

Proceedings of the International Ocean Discovery Program

Volume 357

Atlantis Massif Serpentinization and Life

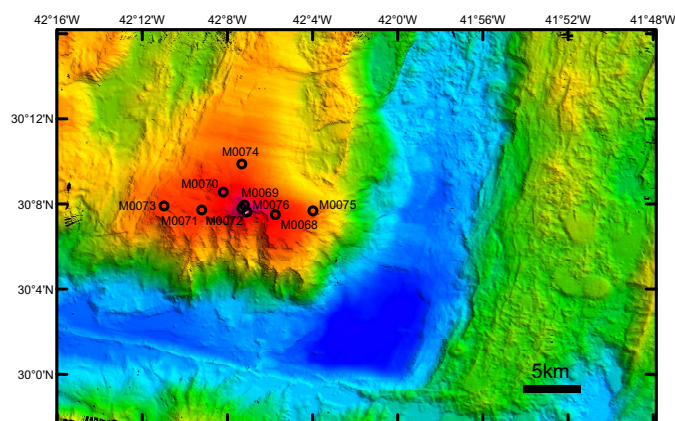
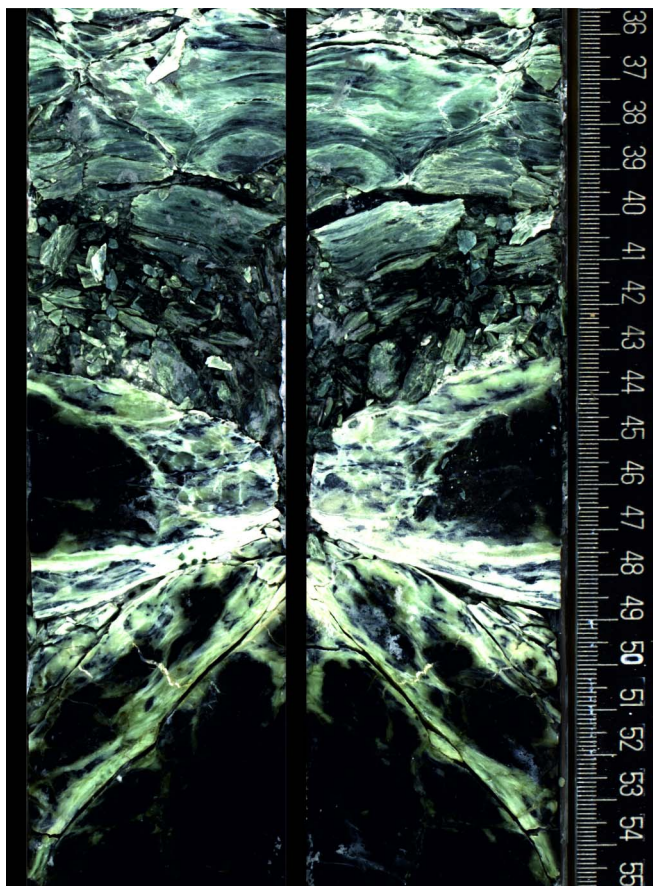
Expedition 357 of the mission-specific drilling platform
from and to Southampton, United Kingdom

Sites M0068–M0076

26 October–11 December 2015

Volume authorship

Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., and the Expedition 357 Scientists



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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 or TAMU.

IODP mission-specific platform data are accessible at <http://iodp.wdc-mare.org>. If you cannot access this site or need additional data, please contact Data Librarian, WDC-MARE/PANGAEA, University of Bremen, Marum, Leobener Strasse, 28359 Bremen, Germany. Tel: (40) 421-218-65592; Fax: (49) 421-218-65505.

A complete set of the logging data collected during the expedition is available at <http://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; Email: logdb@ldeo.columbia.edu.

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

ESO expedition photos are the property of IODP and are in the public domain.

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

Cover photograph shows a unit of talc-amphibole-chlorite schist overlying a unit of serpentinized dunite with sheared zones of talc-tremolite metasomatism (Core 357-M0072B-6R-1). Photo credit: IODP ESO.

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Core descriptions

Visual core descriptions (VCDs) and thin sections are combined into PDF files for each region. The entire set of core images in PDF is available in the IMAGES directory.

