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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Profiling of aerosol microphysical properties at several EARLINET/AERONET sites during July 2012 ChArMEx/EMEP campaign" *by* M. J. Granados-Mu noz et al.

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The authors would like to thank both reviewers for their comments and suggestions, which have helped to improve the quality of the manuscript. Please, find below a detailed response to the reviewer's comments.

Comment: The paper it is clearly written and the authors provide an overview on the dust event that mainly affected the western Mediterranean from 9 to 11 July 2012, without adding any new scientific insight on the spatial and temporal evolution of Mediter-

ranean dust events. Therefore, the paper is not appropriate for the ACP journal, to my opinion.

Response: The main focus of this paper is on the analysis of the microphysical properties during the ChArMEx campaign in 2012, which has not been presented in previous studies mostly based on the analysis of the aerosol optical properties. We show the utility and the potential of having synergies between lidar and sun/sky radiometer for the vertical profiling of microphysical properties during the day. For example, it is evidenced that the aerosol plume coming from the western Mediterranean area is not the one detected over the Balkan's stations, something that is shown using the synergy between active and passive lidar by applying the LIRIC retrieval algorithm. The study also shows the clear advantage of having additional information such as the data provided by the polarization channels to obtain information about aerosol typing. The simultaneous validation of the different models at different sites together with their temporal evaluation is also one of the main points of the study, since no validation of these characteristics has been presented before.

Comment: The methodology applied in the paper is commonly used to analyse dust outbreaks and it was also used by Sicard et al., 2015 to characterize the same dust event at the same sites of this study.

Response: Sicard et al. (2015) focuses on the optical properties derived from lidar profiles while this paper is focused on exploiting the synergies between active profiling and passive remote sensing to retrieve microphysical properties. In this sense, in this work we present atmospheric profiles of the aerosol concentration, including the splitting between spherical and non-spherical coarse mode particles, something that is really relevant in aerosol typing. Data presented in both studies are complementary of each other.

Comment: The results referring to Evora should be taken away from the manuscript to my opinion. Note that Fig. 6a of the paper by Sicard et al., (2015) indicates that the

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Evora lidar signals around 1 km agl were likely affected by the lidar field of view. Note also the sentence at line 225 of the manuscript " the initial vertical resolution. . . .was established to. . . .100 m". The aerosol layer of Fig. 6 extends within 200-400 m.

Response: Data from Evora are mainly kept in the manuscript to evaluate the performance of the models in cases when no mineral dust is observed. Even though not much information on the microphysical properties can be extracted, we consider data are still valuable and reliable for Evora site. The influence of the lidar incomplete field of view below 1 km mentioned in Sicard et al. (2015) is considered when retrieving the microphysical properties with LIRIC. LIRIC software allows making an interpolation of the data from the lower point of the profile not affected by the incomplete field of view down to the surface. To make the interpolation, LIRIC takes into account the integrated volume concentration provided by the sun photometer for each mode, adjusting the volume concentration profiles to this value. More details can be found in Wagner et al. (2013), Granados-Muñoz et al. (2014) and Chaikovsky et al. (2008; 2016). The sentence at line 255 refers only to the data used for the model-LIRIC intercomparison. Data presented in figure 6 (figure 4 in the new version of the manuscript) have 15-m vertical resolution. This information has been included in the manuscript.

Line149-150: "From the combination of all this data, volume concentration profiles C_v (z_n) are obtained for fine and coarse aerosol particles with a vertical resolution of 15 m in our case."

Comment: In addition, I believe that the altitude scale of the RCSs referring to Evora (fig. 5 of the manuscript) is wrong, since it should start at 0 and not at 1 km, as it is clearly shown in Fig. 5a of the paper by Sicard et al., (2015).

Response: Scales in Figure 5 were mistaken. We thank the reviewer for pointing it out. Figure 5 (figure 3 in the new version) has been corrected. Please, find the new figure attached below.

Comment: Lines 529-531: The sentence".. the decrease in the fine mode in the co-

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incidence with the increase in the coarse spherical mode could be associated to the aging of the mineral dust particles and aggregation processes" is to my opinion rather speculative.

