

Annexes

Annex I: Observational Products

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AI.1 Introduction

The purpose of this annex is to document observational datasets used by Working Group I in the Sixth Assessment Report. This includes details of the types and versions of datasets, the time period they cover, the chapters in which they appear, and citations and (where available) web links to the data.

This list includes those observational datasets that contribute to values reported in the text or in figures, unless they are citing a specific result from a paper (as opposed to an ongoing dataset for which that paper is a reference).

Reanalyses are within the scope of this annex, but historical climate model simulations are not. Proxy datasets are also outside the scope of this annex.

Datasets which are updated regularly on an operational basis are shown as ending in 2020, even if no 2020 data have yet been published at the time of writing.

Datasets are sorted alphabetically according to the dataset name or, if there is no formal name, the name of the responsible institution or lead author.

Table AI.1 | Observational products used by Working Group I in the Sixth Assessment Report.

Name	Version	Type	Resolution (Time and Space)	Section(s)	Time Period	Citation, Link and DOI (Where Available)
NOAA-CIRES 20th Century Reanalysis (20CR)	2c	Reanalysis	3-hourly 2° × 2°, 24 vertical levels	2.4.1	1851–2014	Compo et al. (2011) www.esrl.noaa.gov/psd/data/20thC_Rean/
NOAA-CIRES 20th Century Reanalysis (20CR)	3	Reanalysis	3-hourly 0.5° × 0.5°	2.3.1 3.3.3 3.7.1	1851–2020	Slivinski et al. (2019) www.esrl.noaa.gov/psd/data/20thC_Rean/
Finland Climate (Aalto)		In situ	Daily 0.1° × 0.1°	10.2.1	1961–2010	Aalto et al. (2016) www.csc.fi/~paituli
ACORN-SAT Australian temperature data	2.1	In situ	Daily Point-based	Atlas 6.2	1910–2020	Trewin et al. (2020) www.bom.gov.au/climate/data/acorn-sat/
AERONET AOD Level 2.0	3	Remote sensing	Monthly Point-based	2.2.6	1995–2020	Giles et al. (2019) https://aeronet.gsfc.nasa.gov/data_push/AOT_Level2_Monthly.tar.gz
Advanced Global Atmospheric Gases Experiment (AGAGE)		In situ	Up to 36 times per day Point-based	2.2.3 2.2.4 5.2.2 5.2.3	1978–2020	Prinn et al. (2018) http://agage.mit.edu/data
Australian Gridded Climate Data (AGCD)		In situ	Daily 0.05° × 0.05°	Atlas 6.2	1900–2020	Jones et al. (2009); Evans et al. (2020) www.bom.gov.au/climate/maps/rainfall
AIRS specific humidity	RetStd-v5	Remote sensing	Monthly 1° × 1°	3.3.2	2003–2010	Susskind et al. (2006); Tian et al. (2013) https://esgf-node.llnl.gov/search/obs4mips/
AIRS-6 climate data products		Remote sensing	Various	2.3.1	2002–2020	Susskind et al. (2014) http://disc.sci.gsfc.nasa.gov/AIRS/data-holdings
Energy balance reconstruction (Allan)		Remote sensing	Monthly 10° × 10°	7.2.2	1985–2012	Allan et al. (2014) http://met.reading.ac.uk/~sgs02rpa/research/DEEP-C/GRL/
AMOC dataset		In situ, reanalysis	Monthly Regional time series	3.5.4	2004–2017	Smeed et al. (2018)
Advanced Microwave Scanning Radiometer 2 (AMSR2)		Remote sensing	3-hourly	8.3.1	2012–2019	Kummerow et al. (2015) https://lance.nsstc.nasa.gov/amr2-science/data/level2/rainocean/
Aqua's Advanced Microwave Scanning Radiometer for Earth Observing System (AMSR-E)		Remote sensing	5.4–56 km	8.3.1	2002–2011	Kawanishi et al. (2003)
Arctic sea ice thickness from submarine transects		In situ	Intermittent Track-based	2.3.2	1975–2000	Rothrock et al. (2008)
Asian Precipitation – Highly-Resolved Observational Data Integration Towards Evaluation (APHRODITE's) Precipitation		In situ	Daily 0.05° × 0.05°	8.3.2 10.2.1 10.6.3	1900–2020	Kamiguchi et al. (2010); Yatagai et al. (2012)

Name	Version	Type	Resolution (Time and Space)	Section(s)	Time Period	Citation, Link and DOI (Where Available)
Asian Precipitation – Highly-Resolved Observational Data Integration Towards Evaluation Monsoon Asia (APHRO-MA)	V1808	In situ	Daily 0.5°	Cross-Chapter Box (CCB) 10.4	1961–2014	Yasutomi et al. (2011) http://aphrodite.st.hirosaki-u.ac.jp/products.html
Asian Precipitation – Highly-Resolved Observational Data Integration Towards Evaluation Monsoon Asia (APHRO-MA)	V1101	In situ	Daily 0.5°	10.6.3	1956–2005	Yatagai et al. (2012) http://aphrodite.st.hirosaki-u.ac.jp/products.html
Advanced Scatterometer (ASCAT)		Remote sensing	Daily 25 km	8.3.1	2006–2016	Wagner et al. (1999)
Cross-calibrated multi-platform wind dataset (Atlas)		Remote sensing, in situ	6-hourly 25 km	2.3.1	1987–2020	Atlas et al. (2011) www.remss.com/measurements/ccmp/
Australian vineyard data		In situ	Annual Point-based	2.3.4	Varies by site	Webb et al. (2011)
AVISO sea level observations		Remote sensing	Monthly 0.25°	9.2.4	1995–2020	Legeais et al. (2018) www.aviso.altimetry.fr/en/data/products/ocean-indicators-products/mean-sea-level.html
Beaune grape harvest dates		In situ	Annual Point-based	2.3.4	1354–2018	Labbé et al. (2019) www.euroclimhist.unibe.ch/en/
Berkeley Earth surface air temperature		In situ	Monthly 1° × 1° (or equivalent equal-area grid)	1.3.6 1.4.1 1.4.2 1.6.1 FAQ 1.2 2.3.1 CCB 2.3 3.3.1 3.7.3 10.3.3 10.6.4 Box 10.3 CCB 10.4 Atlas	1750–2020	Rohde and Hausfather (2020) www.berkeleyearth.org
Berlin City Measurement Network		In situ	1-minute	Box 10.3	Ongoing	www.geo.fu-berlin.de/en/met/service/stadtmessnetz/index.html
Bermuda Atlantic Time-series Study Data		In situ	Point-based	2.3.3	1988–2016	Bates et al. (2014); Bates and Johnson (2020) http://bats.bios.edu/bats-data/
Czech Republic precipitation (Bližňák)		In situ	10 min 0.01° × 0.01°	10.2.1	2002–2011	Bližňák et al. (2018)
Boulder stratospheric water vapour		In situ	Profiles approx. monthly Point-based	2.2.5	1980–2010	Hurst et al. (2011)
BUCL (Birmingham)		In situ	Hourly	Box 10.3	2013–2020	Chapman et al. (2015)
Global temperature data (Callendar)		In situ	Annual Global time series	1.3.3	1880–1935	Callendar (1938); Hawkins and Jones (2013)
Cyprus precipitation (Camera)		In situ	Daily 0.01° × 0.01°	10.2.1	1980–2010	Camera et al. (2014)
CAMS atmospheric composition reanalysis		Reanalysis	3-hourly 1° × 1°	7.3.3	2003–2018	Inness et al. (2019) http://atmosphere.copernicus.eu
Data of CARIACO ocean time-series program in the Cariaco Basin		In situ	Point-based	5.3.2	1996–2017	Bates et al. (2014) http://imars.marine.usf.edu/cariaco
CCU 'IKI-Monitoring' satellite data archive		Remote sensing	Daily Resolution varies	Atlas	1984–2020	Loupian et al. (2015)

