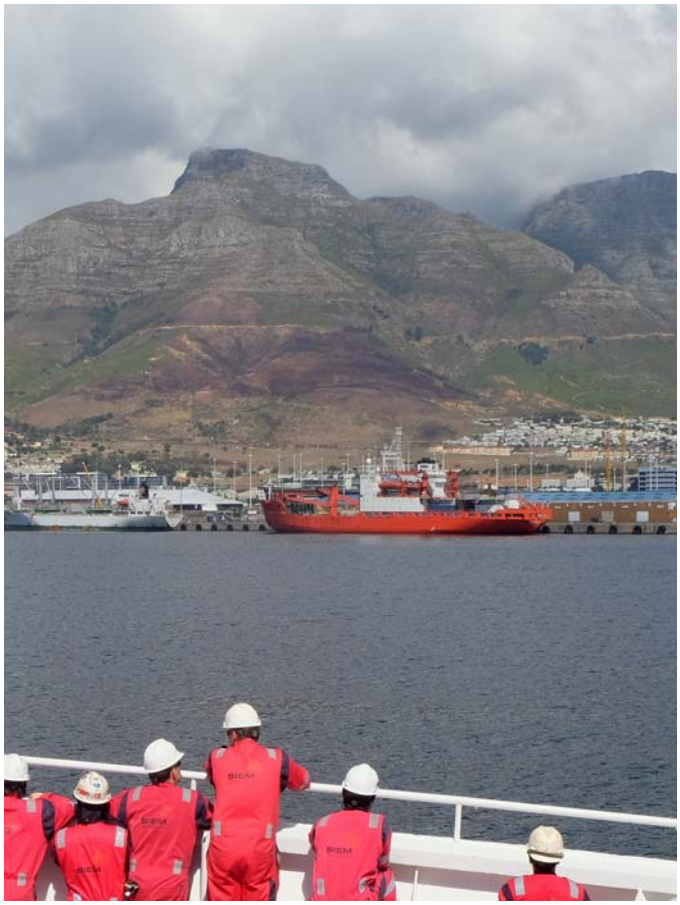
Proceedings of the International Ocean Discovery Program

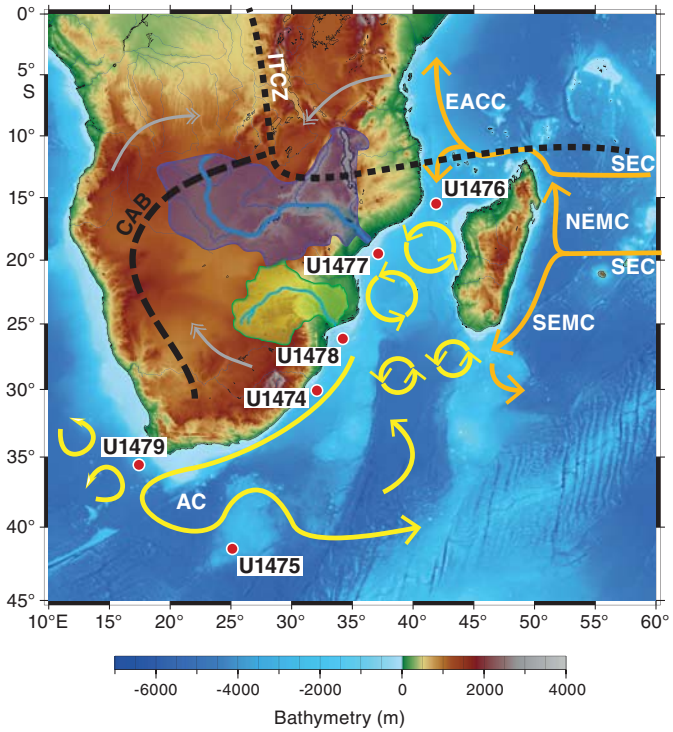
Volume 361

South African Climates (Agulhas LGM Density Profile)

Expedition 361 of the riserless drilling platform
Port Louis, Mauritius, to Cape Town, South Africa
Sites U1474–U1479
30 January–31 March 2016

Volume authorship
Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists





Published by
International Ocean Discovery Program

Publisher's notes

This publication was prepared by the *JOIDES Resolution* Science Operator (JRSO) at Texas A&M University (TAMU) as an account of work performed under the International Ocean Discovery Program (IODP). Funding for IODP is provided by the following international partners:

National Science Foundation (NSF), United States
Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan
European Consortium for Ocean Research Drilling (ECORD)
Ministry of Science and Technology (MOST), People's Republic of China
Korea Institute of Geoscience and Mineral Resources (KIGAM)
Australia-New Zealand IODP Consortium (ANZIC)
Ministry of Earth Sciences (MoES), India
Coordination for Improvement of Higher Education Personnel (CAPES), Brazil

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, TAMU, or Texas A&M Research Foundation.

