Deepwater Clastics: Source-to-Sink Studies in the Exploration of Turbidite Reservoirs, San Diego, California (G103)

Tutor(s)

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Overview

The course will visit spectacular outcrops along the California coastline just north of San Diego. Field work will follow a source-to-sink approach and will focus on specific deepwater architectural elements, including canyons, slope channels, channel-lobe-transition-zones and lobes. The course will provide insights into exploration and development themes and challenges in deepwater depositional systems, with direct analogs to Gulf of Mexico reservoirs.

Duration and Logistics

A 6-day field course based in La Jolla, California. Training will take place through in-class presentations, field observations, printed exercises and discussions in the field. Transport will be by coach.

Exertion Level

This class requires a **MODERATE** exertion level. Access to the coastal cliff outcrops is via sandy beaches with walks no more than 3km (1.9 miles). Field stops are all at approximately sea level and some are tide dependent. There are some steep steps to negotiate to reach some beach sections.

Level and Audience

Intermediate. The course is aimed at geoscientists, engineers, petrophysicists, geophysicists and managers who are working deepwater reservoirs or would like to improve their knowledge of these systems.

Objectives

You will learn to:

1. Characterize the sedimentary processes and facies of turbidite systems and mass-transport deposits, and the broad nature of submarine depositional architecture.
2. Evaluate submarine-channel systems, including scales/dimensions, axis-to-margin architecture, evolution, heterogeneity and potential baffles/barriers to flow.
3. Predict connectivity in channelized systems from their seismic-geomorphic and well-log expression.
4. Assess submarine canyon forming-and-filling processes, including mass wasting, bypass, sandy and muddy fill, and up-dip trapping mechanisms.
5. Illustrate the importance of source-to-sink studies in the exploration of turbidite reservoirs.
6. Evaluate submarine lobe/sheet systems, including scales/dimensions, axis-to-fringe architecture, compensational stacking, hierarchy and heterogeneity (e.g. hybrid-event-beds).
7. Analyze channel-lobe-transition-zone deposits and supercritical-flow bedforms.

8. Assess faulting in lobe deposits and impacts on connectivity.
9. Appraise the facies variability in proximal/axial and distal/fringe lobe deposits, and the implications for connectivity between these sub-environments.

Course Content

Course Details

The cliffs of the California coast preserve the deposits of several episodes of deepwater sedimentation, including those from the Cretaceous through to the Miocene, and we will visit select outcrops covering this time period including:

1. Miocene-Pliocene Capistrano Formation at San Clemente State Beach.
2. Eocene strata in the cliffs north of Scripps Institute of Oceanography (Blacks Beach).
3. Cretaceous Point Loma Formation exposed near La Jolla and on the Point Loma Peninsula.

Day 1: Arrive in San Diego

Classroom

- Course introduction and safety briefing
- Sedimentary processes and facies of turbidite systems and mass-transport deposits, and the broad nature of submarine depositional architecture

Overnight in La Jolla.

Day 2: Channel systems

Classroom:

- Submarine channel systems, including scales/dimensions, axis-to-margin architecture, evolution, heterogeneity and potential baffles/barriers to flow
- Predicting connectivity in channelized systems from their seismic-geomorphic and well-log expression

Fieldwork:

- Channelized reservoir analogs at San Clemente State Beach

Overnight in La Jolla.

Day 3: Canyons

Classroom:

- Submarine canyon forming-and-filling processes, including mass wasting, bypass and sandy and muddy fill, up-dip trapping mechanisms
- The importance of source-to-sink studies in the exploration of turbidite reservoirs

Fieldwork:

- Contrasting deep and shallow marine units, large-scale submarine canyon/channel architecture at Blacks Beach

Overnight in La Jolla.

Day 4: Channel-lobe transition

Classroom:

- Submarine lobe/sheet systems, including scales/dimensions, axis-to-fringe architecture, compensational stacking, hierarchy and heterogeneity (e.g. hybrid-event-beds)
- Channel-lobe-transition-zone deposits and supercritical-flow bedforms
- Faulting in lobe deposits, and impacts on connectivity

Fieldwork:

- Contrasting the connectivity and seismic expression of channel-lobe-transition-zone and related lobe deposits of the Point Loma Formation at Sunset Cliffs and Goldie locales

Overnight in La Jolla.

Day 5: Lobe deposits

Classroom:

- Submarine lobe reservoirs: What’s inside the seismic loop?
- Facies variability in proximal/axial and distal/fringe lobe deposits, and the implications for volumetric contribution (i.e. pressure support) of low N:G lobe deposits to high N:G lobe deposits.

Fieldwork:

- Contrasting proximal and distal lobe deposits, exploration and production focus at La Jolla and Cabrillo National Monument

Overnight in La Jolla.

Day 6: Departure

Departure for airport and travel home.