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On the universality of dissipation mechanisms in mixing ANDREW LAWRIE, STUART DALZIEL, University of Cambridge — We consider partitioning of energy in incompressible miscible variable density flows and in particular choose to distinguish between energy that is dissipated due to viscosity, and that which performs mixing. Variable density fluids exhibit a change in potential energy exclusively associated with mixing, as well as an overall change due to the system relaxation. The relationship between these energies provides a global measure of mixing efficiency that can be easily diagnosed from experiments and comparable simulations. Rayleigh-Taylor instability is one of the most efficient mechanisms for mixing: typically half of the initially available potential energy is used in doing so, an efficiency of 50%. Unfortunately initial and final states in a Rayleigh-Taylor unstable flow are such that, by construction, mixing efficiency is bounded at 50%. Our new configuration has an energetically admissible end-state that could be achieved if the mixing efficiency were 75%, but our experiments show that despite the possibility of achieving a higher mixing efficiency, the system once more relaxes to 50%. We conclude that the processes governing the distribution of energy are micro-scale, and not pre-determined by initial conditions.

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