Crustal Structure of Back-Arc Basins in Mediterranean Orogenes

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Summary:
A review on crustal structure of the hinterland is given. A comparison shows the wide variety in structure and development which may be controlled by the dip of the Benioff plane and the configuration of continental blocks and oceanic belts.

Sommaire:
Un aperçu de la structure de la croûte de l'arrière-pays est présenté ici. Une comparaison montre la grande diversité de la structure et du développement qui peuvent être contrôlés par le plongement de la surface Benioff et la configuration de blocs continentaux et de bassins océaniques.

Introduction:

The expression back-arc basin has been derived from the island arc and marginal sea configurations in the Western Pacific. A hinterland is regarded as an area bordering on or within an orogenic belt on the internal side, away from the direction of overfolding and thrusting. (For references see GIESE and REUTTER 1978).

Tyrrhenian Sea:

The central Tyrrhenian Sea has a crustal thickness of 12 km. The nature of this crust is of oceanic type. At its southern and eastern margins (Sicily, Calabria, Campagnia) thickness increases to 20-25 km. On shore it changes abruptly to 40-45 km, thus indicating the margin of the hinterland.

Alboran Sea:

In the Alboran Sea a crustal thickness of 17 km has been found. Towards the southern Spanish coast, crustal thickness increases to about 25-30 km which is typical for the Betic Cordillera. As proved by gravimetric and seismic data, an abrupt increase of crustal thickness to 40-60 km takes place towards the Subbetic zone (UDIAS 1977).

Pannonian Basin:

From the numerous seismic profiles an average crustal thickness of 25-27 km could be revealed for the Pannonian basin and the inner Carpathians. The Pieninian zone bor-

ders the hinterland against the Outer Carpathians which have a crustal thickness of 40-45 km.

Aegean Sea:
In the central Aegean Sea a sialic crust exists with a thickness of about 25 km. Offshore the northern coast of Crete and along the W-coast of the Peloponnesus a strong gravity gradient indicates an abrupt change of crustal thickness from 25 to about 35-45 km, which marks again the border of the hinterland.

Alps:
The Periadriatic line separates quite clearly the hinterland - the Southern Alps - from the central zones. The situation is different in the western and eastern part of the Southern Alps. In the inner arc of the Western Alps - the Ivrea zone - and the Bergamasc Alps, the crust shows a reduced thickness. The western Po plain has a total crustal thickness of 30-35 km, the sedimentary cover may be 10-15 km thick. During the lower Tertiary, the western Po plain can be regarded as hinterland basin, whereas it acted in the upper Tertiary as foreland of the Apennines.
In the eastern part of the Southern Alps, S of the Insubric line, total crustal thickness is about 45-50 km. This great thickness can be explained by a model with crustal doubling.

Northern Apennines:
The Tuscany region in the Northern Apennines presents some typical features of a back-arc basin, es e.g. extensional tectonics and volcanism. A thin crust of 20-25 km thickness is in agreement with its hinterland behaviour. This thin crust, however, belongs to the margin of the Adria plate, being the foreland of the Northern Apennines.

Conclusions:
This review has proved that, in most cases, sialic hinterland crust lies on the foreland crust or on intrageosynclinal fragments. This synthetic structure causes the abrupt increase of crustal thickness at the border of the hinterland against the adjacent orogenic belt. The case is different in the Northern Apennines with its antithetic structure.

References:

GIESE and REUTTER 1978 in: Alps, Apennines, Hellenides, Editors H. Closs, D. Roeder, K. Schmidt - Schweizerbart'sche Verlagsbuchhandlung, Stuttgart.
UDIAS 1977: Perfiles sísmicos profundos in Espana (1974-1975) - Madrid.