMGHG. Comment no longer applies.
SPM-2715	SPM	22	6	22	6	Why are there no uncertainty ranges for 1980 and 1950? [Government of Germany]	Taken into account. Revised figure SPM.4 now has three time periods given for the total anthropogenic radiative forcing only, but does include estimated uncertainties for those.
SPM-2716	SPM	22	6	22	6	insert "(Total Anthropogenic)" after "indicated" [Ingeborg Levin, Germany]	Figure caption has been substantially revised and expanded. Comment no longer applies.
SPM-2717	SPM	22	6			Figure SPM.3 What does "assessed uncertainty" mean? It's an uncommon - and heretofore unused - term in the SPM. [Government of United States of America]	Figure caption has been revised -- term no longer used.
SPM-2718	SPM	22	6			Just what does “Assessed uncertainty ranges” mean? [William Ingram, United Kingdom]	Figure caption has been revised -- term no longer used.
SPM-2719	SPM	22	7	22	7	In the Fig SPM.3 caption, suggest adding a line to indicate why volcanic forcing is not included in this Figure as volcanic forcing is often referred to in the text discussion of RF. [Government of Canada]	Taken into account. The figure caption now specifically mentions that radiative forcing from volcanic eruptions is not included in the figure due to it's sporadic nature and the fact that it is small compared to other forcings.
SPM-2720	SPM	22		22		For policy makers it is essential to have separate estimates for the radiative forcing for each of the three pollutants (i.e. CH4, N2O and others i.e also BC) similar to the comparable figure in AR4. It needs to make clear what pre-industrial is. [European Union]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing are now listed explicitly.

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SPM-2721	SPM	22		22		Reference level is 1750! Thank you. [Government of Germany]	done. indicated in caption, on x-axis and in the relevant column describing the total forcing.
SPM-2722	SPM	22		22		SPM. Figure SPM.3. The concept of radiative forcing of climate has not been explained in order a wide audience can understand this figure. So, it would be advisable to remove this figure from the Summary for Policymakers. [Government of Spain]	Reject. This is a key figure from the assessment linking observations and understanding of observed changes. However, in the revisions of the SPM, we have put more emphasis on explaining the concept of radiative forcing to the reader. It is now introduced more comprehensively and in simpler terms in the introductory text of Section 3 of the SPM "Drivers of Climate Change" as well as in a separate footnote. Radiative forcing is also defined in the WGI Glossary.
SPM-2723	SPM	22		22		Figure SPM.3: in the figure's vertical axis labels, the word "aerosols" refers to their direct effect and impact on clouds. Its location a a little misleading, it would be clearer to repeat the word "aerosols" for both effects. [Masa KAGEYAMA, France]	Taken into account. The figure has been substantially revised. Individual components contributing to radiative forcing, including aerosols and the cloud adjustments due to aerosols, are now listed explicitly. The caption has been expanded and provides more details.
SPM-2724	SPM	22		24		Fig. SPM.3 should have a bar representing RCP 8.5; i.e., it should have a bar with forcing of 8.5 W/m2 for comparison. Fig. SPM.5 is very good, but could be improved with a horizontal bar at 6.5 W/m2 in part (a) to show how the forcing of 6.5 W/m2 at the end of the last ice age compares to the bau projection. Fig. SPM.5 also should have another panel (a) to show the projected concentraions of the key gases...at least CO2..., and all the other panels should be relettered accordingly. Why? To make certain that the reader sees how large the CO2 etc. concentraions will become if we don't control them. ALSO, the concentrations are the key measured quantity that can be compared to predictions as the years and decades go by. We actually have measured values of CO2 etc. to compare to the projections for ca. the last few decades, and it seems as if we are at or above the bau projection! Figure SPM.5 (e) could have a horizontal bar to represent the pH at which key marine minerals (e.g., aragonite) begin to dissove. [Robert Charlson, United States of America]	Noted. Figure SPM.4 (formerly Figure SPM.3) is about the past up to present-day. Radiative forcing for projections using the RCPs is being presented in the SPM section on Projections, in particular the new SPM Box on the RCP scenarios. With regard to Figure SPM.6 (formerly Figure SPM.5). This figure presents model outputs from the multi-model CMIP5 ensemble for the concentration-driven RCP runs. CO2 concentrations in the concentration-driven runs are an input to the models and adding those would thus be inconsistent with the rest of Figure SPM.6.
SPM-2725	SPM	22				A bracket or something is needed to make it clear that "direct" relates to aerosols. [James [Jim] Crawford, United States of America]	Taken into account. The figure has been substantially revised. Individual components contributing to radiative forcing, including aerosols and the cloud adjustments due to aerosols, are now listed explicitly in separate rows. The caption has been expanded and provides more details.
SPM-2726	SPM	22				Absence of tropospheric water vapor is surprising. Perhaps it should be shown for perspective, even if the effect is very small. [James [Jim] Crawford, United States of America]	This section discusses radiative forcing from drivers of climate change. Tropospheric water vapor changes are considered a feedback and thus discussed as part of the SPM section on "Understanding the Climate System and its Recent Changes"
SPM-2727	SPM	22				Figure SPM.3: Please add the Level of scientif undersanding (LOSU) similar to AR4 WG1 Figure SPM2. [Andrew Ferrone, Germany]	Taken into account. Confidence Levels, as used in WGI AR5, have been added to each entry in Figure SPM.4
SPM-2728	SPM	22				Figure SPM.3: Add error bars for each individual time period. [Andrew Ferrone, Germany]	Taken into account. Revised figure SPM.4 now has three time periods given for the total anthropogenic radiative forcing only, but does include estimated uncertainties for those.
SPM-2729	SPM	22				Figure SPM.3: Specify the source of stratospheric H2O (from CH4 or also anthropogenic emissions of airplanes?). [Andrew Ferrone, Germany]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing

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							to radiative forcing are now listed explicitly.
SPM-2730	SPM	22				Figure SPM.3: Caption: Please specify which other well-mixed green-houses gases are considered (more specific than "and others"). [Andrew Ferrone, Germany]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing are now listed explicitly.
SPM-2731	SPM	22				Figure 3 makes land use change look like a positive thing as it has a cooling impact - is there a way to capture the GHGs from land use change vs albedo or other negative forcings? [Government of Australia]	Revised Figure now lists this term as "Albedo change due to land use"
SPM-2732	SPM	22				Figure SPM.3: This figure is useful and easy to understand (particularly with the three time periods for the RF chart), but we have the following two comments: (1) It is recommended that an estimate for black carbon RF be included in this figure. This topic of particular policy interest, and the fact that albedo effects of black carbon on snow were included last time means readers will wonder why this was omitted this time. It seems that black carbon was included in the similar diagram presented in the TS, pg. 75. (2) Please clarify land-use change as a negative forcing agent. This seems in contrast to the statement on p. 6 (lines 8-9) that deforestation and other land use change are estimated to have released about half of the total anthropogenic carbon since 1750. [Government of Canada]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing are now listed explicitly. Revised Figure now clarifies that the land use term is "Albedo change due to land use"
SPM-2733	SPM	22				It would be highly policy relevant to depict the specific contribution of more species, such as methane, and black carbon. [Government of Denmark]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing, e.g., Ch4, black carbon, etc., are now listed explicitly.
