N454: Turbidite Fairway Processes and Products of the Basque Basin *(Northern Spain)*

Instructor(s): John Cater and John Cummings

3 Days	Competence Level: Skilled
Field Course	
Classroom Elements	
LOW	Low Physical Demand

Summary

This course focuses on the sedimentological aspects of turbidite channels and associated lobe deposits. Outcrops allow sand body architecture to be seen between core and seismic scale and demonstrate links between depositional sub-environment and trace fossil assemblages in deep-water settings.

Learning Outcomes

Participants will learn to:

1. Appraise bed scale deposits of particulate gravity currents including classic turbidites and hyperpycnal deposits.
2. Evaluate controls on bed-form generation and sand-body geometry in systems dominated by suspension fall-out versus tractional flow.
3. Identify the sedimentary features and trace fossils that can be used to infer depositional setting within a deep marine gravity-flow fairway.
4. Assess the emplacement processes of deepwater clastic sequences and compare the range of facies present in channelised and weakly-confined gravity flow deposits.

Duration and Training Method

A three-day field course including classroom sessions and exercises. The proportion of field to classroom time is approximately 90:10.

Physical Demand

The physical demands for this course are LOW according to the Nautilus Training Alliance field course grading system. Most of the outcrops are coastal sections. Maximum walking distance in one day is c. 7km, including ascent/descent of c. 200m.

Who Should Attend

Geoscientists who have worked with deepwater clastic depositional systems and want to further improve their understanding, interpretation skills and predictive ability of the reservoir properties encountered within such depositional environments, especially through a deeper understanding of the processes that build deepwater clastic systems.

Prerequisites and Linking Courses

Participants would benefit from having a basic knowledge of deepwater clastic systems. This can be gained from attending N155 (Introduction to Clastic Depositional Systems; a Petroleum Perspective). This course also links well with other deepwater offerings in the Nautilus Training Alliance portfolio including N009, N028 N033, N107 and N112.

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Course Content

This course examines extensive coastal outcrops of Eocene age, comprising a sand-rich gravity-flow system deposited in a deep-marine rift basin. Channel-filling coarse-grained sandstones to the east pass westwards into fine-grained lobes and fan-fringe deposits. Transitions from confined channel fills to unconfined lobe deposits are well exposed. Direct sediment input from rivers in flood to form deepwater hyperpycnal flows is evident from characteristic sedimentary structures and trace fossil assemblages.

Itinerary

Day 0: Travel to Spain

- Arrival into Bilbao airport, transfer to San Sebastian.

- Introduction to turbidite sedimentology, Urgull headland outcrops, San Sebastian.

- Evening course introduction and safety briefing in hotel.

Day 1: Channelised fairway axis

- Hondarribia coast – channel axis structure and trace fossils, including lateral accretion, off-axis heteroliths, in-channel slides and slumps.

Day 2: Channel-Lobe Transition

- Pasaia coast - transition from confined channelised to lobe sandstones.

- Orio harbour – channel/lobe heterolithics and trace fossils.

Day 3 – Lobe Facies

-Getaria coast. Observe the sand-rich axis of the depositional lobe system. Outcrop logging exercise.

-Zumaia Beach. Muddy lobe-fringe facies and trace fossils.

-Wrap up session.

-Departure and early evening flights home.