

Proceedings of the International Ocean Discovery Program

Volume 372A

Creeping Gas Hydrate Slides

Expedition 372A of the R/V *JOIDES Resolution*

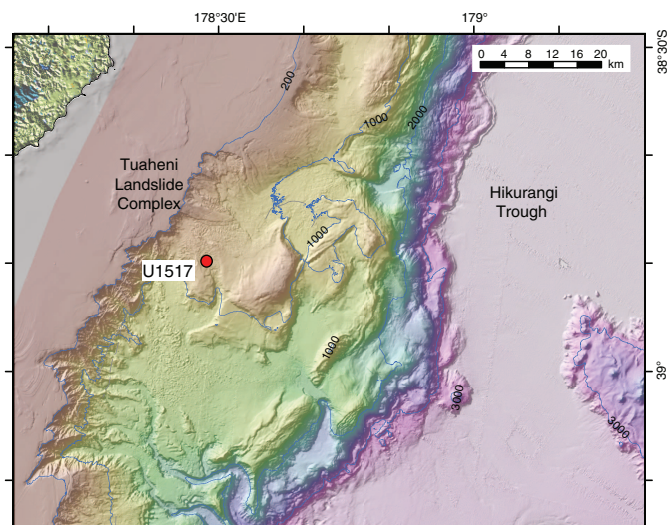
Fremantle, Australia, to Lyttleton, New Zealand

Site U1517

26 November 2017–4 January 2018

Volume authorship

Pecher, I.A., Barnes, P.M., LeVay, L.J., and the Expedition 372A 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, 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://mlp.ldeo.columbia.edu/logdb/scientific_ocean_drilling. 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 photographs show (top left) rig floor crew preparing logging-while-drilling tools for deployment, (top right) resistivity bit image and coherence velocity, and (bottom) gas hydrate identified using infrared imaging. Photo credit: David McNamara and IODP JRSO.

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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.

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Supplementary material

Supplementary material for the Volume 372A expedition reports includes DESClogik workbooks and downhole temperature dual pressure probe data in Microsoft Excel format. A full list of directories can be found in SUPP_MAT in the volume zip folder or

on the [Supplementary material for Volume 372A 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 372A site map](#)

[IODP map](#) (Expeditions 349–357, 359–372, and 381)

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[ODP map](#) (Legs 100–210)

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Acknowledgments

We are very grateful to the entire teams of International Ocean Discover Program (IODP) Expeditions 372 and 375 for the smooth coordination between various Expedition 372 objectives. This *Proceedings* volume summarizes results from Expedition 372 Site U1517 concerning the role of gas hydrates in slow deformation at the Tuaheni Landslide Complex. Expedition 372 also included logging while drilling in preparation for Expedition 375. We acknowledge the important role of the *JOIDES Resolution* Facility Board in supporting and coordinating the complex operations of Expedition 372.

We would like to thank staff and crew aboard the R/V *JOIDES Resolution* for their skills, enthusiasm, and professionalism, which were pivotal for successful operations. We also acknowledge the significant efforts in coordinating and planning by many IODP staff leading up to the expedition, most notably, Leah LeVay, Katerina Petronotis, and Kevin Grigar. We wish to acknowledge support of the temperature dual pressure probe (T2P) by the Jackson School of Geosciences at the University of Texas (USA) and the UT GeoFluids Consortium, in particular Peter Polito. We are grateful for the enthusiasm of Schlumberger's shipboard logging team, David Pedulla, Liam Warda, and Lachlan Douglass, in logging the unusually shallow, by industry standards, Expedition 372 targets. We wish to thank the captains, crews, and scientists of the R/V *Tangaroa* Voyages TAN1114 and TAN1404 and R/V *Sonne* Voyage SO-247, which collected most of the site survey data.

