CRUISE REPORT

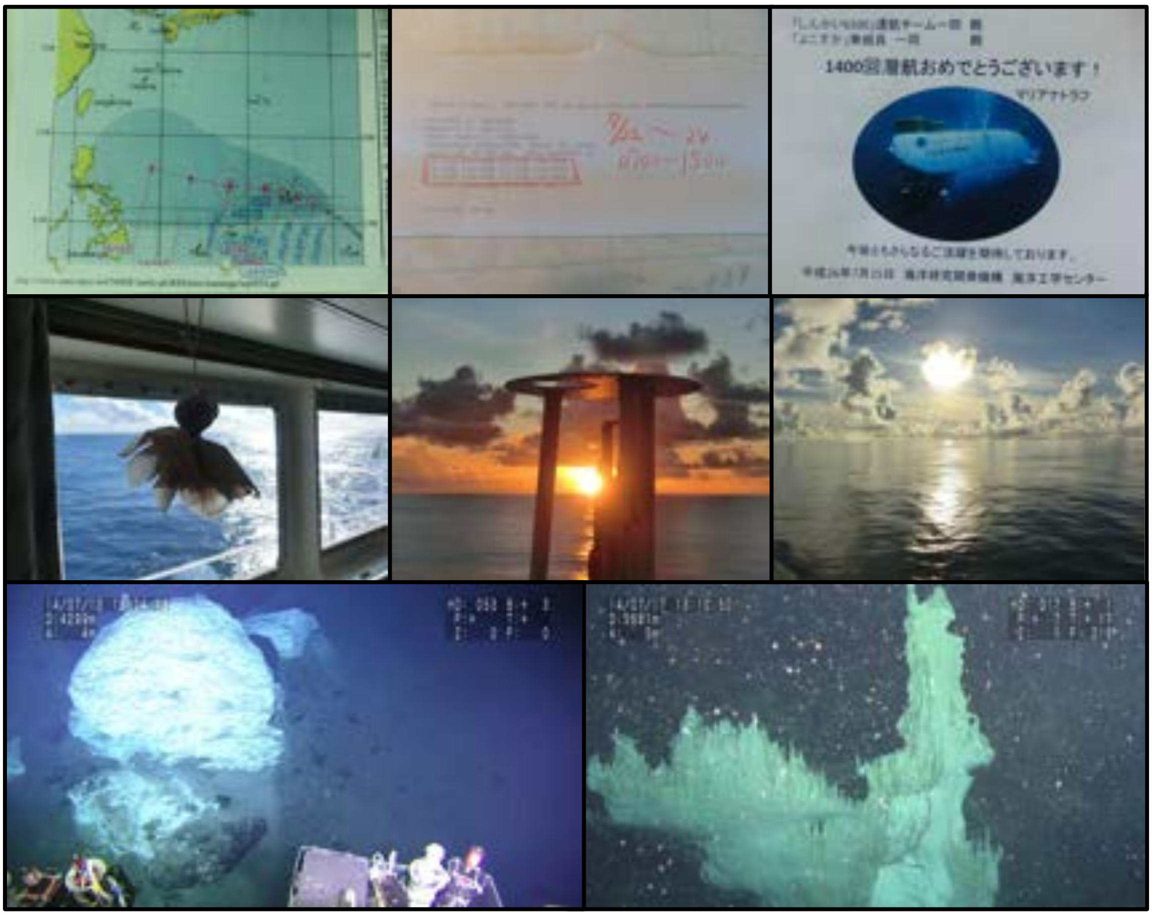
JAPAN AGENCY FOR MARINE-EARTH SCIENCE AND TECHNOLOGY

R/V YOKOSUKA YK14-13 CRUISE

BIOGEOSCIENTIFIC INVESTIGATION OF THE SOUTHWESTERN END OF THE MARIANA ARC SYSTEM

JULY 7, 2014 TO JULY 28, 2014

(YOKOSUKA, JAPAN TO YOKOSUKA, JAPAN)



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November 17, 2014
Edited by Yasuhiko Ohara, Chief Scientist

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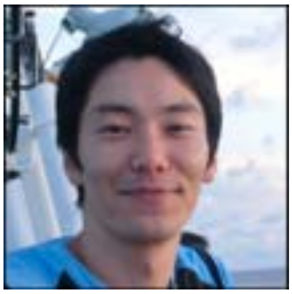

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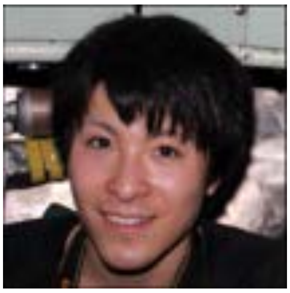

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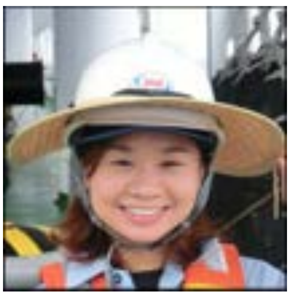

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1. Introduction and objectives of the cruise

The 3000 km long Izu-Bonin-Mariana (IBM) arc system is an outstanding example of an intraoceanic convergent plate margin. The IBM forearc is a typical nonaccretionary convergent plate margin; the inner trench slope exposes lithologies found in many ophiolites. To more clearly delineate the geology of the forearc, we have been investigating a ~500 km long region of the Mariana forearc south of ~13°N using the DSV Shinkai 6500 and deep-tow camera since 2006. Discoveries includes the presence of MORB-like basalts that formed during subduction initiation (~51 Ma) [Reagan et al., 2010], a region of forearc rifting unusually close to the trench axis, the Southeast Mariana Forearc Rift [Ribeiro et al., 2013a, b], and a serpentinite-hosted ecosystem near the Challenger Deep, the Shinkai Seep Field [SSF; Ohara et al., 2012].

However, there have been no studies on the southern Mariana area west of the Challenger Deep except one [Hawkins and Batiza, 1977], hindering our understanding of the IBM system. The SSF is the serpentinite-hosted ecosystem discovered for the first time in the southern Mariana forearc, hosting robust vesicomyid clam communities [Ohara et al., 2012]. This is not associated with serpentinite mud volcanoes as is the case for the forearc from Guam north, instead venting in the forearc facing the Challenger Deep is probably controlled by high angle faulting in the forearc. The discovery of the SSF suggests that serpentinite-hosted vents may be more widespread on the ocean floor than presently known.

The deep geology of the Mariana forearc near the Challenger Deep is dominated by peridotite and is heavily faulted, suggesting that more SSF-type seeps exist along this segment. Hence, **the major objective of the scheduled cruise (YK14-13) was to advance our biogeoscientific understanding of the southern Mariana seafloor west of the Challenger Deep** (**Figs. 1 and 2**). Especially, we wanted (1) to know the geology and biology of the inner trench slope west of the Challenger Deep (Site A West and Site A East), to test the hypothesis that serpentinite-hosted ecosystems exist there, (2) to know the geology and biology of the southwesternmost tip of the Mariana Trough (Site B) where the backarc basin spreading axis is only 130 km away from the trench axis. The distance between backarc basin spreading axis and trench is abnormally short and hence interesting biogeoscientific phenomena can be expected there. In addition, we set the SSF and its vicinities (Site C) as the contingency site with the objectives to further sample and characterize the SSF.

2. The southernmost Mariana system

The Mariana arc-trench system is a nonaccretionary convergent plate margin where the mantle of the overriding Philippine Sea Plate interacts with fluids released by the subducting Pacific Plate. Subduction to form the IBM arc-trench system began at ~51 Ma (million years) [Reagan et al., 2010; Ishizuka et al., 2011]. Forearc is an important component of a convergent plate margin and is a broad region between the trench axis and the associated volcanic arc. Along the Mariana forearc southwest of Guam, the West Santa Rosa Bank Fault at ~144°15'E marks a major tectonic boundary [Fryer et al., 2003], dividing the Mariana forearc into a stabler northern part and a southern part which is more tectonically active. The southern Mariana forearc faces the world-famous Challenger Deep.

A number of serpentinite mud volcanoes exist in the much broader Mariana forearc to the north. These are found ~30 to ~100 km west of the trench axis [Fryer, 1996; Fryer et al., 1999; Stern et al., 2003], however none is known from the southern Mariana forearc. Instead, serpentinized peridotite crops out and has been sampled from the inner trench slope along the southern Mariana forearc [Bloomer and Hawkins, 1983; Ohara and Ishii, 1998]. Opening of the southern Mariana Trough (a backarc basin) and the presence of a short and narrow subducted slab west of the West Santa Rosa Bank Fault allows the narrow slab to roll back rapidly, causing the upper plate to stretch and deform. The rapidly deforming upper plate is also characterized by abundant basaltic volcanism near the trench [Ribeiro et al., 2013a, b]. The greater tectonomagmatic activity in the south engendered by the combined effects of backarc extension and rapid rollback of the narrow slab might be responsible for the different geologies of the northern and southern forearc segments [Fryer, 1996; Fryer et al., 1999, 2003; Stern et al., 2003; Gvirtzman and Stern, 2004].

We further argue that backarc regions in the southern Marianas and the region north of Guam should be distinct. For example, the distance between the trench axis to the backarc axis is ~300 km in the northern Mariana system, whereas it is only ~130 km in the south. The southernmost Mariana system therefore consists of forearc and backarc within a very narrow space and no well-defined magmatic arc has developed over the downgoing slab, making this a unique geological region. However, there have been no studies on the western extension of the Mariana Trough backarc basin, in contrast to the better-studied Mariana Trough to the north [e.g., Ohara et al., 2002; Yamazaki et al., 2003].

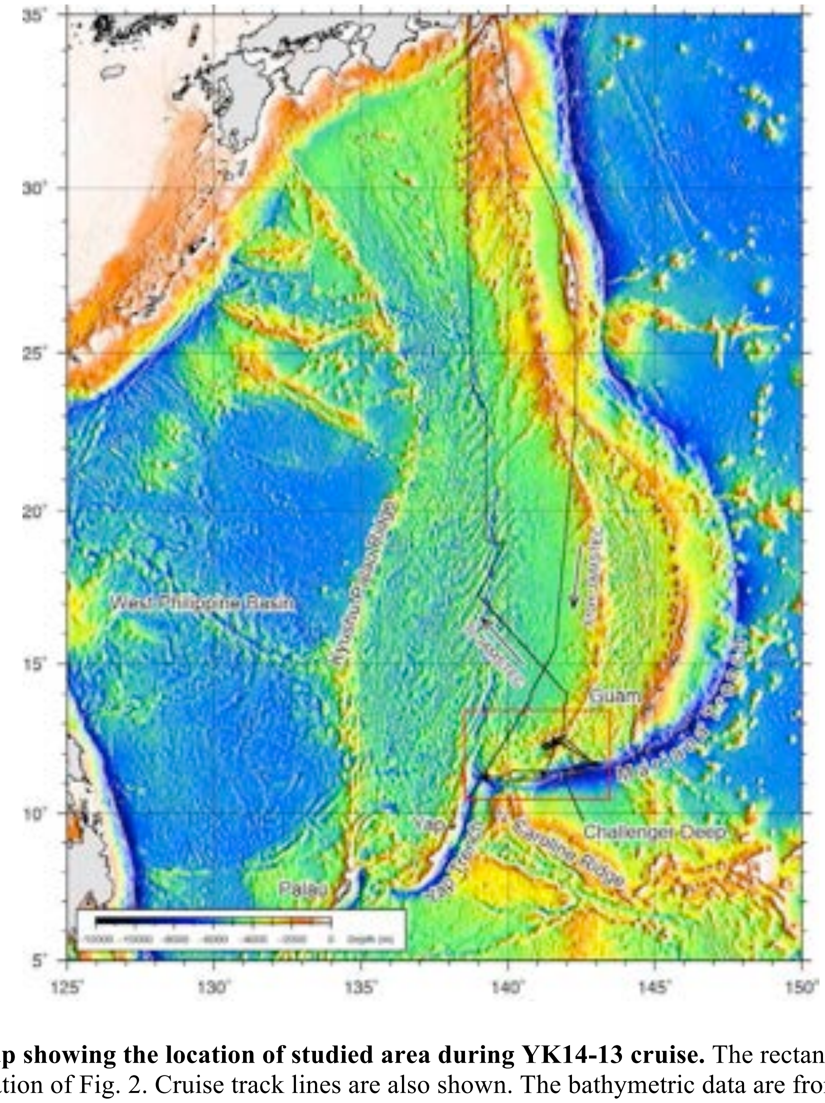

Fig. 1. Index map showing the location of studied area during YK14-13 cruise. The rectangle shown in red indicates the location of Fig. 2. Cruise track lines are also shown. The bathymetric data are from the GEBCO 08 grid.

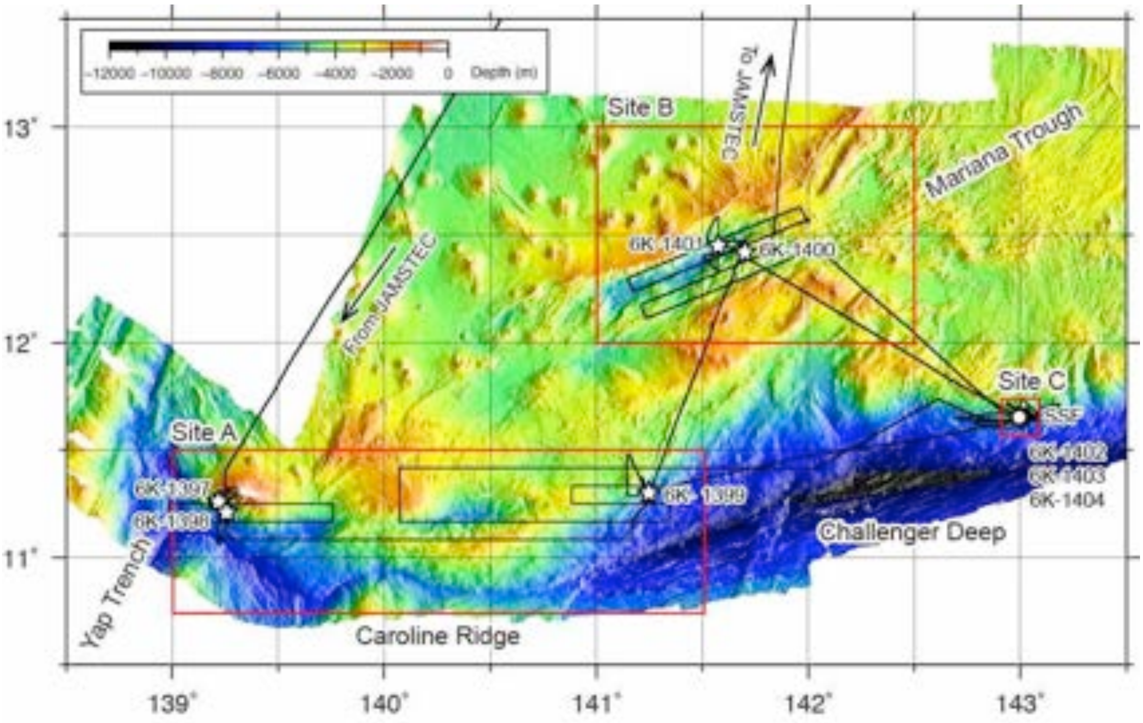

Fig. 2. Location of the dives during YK14-13 cruise. The rectangles shown in red indicate the location of Site A, Site B and Site C. Cruise track lines are also shown. The bathymetric data are from the US Extended Continental Shelf Cruises.

3. Survey items

During YK14-13 cruise, we have conducted eight Shinkai dives in Site A West, Site A East, Site B and Site C (**Fig. 2**). Because of the large swells from typhoon #10, we were unable to conduct Shinkai dive operations in Sites A and B during the later phase of the cruise. We therefore decided to take the contingency plan, diving at Site C. Geophysical mapping were done on the selected areas. On our way back to home, a single swath mapping was made along the track within a certain portion of the Parece Vela Basin (**Fig. 1**).

3-1. Shinkai dives

We have conducted eight Shinkai dives (**Table 1**). Since one of the major objectives were sampling the vent fluid and associated sediment as well as the associated macro fauna, we have employed the following instruments as the payloads (**Fig. 3**):

- Niskin sampler (1 bottle, 5 litter)
- D-WHATS with 6 bottles (2 sets of 3 bottles) + Thermometer
- H corer (4 cores)
- Imai corer (1 cores)
- Multiple canister with 6 compartments and slurpgun
- Sample box
- Scoop
- Multisensor
- Marker (2 sets)

On board treatment for D-WHATS samples followed the procedure in Konno et al. [2006]. The Multisensor was used with the Shinkai 6500 for the first time in this cruise. We often had malfunctioning of the battery installed on the Multisensor, and data collection was aborted halfway of dives (e.g., 6K-1403). So, we do not deal with the Multisensor data this time.

Table 1. List of Shinkai 6500 dives completed during YK14-13

Dive #	Date	Observer	Pilot	Co-pilot	On bottom / Off bottom	Lat	Lon	Start depth (m) / End depth (m)	Location	Samplings and operations	Rock Types
1397	12-Jul-14	Yasuhiko Ohara	Fumitaka Saito	Yudai Tayama	11:37	11°11.9260' N	139°14.4876' E	6000	Site A West	26 rocks + 1 Niskin	Peridotite, limestone
					15:08	11°13.5756' N	139°15.1814' E	4640			
1398	13-Jul-14	Ignacio Pujana	Hirofumi Ueki	Masaya Katagiri	12:09	11°14.1597' N	139°14.3124' E	4683	Site A West	23 rocks + 2 scoops	Peridotite, troctolite, gabbro, basalt, limestone
					15:51	11°15.7413' N	139°14.7979' E	3430			
1399	14-Jul-14	Tomoyo Okumura	Kazuki Iijima	Tetsuya Komuku	11:37	11°17.3356' N	141°13.8913' E	5920	Site A East	12 rocks + 1 scoop + 3 H-cores + 1 Imai-core + 1 Niskin	Peridotite, troctolite, gabbro, volcanic sandstone, mud
					15:07	11°18.5805' N	141°12.7359' E	5147			
1400	15-Jul-14	Teruaki Ishii	Keita Matsumoto	Masaya Katagiri	11:02	12°28.4928' N	141°40.8320' E	4568	Site B	26 rocks + 2 scoops	Gabbro, basalt
					15:20	12°27.3445' N	141°41.4709' E	3119			
1401	16-Jul-14	Hiromi Watanabe	Yoshitaka Sasaki	Keigo Suzuki	11:48	12°25.4889' N	141°33.5704' E	5546	Site B	13 rocks	Basalt, volcanic sandstone, scoria, pumice, mud
					15:10	12°26.8502' N	141°34.8067' E	4615			
1402	17-Jul-14	Uta Konno	Fumitaka Saito	Tetsuya Komuku	11:34	11°39.2215' N	143°02.8401' E	5905	Shinkai Seep Field	Several rocks + 2 large chimneys + 3 baby chimneys + 1 Imai-core + 3 slurpguns + 1 WHATS	Unknown (most likely peridotite)
					14:51	11°39.1987' N	143°02.7840' E	5704			
1403	18-Jul-14	Tomoyo Okumura	Hirofumi Ueki	Keigo Suzuki	11:32	11°39.1576' N	143°03.0400' E	5935	Shinkai Seep Field	3 cores + 1 core residue + 1 scoop + 1 WHATS + 1 Niskin	-
					14:46	11°39.4922' N	143°03.0636' E	5627			
1404	19-Jul-14	Yasuhiko Ohara	Kazuki Iijima	Yudai Tayama	11:25	11°39.1478' N	143°02.6359' E	5952	Shinkai Seep Field	2 rocks + 2 chimneys + 1 scoop + 3 slurpguns + 1 Niskin	Peridotite; in scoop: peridotite
					14:52	11°39.3276' N	143°02.9298' E	5722			
1405	Canceled	Ignacio Pujana	Keita Matsumoto	Masaya Katagiri	-	-	-	-	-	-	-
					-	-	-	-			

Ship's navigation: D-GPS + WGS84
Submersible's navigation: SSBL

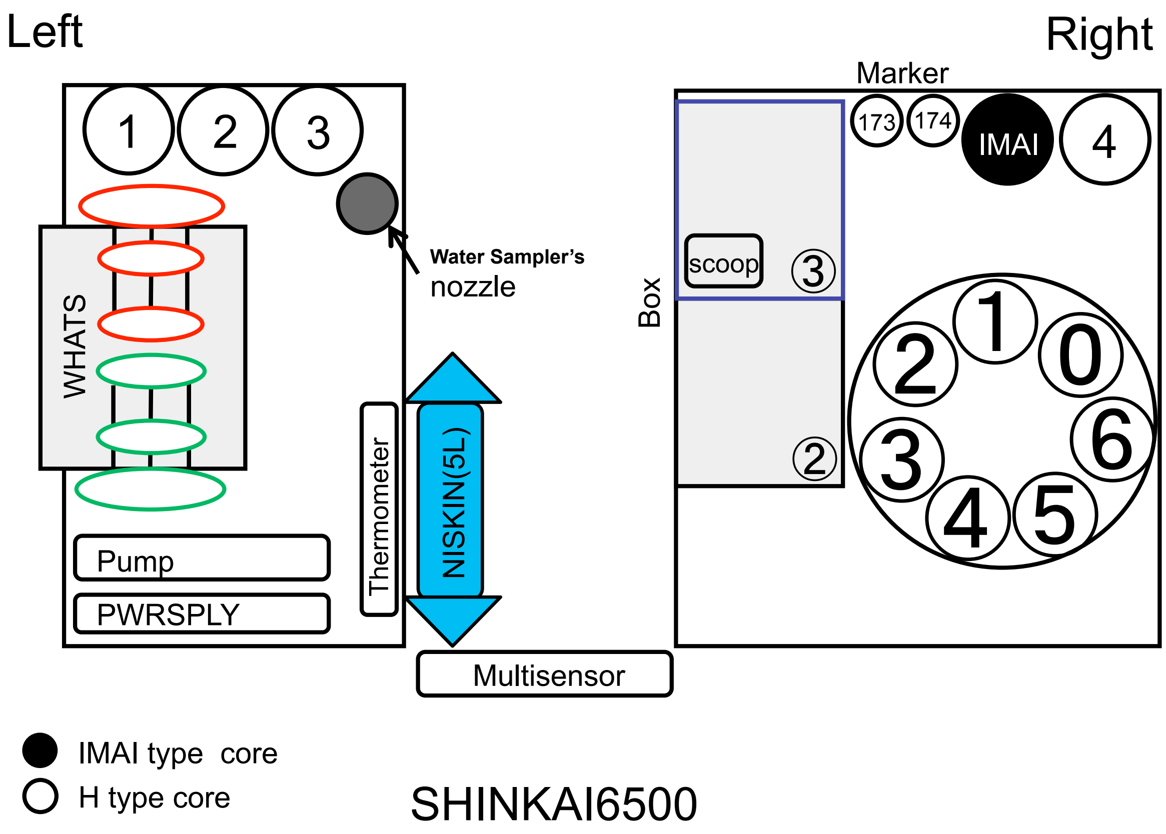

Fig. 3. Schematic illustration showing a typical payload layout employed in YK14-13 cruise.

3-2. Geophysical mapping

Geophysical Data collected during YK14-13 cruise included Simrad EM122 multibeam bathymetry and associated amplitude and backscatter measurements, towed proton precession magnetometer (PM-217, Kawasaki Geological Engineering and Terra Technica) and shipboard three-component magnetometer (SFG-1212, Terra Techinica) measurements, and gravity (Lacoste-Romberg Air-Sea S-63) measurements.

Onboard multibeam data were processed with MB-System and GMT software to produce grids and postscript maps of the surveyed areas (**Fig. 4A, 4B**).

Total field magnetic data were processed to magnetic anomaly by removing the International Geomagnetic Reference Field (IGRF) using GMT software (mgd77magref) (**Fig. 5**). Raw three-component magnetometer data were acquired onboard but not further processed.

Gravity data were processed by shipboard technicians removing the Eotvos correction and averaging out wave motion to yield mGal values. Because the final gravity tie at dockside had not yet been done (see Appendix F), the ship gravity data were approximately adjusted to absolute gravity values using a previous gravity tie value. The latitude correction using the International Gravity Formula 1980 was then removed from the data to yield approximate free-air anomaly values. These were plotted vs time (**Fig. 6**), and stored as lon, lat, free air, and time values in files corresponding to the shipboard logged data files (e.g., YK14-13_140704.grv to YK14-13_140704.faa.xygt).

Bathymetric data of the Parece Vela Basin were also collected on the return transit (**Fig. 7**).

4. Running cruise narrative

Local time (Approximate)	Notes
7-Jul-14	**The Yokosuka YK14-13 cruise began. The Yokosuka was underway to the survey area at the Southern Marianas.**
9:00	All scientists aboard.
9:15-9:30	Science meeting, doing self introduction.
10:00	YK14-13 cruise began.
11:00-11:30	Meeting with the chief mate and chief radio officer.
18:00-18:30	Science meeting, determining the onboard talk schedule.
8-Jul-14	**Underway to the survey area. No scientific activities were held during the daytime.**
18:00-19:10	Science meeting; talk by Yasuhiko Ohara on introduction to the YK14-13 cruise, and by Fernando Martinez on the regional geophysical background.
20:30-22:00	Party at Chief Scientist's room.
9-Jul-14	**Underway to the survery area. Typhoon #8 hit Okinawa Island. Scientists worked on setting up the labs during the daytime.**
9:00-9:20	Meeting with the 6K team.
13:00-14:30	Each scientist got briefed on the details of the Shinkai 6500 by the 6K team.
16:40-17:00	Konpira-san ceremony, praying for a safe and successful cruise.
18:00-19:00	Science meeting; talk by Yuji Onishi on chemistry of Shinkai Seep Field (SSF) chimney, and by Uta Konno on chemistry of SSF water.
10-Jul-14	**Underway to the survey area. Typhoon #8 hit the mainland of Japan.**
18:05-18:20	Sunset viewing.
18:30-19:00	Science meeting; talk by Tomoyo Okumura on mineralogy of SSF chimney, I. Pujana also on mineralogy of SSF chimneys, and by Teruaki Ishii on EPMA elemental mapping results of SSF chimney.
21:00-23:00	Party at Chief Scientist's room.
11-Jul-14	**Underway to the survey area. Typhoon #9 emerged to the west of Guam. The sea condition, however, very good; sometimes glassy water was appeared.**
9:00-9:10	Science meeting; logistical announcement on Typhoon #9.
13:00-14:00	Fire drill.
15:00-15:20	Meeting with the Shinkai team for the strategy of 6K-1397 dive.
18:00-18:20	Sunset viewing.
18:20-19:00	Science meeting; talk by Maryjo Brounce on oxygen fugacity in Mariana subduction system.
12-Jul-14	**The Yokosuka arrived at Site A West. 6K-1397 was conducted. Yasuhiko Ohara as the observer.**
0:00	The survey within the Micronesian EEZ is now allowed. The Yokosuka started multibeam survey on the way to the first dive site (6K-1397) at

	Site A West.
5:00-7:00	The Yokosuka arrived at 6K-1397 site. After deploying a XBT, site survey for 6K-1397 was conducted.
9:03	The Shinkai opened vent, start of 6K-1397 dive. Yasuhiko Ohara as the observer.
11:37	The Shinkai on bottom (6000 m).
15:08	The Shinkai off bottom (4640 m).
17:33	The Shinkai on deck.
18:12	The Yokosuka started geophysical mapping, deploying proton magnetometer.
18:36-19:13	The Yokosuka carried out site survey for 6K-1398.
19:10-19:30	Science meeting; Yasuhiko Ohara summarized the results of 6K-1397.
19:28-19:47	The Yokosuka made a figure-8 turn.
13-Jul-14	**6K-1398 was conducted at Site A West. Ignacio Pujana as the observer. The Yokosuka conducted geophysical mapping in the night, headed to Site A East.**
6:46	The Yokosuka finished geophysical mapping.
7:08	The Yokosuka arrived at 6K-1398 site, retrieving the proton magnetometer.
10:03	The Shinkai opened vent, start of 6K-1398 dive. Ignacio Pujana as the observer.
12:09	The Shinkai on bottom (4683 m).
15:51	The Shinkai off bottom (3430 m).
17:45	The Shinkai on deck.
18:59	The Yokosuka started geophysical mapping, headed to 6K-1399 site at Site A East. Proton magnetometer was not deployed.
19:30-19:45	Science meeting; Yasuhiko Ohara and Ignacio Pujana summarized the results of 6K-1398.
14-Jul-14	**6K-1399 was conducted at Site A East. Tomoyo Okumura as the observer. The Yokosuka conducted geophysical mapping in the night, headed to Site B.**
5:15	The Yokosuka finished geophysical mapping.
5:27	The Yokosuka deployed a XBT.
6:50	The Yokosuka arrived at 6K-1399 site, finishing the site survey.
9:02	The Shinkai opened vent, start of 6K-1399 dive. Tomoyo Okumura as the observer.
11:37	The Shinkai on bottom (5920 m).
15:07	The Shinkai off bottom (5147 m).
17:35	The Shinkai on deck.
18:00	The Yokosuka started geophysical mapping, headed to 6K-1400 site at Site B. Proton magnetometer was not deployed.
20:30-20:50	Science meeting; Yasuhiko Ohara and Tomoyo Okumura summarized the results of 6K-1399.
15-Jul-14	**6K-1400 was conducted at Site B. Teruaki Ishii as the observer. The Yokosuka conducted geophysical mapping in the night.**
4:00	The Yokosuka arrived at Site B.

4:55	The Yokosuka deployed a XBT.
6:01	The Yokosuka arrived at 6K-1400 site, finishing the site survey.
9:01	The Shinkai opened vent, start of 6K-1400 dive. Teruaki Ishii as the observer.
11:02	The Shinkai on bottom (4568 m).
15:20	The Shinkai off bottom (3119 m).
17:07	The Shinkai on deck.
17:51	The Yokosuka started geophysical mapping, deploying proton magnetometer.
18:18-18:49	The Yokosuka carried out site survey for 6K-1401.
19:13-19:44	The Yokosuka carried out site survey for 6K-1402 (supposed to be happened in Site B).
19:50-20:20	Science meeting; Yasuhiko Ohara summarized the results of 6K-1400.
21:22	The Yokosuka started geophysical mapping.
16-Jul-14	**6K-1401 was conducted at Site B. Hiromi Watanabe as the observer. Because of the typhoon located to the west, the sea condition was presumed to become worse in Site B. The Yokosuka therefore moved to Site C in the night.**
6:00	The Yokosuka finished geophysical mapping.
6:01-6:19	The Yokosuka made a figure-8 turn.
6:39	The Yokosuka recovered proton magnetometer.
9:12	The Shinkai opened vent, start of 6K-1401 dive. Hiromi Watanabe as the observer.
11:48	The Shinkai on bottom (5546 m).
15:10	The Shinkai off bottom (4615 m).
17:29	The Shinkai on deck.
18:00	The Yokosuka left Site B for Site C
19:50-20:20	Science meeting; Yasuhiko Ohara and Hiromi Watanabe summarized the results of 6K-1401.
17-Jul-14	**6K-1402 was conducted at Site C. Uta Konno as the observer. Because of typhoon #10 located to the west, the Yokosuka took the contingency plan, diving at the SSF in Site C. Since the survey box for Site C is small (10 NM by 10 NM), no geophysical mapping was conducted.**
3:30	The Yokosuka arrived at the SSF.
4:53	The Yokosuka deployed a XBT.
5:24-5:53	The Yokosuka carried out site survey for 6K-1402.
9:04	The Shinkai opened vent, start of 6K-1402 dive. Uta Konno as the observer.
11:34	The Shinkai on bottom (5905 m).
14:46	The Shinkai off bottom (5704 m).
17:30	The Shinkai on deck.
20:20-20:30	Science meeting; Yasuhiko Ohara and Uta Konno summarized the results of 6K-1402.

18-Jul-14	**6K-1403 was conducted at Site C. Tomoyo Okumura as the observer. As was the case for July 17, because of typhoon #10 located to the west, the Yokosuka took the contingency plan, diving at the SSF in Site C. Since the survey box for Site C is small (10 NM by 10 NM), no geophysical mapping was conducted.**
9:04	The Shinkai opened vent, start of 6K-1403 dive. Tomoyo Okumura as the observer.
11:32	The Shinkai on bottom (5935 m).
14:51	The Shinkai off bottom (5627 m).
17:28	The Shinkai on deck.
18:14-18:32	The Yokosuka carried out site survey for 6K-1404.
19:40-19:50	Science meeting; Yasuhiko Ohara and Tomoyo Okumura summarized the results of 6K-1403.
19-Jul-14	**6K-1404 was conducted at Site C. Yasuhiko Ohara as the observer. As was the case for July 17, because of typhoon #10 located to the west, the Yokosuka took the contingency plan, diving at the SSF in Site C. Since the sea condition was presumed to become worse also in Site C, 6K-1405 dive was presumed impossible. Therefore, the Yokosuka left the SSF for Site A East for geophysical mapping in the night.**
8:59	The Shinkai opened vent, start of 6K-1404 dive. Yasuhiko Ohara as the observer.
11:25	The Shinkai on bottom (5925 m).
14:52	The Shinkai off bottom (5722 m).
17:33	The Shinkai on deck.
18:09	The Yokosuka started geophysical mapping, deploying proton magnetometer.
19:25-19:35	Science meeting; Yasuhiko Ohara summarized the results of 6K-1404.
20-Jul-14	**6K-1405 dive was canceled due to rough sea condition. The Yokosuka conducted gephysical mapping in Site A East.**
1:28	The Yokosuka arrived at Site A East.
18:15-19:15	Science meeting; Yasuhiko Ohara briefed the current status.
21:43	The Yokosuka left Site A East for the SSF.
21-Jul-14	**6K-1405 dive was again canceled due to rough sea condition. The Yokosuka stayed in Site C for whole day, just being drifted. A tropical depression (to become typhoon #11) had passed us from the daytime to the night.**
6:43	The Yokosuka recovered proton magnetometer.
18:00-18:10	Science meeting; Yasuhiko Ohara briefed the current status. Science talk by Shoma Oya on the deformation structure of the SSF peridotites.
22-Jul-14	**Although the weather became fine in the morning, large swells still prevailed. Therefore 6K-1405 dive was again canceled, ending our dive campaign in this cruise. The Yokosuka left the SSF for Site B for geophysical mapping until midnight.**
10:40	Since 6K-1405 was finally canceled. The Yokosuka then left the SSF for Site B. Proton magnetometer was not deployed.

16:08	The Yokosuka arrived at Site B, starting geophysical survey.
18:00-18:20	Science meeting; Y. Ohara briefed the current status. Science talks were scheduled for the rest of the cruise.
Midnight	The Yokosuka ended the geophysical survey at Site B, headed to home (via the Parece Vela Basin).
23-Jul-14	**Underway to home. Scientists worked in the labs. Single swath mapping in the Parece Vela Basin.**
18:00-18:20	Sunset viewing.
18:20-18:50	Science meeting; Yasuhiko Ohara breifed the current status. Science talk by Mayjo Brounce on the oxygen fugacity of incoming Pacific Plate and resulting signature of the wedge mantle.
20:00	The Yokosuka started single swath bathymetry mapping in the Parece Vela Basin.
24-Jul-14	**Underway to home. Scientists worked in the labs. Single swath mapping in the Parece Vela Basin.**
18:20-18:50	Science meeting; Yasuhiko Ohara briefed the current status. Science talk by Tomoki Mizuno on the deformation structure of the Tanzawa plutonic rocks.
25-Jul-14	**Underway to home. Scientists worked in the labs. Single swath mapping in the Parece Vela Basin.**
9:00-10:00	Onboard seminar; Yasuhiko Ohara talked on the scientific results of the cruise and Tomoyo Okumura talked on stromatolite.
18:00-18:10	Science meeting; Yasuhiko Ohara briefed the current status.
19:50-20:00	Science talk by Yusuke Miyajima on the Neogene vesicomyids from Niigata, Japan.
26-Jul-14	**Underway to home. Scientists worked in the labs. Single swath mapping in the Parece Vela Basin was finished in the morning.**
5:25	The Yokosuka finished single swath bathymetry mapping in the Parece Vela Basin.
27-Jul-14	**Underway to home. Scientists worked in the labs.**
18:10-18:50	Science meeting; Yasuhiko Ohara briefed the current status. Science talk by Tomoyo Okumura on hot spring stromatolite.
28-Jul-14	**The Yokosuka arrived in the JAMSTEC pier in the morning. End of the cruise.**
9:00	The Yokosuka arrived in the JAMSTEC pier in the morning. End of the cruise.
11:30	YK14-13 scientist disembarked.

5. Dive results and discussions

Site A West (6K-1397 and 6K-1398; **Fig. 8A, 8B**) recovered very fresh mantle peridotite associated with troctolite, gabbro and limestone. 6K-1398 also recovered some basalts. Peridotite was recovered at as shallow as 3431 m in 6K-1398, but Hawkins and Batiza [1977] recovered peridotite at further as shallow as 1566 m. The limestone preserves the remnants of corals, clearly indicating that the limestone is an accreted material originating from the incoming (colliding) Caroline Ridge. It should be noted that limestones were observed as shallow as ~3800 m in 6K-1398. It should be further noted that the targeted ridge at Site A West is as shallow as ~20 m, suggesting an active tectonics to support the shallowness of the ridge. The freshness of the peridotites also indicates that the collision is an ongoing event, resulting in a protruding peridotite ridge along the inner trench slope west of the Challenger Deep. No serpentinite-hosted ecosystems were found in this site. Post cruise trace element analyses by Maryjo Brounce on two basalts (6K-1397-R03 and 6K-1397-R04) indicate that these two may be forearc basalts (FAB [Reagan et al., 2010]) [M. Brounce, per. com.]. Age determination will be critical to determine if these basalts are FAB or not.

Site A East (6K-1399; **Fig. 9A, 9B**) recovered altered and serpentinized mantle peridotite associated with troctolite and gabbro. Some white, "diffuse" precipitates were also recovered with sediment corers. However, no large, obvious "accreted" limestones were not observed during the dive. Initially, we argued that this perhaps means that collision of the incoming Caroline Ridge does not affect the geology of the inner slope of the Mariana Trench at the longitude of ~141°15'E. No serpentinite-hosted ecosystems were found in this site. Post cruise XRD and thin section analyses by Tomoyo Okumura on cored white precipitates indicate that these white materials are calcites consisted of foraminifera and micrite, suggesting that these precipitates were sedimented at depth shallower than CCD and deeper than the depth surface wave affects [T. Okumura, per. com.]. This in turn suggests that these calcites were derived from the incoming Caroline Ridge.

Site B (6K-1400 and 6K-1401; **Fig. 10A, 10B**) recovered basalt and gabbro. The Mariana Trough appears to propagate to the west in this region. Therefore the site may represent either the backarc crust or the rifted old arc (West Mariana Ridge) crust. Post cruise trace element analyses by Maryjo Brounce on 6K-1400 and 6K-1401 basalts indicate that 6K-1400 basalt has a Mariana Trough backarc basin basalt-like affinity, whereas 6K-1401 basalt has an arc-like affinity [M. Brounce, per. com.].

Site C (6K-1402, 6K-1403 and 6K-1404; **Fig. 11A, 11B**) revisited the SSF and made biogeochemical samplings of the field, including sediment cores, macro and meio faunas, and Niskin and pressure-tight water samples. Furthermore, 6K-1402 and 6K-1404 discovered new carbonate chimney sites. Following discoveries were made so far:

- Onboard analyses by Yuji Onishi on pore waters from the fragile large chimney 6K-1404-R05 yielded a highly alkaline pH value of 9.3 for the first time in the SSF.
- Post cruise DNA analyses by Hiromi Watanabe on the "tube worms" from 6K-1402 indicate that these are in fact a mixture of two species of *Phyllochaetopterus*. This is perhaps the deepest record (~5600 m) of *Phyllochaetopterus* [H. Watanabe, per. com.].
- 6K-1402 obtained a good spatial relationship on a SSF chimney site. This relationship is illustrated in **Fig. 12**. We have confirmed that Chim-2 (Bloomer Site) and Chim-3 (Konno2 Site) located next each other within ~10 m distance at a depth of ~5690 m, with Chim-2 to the west. This discovery has an important implication for considering the fluid circulation within the SSF. Our unpublished data indicate that Chim-2 is consisted of barren (therefore old) calcite chimneys [I. Pujana, per. com.; T. Okumura, per. com.]. On the other hand, Chim-3 is apparently consisted of active (therefore young) brucite chimneys (brucite data from Chim-1 [I. Pujana, per. com.; T. Okumura, per. com.]). Ohara et al. [2012] argued that fluid from subducting slab is responsible for the SSF. However, the new observation from 6K-1402 is not favor of this conventional idea. Persistent fluid flow from the subducting slab will keep chimneys fresh, and therefore calcite chimneys are

not likely expected (**Fig. 13A**; serpentinite volcano-like origin of fluid). In stead, co-existing of young and old chimneys may indicate that fluid is originated from seawater and circulated within the shallow crust driven by the heat of young magmatic intrusion (**Fig. 13B**; Lost City-like origin of fluid). Presence of young volcanism near the SSF is evidenced by fresh volcanic glass recovered by 6K-1363 (YK13-08 cruise) [Stern et al., in press].

- We have now an impression that all of the important biological events (clam colonies and chimneys) in the SSF are found at depths of ~5800 m to ~5600 m (**Fig. 12**).

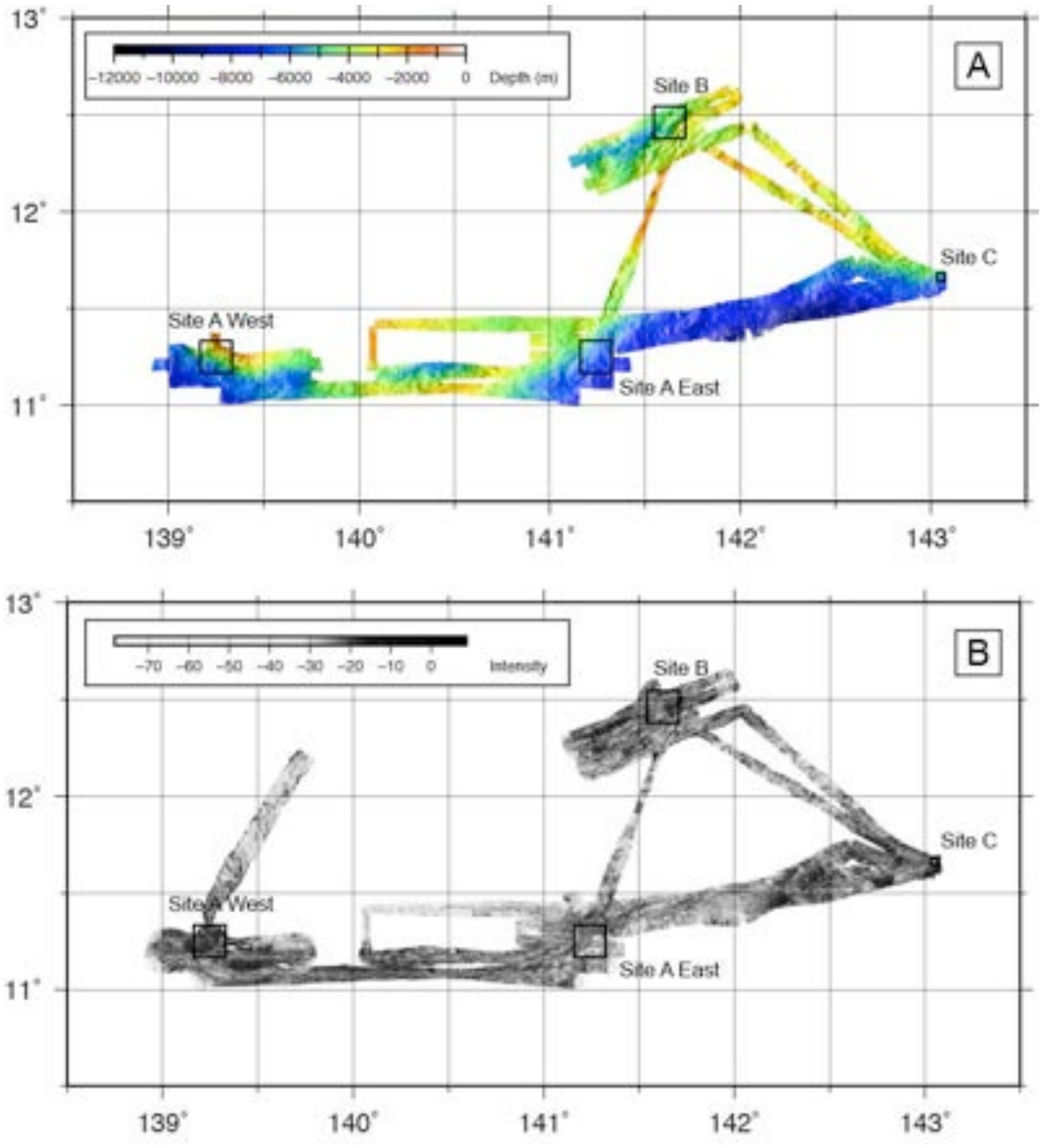

Fig. 4. Bathymetry data obtained during YK14-13 cruise. (A) Bathymetry (B) Side scan image

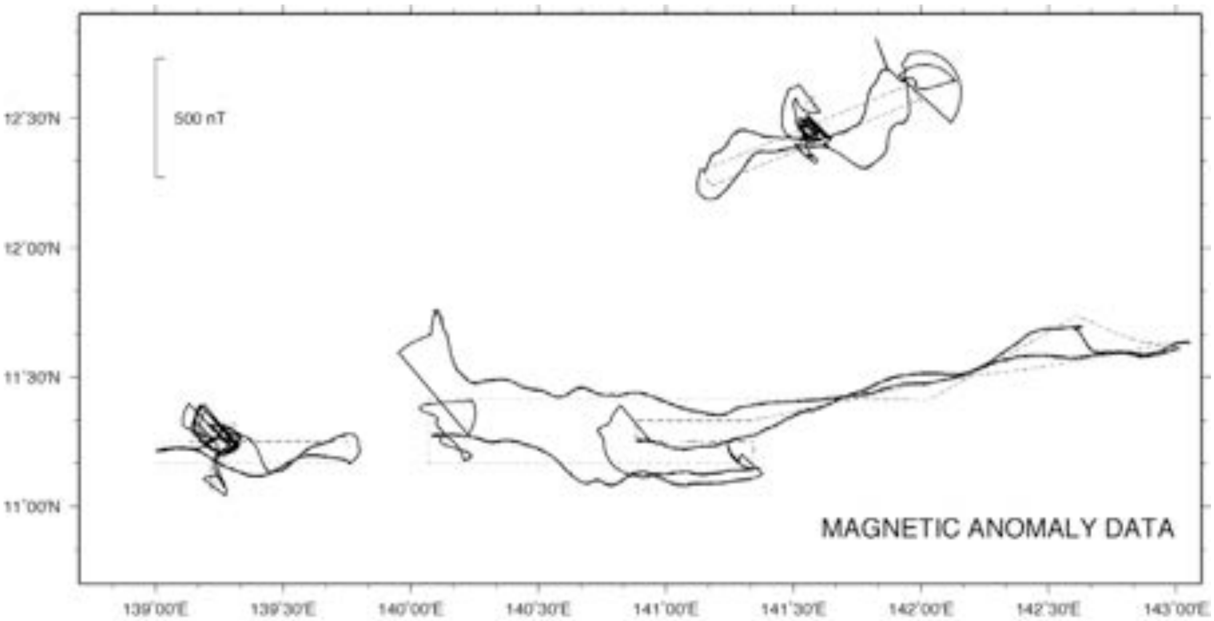

Fig. 5. Proton magnetometer data (IGRF removed) obtained during YK14-13 cruise. Anomaly is projected perpendicular to the cruise track (dashed line).

Fig. 6. Free air gravity data during YK14-13 cruise.

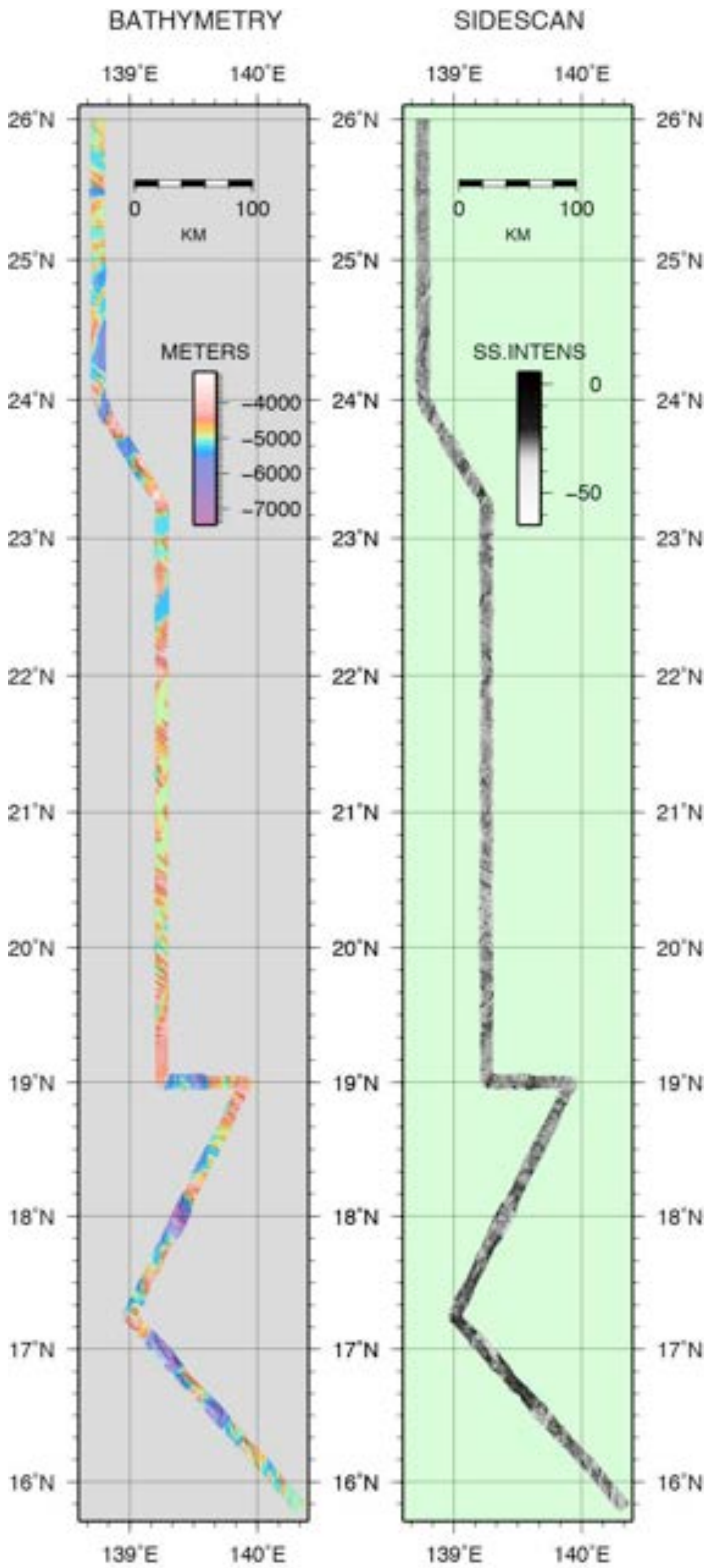

Fig. 7. Bathymetry data of the Parece Vela Basin obtained during YK14-13 cruise. (A) Bathymetry (B) Side scan image

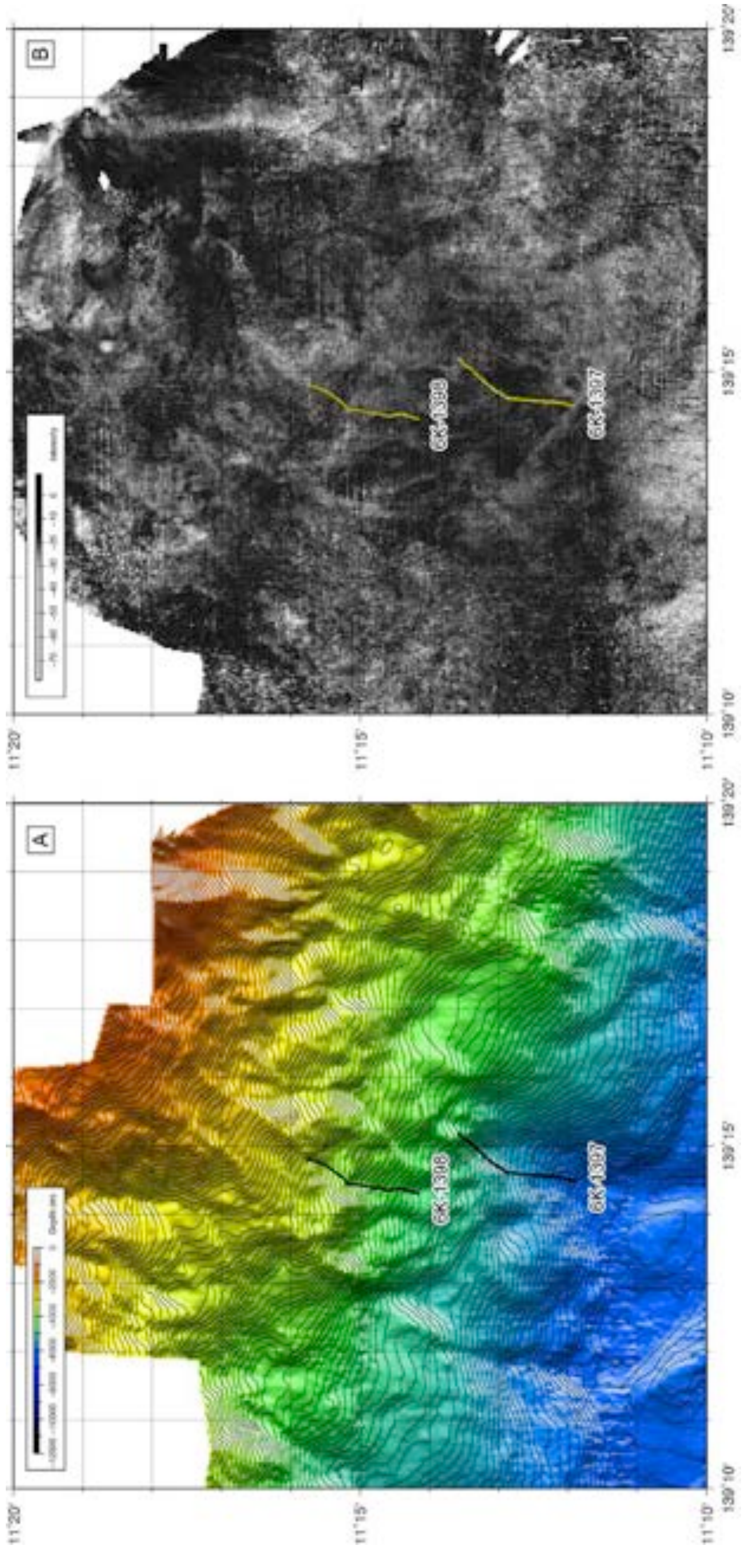

Fig. 8. Bathymetry data of Site A West. (A) Bathymetry. Contours in 50 m. (B) Side scan image

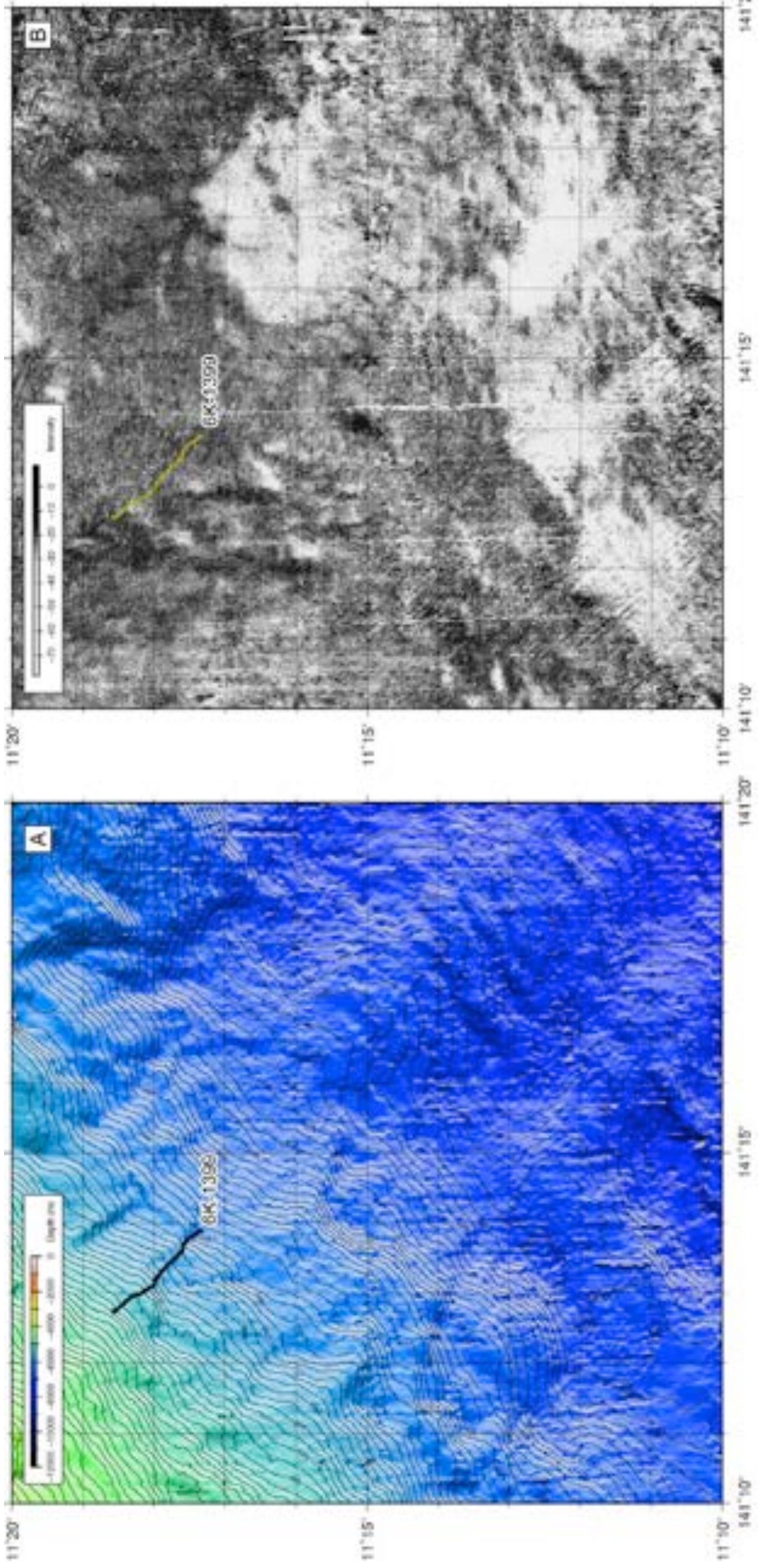

Fig. 9. Bathymetry data of Site A East. (A) Bathymetry. Contours in 50 m. (B) Side scan image

