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Conditioned quadrature moment methods for cavitating bubble dispersions[1] SPENCER BRYNGELSON, Caltech, RODNEY FOX, Iowa State University, TIM COLONIUS, Caltech — Bubbles dispersed in a fluid flow oscillate in response to pressure changes. These volume changes are sensitive to properties of the surrounding fluid and the bubble contents. The effect of the oscillations on the carrier fluid flow can be significant for even small void fractions. These interactions can be represented in a simulation framework via phase-averaging. However, this model requires statistical moments of the oscillating bubble dispersion. This can be problematic: for polydisperse bubble dispersions, the computational expense of class-based simulations is dominated by these moment computations. We show that quadrature-based moment methods can alleviate this cost and provide a more general description of the evolving bubble quantities. Conditioned hyperbolic QMOM (CHyQMOM) represents and inverts the internal coordinates of the bubble dynamics model. Comparisons to Monte Carlo simulations show that this approach can represent the evolving moment system, despite extrapolation out of the moment space. Fully-coupled simulations of acoustically-excited bubble screens are compared to class-based solutions. This comparison shows that a QMOM approach can reach a broader range of physical conditions, and thus is expected to be useful for matching experimental configurations.

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