Name	Version	Type	Resolution (Time and Space)	Section(s)	Time Period	Citation, Link and DOI (Where Available)
Community Emissions Data System (CEDS)		In situ	Monthly 50 km (nominal)	6.2.1	1750–2014	Hoesly et al. (2018) www.globalchange.umd.edu/ceds/
CERA-20C reanalysis		Reanalysis	3-hourly 125 km, 91 levels	10.3.3	1901–2010	Laloux et al. (2018) www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/cera-20c
CERES EBAF	Ed2.8	Remote sensing	Monthly 1° × 1°	3.8.2	2000–2018	Loeb et al. (2009, 2012) https://esgf-node.llnl.gov/search/obs4mips/
CERES EBAF	Ed4.0	Remote sensing	Monthly 1° × 1°	7.2.2 9.2.1	2000–2016	Loeb et al. (2017, 2020) http://ceres-tool.larc.nasa.gov/ord-tool/jsp/EBAF4Selection.jsp
NCEP Climate Forecast System Reanalysis (CFSR)		Reanalysis	Hourly T382 (approx. 38 km)	2.3.1 8.3.2	1979–2010	Saha et al. (2010) https://cfs.ncep.noaa.gov/cfsr/
High-resolution Gridded Daily Meteorological Dataset over Sub-Saharan Africa (Chaney)		Reanalysis	Daily 0.1° × 0.1°	10.2.1	1979–2005	Chaney et al. (2014)
Cheng ocean heat content		In situ	Monthly Ocean basin	2.3.3	1960–2020	Cheng et al. (2017)
Global mean sea level reconstruction (Church and White)		In situ, remote sensing	Monthly Global time series	2.3.3	1880–2009	Church and White (2011)
Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS)	2.0	Remote sensing	Daily, monthly 0.25° × 0.25°	10.2.1	1981–2018	Funk et al. (2015) www.chc.ucsb.edu/data/chirps
CLIMATER		In situ	Daily Point-based	Atlas 5.2	1874–2020	Bulygina et al. (2014)
China Land Surface Air Temperature (CLSAT)		In situ	Monthly Point-based	2.3.1	1900–2020	Xu et al. (2018)
CPC Merged Analysis of Precipitation (CMAP)		Remote sensing	Monthly 2.5° × 2.5°	3.3.3 Atlas	1979–2020	Xie et al. (2007a) www.esrl.noaa.gov/psd/data/gridded/data.cmap.html
Copernicus Marine Environment Monitoring Service (CMEMS) ocean pH		In situ	Annual Global mean	2.3.3	1985–2020	Gehlen et al. (2020) https://marine.copernicus.eu/access-data/ocean-monitoring-indicators
CMEMS global mean sea level		Remote sensing	10-day Global time series	2.3.3	1993–2020	Ablain et al. (2019)
China Mean Surface Temperature (CMST)		In situ	Monthly 5° × 5°	2.3.1	1854–2020	Sun et al. (2021)
A gridded daily dataset over China CN05.1	5.1	In situ	Daily 0.25° × 0.25°	10.2.1	1961–2005	Wu and Gao (2013)
COBE Sea Surface Temperature	2	In situ	Daily 1° × 1°	2.4.3 2.4.5 3.7.6 3.7.7	1845–2020	Hirahara et al. (2014) https://ds.data.jma.go.jp/tcc/tcc/products/elnino/cobesst/cobe-sst.html
Bootstrap Sea Ice Concentrations From Nimbus-7 SMMR and DMSP SSM/I-SSMIS (Comiso)	3	Remote sensing	Monthly 25 km	2.3.2 3.4.1	1979–2020	Comiso (2017) https://nsidc.org/data/nsidc-0079
CORA Ocean Heat Content	5.2	In situ	Monthly Global time series	2.3.3	1950–2020	Cabanes et al. (2013) www.coriolis.eu.org/Science2/Global-Ocean/CORA
Co-WIN (Hong Kong)		In situ	15-minute	Box 10.3	2007–2020	Hung and Wo (2012)
Cowtan and Way global temperature	2.0	In situ	Monthly 5° × 5°	1.3.6 2.3.1 3.3.1	1850–2020	Cowtan and Way (2014) http://www-users.york.ac.uk/~kdc3/papers/coverage2013/series.html
Climate Prediction Center (CPC) Niño indices		In situ	Monthly Regional time series	2.4.2 2.4.3	1950–2020	www.cpc.ncep.noaa.gov/data/indices/ Derived from ERSSTv5

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Climate Prediction Centre (CPC) Precipitation		In situ	Hourly 2.0° × 2.5° Daily 0.25° × 0.25°	10.2.1	1948–2006	Higgins et al. (2000); Xie et al. (2007b); Chen et al. (2008)
CPC teleconnection indices (AAO, AO, NAO, PNA)		In situ	Daily Regional means	2.4.1	1950–2020 (1979–2019 for AAO)	www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/teleconnections.shtml
CPC Unified Gauge-Based Analysis of Global Daily Precipitation		In situ, remote sensing	Daily 0.5° × 0.5°	8.3.1	1979–2019	Xie et al. (2010) https://psl.noaa.gov/data/gridded/data.cpc.globalprecip.html
CloudSat Cloud Profiling Radar (CPR)		Remote sensing	1.5 km horizontal, 0.5 km vertical	8.3.1	2006–2019	Tanelli et al. (2008)
CRU TS	4.02	In situ	Monthly 0.5° × 0.5°	3.3.2 3.3.3 3.7.3 5.2.1	1901–2017	Harris et al. (2014) https://crudata.uea.ac.uk/cru/data/hrg/cru_ts_4.02/
CRU TS	4.03	In situ	Monthly 0.5° × 0.5°	10.6.2	1901–2017	Harris et al. (2014) https://crudata.uea.ac.uk/cru/data/hrg/cru_ts_4.03/
CRU TS	4.04	In situ	Monthly 0.5° × 0.5°	2.3.1 8.3.2 Box 8.1 10.3.3 10.3.4 10.4.2 10.6.3 10.6.4 Box 10.3 CCB 10.4 Atlas	1901–2020	Harris et al. (2020) https://crudata.uea.ac.uk/cru/data/hrg/cru_ts_4.04/
CRUTEM	4	In situ	Monthly 5° × 5°	10.6.4 Atlas	1850–2020	Jones et al. (2012) https://crudata.uea.ac.uk/cru/data/temperature/
CRUTEM	5	In situ	Monthly 5° × 5°	Atlas	1850–2020	Osborn et al. (2021) https://crudata.uea.ac.uk/cru/data/temperature/
Cryosat Arctic sea ice thickness data		Remote sensing	Monthly 25 × 25 km	2.3.2 9.4.1	2011–2020	Kwok and Cunningham (2015); Bamber et al. (2018) http://nsidc.org/cryosphere/sotc/sea_ice.html https://science-pds.cryosat.esa.int/
CSIR-ML6 air-sea CO ₂ fluxes	2019	In situ	Monthly 1° × 1°	5.2.1	1982–2015	Gregor (2019) https://doi.org/10.6084/m9.figshare.7894976
CSIRO atmospheric gas measurements		In situ	Monthly Point-based	2.2.3 5.2.3	1976–2019	Langenfelds et al. (2002); Francey et al. (2003); Kirschke et al. (2013)
CSIRO global mean sea level		Remote sensing	Monthly 1° × 1°	2.3.3	1993–2020	Church and White (2011)
CSIRO ocean heat content		In situ	Annual Global	2.3.3	1950–2020	Domingues et al. (2008); Wijffels et al. (2016)
Mexican climate (Cuervo-Robayo)		In situ	Monthly 30 arcsec	10.2.1	1910–2009	Cuervo-Robayo et al. (2014)
3D-VAR regional reanalysis (Dahlgren)		Reanalysis	6-hourly 0.2° × 0.2°	10.2.1	1989–2010	Dahlgren et al. (2016)
Global sea level reconstruction (Dangendorf)		In situ, remote sensing	Monthly Regional means	1.2.1 2.3.3	1900–2015	Dangendorf et al. (2017, 2019)
DCNet (Washington)		In situ	Hourly	Box 10.3	Ongoing	Hicks et al. (2012)
Ethiopian precipitation (Dinku)		In situ	Sub-monthly 0.1° × 0.1°	10.2.1	1983–2013	Dinku et al. (2014)
Data of DYFAMED station in the Ligurian Sea		In situ	Point-based	5.3.2	1991–2016	Merlivat et al. (2018) http://dyfbase.obs-vlfr.fr/

