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R/V Yokosuka Cruise Report

YK08-05

2008 Deep Sea Research Shinkai 6500 scientific dives: Izu-Ogasawara (Bonin) area (Ohmachi Seamount)

April 21 - 30, 2008

(Yokohama - Yokosuka)

JAMSTEC

Contents

1. General cruise informations

(1) Cruise number / ship name

YK08-05 / R/V Yokosuka

(2) Title of the cruise

2008 Deep Sea Research / Shinkai 6500 scientific dives: Izu-Ogasawara (Bonin) area

(3) Proposal number and scientific title

S08-22 Exhumation of ultramafic and high-pressure metamorphic rocks and solid material circulation in the infant Bonin subduction system.

(4) Period of the cruise

From April 21 to April 30, 2008

(5) Port calls

Departure: Yokohama (April 21, 2008)
Arrival: Yokosuka (April 30, 2008)

(6) Investigation area

Area 1: Ohmachi Seamount (2200 - 3500 m bsl)
28º40.0' – 31º00.0'N, 139°00.0'E - 141°20.0'E

Area 2: Kita-Jokyo Seamount (2300 - 3900 m bsl)
31º20.0' – 31º40.0'N, 138°00.0'E - 138°30.0'E

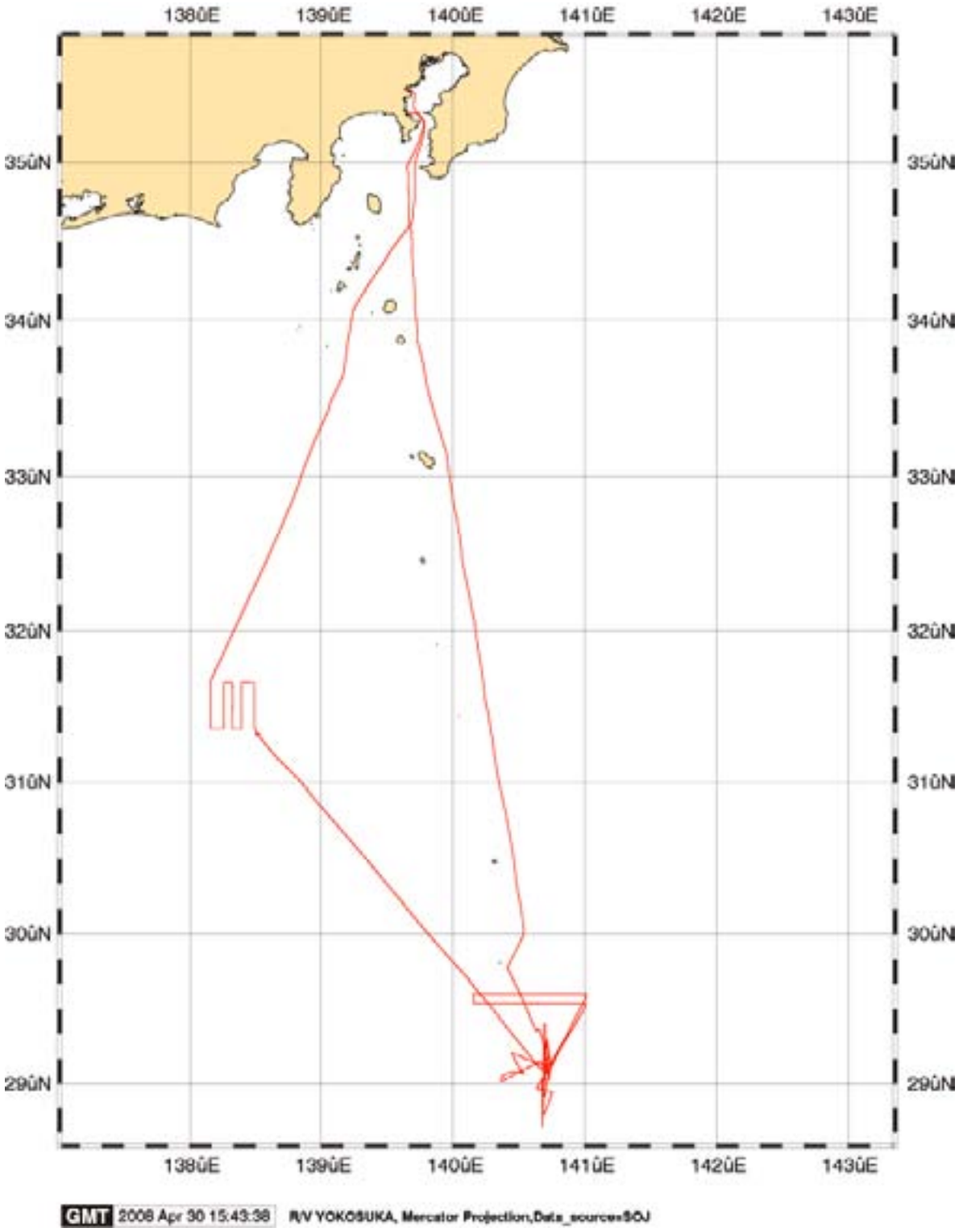

Fig. 1 R/V Yokosuka track during the YK08-05 cruise.

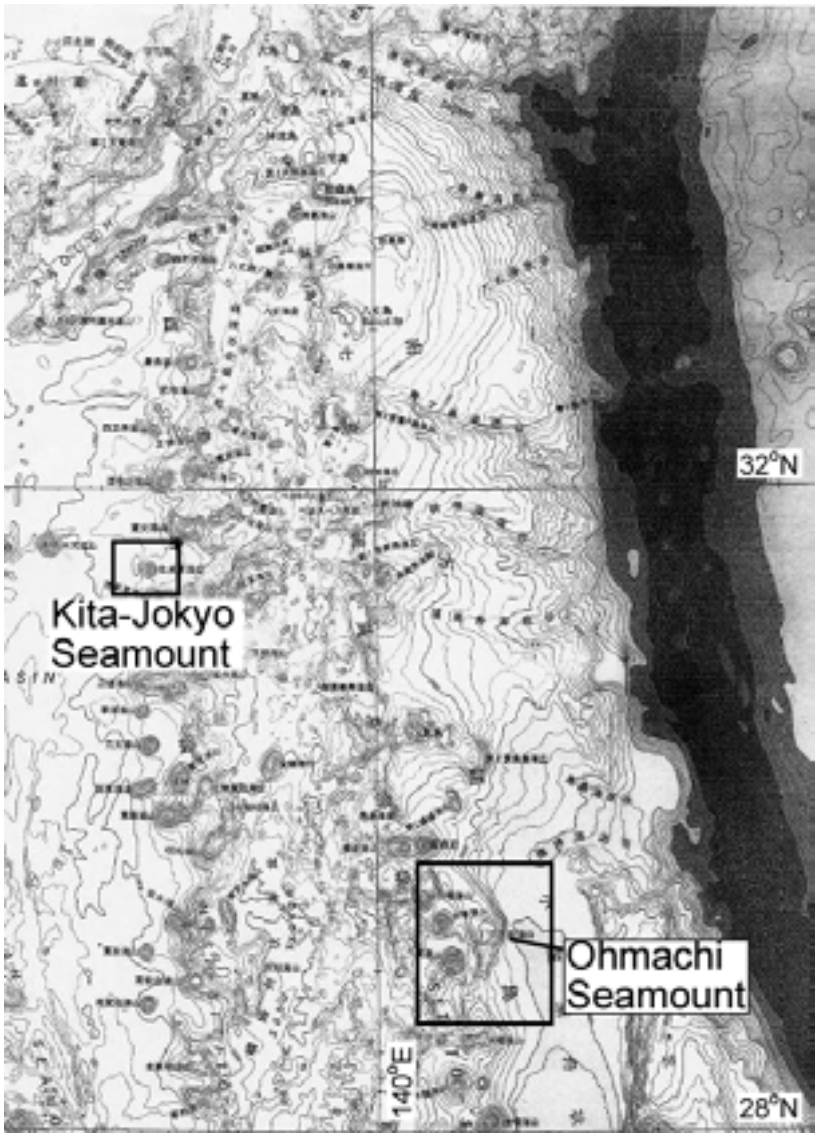

Fig. 2 Research areas of YK08-05 Cruise.

