We thank the reviewer for carefully reading our manuscript and helpful comments. Below, the reviewer's comments are marked in blue and our answers to the comments are written in black.

The authors present a new retrieval scheme for aerosol extinction coefficient derived from profiles of limb-scatter radiance as applied specifically to OMPS-LP data. Advantages over their previous algorithm are shown in a convincing manner. While there are several differences between the two algorithm versions, the authors state the overruling factor is the normalization approach. The manuscript would benefit from a sensitivity analysis for typical error sources, even a limited one would be enlightening. Highlighting results from the Hunga eruption is very nice. I recommend publishing this article, after successfully addressing the comments below.

A thorough investigation of the major error sources typical for retrievals of the aerosol extinction coefficients from limb-scatter measurements was published in [1]. Most of the results are applicable to our algorithm as well. The most significant error source is the assumption about the aerosol particle size distribution. A detailed investigation of its influence is a subject of a follow-up paper.

Is there a missing affiliation in the list on the cover page, i.e. 3?

corrected

Lines 136-144: Need to include quantitative estimates of the retrieval errors.

Unfortunately, the is no reliable way to quantify potential errors related to the absolute calibration, which are systematic errors. Where systematic errors have been identified, they are corrected for during the Level 1 calibration procedure. As we explain in the text, up to the present there are no indications of unknown errors in the absolute calibration of OMPS-LP level 1 data. If present these would lead to bias and propagate into the level 2 data product.

Section 4: Should make it clear that there are only a finite number of wavelengths to use since OMPS-LP does not download the full spectrum. That would be why you are not suggest using slightly different wavelengths to reduce interference from atmospheric absorption/emission.

We added the following sentence to the manuscript text in Sect. 4: "It might be advantageous to slightly shift the central point towards the shorter wavelengths. However, due to a sparse spectral sampling of the OMPS-LP level 1 data, this is not possible without including the water vapor band on the short-wavelength side."

Line 200: Should be O_2-A instead of O_2-B and wavelength is 688nm (Newnham & Ballard, 10.1029/98JD02799)

Indeed, we mixed up the A and B bands of O_2. This mistake is corrected in the revised manuscript. The wavelength of the O_2-B band is corrected to 688 nm.

Line 204: O_2 has a band near 867 nm

This band is not identified in the limb spectra shown in Fig. 1 and thus can be considered irrelevant.

Figure 3: What solar irradiance spectra are used for these cases?

The sun-normalized radiances are provided in OMPS-LP Level 1 data. These radiances are obtained using the solar irradiance spectra measured by the OMPS-LP instrument.

Figure 3: What do the aerosol profiles look like with the new algorithm for altitudes above 35km? This should help the OMPS team know how well the stray light correction scheme performs.

We added a figure illustrating the results for altitudes above 35 km to the supplement.

Line 244: The normalization range does seem to be too low in altitude. If the solar normalized radiances up to 50 km are good enough to estimate surface albedo, then the normalization range for the V1.0.9 retrieval should be raised, maybe above 45 km.

We would like to point out that in V2.1 all tangent heights are used to retrieve the effective surface albedo rather than one particular. From the results of this study, we cannot say if single tangent heights above 50 km are good enough to estimate the surface albedo. When optimizing the parameters for V1.0.9 we considered an option to raise the reference tangent height and found it sub-optimal with the setup of V1.0.9. There is certainly a potential to develop another retrieval which uses a higher reference tangent height but this is outside the scope of the current study.

Line 253: What are the reflectance values for the various cases?

We provided the obtained values in the supplement.

Line 254: "scaling of the a priori at the ...reference tangent height" This appears to behave differently than trace gas retrievals from UV/VIS backscattered sunlight that use a normalizing spectra obtained from backscattered radiance spectra over a reference sector, typically a region with low trace gas amounts. The trace gas amounts from the reference sector are subtracted from the total trace gas.

Yes, it behaves differently as the reference sector method works on the Level 2 data while here the subtraction of radiances takes place.

Line 332: Is the same mean added to all three datasets to make the left panel of Fig. 8?

Its own mean is added to each dataset. This is clarified in the text of the revised manuscript.

References

[1] Rieger, L. A., Malinina, E. P., Rozanov, A. V., Burrows, J. P., Bourassa, A. E., and Degenstein, D. A.: A study of the approaches used to retrieve aerosol extinction, as applied to limb observations made by OSIRIS and SCIAMACHY, Atmos. Meas. Tech., 11, 3433-3445, https://doi.org/10.5194/amt-11-3433-2018, 2018.