Potential Prospectivity Identified in the Orphan Basin

Offshore Newfoundland has promising hydrocarbon potential along the shelf and slope areas as proven by PGS Ultima.

Access to 3D data provides confidence when bidding on prime blocks and the use of high-end technology shortens the time to first drill and potentially first oil. The PGS/TGS data library comprises approximately 30,000 sq. km of 3D GeoStreamer data in the Eastern Newfoundland region defined under the Land Tenure System. The Call for Bid for this area closes in November 2022.
A Paradigm Shift in Data Imaging

Accurate velocity and reflectivity models are essential for high-fidelity seismic interpretation.

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Full Waveform Inversion (FWI) followed by Least-Squares Migration (LSM) is currently the high-end technique to invert for high-resolution velocity and reflectivity models. However, in a traditional sequential workflow, velocity and reflectivity are inverted separately and leakage between the two parameters is unavoidable. FWI and data domain LSM share a similar framework, both aiming to minimize the misfit between modeled and recorded data. Accordingly, it is possible to solve both problems in a compact framework. PGS Ultima implements FWI and LSM in a joint scheme. The inverse scheme updates both velocity and reflectivity simultaneously at each iteration as summarised in the inversion workflow as shown in the figure above.

The output of PGS Ultima is a joint scheme that delivers direct estimates of the subsurface velocity, reflectivity, and their derivatives, relative impedance and relative density. Depending on the geological setting and the target level, it can even start from minimal pre-processed input data and can be run very effectively, enabling the technical teams to perform prospectivity and lead risk assessments in a shorter time frame.

Examples of outputs from PGS Ultima: Top) the relative impedance (rel.Ip) map and Bottom) the relative density (rel.Rho) map. Overlaying the relative density on the bottom map the right portion of the secondary fan demonstrates a break in relative density, signaling a change in the reservoir property or a fluid change.

Inverse-scattering image condition can efficiently separate the velocity and reflectivity updates and minimise the leakage between the two parameters. The output of PGS Ultima is a high-resolution velocity model and an accurate inverted reflectivity are output simultaneously. Relative impedance and relative density attributes can be output in addition to the main products.

The general workflow for PGS Ultima. Starting with observed seismic data with minimal pre-processing and an initial velocity model, FWI and LSM are iteratively implemented in a single inversion framework. A high-resolution velocity model and an accurate inverted reflectivity are output simultaneously. Relative impedance and relative density attributes can be output in addition to the main products.