TETRA TECH
RPS ENERGY | **TRAINING**

N317: A Practical Introduction to Depth Imaging for Interpreters

Format and Duration
Classroom - 3 Days

Instructor(s): Etienne Robein

Summary

This course provides an introduction to modern seismic depth imaging methods. It addresses initial design and input data considerations, velocity model-building, pros and cons of various migration algorithms, and quality control.

Business impact: The course addresses how and where in an imaging project an interpreter can **add value** and **ensure project objectives are met**. It provides **guidance on the questions that an interpreter needs to ask** themselves and others, such as: What workflow elements are most important to focus attention on for a good end result? How can a non-specialist effectively QC the adequacy of the job at each stage, without having the in-depth knowledge that the processors have? What deliverables should they receive (interim and final products) and how might they each be used?.

Learning Outcomes

Participants will learn to:

1. Distinguish the fundamental differences between time and depth migration.
2. Differentiate between commonly used imaging algorithms including ray and wave-equation techniques.
3. Determine seismic imaging challenges for specific projects and select appropriate imaging workflows to satisfy project requirements.
4. Monitor the data conditioning stage of the initial processing sequence.
5. Establish the appropriate interpretation inputs to the velocity model building process, and verify that the form of the velocity model is appropriate for the geology of the project.
6. Generate an optimized seismic/well tie database that can be used as a constraint for velocity modeling and the determination of anisotropy parameters.
7. Establish project Q/C milestones with imaging specialists, monitor the outcomes, and approve transitions to subsequent project stages.

Training Method

A classroom course comprising lectures, demonstrations, case histories, and hands-on practical exercises.

Participants are encouraged to bring data examples to the class for general discussion, and time will be provided during the course for an open forum discussion of client-provided project examples

Who Should Attend

This course should be of interest to all seismic interpreters planning to incorporate depth imaging into their exploration and/or exploitation projects. Project leaders and non-specialists may also benefit from

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Course Content

1. What is a seismic image?

- The seismic experiment
- Wave propagation
- Reflection and the reflection coefficient
- Velocity fields for imaging
- What is seismic anisotropy?

2. Four key imaging challenges: definition and examples

- To see reflectors: detection, illumination, signal/noise
- To see details of the reflectors: resolution
- To get the "true" reflection coefficient: amplitude fidelity
- To get reflectors at their correct location in depth: image distortion, accuracy

3. Overview of seismic imaging methods and workflows

- Data acquisition and organization: binning, "Naz" versus "Waz"
- Concept of migration: principles of Kirchhoff migration in depth and tie
- A short overview of other migrations: The various Beam migrations, WEM, Reverse time migration

4. Well-to-seismic ties

- Scale issues
- Vertical time and the synthetic seismograms
- The Time-Depth curve
- Pitfalls in synthetic seismograms

5. Pre-processing

- Noise
- Near surface anomalies; statics
- Multiples

6. Migration options and their respective merits

- Time versus depth migration
- Kirchhoff versus Beam migrations

- When are Wave equation-based methods necessary
- WEM versus RTM

7. Acquisition considerations

- Broadband seismic
- Narrow azimuth; multi-azimuth; wide azimuth

8. Understanding Ray-based Velocity Model Building (Tomography)

- Model description
- Residual Move-Out
- The PreSDM - Model update loop
- When and how to include anisotropy: getting Velocity, epsilon and delta
- The key role of Interpreters in VMB

9. Examples of imaging strategies

- What can justify reshooting
- Moving from Time- to Depth Imaging

10. A recap of Imaging methods