Abstract Submitted
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A multiphase flow solver with adaptive mesh refinement[1] KEEGAN DELANEY, ELIAS BALARAS, The George Washington University, ZHIPENG QIN, AMIR RIAZ, University of Maryland — We will present a scalable Navier-Stokes solver applicable to multiphase incompressible flows. The solver employs Level Set techniques to sharply define the interface between different phases (i.e. air and water). A fractional step method is used to solve the momentum and continuity equations, which results in a variable coefficient Poisson pressure equation. Proper jump conditions are applied to the Poisson pressure equation to accurately capture the jump in pressure that results from surface tension between different phases. Scalable linear solvers are used to solve the variable coefficient Poisson pressure equation on large core counts. Scalability and efficiency were placed at a premium during development of the solver, which has been tested to core counts on the order of 10,000. The solver takes advantage of Adaptive Mesh Refinement (AMR) to reduce overall cell count in the solution domain, thus reducing computational time. This feature allows for sufficient resolution of complex interfacial features without over-resolving areas of no interest. In the present work, the mesh is selectively refined around the multiphase interface, which is evolving in time. A wide range of multiphase problems will be presented to demonstrate the accuracy and efficiency of the solver.

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