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Size resolved dust emission fluxes measured in Niger during 3 dust storms of the AMMA experiment

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During the 2006 and 2007 special observing periods of the African Monsoon Multidisciplinary Analysis campaign an original experimental system has been implemented in Banizoumbou (Niger) for measuring the size-resolved dust emission flux in natural conditions and documenting the possible influence of wind speed on its size distribution. The instrumental set-up, associated methodology, and the quality tests applied to the data set are described before the results acquired during 2 events of the Monsoon type and 1 of the convective type are analyzed in detail. In good agreement with the theory of sandblasting, it is found in all cases that saltation must take place for a vertical emission flux to be detected. During a particular erosion event, the magnitude of the vertical flux is controlled by the surface roughness, which conditions the saltation threshold, and by the wind friction velocity. The dust flux released by the high energy convective event is also found to be much richer in very fine ($<2\mu$m) particles than those of the relatively moderate Monsoon events, which shows that aerodynamic conditions definitely influence the initial size distribution of the erosion flux as previously suggested by wind tunnel experiments. However, the size distribution of the dust released by a given event is fairly constant and insensitive to even relatively important variations of u*. This is interpreted as a possible result of the rather long duration (15') over which wind fluctuations must be averaged for computing u*, which could make it an inadequate parameter for representing the very short response-time physical processes that are at the origin of fine dust emission at the measurement sites