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NATSUSHIMA Cruise Report
NT10-06
Leg. 2

Daiichi Kohama knoll

&

Tarama knoll

April 4 (Iheya area) – April 12 (Ishigaki), 2010

Japan Agency for Marine-Earth Science & Technology
(JAMSTEC)

Contents

1. Cruise Information

1.1. Cruise number:

NT10-06 Leg. 2

1.2. Name of vessel:

R/V Natsushima

ROV Hyper-Dolphin

1.3. Title of the cruise:

'Hyper-Dolphin' deep-sea dive research

1.4. Titles of proposals:

- Geoscientific and biological investigation using submersible for unexplored hydrothermal fields in the Central ~ Southern Okinawa Trough

1.5. Cruise period:

April 4 - April 12, 2010

1.6. Ports of call:

Iheya area (daparture) – Ishigaki (arrival)

1.7. Research area:

Daiichi Kohama knoll and Tarama knoll, the Nansei Islands (Fig.1) The area surrounded with the following lines of longitudes and latitudes, Daiichi Kohama knoll: 24˚44.0'N, 123˚54.0'E – 24˚48.0'N, 123˚59.0'E, Tarama knoll: 25˚04.0'N, 124˚30.0'E – 25˚07.0'N, 124˚36.0'E.

1.8. Research map:

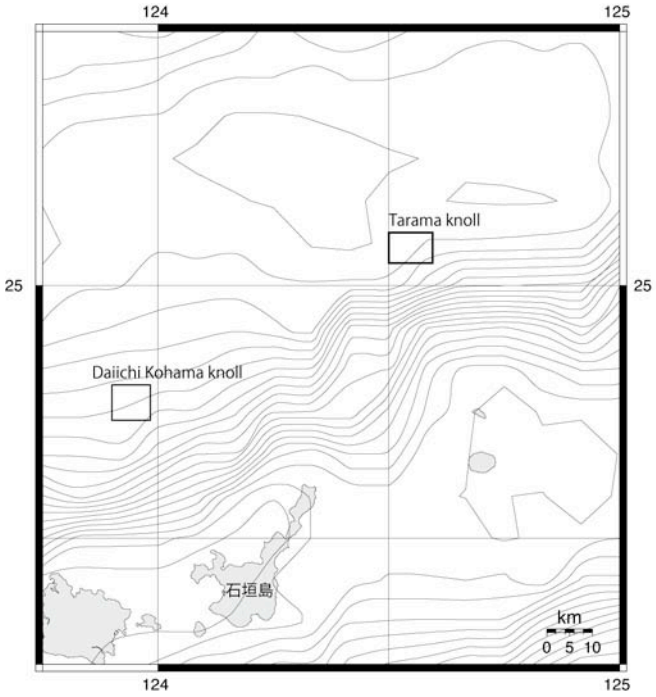


Fig.1　Research area

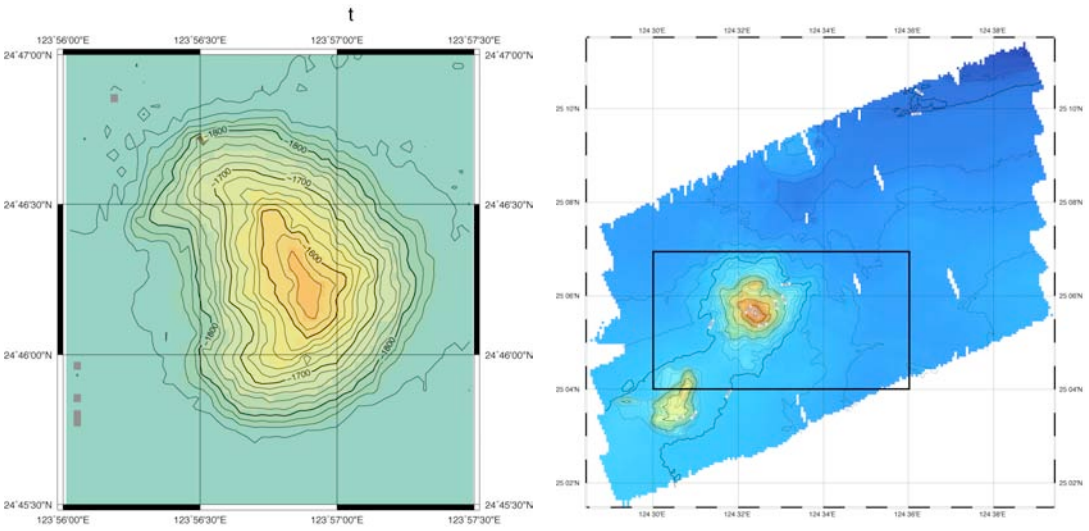


Fig.2　Bathymetory maps of Daiichi Kohama (Left) & Tarama (Right) knolls

See '3.4. Dive information' for the details.

2. Researchers

2.1. Chief scientist:

Toshiro Yamanaka [Okayama Universuty]

2.2. Representatives of the science party:

Toshiro Yamanaka [Okayama Universuty]

2.3. Science party:

Names	Affiliations
Toshiro Yamanaka	Okayama Universuty
Hiromi Nagashio	Okayama Universuty
Ryu Nishio	Okayama Universuty
Kei Okamura	Kochi Universuty
Takuro Noguchi	Kochi Universuty
Hiroaki Kawakami	Kochi Universuty
Takuro Nunoura	JAMSTEC
Hiroko Makita	JAMSTEC
Hiromi Watanabe	JAMSTEC
Kentaro Nakamura	JAMSTEC
Miho Hirai	JAMSTEC
Shinsuke Kawaguchi	JAMSTEC
Yoshimi Takahashi	JAMSTEC
Michinari Sunamura	University of Tokyo
MiHye Seo	University of Tokyo
Akira Ijiri	University of Tokyo
Ryoichi Nakada	Hiroshima University

3. Observation

3.1. Observation

3.1.1. Objective and Background

For understanding of whole Okinawa Trough as a single system, it is necessary to research of a blank area of possible hydrothermal activity. It is expected o strongly improve the knowledge how geology and tectonics control chemistry of the hydrothermal fluids and distribution of the related (micro-) organisms in the Okinawa Trough. To reach the goal our targets of this cruise were focused on the Daiichi Kohama and Tarama knolls, which are located southeastern part of western edge of the Okinawa Trough. Significant methane-concentration anomaly possibly originated in hydrothermal activity has been found on the summit of Daiichi Kohama and Tarama knolls during the KT05-26 cruise in 2005 by surface ship study. Although last year we surveyed the Tarama knoll using HyperDolphin during NT09-10 leg.2 cruise, we found dense turbid water around the summit and weak shimmering from the seafloor covered with characteristic red-brown sediment. However we could not found hydrothermal vent emitting high temperature fluid. Therefore, we try again to find venting site at the Tarama knoll and also visit the Daiichi Kohama knoll for finding venting sites. After the identifying the venting sites we plant to conduct the geological, geochemical and (micro-) biological sampling and clarify the nature. Then we compare the nature with the known hydrothermal sites in the Okinawa Trough for further understanding of the linkage between the chemical and biological nature and the geological and tectonic background.

