

N305: Core Facies Analysis for Resource Plays

Instructor(s): Gus Gustason

Format and Duration

Classroom - 5 Days

Summary

Business Impact: Participants attending this workshop will learn and practice **core description techniques** and **work flows** useful for **reservoir characterization** and **exploration projects** in **conventional and unconventional resource plays**.

This course teaches the fundamentals of core description and core facies analysis of siliciclastic and mixed carbonate-siliciclastic depositional systems. The course takes place in a core research library and a core storage facility in the Denver area.

Learning Outcomes

Participants will learn to:

1. Properly lay out, orient, and mark core for description and sampling.
2. Identify and interpret the important physical and biological parameters of core, including sedimentary structures, biogenic structures, significant surfaces, and diagenetic textures, from a wide variety of clastic depositional environments and reservoir types (conventional and unconventional).
3. Examine and describe basic structural features in cores, including faults and fractures, and relate them to mechanical stratigraphy, in situ stresses, and borehole stability issues.
4. Integrate routine core analysis and/or unconventional shale and tight rock analysis with core descriptions to better understand the controls on porosity and permeability.
5. Compare and calibrate core descriptions and wireline log data, including image logs.
6. Discretize core descriptions for core-to-log facies analysis and reservoir modeling input.
7. Select appropriate outcrop analogs.
8. Integrate all the above data into a comprehensive, sequence stratigraphic study.

Training Method

A five-day workshop comprising approximately 25% classroom lectures and 75% hands-on core description exercises.

Who Should Attend

This workshop will benefit geoscientists, reservoir engineers, and petrophysicists who want to extract maximum value from cores to improve reservoir characterization and exploration play analysis.

Prerequisites and Linking Courses

This course assumes that participants have a basic knowledge of clastic and carbonate sedimentology and stratigraphy, such as presented in N020 (Carbonate Depositional Systems: Reservoir Sedimentology and Diagenesis) and N155 (Introduction to Clastic Depositional Systems: a Petroleum Perspective).

Course Content

Core facies analysis is the foundation for understanding subsurface sedimentary geology. Core-based sequence stratigraphic studies have consistently yielded new interpretations of exploration plays and

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mature oil and gas fields which, in turn, have led to new field discoveries and/or discoveries of stratigraphic compartments within existing fields.

The course uses core examples from both conventional and unconventional reservoirs, including non-marine, coastal plain, shoreline, shelf, and offshore marine environments. Specific examples include:

1. Non-marine deposits of the Jurassic Salt Wash Formation from the San Juan Basin.
2. Nearshore and coastal plain deposits of the Cretaceous Mesaverde Group from the Uinta, Piceance, and Greater Green River basins.
3. Nearshore and valley-fill deposits of the Lower Cretaceous Muddy (J) Sandstone from the Powder River and Denver basins.
4. Shelf sandstone deposits of the Frontier, Shannon, and Sussex sandstones from the Powder River Basin.
5. Deepwater deposits of the Lewis Shale from the Greater Green River basin Mixed siliciclastic and carbonate pelagic and hemipelagic deposits of the Niobrara Formation from the Denver Basin and the Marcellus Formation from the Appalachian Basin.

Hands-on demonstrations and exercises will introduce participants to core handling, description, and data integration techniques. Lectures are designed to introduce or re-familiarize participants with lithofacies and facies associations including alluvial fan deposits, braided stream deposits, meandering stream deposits, avulsion, alluvial architecture within a sequence stratigraphic framework, deltaic deposits, strand plain and barrier island deposits, valley-fill deposits, shelf deposits, deepwater deposits, hemipelagic and pelagic marine deposits. Lectures also describe applications of core-facies analysis to reservoir characterization.

Itinerary: Days 1 through 4 will be held at the US Geological Survey's Core Research Center in Lakewood (immediately west of Denver). Day 5 will be at the Triple O Slabbing facility in Denver.

Topic 1

- Introduction to coring, core handling, core description basics

Topic 2

- Continental and coastal plain deposits

Topic 3

- Nearshore, shelf, and deepwater marine deposits

Topic 4

- Valley-fill deposits

Topic 5

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- Pelagic and hemi-pelagic marine deposits