SPM-2734	SPM	22				Figure.SPM.3: Black carbon, which has a warming effect, should be distinguished from other types of aerosol, considering the different effect mitigation measures will have upon climate change. Therefore, the radiative forcing estimates and ranges should be separately given for each aerosol type, as in Figure TS.5. [Government of Japan]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing, e.g., black carbon and other aerosols, are now listed explicitly.
SPM-2735	SPM	22				Figure SPM.3: colours for rectangular bars showing minus values (in the lightest blue) need to be darkened, because the bars for 1750-1950 are scarcely discernible. There is no bar of Ozone for this period, and explanation for this absence is also desirable. [Government of Japan]	Figure has been substantially revised and use of colors has been revisited. The figure now presents the emission based radiative forcing. Individual components, e.g., ozone, contributing to radiative forcing are now listed explicitly.
SPM-2736	SPM	22				Figure SPM 3: Please include another set of horizontal bars to this figure where SLCF are addressed (e.g. different types of aerosols). Please explain what is included in Land Use Change (is eg. ice extent included?), and why Land Use Change gives negative RF. Which gases are contained under other well mixed GHGs (are both CFC and f-gases regulated under the UNFCCC included)? It might be relevant to subdivide this part of the figure to clearly indicate the contribution from different gases/groups of WMGHGs. [Government of NORWAY]	Taken into account. The figure has been substantially revised and now presents the emission based radiative forcing. Individual components contributing to radiative forcing are now listed explicitly. Revised Figure now clarifies that the land use term is "Albedo change due to land use"
SPM-2737	SPM	22				Figure SPM.3. The smaller frame that provides a legend for the time period is slightly confusing. It sort of suggests that the size of all forcing agents has increased with the lengthening of the time period. This is so for many, but not all agents. [Government of Sweden]	Figure has been substantially revised. The inset figure has been deleted.
SPM-2738	SPM	22				Figure 3 Presumably "Aerosols" is meant to be divided into "Direct" and "Impact on Clouds," but the placement of words on the chart leaves this unclear. [Government of United States of America]	The figure has been substantially revised. Individual components contributing to radiative forcing, including aerosols and the cloud adjustments due to aerosols, are now listed explicitly in separate rows.
SPM-2739	SPM	22				Figure 3 The authors might consider adding the impact from volcanic eruptions as an additional natural forcing component in this figure. [Government of United States of America]	Noted. We prefer not to include radiative forcing from volcanoes in the figure. The figure caption now specifically mentions that radiative forcing from volcanic eruptions is not included in the figure due to it's sporadic nature and the fact that it is small

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							compared to other forcings.
SPM-2740	SPM	22				Fig. SPM.3: Why do the earlier time periods not have an error bar? [Reto Knutti, Switzerland]	Taken into account. Revised figure SPM.4 now has three time periods given for the total anthropogenic radiative forcing only, but does include estimated uncertainties for those.
SPM-2741	SPM	22				figure SPM3. Need to explain that the box at the bottom is the key [John Mitchell, United Kingdom]	Figure has been substantially revised. The inset figure has been deleted.
SPM-2742	SPM	22				Specify meaning of uncertainties in caption. [Stephen E Schwartz, United States of America]	Taken into account. Radiative forcing estimate and uncertainties are now also given as numbers to the right of the bars. The meaning of uncertainties as reported in the WGI AR5 SPM is explained in the new footnote 3 (90% uncertainty intervals, unless otherwise stated).
SPM-2743	SPM	22				Perhaps better to show adjusted forcings (or even better, both). [Stephen E Schwartz, United States of America]	Noted. What is being reported in the revised SPM is in fact adjusted forcing (now termed effective radiative forcing) if available. For drivers for which adjusted forcing is not available (see footnote 8 on radiative forcing), the traditional radiative forcing is provided. However, for the purpose of the SPM, we felt that this level of detail and the separation was not needed (and probably more confusing than useful) and thus have decided to always refer to the estimates as radiative forcing.
SPM-2744	SPM	22				An argument can be made that the uncertainties indicated for LW forcings by CO2 and by WMGHGs are substantially underestimated. CO2 forcings and climate response of 15 atmosphere-ocean general circulation models (GCMs) that participated in round 5 of the Coupled Model Intercomparison Project (CMIP-5) were compared by Andrews et al (2012). Forcing and temperature response coefficient were inferred from the output of the model runs respectively as intercept and slope of a graph of net top-of-atmosphere energy flux versus global mean temperature anomaly subsequent to a step-function quadrupling of atmospheric CO2. (Because the model experiments examined response to a quadrupling of CO2, rather than a doubling, the intercept had to be divided by 2 to obtain the forcing pertinent to doubled CO2). The forcing is interpreted as an "adjusted forcing" that includes rapid adjustments, mainly of atmospheric structure, that modify the TOA radiative flux on time scales shorter than a year or so. A key finding of Andrews et al. was the spread of values of forcing exhibited by the different GCMs, 16%, 1-sigma. The spread in forcing is a consequence of differing treatments of the radiation transfer in the several models as well as different treatments of clouds that interact with radiation. As the forcing inferred from the analysis of Andrews et al. is an adjusted forcing, it appropriately reflects differences among the models in rapid (<~ 1 yr) response of atmospheric structure to the imposed forcing. This spread in forcings inferred from the climate model runs is substantially greater than the uncertainty specified in the Figure. That there is such a range of forcing as inferred from GCM runs should not come as much of a surprise. For example, although the Radiative Transfer Model Intercomparison Project (Collins et al., 2006) reported a 1-sigma spread in longwave forcing at 200 hPa among the GCMs compared of only 8.5%, that study was restricted to cloud-free atmospheres, with the reason given that "the introduction of clouds would greatly complicate the intercomparison exercise," from which one infers that the spread of forcing in a model with clouds would greatly exceed that in an idealized cloud-free model. Hence the finding of a 1-sigma spread of ± 16% in the forcings (i.e., 5-95% range ± 26%, well greater than the ± 10% shown in the figure) is likely as accurate an assessment of the maximum level of confidence as can be placed at the present time in forcing by LLGHGs. Andrews, T., Gregory, J. M., Webb, M. J. and Taylor, K. E. 2012. Forcing, feedbacks and climate sensitivity in CMIP5 coupled atmosphere-ocean climate models. Geophys. Res. Lett. 39, L09712.	Noted. Estimates of radiative forcing and corresponding uncertainties presented in the SPM are fully based on and consistent with the comprehensive assessment presented in the underlying report, in particular in Chapter 8.

