



# **PROCEEDINGS OF THE INTEGRATED OCEAN DRILLING PROGRAM**

## **VOLUME 333 EXPEDITION REPORTS NANTROSEIZE STAGE 2: SUBDUCTION INPUTS 2 AND HEAT FLOW**

Expedition 333 of the riser drilling platform  
from and to Shingu, Japan  
Sites C0011, C0012, and C0018  
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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 at [sio7.jamstec.go.jp/](http://sio7.jamstec.go.jp/).

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 D/V *Chickyu* derrick at night. Photo © JAMSTEC.

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# Foreword

## By Integrated Ocean Drilling Program Management International, Inc.

The Integrated Ocean Drilling Program (IODP) is now in the latter half of its decadal program (2003–2013). As envisioned in the Initial Science Plan (ISP), IODP expeditions take advantage of three scientific ocean drilling platforms that enable us to cover unprecedented areas of wide oceans, from ice-covered shallow water to full ocean depths. Drilling miles of depth below seafloor, now part of IODP capabilities, is the major advance from the program predecessors, the Deep Sea Drilling Project and the Ocean Drilling Program. The living Earth is a dynamic system that is continuously evolving. IODP seeks 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 is an international collaboration among scientists and nations with keen aspirations to attain the scientific goals of the ISP. IODP currently includes participating members from 24 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.

IODP expeditions begin with scientists who submit research drilling proposals to test new and innovative ideas, then the proposals progress to international scientific advisors (Science Advisory Structure) who nurture, evaluate, rank, and prioritize proposals. Scientists also schedule the science operations, select science party members from scores of international scientists qualified to participate, plan platform operations, ready the drillship, and choose borehole locations. The science party, collectively and individually, conducts science on board and on shore. The co-chief scientists on each expedition are responsible for synthesizing the scientific results as hallmark of expedition.

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 is truly an expansion and extension of the scientific research conducted by the legacy programs, engaging in cutting-edge research concerning topics of global importance.

IODP drilling platform operations are conducted by three Implementing Organizations (IOs). Riserless platform operations are 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 are 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 are 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 currently represents 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. Expedition *Proceedings* are 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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# Dedication



**Dr. Yutaka Aoki**

The IODP Expedition 333 volume is dedicated to the memory of Dr. Yutaka Aoki, who died in May 2011 due to blood disease after long-term medical treatment. Dr. Aoki published the first multichannel seismic lines across the Nankai Trough in 1982. These lines clearly demonstrated the nature of imbricate thrusting at the toe of the accretionary prism at a time when these structures had only been inferred from analog seismic lines and drilling data. Dr. Aoki remained actively involved in Nankai studies for many years until his rise to higher levels of management in Japan Petroleum Exploration Company (JAPEX) and JGI, Inc., diminished his time spent on science. Even as President of JGI (2004–2007), however, he was willing to provide guidance and technical assistance for our NanTroSEIZE studies.

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### Core descriptions

Visual core descriptions (VCDs), smear slide data tables, thin sections, 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 C0011**

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

#### **Site C0012**

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#### **Site C0018**

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

## Expedition research results

### Data reports

Titles are available in [HTML](#).

### Syntheses

See "[Syntheses](#)" in the Expedition-related bibliography.

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# Supplementary material

Supplementary material for this volume includes structural geology data in Microsoft Excel format and PDF format and visual core description scans in PDF format. See [README.TXT](#) in the SUPP\_MAT directory for a full listing of directories and files, or see the [Directory structure](#) for the names of the main subdirectories.

## 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/](http://gmt.soest.hawaii.edu/)).

[IODP Expedition 333 site map](#)

[IODP map](#) (Expeditions 301–329 and 331–333)

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[DSDP map](#) (Legs 1–96)



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# Expedition-related bibliography

## IODP publications

### *Scientific Prospectus*

Henry, P., Kanamatsu, T., and Moe, K.T., 2010. NanTroSEIZE Stage 2: subduction inputs 2 and heat flow. *IODP Sci. Prosp.*, 333. doi:10.2204/iodp.sp.333.2010

### *Preliminary Report*

Expedition 333 Scientists, 2011. NanTroSEIZE Stage 2: subduction inputs 2 and heat flow. *IODP Prel. Rept.*, 333. doi:10.2204/iodp.pr.333.2011

