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A Multiphase Open Boundary Treatment for Interface Capturing Methods[1] MANUEL GALE, MARCUS HERRMANN, Arizona State University — Open or outflow boundaries are present in a number of fluid dynamics problems, both internal and external. The main characteristic of this type of boundary is that flow variables are not known and must be computed such that the resulting flow field yields are both stable and accurate. With a focus on incompressible flow, there have been numerous boundary treatments with relevance to finite-element and finite-volume methods. However, while single phase outflow conditions have been widely studied, the work in multiphase outflow boundaries is limited. In this work, the single phase boundary treatment approach of Dong et al. (2014) is extended to multiphase flows using a fractional-step method in combination with either a level-set or volume-of-fluid interface capturing method. The kinetic energy influx through the outflow boundary is locally balanced to improve stability under heavy reverse flow conditions that can arise from having two fluids with high density ratio. Presented is a detailed mathematical description of the outflow boundary condition and representative numerical tests for both single and multiphase flows.

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