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Eastern China spring phenology index		In situ	Annual Point-based	2.3.4	1834–2009	Ge et al. (2014)
European Climate Assessment & Dataset (ECA&D)		In situ	Daily Point-based	10.6.4	1775–2020	Klein Tank et al. (2002) www.ecad.eu/
EDGARv4.3.2	2019	In situ	Monthly 0.1° × 0.1°	6.7.1	1970–2012	Janssens-Maenhout et al. (2019) http://edgar.jrc.ec.europa.eu/overview.php?v=432_GHG&SECURE=123
EN4 ocean subsurface profiles		In situ	Monthly Point-based	2.3.3	1900–2020	Good et al. (2013) www.metoffice.gov.uk/hadobs/
E-OBS	V19.0	In situ	Daily 0.1° and 0.25°	10.3.3 10.6.4 Atlas 8.2	1950–2020	Cornes et al. (2018) www.ecad.eu/
ERA 20th Century (ERA-20C) reanalysis		Reanalysis	3-hourly Approx. 125 km, 128 vertical levels	2.3.1 3.3.3 3.7.1	1900–2010	Hersbach et al. (2015); Poli et al. (2016) www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era-20c
ERA-5		Reanalysis	Hourly 30 km, 137 vertical levels	1.4.1 2.3.1 3.3.1 3.3.2 3.3.3 3.7.1 3.8.2 CCB 3.1 8.3.2 11.4.3 Box 11.4 Atlas	1979–2020	Hersbach et al. (2020) www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era5
ECMWF ERA-Interim reanalysis		Reanalysis	6-hourly T255 spectral (approx. 80 km), 60 vertical levels	2.3.1 3.3.3 3.7.1 8.3.2 10.3.3	1979–2019	Dee et al. (2011) www.ecmwf.int/en/forecasts/datasets/reanalysis-datasets/era-interim
ECMWF ERA-Interim reanalysis – Land		Reanalysis	6-hourly T255 spectral (approx. 80 km), 60 vertical levels	10.2.1	1979–2010	Balsamo et al. (2015)
NOAA ERSST sea surface temperature	5	In situ	Monthly 2° × 2°	2.4.2 2.4.3 2.4.5 3.7.3 3.7.6 3.7.7 9.2.1 CCB 9.2 Atlas	1880–2020	Huang et al. (2017) www.ncdc.noaa.gov/data-access/marineocean-data/extended-reconstructed-sea-surface-temperature-ersst-v5
ESA CCI sea surface temperature	L4-GHRSST-SSTdepth-OSTIA-GLOB	Remote sensing	Monthly 0.05° × 0.05°	3.8.2	1992–2010	Merchant et al. (2014a, b) ftp://anon-ftp.ceda.ac.uk/neodc/esacci/sst/data/
ESA CCI Soil Moisture	L3S-SSMV-COMBINED-v4.2	Remote sensing	Monthly, 0.25° × 0.25° Daily, global images	3.8.2 8.3.1	1979–2016	Y.Y. Liu et al. (2012); Dorigo et al. (2017); Gruber et al. (2017) ftp://anon-ftp.ceda.ac.uk/neodc/esacci/soil_moisture/data/
European Station for Time series in the Ocean Canary Islands (ESTOC)		In situ	Point-based	5.3.2	1995–2018	González-Dávila et al. (2010) http://data.plocan.eu/thredds/catalog/aggregate/public/ESTOCInSitu/EMSOservices/Biogeochemistry/catalog.html
Alpine precipitation grid dataset (EURO4M-APGD)	1.0	In situ	Daily 0.04° × 0.04°	10.2.2	1971–2008	Isotta et al. (2014)
FLO1K flow metrics dataset		In situ	Annual 1 km	2.3.1	1960–2015	Barbarossa et al. (2018)

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Fogt SAM reconstruction		In situ	Monthly index	2.4.1	1865–2005	Fogt et al. (2009) http://polarmet.osu.edu/ACD/sam/sam_recon.html
Global mean sea level reconstruction (Frederikse)	2018	In situ	Annual Global time series	2.3.3	1958–2014	Frederikse et al. (2018)
Global mean sea level reconstruction (Frederikse)	2020	In situ	Annual Global time series	2.3.3	1900–2018	Frederikse et al. (2020)
GHCN precipitation	2	In situ	Monthly 5° × 5°	3.3.2 3.8.1 3.8.2	1900–2014	Jones and Moberg (2003) www.esrl.noaa.gov/psd/data/gridded/data.ghcngripp2.html
Global Historical Climatology Network (GHCN) – Monthly	4	In situ	Monthly Point-based	2.3.1 3.8.2 10.3.3	1880–2020	Menne et al. (2018) www.ncdc.noaa.gov/ghcnm/
GHCNDEX		In situ	Monthly 2.5° × 2.5°	2.3.1	1951–2020	Donat et al. (2013b) www.climdex.org
Global albedo change (Ghimire)		In situ	Monthly 1° × 1°	2.2.7	1700–2005	Ghimire et al. (2014)
GISTEMP	4	In situ	Monthly 2° × 2°	1.3.6 2.3.1 3.7.3 CCB 3.1 10.6.4 Box 10.3	1880–2020	Lenssen et al. (2019) https://data.giss.nasa.gov/gistemp/
Glacier Thickness Database (GlaThiDa)	3.0.1	In situ	Annual Point-based	9.5.1	1935–2018	GlaThiDa Consortium (2019) www.gtn-g.ch/data_catalogue_glathida/ doi:10.5904/wqms-glathida-2019-03
GLDAS		Reanalysis	Monthly 1° × 1°	3.4.2 8.3.1	1951–2010	Rodell et al. (2004) https://hydro1.gesdisc.eosdis.nasa.gov/data/GLDAS/GLDAS_NOAH10_M.2.0/
Global Carbon Project		In situ	Global Spatial average	5.2.1 5.2.2	1959–2020	Friedlingstein et al. (2020); Saunio et al. (2020) www.globalcarbonproject.org/
Global Ocean Data Analysis Project (GLODAP)	2	In situ	Point-based	5.2.1	1972–2020	Olsen et al. (2019) www.glodap.info/
Global Space-based Stratospheric Aerosol Climatology (GloSSAC)	1.0	Remote sensing	Monthly 5° zonal means	2.2.2 7.3.2	1979–2016	Thomason et al. (2018) https://eosweb.larc.nasa.gov
Ghana Meteorological Agency (GMet) precipitation	1.0	In situ	Monthly 0.5° × 0.5°	10.2.1	1990–2012	Aryee et al. (2018)
GOME global total ozone (GTO) dataset		Remote sensing	Monthly 1° × 1°	2.2.5	1996–2020	Coldewey-Egbers et al. (2015) www.esa-ozone-cci.org/?q=node/163
GOME GSG ozone dataset		Remote sensing	Monthly 5° zonal means	2.2.5	1995–2020	Weber et al. (2018a) www.iup.uni-bremen.de/gome/wfdoas/merged/
GOSAT	2019	Remote sensing	Hourly–monthly	5.2.1	2009–2017	Yoshida et al. (2013) www.gosat.nies.go.jp/en/recent-global-ch4.html
Global Precipitation Climatology Centre (GPCP)	8	In situ	Monthly 0.25° × 0.25°	1.2.1 2.3.1 3.3.3 3.7.3 8.3.1 8.3.2 Box 8.1 10.3.3 10.4.2 10.6.3 10.6.4 11.6.2 Atlas	1981–2020	Becker et al. (2013); Schneider et al. (2017) ftp://ftp.dwd.de/pub/data/gpcp/html/fulldata-monthly_v2018_doi_download.html

