



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

Project Title: Sediment dynamics and destabilization of continental margins: predicting shelf and slope instability under a changing climate.

Host institution: University of Aberdeen

Supervisor 1: Vittorio Maselli (UoA)

Supervisor 2: Alex Sharples (BP, Site Investigation Team), Brice Rea (UoA)

Additional Supervisor (s): Mads Huuse (University of Manchester)

Project description: The increase in energy demand has pushed the E&P industry toward new frontiers that carry with them implicitly higher socio-environmental risk. In deep and ultra-deep water targets it is requisite to identify the source and trigger of surface and subsurface natural hazards. Sea bed instability, pore pressure phenomena and seismicity are (often linked) marine geohazards that may compromise sea-floor engineering projects, and a detailed characterization of their distribution, occurrence and potential impact under future climate change scenario is a fundamental aspect that require mitigation prior to installation of infrastructures in these challenging environments.

The evolution of the North Atlantic continental margins during the Quaternary has been primarily driven by the impact of high-frequency glacio-eustatic oscillations on depositional systems, and the modern physiography of the North Sea and the North Atlantic margins of the UK and Norway show a combination of “remnant” glacial features and modern sediment accumulation. Changes in sea level, sedimentation rates, strength of oceanographic currents, bottom water temperature and dynamics of ice sheets, promoted contrasting scenarios during glacial and interglacial periods that led to the generation of different sources of continental margin instability, including huge landslides. Possible causal factors may be related to shallow-gas accumulations, gas hydrate dissociation, current-induced scour, mud diapirism/volcanism, pockmark formation and tilting and seismicity associated with glacial/de-glacial isostatic adjustments.

This project will investigate environmental conditions and geological processes that may generate natural hazards affecting the sea floor along the Eastern margin of the North Atlantic Ocean, defining their occurrence through time (glacial vs interglacial periods) and delineating areas likely to become vulnerable during future climate change combined with increasing anthropic pressure on the environment. Data: 2D and 3D seismic data, multibeam bathymetry, sediment samples (boreholes, IODP, data from site surveys, etc)

Approach: The characterization of the North Atlantic margin and the definition of potential geohazards will be achieved in 4-steps. 1- Definition of the processes that shaped the sea floor during the Quaternary and led to the modern physiography of the North Sea and Norwegian Sea. 2- Identification of surface and subsurface geomorphic features and related deposits that may affect the stability of the margin. 3- Development of a GIS-based hazard map of the sea floor. 4- Evaluation of the occurrence and location of future potential geohazards.

CDT Research theme(s): “Exploitation of Challenging Environments” (70%) and “Environmental Impact and Regulation” (30%). **Major scientific outcomes:** Increase our knowledge of glacially-influenced depositional systems and associated geohazards.

Research context: The student will join the strong and dynamic scientific communities of the Basin Fill Group and Geography&Environment of the University of Aberdeen, the Site Investigation Team of BP, and the Basin Studies and Petroleum Geoscience Group of University of Manchester.

Research costs: Costs should not exceed £ 5k per annum, and includes high-performance workstation (£ 3k), attendance of international conferences (£ 5k), field work (£ 3k).

Career routes: The student will gain expertise in the use of industry-standard seismic interpretation and mapping software to assess the risk of geological hazards to drilling operation and subsea installation. Future career path may include Oil and Gas industry, specialist research in Service Company, post-doctoral research in Academia.

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.