

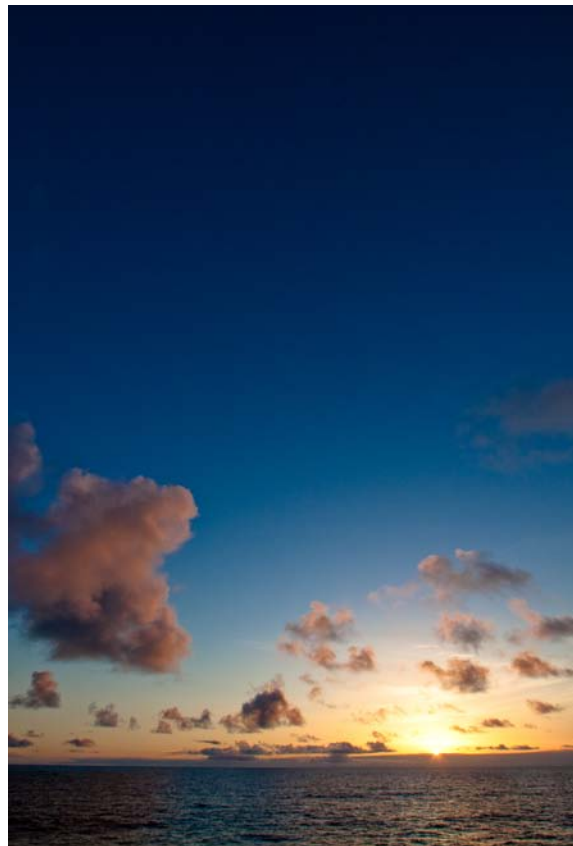
CRUISE REPORT

R/V YOKOSUKA YK10-04

SHINKAI6500 & Deep Tow surveys

April 22, 2010 – May 10, 2010

Institute for Research on Earth Evolution
Japan Agency for Marine-Earth Science and Technology
(IFREE, JAMSTEC)



© H. Shukuno (Sunset of 2010.5.5, Amami Plateau)

***Crustal and magmatic evolution of the
Northwestern Philippine Sea***

Amami Plateau – Daito Ridge – Okidaito Ridge, NW Philippine Sea

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List of cruise members:

Shipboard Scientific Party:

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Agency for Marine-Earth Science and Technology (JAMSTEC)

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Shinichi Hosoya

Marine Science Department, Nippon Marine Enterprises, Ltd.

Shore-based Scientific Party:

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Satoshi Saito PD Research Scientist, IFREE, JAMSTEC

Jun-Ichi Kimura Team Leader, IFREE, JAMSTEC

Yoshiyuki Tatsumi Program Director, IFREE, JAMSTEC

SHINKAI6500 Operation Team:

Senior pilot operation manager	Sakurai	Toshiaki
Pilot assistant operation manager	Ogura	Satoshi
Chief pilot mechanic	Yoshiume	Tsuyoshi
Pilot chief mechanic	Matsumoto	Keita
Pilot / mechanic chief acoustic navigator	Yanagitani	Masanobu
Pilot mechanic	Ueki	Hirofumi
Pilot mechanic	Chida	Yosuke
Co-pilot mechanic	Suzuki	Keigo
Co-pilot mechanic / acoustic navigator	Saitou	Fumitaka
Co-pilot mechanic / acoustic navigator	Oonishi	Takumi
Mechanic	Ikeda	Hitomi
Mechanic / acoustic navigator	Katagiri	Masaya
PilotROV HPD operation manager	Ono	Yoshinari

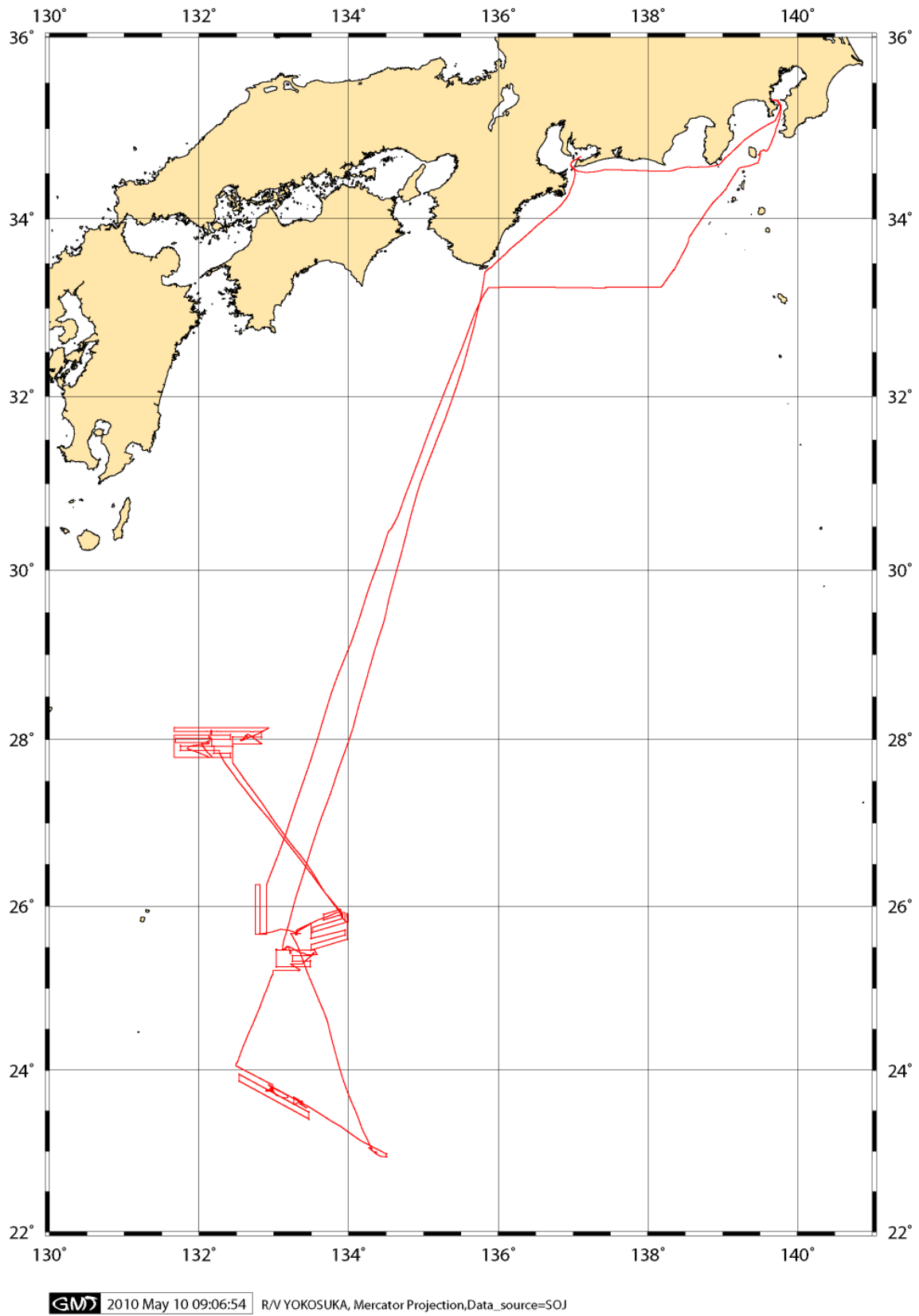
R/V Yokosuka crew:

Captain	Ukekura	Eiko
Chief Officer	Aoki	Takafumi
2nd Officer	Shirayama	Tetsuo
3rd Officer	Ito	Masashi
Chief Engineer	Kikkawa	Hiroyoshi
1st Engineer	Matsukawa	Kimio
2nd Engineer	Sakaemura	Saburo
3rd Engineer	Keguchi	Kenta
Chief Radio Off.	Akama	Hideyuki
2nd Radio Officer	Ishiwata	Hiroki
3rd Radio Officer	Minamoto	Mai
Boat Swain	Abe	Shoichi
Able Seaman	Toguchi	Tadahiko
Able Seaman	Oda	Hatsuo
Able Seaman	Ichikawa	Nobuyuki
Able Seaman	Hirai	Saikan
Sailor	Yanagitani	Daisuke
Sailor	Abe	Shun
No.1 Oiler	Miura	Kozo
Oiler	Ueda	Masanori
Oiler	Fujiwara	Masayuki
Assistant Oiler	Suzuki	Yuta
Assistant Oiler	Matsui	Toshinori
Chief Steward	Miyauchi	Takeshi
Chief Steward	Sonoda	Kazuma
Steward	Kirita	Koji
Steward	Abe	Takahiro
Steward	Ito	Kei

Acknowledgements

We are grateful to Captain Eiko Ukekura and the crew of the R/V YOKOSUKA, the SHINKAI 6500 operation team manager Toshiaki Sakurai and the operation team staff for their professional and outstanding efforts to make this scientific cruise successful. We also thank JAMSTEC ship operation division for their support of this project.

Figure 1. YK10-04 survey ship track



Cruise Summary

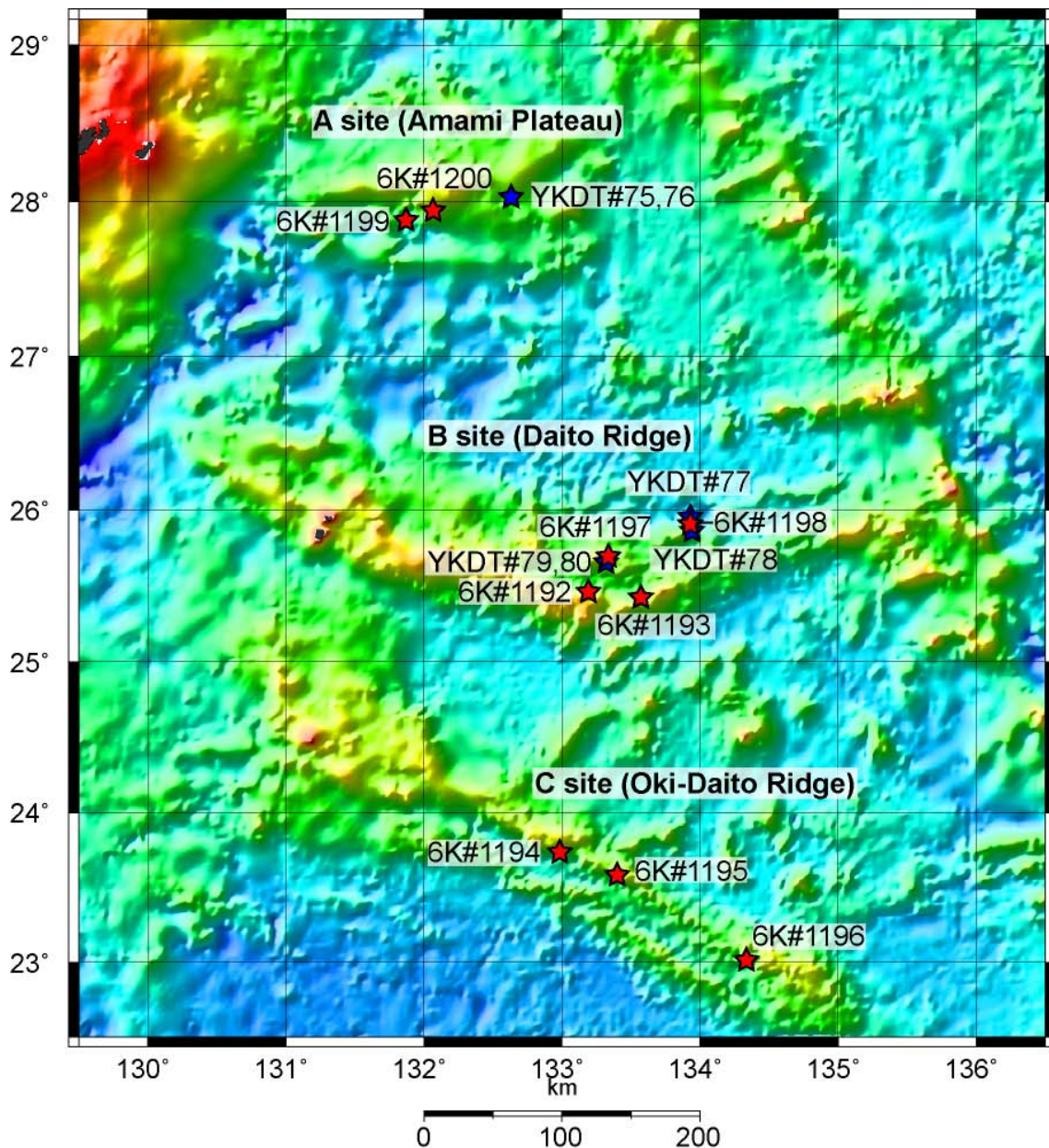
R/V YOKOSUKA and manned-submersible SHINKAI6500 cruise YK10-04 was held from April 22, 2010 to May 10, 2010, a round trip from JAMSTEC pier in Yokosuka. The chief targets of this cruise were to investigate the geology of the proto-Philippine Sea Plate which existed prior to the initiation of subduction at Izu-Bonin-Mariana arc. For these purposes, we have selected Amami Plateau, Daito Ridge, and Oki-Daito Ridge (ADO) area, located in the northwestern Philippine Sea (Figure 2).

