

Figures of “Regression analysis of macroscopic tsunami intensity and offshore wave height in the Mediterranean Sea”

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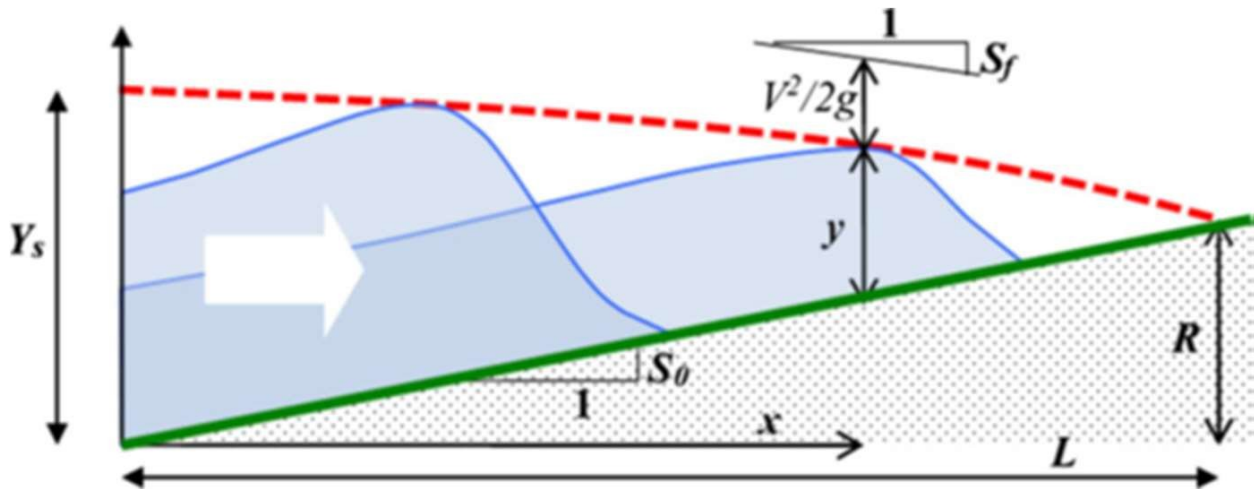
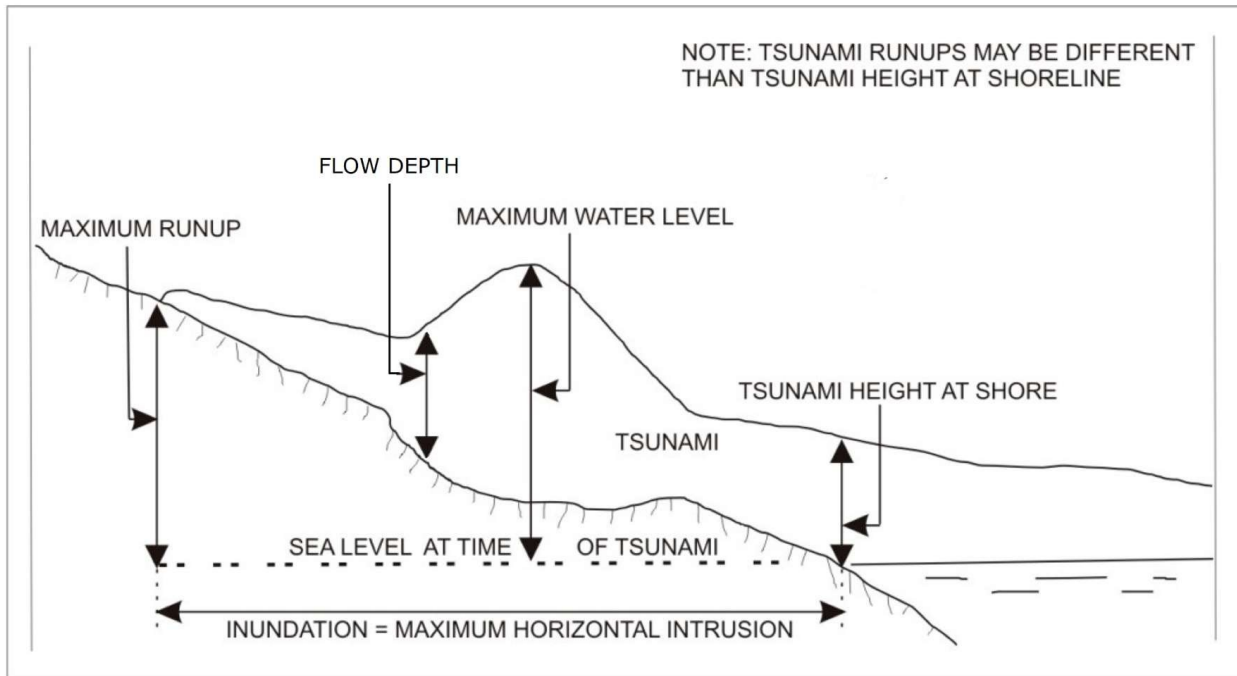


