



## Variations in the mass-specific absorption coefficient of mineral particles suspended in water

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**ABSTRACT:** We examined the light-absorption properties of various samples of mineral particles suspended in water, which included pure mineral species (quartz, calcite, illite, kaolinite, and montmorillonite) and natural particulate assemblages such as desert dust originating from different locations in the Sahara. The absorption coefficient was measured in the spectral region from ultraviolet (UV) to near-infrared on particle suspensions, using a special measurement geometry that reduced the scattering error to a very small level. The concentrations of the total mass of particles in suspension, as well as the mineralogical and elemental composition of particulate samples, were also determined. For the samples of pure mineral species with negligible contamination with iron, absorption was undetectable in the visible spectral region. All of the examined natural assemblages of mixed mineral species showed a significant content of iron (5-29% by weight), and all these samples exhibited significant absorption in the UV and blue-green (400-550 nm) spectral regions. The spectral shape of absorption was similar to that determined on pure iron hydroxide suspension, with some spectral features (shoulders and changes in slope) superposed onto a general increase of absorption toward short wavelengths in the UV. The mass-specific absorption coefficient of the mineral samples,  $a_m^*(\lambda)$ , obtained by normalization of the absorption coefficient to the dry-mass concentration of particles,  $a_m$  showed a significant positive correlation with Fe content. No such relationship was found for other elements present in particles. The range of  $a_m^*(\lambda)$  values covered more than an order of magnitude (from  $<0.1$  to  $<1 \text{ m}^2 \text{ g}^{-1}$  near 400 nm), but the normalization of absorption coefficient to iron concentration led to a considerable reduction in variability among the samples. The iron-specific absorption coefficient,  $a_{Fe}^*(\lambda)$ , varied from  $<1$  to  $4 \text{ m}^2 (\text{g Fe})^{-1}$  near 400 nm for the natural mixtures of mineral species. Although iron was a major pigmenting agent, its concentration could explain only part of variability observed in the absorption properties of mineral particles.

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