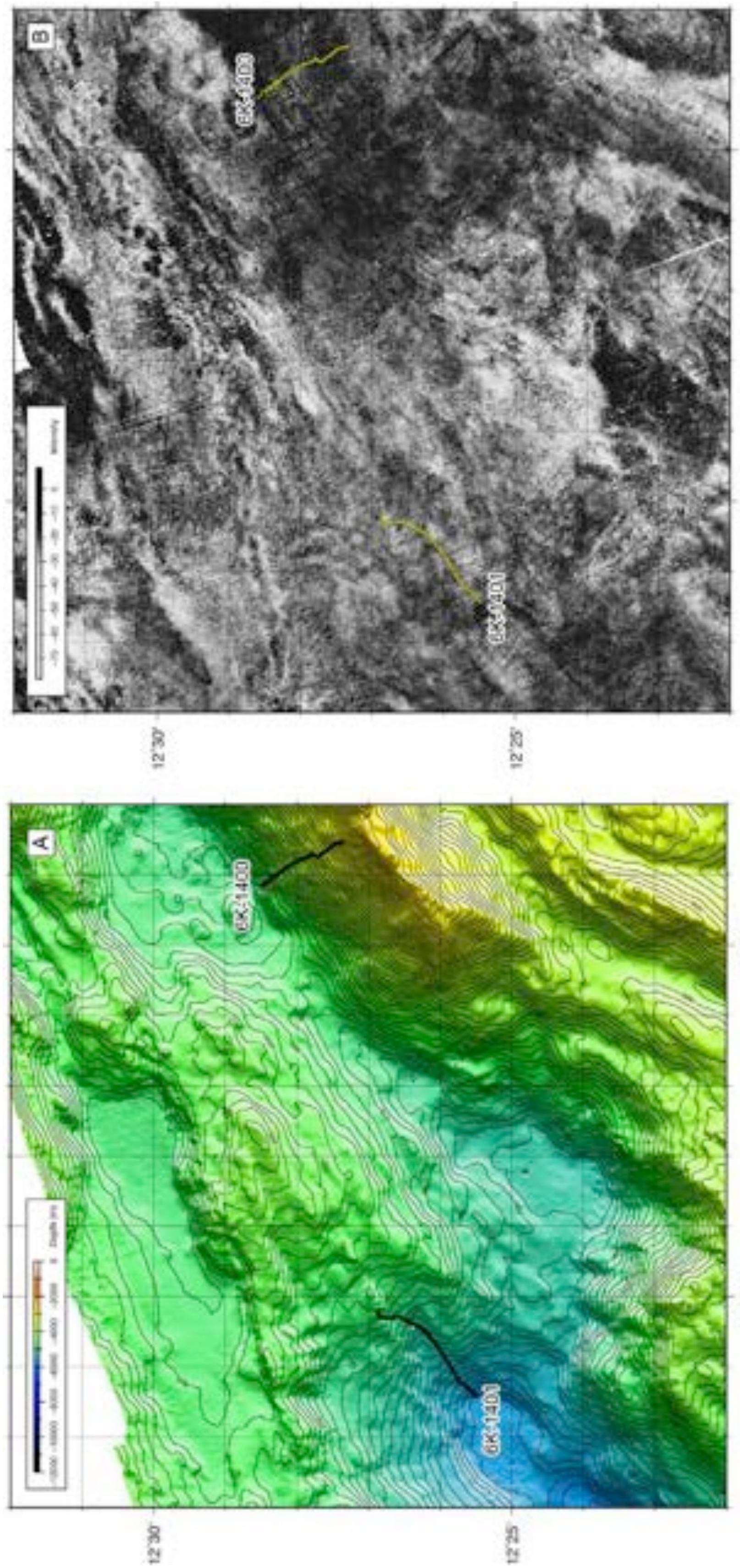

Fig. 10. Bathymetry data of Site B. (A) Bathymetry. Contours in 50 m. (B) Side scan image

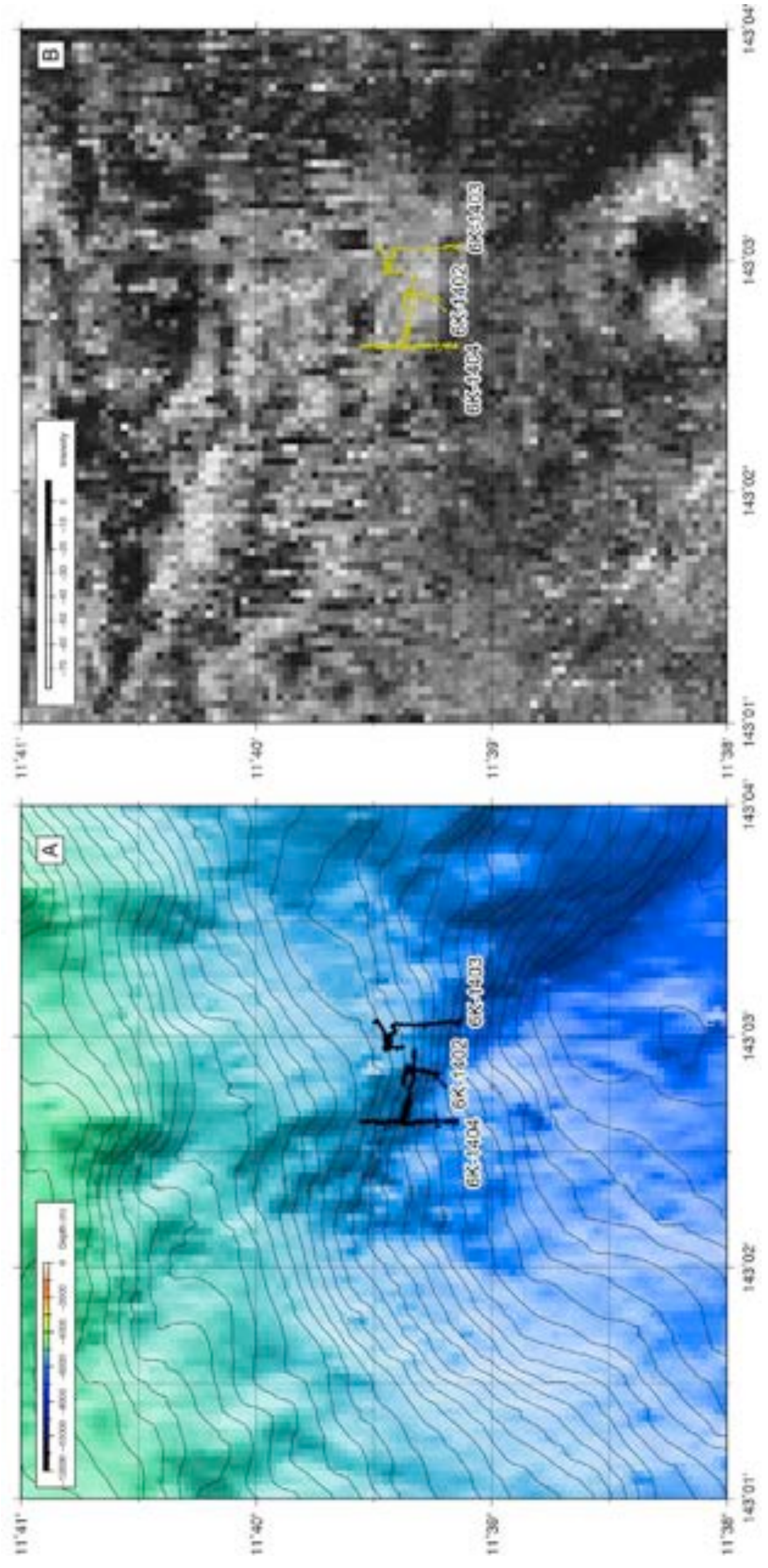

Fig. 11. Bathymetry data of Site C (SSF). (A) Bathymetry. Contours in 50 m. (B) Side scan image

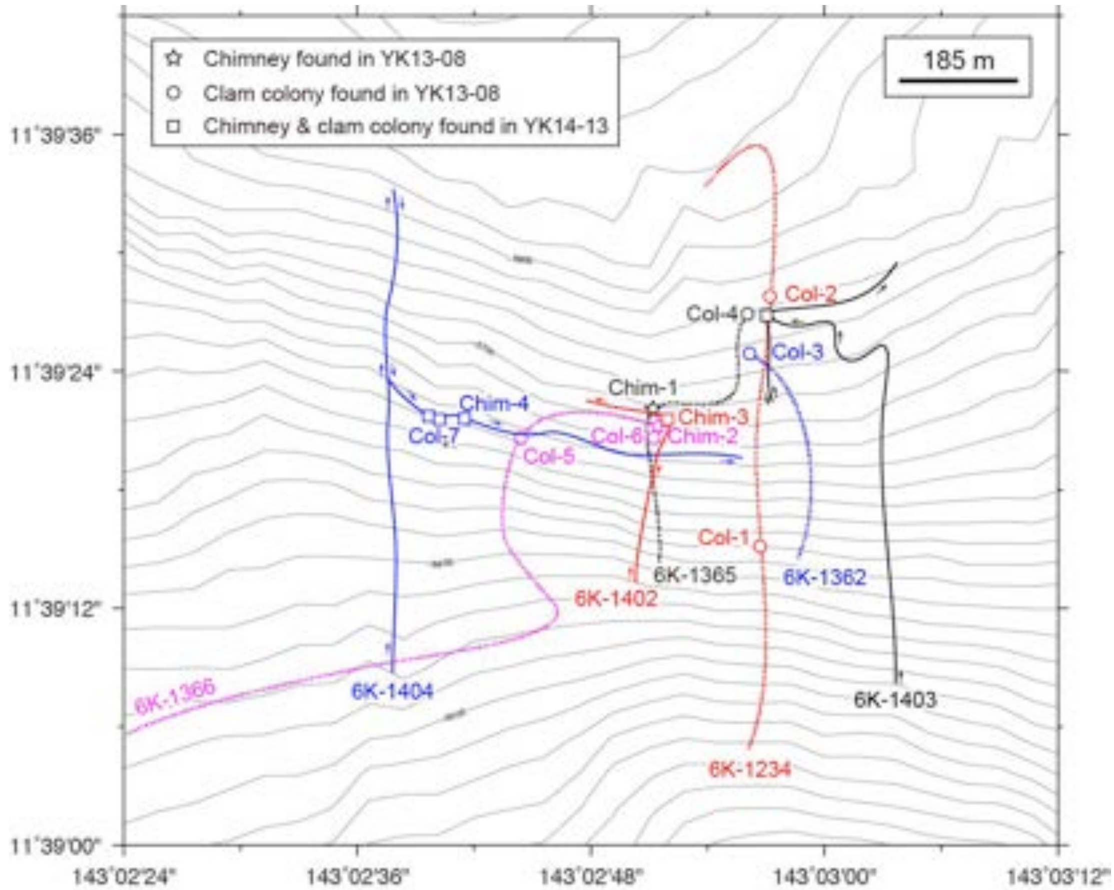

Fig. 12. Chimneys and Calyptogena clam colonies identified in the Shinkai Seep Field. Contours in 20 m. Col-2 (Ishii Site) and Col-4 are in fact identical; the makers for each colony locate within only a few meters (see 6K-1403 dive report). Chim-2 (Bloomer Site) and Chim-3 (Konno2 Site) locate within ten-odd meters (see 6K-1402 dive report). Chim-1 (Konno Site) is consisted of brucite chimneys, whereas Chim-2 calcite chimneys [I. Pujana, per. com; T. Okumura, per. com.]. It should be noted that there are in general ~20 m discrepancies between the depth of each event site deduced from this map (i.e., the depth from EM122 multibeam bathymetry) and the depth of the depth meter installed on the Shinkai 6500. We believe that the depth of the Shinkai depth meter is the true one, so a caution is necessary to use this map.

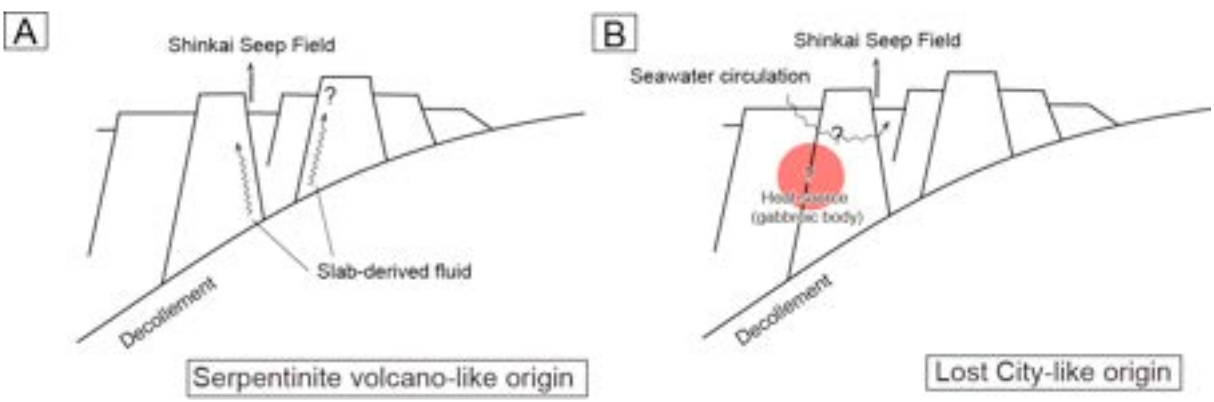

Fig. 13. Schematic model illustrating the origin of the fluid in the Shinkai Seep Field. (A) Serpentinite volcano-like origin. Persistent fluid flow from subducted slab is expected. (B) Lost City-like origin. Fluid is circulated within the shallow crust, driven by magmatic heat source.

6. Future studies and analytical tasks

SOLID EARTH SCIENCE

- **Fernando Martinez:** Geophysical characterization
  - ✧ Bathymetry, gravity and magnetics
  - ✧ Rock magnetic properties analyses on peridotites

- **Yasuhiko Ohara, Shoma Oya (and Katsuyoshi Michibayashi) and Teruaki Ishii:** Characterization of peridotite
  - ✧ Microprobe analyses
  - ✧ EBSD analyses for fabrics
  - ✧ Laser ICP-MS

- **Baryjo Brounce (and Katherine Kelley):** Characterization of basalt
  - ✧ Glass and whole rock geochemistry

- **Osamu Ishizuka:** Characterization of basalt
  - ✧ Ar-Ar dating

- **Hiroyuki Yamashita:** Characterization of gabbroic rock
  - ✧ Whole rock geochemistry
  - ✧ Mineralogical analyses

- **Ken Tani:** Characterization of gabbroic rock
  - ✧ Zircon U-Pb dating

- **Ignacio Pujana and Robert J. Stern:** Characterization of sediment
  - ✧ Analyses of detritus mineral

BIOLOGY AND BIOGEOCHEMISTRY SCIENCE

- **Yusuke Miyajima:** Characterization of sediment
  - ✧ Structural analyses of cored sediment

- **Tomoyo Okumura (and Ken Takai):** Biogeochemical characterization of limestone, sediment and chimney
  - ✧ Biogeochemical analyses of limestone from Site A West
  - ✧ Biogeochemical analyses of sediment from Site A East and Site B
  - ✧ Biogeochemical analyses of chimney from the SSF (Site C)

- **Yuji Onishi (and Toshiro Yamanaka):** Biogeochemical characterization of water, limestone, cored sediment and chimney
  - ✧ Biogeochemical analyses of water and limestone from Site A West
  - ✧ Biogeochemical analyses of the cored sediment from Site A East
  - ✧ Biogeochemical analyses of water, cored sediment and chimney from the SSF (Site C)

- **Teruaki Ishii:** Characterization of chimney and *Calyptogena* clam shell
  - ✧ Structural and geochemical analyses of chimney with CT-scan and XRF mapping

techniques
  - ✧ Geochemical analyses of *Calyptogena* clam shell with XRF mapping technique

- **Hiromi Watanabe:** Characterization of macro and meio faunas
  - ✧ Multivariate analyses to figure out relationships between faunal composition and environmental factors
  - ✧ Stable isotopic analyses on carbon, nitrogen and sulfur to figure out trophic ecology

- **Akinori Yabuki:** Characterization of protest

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Appendix A

Dive reports

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A-1. 6K-1397 Dive Report

Date: July 12, 2014
Site: Site A West (Landward slope of a small ridge at the westernmost Mariana Trench)
Observer: Yasuhiko Ohara
Pilot: Fumitaka Saito, **Co-Pilot**: Yudai Tayama

Objectives:
The westernmost Mariana Trench has virtually been unexplored except one study [Hawkins and Batiza, 1977]. Hawkins and Batiza [1977] recovered peridotite from the shallow part of the trench inner slope at ~139°20'E, suggesting that the trench inner slope exposes peridotite extensively. The objective of 6K-1397 was therefore to know the geology and biology of the westernmost Mariana Trench inner slope, and especially to test a hypothesis that Shinkai Seep Field-type serpentinite-hosted ecosystems exist there.

Observations and operations:
The bottom came into sight at 11:35 at a depth of 6000 m. The Shinkai landed on the seafloor at 6000 m at 11:37. The landing point was a tan-colored sediment floor scattered with various sized rubbles. The water temperature by the 6K was 1.6°C.

Stop 1 was made near the landing point during 11:42-11:51. Three rocks (R01, R02, R03) were collected firstly (at 5999 m). Then the Shinkai moved up slightly and collected two rocks (R04, R05) from the bottom of a cliff (at 5995 m), exposing white and black materials (**Photo 1**). All these five rocks were fresh peridotites. White material appeared to be carbonate intrusions into peridotite matrix. From Stop 1, the Shinkai headed to north to examine the steep cliff. The cliff is likely consisted of outcrop of peridotite, often being intruded by carbonate. The cliff continued to 5961 m (11:55). Upslope, scattered real-white rocks were observed on tan-colored sediment floor. At 11:57 (at 5949 m), large boulders of real-white rocks were encountered, appeared to be limestones (**Photo 2**). The limestones sometimes have hollows of various sizes.

We tried to make Stop 2 at 5951 m (at 12:03) there, but sampling the limestones were not successful. The Shinkai then moved slightly upslope and made Stop 2 at 5947 m (at 12:09). Two rocks (R06, R07) were collected at this stop during 12:10-12:15. Unfortunately, R06 was lost during the recovery of the Shinkai, but R07 was a limestone. The Shinkai left this stop at 12:15, headed to north. Upslope of Stop 2, the seafloor had the similar appearance as at Stop 2, a rubble field of peridotite and limestone scattered on tan-colored sediment floor. At 5838 m (at 12:27), the number of limestones was decreased to almost zero.

We made Stop 3 at 5764 m (at 12:33) on sediment-dominated floor free from limestones. Two rocks (R08, R09) were collected during 12:33-12:43. All these two rocks were fresh peridotites. The Shinkai left this stop at 12:44, headed to north. Upslope of Stop 3, the seafloor again was dominated mostly by sediment. At 5714 m (at 12:48), a limestone boulder was observed. Beginning at 5658 m (at 12:52), a steep slope was encountered and the number of black boulders and rubbles increased with lesser limestones. Beginning at 5615 m (at 12:55), a possible peridotite outcrop with numerous carbonate veins was encountered. Beginning at 5574 m (at 12:58) to 5358 m (at 13:16), the seafloor became sediment-dominated, but the underlying hard rocks occasionally cropped out.

We made Stop 4 at 5358 m to 5350 m (during 12:16 to 13:34), where blocky and angular outcrop emerged. Two rocks (R10, R11) were collected. All these two rocks were fresh peridotites. The Shinkai left this stop at 13:36, headed to 40 degrees. Upslope of Stop 4, blocky and angular outcrop continued.

We made Stop 5 at 5264 m (at 13:45) on a local blocky talus floor. Three rocks (R12, R13, R14) were collected during 13:46-13:49. All these three rocks were fresh peridotites.

Further upslope, blocky and angular outcrop continued. Occasionally, the peridotite outcrop was intruded by carbonate and/or serpentine veins (**Photo 3**). Beginning at 5215 m (at 13:55), the seafloor became sediment-dominated. At 5155 m (at 14:01), the seafloor was became scattered with small gravels.

At 5103 m (at 14:05), we reached the bottom of an outcrop, making Stop 6 at 5096 m (at 14:07). Five rocks (R15, R16, R17, R18, R19) were collected during 14:05-14:11. All these five rocks were fresh peridotite. Upslope of Stop 6, blocky and angular outcrop continued (**Photo 4**). At 4899 m (at 14:27), the outcrop became a blocky rubble field.

We made Stop 7 at 4892 m (at 14:29) on the blocky rubble field, which was still considered to be a part of an outcrop. Three rocks (R20, R21, R22) were collected during 14:29-14:32. All these three rocks were fresh peridotite.

Further upslope, blocky and angular outcrop continued. We made Stop 8 at 4732 m (at 14:46) on a blocky outcrop. Four rocks (R23, R24, R25, R26) were collected during 14:46-14:50. All these four rocks were fresh peridotite.

We then moved further upslope along the blocky and angular outcrop. We made Stop 9 at 4640 m (at 15:00). After setting Marker #169, a Niskin sample was taken. The Shinkai secured the equipment and dropped ballast and left the bottom at 15:07.

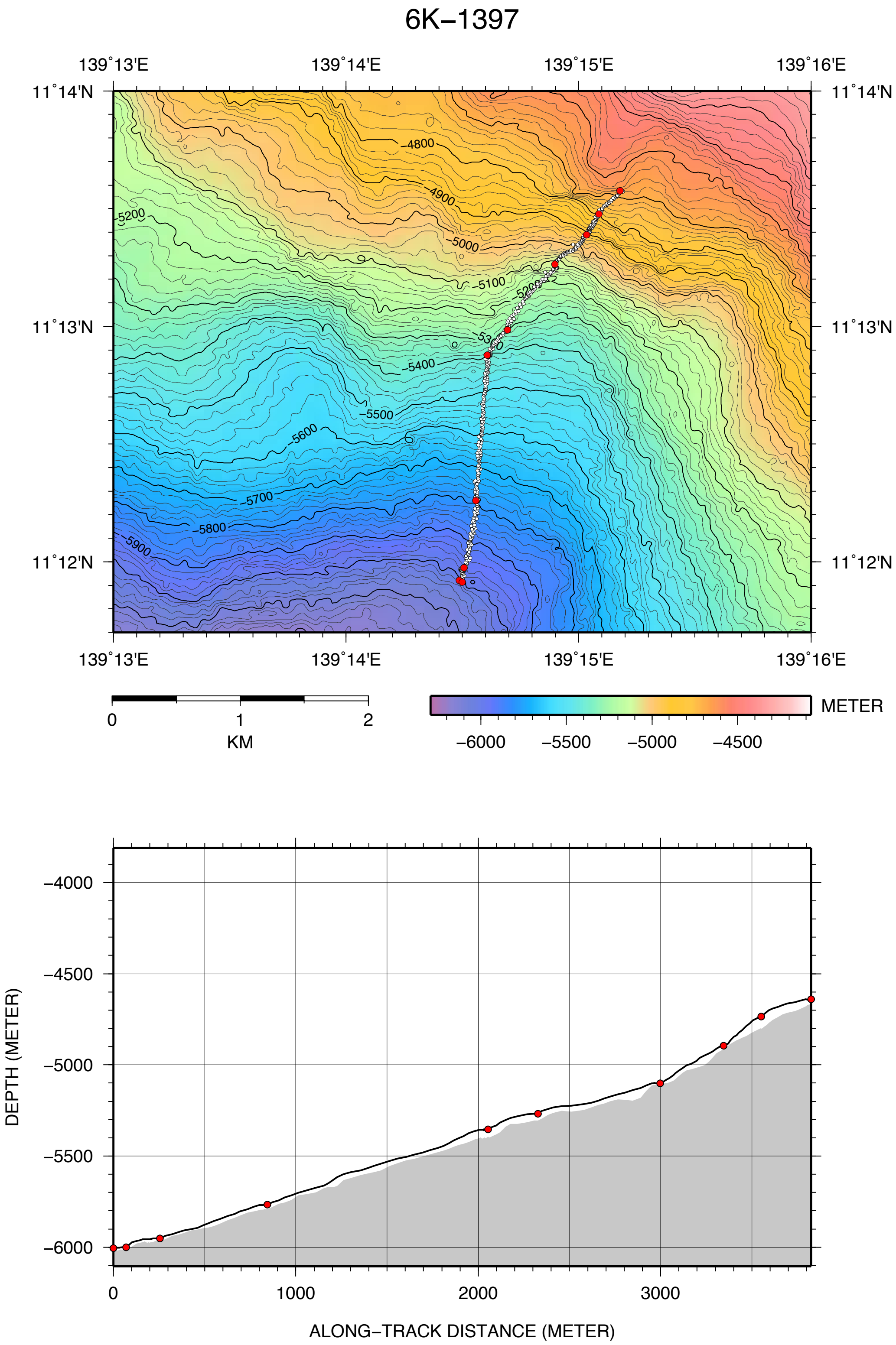
Brief discussion:
6K-1397 recovered very fresh mantle peridotites and limestones. Onboard specimen examination revealed that the limestone preserves the remnants of corals, clearly indicating that the limestone is an accreted material originating from the incoming (colliding) Caroline Ridge. The freshness of the peridotite also indicates that the collision is an ongoing event, resulting in a protruding peridotite ridge along the inner trench slope west of the Challenger Deep.

Payloads:
- Niskin sampler (1 bottle)
- D-WHATS with 6 bottles (2 sets of 3 bottles) + Thermometer
- H corer (4 cores)
- Imai corer (1 core)
- Sample box
- Scoop
- Marker (2 sets)

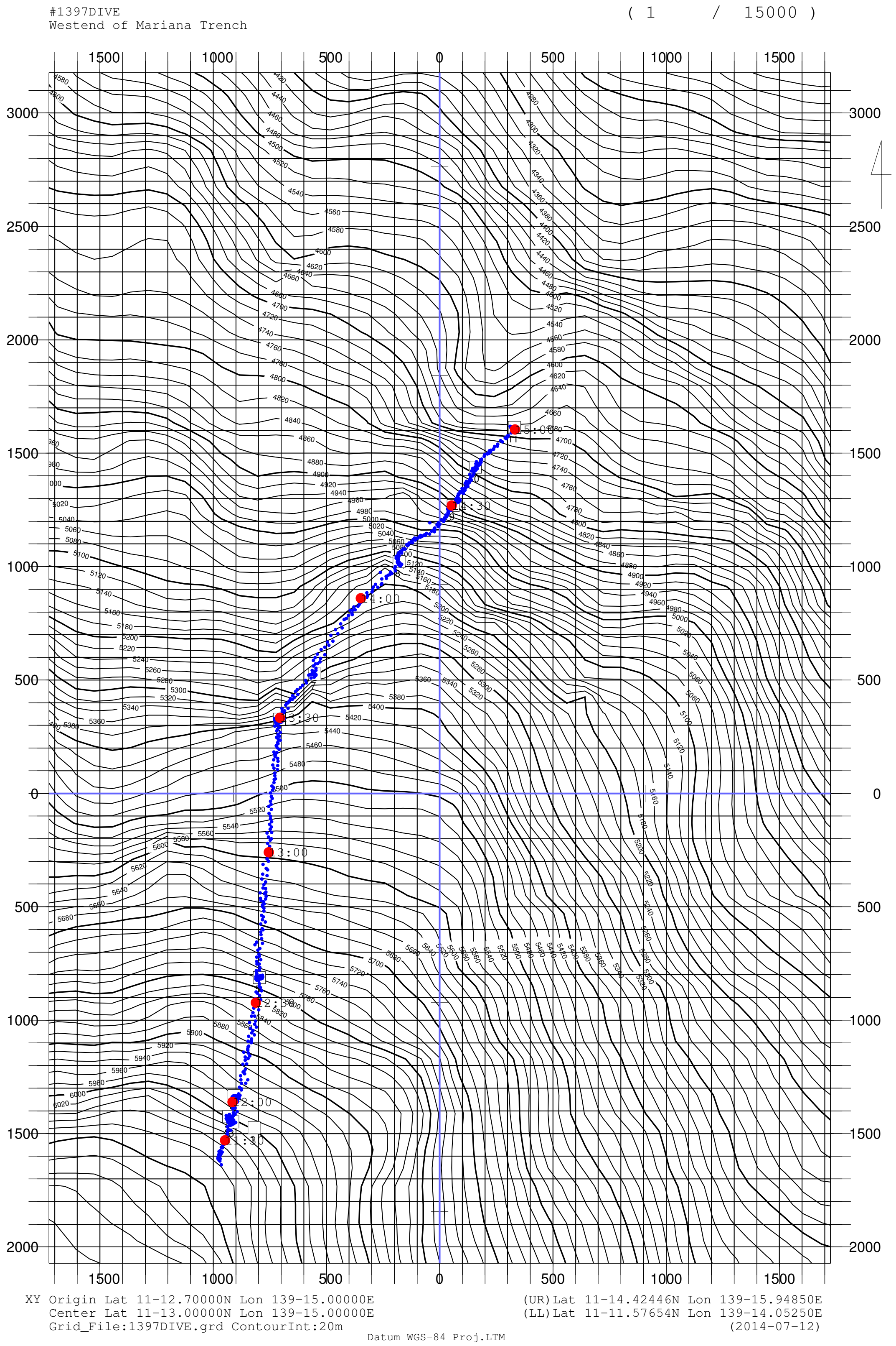
Event list: 6K-1397 (Y. Ohara), July 12, 2014

No.	Time	X	Y	Lat	Lon	Depth (m)	Event
1	9:00	-1474.87	-819.1	11-11.9000N	139-14.5500E	6000	Target Point
2	11:37	-1426.94	-932.68	11-11.9260N	139-14.4876E	6000	Landing
3	11:51	-1448.88	-913.21	11-11.9141N	139-14.4983E	5996	Stop 1: Sampling 5 rocks
4	12:15	-1333.83	-908.47	11-11.9765N	139-14.5009E	5947	Stop 2: Sampling 2 rocks
5	12:43	-812.84	-796.52	11-12.2591N	139-14.5624E	5764	Stop 3: Sampling 2 rocks
6	13:34	327.25	-708.21	11-12.8775N	139-14.6109E	5350	Stop 4: Sampling 2 rocks
7	13:49	527.28	-552.22	11-12.9860N	139-14.6966E	5263	Stop 5: Sampling 3 rocks
8	14:11	1022.83	-180.01	11-13.2548N	139-14.9011E	5096	Stop 6: Sampling 5 rocks
9	14:32	1270.43	59.33	11-13.3891N	139-15.0326E	4889	Stop 7: Sampling 3 rocks
10	14:49	1438.38	157.8	11-13.4802N	139-15.0867E	4728	Stop 8: Sampling 4 rocks
11	15:08	1614.26	330.16	11-13.5756N	139-15.1814E	4640	Stop 9: Sampling Niskin, Set #169 Marker, Left bottom

(X, Y) origin = (11-12.7000N, 139-15.0000E)



Bathymetric map and dive track profile for 6K-1397



X-Y map for 6K-1397

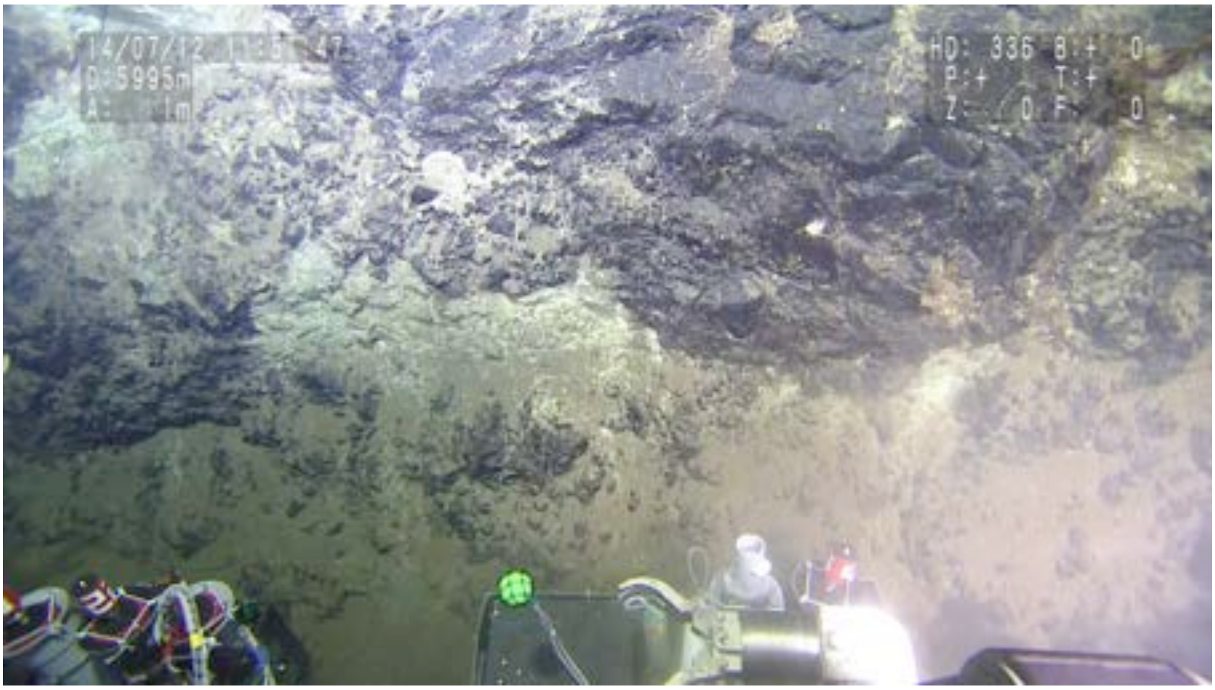


Photo 1. Seafloor at Stop 1. White material appeared to be carbonate intrusions into peridotite matrix.

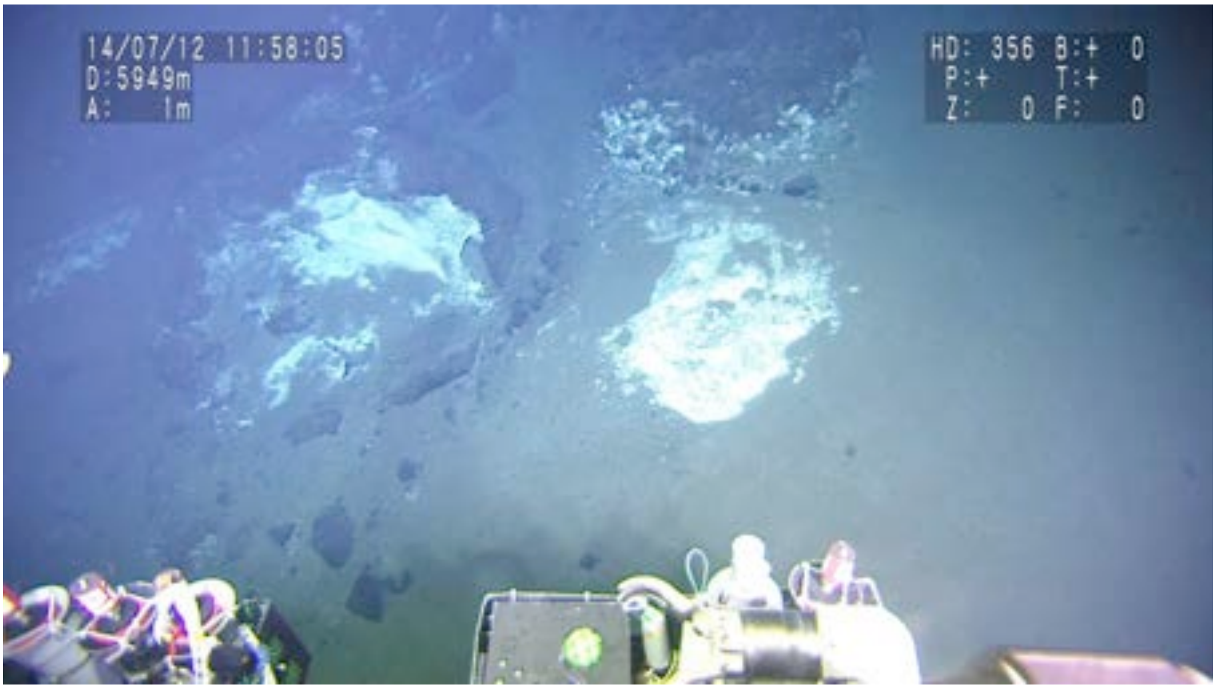


Photo 2. Seafloor near Stop 2. Large boulders of real-white limestone on tan-colored sediment floor.

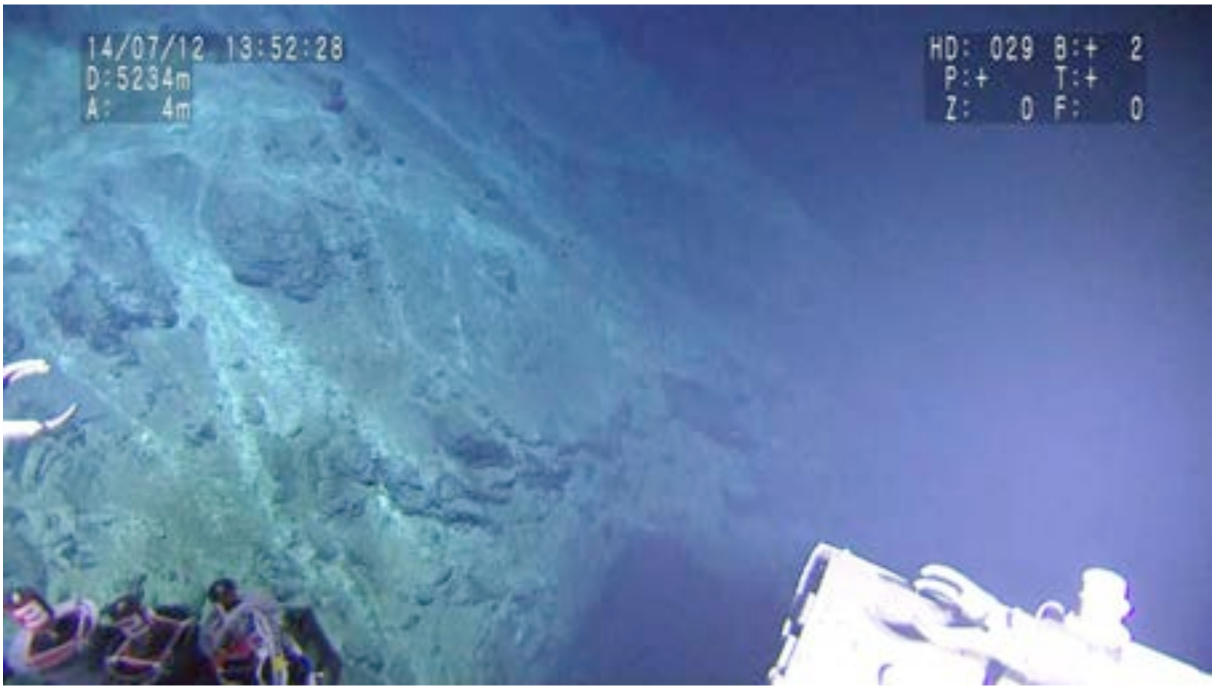


Photo 3. Seafloor near Stop 5. Peridotite outcrop was intruded by carbonate and/or serpentine veins.

Photo 4. Seafloor near Stop 6. Blocky and angular outcrop of fresh peridotite.

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A-2. 6K-1398 Dive Report

Date: July 13, 2014
Site: Site A West (Landward slope of a small ridge at the westernmost Mariana Trench)
Observer: Ignacio Pujana
Pilot: Hirofumi Ueki, **Co-Pilot**: Masaya Katagiri

Objectives:
The objective of 6K-1398 was the same as 6K-1397; in particular 6K-1398 was to examine the upper slope of 6K-1397.

Observations and operations:
The bottom came into sight at 12:03 at a depth of 4668 m. The Shinkai landed on the seafloor at 4683 m at 12:06. The landing point was a tan-colored sediment floor scattered with various sized rubbles and boulders interspersed with a few white rocks. The water temperature by the 6K was 1.5°C.

We made Stop 1 near the landing point during 12:12-12:23. Stop 1 was composed by tan sediments with some large sub-angular to rounded boulders interspersed with a few white sub rounded rocks and diffuse white precipitates (**Photo 1**). Observed also in abundance are lenticular shaped areas with closely packed grape size sediment spheres. These lenses occupy slight depressions and are elongated in the slope direction, normally occurring in close proximity to medium size blocks and not connecting with other lenses (**Photo 1**). We collected these spheres with scoop (Scoop 1). Then two rocks (R01, R02) were collected. R01 was a serpentinized peridotite, and R02 was a gabbro. The Shinkai left Stop 1 at 12:25, headed to 10°.

The seafloor upslope was more or less similar to that of Stop 1. At 4593 m (at 12:35), a large Anthozoa sp. was observed. Beginning from 4543 m (at 12:39), the seafloor became sedminent-dominated. We made Stop 2 at 4533 m (at 12:40) on a sediment-dominated seafloor with scattered rubbles and boulders associated with large white material that had similar appearance to those observed in 6K-1397 yesterday (**Photo 2**). Four rocks (R03, R04, R05, R06) were collected. R03 was an olivine-phyric basalt, R04 was a basalt, and R05 and R06 were olvine-gabbros. The Shinkai left Stop 2 at 12:47, headed to 10°.

At 4515 m (at 12:49), a very large boulder was observed. The seafloor upslope was more or less similar to that of Stop 1. At 4388 m (at 13:08), we made Stop 3 (**Photo 3**). Three rocks (R07, R08, R09) were collected. R07 was a limestone, R08 was an olivine-gabbro, and R09 was a peridotite, suggesting that the slope at Stop 3 has the lithology occurred in an olistostrome. The Shinkai left Stop 3 at 13:14, headed to 10°.

At 4358 m (at 13:18), the slope became steeper. At 4297 m (at 13:27), we encountered some large blocks of limestone (about half the size of the Shinkai) and made Stop 4 there (**Photo 4**). We took a sample from the protuberane on top of a large block (R10) (**Photo 5**). The Shinkai left Stop 4 at 13:34, headed to 10°.

Upslope of Stop 4, large blocks of limestone were occasionally observed. We made Stop 5 at 4128 m (at 13:55) on a rubble field. Three rocks (R11, R12, R13) were collected. R11 and R12 were peridotites and R13 was a troctolite. The Shinkai left Stop 5 at 14:00, headed to 10°.

A steep talus slope continued upslope of Stop 5. The color of the most rocks was reddish and these were associated with grayish mud, apparently looked like a fractured outcrop of peridotite. At 4087 m (at 14:07), the slope became almost vertical (**Photo 6**). At 4042 m (at 14:13), we made Stop 6 to sample the rocks from the vertical slope. Three rocks (R14, R15, R16) were collected. All were peridotites, supporting the contention that the vertical slope consisted of fractured outcrops of peridotite. The Shinkai left Stop 6 at 14:21, headed to 10°.

At 4024 m (at 14:23), an obvious serpentine vein was observed (**Photo 7**). At 14:24, the Shinkai changed its heading to 30°. The steep slope continued, often with diffuse white precipitates and serpentine veins. At 14:32 (at 3960 m), the Shinkai changed its heading to 50°. At 3940 m (at 14:36), a small block of limestone was observed. At 3935 m (at 14:37), the slope became gentle and covered with tan sediment. At 14:40 (at 3921 m), the Shinkai changed its heading to 30°.

At 3901 m (at 14:44), the Shinkai landed on a seafloor scattered with medium size blocks, and we made Stop 7 there. The block included black colored ones, as well as some white limestones. Firstly we collected sediment with scoop (Scoop 2). Then, we collected two rocks (R17 and R18). Both were basalts. The Shinkai left Stop 7 at 14:51, headed to 35°.

Upslope of Stop 7, the seafloor was more or less similar to those observed down below. White limestone was often observed between Stop 7 and ~3800 m depth (at 15:04) (**Photo 8**). We made Stop 8 at 3705 m (at 15:14) at a possible outcrop exposing fractured blocks (**Photo 9**). Three rocks (R19, R20, R21) were collected. All were fresh peridotites. The Shinkai left Stop 8 at 15:20, headed to 30°.

Upslope of Stop 8, a steep slope consisting of large to medium size boulders and occasional possible outcrops continued. No limestones were recognized along the dive track. We made Stop 9 at 3431 m (at 15:42) at a possible outcrop exposing large and fractured blocks. Two rocks (R22, R23) were collected. Both were peridotites. R23 was especially a highly-fractured serpentinized peridotite. The Shinkai secured the equipment and dropped ballast and left the bottom at 15:50.

Brief discussion:
6K-1398 recovered peridotite, troctolite and gabbro from the landing point (Stop at 4593 m) to final stop (Stop 9 at 3431 m), suggesting that the dive examined a Moho transition zone. Two basalts (R17 and R18) were recovered at 3901 m and limestones were observed as shallow as at ~3800 m. The limestones are obviously derived from the colliding Caroline Ridge; it was in fact surprising that the accreted materials occurs at as shallow as at ~3800 m. At this point, we do not know the affinity of two basalts, but these might also come from the Caroline Ridge.

Note added on November 12, 2014:
Post cruise trace element analyses by Maryjo Brounce on two basalts (R03 and R04, not R17 and R18 noted above) indicate that R03 and R04 may be forearc basalts (FAB; Reagan et al., 2010) (M. Brounce, per. com). Age determination will be critical to determine if these basalts are FAB or not.

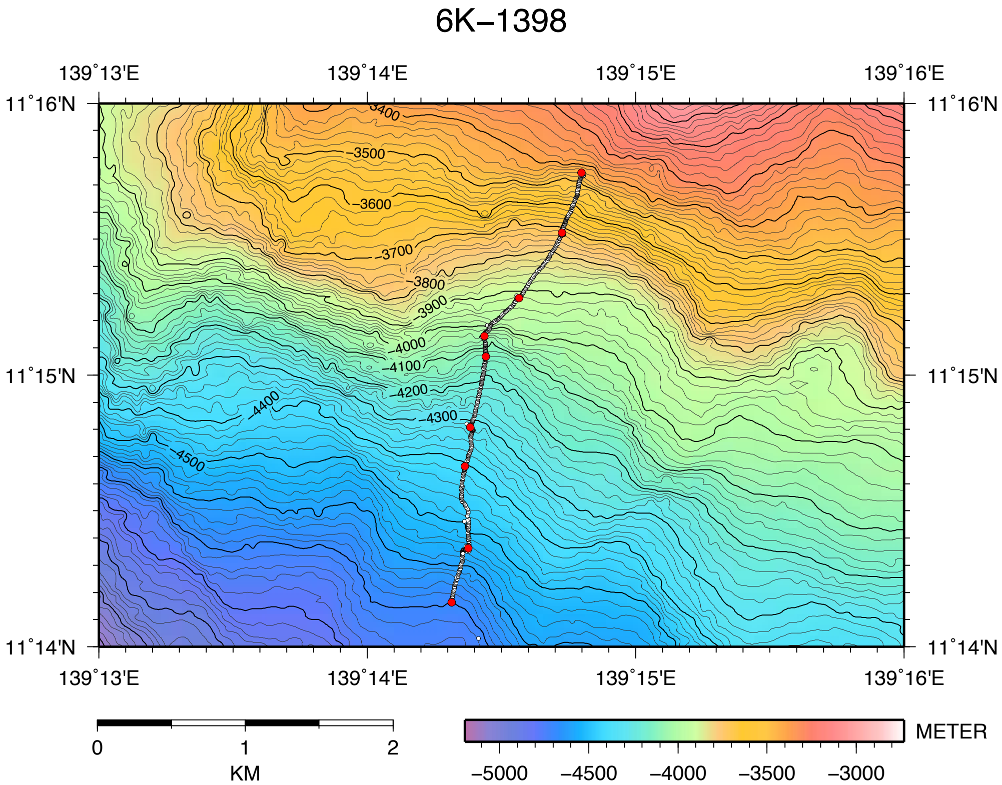
Payloads:
- Niskin sampler (1 bottle)

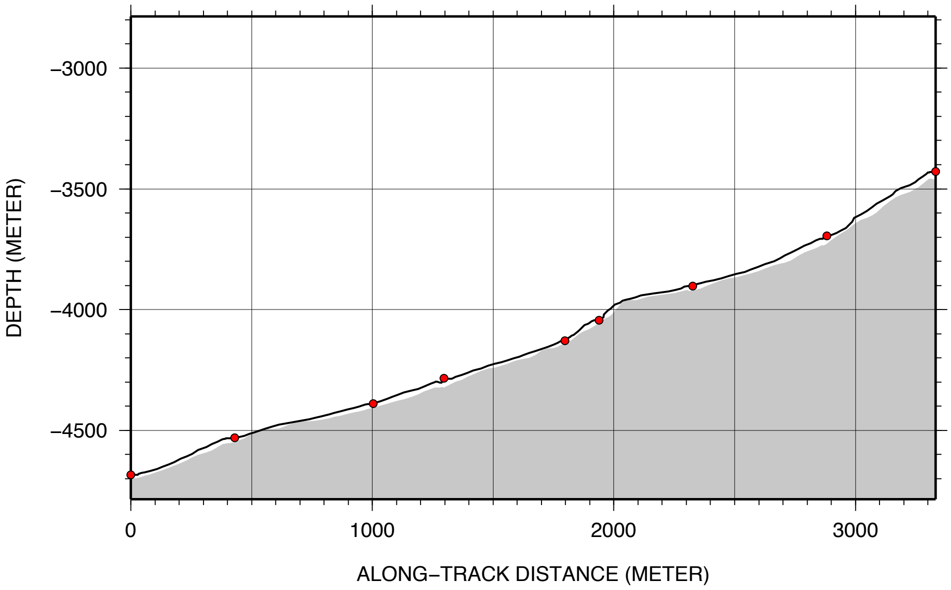
- D-WHATS with 6 bottles (2 sets of 3 bottles) + Thermometer
- H corer (4 cores)
- Imai corer (1 core)
- Sample box
- Scoop
- Marker (2 sets)

Event list: 6K-1398 (I. Pujana), July 13, 2014

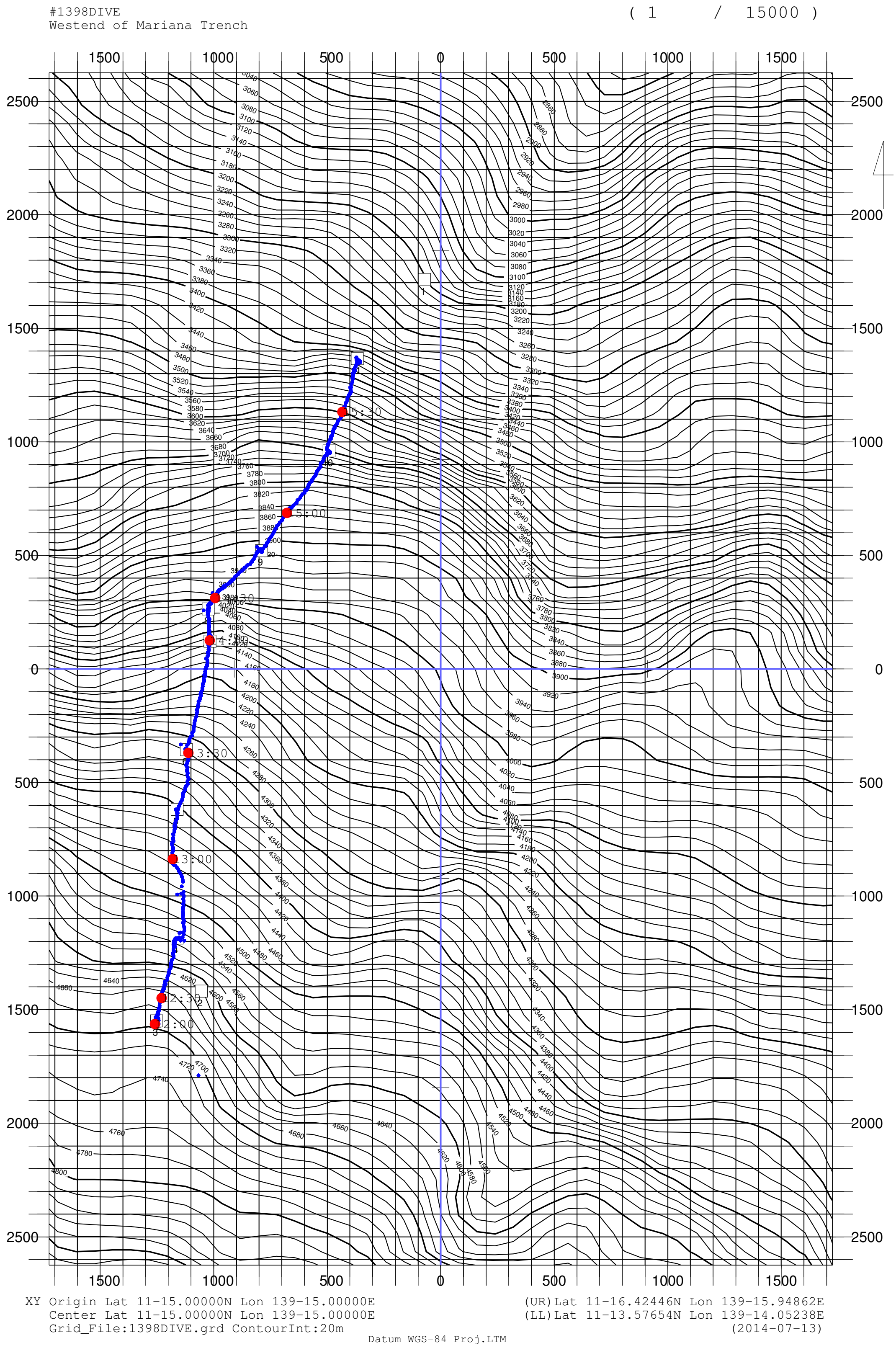
No.	Time	X	Y	Lat	Lon	Depth (m)	Event
1	10:00	-1419.56	-1055.59	11-14.2300N	139-14.4200E	4600	Target Point
2	12:09	-1549.16	-1251.43	11-14.1597N	139-14.3124E	4683	Stop 1: Landing, Sampling 2 rocks & 1 scoop (sediment spheres)
3	12:47	-1185.6	-1161.33	11-14.3569N	139-14.3619E	4530	Stop 2: Sampling 4 rocks
4	13:14	-619.43	-1161.12	11-14.6640N	139-14.3620E	4389	Stop 3: Sampling 3 rocks
5	13:33	-355.06	-1121.44	11-14.8074N	139-14.3838E	4297	Stop 4: Sampring 1 rock
6	14:00	122.8	-1016.05	11-15.0666N	139-14.4417E	4127	Stop 5: Sampling 3 rocks
7	14:20	264.21	-1024.42	11-15.1433N	139-14.4371E	4042	Stop 6: Sampling 3 rocks
8	14:50	521.01	-789.28	11-15.2826N	139-14.5663E	3901	Stop 7: Sampling 1 scoop (sediment) & 2 rocks
9	15:20	960.16	-492.09	11-15.5208N	139-14.7296E	3701	Stop 8: Sampling 3 rocks
10	15:51	1366.67	-367.79	11-15.7413N	139-14.7979E	3430	Stop 9: Sampling 2 rocks, Left bottom

(X, Y) origin = 11-15.0000N,139-15.0000E





Bathymetric map and dive track profile for 6K-1398



X-Y map for 6K-1398

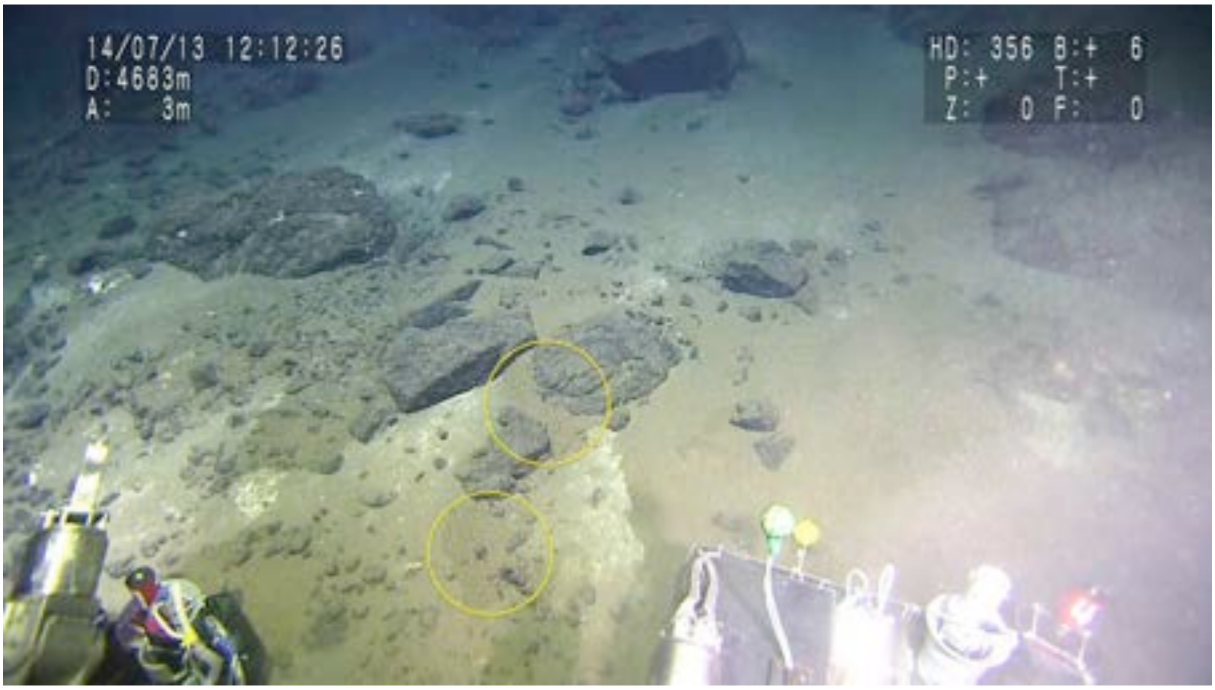


Photo 1. Seafloor at Stop 1. Lenses of grape size sediment spheres are indicated by yellow circles.

