

Re-stitching the Newfoundland–Ireland conjugate margins back together with geophysical megatranssects and plate reconstructions

KIM J. WELFORD, ALEXANDER L. PEACE, HEIDE MACMAHON, LARRY SANDOVAL, AND PEI YANG

Department of Earth Sciences, Memorial University of Newfoundland, St. John's, Newfoundland and Labrador A1B 3X5, Canada

The deepwater Orphan Basin and adjacent Flemish Cap continental ribbon, offshore Newfoundland and Labrador, acquired their unique spatial configuration during the formation of the modern North Atlantic Ocean. On the conjugate Irish margin, the Porcupine and Rockall basins lie adjacent to similar continental ribbons such as the Goban Spur and Porcupine Bank, which developed simultaneously with the aforementioned Newfoundland features, and in response to similar tectonic processes. Despite their spatial similarities and cotemporaneous development, fundamental differences exist between the two conjugate margins in terms of the distribution and nature of petroleum systems, and the degree, style, and localization of crustal thinning and mantle serpentinization.

To better characterize the similarities and differences across the conjugate pair, we are endeavouring to construct geophysical crustal-scale megatranssects that reconstruct the margins back together, while remaining true to spatial constraints from recent plate reconstructions. Our main targets of interest are the West Orphan, East Orphan, Rockall, and Porcupine basins, along with the Flemish Cap and Goban Spur. The megatranssects are constructed from both seismic reflection data and gravity modelling/ inversion results, providing regional views of how the basinal and crustal structures vary both across and along strike of each margin. The seismic megatranssects in particular allow for margin-to-margin reconstructed basin models to be restored back in time to their prerift state and for the evolutionary link between the conjugate basins to be tested. These types of studies are crucial for developing our fundamental understanding of basin evolution on rifted margins, particularly those with extreme crustal thinning and orphaned continental ribbons. The results are also directly relevant to petroleum exploration as they provide the regional full-crustal context.