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YK09-13_Leg1 Cruise Report

October10, Port Louis, Mauritius – October29, Port Louis, Mauritius, 2009

Japan Agency for Marine-Earth Science & Technology

Contents

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Masaya, KATAGIRI, 3rd Submersible Staff

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Shinya RYONO

Rikita YOSHIDA, Chief Officer
Hiroyuki KATO, 2nd Officer
Syunsuke FUJII, 3rd Officer
Hiroyuki SHIBATA, Chief Engineer
Kazuhiro KANEDA, 1st Engineer
Yoshinobu HIRATSUKA, 2nd Engineer
Ichiro, DEGUCHI, 3rd Engineer
Hiroyasu SAITAKE, Chief Radio Operator
Yohei YAMAMOTO, 2nd Radio Operator
Yuka MORIWAKI, 3rd Radio Operator
Yasuyoshi KYUKI, Boat Swain
Katsumi SHIMIZU, Able Seaman
Osamu TOKUNAGA, Able Seaman
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Kazuhiro HIRAYAMA, Steward
Hiroyuki OHBA, Steward
Kazuma SONODA, Steward
Kei ITO, Steward

Acknowledgements

We are grateful to Captain Shinya RYONO and the crew of “R/V Yokosuka” for their safe and skillful navigation. Great thanks are also due to Operation Manager Toshiaki SAKURAI and “Shinkai 6500” operation team for taking us to deep sea floor and accurate operations in sampling. We also thank Satoshi SHIMIZU, Syusuke MACHIDA, and Takuya MAEKAWA, Nippon Marine Enterprise, Ltd., for their attentive supports.

We thank all the JAMSTEC and Nippon Marine Enterprises personnel who have supported the shipboard scientists. Finally, we would like to appreciate all the persons who supported directly or indirectly this cruise.

I. INTRODUCTION

In October 2009, we conducted YK09-13 cruise by R/V Yokosuka with a manned deep-sea submersible vehicle (DSV) Shikai6500 in two regions of the Central Indian Ridge (CIR) 18˚-20˚S and successfully discovered two active hydrothermal sites; one is the Dodo field at the Dodo Great Lava Plain (CIR Segment 16 at 18˚20'S) and the other is the Solitaire Field at the Roger Plateau (Segment 15 (19˚33'S), respectively. The Roger Plateau is an expression of ongoing interaction of Reunion hotspot – Rodriguez Ridge with the CIR spreading center. These findings are based on the results of the previous cruise KH06-4 cruise R/V Hakuho-maru done in 2006 with intensive seafloor mapping, CTD hydrocasts, and AUV-r2D4 diving researches. DSV Shinkai6500 made focused diving at the areas where chemical anomalies are detected by AUV-r2D4 Gamos in-situ chemical sensor and CTS hydrocasts. The Dodo field and Solitaire field are named after extinct bird species of the Mauritius Island and the Rodriguez Island, respectively.

The black smoker fluids in the Dodo field exhibit unusually high concentrations of H2 in spite of the slightly brine-enriched feature of the fluids. Chemosynthetic faunal communities in the Dodo field are emaciated in size and composition. The Solitaire field is characterized by extensive diffusing flows throughout the field, suggesting that the emission patterns of the hydrothermal fluids were atypical among the CIR hydrothermal systems known so far including the Dodo field. The most outstanding feature was the prosperous macrofaunal communities that potentially contained the almost entire members of macrofaunal genera found in the CIR hydrothermal environments and even previously unexplored animal members (e.g., Alvinellidae polychaetes). Moreover, a new morphotype of scaly foot gastropod, of which one type has been known only in the Kairei field in the world, dominated the chemosynthetic animal communities in the Solitaire field. These findings provide important insights into geochemical diversity of hydrothermal activity and biodiversity and biogeography of vent-endemic ecosystem in the Indian Ocean.

YK09-13 Leg1 cruise originally planed 12 submersible dives. However, because of rather rough weather condition, 7 dives were conducted. Instead, three deep tow TV camera surveys were conducted on the occasion when weather condition allows. Actually deep tow TV camera surveys provided most critical information to locate the hydrothermal sites and led the subsequent successful dives to discover active hydrothermal sites.

Some geophysical mapping with multi-narrow beam bathymetric survey and proton magnetometer survey was done during nights and on the occasion of transits. The tracks of geophysical survey are most complementary to the more completed geophysical tracks of KH06-4 cruise. The geophysical data obtained will be processed with KH06-4 data to understand general tectonics and geology in the area.

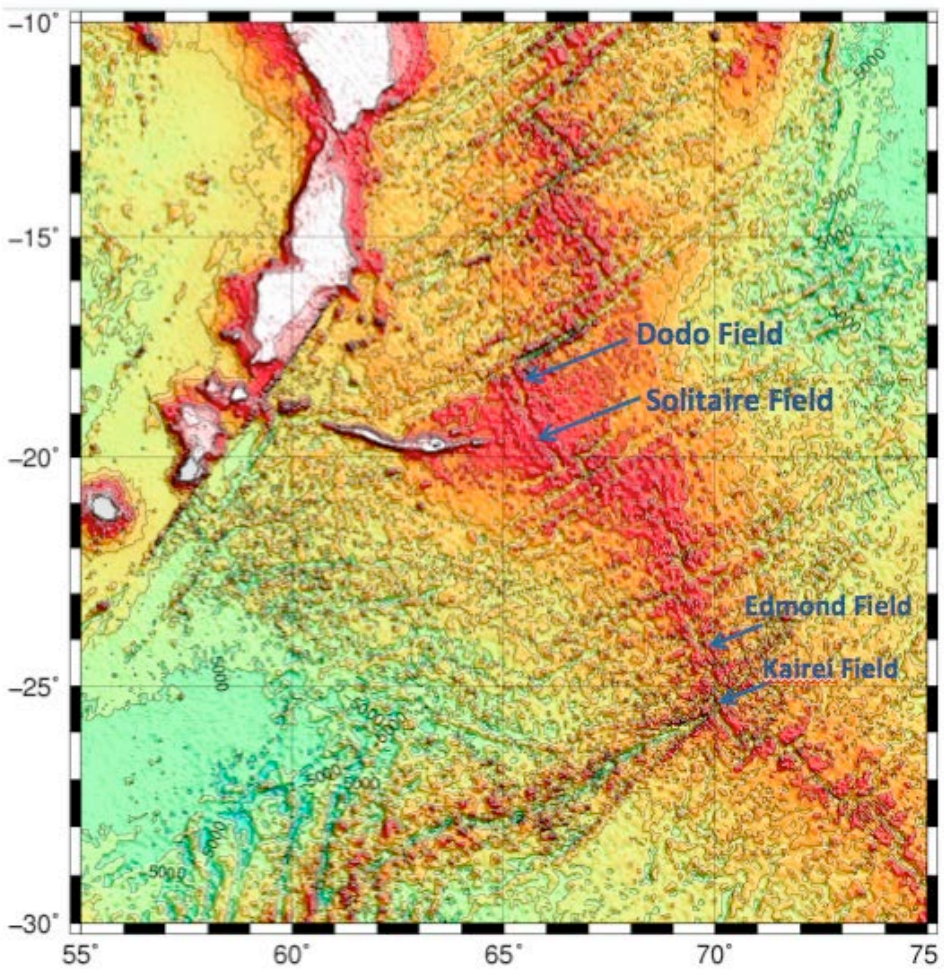


Figure 1：Dodo Field and Solitaire Field are newly discovered hydrothermal fields. All the submersible dives and associated surveys of YK09-13 Leg 1 were conducted at these two sites.

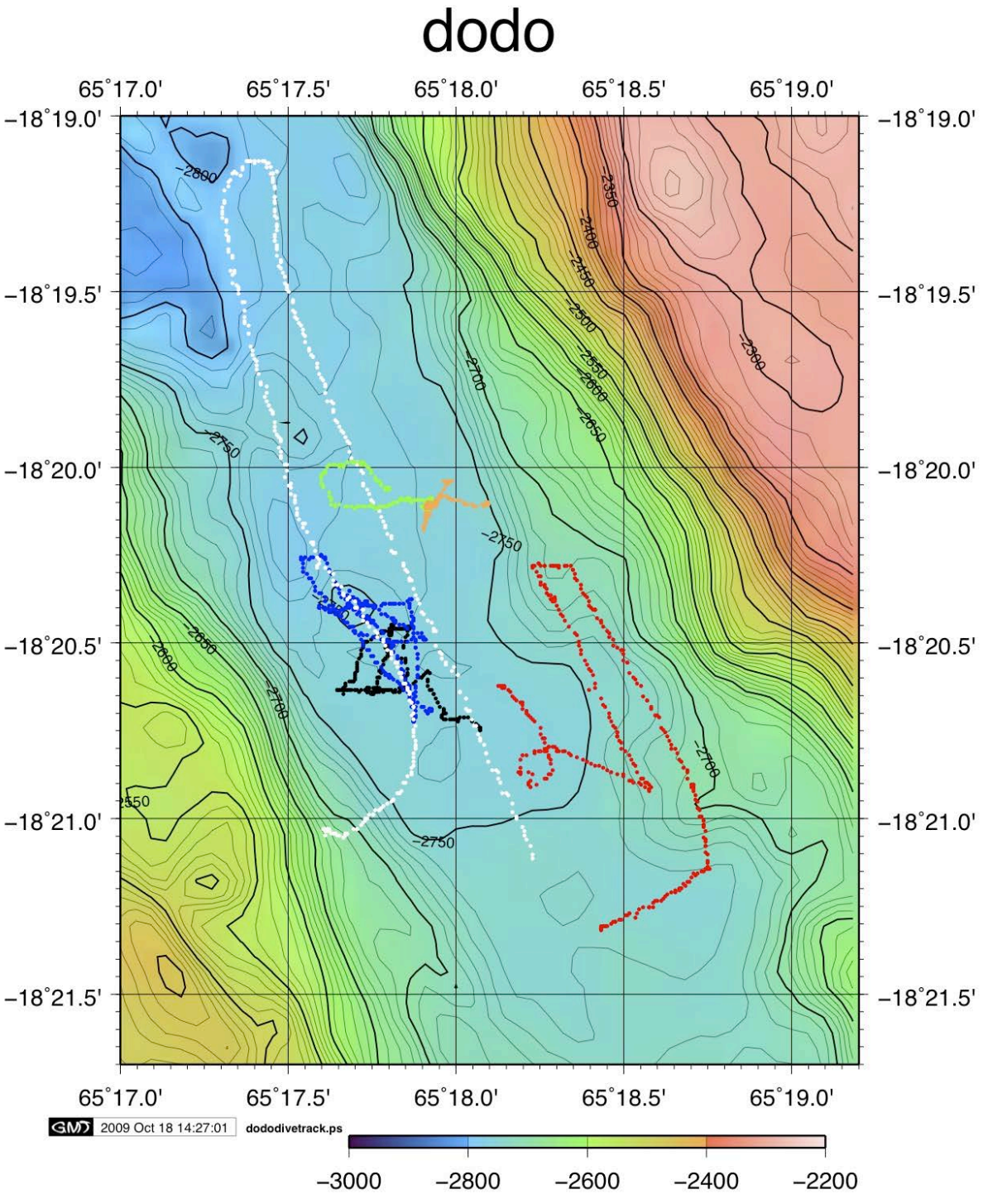


Figure 2: Dive tracks at the Dodo Lava Plain. Black: #1162, red: #1163, blue: #1164, light green: #1165, and orange: #1166. White color shows deep tow TV camera track.