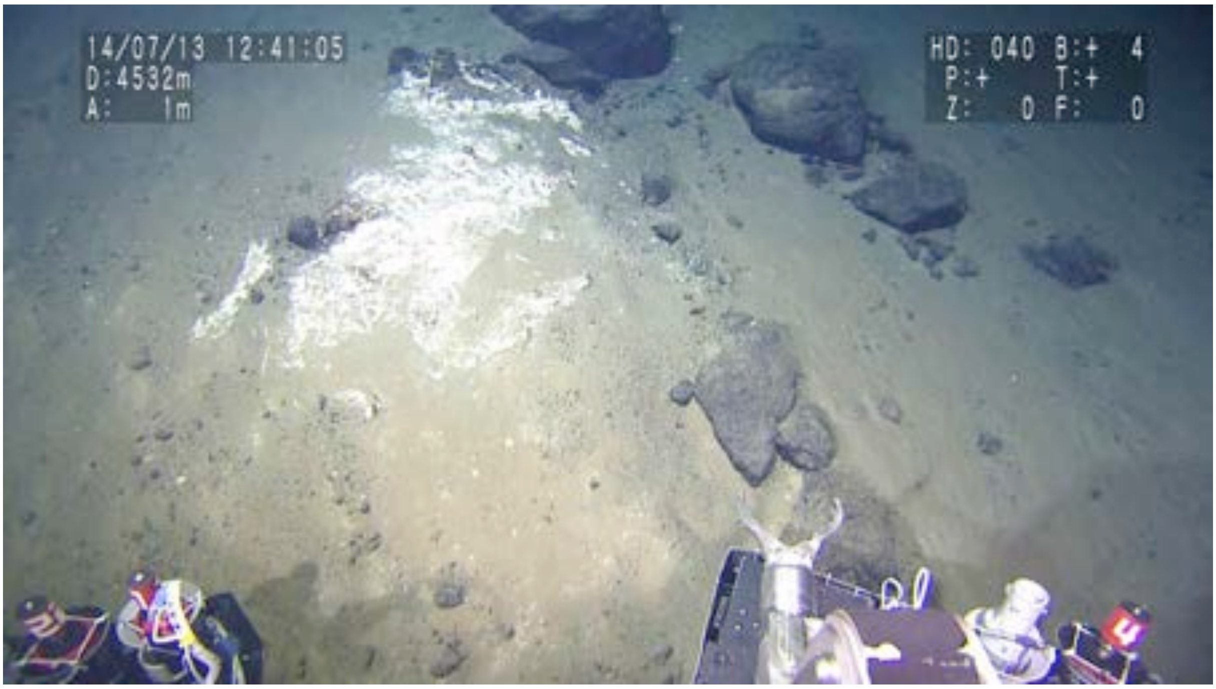


Photo 2. Seafloor at Stop 2. White material that appeared to be limestone originated from the Caroline Ridge.

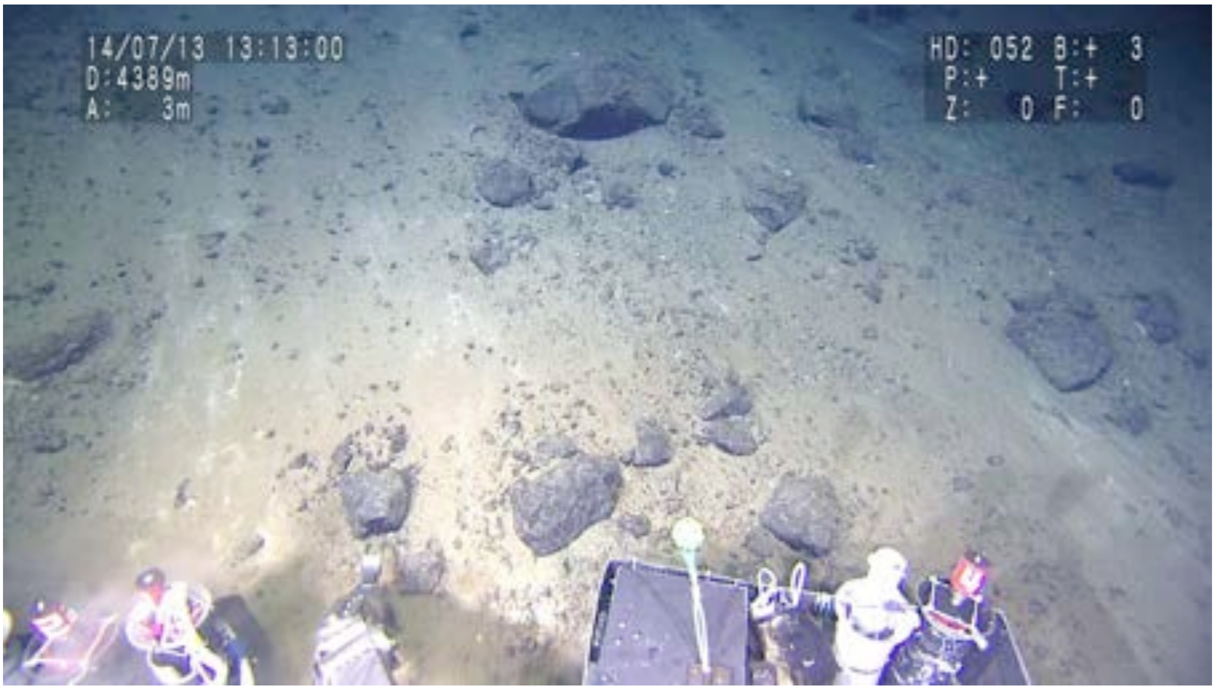


Photo 3. Seafloor at Stop 3. Three rocks were collected (R07, R08, R09). R07 was a limestone, R08 was an olivine-gabbro, and R09 was a peridotite.

Photo 4. Seafloor at Stop 4. Some large blocks of limestone.

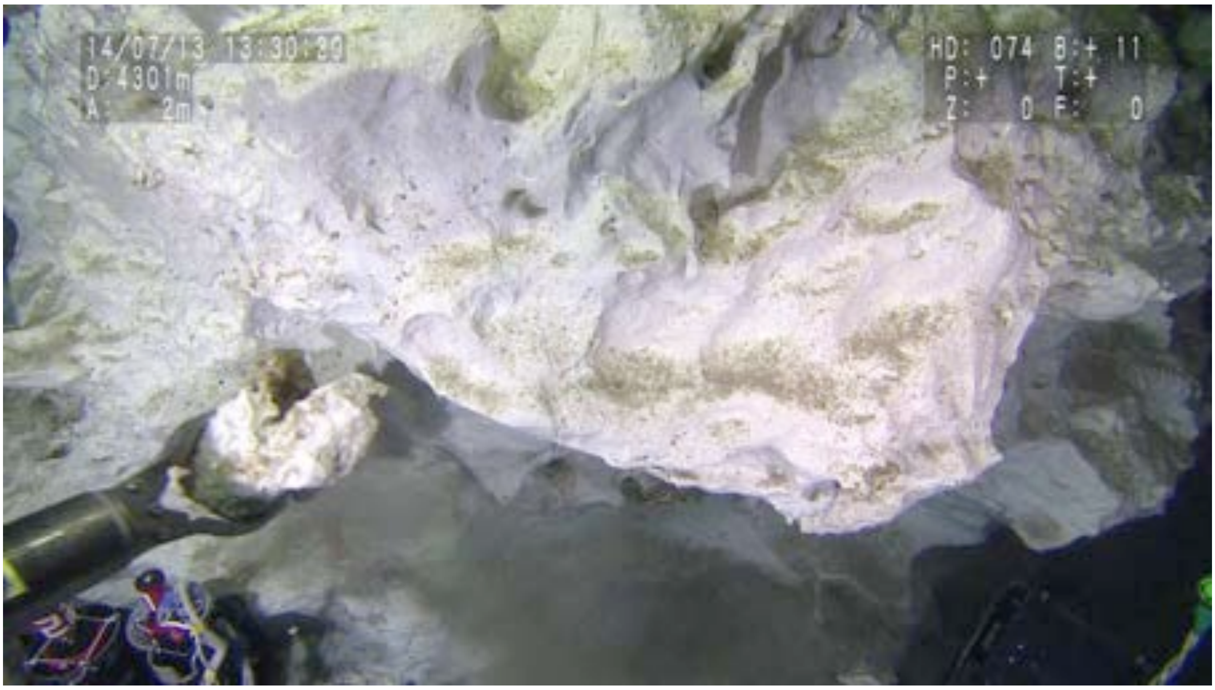


Photo 5. Sampling the limestone (R10).

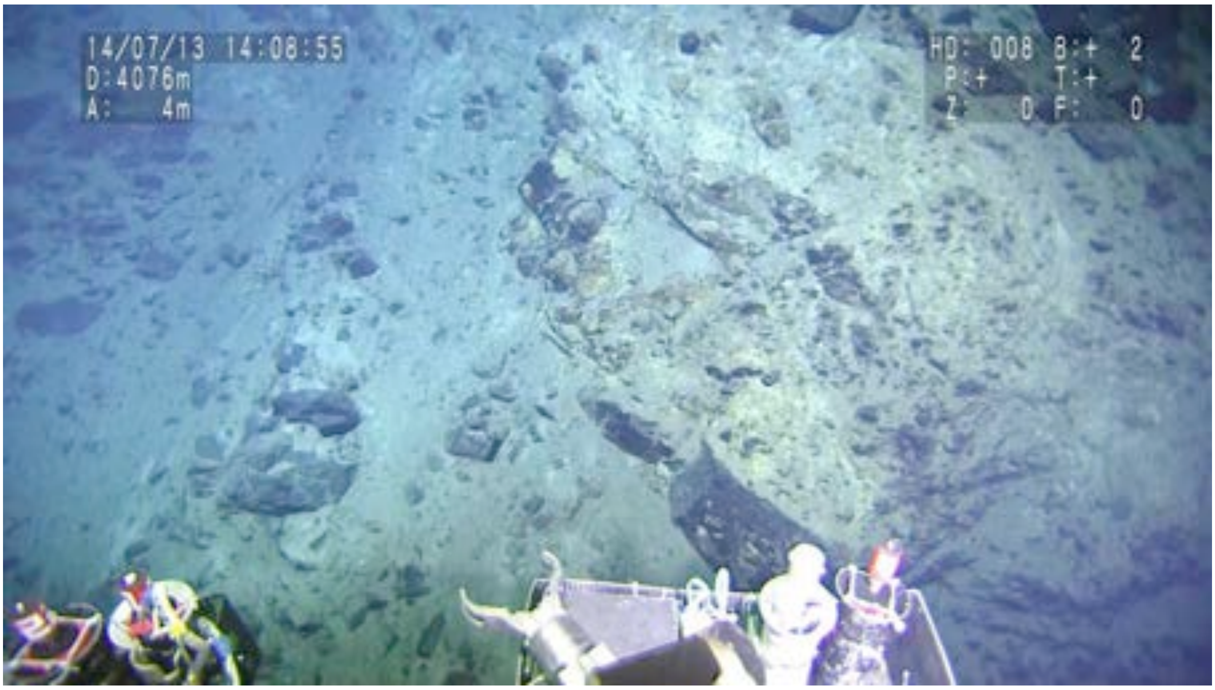


Photo 6. Seafloor upslope of Stop 5. Potential outcrop of peridotite.

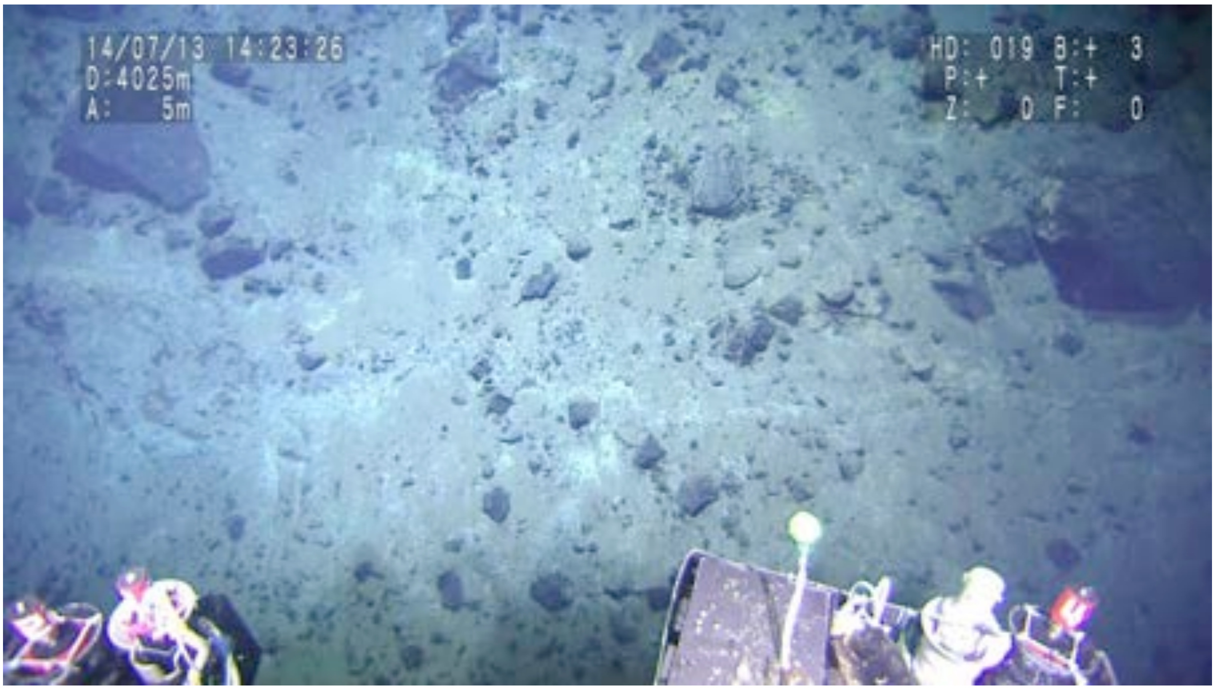


Photo 7. Seafloor upslope of Stop 6. Serpentine vein was observed.

Photo 8. Limestone was observed as shallow as ~3800 m depth.

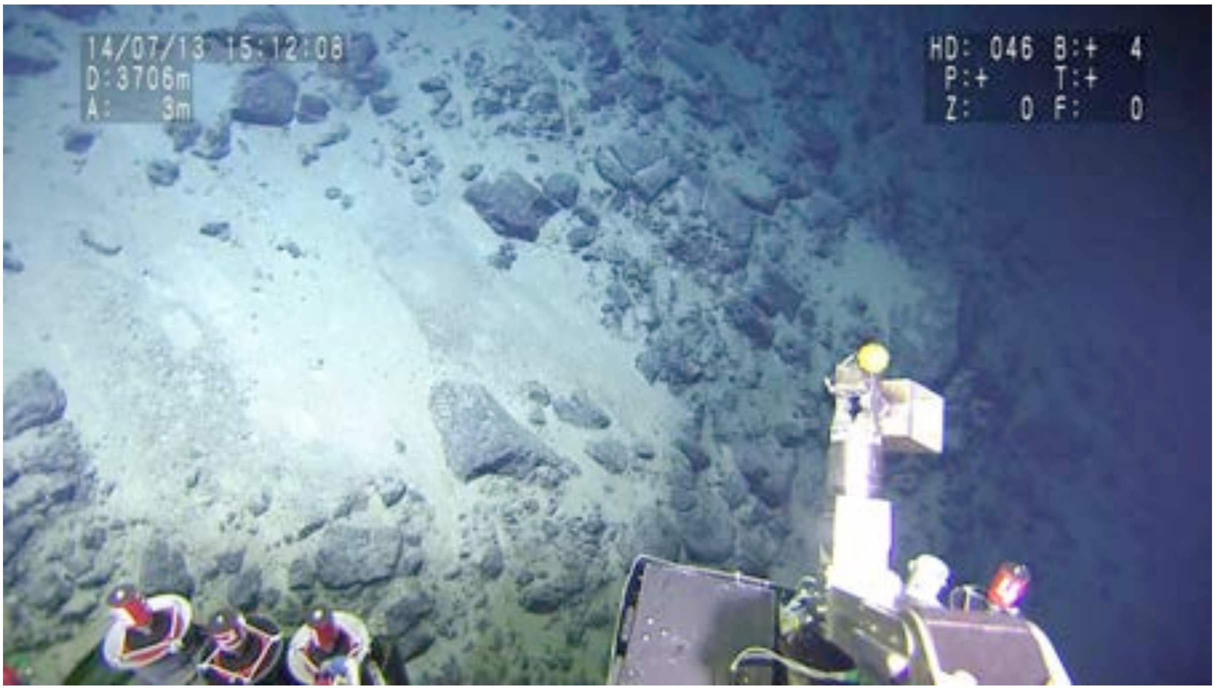


Photo 9. Seafloor at Stop 8. Fractured outcrop of peridotite.

A-3. 6K-1399 Dive Report

Date: July 14, 2014
Site: Site A East (Inner trench slope of the Mariana Trench to the northwest of the Challenger Deep)
Observer: Tomoyo Okumura
Pilot: Kazuki Iijima, **Co-Pilot**: Tetsuya Komuku

Objectives:
As far as we know, the inner trench slope of the Mariana Trench to the northwest of the Challenger Deep was never explored before. The objective of 6K-1399 was therefore to know the geology and biology there. We especially wanted to test a hypothesis that Shinkai Seep Field-type serpentinite-hosted ecosystems exist there.

Observations and operations:
The bottom came into sight at 11: 24 at a depth of 5900 m. The Shinkai landed on the seafloor at 5920 m at 11:30. The landing point was a tan-colored sediment floor scattered with various sized rubbles. The water temperature by the 6K was 1.6°C. Stop 1 was made at the landing point during 11:30-11:38. Three rocks (R01, R02, R03) were collected. R01 was a gabbro, R02 was a mud, and R03 was a peridotite. From Stop 1, the Shinkai was headed to 330°. Upslope of Stop 1, the seafloor was more or less similar to that of the landing point. Beginning at 5820 m (at 11:52), large blocks occasionally occurred on the seafloor. At 11:54, the Shinkai changed its heading to 310°. We encountered a local cliff at 5759 m (at 11:59), seen on the left window.

We made Stop 2 at 5757 m on a local cliff, consisting of a rubble floor during 12:02-12:07 (**Photo 1**). Three rocks (R04, R05, R06) were collected. All these three rocks were troctolites. From Stop 2, the Shinkai was headed to 310°. Upslope of Stop 2, the seafloor was more or less similar to that of Stop 2. At 12:14, the Shinkai changed its heading to 270°.

We made Stop 3 at 5697 m (at 12:20) at a steep slope consisting of angular blocks of various sizes (**Photo 2**). We then tried to sample a large black boulder with tan internal appearance. A rock (R07) was collected there (at 12:32), which consisted of peridotite (R07a), serpentinized harzburgite (R07b), and troctolite (R07c). From Stop 3, the Shinkai was headed to 320°. Upslope of Stop 3, the seafloor was more or less similar to that of Stop 3. Beginning at 5680 m (at 12:38), the slope became a tan-colored sediment floor. At 5659 m (at 12:46), rubbles with various sizes appeared again. Upslope, some white specks were often observed (such as at 5651 m at 12:47). At 5617 m (at 12:52), we encountered a thick white precipitate layer within a steep slope with various size boulders (**Photo 3**).

We made an informal stop (i.e., no Stop number) there to observe the white layer (**Photo 4**). No samples were taken there, because it appeared to Tomoyo Okumra that the white material was a limestone. Upslope, the white precipitates disappeared at 5600 m (at 12:56).

Further upslope, the slope is a tan-colored sediment floor scattered with various size rubbles. At 13:07 (at 5539 m), the Shinkai changed its heading to 300°. At 5503 m (at 13:12), white specks were observed with small gravels. At 13:15 (at 5488 m), the Shinkai changed its heading to 350° to be normal to the slope. However, the Shinkai again changed its heading to 270° at 5465 m (at 13:20).

We made Stop 4 at 5443 m (at 13:26) at a relatively steep slope consisting of angular blocks of various sizes. Two rocks (R08, R09) were collected. R08 was a peridotite, and R09 was a volcanic sandstone, suggesting that the slope consisted of talus piles (**Photo 5**). The Shinkai left Stop 4 at 13:35, headed to 330°. Upslope, the slope is a tan-colored sediment floor scattered with various size rubbles. At 5375 m (at 13:48), the shape of the rubbles became rather flat. At 5372 m (at 13:49), the slope became flat sedimented floor. White specks were occasionally observed. We wanted to sample cores there. However, since we missed the right place to core, we did nothing there. At 5356 m (at 13:57), a local steep slope consisting of large blocks was encountered. At 5304 m (at 14:04), some white precipitates associated with rubbles were observed. At 5288 m (at 14:07), the slope became a sedimented floor with many bioturbations. At 5279 m (at 14:10), the slope was floored with medium to large size enlongated ledges aligned to a same direction (NW) (**Photo 6**).

We made Stop 5 at 5277 m (at 14:12) there. Two rocks were collected (R10, R11). R10 was a mud, and R11 was unknown (it was lost; likely a small crust judging from the video record). The Shinkai left Stop 5 at 14:20, headed to 330°. Upslope to 5265 m, the slope became a gentle sedimented floor. Rubble field appeared at 5265 m (at 14:25). At 5262 m (at 14:27), the seafloor again became sedimented, scattered with small gravels.

We made Stop 6 at 5263 m (at 14:30) there. We collected the gravels with scoop (Scoop 1). The Shinkai left Stop 6 at 14:35, headed to 320°. Upslope of Stop 6, the seafloor was more or less similar to that of around Stop 6. At 5205 m (at 14:43), the slope became steeper, consisting of various size rubbles. At 5170 m (at 14:47), we encountered a layer of white precipitates within the relatively steep rubble field (**Photo 7**). The situation was similar to that seen at 5617 m (at 12:52) at an informal stop.

We made Stop 7 there. Two H-type cores were used to sample the white precipitates. At 14:48, core #2 was obtained. The core was marked with yellow tape to identify the direction of 180°, parallel to the Shinkai heading (54°). The coring was successful. Then, at 14:52, core #1 was obtained (**Photo 8**). The core was marked with red tape to identify the direction of 180°, parallel to the Shinkai heading (24°). Then, a Niskin sample was taken at 14:55.

We then moved to upslope a little bit, making Stop 8 at 5150 m (at 14:57). At 14:59, core #3 was obtained. The core was marked with white tape to identify the direction of 180°, parallel to the Shinkai heading (339°). Then, an Imai-type core was obtained at 15:04. The core was marked with blue tape to identify the direction of 180°, parallel to the Shinkai heading (0°). Finally, one rock (R12) was collected. R12 was a gabbro. The Shinkai secured the equipment and dropped ballast and left the bottom at 15:07.

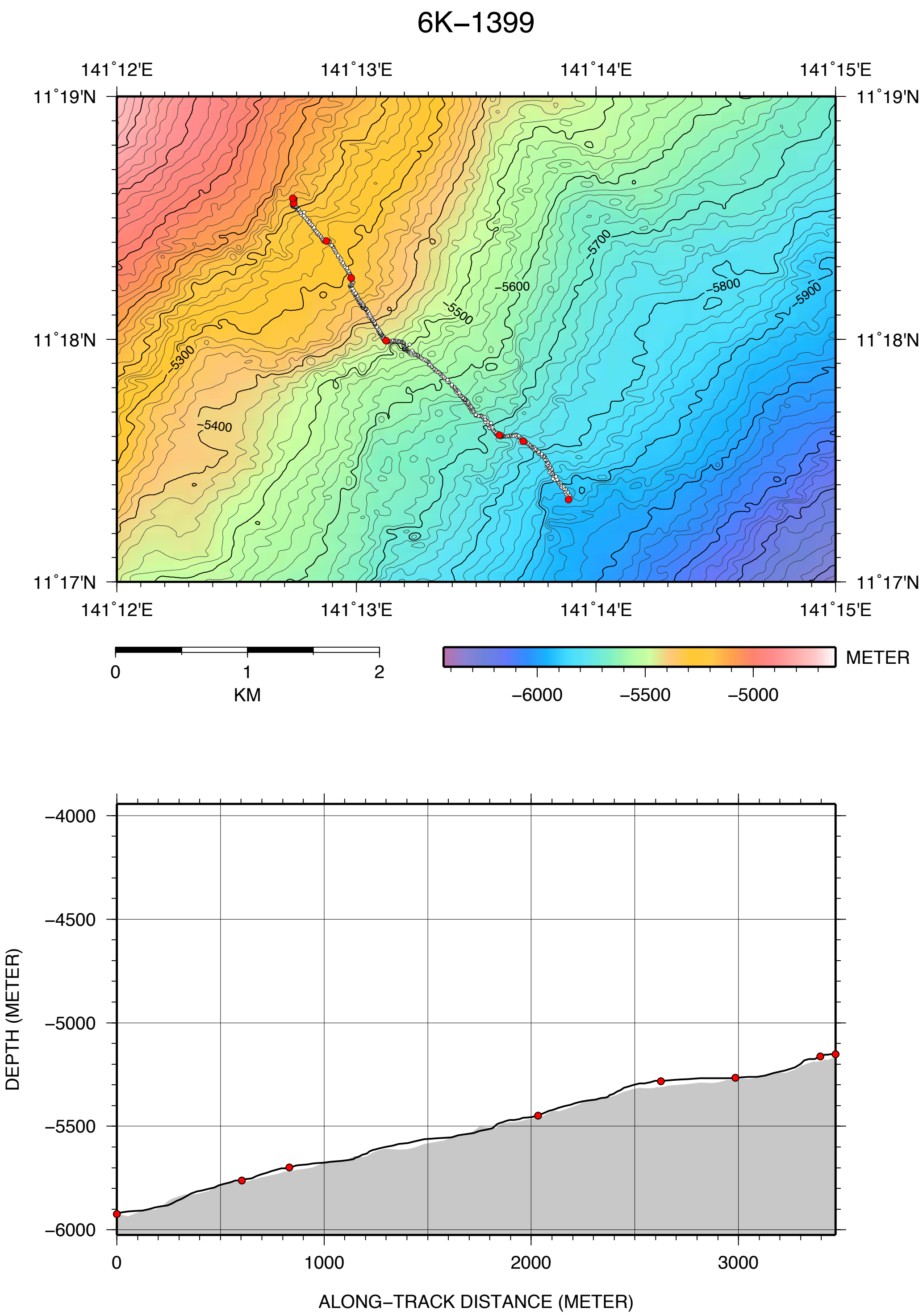
Payloads:

- Niskin sampler (1 bottle, 5 litter)
- D-WHATS with 6 bottles (2 sets of 3 bottles) + Thermometer
- H corer (4 cores)
- Imai corer (1 core)
- Sample box
- Scoop
- Multisensor
- Marker (2 sets)

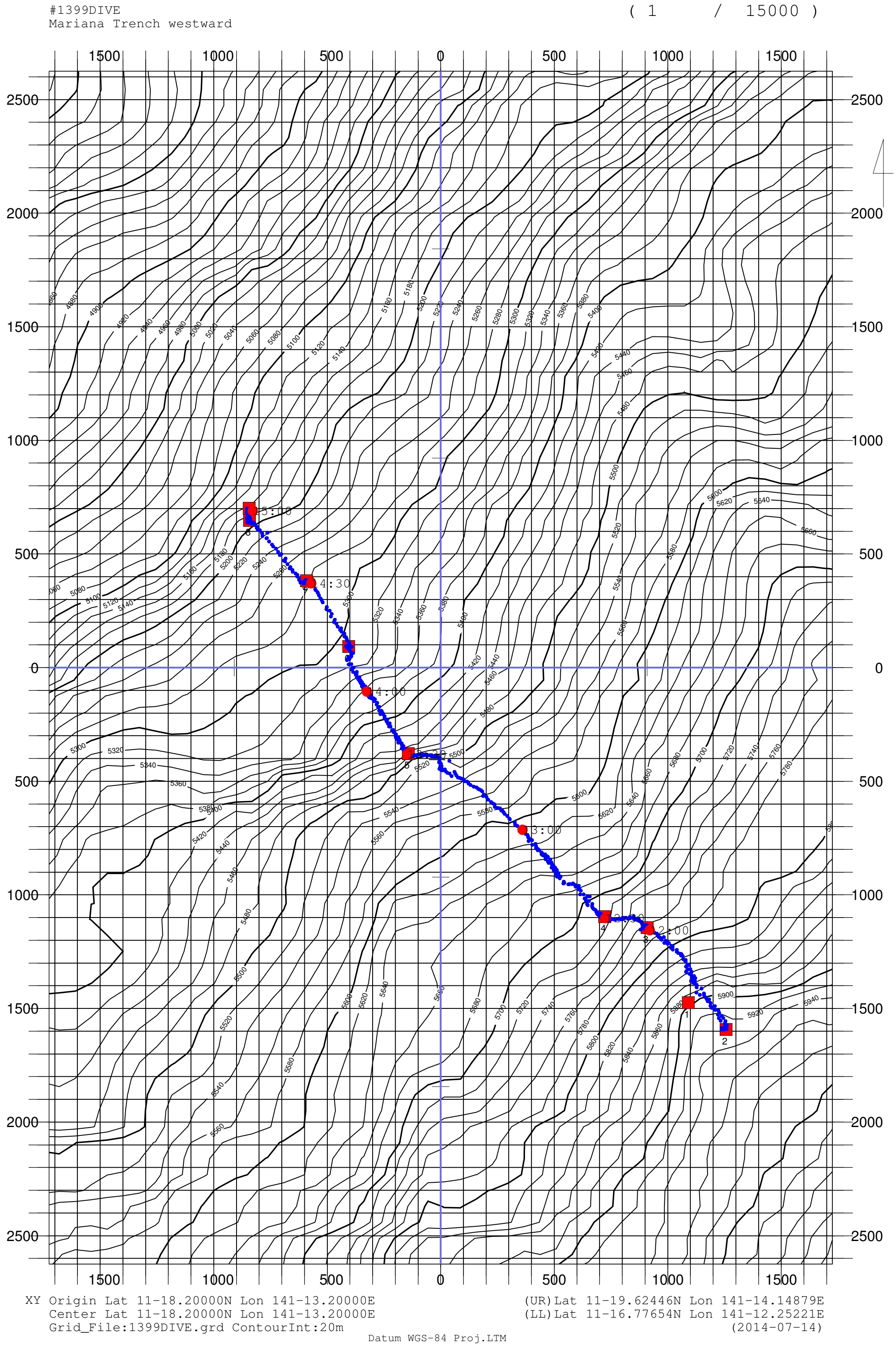
Event list: 6K-1399 (T. Okumura), July 14, 2014

No.	Time	X	Y	Lat	Lon	Depth (m)	Event
1	9:00	-1474.87	1091.79	11-17.4000N	141-13.8000E	5940	Target Point
2	11:37	-1593.6	1257.93	11-17.3356N	141-13.8913E	5920	Stop1: Landing, Sampling 3 rocks
3	12:07	-1143.95	909.82	11-17.5795N	141-13.7000E	5757	Stop 2: Sampling 3 rocks
4	12:32	-1096.21	722.76	11-17.6054N	141-13.5972E	5696	Stop 3: Sampling 1 rock
5	13:34	-378.86	-143.02	11-17.9945N	141-13.1214E	5443	Stop 4: Sampling 2 rocks
6	14:19	93.66	-405.22	11-18.2508N	141-12.9773E	5277	Stop 5: Sampling 2 rocks
7	14:35	382.19	-590.99	11-18.4073N	141-12.8752E	5263	Stop 6: Sampling 1 scoop (gravels)
8	14:55	648.23	-842.81	11-18.5516N	141-12.7368E	5205	Stop 7: Sampling 2 cores (#1, #2) & Niskin
9	15:07	701.51	-844.44	11-18.5805N	141-12.7359E	5147	Stop 8: Sampling 2 cores (#3, Imai) & 1 rock, Left Bottom

(X, Y) origin = (11-18.2000N, 141-13.2000E)



Bathymetric map and dive track profile for 6K-1399



X-Y map for 6K-1399

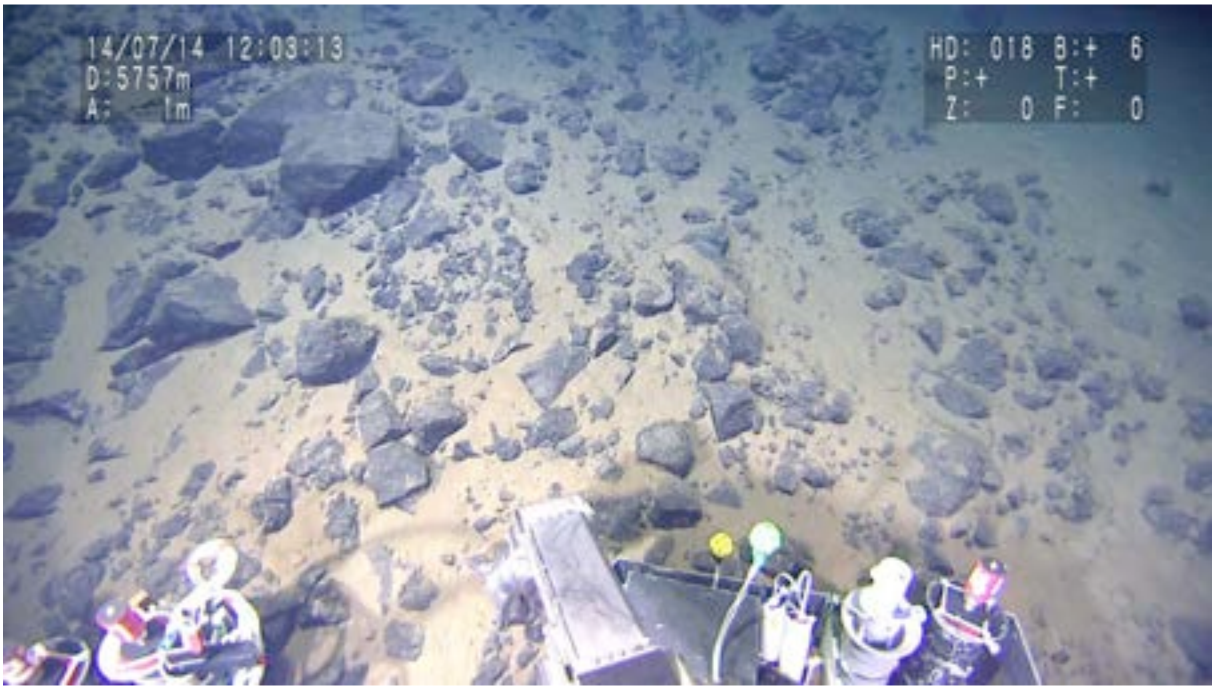


Photo 1. Seafloor at Stop 2. Three rocks (R04, R05, R06) were collected there. All these three rocks were troctolites.

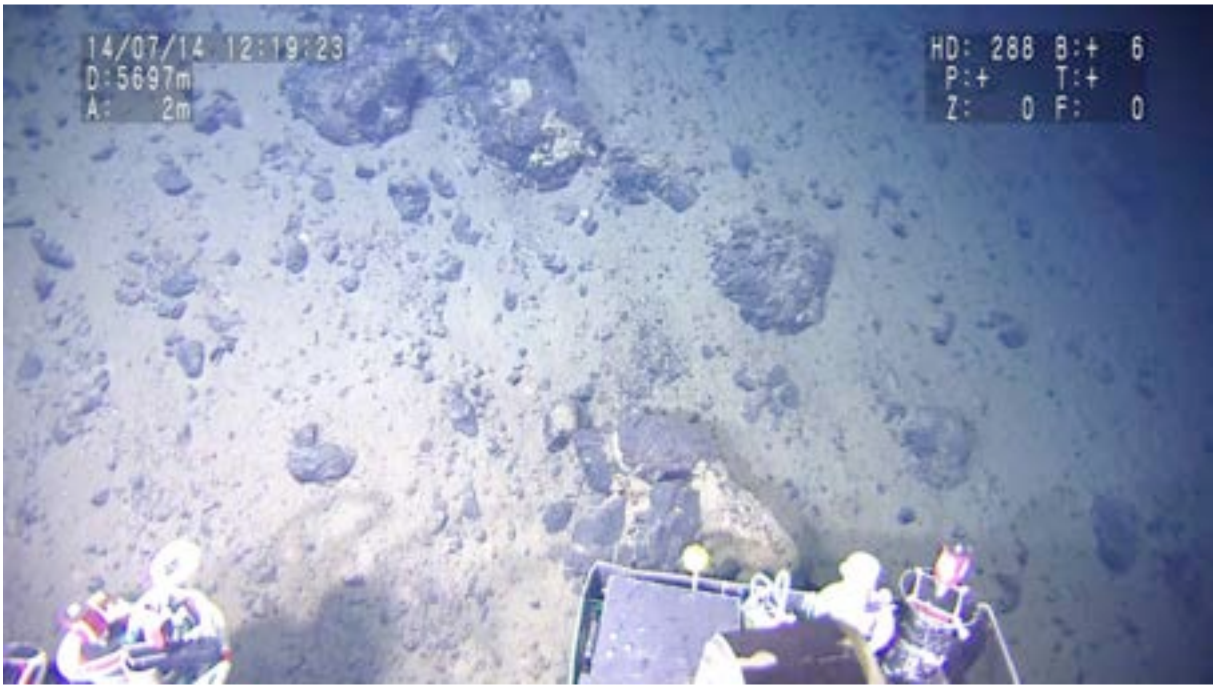


Photo 2. Seafloor at Stop 3. One rock (R07) was collected there. The rock was consisted of peridotite, serpentinized harzburgite, and troctolite.

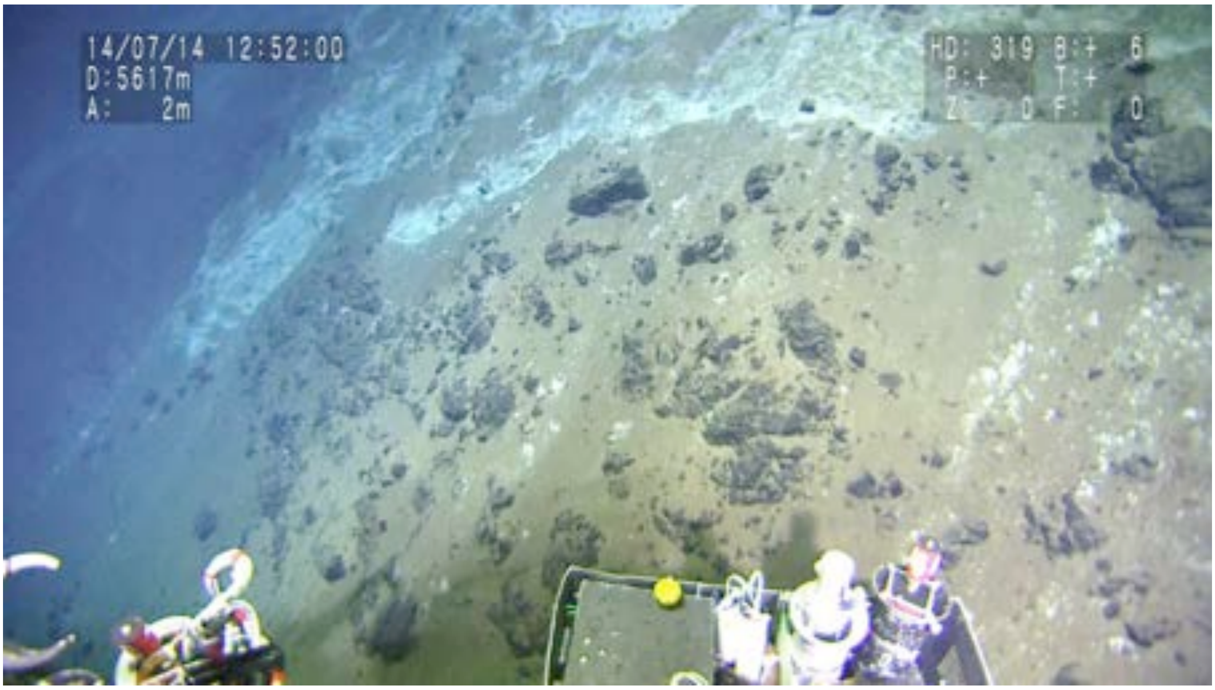


Photo 3. Seafloor at an informal stop. White precipitate layer within a steep slope with various size boulders.

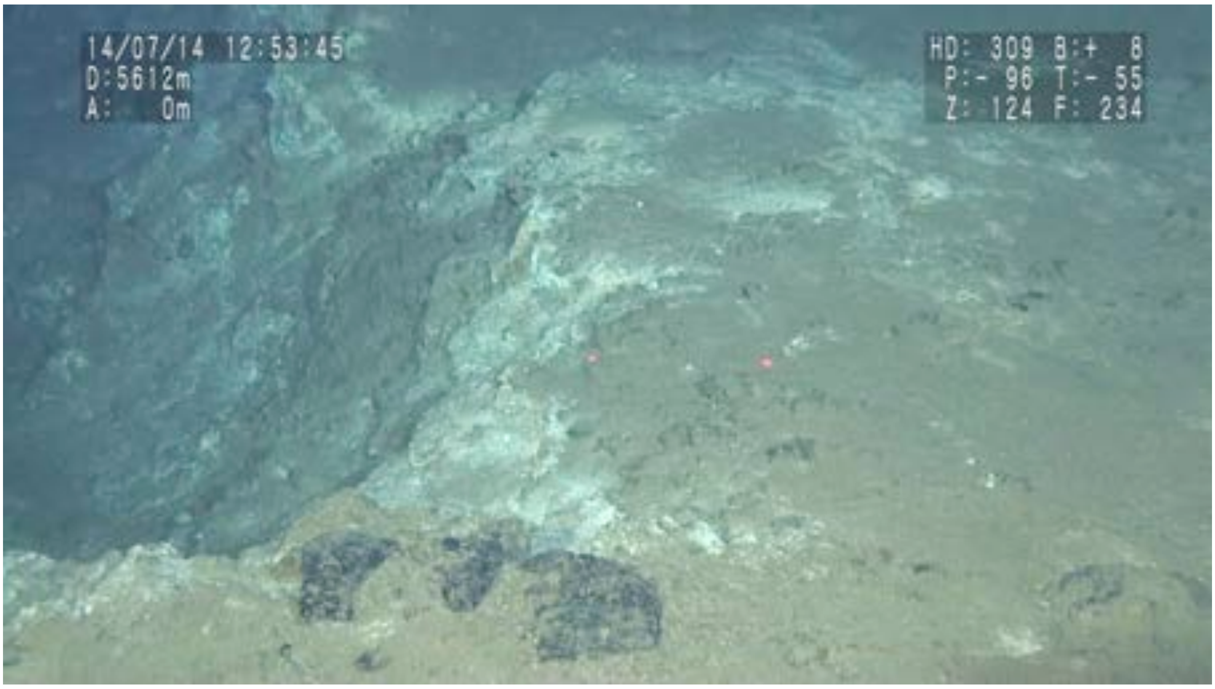


Photo 4. Close-up view of the white precipitate layer at the informal stop.

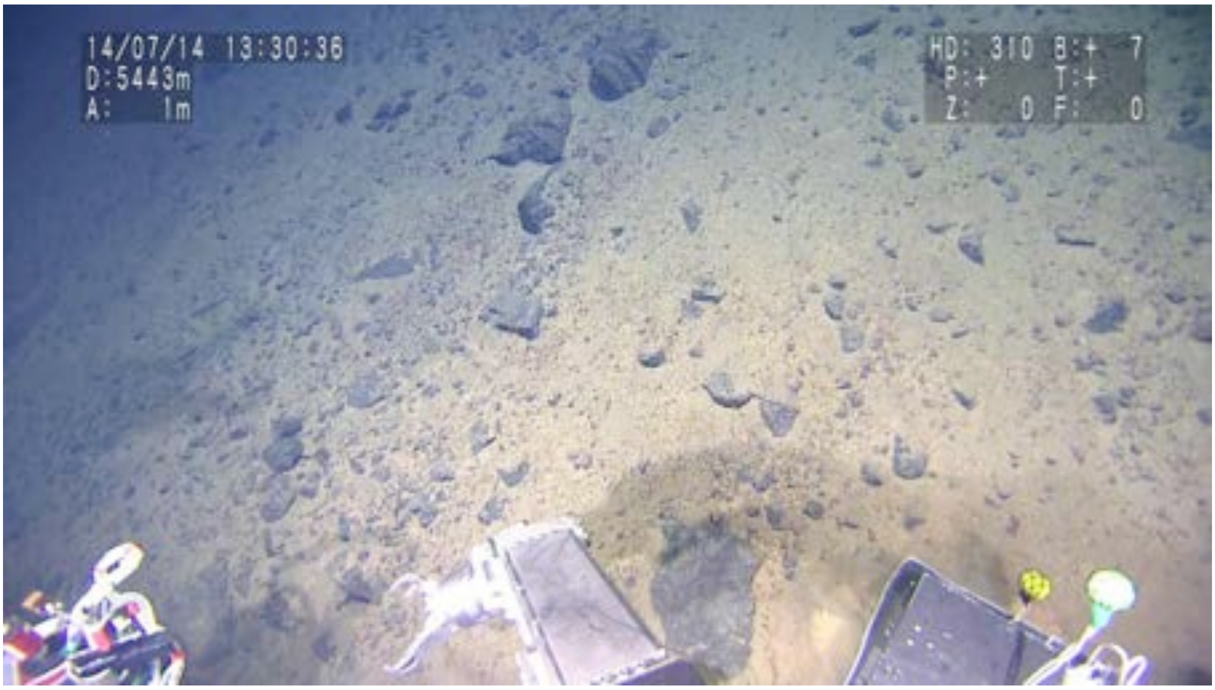


Photo 5. Seafloor at Stop 4. Two rocks (R08, R09) were collected. R08 was a perdiotite, and R09 was a volcanic sandstone, suggesting that the slope there consisted of talus piles.

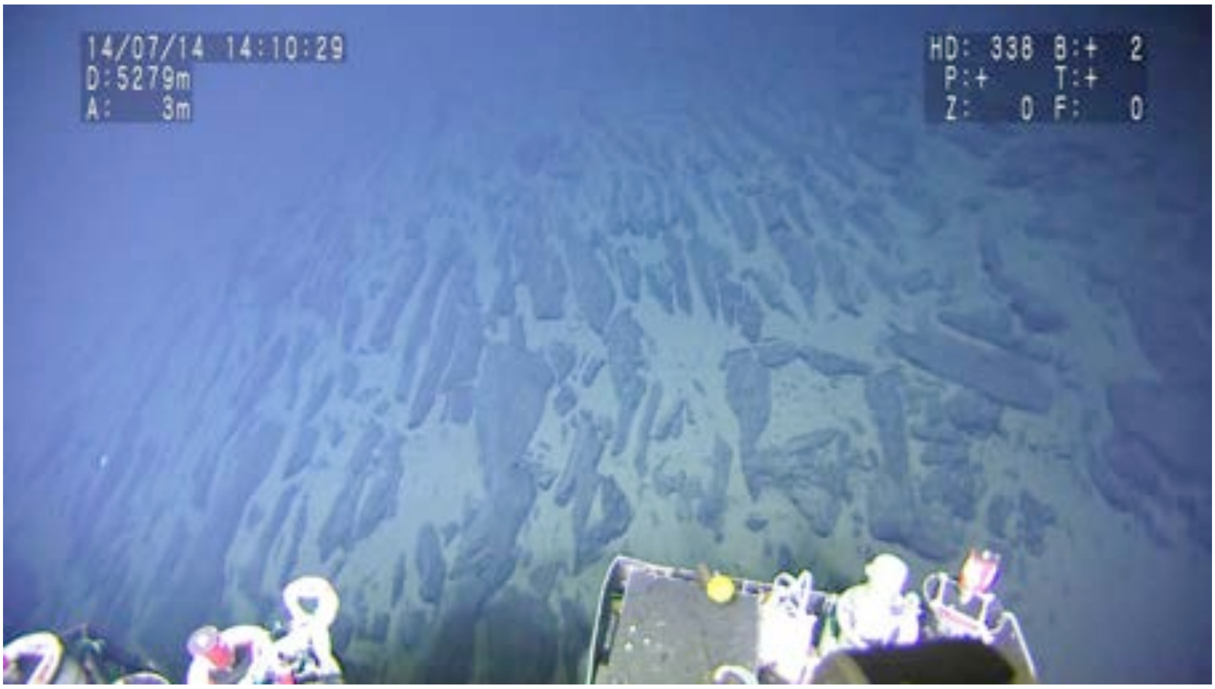


Photo 6. Seafloor at Stop 5, showing the dominant elongated ledges of mud.

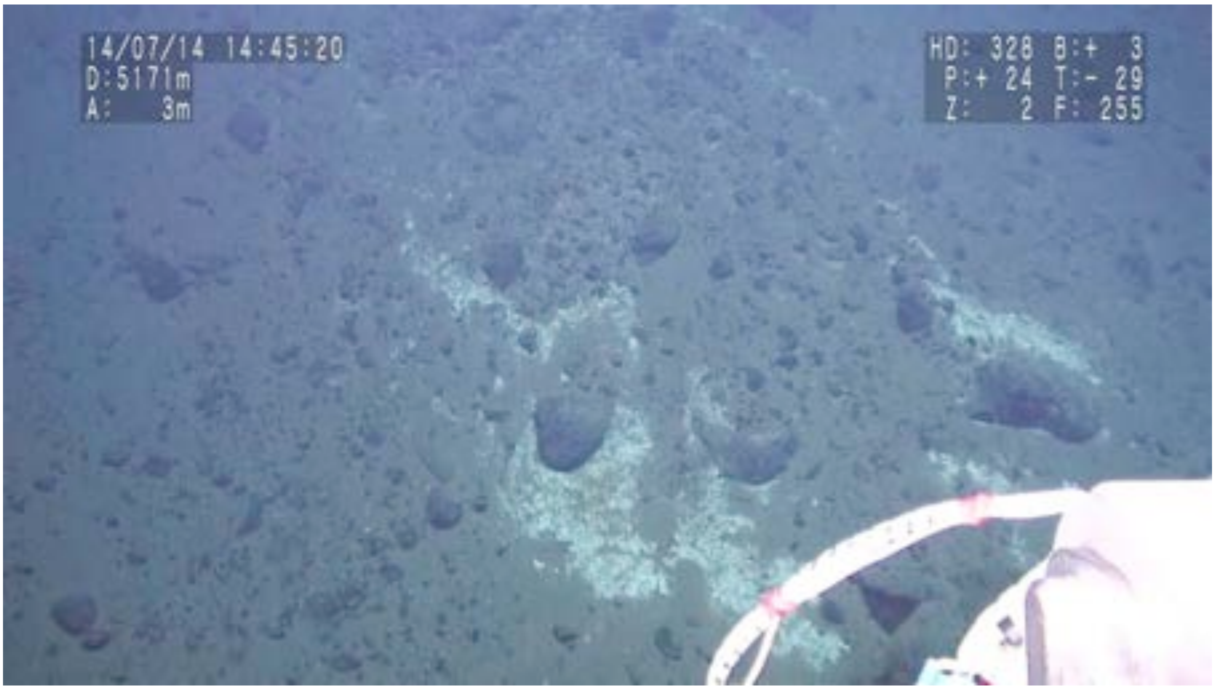


Photo 7. Seafloor at Stop 7. White precipitate layer within a steep slope with various size boulders, similar to that observed at the informal stop (see Photo 3).

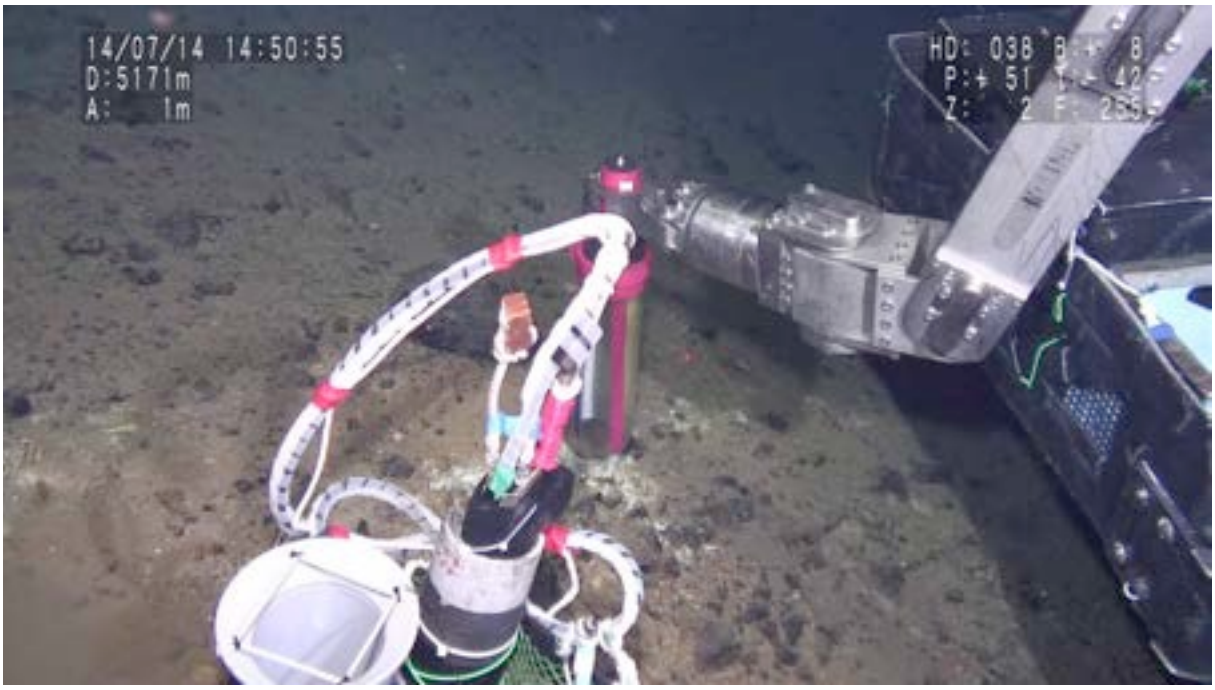


Photo 8. Sampling core #1 at Stop 7.

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A-4. 6K-1400 Dive Report

Date: July 15, 2014
Site: Northwestern slope of a linear ridge at the southwesternmost tip of the Mariana Trough (Site B)
Observer: Teruaki Ishii
Pilot: Keita Matsumoto, **Co-Pilot**: Masaya Katagiri

Objectives:
There have been almost no studies on the southwesternmost tip of the Mariana Trough, except an old unpublished work by Fryer et al. (F. Martinez, pers. com.). The southwesternmost tip of the Mariana Trough consists of a deep rift (= Southwestern Rift). **By analogy with the deep rift in the northern Mariana Trough (= Central Graben; Ohara et al., 2002), this rift may expose mantle peridotite and harbor serpentinite-hosted seeps. Furthermore, the targeted linear ridge resembles the "mantle slab" ridge proposed in ultraslow spreading ridges (e.g., in the Lena Trough; Snow et al., 2011).** The objective of 6K-1400 was therefore to know the geology and biology of the northwestern slope of a linear ridge.

Observations and operations:
The bottom came into sight at 10:57 at a depth of 4558 m. The Shinkai landed on the seafloor at 4568 m at 11:00. The landing point was a rubble floor with tan-color sediment. The water temperature by the 6K was 1.6°C.

Stop 1 was made at the landing point during 11:00-11:06. Three rocks (R01, R02, R03) were collected. All these three rocks were basalts. From Stop 1, the Shinkai headed to 155° to examine the steep slope. The slope was consisted of various size rubbles. Teruaki Ishii thought that this slope was covered by debris avalanche. White specks and white rocks were often observed on the seafloor (**Photo 1**).

In order to collect these white stuffs, the Shinkai made Stop 2 at 4516 m (at 11:15). Teruaki Ishii had an instinct that these white rocks were gabbros (**Photo 2**). Five rocks (R04, R05, R06, R07, R08) were collected at this stop during 11:15-11:21. R04, R05 and R06 were gabbros, whereas R07 and R08 were basalts. Upslope of Stop 2, the Shinkai headed to 150° to examine the steep slope.

At 4488 m (at 11:27), we encountered a diffuse layer of white precipitate (**Photo 3**). We made Stop 3 there. It turned out that the white precipitate layer is very fragile, and we used scoop to sample it (Scoop 1) (**Photo 4**). Then, two rocks (R09, R10) were collected. Both were fresh gabbros. The Shinkai left this stop at 11:41, headed to 150°. A steep, almost vertical slope continued upslope. The slope appeared to be fragmented outcrop, with ubiquitous white precipitates. At 4436 m (at 11:47), we encountered an outcrop consisted of massive blocks. The white precipitate formed as veins there (**Photo 5**). The vertical outcrop still continued at 4391 m (at 11:51).

At 4330 m (at 11:56), a local gully covered with talus rubbles were encountered. We made Stop 4 there. The rubbles included both white and gray colored ones. Four rocks (R11, R12, R13, R14) were collected. All these four were gabbros. In particular, R13 and R14 were heavily altered. The Shinkai left this stop at 12:08, headed to 150°. Upslope, a vertical slope exposing massive blocks continued. Teruaki Ishii thought that the outcrop might represent layered gabbro intrusion. Beginning at 4215 m (at 12:19), the seafloor became sediment-dominant, scattered with various size rubbles. At 4172 m (at 12:23), the slope again became steep (although not vertical), consisting of tan sediment scattered with various size rubbles.

We made Stop 5 at 4145 m (at 12:27). Bioturbation was observed on the sediment at Stop 5. Two rocks were collected (R15, R16). Both were altered basalts. The Shinkai left this stop at 12:36, headed to 150°. At 4121 m (at 12:40), the slope became vertical, consisting of fractured outcrop (**Photo 6**). **It should be noted that there were no white precipitates there.** Furthermore, the seafloor had sediment cover, in contrast to the observation between Stop 1 to Stop 5. At 4089 m (at 12:44), we encountered a near-vertical slope, exposing fractured blocks. The slope was also covered with thin sediment. At 4061 m (at 12:49), the slope became a gentle sedimented floor. It appeared that the Shinkai climbed up the vertical slope, arriving at the top of this slope.

