



**PROCEEDINGS OF THE
INTEGRATED OCEAN
DRILLING PROGRAM
VOLUME 303/306 EXPEDITION REPORTS
NORTH ATLANTIC CLIMATE**

Expeditions 303 and 306 of the riserless drilling platform
St. John's, Newfoundland, to Ponta Delgada, Azores
Sites U1302–U1308

25 September–17 November 2004
and

Ponta Delgada, Azores, to Dublin, Ireland
Sites U1312–U1315

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Abbreviations for names of organizations and publications in IODP reference lists follow the style given in *Chemical Abstracts Service Source Index* (published by American Chemical Society).

The bulk of the shipboard-collected core data from this expedition is accessible from Integrated Ocean Drilling Program U.S. Implementing Organization (IODP-USIO) Science Services, Texas A&M University (TAMU), at iodp.tamu.edu/database/index.html. If you cannot access this site or need additional data, please contact:

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Some close-up core photographs have been tonally enhanced to better illustrate particular features of interest. Cover photograph, by William Crawford, is of storm-force winds north of the Azores during Expedition 306.

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Foreword

By Integrated Ocean Drilling Program Management International, Inc.

The Integrated Ocean Drilling Program (IODP) is the most ambitious ocean exploration and drilling program ever undertaken. With multiple platforms and multiple partners, our research spans the globe and truly represents international collaboration and diplomacy among scientists and nations interested in attaining scientific goals.

The *Proceedings* present the scientific and engineering results of IODP drilling projects, each an important component of an international program designed to better understand Earth, its environmental changes and processes, the deep biosphere, and climate change.

The collective effort required to conduct each IODP expedition is colossal. Beginning with scientists who submit ocean drilling research proposals, there are others who evaluate, rank, and prioritize proposals. Scientists also schedule the science operations, select science party members from scores of international scientists qualified to participate, plan platform operations, ready the drillship, and choose borehole locations. There are onboard logistics to manage and critical communications to coordinate among various academic institutions, governments, and national science organizations. And the resulting data must be managed and made accessible to scientists, particularly those who will prepare future proposals. Every aspect of planning an IODP expedition takes a village—or several. There are many participants and many more stakeholders.

Ocean-drilling achievements, however complex, help us understand extraordinary linkages and interpret relationships as they exist in various parts of the Earth system. Achievements in two legacy drilling programs (the Ocean Drilling Program and Deep Sea Drilling Program) have validated the scientific concepts behind plate tectonics, contributed to the understanding of ocean circulation changes, and extended our knowledge of long- and short-term climate change—scientific information at the foundation of our current drilling program.

IODP drilling platform operations are conducted by three Implementing Organizations (IOs). Riserless platform operations are conducted by the JOI Alliance, comprising the Joint Oceanographic Institutions, Inc., Texas A&M University through the Texas A&M Research Foundation, and Lamont-Doherty Earth Observatory of Columbia University. Riser platform operations are conducted by the Japan Agency for Marine-Earth Science and Technology through Japan's Center for Deep Earth Exploration in cooperation with the Center for Advanced Marine Core Research at Kochi University. Mission-specific platform operations are conducted by the European Consortium for Ocean Research Drilling, Science Operator, comprising the British Geological Survey, Bremen University, and the European Petrophysics Consortium. The European IO currently represents the ocean-drilling efforts of 16 nations in Europe, plus Canada. At the start of this drilling project, IODP involved 20 nations.

The discoveries discovered in this volume build upon layers of knowledge and science developed over roughly the last fifty years. Expedition *Proceedings* are published by IODP Management International for IODP under the sponsorship of the U.S. National Science Foundation (NSF), Japan's Ministry of Culture, Education, Sports, Science and Technology, and other IODP members. The material is based upon research supported under Contract OCE-0432224 from NSF.

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These cruises would not have taken place without the cooperation of Greg Mountain (Rutgers University and Lamont-Doherty Earth Observatory of Columbia University), who led cruise KN166-14 (*Knorr*) in summer 2002, during which site survey data on the Eirik and Gardar Drifts were acquired. Bruce Malfait (National Science Foundation) guided the funding that made KN166-14 possible. Greg Mountain and Ryan Earley helped with the choice of sites on Eirik Drift, provided data from both the Eirik and Gardar Drifts, and responded generously to our numerous requests as Pollution Prevention and Safety Panel decisions affected site locations. Plots of multichannel seismic data that appear in Eirik and Gardar Drift site chapters were generated through their generous cooperation.

In August 2001, David Piper (Geological Survey of Canada) led a site survey cruise of the *Hudson* close to Orphan Knoll that provided site survey data for Sites U1302 and U1303 (Toews and Piper, 2002). David Piper was most helpful with the interpretation and display of these data.

Dan Quoidbach and the staff at the Lamont Databank were diligent in gathering other relevant site survey data and were always responsive to our requests.

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Listed above is a small fraction of the people who have contributed to the success of Expedition 303/306. The science parties are cognizant of, and thankful for, the many behind-the-scenes contributors that turn scientific ideas into scientific production through the international efforts of IODP.

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Core descriptions

Visual core descriptions (VCDs), smear slide data tables, and digital images are included in this section. VCDs and smear slide data tables are combined into one PDF file for each site.

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Data reports

Titles are available in [HTML](#) pending completion of the volume.

Syntheses

Titles are available in [HTML](#) pending completion of the volume.

Supplementary material

Expanded coring summary tables are presented as supplementary material in Excel 97/98 spreadsheet format. Images in TIFF format of nannofossil species, sediment samples, and smear slide photomicrographs are also presented as supplementary material. See [README.TXT](#) in the SUPP_MAT directory for a full listing of directories and files, or see the [Directory structure](#) for the names of the main subdirectories.

Drilling location maps

A site map showing the drilling locations for this expedition and maps showing the drilling locations of all Integrated Ocean Drilling Program (IODP), Ocean Drilling Program (ODP), and Deep Sea Drilling Project (DSDP) drilling sites are available in PDF format. These maps were produced using Generic Mapping Tools (GMT) of Paul Wessel and Walter H.F. Smith (gmt.soest.hawaii.edu).

[IODP Expedition 303/306 site map](#)

[IODP map](#) (Expeditions 301–312)

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