(7) Shinkai 6500 dive list

Table 1 List of Shinkai 6500 dives during YK08-05 Cruise.

Dive no.	Pilot	Copilot	Observer	Location	keyword
6k#1064	K. Matsumoto	K. Chiba	H. Ueda	Ohmachi Seamount	serpentinite
6k#1065	Y. Ohno	Y. Chida	T. Usuki	Ohmachi Seamount	serpentinite
6k#1066	Y. Sasaki	T. Komuku	K. Hirauchi	Ohmachi Seamount	serpentinite
6k#1067	K. Matsumoto	K. Chiba	M. Meschede	Ohmachi Seamount	serpentinite
6k#1068	Y. Ohno	H. Ueki	K. Niida	Ohmachi Seamount	serpentinite

(8) Researchers

Onboard scientists

Hayato UEDA: Faculty of Education, Hirosaki University (Chief Scientist / Representative of the proposal).

Yujiro OGAWA: Graduate School of Life and Environmental Sciences, University of Tsukuba (Co-chief Scientist).

Kiyoaki NIIDA: Department of Natural History Sciences, Graduate School of Science, Hokkaido University.

Martin MESCHEDE: Institute of Geography and Geology, University of Greifswald.

Tadashi USUKI: Institute of Earth Sciences, Academia Sinica.

Ken-ichi HIRAUCHI: Department of Earth and Planetary Systems Science, Graduate School of Science, Hiroshima University.

Ryo MIURA: Institute of Seismology and Volcanology, Graduate School of Science, Hokkaido University.

Toyoto AZUMA: Hidaka Mountains Museum / Department of Natural History Sciences, Graduate School of Science, Hokkaido University.

Takeshi IMAYAMA: Department of Natural History Sciences, Graduate School of Science, Hokkaido University.

Yuki MIYAJIMA: Department of Marine Mineral Resources, School of Marine Science and Technology, Tokai University.

Tae CHIBA: Graduate School of Life and Environmental Sciences, University of Tsukuba.

Takahiro SAITO: Faculty of Education, Hirosaki University.

Misumi AOKI: Nippon Marine Enterprises ,Ltd (Marine technician).

Shore-base scientists

Makoto YUASA: The Institute of Geology and Geoinformation, Geological Survey of Japan, AIST.

Toru TAKESHITA: Department of Natural History Sciences, Graduate School of Science, Hokkaido University.

Izumi SAKAMOTO: Department of Marine Mineral Resources, School of Marine Science and Technology, Tokai University.

(9) Actual schedule

2008/04/21 35º08.2'N, 139º44.6'E (12:00 JST)
Weather: overcast/ Wind direction: NNE/ Wind force:4/ Wave: 3 m / Swell: 1 m / Visibility: 8 NM.

09:00	Scientist embarkation
10:00	Departure from Yokohama port
11:00-11:40	Briefing about ship's life and safety
12:45-	Scientific Meeting
13:30-	Meeting about the cruise plan
14:30-15:00	Scientific meeting

2008/04/22 29º31.7'N, 140º31.5'E (12:00 JST)
Weather: fine but cloudy/ Wind direction: North/ Wind force: 5/ Wave: 4m/ Swell: 3m/ Visibility: 8 NM.

10:00-	Briefing for the dive scientists
13:02	XBT
13:07	Launch proton magnetometer
14:27-16:40	MBES/SBP survey
14:30-16:00	Science seminar
16:49	Retrieve proton magnetometer
19:00-21:00	Scientific meeting and seminar

2008/04/23 29º08.3'N, 140º44.0'E (12:00 JST)
Weather: fine but cloudy/ Wind direction: NNE/ Wind force: 5/ Wave: 4m/ Swell: 4m/ Visibility: 10 NM.

10:00	Dive canceled
11:54-14:22	MBES/SBP survey
13:00-14:30	Ship tour
15:15-16:00	Science seminar
19:00-21:00	Science seminar

2008/04/24 (12:00 JST)
Weather: fine but cloudy/ Wind direction: South/ Wind force: 4/ Wave: 3m/ Swell: 1m/ Visibility: 12 NM.

09:59	Launching the Shinkai
10:08	Start diving, 6K#1064 dive in the Ohmachi Seamount
11:38	Landing (water depth = 3,425m)
15:46	Taking off (water depth = 3,182m)
16:55	Coming up to the surface
17:23	On deck
19:00-20:00	Scientific meeting

2008/04/25 (12:00 JST)
Weather: rain/ Wind direction: SW/ Wind force: 5/ Wave: 4m/ Swell: 1m/ Visibility: 3 NM.

08:10-08:30	Meeting
09:56	Launching the Shinkai
10:04	Start diving, 6K#1065 dive in the Ohmachi Seamount
11:34	Landing (water depth = 3,453m)
15:51	Taking off (water depth = 3,078m)
16:58	Coming up to the surface
17:27	On deck
19:00-20:00	Scientific meeting

2008/04/26 (12:00 JST)
Weather: cloudy/ Wind direction: North/ Wind force: 2/ Wave: 2m/ Swell: 1m/ Visibility: 6 NM.

08:10-08:30	Meeting
09:53	Launching the Shinkai

10:01	Start diving, 6K#1066 dive in the Ohmachi Seamount
11:33	Landing (water depth = 3,469m)
15:48	Taking off (water depth = 3,407m)
17:00	Coming up to the surface
17:26	On deck
19:00-19:30	Scientific meeting

2008/04/27 (12:00 JST)
Weather: fine but cloudy/ Wind direction: WNW/ Wind force: 2/ Wave: 2m/ Swell: 1m/ Visibility: 12 NM.

08:10-08:30	Meeting
09:57	Launching the Shinkai
10:04	Start diving, 6K#1067 dive in the Ohmachi Seamount
11:31	Landing (water depth = 3,453m)
15:52	Taking off (water depth = 3,221m)
17:07	Coming up to the surface
17:31	On deck
18:08	Proton magnetometer launched
18:28-18:50	Calibration of the magnetometer (8 figure turn)
19:00-21:20	Scientific meeting
20:54	Start geophysical survey line (north of the Ohmachi Smt.)

2008/04/28 (12:00 JST)
Weather: fine but cloudy/ Wind direction: NW/ Wind force: 2/ Wave: 2m/ Swell: 1m/ Visibility: 12 NM.

