



R/V Kairei Cruise Report

KR16-03

SIP Project for Development of New-Generation Research
Protocol for Submarine Resources: Protocol development for
environmental assessment of hydrothermal vent area.

Noho site and Gondo site of Okinawa Through

10 to 18 February 2016

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

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1. Cruise Information

1.1. Title of the cruise

SIP Project for Development of New-Generation Research Protocol for Submarine Resources: Protocol development for environmental assessment of hydrothermal vent area.

1.2. Cruise number

KR16-03

1.3. Name of vessel and submersible vehicle

R/V Kairei and ROV Kaiko Mk IV

1.4. Title of the proposal

Monitoring the hydrothermal ecosystem and assessment of effects of drilling activity

1.5. Cruise period

10 to 18 February 2016

1.6. Ports of call

Departure : Yokosuka, Kanagawa

Arrival : Yokosuka, Kanagawa

1.7. Research area

Noho site and Gondo site of Okinawa Trough

26° 17.5'N、 26° 19.0'N、 126° 52.0'E、 127° 10.0'E

Water depth: 1200-1500m

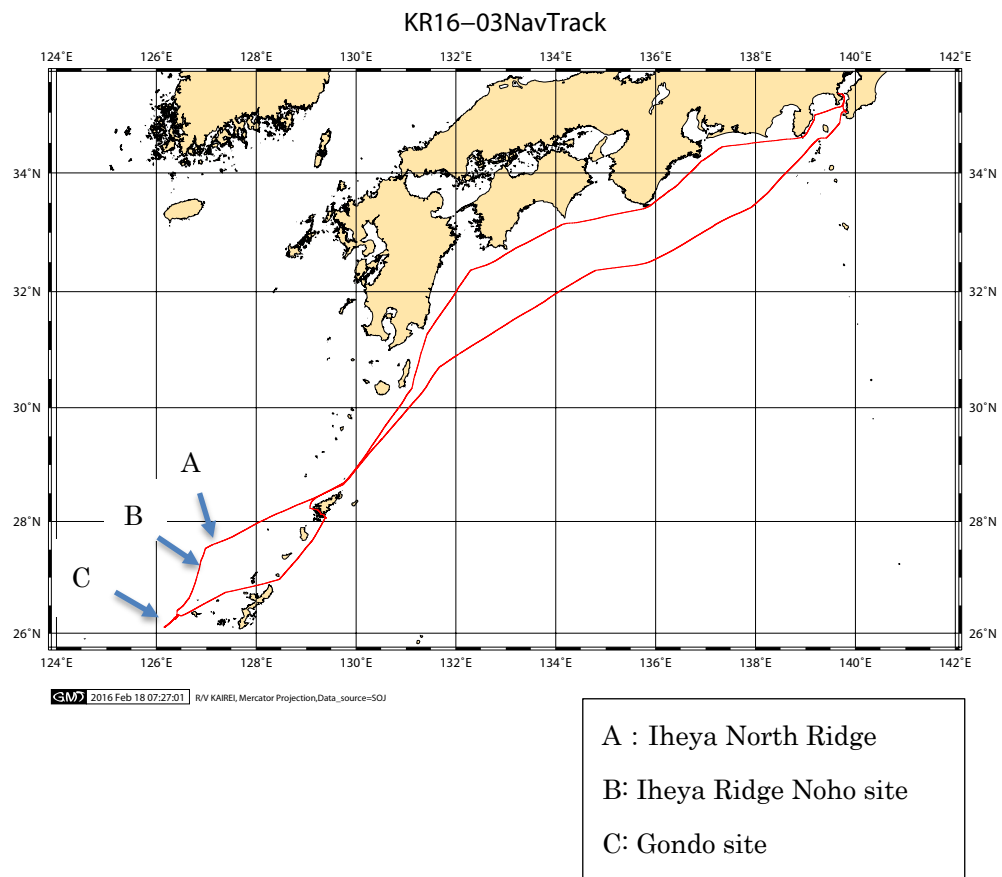
Noho site

27° 30.0'N、 27° 33.5'N、 126° 23.7'E、 126° 25.5'E

Water depth: 1300-1600m

2. Research map

Location of research area in Okinawa Trough



3. Onboard members

Research team

Chief Scientist / Representative of Science Party:

Hiroyuki YAMAMOTO	JAMSTEC
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Onboard Researchers:

