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Geovolume Visualization and Interpretation: Using 3-D Visualization and Seismic Attributes to Examine Stratigraphic Features and Discontinuities

The complex nature of stratigraphic features and discontinuities are difficult to interpret in 2-D or 2.5-D interpretation environments due to the intrinsic three-dimensional nature of complex fault patterns and internal geometries of channels. Using geovolume visualization and interpretation (GVI) in a 3-D environment along with seismic attribute analysis is key to understanding the geological complexities of stratigraphic and structural relationships.

By examining a set of attributes, the best subset of attributes for characterizing an event or area of interest can be determined. Attributes that both visualize and physically extract information about geophysical and geological events allow the interpreter to evaluate specific geological features.

Utilizing attributes such as Spectral Decomposition, Semblance, Phase, and Sweetness (combination of Instantaneous Amplitude and Frequency) stratigraphic features and discontinuities are accurately and quickly evaluated. For example, Spectral Decomposition images and maps temporal bed thickness and geologic discontinuities over 3-D surveys. It can improve your prospect definition beyond seismic tuning resolution by delineating facies and stratigraphic settings like flood plain boundaries, channels sands, and thin beds. Frequency slices (tuning maps) are very useful when visualizing thin bed interference patterns in plan view and by animating through them the lateral variability in the subsurface can be interpreted. Semblance sliced in time or draped on a surface helps define faults and stratigraphy by looking for discontinuities or boundaries surrounding areas of interest.

The integration and evaluation of multiple attributes in an interpreter’s daily workflow allow for a faster more geologically correct interpretation in reduced cycle time.