**Atmospheric
Measurement
Techniques**
Discussions

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# *Interactive comment on* "Determination and analysis of spectral aerosol optical properties by a multi-instrumental approach" *by* S. Segura et al.

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We thank the reviewer for the nice summary of our paper and the positive comments. In the following we will respond to each comment listed below separately.

General comments

1. The first part of the paper, related to the correction method, is an exhaustive work, well describing the complexity of aerosol absorption in situ measurements. However, the second part, regarding the data collected at Granada, is not as interesting as measurement technique, and makes the paper rather long. I would either shorten or remove sections 5.1 and 5.2. The analysis of atmospheric data, dust or pollution events, etc. is not as interesting in my view for AMT. Figures 6 to 10 are not necessary (figure 5 could

be retained to show the data set and allow some discussion).

The aim of including this section in the article was to show an application of this compensation approach to ambient data and if they were consistent with estimates from other models (HYSPLIT, NAAPS and LIDAR data). It was also a good opportunity to apply the method proposed by Collaud-Coen et al. (2004) to distinguish dust intrusions based on the spectral dependence of the single scattering albedo.

However, following the comments of the referee, authors have shortened this section by deleting some redundant sentences, shortening discussions, and changing the descriptions of HYSPLIT, Lidar and NAAPS model.

2. Is the measurement protocol at Granada station organized according to some specific requirements? Might the absence of heating of the inflow induce problems in the nepehlometer (scattering) measurements? How is high relative humidity accounted for? Might the described correction method be affected by high relative humidities?

The measurement protocol follows the ACTRIS recommendations and therefore measurements of aerosol optical properties are conducted at dry conditions. Due to the low RH of the sampled air there was no need of drying at Granada station during the analyzed period. Nevertheless, the laboratory room air is kept at a constant temperature around 25 °C in order to reduce the RH of the sampled air to RH<50%. In particular, for the study period, the RH inside the nephelometer chamber was 28±10% on average (± standard deviation), as mentioned in page 1877 lines 14-16 of the manuscript. Recent work of Titos et al. (2013) showed negligible enhancement of the scattering coefficient due to water uptake below 50% RH at Granada. Other authors (Fierz-Schmidhauser et al., 2010; Zieger et al., 2011) have also shown low scattering enhancement for RH<50%, especially for continental and polluted air masses. Thus, we think that the methodology described in this work is not affected by the relative humidity since the instrument was operated at RH<50%. To avoid confusion we have replaced page 1877 lines14-16 by:

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"In our case, although no drying of the aerosol stream was performed, the relative humidity measured within the nephelometer chamber was low with a mean value of 28±10%. Thus, we can consider that the hygroscopic growth does not affect our measurements."

References: Fierz-Schmidhauser, R., Zieger, P., Gysel, M., Kammermann, L., DeCarlo, P. F., Baltensperger, U. and Weingartner, E.: Measured and predicted aerosol light scattering enhancement factors at the high alpine site Jungfraujoch, Atmos. Chem. Phys., 10, 2319-2333, 2010.

Titos G., H. Lyamani, A. Cazorla, Z.J. Wu, M. Sorribas, I. Foyo-Moreno, J. Cheng, H. J. Liu, A. Wiedensohler and L. Alados-Arboledas: Measurements of aerosol light-scattering enhancement factors at the urban environment of Granada (Spain), European Aerosol Conference 2013, Prague.

Zieger, P., Weingartner, E., Henzing, J., Moerman, M., de Leeuw, G., Mikkilä, J., Ehn, M., Petäjä, T., Clémer, K., van Roozendael, M., Yilmaz, S., Frieβ, U., Irie, H., Wagner, T., Shaiganfar, R., Beirle, S., Apituley, A., Wilson, K., and Baltensperger, U.: Comparison of ambient aerosol extinction coefficients obtained from in-situ, MAX-DOAS and LIDAR measurements at Cabauw, Atmos. Chem. Phys., 11, 2603-2624, 2011.

Specific comments

Page1, Line 17: add year

Done

P2, L3: give full description of b_abs the first time that it is written in the text. The same applies to other variable names throughout the manuscript.

We have searched the manuscript throughout in order to describe first appearances of all the variables and changes have been made according to this this.

P2, L4: "weekdays" should likely say "working days". Please check other possible

occurrences in the text.

Done

P2, L13: "...cooling of the underlying atmosphere" Also surface is affected.

Yes, this has been included in the sentence.

P18: the descriptions of HYSPLIT, NAAPS and the Granada lidar system should be drastically reduced (if not removed, see general comment 1). Some paper citation should be enough.

Section 5.1 has been shortened, as suggested by the referee. In other to do this lines 22 – 27 on page 1891, and lines 1 – 15 on page 1892, have been replaced by: "(. . .) The model used for calculating back trajectories is the Hybrid Single-Particle Lagrangian Integrated Trajectory Model (HYSPLIT) developed by the National Oceanic and Atmosphere Administration (Draxler & Rolph, 2003). On the other hand, the NAAPS model is a global model that predicts concentrations of sulfates, dust and smoke aerosols in ground level and in the atmospheric column (Christensen, 1997). Measurements of a Raman Lidar operated at Granada station (Guerrero-Rascado et al., 2008) and included in EARLINET (Boesenberg et al., 2001) were used to support the interpretation of the data. Images of the temporal evolution of the lidar range corrected signal can be consulted online at (http://atmosfera.ugr.es/inv/index.php/en/quicklooks.html)."

P19, L8: even though this reviewer considers that section 5 is unnecessary, should this material be used elsewhere, consider adding your AERONET data together with the lidar, to help discriminate Saharan dust events.

Unfortunately, the authors don't plan to use the material elsewhere, and therefore we have decided not to remove section 5 completely but to shorten it as the material could be interesting for the reader. Therefore, AERONET data has not been included.

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