The surveys during the cruise were very smooth and successful. We completed all the planned surveys, including 9 SHINKAI6500 dives and 3 Deep Tow dives, collected over 218 rocks and sediment samples. Collected samples range from ultramafic rocks, gabbro, granites, metamorphic rocks, sedimentary rocks, to volcanic rocks, indicating that these samples represent the full crustal section of the proto-Philippine Sea Plate. In addition, newly acquired SEABEAM bathymetry data and geomagnetic data will complement the preexisting geophysical data set.

This cruise was originally scheduled until May 11, but due to the accomplishment of the planned surveys and approach of low pressure, we returned to JAMSTEC pier 1 day earlier.

The following paragraphs summarize our findings in each survey area; more detailed descriptions and results can be found in the individual dive logs.

Figure 2. Surveyed sites during YK10-04 cruise.



Amami Plateau area (A site):

We have conducted 2 SHINKAI6500 dives (6K1999 and 6K1200) and 2 Deep Tow dives (YKDT#75 and #76) in the Amami Plateau area:

- Dive 6K1999 surveyed the base of the southern slope of Amami Plateau from 4246 to 3990 mbsl. The dive observed jointed outcrops and collected gabbro and tonalite.
- Dive 6K1200 surveyed the shallower and northeastern section of the same slope surveyed by dive 6K1199 from 2794 to 2134 mbsl. The dive observed thickly Mn-coated breccia and jointed outcrop consisting of andesite.
- YKDT#75 and #76 visited a cliff at the eastern end of Amami Plateau. YKDT#75 (3160 – 2885 mbsl) observed a layered outcrop, probably composed of semi-consolidated mudstone. YKDT#76 (3026 – 2735 mbsl) observed a dark breccia-like outcrop overlain

by a layered semi-consolidated mudstone at the top of the dredged slope. The dredge box deployed at YKDT#76 recovered 1 fresh clast of andesite, which may be derived from the observed breccia-like outcrop.

In summary, we have successfully observed a deep crustal section of the Amami Plateau (6K1999), and sections of the andesite volcanoes (6K1200 and YKDT#76).

Daito Ridge area (B site):

We have conducted 4 SHINKAI6500 dives (6K1192, 6K1193, 6K1197, and 6K1198) and 4 Deep Tow dives (YKDT#77, #78, #79, and #80) in the Daito Ridge area:

- Dive 6K1192 surveyed the north-facing cliff of the western central part of Daito Ridge from 3282 to 2788 mbsl, and observed thickly Mn-coated outcrops that may have been volcanic breccia or intrusives. The collected samples were basaltic breccia and dolerite.
- Dive 6K1193 surveyed the north-facing slope of the eastern central part of Daito Ridge from 3317 to 2815 mbsl. The dive observed thickly Mn-coated outcrops and occasionally encountered surface with evident horizontal foliations, and recovered metamorphic rocks and diorite.
- Dive 6K1197 visited the southern slope of the seamount north of the central region of the main Daito Ridge from 2166 to 1542 mbsl, and observed a thickly Mn-coated seafloor and recovered Mn-coated volcanoclastics and calcareous sediments.
- Dive 6K1198 visited the northern slope of the central Daito Ridge basement from 3899 to 3467 mbsl, and observed extensive outcrops of foliated metamorphic rocks and brecciated outcrops consisting of andesite and gabbro.
- YKDT#77 and #78 visited the deeper and shallower extensions of the dive 6K1198, respectively. YKDT#77 (4440 – 4055 mbsl) observed blocky and partly jointed outcrops and recovered many gravels including granitic and metamorphic rocks with the dredge box. YKDT#78 (3427 – 3056 mbsl) observed outcrops of foliated metamorphic rocks overlain by calcareous sediments; recovered dredge samples include large clasts of metamorphic rocks, sheared granites, serpentinite, and calcareous sediments.
- YKDT#79 and #80 visited the deeper section of the dive 6K1197. YKDT#79 (2476 – 2328 mbsl) and #80 (2618 – 2188 mbsl) observed massive outcrops with occasional jointing and brecciation, and recovered small amounts of pebbles and granules, consisting of altered volcanic, hypabyssal and granitic rocks, and exotic pumice and scoria clasts.

As a summary, we have successfully observed deep crustal sections of Daito Ridge (6K1193, 6K1198, YKDT#77, and #78), and sections of basaltic volcanic edifices (6K1192, 6K1197, YKDT#79, and #80).

Oki-Daito Ridge area (C site):

We have conducted 3 SHINKAI6500 dives (6K1194, 6K1195, and 6K1196) in the area:

- Dive 6K1194 visited the southern slope of a topographic high situated in the central part of

the northern Oki-Daito Ridge from 3604 mbsl to 2685 mbsl. The dive traverse was mostly covered with talus deposits of basalt and dolerite boulders.

- Dive 6K1195 visited the southern slope of the central part of the northern Oki-Daito Ridge, a topographic high situated to the east of the site of dive 6K1194. The dive traverse was from 3284 mbsl to 2600 mbsl, and outcrops of breccia and associated talus deposits were observed. Collected samples were mostly basaltic to andesitic breccia.
- Dive 6K1196 visited the southern slope of a topographic high situated on the eastern end of Oki-Daito Ridge from 2840 mbsl to 2197 mbsl. The dive observed outcrops of lava breccia and dikes, overlain by horizontally-bedded calcareous sediments. The recovered samples were basaltic to andesitic lava and breccia.

As a summary, we have successfully observed sections of volcanic edifices that are basaltic to andesitic in composition at 3 different topographic highs situated on the northern Oki-Daito Ridge.

YK10-04 Shipboard Log:

2010/04/22

Weather: rain/ Wind direction: NNE/ Wind force: 6/ Wave: 4 m/ Swell: 3 m/ Visibility: 3 nautical miles (12:00 JST)

09:00 Onboard
10:00 Departure from YOKOSUKA(JAMSTEC)
10:50-11:20 Briefing about ship's life and safety
16:40-17:00 Pray for safety of cruise to KONPIRASAN
Stay at MIKAWA bay due to bad sea condition

2010/04/23

Weather: overcast/ Wind direction: NNW/ Wind force: 4/ Wave: 3 m/ Swell: 3 m/ Visibility: 6 nautical miles (12:00 JST)

09:00-09:20 Shinikai6500 team and scientists meeting
13:30-15:30 Briefing about Shinikai6500
18:00-18:50 Scientific meeting

2010/04/24

Weather: cloudy/ Wind direction: North/ Wind force: 5/ Wave: 3 m/ Swell: 3 m/ Visibility: 7 nautical miles (12:00 JST)

10:00-10:40 Set up the Laboratory
18:00-18:05 Scientific meeting

2010/04/25

Weather: fine but cloudy/ Wind direction: ENE/ Wind force: 5/ Wave: 4 m/ Swell: 4 m/ Visibility: 8 nautical miles (12:00 JST)

01:45	Arrived at survey area "B"
06:25	XBT
06:56-07:37	MBES mapping survey for 6K dive
09:57	Launch Sinkai6500 (6K#1192dive)
11:29	6K lands (3,282m)
16:01	6K leaves the bottom (2,788m)
17:25	6K on deck
17:59	Proton magnetometer deployed
18:13-18:29	Eight figure turn
19:00-19:30	Scientific Meeting
19:50-20:34	MBES mapping survey for 6K dive
21:09	Start of the geological survey

2010/04/26

Weather: cloudy/ Wind direction: ENE/ Wind force: 4/ Wave: 3 m/ Swell: 3 m/ Visibility: 7 nautical miles (12:00 JST)

06:21	End of the geological survey
06:34	Proton magnetometer on deck
09:52	Launch Sinkai6500 (6K#1193dive)
11:22	6K lands (3,317m)
16:02	6K leaves the bottom (2,815m)
17:27	6K on deck
18:06	Proton magnetometer deployed
18:29	Start of the geological survey
22:00	Transit to survey area "C"
20:00-20:30	Scientific Meeting

2010/04/27

Weather: fine but cloudy/ Wind direction: SSE/ Wind force: 5/ Wave: 4 m/ Swell: 3 m/ Visibility: 8 nautical miles (12:00 JST)

02:20	Arrive at survey area "C"
05:58	End of the geological survey
06:03	XBT
06:41-07:15	MBES mapping survey for 6K dive
07:32	Proton magnetometer on deck
09:54	Launch Sinkai6500 (6K#1194dive)
11:26	6K lands (3,604m)

15:56 6K leaves the bottom (2,685m)
17:20 6K on deck
17:51 Proton magnetometer deployed
19:27 Start of the geological survey
21:00-21:30 Scientific Meeting

2010/04/28

Weather: fine but cloudy/ Wind direction: NE/ Wind force: 4/ Wave: 3 m/ Swell: 3 m/ Visibility: 7 nautical miles (12:00 JST)

06:13 End of the geological survey
06:49-07:19 MBES mapping survey for 6K dive
07:35 Proton magnetometer on deck
09:54 Launch Sinkai6500 (6K#1195dive)
11:24 6K lands (3,284m)
16:06 6K leaves the bottom (2,600m)
17:29 6K on deck
18:01 Proton magnetometer deployed
18:37 Start of the geological survey
19:30-19:45 Scientific Meeting

2010/04/29

Weather: rain / Wind direction: North/ Wind force: 6/ Wave: 4 m/ Swell: 3 m/ Visibility: 4 nautical miles (12:00 JST)

05:45 End of the geological survey
06:02 XBT
06:31-07:12 MBES mapping survey for 6K dive
07:16-07:29 Eight figure turn
07:43 Proton magnetometer on deck
09:54 Launch Sinkai6500 (6K#1196dive)
11:11 6K lands (2,840m)
16:07 6K leaves the bottom (2,197m)
17:21 6K on deck
18:00 Transit to survey area "B"
20:00-20:30 Scientific Meeting

2010/04/30

Weather: overcast / Wind direction: North/ Wind force: 5/ Wave: 4 m/ Swell: 3 m/ Visibility: 7 nautical miles (12:00 JST)

06:00 Arrive at survey area "B"

06:03 XBT
06:35-07:16 MBES mapping survey for 6K dive
10:31 Launch Sinkai6500 (6K#1197dive)
11:33 6K lands (2,166m)
16:30 6K leaves the bottom (1,542m)
17:30 6K on deck
18:01 Proton magnetometer deployed
19:45-20:00 Scientific Meeting
20:27-21:01 MBES mapping survey for 6K dive
21:10 Start of the geological survey

2010/05/01

Weather: overcast / Wind direction: NE/ Wind force: 3 / Wave: 2 m/ Swell: 2 m/ Visibility: 7 nautical miles (12:00 JST)

06:15 End of the geological survey
06:34 Proton magnetometer on deck
08:50 Launch Sinkai6500 (6K#1198dive)
10:34 6K lands (3,899m)
14:53 6K leaves the bottom (3,467m)
16:29 6K on deck
17:01 Proton magnetometer deployed
17:10 Transit to survey area "A"
20:00-20:20 Scientific Meeting

2010/05/02

Weather: cloudy / Wind direction: East/ Wind force: 2 / Wave: 1 m/ Swell: 1 m/ Visibility: 8 nautical miles (12:00 JST)

06:00 Arrive at survey area "A"
06:03 XBT
06:40-12:48 MBES mapping survey for 6K dive
12:56-14:55 Geological survey
15:04 Start of MBES mapping survey for 6K dive
17:00-17:12 Eight figure turn
19:48 Proton magnetometer on deck
18:00-18:05 Scientific Meeting

2010/05/03

Weather: overcast / Wind direction: East/ Wind force: 5 / Wave: 4 m/ Swell: 3 m/ Visibility: 7 nautical miles (12:00 JST)

00:34 End of the MBES mapping survey for 6K dive

00:43-05:31	Geological survey
08:52	Launch Sinkai6500 (6K#1199dive)
10:44	6K lands (4,264m)
14:40	6K leaves the bottom (3,990m)
16:29	6K on deck
18:06-19:08	MBES mapping survey for 6K dive
19:08	Start of the geological survey
19:00-19:20	Scientific Meeting

2010/05/04

Weather: cloudy / Wind direction: NE/ Wind force: 5 / Wave: 4 m/ Swell: 4 m/ Visibility: 5 nautical miles (12:00 JST)

05:36	End of the geological survey
08:51	Launch Sinkai6500 (6K#1200dive)
10:05	6K lands (2,794m)
15:14	6K leaves the bottom (2,134m)
15:59	6K on deck
18:36	Start of the geological survey
19:30-20:00	Scientific Meeting

2010/05/05

Weather: fine but cloudy / Wind direction: ENE/ Wind force: 3 / Wave: 2 m/ Swell: 2 m/ Visibility: 7 nautical miles (12:00 JST)

