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Scaling During Drop Formation and Filament (Thread) Breakup

BRAYDEN WAGONER, SUMEET THETE, OSMAN BASARAN, School of Chemical Engineering, Purdue University — Many free surface flows such as drop formation, filament (thread) breakup, and drop coalescence are important in applications as diverse as ink jet printing, atomization, and emulsion science and technology. A common feature of these flows is that they all exhibit finite time singularities. When a liquid filament undergoes capillary thinning and tends toward pinch-off, it is instructive to monitor how certain quantities, such as the threads radius, vary with time remaining until the pinch-off singularity. Experimental determination of this so-called scaling behavior of thread radius and other quantities is important for testing scaling theories and the accuracy of numerical simulations of free surface flows. Conversely, the experimental measurements can be used to develop new theories when none are available. In this talk, we will present some novel ways of experimentally measuring scaling behaviors. The results will be highlighted in terms of experiments involving the formation and breakup of drops and filaments of (a) simple or pure Newtonian fluids and also (b) particle-laden liquids or suspensions containing non-Brownian particles.

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