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Ocean-Continent Transition Structure of the SE Greenland - Hatton Bank Magma-Rich Rifted Margins

Caroline Harkin and Nick Kusznir
University of Liverpool, Earth, Ocean & Ecological Sciences, Liverpool, United Kingdom (c.harkin@liverpool.ac.uk)

The conjugate rifted margins of south-east Greenland and Hatton Bank in the North Atlantic show anomalously thick crust within their ocean continent transition (OCT) zones, interpreted as oceanic crust and as such are classified as magma-rich rifted margins. Existing interpretations propose that the distribution of the anomalously thick oceanic crust is asymmetric with a greater width on the south-east Greenland margin compared with that of Hatton Bank. This has been explained by asymmetric magma-rich sea-floor spreading and assumes that there is a sharp continent-ocean boundary on both margins.

We examine an alternative hypothesis that the south-east Greenland margin consists of a wide region of hyper-extended continental crust sandwiched between extrusive and intrusive magmatic material. Hyper-extended crust is a common feature of magma-poor margins and at some margins (e.g. Iberia) is also sandwiched by varying amounts of magmatic material.

We use quantitative geophysical methods on both the iSIMM (Hatton Bank) and SIGMA (south-east Greenland) seismic datasets in order to investigate the ocean-continent transition structure. Our quantitative techniques consist of the gravity anomaly inversion, residual depth anomaly (RDA) analysis and subsidence analysis, to try and constrain the crustal type.

Initial results from the gravity inversion suggest hyper-extended continental crust of 150km width exists on the south-east Greenland margin with $\sim$5-8km of magmatic addition. Results from the Hatton Bank margin indicate a sharper OCT zone. For both rifted margins, the gravity inversion suggests first oceanic crust of approximately 10km thickness. RDA results using a sediment corrected bathymetry calculated using 2D flexural backstripping and decompaction are also consistent with the existence of a broad region of hyper-extended continental crust with magmatic addition on the SE Greenland margin.

Our initial results are in favour of an asymmetric conjugate rifted margin structure, where the south-east Greenland OCT contains hyper-extended crust with magmatic additions, while the Hatton Bank rifted margin has a sharp OCT. Comparable margin structures have been observed at magma-poor margins such as Iberia-Newfoundland, implying the formation process of both magma-poor and magma-rich rifted margins is similar, with magma playing a minor role in controlling the final structures.