






N213: Advanced Reservoir Characterisation and 3D Petrel Modelling of Coal-bearing, Fluvio- Deltaic Sediments (*Kentucky, USA*)

Instructor(s): Huw Williams and Paul Davies

| | |
|---|------------------------------|
| 5 Days | Competence Level: Skilled |
|  | Field Course |
|  | Classroom Elements |
|  | Computer Usage |

Summary

This reservoir characterisation and modelling course focuses on capturing the geological knowledge necessary to build realistic models of coal-bearing fluvial and deltaic sediment body architecture. Outcrops, cores and well logs are studied to characterise both small and large-scale patterns of sedimentary architecture within a sequence stratigraphic framework in these Carboniferous coalbearing fluvio-deltaic sediments.

Learning Outcomes

Participants will learn to:

1. Evaluate and characterise the individual facies components and facies associations of coal-bearing fluvio-deltaic depositional environments using core, log and outcrop data.
2. Construct a sequence stratigraphic-based framework for the reservoir modelling of coal-bearing fluvio-deltaic depositional environments.
3. Construct a realistic conceptual model against which the final 3D reservoir models can be checked.
4. Integrate core, log and any other available data to build a reservoir model which distributes reservoir properties realistically in 3D and establishes flow and non-flow units within it.
5. Perform deterministic modelling of coal-bearing fluvio-deltaic sediments using Petrel and compare results from different Petrel modelling techniques in order to formulate the best modelling strategy.

Duration and Training Method

A five-day field and classroom-based reservoir geology and modelling course blending outcrop instruction with corresponding instruction in building 3D Petrel models of the same outcrops. Generally, the mornings are spent in the field with afternoon classroombase modelling sessions.

Physical Demand

he physical demands for this class are LOW according to the Nautilus Training Alliance field course grading system. The field sites are all roadside stops in the Appalachian foothills of East Kentucky at altitudes of 200-500 m (600-1500 ft). In Autumn the weather is generally sunny with daytime temperatures of 8-21 °C (46-69°F) with cooler evening temperatures. The terrain comprises man-made roadcuts through gentle rolling wooded hills. Transport is by minibus on black-top roads. There will be some walking up onto and along lower level road-cut benches.




Who Should Attend

This class is for geoscientists who are interested in characterising and realistically modeling coalbearing sedimentary architecture to support conventional hydrocarbon or coal-bed methane and underground coal 3D modelling projects



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Prerequisites and Linking Courses

Although there are no defined prerequisites for attending this course, previous experience building reservoir models would be desirable including a knowledge of 3D modelling software.

Please note a licensed and mobile version of Petrel, with a suitable laptop is required for attendance on this course.

Related companion and follow up courses to N213 are: N012 (Reservoir Modelling Field Class, Utah, USA), N106 (Advanced Reservoir Modelling, Elgin, Scotland), N033 (Characterisation, Modelling, Simulation and Developing Planning in Deepwater Clastic Reservoirs, Tabernas, Spain) and N213 sister course N215 (Advanced Techniques for Modelling Fluvial and Deltaic Architecture using Petrel, Utah, USA).

Course Content

The course follows the typical workflow of a subsurface 3D modelling project and is aimed at fluvio-deltaic reservoir characterisation and making realistic predictive models of sedimentary geometries and architecture by incorporating detailed knowledge of sedimentology and sequence stratigraphic concepts.

Although the class is based around coal-bearing fluvial and deltaic outcrop examples, many of the techniques can be easily adapted to other depositional environments.

The primary topics covered in the course are:

1. Diagnostic outcrop, core and log interpretation of coal-bearing fluvio-deltaic environments and facies
2. Building a sequence stratigraphic framework in coal-bearing sediments for reservoir modelling
3. Coal and coal-bearing sediment correlation techniques from well data
4. Deterministic modelling techniques for coal-bearing sediments using Petrel
5. Using Petrel hierarchy, zone logs and layering
6. Comparison of modelling results from different Petrel techniques
7. Creating and using isochores to control shapes of sediment bodies
8. Analysis of static connectivity of different facies modelling techniques

Day 0:

Evening introduction and ice breaker at hotel in Lexington, Kentucky




Day 1:

- Lectures: Geological Setting, Upper Carboniferous Stratigraphy, Sedimentology, Core/Log Characterisation.
- Petrel modelling.
- Core workshop. (All at KGS Core Store Facility)



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- Travel and overnight in Prestonsburg area (Approx. 2 hours)

Day 2:

- Stop 1: Pikeville Cut-Thru, US23 – overview Pikeville Formation
- Stop 2: Coal Run Village, US23 – marine and mouth bar
- Stop 3: Johns Creek, USI 19 – overview Pikeville Formation
- Classroom: Modelling Introduction
- Overnight in Prestonsburg area.

Day 3:

- Stop 4: Ivel, US23 – coastal plain
- Stop 5: Raccoon Creek, USI 19-Kendrick Shale
- Classroom: Modelling 1
- Overnight in Prestonsburg area

Day 4:

- Stop 6: Sidney 1 – USI 19 Pikeville Formation
- Stop 7: Sidney 2 – USI 19 Pikeville and Hyden Formation
- Stop 8: Zebulon 2, USI 19- Fossil forest
- Classroom: Modelling 2
- Overnight in Prestonsburg area

Day 5:

- Classroom: Modelling Wrap-up
- Stop 9: Burning Fork, USI 19 – Harold Sst valley margin
- Stop 10: Zebulon 1, USI 19 – Pikeville Formation and Harold Sandstone
- Travel to Lexington
- Overnight in Lexington