Abstract Submitted
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Study of Local Profiles Relative to the Particle Surface in a Forced Particle-Laden Turbulent Flow[1] OSCAR CASTRO, University of Delaware, ORLANDO AYALA, Old Dominion University, LIAN-PING WANG, University of Delaware, LIAN-PING WANG COLLABORATION, ORLANDO AYALA COLLABORATION — Turbulent flows laden with solid particles, liquid droplets, or air bubbles are relevant to many engineering applications and biological and environmental processes. 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 interaction of a solid particle with the carrier flow when its size is comparable or larger than the Kolmogorov scale. Here we address the interaction of finite-size particles with the carrier fluid turbulence using lattice-Boltzmann-based, particle-resolving simulations. Our recent results (Comput. & Math. with Applications, DOI: 10.1016/j.camwa.2013.04.001) on forced turbulence laden with non-sedimenting solid particles at a particle-to-fluid density ratio of 5, solid volume fraction of 0.102, and particle diameter to Kolmogorov length ratio of 8.05 reveal that the enhanced viscous dissipation is related to the local flow profiles near the particle surface. Here we repeat this simulation and present more accurate local profiles by averaging over time in addition to space. We will also analyze how such profiles change with the particle volume concentration and the particle size relative to the Kolmogorov scales.

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