

Atmos. Meas. Tech. Discuss., referee comment RC4
<https://doi.org/10.5194/amt-2022-95-RC4>, 2022
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Comment on amt-2022-95

Anonymous Referee #3

Referee comment on "The New MISR Research Aerosol Retrieval Algorithm: A Multi-Angle, Multi-Spectral, Bounded-Variable Least Squares Retrieval of Aerosol Particle Properties over Both Land and Water" by James A. Limbacher et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-95-RC4>, 2022

#####GENERAL COMMENTS#####

This manuscript by Limbacher et al. present a new MISR research algorithm (RA) for retrieving aerosol over land and water surface. To address the issues of large biases of high aerosol loading in MISR operational standard aerosol algorithm (SA), the proposed RA utilized and combined 2 schemes: (i) retrieved surface; (ii) prescribed surface from MODIS/MAIAC product. If the prescribed surface algorithm reported $AOD < 1$, then the results from retrieved surface algorithm will be used; if the prescribed surface algorithm reported $AOD > 2$, the results will adopt from prescribed surface algorithm; while if the $1 < AOD < 2$, the results will be merged from 2 algorithms. In general, the methodology is sound. The validation with AERONET suggest a good quality for AOD, ANG as well as FMF, SSA and non-sphericity both over land and water. Overall, I think this paper is well-structured and clearly written, I recommend this paper to be published in AMT after some minor comments have been addressed.

(i) One interesting part however missing in the current manuscript is the direct comparison with MISR operational SA product. I would suggest to add at least some demonstrations of this part to show the evolution.

(ii) In the validation section, the authors evaluate the fine mode fraction with AERONET almucantar inversion product. Why not to use AERONET SDA FMF, which definitely will provide more coincidences?

#####SPECIFIC COMMENTS#####

Page 4 Line 15: How the temporally interpolation is done? Meanwhile, how do you deal with the differences of MISR and MODIS wavelengths?

Page 4 Line 20: MISR's 36 channels? This should be a mistake. Do you mean 4 wls x9 angles?

Page 5 Line 21: Surface reflectance correction? This is not clear to me.

You correct your retrieved surface reflectance? If yes, how it can help to remove AOD bias?

or you correct measured TOA reflectance?

Page 6 Line 15: How do you derive ANG from your algorithm, this is not clear in the text?

Page 14 Line 24: ANG at 550 nm?

Page 15 Line 17: So the $NDVI < 0.1$ is not retrieved over land, right? Or you still retrieve it but not pass with high quality flag.

Page 20 Line 1: it's not clear from Section 2. How the ANG is derived from the algorithm? Only AOD at 550 nm is mentioned.

Tables 4 and 6: it looks like incorrect for AOD blocks. $0.2 < AOD < 0.5$ not $0.2 > AOD > 0.5$?