Figure 1: a) Physical measures of tsunamis (modified from Triantafyllou et al., 2021). b) Wave impact on a constant slope S_0 land profile, reporting wave-crest levels (Y_s), onshore inundation distance (L), run-up (R), total head friction gradient (S_f), water depth (y) and the profile of wave-crest heights (dashed red line; modified from Smart et al. 2016).



20 Figure 2: a) Transects drawn between Briga Marina (San Paolo district) and Malati district, in Sicily. The central transect extends over the bed of the Briga stream, with a smaller slope than the residential areas. b) Example of transects plotted from Google Earth in Santa Tecla (Sicily). For one of the transects, the elevation profile from which the mean characteristic slope was calculated is displayed. Maps data: © Google Earth 2022; images: © Terrametrics, SIO, NOAA, U.S. Navy, NGA, GEBCO.

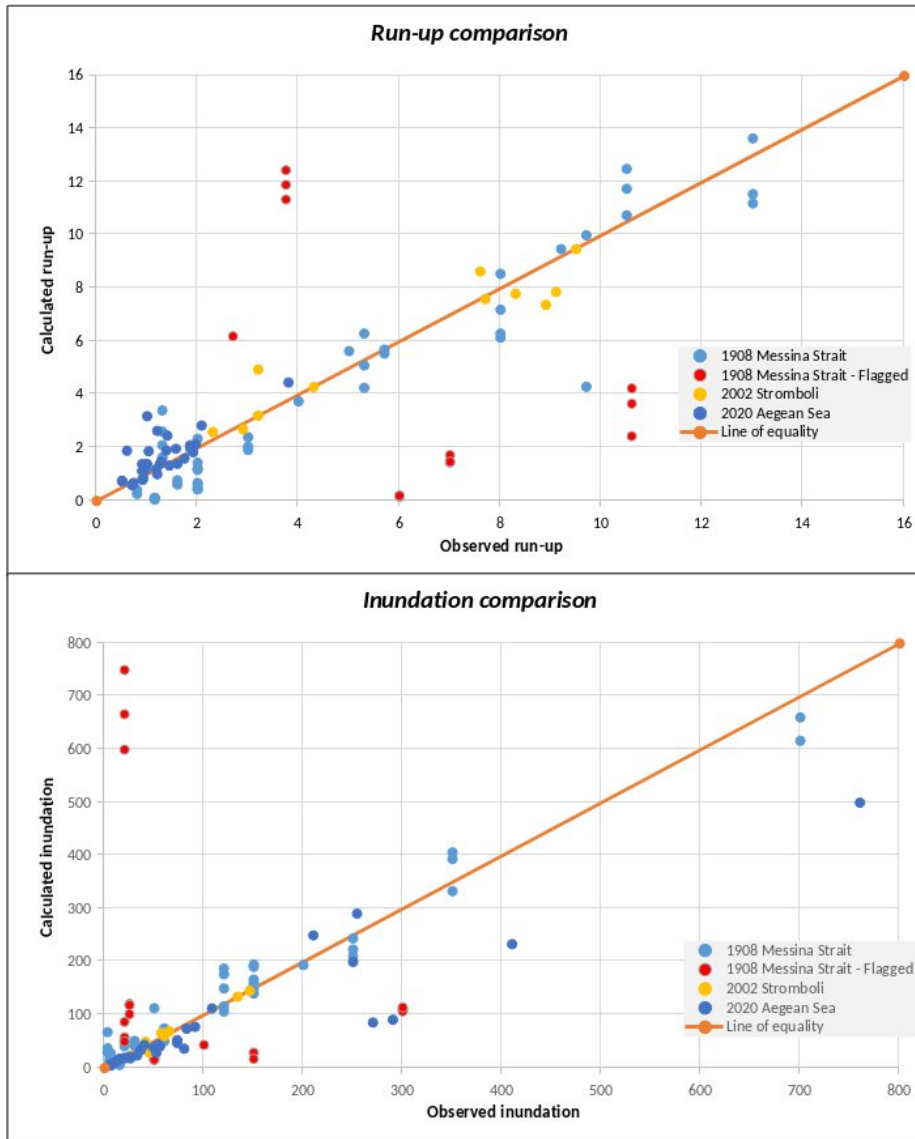
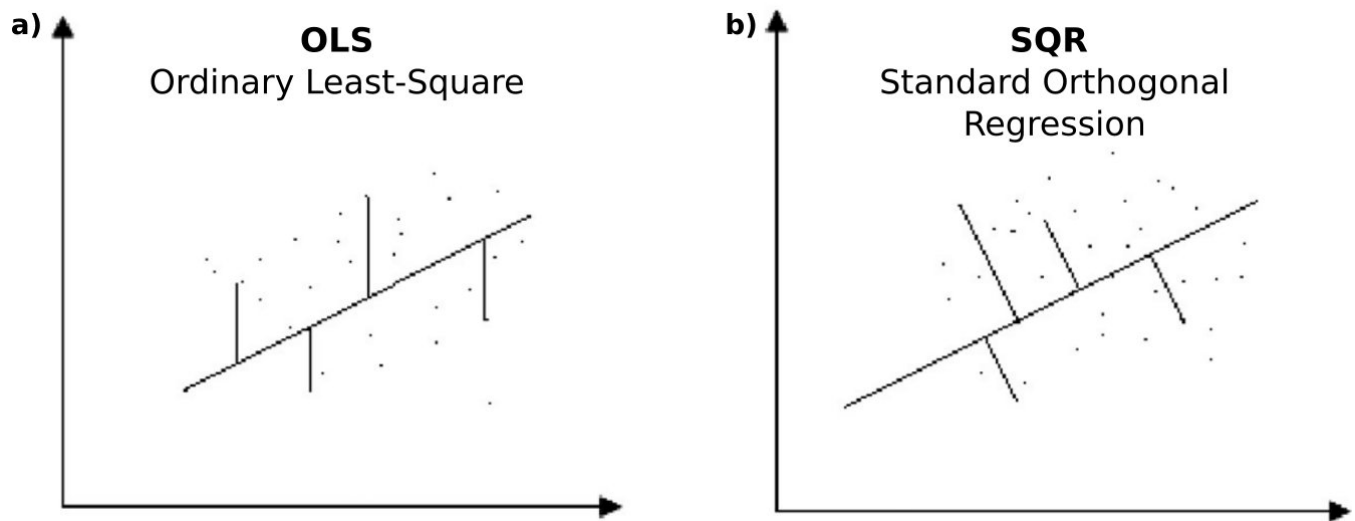
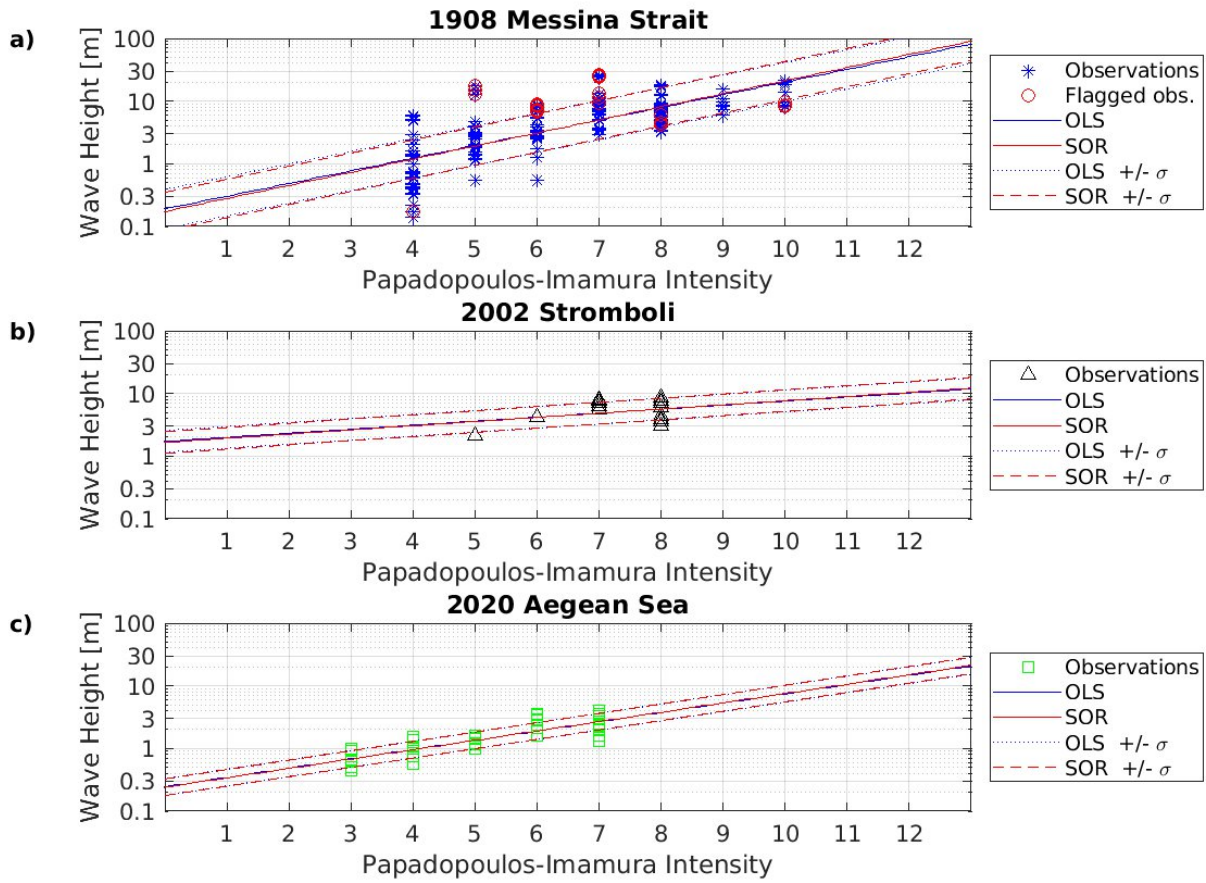


