As a result of the review process, the manuscript has been modified significantly. Mayor changes are:

1) Section 2 of the paper has been extended to include a brief but detailed description of the TropOMAER algorithm. It includes a description of the UVAI calculation as well as a summary of the AOD/SSA retrieval process.
2) Section 3 on the validation of retrieval results using AERONET observations also changed considerably. The original validation analysis consisting of a direct validation of TROPOMI AOD results to AERONET observations at 12 sites was replaced with an approach that allows the separate evaluation of retrieved product improvement as a result of instrument enhancement and algorithmic improvement. AERONET observations 12 sites are used as an aggregate. A three way validation exercise is then carried out: 1) AERONET vs OMI, 2) AERONET vs TROPOMI using heritage (OMI) cloud mask, and 3) AERONET vs TROPOMI using VIIRS-based cloud mask. Inter-comparison for validations 1 and 2 highlights the effect of improved instrumental capabilities, whereas differences in validations 2 and 3 indicate retrieved product improvement due to algorithmic upgrades.
3) The revised paper (to be available soon after the submission of replies to reviewers' comments) contains 13 figures (five more than in the original version).

In the reply below the reviewer's comment is in black and our answer in blue.

Reply to Comments by Reviewer 3

This paper presents NASA aerosol product for TROPOMI obtained with TropOMAER retrieval algorithm. In general, the manuscript is well-written, well-structured and demonstrates the possibilities of TropOMAER retrieval algorithm. First, the AOD and SSA products were evaluated using AERONET dataset for 12 representative sites. Then, the results of the algorithm application to a few important aerosol events were presented and total aerosol mass injection was estimated. There are few remarks regarding AOD and SSA validation against AERONET.

1. Figure 1 and Table 1 clearly indicate the presence of positive bias in TropOMAER AOD product at 380nm over all 12 representative sites. Authors already provided some guess about the origin of this bias and mention that this issue is under investigations. Nevertheless, since the retrieval is carried out at 388 nm, and reported also at 354 and 500 nm, presenting AOD validation results in the manuscript for two wavelengths (for example, 380 and 500 nm) would be very useful to address the bias issue.

The TropOMAER reported 354 and 500 nm AOD values are obtained by direct conversion from the retrieved 388 nm product that is based on the assumed spectral dependence of the aerosol models. We do not think the small wavelength difference between the AERONET 380 nm, and the satellite reported value at 388 nm explain the reported difference in the comparison. In regard to the evaluation at 500 nm, the added uncertainty of the reported AOD associated with the wavelength dependence would only make the interpretation of results more complicated. The suggestion, however, is very good and will be considered in upcoming evaluations of TropOMAER results.

2. One of the parameters of AOD evaluation is 30% matchup criteria. What is the origin of these criteria? Is AOD product with 30% uncertainty sufficient for trace gases retrieval? For example, GCOS requirements on AOD are much more strict: 0.03 or 10%.

TROPOMI's retrieval uncertainty is probably lower than the quoted 30% value. It is not, however, used as a matchup criterion. This value is actually a conservative TOMS/OMI-based estimate that includes the combined effect of the uncertainty on assumed aerosol layer height (smoke and dust layers) and sub-pixel cloud contamination. At TROPOMI's much finer spatial resolution the cloud contamination component should be significantly lower. Actual uncertainty is still to be determined pending remaining calibration issues as discussed in this manuscript.

3. The results of SSA validation show reasonable correspondence with AERONET. Nevertheless, Figure 2 clearly shows overestimation of SSA especially for absorbing aerosol when SSA from AERONET < 0.9. Is this related to the same issues providing positive bias in AOD? Is this SSA overestimation a demonstration of limitation of aerosol model used in TropOMAER algorithm? More discussions here are necessary.

The revised version of the paper includes parallel AERONET-OMI and AERONET-TROPOMI evaluations of both AOD and SSA products. The observed apparent overestimation of the satellite SSA values for desert dust aerosols is also present in the OMI comparisons (Figure 3a) and has been discussed in published literature (Jethva et al., 2014). Such overestimation, however, is not as clear in the presence of carbonaceous aerosols. The larger-than-AERONET desert dust SSA values (when AERONET < 0.9) are also observed in the TropOMAER evaluation for both the heritage (Figure 3b) and VIIRS (Figure 3c) cloud screening approaches. A smaller but observable similar effect is also apparent in the TROPOMI evaluation, suggesting a possible connection with lingering sensor calibration issues.

In general, I would recommend authors to reserve some space in the manuscript for discussions regarding identified issues in the retrieval. For example, the mentioned above issues for AOD and SSA retrieval as well as authors thoughts how to treat these issues would be highly appreciated by broad remote sensing community. These discussions would greatly increase the scientific strength of the paper.

These issues are discussed in the revised version of the manuscript.