

Interactive comment on “Investigations into the Development of a Satellite-Based Aerosol Climate Data Record using ATSR-2, AATSR and AVHRR data” by Yahui Che et al.

Anonymous Referee #3

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This manuscript compares aerosol retrievals from 3 different sensors (MODIS, ATSR, and AVHRR) with ground based validation data (including AERONET) over a 10x10 degree box centered on eastern China. The goal is a worthy one, the creation of a continuous climate data record of satellite-retrieved aerosol optical depth from the early 1980's until the present day period. I believe this work can be published if the authors are willing to substantially change the manuscript.

Most of my comments are embedded within the PDF attached, but I will summarize a few points.

1) As was mentioned by the other two reviewers, where is the SLSTR data? If this data

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is not available, this manuscript can still add value, but not much (in its current form).

2) MISR shares a lot of similarities to ATSR including: swath size, multi-angle viewing, equatorial crossing time, and algorithm heritage (over-land). Additionally, I expect that the error statistics for MISR (over this region) are quite a bit better than for any other sensor used in this paper. In fact, given MISR's very long data record (2000→2019 and counting), its similarities with ATSR, its overlap with *both* ATSRs *and* SLSTR, I think it makes much more sense to use MISR to stitch together the ATSRs and SLSTR. Once those two datasets are harmonized with MISR (globally, not for one region), I would then look back and compare with AVHRR (globally, or at least using all regions available).

3) Please find a way to make this work much more global. A 10x10 degree region is not a very useful climate data record, especially in a region with so much dust and pollution transport. Additionally, the authors could show consistencies and discrepancies with other sensors via a map of gridded correlations and differences (using seasonal AODs, compared with other sensors).

4) As a third party (I work with MISR data) with no stake in any of these instruments (at least data from the ones presented), it seems pretty clear from this small dataset that MODIS provides the best available AOD here (by far). One (or more) of three things is going on here: (1) AATSR's aerosol retrieval algorithm is inferior to MODIS, (2) AATSR's sample size in this region is so small as to border on the irrelevant, or (3) the region selected is so small that regional biases in the algorithm dominate your observed errors.

If (1), I have to wonder why bother stitching together AOD from ATSR and AATSR with SLSTR (and AVHRR) at all? Even though ATSR, AATSR, and SLSTR all lack a blue band (which will significantly degrade performance over brighter regions), this should be compensated by the additional view angle. If the current algorithm is insufficient, maybe a new one should be developed. Otherwise, if MODIS truly gives better perfor-

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mance, just create the CDR using MODIS, AVHRR, and VIIRS, which would be easier anyways. If (2) or (3) see point 3) above, you need more data.

I don't want to discourage the authors, this work does have the potential to add value, but more work needs to be done.

Please also note the supplement to this comment:

<https://www.atmos-meas-tech-discuss.net/amt-2019-26/amt-2019-26-RC3-supplement.pdf>

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-26, 2019.