



Conceptual Design and Challenges for a Tsunami Early Warning System in the Sea of Marmara

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In this study, while discussing associated challenges such as contradictions between earthquake and tsunami mitigation activities in the Marmara Region, I suggest a conceptual design for a tsunami warning system in the Sea of Marmara upon an improved version of an applicable model for the near-field tsunami early warning and emergency planning in the Mediterranean Area presented by Papadopoulos and Fokaefs (2013). Due to the extreme short arrival times as a result of the close proximity of main fault lines to the coastal regions, and existence of potential submarine landslide sources, any tsunami early warning system in the Sea of Marmara has to be strongly coupled with the earthquake warning system and stakeholders of the tsunami mitigation activities, such as local and regional components of disaster and emergency management and civil protection units. Since 1900, around 90,000 people have lost their lives in 76 earthquakes in Turkey, with a total affected population of around 7 million and direct losses of around 25 billion USD (Erdik, 2013). Based on a time-dependent model that includes coseismic and postseismic effects of the 1999 Izmit earthquake with $M_w = 7.4$, the probability of an earthquake with $M_w > 7$ in the Sea of Marmara near Istanbul, as a mega-financial-city in the heart of the Marmara Region with a population around 13 million and 1,000,000 buildings, is 35% to 70% in the next 30 years (Parsons, 2004). Historical records indicate around 30 tsunamis in the Sea of Marmara until today (Altinok et al., 2011). Among those, catastrophic earthquakes such as 1509, 1766 and 1894 resulted in considerable tsunamis and some damage. Latest tsunami observed in Marmara was due to a triggered submarine landslide of 1999 Izmit earthquake which led to reported run-up heights of 1-3 m in most places (Tinti et al., 2006). Hence, the add-on impact of a tsunami generated by the anticipated next earthquake in the Sea of Marmara should not be neglected.