The bulk of the shipboard-collected core data from this expedition is accessible at **http://iodp.tamu.edu/database/index.html**. If you cannot access this site or need additional data, please contact Data Librarian, International Ocean Discovery Program *JOIDES Resolution* Science Operator, Texas A&M University, 1000 Discovery Drive, College Station TX 77845-9547, USA. Tel: (979) 845-8495; Fax: (979) 458-1617; Email: **database@iodp.tamu.edu**.

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.

JRSO expedition photos are the property of IODP and are public access.

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

Cover photograph shows Tabletop Mountain, Cape Town, South Africa, with Siem crew in the foreground. Photo credit: Jens Gruetzner and IODP JRSO.

Copyright

Examples of how to cite this volume or part of this volume are available at **http://publications.iodp.org/proceedings/361/361title.html#bib**.

ISSN
World Wide Web: 2377-3189

Volume DOI
https://doi.org/10.14379/iodp.proc.361.2017

Publication date
30 September 2017

Contents

Expedition reports

Chapters

Expedition 361 summary
I.R. Hall et al.

Expedition 361 methods
I.R. Hall et al.

Site U1474
I.R. Hall et al.

Site U1475
I.R. Hall et al.

Site U1476
I.R. Hall et al.

Site U1477
I.R. Hall et al.

Site U1478
I.R. Hall et al.

Site U1479
I.R. Hall et al.

Core descriptions

Visual core descriptions (VCDs) are presented in PDF files for each site. Smear slides and/or thin sections are presented in PDF and/or CSV files for each site and/or hole (CSV files are available in the CORES directory). The entire set of core images in PDF is available in the IMAGES directory.

Site U1474
Visual core descriptions · Smear slides

Site U1475
Visual core descriptions · Smear slides

Site U1476
Visual core descriptions · Smear slides

Site U1477
Visual core descriptions · Smear slides

Site U1478
Visual core descriptions · Smear slides

Site U1479
Visual core descriptions · Smear slides

Supplementary material

Supplementary material for the Volume 361 expedition reports includes DESClogik workbooks in Microsoft Excel and *P*-wave logger technical report in Microsoft Word. A full list of directories can be found in SUPP_MAT in the volume zip folder or on the **Supplementary material for Volume 361 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) expeditions, produced using QGIS (**http://www.qgis.org**), and all Integrated Ocean Drilling Program, Ocean Drilling Program (ODP), and Deep Sea Drilling Project (DSDP) 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 361 site map
IODP map (Expeditions 349–357 and 359–361)
Integrated Ocean Drilling Program map (Expeditions 301–348)
ODP map (Legs 100–210)
DSDP map (Legs 1–96)

Dedication

The IODP Expedition 361 shipboard scientists dedicate this volume to Harry Elderfield for his contribution to advancing paleoceanography.

Acknowledgments

We are indebted to the captain, operations superintendent, offshore installation manager, shipboard personnel, laboratory officers, and laboratory technicians who sailed on the R/V *JOIDES Resolution* during IODP Expedition 361 for their dedication, "can do" attitude, and assistance with all aspects of coring, sampling, and shipboard laboratory measurements. Expedition 361 would not have happened without the vision, dedication, and enthusiasm of Professor Rainer Zahn, a lead proponent and driving force behind the scientific effort to drill in the challenging environment of the greater Agulhas Current system. Several research cruises to collect and analyze marine geophysical data and paleoceanographic samples have supported this project and have been funded through Natural Environment Research Council (NERC; RRS *Charles Darwin*, Cruise 154), EU Improving Human Potential Access to Major Research Infrastructures Programme (R/V *Marion Durfrense*, Cruise SWAF), Deutsche Forschungsgemeinschaft (DFG; R/V *Meteor*, Cruises M63/1 and M75/3; R/V *Petr Kottsov*, Cruise SETARAP), and EU Marie Curie Initial Training Network marine integrated studies in rapid climate and ocean change (GATEWAYS). We sincerely thank Professor Volkhard Spieß, Professor Gabriele Uenzelmann-Neben, and Dr. Benedict Preu for their invaluable help in the interpretation of the presite multichannel seismic survey data. The Publications staff at the IODP *JOIDES Resolution* Science Operator at TAMU are thanked for help with publication of this document. Finally, we thank the Science Evaluation Panel and the Environmental Protection and Safety Evaluation Panel for their support and advice in bringing the proposal to a successful completion.