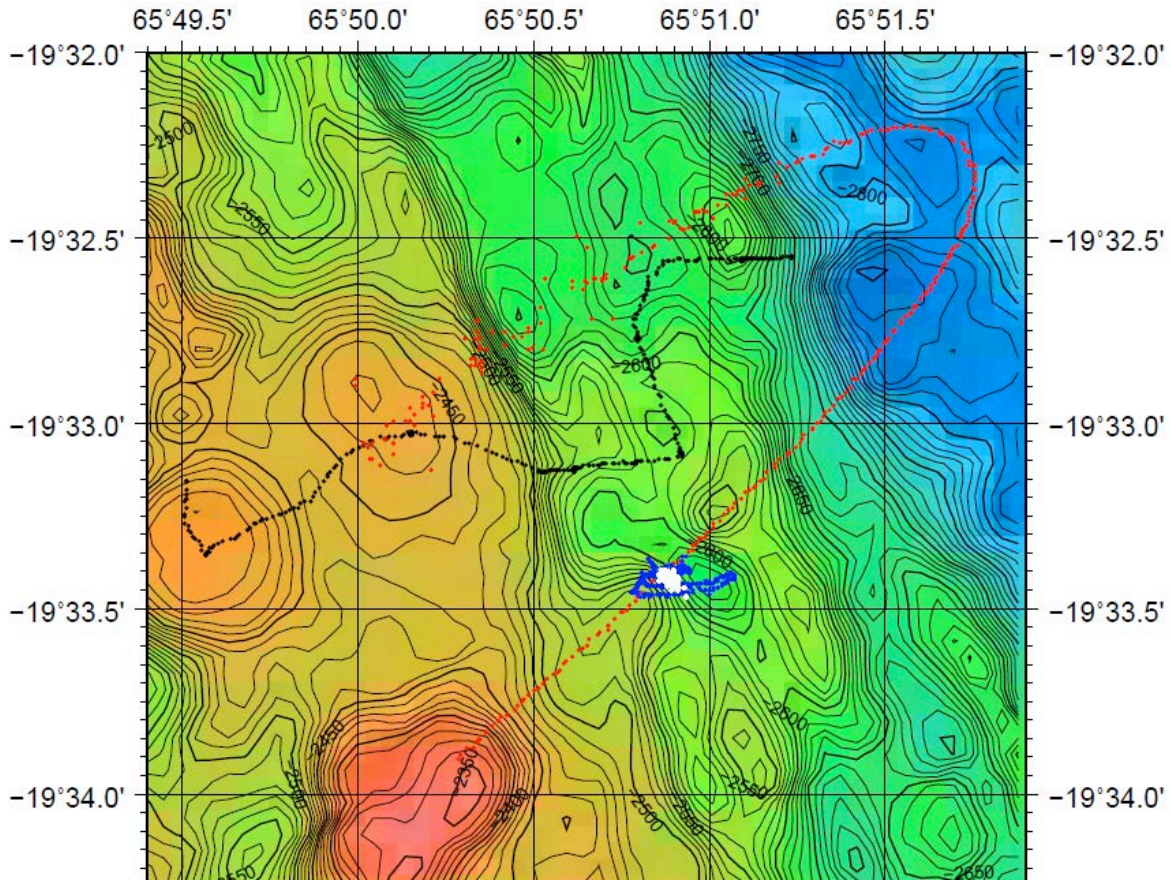


Figure 3: Dive tracks at the Roger Plateau area. Black: #1167 and white: #1168. Black and blue colors show deep tow TV camera tracks.

II. EXPLANATORY NOTE

1. Manned Research Submersible "Shinkai 6500"

Mission of "Shinkai 6500"

"Shinkai 6500" is able to operate surveys and observations down to the depth 6500 meters with one scientist and two pilots. During the operation, "Shinkai 6500" finds her position by two ways; Long Base Line system (LBL) and Super Short Base Line system (SSBL). The LBL system needs three bottom-mounted transponders to be deployed in the survey area. "Shinkai 6500" locates her own position by herself in real time and the mother ship determines the position of "Shinkai 6500" based on the position of transponders. The SSBL system does not require any transponder but the accuracy of the position is inferior to LBL system and "Shinkai 6500" can not determine her own position.

Specifications

Length:	9.5m
Width:	2.7m
Height:	3.2m
Weight in air:	25.8t
Maximum operation depth:	6500m
Complement:	3 (2 pilots and 1 researcher)
Inner radius of pressure vessel:	2.0m
Normal dive time:	8 hours
Life support duration:	129 hours
Payload:	150kg (weight in air)
Under water speed:	0-2.0 knots (Emergency: 2.5 knots)
Observation instruments:	Pan-tilt-zoom color video camera
	Fixed-view color video camera
	35mm still camera
	CTD sensors
	Gamma ray spectrometer
	CTFM sonar
	Video-image transmission system
Operating devices:	2 manipulators
	2 retractable baskets

2. Research Vessel “Yokosuka”

Mission of “Yokosuka”

1) Operate submersible “Shinkai 6500”
2) Operate underway-geophysical equipments;
   Multi Narrow Beam Echo Sounder (Sea Beam 2112.04)
   Gravity meter (Type S-63)
   Ship-borne three-components magnetometer (Type SFG-1212)
   Proton magnetometer (Typ STC10)

Research Facilities

In wet laboratory, a fumigation chamber, Milli-Q water purification system, -80°C and -20°C freezer, incubator and rock saw are equipped. In addition, “Yokosuka” has on-board video editing system for DVCAM, S-VHS and VHS.

Specifications

Length:	105.22m
Breadth:	16.0m
Height:	7.3m
Draft:	4.5m
Gross tonnage:	4439t
Cruising speed:	about 16kts
Cruising range:	about 9000mile

III. DIVE REPORTS

#1162 Dive (Dodo lava plain) Dr. K.Tamaki
#1163 Dive (Dodo Great Lava Plain) Dr. S.Kawagucci
#1164 Dive (Dodo lava plain) Dr. D.Marie
#1165 Dive (Dodo Great Lava Plain) Dr. K.Nakamura
#1166 Dive (Dodo lava plain) Mrs. M. Koonjul
#1167 Dive (Roger Plateau) Dr.Y.Orihashi
#1168 Dive (Solitaire Hydrothermal field) Dr. K.Takai

Dive Report: Shinkai 6500 Dive#1162

Date: October 13, 2009
Site: Dodo Lava Plain
Landing: 18°20.5000'S, 65°18.0000'E, 2747 m
Leaving: 18°20.7500'S, 65°18.0700E, 2646 m
Observer: Kensaku Tamaki (The University of Tokyo)
Pilot: Y.Yoshiume **Co-Pilot:** Y.Chida

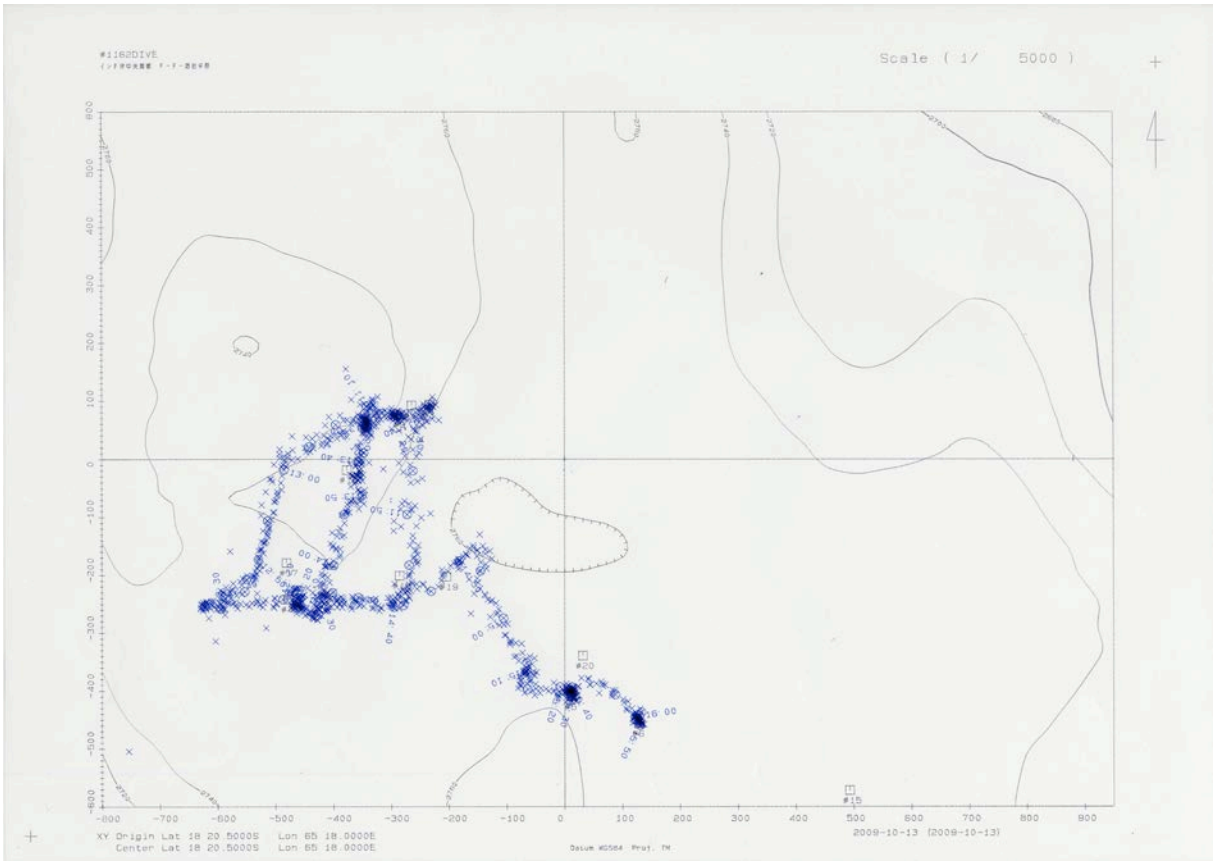
Objectives:

Objectives of this dive are to confirm the security of the lava plain as the first dive on the site and to find an active hydrothermal area, suggested by KH-06-4 survey.

Dive Summary:

The whole area along the dive tracks is covered by basaltic lava. The landing location is assigned at the anomaly peak of CTDH-25 of KH-06-4. All along the diving tracks none of signatures of hydrothermal activity were found. The area is characterized by common occurrence of fissures with the width of a few meters and graben-like depressions with the width of around 10 meters. The trend of those features, NNW-SSE, are consistent with the spreading axis. The attached video observation was summarized by Manvendra Singh of MOI by post-cruise work at Tokyo, Japan.

