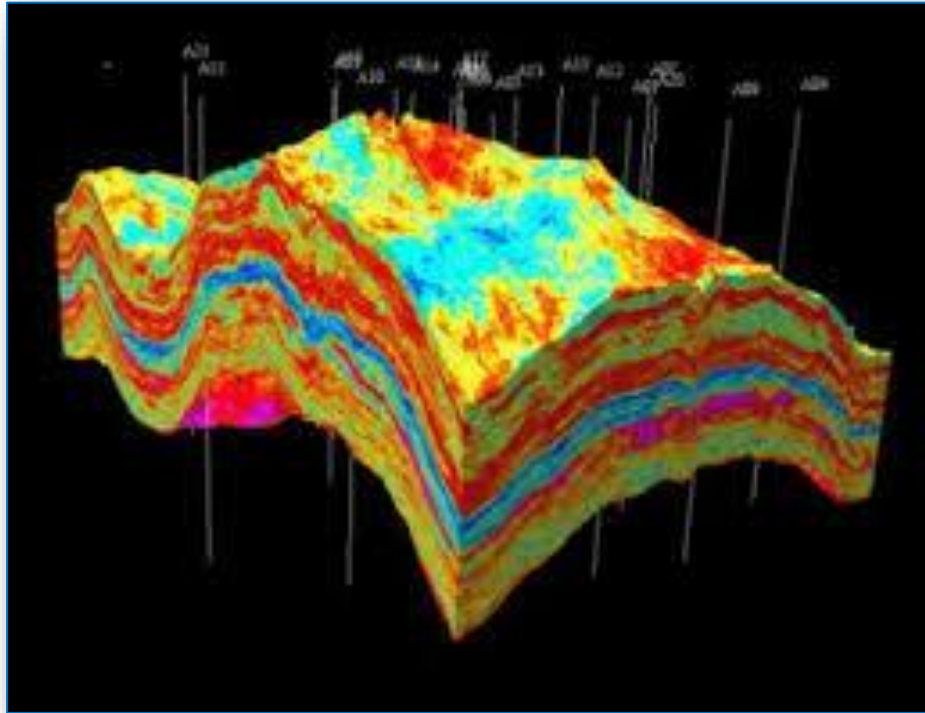




DE128

Seismic Inversion Techniques

Course Introduction:

Seismic inversion is now commonly used on post-stack and pre-stack seismic data for estimating rock properties used in reservoir characterization. While seismic migration is aimed at imaging the reflectors or the interfaces at their correct subsurface locations, seismic inversion attempts to estimate elastic and flow properties of the layers bounded by these interfaces. Seismic data are sensitive essentially to seismic wave velocity and density contrasts in the subsurface rocks. Because of significant overlap in elastic properties among different rock types, mapping of these elastic properties to rock types and estimating porosity are not trivial.

Thus, seismic inversion is best done by combining data of all types such as seismic, well log, petrophysics and production history. The results of seismic inversion can be best interpreted by a team of geologists, geophysicists and reservoir engineers. The goal of this course is to explain the fundamental principles of seismic exploration, seismic wave propagation, and inversion in a language that is understandable by geoscientists and engineers alike so that the team is aware of the significance and limitations of the inversion results

Course participants are encouraged to bring their own data examples for individual and group discussions. The material covered in this course provides essential basics to intermediate and specialized geophysics courses such as AVO Inversion and Attributes, Seismic Attributes for Reservoir Characterization and Applied Seismic Anisotropy for Fractured Reservoir Characterization.

Course Objectives:

Upon successful completion of this course, the delegates will be able to:

- ✓ Assess and determine data processing flows for a variety of acquisition and reservoir scenarios
- ✓ Determine the most cost-effective imaging or migration technique given acquisition and structural scenarios
- ✓ Providing layer properties which reflect the true vertical layering of the earth
- ✓ Reducing seismic tuning related to wavelet interference
- ✓ Enhancing the bandwidth of the seismic data
- ✓ Reducing ambiguity in areas of complex seismic responses
- ✓ What seismic data tells you
- ✓ Collecting seismic data
- ✓ Analyzing seismic data
- ✓ How to appreciate what seismic data can tell us
- ✓ Analyzing seismic data

Who Should Attend?

This course is intended for seismic interpreters, geophysicists, geologists, and exploration team members who use seismic data and need to understand the purpose and implications of the data acquisition and processing steps that lead to the final seismic images and derivative attributes. Also, the course is appropriate to early-career processing geophysicists seeking a rigorous foundation of the principles of data processing and seismic imaging.

Course Outline:

Day 1:

- Seismic Exploration Fundamentals
 - Seismic Experiments
 - Reflection
 - Seismic Wave Velocities
 - Rock Physics/Fluid Substitution Model
 - Seismic Resolution
 - Seismic Processing

Day 2:

- Seismic Wave Propagation
 - Stress, Strain, and Hooke's Law
 - Equation of Motion
 - The Wave Equation
 - Wave Types
 - Spherical Waves and Plane Waves
 - Wavefronts and Rays
 - Plane-Wave Reflection at a Boundary
 - Seismic Response of a Layered Earth Model
 - Seismogram Synthesis in Laterally Heterogeneous Media
 - Viscoelasticity
 - Factors Affecting Seismic Amplitudes
- Inverse Theory
 - Inversion
 - Model-Based Inversion Methods
 - Examples of Some Geophysical Inverse Problems
 - Solution of Linear Inverse Problems

- Methods of Constraining the Solution
- Optimization Methods for Nonlinear Problems

Day 3:

- Inversion of Post-Stack Data: Wavelet and Acoustic Impedance
 - Non-uniqueness and Deconvolution
 - Wavelet Estimation
 - Impedance Estimation
 - Estimation of Petrophysical Parameters-Interpretation of Results
- Prestack Inversion
 - Amplitude Variation with Offset
 - Elastic Impedance
 - Full Waveform Inversion

Day 4:

- Seismic data readings
- How to collect seismic data
- Why do we collect seismic data

Day 5:

- How to analyze seismic data
- What the data analysis can tell us
- Collation and logging of seismic data

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Methodology:

A variety of methodologies will be used during the course that includes:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test
- Variety of Learning Methods

- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Fees:

To be advised as per the course location. This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session

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