

Abstract Submitted
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Direct numerical simulation of particles in a turbulent channel flow ANKIT TYAGI, VISHWANATHAN KUMARAN, Indian Institute of Science — Goswami and Kumaran(2009a,b,2011a) studied the effect of fluid turbulence on particle phase in DNS. However, their studies were restricted to one way coupling where the effect of particles on fluid turbulence was not incorporated. We have extended their work by formulating a reverse force treatment through multipole expansion for the particle disturbance to the fluid turbulence. Here, the fluid velocity, strain rate and rotation rate at the particle position are used, as a far field, to calculate the disturbance caused by the particle and relaxing the point particle approximation. The simulations are done at high Stokes number where the fluid velocity fluctuations are uncorrelated over time scales of the particle dynamics. The results indicate that the particle mean velocity and stress are reduced when reverse force is incorporated. Level of reduction increases with mass loading and Stokes number. The variance of particle distribution function is reduced due to reduction in the fluid turbulent intensities. The particle velocity, angular velocity distribution function and stresses are compared for simulations where only the reverse force is incorporated, and where the dipoles are also incorporated, to examine the effect of force dipoles on the fluid turbulence and the particle distributions.

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