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Low-symmetric coherent structures and dimensional crossover in Rayleigh Taylor flows driven by time dependent accelerations[1] AKLANT BHOWMICK, SNEZHANA ABARZHI, Carnegie Mellon University — We investigate the nature of the dimensional crossover i.e. transition between the nearly isotropic 3D periodic flows with group p4mm (square) to highly anisotropic 2D periodic flows with group p2m1 in Rayleigh Taylor (RT) instability. Power law time dependence of the acceleration is considered with the emphasis on sub-regime, where the behavior is the RT type. We consider flow with group p2mm (rectangle) and obtain the 3D square and 2D limits with leading order rectangular corrections. Regular asymptotic solutions evolve as power law and form a two parameter family parametrized by the principal curvatures of the bubble. The bubbles with near circular contour separate the 2-dimensional solution space into two sub-regimes having distinct properties under the dimensional crossover. In one sub-regime, the elongated bubbles transform to 2D solutions, whereas in the other they flatten. 3D square bubbles are universally stable whereas 2D bubbles are unstable with respect to 3D modulations, implying that the dimensional crossover is discontinuous. We find that the time dependence affects the growth/decay of perturbations and has no consequence on the overall stability properties of the solution.

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