04:19	End of the geological survey
08:57	Launch YOKOSUKA Deep-Tow (YKDT#75dive)
10:07	YKDT start towing
11:15	YKDT leaves the bottom (2,885m)
12:06	YKDT on deck
13:07	Launch YOKOSUKA Deep-Tow (YKDT#76dive)
14:14	YKDT start towing
15:09	YKDT leaves the bottom (2,767m)
16:08	YKDT on deck
17:25	Start of the geological survey
18:10-18:30	Scientific Meeting
20:20	End of the geological survey
20:20	Transit to survey area "B"

2010/05/06

Weather: fine but cloudy / Wind direction: clam/ Wind force: 1 / Wave: 1 m/ Swell: 1 m/ Visibility:
8 nautical miles (12:00 JST)

06:00 Arrive at survey area "B"
08:39 Launch YOKOSUKA Deep-Tow (YKDT#77dive)
10:06 YKDT start towing
11:56 YKDT leaves the bottom (4,055m)
12:17 YKDT on deck
13:08 Launch YOKOSUKA Deep-Tow (YKDT#78dive)
14:19 YKDT start towing
15:17 YKDT leaves the bottom (3,056m)
16:18 YKDT on deck
16:30 Proton magnetometer deployed
17:52 Start of the geological survey
18:00-18:20 Scientific Meeting

2010/05/07

Weather: fine but cloudy / Wind direction: South/ Wind force: 3 / Wave: 2 m/ Swell: 1 m/ Visibility:
8 nautical miles (12:00 JST)

04:31 End of the geological survey
06:15 Proton magnetometer on deck
07:17 Launch YOKOSUKA Deep-Tow (YKDT#79dive)
08:11 YKDT start towing
08:38 YKDT leaves the bottom (2,328m)
09:25 YKDT on deck
09:56 Launch YOKOSUKA Deep-Tow (YKDT#80dive)
10:51 YKDT start towing
12:00 YKDT leaves the bottom (2,188m)
12:47 YKDT on deck
15:43 Start of the geological survey
18:00-18:20 Scientific Meeting

2010/05/08

Weather: fine but cloudy / Wind direction: NE/ Wind force: 5 / Wave: 4 m/ Swell: 3 m/ Visibility: 8
nautical miles (12:00 JST)

01:15 End of the geological survey
Transit to Yokosuka (JAMSTEC)

2010/05/09

Weather: cloudy / Wind direction: North/ Wind force: 4 / Wave: 3 m/ Swell: 2 m/ Visibility: 8 nautical miles (12:00 JST)

Transit to Yokosuka (JAMSTEC)

09:30-10:00 Seminar for crews

13:30-14:00 Engine room excursion

2010/05/10

09:30 Arrival at Yokosuka (JAMSTEC), YK10-04 finish and disembarkation

1. Operations and data processing information

1.1 SHINKAI6500 survey

The SHINKAI6500 usually dived with payloads of 1 sample box, 3 push cores, 1 chisel, and one scoop sampler. The rock samples were collected using the two manipulators of SHINKAI6500. During dive 6K1998, the submersible-carried clinometer “UEDAX” was used to measure geological surface orientation in situ.

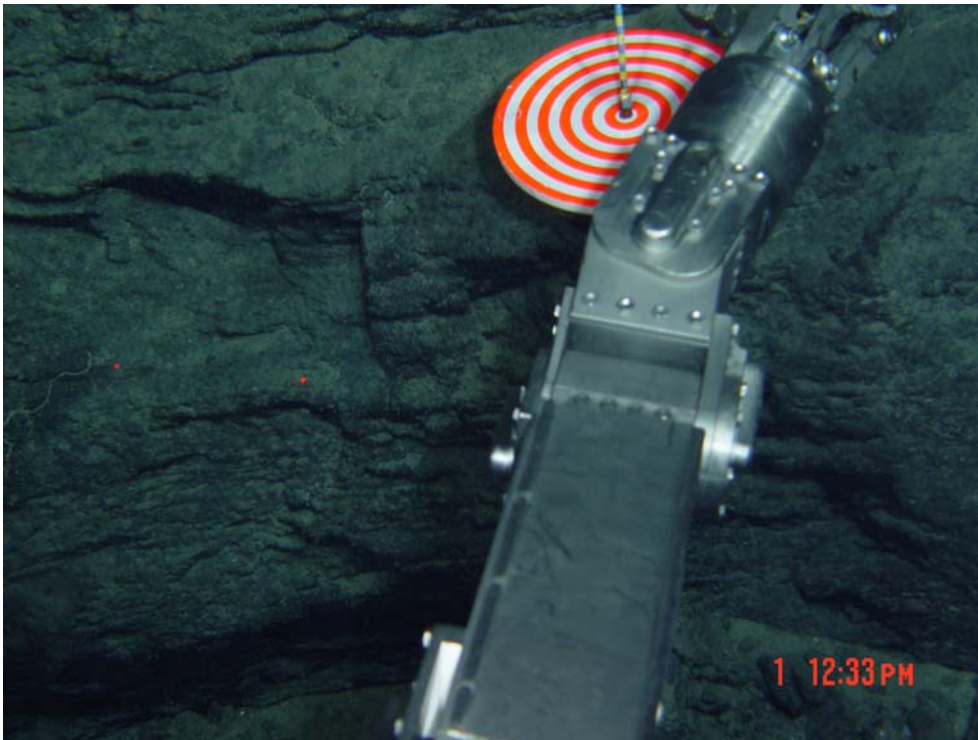


Figure 3. Measurement of surface orientation at the outcrop using UEDAX.

1.2 Yokosuka Deep Tow survey

1.2.1. Underwater units

Underwater units include one color TV camera, one black and white TV camera, four underwater lights, one digital still camera, one CTD (Seabird SBE49), one altimeter (MESOTECH 1007), one acoustic transponder (OKI SB-1023 7Hz), and one releaser (InterOcean MR5000) for deployment of dredge box. The maximum operation depth of each unit is 4500 m. These units are installed on an open frame made of iron pipe. The weight of this system is 500 kg in water, 700 kg in air. Dimensions of this system are 3.5 m in length, 1.1 m in width, 1.45 m in height. The color TV camera viewing frame is directed vertically and used for sea floor observation. The black and white camera is used to monitor the forward direction. The winch system on deck was used to adjust the depth of the camera array from the surface, based on real-time CTD data feed.



Figure 4. Yokosuka Deep Tow system.

1.2.2. Dredge box for Deep Tow

The dredge box was mounted in Deep Tow for the purpose of collecting the rocks deposited on the sea floor. The dimensions of the dredge box were 50 cm in length, 50 cm in width, 32 cm in height. When Deep Tow reached a suitable location for sampling, a command signal was transmitted from onboard. The command signal activates the separation equipment on Deep Tow, releasing the dredge box to the sea floor with ~3m rope. Since the rope was extended after the separation, the Deep Tow was towed higher than the usual altitude.

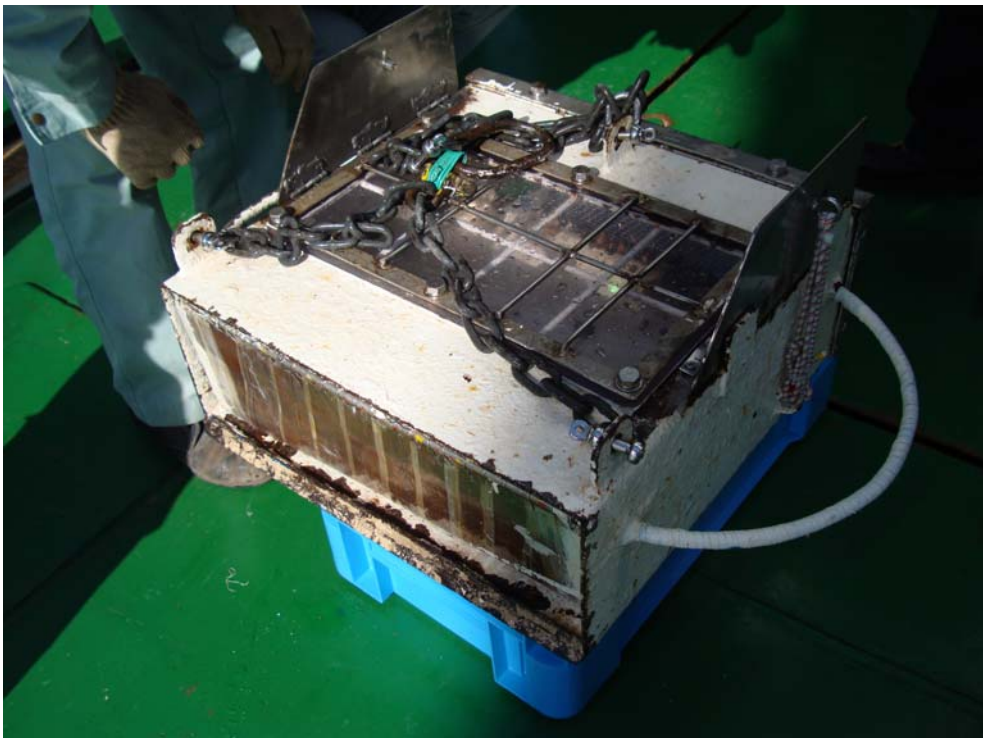


Figure 5. Dredge box for Yokosuka Deep Tow system.

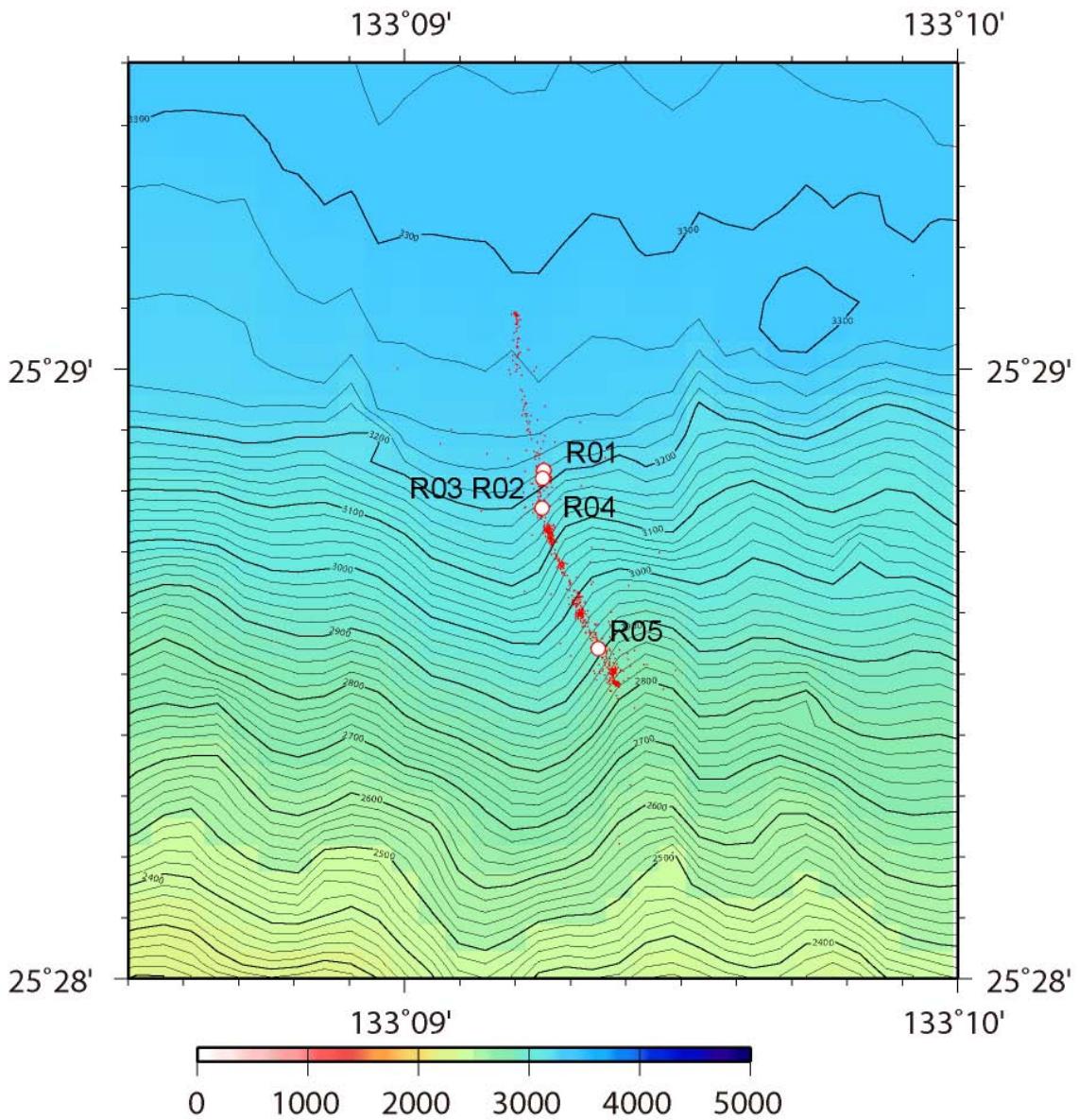
1.2.3. Operating instructions

Towing speed of the Deep Tow system from the stern of the R/V Yokosuka was approximately 1.0 knot. Towing depth from the surface can be measured by the CTD unit. An altitude of ~4 m from the seafloor was maintained during the survey. The data for ship and vehicle position, towing cable tension and distance, CTD, and altitude can be recorded digitally. Tension and the length deployed and direction of the towing cable are recorded using a pen-recorder and printer. Visual data with overlay can be recorded on HDD recorder and DVD.

