TETRA TECH RPS ENERGY | TRAINING

N673: Applied Seismic Interpretation

Instructor(s): Rachel Newrick

Format and Duration

Classroom - 5 Days
Virtual - 10 Sessions

Summary

This course is designed to strengthen key interpretation skills and add tools to the interpreter's workflow. Topics include understanding the crucial elements of seismic interpretation, velocity modelling & depth conversion, creative use of seismic attributes to extract stratigraphic detail and rock property information from 3D data. A key theme is understanding the importance of geophysical data and consciously communicating the value of these data to the team.

Much of the discussion within the course is tailored to help participants with current challenges.

Learning Outcomes

Participants will learn to:

1. Consider the critical questions that need to be answered by the seismic interpretation.
2. Evaluate phase, polarity, bandwidth, and other factors affecting seismic resolution and interpretability.
3. Use color and other display parameters to extract maximum structural and stratigraphic detail from 3D data.
4. Investigate the use of various workstation tools to perform jump-correlations, seismic well-ties using synthetic seismograms, construct structural and stratal slices, and perform horizon flattening, auto-tracking and auto-extraction for efficient interpretation of horizons and faults. Consider structural attributes to aid interpretation.
5. Utilize all available velocity data to build an appropriate velocity model for depth conversion including synthetic seismograms, VSPs, seismic velocities and geological models.
6. Compare seismic time-to-depth conversion techniques and recognize the advantages and disadvantages of different methods. Discuss the appropriate stage of the project to depth convert data, horizons, faults and/or maps, and consider how to manage uncertainty in depth conversion.
7. Differentiate the various types of seismic attributes available and select appropriate attributes for a given project. Consider the advantages and limitations of various attributes and think about constructing fit for purpose custom attributes.
8. Understand the uses of rock physics within the seismic interpretation workflow including assessing the trend of data with depth, cross-plotting various seismic and petrophysical properties.
9. Review prestack interpretation techniques including the modelling and interpretation of gathers and partial angle stacks (near, mid, far, etc.). Consider the various uses and challenges of a variety of approaches to amplitude variation with offset (AVO) methodologies.
10. Design interpretation workflows to assist in estimating reservoir properties.
11. Export / transfer data from one package to another and have an awareness of pitfalls (e.g. datums, polygons, maps, data qc).
12. Demonstrate the importance of geophysics and consciously communicate the value, necessity and limitations to the team.

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Training Method

This is a classroom or virtual classroom course comprising a mixture of lectures, discussion, case studies, and practical exercises.

Who Should Attend

Practicing seismic interpreters who wish to improve their interpretation skills and gain awareness of interpretation workflows.

Course Content

Recent advances in seismic technology now provide seismic interpreters with advanced tools for risk and resource assessment, and for characterizing reservoirs. The materials covered in this class are designed to help practicing interpreters construct interpretation workflows to extract the information necessary to make good business decisions and to convey their ideas to others.

Topics covered are summarized below.

- Project goals including the critical questions to ask.
- Seismic data assessment including review of the acquisition and processing of the seismic volumes, data loading parameters, phase, polarity, bandwidth, horizontal and vertical resolution.
- Horizon and fault interpretation including display parameters, visualization techniques, synthetic seismograms, auto-tracking, auto-extraction, correlation tools and structural seismic attributes.
- Velocity model building including a review of data to include within a model, creating and analyzing synthetic seismograms, considering the style of velocity model, and challenges that may be encountered.
- Depth conversion techniques. Managing uncertainty such as analysis of a range of depth prognoses and/or alternate scenario maps.
- Seismic attributes including structural & stratigraphic, post-stack & pre-stack, horizon & volume. Creating customized fit-for-purpose seismic attributes.
- Rock physics for the seismic interpreter. The effect of fluids, stresses and rock properties on the seismic response.
- Pre-stack interpretation with offset modelling for amplitude variation with offset (AVO) analysis. A review of the many AVO techniques including use of partial seismic stacks.
- Review of workflows that will be useful in estimating reservoir properties.
- Data transfer between packages and collaborating team members.
- Presenting your ideas to team members and management.