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Simulation of the shock-induced dynamics of bubble arrays RATNESH SHUKLA, HONG ZHAO, CARLOS PANTANO, JOANNA AUSTIN, JONATHAN FREUND, University of Illinois, Urbana-Champaign — Simulation of shock-induced collapse of air bubbles in a stiff medium, such as water, poses a significant challenge to conventional shock-capturing schemes. Previous studies have often been limited to relatively low density and pressure ratios along with simplified equations of state, due to the spurious oscillations which develop at the bubble medium interface. We present results utilizing a high-fidelity shock capturing multi-material compressible-flow solver, which combines the features of a level-set method and a moving mesh technique. We demonstrate application of our numerical methodology to the collapse of arrays of bubbles after they are impulsively accelerated by a planar shock. The role of the strength of the incident shock and initial bubble configuration in the subsequent motion and merger of the bubbles is investigated. Comparison of the full compressible solutions with a vortex-sheet model initialized with the baroclinic vorticity deposited during the interface-shock interaction show good agreement with respect to the motion of the bubbles.

Ratnesh Shukla
University of Illinois

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