Enhancing our View of the Reservoir: New Insights into Deepwater Gulf of Mexico fields using Frequency Decomposition

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ABSTRACT

Color-blended frequency decomposition is a seismic attribute that can be used to deduce or draw out and visualize geomorphological features enabling a better understanding of reservoir architecture and connectivity for both exploration and field development planning.

Color-blended frequency decomposition was applied to seismic data in several areas of interest in the Deepwater Gulf of Mexico. The objective was stratigraphic characterization to better define reservoir extent, highlight depositional features, identify thicker reservoir zones and examine potential connectivity issues due to stratigraphic variability.

Frequency decomposition is a technique to analyze changes in seismic frequency caused by changes in the reservoir thickness, lithology and fluid content. This technique decomposes or separates the seismic frequency spectra into discrete bands of frequency limited seismic data using digital filters. The workflow consists of frequency (spectral) decomposition, RGB color blending of three frequency slices, and horizon or stratal slicing of the color blended frequency data for interpretation.

Patterns were visualized and identified in the data that were not obvious on standard stacked seismic sections. These seismic patterns were interpreted and compared to known geomorphological patterns and their environment of deposition. From this we inferred the distribution of potential reservoir sand versus non-reservoir shale and even finer scale details such as the overall direction of the sediment transport and relative thickness.

In exploratory areas, stratigraphic characterization from spectral decomposition is used for prospect risking and well planning. Where well control exists, we can validate the seismic observations and our interpretation and use the stratigraphic/geomorphological information to better inform decisions on the need for and placement of development wells.

BIOGRAPHY

Michael Murat is a Geophysical Consultant with the Gulf of Mexico Applied Reservoir Management Geophysics team at Chevron North America Exploration and Production Company. He has 26 years with Chevron working on reservoir properties from seismic, AVO, DHI risking and 4-D time lapse analysis. Michael holds a M.S. degree in Geophysics from Indiana University and was a Fulbright Fellow Warsaw University and Polish Academy of Sciences, 1988-1989. He also holds a BS degree in Geophysics from Saint Louis University.