### *Scientific Drilling journal\**

Pending

### *Proceedings volume*

Henry, P., Kanamatsu, T., Moe, K., and the Expedition 333 Scientists, 2012. *Proc. IODP*, 333: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/iodp.proc.333.2012

Expedition 333 Scientists, 2012. Expedition 333 summary. In Henry, P., Kanamatsu, T., Moe, K., and the Expedition 333 Scientists, *Proc. IODP*, 333: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/iodp.proc.333.101.2012

Expedition 333 Scientists, 2012. Methods. In Henry, P., Kanamatsu, T., Moe, K., and the Expedition 333 Scientists, *Proc. IODP*, 333: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/iodp.proc.333.102.2012

Expedition 333 Scientists, 2012. Site C0018. In Henry, P., Kanamatsu, T., Moe, K., and the Expedition 333 Scientists, *Proc. IODP*, 333: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/iodp.proc.333.103.2012

Expedition 333 Scientists, 2012. Site C0011. In Henry, P., Kanamatsu, T., Moe, K., and the Expedition 333 Scientists, *Proc. IODP*, 333: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/iodp.proc.333.104.2012

Expedition 333 Scientists, 2012. Site C0012. In Henry, P., Kanamatsu, T., Moe, K., and the Expedition 333 Scientists, *Proc. IODP*, 333: Tokyo (Integrated Ocean Drilling Program Management International, Inc.). doi:10.2204/iodp.proc.333.105.2012

## Syntheses\*

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## Journals/Books\*

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## Conferences\*

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\*The Expedition-related bibliography is continually updated online. Please send updates to [PubCrd@iodp.tamu.edu](mailto:PubCrd@iodp.tamu.edu).



# Directory structure\*

<b>333.PDF</b> (Preliminary pages and table of contents)			
<b>README.TXT</b> (Information about the Expedition Reports DVD-ROM)			
<b>ACROREAD</b> (Acrobat Reader installation software and instructions for different platforms)	<b>MAC_OS</b>		
	<b>WINDOWS</b>		
	<b>UNIX</b>		
	<b>README.TXT</b>		
<b>EXP_REPT</b> (Expedition Reports section of <i>Proc. IODP, 333</i> )	<b>CHAPTERS</b> (Expedition Reports chapters)	<b>333_101.PDF</b> (Expedition 333 summary)	
		<b>333_102.PDF</b> (Methods)	
		<b>333_103.PDF</b> (Site C0018)	
		<b>333_104.PDF</b> (Site C0011)	
		<b>333_105.PDF</b> (Site C0012)	
	<b>CORES</b> (Visual core descriptions, smear slide data tables, thin sections, and digital core images)	<b>CORC0011.PDF</b> (Site C0011)	
		<b>CORC0012.PDF</b> (Site C0012)	
		<b>CORC0018.PDF</b> (Site C0018)	
		<b>IMAGES</b> (PDF files of core images)	
<b>SUPP_MAT</b> (Supplementary material)	<b>STRUCTUR</b> (Structural geology tables)	<b>C0011.XLS</b> (Site C0011)	
		<b>C0012.XLS</b> (Site C0012)	
		<b>C0018.XLS</b> (Site C0018)	
		<b>LOG</b> (Structure logs)	
	<b>VCD</b> (Visual core description scans)	<b>C0011C.PDF</b> (Hole C0011C)	
		<b>C0011D.PDF</b> (Hole C0011D)	
		<b>C0012C.PDF</b> (Hole C0012C)	
		<b>C0012D.PDF</b> (Hole C0012D)	
		<b>C0012E.PDF</b> (Hole C0012E)	
		<b>C0012G.PDF</b> (Hole C0012G)	
		<b>C0018A.PDF</b> (Hole C0018A)	
		<b>HR_C0012F.PDF</b> (Hole C0012F hard rock)	
	<b>HR_C0012G.PDF</b> (Hole C0012G hard rock)		
	<b>README.TXT</b>		
	<b>MAPS</b> (Drilling location maps)	<b>333_MAP.PDF</b> (Expedition 333 site map)	
		<b>IODPMAP.PDF</b> (IODP map, Expeditions 301–329 and 331–333)	
		<b>ODPMAP.PDF</b> (ODP map, Legs 100–210)	
		<b>DSDPMAP.PDF</b> (DSDP map, Legs 1–96)	

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