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Comment on acp-2021-1032

Anonymous Referee #1

Referee comment on "Assessing the consequences of including aerosol absorption in potential stratospheric aerosol injection climate intervention strategies" by Jim M. Haywood et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-1032-RC1, 2022

I very much appreciate this study. I reviewed Gao et al. (2021), and while I thought it was a clever idea and worth discussion in the literature, it was easy to see some potential problems with adding absorbing aerosols to the stratosphere. The present study provides much of that context and does a nice job with it. Furthering the discourse is exactly what needs to happen. I am recommending revisions, some of which could take a bit of work.

General comment: None of the figures has statistical significance calculations, so it is difficult for me to understand whether the values I'm looking at are important. (I suspect they are, but I'd rather not guess.)

Introduction: Some discussion of the work of Wake Smith is warranted.

Lines 154-155: I wonder if you're missing a few mechanisms here. Ozone is a greenhouse gas, and it will certainly change in G6abs. Stratospheric water vapor is too, and G6abs has strong heating of the tropopause cold point. And now that I'm looking through the paper, I don't see any mention of stratospheric water vapor, which seems like an important oversight.

Lines 182ff: How do these results compare with the hydrological cycle impacts of tropospheric BC and sulfate? Are the mechanisms related? Also, you don't provide a mechanism –Bala et al. (2008, PNAS) seems be relevant here.

Line 281: This is a bit of an overstep. I agree that if the models get all of the dynamics right, they should all show this response. I have to imagine there are some models that have problems here.

Figure 8: Can you report slopes and R2 values?

Section 5: Your results for the QBO are dependent upon these being equatorial injections – see Richter et al. (2017, 2018) and Kravitz et al. (2019). I'm not disputing your results, but I do think your description needs this qualification.