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深海調査研究船「かいれい」
KR07-07 調査航海
三陸沖日本海溝周辺海域
クルーズレポート

2007 年 6 月 1 日（岩手県釜石港）
～2007 年 6 月 8 日（岩手県釜石港）

Preliminary Report of
the Kairei KR07-07 Cruise

June 1, 2007 (Kamaishi) ～ June 8, 2007 (Kamaishi)

研究課題　三陸沖日本海溝のアウターライズの潜航調査
(Diving survey of the outer rise of the Japan Trench off Sanrik)

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Preface

A proposal of this cruise was applied to the JAMSTEC Deep-sea Research Program in 2006 and the cruise was realized in early June 2007 as the Kaire/KAIKO 7000 II KR07-07 cruise. The Kairei started from Kamaishi on June 1 and returned to the same port on June 8, 2007.

The cruise aims at diving surveys on the outer rise of the Japan Trench off Sanriku for three objectives. The first is diving surveys for ‘petit spot’ young volcanoes. Petit spot is a new type volcano recently found in the northeast Pacific Plate. The survey area of KR07-07 is one of the potential localities for another petit spot volcanic field. The primary objective of the dive is to get basalt rock samples from some knolls of these and to make sure that these knolls could be petit spot volcanoes.

The second objective is diving surveys in the source region of the 2005 M7.1 outer rise earthquake. The earthquake occurred on 15 November 2005 JST about 300 km east of the Pacific coast of Iwate Prefecture. The main interest in this earthquake is that it occurred on the outer rise of the Japan Trench just 100 km south the 1933 great M8.4 Sanriku-oki tsunami earthquake, one of the four most fatal earthquakes in Japan since 1920. The 2005 outer rise earthquake was the largest recorded off the Japan Trench since 1933 and one of the largest in the world since 1986. It was extremely well recorded in Japan and around the world. It was found that the earthquake has approximately the same mechanism of a normal fault with the 1933 tsunami earthquake. Therefore, the source region of the 2005 earthquake can be a good target for the study of tsunami earthquakes caused by normal faults in the outer rise. As Dr. Ryota Hino failed to join the cruise, I invited Dr. Stephen Kirby from USGS for this study.

The area of aftershocks of the 2005 earthquake is overlapped with the area where many petit spot-like knolls are recognized. The relationship between the two phenomena can be another interesting topic.

The third objective is renewal of acoustic seafloor benchmarks deployed on the outer rise. Three precision acoustic transponders (PXPs) were deployed in 2002 to observe the motion of the pacific plate near the subduction plate boundary. Unfortunately it seems that the batteries of these instruments have been exhausted earlier than expected. At least two PXPs should be replaced with new ones after cm-order relative positioning. The third PXP can be deployed from the surface with a mooring system.

All of these three objectives are important, but the cruise was planned for only six dives. I earnestly prayed for good weather, and fortunately we could carry out the six dives with a big success. The weather was good as if we were in an equatorial area. The KAIKO 7000 II worked well without any problem. The performance is much the same as the original KAIKO except for the maximum depth. The crew of the Kairei was really helpful.

I hope to express my sincere thanks to Captain S. Ishida and the crew of the Kairei, and Chief KAIKO Operator K. Hirata and the KAIKO Team for their skillful support. We owed much to Director M. Ida and Mr. M. Asanuma, Research Vessel Management and Operations Department, JAMSTEC, for preparing the cruise.

June 8, 2007

Chief Scientist

Hiromi Fujimoto

1. Cruise Log

Aoki Misumi (NME)

1. Cruise Log of Kairei/Kaiko 7000-II in R07-07

Date & Time (Local=GMT+9h)		Note	Remarks	Weather at noon
Fri	**1-Jun-07**			
	8:00	Boarding		bc/NNE/3/2/1/10
	9:00	Departure from Yokosuka		
	10:00-10:30	Briefing about ship's life and safety		
	10:30-11:00	Science meeting		
	13:47	Send wake-up command to the pressure sensor		
	13:52	Released		
	14:08	Surface		
	14:13	Ondeck		
	16:40	KONPIRA ceremony		
	18:00-18:30	Briefing about ROV KAIKO system		
	19:00-20:00	Science meeting		
Sat	**2-Jun-07**			Cloudy/North/4/3/1/12
	1:35	Start MBES mapping		
	5:47	XBT measurement		
	6:38	MBES		
	8:37	KAIKO on the surface	7K#388 dive	
	10:50	Touch the bottom (Depth=5,423m)	Choco Chip	
	14:18	Leave the bottom（Depth=5,207m）	Sea Mounts	
	16:03	Surface		
	16:14	On deck		
	16:55	Launch the Proton Magnetometer		
	17:05	Start geophysical survey		
	19:00-19:45	Science meeting		
	20:26	Recover the Proton Magnetometer		
Sun	**3-Jun-07**			bc/South/2/1/2/12
	7:01	Finish MBES mapping		
	8:27	KAIKO on the surface	7K#389 dive	
	10:41	Touch the bottom (Depth=5,433m)	Deployment of	
	13:31	Leave the bottom（Depth=5,422m）	Ocean Bottom	
	15:18	Surface	Station	
	15:29	On deck		
	16:14	Launch the Proton Magnetometer and start geophysical survey		
	19:00-19:30	Science meeting		
	20:21	Recover the Proton Magnetometer		
Mon	**4-Jun-07**			c/SSE/3/2/4/12
	5:43	Finish MBES mapping		

5:57	Deploy Ocean Bottom Positioning Station		
8:31	KAIKO on the surface	7K#390 dive Deployment of Ocean Bottom Station	
10:40	Touch the bottom (Depth=5,504m)		
12:42	Leave the bottom（Depth=5,503m）		
14:29	Surface		
14:40	On deck		
15:20-16:15	Calibrate position of the ocean bottom station		
16:18	Send release command		
17:23	The buoys at surface		
17:29	On deck		
18:11-18:45	Wake up the ocean bottom stations		
19:09-19:42	Surface buoy measurement		
19:43-19:47	Send sleep command		
19:51	Start MBES mapping		
20:00-20:20	Science meeting		
Tue 5-Jun-07			bc/SSE/3/2/2/12
6:53	Finish MBES mapping		
8:30	KAIKO on the surface	7K#391 dive	
10:38	Touch the bottom (Depth=5,340m)		
14:32	Leave the bottom（Depth=5,284m）		
16:18	Surface		
16:26	On deck		
19:51	Start MBES mapping		
19:00-19:30	Science meeting		
Wed 6-Jun-07			bc/South/3/2/2/10
6:50	Finish MBES mapping		
8:26	KAIKO on the surface	7K#392 dive	
10:38	Touch the bottom (Depth=5,466m)		
14:20	Leave the bottom（Depth=5,286m）		
16:07	Surface		
16:15	On deck		
19:00-19:30	Science meeting		
Thu 7-Jun-07			bc/South/4/3/1/10
8:30	KAIKO on the surface	7K#393 dive	
10:38	Touch the bottom (Depth=5,286m)		
14:22	Leave the bottom（Depth=5,105m）		
16:06	Surface		
16:13	On deck		
19:00-20:00	Onboard seminer		
Fri 8-Jun-07			
9:00	Arrive at Kamaishi port		

Wearther/Wind direction/Wind speed index/wave(m)/swell(m)/visibility (nautical mile)

Wearther

f= fine
bc= fine but cloudy
c= cloudy

Wind speed index

0 = 0 - 0.2 m/sec.
1 = 0.3 - 1.5
2 = 1.6 - 3.3
3 = 3.4 - 5.4
4 = 5.5 - 7.9
5 = 8.0 - 10.7
6 = 10.8 - 13.8
7 = 13.9 - 17.1
8 = 17.2 - 20.7
9 = 20.8 - 24.4
10 = 24.5 - 28.4
11 = 28.5 - 32.6
12 = 32.7 -

2. Shipboard Scientific Party

Name: H. FUJIMOTO
Institute: Tohoku University

Name: N. ABE
Institute: IFREE/JAMSTEC

Name: Stephen Kirby
Institute: US Geological Survey

Name: M. KIDO
Institute: Tohoku University

Name: Y. OSADA
Institute: Tohoku University

Name: Y. KOIKE
Institute: JAMSTEC

Name: H. TSUSHIMA
Institute: Tohoku University

Research Associate
Name: M. AOKI
Company: Nippon Marine Enterprises, Ltd.

Journalist
Name: R. NISHIYAMA
Institute: Japan Image Production, Ltd.

3. Objectives of the cruise

This cruise was proposed and accepted to carry out diving surveys for the following three objectives.

3.1 Purpose of the KAIKO 7000II Dive on petit spot

Natsue Abe (IFREE, JAMSTEC)

The purpose of the KAIKO 7000II Dives on three knolls (7KII Dive #388, 392 & 393) is to obtain hard rock samples of possibly erupted as young volcanoes; 'petit spot'. Petit spot is a new type volcano recently found in the northeast Pacific Plate (Hirano et al., 2006). According to Hirano et al. (2006), 'petit spot' is a unique volcanic type causing by oceanic plate flexure and the small amount of magma came from the asthenosphere through the fractures in the oceanic lithosphere. If the theory is correct, there are other localities of such small volcanoes in other part of the middle of the oceanic plate. The survey area of KR07-07 is one of the potential localities for another petit spot volcanic field. There are numerous small knolls considered to petit spot volcano in the range of 37°20'N to 38°10'N and 144°40'E to 145°50' (figure 1). Petit spot research group tried dredge sampling twice during KR04-08, however, they couldn't get hard rock samples except for some pumice and some possible drop stones from drift ices in this area. Therefore, the primary objective of the dive is to get basalt rock samples from any knolls of these and to make sure that these knolls could be petit spot volcanoes.

3.2 Motivation and Justification for Two Kaiko 7000 II Dives in the Source Region of the M_{JMA} 7.1 Sanriku-oki Earthquake of 15 November 2005 (Japan Time)

Stephen Kirby (USGS)

On 15 November 2005, a M_{JMA} 7.1 earthquake occurred 300 km east of the Pacific coast of Iwate Prefecture. The maximum JMA earthquake intensity near the coast of Tohoku was 3 and hence damage was minimal in Tohoku, as expected for an event so far from shore. The main interest in this earthquake is that it occurred on the outer rise of the Japan Trench just 100 km south the great M8.4 Sanriku-oki of 1933, one of the four most fatal earthquakes in Japan since 1920. More than 3,064 persons were killed or missing. The 1933 event spawned giant, very destructive tsunami waves in northern Japan.

The 2005 outer rise earthquake was the largest recorded off the Japan Trench since 1933 and one of the largest in the world since 1986. It was extremely well recorded in Japan and around the world and generated small tsunami waves that were well recorded on the coastline of northern Tohoku. The source properties of this recent earthquake have been intensively investigated by Japanese and foreign seismologists based on seismic records on land and in 2007 by OBS deployments on the seafloor recording its aftershocks (Hino, personal communication). These data are in remarkable agreement. All investigators agree that this was a very shallow normal faulting earthquake having initially ruptured at a depth of 10-15 km with nodal planes parallel to the Japan Trench and that the trenchward-dipping plane was the active one. Its rupture dimensions based on waveform modeling and the OBS-recorded aftershocks were 45 km long and approximately 20-25 km down dip. An OBS study of its aftershocks investigated by Dr. Ryota Hino and his colleagues also suggests that there may have been two parallel normal-faulting ruptures planes that both strike at an azimuth of about 7° and are spaced about 10 km apart. These would be indistinguishable from a single source based on seismic waves recorded hundreds of kilometers from the source. In summary, this well-studied 2005 earthquake occurred in a similar tectonic setting and had a nearly identical focal mechanism and hypocentral depth to the much larger 1933 event (Kanamori, 1972). However, we know much less about the earlier event and hence the 2005 shock may serve as a compact source model for the earlier earthquake, suitably scaled up in scalar seismic moment.

Diving on the seafloor of the source region of this earthquake with the Kaiko ROV will require new detailed SeamBeam and sidescan sonar mapping of the seafloor above the aftershock zone recorded by Hino's OBS deployments in order to identify possible fault scarps or other evidence of surfaced breaks. Especially valuable for scarp hunting would be maps of grazing incidence side-scan sonar illuminated from the west so that possible west-dipping scarps would show ups as bright reflectors. I propose that we do one cross-scarp transect on the first dive and return to the same scarp on the second dive and explore it in the along-strike direction. These dives would provide important information on this type of earthquake source, such as: (1) whether rupture reached the surface; (2) Whether rupture was compound (two or more planes); (3) Whether there is structural continuity of the surface expressions of faulting with those to the north closer to the 1933 source region; (4) Whether there is evidence for sediment gravity flows or slumps off the scarps due to strong ground motions associated with outer-rise earthquakes. If successful, this would be the first-ever ROV dive on an outer-rise earthquake source. (5) Whether there is some connection between normal faulting with "petit spot" volcanic seamounts.

Addendum on 13:45 on 4 June 2007:

Additional processing of the SEABEAM bathymetry by Kido-san to 10 m contouring reveals two possible north-south features that are aligned with the north-south trend of the main aftershock belt and may represent normal-faulting truncations of the prominent NE-SW-trending ridges that are approximately parallel to magnetic anomalies in this area. One feature is near longitude 145°5.5' E and extends from 38°09' to about 39°20' N latitude. The other N-S feature is at 145°10.5' E longitude and extend from about 38°10.6' to about 38°19' N latitude. For both of these features, the east side is apparently down. If our interpretation of these ridge truncations is correct, they represent as much as 20 meters fault total vertical displacement. Slip modeling indicates that the fault throw of the 2005 earthquake was about 1.2 meters, far too small to detect with SEABEAM mapping. We are hopeful that rupture associated with this earthquake occurred on normal fault structures that have been activated repeatedly in the past and hence are detectible from bathymetry.

There are two significant uncertainties to these interpretations: (1) The N-S feature at 145°5.5' E is in the center of the SEABEAM track line and the onboard scientific team worries that the feature could be an artifact. An additional N to S SEABEAM line at 145°03' from 38°30' to 38°05' is scheduled for this evening. It is offset from the first feature by 2' W, so if it is an artifact, it should be missing from this new SEABEAM line. (2) The aftershocks of the 2005 event were located using an OBS array that was as much as 15 minutes longitude east of the apparent aftershock locations. This could lead to an eastward shift of the apparent locations compared to the actual locations by as much as 20% of array position error, or 20% X 15 minutes or 3 minutes too far west. Since the evidence cited earlier indicates that the active normal fault(s) dips west, the trace of the surface rupture should be on the eastern margin of the dense N-S zone of aftershocks.

First Dive Target
Given these uncertainties, the scientific team decided to select as our first dive target a truncated ridge just east of the eastern N-S feature at 145°10.5' longitude. We want to start at 38°7'N latitude and head due E from longitude 145°10' E to 145°11.5' E, a Kaiko distance traveled of 1.5' in latitude or 1.2 nautical miles.

3.3 Geodetic Experiments for the Renewal of Acoustic Seafloor Benchmarks

Hiromi Fujimoto (Tohoku University)

The pacific plate is estimated to be subducted at the Japan Trench of Sanriku at a speed of about 9 cm/y, but nobody knows its speed near the subduction where big earthquakes have occurred repeatedly. Tohoku University deployed three precision acoustic transponders (PXPs) at GJT1 site in the study area in 2003 to measure the speed in situ. Although cm-level relative positioning has not been attained due to limited chance of geodetic observations, the observed data are valuable. Unfortunately it turned out during the observation in 2005 that the geodetic observation at the site would be terminated; the amplitude of the acoustic signals from the PXPs was less than 20 % of the normal value presumably because of the exhausted batteries. We should deploy new PXPs and measure the relative positions of the new and old PXPs with 1 cm resolution in order to continue the geodetic observation. Diving operation is required for the job after the old PXPs are inactive. That is why we applied to the KAIKO diving surveys.

We plan to let the KAIKO 7K II carry a PXP in the payload space, deploy it on the seafloor side by side to an old PXP. Then we will measure the relative position between the two PXPs with the aid of visual images provided by cameras of the KAIKO. After the measurement, we will try to recover the old PXP with a rope connected to the KAIKO. Two dives are necessary to deploy two PXPs. We plan to deploy another PXP with a mooring system.

4. Results of Diving Surveys

4.1 Report on the Kaiko 7000 II Dive#388 on 2007/06/02

Natsue Abe, Yuki Koike (IFREE, JAMSTEC)

This dive started at depth 5423m, 37°57.80'N latitude, 145°00.87'E longitude and ended at depth 5207m, 37°57.1222'N latitude, 145･00.8067'E longitude. The target is one of Choco-chip knolls which is considered as a kind of petit spot volcano. The aim of this dive is to observe on the surface of this knoll and to take rock samples from this knoll. Some cryptic micro fault was expected before dive according to the multi-narrow beam seafloor survey, but any such feature couldn't be observed during this dive. Nine rock specimens were sampled during the dive including three basaltic samples; one high vesicular fresh basalt that looks similar to the petit spot rock, one highly altered massive lava and one fresh scoria. Some manganese crust and nodules, and pumice are collected. This is the first petit spot that is discovered except Yukawa knoll area and Kaiko knolls area and sampled fresh basaltic samples.

The dive record, dive log, list of samples, and the dive track chart are shown in Tables 4.1.1-4.1.3 and Fig. 4.1.1, respectively.

かいこう７０００Ⅱ　潜航記録

平成 19 年　KR07 07 行動　記載者 瀬底 秀樹

潜航年月日 2007 年 06/02

着底予定位置

緯度 37° 57.80' N

経度 145° 00.87' E

測地系 WGS-84

潜航回数 1 回

通算潜航回数 388 回

潜航海域 日本海溝沖　チョコチップ海丘群

潜航目的 調査潜航　日本海溝沖アウタータイズ上の小海丘における調査

調査主任 藤本 博己

所属 東北大学

ランチャー PILOT 重竹 誠二

PILOT 若松 誉

COPILOT 瀬底 秀樹

作業経過時刻	
吊揚	08:29
着水	08:37
離脱	10:39
着底	10:50
離底	14:18
結合	14:31
水切	16:03
揚収完了	16:14

集計時間	
潜航時間	7:26
前回潜航	2366:1
通算潜航	2373:27

ケーブル使用時間	
1次使用時間	7:45
1次前回時間	2462:24
1次通算時間	2470: 9
2次使用時間	3:52
2次前回時間	1073:34
2次通算時間	1077:26

ケーブル番号別使用時間	
1 次番号	2
1次番号別前回時間	1549:9
1次番号別通算時間	1556:54
2 次番号	5
2次番号別前回時間	69:54
2次番号別通算時間	73:46

海象・気象

天候	風向	風力	波浪	うねり	視程
c	North	4	3	1	12

最大潜航深度 5423 m

着底深度 5423 m　離底深度 5207 m

着底底質 マンガン礫　離底底質 マンガンクラスト

記事 着底点周辺の等深線に沿って海底面の観察・試料採取を行いながら航走した後、分離曳航により北方向へ登頂しながら観察・試料採取を行った。

日付 2007.6.2　KR 0707　No. 385　No.

調査種類 かいこう[illegible]潜航　調査海域 日本海溝沖 チョコチップ海丘群

時刻	深度	作業内容	緯度・経度	
08:37		着水　D= 5410 m	37-57.9937 143-01.3620	X: Y:
:56	150m	下降開始　深度 5000m まで	.8919 .0999	X: 170.0 Y: 321.5
10:39	5297m	VCと離脱	.8357 0.8914	X: 66.0 Y: 26.0
10:50	5423	着底	.8378 .8959	X: 74.0 Y: 30.7
10:55	〃	泥岩採取（2個）資料①	〃	X: Y:
11:09	5419	〃　（1個）　〃 ②	.8366 .8905	X: 71.3 Y: 22.7
11:24	5417	大岩確認　〃 ③	.8645 .8440	X: 119.3 Y: -45.3
11:38	5412	泥岩採取（1個）　〃 ④	.8732 .8167	X: 136.3 Y: -81.3
11:44	5402	岩石採取（2個）　〃 ⑤	.8753 .6340	X: 139.3 Y: -60.0
12:03	5358	〃　（3個）　〃 ⑥	.8970 .8987	X: 179.3 Y: 34.7
:29	5330	〃　（1個）　〃 ⑦	.9117 .8859	X: 206.7 Y: 16.0
13:00	5307	位置確認	.9159 .8395	X: 325.3 Y: -52.0
13:35	5263	泥岩採取（1個）　〃 ⑧	58.0667 .8231	X: 493.3 Y: -96.0
14:02	5247	熊手による採泥　〃 ⑨	.1222 .8067	X: 596.0 Y: -100.0
:18	5207	離底	.1719 .7903	X: 688.0 Y: -124.0
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:

7K Ⅱ #388 R- 01

June 2, 2007
Described by Abe & Koike

SKETCH

Sample Size: X=____cm, Y=____cm, Z=____cm 2~6cm X 4
Weight: 70 g
Mn coating: — mm
Color (Inside): dark brown
Alteration: no week strong
Vesicularity: ____ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ____mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well--------poorly
Roundness : round--------angular
Fabric: clast-support -------- matrix support
Grading : normal--------none--------reverse
Matrix : silt sand others:____
Lithic: Lithified or unlithified

Remarks

Mn nokdule

7K Ⅱ #388 R- 02

June 2, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 13 cm, Y= 8 cm, Z= 6 cm
Weight: 395 g
Mn coating: 7 mm
Color (inside): dark brown
Alteration: no [✓ week] strong
Vesicularity: 50 %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks

Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well--------poorly
Roundness : round--------angular
Fabric: clast-support -------- matrix support
Grading : normal--------none--------reverse
Matrix : silt sand others:____
Lithic: Lithified or unlithified

Remarks

Scoria ?

