Seismic stratigraphy and attribute analysis of the Mesozoic and Cenozoic of the Penobscot area, offshore Nova Scotia

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The Penobscot area is located within the Scotian Basin, northwest of Sable Island, offshore Nova Scotia and comprises geological formations with representative properties for petroleum system in the basin. The Penobscot dataset includes a 3D seismic survey covering 87 km^2, two well logs and corresponding cored intervals totaling nearly 52 m. The cored intervals provide a detailed analysis of the Abenaki and Lower Missisauga formations, both known reservoirs within the Scotian Basin. Penobscot L-30 and Penobscot B-41 are 2 of 180 exploratory wells that have been drilled in the Scotian Basin since 1980. Both wells had hydrocarbon shows; however, they were not considered to be economic.

This study has been designed to determine whether seismic inversion, in conjunction with 3D seismic and well datasets, provides a valuable analytical tool of the rock properties of strata in the Scotian Basin. The analysis of the 3D seismic is completed using geologic software (e.g., Petrel) to interpret the seismic facies, structure, sequence stratigraphy, and seismic attribute analysis. The focus of this study is on seismic inversion that solves for acoustic and elastic properties from the 3D seismic data. Inverting the seismic data from a reflector to a layer property provides a clearer understanding of the subsurface geology and the potential hydrocarbon reservoirs within the survey. Seismic inversion is used to correlate the well logs across the seismic survey to define the reservoirs of interest. The cored intervals from both wells are studied, examining the characteristics of different lithofacies and their corresponding depositional environments. The lithofacies from the core are tied to the well logs to develop petrophysical facies, and then tied to the seismic data to define the seismic facies. The inversion result confirms the correlation of the lithofacies to the petrophysical facies and enables the geological properties to be known within the entire survey area.

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