Figure 3: Run-up (panel A) and inundation length (panel B) measured and calculated for all the events. Points in red correspond to places where it was not possible to conduct an effective measurement of the elevations. Plots reporting separately the comparison for the three events are shown in Figures S7, S8, and S9.



35 Figure 4: a) Ordinary least-square (OLS) where variable x is assumed without associated error and residual minimized vertically, and b) simple orthogonal regression (SOR), where variables are assumed with comparable error distribution and residuals minimized orthogonality to the regression line (modified from Leng et al. 2007).



40 Figure 5: Papadopoulos-Imamura Intensity and wave height regression for a) the 1908 Messina strait tsunami, b) the 2002 Stromboli tsunami, and c) the 2020 Aegean Sea tsunami. The same plots for the Sieberg-Ambraseys scale are reported in figure S10.

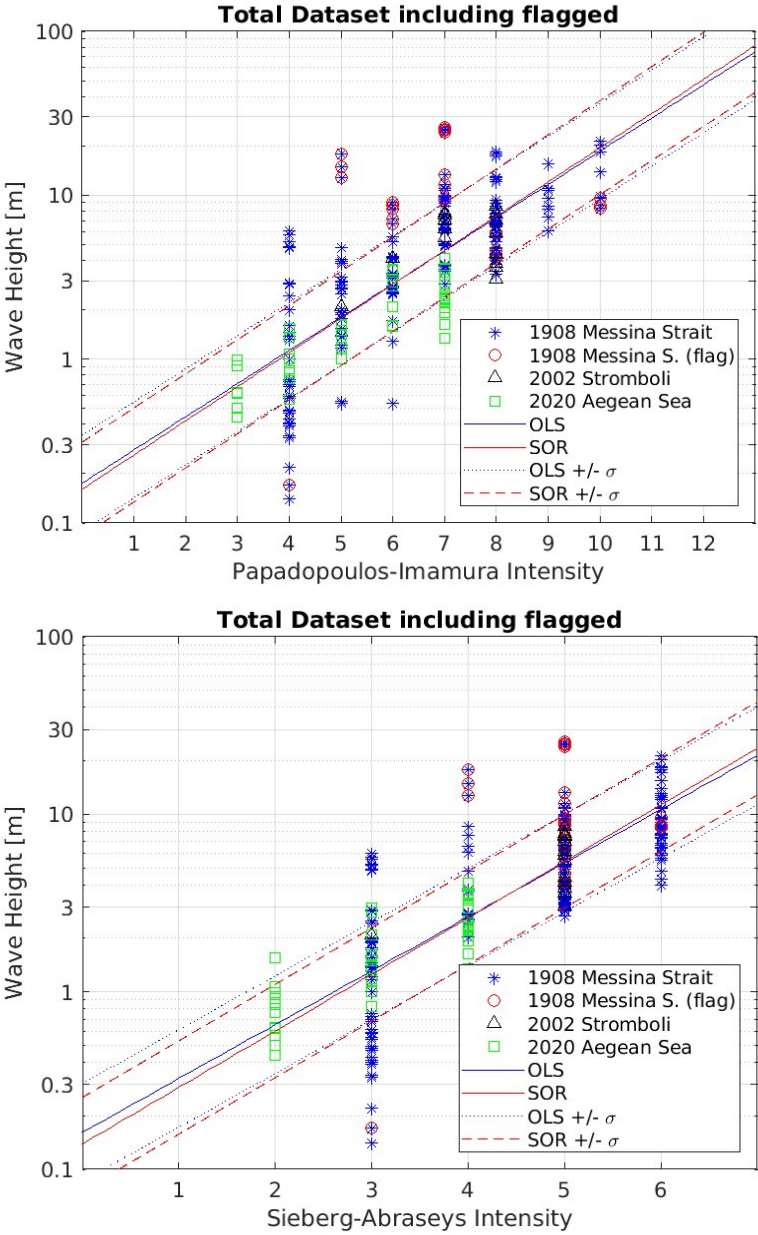
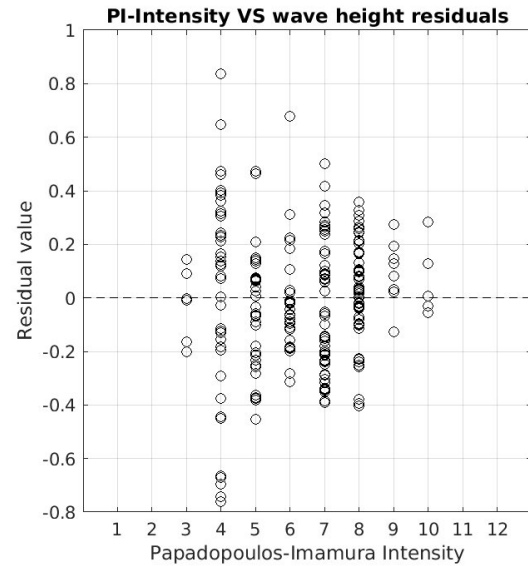
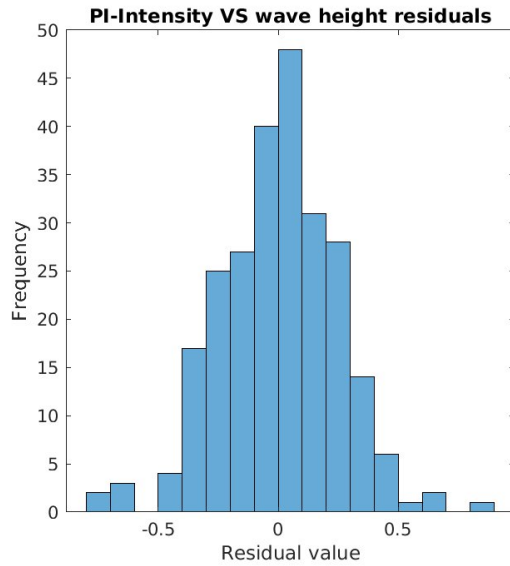


