

Preliminary Report
of
the *R/V KAIYO* Cruise KY09-04

July 23 – 29, 2009

Site Survey for the IBM-4 Drilling Proposal in Izu-Ogasawara Area

Center for Deep Earth Exploration (CDEX)
Japan Agency for Marine-Earth Science and Technology

CONTENTS

PREFACE	1
1. Participants aboard the <i>R/V KAIYO</i> cruise KY09-04	1
2. Objectives	1
3. Survey area	5
4. Cruise track	7
5. Preliminary results	8
5-1. Installation of 2 mooring systems	9
5-2. Core sampling by piston corer	10
5-3. Single Channel Seismic survey (SCS)	12
5-4. Bathymetric and sea current survey	13
6. Acknowledgement	14
References	15

PREFACE

In July, 2009, the KY09-04 cruise using R/V KAIYO of JAMSTEC (Japan Agency for Marine-Earth Science and Technology) was successfully carried out in the Izu-Ogasawara area, Japan.. We installed 2 mooring systems and collected core sample near IBM-4 proposed riser drilling site. We also acquired high resolution bathymetric data during the cruise. The purpose of these operations is site survey for the IODP (Integrated Ocean Drilling Program) 698-Add riser drilling proposal.

1. Participants aboard the R/V KAIYO cruise KY09-04

YAMAMOTO Fujio*	JAMSTEC/CDEX
GOTO Shinya	JAMSTEC/CDEX
TOMIYAMA Takayuki	JAMSTEC/Kochi Institute for Core Sample Research

*Chief of the cruise

2. Objectives

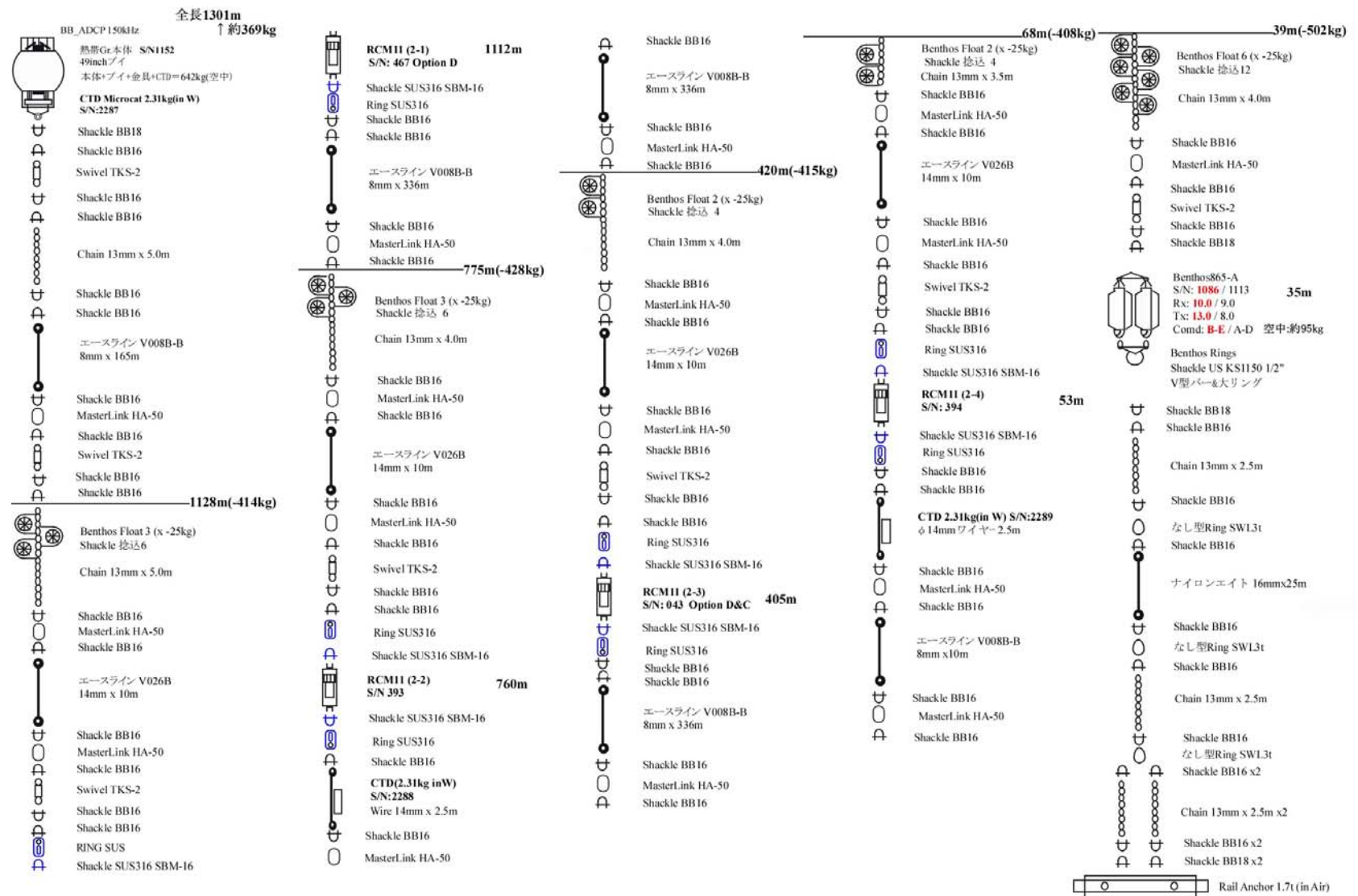
To investigate drilling hazards around proposed drilling site in the Izu-Ogasawara area, the following site surveys were conducted for safety and efficient riser drilling by *D/V CHIKYU*. Each objective of the missions is as follows.

