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Effects of Deterministic and Stochastic Forcing Schemes on Inertial Particle Statistics in DNS of Isotropic Turbulence ROHIT DHARIWAL, KIRUTHIKA SUNDARARAJAN, SARMA L. RANI, Univ of Alabama - Huntsville — In DNS of isotropic turbulence, statistical stationarity is achieved through a forcing scheme that supplies energy to the large scales. These schemes may be broadly classified into deterministic and stochastic forcing schemes. In the deterministic scheme, the turbulent kinetic energy dissipated during a time step is resupplied, whereas in stochastic schemes, forcing is determined based on the evolution of Ornstein-Uhlenbeck processes. Both approaches add the forcing within a band of wavenumbers at the low-wavenumber end of the energy spectrum. The goal of this study is to investigate the effects of the two forcing schemes on the flow, and on the relative motion statistics of inertial particles in forced isotropic turbulence. An important parameter in stochastic forcing is the forcing time scale T_F. DNS was performed using both forcing schemes for $T_F = T_E/4,\ T_E/2,\ T_E,\ 2T_E,\ 4T_E$. Here T_E is the large eddy turnover time obtained from the DNS with deterministic forcing. Three Taylor micro-scale Reynolds numbers $Re_\lambda = 76,\ 131,\ 195$, and twelve particle Stokes numbers based on the Kolmogorov time-scale, $St_\eta = 0.05$ to 40 are considered. Detailed analysis of the effects of forcing time scales on both fluid and particle statistics is undertaken.

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