7K Ⅱ #388 R- 03

June 2, 2007
Described by Abe & Koike

Sample Size: X= 31 cm, Y= 24 cm, Z= 13 cm
Weight: 5345 g
Mn coating: ____ mm
Color (inside): Brown
Alteration: no week strong
Vesicularity: ____ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ____ mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well----poorly
Roundness : round----angular
Fabric: clast-support ---- matrix support
Grading : normal----none----reverse
Matrix : silt sand others: ____
Lithic: Lithified or unlithified

Remarks

Mn crust, pumice

7K Ⅱ #388 R- 04

June 2, 2007
Described by Abe & Koike

Sample Size: X= 12 cm, Y= 8 cm, Z= 6 cm
Weight: 660 g
Mn coating: 5 mm
Color (inside): Brown ~ Dark brown
Alteration: no week strong
Vesicularity: ____ %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ____ mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well----poorly
Roundness : round----angular
Fabric: clast-support ---- matrix support
Grading : normal----none----reverse
Matrix : silt sand others: ____
Lithic: Lithified or unlithified

Remarks

~~[illegible]~~ Breccia

7K II #388 R- 05

June 2, 2007

Described by Abe & Koike

Sample Size: X= 13 cm, Y= 11 cm, Z= 9 cm
Weight: 2370 g
Mn coating: 9 mm
Color (inside): dary grey
Alteration: no week [✓ strong]
Vesicularity: 5 %
Lithology: monomict or polymict
Occurrence: massives [✓ lavas] volcaniclastics sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: basalt [✓ basaltic andesite] andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= PL 20 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------------poorly
Roundness : round------------------angular
Fabric: clast-support ------------ matrix support
Grading : normal------------none------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks strongly altered. reddish altered phenocryst.

7K II #388 R- 06

June 2, 2007

Described by Abe & Koike

Sample Size: X= 23 cm, Y= 20 cm, Z= 14 cm
Weight: 2990 g
Mn coating: thin mm
Color (inside): grey , brown
Alteration: no [✓ week] strong
Vesicularity: 30 %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite [✓ rhyolite]
Thickness of glass: mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------------poorly
Roundness : round------------------angular
Fabric: clast-support ------------ matrix support
Grading : normal------------none------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks Pumice

7K Ⅱ #388 R- 07

June 2, 2007
Described by Abe & Koike

Sample Size: X= 8 cm, Y= 7 cm, Z= 4 cm
Weight: 190 g
Mn coating: — mm
Color (inside): dark brown
Alteration: no week strong
Vesicularity: ____ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

SKETCH

Igneous & Ultramafic Rocks
Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ____ mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type: ____
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well----------poorly
Roundness : round----------angular
Fabric: clast-support ---------- matrix support
Grading : normal----------none----------reverse
Matrix : silt sand others: ____
Lithic: Lithified or unlithified

Remarks
Layered Mn crust

7K Ⅱ #388 R- 08

June 2, 2007
Described by Abe & Koike

Sample Size: X= 24 cm, Y= 12 cm, Z= 9 cm
Weight: 1850 g
Mn coating: 10 mm
Color (inside): grey, brown, pale brown
Alteration: no [✓ week] strong
Vesicularity: 20 %
Lithology: monomict or polymict
Occurrence: massives [✓ lavas] volcaniclastics sediments others

SKETCH

Igneous & Ultramafic Rocks
Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: 8 mm
Phenocrysts= Ol 2 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type: ____
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well----------poorly
Roundness : round----------angular
Fabric: clast-support ---------- matrix support
Grading : normal----------none----------reverse
Matrix : silt sand others: ____
Lithic: Lithified or unlithified

Remarks
peperite

7K Ⅱ #388 R- 09

June 2, 2007
Described by Abe & Koike

SKETCH

Sample Size: X=_______cm, Y=_______cm, Z=_______cm
Weight: 60 g 1~5cm x 8
Mn coating: __________ mm
Color (inside): dark brown
Alteration: no week strong
Vesicularity: __________ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: _________mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____________________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____________________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well---------------------poorly
Roundness : round---------------------angular
Fabric: clast-support ———— matrix support
Grading : normal------------none------------reverse
Matrix : silt sand others: ______
Lithic: Lithified or unlithified

Remarks Mn nodules

7K Ⅱ #388 R- UN

June 2, 2007
Described by Abe & Koike

SKETCH

Sample Size: X=_______cm, Y=_______cm, Z=_______cm
Weight: __________ g 1~4cm
Mn coating: __________ mm
Color (inside): dark brown
Alteration: no week strong
Vesicularity: __________ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

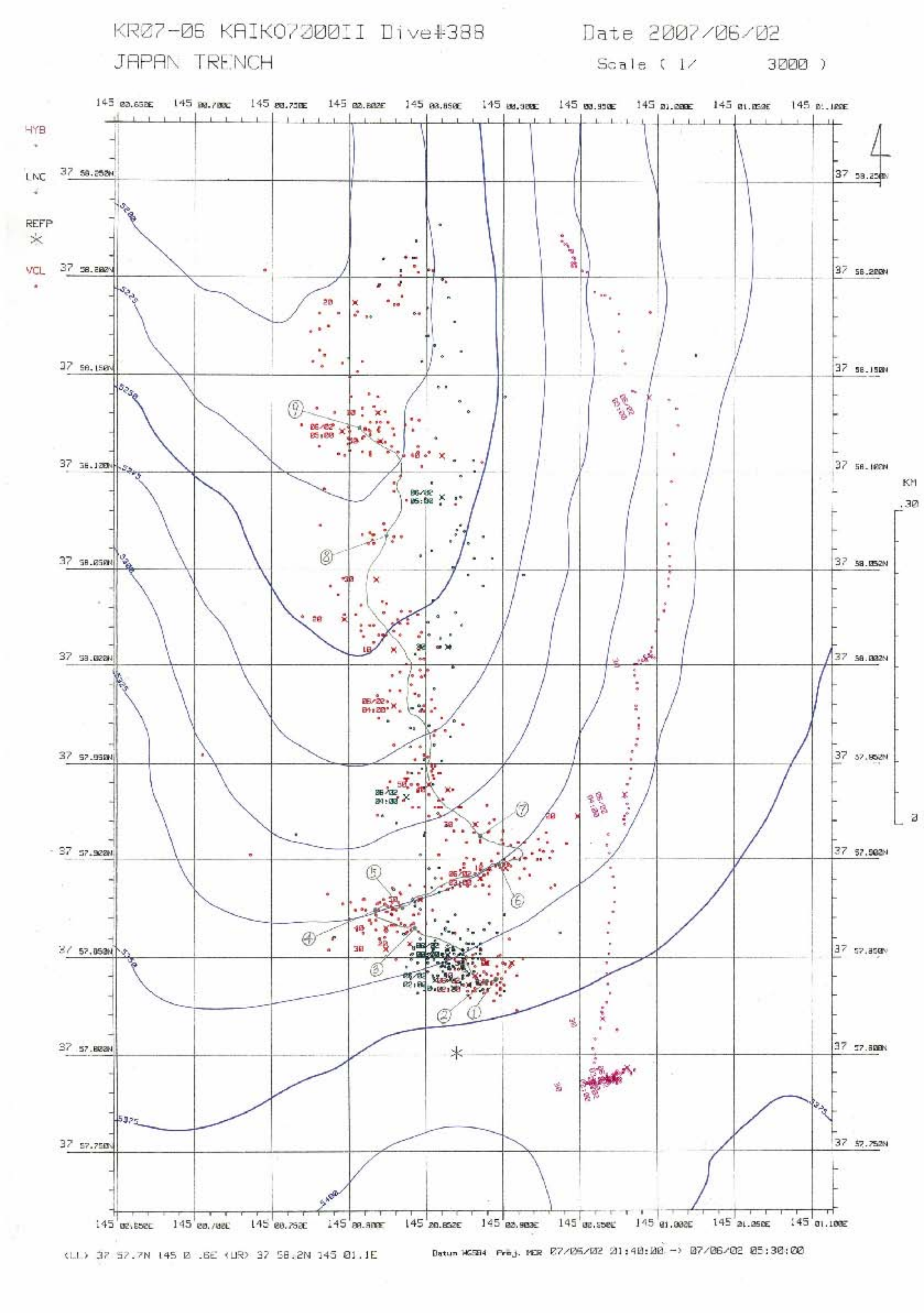
Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: _________mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____________________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____________________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well---------------------poorly
Roundness : round---------------------angular
Fabric: clast-support ------------ matrix support
Grading : normal------------none------------reverse
Matrix : silt sand others: ______
Lithic: Lithified or unlithified

Remarks Mn crust

KR07-06 KAIKO7000II Dive#388
Date 2007/06/02
JAPAN TRENCH
Scale (1/ 3000)
HYB
LNC
REFP
VCL
145 00.650E
145 00.700E
145 00.750E
145 00.800E
145 00.850E
145 00.900E
145 00.950E
145 01.000E
145 01.050E
145 01.100E
37 58.250N
37 58.200N
37 58.150N
37 58.100N
37 58.050N
37 58.000N
37 57.950N
37 57.900N
37 57.850N
37 57.800N
37 57.750N
KM
.30
0
5200
5225
5250
5275
5300
5325
5350
5375
5400
4
①
②
③
④
⑤
⑥
⑦
⑧
⑨
(LL) 37 57.7N 145 0 .6E (UR) 37 58.2N 145 01.1E
Datum WGS84 Proj. MCR 07/06/02 01:40:00 -> 07/06/02 05:30:00

4.2 Report on the Kaiko 7000 II Dive #389 on 2007/06/03

Hiromi Fujimoto, Motoyuki Kido, Yukihito Osada, Hiroaki Tsushima
(Tohoku University)

Three precision acoustic transponders (PXPs) are deployed on the outer rise of the Japan Trench at the GJT1 site in the study area to measure the motion of the Pacific plate near the subduction plate boundary. Because the battery of each instrument is estimated to be exhausted, we should deploy a new PXP and measure the relative positions of the new and old PXPs with 1 cm resolution in order to continue the geodetic observation. Diving operation is required for the job after the old PXPs are inactive.

The Kaiko 7K II carried a PXP in the payload space, deployed it on the seafloor side by side to an old PXP, and we measured the relative position between the two PXPs with the aid of visual images; the direction of cameras and images of the 4 cm by 4 cm meshes of the PXP's bottom frame were useful to measure the direction and the length of line connecting the two instruments. The PXP DJ8 was deployed at 38-22.8622 N, 144-53.3923 E, depth 5438.8 m. After the measurement, the old PXP was recovered with a rope connected to the Kaiko.

Judging from a multi-narrow beam bathymetric map, the old PXP was deployed in the middle of a flat belt of the seafloor. The belt was a NW-SE trending depression about 15 km wide and bounded by gentle slopes on both sides. Therefore we observed the seafloor along a E-W line of about 500 m before the deployment of the new PXP. The results of observation with 5 cameras of the vehicle and the side-scanning sonar of the launcher show that the seafloor is quite flat without any indication of local reliefs.

The dive record, dive log, and the dive track chart are shown in Tables 4.2.1-4.2.2 and Fig. 4.2.1, respectively.

かいこう７０００Ⅱ　潜航記録

平成 19 年　　KR07-07 行動　　記載者 瀬底 秀樹

潜航年月日 2007 年 06/03

着底予定位置

緯度	38°22.86′N
経度	144°53.73′E
測地系	WGS-84

潜航回数 2 回

通算潜航回数 389 回

潜航海域 日本海溝　三陸沖アウターライズ

潜航目的 調査潜航　海底地殻変動観測に使用している音響トランスポンダーの交換

調査主任 藤本 博己

所属 東北大学

ランチャー PILOT 重竹 誠二

PILOT 若松 誉

COPILOT 瀬底 秀樹

作業経過時刻	
吊揚	08:27
着水	08:33
離脱	10:30
着底	10:41
離底	13:31
結合	13:42
水切	15:18
揚収完了	15:29

累計時間	
潜航時間	6:45
前回潜航	2373:27
通算潜航	2380:12

ケーブル使用時間	
1次使用時間	7: 2
1次前回時間	2470: 9
1次通算時間	2477:11
2次使用時間	3:12
2次前回時間	1077:26
2次通算時間	1080:38

ケーブル番号別使用時間	
1次番号	2
1次番号別前回時間	1556:54
1次番号別通算時間	1563:56
2次番号	5
2次番号別前回時間	73:46
2次番号別通算時間	76:58

海象・気象

天候	風向	風力	波浪	うねり	視程
bc	South	2	1	2	12

最大潜航深度 5442 m

着底深度 5433 m　　離底深度 5442 m

着底底質 泥　　離底底質 泥

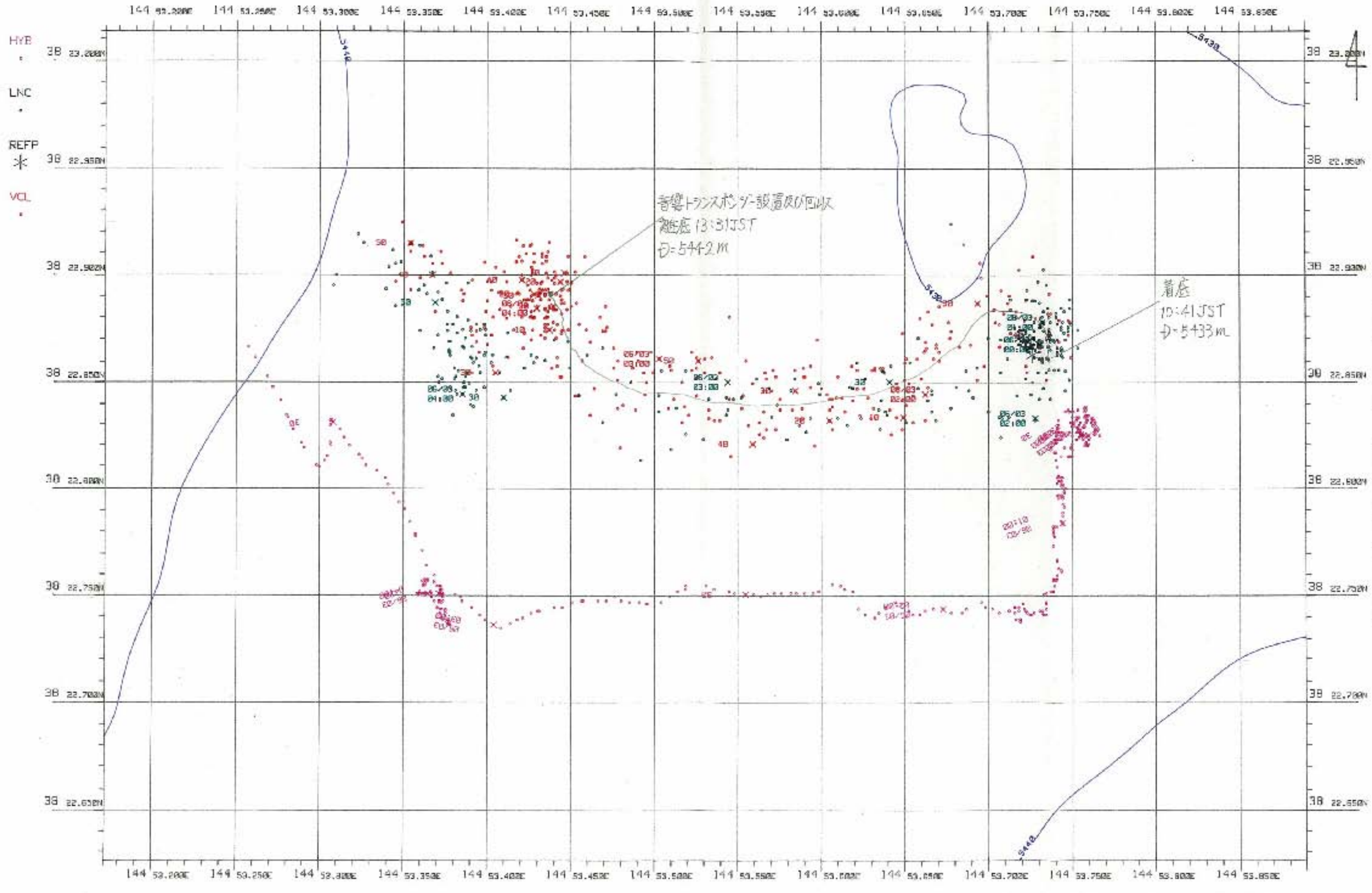
記事 海底を観察しながら分離曳航で約450m西へ航走。既設トランスポンダーとの相対位置を把握できるよう新規トランスポンダーを設置。既設品を回収した。

6月3日 div 389 海底局（DJ6-> DJ8）リプレイス

時間(JST)	
10:25	かいこう　下降終了
10:32	ビークル　離脱
10:41	ビークル　着底　(水深　5432m)
10:46	Sonar(レンジ 150m)で海底はフラットなのを確認 母船　270°　に 0.2　もしくは 0.3 knot で移動
12:01	Sonar に金属反応らしいものあり（2 個）
12:08	海底局（DJ6）目視で確認
12:10	着底
12:23	ビークルを流れの向きに合わせるため離底（視界は良くないため）
12:43	着底
12:49	PXP(DJ8)ビークルにより設置 DJ6 の設置状況 鉄フレームと FRP にずれあり. 2002 年設置時のフレーム回収時にずれたか（？）もしくは設置時の衝撃でずれたかは不明
12:50	2つの海底局の方位を決める　縦：79°
12:56	水平：140°
13:12	フックを DJ6 に引っかける
13:31	ビークル離底　5503m

KR07-06 KAIKO7000II Dive#389
JAPAN TRENCH

Date 2007/06/03
Scale (1/ 3000)



音響トランスポンダー設置及び回収
離底 13:31JST
D=5442m

着底
10:41JST
D=5433m

<LL> 38 22.6N 144 53.1E <UR> 38 23.0N 144 53.8E

Datum WGS84 Proj. MER

07/06/02 22:20:10 -> 07/06/03 04:52:00

4.3 Report on the Kaiko 7000 II Dive #390 on 2007/06/04

Hiromi Fujimoto, Motoyuki Kido, Yukihito Osada, Hiroaki Tsushima
(Tohoku University)

We carried out the second experiment following the Kaiko dive 389. The Kaiko 7K II carried PXP DJ7 in the payload space, deployed it on the seafloor side by side to an old PXP, and we measured the relative position between the two PXPs with the aid of visual images taken from the Kaiko in the same way as the previous dive. The PXP DJ7 was deployed at 38-23.8165 N, 144-47.3371 E, depth 5499.0 m. After the measurement, the old PXP was recovered with a rope connected to the KAIKO.

The dive record, dive log, and the dive track chart are shown in Tables 4.3.1-4.3.2 and Fig. 4.3.1, respectively.

かいこう７０００Ⅱ　潜航記録

平成 19 年　KR07-07 行動　記載者 瀬底 秀樹

潜航年月日 2007 年 06/04

潜航回数 3 回

通算潜航回数 390 回

着底予定位置

緯度 38° 23. 81' N

経度 144° 47. 33' E

測地系 WGS-84

潜航海域 日本海溝　三陸沖アウターライズ

潜航目的 調査潜航　海底地殻変動観測に使用している音響トランスポンダーの交換

調査主任 藤本 博己

所属 東北大学

ランチャー PILOT 重竹 誠二

PILOT 若松 誉

COPILOT 瀬底 秀樹

作業経過時刻	
吊揚	08:25
着水	08:31
離脱	10:28
着底	10:40
離底	12:42
結合	12:52
水切	14:29
揚収完了	14:40

累計時間	
潜航時間	5:58
前回潜航	2380:12
通算潜航	2386:10

ケーブル使用時間	
1次使用時間	6:15
1次前回時間	2477:11
1次通算時間	2483:26
2次使用時間	2:24
2次前回時間	1080:38
2次通算時間	1083: 2

ケーブル番号別使用時間	
1次番号	2
1次番号別前回時間	1563:56
1次番号別通算時間	1570:11
2次番号	5
2次番号別前回時間	76:58
2次番号別通算時間	79:22

海象・気象

天候	風向	風力	波浪	うねり	視程
c	SSE	3	2	4	12

最大潜航深度 5504 m

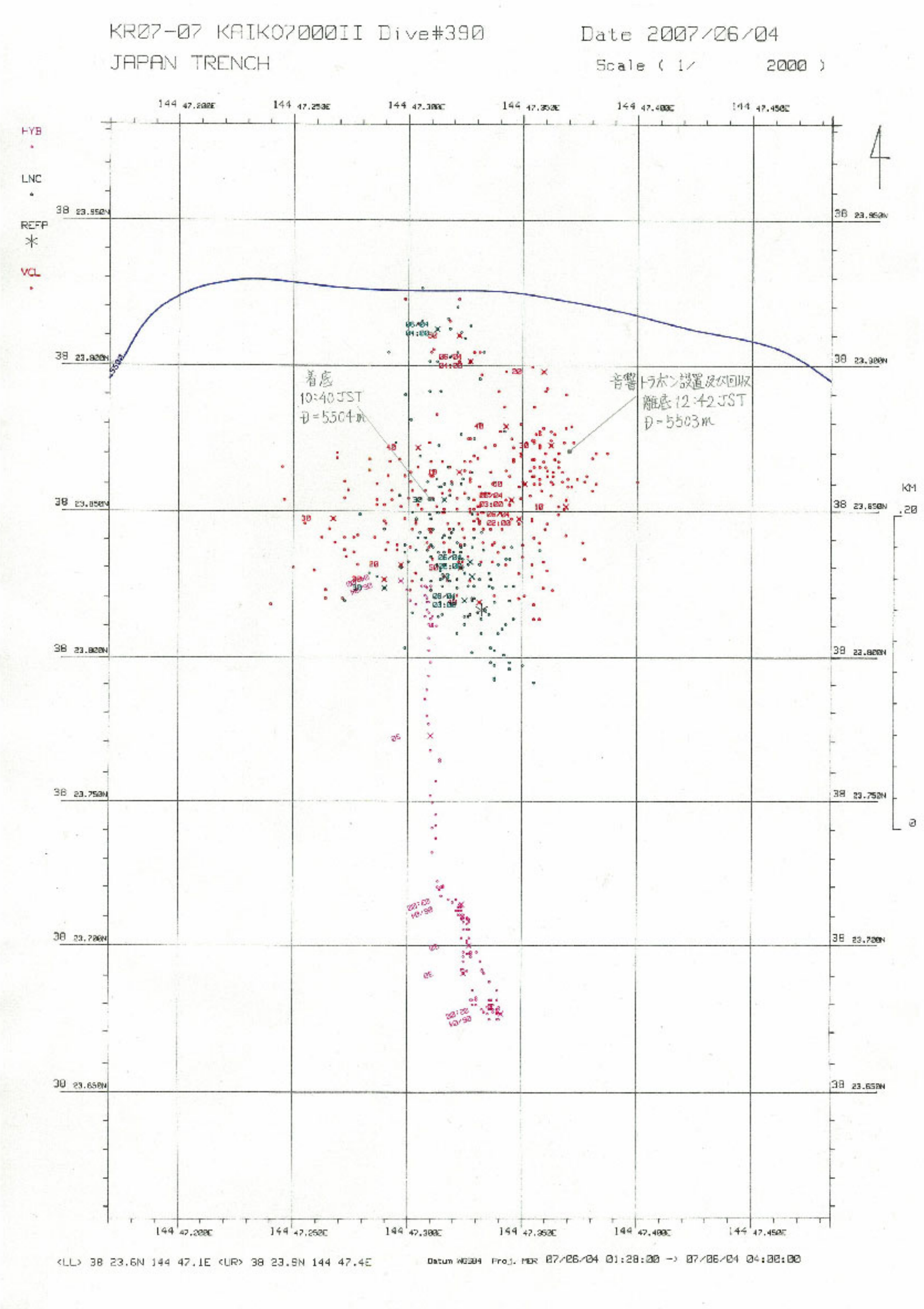
着底深度 5504 m　離底深度 5503 m

着底底質 泥　離底底質 泥

記事 既設トランスポンダー至近に新規トランスポンダーを設置し、設置状況を正確に記録した後、既設トランスポンダーを回収した。

6 月 4 日 div 390 海底局（DJ5 -> DJ7）リプレイス

時間(JST)	
10:22	かいこう　下降終了
10:29	ビークル　離脱
10:40	ビークル　着底　(水深　5504m) Sonar に 0°，330° に強い反射あり
11:01	ビークルを一度着底点に戻し，装置の確認をやり直す． 3 個強い反射ある．
11:36	正面に強い反射ある．
11:49	着底したが目視で装置確認できず
11:50	離底し，違う物体を確認することにする
12:02	DJ5 目視で確認
12:05	海底に着底(水深 5504m)
12:12	PXP(DJ7)ビークルにより設置 DJ5 の設置状況 昨日の DJ6 とは鉄フレームと FRP にずれなし．
12:19	２つの海底局の方位を決める　縦：250°
12:21	水平：142°
12:29	フックを DJ5 に引っかける
12:42	ビークル離底　5503m
12:44	DJ5 離底