Dive Track #1162:



Video observation log #1162 (by Manvendra Singh)

Record and Observation of Dive # 1162; CAM 2; Date: 13/10/2009					
Time	Direction	Height	Water depth	Geology	Comments
11:16:10	94°	2747 m	2748m	Lobate-Sheet	Medium size lobate, very thin sediment cover
11:30:08	46°	2748 m	2749 m	Lobate-Sheet	Medium size lobate, very thin sediment cover
11:30:54	48°	2745 m	2748 m	Pillow lava	Cliff of small size pillow, cross-section of pillow visible, Height ~ 7m
11:36:41	245°	2745 m	2748 m	Lobate-Sheet	Medium size lobate, very thin sediment cover
11:38:03	196°	2747 m	2748 m	Lobate-Sheet	Medium size lobate, very thin sediment cover
11:40:13	220°	2747 m	2748 m	Lobate-Sheet	Medium to large size lobate, very thin sediment cover
11:42:18	220°	2748 m	2749 m	Lobate-Sheet	Small to Medium size lobate, thin sediment cover
11:44:10	220°	2748 m	2749 m	Lobate-Sheet	Medium size lobate, thin sediment cover
11:44:50	217°	2748 m	2749 m	Lobate-Sheet	Medium size lobate, thin sediment cover, shirmp
11:45:32	213°	2748 m	2749 m		Change from Lobate to jumbled sheet flow
11:46:04	186°	2749 m	2749 m		Crevice almost north south direction, On the sides jumbled sheet flow
11:47:36	151°	2749 m	2752 m	collapsed sheet flow	Very thin sediment cover
11:48:51	141°	2747 m	2749 m	Sheet flow	Very flat surface,thin sediment cover
11:49:02	143°	2747 m	2749 m	Sheet flow	Collapsed (Rough) surface,thin sediment cover
11:49:43	167°	2747 m	2748 m	Sheet flow	Very flat surface,thin sediment cover
11:50:02	174°	2748 m	???	Transition from Sheet to Lobate	Medium size lobate, very thin sediment cover
11:50:50	186°	2748 m	2749 m	Lobate-Sheet	Crevice, small size crack running almost north-south direction, Medium size lobate, very thin sediment cover
11:51:22	180°	2749 m	2750 m	Lobate-Sheet	Crevice, crack size widening, running north-south direction, Medium to large size lobate, very thin sediment cover, crosssection of lobate visible on the side of crevice
11:52:00	189°	2748 m	2750 m	Lobate-Sheet	Medium to large size lobate, very thin sediment cover
11:53:40	199°	2748 m	2749 m	Lobate-Sheet	Small to Medium size lobate, very thin sediment cover
11:54:22	199°	2749 m	2750 m	Lobate-Sheet	Medium to large size lobate, very thin sediment cover
11:54:56	201°	2748 m	2750 m	Lobate-Sheet	Small to medium size lobate, very thin sediment cover
11:55:46	201°	2747 m	2749 m	Lobate-Sheet	Small to Medium size lobate, surface more regular, very thin sediment cover
11:56:23	201°	2749 m	2749 m	Lobate-Sheet	Medium to large size lobate, thin sediment cover
11:57:57	200°	2746 m	2747 m	Lobate-Sheet	Small to Medium lobate, very thin sediment cover
11:58:27	201°	2746 m	2747 m	Lobate-Sheet	Small to Medium lobate, surface more regular, thin sediment cover
11:58:59	218°	2746 m	2747 m	Lobate-Sheet	Medium to large size lobate, surface more regular, thin sediment cover
11:59:28	261°	2745 m	2746 m	Lobate-Sheet	Small to Medium size lobate, thin sediment cover
12:00:35	270°	2746 m	2747 m	Lobate-Sheet	Medium size lobate, thin sediment cover
12:01:23	270°	2745 m	2746 m	Lobate	Medium to large size lobate, thin sediment cover
12:01:56	271°	2745 m	2746 m	Lobate-sheet	Variable size lobate, thin sediment cover
12:03:01	271°	2746 m	2747 m	Lobate-sheet	Medium to large size lobate, thin sediment cover
12:03:36	271°	2745 m	2746 m	Sheet	Jumbled surface, very thin sediment cover, columnar joint
12:04:37	271°	2743 m	2744 m	Sheet	Faulting, Jumbled configuration on up throw side, down trow side towards west, thin sediment cover
12:05:40	271°	2742 m	2744 m	Sheet	Jumbled surface, very thin sediment cover
12:06:28	274°	2741 m	2742 m	Sheet	Two parallel Crevices, Running nearly East-West direction, Jumbled configuration, very thin sediment cover, columnar joint
12:08:04	249°	2741 m	2742 m	Sheet	Smooth surface, thin sediment cover
12:11:47	304°	2744 m	2745 m	Sheet	Jumbled surface, very thin sediment cover
12:17:59	276°	2742 m	2745 m	Sheet	Crevice, Jumbled surface on both sides of crevice, running nearly North-South direction, very thin sediment cover
12:19:24	270°	2741 m	2742 m	Sheet	Faulting, Jumbled configuration on up throw side and down trow side, down trow side towards west, thin sediment cover
12:21:09	271°	2744 m	2745 m	Lobate-Sheet	Medium to large size lobate, thin sediment cover
12:21:51	271°	2745 m	2747 m	Sheet	Ropy surface, thin sediment cover
12:22:21	271°	2746 m	2748 m	Lobate-Sheet	Large size lobate, thin to thick sediment cover
12:23:25	271°	2747 m	2748 m	Sheet	Crevice, Jumbled surface, thin sediment cover, columnar joint
12:23:53	272°	2746 m	2747 m	Sheet	Very smooth surface, thin to thick sediment cover
12:24:23	271°	2747 m	2749 m	Sheet	Transition fron sheet to lobate-sheet, Jumbled surface, thin sediment cover
12:24:39	271°	2747 m	2748 m	Lobate-Sheet	Medium size lobate, thin to thick sediment cover
12:25:34	272°	2748 m	2749 m	Lobate-Sheet	Ocassional sight of medium to big size pillow lava, Medium size lobate, thin to thick sediment cover
12:26:03	273°	2748 m	2749 m	Sheet	Jumbled surface, very thin sediment cover
12:27:31	276°	2746 m	2748 m	Sheet	Crevice, Jumbled surface, Running almost North-South direction very thin sediment cover
12:28:55	273°	2745 m	2751 m		Different types of sheet seen in crevice wall
12:30:03	270°	2745 m	2747 m		Faulting, jumbled surface on up throw side and medium size lobate-sheet on down throw side, Down throw side is on west
12:32:23	271°	2747 m	2750 m		Pit observed, thin sediment cover
12:32:42	272°	2748 m	2749 m	Lobate-Sheet	Small to medium size lobate, thin sediment cover
12:36:46	51°	2748 m	2749 m	Lobate-Sheet	Medium to large size lobate, thin to thick sediment cover
12:37:11	56°	2747 m	2749 m	Sheet	Jumbled surface, very thin sediment cover
12:38:08	41°	2745 m	2746 m	Sheet	Crevice, approximately 4 meters deep, running almost east west direction, Jumbled surface, very thin sediment cover
12:39:36	47°	2745 m	2747 m	Pillow-lobate	Medium to big size lobes, Thick to thin sediment cover
12:40:11	46°	2747 m	2749 m	Pillow-lobate	Variable size lobes, Thick to thin sediment cover
12:41:19	48°	2748 m	2749 m	Sheet	Jumbled to wrinkled surface, thin sediment cover
12:42:02	44°	2747 m	2748 m	Lobate-Sheet	Medium to large size lobate, thin to thick sediment cover
12:47:35	2°	2746 m	2747 m	Lobate-Sheet	Medium to large size lobate, thin to thick sediment cover
12:49:42	2°	2746 m	2747 m	Lobate-Sheet	Variable size lobate, thin sediment cover
12:51:27	2°	2748 m	2749 m	Lobate-Sheet	Medium to large size lobate, thin sediment cover
12:54:44	1°	2749 m	2750 m	Lobate-Sheet	Medium to large size lobate, thin to thick sediment cover
12:56:30	2°	2750 m	2751 m	Lobate-Sheet	Small to Medium size lobate, thin to thick sediment cover
12:57:05	1°	2750 m	2751 m	Pillow	Medium to large size well rounded lobe, thin to thick sediment cover
13:00:26	28°	2755 m	2756 m	Pillow-Lobate	Medium to large size well rounded lobe, thin to thick sediment cover
13:02:10	38°	2753 m	2755 m	Pillow-Lobate	Medium to large size well rounded lobe, cross section of lobes observed, thin to thick sediment cover, Shrimp
13:02:45	44°	2753 m	2761 m	Pillow-Lobate	Crevice, Small fragments of laote observed, thin sediment cover
13:03:04	61°	2753 m	2755 m	Lobate-Sheet	Small to Medium size lobate, thin to thick sediment cover
13:03:09	57°	2756 m	2758 m	Lobate-Sheet	Medium to small size lobate, thin to thick sediment cover
13:05:52	58°	2757 m	2757 m	Lobate-Sheet	Medium to small size lobate, thin to thick sediment cover, plant
13:08:10	60°	2759 m	2759 m	Lobate-Sheet	Medium to large size lobate, thick sediment cover
13:10:25	61°	2754 m	2759 m	Lobate-Sheet	Small to Medium size lobate, thin sediment cover, cross-section of lobes observed
13:10:54	64°	2752 m	2754 m	Lobate-Sheet	Fault, Down throw side on North, shrimp
13:12:20	61°	2751 m	2755 m	Sheet	Jumbled surface
13:13:11	59°	2752 m	2756 m	Lobate	Small to Medium size lobate, thin sediment cover, cross-section of lobes observed
13:15:26	16°	2746 m	2752 m	Lobate-Sheet	Crevice, Running almostnorth-south direction, small to medium size lobate
13:17:37	41°	2738 m	2742 m	Lobate	Small to medium size lobate, cross-section of lobes observed
13:17:37	42°	2737 m	2739 m	Pillow	Small to medium size Pillow, very thin sediment cover, cross-section observed
13:28:20	39°	2736 m	2737 m	Lobate	Crevice, Running approx. north-south direction, small to medium size lobes, cross-section observed in lobes.
13:28:36	61°	2736 m	2738 m	Pillow-Lobate	Small to medium size lobes, very thin sediment cover, cross-section observed in some lobes
13:29:54	150°	2735 m	2737 m	Pillow-Lobate	Crevice running almost East-West direction, small to medium size lobes
13:31:49	212°	2737 m	2739 m	Pillow-Lobate	Small to medium size lobes, very thin sediment
13:32:53	206°	2743 m	2755 m		Crevice, running almost East-West direction
13:35:57	201°	2752 m	2753 m	Lobate-Sheet	Small to Medium size lobate, thin to thick sediment cover
13:37:47	201°	2752 m	2753 m	Pillow-lobate	Medium size lobes, thin to thick sediment cover
13:40:22	236°	2752 m	2753 m	Lobate-Sheet	Small to Medium size lobate, thin to thick sediment cover
13:42:22	204°	2752 m	2753 m	Lobate-Sheet	Small to Medium size lobate, almost flat surface, thin to thick sediment cover, Organism sited
13:46:04	170°	2752 m	2753 m	Lobate-Sheet	Small to Medium size lobate, almost flat surface, thick sediment cover
13:48:33	182°	2746 m	2749 m	Lobate-Sheet	Small to Medium size lobate, thin to thick sediment cover
13:52:09	214°	2749 m	2750 m	Lobate-Sheet	Medium size lobate, thick sediment cover
13:55:19	210°	2748 m	2749 m	Lobate-Sheet	Medium size lobate, thin to thick sediment cover
13:56:27	194°	2747 m	2749 m	Sheet	Jumbled surface, thin sediment cover
13:56:36	192°	2747 m	2748 m	Sheet flow	Flat surface, Thin sediment cover
13:57:20	179°	2748 m	2749 m	Lobate-Sheet	Medium size lobate, thin sediment cover
14:03:10	137°	2748 m	2750 m	Lobate-Sheet	Medium size lobate, thin sediment cover

