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YOKOSUKA Cruise Report

YK-10-11

SHINKAI6500

the southern Mariana Trough

3-15 September 2010

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

CONTENTS

1. Cruise Information

Cruise ID: YK-10-11

Names of vessels: YOKOSUKA/SHINKAI6500

Title of cruise: SHINKAI 6500, the southern Mariana Trough

Titles of the proposal:

1) “Organization process of chemosynthesis-based communities in the southernmost part of the Mariana area”

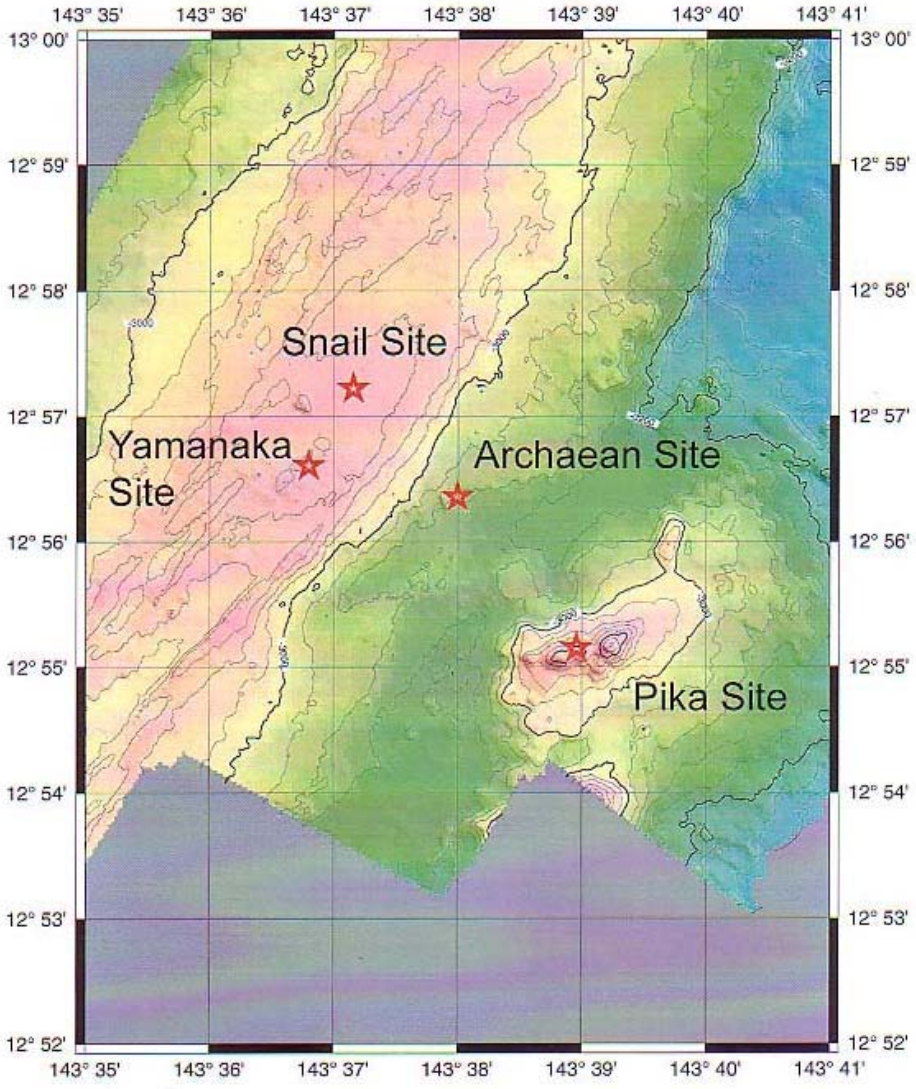
2) “Evolution history of hydrothermal activities on southern Mariana Trough”

Cruise period: September 3-15, 2010

Ports of call: Guam

Research area: the southern Mariana Trough

Research map:



2. Researchres

Chief scientist: Shigeaki Kojima (Atmosphere and Ocean Research Institute, the University of Tokyo)

Representatives of the Science parties

1) Shigeaki Kojima (Atmosphere and Ocean Research Institute, the University of Tokyo) "Organization process of chemosynthesis-based communities in the southernmost part of the Mariana area"