KR07-07 KAIKO7000II Dive#390
Date 2007/06/04
JAPAN TRENCH
Scale (1/ 2000)
144 47.200E
144 47.250E
144 47.300E
144 47.350E
144 47.400E
144 47.450E
HYB
LNC
REFP
VCL
38 23.950N
38 23.900N
38 23.850N
38 23.800N
38 23.750N
38 23.700N
38 23.650N
4
5500
着底
10:40 JST
D = 5504 m
音響トラポン設置及び回収
離底 12:42 JST
D = 5503 m
KM
.20
0
<LL> 38 23.6N 144 47.1E <UR> 38 23.9N 144 47.4E
Datum WGS84 Proj. MER 07/06/04 01:28:00 -> 07/06/04 04:00:00

4.4 Report on the Kaiko 7000 II Dive #391 on 2007/06/05

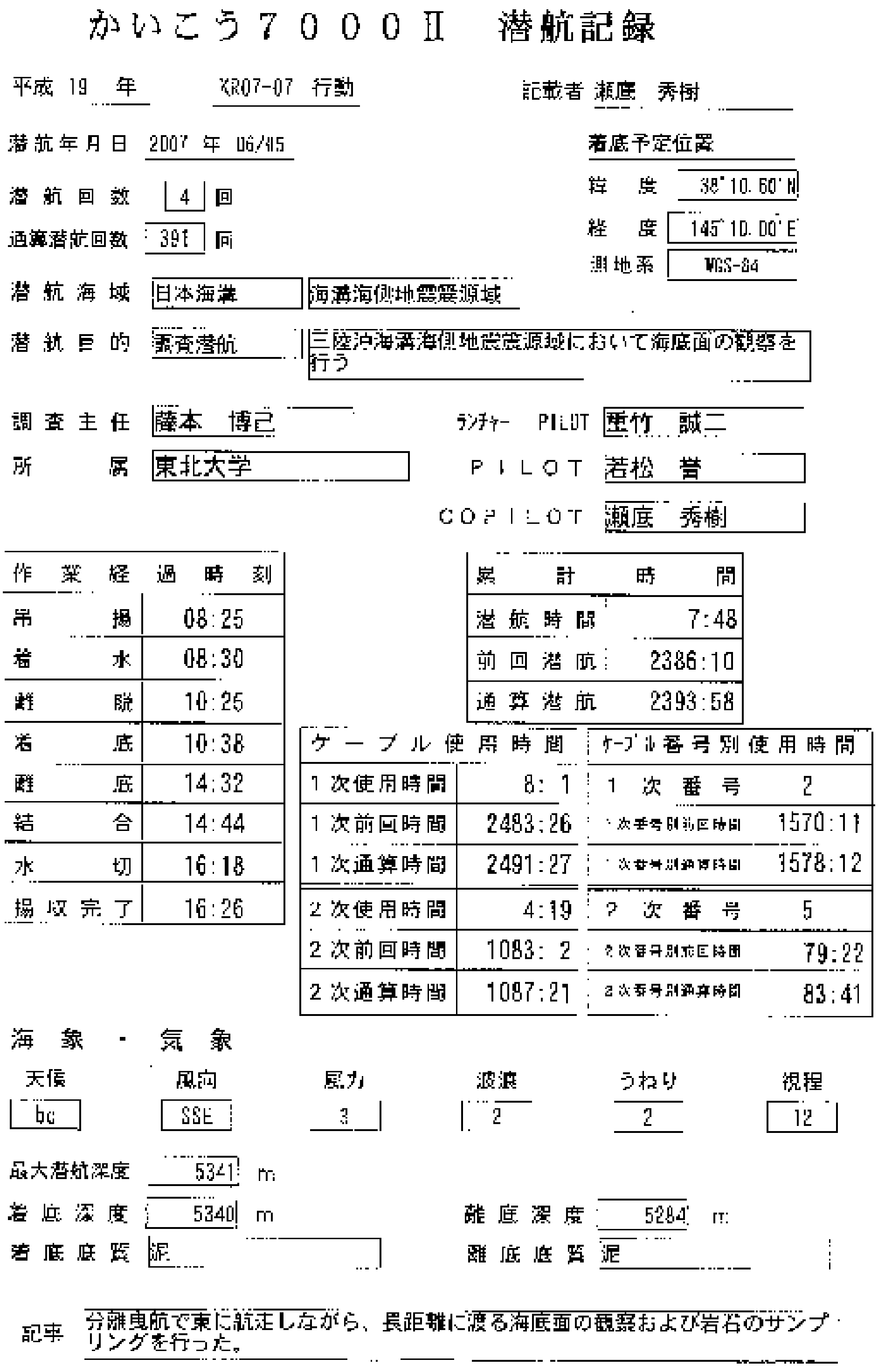
Stephen Kirby, (USGS)

This dive started at depth 5340 m depth at position 38°07' N latitude and 145° 10'E longitude and ended at depth 5289 m and approximate position 38°07' N and 145° 11.75' E. The target on this west-to-east course approaching a gentle ridge was possible fault disturbance of the seafloor caused by the M7.1 earthquake of 15 November 2005 (Japan Date) based on the hypothesis that vertical displacements of NE-SW ridges are caused by cumulative normal-fault displacements *on the same fault* by many earthquakes similar to the most recent event in 2005. Three or possibly four such ridges were identified along a north-south SEABEAM track at longitude 145°10' E where the SW segment of each ridge was lower in relief that the NE segment by 10 to 20 m. The seafloor along the Kaiko course was only composed of fine-grained soft sediment and *no evidence of disturbance of the seafloor caused by recent faulting was found during the dive*. To the contrary, the seafloor was remarkably smooth and the only noteworthy feature about the seafloor was that it displayed scattered rocks on the surface. Six rocks were sampled by Kaiko and all proved to be low-density pumice. According to Dr. Natsue Abe, such a scattered field of rocks is unusual in deeply sedimented areas. The area traversed by this dive was in the "near field" of the 15 November 2005 earthquake where seismic intensity probably exceeded JMA intensity 5. The 2005 earthquake was of the normal faulting type and hence vertical accelerations could have exceed 1 g. This might explain why these volcanic rocks could have been accelerated into the water column. This hypothesis does not explain how these rocks ended up in soft sediment in the first place. Natsue Abe suggests floatation of these low-density rocks rafted from some other source, perhaps an island arc such as the Izu-Bonin system.

The failure of this dive to discover any seafloor disturbance associated with the 2005 earthquake using the search hypothesis described above argues for using a different, more efficient approach to find seafloor evidence of recent faulting for Kaiko ROV dives during future cruises. Future inversions of seismic arrival-time data from Dr. Ryoto Hino's present-day OBS deployment *above* the locations of the aftershock zones of the 2005 event should make it easier to narrow down the surface trace of the fault(s), especially if relocations could be used using methods like double-difference and if poorly located events are not included in the analysis. Dr. Natsue Abe suggests that further refinement of surface expressions of these faults could result from observations using deep-tow camera systems or deep tow side-scan sonar that has much longer profile lengths than the Kaiko ROV. All of these approaches could be applied in future cruises when these data and other tools could be used to narrow down the target areas for Kaiko ROV investigations.

It is therefore suggested that the second Kaiko dive for this cruise planned for the search for seafloor disturbance of the 2005 earthquake be postponed to a later cruise and that, instead, this second dive target one of the "petit spot" volcanic centers in the north-south volcanic chain that Dr. Natsue Abe is studying. The author of this report proposes that the ROV Kaiko dive on the volcanic edifice near 38°08' N and 145° 01.3' E, approaching it from its steep eastern side. This ROV course would involve as much as 1000 m of seafloor relief. It is hoped that fresher rock exposure will be found on those steep eastern slopes could be useful to Dr. Abe and that perhaps recent faulting could have produced that slope. Some apparent aftershocks in the western N-S band determined from Dr. Hino's first OBS deployment occurred below the vicinity of this volcanic target.

The dive record, dive log, list of samples, and the dive track chart are shown in Tables 4.4.1-4.4.3 and Fig. 4.4.1, respectively.



かいこう７０００Ⅱ　潜航記録

平成 19 年　KR07-07 行動　記載者 瀬底 秀樹

潜航年月日 2007 年 06/15

潜航回数 4 回

通算潜航回数 391 回

着底予定位置

緯度 38°10.60'N

経度 145°10.00'E

測地系 WGS-84

潜航海域 日本海溝　海溝海側地震震源域

潜航目的 調査潜航　三陸沖海溝海側地震震源域において海底面の観察を行う

調査主任 藤本 博己

所属 東北大学

ランチャー PILOT 重竹 誠二

PILOT 若松 誉

COPILOT 瀬底 秀樹

作業経過時刻	
吊揚	08:25
着水	08:30
離脱	10:25
着底	10:38
離底	14:32
結合	14:44
水切	16:18
揚収完了	16:26

累計時間	
潜航時間	7:48
前回潜航	2386:10
通算潜航	2393:58

ケーブル使用時間		ケーブル番号別使用時間	
1次使用時間	8: 1	1次番号	2
1次前回時間	2483:26	1次番号別前回時間	1570:11
1次通算時間	2491:27	1次番号別通算時間	1578:12
2次使用時間	4:19	2次番号	5
2次前回時間	1083: 2	2次番号別前回時間	79:22
2次通算時間	1087:21	2次番号別通算時間	83:41

海象・気象

天候	風向	風力	波浪	うねり	視程
bc	SSE	3	2	2	12

最大潜航深度 5341 m

着底深度 5340 m　離底深度 5284 m

着底底質 泥　離底底質 泥

記事 分離曳航で東に航走しながら、長距離に渡る海底面の観察および岩石のサンプリングを行った。

日付 2007.6.5 KR 0707 No. 391 No.

調査種類 かいこう調査潜航 調査海域 日本海溝沖 2005年海溝海側地震震源域

時刻	深度	作業内容	緯度 ・ 経度	
08:30		着水 D=5337m	38-10.5792 144-10.0228	X: Y:
:45	50m	下降開始 深度5220m	10.6214 11.7263	X: 2.7 Y:-20.0
10:25	5209m(L)	VCL離脱	10.6250 10.6115	X:10.0 Y:16.0
:38	5340m	着底	10.6092 09.7722	X:13.3 Y:-2.7
:44	〃	Co=70° 移動開始	〃	X: Y:
:54	〃	泥岩採取(1個) 資料①	10.6115 10.9317	X:-1.3 Y:78.2
:57	〃	〃 〃②	6193 6520	X:32.0 Y:76.2
11:55	5391m	〃 〃③	5863 5291	X:-25.3 Y:21.3
13:48	5304	岩石採取(1個) 〃④	10.5162 11.2985	X:30.0 Y:1896.0
14:07	5294	〃 (1個) 〃⑤	.6061 .4710	X:11.3 Y:2148.0
:20	5289	〃 (1個) 〃⑥	.6076 .6016	X:14.0 Y:2358.
:32	5284	離底	.6198 .6920	X:36.7 Y:2470.9
:		VCL結合		X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:

7K II #391 R- 01

June 5, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 9 cm, Y= 6.5 cm, Z= 9 cm
Weight: 360 g
Mn coating: ____ mm
Color (inside): ~~white to gray~~ brown
Alteration: no week strong
Vesicularity: ____ %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ____ mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well————poorly
Roundness : round————angular
Fabric: clast-support ---------- matrix support
Grading : normal————none----------reverse
Matrix : silt sand others: ____
Lithic: Lithified or unlithified

Remarks pumice with mud

7K II #391 R- 02

June 5, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 14 cm, Y= 11 cm, Z= 10 cm
Weight: 610 g
Mn coating: ____ mm
Color (inside): white to gray
Alteration: no week strong
Vesicularity: ____ %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ____ mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well————poorly
Roundness : round————angular
Fabric: clast-support ---------- matrix support
Grading : normal————none----------reverse
Matrix : silt sand others: ____
Lithic: Lithified or unlithified

Remarks pumice

7K II #391 R- 03

June 5, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 17 cm, Y= 15 cm, Z= 11 cm
Weight: 1310 g
Mn coating: mm
Color (inside): white to gray
Alteration: no week strong
Vesicularity: %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------poorly
Roundness : round------------angular
Fabric: clast-support ------------ matrix support
Grading : normal------------none------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks pumice

7K II #391 R- 04

June 5, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 14 cm, Y= 12 cm, Z= 10 cm
Weight: 1010 g
Mn coating: mm
Color (inside): white to gray
Alteration: no week strong
Vesicularity: %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------poorly
Roundness : round------------angular
Fabric: clast-support ------------ matrix support
Grading : normal------------none------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks pumice

7K II #391 R- 05

June 5, 2007

Described by __Abe & Koike__

Sample Size: X= 25 cm, Y= 16 cm, Z= 17 cm

Weight: 2950 g

Mn coating: ________ mm

Color (inside): white to gray

Alteration: no week strong

Vesicularity: ________ %

Lithology: monomict or polymict

Occurrence: massives lavas [✓ volcaniclastics] sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite

Thickness of glass: ____ mm

Phenocrysts= %, %, %

Plutonic: gabbro diorite quartz diorite granite

Crystals= %, %, %

Ultramafic: lerzolite harzburgite dunite pyroxenite others

Crystals= %, %, %

Others: ________

Sedimentary rocks & others (characteristic of the clast(s)

Fragments comp.: mono or poly

Rock type: ________

Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <

Sorting : well-----------------poorly

Roundness : round——————angular

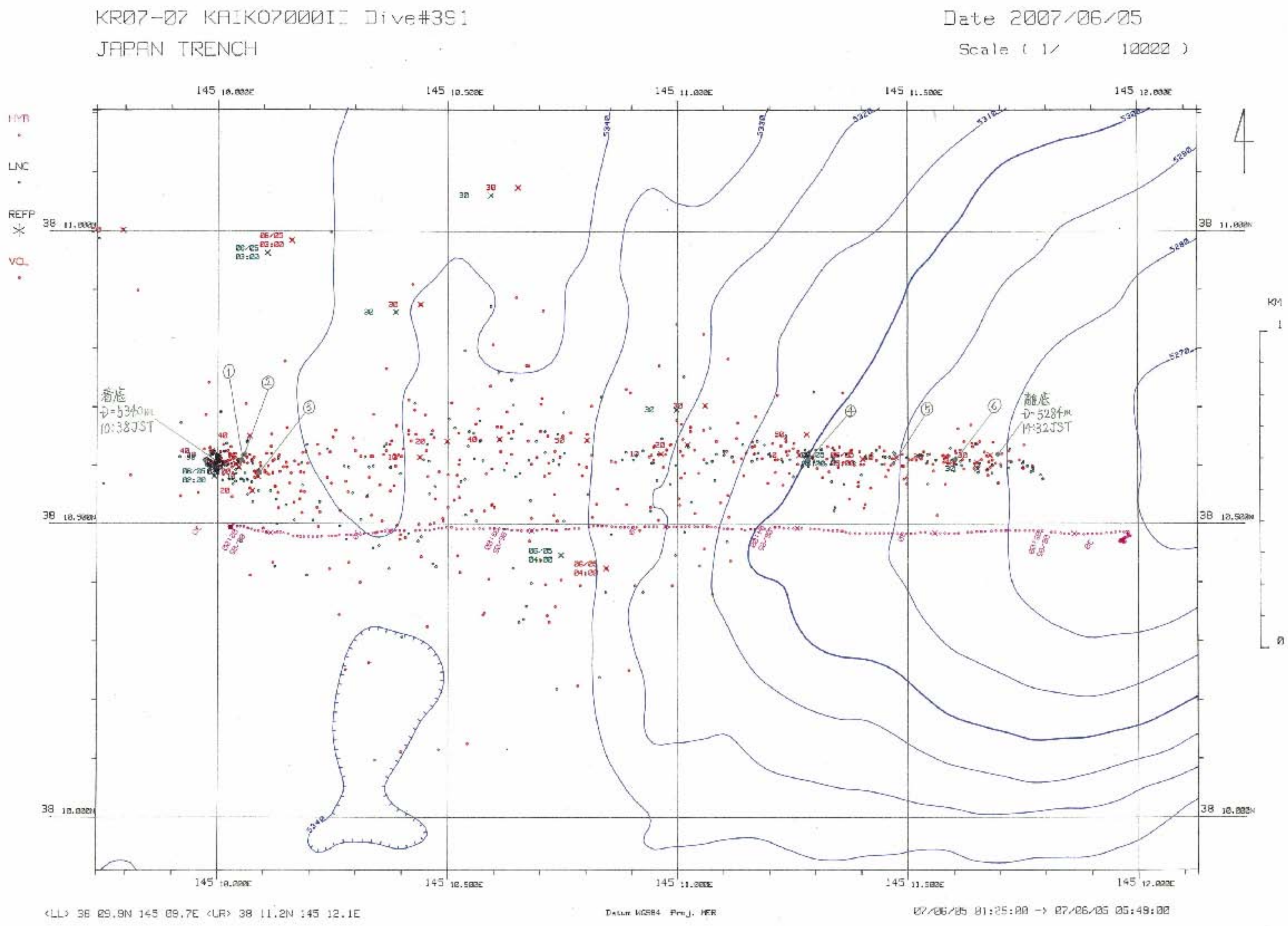
Fabric: clast-support -------------- matrix support

Grading : normal---------—none-------------reverse

Matrix : silt sand others:________

Lithic: Lithified or unlithified

Remarks pumice


KR07-07 KAIKO7000II Dive#391
JAPAN TRENCH
Date 2007/06/05
Scale (1/ 10000)
4
HYB
LNC
REFP
VCL
KM
1
0
145 10.000E
145 10.500E
145 11.000E
145 11.500E
145 12.000E
38 11.000N
38 10.500N
38 10.000N
5340
5330
5320
5310
5300
5290
5280
5270
着底
D=5340m
10:38JST
①
②
③
④
⑤
⑥
離底
D=5284m
14:32JST
06/05 02:20
06/05 03:00
06/05 04:00
<LL> 38 09.9N 145 09.7E <UR> 38 11.2N 145 12.1E
Datum WGS84 Proj. MER
07/06/05 01:25:00 -> 07/06/05 05:49:00

4.5 Report on the Kaiko 7000 II Dive#392 on 2006/06/06

Natsue Abe and Yuki Koike (IFREE, JAMSTEC)

This dive started at depth 5450m, 38°04.250'N latitude, 145°01.2500'E longitude and end at depth 5286m, 38°04.4048'N latitude, 145・01.6085'E longitude. The target knoll has a large crater which is thought to be made by volcanic eruption. This is also one of Chocochip knolls which is considered as a petit spot type volcano. The aim of this dive is to observe on the surface of this knoll and to take rock samples especially from inside of the caldera and caldera wall. The bottom of the caldera is almost flat and the slop of the wall grows steep towards the top of the hill. There is the criff at the edge of the wall top and pillow lava like structure was observed there. Large columnar joint like structure was observed on the way to the edge of the wall. 17 rock specimens were sampled during the dive including fresh dense basaltic samples and one doleritic hypabyssal rock. One of them shows high vesicularity.

The dive record, dive log, list of samples are shown in Tables 4.5.1-4.5.3, respectively. The dive chart and dive track are shown in Figs. 4.5.1-4.5.2.

かいこう７０００Ⅱ　潜航記録

平成 19 年　KR07-07 行動　記載者 瀬底 秀樹

潜航年月日 2007 年 06/06

潜航回数 5 回

通算潜航回数 392 回

着底予定位置

緯度 38°04.25'N

経度 145°0[illegible].25'E

測地系 WGS-84

潜航海域 日本海溝沖　チョコチップ海丘群

潜航目的 調査潜航　日本海溝沖アウターライズ上の小海丘における調査を行う

調査主任 藤本 博己

所属 東北大学

ﾗﾝﾁｬｰ PILOT 重竹 誠二

PILOT 若松 誉

COPILOT 瀬底 秀樹

作業経過時刻	
吊揚	08:21
着水	08:26
離脱	10:23
着底	10:38
離底	14:20
結合	14:32
水切	16:07
揚収完了	16:15

累計時間	
潜航時間	7:41
前回潜航	2393:58
通算潜航	2401:39

ケーブル使用時間		ケーブル番号別使用時間	
1次使用時間	7:54	1次番号	2
1次前回時間	2491:27	1次番号別前回時間	1578:12
1次通算時間	2499:21	1次番号別通算時間	1586: 6
2次使用時間	4: 9	2次番号	5
2次前回時間	1087:21	2次番号別前回時間	83:41
2次通算時間	1091:30	2次番号別通算時間	87:50

海象・気象

天候	風向	風力	波浪	うねり	視程
bc	South	3	2	2	10

最大潜航深度 5466 m

着底深度 5466 m　離底深度 5286 m

着底底質 泥　離底底質 泥

記事 カルデラ内部に着底後、北東方向に急崖を上昇し、海底面の観察と岩石採取を行った。登頂後は東側に頂上部を観察・試料採取を行いながら航走した。

日付 2007.6.6　KR 0707　No. 392　No.

