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Kelvin-Helmholtz instability of a thin liquid sheet: Effect of the gas-boundary layer[1] MAHESH TIRUMKUDULU, Department of Chemical Engineering, IIT Bombay — It is well known that when a thin liquid sheet moves with respect to a surrounding gas phase, the liquid sheet is susceptible to the Kelvin-Helmholtz instability. Here, flow in both the liquid and the gas phases are assumed to be inviscid. In this work, we include exactly via a perturbation analysis, the influence of the growing boundary layer in the gas phase in the base flow and show that both temporal and spatial growth rates obtained from the linear stability analysis are significantly reduced due to the presence of the boundary layer. These results are in line with the simulation results of Lozano et al [1] and Tammisola et al[2]. We conclude with the implication of these results on the break-up of radially expanding liquid sheets.

1. A. Lozano, F. Barreras, G. Hauke, and C. Dopazo, Longitudinal instabilities in an air-blasted liquid sheet, J. Fluid Mech. 437, 143 (2001).
2. O. Tammisola, A. Sasaki, F. Lundell, M. Matsubara, and L. Sderberg, Stabilizing effect of surrounding gas flow on a plane liquid sheet, J. Fluid Mech. 672, 5 (2011).

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