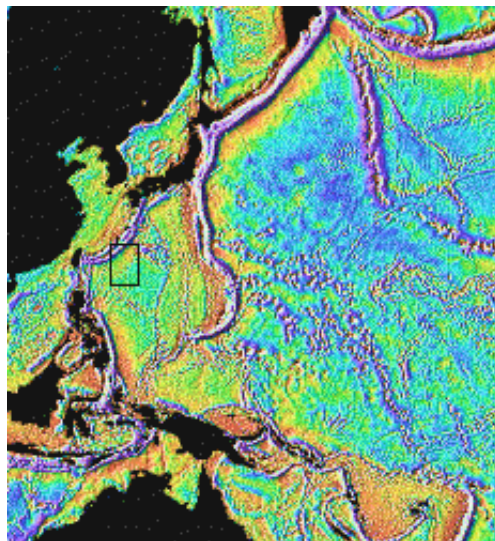


*Confidential*

**Preliminary Report  
of  
KR03-04 Leg-1 Cruise**



**April 15 ~ May 2, 2003  
ROV *KAIKO* & R/V *KAIREI*  
JAMSTEC**

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Preface

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*KAIKO* team personnel, *KAIKEI* crew

## Preface

The back-arc basins, volcanic island arcs, and deep-sea trenches rimming the western Pacific Ocean have attracted the attention of geoscientists for well over a century with the region ultimately evolving into a veritable geological testing ground. Of the several major complexes of back-arc basins in the western Pacific, the Philippine Sea seemed to show the most straightforward sequence of development. In this context, the West Philippine Basin (WPB) represents the oldest back-arc basin. Although extensive geophysical and petrological investigation have been integrated on relatively young basins (like the Shikoku and Pares Vela Basins and Mariana Trough) to prove tectonic and magmatic processes operative in these arc-back-arc basin complexes along with a deciphering of basin history, the WPB holds many of obscure points. To address unsolved question about its tectono-magmatic evolution, we conducted scientific dives by ROV *KAIKO* and regional mapping by marine geophysical survey systems of R/V *KAIREI* in the northwestern WPB.

Leg 1 of KR03-04 cruise started on 15 April 2003 at Yokosuka, Japan, and ended 17 days later at Naha, Japan, on 2 May 2003. Despite of unavoidable problems (medical emergency and bad sea condition by typhoon), a total of 7 dives (Dive 287 to 293) were performed by ROV *KAIKO*, even though we originally planed 12 dives. Trouble about crack initiation of the second cable between the launcher and vehicle resulted in Leg 1 being terminated 1 day early (also lost 1 dive), underscoring the necessity of continued exploration of the region.

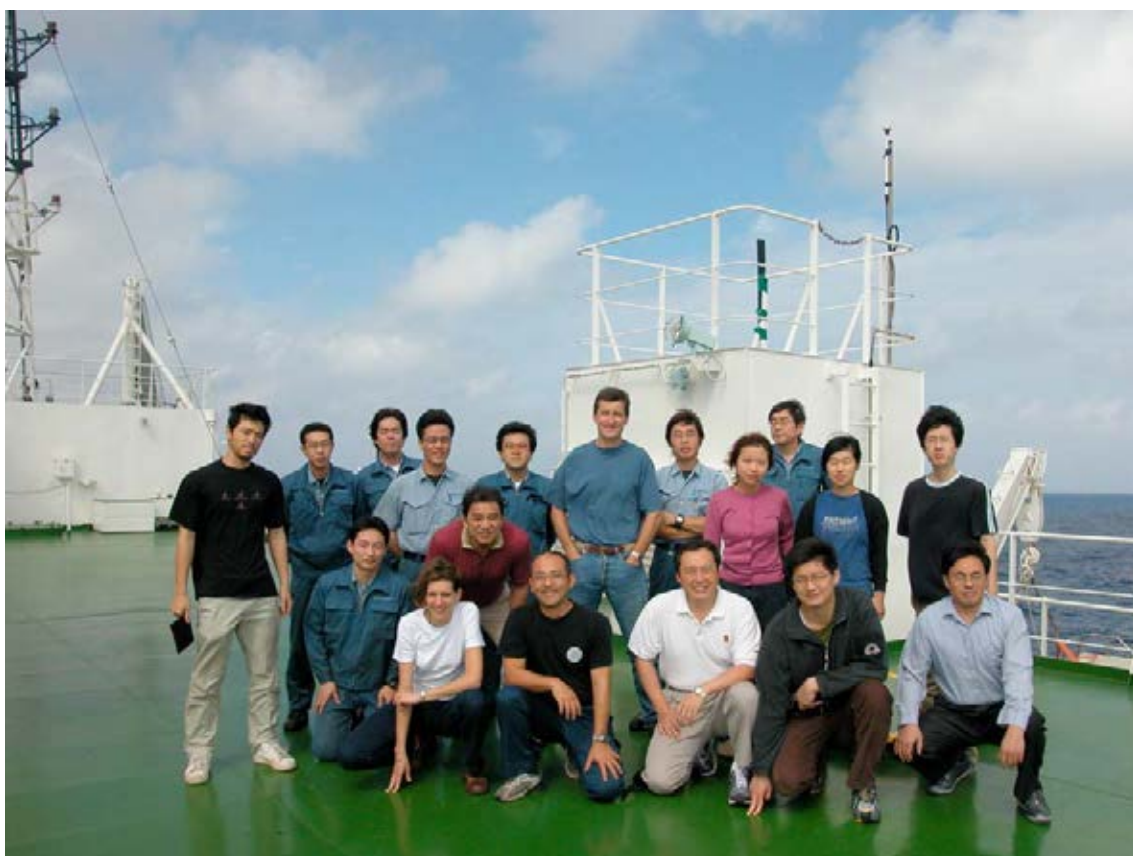
Six sites of dive (287-292) are located at the east of the Okinawa-Luzon Fracture Zone (OLFZ), in which one dive (290) is in northern Urdaneta Plateau. One site (293) is located at the west of OLFZ. Detailed results for all dives are presented in the following chapters. Significantly, except for dive 292, all the other dives recovered a number of relatively-fresh basalts and dolerites of basement, suitable for Ar/Ar dating and geochemical analyses. Multi-beam bathymetric survey revealed, though limited coverage, fine structure characterized by several overlapping spreading centers, a feature distinctive compared with the eastern WPB. Together with post-cruise laboratory works, including magnetic and gravity analyses, we believe that these provocative data will help for better understanding of the tectono-magmatic evolution of the northwestern WPB.

## Acknowledgements

The scientific party aboard *KAIREI* during Leg 1 of KR03-04 cruise gratefully acknowledges the assistance of numerous workers who made the expedition possible. The efforts and enthusiasm of Captain Osamu Yukawa, the ship's crew, and the ROV KAIKO Operation Team, in sea conditions that at times made operations very difficult, are especially appreciated.

We also sincerely appreciate the technical assistance and cooperation of the technical group (Nippon Marine Enterprises, Ltd.) who performed numerous tasks necessary for the success of the scientific studies.

Finally, we also acknowledge JAMSTEC Headquarters. The Liaison between the scientists and ship crew was effectively undertaken by Mr. Naoto Kimura (JAMSTEC).



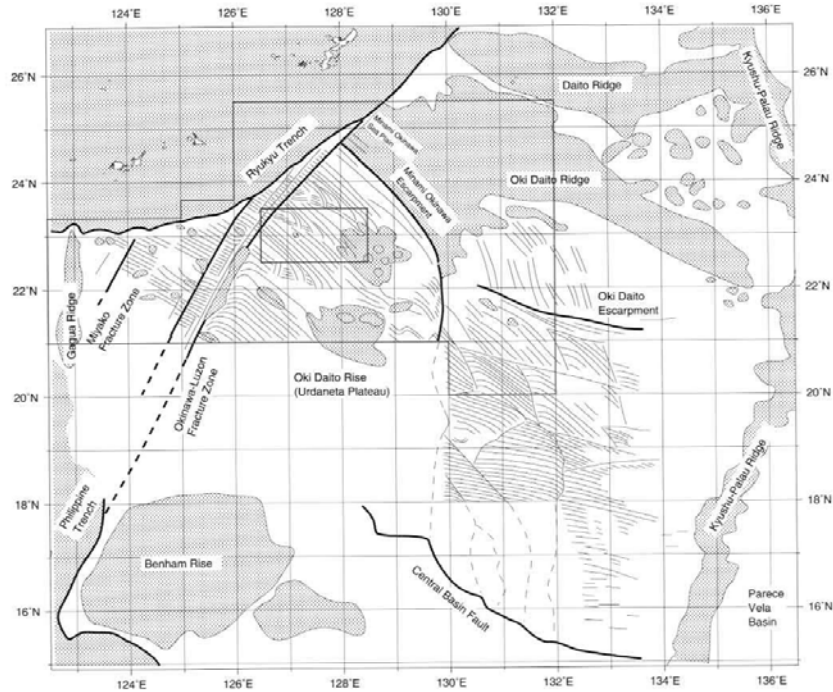
## 1. Introduction

The West Philippine Basin (WPB) is a currently inactive marginal basin belonging to the Philippine Sea Plate (Figure 1). The most referred model proposed for the spreading processes within the basin is from Hilde and Lee (1984). These authors analyzed magnetic anomalies and seafloor structures to propose a formation of the basin between 58 and 33 Ma, during two phases of spreading in a NE-SW and N-S directions respectively, from a single spreading center.

Since 1984, several geophysical surveys have been performed in the WPB, mainly over its central part. Data collected during these surveys show that its spreading history is much more complicated than was inferred in Hilde and Lee's model (Deschamps et al., 1999; 2002; Fujioka et al., 1999; Okino et al., 1999; Deschamps and Lallemand, 2002; Okino and Fujioka, 2003). Deschamps and Lallemand (2002) show that spreading occurred in the basin from 54 Ma until 33/30 Ma, and that the spreading history was characterized by (1) a strong rotation of the spreading system, (2) spreading segment propagations and jumps, and (3) by the development of a microplate in the western part of the basin. They evidence a spreading history that is more complicated in the western part of basin than in its eastern part, due to the presence of an active mantle plume in this region during spreading.

At the northwestern WPB, the Hydrographic Dept., Japan Maritime Safety Agency, has recently conducted geophysical surveys including seabeam mapping, gravity and magnetic anomalies (Figure 1; Yoshida et al., 2000; Nakagawa et al., 2000; Sugiyama et al., 2000). Based on these results, Yoshida et al. (2000) proposed the tectonic evolution of the region: At least three fabrics formed between two overlapping spreading centers have been identified. Deschamps and Lallemand (2002) propose that this area was formed by NE-SW -directed spreading, and that the spreading system was highly disorganized in this part of the basin, due to the presence of an active mantle plume during spreading. The Urdenata plateau in the northern basin, and the Benham plateau in the southern basin result from the interaction of such a mantle plume with the western part of the WPB spreading system (Okino et al., 1999; Deschamps et al., 2002; Deschamps and Lallemand, in press). The western part of the WPB then displays rough

and complicated morphology and excess magmatism. As proposed by Yoshida et al. (2000), Deschamps (2001) propose that several overlapping spreading centers developed in the vicinity of these plateaus, and that the spreading center progressively moved to the south through several southward jumps toward the mantle plume.



**Figure 1**

Another important feature of the western WPB is the Okinawa-Luzon fracture zone. It is hundreds km long over its apparent part (its northern termination might indeed have already been subducted into the Ryukyu Trench) and trends perpendicular to the spreading fabric. This feature is interpreted to be a major inactive fracture zone of the WPB that was active during spreading in the Eocene time (Hilde and Lee, 1984; Deschamps et al., 1999; Deschamps and Lallemand, 2002). Because the spreading segments on both sides of this feature are not well-expressed in a morphological point of view, because there is no good-quality magnetic line on its both sides, and because there is only one age that has been determined on the basement west of this fracture zone using K-Ar or Ar-Ar whole rock methods on very altered samples (Karig et al., 1975; Ozima et al., 1983), the age and the sense of offset along this fracture zone remains speculative (Hilde and Lee, 1984; Deschamps and Lallemand, 2002).

## 2. Objective and strategy of the cruise

Despite the occurrence of magnetic data on the Northwestern part of the WPB (Hilde and Lee, 1984; Okino et al., 1999), the age of the crust in this area is still uncertain, because of the disorganization of the magnetic anomalies that prevents authors to perform a reliable identification. Models for the development of the basin indicate this area may be 50-45 Ma (Deschamps and Lallemand, 2002). However, these results are conflicting with dating on few samples recovered by SHINKAI-6500 in 1992 near the Ryukyu Trench, east of the Okinawa-Luzon Fracture Zone (Fujioka et al., 1994), which indicate ages of about 25 Ma (Shinjo, in preparation). Their chemical and isotopic characters are similar to those of ocean island basalts (OIB)-like basalts recovered at DSDP 292 (Benham Rise), 294 and 446 (Daito Basin) reported by Hickey-Vargas (1998). Alkali basalts and related rocks from the southern Urdaneta Plateau have been dated at ~23 Ma and ~40 Ma by K-Ar method (Shcheka et al., 1995). In 1999, ROV Kaiko (Dive#122) recovered basaltic fragments at seamount close to the Okinawa-Luzon Fracture Zone (Preliminary Report of R/V KAIREI KR99-07 Cruise Leg 1 & 2). Although Ar-Ar dating and geochemical analyses for the rocks are in progress, they are fresh and look young. These available age data appear to be surprisingly young, because this region has been thought to represent the early part (~50 Ma) of opening episode of WPB (Hilde and Lee, 1984; Deschamps and Lallemand, 2002) according to the magnetic anomalies identification and to the geodynamic models. This also conflicts with the previous conclusion that spreading of WPB ceased near 33/30 Ma.

The objectives of this cruise are:

- (1) geophysical mapping (bathymetry, gravity, magnetic) of the northwestern part of the WPB
- (2) the collection of basement rocks in order to perform (a) dating and (b) geochemical analyses.

Multibeam, gravity field, and magnetic field data were collected during this cruise. These data are used to investigate (1) the structure and the age of this part of the basin, (2) to determine the amount and the sense of offset along the Okinawa-Luzon

Fracture Zone, and (3) the influence of the hot spot on the development of the basin. In general, we wish to define more precisely the spreading processes in this complicated area.

### **3. Cruise synthesis: bathymetric data**

Bathymetric data were obtained by SEABEAM 2112, which has 149 beams. The system consists of 12 kHz projector array along the ship's keel and hydrophone array across the projector. SeaBeam 2112 synthesizes 2°x2° narrow beams at the interval of 1, and the swath width varies from 120° at intermediate depth (4500 m) to 90° at deeper seas (11 000 m). The ping interval increases with water depth, for example about 13 sec at 4000 m. The accuracy of the depth measurement is reported as 0.5% of the depth. The software that controls the system is SEA VIEW; raw data include data record (bathymetry, intensity, beam position), side-scan record (binary side scan image), nautical information, and correction parameters such as water velocity structure. Software used for post processing are Sea View, MB system and GMT.

One of the important parameters for depth and position accuracy of the bathymetric survey is the sound velocity profile. SeaBeam 2112 system uses the velocity data for calculating the depth and position of each beam, and also for the beam forming process. The temperature of the surface layer is most important in this regard and the system measures and uses surface temperature in real time. Except for the surface layer, the user should input the appropriate velocity profile. During KR03-04 cruise, several XBT measurements to about 1830 m water depth have done, because of the presence of strong currents in the survey area. The obtained temperature profiles are shown on Figures 2 to 5. For depth greater than 1830 m, reasonable temperature and salinity values were used for calculation. We edited bathymetric data (deletion of bad data) and made grid files with 100 and 150 m of resolution. Global maps were grided at 200 m of resolution.

Navigation map is shown on Figure 6. Some long lines are parallel to the Okinawa-Luzon Fracture Zone (which is N30 to N50E -oriented) and nearly normal to the spreading fabric developed in the region. Geophysical data have also been acquired at the location of dive sites. Bathymetric data were collected on both sides of the Okinawa-Luzon Fracture Zone (Figure 7) in order to characterize the seafloor on its both sides. Detailed maps (100 m -interval grids) allow us to establish structural maps (Figures 8 to 13). This allow us to make preliminary observations:

- (1) The depth of the survey area is generally comprised between 5500 m and

6000 m (Figure 14). It is much shallower at the vicinity of the Urdenata Plateau, where it raises up to 3400 m.

(2) East of the Okinawa-Luzon Fracture Zone (FZ), the spreading fabric generally trends N135 in the northernmost part of the basin, and its orientation progressively changes till N120 toward the central part of the basin. West of the FZ, the trend of abyssal hills is roughly constant with a N120E value.

(3) The Okinawa-Luzon FZ was surveyed (1) at its northernmost part, where it merges with the Ryukyu Trench, and (2) at its central part. The FZ consists in several linear and parallel faults (at least 3 at latitude 21°30'N). The FZ trends N45 and N25E at these two locations, respectively. The variation of FZ trend roughly correlates with the variation of abyssal hills trend mentioned above. This indicates that the spreading direction has changed by 20-25° during spreading at the survey area east of the FZ.

(4) The occurrence of seamounts and of volcanic ridges that parallel to the spreading fabric indicates excess of volcanism during spreading. This is likely due to the presence of a hot spot in the WPB's region during spreading. Geochemical analyses of samples collected during Kaiko dives will help us to determine more precisely the influence of such a hot spot on the spreading system.

(5) At several places in the survey area, deep curved valleys (up to -6600 m at 23°45'N/127°40'E and 22°10'N/127°15'E) are observed (Figs. 14). Immediately south of these valleys, discordant spreading fabrics are systematically observed. These fabrics generally trend NW-WNW. It is interpreted as fabric formed between overlapping spreading centers. The location and shape of the successive failed rifts and associated discordant fabrics indicate that discordant fabric was formed when the current spreading axis was overlapped by another stronger one located more to the south. New spreading axes did propagate from east to west in the east of FZ. Failed rifts have retreated also from east to west.

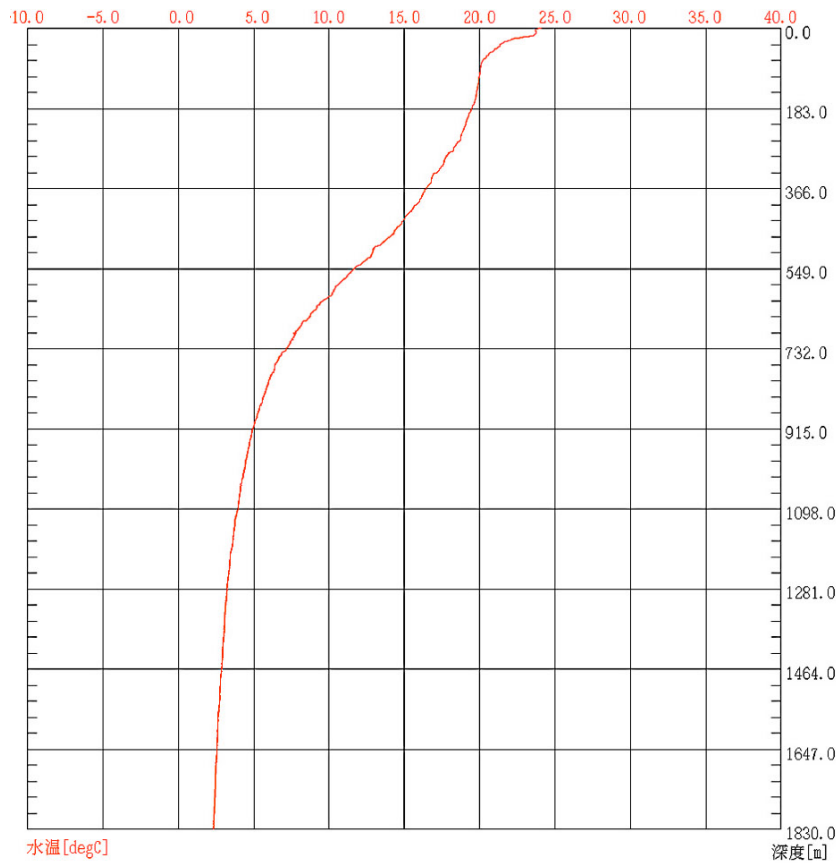
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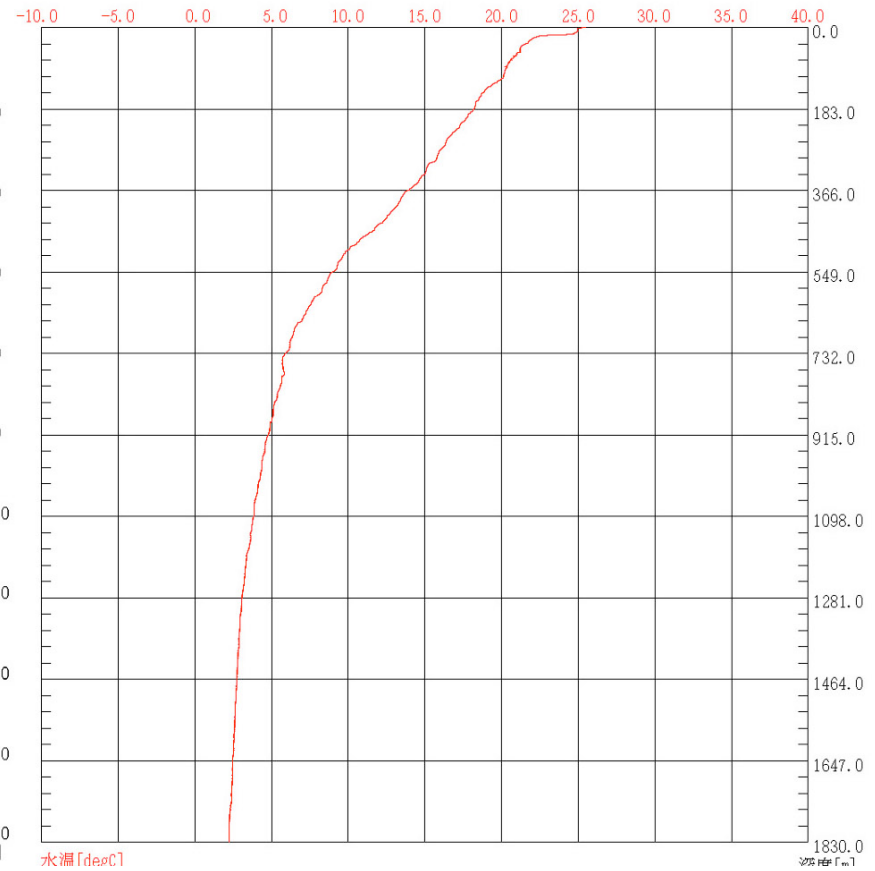


Figure 2 : XBT measurement on the 2003/04/22 and 2003/04/23

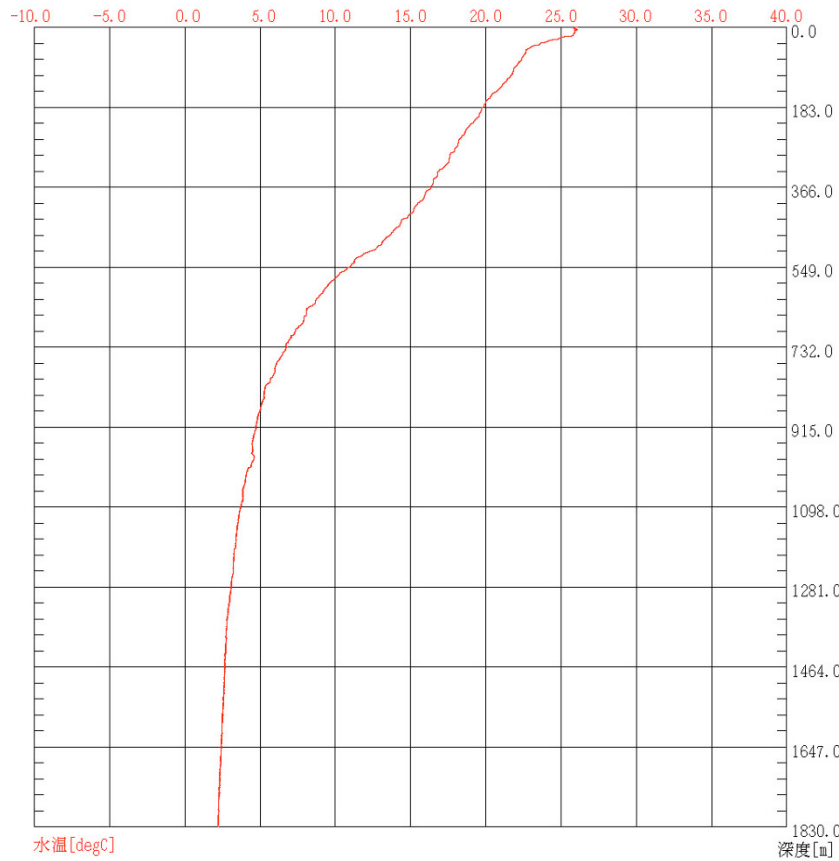
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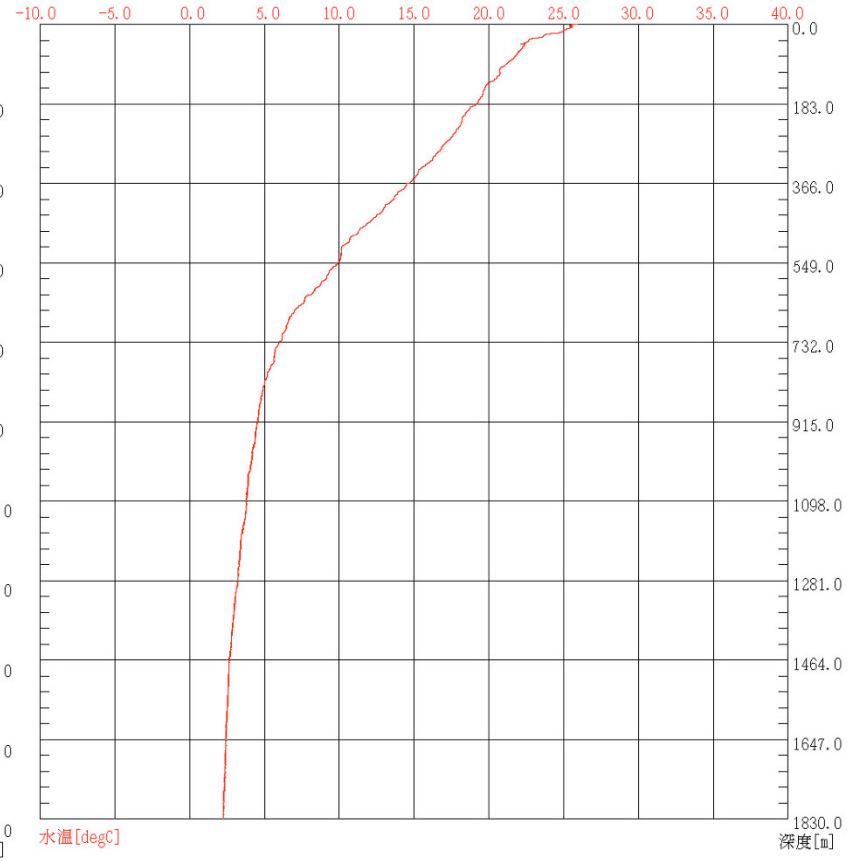


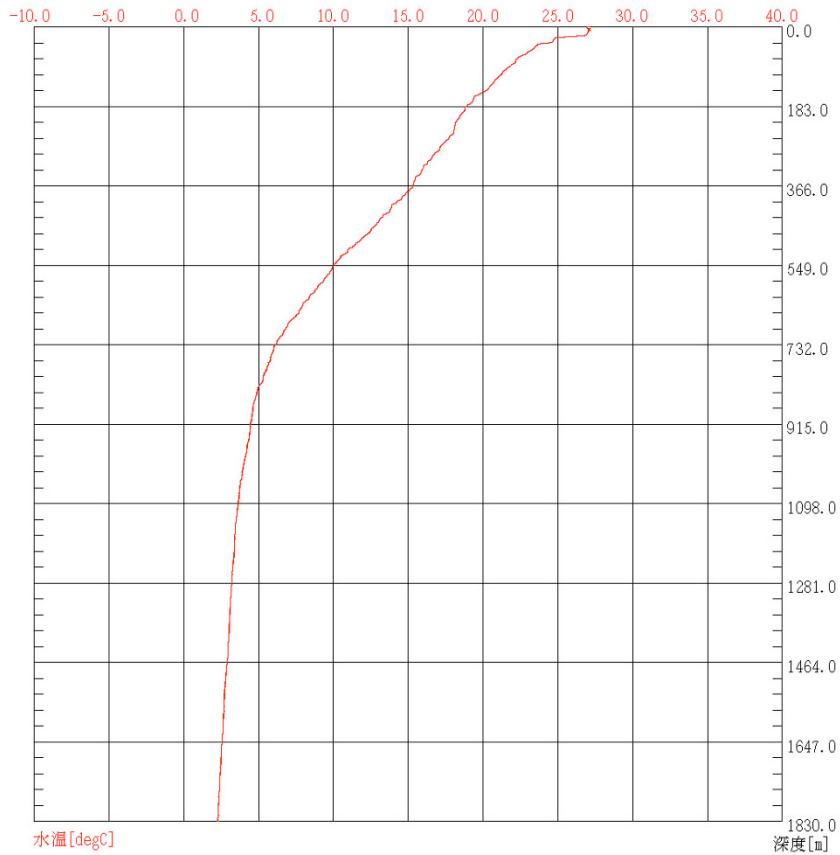
Figure 3 : XBT measurement on the 2003/04/24 and 2003/04/25

Figure 4 : XBT measurement on the 2003/04/26 and 2003/04/27

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緯度 : 22-37.6653N	データ数 : 5821	深度ステップ : ALL
経度 : 128-31.3296E		

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緯度 : 21-54.1463N	データ数 : 5821	深度ステップ : ALL
経度 : 126-29.9483E		

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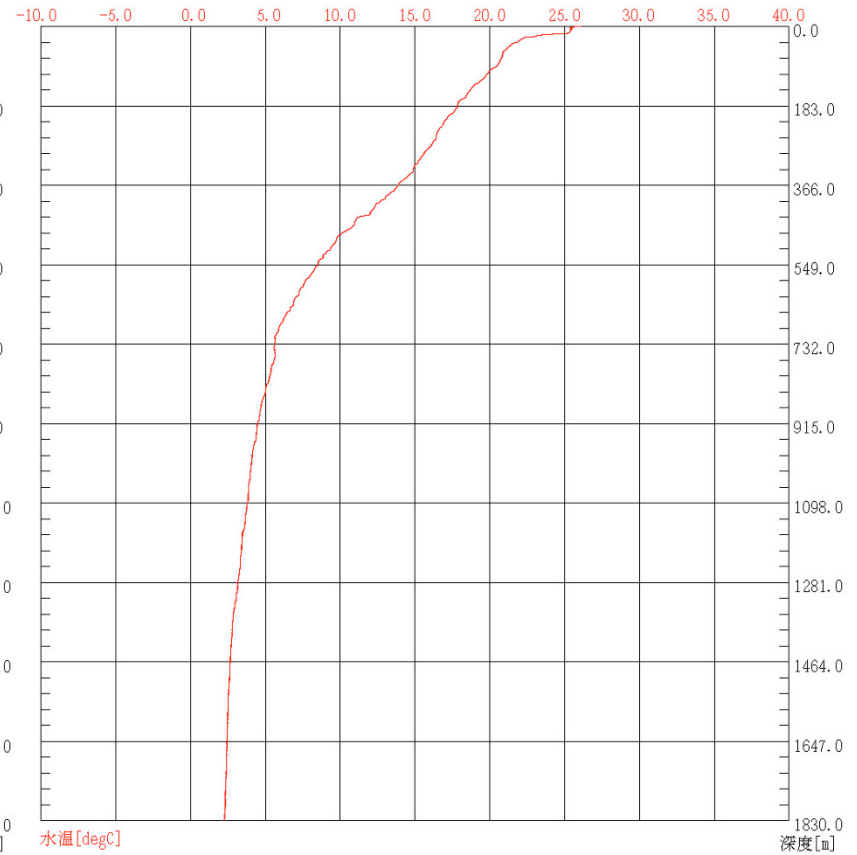


Figure 5 : XBT measurement on the 2003/04/29 and 2003/04/30

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 データ数 : 5801

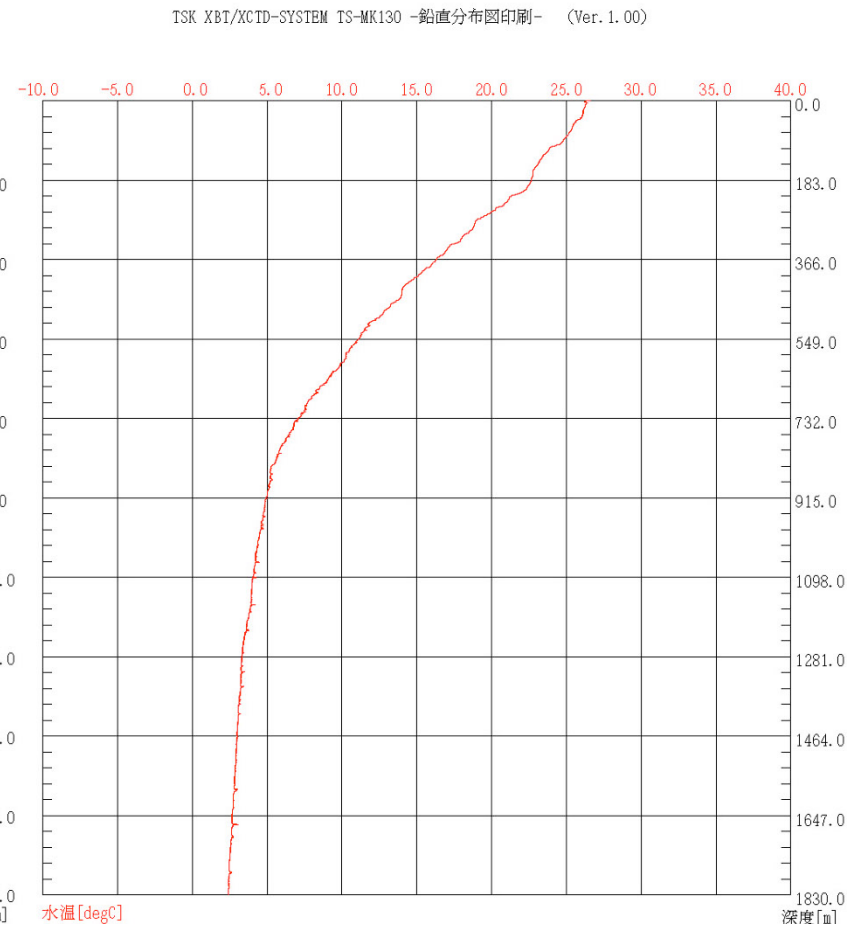
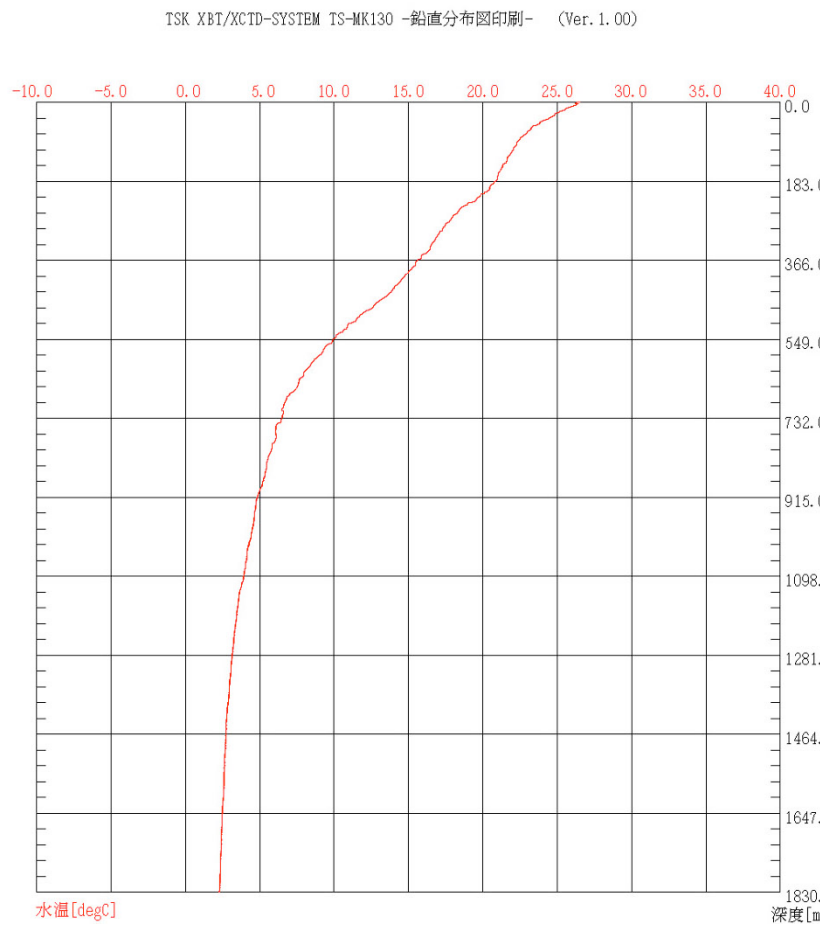
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 BATHY処理器 : 46  
 深度ステップ : ALL