Name	Version	Type	Resolution (Time and Space)	Section(s)	Time Period	Citation, Link and DOI (Where Available)
Global Precipitation Climatology Project (GPCP)	2.3	Remote sensing, in situ	Monthly 2.5° × 2.5°	2.3.1 3.3.2 3.3.3 3.7.3 3.8.2 8.2.3 8.3.1 9.2.1 10.4.2 Atlas	1979–2020	Adler et al. (2018) www.esrl.noaa.gov/psd/data/gridded/data.gpcp.html
Gravity Recovery and Climate Experiment (GRACE)		Remote sensing	3 days 400 m	2.3.2 8.3.1	2002–2017	Tapley et al. (2004); Wouters et al. (2019) https://gracefo.jpl.nasa.gov/data/grace-fo-data/
GRID-Sat		Remote sensing	15-minute 4 km	8.3.1	1994–2016	Inamdar and Knapp (2015)
The Oceanic sink for anthropogenic CO ₂ from 1994 to 2007 – the data (Gruber)		In situ	1° × 1°	5.2.1		Gruber et al. (2019) www.nodc.noaa.gov/archive/arc0132/0186034/1.1/data/0-data/
Global Streamflow Indices and Metadata Archive (GSIM)		In situ	Daily Point-based	2.3.1	1806–2016	Do et al. (2018)
GSMaP		Remote sensing	Hourly 0.1°	10.3.3	2007–2020	Kubota et al. (2020)
GEWEX Water Vapour Assessment (G-VAP)		Reanalysis, remote sensing	Monthly 2° × 2°	2.3.1	1988–2009	Schröder et al. (2018) http://qewex-vap.org/
HadAT	2	In situ	Monthly 5° latitude by 10° longitude	Atlas	1958–2012	Thorne et al. (2005) www.metoffice.gov.uk/hadobs/hadat/
HadCRUT	5	In situ	Monthly 5° × 5°	1.2.1 1.3.6 1.4.1 1.6.1 2.3.1 CCB 2.3 3.3.1 3.6.1 3.8.1 CCB 3.1 Box 10.3	1850–2020	Morice et al. (2021) www.metoffice.gov.uk/hadobs/
HadCRUT	4	In situ	Monthly 5° × 5°	3.3.1 FAQ 3.1 8.2.3 10.3.3 10.6.4	1850–2020	Morice et al. (2012) www.metoffice.gov.uk/hadobs/hadcrut4/
HadEX	2	In situ	Monthly 3.75° × 2.5°	2.3.1	1901–2010	Donat et al. (2013a) www.climdex.org
HadEX	3	In situ	Monthly 1.875° × 1.25°	CCB 3.2 11.1.4 11.3.2 11.4.3 11.6.2	1901–2020	Dunn et al. (2020) www.metoffice.gov.uk/hadobs/hadex3/
HadGHCND		In situ	Daily 3.75° × 2.5°	Atlas	1950–2014	Caesar et al. (2006) www.metoffice.gov.uk/hadobs/hadghcnd/
HadISD	2.0.2. 2017f	In situ	Sub-daily Point-based	2.3.1	1973–2020	Dunn et al. (2012, 2016) www.metoffice.gov.uk/hadobs/hadis/
HadISDH	1.0.0. 2019f	In situ	Monthly 5° × 5°	2.3.1	1973–2020	Willett et al. (2014, 2020) www.metoffice.gov.uk/hadobs/hadisdh/

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Hadley Centre Sea Ice and Sea Surface Temperature dataset (HadISST)	1	In situ, remote sensing	Monthly 1° × 1°	2.4.3 2.4.5 3.5.1 3.7.3 3.7.6 3.7.7 3.8.1 7.4.4 9.2.1	1871–2020	Rayner et al. (2003) www.metoffice.gov.uk/hadobs/hadisst/
Hadley Centre HadNMAT2 night marine air temperature	2	In situ	Monthly 5° × 5°	CCB 2.3	1880–2010	Kent et al. (2013) www.metoffice.gov.uk/hadobs/hadnmat2/
Hadley Centre Sea Level Pressure (HadSLP)	2r	In situ, reanalysis	Monthly 5° × 5°	3.3.3	1850–2020	Allan and Ansell (2006) www.metoffice.gov.uk/hadobs/hadslp2/
Hadley Centre HadSST sea surface temperature	4	In situ	Monthly 5° × 5°	9.2.1 Atlas	1850–2020	Kennedy et al. (2019) www.metoffice.gov.uk/hadobs/
HadUK-Grid	1.0	In situ	Daily 0.009° × 0.009°	10.2.1	1862–2019	www.metoffice.gov.uk/climate/uk/data/haduk-grid/haduk-grid
Hawaii Ocean Time-series Data		In situ	Point-based	2.3.3	1988–2018	Dore et al. (2009) http://hahana.soest.hawaii.edu/hot/hot-dogs/interface.html
Global mean sea level reconstruction (Hay)		In situ	Annual Global mean	2.3.3	1901–2010	Hay et al. (2015)
Boulder stratospheric water vapor (Hegglin)		In situ		2.2.5	1980–2010	Hegglin et al. (2014)
Hamburg Ocean Atmosphere Parameters and Fluxes from Satellite data record (HOAPS4)		Remote sensing	6-hourly 0.5° × 0.5°	2.3.1	1987–2014	Andersson et al. (2010, 2017) https://wui.cmsaf.eu/safira/action/viewDoiDetails?acronym=HOAPS_V002 doi:10.5676/EUM_SAF_CM/HOAPS/V002
Glacier and ice sheet dataset (Hugonnet)		Remote sensing	Annual Point-based	2.3.2	2000–2019	Hugonnet et al. (2021)
Central European high-resolution gridded daily datasets (HYRAS)	1.0	In situ	Daily 0.5° × 0.5°, 0.25° × 0.25°	10.2.1	1951–2006	Frick et al. (2014)
IAGOS airborne ozone data		In situ	Intermittent	2.2.5 6.3.2	1994–2020	Cohen et al. (2018); Cooper et al. (2020); Gaudel et al. (2020) www.iagos-data.fr/ doi:10.25326/20
ICESat sea ice thickness data		Remote sensing	Intermittent 25 × 25 km	2.3.1	2003–2008	Kwok et al. (2009) http://nsidc.org/cryosphere/sotc/sea_ice.html
International Comprehensive Ocean–Atmosphere Data Set (ICOADS)	3.0	In situ	Frequency varies, point-based Monthly, 1° × 1°	2.3.1	1662–2019	Freeman et al. (2017) https://icoads.noaa.gov/
IFREMER4	4	Remote sensing	Daily 0.25° × 0.25°	9.2.1	1992–2017	de Boyer Montégut et al. (2004); Bentamy et al. (2017)
Integrated Global Radiosonde Archive (IGRA)		In situ	Point-based	8.3.1	1900–2019	Durre et al. (2006) https://data.noaa.gov/dataset/dataset/integrated-global-radiosonde-archive-igra-version-2
IMBIE Greenland and Antarctic ice sheet mass		Remote sensing	Regional aggregate	2.3.2 9.4.1 9.4.2	1992–2017	The IMBIE Team (2018, 2019, 2021)
Indian Monsoon Data Assimilation and Analysis (IMDAA)		Reanalysis	Sub-daily 0.11° × 0.11°	10.2.1	1979–2016	Mahmood et al. (2018)
Indian Institute of Tropical Meteorology (IITM) all-India rainfall		In situ	Monthly Time series	10.6.3	1871–1993	Parthasarathy et al. (1994)
IPRC subsurface temperature data		In situ	Monthly 1° × 1°	2.3.3	2005–2020	http://apdrc.soest.hawaii.edu/projects/Argo/data/gridded/On_standard_levels/index-1.html

