

## ***Interactive comment on “Size distributions of mineral aerosols and dust emission flux observed over Horqin Sandy Land area in northern China” by X. Li and H. S. Zhang***

**Anonymous Referee #2**

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Comments on ‘Size distributions of mineral aerosols and dust emission flux observed over Horqin sandy land area in northern China’ by Li and Zhang by reviewer 2

General comments.

This paper presents results of field experiment lasting 2 springs (2010 and 2012 - even if only 2012 measurements are detailed), in the Eastern edge of Horqin desert, China. These measurements rely on a fully instrumented tower, 20 m height, equipped in particular with 4 anemometers, 2 beta gauge sensors (at 3 and 18 m height) to measure dust concentrations, only one cascade impactor at 3 m height and 1 sensit to measure local erosion at 75 cm height.

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As already noticed by reviewer #1, such a device cannot be used to accurately compute size resolved dust flux. The first problem is that there is only 1 impactor. Even if size distribution does not change a lot between the two levels observed by Sow et al. 2009 (note that the y axis is log) the dust concentration was measured between about 2 and 6 m whereas in this study they are between 3 and 18 m that is to say almost 4 times larger. Thus size distribution changes are supposed to be more important. Another problem is the very poor correlation between PM10 mass measured with impactor and with beta gauge device ( $R^2$  is at best 0.6). Authors claimed that the mass underestimation of impactor is equally distributed on its 10 stages. But this is far to be established. For instance coarse particles bounces on the higher stages of impactor are well known. This could lead to mass underestimation of coarse and overestimation of fine particles. Thus detailed information should have been given on the impactor principle. Such a problem in dust distribution measurements by cascade impactor should explained the extremely strange mass size distribution obtained for the Horqin dust. To my knowledge a mass size distribution of desert dust almost dominated by the submicronic particles near desert areas, in a supposed not polluted area, was never observed. This could be a major result, but it must be very precisely demonstrated, that is far to be the case in this paper. He measurement height of saltation (0,75 m) is also questionable: it is clearly too height to detect low intensity local erosion that is the best method to be sure that there is a real vertical flux of dust.

Even if the experimental setup is not perfectly adapted to measure vertical flux, results should, at least, have been very precisely discussed. For example, it seems clear from the fig 4a that there is a failure in dust concentration monitoring at 10:00 at the 18m level. But this is not noticed and vertical flux is computed even if dust concentration tends to 0 during an erosion event! On the same figure at 16:00, I cannot understand how dust concentration can decrease at 18 m height during a clearly established erosion event, whereas 2 hours later in almost the same wind conditions it clearly increases simultaneously with the low level (same observations on fig 8). This raises the question of the PM10 inlet used on the dust monitoring instruments, that is not

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describe. Should it be sensible to the wind intensity, to the wind direction? Or is it the average time (10 mn or 30 mn?) that artificially creates these smoothed peaks?

Another type of questions concerns the measurement of wind parameters. From the figure 1 and the site description, it is clear that the soil surface is far to be flat. In these conditions, the computation of  $Z_0$  and  $U^*$  seems difficult and should at least vary according to the wind direction as observed by Sow et al. 2009.

Thus even if such field measurements are really rare and must be encouraged in the wind erosion research topic, this paper is clearly not suitable for publication.

Other comments:

The Naiman station is not located at  $42^{\circ}27'$  (according to Google Earth!) but at  $42^{\circ}56'$ , thus more than 50 km north...

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 2671, 2013.