TETRA TECH RPS ENERGY | TRAINING

N385: Quantitative Reservoir Characterization

Instructor(s): Jaap Mondt

Format and Duration

Classroom - 5 Days
Virtual - 10 Sessions

Summary

This course provides participants with the skills to design and execute workflows to achieve optimum seismic reservoir characterisation results. The course focusses on methodologies to enhance the seismic data to make quantitative estimates of reservoir properties and includes a comprehensive review of AVO and AVA methods.

From quantitative analysis of pre-stack seismic data, elastic properties of the reservoir can be derived and translated into relevant rock properties such as porosity and fluid saturations. The use of gravity, magnetics, electrical, electromagnetics and spectral data to complement seismic methods in subsurface evaluation provides ways of reducing uncertainty of subsurface models.

Machine Learning methods are included which provide means of classification and clustering of seismic reservoirs, using open-source software like Weka, Keras and TensorFlow. A working knowledge of the seismic method is assumed.

Learning Outcomes

Participants will learn to:

1. Develop a solid foundation in and conceptual understanding of Seismic Quantitative Interpretation.
2. Construct coherent workflows to estimate reservoir properties and associated uncertainties by integrating seismic data with other data types.
3. Apply appropriate methodologies of seismic data processing (e.g. AVO and AVA) to determine reservoir properties.
4. Use quantitative analysis of pre-stack seismic data to derive elastic and translate into relevant rock properties such as porosity and fluid saturations.
5. Use gravity, magnetics, electrical, electromagnetics and spectral data to complement seismic methods in subsurface evaluation.
6. Use Machine Learning applications for the classification and clustering of reservoir characteristics.

Training Method

The course is available as a classroom or virtual classroom format. It uses a mixture of lectures, practical exercises and direct (workshop-like) participant involvement, complemented with case histories.

The course can be customized to meet specific needs of participants.

Who Should Attend

Geologists, geophysicists, petroleum and reservoir engineers, involved in exploration and development of hydrocarbon fields.

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Course Content

Part 1

- Geophysical Methods, Seismic Acquisition and Processing, Workflow,
- Seismic for QI
- Rock Physics
- Seismic Resolution: Point-Spread or Resolution Functions

Part 2

- Structural & Stratigraphic Interpretation, Tuning: Simmons & Backus
- Tuning Wedge, Tuning amplitude variation with angle of incidence (AVA)
- Fluid Replacement, amplitude variation with offset (AVO)
- Anisotropy, Amplitude variation with angle of incidence (AVA)

Part 3

- Amplitude variation with angle of incidence (AVA) (ΔRPP, ΔRSS)
- Inhomogeneity & Anisotropy
- Wave Equation amplitude variation with offset (AVO), Activation Functions
- Amplitude variation with angle of incidence (AVA) vertical and horizontal transverse anisotropy

Part 4

- AVAz Fractures, Machine learning,
- Fractures Amplitude variation with angle of incidence (AVA)
- Machine Learning amplitude variation with offset (AVO), Inversion
- Machine Learning Classification
- Classification, Inversion vs Machine learning I, Clustering
- Machine Learning Amplitude variation with angle of incidence (AVA)
- Clustering
- Supervised, Unsupervised and Semi-Supervised learning

Part 5

- Hydrocarbon Indicators,
- Gassmann Fluid Replacement
- Machine Learning: Keras, TensorFlow
- Machine Learning Regression
- Gassmann subsalt rock