調査種類 かいこう調査潜航　調査海域 日本海溝沖 チョコチップ海丘群

時刻	深度	作業内容	緯度・経度	
8:26		着水 D=5309m	38-03.9259 145-01.6399	X: Y:
:42	150m	下降開始 深度5100mまで	04.0992 01.3359	X:-165.0 Y:-58.0
10:23	5327(L)	VCL離脱	.2181 .1609	X: 62.0 Y: 28.0
:38	5466	着底	.2152 .1590	X: 46.7 Y:-30.7
:41	〃	泥岩採取(1個) 資料 ①	〃	X: Y:
11:00	5445	位置確認	.2650 .1381	X:138.7 Y:-61.3
:05	5442	泥岩採取(1個) 資料 ②	.2707 .1308	X:149.3 Y:-72.0
:07	〃	岩石採取(1個) 〃 ③	〃	X: Y:
:15	5436	〃 (2個) 〃 ④.⑤	.2981 .1289	X: 200.0 Y:-46.7
:28	5432	位置確認	.2996 .1335	X:202.7 Y:-68.0
:54	5410	岩石採取(1個) 〃 ⑥	.2960 .2502	X:196.0 Y:102.7
12:07	5408	〃 (1個) 〃 ⑦	.2859 .2867	X: 177.3 Y: 156.0
:09	〃	〃 (1個) 〃 ⑧	〃	X: 〃 Y:
:10	5407	〃 (1個) 〃 ⑨	.2902 .2849	X: 185.3 Y: 153.3
:13	〃	〃 (1個) 〃 ⑩	〃	X: 〃 Y:
:22	5390	〃 (1個) 〃 ⑪	.2902 .3195	X: 185.3 Y: 204.0
:23	〃	〃 (1個) 〃 ⑫	〃	X: 〃 Y:
:33	5362	〃 (1個) 〃 ⑬	.2924 .3423	X: 189.7 Y: 237.3
:43	5339	〃 (1個) 〃 ⑭	.3082 .3323	X: 218.7 Y: 222.7
:44	〃	〃 (1個) 〃 ⑮	〃	X: 〃 Y:
:47	〃	〃 (1個) 〃 ⑯	〃	X: 〃 Y:
13:09	5311	熊手による採取 〃 ⑰	.3435 .3532	X:284.0 Y:253.3
14:20	5286	離底	.4041 .6632	X:396.0 Y: 706.7
:32		VCL結合	.4048 .6085	X:397.3 Y: 626.7
:34		一次ケーブル巻取開始	〃	X: Y:
:		浮上		
:				

7K Ⅱ #39~~1~~2 R- 01

2pieces **June 6, 2007**
Described by __Abe & Koike__

SKETCH

Sample Size: X=________cm, Y=________cm, Z=________cm 4~6 cm
Weight: 90 g
Mn coating: – mm
Color (inside): dark brown
Alteration: no week strong
Vesicularity: — %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments [✓ others]

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: __________mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____________________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____________________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well--------------------------------poorly
Roundness : round--------------------------------angular
Fabric: clast-support ——————— matrix support
Grading : normal---------------none---------------reverse
Matrix : silt sand others:____________________
Lithic: Lithified or unlithified

Remarks Mn nodule

7K Ⅱ #39~~1~~2 R- 02

June 6, 2007
Described by __Abe & Koike__

SKETCH

Sample Size: X=________cm, Y=________cm. Z=________cm
Weight: 50 g
Mn coating: – mm
Color (inside): dark brown.
Alteration: no week strong
Vesicularity: — %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments [✓ others]

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: __________mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____________________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____________________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well--------------------------------poorly
Roundness : round--------------------------------angular
Fabric: clast-support ——————— matrix support
Grading : normal---------------none---------------reverse
Matrix : silt sand others:____________________
Lithic: Lithified or unlithified

Remarks manganese several pieces
Mn crust, nodule.

7K Ⅱ #39~~1~~2 R- 03

June 6, 2007
Described by __Abe & Koike__

SKETCH

Sample Size: X= 9 cm, Y= 8 cm, Z= 5 cm
Weight: 200 g
Mn coating: <3 mm
Color (inside): dark gray & dark brown
Alteration: no week strong
Vesicularity: 50 %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ________ mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well————poorly
Roundness : round————angular
Fabric: clast-support ———— matrix support
Grading : normal————none————reverse
Matrix : silt sand others:________
Lithic: Lithified or unlithified

Remarks pumice.

2

7K Ⅱ #39~~1~~ R- 04

June 6, 2007
Described by __Abe & Koike__

SKETCH

Sample Size: X= 13 cm, Y= 11 cm, Z= 8 cm
Weight: 1550 g
Mn coating: < 12 mm
Color (inside): dark gray
Alteration: no [✓ week] strong
Vesicularity: — %
Lithology: monomict or polymict
Occurrence: [✓ massives] lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks

Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= Pl 4 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well————poorly
Roundness : round————angular
Fabric: clast-support ———— matrix support
Grading : normal————none————reverse
Matrix : silt sand others:________
Lithic: Lithified or unlithified

Remarks crack.

2

7K II #391 R- 05

June 6, 2007

Described by Abe & Koike

Sample Size: X= 23 cm, Y= 15 cm, Z= 10 cm
Weight: 2500 g
Mn coating: <30 mm
Color (inside): dark brown / dark gray
Alteration: no [✓ week] 2 strong
Vesicularity: – %
Lithology: monomict or polymict
Occurrence: [✓ massives] [✓ lavas] volcaniclastics sediments others

Igneous & Ultramafic Rocks

Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: <5 mm
Phenocrysts= — %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well————poorly
Roundness : round————angular
Fabric: clast-support ———— matrix support
Grading : normal————none————reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks glass / broken pieces.

SKETCH

7K II #39~~1~~2 R- 06

June 6, 2007

Described by Abe & Koike

Sample Size: X= 12 cm, Y= 8 cm, Z= 6 cm
Weight: 390 g
Mn coating: <5 mm
Color (inside): pale → dark brown
Alteration: no week [✓ strong]
Vesicularity: <10 %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well————poorly
Roundness : round————angular
Fabric: clast-support ———— matrix support
Grading : normal————none————reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks pumice

SKETCH

7K Ⅱ #39~~1~~2 R- 07

* to be cut

June 6, 2007
Described by __Abe & Koike__

SKETCH

Sample Size: X= 24 cm, Y= 16 cm, Z= 15 cm
Weight: ______ g heavy
Mn coating: — mm
Color (inside): gray
Alteration: no week strong
Vesicularity: ______ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks

Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: ______ mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ______

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ______
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------poorly
Roundness : round------------angular
Fabric: clast-support ------------ matrix support
Grading : normal------------none------------reverse
Matrix : silt sand others:______
Lithic: Lithified or unlithified

Remarks

7K Ⅱ #39~~1~~2 R- 08

* to be cut

June 6, 2007
Described by __Abe & Koike__

SKETCH

Sample Size: X= 26 cm, Y= 21 cm, Z= 17 cm
Weight: ______ g heavy
Mn coating: -- mm
Color (inside): dark gray
Alteration: no [✓ week] strong
Vesicularity: — %
Lithology: monomict or polymict
Occurrence: [✓ massives] lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks

Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= Pl 7 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ______

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ______
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------poorly
Roundness : round------------angular
Fabric: clast-support ------------ matrix support
Grading : normal------------none------------reverse
Matrix : silt sand others:______
Lithic: Lithified or unlithified

Remarks joint like surface

7K Ⅱ #39~~1~~2 R- 09

June 6, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 22 cm, Y= 16 cm, Z= 13 cm
Weight: 3650 g
Mn coating: – mm
Color (inside): dark gray
Alteration: no [✓ week] strong
Vesicularity: < 1 %
Lithology: monomict or polymict
Occurrence: [✓ massives] lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks
Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= pl 8 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------------------------poorly
Roundness : round------------------------------angular
Fabric: clast-support ---------------- matrix support
Grading : normal-------------none---------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks crack

7K Ⅱ #39~~1~~2 R- 10

June 6, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 15 cm, Y= 13 cm, Z= 8 cm
Weight: 2000 g
Mn coating: mm
Color (inside): dark gray
Alteration: no [✓ week] strong
Vesicularity: 1 %
Lithology: monomict or polymict
Occurrence: [✓ massives] lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks
Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: 1 mm
Phenocrysts= pl 7 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------------------------poorly
Roundness : round------------------------------angular
Fabric: clast-support ---------------- matrix support
Grading : normal---------------none---------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks glass

7K II #39~~1~~2 R- 11

June 6, 2007
Described by Abe & Koike

Sample Size: X= 11 cm, Y= 17 cm, Z= 6 cm
Weight: 1120 g
Mn coating: — mm
Color (inside): gray
Alteration: no weak strong
Vesicularity: 20 %
Lithology: [✓ monomict] or polymict
Occurrence: [✓ massives] lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks
Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= Pl 5 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well——————poorly
Roundness : round——————angular
Fabric: clast-support ---------------- matrix support
Grading : normal————none----------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

SKETCH

Remarks high vesicularity

7K II #39~~1~~2 R- 12

June 6, 2007
Described by Abe & Koike

Sample Size: X= 10 cm, Y= 8 cm, Z= 3 cm
Weight: 360 g
Mn coating: — mm
Color (inside): dark gray
Alteration: no [✓ weak] strong
Vesicularity: 1 %
Lithology: monomict or polymict
Occurrence: [✓ massives] lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks
Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= Pl 5 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well——————poorly
Roundness : round——————angular
Fabric: clast-support ---------------- matrix support
Grading : normal----------------none----------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

SKETCH

Remarks

7K II #391 R-13

June 6, 2007
Described by __Abe & Koike__

Sample Size: X=_______cm, Y=_______cm, Z=_______cm
Weight: ___________ g
Mn coating: ___________ mm
Color (inside): _______________
Alteration: no week strong
Vesicularity: ___________ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: _________mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ______________________________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ______________________________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well-----------------------------poorly
Roundness : round——————————angular
Fabric: clast-support ---------------- matrix support
Grading : normal—————none---------------reverse
Matrix : silt sand others:___________________
Lithic: Lithified or unlithified

Remarks

7K II #391 R-14

June 6, 2007
Described by __Abe & Koike__

Sample Size: X=_______cm, Y=_______cm, Z=_______cm
Weight: ___________ g
Mn coating: ___________ mm
Color (inside): _______________
Alteration: no week strong
Vesicularity: ___________ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: _________mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ______________________________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ______________________________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well-----------------------------poorly
Roundness : round——————————angular
Fabric: clast-support ---------------- matrix support
Grading : normal—————none---------------reverse
Matrix : silt sand others:___________________
Lithic: Lithified or unlithified

Remarks

7K II #39~~1~~2 R- 15

June 6, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 18 cm, Y= 18 cm, Z= 12 cm
Weight: 9300 g
Mn coating: <1 mm
Color (inside): yellowish brown
Alteration: no week [✓ strong]
Vesicularity: — %
Lithology: monomict or polymict
Occurrence: [✓ massives] lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: mm
Phenocrysts= %, %, %
Plutonic: gabbro [✓ diorite] quartz diorite granite
Crystals= Pl 50 %, Py 45 %, (Am. 5 %?)
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well———————poorly
Roundness : round———————angular
Fabric: clast-support ---------------- matrix support
Grading : normal————none----------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks

7K II #39~~1~~2 R- 16

June 6, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 18 cm, Y= 12 cm, Z= 11 cm
Weight: 5800 g
Mn coating: <1 mm
Color (inside): dark gray
Alteration: no [✓ week] strong
Vesicularity: <1 %
Lithology: monomict or polymict
Occurrence: [✓ massives] lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks

Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= Pl %, %. %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgile dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well-----------------------------poorly
Roundness : round---------------------------angular
Fabric: clast-support ————---- matrix support
Grading : normal--------------none————reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks M.ORB ,

7K Ⅱ #39~~1~~2 R- 17

June 6, 2007
Described by Abe & Koike

SKETCH

Sample Size: X=______cm, Y=______cm, Z=______cm
Weight: 660 g
Mn coating: < 7 mm
Color (inside): dark brown / grey
Alteration: no week [✓ strong]
Vesicularity: ______ %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ______mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ______

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ______
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------------------------poorly
Roundness : round------------------------------angular
Fabric: clast-support ———————— matrix support
Grading : normal---------------none---------------reverse
Matrix : silt sand others:______
Lithic: Lithified or unlithified

Remarks pumice with thin manganese.
Mn nodule

7K Ⅱ #391 R- UN /

June 6, 2007
Described by Abe & Koike

SKETCH

Sample Size: X=— — —cm, Y=__—__cm, Z=______cm 7~6cm
Weight: 230 g
Mn coating: ----- .. mm
Color (inside): ______
Alteration: no week strong
Vesicularity: ______ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ______mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ______

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ______
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------------------------poorly
Roundness : round------------------------------angular
Fabric: clast-support ———————— matrix support
Grading : normal---------------none---------------reverse
Matrix : silt sand others:______
Lithic: Lithified or unlithified

Remarks

7K II #391 R- UN2

June 6, 2007
Described by __Abe & Koike__

Sample Size: ~~X=______cm, Y=______cm, Z=______cm~~
Weight: ___60___ g 1~3 cm
Mn coating: __________ mm
Color (inside): __________
Alteration: no week strong
Vesicularity: __________ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: __________mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: __________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: __________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well--------------------------poorly
Roundness : round--------------------------angular
Fabric: clast-support ———— matrix support
Grading : normal-----------none-----------reverse
Matrix : silt sand others:__________
Lithic: Lithified or unlithified

Remarks

7K II #391 R- UN3

June 6, 2007
Described by __Abe & Koike__

Sample Size: ~~X=______cm, Y=______cm, Z=______cm~~
Weight: ___40___ g 1~3 cm
Mn coating: __________ mm
Color (inside): __________
Alteration: no week strong
Vesicularity: __________ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

SKETCH

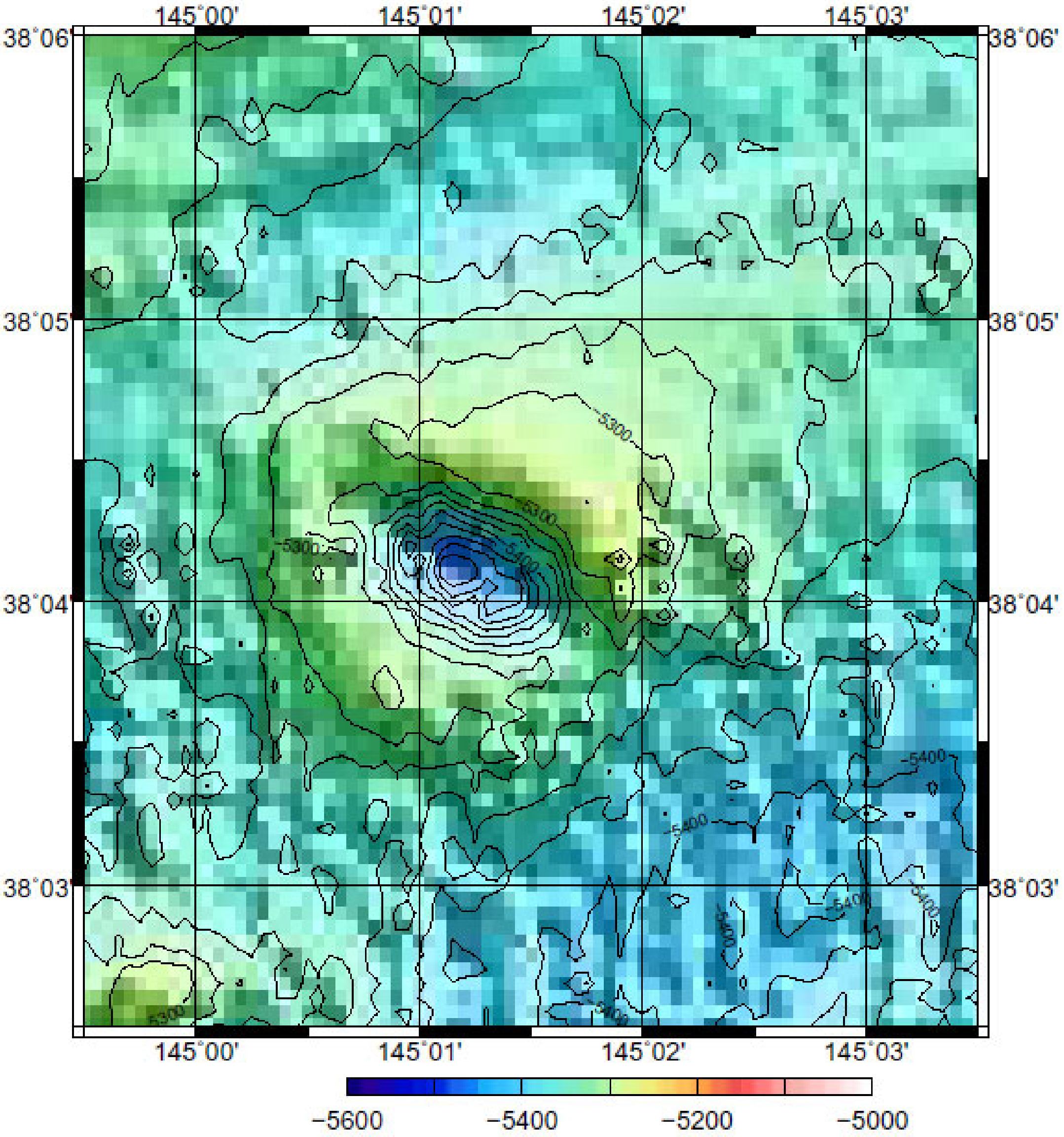
Igneous & Ultramafic Rocks

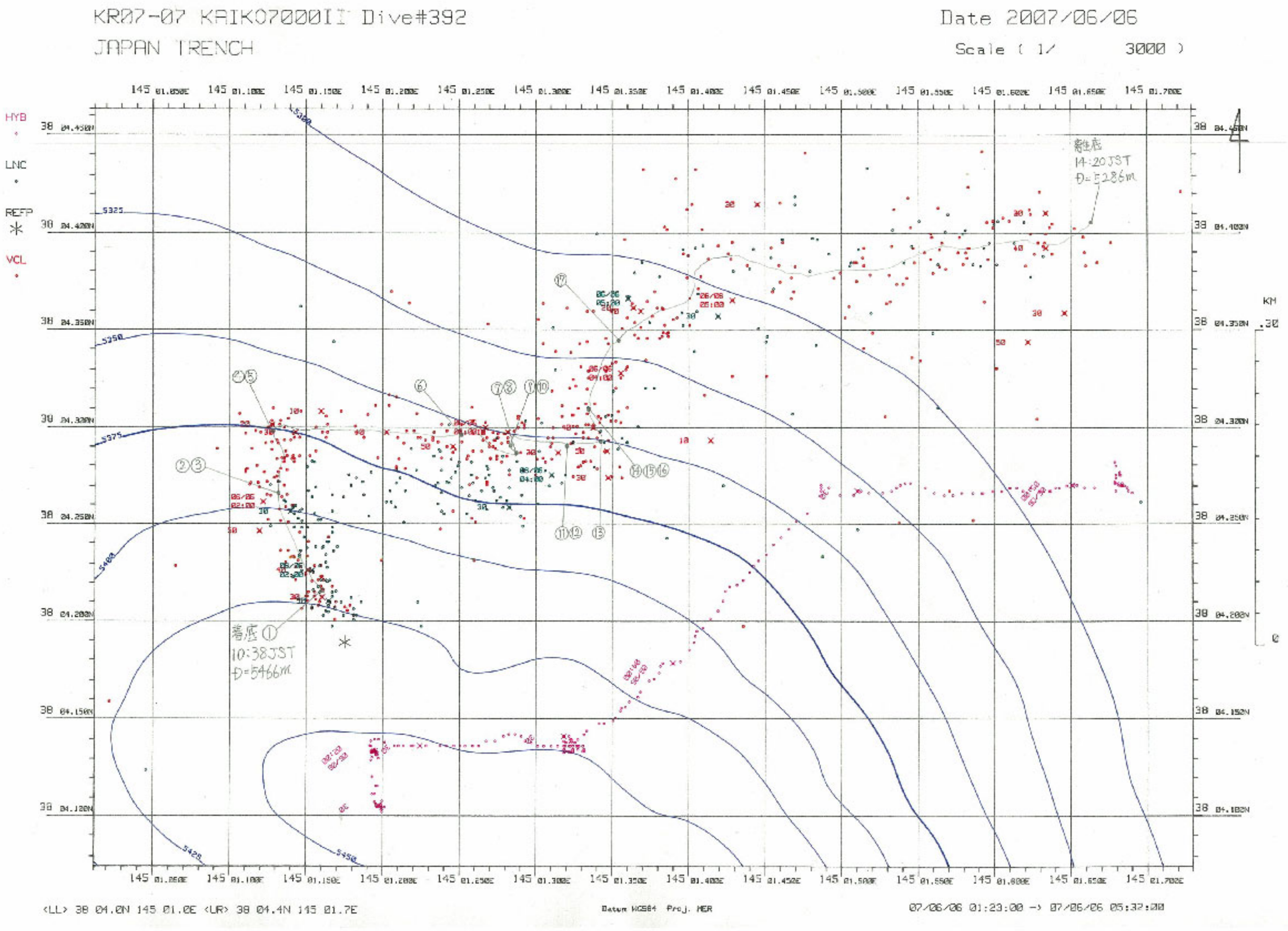
Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: __________mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: __________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: __________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well--------------------------poorly
Roundness : round--------------------------angular
Fabric: clast-support ———— matrix support
Grading : normal-----------none-----------reverse
Matrix : silt sand others:__________
Lithic: Lithified or unlithified

Remarks


145˚00'
145˚01'
145˚02'
145˚03'
38˚06'
38˚05'
38˚04'
38˚03'
-5300
-5400
−5600
−5400
−5200
−5000


KR07-07 KAIKO7000II Dive#392
JAPAN TRENCH
Date 2007/06/06
Scale (1/ 3000)
HYB
LNC
REFP
VCL
145 01.050E
145 01.100E
145 01.150E
145 01.200E
145 01.250E
145 01.300E
145 01.350E
145 01.400E
145 01.450E
145 01.500E
145 01.550E
145 01.600E
145 01.650E
145 01.700E
38 04.450N
38 04.400N
38 04.350N
38 04.300N
38 04.250N
38 04.200N
38 04.150N
38 04.100N
5300
5325
5350
5375
5400
5425
5450
KM
.30
0
離底
14:20JST
D=5286m
着底 ①
10:38JST
D=5466m
②③
④⑤
⑥
⑦⑧
⑨⑩
⑪⑫
⑬
⑭⑮⑯
⑰
<LL> 38 04.0N 145 01.0E <UR> 38 04.4N 145 01.7E
Datum WGS84 Proj. MER
07/06/06 01:23:00 -> 07/06/06 05:32:00

4.6 Report on the Kaiko 7000 II Dive#393 on 2006/06/07

Stephen Kirby (USGS) and Natsue Abe (IFREE, JAMSTEC)

This dive started at depth 5320m, 38°08.1000'N latitude, 145°02.0000'E longitude and end at depth 5207m, 38°08.1346 latitude, 145°01.3265E longitude. The target is one of Chocochip knolls which is considered as a kind of petit spot volcano. The aim of this dive is to observe on the surface of this knoll and to take rock samples from this knoll. There is slightly large crater on the top unexpectedly. 15 rock specimens were sampled during the dive including 10 basaltic and high vesicular fresh basalt that looks similar to the petit spot rock, and some pumice and manganese crusts. This is the second petit spot that is discovered except Yukawa knoll area and Kaiko knolls area and sampled fresh basaltic samples.