(A) Installation of 2 mooring systems

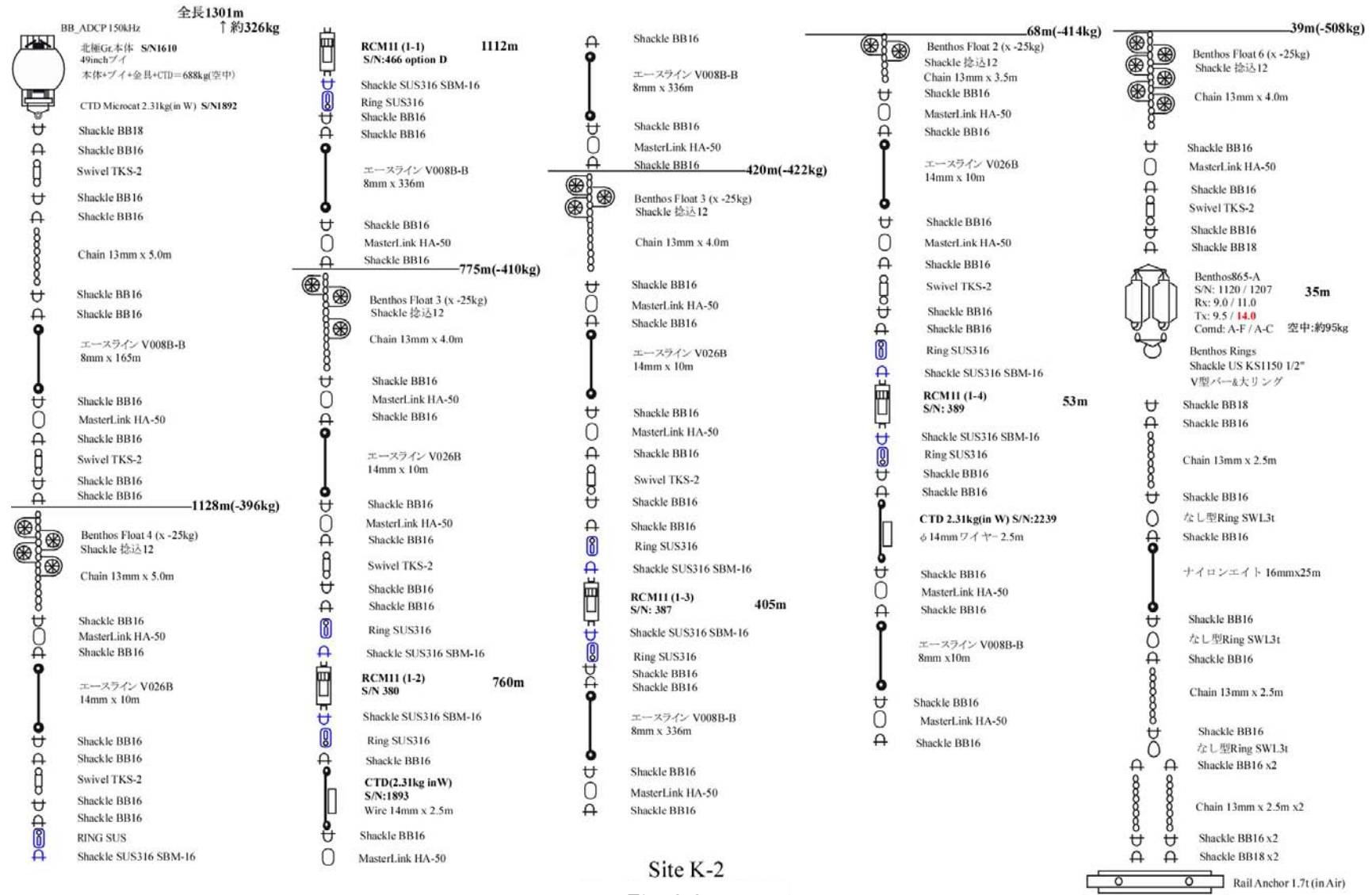
Two mooring systems were installed around proposed riser drilling site to acquire sea current magnitude and direction data including its vertical profiles. Purpose of these installations is to understand the effects of the sea current to the riser pipes during riser drilling operation. Strong sea current would push the riser pipes and pipes would curves. So, obtained data will be used for riser analysis.

The mooring system consists of one Acoustic Doppler Current Profiler (ADCP), four RCM-11 Doppler current meters, 3 CTDs, and two releasers. The total length of the system is 1,300m. Top buoys are designed to locate in about 500 meters of water depth. The configurations of each mooring system are shown Fig. 2-1 and 2-2. The data is stored in the internal memory pack of the instruments. The recoveries of these mooring systems are planned in the next Japanese fiscal year.

In addition, about 1,000 meters current profile data below sea surface was measured and recorded by *R/V KAIYO*'s hull mounted ADCP system during the cruise.



Site K-1
Fig. 2-1
- 2 -



Site K-2
Fig. 2-2

(B)Core sampling by piston corer

Main objective of sediment coring in this cruise is to measure mechanical strength of the core sample for the riser tophole section. Because it is required for future drilling planning, about 30 cm long whole-round core samples are chosen from an entire core sample based upon magnetic susceptibility data measured during the cruise. This sort of study must be done well in advance to the operation, because if the mechanical strength is not enough to support the conductor pipe, we need to make some modification on the casing plan.

Piston core sampler that we used in this cruise consists of an 800 kg-weight, a total 6 m-long stainless tube with plastic inner tube, and a pilot core sampler. Because the IBM-4 site is located near the ocean floor cables and we cannot carry out coring operation due to JAMSTEC's existing rule, we changed the coring site, 3 miles WSW from the IBM-4 site.

A tri-axial compressional test for the whole-round core samples obtained during this cruise will be performed by a geological company after the cruise. The results will be used to design for deployments of a 36" conductor pipe and the BOP (blow-out preventer).

(C)Single Channel Seismic survey (SCS)

To investigate the shallow hazards such as shallow gas, shallow water flow, and shallow faults, a single channel seismic survey was conducted around proposed drilling sites. Bolt's 2800LL-X Cluster gun and SIG 16 streamer cable were used for the SCS survey. The cluster gun system is effective to obtain images for the shallower part, down to a few hundred meters. Specifications for the cluster gun system and SIG streamer cable are as follows.

- Cluster gun system

Manufacturer:	Bolt Technology
Type of airgun:	2800LL-X Cluster
Volume:	40 cuin×2
Air pressure:	2000 psi
Source depth:	1.5 m
Dominant frequency (-6 dB):	50 Hz – 300 Hz

- SIG 16 streamer cable

Manufacturer:	SIG
Length:	47 m
No. of hydrophones:	48
Hydrophone interval:	1 m
Frequency:	10 – 1,000 Hz
Streamer depth:	2.0 – 3.0 m

Fig. 2-3 shows planned SCS lines for this cruise. Direction of survey lines were decided based on the results of IFREE MCS lines.

