



Formation and evolution of Irish passive margins: implications for locating the transition between continental and oceanic crust

L. Gernigon (1), C. Ravaut (2), P.M. Shannon (1), A. Chabert (1), B.M. O'Reilly (2) and P.D. Readman (2)

¹ Department of Geology, University College Dublin (UCD), Belfield, Dublin 4, Ireland.

² Dublin Institute for Advanced Studies (DIAS), 5, Merrion Square, Dublin 2, Ireland

Defining the exact location and nature of the transition between continental and oceanic crust is of key importance to understanding the structure and evolution of continental passive margins. The Irish passive margins provide an excellent natural laboratory for studying such processes, as they display a large variety of styles, including narrow, wide, volcanic and non-volcanic margins. Integration of new seismic, potential field and well calibration data allows us to clarify the structure and stratigraphy of both the West Hatton margin (WHM) and the south Rockall/Hatton margin (SHRM). The WHM represents a Late Paleocene-Early Eocene volcanic margin, as suggested by the typical volcano-stratigraphic sequence (Inner SDRs, Outer High, Outer SDRs, oceanic crust) observed near the breakup axis. The Inner SDR wedges are typically underlain by thin and intruded sediments and continental crust. Oceanward, the deep structures of the Outer High and outer SDRs features are underlain by a massive, uniformly thick high-velocity lower crustal body interpreted as breakup underplating that probably controlled the SDRs emplacement. To the south, the SHRM is a complex rifted zone linking the WHM with the Celtic and Iberian non-volcanic margins. The SHM was also influenced by an earlier Cretaceous phase of break-up and, compared to the WHM, the nature of the continent-ocean transition is different. Close to the C34 magnetic anomaly, the continent-ocean transition is defined by a sharp contrast between a smooth oceanic basement and block-faulted structures that exhibit both syn- and post-breakup features. Close to the oceanic crust, the C34 may not necessarily represent 'true' oceanic crust but the complex may represent a combination of serpentinized peridotites and/or intruded continental basement. No SDRs are imaged, but

evidence of magmatism is identified. Thin lava flows and transgressive sill complexes, magmatic plugs and seamounts intruding the Cretaceous oceanic crust are observed near the SRHM. Close to the Charlie-Gibbs Fracture Zone the West Thulean Rise, defining the southern end of the volcanic province, is also imaged. It probably represents a thick Paleocene oceanic volcanic plateau, uplifted and block faulted during Cenozoic time and interacting with the oceanic spreading initiated earlier in the Porcupine Abyssal Plain. The age of the magmatism along the SRHM and adjacent basins is controversial. Evidence of Palaeogene magmatism can be observed but Early Cretaceous igneous activity is also indicated. The best example is the Barra Volcanic Ridge, which is reinterpreted here as a structural horst (serpentine or continental block) cut by Early Cretaceous extrusives and intrusives and subsequently by Tertiary dykes. Detailed stratigraphic analysis documents the contrasting subsidence/uplift patterns that differentiate the sedimentary architecture of the WHM and the SRHM. This project is funded by the Geological Survey of Ireland and the Irish Petroleum Infrastructure Programme.