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Simulated Collapse of Small Bubble Clusters on a Wall ARPIT TIWARI, CARLOS PANTANO, JONATHAN B. FREUND, University of Illinois at Urbana-Champaign — The dynamics of bubble clusters have largely been studied either via simplified continuum models for bubbly liquids that augment single-phase system with equations for spherical bubble dynamics (forgoing shape distortions and jetting) or by assuming the liquid to be incompressible. However, these simplifications are not fully applicable, even for a near-wall single-bubble collapse. It is expected that jetting and acoustic emissions potentially play an important role, for example, in damage to the wall. We present simulations in which up to 50 bubbles interact in a compressible liquid adjacent a wall. A new numerical scheme enables these simulations by using a diffuse-interface-based Eulerian approach with a multiphase mixture model that maintains interface integrity without requiring the geometric description demanded in typical interface tracking methods. The properties of this scheme and its integration in an adaptive mesh refinement framework facilitate simulation of three-dimensional clusters. We will discuss the cluster dynamics, including the collapse and re-expansion history, and particularly assess pressure on the wall as potential surrogate for damage. We see strong, though at times significantly asymmetric and transitory, focused high and low pressures on the wall.

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