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Combined effects of finite plate thickness and acceleration rates on Rayleigh-Taylor instability in elastic-plastic materials.[1] ARINDAM BANERJEE, RINOSH POLAVARAPU, AREN BOYACI, Lehigh University — Majority of theoretical and computational studies of Rayleigh-Taylor instability (RTI) in solid-fluid interfaces assume the materials to be incompressible with infinite/semi-infinite thickness subjected to a constant driving acceleration. A recent theoretical study by Piriz et al. (PRE \textbf{95}, 053108, 2017) has explored finite thickness effects using an impulsive acceleration profile where the initial rate of increase in the driving pressure is nearly infinite. In previous studies, our group has addressed the independent effects of the finite plate/slab thickness and finite rate of increase in driving acceleration (pressure). In this talk, we will address the combined effects of both the aforementioned parameters on RTI by employing the soft solid (mayonnaise)-air interface using our rotating wheel experimental setup. A set of experiments was run at four different acceleration rates in combination with three test-section container halves of varying depths using initial conditions with different wavelengths and amplitudes. The aggregate effects of these parameters on interface growth were quantified in terms of instability acceleration, which signifies the material transition from elastic-plastic regime to the viscous regime. In addition, the growth rates for each experiment are determined and compared to the existing theoretical models which tackle the RTI problem in solids.

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