

Proceedings of the International Ocean Discovery Program

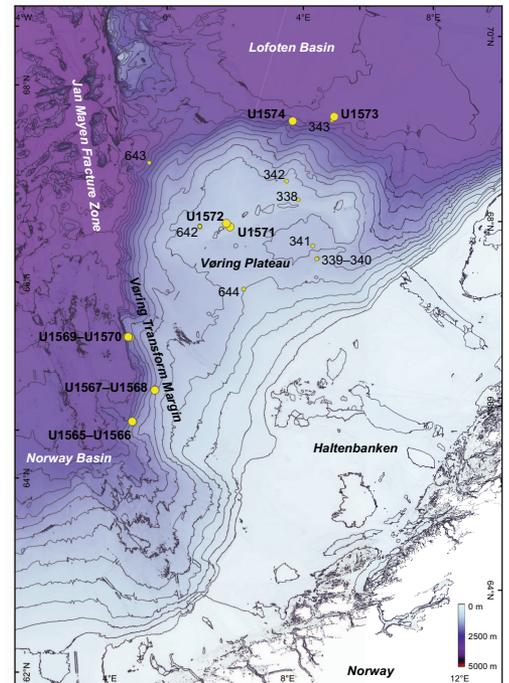
Volume 396

Mid-Norwegian Margin Magmatism and Paleoclimate Implications

Expedition 396 of the R/V *JOIDES Resolution*
from and to Reykjavík, Iceland
Sites U1565–U1574
6 August–5 October 2021

Volume authorship

Planke, S., Berndt, C., Alvarez Zarikian, C.A., and the Expedition 396 Scientists



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The bulk of the shipboard-collected core data from this expedition is accessible at <https://zenodo.org/communities/iodp> (see list of [available data sets](#)). 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 (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 (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 northern lights or aurora borealis over Site U1574 on 28 September 2022. Photo credit: Reed Scherer and IODP JRSO.

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Contents

Expedition reports

Chapters

[Expedition 396 summary](#)

S. Planke et al.

[Sites U1569 and U1570](#)

S. Planke et al.

[Expedition 396 methods](#)

S. Planke et al.

[Sites U1571 and U1572](#)

S. Planke et al.

[Site U1565](#)

S. Planke et al.

[Site U1573](#)

S. Planke et al.

[Site U1566](#)

S. Planke et al.

[Site U1574](#)

S. Planke et al.

[Sites U1567 and U1568](#)

S. Planke et al.

Core descriptions

Visual core descriptions (VCDs) are presented in PDF files for each site.

[Site U1565](#) · [Site U1566](#) · [Site U1567](#) · [Site U1568](#) · [Site U1569](#) ·
[Site U1570](#) · [Site U1571](#) · [Site U1572](#) · [Site U1573](#) · [Site U1574](#)

Thin sections and/or smear slides for each site or hole are presented in CSV or PDF format in the CORES directory and in Excel format in DESC_WKB in Supplementary material. The entire set of core images in PDF is available in the IMAGES directory.

Supplementary material

Supplementary material for the Volume 396 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 396 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 (<https://www.generic-mapping-tools.org>), are available in PDF.

[IODP Expedition 396 site map](#)

[IODP map](#)

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

[ODP map](#) (Legs 100–210)

[DSDP map](#) (Legs 1–96)

Dedication

Professor Olav Eldholm

This IODP Expedition 396 volume is dedicated to the memory of Professor Olav Eldholm, who died in March 2022.

Professor Eldholm served as a Co-Chief Scientist aboard the R/V *JOIDES Resolution* during Ocean Drilling Program Leg 104, drilling the Vøring Marginal High. The results of Leg 104 laid very important foundations for the understanding of volcanic rifted margins and subsequently the development of the concept of large igneous provinces. His advice was instrumental for the development of the Expedition 396 drilling proposal. The Outer High structure drilled at the last site of Expedition 396, Site U1574, was named Eldhø in honor of his pioneering work in the Norwegian Sea.

Olav was heavily involved in international scientific ocean drilling during his entire career. He participated in the establishment of the 12-member European Science Foundation Consortium for Ocean Drilling (ECOD), the predecessor of today's European Consortium for Ocean Research Drilling (ECORD). He also acted as chair of the ECOD Scientific Committee and as head of the ECOD Science Office. Other involvements included membership on the JOIDES Planning Committee, the JOIDES Executive Committee, the IODP Management International (IODP-MI) Board of Governors, and the first IODP-MI Review Committee commissioned by the U.S. National Science Foundation (NSF) and Japan's Ministry of Education, Culture, Sports, Science, and Technology (MEXT).

An AGU *In Memoriam* is found at <https://www.agu.org/stay-informed/in-memoriam>.

Acknowledgments

Expedition 396 would not have been possible without the great effort from many of our coworkers developing the proposal over the past two decades, not the least of whom are the expedition's first proponent Ritske Huisman and the participants in the Magellan Workshop in Kiel, Germany, in May 2019. Site selection was based on access to proprietary seismic data kindly made available by the Norwegian Petroleum Directorate, TGS, and the University of Tromsø. Expedition 396 is the latest in a long tradition of deep-sea drilling campaigns to the Norwegian Sea during the 1970s and 1980s that were pioneered by Professors Manik Talwani, Karl Hinz, Jörn Thiede, and Olav Eldholm.

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 an intense 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 current IODP phase 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 Institute for Marine-Earth Exploration and Engineering (MarE3), 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 current 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 current 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 current IODP also has an international integrative level for high-level discussion and global consensus-building: the IODP Forum. The Forum is not only charged with assessing program-wide progress toward achieving the current Science Plan, but also with overseeing approaches toward a new bright future of scientific ocean drilling post 2023. At present, IODP involves 22 international funding agencies, including those from the United States, Japan, an Australia/New Zealand consortium (ANZIC), China, India, South Korea, and the 15 members of ECORD (Austria, Canada, Denmark, Finland, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom). The IODP membership represents an unparalleled level of international scientific collaboration; one of the greatest and ongoing strengths of scientific ocean drilling.

Henk Brinkhuis
Chair, IODP Forum

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

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IODP publications

Scientific Prospectus

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Preliminary Report

Planke, S., Berndt, C., Alvarez Zarikian, C.A., and the Expedition 396 Scientists, 2022. Expedition 396 Preliminary Report: Mid-Norwegian Margin Magmatism and Paleoclimate Implications. International Ocean Discovery Program. <https://doi.org/10.14379/iodp.pr.396.2022>

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Planke, S., Berndt, C., Alvarez Zarikian, C.A., Agarwal, A., Andrews, G.D.M., Betlem, P., Bhattacharya, J., Brinkhuis, H., Chatterjee, S., Christopoulou, M., Clementi, V.J., Ferré, E.C., Filina, I.Y., Frieling, J., Guo, P., Harper, D.T., Jones, M.T., Lambert, S., Longman, J., Millett, J.M., Mohn, G., Nakaoka, R., Scherer, R.P., Tegner, C., Varela, N., Wang, M., Xu, W., and Yager, S.L., 2023. Expedition 396 summary. In Planke, S., Berndt, C., Alvarez Zarikian, C.A., and the Expedition 396 Scientists, Mid-Norwegian Margin Magmatism and Paleoclimate Implications. Proceedings of the International Ocean Discovery Program, 396: College Station, TX (International Ocean Discovery Program). <https://doi.org/10.14379/iodp.proc.396.101.2023>

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Supplementary material

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