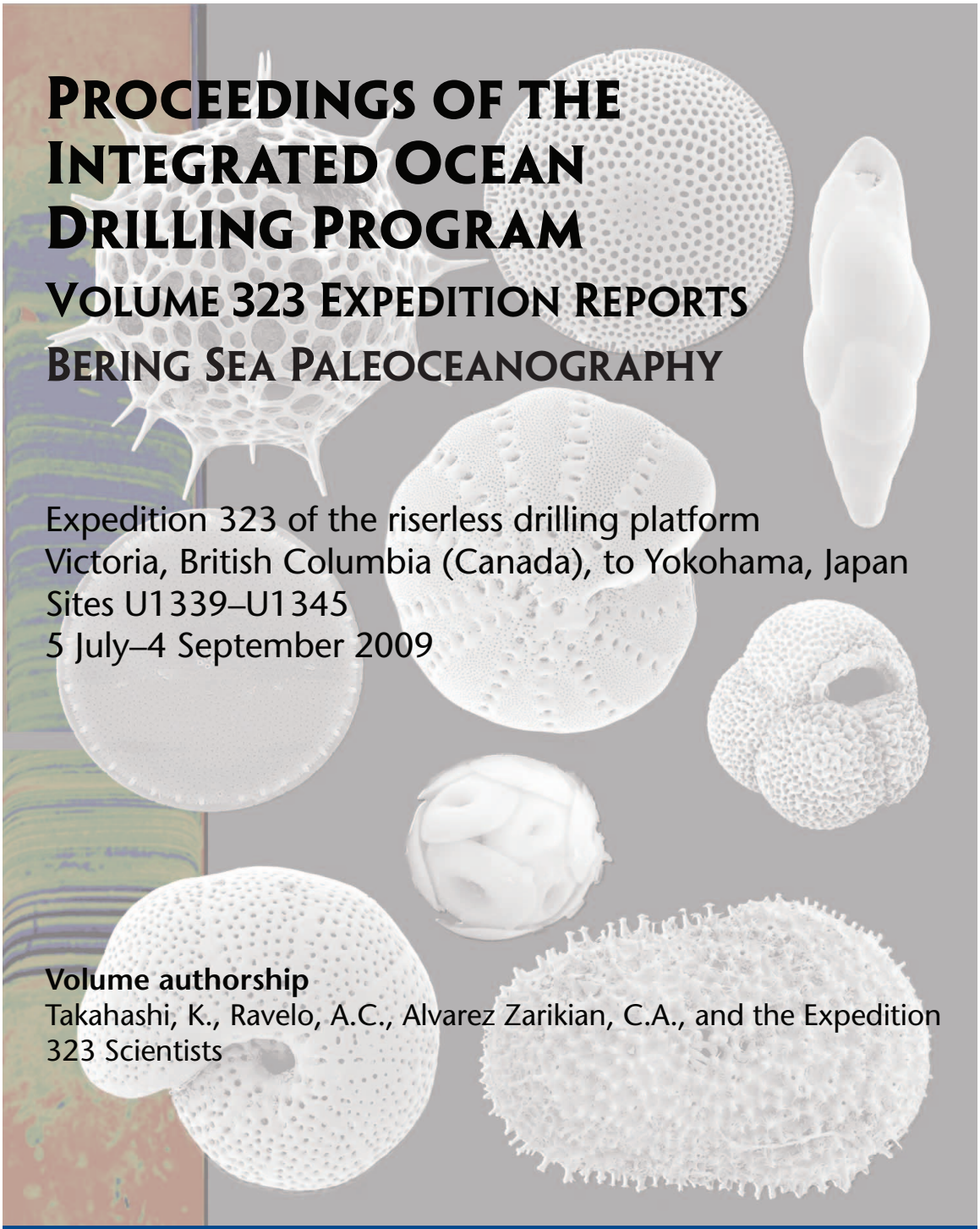
Proceedings of the Integrated Ocean Drilling Program

Volume 323 Expedition Reports

Bering Sea Paleoceanography



Expedition 323 of the riserless drilling platform
Victoria, British Columbia (Canada), to Yokohama, Japan
Sites U1339–U1345
5 July–4 September 2009

Volume authorship
Takahashi, K., Ravelo, A.C., Alvarez Zarikian, C.A., and the Expedition 323 Scientists

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Korea Institute of Geoscience and Mineral Resources (KIGAM)

Australian Research Council (ARC) and New Zealand Institute for Geological and Nuclear Sciences (GNS), Australian/New Zealand Consortium

Ministry of Earth Sciences (MoES) India

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, IODP Management International, Inc., Consortium for Ocean Leadership, Lamont-Doherty Earth Observatory of Columbia University, Texas A&M University, or Texas A&M Research Foundation.

Examples of how to cite this volume or part of this volume are available at **publications.iodp.org/proceedings/323/323bib.htm**.

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:

Data Librarian, Integrated Ocean Drilling Program, Texas A&M University,
1000 Discovery Drive, College Station TX 77845-9547, USA. Tel: (979) 845-8495; Fax: (979) 458-1617;
E-mail: **database@iodp.tamu.edu**

A complete set of the logging data collected by IODP-USIO Science Services, Lamont-Doherty Earth Observatory (LDEO), is available at **brg.ldeo.columbia.edu/logdb/.** If you have problems downloading the data, wish to receive additional logging data, or have questions regarding the data, please contact:

Database Administrator, Borehole Research Group, Lamont-Doherty Earth Observatory of Columbia University, PO Box 1000, 61 Route 9W, Palisades NY 10964, USA. Tel: (845) 365-8343; Fax: (845) 365-3182;
E-mail: **logdb@ldeo.columbia.edu**

Supplemental data were provided by the authors and may not conform to IODP publication formats.