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/chikyu/e**

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 361 participants*

Expedition 361 scientists

Ian R. Hall
Co-Chief Scientist
School of Earth and Ocean Sciences
Cardiff University
Main Building, Park Place
Cardiff Wales CF10 3AT
United Kingdom
hall@cardiff.ac.uk

Sidney R. Hemming
Co-Chief Scientist
Lamont-Doherty Earth Observatory
Columbia University
61 Route 9W
Palisades NY 10964
USA
sidney@ldeo.columbia.edu

Leah J. LeVay
Expedition Project Manager/Staff Scientist
International Ocean Discovery Program
Texas A&M University
1000 Discovery Drive
College Station TX 77845
USA
levay@iodp.tamu.edu

Stephen R. Barker
Stratigraphic Correlator
School of Earth and Ocean Sciences
Cardiff University
Main Building, Park Place
Cardiff Wales CF10 3AT
United Kingdom
barkers3@cf.ac.uk

Melissa A. Berke
Organic Geochemist
Department of Civil Engineering & Geological Sciences
University of Notre Dame
156 Fitzpatrick Hall
Notre Dame IN 46556
USA
mberke@nd.edu

Luna Brentegani
Paleontologist (nannofossils)
Earth and Environmental Sciences
University of Technology Queensland
Gardens Point Campus
Brisbane QLD 4000
Australia
luna.brentegani@qut.edu.au

Thibaut Caley
Sedimentologist
EPOC, UMR CNRS 5805
University of Bordeaux
Allee Geoffroy saint Hilaire
33615 Pessac
France
thibautcaley@gmail.com

Alejandra Cartagena-Sierra
Sedimentologist
Department of Civil Engineering & Geological Sciences
University of Notre Dame
125 Fitzpatrick Hall
Notre Dame IN 46556
USA
acartage@nd.edu

Christopher D. Charles
Stratigraphic Correlator
Scripps Institution of Oceanography
University of California, San Diego
La Jolla CA 92093-0220
USA
ccharles@ucsd.edu

Jason J. Coenen
Paleontologist (diatoms)
Department of Geology
Northern Illinois University
235 North Sacramento Street, Unit F
Sycamore IL 60178
USA
jcoenen@niu.edu

Julien G. Crespin
Sedimentologist
EPOC, UMR CNRS 5805
University of Bordeaux
Allee Geoffroy saint Hilaire
33615 Pessac
France
j.crespin1978@gmail.com

Allison M. Franzese
Inorganic Geochemist
Natural Sciences Department
School of Earth and Environmental Sciences
Hostos Community College (CUNY)
500 Grand Concourse
Bronx NY 10451
USA
afranzese@hostos.cuny.edu

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

Jens Gruetzner
Physical Properties Specialist/Logging Scientist
Geosciences
Alfred-Wegener-Institut for Polar and Marine Research
Am Alten Hafen 26
27568 Bremenhaven
Germany
Jens.gruetzner@awi.de

Xibin Han
Sedimentologist
Second Institute of Oceanography (SOA)
Key Laboratory of Submarine Science
36 Baochubeilu
Hangzhou City
China
hanxibin@sio.org.cn

Sophia K.V. Hines
Inorganic Geochemist
Division of Geological and Planetary Sciences
California Institute of Technology
1200 East California Boulevard, MC 131-24
Pasadena CA 91125
USA
shines@caltech.edu

Francisco J. Jimenez Espejo
Physical Properties Specialist
Institute of Biogeosciences
Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
Natsushima-cho 2-15
Yokosuka 237-0061
Japan
fjjspejo@jamstec.go.jp

Janna Just
Paleomagnetist
Geologisches Institut
Universität Kõln
Zühlpicher Strasse 49a
50674 Cologne
Germany
janna.just@uni-koeln.de

