



# D073: Integration of Sedimentology, Petrophysics and Seismic Interpretation for Exploration and Production of Carbonate Systems (Distance Learning)

Tutor(s): Gregor Eberli

5 Days

Competence Level:  
Skilled Application



Virtual Course

## Summary

This Distance Learning course will be scheduled as a series of two- to three-hour long webinars over a two-week period (equivalent to a five-day classroom course), comprising a mixture of lectures, discussions, case studies, and worked examples to be completed by participants during and between webinar sessions.

This course provides a comprehensive overview of necessary concepts for seismic interpretation in carbonate systems for successful exploration and production. Newest concepts in depositional and microbial processes in shallow and deep water carbonate environments, rock physics, and sequence stratigraphy are presented through a combination of lectures, case studies and exercises. The participants will be exposed to many aspects of seismic stratigraphic interpretation related to carbonate reservoirs in traditional, unconventional and lacustrine environments.

## Learning Outcomes

Participants will learn to:

1. Appraise common carbonate seismic facies and geometries.
2. Assess the diagenetic influence on porosity, permeability, and sonic velocity of carbonate reservoirs.
3. Evaluate possible carbonate depositional environments on seismic data and predict the facies within the various environments.
4. Evaluate the usage of seismic attributes in interpreting carbonates.
5. Examine potential reservoirs in carbonate contourite systems.
6. Appreciate the difficulty of distinguishing carbonate buildups from volcanic edifices.
7. Perform seismic stratigraphic interpretations to predict, map and quantify carbonate reservoirs.
8. Integrate stratigraphic principles into a carbonate interpretation.
9. Evaluate seismic data for an integrated carbonate reservoir characterization.
10. Evaluate the controlling factors for variations of carbonates in unconventional reservoirs.

## Duration and Training Method

A virtual classroom course divided into 10 webinar sessions, comprising lectures, discussion, case studies and exercises to be completed by participants during and between sessions.

## Who Should Attend

This course is aimed at motivated geoscientists working on carbonate plays, prospects and fields, who are seeking to build upon their knowledge of carbonate systems and skills in seismic interpretation related to carbonate reservoirs.



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## Prerequisites and Linking Courses

Basic Application level course N020 (Carbonate Depositional Systems: Reservoir Sedimentology and Diagenesis) provides a comprehensive classroom introduction to the petroleum geology of carbonates.

Participants will benefit from most of this course if they have previously attended Nautilus Training Alliance Field courses in carbonate systems, although these may be taken following this course. Options include N091 (Carbonate Reservoir Architecture and Applied Carbonate Sequence Stratigraphy, West Texas, USA), N494 (Oligo-Miocene Carbonate Systems: Examples from Southern Italy (Apulia, Italy) and N059 (Applied Carbonate Geology: Carbonate Facies and Reservoirs, Mallorca, Spain).

## Course Content

Carbonate Depositional Systems: morphologies of shelf, isolated platform, ramp:

1. Unique aspects of carbonates
2. Modern examples of ramp, shelf and isolated platforms
3. Exercise
4. Oligo - Miocene Carbonate Ramp Systems
5. Apulia and elsewhere

Seismic Geometry and Facies in Carbonate Systems:

1. Seismic facies analysis of carbonate systems
2. Exercise
3. Seismic attributes in carbonates
4. Examples and exercise

Carbonate Depositional Systems: slope and basin:

1. Modern carbonate slopes: morphology, processes and facies
2. Carbonate contourite drift systems - overview
3. Carbonate contourites and the petroleum system
4. Examples and case studies

Carbonate Petrophysics:

1. Carbonate diagenesis and its influence on petrophysical properties
2. Control on sonic velocity in carbonates
3. Exercise
4. Rock physics models explaining velocity variations in carbonates



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5. Permeability from seismic data
6. Effect of Saturation on Velocity in Carbonates
7. Control of resistivity in carbonates

## Carbonate Microbialites:

1. Modern stromatolites and associated facies
2. Microbial processes influence on reservoir quality
3. Petrophysical properties of microbialites
4. Lessons from the modern carbonates for the exploration in the Presalt

## Carbonate Sequence Stratigraphy:

1. Introduction to carbonate sequence stratigraphy
2. Comparison of sequence stratigraphic models
3. Exercise: Sequence analysis

## (Seismic) Carbonate Reservoir Characterization:

1. Carbonate depositional cycles as building blocks for reservoirs
2. Exercise
3. Fractures within depositional cycles and flow units
4. Workflow in seismic reservoir characterization illustrated on Giant field in Abu Dhabi

## Mixed Carbonate-Siliciclastic Systems:

1. Modern mixed systems
2. Reciprocal sedimentation: Permian of West Texas
3. Vertical and lateral mixing in the Pennsylvanian of the Paradox Basin
4. Exercise: Stacking patterns and well-placement 1.7.4
5. Lateral mixing: Devonian of Canada
6. Exercise

## Challenges in Carbonate Exploration:

1. Distinguishing carbonates buildups from volcanic edifices in seismic data
2. Exercise

## Carbonates in unconventional reservoirs:

1. Depositional and diagenetic processes of fine-grained carbonates
2. Case study: Vaca Muerta Neuquén Basin



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