Figure 6: a) Regression between Papadopoulos-Imamura intensity and wave height using the entire dataset, excluding flagged observation (high uncertainty). b) Same of a), for the Sieberg-Ambraseys intensity. The same plots including flagged events are reported in Figure S12.



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Figure 7 - Analysis of the orthogonal residuals for the Papadopoulos-Imamura intensity: a) distribution of the orthogonal residual. b) Distribution of the orthogonal residual as a function of the intensity.

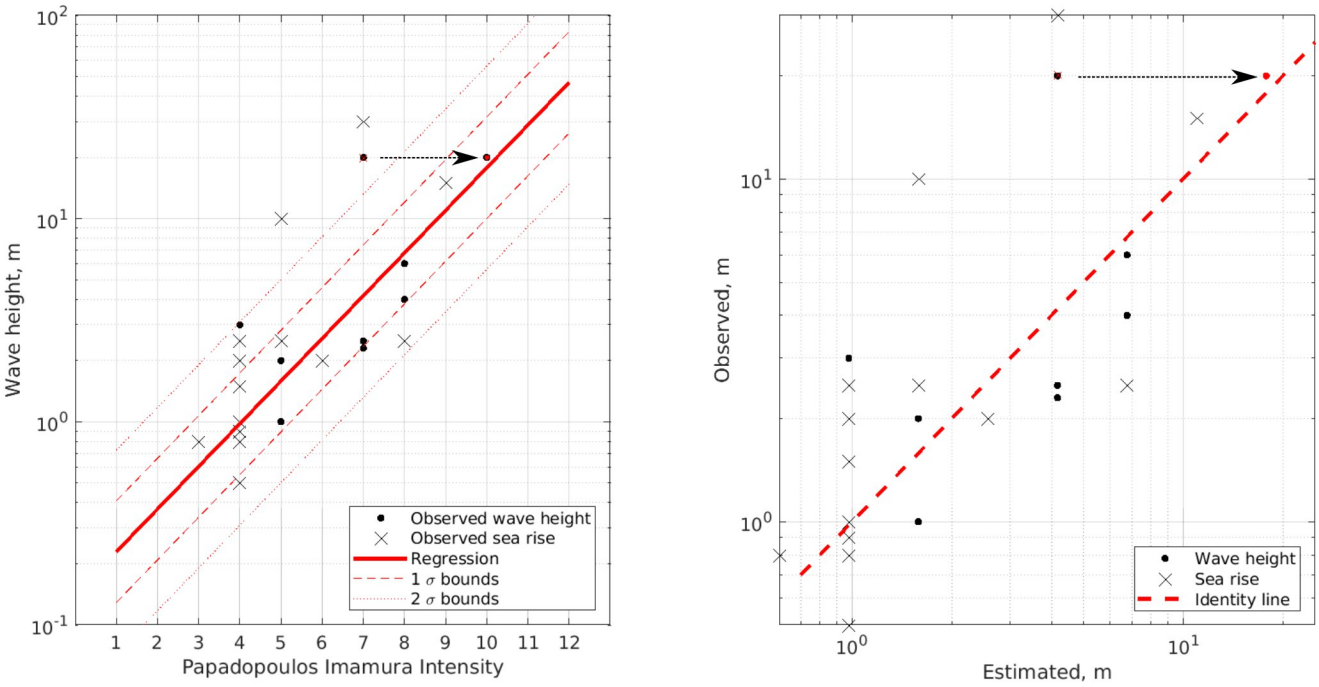


Figure 8: Sanity check of the empirical relationship, comparing a) measured wave height with the empirical relationship ad b) estimated VS measured wave height. The 1783 observation at Giogia Tauro is reported both in its original position (black dot and red cross), and in its potentially corrected position (red dot). See text for more details.

