Review of revised paper:

Extended validation and evaluation of the OLCI-SLSTR synergy aerosol product (SY_2_AOD) on Sentinel-3 *by L. Sogacheva et al.*

Highlights

- now inclusion of fine-mode AOD analysis
- now much better plots on behavior for different AOD regions

Concerns

- discussions are too brief (also provide use-recommendations to potential users?)
- missing comparisons to the standard SLSTR retrieval (to justify the synergy approach)
- no fine-mode AOD results in the abstract and fine-mode AOD comparisons to MODIS
- too extensive comparisons to AERONET (move material in the appendix or supplement)
- consider AERONET mid-vis AOD <0.04 (and/or remove mountain AERONET site data)

General comments

The paper investigates the performance of a combined OLCI and SLSTR retrievals for AOD, Angstrom (via spectral AOD dependence), AAOD (?), AODf and surface reflection. I assume that the SY_2_AOD retrieval performance mainly mirrors for SLSTR covered regions, the SLSTR retrieval performance with a degraded performance in regions, which only the OLCI sensor covers. Here comparisons and use-statements are at least needed for the discussion section at the end. The discussion section should also address why anyone (user) would want to work with SY_2_AOD in comparison to available data from SLSTR (which still have major issues) and especially over available data from MODIS, VIIRS or MISR.

I could not find a detailed response to my initial review so some of the concerns I voiced in my initial review are still valid. On the other hand, I very much like in the revised version the new plots that analyze the retrieval performance as function of AOD ranges. These new figures provide much more insights that scatter plots and tables and I suggest to move (the more general performance summaries of) tables (e.g. positive bias but linear fit slope below one seem inconsistent … without the AOD range analysis) and scatter plots - as well as uncertainly analyses into an Appendix or supplement, as the paper is very long and exhausting on the comparisons to AERONET (e.g. I did not know that spectral surface solar reflection is an official AERONET product). In that context, I also would focus on AERONET data with mid-vis AOD > 0.04 (as lower values are likely related to mountain sites, which should not be considered when comparing to regional data (even for regions as small as 3.5x3.5km areas).

Many important regions for aerosol properties have no or only poor AERONET coverage, so comparisons to global data-sets are essential for a complete pictures. Thus, the effort to compare at the end to a commonly used and likely more mature data-set of MODIS (although potentially with biases, as MODIS AOD overestimates over oceans) is well received, but offered comparisons are way too brief and also miss potentially important AODf comparison (AODf over oceans is offered by the standard MODIS 6.1 product and over land AODf data are available by MODIS-DB AODdust [AODf ~AOD-AODdust] by Pu, B., Ginoux, P., et al., Atmos. Chem. Phys., 20, 55–81, 2020).

The discussion summary is very brief and disappoints on content, more so since in the data-comparisons, the focus was just on differences and performance with no (or at best little) efforts on interpretations. I strongly suggest to expand the discussion section on major results and their background, so that a reader has a more satisfying element from this comparison paper.

Specific comments

27 is there a way to get rid of large outliers (e.g. with a better QA control?)

30 the abstract does not address high AODf bias (for coarse mode dominated references)

119 the aim "to allow for a more robust retrieval" needs to be demonstrated (e.g. vs SLSTR)

119 The aim "to offer data over the entire Sentinel-3 swath" should also be addressed in the discussion (vs SLSTR). I assume similar quality in OCLI only regions over oceans, but significantly reduced quality over OCLI only regions over land.

130 As different products are offered (e.g. all, dual, nadirS, NadirO) are there reasons why particular versions show be used or avoided in particular regions? If the performance all these different SY versions are addressed, there should be some discussion on their use at the end.

177 the Angstrom parameter of the retrieval with AOD at 550 and 865nm over land could be highly inaccurate over vegetation (large/uncertain surf near-IR contributions … any comment?)

295 aAOD as low as 0.02 permitted? (I would use aAOD>0.04 – as a simple way to exlude mountain sites … although a mountain site exclusion to begin with would be better). I suggest to used aAOD >0.04 only.

298 these biases at low AOD are shocking! Why would anyone want to use that product?

305/315 420/424 528/544 654/660 scatter plots and tables (and the explanation) in the Appendix as Figures 3/7/13/19 better tell the entire story.

385 SH Jul-Oct correlation is much better, since (biomass related dry-season) AOD values are higher … so no surprise here.

503 how are uncertainties considered (via weights …?). It is not possible just to remove all data below a specific uncertainty threshold for a higher quality product?

520 what is the value of comparing AOD at longer (865 and 1600nm) wavelengths, when aerosol signals are much weaker (or are completely missed when fine-mode aerosol dominates)?

800 apparent land-sea contrast in SY data (also easily seen in differences to MODIS) need some explanations. I also strongly encourage to extend such comparisons to the AODf for more insights.

870 remove "SKYNET, SURFRAD"

878 the discussion (e.g. "Against MODIS, agreement is good") is way too superficial. MODIS overestimates AOD over oceans (compared to MISR, AATSR and AVHRR-DB … and modeling) so that the relative high SY AOD values over oceans, although they compare to MODIS there) are not really encouraging. A closer inspection will also show that SY AOD – also over oceans – are much more fine-mode dominated than most another satellite retrievals (and modeling), which in part causes the land/ocean contrast of Africa for larger dust outflow AOD.