



Mapping the extent of thinned continental crust across the Orphan Basin, offshore Newfoundland, Canada, using a combination of vintage and new seismic refraction/wide-angle reflection data

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The SIGNAL (Seismic Investigations off Greenland, Newfoundland and Labrador) 2009 cruise was undertaken by the Geological Survey of Canada (GSC) and the Geological Survey of Denmark and Greenland (GEUS), with scientific contributions from Dalhousie University, to collect refraction/wide-angle reflection (RWAR) profiles as part of each country's continental shelf program under UNCLOS (United Nations Convention on the Law of the Sea) Article 76. Line 1 extended from the Bonavista Platform off Newfoundland, across the Orphan Basin, to Orphan Knoll and beyond into oceanic crust. The line followed the same track as an earlier seismic refraction line and ocean-bottom seismometer (OBS) locations were chosen to complement and to extend the original station coverage.

The final crustal velocity model across Orphan Basin shows thinned continental crust (15 to 20 km thick) beneath most of the basin with thinner crust (10 km thick) immediately outboard of the Bonavista Platform, interpreted as a failed rift zone. Seaward of the failed rift, the velocity structure of the thinned continental crust is generally uniform over 250 km toward Orphan Knoll. Immediately outboard of Orphan Knoll, the crust thins to 8 km and exhibits a velocity structure consistent with oceanic crust. The results from modelling of the combined refraction/wide-angle reflection dataset support an extension of Canada's continental shelf beyond the seaward limits of the Orphan Basin.