Crustal Structure of the Aegean Sea and the Hellenides obtained from Geophysical Surveys

by

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In the period 1971 to 1974 the territory of Greece has been geophysically investigated by Greek and German Institutions. Gravity and magnetic stations have been distributed at a spacing of one station per 25 km^2. Five deep seismic sounding cross-sections have been fired and recorded along the lines : Jonian Sea - Peloponnese, Amorgos - Mikonos - Evia, Crete : East-West, Cretean Sea : North-South, Cretean Sea : East-West.

The results of the seimsic programms revealed a pure continental structure of variable thickness. The most attenuated area is that of the Cretean Sea, with only 22 km depth to the Moho-Discontinuity at the Bouguer gravity maximum of + 175 mgal. The very unevenly distributed sedimentary cover is composed of mainly Neogene Sediments with thickness of 3 - 3,5 km in local basins, JONGSMA *et al.*, 1975. The Greek mainland, along the Pindos Chains has minimum Bouguer anomalies of — 120 to - 140 mgal and Moho-Depths '' between 42 - 46 km. The Aegean Area builds a large dome and incorporates also a large part of the Taurides, Western Turkey.

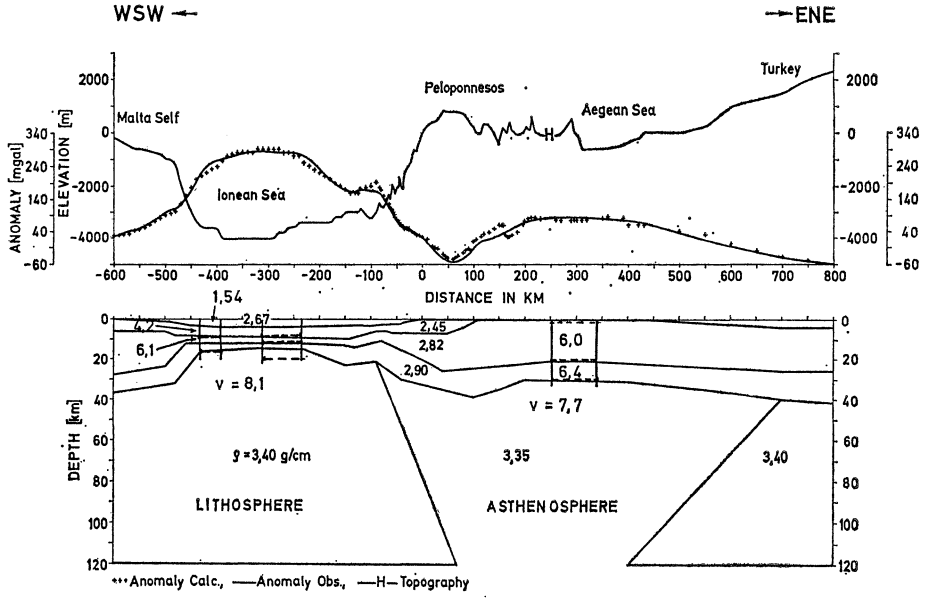

FIG. 1. — 2-D crustal model between the Malta Shelf and Turkey. Seismic data in the Jonian Sea and Greece, see text. Gravity values give Bouguer anomalies.

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Combining the seismic results of *Meteor* Cruises Nr. 17 and 21, WEIGEL, 1974, HINZ, 1974, from the Jonian Sea with gravity and seismic data of the Hellenides, MAKRIS, 1973, MAKRIS *et al.*, 1973, a 2-D density model was computed, fig. 1, between Turkey and the Malta Shelf. The model exhibits large lateral density variations between the deep Jonian Basin and the adjacent continental areas. These variations are not only limited in the crust but extend also in the Upper Mantle. A " Lithothermal " plume of low velocity and density rises from the Asthenosphere into the Lithosphere transporting thermal energy and causing the present tectonic activity of the Hellenides. The upwards movement of the hot plume has most probably been initiated by the subduction of oceanic crust below the Hellenides. The existence of deep sitted earthquake foci, GALANOPOULOS, 1974, strongly supports this supposition, though their very unequal distribution indicates that active subduction might have ceased. The massdeficiency below the Aegean Region explains appr. 100 mgal of the gravity difference of nearly 450 mgal between the Hellenides and the deep Jonian Basin. The rest can be explained by the sediments and also the strong crustal attenuation of the Jonian Sea. The type of the crust in this region has not been explained satisfactorely and it seems to be of a transition between continental and oceanic. More deep seismic soundings are required.

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Discussion

Krause D. I congratulate Dr. MAKRIS on his excellent research. His model will have to be carefully considered in tectonic models for the region.

Such models will have to take into consideration the movements of plates, large and small. Our knowledge of the mouvements of the large plates sets useful limits in which the plates of the Mediterranean might move. The extreme complexity of the Mediterranean structure permits a great many tectonic models. However we do need specific tectonic models which can be tested so that scientific progress can be obtained.

Flores G. : Your gravity map of Greece shows a gravity (Bouguer) minimum value of - 130 milligal under the Gavrovo, particularly concentrated in two points. Do you know if this could be interpreted in support of Dr RICHTER'S suggestion that the Gavrovo uplift could be controlled at depth by salt action?

Closs H. : 1. The results of MAKRIS are very interesting especially the possibility of having a low velocity mantle under the crust in the Aegean sea. The velocity respecting density corresponds to that of bodies in the Mid-ocean ridges. Perhaps it might be possible to explain the low velocity body by disturbance of the temperature in the mantle and expansion. The reaction of the crust is the distructive tectonic in the Aegean sea which can be observed today.

2. The creation of such a low velocity body may have here four reasons : the orogenes of the Hellenides, the movements along the Anatolian fault, the Benioff zones under the Hellenides and Crete. The Benioff zone below the Hellenides in the area of the Peloponnese have been prooved on the last years by mobile stations and for the subduction under Crete and the southern Aegean sea Puchelt presented good evidence during this meeting.

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