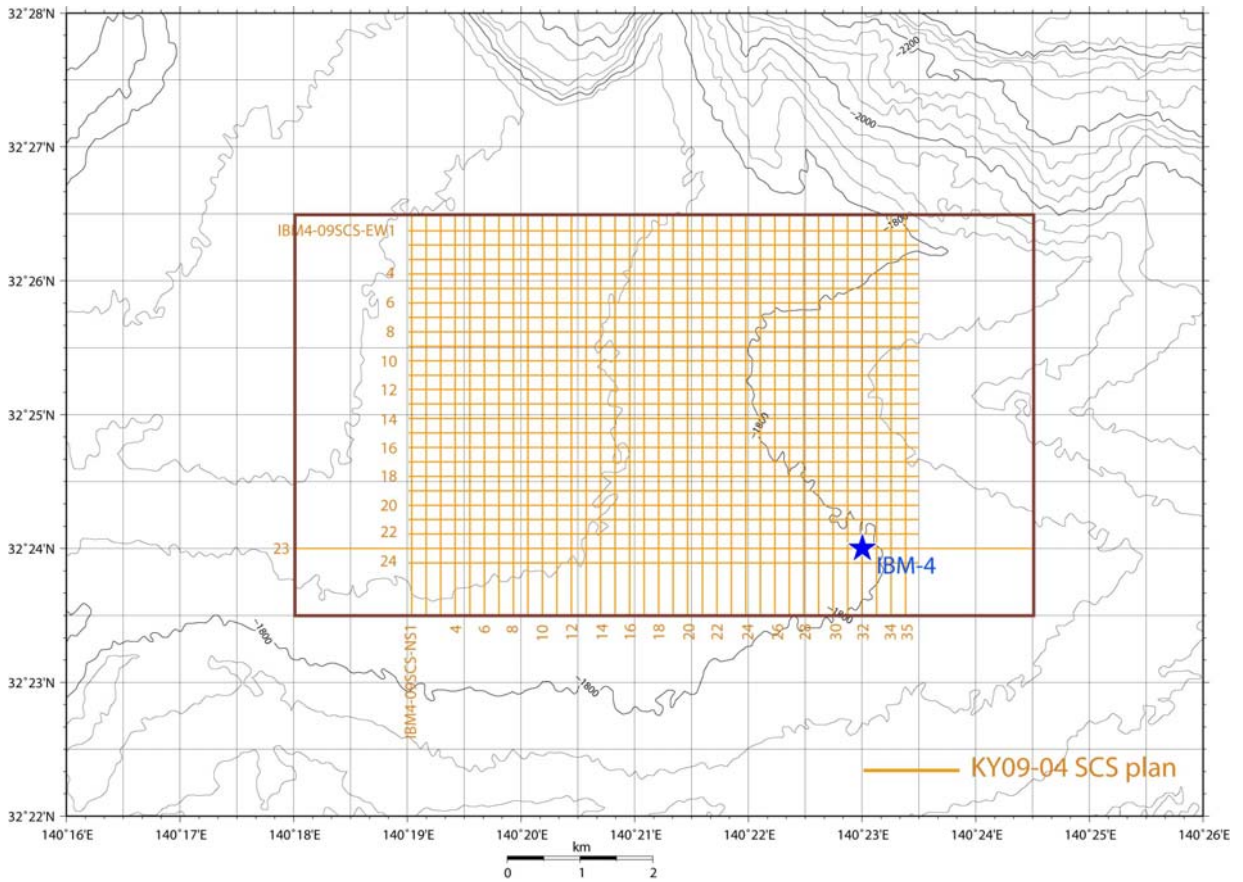


Fig. 2-3 Planned SCS lines

(D) Bathymetric survey and sea current survey

Bathymetric survey and sea current survey by using ship's hull mounted systems were also conducted to understand seafloor topography and sea current condition around the proposed riser drilling site.

3. Survey area

Proposed riser drilling site (IBM-4) shown in Fig. 3-1 is located in the forearc of the northern Izu-Bonin-Mariana (IBM) arc, offshore Hachijo-jima in the east. This site is also considered to be situated above a buried volcanic edifice with domal basement structure including that of the plutonic middle crust (6.0 km/sec layer) on the past volcanic front of the IBM arc in the Paleogene.

