Pushing the Margins:


Introduction

The Ocean Margin LINK Programme is a research programme co-funded by the UK Natural Environment Research Council and industry focusing on the geological evolution of ocean margins. The LINK scheme is the UK Government’s principal mechanism for promoting partnership in research between industry and academia. The first small grants were allocated in 2000, since which time 14 full projects along with 9 stand-alone studentships have been funded by the Programme, which is due to end in late 2006. On 16th November 2004 a Workshop was held at the offices of the Department of Trade and Industry (DTI) in London, UK, giving proponents of projects a chance to summarise research progress and to discuss future collaborations and themes for research.

The programme has three main themes; deep structure and rifting, sedimentary processes and slope stability and fluid flow. Interests include improved prediction in exploration and reservoir characterisation both on the UK margin and globally, gas hydrates as a hazard and potential energy source, prediction of deepwater geohazards and sustainable management of hydrocarbon resources and the deep-water environment. Projects have covered topics both within and across themes fitting into one of the Link Programme remits of multidisciplinary research work. In this report project PIs are given with their academic institution: more details are available at the web site (address given below).

The OML Programme is aimed at promoting industry / academia links with the aim of maximising the value of data generated by industry. In the next two years one focus will be the development of research partnerships that can continue work beyond the end of the OML Programme in 2006. A common viewpoint expressed at the workshop is that there are still insufficient resources allocated to study of aspects such as early stages of rifting, conjugate systems and lateral (along strike) variations on margins.

There is an emphasis on the NW European (passive) margin but work is also ongoing in the South Atlantic and the Black Sea. The Programme aims are similar to those of the European Science Foundation’s Euromargins Programme (whose projects cover complimentary parts of Europe’s margins) and links have been forged with the Intermargins and IODP communities. To this end the OML Programme Committee is hoping to set up a conference in late 2005 where leading members of all the margins communities can get together to discuss global margin research themes.

Deep structure and rifting
The deep structure and rifting theme has included seismic imaging, crustal modelling and subsidence analysis to analyse the structure of the continental margins of northwest Europe, French Guinea and north Brazilian and east Black Sea areas.

On the northwest European margin the iSIMM project led by Kusznir (Liverpool), RS White (Cambridge), Roberts (Badleys) and Christie (Schlumberger) has investigated the nature of the continent-ocean boundary in two places. Seismic data from the Hatton-Rockall and Faroes margins have helped characterise the extrusive basalts and intrusive magmas, identified clinoforms associated with progradation of the basalt and imaged the underlying stratigraphy on the margin of the continental plate. This has been coupled with modelling of the stretched continental lithosphere to predict changes in bathymetry, heat flow and gravity anomaly.

Seismic data off South America has been collected by Watts (Oxford) with a view to examining the lithospheric structure associated with both early opening of the Equatorial Atlantic and the deposition of the Amazon Fan. An increase in subsidence in the Miocene is associated with the onset of deposition of Amazon sediments.

N White (Cambridge) has used inverse modelling of margins, determining strain rate from available data and using this to drive margin evolution. The model is in an early stage but strain rate distributions appear to fit observations.

Minshull (SOC Southampton) is studying the tectonic evolution of the east Black Sea Basin, an extensional basin with an uncertain history including Palaeogene extension and Neogene foreland basin growth.

**Shallow geology including sedimentary processes and slope stability**

The structural evolution of margins is studied by the Holdsworth (Durham) group who have collected data on fault systems on both regional and outcrop scales, providing a connection between the deep and shallow themes. These data demonstrate that basement deformation patterns can have an effect on post-break up structure down to reservoir scale features.

Gravity flow studies are represented by modelling of submarine channels (Gupta, Imperial London) and study of stratified flows (Talling, Leeds). Both of these studies are of interest in predicting distribution and characteristics of deep-water sand bodies, a common exploration target.

Improved imaging of the sea bed on the margin south west of the UK has allowed the team led by Parson (SOC Southampton) to identify sediment wave forms, slope failures and canyons. Identification of these features is essential in characterising the potential for instability on the margin and therefore for routing of sea bed installations.

**Fluid Flow particularly into and out of the seabed**
The fluid flow theme contains a number of diverse projects, one of which (Knipe) attempts to characterise the impact of faulting on deep marine reservoirs through outcrop observation and modelling.

Jackson (BGS) and Lovell (Leicester) have investigated the impact of seismic shock on gas hydrate stability to determine potential for slope failure. Parnell (Aberdeen) reports thermal anomalies in Paleocene rocks of the North Atlantic and relates them to magmatic activity. Snape (Nottingham) has used hydropyrolysis to determine origins for degraded hydrocarbons and therefore to investigate the history of movement of oil and gas within a basin.

Overall the workshop has displayed the significant potential for multidisciplinary work in the area of margins research. Integration of fluid flow, fault geometry and sediment body stacking will have significant implications for prediction of hydrocarbon resources. Modelling of the margins allied to high quality seismic studies will help to define depocentre geometries both during and after break up. Taken together the three themes are building towards an integrated model of ocean margin creation and evolution that provides improved understanding and prediction of resources in hydrocarbon exploration, of slope instability and geohazards and of the new resource that potentially can be provided by hydrate accumulations.

The Ocean Margin Link Programme will end in 2006 with a conference and associated publication including contributions from the research projects and students funded by the programme.

Abstracts and some publications from the Workshop are available at:

http://www.nerc.ac.uk/funding/thematics/oceanmargins/

Dr Alick Leslie
OML Science Co-ordinator
Email: aleslie@bgs.ac.uk
Tel: 0131 650 0315
Fax: 0131 668 4140