Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Computational simulation of the interactions between water waves and two-dimensional wave energy converters AMIRMAHDI GHASEMI, ASHISH PATHAK, ROBERT CHIODI, MEHDI RAESSI, University of Massachusetts Dartmouth — Ocean waves represent a vast renewable energy resource, which is mostly untapped. We present a computational tool for simulation of the interactions between waves and two-dimensional oscillating solid bodies representing simple wave energy converters (WECs). The computational tool includes a multiphase flow solver, in which the two-step projection method with GPU acceleration is used to solve the Navier-Stokes equations. The fictitious domain method is used to capture the interactions of a moving rigid solid body with the two-fluid flow. The solid and liquid volumes are tracked using the volume-of-fluid (VOF) method, while the triple points and phase interfaces in three-phase cells are resolved. A consistent mass and momentum transport scheme is used to handle the large density ratio. We present results of two wave generation mechanisms with a piston or flap wave maker, where the theoretical and experimental results were used for validation. Then, simulation results of several simple devices representative of distinct WECs, including a bottom-hinged flap device as well as cylindrical or rectangular terminators are presented. The results are in good agreement with the available experimental data.

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Date submitted: 02 Aug 2013 Electronic form version 1.4