3.1.2. Methods and Instruments

For accomplish the purpose, we sampled seawater (Niskin bottle, bag pump sampler, multi syringe water sampler and WHATS with temperature probe), sediments (push corer), rocks and organisms (sponge, fish, etc. with suction sampler). And we also deployed three *in situ* colonization systems and recovered one of them. In addition, during each dive the transmissivity of water had been measured and pH and ORP sensors were tested.

3.1.3. Research Results

We first visited the summit of Daiichi Kohama knoll, where was reported anomaly of methane concentration around the summit. The knoll also was surveyed by DSV/Shinkai 2000 in 1996 (Watanabe, 2000), however, any sign of hydrothermal activity was not reported. We planed the dive study of HyperDolphin #1105 to observe mainly southwest slope of the knoll, where Shinkai 2000 did not visit, as a result we also had not found any evidence of hydrothermal activity around the summit. We concluded that hydrothermal activity at the Daiichi Kohama knoll was currently inactive.

The other three days we did the survey at the Tarama knoll. At the knoll we recognized dense turbid water at the almost same depth frequently during the dives performed last year, and we detected anomaly of methane concentration in the turbid water sampled last year, strongly suggesting existence of active hydrothermal venting from the knoll. We first visited the area covered with red-brown sediment found last year, where was detected temperature anomaly about 7˚C higher than the ambient seawater, then we sampled the red-brown sediment and deployed two in situ colonization system. After that, we surveyed the west slope of the knoll widely and we observed dense turbid water frequently during the dives. However, we could not found active hydrothermal vent site. So at the last dive we visited the area covered with red-brown sediment again, then we found a significant shimmering in the area. The temperature of the shimmering fluid was about 20˚C higher than that of the ambient seawater. We sampled the shimmering fluid and replaced the in site colonization system with new one. During the dives we samples some benthic animals, such as a squad shrimp and a sea cucumber.

After back to the onland laboratory we will analyses the shimmering fluid sample and it's dissolved gas for clarify the origin of the shimmering fluid and the red-brown sediment. In addition, from the isotopic signatures of the benthos samples we try to estimate whether they rely on the chemosynthesis-based primary production.

3.1.4. Future Studies

We got seawater, sediment, rocks and biological samples during the dives. The

water samples are provided to analyze some metal species for determining the hydrothermal contribution. From the interstitial water and its dissolved gas chemistries in the red-brown sediment sample we plan to decide whether the temperature anomaly is caused by a hydrothermal activity. Dissolved organic chemicals in the seawater samples are also important object for understanding the character of hydrothermal activity occurred in Okinawa Trough. DOC, volatile organic acids, amino acids, and some protein also plan to measure at the onshore-based laboratories. Such geochemical studies are conducted at the following institutions and colleagues: Okayama, Kyushu, University of Ryukyus, Hiroshima University and Kochi University. In addition, from the isotopic signatures of the benthos samples we try to estimate whether they rely on the chemosynthesis-based primary production. Such biogeochemical studies are conducted at the following institutions and colleagues: ORI, University of Tokyo, JAMSTEC, and Okayama University.

Another specific studies conducted by each colleague are proposed as follows.

3.1.4.1. Petrological study

Kentaro NAKAMURA (JAMSTEC, Precam. Lab.)

1. For the purpose of elucidating geological background of the newly discovered hydrothermal activities, petrological and geochemical study of rock samples from the Daiichi Tarama knoll will be performed. In order to determine major, trace, and rare earth elements, XRF at Senshu university and ICP-MS at JAMSTEC will be used.

2. Using the chemical data obtained by the XRF and ICP-MS analyses, geochemical modeling will be performed in order to assess water-rock interactions at the reaction zones under the hydrothermal systems and its role for hydrothermal fluid chemistry.

3.1.4.2. Biological study

Hiromi Watanabe, Yoshimi Takahashi (JAMSTEC)

MiHye Seo (ORI, University of Tokyo)

To elucidate faunal composition in details, we will study the following things

with our colleagues;

1. Morphological and phylogenetical analyses of rossellid sponges. Collaborative study with Dr. Yuji Ise in MMBS, University of Tokyo.

2. Molecular phylogenetic analyses of lirarid fish. Collaborative study with Dr. Shigeaki Kojima in ORI, University of Tokyo.

3. Stable isotopic analyses by Dr. Toshiro Yamanaka in Okayama University.

3.1.4.3. Determination and imaging of growing chemolithotrophic microbial cells using syringe type *in situ* growth chamber

Michinari Sunamura (University of Tokyo)

To elucidate the biogeochemical cycling in the hydrothermal plume and fluid, total microbial cell density, specific microbial cell density, and microbial phylogeny in the plume samples will be determined by total cell counting, FISH analysis, and gene analysis, respectively. In addition, incubated microbial cells under in situ condition in syringe sampler will be stained and observed based on FISH-BrdU staining.

3.1.4.4. Chronological study of volcanic rocks

Shin Toyoda (Okayama University of Science)

For the purpose of elucidating history of volcanism and the following hydrothermal activity we will try to isolate suitable minerals for dating from the rock and sediment samples.

3.1.4.5. Geochemical study I

Kei Okamura, Takuro Noguchi (Kochi University)

I will conduct the chemical analysis on the fluid samples collected during this NT10-06 Leg.2 cruise. Elements and/or chemical species to be measured are described as follows;

(1) heavy metal elements (manganese, iron, zinc, copper, etc.)
(2) major cation and anions (sodium, magnesium, calcium, potassium, chloride, and sulfate)
(3) nutrients (phosphate, nitrate, and nitrite)

Based on these geochemical results, microbial results, and geological results, we will estimate end-member fluid chemistry.

3.1.4.6. Geochemical study II

Akira Ijiri, Michinari Sunamura (University of Tokyo)

We plan to analyze concentrations and stable carbon isotopic compositions of dissolved organic carbon (DOC) in seawater samples collected from hydrothermal plume.

