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A low Mach number preconditioned scheme for a two-phase liquid-gas compressible flow model MARICA PELANTI, ENSTA ParisTech — The simulation of liquid-gas flows such as cavitating flows demands numerical methods efficient for a wide range of Mach number regimes, due to the large and rapid variation of the speed of sound in these two-phase flows. When classical upwind finite volume discretizations for compressible flow models are employed, suitable strategies are needed to overcome the well known difficulty of loss of accuracy encountered at low Mach number by these methods. In this work we present a novel finite volume wave propagation scheme with low Mach number preconditioning for the numerical approximation of a six-equation two-phase liquid-gas compressible flow model with stiff mechanical relaxation. A Turkel-type preconditioner is designed to correct the acoustic fields at low Mach number, by altering the numerical dissipation tensor of the scheme. We present numerical results for two-dimensional liquid-gas nozzle flow tests both for low Mach number regimes and for transonic regimes with shock formation, which show the effectiveness and accuracy of the proposed preconditioned method. In particular, in the low Mach number limit the order of pressure perturbations at the discrete level agrees with the theoretical results for the continuous two-phase flow model.

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