Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Interaction between Saltating Particles and Turbulent Structures in Wall Region of Boundary Layer[1] WEI ZHU, Lanzhou University, DEPARTMENT OF MECHANICS, LANZHOU UNIVERSITY, KEY LABORATORY OF MECHANICS ON DISASTER AND ENVIRONM TEAM — Interaction between saltating particles and turbulent structures in the wall region of boundary layers was investigated through vertical 4-point measurements of wind fluctuations and sand particle counts synchronously at the Qingtu Lake Observation Array (QLOA) site. The measuring spots were positioned within the sand saltation layer at wall-normal heights of 0.15, 0.2, 0.3 and 0.5m respectively. Based on autocorrelation analysis on the spatial scale of coherent structures, the results show that saltating particles cause the streamwise length scale of coherent structures in the wall region decrease, and the effect introduced by moving particle-phase becomes more obvious as the wall-normal distance decreases. Spectrum analysis on the one-hour wind fluctuations with and without saltating particles shows that saltating particles significantly enhance small-scale turbulent fluctuations while the large-scale motions are weakened in the near wall region. These results indicate that saltating particles destroy the large-scale motions at the bottom of the logarithmic region of the Atmospheric Surface Layer (ASL), which are dissipated into smaller-scale structures.

[1]This research was supported by the grants of the National Natural Science Foundation of China (nos. 11490553, 11702122).

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Date submitted: 31 Jul 2019 Electronic form version 1.4