

Replies to comments by Travis N. Knepp

Comment: Hello Anna! Thank you for submitting this paper.

The authors present a non-sophisticated (simplicity is beauty), simple evaluation of a solar occultation instrument's (here, SAGE III/ISS) ability to detect changes in stratospheric aerosol load with a continual injection of 1-2 Tg S/year. This study is elegant in its simplicity. Here, the authors determine that such changes would be detectable. To carry out this study the authors use MAECHAM5-HAM model to generate extinction coefficients at 500 and 550 nm, which were then converted to 520 nm (via Angstrom parameterisation), which was then fed into SCIATRAN to produce transmission data, which was then used to retrieve 520 nm extinction. I believe the accuracy of the authors' conclusions depends on the quality of these models, which I am not qualified to judge.

Overall, this paper is well written and I believe makes an important contribution to the scientific community. It would be interesting to see this study continue to evolve (e.g., if your "natural variability" included pyroclasts and volcanic eruptions (i.e., the stratospheric conditions that SAGE III/ISS has observed under), would you still have the requisite sensitivity to detect changes?; by continually injecting S you are changing the baseline stratospheric aerosol distribution...how does that impact particle growth and radiative transfer after another eruption, etc.), but the authors present an interesting and convincing proof of concept that stands on its own.

I only have minor suggestions for improving the paper.

Comment: 1. In Fig. 1 (b), when does injection start? Did it start in January? I apologize if this was mentioned in the text and I missed it, but adding this information to the caption would aid the reader.

Reply: Thank you for the comments and the very good suggestions made above, which we also intend to look at in the future.

As described in more detail in the ECHAM subsection, these are continuous emissions, i.e. at each time step, at an altitude of 60 hPa.

Comment: 2. For Figures 2, 4, 5, 9, have the authors considered making the x-axis scale logarithmic? Especially in Fig. 4/5 this would help the reader appreciate the magnitude of change from background to enhanced conditions. Currently, I can barely tell that background is different from zero and a log scale would help the reader quantify this.

Reply: Thank you, this was changed for the illustrations of the aerosol extinction profiles.

Comment: 3. Do you have any information on how particle size may change with these injections? That level of information would be very interesting (at least to me).

Again, well done on the paper. I look forward to seeing this published; best of luck.

Reply: Thank you again. We agree that this would be an interesting aspect, but we did not look at this in the context of the aims of this study. We are planning, however, to investigate this aspect in a future study.