

Response to Reviewers

Referee 1: "L279 If you don't find any proof of cloud contamination, you should not attribute not good results to this cause. So, either you remove this suggestion from the text (you spend almost 20 lines on this concept), or you find a way of proving it."

The 20 lines that the reviewer identifies, beginning with L279 are part of the section where we are describing the differences in instrument configuration and how those differences may affect the application of the Dark Target retrieval on AHI. The section identifies the need for new gas absorption correction, new LUTs, and the loss of the 1.24 μm channel and potential consequences for sediment and snow masking because of that loss. It also discusses the loss of the 1.38 μm channel and potential consequences for that loss. The conclusion to these 20 lines is:

"Because alternative methods have not been developed for masking clouds, and the alternative method for identifying sediments has not been vetted to the same extent as the original MODIS DT masking techniques, the possibility of contamination from these features affecting the aerosol retrievals is higher than expectations based on the MODIS heritage."

We, respectfully, believe this discussion is essential information for a reader to understand all of the subsequent analysis, and that the conclusion is measured, pointing out "the possibility of contamination". In our opinion the possibility must be mentioned. We are committed to retaining these 20 lines.

Later in the conclusions (L926 to L931) we bring up the possibility again.

"The lack of these specific masks may permit additional cirrus and cloud contamination into the results of this two-month preliminary demonstration, although large-scale comparisons of collocated AHI and AERONET or AHI and MODIS retrievals do not reveal significant overall biases. However, AHI retrievals may be benefitting from AERONET or MODIS cloud masking in the collocations."

Here the issue is brought up and then dismissed because we did not find the biases expected from such contamination. Again, to not revisit cloud contamination, given the different sensor configuration, would be remiss in the over all presentation of the paper. We were on the look out for cloud contamination, did not find it, and therefore there can be no proof that it exists. Here we also note that contamination is difficult to identify in collocated data sets because of the assist to cloud clearing by the older sensors/algorithms.

These statements are important to the overall message of the paper, and we are committed to retaining them.

L444 GCOS requirements might be stringent, but this does not justify not using them to evaluate your product, as they set a global standard on which most of aerosol retrieval algorithm are evaluated.

Yes. GCOS does set a global standard. It is a standard that Dark Target aerosol algorithms are not yet meeting. This is stated in the revised paper in lines 449 to 454.

“Another metric that could be used would be the Global Climate Observing System (GCOS) criteria for AOD, which is 0.03 or 10%. This is a more stringent requirement than what we have been able to achieve with the DT algorithm applied to MODIS for 20 years, or to VIIRS. Thus, the GCOS requirement is not shown on the validation plots, as it is certainly out of reach for this first test of DT applied to a GEO sensor.”

We also did a quick survey of aerosol validation papers since 2016. None of the following even mention GCOS.

<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2016JD024834>

<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2016JD024859>

<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2017JD027412>

<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2017JD026934>

<https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2014JD022453>

The following paper does mention GCOS, but not in the sense of setting a new standard for validation and does not show GCOS criteria on any of its plots.

<https://www.atmos-meas-tech.net/12/4619/2019/amt-12-4619-2019.pdf>

We now cite this paper in the second revision, as it is an important new publication.

We appreciate the reviewer’s interest in moving the community to an international standard for aerosol validation. However, this puts us in a bind. In this paper we are introducing a new member of the Dark Target family. In order to put this new family member into context with the 20 year Dark Target history, we have to use the same validation criteria that we have been applying since Remer et al., 2005, otherwise the community who follows DT development will have no baseline to make an evaluation. Thus, we cannot abandon the old. We could apply both the old and GCOS, but the plots get messy very quickly. We do not see the value, in this paper, of applying both criteria in the plots when we know a priori that the retrievals will not meet the GCOS criteria, have not been designed to meet the more stringent criteria and state these facts a priori on lines 449 to 454.

However, to help with the transition from old methodology to GCOS we have added a sentence at L501 to 503, and also at L941-942.

Figure3. You state that on global scale you cannot fine-tune the model and assumption at each location. Well, you are not supposed to do that. It looks here as you’re justifying your results as if they don’t depend on the algorithm, but they do, showing some limitations of the DT algorithm. No algorithm is perfect, it is not needed to hide limitations or current issues. Fine tuning the retrieval on specific location should never be the mean by which aerosol retrieval algorithm are evaluated."

We have tried to convey this limitation with new wording at L486 to 488 and

Referee 2: "Recommend publishing the paper with added reference to S. Kondragunta, I. Laszlo, H. Zhang, P. Ciren, A. Huff, Air Quality Applications of Aerosol Products from the GOES-R ABI, <https://doi.org/10.1016/B978-0-12-814327-8.00017-2> in the book The GOES-R Series: A New Generation of Geostationary Environmental Satellites 1st Edition by Steven J. Goodman (Editor), Timothy J. Schmit (Editor), Jaime Daniels (Editor), Robert J. Redmon (Editor)"

Added

Thanks, Pawan