



**PROCEEDINGS OF THE
INTEGRATED OCEAN
DRILLING PROGRAM
VOLUME 327 EXPEDITION REPORTS
JUAN DE FUCA RIDGE-FLANK
HYDROGEOLOGY**

Expedition 327 of the riserless drilling platform
from and to Victoria, British Columbia (Canada)
Sites U1362, U1301, 1027, and U1363
5 July–5 September 2010

Volume authorship

Fisher, A.T., Tsuji, T., Petronotis, K., and the Expedition 327 Scientists

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Ministry of Earth Sciences (MoES) India

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Examples of how to cite this volume or part of this volume are available at publications.iodp.org/proceedings/327/327bib.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 core photographs have been tonally enhanced to better illustrate particular features of interest. High-resolution images are available upon request.

Cover photograph shows Hole U1362A CORK on the rig floor of the *JOIDES Resolution*. Photograph by Bill Crawford.

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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 (ESO), comprising the British Geological Survey, the University of Bremen, 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) Zurich,
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Florida State University, USA

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University of Southampton, National Oceanography
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University of Texas at Austin, USA

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*At time of expedition.



Implementing organizations

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IODP Japanese Implementing Organization: Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

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Contents

Expedition reports

Chapters

[Expedition 327 summary](#)

Expedition 327 Scientists

[Methods](#)

Expedition 327 Scientists

[Site U1362](#)

Expedition 327 Scientists

[Site U1301](#)

Expedition 327 Scientists

[Site 1027](#)

Expedition 327 Scientists

[Site U1363](#)

Expedition 327 Scientists

[Preparation and injection of fluid tracers during IODP Expedition 327, eastern flank of Juan de Fuca Ridge](#)

A.T. Fisher, J. Cowen, C.G. Wheat, and J.F. Clark

[Design, deployment, and status of borehole observatory systems used for single-hole and cross-hole experiments, IODP Expedition 327, eastern flank of Juan de Fuca Ridge](#)

A.T. Fisher, C.G. Wheat, K. Becker, J. Cowen, B. Orcutt, S. Hulme, K. Inderbitzen, A. Haddad, T.L. Pettigrew, E.E. Davis, H. Jannasch, K. Grigar, R. Aduddell, R. Meldrum, R. Macdonald, and K.J. Edwards

[Fluid sampling from oceanic borehole observatories: design and methods for CORK activities \(1990–2010\)](#)

C.G. Wheat, H.W. Jannasch, M. Kastner, S. Hulme, J. Cowen, K.J. Edwards, B.N. Orcutt, and B. Glazer

Core descriptions

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

Site U1362

[Visual core descriptions](#) · [Thin sections](#) · [Vein log](#)

Site U1363

[Visual core descriptions](#) · [Smear slides](#)

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 Hole U1362A alteration log in Excel format, 360° composite image of 327-U1362A-18R whole-round sections in TIF format, photographs of microbiology whole-round samples in PDF format, underwater VIT footage of selected Site U1362 operations in QuickTime format, CORK animation in QuickTime format, CORK assembly footage in MPEG4 format, overview of CORKs and scientific objectives in QuickTime format, selected thin section photomicrographs in TIF format, and Hole U1362A vein log in Excel format (PDF included in “[Core descriptions](#)”). 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.

Engineering drawings of Hole U1362A and U1362B CORK configurations in PDF format are included for Fisher, Wheat, et al. (2011).

CAD drawings of CORK components in PDF format are included for Wheat et al. (2011).

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 327 site map](#)

[IODP map](#) (Expeditions 301–327)

[ODP map](#) (Legs 100–210)

[DSDP map](#) (Legs 1–96)



Expedition-related bibliography

IODP publications

Scientific Prospectus

Fisher, A.T., Tsuji, T., and Gamage, K., 2010. Juan de Fuca Ridge-Flank Hydrogeology: the hydrogeologic architecture of basaltic oceanic crust: compartmentalization, anisotropy, microbiology, and crustal-scale properties on the eastern flank of Juan de Fuca Ridge, eastern Pacific Ocean. *IODP Sci. Prosp.*, 327. doi:10.2204/iodp.sp.327.2010

