

MODES OF TECTONICS IN GOKCEADA ISLAND, NORTHERN AEGEAN SEA: IMPLICATIONS FOR THE NORTH ANATOLIAN FAULT

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Abstract

Gokceada (formerly Imbros) Island lies in the northern Aegean Sea in close proximity of the Saroz Trough along the seismically active North Anatolian Fault (NAF). Fault segments including those in NE-SW orientation parallel to the NAF truncate the sequence in the island that comprises 2 km thick Tertiary sedimentary strata and the underlying metamorphics. Evidence of many morphological, coastal and geological/tectonic features suggests a component of reverse dip-slip within extensional tectonic setting of the strike-slip North Anatolian Fault (NAF). Tectonics along the NAF does include both modes of dip-slip along with strike-slip movements.

Keywords : Aegean Sea, Geomorphology, Sea Level, Tectonics.

Gokceada (formerly Imbros) is one of the few islands in the northern Aegean Sea. The island is situated in close proximity of the North Anatolian Fault (NAF), that occupies a NE-SW orientation off-shore to the west along a rugged bathymetry and a deep channel known as the Saroz Trough [1] (Fig. 1). The NAF, accommodating the westerly movement of the Anatolian Plate, extends through northern Turkey into depressions of the NW Turkey such as the Marmara Sea and the Gulf of Saroz.

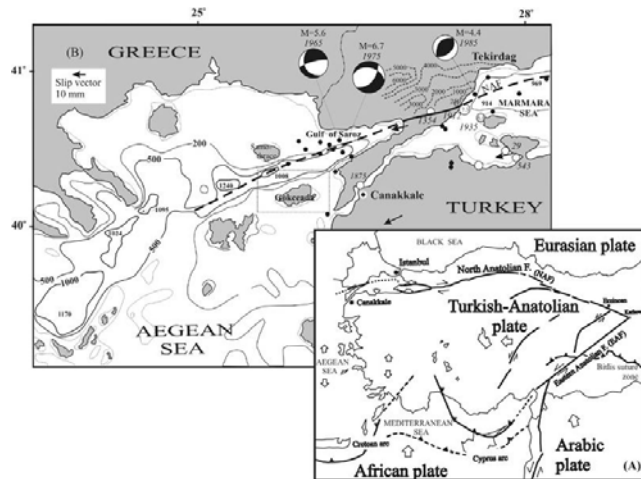


Fig. 1. Seismo-tectonic features of Turkey and Gokceada Island. Dashed contours top of the Middle Eocene age unit in meters below sea level [2].

In the Gulf of Saroz, the NAF is considered to exhibit an extensional character attributed to releasing fault bend geometry, and the region is considered to have been undergoing a subsidence in association with the development of the fault. Gokceada Island is a terrain in the northern Aegean Sea that allows this fault system and its tectonic characteristics to be investigated in relation to morphological and coastal features.

Gokceada has a high and rough topography along its western shore that diminishes towards the north and east with a depression in the middle. The peaks reach up to 673 m in the western half of the island and the island has a water division line in a NE orientation asymmetrically proximal to the western coast. The island possesses a variety of morphological and coastal features such as paleo-coastal notches, hanging valleys, waterfalls, springs and travertine formation [3] (Fig. 2a). Along the northern coast near Mavi Cove, a distinct paleoshore structure is seen at an elevation of 12 m on a steep slope. This paleo-coastal notch has a width of 6 m and length of 200 m (Fig. 2b) and it occurs in stiff volcano-clastics on the steep cliff. There are also occurrences of prominent water-falls in the northern half of the island. One of these is located at the northern side of the village of Derekoy with a height of 35 m.

Morphological features of Gokceada are evidences of active tectonics. A history of uplift in this transtensional tectonic setting of the NAF is evident in uplifted wave-cut notches, uplifted terraces, hanging valleys and water falls. The paleo-shoreline at northwest of the island in stiff volcanics (andesite) at the foot of a steep cliff is of importance.

Further strong support for tectonic uplift is evident by the exposure of the basement rocks along the western coast of the island. There, the exposure of the metamorphics occurs at the base of Tertiary strata that have a thick-

ness more than 2000 m in the SW Thracian basin (Fig. 1). Considering these rocks presently lie at a water depth of more than 1000 m in the Saroz Trough, we could suggest a few kilometers of vertical displacement must have occurred for the metamorphics to acquire their position on the island. This uplift may be attributed to the collision tectonics in the early Tertiary along the intra-Pontid ocean. However, the occurrence of basement rocks under a very thick sedimentary cover of the Thrace basin, their total absence on the surface in the Thrace, but their exclusive occurrences along the North Anatolian suggest an alternative setting of strike-slip transpressional fault as a significant parameter in this process. In Gokceada, the northern Aegean Sea, the uplift is affiliated with interaction of faults in a strike-slip fault system and supported by the fault geometry, displacement of the units, and fault lineations. This is consistent with the thrust and normal-slip components observed in the seismic events of the region [4].

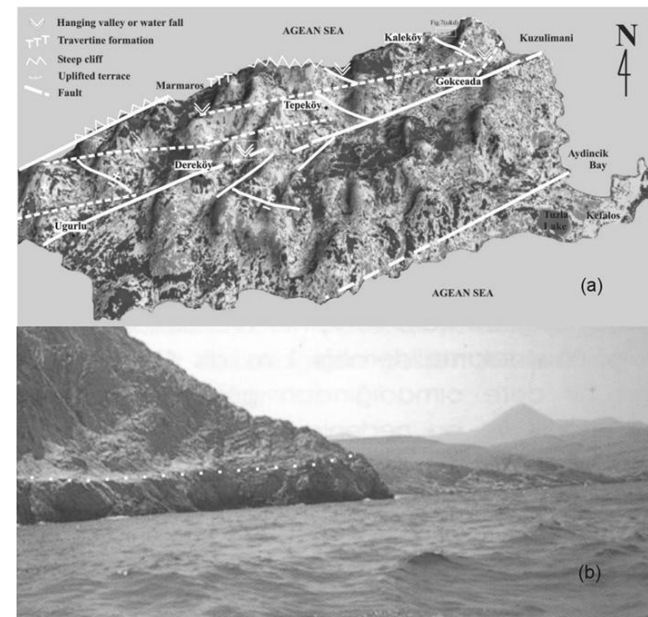


Fig. 2. a) Principal morphotectonic features of the island; b) Paleowave-cut notch occurs at 12 m elevation in the north of the island.

References

- 1 - Saroglu, F., Emre O., Kucsu, I., 1992. Active Fault Map of Turkey. Gen. Direc. Min. and Res. Exp. Turkey (MTA), publications, Ankara.
- 2 - Hosgormez, H., Yalcin, N., 2005. Gas-source rock correlation in Thrace basin, Turkey. *Marine and Petr. Geol.* 22, 901-916.
- 3 - Ozturk H., Hanilci, N., 2002. Geology of Gokceada and its natural resources, in: B. Ozturk (Ed), Gokceada, pp.127-150.
- 4 - Ambraseys, N.N., Finkel, C.F., 1987. Seismicity of Turkey and neighbouring regions, 1899-1915. *Annales Geophysicae* 5B, 701-726.