Dear Reviewer,

Thank you very much for your valuable comments on our paper amt-2016-219 “Improved GOMOS/Envisat ozone retrievals in the upper troposphere and the lower stratosphere”, which are taken into account in the revised version. In addition (as suggested by Reviewer#2), the enlarged significantly the ozonesonde dataset used for validation and updated the sections related to validation against ozonesonde profiles.

Below we present the detailed replies to your comments. Your comments are in blue, replies are in black font.

Major corrections

The use of the triplet method to produce ALGOMs v1.0 data is a good idea to mitigate the influence of aerosol in the UTLS. However, the methodology ought to be valid as a means of retrieval for the entire profile as well and, as such, would present an entirely new data product. The authors should present the fidelity of this data product across the full range of altitudes and compare to the V6 method. This is particularly applicable as the authors appear to choose an altitude cutoff (Z_{TROP} +6km) above which the triplet method is not included (or in the case where V6 terminates above the tropopause, the triplet method is not performed at all).

Generally, arbitrary changes or transitions in the retrieval algorithm will cause anomalous effects that are revealed when analyzing data in bulk. While one would assume that the two methods would be nearly equivalent in the absence of aerosols higher in the atmosphere, I would guess that, due to algorithmic effects, they may not be. If the two methods do differ significantly at higher altitudes, my recommendation would be to release both as separate data products as well as a third, merged-data product (what the authors are currently presenting) as their recommended product to use. This would give maximum utility to the data user while presenting the opportunity for additional validation of the new retrieval. Of course, this recommendation of an extra data product is only a side-note to the authors and is not required for this paper.

In the middle and upper stratosphere, GOMOS ozone retrievals from the visible triplet only have very large uncertainties; they are much poorer than V6 ozone profiles (This is quite expected. The necessity of UV channels for good quality of ozone profiles has been discussed in many papers. This is especially important for stellar occultation measurements, due moderate signal-to-noise ratio). This is the reasons of combining the triplet inversion with V6 ozone profiles. We added a corresponding note on page 11 of the revised manuscript.

We are planning to release only the user-friendly ALGOM2s ozone dataset. Interested users can acquire all intermediate data products from the corresponding author. This note is added on page 21 of the revised version.

Since the new ALGOMs methodology attempts to retrieve ozone in a way that is less sensitive to interference from aerosol, it would stand to reason that a better ozone retrieval should also result in a better aerosol retrieval. Since the retrieval of different species are often inter-dependent, it would be interesting to see how this new ozone retrieval impacts the resulting aerosol extinctions and whether they make sense or not when compared with other data sets. At the very least, the ALGOMs aerosol and V6 aerosol should be compared to ensure there are no sudden jumps in aerosol extinction at the transition, unless of course this new ozone retrieval has not been incorporated into a new aerosol extinction product as well. Then again, and at the discretion of the editor, perhaps this is beyond the scope of this paper.

The ALGOM2s algorithm provides ozone only, no other species. You are right that improved ozone can be used for improved aerosol retrievals. We can speculate that one of the method can be removal of transmittances due to ozone, NO2, and Rayleigh scattering from measured transmittances corrected for refractive attenuation and scintillation. We are planning such analyses in future. However, we have to note that retrievals of aerosol extinction (especially its wavelength dependence) from individual GOMOS occultations is a rather complicated, because if limited wavelength range (one might consider also using data from GOMOS infrared spectrometer, as e.g., in Vanhellemont, 2016, AMT), and perturbations of transmission spectra by incompletely corrected chromatic scintillation in case of oblique occultations. Other retrieval methods can be considered as well. All these can be the subject of future work.

I do not agree with the use of the term “aerosol-insensitive” retrieval. While I would expect the triplet method to be much less sensitive to interference from aerosol loading, no sensitivity analysis is performed as was done to quantify the effect of different aerosol models on V6. This ties somewhat into the previous comment about needing to investigate the result on the aerosol product.

In the revised version, the term “aerosol-insensitive” retrieval is not used.

Minor corrections

Table 1 shows the number of colocations in the UTLS. How is this defined? Is it simply ZTROP +6km as used later in the paper?

In the revised version, we extended the dataset used for validation, and presented the information about the number of collocated profiles as a latitude-altitude color plot (Figure 1, bottom of the revised manuscript).

Page 7, Line 1 notes that “the results are in perfect agreement” with Hubert et al. 2015. “Perfect agreement” is too strong of a statement, particularly since no direct comparison is made between this study and Hubert et al. and cannot be made given the differences in scale of figures in that paper and this one. Additionally, Hubert et al. 2015 is now fully published and so the reference should be updated accordingly.

We updated the reference to (Hubert et al., 2016) paper. In the revised version of the paper, we use exactly the same dataset as in (Hubert et al., 2016), therefore this note is removed.

Earlier in the paper, the term ozone “horizontal column density” is used but then it appears this terminology is changed later in the paper to ozone “line density”. To avoid any confusion related to spectroscopy, I would suggest maintaining the usage of the term “horizontal column density” throughout the paper. For the sake of brevity, simply introducing “HCD” may make things easier.

The term “horizontal column density ” is now used throughout the paper.

Page 15, Line 13: “Also reduction of the spread in the UTLS is clearly observed for new ALGOM2s retrievals, as illustrated on the right panels of Figures 9 and 10.” With the exception of comparisons at La Reunion, I do not agree that a reduction is “clearly observed.”

In the revised version, we included a figure (Fig. 12) illustrating the changes in the spread as a function of latitude and altitude relative to tropopause.

With regard to Figure 11 (right), normally I would advocate for showing percent comparisons over absolute comparisons. However, for this particular case, I would argue that 11 (right) does not add any informational value over 11 (center). Instead, given the reduction in bias in the UTLS, it requires additional explanation to explain why the absolute uncertainty decreases and the relative uncertainty increases. As such, I would advocate eliminating the rightmost figure in Figure 11.

The rightmost panel of the Figure 11 was removed and replaced with the panel showing relative difference between ozone profiles from the satellite measurements (suggested by Reviewer#2).

I would generally clean up the figures. At full size, they are legible but once they are shrunk down to a standard size for a published paper, many of the axes and labels will be too small to read.

We have improved the quality of the figures.

Grammatical Corrections:

Page 9, Line 7: “ozone and aerosol number density” should be “ozone number density and aerosol extinction”

Corrected.