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						Collins, W. D., Ramaswamy, V., Schwarzkopf, M. D., Sun, Y., Portmann, R. W., Fu, Q. et al. 2006. Radiative forcing by well-mixed greenhouse gases: Estimates from climate models in the IPCC AR4. J. Geophys. Res. 111, D14317. [Stephen E Schwartz, United States of America]	
SPM-2745	SPM	22				labelling of "Aerosols : Direct / Impact on clouds" could be improved. [Conor Sweeney, Ireland]	The figure has been substantially revised. Individual components contributing to radiative forcing, including aerosols and the cloud adjustments due to aerosols, are now listed explicitly in separate rows.
SPM-2746	SPM	23	0			Figure SPM3: not convinced that adding 1750 to 1980 and 1750 to 1950 time periods adds anything useful (rather than just confusing the policy maker reader) as only for Solar is interesting extra information added. [Government of United Kingdom of Great Britain & Northern Ireland]	Figure has been substantially revised. The three time bars are now only given for the total anthropogenic radiative forcing. All other bars/numbers are presented for radiative forcing compared to 1750.
SPM-2747	SPM	23	0			Figure SPM4 is confusing as it presents a lot of information in one place. Suggest there should be a legend within the graph itself which shows what the different colours represent. There also needs to be a clearer explanation of what it means - that anthropogenic contribution to climate change is stronger than that from natural forcing. The lines on the graphs are far too fat for the size of the graphs and no detail can be gleaned. [Government of United Kingdom of Great Britain & Northern Ireland]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2748	SPM	23	1	23	1	This figure has a lot of information on it, and would be clearer if there was less information. The plots do not need to be superimposed on a map of the world; this makes the figure busier. The main concept can be conveyed without including the precipitation plots, so those can be eliminated. Perhaps it would be better to make two smaller figures, one with the land surface temperatures and one with the ocean heat content. [Alice Alpert, United States of America]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented. We prefer to maintain the world map layout, as this is a familiar layout to the users.
SPM-2749	SPM	23	1	23	1	Figure SPM.4 should include a comparison of the models against observations for the global mean surface temperature anomaly, not just land. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	This has been added.
SPM-2750	SPM	23	1	23	1	Figure 4 is overwheming and not very useful. The AR4 version of this figure was in a similar map form, but was simpler and more aesthetically pleasing. If you want to include this much more information, using a map format seems to clutter the figure without adding much information. Consider using a table of figures instead. [Sarvesh Garimella, United States of America]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented. We prefer to maintain the world map layout, as this is a familiar layout to the users.
SPM-2751	SPM	23	1	23	9	Temperature data for Africa and South America are sparse. The number of stations with homogeneous series from around 1900 up to now is very limited and unequally distributed over these continents. This inhibits a proper deduction of the historic data series, consistent with the conclusion in the SREX report Table 3.2, pages 193 and 194. We therefore would like to see an argumentation why these data records have been applied for model validation. According to the Appendix of Chapter 10, p 10-94, HadCRUT4 is used. However, Fig. 2.22 (page 2-164) shows only about 10 gridboxes with enough data to compute a trend over 1901-2011 in this dataset, which are not representative for the whole continent. Why is just HADCRUT4 used? Why not apply other datasets? Such as GISTEMP1200 and (for the period since 1979) ERA-interim. [Government of Netherlands]	Underlying discussion of the data used is provided in chapters 2 and 10. In the revised version of this figure we have added an indication of data uncertainty, which can be seen clearly for the continent of Africa and South America.
SPM-2752	SPM	23	1	23	9	the pastel colours here are too similar to distinguish [Mark Siddall, United Kingdom]	cosmetic changes to the figure have been implemented.
SPM-2753	SPM	23	2			Figure SPM-4 is way too complicated. It is more suitable for the technical summary. [Daniel Murphy, United States of America]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2754	SPM	23	3	23	3	Please explain the differences in the three observation lines. They all refer to observations but deviate significantly among each other. [Government of Netherlands]	This relates to the 3 different datasets used for ocean heat content. For the purpose of the SPM, details on

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							these datasets are not given, but can be found in the underlying Chapter version of this figure.
SPM-2755	SPM	23	3	23	9	Figure SPM.4: complex but very informative figure ! [SYLVIE JOUSSAUME, France]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2756	SPM	23	3			Figure SPM.4 is an excellent figure, congratulation! but it is rather complex. I have 2 proposals: - show one line with observation only and shading for uncertainty - keep the time period to 1950 - 2010 for all panels (instead a mix) ---> this would also give more space for the time period where it is anticipated that the "anthropogenic" changes should be seen. . [Christof Appenzeller, Switzerland]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2757	SPM	23	3			Caption for Figure SPM.4 should explain why there are three different colour / shades used for observations/data in this diagram. [Government of Canada]	This relates to the 3 different datasets used for ocean heat content. For the purpose of the SPM, details on these datasets are not given, but can be found in the underlying Chapter version of this figure.
SPM-2758	SPM	23	4		5	“padded” is the wrong word – replace “padded panels” with “background” [William Ingram, United Kingdom]	wording revised
SPM-2759	SPM	23	4			Be explicit that Antarctica is omitted from the continents [William Ingram, United Kingdom]	Antarctica has been added in the revised version of this figure.
SPM-2760	SPM	23	4			Omit “zonal” as plainly untrue [William Ingram, United Kingdom]	precipitation panels have been removed to simplify this figure.
SPM-2761	SPM	23	5	23	5	OHC I would unstand as "ocean heat content", ocean heat uptake would be a change of the content, and would thus have the unit of J/yr or something like this. This is a bit confusing. [Ingeborg Levin, Germany]	caption has been revised.
SPM-2762	SPM	23	5			Global-mean sea-ice is not given [William Ingram, United Kingdom]	It is not clear why this would be an appropriate or useful quantity, and has not been assessed in the underlying chapters.
SPM-2763	SPM	23	6	23	6	If only the ocean series have multiple observation based estimates then this information could be added to this line. [Government of Canada]	We feel this is clear from the figure.
SPM-2764	SPM	23	6	23	6	It is not clear what the difference is between the black and the grey curves (observations) [Ingeborg Levin, Germany]	This relates to the 3 different datasets used for ocean heat content. For the purpose of the SPM, details on these datasets are not given, but can be found in the underlying Chapter version of this figure.
