Structural Restoration and 2D Basin Modeling in Western Newfoundland

Martin Schwangler[1], Nicholas B. Harris[1], John F. Waldron[1]
[1]University of Alberta, Earth and Atmospheric Sciences

The western coast of Newfoundland, part of the eastern margin of the Anticosti Basin, hosts a petroleum system sitting at the structural front of the north-eastern Canadian Appalachian orogen. In this study we assess the timing of oil generation and the style and geometry of oil migration pathways in a structurally complex setting, applying two-dimensional basin modeling and structural restoration.

Several shallow wells drilled in the Parson's Pond area in the 1950s encountered light oil shows. The most viable source rocks for this petroleum system are hosted in distal parts of the continental slope and rise deposits, with TOC concentrations of up to 10.35 wt.% and a type I/II kerogen with high hydrogen index (HI) values of over 840 [mg HC/g TOC]. Late Cambrian to early Ordovician source rocks were thrusted in-sequence during the Taconian Orogeny (Early Ordovician) onto passive margin carbonates. The later Acadian (Devonian) compressional deformation reactivated and inverted major basement thrusts, placing Grenville chrystalline rock on top of platform carbonates and continental slope and rise deposits.

This ongoing investigation presents a two-dimensional petroleum basin model including a structural restoration of the fold and thrust belt in combination with a full PVT hydrocarbon migration model for the study area. The model is calibrated with petrophysical property logs collected from two well, Seamus #1 and Finnegan #1 drilled in 2010. Geochemical data from outcrop samples and oil seeps were used to characterize the source rock quality and conversion kinematics.

This first 2D model for the area gives an in-depth understanding of the evolution of the petroleum system in western Newfoundland and contributes to a better understanding of hydrocarbon generation and migration in fold and thrust belts in general.