

High Resolution Sequence Stratigraphic Correlation and Coal Seam Distribution in the Upper Carboniferous Strata of the Central Maritimes Basin

Gillian Chi*

Geological Survey of Canada, Calgary, AB
gchi@nrcan.gc.ca

James Dietrich

Geological Survey of Canada, Calgary, AB, Canada

and

Peter Giles

Geological Survey of Canada, Dartmouth, NS, Canada

Summary

Upper Carboniferous strata in the Magdalen Basin, southern Gulf of St. Lawrence were deposited in restricted–marine to alluvial environments, with abundant coal seams in the Namurian-Westphalian succession (Cumberland and Pictou groups). Because the coal measures represent significant hydrocarbon source rocks, an evaluation of the distribution and thickness of the coal-bearing strata is essential for assessing petroleum potential in this basin.

High resolution sequence stratigraphic correlations of the coal-bearing strata were conducted using data from four offshore wells and seven regional seismic reflection cross sections. The correlations were achieved utilizing the control of base level change on non-marine sequence stratigraphy, basin fill depositional patterns and coal accumulation. The depositional cycles within the coal - bearing strata are predominantly asymmetric, leading to thicker sediments in the transgressive system tract (TST) than in the regressive system tract (RST), they are separated by maximum regressive surfaces and equivalent erosional unconformities, which can be clearly observed on the seismic sections.

Nine third-order depositional sequences have been identified in the Upper Carboniferous strata, with four in the Bradelle (SS1 to SS4), three in the Green Gable (SS5 to SS7), and two in the Cable Head Formation (SS8 to SS9). Interestingly, the SS4 sequence in the upper part of the Bradelle Formation was observed only in the central part of the basin.

The interpretation of coal-bearing strata in a sequence stratigraphic framework provides an improved understanding of the variability in the coal distribution and thickness. The identification of abundant coal beds and numerous incised channels from the well and seismic data indicates low to intermediate sediment accommodation rates in this basin. The vertical distribution of the coal-bearing strata varies in different parts of the basin. In the basin margins represented by the Bradelle

L49 well, most of the coal-bearing strata were deposited more border areas from the late stage of TST to the early stage of regressive (upper TST to lower RST). In contrast, more coal seams in the central part of the basin (Cablehead E95 well area) were deposited near the base RST, extending over a wide area.

Acknowledgements

We thank the Geological Survey of Canada for supporting this research through the Gulf of St. Lawrence Project and granted approval for publication. An initial draught of this manuscript was reviewed by M. Li and A.E. Embry, and their comments helped improve the final text.

References

- Rehill, T. A., 1996. Late Carboniferous Nonmarine sequence stratigraphy and Petroleum Geology of the Central Maritimes Basin, Eastern Canada; Dalhousie University, Halifax, Nova Scotia.
- Embry, A.F., Johannessen, E, Owen, D, Beauchamp, B. and Gianolla, P., 2007. Sequence Stratigraphy as a "Concrete" Stratigraphic Discipline; Report of the ISSC Task Group on Sequence Stratigraphy.