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**A multi-scale character of the large-scale coherent dynamics in the Rayleigh-Taylor instability** SNEZHANA ABARZHI, Center for Turbulence Research, Stanford, KATSUNOBU NISHIHARA, Intitute of Laser Engineering, Osaka University, Japan — We report nonlinear solutions for a system of conservation laws describing the dynamics of the large-scale coherent structure of bubbles and spikes in the Rayleigh-Taylor instability for fluids with a finite density ratio. Three-dimensional flows are considered with general type of symmetry in the plane normal to the direction of gravity. The non-local properties of the interface evolution are accounted for on the basis of symmetry theory. It is shown that isotropic coherent structures are stable. For anisotropic structures, secondary instabilities develop with the growth-rate determined by the density ratio. For stable structures, the curvature and velocity of the nonlinear bubble have non-trivial dependencies on the density ratio, yet their mutual dependence on one another has an invariant form independent of the density ratio. Based on the obtained results we argue that the large-scale coherent dynamics in RTI has a multi-scale character.

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