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Revisiting the stability analysis of miscible shear flow in the inertialess regime LAURENT TALON, FAST CNRS, DOMINIQUE SALIN, FAST UPMC Paris6, ECKART MEIBURG, UCSB — Inertia is responsible for the shear instability between two immiscible fluids of different viscosities (growth rate proportional to Re). For the two miscible fluids case, molecular diffusion leads to a transition layer of intermediate viscosity between the two fluids. For moderate Peclet number (small mixing layer) and finite Reynolds number, it has been shown, (P. Ern et al JFM 496, 2003) that mixing stabilizes the inertial instability. Here, we investigate numerically the stability of miscible viscous flow in the inertialess regime (Re=0). Surprisingly, we do observe that this system can also be unstable at intermediate wavenumber depending on the position and the thickness of the pseudo-interface. By solving the LSA for a modeled flow consisting of three layers of immiscible fluids (without surface tension) with different viscosities at Re=0. This simplified model showes that the instability observed in the miscible case is due to the viscosity stratification of the base state.

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