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Experimental Studies of the Dynamics of Breakup for Immiscible Liquid Droplets in a Sheared Turbulent Flow CHIN HEI NG, ALBERTO ALISEDA, University of Washington — Breakup of a dispersed phase in a turbulent flow is a classical problem in multiphase flow with multiple applications to industrial and environmental processes. Most turbulent breakup models are inspired by Kolmogorov-Hinze theory, and assume the breakup is the result of the interaction between a droplet and an eddy of similar length scale. There are, however, conditions in which a droplet is stretched by the mean shear into long ligaments before break-up. The stretched droplet has a length scale larger than the inertial subrange, and collides with multiple eddies of different sizes that produce direct pinch off, or Raleigh-Plateau instability. We present experiments in which various immiscible liquids were injected in a well-characterized turbulent round jet at different Weber and Ohnesorge numbers. Droplet size distributions are compared to classical results from breakup dominated by surface tension system and to existing turbulent breakup models. Breakup characteristics, such as the breakup time and daughter particle size distribution, are obtained from breakup tracking of high-speed video images. The dependency of the breakup statistics on the relevant non-dimensional parameters that dominate the process are investigated.

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