SPM-2765	SPM	23	7			Text lacks e.g. “uncertainty range” - but more importantly, any explanation of what uncertainties this range allows for & how it was derived, what standard deviation is used for the other variables, & why temperature is treated differently [William Ingram, United Kingdom]	This information has been added in the footnote to the revised caption.
SPM-2766	SPM	23		23		Figure 4. Much too complex. When printed it is very hard to decipher. Separate into 4 figures. 1. Global averages, 2. Ocean 3. Continental 4. Precipitation. How can there be 3 sets of observations (black, grey and grey). Limit only to one line (black). Include blue and red bands in figure graphic (as part of models using only natural/natural and human forcing). Change anthropogenic to human. Include Figure heading ie. Observed and simulated climate change. Different time starting points v. confusing (1870, 1950, 1960) - should not be compared together in this way. Green, blue, yellow and white padded panels meaningless when printed in greyscale. Why are the precipitation observations on the left hand side so far outside the model ranges? [Government of Australia]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented. the 3 different observational datasets relates only to ocean heat content. For the purpose of the SPM, details on these datasets are not given, but can be found in the underlying Chapter version of this figure.
SPM-2767	SPM	23		23		Why are there three different types of grey/black for the observations? [Government of Germany]	This relates to the 3 different datasets used for ocean heat content. For the purpose of the SPM, details on

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							these datasets are not given, but can be found in the underlying Chapter version of this figure.
SPM-2768	SPM	23				Figure SPM.4: I think it's very important to have summary figures like this - the previous iteration of this figure from AR4 was incredibly widely used and effective in communicating, as is the goal of SPM figures. I very much wish this SPM author group success in constructing similarly useful and digestible figures. Unfortunately, this figure includes far too much to be useful. Approach this graph as if you wanted to show it as the first slide in every presentation you gave on climate change to any audience. For the current iteration of be of use, one would have to chop up this carefully constructed figure into many different parts that obviate the use of a synthesis figure in the first place. Graphs are so small that even with a full-page, it is very difficult to distinguish observations and assess differences in model runs with different forcings. I would recommend removing the zonal precipitation graphs and the sea-ice graphs at a bare minimum. Much of the rest of the graph is in units of heat or heat content. Furthermore, perhaps breaking this up into a two-panel figure with one panel of land surface temperatures and the second panel of ocean heat content might improve this. As it is, the figure does a very poor job at conveying any information and needs a great overhaul to be useful and widely reproduced. [William Anderegg, United States of America]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2769	SPM	23				The individual panels are so small that they aren't very useful. [James [Jim] Crawford, United States of America]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2770	SPM	23				Figure SPM4: Not sure if wide audiences know K is a measure of temperature, maybe better use C? This would be consistent with other ficures too (e.g., SPM5) [Luisa Cristini, United States]	Agree, this change has been implemented.
SPM-2771	SPM	23				Figure SPM.4: If possible please treat statistics consitently: For temperatures the 5 to 95% perecentile range is indicated, wheras for other variables the standard deviation is indicated, which is difficult to interpret for non-gaussian distributions. [Andrew Ferrone, Germany]	This has been made consistent.
SPM-2772	SPM	23				The figure is appropriate for a TS, but seems to complex for an SPM. Consider a simpler graphical represention, or a table format, or maybe leave it out. [Government of Denmark]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2773	SPM	23				Figure SPM.4. Is the latitude band (60S-30N) correct in the lowest panel of Precipitation time series on the left side of the figure? [Government of Finland]	precipitation panels have been removed to simplify this figure.
SPM-2774	SPM	23				Figure SPM.4 Southernmost precipitation inset graph should be titled "60 S - 30 S" [Government of New Zealand]	precipitation panels have been removed to simplify this figure.
SPM-2775	SPM	23				Figure SPM.4: This figure contains a lot of relevant information, but is complicated to understand. We suggest that you consider giving the global averages in a separate figure. Furthermore we suggest that you in the figure write out OHC, which is difficult to understand, e.g. by saying "South Pacific Ocean Heat Content" in the figure etc. Furthermore we suggest that you reconsider the classification used for precipitation. It does not match with the classification to be used in WGII. It also seems to us that some of these regions may encompass areas where the precipitation is expected to increase and area where the precipitation is expected to decrees. Furthermore we note that the area between 60S and 30S (it should be 30S and not 30N in the lowest panel see fig 10.9 and 10.20) contain only a small part of land surface compared to the other areas. Does this affect the results? [Government of NORWAY]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2776	SPM	23				Figure SPM.4 What do the 3 different lines for "observations" represent (black, lt gray, dark gray)? This should be explained in the caption. [Government of United States of America]	This relates to the 3 different datasets used for ocean heat content. For the purpose of the SPM, details on these datasets are not given, but can be found in the underlying Chapter version of this figure.
SPM-2777	SPM	23				It might be helpful to break this figure into multiple parts. It also might make sense to point out that the	Figure has been revised and simplified. Precipitation

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						variability is larger on continental scales than on global scales, as expected. [Government of United States of America]	plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2778	SPM	23				Figure 4 - (1) Should the caption refer to zonal mean LAND precipitation? (2) I don't recognize the black curves in the zonal precipitation boxes from Chapter 2, which also showed zonal precipitation trends. (3) The overlap of blue and pink is hard to perceive in these plots, making them impossible to understand. [Government of United States of America]	precipitation panels have been removed to simplify this figure.
SPM-2779	SPM	23				Figure 4 In the figure caption, use consistent terms: ocean heat content vs ocean heat uptake. Also make sure to attribute the acronym, 'OHC', to ocean heat content in the figure caption. [Government of United States of America]	caption has been revised.
SPM-2780	SPM	23				I hope its ok to comment on thisuse of figure from ch10 as a CH10 author - I would hesitate to use every one of these panels. Some are still quite uncertain. I would, for the SPM, focus on the best understood results. Also, some surprise me eg the enormouos bump in global precip in the 1950s does not look like the figure from Gillett et al. I like the ocean and continent SAT panels. I think we need to triplecheck the precip panels and understand robustness a bit better, some features I suspect are sensitive to processing order etc. I wonder if given the enormous sampling uncertainties in the tropics it would be ok to focus on the well understood high lat precipitation - although the policymakers might be keen on the other panels too. [Gabriele Hegerl, United Kingdom]	precipitation panels have been removed to simplify this figure.
