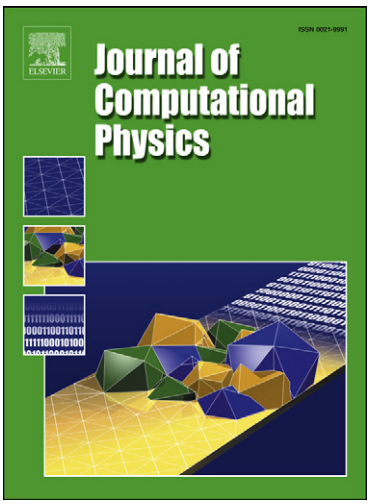

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An extended validation of the last generation of particle finite element method for free surface flows

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Abstract

In this paper, a new generation of the particle method known as Particle Finite Element Method (PFEM), which combines convective particle movement and a fixed mesh resolution, is applied to free surface flows. This interesting variant, previously described in the literature as PFEM-2, is able to use larger time steps when compared to other similar numerical tools which implies shorter computational times while maintaining the accuracy of the computation. PFEM-2 has already been extended to free surface problems, being the main topic of this paper a deep validation of this methodology for a wider range of flows. To accomplish this task, different improved versions of discontinuous and continuous enriched basis functions for the pressure field have been developed to capture the free surface dynamics without artificial diffusion or undesired numerical effects when different density ratios are involved. A collection of problems has been carefully selected such that a wide variety of Froude numbers, density ratios and dominant dissipative cases are reported with the intention of presenting a general methodology, not restricted to a particular range of parameters, and capable of using large time-steps. The results of the different free-surface problems solved, which include: Rayleigh-Taylor instability, sloshing problems, viscous standing waves and the dam break

[☆] Fully documented templates are available in the elsarticle package on CTAN.

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