

Preparation of Synthetic Earthquake Catalogue and Tsunami Hazard Curves in Marmara Sea using Monte Carlo Simulations

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The Marmara Sea and its surrounding is one of the most populated areas in Turkey. Many densely populated cities, such as megacity Istanbul with a population of more than 14 million, a great number of industrial facilities in largest capacity and potential, refineries, ports and harbors are located along the coasts of Marmara Sea. The region is highly seismically active. There has been a wide range of studies in this region regarding the fault mechanisms, seismic activities, earthquakes and triggered tsunamis in the Sea of Marmara. The historical documents reveal that the region has been experienced many earthquakes and tsunamis in the past. According to Altinok et al. (2011), 35 tsunami events happened in Marmara Sea between BC 330 and 1999. As earthquakes are expected in Marmara Sea with the break of segments of North Anatolian Fault (NAF) in the future, the region should be investigated in terms of the possibility of tsunamis by the occurrence of earthquakes in specific return periods.

This study aims to make probabilistic tsunami hazard analysis in Marmara Sea. For this purpose, the possible sources of tsunami scenarios are specified by compiling the earthquake catalogues, historical records and scientific studies conducted in the region. After compiling all this data, a synthetic earthquake and tsunami catalogue are prepared using Monte Carlo simulations. For specific return periods, the possible epicenters, rupture lengths, widths and displacements are determined with Monte Carlo simulations assuming the angles of fault segments as deterministic. For each earthquake of synthetic catalogue, the tsunami wave heights will be calculated at specific locations along Marmara Sea. As a further objective, this study will determine the tsunami hazard curves for specific locations in Marmara Sea including the tsunami wave heights and their probability of exceedance.

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