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Finite-size particles in turbulence: effect of particle shape and rotational dynamics[1] GABRIELE BELLANI, KTH Mechanics, Stockholm, Sweden, EVAN A. VARIANO, UC-Berkeley, CEE department, Berkeley (CA), USA — In this laboratory study we investigate the two-way coupling between rigid particles and homogeneous isotropic turbulence. Turbulence Reynolds number is $\mathrm{Re}_\lambda \approx 350$ and the particle length and time scales are within the inertial sub-range. We focus on the effects of particle shape and rotation. Rotational dynamics play an important role in inter-phase momentum exchange, especially for non-spherical particles. A novel technique resolves particle velocity and rotation, simultaneously with fluid-phase velocities. From these measurements we analyze the inter-phase coupling of both translational and rotational motion. Analysis includes correlations between particle motion and the surrounding fluid, wake dynamics, and particle motion statistics. Effect of particles on the turbulent flow is investigated from the fluid-phase turbulent kinetic energy and dissipation rates.

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