

Howard Johnson, Derek Ritchie and Bob Gatliff describe the BGS's recent research at the 'exploration frontier'.

Oil and gas on the Atlantic Margin

One of the most prominent economic problems facing the UK government today is the maintenance of adequate energy supplies. To address this the BGS has made strong contributions, over the past decade, to advance the geoscientific understanding of the UK Atlantic margin. A strategic driver for this research is the potential for further significant discoveries of commercially exploitable oil and gas.

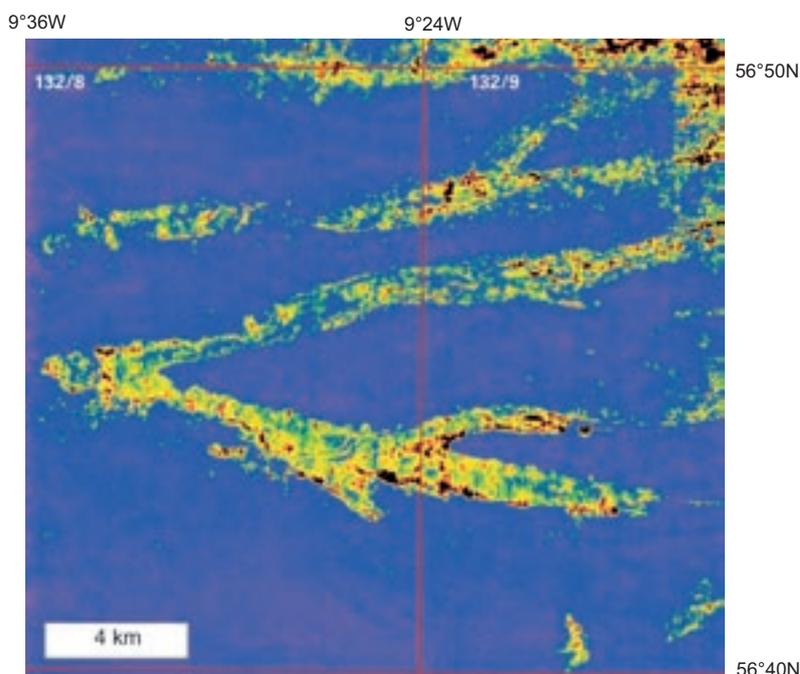
This extensive region contains deep-water sedimentary basins that are remote and underexplored when compared with those of the North Sea. Some areas, such as the Rockall and Hatton basins, are commonly termed the 'exploration frontier'. However, there are also some areas, such as the Faroe–Shetland Basin, that already contain commercial oilfields, such as BP's Foinaven and Schiehallion. Other major oilfields in the Faroe–Shetland Basin, such as BP's Clair Field, although discovered decades ago, are only now being developed, due to technological advances and more favourable economic conditions. A recent upturn in exploration activity in the Faroe–Shetland Basin, partly in response to a rise in oil prices, has resulted in exciting new finds, such as Chevron's Rosebank/Lochnagar discovery.

Our research on the north-east Atlantic margin complements work done by the oil industry and academic researchers. Indeed, our studies have benefited from sponsorship and collaboration with the oil industry, UK government departments, the Faroese Earth and Energy Directorate (Jardfeingi), the European Union, and with international universities and research organisations. The nature of our research has been varied, and includes contributions to

assessing the amount of undiscovered oil and gas resources, the study of large trap-forming fold structures, the evaluation of earth hazards to better understand engineering risks to sea-floor structures, and strategic environmental work to aid sustainable development of the region.

Impartial advice to government

For the past 30 years, the BGS has provided detailed and impartial geoscientific advice to the UK government. Over the past 12 years or so, this work has been awarded following open competition with the private sector. Our experienced seismic interpretation and basin analysis team is based at the BGS Gilmerton Core Store in Edinburgh, and is contracted exclusively to the government. The team has access to all the commercial



