

Abstract Submitted
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Simultaneous tracking of suspended particles and time-resolved PIV in a turbulent boundary layer¹ FILIPPO COLETTI, LUCIA BAKER, University of Minnesota — A detailed picture of the interaction between suspended sediment and the carrier fluid has only recently begun to emerge due to recent advances in experimental and numerical methods. Here we investigate experimentally the dynamics of spherical particles in a turbulent boundary layer in a saltation-suspension transport regime. Particle image velocimetry and particle tracking velocimetry are used to obtain simultaneous, time-resolved fluid velocity fields and particle trajectories. Statistics of particle velocity, particle acceleration, and fluid velocity at particle locations are computed to characterize particle behavior and investigate mechanisms for particle deposition and resuspension. Fluid ejection events near the wall appear to be a main mechanism for particle suspension, while fluid sweeps contribute less to particle deposition. Particle acceleration variance is found to peak markedly near the wall, in response to passing turbulent structures. Resuspension is preceded on average by an increase in streamwise fluid velocity at particle location, while deposition is preceded by a decrease in fluid velocity. Resuspending particles experience much stronger wall-normal acceleration magnitude than depositing particles.

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