Response to comments:

Thank you very much for your comments, which would be very helpful for my research. I have modified some places in the paper according to your suggestion, and the detail as following:

First of all, as you mentioned, it is usually to obtain size-resolved dust emission fluxes $F(D_{di})$ with two methods based on field observations at present. One is the gradient method that requires dust number or mass concentration of different sizes at two various levels at least (e.g. Sow et al., 2009). The other is the eddy co-variance method that is based on the data of wind and temperature turbulence as well as dust concentration by fast response measurements (e.g. Fratini et al., 2007; Schmidt and Klemm, 2008). When these measurements are not available as in most of field experiments, the other way of obtaining $F(D_{di})$ is to compute the total dust (e.g. PM10) emission flux F first, and then compute $F(D_{di})$ using $F(D_{di}) = \int F \cdot p(d) \delta d$, assuming the airborne dust particle size distribution (psd) $p(d)$ is known as a priori (Westphal et al., 1988; Shao et al. 2011). Although $p(d)$ should change with heights, its difference with heights appears not so much for PM20 in surface layer, according to the observed results by Sow et al. (2009), as shown in Fig. 1. Therefore, we can use this method to roughly estimate $F(D_{di})$.

The main purposes of this study are to investigate how the size distribution of dust concentration and dust emission flux changes under different wind conditions (represented with friction velocity u_*) and how dust advection probably affects the size distribution of dust emission flux. The qualitative analysis and relative explanation has been demonstrated based on two dust events occurring on 7 and 19 April 2012. However, the relationship between $p(d)$ and $F(D_{di})$ together with u_* cannot be quantified due to lack of enough samples during dust events measured by quartz crystal microbalance (QCM) cascade impactor. More observations are required to accomplish quantifying the relationship between $p(d)$ and $F(D_{di})$ with u_*.

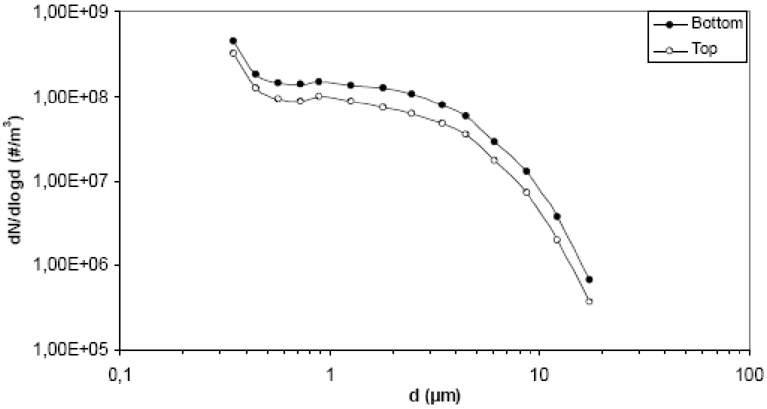

Fig. 1. Averages of the size-resolved particle concentration ($dN/d\log d$) measured at the low (2.1 m) and high (6.5 m) sampling levels during ME1. Note that the concentration at the lowest level is larger than the one at the highest level, which characterizes an upward direct flux and is typical of an erosion event. Cited from Fig. 8. in Sow et al., (2009).

One advantage of this study to make up for the methodology is to obtain the statistical $p(d)$ under clear and dusty days from a long observational periods in springs of 2010 and 2011.The psd on individual dust event is similar to the statistical result, increasing the reliability of the assumption for calculating $F(D_{di})$. The other advantage is that QCM cascade impactor can directly measure the particle mass concentrations of different sizes. In most of previous studies, optical particle counters (OPC) were used to measure dust number concentrations firstly, and then dust mass concentration are calculated with the assumption that dust particles are considered to be spherical. In fact, dust particles have different shapes, so the calculated result of dust mass concentration should be different from the real one.

The dependency of $p(d)$ and $F(D_{di})$ on u_* is difficult to evaluate. Shao et al. (2011) divided psd data into different groups according to u_* values and cannot identify a clear and systematic dependency of psd on u_* based on the mean for each group. More investigations on this subject are necessary. We hope that our results will be useful to understand the effects of u_* on size distribution of airborne dust particles and size-resolved dust emission fluxes as well as the effects of dust advections on them.

For other comments:

1. On page 2674, line 10 – 13: Fratini et al. (ACP, 2007) recently provided size-resolved measurements of the dust flux in China and would be good to cite here.

   Response: Thank you for your recommendation. I have cited this article in my revision.

2. Page 2676, line 5-7: Please add a reference for this description of shortcomings of the QCM cascade impactor.

   Response: The relative reference is added to the revision. "7pp, Instruction manual of air particle analyzer 10 stage QCM Cascade Impactor Model PC-2HX, California Measurements, Inc."

3. Some critical information about the measurements is missing. What was the size distribution of the parent soil? Were non-erodible elements, such as rocks or vegetation, present?

   Response: The information about the soil conditions of observational site is added in the revision, "The medium and fine particles with diameters between 1.0-0.25 mm and 0.25-0.55 mm take over more than 90% of the surface soil particles. The detailed soil components include 22.54% of soil particles with diameter >0.25 mm, 73.68% with diameter between 0.10-0.25 mm, 1.38% between 0.05-0.10 mm, 0.58% between 0.02-0.05 mm, 0.46% between 0.002-0.02 mm, 1.07% with diameters < 0.002 mm (Yi et al., 2007)."

Reference:

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Shao, Y., Ishizuka, M., Mikami, M. and Leys, J. F.: Parameterization of size-resolved dust emission and validation with measurements, J. Geophys. Res., 116, 19 PP., doi:201110.1029/2010JD014527, 2011.

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Yi, X., Zhao, H., Li, Y., Li, Y., Fu, Z.: Wind erosion characteristics of Aeolian soils in Horqin Sandy Land, Journal of Soil and Water Conservation, 20(2), 10-13, 2006.