The dive record, dive log, list of samples are shown in Tables 4.6.1-4.6.3, respectively. The dive chart and dive track are shown in Figs. 4.6.1-4.6.2.

かいこう７０００Ⅱ　潜航記録

平成 19 年　KR07-07 行動　記載者 瀬底　秀樹

潜航年月日 2007 年 06/07

潜航回数 6 回

通算潜航回数 393 回

着底予定位置

緯度 38°08.10'N

経度 145°02.00'E

測地系 WGS-84

潜航海域 日本海溝沖　チョコチップ海丘群

潜航目的 調査潜航　日本海溝沖アウターライズ上の小海丘における調査を行う

調査主任 藤本　博己

所属 東北大学

ランチャー PILOT 重竹　誠二

PILOT 若松　誉

COPILOT 瀬底　秀樹

作業経過時刻	
吊揚	08:24
着水	08:30
離脱	10:23
着底	10:38
離底	14:22
結合	14:36
水切	16:06
揚収完了	16:13

累計時間	
潜航時間	7:36
前回潜航	2401:39
通算潜航	2409:15

ケーブル使用時間	
1次使用時間	7:49
1次前回時間	2499:21
1次通算時間	2507:10
2次使用時間	4:13
2次前回時間	1091:30
2次通算時間	1095:43

ケーブル番号別使用時間	
1次番号	2
1次番号別前回時間	1586: 6
1次番号別通算時間	1593:55
2次番号	5
2次番号別前回時間	87:50
2次番号別通算時間	92: 3

海象・気象

天候	風向	風力	波浪	うねり	視程
bc	South	4	3	1	10

最大潜航深度 5286 m

着底深度 5286 m　離底深度 5105 m

着底底質 泥　離底底質 礫

記事 断層地形を探しながら小海丘麓の平坦部を航走、小海丘斜面と山頂部にて露頭観察と岩石試料採取を行った。

日付 2007.6.7 KR 0707 No. 393 No.

調査種類 かいこう調査潜航 調査海域 日本海溝沖 チョコチップ海丘群

時刻	深度	作業内容	緯度・経度	
08:30		着水 D = 5303m.	38-07.9804N 145-02.0632E	X: Y:
:48	150m	下降開始 深度5000mまで	08.0786 01.9945	X:-2.7m Y:-8.0m
10:23	5148m(L)	VCL離脱	.1245 02.0046	X:45.3 Y: 6.7
:38	5286	着底	.1187 .9037	X:34.7 Y: 5.3
11:26	5254	位置確認	.1252 01.7865	X:46.7 Y:-312.0
:36	5241	泥岩採取(2回) 資料 ①,②	.1228 .7291	X:53.3 Y:-398.7
:45	5224	岩石採取(2個) 〃 ③,④	.1274 .6943	X:60.7 Y:-446.7
:58	5172	〃 (1個) 〃 ⑤	.1360 .6185	X:66.7 Y:-557.3
12:18	5171	泥岩採取(1個) 〃 ⑥	.1656 .6076	X:121.5 Y:-573.3
:21	〃	岩石採取(1個) 〃 ⑦	〃	X: 〃 Y:
:27	5160	〃 (2個) 〃 ⑧,⑨	.1541 .6021	X:102.0 Y:-581.3
:35	5148	〃 (1個) 〃 ⑩	.1447 .5966	X:82.7 Y:-589.3
:54	5127	〃 (1個) 〃 ⑪	.1447 .5090	X:82.7 Y:-717.3
13:09	5123	泥岩採取(1個) 〃 ⑫	.1447 .4935	X:82.7 Y:-740.0
:30	5116	岩石採取(1個) 〃 ⑬	.1879 .4588	X:162.7 Y:-790.7
:31	〃	泥岩採取(1個) 〃 ⑭	〃	X: 〃 Y:
14:04	5111	岩石採取(1個) 〃 ⑮	.1778 .3511	X:144.0 Y:-948.0
:22	5105	離底	.1346 .3265	X:64.0 Y:-984.0
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:
:				X: Y:

7K II #393 R-01

June 7, 2007
Described by Abe & Koike

Sample Size: X=______cm, Y=______cm, Z=______cm
Weight: ______ g
Mn coating: ______ mm
Color (inside): ______
Alteration: no week strong
Vesicularity: ______ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ______ mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ______

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ______
Grain size (mm): < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------------------------poorly
Roundness : round------------------------------angular
Fabric: clast-support ———————— matrix support
Grading : normal---------------none——————reverse
Matrix : silt sand others:______
Lithic: Lithified or unlithified

Remarks

7K II #393 R-02

June 7, 2007
Described by Abe & Koike

Sample Size: X=1~5cm × 6コ cm, Y=______cm, Z=______cm
Weight: 150 g
Mn coating: - - mm thick
Color (inside): dark brown
Alteration: no week strong
Vesicularity: ______ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments [✓ others]

SKETCH

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ______ mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ______

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ______
Grain size (mm): < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------------------------poorly
Roundness : round------------------------------angular
Fabric: clast-support ———————— matrix support
Grading : normal---------------none——————reverse
Matrix : silt sand others:______
Lithic: Lithified or unlithified

Remarks Mn crusts, nodule

7K Ⅱ #393 R- 03

June 7, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 7 cm, Y= 7 cm, Z= 5 cm
Weight: 180 g
Mn coating: thin mm
Color (inside): dark brown
Alteration: no week strong
Vesicularity: 40 %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks
Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: mm
Phenocrysts= Ol < 1 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well-----------------------------poorly
Roundness : round-----------------------------angular
Fabric: clast-support ---------------- matrix support
Grading : normal-----------------none-----------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks paragonite. (≤4mm)

7K Ⅱ #393 R- 04

June 7, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 12 cm, Y= 8 cm, Z= 8 cm
Weight: 390 g
Mn coating: mm
Color (inside): dark brown
Alteration: [✓ no] week strong
Vesicularity: 40 %
Lithology: monomict or polymict
Occurrence: massives [✓ lavas volcaniclastics] sediments others

Igneous & Ultramafic Rocks
Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: - mm
Phenocrysts= ol/ 2 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well-----------------------------poorly
Roundness : round-----------------------------angular
Fabric: clast-support ---------------- matrix support
Grading : normal-----------------none-----------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks large xenocryst (ol) up to 7mm

7K II #393 R- 05

June 7, 2007
Described by Abe & Koike

Sample Size: X= 13 cm, Y= 11 cm, Z= 9 cm
Weight: 550 g
Mn coating: < 20 mm
Color (inside): dark brown
Alteration: [✓ no] week strong
Vesicularity: 40 %
Lithology: monomict or polymict
Occurrence: massives [✓ lavas] [✓ volcaniclastics] sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= ol 1 %, Py < 1 %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well--------------------------------poorly
Roundness : round------------------------------angular
Fabric: clast-support ---------------- matrix support
Grading : normal---------------none---------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks

7K II #393 R- 06

June 7, 2007
Described by Abe & Koike

Sample Size: X= 14 cm, Y= 12 cm, Z= 8 cm
Weight: 800 g
Mn coating: — mm thin
Color (Inside): dark brown
Alteration: [✓ no] week strong
Vesicularity: 30 %
Lithology: monomict or polymict
Occurrence: massives [✓ lavas] [✓ volcaniclastics] sediments others

SKETCH

Igneous & Ultramafic Rocks

Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= ol 2 %, Py < 1 %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well--------------------------------poorly
Roundness : round------------------------------angular
Fabric: clast-support ---------------- matrix support
Grading : normal---------------none---------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks tiny wehrlite xenoliths, xenocrysts
crack.

7K II #393 R- 07

June 7, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 13 cm, Y= 16 cm, Z= 10 cm
Weight: 1320 g
Mn coating: — mm
Color (inside): dark brown
Alteration: no week strong
Vesicularity: ____ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments [✓ others]

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ____ mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well-------------------------------poorly
Roundness : round-------------------------------angular
Fabric: clast-support ———————— matrix support
Grading : normal--------------none——————reverse
Matrix : silt sand others: ____
Lithic: Lithified or unlithified

Remarks Mn crust

7K II #393 R- 08

June 7, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 19 cm, Y= 18 cm, Z= ~~28~~ 18 cm
Weight: 5525 g
Mn coating: thin mm
Color (inside): dark brown
Alteration: [✓ no] week strong
Vesicularity: 35 %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= Ol 2 %, Py <1 %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well-------------------------------poorly
Roundness : round-------------------------------angular
Fabric: clast-support ———————— matrix support
Grading : normal--------------none——————reverse
Matrix : silt sand others: ____
Lithic: Lithified or unlithified

Remarks cracks, peperite

7K II #393 R-09

June 7, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 7 cm, Y= 4 cm, Z= 5 cm
Weight: 90 g
Mn coating: — mm
Color (inside): dark brown
Alteration: [✓ no] week strong
Vesicularity: 40 %
Lithology: monomict or polymict
Occurrence: massives [✓ lavas] ≤ [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks

Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: < 3 mm
Phenocrysts= ol 2 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – **4** – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well-----------------------------poorly
Roundness : round-----------------------------angular
Fabric: clast-support ———————— matrix support
Grading : normal---------------none——————-reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks Ol xenocrysts , highly vesicular.

7K II #393 R-10

June 7, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 35 cm, Y= 26 cm, Z= 19 cm
Weight: g （重い、未計測）
Mn coating: — mm
Color (Inside): white to grey
Alteration: no week strong
Vesicularity: 40 %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks

Volcanic: basalt basaltic andesite andesite dacite [✓ rhyolite]
Thickness of glass: mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well-----------------------------poorly
Roundness : round-----------------------------angular
Fabric: clast-support ———————— matrix support
Grading : normal---------------none——————-reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks large pumice ,

7K II #393 R- 11

June 7, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 10 cm, Y= 7 cm, Z= 5 cm
Weight: 220 g
Mn coating: <10 mm
Color (inside): dark brown
Alteration: [✓ no] week strong
Vesicularity: 40 %
Lithology: monomict or polymict
Occurrence: massives [✓ lavas volcaniclastics] sediments others

Igneous & Ultramafic Rocks
Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: – mm
Phenocrysts= Ol 2 %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------poorly
Roundness : round------------angular
Fabric: clast-support ———— matrix support
Grading : normal------none———reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks brecciated part between basalt and Mn crust .

7K II #393 R- 12

June 7, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 22 cm, Y= 14 cm, Z= 13 cm
Weight: 2800 g
Mn coating: <20 mm
Color (inside): drak gray To dark brown
Alteration: no [✓ week] strong
Vesicularity: 35 %
Lithology: monomict or polymict
Occurrence: massives [✓ lavas] volcaniclastics sediments others

Igneous & Ultramafic Rocks
Volcanic: [✓ basalt] basaltic andesite andesite dacite rhyolite
Thickness of glass: — mm
Phenocrysts= %. %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others:

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type:
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------------poorly
Roundness : round------------angular
Fabric: clast-support ------------ matrix support
Grading : normal———none------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks thick Mn crust
crack.

7K II #393 R-#13

June 7, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 13 cm, Y= 10 cm. Z= 13 cm
Weight: 720 g
Mn coating: thin mm
Color (inside): gray
Alteration: no [✓ week] strong
Vesicularity: 30 %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks
Volcanic: basalt basaltic andesite andesite [✓ dacite] ? rhyolite
Thickness of glass: ______mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ______

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type: ______
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------poorly
Roundness : round------angular
Fabric: clast-support ------ matrix support
Grading : normal------none------reverse
Matrix : silt sand others: ______
Lithic: Lithified or unlithified

Remarks pumice with mafic minerals.

7K II #393 R-~~13~~14

June 7, 2007
Described by Abe & Koike

SKETCH

Sample Size: X= 10 cm, Y= 11 cm, Z= 10 cm
Weight: 1090 g
Mn coating: < 1.0 mm
Color (inside): pale brown
Alteration: no [✓ week] strong
Vesicularity: 40 %
Lithology: monomict or polymict
Occurrence: massives lavas [✓ volcaniclastics] sediments others

Igneous & Ultramafic Rocks
Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: ______mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ______

Sedimentary rocks & others (characteristic of the clasts)
Fragments comp.: mono or poly
Rock type: ______
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well------poorly
Roundness : round------angular
Fabric: clast-support ------ matrix support
Grading : normal------none------reverse
Matrix : silt sand others: ______
Lithic: Lithified or unlithified

Remarks pumice

7K Ⅱ #393 R- 15

* need to be described **June 7, 2007**

Described by __Abe & Koike__

Sample Size: X= 35 cm, Y= 16 cm, Z= 12 cm
Weight: ____________ g 重い（未計測）
Mn coating: ____________ mm
Color (inside): ____________________
Alteration: no week strong
Vesicularity: ____________ %
Lithology: monomict or polymict
Occurrence: massives lavas volcaniclastics sediments others

SKETCH

large sample to be cut

Igneous & Ultramafic Rocks

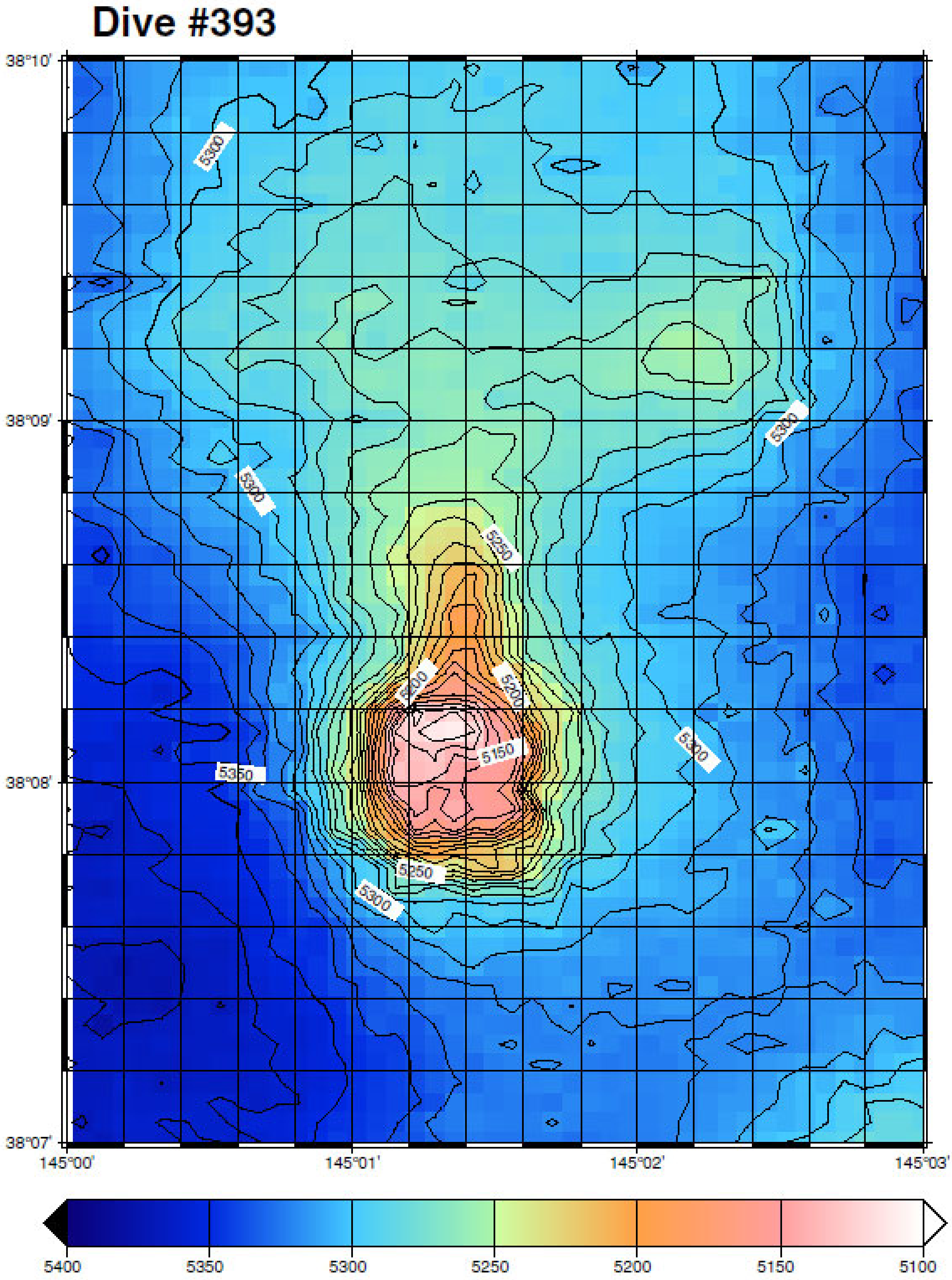
Volcanic: basalt basaltic andesite andesite dacite rhyolite
Thickness of glass: __________mm
Phenocrysts= %, %, %
Plutonic: gabbro diorite quartz diorite granite
Crystals= %, %, %
Ultramafic: lerzolite harzburgite dunite pyroxenite others
Crystals= %, %, %
Others: ____________________

Sedimentary rocks & others (characteristic of the clasts)

Fragments comp.: mono or poly
Rock type: ____________________
Grain size (mm) : < 1 – 2 – 4 – 8 – 16 – 32 – 64 – 128 – 256 <
Sorting : well————————————poorly
Roundness : round------------------------------angular
Fabric: clast-support ———-——— matrix support
Grading : normal--------------none--------------reverse
Matrix : silt sand others:
Lithic: Lithified or unlithified

Remarks coverded with Mn crust
heavy

Dive #393



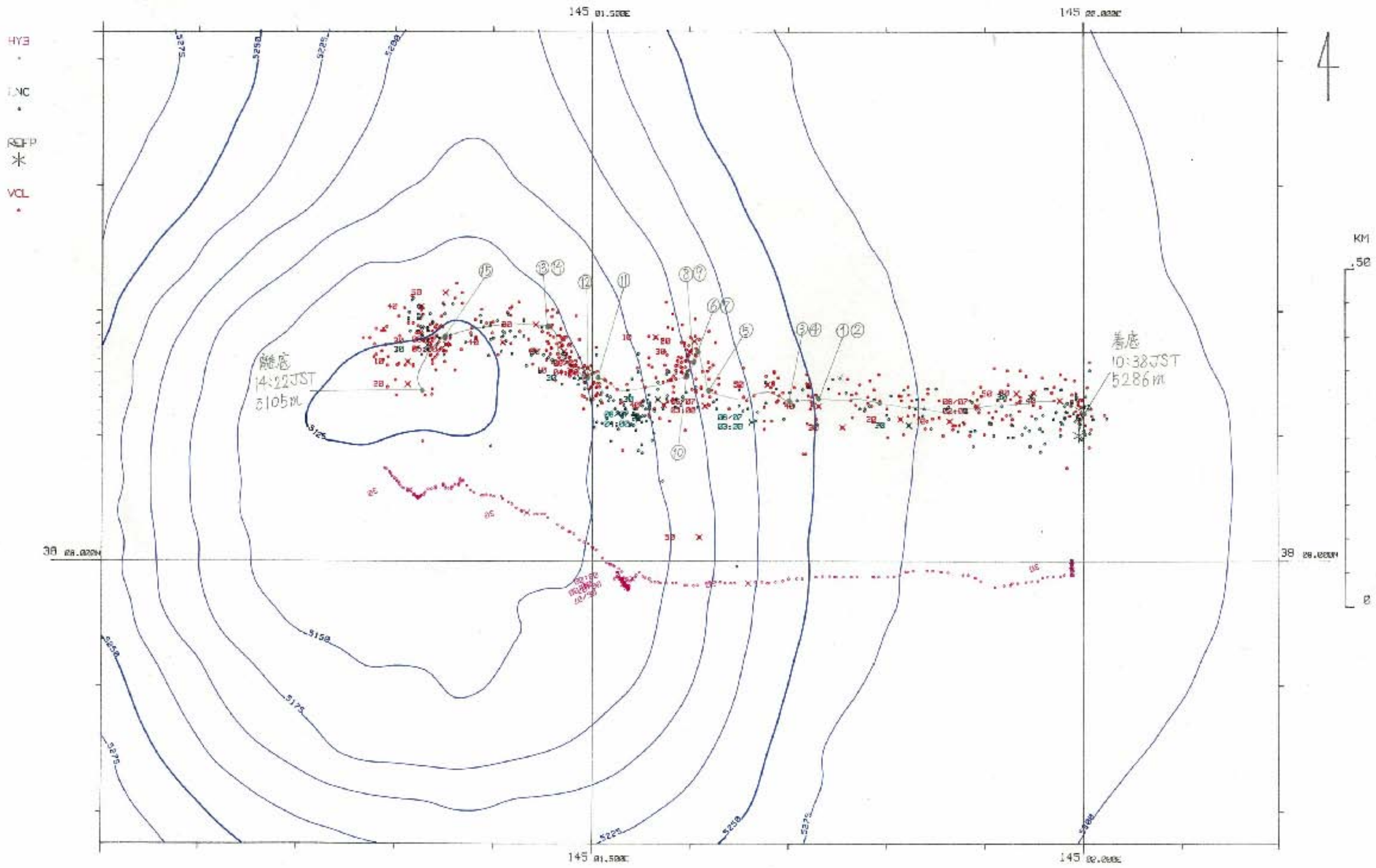
38°10'
38°09'
38°08'
38°07'
145°00'
145°01'
145°02'
145°03'
5300
5300
5300
5250
5200
5200
5150
5350
5300
5250
5300
5400
5350
5300
5250
5200
5150
5100

KR07-07 KAIKO7000II Dive#393

JAPAN TRENCH

Date 2007/06/07

Scale (1/ 5000)



<LL> 38 07.7N 145 01.8E <UR> 38 08.4N 145 02.1E

Datum WGS84 Proj. MER

07/06/07 01:23:00 -> 07/06/07 05:45:00

5. Results of Other Observations

5.1 Underway Geophysics

Motoyuki Kido, Hiromi Fujimoto (Tohoku University)
Stephen Kirby (USGS), and Natsue Abe (IFREE, JAMSTEC)

(1) Summary of observations

The target region of this research is known to upward bending of the subducting Pacific plate, called outer rise, where systematic positive gravity anomaly is observed due to dynamically supported excess topography and horst-graben structure is developed due to extensional stress field. This specific tectonic setting produces normal fault earthquakes, some of large one results disastrous tsunami waves attacking the Japanese east coast. Moreover, initiation of the upward bending starts with compressionanl plate surface due to the opposite bending. This may cause the petit-spot activities in this region, however, their origin is still controversial. The region of transition between the bending and unbending is a key to understand the above mentioned phenomenon.

