Review of the paper: *The Interactive Stratospheric Aerosol Model Intercomparison Project (ISA-MIP): Motivation and experimental design*, by C. Timmreck et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2017-308, 2018.

This paper presents a new Model Intercomparison Project, that will result very useful for the stratospheric aerosol-chemistry-climate community. Motivation and protocols for input/output data relative to four different experiments are presented in Section 3 in a detailed and clear way, so that (once published) this paper can be used in the community as a guideline for the experiments to be completed by the modellers.

The introductory part to the actual MIP description (i.e., Sections 1-2) is also well written and clear and help the reader capturing the importance for a better understanding of stratospheric aerosols, their variability, role of gas precursors, climate impact of stratospheric sulfate from explosive volcanic eruptions, and other important aspects (large scale transport, QBO, size distribution, etc).

Here, however, the manuscript may be somewhat improved (in my opinion), in at least two main aspects, discussed below. For this reason, I recommend publication of this paper, after these specific points are properly addressed.

Specific points

(1) The authors discuss the climate impact of stratospheric volcanic aerosols, how their large scale distribution may be affected by stratospheric transport oscillations (QBO) and how their size distribution may change as a function of the injected SO_2. A paragraph should be added, addressing the potential impact of the aerosol radiative interactions on some features of stratospheric dynamics and transport, as age of air and strat-trop exchange of trace species. Recent studies which may be relevant from this point of view, are those by Ray et al. (2014), Pitari et al. (2016a), Diallo et al. (2017). A brief paragraph on this aspect would make even stronger the need for the proposed MIP. This paragraph could probably be inserted in the Introduction or at the end of Subsection 3.3.2.

Ray, E.A. et al.: Improving stratospheric transport trend analysis based on SF_6 and CO_2 measurements, *J. Geophys. Res*., *119*, doi:10.1002/2014JD021802, 2014.

Pitari, G., et al.: Impact of stratospheric volcanic aerosols on age-of-air and transport of long-lived species, *Atmosphere, 7,* 149, doi: 10.3390/atmos7110149, 2016a.

Diallo, M., et al.: Significant Contributions of Volcanic Aerosols to Decadal Changes in the Stratospheric Circulation, *Geophys. Res. Lett., 44*, 10780, https://doi.org/10.1002/2017GL074662, 2017.

(2) References to new studies on volcanic aerosols may be added. The QBO impact on aerosol dispersal and e-folding time has been discussed in Pitari et al. (2016b) and could be cited at page 5 line 181. A re-examination of the initial SO_2 cloud lifetime was made in Mills et al. (2017) and could be cited at page 2 line 51.

Pitari, G., et al.: Stratospheric aerosols from major volcanic eruptions: a composition-climate model study of the aerosol cloud dispersal and *e*-folding time, *Atmosphere*, *7,* 75, doi:10.3390/atmos7060075, 2016b.

Mills, M.J., et al.: Radiative and chemical response to interactive stratospheric sulfate aerosols in fully coupled CESM1(WACCM), *J. Geophys. Res.,* doi: 10.1002/2017JD027006, 2017.

(3) At page 7 lines 271-273 the authors write: “Modelling groups are encouraged to include a set of passive tracers to diagnose the atmospheric transport independently from emissions mostly following the CCMI recommendations (Eyring et al., 2013). These tracers are listed in Table S3 in the supplementary material.” It should be specified that in case modelling groups had already run these experiments, results produced and uploaded for CCMI may also be used for ISA-MIP, taking them directly from the CCMI data repository. I would also suggest to provide a link (as made in Eyring et al., 2013) where gridded input data may be available for download (S fluxes etc.).

Minor points

At the beginning of Section 2 (page 5 lines 15-155) the following sentence sounds odd: “However, the focus of the ISA-MIP experiments described here is on comparing to measurements of the overall optical and physical properties of the stratospheric aerosol layer, which is manly determined by stratospheric aerosol”. Maybe the final “aerosol” should be substituted with sulfate.

The discussion at the end of Section 2 (page 7 lines 210-219) could probably be made even more robust with reference to sulfate geoengineering studies. Some of these have highlighted differences in what the authors themselves call “a crucial point”, i.e., the different degree of isolation of the tropical pipe and the meridional transport of sulfate aerosols through the subtropical barrier. See for example Tilmes et al. (2015) and Visioni et al. (2018).

Tilmes, S., et al.: A new Geoengineering Model Intercomparison Project (GeoMIP) experiment designed for climate and chemistry models, *Geosci. Model Dev.*, *8*, 43-49, doi: 10.5194/gmd-8-43-2015, 2015.

Visioni, D., et al.: Sulfur deposition changes under sulfate geoengineering conditions: QBO effects on transport and lifetime of stratospheric aerosols, *Atmos. Chem. Phys.*, *in press*, 2018. [*Atmos. Chem. Phys. Discuss.*, https://doi.org/10.5194/acp-2017-987, 2017; accepted for publication on Atmos. Chem. Phys.].