04:20	Finish geophysical survey line
07:00	Proton magnetometer recovered
08:10-08:30	Meeting
09:51	Launching the Shinkai
09:58	Start diving, 6K#1068 dive in the Ohmachi Seamount
11:29	Landing (water depth = 3,453m)
15:59	Taking off (water depth = 3,079m)
17:06	Coming up to the surface
17:33	On deck
19:00-19:35	Scientific meeting

2008/04/29 (12:00 JST)
Weather: / Wind direction: / Wind force: / Wave: m/ Swell: m/ Visibility: n. mile

05:45	XCTD measurement
05:00-06:21	Calibration of the magnetometer (8 figure turn)
06:35-	Start geophysical survey lines (Kita-Jokyo Smt.)
08:10-08:30	Scientific meeting
10:30-12:00	6K tour for non-divers

2008/04/30

09:00	Arrive at JAMSTEC, Scientists disembarkation

2. Backgrounds and purposes

Exhumation of high-pressure and low-temperature (high-P/T) metamorphic rocks is one of the most drastic tectonic movements induced by ocean plate subduction. These rocks were once subducted into depths of upper mantle, metamorphosed, and finally returned to the surface. Exhumation of high-P/T rocks also suggest removal of rocks of several tens kilometer thick which must have overlain the subducted metamorphic rocks as the load. These movements as a whole are thus considered to represent a mode of solid material (i.e. rock) movements or circulation inside subduction zones.

Although occurrences of high-P/T rocks are common along the ancient subduction zones exposed on land as orogenic belts, their original geologic structures were commonly modified by younger, secondary tectonic movements such as succeeding subduction or continent-continent collision. Since many scientists believe that the exhumation events occurred (or initiated) under subaqueous parts of subduction zones, seafloor occurrences of the exhumed rocks without later structural modification are very important to understand their early processes.

To date, such cases are known only in the Philippine Sea plate in the world. The first case was reported from ODP drill cores penetrated serpentine mud volcanoes on inner trench slopes of the Izu-Bonin and Mariana Trenches. High-P/T rocks, metamorphosed at ~20 km depths, are mostly small clasts within mudflow deposits effused from the mud volcanoes. However, such mode of occurrence is hardly correlative with those of on-land ancient subduction zones, where high-P/T metamorphic rocks dominantly occur as flat-lying sheet bodies with several tens to hundreds kilometers without any mudflow deposits. The second case was found by a Shinkai 6500 dive in the Ohmachi Seamount in the Izu-Bonin frontal arc in 2001 by our group. The high-P/T metamorphic rocks, once subducted into a depths up to 70 or 80 km, were obtained as floats within a coherent serpentinite body with >7 km extent, parts of which show common deformation history with the metamorphic rocks. This implies that the high-P/T metamorphic rocks (of crustal origins) were exhumed with serpentinite (i.e. metamorphosed upper mantle rocks) as coherent masses, and this occurrence is much more similar to on-land occurrences than the first case. However, geological informations are still quite insufficient for the only seafloor reference cite in the world analogous to on-land metamorphic terranes.

The purpose of this cruise is to elucidate geologic structure, age, and field occurrences of metamorphic rocks and serpentinite. We set five parallel transect route maps across the serpentinite body by submersible Shinkai 6500, with observation of, and rock sampling from many outcrops, in order to create a geological map with a resolution enough to compare with on-land geology. We also obtained bathymetric data around the Kita-Jokyo Seamount, another locality of metamorphic rocks in the Izu-Bonin back arc.

3. Research activities and methods

(1) Site survey

Table 2. List of site surveys during YK08-05 cruise.

Area / Line	From:	To:	Speed(Kt)	Date / Survey contents
Southwestern part of the Ohmachi Seamount				2008/4/22-23
Line 1	29º09.50'N 140º42.00'E	29º02.00'N 140º42.00'E	8.0	4/22 Bathymetry Side scan sonar SBP Proton magnetometer
1-2 int.	29º02.00'N 140º42.00'E	29º02.00'N 140º44.00'E		
Line 2	29º02.00'N 140º44.00'E	29º09.50'N 140º44.00'E		
Line3	29º08.30'N 140º44.00'E	29º06.70'N 140º41.00'E	4.0	4/23 SBP
Line4	29º06.70'N 140º41.00'E	29º08.30'N 140º44.00'E		
Northern part of the Ohmachi Seamount				2008/4/27-28
Approach	29º05.00'N 140º43.50'E	29º32.00'N 141º00.00'E	15.0	Bathymetry Side scan sonar Proton magnetometer
Line1	29º32.00'N 141º00.00'E	29º32.00'N 140º10.00'E	12.0	
1-2 int.	29º32.00'N 140º10.00'E	29º36.00'N 140º10.00'E		
Line 2	29º36.00'N 140º10.00'E	29º36.00'N 141º00.00'E		
Return	29º36.00'N 141º00.00'E	29º03.50'N 140º43.00'E	15.0	
Kita-Jokyo Seamount				2008/4/28-29
Line1	31º22.00'N 138º29.50'E	31º39.00'N 138º29.50'E	12.0	Bathymetry Side scan sonar Proton magnetometer
1-2 int.	31º39.00'N 138º29.50'E	31º39.00'N 138º23.50'E		
Line 2	31º39.00'N 138º23.50'E	31º22.00'N 138º23.50'E		
2-3 int.	31º22.00'N 138º23.50'E	31º22.00'N 138º19.50'E		
Line 3	31º22.00'N 138º19.50'E	31º39.00'N 138º19.50'E		
3-4 int.	31º39.00'N 138º19.50'E	31º39.00'N 138º15.50'E		
Line 4	31º39.00'N 138º15.50'E	31º22.00'N 138º15.50'E		
4-5 int.	31º22.00'N 138º15.50'E	31º22.00'N 138º09.50'E		
Line 5	31º22.00'N 138º09.50'E	31º39.00'N 138º09.50'E		

List of observation instruments

- SeaBeam 2112 multibeam echosounder (L-3 ELAC Nautik)
- Proton magnetometer (Kawasaki Geological Engineering PRT010)
- Shipboard magnetometer (Tierra Technica SFG-1212)
- Shipboard gravimeter (LaCoste & Lomberg S-63)

Bathymetry

During R/V Yokosuka YK08-05 cruise, swath bathymetric data were acquired using SeaBeam2112 multi narrow beam echo sounder with 12-kHz frequency. Swath bathymetric data were recorded in three mapping areas (southwestern and northern parts of the Ohmachi Seamount, and Kita-Jokyo Seamount: Table 1). The mapping area of the southwestern part of the Ohmachi Seamount covered the 6k dive routes on the southwestern slope of the Ohmachi Seamount in order to obtain precise bathymetric features to set dive routes. The northern part of the Ohmachi Seamount aimed to complete the bathymetric data of the entire seamount. Mapping around the Kita-Jokyo Seamount as a site survey for future program. All the data were processed using MB-system software, and visualized using GMT (Generic Mapping Tools) software.

Side-scan sonar imaging

During bathymetric mapping, the SeaBeam2112 also recorded side-scan sonar data in the three bathymetric mapping areas. Before the first dive, we imaged side-scan sonar data around the proposed dive sites (southwestern part of the Ohmachi Seamount), to modify the dive routes to pass the highly refractive areas presumably by rock exposure.

Sub-bottom profiling

In order to estimate sediment thickness of Shinkai 6500 dive sites, we planned to collect sub-bottom reflection profiles using sub-bottom profiler of SeaBeam2112 system with 4-kHz frequency. Profiling sections were planned along the routes of the five Shinkai 6500 dives.

