

## Curriculum Vitae for Ken Caldeira

### PRESENT POSITION

Senior Scientist  
Department of Global Ecology  
Carnegie Institution  
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Professor (by courtesy)  
Department of Earth System Science  
Stanford University  
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### EDUCATION

Ph.D., 1991, New York University, Atmospheric Sciences, Department of Applied Science  
M.S., 1988, New York University, Atmospheric Sciences, Department of Applied Science  
B.A., 1978, Rutgers College, Philosophy

### PRIOR RESEARCH EXPERIENCE

Physicist/Environmental Scientist (Lawrence Livermore National Laboratory, 1995 to 2005) Research ocean carbon cycle, atmospheric CO<sub>2</sub>, ocean/sea-ice physics, climate, and energy systems  
Post-Doctoral Researcher (Lawrence Livermore National Laboratory; 1993 to 1995) Research the ocean carbon cycle, atmospheric CO<sub>2</sub> and climate  
NSF Earth Sciences Postdoctoral Fellow (Earth Systems Science Center & Dept. of Geosciences, The Pennsylvania State University; 1991 to 1993) Role of the carbonate-silicate cycle in long-term atmospheric CO<sub>2</sub> content and climate

### GENERAL RESEARCH INTERESTS

Ocean acidification; climate/carbon-cycle interactions; numerical simulation of climate and biogeochemistry; marine biogeochemical cycles; global carbon cycle; long-term evolution of climate and geochemical cycles; intentional intervention in the climate system; energy technology and policy

### ADVISORY PANELS / DISSERTATION COMMITTEES / ETC

National Academy of Sciences, Geoengineering Climate Panel Member (2014)  
IPCC AR5 Report Climate Change 2013: The Physical Science Basis, Contributing Author (2013)  
Fellow of the American Geophysical Union (2010)  
National Academy of Sciences, America's Climate Choices Panel Member (2009)  
UK Royal Society Geoengineering Report Panel Member (2009)  
Global Carbon Project, Scientific Steering Committee Member (2009-2013)  
European Project on Ocean Acidification (EPOCA), Advisory Board Member (2008-2012)  
Intergovernmental Oceanographic Commission, Rep. at International Maritime Union Negotiations (2008, 2009)  
UK Royal Society Ocean Acidification Report Panel Member (2007)  
IPCC Special Report on CO<sub>2</sub> Capture and Storage, Oceans Chapter, Coordinating Lead Author (2005)  
US Delegation to climate-related negotiations leading up to G8 Summit, Technical Support (2005)  
UNESCO International Oceanography Commission CO<sub>2</sub> Panel of Experts (2002-2004)  
US Global Carbon Cycle Scientific Steering Group (2001-2004)  
Dissertation Committees of students at Stanford, MIT, and University of Illinois

### PRINCIPAL PUBLICATIONS

Winkelmann, R., A. Levermann, A. Ridgwell, and K. Caldeira (2015) *Combustion of available fossil fuel resources sufficient to eliminate the Antarctic Ice Sheet*. **Science Advances**, Vol. 1, no. 8, e1500589 doi: 10.1126/sciadv.1500589

Petri, Y., and K. Caldeira (2015) *Impacts of global warming on residential heating and cooling degree-days in the United States*. **Scientific Reports**, 5, doi:10.1038/srep12427

Mathesius, S., M. Hofmann, K. Caldeira, and H. J. Schellnhuber (2015) *Long-term response of oceans to CO<sub>2</sub> removal from the atmosphere*. **Nature Climate Change**, doi:10.1038/nclimate2729

Albright, R., J. Benthuyzen, N. Cantin, K. Caldeira, and K. Anthony (2015) *Coral reef metabolism and carbon chemistry dynamics of a coral reef flat*. **Geophysical Research Letters**, doi:10.1002/2015GL063488

