Regression analysis of macroscopic tsunami intensity and offshore wave height in the Mediterranean Sea, by Selva et al.

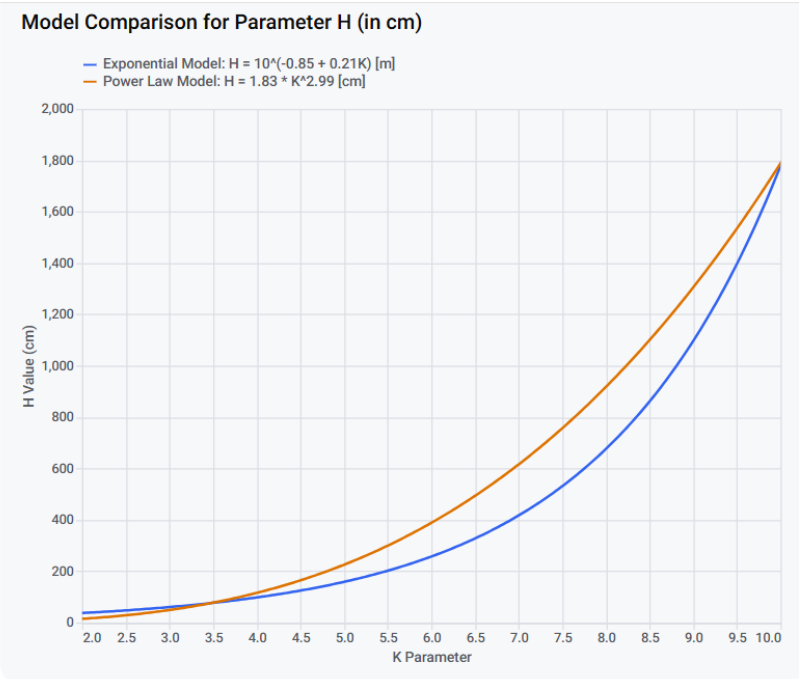
Major comments

This paper focuses on the regression analysis of macroscopic tsunami intensity and offshore wave height in the Mediterranean Sea. The basic concept is that pre-instrumental records predominantly consist of qualitative descriptions from which macroscopic intensity are defined to quantify the size of the tsunami. The authors underline in several points of the paper that there is lack of empirical relationship linking local macroscopic tsunami intensity, I (or K), to shoreline wave height, H, and claim that their study presents the first empirical, statistically robust, and fully invertible relationship. To establish their relationship, they proceed to coupling a simplified 1D onshore hydraulic propagation model with high-resolution coastal transects and local roughness constraints with application to Mediterranean tsunamis.

In principle, their approach is methodologically interesting. However, there is a major drawback in the paper, which is the ignorance of previous empirical K/H relationships. As a matter of fact, after the introduction of the 12-degree tsunami intensity scale by Papadopoulos and Imamura (2001), which is adopted by the authors, Papadopoulos (2003) published a first rough K/H empirical correlation. Soon after, Papadopoulos and Fokaefs (2005) published a series of empirical K/H relationships based on direct H observations and K estimations in the entire Mediterranean as well as in the east and west Mediterranean basins.

The empirical relationship (7) obtained by the authors, after Log transformation reversal of the term log H in the left hand-side of (7), concludes to the exponential H (in m) = 10^(-0.85 + 0.21K), or to the calibrated formula H (in cm)=10^(1.15+0.21K), which is quite similar to the power-law H (cm)=1.83 (K^2.99) (σ^2=0.83) found by Papadopoulos and Fokaefs (2005) from eastern Mediterranean Sea data. The similarity between the results by Papadopoulos and Fokaefs (2005) and those of the current paper can be found by using the 6-grade scale by Sieberg-Ambraseys instead of the Papadopoulos and Imamura (2001) scale. It is noteworthy that the empirical K/H relationship found by Papadopoulos and Fokaefs (2005) was utilized more recently for the data-driven probabilistic tsunami hazard assessment in the Mediterranean (Triantafyllou et al., 2023).

A comparison of the two models can be seen in the figure below. The strong alignment of both curves throughout the K = 2 to 10 domain clearly indicates that the two models represent alternative curve-fitting methodologies (Exponential vs. Power Law) describing the exact same physical correlation.



Specific comments

35 Tsunamis are events rare. Correct to "Tsunamis are rare events".
94 inundation length. This term should be "inundation intrusion" according to Fig. 1.
98 Equation 1. Would it be (R= L tan So)? Please check.
156 & 160...where a is the roughness aperture. Would it be «...where α is the roughness aperture». Also, in Table 1 and elsewhete. Please check.
189 ...the extension of villages. Would it be "the land area covered by villages" or something like that. Please check.
All Figures are blurred, please check.

Conclusion and recommendation

I concluded that the empirical relationship reached by the authors is not new, it was reached more than 25 years ago. Therefore, the claim that the authors present the first empirical K/H relationship is not correct and understates previous similar findings by others. What remains is the different approach used by the authors to reach the same empirical relationship. Because I appreciate this effort I recommend that the paper should be revised extensively by comparing and discussing the two models examined previously in the spirit of my previous analysis. Specific comments should also be considered.

References

Papadopoulos, G.A. 2003. Quantification of tsunamis: a review. In: Yalciner A.C. et al. (eds.), Submarine Landslides and Tsunami Generation, Kluwer, 285-291.

Papadopoulos, G.A., A. Fokaefs, 2005. Strong tsunamis in the Mediterranean Sea: a re-evaluation. ISET J. of Earthq. Technology, 42, 159-170.

Triantafyllou, I., et al., 2023. Probabilistic Tsunami Risk Assessment from Incomplete and Uncertain Historical Impact Records: Mediterranean and Connected Seas. Pure Appl. Geophys. 180, 1785–1809. https://doi.org/10.1007/s00024-023-03262-6