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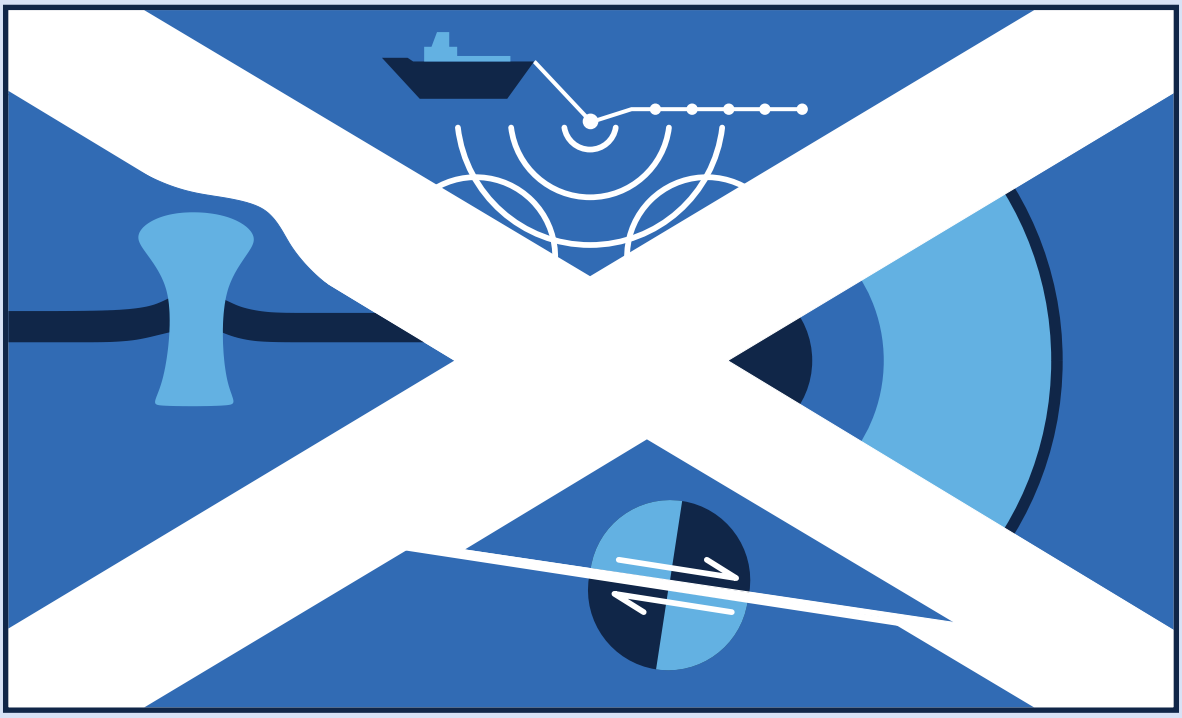
seismology at the crossroads



ABSTRACT VOLUME

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Crustal structure variations in the southern Central Iberian Zone: Effects of composition and Alpine reactivation in an internal Variscan domain

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The IBERSEIS and ALCUDIA projects have acquired vertical incidence and wide-angle reflection seismic data in the Variscan Central Iberian Zone of Spain. Together, they present a NE-SW, ~300 km long transect that samples an area going from the Ossa-Morena Zone in the S, through the Central Iberian Zone, to the Alpine Central System to the N.

Although crustal thickness appears to be fairly constant along most of the Central Iberian Zone, the seismic signature of the laminated lower crust suggests that the latest varies in thickness, decreasing from 6 s TWT in the S to 2 s TWT to the N. This implies overall compositional and velocity changes in the crust that may place the crust-mantle boundary at different depths. That, together with a well constrained velocity increase in the upper crust and the existence of the sedimentary basin to the N, configures a complicated pattern when trying to establish the Moho depth.

Wide angle reflection data provides good velocity control in the upper crust and the mantle along the entire transect, imaging a gradual increase of 3-5 km in the Moho depth to the N. There, the amount of Variscan metasediments diminish and the surface geology is characterized by granodiorites, migmatites and by the Madrid Basin, a foreland basin of the Alpine Central System that is part of the bigger Tagus Basin. The increase in crustal thickness identified in the neighborhood of the Central System is also accompanied by a slight increase in the Poisson ratio values, that even though still below 0.25, they are higher than those observed in the southern part of the profile, far from the influence of a late Variscan melting episode and of that of Alpine tectonics.

Two scenarios are considered to take part in the Moho deepening near the Central System: the Alpine reactivation causing this mountain belt has increased the crustal load giving rise to a foreland basin and, probably, to a moderate crustal thickening. Also, a gradual change in crustal composition to the N, triggered by generalized melting, has probably incorporated denser and more basic rocks, contributing to Moho deepening by isostatic readjustment. The importance of each of these processes is, as yet, unknown. However, the next acquisition of the CIMDEF project wide-angle reflection dataset across the Central System will surely shed some light on this issue (Research supports: CGL2014-56548-P, 2009-SGR-1595).