



# N402: Seismic and Sequence Stratigraphy for Subsurface Exploration and Development

Tutor(s): Peter Burgess

5 Days

Competence Level:  
Basic Application



Classroom Course

## Summary

Seismic and sequence stratigraphic methods allow interpretation and prediction of reservoir, seal and trapping at basin, play and prospect scale. This course provides a strong theoretical background and hands-on practical examples to demonstrate how the principles of seismic and sequence stratigraphy can be applied in this way, across a range of scales, in both siliciclastic and carbonate settings, including use of the latest stratigraphic forward modelling methods.

## Learning Outcomes

Participants will learn to:

1. Understand how accommodation and supply are fundamental controls on how strata accumulate, allowing simple prediction of petroleum system elements, even with few data
2. Apply the principles of seismic and sequence stratigraphy to evaluate regional basin-scale seismic sections, defining significant boundaries, megasequences, key geological intervals and construct plays and leads without the aid of well control.
3. Apply seismic and sequence stratigraphic methods to predict the distribution of source rocks, reservoirs and seals without the aid of well control.
4. Appraise sequences and system tracts on seismic data and well logs for use in predicting reservoir, source and seal variations and identifying stratigraphic trapping potential in different basins.
5. Compare accommodation and sediment supply controls on siliciclastic and carbonate sedimentation and the resulting uncertainty in interpretation in a wide range of basin types and sedimentary environments
6. Understand the assumptions that underpin the sequence stratigraphic method and models and critically assess how these impact on subsurface interpretation and prediction.

## Duration and Training Method

A five-day classroom course consisting of lectures, practical exercises and case studies.

## Who Should Attend

Graduate-level geoscientists who require a working knowledge of stratigraphic principles applied to play fairway analysis, basin analysis and reservoir description. Experienced geoscientists who wish to broaden their knowledge of these principles in the application of exploration and development subsurface analysis and prediction. Those wishing to attend should have a working knowledge of fundamental geological concepts.

## Prerequisites and Linking Courses

There are no prerequisites for this course, but participants should have a basic understanding of the following (a) interpretation of seismic sections (b) recognition of sedimentary facies on well logs (c) models for siliciclastic and carbonate depositional systems.

Participants who wish to deepen their knowledge of sequence stratigraphy and the interpretation of seismic data and well logs may wish to consider linking Nautilus classroom courses N007: Seismic and Sequence Stratigraphy for Play Prediction and Basin Analysis or N357: Seismic and Well Facies Mapping in



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a Sequence Stratigraphic Framework.

## Course Content

### Day 1

Presentation: Introduction

- Format, content, aims and objectives of course

Presentation: Controls on Strata

- Accommodation and supply
- How and why relative sea-level varies, eustatic and tectonic controls

Exercise: Relative sea-level modelling in Excel

- How do subsidence and eustasy add up to relative sea-level?
- How are greenhouse and icehouse relative sea-level curves different and why is this important for petroleum systems?

Presentation: Basin types and style of fill

- Extensional, compressional and strike slip basins, subsidence mechanisms and characteristic stratal motifs and petroleum system elements
- Dynamic topography and mantle convection influences on basin formation

Exercise: Construction of chronostrat diagrams

- How to make a chronostrat diagram from seismic data
- How to interpret chronostrat diagrams

### Day 2

Presentation: Siliciclastic sequence models & method

- The purpose of sequence stratigraphy
- What is the sequence stratigraphic method?
- Megasequences, sequences, systems tracts and parasequences

Exercise: Correlation exercises

- How to correlate outcrop and logs at various scales

Exercise Vulcan graben well correlation



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Presentation: Siliciclastic seismic stratigraphy

- Seismic reflections as time lines and what this means
- Stratal termination, seismic facies and attribute mapping

Exercise: Seismic stratigraphy exercises

- Identifying and interpreting stratal terminations a

Exercise: Barrow delta exercise - how good is the slug?

- Lowstand, highstand or allstand fans and how to spot them

## Day 3

Presentation: Siliciclastic sequence model predictions

- Source rock, reservoir, seal and trap distribution predictions
- Basinward shifts and correlation, maybe global...

Exercise: Otway Basin - what's in a rift?

- Seismic interpretation of synrift strata
- Growth packages and ID of petroleum system elements

Exercise: Offshore Morocco passive margin - where is the sand?

- Seismic interpretation of passive margin strata

Presentation: Carbonate sequence strat model & predictions

- Carbonate refresher: factories and platform types
- Carbonate sequences and high frequency sequences in platforms

Exercise: Modelling carbonate reservoir stacking

- What controls how carbonate reservoirs stack?

## Day 4

Exercise: Canning Basin carbonate well correlation

- How to correlate carbonate strata from well logs

Presentation: Carbonate seismic stratigraphy



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- Carbonates seismic properties
- Carbonate ID and mapping on seismic

Exercise: Offshore India - clinoforms and a bump

- How do seismic and sequence strat methods allow derisking on a basin and play level?

Presentation: Sequence model assumptions and consequences for prediction

- Discussion of the purpose of sequence stratigraphy
- Assumptions of the model and how they lead to uncertainty

Exercise: Numerical SFM with Excel or Javascript

- Modelling the simple sequence development

Exercise Gulf Of Mexico salt minibasin cyclicity

- Patterns and lateral continuity in strata and what they mean for sequence correlation and petroleum system prediction

## Day 5

Presentation: Recent developments in the standard siliciclastic model

- Lateral variability and 3D sequence stratigraphy
- Sediment supply complications and how to deal with them

Presentation: Recent developments in the global correlation model

- Do we know the global sea-level history and do we need to?

Presentation: Recent developments in the standard carbonate model

- Consequences of carbonate sediment transport for sequence development
- Lateral variability and 3D sequence stratigraphy

Exercise: Numerical SFM with Excel and Javascript

- What you see is not always what you get – why sequence geometries can be none unique

Presentation: Pragmatic sequence stratigraphy - things that work best

- How to do sequence strat in 3D
- How to embrace uncertainty in sequence stratigraphy

Summary & and final group discussion



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