Carbonate Reservoirs

Course Description

This carbonate course addresses the fundamentals of carbonate systems from deposition to early and late diagenesis, and how these impact on reservoir properties. The module starts with the basics of carbonate classification, biological properties of carbonate grains and their relevance for the oil geoscientist, and how sequence stratigraphy in carbonates compares and differs with their siliciclastic counterparts. Furthermore, post-depositional mineralogic and chemical transformations are extremely important in carbonate reservoirs, and the module will thus explore diagenesis and how these transformations can be fingerprinted using a variety of methods.

Course Objectives

On completion of this course participants will have attained understanding of carbonate rocks – their components, depositional models and diagenetic variation that will assist in the prediction of carbonate reservoirs from seismic to pore scale.

Participants completing this course will be able to:

1. Understand and describe the principal carbonate sediment components, and systems of carbonate classification.
2. Describe the primary controls on carbonate deposition temporally and spatially, discuss the contrasts between the controls on siliciclastic deposition.
3. Describe the main types of carbonate platform, their variability, scale, main seismic features and distribution of likely reservoir units.
4. Demonstrate sequence stratigraphic aspects of carbonate build-ups, their differing response to SL change compared to clastic sediments and discuss their seismic characters.
5. Review principal types of likely reservoir facies (platform interior, carbonate sands, reefs, slope systems and chalks), their recognition, architecture, sequence stratigraphy and porosity types.
6. Identify the diverse pore types in carbonates and how these relate to reservoir quality.

7. Understand how the development of primary and secondary porosity has varied through geologic time and how these changes impact upon reservoir quality.

8. Explain how the variety of diagenetic environments affects primary and secondary porosity in carbonate rocks and understand the implications for reservoir quality.

9. Understand the uses of the main techniques for deciphering diagenetic sequences in carbonates.

10. Discuss the principal modes of formation of dolomites and the predictive uses of different dolomite models.

11. Understand the diverse origins of palaeokarstic macroporosity, its subsurface recognition, and different strategies for developing palaeokarstic reservoirs.

Who Should Attend

This course is designed for all geoscientists who want to learn or rehearse the basics of carbonate systems, and who also wants to have a deeper understanding of what governs carbonate reservoirs. The course is designed as a practical class, with lecturing interspersed with practical examples to allow participants to check their understanding of the taught material and ask questions.

Prerequisites

No previous knowledge of carbonate sedimentology required, however the course will also present advanced concepts and thus is suitable for people with previous carbonate experience.

Course Content

Introduction
Principles and concepts of carbonate deposition
Classifying carbonate rocks
Isolated platforms (ICB's) and de-risking carbonate prospects
Carbonate shelves
Carbonate Ramps
Intraplatformal basins (IPB's)
Carbonate sequence stratigraphy
Platform interior deposystems & reservoirs
Carbonate sands & reservoirs
Reefs: Part 1
Reefs: Part 2
Reefs: Part 3 & reservoirs

Carbonate Slopes & reservoirs
Platform drowning
Chalk deposystems & reservoirs
Porosity: Introduction
Porosity: Classification and application
Diagenesis 1: Marine diagenesis and porosity evolution
Diagenesis 2: Meteoric diagenesis and porosity evolution
Diagenesis 3: Burial diagenesis and porosity evolution
Diagenesis in a sequence stratigraphic framework
Techniques
Dolomite reservoirs Part 1
Dolomite reservoirs Part 2: models
Palaeokarst reservoirs
Optional:
Reef case studies: rudists and phylloids
Case study: Capitan Shelf
Lacustrine carbonates and related deposystems