Hydrocarbon potential of the eastern Shelburne sub-basin and surrounding areas from petroleum systems modelling constrained by well log information, seismic images, and analogue models

ERIC NEGULIC
Department of Earth Sciences, Dalhousie University, Halifax, NS, B3H 4J7 Canada <er810359@dal.ca>

Recent petroleum exploration on the Scotian margin has yielded poor results as new wells drilled into the shallow-water shelf and along the deep-water continental slope struck no economic hydrocarbon deposits. This lack of recent exploration success shows that a better understanding of the Scotian margin's geological complexity and structural evolution is required for future successful exploration. In an attempt to broaden our knowledge of the Scotian margin, I have compared analogue modelling results with seismic data from the eastern Shelburne sub-basin and surrounding regions, and have created a petroleum systems model of the area using PetroMod software. The goal of this project was two fold: (1) Interpret and correlate available seismic data with available well data from the targeted area for petroleum systems modelling, as well as for comparison with existing analogue models; (2) Create a petroleum systems model constraining possible hydrocarbon reservoirs, also to be used in determining regions for future heat flow measurements in the Scotian Basin.

Three 2D Seismic lines from the GXT NovaSPAN survey and one 2D Lithoprobe line were interpreted, depicting stratigraphic boundaries and outlines of all salt structures present. A 3D analogue model with a symmetric rift graben basement structure and thick salt fill (~2 km when scaled) representing a possible Late Triassic configuration in the Scotian Basin was structurally analyzed and retrodeformed. Salt structures identified in the analogue model were compared to those in the seismic images. Structural restorations of the analogue model through time constrained the evolution of the salt deformation structures and provided insight on the formation mechanism of salt structures within the Scotian Basin. The simplified analogue model setup of the Scotian Basin developed many salt structures similar to those seen in seismic images. The 2D

Atlantic Geology, 2008, Volume 44, Number 1

seismic lines all intersect forming a four sided grid, and the interpretations of these lines were used to create 3D surfaces as the initial constraint for petroleum systems modeling. The retrodeformation of the analogue model was used to provide constraints for the evolution of salt structures in the petroleum systems model, and well data from the region was used to provide stratigraphic and sedimentological constraints in the model. The model is used to interpret the hydrocarbon potential of the region, and to demonstrate in 3D the locations and evolution of salt diapirs. The model also produces surface heat flow estimates and is used to interpret the affects of salt diapirs on heat flow. The model will ultimately be used in order to define potential regions for future heat flow measurements within the Scotian Basin.