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Numerical studies on the rise of microscopic oil droplets in high intensity isotropic turbulence MURRAY SNYDER, United States Naval Academy — The rise of small oil droplets in water under three different isotropic turbulence conditions is analyzed. The simulations focus on explaining the puzzling behavior observed by both Friedman and Katz [Phys. Fluids **14**, 3059 (2002)] and Gopalan *et al.* [Phys. Fluids **20**, 095102 (2008)], specifically, the size dependent enhanced or suppressed rise of small oil droplets in turbulence. Both showed that droplets with diameters smaller than approximately 900 microns exhibited enhanced rise when compared with quiescent rise behavior. Conversely, they observed that larger droplets exhibited retarded rise in turbulence versus quiescent conditions. Snyder *et al.* [Phys. Fluids **20**, 073301 (2008)] showed that the experimental results of Friedman and Katz could be captured using a 128^3 direct numerical simulation with a dynamical droplet equation of motion. Snyder *et al.*, however, used non-physical approximations that drag and virtual mass coefficients depend upon mean turbulence intensity or droplet size. Enhanced computations have been done with both 128^3 and 1024^3 direct numerical simulations using the commonly observed correlation that drag and virtual mass coefficients vary with droplet Reynolds number. These computations show that the observed experimental behavior can be approximately captured using Reynolds number dependent drag and virtual mass coefficients for Kolmogorov microscales of 60-180 microns.

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