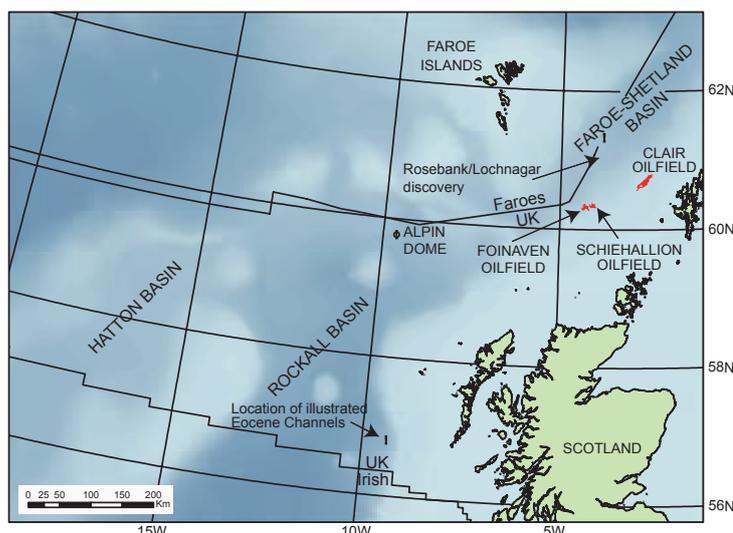
Seismic attribute map showing the nature of Eocene channels on the eastern margin of the Rockall Basin. The image is derived from Petroleum Geo-Services (PGS) 3D seismic data, and is reproduced from the Promote UK 2007 CD with kind permission from the DTI and PGS.

exploration data acquired over the UK continental shelf (UKCS), and therefore commands a unique overview. This work provides the government with wide-ranging technical advice, including quantitative estimates of 'yet-to-find' oil and gas resources within the UKCS (onshore and offshore). In recent years, our work has also included technical input to the DTI's UK Promote campaign. This has included the characterisation and depiction of undrilled exploration leads within open acreage on the UKCS, such as Eocene channels within the Rockall Basin. The promotional work has been very successful. As a direct consequence, many oil companies new to the UK have been awarded exploration licences on the Atlantic margin and in the North Sea, and there have been much higher levels of exploration activity, resulting in the discovery of more oil and gas resources.

Oil and gas development and activity scenarios need to be put into their natural environment context for planning purposes, and consequently the DTI has undertaken offshore Strategic Environmental Assessments (SEAs) prior to any UKCS licence rounds for oil and gas exploration and production. We have used our archive of existing data and library of thematic maps, together with specifically commissioned and newly acquired survey data, to prepare technical reports on the attributes of the seabed, the superficial geology, sedimentary and marine processes within the UK Atlantic margin and other SEA areas. Data and knowledge acquired under the auspices of the SEAs are made available via the UK DEAL website (www.ukdeal.co.uk), which operates via a contract to Common Data Access/Oil and Gas UK, with additional support from the DTI.

Research consortia and collaboration

Over the past 15 years or so, we have developed a number of research consortia. These consortia foster partnerships with industry and academia, and provide greater resources with which to pursue our strategic research. For example, for over a decade the ongoing BGS Rockall Consortium has been sponsored by several oil companies and by the DTI. This sponsorship has allowed a wide range of marine



Map of the UK Atlantic margin and surrounding region showing the position of oilfields mentioned in the text, and of Eocene exploration plays and the Alpin Dome within the Rockall Basin.

geoscientific data to be acquired across the frontier Rockall and Hatton areas, including high-resolution seismic surveys and shallow subseabed drill cores (in deep water) to calibrate a seismic stratigraphy for these regions. Geoscientific interpretations have been published in the form of geological maps and peer-reviewed papers for the benefit of the oil industry and the wider community. In addition, we are currently preparing a comprehensive report on the Rockall Basin, for publication in 2008. BGS also contributed to a Strategic Environmental Assessment of the Rockall Basin on behalf of the DTI, which will enable this area to be considered for oil exploration licensing in the coming years.

Much of our research in the Faroe–Shetland Basin is conducted in collaboration with the Jardfeingi and oil company sponsors. A major benefit is that the entire basin is being considered, rather than merely the UK national sector. We are preparing a comprehensive report summarising the geoscience of the Faroe–Shetland Basin to be distributed to oil industry sponsors in 2007, with general publication likely in 2008. Following the success of this project, the BGS and Jardfeingi have recently agreed to cooperate on new research projects to address key geoscientific issues for oil and gas exploration and development within the Faroe–Shetland Basin.

Much of our research is truly regional in nature and spans the entire north-east Atlantic margin from mid-Norway to offshore Ireland. An example is the STRATAGEM (Stratigraphic Development of the Glaciated European Margin) Project, which was sponsored by the EU and the oil industry. This project investigated Neogene tectono-stratigraphical development along the entire margin and involved collaboration with European universities. The Passive Margins Modelling Project, sponsored by the oil industry, also spans from mid-Norway to offshore Ireland and developed sophisticated techniques for integrating evidence from deep seismic profiling and potential field data to model subvolcanic basin structure in areas of poor seismic imaging.

Recently, our research has focused on post-break-up compression structures along the north-east Atlantic margin. This compression has contributed to the development of numerous large anticline and dome structures within the margin, such as the Alpin Dome, which are important as they form potential trapping structures for undiscovered oil and gas resources.

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