

Interactive comment on “Optical properties and mineralogical composition of different Saharan mineral dust samples: a laboratory study” by C. Linke et al.

Anonymous Referee #1

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General Comments:

This paper describes an optical and mineralogical study of dust, primarily to determine the optical effect of specific iron minerals. Overall I think this paper provides a good contribution to furthering the understanding of light absorption of dust aerosol. The incorporation of a multi-wavelength photoacoustic instrument for measuring the absorption component is also great to see. There was a couple of confusing sections which I think can be easily clarified to provide a worthwhile addition to the body of work on dust aerosol.

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Specific Comments

1) I was confused as to the sample preparation. It seems as though the authors prepared a ≤ 1.2 micron aerodynamic diameter dust sample into the chamber. The APS instrument measures from 0.5 to 10 micron, apparently limiting the particle size measurements from 0.5 to 1.2 micron. The discussion goes on to describe the lognormal fitting to the size distribution obtained from the APS, which is used to determine the mass concentration (section 2.2-25). The authors comment on the “large-diameter tail”; is this the tail up to 1.2 micron or does this tail extend further? I would like to see this section expanded to clarify this process of sample preparation and also the mass distribution determination.

2) The manuscript references manuscripts for the LOPES and PA instruments. The application of LOPES to aerosol has been described however this appears to be the first use of this PA system to aerosol. I would like to see a section on any limitations, uncertainties etc. in using the PA system for this study. The PA calibrations are of particular interest. What are the uncertainties associated with the 1064nm calibration in particular?

3) At 750mW of power for 1064nm, and the technique used to modulate laser power, what is the expected incident power onto a typical soot particle used for calibration? I haven't run any calculations but high incident power onto soot could create some issues with the PA signal (i.e. energy going to separating the aggregates instead of acoustic signal).

4) The dust was analysed for chemical composition and mineral structure using XRF, IR and XRD. These samples were a < 20 micron fraction whereas the optical measurements were based on a < 1.2 micron fraction. Could this be a cause for uncertainties in any conclusions made? Do the authors suspect that the mineralogical composition shown in Table 3 to be an internal or external-type mixture?

5) Do the uncertainties quoted for the extinction cross sections (and hence SSA) in-

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clude the uncertainty in calculating the mass distribution? I think further discussions on this is warranted. Same for absorption cross sections.

6) The conclusions drawn from Figure 9 seem ambiguous. Figure 9 shows the extinction spectra for monodisperse Hematite. The absorption structure shown is strongly correlated to the size of the Hematite used (i.e. Mie structure). This is then compared to (I am assuming) poly-disperse dust samples. Comparison between the two is difficult to make because any Mie structure in the dust sample will be washed out by the poly-dispersivity of the sample.

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