

## ***Interactive comment on “Relationships between columnar aerosol optical properties and surface particulate matter observations in north-central Spain from long-term records (2003–2011)” by Y. S. Bennouna et al.***

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Received and published: 7 November 2014

### General comments:

Regarding the lack of bimodality in the AOD, not only sampling issue but also the changing aerosol vertical profile is now mentioned as an additional explanation throughout the text. Besides, in our opinion we must investigate the behavior of air masses at three levels (500 m, 1500 m, 3000 m) in order to explain the differences between PM<sub>x</sub> and AOD cycles. The results of an analysis relying on airmasses have

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been added in additional material, and these results are used in the discussion on the climatological cycles.

As regards the results of Cachorro et al. 2013, as referee 2 and 3 do not agree with the fact to refer to the conference proceedings of Cachorro et al., 2013 written in spanish, the authors decided to remove all the parts of the manuscript (text, Figures 6b and 7) relying on the results of this desert dust inventory. For information, the inventory of desert dust events in the region is based on a conference proceedings of Cachorro et al. (2013) written in spanish, it is important to note that the method applied in this study for the detection of desert dust events is the same as that used in a previous published paper Toledano et al., (2007b) focusing on the southwestern part of Spain with data from the AERONET site of El Arenosillo. The details on this method are already fully described in this peer-reviewed publication.

For more details on all aforementioned aspects, please see answers to general comments of referee 2, as referee 3 mentions that "main points of my specific comments came up in earlier referee comments".

### Specific comments:

The legend of Fig.4 now has a greater font size.

Fig. 8a and 8c (now Fig. 7a and 7c) have been changed to have the same y-ranges.

In Fig. 11 (now Fig. 10), the authors prefer to leave the artefact on the graph and explain the reason for those artefacts so that the same number of data appears in all graphs for consistency.

In Fig. 12 (now Fig. 11), it is difficult actually to find an empty space to put the legend on these graphs as they are particularly full of information. However despite the fact that legend sometimes slightly overlapp with data points, it should be noted that is also added in the caption description.

Page 5833, line 1: This text was corrected as suggested by the referee.

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Page 5835, line 22: The text was slightly modified by "which makes it the third European region in size"

Page 5841, line 18: This text was corrected as suggested by the referee.

Page 5842, line 17: This text was corrected as suggested by the referee.

With respect to the different inconsistencies in the discussion of the trends in Section 4.2 pointed out by the reviewer: Page 5841, line 18-20: The missing negative sign was added.

Page 5845, line 5 and Page 5844, line 28-29: These lines are not included in the new version because as mentioned before, all parts of the manuscript relying on the results of the desert dust inventory obtained in Cachorro et al., 2013 have been removed.

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Interactive comment on Atmos. Meas. Tech. Discuss., 7, 5829, 2014.