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Chemical composition and complex refractive index of Saharan Mineral Dust at Izaña, Tenerife (Spain) derived by electron microscopy

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The Saharan Mineral Dust Experiment (SAMUM) is dedicated to the understanding of the radiative effects of mineral dust. A field campaign dedicated to electron-microscopical investigation of slightly aged Saharan dust was carried out at Izaña (Tenerife, Spain) between July 8^{th} and August 8^{th}, 2005. Samples from two strong homogeneous Saharan dust plumes were collected. Size, aspect ratio and chemical composition of more than 22000 individual particles and mineralogical phase composition of about 200 particles was studied by electron microscopy. In all samples, the aerosol was dominated by mineral dust with an average composition (by volume) of 64 % silicates, 6 % quartz, 5 % calcium-rich particles, 14 % sulfates, 1 % hematite, 1 % soot and 9 % other carbonaceous material. Sulfate was found predominantly as coating on other particles with an average thickness of approximately 60 nm. The aerosol calcium content is correlated with the calcite concentrations of soils in the source region, highest values were observed for northern and central Algeria and Morocco. The average aspect ratio of the particles was 1.64. Single scattering albedo (0.95) and asymmetry factor ($0.74 - 0.81$) for solar wavelengths was measured by polar aerosol photometry on filter samples. The apparent soot content of the sample (1 vol. %) was determined by the same technique. From the mineralogical data, an average complex refractive index of $1.59 - 9 \times 10^{-3} i$ for visible light was derived. The imaginary part of the complex refractive index decreases with increasing particle size from $2.5 \times 10^{-2} i$ to below $10^{-3} i$, reflecting the decreasing hematite and soot contents. The imaginary part derived directly from polar photometry measurements was $7 \times 10^{-3} i$.