



EGUsphere, community comment CC1
<https://doi.org/10.5194/egusphere-2022-125-CC1>, 2022
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Comment on egusphere-2022-125

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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., EGU sphere, <https://doi.org/10.5194/egusphere-2022-125-CC1>, 2022

My first concern about this paper is that it does not discuss seasonal impacts on temperature and precipitation as a function of latitude at all. This must be done. For example, we know that the annual average temperature impacts of climate change on annual average temperature occur most in the high northern latitudes, in places like Alaska. Furthermore, in theory, having more CO₂ in the atmosphere over such regions clearly has a huge impact in reducing radiative cooling in winter, thus increasing surface temperatures substantially. Yet, having sulfate particles over Alaska in winter won't have much impact in reducing temperatures since the periods of sunlight are so short. Furthermore, having most of the sulfate particulates much farther south, as shown in Figure 2, would seem to imply that incoming summer radiation will not be reflected very much in the far north where it is needed to be reflected during the long daytimes of summer to cool the air. Similar seasonal asymmetries are probably important for precipitation impacts of climate change even though these would be much harder to model accurately. The seasonal asymmetries with regard to surface temperature seem to derive much more simply from the physics of CO₂ concentrations and the density of sulfate particles in the air. Thus, concluding that "on average" over the year or over many years solar geoengineering can mitigate climate change is not very helpful when trying to analyze the impact of climate change on human society and the ecology. Seasonal and time of day (day vs. night) differences in impact on temperature and precipitation are very important to consider.

My second concern is that I do not quickly see any discussion of how the impact of sulfate particles on the reflectivity of solar radiation is modelled at different wavelengths, and at different times of the day. Also, I do not see any discussion of the impact of continually falling particles on air quality, human beings breathing the air, and on ecology and agriculture.