- Cvijanovic, I., K. Caldeira, and D. G. MacMartin (2015) *Impacts of ocean albedo alteration on Arctic sea ice restoration and Northern Hemisphere climate*. **Environmental Research Letters**, 10, 044020, doi:10.1088/1748-9326/10/4/044020
- Cvijanovic, I., and K. Caldeira (2015) *Atmospheric impacts of sea ice decline in CO<sub>2</sub> induced global warming*. **Climate Dynamics**, 1–14, doi:10.1007/s00382-015-2489-1
- Kline, D. I., and Coauthors (2015) *Six Month In Situ High-Resolution Carbonate Chemistry and Temperature Study on a Coral Reef Flat Reveals Asynchronous pH and Temperature Anomalies*. **PLOS ONE**, 10, e0127648, doi:10.1371/journal.pone.0127648
- Kwiatkowski, L., K. L. Ricke, and K. Caldeira (2015) *Atmospheric consequences of disruption of the ocean thermocline*. **Environmental Research Letters**, 10, 034016, doi:10.1088/1748-9326/10/3/034016
- Zhang, X., and K. Caldeira (2015) *Time scales and ratios of climate forcing due to thermal versus carbon dioxide emissions from fossil fuels*. **Geophysical Research Letters**, 2015GL063514, doi:10.1002/2015GL063514
- Ricke, K., and K. Caldeira (2014) *Maximum warming occurs about one decade after a carbon dioxide emission*. **Environmental Research Letters**, 9, 124002. doi:10.1088/1748-9326/9/12/124002
- Zhang, X., N.P. Myhrvold, and K. Caldeira (2014) *Key factors for assessing climate benefits of natural gas versus coal electricity generation*. **Environmental Research Letters**, 9, 114022. doi:10.1088/1748-9326/9/11/114022
- MacMartin, D. G., K. Caldeira, and D. W. Keith (2014) *Solar geoengineering to limit the rate of temperature change*. **Philosophical Transactions of the Royal Society A**, 372, 20140134. doi:10.1098/rsta.2014.0134
- Caro, D., A. LoPresti, S. J. Davis, S. Bastianoni, and K. Caldeira (2014) *CH<sub>4</sub> and N<sub>2</sub>O emissions embodied in international trade of meat*. **Environmental Research Letters**, 9, 114005. doi:10.1088/1748-9326/9/11/114005
- Caldeira, K., and I. Cvijanovic (2014) *Estimating the Contribution of Sea Ice Response to Climate Sensitivity in a Climate Model*. **Journal of Climate**, 27, 8597–8607. doi:10.1175/JCLI-D-14-00042.1
- Caro, D., S. J. Davis, S. Bastianoni, and K. Caldeira (2014) *Global and regional trends in greenhouse gas emissions from livestock*. **Climatic Change**, 126, 203–216. doi:10.1007/s10584-014-1197-x
- Davis, S. J., J. A. Burney, J. Pongratz, and K. Caldeira (2014) *Methods for attributing land-use emissions to products*. **Carbon Management**, 5, 233–245. doi:10.1080/17583004.2014.913867
- Intergovernmental Panel on Climate Change (2014) *Clouds and Aerosols in Climate Change 2013 - The Physical Science Basis*, Cambridge University Press, Cambridge, 571–658. doi: CBO9781107415324A024
- Intergovernmental Panel on Climate Change (2014) *Carbon and Other Biogeochemical Cycles in Climate Change 2013 - The Physical Science Basis*, Cambridge University Press, Cambridge, 465–570. doi: CBO9781107415324A023
- Kalidindi, S., G. Bala, A. Modak, and K. Caldeira (2014) *Modeling of solar radiation management: a comparison of simulations using reduced solar constant and stratospheric sulphate aerosols*. **Climate Dynamics**, 1–17, doi:10.1007/s00382-014-2240-3
- Ricke, K. L., and K. Caldeira (2014) *Natural climate variability and future climate policy*. **Nature Climate Change**, 4, 333–338. doi:10.1038/nclimate2186
- Silverman, J., and Coauthors (2014) *Community calcification in Lizard Island, Great Barrier Reef: A 33 year perspective*. **Geochimica et Cosmochimica Acta**. doi:10.1016/j.gca.2014.09.011
- Bala, G., N Devaraju, RK Chaturvedi, K Caldeira, R Nemani (2013) *Nitrogen deposition: how important is it for global terrestrial carbon uptake?* **Biogeosciences Discussions**, 10, 11077-11109. doi: 10.5194/bgd-10-11077-2013
- Bala, G., S Krishna, D Narayanappa, L Cao, K Caldeira, R Nemani (2013) *An estimate of equilibrium sensitivity of global terrestrial carbon cycle using NCAR CCSM4*. **Climate Dynamics**, 1-16. doi: 10.1007/s00382-012-1495-9
- Caldeira, K., KL Ricke (2013) *Prudence on solar climate engineering*. **Nature Climate Change**, 3 (11), 941-941
- Caldeira, K., NP Myhrvold (2013) *Projections of the pace of warming following an abrupt increase in atmospheric carbon dioxide concentration*. **Environmental Research Letters**, 8 (3), 034039
- Caldeira, K., (2013) *Coral Bleaching: Coral'refugia'amid heating seas*. **Nature Climate Change**, 3, 444-445. doi: 10.1038/nclimate1888
- Caldeira, K., G Bala, L Cao (2013) *The science of geoengineering*. **Annual Review of Earth and Planetary Sciences**, 41. doi: 10.1146/annurev-earth-042711-105548
- Ciais, P., T Gasser, JD Paris, K Caldeira, MR Raupach, JG Canadell, A Patwardhan, P Friedlingstein, SL Piao, V Gitz (2013) *Attributing the increase in atmospheric CO<sub>2</sub> to emitters and absorber*. **Nature Climate Change**. doi: 10.1038/NCLIMATE1942
- Davis, S.J., L Cao, K Caldeira, MI Hoffert (2013) *Rethinking wedges*. **Environmental Research Letters**, 8, 011001. doi: 10.1088/1748-9326/8/1/011001

