

General Comments:

The main drawback given by the reviewer 1 is related with “I disagree with the authors when say that the Angstrom exponent (AE) characterizes the particle number distribution.....

Answer: Yes, we agree that this was a misleading and it was removed from the text or conveniently modified. The AE is related with the particle size distribution, being this expressed in number, surface o volume. In particular, section 4.3 has been modified accordingly.

Specific Comments:

p18353, line 23: AERONET actually has many more wavelengths for aerosol studies (340, 380, 440, 500, 670, 870, 1020 nm). These wavelengths can also vary slightly from instrument to instrument (i.e., some instruments use 675 instead of 670, etc.).

Answer: You are right and but it is well known in the AERONET community that the instruments have many more wavelengths (340, 380, 500, 1640nm) and that some instruments use 675 instead of 670 nm. We are referring to those four wavelengths used currently for inversion and also in this sense we say “nominal” wavelengths. Therefore these sentences are not modified.

p18355, lines 17-20: I don't understand the statement "... and those calculated on the basis of earlier retrieved parameters (e.g. phase function, single scattering albedo, broad-band fluxes, etc.)." How are these *earlier* parameters? These are not earlier in terms of the AERONET retrieval – some clarification would be helpful, here.

Answer: With “earlier” we refer to the previously cited parameters i.e. volume size distribution, complex refractive index and partition of spherical/non-spherical particles. We have changed “earlier” by “previously”.

p18358, line 8: Paragraph should begin with The *coarse* mode radius...
Done

p18360, line 1: The authors state that the minimum in July in Fig 4 is caused by the frequency of occurrences of Atlantic air masses, but this does not seem to be consistent with Figure 2, where we see that the coarse mode for July is similar in shape to June and August, but the fine mode for July is much lower in magnitude than June and August.

Answer: This is true but it is consistent with the volume concentration of total, fine and coarse mode of Figure 4. In this case we must consider the area (which gives the volume concentration) of the graphics in Figure 2 and not the maximum or shapes. This finding is only well fixed when a long data series has been available, otherwise it is masked by the monthly variability. The minimum in July seems to be a climatological particularity of the region. This behaviour seems to be linked with the frequency of the Atlantic air masses over the Iberian Peninsula which define the north-south gradient of the column water vapour content, which also shows this minimum as it is demonstrated by the analysis of Ortiz de Galisteo et al., 2011 (papers submitted for publication, see below). The same minimum shown by the AERONET-AOD it is also observed analyzing the AOD data given by MODIS sensor in Bennouna et al. 2011, (the reference of 2009 has been changed to that of 2011). In spite of these observed evidences we need to study what is the real cause of this behaviour, which seems to be related with the air masses or the general atmospheric circulation pattern over the Iberian Peninsula, i.e. less frequency of Saharan air masses during July (compared to June and August).

The paper of “Ortiz de Galisteo et al., 2011 has been added as a reference in spite of the fact that the manuscript is under review. It has been assigned the manuscript number 2011JD016743 in

JGR..

line 8: the authors talk about the "complete dataset of the volume particle concentrations (not shown here)..." Fig 4 is 2000-2008, though – that's not complete? If not, why not show the complete dataset instead of Fig 4?.

Answer: yes, the dataset is complete. Here we intended to say that AOD and volume concentrations run parallel both if we look at multi-annual monthly means (Fig. 4) and the time series of daily means (not shown). The text has been changed for clarification.

p18361, line 13: The authors cite Cachorro and De Frutos in their discussion of the Junge function, but they should cite the original work by Junge as well.

Answer: Originally we cited the work of Junge in the first version of the paper, but it was recommended to reduce the amount of bibliography. Otherwise this section has been modified substantially.

line 24: Curvature is real, but that does not mean that any choice of wavelengths for AE is more poor than another choice. The different wavelengths are sensitive to different characteristics of the size distributions, but they are not "poorer."

Answer: Perhaps the word "poor" is not the best word and certainly that the different wavelengths are sensitive to different characteristics of the size distributions. But as you said the curvature is real and it is well known that the fit by the AE is worse when the spectral range is larger. Also it may be observed that the AOD curvature depends of the spectral range, therefore the obtained AE fits the experimental values best or worse. Therefore, the sentence must be considered in a wide sense including your meaning and also our meaning. With this paragraph we only want to express the limitations of AE parameter (linear approximation).

p18362, line 11: AE is not really related to the number distribution; it is more closely related to the surface area or volume distribution.

Answer: Yes, we have modified this misleading in the text. Also all section 4.3 has been modified substantially.

line 22: Fig 6a does not tell us that 23% of the measurements are dominated by the coarse mode and 77% by the fine mode; it only tells us that the AE is less than 0.75 for 23% of the measurements. Indeed, Fig 7 indicates there are many cases where AE is greater than 0.75 and the size distribution is dominated by coarse mode particles (i.e., all of the points to the right of the green line and below the thick red line in Fig 7).

Answer: Yes, it is true and in this sense the text has been modified.

p18365, line 5: AERONET Version 2 accounts for non-sphericity in both the fine and coarse modes, to the extent that spheroid aerosols are applicable.

Answer: We agree, as you said "to the extent that spheroid aerosols are applicable". In spite of taking into account the spheroid model in the new algorithm version 2 to apply to such situations, it

seems that there is still some artifact in the retrieval of fine mode characteristics, since we observe the same results than those in the paper of Gonzi et al. 2002. As we say in the text, it would need a deeper study given the difficulty of the evaluation.

Figure 1b: state that data is level 2.0 in the caption.

Done. This was already expressed in section 2.2, page 18354 line 5, but it is now repeated in the abstract and in other parts of the text.

Figure 2: state that data is level 2.0 and mention the wavelengths used for AE.

Done.