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**Fluid-structure interaction of complex bodies in two-phase flows on locally refined grids**[1] DIONYSIOS ANGELIDIS, St. Anthony Falls Laboratory, University of Minnesota, LIAN SHEN, Department of Mechanical Engineering, University of Minnesota, FOTIS SOTIROPOULOS, Department of Civil Engineering, College of Engineering and Applied Sciences, Stony Brook University — Many real-life flow problems in engineering applications involve fluid-structure interaction (FSI) of arbitrarily complex geometries interacting with free surface flows. Despite the recent significant computational advances, conventional numerical methods are inefficient to resolve the prevailing complex dynamics due to the inherent large disparity of spatial and temporal scales that emerge in the air/water phases of the flow and around rigid bodies. To this end, the new generation 3D, unsteady, unstructured Cartesian incompressible flow solver, developed at the Saint Anthony Falls Laboratory (SAFL), is integrated with a FSI immersed boundary method and is coupled with the level-set formulation. The predictive capabilities of our method to simulate non-linear free surface phenomena, with low computational cost, are significantly improved by locally refining the computational grid in the vicinity of solid boundaries and around the free surface interface. We simulate three-dimensional complex flows involving complex rigid bodies interacting with a free surface both with prescribed body motion and coupled FSI and we investigate breaking wave events. In all the cases, very good agreement with benchmark data is found.

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Dionysios Angelidis
St. Anthony Falls Laboratory, University of Minnesota

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