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Mineral dust emissions by convective systems: observations and modelling in the framework of the AMMA project

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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.

In the Sahel, dust emissions occur mostly above 10˚N at the beginning of the wet season (May-July), when the strong winds associated to isolated mesoscale convective systems provoke erosion of bare soils. Later in the Monsoon season, soil erosion is prevented by the developing vegetation. To estimate the contribution of the Sahel to

the mineral dust budget at the continental scale, it is therefore necessary to look at the interactions between mineral dust and the convective systems, and at the balance between emissions by gust winds and subsequent scavenging by precipitation.

In this talk the first results on mineral dust emissions due to convective systems in the Monsoon period obtained in the framework of the AMMA project are illustrated. The study is conducted by coupling numerical dynamical simulations to local measurements of erosion and deposition fluxes, dust mass concentration and size distribution (ground-based and airborne).