Tectonic Activity and Stratigraphic History over the Last 100-252ka on the Southern Shelf of the Sea of Marmara, Western North Anatolian Fault, Turkey

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The submerged section of the North Anatolian Fault in the Sea of Marmara, which corresponds to the dextral plate boundary between Eurasia and Anatolia, poses strong hazard for earthquakes and subsequent submarine landslides and tsunamis in the vicinity of the highly populated region of Istanbul. Most of the right-lateral slip is accommodated by the Northern Branch of the North Anatolian Fault (NAF-N), which crosses the central part of the Sea of Marmara and is capable of an earthquake with a magnitude greater than 7. However, both the geology and the geodesy suggest that the NAF-N accommodates only ~3/4 of the total slip between the plates. The deformation mechanisms for the rest of the strain (slip distributed on secondary faults, strain partitioning, and diffuse deformation) remains unexplained. Other fault systems, primarily south of the NAF-N, are shown to be important regarding the tectonic evolution of the Sea of Marmara. However, the activity of these peripheral fault systems as well as their relationships with the NAF-N need to be further constrained. For this purpose, a dense dataset of 2D geophysical images (high-resolution seismic reflection data, sparker reflection, CHIRP sub-bottom profiling), as well as multibeam bathymetry, have been acquired in 2008, 2010, 2013 and 2014 during TAMAM and SOMAR cruises, primarily in the southern shelf of the Sea of Marmara. The 15-20 km-wide southern shelf ledge is relatively flat and mostly shallower than 90 meters. In this shallow marine region, we have been able to image the detailed stratigraphic record associated with the 125 ka and younger glacio-eustatic cycles and, notably, to identify paleo-shorelines at water depths shallower than 100 meters. Several erosional unconformities, laterally correlative to low-stand deltas have been regionally linked to the stratigraphic boundaries previously defined for the last 100-252 ka. While the present-day shelf is relatively flat, a shallow ridge separates the inner and outer parts of the shelf. This ridge exhibits erosional unconformities, and a set of transtensive faults are mapped along its length. We show that parts of these faults were active during the last 252 ka.