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Atmospheric Measurement Techniques Discussions

Interactive comment on "Validation and empirical correction of MODIS AOT and AE over ocean" *by* N. A. J. Schutgens et al.

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Dear Authors,

Thank you for this detailed study you have prepared on a topic of considerable interest. Estimating uncertainty in satellite data products in ways that are directly relevant to weather and climate applications is an important developing area.

I believe that your paper could be of more use to the reader if you add some more description regarding your selection of statistical methods. The methods you use here are just different enough to complicate comparison of your results to other literature on this topic, and the selection of appropriate metrics for understanding of Earth observations is a lively topic of scientific discussion in its own right.

Some specific questions I had, which I think other readers would likely also wonder:

1) The figure 1 labeling indicates that the statistic being shown is a rank correlation. For a continuous quantitative variable like AOD, why is a rank correlation being used here? This is an example where a different choice of statistic complicates comparison with other recent studies (for instance, correlation length of AOD is also the subject of a recent ACP paper by Shinozuka and Redemann: http://www.atmos-chem-phys.net/11/8489/2011/acp-11-8489-2011.html)

2) "correlations in the full dataset will suppress the biases", and later "Cloud-free scenes allow more succesful retrievals (more co-located pixels) than cloudy scenes." The second is a more proximate explanation for the differences seen in Figure 3. Is having more retrievals under certain conditions an auto-correlation effect? I guess what I am saying is, the principle of correlations suppressing biases makes sense, but what you are actually observing seems to be a sampling effect. If differences in sampling alter the statistics, then it seems to me that systematic variation in uncertainty is present that needs to be diagnosed and hopefully corrected. In the case of clear and cloudy, you have taken this approach by including cloud fraction in your empirical correction. In your estimation, is this sampling difference a correlation effect?

3) The sampling used to estimate uncertainty should match as closely as possible the sampling of the bulk dataset. You have developed corrections based on several observation characteristics that affect both AOD retrieval error and probability of retrieval success (sampling). If this correction is successful, one effect should be that the sampling-related differences in statistics shown in Figure 3 should diminish after application of corrections. Did you observe this?

4) Interesting results on matching the observed distributions to equations based on the interquantile distance. I am impressed by the quality of fit achieved, but I do not understand how these synthetic distributions are generated. Perhaps an equation might make this clearer.

There are many interesting results in this paper. I shall spend quite a while contemplating the potential physical explanation for many of your statistical findings. Best of luck in revising this paper for final publication.

Interactive comment on Atmos. Meas. Tech. Discuss., 6, 3765, 2013.