Sequence Stratigraphy of the Permian Basin, Texas and New Mexico (G002)

Tutor(s)

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Overview

This field course is designed for geoscientists and engineers exploring and developing plays in mixed carbonate-siliciclastic systems; it is relevant to those working in the Permian Basin. The course will enhance each participant's ability to distinguish depositional facies and play elements, based on seismic features, stratal geometries, sequence stratigraphy, diagenetic changes impacting reservoir quality and depositional models. Subsurface data from the Permian Basin, including seismic, well logs and cores, will be used to establish a sequence stratigraphic framework for the basin, with emphasis on the prediction of play element presence and quality, both for conventional and unconventional resources, including discussions on production behavior and strategies.

Duration and Logistics

A 5-day field course; a mix of field activities (60%) and classroom lectures and exercises (40%), with long days (typically 10 hours). The course begins and ends in El Paso, Texas. The first night is spent in El Paso; subsequent nights are spent in Carlsbad, New Mexico.

Level and Audience

Advanced. This course is intended for geoscientists, petrophysicists, engineers and managers who are seeking a comprehensive examination into the seismic stratigraphy of the Permian Basin.

Exertion Level

This class requires a **MODERATE** exertion level. Fieldwork is in west Texas and southeast New Mexico, where the weather is arid and usually hot, although cold and wet weather is possible in the spring and fall when daily temperatures range from 5–25°C (40–80°F). The course includes walks of a moderate length (up to 3.2km/2 miles) with an ascent of 305m (1000 ft), frequently over very steep and uneven ground. Transport on the course will be by mini-van. Most of the driving is on black-top roads, with some driving on graded dirt roads.

Objectives

You will learn to:

1. Analyze exposures of carbonate shelf and ramp to siliciclastic basinal systems, in order to relate depositional facies to seismic scale geometries and sequence stratigraphy.
2. Examine seismic scale outcrop geometries, document outcrop facies and demonstrate similarities to productive intervals in the Permian Basin.
3. Understand how subaerial exposure, marine diagenesis and early near-surface dolomitization can affect ultimate reservoir porosity and permeability and overall reservoir geometry in subsurface.
4. Assess changes in carbonate facies and relate these changes to depositional environments.

5. Apply Walter’s Law and chronostratigraphic principles in core, well log and seismic interpretation, and relate to prediction of play elements and best productive intervals for unconventional resources.
6. Analyze sequence stratigraphy for carbonates and mixed carbonate-clastic depositional systems.
7. Interpret carbonate sequence stratigraphic patterns from outcrop, well log and seismic data.

Course Content

Course Details

The following itinerary is provisional.

Day 0

- Arrive in El Paso, Texas.
- Meet and greet session at the hotel. Discussion of safety procedures and basics of Sequence Stratigraphy.

Day 1

Field visits: Salt Flat Graben and El Capitan

- Class begins at 8:00 AM – meet at conference room to discuss safety procedures for the day and for discussion about Permian Basin.
- Leave for Carlsbad at 10:00 AM. First stop at Salt Flat Graben to provide overview of Guadalupe Mountains.
- Lunch at El Capitan followed by a sequence stratigraphy exercise.
- Arrive in Carlsbad no later than 6:00 PM.

Day 2

Field visit: McKittric Canyon

- Class begins at 8:00 AM – meet at conference room to discuss safety procedures for the day.
- Leave for McKittric Canyon by 8:15 AM.
- Lunch at the park.
- Leave the park by 2:00 PM to arrive back at the hotel in Carlsbad.
- Meet at conference room at 4:00 PM for lectures and exercises on seismic stratigraphy.

Day 3

Field visit: Walnut Canyon

- Class begins at 8:00 AM – meet at conference room to discuss safety procedures for the day and for discussion about the field visit.
- Stop at Walnut Canyon for an overview of the Permian reef builders and main depositional facies of the platform.
- Meet at conference room at 4:00 PM for lectures and exercises on stratigraphic hierarchy.

Day 4

Field visit: Last Chance Canyon

- Class begins at 8:00 AM – meet at conference room to discuss safety procedures for the day and for discussion about the field visit.
- Outcrop and a sequence stratigraphy exercise at Last Chance Canyon.
- Meet at conference room at 4:00 PM to discuss the Guadalupe Mountains impact for unconventional resources.

Day 5

Field visit: Slaughter Canyon

- Check out from the hotel.
- Leave for Slaughter Canyon at 8:30 AM.
- Sequence stratigraphy exercise and a core-log correlation exercise.
- Arrive at West Face to conclude the field course with a sequence stratigraphy exercise of the
- Guadalupe Mountains. A reservoir engineer will accompany the group to provide enhanced
- insights between outcrop-scale depositional facies and production performance.
- Leave for El Paso by 1:00 PM.