

## ***Interactive comment on “Improvement of stratospheric aerosol extinction retrieval from OMPS/LP using a new aerosol model” by Zhong Chen et al.***

### **Anonymous Referee #1**

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#### General comments:

This is an interested and well written study on the improvement of stratospheric aerosol extinction profile retrievals from OMPS/LP limb scatter observations. Retrievals of this kind require a priori knowledge on the aerosol particle size distribution (or prior particle size retrievals/estimations), which is one of the main weaknesses of this retrieval method. The study uses a priori information on the aerosol particle size modeled with the CARMA model in combination with a gamma-function parameterization of the size distribution. In my opinion this study is a relevant contribution to the field and should be published with some modifications and additions.

C1

I start with a few general comments, followed by some more specific and mainly minor comments:

I'm not a modeler myself, but hear from colleagues that modeling the size distribution of stratospheric aerosols is a non-trivial task and may be affected by different (partly arbitrary) assumptions. From that perspective, one can be skeptical whether modeled size distributions are in general suitable as a basis for aerosol retrievals from scattered radiance measurements. Perhaps the model simulations were also tuned to reproduce some observational data sets? I don't think this aspect is a big issue for the current paper, though, because the paper convincingly demonstrates that the retrieval results improve with the modeled size distribution. But I suggest adding a brief discussion stating that modeled size distributions may not (or probably will not) always lead to robust retrieval results.

Another more general point: The previous version of the OMPS/LP stratospheric aerosol data product was V1.0, the new version is V1.5. Please describe briefly, what was changed for the intermediate versions (1.1, 1.2, ..) that probably exist, too.

#### Specific comments:

Page 2, line 17: “in (Jaross et al., 2014)” -> “in Jaross et al. (2014)” (wrong cite command used) Page 3, line 9: “described in (Rault and Loughman, 2013)” -> “described in Rault and Loughman (2013)”

Similar typo in lines 11, 16 and 28 on page 3.

Page 3, line 29: “when the optical path along the line of sight (LOS) becomes thick”. Can the “optical path” become “thick”? I suggest replacing “thick” by “optically thick”

Page 4, lines 19 and 20: please use the correct LaTeX cite command (same problem as above)

Page 8, line 10: wrong citation command used.

C2

Caption Fig. 1, last sentence: “The V1.0 distribution has the largest  $dN/d\log r$  value at  $r = 0.1 \mu m$  and the smallest value at  $r = 0.3 \mu m$ .”

I don't understand the second part of this sentence. The V1.0 distribution does not have its smallest value at 0.3 micron. You probably mean compared to the other distributions, right? But this is not clearly stated.

Caption Fig. 2: The GD phase function shown is the one corresponding to the GD parameters in Fig. 1, right? I suggest to mention this.

Caption Fig. 5: “left/right panel” -> “left/right column” ?

Page 9, line 25: please use correct cite command

Page 9, line 28: “This behavior as a function of reflectivity is further illustrated in Fig. 6.”

I'm not sure, if the behavior described in the previous sentence is really illustrated in fig. 6.? How does the Fig. illustrate that the retrieval is less sensitive to aerosols at lower altitudes? Please explain. It would also be good to provide a brief, qualitative explanation for the albedo dependence of the extinction ratios.

Page 11, line 9: please use correct cite command

Fig. 10: I'm not sure how to do this better, but in the current Figure a lot of the blue dots appear to be hidden by the green dots, i.e. the V1.5 LP values appear somewhat biased. Perhaps you can test plotting V1.5 on top of V1.0 and check, whether the apparent message of the Figure can be improved?

Page 12, line 25: I suggest writing “is generally < 10% for 19–29 km”, because there are a few points in this altitude range, where the differences are larger than 10%.

Fig. 13: The Figure and the caption include a standard deviation. It is not clear – at least to me – which standard deviation this is.

C3

Page 14, Table A1: Is the use of “mode radius” intended, or is this rather the median radius as in the main text of the manuscript?

Caption Fig. A1: I suggest defining  $f_c$  also in the figure caption.

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C4