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Mineral dust in Sahelian Africa: the AMMA 2005-2007 field experiment

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Mineral dust is one of the main components of the tropospheric aerosol in the Sahelian part of Western Africa, associated with carbonaceous aerosols from biomass burning. The aerosol optical thickness (AOT) exhibits a clear seasonal cycle, with a maximum in winter, when the "Harmattan" is responsible for intense dust emissions and very efficient transport. At contrary, during summer, the monsoon flow is responsible of the scavenging of aerosol transported from remote sources, the development of the annual vegetation preventing local aeolian erosion. The quantification of mineral dust emissions in the Sahel remains questionable, especially due to human and climatic disturbances to their natural levels. Such disturbances are expected to increase in the next future so that their influence on the mineral dust emissions must be assessed right now. Furthermore, the radiative impact of dust emitted from disturbed soils is considered as a forcing effect to the natural climate system. The AMMA program offers the opportunity to address specific questions related to mineral dust: 1) How much mineral dust is emitted from the Sahel, and what are the main factors controlling the variability of emissions at various time scale? 2) What are the physico-chemical properties of mineral dust and how can they be linked to their spectral optical properties? What is the resulting radiative forcing at the regional scale? The intensive field experiments required to answer these questions will focus on: * The estimation of the mineral dust budget during squall lines in the Monsoon period by coupling numerical dynamical simulations to local measurements of erosion and deposition fluxes, dust

mass concentration and size distribution (ground-based and airborne measurements). * The estimation of mineral dust emissions in the Sahel at the seasonal and interannual time scales using long-term measurements and a regional model of the dust cycle including specific parameterisation for the emissions in semi-arid areas. * The chemical, mineralogical, and physical properties of mineral dust from Saharan and Sahelian source regions, as well as mixed with carbonaceous aerosols from biomass-burning by ground-based and airborne measurements.