

M.Sc. THESIS DEFENCE

by

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***"PETROLEUM SYSTEM MODELLING OF POTENTIAL LOWER JURASSIC SOURCE ROCKS
ALONG THE SCOTIAN MARGIN"***

PLACE: *The Milligan Room, 8th Floor Biology Wing, LSC, Dalhousie University*

DATE: *Friday, August 10, 2018*

TIME: *9:00 a.m.*

EXAMINING COMMITTEE:

<i>Dr. Steven Ings</i>	<i>ExxonMobil Canada</i>	<i>External Examiner</i>
<i>Dr. Marcos Zentilli</i>	<i>Dalhousie University</i>	<i>Reader</i>
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PLEASE NOTE: *A copy of the thesis is available in the main Earth Sciences Office*

ABSTRACT

A mature source rock is the key element in a petroleum system and is a critical risk when exploring undrilled areas where there are few direct indications of hydrocarbons (either from surface seeps or seismic data). On the Scotian Margin, there are proven commercial hydrocarbon fields in Jurassic and Cretaceous reservoirs that have geochemical characteristics consistent with proven Upper Jurassic source rocks - but the unequivocal linkage between source and reservoir has not been demonstrated. In rocks of Lower and Middle Jurassic age, source rocks are abundant globally and are related to restricted marine and lacustrine depositional environments associated with the break-up of Pangea. However, it is uncertain whether source rocks of this age are present on the Scotian Margin. If they are, and they have a suitable thermal history, then there is potential for commercial petroleum systems that are currently undiscovered. The objective of this study is to address this problem through 2D thermal modelling, by integrating source rock geochemistry and depositional history from proven source rocks in Morocco (the conjugate margin), with basin modelling of the Scotian Margin.

This thesis presents the results of 2D Petroleum System models using PetroMod software on four shelf-to-slope regional seismic lines (NovaSPAN 1100, 1400, 1800 and 2000), by incorporating new data from the Nova Scotia Department of Energy-sponsored Play Fairway Analysis and outcrop data from Aït Moussa in the Middle Atlas, Morocco. In each of the four models, different source rock variables (hydrogen index and total organic carbon) were used based on data from Aït Moussa. Results suggest Lower Jurassic source rocks in the Scotian Basin, if present, are within the oil maturity window in the southwest and in the gas maturity to overmature window to the northeast. The transformation ratio (organic matter to hydrocarbons) for each kerogen type shows subtle variations along the margin but overall increases towards the northeast of the margin.