2. Scientific results

2.1 SHINKAI6500 dive surveys

2.1.1 6K1192 dive



Observer: Osamu Ishizuka

Technical information:

Location: Central part of Daito Ridge (B site).

Objective: Geological observation and rock sampling of Daito Ridge.

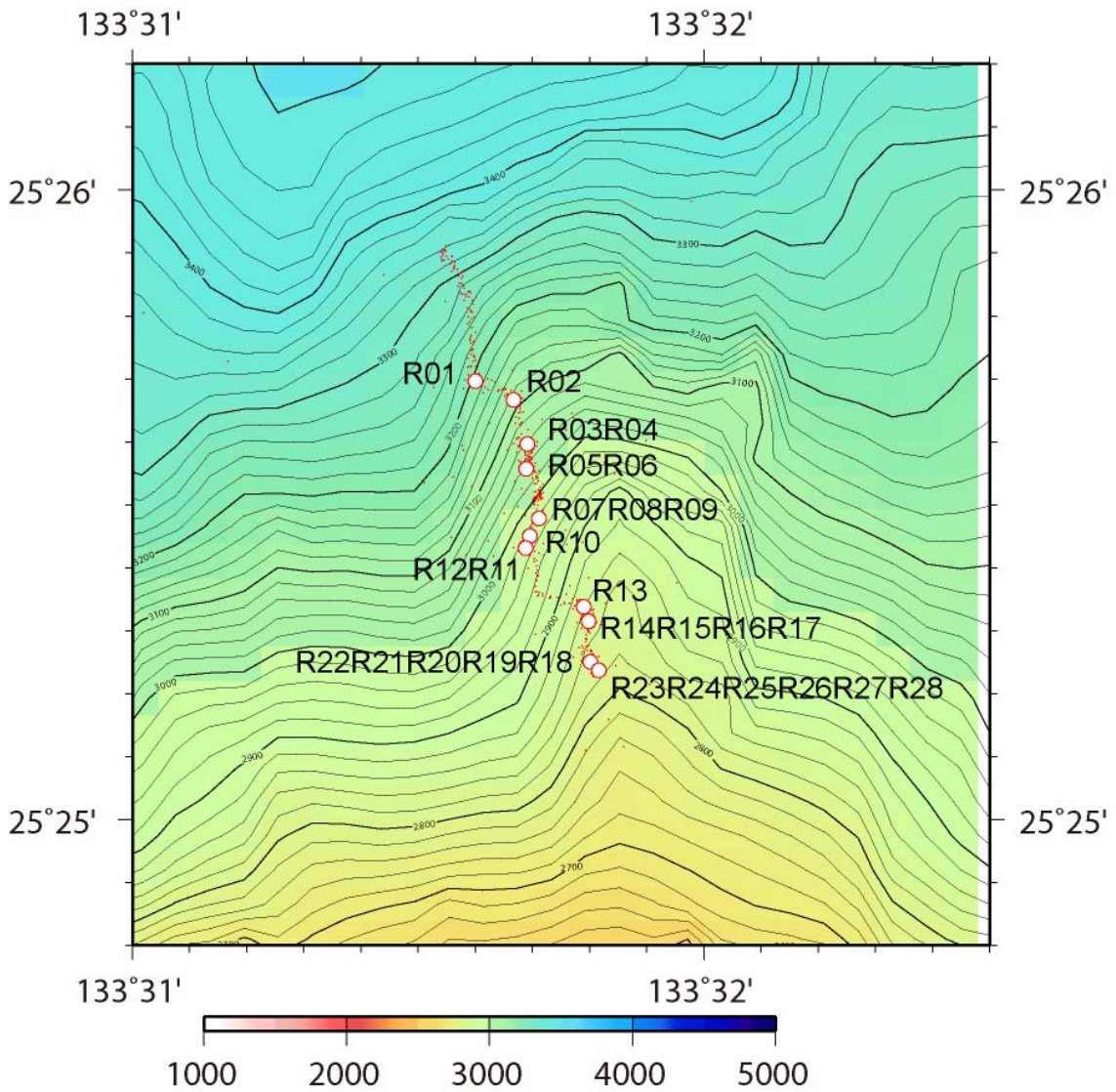
	On bottom:	Off bottom:
Time (local)	11:29	16:01
Latitude:	25°29.0894' N	25°28.478' N
Longitude:	133°9.1994' E	133°9.3839' E
Depth (m):	3282	2788

5 samples collected (1 lost (R04))

Purpose:

The main purpose of this dive was to observe and sample rocks from the north-facing steep cliff of the central part of Daito Ridge. We hope to observe the crustal section of the Cretaceous remnant arc.

2.1.2 6K1193 dive.



Observer: Hayato Ueda

Technical information:

Location: Northern slope of the east-central Daito Ridge (B site).

Objective: Geological observation and rock sampling of the Daito Ridge.

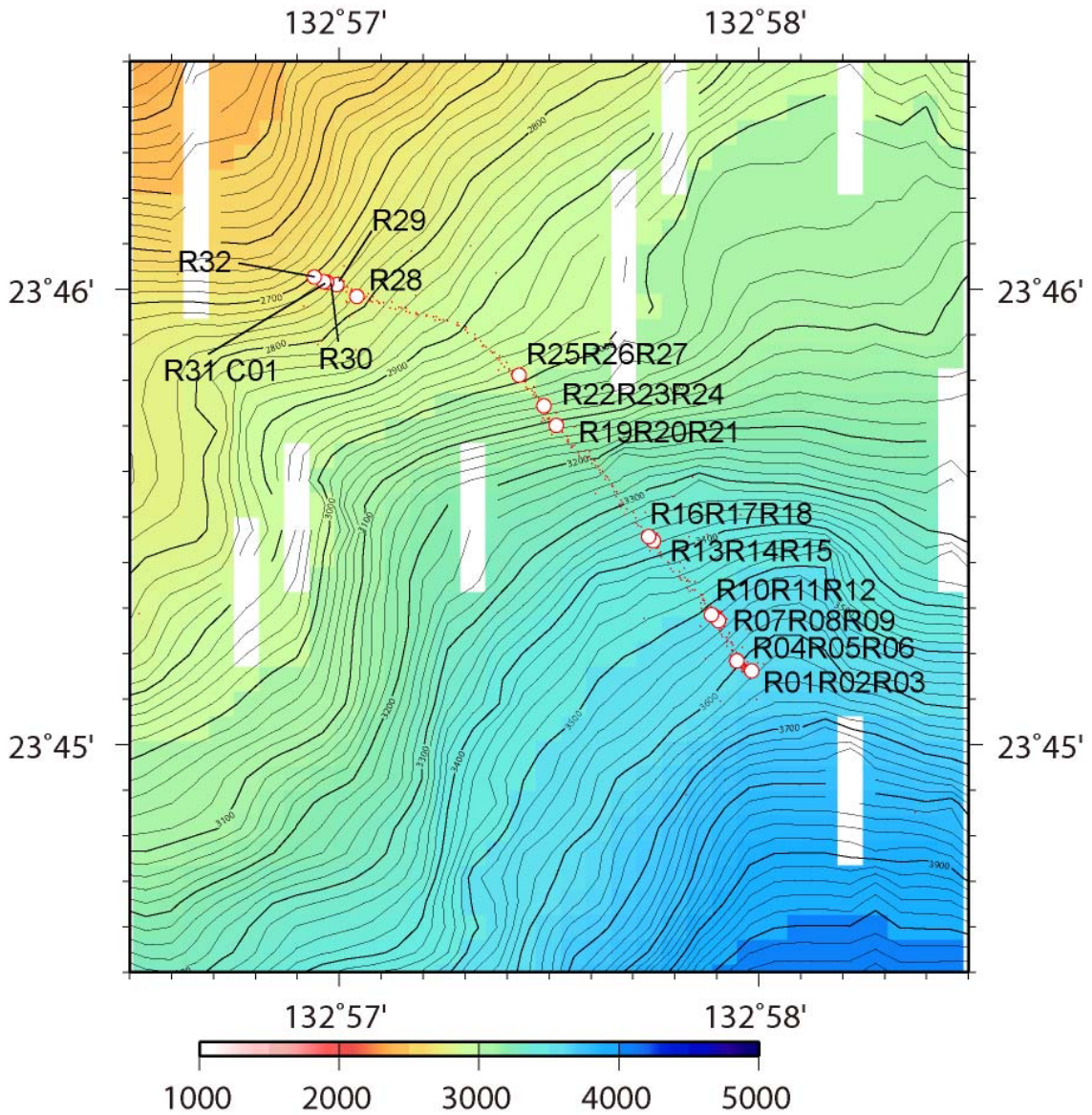
	On bottom:	Off bottom:
Time (local)	11:22	16:02
Latitude:	25°25.8999' N	25°25.2361' N
Longitude:	31.5451' E	133°31.8163' E
Depth (m):	3317	2815

28 samples collected

Purpose:

The main purpose of this dive was to observe and sample rocks from the north-facing steep cliff of the eastern central part of Daito Ridge. Amphibole schist and serpentinite were dredged in the vicinity of this dive site during a previous survey. We expect to collect the rocks from upper mantle and lower crust of the Cretaceous remnant arc.

2.1.3 6K1194 dive.



Observer: Yuka Hirahara

Technical information:

Location: Oki-daito Ridge (C site).

Objective: Geological observation and rock sampling along a transect on the southward side of central part of the northern Oki-Daito Ridge.

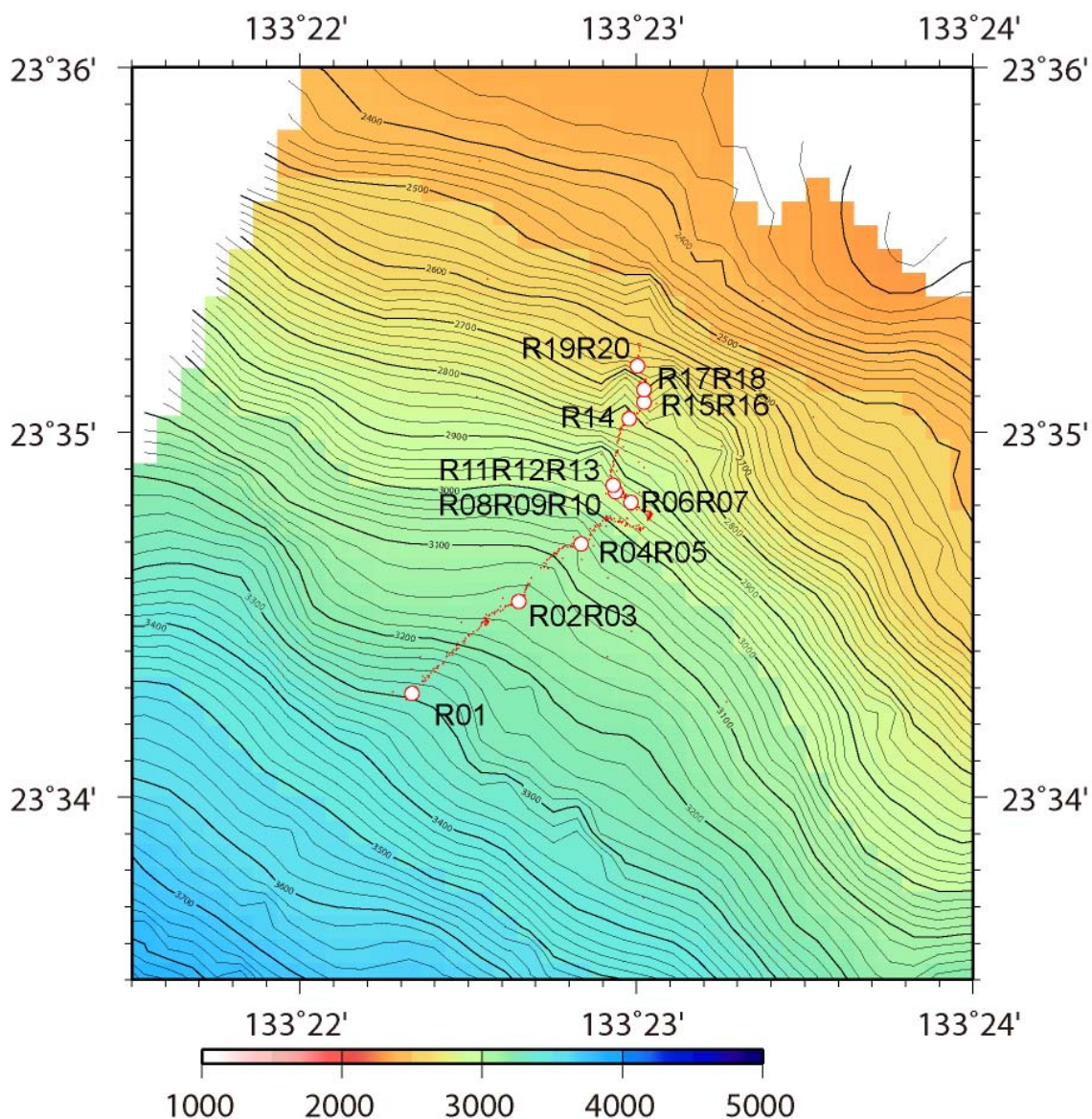
	On bottom:	Off bottom:
Time (local)	11:26	15:56
Latitude:	23°45.0000' N	23°46.0258' N
Longitude:	132°58.0000' E	132°56.9399' E
Depth (m):	3604	2685

32 rock and 1 sediment (by push core) samples collected (2 lost)

Purpose:

The main purpose of this dive was to observe and sample rocks from central northern Oki-Daito Ridge. Although there is little existing geological information on Oki-Daito Ridge, we expect to collect crustal material from the Cretaceous remnant arc.

