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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Column-integrated aerosol microphysical properties from AERONET Sun photometer over Southwestern Spain" *by* N. Prats et al.

Anonymous Referee #1

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General Comments:

This paper characterizes the aerosol size distribution retrievals provided by AERONET at El Arenosillo station in Huelva, Spain. They discuss the seasonal variability of aerosol optical depth, fine and coarse mode concentrations, fine mode fractions, Angstrom exponent, and the relationship of these parameters to seasonal dust and maritime aerosol cycles. The paper is suitable for publication, with some minor revisions.

I disagree with the authors when they say that the Angstrom exponent (AE) characterizes the particle number distribution. The AE is an optical parameter, and more closely related to surface area than to the number distribution (recall that AE is essentially a ratio of optical depths, and in terms of spheres, tau(lambda) $\sim$ Q(m,r,lambda)*pi*r^2*n(r)). AE is also related to particle volume to the extent that surface area is related to volume. That's why it is not surprising to see that AE is related to the fine mode volume fraction. I recommend removing the statements that imply that the AE represents the number distribution. The true utility of AE is that it is a simple measurement that is often available when other measurements are not available. Even AERONET's fine mode volume fraction requires an almucantar scan, and is not available as frequently as the AE.

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.).

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.

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

p18360, line 1: The authors state that the minimum in July in Fig 4 is caused by the frequency of occurances of Atlantic airmasses, 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. 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?

p18361, line 13: The authors cite Cachorro and De Frutos in their discussion of the

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Junge function, but they should cite the original work by Junge as well. 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."

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

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.

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

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

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 18349, 2011.