14:03:10	137°	2748 m	2750 m	Lobate-Sheet	Medium size lobate, thin sediment cover
14:05:15	189°	2748 m	2749 m	Lobate-Sheet	Medium size lobate, broken pieces of lobate, faulting, downthrowside towards south
14:09:11	198°	2746 m	2748 m		Columnar joints, thin sediment cover
14:10:18	194°	2743 m	2744 m	Sheet flow	Crevice, thin to thick sediment cover, running east-west direction
14:11:18	214°	2743 m	2744 m	Sheet flow	Jumbled to wrinkled surface, thin sediment cover
14:14:47	287°	2743 m	2744 m	Sheet flow	Jumbled to wrinkled surface, thin sediment cover
14:16:05	273°	2742 m	2744 m	Sheet flow	Crevice running north-south direction, Jumbled to wrinkled surface, thin sediment cover
14:19:04	304°	2742 m	2744 m	Sheet flow	Jumbled to wrinkled surface, thin sediment cover
14:20:35	341°	2742 m	2743 m	Sheet flow	Crevice running NW-SE direction, Jumbled to wrinkled surface, thin sediment cover
14:20:43	342°	2742 m	2744 m	Sheet flow	Jumbled to wrinkled surface, thin sediment cover
14:20:55	333°	2742 m	2744 m	Sheet flow	Crevice running NW-SE direction, Jumbled surface, thin sediment cover
14:22:21	330°	2742 m	2744 m	Sheet flow	Jumbled to wrinkled surface, thin sediment cover
14:22:36	335°	2742 m	2743 m	Sheet flow	Crevice running NE-SW direction, Jumbled surface, thin sediment cover
14:24:43	3°	2742 m	2743 m	Sheet flow	Jumbled to wrinkled surface, thin sediment cover
14:26:28	75°	2744 m	2745 m	Lobate-Sheet	Small to Medium size lobate, thin sediment cover
14:29:10	99°	2746 m	2749 m	Sheet flow	Jumbled to wrinkled surface, thin sediment cover
14:29:39	108°	2743 m	2747 m	Sheet flow	Smooth surface, thin sediment cover
14:30:53	91°	2743 m	2744 m	Sheet flow	Crevice, running North-South direction
14:31:42	94°	2742 m	2743 m	Sheet flow	Crevice, running North-South direction, parallel
14:32:24	102°	2743 m	2744 m	Sheet flow	Smooth surface, thin sediment cover
14:32:56	83°	2743 m	2744 m	Sheet flow	Broken surface, thin sediment cover
14:33:14	80°	2743 m	2744 m	Sheet flow	Jumbled to wrinkled surface, thin sediment cover
14:33:33	82°	2742 m	2743 m	Sheet flow	Crevice, running almost North-South direction, Jumbled to wrinkled surface, thin sediment cover
14:33:46	83°	2742 m	2743 m	Sheet flow	Jumbled to wrinkled surface, thin sediment cover
14:34:20	90°	2743 m	2744 m	Sheet flow	Wrinkled surface, thin sediment cover
14:34:43	88°	2743 m	2744 m	Sheet flow	Smooth surface, thin sediment cover
14:34:59	87°	2743 m	2745 m	Sheet flow	Smooth to wrinkled surface, thin sediment cover
14:35:22	90°	2743 m	2745 m	Sheet-Lobate	Small to medium size lobes, thin to tick sediment cover
14:37:07	84°	2744 m	2745 m	Lobate	Small to medium size lobes, thin sediment cover
14:39:00	334°	2745 m	2746m	Loate-Sheet	Small to medium size lobes, thin sediment cover
14:40:02	14°	2745 m	2746m	Loate	Small to medium size lobes, thin sediment cover
14:42:42	97°	2745 m	2746m	Loate-Pillow	Small to medium size lobes, thin sediment cover
14:44:43	83°	2745 m	2746m	Loate	Small to medium size lobes, thin sediment cover
14:46:23	42°	2745 m	2746m	Loate	Crevice, running NW-SE direction, Small to medium size lobes, thin sediment cover
14:47:05	41°	2746 m	2747m	Loate-Sheet	Medium size lobes, almost smooth surface, thin sediment cover
14:49:55	39°	2745 m	2746m	Loate-Sheet	Wrinkled surface, thin sediment cover
14:50:08	51°	2744 m	2745m	Loate-Sheet	Small to medium size lobes, thin sediment cover
14:51:47	81°	2746 m	2747 m	Loate-Pillow	Small to medium size lobes, thin sediment cover
14:52:47	168°	2745 m	2746 m	Loate-Pillow	Crevice, running NW-SE direction, crossection in lobes visible, small to medium size lobes, thin sediment cover
14:53:17	178°	2746 m	2747 m	Loate-Pillow	Small to medium size lobes, thin sediment cover
14:53:51	197°	2746 m	2747 m	Loate-Sheet	Small to medium size lobes, thin sediment cover
14:54:27	214°	2744 m	2745 m	Sheet flow	Wrinkled surface, thin sediment cover
14:54:37	214°	2745 m	2746 m	Loate-Sheet	Small to medium size lobes, thin sediment cover
14:55:34	192°	2745 m	2746 m	Sheet flow	Almost smooth surface, thin sediment cover
14:55:59	180°	2745 m	2746 m	Loate-Sheet	Small to medium size lobes, thin sediment cover
14:56:17	170°	2745 m	2746 m	Sheet flow	Almost smooth surface, thin sediment cover
14:56:30	157°	2745 m	2746 m	Sheet flow	Cracked surface, thin sediment cover
14:56:43	150°	2745 m	2746 m	Sheet-Lobate	Small to medium size lobes, thin sediment cover
14:57:26	141°	2744 m	2745 m	Sheet flow	Cracked surface, thin sediment cover
14:57:43	141°	2743 m	2744 m	Sheet flow	Jumbled to wrinkled surface, thin sediment cover
14:58:19	142°	2743 m	2744 m	Sheet flow	Crevice, running NE-SW direction, jumbled to wrinkled surface, thin sediment cover
14:58:41	143°	2743 m	2744 m	Sheet-Lobate	Faulting, downthrow side on SE, small size lobes thin sediment cover
14:58:57	144°	2744 m	2746 m	Sheet flow	Cracked surface, thin sediment cover
14:59:15	145°	2745 m	2746 m	Sheet-Lobate	Small to medium size lobes, thin sediment cover
15:00:22	156°	2747 m	2748 m	Pillow lava	Small to medium size Pillows, thin sediment cover
15:02:49	140°	2749 m	2750 m	Pillow-lobate	Small to medium size lobes, thin sediment cover
15:04:34	140°	2748 m	2749 m	Sheet flow	Cracked and jumbled surface, thin sediment cover
15:05:24	150°	2748 m	2749 m	Sheet-Lobate	Small to medium size lobe, thin sediment cover
15:06:13	193°	2749 m	2750 m	Sheet flow	Cracked and jumbled surface, thin sediment cover
15:10:15	242°	2749 m	2750 m	Sheet-Lobate	Medium to large lobate, almost smooth surface, thin to thick sediment cover
15:12:01	241°	2749 m	2750 m	Sheet-Lobate	Medium to large lobate, few cracked surface, very thin sediment cover
15:13:12	172°	2748 m	2749 m	Sheet-Lobate	Medium to large lobate, thin sediment cover
15:14:50	106°	2749 m	2750 m	Sheet-Lobate	Medium to large lobate, few cracked surface, thin sediment cover
15:15:42	104°	2749 m	2750 m	Lobate-Pillow	Medium to large lobate, thin sediment cover
15:16:40	104°	2749 m	2750 m	Lobate-Pillow	Crevice, running almost North-South direction, Cross section of lobes visible, small to medium lobate, thin sediment cover
15:18:18	88°	2752 m	2753 m	Lobate-Pillow	Pithole, small to medium lobate, thin sediment cover
15:18:44	88°	2752 m	2753 m	Lobate-Pillow	Crevice???? Or roof collapse forming pillar, small to medium lobate, thin sediment cover, pillars observed
15:21:47	74°	2751 m	2752 m	Pillow lava	Small to medium size pillow, thin sediment cover
15:26:14-15:39:45	44°	2750 m	2751 m		Sampling
15:39:50	27°	2748 m	2749 m	Sheet-Lobate	Small to medium size lobate, thin sediment cover
15:40:39	37°	2747 m	2748 m	Pillow lava	Small to medium size pillow, thin sediment cover
15:40:54	54°	2746 m	2747 m	Sheet-Lobate	Small to medium size lobate, thin to thick sediment cover
15:46:55	138°	2745 m	2746 m	Sheet-Lobate	Small to medium size lobate, thin to thick sediment cover
15:49:57-16:00:35	144°	2745 m	2746 m		Sampling

Dive Report: Shinkai 6500 Dive#1163

Date: October 14, 2009
Site: Dodo Great Lava Plain at the CIR-S16
Landing: 10:10; 18°21.3000'S, 65°18.5000'E, 2729 m
Leaving: 16:03; 18°20.6262'S, 65°18.1026'E, 2749 m
Observer: Shinsuke Kawagucci (Precambrian Ecosystem Lab., JAMSTEC)
Pilot: M. Yanagitani **Co-Pilot:** H. Ueki

Objectives:

Objective of this dive is to find a hydrothermal area, suggested by CTD-CMS observation dataset in KH-06-4 (Kawagucci et al., 2008).

Dive Summary:

We landed at approximately 1000 m southeast of the position of "CTDH-26 in Kawagucci et al. (2008)", where hydrothermal anomalies were observed in the bottom water. Just before the landing, we got seawater sample by Niskin sampler. At first, we went to eastern wall of the axial valley by Shinkai heading at 50°. Then, we went to NNW direction (ca. 320°) in parallel with ridge axis at the depth ca. 2720 m. Seafloor condition during the running are Sheet lava, Pillow lava, and Pillar with sheet lava roof structure. After 2000 m running, we turned left and went to SSE direction. Rock sample was taken at a bit white sediment-covered pillow lava area at 13:59. Again we went to SSE direction and some intensive observation at around the CTDH-26.