2) Jun-ichiro Ishibashi (Department of Earth and Planetary Sciences, Kyushu University) "Evolution history of hydrothermal activities on southern Mariana Trough"

Science parties:

Party 1

Shigeaki Kojima (Atmosphere and Ocean Research Institute, the University of Tokyo)
Hiromi Watanabe (Biogeos, Japan Agency for Marine-Earth Science and Technology)
Florence Pradillon (Biogeos, Japan Agency for Marine-Earth Science and Technology)
Takenori Sasaki (University Museum, the University of Tokyo)
Stacey Ellen Beaulieu (Biology Department, Woods Hole Oceanographic Institution)
Susan Wier Mills (Biology Department, Woods Hole Oceanographic Institution)
Sayaka Mino (Graduate School of Fisheries Sciences, Hokkaido University)
Mihye Seo (Atmosphere and Ocean Research Institute, the University of Tokyo)
Hiroka Hidaka (Atmosphere and Ocean Research Institute, the University of Tokyo)
Tomomi Ogura (Japan Agency for Marine-Earth Science and Technology / Faculty of Marine Science, Tokyo University of Marine Science and Technology)

Party 2

Shin Toyoda (Faculty of Science, Okayama University of Science)
Debabrata Banerjee (Faculty of Science, Okayama University of Science)
Miho Asada (IFREE, Japan Agency for Marine-Earth Science and Technology)
Nobutatsu Mochizuki (Priority Organization for Innovation and Excellence, Kumamoto University)

3. Researches

Overview of the researches: The objectives of this cruise, which focused on three hydrothermal vent fields distributed almost on a straight line in the southern Mariana Trough, namely, the Snail (Fryer) site, the Archaean site, and the Pika site, were 1) to estimate the history (age) of hydrothermal activity of each site using both biological and geochemical methodologies; 2) to improve those methodologies for age-estimation by comparing results obtained using each method; and 3) to reveal processes of changes in hydrothermal activities and foundation of vent-endemic biological communities. In addition to three dives of the submersible SHINKAI6500 at each of three hydrothermal vent sites mentioned above, we also visited the Yamanaka site during a single dive. For biological researches, we sampled animals such as *Alviniconcha* snails, revealed fauna of each site, and recorded their distribution in video images. We deployed two mooring systems plankton pump systems around each of three vent sites to collect plankton samples for 24 hours. We also deployed a current meter mooring system near the Snail site and succeeded to obtain near-bottom water currents data for 10 days. After this cruise, we attempt to classify collected animals, to analyze population structure of dominant species, and to estimate age of foundation of population of each species based on larval dispersal and genetic deviation between vent sites. For geological researches, we observed and recorded sea bottom, collected basaltic rocks, sulfide chimney, and bottom sediment samples, surveyed bottom sediment layers using a sub-bottom profiler, measured *in situ* gamma ray doses using a gamma-ray spectrometer, measured magnetization of sea bottom using a three-component magnetometer. We recovered OSL (Optically Stimulated Luminescence) dosimeters, which were deployed during the previous cruise at the Pika site, and deployed them at the Archaean site. Deployed dosimeters will be recovered during the cruise YK-10-13. After this cruise, we will employ the following four dating methods to determine the ages of each sample; the ESR (electron spin resonance) method; the U-Th method; the ^{226}Ra-^{210}Pb and ^{228}Ra-^{228}Th disequilibrium method; and the K-Ar method. Combining with data of magnetization of rock samples and that of bottom sediment, we will try to reconstruct the history of hydrothermal activities, such as ages when activities started and fluctuated, at each vent site. By comparing the ages estimated based on geological data with foundation ages of animal populations, we attempt to synthetically understand relationships between geological events and changes of biological communities.

