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Non-linear effects in the combined Rayleigh-Taylor and Kelvin-Helmholtz Instabilities[1] BRITTON OLSON, JOHAN LARSSON, SANJIVA LELE, Stanford University — The combined Rayleigh-Taylor (RT) and Kelvin-Helmholtz (KH) Instability has been studied extensively in the linear regime. We have performed studies outside the linear regime by means of Direct Numerical Simulation (DNS) and Large-Eddy Simulation (LES) where relatively little attention has been devoted. Motivation for research in this area has traditionally been plasma physics applications such as Inertial Confinement Fusion (ICF) and Type-1a supernovae collapse. Results of linear stability analysis for a discontinuous interface which combines RT with KH show that for all parameters defining the instabilities, shear addition will increase the growth rate of the RT instability. Our results show that outside this linear regime, shear in fact does mitigate the spreading rate of the RT mixing region. We present a physical explanation of this phenomenon and simple scaling laws which provide a collapse of the data. We further provide a method for determining the optimal amount of velocity shear that will effectively minimize the early time peak mixing rate.

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