Finally, we cannot detect any hydrothermal signature and left the bottom at 16:03.

Payloads:

1) Niskin water sampler
2) WHATS II with a temperature probe
3) Cheep WHATS
4) Sample box x3
5) Suction sampler (single canister)
6) Marker x3 (#99, #100 & #101)

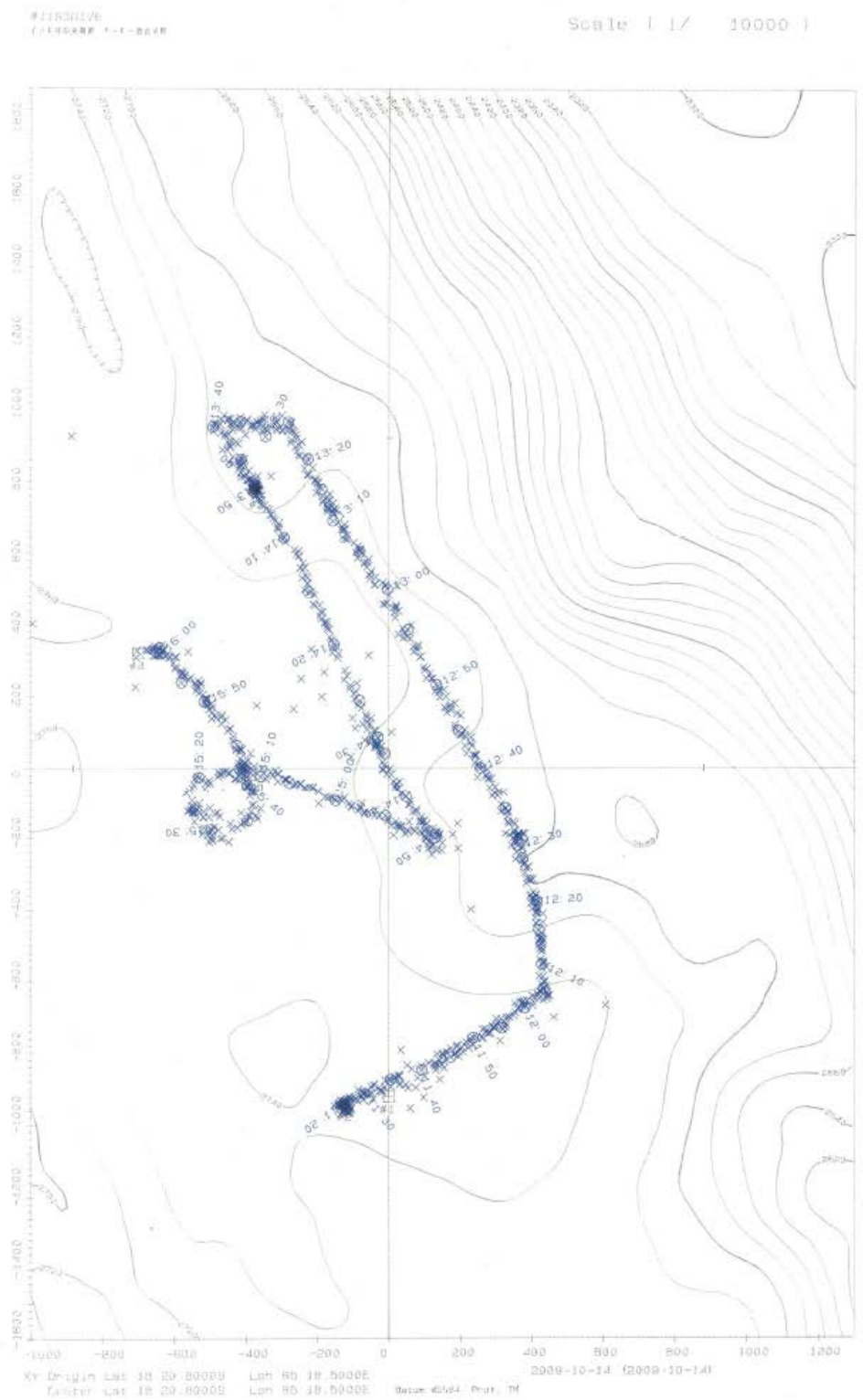
Location of Events:

As in the section, "Event List".

Event List:

1) 10:00, 18°21.3000'S, 65°18.5000'E, Landing Target
2) 11:21, 18°21.3111'S, 65°18.4307'E, Sampling Niskin & Landing, D=2729m
3) 13:59, 18°20.3818'S, 65°18.2915'E, Sampling Rock, D=2700m
4) 16:07, 18°20.6262'S, 65°18.1026'E, Left bottom, D=2749 m

Dive Track #1163:



Dive report: SHINKAI 6500 # 1164

Date: 15th October 2009
Site: Dodo lava plain
Landing: 10:14, 18º 20.6700' 65º 17.8800', D=2748 m
Leaving: 15:02, 18º 20.3524' 65º 17.6830', D=2697 m
Observer: Daniel Marie
Pilot: K.Chiba
Co-pilot: K.Iijima

Dive Objectives:

1. To find the signatures for black smoker chimney
2. Find black smoker chimney on the "Beak Rock" situated on the Dodo lava plain.
3. Sample organisms find at the sea bed
4. Collect rock sample

Dive summary

Dive 1164 was the third dive for the YK09-13 Leg 1 cruise. The first two dives 1162 and 1163 were performed in two different areas of the same Dodo Lava plain region situated …….km to the East of Rodriguez Island.

SHINKAI 6500 reached the bottom at 10.14 a.m. without any problem and start moving, after trimming and Niskin sampling, on a bearing of 098º at a depth of 2748m. We landed on a plain of bare pillow lava. We changed course around 10:26 a.m. and start moving on a bearing of 321º. The lava pillow was covered with a thin layer of sediment. The first sponge specimen, together with a barnacle, were collected by suction at 10.42, while moving on a bearing of 312º at a depth of 2750m.

SHINKAI encountered a wall of 26 metres height while moving on the same heading of 312º at 11.00. This may be the beginning of Beak Rock and need to confirm with the interferometer data obtained previously. The surface consists of pillow lava again. While navigating on the Beak Rock, we find three large crevasses, about 1-2 metres deep, at 11:04, 11:14, 11: 16 and 11:40.

A second sponge specimen was collected by suction at 11:11, heading 312º and depth 2721 m.

At 11.48 we started moving on a bearing of 177º at a depth of 2776m on pillow lava plain. This track was almost parallel to the first one and the topography resembles very much the first track.

A third sponge specimen was collected at 12:32 while moving on a bearing of 129º at a depth of 2748 m. A rock sample was also taken at the same location.

We changed course again at 12:52 to 359º at a depth of 2750 m. On this track we found a series of crevasses and walls again.

At 13:20, we started moving on a bearing of 273º at a depth of 2742 m. Three crevasses were encountered on this course.

After thirty three minutes, we changed course again to 124º at 2752 m deep, and then we did two last tracks on the respective courses of 129º and 302º.

We left the bottom at 15:00 after reaching a pillow lava plain at a depth of 2697 m.

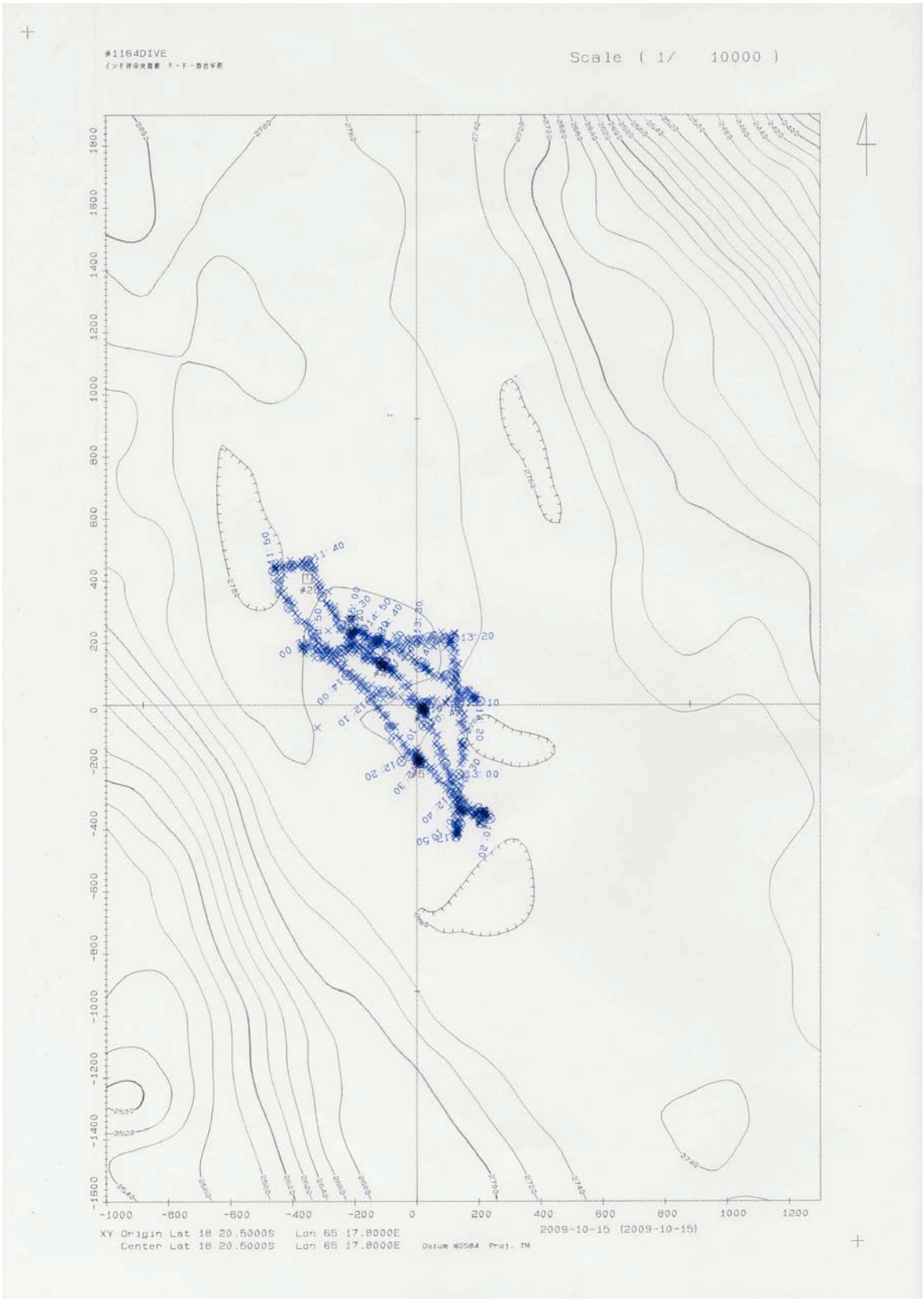
Conclusion

Further to the objectives set, we managed to collect some rock samples and deep sea organisms. However, no observation was made of the presence of any physical or biological signatures indicative of the presence of black smoker in the region.