2.1.4 6K1195 dive.



Observer: Toshiro Takahashi

Technical information:

Location: Southern slope of central part of the northern Oki-Daito Ridge (C site).

Objective: Geological observation and rock sampling of the northern Oki-Daito Ridge.

	On bottom:	Off bottom:
Time (local)	11:24	16:06
Latitude:	23°34.2843' N	23°35.2454' N
Longitude:	133°22.3267' E	133°23.0082' E
Depth (m):	3284	2600

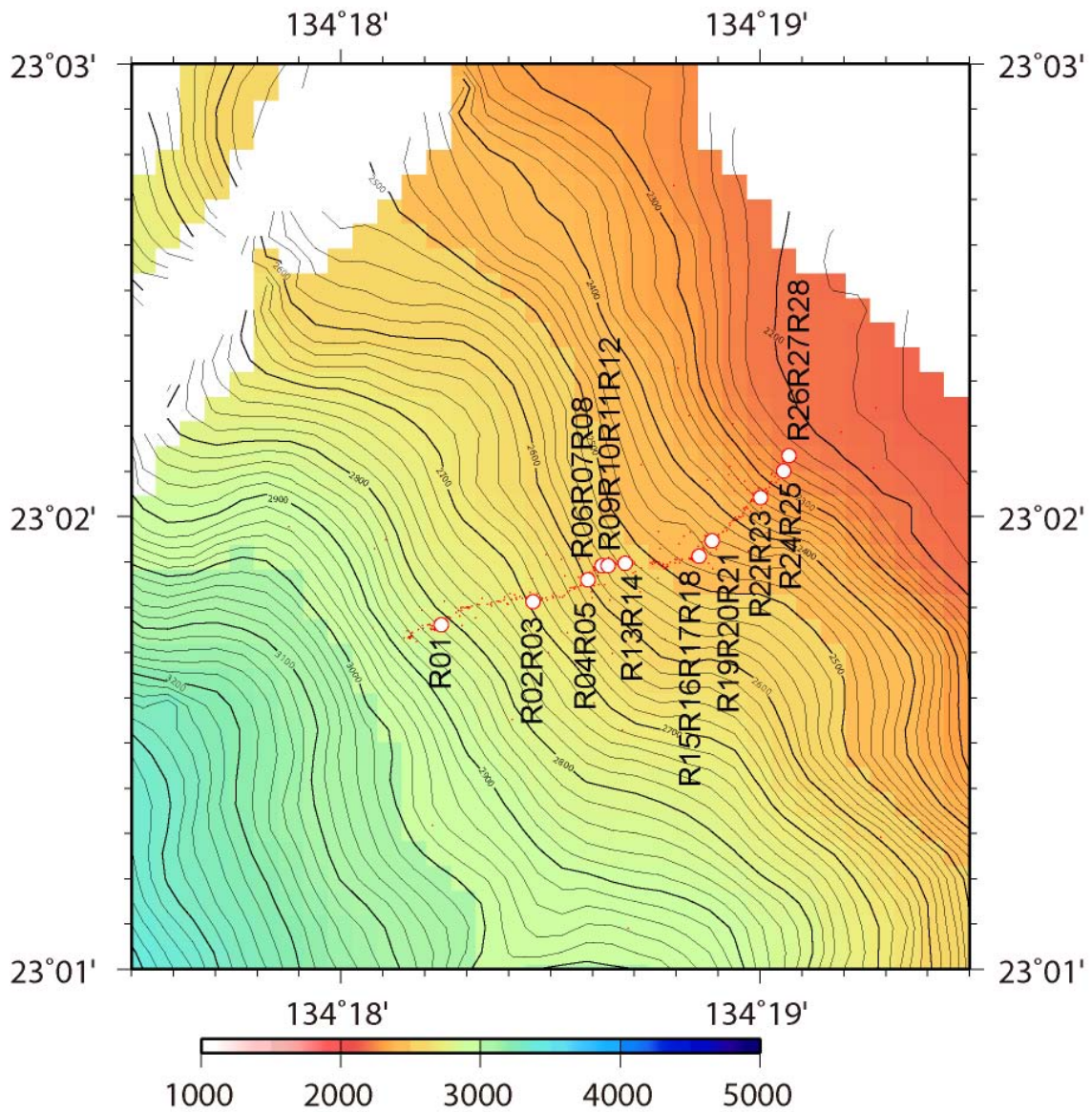
19 samples collected

Purpose:

The purpose of this dive was to observe and sample rocks from the seafloor on Oki-Daito Ridge. Alkali basalt was reported from the southern Oki-Daito Ridge in previous dredge sampling (GH70-07, site 160). Dive #1194 observed the central part of the southern slope of the northern Oki-Daito Ridge and collected basaltic to andesitic rocks.

These previous observations indicate that the northern and southern Oki-Daito Ridge are compositionally distinct. Thus, this dive will collect samples in order to further investigate the distribution of the volcanic rocks that make up the northern Oki-Daito Ridge.

2.1.5 6K1196 dive.



Observer: Hiroshi Shukuno

Technical information:

Location: Oki-Daito Ridge (C site).

Objective: Geological observation and rock sampling on the southern slope of the eastern side of the Oki-Daito Ridge.

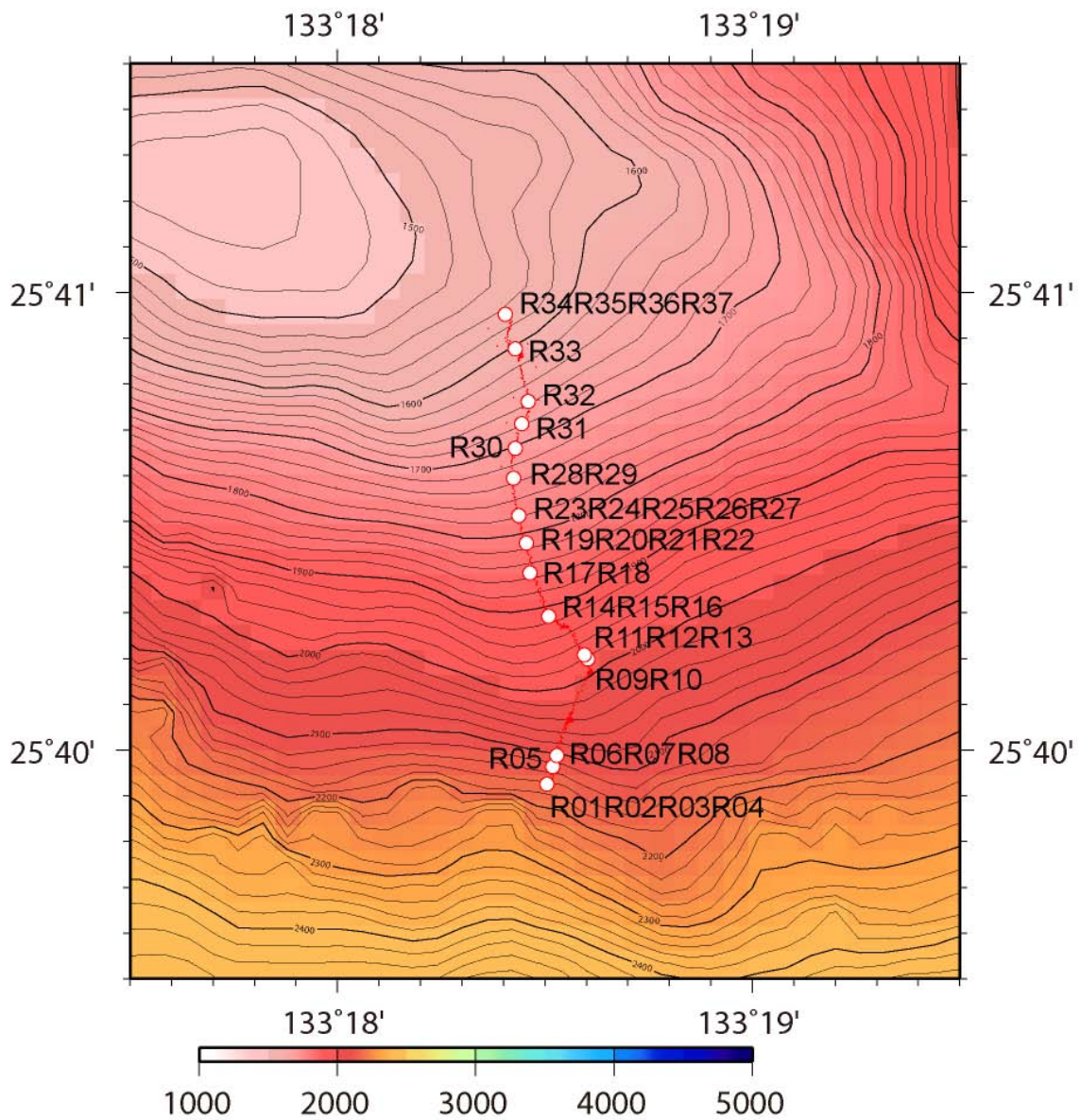
	On bottom:	Off bottom:
Time (local)	11:11	16:05
Latitude:	23°01.7454' N	23°02.1341' N
Longitude:	134°18.1594' E	134°19.0687' E
Depth (m):	2840	2197

28 rock samples collected.

Purpose:

The main purpose of this dive was to observe and sample rocks from the seafloor on the eastern side of the Oki-Daito Ridge. We hope to collect the crustal materials of the Cretaceous remnant arc, because to date there is little geological information on the Oki-Daito Ridge.

2.1.6 6K1197 dive.



Observer: Tetsuya Sakuyama

Technical information:

Location: Daito Ridge (B site).

Objective: Geological observation and rock sampling on the southern slope of the seamount north of the central region of the main Daito Ridge.

