N527: Interpretation of Complex Structures: Techniques for Unraveling Structural Geometry and History

Instructor(s): Gloria Eisenstadt

Format and Duration

Classroom - 4 Days
Virtual - 8 Sessions

Summary

Business Impact: Correctly evaluating both the **timing** of trap formation and the corresponding **burial history** are essential to **building a portfolio of drillable prospects** and **assessing risk**.

This is a hands-on workshop that is focused on interpretation techniques for complex 2D and 3D seismic data. Many exploration areas have undergone multiple periods and directions of deformation and are often misinterpreted. 2D and 3D seismic data in complex areas present very different problems for the interpreter. 2D seismic data sets are less time consuming to interpret but usually, there are not enough data to constrain the interpretation. Complexly deformed 3D datasets can present a different challenge, as the frequency and complexity of the faulting can be overwhelming. In both cases, experience in unraveling, multiple deformations, evaluating confusing map patterns, evaluating results from auto-fault picking and machine learning, and knowing best practice use of seismic attributes for structural interpretation is essential.

Learning Outcomes

Participants will learn to:

1. Analyze data and select an appropriate structural analysis workflow for interpreting a data set.
2. Understand the possible causes for complex structures and know how to use structural analysis tools such as regional elevation, recognizing growth layers, fault-fold relationships, recognizing detachments and ductile layers to constrain interpretation.
3. Understand the theoretical and experimental basis for structural models and understand the impact of detachments and ductile layers on structural style.
4. Learn how to differentiate strike-slip deformation from multiple deformation events.
5. Understand the concepts of restoration and forward modelling and employ them to diagnose interpretation errors.
6. Analyze the use of curvature analysis and coherence as a proxy for fault mapping.
7. Analyze pre-existing structural interpretations

Training Method

This is a highly interactive and participatory classroom or virtual classroom course oriented towards problem solving rather than theory. It contains short lectures interspersed with seismic interpretation exercises, discussions and experimental models. Participants are encouraged to bring samples of problem data for group discussion. The ratio of exercises to lectures is 80:20. All remote participants are required to have and use both a camera and microphone, and need to be willing to be an active participant.

Who Should Attend

This course is designed for the experienced interpreter working with complex data but could be applicable for geoscientists with a minimum of four to five years' experience interpreting seismic data and at least a college-level course in structural geology.

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Prerequisites and Linking Courses

This course is designed as a Skilled-Level follow-on to Foundation-Level N090 (Seismic Structural Styles Workshop). A basic knowledge of seismic interpretation is assumed, as presented in N085 (Introduction to Seismic Interpretation).

Geoscientists taking this course may also wish to consider field courses on the Structure and Tectonics portfolio, such as N053 Compressional Structural Styles: Models for Exploration and Production (Alberta, Canada).

Course Content

Structural interpretation topics covered will include:

- Structural analysis work flow – how to determine the best way to approach each data set
- Quick restoration techniques to diagnose interpretation errors
- Differentiating strike-slip deformation from oblique reactivation of basement faults or inversion
- Recognizing map patterns of reactivated structures
- How useful are traditional fault analysis tools in areas of multiple deformations?
- Do older faults always get reactivated?
- Is lineament analysis useful?
- Use of growth stratigraphy to determine timing of each deformation event
- Use of curvature analysis and coherence as a proxy for fault mapping
- How ductile layers change patterns of fault reactivation