IODP drilling at the Tuaheni Landslide Complex was the culmination of a number of research initiatives. We particularly acknowledge Joshu Mountjoy for leading studies into deformation of this landslide system for more than a decade. Selection of Site U1517 was underpinned by numerous seismic imaging and multibeam bathymetric expeditions led by scientists from New Zealand and Germany. We gratefully acknowledge Gareth Crutchley's processing of our 3-D P-Cable site survey data set and Joshu Mountjoy, Phil Barnes, Stuart Henrys, Sebastian Krastel, Stephanie Koch, Anke Danowski, Andreia Plaza-Faverola, Steve Wilcox, John Mitchell, and Susi Woelz for their various contributions to seismic and bathymetric acquisition, processing, and interpretations of the data sets that were critical for drill site characterization and safety evaluation. Remotely operated Meeresboden-Bohrgerät 200 (MeBo) drilling during *Sonne* Voyage SO-247 led by Katrin Huhn and Nina Kukowski greatly facilitated site selection. We thank the Australia-New Zealand IODP Consortium for organizing the IODP Southwest Pacific Ocean Workshop in 2012, which was crucial for proposal development. We are grateful to Stuart Henrys and Mitch Malone for their immense efforts in tackling environmental protection regulations and obtaining the necessary clearances for research in New Zealand waters.

We wish to thank the funding agencies that supported acquisition and analysis of site survey and other relevant data. Crown Minerals (now New Zealand Petroleum and Minerals) commissioned the O5CM seismic survey. Land Information New Zealand's Ocean Survey 20/20 program supported *Tangaroa* Voyage TAN1114. *Tangaroa* Voyage TAN1404 was supported by National Institute of Water & Atmospheric Research internal funds, GNS Science internal funds, and German Science Foundation projects (KR2222/18; Bl 404/7-1). Funding sources for *Sonne* Voyage SO-247 included the German Ministry of Education and Research (03G0247A; 03G0247B) and the United States National Science Foundation (NSF) (OCE-1557519). Key funding for data analysis was provided by the New Zealand Marsden Fund (14-NIW-008) and the Ministry of Business, Innovation, and Employment (C05X0908). The NSF supported initial development of the T2P (OCE-0351085).

Finally, we wish to sincerely thank IODP, including all its Program Member Offices, for their continued support of scientific ocean drilling.

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.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 372A participants*

Expedition 372A scientists

Ingo A. Pecher

Co-Chief Scientist

School of Environmental and Marine Sciences
University of Auckland
New Zealand

i.pecher@auckland.ac.nz

Philip M. Barnes

Co-Chief Scientist

Ocean Geology
National Institute of Water and Atmospheric Research (NIWA)
New Zealand

philip.barnes@niwa.co.nz

Leah J. LeVay

Expedition Project Manager/Staff Scientist

International Ocean Discovery Program
Texas A&M University
USA

levay@iodp.tamu.edu

Sylvain M. Bourlange

Physical Properties Specialist

Ecole Nationale Supérieure de Géologie-Laboratoire
geoRessources
Université de Lorraine
France

sylvain.bourlange@univ-lorraine.fr

Morgane M.Y. Brunet

Sedimentologist

MARUM-Center for Marine Environmental Sciences
University of Bremen
Germany

Present affiliation (1 January 2019):

University of Rennes 1
France

morganebrunet@hotmail.com

Sebastian Cardona

Sedimentologist

Department of Geology and Geological Engineering
Colorado School of Mines
USA

scardona@mines.edu

Michael B. Clennell

Physical Properties Specialist/Downhole Measurements

Energy
CSIRO
Australia

ben.clennell@csiro.au

Ann E. Cook

Physical Properties Specialist/Downhole Measurements

School of Earth Sciences
Ohio State University
USA

cook.1129@osu.edu

Martin P. Crundwell[†]

Micropaleontologist (foraminifers)/Observer

Paleontology and Environmental Change Section
GNS Science
New Zealand

m.crundwell@gns.cri.nz

Brandon Dugan

Physical Properties Specialist/Downhole Measurements

Department of Geophysics
Colorado School of Mines
USA

dugan@mines.edu

Judith Elger

Physical Properties Specialist/Downhole Measurements

Helmholtz Centre for Ocean Research Kiel
Christian-Albrechts-Universität zu Kiel (IFM)
Germany

jelger@geomar.de

Davide Gamboa

Physical Properties Specialist/Downhole Measurements

British Geological Survey-Wales
United Kingdom

davide@bgs.ac.uk

Aggeliki Georgiopoulou

Sedimentologist

UCD School of Earth Sciences
University College Dublin
Ireland

Present affiliation (1 February 2019):

School of Environment and Technology
University of Brighton
United Kingdom

A.Georgiopoulou@brighton.ac.uk

Annika Greve[†]

Paleomagnetist

R&D Center for Ocean Drilling Science (ODS)
Japan Agency for Marine-Earth Science and Technology
(JAMSTEC)

Japan

Annika.Greve@jamstec.go.jp

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

[†]Sailed Expedition 375.

