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Two-way Interactions in Particle-Laden Turbulent Channel Flow¹ CHENG PENG, OSCAR CASTRO, University of Delaware, ORLANDO AYALA, Old Dominion University, LIAN-PING WANG, University of Delaware — Most previous studies of two-way interactions in particle-laden turbulent channel flows were performed using the point-particle approach. Here we present preliminary results on two-way coupling of finite-size particles with turbulence in a channel flow. The lattice Boltzmann approach is used to resolve both the channel flow and the disturbance flows around moving particles. Results of single-phase turbulent channel flows are first compared to published benchmark DNS results to validate the lattice Boltzmann approach. Preliminary results on turbulent particle-laden channel flow are analyzed at three levels: whole-field, phase-partitioned, and profiles as a function of distance from the surface of solid particles. We will examine the effects of finite particle size on the mechanisms of energy production and dissipation. Specifically, the two-way interactions near the channel wall are contrasted with those away from the walls. Results will be compared to those based on the point particle approach. We will also study how the results change with particle size, particle-to-fluid density ratio, and particle volume fraction.

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