Based on the relationship between the DOC data and microbiological data, we will investigate carbon cycle in the plume and the evolution of hydrothermal plume.

3.1.4.7. Geochemical study III

Ryoichi Nakada, Yoshio Takahashi (Hiroshima University of Tokyo)

Composition of trace elements including rare earth elements (REE), and if possible, stable isotope ratio of heavy metals of water sample will be determined using ICP-AES, -MS and MC-ICP-MS. The similar experiments will be conducted for mud and microbial mat samples. In addition, speciation of some elements (Fe, Mn, Ce, etc.) will be determined using synchrotron radiation experiment (KEK-PF and SPring-8).

3.1.4.8. Geochemical study IV

Shinsuke Kawagucci (PEL, JAMSTEC)
Ryoichi Nakada, Yoshio Takahashi (Hiroshima University of Tokyo)

Dissolved gases in hydrothermal fluid (taken by WHATS) were extracted by

the vacuum line at onboard labolatory. Aliquots of the extracted gases were subsampled into 50 mL glass and stainless steel bottles. At onshore laboratory, gas species (H_2, CH_4, CO_2, H_2S, and so on) in the extracted gas samples will be analyzed by GC and CF-IRMS technique to determine their concentrations and isotopic composition.

3. 2. Instruments

Place	Instruments
ROV payload	WHATS Bag pump sampler Niskin bottle water sampler Syringe-type in situ growth chamber Sampling box Suction sampler Turbidity meter *in situ* colonization system
Laboratory	HPLC pH meter Digital Titrator Gas extraction system UV-VIS Spectrophotometer Water tank with cooler and air pump

3.3. Cruise log:

Date (2010)	Vessel	Area	Work
April 4 (Sun)	Departure	Iheya	
5 (Mon)	Cruising		
6 (Tue)	Dive #1105	Tarama knoll	Seabat mapping and survey
7 (Wed)	Suspending	Iriomote Is.	Research ・Data collection
8 (Thu)	Dive #1106	Daiichi Kohama knoll	・Sampling of water, rocks, and animals
9 (Fry)	Dive #1107	Tarama knoll	
10 (Sat)	Dive #1108	Tarama knoll	
11 (Sun)	Dive #1109	Tarama knoll	
12 (Mon)	Arrival	Naha	Disembark

3.4. Dive information:

3.4.1. #1105

Toshiro Yamanaka

Date: April 6, 2010
Site: Daiichi Tarama knoll

Objective:

The major objective of this dive is finding hydrothermal venting site of the Tarama knoll, then we plan to sample hot fluids, organisms, hydrothermal precipitations and rocks.

Dive Summary:

During sunk to the bottom condition of the ROV/Hyper-dolphin became bad. So we quitted the dive immediately and recovered the ROV.

Payloads:

1) WHATS with a temperature probe
2) Bag pomp sampler (20L x 1)
3) Niskin bottles (2 bottles)
4) Suction sampler (multi canister)
5) Sample box x 2
6) Turbidity meter
7) M-type sediment sampler
8) MBARI core sampler
9) Syringe-type in situ growth chamber

3.4.2. #1106

Toshiro Yamanaka

Date: April 8, 2010
Site: Daiichi Kohama knoll
Landing: 15:06, Depth 1638 m, 24°45.976'N, 123°56.788'E
Leaving: 17:17, Depth 1631 m, 24°46.331'N, 123°57.010'E

Objectives:

The major objective of this dive is finding hydrothermal venting site of the Tarama knoll, then we plan to sample hot fluids, organisms, hydrothermal precipitations and rocks.

Dive Summary:

We choose southwest slope of the knoll as the first landing point. After landing we started observation of seafloor toward to the summit of the knoll carefully. The seafloor was covered thick soft clayey sediment, so the seafloor was very smooth and any outcrop was not been observed. Seawater sample was collected by the Niskin bottle when the ROV arrived at the summit of the knoll (1546m in depth), then we continued observation of seafloor toward to the north along a ridge. At the point about 600m apart from the summit, we turned to east direction for observation of west slope of the knoll near the summit. We sampled the surface sediment using M-type sediment sampler and one peace of rock fragment at the east slope of the knoll. We surveyed the east slope about 30 minutes then we leaved the seafloor. After leaving the seafloor seawater sample was collected using the Niskin bottle at the depth of 1400m.

Payloads:

1) WHATS with a temperature probe
2) Bag pomp sampler (20L x 1)
3) Niskin bottles (2 bottles)

4) Suction sampler (multi canister)
5) Sample box x 2
6) Turbidity meter
7) M-type sediment sampler

Event List:

15:06 24°45.976'N, 123°56.788'E (D = 1638 m) Landing

15:40 24°46.137'N, 123°56.913'E (D = 1546 m) Seawater sampling (Niskin Bottol #2)

