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Computational simulation of ocean wave energy converters using the fast fictitious domain method AMIRMAHDI GHASEMI, ASHISH PATHAK, MEHDI RAESSI, University of Massachusetts Dartmouth — Ocean wave energy is considered one of the major renewable energy resources. We are developing a computational tool for analysis of wave energy converters. This computational tool is envisioned to complement and leverage experimental knowledge base, which is expensive or difficult to develop in this field. The computational tool simulates the interaction of two-phase fluid flows with a moving solid object by solving the full Navier-Stokes equations. Unlike previous models, it considers all non-linear effects, e.g. wave breaking and fluid-solid interactions. We use the two-step projection method in the finite-volume context with GPU acceleration to solve the flow equations. The fluid interfaces are tracked by using the volume-of-fluid (VOF) method. We incorporated the fast fictitious-domain method into our flow solver to simulate the interactions of a moving solid object with two-phase flows. Extending Youngs' piecewise linear interface reconstruction technique, we use a geometrical reconstruction of liquid-gas-solid interfaces at the triple point to accurately track the three phases. We will present results of canonical test cases, which demonstrate the accuracy of the above approach, as well as a 2D simulation of a buoy interacting with water waves in a tank.

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