We made Stop 6 at 4062 m (at 12:50). One rock on the sediment was collected (R17). R17 was an altered basalt. The Shinkai left this stop at 13:02, headed to 160°. To the next stop, the Shinkai traversed ~450 m horizontally. The slope was consisted of sedimented floor scattered with various size rubbles. On the sediment, bioturbation was often observed.

We made Stop 7 at 3860 m (at 13:23) on a steep slope scattered with rubbles (**Photo 7**). Three rocks (R18, R19, R20) were collected. All these three were altered basalts. The Shinkai left this stop at 13:30, headed to 170°. To the next stop, the Shinkai traversed ~900 m horizontally. The slope was consisted of sedimented floor scattered with various size rubbles. At 3755 m (at 13:38), the rubble included white ones. At 3730 m (at 13:40), we encountered a potential fractured outcrop often associated with white layers (**Photo 8**). At 3620 m (at 13:54), the slope became partly sedimented. At 3605 m (at 13:57), the Shinkai changed its heading to 220°. Then, at 3550 m (at 14:05), the Shinkai changed its heading to 160°. A gentler slope continued.

We made Stop 8 at 3488 m (at 14:15) on a gentler slope scattered with various size rubbles. One rock (R21) on the sediment was collected. R21 was an altered basalt. The Shinkai left this stop at 14:22, headed to 150°. To the next stop, the Shinkai traversed ~450 m horizontally. The slope was consisted of sedimented floor scattered with various size rubbles. At 3334 m (at 14:38), the density of rubbles increased. At 3302 m (at 14:41), the Shinkai changed its heading to 180°.

We made Stop 9 at 3235 m (at 14:50) on a rubble floor. One rock (R22) was collected. R22 was an altered basalt. The Shinkai left this stop at 14:56, headed to 180°. To the final stop, the Shinkai traversed ~150 m horizontally. Upslope, a rubble floor continued to the final stop.

We made final stop, Stop 10 at 3128 m (at 15:08) on the rubble floor. Four rocks (R23, R24, R25, R26) were collected. All these four were basalts. Then, scoop was used to sample the sediment (Scoop 2). Finally, Marker #170 was set there. The Shinkai secured the equipment and dropped ballast and left the bottom at 15:18.

Brief discussion:
6K-1400 examined a steep northwestern slope of a linear ridge at the westernmost tip of the Mariana Trough. It appears that there was an obvious lithological boundary at around 4145 m (at Stop 5). Below that depth, the slope had massive, blocky appearance of gabbro often associated with white precipitate layer. In contrast, above that depth, the slope had fractured

appearance (often in the form of rubble field) of basalt not associated with white precipitate layer. However, at around 3730 m, the slope had the potential outcrop associated with white precipitate layer, suggesting that gabbroic intrusion was occurred there (**Photo 8**). In comparison with the results of 6K-1401, the linear ridge examined by 6K-1400 is far less sedimented and therefore appears to be tectonically active, suggesting that rifting of the southwesternmost Mariana Trough is ongoing.

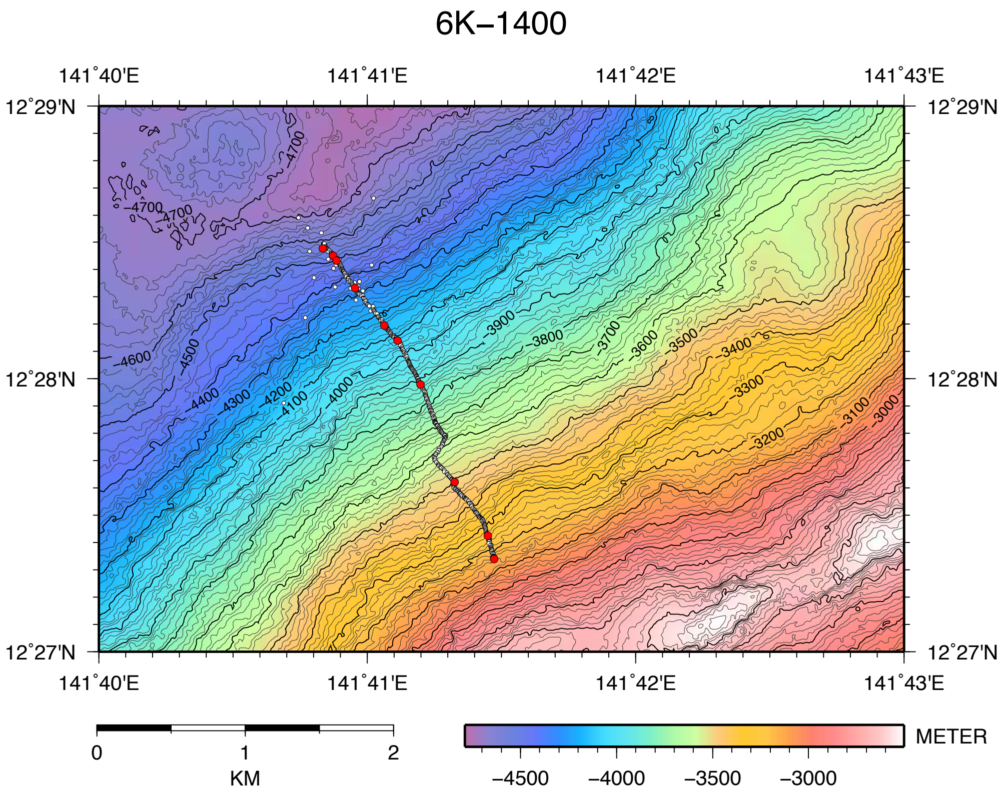
Payloads:

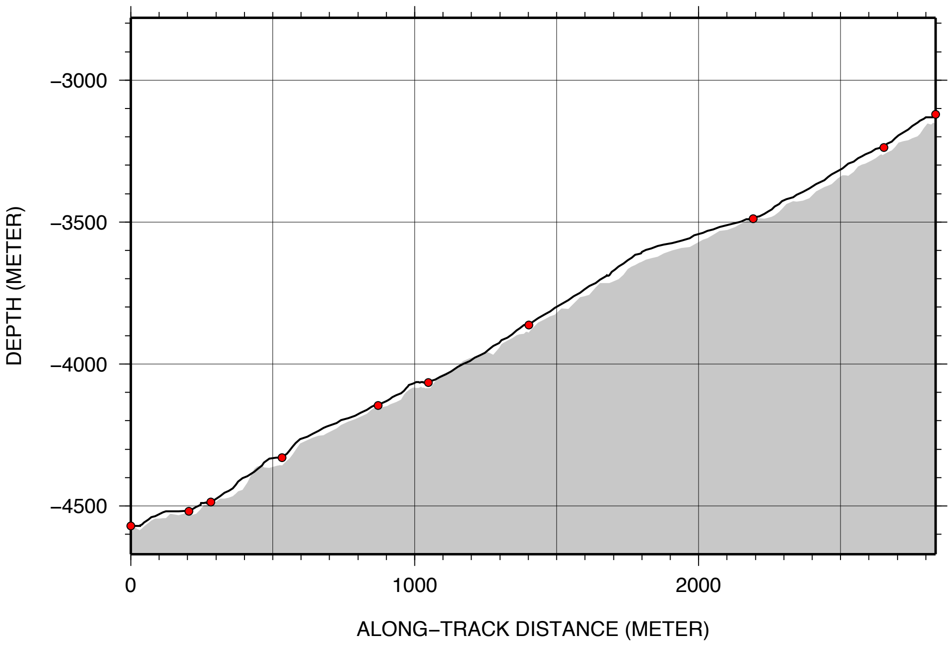
- Niskin sampler (1 bottle)
- D-WHATS with 6 bottles (2 sets of 3 bottles) + Thermometer
- Thermometer
- H corer (4 cores)
- Imai corer (1 core)
- Sample box
- Scoop
- Multisensor
- Marker (2 sets)

Event list: 6K-1400 (T. Ishii), July 15, 2014

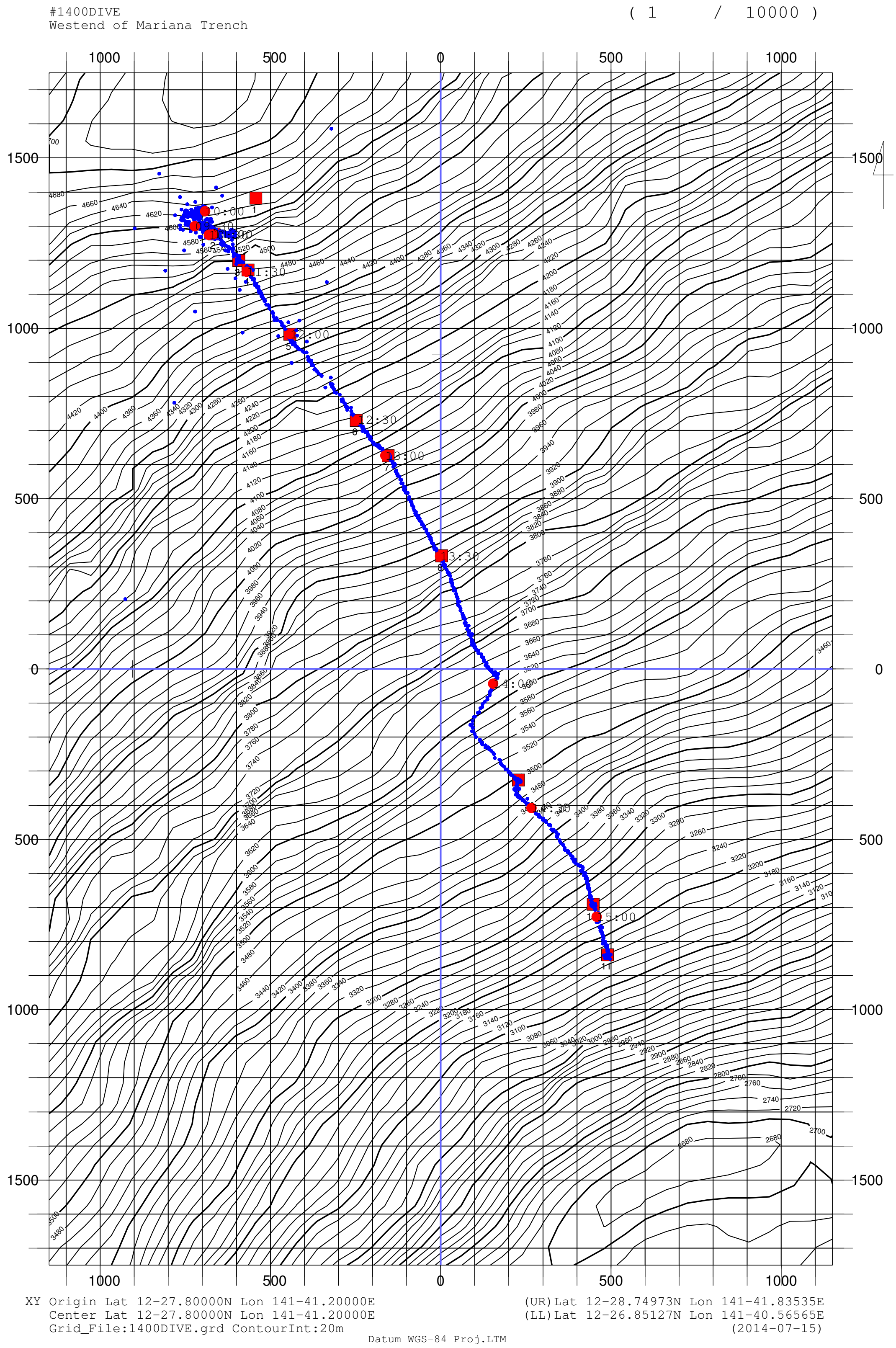
No.	Time	X	Y	Lat	Lon	Depth (m)	Event
1	9:00	1382.83	-543.54	12-28.5500N	141-40.9000E	4600	Target point
2	11:02	1277.37	-666.74	12-28.4928N	141-40.8320E	4568	Stop 1: Landing, Sampling 3 rocks
3	11:21	1199.19	-593.91	12-28.4504N	141-40.8722E	4516	Stop 2: Sampling 5 rocks
4	11:40	1170.98	-566.92	12-28.4351N	141-40.8871E	4487	Stop 3: Sampling 1 scoop (white precipitate) & 2 rocks
5	12:07	982.36	-443.35	12-28.3328N	141-40.9553E	4328	Stop 4: Sampling 4 rocks
6	12:35	730.69	-248.4	12-28.1963N	141-41.0629E	4133	Stop 5: Sampling 2 rocks
7	13:01	626.33	-154.37	12-28.1397N	141-41.1148E	4062	Stop 6: Sampling 1 rock
8	13:29	332.43	2.9	12-27.9803N	141-41.2016E	3860	Stop 7: Sampling 3 rocks
9	14:22	-326.16	228.48	12-27.6231N	141-41.3261E	3485	Stop 8: Sampling 1 rock
10	14:56	-691.22	448.81	12-27.4251N	141-41.4477E	3234	Stop 9: Sampling 1 rock
11	15:20	-839.83	490.85	12-27.3445N	141-41.4709E	3119	Stop 10: Sampling 4 rocks & 1 scoop (gravels), Set #170 Marker, Left bottom

(X, Y) origin = (12-27.8000N, 141-41.2000E)





Bathymetric map and dive track profile for 6K-1400



X-Y map for 6K-1400

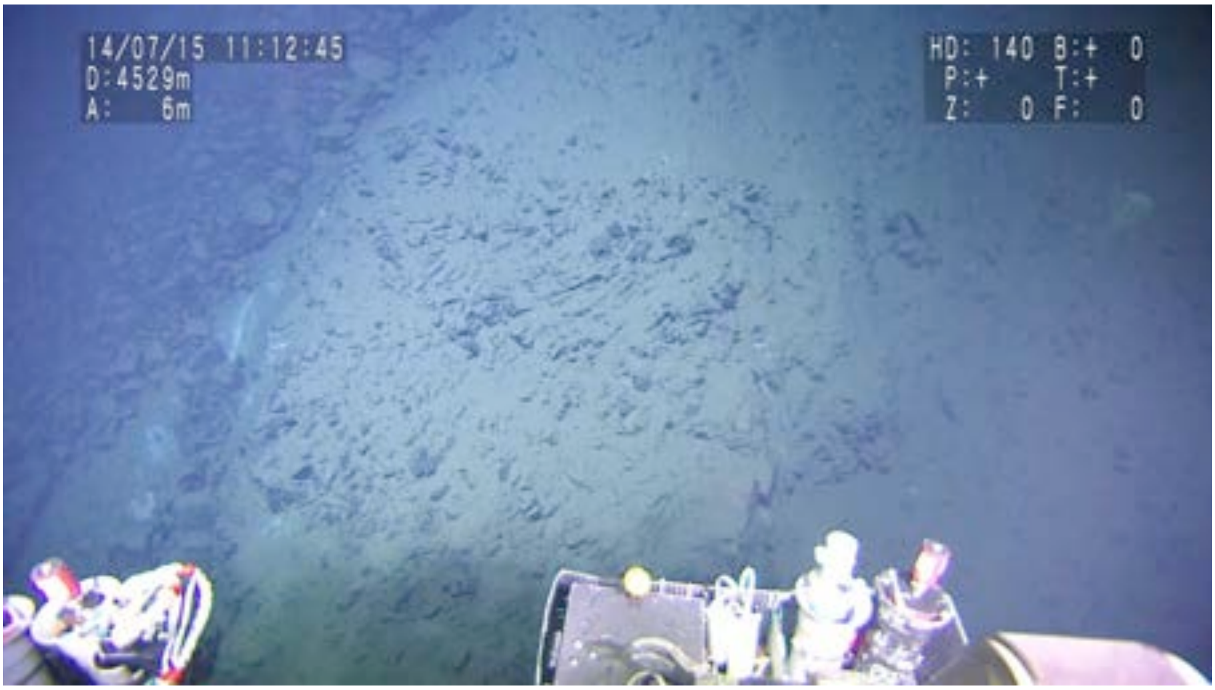


Photo 1. Seafloor upslope of Stop 1. White specks were often observed on the seafloor there.

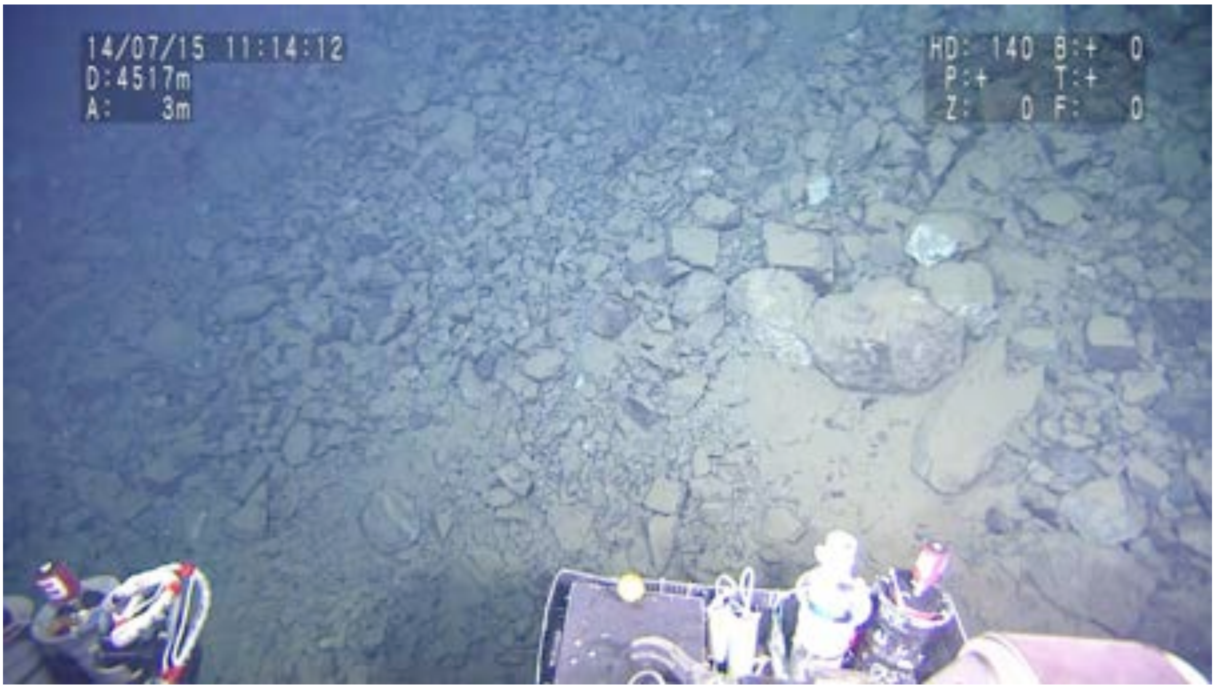


Photo 2. Seafloor at Stop 2. Five rocks were collected there; three were gabbros and two were basalts.

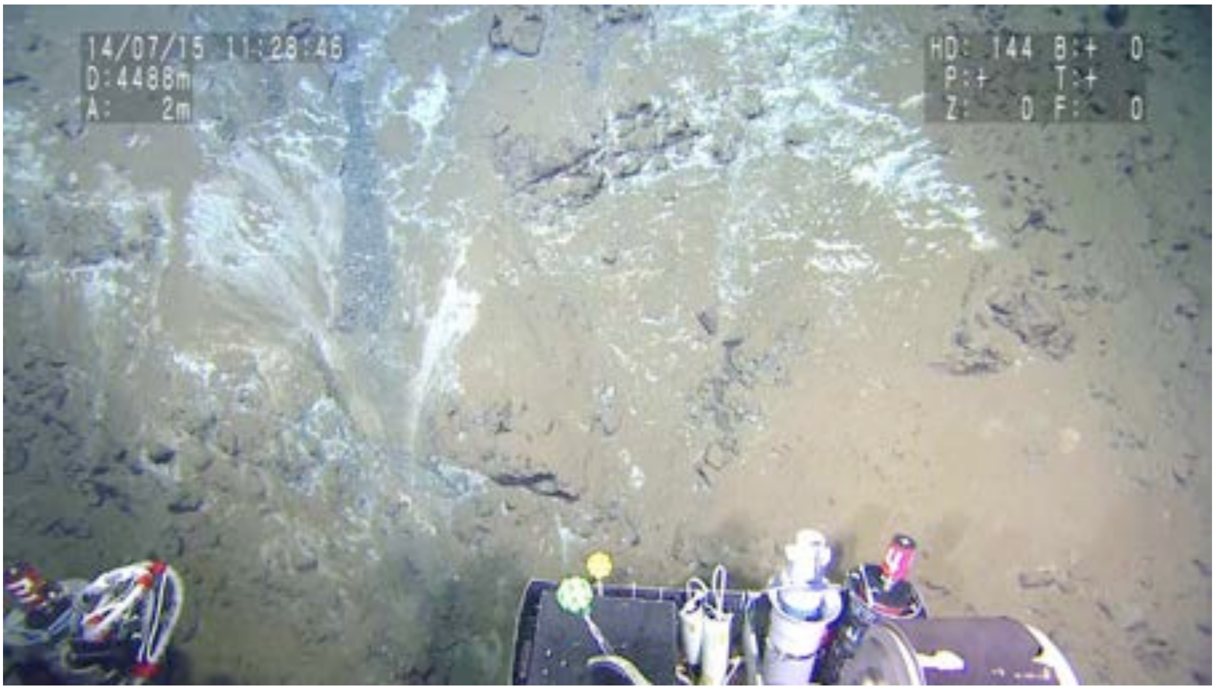


Photo 3. Seafloor at Stop 3. Diffuse layer of white precipitate is observed.

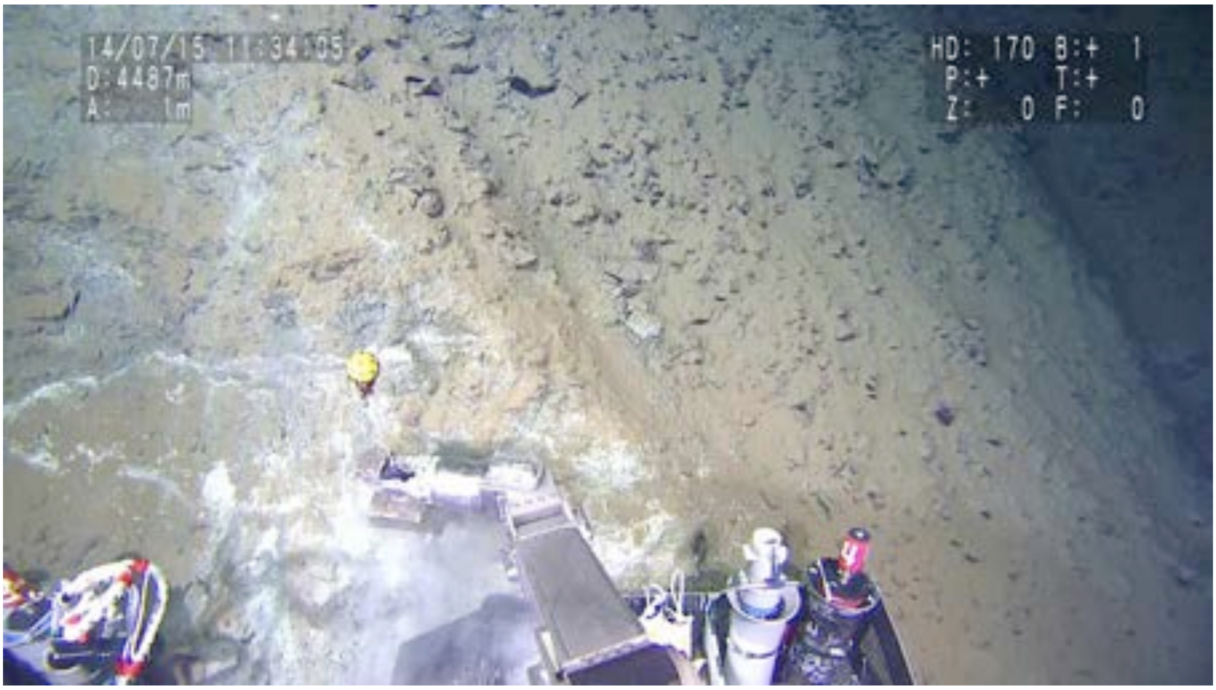


Photo 4. Sampling the white precipitate layer with scoop (Scoop 1) at Stop 3.

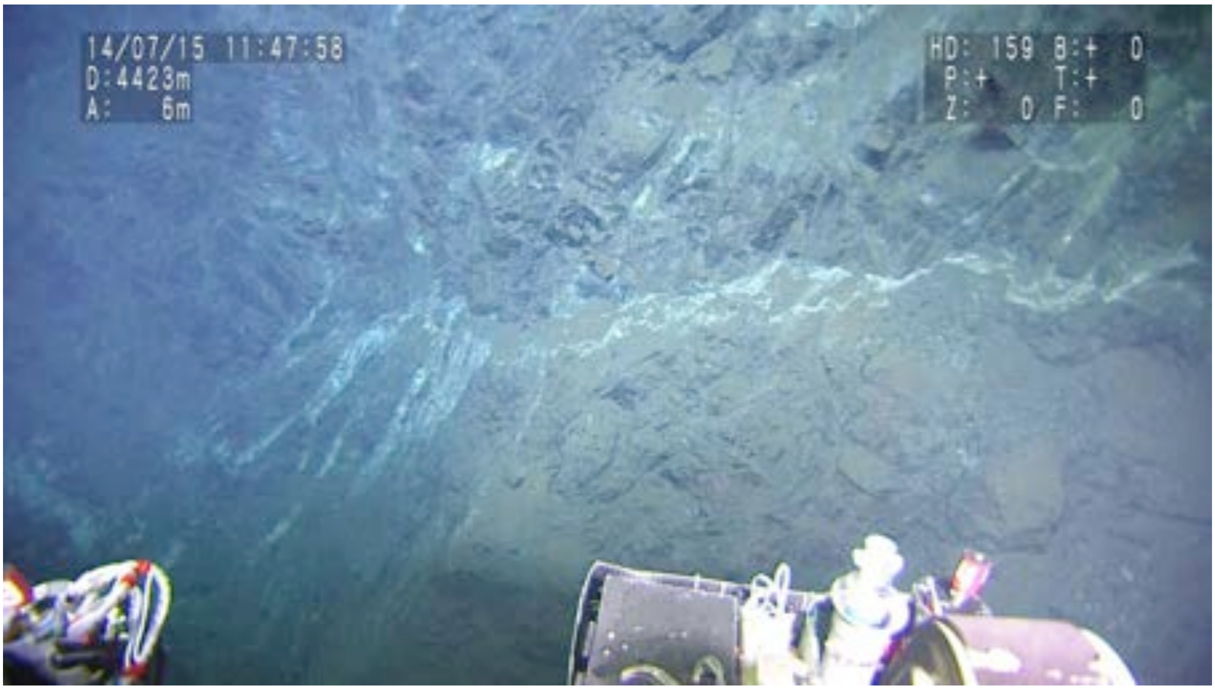


Photo 5. Seafloor upslope of Stop 4. Potential gabbroic outcrop with white precipitate as veins.

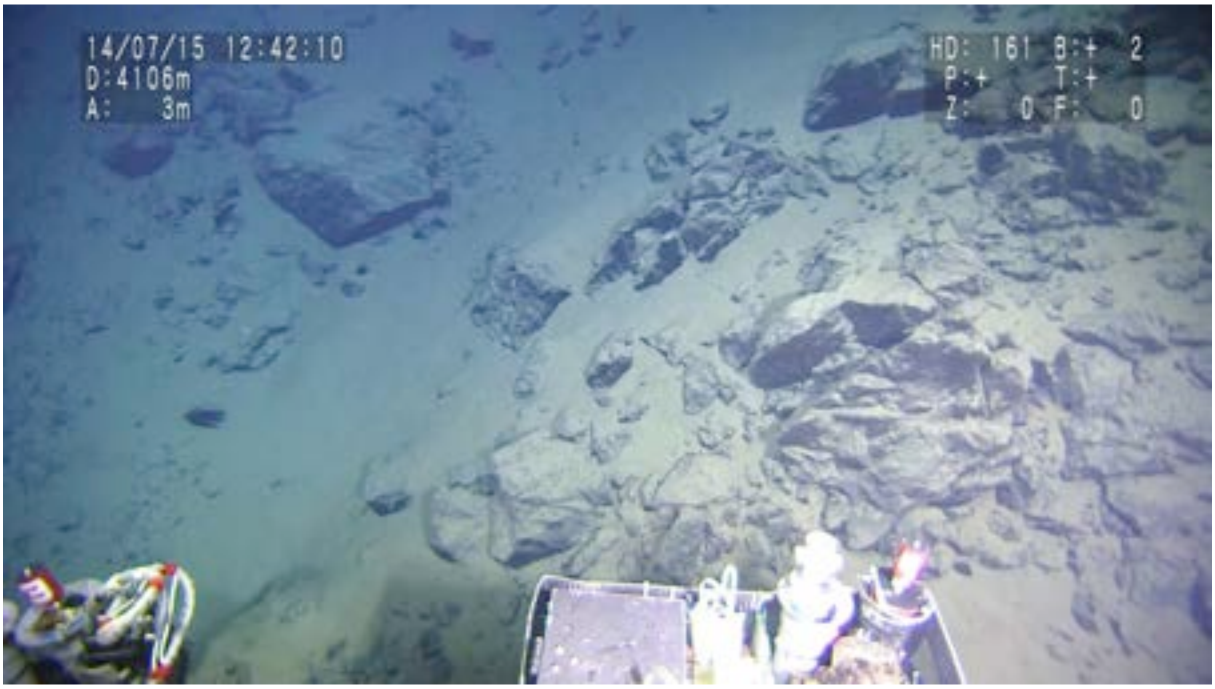


Photo 6. Seafloor upslope of Stop 5. Potential fractured outcrop of basalt.

Photo 7. Seafloor at Stop 7. A steep slope with basaltic rubbles.

Photo 8. Seafloor upslope of Stop 7. Potential gabbroic intrusive outcrop with white precipitate layer. Unfortunately, no rock samples were collected there.

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A-5. 6K-1401 Dive Report

Date: July 16, 2014
Site: Northeastern slope of the Southwestern Rift, the southwesternmost tip of the Mariana Trough (Site B)
Observer: Hiromi Watanabe
Pilot: Yoshitaka Sasaki, **Co-Pilot**: Keigo Suzuki

Objectives:
There have been almost no studies on the southwesternmost tip of the Mariana Trough, except an old unpublished work by Fryer et al. (F. Martinez, pers. com.). The southwesternmost tip of the Mariana Trough consists of a deep rift (= Southwestern Rift). **By analogy with the deep rift in the northern Mariana Trough (= Central Graben; Ohara et al., 2002), this rift may expose mantle peridotite and harbor serpentinite-hosted seeps.** The objective of 6K-1401 was therefore to know the geology and biology of the northeastern slope of the Southwestern Rift.

Note:
Because of some troubles in setting up of the Shinkai system, the time reads on the video was ~10 seconds later than the actual time. The actual time was recorded as the time core of the video.

Observations and operations:
The bottom came into sight at 11:44 at a depth of 5540 m. The Shinkai landed on the seafloor at 5546 m at 11:48. The landing point was a tan-colored sediment floor, with many traces of biological activities and a few gravels. The water temperature by the 6K was 1.7°C. The Shinkai immediately headed to 30° (later 45°) to get to a cliff to collect rock samples. At 11:54 (at 5506 m), we encountered a local cliff, consisting of alternating layer of white and tan sediments (**Photo 1**). After this point, a sediment-dominant gentle slope continued. At 12:00 (at 5473 m), the Shinkai changed its heading to 35°.

We made Stop 1 at 12:05 (at 5467 m) to collect the rocks scattered on sedimented floor. Three rocks (R01, R02, R03) were collected at this stop during 12:07-12:21. R01 was a mud, R02 was a basalt, and R03 was a pumice. At 12:24, the Shinkai resumed moving upslope (30°). At 5424 m (at 12:30), the number of scattered rocks on sedimented floor increased.

At 5412 m (at 12:33), we encountered a local cliff, a potential outcrop, exposing fractured rocks (**Photo 2**). The outcrop had a joint structure, being looked like a sheeted dyke complex. We made Stop 2 there, and two rocks (R04, R05) were collected at 12:44 (at 5403 m). R04 was a mud, and R05 was an altered volcanic sandstone.

The Shinkai then moved upslope, headed to 30°. Beginning at 5358 m (at 12:50) to 5340 m (at 12:52), platy rocks were dominated on the sedimented floor. At 5329 m (at 12:54), we encountered a local cliff consisted of talus piles, and made Stop 3 there (**Photo 3**). Two rocks (R06, R07) were collected at 13:00. Both were massive basalts.

The Shinkai then moved upslope, headed to 65°. The slope was more or less sedimented, sometimes with scattered platy rocks. Hiromi Watanabe noted the biology observed so far was for hard rock species rather than for sediment, thereby argued that sediment cover there might be thinner. Biological turbation was often seen upslope. At 5237 m (at 13:11), a protruded intrusion was passed.

We made Stop 4 at 5188 m (at 13:17) at a local talus cliff. Two rocks (R08, R09) were collected at 13:24. R08 was a mud and R09 was a bit altered basalt.

The Shinkai then moved upslope at 13:25. The slope was again more or less sedimented, sometimes with scattered rocks. At 5162 m (at 13:28), a white layered structure was seen. Beginning at 5130 m (at 13:33) to 5117 m (at 13:34), the number of scattered rocks increased. At 5101 m (at 13:36), the slope became steeper. At around 5083 m (at 13:38), some scattered white patches were seen on the sedimented floor. Beginning at 5032 m (at 13:45), the slope was dominated by large size blocks and the slope was steepening. At 5013 m (at 13:49), we made Stop 5 (**Photo 4**) and collected a rock (R10), which was a volcanic sandstone at 13:58.

At 13:59, the Shinkai started moving upslope, headed to 60°. At 4983 m (at 14:06), a talus pile exposing grayish inner was seen (**Photo 5**). At 14:07, the Shinkai changed the course to 30°. Beginning at 4996 m (at 14:17), the number of small to medium gravels increased as the slope became steeper. The slope became almost vertical at 4950 m (at 14:20). The steep slope sometimes exposed layered structure of volcanic sediments (**Photo 6**). Upslope of 4874 m (at 14:25), the slope was still steep but more sedimented.

At 14:39 (at 4768 m), we saw a local cliff exposing developed layer structure of volcanic sand (**Photo 7**). Just ~10 m above the cliff, we made Stop 6 at 4753 m (at 14:41). Two rocks (R11, R12) were collected; both were scoria.

After sampling, the Shinkai immediately moved (headed to 0°) upslope at 14:45. A steep slope continued, exposing black small to medium gravels. Beginning at 4705 m (at 14:48), the slope consisted of massive lava-like structure, sometimes with layers (**Photo 8**). At 4682 m (at 14:52), the Shinkai was headed to 30°.

The Shinkai finally stopped at the basement of the summit at 4616 m (at 15:04), the target point of this dive, and we made Stop 7 there. A rock (R13) was collected (**Photo 9**). R13 was a scoria. The Shinkai secured the equipment and dropped ballast and left the bottom at 15:10.

Brief discussion:
To the contrary to the initial hypothesis that the Southwestern Rift may expose mantle peridotite and harbor serpentinite-hosted seeps, 6K-1401 only recovered altered volcanics. It should be further noted that the seafloor examined by the dive was more or less sedimented. These observations may suggest that the Southwestern Rift is not associated with the Mariana Trough, but it exposes crustal materials of the old West Mariana Ridge.

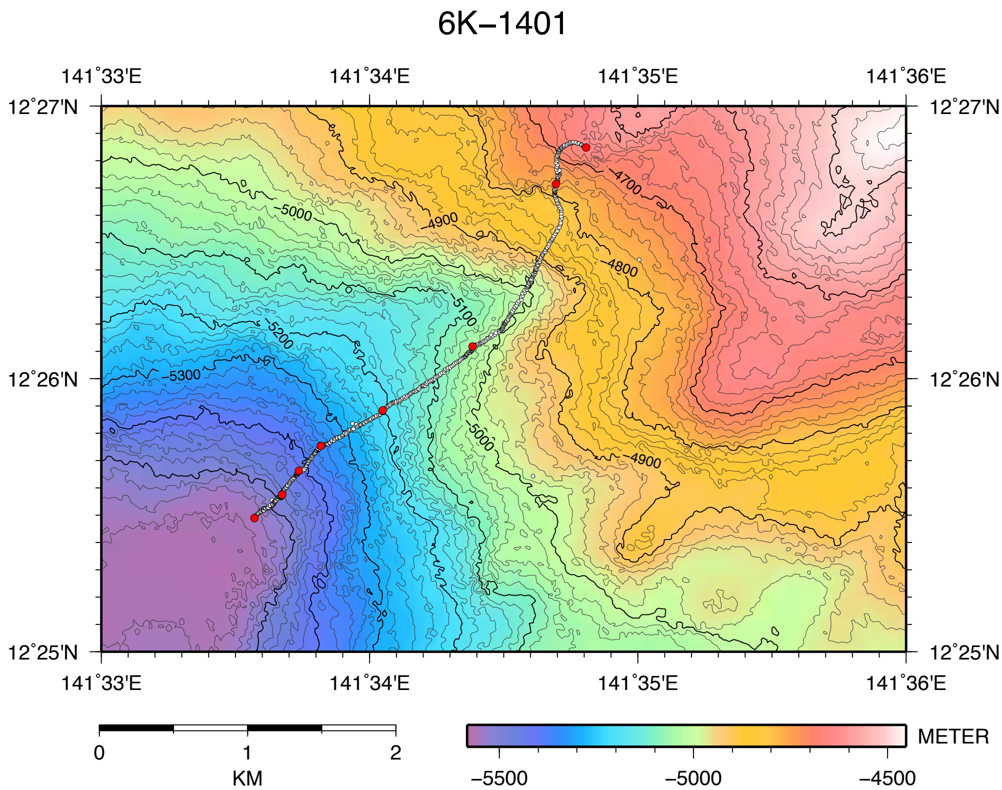
Payloads:
- Niskin sampler (1 bottle)
- D-WHATS with 6 bottles (2 sets of 3 bottles) + Thermometer
- Thermometer
- H corer (4 cores)
- Imai corer (1 core)
- Sample box
- Scoop
- Multisensor

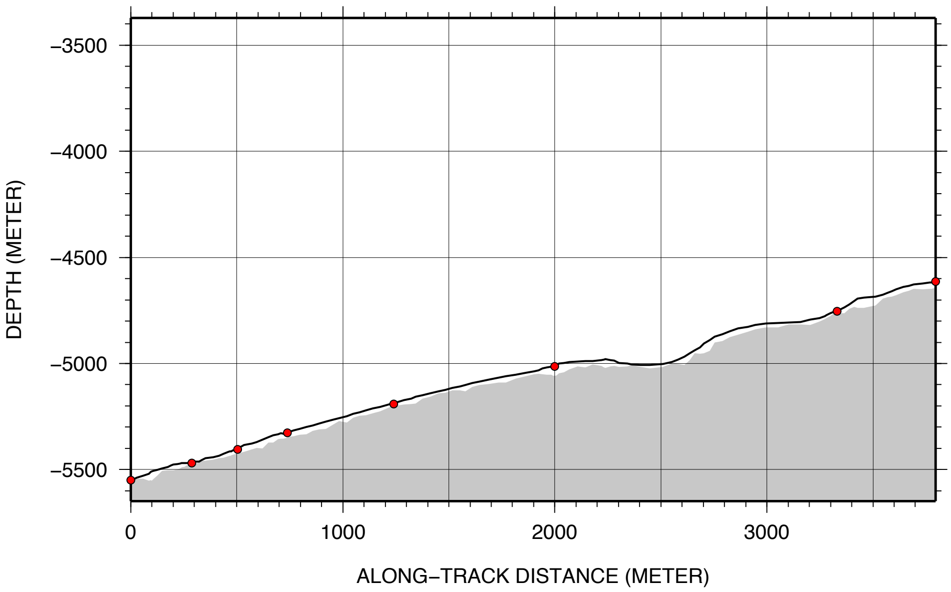
- Marker (2 sets)

Event list: 6K-1401 (H. Watanabe), July 16, 2014

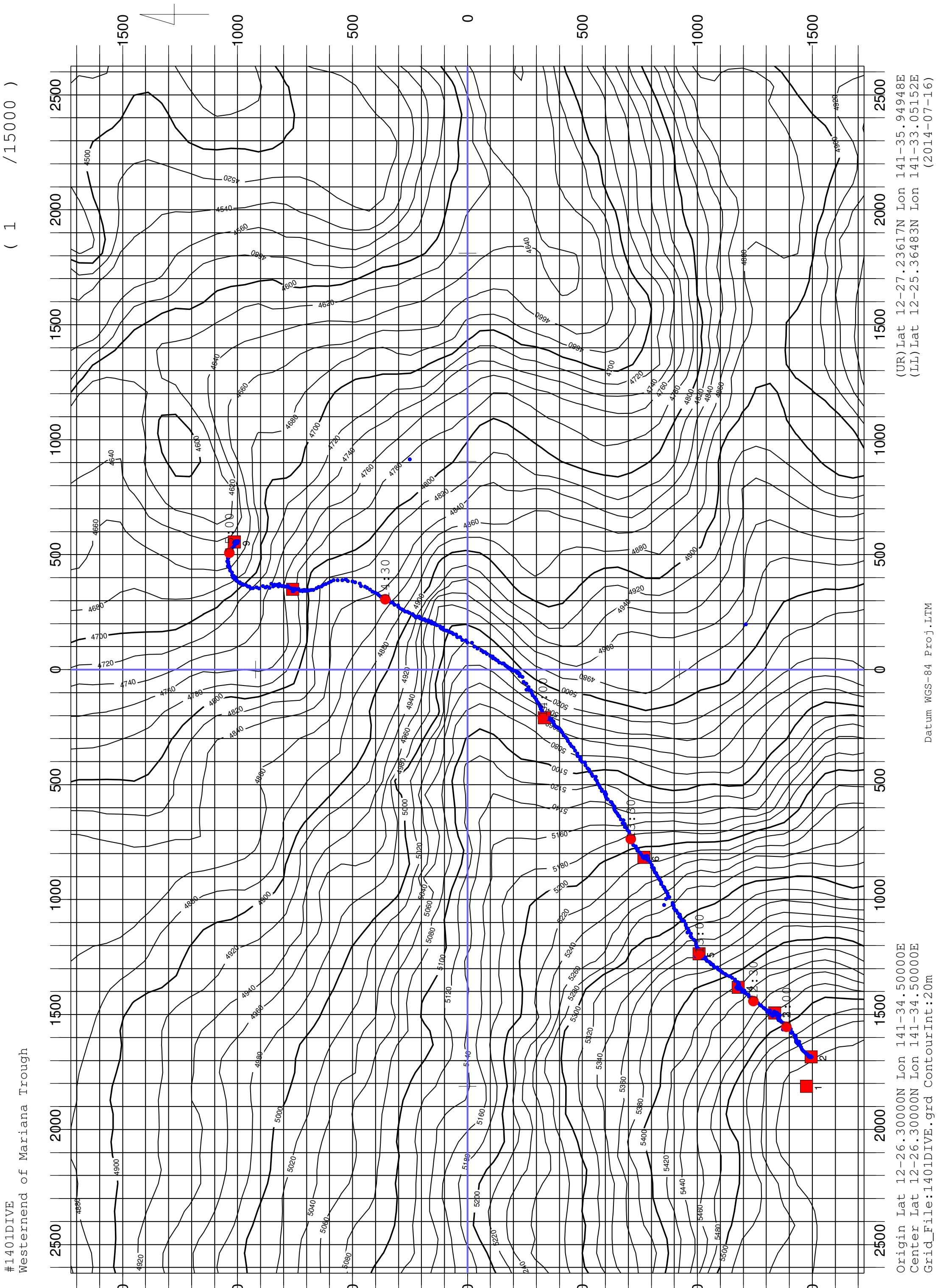
No.	Time	X	Y	Lat	Lon	Depth (m)	Event
1	9:00	-1474.95	-1812.15	12-25.5000N	141-33.5000E	5500	Target point
2	11:48	-1495.43	-1684.58	12-25.4889N	141-33.5704E	5546	Landing
3	12:21	-1335.95	-1493.02	12-25.5754N	141-33.6761E	5467	Stop 1: Sampling 3 rocks
4	12:44	-1177.95	-1382.84	12-25.6611N	141-33.7369E	5403	Stop 2: Sampling 2 rocks
5	13:01	-1007.59	-1235.87	12-25.7535N	141-33.8180E	5325	Stop 3: Sampling 2 rocks
6	13:25	-767.36	-817.44	12-25.8838N	141-34.0489E	5188	Stop 4: Sampling 2 rocks
7	13:58	-334.64	-209.48	12-26.1185N	141-34.3844E	5014	Stop 5: Sampling 1 rock
8	14:45	761.48	349.9	12-26.7130N	141-34.6931E	4753	Stop 6: Sampling 2 rocks
9	15:10	1014.44	555.74	12-26.8502N	141-34.8067E	4615	Stop 7: Sampling 1 rock, Left Bottom

(X, Y) origin = (12-26.3000N, 141-34.5000E)





Bathymetric map and dive track profile for 6K-1401



X-Y map for 6K-1401

Photo 1. Seafloor just above Stop 1. A local cliff consisting of alternating layer of white and tan sediments.

Photo 2. Seafloor at Stop 2. A local cliff exposing fractured rocks.

Photo 3. Seafloor at Stop 3. A local cliff consisted of talus piles.

Photo 4. Seafloor at Stop 5.

Photo 5. Seafloor above Stop 5. A talus pile exposing grayish inner.

Photo 6. Seafloor between Stops 5 and 6. A steep slope exposing layered structure of volcanic sediments.

Photo 7. Seafloor near Stop 6. A local cliff exposing developed layer structure of volcanic sand. Judging from samplings at Stops 6 and 7, the volcanic sand can be scoriaceous.

Photo 8. Seafloor near Stop 7. A slope consisting of massive lava-like structure with layers. The layers can be scroriaceous.

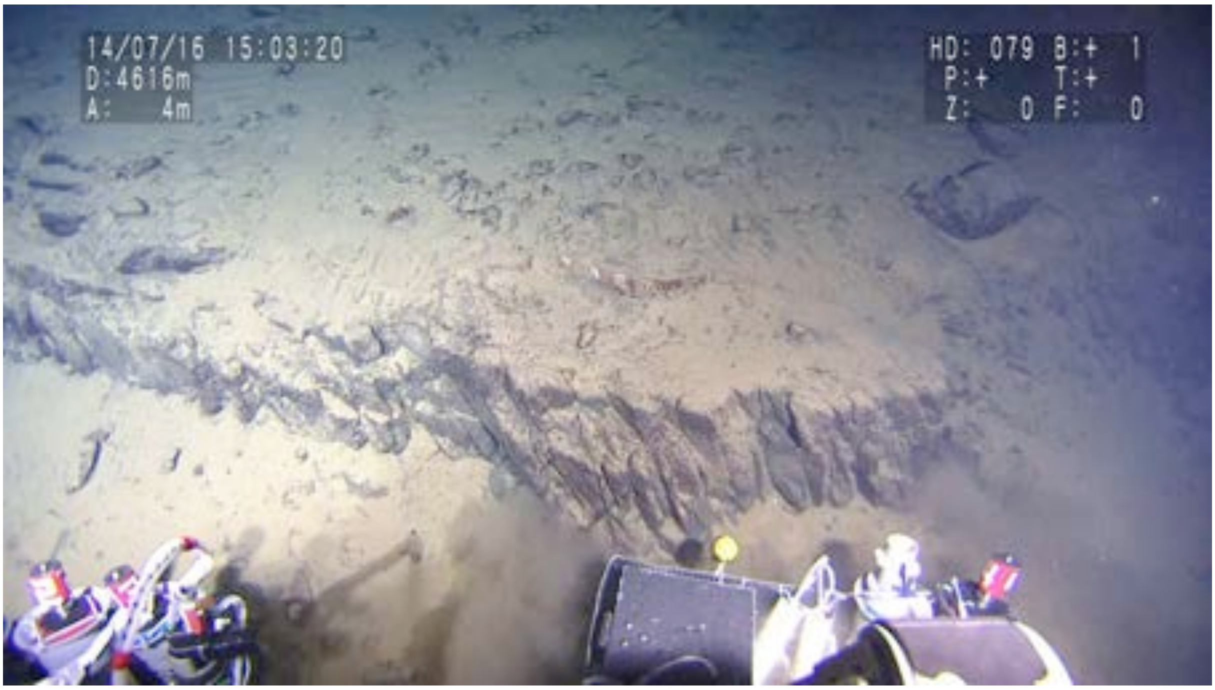


Photo 9. Seafloor at Stop 7. A rock was collected (R13) here, which was a scoria.

A-6. 6K-1402 Dive Report

Date: July 17, 2014
Site: Shinkai Seep Field
Observer: Uta Konno
Pilot: Fumitaka Saito, **Co-Pilot**: Tetsuya Komuku

Objectives:
The objective of 6K-1402 was to re-visit Chim-1 (Konno Site) for sampling more brucite chimneys. If successful in sampling, the dive would examine the surroundings to search for additional *Calyptogena* clam colonies and chimneys to understand the extent and the geochemical variation of the Shinkai Seep Field.

Note:
It should be noted that sample numbering in this dive does not follow the normal numbering protocol (i.e., numbering following a time series samplings). Instead, two large chimneys have young numbers, R01 and R02.

Observations and operations:
The bottom came into sight at 11:30 at a depth of 5900 m. The Shinkai landed on a steep slope at 5905 m at 11:33. The landing point was a tan-colored sediment floor scattered with various sized rubbles. The water temperature of the 6K was 1.5°C.

The Shinkai immediately headed to 10° to examine the slope to look for Chim-1 (Konno Site) at ~143°02’48.5”E approximately along the track line of 6K-1365. Just above the landing point, the seafloor consisted of vertical outcrop of possible serpentinized peridotite. At 5706 m (at 11:54), the pilot noticed a dead clam shell. Then some pieces of collapsed chimneys were observed at 5702 m at (11:55) (**Photo 1**). The Shinkai then moved rightward few meters, and another collapsed chimneys were observed. After that, the Shinkai moved up few meters, and then a new chimney site was encountered at 5686 m (at 11:58) (**Photo 2**). The new chimney site was located within the continued steep (almost vertical) slope.

Stop 1 was made there at 5682 m (at 12:02), just in front of a yellowish-brown huge chimney (**Photo 3A**). The chimney consisted of two parts. One part was a rough appearance with shells of tube worm associated with polyp-like features and possible bacteria mat, and the other part had smooth surface without any biological signs (**Photo 3B**).

At 12:07, tube worms on the rough part were sampled with slurpgun (Canister 1) (**Photo 3B**). At this site, a patchy small *Calyptogena* clam colony was also observed (**Photo 4**). There were several slits nearby the chimneys. Tube worms and Anthozoa sp. were there on one of the slits associated with a rock with white filamentous material (**Photo 5**). We sampled the tube worms and Anthozoa sp. with slurpgun (Canister 2) (**Photo 6**) at 12:20. At this slit, the water was collected with D-WHATS sampler (green; DW3, DW4 and CW2) (during 12:36-12:44) (**Photo 7**). The temperature of sampling water was as same as the ambient seawater. Just to the left of the huge chimney (**Photo 8**), there was a “colony” of Anthozoa sp. (**Photo 9**). Then, at least two rock fragments, one with the white filamentous material (archived as R1_23), were sampled with manipulator (**Photo 10**). After that, two baby chimneys (archived as R03_1, R03_2) were collected with manipulator (**Photo 11**). Then, a different baby chimney (R03_3) and at least two rock fragments (not archived) were collected with manipulator (**Photo 12**). We then tried to sample larger chimneys with manipulator. At

13:11, we finally recognized that the huge chimney was in fact huge size, the middle to upper part of the chimney had an overhang portion and the total relief was assumed to be more than 10 m (**Photo 13 and 14**). We then moved ~5 m downward and found several chimneys associated with numerous tube worms at 5689 m (at 13:18) (**Photo 15**). Two chimneys (archived as R01 and R02) and the blackish root rock of a chimney (archived also as R01) were collected with manipulator (**Photo 16 and 17**). Then, macrofaunas including galatheid crabs were sampled with slurpgun at 13:31 (Canister 3) (**Photo 18**). After that, we tried to sample sediment with H-type core, but in vain. We then used an Imai core, and successfully sampled small amount of sediment (Imai core) (**Photo 19**). Then the Shinkai stepped back to check the whole view of the chimney site, and we saw Chim-2 (Bloomer Site) to the left at 13:49. Finally, we set Marker #171 at 5696 m (at 14:00) beneath the group of the chimneys (**Photo 20**). We named this site "Konno2 Site (or Chim-3)". We then headed to the west for Chim-2 (Bloomer Site).

Immediately after that, at 14:03, we saw Chim-2 (Bloomer Site) at 5688 m, confirming Marker #162 (**Photo 21**). Just ~10 m above Chim-2 (at ~5675 m at 14:13), we found a site of collapsed chimneys (**Photo 22**). We then found Konno2 Site (Chim-3) to the east of the collapsed chimneys (**Photo 23**). It therefore turned out to be that the collapsed chimneys, Chim-2 (Bloomer Site) and Konno2 Site (Chim-3) in fact locate next to each other within ~10 m distance at a depth of ~5690 m (**Photo 24**). It should be noted that there is a small *Calyptogena* clam colony just to the west of the collapsed chimneys.

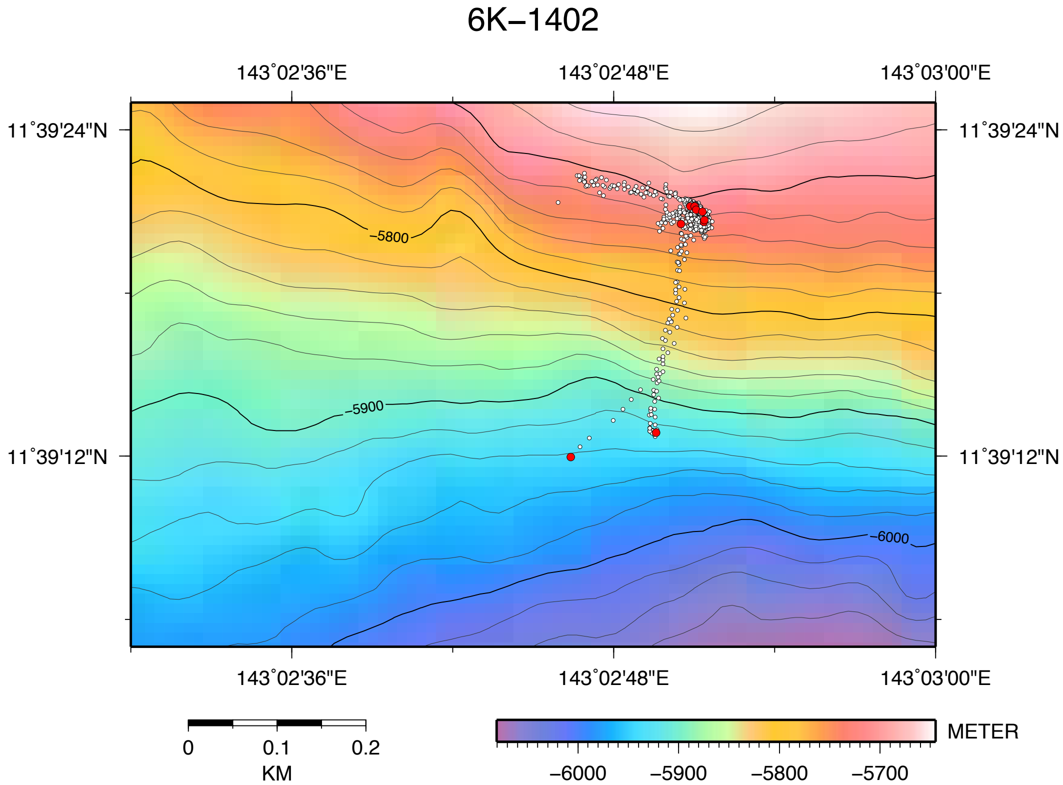
We then made efforts to find Chim-1 (Konno Site), headed to ~330° along a depth of ~5680 m. The seafloor was a steep slope of large boulders and/or rubbles covered with tan-colored sediment. At 14:43 (at 5682 m), after seeing Chim-2 (Bloomer Site) again, we gave up searching for Chim-1 (Konno Site). We then headed to 180° to keep away from the chimney sites for finding the place for dropping the ballast. At 14:51, it appeared that we were well away from the chimney sites, the Shinkai dropped ballast and left the bottom.