Title of related project: Scientific Research Innovative Areas, MEXT "TAIGA project" (Representative: Tetsuro Urabe, Department of Earth & Planetary Science, the

University of Tokyo)

List of instruments:

Slurp-gun

Plankton pump

Anderaa current meter

Gamma-ray spectrometer

OSL (Optically Stimulated Luminescence) dosimeter

Sub-bottom profiler

Deep-sea three-component magnetometer

Cruise log:

				Position/Weather/Wind/Sea condition (Noon)
Date	Time	Description	Remark	
03,Sep,10	9:00	departure from Apra port		9/3 12:00(JST+1h)
	14:00	arrived at research point		13-9.5N, 143-58.7E
	14:46	deployed mooring system(Paul)		fine but cloudy
	15:47	deployed mooring system(Ringo)		ENE-5(Fresh breeze)
	16:12	deployed mooring system(current meter)		
	16:52 -19:32	carried out calibration for mooring system		
	20:00	science meeting		
04,Sep,10	10:00	started 6K#1220 dive		9/4 12:00(JST+1h)
	11:18	arrived at bottom	D=2852m	12-57.3N, 143-37.1E
	16:06	left the bottom	D=2842m	fine but cloudy
	17:09	surfaced 6K		E-3(Gentle breeze)
	17:40	recovered 6K		
	19:30	science meeting		
05,Sep,10	9:01	started 6K#1221 dive		9/5 12:00(JST+1h)
	10:20	arrived at bottom	D=3090m	12-56.2N, 143-38.0E
	15:00	left the bottom	D=2842m	cloudy
	16:09	surfaced 6K		E-4(Moderate breeze)
	16:40	recovered 6K		
	17:09	send release signal to mooring		

		system(Ringo)		
	17:47	surfaced mooring system(Ringo)		
	18:12	recovered mooring system(Ringo)		
	20:30	science meeting		
06,Sep,10	5:15	arrived at deploy point		9/6 12:00(JST+1h)
	5:45	send release signal to mooring system(Paul)		12-54.9N, 143-38.6E
	6:22	surfaced mooring system(Paul)		fine but cloudy
	6:47	recovered mooring system(Paul)		E-5(Fresh breeze)
	8:56	started 6K#1222 dive		
	10:17	arrived at bottom	D=2930m	
	14:59	left the bottom	D=2902m	
	16:09	surfaced 6K		
	16:27	recovered 6K		
	17:32	deployed mooring system(Paul)		
	18:18	deployed mooring system(Ringo)		
	18:58 -20:00	carried out calibration for mooring system		
	20:00	science meeting		
	20:12	suspended calibration		
07,Sep,10	5:40	arrived at research area		9/7 12:00(JST+1h)

	5:43 -6:36	carried out calibration for mooring system		12-56.3N, 142-37.7E
	9:50	started 6K#1223 dive		fine but cloudy
	11:20	arrived at bottom	D=3057m	E-3(Gentle breeze)
	16:32	leave the bottom	D=3018m	
	17:35	surfaced 6K		
	18:01	recovered 6K		
	20:00	science meeting		
08,Sep,10	16:10	send release signal to mooring system(Ringo)		9/8 12:00(JST+1h)
	16:52	surfaced mooring system(Ringo)		13-01.3N, 143-34.8E
	17:11	recovered mooring system(Ringo)		fine but cloudy
	17:14	send release signal to mooring system(Paul)		ENE-4(Moderate breeze)
	17:52	surfaced mooring system(Paul)		
	18:09	recovered mooring system(Paul)		
09,Sep,10	8:56	started 6K#1224 dive		9/9 12:00(JST+1h)
	10:20	arrived at bottom	D=3059m	12-56.4N, 143-37.9E
	14:54	left the bottom	D=2997m	fine but cloudy
	16:02	surfaced 6K		NE-3(Gentle breeze)
	16:29	recovered 6K		
	17:26	deployed mooring system(Ringo)		
	17:57	deployed mooring		

		system(Paul)		
	18:52 -19:52	carried out calibration for mooring system		
	20:00	science meeting		
10,Sep,10	7:10 -7:40	carried out calibration for mooring system		9/10 12:00(JST+1h)
	9:59	started 6K#1225 dive		12-55.5N, 143-38.9E
	11:31	arrived at bottom	D=3011m	fine but cloudy
	15:57	leave the bottom	D=2781m	E-4(Moderate breeze)
	16:58	surfaced 6K		
	17:24	recovered 6K		
	20:00	science meeting		
11,Sep,10	16:12	send release signal to mooring system(Ringo)		9/11 12:00(JST+1h)
	16:51	surfaced mooring system(Ringo)		12-45.0N, 143-39.8E
	17:14	recovered mooring system(Ringo)		fine but cloudy
	18:29	send release signal to mooring system(Paul)		E-4(Moderate breeze)
	19:09	surfaced mooring system(Paul)		
	19:29	recovered mooring system(Paul)		
12,Sep,10	9:56	started 6K#1226 dive		9/12 12:00(JST+1h)
	11:16	arrived at bottom	D=2919m	12-55.3N, 143-38.9E

