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Nonmodal Growth Of Kelvin-Helmholtz Instability In Compressible Flows MONA KARIMI, SHARATH GIRIMAJI, Texas A&M Univ. — Kelvin-helmholtz instability (khi) is central to the vertical mixing in shear flows and is known to be suppressed in compressible flows. To understand the inhibition of mixing under the influence of compressibility, we analyze the linear growth of khi in the short-time limit using initial value analysis. The evolution of perturbations is studied from a nonmodal standpoint. As the underlying suppression mechanism can be understood by considering primarily linear physics, the effect of compressibility on khi is scrutinized by linear analysis. Then its inferences are verified against direct numerical simulations. It has been demonstrated that compressibility forces the dominance of dilatational, rather than shear, dynamics at the interface of two fluids of different velocities. Within the dilatiatonal interface layer, pressure waves cause the velocity perturbation to become oscillatory [karimi and girimaji, 2016]. Thereupon, the focus is to examine the effect of the initial perturbation wavenumber on the formation of this layer and eventually the degree of khi suppression in compressible flows. We demonstrate that the degree of suppression decreases with the increase the wavenumbers of the initial perturbation of dilatational, rather than shear, dynamics at the interface of two fluids of different velocities. Within the dilatiatonal interface layer, pressure waves cause the velocity perturbation to become oscillatory [karimi and girimaji, 2016]. Thereupon, the focus is to examine the effect of the initial perturbation wavenumber on the formation of this layer and eventually the degree of khi suppression in compressible flows. We demonstrate that the degree of suppression decreases with the increase the wavenumbers of the initial perturbation.

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