For this purpose, the surface mapping of the bathymetry using a multi-narrow-beam system and acoustic reflection intensity using a side-scan sonar are strong tools to reveal such signals efficiently with an uniform resolution. It is reasonable to conduct proton-magnetmeter survey along with them. The magnetic signature originated in the petit-spot is too small to detect at the sea surface, though, iso-chron identification in this oldest seafloor is important as lack of the data in this region. However, it found that this region is popular fishing area in this season and many fishing boats were there, possibly with towing fishing net. To make a proton survey in such area has large risk to lose the proton sensor. So we abandon the proton survey at this time.

(2) Track chart

Here is the ship track entire of this cruise (Fig.5.1-1), starting at Kamaishi. Basically we made stationary surveys for diving in the day-time and track surveys for seabeam in the night-time.

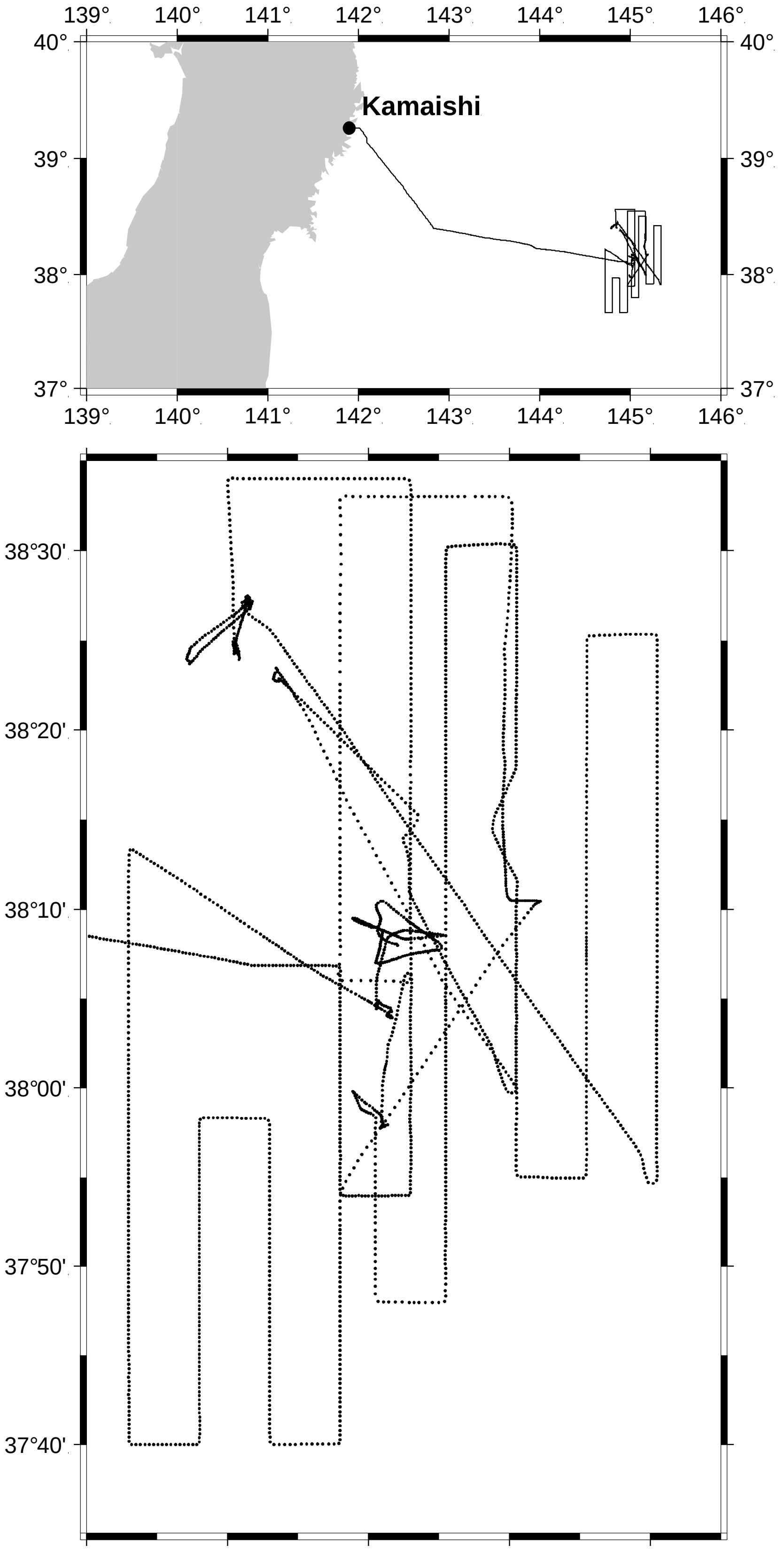


Fig.5.1-1. Entire ship track of the survey (top) and closed view in the survey area (bottom)

(3) Bathymetric maps

We have conducted seabeam topographic mapping for five nights (1st, 2nd, 3rd, 4th, and 5th June) during this research cruise. To save fuel consumption, ship speed was limited upto 10 knot using a half engine. This shorten our track length, however, improve data quality. Coupled with stably calm sea condition, we have obtained high quality bathymetric data. Fig. 5.1-2 is a colored bathymetric relief with an illumination from the north-east compiled all the data obtained during all the night surveys, superimposed with ship track. The figure clearly illustrates the initiation of horst-graben structure in the east and small seamounts distributed in the middle to the west. Most of normal faults are developed NNE-direction, perpendicular to the iso-chron or abyssal hill associated with seafloor spreading more than 100Ma ago, rather than N-S direction parallel to the trench. Some seamounts have crater at their top. The prominent feature is a couple of series of seamounts alignment. They do not necessary to have the same orientation. Identification whether each seamounts are petit-spot or old hot spot may help comprehensive explanation of such alignment together with stress field in the plate.

We also provide here a contour map for the same bathymetric data in Fig. 5.1-3, for the visibility in detail in other point of view. The contour interval is 20m and drawn thick contour every 100m.

The system simultaneously provide side-scan image along the track, whose swath width is wider than that multi-narrow beam. The side-scan image is useful to evaluate seafloor condition. This region is mostly covered with thick abyssal sediments, on the other hand the seamounts are has no. This is clearly be seen in the side-scan image that seamounts are appeared as dark image or strong reflection intensity (Fig.5.1-4). Side-scan data is also helpful to identify sharp cliff or fault nevertheless it is large or not. The normal faults in the east of the region is clearly illustrated. The only the limitation is that the intensity depends elevation angle of swash beam.

These figures are too small to investigate each feature. Then we provide selected two regions of closed view. The first one is south-east region (Fig.5.1-5), where cluster of seamounts is destructing by couple of normal faults on the other hand the alignment of seamounts is obvious along the line on 145 degree longitude. The other is the extent of this alignment (Fig.5.1-6), where three of our dive surveys were conducted (Dive #388, #392, and #393). The side-scan image of the same area is also shown for comparison. An artificial linear pattern is getting apparent with this scale, which originate a kind of aliasing during filtering process of the raw data. Technique of data processing is a further problem.

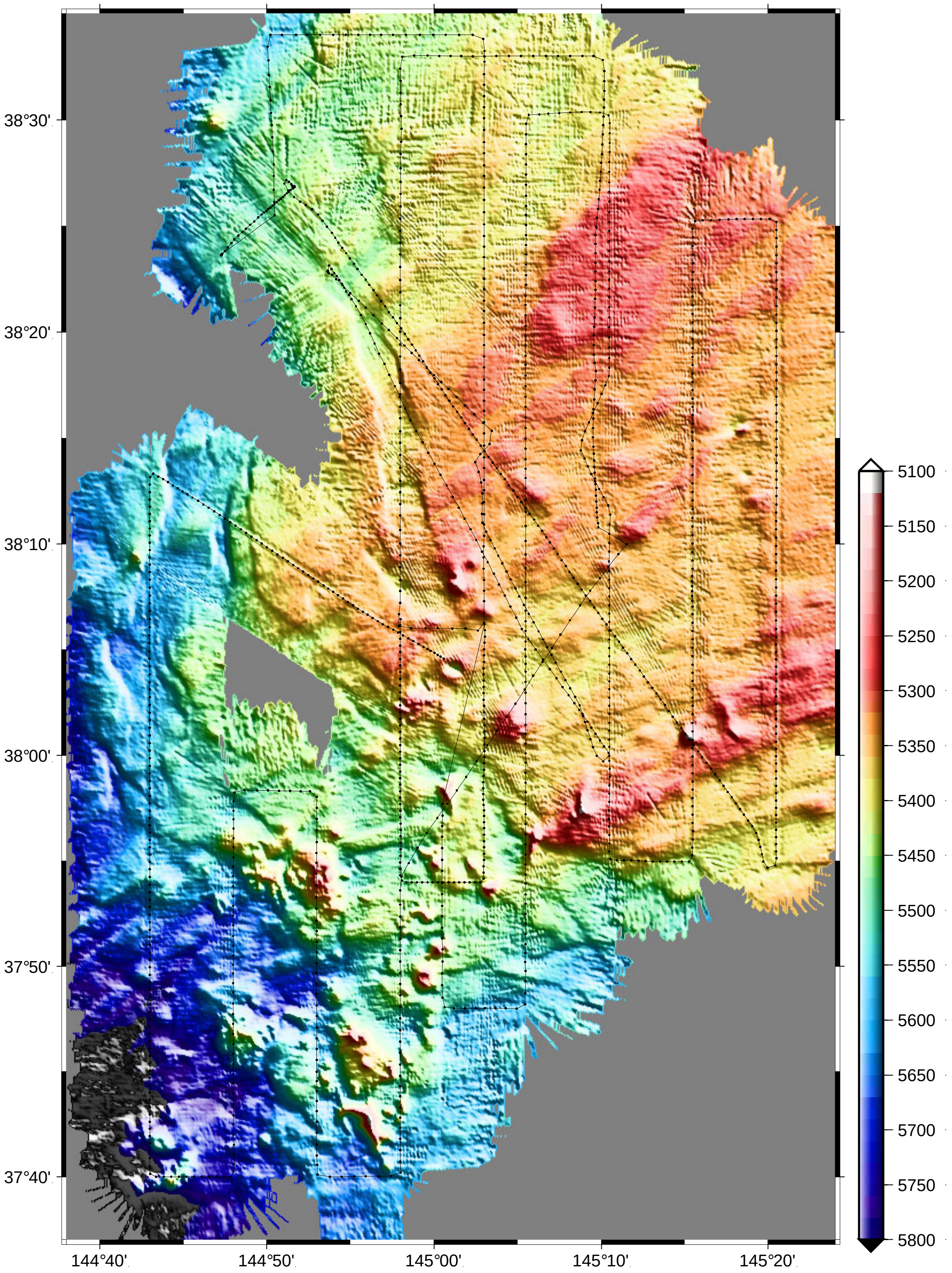


Fig.5.1-2. Bathymetric relief obtained during this research cruise. Track lines are also indicated with dots every 10 pings.

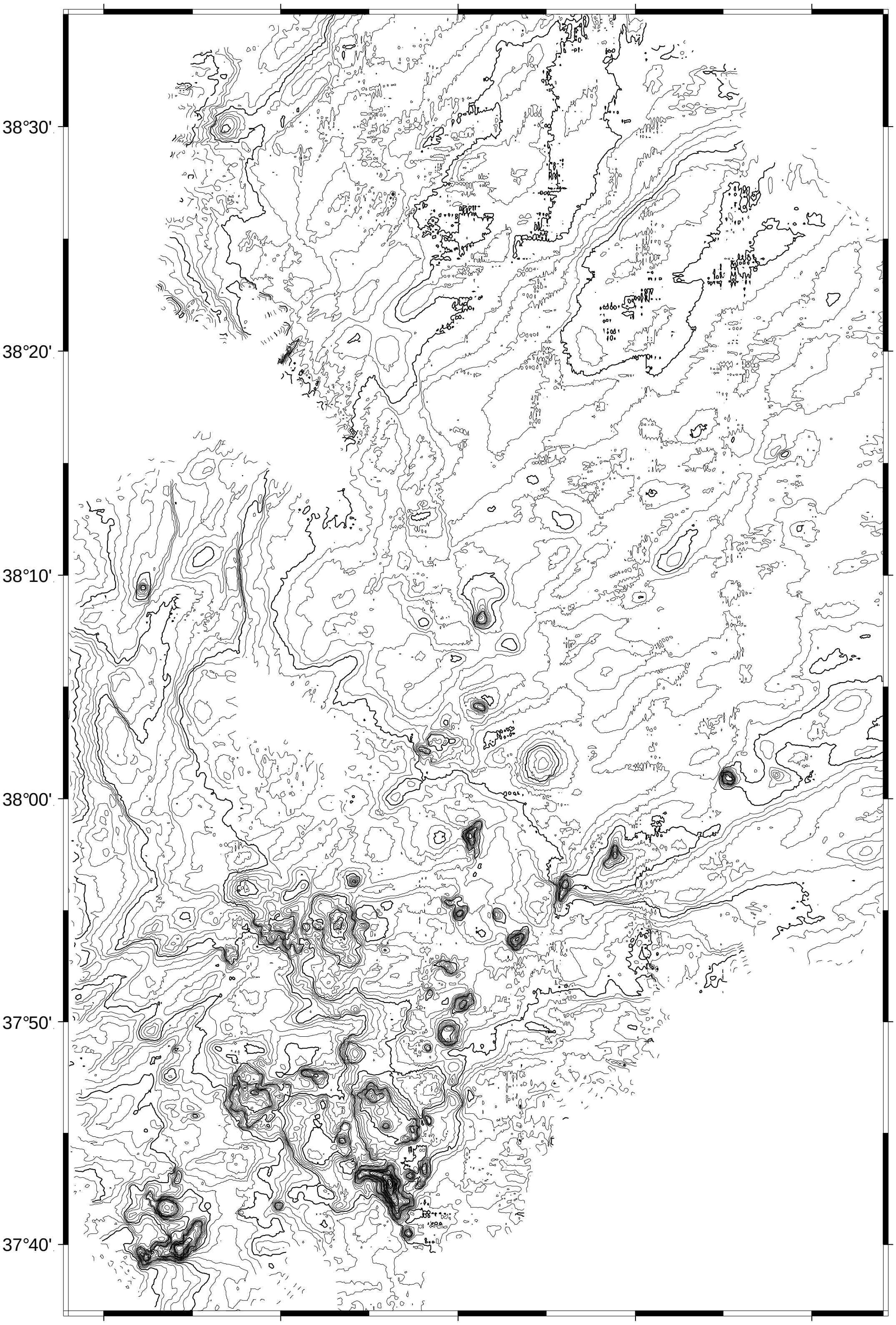


Fig.5.1-3. Contour plot of the same data in Fig.5.1-2. Contour interval is 20m for thin lines and 100m for thick lines.

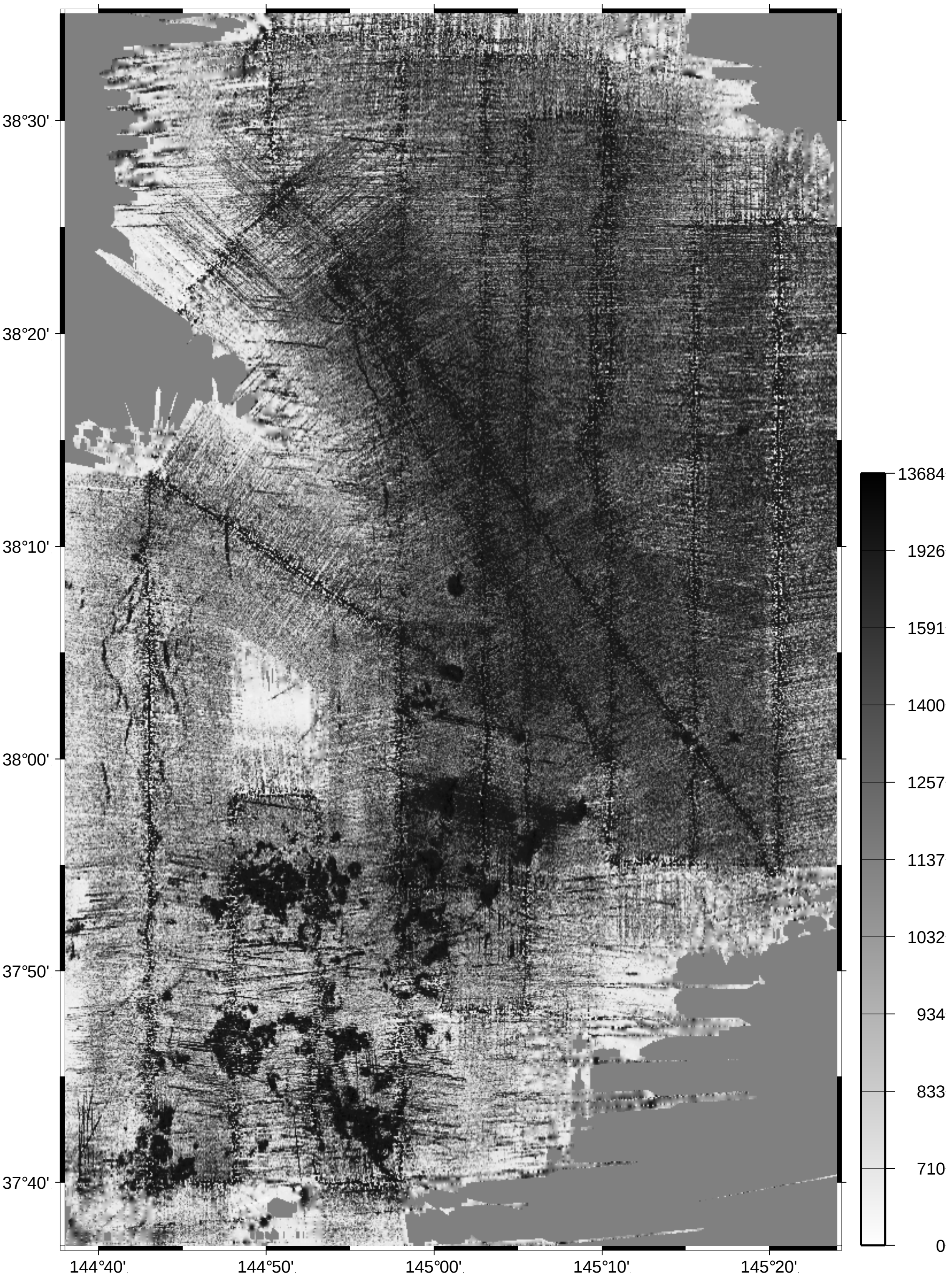


Fig.5.1-4. Side-scan image of the region.