Some close-up core photographs have been tonally enhanced to better illustrate particular features of interest. High-resolution images are available upon request.

Cover photograph shows Bering Sea microfossils: (clockwise from top left) diatom *Thalassiosira antarctica* Comber, a probable spumellarian radiolarian, benthic foraminifer *Bulimina exilis* Brady, planktonic foraminifer *Neogloboquadrina pachyderma* (Ehrenberg), ostracode *Henryhowella dasyderma* (Brady), benthic foraminifer *Melonis barleeanum* (Williamson), diatom *Thalassiosira hyalina* (Grunow), benthic foraminifer *Elphidium batialis* Saidova, and coccosphere *Coccolithus pelagicus* (Wallich). Diatom images by Jonaotaro Onodera. Image of coccosphere by Elena Colmenero-Hidalgo. All other images by Carlos Alvarez Zarikian. Far left: computed tomography scans of laminated core sections (courtesy of Alan Mix).

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Foreword

By Integrated Ocean Drilling Program Management International, Inc.

The Integrated Ocean Drilling Program (IODP) is now in the latter half of its decadal program (2003–2013). As envisioned in the Initial Science Plan (ISP), IODP expeditions take advantage of three scientific ocean drilling platforms that enable us to cover unprecedented areas of wide oceans, from ice-covered shallow water to full ocean depths. Drilling miles of depth below seafloor, now part of IODP capabilities, is the major advance from the program predecessors, the Deep Sea Drilling Project and the Ocean Drilling Program. The living Earth is a dynamic system that is continuously evolving. IODP seeks to understand this complex and unique system through scientific ocean drilling, sampling, and experimenting in deep holes, along with advancement of related scientific disciplines. IODP is an international collaboration among scientists and nations with keen aspirations to attain the scientific goals of the ISP. IODP currently includes participating members from 24 nations.

The *Proceedings* present the scientific and engineering results of IODP drilling projects, each designed to better understand the past, present, and future of the Earth system.

IODP expeditions begin with scientists who submit research drilling proposals to test new and innovative ideas, then the proposals progress to international scientific advisors (Science Advisory Structure) who nurture, 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. The science party, collectively and individually, conducts science on board and on shore. The co-chief scientists on each expedition are responsible for synthesizing the scientific results as hallmark of expedition.

Ocean-drilling achievements help us to understand and interpret phenomena in various parts of the Earth system. Achievements in the two legacy drilling programs 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. IODP is truly an expansion and extension of the scientific research conducted by the legacy programs, engaging in cutting-edge research concerning topics of global importance.

IODP drilling platform operations are conducted by three Implementing Organizations (IOs). Riserless platform operations are conducted by the U.S. Implementing Organization (USIO), comprising the Consortium for Ocean Leadership, 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 (ECORD) 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.

The discoveries presented 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 Education, Culture, 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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Federal Institute of Technology (ETH), Switzerland

Florida State University, USA

Hokkaido University, Japan

Liebniz, Institute of Marine Sciences (IFM-GEOMAR), University of Kiel, Germany

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University of Texas at Austin, USA

University of Tokyo, Japan

University of Washington, USA

Vrije Universiteit, The Netherlands

Woods Hole Oceanographic Institution, USA

*At time of expedition.

Implementing organizations

IODP European Implementing Organization: European Consortium for Ocean Research Drilling, Science Operator (ESO)

Web site: **www.eso.ecord.org/**

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Contents

Expedition reports

Chapters

Core descriptions

Visual core descriptions (VCDs), smear slide data tables, thin sections, and core images are included in this section. VCDs, smear slides, and thin sections are combined into PDF files for each site. The entire set of core images in PDF is available in the IMAGES directory.

Site U1342

Visual core descriptions · Smear slides · Thin sections

Site U1343

Visual core descriptions · Smear slides · Thin sections

Site U1344

Visual core descriptions · Smear slides · Thin sections

Site U1345

Visual core descriptions · Smear slides · Thin sections

Expedition research results

Data reports

Titles are available in HTML pending completion of the volume.

Syntheses

See "Syntheses" in the Expedition-related bibliography.

Supplementary material

Supplementary material for this volume includes smear slide and thin section data in PDF format, XRD data in Adobe Illustrator and Excel formats, and XRD abbreviation key in Word format. Multichannel seismic data in SEG-Y format are included for Sakamoto et al. (2011). 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 323 site map

IODP map (Expeditions 301–316, 319–321, and 323)

ODP map (Legs 100–210)

DSDP map (Legs 1–96)

Expedition-related bibliography

IODP publications

Scientific Prospectus

Takahashi, K., Ravelo, A.C., and Alvarez Zarikian, C.A., 2009. Pliocene–Pleistocene paleoceanography and climate history of the Bering Sea. *IODP Sci. Prosp.,* 323. **doi:10.2204/iodp.sp.323.2009**

Preliminary Report

Expedition 323 Scientists, 2010. Bering Sea paleoceanography: Pliocene–Pleistocene paleoceanography and climate history of the Bering Sea. *IODP Prel. Rept.,* 323. **doi:10.2204/iodp.pr.323.2010**

Scientific Drilling journal*

Pending

Proceedings volume

Takahashi, K., Ravelo, A.C., Alvarez Zarikian, C.A., and the Expedition 323 Scientists, 2011. *Proc. IODP,* 323: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). **doi:10.2204/iodp.proc.323.2011**

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Expedition 323 Scientists, 2011. Site U1340. *In* Takahashi, K., Ravelo, A.C., Alvarez Zarikian, C.A., and the Expedition 323 Scientists, *Proc. IODP,* 323: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). **doi:10.2204/iodp.proc.323.104.2011**

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