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Estimates of molecular mixing in confined Rayleigh-Taylor instability ANDREW LAWRIE, University of Bristol, STUART DALZIEL, University of Cambridge — We examine the behaviour of a system in which a RT unstable interface is confined between stable continuous stratifications. Recent experiments with linear stratifications (Lawrie & Dalziel 2011, JFM) indicate an intrinsic limit to a fluid's ability to mix, which here can be measured robustly between quiescent initial and final states. Standard incompressible ILES does not match well because it cannot respect the balance of energy conversions observed in experiment. ILES operates with Sc=O(1), whereas Sc=700 in our experiments. Lawrie & Dalziel detailed the relation between the p.d.f. of the density field and the availability of energy in the system. Here we extract the evolution of the p.d.f. over the life-cycle of the instability, and thus quantify the ILES mixing estimates in both 2D and 3D RT cases. In 3D, energy cascades to small scales, so the stretching of material surfaces that it induces tends to occur at comparable scales and this is the optimal condition for doing mixing. In 2D, however, energy accumulates at large scales and thus material surfaces do not become so rapidly stretched. We view the 2D case as an analogue for high Schmidt number behaviour, and this helps us understand the modelling approximations in 3D cases.

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