Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-372

Alan Robock (Referee)

Referee comment on "Climate response to off-equatorial stratospheric sulfur injections in three Earth system models – Part 2: Stratospheric and free-tropospheric response" by Ewa M. Bednarz et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-372-RC1, 2022

I don't know what to recommend for this paper. Clearly there was a lot of analysis of different models, and they were all different. But so what? What is the new science? What do we know now that we did not know before? What is the scientific question that is being addressed? Weren't these results found in previous papers, such as part of VolMIP? It would be very useful to know which models or models are actually correct.

You write that we should not depend on the results from just one model, so what should we do? Which model or models should we use? There have been injections into the stratosphere from volcanic eruptions and forest fires, for which we have observations. Have any of these models been used to simulate these real-world cases?

In any case, the authors need to address the points below and the 54 comments in the attached annotated manuscript.

In addition to Fig. 10, provide ones for separate winter and summer seasons, so we can see how the polar vortex behaves in different seasons. For Fig. 10, why does 15°S injections give the largest change in the Northern Hemisphere (NH) polar vortex?

In Fig. 8, why is south polar ozone depletion for 15°N and 30°N injections even larger than for SH injections?

For all the figures with rows for different latitudes of injection, it would be much more intuitive if the rows with the most northerly injections were at the top of the page, that is put 30°N first, then 15°N, and so on.

For Figures 1, 5, 6, 7, 9, 10, and S4-S7 what is the significance of the plots. Since these are means of 8 years and 3 ensemble members, plot dotted shading over the insignificant parts.

For Figures 1, 5, 6, 7, 9, 10, and S4-S7 use one large color bar for entire figure and delete all the tiny illegible ones beneath each panel.

The color scale for Figs. 6, 7, 9, 10, and S4-S7 for negative values is ugly and counterintuitive. Use just gradually darker blue and then purple for more negative values. Don't use green.

Fig. S7 has a caption that does not agree with the figure. It looks like a time series and not an 8-year mean. If so, the x-axis needs to be labeled correctly, in time, with yearly indications and not just arbitrary numbers of months. Also, the image is very blurry and needs to be replaced with a clear one. Also, there are too many black contours that completely cover the shading and information. Use a larger contour interval. And use a better color scale.

For supplemental information, add a table of contents on the first page with a list of the tables.

Review by Alan Robock

Please also note the supplement to this comment:
https://acp.copernicus.org/preprints/acp-2022-372/acp-2022-372-RC1-supplement.pdf