BAMS
Meeting Summary

The Road toward Process-Level Understanding of Solar Geoengineering through a Multimodel Intercomparison

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

What: The tenth GeoMIP meeting aimed to discuss new results from the latest round of simulations, including the importance of process-level understanding of stratospheric aerosols.
When: 29 June–15 July 2020
Where: Online

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The year 2020 is an important one for the Geoengineering Model Intercomparison Project (GeoMIP). We are celebrating our tenth year. Over the past decade, we have published over 100 papers, substantially advancing the research community's understanding of the benefits and risks of solar geoengineering. A 10-yr anniversary has also served as a useful time for reflection. What has GeoMIP accomplished, what does it need to accomplish, and how can we get there?

Due to COVID-19, what is usually an in-person gathering of international participants was not possible, as was the case for most other meetings this year. We chose to move to an online format, rather than canceling the meeting, for a few reasons. First, the latest round of simulations has become available in the past few months, and the first papers are being written, so disseminating the latest results is both important and timely. Also, several new modeling experiments have been proposed in the past few months and convening a group to discuss and debate them (as often happens at GeoMIP meetings) is useful. Another important goal was to test the effectiveness of holding GeoMIP meetings in an online format. Due to the international nature of the project, it is often difficult for some participants to attend in-person meetings; we thought that perhaps holding some GeoMIP meetings online could allow for greater participation. And finally, this community has become fairly tightly knit over the past decade. After being isolated at home for the past few months due to COVID-19, it was good to talk with friends, however briefly.

The online meeting was held in a hybrid format. For two weeks from 29 June through 10 July 2020, participants were invited to an online, asynchronous forum where they could post presentations or discussion topics and comment on each other's posts. This was followed by a 2-h video meeting on 15 July 2020, in which we discussed common themes that arose during the meeting, as well as other standard GeoMIP business like simulation status, papers, new modeling experiments, and coordination with other efforts. Approximately 75 attendees throughout the world registered for the asynchronous forum, but only approximately 25 people attended the live portion of the meeting (Fig. 1).

A primary aim of this meeting was to discuss the latest round of GeoMIP simulations that have recently been completed for phase 6 of the Coupled Model Intercomparison Project (CMIP6). These simulations include an idealized solar dimming experiment that offsets the warming from an abrupt CO_2 increase, as well as two experiments based on the Shared Socioeconomic Pathway (SSP) scenarios, one involving solar dimming and one involving stratospheric sulfate aerosols. Two central questions are how well we understand model response to solar dimming and how well solar dimming can serve as a useful proxy for stratospheric sulfate aerosols.

Because the idealized solar dimming experiment was simulated as part of the previous round of simulations (CMIP5), results from that generation of models could be compared with those in CMIP6. That comparison revealed few changes in model response to idealized solar dimming. This lends confidence to our conclusions about climate response to this scenario. However, preliminary analyses comparing solar dimming and stratospheric sulfate aerosols indicate that important processes are missing from solar dimming. More specifically, solar dimming cannot capture stratospheric heating from the aerosols, which has critical implications for atmospheric circulation, surface climate, and societally relevant impacts. Moreover,

