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Atmospheric Measurement Techniques Discussions

Interactive comment on "Evaluation of OMPS/LP Stratospheric Aerosol Extinction Product Using SAGE III/ISS Observations" *by* Zhong Chen et al.

Anonymous Referee #2

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The Stratospheric Aerosol Layer is an important component of the earth atmosphere through its impacts on climate and stratospheric ozone especially after large volcanic eruptions. Chen et al. (2019) evaluate the OMPS/LP stratospheric aerosol product using the SAGE III/ISS observations. They found a good agreement (+/-25%) between OMPS/LP and a modified version of the SAGE III V5.1 data between 20 and 28 km. OMPS/LP and SAGE III/ISS data are analyzed after a moderate volcanic eruption and extreme fire reaching the stratosphere to highlight the contribution of those events on the stratospheric aerosol extinction. Finally, the sensivity of the aerosol retrieval to the assumed size distribution is also investigated at the end of the study.

I have a number of major concerns about this paper before it can be published in AMT :

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Discussion paper

1- Introduction The introduction does a very poor job in explaining why this work is important and why the stratospheric aerosol layer should be studied. I suggest the authors to do a literature overview of this topic to explain.

2- Novelty of this study? As mentioned by the authors, a precedent paper was published last year to evaluate the new OMPS/LP aerosol product (V1.5) with the SAGE III/ISS data. This study aims to extend this analysis with one more year observations but do not further explain the scientific justifications for providing this update. What is so different between this paper and Chen et al. (2018) ? This is not justified with the publication of a new algorithm or new version of the OMPS dataset so why is it important to publish this ?

3- Justification for using CARMA in April 2012. An important part of the retrieval is the assumption of size parameters into the radiative transfer model to infer the aerosol extinction at 675 nm from OMPS/LP. The description of the algorithm (section2) provides the basis to understand how the extinction is inferred. A gamma size distribution is used to fit size distribution from the CARMA aerosol module running with GEOS model in April 2012. I have several questions associated with this approach:

- Why do you use a Gama function to fit the model data? Bi-Lognormal distributions have been commonly used to fit stratospheric aerosol data such as those observed by the University of Wyoming for more than 30 years (Deshler et al., 2003) - It's rather strange to use one month of model data as an input to constrain a retrieval algorithm. Moreover, the caveat is that the satellite output data will not able to be used by modelers using CARMA-GEOS since they are not independent to each other.

4- Modification/improvement of the SAGE III/ISS official product. In order to correct an apparent issue with the 675 nm extinction coefficient from SAGE III/ISS due to interference with ozone, the authors developed a new algorithm to interpolate the 675 nm channel data using 449 and 756 nm. Without providing further validation of this technique, the authors acknowledge that the new retrieved 675 nm coefficient from

SAGE III is used for comparison and to some extent validate OMPS-LP. I think the approach is questionable here: Without further validation of the new retrieved 675nm extinction coefficient from SAGE III/ISS, you assume that it will be your new reference to compare and validate OMPS-LP. I think OMPS-LP should first be validated/compared with the official product from SAGE III/ISS at 675 nm before transforming the SAGE III data.

Comments:

1) P1-l16: “has been flying”. I believe that this expression could be improved in a scientific publication 2) P1-l29: “high degree of correlation”. Quantify here. 3) P1-L32: “systematically lower. . .” You are not measuring the same air masses so the different between the two instruments are expected to be high at the tropopause or below. 4) P1-L34: “altitude dependent...” Not only altitude but also latitude. 5) P2-L3: “cloud contamination”: That is of the main issue, which is poorly discussed in this paper. 6) P2-L8: “ (Ridley et al., 2014) Âń. There is a very poor review of the available literature on this topic. This should be improved. 7) P2-26: “has become operational...” What does it mean here ? 8) P2-L27: “..A more comprehensive..”: Does it justify another publication on OMPS-LP? 9) P4-L10: “The SAGE III/ISS developed..”: Something is missing between SAGE III/ISS and the verb. It does not read well. 10) P5-L10: “Cloud height rejected. . .”: How is cloud top height inferred from OMPS-LP? 11) P6-L19: “Figure 11..”: You should remove a reference to a figure that you do not explain at this stage of the paper. 12) P7/Figure7. Figure 7 does not really highlight nicely the emergence of new stratospheric aerosol layers before and after the Ambae eruption and the fire in Canada. I would rather suggest producing an anomaly plot before and after each event. 13) P7-10. How sure are you that the corresponding increase in extinction is associated with this eruption? Provide reference or further analysis to make your point. 14) P7-L23. “were produced..” use a better verb than “produce” here. 15) P8-L8. “..for the main aerosol layer..” What do you mean by “main layer”, the Junge layer ? The stratospheric aerosol reservoir in the tropics? Be more accurate so that the reader

can understand what you're talking about. 16) P8-L27-28: "The results. . ." I do not understand this sentence. Please rephrase and improve. 17) P9-L18: "are easily associated.." It does not read well in English. Please improve. 18) P9-L19: You need to include references here. 19) P12-L12: "..broken clouds.." What do you mean by broken clouds, cirrus clouds ?

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