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Bubble motion near a two-fluid interface. GEOFFREY CURTISS, JOHN BLAKE, DAVID LEPPINEN, QUAN XI WANG, University of Birmingham — The interaction between a cavitation bubble and the interface between two incompressible fluids of different densities is investigated. Applications abound, ranging from industrial processes involving bubble assisted mixing, to biomedical procedures for tissue damage via laser ablation techniques and gene-transfection via sonoporation. The system is investigated numerically, by means of a boundary integral approach in both exterior fluids. The code is verified by comparison with theoretical and experimental studies of the density ratios $\rho = 0, 1, \infty$, representative of a free surface, Rayleigh bubble and rigid boundary respectively. Small standoff distances are investigated for a range of density ratios. Results show drastic lessening of the interfacial spiking for $\rho > 0.3$ in comparison to free surface motion. Bubble jetting also appears to be always in the direction of the denser fluid. For $\rho > 1$ the bubble remains entrained in the depressed fluid-fluid interface throughout the collapse phase. Surface tension effects on both the bubble surface and the fluid-fluid interface are also investigated and compared to the purely inertial motion.

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