

Interactive comment on “Advanced characterization of aerosol properties from measurements of spectral optical depth using the GRASP algorithm” by B. Torres et al.

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Received and published: 18 June 2017

Interactive comment on “Advanced characterization of aerosol properties from measurements of spectral optical depth using the GRASP algorithm” by B. Torres et al. M. King (Referee) michael.king@lasp.colorado.edu Received and published: 20 January 2017 Review of “Advanced characterization of aerosol properties from measurements of spectral optical depth using the GRASP algorithm” by B. Torres, O. Dubovik, D. Fuertes, G. Schuster, V. E. Cachorro, T. Lapyonok, P. Goloub, L. Blarel, A. Barreto, M. Mallet, C. Toledano, and D. Tanré Recommendation: This paper presents a sensitivity analysis and application of determining the aerosol size distribution from spectral

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measurements of aerosol optical thickness, in particular determining 6 parameters of a bimodal aerosol size distribution. After the sensitivity study, it applies the method to real observations from AERONET, airborne measurements, and lunar transmission measurements. The paper is extremely thorough and well written. I recommend that this paper be accepted for publication with only minor editorial changes. General Comments: This important paper is very easy to read and covers an important topic of determining the aerosol size distribution from (primarily) ground-based measurements of spectral optical thickness in the absence of almucantar measurement. The treatment of calibration (optical thickness), initial guess, and refractive index sensitivity is clearly presented. Major Comments: All references are missing full initials of authors (like middle initials). The references should be complete in this regard. Please check.

[We have used BibTeX for managing the references. In some of the references, a space was missing between the initials and the compiler was recognizing only the first name. The mistake has been corrected. Thank you very much.](#)

Minor Comments: Page 2, line 12 – change ‘one on the first type of measurements’ to ‘one of the first types of measurements.’

[Changed, thanks.](#)

Page 3, line 25 – change ‘airborne photometers’ to ‘airborne sunphotometers’.

[Changed, thanks.](#)

Page 3, line 30 – change ‘at polar regions’ to ‘in polar regions’. Later in same sentence, change ‘aerosol load’ to ‘aerosol loading’.

[Changed, thanks.](#)

Page 4, line 12 – Consider adding an additional reference to a recent paper by van Donkelaar et al., 2016: van Donkelaar, A., Martin, R. V., Brauer, M., Hsu, N. C., Kahn, R. A., Levy, R. C., Lyapustin, A., Sayer, A. M., and Winker, D. M.: Global estimates of fine particulate matter using a combined geophysical-statistical method with infor-

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mation from satellites, models, and monitors. *Environmental Science Technology*, 50,3762-3772, 2016.

Added, thanks.

Page 5, line 21 – Consider adding an additional reference to a book chapter by King and Dubovik: King, M. D., and Dubovik, O.: Determination of aerosol optical properties from in-verse methods. *Aerosol Remote Sensing*, J. Lenoble, L. Remer, and D. Tanré, Eds., Springer-Verlag, 101–136, 2013.

Added, thanks.

Page 6, Equation (2) – $v(r)$ in equation not defined.

$v(r)$ is the volume of particle. Added, thank you

Page 9, Figure 1 – the line types (dashed, and dot-dashed) are hard to distinguish. Please improve.

We have changed the order between them, and we think that now, it is easy to distinguish them.

Page 11, line 21 – reference to ‘Chapter 2 of Lenoble et al. 2013’ should be to ‘Lenoble et al. 2013’: Lenoble, J., Mishchenko, M. I., and Herman, M.: Absorption and scattering by molecules and particles. *Aerosol Remote Sensing*, J. Lenoble, L. Remer, and D. Tanré, Eds., Springer-Verlag, 13–51, 2013.

Changed. Thank you.

Page 13, line 5 – change ‘regardless the initial guess’ to ‘regardless of the initial guess’.

Changed. Thank you.

Page 15, line 5 – after analysis, add reference back to Table 2 (i.e., ‘analysis (cf. Table 2). The standard deviation...’

Added. However, you may find important changes in the subsection.

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Page 16, line 18 – change ‘aerosol cases are here’ to ‘aerosol cases here’.

Changed thanks.

Page 17, line 32ff – the fact that the refractive index (mostly real part) affects the derived size distribution was also discussed in King et al. (1978), where it was pointed out that the shape of the size distribution remains the same but shifts with a varying real part (with little sensitivity to the imaginary part). This is derived from anomalous diffraction theory of Van de Hulst, and was also discussed in Yamamoto and Tanaka (1969).

We have added this interesting result in the discussion. Thank you very much for your comment.

Page 20, line 11 – change ‘MEXI-A’ to ‘MEXI-C’ if I understand this correctly.

The whole paragraph was modified in the new version.

Page 20, line 15 – change ‘thought’ to ‘though’.

The whole paragraph was modified in the new version.

Page 31, line 25 – the Kieffer and Stone reference needs to have the page range of the publication, not just the first page.

We have corrected it. Thank you.

Interactive comment on *Atmos. Meas. Tech. Discuss.*, doi:10.5194/amt-2016-334, 2016.

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