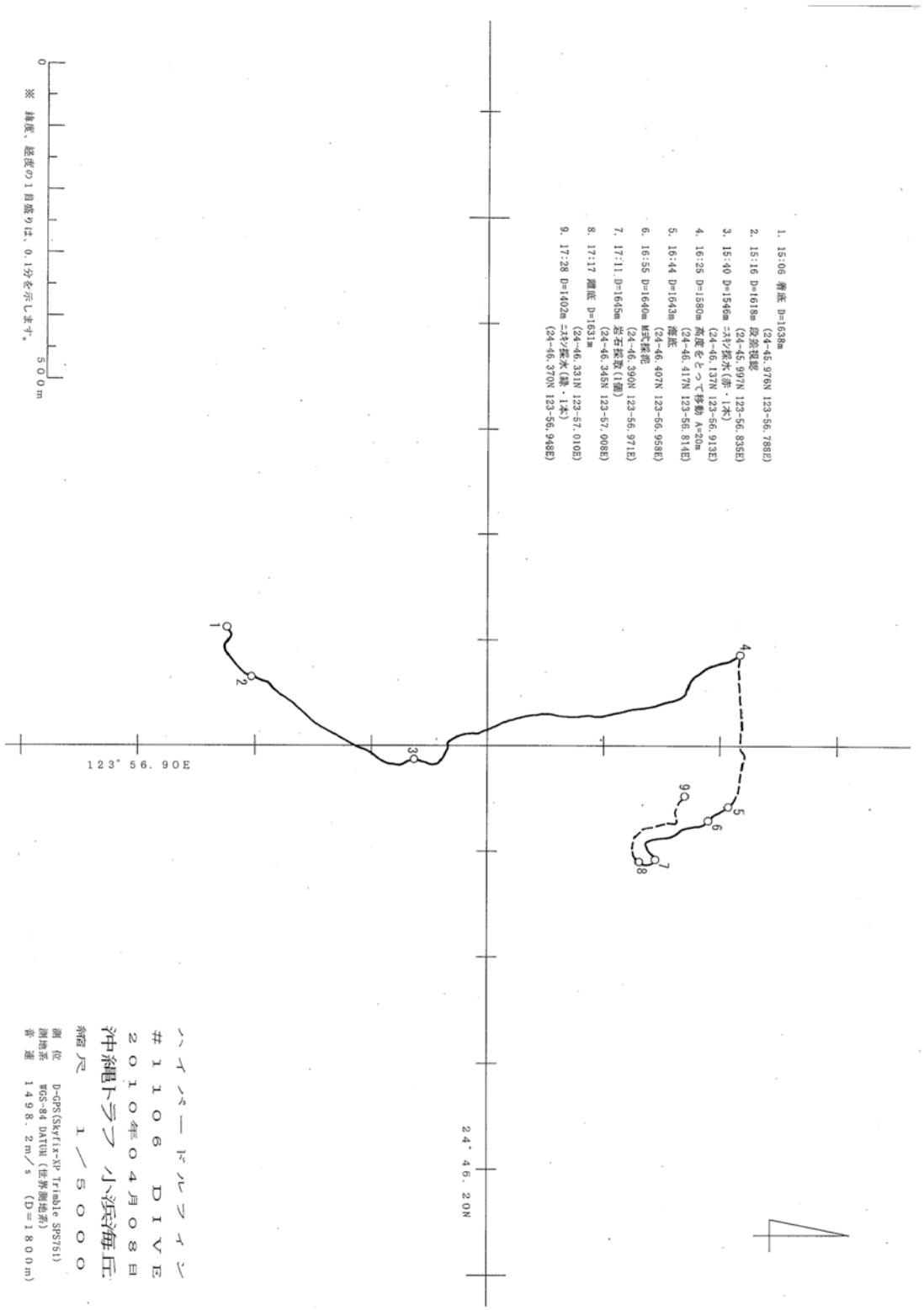
16:55 24°46.390'N, 123°56.971'E (D = 1640 m) Sediment sampling (M-type sediment sampler)

17:11 24°46.345'N, 123°57.008'E (D = 1645 m) Rock sampling (1)

17:17 24°46.331'N, 123°57.010'E (D = 1631 m) Leaving bottom

17:28 24°46.370'N, 123°56.948'E (D = 1402 m) Water sampling (Niskin bottle #1)

Dive track:


1. 15:06 着底 D=1638m
(24-45.976N 123-56.788E)
2. 15:16 D=1618m 段差視認
(24-45.997N 123-56.835E)
3. 15:40 D=1546m ニスキン採水(赤・1本)
(24-46.137N 123-56.913E)
4. 16:25 D=1580m 高度をとって移動 A=20m
(24-46.417N 123-56.814E)
5. 16:44 D=1643m 着底
(24-46.407N 123-56.959E)
6. 16:55 D=1640m 試採泥
(24-46.390N 123-56.971E)
7. 17:11 D=1665m 岩石採取(1個)
(24-46.345N 123-57.008E)
8. 17:17 離底 D=1631m
(24-46.331N 123-57.010E)
9. 17:28 D=1402m ニスキン採水(青・1本)
(24-46.370N 123-56.948E)
0
500m
※ 緯度、経度の1目盛りは、0.1分を示します。
123° 56.90E
24° 46.20N
ハイパードルフィン
#1106 DIVE
2010年04月08日
沖縄トラフ 小浜海丘
縮尺 1／5000
測 位 D-GPS(Skyfix-XP Trimble SPS751)
測地系 WGS-84 DATUM (世界測地系)
音 速 1498.2m／s (D=1800m)

3.4.3. #1107

Hiroko Makita

Date: April 9, 2010
Site: Daiichi Tarama knoll
Landing: 9:47, Depth 1575 m, 25°05.550'N, 124°32.361'E
Leaving: 13:28, Depth 1819 m, 25°05.402'N, 124°32.123'E

Objectives:

The major objective of this dive is finding hydrothermal venting site of the Tarama Knoll, then we plan to sample hot fluids, organisms, hydrothermal precipitations and rocks. In addition, we plan to deploy two *in site* colonization systems at the Iron mat Site.

Dive Summary:

Before landing the seafloor we sampled plume water using the syringe-type and Niskin bottle sampler at 1536 m in depth, where hydrothermal plume was expected based on the previous cruise during NT09-10 Leg 2. The ROV landed on seafloor at the event mark #1. Then, we moved to event mark #2. At the event mark #2 (Iron mat site), we measured temperature in the surface sediment and collected some sediment, and deployed the *in situ* colonization system (GALI-1) and #1107-1 marker. At the event mark #3 (Iron chimney site), we also measured temperature and collected a rock sample, and deployed the *in situ* colonization system (GALI-2). These *in situ* colonization systems will provide us about the information of the pioneer populations of bacteria at Iron mat and Iron chimney site. The measured temperature at the event mark #2 and #3 were up to 4.3˚C and 4.1˚C, respectively. During the survey we found many ascidian, sea sponges and some fish in the plume and on the sea floor, but they were likely common marine animals. We recognized dense turbid water several times around 1540 m in depth. It was expected us that we closed to the hydrothermal vent.

Payloads:

1) WHATS with a temperature probe
2) Vacuum bottle sampler
3) Bag pomp sampler (20L x 1)
4) Niskin bottles (2 bottles)
5) Suction sampler (multi canister)
6) Sample box x 2
7) Turbidity meter
8) M-type sediment sampler
9) *in situ* colonization system (x 2)
10) Syringe-type in situ growth chamber

Event List:

9:40 25°05.550'N, 124°32.361'E (D = 1536 m, A = 44 m) Water sampling (Niskin bottle #2, Syringe-type)

9:47 25°05.550'N, 124°32.361'E (D = 1575 m) Landing on seafloor

10:04 25°05.581'N, 124°32.383'E (D = 1541 m) Deploying *in situ* colonization system (GALI-1)

10:10 *ditto* Temperature measurement of surface sediment

10:30 *ditto* Sediment sampling (M-type sediment sampler)

