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INSTITUT DE MECANIQUE DES FLUIDES - Amphi Nougaro
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ON THE EFFECTS OF FINITE-SIZE SOLID PARTICLES ON DECAYING ISOTROPIC TURBULENCE

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The objective of the present study is to investigate the two-way coupling effects of freely-moving finite-size solid spherical particles on decaying isotropic turbulence. We perform direct numerical simulation to resolve all the scales of the turbulent motion including the flow around each moving particle. We use the immersed boundary method on a uniform staggered mesh of 256^3 grid points with an initial microscale Reynolds number, $Re_\lambda = 75$. The particle diameter $d = 32\eta$ (at time t = 1), and $\tau_p / \tau_k = 144$, where τ_p , η and τ_k are respectively the particle response time, and the Kolmogorov length and time scales. The number of the dispersed particles is 88 for $\phi_V = 0.01$, and 884 for $\phi_V = 0.1$, where ϕ_V is the volume fraction of the dispersed phase. The material density of the solid particles is 2.56 times that of the carrier fluid. The modifications of the decay rate and the spectra of the turbulence kinetic energy and its dissipation rate are discussed.

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