

## A comparative study of controls on shoreline trajectories in rift-margin and rift-interior shallow marine systems

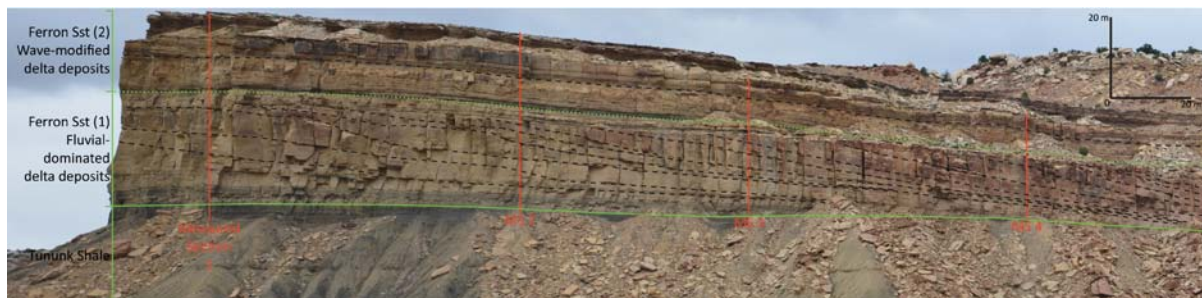
Award: \$1000 Allan and Eleanor Martini Named Grant

### Rationale

The Middle-to-Upper Jurassic Krossfjord and Fensfjord formations of offshore Norway are shallow marine sandstones situated on the eastern margin of the Viking Graben, northern North Sea, and form a prospective reservoir interval in the area around the existing Troll, Brage and Gjøa fields. The facies associations identified in core represent wave- and tide-dominated deltaic, shoreline and shelf depositional environments. Future work will focus on seismic interpretation away from the sparse well-data control. However, the limited availability and distribution of core and well-log data restricts the detail and confidence with which seismically imaged architectures can be interpreted. It is therefore intended that these seismic interpretations will be calibrated by numerical modelling of the seismic expression of stratigraphic architectures observed in outcrop analogues.

### Fieldwork

A generous research grant from the American Association of Petroleum Geologists facilitated fieldwork to the Cretaceous Western Interior, USA in 28 days in September 2011. A wide range of shallow-marine sandbodies containing clinoforms were visited in the US Cretaceous Western Interior in Utah, Colorado and Wyoming: (1) the Ferron Sandstone; (2) the Panther Tongue; (3) the Chimney Rock Tongue; (4) the Hygiene Sandstone; and (5) the Loyd Sandstone. Field work on the range of outcrop analogues listed above quantified the geometry, distribution and lithological character of clinoform-bearing units through the creation of photo mosaics and measured sections from each locality (e.g. Figure 1). Measured sections were taken at regular intervals to highlight the changes in lithological character along dip of the clinoform-bearing units. Facies analysis published by previous authors was used to constrain the measured sections.



**Figure 1.** Annotated photo mosaic of the Ferron Sandstone at Ivie Creek, Utah highlighting two different depositional styles.

### Future Objectives

The data collected will be matched to the observed facies changes in core data from the Troll Field and petrophysical properties from those intervals will be extracted. These data will be imported into the Earth model to create a forward seismic model which will provide calibration of the seismic data from the Troll Field. Once the 3D seismic data volume has been interpreted and calibrated with outcrop-based seismic models, shoreline trajectory analysis will be used to characterise the stratigraphic architecture of these shallow marine deposits and to constrain the volumes of sediment contained within particular stratigraphic packages. Seismic geomorphological analysis will be used to interpret shoreline process regime (e.g. relative influence of waves, tides and river-mouth processes) in the context of shoreline trajectories and sediment volumes. Variability in stratigraphic architecture and sediment volumes will be evaluated in different parts of the evolving rift basin, in order to identify local and regional controls. Ultimately, the project will: (1) highlight the relationship between shallow-marine sedimentology, sequence stratigraphy and syn-depositional structure in rift basins, and (2) aid the prediction of the character, distribution and connectivity of shallow-marine reservoir sandbodies.