BAMS
Meeting Summary

Future Geoengineering Scenarios

Balancing Policy Relevance and Scientific Significance

Daniele Visioni and Alan Robock

The Eleventh Meeting of the Geoengineering Model Intercomparison Project (GeoMIP)

What: The 11th GeoMIP meeting aimed to discuss future scenarios to be used in climate models to better understand the societal and physical impacts of geoengineering, and new results from the latest simulations.
When: 8–9 July 2021
Where: Online

KEYWORDS: Communications/decision making; Model comparison; Societal impacts

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Corresponding author: Daniele Visioni, dv224@cornell.edu
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AFFILIATIONS: Visioni—Sibley School of Mechanical and Aerospace Engineering, Cornell University, Ithaca, New York; **Robock**—Department of Environmental Sciences, Rutgers, The State University of New Jersey, New Brunswick, New Jersey

The 11th annual Geoengineering Model Intercomparison Project (GeoMIP) workshop was held on 8 and 9 July 2021. Like last year, it was held online due to the ongoing COVID-19 pandemic. While this obviously represented a challenge, it also offered the opportunity for a wide audience to join from six continents in the 2 days when it was held. Participants interested in presenting their work uploaded their presentations (or video recordings or posters) online in the weeks before the meeting, where they were available for all participants to peruse beforehand, allowing for a lively discussion during the 6 h of the meeting itself. Overall, more than 70 people registered (Fig. 1) and participated for at least 1 day of the meeting, and 11 presented their work in the first hour of both days, which inspired some very engaging discussions both during and afterward. The 2 days of the meeting were structured around two main topics: current and future analyses of recently completed GeoMIP simulations as part of CMIP6 (Kravitz et al. 2015), and ideas and opinions about the future directions of GeoMIP.

