THE TECTONIC INTERACTION BETWEEN THE CYPRUS AND HELLENIC ARCS AT THE ANAXIMANDER MOUNTAINS COMPLEX

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Abstract

The Anaximander Mountains Complex is formed by southward-rifted and foundered blocks of the Tauride mountains. They are currently undergoing neotectonic deformation in the collision zone between the African and Anatolian/Aegean plates. As a result, two of the mountains are being underthrust, tilting them both to the north; and the southern one is pushing the eastern one eastward, creating a large fold-belt in the sediments of the Antalya Basin, raising up and tilting the eastern mountain eastward, and bending the southern one.

Key-words : active margins, geophysics, seismic, tectonics, Cyprus Arc

The Anaximander Mountains (fig. 1) lie just south of southwestern Turkey, near the intersection of the Cyprus and Hellenic Arcs and roughly midway between Cyprus and Rhodes. They are geologically a part of the southwestern Turkish Taurides but are currently tectonically a part of the African plate undergoing collision with the Anatolian-Aegean domain within the African-Eurasian collision zone. The eastern part of the mountains belongs to the Antalya Nappes Complex; and the western part belongs to the Bey Daglari - Susuz Dag province. The connection was established though examination of samples from all parts of the Anaximander Mountains and the faulted southern margin of Turkey, and comparison with the known geology of the land area (as part of the Dutch ANAXIPROBE Project and the international Training Through Research Programme).

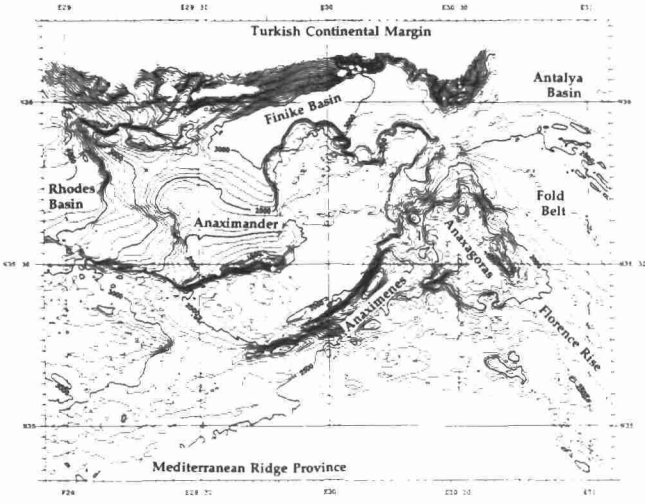

Figure 1. Generalized Simrad EM-12D bathymetric map of the Anaximander Mountains Complex with a contour interval of 100 m. The three principal mountains are indicated by name: Anaximander, Anaximenes, and Anaxagoras.

Rifting of the mountains began probably in Middle Miocene as a part of the rifting in western Turkey and the Aegean. The actual foundering of the mountains did not result in submergence below sea-level until Late Miocene, and had not developed to the point that significant layers of Messinian evaporites were deposited on them. Messinian evaporites are well-developed in the Antalya Basin to the east as well as to the south. On the other hand, Pliocene-Pleistocene sediments are present over most of the area in varying thickness, to over 2 s two-way travel time (TWTT), indicating deposition on a surface having substantial relief (fig. 2); and northward dipping reflectors in the Finike Basin provide evidence of the gradual development of that basin during the post-Miocene period. Differences in the present vertical configuration of the post-Miocene sediments attest to the significant vertical displacements which have taken place, up to at least 1500 m (*e.g.* fig. 2).

The configuration of the western (Anaximander) and southern (Anaximenes) mountains in the complex is simpler than that of the eastern mountain (Anaxagoras). Seismic lines across Anaximander Mountain show north-dipping (at about 4°) Pliocene-Pleistocene sediments disconformably overlying a basement which appears to dip to the west on the west part of the mountain, but may actually be anticlinal under Anaximander, with east dipping basement strata to the east. This is consistent also with the general anticlinal structure of the Susuz Dag - Bey Daglari directly to the north. The Pliocene-Pleistocene sediments on Anaximander are thinnest in the central part of the mountain (north side of figure 2) and thicken to the north to over 2 s TWTT and to the south to about 2 s TWTT (fig. 2). To the southeast, Anaximenes Mountain does not appear to have a significant cover of Pliocene-Pleistocene sediments, but it is difficult to tell from the seismic profiles because of the steep (about 25°) northwest dip of the basement sedimentary rocks. The large tilt of Anaximenes, and the lesser tilt of Anaximander are both caused probably by underthrusting of Anaximander by Anaximenes and Anaximenes by the Mediterranean Ridge from the south. Northeast-southwest compression of Anaximenes has given it a curved (concave to the northwest) shape in plan view.

Anaxagoras Mountain appears to be continuous with the Florence Rise to the southeast as well as with the Antalya Nappes Complex to the north. It is distinct from the other two mountains in the complex not only in morphology and structure but also because of a significant lithospheric discontinuity between Anaximenes and Anaxagoras, indicated by a sharp northeastward decrease in the Bouguer gravity field by 150 mGal over a distance of about 70 km, with a maximum gradient of about 4 mGal/km. The increased relief of the Florence Rise, a gentle seafloor bulge forming the western branch of the Cyprus Arc, where it merges with Anaxagoras Mountain, probably relates to the compressional deformation caused by the northeastward movement of Anaximenes Mountain. The curvature of Anaximenes can be seen as a consequence of this compression. To the northeast of Anaxagoras can be seen a large fold belt which coincides with, and is inferred to result

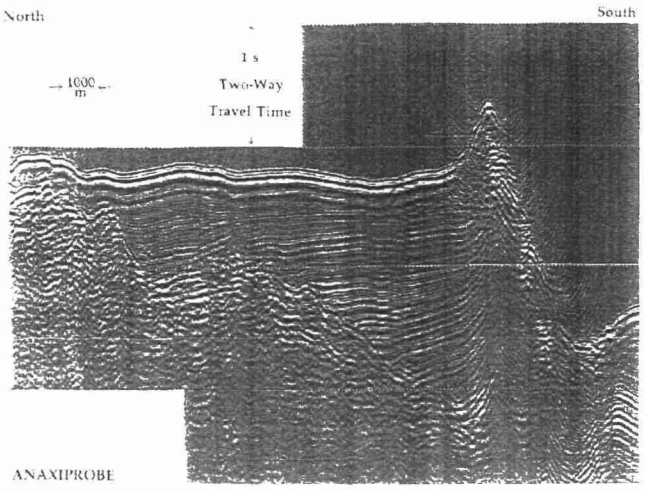

Figure 2 : Seismic line running almost north-south across the southern escarpment of Anaximander Mountain at roughly 29°30'E (see fig. 1). Post-Miocene marine sediments onlap Miocene Susuz Dag rocks. Vertical displacement at the escarpment took place after most of the post-Miocene sediments had been deposited in a basinal setting. (Processing by Anna Volkonskaya, Serguei Bouriak, Roman Almendinguer, and Valery Gaynanov of MSU).