The BGS has a wealth of experience working in the offshore sector. **Robert Gatliff** and **Alan Stevenson** explain how the organisation is refocusing its activities to help meet the UK's strategic requirements.

# Marine and coastal science

April 2005 saw the start of the BGS's new five-year scientific programme, which in the offshore sector is entitled the Marine, Coastal and Hydrocarbons programme. The new structure will provide, for the first time within BGS, an integrated approach to the challenges of the marine and coastal environment across the entirety of UK designated waters. The combination with hydrocarbons research projects reflects the 3D-mapping and modelling aspects of the new programme, and the support we receive from industry for our regional mapping and geohazards research. This volume of *Earthwise* highlights many of the strategic areas of research that are focused in the coastal and marine environment.

The BGS has previously undertaken extensive reconnaissance mapping of shelf areas. Indeed, the UK was the first country to produce a series of offshore geological maps and reports. Our new programme builds on the successes of previous projects but develops in several new directions:

- a move into more detailed sea-bed mapping to reflect the increasing demands on management of the marine environment
- a move towards 3D and 4D modelling, both at a basin scale and in key areas
- a focus on the coastal zone
- reconnaissance studies in the Atlantic margin
- marine geohazards research.

### High-resolution sea-bed mapping

The increasing demand for the provision of information on the environment, the coastal zone, sustainable offshore management and renewable energy, plus research into ice-sheet dynamics and climate change, requires an improved knowledge of the processes that have shaped the marine landscape. We cannot manage our seas without a sound knowledge of the geology of the sea-bed environment. Neither can we conserve key areas, maintain biodiversity and develop our marine resources in an economic, efficient and sustainable way.

Recent developments in marine landscape mapping, data delivery and visualisation techniques provide technologies to underpin a new national mapping programme based primarily on high-resolution information such as multibeam sonar data. The BGS alone does not have the resources to undertake a national multibeam mapping programme so we are part of a consortium of marine organisations that are developing a united approach to a new mapping programme. It works on the principle of 'collect once and use many times'. Partners in discussions include the UK Hydrographic Office

(UKHO), the Maritime and Coastguard Agency, the Centre for Environment Fisheries and Aquaculture Services, the Fisheries Research Services, and national heritage and conservation bodies.

If successful, the outcome of this collaboration will be to underpin the ecosystem-based management approach to the marine environment, which has been formally endorsed by UK and other European governments. In the meantime, we are focusing on gathering geological information from existing surveys. A new sea-bed character and



Phono-tephrite lava core samples from Rosemary Bank Seamount.



Marine landscapes: Firth of Forth sea-bed morphology.

bed-form map product will be developed through integration of BGS data, sidescan sonar data from the UKHO and other data where available (at 1:50 000 compilation scale). These maps will be the first example of high-resolution products.

# 3D and 4D modelling

Boreholes and geophysical techniques now show much greater detail in the subsurface and also allow for monitoring of change with time. We are looking to develop detailed 3D models of key areas, such as those beneath cities and other areas of environmental stress. A similar approach will be taken in the marine area, where regional basin-wide deep models and detailed 3D models, particularly in selected areas of the coastal zone, will be developed.

# The coastal zone and the 'white ribbon'

The 'white ribbon', is so called because on many BGS products the coastal zone is blank as a result of the difficulties of data collection in this area. We therefore intend to develop a new series of onshore–offshore contiguous digital maps and models in this zone. A review of techniques to use in the coastal zone is currently in progress before new surveys begin. The BGS has undertaken multibeam surveys in the Firth of Forth and around the Summer Isles and laser scanning of coastal zones, particularly in areas of increased vulnerability such as Spurn Head. An onshore drilling survey is planned on the banks of the Thames Estuary prior to an extension of the project offshore. Estuaries are rapidly becoming the focus of national interest because of concerns about climate change with the associated potential problems of coastal flooding, unstable ground and contamination in major urban areas.

# The Atlantic margin

The Rockall Basin and Hatton Basin are the two largest under-explored regions of the UK continental shelf. They have potential to contain significant hydrocarbon resources, including traditional oil and gas and also untested potential for hydrates. The Rockall Consortium, including four major oil companies and the DTI, is currently co-funding the completion of a major report summarising the geology

of the Rockall Trough and surrounding areas, and negotiations are in place for the production of a Hatton Basin Offshore Report in conjunction with the Irish Petroleum Affairs Division, and Irish and UK universities. One of the scientific challenges in this area is to understand the origin of many Palaeogene and Neogene inversion or compressional structures along the Atlantic margin.

## Marine geohazards research

A consortium of oil companies co-funds the BGS's marine geohazards research through the Western Frontiers Association. The project addresses the 3D characterisation of the Faroe-Shetland Basin and provides models of the shallow geology. Although the results of the work are focused on the oil industry, important new data and understanding will enhance modelling of variability in ocean circulation and other processes in this key area. These studies support the sustainable development of new deep-water hydrocarbon discoveries, and results are applied on a global basis. The study of submarine landslides on the Atlantic margin has been applied to tsunami generation and has led to BGS participation in a series of studies on the marine geological aspects of the Indian Ocean tsunami that occurred on Boxing Day 2004.

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Sampling sediment on the Dungeon Banks, Mersey Estuary to determine the input of contaminants.