

Proceedings of the International Ocean Discovery Program

Volume 372B/375

Hikurangi Subduction Margin Coring, Logging, and Observatories

Expedition 372B/375 of the R/V *JOIDES Resolution*

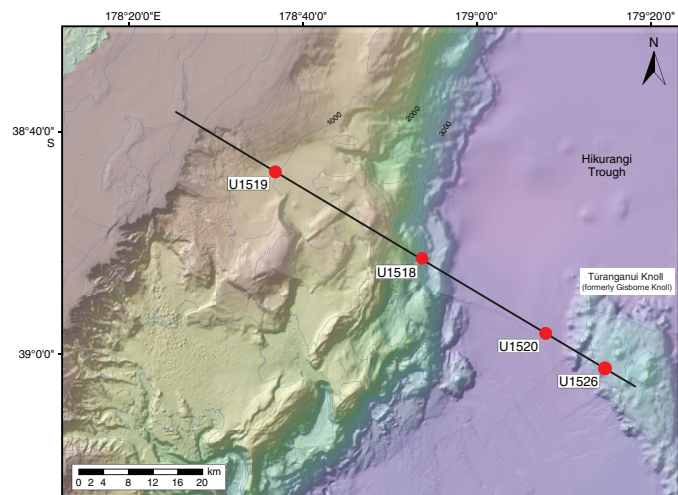
Timaru, New Zealand, to Auckland, New Zealand

Sites U1518–U1520 and U1526

8 March–5 May 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 wellhead of ACORK/CORK-II nested observatory deployed at Site U1518. The CORK was named "Te Matakite," which means "to see into the future" in Māori. Photo credit: Demian Saffer 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 372B/375 expedition reports includes DESClogik workbooks, layer thickness data, and structure calculations in Microsoft Excel format, structure spreadsheet notes in Microsoft Word format, and smear slide log sheets and handwritten VCDs in PDF. A full list of directories can be found in SUPP_MAT in the volume zip folder or on the [Supplementary material for Volume 372B/375 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 372B/375 site map](#)

[IODP map](#) (Expeditions 349–357, 359–372, 374–375, and 380–381)

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

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Acknowledgments

The success of International Ocean Discover Program (IODP) Expeditions 372 and 375 hinged on the dedication, support, and professionalism of the staff and crew aboard the R/V *JOIDES Resolution* and the *JOIDES Resolution* Science Operator (JRSO) technical staff. We acknowledge their pivotal contributions in accomplishing the objectives of the Hikurangi margin drilling program. They ensured that operations went smoothly with very few major issues, and when issues did arise, they addressed them quickly. This was key to achieving nearly 100% of our operational targets. We also acknowledge support from many other IODP staff before, during, and after the expedition, particularly in planning operations and observatory installations.

Because of the complex and varied objectives of this drilling program, both expeditions involved multiple years of planning with heavy involvement from many IODP staff, most notably Katerina Petronotis, Kevin Grigar, Bill Rhinehart, John van Hyfte, Mike Storms, and Steve Midgely. We also gratefully acknowledge Hans Jannasch, Earl Davis, Tom Pettigrew, and Keir Becker for sharing their extensive knowledge during the design and planning phases of the observatories and Earl and Hans for constructing, designing, and testing some of the components.

We are also grateful to the United States National Science Foundation (NSF) for funding support of the CORK observatories and for supporting the planning, design, and fabrication efforts well in advance of drilling. This lead time was critical to the success of the expeditions.

We thank Dan Bassett, Greg Foothead, and the captain and crew of the R/V *Tangaroa* for facilitating delivery of some observatory components to *JOIDES Resolution* at sea during Expedition 375.

The IODP expeditions at the Hikurangi margin were the culmination of decades of a diverse array of surveys and research on the offshore Hikurangi margin and the slip behavior that occurs there. In particular, we thank the GeoNet project (<https://www.geonet.org.nz>; funded by the New Zealand Earthquake Commission and Land Information New Zealand), which operates the continuous GPS and seismic monitoring network that enabled the discovery of shallow slow slip events at the northern Hikurangi margin, thus motivating these expeditions. The tectonic and geological framework of the drilling transect for Expeditions 372 and 375 was underpinned by numerous seismic imaging and multibeam bathymetric expeditions led by scientists from New Zealand, the United States, and Europe. In particular, we gratefully acknowledge Phil Barnes, Rupert Sutherland, Stuart Henrys, Dan Barker, Joshu Mountjoy, Sebastian Krastel, Rob Harris, Anne Trehu, Rebecca Bell, Melissa Gray, Joanna Morgan, Andrea Plaza-Faverola, Dan Bassett, Steve Wilcox, John Mitchell, and Susi Woelz for their various contributions to seismic and bathymetric acquisition, processing, and/or interpretations of these data sets that provided a framework for the drilling transect and were critical for drill site characterization and safety evaluation. We are grateful to the funding agencies that supported the acquisition of site survey and regional geophysical and bathymetric data, including the New Zealand Ministry of Business, Innovation, and Employment (MBIE), New Zealand Ocean Survey 20/20 program, National Institute of Water & Atmospheric Research (NIWA), GNS Science, German Science Foundation, and NSF.

The IODP proposals that formed the basis for Expeditions 372 and 375 emerged from a series of workshops and meetings that involved a dedicated proponent group who were key contributors to the proposals, and members of the drilling proponent team provided continued input and guidance throughout the planning and implementation of the expeditions. We acknowledge the New Zealand MBIE, U.S. Science Support Program, New Zealand Earthquake Commission, and NSF for support of these workshops.

We also thank Stuart Henrys for his help in assembling materials for the IODP Environmental Protection and Safety Panel (EPSP) and for providing advice to Mitch Malone, who successfully dealt with the New Zealand environmental protection regulations and clearance requirements that were needed to undertake the drilling expedition.

Finally, we are grateful to IODP and the *JOIDES Resolution* Facility Board for supporting this complex project. We hope that it will help further build on the extensive legacy of IODP in illuminating fundamental and societally relevant processes that shape our planet.

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.

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