Andreas Koutsodendris
Sedimentologist
Institute of Earth Sciences
University of Heidelberg
Im Neuenheimer Feld 234
69120 Heidelberg
Germany
andreas.koutsodendris@geow.uni-heidelberg.de

Kaoru Kubota
Sedimentologist
Atmosphere and Ocean Research Institute
University of Tokyo
5-1-5 Kashiwano-ha
Kashiwashi Chiba 277-8564
Japan
kaoryu0129@gmail.com

Nambiyathodi Lathika
Physical Properties Specialist
Ice Core Laboratory
National Centre for Antarctic and Ocean Research (NCAOR)
Head Land Sada
Vasco da Gama Goa 403804
India
lathika@ncaor.gov.in

Richard D. Norris
Paleontologist (planktonic foraminifers)
Scripps Institution of Oceanography
University of California, San Diego
9500 Gilman Drive
LaJolla CA 92093-0244
USA
rnorris@ucsd.edu

Thiago Pereira dos Santos
Paleontologist (planktonic foraminifers)
Institute for Geosciences
Universidade Federal Fluminense (UFF)
Rio de Janeiro 24020
Brazil
tsantos@marum.de

Rebecca Robinson
Inorganic Geochemist
Graduate School of Oceanography
University of Rhode Island
South Ferry Road
Narragansett RI 02882
USA
rebeccar@gso.uri.edu

John M. Rolison
Inorganic Geochemist
Lawrence Livermore National Laboratory
7000 East Avenue
Livermore CA 94588
USA
rolison2@llnl.gov

Margit H. Simon
Paleontologist (benthic foraminifers)
School of Earth and Ocean Sciences
Cardiff University
Main Building, Park Place
Cardiff Wales CF10 3AT
United Kingdom
margit.simon@uni.no

Deborah Tangunan
Paleontologist (nannofossils)
Department of Geosciences
University of Bremen
Klagenfurterstrasse
28359 Bremen
Germany
tangunan@uni-bremen.de

Jeroen J.L. van der Lubbe
Paleomagnetist
Department of Sedimentology
University Amsterdam
1081 Amsterdam
Netherlands
h.j.l.vander.lubbe@vu.nl

Masako Yamane
Sedimentologist
Department of Biogeochemistry
Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
2-15 Natsushima-cho
Yokosuka Kanagawa 237-0061
Japan
yamanem@jamstec.go.jp

Hucai Zhang
Sedimentologist
Lab of Plateau Lake Ecology and Global Change
Yunnan Normal University
1 Yuhua District
Kunming Chengong 650500
China
zhanghc@niglas.ac.cn

Education and outreach

Nina Rooks-Cast
Education/Outreach Officer
Mount Pleasant High School
Providence RI
USA
nina.rooks-cast@ppsd.org

Operational and technical staff

Siem Offshore AS officials

Steve Bradley
Master of the Drilling Vessel

Wayne Malone
Offshore Installation Manager

JRSO shipboard personnel and technical representatives

Alexis Armstrong
Core Laboratory (temporary)

Lisa Brandt
Chemistry Laboratory

Timothy Bronk
Assistant Laboratory Officer

Chad Broyles
Curatorial Specialist

Lisa Crowder
Assistant Laboratory Officer

Benjamin Daniel
Thin Section Laboratory

Keith Dupuis
Publications Specialist

Seth Frank
X-Ray Laboratory

Timothy Fulton
Senior Imaging Specialist

Clayton Furman
Logging Engineer

James Gillette
Marine Computer Specialist

Randy Gjesvold
Marine Instrumentation Specialist

Rachael Gray
Chemistry Laboratory

Kevin Grigar
Operations Superintendent

Margaret Hastedt
Physical Properties Laboratory

Sandra Herrmann
Core Laboratory

Michael Hodge
Marine Computer Specialist

Jon Howell
Applications Developer

Michael Meiring
Engineer

William Mills
Laboratory Officer

Algie Morgan
Applications Developer

Beth Novak
Paleomagnetism Laboratory

Lars Thorsen
Core Laboratory (temporary)

Garrick Van Rensburg
Marine Instrumentation Specialist

IODP Publication Services staff*

Douglas Cummings
Graphics Specialist II

Gudelia ("Gigi") Delgado
Senior Publications Coordinator

Ekanta Desai
Graphics Specialist II

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

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

Hall, I.R., Hemming, S.R., and LeVay, L.J., 2015. *Expedition 361 Scientific Prospectus: South African climates (Agulhas LGM density profile).* International Ocean Discovery Program. **http://dx.doi.org/10.14379/iodp.sp.361.2015**