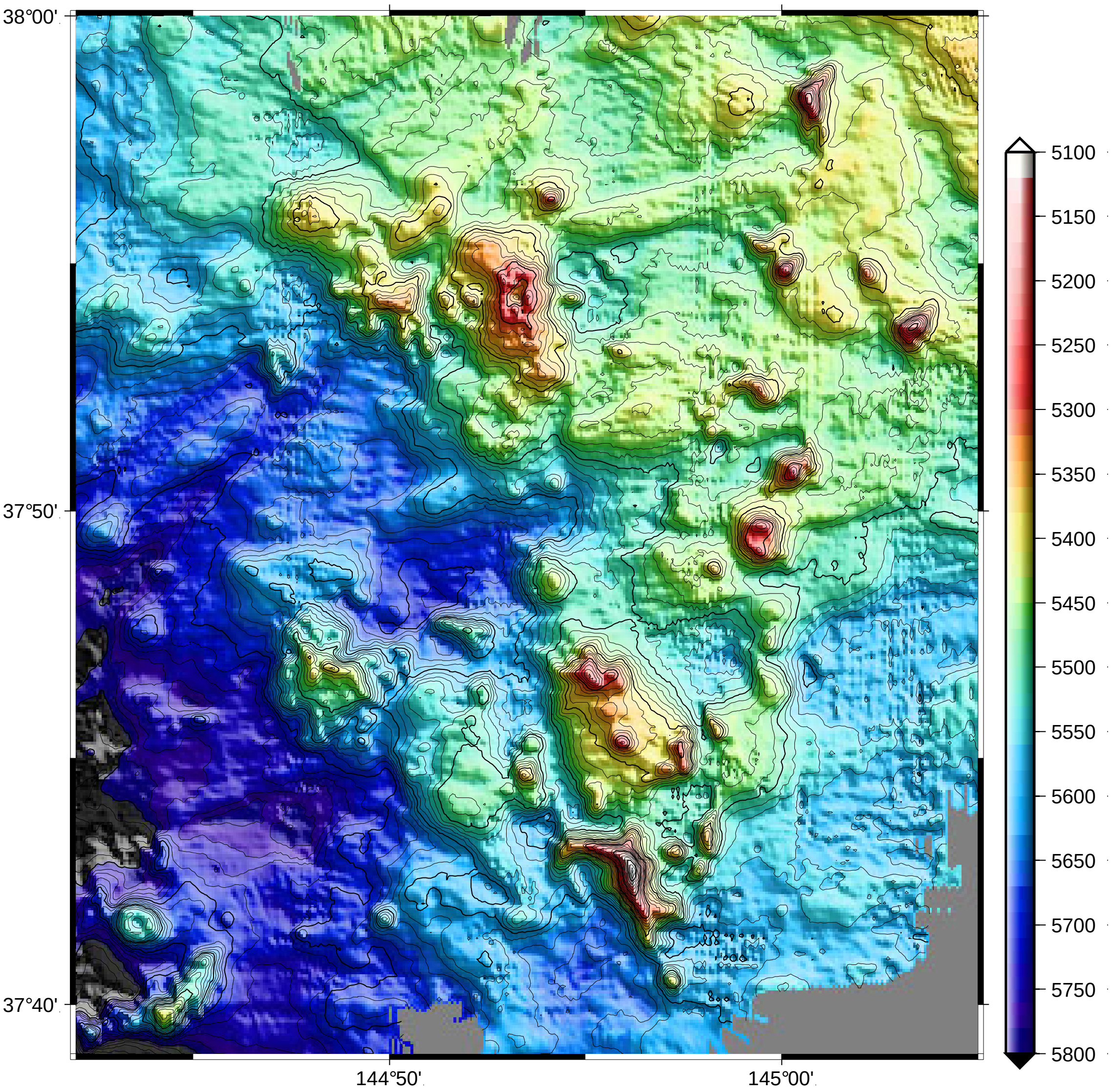


Fig.5.1-5. Close-up view of the southeast region of Fig. 5.1-2.

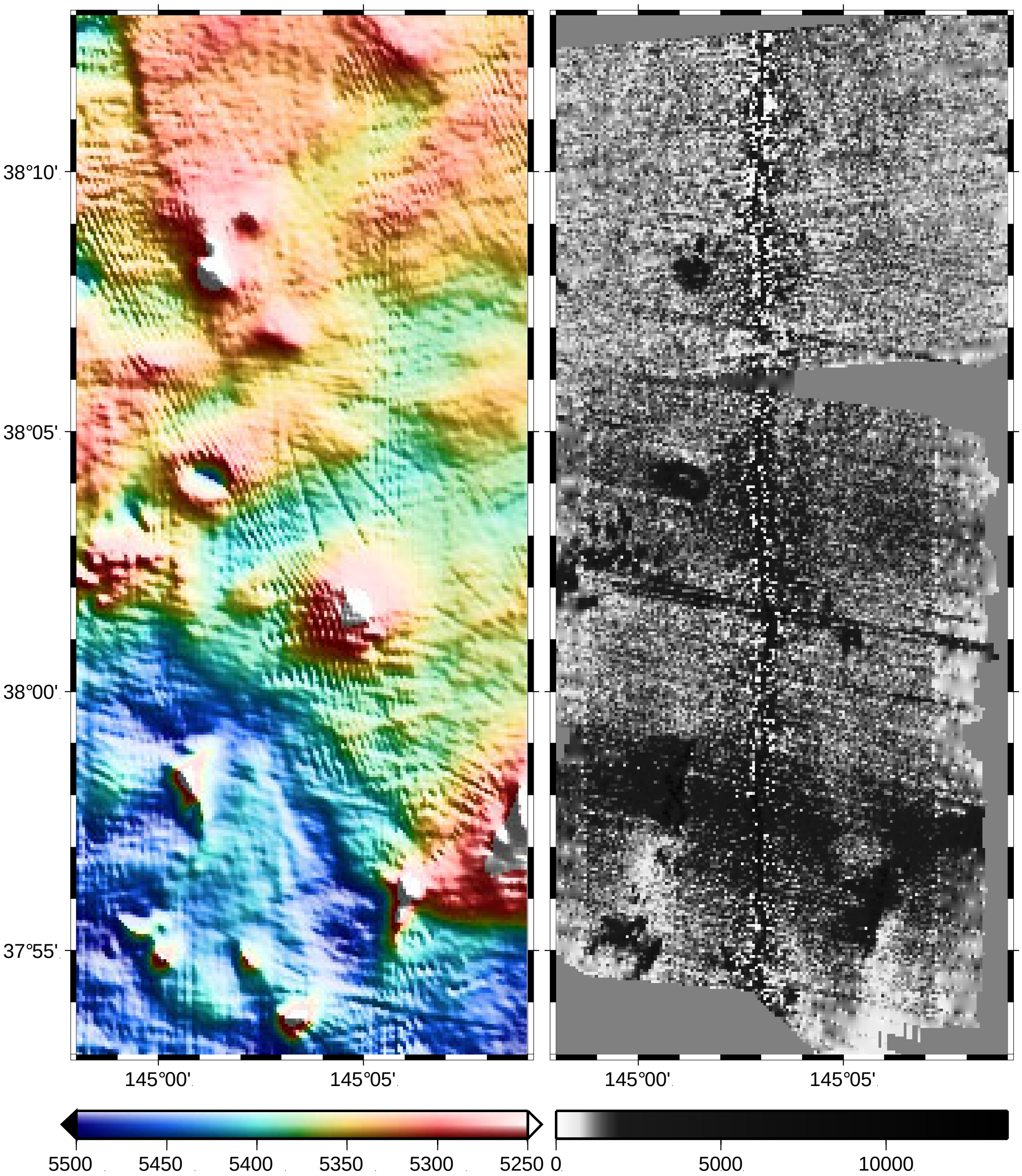


Fig.5.1-6. Close-up view around the dive sites for petit-spot surveys. A side-scanning sonar image is also shown for comparison.

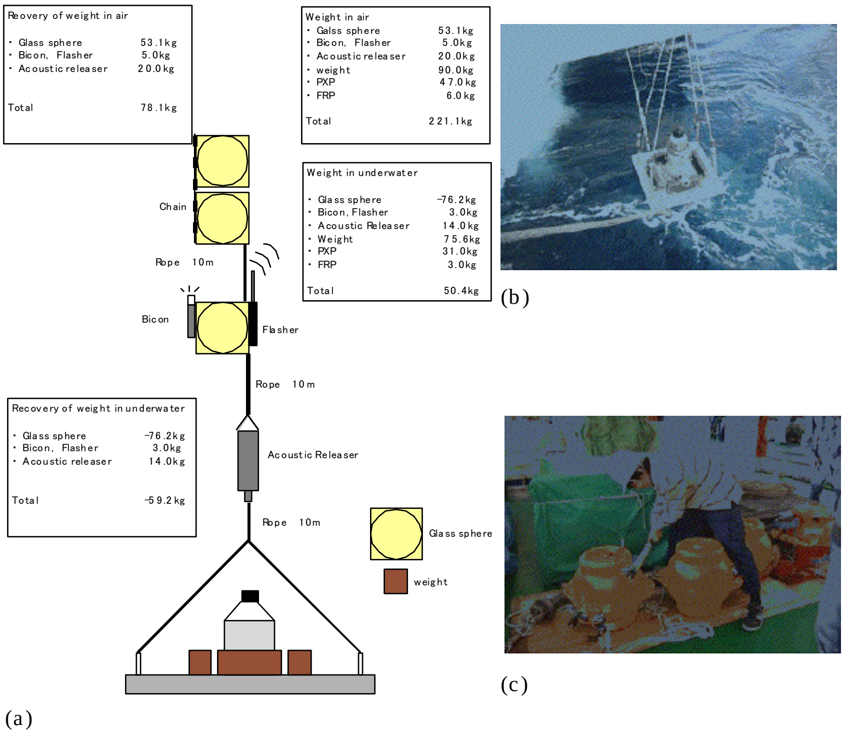
5.2 Experiments on seafloor geodesy

(1) Deployment of an acoustic transponder with a mooring system

Yukihito Osada, Hiroaki Tsushima, Hiromi Fujimoto (Tohoku University),
and Misumi Aoki (NME)

Large earthquakes occurred around northeastern Japan associated with subduction of the Pacific plate. Seismic coupling on the subduction plate boundaries is a key factor for the study of the large earthquakes. The GPS/A (GPS/Acoustic) observation at the GJT1 site started in 2002. Precise plate motion at the site still remains to be determined, because this site has been visited only a few times. It turned out during a cruise last year that the acoustic signals from the PXPs (precise acoustic transponders) were exceptionally weak presumably due to the lifetime of the batteries. Therefore we have tried to replace the PXPs at GJT1 site during the KR07-07 cruise. Two PXPs in glass sphere housing were replaced with KAIKO 7000 II (Dive #389, #390). One PXP in titanium-alloy pressure housing was deployed with a moored system as is shown in Fig. 5.2.1.

On June 4, 2007 we deploy the PXP (DJ3) using the moored system at the GJT1 site where an old PXP DJ4 had been deployed. After the dive #390 for deployment of another PXP, we calibrated the position of the mooring system. We collected the acoustic signals within 1000 m in the horizontal distance from the point of the deployment (Fig. 5.2.2), because the maximum range of the slant range was limited to 6500 m for an acoustic recovery unit.



Reovery of weight in air

・Glass sphere	53.1kg
・Bicon, Flasher	5.0kg
・Acoustic releaser	20.0kg
Total	78.1kg

Weight in air

・Galss sphere	53.1kg
・Bicon, Flasher	5.0kg
・Acoustic releaser	20.0kg
・weight	90.0kg
・PXP	47.0kg
・FRP	6.0kg
Total	221.1kg

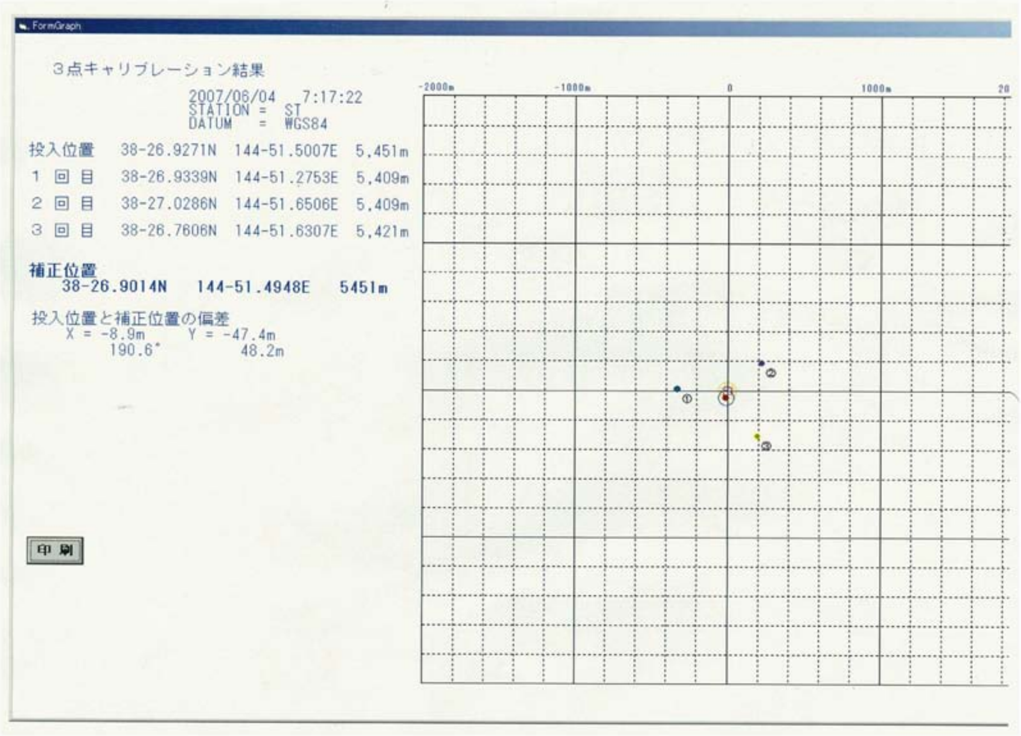
Weight in underwater

・Glass sphere	-76.2kg
・Bicon, Flasher	3.0kg
・Acoustic Releaser	14.0kg
・Weight	75.6kg
・PXP	31.0kg
・FRP	3.0kg
Total	50.4kg

Recovery of weight in underwater

・Glass sphere	-76.2kg
・Bicon, Flasher	3.0kg
・Acoustic releaser	14.0kg
Total	-59.2kg

Fig. 5.2.1 (a) Outline of the moored system for deployment of a PXP in titanium alloy pressure housing. An acoustic releaser was set 10 m above the PXP. The bottom frame of the PXP is 1-m square. (b) A photograph of deployment of the PXP. (c) The moored system after the recovery.



```
３点キャリブレーション結果
                    2007/06/04   7:17:22
                    STATION =  ST
                    DATUM   =  WGS84
投入位置   38-26.9271N  144-51.5007E  5,451m
1 回 目   38-26.9339N  144-51.2753E  5,409m
2 回 目   38-27.0286N  144-51.6506E  5,409m
3 回 目   38-26.7606N  144-51.6307E  5,421m

補正位置
    38-26.9014N   144-51.4948E   5451m

投入位置と補正位置の偏差
    X = -8.9m      Y = -47.4m
        190.6°          48.2m
```

Fig. 5.2.2 The results of the calibration of the position of the mooring system.

(2) Test of a new acoustic ranging unit

Motoyuki Kido and Hiromi Fujimoto (Tohoku University)

We are developing now a new acoustic ranging buoy for automatic and continuous GPS/Acoustic seafloor positioning, and it will be a future application to the seafloor network cable system, DONET. In this system, acoustic unit is completely separated with other parts, such as GPS data acquisition unit, and is packed in a glass sphere with an acoustic transducer. It contains batteries, an acoustic amplifier, and a microprocessor to control the measurement and acoustic data recording. In March 2007, we have made an initial test for this acoustic unit in outside of the Shimizu port and obtained high quality ranging data although a transponder was deployed at shallow depth in a short distance. In this cruise, we extend the test into long distance with practical transponders, which are also installed in this cruise.

First, we transmitted a wakeup signal to newly installed three transponders using an old system (Fig.5.2.3a), which is not required in the future cabled measurement because of its long-term continuous measurement. Transmitting the wakeup signal, we sustained a cabled transducer from the side deck and kept it at a depth around five to ten meters so that a signal can directly travel under the ship's bottom to the transponder behind the ship. There was a difficulty to wake up transponders probably because of strong acoustic reflection from the ship's side wall or the bottom. However after trials for up to 30 minutes, all of the three transponders responded.

Then we set the new all-in-one acoustic unit to repeatedly make ranging every 30 seconds starting at 19:18 and ending at 19:40 for about 20 minutes. The data acquisition interval was set to 10 seconds to match the two-way travel time of the slant range to the 5500m deep transponders. The acoustic unit itself has buoyancy of 14 kg in water, so we simply kept it with a rope of 20 meter. Unfortunately due to a wind and current condition, the acoustic unit did not apart from the ship with enough distance (Fig.5.2.3d). However, it still had a possibility to communicate with foreside transponder. Therefore we kept the test as it was. A ping sound was quite large so that we can hear even from the bridge of the Kairei. After we confirmed that the pinging stopped at 19:40 as was set, we recovered the acoustic unit.

Fig. 5.2.3. (a) The old acoustic system used for the wakeup test. (b) The nre all-in-one acoustic unit, which was deployed from the side deck (c) and floated by buoyancy itself (d).

45 times of ranging data were recorded. However, no clear response signal was found in the data other than the transmitted signal itself. The Fig. 5.2.4 is an example of the recorded wave signal. There were some signals looked like a response signal, however, these were found to be noise resulting from the correlation analysis.

The transponders respond only when they recognize a frequency tag in the transmitted data. So we expect the tag was contaminated with significant noise by strong reflection from the ship even for the forehand direction transponder. Moreover, the acoustic unit is designed for cable system in the Kumano-nada region with relatively shallow depth of 2000m, so the signal amplitude is not strong enough for the deep ocean in the Japan trench. Then the test for the new acoustic unit resulted in just confirmation to work properly. However, we have ensure the availability of the new transponders installed in this cruise using the wakeup test with old system.

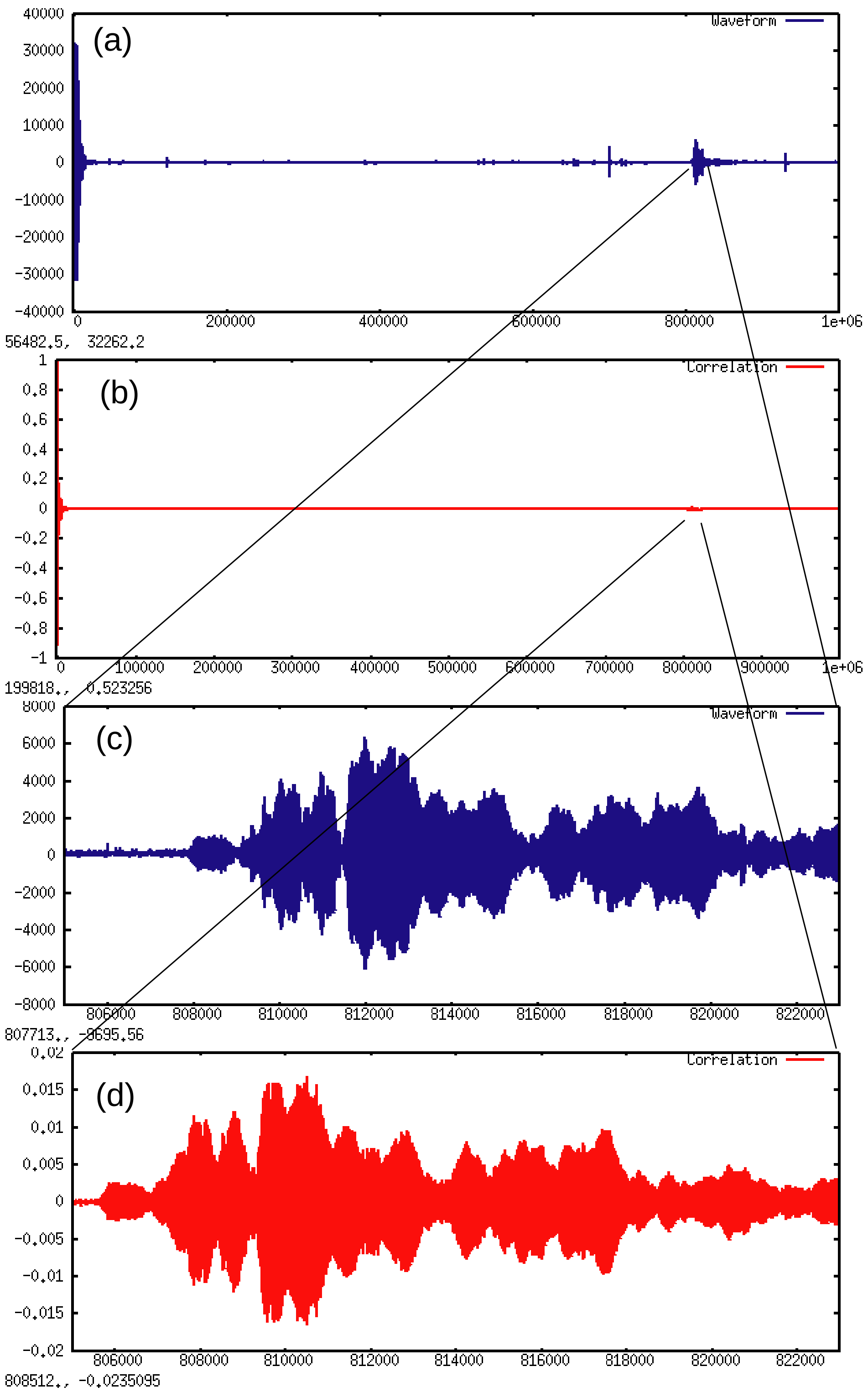


Fig.5.2.4. An example of the recorded acoustic signals. The transmitted signal is at the beginning of the graph. Signal at 9 sec in (a) looked like a reply from a transponder, however its cross correlation with the transmitted signal is quite low (b), so this must be a noise, not a reply.

(3) Recovery of an ocean bottom pressure recorder

Yukihito Osada, Hiroaki Tsushima, Hiromi Fujimoto (Tohoku University)

We have started the study on the region of 2005 Miyagi-Oki earthquake since 2006. In July 2006, we deployed an OBP (Ocean Bottom Pressure recorder) to monitor the vertical movement in case of a big earthquake. We recovered the OBP (Fig.5.2.5) along the way to the study area for the diving survey. The OBP had recorded pressure variation for 11 months (the total data is 76050 samples) at the sampling interval of 10 sec (Fig. 5.2.6).

Fig. 5.2.5 A photograph of the OBP after the recovery.

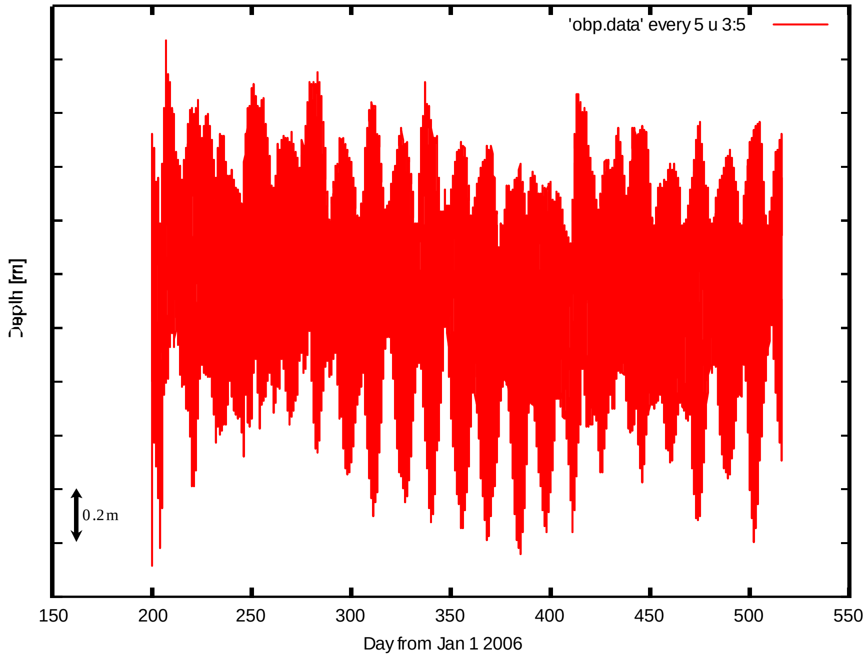


Fig. 5.2.6 Time series of depth calculated from OBP data.

