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Atmospheric Measurement Techniques Discussions

Interactive comment on "Accuracy Assessment of MODIS Land Aerosol Optical Thickness Algorithms using AERONET Measurements" *by* Hiren Jethva et al.

Anonymous Referee #3

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The paper validates the three existing MODIS aerosol products over North America. Several issues need to be clarified. Major comments: 1. The novelty of the manuscript has to be defined since there are so many similar works in the past decades. Although the author mentioned the paper as a preparation for the (TEMPO) mission, but again, so many similar works for the region, even in the conclusion part, the author mentioned the evaluation of three algorithm over NA is the "first time". 2. The paper used AERONET version 2 even the AERONET version 3 has been released for such a long time. Since the authors intend to understand three well-known aerosol products, the quality of those three products could be similar for most cases, thus an accurate reference is needed. Thus, I would like to ask the author to use version 3 for the validation.

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Discussion paper

3. The authors use the MAIAC reflectance product as reference" to understand the impact of surface to aerosol, this need to be further clarified since it is difficult to evaluate the "coupling" of MAIAC aerosol and surface product. I would ask the authors to use an independent surface product (MOD09 or MCD43).

Minor comments: P1 L12, full name of GOES R/S P1 L15 change "spectral coverage" to "wavelengths" P1 L16 change "currently used" to "existing" P1 L17 change "existing" to "three" P1 L17 change "of that derive" to "derived" P1 L20 full name of "Aqua-MODIS" P1 L20 change "carried out an independent evaluation of" to "evaluated" P1 L21 change "the retrieved AOT" to "the satellite retrieved AOT" P1 L24 are they really "consistently"? later you mentioned different criteria of pixel selection were used? P1 L25, delete "while" P1 L26 change "the MAIAC algorithm" to "and the MAIAC algorithm" P1 L28 change "finder" to "higher" P2 L1 is it really "error"? P2 L2-3, refer to major comment 3 P2 L4-9, these sentences are too general presented in abstract. P3 L6, what suspended particle means here? PM concentration? If so, how the vertical profile can be derived from ABI? P3 L14 – 16, this is not really accurate, the problem to get PM is to describe the vertical profile of aerosol and the humidity dependence of particle growth with respect to humidity. P3 L26 "over the globe" to "globally" P3 L27 "land and oceans" to "land and ocean" P4 L4, several sentence for the "similarities" and "differences" of those three algorithms have to be described. P4 L5, refer to major comment 1, a quick search online, we can already find similar work over other regions, if we focus over NA, there are much more publication for either two or single product(s) of them. Lyapustin, A., Wang, Y., Hsu, C., Torres, O., Leptoukh, G., Kalashnikova, O., Korkin, S., 2011b. Analysis of MAIAC dust aerosol retrievals from MODIS over North Africa. AAPP Phys. Math. Nat. Sci. 89. ELS XIII Conference, Vol. 89, Supplement No 1 Liu, N., Zou, B., Feng, H., Tang, Y., and Liang, Y.: Evaluation and comparison of MAIAC, DT and DB aerosol products over China, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-1339, in review, 2019. P4 L15-17, how DT separate land and ocean? And there is no description of ocean algorithm in this section. P4 L19-20, I suggest re-write this sentence, the assumption is the impact of fine mode

aerosol to 2.1 μm is ignorable P4 L25, how “cloudy pixels” detected? A reference is needed. P4 L26-28, aerosol type in DT is a location-time dependent prescribed type. P5 L1, how “best match” is found? P5L13, here the ocean algorithm suddenly appears. P5 L18, there is no” AOT over vegetated” in Hsu et al (2004) P5, L24 – 26, the dust screening should be mentioned P6, L3, “Hsu et al., (2013)” to “Hsu et al. (2013)” P6 L21, “$\pm$0.05$\pm$0.15*AOD” to “$\pm$(0.05+15%)”, and harmonize AOT, AOD in the manuscript. P6 L21, “($\pm$0.05$\pm$0.1*AOD)” to “$\pm$(0.05+10%)” P7 L3, refer to major comment 2, why version 2? P8 L10 – 13, please check what the DT and DB retrieve? No AOT at 550 nm? P9 L3 -5, why? P9 L6, what is “better statistics” and why better? P9 L10 – 25, again, why? The authors need more explanations rather than simply list the statistics. Section 3.3, refer to major comment 3, I think the authors need to use an independent surface product. P13 L7-8, this statement is not enough as “novelty”

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