SPM-2781	SPM	23				Fig. SPM.4: In my view this figure is far too complex. Even if it may pass the plenary meeting, that does not mean anyone will see the main message from it. There are too many regions, models, observations, and variables, and a lot of noise. In many panels there are discrepancies that raise more questions that they answer. I would propose something much simpler, the global temperature (top right panel) for example, along with a map of the observed warming since 1950 for example, and the simulated. Or no timeseries, and simply maps of observed temperature change, precipitation change, and sea ice, compared with simulated maps with and without anthropogenic forcing. The figures that are used most from IPCC reports are the simple ones, and if it takes a PhD to understand the figure then the report will not be as policy relevant as it should be. [Reto Knutti, Switzerland]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2782	SPM	23				Figure SPM4 Not clear whqat the baseline is. Needs to be clear that OHC and precipitation records are about half the length- ideally should use same horizontal (time) scale for all quantities [John Mitchell, United Kingdom]	agree, x-axis has been made consistent. Details on the baseline is available in the underlying chapter.
SPM-2783	SPM	23				The figure is faar too complex with tiny figures containing multiple observations an two models. The reference frame is always 1986 - 2005. This makes it quite difficult to compare the results with [Christoph Ritz, Switzerland]	Figure has been revised and simplified. Precipitation plots are removed, lines have been smoothed to decadal averages, time axis are consistent, and small cosmetic changes to the layout have been implemented.
SPM-2784	SPM	23				Are these diagrams based on simulations with ALL CMIP5 models (and not just a subset as in AR4)? [Henning Rodhe, Sweden]	Footnote added to the revised caption provides the is technical detail.
SPM-2785	SPM	23				Fig. SPM.4 What are the temperature trends in Africa based on? According to the Appendix of Chapter 10, p 10-94, HadCRUT4 is used. However, Fig. 2.22 (p. 2-164) shows only O(10) gridboxes with enough data to compute a trend over 1901-2011 in this dataset, which are not representative for the whole continent. Plaese use a dataset with a more representative extrapolation scheme, such as GISTEMP1200 and (for the the period since 1979) ERA-interim. [Geert Jan van Oldenborgh, Netherlands]	Underlying discussion of the data used is provided in chapters 2 and 10. In the revised version of this figure we have added an indication of data uncertainty.
SPM-2786	SPM	23				Fig. SPM.4 Why are the observations of land areas based on the combined land/sea dataset HadCRUT4 and not on a land-only dataset such as CRUTEM3? [Geert Jan van Oldenborgh, Netherlands]	The reason the underlying chapter figure used HadCRUT4 was because land only near surface air temperatures were not a diagnostic provided in the CMIP5 archive. This enables the assessment to compare/process observations with model data in as

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							similar way as possible.
SPM-2787	SPM	23				Fig. SPM.4 Please show multiple datasets for the land temperatures instead of only HadCRUT4, just like for ocean heat content. [Geert Jan van Oldenborgh, Netherlands]	Given the numerous comments wanting this figure simplified, it seems not desirable to add additional lines. The reader can turn to SPM figure 1, and see that the difference between the datasets is not large.
SPM-2788	SPM	23				Fig. SPM.4 Please use dashes lines when the confidence in the observations is medium and leave out when it is low due to limited areal availability and/or inhomogeneities due to non-climatic factors. [Geert Jan van Oldenborgh, Netherlands]	An indication of data uncertainty/quality has been added.
SPM-2789	SPM	23				Fig. SPM.4 The observed precipitation curves in this figure are from Zhang et al (2007b). This dataset is not assessed in Chapter 2. Please use a dataset that is assessed in Chapter 2. [Geert Jan van Oldenborgh, Netherlands]	precipitation panels have been removed to simplify this figure.
SPM-2790	SPM	23				Fig. SPM.4 The impression one obtains from the precipitation plots is that the models do not reproduce the observed trends and the observed decadal variability. This could be improved by subsampling the models on the grid boxes where there are observations, but in view of the unreliability of regional precipitation trends (Box 11.2) it may improve the communication to leave these plots out. [Geert Jan van Oldenborgh, Netherlands]	precipitation panels have been removed to simplify this figure.
SPM-2791	SPM	24	0			Figure SPM.5d: If RCP8.5 projects 94% disappearance of September sea ice by 2100, then is it misleading to have the y axis go down to -12.0 x 106 km? Could a line for complete disappearance be added to this Figure for reference? [Government of Canada]	Please see revised figure panel, which now is plotted as absolute extent, and includes a line where conditions are defined as "nearly ice-free".
SPM-2792	SPM	24	1	24	1	Figure SPM.5 should include an indication of the ranges of possible global mean surface temperature changes including year-by-year natural internal variability, to make it clear that it is not expected that temperatures will increase consistently year-by-year. Figure TS.12(a) is good for this. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Reject. The primary purpose of this figure is to present the projected mean climate change over the 21st century. The focus is not on interannual variability. Please also see TS TFE.3 figure 1.
SPM-2793	SPM	24	1	24	1	I suggest that for panel (d) it would be useful to find some way of showing the level of anomaly that would constitute "ice free" as this is of significant interest to policymakers and page SPM-15 lines 50-51 mentions September Arctic sea ice "nearly vanishing" before the end of the century under RCP8.5. I appreciate that this will probably require showing a range rather than a precise number, as the models will have biases in their baseline sea ice states, so this is probably not trivial, but I suggest that it would be worth trying. Presumably since neither the multi-model mean and lower end of the range have flattened out by 2100, this implies that 100% ice loss is not projected by that time? Given extremely high levels of interest in claims of an ice-free Arctic relatively soon, there should be a very clear indication of what IPCC WG1 projects for this iconic indicator of climate change. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Please see revised figure panel, which now is plotted as absolute extent, and includes a line where conditions are defined as "nearly ice-free".
SPM-2794	SPM	24	1	24	1	Figure SPM.5 needs to somehow show the true range of uncertainties including carbon cycle feedback uncertainties. This will entail uncertainty ranges on the radiative forcings in panel(a) and larger uncertainties ranges in the other panels. Rather than increasing the width of the plumes, which presumably is not possible since the CMIP5 ESMs don't provide the required information, there should be uncertainty bars on the right hand side (like in the AR4 WG1 figure SPM-5) [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Reject. The SPM text in the projection section and figure caption clearly state that these projections are based on the concentration-driven CMIP5 runs. The ranges requested by the reviewer are not available from the underlying WGI AR5 assessment and thus can't be presented in the SPM.
SPM-2795	SPM	24	1	24	1	Does panel (d) include the range of possibilities that could arise from interannual variability in ice extent? It looks like not, but I think that would be important information as the first occurrence of ice-free conditions (even as a temporary one-off event) is probably the way in which this figure will be judged in the future. [Richard Betts, United Kingdom of Great Britain & Northern Ireland]	Reject. The primary purpose of this figure is to present the projected mean change over the 21st century. The focus is not on interannual variability. Thus a 5-year running mean filter has been applied to the sea ice results.
SPM-2796	SPM	24	1	24	1	Please add the two intermediate RCPs to the panels when this can be done cleanly. There is inconsistency about whether blue range is in front of or behind red range in these panels. Please make which ever range is on top semi-transparent. There is an error in the scale on panel a) with 4.0 repeated twice. [Government of Australia]	Results for the end of the 21st century are provided as bars for all RCP's. Panel a removed.
