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Interactive comment on "Parametrization of convective transport in the boundary layer and its impact on the representation of diurnal cycle of wind and dust emissions" *by* F. Hourdin et al.

Z. xuelei

zhangxuelei@neigae.ac.cn

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This manuscript is an interesting article that considering an new parameterization of convective transport in parameterization of turbulent diffusion, and how this affecting dust emission. The authors only considering the turbulent effect on the friction velocity U* by the method of Beljaars and Viterbo (1994), and this will increases the horizontal flux (or dust emission rate).Once considering turbulence effects, both the threshold friction velocity U*Th and the horizontal flux should be amended with the modified factors following Xuan Jie (2004). Thus, the authors should also modify the U*Th in the dust emission module of CHIMERE. The physical dust emission progresses can be

divided into aerodynamic lifting under weak wind conditions, saltation bombardment and aggregates disintegration during strong wind events. While strong dust events are important to the episodic increase in atmospheric dust concentration, the weak but frequent dust events may be more important in maintaining the background dust concentration. It has been reported that, sometimes, dust emission occurs even when the wind speed is lower than the threshold (U*<U*Th)(Loosmore and Hunt, 2000; Park et al., 2011). Vortex effect has been raised to be a possible explanation (Iversen, 2002), i.e. the negative pressure gradient in the center of the dust devil lifts dust particles. More recently, Klose and Shao (2012; 2013; 2014) have studied this turbulent dust emission with a new method of stochastic parameterization. If possible, the authors should also take this parameterization into this manuscript to check the new scheme (NP)and old scheme (SP) in LMDZ5.

References: Xuan J. Turbulence factors for threshold velocity and emission rate of atmospheric mineral dust[J]. Atmospheric Environment, 2004, 38(12): 1777-1783. Loosmore G A, Hunt J R. Dust resuspension without saltation[J]. Journal of Geophysical Research: Atmospheres (1984–2012), 2000, 105(D16): 20663-20671. Park M S, Park S U, Chun Y. Improved parameterization of dust emission (PM10) fluxes by the gradient method using the Naiman tower data at the Horqin desert in China[J]. Science of the Total Environment, 2011, 412: 265-277. Klose, M. and Shao, Y.: Stochastic parameterization of dust emission and application to convective atmospheric conditions, Atmos. Chem. Phys., 12, 7309-7320, doi:10.5194/acp-12-7309-2012, 2012. Klose M, Shao Y. Large-eddy simulation of turbulent dust emission[J]. Aeolian Research, 2013, 8: 49-58. Klose M, Shao Y, Li X, et al. Further development of a parameterization for convective turbulent dust emission and evaluation based on field observations[J]. Journal of Geophysical Research: Atmospheres, 2014, 119(17): 10441-10457.

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