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A Conservative Level Set Method on an Overset High-Resolution Cartesian Grid MANUEL GALE, MARCUS HERRMANN, Arizona State University — Distance function level set approaches for capturing moving interfaces in multi-phase flows generally possess a major drawback: the enclosed mass is poorly conserved. Alternative methods such as the volume-of-fluid (VOF) and coupled level-set VOF provide better mass conservation, yet they face some unique challenges. Olsson and Kreiss (2005, 07) proposed a conservative level set (CLS) method that defines the level set scalar as a hyperbolic tangent away from the phase interface iso-surface. While drastically improving mass conservation, the necessary introduction of an interfacial thickness length scale, coupled to the local flow solver resolution, may adversely impact interface dynamics in complex scenarios. We propose to decouple the interface thickness scale from the local flow solver resolution scale, by solving the conservative level set scalar on an overset, high resolution Cartesian mesh, using the Refined Level Set Grid (RLSG) method. The resulting CLS-RLSG solver is coupled to a fully unstructured flow solver to solve the Navier-Stokes equations in the incompressible limit. Several test cases will be presented demonstrating the performance of the resulting code infrastructure, focusing on the interplay of local flow solver-RLSG resolution and CLS interfacial thickness.

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