

The effects of salt on Lower Jurassic Source Rock maturation on the Scotian Margin

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ABSTRACT

Organic rich intervals have been identified in the Mesozoic conjugate margins of the North and Central Atlantic. The depositional environments and paleogeography of the conjugate Western European and African domains contain a proven Lower Jurassic source rock succession. This suggests the existence of a similar intervals in the conjugate offshore Scotian Margin (280,000 km²) but has not been drilled. If present, there is an uncertainty of their source rock characteristics (quantity, quality, and maturity). These Lower Jurassic intervals overlie the evaporites of the Argo Formation that have mobilized since deposition. The salt structures produce thermal irregularities that affect the thermal maturity of these potential source rocks. Salt basins are part of the evolution of rifted margins, as seen in the Gulf of Mexico, West Africa, the Persian Gulf, the North Sea, etc. which are known prolific petroleum systems basins.

To test the Lower Jurassic interval on the Scotian Margin for maturation and source rock potential, PetroMod by Schlumberger was used to build 2D models by using dip lines of the ION NovaSpan geophysical dataset. These models display a variety of salt structures observed across the Scotian Basin. The problems of modelling salt are not well addressed in petroleum system models. Their complexity is often ignored or over simplified. These salt structures are a concern when using petroleum systems modeling as it may affect the maturity and quality of the Lower Jurassic rocks. We can see the thermal effects that the salt has on each model that was tested. These models demonstrate the effect that the salt has on the Scotian Basin. The results show that source rock quality and maturity in the Scotian Basin are affected by the salt mobilization, which affects the transformation ratio (organic matter to hydrocarbons) of the Lower Jurassic interval has. These resulting compilations of models suggest a potential 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.