Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 7, 2839-2854, 2007
www.atmos-chem-phys.net/7/2839/2007/

Size-segregated fluxes of mineral dust from a desert area of northern China by eddy covariance

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Abstract. Mineral dust emission accounts for a substantial portion of particles present in the troposphere. It is emitted mostly from desert areas, mainly through intense storm episodes. The aim of this work was to quantify size-segregated fluxes of mineral dust particles emitted during storm events occurring in desert areas of northern China (Alashan desert, Inner Mongolia), known to act as one of the strongest sources of mineral dust particles in the Asian continent. Long-range transport of mineral dust emitted in this area is responsible for the high particle concentrations reached in densely populated areas, including the city of Beijing. Based on a theoretical analysis, an eddy covariance system was built to get size-segregated fluxes of mineral dust particles with optical diameters ranging between 0.26 and 7.00 µm. The system was optimised to measure fluxes under intense storm event conditions. It was tested in two sites located in the Chinese portion of the Gobi desert. During the field campaign, an intense wind erosion event, classified as a "weak dust storm", was recorded in one of them. Data obtained during this event indicate that particle number fluxes were dominated by the finer fraction, whereas in terms of mass, coarser particle accounted for the largest portion. It was found that during the storm event, ratios of size-segregated particle mass fluxes remained substantially constant and a simple parameterization of particle emission from total mass fluxes was possible. A strong correlation was also found between particle mass fluxes and the friction velocity. This relationship is extremely useful to investigate mechanisms of particle formation by wind erosion.

Final Revised Paper (PDF, 1631 KB) Discussion Paper (ACPD)

Citation: Fratini, G., Ciccioli, P., Febo, A., Forgione, A., and Valentini, R.: Size-segregated fluxes of mineral dust from a desert area of northern China by eddy covariance, Atmos. Chem. Phys., 7, 2839-2854, 2007. Bibtex EndNote Reference Manager