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The analysis of historical earthquakes of the North Anatolian Fault in the Marmara Region, Turkey for the last 15 centuries based on intensity and continuous Coulomb scenarios: Implications for the fault geometry and the interaction of individual earthquake segments

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In this study we evaluated the historical earthquakes of the Marmara Region totally in three-stages. In first stage, historical earthquakes were compiled from the available catalogues and classified according to their spatial distribution, whereas only the ones, related with the active northern branch of the North Anatolian Fault (NAF) were selected. Then, the next phase of classification was made to relate historical data to the ancient and historical settlements, for which a kind of shake map was produced for each event. In the second stage, three different fault models, suggested for the geometry of the NAF in the Marmara Region, were integrated into a GIS database. Mw magnitudes were calculated for each fault segment by using lengths, seismogenic depths, and slip-rates of fault segments. In the third stage, the revised digital geological map of the Marmara Region were compiled based on 1:500k conventional maps and were used to estimate the Vs30 distribution within a grid of 750x750 m. Modified Mercalli Intensity (MMI) maps were produced for each earthquake scenario, depending on the geometry of different fault models, calculated model magnitudes and intensity distributions. Moreover, we tested the surface ruptures of each earthquake scenarios by using the Coulomb stress change model for historical data covering a time era between AD 478 and 2016 in assumption with a constant horizontal slip rate of 19 mma-1 for all fault segments. As conclusion, the horsetail-fault geometry (Yaltırak, 2002) among all 3 fault models yielded the best fit to the distribution of intensities and coulomb models.