

CASP Research Award for Geological Fieldwork- 2017 Award Winner

Applicant: Mr. Grant Cole, Plymouth University.
Project title: Architectural analysis of tectonically influenced shallow-water mouth bar complexes, Lower Cretaceous Galve sub-basin, Spain: Implications for reservoir characterisation and modelling.
Award: £1,350.

Scientific question and rationale: Shallow marine deposits form a major proportion of the world's hydrocarbon reservoirs and can often be stratigraphically complex leading to difficulties in reservoir prediction and modelling. Furthermore, borehole and core data only provide a vertical/temporal view of the reservoir and 3D seismic data (spatial insight) often cannot resolve the scale of architectural elements that make-up a reservoir. A way to overcome these complexities and help predict spatial variability of a reservoir (static reservoir model) and their controls (for prediction) is to use an outcrop analogue. The Galve sub-basin (Teurel province, eastern Spain) has superbly exposed deltaic facies and genetically related carbonates providing the perfect location for such an analogue study to be undertaken. This project aims to answer the following: 1) What controlled the spatial and temporal variability in facies and architecture within the shallow-water delta complex? 2) What architectural elements constitute the delta mouth bar complex? and 3) How do these stack vertically (temporally) and laterally (spatially) to build-up the sand body?

Specific Objectives and Deliverables:

Objectives:

- Document the internal and external architecture of the delta mouth bar complex capturing its spatial and temporal variation.
- Develop a high-resolution correlative framework for delta mouth bar sand bodies and delta mouth bar complexes which can be used as a framework for future delta front mouth bar correlations and to help guide subsurface correlations.
- Identify the extrinsic and intrinsic controls on the sedimentary and stratigraphic architecture of the delta system (work is ongoing with Midland Valley's MOVE software to ascertain the overall influence of structure on the stratigraphy within the basin).
- Relate the internal architecture of delta mouth bars to sedimentary processes and contemporaneous structural evolution.

Deliverables:

- A model illustrating how shallow water deltaic sandbody architecture can be described and evaluated along with how these techniques can be applied in reservoir characterisation and modelling studies.
- An outcrop analogue that can be used for subsurface deltaic reservoirs (e.g. Tethyan / Middle East).

Proposed Work Plan:

Four week field season (11th Sept - 09th Oct, 2017) to Aliaga, Teruel province, Aragon, Spain:

- Seven separate locations (that have previously been scouted) within the Galve sub-basin will be photographed through the use of a drone and processed, post-capture, in order to create a 3D virtual outcrop model. This will allow for the architecture from different locations within the depositional system to be compared and contrasted and graphically show the spatial and temporal variation of the mouth bar complexes. - Closely spaced (10's metres), high resolution (1:50) lateral sedimentary logging of the delta mouth bar complex sands. This will allow for the capture of variations in sedimentary facies and used to populate the 3D model.
- Palaeocurrent data collection to record spatial and temporal variations in palaeoflow directions.
- Record the geometries (thickness, width) of architectural elements in order to create an architectural element database.
- Bed walking of delta sandbodies in order to test viability of correlative framework.

Proposed Expenditure including details of any other sources of funding:

Train: Plymouth - London Gatwick, Off-peak return (trainline.com) - £67.25

Flights: Return London Gatwick - Valencia (British Airways, 11th Sept - 09th Oct) - £120.80

Car hire (SUV): Transport to/from Aliaga and in/around study area (Goldcar) - £557.62

Fuel: Travel to/from Aliaga and in/around study area (mpg: 40, average 50 miles a day) - £186.80

Accommodation: APARTAMENTO PARQUE GEOLÓGICO ALIAGA BARRIO ALDEHUELA, Aliaga, Aragón (28 nights) - £605.43
Subsistence: Food & drink (£60 per week) - £240

Total cost of fieldwork: £1777.90