The Eastern Mediterranean Ridge

by

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The Eastern Mediterranean Sea is characterized by a submarine ridge, 1600 km long. It begins south of Apulia, follows the large arc of the Dinaric and Taurus Mountains, and ends west of Cyprus. It consists of a higher central zone and two forelands, one in the Ionian Sea and one near the southwest coast of Crete.

The width of the ridge expands from 50 km south of Apulia to 240 km in the Ionian Sea (including the Ionian foreland), then has a more regular width of 140-170 km south and southwest of Crete, and decreases to 110 km west of Cyprus.

As for the crest-province of the ridge, it lies south of Apulia at a depth of 3200 m, rises to -1300 m in the narrow pass between Crete and Africa, and sinks down again to -2300 m near Cyprus. In the same way, the relative altitude of the ridge over the bottom of the foredeeps is low near Apulia, increases up to 1400 m south of Crete, and decreases again towards Cyprus.

The morphology of the ridge consists of two types : a very characteristic fine-textured relief, looking [after HEEZEN] like « cobblestones », and a more coarse-textured relief, consisting of up- and downfolds. Sparker profiles of the R/V Chain (cruise no. 43) made it sure, that the ridge was built up by « folding and faulting » [HERSEY, 1965]. Refraction measurements made on R/V *Academic S. Vavilov* show velocities over the ridge south of Crete of 2.8, 3.7 and 4.7 km/sec, the roof of the consolidated deposits (4.7) found 1100 m under the sea bottom [MOSKALENKO & ELNIKOV, 1966]. Evidently, the ridge is an alpine mountain chain, following the Dinarides and Taurides in the south, as the Swiss Jura follows the Alps in the north.

Two areas of the ridge are of special interest : its beginning and its end. In a topographic view, the ridge touches the outer slope of the Apulian Swell, the submarine continuation of the Apulian peninsula. This is made clear by two sounding profiles recorded in 1964 by the Calypso [GIERMANN, 1964].

The following geological interpretation is possible :

During the Miocene age, both the areas of the Tyrrhenian Sea and of western Greece were lifted up : the Ionian Furrow (nowadays part of the Greek mainland) and the Apulian Swell [after AUBOUIN, 1960] at Helvetian, i.e. middle Miocene times; the Tyrrhenian tectorogène [after GLANGEAUD] in a first stage of upper Miocene. With the uplifting, the two zones slightly approached each other, causing a downwarping of the Molise area. South of the Molise, in the basin of the Ionian Sea, it is supposed that by the same movement the marine sediments were compressed and folded up into the ridge. If this was the case, the formation of the ridge was synchronous with the third and last tectonic phase of the Alps, in which the molasse was folded up.

At the eastern end, the ridge comes very near to the steep slopes of western Cyprus and the South-Cyprus-Seamount (Eratosthenes Seamount), and is then suddenly cut off by a furrow. If we look for its continuation, we can only find it in the Northern (or Kyrenia) Range of Cyprus, the western continuation of which has always been sought but never found. It is supposed that in full consensus with gravimetric data, the submarine ridge and the Northern Range are of the same origin — except that the eastern part, i.e. Cyprus area, was pushed to the north along a NW-SE wrench-fault. While this happened, a deeper portion of the crust reached the surface on the Troodos Mountains of Cyprus. As a result the sediments in the north were overthrusted towards the south, forming the Northern Range. It is very important to know that this took place in the upper Miocene age [W.F. SCHMIDT, 1960], i.e. at the same time as the ridge near Apulia was formed.