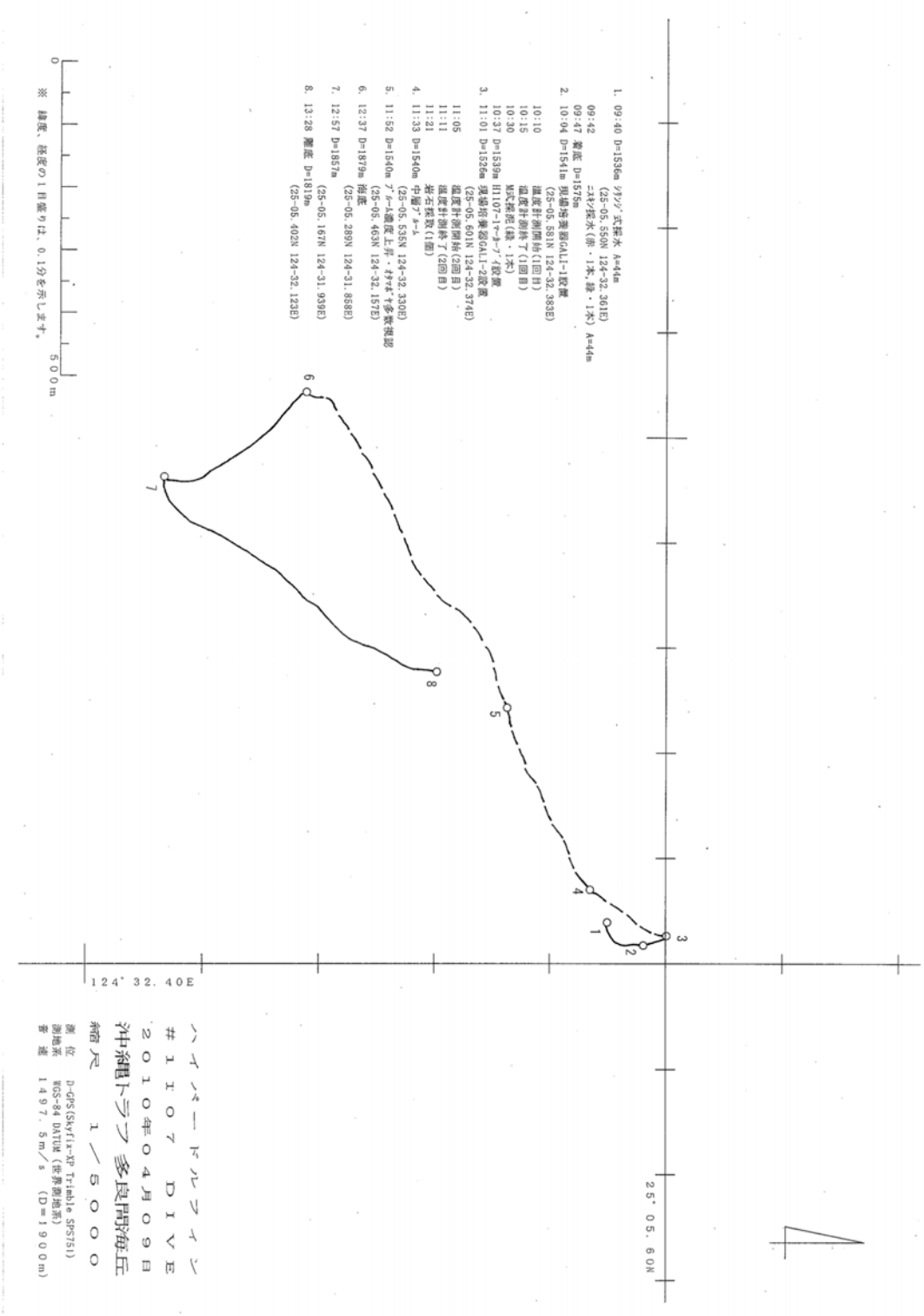
10:37 *ditto* Deploy maker buoy (H1107-1)

11:01 25°05.601'N, 124°32.374'E (D = 1526 m) Deploy *in situ* colonization system (GALI-2)

11:05 *ditto* Temperature measurement of surface sediment

13:28 25°05.402'N, 124°32.123'E (D = 1819 m) Leaving bottom

Dive track:


1. 09:40 D=1536m ｸﾘｯﾌﾟ式採水 A=44m
(25-05.550N 124-32.361E)
09:42 ﾆｽｷﾝ採水(赤・1本,緑・1本) A=44m
09:47 着底 D=1575m
2. 10:04 D=1541m 現場海洋観測(ALI-1投棄
(25-05.581N 124-32.383E)
10:10 温度計測開始(1回目)
10:15 温度計測終了(1回目)
10:30 堆石採取(緑・1本)
10:37 D=1539m ROV107-ﾄﾗｰﾌﾟ(投棄
3. 11:01 D=1526m 現場海洋観測(ALI-2投棄
(25-05.601N 124-32.374E)
11:05 温度計測開始(2回目)
11:11 温度計測終了(2回目)
11:21 岩石採取(1個)
4. 11:33 D=1540m 中層ﾌﾞｰﾑ
(25-05.535N 124-32.330E)
5. 11:52 D=1540m ﾌﾞｰﾑ濃度上昇・ﾌﾟﾗﾝｸﾄﾝ多数観察
(25-05.463N 124-32.157E)
6. 12:37 D=1879m 海底
(25-05.289N 124-31.868E)
7. 12:57 D=1857m
(25-05.167N 124-31.939E)
8. 13:28 離底 D=1819m
(25-05.402N 124-32.123E)
0
500m
※ 緯度、経度の1目盛りは、0.1分を示します。
124° 32.40E
25° 05.60N
ハイパードルフィン
#1107 DIVE
2010年04月09日
沖縄トラフ 多良間海丘
縮尺 1／5000
測 位 D-GPS(Skyfix-XP Trimble SPS751)
測地系 WGS-84 DATUM (世界測地系)
音 速 1497.5m/s (D=1900m)

3.4.4. #1108

Toshiro Yamanaka

Date: April 10, 2010
Site: Daiichi Tarama knoll
Landing: 9:23, Depth 1830 m, 25°05.354'N, 124°32.157'E
Leaving: 16:41, Depth 1536 m, 25°05.528'N, 124°32.361'E

Objectives:

The major objective of this dive is finding hydrothermal venting site of the Tarama Knoll, then we plan to sample hot fluids, organisms, hydrothermal precipitations and rocks.

