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Atmospheric Measurement Techniques Discussions

Interactive comment on "Accuracy assessment of Aqua-MODIS aerosol optical depth over coastal regions: importance of quality flag and sea surface wind speed" *by* J. C. Anderson et al.

Anonymous Referee #3

Received and published: 12 September 2012

Dear Authors,

First, thank you for an interesting manuscript, with very attractive graphs and figures, on a topic of considerable scientific interest.

Echoing what other reviewers have said, I do not think that this manuscript is publishable in its current form. The results presented are largely derivative of other works, and I do not see any point made in the paper that would cause me to cite this paper, instead of an earlier work. On that basis alone, the paper needs to be reconsidered.

When reconsidering, I encourage the authors to examine in more detail the differences

between the coastal, ocean, and continental environments that might cause the differences observed between these subsets of the MODIS-AERONET comparison. The paper makes much of the fact that the error statistics differ for these subsets (land, ocean, and "coast"), and presents some background on the potential distinguishing characteristics of coastal retrievals in the introduction. But the manuscript generally assumes that the error characteristics of retrievals in the coastal zone are explained by different causal factors than other land or ocean areas, and does not support this assumption with any quantitative analysis. I think an analysis that isolates "coastal" areas should defend that narrowing of the analysis by quantitative proof that retrieving conditions are different in the coastal zone as defined for that analysis. A significance test is not adequate for this purpose, especially when no account is made for correlation among observations.

When one thinks in general terms about retrieval of aerosol in coastal zones, the differences that come to mind are differences in the surface boundary condition: elevated water-leaving radiance in shallow water, high contrast areas with bright sand and dark water, and heterogeneous pixels with both land and water. All of these pose challenges to current methods of retrieving aerosol properties, and this is why all of these conditions are screened and excluded from the MODIS products. So unless the authors can demonstrate that this screening is incomplete or ineffective, the main source of differences between coastal areas and other land and ocean areas is non-operative for the MODIS products. It is also possible that the coastal areas have a different distribution of aerosol properties. This is certainly testable with the data the authors have used, but in the current manuscript the uniqueness of the coastal environment is again assumed when it should be evaluated. Even if the coastal environment has a different distribution of aerosol properties, this is no guarantee that the error correction methodologies used for open-ocean and land areas will not be effective in this zone. Again, this is a testable hypothesis, whose results should not be assumed.

Finally, I must comment about the introductory discussion of global trends in aerosol

properties measured from space. Aerosols have a relatively short atmospheric lifetime compared to CO2 and CH4, but climate scientists seem driven to apply the same type of trend analysis used for those long-lived species to aerosols. The problem arises because while sparse sampling of well-mixed species can represent the global atmospheric concentration, any "global" aerosol loading is simply an integrated measure of incompletely observed regional aerosols. Any "global" trend in aerosol loading is simply the observed sum of incompletely observed regional trends. And worst of all, any "global" characterization of error in satellite-retrieved AOD is composed of many different errors associated with different aerosol properties and observing conditions, and these different errors will also frequently interact with the ability of the satellite to sample the aerosols. In short, the scientific problem of characterizing atmospheric aerosols is not a global problem, but a regional one, and our understanding of this problem is not advanced by another "global" statistical calculation of the integrated sum of the diverse, often compensating, errors associated with this measurement.

I wish the authors the best of luck with revising their manuscript, and concur with Reviewer #1 that the nearing debut of MODIS Collection 6 is a good opportunity to revisit this analysis and produce a manuscript of more lasting value to the scientific community.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 5205, 2012.