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The Many Fates of Retracting Newtonian Filaments CHRISTOPHER ANTHONY, SUMEET THETE, MICHAEL HARRIS, OSMAN BASARAN, Purdue University — The retraction of Newtonian filaments plays a central role in applications as diverse as inkjet printing and atomization where formation of satellite droplets is undesirable. In order to avoid satellite drop production, filaments formed after drop, jet, or sheet breakup should contract to spheres without undergoing further pinch-off. Therefore, it is important to understand all of the dynamical responses that can arise during filament recoil. To accomplish this goal, we use high accuracy simulations to analyze the retraction of Newtonian filaments in a passive ambient fluid. Previously, Notz and Basaran described the fate of low-viscosity filaments. More recent works by Hoepffner and Pare on intermediate viscosity filaments and by Lohse et al. on high viscosity filaments have greatly enhanced our understanding of filament recoil. Unfortunately, taking all of these works in aggregate does not provide a comprehensive picture of filament dynamics. Here, we overcome the deficiencies of these earlier studies to provide a comprehensive analysis of filament recoil and arrive at a complete phase diagram of the system response. While doing so, we also uncover a new mode of filament breakup that has been missed by earlier investigators.

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