Abstract Submitted
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Three-dimensional numerical simulations of a bubble rising in an unbounded weakly viscous fluid[1] JOSE CARLOS CANO-LOZANO, CARLOS MARTíNEZ-BAZÁN, Universidad de Jaén, JOEL TCHOUFAG, Universite de Toulouse-IMFT, JACQUES MAGNAUDET, CNRS-IMFT — Direct Numerical Simulations (DNS) of a freely rising bubble in an unbounded low-viscosity fluid are performed to analyze the bubble trajectory for values of Galileo and Bond numbers close to the transition between vertical and non-vertical paths. The simulations are performed with the Gerris Flow Solver, based on the Volume of Fluid technique to track the interface, allowing deformations of the bubble during its rising motion. We find the existence of novel regimes of the bubble rise which we describe by tracking the bubble shape, path geometry and wake vortical structures, as well as the temporal evolution of the instantaneous Reynolds number. Besides the traditional rectilinear, zigzag and spiral paths, we observe chaotic, reflectional-symmetry-breaking or reflectional-symmetry-preserving regimes previously reported for axisymmetric solid bodies. The DNS results also allow us to check the accuracy of the neutral curve defining the region of the parameter space within which the vertical path of a buoyancy-driven bubble with fore-and-aft asymmetric shape is linearly stable.

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