Nat. Hazards Earth Syst. Sci. Discuss.,
doi:10.5194/nhess-2017-37-AC2, 2017

Natural Hazards and Earth System Sciences Discussions
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Interactive comment

Interactive comment on "A numerical study of tsunami wave run-up and impact on coastal cliffs using a CIP-based model" *by* Xizeng Zhao et al.

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Received and published: 30 March 2017

Reviewer #2: This paper has presented some interesting results of tsunami wave run-up and impact on the coastal cliffs, which provide a valuable contribution to prevent the damage caused by tsunami. The content is clear, concise and well-presented. However, the text needs to be significantly improved before consideration for publication and these comments are outlined below. Q: 1) Please provide a more detailed description of the numerical CIP method and THINC/SW scheme in section 2. R: 1) Description and advantage of CIP and THINC/SW are added in subsections 2.3 and 2.4, respectively. Some references about CIP are also introduced in Introduction, Page 2, Lines 21-31.

Q: 2) In section 3.2, the authors should describe the method they used to define and

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create the solitary wave. R: 2) The subsection “3.2 Numerical wave-maker” has been added from Page 9, Line 1 to Page 10, Line 3.

Q: 3) Please ensure that all figures appear on the top of each page. R: 3) It has been improved.

Q: 4) The English expression of the whole text needs to be improved. R: 4) The whole text has been reviewed carefully and the English expression has been improved.

Q: 5) Please ensure on your next submission that the line numbers appear throughout the whole document rather than showing just 5, 10, 15, 20 and 25. R: 5) The line numbers has been corrected in the revison.

Q: 6) Please make sure that Fig.1 and Fig. 2 are presented clearly. R: 6) These Figures have been redrawn more clearly.

Q: 7) Please enlarge the font in Figures 1, 2, 4 and 6 so that these figures are readable. R: 7) The font in Figs. 1 and 2 has been enlarged. Figs 4 and 6 have been enlarged in whole.

Q: 8) In Page 5, Line 2, “The angles of slopes are tanθ1=25/17, tanθ2=1/15, tanθ3=1/30” is a wrong expression. R: 8) The sentences “The angles of slopes are tanïĄś1= 25/17, tanïĄś2= 1/15, tanïĄś3= 1/30.” and “The angles of slopes are tanïĄś1 = 1.38, tanïĄś2 = 0.08, tanïĄś3 = 0.02.” have been deleted. New expressions are added in the Figure captions “Fig. 3 Schematic diagram of Tank 1. tanïĄś1= 25/17, tanïĄś2= 1/15 and tanïĄś3= 1/30.” and “Fig. 4 Schematic diagram of Tank 2. tanïĄś1 = 1.38, tanïĄś2 = 0.08 and tanïĄś3 = 0.02.”.

Q: 9) Please also check the description in Page 5, Line 13 “The angles of slopes. . .”. R: 9) It has been improved as shown in “R: 8)”.

Q: 10) In Page 5, Line 15, the sentence should be “Two kinds of cliff, normal cliff of θ4 =80.02âŮędegree and toe-eroded cliff θ4 = 91.91âŮę are considered.” R: 10) It has been improved in the revision.

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Q: 11) In Page 5, Line 4, “Solitary waves are” should be “Solitary wave is”. R: 11) It has been corrected in the revision.

Q: 12) In the whole text, the authors can consider to use the expression of “Tank 1” and“Tank 2” not “1# tank and 2#tank”. R: 12) It has been improved according to the reviewer’s advice.

Q: 13) In Page 6, Line 18, please improve the expression of the sentence “Then, it impacts and runs upon the cliff and falls back to the beach.”. R: 13) The sentence has been changed to “Then, the water jet impacts the cliff, accompanied by large pressure acting on the toe of cliff. Great acceleration is produced by the impact, making the water run up on the cliff. Under the action of gravity, water finally falls back, large quantity of air is entrained in water when backflow interacts with the incident flow.”.

Q: 14) In Page 7, Line 6, “However, for the” should be “However, as the”. R: 14) It has been corrected in the revision.

Q: 15) In Page 7, Line 19, “As for Fig. 4(e) and (f)” should be “As for Figs. 4(e) and (f)”. R: 15) It has been corrected in the revision.

Q: 16) In Page 8, Lines 3-4, the velocity of the water particle cannot be faster, it should be higher. R: 16) It has been corrected in the revision.

Q: 17) In Page 9, Line 4, “Figs. 5(b), (d), (f)” should be “Figs. 5(b), (d) and (f)”, “Figs. 5(a), (c), (e)” should be “Figs. 5(a), (c) and (e)”. R: 17) It has been corrected in the revision.

Q: 18) In Page 10, Line 2, “x=0m, 0.1m, 0.2m, 0.3m, 0.4m” should be “x=0m, 0.1m, 0.2m, 0.3m and 0.4m”. R: 18) It has been corrected in the revision.

Q: 19) In Page 10, Lines 4-5, there is no number after the word of “Figs”. R: 19) It has been changed to “Figs. 8” in the revision.

Q: 19) Please complete and improve the introduction and literature review with more recent journal publications. R: 19) More recent journal publications have been discussed in Introduction. And they are also shown as follow. “Finite difference method is widely used in various CFD models as flow solver. Hitherto, the accuracy of finite difference method is still a great challenge. In this paper, we introduce a CFD model based on constrained interpolation profile (CIP) algorithm. The CIP method was first introduced by Takewaki et al. (1985) as a high order method to solve the hyperbolic partial differential equation. Tanaka et al. (2000) proposed a new version of the CIP-CSL4, which overcomes the difficulty of conservative property. Hu et al. (2009) simulated strongly nonlinear wave-body interactions used a CIP-based Cartesian grid method, and the results were in good agreement with experiment data. Kawasaki et al. (2015) developed a tsunami run-up and inundation model based on CIP method, and high accurate water surface profile was observed by using slip condition on the wet-dry boundary. Fu et al. (2017) simulated the flow past an in-line forced oscillating square cylinder by a CIP-based model. CIP method can be not only applied in CFD, but also has good performance in other areas. Sonobe et al. (2016) employed CIP method to simulate sound propagation involving the Doppler-effect.” “Yokoi et al. (2013) proposed a numerical framework consisting of CLSVOF method, multi-moment methods and density-scaled CSF model. The framework can well capture free surface flows with complex interface geometries. More recently, conventional VOF has been widely used by combining with various additional scheme. Malgarinos et al. (2015) proposed an interface sharpening scheme on the basic of standard VOF method, which effectively restrained interface numerical diffusion. Gupta et al. (2016) used a coupled VOF and pseudo transient method to solve free surface flow problems, and the numerical solution was compared well with analytical or experimental data. Quiyoom et al. (2017) simulated the process of gas-induced liquid mixing in a shallow vessel, found that the mixing time predicted by EL+VOF was in good agreement with the measurements.” “Markus et al. (2014) introduced a Virtual Free Surface (VFS) model, which enabled the simulations of fully submerged structures subjected to pure waves and combined wave–current scenarios. Vicinanza et al. (2015) proposed new equations to predict the magnitude of forces exerted by the wave on its front face. The equations were added in 5 random wave CFD model and good agreement was obtained when compared with empirical predictions. Oliveira et al. (2017) utilized PFEM to simulate complex solid-fluid interaction and free surface, so that a piston numerical wave-maker are implemented in a numerical wave flumes. Regular long wave was successfully generated in the numerical wave flumes."

Please also note the supplement to this comment:
http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2017-37/nhess-2017-37-AC2-supplement.zip

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