

Atmos. Chem. Phys. Discuss., referee comment RC1
<https://doi.org/10.5194/acp-2022-766-RC1>, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on acp-2022-766

K. Caldeira (Referee)

Referee comment on "Opinion: The scientific and community-building roles of the Geoengineering Model Intercomparison Project (GeoMIP) – past, present, and future" by Daniele Vioni et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2022-766-RC1>, 2022

The GeoMIP project has produce a lot of useful results so it is good to take a step back and think about lessons learned.

The review of past experiments and pointers to some of the resulting papers is very useful and interesting.

Major notes:

This paper would be substantially improved with the addition of a section titled something like "Lessons learned". If you were to start this project over again knowing what you know now, what would you have done differently? [Since there might be multiple perspectives on what should have been done differently, this might be an opportunity to share several perspectives. In this reviewers perspective, this lessons learned section would be the most important section of this paper.

Similarly, it might be good to pull together what I would see as a section on cross cutting issues. The two issues that I see as being raised at several points are:

- To what extent should simulations attempt to be "realistic" and to what extent should the simulations be highly stylized aimed at facilitating more straightforward analysis?
- Where should the balance be between simulations that may in some sense be "better", but be difficult for modeling groups to perform, versus simulations that might not be as useful, but might be easier for modeling centers to perform?

There are probably similar cross-cutting questions that you might want to address, for example: When is it enough to have a small number of groups do a simulation and when do you really need a large number of groups to do a simulation? How do you draw a balance between then number of simulations that people need to perform versus the number of ensemble members for each simulation? How to think about the GEOMIP demands on people's time versus everything else they need to be doing?

I would not expect to see resolution on all of these questions, but maybe a couple of sentences showing the thinking on all of these questions might be useful.

Some of this material is already in Section 5.2 and the Conclusions section. Nevertheless, I think adding a "Lessons learned" section would be highly useful, and a "Cross-cutting issues" might be a place to focus discussion on some of the questions raised in Section 5.2 and the Conclusions.

The reviewers can accept or reject my "cross-cutting issues" suggestion but I hope would adopt my "Lessons Learned" proposal would be adopted.

Minor notes:

[line] comment

[24] Eliminate word "these" (stylistic)

[43-45] Provide citation for IS92a claim.

[67] Properly capitalize of project name.

Table 1. Maybe make another column for the background scenario.

Figure 1. It might be helpful in this figure or in an additional figure to make it clear which CMIP scenario is the reference "ungeoengineered" case relating to each geoengineering case. At the very least this could be in the figure caption.

Figure 2: Expand figure caption to explain all labeled points in the figure. For what years are this? Is it really the standard deviation so low, or are these perhaps standard errors? If the values for G6Solar, G6sulfur, are compared against SSP2-4.5 values, might it be a good idea to show the SSP2-4.5 value on the figure? Do something to let people know which geoengineering case is related to which case without geoengineering.

[104-105] Please mention whether the reduction was the same in each model or different to achieve a temperature balance.

[124] Please mention whether the reduction was the same in each model or different to achieve a temperature balance.

[221-226] Some discussion of the use of SSP2-4.5 as a reference state rather than SSP5-8.5 would be appreciated. Was the choice to be more "realistic" worth having a higher signal-to-noise ratio? From the discussion on these lines, it seems researchers wanted to be more "realistic", but maybe it is better to hit models with a hammer to see how they behave with more extreme forcing.

[228-229] This discussion of "future proofing" might be expanded and discussed later along with the above questions. Is the goal to be "realistic" or to understand how models behave? How are these competing goals best balanced?

[Section 3 and 4] For each of these subsections, it might be good to start each section with the main scientific question that each project is intended to address. (For example, line 509 mentions a question in a section that has no questions in it.)

[619] Something akin to this boldfaced question should appear in each of the subsections of Sections 3 and 4. (Maybe not a bad idea to do this for Section 2 also.)

[777-788] These kinds of questions about tradeoffs in design should get more prominence.