Geomagnetic data

During the bathymetric mapping in the three bathymetric mapping areas, geomagnetic data were acquired using shipboard three-component magnetometer. Proton magnetometer sensor was towed from stern and recorded geomagnetic data. To calibrate hull-magnetization effect to the three component geomagnetic data, two times of 8-shaped turn were conducted.

Gravity data

Gravity data were acquired during the cruise using LaCoste & Lomberg S-63 shipboard gravimeter.

To combine with absolute gravity value at JAMSTEC, gravity values at Yokohama (April 21) and Yokosuka (April 30) wharfs were also measured by portable gravimeter.

(2) Shinkai 6500 dives

Five dives were performed using Shinkai 6500 on the southwestern slope of the Ohmachi Seamount. We set five parallel, upslope transect routes across the serpentinite body occurring at the foot of the slope, in order to elucidate distribution and geologic structure of serpentinites and metamorphic rocks, and to create a geological map. In every dive, the landing point was set near the top of apron at the base of seep rocky slope, and the submarine left the bottom after observing the overlying volcanic rocks until the time limit. In order to observe outcrops as many as possible, the dive routes were carefully decided with reference to bathymetric contour maps, slope gradient maps generated by bathymetric data, and bottom reflection images by side-scan sonar.

For in-situ measurements of dips and strikes of foliation or bedding planes on sea bottom outcrops, we newly developed a clinometer plate. After significant and thankful onboard improvements by the 6k team, it was introduced since the first dive (6k#1064) as a payload.

Payload:

*Push core ×1

*Sample boxes and separation boards for sample basket

*Clinometer plate ×1

4. Preliminary results

(1) Site survey insouthwestern part of the Ohmachi Seamount)

SeaBeam Bathymetry

Using SeaBeam2112 swath bathymetry data, we constructed 0.04-minute grid bathymetry data for GMT. From the grid data, we first generated a bathymetric contour map with 20 m intervals. The

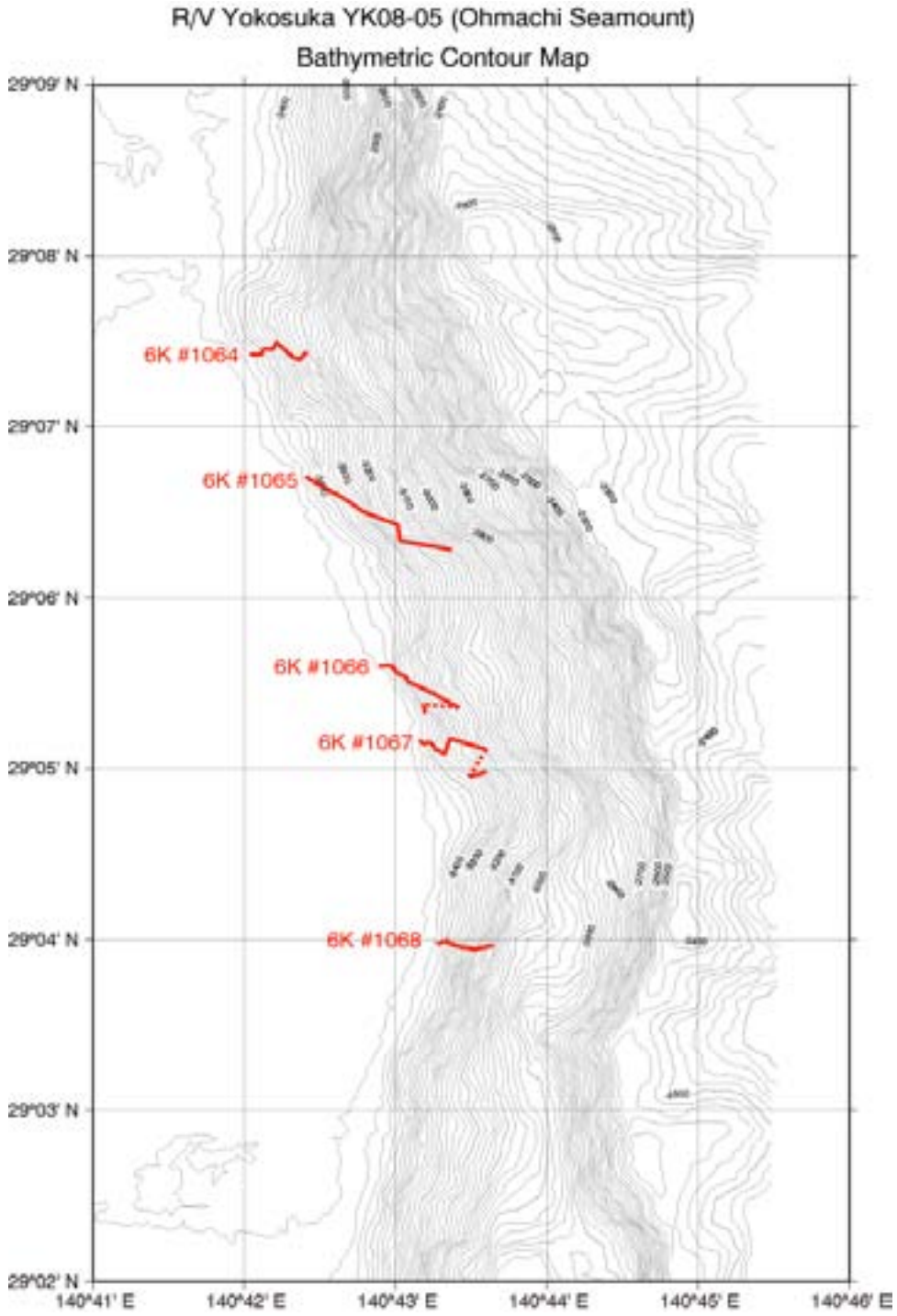

Fig.3 Bathymetric contour map in the southwestern part of the Ohmachi Seamount and Shinkai 6500 dive tracks.

