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Spin, slip, and settle: effects of shape on motion for Taylor-scale particles in homogeneous isotropic turbulence MARGARET BYRON, YI-HENG TAO, ISABEL HOUGHTON, EVAN VARIANO, University of California Berkeley — We fabricate hydrogel cylinders of varying aspect ratios and suspend them in homogeneous isotropic turbulence at high Reynolds number. Cylinders are nearly neutrally buoyant and refractive-index-matched to water, with characteristic lengthscales that are close to the Taylor microscale. We simultaneously image these cylinders and the surrounding fluid for stereoscopic PIV measurement, permitting calculation of instantaneous particle slip velocity. We measure the particles' settling velocity in quiescent flow and compare this to both the calculated slip velocities and empirically-predicted settling velocities. Particle rotation is determined via the solid-body rotation equation and compared with fluid-phase properties (vorticity, shear, et al). We find that the aspect ratio of the cylinder has only a weak effect on its expected value of angular velocity magnitude, and further examine the influence of aspect ratio on slip and settling velocities. Lastly, we discuss applications of our results to problems of underwater navigation in aquatic organisms.

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