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Pressure-based algorithm and thermodynamic closure for compressible gas-liquid flows FABIAN DENNER, FABIEN EVRARD, BEREND VAN WACHEM, Otto-von-Guericke University Magdeburg — Simulating compressible gas-liquid flows, e.g. air-water flows, presents considerable numerical challenges due to the stiff pressure-density-temperature relationship of the liquid and the sharp difference in compressibility at the fluid interface. We present a fully-coupled pressure-based algorithm for the simulation of interfacial flows in all Mach number regimes, based on a conservative finite-volume discretisation and a VOF-PLIC method to represent the interface, which treats the continuity equation as an equation for pressure and solves the discrete governing equations in a single linear system of equations. In this contribution, we focus especially on the implementation of the discretised governing equations and on different thermodynamic closures based on the Noble-Abel-stiffened-gas model in fully-compressible and polytropic form. Results of representative test-cases, e.g. pressure-driven bubble collapse or the interaction of shocks with bubbles and drops, are presented to scrutinise the presented algorithm and to highlight the differences caused by the considered thermodynamic closure models.

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