THE NEOTECTONICS OF THE GULF OF GÖKOVA: SOUTHEAST AEGEAN SEA-SOUTHWESTERN TURKEY

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Abstract

The Sedimentary and tectonic Late Quaternary evolution of the Gulf of Gökova, located at the southwest Anatolia–southeastern Aegean Sea region, has been interpreted from 3.5 kHz and single channel airgun seismic reflection profiles. The oldest part of the Gökova basin is bounded by mainly E-W trending faults, and filled by Miocene–Pliocene–Quaternary hemipelagic sediments with thickness up to 2.5 km. Younger active faulting, the so-called Gökova Transfer Fault, trends NE in the central part of the Gulf of Gökova basin and records sinistral strike-slip motion broadly parallel to the convergence motion of the Aegean-Anatolian and African plates.

Keywords: Aegean Sea, Seismic stratigraphy, Neotectonics

Introduction

In the Mediterranean the Aegean Sea is a region of active extensional tectonism within the overriding part of a convergent plate margin system (Africa with respect to Europe). The tectonic framework of western Turkey comprises numerous east-west trending graben, associated with the regional north-south extension of the Aegean plate (1). Detailed studies (2) in Aegean Sea show that there have been significant changes in the fault patterns during the Quaternary. The Gulf of Gökova is located in the southeast Aegean Sea, along the coast of southwest Anatolia, which is a region including most of the major rifts and grabens. The Gulf has about 90 km E–W length and 25 km N–S width and it is bordered by Datça Peninsula to the south, the island of Kos to the west and Bodrum Peninsula to the north. The Gökova region is a part of the western Anatolia–Aegean Sea area, which is presently submitted to an N–S regional extensional tectonic system. The imprints of this extensional regime are clearly seen in the geology and geomorphology of western Anatolia, as well as in the bathymetry of the Aegean Sea.

The Gökova province is mainly characterized by two successive tectonic regimes. These overlapping rift and graben systems are well seen in the land geology. The first one is the N–S compressional paleo-tectonic regime, possessing the later counter-clockwise rotation, and resulted in a NW–SE rift and graben system. The NW–SE-oriented paleotectonic rifts and grabens, i.e., Milas–Ören and Yatağan Muğla Rifts, are filled by mainly Middle Miocene to Quaternary deposits of continental origin. The second one is the neotectonic regime, possessing the N–S extension that has resulted in mainly E–W-oriented rift and graben systems, i.e., Gökova Rift (3). The Gulf of Gökova was mainly opened by an E–W-oriented, major normal listric Datça Fault (Fig 1). The estimated overall rate of extension in the gulf is at least 1.1 mm/y and the amount of total extension is at least 5.5 km (4).

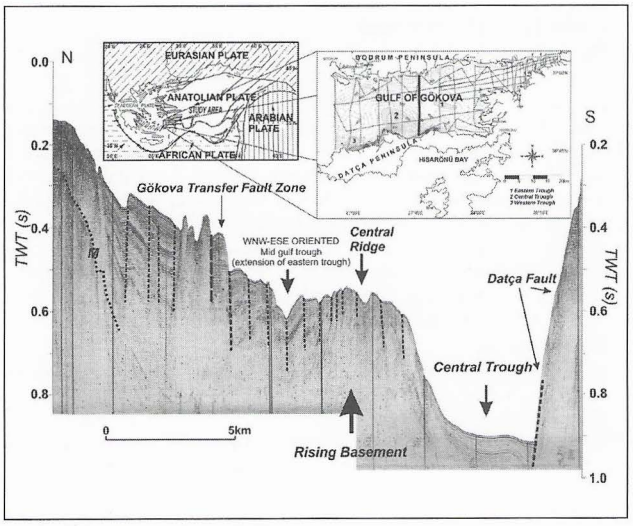

Fig. 1. Airgun profile from the Gulf of Gökova. Inset shows the survey lines and the location of pofile as heavy line. Sub-vertical dashed lines=faults, M=Multiple. Profile is ca. 20 km long.

Results

At least five superimposed deltaic sequences, separated by major erosional unconformities, occupy the shelf and the basin slope region of the northeastern Gulf of Gökova. The oldest recognized delta sequence (DS5) probably dates from isotopic stages 10 (ca. 0.34 Ma). Marine isotopic stage 10 unconformity separates DS4 and DS5; and lies approximately 215 m below the present sea-level. The tentative age assigned to the delta sequences yields rates of tectonic subsidence to be appraised. In the northeastern slope of the basin the late Quaternary tectonic subsidence is about 0.3-0.4 m/1000yr and is probably related to basement graben structures.

Gulf of Gökova is mainly opened by the E–W-oriented, buried Datça Fault located at the south and its antithetic faults located at the north (Fig. 1). The Datça Fault might have begun to work in the Latest Miocene–Pliocene. In terms of local rather than regional effects, its activity has been decelerated, possibly since the Pleistocene. The continuing extension in the area may have initiated a second phase of faulting, e.g., WNW–ESE-oriented subgrabens in the central gulf and major WSW–ENE normal faulting at the northwest margin. Younger active faulting so-called Gökova Transfer Fault (GTF) (Fig. 2) trends NE in the central part of the Gulf of Gökova basin and records sinistral strike-slip motion broadly parallel to the convergence direction of the Aegean-Anatolian and African plates.

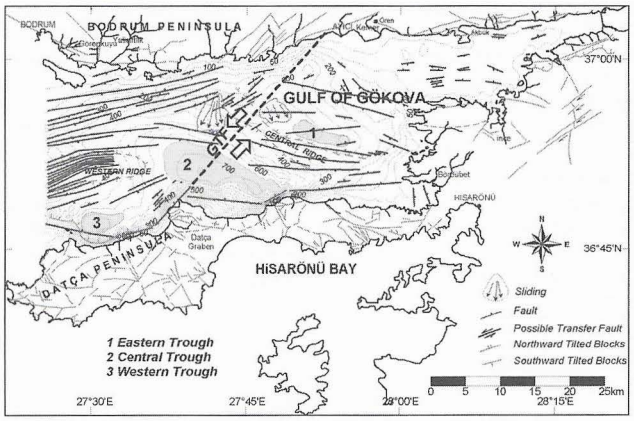

Fig. 2. Tectonic map of the study area, showing major faults with ticks at downthrows. The faults on land were adopted from (3). GTF Gökova transfer fault.

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