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Visual core descriptions · Thin sections

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Visual core descriptions · Thin sections

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Visual core descriptions · Thin sections

Supplementary material

Supplementary material for the Volume 357 expedition reports includes core description logs in Microsoft Excel, handwritten VCDs in PDF, scan images in JPG format, thin section images in TIFF and JPG formats, XRD data in Microsoft Excel and CSV format, drill videos in AVI format, geochemistry data in Microsoft Excel and JPG format, microbiology data in JPG format, and sensor data in PDF and a variety of native formats. A full list of directories can be found in SUPP_MAT in the volume zip folder or on the [Supplementary material for Volume 357 expedition reports](#) web page.

Expedition research results

Data reports

Titles are available in [HTML](#).

Syntheses

Titles are available in [HTML](#).

Drilling location maps

A site map showing the drilling locations for this expedition and maps showing the drilling locations of all International Ocean Discovery Program (IODP), produced using QGIS (<http://www.qgis.org>), and Integrated Ocean Drilling Program, Ocean Drilling Program (ODP), and Deep Sea Drilling Project (DDP) expeditions, produced using Generic Mapping Tools (GMT) of Paul Wessel and Walter H.F. Smith (<http://gmt.soest.hawaii.edu>), are available in PDF.

[IODP Expedition 357 site map](#)

[IODP map](#) (Expeditions 349–357 and 359)

[Integrated Ocean Drilling Program map](#) (Expeditions 301–348)

[ODP map](#) (Legs 100–210)

[DDP map](#) (Legs 1–96)

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Foreword

The International Ocean Discovery Program (IODP) represents the latest incarnation of almost five decades of scientific ocean drilling excellence and is generally accepted as the most successful international collaboration in the history of the Earth sciences. IODP builds seamlessly on the accomplishments of previous phases: the Deep Sea Drilling Project, Ocean Drilling Program, and Integrated Ocean Drilling Program. The 2013–2023 IODP Science Plan (*Illuminating Earth's Past, Present, and Future*) defines four themes and thirteen challenges for this decade of scientific ocean drilling that are both of fundamental importance in understanding how the Earth works and of significant relevance to society as the Earth changes, at least in part in response to anthropogenic forcing. This phase of IODP represents a renewed level of international collaboration in bringing diverse drilling platforms and strategies to increasing our understanding of climate and ocean change, the deep biosphere and evolution of ecosystems, connections between Earth's deep processes and surface manifestations, and geologically induced hazards on human timeframes.

The *Proceedings of the International Ocean Discovery Program* presents the scientific and engineering results of IODP drilling projects, expedition by expedition. As in the preceding Integrated Ocean Drilling Program, expeditions in the new IODP are conducted by three implementing organizations, each providing a different drilling capability. These are the US Implementing Organization (USIO; through September 2014) and the *JOIDES Resolution* Science Operator (JRSO; as of October 2014), providing the leased commercial vessel *JOIDES Resolution* for riserless drilling operations; JAMSTEC's Center for Deep Earth Exploration (CDEX), providing the drillship *Chikyu* for riser and occasional riserless operations; and the European Consortium for Ocean Research Drilling (ECORD) Science Operator (ESO), providing "mission-specific" platforms (MSPs) for expeditions that extend the IODP operational range where neither drillship is suitable, for example, in polar environments and in shallow waters. Scheduling decisions for each capability are made by three independent Facility Boards, each of which includes scientists, operators, and platform funding partners: the *JOIDES Resolution* Facility Board (JRFB), *Chikyu* IODP Board (CIB), and ECORD Facility Board (EFB). At the beginning of the new IODP, the three Facility Boards agreed to utilize Publication Services at the USIO and now the JRSO for production of all expedition *Proceedings* volumes and reports.

The new IODP differs from prior scientific ocean drilling programs in that it has neither a central management organization nor commingled funding for program-wide activities. Yet, this phase of IODP retains a fundamental integrative structural element: a "bottom-up" evaluation of all proposals for drilling expeditions by a single advisory structure composed of scientists representing all international program partners. International scientists may submit drilling proposals to the Science Support Office; all submitted proposals are then evaluated by a Science Evaluation Panel in the context of the Science Plan.

The new IODP also has a second internationally integrative level for high-level discussion and consensus-building: the IODP Forum. The Forum is charged with assessing program-wide progress toward achieving the Science Plan. At present, IODP involves 26 international financial partners, including the United States, Japan, an Australia/New Zealand consortium (ANZIC), Brazil, China, India, South Korea, and the eighteen members of ECORD (Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Israel, Italy, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom). This enhanced membership in the new IODP represents a remarkable level of international collaboration that remains one of the greatest ongoing strengths of scientific ocean drilling.

