BAMS
Meeting Summary

Process-Level Experiments and Policy-Relevant Scenarios in Future GeoMIP Iterations

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

What: The twelfth 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: 29 June 2022
Where: Newry, Maine

KEYWORDS: Climate models; Coupled models; General circulation models

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The twelfth annual Geoengineering Model Intercomparison Project (GeoMIP) workshop was held on 29 June 2022 during the second Gordon Research Conference (GRC) on Climate Engineering. It was the first in-person meeting since the 2019 one in Beijing, China, and a great opportunity for community engagement given the already-large participation to the GRC, which had close to 150 participants. A large majority of them selected to attend the GeoMIP meeting as well, and since many of the GRC presentations and posters already included GeoMIP results, the meeting could focus mainly on planning out future experiments that the community might be interested in running.

As already highlighted in the previous meeting (Visioni and Robock 2022), the topic of balancing policy relevance and scientifically meaningful scenarios was still front and center in the discussion this year. Fundamentally, there is agreement that it might just be impossible to satisfactorily do both in the same experiment, and there is merit in more clearly separating process-based experiments to explore uncertainties and sensitivities in climate models from policy-relevant scenarios, with an eye on the future development of climate scenarios for the Coupled Model Intercomparison Project, phase 7 (CMIP7), which will eventually be used for the next set of Intergovernmental Panel on Climate Change reports, and which most agree should form the basis of the scenarios used by GeoMIP. The latter are clearly important as high-profile results that might drive future decisions, but the timeline for scenario definition for CMIP7 is still long and it might be a few years before those are ultimately decided—maybe with input from the GeoMIP community as well. Some members highlighted the importance of simulating scenarios that make clear that geoengineering cannot be considered as a substitute for mitigation, but that it should be considered as a form of "peak shaving" (Tilmes et al. 2020) in conjunction with strong mitigation measures, in an "overshoot" framework.

In the meantime, many agree that the time could be spent focusing on process-based experiments more. This also offers up the possibility for GeoMIP to more closely collaborate with other modeling efforts focused on specific aspects of the climate system, leveraging the shared expertise to more closely understand some of the processes involved in climate intervention simulations. For instance, members of the community reported interest in both the Climate-Chemistry Intercomparison Project (CCMI; Plummer et al. 2021) and the Quasi-Biennial Oscillation initiative (QBOi; Butchart et al. 2018) to codevelop experiments of relevance to both communities. Cloud processes is also a field on which GeoMIP perhaps has not focused as much in the last few years, but should, based on many comments. As an example, it was highlighted during the meeting that only two models in CMIP6 produced results for the G7cirrus experiment (Kravitz et al. 2015), and nobody has yet set out to analyze those. Given the ongoing interest for marine cloud brightening (MCB), especially for more regional deployment scenarios, how should GeoMIP be involved? Some members suggested that, for MCB, the focus should be more on large-eddy simulations than on

Fig. 1. Group photos of all the participants in the twelfth GeoMIP meeting.

global climate modeling. Many of the discussions held during the meeting also inspired the writing of a longer opinion piece for the journal *Atmospheric Physics and Chemistry* (Visioni et al. 2022), looking back at past experiments and highlighting future one to be proposed and analyzed.

Concluding the meeting, Jim Haywood from the University of Exeter volunteered to host the thirteenth GeoMIP workshop, 3–7 July 2023, in Exeter, to which the room wholeheartedly agreed. Given the growing interest from undergraduate and graduate students in climate intervention, a summer school before the GeoMIP workshop is planned to familiarize students with the science of climate intervention, the GeoMIP experiments that have been completed and studied so far, and to help students navigate and utilize model output.

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