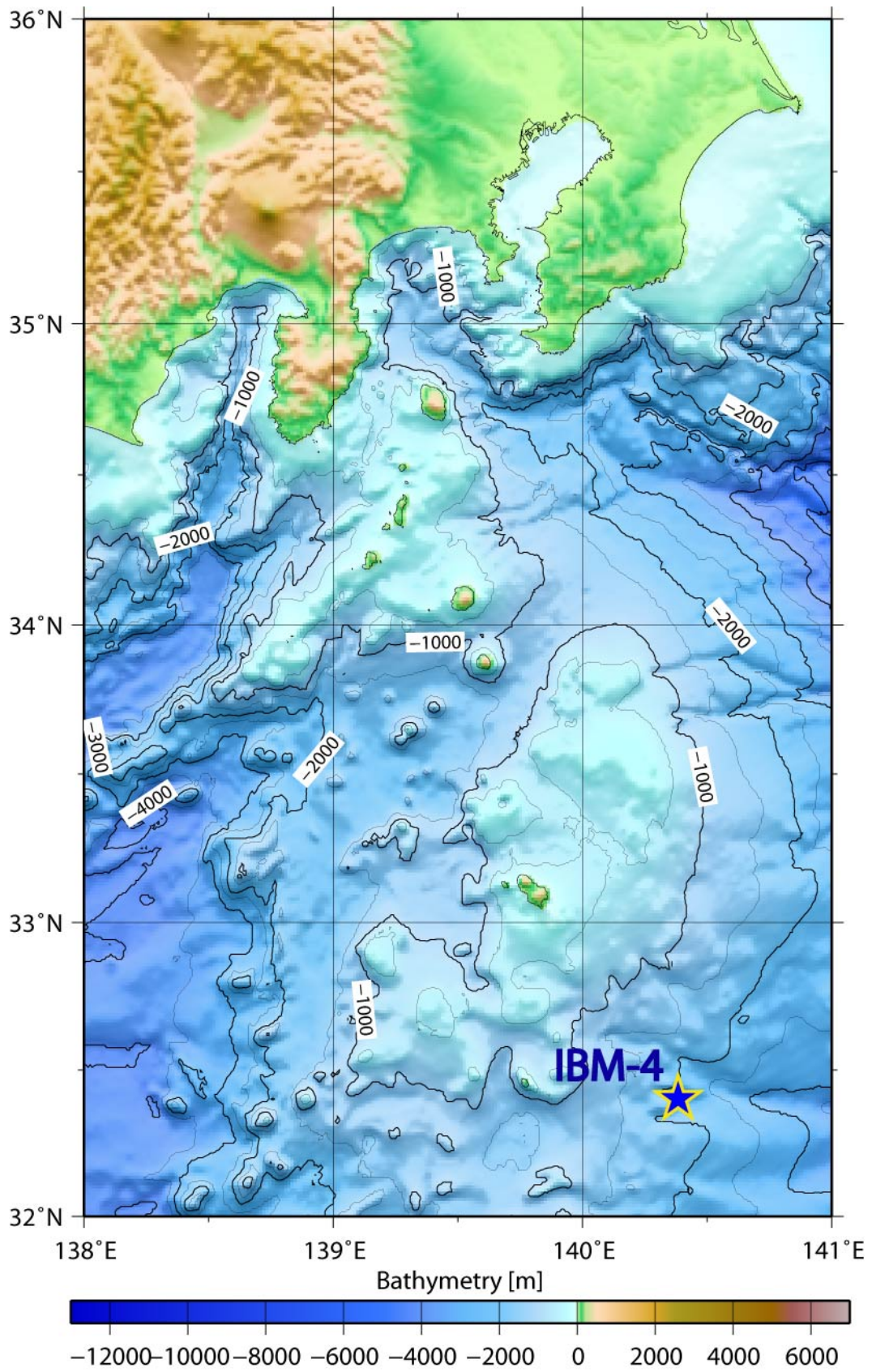


Fig. 3-1 Topographic map with IBM-4 proposed riser drilling site

4. Cruise track

KY09-04 cruise was started from JAMSTEC pier on July 23 and then, the vessel went to the Izu-Ogasawara area. Mooring installations, core sampling, and a bathymetric survey were conducted in this area. Finally, the vessel arrived at JAMSTEC pier on July 29 and we ended KY09-04 cruise.

Fig. 4-1 shows ship's tracks for the entire KY09-04 cruise and table 4-1 shows activity log during the cruise.

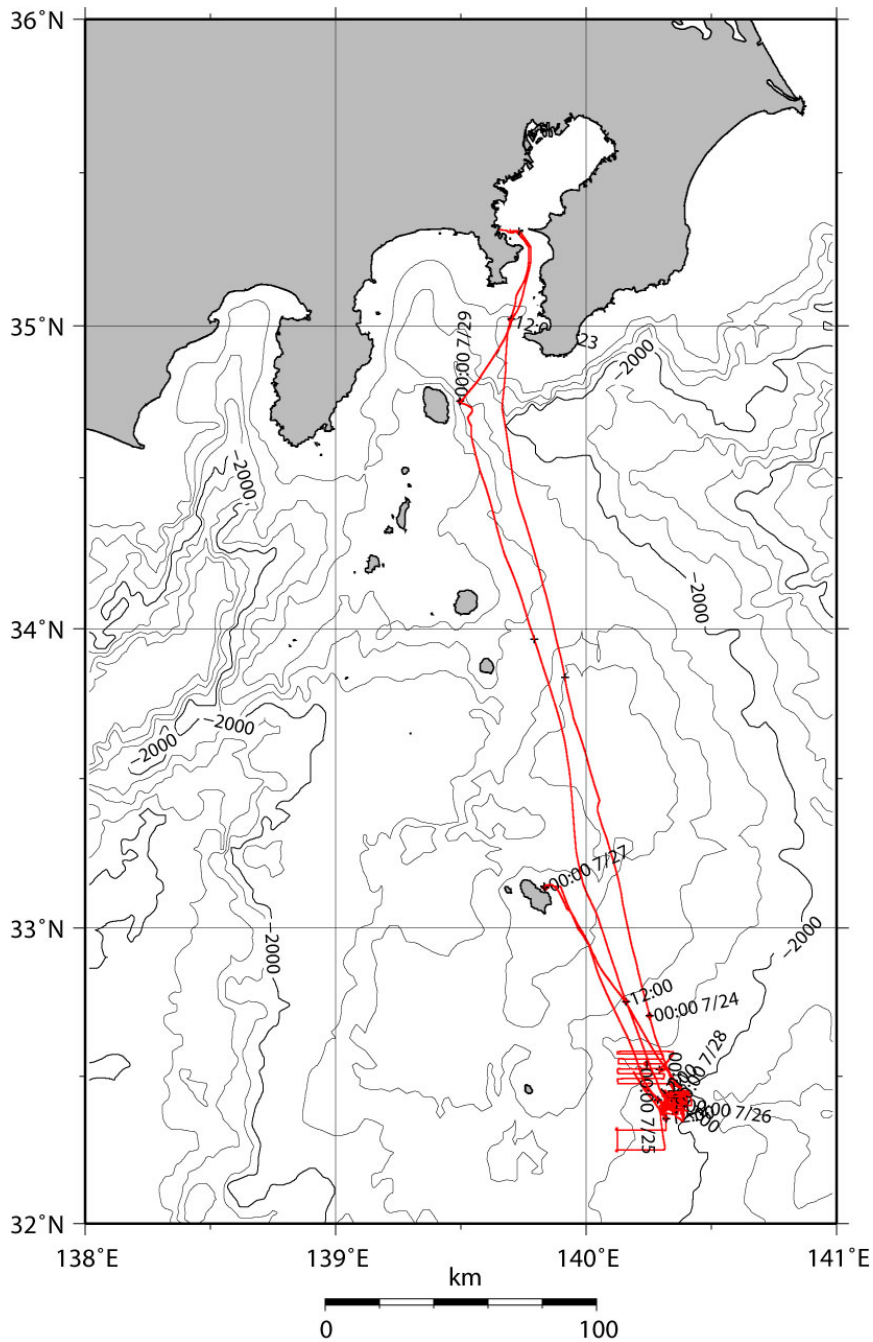


Fig. 4-1 Ship's tracks for the entire K09-04 cruise (Contour interval : 500 m)

Table 4-1 Cruise log

Date	Remarks
July 23	Departure from Yokosuka, Transit to survey area
24	Arrival at survey area, XBT measurement, SeaBeam survey, Mooring installation (K-2)
25	Mooring installation (K-1), Piston coring (PC-1), SCS
26	SCS, Transit to Off Hachijo-jima for weather stand by
27	Transit to survey area, SCS
28	SCS, Transit to Yokosuka
29	Arrive at Yokosuka (Leg2)

5. Preliminary results

Fig. 5-1 shows the results of KY09-04 cruise. Bathymetric survey lines and SCS lines conducted during the cruise are also plotted in this figure.

