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Geometry and segmentation of the North Anatolian Fault beneath the Marmara Sea, Turkey, deduced from long-term ocean bottom seismographic observations

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Both the geometry and the depth of the seismogenic zone of the North Anatolian Fault under the Marmara Sea (the Main Marmara Fault; MMF) are poorly understood, in part because of the fault's undersea location. We have started a series of long-term ocean bottom seismographs (OBSs) observation since 2014, as a part of the SATREPS collaborative project between Japan and Turkey namely "Earthquake and Tsunami Disaster Mitigation in the Marmara Region and Disaster Education in Turkey". We recorded 10 months of microseismic data with a dense array of OBSs from Sep. 2014 to Jul. 2015 and then applied double-difference relocation and 3-D tomographic modeling to obtain precise hypocenters on the MMF beneath the central and western Marmara Sea. The hypocenters show distinct lateral changes along the MMF: (1) Both the upper and lower crust beneath the Western High are seismically active and the maximum focal depth reaches 26 km, (2) seismic events are confined to the upper crust beneath the region extending from the eastern part of the Central Basin to the Kumburgaz Basin, and (3) the magnitude and direction of dip of the main fault changes under the Central Basin, where there is also an abrupt change in the depth of the lower limit of the seismogenic zone. We attribute this change to a segment boundary of the MMF. Our data show that the upper limit of the seismogenic zone corresponds to sedimentary basement. We also identified several inactive seismicity regions within the upper crust along the MMF; their spatial extent beneath the Kumburgaz Basin is greater than beneath the Western High. From the comparison with seafloor extensometer data, we consider that these inactive seismicity regions might indicate zones of strong coupling that are accumulating stress for release during future large earthquakes. In this presentation, we will also show the preliminary result of our second phase observation from Jul. 2015 to Jun. 2016.