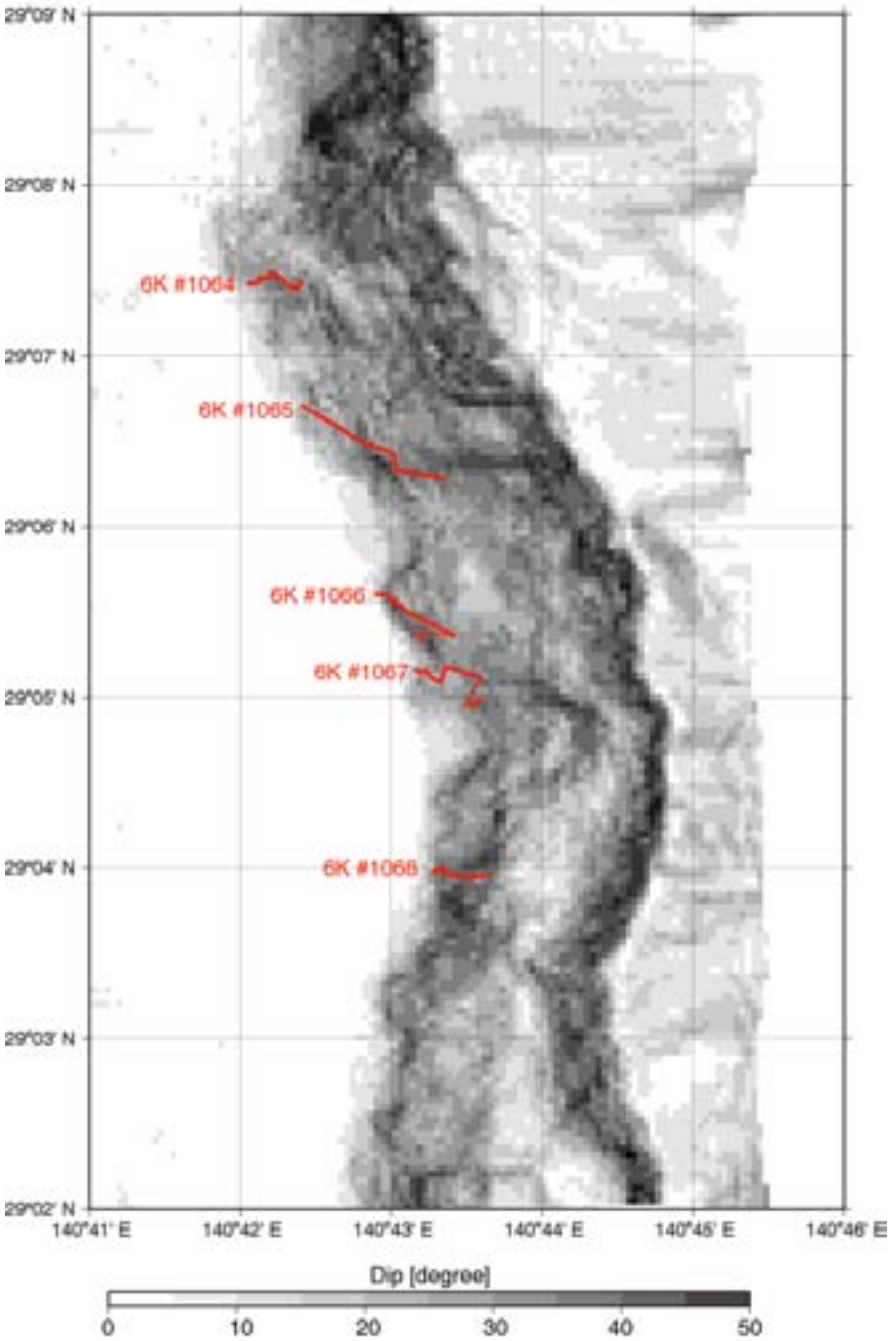

Fig.4 Slope gradient map in the southwestern part of the Ohmachi Seamount generated from SeaBeam bathymetric data.

contour map drew many landslide features on the target area: U-shaped steep slopes of head and side scarps of landslides and gentle slopes of their debris. We then analyzed slope gradient around the dive sites from the grid data and displayed as a slope gradient map. The dive sites were selected to escape from features of landslide debris, and to trace the areas with greater gradient (mainly of landslide scarps), which suggests higher probability of rock exposure.

Side-scan sonar data

Combined with bathymetric contour and slope gradient maps, we referred bottom reflectivity map acquired by the SeaBeam side-scan sonar to decide dive sites. The sonar data were generally well compatible with the topographic gradient map: steeper areas showed higher reflection, and vice versa. These characteristics seemed to prove the distribution of rock exposures. These analyses greatly contributed to set the dive sites, and as a result, the Shinkai 6500 could visit many rock exposures with successful sample recovery in every dive.

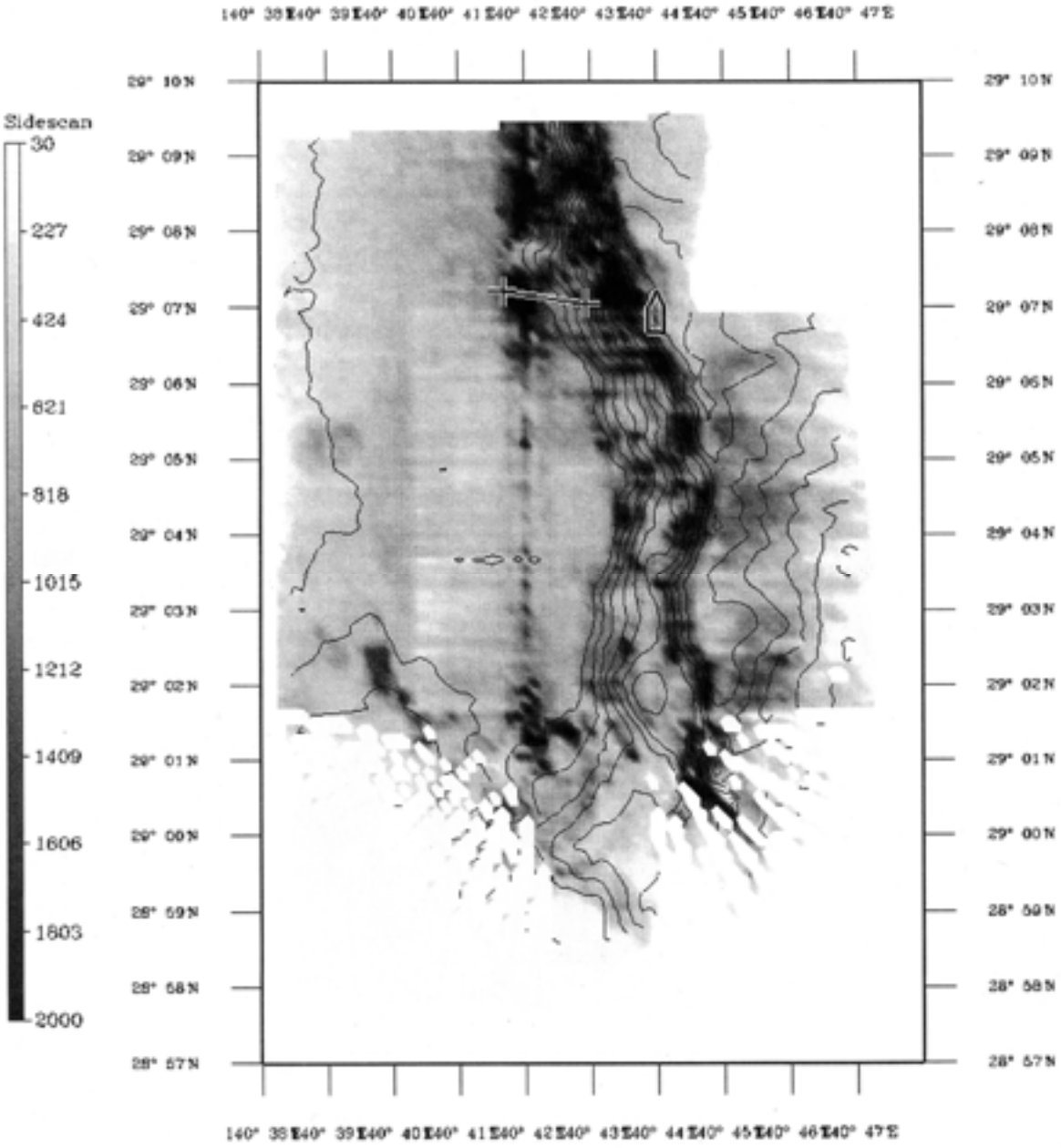

Fig.5 A draft output of side-scan sonar back-scatterd image in the southwestern part of the Ohmachi Seamount.