Attached documents:

1. Events list
2. SHINKAI 6500 tracks

Dive Track #1164:



Dive Report: Shinkai 6500 Dive#1165

Date: October 17, 2009
Site: Dodo Great Lava Plain at the CIR-S16
Landing: 11:17; 18°20.0103'S, 65°17.7148'E, 2753 m
Leaving: 16:03; 18°20.1156'S, 65°17.9302'E, 2743 m
Observer: Kentaro Nakamura (Precambrian Lab., JAMSTEC)
Pilot: M. Yanagitani **Co-Pilot:** H. Ueki

Objectives:

Objective of this dive is searching the brownish stained lava area, which was observed yesterday by Deep-Tow camera, in order to find out hydrothermal vent site.

Dive Summary:

We landed at approximately 100 m southeast of the brownish colored (stained) lava area which was observed by Deep-Tow survey yesterday. Just before the landing, we got seawater sample by Niskin sampler. In this area, the stained lavas were not found, but small amounts of brownish sediments filling the interpillow space were found. When the landing, we also found three crabs and many of small anemones on pillow lavas, strongly suggesting the existence of hydrothermal vent site near here. After landing, we headed to northwest to get the Deep-Tow observed point. Soon after the moving, the crabs and anemones on the pillow lavas as well as the brownish sediments in interpillow spaces were disappeared and thus, we noticed that hydrothermal vent site should not be existed on the western part of the Deep-Tow point, but existed on somewhere in the eastern part. Then we decided to turn and headed to east in order to search hydrothermal venting site. Although it was difficult to turn quickly due to the rough topography (steep up and down slopes), we finally turn and headed to east at 12:05 at the ~300m ESE of the landing point. After that we went to east, and when we reached the point, several tens of meters south of the landing point, we again found the stained spots and cracks in basaltic lavas as well as crabs and small anemones on the lavas. We still went to east and then, number of crabs was increasing, and size of anemones was getting bigger. We thought these signatures indicated that we were approaching to the hydrothermal venting site. At the point of 100m east of the landing point, we still saw many crabs and much bigger anemones on lavas, and cracks and crevasse in the lavas were stained to be brownish color. Thus, we tried to see if low-temperature simmering was come from the cracks and/or crevasse. However, we could not find out any signatures of low-temperature simmering. Then, we continued to go to east again.

At 12:53, on the point of ~300m east of the landing point, we finally found out a black smoker chimney that is approximately 1m height directly on the sheet flow lava without any sulfide mound on the base. We decided to collect chimney, hydrothermal fluid, and animal samples in this point. The chimney was broken by manupirator and then, we corrected chimney samples. After that, we started to collect vent fluids with WHATS II bottle 1 & 2 whose average temperatures are 64.7 and 60.7 deg-C, respectively. We also collected additional fluid samples by Cheep WHATS bottle 1 & 2 with average temperature of 123.6 deg-C. Then, we collected animals (crabs, shrimps, and anemones) by suction sampler, and finally we set to marker #99 at the chimney. After the sampling, we started searching another chimney again and headed to south.

Soon after the moving, we found out new several black smoker chimneys, most of which are less than 1 m height. Among them, the tallest chimney (~2 m in height) was venting black smoke most vigorously and thus, we decided to sample the venting fluids from the chimney. At first, the chimney was broken by manupirator to corrected chimney samples. After the chimney sampling, we collected vent fluids by WHATS II bottle 3 & 4 with average temperatures of 319.4 and 319.9 deg-C, respectively. Then, we tried to collect animals (crabs, shrimps, and anemones) by suction sampler. However, the suction sampler did not work well and could not get any animals in this chimney. We also found another chimney in proximity to the previous sampling point, which is a little bit smaller (~1.5 m in height) but vigorously venting black smoke from the top. We moved to in front of the chimney and tried to get chimney and fluid samples. The chimney was also broken by manupirator and then, we corrected chimney samples. After that, we started to collect vent fluids with Cheep WHATS bottle 3 & 4 with average temperature of 323.8 deg-C. We again tried to get animal samples by suction sampler, but it still did not work well and could not sample any animals. So, we finally set to marker #100 near the chimney and left this point.

Then we decided to search other chimneys around the vent site, and headed to south. We were searching in the southern part of the vent site, but any other chimneys could not find out. Finally, we left the bottom at 16:03.

Payloads:

1) Niskin water sampler
2) WHATS II with a temperature probe
3) Cheep WHATS with a temperature probe
4) Sample box x3
5) Suction sampler (single canister)
6) Marker x3 (#99, #100 & #101)

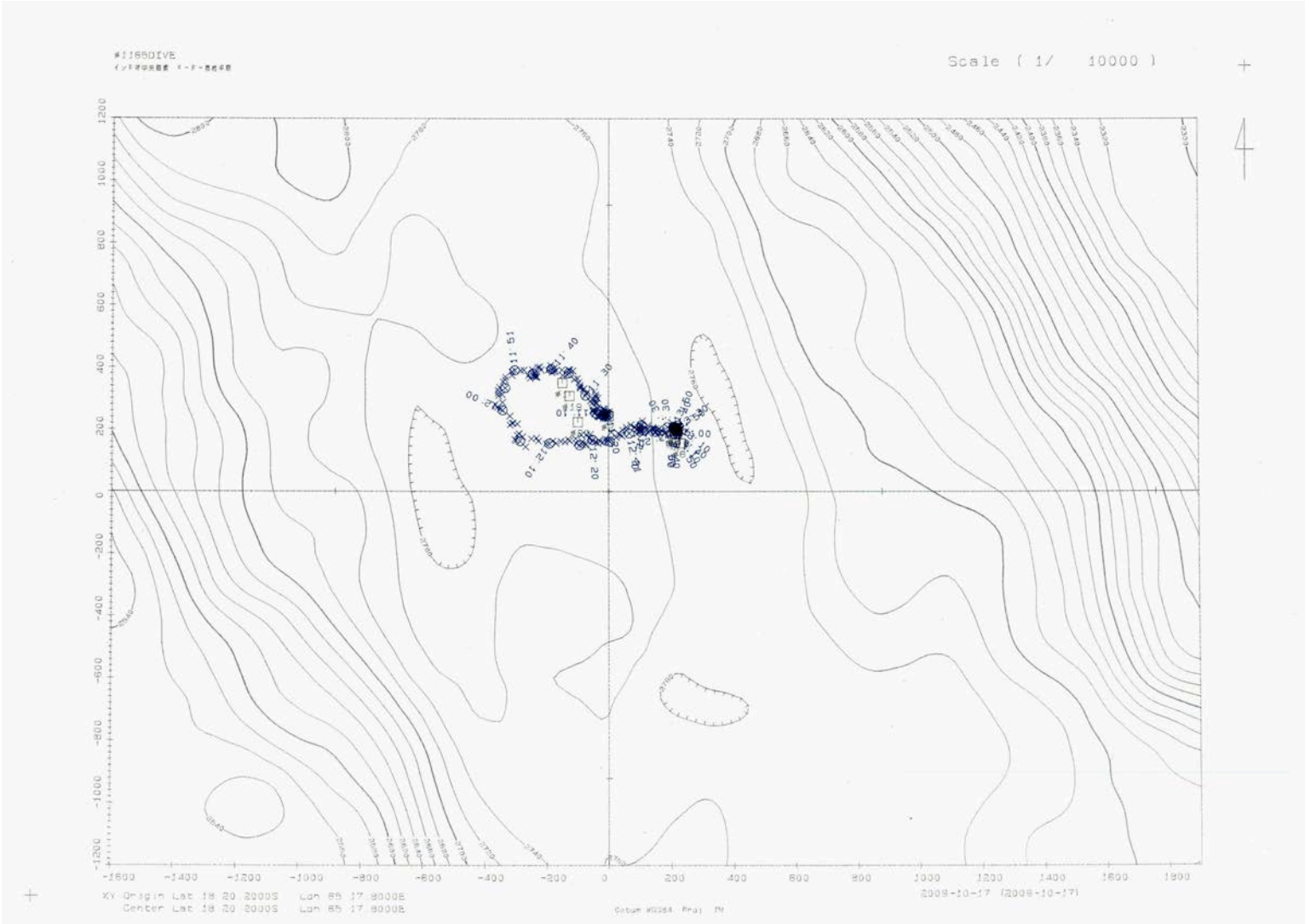
Location of Events:

As in the section, “Event List”.

Event List:

1) 10:00, 18°20.0103'S, 65°17.7148'E, Landing Target
2) 11:17, 18°20.0681'S, 65°17.8004'E, Sampling Niskin & Landing, D=2753 m
3) 12:53, 18°20.0937'S, 65°17.9211'E, Finding Black smoker, D=2745 m
4) 13:27, 18°20.0937'S, 65°17.9211'E, Samp. Chimney, WHATS (2), Cheep WHATS, Animals, Dep. #99 Mkr, D=2745 m
5) 15:49, 18°20.0986'S, 65°17.9200'E, Samp. Chimney, WHATS (2), Cheep WHATS, Dep. #100 Mkr, D=2745 m
6) 16:03, 18°20.1156'S, 65°17.9302'E, Left bottom, D=2743 m

Dive Track #1165:



Dive Report: SHINKAI 6500 Dive # 1166

Date: October 18th 2009
Site: Great Dodo Lava Plain
Landing: 11.17, 18 º 20.1028' S, 65º 18.0912'E, D= 2753m
Leaving: 14.11, 18º 20.0374' S, 65º 17.9703' E, Left bottom, D=2746m
Observer: Meera Koonjul (Ministry of Agro-Industry, FP&S- Fisheries Division)
Pilot: Y.Chida, **Co-Pilot:**K.Chiba

Objectives:

- Mapping of Dodo hydrothermal field and active chimneys near #100.
- Sampling of chimneys, measurement of temperature of chimneys, water sampling with Niskin and WHATS Cheap equipment,
- Sampling of animals found in the zone (suction)

Dive summary:

We landed about 100m east of the actual landing point and moved straight towards the marker #100. The Seafloor consisted of blackish rocks and at certain places yellow coloured rocks were also observed. Soon after landing, the Niskin water sampler was operated.

We were close to the marker #100 and the flag was noted. At this spot there were two sets of chimneys. One was the area sampled by Nakamura san. This had one chimney intact and the other broke which was giving out black smoke. About 5m from this site were few other chimneys (about 4-5) which were less than 1m high and were giving out black smoke. The seafloor was covered with many crabs, shrimps and few sea anemone (very small white), and some a bit more large. Two chimneys were samples at this spot.

At the first chimney, WHATS samples were collected (1,2 bottles) and animals (crabs, shrimps and anemone) were collected by suction. The chimney samples were put in box no. 1 and 3.The temperature of the chimney was 180º C.

