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Transient bubble dynamics in a constricted Hele-Shaw channel ANTOINE GAILLARD, JACK KEELER, MCND (University of Manchester), GRÉGOIRE LE LAY, École normale suprieure de Paris , GRÉGOIRE LEMOULT, ANNE JUEL, ALICE THOMPSON, ANDREW HAZEL, MCND (University of Manchester) — We explore the applicability of dynamical systems concepts recently used to study the transition to turbulence in shear flows to other subcritical transitions in fluid mechanics. We are ultimately interested in the subcritical instability of the linearly stable Saffman-Taylor finger in a Hele-Shaw channel, where finite perturbations can initiate complex dynamics for sufficiently large values of the driving parameter. Here, we concentrate on a geometrically-perturbed Hele-Shaw channel which supports multiple stable modes. We experimentally investigate and classify the different time-evolution scenarios of an air bubble of given volume when varying both the flow rate and the initial bubble shape. As the flow rate increases, the bubble exhibits increasingly complex behaviors, including oscillatory deformations and transient explorations of multiple-tipped unstable modes which often lead to bubble breakup, followed by multiple bubble interactions. Besides, we show that long and disordered transients can be observed at large flow rates depending on the level of noise in the system.

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