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Correction of Lamb's dissipation calculation for the effects of viscosity on capillary-gravity waves JUAN C. PADRINO, DANIEL D. JOSEPH, Aerospace Engineering and Mechanics Department, University of Minnesota, Minneapolis, 55455, MN — Purely irrotational theories of the flow of a viscous liquid are applied to model the effect of viscosity on the decay and oscillation of capillarygravity waves. In particular, the dissipation approximation used in this analysis gives rise to a viscous correction of the frequency of the oscillations which was not obtained by Lamb's [H. Lamb, Hydrodynamics (Cambridge University Press, Cambridge, UK, 1932) (reprinted in 1993)] dissipation calculation. Moreover, our dissipation method goes beyond Lamb's in the sense that it yields an eigenvalue relation for the entire continues spectrum of wave numbers. Comparisons are presented between the purely irrotational theories and Lamb's exact solution, showing good to reasonable agreement for long, progressive waves and for short, standing waves, even for very viscous liquids. The performance of the irrotational approximations deteriorates within an interval of wave numbers containing the cutoff where traveling waves become standing ones.

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