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Simulation of finite size particles in turbulent flows using entropic lattice boltzmann method[1] ABHINEET GUPTA, HERMAN J. H. CLERCX, FEDERICO TOSCHI, TU Eindhoven — Particle-laden turbulent flows occur in variety of industrial applications. While the numerical simulation of such flows has seen significant advances in recent years, it still remains a challenging problem. Many studies investigated the rheology of dense suspensions in laminar flows as well as the dynamics of point-particles in turbulence. Here we will present results on the development of numerical methods, based on the Lattice Boltzmann method, suitable for the study of suspensions of finite-size particles under turbulent flow conditions and with varying geometrical complexity. The turbulent flow is modeled by an entropic lattice Boltzmann method, and the interaction between particles and carrier fluid is modeled using bounce back rule. Direct contact and lubrication force models for particle-particle interactions and particle-wall interaction are taken into account to allow for a full four-way coupled interaction. The accuracy and robustness of the method is discussed by validating velocity profile in turbulent pipe flow, sedimentation velocity of spheres in duct flow and resistance functions of approaching particles. Results show that the velocity profiles and turbulence statistics can be significantly altered by the presence of the dispersed solid phase.

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