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ISAS-15 temperature and salinity gridded fields		In situ	Monthly 1° × 1°	2.3.3	2002–2015	Gaillard et al. (2016); Kolodziejczyk et al. (2017) www.seanoe.org/data/00412/52367/
Ocean heat content (Ishii)		In situ	Annual Time series	2.3.3 9.2.2	1955–2020	Ishii et al. (2017)
JAMSTEC Database for time series stations K2 and S1		In situ	Point-based	5.3.2	1997–2018	Wakita et al. (2017) www.godac.jamstec.go.jp/catalog/data_catalog/metadataDisp/JAMSTEC_K2_S1?lang=en
Jena-MLS air–sea CO ₂ fluxes	2018	In situ	Daily 4° × 5°	5.2.1	1982–2017	Rödenbeck et al. (2013, 2014) www.bgc-jena.mpg.de/CarboScope/?ID=oc
Global mean sea level reconstruction (Jevrejeva)		In situ	Annual Global time series	2.3.3	1807–2009	Jevrejeva et al. (2014)
JMA-TRANSCOM		Reanalysis	Monthly 1° × 1°	3.6.1 3.8.2	1985–2008	Gurney et al. (2003)
Japanese Ocean Flux Data Sets with Use of Remote Sensing Observations (JOFURO3)	3	Remote sensing	Daily 0.25° × 0.25°	8.3.1	1988–2013	Tomita et al. (2017)
Belgium precipitation (Journée)		In situ	Daily 4 km ²	10.2.1	1981–2010	Journée et al. (2015)
Japan Meteorological Agency JRA-55 reanalysis		Reanalysis	3-hourly TL319 (approx. 55 km), 60 vertical levels	2.3.1 3.3.3 3.7.1 3.8.2 8.3.2 10.3.3 CCB 10.4	1958–2020	Kobayashi et al. (2015); Harada et al. (2016) https://jra.kishou.go.jp/JRA-55/index_en.html
JRA-25		Reanalysis	6-hourly T106 (approx. 120km)	10.3.3	1979–2004	Onogi et al. (2007) https://jra.kishou.go.jp/JRA-25/index_en.html
Kadow global temperature dataset		In situ	Monthly 5° × 5°	1.4.1 1.6.1 2.3.1 CCB 2.3 3.3.1 CCB 3.1	1850–2020	Kadow et al. (2020)
Kaplan Extended SST dataset	2	In situ	Monthly 5° × 5°	2.4.3 2.4.5 Atlas	1856–2019	Kaplan et al. (1998) www.esrl.noaa.gov/psd/data/gridded/data.kaplan_sst.html
Greenland Ice Sheet discharge (King)		Remote sensing	Annual Regional time series	9.4.1	1985–2018	King et al. (2020) https://datadryad.org/stash/dataset/doi:10.5061/dryad.qrfj6q5cb doi:10.5061/dryad.qrfj6q5cb
Kyoto cherry blossom data		In situ	Annual Point-based	2.3.4	801–2020	Aono and Saito (2010) http://atmenv.envi.osakafu-u.ac.jp/aono/kyophenotemp4/
LAI3g		Remote sensing	Monthly 0.5° × 0.5°	3.6.1 3.8.2	1982–2011	Zhu et al. (2013)
LandFlux-EVAL		In situ	Monthly	3.8.2 8.3.1	2000–2004	Mueller et al. (2013) www.iac.ethz.ch/groups/seneviratne/research/LandFlux-EVAL
Landsat Global Land Survey (GLS) database		Remote sensing	Daily Global images	8.3.1	1972–2019	Gutman et al. (2013)
LAQN (London)		In situ	15-minute	Box 10.3	1993–2019	www.londonair.org.uk
LDEO Global Ocean Surface Water Partial Pressure of CO ₂ Database		In situ	Point-based	5.3.2	1957–2018	Takahashi et al. (2014) www.nodc.noaa.gov/ocads/oceans/LDEO_Underway_Database/NDP-088_V2018.pdf
LEGOS sea level budget		Remote sensing	Monthly Global time series	2.3.3	1993–2020	Blazquez et al. (2018)

