Neotectonics of the Sea of Marmara basin

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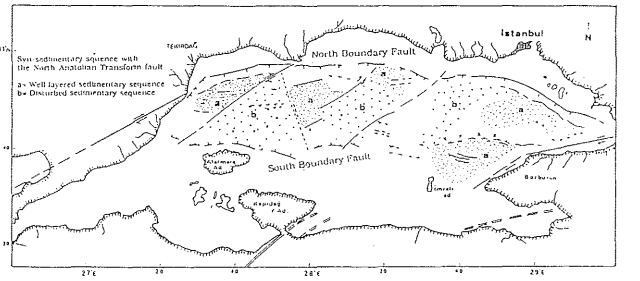
The Sea of Marmara is an inland sea with the areal extension of about 11,350 square km. It is connected with the straits of Bosphorus and Dardanelles to the Black Sea in the north and to the Aegean Sea in the south respectively. It has a very large continental shelf area with many islands. The southern shelf area is much larger than the northern one. There are three deep basins running in the E-W direction. These depressions have the depths : 1112 m in the west ; 1220 m in the middle ; and 1238 m in the east.

The Western Turkey extensional province is the westernmost of three major neotectonic provinces in Turkey that formed following the Arabian/Anatolian collision in the late Serravallian (≈12 Ma) (SENGOR *et al*, 1985). These around the Sea of Marmara (Gulfs of Izmit, Iznik, Gemlik; and Yenisehir-Bursa-Manyas and Saros) lie along the course of N and S strands of the North Anatolian fault, have very strong strike-slip components. The origin of these circum-Marmara grabens is apparently directly associated with the strike-slip tectonics of the North Anatolian fault (BARKA and KADINSKY-CADE, 1988).

Marmara region has different seismic characteristics from the rest of Western Anatolia and appears to act as a separate tectonic unit (CRAMPIN and EVANS, 1986, and EYIDOGAN, 1988). This region shows higher seismic activity than the Western Turkey in general, indicating that this region is partly under the influence of the western end of the North Anatolian fault which splays into a number of branches in and around the Sea of Marmara. Based on fault mechanism solutions, the Marmara block is being rotated and sheared in order to accommodate the right-lateral motion of the North Anatolian fault and extensional tectonics of the Southwestern Turkey province.

The northern side of the Sea of Marmara shows smoother gravity and magnetic anomalies. This area is locally isostatically compensated by an underlying zone of thinned crust with an overall crustal thickness of about 25-30 km. Viewed in their regional context, the magnetic anomalies over the basin, as evidence of recent volcanic activity, are much more likely to be caused by large buried ophiolite bodies, up to several kilometers thick.

The sedimentary sequence in the Sea of Marmara basin is made up of four different formations after the Upper Miocene determined from the single channel airgun seismic data (ÖZEL, 1992). The existance of two basic fault systems is observed: the first one has made up of normal faults at the either sides of the Sea of Marmara basin, extending in the E-W direction; and the secondary system is formed by the NE-SW trending, subvertical strike-slip faults. The E-W trending North Anatolian transform fault changes its direction to west-southwest in the Sea of Marmara, and it is understood that the pure strike-slip motion changes into the wrench fault with extension. The Fault system patterns indicate the surface affects of branches formed by the negative flower structures within the divergent wrench faults.



The map of fault systems and sedimentary distribution
(Fault systems modified from BARKA and KADINSKY-CADE, 1988)

REFERENCES

BARKA A.A. and KADINSKY-CADE K., 1988. - Strike-slip fault geometry in Turkey an its influence on earthquake activity. *Tectonics*, Vol. 7, p 663-684.

CRAMPIN S. and EVANS R., 1986. - Neotectonics of the Marmara Sea region of Turkey. *Jour. Geol. Soc.* (London), Vol. 143, p 343-348.

EYIDOGAN H., 1988. - Rates of crustal deformation in western Turkey as deduced from major earthquakes. *Tectonophysics*, Vol. 148, p 83-92.

ÖZEL E., 1992. - *Geophysical interpretation of neotectonics of the Sea of Marmara*. Ph.D. Thesis, Dokuz Eylul University (in Turkish).

SENGOR A.M.C., GORUR N. and SAROGLU F., 1985. - Strike-slip faulting and related basin formation in zones of tectonic escape: Turkey as a case study. In "Strike-slip deformation, basin formation and sedimentation", *Soc. Econ. Paleontol. Mineral.*, Spec. Publ., Vol 37, p 227-264.