Dive Summary:

Before landing on the seafloor we sampled plume water using the Niskin bottle sampler at 1553 m in depth, where hydrothermal plume was expected based on the previous dive #1107. When landing the seafloor we found significant turbid seawater at that site. We observed about a few minutes around the seafloor at the landing point, where dense animal community mainly of sea sponge, then we leaved the seafloor for migrating to the deeper site of the slope. After relanding we continued observation of seafloor toward to the summit. When we reached to the Iron mat site, we leaved the seafloor again and migrate to the west slope. During the migration we kept the depth at 1560m, where turbid seawater was significant. About 500m-west from the Iron mat site, where turbid seawater disappeared, we relanded on the seafloor and observed seafloor through to the summit. After reached to the summit we surveyed about 100m-north line from just before the observation to the summit. We could found dense sea sponge community during the survey, but any evidence of hydrothermal emission had not been found. Finally we migrated to the south slope and surveyed the south slope. When we reached near the Iron mat site, we found fluid shimmering from some fissures of red brownish sediment. We collected the shimmering fluid using

WHATS fluid sampler and Bag water sampler and sediment sample using suction sampler into the #1 canister. Before leaving the seafloor we deployed a marker buoy (H1108-1) at the site.

Payloads:

1) WHATS with a temperature probe
2) Vacuum bottle sampler
3) Bag pomp sampler (20L x 1)
4) Niskin bottles (2 bottles)
5) Suction sampler (multi canister)
6) Sample box x 2
7) Turbidity meter
8) M-type sediment sampler
9) MBARI-type core sampler (x2)

Event List:

9:12 25°05.356'N, 124°32.158'E (D = 1553 m) Water sampling (Niskin bottle #2)
9:23 *ditto* (D = 1830 m) Landing on seafloor
9:52 25°05.303'N, 124°32.124'E (D = 1862 m) Sediment sampling (MBARI-type core sampler, Blue)
9:56 *ditto* Sampling of organism (#1 canister)
10:07 25°05.326'N, 124°32.136'E (D = 1850 m) Sampling of organisms with rock
10:13 25°05.346'N, 124°32.151'E (D = 1831 m) Sampling of organism (#1 canister)
13:58 25°05.608'N, 124°32.205'E (D = 1540 m) Water sampling (Niskin bottle #1)
14:47 25°05.670'N, 124°32.289'E (D = 1530 m) Sampling of organism (#2 canister)
16:15 25°05.582'N, 124°32.361'E (D = 1536 m) Shimmering fluid sampling (WHATS #1 bottle)

16:16 *ditto* Shimmering fluid sampling (Bag water sampler)

16:24 *ditto* Shimmering fluid sampling (WHATS #2 bottle)

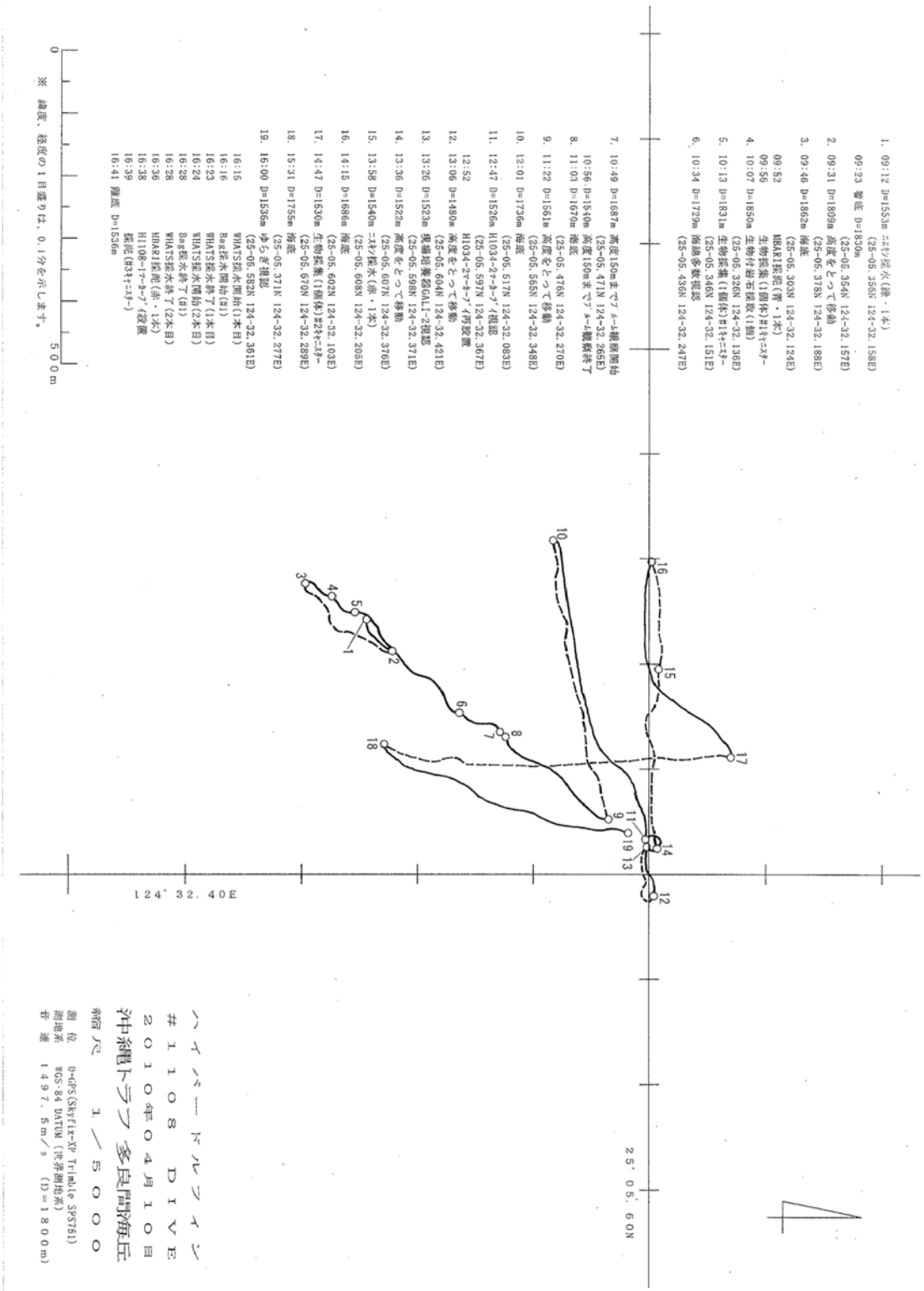
16:36 *ditto* Sediment sampling (MBARI-type core sampler, Red)

16:38 *ditto* Deploying marker buoy (1108-1)

16:39 *ditto* Sediment sampling (Suction sampler #3 canister)

16:41 *ditto* Leaving bottom

Dive track:


