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Revised Froude number for Rayleigh-Taylor flow with secondary instabilities KARTHIK MAHADEVAN MUTHURAMAN, PRAVEEN RAMAPRABHU, UNC Charlotte, GUY DIMONTE, Los Alamos National Laboratory, PAUL WOODWARD, University of Minnesota, CHRIS FRYER, GABE ROCKEFELLER, Los Alamos National Laboratory, YUAN-NAN YOUNG, NJIT
— Recent simulations [1] and experiments [2] have shown the late-time Rayleigh-Taylor (RT) saturation velocity is sensitive to the appearance of secondary Kelvin-Helmholtz (KH) vortices. Specifically, RT bubbles experience a late surge due to the induced velocity of the KH vortices and saturate at a Froude number twice that predicted by potential flow models [3]. We describe this picture with a simple toy model that idealizes the KH rollups as a pair of counter-rotating point vortices. From classical linear theory, the KH growth rates depend on several parameters such as viscosity, surface tension, and density difference between the fluid streams. We have studied the influence of these parameters on the fundamental RT mode using high aspect ratio, single mode numerical simulations, and will discuss our findings. At very late time, turbulent mixing occurs due to further instabilities. The results are expected to be of relevance to turbulent mix models that are based on bubble growth and merger.[1] Ramaprabhu, P. et al. 2006, Physical Review E. 74, 066308. [2] Wilkinson, J.P. & Jacobs, J.W. 2007, Phys. Fluids 19, 124102. [3] Goncharov, V.N. 2002 Physical Review Letters 88, 1345021.

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