6. Discussions and Summary

6.1 Preliminary Seismo-Tectonic Discussion of the Outer Rise Region Investigated by the Cruise KR07-07 (1-8 June 2007) from 37°40' to 38°30' N and from 144°40' to 145°25'

Stephen H. Kirby, Research Geophysicist and Senior Scientist, U.S. Geological Survey, Menlo Park, California, USA and Invited Shipboard Scientist, JAMSTEC R/V Kairei

In addition to SEABEAM bathymetry, side scan sonar imaging, and Kaiko 7000 II dive information, the cruise benefited from the availability of preliminary 2007 OBS earthquake data made available from Dr. Ryota Hino of Tohoku University. Dr. Hino's deployment was motivated by interest in monitoring aftershocks of the M7.1 outer-rise normal-faulting earthquake of 15 November 2007. Detection of some of the smaller events may have succeeded in documenting background seismicity as well. A redeployment of OBS instruments to the area directly above the aftershocks promises in near future to provide improved accuracy of hypocenter distribution. Accordingly, this report is labeled "Preliminary". However, this is an unusual opportunity to comment upon the deformation of the outer-rise region off the Japan Trench in light of completely new and independent information.

Two morphological features appear to correlate with earthquake distribution from Dr. Hino's OBS study. First, SEABEAM bathymetry indicates the presence of more than 20 small seamounts that were considered by Dr. Natsue Abe for investigation during this cruise These seamounts occur in three sharply chains, one roughly north-south chain near longitude 145°00'. Three seamounts in this chain were selected for Kaiko dive targets. She has confirmed that the northern and southern seamounts are of the "petit spot" type (see Figure 1). A prominent north-south band of earthquakes occurs under this chain (Figure 6.1.1), including under all three Kaiko dive sites.

A second interesting seafloor feature is a NNW escarpment bounding another chain of small seamounts in the SW corner of the study area. The seafloor SW of the escarpment is a few hundred meters deeper than the other side. About a dozen earthquakes occurred under the part of the escarpment near 37°55'. The NNW trend of this escarpment parallels one of the two trends of several "zig-zag" grabens further north that on average are parallel to the trench. The other trend is approximately parallel to the Pacific-Plate magnetic anomalies. Such "zig-zag" grabens become increasingly common along the outer-rise/outer-trench-wall further to the south as the azimuth of the trench increases and approaches the azimuths of the seafloor magnetic anomalies.

It is believed that "petit-spot" volcanic edifices near the Japan Trench are not active magmatic systems, and are at least several million years old (Natue Abe, personal communication). The alignment of bands of earthquakes therefore probably represents exploitation of zones of weakness in these seamount chains during bending of the Pacific Plate.

The main trend in the OBS earthquake map (Fig. 6.1.2) is parallel to the NNE-orientation of nodal planes of numerous investigations of the focal mechanisms for the 15 November 2005 earthquake. This trend is approximately parallel to the trench at the same latitude. No other morphological features on the seafloor correspond to this trend.

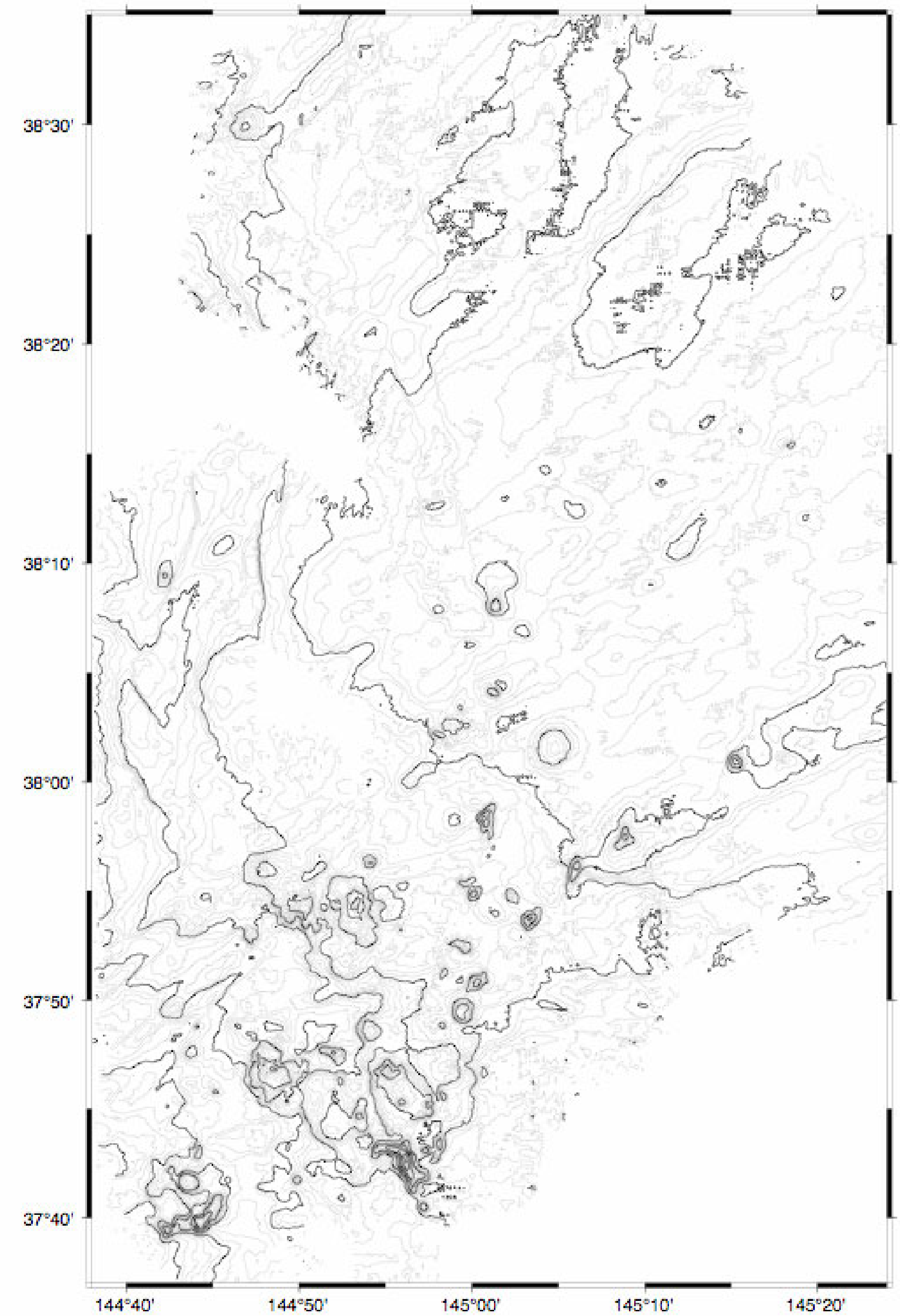


Figure 6.1.1: Bathymetric map of the study area based on largely new SEABEAM data. The contour interval is 10 meters.

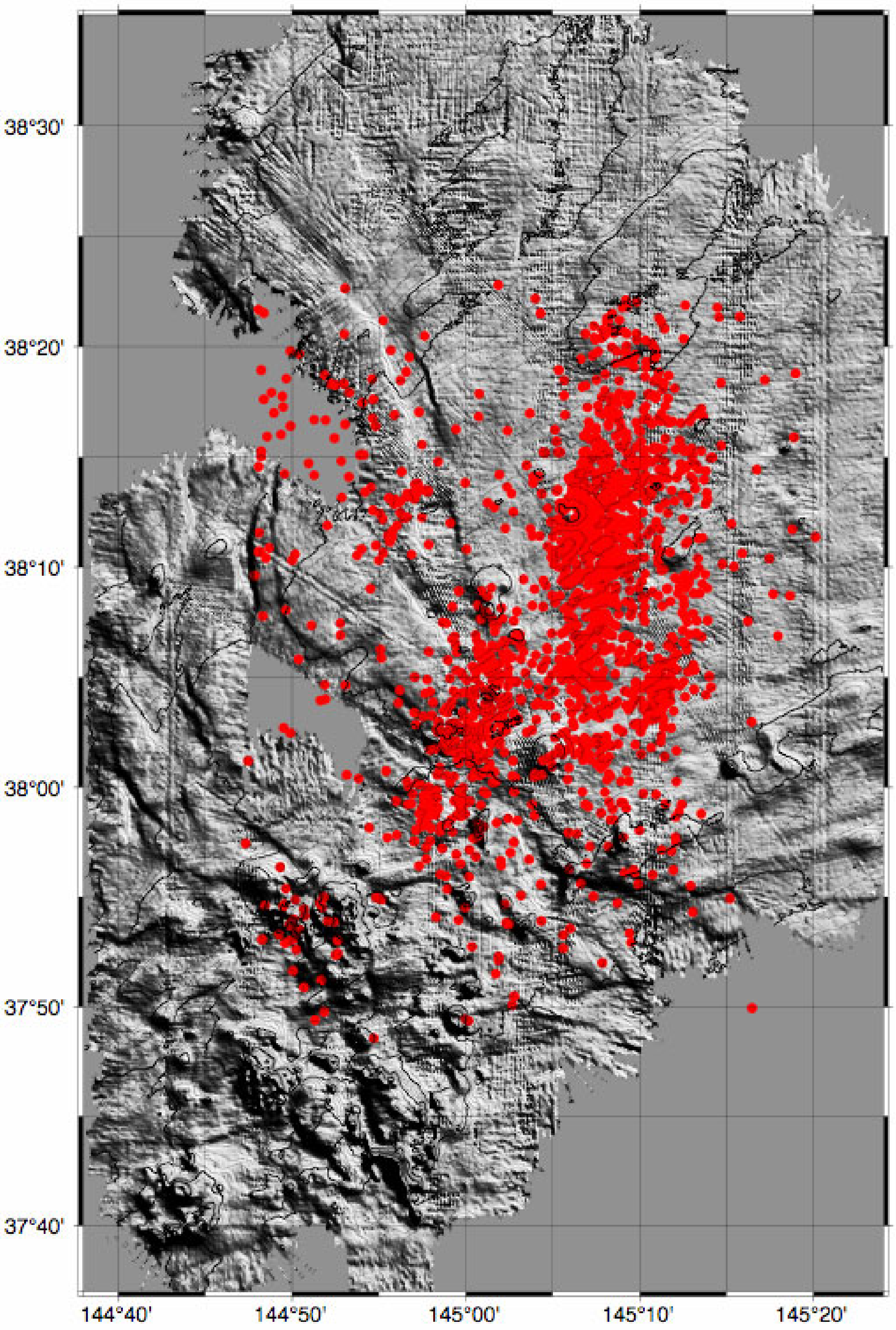


Figure 6.1.2: Earthquake epicenter map plotted on a grey shaded relief map base. Data made available by Dr. Ryoto Hino of Tohoku University.

6.2 Summary

Hiromi Fujimoto (Tohoku University) and Natsue Abe (IFREE, JAMSTEC)

Summary of petit spot dives

Totally three dives (7KII Dive #388, 392 & 393) during KR07-07 were taken on small knolls and the petit spot rock samples were sampled from two of them. These two knolls are absolutely ‘petit spot’ type volcanoes, though the age and the place of the eruptions are not known at the moment. These knolls are the first finding petit spot knolls other than Kaiko knolls and Yukawa knolls both in the same flow line of one age transect line. This discovery implies that there could be other places of petit spot volcanic fields in the any place of the oceanic plate where it is bending.

The other knoll has a caldera on the top and inside it has steep cliff with dolerite and pillow lava outcrops. The samples taken from these outcrops are very fresh MORB-like basalt and dolerite. Therefore, the caldera may be cross section of the upper part of the oceanic crust between layer 2a and layer 2b. To make sure this speculation, post cruise research on the rock samples should be taken petrologically and geochemically.

Summary of expedition in the source region of the 2005 M7.1 earthquake

The main trend in the aftershock distribution of the 2005 M7.1 earthquake is parallel to the NNE-orientation of nodal planes of numerous investigations of the focal mechanisms for the earthquake. This trend is approximately parallel to the trench at the same latitude. There was no prominent topographic feature indicating repeated normal faults. Therefore further surveys are necessary for fine topographic mapping with a deep-towed system.

The smaller band in the western part of the aftershock distribution coincides with one roughly north-south chain of small seamounts near longitude 145°00’. The newly found two “petit spot” type knolls are in this chain. It is believed that “petit-spot” volcanic edifices near the Japan Trench are not active magmatic systems. The alignment of bands of earthquakes therefore probably represents exploitation of zones of weakness in these seamount chains during bending of the Pacific Plate.

Geodetic experiments for the renewal of acoustic seafloor benchmarks

The KAIKO 7K II carried a precision acoustic transponder (PXP) in the payload space, deployed it on the seafloor side by side to an old PXP, and measured the relative position between the two PXPs with visual monitoring. Two PXPs were renewed in this way. Another PXP was deployed nearby an old one with a mooring system. Now we can continue the seafloor geodetic measurements in order to measure the motion of the Pacific plate near the subduction plate boundary.

7. Data list

7.1 List of Movie Data

Misumi Aoki (NME)

List of movie data obtained by the cameras of the Kaiko 7000 II is shown in Table 7.1.

List of　Movie Data
KR07-07

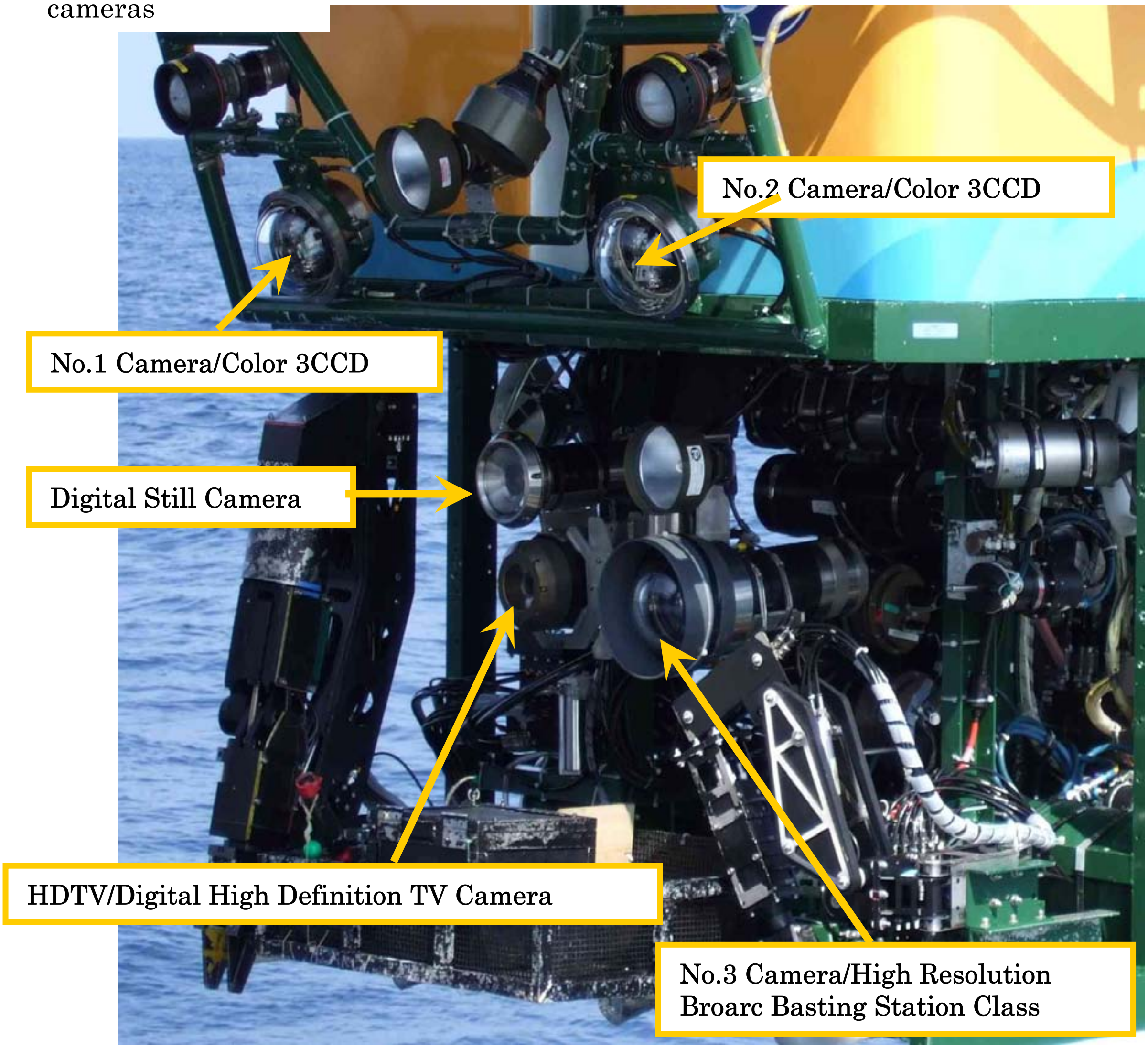
				Recorded Time		Distribution		
Date	Dive No.	Camera		Start	End	Tohoku Univ.	JAMSTEC	USGS
2007.06.02	#388	No.1Camera /HDTV	1/2	10:37	12:37	DVD-R	DVD-R	
			2/2	12:37	14:23	DVD-R	DVD-R	
		No.3 Camera	1/2	10:37	12:37	DVD-R	DVD-R	
			2/2	12:37	14:23	DVD-R	DVD-R	
2007.06.03	#389	No.1Camera /HDTV	1/2	10:32	12:32	DVD-R	DVD-R	
			2/2	12:32	13:42	DVD-R	DVD-R	
		No.3 Camera	1/2	10:32	12:32	DVD-R	DVD-R	
			2/2	12:32	13:42	DVD-R	DVD-R	
2007.06.04	#390	No.1Camera /HDTV	1/2	10:30	11:30	DVD-R	DVD-R	
			2/2	11:30	12:46	DVD-R	DVD-R	
		No.3 Camera	1/2	10:30	11:30	DVD-R	DVD-R	
			2/2	11:30	12:46	DVD-R	DVD-R	
2007.06.05	#391	No.1Camera /HDTV	1/2	10:33	12:33	DVD-R	DVD-R	
			2/2	12:33	14:33	DVD-R	DVD-R	
		No.3 Camera	1/2	10:33	12:33	DVD-R	DVD-R	
			2/2	12:33	14:33	DVD-R	DVD-R	
2007.06.06	#392	No.1Camera /HDTV	1/2	10:25	12:25	DVD-R	DVD-R	
			2/2	12:25	14:25	DVD-R	DVD-R	
		No.3 Camera	1/2	10:25	12:25	DVD-R	DVD-R	DVD-R
			2/2	12:25	14:25	DVD-R	DVD-R	DVD-R
2007.06.07	#393	No.1Camera /HDTV	1/2	10:30	12:30	DVD-R	DVD-R	
			2/2	12:30	14:25	DVD-R	DVD-R	
		No.3 Camera	1/2	10:30	12:30	DVD-R	DVD-R	DVD-R
			2/2	12:30	14:25	DVD-R	DVD-R	DVD-R

*1: video signals are NTSC

PDP arrangement :

Vew finder of Digital Still Camera	No.2 Camera
No.3 Camera	No.1Camera or HDTV

Arangement of cameras



7.2 List of Digital Data（XBT, MNBES, CTD etc.）

Misumi Aoki (NME)

List of digital data obtained in this cruise is shown in Table 7.2.

List of Dive Data / KR07-07

Dive No.	CTD Data*1	Vehicle Log	Acoustic Navigation	SOQ	SOJ	Seabeam data	Magnetometer	Gravity
KAIKO7K#388 (07/06/02)	07060201.DAT 07060201.CFG 07060201.AVG 07060201.HDR		dive.388.csv	07006012200_01.soq	07006012200_01.soq	sb200706020805_e.mb41 - sb200706022034_e.mb41	070601.dat	2007060100.grv
KAIKO7K#389 (07/06/03)	07060301.DAT 07060301.CFG 07060301.AVG 07060301.HDR 07060301.SUM	LOG06-03-0_001.xls - LOG06-03-0_052.xls	dive.389.csv	07006022200_01.soq	07006022200_01.soq	sb200706030700_e.mb41 - sb200706032220_e.mb41	070602.dat P070602.dat	2007060200.grv
KAIKO7K#390 (07/06/04)	07060401.DAT 07060401.CFG 07060401.AVG 07060401.HDR 07060401.SUM	LOG06-04-0_001.xls - LOG06-03-0_045.xls	dive.390.csv	07006032200_01.soq	07006032200_01.soq	sb200706041051_e.mb41 - sb200706042100_e.mb41	070603.dat P070603.dat	2007060300.grv
KAIKO7K#391 (07/06/05)	07060501.DAT 07060501.CFG 07060501.AVG 07060501.HDR 07060501.SUM		dive.391.csv	07006042200_01.soq	07006042200_01.soq	sb200706050735_e.mb41 - sb200706052102_e.mb41	070604.dat	2007060400.grv
KAIKO7K#392 (07/06/06)	07060601.DAT 07060601.CFG 07060601.AVG 07060601.HDR 07060601.SUM		dive.392.csv	07006052200_01.soq	07006052200_01.soq		070605.dat	2007060500.grv
KAIKO7K#393 (07/06/07)	07060701.DAT 07060701.CFG 07060701.AVG 07060701.HDR 07060701.SUM	LOG06-04-0_001.xls - LOG06-07-0_047.xls	dive.393.csv	07006062200_01.soq	07006062200_01.soq		070606.dat	2007060600.grv

Others	Readme_CTD.txt	Readme_VehicleLog.xls		0705292200_01.soq 0705312340_01.soq SOQformat.xls	0705292200_01.soq 0705312340_01.soq SOJformat.xls	KR0707_100.grd KR0707_200.grd sb200706011635_e.mb41 sb200706011802_e.mb41 sb200706011837_e.mb41 sb200706012005_e.mb41	070531.dat 三成分フォーマット.xls	2007053102.grv