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Four-way coupling simulation of particle-laden turbulent channel flow JUNGHOON LEE, CHANGHOON LEE, Yonsei University — Transport of small inertial particles near a wall in turbulent flows is frequently observed in various engineering applications. In this kind of flow, the gas-phase turbulence level may be modified due to the presence of the particles. Furthermore, for sufficiently high volume fractions, particle-particle interactions strongly influence particle dispersion and thus four-way coupling becomes essential in simulation of particle-laden turbulence. In this study, we investigate inertial particle motion in near-wall turbulence using direct numerical simulations. The effects of inter-particle collisions and particle feedback on the fluid were taken into account in our spectral simulation. It is assumed that inertial particle motion is governed by Stokes drag, lift and gravitationa forces. Particle deposion, velocity and acceleration statistics are discussed for various Stokes numbers and particle volume fractions. The particle Stokes number is defined as the particle response time normalized by the wall units. The Stokes number range considered is 25$\sim$2,000 and particle volume fraction ranges from 3×10^{-6} to 6×10^{-5}. We also compare our numerical results with available experimental measurements. Detailed results will be presented in the meeting.

Changhoon Lee
Yonsei University

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