

SEISMIC AMPLITUDE INTERPRETATION - LITHOLOGY & PORE FLUID ESTIMATION

Fred Hilterman

(2 days)

Who Should Attend

This course is intended for geologists, geophysicists and engineers who are engaged in or are considering the interpretation of seismic data and who desire to become familiar with the techniques to estimate lithology and/or pore-fluid properties using seismic amplitude.

Objectives

Upon completion of course, participants should understand the techniques for pore-fluid and lithology prediction from seismic data. In addition, the participants should acquire knowledge of

- How hydrocarbon signatures vary in different rock-property environments and how to recognize these environments
- What additional information and data are needed to predict lithology and pore-fluid content from seismic data
- Which rock-property environments are friendly (sensitive) to lithology and pore-fluid content estimation
- What seismic attribute is appropriate for prediction in each rock-property environment
- What parameters determine the chances of a successful amplitude interpretation

Content

The goal of seismic amplitude interpretation and this course is the validation of reservoir composition. This characterization has matured from the 1970 Bright Spot analyses to numerous amplitude-versus-offset (AVO) techniques. Along the way, many seismic amplitude attributes supposedly related to rock properties have been proposed.

The course introduces the empirical and theoretical rock-physics basis for reservoir characterization and catalogs rock properties to expected seismic signatures. Techniques for recognizing and quantifying hydrocarbons in different rock-property settings, which are often referred to as Class 1-4 AVO, will be introduced and subsequently illustrated with numerous field examples. Various seismic amplitude attributes for distinguishing lithology and pore fluid along with their applicability and robustness in different environments

Instructor

Hilterman, Fred, is vice-president of development at Geophysical Development Corp., in Houston, Texas, which he co-founded in 1981. He received his Ph.D. from Colorado School of mines in 1970. His current emphasis is the calibra-

tion of rock properties to the seismic response leading to the development of exploration tools to accurately predict lithology. He is a past-President and past Distinguished Lecturer for SEG.

will be introduced. Rock-property and AVO modeling programs are supplied to each participant to assist in the classroom exercises involving seismic discrimination of lithology and pore-fluid. Case histories involving Class 1, 2, and 3 AVO anomalies are presented along with numerous rock-property studies.

Topics include:

- Introduction to seismic amplitude interpretation
- Rock Physics
- Generation and interpretation of rock-property trends and transforms
- In-situ and fluid-substitution properties of rock velocity and density
- Seismic Reflection Amplitude
- Quantification of lithology and pore fluid to AVO signatures
- Prediction of lithology and pore fluid from seismic AVO responses using graphic techniques and supplied computer programs
- Amplitude Attributes
- Theoretical and *practical* sensitivity to various rock-property variations
- Crossplotting for lithology and pore fluid discrimination in various environments
- Participant Exercise
- Calibration of Sw using near- and far-offset seismic horizon maps
- Case Histories
- AVO Class 3 – Lithologic and pore-fluid identification & Log evaluation
- AVO Class 2 – Axis rotation and Crossplotting
- AVO Class 2 – Recognition of hydrocarbons with anisotropic NMO
- AVO Class 1 – SW calibration with anisotropic NMO
- Final Comments
- Current and future research expectations in reservoir characterization

As a metric to the success of the learning objectives, a checklist for a reservoir-characterization study will be presented to the participants for evaluation and future application.