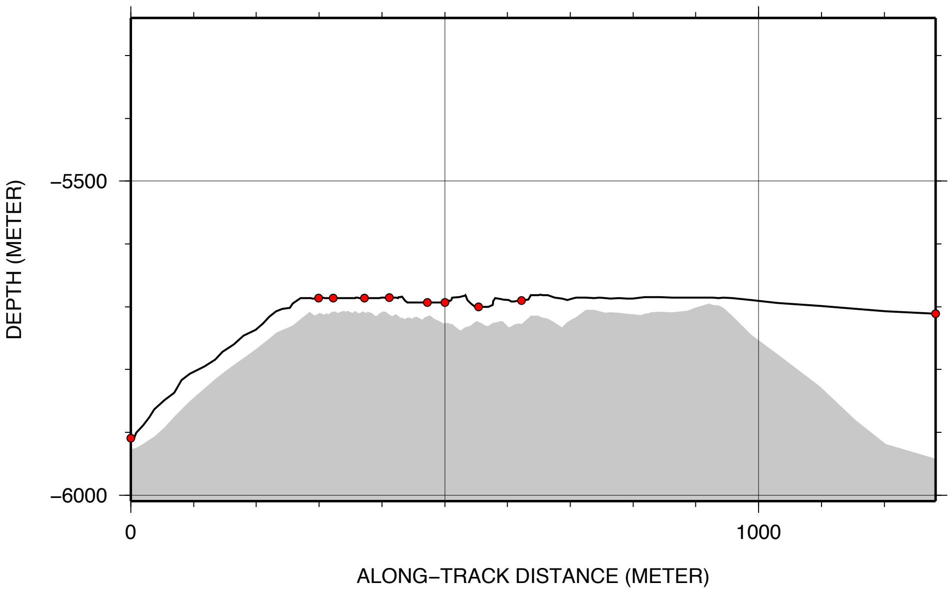
Payloads:
- Niskin sampler (1 bottle, 5 litter)
- D-WHATS with 6 bottles (2 sets of 3 bottles) + Thermometer
- H corer (4 cores)
- Imai corer (1 core)
- Multiple canister with 6 compartments and slurpgun
- Sample box
- Scoop
- Multisensor
- Marker (2 sets)

Event list: 6K-1402 (U. Konno), July 17, 2014

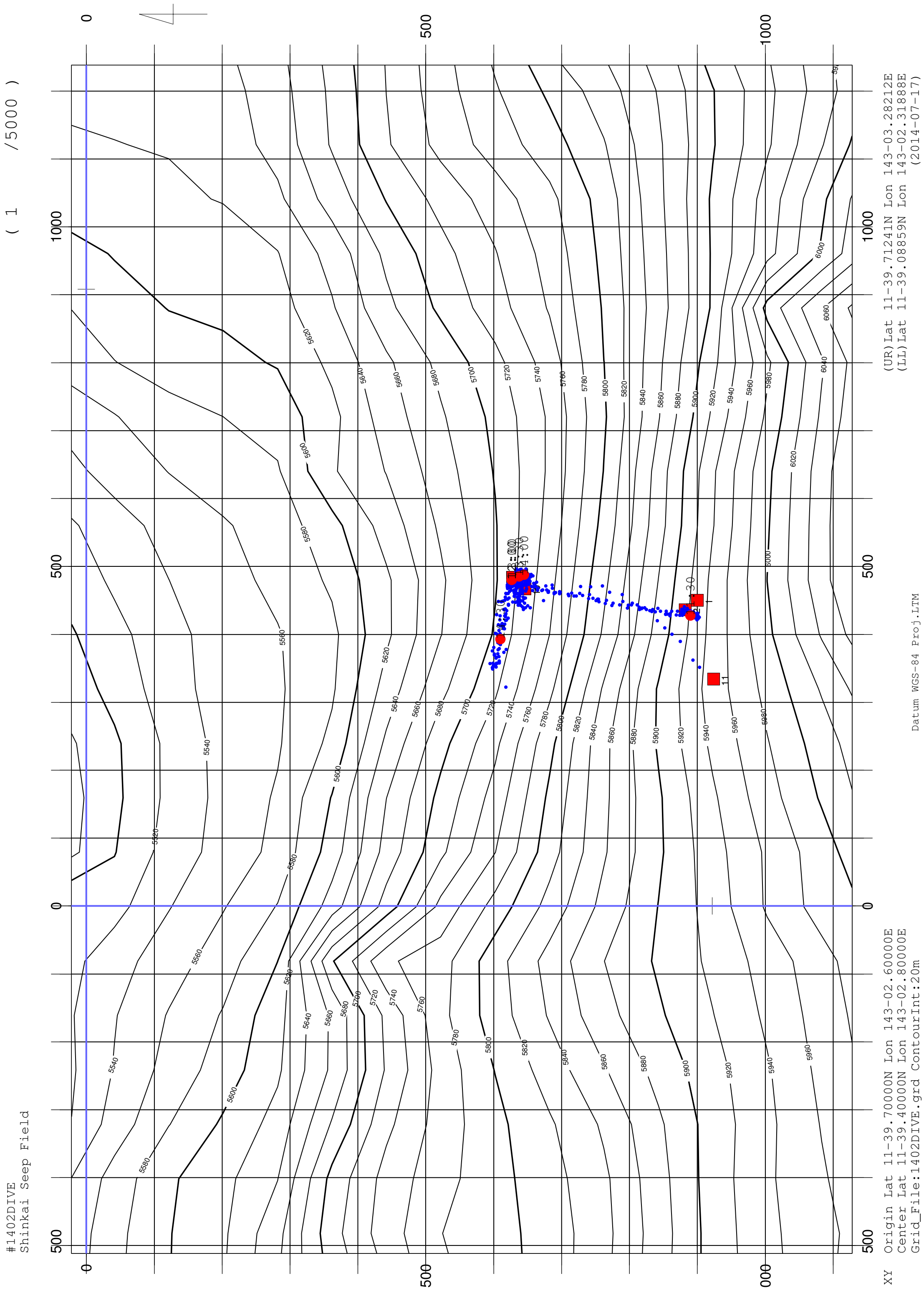
No.	Time	X	Y	Lat	Lon	Depth (m)	Event
1	0	-900.07	449.97	11-39.2118N	143- 2.8476E	5900	Target Point
2	11:34	-882.19	436.34	11-39.2215N	143- 2.8401E	5905	Landing
3	12:09	-628.68	484.31	11-39.3590N	143- 2.8665E	5683	Sampling tube worms on chimney with slurpgun (Canister 1)
4	12:22	-628.68	484.31	11-39.3590N	143- 2.8665E	5683	Sampling tube worms and Anthosoza sp. with slurpgun (Canister 2)
5	12:47	-628.68	484.31	11-39.3590N	143- 2.8665E	5682	Sampling D-WHATS (green)
6	13:07	-628.68	484.31	11-39.3590N	143- 2.8665E	5681	Sampling rocks (one rock was archved for biological analyses; R1_23), baby chimneys (R03_1, R03_2, R03_3) & rock fragments (not archived for biological analyses)
7	13:31	-628.68	484.31	11-39.3590N	143- 2.8665E	5689	Sampling 2 chimneys (R01, R02), Sampling macrofaunas with slurpgun (Canister 3)
8	13:41	-628.68	484.31	11-39.3590N	143- 2.8665E	5689	Sampling 1 core (Imai)
9	13:56	-628.68	484.31	11-39.3590N	143- 2.8665E	5696	Set #171 Marker
10	14:11	-646.02	467.23	11-39.3496N	143- 2.8571E	5685	Finding #162 Marker
11	14:51	-924.23	334.39	11-39.1987N	143- 2.7840E	5704	Left Bottom, A = 228 m

(X, Y) origin = (11-39.7000N, 143-02.6000E)





Bathymetric map and dive track profile for 6K-1402



X-Y map for 6K-1402

Photo 1. Collapsed chimneys near Konno2 Site (Chim-3).

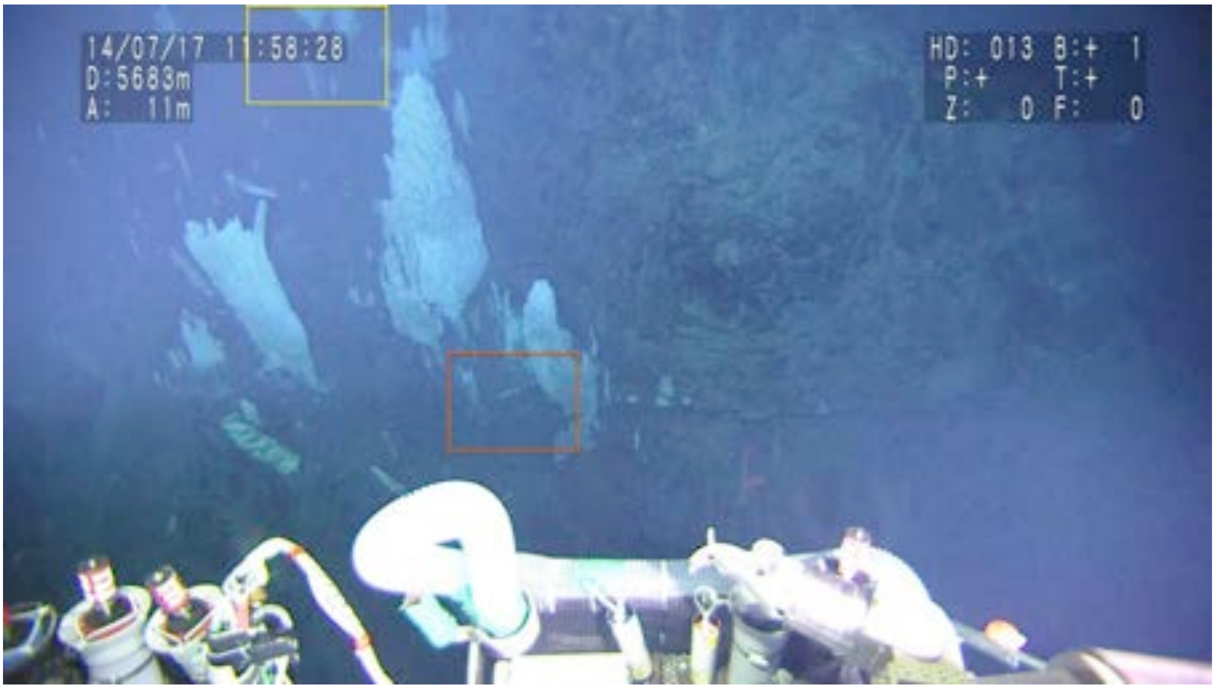


Photo 2. Chimneys at Konno2 Site (Chim-3). The yellow box indicates a huge chimney in the site (see **Photos 3A to 14**). The red box indicates the chimneys with numerous tube worms (see **Photos 15 to 19**).

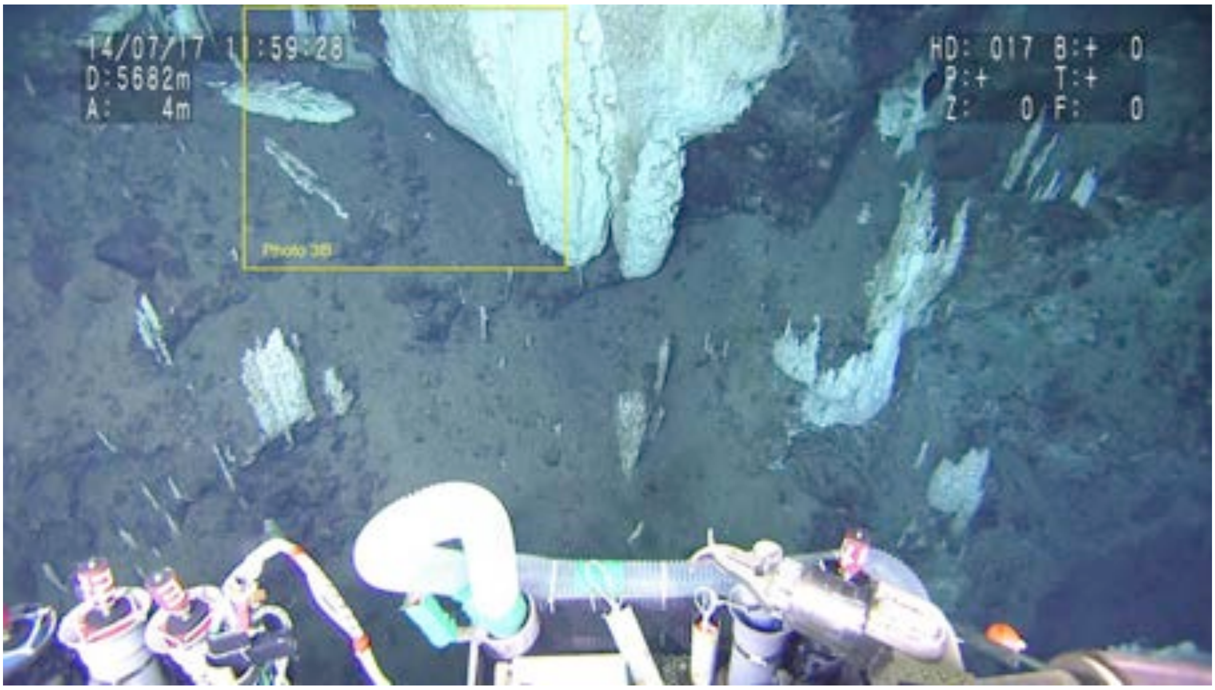


Photo 3A. Approaching to a huge chimney in Konno2 Site (Chim-3).

Photo 3B. Sampling tube worms on the rough surface of the huge chimney.

Photo 4. A patchy *Calyptogena* clam colony near the largest chimney.

Photo 5. Tube worms and Anthozoa sp. on a slit associated with a rock with white filamentous material.

Photo 6. Sampling tube worms and Anthozoa sp. with slurpgun.

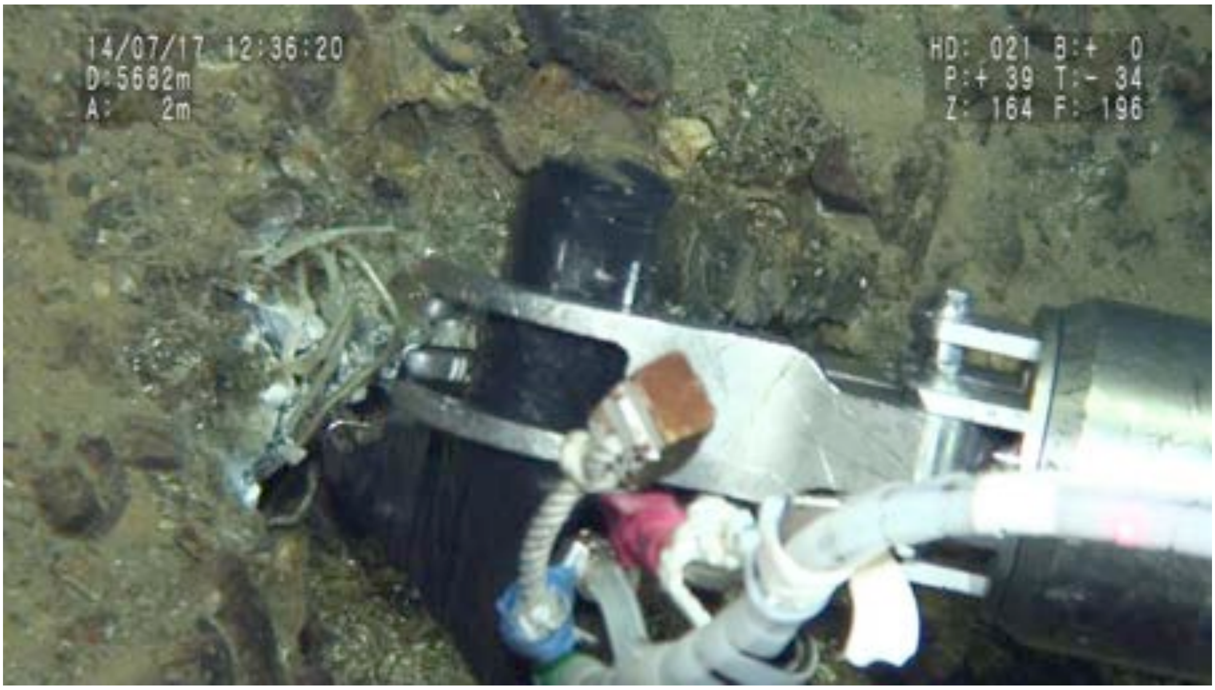


Photo 7. Sampling the water within the slit with D-WHATS.

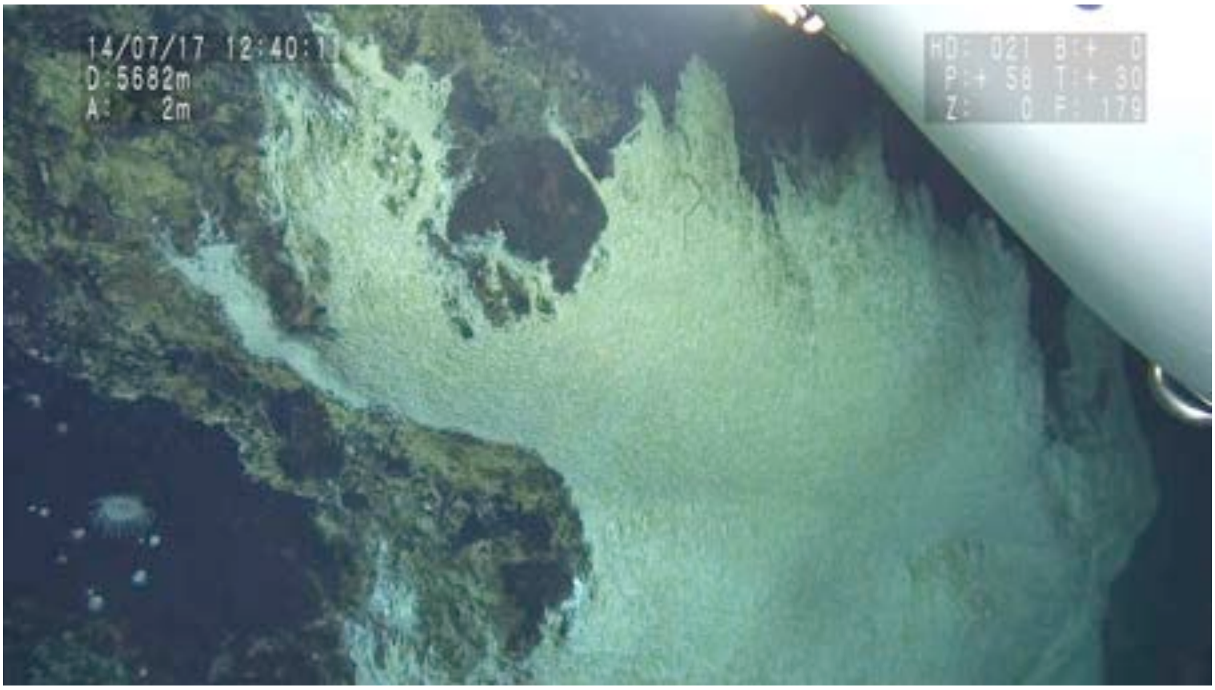


Photo 8. The upper part of the huge chimney. Anthozoa sp. colony is to the left.

Photo 9. Anthozoa sp. colony.

Photo 10. Sampling the rocks with white filamentous material (R01_23).

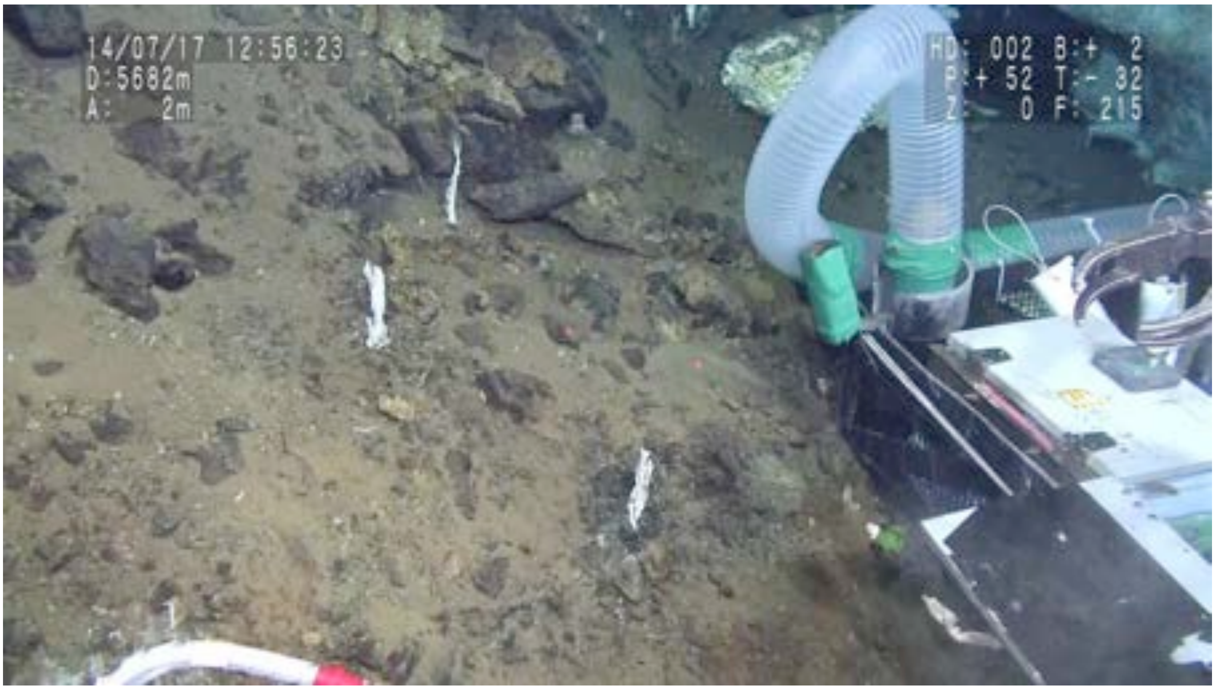


Photo 11. Baby chimneys (R03_1, R03_2, R03_3) sampled with manipulator.

Photo 12. Sampling a baby chimney (R03_3) and rock fragments (not archived for biological study).

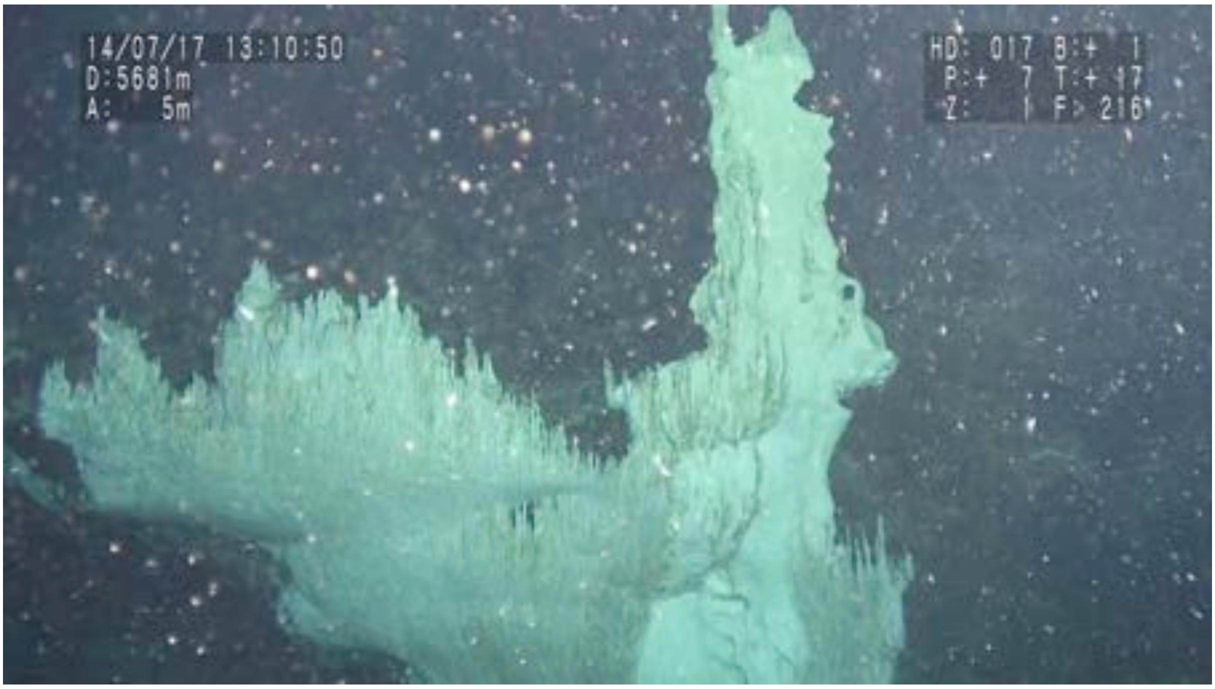


Photo 13. The top part of the huge chimney.

Photo 14. The entire view of the huge chimney.

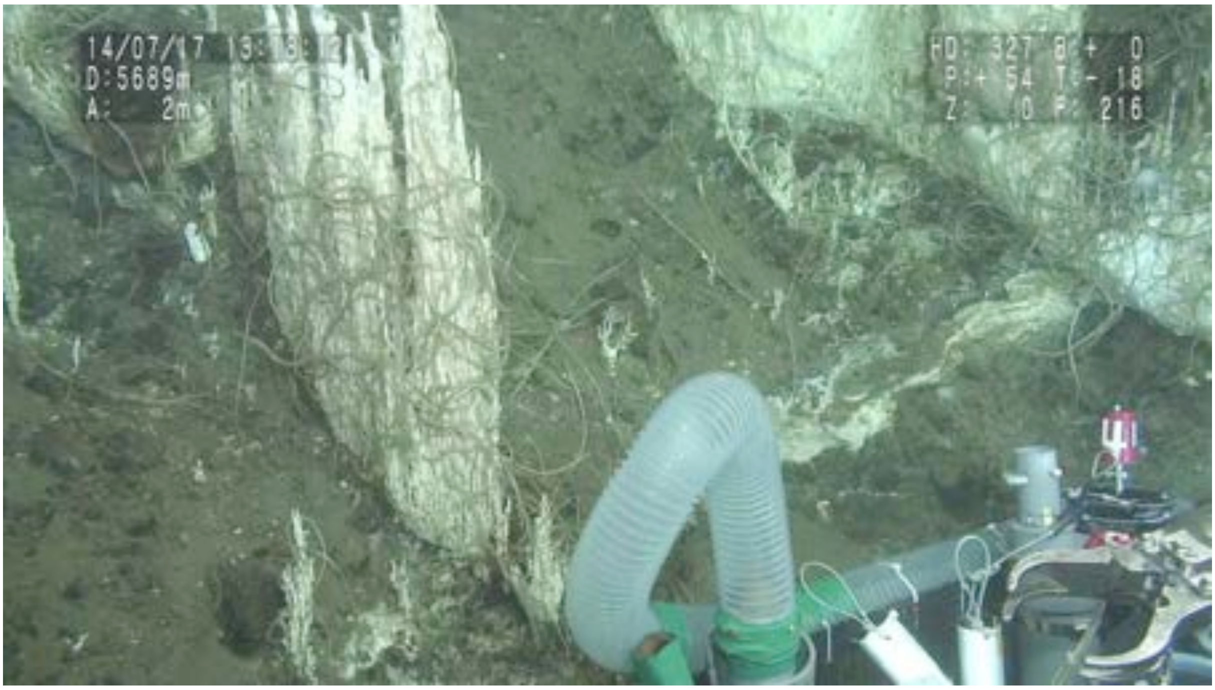


Photo 15. Chimneys with numerous tube worms (indicated by red box in **Photo 2**).

Photo 16. Sampling the chimney (R02).

Photo 17. Sampling the blackish root rock of the chimney (R01).

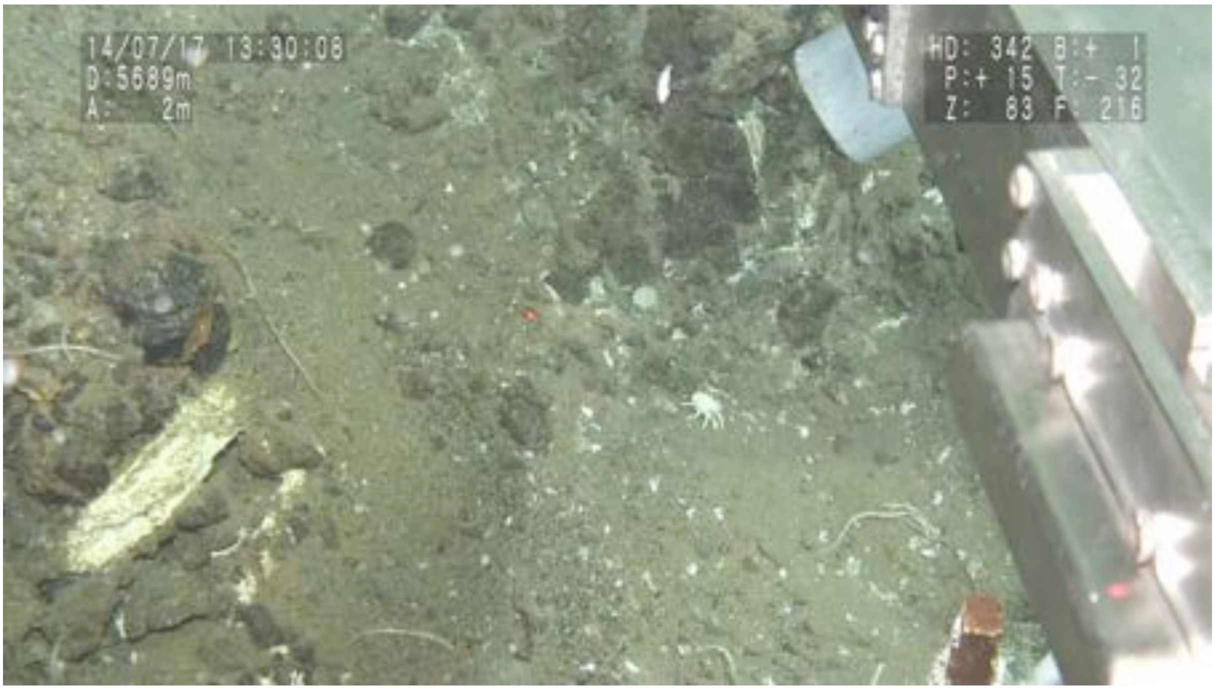


Photo 18. Sampling macrofaunas with slurpgun.

Photo 19. Sampling sediment with an Imai core.

Photo 20. Setting Marker #171 at several meters below Konno2 Site (Chim-3).

Photo 21. Chim-2 with Marker #162 (Bloomer Site).

Photo 22. A site of collapsed chimneys.

Photo 23. Konno2 Site (Chim-3) is to the right of the site of collapsed chimneys.

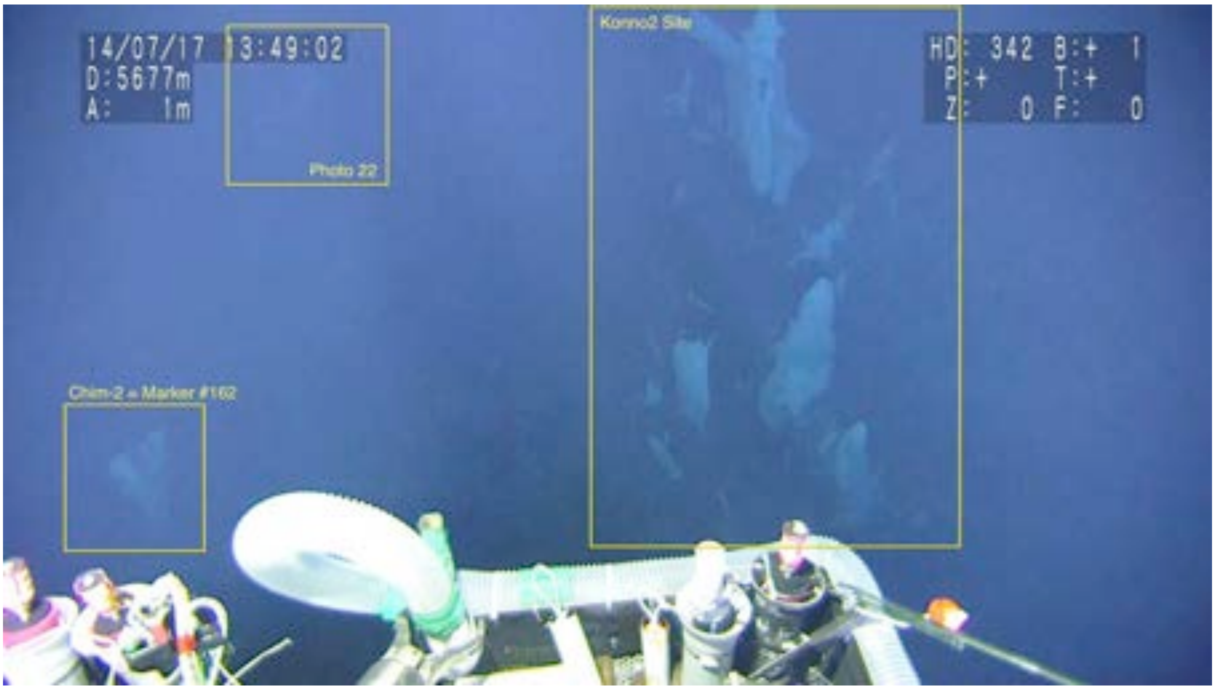


Photo 24. The spatial relationship between Konno2 Site (Chim-3), Chim-2 (Bloomer Site) and a site of collapsed chimneys.

A-7. 6K-1403 Dive Report

Date: July 18, 2014
Site: Shinkai Seep Field
Observer: Tomoyo Okumura
Pilot: Hirofumi Ueki, **Co-Pilot**: Keigo Suzuki

Objectives:
The objective of 6K-1403 was to re-visit Col-3 (Watanabe Site) for sampling more sediment cores. If successful in sampling, the dive would examine the surroundings to search for additional *Calyptogena* clam colonies and chimneys to understand the extent and the geochemical variation of the Shinkai Seep Field.

Landing:
The bottom came into sight at 11: 30 at a depth of 5935 m. The Shinkai landed on a steep slope inclined to south at 11:33. The seafloor around there consisted of sediments with large boulders and middle to small gravels (**Photo 1**). White precipitates occasionally exposed in the sediment. The water temperature of the 6K was 1.6°C. After landing, the Shinkai started moving to north for Col-3 (Watanabe Site) at 11:34.

Searching for biological events at an eastern slope of the Shinkai Seep Field:
The Shinkai moved up to north to observe the eastern slope of the Shinkai Seep Field at ~143°03'04"E. From the depth of 5935 to 5877 m, a steep slope with large fractured black blocks continued in the sediment with white precipitates. The white precipitates appeared occurring as veins in the blocks. At 5839 m (at 11:42), a dead clam shell was observed. The inclination of the slope became gentle from 5877 m at 11:39. The slope became steeper again at 5862 m (at 11:45), consisting of large fractured blocks with white precipitates. At 5768 m (at 11:47), the slope became a cliff wall (**Photo 2**). The large blocks there were angular shape, and several meters thick white precipitates were exposed on the surface at 5765 m. At 5760 m (at 11:48), the seafloor exhibited a gentle slope inclined to south. At 5754 m (at 11:48), a dead *Calyptogena* clam shell was again observed. Seafloor appearances, occurrence of large to middle size sub-angular gravels in sediment, were not changed until 5678 m (at 11:54). From this depth, dead *Calyptogena* clam shells were occasionally observed on the sedimented slope. At the 5667 m (at 11:56), the seafloor consisted of large platy blocks.

The Shinkai changed the heading from 0° to 270° at 5660 m at 11:57 and kept this heading until 12:04. The seafloor was a rubble field, consisted of middle size sub-angular gravels in sediment. The Shinkai changed the heading from 270° to 0° at 5661 m at 12:04. The appearance of the seafloor did not change until 12:07 at 5635 m. The Shinkai changed heading from 0° to 270° at 12:07. Gravels at this site elongated to northwest. At 5630 m at 12:12, two markers were found. The Shinkai landed there at 12:13 (at 5625 m). The makers were #117 and #160, confirming that the site was Col-4 (= Col-2; Ishii Site). We then left the site at 12:13 for searching for Col-3 (Watanabe Site), headed to 180°. At 12:21, the Shinkai stopped going to 180°, and then again headed to 0° to observe the slope. The seafloor consisted of middle size gravels in sediment, dotted with *Calyptogena* clam shells. On the way to north, we were not able to find Col-3 (Watanabe Site). At 12:30, the Shinkai returned to Col-4 again. Because of time limitation, we decided to start samplings there.

Sediment core sampling at Col-4:
Figure 1 shows the schematic sketch of Col-4 site (**Photo 3**). At 12:34, the Shinkai landed on Point A that located to the east from the markers (**Photo 4**). Firstly, D-WHATS water sample (green) started at medium speed from just above the center of the colony at Point A (during 12:44-12:54) (**Photo 5**). Next at 12:59, a H-type core #1 was attempted for sampling the sediment at the center of the colony at Point A (**Photo 6**). The core was marked with red tape to identify the direction of 180°, parallel to the Shinkai heading. The coring attempt was, however, unsuccessful. Since the sediment structure was disrupted due to this attempt, we decided to change the sampling target.

The Shinkai landed on Point B that was located to the east of Point A (**Photo 7**). Point B was located adjacent to a local step exposing gray color serpentine mud (**Photo 8A and 8B**). At 13:16, a H-type core #3 was attempted for sampling the sediment at the center of the colony at Point B. The core was marked with blue tape to identify the direction of 180°. We attempted twice, but coring was unsuccessful due to hard substratum beneath the colony (**Photo 9**). The core was finally broken and we gave up coring attempts there (at 13:20) (**Photo 10**).

At 13:25, a relatively large shrimp was seen. At 13:26, the Shinkai landed on Point C that was located at several meters down from the two markers (**Photo 11**). A 13:29, a H-type core #2 was attempted for sampling the sediment at the small colony at Point C. The core was marked with yellow tape to identify the direction of 180°, parallel to the Shinkai heading. The coring attempt was partly successful, recovering small amount of sediment (at 13:30), which was named "Core #2 Residue" (see the event at 13:52) (**Photo 12**). Since the sediment at this site appeared easy to spud, an Imai-type core was attempted at 13:40. However it was unsuccessful (**Photo 13**). A 13:45, a H-type core #4 was attempted for sampling the sediment with living clams (**Photo 14**). The core was marked with blue tape to identify the direction of 180°. The coring attempt was partly successful, recovering small amount of sediment (at 13:45) (**Photo 15**). At 13:47, a H-type core #1 was attempted for sampling the sediment without any clams for obtaining a reference sediment (**Photo 16**). The core was marked with yellow tape to identify the direction of 180°. The coring was successful (**Photo 17**).

At 13:52, a H-type core #2 was cleaned with ambient water and put into the sheath for core #3, because core #3 was already broken at 13:20. Instead of core #2, core #3 was put into the sheath for core #2. The sediment fallen into the sheath of core #2 was named "Core #2 Residue". After that, core #2 was used for sampling of the sediment with dead clams at 13:57 (**Photo 18**). The core was marked with blue tape to identify the direction of 180°. The coring attempt was successful and put into the sheath for core #3, recovering moderate amount of sediment (at 13:57) (**Photo 19**). From 13:57, an Imai-type core was used for sampling of the sediment with living clams. However the core was broken and coring attempt was aborted (at 14:02) (**Photo 20**). After that, a Niskin sample was taken at 14:05.

Observation of the seafloor at 5630 m deep to eastern area of Shinkai Seep Field:
After sampling, the Shinkai left Col-4 site and moved to 90°, along ~5620 m depth from 14:07. However, the Yokosuka wanted the Shinkai to leave the exact location of Marker #160, the Shinkai changed its heading to 270° for searching for the marker and found it at 14:21. The Shinkai then headed to 90° at 14:24 at ~5620 m depth. Various size rubbles and gravels distributed on the eastern slope until 14:29. At 14:29, the seafloor became sediment-dominated. There were many small white patchy mound-like features (**Photo 21**). At 14:34, the Shinkai landed on the bottom to collect sediment and set marker at 5627 m.

Marker #172 was set at 14:39. Then we sampled the sediments with scoop (Scoop 1). The Shinkai then secured the equipment and dropped ballast and left the bottom at 14:46.

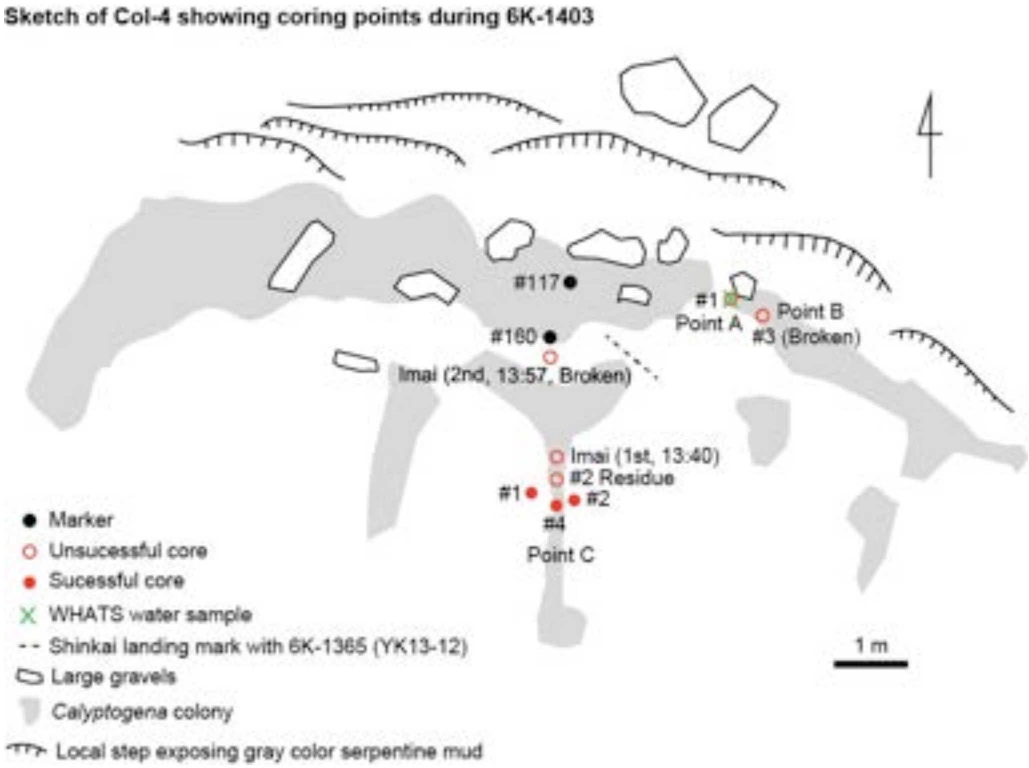


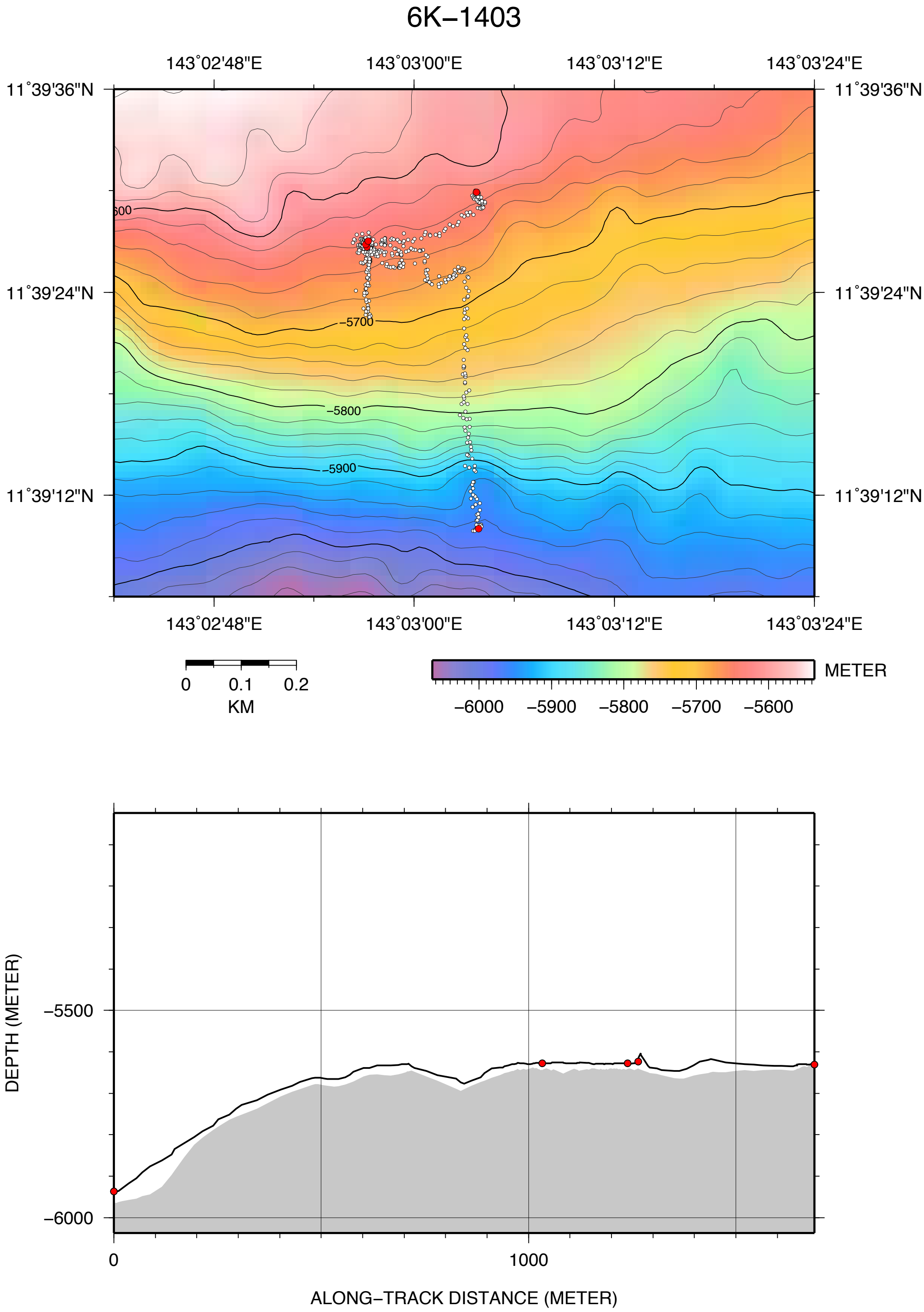
Fig. 1. Sketch of Col-4 showing coring points during 6K-1403.

Payloads:
- Niskin sampler (1 bottle, 5 litter)
- D-WHATS with 6 bottles (2 sets of 3 bottles) + Thermometer
- H corer (4 cores)
- Imai corer (1 core)
- Multiple canister with 6 compartments and slurpgun
- Sample box
- Scoop
- Multisensor
- Marker (2 sets)

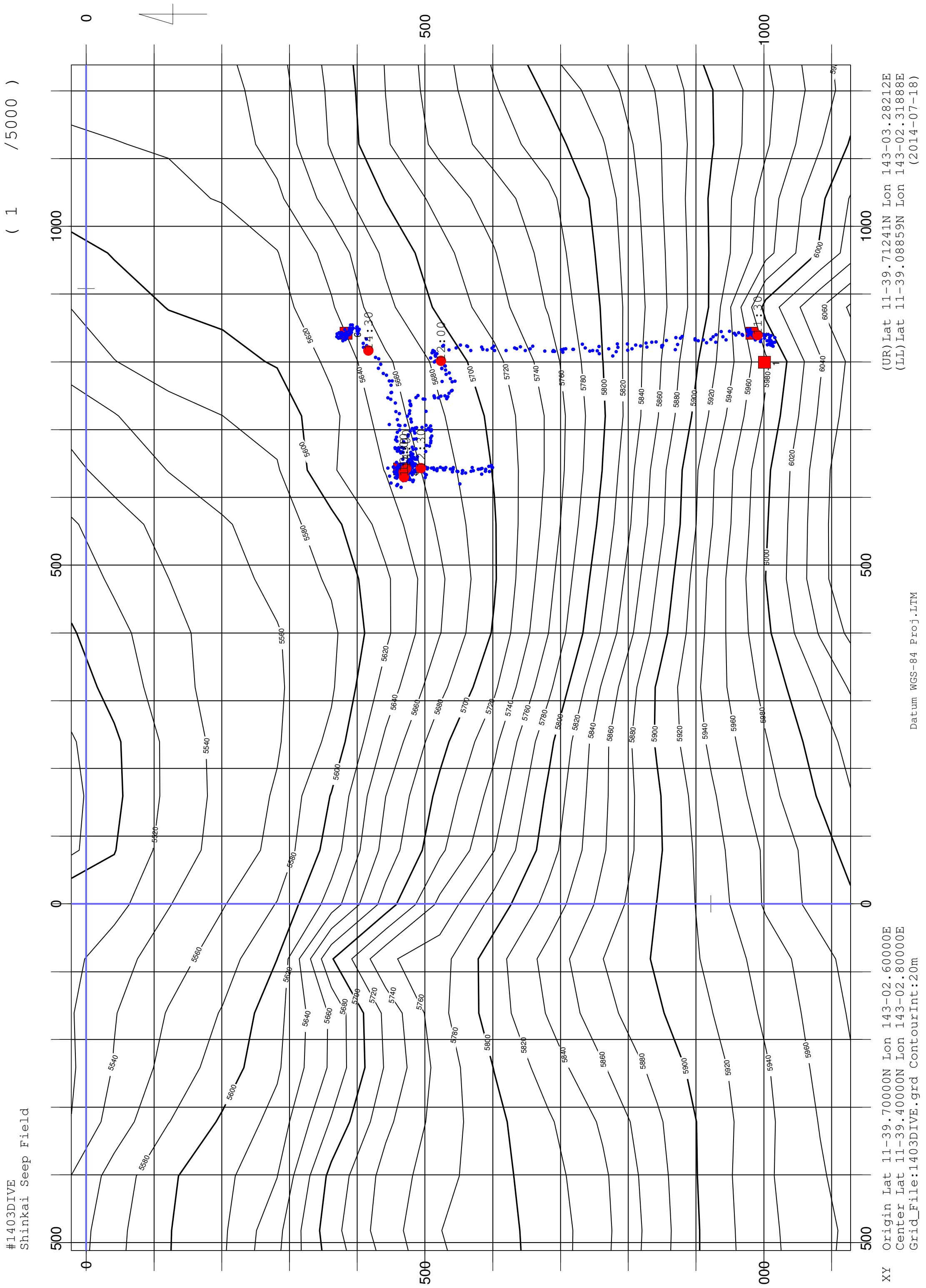
Event list: 6K-1403 (T. Okumura), July 18, 2014

No.	Time	X	Y	Lat	Lon	Depth (m)	Event
1	9:00	-999.99	799.63	11-39.1576N	143- 3.0400E	5800	Target Point
2	11:32	-982.11	842.33	11-39.1673N	143- 3.0635E	5935	Landing
3	12:58	-466.81	638.6	11-39.4468N	143- 2.9514E	5626	Finding #117 & #160 Markers, Sampling D-WHATS (green)
4	14:01	-467.73	638.06	11-39.4463N	143- 2.9511E	5625	Sampling "Core #2 Residue" & 3 cores (#4, #1, #2)
5	14:06	-462.38	642.05	11-39.4492N	143- 2.9533E	5618	Sampling Niskin
6	14:46	-383.1	842.5	11-39.4922N	143- 3.0636E	5627	Set #172 Marker, Sampling 1 scoop (sediment), Left bottom

(X, Y) origin = (11-18.2000N, 141-13.2000E)



Bathymetric map and dive track profile for 6K-1403



X-Y map for 6K-1403

Photo 1. Seafloor at landing point.

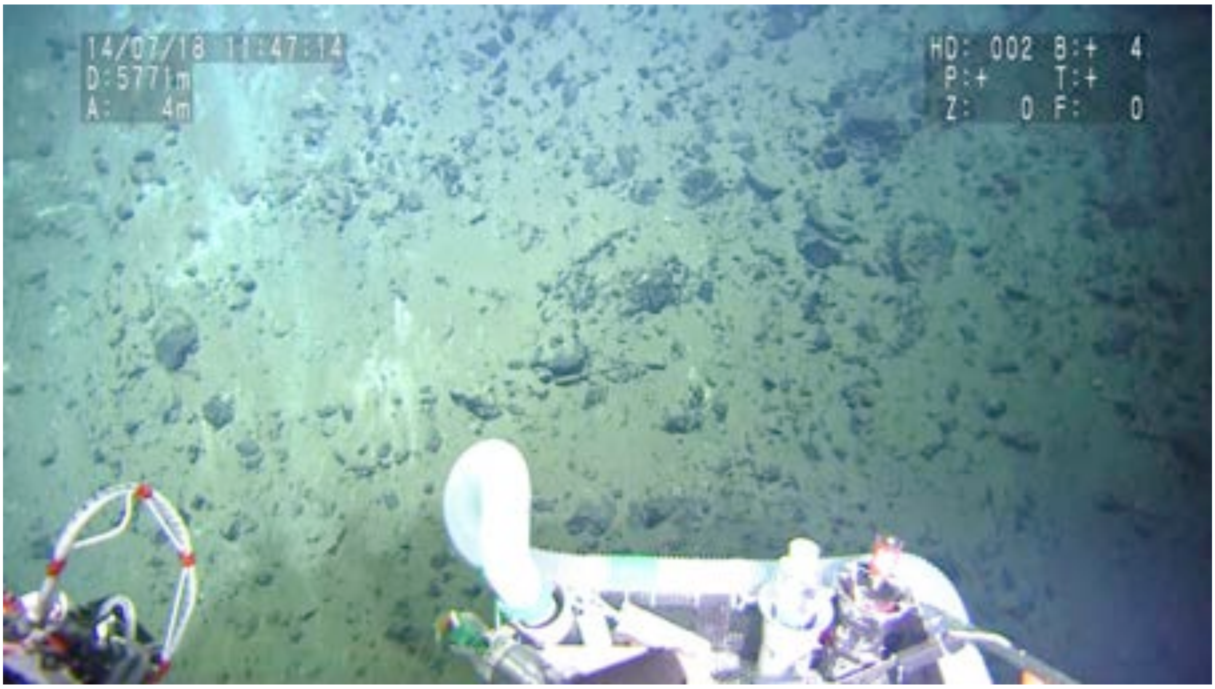


Photo 2. Steep slope at ~5770 m.

Photo 3. Overview of Col-4. The landing mark by 6K-1365 is obvious.

Photo 4. The *Calyptogena* colony at Point A.

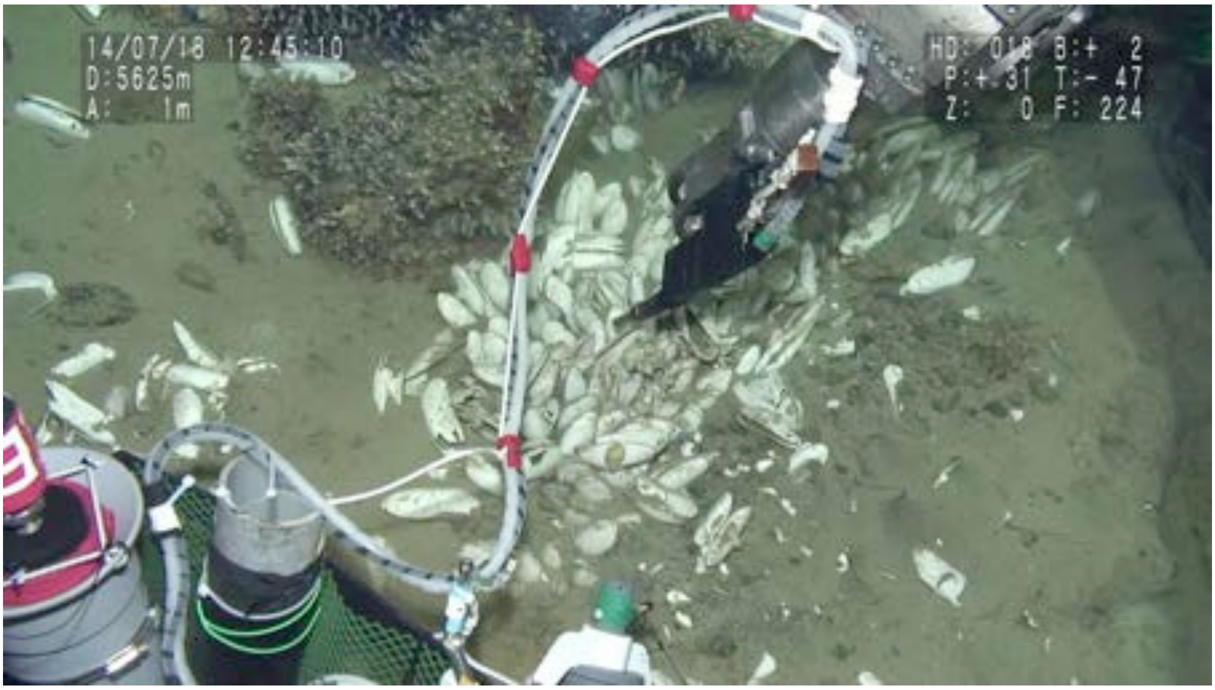


Photo 5. Sampling the water at Point A with D-WHATS.

Photo 6. Core #1 attempt at Point A (unsuccessful).

Photo 7. Overview of Point B.

Photo 8A. Point B was located adjacent to a local step exposing gray color serpentine mud.

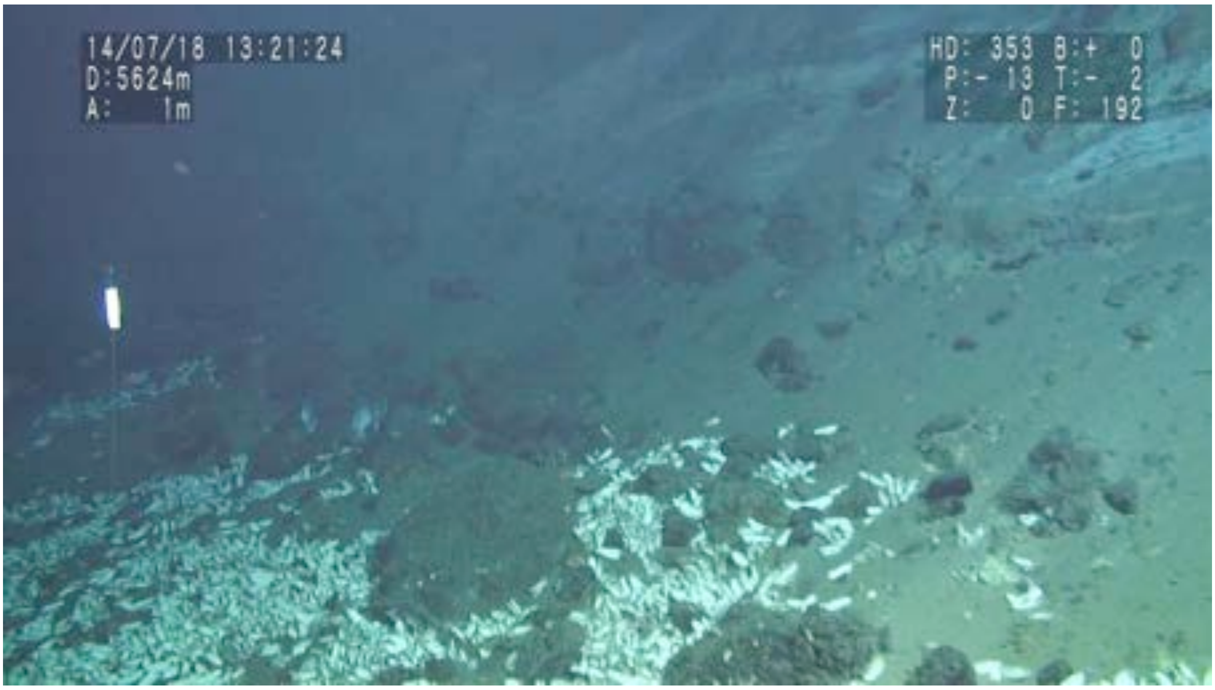


Photo 8B. Col-4 site is surrounded by local steep steps exposing gray color serpentine mud.

