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Non-Newtonian bubbles: dynamics of colloidal film rupture PHALGUNI SHAH, SRISHTI ARORA, MICHELLE DRISCOLL, Northwestern University — A Newtonian soap bubble ruptures on the timescale of milliseconds, and this rupture grows at a constant rate [1]. Inspired by recent work [2] where films with high surfactant concentration developed crack-like instabilities during rupture, we investigate whether soap films with colloidal particles (˜1 micron) show similar behavior. We rupture a flat film containing surfactant and colloidal spheres using a needle and record it with a high-speed camera at 83,000 frames per second. By varying colloidal volume fraction, we can access a wide range of non-Newtonian behavior. We find that rupturing colloidal films exhibit a wide variety of instabilities, and their occurrence is sensitive to film thickness. We systematically study film rupture dynamics as a function of film thickness and colloidal volume fraction. Surprisingly, the rupture opens at a constant rate even at high colloidal volume fraction, but this rate is significantly slower than the Culick velocity. [1] F. E. C. Culick, Journal of Applied Physics(1960), [2] Petit, P., Le Merrer, M., & Biance, A., Journal of Fluid Mech(2015)

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