MEETINGS

Progress in Climate Model Simulations of Geoengineering

Second GeoMIP Stratospheric Aerosol Geoengineering Workshop; Exeter, United Kingdom, 30–31 March 2012

PAGE 340

Geoengineering through solar radiation management consists of hypothetical approaches to directly intervene in the climate system to counteract some consequences of anthropogenic greenhouse gas emissions. One commonly studied method involves creating a layer of sulfate aerosols in the stratosphere covering most of the globe. This method takes inspiration from large volcanic eruptions, which cool the planet for a few years after the eruption.

Deliberately cooling the planet could help to temporarily alleviate some dangerous impacts of anthropogenic warming and, depending on the degree of geoengineering, could reverse some of the expected impacts on sea level rise and the cryosphere. However, geoengineering could have unintended side effects, including a weaker summer monsoon system in India, Asia, and the Sahel than in the present day. Regional disparities are also likely, and there are many other potential risks of stratospheric geoengineering, including ozone depletion.

Some climate model simulations of geoengineering with stratospheric sulfate aerosols have been performed, but most used different scenarios in their simulations, making the results difficult to compare. The Geoengineering Model Intercomparison Project (GeoMIP) provides a framework of four standardized geoengineering experiments, allowing for comparison of climate model results between different models and revealing the robust features of model responses to geoengineering (B. Kravitz et al., The Geoengineering Model Intercomparison Project (GeoMIP), *Atmos. Sci. Lett., 12*(2), 162–167, doi:10.1002/asl.316, 2011). This project is a "coordinated experiment" within the Coupled Model Intercomparison Project Phase 5 and involves simulations of either solar constant reductions or stratospheric aerosol layers by state-of-the-art climate models.

The first GeoMIP workshop, which outlined the project and included detailed discussions of simulation protocols, was held at Rutgers University on 10–12 February 2011 (A. Robock et al., Standardizing experiments in geoengineering, *Eos Trans. AGU, 92*(23), 197, doi:10.1029/2011EO230008, 2011). The second workshop, held on 30–31 March 2012 at the University of Exeter (http://www.exeter.ac.uk/g360/geomip2012/), involved assessment of progress on the project. Preliminary results from multiple models showed agreement on reductions in the global hydrologic cycle from balancing increases in greenhouse gases with a reduction in the solar constant caused by a difference in response times to the different forcings. However, the magnitude of precipitation decrease differs among models, partly because each model has different sensitivities to solar and greenhouse gas forcings. Methods of coordinated analysis were discussed, as were potential contributions to the Intergovernmental Panel on Climate Change's Fifth Assessment Report, including an analysis of the climate effects of immediate cessation of geoengineering. Model output can be provided to social scientists, agriculture modelers, and other parties interested in applying model results to other studies. A suite of experiments was proposed to investigate geoengineering by brightening of marine stratocumulus clouds.

The workshop included 26 members of the science research and communication communities from seven different countries. Results from more than 20 climate models will soon be available on the Earth System Grid network. The GeoMIP official Web page (http://climate.envsci.rutgers.edu/GeoMIP/) discusses simulation specifications in detail and will be updated with new information, including results and publications, as these results become available.

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