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INVESTIGATON of ÇINARCIK BASIN and NORTH ANATOLIAN FAULT WITHIN the SEA of MARMARA WITH MULTICHANNEL SEISMIC REFLECTION DATA

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The Sea of Marmara is becoming a natural laboratory for structure, sedimentation, and fluid flow within the North Anatolian fault (NAF) system. Much marine geological and geophysical data has been collected there since the deadly 1999 M=7.2. Izmit earthquake. The Sea of Marmara occupies 3 major basins, with the study area located in the eastern Cinarcik basin near Istanbul. These basins are the results of an extensional component in releasing segments between bends in this right-lateral tranmsform. It is controversial whether the extensional component is taken up by partitioned normal slip on separate faults, or instead by oblique right-normal slip on the non-vertical main northern branch of the NAF. High resolution multichannel seismic reflection (MCS) and multibeam bathymetry data collected by R/V K.Piri Reis and R/V Le-Suroit as part of two different projects respectively entitled “SeisMarmara”, “TAMAM” and “ESONET”. 3000 km of multichannel seismic reflection profiles were collected in 2008 and 2010 using 72, 111, and 240 channels of streamer with a 6.25 m group interval. The generator-injector airgun was fired every 12.5 or 18.75 m and the resulting MCS data has 10-230 Hz frequency band. The aim of the study is to investigate continuation of North Anatolian Fault along the Sea of Marmara, in order to investigate migration of depo-centers past a fault bend. We also test and extend a recently-published age model, quantify extension across short normal faults, and investigate whether a major surface fault exists along the southern edge of Çınarcık Basin.

MCS profiles indicate that main NAF strand is located at the northern boundary of Çınarcık Basin and has a large vertical component of slip. The geometry of the eastern (Tuzla) bend and estimated right-lateral slip rates from GPS data requires as much of ten mm/yr of extension across Çınarcık Basin. Based on the published age model, we calculate about 2 mm/yr of extension on short normal faults in the southeast basin. Furthermore, MCS do not image any major East-West striking fault along the South boundary of Çınarcık Basin, at least not in strata of less than a half million years. This situation probably means that the northern NAF in Çınarcık Basin dips south to accommodate most of the extension by oblique right-normal slip. Thickness maps between stratigraphic horizons show that depocenters formed near Tuzla bend are transported westward with time. We assume constant tilt rates in southeast Çınarcık Basin and use dip vs. age scaling to produce an age model since the last major bathyal onlap expected during the last interglacial at $\sim$120,000 years.