SPM-2797	SPM	24	1	24	1	Figure SPM.5, panel d: it might be more interesting to use an absolute scale, to know where the zero-line is.	Please see revised figure panel, which now is plotted

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						[Urs Neu, Switzerland]	as absolute extent, and includes a line where conditions are defined as "nearly ice-free".
SPM-2798	SPM	24	1	24	12	In Figure SPM.4.Top (Radiative Forcing), please verify if the vertical axis has the correct unit of radiative forcing [Wm-2] and not [Wm2] (since it is so small that it is difficult to me to see if the minus sign is included). [Rubén D Piacentini, Argentina]	to simplify this figure, this panel has been removed.
SPM-2799	SPM	24	3	24	3	Please indicate number of models and simulationes involved in figure a) [Government of Germany]	to simplify this figure, this panel has been removed.
SPM-2800	SPM	24	3	24	3	Caption to Figure SPM 5: We suggest that the first sentence in the figure caption is made easier to understand and is highlighted e.g. something like "Observed and future climate change simulated by climate models" and then you could follow with explanation of what kind of models etc. and a description of the different panels. [Government of NORWAY]	reject, this is incorrect. There are no observed changes shown in this figure.
SPM-2801	SPM	24	3	24	4	It would arguably be more consistent to show the CMIP5 model-based RF (+/-1 SD range) in panel (a) of Fig SPM.5 (as in Fig 12.4 and Table AII.6.10). This would make all parts of the figure 'CMIP5 multi-model simulated' in the same sense. [Tim Johns, United Kingdom of Great Britain & Northern Ireland]	to simplify this figure, this panel has been removed.
SPM-2802	SPM	24	3	24	4	It's not the radiative forcing, but the radiative forcing due to GHGs, aerosols, etc. [Andreas Sterl, Netherlands]	to simplify this figure, this panel has been removed.
SPM-2803	SPM	24	3	24	12	For sea ice, the shading denotes the 5-95% range of the CMIP5 ensemble (see Figure 12.28 of Chapter 12). [Thierry Fichefet, Belgium]	caption has been revised
SPM-2804	SPM	24	3	24	12	For Figure SPM5, a good description is made for each panel, but the figure lacks interpretation or explanation. [Government of Benin]	Figure is supported by a series of paragraphs in the text of the SPM.
SPM-2805	SPM	24	3	24	12	Language is needed to make clear how the temperature change in exhibit b) have been recalculated compared to pre-industrial. [European Union]	Temperature projections are relative to the reference period for 1986 - 2005. See SPM Table 2 (footnote a) for other reference periods.
SPM-2806	SPM	24	3	24	13	The SPM should show how the CO2 concentration is changing over time according to the different RCPs, either as percentage relative to now or to the Kyoto reference year, or as absolute concentrations. In addition, there should be more visible information for the near term of policy highly relevant parameters, such as heavy precipitation and warm days. The focus should be on the current time till the next few decades only, which is the time frame many policy makers use. The current visualization on the global scale does not make clear, at least for policy makers not specialized in the subject, what the effects are. For example, the figure c indicates that for the next 50 years the climate mitigation policy does not matter at all. I'm not sure if this is the intended message of the authors. If so, the SPM should explicitly include this important policy relevant statement. If not, beware that the figure does. [Government of Netherlands]	The projections shown here are RCP based, where the CO2 concentrations are prescribed. In other words, CO2 concentrations are an input to the projections, and not an output. In formation on projected changes for the next few decades are provided in the SPM text, and in Tables 1 and 2 of the SPM.
SPM-2807	SPM	24	3			Figure SPM.5 is an important figure. But would it be possible to generate a figure SPM.5 that looks similar to Figure SPM.4 i.e. that covers historical time period and projection for the future from the same regions and same key variables as in Figure SPM.4? [Christof Appenzeller, Switzerland]	Our consistent approach in the SPM is to maintain a clear distinction between observations and model results. The exception is for detection and attribution (figure 5).
SPM-2808	SPM	24	3			Are these running 20-year means? If so, mention it in the caption. [Geert Jan van Oldenborgh, Netherlands]	Running means are shown for Sea Ice extent only (see caption).
SPM-2809	SPM	24	6			For pH (panel e) not the changes are shown, but the absolute values. Should be left as it is, as pH=7 is the best reference there is, but legend needs to be modified. [Andreas Sterl, Netherlands]	caption has been revised
SPM-2810	SPM	24	12			Figure SPM.5 Should read "The number of CMIP5 models… is indicated for each time period/scenario IS IN PARENTHESES." (Add last 3 words). [Government of United States of America]	parentheses are no longer used.
SPM-2811	SPM	24				It would be nice to have a box or a paragraph where the reader can get information what is meant with "Long-Term" and "near-term" Projections [Christof Appenzeller, Switzerland]	We believe this is sufficiently clear from the SPM text, and the introduction provided in chapters 11 and 12.
SPM-2812	SPM	24				Figure SPM.5 It is difficult to understand why not the same reference period is used as in Figure SPM.5 and SPM.1 [Christof Appenzeller, Switzerland]	The reference period used for projections in the AR5 was considered and agreed by the relevant chapters.

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							For a comparison of this reference period with other commonly used reference periods, see footnote (a) of SPM table 2.
SPM-2813	SPM	24				In panel (a), the 20th century should'nt start in 1850. [James [Jim] Crawford, United States of America]	to simplify this figure, this panel has been removed.
SPM-2814	SPM	24				The y-axis in Figure SPM.5a is wrong. It goes from 0 to 4 and then to 4 again. [European Union]	to simplify this figure, this panel has been removed.
SPM-2815	SPM	24				Fig SPM5/Panel a : The y-axis is wrong; there are twice number 4 and no number 2 [Government of France]	to simplify this figure, this panel has been removed.
SPM-2816	SPM	24				Please make reference to preindustrial levels also in the figures. [Government of Germany]	The reference period used for projections in the AR5 was considered and agreed by the relevant chapters. For a comparison of this reference period with other commonly used reference periods, see footnote (a) of SPM table 2.
SPM-2817	SPM	24				It is important to indicate that projections of temperature change contain some ranges of uncertainty, especially because in the negotiations under UNFCCC, temperature anomaly is referred as an indicator of global warming and even a 0.5 C difference could be quite contentious. Therefore, please indicate a likely-range of projected value in 2100 for each scenario on the right side of Fig. SPM.5 (b), (c), (d) and (e), the example of likely-range can be seen in Fig 12-26(a) or Fig. 12-40, and also in AR4-SPM (Fig SPM.5). In addition, if possible, it would be even better to add another smaller probability range (ex. 30% range) which is closer to the best estimate range. [Government of Japan]	For all panels and all RCPs, the mean and uncertainties for the period 2081 - 2100 are provided as bars. See SPM table 2 for likely ranges.
