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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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General comments:

The discussion paper "Simulations of moving effect of coastal vegetation on tsunami damping" is well structure and covers an interesting topic, i.e. the effect of vegetation movement under flow action in the resulting wave attenuation. However, there are some weak points in the statement of the problem as well as along the validation and discussion of the results. These points are highlighted in the following sections. In addition, a strong effort should be done in the English grammar correction since there are some grammar mistakes and sentences that are not well written.

Specific comments:

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1. The manuscript is focus on mangrove forests. However, authors do not provide with evidences of mangroves movement under wave action. Previous studies have argued that mangroves are stiff enough to be considered as rigid-not moving bodies under flow action (e.g.: Zhang et al. 2015, “Hydrodynamics in mangrove prop roots and their physical properties”). Since the model used in the manuscript only considers the movement with respect to the bottom by using a spring, authors maybe can state this is a very simplified way to represent some movements induced by sediment scour and mangrove uproot states, as shown in the field campaing performed by Yanagisawa et al. (2009): “The reduction effects of mangrove forest on a tsunami based on field surveys at Pakarang Cape, Thailand and numerical analysis”.

2. Introduction: in general literature review of the problem is poor. a. There are more recent papers about tsunami reduction by mangroves than the ones highlighted in the manuscript. b. Another important point is the lack of literature review on models able to capture vegetation flexibility under waves action (e.g.: Maza et al. 2013, “A coupled model of submerged vegetation under oscillatory flow using Navier–Stokes equations”). Since they are proposing a new model to represent vegetation motion they should perform a literature review of this issue to find the models that have been already proposed to solve that problem. This will allow them to highlight the advantages of the proposed approach. c. Authors mentioned Paul et al. (2012) work to point out the importance of considering vegetation motion but that paper was performed for submerged vegetation under tidal current action, something that is far from the problem faced here (emergent vegetation under solitary wave action). They should find a different reference to point out the importance of considering that aspect in mangrove forests or explain the implications of Paul’s paper in their work. d. Also, in the last paragraph they talk about “vegetation is deformable” but mangrove, in general are not.

3. Numerical model description: a. There are some variables that are not defined: “uj, xi, xj, t”. Notation is not consistent along the different equations: authors used sometimes vector notation, in some other equations they use Einstein notation. You

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should write everything following the same criterion. b. Turbulence closure model: authors should explain why they are using RNG k-epsilon model instead some other options such as k-omega SST that is aim to be the most suitable one for cases where there is flow-structure (in this case cylinder) interaction.

4. Validation: a. Different mesh discretizations can be better understand if authors provide with the number of points defining cylinder's diameter for each case. In addition, figure 2 does not provide with very valuable information, a zoom in around one cylinder will be useful to better visualize the mesh. b. No validation is shown for cases where cylinders move. Experiments consider here where performed using rigid stationary cylinders so that information is not available. However, authors can refer some other applications of the GMO model to shows its capabilities on solving similar problems. c. Figure 4: y-axis scale is not providing enough information; there are only two points. Furthermore, it will be more helpful to set the axis as no dimensional variables: H/Hincident and X/Lcylinders, for example. Data from Maza et al. (2015) looks different than the one provided at panel C in figure 14 of that paper. How is that data obtained?

5. Results and discussion: a. Authors are using a spring constant equal to 1kgw/m and specific cylinder gravity equal to 0.25, why? They should explain where these values come from. b. Section 4.2: "The weakly wave reflection can be found at the front row of the stationary cylinders while it is not obviously for the moving cylinders" how do you see this effect? I do not see any significant reflected wave for any case. c. Figure 8 is not giving any valuable additional information. d. Figure 10 shows turbulent kinetic energy dissipation or turbulent kinetic energy (k)? e. Section 4.3: "DTKE is calculated from the total computed meshes of the numerical tank", do you mean it is the integrated value in the entered domain? It is not clear how you compute this value. In addition, authors say they are calculating DTKE after wave crest passes each gauge, is that a good way to evaluate TKE evolution in the problem? The maximum TKE is produced after wave crest passes, that is there is a lag between the maximum wave elevation and the occurrence of maximum TKE. Then, I think values represented in figure 11 are

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not providing with all the required information to understand what is happening with this variable, especially when thinking about maximum TKE values. Instead, authors can provide, for example, with the maximum TKE value at each mesh cell recorded in the whole simulation. That way they will provide with a map of the maximum TKE along the entered domain for both cases (stationary and moving).

6. Conclusions: authors talk about TKE dissipation rate but they are not providing with any rate values.

Technical corrections:

1. IHFOAM is misspelled along the entered manuscript; authors are using IHFORM, which is wrong.

2. Page 2, line 11: change “For most of” to “Most of”.

3. Page 2, line 20: rephrase “to involve the motion of the vegetation accompanied by wave”, by something like “including vegetation motion under waves action”.

4. Page 2, line 23: “shown” by “has been shown”.

5. Page 4, validation section: there are several grammar mistakes or sentences that are not very well written such as: “The arrangement of cylinders with density of 560 and with field length. . .”, “Fig. 4 shows the maximum wave height at each wave gauge probe between numerical results and experimental. . .”.

6. Figure 5: it would be better if the color scale is different (similar to the one shown in figure 10 for example) to better observe the differences between two approaches.

7. Figure 6: Wave gauges names are very small, please increase the names or set them on top of the panels.

8. Page 5, line 3: “the same previous section” to “the same as in previous section”.

9. Page 5, lines 3 – 5: you have already explain the experimental set-up so you don’t

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need to include again the values of the water depth and cylinders field.

10. Section 4: there are many grammar mistakes: "while the wave crest passing over...", "resulting less water velocity...", "keeps with the same", "yet it is nearly", "the important mechanism", "the dissipation is less than the stationary".....

11. Page 7, line 1: "note that it might be overestimated for tsunami damping if..." to "that is, tsunami damping can be overestimated if...".

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