	15:58	left the bottom	D=2922m	cloudy
	17:03	surfaced 6K		E-4(Moderate breeze)
	17:33	recovered 6K		
	20:00	science meeting		
13,Sep,10	9:00	started 6K#1227 dive		9/13 12:00(JST+1h)
	10:21	arrived at bottom	D=2850m	12-57.2N, 143-37.1E
	15:07	left the bottom	D=2771m	fine but cloudy
	16:05	surfaced 6K		ESE-3(Gentle breeze)
	16:35	recovered 6K		
	17:09	send release signal to mooring system(CM)		
	17:41	surfaced mooring system(CM)		
	17:56	recovered mooring system(CM)		
	20:00	science meeting		
14,Sep,10	9:51	started 6K#1228 dive		9/14 12:00(JST+1h)
	11:12	arrived at bottom	D=2861m	12-57.0N, 143-36.7E
	16:05	left the bottom	D=2851m	fine but cloudy
	17:12	surfaced 6K		NE-3(Gentle breeze)
	17:36	recovered 6K		
	18:00	left research area for Apra port		
15,Sep,10	9:00	arrived at Apra port		9/15 12:00(JST+1h)
	14:00	unloaded WHOI's equipments		Apra port
	17:00	disemberkation science group & concluded YK10-11		

Dive information:

Dive 1220 of Shinkai 6500

Day: 4 September 2010

Observer: Hiromi Watanabe (JAMSTEC)

Objectives: Development of biological communities around Southern Mariana Trough

Diving site: Snail site, southern Mariana Trough

Dive 1221 of Shinkai 6500

Day: 5 September 2010

Observer: Shin Toyoda (Okayama University of Science)

Objectives: Collecting samples for dating and rock petrology, and Gamma ray measurements

Diving site: Archaean site, southern Mariana Trough

Dive 1222 of Shinkai 6500

Day: 6 September 2010

Observer: Miho Asada (JAMSTEC)

Objectives: Acquisition of ground reference information of AUV-Urashima acoustic images and sampling of low-magnetic rocks

Diving site: Pika site, southern Mariana Trough

Dive 1223 of Shinkai 6500

Day: 7 September 2010

Observer: Stacey Ellen Beaulieu (Woods Hole Oceanographic Institution)

Objectives: Development of biological communities around Southern Mariana Trough

Diving site: Archaean site, southern Mariana Trough

Dive 1224 of Shinkai 6500

Day: 9 September 2010

Observer: Takenori Sasaki (the University of Tokyo)

Objectives: Development of biological communities around Southern Mariana Trough

Diving site: Archaean site, southern Mariana Trough

Dive 1225 of Shinkai 6500

Day: 10 September 2010

Observer: Susan Wier Mills (Woods Hole Oceanographic Institution)

Objectives: Development of biological communities around Southern Mariana Trough

Diving site: Pika site, southern Mariana Trough

Dive 1226 of Shinkai 6500

Day: 12 September 2010

Observer: Florence Pradillon (JAMSTEC)

Objectives: Development of biological communities around Southern Mariana Trough

Diving site: Pika site, southern Mariana Trough

Dive 1227 of Shinkai 6500

Day: 13 September 2010

Observer: Nobutatsu Mochizuki (Kumamoto University)

Objectives: Observation of ocean floor around the backarc spreading axis

Diving site: Snail site and Yamanaka site, southern Mariana Trough

Dive 1228 of Shinkai 6500

Day: 14 September 2010

Observer: Shigeaki Kojima (the University of Tokyo)

Objectives: Development of biological communities around Southern Mariana Trough

Diving site: Snail site, southern Mariana Trough

4. Notice on using

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 the 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 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.