SPM-2818	SPM	24				Fig SPM.5 only indicates projection of RCP2.6 and RCP8.5, which is the smallest and largest scenarios, respectively. However, it would be better to add other two scenarios (i.e., RCP4.0 and 6.5) in order to show the variations. [Government of Japan]	For all panels and all RCPs, the mean and uncertainties for the period 2081 - 2100 are provided as bars. See SPM table 2 for likely ranges.
SPM-2819	SPM	24				Figure SPM.5 Panel d) is inconsistent with the others, plotting the RCP2.6 results on top of RCP8.5. [Government of New Zealand]	this has been corrected.
SPM-2820	SPM	24				Figure SPM 5 d): It would be helpful if the mean sea-ice extent in the Arctic 1986-2005 was indicated as a line in the figure in order to see at what period it crosses the projections. Furthermore we feel that the Arctic is a better phrase than the Northern Hemisphere and that the word "change" could be used her instead of anomaly as for the other panels. [Government of NORWAY]	Please see revised figure panel, which now is plotted as absolute extent, and includes a line where conditions are defined as "nearly ice-free".
SPM-2821	SPM	24				Panel d - should maybe be presented as absolute rather than anomaly. Is the flattening toward 2100 is because the absolute sea ice is more or less zero by that point? [Government of United States of America]	Please see revised figure panel, which now is plotted as absolute extent, and includes a line where conditions are defined as "nearly ice-free".
SPM-2822	SPM	24				Figure 5a Labeling error on y-axis ticks. [Government of United States of America]	to simplify this figure, this panel has been removed.
SPM-2823	SPM	24				It would be marvellous (and save space) if there could be observations too - is the problem the different datamask? [Gabriele Hegerl, United Kingdom]	Our consistent approach in the SPM is to maintain a clear distinction between observations and model results. The exception is for detection and attribution (figure 5).
SPM-2824	SPM	24				Figure SPM5: Suggest including all 4 RCPs and not only the RCP extremes. Some may interpret this as a false choice between two extreme scenarios. The middle scenarios may end up being more likely outcomes and should not be omitted. [HAROON KHESHGI, United States of America]	For all panels and all RCPs, the mean and uncertainties for the period 2081 - 2100 are provided as bars. See SPM table 2 for likely ranges.
SPM-2825	SPM	24				Figure SPM5: Suggest either not showing statics of models (shaded areas), or show the likely range of projections with shaded areas; since the relation between model statistics and likelihood is different for different metrics, showing shaded regions could easily mislead the reader into thinking that these are likely ranges. [HAROON KHESHGI, United States of America]	Caption provides a clear explanation of the shaded ranges. Likely ranges are provided in Table 2, and described in the SPM paragraphs. We believe this is clear for the reader.
SPM-2826	SPM	24				Figure SPM5: Panel d could be improved by showing the ice-free limit. [HAROON KHESHGI, United States of America]	Please see revised figure panel, which now is plotted as absolute extent, and includes a line where conditions are defined as "nearly ice-free".

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SPM-2827	SPM	24				Fig. SPM.4: Global mean precipitation change is confusing and misleading. It can be misunderstood as precipitiation increasing everywhere, which is not true. And it implies that changes will be small (a few %) whereas in fact they exceed 20% in many regions. [Reto Knutti, Switzerland]	to simplify this figure, this panel has been removed.
SPM-2828	SPM	24				Fig. SPM.4: For sea ice the absolute scale to -12 is a problem, since the current ice cover is 5E6 km2 so only. The figure suggests that even in the largest RCP the decline will reduce towards 2100, but in reality the models simply go to ice free conditions. The scale to -12 was chosen in chapter 12 to have it idential for two seasons and hemispheres, and the chapter also has figures with absolute numbers. One option here is to use a percent reduction from present day. [Reto Knutti, Switzerland]	Revised figure panel is now plotted as absolute extent, and includes a line where conditions are defined as "nearly ice-free".
SPM-2829	SPM	24				Fig. SPM.4: One issue in this figure is the uncertainties implied by the shaded band. First, these are 1 sigma and not the same as those in the table indicating global temperature changes, which is likely to cause confusing. Adding bars to the right of panel b as in AR4 would help. Second, for quantities other than temperature no formal uncertainty estimate is possible, so the shading does not mean anyhting, but it will be interpreted of course as an uncertainty. The figure must state that this is a measure of model spread that is not necessarily representative of anything. [Reto Knutti, Switzerland]	figure has been revised, and the uncertainty range shown is now consistent with the 5 - 95% ranges given in SPM table 2. Bars have been added, and caption has been revised to improve clarity.
SPM-2830	SPM	24				panel d: Better to give SIE instead of SIE anomaly. Milestone for many people is “ice-free Arctic”, but from anomalies you cannot say when this milestone has been passed. [Andreas Sterl, Netherlands]	Revised figure panel is now plotted as absolute extent, and includes a line where conditions are defined as "nearly ice-free".
SPM-2831	SPM	24				Figure SPM.5 Panel (d) sea-ice anomaly. As this is a quantity with a very clear zero point, surely it would be more useful to plot absolute values rather than anomalies? [Erica Thompson, United Kingdom of Great Britain & Northern Ireland]	Revised figure panel is now plotted as absolute extent, and includes a line where conditions are defined as "nearly ice-free".
SPM-2832	SPM	24				There is a printing error in Panel a) on the RF axis where the number "4.0" appears twice. The number "2.0" is missing. [Terje Wahl, Norway]	to simplify this figure, this panel has been removed.
SPM-2833	SPM	25	1	25	9	In Figure SPM.4.c) there is no explanation for the left map. I assume that there is an error in the upper text since the texts of the other figures: a), b) and d) start with the word "Change…" and this figure c) is the only one that have the final interval of reference: "2081-2100", but not the initial one: "1986-2005". Please modify the upper text following the same scheme as the othe ones. For example: "Change in NH September sea ice concentration (1986-2005 to 2081-2100)". [Rubén D Piacentini, Argentina]	Figure has been improved with clear legend provided. It is correct that this figure does not show a change, but rather for each RCP gives the extent in 1986-2005 and in 2081-2100.
SPM-2834	SPM	25	3	25	9	A brief comment or interpretation of the maps of multi-model results in 2081-2100 would be of great importance. [Government of Benin]	Please see the relevant paragraphs in the SPM text.
SPM-2835	SPM	25	3	25	9	Figure SPM.6: it may be good to add the near term projection at least for temperature since there is a strong policy request for shorterm term information. [SYLVIE JOUSSAUME, France]	near term values are provided in SPM table 2, but we do not show additional maps due to space limitations.
