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Numerical Modeling and Simulation of an Underwater Explosion Bubble RANDY S. LAGUMBAY, THOMAS L. GEERS, OLEG V. VASILYEV, University of Colorado at Boulder — Two representative single-degree-of-freedom models for the dilation of an oscillating bubble are assessed. One, by Keller and Kolodner (K&K), includes energy loss associated with external acoustic waves; the other, by Geers and Hunter (G&H), includes energy loss associated with both external and internal acoustic waves. In the evaluation, the spherically symmetric Euler equations for adiabatic conditions are expressed over a mapped space that explicitly defines the gas-liquid interface, and are then solved numerically. The details of the numerical method are given and spatial and temporal evolution of pressure and velocity fields, together with evolution of bubble radius are presented. The results for the transient solution demonstrate the wave nature of the phenomena as well as point out to the challenges posed by this seemingly straightforward problem. The results obtained lie between those produced by the K&K and G&H models, demonstrating that the former underestimates acoustic energy loss while the latter overestimates it. A comparison with experimental data shows total energy loss to be greater than that predicted even by the G&H model, which points to the role played by non-acoustic loss mechanisms.

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