JOURNAL OF COASTAL AND HYDRAULIC STRUCTURES

Review and rebuttal of the paper

# Formulation of a Surf-Similarity Parameter to Predict Tsunami Characteristics at the Coast

Roubos et al.

Editor handling the paper: Nils Goseberg

*Round 1:*

## REVIEWER #1 COMMENTS

For author and editor

Review of the article Formulation of a Surf-Similarity Parameter to Predict Tsunami Characteristics at the Coast

The paper proposed new tsunami surf-similarity parameters to quantitatively predict the type of wave breaking at the coastline. Three types of breaking are identified, namely, surging, breaking front and undular bore. In addition, it was found that bathymetry and coastal morphology play an important role on tsunami breaking type.

My major concern deals with validation of numerical simulations and the use of solitary waves. If possible, please add more information on this topic, possibly in a Supplementary Material. Moreover, the structure of the paper makes it difficult to follow, and some sections repeat some ideas. I suggest to combine and simplify sections 1 (introduction) and 2 (literature review) to define clearly the gap to be investigated. Lines 65 to 69 describe somehow the objective of the paper, but lines 128-129 describe another objective.

Section 3, 4 and 5 should be all part of the Methodology. Please carefully review these sections and try to explain clearly what you did and how. As presented now, it is difficult to follow the methodology. Please reorganize the paper to provide a smooth reading. Some paragraphs are too short.

Line 181, the title of section 4 is the same as section 3. Should it be the study area?

Lines 187 and 188. Please clarify whether the breaking type is from Shimozono et al (2012) or from the own analysis of the authors here.

Figure 7. Instead of an image of the coast of Japan, it would be useful to present a figure with real bathymetry (colormap) which helps readers to see better the coastal morphology and differences between ria and plain coast. A figure like that, would help to understand better the information given in Table 1.

Equation 6. Please clearly indicate whether the angle (wt/2) has an exponent of 2 or the whole function [Sin(wt/2)]

Table 2, please clarify whether all parameter were combined, and indicate how many simulations were obtained.

Lines 258-263. I asume that simulations in this section are only for validation purposes. However, It was described above that solitary waves do not describe well the tsunami waves. So, why do you use solitary waves?, Please explain better why you use those old experiments and not other more recent ones. For example, would it be possible to validate the model with the numerical experiments from Larsen and Furhman (2019)?

Line 299. 600 and 1200s should be periods T, not Lengths.

Lines 348-349. This phenomenon has already been studied. Please read the article of Didenkulova and Pelinovsky (2011) “Runup of Tsunami Waves in U-Shaped Bays“. You may compare your results with discussion given in that paper.

Lines 374-375. How do you define the breaking type? Visual observation of numerical simulations or is there any numerical criterion?

Table 5. Could you provide the youtube links to the videos? (may be in SM).

Lines 394-395. You stated “It is therefore recommended to include the incoming wave angle in the tsunami surf-similarity parameter…” but you do not even say how to do it. It would be better to say something like “Since tsunami directivity demonstrated to have an influence on breaking type, future research should include this variable into the analysis…”

Discussion and Conclusions do not include comments nor statments on the influence of the surf similarity parameters on tsunami forces. You started the abstract as “To calculate tsunami forces on coastal structures it is of great importance to determine the shape of the tsunami front reaching the coast”, In addition, in the introduction it is written: “…a more quantitative understanding of tsunami wave transformation is needed to predict the impact that such waves can have on coastal defense systems along the Tohoku coastline and to increase the safety of these systems in the future“, therfore, it would be interesting to know how your findings may change the tsunami impact, tsunami forces or design philosophy of tsunami countermeasures. What would the implication be by knowing the breaking type?

## REVIEWER #2 COMMENTS

For author and editor

The study presents a new surf-similarity parameter to provide insights to tsunami wave transformation inside a specific type of bay setting and applies the parameter to classify types of tsunami wave breaking over various continental slopes. This research extends the applications of tsunani surf-siilarity parameter that commonly assumes infinitely wide plane beach. It is suitable for this journal and is of interest to tsunami hazard and impact assessment and tsunami-resilent structure designs.

The paper is organised fairly well and clearly written. Both arguements and conclusions are substantiated by literature review, theorectical reasoning and numerical modelling.

However, this paper still requires a moderate to major revision to bring its quality up to standards of acceptance for publication. These incude, but are not limited to following aspects:

Sections:

* Section 4 has a wrong title. Please correct it.