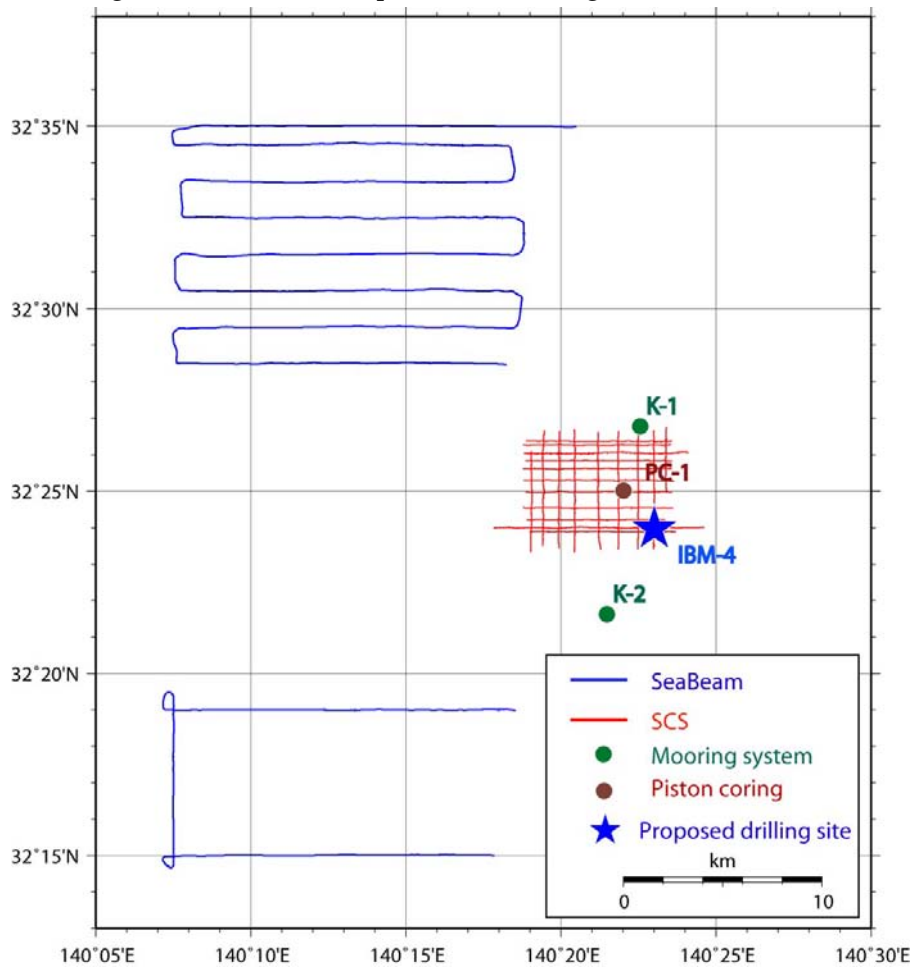


Fig. 5-1 Survey points and lines during the KY09-04 cruise

5-1. Installation of 2 mooring systems

As soon as we arrived at the IBM-4 riser drilling site, we conducted XBT measurement to investigate a vertical profile of temperature for correction of both Super Short Base Line (SSBL) and SeaBeam measurements. Then, we installed one mooring system at station K-2 in July 24 and the other mooring system was installed in July 25. The SSBL combined with Differential Global Positioning System (DGPS) of WGS84 was adopted to determine a geographic position of station K-2. 3 points measurements combined with DGPS of WGS84 was conducted to determine a geographic position of station K-1. Parameter settings of each mooring system are shown in Table 5-1.

Table 5-1 Parameter settings of instruments on mooring systems

	Site	K-1		K-2	
		32° 26.763'N	140° 22.557'E	32° 21.6145'N	140° 21.477'E
	Water Depth	1772 m		1890 m	
ADCP	Serial Number	1152 (熱帯)		1610 (北極)	
	Frequency	153.6 kHz			
	Head Angle	30 degrees			
	Head Arrangement	4 Beam Convex			
	pings per ensemble	6		4	
	Bin size	16 m		32 m	
	Number of Bins	20		10	
	Blank after Transmit	16 m		32 m	
	Time between pings	2 sec			
	Recording Interval	30 min			
	Transducer Depth (Plan)	485 bMSL		485 bMSL	
	Depth of First Bin (Plan)	461 bMSL		419 bMSL	
	Depth of Last Bin (Plan)	157 bMSL		131 bMSL	
	Velocity standard deviation	2.6 cm/s		1.6 cm/s	
	Total space needed	8.52 MB		5.07 MB	
Energy required	1003.82 Wh		1160.27 Wh		
RCM	Recording Interval	30 min			
	Serial Number	467		466	
	Sensor Depth (Plan)	683 bMSL		673 bMSL	
	Option Sensor	Pressure, Tilt, Signal strength		Pressure, Tilt, Signal strength	
	Serial Number	380		393	
	Sensor Depth (Plan)	1035 bMSL		1025 bMSL	
	Option Sensor	Tilt, Signal strength		Tilt, Signal strength	
	Serial Number	43		387	
	Sensor Depth (Plan)	1390 bMSL		1380 bMSL	
	Option Sensor	Pressure, Conductivity, Tilt, Signal strength		Tilt, Signal strength	
	Serial Number	394		389	
	Sensor Depth (Plan)	1742 bMSL		1732 bMSL	
Option Sensor	Tilt, Signal strength		Tilt, Signal strength		
CTD	Recording Interval	30 min			
	Serial Number	2287		1892	
	Sensor Depth (Plan)	496 bMSL		486 bMSL	
	Serial Number	2288		1893	
	Sensor Depth (Plan)	1039 bMSL		1029 bMSL	
Serial Number	2289		2239		
Sensor Depth (Plan)	1745 bMSL		1735 bMSL		
Acoustic Releaser	Serial Number	1086	1120	1113	1207
	Receive Frequency	10.0	9.0	9.0	11.0
	Transmit Frequency	13.0	9.5	8.0	14.0
	Enable Code	B	A	A	A
Release Code	E	F	D	C	

The recoveries of 2 mooring systems are planned in the next Japanese fiscal year. Obtained data will be used for the riser analysis.

