

Interactive comment on “Fine and coarse dust separation with polarization lidar” by R. E. Mamouri and A. Ansmann

Anonymous Referee #2

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Mamouri and Ansmann - Fine and coarse dust separation with polarization lidar

This paper describes a numerical technique for distinguishing fine and coarse mode dust optical properties using a polarization lidar. This technique follows similar methodology of Tesche et al. (2009), by constraining the lidar equation through parameterization of depolarization ratios. The technique, as described and applied, is only applicable to specific scenes, however, as a result. That is, specific assumptions used for depolarization ratios for non-dust fine-mode particles, fine-mode dust and coarse-mode dust, would break down in the presence of other depolarization particles (pollens, ocean biogenics, aged smoke, etc...). The authors, however, are very up front about the limitations of the technique, and the uniqueness of its intended application. As such, the paper is wholly appropriate for AMT, figures are unusually compelling and

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clear, and mostly well written.

My recommendation to the Editor is an "acceptance with minor revisions". Technically speaking, I don't have any real problems with the science presented. I do have issues with the mostly "hand waving" arguments around uncertainties. It seems to me that it would not be too difficult to do the math and solve an error model based on input uncertainties that propagate all the way through the solution. I recognize that the Authors are using AERONET to verify results, and that's okay. But, this portion of the manuscript is a bit wanting, and something that the lead should simply break down and try to formulate sometime. It's not a make-or-break request, however.

As with Reviewer #2, I do think you should specifically define ranges for fine and coarse mode somewhere in the Introduction.

Also, with respect to some of the information used from AERONET inversion retrievals (mass volume concentrations), I wonder what the impact is on your verification considering that these retrievals are usually only conducted for relatively high optical depth loading cases ($\tau_{500} > 0.4$). It's a minor point, however, given that this mostly a secondary verification parameter.

Otherwise, I'm uploading my reviewer notes, which contain what is mostly minutiae and technical notes if anything. Lots of places to improve the narrative are highlighted. Sorry for the relatively small notation. I wish Copernicus would give us proper manuscripts to edit!

One final note, however, that I'd like the authors to consider. Typically, use of AERONET data for publication implies that you've talked with the site PIs before you use their data. In particular, Barbados is Joe Prospero's site. These guys like to be contacted ahead of time, and, if not at least acknowledged, offered full co-authorship. You folks would be wise to get in touch with these PIs and let them know that this exists. These data can't be collected if the PIs can't advise their sponsors that the data are being put to good use!

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All the best.

Please also note the supplement to this comment:
<http://www.atmos-meas-tech-discuss.net/7/C1377/2014/amtd-7-C1377-2014-supplement.pdf>

Interactive comment on *Atmos. Meas. Tech. Discuss.*, 7, 5173, 2014.

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