Proceedings of the Integrated Ocean Drilling Program

Volume 304/305 Expedition Reports

Oceanic Core Complex Formation, Atlantis Massif

Expeditions 304 and 305 of the riserless drilling platform
from and to Ponta Delgada, Azores (Portugal)
Sites U1309–U1311
17 November 2004–7 January 2005
and
from and to Ponta Delgada, Azores (Portugal)
Site U1309
7 January–2 March 2005

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Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the participating agencies, Integrated Ocean Drilling Program Management International, Inc. (IODP-MI), or the Integrated Ocean Drilling Program Implementing Organizations.

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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A complete set of the logging data collected by ODP-USIO Science Services, Lamont-Doherty Earth Observatory (LDEO), is available at **iodp.ldeo.columbia.edu/DATA/IODP/**. If you have problems downloading the data, wish to receive additional logging data, or have questions regarding the 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 the Expedition 304/305 Scientists, is a photomicrograph of a thin section of fresh olivine and plagioclase in olivine-rich troctolite.

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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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*At time of expedition.

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Acknowledgments

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On shore, contributions came from nonsailing coproponents (John Collins, Gretchen Früh-Green, and Monique Seyler) and colleagues on earlier work in the area (Joe Cann, Jeff Karson, and Deb Kelley), whose efforts helped provide the context and motivation for IODP drilling at Atlantis Massif.

Contents

Expedition reports

Chapters

Core descriptions

Visual core descriptions (VCDs), thin section data tables, and digital images are included in this section. VCDs and thin section data tables are included in PDF files for each site. There are four VCD files and one thin section file for Site U1309, and Sites U1310 and U1311 have one file each for VCDs and thin sections.

Site U1309

Visual core descriptions · Thin sections

Site U1310

Visual core descriptions · Thin sections

Site U1311

Visual core descriptions · Thin sections

Expedition research results

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

Supplementary material for this volume includes expanded coring summary tables, Formation MicroScanner data, geochemistry data, glass log, igneous petrology logs, alteration logs, vein logs, microbiology logs, metamorphic petrology logs, thin section metadata, paleomagnetism data, thin section photo sheets, physical property data, and structure logs. 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 304/305 site map

IODP map (Expeditions 301–312)

ODP map (Legs 100–210)

DSDP map (Legs 1–96)

Expedition-related bibliography

IODP publications

Scientific Prospectus

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