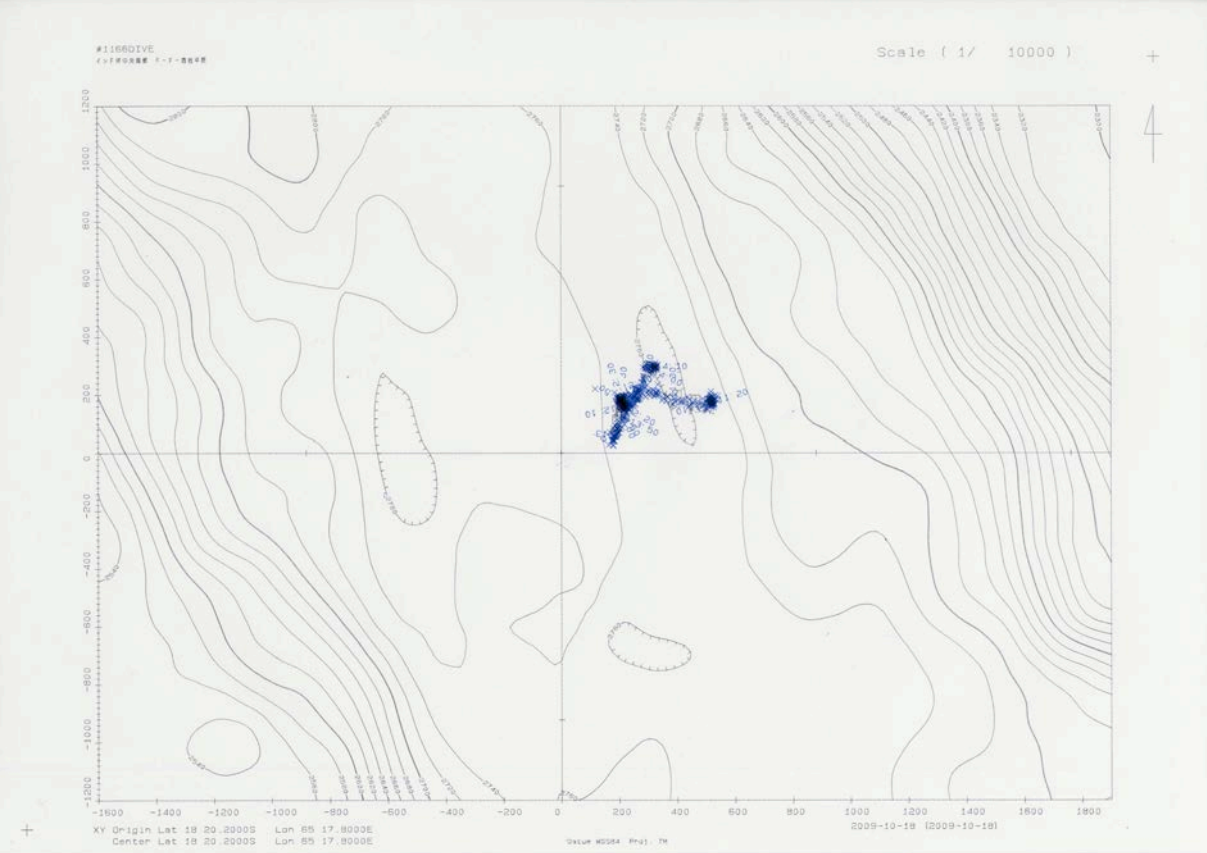
At the second chimney, WHATS samples were collected (3,4 bottles). The chimney samples were put in box no. 2. No animals were collected. The temperature of the chimney was 200º C.

Another sample of WHATS (5,6 bottles) were collected. The temperature of the chimney was 355º C.

There were also a few dead chimneys observed in the area. Many yellow coloured rocks were seen. In general, the area that contained the black smokers was very flat. In ceratin places, black smoke was coming out from cracks in the ground. From marker #100, we then

proceeded in the easterly direction and the topography was different with crevices and the crabs were becoming less in number. From the east we went to the north and no vents were found. It can be summarized that the HTV were found in a small area of 15m x 15m. Due to bad weather we left bottom at 14.11h , D= 2746m.

Dive Track #1166:



Dive Report: SHINKAI 6500 Dive # 1167

Date: 19th October, 2009 Place: Eastern Roger Plateau

Pilot: Matsumoto Co-pilot: Saito

Observer: Yuji Orihashi

Pilot: K.Matsumoto **Co-Pilot:** F.Saito

Abstract

Our purpose on this dive is to observe occurrence of pillow lavas and geological structure on the on-axis of the Central Indian Ridge (CIR), Mepris Pit crater, western and eastern Bridge hill on the Roger Plateau, located on the triple junction between the CIR and Rodriguez ridge.

Dive result

The dive landed on outcrop of pillow lavas on the eastern slope of on-axis on the CIR at 2,700m water depth. The slope was made up of well-preserved pillow lava having E-W current direction with around 1 to 2 m on the each head, covered partly by thin soft sediment. At 2,687m water depth, two fragments of the pillow lava were collected from the outcrop (Sample: 6K#1167-R01). The collected sample was slightly vesicular aphyric basalt with slightly altered quenched glass rim (max 3mm thickness). Climbing up the eastern slope, pillow lavas were continuously exposed but the current direction was changed to NW-SE current direction near top of the seamount at 2,555m water depth, where fragment of well-preserved pillow lava was collected from the outcrop (Sample: 6K#1167-R02). The collected sample was aphyric basalt with thick quenched glass rim (max 10mm thickness) and Mn coating was filmed, which seems that this sample might be slightly older than sample R01. Passing western steep-slope of the seamount downward, relatively large and elongated pillow lavas (around 2-3m width and more then 5m length) with NW-SE current direction were filled throughout the flat valley (around 100m width) between the seamount and the Roger Plateau. All pillow lavas were well-preserved but some ones were partly rusted (Location: 19°32.565' S, 65°50.800' E, 2620m water depth).

At the middle of the flat valley, Shinkai6500 was turned southward in the direction. This area was located on the bottom of the valley. The floor was formed by well-preserved pillow lava covered entirely with thin soft sediment. The pillow lava, which formed the floor, was collected (Sample: 6K#1167-R03). The collected sample was slightly vesicular and sparsely Pl-phyric basalt with slightly altered quenched glass rim (max. 3mm thickness). Going ahead southward, pillow lavas having E-W current direction down from the Roger Plateau were exposed. Deep and narrow crevasse was developed along western steep-slope of the on-axis seamount. This indicates that the crevasse is the recent boundary between on-axis ridge and the Roger Plateau. Although it was very difficult to recognize the structure of volcanic crater with the naked eye, Shinkai6500 entered in the Mepris Pit crater previously observed by the bathymetric map on KH06-04 cruise. In the crater, well-preserved and fresh sheet flows, hardly covered

with the soft sediment, were filled and the lava fragment was collected at 2,597m water depth (Sample: 6K#1167-R04). The collected sample was sparsely Pl-phyric basalt with fresh to slightly altered quenched glass rim (max. 5mm thickness), which seems that this basaltic sample might be freshest among the collected ones in this dive. Based on the previous result, we expected to find somewhat related to hydrothermal process in the crater but there was no evidence at all so that Shinkai6500 was turned again westward in the direction and climbed up the steep-slope of the Roger Plateau. On the slope, "step-structure" made up of numerous normal faults with NNW-SSE direction was observed. The each narrow floor was covered with the talus made up of fragments of the pillow lava. At the relatively wider floor on the middle of the steep-slope, one pillowed fragment on the outcrop was collected at 2,537m water depth (Sample: 6K1167-R05). The collected sample was sparsely Pl-phyric basalt with moderately to slightly altered thin quenched glass rim (less than 1mm thickness) and Mn coating was filmed. Total height of the platform developing the step structure on eastern slope of the Roger Plateau was around 100m from the Mepris Pit crater and maximum height of each wall on the step structure was around 30m.

Top of the platform was completely covered with thick soft sediment and tip of the pillow lava was rarely exposed from the soft sediment. Climbing up the gentle eastern slope of the Eastern Brigitte Protrusion, the same occurrence was continued. Near the top, five caves with several 10m wide were observed. On the some caves, section of the sheet lava flows was exposed from the thick soft sediment and then the pillow rind was collected (Sample: 6K#1167-R06). The collected sample was slightly vesicular and sparsely Pl-phyric basalt with moderately altered very thin quenched glass rim and Mn coating was covered with 2-3mm thickness. At the top of the Eastern Brigitte Protrusion, Shinkai6500 was turned in WSW-ENE direction and went down the western gentle slope. At the valley between Eastern and Western Brigitte Protrusions, well-preserved pillow lavas were exposed in the small amphitheater-shaped landslide. As a whole, eastern slope of Western Brigitte Protrusion was covered with thick soft sediment but tip of pillow lavas were partly exposed. Since pillow lavas were exposed on the top, the fragment was collected from the outcrop (Sample: 6K#1167-R07). The collected sample was moderately vesicular aphyric basalt with moderately altered thin quenched glass rim and Mn coating was covered with 1-3mm thickness. Turing N-S direction at the top and went down the northern slope. On the steep slope, large and elongated pillow lavas were partly exposed from the soft sediment. Here, the dive was ended due to time-up.

Video highlights

1) 11:08 – 11:22 (camera#1 and #2)

   Occurrence of the first steep slope of on-axis ridge on Central Indian Ridge: This ridge consisted of slightly vesicular aphyric basalt with slightly altered quenched glass rim, mainly well-preserved pillow lava texture.

2) 12:07 –12:27 (camera#1 and #2)

Occurrence of the western slope of the on-axis ridge: Large and elongated pillow lavas were exposed. Since the outcrop was hardly covered with soft sediment, recent volcanic activity was occurred here.

3) 12:49 –13:15 (camera#1 and #2)

Occurrence of recent boundary between on-axis ridge and the Roger Plateau: Deep and narrow crevasse developed NNW-SSE direction was developed along western steep-slope of the on-axis seamount. The outcrop consisted of was sparsely Pl-phyric basalt with fresh to slightly altered quenched glass rim, mainly well-preserved pillow lava texture.