- Hsieh, W.C., WD Collins, Y Liu, JCH Chiang, CL Shie, K Caldeira, L Cao (2013) *Climate response due to carbonaceous aerosols and aerosol-induced SST effects in NCAR community atmospheric model CAM3.5. Atmospheric Chemistry and Physics Discussions*, 13, 7349-7396. doi: 10.5194/acpd-13-7349-2013
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- Mackey, K.R.M., A Paytan, K Caldeira, AR Grossman (2013) *Effect of Temperature on Photosynthesis and Growth in Marine Synechococcus spp. Plant physiology*, 163 (2), 815-829
- MacCracken, M.C., HJ Shin, K Caldeira, GA Ban-Weiss (2013) *Climate response to imposed solar radiation reductions in high latitudes. Earth System Dynamics*, 4 (2), 301-315
- Ricke, K.L., JB Moreno-Cruz, K Caldeira (2013) *Strategic incentives for climate geoengineering coalitions to exclude broad participation. Environmental Research Letters*, 8, 014021. doi: 10.1088/1748-9326/8/1/014021
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- Ban-Weiss, G.A., L Cao, G Bala, K Caldeira (2012) *Dependence of climate forcing and response on the altitude of black carbon aerosols. Climate Dynamics*, 38, 897-911. doi: 10.1007/s00382-011-1052-y
- Caldeira, K., (2012) *Avoiding mangrove destruction by avoiding carbon dioxide emissions. Proceedings of the National Academy of Sciences*, 109, 14287-14288. doi: 10.1073/pnas.1211718109
- Caldeira, K., (2012) *The Great Climate Experiment. Scientific American*, 307, 78-83. doi: 10.1038/scientificamerican0912-78
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- Cao, L., G Bala, K Caldeira (2012) *Climate response to changes in atmospheric carbon dioxide and solar irradiance on the time scale of days to weeks. Environmental Research Letters*, 7, 034015. doi: 10.1088/1748-9326/7/3/034015
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- Kravitz, B., DG MacMartin, K Caldeira (2012) *Geoengineering: whiter skies? Geophysical Research Letters*, 39.
- MacCracken, M.C., HJ Shin, K Caldeira, GA Ban-Weiss (2012) *Climate response to imposed solar radiation reductions in high latitudes. Earth System Dynamics Discussion*, 3, 715-757. doi: 10.5194/esdd-3-715-2012
- MacMartin, D.G., DW Keith, B Kravitz, K Caldeira (2012) *Management of trade-offs in geoengineering through optimal choice of non-uniform radiative forcing. Nature Climate Change*. doi: 10.1038/nclimate1722
- Marvel, K., B Kravitz, K Caldeira (2012) *Geophysical limits to global wind power. Nature Climate Change*, 3, 118-121. doi: 10.1038/nclimate1683
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- Pongratz, J., K Caldeira (2012) *Attribution of atmospheric CO2 and temperature increases to regions: importance of preindustrial land use change. Environmental Research Letters*, 7, 034001. doi:10.1088/1748-9326/7/3/034001
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- Rau, G.H., KG Knauer, K Caldeira (2011) *Capturing and Sequestering Flue-Gas CO2 Using a Wet Limestone Scrubber*.
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- Bala, G., K Caldeira, R Nemani (2010) *Fast versus slow response in climate change: implications for the global hydrological cycle*. **Climate dynamics**, 35, 423-434. doi: 10.1007/s00382-009-0583-y
- Ban-Weiss, G.A., K Caldeira (2010) *Geoengineering as an optimization problem*. **Environmental Research Letters**, 5, 034009. doi: 10.1088/1748-9326/5/3/034009
- Caldeira, K., DW Keith (2010) *The need for climate engineering research*. **Issues in Science and Technology**, 27, 57-62.
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