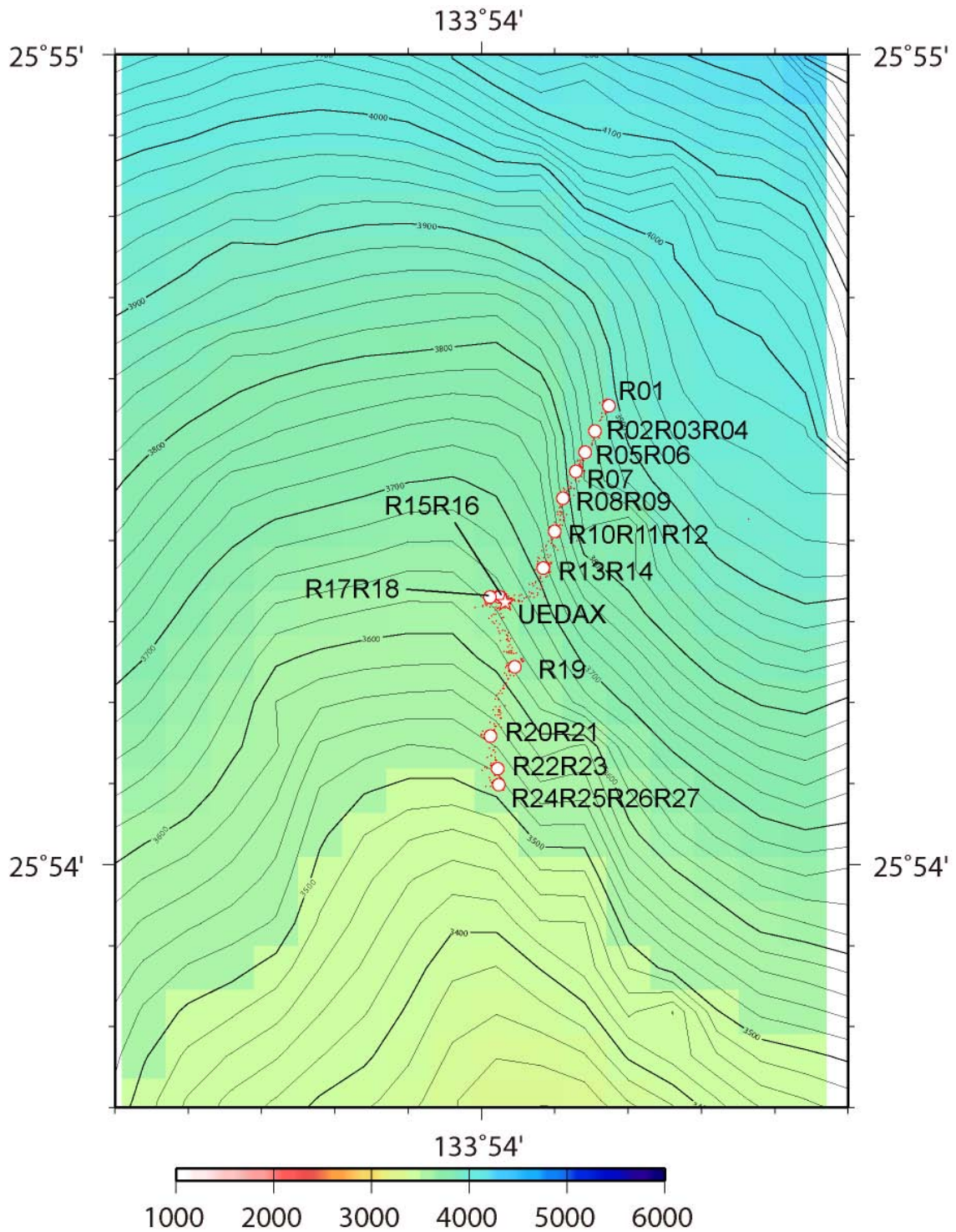
	On bottom:	Off bottom:
Time (local)	11:33	16:30
Latitude:	25°39.9255' N	25°40.9534' N
Longitude:	133.185060' E	133°18.4030' E
Depth (m):	2166	1542

36 rock samples collected.

Purpose:

The purpose of dive 6K1197 was to obtain silicic plutonic rocks. Previous dredging, GDP15-1, has found small silicic rock fragments exactly at this site. Although there is little existing geological information on the Daito Ridge, we expect to collect deep crustal material from the Cretaceous remnant arc.

2.1.7 6K1198 dive.



Observer: Kenichiro Tani

Technical information:

Location: Daito Ridge (B site).

Objective: Geological observation and rock sampling from the northern slope of central Daito Ridge basement.

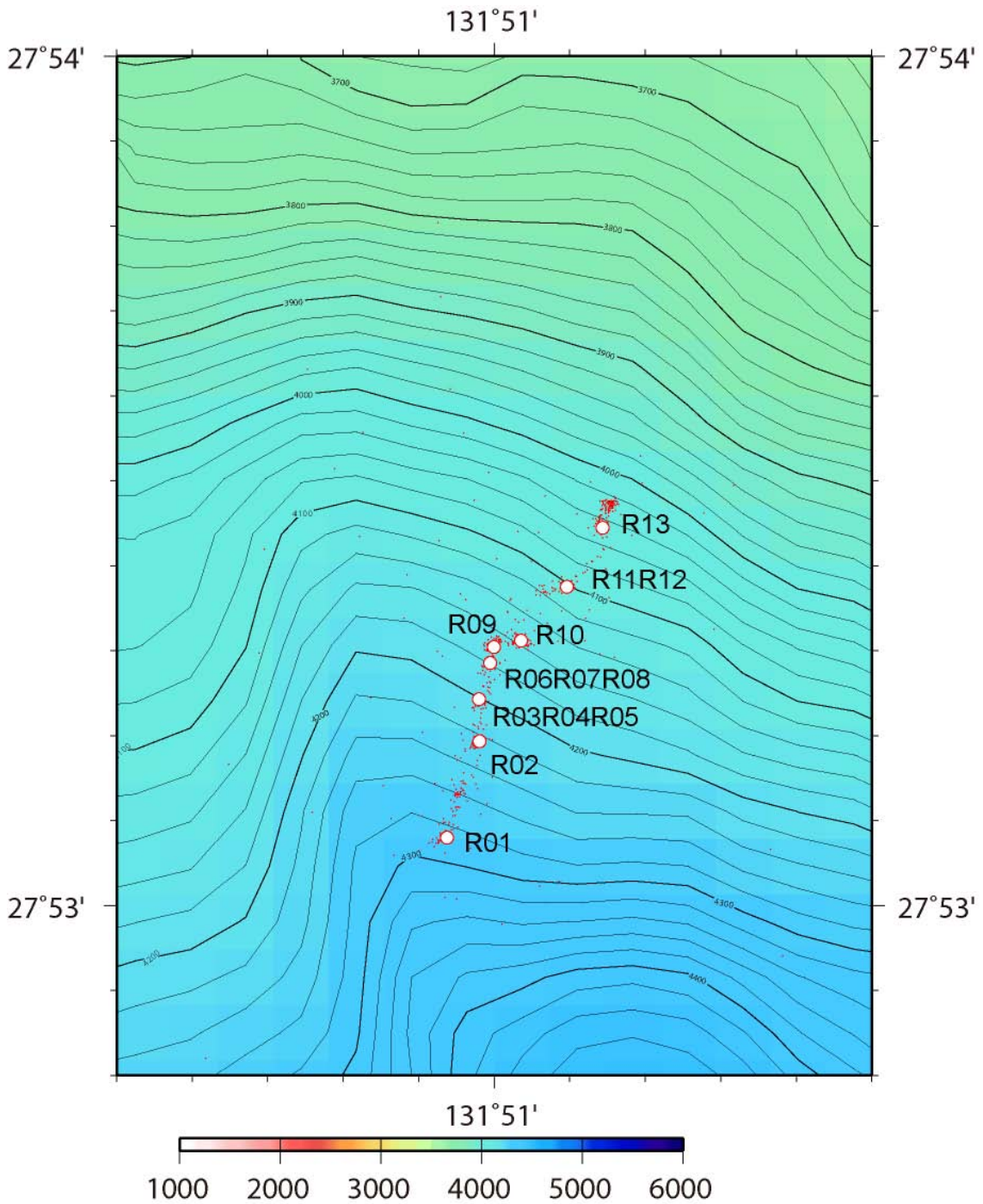
	On bottom:	Off bottom:
Time (local):	10:34	14:53
Latitude:	25°54.5658' N	25°54.0979' N
Longitude:	133°54.1741' E	133°54.0232' E
Depth (m):	3899	3467

27 rock samples collected.

Purpose:

The main purpose of this dive was to observe and sample rocks from basement of Daito Ridge. Although there is little existing geological information on Daito Ridge, we expect to collect deep crustal material from the Cretaceous remnant arc.

2.1.8 6K1199 dive.



Observer: Alex Nichols

Technical information:

Location: Amami Plateau (A site).

Objective: Geological observation and rock sampling of the lower slope at the back of a steep flat-bottomed canyon incising the south eastern corner of the Amami Plateau.

On bottom:

Off bottom:

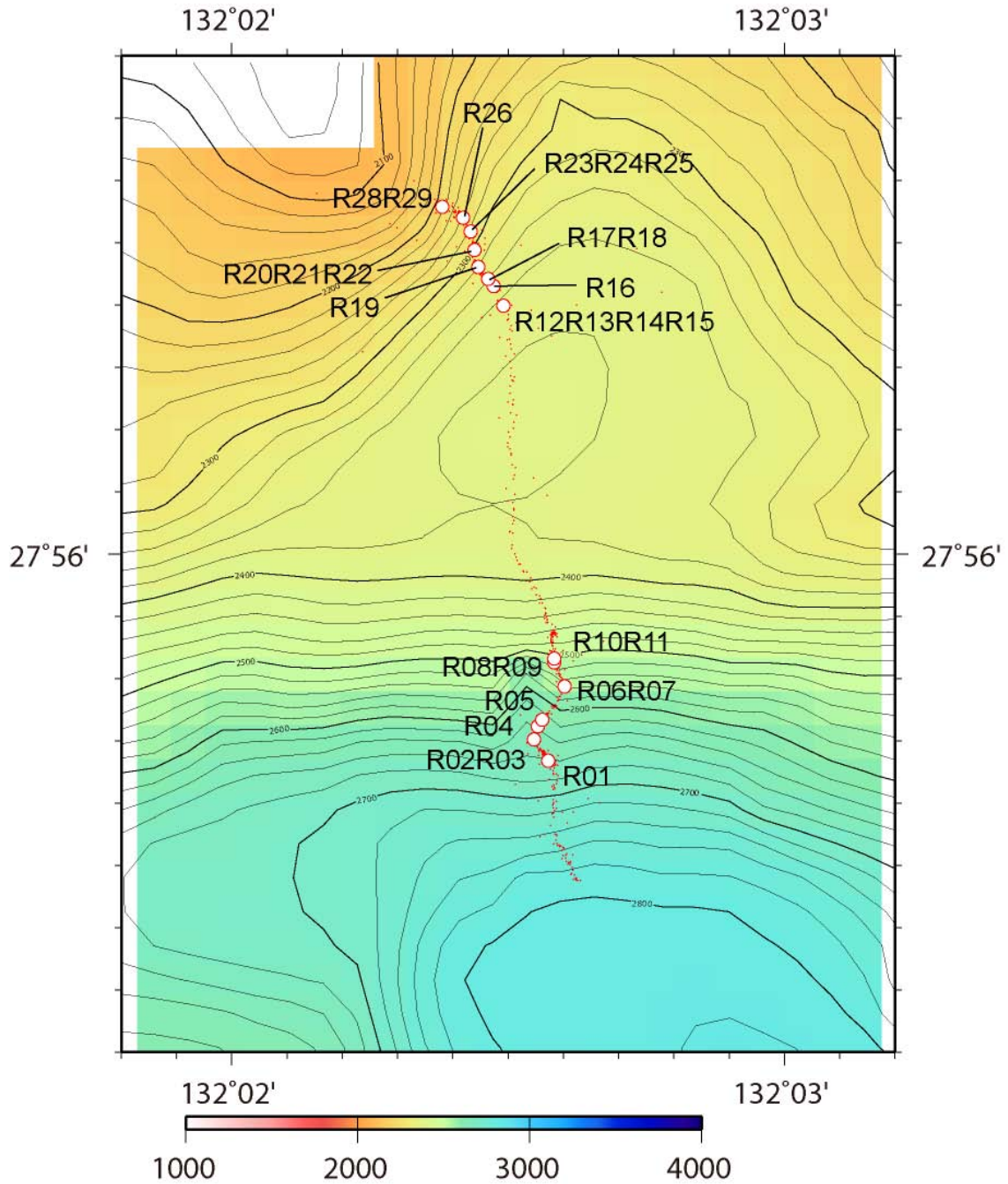
Time (local)	10:39	14:40
Latitude:	27°53.0796' N	27°53.4738' N
Longitude:	131°50.9372' E	131°51.1542' E
Depth (m):	4246	3990

13 rock samples collected.

Purpose:

Dredge GDP11-7 recovered granitic rocks from Amami Plateau, which have ages of 112 to 114 Ma (Hickey-Vargas, 2005). This finding has contributed to the hypothesis that the proto-Philippine Sea plate, which these Late Cretaceous rocks were part of, may represent remnant blocks separated from the basement of the paleo-Philippine Arc and the present island of Borneo. As a result, Amami Plateau was chosen as one of the dive areas in cruise YK10-04 in the hope of finding more tonalite samples and discovering the rocks they are in association with, to reveal a more detailed crustal structure and the temporal relationships between the rocks.

2.1.9 6K1200 dive.



Observer: Kenichiro Tani

Technical information:

Location: Amami Plateau (A site).

Objective: Geological observation and rock sampling from the southern slope of central Amami Plateau.