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Combined satellite and station data (Maidment)		Remote sensing, in situ	10-day 0.0375° × 0.0375°	10.2.1	1983–2012	Maidment et al. (2014)
Marshall SAM index		In situ	Monthly Regional means	2.4.1	1957–2020	Marshall (2003) www.nerc-bas.ac.uk/icd/gjma/sam.html
Princeton MEaSUREs		Reanalysis, remote sensing, in situ	Monthly 0.5° × 0.5°	8.3.1	1950–2019	Pan et al. (2012)
Multivariate ENSO Index (MEI)		In situ	Monthly	5.2.3	1977–2017	Wolter and Timlin (1998) www.esrl.noaa.gov/psd/enso/mei/
Historical greenhouse gas concentrations for climate modelling (Meinshausen)		In situ	Monthly 15° zonal means	2.2.3	1850–2014	Meinshausen et al. (2017) www.climatecollege.unimelb.edu.au/cmip6
MERRA Reanalysis	1	Reanalysis	3-hourly 0.5° × 0.66°	8.3.2	1979–2016	Rienecker et al. (2011)
MERRA-2 reanalysis	2	Reanalysis	Hourly 0.5 × 0.66°, 72 vertical levels	2.3.1 3.3.3 8.3.2	1980–2020	Gelaro et al. (2017) https://gmao.gsfc.nasa.gov/reanalysis/MERRA-2/
MERRA-2 reanalysis – Land	2	Reanalysis	6-hourly 0.5° × 0.66°, 72 vertical levels	8.3.1	1980–2020	Reichle (2012) http://gmao.gsfc.nasa.gov/pubs/office_notes
METROS (Tokyo)		In situ	15-minute	Box 10.3	2000–2005	Takahashi et al. (2011)
MIROC4-ACTM emission flux data	2018	Reanalysis	Monthly 1° × 1°	5.2.2	1996–2016	Patra et al. (2016, 2018); Saeki and Patra (2017) https://ebcrpa.jamstec.go.jp/~prabir/data/co2l2r84/s042_FaChOt_srcdf1/ https://ebcrpa.jamstec.go.jp/~prabir/data/ch4l2r53/gcp2019/ https://ebcrpa.jamstec.go.jp/~prabir/data/n2ol2r84/s037_edqman1/
MISR Component Global Aerosol Product	V4, Level 3	Remote sensing	Yearly 0.5° × 0.5° grid	2.2.6	2000–2020	Garay et al. (2017) https://cmr.earthdata.nasa.gov/search/concepts/C43677715-LARC.html
MOCCA (Ghent)		In situ	15-minute	Box 10.3	2016–2020	Vandemeulebroucke et al. (2019); Caluwaerts et al. (2020)
NASA Merged Ozone Data (MOD)	8.6	Remote sensing	Monthly 5° zonal means	2.2.6	1970–2020	Frith et al. (2017) https://acd-ext.gsfc.nasa.gov/Data_services/merged/index.html
MODIS Aerosol Optical Depth 550nm	MYD08_M3	Remote sensing	Monthly 1° × 1°	2.2.6	2003–2011	Platnick et al. (2003) https://adsweb.modaps.eosdis.nasa.gov/search/order
MODIS NDVI/EVI vegetation greenness index	6	Remote sensing	16-day 1 km	5.2.1	2000–2018	Myneni et al. (2015) doi:10.5067/MODIS/MCD15A2H.006
Moderate Resolution Imaging Spectro-radiometer (MODIS)	MCD12Q1	Remote sensing	Annual 500 m	8.3.1	2001–2019	Loveland and Belward (1997)
MPI-SOMFFN air–sea CO ₂ fluxes	2016	In situ	Monthly 1° × 1°	3.8.2 5.2.1	1982–2015	Landschützer et al. (2016) www.nodc.noaa.gov/ocads/oceans/SPCO2_1982_2015_ETH_SOM_FFNN.html
Ozone Multi-sensor Reanalysis (MSR)	2	Reanalysis	6-hourly 1° × 1°	2.2.5	1970–2019	Braesicke et al. (2018); Chipperfield et al. (2018); Weber et al. (2018b, 2020) www.temis.nl/protocols/O3global.php
Multi-Source Weighted-Ensemble Precipitation dataset (MSWEP)		Reanalysis, remote sensing, in situ	3-hourly 0.25° × 0.25°	8.3.1	1979–2015	Beck et al. (2017) https://wald.anu.edu.au/data_services/data/mswep-multi-source-weighted-ensem%20ADble-pre%20ADcip%20ADi%20ADta%20ADtion/
MTE Gross Primary Productivity	May12	Reanalysis	Monthly 0.5° × 0.5°	3.8.2	1982–2011	Jung et al. (2011)

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Northern Hemisphere Blended Snow Cover Extent and Snow Mass Time Series (Mudryk)		Remote sensing, in situ	Monthly Time series	2.3.2 3.4.2 9.5.3	1980–2018	Mudryk et al. (2020) http://data.ec.gc.ca/data/climate/scientificknowledge/climate-research-publication-based-data/northern-hemisphere-blended-snow-extent-and-snow-mass-time-series/
NASA global mean sea level	4.2	Remote sensing	10-day Global time series	2.3.3	1993–2020	Beckley et al. (2016)
NASA Team Sea Ice Concentrations from Nimbus-7 SMMR and DMSP SSM/I-SSMIS Passive Microwave Data	1	Remote sensing	Monthly 25 km	3.4.1	1979–2019	Cavalieri et al. (1996) https://nsidc.org/data/nsidc-0051
NCEI Ocean Heat Content		In situ	Annual 1° × 1°	2.3.3 9.2.2 9.3.2	1955–2020	Levitus et al. (2012) www.ncei.noaa.gov/access/global-ocean-heat-content/
NCEP-NCAR Reanalysis		Reanalysis	Daily and monthly 2.5° × 2.5°	3.7.1 3.8.2 10.3.3	1980–2020	Kalnay et al. (1996) www.esrl.noaa.gov/psd/data/gridded/data.ncep_reanalysis.html
New Zealand temperature and rainfall datasets		In situ	Daily Point-based	Atlas 6.2	1870–2020	NIWA (2020)
NIWA d ¹³ C-CO ₂	2019	In situ	Monthly	5.2.1	1957–2015	Turnbull et al. (2017)
NOAA atmospheric gas measurements		In situ	Time resolution depends on gas Point-based	2.2.3 2.2.4 3.6.1 5.1.2 5.2.1 5.2.2 5.2.3	Varies depending on gas	Masarie and Tans (2004); Montzka et al. (2009, 2015); Hall et al. (2011); Dlugokencky and Tans (2019) www.esrl.noaa.gov/gmd/ccgg/
NOAA ESRL MLO Carbon dioxide		In situ	Monthly Point-based	3.6.1	1980–2014	Zeng et al. (2014) www.esrl.noaa.gov/gmd/ccgg/trends/data.html
NOAA Global Temp	5	In situ	Monthly 5° × 5°	1.3.6 10.6.4	1880–2020	Huang et al. (2020) www.ncdc.noaa.gov/data-access/marineocean-data/noaa-global-surface-temperature-noaaglobaltemp
NOAA Global Temp – Interim		In situ	Monthly 5° × 5°	1.4.1 1.6.1 2.3.1 3.3.1 CCB 2.3 CCB 3.1	1850–2020	Vose et al. (2021)
NOAA Merge ozone data (SBUV)	8.6	Remote sensing	Daily 5° zonal means	2.2.5	1978–2020	Wild et al. (2016) ftp://ftp.cpc.ncep.noaa.gov/SBUV_CDR/
NOAA reconstructed snow cover dataset		Remote sensing, in situ	Monthly Hemispheric time series	3.4.2 9.5.3	1915–1997	Brown (2002); Brown and Robinson (2011) https://nsidc.org/data/q02131
NOAA Climate Data Record of Sea Ice Concentration	3.0	Remote sensing	Monthly 25 km	2.3.2	1979–2020	Peng et al. (2013) https://nsidc.org/data/q02202
NOAA STAR satellite temperature	3.0	Remote sensing	Monthly 2.5° × 2.5°, 3 vertical layers	2.3.1	1979–2020	Zou and Wang (2011) www.star.nesdis.noaa.gov/smcd/emb/mscat/
National Oceanography Centre (NOC) surface flux and meteorological dataset	2.0	In situ	Monthly 1° × 1°	2.3.1	1973–2014	Berry and Kent (2011) http://badc.nerc.ac.uk/data/nocs_flux/
African Rainfall Climatology (Novella and Thiaw)	2.0	Remote sensing	Daily 0.1° × 0.1°	10.2.1	1983–2010	Novella and Thiaw (2013)
National Sea and Ice Data Center (NSIDC) sea ice index	3	Remote sensing	Daily 25 km	2.3.2	1978–2020	Fetterer et al. (2017) https://nsidc.org/data/G02135/versions/3