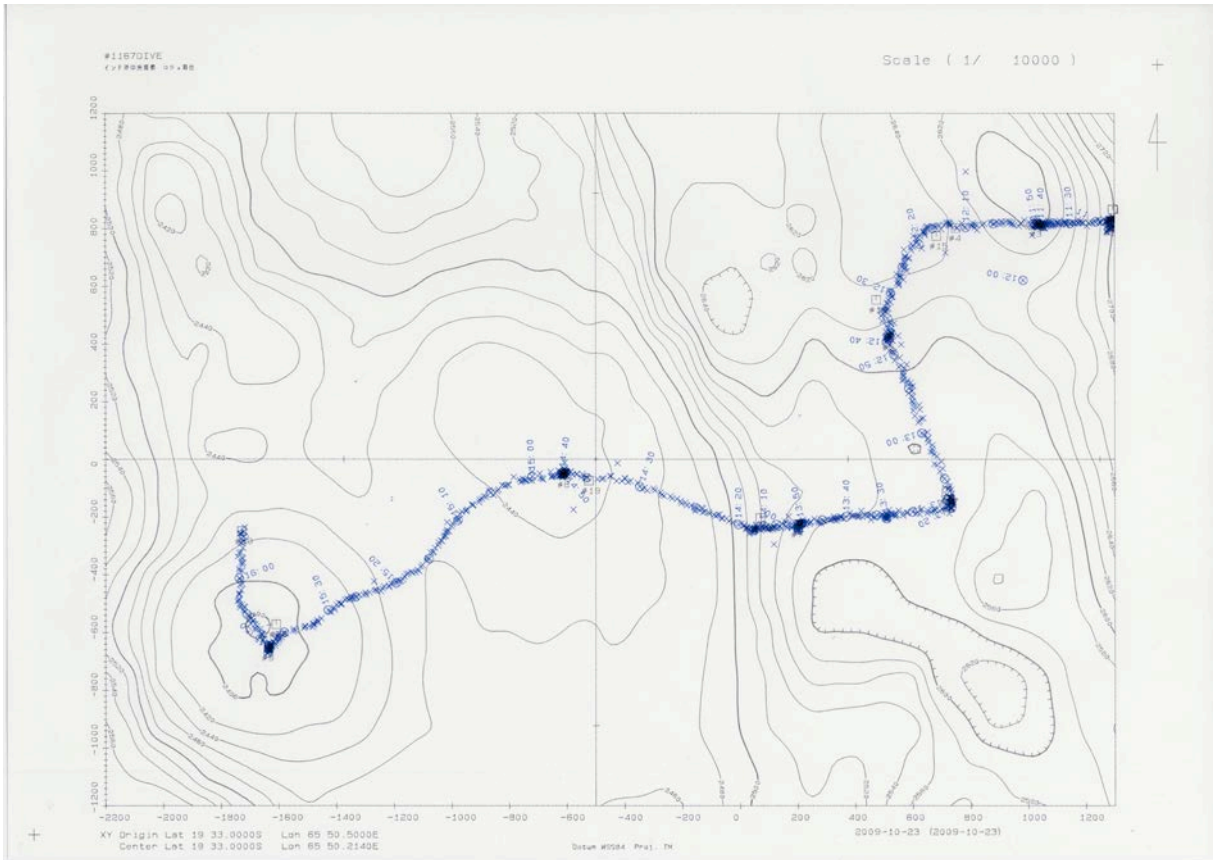
4) 13:29–14:15 (camera#1 and #2)

Occurrence of eastern frank of the Roger Plateau: “Step-structure” made up of numerous normal faults with NNW-SSE direction was developed. The outcrop consisted of was sparsely Pl-phyric basalt with moderately altered quenched glass rim, mainly broken pillow lava texture.

5) 14:37–14:56 (camera#1 and #2)

Occurrence of top of Eastern Brigitte Protrusion: numerous lava carves were developed. The cone consisted of sheeted lava flow, manly covered with thick soft sediment. The rock type was slightly vesicular and sparsely Pl-phyric basalt with moderately altered very thin quenched glass rim, covered by thick Mn coating.

Dive Track #1167:



Dive Report: Shinkai 6500 Dive#1168

Date: October 27, 2009
Site: Solitaire Hydrothermal field
Landing: 12:37; 19°33.4255'S, 65°50.9092'E, 2611 m
Leaving: 15:03; 19°33.4166'S, 65°50.8604'E, 2565 m
Observer: Ken Takai (SUGAR Program & Precambrian Lab., JAMSTEC)
Pilot: M. Yanagitani **Co-Pilot:** K. Iijima

Objectives:

Major objectives of this dive are: (1) to find and record a new hydrothermal field, (2) to take geochemical and microbiological samples and (3) to take biological and microbiological samples.

Dive Summary:

We landed at approximately 100 m southeast of the targeted hydrothermal field. Before landing, Niskin water sample was taken. The bottom was breccia of basalts, which seemed to result from the collapsed cliff on the west. Then we moved to northwest parallely to the cliff. A chimney site having three separate chimneys, named as 'the Toukon chimney site' was easily found. Already at 70 m away from the chimney, numerous small barnacles were observed on the cliff and rocks. From the chimneys, a little blackish fluids and completely clear fluids flowed out. The most eastern chimney (Bucher chimney) was first sampled and the effluent fluid (maximally 295 ˚C) was sampled by WHATS (#1 & #2 bottles). Next, the central chimney (Muta chimney) was sampled and the effluent fluid (maximally 230 ˚C) was sampled by WHATS (#3 & #4 bottles). Before sampling the chimney, *Rimicaris* shrimps (middle size ones and small size and red ones) were collected by a suction sampler. After the hydrothermal chimney and fluid sampling, we moved to a Scaly Foot colony with simmering located at 5 m east of the Toukon chimney site. The colony consisted only of white scaly foot species and around the scaly foots, mussels, the turridae *Phymorhynchus* sp. gastropods and barnacles were observed. After collecting animals, the diffuse flow fluid was obtained by C-WHATS (#1 and #2 bottles). The maximal temperature was 70 ˚C. This result indicated that the white scaly foots were exposed to diffusing flow at up to 70 ˚C, which was much higher than the temperature of colonies of black scaly foot in the Kairei field. In this colony site, no Alviniconcha gastropod was present. So, we moved to the Alviniconcha colonies at several meters east from the white scaly foot colony. Then, in the colony, we collected the Alviniconcha gastropods and barnacles. Finally, we had no time to do something. We left the

bottom.

As a memo of animal species we observed, (1) barnacles (2 types), (2) crub, (3) galetheid, (4) shrimps (2 types), (5) Alviniconcha sp., (6) Marianactis anemone, (7) Crysomallon scaly foot, (8) vent mussel, (9) scaly worm, (10) *Phymorhynchus* sp. gastropod, (11) Spunculoida and (12) several types of fish.

Payloads:

1) Niskin water sampler
2) WHATS II with a temperature probe
3) Cheep WHATS with a temperature probe
4) Sample box x3
5) Suction sampler (single canister)
6) Marker x3 (#99, #100 & #101)

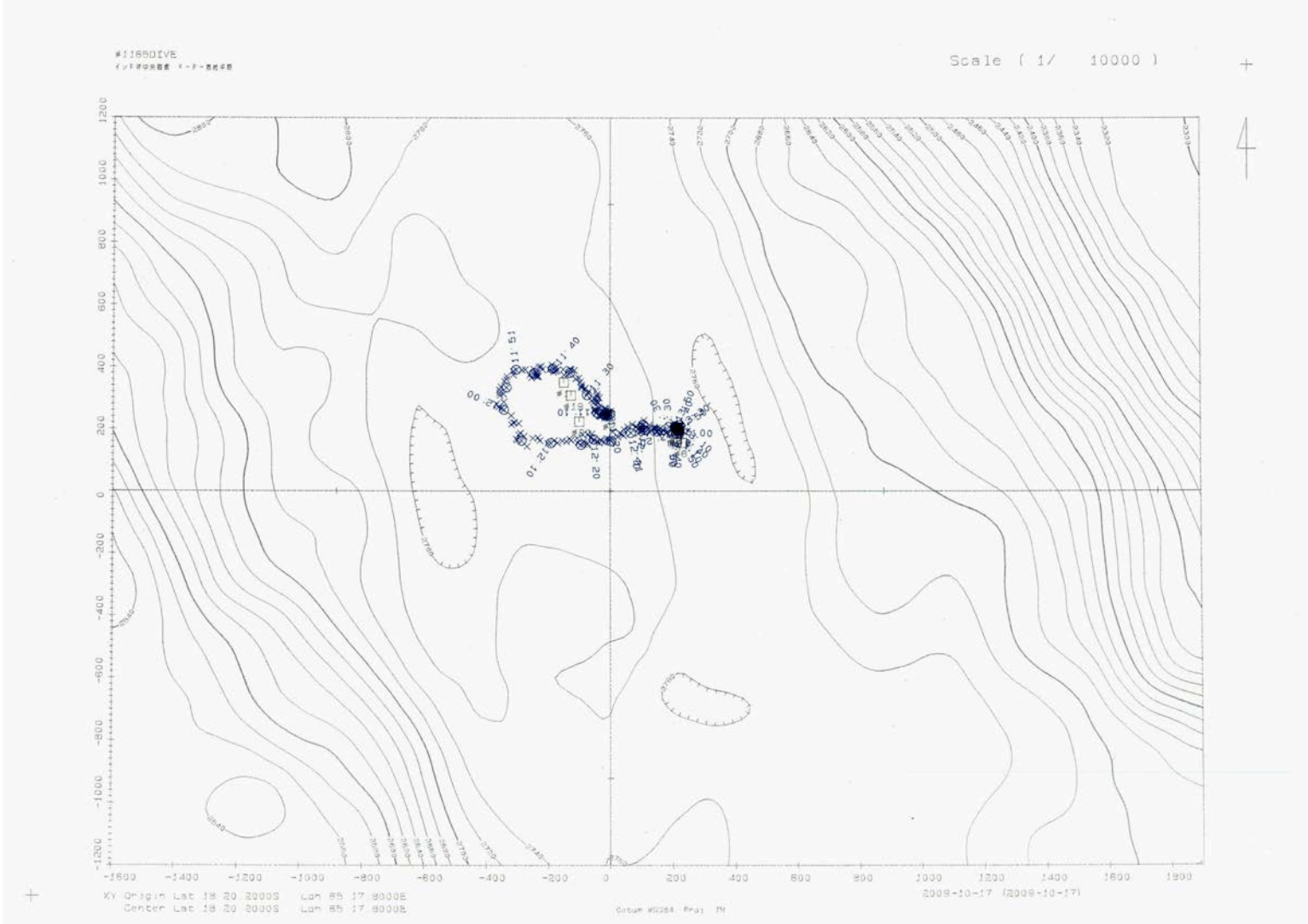
Location of Events:

As in the section, “Event List”.

Event List:

(1) 12:37, 19-33.4255S, 65-50.9092E, Sampling NISKIN, Landing, D=2611m
(2) 13:32, 19-33.4200S, 65-50.8867E, Sampling Chimney, WHATS(2), D=2605m
(3) 14:02, 19-33.4143S, 65-50.8819E, Sampling Chimney, WHATS(2), D=2605m
(4) 14:36, 19-33.4128S, 65-50.8865E, Sampling Scaly Foot, Cheap WHATS(2), D=2607m
(5) 14:39, 19-33.4126S, 65-50.8876E, Deployment #102 Marker, Sampling Rock with neolepas, D=2606m,
(6) 14:57, 19-33.4103S, 65-50.8808E, Sampling animals, D=2606m
(7) 15:03, 19-33.4166S, 65-50.8604E, Left Bottom, D=2565m

Dive Track:


#1165DIVE
Scale (1/ 10000)
XY Origin Lat 18 20 2000S Lon 65 17 9000E
Center Lat 18 20 2000S Lon 65 17 9000E
2009-10-17 (2009-10-17)