TSK XBT/XCTD-SYSTEM TS-MK130 Tsurumi-Seiki CO.,Ltd (Ver.1.00)

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 経度 : 124-55.8052E

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 深度係数 b : -1.82  
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 データ数 : 1831

BATHYプローブ : 231  
 BATHY処理器 : 46  
 深度ステップ : 1m



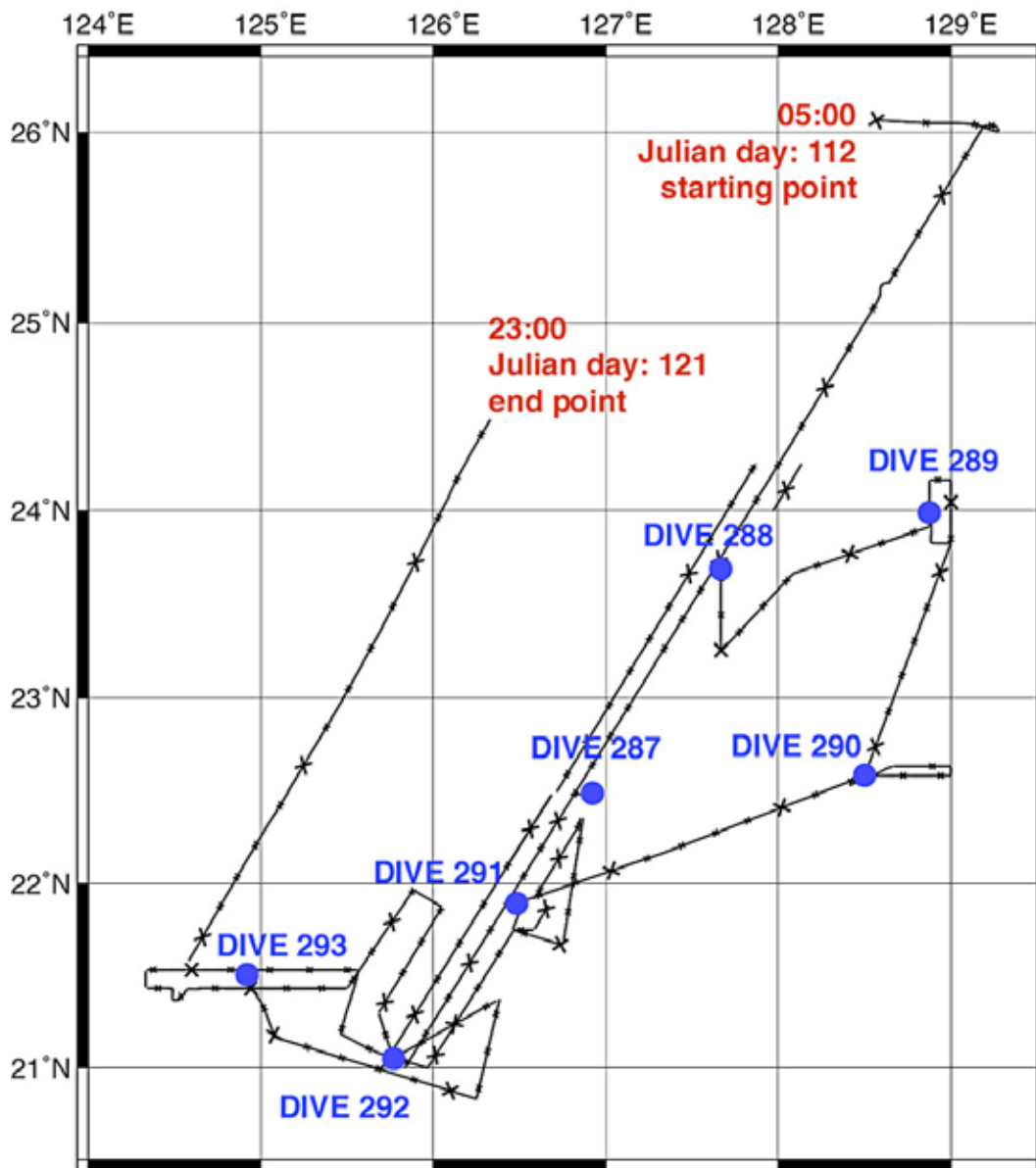


Figure 6 : navigation map of the KR03-04 cruise, with the location of dive sites

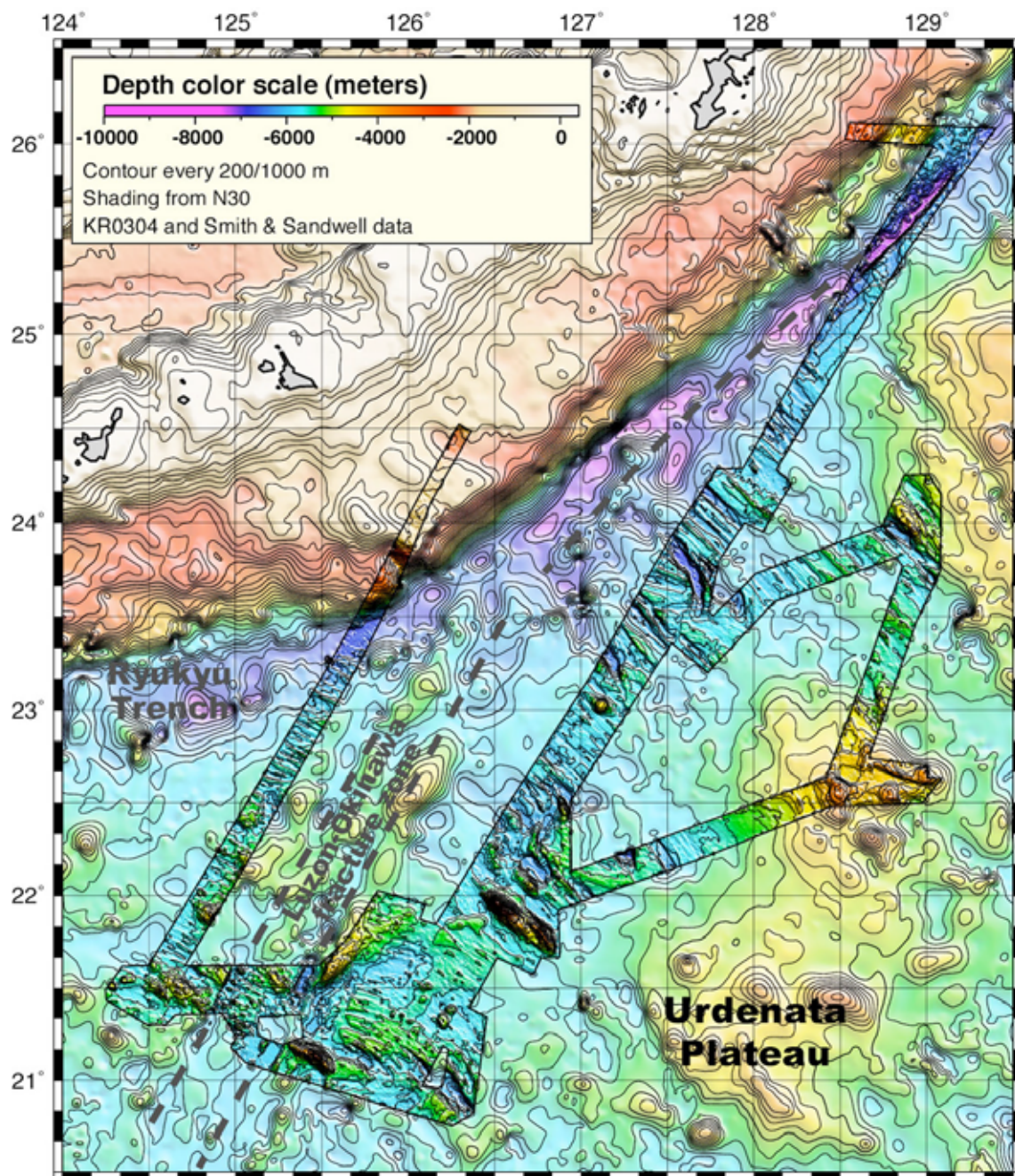


Figure 7 : Bathymetric data from KR03-04 cruise, mixed with Smith and Sandwell's 2 -minutes altimetric data.

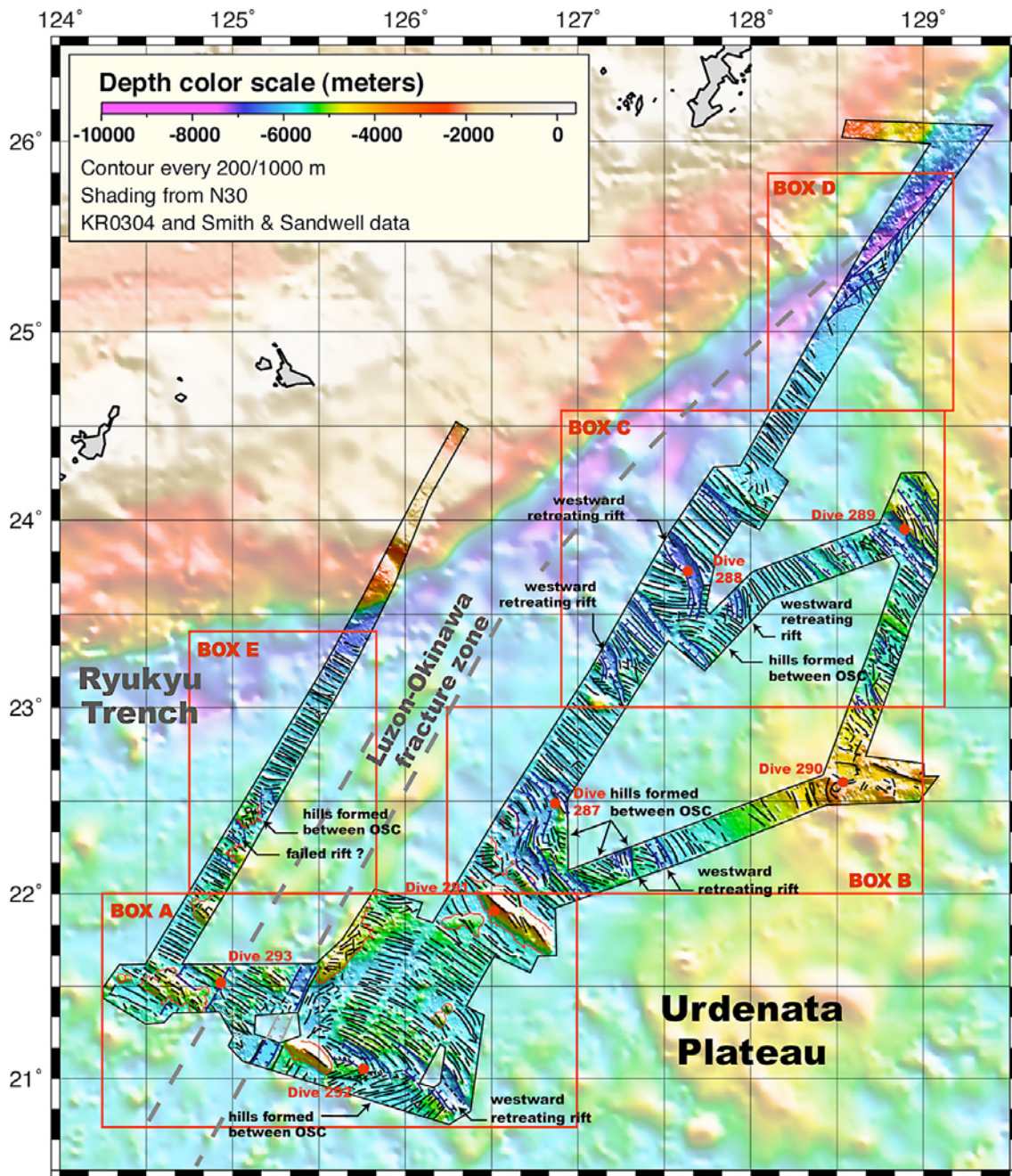


Figure 8 : Global structural map of seafloor surveyed during the KR03-04 cruise, with the location of boxes A, B, C, D, E shown on the next figures. Diving sites are plotted.

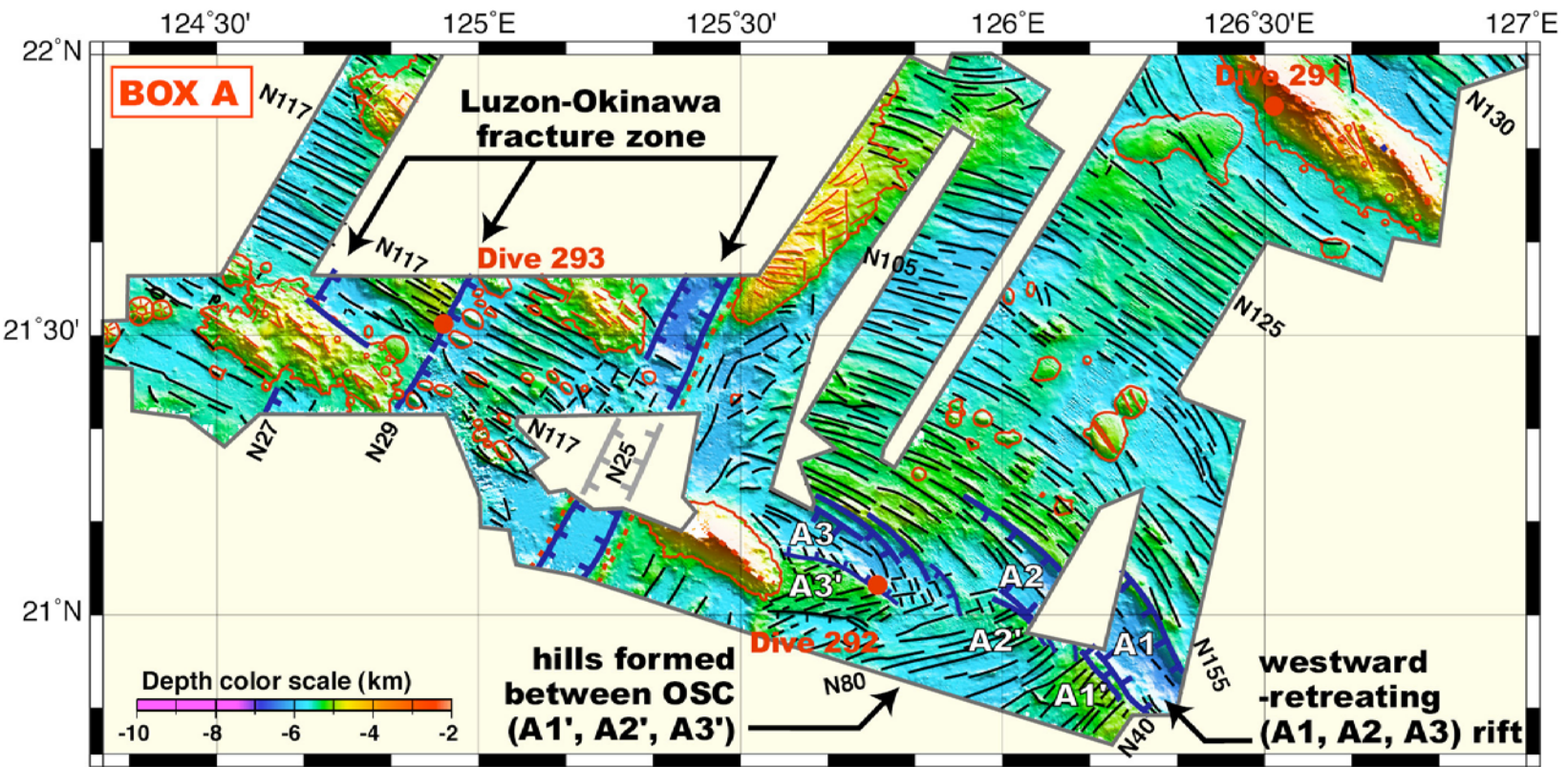
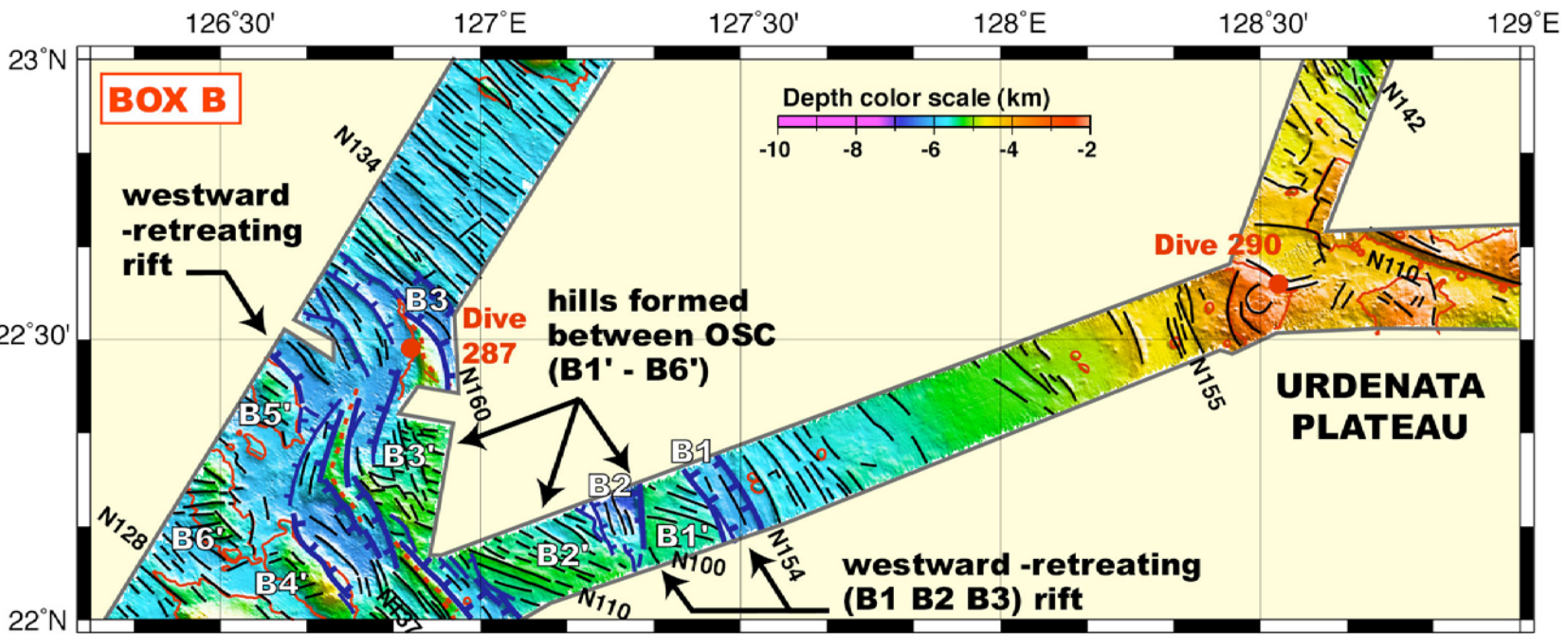


Figure 9 : Structural map of seafloor in the southernmost part of the KR03-04 survey. Location of the box on figure 7.

Figure 10 : Structural map of seafloor: Location of the box on figure 7.



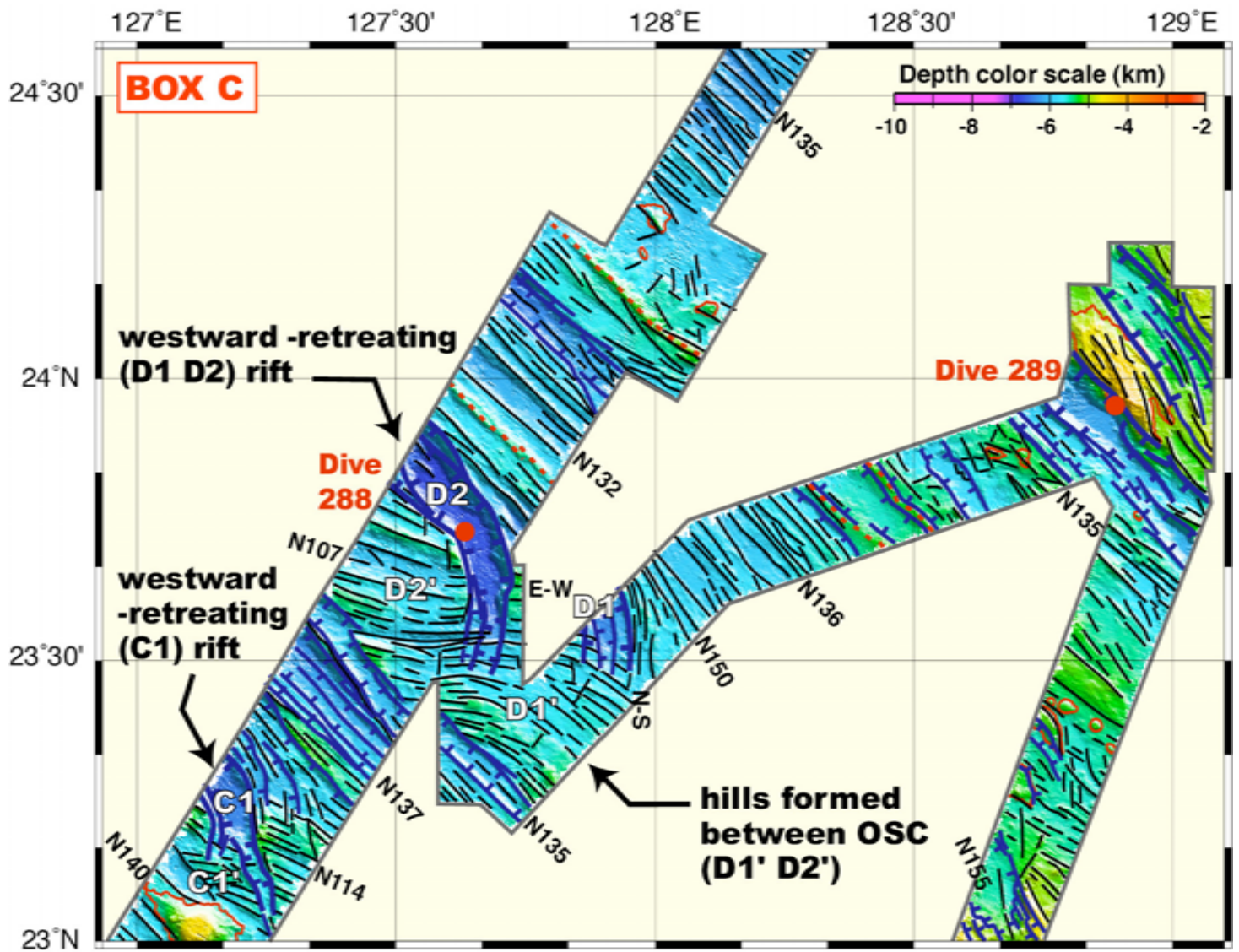


Figure 11 : Structural map of seafloor at the vicinity of the southern boundary of the Oki-Daito Ridge. Location of the box on figure 7.

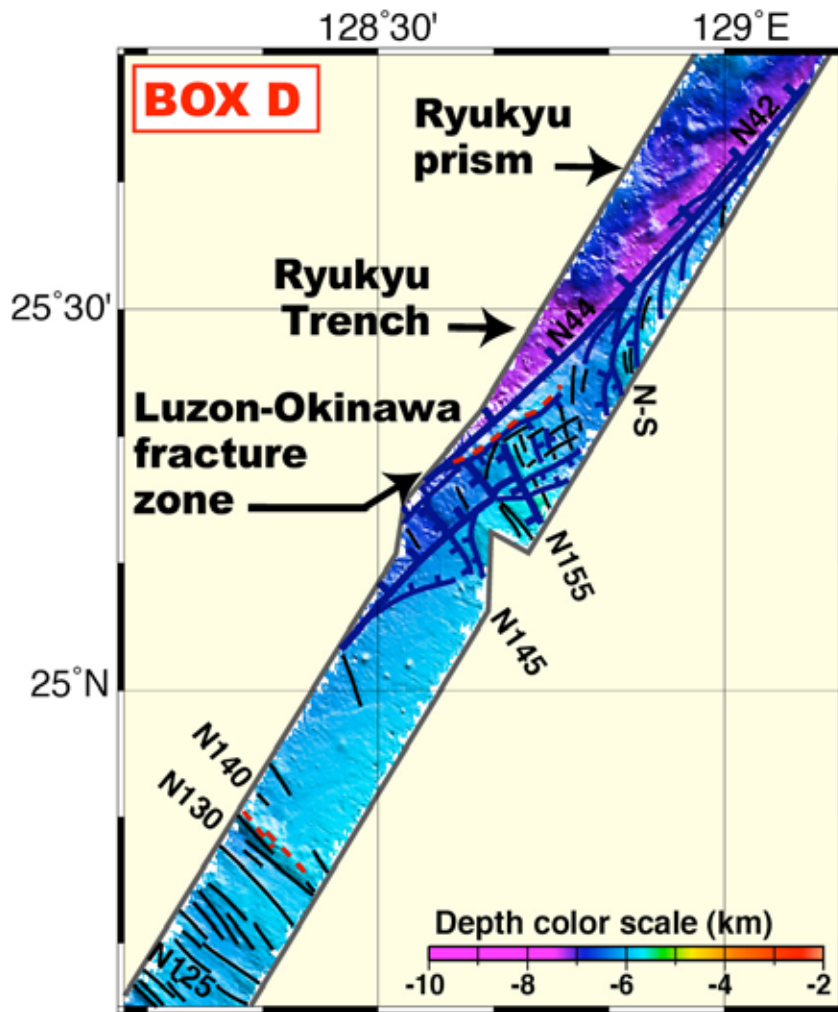


Figure 12: Structure of seafloor at the intersection of the Luzon-Okinawa Fracture Zone and to the Ryukyu Trench. Location of the box on figure 7.

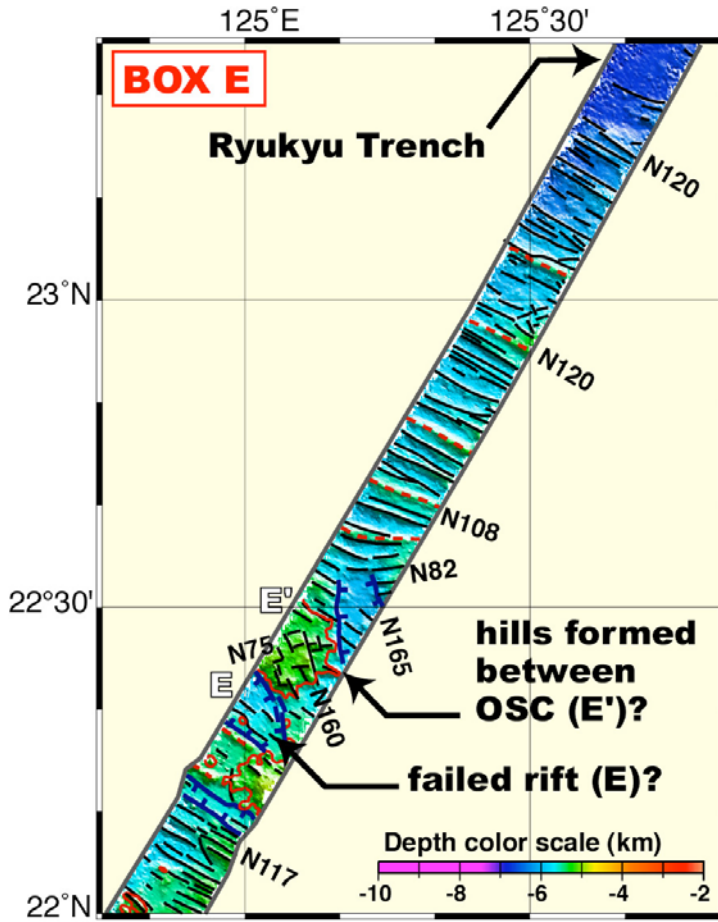
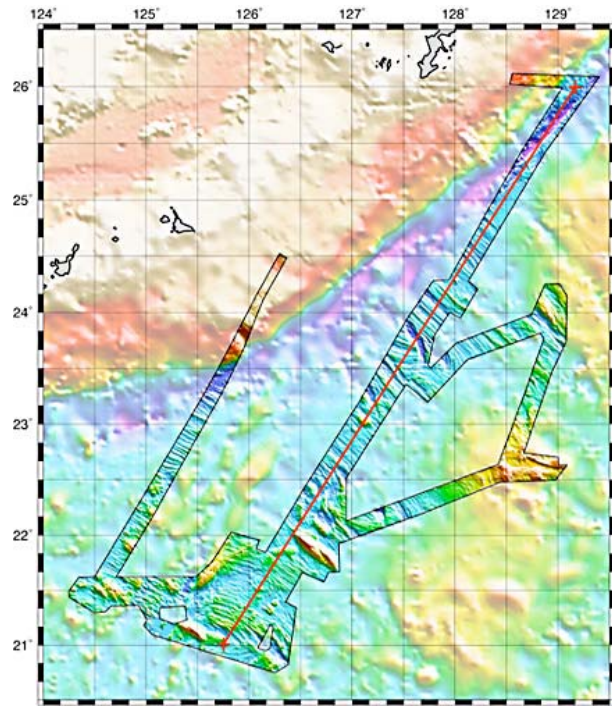
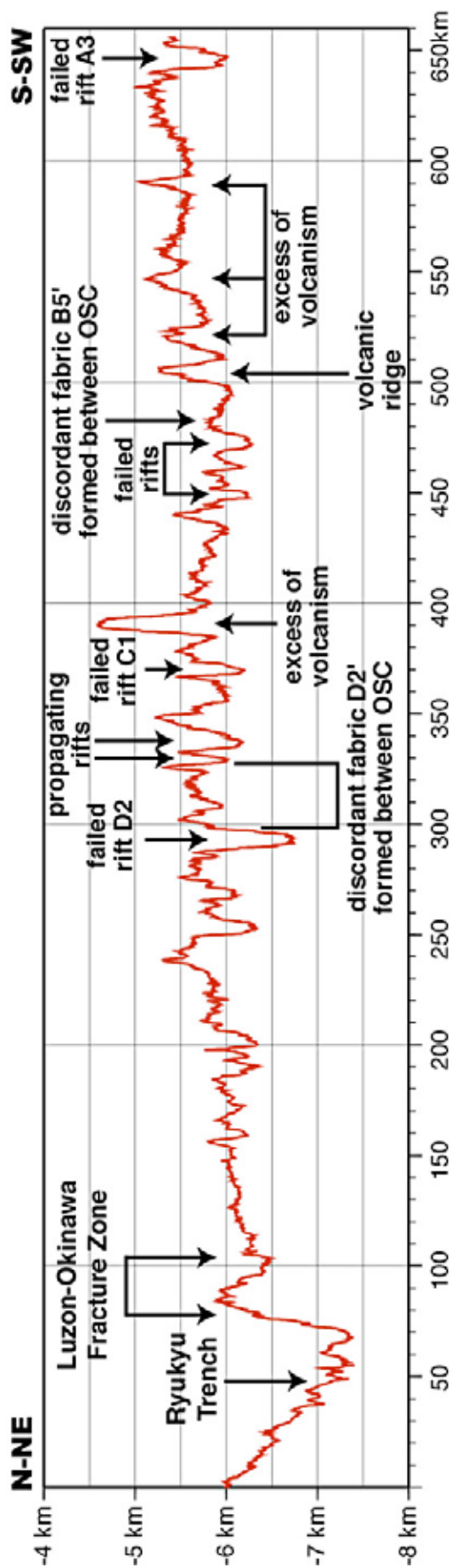


Figure 13: Structure of seafloor west of the Luzon--Okinawa Fracture Zone, and close to the Ryukyu Trench. Location of the box on figure 7.



**Figure 14 : Bathymetry along a NNE-SSW -oriented profile. Start point : 129°10'E/26°N. End point : 125°45'E/21°N). The profile is located east of the**

#### **4. Dive plans, log, and preliminary results**

## **KR03-04 Leg-1 Dive#287 Dive Plan**

**Date of Dive:** 24 April 2003 (Thu)

**Observer:** Ryuichi Shinjo (Univ. Ryukyus)

**Target area:** NW part of the West Philippine Basin; point **A-4**

Start Point: 22°29.00'N 126°52.00'E Depth=6000 m

End Point: 22°29.00'N 126°53.00'E Depth=5100 m

### **Payload:**

- partitioned sample basket
- push core (one set including 2 cores)
- ~30cm-long stick for digging

### **Objectives:**

The objectives of dive#287 are:

- 1) to observe the outcrop exposed at the slop of NW-SE trending seamount, which was formed with relation to the spreading the the basin;
- 2) to collect volcanic rocks exposed at the outcrop, in order to determine its ages and petrological-geochemical characteristics.

### **Dive strategy:**

- 1) Landing at the base of slop (~6000 m depth), then move eastward to the top (5000 m)
- 2) Observing and exploring the outcrop of hard rock
- 3) Collecting the most fresh samples (maybe basalts)
- 4) etc.