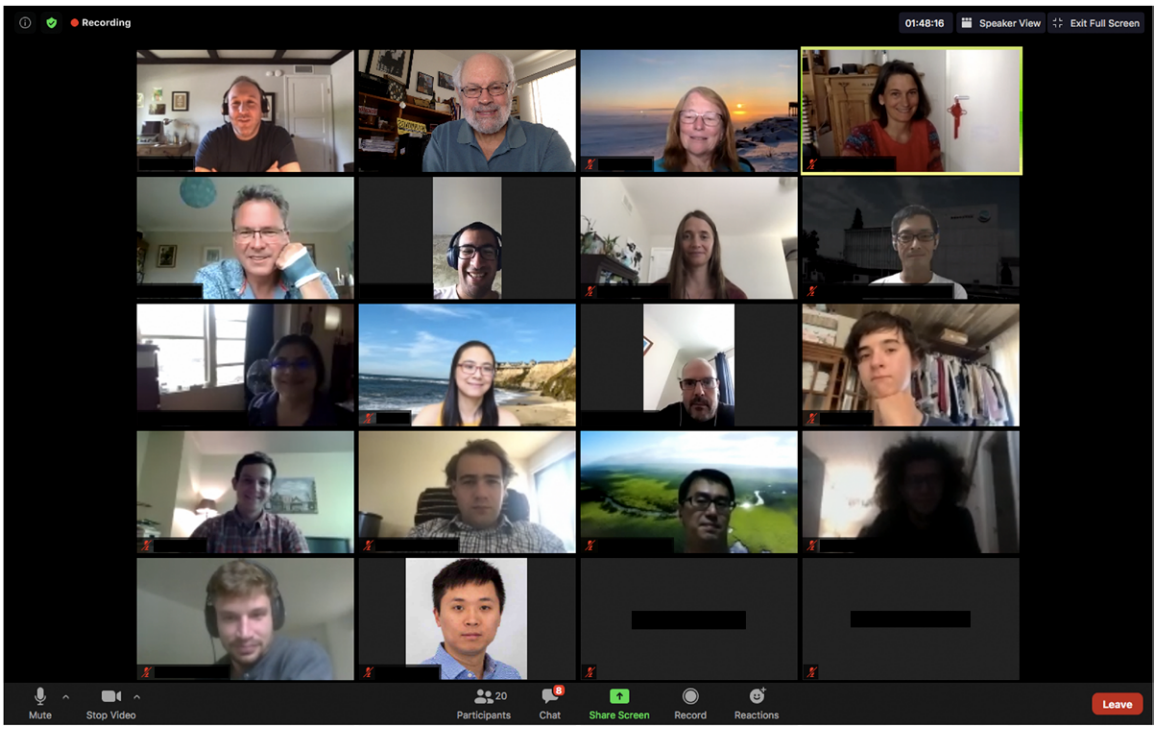

Fig. 1. A Zoom capture of some of the participants in the synchronous portion of the most recent GeoMIP meeting.

because models have different representations of the various processes involved in stratospheric sulfate aerosols (sulfur dioxide loading, aerosol microphysical growth, transport, and interaction with radiation and dynamics), model spread for stratospheric sulfate aerosols is much larger than for solar dimming.

As a potential way to narrow these uncertainties, participants suggested the need for better validation of our models in simulating the effects of stratospheric sulfate aerosols. Most of the models have been validated against the large eruptions of the twentieth century (like the 1991 eruption of Mt. Pinatubo), but there have been numerous smaller eruptions in the twenty-first century that have been observed with more precise instruments, potentially allowing us to better understand uncertainty. Participants in the meeting agreed that better coordination with volcanic modeling groups could prove to be fruitful. There could be additional value in coordinating with other groups designed for more process-level investigations—as an Earth system model intercomparison project, GeoMIP is well suited for exploring climate uncertainty, particularly linkages between climate outcomes and process-level uncertainty.

One of the outcomes of the meeting was a list of GeoMIP-related papers that participants want to write. Many of the papers focus on the new round of simulations and will be collected into a special issue of a journal, for which we are preparing a proposal. Many of the proposed papers involve analyses of societally relevant impacts and extreme events, topics that have been high priorities for GeoMIP analyses for some time.

After the meeting concluded, a survey was sent to all GeoMIP participants about their experience with the online meeting or, if they did not attend, whether there were any obstacles that we could resolve for the future. Of the respondents thus far, the general sentiment is that the hybrid online format worked well, allowing varying levels of participation. In particular, participants appreciated how the asynchronous forum did not have any difficulties with scheduling or time zones, and most thought that complementing the online forum with a 1–2-h synchronous session was useful. Participants who completed the survey universally requested more online meetings like this one, with the most popular request being meetings every 3–4 months. However, not being able to spend 2–3 days together, including informal

discussions, detracted from the success of the meeting. While we were able to replicate some of the communication that resulted from previous meetings, and were stimulated to have more frequent online meetings, we look forward to starting to have in-person meetings next year.

GeoMIP continues to expand its participation base to include new and varied communities. Since last year's meeting in Beijing (Kravitz et al. 2020), we have had increased involvement from developing country scientists as part of the Developing Country Impacts Modeling Analysis for Solar Radiation Management (DECIMALS) project. The online format of this year's meeting has allowed us to pilot a process of further engaging participants throughout the world, especially those for whom travel is difficult.

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Reference

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