Re-processing of seismic reflection data in the Cumberland Basin

F. Marillier[1] and P. Durling[2]
[1]*Atlantic Geoscience Centre, Bedford Institute of Oceanography, P.O. Box 1006, Dartmouth, Nova Scotia B2Y 4A2, Canada*
[2]*Durling Geophysics, 36 Beaufort Drive, Dartmouth, Nova Scotia B2W 5V4, Canada*

To better understand the geology and the resource potential of the Cumberland Basin, northern Nova Scotia, and to establish linkages with offshore sedimentary basins, we have initiated a compilation of seismic reflection data acquired mainly by the oil industry. Some of the data, gathered in the early 1970s for Anschutz Exploration (Canada) and Gulf Oil Canada Limited, need to be re-processed to better image stratigraphic and structural features. Here we report on the re-reprocessing and preliminary interpretation of about 500 km of seismic profiles.

Re-processing was conducted by Pulsonic Geophysical Limited. The selection of the critical processing parameters was made in close collaboration between the company and ourselves in order to meet specific objectives. These included better imaging the upper part of the seismic sections, recovery of meaningful data beyond the original limit of four seconds, and continuity of data quality from top to bottom of the section. Processing operators such as statics corrections, deconvolution and migration were found to offer the greatest improvement in the section quality which is far superior in the re-processed profiles.

The re-processed data together with other seismic sections allow us to pick a few seismic horizons basin wide and to identify the main stratigraphic units. Major structural features within the basin are identified and mapped. For example, the data indicate that the basin is subdivided into two distinct structural domains, separated by the east-west striking Beckwith Fault. To the north of the fault, the strata are horizontal, whereas to the south their structure is more complex and their thickness varies greatly. In the Athol Syncline, the sediments thicken up to 2.8 s two-way travel time (about 5 km). To the south and to the southeast, the basin is bounded by the Cobequid Highlands and by the Scotsburn Anticline. There is evidence for north-directed thrusting along the northern margin of the anticline.

The data indicate that several structural features observed in the basin including the Beckwith Fault, and the Malagash and Scotsburn anticlines extend offshore to the northeast. This suggests that the on land Cumberland Basin is part of a much larger basin that stretches under the eastern Northumberland Strait and eastern Prince Edward Island.