



**PROCEEDINGS OF THE
INTEGRATED OCEAN
DRILLING PROGRAM
VOLUME 346 EXPEDITION REPORTS
ASIAN MONSOON**

Expedition 346 of the riserless drilling platform
Valdez, Alaska (USA), to Busan, Republic of Korea
Sites U1422–U1430
29 July–28 September 2013

Volume authorship

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Expedition 346 Scientists

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Ministry of Earth Sciences (MoES) India

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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, IODP Management International, Inc., Consortium for Ocean Leadership, Lamont-Doherty Earth Observatory of Columbia University, Texas A&M University, or Texas A&M Research Foundation.

Abbreviations for names of organizations and publications in IODP reference lists follow the style given in *Chemical Abstracts Service Source Index* (published by American Chemical Society).

The bulk of the shipboard-collected core data from this expedition is accessible from International Ocean Discovery Program (IODP), *JOIDES Resolution* Science Operator (JRSO), Texas A&M University (TAMU), at 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; E-mail: database@iodp.tamu.edu

A complete set of the logging data collected by IODP-USIO Science Services, Lamont-Doherty Earth Observatory (LDEO), is available at 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; E-mail: logdb@ldeo.columbia.edu

Supplemental data were provided by the authors and may not conform to IODP publication formats.

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

Cover photograph shows core from Site U1422 in the Japan Basin on the *JOIDES Resolution* core lab description table. Photograph by Bill Crawford.

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Foreword

By Integrated Ocean Drilling Program Management International, Inc.

The Integrated Ocean Drilling Program (IODP) concluded its decadal program (2003–2013) in September 2013. As envisioned in the Initial Science Plan (ISP), IODP expeditions utilized three scientific ocean drilling platforms to cover unprecedented areas of wide oceans, from ice-covered shallow water to full ocean depths. The major advance from the program predecessors, the Deep Sea Drilling Project and the Ocean Drilling Program, was the ability to drill miles of depth below seafloor. The living Earth is a dynamic system that is continuously evolving. Among its aims, IODP sought to understand this complex and unique system through scientific ocean drilling, sampling, and experimenting in deep holes, along with advancement of related scientific disciplines. IODP has been an international collaboration among scientists and nations with keen aspirations to attain the scientific goals of the ISP. By the program's end, IODP included participating members from 26 nations.

The *Proceedings* present the scientific and engineering results of IODP drilling projects, each designed to better understand the past, present, and future of the Earth system.

Each IODP expedition started with scientists who submitted research drilling proposals to test new and innovative ideas. These proposals then progressed to international scientific advisors (Science Advisory Structure) who nurtured, evaluated, ranked, and prioritized proposals. Scientists scheduled the science operations, selected science party members from scores of international scientists qualified to participate, planned platform operations, readied the drillship, and chose borehole locations. The science party, collectively and individually, conducted science on board and on shore. The co-chief scientists of each expedition have been responsible for synthesizing the scientific results and will continue in this role as IODP postcruise research results become available.

Ocean-drilling achievements help us to understand and interpret phenomena in various parts of the Earth system. Achievements in the two legacy drilling programs have validated the scientific concepts behind plate tectonics, contributed to the understanding of ocean circulation changes, and extended our knowledge of long- and short-term climate change. IODP has expanded and extended the scientific research conducted by the legacy programs, engaging in cutting-edge research concerning topics of global importance.

Three Implementing Organizations (IOs) conducted IODP drilling platform operations. Riserless platform operations have been conducted by the U.S. Implementing Organization (USIO), comprising the Consortium for Ocean Leadership, Inc., Texas A&M University through the Texas A&M Research Foundation, and Lamont-Doherty Earth Observatory of Columbia University. Riser platform operations have been conducted by the Japan Agency for Marine-Earth Science and Technology through Japan's Center for Deep Earth Exploration in cooperation with the Center for Advanced Marine Core Research at Kochi University. Mission-specific platform operations have been conducted by the European Consortium for Ocean Research Drilling (ECORD) Science Operator (ESO), comprising the British Geological Survey, the University of Bremen, and the European Petrophysics Consortium. The European IO represented the ocean-drilling efforts of 16 nations in Europe, plus Canada.

The discoveries presented in this volume build upon layers of knowledge and science developed over roughly the last fifty years. Through September 2013, expedition *Proceedings* were published by IODP Management International for IODP under the sponsorship of the U.S. National Science Foundation (NSF), Japan's Ministry of Education, Culture, Sports, Science and Technology, and other IODP members. The material is based upon research supported under Contract OCE-0432224 from NSF.

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University of California at Santa Cruz, USA

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University of Southampton, National Oceanography
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University of Tokyo, Japan

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*At time of expedition.

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IODP Japanese Implementing Organization: Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

Web site: www.jamstec.go.jp/chikyu/eng/index.html

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Dedication

As Expedition 346 is the last of the research voyages of the R/V *JOIDES Resolution* for the Integrated Ocean Drilling Program, we dedicate these Expedition Reports to the men and women who have committed their lives to scientific ocean drilling over the past four decades. The scientists, technicians, and crew who have devoted their excellence to the pursuit of knowledge about Planet Earth for the betterment of all deserve the greatest of accolades.

We further offer our respectful remembrances of the late Kensaku Tamaki, who served as an inspiration to many of us throughout our careers.

Ryuji Tada
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[Site U1430](#)

R. Tada et al.

Core descriptions

Visual core descriptions (VCDs), smear slide data, thin section data, and core images are included in this section. VCDs, smear slides, and thin sections are combined into PDF files for each site. The entire set of core images in PDF is available in the IMAGES directory.

Site U1422

[Visual core descriptions](#) · [Smear slides](#)

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[Visual core descriptions](#) · [Smear slides](#)

Site U1424

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Expedition research results

Data reports

Titles are available in [HTML](#).

Syntheses

Titles are available in [HTML](#).

Supplementary material

Supplementary material for this volume includes DESC workbooks in Microsoft Excel format, splice data in CSV format, and VCD scratch sheets in PDF. See [README.TXT](#) in the SUPP_MAT directory for a full listing of directories and files.

Drilling location maps

A site map showing the drilling locations for this expedition and maps showing the drilling locations of all Integrated Ocean Drilling Program (IODP), Ocean Drilling Program (ODP), and Deep Sea Drilling Project (DSDP) drilling sites are available in PDF format. These maps were produced using Generic Mapping Tools (GMT) of Paul Wessel and Walter H.F. Smith (gmt.soest.hawaii.edu/).

[IODP Expedition 346 site map](#)

[IODP map](#) (Expeditions 301–346)

[ODP map](#) (Legs 100–210)

[DSDP map](#) (Legs 1–96)



Expedition-related bibliography*

IODP publications

Scientific Prospectus

Tada, R., Murray, R.W., and Alvarez Zarikian, C.A., 2013. Asian Monsoon: onset and evolution of millennial-scale variability of Asian Monsoon and its possible relation with Himalaya and Tibetan plateau uplift. *IODP Sci. Prosp.*, 346. doi:10.2204/iodp.sp.346.2013

Preliminary Report

Expedition 346 Scientists, 2013. Asian Monsoon: onset and evolution of millennial-scale variability of Asian monsoon and its possible relation with Himalaya and Tibetan Plateau uplift. *IODP Prel. Rept.*, 346.

doi:10.2204/iodp.pr.346.2014

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