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Coalescence of Bubbles CHRISTOPHER ANTHONY, SUMEET THETE, KRISHNARAJ SAMBATH, OSMAN BASARAN, Purdue University —
Drop and bubble coalescence plays a central role in industry and nature. During drop coalescence, two drops touch and merge as a liquid neck connecting them grows from microscopic to macroscopic scales. The hydrodynamic singularity that arises as two drops begin coalescing in a dynamically passive outer fluid (air) has been studied thoroughly in recent years. As a preliminary to developing a similar level of understanding when two drops coalesce in an outer fluid of non-negligible density and viscosity, we use simulation to analyze the coalescence of two identical gas bubbles (idealized as two passive spherical voids) in a liquid. This problem has recently been studied experimentally by Nagel and coworkers (2014). The simulations allow probing of the dynamics for neck radii much smaller than what is possible in experiments. At times earlier than those accessible in experiments, simulations reveal a new type of scaling response than those reported by Nagel et al. However, at larger times, the dynamics is shown to transition to regimes that have been proposed by Nagel and coworkers. Unlike in the experiments, it is shown that the observed scaling regimes can be readily rationalized by judicious interrogation of computed flow fields.

Osman Basaran
Purdue University

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