

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

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This work extended the stratospheric aerosol reconstruction to the period 1979-2016, using a number of space-based instruments and a new method to fill the post-Pinatubo/El Chichón eruption data gaps. The topic is an important contribution to the climate chemistry modeling community. The paper is nicely written, and the results are presented and discussed with sufficient details. I recommend publication of the paper with the following comments:

Major comments

1. 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

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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. 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.

2. 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.

Miner comments

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.

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

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mean" in several figures is misleading, please consider change to model ensemble.

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

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.

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

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?

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.

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