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Atmospheric Measurement Techniques Discussions

Interactive comment on "Critical evaluation of cloud contamination in the MISR aerosol products using MODIS cloud masking products" *by* Y. Shi et al.

Anonymous Referee #2

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This paper presents an interesting approach to improving on an existing aerosol product using an existing cloud masking scheme. Complete and up to date references to the aerosol and cloud mask products therefore represent an important facet of this research. While another reviewer has suggested improved references to the MISR retrieval algorithm(s), I would suggest correcting the reference to the thin cirrus detection from Gao et al. 2003, which focuses on water vapor retrievals, to Gao, B., Yang, P., Han, W., Li, R., and Wiscombe, W.: An algorithm using visible and 1.38 μm channels to retrieve cirrus cloud reflectances from aircraft and satellite data, IEEE T. Geosci. Remote, 40, 1659–1668, doi:10.1109/TGRS.2002.802454, 2002. More re-

cent references to the MODIS cloud mask are Frey, R. A., S. A. Acherman, Y. Liu, K. I. Strabala, H. Zhang, J. R. Key, and X. Wang, 2008: Cloud detection with MODIS. Part I: Improvements in the MODIS cloud mask for Collection 5. J. Atmos. Oceanic Technol., 25, 1057–1072 and Acherman, S. A., R. E. Holz, R. A. Frey, E. W. Eloranta, B. C. Maddux, M. McGill 2008: Cloud detection with MODIS. Part II: Validation J. Atmos. Oceanic Technol., 25, 1073–1086. Finally with regard to references the recent paper on the new MODIS aerosol product has a much more detailed and nuanced discussion of the use of the MODIS cloud masking scheme in an aerosol retrieval product than is given here viz., Levy, R. C., S. Mattoo, L. A. Munchak, L. A. Remer, A. M. Sayer, and N. C. Hsu, 2013: The Collection 6 MODIS aerosol products over land and ocean, Atmos. Meas. Tech. Discuss., 6, 159–259, 2013 www.atmos-meas-tech-discuss.net/6/159/2013/ doi:10.5194/amtd-6-159-2013. In particular an approach to restoring scenes which are bright as a result of thick dust and other approaches when there is thick smoke that is falsely identified as clouds are discussed, which is germane to the loss of data off the west coast of Africa using the cloud masking that is presented here and identified as a problem in bullet 3 of Section 4 “Recommendations and Conclusions”. That bullet must make reference to the published material regarding such issues that is A more comprehensive, or comprehensible, description of Tables 1 and 2 is certainly warranted since presumably the Fcd and Fuc screens change the amount of MISR data that is available, but this is not noted in the tables. Whatever the reason for this, it should be clearly stated. While I would not make it a requirement for publication, I find it unfortunate that the distance in time and space between AERONET and the retrieved aerosol optical depth is not used to generate weighted RMSE and MAE statistics to explore the contribution of heterogeneity of the aerosol field in time and space to the differences in aerosol optical depths. This might help in assessing such peculiarities as the screening threshold over land increasing from 20 to 50% with negligible effect on performance or data loss in Table 2. The authors should provide some at least qualitative discussion of the cost/benefits of losing roughly 20% of data per 0.006 decrease in bias against AERONET over ocean. Cer-

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tainly in terms of the direct radiative impact of the aerosols the value of the thin cirrus filter should be larger than the other screens since thin cirrus tend to warm the planet rather than cooling it. Comments regarding appropriateness and/or value of the different screens for assimilation or radiative assessments are highly desirable in a paper that is attempting to "improve" an existing product. As regards cloud haloes, adjacency and 3D effects the authors should note for any future work that the MODIS Collection 6 includes (see Section 3.5 of Levy et. 2013 reference introduced above) 'the algorithm also determines the distance from every pixel to the nearest "cloud" pixel. This is "Cloud Distance Land Ocean". The intention is that users concerned about aerosol retrievals affected by cloud adjacency effects (3-D effects) or by humidified aerosols and cloud fragments in cloud fields (twilight zone) can trace exactly which pixels were used in the retrieval or plot the retrievals as a function to the nearest cloud. There is also a 10 km product that offers the average distance to the nearest cloud of all the pixels within the 10 km box used by the retrieval, i.e., "Average Cloud Distance Land Ocean".' The use of this product in conjunction with the MODIS cloud mask and the MISR aerosol product would allow for a better assessment of the efficacy and quantitative impact of eliminating cloud edges with different Fcc screening criteria. This might in turn facilitate an assessment of whether such edges are dominated by humidified aerosols, side illumination from clouds or residual cloud contamination, but would at least allow the class of cloud edge pixels to be identified and separately analyzed.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 10057, 2013.