

Vital information about past climate change, sea-level variations and natural hazards is recorded in the sediments beneath the sea floor. **Dan Evans** and **Heather Stewart** describe how the BGS is helping to retrieve the evidence.

BGS and the IODP

The history of international scientific ocean drilling extends back to the 1960s, but a new phase was initiated in 2003 with the start of the Integrated Ocean Drilling Program (IODP). The IODP's purpose is to improve our understanding of earth system processes ranging from changes in the Earth's climate, to the rifting and drifting of continents as well as studying the deep biosphere. Many of these objectives address issues important to the world today, including climate change, sea-level rise and natural hazards.

The BGS's role in this programme is to lead a European consortium that operates mission-specific platforms for the IODP. This consortium is named the ECORD Science Operator (ESO), ECORD being the European Consortium for Ocean Research Drilling that comprises 16 European countries

and Canada. The ESO comprises the University of Bremen, the European Petrophysics Consortium (the universities of Montpellier, Aachen and Amsterdam led by Leicester University), and the BGS which acts as the co-ordinator.

Altogether, the IODP has capability provided by three scientific ocean drilling platforms: the non-riser *Joides Resolution* (or its replacement from 2007) provided by the USA; the Japanese drilling vessel *Chikyu* that has riser capability; as well as the mission-specific platforms (MSPs) provided by ECORD. As the name implies, MSPs are not single platforms or vessels, but will be selected on a case-by-case basis to best address each scientific problem. The appropriate platform is chosen to meet specific objectives defined on the basis of science prioritisation undertaken by the IODP Science Advisory Structure.

Arctic drilling in 2004

The first expedition for MSPs in the IODP was to the Arctic Ocean in 2004. For three weeks in August and September

The scientific and technical results of the IODP are all openly available; further details of the programme and its structure can be found at www.iodp.org and more details of ECORD are available from www.ecord.org.

Participation in IODP is open to any scientists from countries that are IODP members. Those from ECORD member countries (see www.ecord.org) should contact their national funding agencies or the ESSAC office (www.essac.ecord.org). Furthermore, after a period of one year, all samples may be accessed by any worker worldwide who has a justifiable reason for using the core (applications should be made via www.iodp.org).

2004, the Lomonosov Ridge was drilled to a depth of 440 m below the sea bed, an accomplishment not previously achieved in the Arctic sea ice. The sediments and rocks cored record the climatic history of the Arctic Ocean over the past 65 million years. This history could not previously be described due to lack of data, but the international team of scientists working on the core have established that the Arctic enjoyed a Mediterranean-type climate at the start of that period, and a great deal more new information will soon be published.



Heiko Palfus, IODP

The Sovetskiy Soyuz, the Oden and the Vidar Viking in operation during the Arctic Coring Expedition.



DP Hunter off the coast of Tahiti.

To carry out the drilling it was necessary for the drilling vessel, the *Vidar Viking*, to have icebreaker class, and for the vessel to be accompanied by two Arctic-class icebreakers, the 76 000 horsepower nuclear-powered *Sovetskiy Soyuz* and the diesel-powered *Oden*. The *Vidar Viking* required considerable modification, including the installation of a two-metre-diameter moonpool, and a complete drilling system installed by the drilling contractors, Seacore Ltd from Cornwall.

Crucial to the success of the operation were both the ice-management and fleet-management teams that were based on the *Oden*, as well as the input of a range of experts on Arctic operations that were organised for ESO by the Swedish Polar Research Secretariat.

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A warmer location in 2005

The second MSP expedition took place in a very different environment — the

tropical coral reefs of Tahiti. The drilling vessel, the *DP Hunter* sailed from Papeete with a full ESO crew and party of international scientists. The expedition lasted seven weeks, and the drilling contractors were again Seacore Ltd. Living reefs are very sensitive ecosystems, and great care was taken to minimise the impact of drilling.

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Coral reefs are excellent sea-level indicators as their growth keeps pace with sea-level rise. This means that the details of the rise of about 120 m in sea level during the most recent deglaciation can be ascertained in a tectonically inactive reef setting located far away from glaciated regions. This can be done by studying core recovered from successive reef terraces seaward of the living barrier reef. Determining the rate at which sea level rose at that time is important as it provides an indication of the rate at which sea level could rise with global warming and melting ice sheets.

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UK participation in IODP

The UK’s participation in the IODP is funded by the NERC. The UK-IODP is charged with directing and managing a national thematic programme of relevance to our scientific community. As part of this responsibility the NERC funds a UK-IODP Science Co-ordinator, a post that has to date been based at the BGS and is currently held by Heather Stewart at the Edinburgh Office.

The IODP is a unique scientific endeavour. One of the more unusual aspects is the opportunity it presents for people at all stages of their careers to be involved. For UK scientists, applications to participate in IODP expeditions are submitted to the ECORD Science Support Advisory Committee (ESSAC). Anyone interested in participating in an IODP expedition is encouraged to consult the

IODP website for details of upcoming expeditions and submit their application to both ESSAC (essac@cardiff.ac.uk) and the UK-IODP Science Coordinator (ukiodp@bgs.ac.uk).

To support UK membership in the IODP, the NERC has established a Directed Science Programme to enable UK scientists to carry out the best and highest priority IODP science using material from drilling legs, and to allow UK scientists to capitalise on the results of IODP drilling. For more information on funding opportunities through UK-IODP please contact the Science Coordinator.

If you would like any further information or advice please contact the Science Coordinator Heather Stewart (ukiodp@bgs.ac.uk) and see the UK-IODP website (www.ukiodp.bgs.ac.uk).