5-2. Core sampling by piston corer

Piston coring operation was conducted near the IBM-4 proposed riser drilling site. Table 5-2 and Fig. 5-3 show the results of core sampling. The SSBL combined with Differential Global Positioning System (DGPS) of WGS84 was adopted to determine a geographic position of station PC-1. The obtained core is 480 cm long and consists of silt to sandy silt intercalated with several tephra layers, shown in Fig. 5-4.

After retrieving the corer on deck, an inner tube was pushed out from an outer pipe. The inner tube was sectioned into every 1 meter in length using a rotary band saw. In order to know successive magnetic susceptibility throughout whole-round section, the magnetic susceptibility data measured by Magnetic Susceptometer Bartinton MS-2 (Bartinton Co. Ltd., UK) with a loop sensor used to select 3 whole-round core samples (30 cm long) for the tri-axial compressional test.

Whole – round samples except tri-axial compressional core sample was split lengthwise into working and archive halves with a stainless steel wire. Visual core description was conducted at the No.4 laboratory and then sediments were photographed.

The tri-axial compressional test of 3 whole-round core samples will be conducted by a geological company in this September and it will be finished and reported by the end of this year.

Table 5-2 Results of core sampling

Site	Latitude (N)	Longitude (E)	Water Depth [m]	Coring	Recovery [m]
PC-1	32° 25.0156'	140° 22.0179'	1,792	6	4.8