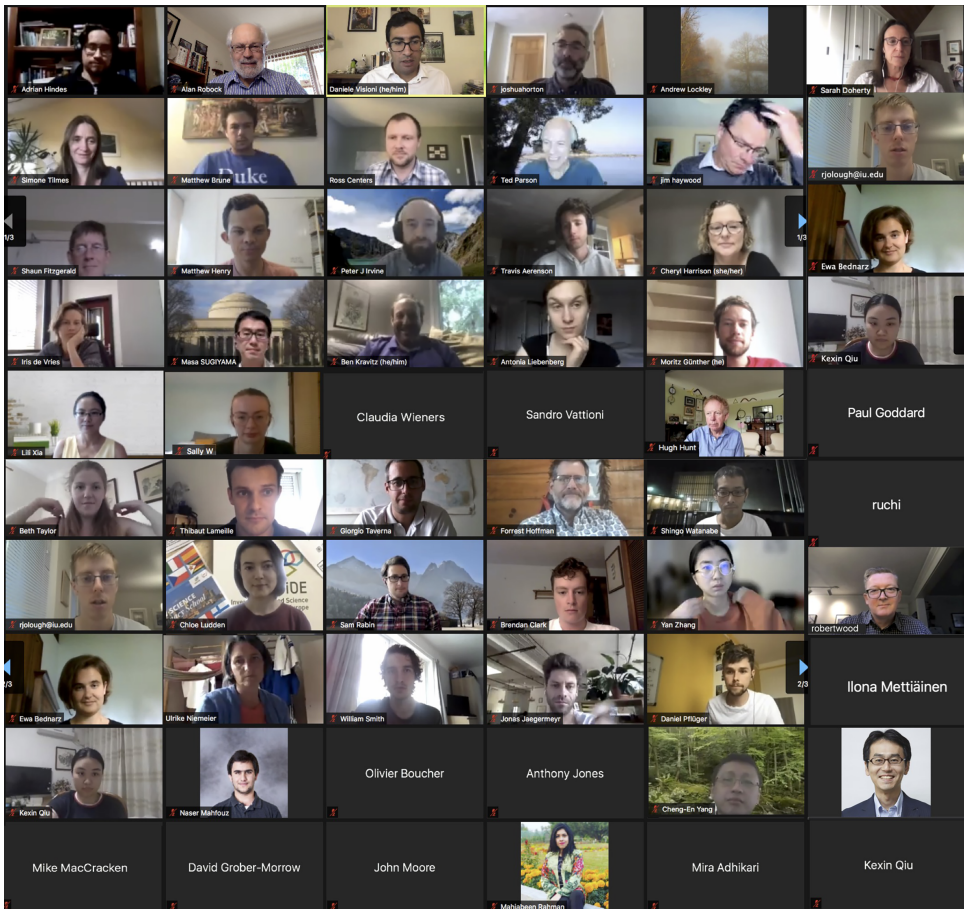

Fig. 1. A composite of some of the participants during the 2 days of the 11th annual GeoMIP workshop.

In the first day, we listened to multiple presentations revolving around one common question: Are the current scenarios used in geoengineering simulations relevant in terms of policy, politics, and decision-making, and if not, what can be done to make future scenarios more relevant? This topic spanned some very useful discussions around the goal of the geoengineering simulations that we use in our research. On one hand, experiments where a very strong forcing is applied to the system, such as the G1 experiment, where the solar constant is uniformly reduced to counterbalance a sudden 4-times increase in CO_2 concentrations, are useful because of the high signal-to-noise ratio, allowing for a much easier identification of the response from the climate system without needing extremely long simulations or a large ensemble to determine statistically significant phenomena. These kinds of simulations are easy to set up and to run across multiple climate models, as just one simple parameter is modified, and they allow for comparisons between different generations of climate models, as was recently shown by Kravitz et al. (2021). They are not, however, policy relevant in the sense that they do not represent a scenario that could actually happen in the real world. At the other hand of the spectrum, there are experiments such as G6sulfur, where SO_2 is injected into the tropical stratosphere between 2020 and 2100 under a scenario with very high emissions throughout the century (SSP5-8.5) to reduce temperatures to those achieved under a medium-emission scenario (SSP2-4.5). This experiment makes use of the most recent CMIP6 scenarios, so it is in many ways more policy relevant. However, this is also a scenario that is not *realistic*, as many noted, as we are now in 2021 and no one is injecting SO_2 in the stratosphere on purpose. So while more relevant scenarios may be of more interested to policymakers, they are also hard to define, and quick to become outdated if new information comes to light, for instance, regarding which emission pathway is more likely, or insurmountable risks from any stratospheric aerosol injection.

We came to a common agreement that there is no urgent need to devise novel geoengineering experiments and scenarios at this time, nor, if those simulations were performed would there be enough resources to analyze them fully. But for the numerous simulations already available, the community should be mindful of framing the results we obtain in a way that makes clear to any reader that the role of geoengineering scenarios is not to dictate policy, but to explore the risks, benefits, and opportunities. An interest was also shown toward trying to find a common way to describe the results of multiple scenarios, for instance, by determining how shared the climate response is between different amounts of cooling and different scenarios when everything is normalized to 1°C of cooling.

Some novel scientific results were also presented, especially in the second day, both showing the capacity of current GeoMIP simulations to explore various components of the Earth system, from the surface to stratospheric ozone, and highlighting some original work around extratropical SO_2 injections and around marine cloud brightening, both of which might, in the future, be candidates for new GeoMIP experiments for the next set of climate model intercomparisons.

After 1 year of online meetings, everyone was much more accustomed to the nuances of virtual engagement, and people moved between the screen discussion and the chat available to all participants with ease, resulting in an engaging experience that, even if it cannot be a match to meeting in person over multiple days, all participants found satisfying. The diversity of voices that a remote meeting can afford is something that should not be lost, suggesting that hybrid options be explored for future meetings, even when in-person meetings return.

References

Kravitz, B., and Coauthors, 2015: The Geoengineering Model Intercomparison Project phase 6 (GeoMIP6): Simulation design and preliminary results. *Geosci. Model Dev.*, **8**, 3379–3392, https://doi.org/10.5194/gmd-8-3379-2015.

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