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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Size-segregated fluxes of mineral dust from a desert area of northern China by eddy covariance" *by* G. Fratini et al.

G. Fratini et al.

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Response to anonymous Referee 1

We have greatly appreciated the general positive comments of the Referee, and the specific questions raised because they have helped us to improve the quality of the paper.

The main comments of the Referee deal with a quantitative evaluation of uncertainties associated with flux measurements, especially for what the reliability of size-resolved measurements is concerned. The referee supports his analyses by looking at the number of particles reaching the OPC. The referee assumes that the total flow rate was 1.42 l min^{-1}. Actually our total flow rate was 28.4 l min^{-1} and only 1/20 of it (1.42 l min^{-1}) was the one used for measuring particles. Consequently, the number

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of particles estimated by the Referee must be multiplied by 20. The Referee also asks for error bars and relative uncertainties. They have been calculated and included in the new version of the manuscript. Data in the corrected Figures show that the uncertainty was 1-10%, during the storm event, whereas it reached values as high as several hundred percents in previous days, when concentrations were much lower. This aspects have been clarified in the new version of the manuscript.

As far as the question of laminar flow is concerned, the flow in our instrument could have been laminar (Re=370), only in the first 3 cm of the line. After this point a turbulent regime was generated (Re= 6820) by adding a flow of clean air (dilution flow) to the sample. This turbulent regime was maintained until the sensor was reached. We have minimized dumping effects by following this approach. The text was modified in order to include this aspect in the new version of the manuscript.

As far as the time response of the OPC is concerned, it can be considered an almost real-time response, because the detector is basically a tube (5.3 mm inner diameter) directly connected to the sampling line, in which the signal is generated by the scattering of light coming from a thin laser beam.

Following the suggestion of the Referee, all plots in the mentioned Figures have been converted from volume into mass.

The Referee asks for clarification on how atmospheric stationarity was evaluated during the storm event. It was tested using the approach described by Foken et al., 2004 (in Lee et al., Handbook of Micrometeorology). This test showed that non-stationarity conditions only sporadically occurred. Because of this, they were not substantially affecting trends obtained during the storm event. The stationarity analysis has been included in the new version of the manuscript.

The Referee requests more details about the effects of gravitational settling and specifically asks how the settling velocity was estimated for optical particle diameters of 1 and 7 μm. The settling velocity for particles subject only to gravity and aerodynamic

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drag was estimated by following the approach of Shao, 2000 (Physics and Modelling of Wind Erosion, Kluwer Acad. Publ.), who also suggests that gravity is negligible with respect to turbulent transport whenever the settling velocity is much lower than the mean Lagrangian velocity of the vertical wind.

The question regarding Section 3.1 arises from the fact that a paragraph present in the original manuscript was missing when it was converted into the discussion paper. The paragraph has been re-included in the new version of the manuscript.

The Referee highlights an inconsistency between data of Fig. 8 and the maximum value of particle number fluxes reported in the text. He is right because the actual number was 3.2x10^{3} particles cm^{-2}s^{-1}, instead of 3x10^{4} particles cm^{-2}s^{-1}. This inconsistency has been corrected in the new version of the manuscript, by introducing the correct value.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 2133, 2007.