Abstract Submitted
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On the stability of two-layer channel flow AHMED KAFFEL, University of Maryland — The effects of the viscosity, density and surface tension on the hydrodynamic instability of a two-layer viscous stratified shear flows are investigated through a linear stability analysis. In a first stage, we consider the case of isothermal, non-adiabatic, parallel two phase flows. The system of equations for stability are derived and solved numerically using the Chebyshev collocation spectral method. This algorithm is computationally efficient and accurate in reproducing the eigenvalues. The derivation of the asymptotics of these modes shows that our numerical eigenvalues are in agreement with the analytic formula obtained by Yih (1967), Kao and Park (1972), Stergios et al (1988), Pritchard et al (1992) and Pelekasis and Tsamopoulos (2001). These numerical stability results will be used for hydrodynamic problems as a tool to validate the direct numerical solver that solves the coupled two-phase liquid vapor flow dynamics with phase change to characterize the physical mechanisms underlying the quality-heat transfer relationship and thus facilitate the design of microgap channel coolers for specific two-phase heat transfer applications.

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