Sub-Bottom Profiler

The first profiling was made along the Lines 1 and 2 (parallel to the strike of the target slope) along with SeaBeam mapping as test surveys. The obtained data were quite noisy (highly disturbed) especially on the slope. The second profiling were made downslope (Line 3) and upslope (Line 4) normal to the slope along the planned 6k#1064 dive route. Reflection profiles with lesser noises were acquired only on the flat basin floor, and we could not obtain any practical profile on the target slope, probably because of its too steep topography. Although we had also planned to take profiles along the other dive routes, we canceled the rest surveys concerning the similar topography.

(2) Shinkai 6500 dives

The first dive 6k#1064, which was planned to be taken place in April 23, was postponed until the next day because of high swell from a depression farther to the east of northern Japan, in spite of fine weather around the dive area. Since April 24, totally five dives were successfully taken place without further postponement or any cancellation. As individually described later, we could observe many rock exposures and collect great amounts of samples of serpentinite in all dives. We collected totally 106 rock samples (exceeding 330 kg in total weight), majority of which were serpentinite of various lithotypes. Many of them were successfully collected from outcrops, and will thus greatly contribute to understand precise distribution of rock species and types. Unfortunately, any metamorphic rocks could not found even as float in this cruise.

Majority of the serpentinite samples was serpentine schist, with subordinate amounts of massive ones. These could be classified more in detail through onshore petrologic examinations. In addition, brittle fault rocks of serpentinite breccia were found and recovered for the first time in the area. Before the cruise, we made a hypothesis that foliated serpentinite structurally overlay massive serpentinite based on the distribution of previously recovered rock samples. However, the result suggests more complicated distribution: the foliated rocks surely overlay the massive rocks in several dive routes, but vice versa in the others. We also successfully made direct measurements of dips and strikes of foliation using newly developed clinometer plate. The foliations struck generally to the north, with varying dips dominantly to the east. Based on these seafloor observations, mineralogical and textural examination of rock samples, and measurements of geologic structures, we will analyze exhumation history and resultant geologic structures. Dips and strikes of foliation in serpentinite were measured *in-situ* using the clinometer plate handled by the Shinkai manipulator. Although the data should be carefully calibrated later, draft results calculated onboard suggest this trial was successful.

Preliminary Results of SHINKAI6500 Dive

Deep Sea Research Department, JAMSTEC

<table>
<tr><td>Dive No.</td><td colspan="2">6k#1064 (H. Ueda)</td><td>Date</td><td colspan="2">08/04/24</td></tr>
<tr><td>Main
Purpose</td><td colspan="5">To observe the occurrence of basement rocks and wall morphologic features of the Omachi Seamount, and to take rock samples.</td></tr>
<tr><td>Dive
Site</td><td colspan="5">West wall of the Omachi Seamount. The landing site is near the northern tip of serpentinite distribution.</td></tr>
<tr><td rowspan="2">Landing</td><td>Latitude</td><td colspan="2">Longitude</td><td>Time</td><td>Depth</td></tr>
<tr><td>29° 7.4240’N</td><td colspan="2">140° 42.0389’E</td><td>11:38</td><td>3425</td></tr>
<tr><td>Lift-off</td><td>29° 7.4371’N</td><td colspan="2">140° 42.4125’E</td><td>15:46</td><td>3182</td></tr>
<tr><td>Payload</td><td colspan="5">Two sample baskets with partition walls, one sediment sampler (push-corer) and one clinometer plate.</td></tr>
<tr><td>Dive
Summary</td><td colspan="5">The landing point was near the top of apron debris containing rubbles of serpentinite, basalt, and mudstone. From 3336 m to 3260 m b.s.l. occurred serpentinite consisting almost entirely of schistose serpentinite. In-situ measurements by clinometer and naked-eye observations showed that the foliation surfaces generally dip to E with NNE strikes. The schistose serpentinite was locally brecciated by cataclastic deformation. In the upper slope occurred basalt (Paleogene?) and semi-consolidated silt (Pleistocene?) probably overlying the serpentinite.</td></tr>
<tr><td>Key words</td><td colspan="5">Ohmachi Seamount, Izu-Bonin Arc, Philippine Sea</td></tr>
</table>

Preliminary Results of SHINKAI6500 Dive

Deep Sea Research Department, JAMSTEC

<table>
<tr><td>Dive No.</td><td colspan="2">6k#1065 (T. Usuki)</td><td>Date</td><td colspan="2">08/04/25</td></tr>
<tr><td>Main
Purpose</td><td colspan="5">To observe the occurrence of basement rocks and wall morphologic features of the Omachi Seamount, and to take rock samples.</td></tr>
<tr><td>Dive
Site</td><td colspan="5">West wall of the Omachi Seamount. The landing site is 1200 m south of that of 6k#1064.</td></tr>
<tr><td rowspan="2">Landing</td><td>Latitude</td><td colspan="2">Longitude</td><td>Time</td><td>Depth</td></tr>
<tr><td>29° 6.7090’N</td><td colspan="2">140° 42.3426’E</td><td>11:36</td><td>3453</td></tr>
<tr><td>Lift-off</td><td>29° 6.2816’N</td><td colspan="2">140° 43.3704’E</td><td>15:51</td><td>3078</td></tr>
<tr><td>Payload</td><td colspan="5">Two sample baskets with partition walls, one sediment sampler (push-corer) and one clinometer plate.</td></tr>
<tr><td>Dive
Summary</td><td colspan="5">Serpentinite body in this section exposes from -3383 m to at least 3078 m b.s.l. The root of the cliff (-3453 m to -3383 m) is covered with mud. Strongly schistose serpentinite exposes in lower part of the cliff (-3383 to -3276 m). Strike and dip of foliation is NS-N30°E and 30-40°E, respectively (Estimation by video image). Massive serpentinite with schistose serpentinite layers expose in the upper part of the cliff (-3276 m to at least -3078 m). The upper boundary of the serpentinite body with Eocene volcanic rocks could not be confirmed.</td></tr>
<tr><td>Key words</td><td colspan="5">Ohmachi Seamount, Izu-Bonin Arc, Philippine Sea</td></tr>
</table>

Preliminary Results of SHINKAI6500 Dive

Deep Sea Research Department, JAMSTEC

<table>
<tr><td>Dive No.</td><td colspan="2">6k#1066 (K. Hirauchi)</td><td>Date</td><td colspan="2">08/04/26</td></tr>
<tr><td>Main
Purpose</td><td colspan="5">To recognize the relationship between different types of serpentinites on the western flank of the Ohmachi Seamount, and to take rock samples.</td></tr>
<tr><td>Dive
Site</td><td colspan="5">Western flak of the Ohmachi Seamount. The landing site is 1800 m south of that of 6k#1065.</td></tr>
<tr><td rowspan="2">Landing</td><td>Latitude</td><td>Longitude</td><td>Time</td><td colspan="2">Depth</td></tr>
<tr><td>29° 5.6030’N</td><td>140° 42.8940’E</td><td>11:33</td><td colspan="2">3469</td></tr>
<tr><td>Lift-off</td><td>29° 5.3388’N</td><td>140° 43.1876’E</td><td>15:48</td><td colspan="2">3407</td></tr>
<tr><td>Payload</td><td colspan="5">Two sample baskets with partition walls, one sediment sampler (push-corer) and one clinometer plate.</td></tr>
<tr><td>Dive
Summary</td><td colspan="5">In this route, serpentinite bodies were exposed on the flank, in the depth of -3414 to -3286 m b.s.l. I collected cover sediments at the depth of -3445 m by using a push-corer. The lower part of the cliff (-3414 m to -3387 m) is characterized by massive rocks, probably consisting of interpenetrating serpentinites. Schistose serpentinites, striking N-S and dipping eastward at high angles, dominated the middle part of the cliff (-3375 to -3318 m). From the depth of -3240 m, volcano-clastic sediments are widely exposed on the flank.</td></tr>
<tr><td>Key words</td><td colspan="5">Izu-Bonin Arc, Ohmachi Seamount, Philippine Sea, serpentinite</td></tr>
</table>

