Response to referee #2's interactive comment on the manuscript "Impact of Turbulence on Aeolian Sand and Dust Entrainment: Results from Wind-tunnel Experiment"

The authors designed a novel technique in wind tunnel to measure the entrainment rate of various particle sizes under different flow conditions. They show that quasi-convective turbulence increases the surface shear stress and hence substantially enhances the entrainment of sand and dust particles. It is a very novel experiment design, and the results are very enlightening.

Response: we much appreciate the positive comments from Prof. Cheng.

Comments:

The authors analyzed the power spectrum and PDF of the quasi-convective turbulence, and believed it is similar to convective eddies in atmospheric boundary layers. But from the generation way, the quasi-convective turbulence is more like a kind of coherent structure observed in the atmospheric boundary layer (Liu and Zheng, 2021). Please give some explanation and discussion.

Response: thanks for the insight comment and valuable suggestion. The purpose of the arrangement of fluttering cloth in our experiment is to generate different distribution of surface shear stress which is supposed to be significant for surface particle emission. We verified the implementation effect by measuring the distribution of surface shear stress, and analyzed the wind profile and the wind energy spectrum to expose its influence on the boundary layer flow. We indistinctly call it quasi-convective turbulence without deep analysis on eddy structure. Thanks to the reviewer for reminding that our modeled turbulence is similar to the case observed in the field. We will add some explanation and discussion in the revised version.

In line 119-123, how to get z_{0ABL}?

Response: Z_{0ABL} is set to 3.10 mm, which is suggested to be 2~5mm over concrete, flat desert and tidal flat (Wieinga, 1993). The information is provided in the caption of Figure 2.

In line 141, should "z<0.2m" be "z>0.2m"?

Response: actually it is z<0.2m. We focus on the wind condition close to surface (z<0.2 m), because the wind in this region directly drive soil erosion. And the surface shear stress is deduced form the wind profile below 0.2m in the case without fluttering cloth.

Reference

Liu, H. Y. and X. J. Zheng, 2021. Large-scale structures of wall –bounded turbulence in single- and two-phase flows: advancing understanding of the atmospheric surface layer during sandstroms. Flows, 1 E5.