

Reservoir Characterization for Carbon Capture and Underground Storage, Devon and Dorset, UK (G556)



Tutor(s)

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Overview

This course provides a field-based overview of reservoir characterization relevant to carbon capture and underground storage (CCS) and focuses on widely exploited reservoir depositional environments and their associated heterogeneity. The course links geological heterogeneity observed in well-exposed outcrop analogues with flow and transport processes during CO₂ injection and plume migration, and also discusses the characterization and modelling of heterogeneity using typical subsurface datasets. The concepts are illustrated using numerous practical examples.

Duration and Logistics

A 5-day field course with a combination of field activities and exercises, plus classroom sessions. A manual and exercise materials will be distributed to participants on the course. Transport is by small coach.

Level and Audience

Intermediate. The course is intended for professionals with experience of, or background in, a related subsurface geoscience area, and / or recent graduates in a relevant topic.

Exertion Level

This class requires an **EASY** exertion level. Field locations are mainly accessed by hikes of 1–2km (roughly 1 mile) across some irregular terrain, including sandy beaches, coastal paths and pebbly / rocky beaches.

Objectives

You will learn to:

1. Describe and explain types of geological heterogeneity associated with reservoirs, storage units and aquifers developed in common depositional environments.
2. Evaluate how these heterogeneities can be characterized and quantified in the subsurface and represented in static and dynamic reservoir models.
3. Consider the impact of these heterogeneities on fluid flow and transport in the context of CO₂ storage.
4. Understand reservoir characterization requirements for the prediction of CCS.

Course Content

Course Details

Subsurface reservoirs and aquifers have huge capacity and potential for CCS. Fluid flow and associated transport of species are central to plume migration and trapping efficiency. It is well known that geological heterogeneity plays a critical role in controlling flow and transport. Fit for purpose reservoir characterization is therefore essential to ensure reservoir behavior can be understood and predicted. However, fluid properties and flow behavior, and the types and abundance of subsurface data available for reservoir characterization, can differ widely for CCS projects. The course will link field observations with subsurface flow, transport and trapping mechanisms during CCS. Topics to be covered include:

- An overview of facies associated with fluvial, aeolian, lacustrine and shallow-marine clastic environments and shallow-marine carbonate depositional environments
- Types of heterogeneity associated with these facies
- Stratigraphic and structural controls on the distribution and organization of heterogeneity
- Types and scales of subsurface data available for reservoir characterization
- Strategies to capture key heterogeneities in reservoir models
- Effects of heterogeneity on fluid flow in the context of CCS

Outcrop exercises are used to demonstrate the topics listed above, and as a starting point for further discussion.

Day 1: Arrive in Exeter, Devon

Classroom:

- Evening introduction and safety brief

Overnight in Exeter

Day 2: Fluvial reservoirs

Fieldwork:

- Sherwood sandstone (Budleigh Salterton) – mixed fluvial and aeolian sandstones, faults
- Sherwood sandstone (Ladram Bay) – fluvial sandstones

Overnight in Exeter

Day 3: Shallow marine and carbonate reservoirs

Fieldwork:

- Mercia mudstone (Seaton or Branscombe) – lacustrine mudstones, seal
- Chalk (Beer) – fine-grained carbonates
- Bridport Sands (West Bay) – shallow-marine sandstones

Overnight in Weymouth

Day 4: Seals

Fieldwork:

- Portland limestone (Freshwater Bay, Isle of Portland) – limestones, evaporite seal (CCS analogue)

Overnight in Weymouth

Day 5: Conclusions and wrap up

Classroom:

- Course summary and wrap up

Departure and travel home