### **Data:**

- Video records (by Hi-vision and panorama middle cameras)
- Pictures taken by still-camera
- CTD data
- seismic data (sub-bottom profile) by the launcher

# かいこう 潜航記録

平成 15 年

KR03-04 行動

記載者 三浦 豊司

潜航年月日 2003 年 04/24

着底予定位置

潜航回数 1 回

緯度 22° 29.00' N

通算潜航回数 287 回

経度 126° 52.00' E

測地系 WGS-84

潜航海域 西フィリピン海 北西部 A-4

潜航目的 調査潜航 海洋地殻の拡大年代とそのメカニズムを解明するため、新鮮な基板岩の採取と露頭観察を行う。

調査主任 新城 竜一

ランチャー PILOT 若松 豊

所属 琉球大学

PILOT 三浦 豊司

COPILOT 藤 勝利

作業経過時刻		
吊揚		08:22
着水		08:27
離脱		10:27
着底		10:38
離底		14:30
結合		14:49
水切		16:19
揚収完了		16:27

累計時間	
潜航時間	7:52
前回潜航	1807:15
通算潜航	1815:7

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	8:5	1次番号	2
1次前回時間	1876:11	1次番号別前回時間	962:56
1次通算時間	1884:16	1次番号別通算時間	971:1
2次使用時間	4:22	2次番号	4
2次前回時間	873:27	2次番号別前回時間	428:06
2次通算時間	877:49	2次番号別通算時間	432:28

## 海象・気象

天候 bc 風向 SSE 風力 4 波浪 3 うねり 3 視程 7

最大潜航深度 5992 m

着底深度 5992 m

離底深度 5353 m

着底底質 泥

離底底質 礫混じりの泥

記事

分離曳航にて海底を観察しながら航走し、適宜岩石の採取を行った。

## Preliminary Results of KAIKO Dive

<b>Dive No.</b>	287	<b>Date</b>	April 24, 2003	
<b>Main Purpose</b>	<p>The objectives of the dive are:</p> <p>1) to observe the outcrop exposed at the slop of NW-SE trending seamount, which was formed with relation to the spreading the the basin;</p> <p>2) to collect volcanic rocks exposed at the outcrop, in order to determine its ages and petrological-geochemical characteristics.</p>			
<b>Dive Site</b>	The central part of the 3rd failed rift developed near the Urdaneta Plateau, NW part of the West Philippine Basin.			
	<b>Latitude</b>	<b>Longitude</b>	<b>Time</b>	<b>Depth (m)</b>
<b>Landing</b>	22-29.07	126-51.96	10:38	5,992
<b>Lift-off</b>	22-29.10	126-52.55	14:30	5,353
<b>Payload</b>	<ul style="list-style-type: none"> <li>- 6-partitioned sample basket</li> <li>- Stick (~30 cm long)</li> </ul>			
<b>Dive Summary</b>	<p>Along the survey track, most parts are covered by mud, but pebbles from place to place. These pebbles (with smoth surface of Mn coating) were hard and heavy weight to pick up by manipulator. On the way to the top, we observed continuous outcrop, looking like pillow lavas; but totally coated with Mn oxide.</p> <p>The rocks taken by this dive can be divided into four types: 1) basaltic rock with thick (~30 cm) Mn coating, 2) sandstone (?) with thin (~0.5 cm) Mn coating, 3) pumice and scoria without Mn coat, and 4) Mn crust (some have highly-altered igneous rock core).</p>			
<b>Key words</b>	West Philippine Basin, Overlapping Spreading Center, Basalts			

## Preliminary Results of KAIKO Dive

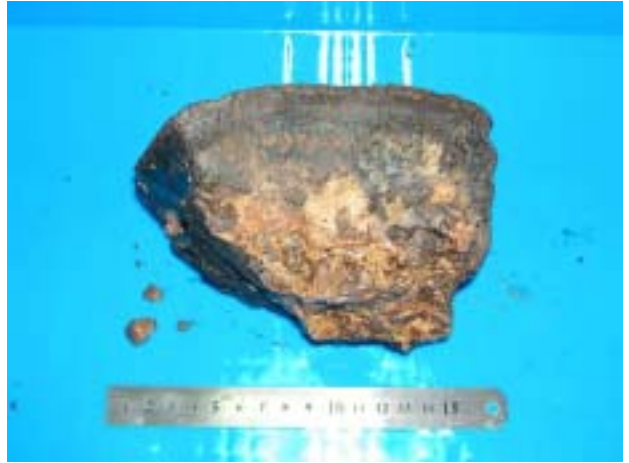
Dive#	287	Name	Ryuichi Shinjo
<p><b>1) Topography, Geology and Geophysics</b></p> <p>The landing area was covered by mostly mud, but sporadically Mn-coated boulders were observed. Gently undulating slop was observed. The strike of these reliefs is NW-SE trending, concordant to general trend (spreading fabric) developed around this area. At around 5600 m water depth, continuous outcrop (~5 m height) without sediment cover were observed, but these are coated with Mn oxide (~30 cm thick); they look like aggregation of pillow lavas. Due to heavy coating of Mn-crust on the scarp (scratching with steel stick was not effective), we cannot identify geology of the outcrop. In side of one large rock taken along cranny of Mn-pavement, basaltic rock was recovered. Numerous cracks, spacing ~1 m, developed on the Mn-pavement, which may be related to mass movement after coating by probably earthquakes.</p>			
<p><b>2) Biology and Microbiology</b></p> <p>N/A</p>			
<p><b>3) Chemistry</b></p> <p>N/A</p>			
<p><b>4) Ocean Physics</b></p> <p>N/A</p>			
<p><b>5) Engineering</b></p> <p>N/A</p>			
<p><b>6) Others</b></p>			

## Video Results of KAIKO Dive

Dive#	287	Name	Ryuichi Shinjo
<b>Video Time, Camera No., and Comments</b>			
<p><b>1) 1104 - 1108 Center camera (broadcast-station-grade camera)</b>            Water depth=5963 m. Landing area. Mud covering sporadic pebble-like Mn-coated rocks, which are hard to pick up by manipular</p>			
<p><b>2) 1236 - 1239 Center camera (broadcast-station-grade camera)</b>            Water depth=5640 m. Sandstone (?) (15x15x10 cm) pebble on the pillow lava-like surface consisting of Mn-coating.</p>			
<p><b>3) 1238 – 1241 Center camera (broadcast-station-grade camera)</b>            Water depth=5640 m. Scoria block (~15 cm diameter) on the surface.</p>			
<p><b>4) 1250 – 1255 Center camera (broadcast-station-grade camera)</b>            Water depth=5607 m. Scarp totally coated by Mn oxide (Mn pavement).</p>			
<p><b>6) 1321 – 1326 Center camera (broadcast-station-grade camera)</b>            Water depth=5538 m. Crack developed on the surface of Mn coating. Basaltic sample was collected at the one of fragmented block.</p>			
<p><b>7) 1330 – 1333 Center camera (broadcast-station-grade camera)</b>            Water depth=5529 m. Crack developed on the Mn coating surface.</p>			



287\_basalt



287\_Mn crust



287\_pumice and scoria



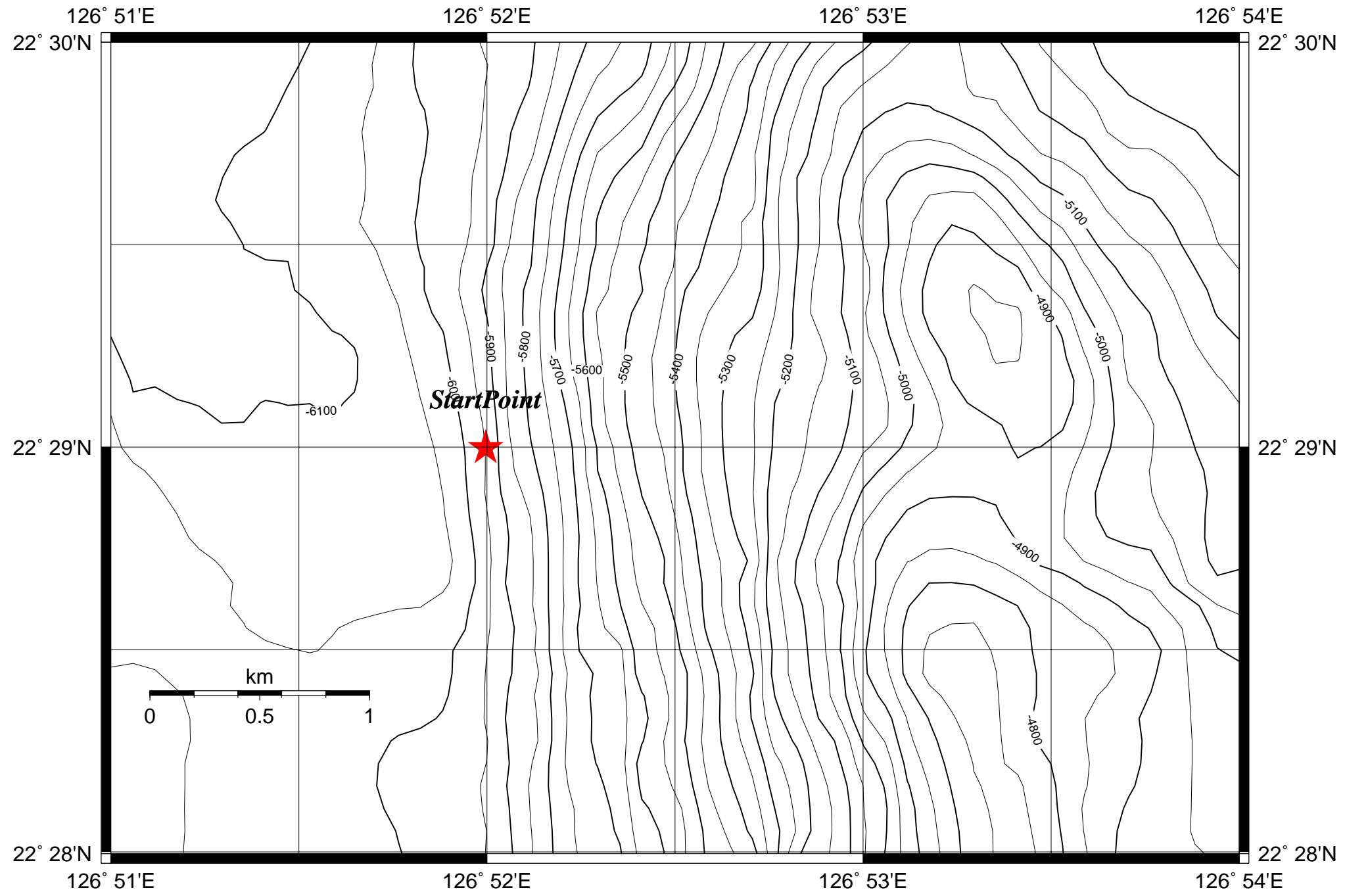
287\_sandstone

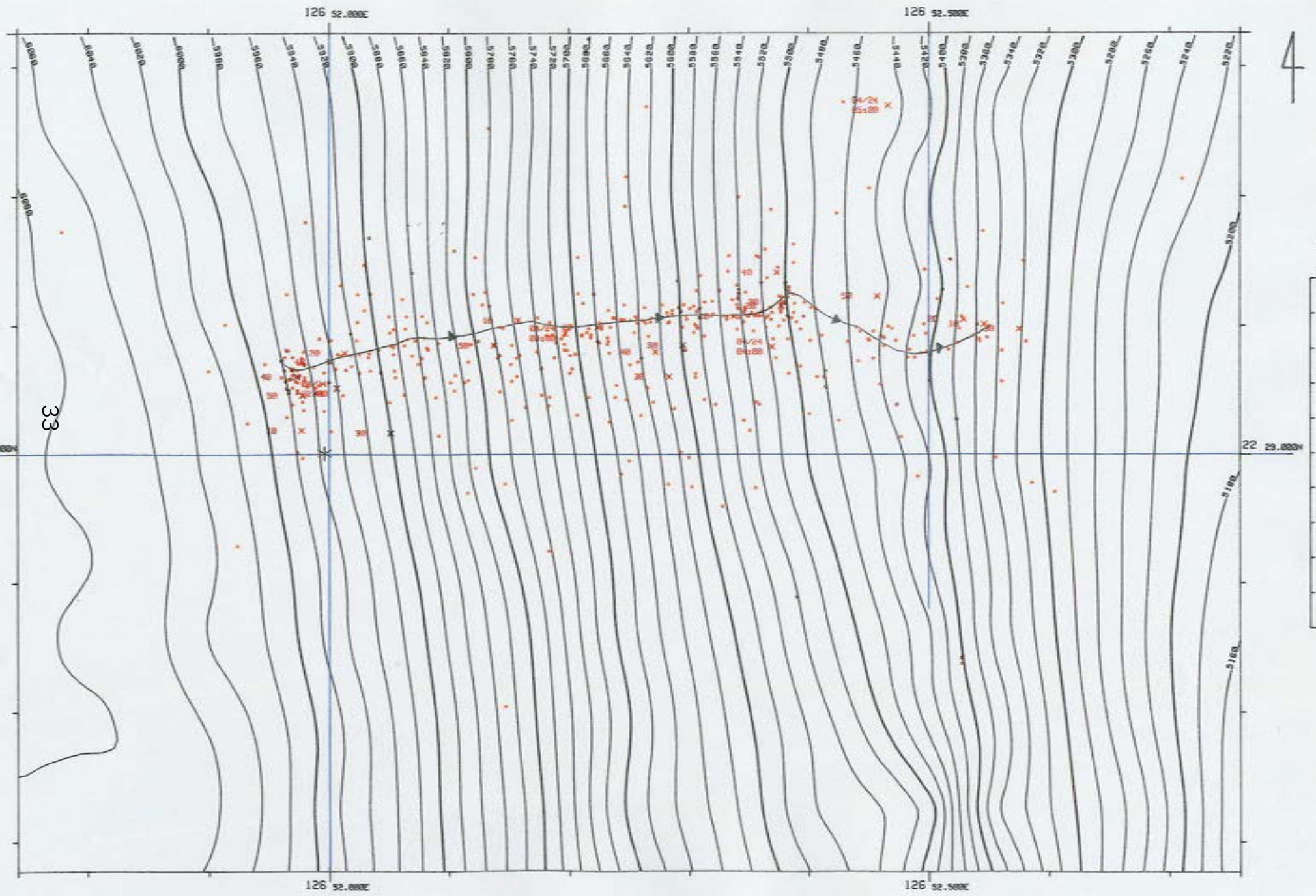
**Dive No. #287**  
**Date 2003/4/24**

Time(hh:mm)	Vehicle			Narrative	Sample
	Depth(m)	Altitude(m)	Heading(deg)		
10:28	5853	-	186	Kaiko detaches from launcher	
10:36	5983	-	88	bottom seen	
10:38	5991	0.2	88	kaiko touches down on muddy & some rocks's bottom	
10:47	5989	1.4	-	1rock in box	R4
10:53	5977	1.8	-	1rock in box	R2
10:59	5977	1.5	112	1rock in box	R3
11:02	5977	1.5	112	1rock in box	R4
11:04	5972	2.5	115	get 1rock , but it is broken	
11:07	5963	2.2	103	1rock in box	R5
11:13	5962	1.8	111	try to move the rock by the stick , but it is not move	
11:27	5898	1.7	95	1rock in box	R5
11:33	5888	1.4	96	1rock in box	R5
11:36	5887	3.4	88	traveling to 5700m depth	
11:58	5726	0.5	97	8rocks in box	R6
12:16	5705	1.2	87	5rocks in box	R6
12:20	5703	1.1	99	3rocks in box	R6
12:39	5694	4.7	89	add 2 rocks in box R3	R3
12:45	5639	2.4	65	add 2 rocks in box R3	R3
13:02	5563	1.6	78	get 1rock , but it is broken	
13:09	5562	1.8	99	add 1 rock in box R4	R4
13:12	5557	1.9	77	add 2 rock in box R4	R4
13:19	5536	1.1	51	some manganese's rocks are cracked add 2 rocks in box R4 add 1 <b>big rock</b> in box R2	R4 R2
13:30	5534	2.8	80	traveling along the crack	
13:40	5520	1.6	81	add 1 rock in box R5	R5
13:50	5462	3.2	78	add 1 rock in box R5	R5
14:09	5423	0.9	98	add 3 rocks in box R5	R5
14:31	5350	2.9	118	leave bottom	

Sample box No.

*KAIKO #287Dive*





4

KM  
50  
0

## KR03-04 Leg-1 Dive#288 Dive Plan

**Date of Dive:** 25 April 2003 (Friday)

**Observer:** Serge Lallemand (Montpellier Univ.)

**Target area:** NW part of the West Philippine Basin; point **A-2**

Start Point:	23°42'20"N	127°37'55" E	Depth = 6600 m
or	23°42.33' N	127°37.92' E	
End Point:	23°41'30"N	127°36'50"E	Depth = 5300 m
	23°41.50 N	127°36.83'E	

### **Payload:**

- partitioned sample basket
- push core (one set including 2 cores)
- ~30cm-long stick for digging

### **Objectives:**

The objectives of dive #288 are:

- 1) to observe outcrops exposed along the NNW-SSE trending scarp separating a failed rift to the east and a discordant trend of oceanic crust that was emplaced between 2 overlapping spreading centers.
- 2) to sample volcanic rocks exposed along the slope, in order to determine their ages and petrological-geochemical characteristics.
- 3) to sample sediment cores if we find a sedimented area (may be at the bottom of the cliff ?)

### **Dive strategy:**

- 1) Landing at the base of slope (~6600 m depth), then move first toward WSW until 5600 m depth, and finally toward SSW to reach the top of the oceanic high.
- 2) Observing and exploring the outcrop of hard rock
- 3) Collecting the most fresh samples (maybe basalts)
- 4) etc.

### **Data:**

- Video records (by Hi-vision and panorama middle cameras)

- Pictures taken by still-camera
- CTD data
- seismic data (sub-bottom profile) by the launcher

# かいこう 潜航記録

平成 15 年

KR03-04 行動

記載者 瀬底 秀樹

潜航年月日 2003 年 04/25

着底予定位置

潜航回数  回

緯度

通算潜航回数  回

経度

測地系

潜航海域

潜航目的

調査主任

ランチャー PILOT

所 属

PILOT

COPILOT

作業経過時刻	
吊揚	08:17
着水	08:22
離脱	10:30
着底	10:41
離底	14:10
結合	14:24
水切	16:01
揚収完了	16:08

累計時間	
潜航時間	7:39
前回潜航	1815:7
通算潜航	1822:46

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	7:51	1次番号	2
1次前回時間	1884:16	1次番号別前回時間	971:1
1次通算時間	1892:7	1次番号別通算時間	978:52
2次使用時間	3:54	2次番号	4
2次前回時間	877:49	2次番号別前回時間	432:28
2次通算時間	881:43	2次番号別通算時間	436:22

## 海象・気象

天候	風向	風力	波浪	うねり	視程
<input type="text" value="bc"/>	<input type="text" value="SSW"/>	<input type="text" value="5"/>	<input type="text" value="4"/>	<input type="text" value="3"/>	<input type="text" value="8"/>

最大潜航深度  m

着底深度  m

離底深度  m

着底底質

離底底質

記事

## Preliminary Results of KAIKO Dive

<b>Dive No.</b>	288	<b>Date</b>	April 25, 2003	
<b>Main Purpose</b>	<p>The objectives of the dive are:</p> <p>1) to observe outcrops exposed along the NNW-SSE trending scarp separating a failed rift to the east and a discordant trend of oceanic crust that was emplaced between 2 overlapping spreading centers.</p> <p>2) to sample volcanic rocks exposed along the slope, in order to determine their ages and petrological-geochemical characteristics.</p> <p>3) to sample sediment cores if we find a sedimented area (may be at the bottom of the cliff ?)</p>			
<b>Dive Site</b>	Southern cliff of northernmost failed rift of the West Philippine Basin. Discordant fabric in between two overlapping spreading centers			
	<b>Latitude</b>	<b>Longitude</b>	<b>Time</b>	<b>Depth</b>
<b>Landing</b>	23°42.38' N	127°38.50' E	10:41	6684
<b>Lift-off</b>	23°41.97' N	127°37.37' E	14:11	5844
<b>Payload</b>	<ul style="list-style-type: none"> <li>* partitioned sample basket</li> <li>* push core (one set including 2 cores)</li> <li>* ~30cm-long stick for digging</li> </ul>			
<b>Dive Summary</b>	<p>We started the dive from the bottom of a wide sedimented trough where we sampled 2 push cores. We then observed some collapsed scattered rocks with thin or no Mn crust. We then climbed the cliff composed of a succession of debris flow containing brecciated basalts almost free of Mn coating, and outcrops fully wrapped into thick Mn crust. We have also observed at many locations either large areas of lava flow sheets-like with sharp broken angular section (sampling trials were unsuccessful because too much altered), or even a 1 meter-thick sequence of stratified layers that might be lava flows or Mn coating (no sampling unfortunately). Most of the 20 samples were angular blocks from debris flow. Preliminary identification by R. Shinjo has revealed that 2/3 are fresh porphyric as well as aphyric basalts whereas 1/3 were mildly altered basalts</p>			
<b>Key words</b>	West Philippine Basin, Overlapping spreading center, Basalts			

## Preliminary Results of KAIKO Dive

Dive#	288	Name	Serge Lallemand
<p><b>1) Topography, Geology and Geophysics</b>            The diving site located along the southern cliff that bordered a 3 miles-wide trough, supposed to be a failed rift in the northern part of the West Philippine Basin. The cliff regionally strike N15°W and locally presented a small reentrant interpreted as a scar caused by gravitational collapse. Our observations during that dive confirmed the hypothesis of a collapsed area. Such context favors the occurrence of brecciated rocks free of Mn coating. Some trends coinciding with the heading of the submersible (N240° or downslope) were observed. On the opposite, no trends parallel to the discordant fabric of oceanic crust (N290°) were observed.</p>			
<p><b>2) Biology and Microbiology</b>            Numerous anemones, crinoids, asterides and shrimps were found all along the dive, especially in debris flow. We interpret their occurrence as fluid seepage from denuded areas (landslides).</p>			
<p><b>3) Chemistry</b>             N/A</p>			
<p><b>4) Ocean Physics</b>             N/A</p>			
<p><b>5) Engineering</b>             N/A</p>			
<p><b>6) Others</b></p>			

## Video Results of KAIKO Dive

Dive#	288	Name	Serge Lallemand
<b>Video Time, Camera No., and Comments</b>			
<b>1) 10:42 – 10:45</b>	<b>Centercamera</b>	sampling 2 push cores into mud	
<b>2) 11:17 – 11:19</b>	<b>Centercamera</b>	altered crust with sharp borders	
<b>3) 11:41</b>	<b>Centercamera</b>	dismembered crust	
<b>4) 12:08 – 13:07</b>	<b>Centercamera</b>	debris flow with angular brecciated basalt blocks	
<b>5) 13:08 – 13:25</b>	<b>Center camera</b>	chaotic dismembered area with coarse blocks	
<b>6) 13:34 – 13:42</b>	<b>Center camera</b>	N210° outcrop of 1 m thick lava flow (?) with thick Mn crust on top (rounded shape)	
<b>7) 13:43 – 14:11</b>	<b>Center camera</b>	alternance of debris flow, dismembered areas and thick Mn crust	



288-R1 basalt



288-R2 basalt



288-R3 basalt



288-R4 basalt



288-R5 Mn crust



288-R6 basalt



288-R7 basalt



288-R8 basalt



288-R9 basalt



288-R10 basalt



288-R11 basalt



288-R12 basalt



288-R13 basalt



288-R14 basalt



288-R15 basalt



288-R16 basalt



288-R17 basalt



288-R18 basalt



288-R19 basalt

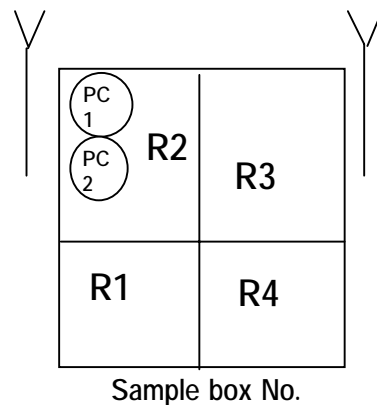


288-R20 basalt

**Dive No. #288**

**Date 2003/4/25**

Time(hh:mm)	Vehicle			Narrative	Sample
	Depth(m)	Altitude(m)	Heading(deg)		
10:30	6550	-	-	Kaiko detaches from launcher	
10:40	6678	12	232	bottom seen	
10:41	6689	0.2	243	kaiko touches down on muddy bottom	
10:43	6689	0.1	243	push core Green PC1	PC1
10:45	6689	0.1	243	push core Yellow PC2	PC2
10:49	6683	0.1	250	observing the rock	
10:52	6674	2.3	242	traveling over flat muddy & some rocks bottom	
10:58	6674	0.2	234	2rocks in box	R1
11:08	6660	1.1	245	2rocks in box	R1
11:18	6643	2.2	265	get 1sample from a board	R1
11:20	6642	3.4	242	moving along the trending scarp	
11:30	6594	2.9	221	changing the direction to 210	
11:33	6598	1.9	236	2rocks in box	R2
11:48	6541	2.3	252	1rock in box	R2
12:02	6506	3.1	250	observing the rock	
12:10	6491	1.1	248	2rocks in box	R2
12:25	6464	1.6	251	2rocks in box ,there are some rocks.	R3
12:40	6430	2	284	1rock in box	R3
12:55	6388	2.4	270	1rock in box	R3
13:02	6337	1.6	237	2rocks in box	R4
13:20	6212	3	238	moving along the trending scarp	
13:26	6178	3.3	206	2rocks in box	R4
13:35	6137	5.4	231	observing the outcrop of hard rock	
13:43	6042	3.4	237	2rocks in box	R3
13:45	6037	3.5	242	moving along the trending scarp	
14:04	5897	2.5	254	1rock in box	R3
14:06	5895	3.6	256	moving along the trending scarp	
14:10	5847	4.2	250	leave bottom	



## DIVE' MINUTES FORM

KR03-04-Leg1

Dive # 288

Observer: Serge Lallemand

Date: April 25, 2003

Scheduled start point : lat. 23°42.35'N lon. 127°38.00'E

Scheduled end point: lat. 23°41.98'N lon. 127°37.13'E

Time	Depth	Heading	Sample n°	Basket loc.	Description	Best-of
08:23:00	0				ROV Kaiko at sea	
10:30:00	6540				ROV separated from launcher	
10:41:00	6684	248			landing on seafloor	
10:43:00	6689	243	PC1	L1	core sampling within mud	
10:45:16	6689	243	PC2	L1	core sampling again	
10:50:00	6683	250			big rock on seafloor	
10:53:00	6673	243			big rock on seafloor	
10:58:09	6674	234	1	L3	big rock sampled	
10:59:37	6674	231	2	L3	big rock sampled	
11:09:18	6660	240	3	L3	angular rock sampled	
11:10:24	6660	240	4	L3	rounded rock collected	
11:18:12	6643	272			altered basalt flow sheets ?	
11:19:37	6643	257	5	L3	basalt flow sheets with sharp borders ? sampled	X
11:22:00	6630	242			climbing the wall of a valley	
11:23:01	6613	244			structural direction ? N244	
11:24:31	6611	243			scheduled starting point	X
11:33:22	6598	249	6	L1	angular rock sampled	
11:39:16	6597	246	7	L1	small block sampled	
11:48:47	6541	249	8	L1	big altered block with Mn crust	
12:03:00	6504	291			splitted pillow like outcrop	
12:10:00	6490	249	9	L1	angular block sampled within debris flow	
12:15:00	6490	255	10	L1	same as above	
12:24:38	6464	236	11	R1	angular block sampled within debris flow	X
12:25:00	6464	236	12	R1	same as above	
12:42:40	6430	273	13	R1	angular block sampled within debris flow	
12:52:16	6388	260	14	R1	angular block sampled within debris flow	
12:53:47	6388	269	15	R1	same as above	
13:00:00	6337	234	16	R3	angular block sampled within debris flow	
13:04:24	6337	237	17	R3	prismatic big rock sampled	
13:14:20	6260	240			dislocated Mn crust – gravitational collapse	X
13:28:35	6178	210	18	R3	triangular block sampled within debris flow	

13:34:00	6132	229			following a 1 m thick "stratified" (lava flow or Mn layers ?) scarp along the heading	X
13:39:00	6075	232			most outcrops coated with thick Mn crust without cracks	
13:42:45	6044				debris flow with angular blocks again	
13:43:39	6039	233	19	R1	big angular block sampled within debris flow	
13:49:00	6000	238			most outcrops coated with thick Mn crust without cracks	
13:55:00	5946				gentle slope, sedimented area without any outcrop	
13:57	5936	240			debris flow with angular blocks again	
14:04:00	5897	243	20	R1	angular block	
14:11:00	5844	297			land off	

# *KAIKO #288Dive*

127° 37'E

127° 38'E

127° 39'E

23° 43'N

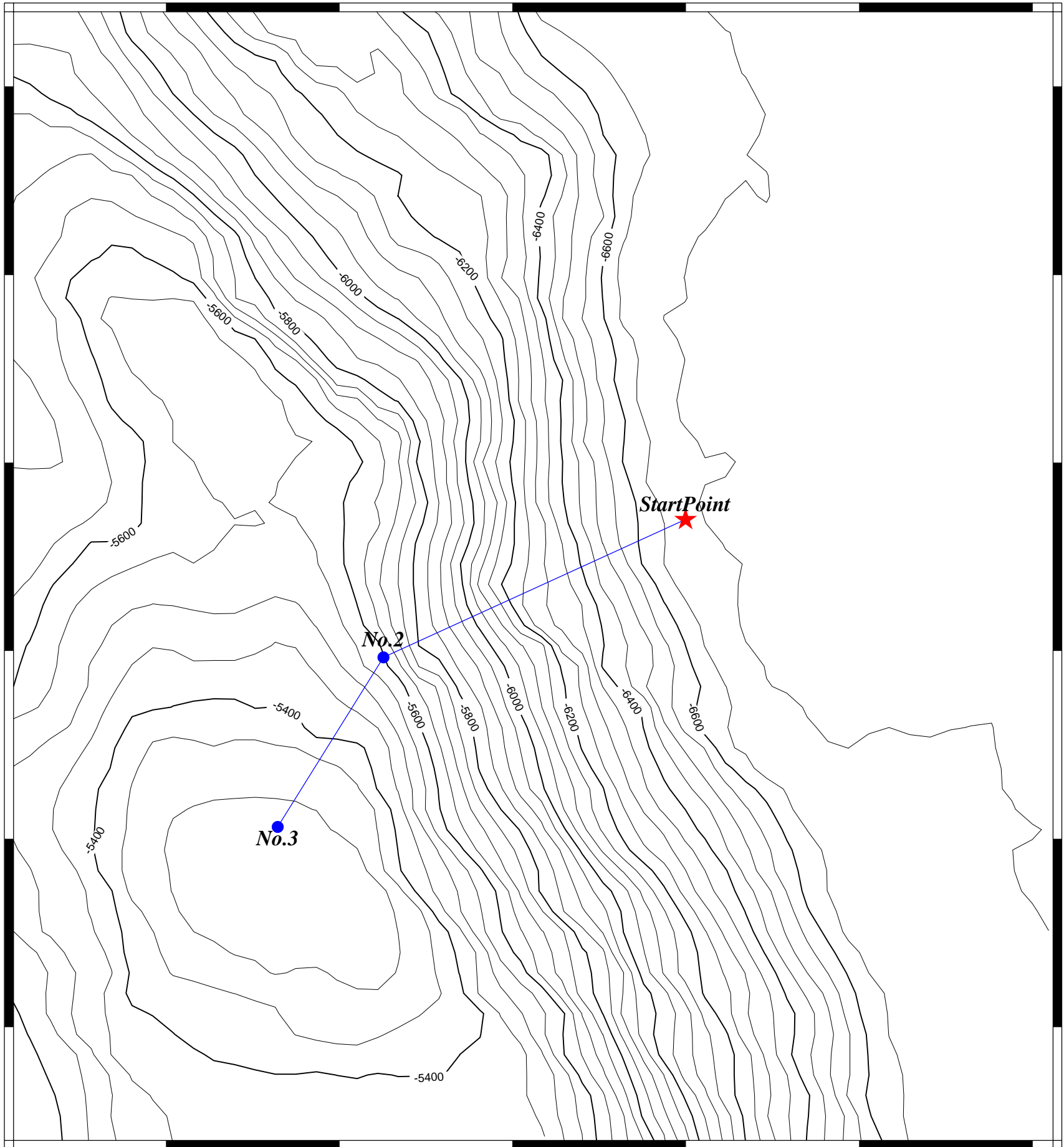
23° 43'N

23° 42'N

23° 42'N

23° 41'N

23° 41'N



127° 37'E

127° 38'E

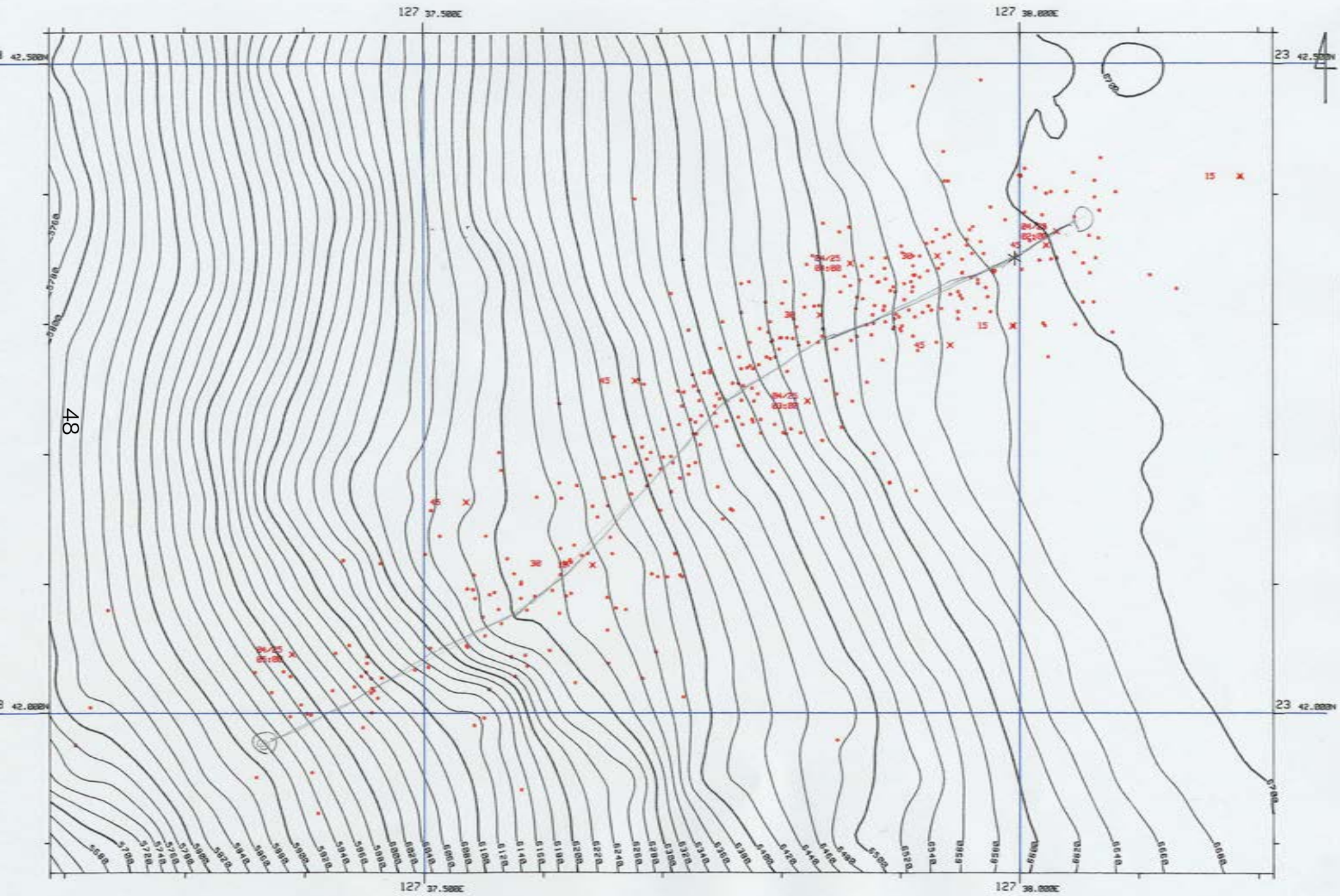
127° 39'E

km

0

1

2



SW

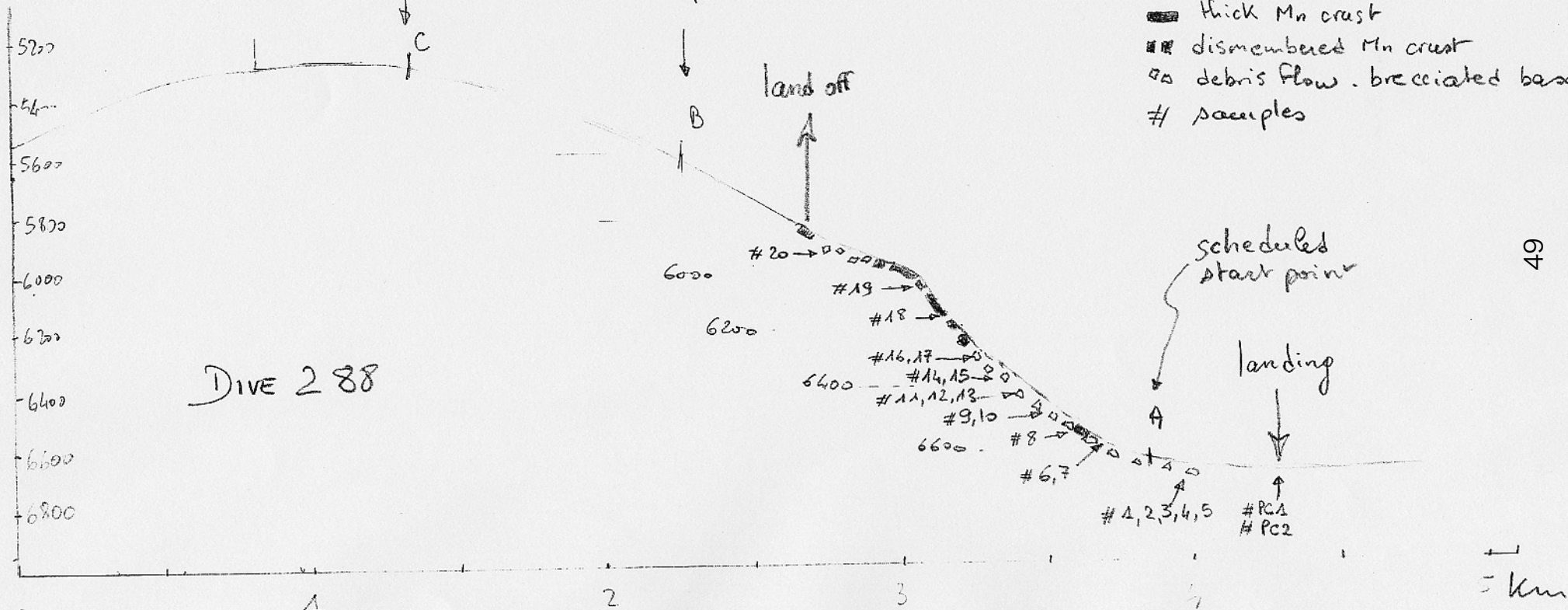
NE

depth (m)

scheduled end point

scheduled turn point

- thick Mn crust
- ▣ dismembered Mn crust
- ◊ debris flow - brecciated basalts
- # samples



DIVE 288

1 Km

No vertical exaggeration

## **KR03-04 Leg-1 Dive#289 Dive Plan**

**Date of Dive:** 26 April 2003 (Sat)

**Observer:** Chao-Shing Lee (National Taiwan Ocean University)

**Target area:** NW part of the West Philippine Basin; point **A-1**

Start Point:        23° 57.00' N    128° 53.20' E    Depth= 5450 m

End Point:         23° 58.00' N    128° 53.55' E    Depth= 4700 m

### **Payload:**

- Partitioned sample basket (2 x 2)
- push core (one set including 2 cores)
- ~30 cm-long stick for digging

### **Objectives:**

The objectives of dive#289 are:

- 1) to observe the outcrop exposed at the boundary of Urdaneta Plateau. The slope is trending NW-SE, however, they are probably formed at a complex overlapping spreading center, which was evolved with sea floor spreading of the West Philippine Basin;
- 2) to collect volcanic rocks exposed at the outcrop, in order to determine its ages and petrological/geochemical characteristics.
- 3) to collect 2 push cores for the study of burrow and bacteria which may live in this area and contribute to the formation of Manganese nodule.

