

# ***Interactive comment on “Assessment of peak tsunami amplitude associated with a great earthquake occurring along the southernmost Ryukyu subduction zone for Taiwan region” by Yu-Sheng Sun et al.***

## **Anonymous Referee #1**

Received and published: 24 November 2017

First of all, I want to point out that I can only review the tsunami modeling part of the preprint. I cannot comment on the seismological part, the choice of stochastic sources.

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*1. Does the paper address relevant scientific and/or technical questions within the scope of NHESS?*

Yes.

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*2. Does the paper present new data and/or novel concepts, ideas, tools, methods or results?*

To my knowledge, it is the first published assessment of tsunami amplitudes of this kind for Taiwan. The setting that the coast line is perpendicular to the rupture is interesting in general.

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*3. Are these up to international standards?*

*4. Are the scientific methods and assumptions valid and outlined clearly?*

*7. Is the description of the data used, the methods used, the experiments and calculations made, and the results obtained sufficiently complete and accurate to allow their reproduction by fellow scientists (traceability of results)?*

Concerning the application of the tsunami model: No. COMCOT is used as a black box. My major criticism is that the model is not validated for this area, and I strongly suggest to add a hind cast of a real event to prove that COMCOT with the chosen settings delivers realistic simulations. Probably, the last near field tsunami in 1867 is not well suited for a hind cast due to the lack of measurements, but the Tōhoku tsunami 2011 should be a good test case also for Taiwan.

The following questions should be addressed:

- Which formulas and parameters are used, in particular for bottom friction (Manning coefficient)? The bottom friction has an impact on the simulated tsunami amplitude at the coast.
- Which bathymetry and topography data is used? Free GEBCO and SRTM?
- The resolution of 1 minute for the inner mesh is quite rough for simulations that should give estimates of the tsunami amplitude at the coast. Our experience

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from hind casts of real events suggests that at the coast line, the horizontal resolution should be 500m (edge length in an unstructured triangular grid) or better. This should be transferable, as COMCOT also is a model with first order spatial discretization.

- Where are the tide gauges located? See also point 14, references. On the one hand, the exact location is not really important, because the study could be performed with virtual sensor locations or coastal forecast points, but
  - to reproduce the results, the locations of the (real or virtual) gauges are needed,
  - for hind casts of real events, the location and measurements from real tide gauges are needed,
  - the simulation of the tsunami wave form at a tide gauge that is located e.g., inside a harbor or narrow bight is very sensitive to errors in the representation of bathymetry and topography (1min resolution for sure is too coarse!) and to the choice of the roughness parameter (wave reflections).
  - The comparison in fig. 6 may be spoiled by different gauge locations. Distance to the source is not the only parameter, as it is also stated in the paper, too (e.g., page 7 line 23-24).

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5. *Are the results sufficient to support the interpretations and the conclusions?*

6. *Does the author reach substantial conclusions?*

Yes, but keep in mind that the results were obtained by a black box simulation.

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8. *Does the title clearly and unambiguously reflect the contents of the paper?*

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9. Does the abstract provide a concise, complete and unambiguous summary of the work done and the results obtained?

10. Are the title and the abstract pertinent, and easy to understand to a wide and diversified audience?

Yes.

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11. Are mathematical formulae, symbols, abbreviations and units correctly defined and used? If the formulae, symbols or abbreviations are numerous, are there tables or appendixes listing them?

Equation (1): W for width, L for length: It's obvious, but nevertheless should be added in the text above.

Which value for  $\mu$  is assumed when estimating Mw? And as a non-seismologist, I would like to ask if the estimate of  $\bar{D} = 8.25\text{m}$  is really obvious?

Section 2.2: Not my field of expertise at all.

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12. Is the size, quality and readability of each figure adequate to the type and quantity of data presented?

Figure 4: change y-axis label to "Wave amplitude"

Figure 6: I would keep this figure, but skip the explicit linear fitting. It pretends an accuracy that cannot be obtained.

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13. Does the author give proper credit to previous and/or related work, and does he/she indicate clearly his/her own contribution?

To me, the distinction between own work and work from other scientists seems clear.

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#### 14. *Are the number and quality of the references appropriate?*

A citation for the tide gauge locations or at least a list of coordinates would be handy. The Taiwanese tide gauges are not available at

<http://www.ioc-sealevelmonitoring.org> or <http://www.psmsl.org/> (Taipei until 1995, Kaohsiung until 1996), and I could not find a link to the gauges at the website of the Taiwanese Central Weather Bureau (CWB) <http://www.cwb.gov.tw> This private/commercial site was the best information I could find:

<https://www.tide-forecast.com/locations/Hualien-City>. Still, no exact location, but the "Detailed Map" gives at least an idea that this station is located inside the harbour. In total, 9 Taiwanese stations are available here.

I am missing a short overview of historical tsunamis in Taiwan, but the last local tsunami occurred in 1867, and it might be difficult to find scientific papers to cite, see e.g.,

<http://scweb.cwb.gov.tw/NewsContent.aspx?ItemId=37&CId=199&loc=en>

However, I found the following paper - no tsunami, but a report on the uplift of the tide gauge due to the earthquake. Maybe, this paper provides a helpful hindcast, too: COMCOT should not show a strong tsunami.

Chung-Liang Lo, Emmy Tsui-Yu Chang, and Benjamin Fong Chao. Relocating the historical 1951 Hualien earthquake in eastern Taiwan based on tide gauge record. *Geophys. J. Int.* (2013) 192, 854–860. doi: 10.1093/gji/ggs058

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#### 15. *Are the references accessible by fellow scientists?*

Yes, but please add doi numbers.

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16. *Is the overall presentation well structured, clear and easy to understand by a wide and general audience?*

17. *Is the length of the paper adequate, too long or too short?*

Yes, and adequate except that more explanation is needed for the tsunami simulation.

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18. *Is there any part of the paper (title, abstract, main text, formulae, symbols, figures and their captions, tables, list of references, appendixes) that needs to be clarified, reduced, added, combined, or eliminated?*

Figures: See remark for point 12.

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19. *Is the technical language precise and understandable by fellow scientists?*

20. *Is the English language of good quality, fluent, simple and easy to read and understand by a wide and diversified audience?*

As a non-native speaker, it is not easy to comment on the language. I observed several grammatical errors, but overall, I found the article easy to read and understand. In particular in the tsunami context, the scientific language is precise.

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21. *Is the amount and quality of supplementary material (if any) appropriate?*

N/A

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