Atmos. Meas. Tech. Discuss., 7, C2989–C2991, 2014
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Atmospheric Measurement Techniques Discussions

Interactive comment on "Mass specific optical absorption coefficients of mineral dust components measured by a multi wavelength photoacoustic spectrometer" *by* N. Utry et al.

Anonymous Referee #3

Received and published: 2 October 2014

This manuscript describes the use of a four-wavelength (266 nm, 355 nm, 532 nm, 1064 nm) photoacoustic spectrometer to measure the absorption of various mineral dust (MD) components in aerosol form. The measured absorption values are combined with aerosol size distribution and mass measurements to derive mass specific absorption coefficients (MAC's) for all seven components. These values could be of utility to others wishing to estimate absorption by mineral dust aerosols or, as the authors suggest, for comparing to bulk measurements. Comparisons to absorption predicted by Mie theory and based on previous (bulk) measurements of indices of refraction demonstrate general agreement between the two approaches but also indicate

some discrepancy which may, or may not, be attributed to deficiencies in the methods used to make the bulk measurements.

Overall, the manuscript is fairly well written, though there are some sections and paragraphs that run on too long. Conversely, the Results section is only one paragraph long; I suggest that the authors consider moving Section 2.4 (Calculations) to Results from Experimental and methods. The authors have done a good job of describing the instrument and the methodology as well as the calculations. The scope of the results and conclusions from this work is fairly limited, but they still could be of use to others in the field and therefore I recommend publication with the following comments being considered.

Specific comments:

1. Please show reproducibility of the absorption measurements for individual MD components. Also, please indicate how many data sets or measurements were averaged to obtain the results presented in Figure 3 and Table 1.

2. How appropriate is the use of Mie theory with MD particles? Specifically, how good is the assumption that the particles are homogeneous and spherical? This should be addressed quantitatively and with citations to previous work in this area since comparisons are made to Mie theory results.

3. Is "AOC" a common abbreviation for "aerosol optical absorption coefficient"?

4. Page 9027, lines 17-18: The work cited of Lin and Campillo, 1985 doesn't seem to have employed either the difference approach or the filter transmission approach mentioned.

5. Page 9028, line 27-29: Citations to previous work with photoacoustic spectroscopy of aerosols need to be added.

6. Page 9030, line 2: What is meant by "free-floating operation"? Measurement of suspended particles? Please be more specific.

7. Page 9033: With such wide size distributions, how are doubly-charged (and triply-charged for that matter) particles accounted for?

8. Page 9033, line 9: Please quantify the “Negligible differences” between the CPC and the OPC particle counting in the overlap region.

9. Page 9036, lines 16-17: How do the data in Table 1 and Fig. 3 (I assume “Fig. 1” on line 16 is a typo) prove the MD components are volumetric absorbers. This statement needs to be explained in much more detail.

10. Page 9036, lines 17-19: What are MAC’s black carbon and brown carbon for comparison to the MAC’s for MD measured here?

11. Table 1: Lambda_2 should be a lowercase lamda. Also, how do these values of MD MAC’s compare to any others that have been measured?

12. Figure 1: “Teom” should be all capitals: “TEOM”. Also, the dotted flask and the associated arrow are confusing. Is this meant to represent shaking of the flask?

13. Figure 3: The axis of ordinates uses the abbreviation “OAC” for the aerosol optical absorption coefficient, but “AOC” is used everywhere else in the manuscript including in the caption for this figure.

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 9025, 2014.