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Bubble Cloud Dynamics in a Focused Ultrasound Field KAZUKI MAEDA, TIM COLONIUS, California Institute of Technology, WAYNE KREIDER, ADAM MAXWELL, BRYAN CUNITZ, MICHAEL BAILEY, University of Washington — In order to characterize and control cloud cavitation in burst wave lithotripsy, modeling and experimental analysis of the acoustic radiation from a spherical bubble cloud interacting with a traveling ultrasound wave of amplitude $O(10)$ MPa in water are presented. In modeling, bubbles are treated as spherical, radially oscillating cavities under mutual interactions dispersed in continuous liquid phase. We solve the bubble radius evolution and continuous flow field using a WENO-based compressible flow solver. In the solver, Lagrangian point bubbles are coupled with the continuous phase, defined on an Eularian grid, at the sub-grid-scale through volume averaging techniques. In the experiment, we use a passive cavitation detector to measure acoustic radiation from a cavitation bubble cloud initiated by a focused, traveling ultrasound wave that is generated from a 335 kHz piezoelectric transducer in a water tank. The evolution of the bubble cloud is concurrently captured by a high-speed camera. Based on comparison of modeling and the experiment, we will discuss the effect of initial size and the bubble void fraction of the cloud to the directivity of resulting acoustic radiation.

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