Coherence Cube™ Processing – Providing the Advantage in 3D Seismic Visualization

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Paramount to success in the petroleum industry is the need to define the hydrocarbon prospect or trap with precision, accuracy and speed. To accomplish these goals the industry has turned to 3D seismic surveys and the skills of interpretational geoscientists. With a wealth of information contained within 3D seismic volumes it is often a challenge to interpret and "visualize" with full confidence all the structural and stratigraphic features offered by the seismic data, particularly when confronted with complex geologic volumes. Coherence Cube processing, developed by Amoco Production Research and licensed to Coherence Technology Company, has emerged as an important asset in providing useful images for rapid and informative interpretation of 3D seismic volumes.

The Coherence Cube measurement is computed by measuring waveform similarity within a 3D aperture by an algorithm that compares seismic traces with the specified window in crossline, inline and time directions. The end product is a 3D seismic volume that provides a platform that is very effective for timeslice interpretation. Variations in coherence values may reflect waveform changes due to geometric changes in the subsurface such as faults, pinchouts, unconformities, channel boundaries, etc. Additionally, they may reflect physical changes in the rock properties themselves, such as spatial changes in lithology, porosity, density, and fluid content. Often these same features would go undetected on normal amplitude seismic timeslices.

Coherence Cube calculation of seismic attributes is another emerging aspect of applying Coherence Cube technology. This methodology uses standard complex trace analysis as described in the geophysical literature, except it is run on an ensemble of traces. As coherence cube measurements represent the changes in the local waveform similarity, irrespective of whether it is an amplitude, frequency or phase change, coherence volumes of attributes have developed as valuable tools in reducing drilling risks where correlation with reservoir characteristics have been established.

Coherence Cube data has been used by geophysicists and geologists worldwide to image faults and stratigraphic features. Examples are offered to demonstrate the use and interpretation of Coherence Cube data. Drilling success directly attributable to the application of Coherence Cube data is just now beginning to emerge from various case histories.

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