Practical Attributes Analysis

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Introduction:

Seismic geophysics represents a fundamental tool for both the exploration and development of hydrocarbon resources. This course provides the fundamentals and the practical application of seismic principles, including aspects of acquisition, processing, and interpretation. Primary emphasis is toward interpretation aspects and workflow.

Key topics include survey design for maximizing interpretational goals such as multicomponent and azimuthal surveys, processing techniques including prestack versus poststack migration, visualization and presentation techniques, general 2D/3D/4D interpretational techniques and principles including various pitfalls of seismic interpretation, integration of seismic data and other datasets (especially well data), and attribute and AVO/AVA analyses.

The course is designed from an applied standpoint for geophysicists, with numerous case studies serving to provide critical insight into the use of seismic data in early exploration efforts through later development and reservoir characterization phases. Multiple exercises are used to provide important hands-on learning.

Please note:

Participants must provide their own laptops for this course.

Learning Outcomes:

- Achieve an understanding of seismic wave types and propagation, and elastic properties.
- Achieve an understanding of seismic acquisition fundamentals and new technologies.
- Achieve an understanding of seismic processing fundamentals and new methods.
- Achieve an understanding of seismic interpretation fundamentals and modern techniques.
- Achieve and understanding of basics of seismic attributes, AVO/AVA, and inversion.

Course Content:

- Introduction to Seismic Geophysics: the need for seismic interpretation and reservoir analysis, with worldwide case examples illustrating their importance to hydrocarbon production and development.
- Seismic Reflection Surveying – general principals of reflection surveying from acquisition, processing, and interpretation including 2D versus 3D versus time-lapse (4D), survey design and optimization, and other principles such as wavelength and resolution, primary versus multicomponent surveys, p-wave versus s-wave surveys (and multicomponet data), amplitude preservation, migration, binning, zero-phase versus phased data (and recognition of), wavelet extraction, inverse modeling, etc.

- Seismic Interpretation Principles – discussion and application of various interpretation techniques and principles as applied to exploration and reservoir characterization, including concepts of structural interpretation (lines/cross-lines, arbitration [user-defined] lines, time slices, visualization techniques, user-tracking versus auto-tracking, etc.), and stratigraphic interpretation (sequence stratigraphy, appearance of key stratigraphic features, texture mapping, etc.). A detailed discussion of display concepts and interpretation procedures/options will be discussed.

- Seismic Attribute Analysis – the fundamental concepts of seismic attributes, including amplitude, phase, and frequency derived attributes, as well as AVA (amplitude versus angle); additional emphasis on specific attributes as related to structure (e.g., coherence, dip displays, derivative, etc.), stratigraphy (horizon slices and windows, amplitude and other attribute extractions, etc.), and reservoir (see below); and shear-wave anisotropy.

- Reservoir Identification and Evaluation – fundamental concepts of reservoir characterization, including attribute analysis and hydrocarbon indicators, fluid analysis, defining reservoir limits, porosity evaluation, net pay, etc.

- Seismic Petrophysics and Data Integration – concepts including extraction of petrophysical information from seismic data, and the integration of well log (including well bore geophysics) and geological analyses to develop coherent reservoir models.

- Case Histories of Seismic Exploration and Reservoir Evaluation – a detailed examination of worldwide case examples of seismic analysis of hydrocarbon reservoirs.

- Emerging and Alternative Technologies – a look at the future of seismic geophysics and reservoir characterization, including for example reservoir listening techniques.