### **Dive strategy:**

- 1) Landing at the base of slop (~5450 m depth), then move northeastward to the top (4700 m)
- 2) Observing and exploring the outcrop of hard rock
- 3) Collecting the most fresh samples (may be basalts)

### **Data:**

- Video records (by Hi-vision and panorama middle cameras)
- Pictures taken by still-camera
- CTD data
- Seismic data (sub-bottom profile) by the launcher

# かいこう 潜航記録

平成 15 年

KR03-04 行動

記載者 竹ノ内 純

潜航年月日 2003 年 04/26

着底予定位置

潜航回数 3 回

緯度 23° 57.00' N

通算潜航回数 289 回

経度 128° 53.20' E

測地系 WGS-84

潜航海域 西フィリピン海 北西部 A-1

潜航目的 調査潜航 海洋地殻の拡大年代とそのセスを解明するため、新鮮な基板岩の採取と露頭観察を行う。

調査主任 新城 竜一

ランチャー PILOT 若松 誉

所属 琉球大学

PILOT 三浦 豊司

COPILOT 藤 勝利

作業経過時刻	
吊揚	08:13
着水	08:19
離脱	10:09
着底	10:19
離底	14:22
結合	14:33
水切	15:56
揚収完了	16:02

累計時間	
潜航時間	7:37
前回潜航	1822:46
通算潜航	1830:23

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	7:49	1次番号	2
1次前回時間	1892:7	1次番号別前回時間	978:52
1次通算時間	1899:56	1次番号別通算時間	986:41
2次使用時間	4:24	2次番号	4
2次前回時間	881:43	2次番号別前回時間	436:22
2次通算時間	886:7	2次番号別通算時間	440:46

## 海象・気象

天候	風向	風力	波浪	うねり	視程
bc	S	3	2	3	8

最大潜航深度 5398 m

着底深度 5398 m

離底深度 4757 m

着底底質 礫混じりの泥

離底底質 マグネシウム

記事

分離曳航を行いながら、海底の観察及び岩石採取、採泥を行った。

## Preliminary Results of KAIKO Dive

<b>Dive No.</b>	289	<b>Date</b>	April 26, 2003	
<b>Main Purpose</b>	<p>The objectives are:</p> <p>1) to observe the outcrop exposed at the boundary of Urdaneta Plateau. The slope is trending NW-SE, however, they are probably formed at a complex overlapping spreading center, which was evolved with sea floor spreading of the West Philippine Basin;</p> <p>2) to collect volcanic rocks exposed at the outcrop, in order to determine its ages and petrological/geochemical characteristics.</p> <p>3) to collect 2 push cores for the study of burrow and bacteria which may live in this area and contribute to the formation of Manganese nodule.</p>			
<b>Dive Site</b>	The NW part of West Philippine Basin, point A-1 in the proposal, supposed this is the oldest rock in the survey area.			
	<b>Latitude</b>	<b>Longitude</b>	<b>Time</b>	<b>Depth (m)</b>
<b>Landing</b>	23-57.00	128-53.20	10:09	5,450
<b>Lift-off</b>	23-58.00	128-53.55	14:22	4,750
<b>Payload</b>	<ul style="list-style-type: none"> <li>- 4-partitioned sample basket</li> <li>- Stick (~30 cm long)</li> <li>- Push cores</li> </ul>			
<b>Dive Summary</b>	<p>1. We have traveled through two slopes; collected a total of 19 rocks in the lower slope, however, failed to obtain any “fresh” rock in the upper slope.</p> <p>2. Along the survey track, most parts are covered by the manganese coating crust, but the pebbles are found from place to place. These pebbles (with smooth surface of Manganese coating) were altered basalts. But we also observed several sites with the basaltic sheet disks and collected several “fresh” basalts.</p>			

	<p>3. On the way to the top, we observed continuous outcrops of the manganese-coated crust, looks like the pillow lavas.</p> <p>4. We have seen many biological activities in the deep water; one unknown, “strange-like”, but all-transparent animal came up to the surface with the rocks.</p>
<b>Key words</b>	West Philippine Basin, Overlapping Spreading Center, Basalts

## Preliminary Results of KAIKO Dive

Dive#	289	Name	Chao-Shing Lee
<p><b>1) Topography, Geology and Geophysics</b></p> <p>The strike of the seafloor spreading fabric in this area is generally in NW-SE trend. We have designed the course to be northeastward (about 20<sup>0</sup>) in order to cover a steep slope. The slope is about 26<sup>0</sup> with some local areas are steep walls and valleys. It has two slopes: the lower and upper slope, and there is a gentle flat seafloor in between. The landing area (5450 m) is covered with the mud and Mn-coated rocks. We have found several heavy Mn-coated crusts at the lower slope at about 5400 m. Because they are in concordant with the angle of the slope. We suspect that these may be the pillow lava flow when the seamount was erupted. At the depth of about 5300 m, we have entered a zone of long valleys and found many broken rocks. Above the valley (at depth 5200 m), we start to observe the sheet-dyke structure and the rocks in this area are mostly angular. It is probably related to the mass movement due to recent earthquake. The rocks are the most “fresh” basaltic samples of the site. The area between the lower and upper slope is generally flat with sediment and Mn pebbles. The upper slope is covered with heavy Mn-coated rocks and Mn nodules. We do not collect any samples from this slope.</p>			
<p><b>2) Biology and Microbiology</b></p> <p>N/A</p>			
<p><b>3) Chemistry</b></p> <p>N/A</p>			
<p><b>4) Ocean Physics</b></p> <p>N/A</p>			
<p><b>5) Engineering</b></p> <p>N/A</p>			

## Video Results of KAIKO Dive

Dive#	289	Name	Chao-Shing Lee
<b>Video Time, Camera No., and Comments</b>			
<b>1) 10:38 – 10:40 Center camera (broadcast-station-grade camera)</b> At 5311 m, observed an outcrop with heavy Mn-coated crust (pillow lava?).			
<b>2) 10:47 – 10:56 Center camera (broadcast-station-grade camera)</b> At 5285 m, seen a series of long valleys, which are covered with broken crust.			
<b>3) 11:02 – 11:07 Center camera (broadcast-station-grade camera)</b> At 5250 m, observed a site with a lot of broken Mn-coated crusts.			
<b>4) 11:14 – 11:20 Center camera (broadcast-station-grade camera)</b> At 5225 m, the sheet-dyke structures were observed; the rocks are most angular.			
<b>5) 12:01 – 12:09 Center camera (broadcast-station-grade camera)</b> At 5040 m, a lot of big boulders with heavy Mn-coating; it is difficult to collect any sample from this site.			
<b>6) 12:43 – 12:51 Center camera (broadcast-station-grade camera)</b> At 4956 m, a field of Mn nodules.			



289-R1 basalt



289-R2 basalt



289-R3 basalt



289-R4 basalt



289-R5 basalt



289-R6 basalt



289-R7 basalt



289-R8 basalt



289-R9 basalt



289-R10 basalt



289-R11 basalt



289-R12 basalt



289-R13 basalt



289-R14 basalt



289-R15 basalt



289-R16 basalt



289-R17 basalt



289-R18 Mn nodule



289-R19 basalt

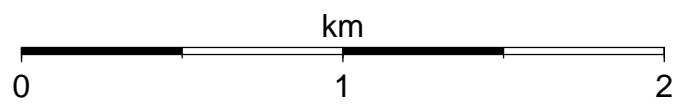
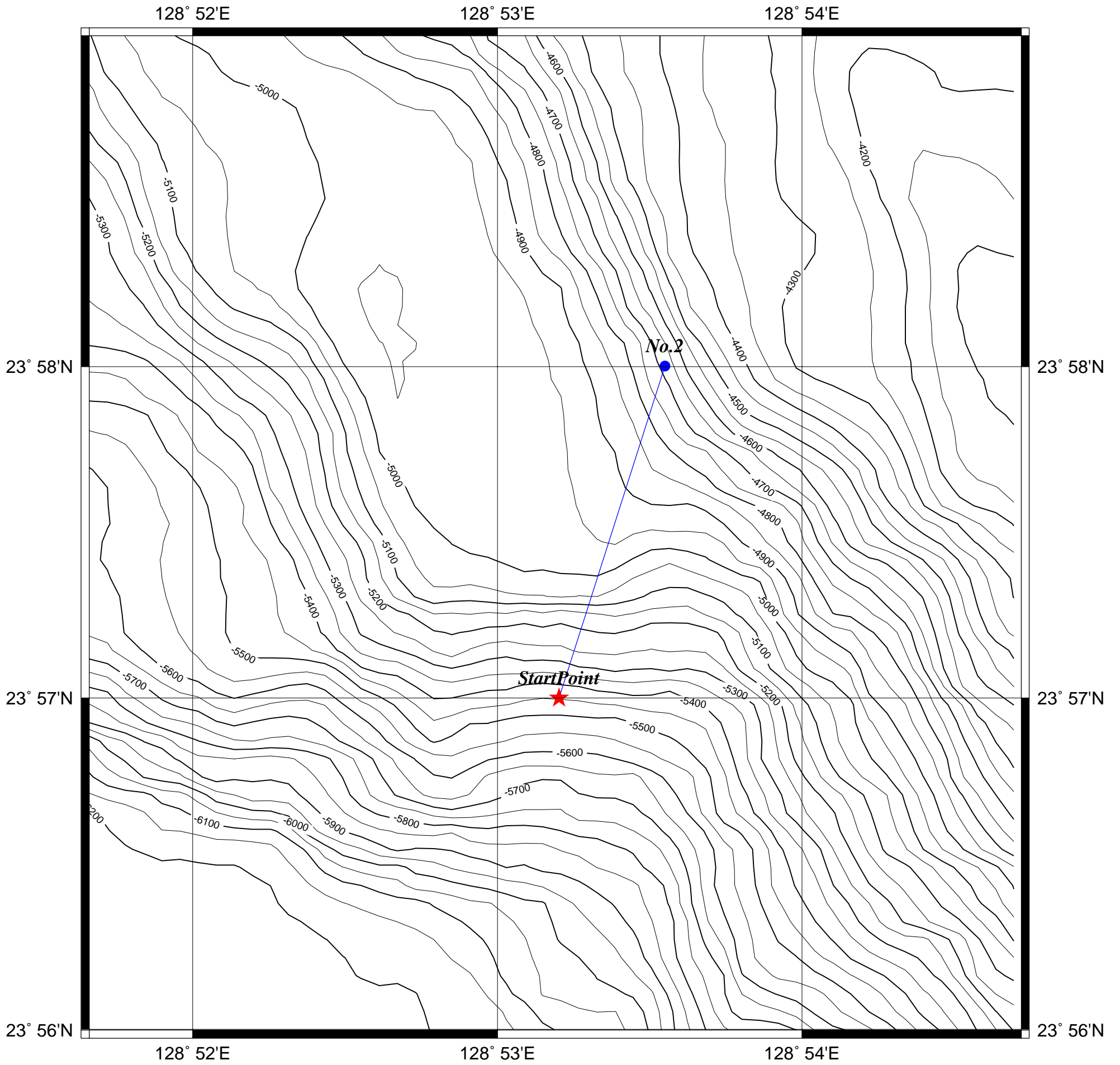
**Dive No. #289**

**Date 2003/4/26**

Time(hh:mm)	Vehicle			Narrative	Sample
	Depth(m)	Altitude(m)	Heading(deg)		
10:09	5275	-	-	Kaiko detaches from launcher	
10:17	5288	18.8	15	bottom seen	
10:19	5397	1.2	13	kaiko touches down on rock&muddy bottom	
10:21	5397	1.3	10	push core Green PC1	PC1
10:22	5392	2.8	20	traveling over muddy bottom	
10:28	5382	1	55	1rock in box No.1	R1
10:33	5370	1.9	51	1rock in box No.1	R2
10:34	5366	3.1	21	moving along the trending scarp observing the outcrop of hard rock	
10:42	5290	2.6	15	2rocks in box No.1	R3,R4
10:45	5285	3.2	13	observing the outcrop 1rock a part of the outcrop in box No.1	R5
10:48	5285	2.3	37	1rock in box No.1	R6
10:51	5271	2.7	49	1rock in box No.1	R7
10:57	5261	2.2	47	1rock in box No.2	R8
11:00	5234	2.8	38	2rocks in box No.2	R9,R10
11:03	5226	4.5	21	2rocks in box No.2	R11,R12
11:18	5200	3.7	61	3rocks in box No.2	R13,R14,R15
11:48	5105	1.8	32	1rock in box No.3	R16
12:44	4957	0.1	38	1 rock(Mn nodule) in box No.4 2 rocks(Mn nodule) in box No.3	R17,R18,R19
12:47	4957	0.1	41	push core Yellow PC2 (1/3 collect)	PC2
12:50	4956	1.7	17	traveling over Mn nodule bottom	
13:14	4897	3.3	18	observing the outcrop of hard rock	
13:20	4893	0.6?	18	little bit flat bottom	
14:00	4816	3.1	40	traveling over Mn coating rocks bottom	
14:22	4754	3.2	51	leave bottom	

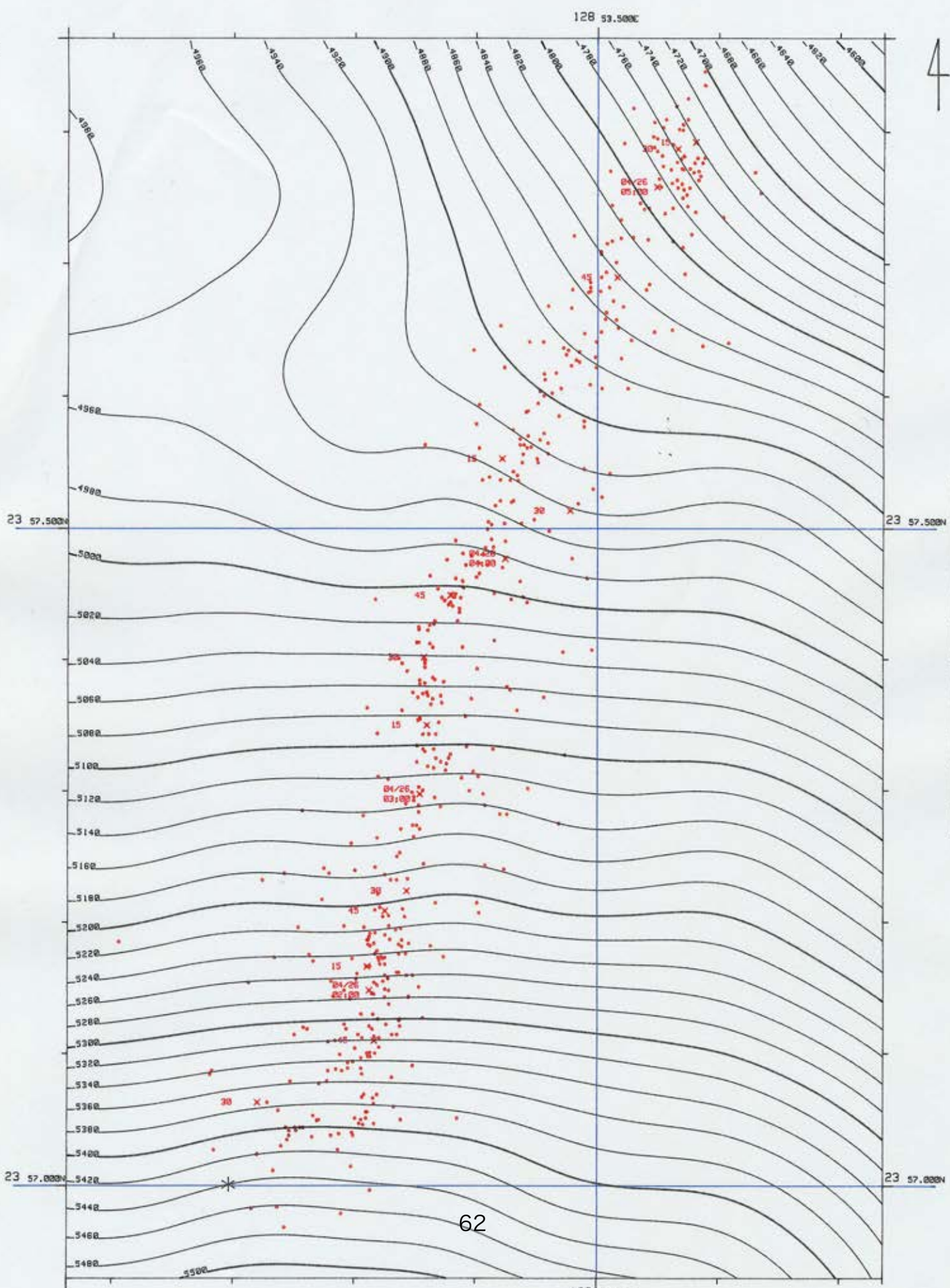
Sample box No.

# KAIKO #289 Dive



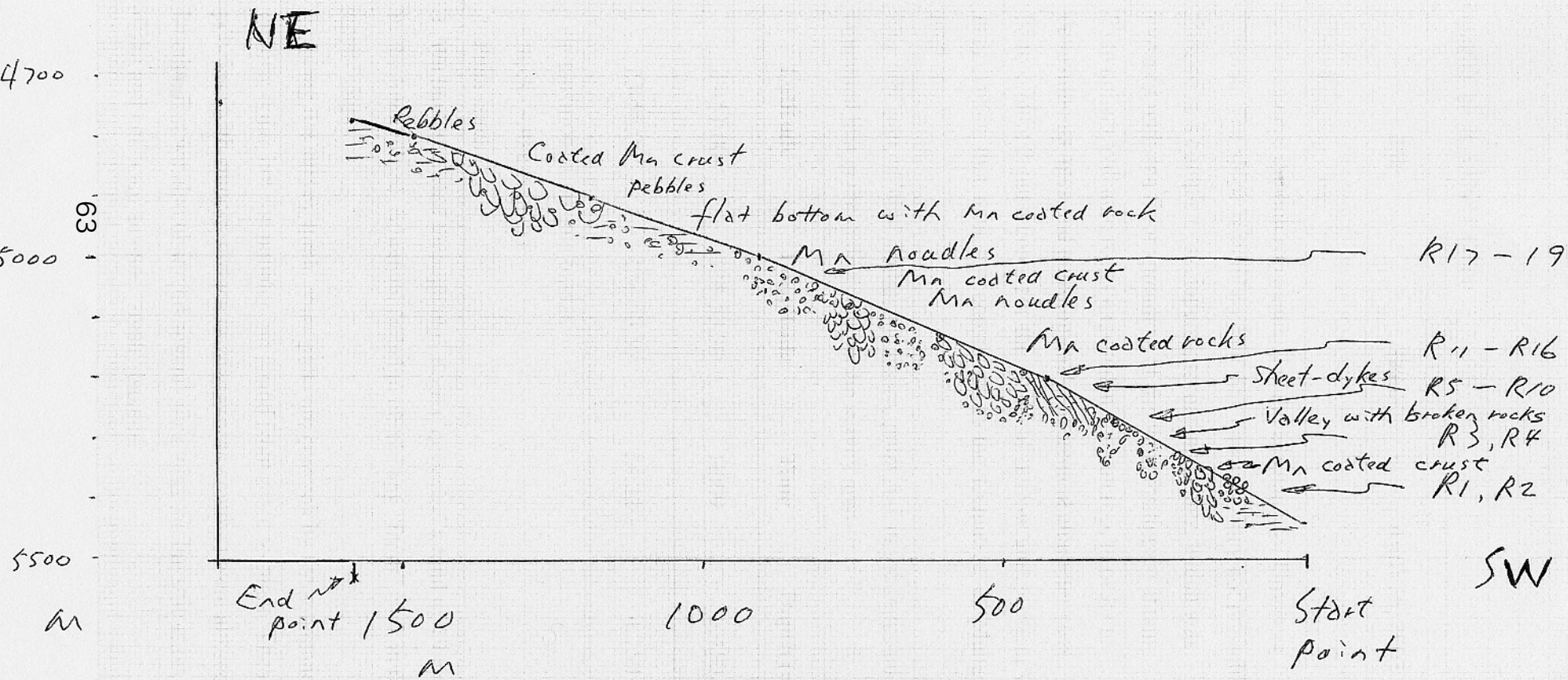
REFP  
\*  
VCL  
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4



Dive 289 (4/26)

Slope  $\approx 26^\circ$



## **KR03-04 Leg-1 Dive#290 Dive Plan**

**Date of Dive:** 27 April 2003 (Sunday)

**Observer:** Anne Deschamps (JAMSTEC)

**Target area:** NW part of the West Philippine Basin;

Start Point:            22°37'70"N            128°31'15" E            Depth = 4450 m

End Point:            22°36'60"N            128°30'60"E            Depth = 3640 m

### **Payload:**

- partitioned sample basket (4 partitions)
- ~30cm-long stick for digging

### **Objectives:**

The objectives of dive #290 are:

- 1) to observe outcrops exposed along the northern flank of a large and high (~3200 m) volcanic edifice located within the Urdenata Plateau. The studied flank of the high is almost linear and trends parallel to the spreading fabric observed at its vicinity. The volcanic high likely formed by excess of volcanism during spreading in the West Philippine Basin, because of the presence of a hot spot (OIB ?) at the origin of the Urdenata Plateau's relief.
- 2) to sample volcanic rocks exposed along the slope, in order to determine their ages (age of spreading and of OIB-like magmatism) + petrological-geochemical characteristics.

### **Dive strategy:**

- 1) Landing at the base of slope (~4450 m depth), then move toward south until 3640 m depth to reach the top of the oceanic high.
- 2) Observing and exploring the outcrops of hard rocks
- 3) Collecting the most fresh samples (maybe basalts)

### **Data:**

- Video records (by Hi-vision and panorama middle cameras)
- Pictures taken by still-camera
- CTD data
- seismic data (sub-bottom profile) by the launcher

# かいこう 潜航記録

平成 15 年

KR03-04 行動

記載者 藤 勝利

潜航年月日 2003 年 04/27

着底予定位置

潜航回数 4 回

緯度 22° 37.65' N

通算潜航回数 290 回

経度 128° 31.30' E

測地系 WGS-84

潜航海域 西フィリピン海 北西部 A-12

潜航目的 調査潜航 海洋地殻の拡大年代とそのセスを解明するため、新鮮な基盤岩の採取と露頭観察を行う。

調査主任 新城 竜一

ランチャー PILOT 若松 誉

所属 琉球大学

PILOT 三浦 豊司

COPILOT 藤 勝利

作業経過時刻	
吊揚	08:12
着水	08:18
離脱	09:56
着底	10:07
離底	14:04
結合	14:17
水切	15:25
揚収完了	15:33

累計時間	
潜航時間	7: 7
前回潜航	1830:23
通算潜航	1837:30

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	7:21	1次番号	2
1次前回時間	1899:56	1次番号別前回時間	986:41
1次通算時間	1907:17	1次番号別通算時間	994: 2
2次使用時間	4:21	2次番号	4
2次前回時間	886: 7	2次番号別前回時間	440:46
2次通算時間	890:28	2次番号別通算時間	445: 7

## 海象・気象

天候 bc 風向 ENE 風力 4 波浪 3 うねり 3 視程 8

最大潜航深度 4478 m

着底深度 4478 m

離底深度 3648 m

着底底質 泥

離底底質 礫混じりの泥

記事

分離曳航により航走し、急崖な海底を観察すると共に岩石の採取を行った。

## Preliminary Results of KAIKO Dive

<b>Dive No.</b>	<b>290</b>		<b>Date</b>	April 27, 2003	
<b>Main Purpose</b>	<p>1) to observe outcrops exposed along the northern flank of a large and high (3200 m -high, at least) volcanic edifice located within the Urdenata Plateau. The studied flank of the high is almost linear and trends parallel to the spreading fabric observed at its vicinity. The volcanic high likely formed by excess of volcanism during spreading in the West Philippine Basin, because of the presence of a hot spot at the origin of the Urdenata Plateau's relief.</p> <p>2) to sample volcanic rocks exposed along the slope, in order to determine their ages (age of spreading and of hot spot magmatism at this location of the West Philippine Basin) and their petrological-geochemical characteristics (N-MORB ? E-MORB ? OIB ?).</p>				
<b>Dive Site</b>	Northern slope of a shallow volcanic high located on the Urdenata Plateau, in the NorthWestern part of the West Philippine Basin.				
	<b>Latitude</b>	<b>Longitude</b>	<b>Time</b>	<b>Depth</b>	
<b>Landing</b>	22°37.65'N	128°31.3' E	10:04	4490 m	
<b>Lift-off</b>	22°36.75'N	128°30.6' E	14:04	3647m	
<b>Payload</b>	<p>- partitioned sample basket (4 partitions)</p> <p>- ~30cm-long stick for digging</p>				
<b>Dive Summary</b>	<p>We started the dive at the foot of the volcanic high, in a flat area entirely covered by sediments. We found few collapsed blocks within sediments. Then we climbed a cliff composed of a succession of debris flows likely containing basalts. Blocks were characterized by a rounded shape due to a strong manganese coating. This outcrop was big in size (we surveyed it during 45'). All tentatives of sampling unfortunately failed due to the presence of the thick and strong Mn crust. We observed such outcrops at many locations during the dive. We also observed some areas almost entirely covered by sediments with few collapsed scattered rocks characterized by rounded shapes</p>				

	<p>due to Mn coating. Other areas were characterized by large and very flat pieces of Mn crust, which was often fractured. We also observed a steep cliff composed of massive basalts. We collected 25 samples from debris flows. Preliminary interpretation by R. Shinjo has revealed 2 samples of relatively fresh basalts (i.e., accurate for Ar-Ar datings). One sample consist in porphyric basalt, the second one is an aphyric basalt. 3 samples consist in mildly altered basalts. Others are very altered basalts, manganese crust, and scoriae.</p>
<b>Key words</b>	<p>West Philippine Basin - Urdenata Plateau - Hot spot -related magmatism, spreading, basalts, manganese</p>

## Preliminary Results of KAIKO Dive

Dive#	290	Name	Anne Deschamps
<p><b>1) Topography, Geology and Geophysics</b></p> <p>The diving site is located in the Northwestern part of the West Philippine Basin, on the northern slope of a volcanic edifice that likely constitutes the highest point of the Urdenata Plateau. The cliff regionally strike N110°E, that is parallel to the spreading fabric in its vicinity as well as in the NW part of the basin in general. The dive has been performed at the location of a small reentrant interpreted as a scar caused by gravitational collapse. Unfortunately, the collapse obviously occurred a long time ago such that all debris flows were covered by the thick and strong Mn crust. No clear trends were observed during the dive. In the vicinity of the top of the volcanic high, the large outcrops of flat Mn crust were often fractured. Cracks looked quite recent.</p>			
<p><b>2) Biology and Microbiology</b></p> <p>Rare crinoids, asterides, gorgonae (1), shrimps and fish were observed.</p>			
<p><b>3) Chemistry</b></p> <p>N/A</p>			
<p><b>4) Ocean Physics</b></p> <p>N/A</p>			
<p><b>5) Engineering</b></p> <p>N/A</p>			

**6) Others**

N/A

## Video Results of KAIKO Dive

Dive#	290	Name	Anne Deschamps
<b>Video Time, Camera No., and Comments</b>			
<b>1) 10:09 - 10:30 Center HV camera</b>			
Flat area (plain) entirely covered by sediments. Few isolated blocks of rocks within sediments.			
<b>2) 10:31 - 11:17 Center HV camera</b>			
Steep slope composed of a continuous outcrop of a major avalanche's debris. Rocks are rounded due to Mn coating. No or few sediments on rocks. All tentatives of sampling failed because of the Mn coating. Few detached samples were extremely weak, thus revealing their strong alteration.			
<b>3) 11:17 - 11:44 Center HV camera</b>			
Almost entirely sedimented area with very few isolated (detached) rocks.			
<b>4) 11:45 - 12:00 Center HV camera</b>			
Flat and large crust of Mn covered by a thin sediment layer.			
<b>5) 12:00- 12:20 Center HV camera</b>			
Sedimented area with debris of avalanche. Rocks display rounded shape because of Mn coating. Some Mn flat pieces of crust were found.			
<b>6) 12:21- 12:44 Center HV camera</b>			
Sedimented area almost entirely covered with debris of avalanche. Rocks looked quiet massive. One sample of fresh basalt (n°15) was collected in debris.			
<b>7) 12:45- 12:55 Center HV camera</b>			
Steep slope with large outcrops of massive basalts. No sediments. Rocks are coated by Mn.			
<b>8) 12:56- 13:00 Center HV camera</b>			
Flat and large crust of Mn sometimes covered by a thin sediment layer. Crust is often fractured.			
<b>9) 13:02- 13:04 Center HV camera</b>			
Large outcrop of massive basalts surrounded by sediments (avalanche's debris ?)			

<b>10) 13:04- 13:17 Center HV camera</b> Cliff composed of massive basalts.
<b>11) 13:17- 13:20 Center HV camera</b> Large outcrop of massive basalts surrounded by sediments (avalanche's debris ?)
<b>12) 13:20- 14:04 Center HV camera</b> Flat sedimented area with outcrops of flat and partially dismembered Mn crust.

### Dive'minutes form

KR03-04-Leg1      Dive # 290      Observer: Anne Deschamps.....      Date:  
April 27, 2003

Time	Depth	Heading	Sample n°	Basket loc.	Description	Best-of
8:23	0		-	-	ROV Kaiko at sea	
9:56	4344	0	-	-	ROV separated from launcher	
10:04	4480	225			landing on seafloor	
<b>10:09</b>	<b>4477</b>	<b>239</b>	<b>Flat area (plain) entirely covered by sediments. Presence of few blocks within sediments</b>			
" "	" "	"			sampling tentative. Failed due to too much massive rocks.	
10:10	4477	245	1	L2	small (altered ?) sample ? (10 cm of diameter)	
<b>10:31</b>	<b>4453</b>	<b>212</b>	<b>Arrival at the foot of the steep slope : continuous outcrop of a major avalanche's debris. Rocks are rounded because of Mn coating. No or few sediments on rocks.</b>			
10:31	4453	212			Seafloor entirely covered by debris of a major avalanche. Rocks are scelled by Mn.	
10:32	4453	226			Sampling failed (rocks coated by Mn)	

10:34	4449	227			Old avalanche ? Slope becomes steeper.	X	
10:40	4434	239			Sampling failed (rocks coated by Mn)		
10:43	4430	196			" "		
10:47	4417	217			Fresh cracks within Mn coating		
10:50	4410	217			Sampling failed (altered rocks)		
10:53	4400	233			Sampling failed (rocks strongly coated by Mn)		
11:03	4360	212			Sampling failed (Mn coating)		
11:12	4316	195			Sampling failed (Mn coating)		
<b>11:17</b>	<b>4311</b>	<b>157</b>	<b>Almost entirely sedimented area with very few blocks.</b>				
11:17	4311	157	2	L2	Small scoriae (~15 cm) in sedimented area		
11:21	4296	140			Sampling failed		
11:26	4281	193			Sampling failed		
11:28	4280	181	3	L2	~20 cm sample		
11:31	4276	182	4	L1	~30 cm big block		
11:40	4261	231	5	L1	medium-size scoriae ?		
<b>11:45</b>	<b>4226</b>	<b>230</b>	<b>Flat and large crust of Mn covered by a thin layer of sediments</b>				
11:45	4226	230			Linear outcrops at the border of the Mn crust	X	
11:45	"	"	6	L1	Angular piece of crust		
11:49	4188	216	7	L1	Medium size block		
11:49	"	"	8	L1	Small-size block		
<b>12:00</b>	<b>4136</b>	<b>208</b>	<b>Sedimented area with debris of avalanche. Rocks have a rounded shape because of Mn coating.</b>				
12:00	4136	208	9	R1	Medium size fresh aphyric basalt	X	
12:00	"	"	10	R1	Small-size block		

12:00	"	"	11	R1	Small-size block		
12:07	4127	196	12	R1	Small-size scoriae ?		
12:11	4114	211	13	R1	" ""		
12:17	4073	221	14	R1	~30 cm long rock		
<b>12:21</b>	<b>4056</b>	<b>214</b>	<b>Sedimented area almost entirely covered with debris of avalanche. Large outcrop of massive basalts.</b>				
12:21	4056	214	15	R2	~40 cm <b>very fresh porphyric basalt</b>	<b>X</b>	
12:37	3942	217	16	R2	~10 cm rounded rock		
12:39	3941	219	17	R2	" "		
12:40	3940	215	18	R2	~10 cm triangular rock		
12:42	3937	217	19	R2	~40 cm -long rock		
12:44	3936	215	20	R2	~20 cm rock		
<b>12:44</b>	<b>3936</b>	<b>215</b>	<b>Large outcrop of massive basalts. Steep slope, no sediments. Rocks coated by Mn</b>				
<b>12:56</b>	<b>3857</b>	<b>208</b>	<b>Flat and large crust of Mn. Mn crust is often dismembered.</b>				
12:58	3827	215			sampling failed		
<b>13:02</b>	<b>3813</b>	<b>209</b>	<b>High/steep wall of massive rocks</b>				
13:02	3813	209	21	R2	15 cm rounded block	<b>X</b>	
13:11	3765	242	22	L2	medium size block		
"	"	"	23	L2	small size block		
"	"	"	24	L2	small size block		
<b>13:20</b>	<b>3708</b>	<b>217</b>	<b>Sedimented area with large flat pieces of Mn = end of the steep scarp and arrival on gently dipping area near the top of the volcanic edifice. Mn crust partially dismembered.</b>				
13:20	3708	217			Mn large flat fractured blocks (due to bench ?)		
13:17	3874	255			beautiful gorgonae !		
13:55	3648	238	25	L2	Half Mn ball for diver !		
14:04	3647	301			Land off		





