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Size distribution and optical properties of long-range transported African dust

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In the framework of the Dust Aging and Transport from Africa to the Caribbean (Dust-ATTAcK) project, a ground-based field campaign has been conducted at the Cape San Juan aerosol station in Puerto Rico, USA, (18.38°N 65.62°W) during June-July 2012. The aim of the field study was to document the physical and optical properties of long-range transported African dust, in order to reduce uncertainties on its effects on radiation and clouds.
Several episodes of long-range transport of mineral dust lasting one-to-three days were observed almost every second day. Dust mostly generated from sources in Mauritania, Western Sahara and Algeria, and remained airborne for approximately seven days before being sampled.
The number size distribution of mineral dust, measured between 10 nm and 20 μm by a combination of Scanning Mobility Particle Sizer and an optical particle counter, showed that dust was generally characterized by three modes in the ultrafine, accumulation and coarse mode. Whereas their amplitude changed, their modal diameter remained constant with time.. The particle fraction below 100 nm showed the highest variability as a consequence of mixing which anthropogenic pollution which occurred any time the trade winds blown from the south east before reaching the sampling site.
Mass scattering and absorption efficiency, and single scattering albedo have been calculated based on measurements of scattering and absorption coefficients and mass concentrations. For particles in the PM10 fraction, the mass scattering efficiency at 450 nm was of the order of 1.4 m2 g-1 and the mass absorption efficiency at 467 nm of the order of 0.05 m2 g-1. The single scattering albedo at 450 nm was of the order of 0.96.