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NASA Water Vapor Project MEaSUREs (NVAP-M)		Remote sensing	Daily 1°	2.3.1	1988–2008	Vonder Haar et al. (2012) https://public.satproj.klima.dwd.de/data/GVAP_data_archive/v1.0/TCWV/long/
NYCMET-NET (New York)	2.0.0	In situ	15-minute	Box 10.3	Ongoing	http://nycmetnet.cuny.cuny.edu
OAFflux		Remote sensing	Daily 0.25° × 0.25°	2.3.1 9.2.1	1987–2019	Yu et al. (2008) http://oaf Flux.whoii.edu/
Ocean Colour Climate Change Initiative (OC-CCI)	4.2	Remote sensing	Daily 4 km	2.3.4	1997–2019	Sathyendranath et al. (2019) https://climate.esa.int/en/projects/ocean-colour/
Ocean Satellite Oceanographic Datasets for Acidification (OCEAN SODA-ETHZ)		Remote sensing	Monthly 1°	2.3.3	1985–2018	Gregor and Gruber (2021) doi:10.25921/m5wx-ja34
NOAA Optimum Interpolation SST (OISST)	2	In situ, remote sensing	Daily 0.25° × 0.25°	2.4.3	1981–2020	Reynolds et al. (2002); Banzon et al. (2016) www.ncdc.noaa.gov/oisst
OSISAF/ CCI sea ice concentration	450	Remote sensing	Monthly 25 km	2.3.2 3.4.1	1979–2015	Lavergne et al. (2019) http://osisaf.met.no/p/ice/
USA temperature (Oyler)		In situ	Daily 30-arcsec	10.2.1	1948–2012	Oyler et al. (2015)
Swiss Alps (Panziera)		Remote sensing	Sub-daily 0.01° × 0.01°	10.2.1	2005–2017	Panziera et al. (2018)
Gridded dataset of hourly precipitation in Germany (Paulat)		In situ	Hourly 0.06° × 0.06°	10.2.1	2001–2004	Paulat et al. (2008)
Portland State University (PDX) CH ₄ , d ¹³ C-CH ₄	2017	In situ	Daily–monthly	5.2.2	1977–2010	Rice et al. (2016)
PERSIANN-CDR		Remote sensing	Daily 0.25° × 0.25°	10.2.1	1982–2020	Ashouri et al. (2015) www.ncdc.noaa.gov/cdr/atmospheric/precipitation-persiann-cdr
Philadelphia plant data		In situ	Annual Point-based	2.3.4	1840–2010	Panchen et al. (2012)
PIOMAS Arctic sea ice reanalysis	2.1	Reanalysis	Monthly 4°–5°	7.2.2	1979–2020	Zhang and Rothrock (2003); Schweiger et al. (2011) http://psc.apl.uw.edu/research/projects/arctic-sea-ice-volume-anomaly/
PMEL ocean heat content		In situ	Annual Global time series	2.3.3	1950–2011	Lyman and Johnson (2014)
PROMICE Greenland Ice Sheet discharge		Remote sensing	Annual Regional time series	9.4.1	1986–2018	Mankoff et al. (2019) http://promice.org/PromiceDataPortal
PROMICE ice sheet mass balance		Remote sensing	Annual Regional time series	9.4.1	1995–2019	Colgan et al. (2019) http://promice.org/PromiceDataPortal
Purkey and Johnson ocean heat content		In situ	Annual Global mean	2.3.3	1981–2010	Purkey and Johnson (2010)
High Resolution Gridded Data for India (Rajeevan)	1.0	In situ	Daily 1° × 1°	10.6.3	1951–2003	Rajeevan et al. (2006)
Randolph Glacier Inventory	6	Remote sensing	Decametric shape files of glacier outlines, global 0.5° global grid of glacierized area	2.3.2 9.5.1	1955–2014	Scherler et al. (2018) www.glims.org/RGI/rgi60_dl.html
RAOB-CORE radiosonde dataset	1.7	In situ	Monthly 10° × 5°, 12 vertical levels	2.3.1 3.3.1	1958–2020	Haimberger et al. (2012) www.univie.ac.at/theoret-met/research/raobcore/
Global mean sea level reconstruction (Ray and Douglas)		In situ	Annual Global time series	2.3.3	1900–2010	Ray and Douglas (2011)

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REGEN global precipitation	1	In situ	Daily 1° × 1°	10.3.2	1950–2016	Contractor et al. (2020) https://researchdata.andis.org.au/rainfall-estimates-gridded-v1-2019/1408744 doi:10.25914/5ca4c380b0d44
RICH radiosonde dataset	1.7	In situ	Monthly 10° × 5°, 12 vertical levels	2.3.1 3.3.1	1958–2020	Haimberger et al. (2012) www.univie.ac.at/theoret-met/research/raobcore/
Antarctic ice mass balance (Rignot)		Remote sensing	Annual Regional average	2.3.2	1979–2017	Rignot et al. (2019)
ROCADA daily dataset Romania	1.0	In situ	Daily 0.1° × 0.1°	10.2.1	1961–2013	Dumitrescu et al. (2016)
MSG-based gridded datasets of clouds, precipitation and radiation (Roebeling and Holleman)		Remote sensing	Daily 0.27° × 0.27°	10.2.1	2005–2019	Roebeling and Holleman (2009)
ROM SAF radio occultation climate data record		Remote sensing	Monthly 5° latitude bins, 200 m vertical resolution	2.3.1	2001–2020	Gleisner et al. (2020) www.romsaf.org
Arctic permafrost layer temperature (Romanovsky)		In situ	Annual Site-based	2.3.2	1977–2020	Romanovsky et al. (2020)
Israel precipitation (Rostkier-Edelstein)		Reanalysis	Seasonal 0.02° × 0.02°	10.2.1	1991–2009	Rostkier-Edelstein et al. (2014)
Remote Sensing Systems (RSS) precipitation and water vapour	7	Remote sensing	2 per day 0.25° × 0.25°	2.3.1 3.3.2	1987–2020	Wentz (2013) www.remss.com/measurements/rain-rate/
Remote Sensing Systems RSS satellite temperature	4.0	Remote sensing	Monthly 2.5° × 2.5°, 5 vertical layers	2.3.1	1979–2020	Mears and Wentz (2017) www.remss.com/measurements/upper-air-temperature/
Rutgers University/NOAA snow cover extent dataset	V01r01	Remote sensing	Weekly 100–200 km	2.3.2 9.5.3	1966–2020	Estilow et al. (2015) https://climate.rutgers.edu/snowcover/
SAFRAN temperature and precipitation for France		Reanalysis	Hourly 8 km ²	10.2.1	1958–2008	Vidal et al. (2010)
SAT1 NASA satellite ozone data		Remote sensing	Daily 1° × 1°	2.2.5	2004–2020	Ziemke et al. (2019) https://acd-ext.gsfc.nasa.gov/Data_services/cloud_slice/new_data.html
SAT2 NASA satellite ozone data		Remote sensing	Daily 1° × 1°	2.2.5	2004–2020	Heue et al. (2016)
SAT3 NASA satellite ozone data		Remote sensing	Daily 1° × 1°	2.2.5	2004–2020	Leventidou et al. (2018)
Scripps atmospheric CO ₂ data		In situ	Weekly Point-based	1.2.1 2.2.3 5.2.1	1958–2019	Keeling et al. (2001, 2005) http://scrippsco2.ucsd.edu/data/atmospheric_co2/
SeaWiFS FAPAR Data	V2010.0	Remote sensing	Monthly 1 km	2.3.4	1998–2017	Gobron (2018) https://fapar.jrc.ec.europa.eu/Home.php
Norwegian seNorge2 precipitation	2.0	In situ	Daily 0.008° × 0.008°	10.2.1	1957–2019	Lussana et al. (2018)
Merged Precipitation in China (Shen)		In situ	Hourly 0.01° × 0.01°	10.2.1	2015	Shen et al. (2018)
The Surface Ocean CO ₂ Atlas (SOCAT)	6	In situ	Point-based	5.2.1	1957–2020	Bakker et al. (2016) www.socat.info/
Southern Oscillation Index (SOI)		In situ	Monthly Regional time series	2.4.2	1876–2020	Troup (1965) www.bom.gov.au/climate/current/soihtm1.shtml
Spain02	5.0	In situ	Daily 0.1° × 0.1°	10.2.1	1948–2002	Herrera et al. (2016)

