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Experimental analysis of a turbulent boundary layer saturared with saltating sand grains

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The work presented here focuses on the analysis of a turbulent boundary layer saturated with saltating particles. Experiments were carried out in a wind tunnel of 10m long and 1m wide in the university of Aarhus in Denmark. We ran experiments with sand grains of two different sizes (240 and 320 micrometers) for various wind speeds ranging from the threshold speed to twice its value. We analyzed the saltating particles by means of particle image velocimetry (PIV) and were able to extract the vertical profiles of particle distribution and particle velocity.The profiles of particle distribution show a remarkable independence with respect to wind speed and particle diameter, which is to be connected with experimental results on the rebound of a particle onto a packing of static particles. The profiles of particle velocity highlight that the saltating particles are accelerating during all their flight. Finally, by combining the results on the particle distribution and the particle velocity, we computed the profiles of the mass flow rate and compared them with existing results of the literature obtained with other experimental techniques (as the laser Doppler anemometry).