Risk evaluation and disaster education around the coastal areas of Sea of Marmara, Turkey through the fault model construction of the North Anatolian Fault

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Recent, many destructive earthquakes and tsunamis occurred around the plate boundary in the world, which are, 2004 Sumatra Earthquake/Tsunami, 2011 East Japan Earthquake/Tsunami in Japan, and so on. Along plate boundary in Turkey, the North Anatolian Fault (NAF) distributes and the large earthquakes has occurred there. The one of the events along NAF in Turkey is the 1999 Izmit Earthquake, and severe damages was brought to residents The NAF between the eastern end of Turkey and the Aegean Sea has been ruptured in turn from the both ends, and the part off Istanbul city still remains as unruptured zone. It is considered that future large event brings fatal damages not only Istanbul city but also the entire of Turkish economy.

To prepare future large earthquake there, Japan and Turkey made an agreement to start a multidisciplinary research project, MarDiM SATREPS in 2003. The Project has four research groups with the following goals. Group 1 is Marmara Earthquake Source region observational research group to clarify seismicity, crustal structures and crustal displacement, and to construct a possible fault model. Group 2 focuses on scenario researches of earthquake occurrence along NAF and precise tsunami simulation in the Marmara region. Group 3 aims improvements and constructions of seismic characterizations and damage predictions based on observation researches and precise simulations. Group 4 promotes disaster educations using research result visuals and construct strategies of disaster mitigation.

Group 1 constructed a fault model along NAF with some asperities and with variation on the dip. The segment boundary was also identified through the modeling and it is consistent with the past rupture pattern and fluid distribution. The NAF on the western region of Sea of Marmara has creep and the rate is nearly half of block motion based on direct seafloor observation for crustal displacement. Group 2 calculated cyclic rupture pattern along NAF using heterogeneous fault model and constructed monitoring system “SWIFT” for crustal stress field by mechanisms of many events estimated automatically. We developed tsunami calculation code to image inundation around the coastal area. Group 3 investigated ground structure through regular fine shake observation, and constructed city model of industrial region supporting Turkish economy. We simulated strong motion using ground structure, city model and fault model derived from Group 1 and made a new hazard map. Group 4 considered teaching materials for disaster prevention including Japanese animation technique based on above results of three groups. These materials are utilized for disaster mitigation in Marmara region and disaster education in Turkey.

Keywords: North Anatolian Fault, Sae of Marmara , Risk evaluation, Disaster education

