

# Assessment of the 1693 tsunami wave generation and propagation simulation based on multiple focal mechanism scenarios for recent disaster mitigation in eastern sicily, Italy

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<b>Abstract</b>	<p>The 1693 tsunami was the most extensive earthquake-tsunami event in Sicily, submerging Catania, Augusta, and Syracuse. However, the earthquake rupture, water level, arrival time, and furthest inundation distance of the tsunami waves are not yet known. This study aims to investigate the tsunamigenic source, run-up height, furthest inundation distance, and arrival time of the 1693 tsunami waves on the east coast of Sicily. Moreover, the assessment of tsunami-prone zones was also conducted based on worst-case earthquake-tsunami scenarios. Numerical modeling was applied by proposing six offshore focal mechanism scenarios using the shallow water equation in Delft3D and Delft Dashboard. The input parameters include length, width, strike, dip, slip, rake, and depth of the earthquake rupture. Meanwhile, the tsunami wave propagation onshore utilized XBeach and ArcGIS, considering the maximum run-up height, surface roughness analyzed from land use maps, slope, river existence, and coastline from Digital Terrain Model (DTM) identification. The results indicate that the worst possible impact of the 1693 tsunami was generated by an earthquake with a magnitude of Mw 7.13. The maximum water level, furthest inundation distance, and arrival time achieved 7.7 m, 318 m, and 9 min after wave generation offshore, respectively. This simulation is consistent with the discovery of 1693 tsunami deposits at a distance of less than 400 m from the coastlines of Augusta and Syracuse, but it is above the estimated furthest inundation distance in previous studies, which only reached around 100 m-200 m from the eastern coastline of Sicily. The results of the study are reliable as they align with the 1697 historical document where seawater inundated San Filippo Square, Catania.</p>
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