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Simulation of nonlinear ocean waves using volume-of-fluid method ZHOU ZHANG, KEVIN MAKI, YULIN PAN, Department of Naval Architecture and Marine Engineering, University of Michigan — The volume-of-fluid (VOF) method is widely used in the numerical simulation of multi-phase flows. In this work, we investigate the capability of VOF method to model nonlinear ocean waves, using several algebraic and geometric interface-capturing approaches. By considering a low viscosity and an initially irrotational flow field, the VOF solution can be validated against a fully nonlinear potential flow solution. We perform this study for both regular and irregular nonlinear waves, which benchmarks the capability of VOF to simulate the evolution of ocean waves. Furthermore, we develop a nonlinear wave inlet boundary based on the relaxation zone technique, enabling the simulation of prescribed incoming nonlinear waves into the computational domain. These developed capabilities are expected to be beneficial for different scenarios in ocean engineering.

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