On bottom:

Off bottom:

Time (local):	10:05	15:14
Latitude:	27°55.4758' N	27°56.5574' N
Longitude:	132°02.6236' E	132°02.3813' E
Depth (m):	2794	2134

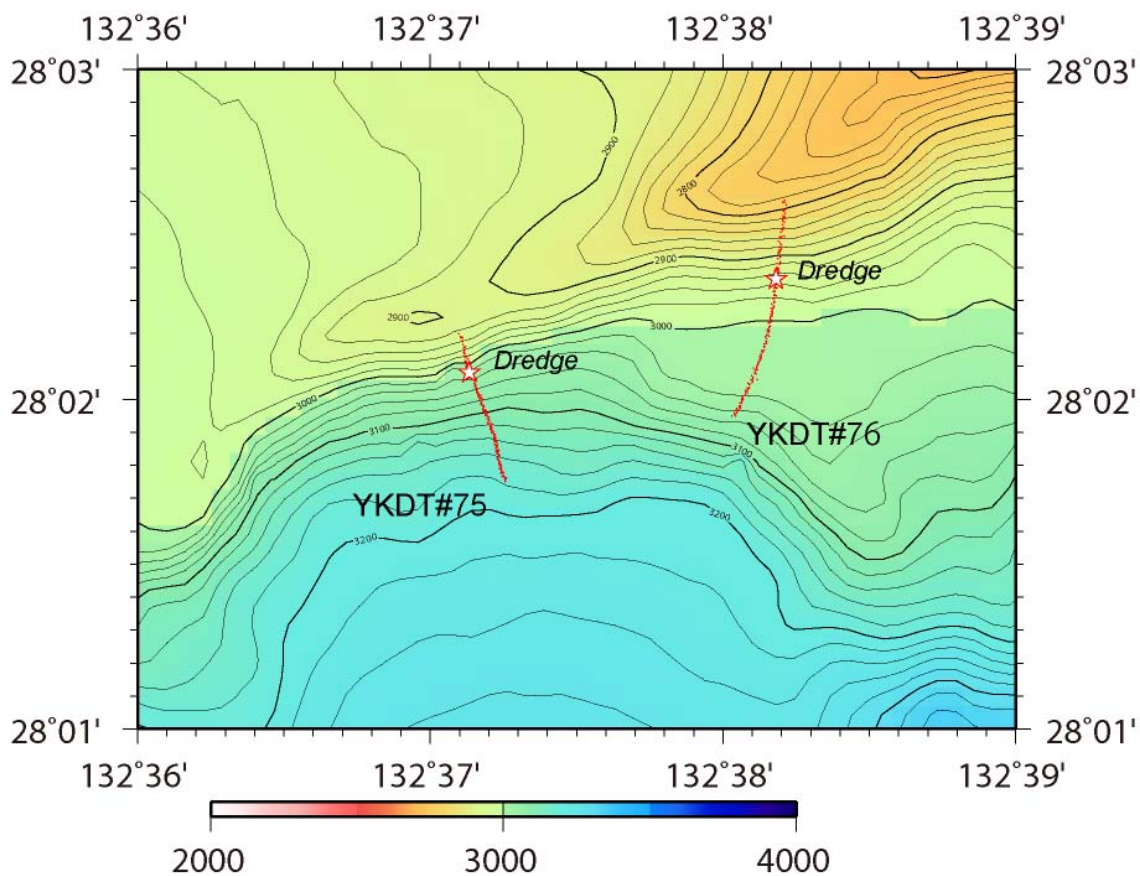
28 rock samples collected.

Purpose:

The main purpose of this dive was to observe and sample rocks from the southern slope of Amami Plateau. The dive route was selected to observe the upper horizon of the dive 6K1999, located southwest and lower down the same slope. During dive 6K1999, outcrops of gabbroic rocks were observed and one loose block of tonalite was recovered from talus. We assumed this tonalite sample had derived from an outcrop situated in the upper slope, and we expected to find the outcrops of tonalite, which might represent the middle crust section of the Cretaceous remnant arc, during dive 6K1200. The dive will traverse two cliffs (between 2680 – 2400 mbsl and 2300 – 2100 mbsl), discovered during the bathymetric survey, and the intervening gentle slope.

2.2 Yokosuka Deep Tow dive surveys

2.2.1 YKDT#75 dive.



Logger: Yuka Hirahara

Technical information:

Location: Amami Plateau (A site).

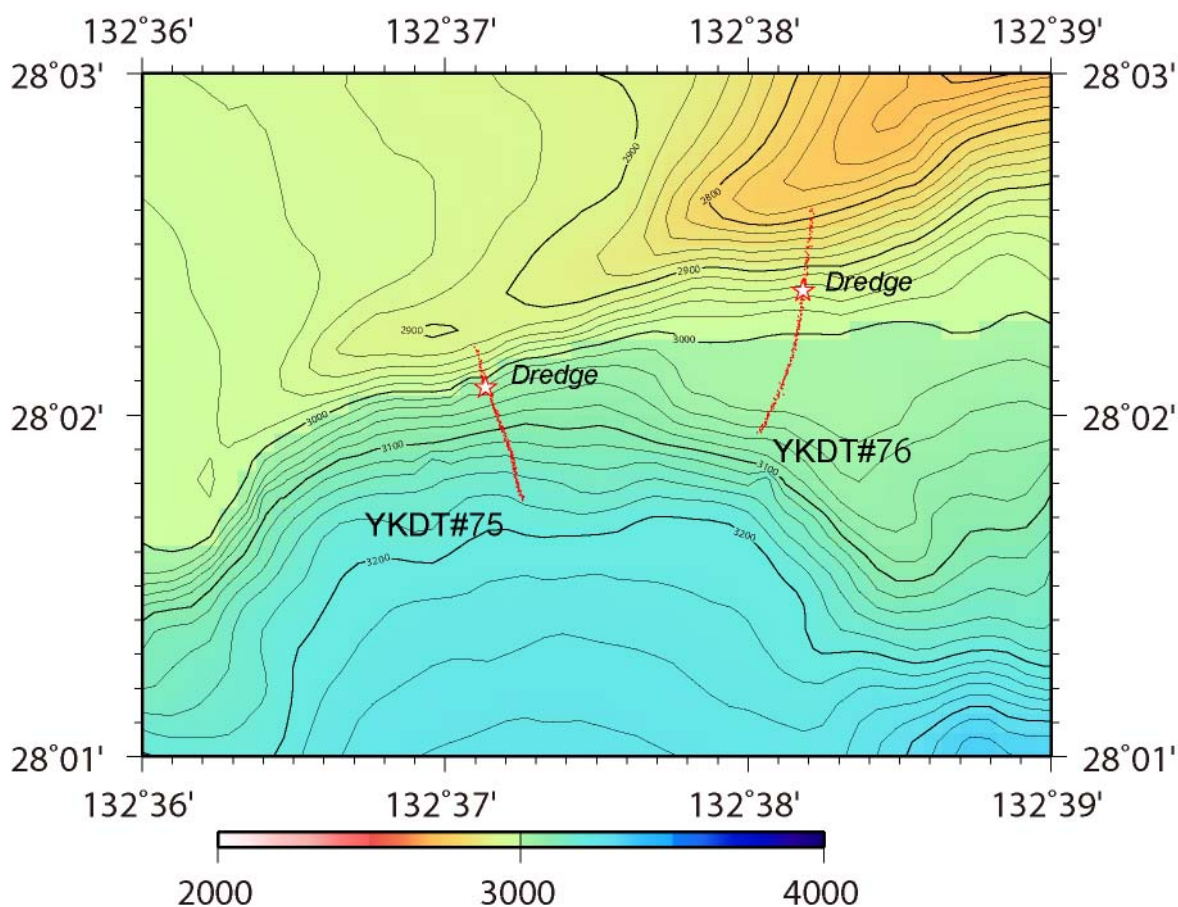
Objective: Geological observation and rock sampling of the Amami Plateau.

	On bottom:	Off bottom:
Time (local)	10:07	11:05
Latitude:	28°01.7603' N	28°02.2065' N
Longitude:	132°37.2570' E	132°37.1015' E
Depth (m):	3160	2885

Samples:

A few rounded pumices and semiconsolidated mudstones.

2.2.2 YKDT#76 dive.



Logger: Toshiro Takahashi

Technical information:

Location: Eastern part of the Amami Plateau.

Objective: Geological observation and rock sampling of the Amami Plateau.

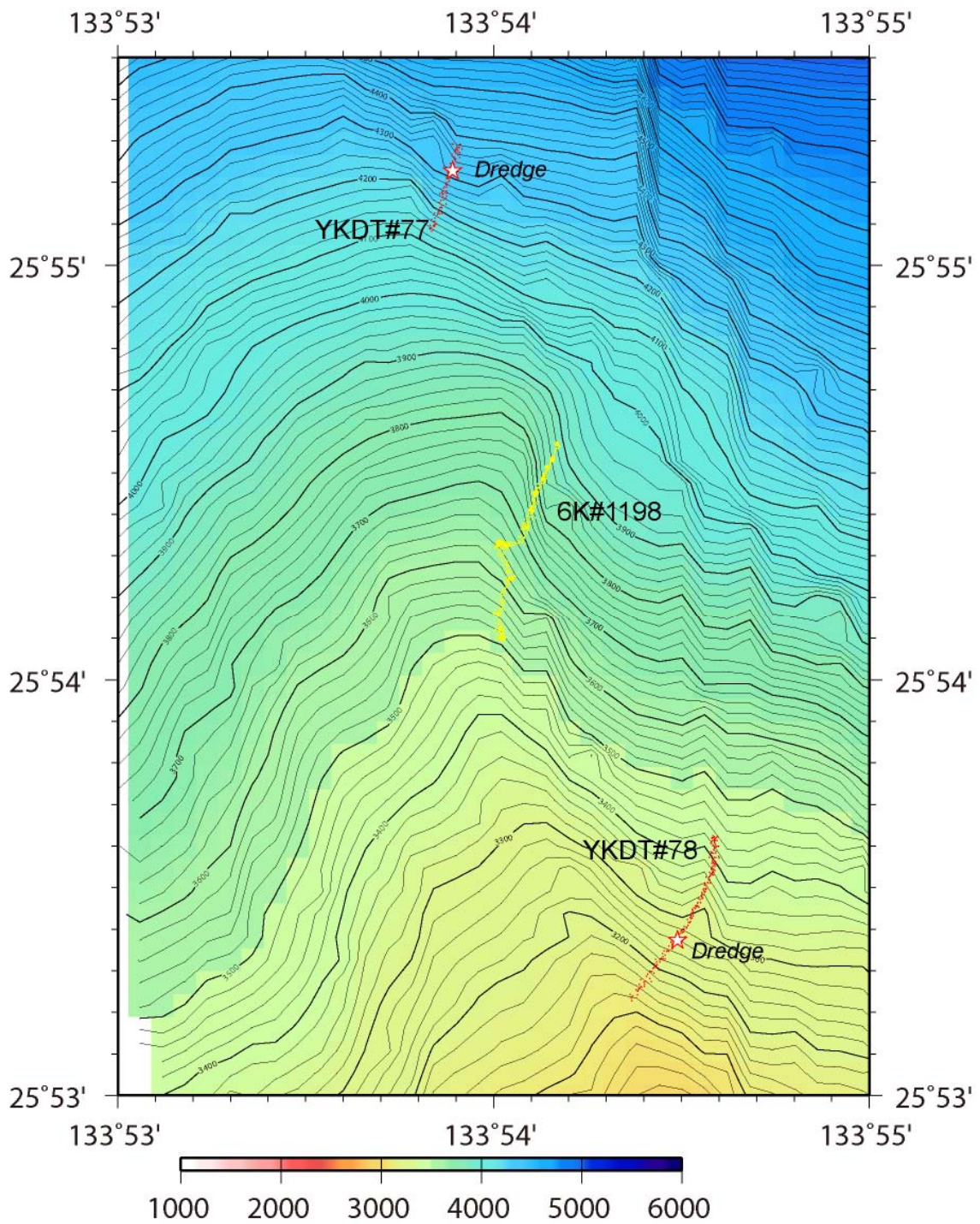
	On bottom:	Off bottom:
Time (local)	14:14	15:09
Latitude:	28°01.9520' N	28°02.6047' N
Longitude:	132°38.0360' E	132°38.2081' E
Depth (m):	3026	2735

Samples:

1 sample collected, hornblende andesite (YKDT#76-R01)

Other materials: pumice, scoria and semi-consolidated mudstone.

2.2.3 YKDT#77 dive.



Logger: Osamu Ishizuka

Technical information:

Location: Daito Ridge (B site).

