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Effect of gravitational settling of small heavy particles on two-way interactions in near-wall turbulence JUNGHOON LEE, CHANGHOON LEE, Yonsei University — We investigate particle-fluid interactions during settling of small heavy particles in shear, using direct numerical simulation of turbulent channel flow with a point-force approach. The particle parameters considered are chosen to be identical to those in the available experiment on micrometer-sized water droplets in a horizontal turbulent boundary layer in air (Gerashchenko et al., JFM 2008). In Lagrangian frame, we track each individual particle that is introduced at the edge of the viscous sublayer in the upper part of the channel until its arrival at the channel bottom. Once a particle reaches the bottom wall, a new particle is considered to keep a constant particle volume fraction. Our results indicate that the settling particles enhance the fluid velocity fluctuations associated with downward motions of the fluid. As a result, more vortices are generated farther away from the upper wall, while in the lower side of the channel vortex suppression is observed. Furthermore, we show the development of large-scale streamwise circulations which span almost the channel half width in the upper part of the channel. We also discuss the difference in the two-way interactions between inhomogeneous shear and homogeneous isotropic turbulence.

Junghoon Lee
Yonsei University

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