

Nat. Hazards Earth Syst. Sci. Discuss., referee comment RC3
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Comment on nhess-2021-369

Anonymous Referee #3

Referee comment on "Characteristics of two tsunamis generated by successive $M_w \square 7.4$ and $M_w \square 8.1$ earthquakes in the Kermadec Islands on 4 March 2021" by Yuchen Wang et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2021-369-RC3>, 2022

In the manuscript entitled 'Characteristics of two tsunamis generated by successive Mw 7.4 and Mw 8.1 earthquakes in Kermadec Islands on March 4, 2021', the authors have addressed a not trivial case capturing tsunami characteristics generated by two successive earthquakes. This study provides insights of the source spectrum based on the empirical Green's function (EGF) and tsunami/background ratio methods. The spectral analysis allows distinguishing the dominant wave periods and ranges. The paper is well written but the discussion and conclusions should be improved. I suggest further revision to the following comments.

General comments:

(1) While the selection of a second-order high-pass filter has been tested (e.g. Heiderzadeh and Satake, 2013; Heiderzadeh et al., 2015), the justification of the window or frequency corner is not clearly stated. This selection may affect results.

(2) Considering that this is a peculiar case where two tsunamis are generated from close sources, I've found that the Section 5 and the Conclusions are weak. These sections could be enhanced by exploiting more the results, and providing a thorough discussion that is lacking. Also, consider to add limitations of this study (e.g. not using the DART records).

(3) The authors are encouraged to provide further interpretation of the results higher frequencies, decaying processes and source characteristics, specially in light of one of the main observations of this study described in Line 195.

(4) The overall structure of the paper is fine, but some elements of the Methods appear in the Section 5, where instead, discussion is expected. Also, the results of the subsection

2.3 'Earthquake Slip Models and Tsunami Numerical Simulation', where simulations based on the USGS source models need further contextualization/discussion, for example, in Figure 5.

Specific details:

Lines 83-84, articles needed.

Line 127, needs rephrasing: Similar patterns were also be observed at Quinne...

Line 133, modify 'at most stations. At most stations ...'

The figures of this manuscript have been greatly improved in the answers to previous comments, but I suggest to modify the green point that shows the spectral peaks in Figure 3. Instead, consider using a stronger color.

References:

Heidarzadeh, M., and Satake, K. (2013). Waveform and spectral analyses of the 2011 Japan tsunami records on tide gauge and DART stations across the Pacific Ocean. *Pure Appl. Geophys.*, 170, 1275–1293. Doi:10.1007/s00024-012-0558-5

Heidarzadeh, M., Pranantyo, I. R., Okuwaki, R., Dogan, G. G., and Yalciner, A.C. (2021). Long tsunami oscillations following the 30 October 2020 Mw 7.0 Aegean Sea earthquake: Observations and modelling. *Pure Appl. Geophys.*, 178, 1531–250. Doi:10.1007/s00024-021-02761-8