290-R1



290-R2



290-R3



290-R4



290-R5



290-R6



290-R7



290-R8



290-R9



290-R10



290-R11



290-R13



290-R14



290-R15



290-R16



290-R17



290-R18



290-R19



290-R20



290-R21



290-R22



290-R23



290-R24



290-R25

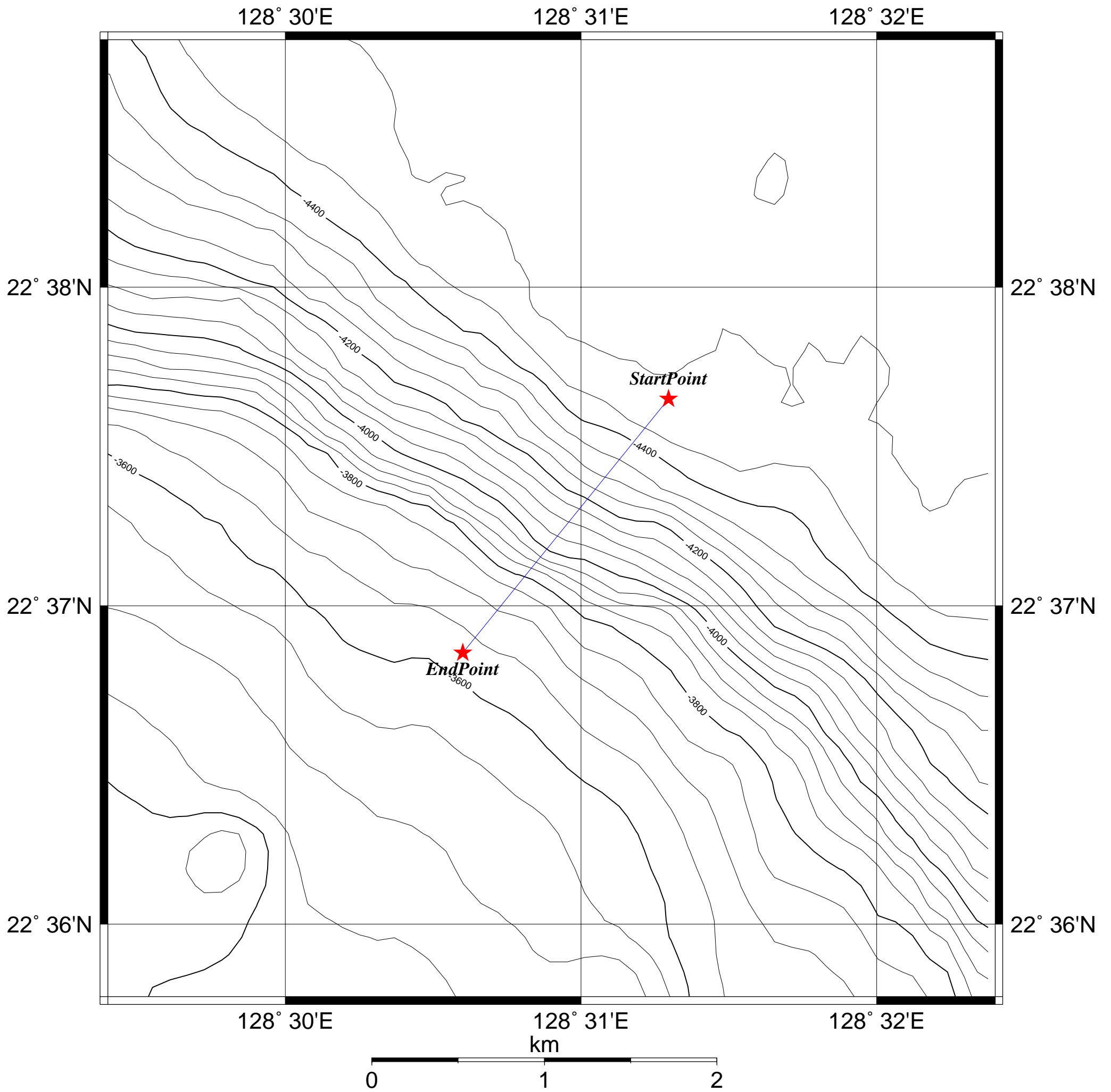
**Dive No. #290**

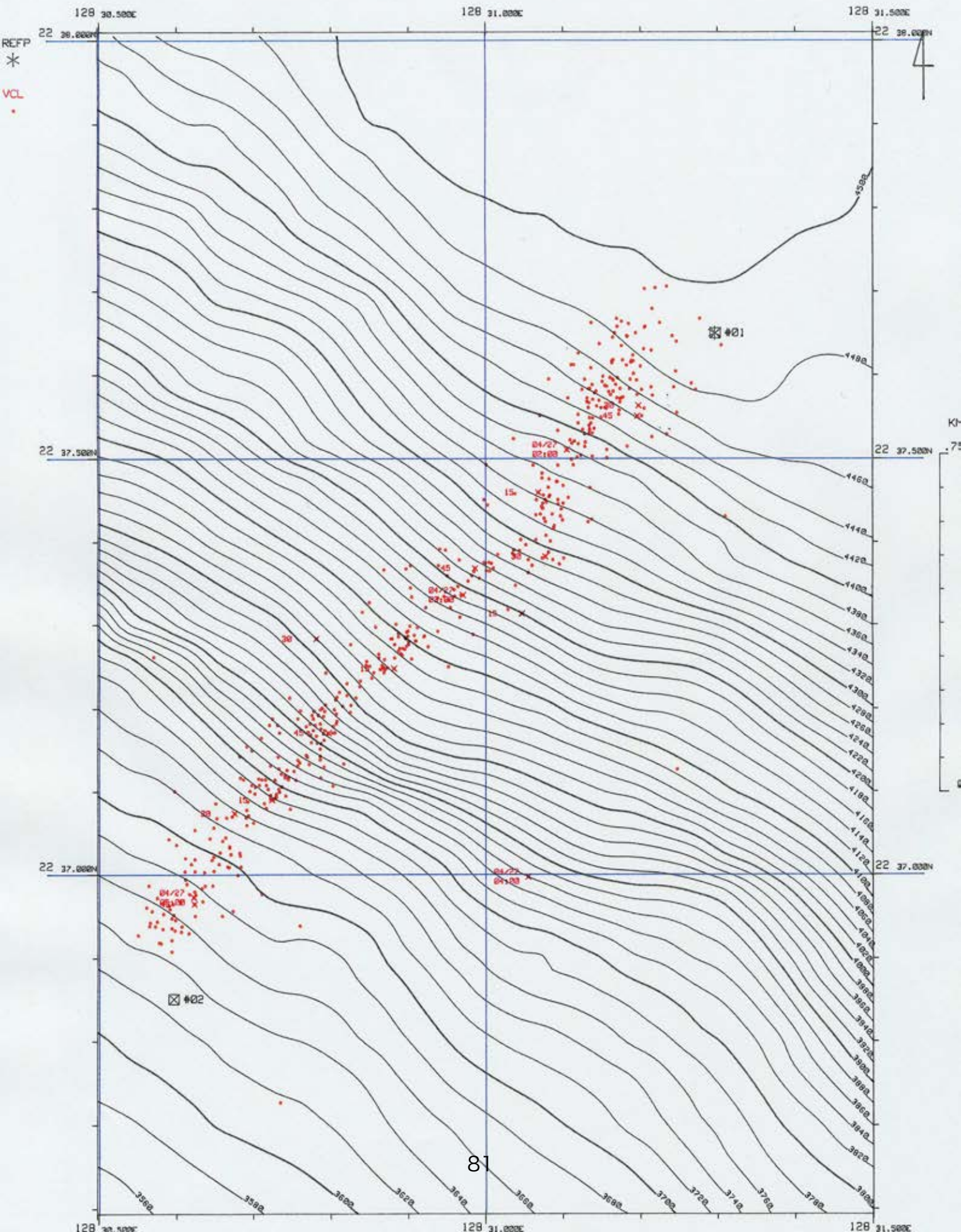
**Date 2003/4/27**

Time(hh:mm)	Vehicle			Narrative	Sample
	Depth(m)	Altitude(m)	Heading(deg)		
9:55	4343	173.6	346	vehicle was released	
10:03	4474	5.7	236	sea floor was seen (entirely covered by sediments)	
10:06	4477	0.1	245	on bottom, sample R1 put in no.3	R1
10:33	4449	3.6	227	moving up on the scarp (Mn coating rocks)	
11:15	4311	3.9	170	sample R2 put in no.3 (between rocks and mud floor)	R2
11:27	4280	0.7	177	sample R3 put in no.3	R3
11:31	4276	0.7	181	sample R4 put in no.1	R4
11:40	4262	0.8	232	sample R5 put in no.1	R5
11:45	4277	1.4	239	sample R6, broke and fall in the basket	(R6)
11:49	4187	2.8	223	sample R7 put in no.1	R7
				sample R8 put in no.1	R8
12:00	4134	2	202	sample R9 put in no.2 (small)	R9
				sample R10 put in no.2 (small)	R10
				sample R11 put in no.2 (small)	R11
12:06	4127	1.9	179	sample R12 put in no.2	R12
12:11	4144	1.8	212	sample R13 put in no.2 (20cm)	R13
12:17	4073	2.1	215	sample R14 put in no.2 (25cm)	R14
12:20	4056	2.7	215	sample R15 put in no.4 (20cm)	R15
12:36	3942	2.2	217	sample R16 put in no.4 (8cm)	R16
12:38	3941	2.3	217	sample R17 put in no.4 (10cm)	R17
				sample R18 put in no.4 (10cm)	R18
12:41	3937	2.2	221	sample R19 put in no.4 (15cm)	R19
12:43	3937	2.6	217	sample R20 put in no.4 (12cm)	R20
12:51	3904	7.7	221	scarp, many Mn coated rocks	
12:56	3857	3.5	206	layered Mn coated rocks on muddy floor	
13:02	3813	2.2	202	sample R21 put in no.4 (15cm)	R21
13:10	3774	7.9	216	moving up along the scarp (Mn coating rocks)	
13:12	3766	4.4	199	sample R22 put in no.3 (15cm)	R22
13:13	3766	3.9	199	sample R23 put in no.3 (15cm)	R23
13:14	3766	3.9	199	sample R24 put in no.3 (15cm)	R24
13:20	3705	6.1	217	Mn crust on sediments	
13:59	3648	0.5	243	sample R25 put in no.3 (20cm)	R25
14:04	3648	0.5	291	vehicle left bottom	

Sample box No.

# *KAIKO #290Dive*





depth (m)

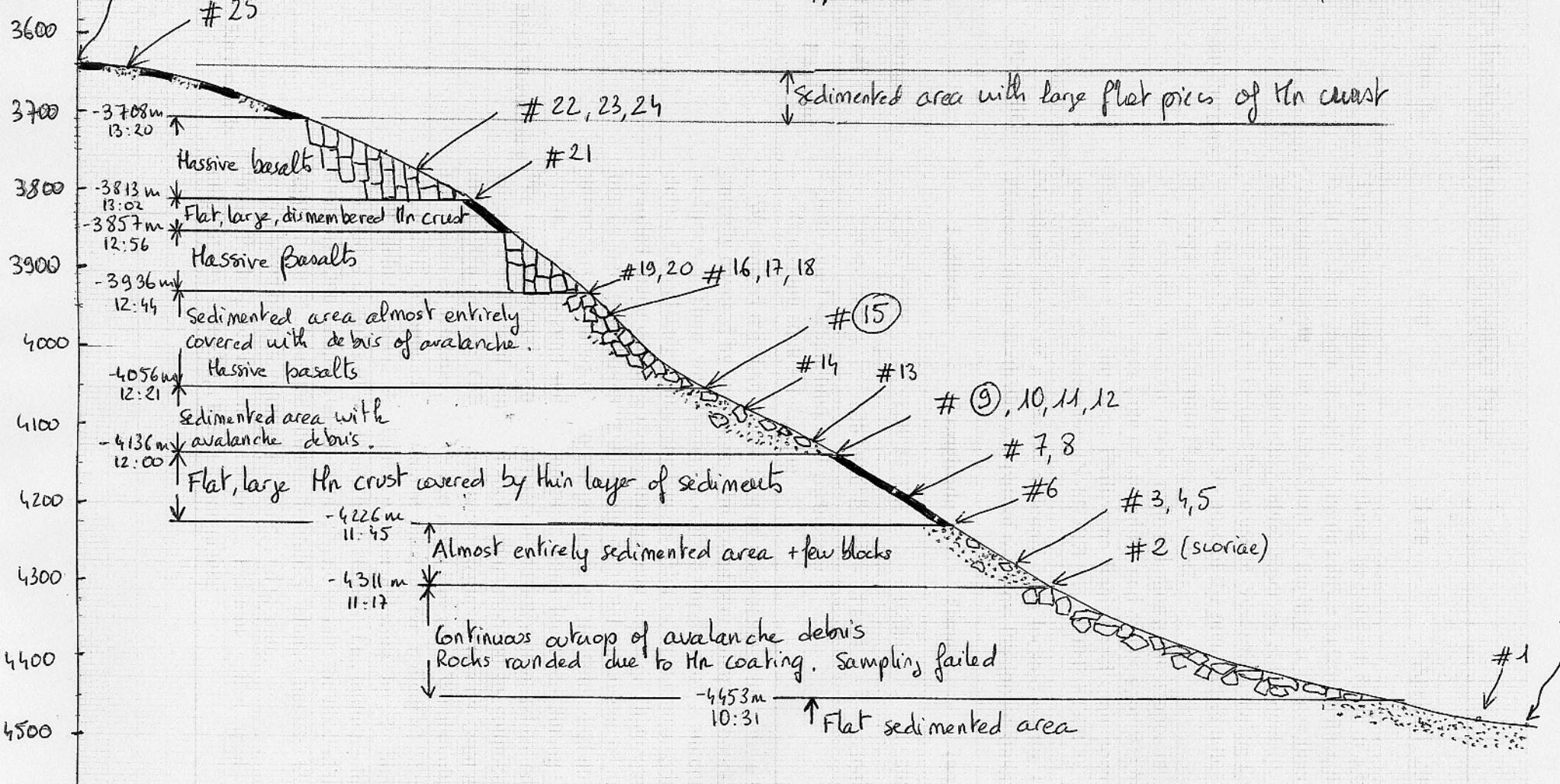
1090

# DIVE # 290

END POINT

SOUTH

NORTH



82

No vertical exaggeration

(15) Fresh basalt samples  
(9)

## **KR03-04 Leg-1 Dive#291 Dive Plan**

**Date of Dive:** 28 April 2003 (Monday)

**Observer:** Shiguo Wu (Institute of Oceanology, CAS)

**Target area:** NW part of the West Philippine Basin; point **A-5**

Start Point:	21°54'15"N	126°30'82" E	Depth = 4800 m
End Point:	21°54'85"N	126°31'62"E	Depth = 3800 m

### **Payload:**

- partitioned sample basket
- push core (one set including 2 cores)

### **Objectives:**

The objectives of dive #291 are:

- 1) to observe outcrops exposed along the south scarp of a NW-SE trending hill.
- 2) to sample volcanic rocks exposed along the slope, in order to determine their ages and petrological-geochemical characteristics.
- 3) to sample sediment cores on the seafloor

### **Dive objective:**

- 1) Landing at the base of slope (~4800 m depth), then move first toward NE until 3800 m water depth,.
- 2) Observing and exploring the outcrop of hard rock
- 3) Collecting the most fresh samples

### **Data:**

- Video records (by Hi-vision and panorama middle cameras)
- Pictures taken by still-camera
- CTD data
- Seismic data (sub-bottom profile) by the launcher

# かいこう 潜航記録

平成 15 年

KR03-04 行動

記載者 藤 勝利

潜航年月日 2003 年 04/28

着底予定位置

潜航回数 5 回

緯度 21° 54. 15' N

通算潜航回数 291 回

経度 126° 30. 82' E

測地系 WGS-84

潜航海域 西フィリピン海 北西部 A-5

潜航目的 調査潜航 海洋地殻の拡大年代とそのセンスを解明するため、新鮮な基盤岩の採取と露頭観察を行う。

調査主任 新城 竜一

ランチャー PILOT 若松 誉

所属 琉球大学

PILOT 三浦 豊司

COPILOT 藤 勝利

作業経過時刻		
吊揚		08:12
着水		08:17
離脱		09:59
着底		10:08
離底		14:33
結合		14:46
水切		15:57
揚収完了		16:04

累計時間	
潜航時間	7:40
前回潜航	1837:30
通算潜航	1845:10

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	7:52	1次番号	2
1次前回時間	1907:17	1次番号別前回時間	994:2
1次通算時間	1915:9	1次番号別通算時間	1001:54
2次使用時間	4:47	2次番号	4
2次前回時間	890:28	2次番号別前回時間	445:7
2次通算時間	895:15	2次番号別通算時間	449:54

## 海象・気象

天候	風向	風力	波浪	うねり	視程
bc	NE	4	2	3	8

最大潜航深度 4873 m

着底深度 4873 m

離底深度 3918 m

着底底質 泥

離底底質 マンガンクラスト

記事

分離曳航により急崖な斜面を登りながら、露頭の観察を行い、適宜岩石のサブリングを行った。

## Preliminary Results of KAIKO Dive

<b>Dive No.</b>	291	<b>Date</b>	April 28, 2003	
<b>Main Purpose</b>	<p>The objectives of the dive are:</p> <ol style="list-style-type: none"> <li>1) to observe outcrops exposed along the south scarp of a NW-SE trending hill.</li> <li>2) to sample volcanic rocks exposed along the slope, in order to determine their ages and petrological-geochemical characteristics.</li> <li>3) to sample sediment cores if we find mud sediments on the seafloor</li> </ol>			
<b>Dive Site</b>	Southern slope of a northwest trending seamount of the West Philippine Sea basin.			
	<b>Latitude</b>	<b>Longitude</b>	<b>Time</b>	<b>Depth (m)</b>
<b>Landing</b>	21°54.15' N	126°30.80' E	10:41	4873
<b>Lift-off</b>	21°54.87' N	126°31.62' E	14:11	3913
<b>Payload</b>	<ul style="list-style-type: none"> <li>- 4 partitioned sample basket</li> <li>- push core (one set including 2 cores)</li> </ul>			
<b>Dive Summary</b>	<ol style="list-style-type: none"> <li>1. We started the dive at 4873m along south slope of a seamount where we sampled 1 push cores. Thinning sediments cover the most of the lower part of track line. We observed some pebbles with strongly manganese coating.</li> <li>2. We then observed outcrops of fully wrapped into thick Mn crust along the upper part of the survey track. We have also observed areas of lava flow sheets-like, but failed to collect the fresh basalt rock samples</li> <li>3. Most of the 15 samples were strongly Mn coating crust identified by R. Shinjo. Two push cores were collected at landing point and top of dive respectively.</li> </ol>			
<b>Key words</b>	West Philippine Basin, Overlapping spreading center, Basalts			

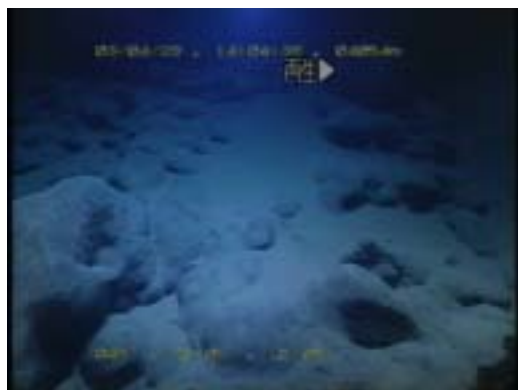
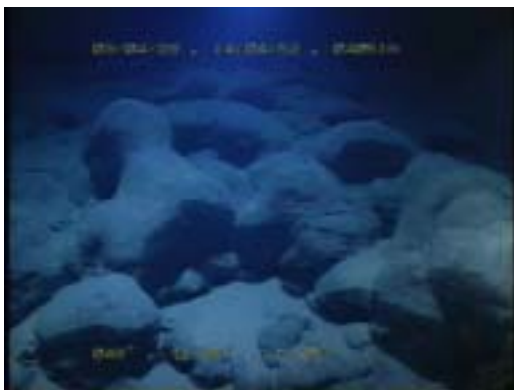
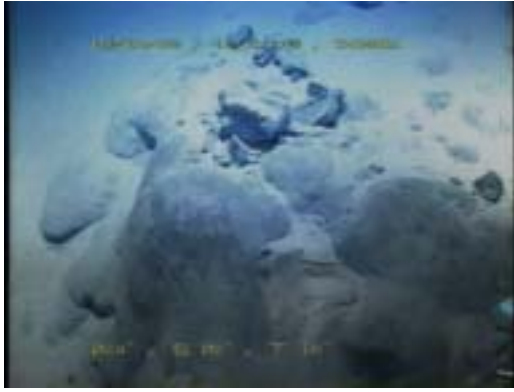
## Preliminary Results of KAIKO Dive

Dive#	291	Name	Shiguo Wu
<b>1) Topography, Geology and Geophysics</b> The diving site located along the southern slope of a NW-SE trending seamount of the West Philippine Sea basin. The gradient of the slope along the dive track is 24°, and locally presented a little steep with some debris flow collapse. Such kind of rocks favors the occurrence of pebbles with Mn coating. Most of the sediments covered the seafloor and heavy coating of Mn-crusts occurred along the track. Few fractures were observed along the track.			
<b>2) Biology and Microbiology</b> Numerous animals (such as crinoids, fishes and shrimps) were found along the dive.			
<b>3) Chemistry</b>  N/A			
<b>4) Ocean Physics</b>  N/A			
<b>5) Engineering</b>  N/A			
<b>6) Others</b>			

## Video Results of KAIKO Dive

Time	Vehicle Depth(m)	Vehicle Altitude(m)	Vehicle Heading(deg)	Narrative	Sample
09:58	4746	182	162	vehicle released	
10:07	4870	8.1	41	sea floor was seen	
10:08	4873	2.0	47	vehicle was on the bottom	
10:10	4873	2.3	47	push core PC(green) in mud sediments	PC(G)
10:15	4827	2.4	46	entirely covered by sediments	
10:47	4738	2.2	31	scarp (by Mn coated rocks)	
10:53	4734	2.6	17	sample#1 put into L2	#1
10:55	4711	2.7	43	entirely covered by sediments	
11:04	4677	5.7	48	scarp (by Mn coated rocks)	
11:07	4648	2.2	41	sampling was failed (strongly coated by Mn)	
11:10	4649	2.0	40	sampling was failed (rock was broken)	
11:14	4638	2.2	36	sampling was failed (rock was broken)	
11:26	4568	2.0	54	sample#2 put into L2	#2
11:31	4562	3.4	38	sampling was failed (strongly coated by Mn)	
11:32	4559	3.2	39	sample#3 put into L1	#3
11:35	4544	3.5	49	sampling was failed (rock was too big)	
11:38	4537	2.9	71	sample#4 put into L2	#4
11:47	4512	3.1	47	entirely covered by sediments	
12:18	4381	2.0	41	sampling was failed (rock was too big)	
12:22	4381	1.8	39	sample#5 put into L1	#5
12:23	4381	2.2	27	sample#6 put into L1	#6
12:26	4380	1.6	21	sample#7 put into R2	#7
12:28	4380	1.8	26	sample#8 put into R2	#8
12:29	4379	1.8	33	sample#9 put into R2	#9
12:30	4379	1.9	30	sample#10 put into R2	#10
12:35	4422	1.8	23	sampling was failed (strongly coated by Mn)	
12:39	4357	1.8	21	sample#11 put into L2	#11
12:42	4357	1.8	21	sample#12 put into L2	#12
12:45	4347	2.6	16	sample#13 put into R1	#13
12:47	4331	3.5	39	scarp (by Mn coated rocks)	
12:48	4328	2.3	28	sample#14 put into R1	#14
12:53	4328	2.0	13	sample#15 put into R1	#15
12:57	4317	1.6	42	entirely covered by sediments	
13:34	4163	5.5	39	scarp (by Mn coated rocks)	

13:39	4148	2.0	45	sampling was failed (rock was too big)	
13:44	4139	3.0	43	sampling was failed (rock was too big)	
13:51	4133	3.3	42	sampling was failed (strongly coated by Mn)	
13:52	4133	2.9	37	sampling was failed (strongly coated by Mn)	
13:55	4123	1.4	47	sampling was failed (strongly coated by Mn)	
14:01	4084	5.7	58	scarp (by Mn coated rocks)	
14:07	4032	1.9	44	entirely covered by sediments	
14:08	4021	3.9	27	scarp (by Mn coated rocks)	
14:17	3960	1.9	39	entirely covered by sediments	
14:21	3956	0.3	58	push core PC(blue) in mud sediments	PC(B)
14:33	3913	6.1	73	vehicle left the bottom	



Photos show the strong manganese coating pebbles during *KAIKO* dive 291



291-R1



291-R2



291-R3



291-R4



291-R5



291-R6



291-R7



291-R8



291-R9



291-R10



291-R11



291-R12



291-R13



291-R14

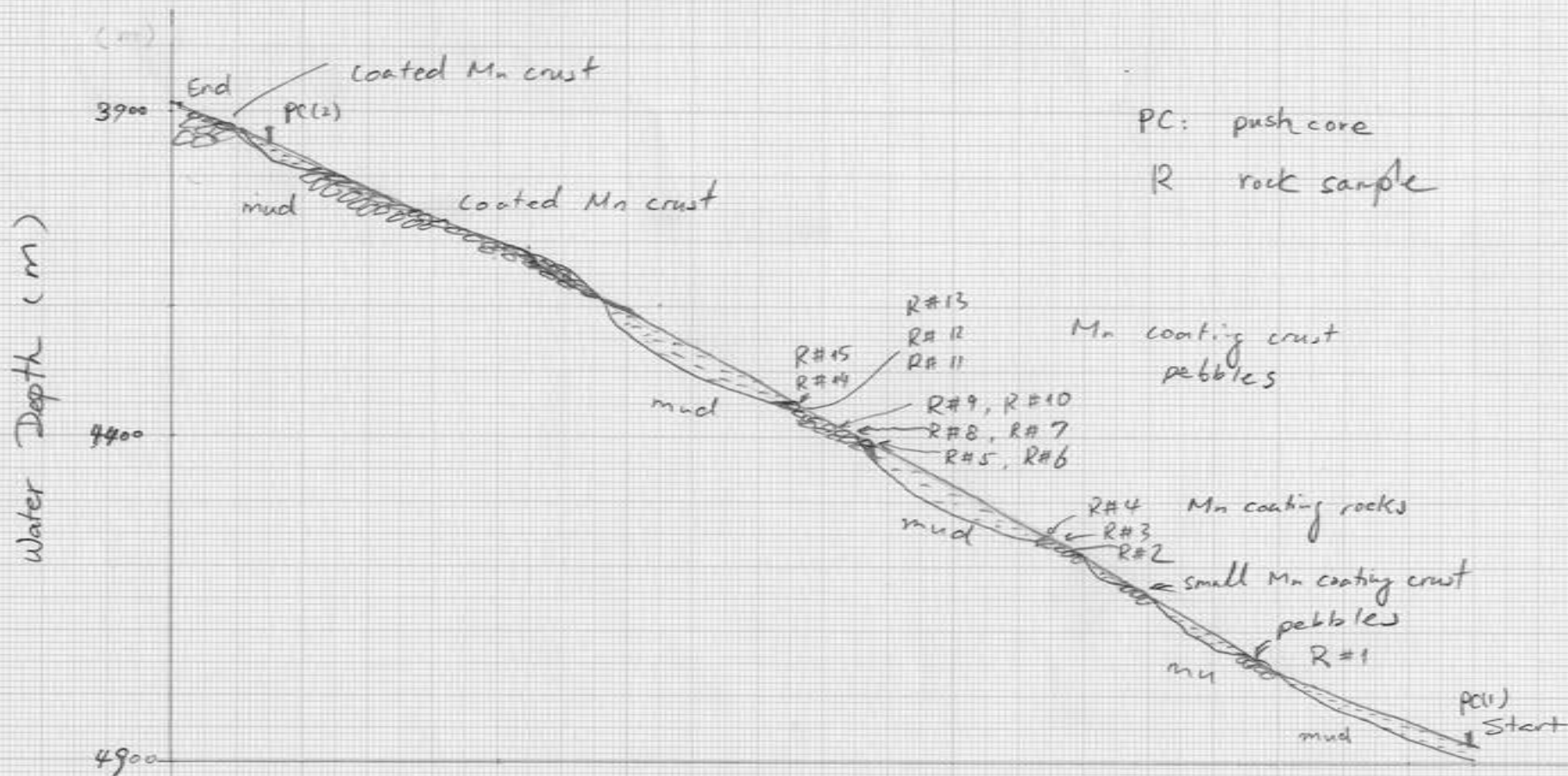


291-R15

**Dive No. #291****Date 2003/4/28**

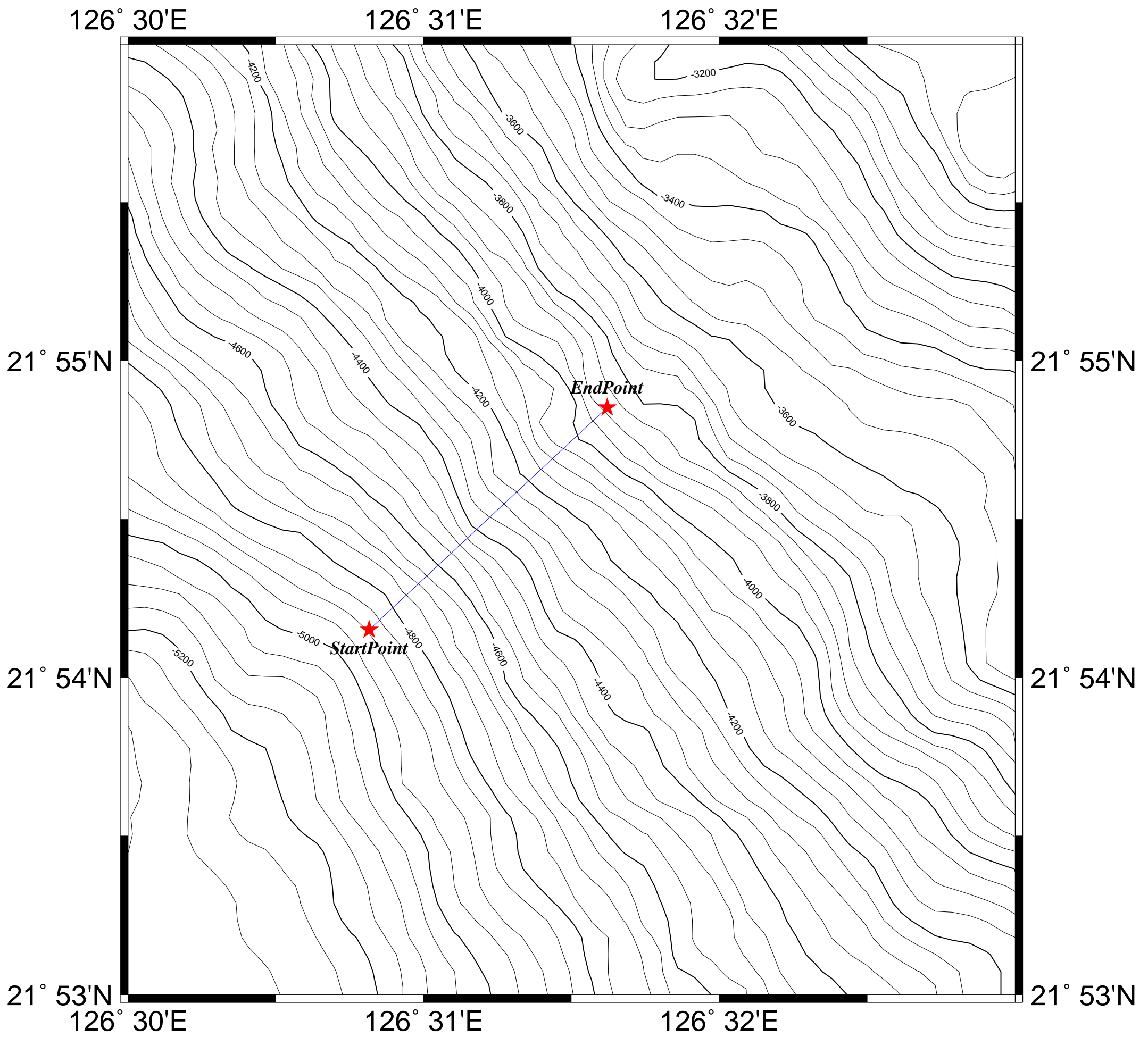
Time(hh:mm)	Vehicle			Narrative	Sample
	Depth(m)	Altitude(m)	Heading(deg)		
09:58	4746	182	162	vehicle was released	
10:07	4870	8.1	41	sea floor was seen	
10:08	4873	2.0	47	vehicle was on the bottom	
10:10	4873	2.3	47	push core PC(green) in mud sediments	PC(G)
10:15	4827	2.4	46	entirely covered by sediments	
10:47	4738	2.2	31	scarp (by Mn coated rocks)	
10:53	4734	2.6	17	sample#1 put into L2	#1
10:55	4711	2.7	43	entirely covered by sediments	
11:04	4677	5.7	48	scarp (by Mn coated rocks)	
11:07	4648	2.2	41	sampling was failed (strongly coated by Mn)	
11:10	4649	2.0	40	sampling was failed (rock was broken)	
11:14	4638	2.2	36	sampling was failed (rock was broken)	
11:26	4568	2.0	54	sample#2 put into L2	#2
11:31	4562	3.4	38	sampling was failed (strongly coated by Mn)	
11:32	4559	3.2	39	sample#3 put into L1	#3
11:35	4544	3.5	49	sampling was failed (rock was too big)	
11:38	4537	2.9	71	sample#4 put into L2	#4
11:47	4512	3.1	47	entirely covered by sediments	
12:18	4381	2.0	41	sampling was failed (rock was too big)	
12:22	4381	1.8	39	sample#5 put into L1	#5
12:23	4381	2.2	27	sample#6 put into L1	#6
12:26	4380	1.6	21	sample#7 put into R2	#7
12:28	4380	1.8	26	sample#8 put into R2	#8
12:29	4379	1.8	33	sample#9 put into R2	#9
12:30	4379	1.9	30	sample#10 put into R2	#10
12:35	4422	1.8	23	sampling was failed (strongly coated by Mn)	
12:39	4357	1.8	21	sample#11 put into L2	#11
12:42	4357	1.8	21	sample#12 put into L2	#12
12:45	4347	2.6	16	sample#13 put into R1	#13
12:47	4331	3.5	39	scarp (by Mn coated rocks)	
12:48	4328	2.3	28	sample#14 put into R1	#14
12:53	4328	2.0	13	sample#15 put into R1	#15
12:57	4317	1.6	42	entirely covered by sediments	
13:34	4163	5.5	39	scarp (by Mn coated rocks)	
13:39	4148	2.0	45	sampling was failed (rock was too big)	
13:44	4139	3.0	43	sampling was failed (rock was too big)	
13:51	4133	3.3	42	sampling was failed (strongly coated by Mn)	
13:52	4133	2.9	37	sampling was failed (strongly coated by Mn)	
13:55	4123	1.4	47	sampling was failed (strongly coated by Mn)	
14:01	4084	5.7	58	scarp (by Mn coated rocks)	
14:07	4032	1.9	44	entirely covered by sediments	
14:08	4021	3.9	27	scarp (by Mn coated rocks)	
14:17	3960	1.9	39	entirely covered by sediments	
14:21	3956	0.3	58	push core PC(blue) in mud sediments	PC(B)
14:33	3913	6.1	73	vehicle left the bottom	

DIVE 291, April 28, 2002

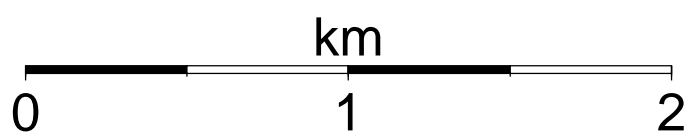


- Total slope angle is  $24^\circ$
- Rock samples strongly coated by Mn crust
- Thinning sediments cover the seafloor along our track line

# KAIKO #291 Dive



GMT Apr 28 00:07 KR03-04 Cotour=50m Gridfile:Dive291\_100.grd

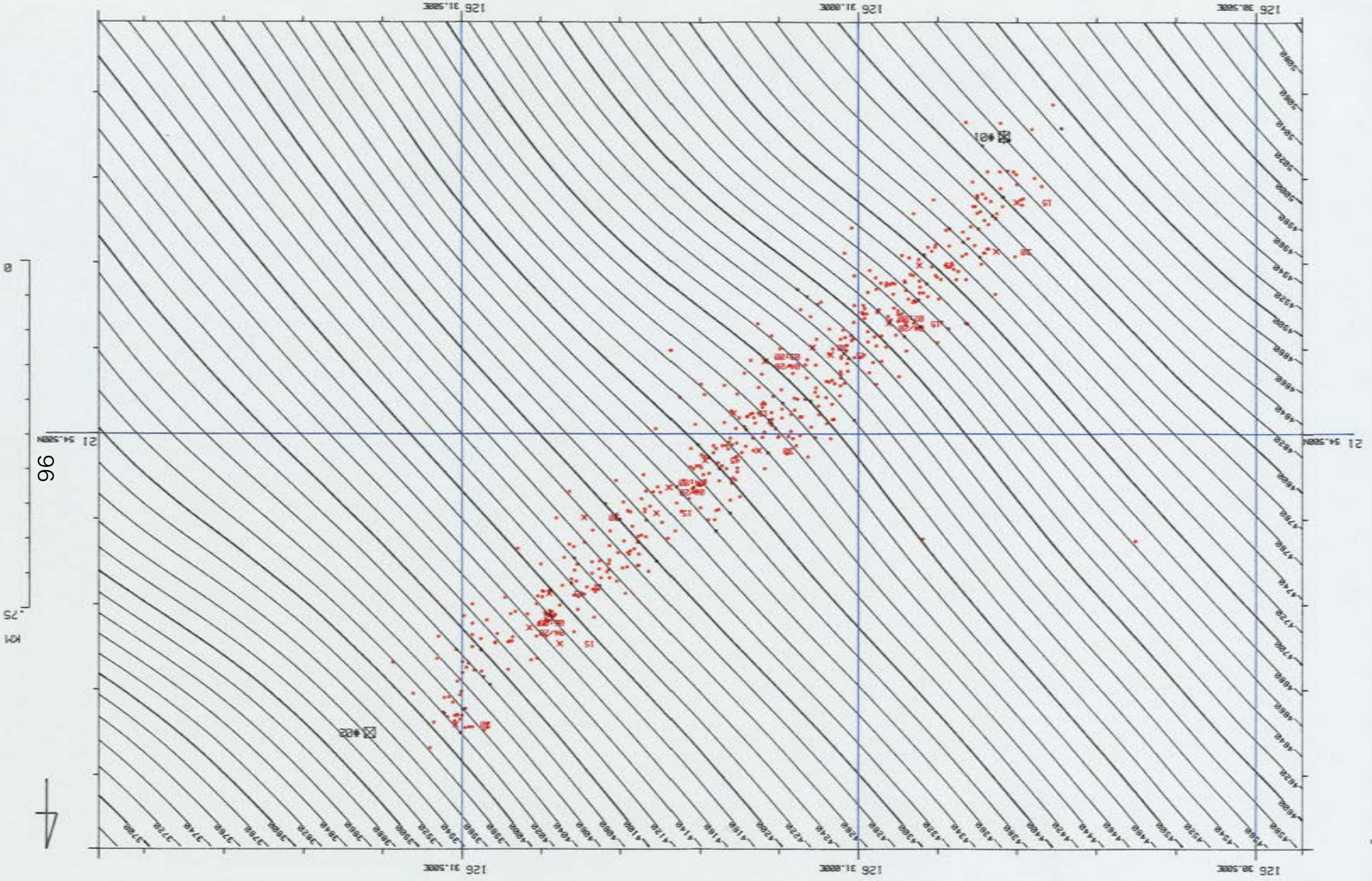


KAIKO Dive291

NW part of the West Philippine Basin (R-5)

