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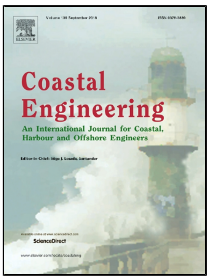

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Coupled finite particle method for simulations of wave and structure interaction

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Abstract

A coupled finite particle method (FPM) is proposed to model wave-structure interaction. The coupled FPM combines the advantages of FPM, smoothed particle hydrodynamics (SPH), δ-SPH model and particle shifting technology (PST). The coupled FPM is more accurate than SPH for evaluating the interior fluid particles and more flexible than FPM for evaluating the free surface. The density diffusive term of δ-SPH model can allow for a relatively large CFL condition number and maintain a high computational efficiency. With the help of PST, the particle clustering and fracturing are eliminated effectively, and the well-conditioned corrective matrix is acquired. The coupled FPM method is tested by simulations of regular waves and the interaction between waves and the rigid plate. Then, the coupled FPM method is applied to model Oscillating Wave Surge Converter (OWSC) including two-dimensional (2-D) and three dimensional (3-D) simulations. All numerical results show that the coupled FPM is robust, and is capable to simulate wave-structure interaction accurately. The linked data are be associated to this paper, and the readers are able to download the source code that can be used to test regular waves contained in the paper.

KEY WORDS: finite particle method (FPM); smoothed particle hydrodynamics (SPH);

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