

Deep seismic profiling onshore and offshore Iberia

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Probing the lithospheric architecture of the Iberian plate by seismic methods is a most relevant target considering its geographic and geotectonic framework. The different crustal signatures of the Variscan and Alpine orogenic cycles, the Cenozoic extensional processes and the continent-ocean structural transitions have been studied by extensive deep seismic measurements carried out since the pioneering ECORS-Pyrenees profile in mid-eighties.

The Western Mediterranean margins (Valencia Trough and Alboran Sea) resulting from the complex Cenozoic tectonics and the non-volcanic passive Atlantic margins were mapped by the VALSIS and IAM experiments, respectively. The Spanish ESCI program provided a comprehensive deep seismic reconnaissance onshore and offshore Iberia, including vertical and wide-angle profiling across the Cantabrian and Betic ranges and their foreland basins.

A 700 km-long crustal transect was completed from the Pyrenees to the South Balearic Basin. It reveals strong lateral variations that affect mainly the reflectivity and thickness of the lower crust, and a total crustal thinning by a factor of three. The Betics-Alboran crustal transition is also very abrupt. A thickened crust of more than 50 km depth at the Pyrenees, well known from the ECORS profile, results from the Alpine underthrusting of Iberia beneath Europe. A remarkably similar image has been found further west, in the Basque area and across the Cantabrian Mountains. This reveals the predominance and western extent of the Alpine tectonics in N Iberia. Towards the hinterland Variscan terranes a 30 km-thick crust is found and the seismic features delineate the transition from thin- to thick-skin tectonics.