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Mixing and scaling of accelerated interfaces

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Rayleigh-Taylor (RT) instability occurs when a layer of dense fluid is placed on top of a less dense layer in a gravitational field or are accelerated. The instability forms a turbulent front between
the two layers, but some patterns seem to have a persistent memory of the initial conditions as turbulence develops. The advance of this front is described in Linden & Redondo (1991), and may be shown to follow a quadratic law in time.

The width of the growing region of instability is proportional to the Atwood number but the distribution of fractal interfaces between the miscible fluids allow to distinguish the dominant mixing regions located at the sides of the RT blobs, where accelerated shear is greatest. A Large Eddy Simulation numerical model is used to predict some of the features of the experiments, different models
on the interaction of the bubble generated buoyancy flux and on the boundary conditions are compared with the experiments.

The aspect ratios of the bubble induced convective cells and some mixing descriptors are also seen to depend on the boundary conditions applied to the enclosure. The influence of the initial conditions on the structure of the flow and its mixing ability are investigated by means of image analysis, PIV and scaling analysis to determine the regions of
the front which contribute most to molecular mixing.