Response: The sentence has been modified: Lines 497-502: "During July 10 in the late afternoon and July 11, a decrease in the fine mode in coincidence with an increase in the coarse spherical mode was observed. The simultaneous decrease of the fine mode and increase of the coarse spherical particles together with the decrease in δ_532nmˆp point out to processes such as mineral dust aging and/or aggregation processes. However, additional analysis would be necessary to confirm this hypothesis."

Comment: I believe that Fig. 6 referring to Granada on 11 July , likely reveals the presence of a dust layer up to about 1.5 km and another dust layer from 3 to about 5.5 km agl. The presence of different dust layers along the aerosol column, as well as the high spatial and temporal variability of the aerosol vertical profile during dust events has been presented and discussed in several papers.

Response: More detailed information about the dust event at Granada is shown in Figures 9 and 10 (figures 7 and 8 in the new version), whereas figure 6 shows the data at the different stations measured simultaneously in order to see the spatial (both in the vertical and horizontal coordinates) and temporal variability of the microphysical properties during the analyzed event. We would like to emphasize here again that our results are focused on the analysis of the microphysical properties, not the optical properties, which have indeed been analyzed in detail in many previous studies. Taking into account the comments from both reviewers, part of the manuscript (mainly the results section) has been reorganized and discussion has been extended at some points and reduced where redundant. With this reorganization we intend to highlight the main findings and conclusions inferred from the present study.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 32831, 2015.

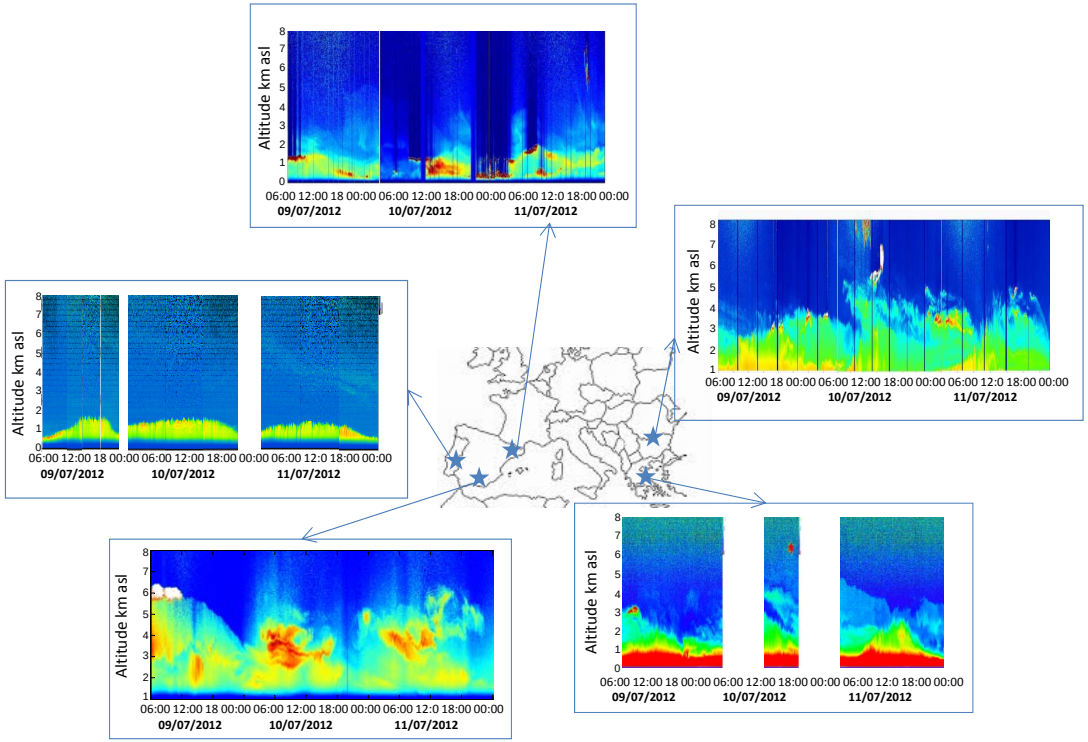

Fig. 1. Figure 3

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