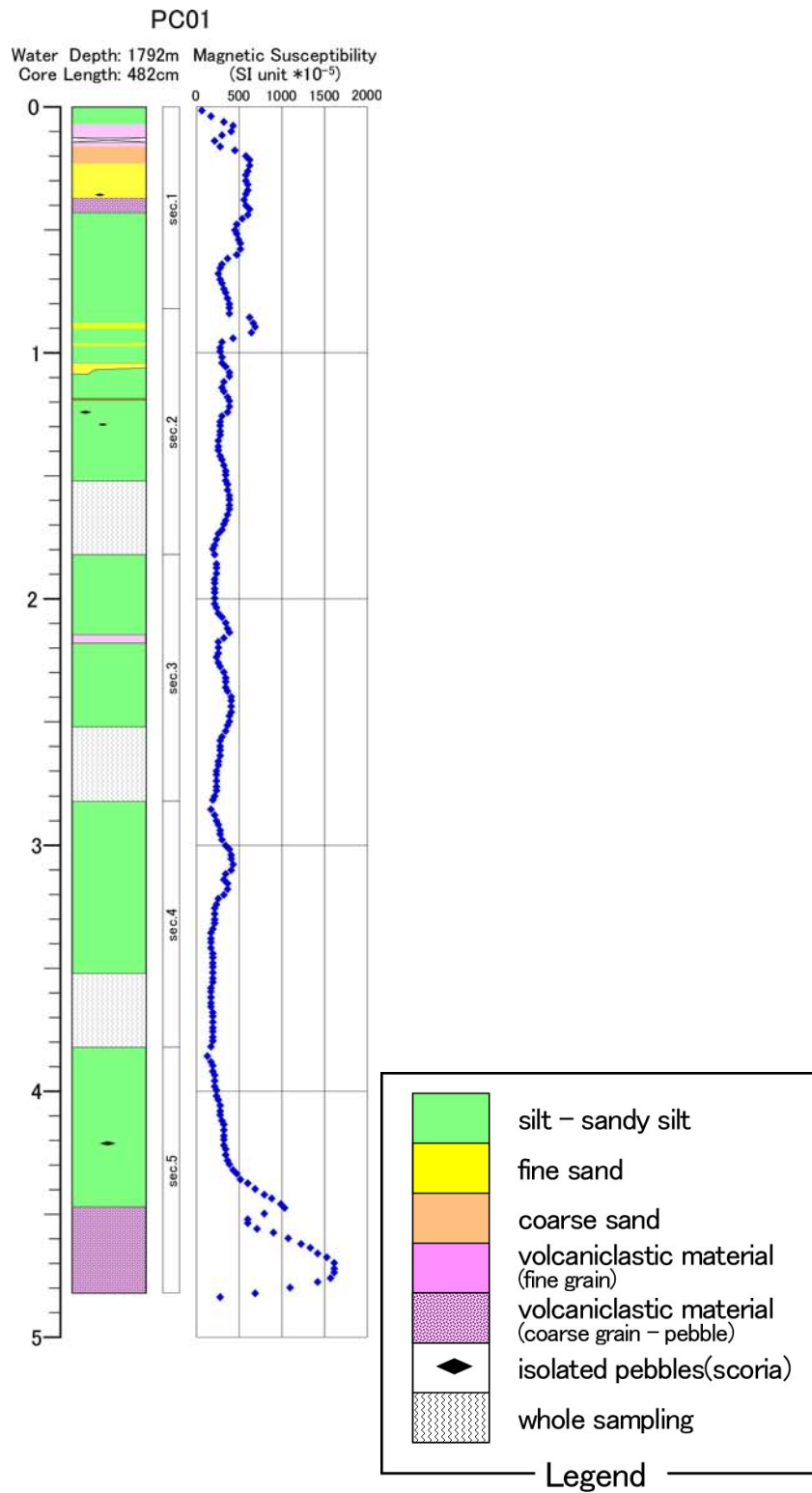


Fig. 5-3 Core description, and magnetic susceptibility of PC-1

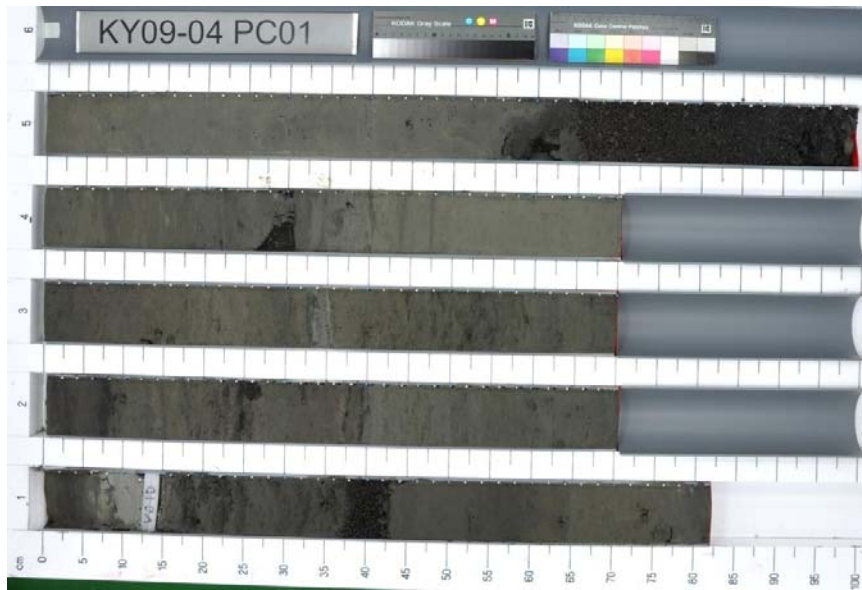


Fig. 5-4 Core sample photograph of PC-1

5-3. Single Channel Seismic survey (SCS)

A total of 141.6 km of SCS data was collected around the proposed riser site. Differential Global Positioning System (DGPS) of WGS84 was used for the positioning. Raw SCS reflection data was processed for the purpose of quality control during the cruise. Onboard data processing includes noisy-trace editing, 25 – 500 Hz band-pass filtering. Fig. 5-5 shows one of the results of the onboard data processing. Interpretation will be performed afterwards.

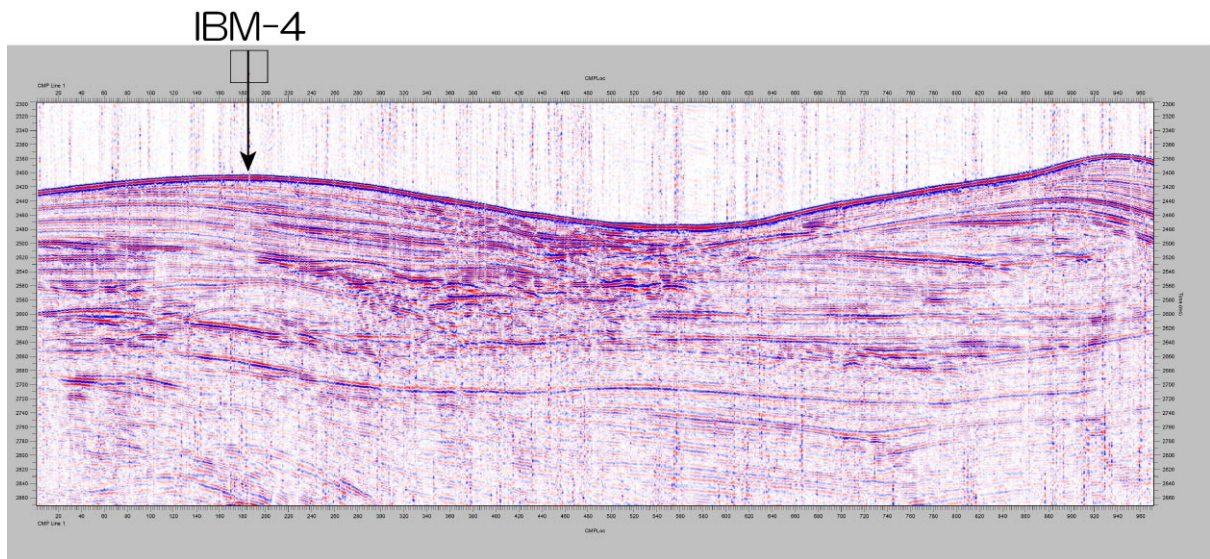


Fig. 5-5 SCS profile with IBM-4 proposed riser drilling site

5-4. Bathymetric and sea current survey

A bathymetric survey by using SeaBeam2112 (12kHz) was conducted around the IBM-4 proposed riser drilling site. We also conducted sea current measurement by using a hull mounted ADCP (38kHz). The results of both bathymetric and sea current survey are shown in the following figures.

