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Preferential Concentration Of Solid Particles In Turbulent Horizontal Circular Pipe Flow[1] JAEHEE KIM, KYUNG-SOO YANG, Inha University — In particle-laden turbulent pipe flow, turbophoresis can lead to a preferential concentration of particles near the wall. To investigate this phenomenon, one-way coupled Direct Numerical Simulation (DNS) has been performed. Fully-developed turbulent pipe flow of the carrier fluid (air) is at $Re_\tau = 200$ based on the pipe radius and the mean friction velocity, whereas the Stokes numbers of the particles (solid) are $St^+ = 0.1,\ 1,\ 10$ based on the mean friction velocity and the kinematic viscosity of the fluid. The computational domain for particle simulation is extended along the axial direction by duplicating the domain of the fluid simulation. By doing so, particle statistics in the spatially developing region as well as in the fully-developed region can be obtained. Accumulation of particles has been noticed at $St^+ = 1$ and 10 mostly in the viscous sublayer, more intensive in the latter case. Compared with other authors' previous results, our results suggest that drag force on the particles should be computed by using an empirical correlation and a higher-order interpolation scheme even in a low-Re regime in order to improve the accuracy of particle simulation.

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