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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "A mathematical formulation for estimating maximum run-up height of 2018 Palu tsunami" *by* Ikha Magdalena et al.

Anonymous Referee #2

Received and published: 10 September 2020

Dear authors,

It was interesting to read your manuscript and I am glad someone was trying to apply cross-sectionally averaged shallow water equations to model tsunamis the Palu bay. Especially, since the Palu bay has an almost ideal parabolic shape with a linear slope.

1) After reading the manuscript, I started to be significantly concerned regarding the applicability of cross-sectionally averages theory to the case of 2018 Sulawesi tsunami. The earthquake rupture happened not across the bay but rather diagonally and near its head. This could be easily seen e.g. at the NOAA tsunami modeling webpage (figure 6 is likely from there) https://nctr.pmel.noaa.gov/sulawesi20180928/ and https://www.youtube.com/watch?v=98scC02hNzo&feature=youtu.be See the attachement, figure 1, for the tsunami wave height right at its initiation. The cross-sectionally

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averaged shallow water equations assume a uniform wave across the entire bay, which is not the case here.

2) In the manuscript it was mentioned that the period of the wave was 3 minutes. Besides the tectonic tsunami caused by the ocean bottom, there were several landslides along the lateral shores, and it is not clear whether the 3 minutes and due to the tectonic and/or landslide components. Overall, the paper would greatly benefit from a short discussion of the tsunami source, wave propagation, observations, etc. This can (or maybe cannot) put a solid footing for the cross-sectionally averaged theory chosen here to model runup.

3) Please explain applicability of the monochromatic wave assumption to compute the runup of Sulawesi tsunami in the Palu bay. This methodology is applicable in some theoretical computations to show importance of the bay geometry, wave period, etc. But we rarely have seen monochromatic tsunami waves. I would almost say 'never have' seen.

4) Derivations of the analytical solutions could be shortened since the bay profiles depend on the exponential. For example, a reader could be referred to Garayshin et al., (2016) and Anderson et al., (2017) who considered runup of long wave runup in the general case of U-shaped and V-shaped bays. These authors also showed that the triangular shaped bay can produce a larger runup, given all other parameters constant.

Garayshin, V., Harris, M., Nicolsky, D., Pelinovsky, E., & Rybkin, A. (2016). An analytical and numerical study of long wave runup in U-shaped and V-shaped bays. Applied Mathematics and Computation, 297, 187–197 Anderson, D., Harris, M., Hartle, H. et al. Run-Up of Long Waves in Piecewise Sloping U-Shaped Bays. Pure Appl. Geophys. 174, 3185–3207 (2017). https://doi.org/10.1007/s00024-017-1476-3

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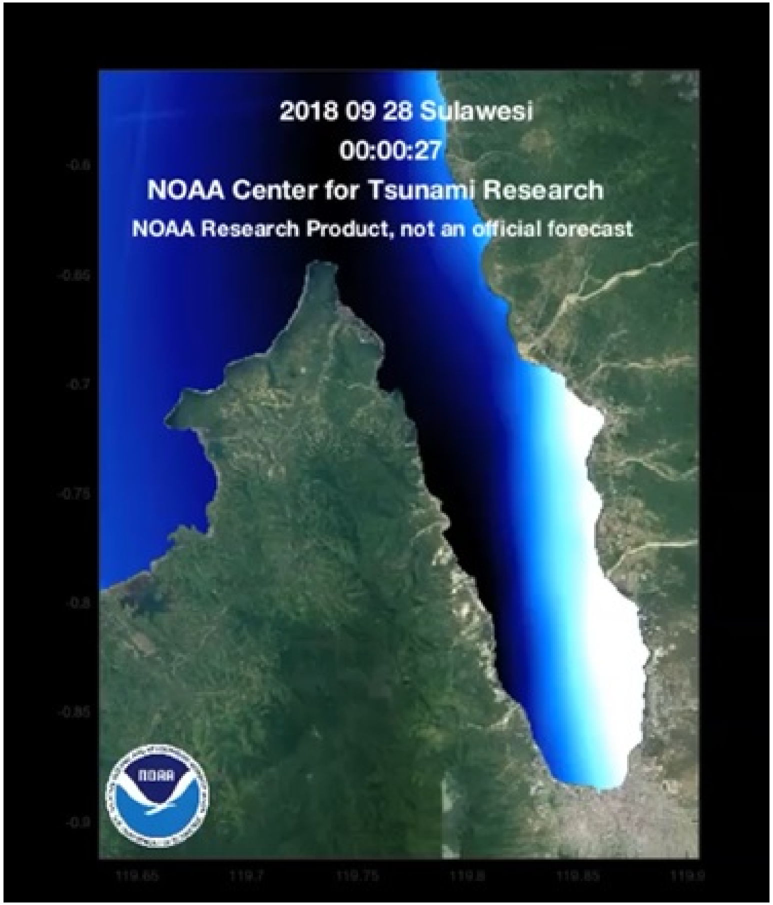

Fig. 1. first seconds of the modeled tsunami according to the PMEL NOAA simulations

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