

Interactive comment on “Retrieval of aerosol properties from ceilometer and photometer measurements: long-term evaluation with in-situ data and statistical analysis at Montsec (southern Pyrenees)” by Gloria Titos et al.

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This paper entitled "Retrieval of aerosol properties from ceilometer and photometer measurements: long-term evaluation with in-situ data and statistical analysis at Montsec (southern Pyrenees)" provides a very detailed statistical assessment of a fairly recent algorithmic approach entitled GRASP (Generalized Retrieval of Aerosol and Surface Properties) to optimize the vertical retrieval of aerosol properties by merging vertical profile data with constraining column data from a sun/sky photometer.

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The novelty of the statistical comparison is that it is done using insitu data obtained from the Montsec Observatory which is ~ 750 meters above the ceilometer profiling instrument which allows the authors to study the retrieval performance above the critical overlap region which even with correction generally leads to significant biases that would be enhanced by the multi-instrument retrieval. Another novelty of the paper is the long duration of the study (3 years) which allows the authors to study the effects of different meteorology and aerosol sources on the results. Based on the authors literature background, this is a significant improvement over existing algorithm retrieval validations which were limited to short duration air craft campaigns.

Besides quantifying the retrieval characteristics and identifying conditions in which the retrieval performances is degraded (fine mode dominated), the authors are able to build a very useful profile climatology of vertical aerosol properties filtered by climatology (RH) and source locations

In summary, the paper illustrates convincingly the usefulness of the GRASP algorithm in optimally analyzing combined Ceilometer / Sky Radiometer data. The fact that a much cheaper ceilometer is used instead of more costly and sophisticated Lidars is very useful since it opens up the possibility of developing a much larger network of such instrument sites.

Suggestions:

One suggestion that comes to mind would be to illustrate the importance of the radiometer (i.e radiance constraints) on the retrieval properties. In particular, prior algorithms that combine lidar (or ceilometers) with only total column Aerosol Optical Depth at multiple wavelengths from a sunphotometer has been used to retrieve vertical aerosol profiles. The sun photometer AOD measurements may provide an even cheaper alternative to an instrument site. Therefore, it would be very helpful to the community if some comparison between the different algorithms could be made to see how much improvement there is in the AERONET Radiometer data as compared to

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just sunphotometer AOD constraints on this very nice and rich data set.

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