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Characteristics of drag and lift forces of a finite-sized particle in isotropic turbulence[1] JUNGWOO KIM, S. BALACHANDAR, University of Florida — In the problem of particle-laden flows, the prediction of drag and lift forces acting on the particle in the presence of turbulence is one of the most important issues. In order to investigate the effect of turbulence at the level of a single particle, we perform direct numerical simulations of an isolated particle subjected to free-stream turbulence, following Bagchi & Balachandar (2003). The particle Reynolds number ranges from 100 to 350. At each particle Reynolds number, the turbulent intensity is about 5-20 percent of the mean relative particle velocity and the corresponding diameter of the particle is comparable to or larger than the Kolmogorov scale. In this study, the instantaneous force is decomposed into the drag and lift forces. Then, the statistical characteristics of the forces are investigated. The present result shows that the use of the stationary sphere drag as quasi-steady force improves the estimation of the drag force as compared to the Schiller-Neumann drag correlation. In addition, the modification of wake dynamics due to turbulence and its relation to the forces acting on the particle is presented. We also investigate the case of a freely moving particle and explore its effect.

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Jungwoo Kim
University of Florida

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