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

Project Title: Submarine Landslides and Mass Transport Deposits from Geohazards to Georesources: An integrated field-numerical approach.
Host institution: University of Aberdeen
Supervisor 1: Mehrdad T. Manzari (UoA)
Supervisor 2: Vittorio Maselli (UoA)
Additional Supervisor (s): Benjamin Kneller (UoA), Fabiano Gamberi (ISMAR-CNR)

Project description: Submarine landslides, among many other phenomena of continental margin instability, represent a major hazard for all the infrastructures deployed on the sea floor, with potential effects also on surrounding coastlines through the generation of tsunamis. Understanding the formation and evolution of submarine landslides, and associated mass transport deposits (MTDs), has long been an open issue that attracted a large community of geoscientists worldwide. The recent interest of the energy industry to expand petroleum E&P towards deep-water targets and an increasing availability of surface and sub-surface 3-D data highlighted submarine landslides as a fundamental process in continental margin growth. Mass transport deposits not only constitute large volumes of sediment in deep water settings, but in some basins they may represent more than half of the sedimentary succession, thus exerting a paramount control on reservoirs and seal location, facies distribution, and migration pathways.

The emplacement of an MTD is a quasi-instantaneous phenomenon that generates a sudden change in the physiography of the basin, in the stress field and in the future evolution of deep-water depositional systems (canyons, turbidity channels, contourites). The increase in shear stress associated with the downslope movement, not only promotes a reorganization of the physical properties of the sediment involved, but may have a profound effect on the underlying stratigraphy that could be completely disrupted and incorporated into the MTD.

Through an integrated mass-balance approach, derived by combining direct geophysical observation with numerical simulation, the student will: 1- quantify the internal architecture and petro-physical properties of mass transport deposits, 2- develop physical and mathematical models for submarine landslides and associated MTDs in different environmental contexts, 3- establish the potential impact of submarine landslides on offshore infrastructures, by assessing also the presence of hazardous zones that might be affected by future mass movements. Moreover, by combining geophysical data with outcrop evidence this project will provide new insights on the nature of the substrate/MTD transition, improving the prediction of the character of this transition at a sub-seismic resolution in this challenging environment.

Data: Conventional and hi-res 3D seismic data, sub-bottom profiles, multibeam bathymetry and sidescan sonar from the Atlantis area of the Gulf of Mexico, modern data from the Tyrrhenian Sea collected by the Institute of Marine Sciences (ISMAR-CNR, Italy), integrated with published data (e.g. from DSDP Leg 155) and data from outcrop studies (Sobiesiak, PhD Aberdeen, 2016).

CDT Research theme(s): This project primarily relates to "**Exploitation of Challenging Environments**" (70%) and to "**Extending the life of mature basins"** (30%).

Research context: The student will join the strong and dynamic scientific community of the Basin Fill Group of the University of Aberdeen that integrates of a large number of PhDs and geoscientists with expertise in several fields of geology, petroleum geology and numerical simulation.

Research costs: Costs should not exceed £ 5k per annum, and includes high-performance workstation (£ 3k), attendance of international conferences (£ 4k), field work (£ 6k).
Career routes: Future career path may include Oil and Gas industry, specialist research in Service Company, post-doctoral research in Academia.