

Proceedings of the International Ocean Discovery Program

Volume 376

Brothers Arc Flux

Expedition 376 of the R/V *JOIDES Resolution*

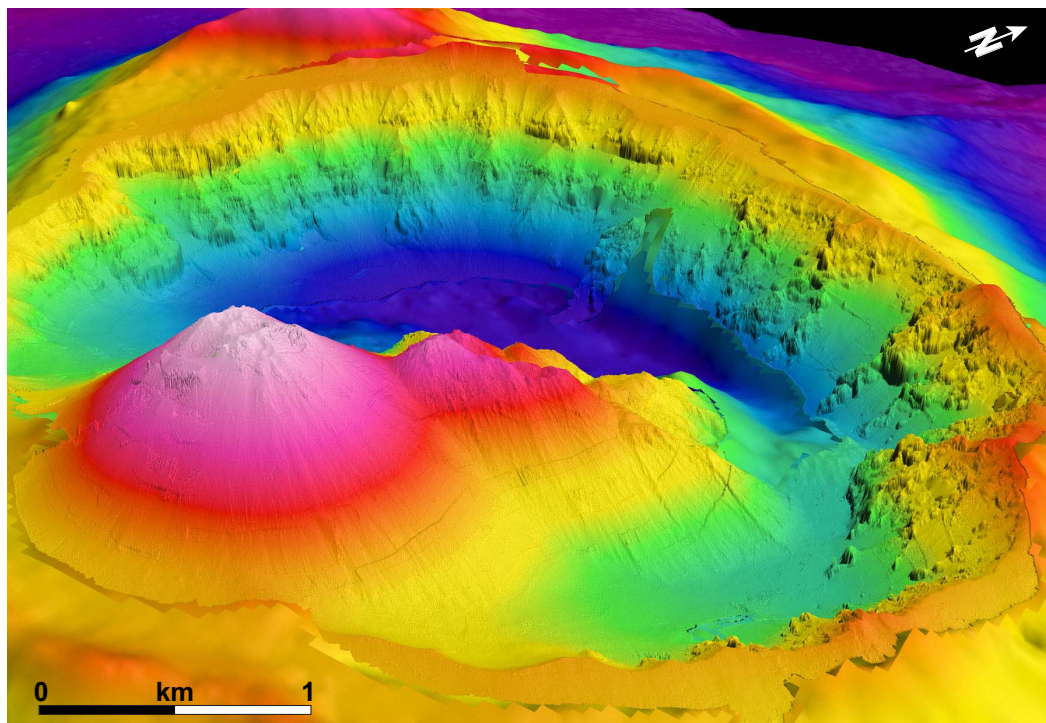
from and to Auckland, New Zealand

Sites U1527–U1531

5 May–5 July 2018

Volume authorship

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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 photograph shows (left) false color image of Brothers volcano using high-resolution (~2 m) autonomous underwater vehicle-derived (~25 m) bathymetry overlain on surface ship-derived bathymetry. View is to the northwest with Upper Cone and flank Lower Cone in the foreground and NW Caldera walls and caldera rim in the background. Image created in Fledermaus by S.G. Merle (National Oceanic and Atmospheric Administration/Pacific Marine Environmental Laboratory). Right: drill string recovered from Hole U1528D. Very acidic, corrosive fluids with high concentrations of H₂S contributed to the corrosion/embrittlement of the pipe (length of crack = 1.4 m), ultimately leading to failure and loss of the bottom-hole assembly. Photo credit: William Crawford, 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 376 expedition reports includes DESClogik workbooks 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 376 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 376 site map](#)

[IODP map](#) (Expeditions 349–357, 359–372, 374–376, 380, and 381)

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This research used samples and data provided by the International Ocean Discovery Program (IODP). We sincerely thank the IODP Technical Support staff and the R/V *JOIDES Resolution* crew for their invaluable support, dedication, and perseverance during what was a challenging expedition. Their proficiency and determination were outstanding. We greatly appreciate the skill and tremendous efforts of the entire drilling crew to recover complex rock material within a technically demanding subseafloor environment. The qualified guidance of both Operations Superintendent Stephen Midgley (IODP *JOIDES Resolution* Science Operator [JRSO]) and Drilling Supervisor Sam McLelland (Siem Offshore) was crucial. The expedition's success was also supported by the IODP Environmental Protection and Safety Panel and by the Ministry of Foreign Affairs and Trade and the Environmental Protection Authority of New Zealand, who approved a change in our drilling targets during the expedition with limited notice. Support from GNS Science (Te Pū Ao) during the pre-expedition clearance process is gratefully acknowledged. We appreciate the collaboration with MB Century/Century Drilling & Energy Services (NZ) Limited (New Zealand) and Petrospec Engineering Ltd. (Canada) and thank them for providing time, guidance, and expertise and making their downhole tools available to us. Their support significantly contributed to the success of the expedition. We thank JRSO Publications Services at the IODP JRSO at Texas A&M University for their help with the publication of this volume.

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.
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Expedition-related bibliography*

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Scientific Prospectus

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Preliminary Report

de Ronde, C.E.J., Humphris, S.E., and Höfig, T.W., and the Expedition 376 Scientists, 2019. *Expedition 376 Preliminary Report: Brothers Arc Flux*. International Ocean Discovery Program. <https://doi.org/10.14379/iodp.pr.376.2019>

Proceedings volume

de Ronde, C.E.J., Humphris, S.E., Höfig, T.W., and the Expedition 376 Scientists, 2019. *Brothers Arc Flux*. Proceedings of the International Ocean Discovery Program, 376: College Station, TX (International Ocean Discovery Program). <https://doi.org/10.14379/iodp.proc.376.2019>

Expedition reports

de Ronde, C.E.J., Humphris, S.E., Höfig, T.W., Brandl, P.A., Cai, L., Cai, Y., Caratori Tontini, F., Deans, J.R., Farough, A., Jamieson, J.W., Koldaivelu, K.P., Kutovaya, A., Labonté, J.M., Martin, A.J., Massiot, C., McDermott, J.M., McIntosh, I.M., Nozaki, T., Pellizari, V.H., Reyes, A.G., Roberts, S., Rouxel, O., Schlicht, L.E.M., Seo, J.H., Straub, S.M., Strehlow, K., Takai, K., Tanner, D., Tepley III, F.J., and Zhang, C., 2019. Expedition 376 summary. *In* de Ronde, C.E.J., Humphris, S.E., Höfig, T.W., and the Expedition 376 Scientists, *Brothers Arc Flux*. Proceedings of the International Ocean Discovery Program, 376: College Station, TX (International Ocean Discovery Program). <https://doi.org/10.14379/iodp.proc.376.101.2019>

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Supplementary material

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Site maps

