



Miocene to Quaternary Seismic Stratigraphy and Tectonic Evolution of the Marine Area Between Çandarlı Bay and Lesbos Basin, Northeastern Aegean Sea

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This study focuses on the marine area located between Çandarlı Bay and Lesbos Basin in the Northeastern Aegean Sea. The high quality multibeam bathymetry data, their processing and interpretation with the onshore structures and an integrated interpretation with seismic reflection profiles allowed to map the offshore active faults, to prepare the seismic stratigraphy and to evaluate the tectonic evolution of the marine area between Çandarlı Bay and Lesbos Basin. In addition, thickness maps were generated from seismic reflection profiles and seismic stratigraphic units were correlated with the Foça-1 well to reveal the characteristics of the deposited strata in this region. The seismic stratigraphic units were also compared with onshore geological units.

Five major seismic stratigraphic units were identified and all of which are compatible with each other from the Çandarlı Bay to the Gulf of İzmir. The findings suggest continuous sedimentation from the Burdigalian (Lower Miocene) to the present day. A predominantly volcanoclastic sequence deposited in the Burdigalian-Serravalian period rests on basement rocks. This unit is overlain by Tortonian clastics and carbonates interbedded with volcanic rocks. Tortonian sediments are followed by about 300-500 m thick clastics and anhydrites, which were deposited in an environment corresponding to the Messinian salinity crisis in the Mediterranean Sea. The post-Messinian unit is of Pliocene age and starts with upper Miocene limestones at the base and transitioning upwards into clastic rocks. The stratigraphy concludes in the upper part with a Quaternary unit, which is mainly composed of fine-grained clastics and has been influenced by sea-level changes.

The study area is dominated by both NW-SE and NNW-SSE-striking normal faults and two distinct tectonic phases have been identified. The first phase spans from the Miocene to the end of the upper Miocene and is characterized as a supra-detachment basin associated with the development of core complexes in the region. These faults do not extend to the surface in seismic sections and are indicative of an early-stage tectonic activity. The homogeneity of the sediment thickness suggests a slowdown in tectonic activity during the Tortonian-Messinian period. In the Plio-Quaternary period, the sediment thicknesses indicate uplift in the surrounding region. Additionally, the bathymetric traces of faults shaping the Lesbos Basin to the west of Çandarlı Bay indicate the presence of a new tectonic system.

