The Crustal Structure and Tectonic Implication of the Westernmost Mediterranean Derived from Geophysical Studies

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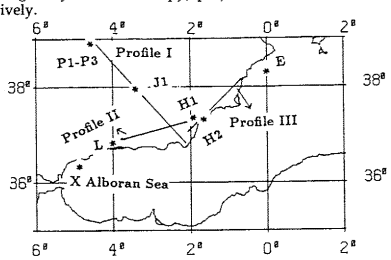
In autumn 1989 a wide angle reflection and refraction seismic (WARRS) survey was carried out in the Betic Cordillera by the Institut für Geophysik, Universität Hamburg and the Instituto Jaume Almera, Barcelona. The figure below shows the location of the shotpoints and recorded profiles. Three quarry blasts (P1P3), four landshots (J1, H1, H2 and L) were recorded along three profiles. In addition, two seashots (X, E) fired during the ILIHA (Iberian Lithosphere Heterogeneity and Anisotropy) project were also recorded along profile II and profile III respectively.



Profile I is about 270 km long and spans from the Iberian Massif to the External and Internal Betics. The results of the ray-tracing modelling, controlled by synthetic sections, show that the lower crust of External Betics consists of two layers. The upper part of the lower crust has a velocity of about 6.4 km/s which overlies a layer with a velocity of 7.0 km/s. In contrast to this, the lower crust in the Internal Betics seems undifferentiated, having a velocity of 6.4 km/s - 6.7 km/s. The Moho has a depth of about 36 km in Iberian Massif and deepens quickly down towards the transition zone between the External and Internal Betics, where the Moho is found at about 43 km depth and the high velocity layer (7.0 km/s) disappears. SE of the transition zone the Moho rises towords the Alboran Sea. The lateral variation of the crustal structure described above suggests that the crust belongs to different crust domains. The External Betics with a lamellae of high velocity (7.0 km/s) in the lower crust belongs to the passive continental margin of the Iberian Plate, while the Internal Betics belongs to the Alboran Domain. Such a lamellae with high velocity of 7.0 km/s in the lower crust is also found in the Valencia Shelf (MAUFFRET *et al.* 1992). MAUFFRET *et al.* (1992) proposed that the formation of this lamellae in the lower crust may be related with a Jurassic extensional event.

Profile II, lying in the Internal Betics and runing WSW-ENE, shows the existence of a prominent reflector at 9-13 km depth between the upper crust and the lower crust. The Moho is found at 38 km depth in the center of Profile II and rises towards east and west.

Compaired with Profile II, profile III (SW-NE) lying in the easternmost Internal Betics shows totally different features. The crust here is undifferentiated. The reflector between the upper and lower crust is absent. The Moho depth varies from 25 km in NE to 27 km in the center part and rises again towards SW. At the SW end of profile III the Moho is only 19 km deep. It is much shallower than the Moho under H1 (30 km) though the distance between the both is only about 20 km! These features may be caused by the Betics Sinistral transcurrent shear zone from Almeria (SW) to Alicante (NE) which may be associated with its extensions to the northeast (Balearic Islands fringe) and to the southwest (Eastern Rif in Morocco) as proposed by DE LAROUZIERE *et al.* (1988). The residual Bouguer anomalies seems to verify the presence of the transcurrent shear zone described above.

Furthermore, the WARRS results were also controled by gravity-modelling using the new terrain corrected Bourger gravity maps.

REFERENCES

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