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Comparison of Tsunami Risk Assessment based on Seismic and Landslide Generated Tsunamis for the Marmara Coast of Istanbul

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A high resolution tsunami vulnerability and risk assessment have been performed for the Marmara coast of the megacity of Istanbul by using the MeTHuVA (METU Metropolitan Tsunami Human Vulnerability Assessment) Method (Tufekci et al., 2018) considering seismic and non-seismic (submarine landslide) tsunami sources in the sea of Marmara.
The 28 September 2018, Mw7.5 strike-slip Sulawesi, Indonesia earthquake triggered an unexpected tsunami and caused damage and loss of lives in Palu Bay. The observed tsunami heights are higher than the estimations from seismic sources and the generation mechanisms of this tsunami has not been well understood yet. Therefore, possible coastal sector collapses and/or subaerial/submarine landslides should also be considered as sources of this event. On the other hand, Palu event reminded 17 August 1999, Mw7.4 strike-slip Izmit, Turkey earthquake and associated tsunami event in the eastern end of Marmara Sea Izmit Bay where coastal collapses generated tsunami. These both events have similarities on the strike-slip type of the faulting mechanisms, and the tsunamis generated by submarine landslides that are probably triggered by earthquakes. These two similar events reveal the importance of landslide generated tsunamis and their destructive impact on coastal areas.
North Anatolian Fault (NAF) is a dextral strike-slip fault that located along northern Anatolia and several earthquakes along NAF have shown its westward migration since 1939. Considering the earthquake in 1912 on Ganos segment, western part of NAF, a seismic gap in Marmara Sea can be recognized. Even the faulting system shows strike-slip motion, a possible future rupture on this seismic gap may trigger a submarine landslide(s). The impacts of above mentioned events, point out the strong possibility of tsunami generation by the landslides triggered by strike-slip faults which are the main character of the faults in the region. Therefore, landslides should be one of the main components in tsunami vulnerability and risk assessments on the coasts of Marmara Sea, especially in the megacity Istanbul.
In this study, three conditions are evaluated, seismic and landslide triggered tsunamis separately and the condition of these two occurred simultaneously. According to these conditions, tsunamis are simulated, their hazard level and vulnerability analysis are performed and tsunami risk maps are plotted.
The outputs are compared in the direction of better assessment of vulnerability and risk. The results are presented and discussed to help increasing preparedness of the megacity İstanbul against possible tsunamis in the Marmara Sea.

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