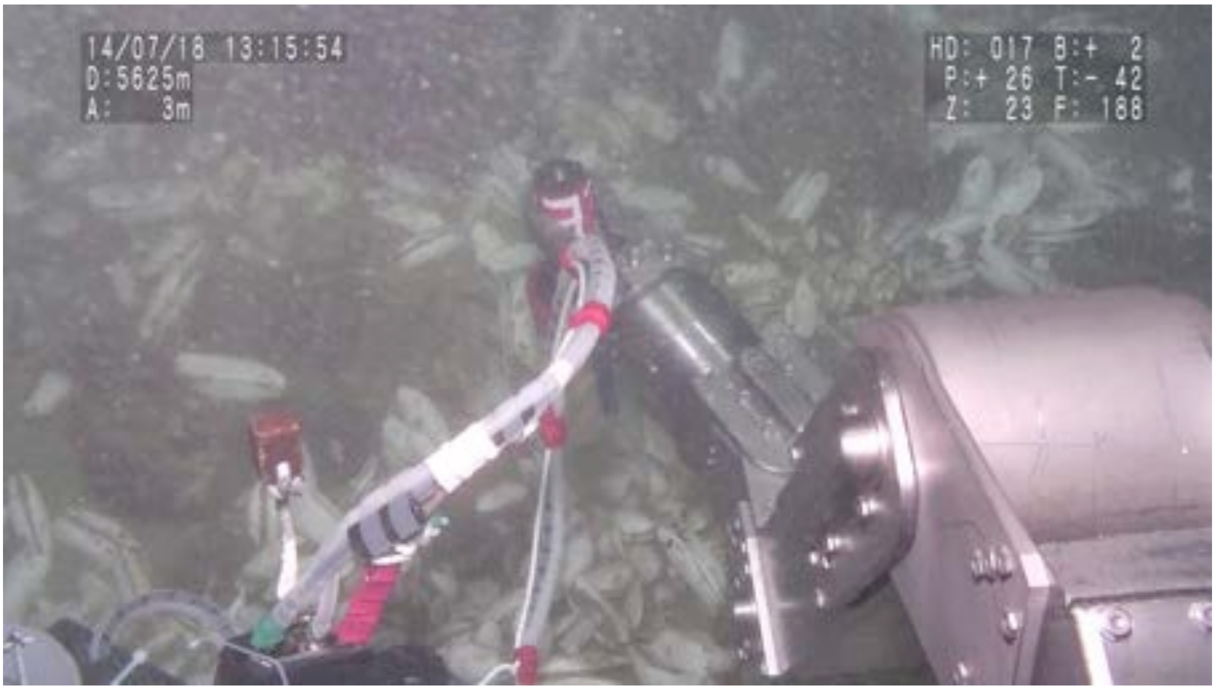


Photo 9. Core #3 attempt at Point B (unsuccessful).

Photo 10. Core #3 attempt at Point B (finally broken).

Photo 11. Col-4 site looked from Point C (i.e., from south).

Photo 12. Core #2 attempt at Point C (partly successful, recovering "Core #2 Residue").

Photo 13. 1st Imai core attempt at Point C (unsuccessful).

Photo 14. Core #4 attempt at Point C (partly successful, recovering small amount of sediment).

Photo 15. Core #4 attempt at Point C (recovering small amount of sediment) (continued from **Photo 14**).

Photo 16. Core #1 attempt at Point C (successful).

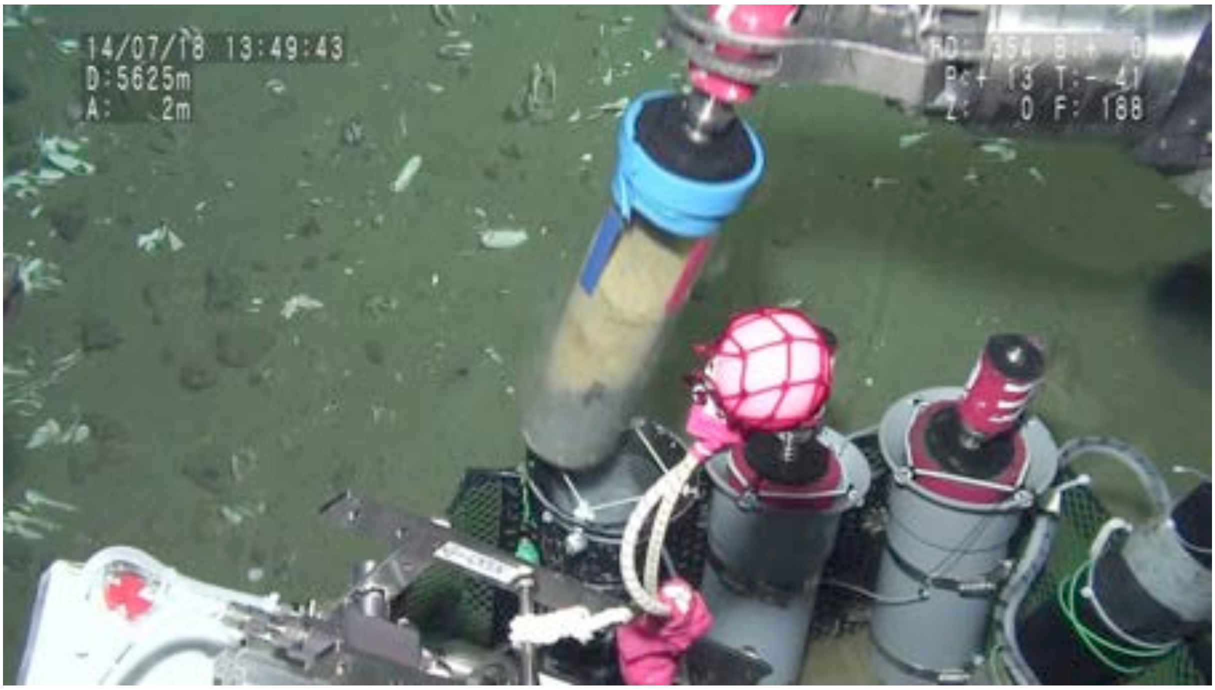


Photo 17. Core #1 attempt at Point C (recovering enough amount of sediment) (continued from **Photo 16**).

Photo 18. Core #2 attempt at Point C (successful).

Photo 19. Core #2 attempt at Point C (recovering moderate amount of sediment) (continued from **Photo 18**).

Photo 20. 2nd Imai core attempt (at Marker #160; unsuccessful, broken).

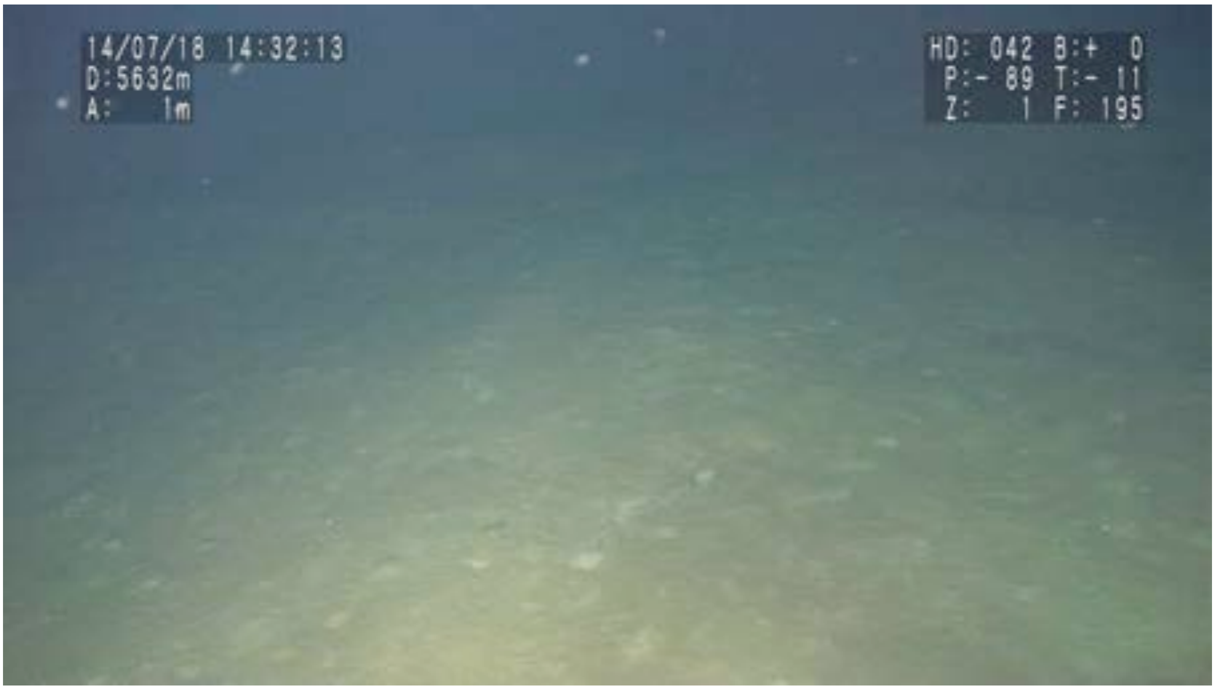


Photo 21. White patchy mound-lie features on sedimented floor east of Col-4.

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A-8. 6K-1404 Dive Report

Date: July 19, 2014
Site: Shinkai Seep Field
Observer: Yasuhiko Ohara
Pilot: Kazuki Iijima, **Co-Pilot**: Yudai Tayama

Objectives:
The objective of 6K-1404 was to examine the slope to the west of Col-5 for finding additional *Calyptogena* clam colonies and chimneys to understand the extent and the geochemical variation of the Shinkai Seep Field.

Observations and operations:
The bottom came into sight at 11:22 at a depth of 5945 m. The Shinkai landed on the seafloor at 5952 m at 11:24. The landing point was a tan-colored sediment floor scattered with various sized rubbles. The water temperature of the 6K was 1.5°C.

The Shinkai immediately headed to north to examine the slope to the west of Col-5 at ~143°02'39"E. The slope between the landing point to 5553 m depth varied from sediment-dominant seafloor, to rubble field with various size rubbles, to occasional large boulders in the sediment (**Photo 1**). Most of the rubbles appeared to be serpentinized peridotites, showing red to gray matrix and having with carbonate and/or serpentine veins. At 5916 m (at 11:31), the pilot noticed a dead clam shell. At 5888 m (at 11:34), a small squid with long legs was seen. At 12:08, the Shinkai reached 5553 m depth. The Shinkai observed the 399 m relief of the ~143°02'39"E slope, but we could not find any biological sign except for a dead clam shell at 5916 m. We therefore decided to go back to ~5740 m depth, the depth that Col-5 locates to the east. At 12:09, the Shinkai headed to south to ~5740 m depth. At 12:29, the bottom came into sight at 5733 m, and the Shinkai headed to 90°. At 5743 m (at 12:33), a group of small *Calyptogena* colonies was observed on a rubble/gravel field.

Stop 1 was made there at 5747 m (at 12:37). Most of the clams looked alive, staying on the gaps between rock piles. One thing should be noted is that there are no noticeable other macro fauna than *Calyptogena* were found except an Anthozoa sp. Two rocks with white filamentous material (R01, R02) were collected at 12:53 (**Photo 2**). R01 was a serpentinized peridotite. The lithology of R02 was not known, because it was frozen for microbiological analyses. The white material was suspected to be bacteria mat. At 12:55, Maker #173 was set there (**Photo 3**). The Shinkai then headed to 90°. Right after that, we found another group of colonies, the size of each was larger than in Stop 1 (**Photo 4**).

We made Stop 2 at 5740 m (at 13:01). There, within the colonies, small size *Calyptogena* clams as well as zoanthids, galatheid crab and tube worm were observed. At 13:10, *Calyptogena* clams were sampled with slurpgun (Canister 1) (**Photo 5**), hoping to sample small size ones. At 13:15, the Shinkai then slightly moved to another colony. A rock surface covered with zoanthids (**Photo 6**) was sampled with slurpgun (Canister 2). Then the rock was sampled (R03). It was a serpentinized peridotite. Then, galatheid crabs and tube worms (**Photo 7**) were collected with slurp gun (again into Canister 2). As was the case for Stop 1, there also were several rocks with white filamentous material in Stop 2 (**Photo 8**). At 13:32, the Shinkai left Stop 2, headed to 90°. Right after that, we found a new chimney site at 13:34.

We made Stop 3 at 5743 m (at 13:48). The chimney site consists of several chimneys of variable size and morphology; some pieces of fallen chimneys were observed (**Photo 9**). At 13:51, the surface of a yellowish-brown chimney with numerous polyp-like features was sampled with slurpgun (Canister 3) (**Photo 10**). Then, the chimney was sampled with manipulator (**Photo 11**). However, the chimney was very fragile, and only a small piece of the chimney was sampled with the manipulator (R04). So, we used scoop to secure the broken chimney fragments, which was successful (R04). A galatheid crab and a dead tube worm shell were observed on one of the chimneys (**Photo 12**). We then sampled a bigger, spindle-shaped chimney at 14:14 (R05) (**Photo 13**). Although there were some Aphroditiformia sp. and film-like materials (assumed to be bacteria mat) on the surface (**Photo 14**), these were not sampled with slurpgun. This was because Tomoyo Okumura wanted to study the intact surface of the chimney. We named this site "Ohara Site". At 14:17, the Shinkai left Stop 3, headed to 90° at a depth of ~5730 m.

At 5740 m (at 14:24), we saw Marker #159 at Col-5 (**Photo 15**). The Shinkai traveled along a depth of ~5730 m along a steep slope continued, looking at the port window. At 5745 m (at 14:31), a possible outcrop was encountered. At 5740 m (during 14:38 and 14:41), the pilot saw some dead *Calyptogena* clam shells.

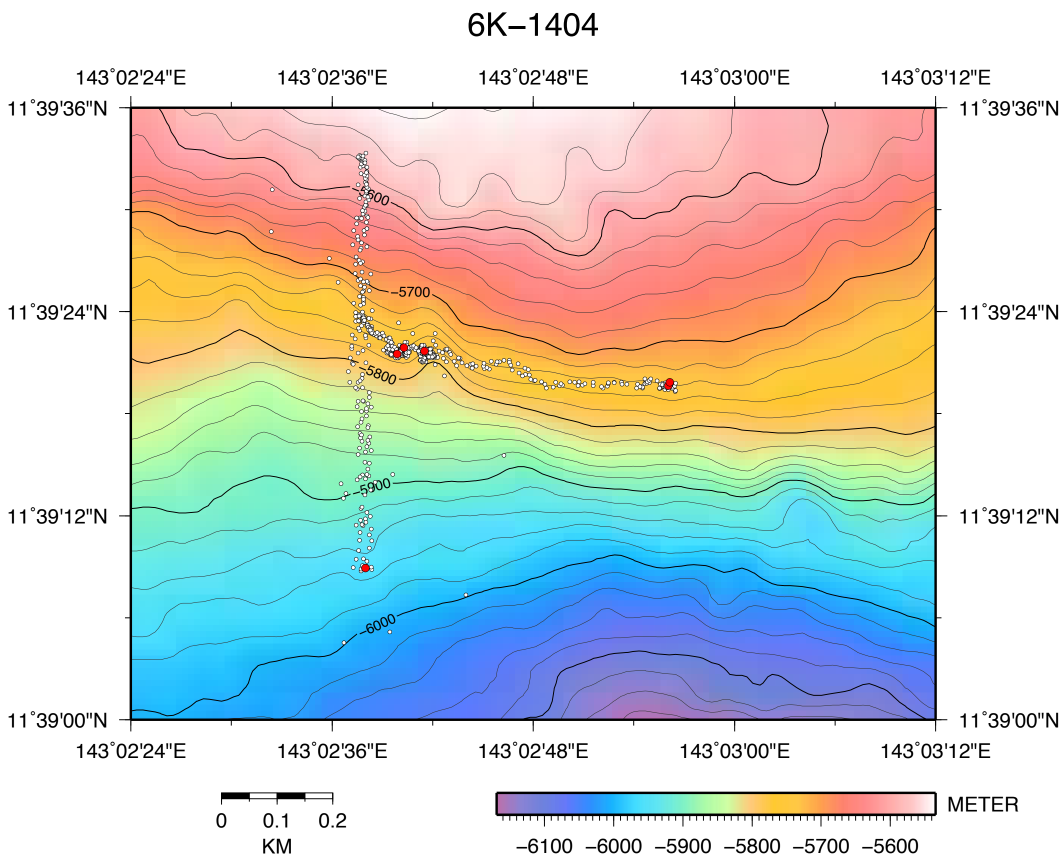
We made Stop 4 at 5735 m (at 14:42) at a cobble field. We sampled the gravels with scoop (Scoop 1). The scooped gravels were serpentinized peridotites. We then set Marker #174 there (**Photo 16**). At 14:51, a Niskin sample was taken. The Shinkai then secured the equipment and dropped ballast and left the bottom at 14:51.

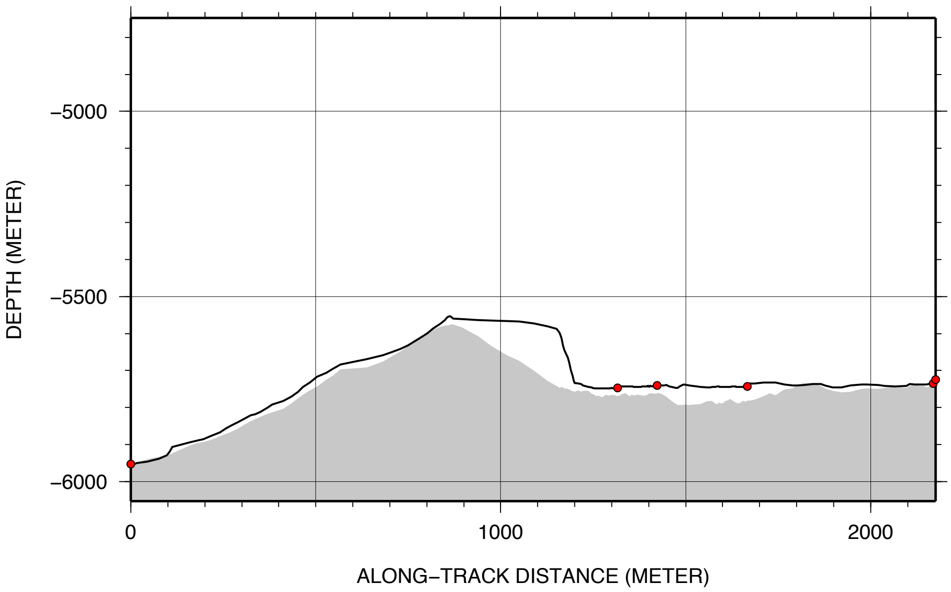
Payloads:
- Niskin sampler (1 bottle, 5 litter)
- D-WHATS with 6 bottles (2 sets of 3 bottles) + Thermometer
- H corer (4 cores)
- Imai corer (1 core)
- Multiple canister with 6 compartments and slurpgun
- Sample box
- Scoop
- Multisensor
- Marker (2 sets)

Event list: 6K-1404 (Y. Ohara) July 19 2014

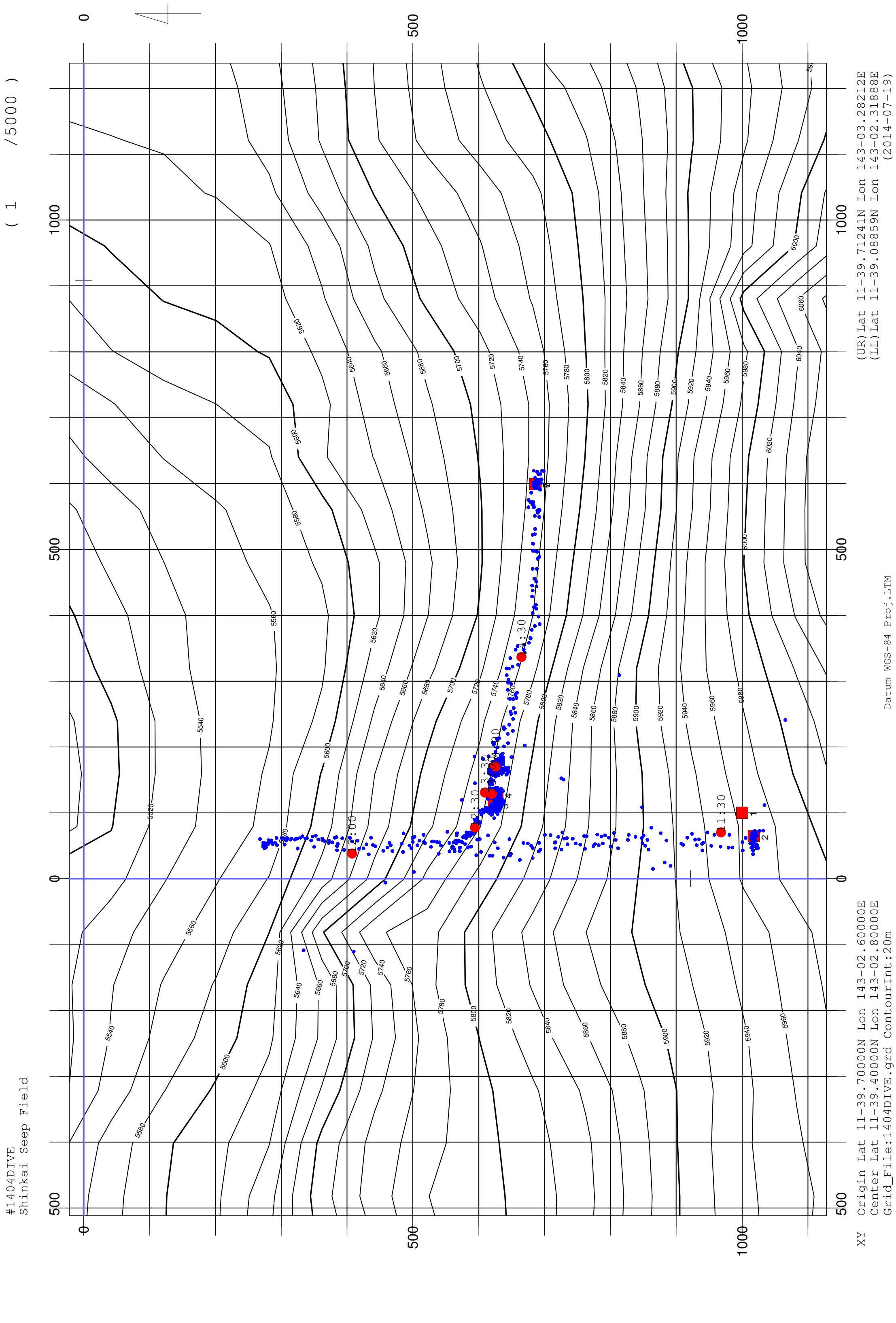
No.	Time	X	Y	Lat	Lon	Depth (m)	Event
1	9:00	-1000	99.95	11-39.1576N	143- 2.6550E	5900	Target Point
2	11:25	-1018.07	65.24	11-39.1478N	143- 2.6359E	5952	Landing
3	12:56	-623.71	112.13	11-39.3617N	143- 2.6617E	5746	Stop 1: Sampling 2 rocks, Set #173 Marker
4	13:32	-628.13	128.85	11-39.3593N	143- 2.6709E	5741	Stop 2: Sampling *Calyptogena* clams (Canister 1) & annimals (zoanthid, galatheid crab, tube worm) (Canister 2)with slurpgun, Sampling 1 rock
5	14:16	-625.37	167.92	11-39.3608N	143- 2.6924E	5743	Stop 3: Sampling chimney surface with slurpgun (Canister 3), Sampling two chimneys (chimney fragments were secured with scoop)
6	14:51	-686.57	599.35	11-39.3276N	143- 2.9298E	5734	Stop 4: Sampling 1 scoop (gravels), Set #174 Marker
7	14:52	-686.57	599.35	11-39.3276N	143- 2.9298E	5722	Stop 4 continued: Sampling Niskin, Left bottom

(X Y) origin = (11-39.7000N 143-2.6000E)





Bathymetric map and dive track profile for 6K-1404



X-Y map for 6K-1404

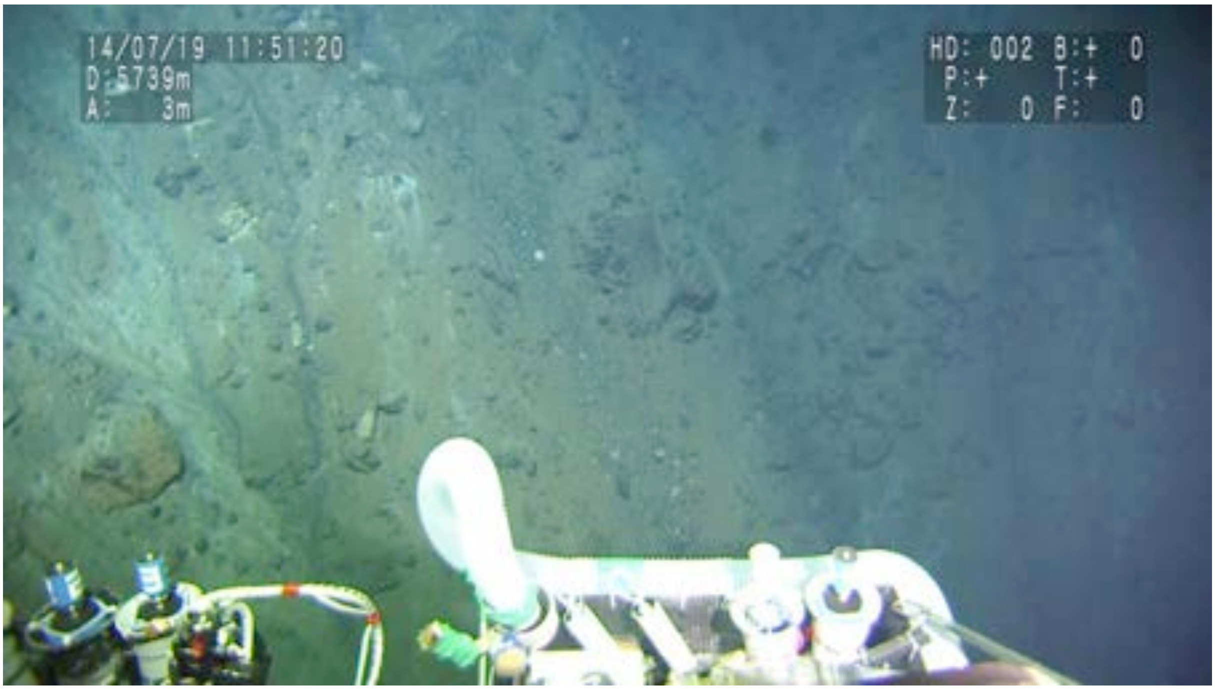


Photo 1. Seafloor along the transect at ~143°02’39”E. Relatively steep slope with peridotite rubbles. Obvious serpentine muds are visible.

Photo 2. Peridotites with white filamentous material (R01, R02).

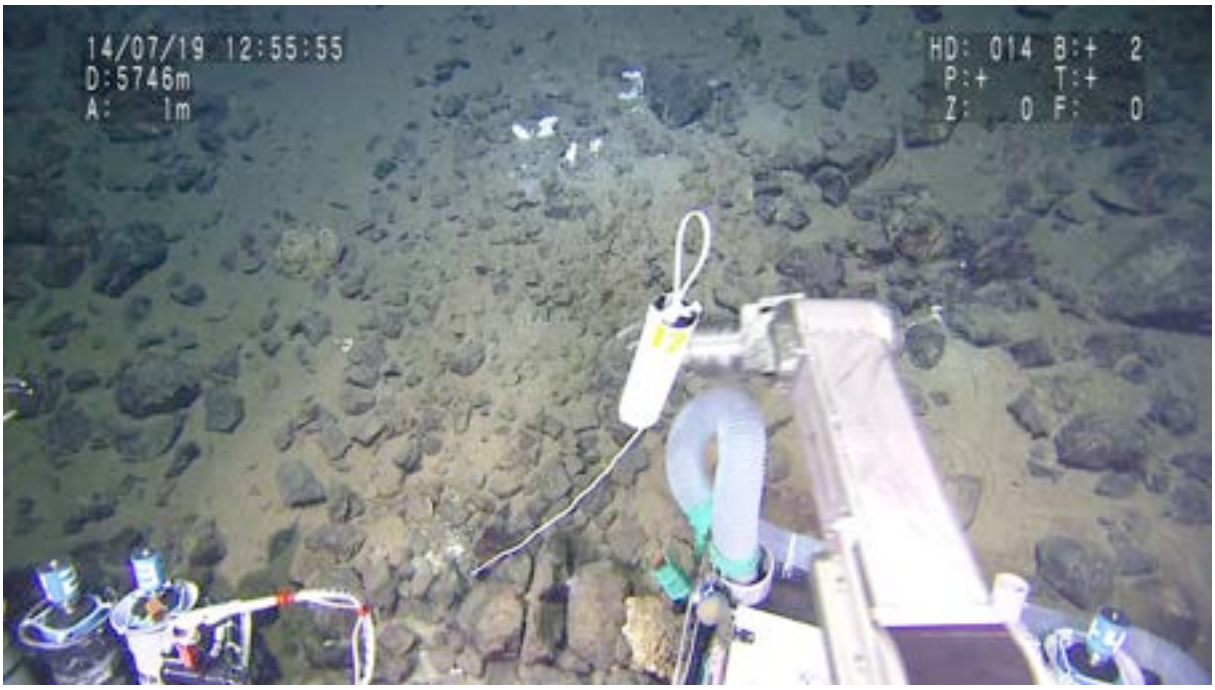


Photo 3. Seafloor at Stop 1. Setting Marker #173.

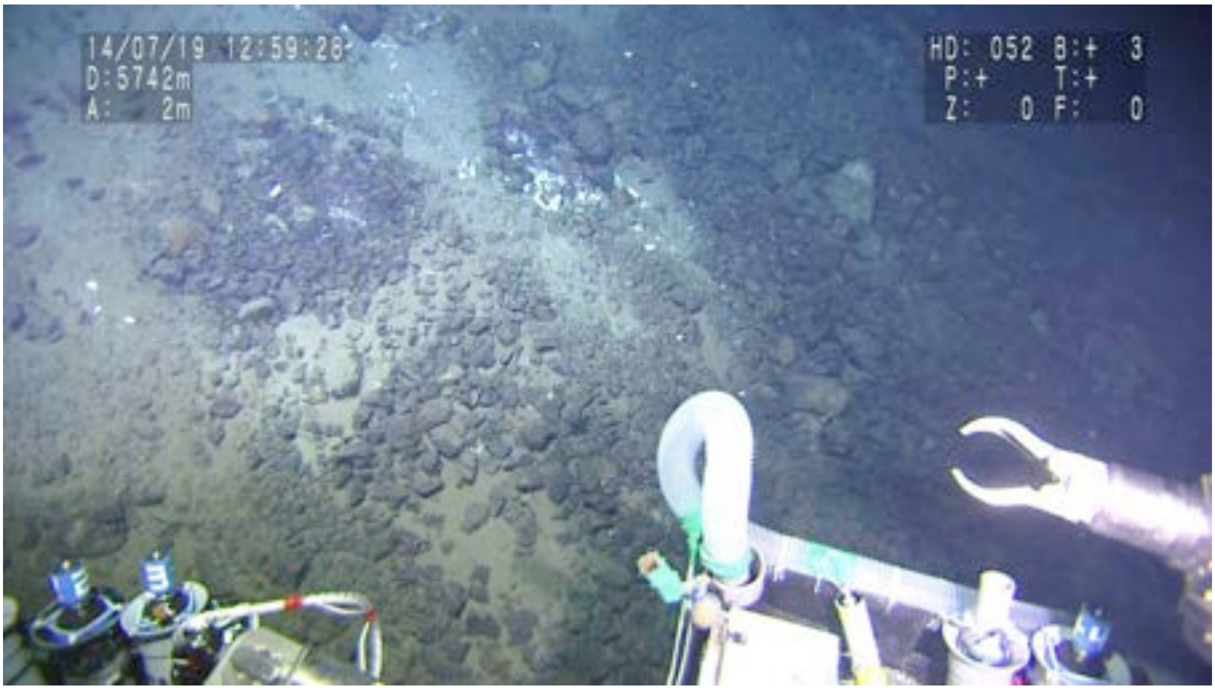


Photo 4. Seafloor at Stop 2.

Photo 5. Sampling *Calyptogena* clams at Stop 2.

Photo 6. Serpentinized peridotite with zoanthids on its surface at Stop 2.

Photo 7. Galatheid crab and tube worm at Stop 2.

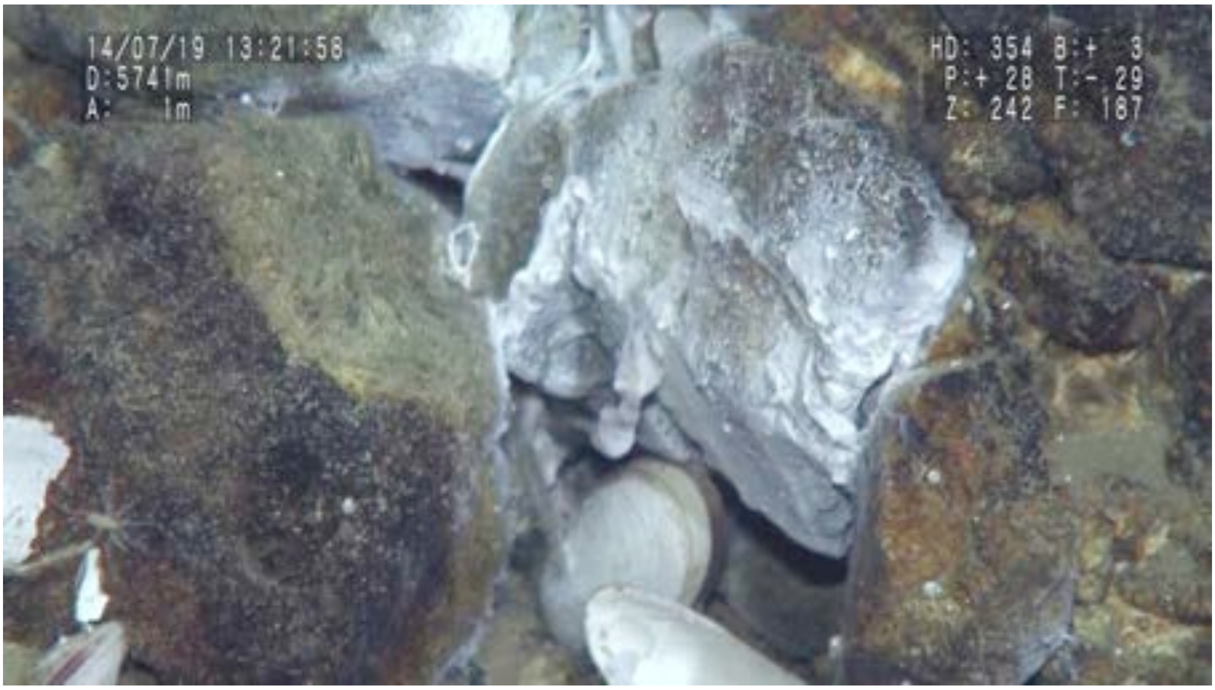


Photo 8. Rock with white filamentous material at Stop 2.

Photo 9. Chimneys at Ohara Site (at Stop 3).

Photo 10. Sampling the surface of a yellowish-brown chimney with polyp-like features.

Photo 11. Sampling a yellowish-brown chimney (R04) with polyp-like features.

Photo 12. Galatheid crab and dead tube worm shell on a yellowish-brown chimney with polyp-like features.

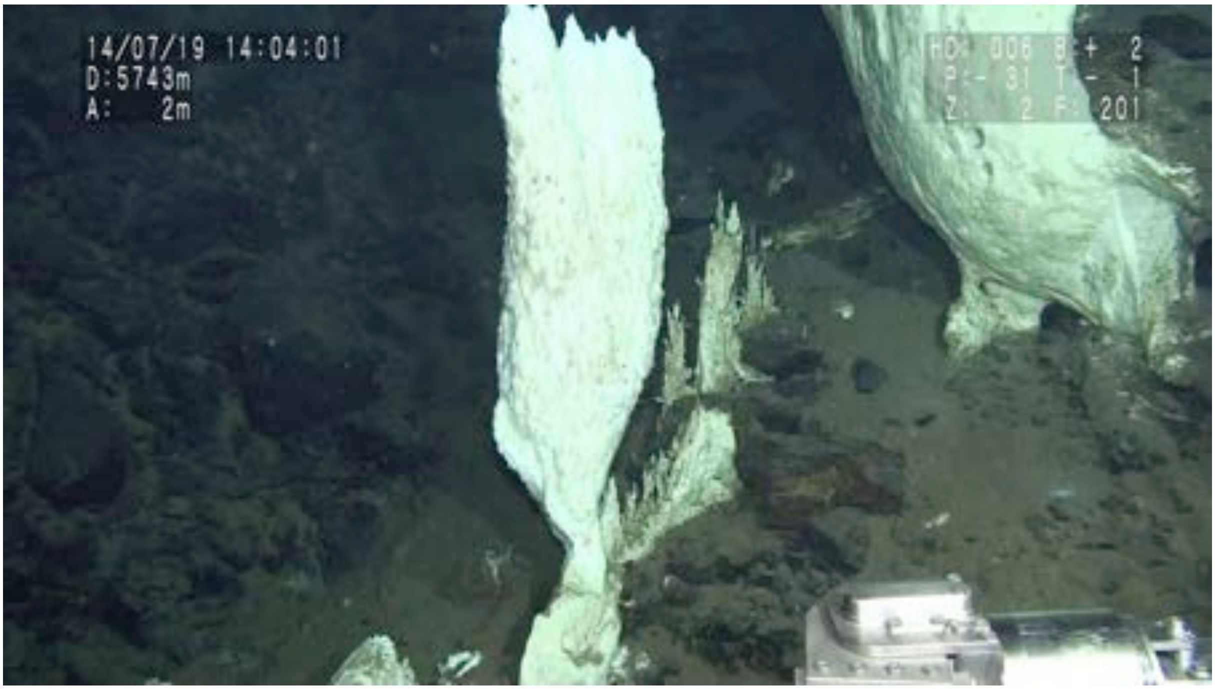


Photo 13. Sampling a spindle-shaped chimney.

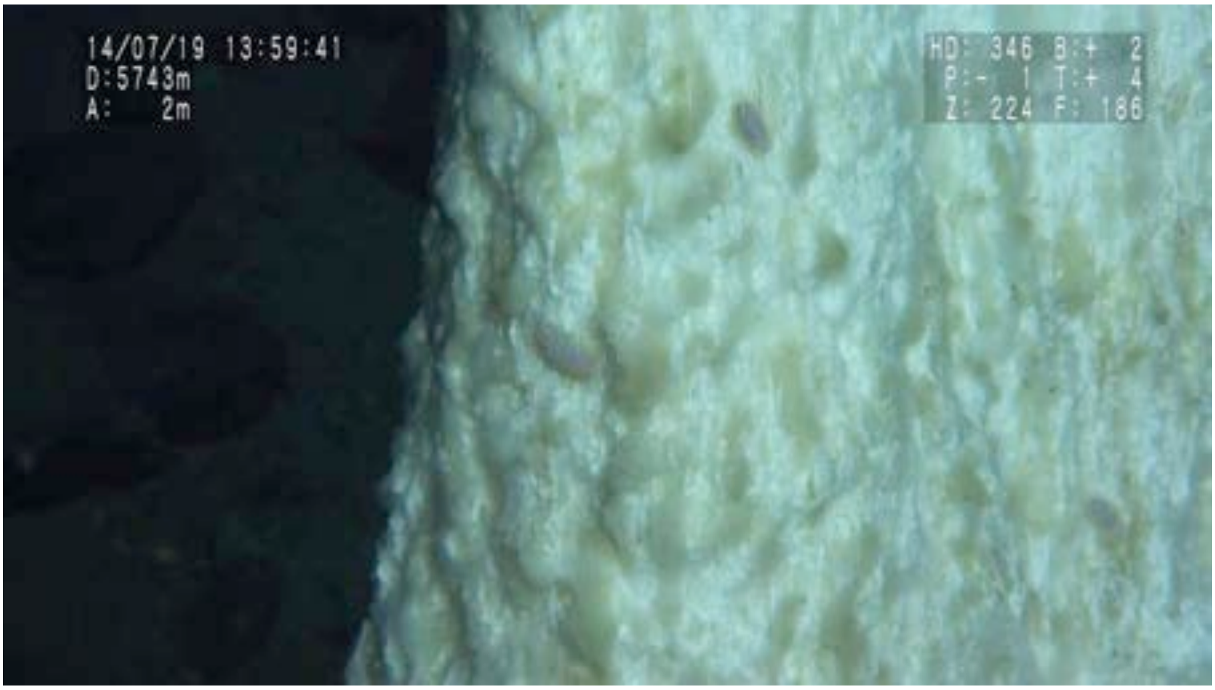


Photo 14. Close-up view of the spindle-shaped chimney. Although Aphroditiformia sp. and film-like materials were obvious, these were not sampled with slurp gun.

Photo 15. Marker #159 at Col-5.

Photo 16. Setting Marker #174 at Stop 4.

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Appendix B

Sample photos

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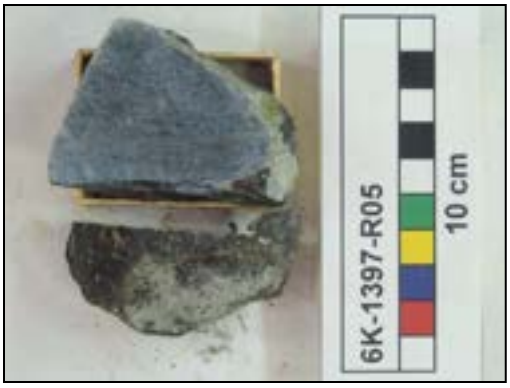
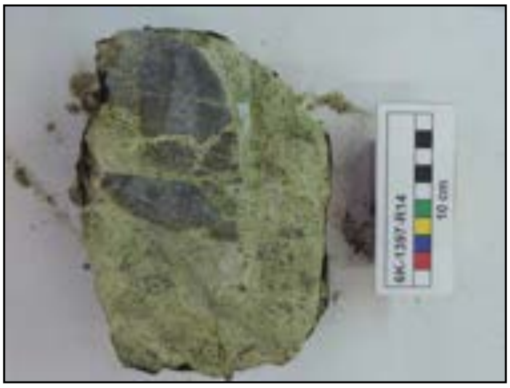
YK14-13_6K-1397 (Y. Ohara) Samples (1/4)

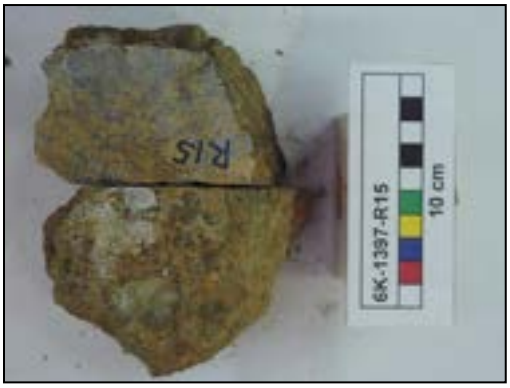


6K-1397-R06: Lost

YK14-13_6K-1397 (Y. Ohara) Samples (2/4)



YK14-13_6K-1397 (Y. Ohara) Samples (3/4)



YK14-13_6K-1397 (Y. Ohara) Samples (4/4)

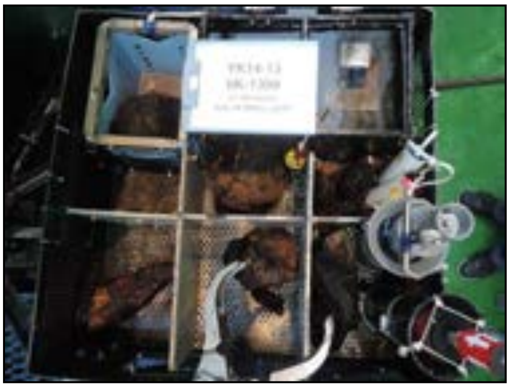
YK14-13_6K-1398 (I. Pujana) Samples (1/4)

YK14-13_6K-1398 (I. Pujana) Samples (2/4)

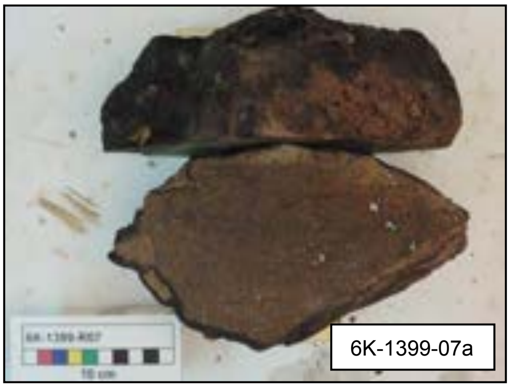
YK14-13_6K-1398 (I. Pujana) Samples (3/4)

YK14-13_6K-1398 (I. Pujana) Samples (4/4)

YK14-13_6K-1399 (T. Okumura) Samples (1/4)

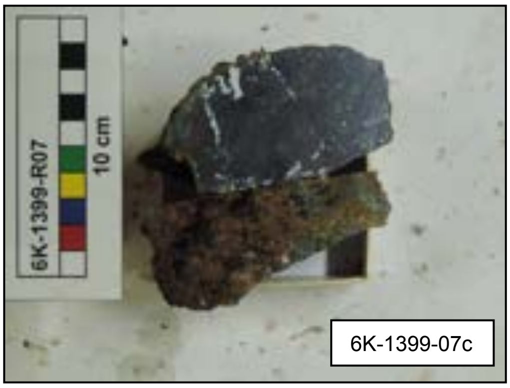


YK14-13_6K-1399 (T. Okumura) Samples (2/4)



6K-1399-07a

6K-1399-07b



6K-1399-07c

6K-1399-R11: Missing

YK14-13_6K-1399 (T. Okumura) Samples (3/4)


6K-1399-Scoop 1

6K-1399-Scoop 1 (I. Pujuna's archive)


6K-1399-Core 1 (sampled by H. Watanabe)

6K-1399-Core 1 Residue (I. Pujuna's archive)


6K-1399-Core 2 (sampled by T. Okumura)

YK14-13_6K-1399 (T. Okumura) Samples (4/4)

6K-1399-Core 3 (sampled by Y. Miyajima)

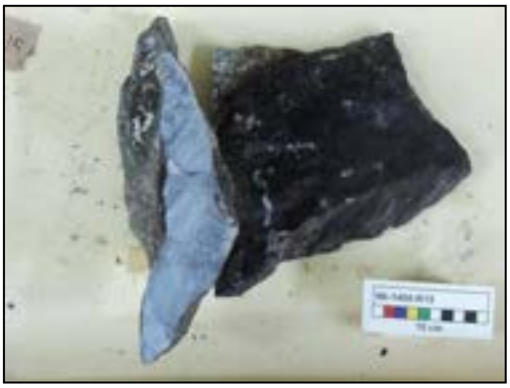
6K-1399-Core 3 (cut surface; sampled by Y. Miyajima)

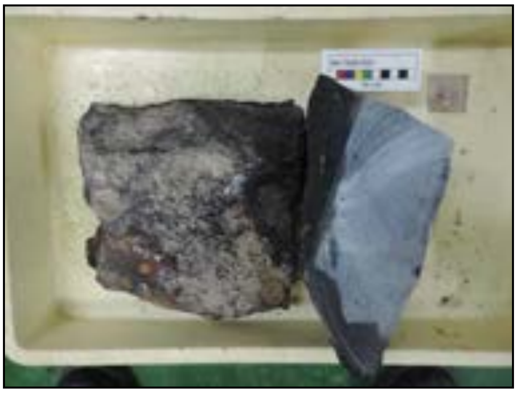
6K-1399-Imai Core Residue (I. Pujuna's archive)

YK14-13_6K-1400 (T. Ishii) Samples (1/4)

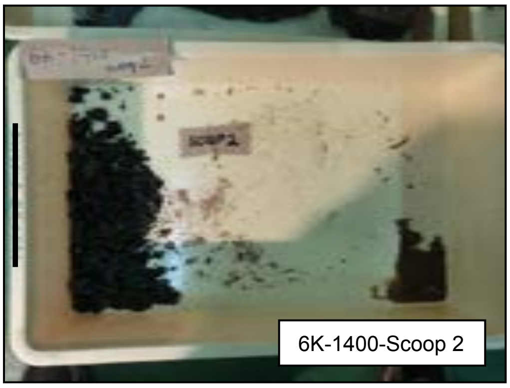
YK14-13_6K-1400 (T. Ishii) Samples (2/4)

YK14-13_6K-1400 (T. Ishii) Samples (3/4)

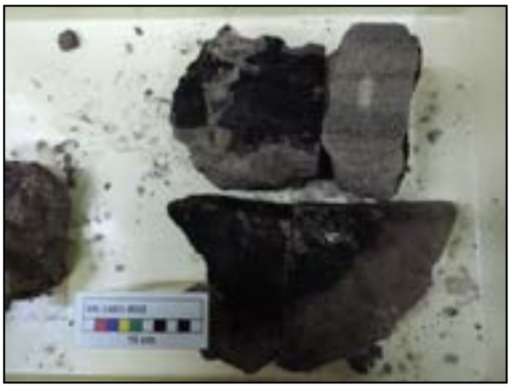




YK14-13_6K-1400 (T. Ishii) Samples (4/4)

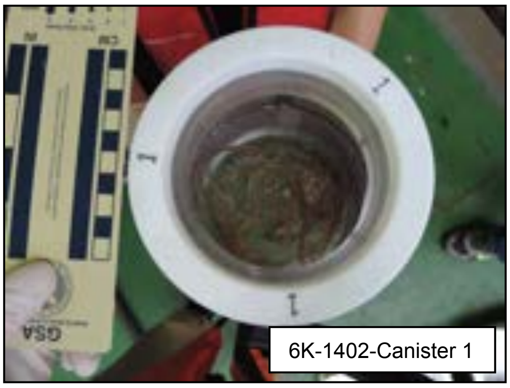


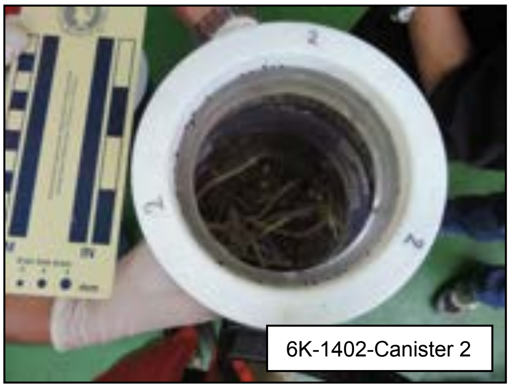
YK14-13_6K-1401 (H. Watanabe) Samples (1/2)

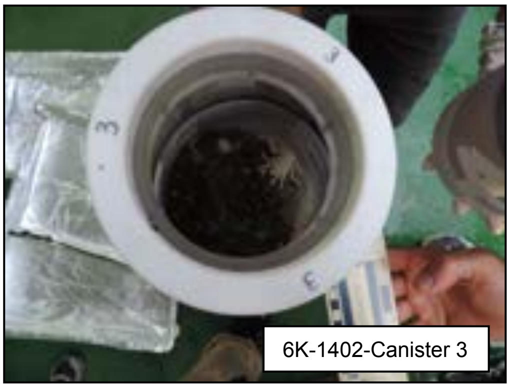


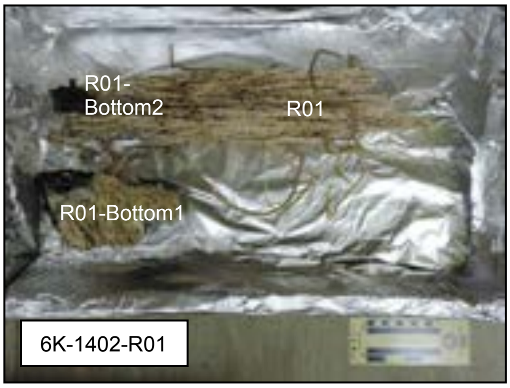
YK14-13_6K-1401 (H. Watanabe) Samples (2/2)

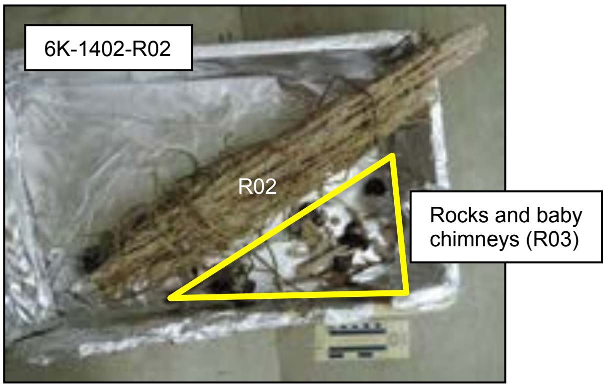
YK14-13_6K-1402 (U. Konno) Samples (1/3)



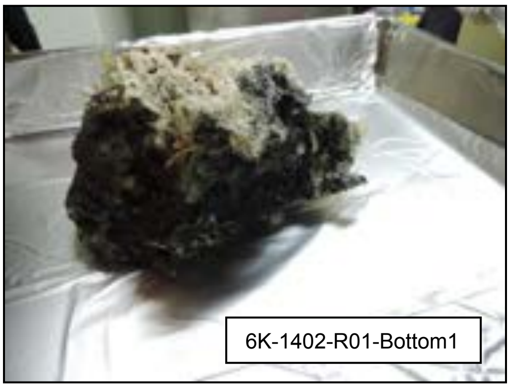


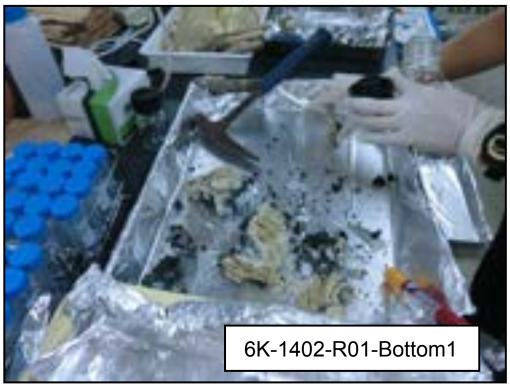




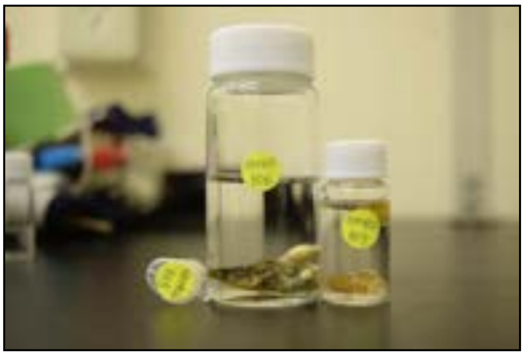


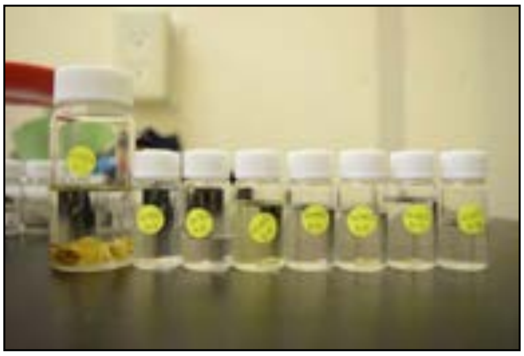
YK14-13_6K-1402 (U. Konno) Samples (2/3)

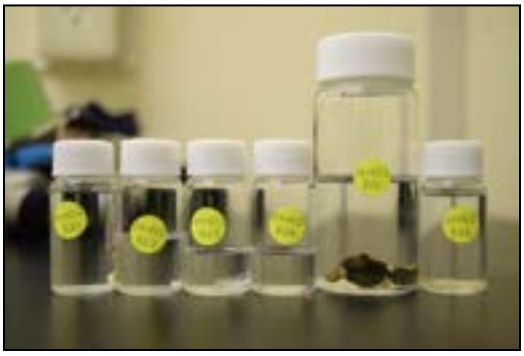


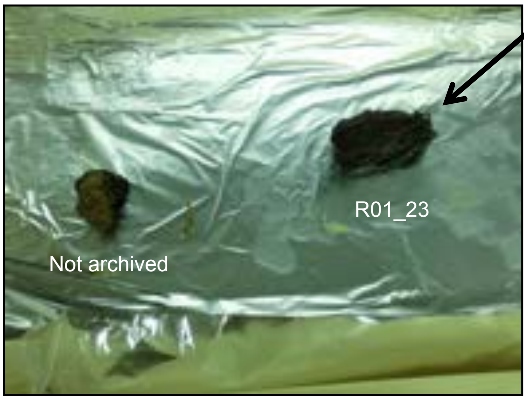


YK14-13_6K-1402 (U. Konno) Samples (3/3)









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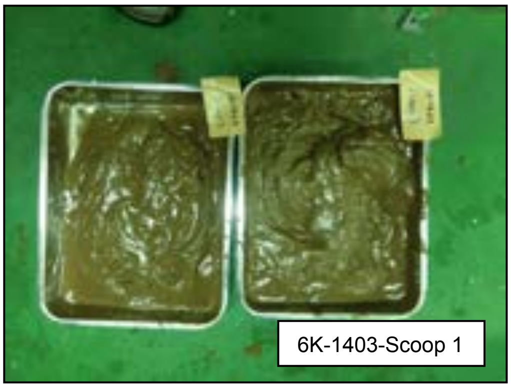
YK14-13_6K-1403 (T. Okumura) Samples (1/3)

6K-1403-Scoop 1

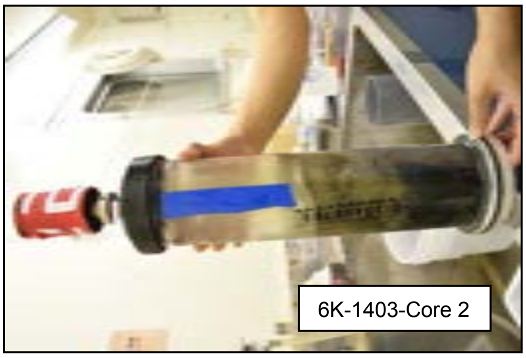

6K-1403-Scoop 1


6K-1403-Core 1


6K-1403-Core 1


6K-1403-Core 1

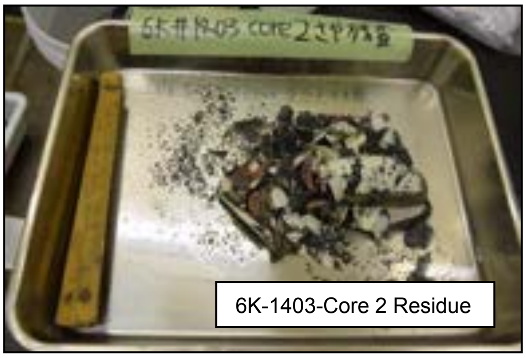
YK14-13_6K-1403 (T. Okumura) Samples (2/3)



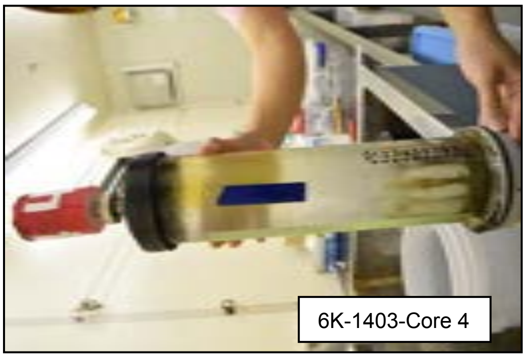
6K-1403-Core 2

6K-1403-Core 2

6K-1403-Core 2



6K-1403-Core 2 Residue



6K-1403-Core 4

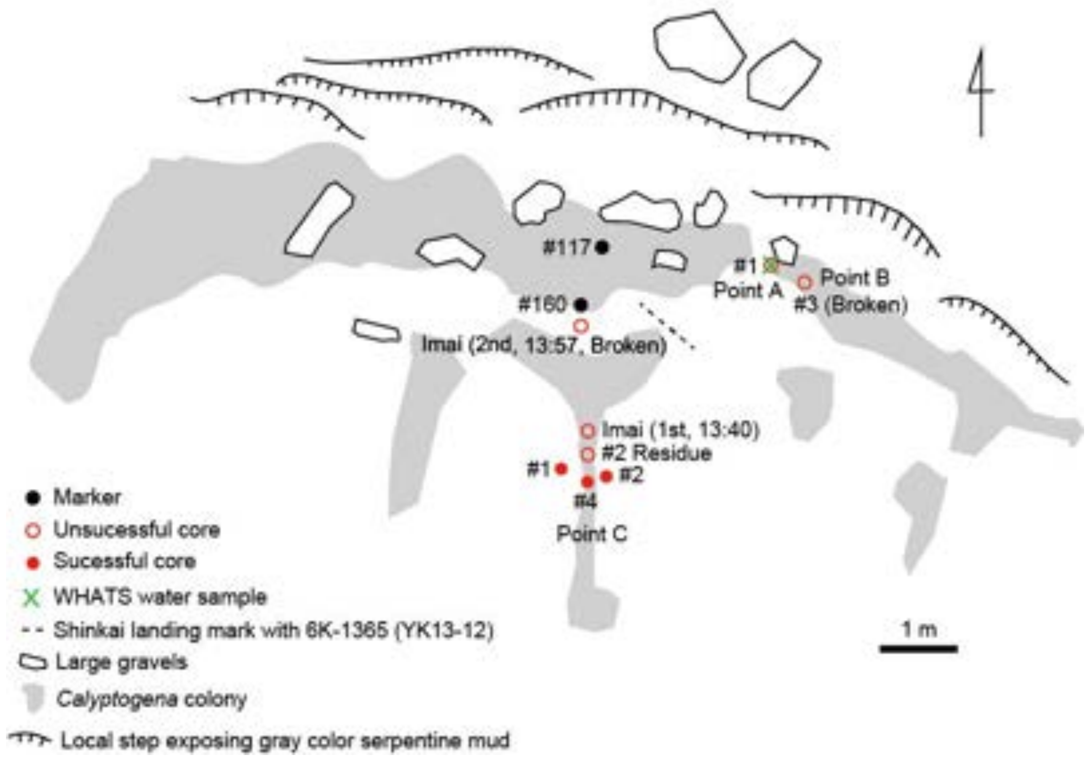
6K-1403-Core 4

6K-1403-Core 4

6K-1403-Core 4 Residue (Y. Miyajima's archive)

YK14-13_6K-1403 (T. Okumura) Samples (3/3)

Sketch of Col-4 showing coring points during 6K-1403



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YK14-13_6K-1404 (Y. Ohara) Samples (1/4)

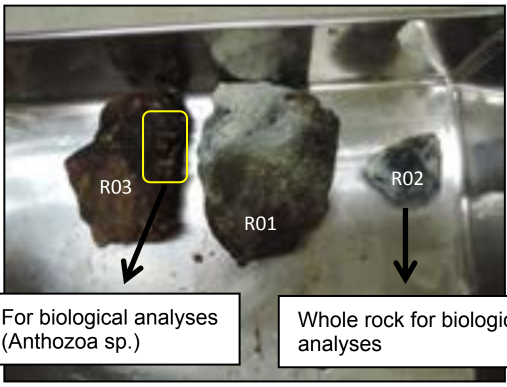
6K-1404-R05 (Intact view right after recovery)

6K-1404-R05 (Close-up of the bottom)

6K-1404-R05

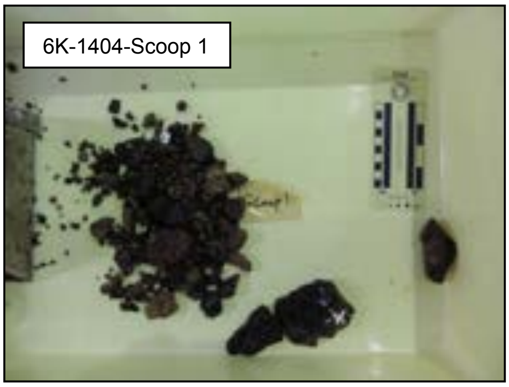
6K-1404-R04

6K-1404-R04



For biological analyses (Anthozoa sp.)

