Abstract Submitted
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Flow and mixing dynamics of phase-transforming multicomponent fluids[1] HECTOR GOMEZ, SAIKAT MUKHERJEE, Purdue University — We develop a continuum model for two-component flow, where one of the components is an non-condensable gas and the other one is a fluid that undergoes liquid-vapor phase transformations accompanied by changes in its miscibility with the gas. We derive the model from a Gibbs free energy that includes gradients of the fluid density and gas concentration, leading to a generalization of the classical equations of multiphase flow hydrodynamics. High-fidelity numerical simulations of the model show a very complex interplay between flow, mixing and phase transformations. The model predicts quantitatively the saturation vapor pressure of water for a given mixture of air and water vapor at different temperatures. When applied to the problem of collapse of cavitation bubbles, the model shows that even very small amounts of gas dissolved in the liquid phase can have a significant impact on the dynamics of the collapsing bubble.

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