

GEODYNAMIC EVOLUTION OF NORTHERN EVOIKOS AND MALIAKOS BASINS, CENTRAL GREECE, DERIVED FROM DEEP SEISMIC SOUNDINGS

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Abstract

In March 1996, a wide aperture reflection/refraction (WARRP) profiling survey was carried out across the Maliakos-Sporades and northern Evoikos basins, central Greece. Two onshore/offshore seismic lines were observed, using 14 ocean bottom seismographs (OBS) and 10 land stations. The results acquired during the survey provided evidence of a thinned, stretched continental crust, of only 19 km thickness below the central part of the northern Evoikos basin. This basin was developed by the separation of the island of Evia – with continental crust of approximated 30 km thickness – from the Greek mainland and transtension and stretching of the crust forming the north Evia and the Sperchios valleys.

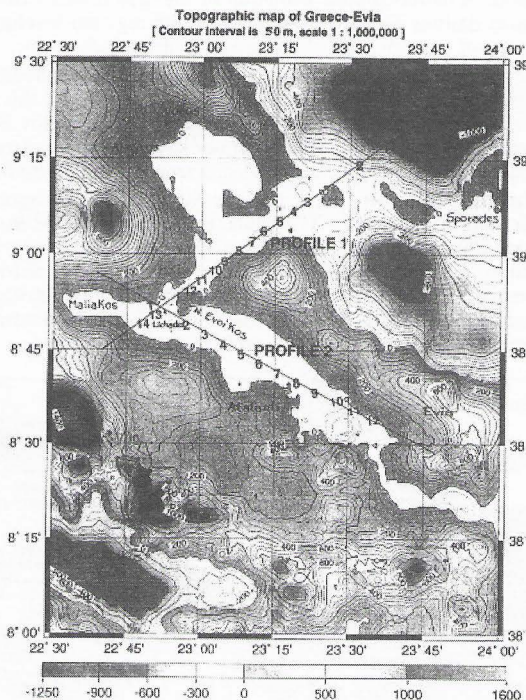
Key words: deep seismic soundings, Evoikos basin, Greece

Introduction

The crustal structure at the interaction of the North Aegean Trough with the Maliakos-Sporades and northern Evoikos basins, central Greece and their tectonic significance have been poorly understood, since neither the geometry nor the nature and thickness of the crust have been seriously studied by geophysical methods. The tectonic evolution of this area however is important, since there are still unclarified questions concerning the development of the north Aegean domain and the Hellenides.

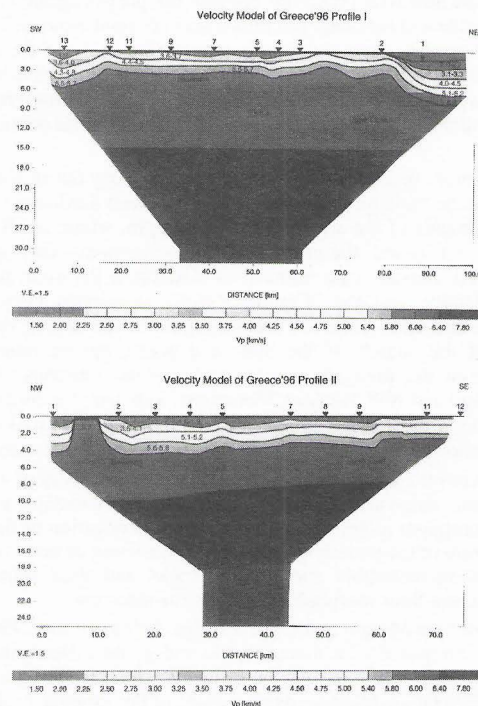
In spring 1996, the above mentioned Institutes conducted a wide aperture reflection/refraction seismic survey onshore/offshore the northern Evoikos and Maliakos basins. Two seismic lines were observed, using 14 ocean bottom seismographs and 10 land stations (fig. 1). The energy source was a sleevegun of 60 lt volume, operating at 120 bar pressure.

crustal discontinuity to an upper and lower crust. The sediments thicken significantly towards the Sporades basin, where they obtain maximum values of the order of 8 to 10 km. The igneous and metamorphic crust thins significantly in the basin maintaining however its continental character along the entire section. The transition from the Maliakos-Trikeri straits to the Sporades basin is controlled by a steep listric fault that downthrows the basin crust by more than 6 to 7 km (Profile I, fig. 2).



Crustal structure

The results acquired by kinematic and dynamic two point raytracing modeling of the time sections provided evidence of a thinned, stretched continental crust, of only 20 km thickness, below the central part of the northern Evoikos basin (Profile II, fig. 2). This crust is comparable to that found under the Cretan Sea and has most probably evolved by transtension in a zone of crustal weakness between Evia and the Greek mainland. The basin was developed by the separation of the island of Evia – with continental crust of approximately 30 km thickness – from the Greek mainland, by transtension and stretching of the crust, forming the north Evia and the Sperchios valleys. Along the Maliakos – north Sporades basin the crust thins from 34 km at the mainland to 22 km at the Sporades basin. The crust at the northern part of the island of Evia and the Trikeri straits is 30 to 32 km thick and of normal continental structure; it is separated by an inter-



The transtensional processes required to explain the rapid changes of crustal thickness follow the general trends of rifting observed in the Corinthiaki basin that deformed the areas between the Peloponnese and central Greece (1, 2). The thinned crust of northern Evoikos basin may be correlated with the Miocene palaeodynamic evolution of the Hellenides, since the basin itself is the NE extension of the Miocene Molassic Hellenic Trench that is expected – as a back arc basin – to have thin crust. A second interpretation might be that the thinned crust of northern Evoikos is the result of a tectonic process with a significant wrench component formed in a pull-apart environment. The transition of the Maliakos – Evia continental block to the thinned continental crust of the Sporades basin with the thick sediments that cover it, most probably delineates an ancient border of a passive margin developed along the Servo-Macedonian massive, presently compressed and crust-shortened between the Evia-Pilion unit, and the Servo-Macedonian massive.

References

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