* not sure how this journal requires, but it will be benefitial if a list of symbols is provided to assist readers with interpretations.

Figures and Tables:

* The schematic illustrations could be further improved to make them more professional;

* Figure numbering is a mess. It seems that Figure 8 on page 12 should be Figure 12; Figure 9 o page 13 should be Figure 13; Figure 10 on page 13 should be 14; Figure 11 on page 14 should be Figure 15; and Figure 12 on page 16 should be Figure 16.

* It will be better to add wave propagation direction in Figure 4.

* In Figure 7, please add a compass (northing) to assist with interpretation of bay orientation.

* In Table 1, what is "Nr." in second column?

* In Table 4, What does symbol X stand for?

Reasoning and methodology

* Arguments/descriptions at line 146-148 in Section 3: may need to delete "behaviorist"; also, the description is not quite right. Frequency dispersion is not a result of nonlinearity. Linear waves in deep ocean can still be dispersive.

* It is not clear how the wave and Bay parameters in Table 2 were combined in numerical investigations.

* In 6. Discussion section: this section also discusses comparisons between SWASH simulation results and Green's Law approximations and application range of Green's Law. Detailed data may be needed to substantiate this.

References

* Inconsistent styles in References, e.g. inconsisent use of abbreviation/full name of a journal;

* Missing references: Binnie and Orkney (1955);

* Reference entry Dalrymple et al (2006) seems not being cited;

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*Round 2*

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Reviewer #1 Comments

For author and editor

The manuscript has been improved and incorporated most of comments from reviewers.

I strongly recommend to modify the introduction. In my previous comment, I suggested to combine and simplify sections 1 (introduction) and 2 (literature review) to define clearly the gap to be investigated. However, the authors just changed the title name of section 2 and included it in section 1.

Paragraphs from line 22 to 45 may be combined and shortened. Please, delete Figure 2, it is not relevant for the introduction due to the fact that the main topic is the tsunami breking type.

The new section 1.1 can be shortened and combined with the paragraph from line 46 to 64. It helps to understand the scientific gap to be investigated, which is partially described in lines 65 to 68. My recomendation is: first you describe the motivation of your research (the Tohoku tsunami and local observations), then you describe the state of the art on tsunami breaking, and then you describe the scientific gap, thus the objective of your research is clear to everyone

The current figure 7 did not provide useful information; the bathymetry is not well represented. If you are using Matlab to create this figure, please use the functions "pcolor" and "shading flat", then add the coastline with a thicker black line. Finally, use a colormap given by "demcmap()" to show a nicer figure.

**REVIEWER #3 COMMENTS**

Journal of Coastal and Hydraulic Structures

Title: “Formulation of a Surf-Similarity Parameter to Predict Tsunami Characteristics at the Coast”

Article Type: Article

Overview:

The manuscript looks at the influence of slope and bay shape on the transformation of tsunami waves, particularly focusing on the 2011 Tohoku tsunami. The manuscript is generally well-written. I think the

largest changes that need to be made are around the quality of the figures, they are sometimes a little hard to read/follow. Also some general formatting of the document is necessary before final publication.

Please review the comments (grouped into Major and Minor). Hopefully, the authors will address them, along with the above mentioned as this is interesting work.

Major:

1) The formatting, especially in Section 3, seems to have some problems. A quick revision may be necessary once the tracked changes are removed.

2) The figure quality should be improved before the final submission. The labels tend to be too small and the figures sometimes seem pixelated.

3) Table 4 seems better suited for the supplementary material. I think a more detailed paragraph outlining how the scenarios were set up for the numerical model would be better suited for within the article.

4) Reviewer 1 Comment on Wave Breaking: I think it would be better to move the sentences on how you determine the type of breaking behaviour in the SWASH model earlier. It is a little difficult to follow the results section as that is later on, putting emphasis on this point would help.

Minor:

- Line 77: It would be useful to expand a little bit on the impact on coastal structures even if it is not the objective of the paper. It would help with context.

o It is briefly mentioned at Line 114, though physical reasoning is not really given only that it is present within different standards.

- Line 107: Sentence is a little awkward, consider revising.

- Line 147: Equation number is not correct.

- Figure 4 seems to be cut off.

- Line 160: I think it would be better to thoroughly introduce the β parameter when it is first discussed as it is unclear and does not get described until much further down in the section.