

## UK Oil and Gas Collaborative Doctoral Training Centre (2015 start)

**Project Title:** The reservoir potential of submarine slide blocks and associated deposits

**Host institution:** Cardiff University

**Supervisor 1:** Tiago M. Alves

**Supervisor 2 (or more) (& Institution if different from host):** Davide Gamboa (BGS Wales)

**Project description:** Submarine slide blocks reflect periods of intense tectonism on continental margins, and comprise a drilling hazard when occurring in units where hydrocarbons accumulate. They are generated during major instability events in a variety of geological settings and their size exceeds that of boulders, which are <4.1 m. In practice, slide blocks can be >500 m high by >4.5 km long on a number of continental margins, presenting internal folding, thrusting and rolling over basal breccia-conglomerate carpets [1]. Strata containing slide blocks can comprise prolific reservoirs for oil and gas. However, no systematic characterisations of the structural styles and morphology of slide blocks, and associated successions, have been undertaken, thus creating a gap in knowledge. This gap needs to be addressed at a time when hydrocarbon exploration is moving to deep-water areas of continental margins, where slide blocks and mass-transport deposits are ubiquitous [2].

This project will use high-quality 3D seismic data and borehole data from SE Brazil, North Sea, Barents Sea and NW Australia to document the internal compartmentalisation and distribution of slide blocks in distinct geological settings. Emphasis will be given to the interpretation of fluid flow features, and magmatic intrusions, associated with the main periods of slide-block formation and deposition. Using 3D Stress<sup>®</sup>, the prospective student will model fluid flow paths in fractured blocks, documenting the regions where fluid accumulations are more likely to occur. Field analogues from SE Crete will be used to document depositional facies variations in slope successions rich in slide blocks. In summary, this project aims to:

- a) Document the internal structure of submarine slide blocks, and 3D seismic character of different deformation styles.
- b) Identify the type(s) and timing(s) of faults in blocks, relating them with specific stages of movement and fluid migration in sedimentary basins.
- c) Quantify differential compaction using novel 3D seismic interpretation methods, documenting the main control(s) on the formation of stratigraphic and structural traps above slide blocks.

[1] Alves, T.M. (2015). *Marine and Petroleum Geology* 67: 262-285.

[2] Kvalstad et al. (2005). *Marine and Petroleum Geology* 22: 245-256.

**Research theme:** Exploitation in Challenging Environments. Environmental impact, with emphasis on Marine Geology and Geophysics

**Research context:** The project is original and will add on to existing PhD projects being developed in the 3D Seismic Lab. No other projects on slide blocks are being developed at Cardiff.

**Research costs:** Cardiff University will provide the £137K asked to associate partners via College funds. Funds for field campaigns will be sought from Geological Society of London grants.

**Career routes:** Exploration, production geoscience, environmental geoscience for oil and gas. Consultancy and Service Provision. The student will be trained on state-of-the-art 3D seismic interpretation, borehole analysis and advanced field techniques.