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Turbulence modulation by Taylor-scale particles: in search of a universal parameter GABRIELE BELLANI, JEFF SEMIGRAN, MARGARET BYRON, EVAN VARIANO, University of California Berkeley — In this work we investigate turbulence modulation effects by Taylor microscale-sized particles in homogeneous isotropic turbulence. We present a novel experimental technique that allows us to explore a wide range of parameters in terms of particle shape and concentration. In lab experiments we perform Particle Image Velocimetry on both the fluid phase and cross-sections of suspended particles. These measurements yield the fluid-phase velocity, linear and angular velocities of the particles, as well as the detail of the flow near the particle interface. We report turbulence modulation effects as function of particle shape and concentration. These include change in turbulent kinetic energy, mean dissipation rates, and spectral analysis. The results are normalized using various scaling factors, in an attempt to find a universal parameter that describes turbulence modulation for particles of any shape and size. The details of the interphase-coupling mechanisms are also investigated by comparing statistics of particle translation and rotation rates to statistics of the fluid-phase velocity field at various length scales.

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