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Experimental Studies on the Saltating Sand Particle Transport and Wind-Sand Interaction WEI ZHANG, Iowa State University, SANG JOON LEE, Pohang University of Science & Technology, South Korea — Saltation is the major transport mode of wind-blown sand particles, accounting for about 75% of total sand transport through saltation, suspension and surface creep. The complex interactions among the saltating sand particles, the particles on the surface and the turbulent flow have not been fully understood owing to lack of experimental data. Various state-of-the-art flow measurement techniques were applied to comprehensively examine three different types of natural sand in a simulated atmospheric boundary layer. Firstly, digital high-speed photography was used to capture images of the saltating sand particles at 2000 frames per second, which resolved the particle motion adjacent to the sand bed surface. Secondly, instantaneous velocities of the saltating sand particles were extracted from the high-speed particle images using the particle tracking velocimetry (PTV). The particle resultant velocity, concentration and the stream-wise mass flux were evaluated as a function of height. Finally, the velocity fields of wind and wind-blown sand particles were simultaneously measured by using the PTV and the particle imaging velocimetry (PIV), respectively. This experimental study shed new lights on the complicated saltation motion, and will be helpful in enhancing formulation of theoretical models and development of effective control measures of wind erosion.

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