Determination of Seismic Activity on the Main Marmara Fault with GPS Measurements

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Key words: Deformation measurement; GNSS/GPS

SUMMARY

The tectonic plates that creates the Earth have always been an important topic to work on for Geosciences. Plate motion affecting the Earth's crust have occurred for millions of years. This slow but continuous movement that has been going on for millions of years can only be followed by instrumental measurements. In recent years, this process has been done with GPS very accurately. The North Anatolian Fault (NAF) is a major right-lateral, strike-slip fault that extends more than 1200 km extends along all North Anatolia from Bingol to Saros Gulf. The NAFZ is divided into Southern and Northern Branches to the east of Marmara region that several destructive earthquakes occurred, such as Izmit (in 1999, Mw=7.4) and Duzce (in 1999, Mw=7.2) in the last century. MMF (Main Marmara Fault) which is the part of the Northern Branch in the Marmara Sea, starting in from the Gulf of Izmit-Adapazarı and reaching the Gulf of Saros. The determination of the deformation accumulated on the MMF has become extremely important especially after the 1999 Izmit earthquake. According to the recent studies, the MMF is the largest unbroken part of the fault and is divided into segments. These segments are Cinarcik, Prince Island, Central Marmara and Tekirdag. Recent studies have demonstrated that the Prince Island segment is fully locked. However, studies that are focused on the Central Marmara segment, that is located offshore Istanbul, a giant metropole that has more than 14 million populations, do not conclude about the presence of a seismic gap, capable of generating a big earthquake.

Therefore, in the scope of this study, a new GPS network was established at short and long distance from the Main Marmara Fault, to densify the existing GPS network. 3 campaign GPS measurements were done in 2015, 2016, 2017. The evaluation of the datasets were done by GAMIT/GLOBK software. For the evaluation, 30 continuous observation stations, 14 stations connected to the IGS network and 16 stations connected to the local networks CORS-TR and ISKI-UKBS, and 18 campaign stations that located in the study area were used. The evaluation was

made between 12-26 August for each year and thus intended to determine the kinematics of the Main Marmara Fault.