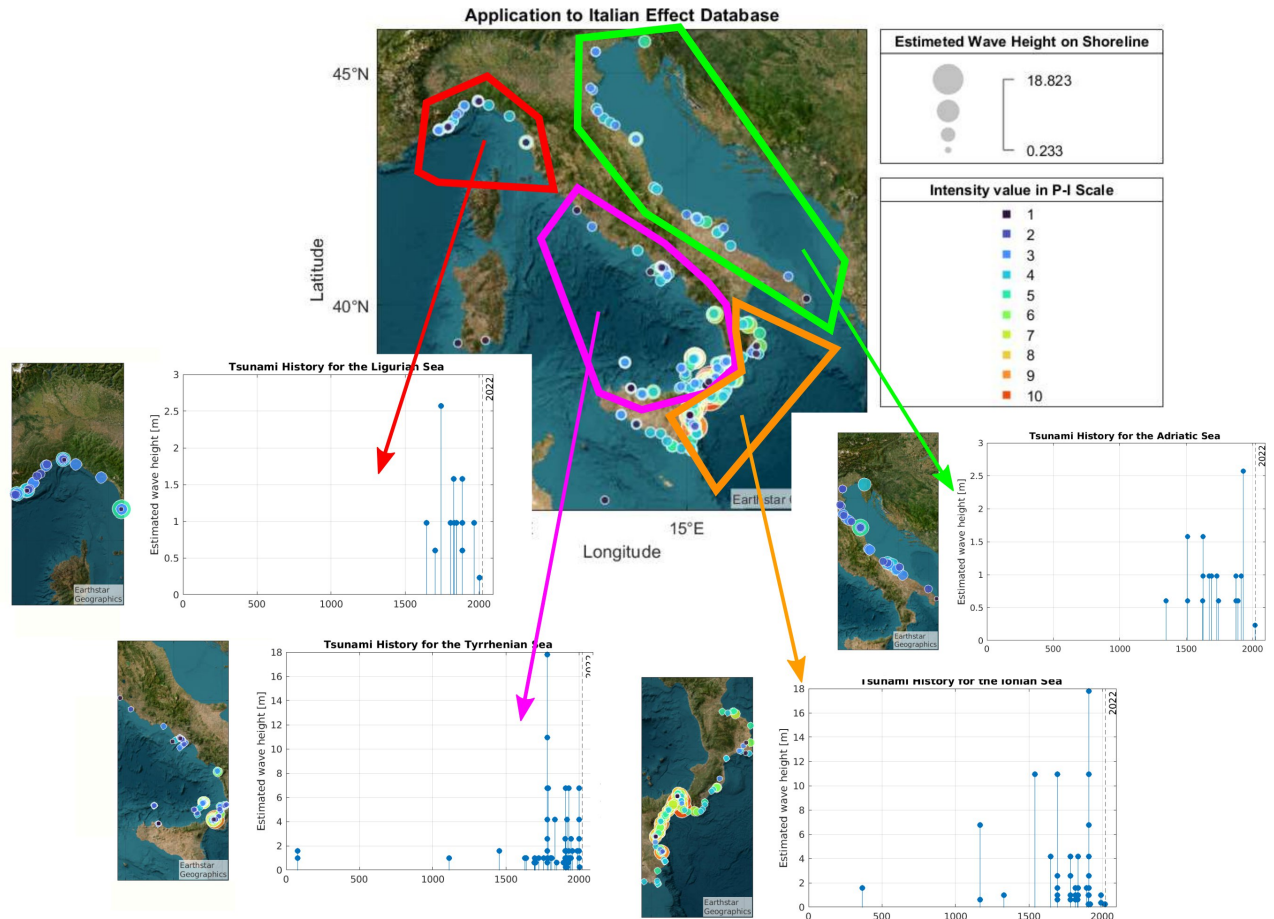


Figure 9: Map displaying the application of empirical relationship of Eq. 7 to the entire ITED dataset, converting all the Papadopoulos-Imamura intensity to wave height values. In the subplots, we report the tsunami history in the different domains.

70 Map produced in Matlab, with data Esri, HERE, Garmin, GeoTechnologies, Inc., USGS|Powered by Esri.