Preliminary Report

Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, 2016. *Expedition 361 Preliminary Report: South African Climates (Agulhas LGM Density Profile).* International Ocean Discovery Program. **http://dx.doi.org/10.14379/iodp.pr.361.2016**

Proceedings volume

Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, 2017. *South African Climates (Agulhas LGM Density Profile).* Proceedings of the International Ocean Discovery Program, 361: College Station, TX (International Ocean Discovery Program). **http://dx.doi.org/10.14379/iodp.proc.361.2017**

Expedition reports

Hall, I.R., Hemming, S.R., LeVay, L.J., Barker, S., Berke, M.A., Brentegani, L., Caley, T., Cartagena-Sierra, A., Charles, C.D., Coenen, J.J., Crespin, J.G., Franzese, A.M., Gruetzner, J., Han, X., Hines, S.K.V., Jimenez Espejo, F.J., Just, J., Koutsodendris, A., Kubota, K., Lathika, N., Norris, R.D., Periera dos Santos, T., Robinson, R., Rolinson, J.M., Simon, M.H., Tangunan, D., van der Lubbe, J.J.L., Yamane, M., and Zhang, H., 2017. Expedition 361 summary. *In* Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, *South African Climates (Agulhas LGM Density Profile).* Proceedings of the International Ocean Discovery Program, 361: College Station, TX (International Ocean Discovery Program). **http://dx.doi.org/10.14379/iodp.proc.361.101.2017**

Hall, I.R., Hemming, S.R., LeVay, L.J., Barker, S., Berke, M.A., Brentegani, L., Caley, T., Cartagena-Sierra, A., Charles, C.D., Coenen, J.J., Crespin, J.G., Franzese, A.M., Gruetzner, J., Han, X., Hines, S.K.V., Jimenez Espejo, F.J., Just, J., Koutsodendris, A., Kubota, K., Lathika, N., Norris, R.D., Periera dos Santos, T., Robinson, R., Rolinson, J.M., Simon, M.H., Tangunan, D., van der Lubbe, J.J.L., Yamane, M., and Zhang, H., 2017. Expedition 361 methods. *In* Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, *South African Climates (Agulhas LGM Density Profile).* Proceedings of the International Ocean Discovery Program, 361: College Station, TX (International Ocean Discovery Program). **http://dx.doi.org/10.14379/iodp.proc.361.102.2017**

Hall, I.R., Hemming, S.R., LeVay, L.J., Barker, S., Berke, M.A., Brentegani, L., Caley, T., Cartagena-Sierra, A., Charles, C.D., Coenen, J.J., Crespin, J.G., Franzese, A.M., Gruetzner, J., Han, X., Hines, S.K.V., Jimenez Espejo, F.J., Just, J., Koutsodendris, A., Kubota, K., Lathika, N., Norris, R.D., Periera dos Santos, T., Robinson, R., Rolinson, J.M., Simon, M.H., Tangunan, D., van der Lubbe, J.J.L., Yamane, M., and Zhang, H., 2017. Site U1474. *In* Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, *South African Climates (Agulhas LGM Density Profile).* Proceedings of the International Ocean Discovery Program, 361: College Station, TX (International Ocean Discovery Program). **http://dx.doi.org/10.14379/iodp.proc.361.103.2017**

Hall, I.R., Hemming, S.R., LeVay, L.J., Barker, S., Berke, M.A., Brentegani, L., Caley, T., Cartagena-Sierra, A., Charles, C.D., Coenen, J.J., Crespin, J.G., Franzese, A.M., Gruetzner, J., Han, X., Hines, S.K.V., Jimenez Espejo, F.J., Just, J., Koutsodendris, A., Kubota, K., Lathika, N., Norris, R.D., Periera dos Santos, T., Robinson, R., Rolinson, J.M., Simon, M.H., Tangunan, D., van der Lubbe, J.J.L., Yamane, M., and Zhang, H., 2017. Site U1475. *In* Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, *South African Climates (Agulhas LGM Density Profile).* Proceedings of the International Ocean Discovery Program, 361: College Station, TX (International Ocean Discovery Program). **http://dx.doi.org/10.14379/iodp.proc.361.104.2017**

