Review of:

High-resolution modeling of tsunami run-up flooding: A case study of flooding in Kamaishi City, Japan, induced by the 2011 Tohoku Tsunami

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The paper presents a Numerical model that is used to calculate tsunami run-up. The model is applied to study the flooding of the 2011 event in Kamaishi city, considering the buildings of the city in a high resolution numerical simulation. It is a necessary next step in the tsunami hazard assessment that is here finally addressed.

In Chapter 1 the authors explain the objective of the paper: to cover with their model the existence gap of including buildings in the simulations of tsunami run-up, by including the hydraulic effects of the presence of buildings. Following, they review the building array treatments in urban flood simulation models, revisiting the previous work on each one of the 4 existing treatments (BR: Building resistance, BB: building blocks, BH: building holes, BP: building porosity). This study deals with the last one, assuming a permeability for the walls of the buildings.

In Chapter 2 a description of the study area is given, by means of figures including the buildings and their characteristics, specifying which of them were washed in the 2011 event.

Chapter 3 presents the numerical model development, the assumptions considered. The authors also include here the sources of the data used, the cases that were considered in the application of the numerical model and the sources of data for the model "verification".

Chapter 4 shows the results obtained in Kamaishi after the application of the developed numerical model. They show the results on 3 different parts of the flooded area: time series on several points, most elevated points reached by the flooding, and arrival time to several intersections of the city. The results are compared with the data that was recorded in several ways (cameras, flooding marks, etc.). The sources of this comparison data is explained in chapter 3 (verification).

Chapter 5 discusses the influence of the permeability constant in the numerical simulations and in the final value of the run-up and studies the effect of the presence of the buildings in the flooding processes, by means of numerical simulations of several hypothetical situations with specific layouts of the buildings near the coast. The authors introduce here an indicator for tsunami run-up flow intensity, $Z=H_{max}*U_{max}$.

Finally, Chapter 6 draws some conclusions of the presented work.

GENERAL COMMENTS:

The topic is suitable for the journal since it addresses an issue which could be of interest to the scientific community. The document is up to the international standards and the length of the paper is adequate. **High-resolution modeling of tsunami run-up flooding: A case study of flooding in Kamaishi City, Japan, induced by the 2011 Tohoku Tsunami** has been analysed with interesting conclusions. The results obtained with the developed numerical model present an interesting replication of the recorded data. However, some more explanations are needed in some chapters, in order make it easier the reading and understanding of the study. In addition, the introduced indicator *Z*, is here discussed.

The reviewer would like to give some comments and suggest corrections in order to increase its overall significance.

Abstract: Although the use of *U* to represent the flow velocity is quite common and it is explained in the chapter 5.2, the abstract must be standalone and thus, the definition of H_{max} and U_{max} must be given.

The presence of the results of numerical simulations (lines 18-20) must be adequately presented. The addition of a sentence like "As a possible mitigation measure, the influence of the buildings in the flowing has been addressed…" would increase the text flow.

1.-Introduction:

The building array treatments are widely explained. But this wide explanation distract from the objective of the paper. A briefer explanation is suggested since the references are enough to study it if necessary. In addition, and this is something common all along the paper, the structure of the chapters is not clear. The **inclusion of a paragraph explaining what the reader is going to find on each chapter is needed to improve the understanding.** If not, although each part is well explained the reader lose their sense of the bigger picture.

In the introduction it is not mentioned that the model has been applied as well to study the influence of the concrete buildings. One of the main points of the study is the application of an alternative mitigation measure (not just a seawall) to reduce the tsunami action and to allow, at the same time, the normal work on marine industries.

3.- Methods and materials:

An introduction must be included (between 3 and 3.1) to explain to the reader what they are about to find in this chapter.

The characteristics of the model are well explained and referred. Is this model new or has it been presented before? If it is new it should be said clearly, or even named.

In this chapter the characteristic of the numerical model, the application case data sources, and verification data sources are presented together.. These 3 different parts should be separated in order to make it easier the understanding, because they present independent parts of the study. In addition the verification data and the results can be explained together what would improve the overall understanding. This reviewer suggests the change of the structure of chapters 3 and 4 to:

- Chapter 3. The numerical model (including chapters 3.1 and 3.2)
- Chapter 4. Application case: Kamaishi port under 2011 event.
    - Introduction explaining the 2011 event
    - 4.1 Mesh generation (including 3.3.1, 3.3.2, and 3.3.3)
    - 4.2 Calculation condition (including 3.4)
- Chapter 5. Validation of the results. Include an introduction explaining that the results of the numerical simulations presented in the previous chapter are here presented and compared to those real data recorded. 3 comparisons:
    - 5.1 Tsunami wave height near the coast (including 3.5.1 and 4.1)

- 5.2 Local highest water surface (including 3.5.2 and 4.2)
- 5.3 Wave front propagation on streets (including 3.5.3 and 4.3)

Again, each chapter must contain an introduction.

5.- Discussion:

An introduction explaining the 2 aspects that are in this chapter (C and Z) is needed.

5.2. Here the indicator Z=U max*Hmax is presented. This is the product of the maximum inundation depth and the maximum flow velocity during the flood. However, the maximum water depth and the maximum flow velocity are not always simultaneous. The value that should be considered is *Z=(U*H)max,* which is the real maximum value of the product. The indicator must be recalculated or an explanation is needed to maintain the original expression.

This product is used to estimate the human instability hazard (Jonkman et al., 2008)

Jonkman, S., Vrijling, J., and Vrouwenvelder, A.: Methods for the estimation of loss of life due to floods: a literature review and a proposal for a new method, Nat. Hazards, 46, 353–389, doi:10.1007/s11069-008-9227-5, 2008.

SPECIFIC COMMENTS

Page 1 Line 10: shallow *water* equations

Page 1 Line 39: The reference Gallinen must be Gallien

Page 2 Line 34: permeability constant, *C* (from..

Page 6 Line 7: It is not included in the text the reference of the survey. In the reference chapter it is included the 2011 tohoku earthquake tsunami joint survey, but it must be referred in the text.

Page 6 Line 30: The influence of the port in the flooding was cited by Tomita in

T. Tomita, G.-S. Yeom, M. Ayugai, T. Niwa, Breakwater Effects on Tsunami Inundation Reduction in the 2011 off the Pacific Coast of Tohoku Earthquake, J. Japan Soc. Civ. Eng. Ser. B 2(Coastal Eng. 68 (2012) 4–8.

In view of this a comment on the no-consideration of the port in the simulation, as well as the citation of Tomita´s paper must be included.

Page 7 Line 10: Is this video available on the internet? If so, a reference would be interested.
Page 8 Line 1: The expression includes h_{max}, but in the rest of the manuscript it is called H_{max}.

FIGURES:

Figure 11 is called for the first time in page 6 line10, but the symbols contained in it are not explained until Figure 15 is called in line 34. They should be explained in the foot of the figure.

Figure 14a. In this figure are depicted the water levels at 4 points, but just the results of the model for the P3 are represented. However there are just 3 points photographed in P3. Other points have many more dots so it seems logical to depict other point time series instead of P3.

In addition, the fact that all the dots (even those from other points like P1, P2 and P4) agreed fairly well in the P3 time series is important as to be highlighted.

REFERENCES:

In page 11 line17 the reference of Water and Disaster management Bureau is not included in the manuscript text

In page 5 line 23 the reference called here Central disaster prevention council, is not included in the references list.