James A. Austin, Jr.
Chair, IODP Forum

International Ocean Discovery Program

JOIDES Resolution Science Operator

Website: <http://iodp.tamu.edu>

IODP JRSO

International Ocean Discovery Program
Texas A&M University
1000 Discovery Drive
College Station TX 77845-9547
USA
Tel: (979) 845-2673; Fax: (979) 845-4857
Email: information@iodp.tamu.edu

IODP JRSO Curation and Laboratories

IODP Gulf Coast Repository (GCR)
Texas A&M University
1000 Discovery Drive
College Station TX 77845-9547
USA
Tel: (979) 845-8490; Fax: (979) 845-1303
Email: rumford@iodp.tamu.edu

European Consortium for Ocean Research Drilling, Science Operator (ESO)

Website: <http://www.eso.ecord.org>

IODP ESO Coordinator: Science, Logistics, and Operations

British Geological Survey
The Lyell Centre
Research Avenue South
Edinburgh EH14 4AP
United Kingdom
Tel: (44) 131-667-1000; Fax: (44) 131-668-4140
Email: eso@bgs.ac.uk

IODP ESO Curation and Laboratories

IODP Bremen Core Repository (BCR)
Center for Marine Environmental Sciences (MARUM)
University of Bremen
Leobener Strasse
28359 Bremen
Germany
Tel: (49) 421-218-65560; Fax: (49) 421-218-98-65560
Email: bcr@marum.de

IODP ESO Petrophysics

European Petrophysics Consortium
Department of Geology
University of Leicester
Leicester LE1 7RH
United Kingdom
Tel: (44) 116-252-3611; Fax: (44) 116-252-3918
Email: sjd27@leicester.ac.uk

Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

Website: <http://www.jamstec.go.jp/chikyue>

IODP Japan Science Operator

Center for Deep Earth Exploration (CDEX)
Japan Agency for Marine-Earth Science and Technology
Yokohama Institute for Earth Sciences
3175-25 Showa-machi
Kanazawa-ku, Yokohama
Kanagawa 236-0001
Japan
Tel: (81) 45-778-5643; Fax: (81) 45-778-5704
Email: cdex@jamstec.go.jp

IODP Japan Curation and Laboratories

IODP Kochi Institute for Core Sample Research (KCC)
Japan Agency for Marine-Earth Science and Technology
200 Monobe Otsu
3175-25 Showa-machi
Nankoku City, Kochi 783-8502
Japan
Tel: (81) 88-864-6705; Fax: (81) 88-878-2192
Email: kcc.contact@jamstec.go.jp

Expedition 357 participants*

Expedition 357 scientists

Gretchen L. Früh-Green[†]

Co-Chief Scientist (Metamorphic Petrologist)

Institute of Geochemistry and Petrology
ETH Zürich
Clausiusstrasse 25, NW E 76.2
CH-8092 Zürich
Switzerland
frueh-green@erdw.ethz.ch

Beth N. Orcutt[†]

Co-Chief Scientist (Microbiologist)

Bigelow Laboratory for Ocean Sciences
60 Bigelow Drive
PO Box 380
East Boothbay ME 04544
USA
borcutt@bigelow.org

Sophie Green

Expedition Project Manager

ECORD Science Operator
British Geological Survey
The Lyell Centre
Research Avenue South
Edinburgh EH14 4AP
United Kingdom
soph@bgs.ac.uk

Carol Cotterill[†]

Expedition Project Manager

ECORD Science Operator
British Geological Survey
The Lyell Centre
Research Avenue South
Edinburgh EH14 4AP
United Kingdom
cjcott@bgs.ac.uk

Sally Morgan[†]

Petrophysics Staff Scientist

European Petrophysics Consortium
Department of Geology
University of Leicester
University Road
Leicester LE1 7RH
United Kingdom
sm509@le.ac.uk

Norikatsu Akizawa

Igneous Petrologist

Kanazawa University
Department of Earth Sciences
Kakuma
Kanazawa, Ishikawa
920-1192
Japan
nori.plus.x@gmail.com

Present address:

Kyoto University
Graduate School of Human and Environmental Studies
Yashida—Nihoumatsu
Sakyo, Kyoto
6068501
Japan
akizawa.norikatsu.2x@kyoto-u.ac.jp

Gaye Bayrakci[†]

Physical Properties Specialist/Geophysicist

Ocean and Earth Science
National Oceanography Centre Southampton
University of Southampton
Southampton
United Kingdom
G.Bayrakci@soton.ac.uk

Jan-Hinrich Behrmann

Physical Properties Specialist

GEOMAR Helmholtz Centre for Ocean Research Kiel
Wischhofstrasse 1-3
24148 Kiel
Germany
jbehrmann@geomar.de

Emilio Herrero-Bervera

Paleomagnetist

University of Hawaii at Manoa
SOEST-Hawaii Institute of Geophysics and Planetology (HIGP)
1680 East West Road POST 716
Honolulu HI 96822
USA
herrero@soest.hawaii.edu

Chiara Boschi

Metamorphic Petrologist

Institute of Geosciences and Earth Resources—CNR
Via Moruzzi 1
Pisa 56124
Italy
c.boschi@igg.cnr.it

*Addresses at time of expedition, except where updated by participants.

[†]Participated in shipboard and shore-based operations.

[‡]Participated in shipboard operations only.

William Brazelton

Microbiologist

University of Utah
257 South 1400 East, Room 201
Salt Lake City UT 84112-0840
USA
william.brazelton@utah.edu

Mathilde Cannat

Structural Geologist

Equipe de Géosciences Marines
Institut de Physique du Globe de Paris
Sorbonne Paris Cité
Univ Paris Diderot
UMR 7154 CNRS.1, rue Jussieu
75238 Paris Cedex 05
France
cannat@ipgp.fr

Kristina G. Dunkel

Physical Properties Specialist

Physics of Geological Processes
University of Oslo
Sem Sælands vei 24
0371 Oslo
Norway
kristina.dunkel@geo.uio.no

Javier Escartin

Structural Geologist

CNRS UMR 7154, IPGP
1 rue Jussieu
75005 Paris
France
escartin@ipgp.fr

Michelle Harris

Metamorphic Petrologist

Plymouth University
109 Fitzroy Building
Drake Circus
Plymouth
Devon PL4 8AA
United Kingdom
michelle.harris@plymouth.ac.uk

Kirsten Hesse

Igneous Petrologist

GeoZentrum Nordbayern, Lehrstuhl für Mineralogie
Friedrich-Alexander-University Erlangen-Nuremberg
Schlossgarten 5a
91054 Erlangen
Germany
kirsten.hesse@fau.de

Barbara John

Structural Geologist

Department of Geology and Geophysics
University of Wyoming
Laramie WY 82071
USA
bjohn@uwoyo.edu

Susan Q. Lang[†]

Organic Geochemist

Department of Earth and Ocean Sciences
University of South Carolina
701 Sumter Street EWS 617
Columbia SC 29208
USA
slang@geol.sc.edu

Marvin Lilley[†]

Fluid and Gas Geochemist

School of Oceanography
University of Washington
Box 355351
Seattle WA 98195
USA
lilley@uw.edu

Hai-Quan Liu

Geochemist

Key Laboratory of Marginal Sea Geology
Guangzhou Institute of Geochemistry
Chinese Academy of Sciences
Guangzhou
China
liuhaiquan@gig.ac.cn

Lisa Mayhew

Geochemist

Department of Geological Sciences
University of Colorado—Boulder
2200 Colorado Avenue
UCB 399
Boulder CO 80309
USA
lisa.mayhew@colorado.edu

Andrew McCaig

Structural Geologist

School of Earth and Environment
University of Leeds
University of Leeds
Leeds LS2 9JT
United Kingdom
a.m.mccaig@leeds.ac.uk

Benedicte Menez

Geomicrobiologist

Institut de Physique du Globe de Paris
1 rue Jussieu
75238 Paris Cedex 05
France
menez@ipgp.fr

Yuki Morono[†]

Microbiologist

Japan Agency for Marine-Earth Science and Technology
Kochi Institute for Core Sample Research
Monobe B200
Nankoku, Kochi
783-8502
Japan
morono@jamstec.go.jp

Marianne Quéménéur[†]

Microbiologist

Mediterranean Institute of Oceanography (MIO), UM110
163 avenue de Luminy
13288 Marseille Cedex 9
France
marianne.quemeneur@ird.fr