Tomo KITAHASHI	JAMSTEC
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Masashi TSUCHIYA	JAMSTEC
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Tetsuya MIWA	JAMSTEC
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Shinsuke KAWAGUCHI	JAMSTEC
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Hiromi WATANABE	JAMSTEC
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Hisako HIRAYAMA	JAMSTEC
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Tatsuo FUKUHARA	JAMSTEC
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Atsushi SASAKI	JAMSTEC
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Masanobu KAWACHI	NIES
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Hiroshi KOSHIKAWA	NIES
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Shun TSUBOI	NIES
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Shigeshi FUCHIDA	NIES
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Hironori HIGASHI	NIES
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Yukako YAMADA	Kyushu University
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Technical supporting staff:

Hikaru IWAMARU	Nippon Marine Engineering
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Kenichi KATAYAMA	Marine Works Japan
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Research vessel and Deep-submersible

R/V KAIREI Crew

Eiko UKEKURA	Captain
Hiroyuki KATO	Chief Officer
Tomoyuki TAKAHASHI	2nd Officer
Satoru YOSHIDA	3rd Officer
Tadashi ABE	Chief Engineer
Shinichi IKUTA	1st Engineer
Naohito TADOOKA	2nd Engineer
Hiroki TANAKA	3rd Engineer
Yohei YAMAMOTO	Chief Electronics Operator
Emi SAWAYANAGI	2nd Electronics Operator
Kazuo ABE	Boat Swain
Kazumi OGASAWARA	Able Seaman
Yukito ISHII	Able Seaman
Hideaki NAKATA	Able Seaman
Yuta MOTOOKA	Sailor
Yusaku KANADA	Sailor
Toshiya SAGA	Sailor
Masanori UEDA	No.1 Oiler
Masaki TANAKA	Oiler
Keiya TANIGUCHI	Oiler
Toshinori MATSUI	Oiler
Atsumu HARA	Assistant Oiler
Toyonori SHIRAISHI	Chief Steward
Masao HOSOYA	Steward
Tatsunari ONOUE	Steward
Toru MURAKAMI	Steward
Yoshie HIDAKA	Steward

KAIKO Mk-IV operating team

Homare WAKAMATSU	Operation Manager
Kiyoshi TAKISHITA	2nd ROV Operator
Tetsuya ISHITSUKA	2nd ROV Operator
Seiji SHIGETAKE	2nd ROV Operator
Ryu ASAI	2nd ROV Operator
Shota IHARA	2nd ROV Operator
Takuma GOTO	3rd ROV Operator

4. Observation / Investigation

4.1 Overview

This research cruise is planned for environmental assessments of hydrothermal vent field in Iheya North Knoll, Noho site, and Gondo site of Okinawa Trough. The Iheya North Knoll has been used for drilling expeditions, the IODP expedition Ex331 in 2010, the SIP project CK14-04 in 2014, and next expedition will be planed in 2016. The Noho site is a new target area for 2016 drilling expedition by SIP project. The Gondo site is reported a hydrothermal activity by the survey of Japan Coast Guard in 2015, and an amount of mineral deposition for seabed mining by the expedition of Japan Oil, Gas and Metals National Corporation (JOGMEC) in 2016.

The seafloor destruction by drilling expedition or mining impacts a habitat condition of seafloor biome. The community changing process has been studied in several cases of volcanic eruption and drilling expedition. The practical environmental assessment protocol for deep-sea ecosystems including hydrothermal vent field is yet an under-developing issue, even in scientific research field. This cruise aims for collecting the data set of base-line condition in deep-sea hydrothermal vent field to examine the environmental assessment protocol, and to study the disturbance of drilling campaign for seafloor biome.

The data on seabed classification, benthic fauna, physicochemical conditions have been collected in this deep-sea expedition. The video survey of seafloor using downward-facing video camera was conducted to analyze the animal distribution and population density. Physical and chemical properties in surrounding area of hydrothermal system are data to determine the extent of chemosynthesis-based ecosystem. In this cruise, several types of physicochemical sensors and two approaches by morphological identification using image data and metagenomic analysis for mieofauna/microbial communities were examined.