SPM-2836	SPM	25	3			Suggest adding number of CMIP5 models involved in northern sea ice projections to the information in the caption. [Government of Canada]	numbers have been added.
SPM-2837	SPM	25	7	25	7	The statement '15% sea-ice concentration limits” is unclear. [Government of Netherlands]	Figure has been revised and now shows only extent (no concentration).
SPM-2838	SPM	25		25		Figure 6. separate into 3 figures - a+b, c and d. [Government of Australia]	The preference is to keep this as a single figure, thus supporting the powerful message that projected changes in the climate system are widespread.
SPM-2839	SPM	25		25		Figure SPM.6. panel c): number of CMIP5 models used in calculations is missing. Also, we welcome information on robustness and model agreement. [Government of Finland]	numbers have been added. For the same models, an indication of uncertainty is provided in the time series shown in Figure 6.
SPM-2840	SPM	25		25		Fig. a) The color bar could start at -0,5 and end at 9. Linear intervals should be used, so that the figure can be understood intuitively. [Government of Germany]	There was much chapter discussion and consideration of the most informative colour bar, and this is the agreed preference.
SPM-2841	SPM	25		25		Fig. b) The color bar could start at -30. [Government of Germany]	There was much chapter discussion and

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							consideration of the most informative colour bar, and this is the agreed preference.
SPM-2842	SPM	25		25		Fig. c) What does sea ice concentration mean? % of what? [Government of Germany]	caption and title of this panel has been corrected.
SPM-2843	SPM	25		25		Fig. d) The left plot is all blue, please modify color bar (e.g. max at -0,1) [Government of Germany]	Figure has been revised and now shows only extent (no concentration).
SPM-2844	SPM	25				Figure SPM.6: The number of CMIP5 models used for C) is not shown. If the number is unknown, there should be an explanation. [Government of Japan]	numbers have been added
SPM-2845	SPM	25				Panel c does not have "the number of CMIP5 models" in the upper right corner. It might be helpful to explain what the pH change means; the other panels are likely understandable by policy makers, but this one is not. [Government of United States of America]	numbers have been added. In combination with the SPM text (where pH is clearly introduced) we believe the implications of the pH time series is clear.
SPM-2846	SPM	25				Figure SPM.6 The maps of future precipitation (figure SPM6b, page SPM-25) should include the stippling and hatching scheme to denote regions of higher confidence as in chapters 11, 12, 14. [Government of United States of America]	stippling and hatching has been added.
SPM-2847	SPM	25				Fig. SPM.5: Boxes around the maps are unnecessary. Robustness of the models should be indicated. Showing only annual means is problematic but there may be no way around it. [Reto Knutti, Switzerland]	boxes have been removed, and model robustness added for precipitation. The WGI Atlas provides seasonal information.
SPM-2848	SPM	25				Fig. SPM.6: Are we confident about the spatial patterns of sea level change? In AR4 the models were all over the place, so I'm not sure. In any case some stippling to indicate robust changes would be useful. [Reto Knutti, Switzerland]	sea level maps are no longer provided at the level of the SPM.
SPM-2849	SPM	26	0	26	0	COMMENT H and last of the series. Consider dropping this figure, in view of my comments about not overemphasizing values for 2100 which are subject to unquantifiable uncertainties which are not communicated in a figure. Thanks for your consideration of this set of comments A-H. [Susan Solomon, United States of America]	This is an important policy-relevant figure and represents a significant development from the AR4 with the inclusion here of projected global mean sea level rise time-series over the 21st century. Figure has been redesigned, and maps are no longer provided at the level of the SPM.
SPM-2850	SPM	26	1	26	1	Figure SPM.7: ranges (90% uncertainty range since not mentioned otherwise) of ice sheet dynamics are astonishingly small in view of the corresponding text on page 16 (lines 31-42) [Urs Neu, Switzerland]	Individual contributions are no longer shown in the revised figure. See underlying chapter assessment for a full discussion of the contributions and their uncertainty ranges.
SPM-2851	SPM	26	13	26	13	Shouldn't there be any policy recommendations coming from the climate scientists? [Dora Marinova, Australia]	See SPM text for clear policy-relevant assessment findings. IPCC does not make policy recommendations.
SPM-2852	SPM	26		26		Purely editorial. Figure SPM.7. In the maps, the colored area (=sea level change) does not "reach" coastlines (=thin black lines showing land areas). This leaves room for interpretation that this map is not relevant for the sea level rise at the costline. [Government of Finland]	Sea level maps are no longer included at the level of the SPM.
SPM-2853	SPM	26		26		The lower plots are too small. [Government of Germany]	Sea level maps are no longer included at the level of the SPM.
SPM-2854	SPM	26		26		The maps of projected regional sea level change do not show data for Europe or the Mediterranean, it is all white. This information would be relevant for policy makers. [Government of Germany]	Sea level maps are no longer included at the level of the SPM.
SPM-2855	SPM	26				Figure SPM.7: This is a very useful figure. I would suggest some changes, however, to disconnect/move the juxtaposition of the 2081-2100 values on the right with the time-series ending in 2100 on the left. This juxtaposition leads to a disjuct visual presentation that is confusing. [William Anderegg, United States of America]	Please see revised figure, which provides a much clearer display of the 2081-2100 values.
SPM-2856	SPM	26				Figure SPM.7: There may be confusion caused by the juxtaposition of plume plots that show SLR out to 2100	Please see revised figure, which provides a much

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						and bars that show total SLR and individual component contributions for 2081-2100. It would be preferable to more clearly visually indicate the relationship between these elements of the figure. [Christopher Field, United States of America]	clearer display of the 2081-2100 values. Note that the revised figure no longer shows the individual components.
SPM-2857	SPM	26				Looking at this page the 1st thing I see is a near-linear increase v a near-exponential one. Couldn't the caption comment on & contextualize this? [William Ingram, United Kingdom]	The SPM text specifically discusses the high rate of global mean sea level rise in RCP8.5 by the end of the 21st century.
SPM-2858	SPM	26				The total sea level changes averaged over the period 2081 - 2100 are shown in the top figure as black line with gray rangs, but not labeled. Should be labeled as well eg as "sum" or "total". [Christoph Ritz, Switzerland]	Please see revised figure.
SPM-2859	SPM	26				Figure SPM.7: What does a correction for glacial isostatic adjustment mean? Please add a short explanation. [Line van Kesteren, the Netherlands]	This text has been removed, because the maps of sea level change are no longer included at the level of the SPM
SPM-2860	SPM	26				The acronym SMB (surface mass balance) is not explained in the caption or text [Guus Velders, Netherlands]	Individual contributions to sea level are no longer shown in the revised figure.