

Sequence stratigraphy (5 days fully classroom)

Introduction

Sequence Stratigraphy is a branch of Geology that combines multiple disciplines, notably Sedimentology, biostratigraphy, trace fossil analysis, and seismic stratigraphy in addition to classical lithostratigraphy.

Since its inception in the 1970s, it has been widely used in both academic and industrial domains. One of its main advantages is the integrated nature of the approach to sedimentary systems, using multiple disciplines. The application at different scales – from kilometric to metric allows the usage of different sets of data: seismic, petrophysical, biostratigraphical and outcrop.

From the perspective of geological resource exploration, the predictive power of Sequence Stratigraphy is immensely important as it allows to reduce risks and estimate resource quantities.

Course objectives

The objective of this training course is to get more out of seismic and well data through the use of sequence and seismic stratigraphy and integrated stratigraphic analysis to further constrain geological models. Ultimately, it can be used to predict and discover more geological resources and predict the geology before wells are drilled.

This 5-day interactive Sequence Stratigraphy training course will deal with the fundamentals and practical applications of sequence and seismic stratigraphy. It will include exercises and case histories for some interpretation and workshop discussion

During the course and in an organized and systematic manner, we aim to achieve several objectives that are briefly presented:

- Understand the critical use of chronostratigraphy in providing a temporal and spatial display of depositional packages
- Have a full understanding of the factors controlling sedimentary basin fill
- Have an awareness of the terms and definitions used in sequence and seismic stratigraphy
- Identify the main stratal terminations, surfaces, system tracts and sequences on seismic
- Integrate other geological data and then identify sequences and system tracts on well logs
- Identify main trends, surfaces and system tract in outcrop

Course contents

Day One

An Overview and the Use of Chronostratigraphy

- Outline and overview
- The history of sequence stratigraphy and stratigraphic models
- Chronostratigraphy and seismic models
- Condensation surfaces
- Erosion and non-deposition surfaces
- Coastal onlap and eustatics

Day Two

Seismic Stratigraphy and Controls on Basin Stratigraphy

- Principles and the geometry of depositional systems
- Types of seismic reflector terminations
- Changes in accommodation space
- Controls on basin stratigraphy
- Orders of cyclicity
- Types of sedimentary basins

Day Three

The Models and Principles

- The Exxon Model
- Sequence boundary types and systems tracts
- Other systems tract types and variations on the ideal model
- Genetic stratigraphic sequences
- Sequences on seismic
- Sequence boundary recognition

Day Four

Sequence Definition from Wells and Seismic

- The use of well log data
- Definition of surfaces and systems tracts
- Recognition of systems tracts on seismic
- Recognition of stratal surfaces on seismic
- Seismic facies analysis
- Analysis of seismic attributes

Day Five

Sequence Stratigraphy of Carbonates and Relative Sea-level Lowstands

- Carbonate systems overview
- Introduction to carbonate sequence stratigraphy
- Carbonate platform drowning and causes
- Highstand shedding
- Controls on carbonate production and sedimentation
- Relative sea level lowstands, carbonate, evaporate and siliciclastic partitioning

Course instructor

Gil Machado holds a degree in Geology and a European Doctorate (PhD) in Stratigraphy and Petroleum Geology and has ca. 12 years of experience in the Energy industry, in exploration projects of Oman, Mozambique, Brazil, Angola, Guinea-Bissau, Senegal, Gabon, Morocco, and other Atlantic basins. He is an advanced seismic interpreter, including sediment fairways identification, deep water sedimentation characterization, sequence stratigraphy and prospect generation and risking. He has worked extensively with well correlation, biostratigraphy, regional prospectivity studies and has managed teams and projects in multiple cultural environments.

He has mentored and supervised Bsc and Msc students, and young professionals and taught several short courses and lectures on these subjects.

As part of his career he worked at Petroleum Development Oman as a Stratigrapher where he was responsible for the Precambrian and Lower Paleozoic stratigraphy studies and for the scientific management of the palynology laboratory of the company. He followed multiple wells as an operational stratigrapher providing real-time advice to the well geologists for casing points, TD calls, etc. He also contributed to the biostratigraphic zonation review of the subsurface of Oman.

He is affiliated with the European Association of Geoscientists and Engineers (EAGE), the American Association of Petroleum Geologists (AAPG) and a corresponding member of the Devonian subcommission of the International Commission on Stratigraphy

Gil Machado is currently heading a geological consulting company – Chronosurveys - providing services and training in Stratigraphy, source rock evaluation, and Petroleum Geology.