

1D and 2D Petroleum System Modelling of Potential Lower Jurassic Source Rock on Scotian Margin

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Summary

The Scotian Basin is a passive margin with an area of approximately 300,000km² (Wade and MacLean, 1990). Five Mesozoic organic rich intervals with potential for source rock (Aptian, Valanginian, Tithonian, Callovian and Early Jurassic) have been identified in the Scotian Basin. However, the Lower Jurassic source interval was never penetrated by drilling and is inferred from the Moroccan and Portuguese conjugate margins. In this study, to test the Lower Jurassic interval on the Scotian Margin for maturation and the potential as source rock, PetroMod by Schlumberger was used to build 2D models by dip and strike lines of the ION NovaSpan seismic dataset. Twenty-one 1D models and nine 2D models were completed across the margin. Variable source rock properties (Hydrogen Index and Total Organic Carbon) were incorporated reflecting the potential range of hydrocarbon that may be encountered during deposition and subsequent maturation of hypothetical organic rich intervals along the Scotian margin.

Method

The objective of basin modelling is to integrate physical and chemical properties into a time-dependent models. These models are run based on the burial and thermal history, producing outputs of hydrocarbon generation, migration, and accumulation (Hantschel and Kauerauf, 2009).

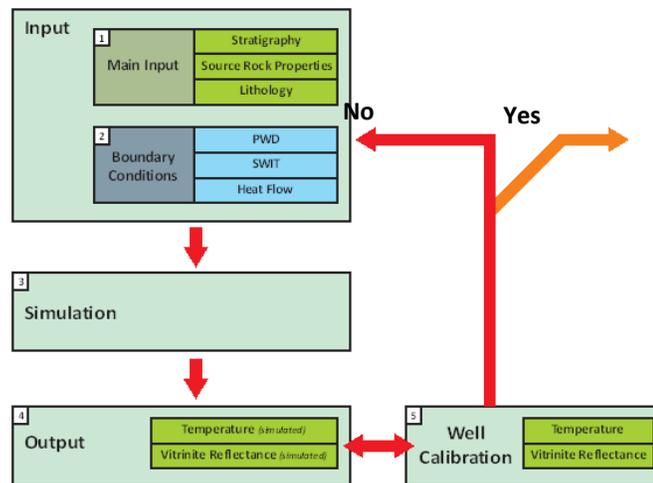


Figure 1. Flowchart of methodology for petroleum system modeling. The model construction starts by inputting known geological data in the following categories. 1) Main inputs, with stratigraphy, source rock properties and lithology properties. 2) Boundary conditions, paleo-water depth (PWD), sediment-water interface temperature (SWIT), and heat flow. Once the model is built it can be simulated (3), each simulation has an output (4) depending on the input's values (1), and (2). With the

output (4) the model must be validated with measured data from the borehole (5), and if it fails validation, the process must start over again in the input (1) and (2) and go through the process again. If the validation is in the acceptable ranges, then we have a possible valid solution.

Conclusion

These models suggest the hypothesized Lower Jurassic source rock in the Scotian Basin within the oil maturity window in the southwest, transitioning to a gas maturity window in the northeast. Determining the maturity of the source rocks reduces the risks related with ongoing and future petroleum exploration offshore Nova Scotia.

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