Date 2003/04/28

Scale ( 1 / 7500 )



• p \* R P

<LL> 21 54.0N 126 30.4E <LR> 21 54.9N 126 31.9E

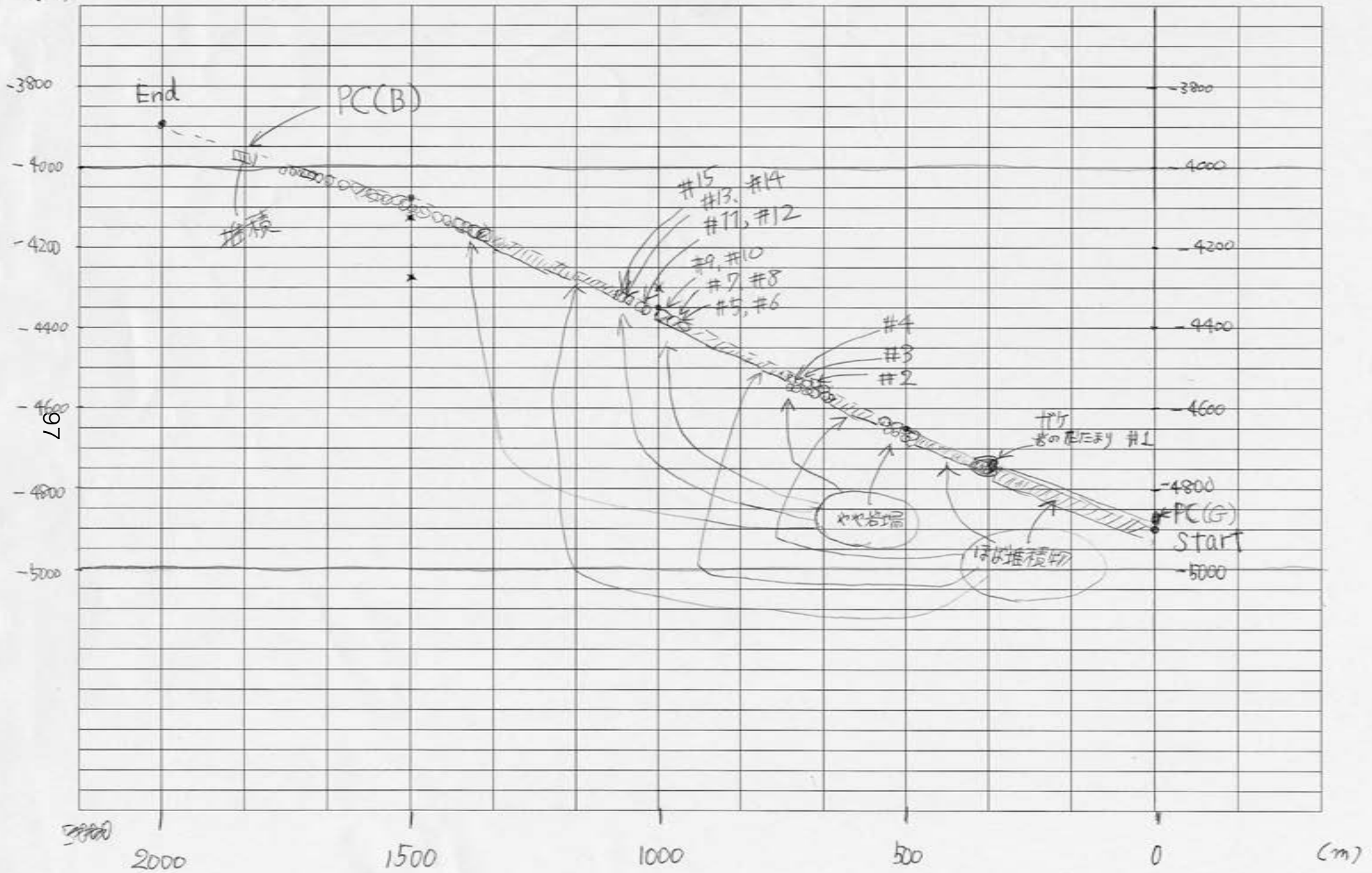
DATA 0304 Proj. MER

03/04/28 01:07:00 -> 03/04/28 05:34:00

4/28

(m)

10K#291



## **KR03-04 Leg-1 Dive#292 Dive Plan**

**Date of Dive:** 30 April 2003 (Wed.)

**Observer:** Ryuichi Shinjo (Univ. Ryukyus)

**Target area:** NW part of the West Philippine Basin; point **A-6**

Start Point: 21°04.12'N 125°45.75'E Depth=6,000 m

End Point: 21°03.10'N 125°45.75'E Depth=5,500 m

### **Payload:**

- 4-partitioned sample basket

### **Objectives:**

The objectives of dive#292 are:

- 1) to observe the outcrop exposed at the scarp, having broadly NW-SE trend, which was formed by spreading of the WPB and considered to be the youngest part in the survey area;
- 2) to collect volcanic rocks exposed at the outcrop, in order to determine its ages and petrological/geochemical characteristics.

### **Dive strategy:**

- 1) Landing at the base of scarp (~6,000 m depth), then move upward (southward) with N180 direction
- 2) Exploring the outcrop of hard rock
- 3) Collecting the most fresh samples (maybe basalts)
- 4) etc.

### **Data:**

- Video records (by Hi-vision middle cameras)
- Pictures taken by still-camera
- CTD data
- seismic data (sub-bottom profile)

# かいこう 潜航記録

平成 15 年

KR03-04 行動

記載者 瀬底 秀樹

潜航年月日 2003 年 04/30

着底予定位置

潜航回数  回

緯度

通算潜航回数  回

経度

測地系

潜航海域

潜航目的

調査主任

ランチャー PILOT

所 属

PILOT

COPILOT

作業経過時刻	
吊揚	08:10
着水	08:15
離脱	10:11
着底	10:22
離底	14:12
結合	14:28
水切	16:01
揚収完了	16:07

累計時間	
潜航時間	7:46
前回潜航	1845:10
通算潜航	1852:56

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	7:57	1次番号	2
1次前回時間	1915:9	1次番号別前回時間	1001:54
1次通算時間	1923:6	1次番号別通算時間	1009:51
2次使用時間	4:17	2次番号	4
2次前回時間	895:15	2次番号別前回時間	449:54
2次通算時間	899:32	2次番号別通算時間	454:11

## 海象・気象

天候	風向	風力	波浪	うねり	視程
<input type="text" value="bc"/>	<input type="text" value="NE"/>	<input type="text" value="2"/>	<input type="text" value="2"/>	<input type="text" value="3"/>	<input type="text" value="9"/>

最大潜航深度  m

着底深度  m

離底深度  m

着底底質

離底底質

## 記事

## Preliminary Results of KAIKO Dive

<b>Dive No.</b>	292	<b>Date</b>	April 30, 2003	
<b>Main Purpose</b>	<p>The objectives of dive#292 are:</p> <p>1) to observe the outcrop exposed at the scarp, having broadly NW-SE trend, which was formed by spreading of the WPB and considered to be the youngest part in the survey area;</p> <p>2) to collect volcanic rocks exposed at the outcrop, in order to determine their ages and petrological/geochemical characteristics.</p>			
<b>Dive Site</b>	The eastern part of Okinawa Luzon Fracture Zone. The southernmost target in the survey area, NW West Philippine Basin.			
	<b>Latitude</b>	<b>Longitude</b>	<b>Time</b>	<b>Depth</b>
<b>Landing</b>	21°03.90	125°45.80	10:21	5887
<b>Lift-off</b>	21°03.10	125°45.75	14:12	5577
<b>Payload</b>	4-partitioned sample basket			
<b>Dive Summary</b>	<p>The ROV landed at the bottom (depth=5887 m) of NE-facing scarp, then head to the south (N180). We observed soft sediments around the starting point. At around water depth of 5850 to 5750, thick layers of Mn crust (Max ~1 m), dipping parallel to the slop, were occasionally observed; the massive layer was often broken due to possible landslide. Fragments of these Mn crust were also present in sediments.</p> <p>Unfurtunatly, it was impossible to obtain volcanic rocks, due to the lacking of fresh outcrop and/or recent collapse of basement.</p>			
<b>Key words</b>	West Philippine Basin, Okinawa-Luzon Fracture Zone, Mn.			



## Preliminary Results of KAIKO Dive

Dive#	292	Name	Ryuichi Shinjo
<p><b>1) Topography, Geology and Geophysics</b></p> <p>The entire range of dive track was covered by soft sediments or thick Mn-crust bedding layers (thickness ranges from ~0.5 to 1 m). At some places, Mn layer cracks due to possible landslide movement, so that their fragments were scattered particularly at steeper part of the scarp. Pillow lava-like Mn pavements were also observed.</p>			
<p><b>2) Biology and Microbiology</b></p> <p>N/A</p>			
<p><b>3) Chemistry</b></p> <p>N/A</p>			
<p><b>4) Ocean Physics</b></p> <p>N/A</p>			
<p><b>5) Engineering</b></p> <p>N/A</p>			
<p><b>6) Others</b></p> <p>N/A</p>			

## Video Results of KAIKO Dive

Dive#	292	Name	Ryuichi Shinjo
<b>Video Time, Camera No., and Comments</b>			
<b>1) 10:25 11sec – 10:26 30sec, Center HV camera</b> Thick (~30 cm) Mn crust coating.			
<b>2) 10:57 10sec – 10:58 00sec, Center HV camera</b> Deformation of ~20 cm-thick Mn crust layer.			
<b>3) 11:28 00sec – 11:28 30sec, Center HV camera</b> Trying to catch Mn crust fragment, but failed.			
<b>4) 11:39 00sec – 11:39 20sec, Center HV camera</b> ~1 m thick Mn crust layer.			
<b>5) 11:53 10sec – 11:53 29 sec, Center HV camera</b> outcrop of collapse of thick Mn crust layer.			
<b>6) 12:24 17sec – 12:24 30sec, Center HV camera</b> Pillow lava-like Mn pavement.			



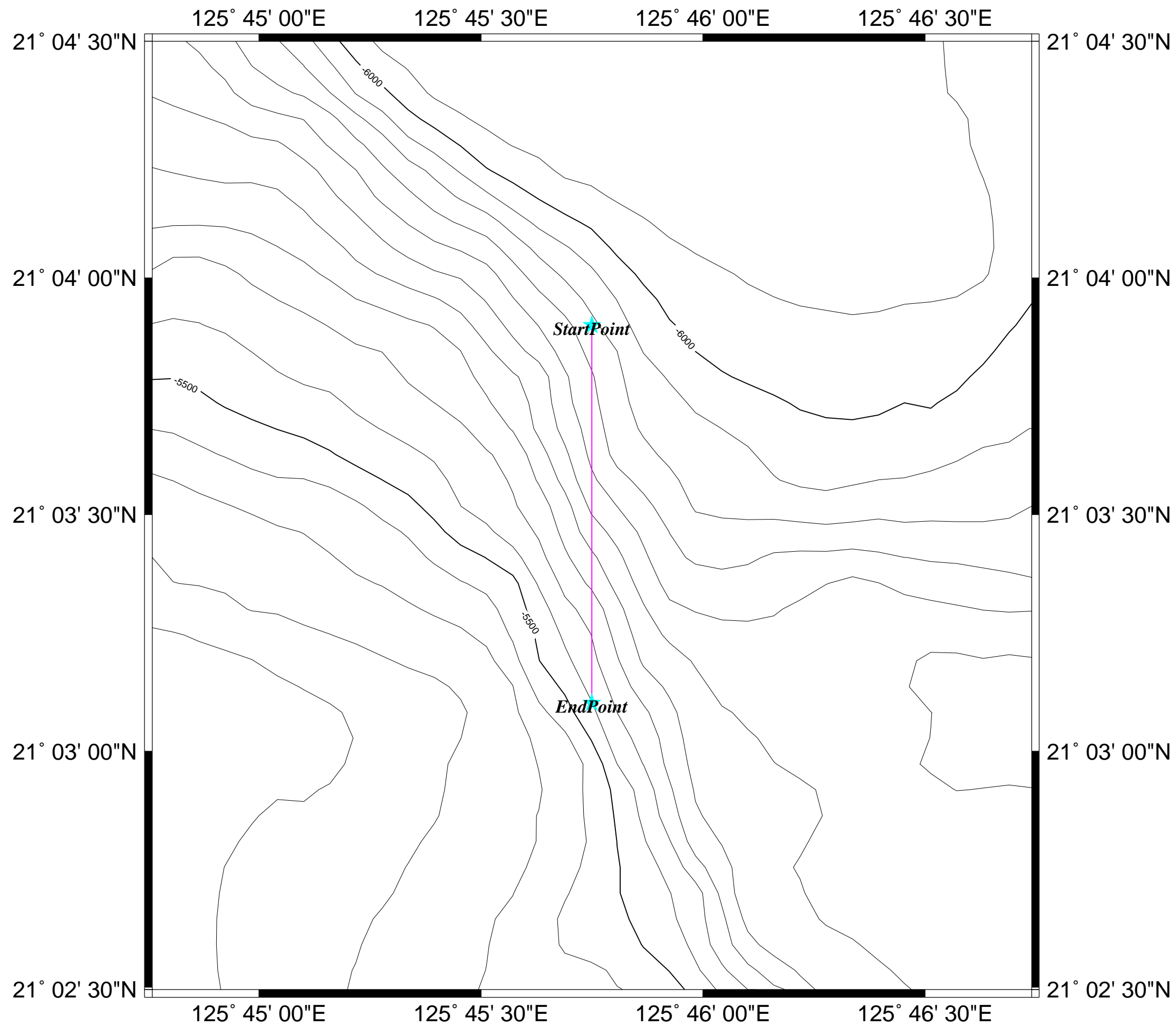
292\_R1

**Dive No. #292**

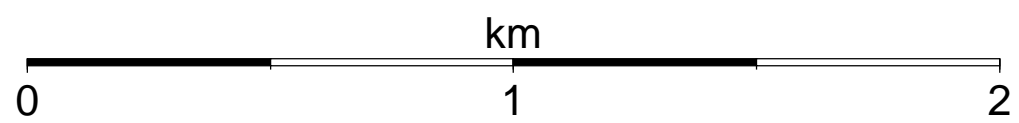
**Date 2003/4/30**

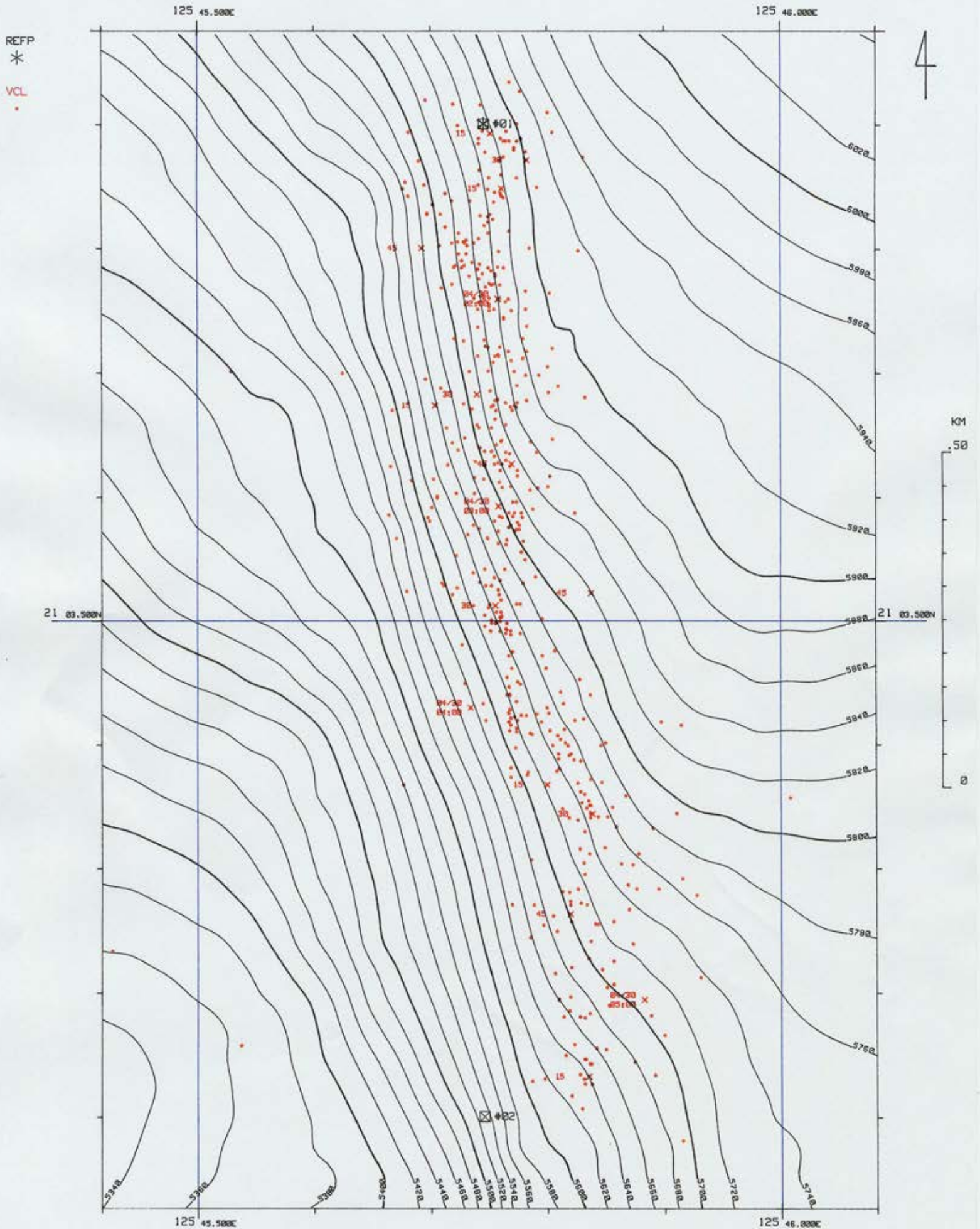
Time(hh:mm)	Vehicle			Narrative	Sample
	Depth(m)	Altitude(m)	Heading(deg)		
10:10	5742	-	12	vehicle was released	
10:21	5887	-	184	sea floor was seen	
10:22	5898	1.3	245	on the bottom (entirely covered by sediments)	
10:25	5875	2.0	253	observed outcrop (Mn crust on sediments)	
10:42	5839	1.3	262	observed rocks (Mn crust on sediments)	
10:58	5846	1.4	220	observed outcrop (Mn crust on sediments)	
11:26	5828	1.4	238	sampling was failed (rock was broken : Mn)	
12:03	5782	1.8	229	sampling was failed (rock was broken : Mn)	
12:20	5725	1.9	227	sampling was failed (rock was broken : Mn)	
12:30	5718	1.0	200	sample#1 put into L2 (from outcrop)	#1
12:35	5705	2.0	208	sampling was failed (rock was broken : Mn)	
12:38	5709	2.2	289	sampling was failed (rock was broken : Mn)	
12:40	5705	1.5	254	sampling was failed (rock was broken : Mn)	
12:42	5705	1.0	240	observed outcrop (Mn crust)	
13:41	5662	2.1	216	sampling was failed (rock was broken : Mn)	
13:56	5601	1.4	222	sampling was failed (rock was broken : Mn)	
14:12	5577	3.6	216	vehicle left the bottom	

# KAIKO #292Dive



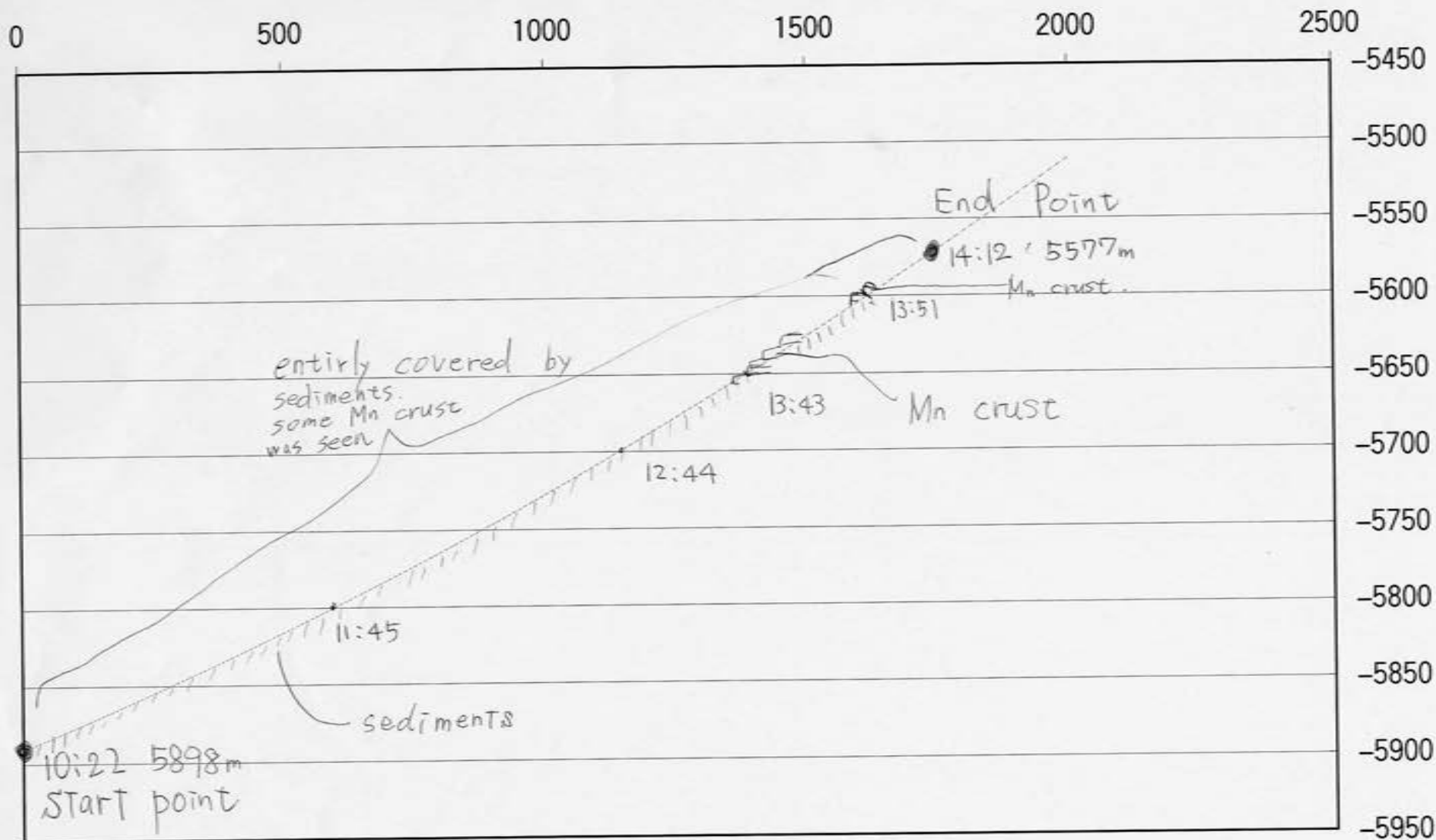
GMT Apr 30 02:51 KR03-04 Cotour=50m Gridfile:Dive292\_100.grd





# DIVE #292

distance(m)



## **KR03-04 Leg-1 Dive#293 Dive Plan**

**Date of Dive:** May 1, 2003 (Thursday)

**Observer:** Serge Lallemand (Montpellier Univ.)

**Target area:** Northern part of the West Philippine Basin across the Luzon-Okinawa Fracture Zone; point **A-8**

Start Point:	21°31.67' N	124°56.95' E	Depth = 5800 m
End Point:	21°31.87' N	124°56.42' E	Depth = 4950 m

### **Payload:**

- partitioned sample basket
- push core (one set including 2 cores)
- 

### **Objectives:**

The objectives of dive #293 are:

- 1) to observe outcrops exposed along the NNE-SSW trending scarp which corresponds to the trace of the paired Luzon-Okinawa Fracture Zone
- 2) to sample volcanic rocks exposed along the slope, in order to determine their ages and petrological-geochemical characteristics.
- 3) to sample sediment cores if we find a sedimented area (may be at the bottom of the cliff ?)

### **Dive strategy:**

According to the sampling difficulties we have encountered during dives 291 & 292, we have defined a target that exhibits the steepest slope west of the Luzon-Okinawa Fracture Zone.

The transect locates along the FZ but should enable us to sample the oceanic crust west of it.

- 1) Landing at the base of slope (~5800 m depth), then climb the cliff until its top (4950 m depth) following a N290° azimuth
- 2) Observing and exploring the outcrop of hard rock
- 3) Collecting the most fresh samples (basalts)
- 4) obtain sediment samples at the beginning of the dive into the trough in order to trace the source of sediments

**Data:**

- Video records (by Hi-vision and panorama middle cameras)
- Pictures taken by still-camera
- CTD data
- seismic data (sub-bottom profile) by the launcher

# かいこう 潜航記録

平成 15 年

KR03-04 行動

記載者 竹ノ内 純

潜航年月日 2003 年 05/01

着底予定位置

潜航回数  回

緯度

通算潜航回数  回

経度

測地系

潜航海域

潜航目的

調査主任

ランチャー PILOT

所属

PILOT

COPILOT

作業経過時刻	
吊揚	08:10
着水	08:16
離脱	10:08
着底	10:20
離底	14:21
結合	14:36
水切	16:01
揚収完了	16:08

累計時間	
潜航時間	7:45
前回潜航	1852:56
通算潜航	1860:41

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	7:58	1次番号	2
1次前回時間	1923:6	1次番号別前回時間	1009:51
1次通算時間	1931:4	1次番号別通算時間	1017:49
2次使用時間	4:28	2次番号	4
2次前回時間	899:32	2次番号別前回時間	454:11
2次通算時間	904:0	2次番号別通算時間	458:39

## 海象・気象

天候  風向  風力  波浪  うねり  視程

最大潜航深度  m

着底深度  m

離底深度  m

着底底質

離底底質

## 記事

## Preliminary Results of KAIKO Dive

<b>Dive No.</b>	293		<b>Date</b>	May 1, 2003	
<b>Main Purpose</b>	<p>The objectives of dive #293 are:</p> <p>1) to observe outcrops exposed along the NNE-SSW trending scarp which corresponds to the trace of the paired Luzon-Okinawa Fracture Zone</p> <p>2) to sample volcanic rocks exposed along the slope, in order to determine their ages and petrological-geochemical characteristics.</p> <p>3) to sample sediment cores if we find a sedimented area (may be at the bottom of the cliff ?)</p> <p>According to the sampling difficulties we have encountered during dives 291 &amp; 292, we have defined a target that exhibits the steepest slope west of the Luzon-Okinawa Fracture Zone (LOFZ). The transect locates along the FZ but should enable us to sample the oceanic crust west of it.</p>				
<b>Dive Site</b>	Northern part of the West Philippine Basin (WPB) across the LOFZ; point A-8				
	<b>Latitude</b>	<b>Longitude</b>	<b>Time</b>	<b>Depth</b>	
<b>Landing</b>	21°31.65' N	124°56.92' E	10:20	5779	
<b>Lift-off</b>	21°31.91' N	124°56.30' E	14:21	4913	
<b>Payload</b>	<ul style="list-style-type: none"> <li>- partitioned sample basket</li> <li>- push core (one set including 2 cores)</li> </ul>				
<b>Dive Summary</b>	<p>The dive was extremely successful. 22 rock samples (most of them being fresh basalts or gabbros) and 2 sediment cores.</p> <p>The dive started at the base of a NNE-SSW trending 38°-dipping slope. That slope was generated along the major LOFZ. About half of the cliff exhibited dislocated basalt outcrops including dykes partly covered with Mn coating. Gravitational instabilities along the slope triggered collapses and consequent cracking &amp; sliding of the thick Mn crust. The slope was extremely steep at several places preventing any sampling with the submersible. Oceanic crust outcrops were exposed from the base to the ultimate top of the abyssal hill. Despite the difficulty to distinguish between huge avalanche debris and highly fractured outcrops, we believe that the second interpretation was the right one for several places.</p>				

<b>Key words</b>	West Philippine Basin, Luzon-Okinawa Fracture Zone, basalts
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## Preliminary Results of KAIKO Dive

Dive#	293	Name	Serge Lallemand
<p><b>1) Topography, Geology and Geophysics</b>            The dive was planned to observe a section of oceanic crust that belongs to the part of the West Philippine Basin west of the LOFZ. We have chosen a site located along the westernmost fracture of the LOFZ, so that the scarp originated from the strike-slip motion along the fracture, reveals a section that belongs to one of the WNW-ESE trending abyssal hills of the western part of the WPB. We ignore the sense of motion of the LOFZ during spreading. There are still controversies among authors. If we are successful in dating the oceanic crust on both sides of the LOFZ, then we will know the sense of motion and thus constrain the location of the fossil spreading center west of the LOFZ. Magnetic survey will also be used to calibrate spreading rates and extend local ages to the whole Basin area.</p>			
<p><b>2) Biology and Microbiology</b>            It seems that deep fauna was less abundant than during previous dives. Nevertheless, a few crinoids, shrimps and other unknown species were observed.</p>			
<p><b>3) Chemistry</b>             N/A</p>			
<p><b>4) Ocean Physics</b>             N/A</p>			
<p><b>5) Engineering</b>             N/A</p>			
<p><b>6) Others</b></p>			

## Video Results of KAIKO Dive

Dive#	293	Name	Serge Lallemand
<b>Video Time, Camera No., and Comments</b>			
<b>1) 10:20 – 10:23 Center HV camera</b>	mud sampling using push cores		
<b>2) 10:23 – 10:36 Center HV camera</b>	debris flow with scattered cm to dm apparently altered blocks		
<b>3) 10:36 – 10:50 Center HV camera</b>	same but metric blocks may be in place		
<b>4) 10:50 – 11:00 Center HV camera</b>	Mn crust wraps sediment		
<b>5) 11:00 – 11:06 Center HV camera</b>	steep cliff with fractured Mn coated rocks		
<b>6) 11:10 – 11:12 Center HV camera</b>	same but thin Mn coating		
<b>7) 11:12 – 11:27 Center HV camera</b>	avalanche debris		
<b>8) 11:27 – 11:50 Center HV camera</b>	crust over debris flow		
<b>9) 11:50 – 11:59 Center HV camera</b>	Mn coated avalanche debris		
<b>10) 11:59 – 12:10 Center HV camera</b>	Thick fractured Mn coating (rounded shape) onto highly fractured rocks – collapse area		
<b>11) 12:10 – 12:20 Center HV camera</b>	flat crust onto outcrops		
<b>12) 12:20 – 12:30 Center HV camera</b>	highly fractured basalts		
<b>13) 12:30 – 12:35 Center HV camera</b>	rounded Mn coating wrapping avalanche debris or fractured rocks ?		

<b>14) 12:35 – 13:00 Center HV camera</b> highly fractured rocks or avalanche ?
<b>15) 13:00 – 13:04 Center HV camera</b> sedimented bench
<b>16) 13:04 – 13:15 Center HV camera</b> avalanche debris – angular rocks in alternance with sedimented areas
<b>17) 13:15 – 13:24 Center HV camera</b> thick flat crust onto debris
<b>18) 13:24 – 13:27 Center HV camera</b> sedimented area
<b>19) 13:27 – 13:31 Center HV camera</b> probable N280° trending thick Mn coated dyke
<b>20) 13:31 – 13:39 Center HV camera</b> rounded Mn coating with cracks
<b>21) 13:39 – 13:41 Center HV camera</b> sedimented area
<b>22) 13:41 – 14:19 Center HV camera</b> encrusted outcrop
<b>23) 14:19 – 14:21 Center HV camera</b> thick altered crust



293\_R1



293\_R2



293\_R3



293\_R4



293\_R5



293\_R6



293\_R7



293\_R8



293\_R9



293\_R10



293\_R11



293\_R12



293\_R13



293\_R14



293\_R15



293\_R16



293\_R17



293\_R18



293\_R19



293\_R20



293\_R21



293\_R22

**Dive No. #293****Date 2003/5/1**

Time(hh:mm)	Vehicle			Narrative	Sample
	Depth(m)	Altitude(m)	Heading(deg)		
10:08	5620	-	315	The vehicle was released	
10:19	5775	-	303	sea floor was seen	
10:20	5781	1.3	352	on the bottom (entirely covered by mud)	
10:21	5781	1.2	350	push core (Green)	
10:22	5781	1.2	350	push core (blue)	
10:26	5771	1.9	331	sample #1(about 10cm) put into L2 (from outcrop)	#1
10:30	5762	2.4	307	sample #2(about 30cm) put into L2 (from outcrop)	#2
10:36	5741	1.2	259	sample #3(about 25cm) put into L2 (from outcrop ?)	#3
10:41	5727	1.6	305	sample #4(about 30cm) put into L2 (from outcrop)	#4
10:44	5713	1.3	287	sample #5(about 25cm) put into L1 (from outcrop)	#5
10:52	5676	1.8	347	Sampling failed	
10:55	5670	1.8	321	Sampling failed	
10:59	5665	2.2	326	sample #6(about 25cm) put into L1 (from outcrop)	#6
11:05	5629	2.2	337	sample #7(about 30cm) put into L1 (from outcrop)	#7
11:18	5542	1.8	299	Sampling failed	
11:23	5527	1.9	224	sample #8(about 20cm) put into L1 (from outcrop ?)	#8
11:32	5497	2.0	285	sample #9(about 25cm) put into R2 (from outcrop ?)	#9
11:35	5488	3.4	299	sample #10(about 20cm) put into R2 (from outcrop)	#10
11:52	5423	3.4	298	sample #11(about 20cm) put into R2 (from outcrop)	#11
11:56	5421	3.4	282	sample #12(about 20cm) put into R2 (from outcrop)	#12
12:02	5406	1.8	246	sample #13(about 20cm) put into R2 (from outcrop)	#13
12:12	5366	3.4	272	sample #14(about 30cm) put into R1 (from outcrop)	#14
12:22	5339	3.3	254	sample #15(about 10cm) put into R1 (from outcrop)	#15
12:24	5334	3.6	282	sample #16(about 20cm) put into R1 (from outcrop)	#16
12:41	5267	3.7	263	sample #17(about 25cm) put into R1 (from outcrop)	#17
12:53	5227	2.7	283	sample #18(about 20cm) put into R1 (from outcrop)	#18
13:06	5191	1.5	267	sample #19(about 25cm) put into R1 (from outcrop ?)	#19
13:11	5179	2.2	274	Sampling failed	
13:13	5179	1.9	267	sample #20(about 25cm) put into R1 (from outcrop)	#20
13:34	5078	4.2	282	sample #21(about 20cm) put into R1 (from outcrop)	#21
14:14	4945	2.9	316	sample #22(about 25cm) put into R2 (from outcrop ?)	#22
14:21	4913	8.8	298	The vehicle left the bottom.	

