Using Advanced Seismic Attribute Analysis to Reduce Risk in Frontier Exploration - West Newfoundland Offshore

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The study, covering 3D data set from the Western Newfoundland in Parsons Pond area, is of high interest with the estimated potential of 2-4 Billion BOE.

The primary target reservoir consist of the dolomitized carbonate bank of St. George Group of Middle Ordovician age.

The objective is to de-risk a frontier prospect, using the latest seismic interpretation techniques, and to integrate it with the knowledge of regional geology. To identify areas with preferential reservoir properties reservoir characterization techiques were applied. The sequence build-ups and internal architectures were investigated using the digital sequence stratigraphic workflow. Then a neural network based multi-attribute classification is applied to determine the areas of high potential reservoir (dolomitization). In addition, a similarity cube has provided further indications of shear zones and karsting which is critical to identify play productivity. The data were further investigated for signatures of vertical fluid migration that could identify either dolomitization due to hydrothermal brines and/or the presence of leaking hydrocarbons.

The sequence stratigraphy workflow allowed us to break out packages with specific stacking patterns (aggradation, progradation), type of stratal termination and internal architecture of the reflectors. These observations were used to identify zones with prospective reservoir properties.

Hydrothermal dolomitization has been one of the major processes of reservoir development in many areas of North America. As karsting within a formation triggers the dolomitization process, we used seismic attributes and neural networks to identify areas with karst morphology, such as rounded collapse features and radial fracturing.

Analysis of the similarity cube helps in finding areas of faulting, shearing and karsting. The karst features are visible on strata slice through similarity cube at 76 ms below the top carbonate platform.

Neural Network based facies analyses helped us reduce the risk especially related to lithological variations. Identification of the right seismic facies brings us one step closer to the answer but not having a modeled well does not allow us to verify the type of rocks. Instead, the features were interpreted using their morphology to identify sedimentary origin and diagenesis.