Name	Version	Type	Resolution (Time and Space)	Section(s)	Time Period	Citation, Link and DOI (Where Available)
Arosa stratospheric ozone data (Staehelin)		In situ	Time resolution varies Point-based	2.2.5	1926–2020	Staehelin et al. (2018)
STAMMEX		In situ	Daily 0.1°, 0.25° and 0.5°	8.3.1	1931–2000	Zolina et al. (2014)
State University of New York (SUNY) radiosonde dataset		In situ	Monthly 10° × 10°	2.3.1	1958–2020	Zhou et al. (2021)
Stratospheric Water and Ozone Satellite Homogenized (SWOOSH)	2.5	Remote sensing	Monthly 2.5° zonal mean, 12 vertical levels	2.2.5	1984–2020	Davis et al. (2016) https://data.nodc.noaa.gov/cgi-bin/iso?id=gov.noaa.ncdc:C00958
Tibetan plateau growing season		In situ	Annual Point-based	2.3.4	1960–2014	B. Yang et al. (2017)
Merged TM4NO2A tropospheric NO ₂ dataset		Remote sensing	Monthly 0.25°	6.3.3	1996–2016	Georgoulias et al. (2019) www.temis.nl/airpollution/no2.php
Tropospheric Ozone Assessment Report (TOAR) surface ozone database		In situ	Hourly Point-based	6.3.2	1970–2020	Schultz et al. (2017); Tarasick et al. (2019) www.igacproject.org/activities/TOAR
Tohoku Univ. N ₂ O, d ¹⁵ N, ¹⁵ Na	2018	In situ	Irregular	5.2.3	1950–2000	Ishijima et al. (2007)
TOST composite ozonesonde product		In situ	Monthly 5° × 5° × 1 km	2.2.5 6.3.2	1965–2012	Tarasick et al. (2010); Liu et al. (2013); Gaudel et al. (2018)
TRMM Precipitation Radar 3A25	7	Remote sensing	Monthly 0.5°	8.3.1	1997–2014	Iguchi et al. (2000)
TRMM GPOF	GPOF	Remote sensing	Daily 0.25° × 0.25°	8.3.1	1997–2015	Stocker et al. (2018)
TRMM Microwave Imager (TRMM TMI)	TMI	Remote sensing	3 day 0.25° × 0.25°	8.3.1	1997–2015	Wentz et al. (2001)
TRMM Multi-Satellite Precipitation Analysis	7.0	Remote sensing	3-hourly 0.25° × 0.25°	10.2.1	1997–2018	Huffman et al. (2007); TRMM (2011); Z. Liu et al. (2012) https://disc.gsfc.nasa.gov/datasets/TRMM_3B42_7/summary
Tropical Rainfall Measuring Mission Precipitation Radar (TRMM PR)	PR	Remote sensing	Monthly 0.5° × 0.5°	8.3.1	1997–2015	Haddad et al. (1997)
TWIN (Taipei)		In situ	Hourly	Box 10.3	2004–2020	Chang et al. (2010)
University of Alabama at Huntsville (UAH) satellite temperature	6.0	Remote sensing	Monthly 3 vertical layers	2.3.1	1979–2020	Spencer et al. (2017) www.nsstc.uah.edu/climate/
UC Berkeley, N ₂ O, d ¹⁵ N, ¹⁵ Na	2018	In situ	Event	5.2.3	1900–1995	Park et al. (2012)
University of Colorado global mean sea level		Remote sensing	Monthly Global time series	2.3.3	1993–2017	Nerem et al. (2018)
UCAR/ NOAA radio occultation data		Remote sensing	Monthly 5° latitude bands	2.3.1	2002–2020	Steiner et al. (2020)
University of California at Irvine (UCI) atmospheric gas measurements		In situ	Several sampling periods per year Point-based	2.2.3	1984–2020	Simpson et al. (2012) http://cdiac.ornl.gov/tracegases.html
UEA-SI air-sea CO ₂ fluxes	2015	In situ	Monthly 2.5° × 2.5°	5.2.1	1985–2011	Jones et al. (2015) doi:10.1594/PANGAEA.849262
UHH sea ice product		In situ, remote sensing	Monthly Area average	2.3.2	1850–2020	Doerr et al. (2021) www.fdr.uni-hamburg.de/record/8559#.YEtN09xxXIU doi:10.25592/uhhfdm.8525
UrBAN (Helsinki)		In situ	Sub-hourly	Box 10.3	2004–2020	Wood et al. (2013) http://urban.fmi.fi
Global temperature dataset (Vaccaro)		In situ	Monthly 5° × 5°	2.3.1	1850–2020	Vaccaro et al. (2021)

Name	Version	Type	Resolution (Time and Space)	Section(s)	Time Period	Citation, Link and DOI (Where Available)
W5E5 bias-adjusted reanalysis	1.0	Reanalysis	Daily 0.5° × 0.5°	Atlas	1979–2016	Lange (2019) https://dataservices.gfz-potsdam.de/pik/showshort.php?id=escidoc:4855898 doi:10.5880/pik.2019.023
Sea ice data (Walsh)		Remote sensing, in situ	Monthly	2.3.2	1850–2020	Walsh et al. (2017)
WASWind marine wind data		In situ	Monthly 4° × 4°	2.4.4	1950–2011	Tokinaga and Xie (2011) https://climatedataguide.ucar.edu/climate-data/waswind-wave-and-anemometer-based-sea-surface-wind
WCRP/Palmer global sea level		Remote sensing, in situ	Monthly Global time series	2.3.3	1901–2018	WCRP Global Sea Level Budget Group (2018); Palmer et al. (2021)
Wegener Centre radio occultation dataset		Remote sensing	Monthly 0.1 km vertical resolution	2.3.1	2001–2020	Angerer et al. (2017)
Global mean sea level reconstruction (Wenzel and Schröter)		In situ	Monthly Global time series	2.3.3	1900–2009	Wenzel and Schröter (2014)
WFDE5	1.0	Reanalysis	Hourly 0.5°	10.3.3	1979–2018	Cucchi et al. (2020)
WMO Global Atmosphere Watch greenhouse gas measurements		In situ	Annual Point-based and global means	2.2.3	1984–2020	Tsutsumi et al. (2009); WMO (2019) https://gaw.kishou.go.jp/publications/global_mean_mole_fractions
World Ocean Atlas (WOA)	2018	In situ	Monthly 1° × 1°	3.5.1	2009	Levitus et al. (2012); Locarnini et al. (2019); Zweng et al. (2019) www.nodc.noaa.gov/OC5/woa18/woa18data.html
World Ozone and UV Data Center (WOUDC) ozone dataset		In situ	Monthly Global and zonal means	2.2.5	1964–2020	Fioletov et al. (2002) https://woudc.org/
Global Earth Observation for Integrated Water Resource Assessment (Earth2Observe) Water Resources Reanalysis v2 (WRR2)	2	Reanalysis	Monthly 0.5° × 0.5°	8.3.1	1979–2012	Schellekens et al. (2017)
Brazil gridded met data 1980–2013 (Xavier)		In situ	Daily 0.25° × 0.25°	10.2.1	1980–2013	Xavier et al. (2016) http://careyking.com/data-downloads/
Chile precipitation (Yang)		In situ	Daily 0.04° × 0.04°	10.2.1	2009–2014	Z. Yang et al. (2017) www.climatedatalibrary.cl/SOURCES/
Ocean heat content and thermocline sea level reconstruction (Zanna)		In situ	Annual Global means	2.3.3	1871–2017	Zanna et al. (2019)

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