Report on the manuscript

Modelling of tsunami wave run-up, breaking and impact on vertical wall by SPH method

by M.H.Dao, H.Xu, E.S.Chan, P.Tkalich

The manuscript shows an interesting comparison between experimental measurements of breaking and non-breaking tsunami-like waves propagating on a sloping beach with two different numerical solvers, namely, an enhanced version of the Smoothed Particle Hydrodynamics method (SPH) and the Tsunamic-N2 model. The aim of the analysis is to prove that the SPH method is a robust and reliable solver for modeling breaking and non-breaking waves. The results shown in the manuscript confirm this thesis.

In my opinion the manuscript is acceptable after a minor revision. Below I listed the minor points.

Minor Points

- In the abstract the Authors write "*the* enhanced Smoothed Particle Hydrodynamics...". Since the term "enhanced" is a bit too generic at this stage, I think it is preferable to write "*an* enhanced Smoothed Particle Hydrodynamics..." or to add a citation (or a brief description) of such an *enhanced* SPH solver.
- Introduction, page 3. The Authors state *"The original SPH methods, although satisfying the mass conservation, still have zero order in the kernel approximation which sometimes leads to significant dissipation of momentum"*. I do not agree with this statement. In absence of solid walls, the standard SPH scheme (without any artificial viscosity) conserves both mass and linear/angular momenta exactly. The zero-consistency of the kernel approximation does not affect these conservation properties. Then, the spurious dissipation in momenta described by the Authors can be only caused by the presence of solid walls and by the way in which the solid wall conditions are enforced. I would like a comment on this topic in the manuscript.

- Introduction, page 3. The enhanced SPH scheme used by the Authors implements specific corrections to improve the accuracy of the SPH differential operators. Similar kind of corrections are also used in other SPH schemes but they generally lead to the loss of the conservation properties I listed in the previous point. Could the Authors clarify this point? Does the enhanced SPH method preserve mass and linear/angular momenta exactly, like the standard SPH scheme?

- Section 2.2. Since the manuscript focuses on the SPH method, the Authors should provide details of the *enhanced* SPH scheme they adopt (or, at least, a brief description). In deed, the presentation given in Section 2.2 just describes the standard SPH scheme.

- Section 2.2, formula (6). May be I am wrong, but the kernel provided in this formula is known in the SPH community as Wendland kernel rather than Quintic kernel.

- Section 2.2. In this section the Authors should provide some details on the adopted numerical sound speed, on the integration time stepping, on the method used for the modeling of the solid walls and on the algorithm used to implement the solid boundary conditions.

- Section 3.1. The Authors should specify the positions of the gages (these are not so clear in figure 1).

- Figures 8 and 10 show the occurrence of large fragmentation of the free surface after the breaking events. Since the standard SPH is generally not affected by this issue, such a fragmentation is probably due to the use of the corrections for the SPH differential operators. The Authors should clarify and comment of this topic.