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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Sun photometer retrievals of Saharan dust properties over Barbados during SALTRACE" *by* Carlos Toledano et al.

Anonymous Referee #1

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The study from C. Toledano et al. represents a fair analysis of the sunphotometer data retrieved during the Saharan Aerosol Long-range Transport and Aerosol-Cloud-Interaction Experiment (SALTRACE) campaign held at Barbados in the Caribbean during June-July 2013. This analysis provides useful information for the comparison and itnerpretation with other colocated vertical and insitu measurements, but it also includes some analysis exercises that broaden the basic analysis of retrievals provided by AERONET, for a deeper insight on the aerosol properties. The techniques and methods are well known and described in many other previous references. The study is considered adequate for this journal. The article is well written, although it would benefit of a final revision by a native English speaker. However, I am not able to find

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Discussion paper

important flaws on the English grammar or style.

General comments:

- The SSARA instrument is introduced in the abstract and briefly described in the introduction. Some comments about the calibration are included in the instrumentation section too. However, its data (AOD) is only represented in Figure 1 for comparison with the other instruments AOD, without proper discussion in the text body. I expected more analysis on this instrument after being included in the abstract. Therefore, expand the SSARA analysis please. Otherwise, it could be avoided in the abstract.

- The analysis of the aerosol retrievals when extending the inversion to 6 wavelengths (i.e. including 500 and 1640 nm) is an interesting section in the study. I wonder if the same conclusions were/would be reached if only i.e. 1640 nm channel is added, as the 500 nm does not really extend the interval. Can the authors comment their findings?

Specific comments:

- Page 4, line 7: Correct "Methodology" - Page 4, line 13: any reference for the analysis of uncertainty of the AOD obtained with SSARA-P? I expect 0.01-0.02 to be the uncertainty of field Cimel instruments, but if the SSARA is calibrated by a standard Langley plot at a high site, then I would expect a lower uncertainty on AOD. - Page 4, line 19: what the 0.003 difference between version 2 and version 3 refers to? Is it the difference found between both datasets from the campaign? Does it represent the RMSD? Please state in the text. - Page 5, line 10: correct "specialissue" - Page 5, lines 17-22: could you give the numerical value of the average AOD found during the episodes? - Table 2: these results are obtained for the aerosol properties during the dust episodes, as it is said in the text (page 5, line 31). But it would be good to add a note in the table caption. - Page 7, line 11-12: why the SSA is believed to be smaller in Morroco? Was it related to a higher pollution? - Page 8, line 14: correct "unfortunately" - Page 8, line 16: LPDR or PLDR? Use the same everywhere. - Page 8, line 21: "is too high for the sunphotometer". This sentence seems ambiguous to me. Please rewrite. - Page 8,

line 23: correct "particular" - Page 8, line 27: Correct "The the" - Page 9, line 3: Please include references, as comparisons between columnar inversions and insitu profiles for dust cases already exist (see for example www.atmos-chem-phys.net/15/8479/2015/) - Figure 8 and related analysis: a broad estimation of more comparable volume distributions could be performed by assuming that the dust layer is distributed evenly in a layer. If this assumption is valid for this campaign day (supported by vertical measurements) it would be interesting to see a modified plot with both distributions in units um3cm-3. - Page 9: I miss results of SSARA from radiance measurements. - Figure 2: This plot does not seem to be a log-log plot as stated in the caption but a semi-log plot. Please check and comment accordingly for the related discussion. - Figure 2: Given that AOD at 2um is not a experimental but extrapolated value, in my opinion it should be better represented with a different shape to avoid confusing the reader (even if highlighted with an external circle).

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