Shuoshuo Han
Physical Properties Specialist/Downhole Measurements
 Institute for Geophysics
 The University of Texas at Austin
 USA
han@ig.utexas.edu

Katja U. Heeschen
Organic Geochemist/Pressure Coring Specialist
 GFZ German Research Centre for Geosciences
 Germany
katja.heeschen@gfz-potsdam.de

Gaowei Hu
Physical Properties Specialist
 Gas Hydrate Department
 Qingdao Institute of Marine Geology
 China
hgw-623@163.com

Gil Young Kim
Physical Properties Specialist/Downhole Measurements
 Marine Geology and Exploration Center
 Korea Institute of Geoscience & Mineral Resources (KIGAM)
 Republic of Korea
gykim@kigam.re.kr

Hiroko Kitajima[†]
Petrophysics (physical properties) Specialist
 Department of Geology and Geophysics
 Texas A&M University
 USA
kitaji@tamu.edu

Hiroaki Koge
Physical Properties Specialist/Downhole Measurements
 Graduate School of Frontier Sciences/Atmosphere and Ocean
 Research Institute
 University of Tokyo
 Japan

 Present affiliation (18 April 2018):
 Marine Geology Research Group
 Geological Survey of Japan
 National Institute of Advanced Industrial Science
 and Technology (AIST)
 Japan
koge.h@aist.go.jp

Xuesen Li[†]
Paleomagnetist
 College of Earth Science
 Guilin University of Technology
 China
lixuesen2000@sina.com

Karina S. Machado
Organic Geochemist
 Production Engineering Department
 Federal University of Paraná
 Brazil
karinascurupa@gmail.com

David D. McNamara
Physical Properties Specialist/Downhole Measurements
 Earth and Ocean Sciences
 School of Natural Sciences
 National University of Ireland, Galway
 Ireland
david.d.mcnamara@nuigalway.ie

Gregory F. Moore
Physical Properties Specialist/Downhole Measurements
 Department of Geology and Geophysics/SOEST
 University of Hawaii at Manoa
 USA
gmoore@hawaii.edu

Joshu J. Mountjoy
Sedimentologist/Structural Geologist/New Zealand Observer
 National Institute of Water and Atmospheric Research (NIWA)
 New Zealand
joshu.mountjoy@niwa.co.nz

Michael A. Nole
Physical Properties Specialist
 Hildebrand Department of Petroleum and Geosystems
 Engineering
 University of Texas at Austin
 USA

 Present affiliation (1 July 2018):
 Applied Systems Analysis and Research
 Sandia National Laboratories
 USA
mnole@sandia.gov

Satoko Owari
Inorganic Geochemist
 Department of Earth Sciences
 Chiba University
 Japan

 Present affiliation (2 April 2018):
 School of Marine Resources and Environment
 Tokyo University of Marine Science and Technology
 Japan
sowari0@kaiyodai.ac.jp

Matteo Paganoni
Physical Properties Specialist/Downhole Measurements
 Department of Earth Sciences
 University of Oxford
 United Kingdom

 Present affiliation (1 July 2018):
 Shell Global Solutions International, B.V.
 Netherlands
matte89paga@gmail.com

Katerina E. Petronotis[†]
Expedition Project Manager/Staff Scientist
 International Ocean Discovery Program
 Texas A&M University
 USA
petronotis@iodp.tamu.edu

Paula S. Rose

Inorganic Geochemist

Physical and Environmental Sciences
Texas A&M University-Corpus Christi
USA
paula.rose@tamucc.edu

Elizabeth J. Screaton

Physical Properties Specialist/Downhole Measurements

Department of Geological Sciences
University of Florida
USA
screaton@ufl.edu

Uma Shankar

Physical Properties Specialist/Downhole Measurements

Department of Geophysics
Institute of Science
Banaras Hindu University
India
umashankar@bhu.ac.in

Claire L. Shepherd[†]

Micropaleontologist (nannofossils)