Amila Sandaruwan Ratnayake

Organic Geochemist

Shimane University
Faculty of Science and Engineering
1060 Nishikawatsu
Matsue
690-8504 Shimane
Japan
amilageopera@gmail.com

Stéphane Rouméjon

Metamorphic Petrologist

ETH Zurich
Institute of Geochemistry and Petrology
Sonneggstrasse 5
8092 Zurich
Switzerland
stephane.roumejon@erdw.ethz.ch

Matthew Schrenk[†]

Microbiologist

Michigan State University
288 Farm Lane, Room 144
East Lansing MI 48824
USA
schrenkm@msu.edu

Esther Schwarzenbach

Metamorphic Petrologist

Institute of Geological Sciences
Freie Universität Berlin
Malteserstrasse 74-100
12249 Berlin
Germany
esther.schwarzenbach@fu-berlin.de

Katrina Twing[†]

Microbiologist

Department of Biology
University of Utah
257 South 1400 East, Room 201
Salt Lake City UT 84112-0840
USA
katrina.twing@utah.edu

Dominique Weis

Geochemist

Earth, Ocean and Atmospheric Sciences
University of British Columbia
2020-2207 Main Mall
Vancouver BC V6T-1Z4
Canada
dweis@eos.ubc.ca

Scott Andrew Whattam

Igneous Petrologist

Korea University
Department of Earth and Environmental Sciences
Seoul 02-841
Republic of Korea
whattam@korea.ac.kr

Morgan Williams

Igneous Petrologist

Research School of Earth Sciences
The Australian National University
Building 142
Mills Road
Acton ACT 2601
Australia
Morgan.williams@anu.edu.au

Rui Zhao

Microbiologist

Centre for Geobiology, Department of Biology
University of Bergen
Allegaten 41
5007 Bergen
Norway
rui.zhao@bio.uib.no

Operational and technical staff

ECORD Science Operator personnel and technical representatives

David Smith*

Offshore Operations Manager

Ursula Röhl

Laboratory and Curation Manager/Onshore Operations Manager

Gareth Carter

Expedition Project Manager in-training (EPM in-training)

Walter Hale

Core Curator

Thomas Frederichs

ESO Paleomagnetist

Rhonda Kappler

Publications Specialist (JRSO)

Brit Kockisch

LECO Operator

Holger Kuhlmann*

Core Curator/Assistant Laboratory Manager

Erwan Le Ber

EPC Petrophysics Technician

Vera Lukies

ESO Petrophysics Technician

*Participated in shipboard and shore-based operations.

Mary Mowat
ESO Database Manager

Silvana Pape
Geochemistry Technician

Laurence Phillpot
EPC Petrophysics Technician

Luzie Schnieders*
ESO Geochemist

Janet Sherwin
EPC Petrophysics Technician

Christoph Vogt
XRD Specialist

Hans-Joachim Wallrabe-Adams*
ESO Data Manager

Alex Wülbers*
Core Curator/Logistics

BCR/MARUM, University of Bremen (temporary student assistants)

Roles included core handling, core splitting, sampling, data entry, and catering

Tobias Beck

Robert Büssing

Lars Feddeck

Lara Gebhard

Lara Jacobi

Verena Junge

Anna Quatmann-Hense

Nina Rohlf

Alexander Rösner

Jana Schroeder

Christopher Vogel

Julian Wecht

Jessica Zarnowski

Marc Zehnich

British Geological Survey (BGS) Rock Drill 2 (RD2)[†]

Iain Pheasant
RD2 shift leader

Michael Wilson
RD2 shift leader

Rodrigue Akkari
RD2 Team

Garry McGowan
RD2 Team

Joseph Hothersall
RD2 Team

Apostolos Tsiligiannis
RD2 Team

David Baxter
RD2 mobilization/demobilization only

Keith Gibson
RD2 mobilization/demobilization only

Alan Gillies
RD2 mobilization/demobilization only

MARUM, University of Bremen MeBo Seafloor Drill Rig[†]

Tim Freudenthal
MeBo Team Leader

Markus Bergenthal
MeBo Team

Siefke Froehlich
MeBo Team

Kai Kaszemeik
MeBo Team

Steffen Klar
MeBo Team

Thorsten Klein
MeBo Team

Kees Noorlander
MeBo Team

Werner Schmidt
MeBo Team

Marcus Kuhnert
MeBo Team

[†]Participated in shipboard operations only.

