NERC Centre for Doctoral Training in Oil & Gas (2017 start)

Project Title: **Diagenesis and reservoir potential of continental carbonates: Cretaceous of the South Atlantic rift**

Host institution: University of Manchester

Supervisor 1: Dr Stefan Schroeder

Supervisor 2: Dr Cathy Hollis

Additional Supervisor (s): Dr Richard Dixon (BP), Dr Ian Sharp (Statoil)

Project description:

The project focuses on the diagenetic and pore network evolution of continental carbonates in Angola, combined with a characterization of diagenetic fluid chemistry and timing of fluid flow. By integrating data from outcrops and offshore reservoirs with the tectonostratigraphic context and paleoenvironmental position in the rift, the study will constrain the regional depositional, diagenetic and tectonic controls on reservoir quality. The regional view is possible through access to a large onshore dataset (samples, shallow cores, logs, outcrop mapping) and to a subsurface reservoir core, provided by BP and Statoil. Results of this study have direct application to South Atlantic reservoirs, but predictive rules are equally applicable to exploration in other rift systems.

Objectives:

- Determine process-based controls on reservoir development in continental carbonates
- Constrain fluid flow and basin thermal evolution, and their impact on reservoir evolution
- Provide keys for reservoir quality prediction, by integrating subsurface and outcrop data with tectonostratigraphic context

Methodological Approach:

- Petrography (microscopy, point counting, SEM, cathodoluminescence) to constrain diagenetic phases and diagenetic evolution
- Geochemistry (XRF/ICP, stable and radiogenic isotopes, clumped isotopes, fluid inclusions) to characterize diagenetic fluids, fluid sources and fluid temperatures
- Petrophysics, pore types to determine pore network evolution and links with sedimentological and diagenetic controls
- Rock elastic properties (Vp, Vs) on key facies to calibrate offshore seismic response of continental carbonates
- Data synthesis and integration with information on tectonostratigraphic and paleoenvironmental setting

CDT Research theme(s): Exploration in Challenging Environments

Research context:

Continental carbonates are a new play type in the Santos and Kwanza Basins of the South Atlantic rift. Exploration success has been mixed, which partly relates to limited understanding of processes governing reservoir development, quality and charge. Deposition and diagenetic alteration of rift-related continental carbonates depend on paleoenvironments, tectonic setting, fluids (meteoric, hydrothermal-volcanic, alkaline, possibly marine), climate and organisms (in particular microbes). Due to this complexity and inherent heterogeneity, an integrated approach of process-based reservoir studies and determination of the links between components of the petroleum systems and tectonostratigraphic evolution is required. It can help reducing the risks of frontier exploration and petroleum systems prediction.

Research costs:

Analytical work and consumables: £47,000; conference travel and company visits to discuss project progress: £7,000. **Total £54,000** for duration of project. Case partner will be sought to support the field and analytical costs.

Career routes:

Sedimentological-petrographic, geochemical and petrophysical techniques, and synthesis of various data sets across a range of observational scales provide integrated training that gives access to industry or academic research career paths.

Submissions must conform to this single-sided A4 format. The Awards Committee reserves the right not to consider submissions that do not adhere to this condition.