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Comment

# ***Interactive comment on “The effect of uncertainty in earthquake fault parameters on the maximum wave height from a tsunami propagation model” by D. Burbidge et al.***

## **Anonymous Referee #3**

Received and published: 31 July 2015

Review of manuscript by Burbidge et al. titled "The effect of uncertainty in earthquake fault parameters on the maximum wave height from a tsunami propagation model".

The research by Burbidge et al. expands on previously published manuscripts that studied on the uncertainty or effects of earthquake fault parameters on the propagating tsunami wave heights. The study computes the Coefficient of Variation of the maximum wave height on a larger domain with a large number of simulations and the Pacific Basin, for historical events, as opposed to looking primarily at a few single points. The results of this study are important since it has implications on the predicted maximum tsunami wave height for PTHA studies and for real-time tsunami warning.

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Interactive Discussion

Discussion Paper



I recommend that this manuscript be published after corrections are made.

Specific comments:

Page 3370, line 1. I suggest using 'precomputed tsunami propagation scenarios/database' instead of 'tsunami propagation models' since you are referring to the precomputed database of tsunami propagation.

Page 3370, line 3. Change the word 'tsunami model' to 'simulated scenarios of tsunami propagation', see above comment.

Page 3370, line 24. Same comment with Page 3370, lines 1 and 3. (See first two comments).

Page 3371, lines 1-4. There is a discontinuity between this paragraph to the previous one. Previous paragraph mentioned about the hundreds to thousands of precomputed tsunami scenarios and the next paragraph jumps to physical parameters such as tides, etc. Discussion on the focus of the study of the manuscript comes one paragraph after. I suggest moving Page 3371, lines 1-20 somewhere else in the introduction since the main focus of the manuscript is the effects of the uncertainty of the earthquake's parameters. If this is not relevant to the study, perhaps shorten this paragraph but still move it.

Page 3372. Equation 1. Missing 'power 2' for the difference inside the root.

Page 3373, lines 4-14. This section needs to be clarified. The manuscript states 'For the location and events that they did study, they found that the tsunami wave height is mostly effected by changes in fault dimensions, strike angle, and slip displacement but not as much by rake, dip, epicenter location and focal depth. This sensitivity was not effected by distance, even in the far field, thus their conclusion was that the earthquake could not be treated as a point source'.

Gica et al.'s study stated that the fault dimension, strike angle, and slip displacement does not always decrease with distance, thus concluding that an earthquake might not

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be treated as a point source. The sentence on Page 3373, lines 13-14 is indicating that the sensitivity of all the parameters are not affected by distance. This needs to be rephrased to indicate that only the rake, dip, epicenter location, and focal depth were not affecting the tsunami wave height by distance but the fault dimensions, strike angle, and slip displacement are.

Page 3373, line 11. This should be 'affected' and not 'effected'. The tsunami wave heights were affected by certain fault parameters or certain fault parameters effected the generated tsunami wave heights.

Page 3374, line 11. The immediate question that comes to mind is 'is the fault dimension adjusted accordingly?' The use of Abe (1975) is not mentioned till Page 3378, line 2. I suggest placing Abe (1975) in this section.

Page 3377, line 23. I am not clear on why the sea floor deformation was calculated on a  $10 \text{ km} \times 10 \text{ km}$  patches if a uniform slip is used on a single fault plane. Is this a specific feature in EasyWave? There will be differences, perhaps minimal impact, on the initial sea surface displacement using a single fault plane as compared to a combined  $10 \text{ km} \times 10 \text{ km}$  patches due to the edge effects of each individual patch.

Page 3377, line 25 to Page 3378, lines 1-2. This is related to the comment for Page 3377, line 23. The scaling relationship between rupture dimension and slip was based on Abe (1975). Are the resulting values of the rupture dimension then rounded off to match the  $10 \text{ km} \times 10 \text{ km}$  patch?

Page 3372, line 16. Use 'standard deviation (SD)' first before abbreviating afterwards.

Page 3379, Section 3.1. I find Figure 1 unnecessary since it only shows the 2010 Maule results using COMCOT and not comparing the maximum wave height between COMCOT and EasyWave. Unless the author wants to show the locations of the DARTs in Figure 2, a plot of the Pacific Basin that indicates which DART locations were compared between COMCOT and EasyWave would suffice.

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Interactive Discussion

Discussion Paper

Page 3379, line 19. Change 'Chile 2010' to '2010 Maule'. Please make changes to the rest of the manuscript.

Page 3384, line 7. Define 'a.s.l.' in the text.

Page 3386, line 15. Do you mean the 'main beam' of the maximum tsunami amplitude? Please clarify.

Page 3388, lines 18-19. See this reference for explanation. Mofjeld, H.O., C.M. Symons, P. Lonsdale, F.I. Gonzalez, and V.V. Titov (2004): Tsunami scattering and earthquake faults in the deep Pacific Ocean. *Oceanography*, 17(1), 38-46.

Page 3389, line 10. I consider inverted sources to be a non-unique solution thus strongly agree with the authors on this. I would suggest to remove the word 'potential' to emphasize that it is a non-unique solution.

Page 3391, line 23. Please remove in reference since manuscript is still in preparation.

Page 3392, line 2. The journal is *Journal of Waterway, Port, Coastal, and Ocean Engineering*. Change the word 'Div.'

Page 3396, Figure 2. Hard to distinguish the blue line from the red. Figure plots are too small.

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Interactive comment on *Nat. Hazards Earth Syst. Sci. Discuss.*, 3, 3369, 2015.

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