

# Deep structure of the Porcupine Basin from seismic refraction data, offshore western Ireland

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The Porcupine Basin is a V shaped failed rift basin located offshore western Ireland. It was formed during Late Paleozoic to Cenozoic, with the main rifting phase in the Late Jurassic to Early Cretaceous. This basin is characterised by some hyperextension, with lithospheric stretching factors of up to 6 previously estimated in the central part of the basin. Such hyperextension led to uppermost mantle serpentinization, which was imaged along a former transect across the basin. A ridge feature is located at the centre of the southern basin, the Porcupine Median Ridge (PMR), and successively interpreted as a volcanic ridge, a tilted block, or a serpentinite mud diapir, with obvious implications on the thermal history of the basin.

We present results from layered travel-time tomographic modelling of five profiles: three across the whole basin, one across the southeastern margin, and one along the centre of the basin that show: (1) variations of thickness of the crust, with crustal thinning factors of up to 10 in the southernmost part of the basin; (2) an asymmetry of the crustal structures together with an asymmetry in the uppermost mantle velocities, which highlights the influence of crustal faulting on amounts of serpentinization; (3) the definition of three distinct crustal domains in the basin, from the thinned continental crust to oceanic crust in the central part of the basin, through a transitional zone; and (4) the probable igneous composition of the PMR. Thus, this study gives a better understanding about the formation of the Porcupine Basin through the observation of the asymmetrical crustal thinning, the characterisation of the nature of the different crustal domains, the study of the amounts of serpentinization in the uppermost mantle and the observation of magmatism.