

Sequence Stratigraphy and its expression on Seismic, Logs and Cores (G001)



Tutor(s)

[Rene Jonk](#): Director, ACT-Geo Consulting and Training; Honorary Professor, University of Aberdeen.

Overview

The application of sequence stratigraphy allows for making geologic interpretations of cores, well logs, seismic and outcrop data within a predictive stratigraphic framework. These predictions can be applied to play and prospect definition and evaluation, pre-drill predictions and discovery appraisal and field development strategies. This course introduces the sequence stratigraphic method and presents workflows and tools to describe, correlate and map strata within a predictive framework using typical subsurface (core, well log and seismic) data. The terminology of surfaces, systems tracts, sequence sets and stratigraphic hierarchy will be described and applied to subsurface data exercises in terrestrial, shallow marine and deep marine depositional settings across clastic and carbonate settings and applied to conventional and unconventional play types. The emphasis will be on the recognition and mapping of play elements (source, seal, reservoir and trap) from exploration to production scales.

Duration and Logistics

Classroom version: A 4-day course comprising a mix of classroom lectures and discussion (50%), and hands-on exercises with subsurface datasets (50%). The lecture materials will be provided in digital format and participants will be required to bring a laptop or tablet computer to follow the lectures and exercises. Exercises manuals will be printed for each student to enhance learning by interpreting using pencil on paper.

Virtual version: Ten 3-hour interactive online sessions presented over 5 days. A digital manual and hard-copy exercise materials will be distributed to participants before the course. Some reading and several exercises are to be completed by participants off-line.

Level and Audience

Intermediate. This course is intended for geoscientists (reservoir modellers, seismic interpreters, sedimentologists), reservoir engineers and petrophysicists who want to understand and apply the concepts of sequence stratigraphy to solve business problems.

Objectives

You will learn to:

1. Understand the sequence stratigraphic method, terminology and application.
2. Contrast the various approaches to sequence stratigraphy.
3. Apply the concept of facies, facies stacking and shoreline trajectories to define sequences, surfaces and system tracts.
4. Evaluate depositional controls on sequences in non-terrestrial, shallow marine and deep marine environments.
5. Assess and interpret cores, well logs and seismic lines to characterize and map hydrocarbon play

elements in different settings using the sequence stratigraphic method.

6. Implement sequence stratigraphic methods to predict play element presence, adequacy and risk from seismic data for exploration play and prospect definition.
7. Apply sequence stratigraphic frameworks to evaluate connectivity in discovery appraisal and field development.
8. Apply sequence stratigraphic methods to define seal adequacy for subtle and stratigraphic traps in various depositional settings.

Course Content

Session 1: Introduction and concepts with cores, well logs and seismic

- Class objectives
- A history of stratigraphy
- Lithostratigraphy vs chronostratigraphy
- Price River C – core description and core and log interpretation
- Sequence stratigraphy concepts
- Well log correlations (incised valleys; Urdanetta)
- Seismic stratigraphy method (Waltman Shale, West Siberia)

Session 2: Sequence stratigraphy applied to paralic clastic settings

- Sequence stratigraphy in paralic settings
- Idealized depositional sequences
- Seismic facies mapping (Woodbine Delta)
- High resolution Reservoir architecture mapping (Brent Delta)
- Seal evaluation for “top-set” stratigraphic traps (North Slope Alaska)

Session 3: Sequence stratigraphy in deep-water clastic settings

- Sequence stratigraphy in deep-water settings
- Idealized depositional sequences
- High resolution seismic-scale architecture (Black Sea, Golo)
- Application to stratigraphic trap mapping and evaluation (West Africa, North Sea)

Session 4: Carbonate and mudstone settings

- Sequence stratigraphy in carbonate settings
- Controls on carbonate reservoir quality
- Regional exercise (NW Shelf Australia, Indonesia)
- Mapping of organic-rich rocks for source and unconventional reservoir prediction
- Regional exercise (Devonian Western Canada, Vaca Muerta)

Optional Session 5: Tectonostratigraphy

- Tectonostratigraphic fundamentals
- Regional south Atlantic conjugate exercise (Namibia to Brazil) for source, reservoir and stratigraphic trap prediction.
- Tectonostratigraphy in syn-rift half grabens (East Africa Rift, North Sea Triassic)