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Coherent vortex interaction with a particle-laden boundary layer FERNANDO MORALES, Arizona State University, IFTEKHAR NAQAVI, Queen's University, KYLE SQUIRES, Arizona State University, UGO PIOMELLI, Queen's University — The focus of the current investigations is numerical modeling of particle entrainment in turbulent boundary layers with and without coherent vortices superimposed on the background flow. Simulations are performed using an Euler-Lagrange method in which a fractional-step approach is used for the fluid and with the particulate phase advanced using Discrete Particle Simulation. The first flow field models a rotor wake comprised of gradually introduced coherent vortices into a turbulent boundary layer. The second flow is a turbulent boundary layer without vortices to discriminate and characterize the effect of the vortex structures on the dispersed phase properties. The third case models interaction of a coherent vortex introduced into a stagnant bed of particles. The simulations are performed with two groups of particles having different densities both of which display strong vortex-particle interaction close to the source location, and with mixing of the particles into the boundary layer downstream. Visualizations and statistical descriptors quantify the strong effect of the coherent vortex structures on dispersed phase properties.

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