

In the following the responses to Dr Dubovik are provided in red.

Dear Dr. Meloni,

I am pleased to accept your paper for publication in ACP.

Best regards,

Oleg Dubovik

Non-public comments to the Author:

I have looked your last version of the paper and have my own very minor comments that you could consider (no obligations).

First, when you talk about spheroid model used in AERONET retrieval, you cite Dubovik et al. (2002b) paper. However, the final model that is used in AERONET is described in Dubovik et al. (2006). It is better to use this reference.

For your future studies, I wanted to indicate that in principle there is effect of desert dust non-sphericity in IR, as discussed by Legrand et al. (2017).

Also, even AERONET level 2 doesn't display SD retrieval for in V2 for AOD > 0.4. The retrieved SD should be of sufficient accuracy as discussed in Dubovik et al. 2000.

Dubovik, O., A. Sinyuk, T. Lapyonok, B. N. Holben, M. Mishchenko, P. Yang, T. F. Eck, H. Volten, O. Munoz, B. Veihelmann, W. J. van der Zander, M. Sorokin, and I. Slutsker, Application of light scattering by spheroids for accounting for particle non-sphericity in remote sensing of desert dust, *J. Geophys. Res.*, 111, D11208, doi:10.1029/2005JD006619d, 2006.

Legrand, M., O. Dubovik, T. Lapyonok, Y. Derimian, Accounting for particle non-sphericity in modeling of mineral dust radiative properties in the thermal infrared, *J. Quant. Spectrosc. Radiat. Transfer*, 149, 219-240, 2014.

Dubovik, O., A. Smirnov, B. N. Holben, M. D. King, Y. J. Kaufman, T. F. Eck, and I. Slutsker, "Accuracy assessments of aerosol optical properties retrieved from AERONET Sun and sky-radiance measurements", *J. Geophys. Res.*, 105, 9791-9806, 2000.

Dear Dr Dubovik,

I thank you for your comments and suggestions.

The reference for the spheroid model used in the AERONET retrieval has been changed in Dubovik et al. (2006) as suggested.

The effect of non-sphericity of dust particles on the infrared radiation is known to the authors. However, quantitative information about the particles' shape is not available for the campaign and the spherical assumption has been made in the calculation of the dust optical properties.

Concerning the derived size distribution from the AERONET inversion, the statement contained in the manuscript "Level 2 quality assured inversion products are obtained only for AOD at 440 nm larger than 0.4: this is the case only for the Cimel SD retrieval on 3 July, while on 22 and 28 June Level 1.5 SDs are used" is not fully correct, since the volume size distribution is reasonably accurate in all AOD conditions. The restriction to the cases of AOD at 440 nm larger than 0.4 is applied to the retrieval of the single scattering albedo and the complex refractive index. The sentence has been modified in "The Level 2 quality assured AERONET SD is available only on 3 July, while on 22 and 28 June Level 1.5 SDs are used".

Please also note that some small changes have been made to the Figures to label the multiple panels with letters in brackets and to the captions accordingly.

All the changes to the manuscript have been marked-up in the .docx file.

Best regards,

Daniela Meloni