Applied Sequence Stratigraphic Analysis of Well Logs (G014)

Tutor(s)

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Overview

This course offers a practical approach to the sequence stratigraphic analysis of well logs. Lectures and exercises introduce the concepts and terminology of sequence stratigraphy and then apply them to the interpretation and correlation of well logs. Exercises are used to identify significant chronostratigraphic surfaces on well logs and then use the surfaces to construct log correlation sections for a variety of depositional settings. The approach allows for subdividing stratigraphic intervals into meaningful genetic packages, in order to interpret depositional histories and build geologically meaningful maps. Participants will develop the skills necessary to identify and predict new prospects and better subdivide reservoirs.

Duration and Logistics

A 5-day classroom course comprising a mix of lectures (30%), exercises (40%) and core examination (30%). The course is delivered at the Colorado School of Mines in Golden, Colorado, allowing participants access to the school's inventory of cores. The manual will be provided in digital format and you will be required to bring a laptop or tablet computer to the course.

Level and Audience

Fundamental. This course is aimed at geoscientists to teach them how to interpret well log data, make well-to-well correlations and generate maps in a sequence stratigraphic framework. The content is also suitable for professionals who work with geoscientists, such as petrophysicists and reservoir engineers.

Objectives

You will learn to:

1. Apply the terminology of sequence stratigraphy.
2. Identify sequences, systems tracts, sequence boundaries, marine regressive and transgressive surfaces of erosion, and flooding surfaces.
3. Apply sequence stratigraphic principles in carbonate, continental, shallow marine, deep marine and shale environments.
4. Generate well-log correlations using sequence stratigraphy concepts and contrast lithostratigraphic and chronostratigraphic correlations.
5. Apply reservoir-seal-source rock concepts to sequence stratigraphic interpretations.
6. Create maps of genetically related sequence stratigraphic units.
7. Predict new stratigraphic prospects or previously untapped reservoir compartments.
8. Assess the influence of chronostratigraphic surfaces on reservoir quality and flow units.

Course Content

Day 1

- **Introduction and controls on basin fill and sequence development**
  - *Exercise: Relative sea level cycles*
- **Sequence stratigraphic models**
  - *Exercise: Siliciclastic basin fill*
  - *Exercise: Siliciclastic chronostratigraphy*
- **Parasequences and parasequence stacking**
  - E*xercise: Recognition of flooding surfaces and stacking patterns*
  - *Exercise: Parasequence definition and facies – Blackhawk Fm core and well log*
  - *Exercise: Correlation of well logs – lithostratigraphy vs chronostratigraphy*

Day 2

- **Parasequences and parasequence stacking (continued)**
  - *Exercise: Almond sandstone well logs – retrogradational parasequences*
  - *Exercise: Parkman sandstone well logs – progradational parasequences*
- **Sequences and sequence boundaries**
  - *Exercise: Sequence boundary model – continental and shallow marine well log*
  - *Exercise: Recognition of sequence boundaries – Villeta Fm well logs and core descriptions*
  - *Exercise: Sequence boundary identification and correlation – Muddy Sandstone core and well logs*
  - *Exercise: Recognition of sequence boundaries – Sego Canyon well log*

Day 3

- **Carbonate sequence stratigraphy models**
  - *Exercise: Carbonate basin fill*
  - *Exercise: Carbonate chronostratigraphy*
  - *Exercise: Flooding surfaces and parasequences in carbonates – Lodgepole Fm well log*
  - *Exercise: Identification of surfaces and systems tracts in well logs from Pearsall-Bexar-Glen*
- **Rose Fms, Natih Fm and Thamama Group**
  - *Exercise: Carbonate parasequences and sequences in core – Marmaton Fm*
- **Continental to shallow marine sequence stratigraphy**
  - *Exercise: Continental sequence boundary identification*
  - *Exercise: Incised valleys – South Louisiana Miocene well logs*
  - *Exercise: Parasequences and incised valleys – Yegua Fm well logs and mapping*

Day 4

- **Continental to shallow marine sequence stratigraphy (continued)**
  - *Exercise: Falling stage systems tract (forced regression) – Woodbine Fm*
  - *Exercise: Carbonate platform to shelf edge – Paris Basin Jurassic*
- **Deep marine sequence stratigraphy**
  - *Exercise: Systems tracts identification – Gulf of Mexico Pleistocene well log*
  - *Exercise: Systems tracts correlation – Gulf of Mexico Miocene well logs (growth faulted margin)*

Day 5

- **Deep marine sequence stratigraphy (continued)**
  - E*xercise: Systems tracts in mixed siliciclastics and carbonates – Pennsylvanian of Oklahoma and Kansas*
  - *Exercise: Systems tracts in mixed siliciclastics and carbonates – Permian Spraberry Formation, Midland Basin*
- **Shale sequence stratigraphy**
  - *Exercise: Interpretation of detrital-dominated (extrabasinal) systems – Mowry Shale core and well log*
  - *Exercise: Interpretation of biogenic-dominated (intrabasinal) systems – Niobrara Formation*
  - *Exercise: Interpretation of evolving extrabasinal to intrabasinal system – Graneros and Greenhorn formations*
- **Course wrap-up**