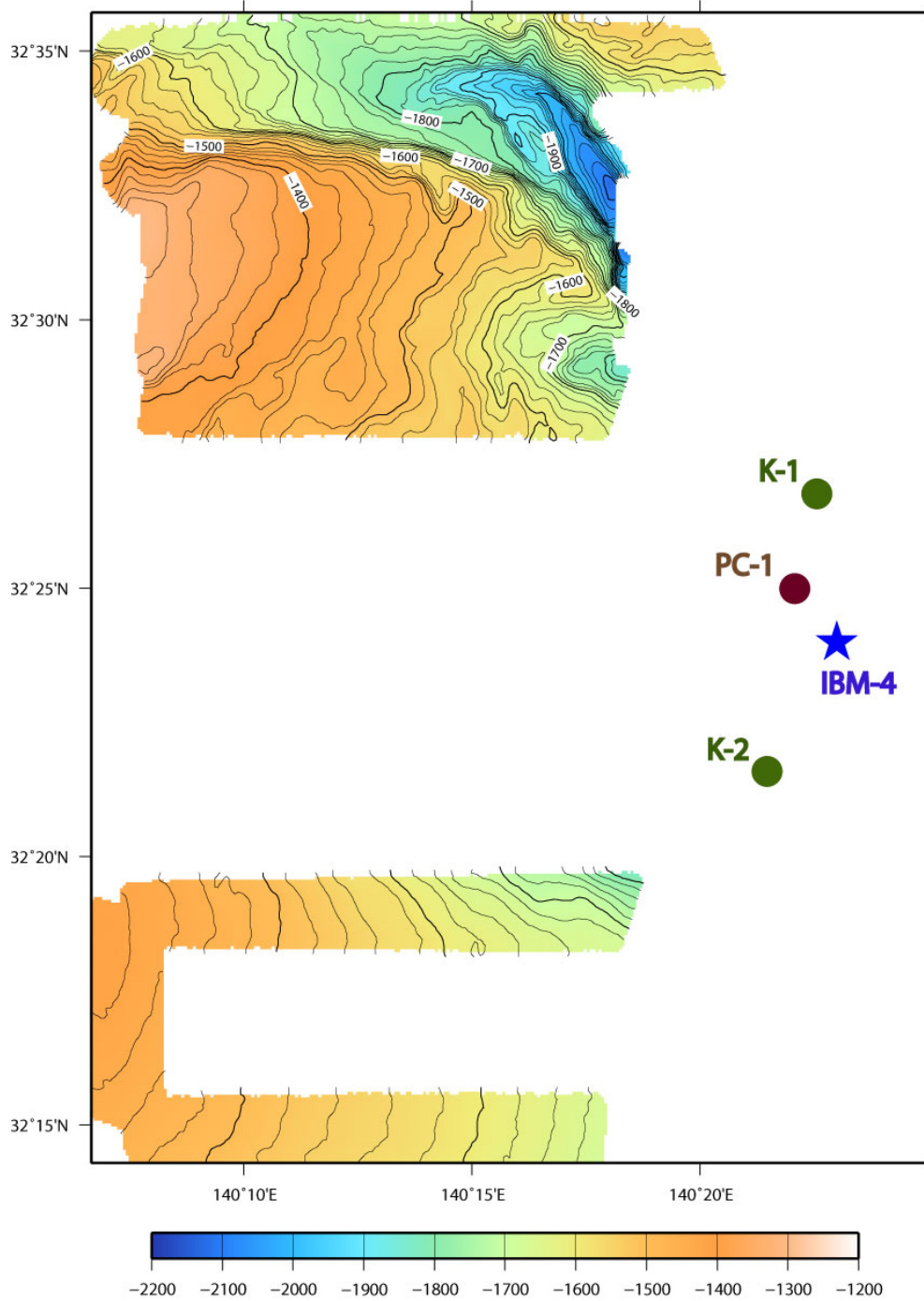


Fig. 5-6 Bathymetric chart with IBM-4 proposed riser drilling site (KY09-04 survey points are shown in this figure)

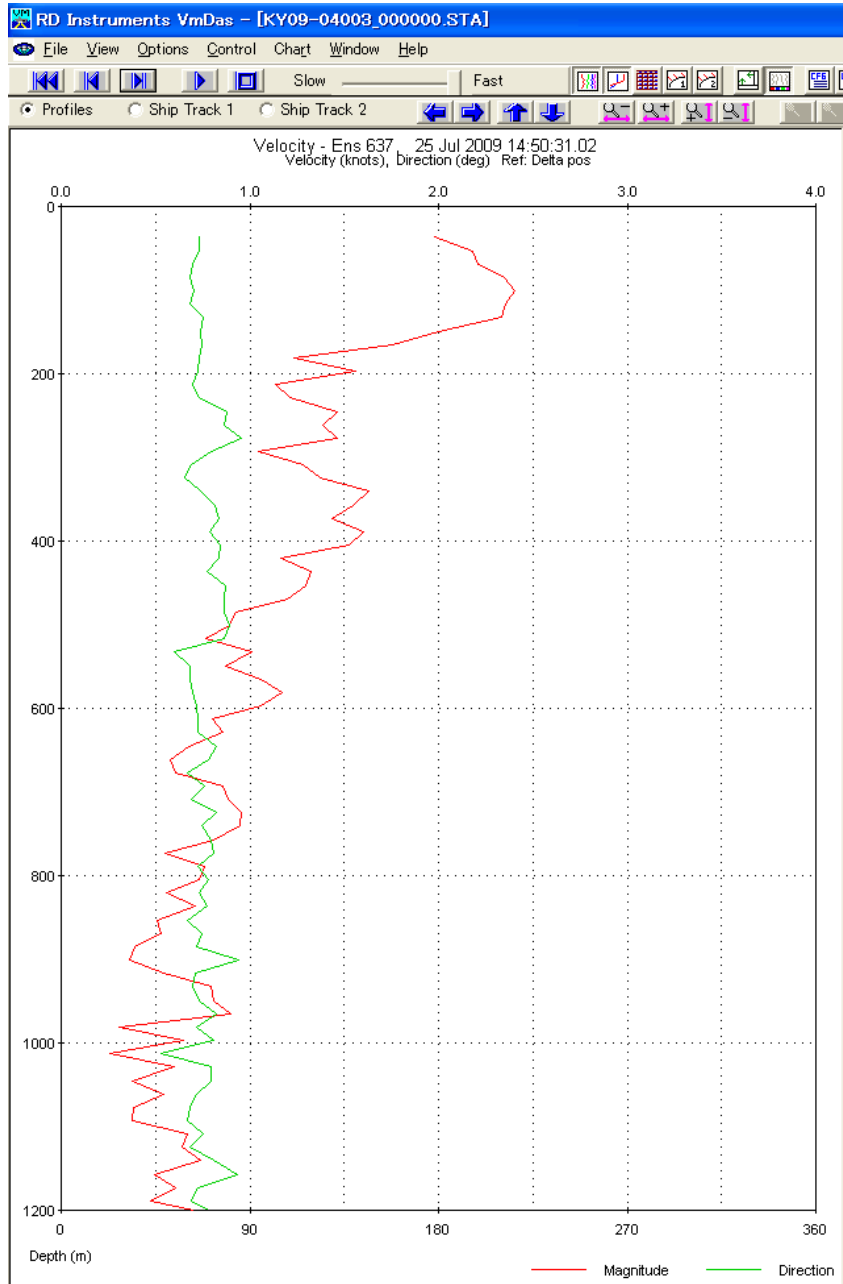


Fig. 5-7 Sea current profile near IBM-4 proposed riser site

6. Acknowledgement

We thank Captain KOUJI Sameshima, crew and technical staffs of our experiments conducted during the KY09-04 cruise, for their kind and thoughtful supports during the cruise.

References

- 1) ODP Initial Reports Vol. 126 Sites 787-793 Bonin Arc-Trench System, Ocean Drilling Program Texas A&M University
- 2) IODP Proposal 698-Full, Continental Crust Formation at Intra-Oceanic Arc : Ultra-Deep Drilling to the Middle Crust of the Izu-Bonin-Mariana Arc.

※ 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 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 Integration and Analysis Group (DIAG) of JAMSTEC.