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Interactive comment on "A global, space-based stratospheric aerosol climatology: 1979 to 2016" *by* Larry W. Thomason et al.

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The paper was written with a significant amount of technical details. However, it is not easy for the readers with limited knowledge of this line of data products to form an easy understanding of the work involved. For example, the authors mentioned about its previous product the "CMIP Phase 5 data sets" at various parts of the manuscript, but no reference was given at these occasions. It would be helpful to give a brief introduction of the previous version with the necessary references, so the readers will know, for instance, the paradigm that produced this and previous versions of the dataset. They can also judge for themselves what are the progresses that have been made in this version.

Printer-friendly version

Discussion paper

There isn't a formal publication on the release of the previous version though it is mostly unchanged from the ASAP version (SPARC, 2006) with the addition of CALIPSO and GOMOS data following the SAGE II period. We have included some related papers that are helpful. (Vernier et al., 2011;Solomon et al., 2011)(Mills et al., 2016). Mills et al point out some shortcomings in the post-SAGE II periods that have been addressed in the new version.

Table 1 lists the instrumental data that were and were not used in this paper, but the information was limited. A better approach might be provide a schematic graph showing the spatial and temporal coverage of the various instrumental data that were used in the reconstruction. Similarly in P10 Line 16, the long paragraph starting at line 16 describes the reconstruction of the SAGE gap period. Several datasets and a lot of details are involved in the reconstruction of different time in different latitude bands. A schematic graph showing the reconstruction process would be helpful for readers to form easy understand of what's going into dataset.

We have tried to create figures that show the reconstruction process and failed to make anything that was clear to me. We recognize the complexity of how the data set is constructed and have added a new table broken into the SAGE I, the gap period, the SAGE II period (with Pinatubo gap), and the OSIRIS/CALIPSO period with all relevant data sets listed with latitude ranges and time periods. We think this addresses the issues in a concise manner.

The gap filling of the two post-volcanic-eruption time slides is really important, therefore it would be helpful to provide brief explanations of why particular instrumental data was used for the specific month(s) and latitude band(s). Was the particular data the only observation data available, or it was the best/most suitable and if so what criteria were used to evaluate the suitability? Some discussion about the uncertainty in the gap filling would be very useful too.

The data paradigm is described in the 2nd paragraph of the introduction. We have

clarified the text in the relevant ‘gap’ sections to reiterate this data selection process.

1. P7L26-28, "Effectively, this approach moves the eruption to July 1991. A possible solution for users is to use data for May 1991 to June 14th and July 1991 after the June 15th eruption." The two sentences did not read explicitly to me, how did the approach move the eruption to July 1991? The proposed solution is confusing.

The eruption is ‘moved’ to July 1991 because there is little reflection of its occurrence in June 1991 (when it actually occurred). We have clarified this text and the proposed solution.

2. One of Figure 8 or Figure 9 should be "SE (instead of NW) Australia" response. Please also correct the reference to the Figure 10 in Line 179. The use of "multi-model mean" in several figures is misleading, please consider change to model ensemble.

I can’t find these comments in the manuscript.

3. P16L35, is "SAGEII eruption" actually "Pinatubo eruption"?

Fixed

4. P17L2-3. " Is likely that there is considerable aerosol in the upper troposphere during this period but we have little ability to produce values based on measurements in this period." Please replace "Is" with "It is" or revise this sentence.

Fixed

5. Figure 1, " From October 2005 to July 2000, there are about 10000 events per 5 year." Is October 2005 instead October 1985?

Fixed

6. Figure 10. "This set of figures shows demonstrates GloSSAC prior to using the equivalent latitude filling process (a) and afterwards (b)". Please remove "shows" or "demonstrates". Also, "Note some parts of the Pinatubo data gap-filling process have

not been performed for the equivalent latitude drawing (c). " Should it refers to (b) instead?

This caption has been updated and corrected.

7. The authors may consider to make the language more concise and break some of the long paragraphs into short ones. For example, "The exceptions are in the SAGE I/II gap from 1982 to 1984 where data from SAM II and groundbased and airborne lidar data sets are used to span the _3 years between the end of the SAGE I mission in November 1981 and the beginning of the SAGE II mission in October 1984." I think the second half of the sentence, i.e., " to span....1984", is unnecessary since it just repeats "the SAGE I/II gap from 1982 to 1984". As another example, it might be helpful to break the long paragraph in page 10 between line 16-38 at line 25 where the discussion changes from latitude distribution to altitude distribution.

Done.

Mills, M. J., Schmidt, A., Easter, R., Solomon, S., Kinnison, D. E., Ghan, S. J., Neely, R. R., Marsh, D. R., Conley, A., Bardeen, C. G., and Gettelman, A.: Global volcanic aerosol properties derived from emissions, 1990-2014, using CESM1(WACCM), Journal of Geophysical Research-Atmospheres, 121, 2332-2348, 10.1002/2015jd024290, 2016.

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