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The effect of particle size on the dynamics of a solid particle in a turbulent carrier flow HUI GAO, ORLANDO AYALA, LIAN-PING WANG, University of Delaware — When the particle size is much smaller than the Kolmogorov scale of the carrier flow, the motion of the particle can be described by a point-particle model. Currently, it is not clear how to treat the motion of a solid particle when its size is comparable or larger than the Kolmogorov scale. Here we address this by using a numerical solution from a particle-resolved simulation code for a freely-moving finite-size particle suspended in a turbulent background flow. The code is based on the multiple-relaxation-time lattice Boltzmann equation. The no-slip boundary condition on the moving particle boundary is handled by a second-order interpolated bounce-back scheme. The populations at a newly converted fluid node are constructed by the equilibrium distribution with non-equilibrium correction. The main purpose here is to extend some recent advances made regarding the finite size effects on a buoyant particle to finite-size heavy or light particles where both inertial effect and finite-size effect are important. We will present results for different particle sizes relative to the Kolmogorov (or Taylor) microscale and different particle to fluid density ratios. The force acting on the particle and particle velocity and acceleration statistics will be discussed.

Lian-Ping Wang
University of Delaware

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