Preliminary Report

Expedition 327 Scientists, 2010. Juan de Fuca Ridge-flank hydrogeology: the hydrogeologic architecture of basaltic oceanic crust: compartmentalization, anisotropy, microbiology, and crustal-scale properties on the eastern flank of Juan de Fuca Ridge, eastern Pacific Ocean. *IODP Prel. Rept.*, 327. doi:10.2204/iodp.pr.327.2010

*Scientific Drilling journal**

Pending

Proceedings volume

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Fisher, A.T., Wheat, C.G., Becker, K., Cowen, J., Orcutt, B., Hulme, S., Inderbitzen, K., Haddad, A., Pettigrew, T.L., Davis, E.E., Jannasch, H., Grigar, K., Aduddell, R., Meldrum, R., Macdonald, R., and Edwards, K.J., 2011. Design, deployment, and status of borehole observatory systems used for single-hole and cross-hole experiments, IODP Expedition 327, eastern flank of Juan de Fuca Ridge. In Fisher, A.T., Tsuji, T., Petronotis, K.,

and the Expedition 327 Scientists, *Proc. IODP, 327*: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). [doi:10.2204/iodp.proc.327.107.2011](https://doi.org/10.2204/iodp.proc.327.107.2011)

Wheat, C.G., Jannasch, H.W., Kastner, M., Hulme, S., Cowen, J., Edwards, K.J., Orcutt, B.N., and Glazer, B., 2011. Fluid sampling from oceanic borehole observatories: design and methods for CORK activities (1990–2010). *In* Fisher, A.T., Tsuji, T., Petronotis, K., and the Expedition 327 Scientists, *Proc. IODP, 327*: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). [doi:10.2204/iodp.proc.327.109.2011](https://doi.org/10.2204/iodp.proc.327.109.2011)

Syntheses*

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Journals/Books*

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Conferences*

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Directory structure*

327.PDF (Preliminary pages and table of contents)			
README.TXT (Information about the Expedition Reports DVD-ROM)			
ACROREAD (Acrobat Reader installation software and instructions for different platforms)	MAC_OS WINDOWS UNIX README.TXT		
EXP_REPT (Expedition Reports section of Proc. IODP, 327)	CHAPTERS (Expedition Reports chapters)	327_101.PDF (Expedition 327 summary) 327_102.PDF (Methods) 327_103.PDF (Site U1362) 327_104.PDF (Site U1301) 327_105.PDF (Site 1027) 327_106.PDF (Site U1363) 327_107.PDF (CORK design, deployment, and status) 327_108.PDF (Fluid tracer preparation and injection) 327_109.PDF (CORK fluid sampling)	
	CORES (Visual core descriptions, smear slide data tables, thin sections, vein log, and digital core images)	CORU1362.PDF (Site U1362) CORU1363.PDF (Site U1363) U1362_TS.PDF (Site U1362 thin sections) U1362_VL.PDF (Site U1362 vein log) U1363_SS.PDF (Site U1363 smear slides) IMAGES (PDF files of core images)	
	OVERSIZE (Large-format file of data table)	327_106 (Site U1363 file)	
	SUPP_MAT (Supplementary material)	327_107 (Engineering drawings)	COMPLTN (Fisher, Wheat et al. files)
		327_109 (CAD drawings)	CORK (Wheat et al. files)
		ALTLOG (Hole U1362A alteration log)	U1362A_ALTLOG.XLSX
		CORE18R (Composite core images)	U1362A (Site U1362 files)
		MICROBIO (Microbiology whole-round samples)	U1362 (Site U1362 files) U1363 (Site U1363 files)
		MOVIES (Animation, videos, and underwater footage)	327_CORK_ANIMATION.MOV 327_CORK_ASSEMBLY.M4V 327_CORK_SCIENCE.MOV 327_VIT.MOV
		PHOTOMIC (Thin section photomicrographs)	U1362 (Site U1362 files)
		VEINLOG (Hole U1362A vein log)	U1362A_VEINLOG.XLS
		README.TXT	
		MAPS (Drilling location maps)	327_MAP.PDF (Expedition 327 site map)
	IODPMAP.PDF (IODP map, Expeditions 301–327)		
	ODPMAP.PDF (ODP map, Legs 100–210)		
DSDPMAP.PDF (DSDP map, Legs 1–96)			
QUICKTIME (Quicktime installation software and instructions for different platforms)	MAC_OS		
	WINDOWS		
	README.TXT		

*Directory structure reflects the Expedition Reports content and volume material produced on DVD-ROM.