1. 09:12 D=1553m ニスキン採水(赤・1本)
(25-05.356N 124-32.158E)
09:23 着底 D=1530m
(25-05.354N 124-32.157E)
2. 09:31 D=1809m 高度をとって移動
(25-05.378N 124-32.188E)
3. 09:46 D=1862m 海底
(25-05.303N 124-32.124E)
09:52 MBARI採泥器(青・1本)
09:55 生物採集(1個体)#11ヤマトメクラ
4. 10:07 D=1850m 生物付岩石採取(1個)
(25-05.326N 124-32.136E)
5. 10:13 D=1831m 生物採集(1個体)#11ヤマトメクラ
(25-05.346N 124-32.151E)
6. 10:34 D=1729m 海綿多数確認
(25-05.436N 124-32.247E)
7. 10:49 D=1687m 高度150mまでチェーン繰出開始
(25-05.471N 124-32.265E)
10:56 D=1540m 高度150mまでチェーン繰出終了
8. 11:03 D=1670m 着底
(25-05.476N 124-32.270E)
9. 11:22 D=1561m 高度をとって移動
(25-05.565N 124-32.348E)
10. 12:01 D=1735m 海底
(25-05.517N 124-32.083E)
11. 12:47 D=1526m H1034-2マーカー付近確認
(25-05.597N 124-32.367E)
12. 12:52 H1034-2マーカー浮設置
13. 13:06 D=1480m 高度をとって移動
(25-05.604N 124-32.421E)
13:20 D=1523m 堆積物急斜面(ALT-2)確認
(25-05.598N 124-32.371E)
14. 13:36 D=1522m 高度をとって移動
(25-05.607N 124-32.376E)
15. 13:58 D=1540m ニスキン採水(赤・1本)
(25-05.608N 124-32.205E)
16. 14:15 D=1686m 海底
(25-05.602N 124-32.103E)
17. 14:47 D=1530m 生物採集(1個体)#22ヤマトメクラ
(25-05.670N 124-32.289E)
18. 15:31 D=1755m 海底
(25-05.371N 124-32.277E)
19. 15:00 D=1536m ゆら着確認
(25-05.582N 124-32.361E)
16:15 WHATS採水開始(1本目)
16:16 Bag採水開始(1)
16:23 WHATS採水終了(1本目)
16:24 WHATS採水開始(2本目)
16:28 Bag採水終了(1)
16:28 WHATS採水終了(2本目)
16:36 MBARI採泥(赤・1本)
16:38 H1106-1マーカー投置
16:39 採泥(ROVヤマトメクラ)
16:41 離底 D=1536m
0
500m
※ 緯度、経度の1目盛りは、0.1分を示します。
124° 32.40E
25° 05.60N
ハイパードルフィン
#1108 DIVE
2010年04月10日
沖縄トラフ多良間海丘
縮尺 1／5000
測位 D-GPS(Skyfix-XP Trimble SPS751)
測地系 WGS-84 DATUM (世界測地系)
音速 1497.5m／s (D=1800m)

3.4.5. #1109

Hiroko Makita

Date: April 11, 2010
Site: Daiichi Tarama knoll
Landing: 9:32, Depth 1746 m, 25°05.444'N, 124°32.197'E
Leaving: 16:11, Depth 1536 m, 25°05.581'N, 124°32.363'E

Objectives:

The major objective of this dive is finding hydrothermal venting site of the Tarama knoll, then we plan to sample hot fluids, organisms, hydrothermal precipitations and rocks. In addition, we deploy an *in site* colonization system at the Iron mat Site and recover one of the deployed them during dive #1107.

Dive Summary:

Before several landing, seawater was taken at 1668 m (N-1; Green), 1790 m (N-2; Red) and 1756 m (N-3; Blue) by the Niskin bottle sampler. The first ROV landed on seafloor at the event no.1. Then, the ROV moved to event no.11 after landing at the event no.1, 4, 7 and 9 next. At the event no. 11 (Yamanaka Fox site), we can see shimmering water from the mat. Then, we collected temperature data, rock and sediment sample, and installed on the in situ colonization system (GALI-3) and #1109-1 marker. And, we collected water sample using WHATS sampler. Then we collected the same water samples into a plastic bag and cheep WHATS bottles using WHATS pump system. Before sampling, we recovered the in situ colonization system (GALI-1). The temperature of event no.11 was up to 23.3oC; this value was about 19.5oC higher than that of the ambient seawater. Existence of the simmering water, and huge iron-oxide deposit and dense turbid water were indicated that the hydrothermal vent is active. We got closer to vigorous Tarama hydrothermal vent, but that day's dive time were running out.

Payloads:

1) WHATS with a temperature probe
2) Vacuum bottle sampler
3) Bag pomp sampler (20L x 1)
4) Niskin bottles (2 bottles)
5) Suction sampler (multi canister)
6) Sample box x 2
7) Turbidity meter
8) M-type sediment sampler
9) MBARI-type core sampler (x2)

Event List:

9:32 25°05.444'N, 124°32.197'E (D = 1746 m) Landing on seafloor

9:46 25°05.492'N, 124°32.236'E (D = 1668 m) Water sampling (Niskin bottle Green)

11:45 25°05.236'N, 124°32.263'E (D = 1790 m) Water sampling (Niskin bottle Red)

13:41 25°05.330'N, 124°32.463'E (D = 1756 m) Water sampling (Niskin bottle Blue)

14:27 25°05.581'N, 124°32.363'E (D = 1537 m) Temperature measurement of surface sediment

14:34 *ditto* Temperature measurement of surface sediment

14:51 *ditto* Shimmering fluid sampling (WHATS #1 bottle)

