TETRA TECH RPS ENERGY | TRAINING

N252: Reservoir Geology of Deepwater Systems: Processes, Architecture and Reservoir Quality Analysis *(Alps, France)*

Instructor(s): Bill McCaffrey

Format and Duration

Field - 5 Days
High Physical Demand

Summary

This course will entail detailed facies analysis of turbidites, linked to system architecture, with focus of the effects of bathymetric confinement, characterisation of sheet and incisional channel architectures, and the processes that cause spatial and temporal transitions between these architectural styles. During the course, participants will learn to characterise and appraise deepwater clastic deposits based upon an informed process understanding, and will acquire the approaches needed to relate facies and architectural variations to both local and basinal contexts. They will also gain experience in assessing the appropriateness of analogues for use in modelling subsurface scenarios. The geology includes a full spectrum of particulate gravity current deposits, including high and low concentration turbidites, mass transport deposits and transitional flow deposits. These can be placed in the context of local basin geometry, and the effects of flow interaction with subsea bathymetry in terms of facies and facies architecture examined in detail.

Business impact: Deepwater clastic depositional processes are almost uniquely complicated, involving process transformations between laminar and turbulent flows and vice versa, the development of variable system geometry, and bathymetric effects at a range of scales.The course assembles a good working knowledge of the key processes that build deepwater clastic systems, and develops the skills needed to make informed depositional interpretations of these environments.

Learning Outcomes

Participants will learn to:

1. Appraise bed scale deposits of particulate gravity currents, including debris flows, high and low concentration turbidites and hybrid event beds.
2. Assess the emplacement processes of deepwater clastic sequences from outcrop or core, and predict the geometrical scenario of deposition.
3. Characterise the depositional expression of transitional flow processes and formulate hypotheses for their spatial distribution.
4. Evaluate and predict the architecture of turbidite onlaps at bed and element scale.
5. Formulate development plans that incorporate insight into the mutual effects of channelisation, system onlap and slope instability on reservoir architecture.
6. Evaluate rival analogue systems when deciding how to apply analogues to subsurface systems.

Training Method

A field course in Maritime and Haute Alpes of France, supported by classroom sessions in a 90:10 ratio. Classroom sessions will detail the links between facies and depositional process that are necessary for

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interpretation of deepwater clastic deposits, as well as summrising and reviewing the fieldwork.

Physical Demand

The physical demands for this course are HIGH according to the Tetra Tech RPS field course grading system; the course requires good to high fitness levels. There will be hikes most days, the longest being 13 kms (8 miles), with an ascent and descent of approx 1000 m (3,280 ft). Due to an altitude of up to 2,500 m (8,202 ft), fatigue and shortness of breath may be felt more than for activity at lower altitudes. Transport will be by coach on alpine style mountain roads, and therefore, motion sickness may be experienced.

Who Should Attend

This course is aimed at geoscientists with experience of deepwater clastic depositional systems, who want to further improve their understanding, interpretation skills, and predictive ability of the reservoir properties encountered within such depositional environments.

Course Content

Day 0: Arrival in Nice and Introduction

- Drive Peira Cava. Peira Cava overview (if timing allows)
- Course introduction and HSSE briefing

Day 1: Peira Cava

- System: ponded minibasin succession with correlations >12 km proximally to distally
- Geology: base of slope scours, confined sheet sands, proximal to distal facies variations, dune development, mass transport
- Learning objectives: reconciliation of seismic to outcrop scales; basin fill architecture; facies analysis across proximal to distal transects; onlap signatures.

Day 2: Braux

- System: point-sourced confined sheet system
- Geology: onlaps, flow deflection, hybrid event beds
- Learning objectives: reconciliation of seismic onlap style and the relative proportions of eventbeds and hemipelagite; hybrid event bed character and causes of flow hybridization; impacts offlow deflection on spatial variations in facies

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Day 3: Annot

- System: laterally-confined but open-ended base-of-slope system
- Geology: steep onlaps, large-scale massive sands, scours.
- Learning objectives: non-uniformity effects on facies and facies architecture; large-scale sand remobilization; waxing flow signatures.

Day 4: Chalufy

- System: laterally-confined sheet system with offset axial channel
- Geology: as above
- Learning objectives: reservoir modelling exercise incorporating the effects of different structural and trapping configurations on which geological features to model

Day 5: Champsaur

- Laterally-confined channelized sheet
- Geology: as above
- Learning objectives: channel recognition; controls system architecture
- Summary lectures
    - Synthesis of the key insights from the field course
    - Analysis of pitfalls in interpretation and the limitations of the Annot depositional system in particular, and the outcrop analogues in general

Day 6: Departure