Paleontology and Environmental Change Section
GNS Science
New Zealand
c.shepherd@gns.cri.nz

Marta E. Torres

Inorganic Geochemist

College of Earth, Ocean and Atmospheric Sciences
Oregon State University
USA
mtorres@coas.oregonstate.edu

Michael B. Underwood[†]

Sedimentologist

Department of Earth and Environmental Science
New Mexico Institute of Mining and Technology
USA
underwoodm@missouri.edu

Xiujuan Wang

Physical Properties Specialist/Downhole Measurements

Key Laboratory of Marine Geology and Environment
Institute of Oceanology, Chinese Academy of Sciences
China
wangxiujuan@ms.qdio.ac.cn

Adam D. Woodhouse[†]

Micropaleontologist (foraminifers)

School of Earth and Environment
University of Leeds
United Kingdom
eadw@leeds.ac.uk

Hung-Yu Wu

Physical Properties Specialist/Downhole Measurements

Japan Agency for Marine-Earth Science and Technology
Japan
Sonata.wu@gmail.com

Education and outreach

Stephanie M. Sharuga

Education Officer

National Oceanic and Atmospheric Administration (NOAA)
USA
ssharuga@outlook.com

Erin K. Todd

Education Officer

Department of Geology
University of Otago
New Zealand
erin.todd@otago.ac.nz

Operational and technical staff

Siem Offshore AS officials

Jacob C. Robinson

Master of the Drilling Vessel

Mark Robinson

Drilling Supervisor

JRSO shipboard personnel and technical representatives

Robert Aduddell

Engineer

Lisa Crowder

Assistant Laboratory Officer

Susan Boehm

Thin Section Laboratory

Aaron de Loach

Core Laboratory

Inva Braha

Curatorial Specialist

Lachlan Douglass

LWD Engineer

Ty Cobb

Physical Properties Laboratory

Keith Dupuis

Underway Geophysics Laboratory/Downhole Tools Laboratory

David Fackler
Applications Developer

Timothy Fulton
Senior Imaging Specialist

Clayton Furman
Logging Engineer

Randy Gjesvold
Marine Instrumentation Specialist

Kevin Grigar
Operations Superintendent

Sandra Herrmann
Assistant Laboratory Officer

Michael Hodge
Marine Computer Specialist

Jon Howell
Applications Developer

Minh Huynh
Marine Computer Specialist

IODP Publication Services staff*

Douglas Cummings
Graphics Specialist II

Gudelia (“Gigi”) Delgado
Publications Coordinator

Ekanta Desai
Graphics Specialist II

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Mike Meiring
Engineer

William Mills
Laboratory Officer

Beth Novak
Paleomagnetism Laboratory

David Pedulla
LWD Engineer

Garrick Van Rensburg
Marine Instrumentation Specialist

Liam Warda
LWD Engineer

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Supervisor of Editing

Julie Myers
Production Editor II

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Editor II

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Production Editor III

Alyssa Stephens
Graphics Specialist III

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Production Editor III

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Graphics Specialist III

Ann Yeager
Distribution Specialist

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Scientific Prospectus

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Preliminary Report

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Expedition reports

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Pecher, I.A., Barnes, P.M., LeVay, L.J., Bourlange, S.M., Brunet, M.M.Y., Cardona, S., Clennell, M.B., Cook, A.E., Crundwell, M.P., Dugan, B., Elger, J., Gamboa, D., Georgiopoulou, A., Greve, A., Han, S., Heeschen, K.U., Hu, G., Kim, G.Y., Kitajima, H., Koge, H., Li, X., Machado, K.S., McNamara, D.D., Moore, G.F., Mountjoy, J.J., Nole, M.A., Owari, S., Paganoni, M., Petronotis, K.E., Rose, P.S., Scream, E.J., Shankar, U., Shepherd, C.L., Torres, M.E., Underwood, M.B., Wang, X., Woodhouse, A.D., and Wu, H.-Y., 2019. Expedition 372A methods. In Pecher, I.A., Barnes, P.M., LeVay, L.J., and the Expedition 372A Scientists, *Creeping Gas Hydrate Slides*. Proceedings of the International Ocean Discovery Program, 372A: College Station, TX (International Ocean Discovery Program).
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Supplementary material

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