12:42	5267	275	17	R1	30 cm long rock	
12:53	5227	287	18	R1	about 20 cm cubic rock	
13:04	5191	250	19	R1	25 cm losangic block	
13:12	5179	274	20	R1	25 cm rounded block	
13:15	5170				coated basalts – nice sections	*
13:28	5117	296			Big coated dyke ?	
13:31	5101	290			pseudo-stratification, dikes ?	
13:33	5078	289	21	R1	small sample	
13:38	5053	289			sedimented area	
14:09	4947	269			failed	
14:13	4945	336	22	R2	about 20 cm block	
14:21	4913	301			end of dive	

## DIVE' MINUTES FORM

KR03-04-Leg1

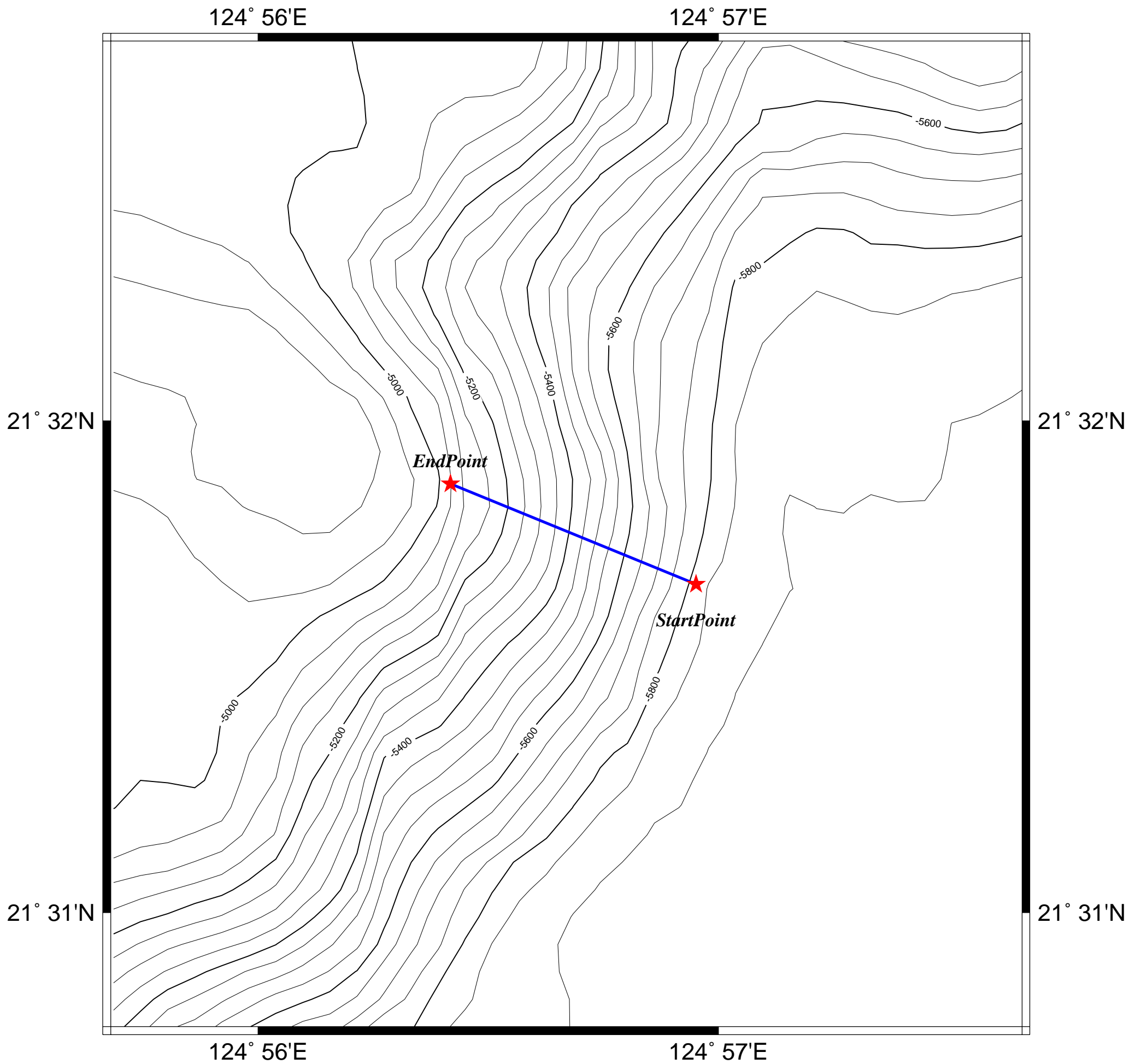
Dive # 293

Observer: Serge Lallemand

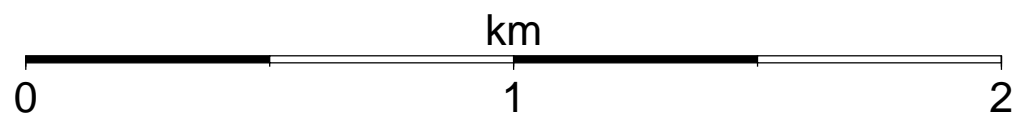
Date: May 1, 2003

Time	Depth	Heading	Sample n°	Basket loc.	Description	Best-of
8:15	0				Kaiko at sea	
10:09	5620				Kaiko separates from launcher	
10:20	5779				Kaiko on seabottom	
10:22	5781		PC1	L1	mud sampling (green)	
10:23	5781		PC2	L1	mud sampling 2 (blue)	
<b>debris flow on sediment</b>						
10:25	5771	329			debris of Mn crust within sed.	
10:26	5768	339	1	L2	small irregular piece of rock	
10:30	5762	306	2	L2	medium size piece of rock	
10:36	5741	259	3	L2	angular rock	
10:40	5727	317	4	L2	big piece (Mn or basalt)	
10:44	5713	294	5	L1	big angular piece of rock (fragment of dyke ?)	
<b>steep wall</b>						
11:00	5665	323	6	L1	big angular piece of rock massive outcrop	*
11:02	5640	339			massive basalt flows with dismembered dykes	
11:06	5630	338	7	L1	big angular block from massive basalts	
<b>avalanche debris</b>						
11:10	5584	301			outcrop of massive rocks coated with Mn	
11:13	5587	299			sedimented area with few rocks (basalts coated with Mn ?)	
11:24	5527	303	8	L1	medium size angular fragment	
11:29	5501	298			only partially dismembered Mn crust & sediment	
11:32	5498	297	9	R2	medium size angular rock	
11:35	5488	299			massive rocks with sharp edges =? dikes	
11:36	5488	299	10	R2	big rock	
11:52	5423	303	11	R2	25 cm block	
11:56	5421	281	12	R2	15 cm small block	
11:58	5414	299			Nice Mn coating + dismembered dykes (collapse)	*
12:02	5406	246	13	R2	15-20 cm block steep cliff	*
12:11	5366	272	14	R1	10 cm thick flat rock	
12:22	5339	251	15	R1	small flat rock	
12:23	5339	16	16	R1	20 cm cubic rock	

# KAIKO #293Dive



GMT Apr 30 10:54 KR03-04 A-8area Cotour=50m Gridfile:Dive293\_100.grd



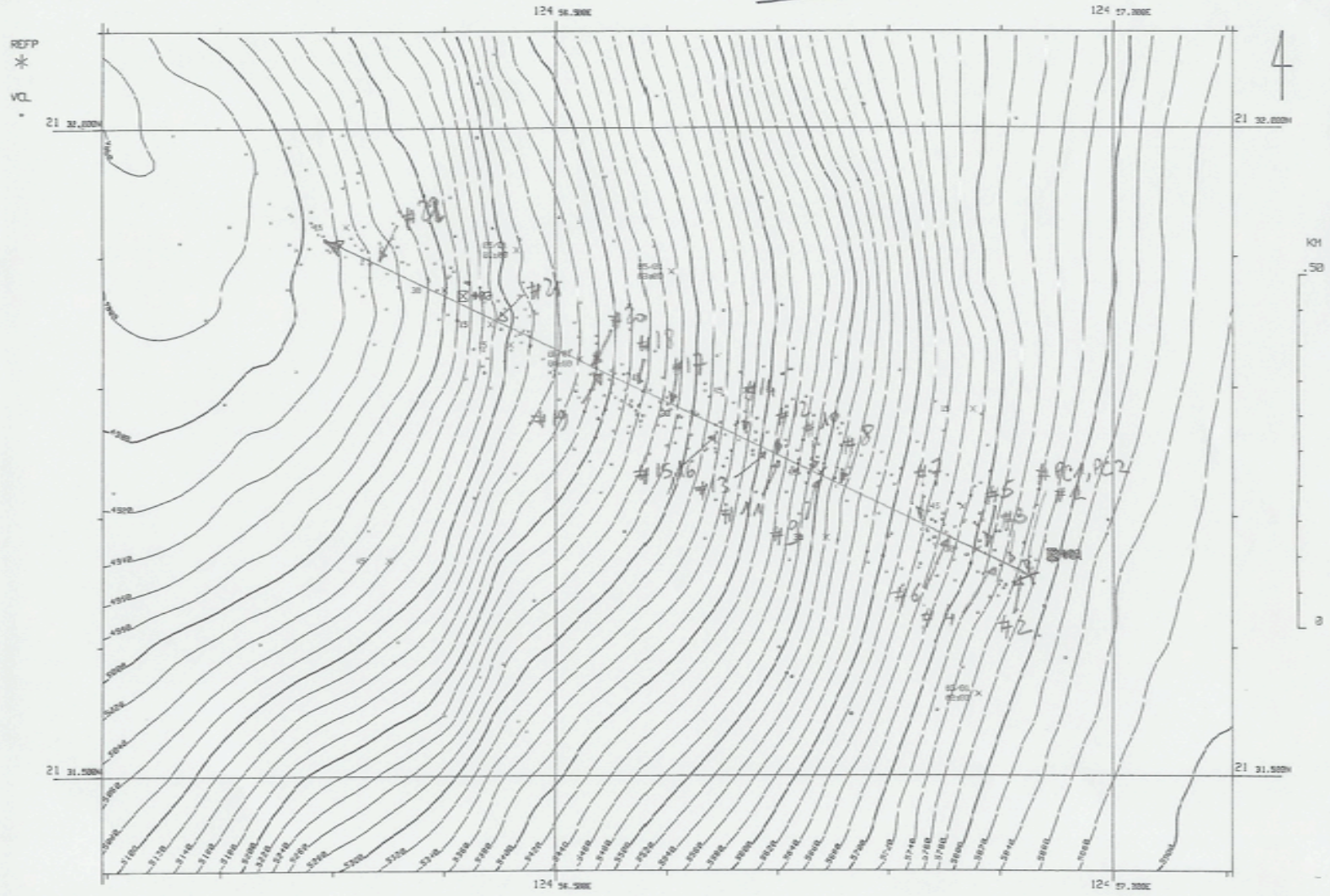
REFP

NW part of the West Philippine Basin (A-B)

Dive 293

DATE LOGG 03/01

Scale ( 1 / 5000 )



<LL> 21 31.4N 124 56.0E <UR> 21 32.0N 124 57.1E

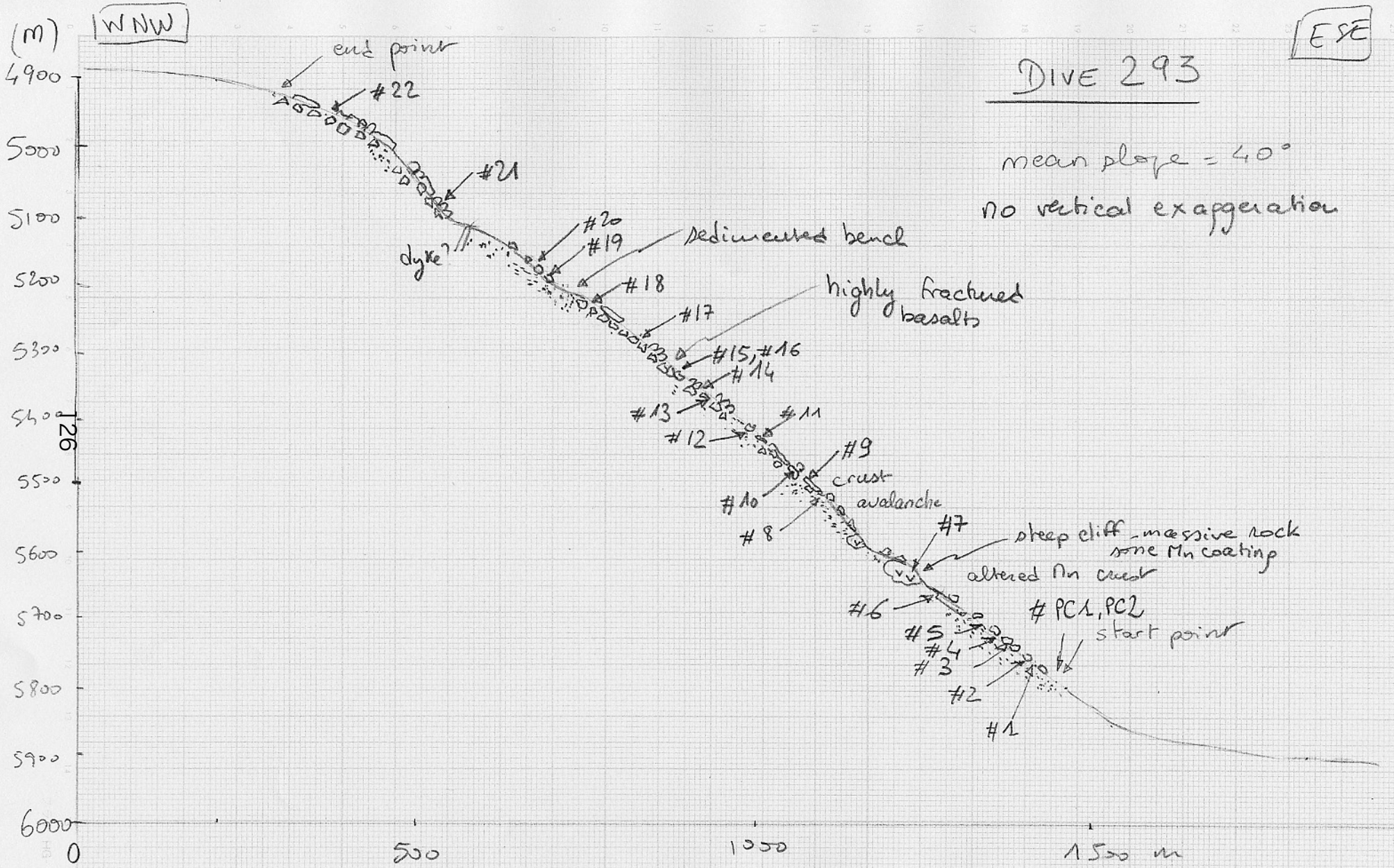
Detun HSBM Proj. HDR

03/05/01 01:15:00 -> 03/05/01 05:22:00

100m = 1,30

# DIVE 293

mean slope = 40°  
no vertical exaggeration



WNW

ESE

end point

dyke?

bedimented bench

highly fractured basalts

crust avalanche

steep cliff - massive rock  
some Mn coating

altered Mn crust

# PC1, PC2

start point

500

1000

1500 m

6000

5900

5800

5700

5600

5500

5400

5300

5200

5100

5000

4900

(m)

126

0

## 5. Summary of Scientific results

1) Preliminary results for multibeam bathymetric survey revealed that the northwestern WPB is characterized by several ridge jump (overlapping spreading centers). This is distinct from the eastern counterpart of the Minami Okinawa Escarpment, implying significant interplay between spreading ridge and mantle plume (Urdaneta Plateau).

2) We conducted a total of 7 dives (Dive # 287 to 293) by ROV *KAIKO*, making the best of terrible situation. Five dives are located east of the Okinawa-Luzon Fracture Zone (OLFZ), one dive is at west of OLFZ, and one dive in the northern Urdaneta Plateau. Except for dive#292, all other dives recovered igneous basement rocks, which will provide us valuable information about formation ages and geochemical composition of their sources.

3) During the cruise, we also undertook geophysical survey including magnetic and gravity anomaly. Together with age and bathymetric data, these geophysical data will be used to help for better understanding of tectono-magmatic evolution of the northwestern WPB.

## **6 Data and sample distribution policy**

Since the current KR03-04 Cruise is organized by Japan Marine Science and Technology Center (JAMSTEC), the cruise participants are responsible to follow the data and sample distribution policy stated below.

Original diving data (including video tapes, still photos, and navigation) and geophysical survey data will be archived by JAMSTEC. Copies will be delivered to those who are either onboard or specified shore-based scientists and submitted a sample request form to JAMSTEC.

All the rock, core and biological samples will be archived by JAMSTEC unless specified. The reasonable amount of these samples will be lent to those who are either onboard or specified shore-based scientists and submitted a sample request form to JAMSTEC.

The cruise participants have the first priority to use the data and samples obtained during the cruise until two years after the end of the cruise. They are responsible for writing scientific papers and reports during the period of the priority.

Other specified shore-based scientists will be able to use the data and samples obtained during the cruise after the first priority publications take place.

After two years have passed after the cruise, the data and samples obtained during the cruise will be released to all scientists. Upon request, a copy of the data will be delivered and reasonable amounts of the sample material for their use will be lent to interested scientists.

A copy volume of the cruise report, together with an electronic version, will be delivered to each cruise participant.

A copy volume of the cruise report will also be delivered to the specified shore-based scientists, Operation Manager of KAIKO and Master of KAIREI.

## **7. Proposals and request for data and samples**

### **KR03-04 Leg-1 Cruise, NW part of the West Philippine Basin**

**Ryuichi Shinjo** (Univ. Ryukyus)

#### **1. Subject**

Bathymetric structure, geotectonic evolution, and magmatic source characteristics of the northwestern part of the West Philippine Basin (WPB)

#### **2. Purpose**

- 1) To provide formation age and comprehensive petrological/geochemical data for volcanic rocks emplaced during the spreading of NW part of the WPB.
- 2) To explore the geotectonic evolution of this part of WPB.

#### **3. Method**

- 1) Petrological and geochemical analyses (whole-rock major and trace element concentrations, Sr/Nd/Pb isotopic ratios, mineral chemistry) for volcanic rocks (Microscopic observation and chemical analyses by EPMA, XRF, ICP-MS, and TIMS)
- 2) Dating volcanic rocks using Ar-Ar method
- 3) Digital analysis of precise bathymetric structure

#### **4. Data and samples to be requested**

- 1) Digital bathymetric data (seabeam mapping)
- 2) Surface ship gravity data
- 3) Magnetic total force intensity data by proton precession magnetometer
- 4) 3-D vector magnetic survey data
- 5) All video images obtained by KAIKO
- 6) All the photos taken by KAIKO
- 7) All the digital observer files obtained by KAIKO
- 8) Detailed descriptions of all the samples collected by KAIKO
- 9) Rock samples (igneous rocks); details are indicated in sample description list

## **5. Possible co-workers**

- 1) Sun-Lin Chung (National Taiwan University); Ar-Ar dating for volcanic rocks
- 2) Serge Lallemant; tectonics and geophysics
- 3) Anne Deschamps; tectonics and geophysics
- 4) Chao-Shing Lee; tectonics and geophysics
- 5) Takeshi Matsumoto; geophysics
- 6) Other possible persons (Japanese or French) who can produce Ar-Ar age data.

## **Proposals and request for data and samples**

### **KR03-04 Leg1 cruise, NW part of the West Philippine Basin**

**Serge Lallemand** (CNRS, Univ. Montpellier 2)

#### **1. Subject**

Bathymetric structure, tectonic & magmatic evolution of the northern part of the West Philippine Basin (WPB)

#### **2. Purpose**

We aim to integrate bathymetric data (seafloor fabric) together with magnetic and age data in order to better constrain the Cenozoic history of that basin. This is clearly the main purpose of the cruise. In addition to that, we have taken the opportunity of diving in the WPB to collect some mud cores in troughs. Our intent is to trace the source of these sediments (some signature of currents and if possible some evidences of uplift & erosion of surrounding islands (Ryukyu islands and if possible Taiwan island).

#### **3. Method**

I will participate in the analysis of geophysical data acquired during this cruise (bathymetry, magnetism, gravity) as well as other data collected during previous cruises (including reflection seismics) after data reduction.

If required, I could negotiate with geochronologists of my lab some laser Ar/Ar datings on igneous rocks.

Concerning the mud analyses, we plan to characterize the geochemical imprint into abyssal sediments such as trace elements and radiogenic isotopes.

#### **4. Data and samples to be requested**

- 1) Digital bathymetric data
- 2) Surface ship gravity data
- 3) Magnetic data
- 4) Some video images obtained with Kaiko ROV (dives 288 & 293)
- 5) Some photos obtained with Kaiko ROV (dives 288 & 293)
- 6) Rock samples if need of datings

7) Mud samples from dives 288 & 293

**5) Possible co-workers**

- 1) Ryuichi Shinjo
- 2) Anne Deschamps
- 3) Chao-Shing Lee
- 4) Yasmine Bentahila
- 5) Jean-Marc Luck
- 6) Patrick Monié
- 7) Nicolas Arnaud

## **Proposals and request for data and samples**

### **KR03-04 Leg 1 cruise, Northwestern part of the West Philippine Basin.**

**Anne Deschamps** (Deep Sea Research Dept., JAMSTEC)

#### 1. Subject

Investigation of the spreading processes within the NW part of the West Philippine Basin

#### 2. Purpose

We propose to lead a detailed study of the spreading processes within the WPB, especially in its northwestern part, through :

- the observation of the seafloor fabric (orientation and trend of abyssal hills, areas formed between overlapping spreading centers, influence of the presence of a hot spot on the spreading system...)
- the dating and the analysis of petrological/geochemical characteristics of rocks collected during dives on the WPB seafloor
- the analysis of the magnetic anomalies in order to perform an identification of anomalies, with the help of age data that will be determined using Ar-Ar methods on samples.

#### 3. Method

- analysis of bathymetric data : identification of areas formed between OSC (Overlapping Spreading Centers) and areas formed by normal spreading (single spreading center), analysis of the roughness of the crust (in relationship with spreading rate and amount of sediments), analysis of the offset along the Luzon-Okinawa Fracture Zone (sense and amount of offset) with the help of the sense of curvature of the abyssal hills at its vicinity. Analysis of bathymetric data will also help to understand the nature of the interactions between spreading centers and hot spot.

Bathymetric data coming from KR03-04 cruise will be mixed with (open) data coming from :

- KR 98 11 (northernmost area of the WPB, close to the Oki-Daito Ridge)
- DK90-8, DK91-2, DY92-1, DK92-3Y92-2, KR97-06 and KR99-07 cruises

- DAVAPUS data (collected on R/V L'atalante in 1994)
  - KAONOUM data (collected on R/V L'atalante in 1996)
  - Hydrographic Department of Japan data (for the northernmost area of the WPB) (free access on HDJ's web site)
- analysis of magnetic data : identification of the magnetic anomalies combined with seafloor fabric analysis and later with Ar-Ar dating results, in order to determine the spreading processes in this part of the basin (age and rate of spreading, occurrence of ridge jumps etc.).
- analysis of gravity data : determination of the thickness of the crust and its variations in relation with spreading rate and excess of volcanism due to the presence of an hot spot).

#### 4. Data and samples to be requested

- 1) Digital bathymetric data (seabeam mapping)
- 2) Surface ship gravity data
- 3) Magnetic total force intensity data by proton precession magnetometer
- 4) 3 -components magnetic survey data
- 5) All video images obtained by KAIKO, except dive 291.
- 6) All the photos taken by Kaiko.
- 7) All the digital observer files obtained by KAIKO
- 8) Detailed description of all the samples collected by KAIKO

#### 5. Possible co-workers

- R. Shinjo (age and geochemical data) (Univ. Ryukyus, Japan)
- S. Lallemand (tectonics and geophysics) (Univ. Montpellier 2, France)
- Chao-Shing Lee (geophysics, magnetism) (National Taiwan Univ., Taiwan)
- Toshiya Fujiwara (magnetism) (DSRD, Jamstec, Japan)

## **Proposals and request for data and samples**

### **KR03-04 Leg1 cruise, NW part of the West Philippine Basin**

**Chao-Shing Lee** (National Taiwan Ocean University)

#### **1. Subject**

Bathymetric structure, gravity, tectonic and magmatic evolution of the northern part of the West Philippine Basin

#### **2. Purpose**

The project is aiming to integrate bathymetric data (seafloor fabric) together with magnetic and age data in order to better understand the Cenozoic evolution of the basin. This is one of the main purpose for this cruise. In addition, we will search through the newest version of the National Geophysical Data Center's data compilation and try to combine the magnetic, gravity and seismic data of other cruises in the survey area, so that we will be able to compensate the seismic data which we are not able to collect during the cruise. The new data will have a better resolution for the spreading history of the whole West Phillipne Basin. We hope to conduct a deep-towed magnetic survey in the future. Two short sediment cores and a piece of manganese crust in the Dive #289 are only intent to test the low temperature/high presure bacteria in the deep sea environment.

#### **3. Method**

1. I will participate in the analysis of geophysical data acquired during this cruise (bathymetry, magnetism, gravity) as well as other data collected during previous cruises (including reflection seismics) after data reduction.
2. I will help to push the Ar/Ar dating to be done as soon as it can in Taiwan.
3. I will organise a future deep-towed magnetic cruise in the survey area.

#### **4. Data and samples to be requested**

- 1) Digital bathymetric data
- 2) Surface ship gravity data
- 3) Magnetic data

- 4) Video images obtained by Kaiko
- 5) Photos obtained by Kaiko
- 6) One piece of Manganese samples from Dive # 289
- 7) Sediment samples from Dives 289

**5) Possible co-workers**

- 1) Ryuichi Shinjo
- 2) Anne Deschamps
- 3) Serge Lallemond
- 4) Shigo Wu
- 5) Shu-Kun Hsu
- 6) T. Matsumoto
- 7) K. Okino
- 8) K. Tamaki

## **Objective and request for data and samples**

**Shiguo WU** (Institute of Oceanology, Chinese Academy of Sciences)

### **Scientific objective of my study**

To study dynamic tectonic process of the west Philippine basin.

To reveal tectonic evolution between the west Philippine basin and East China Sea margin.

### **Method**

To process and interpret the geophysical data

To analyze geochemistry of sediments of pushed core

### **Dataset**

- 1) Digital seabeam bathymetric data
- 2) Surface ship gravity data
- 3) Magnetic total force intensity data by proton precession magnetometer
- 4) 3-D vector magnetic survey data
- 5) Part of Video images obtained by KAIKO
- 6) 4-5 Pushed cores
- 7) All the digital observer files obtained by Kaiko

I would like to cooperate with any onship scientists of this cruise. I also show our research results from this cruise and some data from Chinese research vessel.

## 8. References

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**Annex-1 Cruise Log (KR03-04 Leg 1) *KAIREI /KAIKO***

Date & Time Ship's Time	Note
Tue 15.Apr.03	
10:00	Scientist group (Leg-1) on board
11:00	Departure From Yokosuka port of JAMSTEC <span style="float: right;">Transit</span>
11:15	Briefing about ship's life and safty at Res Room
16:40	"KONPIRASAMA"
19:00	Scientific Meeting-1
Objective of this cruise by Ryuichi	
Wed 16.Apr.03	
9:00	Practice for emergency <span style="float: right;">Transit</span>
14:00	Briefing about KAIKO operation
19:00	Scientific Meeting-2
Overview of WPB tectonics by Anne	
23:00	Shu-Kun comes down with a fever
Thu 17.Apr.03	<span style="float: right;">Transit</span>
anchor in Kinko Bay, Kagoshima	
15:00	Transport Shu-Kun to the hospital
Fri 18.Apr.03	
waiting days <span style="float: right;">Anchored</span>	
19:00	Scientific Meeting-3
Petrological study for WPB rocks by Ryuichi	
Sat 19.Apr.03	
waiting days <span style="float: right;">Anchored</span>	
19:00	Scientific Meeting-4
Magnetism at WPB by Hung-Ming Kao	
Sun 20.Apr.03	
waiting days <span style="float: right;">Anchored</span>	
19:00	Scientific Meeting-5
Geophysics around East China Sea by Shiguo	
Mon 21.Apr.03	
14:30	Departure for the survey area <span style="float: right;">Transit</span>
19:00	Scientific Meeting-6
Boninite tectonics by Serge	
Tue 22.Apr.03	
14:40	Dropping Proton magne & seabeam mapping <span style="float: right;">Geophysical survey</span>
Start point at Line A	
19:00	Scientific Meeting-7
Overapping spreading centers by Anne	

Date & Time Ship's Time	Note
Wed 23.Apr.03	<p>Geophysical survey Magnet. Grav. and Seabeam</p> <p>22:00 End of Line A</p> <p>19:00 Scientific Meeting-8 Dive287 plan by Ryuichi</p>
Thu 24.Apr.03	<p>underway geophysical survey</p> <p>6:00-7:00 Site survey</p> <p>8:30 Kaiko at the sea surface Observation by Ryuichi</p> <p>14:30 Kaiko leave the bottom</p> <p>19:00 Scientific Meeting-9 Dive287 result by Ryuichi Dive288 plan by Serge</p>
Fri 25.Apr.03	<p>underway geophysical survey</p> <p>6:00-7:00 Site survey</p> <p>8:00-18:00 Dive observation by Serge</p> <p>19:00 Scientific Meeting-10 Dive288 result by Serge Dive289 plan by Chao-Shing</p>
Sat 26.Apr.03	<p>underway geophysical survey</p> <p>6:00-7:00 Site survey</p> <p>8:00-18:00 Dive observation by Chao-Shing</p> <p>19:00 Scientific Meeting-11 Dive289 result by Serge Dive290 plan by Anne</p>
Sun 27.Apr.03	<p>underway geophysical survey</p> <p>6:00-7:00 Site survey</p> <p>8:00-18:00 Dive observation by Anne</p> <p>19:00 Scientific Meeting-12 Dive290 result by Anne Dive291 plan by Shiguo</p>

Date & Time Ship's Time	Note
Mon 28.Apr.03	<p>underway geophysical survey</p> <p>6:00-7:00 Site survey</p> <p>8:00-18:00 Dive observation by Shiguo <span style="float: right;">Dive 291</span></p> <p>19:00 Scientific Meeting-13 Dive291 result by Shiguo Dive292 plan by Ryuichi</p>
Tue 29.Apr.03	<p>underway geophysical survey</p> <p>Dive cancellation due to trouble (oil leak) of hydraulic equipment</p> <p>site survey</p> <p>19:00 Scientific Meeting-14 Dive292 plan by Ryuichi</p>
Wed 30.Apr.03	<p>underway geophysical survey</p> <p>8:00-18:00 Dive observation by Ryuichi <span style="float: right;">Dive 292</span></p> <p>19:00 Scientific Meeting-15 Dive292 result by Ryuichi Dive293 plan by Serge</p>
Thu 1.May.03	<p>underway geophysical survey</p> <p>8:00-18:00 Dive observation by Serge <span style="float: right;">Dive 293</span></p> <p>19:00 Scientific Meeting-16 Dive293 result by Serge Dive294 plan by Chao-Shing Proposal to sample request &amp; futur works</p>
Fri 2.May.03	<p>underway geophysical survey</p> <p>Dive cancellation due to trouble for the 2nd cable <span style="float: right;">Transit</span></p> <p>17:00 Arrive at Naha</p>

sampling records			
Dive No.	10K #287	Date	24-Apr-03
Name	R.Shinjo	Time(local)	13:23:09
Sample No.	10K #287 R2	Depth	5536m
Lat.	22° 29.1105'N	Long.	126° 52.3491'E
Sample type	volcanic rock	Number	1
Sample name		Size	30 × 20 × 10 (cm)
Basalt		Weight	about 15kg
Description	<p>Only core is Basalt</p> <p>Surface with manganese coating.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K #287	Date	24-Apr-03
Name	R.Shinjo	Time(local)	10:59:47 12:45:00
Sample No.	10K #287 R3-1	Depth	5977m 5639m
Lat.	22° 29.0592'N 22° 29.1048'N	Long.	126° 51.9813'E 126° 52.2721'E
Sample type	sedimental rock	Number	2
Sample name		Size	5 × 6 × 3.5 8 × 5 × 3.5 (cm)
Mn crust		Weight	0.5kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K #287	Date	24-Apr-03
Name	R.Shinjo	Time(local)	11:59:24 to 12:09:00 12:15:00
Sample No.	10K #287 R6-1	Depth	5726m 5704m
Lat.	22° 29.0918'N 22° 29.0925'N	Long.	126° 52.1858'E 126° 52.2278'E
Sample type	sedimental rock	Number	several
Sample name		Size	13 × 9 × 3.5 (cm)
Mn crust		Weight	0.5kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K #287	Date	24-Apr-03
Name	R.Shinjo	Time(local)	11:59:24 12:15:40
Sample No.	10K #287 R6-2	Depth	5726m 5704m
Lat.	22° 29.0918'N 22° 29.0925'N	Long.	126° 52.1883'E 126° 52.2278'E
Sample type	igneous rock	Number	4
Sample name		Size	22 × 14 × 17 (cm)
scoria		Weight	1.5kg
Description	<p>look like more fresh than 10K #287 R3-2 and 10K #287 R5-2.</p> <p>No manganese coating</p>		
Sample Distribution	Ojectives	Sample Distribution	Ojectives

sampling records			
Dive No.	10K #287	Date	24-Apr-03
Name	R.Shinjo	Time(local)	11:30:54 11:33:00 13:51:32
Sample No.	10K #287 R5-2	Depth	5962m 5520m 5423m
Lat.	22° 29.0744'N 22° 29.8028'N 22° 29.1012'N	Long.	126° 52.0723'E 126° 52.0731'E 126° 52.4229'E
Sample type	igneous rock	Number	3
Sample name		Size	15 × 14 × 8 (cm)
scoria		Weight	1.5kg
Description	No manganese coating		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K #287	Date	24-Apr-03
Name	R.Shinjo	Time(local)	11:08:45 13:40:25 14:08:54
Sample No.	10K #287 R5-1	Depth	5962m 5520m 5423m
Lat.	22° 29.0578'N 22° 29.1098'N 22° 29.0910'N	Long.	126° 51.9930'E 126° 52.3654'E 126° 52.4999'E
Sample type	sedimental rock	Number	5
Sample name		Size	20 × 12 × 5 (cm)
Mn crust		Weight	1.5kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K #287	Date	24-Apr-03
Name	R.Shinjo	Time(local)	10:47:00 11:02:00 13:09:00 13:12:00 13:19:00
Sample No.	10K #287 R4	Depth	5977m 5562m 5557m 5536m
Lat.	22° 29.0592'N 22° 29.1113'N (× 2) 22° 29.1105'N	Long.	126° 51.9813'E 126° 52.3304'E(× 2) 126° 52.3491'E
Sample type	sedimental rock	Number	several
Sample name		Size	30 × 11 × 10 (cm)
Mn crust		Weight	3kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K #287	Date	24-Apr-03
Name	R.Shinjo	Time(local)	12:38:18
Sample No.	10K #287 R3-3	Depth	5648m
Lat.	22° 29.1048'N	Long.	126° 52.2721'E
Sample type	sedimental rock	Number	1
Sample name		Size	15 × 15 × 10 (cm)
Sandstone		Weight	3kg
Description	Surface with the thin manganese coating.		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K #287	Date	24-Apr-03
Name	R.Shinjo	Time(local)	12:38:18
Sample No.	10K #287 R3-2	Depth	5648m
Lat.	22° 29.1048'N	Long.	126° 52.2721'E
Sample type	igneous rock	Number	3
Sample name		Size	15×9×8 9×5.5×4 17×11×9 (cm)
scoria,pumice		Weight	total 1.5kg
Description	No manganese coating		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	#1:10:58:25 #2:10:59:50
Sample No.	10K#288#1#2	Depth	6674m
Lat.	23° 42.3442' N	Long.	127° 37.9764'E
Sample type	#1:volcanic rock #2:volcanic rock	Number	2
Sample name		Size	#1:14 × 16 × 11 #2:13 × 22 × 14.5 (cm)
#1:Basalt #2:Basalt		Weight	#1:4kg #2:6kg
Description	<p>#1: Pl. Fresh. Thin manganese coating.</p> <p>#2: Fresh. Non manganese coating.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	#1: 11:09:15 #2: 11:10:15
Sample No.	10K#288#3#4	Depth	6600m
Lat.	23° 42.3124' N	Long.	127° 37.9427'E
Sample type	#3: volcanic rock #4: volcanic rock	Number	2
Sample name		Size	#3: 11 × 14 × 10 #4: 7 × 13 × 10 (cm)
#3: Basalt #4: Basalt		Weight	#3: 2.5kg #4: 1.5kg
Description	<p>#3: Thin manganese coating. Fresh.</p> <p>#4: Non manganese coating. Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	11:19:46
Sample No.	10K#288#5	Depth	6643
Lat.	23° 42.3059' N	Long.	127° 37.9200'E
Sample type	chemical sedimental rock	Number	1
Sample name		Size	10 × 16 × 4 (cm)
Mn crust		Weight	0.5kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	#6: 11:33:27 #7: 11:38:47
Sample No.	10K#288#6#7	Depth	6598
Lat.	23° 42.2987' N	Long.	127° 37.9019'E
Sample type	#6: volcanic rock #7: volcanic rock	Number	2
Sample name		Size	#6: 12 × 30 × 14 #7: 10 × 10 × 10 (cm)
#6: Basalt #7: Basalt		Weight	#6: 7kg #7: 1kg
Description	<p>#6: Manganese coating. Olded.</p> <p>#7: Aseismic. Non manganese coating. Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	11:48:44
Sample No.	10K#288#8	Depth	6541m
Lat.	23° 42.3052' N	Long.	127° 37.8596'E
Sample type	volcanic rock	Number	1
Sample name		Size	10 × 25 × 10 (cm)
Basalt		Weight	8.5kg
Description	Olded.		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	#9: 12:14:33 #10: 12:15:30
Sample No.	10K#288#9#10	Depth	6491m
Lat.	23° 42.2669' N	Long.	127° 37.7843'E
Sample type	#9: volcanic rock #10: volcanic rock	Number	2
Sample name		Size	#9: 15 × 20 × 15 #10: 15 × 10 × 10 (cm)
#9: Basalt #10: Basalt		Weight	#9: 2.5kg #10: 2kg
Description	<p>#9: Aseismic.</p> <p>#10: Thin manganese coating.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	12:25:37
Sample No.	10K#288#11#12	Depth	6462m
Lat.	23° 42.2453' N	Long.	127° 37.7693'E
Sample type	#11: volcanic rock #12: volcanic rock	Number	2
Sample name		Size	#11: 15 × 25 × 14 #12: 8 × 11 × 9 (cm)
#11: Basalt #12: Basalt		Weight	#11: 5kg #12: 0.5kg
Description	<p>#11: Manganese coating. Old.</p> <p>#12: Non manganese coating. Old.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	12:42:23
Sample No.	10K#288#13	Depth	6430m
Lat.	23° 42.2257' N	Long.	127° 37.7262'E
Sample type	volcanic rock	Number	1
Sample name		Size	13 × 20 × 15 (cm)
Basalt		Weight	7kg
Description	<p>Manganese coating.</p> <p>Interior is fresh.</p>		
Sample Distribution	Ojectives	Sample Distribution	Ojectives

