Abstract Submitted
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Group theory analysis of early-time scale-dependent dynamics of the Rayleigh-Taylor instability with time varying acceleration[1] DESMOND L. HILL, The University of Western Australia, AKLANT K. BHOWMICK, Carnegie Mellon University, DAN V. ILYIN, California Institute of Technology, SNEZHANA I. ABARZHI, The University of Western Australia — We consider the long-standing problem of Rayleigh-Taylor instability with variable acceleration, and focus on the early-time scale-dependent dynamics of an interface separating in-compressible ideal fluids of different densities subject to an acceleration being a power-law function of time for a spatially extended three-dimensional flow periodic in the plane normal to the acceleration with symmetry group p6mm. By employing group theory and scaling analysis, we discover two distinct sub-regimes of the early-time dynamics depending on the exponent of the acceleration power-law. The time scale and the early-time dynamics are set by the acceleration for exponents greater than (-2), and by the initial growth-rate (due to, e.g., initial conditions) for exponents smaller than (-2). At the exponent value (-2) a transition occurs from one sub-regime to the other with varying acceleration strength. For a broad range of the acceleration parameters, the instability growth rate is explicitly found, the dependence of the dynamics on the initial conditions is investigated, and theory benchmarks are elaborated.

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