Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Surfactants and the Rayleigh-Taylor instability of Couette type flows A.L. FRENKEL, D. HALPERN, A.S. SCHWEIGER, The University of Alabama — We study the Rayleigh-Taylor instability of slow Couette- type flows in the presence of insoluble surfactants. It is known that with zero gravity, the surfactant makes the flow unstable to longwave disturbances in certain regions of the parameter space; while in other parametric regions, it reinforces the flow stability (Frenkel and Halpern 2002). Here, we show that in the latter parametric sectors, and when the (gravity) Bond number Bo is below a certain threshold value, the Rayleigh-Taylor instability is completely stabilized for a finite interval of Ma, the (surfactant) Marangoni number: $\mathrm{Ma}_L<\mathrm{Ma}_1<\mathrm{Ma}<\mathrm{Ma}_2$. For $\mathrm{Ma}<\mathrm{Ma}_L$, the instability is longwave: the finite interval of unstable wavenumbers borders on the zero value. For $\mathrm{Ma}>\mathrm{Ma}_2$, and also for $\mathrm{Ma}_L<\mathrm{Ma}<\mathrm{Ma}_1$, the instability is "midwave": the interval of unstable wavenumbers is bounded away from both the zero and infinity. By numerical and asymptotic means, we determine typical dispersion curves and also characteristic dependencies such as the critical Marangoni numbers Ma_L, Ma_1, and Ma_2 as functions of the Bond number. We note that (for an interval of the Bond number) there are two distinct criticalities with nonzero (and distinct) critical wavenumbers.

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Date submitted: 10 Aug 2011 Electronic form version 1.4