



On the crustal structure beneath the eastern termination of the Pyrenees

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The presence of a crustal root beneath the central part of the Pyrenees has been extensively documented by seismic and gravity data and is related to the building of the Pyrenees Chain during the Alpine orogeny. The Eastern termination of the chain is affected by a second major orogenic process, the Neogene extension associated to the rotation of the Sardinia-Corsica block and the opening of the Valencia Trough. This extensional feature has resulted in a rather abrupt thinning of the crust, from 40-45 km about 80 km to the west of the Mediterranean coastline to less than 25 km beneath the eastern termination of the chain. The details of the transition between the central and eastern Pyrenees domains needs still to be fixed into detail.

With this objective in mind, two passive seismic profiles have been acquired from mid 2015 to late 2016 within the OROGEN and Pyrope projects. Up to 38 broad-band stations were deployed along two orthogonal lines, with an interstation spacing close to 10 km. The NNE-SSW profile, oriented orthogonally to the Pyrenees trend, shows a well defined Moho beneath Iberia, slightly deepening from 32 to 35 km northwards. Beneath the Axial zone the Moho is located between 30 and 35 km and appears to be segmented in a couple of convertors. Further North, underneath the North Pyrenean Front Thrust, the Moho appears again as a clear and continuous convertor located at 28-30 km. This image clearly differs from the sections obtained in Central and Western Pyrenees, where the imbrication between the Iberian and Eurasian crusts is more conspicuous.

Results of receiver function migration on the E-W profile suggest a smooth Moho thinning from a 40 km depth beneath the western termination of the line to 23 km close to the coastline, confirming the picture retrieved from previous, lower resolution experiments and evidencing the crustal thinning due to the Neogene extensional processes.

Moderate magnitude earthquakes with epicenters located in the Gulf of Roses and near the intersecting point of the profiles have been recorded along the seismic lines during the experiment, hence providing additional constraints on the geometry of the crust/mantle boundary in the Eastern Pyrenees. In particular, the recordings of the Gulf of Roses event along the NNE-SSW line resulted in a fan profile proving that minor crustal thickness differences between Iberian and Eurasian crusts can still be recognized at longitudes around 2.7°E, about 30km away from the Mediterranean coast.

We are now progressing in the integration of these results with the available geologic transects in order to provide a more accurate geodynamical interpretation of this region.

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