

Structural development of the basin associated with bends on the North Anatolian fault in NW Turkey

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The Marmara Sea in western Turkey contains three subbasins with water depths reaching 1250 m, called from west to east the Tekirdag, Central and Cinarcik basins. These basins are active subsiding marine basins forming along the North Anatolian Fault (NAF) which is 1500 km-long and accommodates the current GPS-derived about 25 mm/yr westward motion of the Anatolian platelet relative to Asia. The Quaternary active Cinarcik basin is representative of the basin that developed in the wake of Tuzla bend along continental transform NAF. The basin is oblique time-transgressive half graben and is bordered by the master northern strand of the transform.

We use existing deep-penetration, low-resolution migrated multichannel seismic reflection (MCS) data and new migrated high-resolution MCS data for seismic stratigraphic interpretations in Cinarcik basin. All the seismic reflection data are used to correlate five stratigraphic horizons which contain stacked low-stand shelf-edge deltas. These five seismic horizons related to the geological boundaries with the known age information are used to calculate thicknesses, depth changes and tilts of the strata within the basin.

The Cinarcik basin has an asymmetric structure and within the basin strata are progressively tilted obliquely toward the bend and toward the border fault, where subsidence is fastest. Yet, nearest the bend is also where the basin is youngest and shallowest. Away from the bend the subsidence rate decreases while the basin get deeper and older. This common pattern is accounted for by time-transgressive basin growth. On the transtensive side of the bend, slip on the transform is oblique normal and the hangingwall side subsides forming the basin. Subsidence continues along the fault and the basin get progressively deeper away from the bend. Eventually, the basin reaches its maximum depth, but can continue to grow longitudinally along the fault.

Keywords: North Anatolian Fault, Marmara Sea, Cinarcik Basin, Multi-Channel Seismic Reflection, Seismic Stratigraphy, Basin Formation