EGUsphere, community comment CC2
https://doi.org/10.5194/egusphere-2022-125-CC2, 2022
© Author(s) 2022. This work is distributed under
the Creative Commons Attribution 4.0 License.

Reply on CC1

Richard Rosen

Community comment on "Assessing Responses and Impacts of Solar climate intervention on the Earth system with stratospheric aerosol injection (ARISE-SAI): protocol and initial results from the first simulations" by Jadwiga H. Richter et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-125-CC2, 2022

It is unfortunate that the authors of this paper have not yet responded to my earlier comments. It is hard to have a community discussion, as the EGU intends for papers submitted to it without such a response. But I will supplement my earlier comments here.

1. It is clear from simple physics that if enough sulfate particles are introduced into the atmoshere that the average temperature at the surface of the globe will cool sufficiently to offset the amount of average global heating due to the increase in greenhouse gases the world is emitting. Again, this could clearly be achieved on average across the entire surface area of the globe. But even the IPCC acknowledges that the distributional effects of such cooling on temperature and its impacts on precipitation would not offset the impacts of climate change at the regional/local scale. One does not need to sophisticated computer model of the climate system to understand why this would be true, and I gave some examples in my earlier comments on this paper of the physics behind this issue.

2. Different climate models give fairly different results, thus the authors need to justify why their paper should focus on only one such model. Why should we believe that the model focused on will yield more accurate regional impacts for sulfate geoengineering and baseline cases than other models in the future?

3. Since large amounts of sulfate particles injected into the atmosphere are likely to diminish the strength of sunlight hitting the surface of the earth, the authors should discuss the impact of this likely effect on agricultural productivity for different food crops, since different crops may have different degrees of sensitivity to the dimming of sunlight during their growing seasons. The same should be discussed for forest growth and health.

4. Again, to the extent that sulfate geoengineering will likely yield different precipitation patterns across the globe relative to normal rainfall patterns, and relative to the rainfall patterns that will be produced by climate change over the next decades, this issue should be explored. However, it is well known that it is likely to be the case that computer-based climate models have a harder time accurately computing the impact of climate change on precipitation then on temperature, and this is likely to even more true for their ability to compute the changes in rainfall patterns due to sulfate geoengineering. This issue needs to be more fully explored in a revised paper.