The Eratosthenes Seamount : a fossil superstructure in the Eastern Mediterranean

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In the present study we interpret the structure of the Eratosthenes Seamount and nearby areas of the southeastern Mediterranean. We integrate available seismic reflection profiles with other geophysical data and with plate kinematic considerations. This allows to distinguish between structural elements of different ages and to relate them to the evolution of the Levant basin, especially in Mesozoic times.

It is found that the Eratosthenes Seamount, one of the most prominent features in the southeastern Mediterranean, forms the highest part of a much larger structural high. The latter is interpreted as a partly volcanic construction over a continental block which was stranded in the Levant basin following Early Mesozoic rifting. This structural high is defined by a prominent seismic reflector which rises several km towards the Eratosthenes Seamount. Mapping of this reflector defines a high (Eratosthenes Structural High, hereafter ESH) which approximately ovelaps the extent of a large magnetic anomaly. We find that the magnetization of the rocks causing this anomaly, deduced in a previous study, is similar to that expected of Early Mesozoic rocks on the African plate. Since at the time rifting-related volcanism was indeed widespread in the Eastern Mediterranean border of Africa, we infer that the ESH formed at that time, coevally with the rifting that formed the Levant basin. However, there was not much motion between this block and Africa since then.

Superimposed on the ESH is a quadrilateral graben delimited by steep fault scarps. As this graben encloses the Eratosthenes Seamount and its slopes, downfaulting of its central area produces a moat which surrounds the topographic high. Messinian evaporites pinch out and onlap the flanks of the ESH outside the graben and seem to be absent in the graben. This shows that the ESH was a well expressed physiographic feature in Messinian times, its peak (the present seamount) having been more than 1500 m higher than the top of evaporites. The steep foults delimiting the graben are interpreted as Miocene strike-slip foults, reactivated with a vertical motion in post-Messinian time. Strike-slip motions presently occur mostly on local structures around the Eratosthenes Seamount whereas the ESH, thicker and more buoyant than the surrounding eastern Mediterranean crust, interrupts the process of subduction along the central segment of the Cypriot Arc, thus causing the younger uplifting phases in Cyprus.

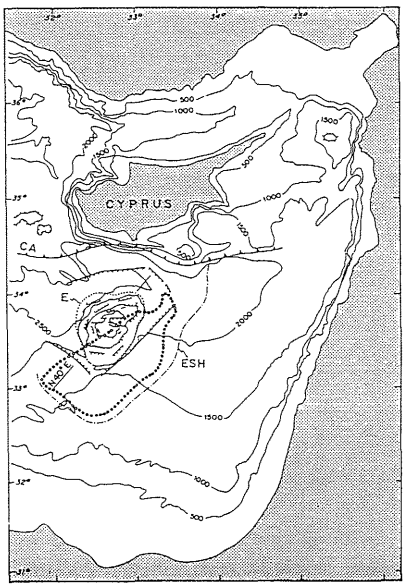

Fig. 1 - The Eratosthenes Seamount, E (dots) forms the central and highest part of the larger Eratosthenes Structural High, ESH (dots and dashes). Note the good correlation between ESH and the zero-contour of the magnetic anomaly (open circles). Steep faults delimit the moat around the seamount, forming a quadrilater graben whose axis strikes about N 40° E. The shape of Africa-Anatolia plate boundary, the Cypriot Arc (CA), is affected by the collision with the ESH which interrupts the process of subduction along this segment. Bathymetry simplified after Hall (1980, 1981). Contour interval is 500 m.