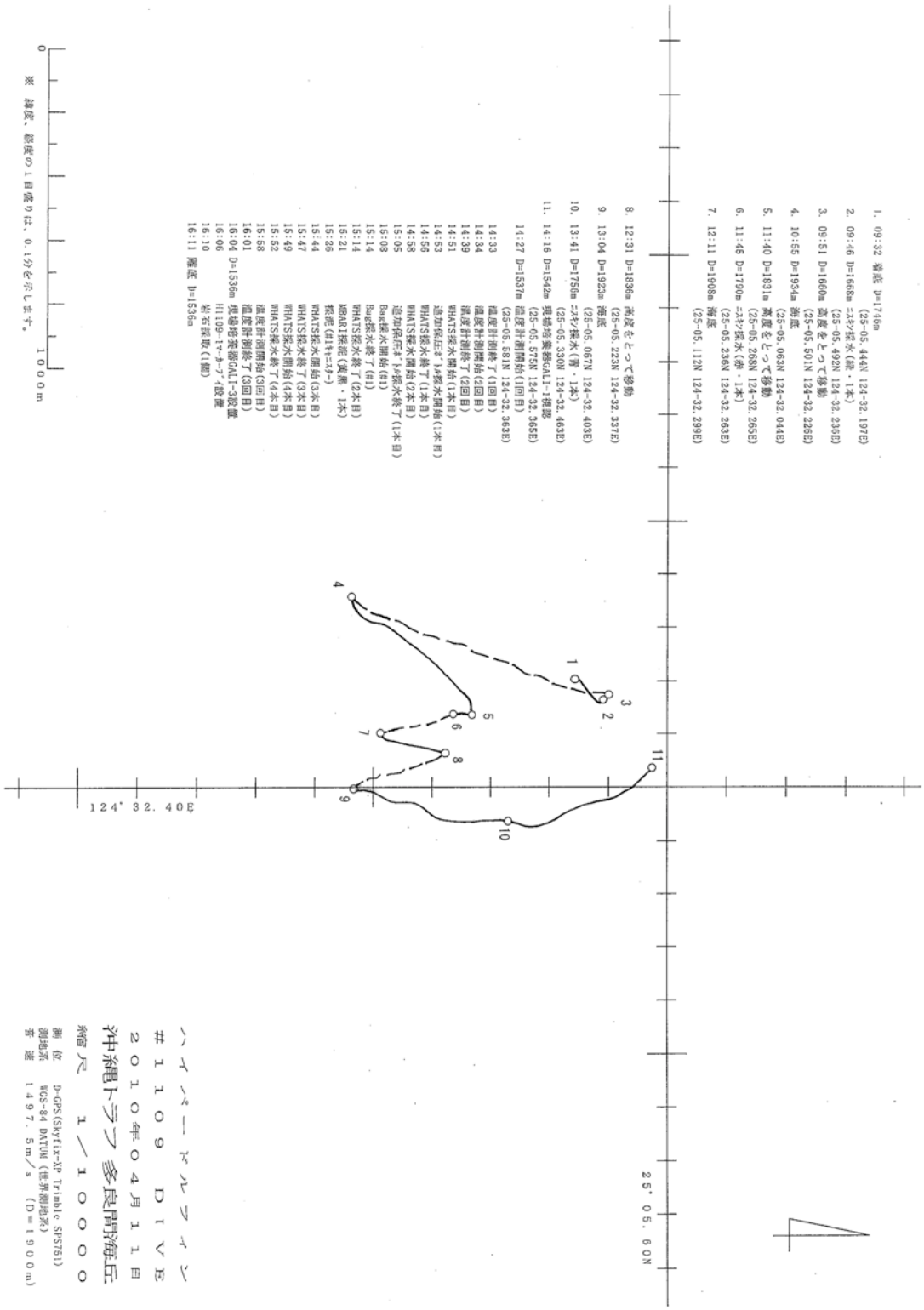
14:53 *ditto* Shimmering fluid sampling (WHATS #A1 bottle)

14:58 *ditto* Shimmering fluid sampling (WHATS #2 bottle)

15:08 *ditto* Shimmering fluid sampling (Bag water sampler)

15:21	*ditto*	Sediment sampling (MBARI-type core sampler, Yellow/Black)
15:26	*ditto*	Sediment sampling (Suction sampler #1 canister)
15:44	*ditto*	Shimmering fluid sampling (WHATS #3 bottle)
15:49	*ditto*	Shimmering fluid sampling (WHATS #4 bottle)
15:58	*ditto*	Temperature measurement of surface sediment
16:04	*ditto*	Deploying *in situ* colonization system (GALI-3)
16:06	*ditto*	Deploying marker buoy (H1109-1)
16:10	*ditto*	Rock sampling
16:11	*ditto*	Leaving bottom

Dive track:


1. 09:32 着底 D=1746m
(25-05.444N 124-32.197E)
2. 09:46 D=1668m ニオシ採水(緑・1本)
(25-05.492N 124-32.236E)
3. 09:51 D=1660m 高度をとって移動
(25-05.501N 124-32.226E)
4. 10:56 D=1934m 揚底
(25-05.063N 124-32.044E)
5. 11:40 D=1831m 高度をとって移動
(25-05.268N 124-32.265E)
6. 11:45 D=1790m ニオシ採水(赤・1本)
(25-05.236N 124-32.283E)
7. 12:11 D=1908m 揚底
(25-05.112N 124-32.299E)
8. 12:31 D=1836m 高度をとって移動
(25-05.223N 124-32.337E)
9. 13:04 D=1923m 着底
(25-05.067N 124-32.403E)
10. 13:41 D=1750m ニオシ採水(青・1本)
(25-05.330N 124-32.463E)
11. 14:16 D=1542m 現場培養器GALI-1設置
(25-05.575N 124-32.365E)
14:27 D=1537m 温度計測開始(1回目)
(25-05.581N 124-32.363E)
14:33 温度計測開始(2回目)
14:34 温度計測終了(1回目)
14:39 温度計測終了(2回目)
14:51 WHATS表水開始(1本目)
14:53 追加採圧ﾎﾞﾄﾙ採水開始(1本目)
14:56 WHATS採水終了(1本目)
14:58 WHATS表水開始(2本目)
15:05 追加採圧ﾎﾞﾄﾙ採水終了(1本目)
15:08 Bac採水開始(#1)
15:14 Bac採水終了(#1)
15:14 WHATS採水終了(2本目)
15:21 MBARI採能(真黒・1本)
15:26 採泥(ｶﾙｷﾆｽﾀｰ)
15:44 WHATS採水開始(3本目)
15:47 WHATS採水終了(3本目)
15:49 WHATS採水開始(4本目)
15:52 WHATS表水終了(4本目)
15:58 温度計測開始(3回目)
16:01 温度計測終了(3回目)
16:04 D=1536m 現場培養器GALI-3設置
16:06 H11109-1ﾏｰｶｰ投棄
16:10 岩石採取(1個)
16:11 離底 D=1536m
0
1000m
※ 緯度、経度の1目盛りは、0.1分を示します。
124° 32.40E
25° 05.60N
ハイペードルフィン
#1109 DIVE
2010年04月11日
沖縄トラフ 多良間海丘
縮尺 1／10000
測 位 D-GPS(Skyfix-XP Trimble SPS751)
測地系 WGS-84 DATUM (世界測地系)
音 速 1497.5m／s (D=1900m)

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 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.