Whole rock for biological analyses



6K-1404-Scoop 1

YK14-13_6K-1404 (Y. Ohara) Samples (2/4)

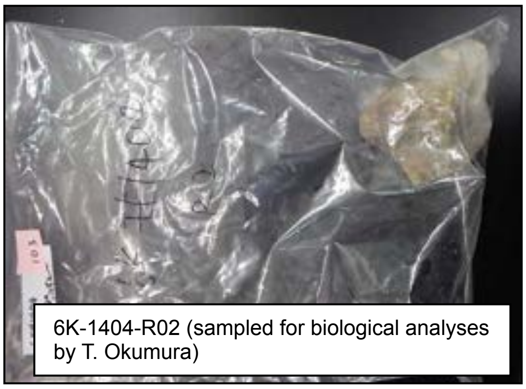

6K-1404-Canister 1


6K-1404-Canister 2


6K-1404-Canister 3


6K-1404 Rock samples (archived ones)


6K-1404 Scoop 1 Residue


6K-1404-R02 (sampled for biological analyses by T. Okumura)

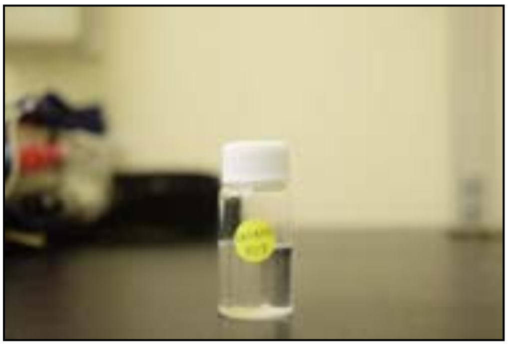
YK14-13_6K-1404 (Y. Ohara) Samples (3/4)

This is the residue after biological sampling by T. Okumura.

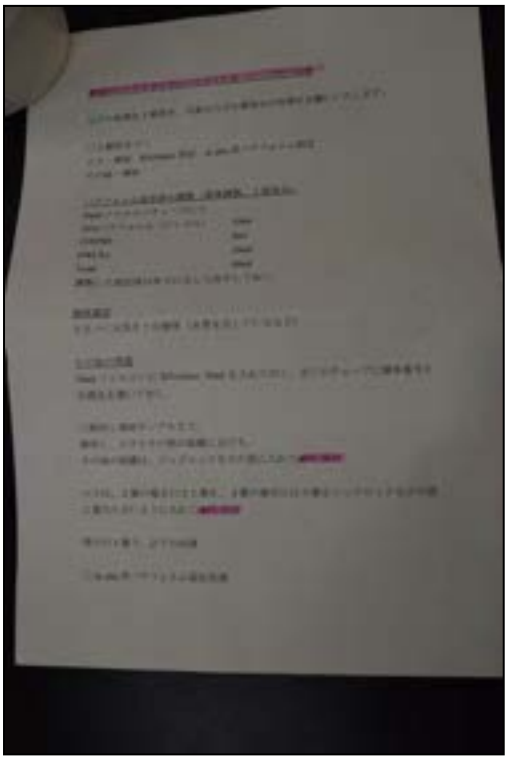
6K-1404-Canister 1

6K-1404-Canister 1

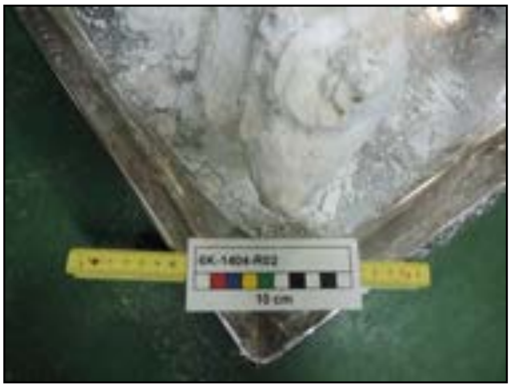
6K-1404-Canister 1



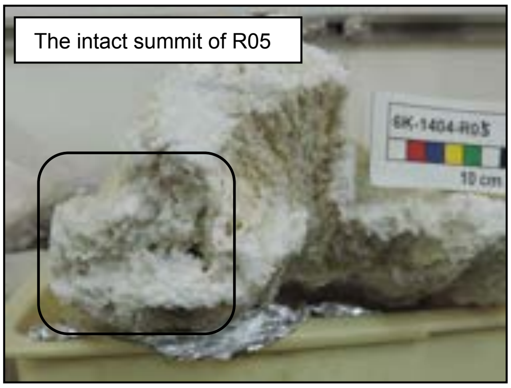
YK14-13_6K-1404 (Y. Ohara) Samples (4/4)

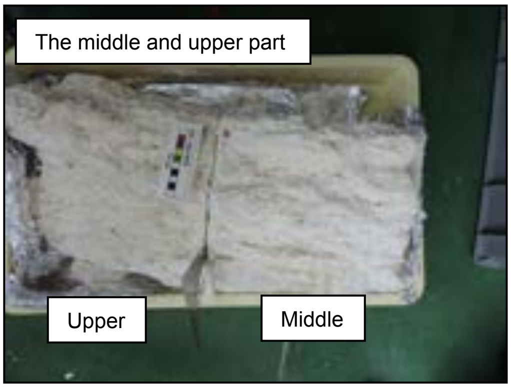


YK14-13_6K-1404 (Y. Ohara) Samples_R05 (1/3)

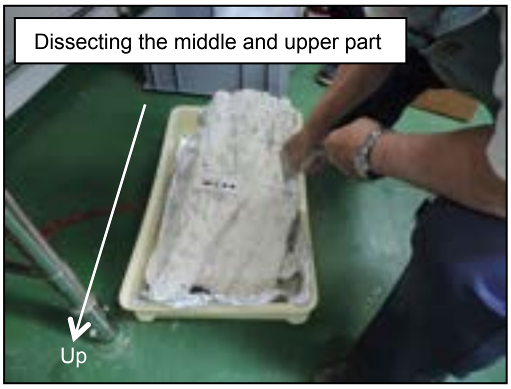



The bottom mouth


The intact summit of R05

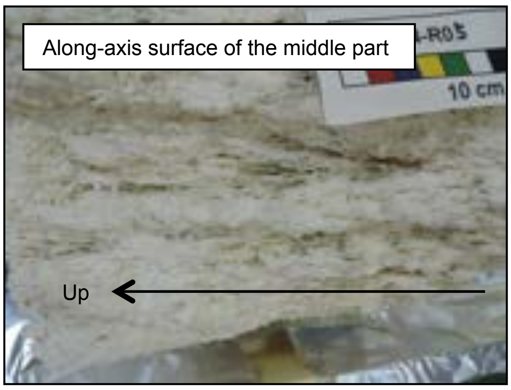


The middle and upper part



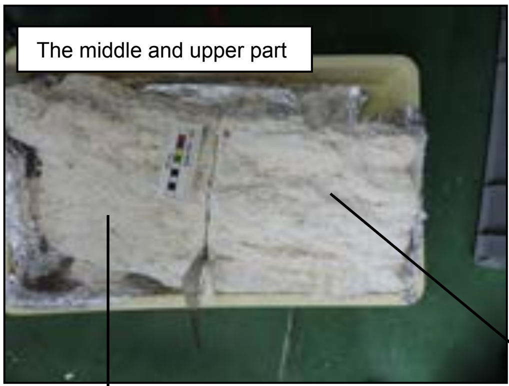
Dissecting the middle and upper part


Cut surface of the top of middle part

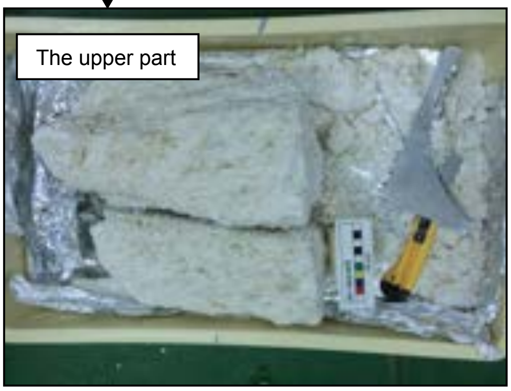


Along-axis surface of the middle part

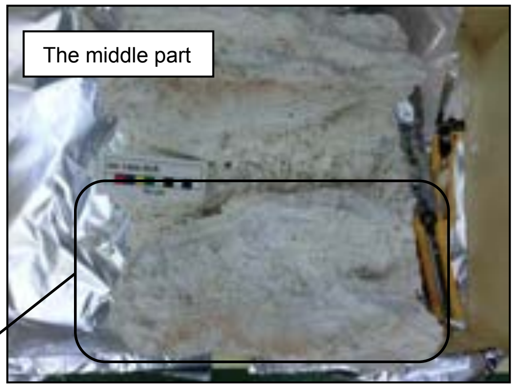
YK14-13_6K-1404 (Y. Ohara) Samples_R05 (2/3)



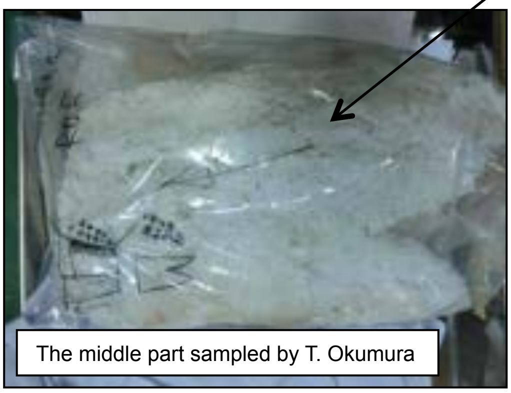
The middle and upper part



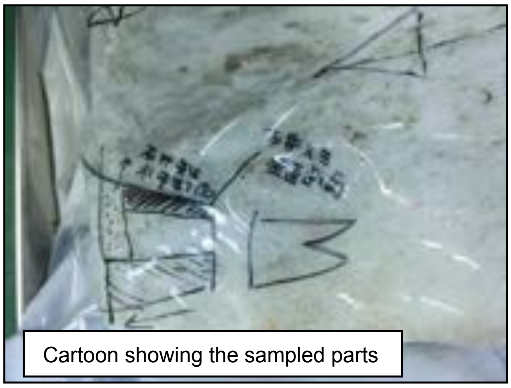
The upper part



The middle part

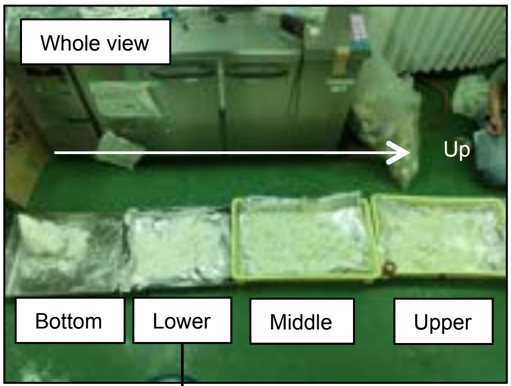


The middle part sampled by T. Okumura



Cartoon showing the sampled parts

YK14-13_6K-1404 (Y. Ohara) Samples_R05 (3/3)



Note: This part was sampled for pore water measurments by Y. Onishi right after the recovery of the sample on July 19, 2014.

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Appendix C

Non-biological sample descriptions

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6K-1397 (Y. Ohara)

Sample #	Lithology	Wt (kg)	X (cm)	Y (cm)	Z (cm)	Comment
R01	Peridotite	1.50	13	11	9	Fresh, serpentinized veins/rim, spinel rich.
R02	Peridotite	2.85	17	13	10	Fresh, many pyroxene, possibly lherzolite.
R03	Peridotite	3.60	17	13	10	Fresh, lineament/foliation visible,possibly harzburgite.
R04	Peridotite	0.65	9	7	4	Fresh, lineament/foliation visible,possibly harzburgite.
R05	Peridotite	0.35	7	6	5	Lineament visible; defined by serpentinization or spinel.
R06	Lost	-	-	-	-	The sample was probably lost during the recovey of the Shinkai.
R07	Limestone	-	22	11	8	Reef limestone, fossil included.
R08	Peridotite	8.30	20	19	16	Lherzolite, matrix altered, yellow/orange color.
R09	Serpentinized peridotite	0.80	10	9	6	Harzburgite?
R10	Peridotite	0.40	9	6	5	Spinel rich.
R11	Peridotite	0.65	12	8	4	Lherzolite, matrix altered, yellow/orange color.
R12	Peridotite	4.90	20	16	10	Lherzolite?
R13	Peridotite	1.00	12	11	5	Lherzolite?
R14	Peridotite	18.2	45	20	15	Sheared peridotite with some blocks intact (not sheared).
R15	Peridotite	1.55	15	10	7	Partially serpentinized peridotite, lherzolite?
R16	Peridotite	0.70	14	11	3	Partially serpentinized peridotite, harzburgite?
R17	Peridotite	1.10	21	8	6	Fresh
R18	Peridotite	4.30	17	23	9	Fresh, black phenocrysts abundan, possibly spinel?
R19	Peridotite	0.70	10	10	4	Fresh, black phenocrysts abundan, possibly spinel?
R20	Peridotite	6.40	27	16	10	Fresh
R21	Peridotite	2.60	16	11	10	Fresh
R22	Peridotite	3.10	33	11	10	Fresh
R23	Peridotite	2.35	10	12	9	Fresh
R24	Peridotite	1.25	14	15	7	Fresh
R25	Peridotite	3.70	23	12	7	Sheared, veins; harzburgite?
R26	Peridotite	0.40	12	3	4	Fresh

6K-1398 (I. Pujana)

Sample #	Lithology	Wt (kg)	X (cm)	Y (cm)	Z (cm)	Comments
R01	Serpentinized peridotite	4.75	21	18	18	
R02	Gabbro	2.40	15	8	11	Large olivine?
R03	Ol-phyric basalt	6.50	27	18	10	Fine grained, ol porphyroclast, pillow lava?
R04	Basalt	1.50	14	10	8	Fine grained.
R05	Ol-gabbro	2.60	13	12	7	
R06	Ol-gabbro	2.20	20	11	6	
R07	Carbonate	2.60	20	15	9	
R08	Ol-gabbro	3.00	16	11	11	
R09	Peridotite	4.80	20	15	13	
R10	Limestone	8.50	37	21	22	
R11	Peridotite	6.50	27	17	11	Serpentine veins.
R12	Peridotite	7.50	20	15	13	Fresh, however altered plagioclase included.
R13	Troctolite	2.30	16	13	9	
R14	Peridotite	15.2	34	26	10	Fresh, however altered plagioclase included.
R15	Peridotite	2.50	20	11	10	Many serpentine veins.
R16	Peridotite	0.90	9	7	9	Fresh?
R17	Basalt	5.80	26	17	13	Matrix altered?
R18	Basalt	2.30	14	14	13	Matrix altered?
R19	Peridotite + gabbro	8.80	26	19	16	Fresh peridotite with gabbroic margin.
R20	Peridotite	10.0	26	18	16	Fresh
R21	Serpentine sandstone with peridotite	4.10	20	13	10	Serpentine sand matrix, peridotite fresh.
R22	Peridotite	2.80	16	11	10	Black-colored, harzburgite?
R23	Serpentinized peridotite	0.60	14	7	4	Many veins, highly fractured; needs careful treatment when thin-sectioning.
Scoop 1	-	-	-	-	-	Grape size sediment spheres. Partly archived by T. Okumura for biogeochemical analyes. Also archvied by I. Pujuna.
Scoop 2	-	-	-	-	-	Archived by I. Pujuna.

6K-1399 (T. Okumura)

Sample #	Lithology	Wt (kg)	X (cm)	Y (cm)	Z (cm)	Comments
R01	Gabbro	1.00	10	11	6	Leucocratic; red/brown alteration minerals.
R02	Mud with Mn crust	1.20	19	15	8	Clastic crust (may contain volcanics).
R03	Peridotite	1.35	18	17	5	Highly weathered; visible spinel, olivine mesh texture.
R04	Troctolite	2.20	12	14	10	Visible olivine, dark mineral (unidentified).
R05	Troctolite	4.80	17	18	11	Altered plagioclase, iddingsite.
R06	Troctolite	6.70	24	18	15	Iddingsite
R07	-	4.70	23	17	11	-
R07a	Peridotite	-	-	-	-	Highly altered; amphibole, altered ol mesh texture; altered plagioclase?
R07b	Serpentinized harzburgite	-	-	-	-	Large iddingsite, pyroxene.
R07c	Troctolite	-	-	-	-	Altered plagioclase, iddingsite
R08	Peridotite	6.50	23	17	14	Outer rim heavily weathered, inner core relatively fresh.
R09	Volcanic sandstone	2.50	19	13	7	Basalt (fresh), maybe glass, clasts ~1 to ~3 mm in diameter.
R10	Mud	2.20	30	13	6	Some small vesicles.
R11	Lost	-	-	-	-	-
R12	Andesitic gabbro	9.90	26	15	17	Some altered plagioclase, spinel?
Imai Core	-	-	-	-	-	The core was not discribed as a core sample. The residue included altered harzburgite. Archived by I. Pujuna.
Core 1	-	-	-	-	-	Whole core was sampled by H. Watanabe for collecting macrofaunas, but small amount residue was available as hard-rock sample. Matrix altered basalt. The residue was archived by I. Pujuna and M. Brounce.
Core 2	-	-	-	-	-	Whole core sampled by T. Okumura.
Core 3	-	-	-	-	-	Whole core sampled by Y. Miyajima.
Scoop 1	-	-	-	-	-	Small volcanic crust, glass included? Archived by T. Okumura, I. Pujuna and JAMSTEC.
Others	-	-	-	-	-	Misc. fragments.

6K-1400 (T. Ishii)

Sample #	Lithology	Wt (kg)	X (cm)	Y (cm)	Z (cm)	Comments
R01	Basalt	1.4	15	14	11	Plagioclase, olivine, black round mineral - sulfide?
R02	Basalt	1.1	10	11	8	Plagioclase, possible chilled margin, autobreccia.
R03	Basalt	2.5	20	12	11	Plagioclase, red alteration in vein, autobreccia.
R04	Gabbro	5.3	14	23	14	Amphibole?
R05	Gabbro	8.6	20	22	17	Heaviliy altered, large altered plagioclase, white veins.
R06	Gabbro	2.6	9	20	12	Amphibole?
R07	Basalt	1.5	13	11	8	Matrix altered, plagioclase, olivine, magnetite or spinel?
R08	Basalt	3.1	24	18	7	Plagiocalse.
R09	Gabbro	0.7	8	10	6	Fresh, white vein.
R10	Gabbro	3.7	14	18	13	Fresh, white vein.
R11	Gabbro	5.8	13	29	10	Amphibole
R12	Gabbro	3.5	14	19	12	Amphibole
R13	Gabbro	2.4	14	13	12	Heaviliy altered, large altered plagioclase, olivine, cpx.
R14	Gabbro	5.0	26	24	12	Heaviliy altered, large altered plagioclase, olivine, cpx.
R15	Basalt	8.8	35	34	11	Altered
R16	Basalt	6.2	26	18	15	Altered, red alteration mineral.
R17	Basalt	10.7	33	24	13	Altered
R18	Basalt	6.2	14	25	14	Matrix altered, green alteration halos around some minerals.
R19	Basalt	1.5	15	10	12	Matrix altered.
R20	Basalt	2.5	13	21	11	Altered outer core, relatively fresh inner core.
R21	Basalt	25.0	45	29	16	Matrix altered, altered plagioclase.
R22	Basalt	30.0	40	32	16	Altered plagioclase.
R23	Basalt	2.1	11	20	8	Fine grained, large vein.
R24	Basalt	1.2	9	19	5	Olivine, magnetite or large spinel?
R25	Basalt	0.7	18	9	4	Altered outer core, relatively fresh inner core.
R26	Basalt	0.2	7	5	3	Small reflective minerals.
Scoop 1	-	-	-	-	-	Archived by Y. Ohara, T. Ishii, T. Okumura, I. Pujuna and H. Yamashita.
Scoop 2	-	-	-	-	-	Archived by Y. Ohara, T. Ishii, T. Okumura, I. Pujuna and H. Yamashita.

6K-1401 (H. Watanabe)

Sample #	Lithology	Wt (kg)	X (cm)	Y (cm)	Z (cm)	Comments
R01	Mud	0.7	7	12	9	With coarser grained dark minerals.
R02	Basalt	0.5	5	8	6	Fresh, olivine, small plagioclase, cpx.
R03	Pumice	0.1	6	4	4	
R04	Mud	1.7	15	15	9	With coarser grained dark minerals.
R05	Volcanic sandstone	6.0	46	15	10	Heavily altered.
R06	Basalt	1.0	9	10	5	Matrix altered, iddingsite, cpx.
R07	Basalt	8.0	25	20	13	Olivine, plagioclase, cpx.
R08	Mud	0.1	3	6	4	With coarser grained dark minerals.
R09	Basalt	1.5	8	10	11	Vesicular, a little bit altered.
R10	Volcanic sandstone	8.7	40	20	13	Heavily altered.
R11	Scoria	1.8	15	14	8	
R12	Scoria	0.5	9	7	3	
R13	Scoria	1.8	13	12	6	

6K-1402 (U. Konno)

Sample #	Lithology	Wt (kg)	X (cm)	Y (cm)	Z (cm)	Comments
R01	Large chimney + chimney bottom	-	-	-	-	Whole sample was archived by T. Okumura for biogeochemical analyes.
R01_23	Unknown	-	-	-	-	Caution: this sample was simultaneously taken with R03, but numbered as "R01". Whole sample was archived by T. Okumura for biogeochemical analyes. The lithology is likely a peridotite.
R02	Large chimney	-	-	-	-	This sample was mostly archived by T. Ishii for mineralogical analyes. Some small fragments were also archived by I. Pujuna.
R03	Baby chimneys	-	-	-	-	Three baby chimneys were archived by T. Okumura for biogeochemical analyes. The rock fragments were archived as "Chimney Basement" by Y. Ohara, I. Pujuna, and M. Brounce.
Canister 1	(No residues)	-	-	-	-	No residue from Canister 1.
Canister 2	-	-	-	-	-	The residue was archived by I. Pujuna and H. Yamashita.
Canister 3	-	-	-	-	-	The residue was archived by I. Pujuna and H. Yamashita.
Imai core	-	-	-	-	-	The residue was archived by Y. Ohara, I. Pujuna and M. Brounce.
Others	-	-	-	-	-	This includes the rock fragments from R03.

6K-1403 (T. Okumura)

Sample #	Lithology	Wt (kg)	X (cm)	Y (cm)	Z (cm)	Comments
Core 1	-	-	-	-	-	Whole sample was archived by Y. Miyajima for sedimentological analyes.
Core 2	-	-	-	-	-	Whole sample was archived by Y. Miyajima for sedimentological analyes.
Core 2 Reidue	-	-	-	-	-	Caution: this residue comes from the point different from Core 2. See 6K-1403 dive report for details. The residues were archived by I. Pujuna and H. Yamashita.
Core 4	-	-	-	-	-	Whole sample was archived by Y. Miyajima for sedimentological analyes.
Scoop 1	-	-	-	-	-	Archived by I. Pujuna, H. Yamashita and JAMSTEC.

Note: Core 3 and Imai core were aborted during the dive operation.

6K-1404 (Y. Ohara)

Sample #	Lithology	Wt (kg)	X (cm)	Y (cm)	Z (cm)	Comments
R01	Peridotite	0.8	13	10	6	
R02	Unknown	-	-	-	-	Whole sample was archived by T. Okumura for biogeochemical analyes.
R03	Peridotite	0.5	11	7	5	Anthozoa sp. (6K-1404-B13) was attached on the surface.
R04	Chimney	-	-	-	-	Anthozoa sp. (6K-1404-B14) was attached on the surface.
R05	Large chimney	-	-	-	-	Large chimney, very fragile.
Scoop 1 R01	Peridotite	0.2	8	8	4	
Scoop 1 R02	Peridotite	-	4	3	2	
Scoop 1 R03	Peridotite	0.1	8	3	3	
Canister 1	-	-	-	-	-	The residue was archived by I. Pujuna.
Canister 2	-	-	-	-	-	The residue was archived by I. Pujuna.
Canister 3	(No residues)	-	-	-	-	No residue from Canister 3.
Scoop 1	-	-	-	-	-	Scoop 1 included three rocks described as Scoop 1 R01, R02, R03. Archived by I. Pujuna and JAMSTEC.

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Appendix D

Metadata sheet for biological and biogeochemical samples

Note 1: this sheet is a modified version of the original sheet that was submitted to JAMSTEC soon after the cruise.

Note 2: most samples are archived by Hiromi Watanabe, some by Tomoyo Okumura and by Yusuke Miyajima.

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No.	Onboard ID	Dive No.	Sample Name	Sample Name (in Japanese)	Number of Individuals (amount)	Attributes	Sampling method	Fixation	Preservation	Remarks
1	6K-1397-1	6K-1397	Protists	真核生物群集			Manipulator	Alive	Alive	For cultivation with EST
2	6K-1397-2	6K-1397	Protists	真核生物群集			Manipulator	Alive	Alive	For cultivation with Serum D
3	6K-1397-MB1	6K-1397	Microbial mat on limestone	石灰岩上の微生物マット	310 g	Limestone	Manipulator	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
4	6K-1397-MB2	6K-1397	Microbial mat on limestone	石灰岩上の微生物マット	10 g	Limestone	Manipulator	4% PFA-PBS	Refrigerated	For texture observation (archived by T. Okumura)
5	6K-1397-MB3	6K-1397	Suspended particles in seawater	海水中の懸濁粒子	1000 ml	Residue after filtering by 0.22 μm celeose filter	Niskin sampler	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
6	6K-1398-MB1	6K-1398	Mud	泥	10 g		Scoop	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
7	6K-1398-MB2	6K-1398	Mud	泥	2 g		Scoop	4% PFA-PBS	Refrigerated	For texture observation (archived by T. Okumura)
8	6K-1398-MB3	6K-1398	Microbial mat on limestone	石灰岩上の微生物マット	200 g	Limestone	Manipulator	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
9	6K-1398-MB4	6K-1398	Microbial mat on limestone	石灰岩上の微生物マット	5 g	Limestone	Manipulator	4% PFA-PBS	Refrigerated	For texture observation (archived by T. Okumura)
10	6K-1399-C01	6K-1399	Sediment core	メイオベントス群集	1	5 cm	H-type corer	99.5% EtOH		Several pices of rock were included.
11	6K-1399-C03	6K-1399	Sediment core	堆積物コア	1	15 cm	H-type corer	-	Refrigerated/frozen	Serpentinite clay, splited into halves (archived by Y. Miyajima).
12	6K-1399-MB1	6K-1399	Sediment core	堆積物コア	20 g	20 cm	H-type corer	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
13	6K-1399-MB2	6K-1399	Sediment core	堆積物コア	20 g	20 cm	H-type corer	4% PFA-PBS	Refrigerated	For texture observation (archived by T. Okumura)
14	6K-1399-MB3	6K-1399	Sediment	堆積物	5 g		Scoop	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
15	6K-1399-MB4	6K-1399	Sediment	堆積物	1000 g		Scoop	4% PFA-PBS	Refrigerated	For texture observation (archived by T. Okumura)
16	6K-1402-B01	6K-1402	Amphipoda sp.	ヨコエビ	68		Slurpgun	99.5% EtOH		Canister 1
17	6K-1402-B02	6K-1402	Tube worm	ハオリムシ?	1		Slurpgun	99.5% EtOH		Canister 1
18	6K-1402-B03	6K-1402	Isopoda sp.	等脚類A	15		Slurpgun	99.5% EtOH		Canister 1
19	6K-1402-B04	6K-1402	Tube worm	ハオリムシ?	5		Manipulator	Frozen		Chimney
20	6K-1402-B05	6K-1402	Tube worm	ハオリムシ?	1		Manipulator	99.5% EtOH		Chimney
21	6K-1402-B06	6K-1402	Anthozoa sp.	イソギンチャク?	4		Manipulator	99.5% EtOH		Chimney
22	6K-1402-B07	6K-1402	Dead shell	巻貝貝殻	2		Manipulator	99.5% EtOH		Chimney
23	6K-1402-B08	6K-1402	Tube worm	ハオリムシ?	2		Slurpgun	Frozen		Canister 2
24	6K-1402-B09	6K-1402	Tube worm	ハオリムシ?	3		Slurpgun	Frozen		Canister 2
25	6K-1402-B10	6K-1402	Gastropoda sp.	巻貝	1		Slurpgun	Frozen		Canister 2
26	6K-1402-B11	6K-1402	Dead shell	巻貝貝殻	15		Slurpgun	99.5% EtOH		Canister 2
27	6K-1402-B12	6K-1402	Amphipoda sp.	ヨコエビ類	17		Slurpgun	99.5% EtOH		Canister 2
28	6K-1402-B13	6K-1402	Isopoda sp.	等脚類B	1		Slurpgun	99.5% EtOH		Canister 2
29	6K-1402-B14	6K-1402	Gastropoda sp.	巻貝A	6		Slurpgun	99.5% EtOH		Canister 2
30	6K-1402-B15	6K-1402	Gastropoda sp.	巻貝B	1		Slurpgun	99.5% EtOH		Canister 2
31	6K-1402-B16	6K-1402	Bivalvia sp.	二枚貝類	2		Slurpgun	99.5% EtOH		Canister 2
32	6K-1402-B17	6K-1402	Anthozoa sp.	イソギンチャク?	1		Slurpgun	99.5% EtOH		Canister 2
33	6K-1402-B18	6K-1402	Polychaetes	多毛類	2		Slurpgun	99.5% EtOH		Canister 2
34	6K-1402-B19	6K-1402	Munidopsis sp.	コシオリエビ類	1		Slurpgun	Frozen		Canister 3
35	6K-1402-B20	6K-1402	Anthozoa sp.	イソギンチャク?	1		Slurpgun	99.5% EtOH		Canister 3
36	6K-1402-B21	6K-1402	Maldanidae sp.	タケフシゴカイ?	2		Slurpgun	99.5% EtOH		Canister 3
37	6K-1402-B22	6K-1402	Dead shell	巻貝貝殻	1		Slurpgun	70% EtOH		Canister 3
38	6K-1402-B23	6K-1402	Isopoda sp.	等脚類B	1		Slurpgun	99.5% EtOH		Canister 3
39	6K-1402-B24	6K-1402	Isopoda sp.	等脚類A	2		Slurpgun	99.5% EtOH		Canister 3
40	6K-1402-B25	6K-1402	Anthozoa sp.	イソギンチャク?	5		Slurpgun	99.5% EtOH		Canister 3
41	6K-1402-B26	6K-1402	Cumacean sp.	クーマ類	67		Slurpgun	99.5% EtOH		Canister 3
42	6K-1402-C05	6K-1402	Sediment core	堆積物コア	1	15 cm	Imai-type corer	-	Refrigerated/frozen	Done at adjacent to chimney, disturbed sediment structure (archived by Y. Miyajima).

No.	Onboard ID	Dive No.	Sample Name	Sample Name (in Japanese)	Number of Individuals (amount)	Attributes	Sampling method	Fixation	Preservation	Remarks
43	6K-1402-MB1	6K-1402	Chimney	チムニー	910 g		Manipulator	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
44	6K-1402-MB2	6K-1402	Chimney	チムニー	50 g		Manipulator	4% PFA-PBS	Refrigerated	For texture observation (archived by T. Okumura)
45	6K-1402-MB3	6K-1402	Chimney	チムニー	51 g		Manipulator	Stored at 4℃	Refrigerated	For cultivation (archived by T. Okumura)
46	6K-1402-MB4	6K-1402	Water at chimney site	チムニーサイトの流体	150 ml	Residue after filtering by 0.22 µm celeose filter	WHATS sampler	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
47	6K-1403-B01	6K-1403	*Calyptogena mariana*	マリアナシロウリガイ	500 ml		H-type corer	10% Formalin		Fractured individuals
48	6K-1403-B02	6K-1403	*Calyptogena mariana*	マリアナシロウリガイ	1		H-type corer	Frozen		Soft tissue of fractured individuals
49	6K-1403-B03	6K-1403	Cruscaceans	小型甲殻類	2		H-type corer	99.5% EtOH		
50	6K-1403-B04	6K-1403	Nautiliniellidae sp.	ヤドリゴカイ類	14		H-type corer	70% EtOH		
51	6K-1403-C01	6K-1403	Sediment core	堆積物コア	1	22 cm	H-type corer	-	Refrigerated/frozen	Done at outside of colony, splited into halves (archived by Y. Miyajima).
52	6K-1403-C02	6K-1403	Sediment core	堆積物コア	1	19 cm	H-type corer	-	Refrigerated/frozen	Done on dead shells, splited into halves (archived by Y. Miyajima).
53	6K-1403-C04	6K-1403	Sediment core	堆積物コア	1	6.5 cm	H-type corer	-	Refrigerated/frozen	Done at inside of colony, splited into halves (archived by Y. Miyajima).
54	6K-1403-MB1	6K-1403	Water at colony site	コロニー直上水	150 ml	Residue after filtering by 0.22 µm celeose filter	WHATS sampler	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
55	6K-1403-MB2	6K-1403	Seawater above colony site	コロニー上部海水	1000 ml	Residue after filtering by 0.22 µm celeose filter	Niskin sampler	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
56	6K-1404-B00	6K-1404	*Calyptogena mariana*	マリアナシロウリガイ	15		Slurpgun	Frozen		Canister 1
57	6K-1404-B01	6K-1404	*Calyptogena mariana*	マリアナシロウリガイ	3		Slurpgun	Frozen		Canister 1
58	6K-1404-B02	6K-1404	*Calyptogena mariana*	マリアナシロウリガイ	3		Slurpgun	4% PFA		Canister 1
59	6K-1404-B03	6K-1404	Nematoda?	線虫?	9 ml		Slurpgun	70% EtOH		Canister 1
60	6K-1404-B04	6K-1404	*Calyptogena mariana*	マリアナシロウリガイ	1		Slurpgun	Frozen		Canister 2
61	6K-1404-B05	6K-1404	Ophiuroida sp,	クモヒトデ類	1		Slurpgun	Frozen		Canister 2
62	6K-1404-B06	6K-1404	Munidopsis sp.	コシオリエビ類	1		Slurpgun	Frozen		Canister 2
63	6K-1404-B07	6K-1404	Polychaetes	多毛類	3		Slurpgun	70% EtOH		Canister 2
64	6K-1404-B08	6K-1404	Cruscaceans	小型甲殻類	39		Slurpgun	99.5% EtOH		Canister 2
65	6K-1404-B09	6K-1404	Nematoda?	線虫?	8		Slurpgun	70% EtOH		Canister 2
66	6K-1404-B10	6K-1404	Residues	残渣	500 ml		Slurpgun	99.5% EtOH		Canister 2
67	6K-1404-B11	6K-1404	Polychaetes	多毛類	2		Slurpgun	70% EtOH		Canister 3
68	6K-1404-B12	6K-1404	Amphipoda sp.	ヨコエビ類	2		Slurpgun	99.5% EtOH		Canister 3
69	6K-1404-B13	6K-1404	Anthozoa sp.	イソギンチャク?	20		Slurpgun	Frozen		Attached on 6K-1404-R03
70	6K-1404-B14	6K-1404	Anthozoa sp.	イソギンチャク?	8		Slurpgun	Frozen		Attached on 6K-1404-R04
71	6K-1404-MB1	6K-1404	Chimney	チムニー	45 g		Manipulator	Stored at 4℃	Refrigerated	For cultivation (archived by T. Okumura)
72	6K-1404-MB2	6K-1404	Chimney	チムニー	65 g		Manipulator	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
73	6K-1404-MB3	6K-1404	Chimney	チムニー	65 g	Residue after filtering by 0.22 µm celeose filter	Manipulator	4% PFA-PBS	Refrigerated	For texture observation (archived by T. Okumura)
74	6K-1404-MB4	6K-1404	Seawater	海水	3000 ml	Residue after filtering by 0.22 µm celeose filter	Niskin sampler	Frozen	Frozen	For DNA extraction (archived by T. Okumura)
75	6K-1404-MB5	6K-1404	Seawater	海水	250 ml	Residue after filtering by 0.22 µm celeose filter	Niskin sampler	Frozen	Frozen	For DNA extraction (archived by T. Okumura)

Appendix E1

List of non-biological sample distribution

Note: Hiroyuki Yamashita at the Kanagawa Prefectural Museum of Natural History archives the designated samples for Yasuhiko Ohara.

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6K-1397 (Y. Ohara)

Sample	Y. Ohara	T. Ishii	K. Michibayashi	T. Okumura (K. Takai)	Y. Onishi	Y. Miyajima	F. Martinez	I. Pujana	M. Brounce	O. Ishizuka	K. Tani	H. Yamashita	JAMSTEC Archive	Notes
R01	✔	✔	✔	–	–	–	✔	–	–	–	–	✔	–	
R02	✔	✔	✔	–	–	–	–	–	✔	–	–	✔	✔	
R03	✔	✔	✔	–	–	–	–	–	✔	–	–	✔	–	
R04	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	
R05	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	
R06 (Lost)	–	–	–	–	–	–	–	–	–	–	–	–	–	Lost during the recovery of the Shinaki
R07	–	✔	–	✔	✔	–	–	✔	–	–	–	✔	–	Limestone
R08	✔	✔	✔	–	–	–	✔	–	–	–	–	✔	✔	
R09	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	
R10	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	Small
R11	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	
R12	✔	✔	✔	–	–	–	✔	–	–	–	–	✔	✔	
R13	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	
R14	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R15	✔	✔	✔	–	–	–	✔	–	–	–	–	✔	–	
R16	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	
R17	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	
R18	✔	✔	✔	–	–	–	–	–	✔	–	–	✔	✔	
R19	✔	✔	✔	–	–	–	–	–	✔	–	–	✔	–	
R20	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R21	✔	✔	✔	–	–	–	✔	–	✔	–	–	✔	–	
R22	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R23	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R24	✔	✔	✔	–	–	–	✔	–	–	–	–	✔	–	
R25	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R26	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	

6K-1398 (I. Pujana)

Sample	Y. Ohara	T. Ishii	K. Michibayashi	T. Okumura (K. Takai)	Y. Onishi	Y. Miyajima	F. Martinez	I. Pujana	M. Brounce	O. Ishizuka	K. Tani	H. Yamashita	JAMSTEC Archive	Notes
R01	✔	✔	✔	–	–	–	✔	–	–	–	✔	✔	✔	
R02	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	–	
R03	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R04	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R05	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R06	✔	✔	✔	–	–	–	✔	–	–	–	✔	✔	✔	
R07	✔	✔	✔	✔	✔	✔	–	✔	–	–	–	✔	✔	Limestone
R08	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R09	✔	✔	✔	–	–	–	✔	–	–	–	✔	✔	✔	
R10	✔	✔	✔	✔	✔	✔	–	✔	–	–	–	✔	✔	Limestone
R11	✔	✔	✔	–	–	–	✔	–	✔	–	–	✔	✔	
R12	✔	✔	✔	–	–	–	–	–	✔	–	✔	✔	✔	
R13	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R14	✔	✔	✔	–	–	–	✔	–	–	–	✔	✔	✔	
R15	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R16	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	Small
R17	✔	✔	✔	–	–	–	–	–	✔	–	–	✔	✔	
R18	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R19	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R20	✔	✔	✔	–	–	–	✔	–	–	–	–	✔	✔	
R21	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R22	✔	✔	✔	–	–	–	✔	–	–	–	–	✔	✔	
R23	–	✔	✔	–	–	–	–	–	–	–	–	✔	–	
Scoop 1	–	–	–	✔	–		–	✔	–	–	–	–	✔	
Scoop 2	–	–	–	–	–		–	✔	–	–	–	–	✔	
Others	–	–	–	–	–		–	–	–	–	–	–	✔	Misc. fragments

6K-1399 (T. Okumura)

Sample	Y. Ohara	T. Ishii	K. Michibayashi	T. Okumura (K. Takai)	Y. Onishi	Y. Miyajima	F. Martinez	I. Pujana	M. Brounce	O. Ishizuka	K. Tani	H. Yamashita	JAMSTEC Archive	Notes
R01	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	–	
R02	–	–	✔	–	–	–	–	–	✔	–	–	✔	✔	Mud
R03	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	
R04	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	–	
R05	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R06	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R07a (Peridotite)	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R07b (Serp. harzburgite)	–	–	✔	–	–	–	–	–	–	–	–	✔	–	Small
R07c (Troctolite)	✔	✔	✔	–	–	–	–	–	–	–	–	✔	–	
R08	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R09	✔	✔	✔	–	–	–	–	✔	✔	–	–	✔	✔	
R10	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R11 (Lost)	–	–	–	–	–	–	–	–	–	–	–	–	–	Lost
R12	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
Imai core	–	–	–	–	–	–	–	✔ (Residue)	–	–	–	–	–	
Core 1	–	–	–	–	–	–	–	✔ (Residue)	✔ (Glass +Volcanics)	–	–	–	–	Whole core was sampled by H. Watanabe for collecting macrofaunas, but small amount residue was available as hard-rock sample.
Core 2	–	–	–	✔	✔	–	–	–	–	–	–	–	–	
Core 3	–	–	–	–	–	✔	–	–	–	–	–	–	–	
Scoop 1	–	–	–	✔	–	–	–	✔	–	–	–	–	✔	
Others	–	–	–	–	–	–	–	–		–	–	–	✔	

6K-1400 (T. Ishii)

Sample	Y. Ohara	T. Ishii	K. Michibayashi	T. Okumura (K. Takai)	Y. Onishi	Y. Miyajima	F. Martinez	I. Pujana	M. Brounce	O. Ishizuka	K. Tani	H. Yamashita	JAMSTEC Archive	Notes
R01	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R02	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	–	
R03	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R04	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R05	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R06	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R07	✔	✔	✔	–	–	–	–	–	–	✔	–	✔	✔	
R08	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R09	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	–	
R10	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R11	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R12	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R13	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R14	✔	✔	✔	–	–	–	–	–	–	–	✔	✔	✔	
R15	✔	✔	✔	–	–	–	–	–	–	✔	–	✔	✔	
R16	✔	✔	✔	–	–	–	–	–	–	✔	–	✔	✔	
R17	✔	✔	✔	–	–	–	–	–	–	✔	–	✔	✔	
R18	✔	✔	✔	–	–	–	–	–	–	✔	–	✔	✔	
R19	✔	✔	✔	–	–	–	–	–	–	✔	–	✔	✔	
R20	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R21	✔	✔	✔	–	–	–	–	–	–	✔	–	✔	–	
R22	✔	✔	✔	–	–	–	–	–	–	✔	–	✔ (one large block for outreach at the museum)	✔	Very large blcok
R23	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R24	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R25	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	–	
R26	–	–	–	–	–	–	–	–	✔	✔	–	✔	–	
Scoop 1	✔	✔	–	✔	–	–	–	✔	–	–	–	✔	–	
Scoop 2	✔	✔	–	✔	–	–	–	✔	–	–	–	✔	–	
Others	–	–	–	–	–	–	–	–	–	–	–	–	✔	

6K-1401 (H. Watanabe)

Sample	Y. Ohara	T. Ishii	K. Michibayashi	T. Okumura (K. Takai)	Y. Onishi	Y. Miyajima	F. Martinez	I. Pujana	M. Brounce	O. Ishizuka	K. Tani	H. Yamashita	JAMSTEC Archive	Notes
R01	–	–	✔	–	–	–	–	–	–	–	–	✔	✔	Mud
R02	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	–	
R03	–	–	✔	–	–	–	–	–	–	–	–	✔	–	
R04	–	–	✔	–	–	–	–	–	–	–	–	✔	✔	Mud
R05	✔	✔	✔	–	–	–	–	–	–	–	–	✔	✔	
R06	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R07	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R08	–	–	–	–	–	–	–	–	–	–	–	–	✔	Mud
R09	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	–	
R10	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R11	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
R12	–	–	–	–	–	–	–	–	✔	–	–	✔	–	
R13	✔	✔	✔	–	–	–	–	–	✔	✔	–	✔	✔	
Others	–	–	–	–	–	–	–	–	–	–	–	–	✔	

6K-1402 (U. Konno)

Sample	Y. Ohara	T. Ishii	K. Michibayashi	T. Okumura (K. Takai)	Y. Onishi	Y. Miyajima	F. Martinez	I. Pujana	M. Brounce	O. Ishizuka	K. Tani	H. Yamashita	JAMSTEC Archive	Notes
R01	–	–	–	✔	–	–	–	–	–	–	–	–	–	Large chimney
R01_23	–	–	–	✔	–	–	–	–	–	–	–	–	–	
R02	–	✔	–	–	–	–	–	✔	–	–	–	–	–	Large chimney
R03	✔ ("Chimney Basement")	–	–	✔	–	–	–	✔ ("Chimney Basement")	✔ ("Chimney Basement")	–	–	–	–	Baby chimneys
Canister 1	–	–	–	–	–	–	–	–	–	–	–	–	–	
Canister 2	–	–	–	–	–	–	–	✔ (Residue)	–	–	–	✔ (Residue)	–	
Canister 3	–	–	–	–	–	–	–	✔ (Residue)	–	–	–	✔ (Residue)	–	
Imai core	✔ (Residue)	–	–	–	–	✔	–	✔ (Residue)	✔ (Residue)	–	–	–	–	
Others	–	–	–	–	–	–	–	–	–	–	–	–	✔	

6K-1403 (T. Okumura)

Sample	Y. Ohara	T. Ishii	K. Michibayashi	T. Okumura (K. Takai)	Y. Onishi	Y. Miyajima	F. Martinez	I. Pujana	M. Brounce	O. Ishizuka	K. Tani	H. Yamashita	JAMSTEC Archive	Notes
Core 1	–	–	–	–	–	✔	–	–	–	–	–	–	–	
Core 2	–	–	–	–	–	✔	–	–	–	–	–	–	–	
Core 2 Residue	–	–	–	–	–	–	–	✔	–	–	–	✔	–	
Core 4	–	–	–	–	–	✔	–	–	–	–	–	–	–	
Scoop 1	–	–	–	–	–	–	–	✔	–	–	–	✔	✔	

Note: Core 3 and Imai core were aborted.

6K-1404 (Y. Ohara)

Sample	Y. Ohara	T. Ishii	K. Michibayashi	T. Okumura (K. Takai)	Y. Onishi	Y. Miyajima	F. Martinez	I. Pujana	M. Brounce	O. Ishizuka	K. Tani	H. Yamashita	JAMSTEC Archive	Notes
R01	✔	✔	✔	–	–	–	✔	–	–	–	–	✔	–	
R02	–	–	–	✔	–	–	–	–	–	–	–	–	–	Whole sample was archived by T. Okumura for biogeochemical analyes.
R03	✔	✔	✔		–	–	–	–	–	–	–	✔	–	
R04	✔	–	–	✔	–	–	–	✔	–	–	–	✔	–	Chimney fragments
R05	✔	✔	–	✔	✔	–	–	✔	–	–	–	✔	–	Large chimney
Scoop 1 R01	✔	–	✔	–	–	–	–	–	–	–	–	✔	–	
Scoop 1 R02	–	–	✔	–	–	–	–	–	–	–	–	✔	–	
Scoop 1 R03	✔	–	✔	–	–	–	–	–	–	–	–	✔	–	
Canister 1	–	–	–	–	–	–	–	✔ (Residue)	–	–	–	–	–	
Canister 2	–	–	–	–	–	–	–	✔ (Residue)	–	–	–	–	–	
Canister 3	–	–	–	–	–	–	–	–	–	–	–	–	–	No residue from Canister 3.
Scoop 1	–	–	✔	–	–	–	–	✔	–	–	–	✔	–	

Appendix E2

Photos of non-biological samples distributed onboard

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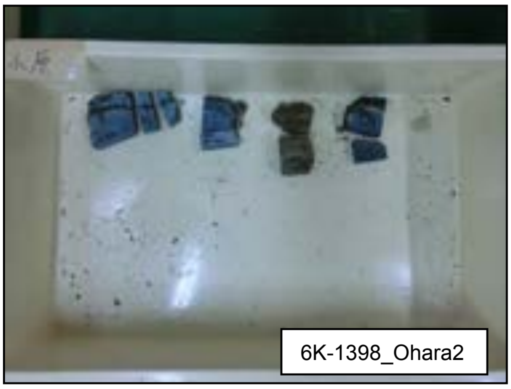
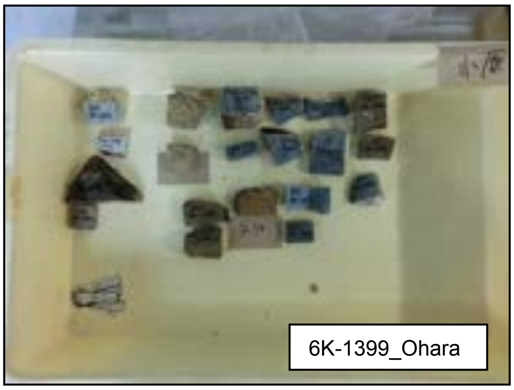
YK14-13_6K-Ohara (1/2)


6K-1397_Ohara1


6K-1397_Ohara2


6K-1398_Ohara1


6K-1398_Ohara2


6K-1399_Ohara


6K-1400_Ohara1


6K-1400_Ohara2


6K-1401_Ohara

YK14-13_6K-Ohara (2/2)

6K-1402_Ohara1


6K-1402_Ohara2

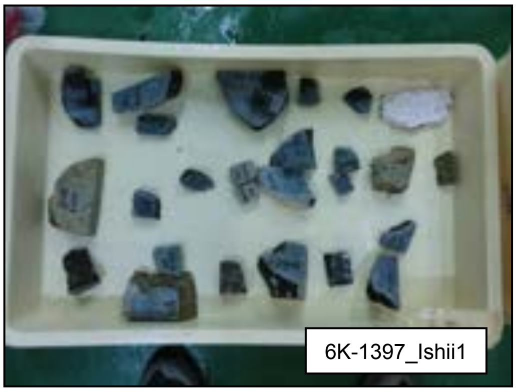
6K-1403: none was sampled for Ohara.


6K-1404_Ohara1

6K-1404_Ohara2

6K-1404_Ohara3

YK14-13_6K-Ishii (1/2)



6K-1397_Ishii1

6K-1397_Ishii2

6K-1398: sample photos were not taken for Ishii.

6K-1399_Ishii

6K-1400: sample photos were not taken for Ishii.

6K-1400_Ishii (scoop)

6K-1401_Ishii

Note: 6K-1402-R02 was being cut by Ishii, and archived by him.

6K-1402_Ishii

YK14-13_6K-Ishii (2/2)

6K-1403: none was sampled for Ishii.

6K-1404_Ishii1

6K-1404_Ishii2

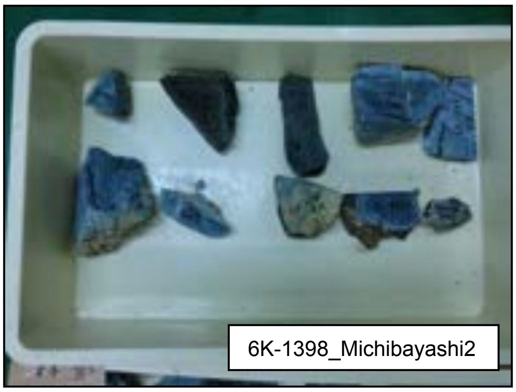
YK14-13_6K-Michibayashi (1/2)


6K-1397_Michibayashi1

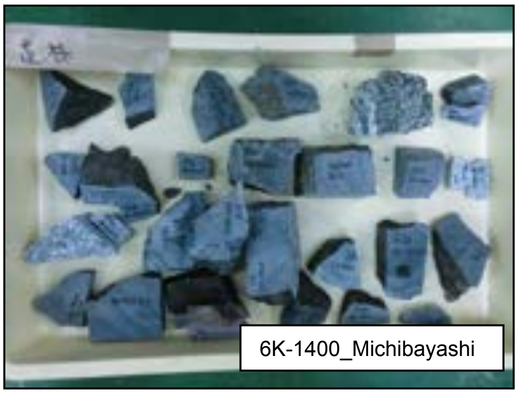

6K-1397_Michibayashi2


6K-1397_Michibayashi3


6K-1398_Michibayashi1


6K-1398_Michibayashi2


6K-1399_Michibayashi

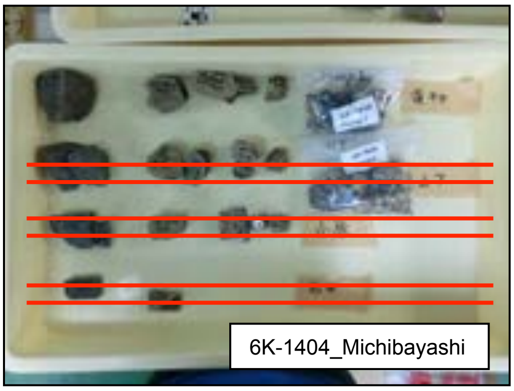

6K-1400_Michibayashi

YK14-13_6K-Michibayashi (2/2)

6K-1401_Michibayashi

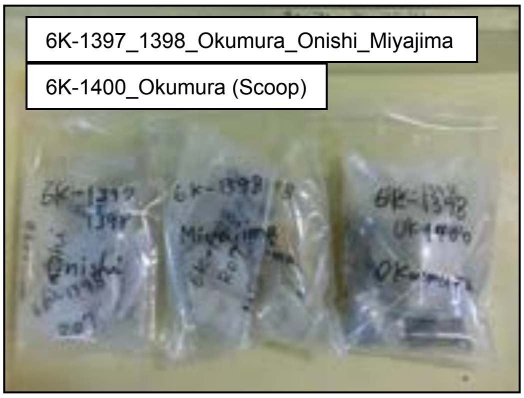
6K-1402: none was sampled for Michibayashi.