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	12:52:30
Sample No.	10K#288#14#15	Depth	6388m
Lat.	23° 42.2084' N	Long.	127° 37.7042'E
Sample type	igneous rock	Number	2
Sample name		Size	#14: 8 × 17 × 7 #15: 10 × 10 × 10 (cm)
Basalt		Weight	#14: 2.5kg #15: 1.8kg
Description	<p>#14: Non manganese coating.</p> <p>#15: thin manganese coating, fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	13:02:43
Sample No.	10K#288#16#17	Depth	6337m
Lat.	23° 42.1810' N	Long.	127° 37.6729'E
Sample type	igneous rock	Number	2
Sample name		Size	#16: 11 × 19 × 11 #17: 20 × 43 × 14 (cm)
Basalt		Weight	#16: 4kg #17: 12kg
Description	<p>#16: non manganese coating. fresh</p> <p>#17: so big. non manganese coating. fresh</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	13:28:38
Sample No.	10K#288#18	Depth	6178m
Lat.	23° 42.1037' N	Long.	127° 37.6015'E
Sample type	igneous rock	Number	2
Sample name		Size	11 × 25 × 10 (cm)
Basalt		Weight	5kg
Description	thin manganese coating.. fresh. Aseismic.		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	13:45:08
Sample No.	10K#288#19	Depth	6040m
Lat.	23° 42.0509' N	Long.	127° 37.5363'E
Sample type	igneous rock	Number	1
Sample name		Size	16 × 40 × 18 (cm)
Basalt		Weight	20kg
Description	fresh. thin manganese coating.		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#288	Date	25, Apr, 2003
Name	Serge Lallemand	Time(local)	14:04:56
Sample No.	10K#288#20	Depth	5897m
Lat.	23° 42.0134' N	Long.	127° 37.4516'E
Sample type	igneous rock	Number	1
Sample name		Size	15 × 17 × 16 (cm)
Basalt		Weight	4kg
Description	<p>Thin manganese coating.</p> <p>Aseismic.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	10:29:50
Sample No.	10K#289#1	Depth	5382m
Lat.	23° 57.0383'N	Long.	128° 53.3085'E
Sample type	volcanic rock	Number	1
Sample name		Size	12 × 18 × 12 (cm)
Basalt		Weight	5kg
Description	<p>Thin manganese coating.</p> <p>Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	10:33:30
Sample No.	10K#289#2	Depth	5369m
Lat.	23° 57.0578'N	Long.	128° 53.3163'E
Sample type	volcanic rock	Number	1
Sample name		Size	15 × 17 × 16 (cm)
Basalt		Weight	5kg
Description	<p>Old.</p> <p>Thin manganese coating.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	#3: 10:43:13 #4: 10:44:30
Sample No.	10K#289#3#4	Depth	5290m
Lat.	23° 57.1134'N	Long.	128° 53.3297'E
Sample type	volcanic rock	Number	2
Sample name		Size	#3: 9 × 12 × 8 #4: 10 × 10 × 13 (cm)
Basalt		Weight	#3: 1kg #4: 1kg
Description	<p>#3: Thin manganese coating. Old.</p> <p>#4: Thin manganese coating. Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	10:47:40
Sample No.	10K#289#5	Depth	5285m
Lat.	23° 57.1214'N	Long.	128° 53.3313'E
Sample type	volcanic rock	Number	1
Sample name		Size	8 × 12 × 7 (cm)
Basalt		Weight	0.7kg
Description	<p>Thin manganese coating.</p> <p>Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	10:47:40
Sample No.	10K#289#6	Depth	5285m
Lat.	23° 57.1214'N	Long.	128° 53.3313'E
Sample type	chemical sedimental rock	Number	1
Sample name		Size	6 × 10 × 4 (cm)
Mn crust		Weight	0.5kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	10:51:10
Sample No.	10K#289#7	Depth	5271m
Lat.	23° 57.1286'N	Long.	128° 53.3313'E
Sample type	sedimental rock	Number	1
Sample name		Size	13 × 23 × 14 (cm)
Like a mudstone		Weight	5kg
Description	<p>Very older mudstone like.</p> <p>Manganese coating.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	10:58:10
Sample No.	10K#289#8	Depth	5239m
Lat.	23° 57.1503'N	Long.	128° 53.3360'E
Sample type	volcanic rock	Number	1
Sample name		Size	9 × 20 × 11 (cm)
Basalt		Weight	2kg
Description	Thin manganese coating.		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	11:00:30
Sample No.	10K#289#9#10	Depth	5233m
Lat.	23° 57.1524'N	Long.	128° 53.3368'E
Sample type	volcanic rock	Number	2
Sample name		Size	#9: 13 × 19 × 11 #10: 9 × 11 × 9 (cm)
basalt		Weight	#9: 2.5kg #10: 1kg
Description	<p>#9: thin manganese coating</p> <p>#10: thin manganese coating. Aseismic.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	11:04:00 ~11:05:50
Sample No.	10K#289#11#12	Depth	5226m
Lat.	23° 57.1524'N	Long.	128° 53.3368'E
Sample type	volcanic rock	Number	2
Sample name		Size	#11: 15 × 22 × 9 #12: 17 × 30 × 17 (cm)
basalt		Weight	#11: 3kg #12: 7kg
Description	<p>#11: manganese coating.</p> <p>#12: thin manganese coating.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	11:19:20~ 11:21:20
Sample No.	10K#289#13#14#15	Depth	5200m
Lat.	23° 57.1806'N	Long.	128° 53.3273'E
Sample type	volcanic rock	Number	3
Sample name		Size	#13: 8×16×8 #14: 8×13×7 #15: 9×15×8 (cm)
basalt		Weight	#13: 1kg #14: 1kg #15: 1kg
Description	<p>#13: manganese coating.</p> <p>#14: thinmanganese coating.</p> <p>#15: non manganese coating.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	11:49:17
Sample No.	10K#289#16	Depth	5104m
Lat.	23° 57.2759'N	Long.	128° 53.3609'E
Sample type	volcanic rock	Number	1
Sample name		Size	10 × 18 × 29 (cm)
basalt		Weight	8kg
Description	thin manganese coating.		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	12:45:30
Sample No.	10K#289#17#18	Depth	4956m
Lat.	23° 57.4493'N	Long.	128° 53.3941'E
Sample type	chemical sedimental rock	Number	2
Sample name		Size	4 × 4 × 2.5 (cm)
Mn nodule		Weight	0.1kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#289	Date	26, Apr, 2003
Name	Chao-Shin Lee	Time(local)	12:45:30
Sample No.	10K#289#19	Depth	4956m
Lat.	23° 57.4483'N	Long.	128° 53.3941'E
Sample type	volcanic rock	Number	1
Sample name		Size	6 × 8 × 4 (cm)
basalt		Weight	0.3kg
Description	thin maganese coating.		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	10:09:43
Sample No.	10k#290#1	Depth	4477m
Lat.	22° 37.6334'N	Long.	128° 31.2058'E
Sample type	igneous rock	Number	1
Sample name		Size	7×5×4 (cm)
Pumice		Weight	0.1kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	11:17:23
Sample No.	10k#290#2	Depth	4312m
Lat.	22° 37.4463'N	Long.	128° 31.0813'E
Sample type	igneous rock	Number	1
Sample name		Size	10×20×12 (cm)
Scoria		Weight	1kg
Description			
Sample Distribution	Ojectives	Sample Distribution	Ojectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	11:28:34
Sample No.	10k#290#3	Depth	4280m
Lat.	22° 37.3921'N	Long.	128° 31.0712'E
Sample type	sedimental rock	Number	1
Sample name		Size	21×20×13 (cm)
Mn crust		Weight	2kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	11:36:28
Sample No.	10k#290#4	Depth	4274m
Lat.	22° 37.3791'N	Long.	128° 31.0712'E
Sample type	volcanic rock	Number	1
Sample name		Size	19×17×17 (cm)
Basalt		Weight	5kg
Description	<p>Thin manganese coating.</p> <p>Altered.</p> <p>Old.</p>		
Sample Distribution	Ojectives	Sample Distribution	Ojectives
R Shinjo	geochemical and dating		

sampling records						
Dive No.	10k#290	Date	27, Apr, 2003			
Name	Anne Deschamps	Time(local)	11:41:53			
Sample No.	10k#290 # 5	Depth	4282m			
Lat.	22° 37.3632'N	Long.	128° 31.0548'E			
Sample type	volcanic rock	Number	1			
Sample name		Size	14×14×12 (cm)			
Basalt		Weight	2kg			
Description	<p>Medium age.</p> <p>Altered.</p> <p>Manganese coating.</p>					
Sample Distribution				Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	11:45:31
Sample No.	10k#290#6	Depth	4227m
Lat.	22° 37.3574'N	Long.	128° 30.9778'E
Sample type	sedimental rock	Number	1
Sample name		Size	11×9×2.5 (cm)
Mn crust		Weight	0.3kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	#7: 11:50:14 #8: 11:51:01
Sample No.	10k#290#7#8	Depth	4188m
Lat.	22° 37.3335'N	Long.	128° 30.9529'E
Sample type	#7: volcanic rock #8: volcanic rock	Number	2
Sample name		Size	#7: 19×12×10 #8: 10×8×6 (cm)
#7: Basalt #8: Basalt		Weight	#7: 2.5kg #8: 1kg
Description	<p>#7: Manganese coating. Altered. Old.</p> <p>#8: Manganese coating. Old.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	#9: 12:00:15 #10: 12:00:30
Sample No.	10k#290#9#10	Depth	4131m
Lat.	22° 37.2844'N	Long.	128° 30.9015'E
Sample type	#9: volcanic rock #10: volcanic rock	Number	2
Sample name		Size	#9: 17×22×15 #10: 10×10×7 (cm)
#9: Basalt #10: Basalt		Weight	#9: 8kg #10: 1kg
Description	<p>#9: Non manganese coating. Fresh.</p> <p>#10: Manganese coating. Old.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	12:01:30
Sample No.	10k#290#11	Depth	4131m
Lat.	22° 37.2844'N	Long.	128° 30.9015'E
Sample type	sedimental rock	Number	1
Sample name		Size	14×9×3 (cm)
Mn crust		Weight	0.7kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	12:08:43
Sample No.	10k#290#12	Depth	4126m
Lat.	22° 37.2844'N	Long.	128° 30.9015'E
Sample type	chemical sedimental rock	Number	1
Sample name		Size	10×10×10 (cm)
Mn nodule		Weight	0.5kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	12:11:35
Sample No.	10k#290#13	Depth	4112m
Lat.	22° 37.2700'N	Long.	128° 30.8891'E
Sample type	sedimental rock	Number	1
Sample name		Size	18×18×6 (cm)
Mn crust		Weight	1kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records						
Dive No.	10k#290	Date	27, Apr, 2003			
Name	Anne Deschamps	Time(local)	12:17:25			
Sample No.	10k#290#14	Depth	4073m			
Lat.	22° 37.2534'N	Long.	128° 30.8696'E			
Sample type	volcanic rock	Number	1			
Sample name		Size	15×24×9 (cm)			
Basalt		Weight	2kg			
Description	<p>Altered.</p> <p>Manganese coating.</p> <p>Old.</p>					
Sample Distribution				Ojectives	Sample Distribution	Ojectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	12:20:54
Sample No.	10k#290#15	Depth	4056m
Lat.	22° 37.'N	Long.	128° 30.'E
Sample type	volcanic rock	Number	1
Sample name		Size	25×17×12 (cm)
Basalt		Weight	5kg
Description	<p>Fresh.</p> <p>Non manganese coating.</p>		
Sample Distribution	Ojectives	Sample Distribution	Ojectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	12:39:00
Sample No.	10k#290#16	Depth	3942m
Lat.	22° 37.1604'N	Long.	128° 30.7809'E
Sample type	igneous rock	Number	1
Sample name		Size	15×14×7.5 (cm)
Scoria		Weight	0.8kg
Description	Thin manganese coating.		
Sample Distribution	Ojectives	Sample Distribution	Ojectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	12:39:00
Sample No.	10k#290#17#18	Depth	3942m
Lat.	22° 37.1604'N	Long.	128° 30.7809'E
Sample type	#17: volcanic rock #18: volcanic rock	Number	2
Sample name		Size	#17: 12×12×7 #18: 11×11×9 (cm)
#17: Basalt #18: Basalt		Weight	#17: 1kg #18: 1.2kg
Description	<p>#17: Medium age. Non manganese coating.</p> <p>#18: Medium age. Thin manganese coating.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R Shinjo	chemical analyses		

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	12:42:00
Sample No.	10k#290#19	Depth	3937m
Lat.	22° 37.1558'N	Long.	128° 30.7700'E
Sample type	igneous rock	Number	1
Sample name		Size	32×15×5 (cm)
Mn crust		Weight	1.5kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	12:42:00
Sample No.	10k#290#20	Depth	3937m
Lat.	22° 37.1558'N	Long.	128° 30.7700'E
Sample type	volcanic rock	Number	1
Sample name		Size	17×15×14 (cm)
Basalt		Weight	4kg
Description	Altered. Thin manganese coating. Old.		
Sample Distribution	Ojectives	Sample Distribution	Ojectives
R Shinjo	chemical analyses		

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	13:03:50
Sample No.	10k#290#21	Depth	3811m
Lat.	22° 37.1067'N	Long.	128° 30.7412'E
Sample type	sedimental rock	Number	1
Sample name		Size	9×10×9 (cm)
Mn crust		Weight	0.8kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	13:12:37
Sample No.	10k#290# 22	Depth	3766m
Lat.	22° 37.0901'N	Long.	128° 30.7101'E
Sample type	sedimental rock	Number	1
Sample name		Size	12×10×9 (cm)
Mn crust		Weight	0.8kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	13:12:37
Sample No.	10k#290# 23	Depth	3766m
Lat.	22° 37.0901'N	Long.	128° 30.7101'E
Sample type	volcanic rock	Number	1
Sample name		Size	10×8×6 (cm)
Basalt		Weight	0.8kg
Description	Mn coating, old		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	13:12:37
Sample No.	10k#290# 24	Depth	3766m
Lat.	22° 37.0901'N	Long.	128° 30.7101'E
Sample type	sedimental rock	Number	1
Sample name		Size	12×15×9 (cm)
Mn crust		Weight	1kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#290	Date	27, Apr, 2003
Name	Anne Deschamps	Time(local)	13:59:37
Sample No.	10k#290#25	Depth	3648m
Lat.	22° 36.9405'N	Long.	128° 30.5824'E
Sample type	sedimental rock	Number	1
Sample name		Size	13×15×9 (cm)
Mn crust		Weight	1kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#291	Date	28, Apr, 2003
Name	Shiguo Wu	Time(local)	10:52:56
Sample No.	10K#291#1	Depth	4734m
Lat.	21° 54.3429'N	Long.	126° 30.0383'E
Sample type	igneous rock	Number	1
Sample name		Size	20×10×8.5 (cm)
moderately altered basalt		Weight	2.5kg
Description			
Sample Distribution	Ojectives	Sample Distribution	Ojectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#291	Date	28, Apr, 2003
Name	Shiguo Wu	Time(local)	11:29:13
Sample No.	10K#291#2	Depth	4568m
Lat.	21° 54.4325'N	Long.	126° 31.0383'E
Sample type	igneous rock	Number	1
Sample name		Size	20×10×11 (cm)
altered basalt		Weight	2kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#291	Date	28, Apr, 2003
Name	Shiguo Wu	Time(local)	11:33:09
Sample No.	10K#291#3	Depth	4559m
Lat.	21° 54.4419'N	Long.	126° 31.0329'E
Sample type	igneous rock	Number	1
Sample name		Size	25×30×15 (cm)
highly altered basalt		Weight	12kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#291	Date	28, Apr, 2003
Name	Shiguo Wu	Time(local)	11:39:59
Sample No.	10K#291#4	Depth	4537m
Lat.	21° 54.4455'N	Long.	126° 31.0445'E
Sample type	igneous rock	Number	1
Sample name		Size	10×10×5.5 (cm)
highly altered basalt		Weight	0.5kg
Description			
Sample Distribution	Ojectives	Sample Distribution	Ojectives

sampling records			
Dive No.	10K#291	Date	28, Apr, 2003
Name	Shiguo Wu	Time(local)	12:21:00 to 12:26:00
Sample No.	10K#291#5#6#7	Depth	4380m
Lat.	21° 54.5149'N	Long.	126° 31.1677'E
Sample type	igneous	Number	3
Sample name		Size	#5: 12×18×11 #6: 13×19×16 #7: 11×11×5 (cm)
highly altered basalt		Weight	#5: 5kg #6: 3.5kg #7: 0.8kg
Description			
Sample Distribution	Ojectives	Sample Distribution	Ojectives

sampling records			
Dive No.	10K#291	Date	28, Apr, 2003
Name	Shiguo Wu	Time(local)	12:27:00 to 12:30:30
Sample No.	10K#291#8#9#10	Depth	4389m
Lat.	21° 54.5149'N	Long.	126° 31.1677'E
Sample type	igneous rock	Number	3
Sample name		Size	#8: 8×9×7 #9: 9×18×7 #10: 19 ×15×10 (cm)
altered basalt		Weight	#8: 0.7kg #9: 1kg #10: 2kg
Description			
Sample Distribution	Ojectives	Sample Distribution	Ojectives
R. Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#291	Date	28, Apr, 2003
Name	Shiguo Wu	Time(local)	12:40:30
Sample No.	10K#291#11#12	Depth	4356m
Lat.	21° 54.5366'N	Long.	126° 31.2025'E
Sample type	igneous	Number	2
Sample name		Size	#11: 32×20×4 #12: 25×12×6 (cm)
altered basalt		Weight	#11: 8kg #12: 1kg
Description			
Sample Distribution	Ojectives	Sample Distribution	Ojectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10K#291	Date	28, Apr, 2003
Name	Shiguo Wu	Time(local)	12:46:12
Sample No.	10K#291#13	Depth	4347m
Lat.	21° 54.5366'N	Long.	126° 31.2025'E
Sample type	igneous rock	Number	1
Sample name		Size	17×6×8 (cm)
highly altered basalt		Weight	0.9kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K#291	Date	28, Apr, 2003
Name	Shiguo Wu	Time(local)	12:52:21 to 12:54:47
Sample No.	10K#291#14#15	Depth	4328m
Lat.	21° 54.5604'N	Long.	126° 31.2079'E
Sample type	volcanic rock	Number	2
Sample name		Size	#14: 10×15×8 #15: 17×10×11 (cm)
highly altered basalt		Weight	#14: 1.2kg #15: 1.5kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10K #292	Date	30-Apr-03
Name	R.Shinjo	Time(local)	12:30:52
Sample No.	10K #292#1	Depth	5718m
Lat.	21° 03.5098'N	Long.	125° 45.7662'E
Sample type	chemical sedimental rock	Number	1
Sample name		Size	9 × 12 × 7 (cm)
Mn crust		Weight	1kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	10:26:11
Sample No.	10K#293#1	Depth	5771m
Lat.	21° 31.6621'N	Long.	124° 56.9237'E
Sample type	volcanic rock	Number	1
Sample name		Size	11 × 21 × 8 (cm)
Gabbro		Weight	1.5kg
Description	<p>Non manganese coating.</p> <p>Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	10:31:07
Sample No.	10K#293#2	Depth	5762m
Lat.	21° 31.6649'N	Long.	124° 56.9091'E
Sample type	volcanic rock	Number	1
Sample name		Size	14 × 13 × 10 (cm)
Basalt		Weight	1.5kg
Description	<p>Non manganese coating.</p> <p>Fresh.</p> <p>Aseismic.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	10:36:27
Sample No.	10K#293#3	Depth	5741m
Lat.	21° 31.6628'N	Long.	124° 56.8604'E
Sample type	volcanic rock	Number	1
Sample name		Size	15 × 18 × 15 (cm)
Gabbro		Weight	7kg
Description	<p>Non manganese coating.</p> <p>Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	10:40:57
Sample No.	10K#293#4	Depth	5727m
Lat.	21° 31.6823'N	Long.	124° 56.8813'E
Sample type	volcanic rock	Number	1
Sample name		Size	15 × 13 × 25 (cm)
Gabbro		Weight	7kg
Description	<p>Non manganese coating.</p> <p>Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	10:44:50
Sample No.	10K#293#5	Depth	5713m
Lat.	21° 31.7061'N	Long.	124° 56.8689'E
Sample type	volcanic rock	Number	1
Sample name		Size	14 × 17 × 27 (cm)
Basalt		Weight	8kg
Description	<p>Non manganese coating.</p> <p>Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	11:00:00
Sample No.	10K#293#6	Depth	5665m
Lat.	21° 31.7061'N	Long.	124° 56.8427'E
Sample type	volcanic rock	Number	1
Sample name		Size	14 × 15 × 30 (cm)
Basalt		Weight	4.5kg
Description	<p>Non manganese coating.</p> <p>Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	11:06:15
Sample No.	10K#293#7	Depth	5630m
Lat.	21° 31.7126'N	Long.	124° 56.8048'E
Sample type	volcanic rock	Number	1
Sample name		Size	15 × 15 × 13 (cm)
Gabbro		Weight	4.5kg
Description	<p>Non manganese coating.</p> <p>Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	11:23:55
Sample No.	10K#293#8	Depth	5527m
Lat.	21° 31.7343'N	Long.	124° 56.7523'E
Sample type	volcanic rock	Number	1
Sample name		Size	7 × 10 × 5 (cm)
Gabbro		Weight	0.5kg
Description	<p>Non manganese coating.</p> <p>Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	11:32:00
Sample No.	10K#293#9	Depth	5498m
Lat.	21° 31.7415'N	Long.	124° 56.7214'E
Sample type	volcanic rock	Number	1
Sample name		Size	8 × 10 × 15 (cm)
Basalt		Weight	3kg
Description	<p>Non manganese coating.</p> <p>Not fine.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	11:36:06
Sample No.	10K#293#10	Depth	5488m
Lat.	21° 31. 'N	Long.	124° 56. 'E
Sample type	volcanic rock	Number	1
Sample name		Size	11 × 22 × 13 (cm)
Basalt		Weight	4kg
Description	<p>Manganese coating.</p> <p>Old.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	11:53:10
Sample No.	10K#293#11	Depth	5423m
Lat.	21° 31.7552'N	Long.	124° 56.6897'E
Sample type	volcanic rock	Number	1
Sample name		Size	10 × 15 × 8 (cm)
Basalt		Weight	2.5kg
Description	<p>Non manganese coating.</p> <p>Medium age.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	11:56:57
Sample No.	10K#293#12	Depth	5421m
Lat.	21° 31.7603'N	Long.	124° 56.6874'E
Sample type	volcanic rock	Number	1
Sample name		Size	7 × 13 × 9 (cm)
Basalt		Weight	1kg
Description	<p>Non manganese coating.</p> <p>Medium age.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	12:02:40
Sample No.	10K#293#13	Depth	5408m
Lat.	21° 31.7582'N	Long.	124° 56.6581'E
Sample type	chemical sedimental rock	Number	1
Sample name		Size	4 × 12 × 9 (cm)
Mn crust		Weight	1kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	12:12:14
Sample No.	10K#293#14	Depth	5366m
Lat.	21° 31.7619'N	Long.	124° 56.6318'E
Sample type	volcanic rock	Number	1
Sample name		Size	5 × 7 × 10 (cm)
Basalt		Weight	0.5kg
Description	<p>Manganese coating.</p> <p>Medium age.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	12:22:05
Sample No.	10K#293#15	Depth	5339m
Lat.	21° 31.7704'N	Long.	124° 56.5994'E
Sample type	volcanic rock	Number	1
Sample name		Size	10 × 11 × 12 (cm)
Gabbro		Weight	3kg
Description	<p>Non manganese coating.</p> <p>Fresh.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	12:22:05
Sample No.	10K#293#16	Depth	5339m
Lat.	21° 31.7704'N	Long.	124° 56.5994'E
Sample type	chemical sedimental rock	Number	1
Sample name		Size	10 × 15 × 10 (cm)
Mn crust		Weight	2kg
Description			
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	12:41:59
Sample No.	10K#293#17	Depth	5267m
Lat.	21° 31.7726'N	Long.	124° 56.5994'E
Sample type	volcanic rock	Number	1
Sample name		Size	10 × 14 × 27 (cm)
Gabbro		Weight	6kg
Description	<p>Manganese coating.</p> <p>Old.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	12:54:00
Sample No.	10K#293#18	Depth	5226m
Lat.	21° 31.8022'N	Long.	124° 56.5530'E
Sample type	volcanic rock	Number	1
Sample name		Size	10 × 13 × 25 (cm)
Gabbro		Weight	5kg
Description	<p>Manganese coating.</p> <p>Old.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	12:07:00
Sample No.	10K#293#19	Depth	5191m
Lat.	21° 31.8131'N	Long.	124° 56.5067'E
Sample type	volcanic rock	Number	1
Sample name		Size	7 × 15 × 22 (cm)
Basalt		Weight	6kg
Description	<p>Thin Manganese coating.</p> <p>Medium age.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	13;13;56
Sample No.	10K#293#20	Depth	5178m
Lat.	21° 31.8246'N	Long.	124° 56.4967'E
Sample type	volcanic rock	Number	1
Sample name		Size	7 × 15 × 21 (cm)
Basalt		Weight	5kg
Description	<p>Thin manganese coating.</p> <p>Medium age.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	13:34:43
Sample No.	10K#293#21	Depth	5077m
Lat.	21° 31.8564'N	Long.	124° 56.4318'E
Sample type	volcanic rock	Number	1
Sample name		Size	10 × 11 × 14 (cm)
Gabbro		Weight	3kg
Description	<p>Non manganese coating.</p> <p>Fresh.</p> <p>Quartz vein.</p>		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives
R.Shinjo	geochemical analyses & dating		

sampling records			
Dive No.	10k#293	Date	1,May,2003
Name	Serge Lallemand	Time(local)	14:15:19
Sample No.	10K#293#22	Depth	4945m
Lat.	21° 31.9258'N	Long.	124° 56.2905'E
Sample type	volcanic rock	Number	1
Sample name		Size	10 × 12 × 10 (cm)
Gabbro		Weight	2kg
Description	Thin manganese coating.  Old.		
Sample Distribution	Ovjectives	Sample Distribution	Ovjectives

### List of rock sample distribution

	Sp. No. (Dive-No)	Name		Sp. No. (Dive-No)	Name
1	287-2	R Shinjo	25	290-4	R Shinjo
2	287-3	R Shinjo	26	290-9	R Shinjo
			27	290-15	R Shinjo
3	288-1	R Shinjo	28	290-17	R Shinjo
4	288-2	R Shinjo	29	290-20	R Shinjo
5	288-3	R Shinjo			
6	288-4	R Shinjo	30	291-1	R Shinjo
7	288-7	R Shinjo	31	291-9	R Shinjo
8	288-8	R Shinjo	32	291-10	R Shinjo
9	288-14	R Shinjo	33	291-11	R Shinjo
10	288-15	R Shinjo			
11	288-16	R Shinjo	34	293-1	R Shinjo
12	288-17	R Shinjo	35	293-2	R Shinjo
13	288-18	R Shinjo	36	293-3	R Shinjo
14	288-19	R Shinjo	37	293-4	R Shinjo
			38	293-5	R Shinjo
15	289-1	R Shinjo	39	293-6	R Shinjo
16	289-3	R Shinjo	40	293-7	R Shinjo
17	289-4	R Shinjo	41	293-8	R Shinjo
18	289-5	R Shinjo	42	293-11	R Shinjo
19	289-8	R Shinjo	43	293-12	R Shinjo
20	289-9	R Shinjo	44	293-15	R Shinjo
21	289-10	R Shinjo	45	293-18	R Shinjo
22	289-12	R Shinjo	46	293-19	R Shinjo
23	289-15	R Shinjo	47	293-20	R Shinjo
24	289-16	R Shinjo	48	293-21	R Shinjo
			49	293-22	R Shinjo

## VIDEO TAPE SAMPLE LIST

<b>Dive</b>	<b>ROV Camera</b>	<b>Media Type</b>	<b>Tape1 Time table</b>	<b>Tape2 Time table</b>	<b>Tape3 Time table</b>
#287	Broadcasting Grade	-Cam	10:36-12:36	12:36-14:32	
		S-VHS	10:26-12:26	12:26-14:24	14:24-14:49
	Panorama (center)	S-VHS			
#288	Broadcasting Grade	-Cam	10:40-12:39	12:39-14:11	
		S-VHS	10:29-12:29	12:29-14:25	
	Panorama (center)	S-VHS			
#289	Broadcasting Grade	-Cam	10:17-12:17	12:17-14:23	
		S-VHS	10:08-12:06	12:06-14:06	14:06-14:34
	Panorama (center)	S-VHS			
#290	Broadcasting Grade	-Cam	10:03-12:04	12:04-14:07	
		S-VHS	09:54-11:53	11:53-13:51	13:51-14:18
	Panorama (center)	S-VHS			
#291	Broadcasting Grade	-Cam	10:07-12:07	12:07-14:07	14:07-14:34
		S-VHS	09:58-11:58	11:58-13:57	13:57-14:46
	Panorama (center)	S-VHS			
#292	Broadcasting Grade	-Cam	10:21-12:18	12:18-14:13	
		S-VHS	09:58-11:58	11:58-13:57	13:57-14:46
	Panorama (center)	S-VHS			
#293	Broadcasting Grade	-Cam	10:19-12:19	12:19-14:22	
		S-VHS	10:07-12:08	12:08-14:05	14:05-14:36
	Panorama (center)	S-VHS			

## VIDEO TAPE SAMPLE COPY LIST

Dive	Observer	ROV Camera	Master	Copy Media	Scientist	QTY.
#287	Ryuichi Shinjo	Broadcasting Grade	-Cam	S-VHS	Ryuichi Shinjo	1
					Serge Lallemand	0
					Anne Deschamps	1
					Shiguo Wu	1
				VHS	Chao-Shing Lee	1
#288	Serge Lallemand	Broadcasting Grade	-Cam	S-VHS	Ryuichi Shinjo	1
					Serge Lallemand	1
					Anne Deschamps	1
					Shiguo Wu	1
				VHS	Chao-Shing Lee	1
#289	Chao-Shing Lee	Broadcasting Grade	-Cam	S-VHS	Ryuichi Shinjo	1
					Serge Lallemand	0
					Anne Deschamps	1
					Shiguo Wu	1
				VHS	Chao-Shing Lee	1
#290	Anne Deschamps	Broadcasting Grade	-Cam	S-VHS	Ryuichi Shinjo	1
					Serge Lallemand	0
					Anne Deschamps	1
					Shiguo Wu	1
				VHS	Chao-Shing Lee	1
#291	Shiguo Wu	Broadcasting Grade	-Cam	S-VHS	Ryuichi Shinjo	1
					Serge Lallemand	0
					Anne Deschamps	1
					Shiguo Wu	1
				VHS	Chao-Shing Lee	1
#292	Ryuichi Shinjo	Broadcasting Grade	-Cam	S-VHS	Ryuichi Shinjo	1
					Serge Lallemand	0
					Anne Deschamps	0
					Shiguo Wu	0
				VHS	Chao-Shing Lee	1
#293	Serge Lallemand	Broadcasting Grade	-Cam	S-VHS	Ryuichi Shinjo	1
					Serge Lallemand	1
					Anne Deschamps	1
					Shiguo Wu	1
				VHS	Chao-Shing Lee	1

## **Annex-5 Participants Aboard the R/V *KAIREI* for KR03-04 Leg 1 cruise**

**Scientific party** (乗船研究者)

**Ryuichi Shinjo** (新城 竜一) [Chief scientist and Representative of Science Party]

Department of Physics and Earth Sciences

University of the Ryukyus

**Serge Lallemand**

Dynamics of Lithosphere Lab

Montpellier 2 University

**Chao-Shing Lee**

Institute of Applied Geophysics

National Taiwan Ocean University

**Anne Deschamps**

Japan Marine Science and Technology Center

**Shiguo Wu**

Department of Marine Geology & Geophysics  
Institute of Oceanology  
Chinese Academy of Sciences

**Shu-Kun Hsu**

Institute of Geophysics  
National Central University

**Hong-Ming Kao**

Institute of Applied Geophysics  
National Taiwan Ocean University

**Jenifer Lee**

Institute of Applied Geophysics  
National Taiwan Ocean University

**Yoshitaka Maeda** (前田 芳孝)

Department of Physics and Earth Sciences  
University of the Ryukyus

**Masaki Shiharashi** (白橋 雅記)

Department of Physics and Earth Sciences

University of the Ryukyus

**Risa Matsumura**

Department of Physics and Earth Sciences

University of the Ryukyus

**Tetsuo No**

Nippon Marine Enterprises, LTD

**Shinichi Hosoya** (細谷 慎一)

Nippon Marine Enterprises, LTD

**Hidenori Shibata** (柴田 英紀)

Nippon Marine Enterprises, LTD

**KAIKO Operation Team** (かいこう運航チーム)

Kazuyoshi Hirata (平田 和好)	Chf.ROV Op.
Yoshiyuki Mizui (水井 吉之)	ROV Op.
Kiyoshi Takishita (滝下 清)	ROV Op.
Atsunori Miura (三浦 豊司)	ROV Op.
Homare Wakamatsu (若松 誉)	ROV Op.
Hideki Sezoko (瀬底 秀樹)	ROV Op.
Kouta Izawwa (井澤 光太)	ROV Op.
Katsunari Fuji (藤 勝利)	ROV Op.
Jun Takenouchi (竹之内 純)	ROV Op.

**R/V KAIREI Crew** (かいはい乗組員)

Osamu Yukawa (湯川 修)	Captain
Masayoshi Ishiwata (石渡 正善)	Chief officer
Daisuke Saasaki (佐々木 大輔)	2 <sup>nd</sup> officer
Testuya Yokota (横田 哲也)	3 <sup>rd</sup> officer
Eiji Sakaguchi (坂口 栄次)	Chief engineer
Miroru Tsuada (塚田 実)	1 <sup>st</sup> engineer
Tadashi Abe (阿部 正)	2 <sup>nd</sup> engineer
Yashuhiro Matani (間谷 安宏)	3 <sup>rd</sup> engineer
Tokinori Nasu (那須 東輝登)	Chief Electronic operater
Takehito Hattori (服部 岳人)	2 <sup>nd</sup> radio operator
Jun Suenaga (末永 純)	3 <sup>rd</sup> radio operator
Makio Nakamura (中村 眞喜男)	Boatswain
Kazuo Abe (阿部 和夫)	Able Seaman
Sakae Sasaki (佐々木 栄)	Able Seaman
Kazuya Yamamoto (山本 和弥)	Able Seaman
Hatuo Oda (小田 初男)	Able Seaman
Kaname Hirosaka (廣崎 要)	Able Seaman

Harumitsu Sato (佐藤 春光)	Ordinary Seaman
Kaito Murata (村田 海人)	Ordinary Seaman
Masayuki Masunaga (益永 政幸)	No.1 Oiler
Kazuaki Nakai (中井 和明)	Oiler
Kunio Honda (本田 久仁雄)	Oiler
Tsuneo Harimoto (張本 恒雄)	Oiler
Syuuichi Sonoh (園生 修一)	Oiler
Sakoh Tanaka (田中 佐幸)	Assistant Oiler
Ryuuichi Mitsumori (光森 龍一)	Chief Steward
Shinsuke Tanaka (田中 信介)	Steward
Yosiyuki Fukuda (福田 好幸)	Steward
Yukihide Chikuba (竹馬 幸秀)	Steward
Teruyuki Yoshikawa (吉川 輝幸)	Steward
Hideki Kubota (久保田 秀樹)	Assistant Steward