Nat. Hazards Earth Syst. Sci. Discuss.,
doi:10.5194/nhess-2016-353-AC2, 2017

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Simulations of Moving Effect of Coastal Vegetation on Tsunami Damping" *by* Ching-Piao Tsai et al.

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Received and published: 28 February 2017

The authors would like to express their deep appreciation to Anonymous Reviewer for the invaluable comments and suggestions, which have led us to improve the quality of the paper. Detailed responses are listed below.

General comments:

A numerical investigation of tsunami damping over coastal vegetation is presented. The authors show that the moving effects of the emergent cylinders have less wave height damping and turbulent kinetic energy dissipation than the stationary, emergent cylinders. The paper is well structured and the purpose of the paper is clear; however, the English grammar and sentences are not well written and need to be improved. The manuscript can be acceptable in Natural Hazards and Earth System Sciences after a

major revision with further treatment of the following sections:

Response: The authors have followed the reviewer's suggestions to make the necessary revisions, which can be seen as RED fonts in the revised manuscript. We also change "Moving Effect" in the title to "Swaying Effect" for complying with the topic of this paper.

Specific comments:

1. Page 2, line 9 – 10: Paul et al., 2012 showed submerged seagrass mimics attenuate wave height, but authors need to provide more literature reviews to convince readers mangroves are considered as moving vegetation motion.

Response: The reference of Paul et al. (2012) has been removed. We have added more than10 references about coastal vegetation involving the flexible effect in general literature review.

2. Page 4, line 19 – 20: There are several references referring to flexible vegetation and authors need to provide in the introduction and to validate your model.

Response: There are a lot of literature regarding the flexible vegetation, but most of them concern high stem plants (seagrasses) under flow action. We have added more than 10 references about flexible tree vegetation under wave action in the introduction. Unfortunately, the experimental information on the swaying cylinders under solitary wave action is lacking. So we could only implement the model validation by the case of stationary cylinders.

3. Page 5, line 3 – 4: The paragraph is repeated as before. They should be deleted.

Response: This repeated paragraph has been removed.

4. Page 5, line 5: Figure 2 is not clear to show the meshes around the cylinders and please explain why the mesh with 0.002 m can achieve accuracy.

Response: Figure 2 has been represented using one cylinder which can show clearly

the meshes. We added one figure (Fig. 3) to compare the accuracy with Maza et al. (2015) using meshes of 0.001 m and 0.002 m. It was found that there are almost no differences between the free surface or wave height results using both computational meshes. But we use the fine mesh (0.001m) to simulate the illustration examples for discussion.

5. Page 5, line 7 – 8: Authors need to explain why you used the specific of the cylinder 0.25 and the spring constant 1 kgw/m and why they are appropriate coefficients to the moving mangroves.

Response: We have stated the use of spring constant and specific cylinder gravity, as in page 6, Lines 18-23. Besides, we added Figs. 6 and 7 to discuss the wave height evolution and the deflection angle variation of cylinder for different spring constants.

6. Page 5, line 23: It would be nice to calculate the wave reflection coefficient from the stationary cylinders and the moving cylinders.

Response: The statement about wave reflection has been omitted because it is not significant.

7. Page 5, line 31 – 32: usually we use Dalrymple et al. (1984) equation or Kobayashi et al. (1993) equation to calibrate the wave height damping coefficients according to your Fig. 8 from G3 to G6 for different incident wave heights.

Response: The empirical formulations proposed in Dalrymple et al. (1984) and Kobayashi et al. (1993) are applied for the situation of periodic waves. But the concern of the present paper is solitary wave that their formulas unfortunately could not be applied in this paper.

8. Page 6, line 7 – 8: Can you explain why you used RNG k-epsilon model instead of k-epsilon or k-omega model?

Response: The use of RNG k-epsilon model was described in pages 2 and 3. When the RANS equations with RNG model was solved by FAVOR technique and VOF

method, we can obtain accurate results for the present wave-structure interaction. Based on the comparisons shown in Figs. 3 and 4, we can find that the accuracy between SST k-omega used in Maza et al (2015) and the present RNG is almost no difference.

9. Page 6, line 7: Authors mentioned TKE dissipation rate (epsilon) but did not discuss that. It would be interesting to see the vertical profiles of TKE budget for both stationary and moving cases.

Response: We have rewritten about the section 4.3 about the turbulent kinetic energy. The formulations of the RNG model also has been added in Section 2. The TKE (k) and DTKE (epsilon) are obtained directly from the RNG model that we did not need to compute each component of TKE budget like one-equation model. Instead of TKE budget profile, we have added the vertical profile evolution of TKE to show the swaying effect of cylinders will induce multiple shear layers.

10. Page 6, line 15: Please define DTKE. How did you calculate DTKE values in your model?

Response: The transport equations of TKE (k) and DTKE (epsilon) of the RNG model has been added in Section 2. The values of k and epsilon are obtained directly by solving RANS and RNG equations.

11. Page 9: Figure 1., the figure doesn't look good. Some number is not necessary to show from G2 – G3 and the fonts are too small. Response: The quality of Figure 1 has been improved.

12. Page 11: Figure 4., it seemed like Maza et al. (2015) results at G7 have wave reflection. Can you explain why?

Response: We would like to thanks Prof. Maza providing their data for our use for Figs. 3 and 4. We have corrected the mistake of Fig. 4. There is no wave reflection found at G7.

13. Page 13: Figure 8., y axis would plot only vegetation field, e.g. G3 to G6 and you can define Kv as the vegetation transmission, Kv(x).

Response: We have omitted the original Fig. 8. Instead, we added figures (new Figs. 6 and 7) to discuss the wave height evolution and the deflection angle variation of cylinder for different spring constants.

Technical corrections:

1. Page 2, line 17: Typo. Substitute 'IHFORM' with 'IHFOAM.'

Response: The typo has been corrected.

2. Page 4, line 25: Typo. Substitute 'IHFORM' with 'IHFOAM.'

Response: The typo has been corrected.

3. Page 5, line 17: 'through each cylinder' should be re-written as 'through G3 to G6' and corresponding Fig. 6 needed to increase the font size of G3 to G6. Also, caption needs to be changed as well.

Response: All figures have been corrected.

4. Page 6, line 26: Typo. Substitute 'moving object (GMO)' with 'general moving object (GMO).'

Response: The typo has been corrected.

Please also note the supplement to this comment:
http://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2016-353/nhess-2016-353-AC2-supplement.pdf

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