Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2018-25-AC3, 2018

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Assessing the tsunami building vulnerability PTVA-3 and PTVA-4 models after the 16S 2015 event in the cities of Coquimbo – La Serena (Chile)" *by* Eduardo Fritis et al.

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Received and published: 16 May 2018

Referee: This paper applied existing vulnerability models to a city in northern Chile. The authors used tsunami inundation data from the 2015 Coquimbo tsunami. The methodology considered two PTVA modes, namely PTVA-3 and PTVA-4, thus results of both methods are compared. The results of vulnerability assessment are also compared with damage data surveyed by the Ministry of Housing (MINVU). One of my major concerns is that the paper does not present new concepts or methods, it is just an application to a very specific location.

Answer: It is true that we used existing methodologies, specifically the PTVA-3 and

PTVA-4 models, and applied it to a study case. However, we did adapt the model to the Chilean construction materials and in addition and more important we compared our modeled results that are normally used by decision makers with the actual damages of a real tsunami. This allowed us to assess if the buildings really had a response similar to the RVI scores obtained trends which a unique opportunity as luckily no many tsunamis affect large cities often. Even tough La Serena – Coquimbo is a very specific location, it is a great example for the validation of these models due to the wide variety of buildings (from informal settlements with light construction materials to modern tower buildings) and different inundation heights.

Referee: The authors mention in the text that "...the RVI scores cannot be used to predict which buildings will reach or exceed a given damage state.....the aim of our comparison is not to provide a damage description to a given RVI score but to verify if the low RVI scores correspond to minor building damages and viceversa.." As a novel thing here, would it be possible to propose a correlation between RVI and damage state?, Would it be possible to add other variables or wights to the model such a better correlation is obtained?

Answer: As mentioned by Dall'Osso et al. (2016) the RVI scores are not predictive but they can be used to compare the expected performance of buildings. The referee suggests the possibility of a direct correlation between the RVI scores and the damage state however this is not possible with the existing methodologies. For doing so, it would be necessary to re-weight the different variables using the real damages to develop a new model which RVI results should agree directly with the MINVU damage categories. Although, this is beyond the scope of this research we consider it is a work that can be approached in a future manuscript.

Referee: I recommend to avoid using the words PTVA in the title, thus the subject is more clear and easy to understand by a wide and general audience. In fact, the meaning of PTVA is never explained throughout the text. I recommend to write something like "The Papathoma Tsunami Vulnerability Assessment (PTVA)..." in some place in

the abstract. In some places it is written PTVA but in other PVTA. Please check.

Answer: As suggested by the referee we will modify the title to avoid including the model names. In addition, we will check the manuscript for any PTVA typos.

Referee: It would be necessary to check the terms related to tsunami inundation. The international scientific community uses words such as Inundation height, Flow depth (or inundation depth) and Runup. The authors use terms such as flood height, inundation height, flood depth, water depth among others in different contexts, which is very confusing.

Answer: We will check the manuscript and modify the terms used in order to use those used by the international scientific community.

Referee: Section 3.2. It is not clear whether the "flood scenario" is a map of inundation height or flow depth. It would be necessary to explain better how the map was obtained. It is mentioned that 24 inundation height measurements were obtained during the field survey, which were combined with SERNAGEOMIN data. But the latter has 18 flow depth measurements. How did you obtained 266 points?. In addition, did you use interpolation? What variable was interpolated, inundation height or flow depth? Which method was used for interpolation?. What kind of DTM model was used? Which was the resolution?

Answer: The answers to the referee questions are included in section 3.2 however, we will rewrite this paragraph in order to make it more understandable. In this sense, the 266 points are obtained from 3 sources: (1) our field campaign that included 24 points; (2) SERNAGEOMIN data that includes 18 measures; and finally the inundation limit in which all the assigned points present a 0 m inundation height. We did interpolate the inundation height obtained from these 266 points using a kriging model in the Geostatistical tool in ArcGIS 10.3 and including a 1 m/pixel DEM as an external drift. The DEM was obtained from the Chilean Navy (SHOA).

Referee: sections 4 and 5 should be part of a section called "Results", while section 6 and 7 should be part of a "Discussion". However, the discussion should be extended.

Answer: We agree that sections 4 and 5 represent our results and sections 6 and 7 are the discussion of the results, however, we do not consider necessary to organized the manuscript in a more conventional way that include results and discussion sections specifically.

Referee: Even though the Introduction shows several papers as literature review on the development and application of PTVA models, the discussion is limited to the current results only.

Answer: Unfortunately, there aren't other similar papers in Chile with the exception of the proposal of fragility curves developed by Aranguiz et al. (2018). We will include a discussion with their results as their study area is also La Serena – Coquimbo. However, discuss and compare our results with other published papers for around the world is difficult as the tsunami scenarios as well as the urban features are completely different for one city to another.

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