Preliminary Results of SHINKAI6500 Dive

Deep Sea Research Department, JAMSTEC

<table>
<tr><td>Dive No.</td><td colspan="2">1067 (M. Meschede)</td><td>Date</td><td>08/04/27</td></tr>
<tr><td>Main Purpose</td><td colspan="4">Geological study on the Basement rocks of the Izu-Bonin Arc

To observe the occurrence of basement rocks and wall morphologic features of the Ohmachi Seamount, and to take samples of rocks.</td></tr>
<tr><td>Dive Site</td><td colspan="4">West wall of the Ohmachi Seamount, only slightly north of Dive #571.</td></tr>
<tr><td rowspan="2">Landing</td><td>Latitude</td><td>Longitude</td><td>Time</td><td>Depth</td></tr>
<tr><td>29°5.1492’N</td><td>140°43.1678’E</td><td>11:31</td><td>3453</td></tr>
<tr><td>Lift-off</td><td>29°4.9811’N</td><td>140°43.5996’E</td><td>15:52</td><td>3221</td></tr>
<tr><td>Payload</td><td colspan="4">Two sample baskets with partition walls, and one sediment sampler (push-corer) and one clinometer plate.</td></tr>
<tr><td>Dive Summary</td><td colspan="4">Two different rock associations have been found: a succession of volcanic rock breccias, composed of rounded large clasts up to >10 cm in diameter and consolidated matrix partly overlain by sedimentary rocks in a depth of 3450-3250m. A number of steeply inclined fractures parallel to the generally steep slope (30-45°, partly vertical walls) are observed. In the same depth but at a scarp produced by a slide a little bit further south (about 250m) basement rocks with very fresh upper mantle-derived serpentinitic rocks crop out. Rock samples obtained are fresh as well as highly altered and weathered.</td></tr>
<tr><td>Key words</td><td colspan="4">Ohmachi Seamount, Izu-Bonin Arc, Philippine Sea</td></tr>
</table>

Preliminary Results of SHINKAI6500 Dive

Deep Sea Research Department, JAMSTEC

<table>
<tr><td>Dive No.</td><td colspan="2">6k#1068 (K. Niida)</td><td>Date</td><td colspan="2">08/04/28</td></tr>
<tr><td>Main Purpose</td><td colspan="5">To observe the basement serpentinites and the related schistose rocks of the Omachi Seamount, and to collect the representative rock samples of massive serpentinite.</td></tr>
<tr><td>Dive Site</td><td colspan="5">Western slope of southern part of the Omachi Seamount. The landing site is close to the western bottom of the serpentinite exposures.</td></tr>
<tr><td rowspan="2">Landing</td><td>Latitude</td><td colspan="2">Longitude</td><td>Time</td><td>Depth</td></tr>
<tr><td>29° 3.9778’N</td><td colspan="2">140° 43.2977’E</td><td>11:29</td><td>3453</td></tr>
<tr><td>Lift-off</td><td>29° 3.704’N</td><td colspan="2">140° 43.6465’E</td><td>15:59</td><td>3079</td></tr>
<tr><td>Payload</td><td colspan="5">Two sample baskets with partition walls, one sediment sampler (push-corer) and one clinometer plate.</td></tr>
<tr><td>Dive Summary</td><td colspan="5">Upper mantle-derived serpentinites are widely exposed in a steep cliff near the base of the western wall, from –3,420 m to -3,150 m b.s.l. The serpentinite samples collected from the basal half of the cliff are mostly massive serpentinites highly altered, whereas some samples are considerably fresh, containing primary olivine, pyroxenes and spinel. Residual lherzolitic peridotites and clinopyroxenite cumulates were identified as representative lithology of the serpentinite. The upper half of the cliff is mostly composed of serpentinites with a conspicuous schistose texture, which are covered by volcaniclastic sedimentary rocks of the younger unit.</td></tr>
<tr><td>Key words</td><td colspan="5">Ohmachi Seamount, Izu-Bonin Arc, Philippine Sea</td></tr>
</table>

(3) Other site surveys

Northern part of the Ohmachi Seamount (MA2)

SeaBeam data of the northern part of the Ohmachi Seamount were acquired in April 27 after the #1067 dive. The topographic data will be combined with the previous data to the south of the mapped area.

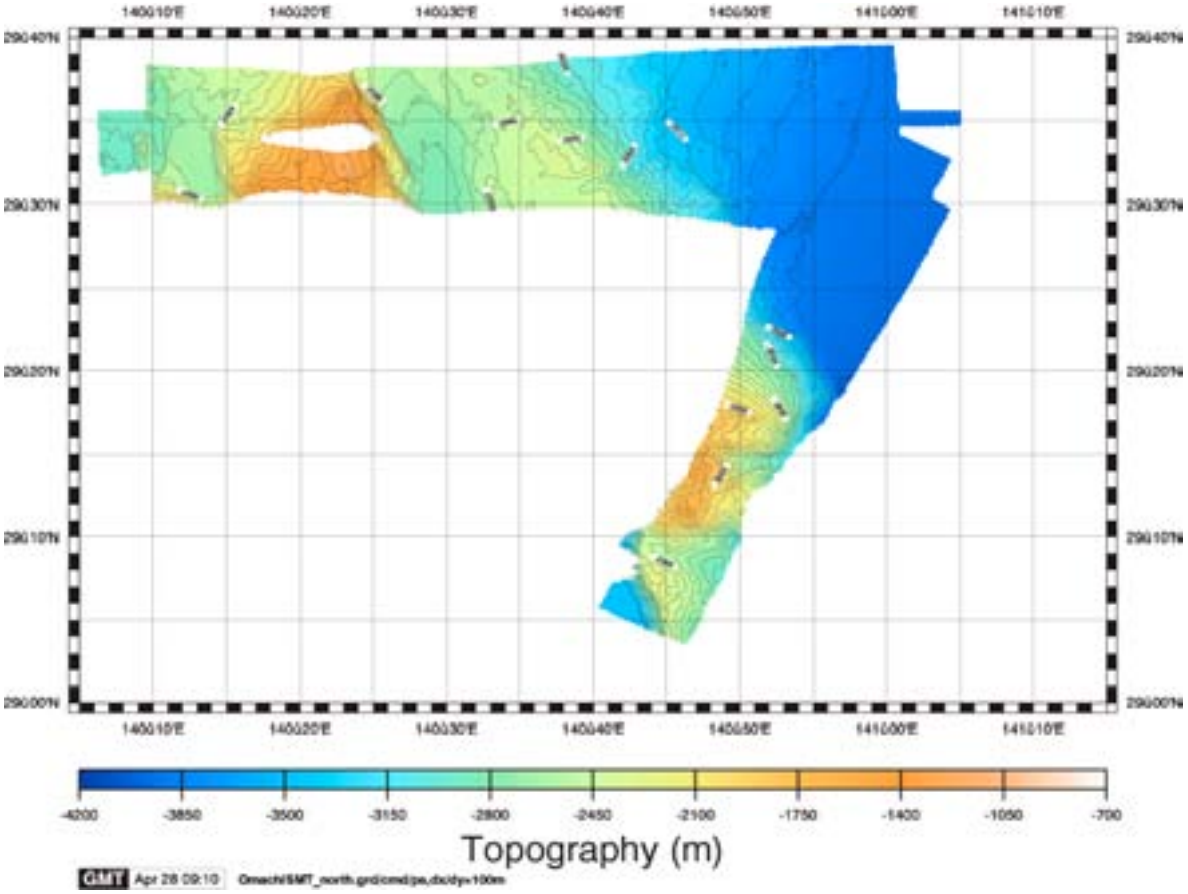

Fig.6 Bathymetric map in the northern part of the Ohmachi Seamount .

