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Lithospheric strength across the ocean-continent transition in the NW of the Iberian Peninsula

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The main objective of this work is to investigate the relation between the strength of the lithosphere and the observed pattern of seismicity across the ocean-continent transition in the NW margin of the Iberian Peninsula. The seismicity is diffuse in this intraplate area, far from the seismically active margin of the plate: the Eurasia-African plate boundary, where convergence occurs at a rate of 4-5mm/year. The earthquake epicentres are mainly limited to an E-W trending zone (onshore seismicity is more abundant than offshore), and most earthquakes occur at depths less than 30 km, however, offshore depths are up to 150 km). Moreover, one of the problems to unravel in this area is that the seismotectonic interpretations of the anomalous seismicity in the NW peninsular are contradictory.

The temperature and strength profiles have been modelled in three domains along the non-volcanic rifted West Iberian Margin: 1) the oceanic lithosphere of the Iberian Abyssal Plain, 2) the oceanic lithosphere near the ocean-continent transition of the Galicia Bank, and 3) the continental lithosphere of the NW Iberian Massif. The average bathymetry and topography have been used to fit the thermal structures of the three types of lithospheres, given that the heat flow and heat production values show a varied range. The geotherms, together with the brittle and ductile rheological laws, have been used to calculate the strength envelopes in different stress regimes (compression, shear and tensile).

The continental lithosphere-asthenosphere boundary is located at 123 km and several brittle-ductile transitions appear in the crust and the mantle. However, the oceanic lithospheres are thinner (110 km near the Galicia Bank and 87 km in the Iberian Abbysal Plain) and more simple (brittle behaviour in the crust and upper mantle). The earthquake distribution is best explained by lithospheres with dry compositions and shear or tensile stress regimes. These results are similar can be compared to those of the Gulf of Cadiz oceanic-continental transition near the Eurasia-African plate boundary (Neves and Neves, 2009), and they contribute to complete the knowledge about seismicity and lithospheric strength in the ocean-continent transition of the Iberian Peninsula.

References

Neves M.C., Neves, R.G.M., 2009. Flexure and seismicity across the ocean-continent transition in the Gulf of Cadiz. Journal of Geodynamics, 47, 119-129.