5. Preliminary Research results

5.1. Survey of environmental condition and biological diversity

5.1.1. Video mapping and in situ measurement by sensors

T. Miwa, Y. Yamada, T. Fukuba

The video mapping was conducted in the belt transect located at the Noho site, using a downward camera system installed with digital hi-vision video camera which mounted on the ROV. The videos image will be analyzed at the laboratory of JAMSTEC.

In order to investigate the biogeochemical condition in benthopelagic zone of hydrothermal environments, Hybrid CO₂ Sensor (HCS), ISFET-pH sensor, and radon sensor had installed on Kaiko Mk-IV. All sensors detected biochemical signature of hydrothermal activity within the dives.

5.1.2. Free-fall observatories

T. Miwa, T. Fukuhara, H. Higashi

Free-fall and standalone platform for seafloor observation system, EDOKKO, was deployed at Noho site. During 48hr observation, time laps video record and physical properties of benthopleagic zone were recoded, and then recovered from the seafloor by acoustic release system.

The Fast Repetition Rate Fluorometer (FRRF) is an in situ sensor for determination of potential activity of photosynthesis. In this cruise, FRRF was operated by the cable winch, and determined from surface to 150m-depth layer at Noho site.

Vertical Microstructure Profiler (VMP-X) is a full-depth profiling system to measure the turbulent microstructure. In this cruise, VMP-X had machine trouble, and be cancelled measurement.

5.1.3. Sediment core sampling

T. Kitahashi, M. Tsuchiya

The H-type push core sampler was used in this cruise. The sediment core was collected at 2 sites of the transect line located in the Gondo site. At each site, the core sample was collected from three adjoining points. The core sample was divided in onboard laboratory, and preserved for examination of chemical properties, meiofauna,

and microorganism. The chimney sample was collected at Noho site.

5.1.4. Water sampling

M. Kawachi, H. Koshikawa, S. Tsuboi, S. Fuchida

The water samples were collected by operation of CTD rosetta sampling system (12L x 12 Niskin bottles) from 15 to 1,550m depths, bucket sampling for the surface water at the Noho site, and Niskin bottles equipped on the ROV for the bottom water at the Gondo site. The water samples were divided into each sample treatment and preserved for the studies on environmental parameters and phytoplankton community. Water samples were collocated from the tap of onboard supply for laboratory use on the way of R/V Kairei cruise, and were used for the survey of phytoplankton habitats and distribution pattern of broad area.

5.1.5. Benthos sampling

H. Watanabe

Representative benthic megafauna species of the Okinawa Trough vent fields including the galatheid squat lobster *Shinkaia crosnieri* were collected from hydrothermal vents and surrounding area at the Gondo site using a slurp gun.

5.1.6 Geochemical and Microbiological sampling

S. Kawaguchi, H. Hirayama

Specimens of hydrothermal fluid and chimney for geochemical and microbiological study were collected from the chimney spouting fluid of 296C at the Gondo site.

6. Acknowledgement

We are grateful thank to all crew of “R/V Kairei” for the safe navigation, and great thanks are due to the “ROV Kaiko Mrk IV” operation team for the sampling and observation of deep-sea hydrothermal field.

7. Notice on Using

Notice on using: Insert the following notice to users regarding the data and samples obtained.

This cruise report is a preliminary documentation as of the end of the cruise. This report may not be corrected even if changes on contents (i.e. taxonomic classifications) may be found after its publication. This report may also be changed without notice. Data on this cruise report may be raw or unprocessed. If you are going to use or refer to the data written on this report, please ask the Chief Scientist for latest information. Users of data or results on this cruise report are requested to submit their results to the Data Management Group of JAMSTEC.

Appendix:

Research log

KR16-03 payload and survey plan_Draft

item/day		2/12	2/13	2/14
site		Noho	Gondo	Gondo
resrach platform		Cable	ROV	ROV cancelled
Edokko -platform			deployment recovery	
ADCP current meter			cancelled	
FRRF		1		
CTD-DO_,12Lx12 NISKIN bottles		2		
Vertical Micro- Profiler	0.6m/sec	cancelled		
ROV:				
Video cam			+	+
Hybrid-pH-CO2 (HCS)	5 pin port, 24V		+	+
ATP			+	+
ISFET pH/pCO2/ORP			+	+
Radon gamma			+	+
NISKIN bottle (5L)			2	2
Sampling tools:				
push core			6	
sample box			1	1
Slurp Gun			single canister	single canister
WHATS			+	