Natural Hazards and Earth System Sciences Discussions

Nat. Hazards Earth Syst. Sci. Discuss., author comment AC1
https://doi.org/10.5194/nhess-2022-200-AC1, 2022

Reply on RC1

Gui Hu et al.

Author comment on "The characteristics of the 2022 Tonga volcanic tsunami in the Pacific Ocean" by Gui Hu et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-200-AC1, 2022

Response to referee #1 for NHESS manuscript nhess-2022-200 by Hu et al

Note: The comments are in "*italics*", and our responses are in "regular" text (in blue) for clarity.

General Comments:

This is a well-written paper. The authors provide a comprehensive summary of the present studies of the 2022 Tonga tsunami, and also present their research results derived from careful analysis of massive records of tsunami data. The suggest that the tsunami data consist of four different components according to their periods due to different mechanisms. I think the current form is acceptable, except a few minor clarifications and editorial changes.

Author's response□We thank referee #1 for the positive comments and encouragements he/she made on the manuscript. Here, we present our point-by-point responses and revision to each of the comments, and believe that the manuscript will be improved as a result of these changes.

2.2 Tsunami Modeling:
JAGURS can consider secondary effects on tsunami propagation, e.g., Earth elasticity and seawater stratification. Did you include these effects in your simulations?

Author's response: For the secondary effects, we have considered the dispersion effect which is important for tsunamis generated by non-seismic sources (e. g. flank failure or landslides caused seafloor crustal displacements). As the purpose of using tsunami modelling approach is to obtain the arrival times of conventional tsunami, we only take into account the secondary effect which has appreciable influence on tsunami arrivals. Among the impact of secondary effects on modelled arrival times, the dispersion effect has a relatively bigger influence in the arrival times in the far-field (Tsai et al., 2013; Watada, 2013). The discrepancy between arrival times including and not including the dispersion effect is ~ ten min. Since the Earth elasticity and seawater stratification have very minor influence on tsunami arrivals, they are not considered in the modeling of the 2022 Tonga volcano tsunami event.

Somewhere in the text the authors may emphasize that the DART data are actually *pressure records, instead of direct water height. Thus, these records can be real pressure in Pascals if the signals are shock or Lamb waves. This is different as the coastal gauges are only water height.*

Author's response□We thank referee #1 for pointing out this important information. We've added the sentences in the manuscript based on the suggestion as "DART buoy with pressure sensor deployed at the ocean's bottom records the sea level change that is transferred from pressure records in Pascals, instead of direct water height. For the 2022 HTHH tsunami event, the pressure fluctuation at DART buoy is a superposition of the pressure changes caused by tsunami and the Lamb wave (Kubota et al., 2022)."

Line 181: CL -> L:subscript
Line 207: delay -> delays
Line 235: exist -> exists

Author's response□Thanks. Done as suggested.

Reference:

Kubota, T., Saito, T., and Nishida, K.: Global fast-traveling tsunamis by atmospheric pressure waves on the 2022 Tonga eruption, Science (80-.)., https://doi.org/10.1126/science.abo4364, 2022.

Tsai, V. C., Ampuero, J. P., Kanamori, H., and Stevenson, D. J.: Estimating the effect of Earth elasticity and variable water density on tsunami speeds, Geophys. Res. Lett., 40, 492–496, https://doi.org/10.1002/grl.50147, 2013.

Watada, S.: Tsunami speed variations in density-stratified compressible global oceans, Geophys. Res. Lett., 40, 4001–4006, https://doi.org/10.1002/grl.50785, 2013.