Geophysical Research Abstracts
Vol. 15, EGU2013-7628, 2013
EGU General Assembly 2013
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High resolution Moho topography map beneath Iberia and Northern Morocco from RF analysis

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The Topoiberia-Iberarray broad-band seismic network has covered in three successive legs the Iberian Peninsula and the Northern part of Morocco, allowing to acquire new seismological data with unprecedented resolution and coverage. One of the classical approaches used to infer information on the structure of the crust using passive seismic data is the inspection of the P-to-S conversions at the main discontinuities. In particular, the application of the H-K technique allows to evaluate the thickness and the mean Vp/Vs ratio for the crust beneath each available station. In this contribution, we benefit from the dense Topoiberia-Iberarray seismic network, with stations distributed on a regular 60 x 60 km grid, to obtain a detailed map of the Moho topography and the Vp/Vs variations beneath Iberia and Northern Morocco. This region show a great geodynamical diversity, including, North to South, crustal imbrication in the Pyrenean range, a large and relatively undisturbed Variscan Massif in the center of Iberia and areas of complex and still not completely understood geodynamics in the Alboran domain and the Atlas range.
Beneath Northern Morocco, strong lateral variations of the crustal thickness are observed, depicting three domains: a previously unidentified thick crust (reaching at least 45 km) beneath the Rif, a thinned crust region beneath NE Morocco, with depths ranging from 22 to 30 km, and a region of 27–34 km thick crust in the Atlas domain and its foreland regions. Vp/Vs ratios show normal values close to 1.75 for most stations except for the Atlas domain, where several stations give low Vp/Vs ratios of around 1.71. Beneath Southern Iberia, the Moho show also significant variations. The highest values of crustal thickness in this region, reaching 46 km, are found under the External zones of the Betic range, near the contact with the Alboran Domain. Southeastern Iberia is affected by significant crustal thinning (from 19 km to 30 km) occurring over a short distance. The Variscan Iberian massif presents a rather flat Moho discontinuity with average crustal thickness of 31 km and low Vp/Vs ratio of 1.72, which may suggest the removal of the lower crust. The areas reworked during the Alpine orogeny (Central System, Iberian Chain) show a slightly thicker crust, with thicknesses of 33-35 km, which may reach values close to 40 km at some particular points. In the Northern part of Iberia, complex receiver functions are observed, as a result of the imbrication of the Iberian and Eurasian crusts during the Alpine orogeny. Depths exceeding 45 km are observed along the Pyrenean range, in good agreement with the results derived from active seismic experiments. Close to the Atlantic coast, the crust thins to values of 26-28 km, depicting the transition to the oceanic domain.

Those results will be compared with other estimations of the crustal thickness variations over this region, as those provided by the more sparse deep seismic sounding profiles and derived from potential fields.