Case Study of a Cadomin Gas Reservoir (Leland) in the Deep Basin: From Deterministic Inversion to Neural Network Analysis

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Abstract

This paper provides a case study of a 3D seismic survey in the Leland area of the Deep Basin, where neural network analysis was used in an effort to refine the interpretation of the reservoir properties derived from deterministic inversion. In this case study, identifying the gas sands within the Bluesky, Gething and Cadomin Formation of the lower Cretaceous was the primary interpretive focus.

Data for the project consist of 47 wells and one 3D seismic survey. First, petrophysical analysis of the well logs was performed in order to provide a trustworthy set of logs that could be used for inversions and multi-attribute analysis and to determine petrophysical relationships that can be useful on seismic data interpretation.

Secondly, we ran AVO analysis and deterministic inversions of the AVO attributes. The P impedance and S impedance volumes were used to estimate rigidity and incompressibility (Goodway et al., 1997) that are very good indicators for lithology and fluids in the target formations of our study.

Finally, neural network analysis was performed on logs and pre- and post-stack seismic attributes. Neural network estimation of reservoir properties (e.g. P impedance, S impedance and density) has proven effective in significantly improving accuracy and vertical resolution in the interpretation of the reservoir.

In addition to the rigidity and incompressibility maps, we derived porosity maps calculated from density, in an effort to delimit the reservoir and find new opportunities for field development. This methodology helped in discriminating gas intervals and in drilling new locations, derived from this work, that encountered new gas charged reservoir.