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Comment

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

**Anonymous Referee #3**

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General comments: This paper documents the optical properties of four laboratory re-suspended North African dust samples in relationship to their mineralogical content, with emphasis on the two iron-bearing minerals hematite and goethite. Such measurements are becoming increasingly important in the fields of global climate change and modeling, and research on the mineralogical and optical properties of aerosols should be encouraged. The paper reads well but the syntax should be improved by further technical editing. The mineralogical and chemical analyses were performed on minus 20 micron sieved bulk samples. These samples were subsequently injected into a re-suspension chamber via a 1.2 micron cutoff size- selective inlet, for optical as well as particle size and number measurements. The extinction coefficients were measured

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on all four re-suspended samples (Cairo 2, Cairo 3, Agadez, Morocco) using a LOPES extinction spectrometer and the absorption coefficients on two of these (Cairo 2, Morocco) with a novel multi-wavelength photo-acoustic absorption spectrometer (PAS). Because of likely mineralogical differences between the minus 20 micron sieved and 1.2 micron size cut fractions, direct comparisons of the optical and mineralogical as well as chemical data may not always be accurate.

Specific comments:

p2902, line21: If the samples are to be representing dust from three (Egypt, Morocco, Niger) regions of North Africa, the two Cairo samples may not qualify as natural dust. Cairo 2 was collected in Cairo from a pit 0.5m deep and could have undergone sedimentary changes (diagenesis), while Cairo 3 is from a surface within the city limits and may be mixed with other local fugitive dust (e.g. polluted road or construction dust).

p2903, line8: The stated reason for the differences in initial number concentrations is not clearly understood. For Cairo 2 it is 6700 per cub cm while for Cairo 3 1300 per cubic cm. This difference should have been reflected in the CMD (Table 1), and if it was due to differences in chemistry and mineralogy, it should at least have been indicated by differences in the chemical results of the minus 20 micron sieved samples. Cairo 2 contains 24.3 percent CaO in comparison to the 13.9 percent of Cairo 3, and if all is contained in calcite and dolomite, Cairo 2 is expected to produce more fine material from this softer mineral. To resolve this and other particle size issues (see other reviews), it is suggested that size distribution plots of the four, minus 1.2 micron aerosols be included in this paper. Overlain on these plots can be the lognormal distribution curves.

p2903, line11: SEM electron images of samples collected on Nuclepore filters (Figures 4 to 6) are used to assess particle shapes, for the estimation of dynamic shape factors and calculation of equivalent sphere diameters. Is such a SEM image available for the Morocco sample? From the SEM images it appears that some particles are individual

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minerals but others are chains or clusters of several mineral particles. Additional information such as the occurrence of hematite and goethite as individual minerals, as coatings on other minerals, or as intergrowths with other minerals can be obtained from the SEM analysis of the Nuclepore filter samples.

p2904, line12: The minus 20 micron sample was ignited (tempered?) at 1000 degrees celsius prior to XRF analysis. This is a standard procedure to measure the loss on ignition (LOI) of soil samples. This number is also useful information because it includes mass loss from the decomposition of carbonates such as calcite and dolomite, as well clay minerals. It is suggested that LOI values be included in Table 3.

p2904, line17: Reference is made to the quantitative XRD procedure of Rietveld (give reference). It is assumed that the hematite content of 0.6 percent for the Morocco sample and a detectable amount of goethite in Agadez sample were modeled by this method. It would be most useful in understanding the mineralogy of the four samples, to include a table with all Rietveld modeled mineral abundances. Also include the four general annotated diffractograms as figures.

p2906, line23: If the method of Lafon et al. (2004) proves to be an accepted way of determining iron oxides in desert soils, it should be applied. This should confirm the XRD measured abundances of hematite or goethite, and explain the differences to the XRF total iron results. It will also be interesting to know what iron bearing silicates or other oxides may be present in the samples. Scrutiny of the X-ray diffractograms complimented by SEM based individual particle analysis performed on the Nuclepore filters, may provide more answers.

Technical corrections:

Syntax errors occur throughout the document. Instead of pointing out each, it is suggested that a technical editor peruse the document before being re-submitted.

p2898, line20: Should read - ...vary with particle size and...

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p2901, line24: Should read - Total particle number concentrations....

p2902, line6: Should read - ...to initial particle number....

p2902, line20: Should read - ...was performed on four Saharan...

p2903, line 19: Should read - ...for minerals like quartz (Baron and Willeke, 2001).

p2904, line 12: Should read - ...samples were ignited for one hour...

p2905, line 5: Should read - The XRD was applied to...

p2908, line 18: Should read - ...mineralogical compositions of the dust samples were analysed...

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Interactive comment on Atmos. Chem. Phys. Discuss., 6, 2897, 2006.

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