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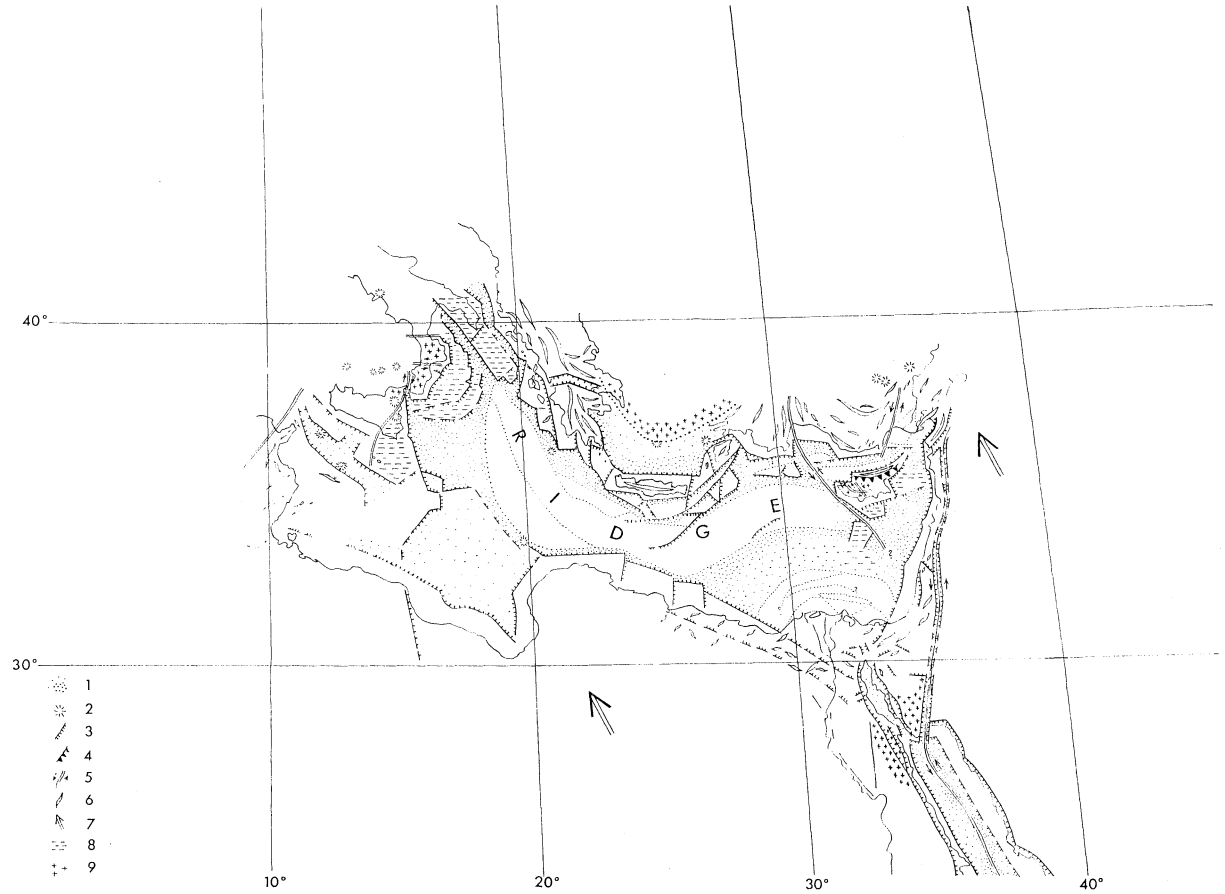
The fact that the main wrench-fault (having smaller parallels in the Troodos Mountains) passes between Cyprus and its seamount in the south, makes it evident that the latter is an ancient part of Cyprus that remained south, while the Troodos Block itself moved to the north. The horizontal displacement of Cyprus relative to the South-Cyprus-Seamount is about 150 km.

The origin of the wrench-fault is easy to explain. It results from the fact, that the Syro-Arabian Block of Gondwana was drifted further to the north than the African one, and that, to lessen the stress, a wedge-shaped link, the Cyprus Block, developed between them, the western limit of which is our wrench-fault. This fault-line is thought to be also responsable for the formation of Antalya Bay and for the curious deformation of the Taurus Mountains in the north.



Schematized Tectonic Map of the Eastern Mediterranean Ridge (by G. Giermann)
1 foredeeps and deep-sea basins — avant-fosses et bassins abyssaux
2 volcanoes — volcans
3 tension-faults — failles de tension
4 thrust-faults (overthrusts) — chevauchements
5 wrench-faults (strike-slip faults) — failles de décrochement
6 anticlines — anticlinaux
7 drift of Gondwana — dérive de Gondwana
8 stable platforms — plates-formes stables
9 cristalline massifs — massifs cristallins

To summarize : It is most evident, that the Eastern Mediterranean Ridge is an outer arc of the alpine mountain belt, folded up during later Miocene times. It consists of a 1600 km long submarine part, and after crossing a wrench-fault, continues for another 300 km in the Northern Range of Cyprus. According to DUCLOZ [1964], this chain goes over to the mainland and enters the Misis Mountains. Thus, the picture of the whole arc is complete !

After the time of compression, of displacing, upfolding and overthrusting, a time of relaxation followed. In the Plio-quaternary period, large parts of the Mediterranean area sunk, Cyprus and Apulia were surrounded by fault scarps, the ridge subsided and fractured; its two foredeeps began to be filled up with sediments. Between the ridge and Crete arc (also broken and partly subsided), a zone of collapse-structures, a mosaic of blocks developed. Simatic magma rose along old lines of weakness, forming the characteristic positive Bouguer- anomalies west and south of the ridge [FLEISCHER, 1964], while volcanoes grew up from the sea bottom. It is the time when the coasts and islands of our days were formed.

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