

Seismicity along the North Anatolian Fault beneath the Marmara Sea, deduced from long-term ocean bottom seismographic observations

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The North Anatolian Fault (NAF) beneath the Marmara Sea is recognized as a seismic gap for $M > 7$ earthquake during more than 100 years. Earthquake hazard and disaster mitigation studies in Marmara region are sensitive to detailed information on fault geometry and its coupling status beneath the Marmara Sea. Although hypocenter distribution could help us to estimate them, it is difficult to obtain precise hypocenter location from only onshore permanent seismic stations. Thus, we have started a series of long-term ocean bottom seismographic (OBS) observations beneath the western and central Marmara Sea since 2014. We have installed 10~15 OBSs along the Main Marmara Fault(MMF) for each observation phases, and observation length is about 10 or 11 months. Based on the first phase observation, conducted from 2014 to 2015, Yamamoto et al. (2017) identified a segment boundary of the MMF beneath the central basin of the Marmara Sea (28.05°E). Besides, they proposed that the zones of no seismicity within the upper crust appear to indicate locked sections of the MMF.

In this study, we analyze the second (from 2015 to 2016) and third phases (from 2016 to 2017) observation data. The OBS distribution of second phase is same as first phase, whereas that of third phase is about 20 km shifted to eastward relative to first and second phases. The tentative result shows that the feature of hypocenter distribution, including the location of no seismicity zones obtained by Yamamoto et al. (2017), is not changed for all phases, suggesting that the coupling status along the fault is almost same during at least three years. In the west of 28.05°E, seismicity located not only the upper but also lower crust. On the other hand, the lower limit of the seismogenic zone in the east of 28.05°E is about 15 km, shallower than the Conrad discontinuity. The largest no seismicity zone extended over the upper crust is located between 28.45°E and 28.65°E, where strong coupling is suggested from seafloor geodetic observation (Sakic et al., 2016).

According to the spatial relationship between the epicenter of microearthquakes and fault trace on the sea floor (Armijo et al., 2005) suggests that the MMF around 28.75°E is near vertical to slightly northward dipping. Since previous study indicates that the east of 28.05°E MMF is southward dipping (Yamamoto et al., 2017), there might be another segment boundary west of 28.75°E. We also find an active seismic cluster around 40.8°N, 28.7°E, 14 km depth. There is a possibility that this cluster relates to the southern branch of NAF.

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