

Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Modification of particle-laden horizontal channel turbulence

JUNGHOOON LEE, CHANGHOON LEE, Yonsei University — Modification of channel turbulence by small, heavy particles that settle towards the bottom wall under the influence of gravity, interacting with the turbulence is investigated using direct numerical simulations coupled with Lagrangian particle tracking. Particles' momentum transfer to the fluid is implemented via a point-force approximation, and particle-particle interactions are not taken into account in the simulation assuming a dilute suspension. Once a particle reaches the bottom wall, it is removed, and then a new particle is injected at a random location in the very vicinity of the top wall with the vertical terminal velocity and horizontal fluid velocities at the new position, with a focus on particles-turbulence interaction before their deposition. We compare our simulation with the available experimental data to validate the simulation condition used. We discuss modifications of turbulence statistics and coherent structures for various Stokes numbers and identify the role of gravity in the particles-turbulence interaction. Plausible physical mechanisms responsible for the modification behavior are also provided.

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Date submitted: 01 Aug 2016

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