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Experimental growth of inertial forced Richtmyer-Meshkov instabilities for different Atwood numbers

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Richtmyer–Meshkov instability occurs when a shock wave impinges on an interface separating two fluids having different densities [1,2]. The instability causes perturbations on the interface to grow, bubbles and spikes, producing vortical structures which potentially result in a turbulent mixing layer.
In addition to shock tube experiments, the incompressible Richtmyer–Meshkov instability has also been studied by impulsively accelerating containers of incompressible fluids. Castilla and Redondo (1994) [3] first exploited this technique by dropping tanks containing a liquid and air or two liquids onto a cushioned surface. This technique was improved upon by Niederhaus and Jacobs (2003)[4] by mounting the tank onto a rail system and then allowing it to bounce off of a fixed spring. A range of both miscible and inmiscible liquids were used, giving a wide range of Atwood numbers using the combinations of air, water, alcohol, oil and mercury. Experimental results show the different pattern selection of both the bubbles and spikes for the different Atwood numbers. Visual analysis of the marked interfaces allows to distinguish the regions of strong mixing and compare self-similarity growth of the mixing region.

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