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Buoyancy effects on rotation and translation of large particles in turbulent flow MARGARET BYRON, YIHENG TAO, EVAN VARIANO, University of California Berkeley — We use laboratory experiments to investigate the effects of homogeneous, isotropic turbulence on particles of varying buoyancy, size, and shape. The buoyancy is varied between a specific gravity of 1.001 and 1.05. All particles are roughly 1 cm, which in this flow is close to Taylor's turbulent microscale. We vary the shape to compare spherical particles to non-spherical particles while matching the settling velocity, volume, and/or surface area. Particles are fabricated in custom shapes using transparent hydrogels whose refractive index is close to water. We embed tracers within the particles and use PIV to image the interior of the particle simultaneously with the exterior flowfield of homogeneous isotropic turbulence, generated by two active-grid synthetic jet arrays. We find that the settling velocity of these particles, regardless of shape, is reduced relative to the quiescent settling velocity as predicted by the Clift-Gauvin model. We explore the distribution of rotation rates, as characterized by the variance of angular velocity. We find significant anisotropy in the angular velocities of negatively buoyant particles, which vanishes as particles approach neutral buoyancy. We also see differences in angular velocity distribution between particles of varying eccentricity.

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