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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol characterization in Northern Africa, Northeastern Atlantic, Mediterranean Basin and Middle East from direct-sun AERONET observations" *by* S. Basart et al.

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The manuscript is focused on the exploitation of the direct sun AERONET data bases. In particular there is a special interest in the characterization of the dust contribution to the atmospheric aerosol in North Africa, South Europe, Mediterranean Basin and Middle East regions. In order to fulfil the objective the authors decide to work with the simplest and more robust product of AERONET, and thus they focus on aerosol optical depth and Angström exponent derived from CIMEL radiometer measurements. The selected analyses tool is a recently published methodology based on the features of

the spectral dependence of AOD. With these data and tools the authors develop an extensive study on different regions using previous literature to support their results.

The paper uses a simple method to infer basic information about the atmospheric aerosol. In fact this could be considered as a first step on the exploitation of rather complete data bases like that of AERONET. As the authors state in their manuscript, the lack of global coverage of the ground-based aerosol network is compensated for the numerous spectral measurements of solar radiation, that are well suited to reliably and continuously derive aerosol optical properties, and from these to retrieve relevant microphysical properties. In this sense, I understand that although the authors focused on the use of the simplest information provided by AERONET they take some advantages of the additional information that can be retrieved through the literature overview, which includes more profound studies covering different areas/stations included in the present study.

The manuscript has an appropriate structure and it is well written. The methodology and data set used are appropriately presented. The analyses are performed in a correct way that leads to interesting results, which are contrasted with previous works developed in the different regions covered in the study.

The manuscript is worthy to be published and appropriate for the scope of Atmospheric Chemistry and Physics Discussion.

Some particular comments on the contents and presentation of the manuscript are included in the next paragraphs.

The authors limit the study to a given threshold in AOD. This can lead to a bias in their study that must be discussed in the manuscript.

The term Northeastern Atlantic to designate the area between Canary Island and Cape Verde seems a little bit confusing.

In Table I some stations are misclassified, for example Lecce can be considered a

“littoral area” (C) while Granada can hardly be considered as a “littoral area”.

The authors justify the findings in the different regions with references to previous publications on the atmospheric aerosol topic. Considering that the study is focused on the characterization of atmospheric aerosol in the vertical column a large amount of references are related to studies based on sunphotometry. This is especially true in the discussion on the Mediterranean region. Nevertheless in their discussion on the Iberian Peninsula area there are some missed references on studies of atmospheric aerosol in the column. In particular some references on studies performed over several of the AERONET stations used might be useful in explaining the differences that the authors encounter between Western and Eastern regions of the Iberian Peninsula or in justifying the bimodal features evidenced in their study of “alpha” and “dalpaha”.

Some of these references are included bellow:

In reference to Évora AERONET station and Portugal:

Silva, A. M., M. L. Bugalho, M. J. Costa, W. von Hoyningen-Huene, T. Schmidt, J. Heintzenberg, and S. Henning (2002), Aerosol optical properties from columnar data during the second Aerosol Characterization Experiment on the south coast of Portugal, J. Geophys. Res., 107(D22), 4642, doi:10.1029/2002JD002196.

Frank Wagner, Daniele Bortoli, Sérgio Pereira, Maria João Costa, Ana Maria Silva, Bernadett Weinzierl, Michael Esselborn, Andreas Petzold, Kathi Rasp, Bernd Heinold, Ina Tegen, (2009). Properties of dust aerosol particles transported to Portugal from the Sahara desert, Tellus B, 61: 297-306

Elias, T., A. M. Silva, N. Belo, S. Pereira, P. Formenti, G. Helas, and F. Wagner (2006), Aerosol extinction in a remote continental region of the Iberian Peninsula during summer, J. Geophys. Res., 111, D14204, doi:10.1029/2005JD006610.

In reference to Eastern Iberian Peninsula and Granada AERONET station:

Alados-Arboledas, L., Lyamani, H., Olmo, F.J., 2003. Aerosol size properties at Armilla,

Granada (Spain). Quarterly Journal of the Royal Meteorological Society 129 (590), 1395-1413.

L. Alados-Arboledas, A. Alcantara, F.J. Olmo, J.A. Martinez-Lozano, V. Estelles, V. Cachorro, A.M. Silva, H. Horvath, M. Gangl, A. Diaz, M. Pujadas, J. Lorente, A. Labajo, M. Sorribas, G. Pavese, (2008) Aerosol columnar properties retrieved from CIMEL radiometers during VELETA 2002, Atmospheric Environment, 42, 2654-2667, DOI: 10.1016/j.atmosenv.2007.10.006.

Lyamani, H., F. J. Olmo, L. Alados-Arboledas, (2004) Long-term changes in aerosol radiative properties at Armilla (Spain), Atmos. Environ., vol. 38, 35, 5935-5943.

Lyamani, H., F. J. Olmo, L. Alados-Arboledas, (2005) Saharan dust outbreak over southeastern Spain as detected by sun photometer, Atmos. Environ., vol. 39, 38, 7276-7284.

Lyamani, H., F. J. Olmo, A. Alcántara and L. Alados-Arboledas , (2006) Atmospheric aerosols during the 2003 heat wave in southeastern Spain I: Spectral optical depth”, Atmos. Environ., vol. 40, 33, 6453-6464.

Lyamani, H., F. J. Olmo, A. Alcántara, L. Alados-Arboledas , (2006) Atmospheric aerosols during the 2003 heat wave in southeastern Spain II: Microphysical columnar properties and radiative forcing, Atmos. Environ., vol. 40, 33, 6465-6476, 2006b.

Some of these studies include retrieval of aerosol size properties that evidences the marked bimodality of the size distributions especially in summer, when the arrival of Saharan air masses leads to the increase of coarse particles due to long-range transport from North Africa.

Along the text the authors use “AdA space” to denote “alpha dalpha” space; this might be changed to avoid confusion.

Figures included in Figure 4 have lost the information on x-axis.

Figures 5 and 7 seem a little bit confusing due to the overlap of symbols in some areas. Although the graphic tool is important the use of additional tables could be very helpful.

Details in Figure 7 would be more evident using colour or shapes scales against the gray scale used.

In most figures the legend explaining the meaning of the different symbols need to be larger to be readable.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 7707, 2009.