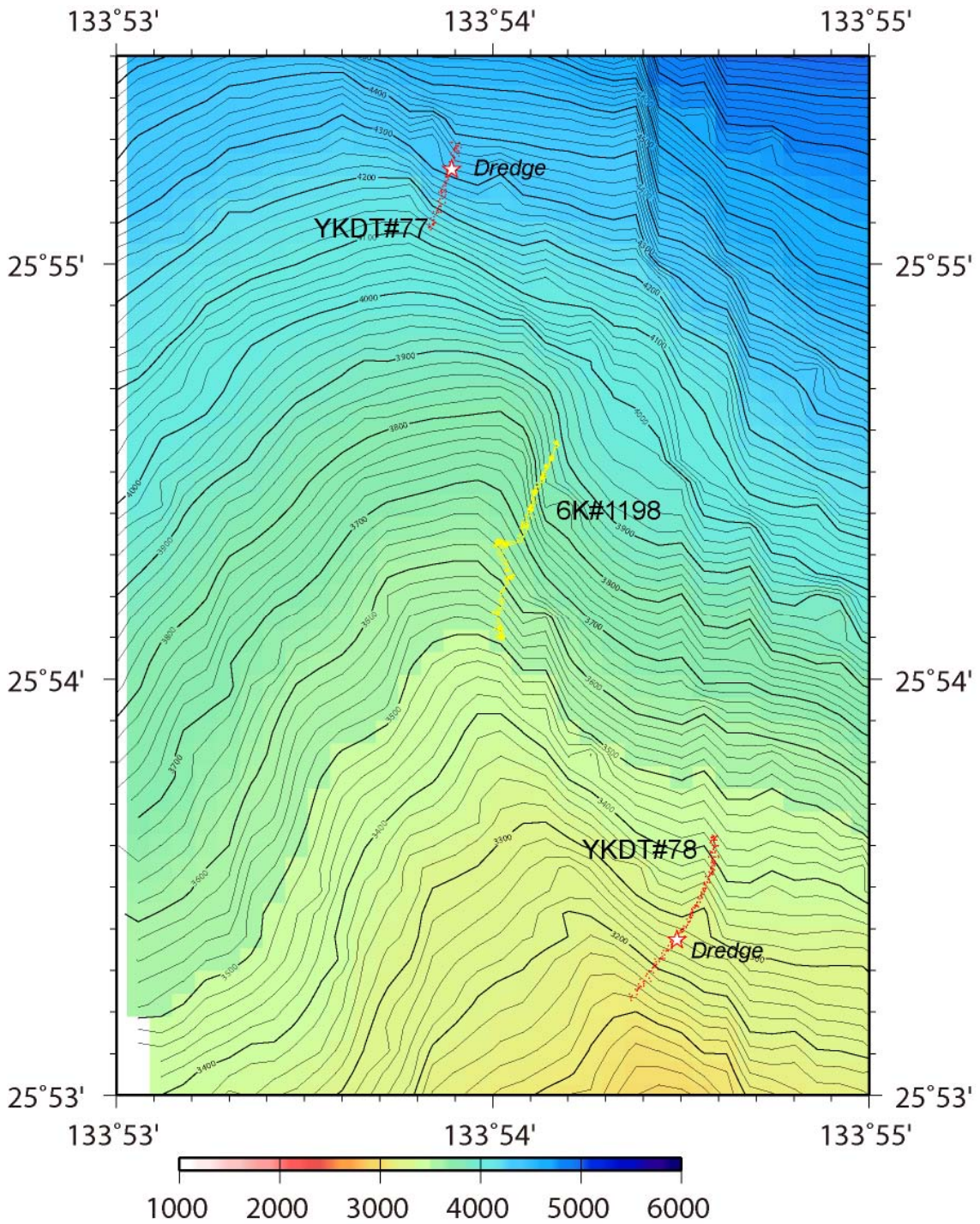
Objective: Geological observation and rock sampling from the northern slope of central Daito Ridge basement.

	On bottom:	Off bottom:
Time (local):	10:06	10:56
Latitude:	25°55.4096' N	25°55.0709' N
Longitude:	133°53.8884' E	133°53.8265' E
Depth (m):	4440	4055

Samples:

Many gravels including fine-grained granitic rocks, schists, altered volcanic rocks and seiconsolidated calcareous sedimentary rocks were recovered.

2.2.4 YKDT#78 dive.



Logger: Hiroshi Shukuno

Technical information:

Location: Daito Ridge (B site).

Objective: Geological observation and rock sampling of the northern slope of central Daito Ridge. Further upslope from dive 6K#1198 and dredge YKDT#77 to extend stratigraphic section even further.

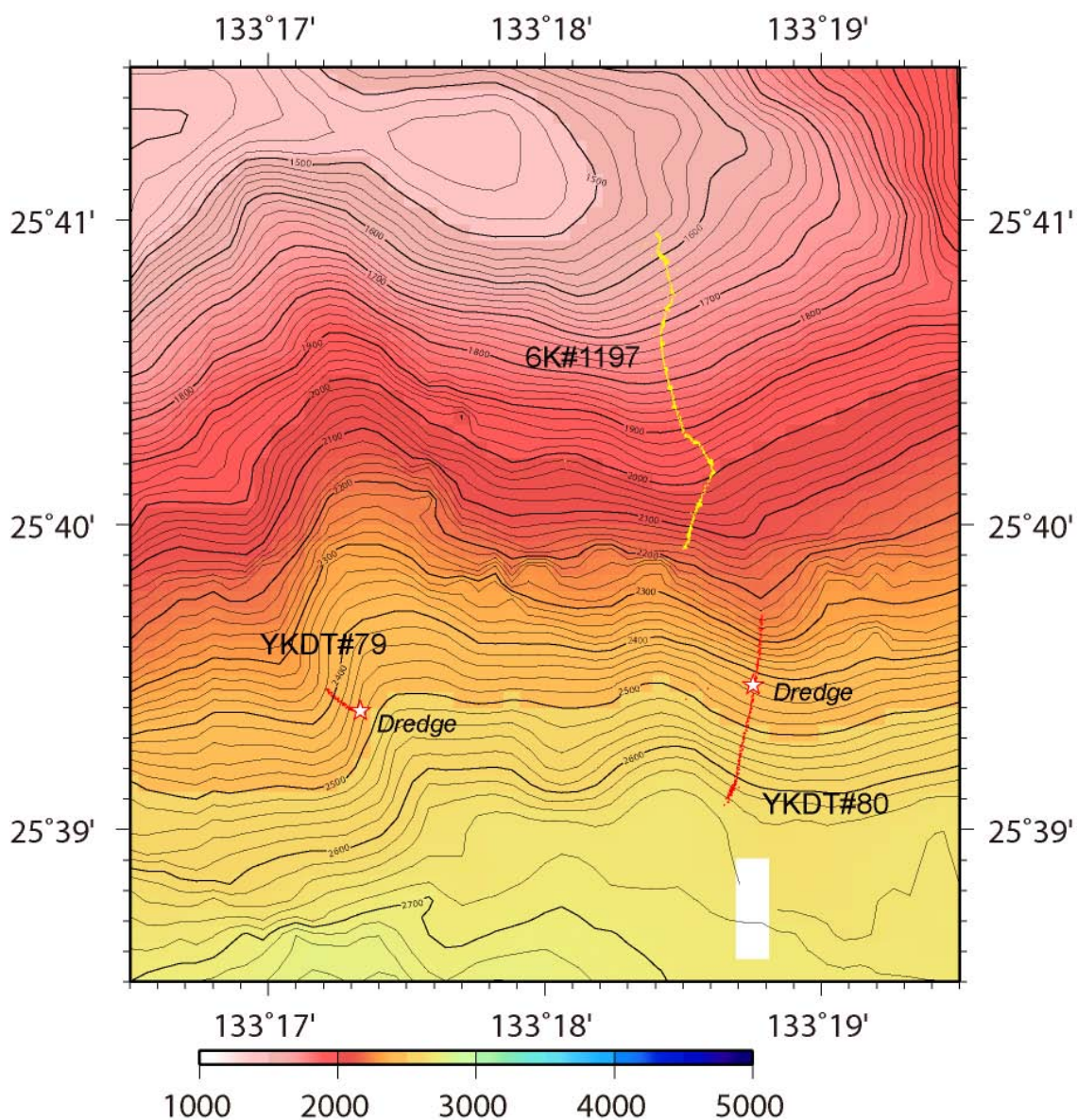
	On bottom:	Off bottom:
Time (local)	14:19	15:17
Latitude:	25°53.6182' N	25°53.2221' N
Longitude:	133°54.5835' E	133°54.3567' E
Depth (m):	3427	3056

Samples:

14 samples selected, R01 to R14. Include mafic schists, sheared plutonic rock, meta gabbro, serpentinite, foliated cataclasite and calcareous mud.

Other material, various pebbles, 18 kg.

2.2.5 YKDT#79 dive.



Logger: H. Ueda

Technical information:

Location: Daito Ridge (B site).

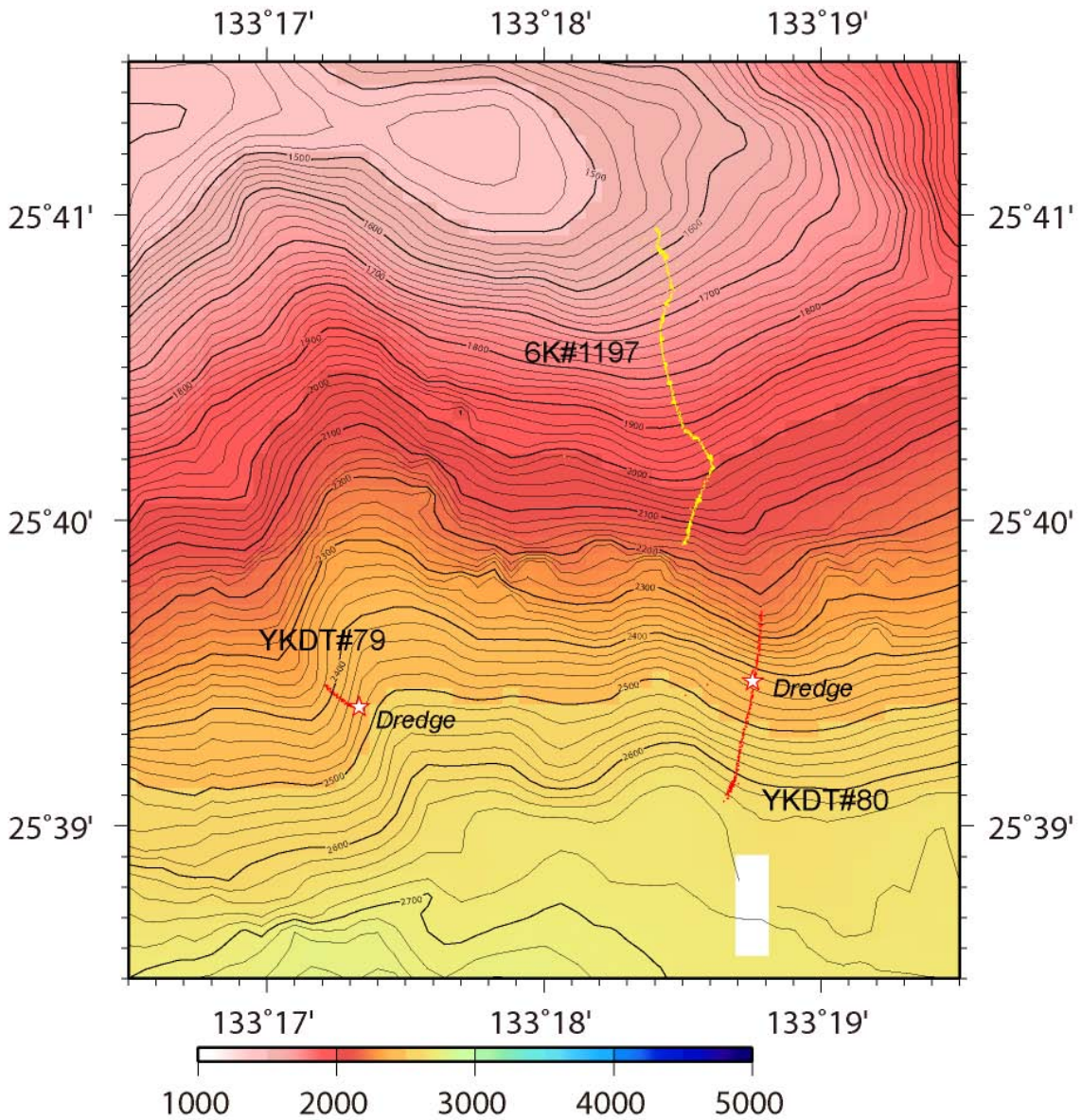
Objective: Geological observation and rock sampling of the Daito Ridge.

	On bottom:	Off bottom:
Time (local)	8:11	8:37
Latitude:	25°39.3906' N	25°39.4564' N
Longitude:	133°17.3470' E	133°17.2135' E
Depth (m):	2476	2328

Samples:

0.5 kg of pebbles and granules, dominantly rounded pumice and scoria with accessory amounts of angular volcanoclastic materials and angular granules, possibly of hypabyssal rocks, were recovered.

2.2.6 YKDT#80 dive.



Logger: Alex Nichols

Technical information:

Location: Southern slopes of the seamount slightly north of main Daito Ridge (near 6K#1197 and YKDT#79).

Objective: To sample further downslope from 6K#1197 in order to obtain a more complete idea of the stratigraphy of the seamount.

	On bottom:	Off bottom:
Time (local)	10:51	12:00
Latitude:	25°39.0909' N	25°39.6907' N
Longitude:	133°18.7200' E	133°18.7805' E
Depth (m):	2618	2188

Samples:

Several small angular (all <1 cm) Mn-coated fragments of granitic and volcanic rock were recovered, weighing no more than 100 g.

3. Notice on using this cruise report

This cruise report is a preliminary documentation as of the end of the cruise. It may not be corrected even if changes on content (i.e. taxonomic classifications) are found after publication. It may also be changed without notice. Data on the cruise report may be raw or not processed. Please ask the Chief Scientist for the latest information before using.