Hall, I.R., Hemming, S.R., LeVay, L.J., Barker, S., Berke, M.A., Brentegani, L., Caley, T., Cartagena-Sierra, A., Charles, C.D., Coenen, J.J., Crespin, J.G., Franzese, A.M., Gruetzner, J., Han, X., Hines, S.K.V., Jimenez Espejo, F.J., Just, J., Koutsodendris, A., Kubota, K., Lathika, N., Norris, R.D., Periera dos Santos, T., Robinson, R., Rolinson, J.M., Simon, M.H., Tangunan, D., van der Lubbe, J.J.L., Yamane, M., and Zhang, H., 2017. Site U1476. *In* Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, *South African Climates (Agulhas LGM Density Profile).* Proceedings of the International Ocean Discovery Program, 361: College Station, TX (International Ocean Discovery Program). **http://dx.doi.org/10.14379/iodp.proc.361.105.2017**

Hall, I.R., Hemming, S.R., LeVay, L.J., Barker, S., Berke, M.A., Brentegani, L., Caley, T., Cartagena-Sierra, A., Charles, C.D., Coenen, J.J., Crespin, J.G., Franzese, A.M., Gruetzner, J., Han, X., Hines, S.K.V., Jimenez Espejo, F.J., Just, J., Koutsodendris, A., Kubota, K., Lathika, N., Norris, R.D., Periera dos Santos, T., Robinson, R., Rolinson, J.M., Simon, M.H., Tangunan, D., van der Lubbe, J.J.L., Yamane, M., and Zhang, H., 2017. Site U1477. *In* Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, *South African Climates (Agulhas LGM Density Profile).* Proceedings of the International Ocean Discovery Program, 361: College Station, TX (International Ocean Discovery Program). **http://dx.doi.org/10.14379/iodp.proc.361.106.2017**

Hall, I.R., Hemming, S.R., LeVay, L.J., Barker, S., Berke, M.A., Brentegani, L., Caley, T., Cartagena-Sierra, A., Charles, C.D., Coenen, J.J., Crespin, J.G., Franzese, A.M., Gruetzner, J., Han, X., Hines, S.K.V., Jimenez Espejo, F.J., Just, J., Koutsodendris, A., Kubota, K., Lathika, N., Norris, R.D., Periera dos Santos, T., Robinson, R., Rolinson, J.M., Simon, M.H., Tangunan, D., van der Lubbe, J.J.L., Yamane, M., and Zhang, H., 2017. Site U1478. *In* Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, *South African Climates (Agulhas LGM Density Profile).* Proceedings of the International Ocean Discovery Program, 361: College Station, TX (International Ocean Discovery Program). **http://dx.doi.org/10.14379/iodp.proc.361.107.2017**

Hall, I.R., Hemming, S.R., LeVay, L.J., Barker, S., Berke, M.A., Brentegani, L., Caley, T., Cartagena-Sierra, A., Charles, C.D., Coenen, J.J., Crespin, J.G., Franzese, A.M., Gruetzner, J., Han, X., Hines, S.K.V., Jimenez Espejo, F.J., Just, J., Koutsodendris, A., Kubota, K., Lathika, N., Norris, R.D., Periera dos Santos, T., Robinson, R., Rolinson, J.M., Simon, M.H., Tangunan, D., van der Lubbe, J.J.L., Yamane, M., and Zhang, H., 2017. Site U1479. *In* Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, *South African Climates (Agulhas LGM Density Profile).* Proceedings of the International Ocean Discovery Program, 361: College Station, TX (International Ocean Discovery Program). **http://dx.doi.org/10.14379/iodp.proc.361.108.2017**

Supplementary material

Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, 2017. Supplementary material, **http://dx.doi.org/10.14379/iodp.proc.361supp.2017**. *Supplement to* Hall, I.R., Hemming, S.R., LeVay, L.J., and the Expedition 361 Scientists, *South African Climates (Agulhas LGM Density Profile).* Proceedings of the International Ocean Discovery Program, 361: College Station, TX (International Ocean Discovery Program). http://dx.doi.org/10.14379/iodp.proc.361.2017

*The Expedition-related bibliography is continually updated online (**http://publications.iodp.org/proceedings/361/361title.html#bib**). Please send updates to **PubCrd@iodp.tamu.edu**.