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Interactive comment on “Tsunami hazard potential for the equatorial southwestern Pacific atolls of Tokelau from scenario-based simulations” by A. R. Orpin et al.

Anonymous Referee #2

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Review of the nhess-2015-15 paper:

Tsunami hazard potential for the equatorial southeastern Pacific atolls of Tokelau from scenario-based simulations By Orpin et al.

This paper presents a tsunami hazard assessment for the atolls of Tokelau using scenario-based simulations. The authors elaborate on pre-existing methodology and obtain tsunami hazard maps in terms of maximum wave heights and flow depths.

While the authors are able to carry out the scenario-based tsunami hazard (SBTH) methodology from the source to the site, there are several points needed to be com-

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pleted in their analysis, and likely also a few conceptual flaws, which I will comment in more detail in the following. Therefore, in my opinion, the paper needs both a further deep editorial effort, and also to complete the hazard assessment, which will lead to calculation of additional results. For all of these reasons, I suggest to ask for major revision, while encouraging its resubmission following a thorough revision.

General comments:

1. All along the paper (e.g. in the abstract, p.2, l4) the authors confuse 'tsunami risk assessment' with tsunami hazard assessment. Risk assessment requires, in addition to the hazard that it is partially (I will explain in the next points 2, 3 and 4) treated in the paper, a vulnerability analysis for a given exposure element (coastal population, structures, ...etc).
2. Also, the authors mentioned, all along the paper, that the tsunami hazard is assessed in terms of "maximum tsunami wave heights": Did the author mean by "wave height" the elevation between the crest and the trough of the wave? Or the height of the crest above the zero-level (wave amplitude)? In order to clarify this point, plots of tsunami waveforms at some points of interest along the coast of Tokelau are required.
3. Another important output of SBTH assessment is the flow velocity maps. As most tsunami-induced loads on coastal structures – tsunami impact- are related to the flow velocity, the authors are invited to present also tsunami flow velocity maps for the studied test-site.
4. The authors are asked, as final step of the SBTH assessment, to build the aggregate scenario plotting the MWH/flow depth at each cell in order to highlight the contribution of all the considered individual scenarios (see Tinti et al., 2011).
5. In the tsunami numerical modelling section there is a lack on how the authors compute the initial sea-surface perturbation caused by the occurrence of the submarine earthquake. Only propagation model is presented, what about the generation model?
6. In both the Abstract and the Section 3, it is mentioned that one of the main scopes of the paper consists of "establishing a relationship between an earthquake characteristics (mag. and location) and a potential tsunami risk", which mean that the authors attempted to establish a kind of "Local Decision Matrix". But how? I cannot find an

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answer to this question neither in the text nor in the tables or figures. 7. It is also important that the authors show in one figure a comparison of tsunami impact (limit of inundation extent for example) between different tidal conditions: MSL, MHHW, MLLW. 8. The figures still need a better representation and the actual ones are inappropriate for a scientific journal: for example, scales in Figures 2, 3, and 10 are presented without legends; Maps with no coordinates; and please separate the results of each scenario on one figure (because for instance Figures 2a and 2b are confusing).

Specific comments:

1. Abstract: . There is a number of sentences that need a re-writing such as sentence from I.7 to I.10 “we assess whethertsunamigenic sources”, the sentence is too long so please try to cut it in two short sentences. . Please provide some information on the magnitude ranges used for the tsunamigenic earthquake considered. . What do the authors mean by “the relative simplicity of the atoll topography and bathymetry”? Flat topography? Shallow bathymetry? 2. Introduction: Please explain shortly and better the SBTH assessment methodology used instead of citing the Lamarche et al. 2015 paper that is not yet published. A number of published works on this aspect are available. 3. Better change the name of the section 2 from “Study Location” to “study area” In this section, I propose also to mention what kind of structures is present in the study area? Given the computed tsunami flow depths and “flow velocities”, what kind of consequences can be inferred on those structures? 4. I propose to merge Sections 4.2 and 4.3 in one section: “Earthquake Tsunamigenic Scenario and Fault Models”, and present a short version of it, if required more information on seismic sources can be inserted in table 2. 5. P11, I.3: D is the verge slip along the fault plane 6. Results and discussion sections: The authors are asked to show new results (General comments: 2, 3, 4 and 7) and discuss them 7. Conclusions should be re-written in light of the new results.

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