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New properties of the interface evolution in the Richtmyer-Meshkov instability MARCUS HERRMANN, SNEZHANA ABARZHI, PARVIZ MOIN, CTR, Stanford — We report analytical and numerical solutions describing the dynamics of the two-dimensional coherent structure of bubbles and spikes in the Richtmyer-Meshkov instability for fluids with a finite density ratio. The theory accounts for the non-local properties of the interface evolution and the simulations treat the interface as a discontinuity. Good agreement between the analytical and numerical solutions is achieved. To quantify accurately the interface evolution in the observations, new diagnostics and scalings are suggested. The velocity, at which the interface would move if it would be ideally planar, is used to set the flow time-scale as well as the reference point for the bubble (spike) position. The data sampling has high temporal resolution and captures the velocity oscillations caused by sound waves. The bubble velocity and curvature are both monitored, and the bubble curvature is shown to be the relevant diagnostic parameter. The obtained results yield new properties of the evolution of the Richtmyer-Meshkov instability. In the non-linear regime, the bubbles flatten and decelerate. The flattening of the bubble front indicates a multi-scale character of the coherent dynamics.

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