Kita-Jokyo Seamount (MA3)

SeaBeam data of the Kita-Jokyo Seamount were acquired in April 28-29 after the #1068. We obtained bathymetric and reflectivity data covering the seamount. The data will be processed for further topographic analyses in order to plan future surveys.

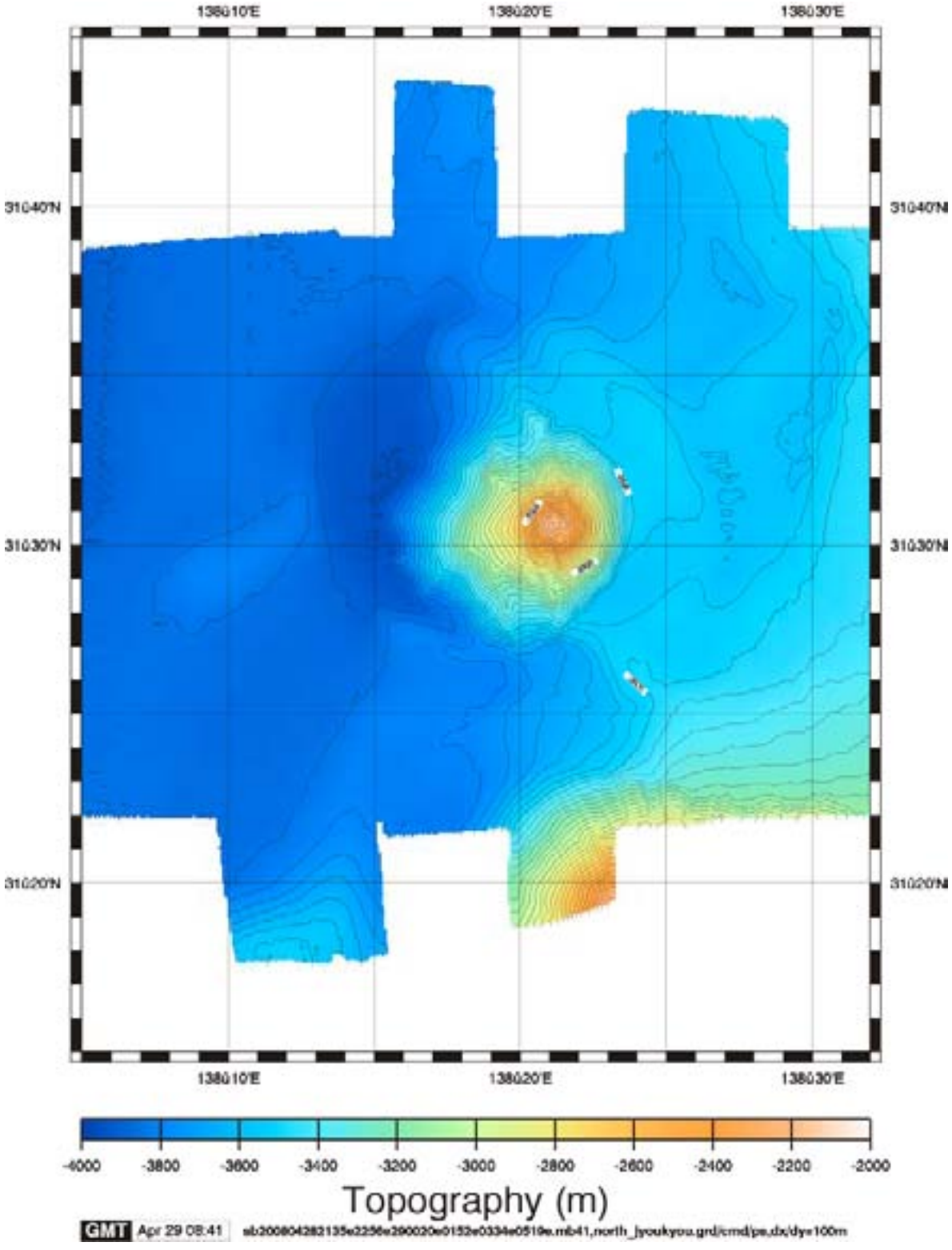

Fig.7　Bathymetric map around the Kita-Jokyo Seamount .

Appendix: Onboard members of R/V Yokosuka YK08-05 Cruise

[R/V Yokosuka Crew]

Captain	S. Ryono
Chief Officer	N. Kimura
2nd Officer	T. Sato
3rd Officer	S. Fujii
Chief Engineer	K. Kajinishi
1st Engineer	T. Abe
2nd Engineer	T. Ohta
3rd Engineer	Y. Hiratsuka
Chief Radio Operator	H. Saitake
2nd Radio Operator	Y. Inoue
Boat Swain	Y. Kyuki
Able Seaman	K. Murata
Able Seaman	T. Chimoto
Able Seaman	H. Oda
Able Seaman	Y. Konno
Able Seaman	Y. Yoshino
Able Seaman	N. Ichikawa
No.1 Oiler	S. Matsuda
Oiler	Y. Higashigawa
Oiler	K. Miyazaki
Oiler	K. Abe
Oiler	J. Takeda
Chief Steward	S. Sasaki
Steward	Y. Hasatani
Steward	K. Kirita
Steward	k. Murakami
Steward	K. Hirayama
Trainee	K. Shirakata
Trainee	S. Ueno
Trainee	S. Ono
Trainee	M. Fujita
Trainee	J. Hanazawa

[Shinkai 6500 Operation Team]

Operation Manager	T. Sakurai
Assistant Operation Manager	K. Chiba
1st Submersible Staff	Y. Sasaki
1st Submersible Staff	T. Maki
1st Submersible Staff	T. Komuku
1st Submersible Staff	Y. Ohno
1st Submersible Staff	K. Matsumoto
2nd Submersible Staff	K. Suzuki
2nd Submersible Staff	A. Ishikawa
2nd Submersible Staff	Y. Chida
3rd Submersible Staff	H. Ueki
3rd Submersible Staff	T. Ohnishi

[Scientific Team]

Chief scientist	H. Ueda
Co-chief scientist	Y. Ogawa
Scientist	K. Niida
Scientist	M. Meschede
Scientist	T. Usuki
Scientist	K. Hirauchi
Scientist	R. Miura
Scientist	T. Azuma
Scientist	T. Imayama
Scientist	Y. Miyajima
Scientist	T. Chiba
Student	T. Saito

[Scientific Supports]

Marine Technician	M. Aoki