Royal Research Ship (RRS) *James Cook*[‡]

John Leask
Master

Stewart Mackay
Chief Officer

Nicholas Norrish
Second Officer

Samuel Vargas
Third Officer

John Haughton
Head Chef

Walter Link
Chef

Peter Robinson
Steward

Carl Piper
Assistant Steward

Robert Brett
Chief Engineer

Graham Bullimore
Purser

Noel Doherty
Third Engineer

IODP Publication Services staff[‡]

Douglas Cummings
Graphics Specialist II

Gudelia (“Gigi”) Delgado
Senior Publications Coordinator

Patrick H. Edwards
Production Specialist IV

Jaime A. Gracia
Supervisor of Production and Graphics

Jenni Hesse
Editor III

Rhonda Kappler
Graphics Specialist III

Shana C. Lewis
Editor III

Ginny Lowe
Reports Coordinator

Gary Slater
Third Engineer

Christopher Kemp
Second Engineer

Paul Damerall
Electrical Technical Officer

Jarrold Welton
Able Seaman

Shane Drury
Able Seaman

Nicholas Byrne
Able Seaman

Gerard Millar
Able Seaman

Steven Duncan
Petty Officer Deck

John Macdonald
Chief Petty Officer Science

Andrew Maclean
Chief Petty Officer Deck

Andrew Moore
Systems Support Technician

Amy McWilliams
Editor IV

Lorri Peters
Manager of Publication Services

Kenneth Sherar
Production Specialist III

Alyssa Stephens
Graphics Specialist III

Crystal Wolfe
Production Specialist III

Jean Wulfson
Graphics Specialist III

Ann Yeager
Distribution Specialist

[‡]At time of publication.

Expedition-related bibliography*

IODP publications

Scientific Prospectus

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<http://dx.doi.org/10.14379/iodp.sp.357.2015>

Preliminary Report

Früh-Green, G.L., Orcutt, B.N., Green, S., Cotterill, C., and the Expedition 357 Scientists, 2016. *Expedition 357 Preliminary Report: Atlantis Massif Serpentinization and Life*. International Ocean Discovery Program.
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Proceedings volume

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<http://dx.doi.org/10.14379/iodp.proc.357.2017>

Expedition reports

Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., Morgan, S., Akizawa, N., Bayrakci, G., Behrmann, J.-H., Boschi, C., Brazelton, W.J., Cannat, M., Dunkel, K.G., Escartin, J., Harris, M., Herrero-Bervera, E., Hesse, K., John, B.E., Lang, S.Q., Lilley, M.D., Liu, H.-Q., Mayhew, L.E., McCaig, A.M., Menez, B., Morono, Y., Quéméneur, M., Rouméjon, S., Sandaruwan Ratnayake, A., Schrenk, M.O., Schwarzenbach, E.M., Twing, K.I., Weis, D., Whattam, S.A., Williams, M., and Zhao, R., 2017. Expedition 357 summary. In Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., and the Expedition 357 Scientists, *Atlantis Massif Serpentinization and Life*. Proceedings of the International Ocean Discovery Program, 357: College Station, TX (International Ocean Discovery Program).
<http://dx.doi.org/10.14379/iodp.proc.357.101.2017>

Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., Morgan, S., Akizawa, N., Bayrakci, G., Behrmann, J.-H., Boschi, C., Brazelton, W.J., Cannat, M., Dunkel, K.G., Escartin, J., Harris, M., Herrero-Bervera, E., Hesse, K., John, B.E., Lang, S.Q., Lilley, M.D., Liu, H.-Q., Mayhew, L.E., McCaig, A.M., Menez, B., Morono, Y., Quéméneur, M., Rouméjon, S., Sandaruwan Ratnayake, A., Schrenk, M.O., Schwarzenbach, E.M., Twing, K.I., Weis, D., Whattam, S.A., Williams, M., and Zhao, R., 2017. Expedition 357 methods. In Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., and the Expedition 357 Scientists, *Atlantis Massif Serpentinization and Life*. Proceedings of the International Ocean Discovery Program, 357: College Station, TX (International Ocean Discovery Program).
<http://dx.doi.org/10.14379/iodp.proc.357.102.2017>

Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., Morgan, S., Akizawa, N., Bayrakci, G., Behrmann, J.-H., Boschi, C., Brazelton, W.J., Cannat, M., Dunkel, K.G., Escartin, J., Harris, M., Herrero-Bervera, E., Hesse, K., John, B.E., Lang, S.Q., Lilley, M.D., Liu, H.-Q., Mayhew, L.E., McCaig, A.M., Menez, B., Morono, Y., Quéméneur, M., Rouméjon, S., Sandaruwan Ratnayake, A., Schrenk, M.O., Schwarzenbach, E.M., Twing, K.I., Weis, D., Whattam, S.A., Williams, M., and Zhao, R., 2017. Eastern

sites. In Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., and the Expedition 357 Scientists, *Atlantis Massif Serpentinization and Life*. Proceedings of the International Ocean Discovery Program, 357: College Station, TX (International Ocean Discovery Program).

<http://dx.doi.org/10.14379/iodp.proc.357.103.2017>

Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., Morgan, S., Akizawa, N., Bayrakci, G., Behrmann, J.-H., Boschi, C., Brazelton, W.J., Cannat, M., Dunkel, K.G., Escartin, J., Harris, M., Herrero-Bervera, E., Hesse, K., John, B.E., Lang, S.Q., Lilley, M.D., Liu, H.-Q., Mayhew, L.E., McCaig, A.M., Menez, B., Morono, Y., Quéméneur, M., Rouméjon, S., Sandaruwan Ratnayake, A., Schrenk, M.O., Schwarzenbach, E.M., Twing, K.I., Weis, D., Whattam, S.A., Williams, M., and Zhao, R., 2017. Central sites. In Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., and the Expedition 357 Scientists, *Atlantis Massif Serpentinization and Life*. Proceedings of the International Ocean Discovery Program, 357: College Station, TX (International Ocean Discovery Program).

<http://dx.doi.org/10.14379/iodp.proc.357.104.2017>

Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., Morgan, S., Akizawa, N., Bayrakci, G., Behrmann, J.-H., Boschi, C., Brazelton, W.J., Cannat, M., Dunkel, K.G., Escartin, J., Harris, M., Herrero-Bervera, E., Hesse, K., John, B.E., Lang, S.Q., Lilley, M.D., Liu, H.-Q., Mayhew, L.E., McCaig, A.M., Menez, B., Morono, Y., Quéméneur, M., Rouméjon, S., Sandaruwan Ratnayake, A., Schrenk, M.O., Schwarzenbach, E.M., Twing, K.I., Weis, D., Whattam, S.A., Williams, M., and Zhao, R., 2017. Western sites. In Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., and the Expedition 357 Scientists, *Atlantis Massif Serpentinization and Life*. Proceedings of the International Ocean Discovery Program, 357: College Station, TX (International Ocean Discovery Program).

<http://dx.doi.org/10.14379/iodp.proc.357.105.2017>

Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., Morgan, S., Akizawa, N., Bayrakci, G., Behrmann, J.-H., Boschi, C., Brazelton, W.J., Cannat, M., Dunkel, K.G., Escartin, J., Harris, M., Herrero-Bervera, E., Hesse, K., John, B.E., Lang, S.Q., Lilley, M.D., Liu, H.-Q., Mayhew, L.E., McCaig, A.M., Menez, B., Morono, Y., Quéméneur, M., Rouméjon, S., Sandaruwan Ratnayake, A., Schrenk, M.O., Schwarzenbach, E.M., Twing, K.I., Weis, D., Whattam, S.A., Williams, M., and Zhao, R., 2017. Northern sites. In Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., and the Expedition 357 Scientists, *Atlantis Massif Serpentinization and Life*. Proceedings of the International Ocean Discovery Program, 357: College Station, TX (International Ocean Discovery Program).

<http://dx.doi.org/10.14379/iodp.proc.357.106.2017>

Supplementary material

Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., and the Expedition 357 Scientists, 2017. Supplementary material,
<http://dx.doi.org/10.14379/iodp.proc.357supp.2017>. Supplement to Früh-Green, G.L., Orcutt, B.N., Green, S.L., Cotterill, C., and the Expedition 357 Scientists, *Atlantis Massif Serpentinization and Life*. Proceedings of the International Ocean Discovery Program, 357: College Station, TX (International Ocean Discovery Program).
<http://dx.doi.org/10.14379/iodp.proc.357.2017>

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