6K-1403: none was sampled for Michibayashi.



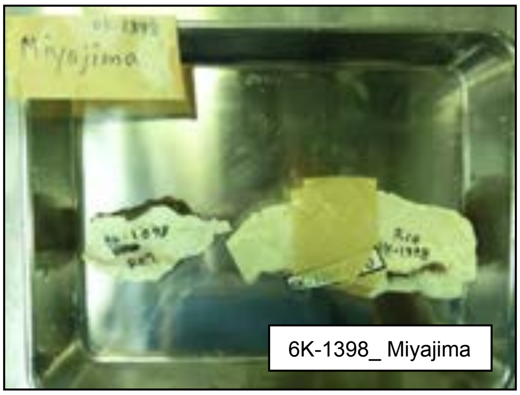
6K-1404_Michibayashi

YK14-13_6K-Okumura_Onishi_Miyajima (1/2)

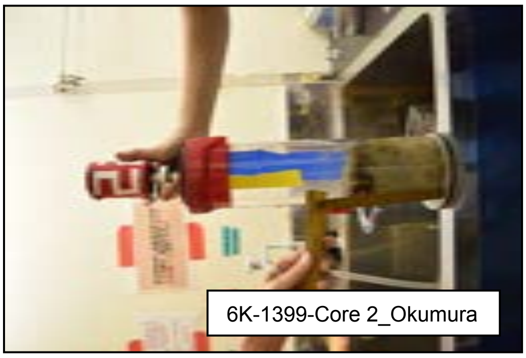


6K-1397_1398_Okumura_Onishi_Miyajima

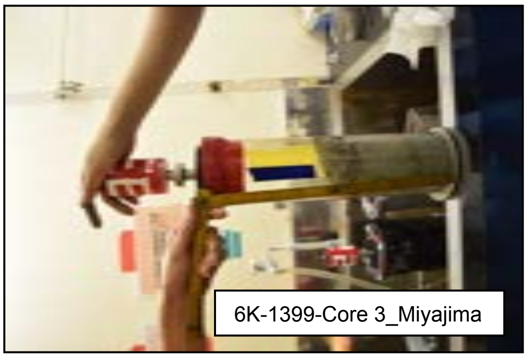
6K-1400_Okumura (Scoop)



6K-1398_ Miyajima



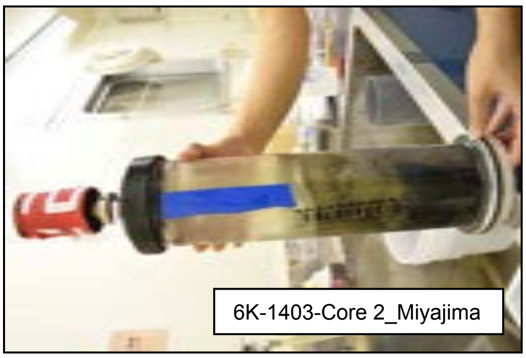
6K-1399-Core 2_Okumura



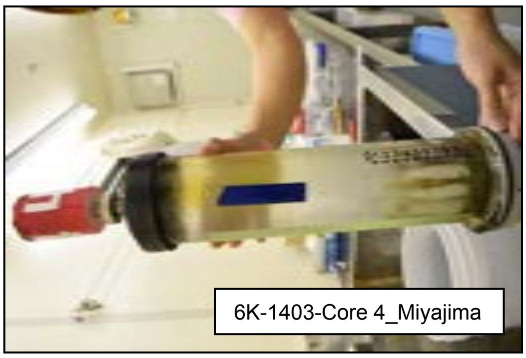
6K-1399-Core 3_Miyajima

6K-1402 Imai Core_Miyajima

6K-1403-Core 1_Miyajima



6K-1403-Core 2_Miyajima



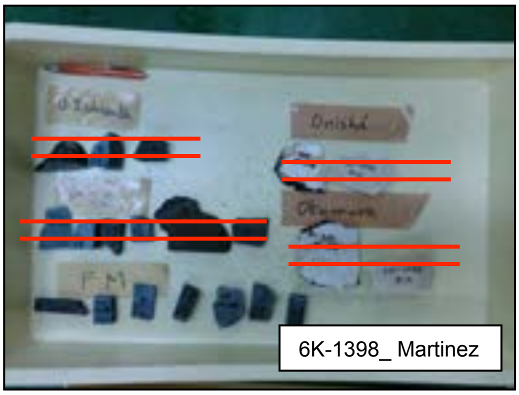
6K-1403-Core 4_Miyajima

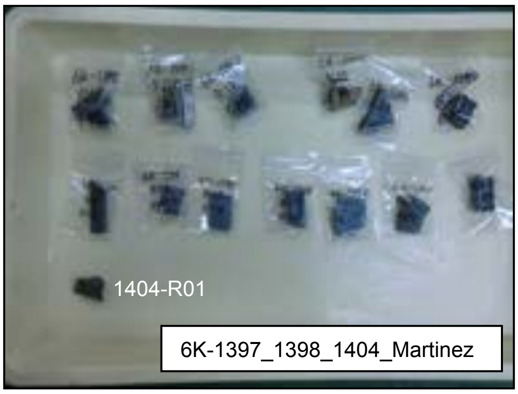
YK14-13_6K-Okumura_Onishi_Miyajima (2/2)

6K-1404_Okumura

6K-1404_Onishi

YK14-13_6K-Martinez (1/1)





YK14-13_6K-Pujana (1/1)

6K-1397_1398_1399_1400_Pujana

6K-1399_ Pujana1

6K-1399_ Pujana2

6K-1399_Pujana3

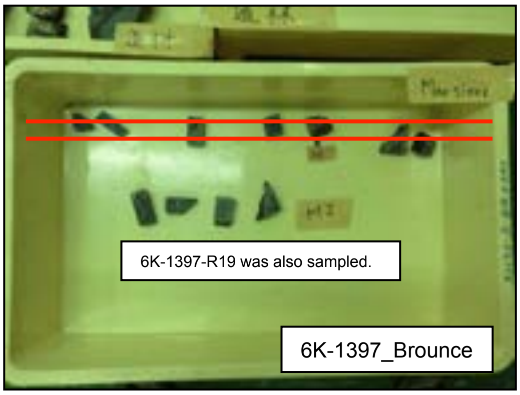
6K-1399_ Pujana4

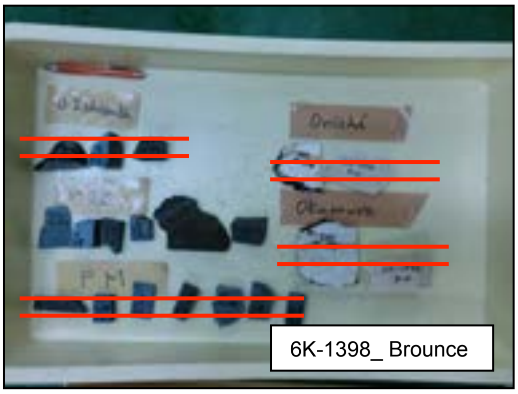
6K-1402_ Pujana

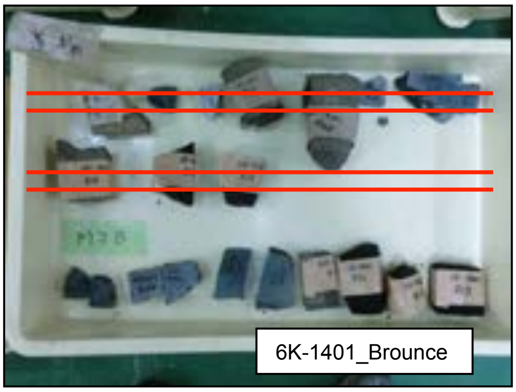
6K-1402_1403_1404_ Pujana

6K-1403_ Pujana

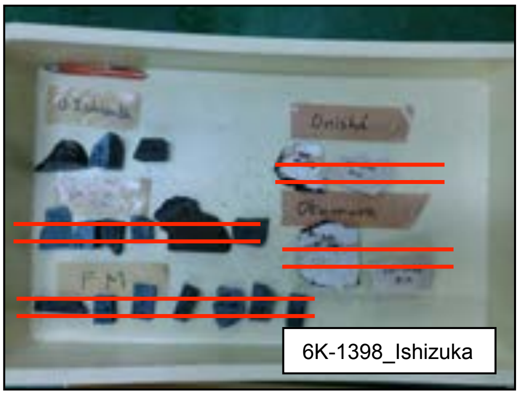
YK14-13_6K-Brounce (1/1)

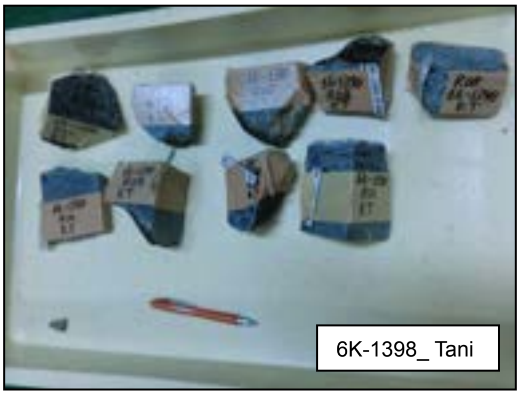






YK14-13_6K-Ishizuka_Tani (1/1)


6K-1398_Ishizuka

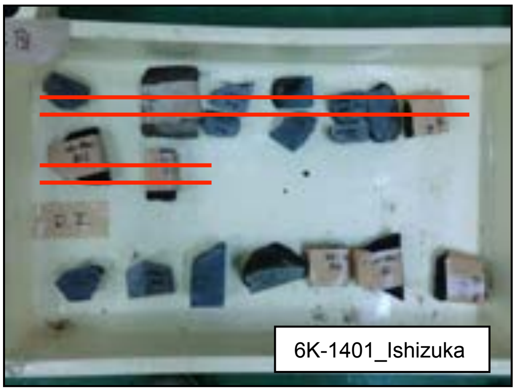

6K-1398_ Tani

6K-1399: none was sampled for Ishizuka.


6K-1399_ Tani


6K-1400_Ishizuka


6K-1400_ Tani


6K-1401_Ishizuka

6K-1401: none was sampled for Tani.

YK14-13_6K-Yamashita (1/2)

6K-1397: sample photos
were not taken for Yamashita.

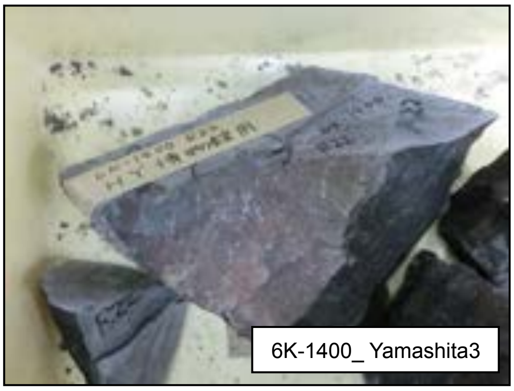

6K-1398_ Yamashita1


6K-1398_ Yamashita2


6K-1399_Yamashita


6K-1400_ Yamashita1

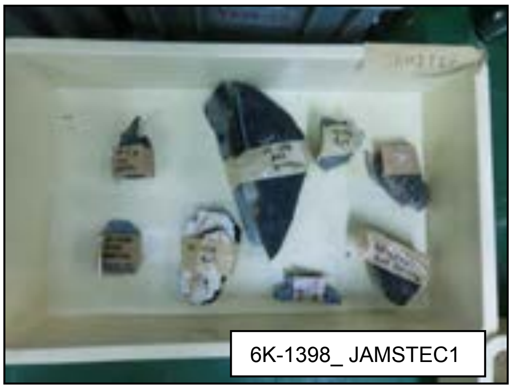

6K-1400_ Yamashita2


6K-1400_ Yamashita3

YK14-13_6K-Yamashita (2/2)

YK14-13_6K-JAMSTEC (1/3)

6K-1397: sample photos
were not taken for JAMSTEC.



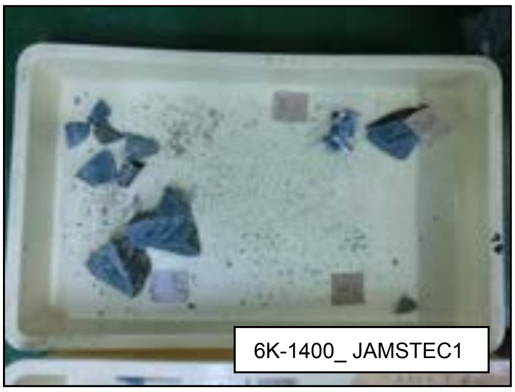
6K-1398_ JAMSTEC1

6K-1398_ JAMSTEC2

6K-1398_ JAMSTEC3

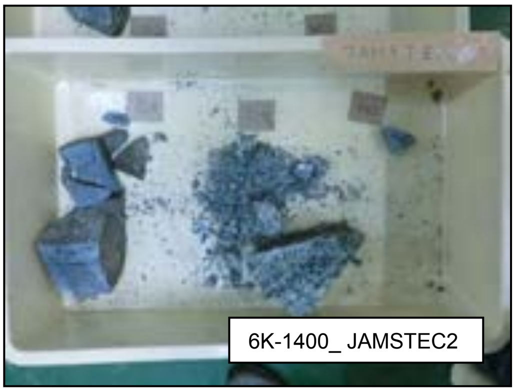
6K-1398_ JAMSTEC4

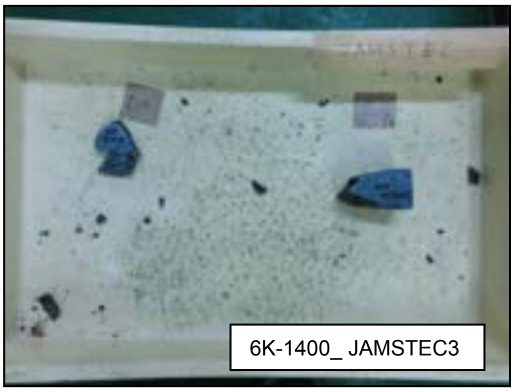
6K-1399_ JAMSTEC

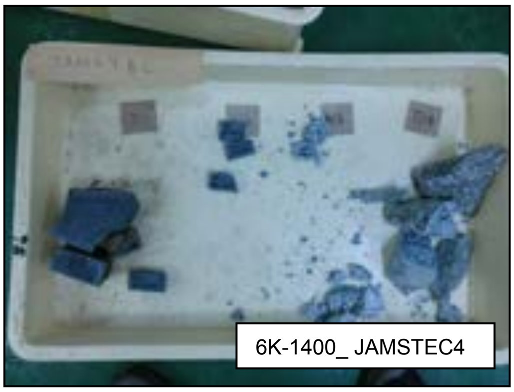


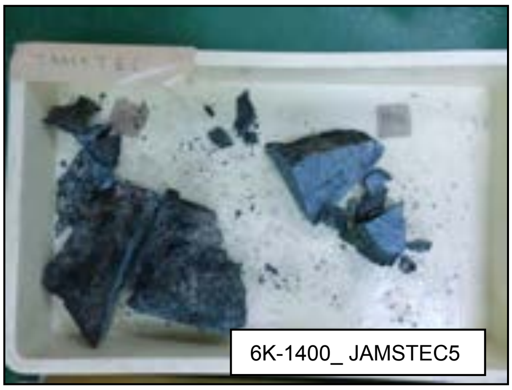
6K-1400_ JAMSTEC1

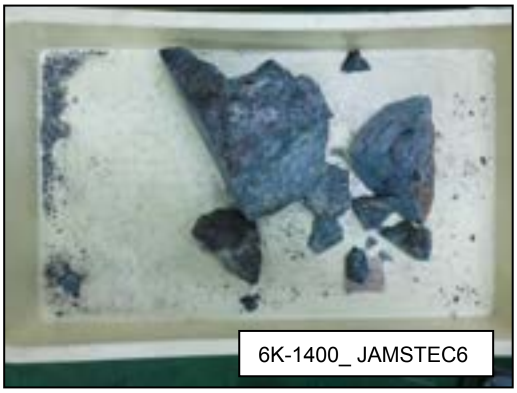
YK14-13_6K-JAMSTEC (2/3)

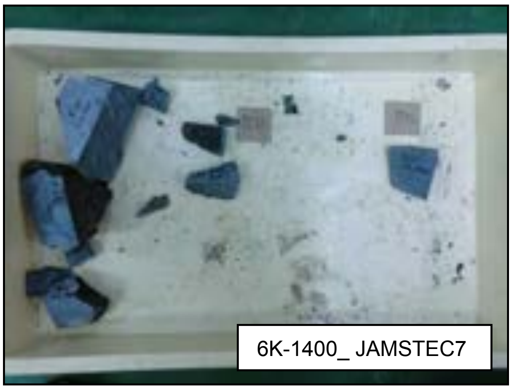

6K-1400_ JAMSTEC2

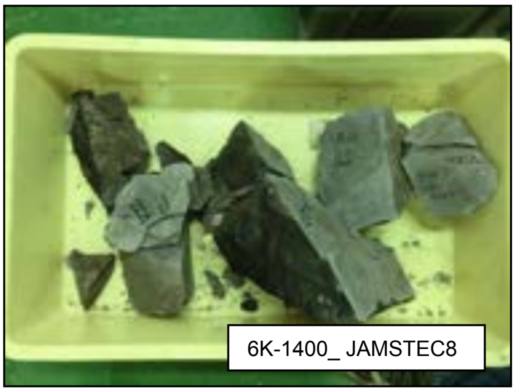

6K-1400_ JAMSTEC3

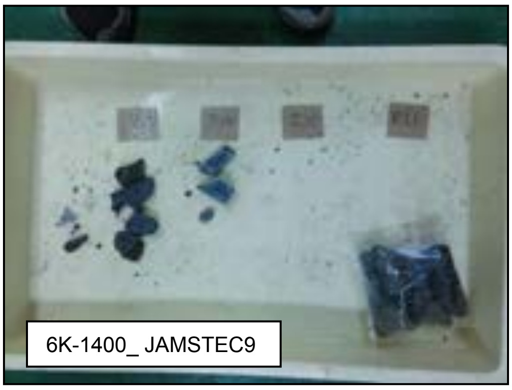

6K-1400_ JAMSTEC4


6K-1400_ JAMSTEC5

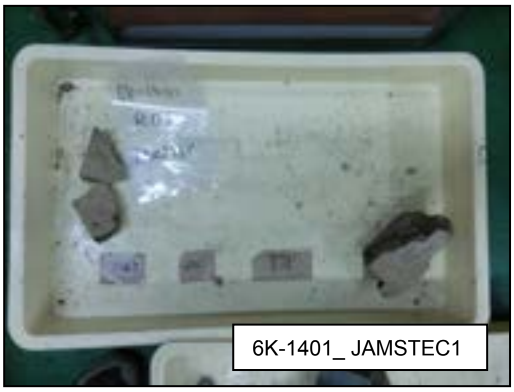

6K-1400_ JAMSTEC6


6K-1400_ JAMSTEC7

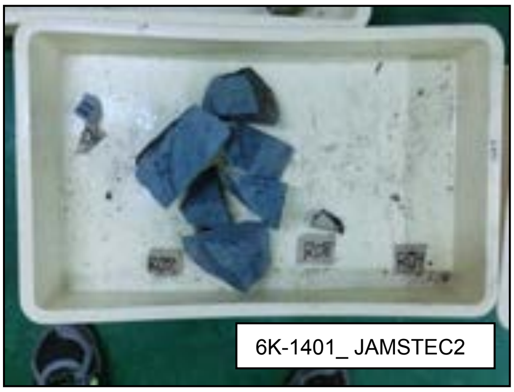

6K-1400_ JAMSTEC8


6K-1400_ JAMSTEC9

YK14-13_6K-JAMSTEC (3/3)



6K-1401_ JAMSTEC1



6K-1401_ JAMSTEC2

6K-1401_ JAMSTEC3

6K-1401_ JAMSTEC4

6K-1402_ JAMSTEC

6K-1402_1403_ JAMSTEC

6K-1403_ JAMSTEC

6K-1404: none was archived for JAMSTEC.

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Appendix E3

List of biogeochemical samples archived by Tomoyo Okumura

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Dive	No.	Type	ID by T. Okumura	Description	Volume	Purpose	Treatment
6K-1397 (Y. Ohara)	1	Water	6K-1397N	Niskin water sample	1000 ml	Gene analysis	Filtered and Frozen (-80°C)
	2	Rock	6K-1397_R07_1g	Surface of the white rock	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	3		6K-1397_R07_1t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	4	Rock	6K-1397_R07_2g	Inner of the white rock	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	5		6K-1397_R07_2t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	6	Rock	6K-1397_R07_3	Fragment of the white rock	300 g	Textural observation	Stored at 4°C
	7	Rock	6K-1397_R07_4	Fragment of the white rock	300 g	Gene analysis	Stored at -80°C
6K-1398 (I. Pujana)	8	Scoop	6K-1398_R01g1	Scoop sample of 'grape' structure at seafloor	5 g of muddy sediment	Gene analysis	Frozen with liquid N2 and stored at -80°C
	9		6K-1398_R01t		2 g of mat material	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	10		6K-1398_R01g2		250 ml of surparnatant	Gene analysis	Frozen with liquid N2 and stored at -80°C
	11	Rock	6K-1398_R10g	Fragments of the white rock	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	12		6K-1398_R10t1		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	13		6K-1398_R10g2		150 g	Store	Stored at -80°C
6K-1399 (T. Okumura)	14	Core	6K-1399_H2_0-3g	White sediment core #2_0-3 cm	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	15		6K-1399_H2_0-3t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	16		6K-1399_H2_3-6g	White sediment core #2_3-6 cm	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	17		6K-1399_H2_3-6t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	18		6K-1399_H2_6-9g	White sediment core #2_6-9 cm	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	19		6K-1399_H2_6-9t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	20		6K-1399_H2_9-12g	White sediment core #2_9-12 cm	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	21		6K-1399_H2_9-12t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	22		6K-1399_H2_r1	White sediment core #2_cream gravel in core	100 g	Textural observation	Stored at 4°C
	23		6K-1399_H2_r1t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	24		6K-1399_H2_r1g		7 g	Gene analysis	Stored at -80°C
	24	Scoop	6K-1399_Scoop1t	Scoop mud	5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	25		6K-1399_Scoop1g		1000 g	Gene analysis	Stored at -80°C
6K-1402 (U. Konno)	25	Chimney	6K-1402_R01_1c	Basement rock at bottom1 of chimney	5 g	Culture	Stored at 4°C in N2 atmosphere
	26		6K-1402_R01_1t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	27		6K-1402_R01_2c	Surface part of bottom1 of chimney	5 g	Culture	Stored at 4°C in N2 atmosphere
	28		6K-1402_R01_2t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	29		6K-1402_R01_3c	Inner part of bottom1 of chimney	5 g	Culture	Stored at 4°C in N2 atmosphere
	30		6K-1402_R01_3t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	31		6K-1402_R01_4c	Surface part of bottom2 of chimney	5 g	Culture	Stored at 4°C in N2 atmosphere
	32		6K-1402_R01_4t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	33		6K-1402_R01_5c	Inner part of bottom2 of chimney	5 g	Culture	Stored at 4°C in N2 atmosphere
	34		6K-1402_R01_5t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	35		6K-1402_R01_6c	Tip of the chimney (whole)	5 g	Culture	Stored at 4°C in N2 atmosphere
	36		6K-1402_R01_6t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	37		6K-1402_R01_7c	Surface part of the middle part of chimney with transparent shell of tube worms	5 g	Culture	Stored at 4°C in N2 atmosphere
	38		6K-1402_R01_7t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	39		6K-1402_R01_8c	Inner part of the middle part of chimney with tube worms	5 g	Culture	Stored at 4°C in N2 atmosphere
	40		6K-1402_R01_8t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	41		6K-1402_R01_9	Basement rock at the chimney bottom (including the sampled parts 1, 2, 3)	150 g	Textural observation	Stored at 4°C-->-20°C (20140804)
	42		6K-1402_R01_10	Surface part of the bottom2 of the chimney (same to 4)	20g	Textural observation	Stored at 4°C-->-20°C (20140804)
	43		6K-1402_R01_11	Surface part of the middle of the chimney (tube worn etc.)	200 g	Textural observation	Stored at 4°C-->-20°C (20140804)
	44		6K-1402_R01_12	Upper part of the chimney (tube worn etc.)	300 g	Textural observation	Stored at 4°C-->-20°C (20140804)
	45		6K-1402_R01_13	Middle part of the chimney (tube worn etc.)	300 g	Textural observation	Stored at 4°C
	46		6K-1402_R01_14	Tip of the chimney (whole)	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	47		6K-1402_R01_15	Tube worm in scoop (recovered with baby chimney) (Note: this should have had the sample number "R03", since this was recovered with the baby chimneys.)	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	48		6K-1402_R01_16	Transparent tube worm shell at the surface of the chimney	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C

Dive	No.	Type	ID by T. Okumura	Description	Volume	Purpose	Treatment
6K-1402 (U. Konno)	49	Chimney	6K-1402_R01_17	White soft projection in a basement rock (recovered with baby chimney) (Note: this should have had the sample number "R03", since this was recovered with the baby chimneys.)	5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	50		6K-1402_R01_18	Surface of the chimney	10 g	Gene analysis	Stored at -80°C
	51		6K-1402_R01_19	Bottom2 of the chimney (whole)_1	200 g	Gene analysis	Stored at -80°C
	52		6K-1402_R01_20	Bottom2 of the chimney (whole)_2	200 g	Gene analysis	Stored at -80°C
	53		6K-1402_R01_21	Tube worm on the chimney surface	200 g	Gene analysis	Stored at -80°C
	54		6K-1402_R01_22	Transparent tube worm on the chimney surface	200 g	Gene analysis	Stored at -80°C
	55		6K-1402_R01_23	A basement rock with white soft tiny projection (Note: this should have had the sample number "R03", since this was recovered with the baby chimneys.)	50 g	Gene analysis	Stored at -80°C
	56	Chimney	6K-1402_R02_1	Basement rock and the bottom of the chimney	200 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	57		6K-1402_R02_2	Surface of the chimney with glutinous material (microbial mat?)	10 g	Gene analysis	Stored at -80°C
	58		6K-1402_R02_3	Surface of the chimney with glutinous material (microbial mat?)	10 g	Gene analysis	Stored at -80°C
	59	Chimney	6K-1402_R01_24	Fragment of chimney bottom	100 g	Gene analysis	Stored at -80°C
	60	Chimney	6K-1402_R03_1	Baby chimney 1	5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	61		6K-1402_R03_2	Baby chimney 2	5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	62		6K-1402_R03_3	Baby chimney 3	5 g	Culture	Stored at 4°C in N2 atmosphere
	63	Water	6K-1402_CW2	WHATS water sample from chimney site	150 ml	Gene analysis	Filtered and Frozen (-80°C)
	64	Blank	-	-	-	-	-
6K-1403 (T. Okumura)	65	Water	6K-1403_CW2	WHATS water sample from colony site	150 ml	Gene analysis	Filtered and Frozen (-80°C)
	66	Water	6K-1403_N	Niskin water sample from colony site	1000 ml	Gene analysis	Filtered and Frozen (-80°C)
6K-1404 (Y. Ohara)	67	Chimney	6K-1404_R04_1c	Fragment of chimney including surface (light brown)	5 g	Culture	Stored at 4°C in N2 atmosphere
	68		6K-1404_R04_1g		5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	69		6K-1404_R04_1t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	70	Chimney	6K-1404_R04_2c	Fragment of chimney (inner part? white-gray)	5 g	Culture	Stored at 4°C in N2 atmosphere
	71		6K-1404_R04_2g		5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	72		6K-1404_R04_2t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	73	Chimney	6K-1404_R04_3c	Surface of the tip of chimney (dark brown)	5 g	Culture	Stored at 4°C in N2 atmosphere
	74		6K-1404_R04_3g		5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	75		6K-1404_R04_3t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	76		6K-1404_R04_4c	Inner part of the tip of chimney (dark brown)	5 g	Culture	Stored at 4°C in N2 atmosphere
	77		6K-1404_R04_4g		5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	78		6K-1404_R04_4t		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	79		6K-1404_R04_5	Fragments of the bottom of chimney (dark brown)	100 g	Textural observation	Stored at -80°C
	80		6K-1404_R04_6		100 g	Textural observation	Stored at -80°C
	81		6K-1404_R04_7		100 g	Textural observation	Stored at -80°C
	82	Chimney	6K-1404_R05_1t	Surface of the bottom of the white huge chimney (rough)	5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	83		6K-1404_R05_1g		5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	84		6K-1404_R05_2t1	Surface of the bottom of the white huge chimney (smooth)	5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	85		6K-1404_R05_2t2		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	85		6K-1404_R05_2g		6 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	86		6K-1404_R05_3c	Surface of the bottom of the chimney (including rough and surface parts 1, 2)	10 g	Culture	Stored at 4°C in N2 atmosphere
	87		6K-1404_R05_4t	Inner grayish part of the bottom of the chimney	5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	88		6K-1404_R05_4g		5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	89		6K-1404_R05_4c		5 g	Culture	Stored at 4°C in N2 atmosphere
	90		6K-1404_R05_5t	Surface of the upper part of the chimney	5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	91		6K-1404_R05_5g		5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	92		6K-1404_R05_5c		5 g	Culture	Stored at 4°C in N2 atmosphere
	93		6K-1404_R05_5t2		5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	94		6K-1404_R05_6t	Surface of the tip of the chimney	5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	95		6K-1404_R05_6g		5 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	96		6K-1404_R05_6c		5 g	Culture	Stored at 4°C in N2 atmosphere

Dive	No.	Type	ID by T. Okumura	Description	Volume	Purpose	Treatment
6K-1404 (Y. Ohara)	97	Chimney	6K-1404_R05_7	Surface of the bottom of the chimney	200 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	98		6K-1404_R05_8	Surface of the bottom of the chimney	100 g	Textural observation	Stored at 4°C
	99		6K-1404_R05_9	Surface of the bottom of the chimney	500 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	100	Canister	6K-1404_R04_1t	White pinacle glutinous material (microbial mat?) on surface of the chimney	0.5 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	101		6K-1404_R04_2t		0.6 g	FISH and SEM observation	Stored at 4°C in 4% formaldehyde in PBS
	102		6K-1404_R04_3g		0.7 g	Gene analysis	Frozen with liquid N2 and stored at -80°C
	103	Rock	6K-1404_R02	Small gravels with light yellow mibcrobial mat	50 g	Gene analysis	Stored at -80°C
	104	Water	6K-1404N	Niskin water sample from off-bottom site (well away from chimney site)	1000 ml x3	Gene analysis	Filtered and frozen (-80°C)
	105	Water	6K-1404N	Niskin water sample from off-bottom site (well away from chimney site)	250 ml	store	Stored at -80°C

*Red: Sample for DNA extraction by Hirai-san
*Green: Sample for cell count by Okumura

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Appendix E4

List of geochemical samples archived by Yuji Onishi

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List of samples archived by Yuji Onishi

Dive	Type	ID	Note
6K-1397 (Y. Ohara)	Water	6K-1397-N_1	Reference deepsea water
		6K-1397-N_2	POM
	Rock	6K-1397-R07	Limestone
6K-1398 (I. Pujana)	Rock	6K-1398-R07	Limestone
		6K-1398-R10	Limestone
6K-1399 (T. Okumura)	Core	6K-1399-H2_1 (0-3 cm)	Sediment
		6K-1399-H2_2 (3-6 cm)	Sediment
		6K-1399-H2_3 (6-9 cm)	Sediment
		6K-1399-H2_4 (9-11 cm)	Sediment
		6K-1399-H2_0 (0 cm)	Pore water
		6K-1399-H2_1 (0-3 cm)	Pore water
		6K-1399-H2_2 (3-6 cm)	Pore water
		6K-1399-H2_3 (6-9 cm)	Pore water
		6K-1399-H2_4 (9-11 cm)	Pore water
		6K-1399-H3_1 (7 cm)	Sediment (Miyajima's archive)
6K-1402 (U. Konno)	Water	6K-1402-DW4_1	Water
		6K-1402-DW4_2	DOC
	Biology	6K-1402-B	Tube worm
6K-1403 (T. Okumura)	Water	6K-1403-DW4_1	Water
		6K-1403-DW4_2	DOC
		6K-1403-N	Reference deepsea water
	Core	6K-1403-H1-1 (3 cm)	Sediment (Miyajima's archive)
		6K-1403-H1-2 (9 cm)	Sediment (Miyajima's archive)
		6K-1403-H1-3 (18 cm)	Sediment (Miyajima's archive)
		6K-1403-H2_1 (3 cm)	Sediment (Miyajima's archive)
		6K-1403-H2_2 (12 cm)	Sediment (Miyajima's archive)
		6K-1403-H2_3 (18 cm)	Sediment (Miyajima's archive)
		6K-1403-H4_1 (3 cm)	Sediment (Miyajima's archive)
		6K-1403-H4_2 (6 cm)	Sediment (Miyajima's archive)
6K-1404 (Y. Ohara)	Chimney	6K-1404-R05_1	Bottom, outer
		6K-1404-R05_2	Bottom, innner
		6K-1404-R05_3	Lower part, outer
		6K-1404-R05_4	Lower part, innner 1
		6K-1404-R05_5	Lower part, innner 2
		6K-1404-R05_6	Lower part, innner 3
		6K-1404-R05_7	Lower part, innner 4
		6K-1404-R05_8	Pore water 1
		6K-1404-R05_9	Pore water 2
		6K-1404-R05_10	Pore water 3
		6K-1404-R05_11	Pore water 4
		6K-1404-R05_12	Middle part, outer
		6K-1404-R05_13	Middle part, inner
		6K-1404-R05_14	Upper part, outer
		6K-1404-R05_15	Upper part, innner
	Water	6K-1404-N	Reference deepsea water

Results of onboard analyses by Yuji Onishi

Dive	ID	pH	Alkalinity (mM)	NH_4 (μM)	SiO_2 (μM)	Note
6K-1397 (Y. Ohara)	6K-1397-N_1	7.8	2.1	< 0.1	132.2	Reference deepsea water
6K-1399 (T. Okumura)	6K-1399-H2_0 (0 cm)	7.8	2.4	< 0.1	131.4	Reference pore water
	6K-1399-H2_1 (0-3 cm)	-	-	0.8	-	Reference pore water
	6K-1399-H2_2 (3-6 cm)	7.7	2.3	3.7	177.3	Reference pore water
	6K-1399-H2_3 (6-9 cm)	7.7	2.6	4.6	187.6	Reference pore water
	6K-1399-H2_4 (9-11 cm)	-	-	4.9	182.3	Reference pore water
6K-1402 (U. Konno)	6K-1402-DW4_1	6.9	< 0.1	1.6	4.7	Seawater adjacent to a chimney
6K-1403 (T. Okumura)	6K-1403-DW4_1	7.7	2.4	< 0.1	136.9	Seawater above a clam's colony
	6K-1403-N	7.8	2.4	< 0.1	138.5	Seawater above a clam's colony
6K-1404 (Y. Ohara)	6K-1404-R05_8	8.9	-	7.0	9.2	Pore water in R05 chimney
	6K-1404-R05_9	9.3	1.4	5.6	2.1	Pore water in R05 chimney
	6K-1404-R05_10	8.6	-	11.7	6.1	Pore water in R05 chimney
	6K-1404-R05_11	9.1	1.8	4.7	3.0	Pore water in R05 chimney
	6K-1404-N	7.8	-	3.9	134.8	Reference deepsea water

Appendix F

Data for gravity calibration (written in Japanese)

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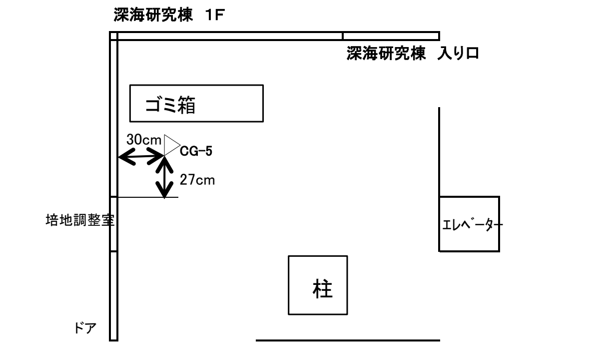
重力検定データ

1.計測情報

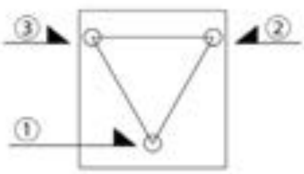
計測場所	JAMSTEC深海研究棟			気象(天気、風等)	曇り
機器名	CG-5 [SCINTREX]			気温	26 ℃
計測日[UTC]	2014/07/06			機器高(センサー高8.9cm加算済)	25.4 cm
緯度	35 °	― 19.20 '	N	[35.32]	引用基準点	−
経度	139 °	― 42.00 '	E	[139.70]	計測者	倉本　小松

2.計測値の概略図



JAMSTEC深海研究棟

3.機器高補正図(①～③は脚上部からセンサー位置の高さ8.9cmは加算しない)



①	16.5 cm
②	16.7 cm
③	16.4 cm

※①が正面

4.機器設定

Mode:	FLD.GRV	SEISMIC FILTER:	○	CONT.TILT CORR:	○	AUTO REJECTION:	○
Read Time:	120 sec	TIDE CORRECTION:	○	AUTO-RECORD:		AUTO-REPEAT:	

5. 計測値

No	時刻(UTC)	読み取り重力値[mgal]	X	Y	SD	Temp(mK)	RJ	E.T.C	船上重力計[mgal]	選択
1	06:56:19	3029.211	3.8	-0.3	0.12	-1.45	0	-0.002		
2	06:59:45	3029.212	1.2	-0.5	0.15	-1.45	0	-0.001		
3	07:02:47	3029.215	1.9	-0.5	0.13	-1.47	0	-0.001		
4	07:05:52	3029.217	2.0	-0.5	0.12	-1.49	0	0.000		
5	07:09:06	3029.220	2.3	-1.2	0.12	-1.51	0	0.000		
6	07:11:57	3029.221	2.5	-1.0	0.13	-1.52	0	0.000		
7	07:15:02	3029.223	2.6	-1.1	0.15	-1.53	0	0.000		
8										
9										
10										

※ 機器設定及びデータ選択においては設定やデータを採用した場合に「○」を選択。

6. 絶対重力値算出

計測点の絶対値	979757.66	±0.04	mgal

7.備考

収録ソフトの収録不良によりデータは欠測していたが、船上重力計本体のcu値は収録されていたので、
下記式にてmgalに計算し直し船上重力値とした。
Gravity(mgal) = Gravity(cu) × Coef1(0.9992)

8.その他(計測に関する諸注意)

・測定は、岸壁→固定点→岸壁の順番で往復計測する事。

・「機器高」は地面からポータブル重力計底面までの高さ。(右図赤矢印部分)

・測定は、測定値が安定するまで行う。(精度0.01mGalなのでその範囲で安定するまで。)

・ポータブル重力計の安定のため、設置後すぐに測定せず、10分間待機した後、測定する事。

・ポータブル重力計の水平は、X,Yが±2以内に収まるように合わせる。

※質問事項等有る場合は、横浜研究所データ管理グループまで連絡の事。

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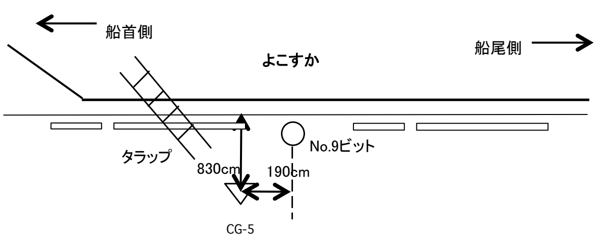
重力検定データ

1.計測情報

計測場所	JAMSTEC専用1号桟橋　旧6番ビット付近			気象(天気、風等)	曇り　南　5m/s
機器名	CG-5 [SCINTREX]			気温	31 ℃
計測日[UTC]	2014/07/06			機器高(センサー高8.9cm加算済)	25.4 cm
緯度	35 °	― 19.13 '	N	35.319	引用基準点	JAMSTEC専用岸壁旧6番ビット
経度	139 °	― 39.00 '	E	139.650	計測者	倉本　小松

2.計測値の概略図



JAMSTEC専用1号桟橋　旧6番ビット付近

3.機器高補正図(①～③は脚上部からセンサー位置の高さ8.9cmは加算しない)

①	16.5 cm
②	16.7 cm
③	16.4 cm
※①が正面	
④	25.4 cm
⑤	3.5 cm
⑥	310.0 cm
⑦	470.0 cm
⑧	776.5 cm

上図:機器高(見下ろし図)、下図:船舶およびポータル重力計関係図

4.機器設定

Mode:	FLD.GRV	SEISMIC FILTER:	○	CONT.TILT CORR:	○	AUTO REJECTION:	○
Read Time:	120 sec	TIDE CORRECTION:	○	AUTO-RECORD:		AUTO-REPEAT:	

5. 計測値

No	時刻(UTC)	読み取り重力値[mgal]	X	Y	SD	Temp(mK)	RJ	E.T.C	船上重力計[mgal]	選択
1	06:29:33	3029.880	-6.3	-5.4	0.10	-1.22	0	-0.005	10885.400	
2	06:33:17	3029.883	-3.2	-2.7	0.13	-1.26	0	-0.004	10885.200	
3	06:36:45	3029.884	-2.1	-2.3	0.14	-1.31	0	-0.004	10885.500	
4	06:39:37	3029.884	-4.3	-1.8	0.12	-1.35	0	-0.004	10885.300	
5	06:42:57	3029.886	-1.4	1.1	0.14	-1.40	0	-0.003	10885.400	○
6	06:46:12	3029.887	-1.7	-1.0	0.15	-1.43	0	-0.003	10885.600	
7										
8										
9										
10										

※ 機器設定及びデータ選択においては設定やデータを採用した場合に「○」を選択。

6. 絶対重力値算出

岸壁の絶対値		岸壁の高さへ高度補正					キャリブレーション後の値		船上重力計値
979758.370 mgal	＋ (	0.3086 mgal	×	0.04 m	)	=	979758.381 mgal	⇔	10885.400 mgal

※計測に使用した絶対重力値

場所	絶対重力値	備考
JAMSTEC専用岸壁旧6番ビット	979758.370 ±0.04 mgal	2014/04/18現在

7.備考

収録ソフトの収録不良によりデータは欠測していたが、船上重力計本体のcu値は収録されていたので、
下記式にてmgalに計算し直し船上重力値とした。
Gravity(mgal) = Gravity(cu) × Coef1(0.9992)

8.絶対重力値情報

No	場所	絶対重力値			最終計測日	備考
1	JAMSTEC専用岸壁新9番ピット	979758.370		mgal	2014/04/15	測定回数1回
2	JAMSTEC専用岸壁旧6番ピット	979758.370	±0.04	mgal	2014/04/18	
3	住重東岸壁北側	979755.770	±0.01	mgal	2014/03/17	
4	住重東岸壁南側	979756.240	±0.01	mgal	2014/03/17	
5	住重東岸壁南側建屋	979756.490	±0.01	mgal	2014/03/17	
6	黒潮公園	979727.490	±0.01	mgal	2013/12/16	測定回数2回
7	新宮港佐野1号岸壁	979727.450		mgal	2013/12/16	測定回数1回
8	和歌山新港中埠頭	979683.230	±0.01	mgal	2013/12/17	
9	川重神戸工場北浜岸壁	979702.670	±0.02	mgal	2014/04/08	
10	横浜新港	979741.810		mgal	2013/09/30	測定回数1回
11	山下埠頭市営9号上屋	979742.540		mgal	2013/07/10	測定回数1回
12	山下埠頭市営10号上屋	979742.510		mgal	2013/07/10	測定回数1回
13				mgal		
14				mgal		
15	固定点実施なし	Nan	Nan	mgal	Nan	

※絶対重力値の±表記は、今までの計測したデータの中央値(絶対重力値)からの差を示す。

9.その他

(1) 用語および値算出説明

参照場所	説明
1	機器高:3-①②③の平均値**(脚上部からセンサー位置の高さ8.9cm済)**
3-①	前脚のポータブル重力計機器高さ**(脚上部からセンサー位置の高さ8.9cmは加算しない)**
3-②	右奥脚のポータブル重力計機器高さ**(脚上部からセンサー位置の高さ8.9cmは加算しない)**
3-③	左奥脚のポータブル重力計機器高さ**(脚上部からセンサー位置の高さ8.9cmは加算しない)**
3-④	岸壁からポータブル重力計センサー位置の高さ(三脚の平均＋センサー高)
3-⑤	船上重力計から岸壁の面位置までの高さ(自動計算)
3-⑥	海面から岸壁の高さ
3-⑦	船底から海面の高さ
3-⑧	船底から船上重力計センサー位置の高さ(「かいれい」4.7【第二甲板】+0.4m【機器高】、「よこすか」7.3【第二甲板】+0.465m【機器高】)
6	岸壁の高さへ高度補正:0.3086mgal(1m当たりの重力値)×3-⑤の高さ

(2) 計測に関する諸注意

・測定は、岸壁→固定点→岸壁の順番で往復計測する事。

・「機器高」は地面からポータブル重力計底面までの高さ。(右図赤矢印部分)

・測定は、測定値が安定するまで行う。(精度0.01mGalなのでその範囲で安定するまで。)

・ポータブル重力計の安定のため、設置後すぐに測定せず、10分間待機した後、測定する事。

・ポータブル重力計の水平は、X,Yが±2以内に収まるように合わせる。

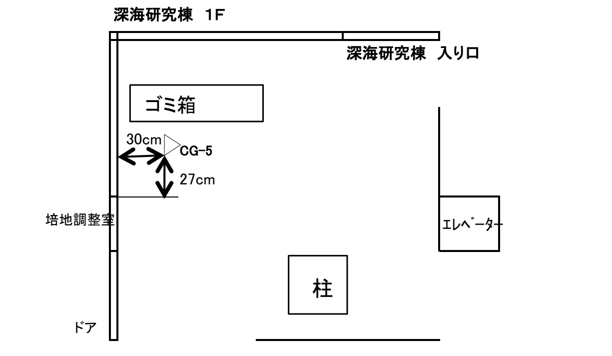
※質問事項等有る場合は、横浜研究所データ管理グループまで連絡の事。

重力検定データ

1.計測情報

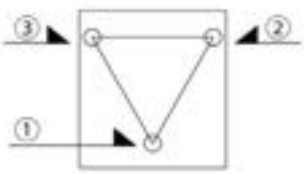
計測場所	JAMSTEC深海研究棟	気象(天気、風等)	晴れ
機器名	CG-5 [SCINTREX]	気温	26 ℃
計測日[UTC]	2014/07/28	機器高(センサー高8.9cm加算済)	25.3 cm
緯度	35 ° — 19.20 ’ N [35.32]	引用基準点	–
経度	139 ° — 42.00 ’ E [139.70]	計測者	倉本 小松

2.計測値の概略図



JAMSTEC深海研究棟

3.機器高補正図(①～③は脚上部からセンサー位置の高さ8.9cmは加算しない)



①	16.3 cm
②	16.6 cm
③	16.3 cm

※①が正面

4.機器設定

Mode:	FLD.GRV	SEISMIC FILTER:	○	CONT.TILT CORR:	○	AUTO REJECTION:	○
Read Time:	120 sec	TIDE CORRECTION:	○	AUTO-RECORD:		AUTO-REPEAT:	

5. 計測値

No	時刻(UTC)	読み取り重力値[mgal]	X	Y	SD	Temp(mK)	RJ	E.T.C	船上重力計[mgal]	選択
1	04:50:54	3044.479	-1.2	0.4	0.09	-1.79	0	0.101		
2	04:53:51	3044.481	-1.9	2.6	0.12	-1.80	0	0.100		
3	04:57:50	3044.483	-2.6	1.3	0.11	-1.83	0	0.097		
4	05:02:26	3044.487	0.3	-1.9	0.10	-1.85	0	0.094		
5	05:05:45	3044.491	0.3	-0.4	0.12	-1.85	0	0.092		
6	05:09:33	3044.491	0.0	0.2	0.11	-1.86	0	0.090		
7										
8										
9										
10										

※ 機器設定及びデータ選択においては設定やデータを採用した場合に「○」を選択。

6. 絶対重力値算出

計測点の絶対値	979757.66	±0.04	mgal

7.備考

8.その他(計測に関する諸注意)

・測定は、岸壁→固定点→岸壁の順番で往復計測する事。

・「機器高」は地面からポータブル重力計底面までの高さ。(右図赤矢印部分)

・測定は、測定値が安定するまで行う。(精度0.01mGalなのでその範囲で安定するまで。)

・ポータブル重力計の安定のため、設置後すぐに測定せず、10分間待機した後、測定する事。

・ポータブル重力計の水平は、X,Yが±2以内に収まるように合わせる。

※質問事項等有る場合は、横浜研究所データ管理グループまで連絡の事。

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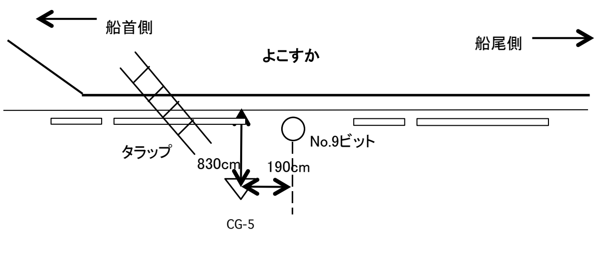
重力検定データ

1.計測情報

計測場所	JAMSTEC専用1号桟橋　旧6番ビット付近		気象(天気、風等)	晴れ
機器名	CG-5 [SCINTREX]		気温	33°
計測日[UTC]	2014/07/28		機器高(センサー高8.9cm加算済)	25.4 cm
緯度	35 °　—　19.13 ’　N	35.319	引用基準点	JAMSTEC専用岸壁旧6番ビット
経度	139 °　—　39.00 ’　E	139.650	計測者	倉本　小松

2.計測値の概略図



JAMSTEC専用1号桟橋　旧6番ビット付近

3.機器高補正図(①～③は脚上部からセンサー位置の高さ8.9cmは加算しない)

①	16.4 cm
②	16.6 cm
③	16.5 cm
※①が正面	
④	25.4 cm
⑤	33.5 cm
⑥	350.0 cm
⑦	460.0 cm
⑧	776.5 cm

上図：機器高(見下ろし図)、下図：船舶およびポータル重力計関係図

4.機器設定

Mode:	FLD.GRV	SEISMIC FILTER:	○	CONT.TILT CORR:	○	AUTO REJECTION:	○
Read Time:	120 sec	TIDE CORRECTION:	○	AUTO-RECORD:		AUTO-REPEAT:	

5. 計測値

No	時刻(UTC)	読み取り重力値[mgal]	X	Y	SD	Temp(mK)	RJ	E.T.C	船上重力計[mgal]	選択
1	04:14:36	3045.135	-7.5	-3.5	0.11	-1.55	0	0.118	108835.000	
2	04:18:40	3045.138	-4.0	-3.8	0.13	-1.60	0	0.117	108831.000	
3	04:22:24	3045.143	-2.4	0.7	0.09	-1.65	0	0.115	108838.000	
4	04:25:18	3045.145	-3.2	-0.2	0.10	-1.68	0	0.114	108834.000	
5	04:30:44	3045.144	0.4	-1.7	0.10	-1.72	0	0.112	108835.000	○
6	04:33:51	3045.146	-0.7	-2.4	0.10	-1.75	0	0.110	108838.000	
7	04:37:08	3045.147	1.7	-4.2	0.11	-1.77	0	0.108	108832.000	
8										
9										
10										

※ 機器設定及びデータ選択においては設定やデータを採用した場合に「○」を選択。

6. 絶対重力値算出

岸壁の絶対値		岸壁の高さへ高度補正					キャリブレーション後の値		船上重力計値
979758.370 mgal	＋ (	0.3086 mgal	×	0.34 m	)	=	979758.473 mgal	⇔	108835.000 mgal

※計測に使用した絶対重力値

場所	絶対重力値	備考
JAMSTEC専用岸壁旧6番ビット	979758.370　±0.04　mgal	2014/04/18現在

7.備考

8.絶対重力値情報

No	場所	絶対重力値			最終計測日	備考
1	JAMSTEC専用岸壁新9番ピット	979758.370		mgal	2014/04/15	測定回数1回
2	JAMSTEC専用岸壁旧6番ピット	979758.370	±0.04	mgal	2014/04/18	
3	住重東岸壁北側	979755.770	±0.01	mgal	2014/03/17	
4	住重東岸壁南側	979756.240	±0.01	mgal	2014/03/17	
5	住重東岸壁南側建屋	979756.490	±0.01	mgal	2014/03/17	
6	黒潮公園	979727.490	±0.01	mgal	2013/12/16	測定回数2回
7	新宮港佐野1号岸壁	979727.450		mgal	2013/12/16	測定回数1回
8	和歌山新港中埠頭	979683.230	±0.01	mgal	2013/12/17	
9	川重神戸工場北浜岸壁	979702.670	±0.02	mgal	2014/04/08	
10	横浜新港	979741.810		mgal	2013/09/30	測定回数1回
11	山下埠頭市営9号上屋	979742.540		mgal	2013/07/10	測定回数1回
12	山下埠頭市営10号上屋	979742.510		mgal	2013/07/10	測定回数1回
13				mgal		
14				mgal		
15	固定点実施なし	Nan	Nan	mgal	Nan	

※絶対重力値の±表記は、今までの計測したデータの中央値(絶対重力値)からの差を示す。

9.その他

(1) 用語および値算出説明

参照場所	説明
1	機器高:3-①②③の平均値**(脚上部からセンサー位置の高さ8.9cm済)**
3-①	前脚のポータブル重力計機器高さ**(脚上部からセンサー位置の高さ8.9cmは加算しない)**
3-②	右奥脚のポータブル重力計機器高さ**(脚上部からセンサー位置の高さ8.9cmは加算しない)**
3-③	左奥脚のポータブル重力計機器高さ**(脚上部からセンサー位置の高さ8.9cmは加算しない)**
3-④	岸壁からポータブル重力計センサー位置の高さ(三脚の平均+センサー高)
3-⑤	船上重力計から岸壁の面位置までの高さ(自動計算)
3-⑥	海面から岸壁の高さ
3-⑦	船底から海面の高さ
3-⑧	船底から船上重力計センサー位置の高さ(「かいれい」4.7【第二甲板】+0.4m【機器高】、「よこすか」7.3【第二甲板】+0.465m【機器高】)
6	岸壁の高さへ高度補正:0.3086mgal(1m当たりの重力値)×3-⑤の高さ

(2) 計測に関する諸注意

・測定は、岸壁→固定点→岸壁の順番で往復計測する事。

・「機器高」は地面からポータブル重力計底面までの高さ。(右図赤矢印部分)

・測定は、測定値が安定するまで行う。(精度0.01mGalなのでその範囲で安定するまで。)

・ポータブル重力計の安定のため、設置後すぐに測定せず、10分間待機した後、測定する事。

・ポータブル重力計の水平は、X,Yが±2以内に収まるように合わせる。

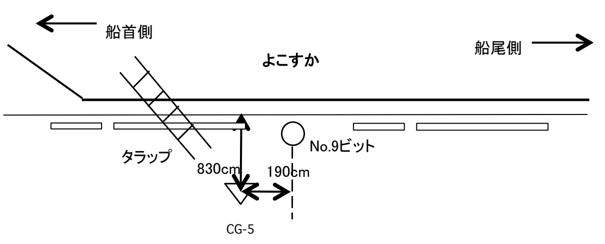
※質問事項等有る場合は、横浜研究所データ管理グループまで連絡の事。

重力検定データ

1.計測情報

計測場所	JAMSTEC専用1号桟橋　旧6番ビット付近		気象(天気、風等)	晴れ
機器名	CG-5 [SCINTREX]		気温	32 ℃
計測日[UTC]	2014/07/28		機器高(センサー高8.9cm加算済)	25.3 cm
緯度	35 ° — 19.13 ’ N	35.319	引用基準点	JAMSTEC専用岸壁旧6番ビット
経度	139 ° — 39.00 ’ E	139.650	計測者	倉本　小松

2.計測値の概略図



JAMSTEC専用1号桟橋　旧6番ビット付近

3.機器高補正図(①～③は脚上部からセンサー位置の高さ8.9cmは加算しない)

①	16.4 cm
②	16.4 cm
③	16.5 cm
※①が正面	
④	25.3 cm
⑤	-16.5 cm
⑥	300.0 cm
⑦	460.0 cm
⑧	776.5 cm

上図:機器高(見下ろし図)、下図:船舶およびポータル重力計関係図

4.機器設定

Mode:	FLD.GRV	SEISMIC FILTER:	○	CONT.TILT CORR:	○	AUTO REJECTION:	○
Read Time:	120 sec	TIDE CORRECTION:	○	AUTO-RECORD:		AUTO-REPEAT:	

5. 計測値

No	時刻(UTC)	読み取り重力値[mgal]	X	Y	SD	Temp(mK)	RJ	E.T.C	船上重力計[mgal]	選択
1	05:57:38	3045.198	0.8	-6.0	0.12	-1.70	0	0.055	108834.000	
2	06:03:34	3045.219	-1.3	-2.0	0.12	-1.71	0	0.050	108833.000	
3	06:07:31	3045.227	-2.2	-0.7	0.12	-1.73	1	0.047	108833.000	
4	06:10:37	3045.242	-1.7	-0.7	0.12	-1.74	0	0.044	108835.000	○
5	06:14:44	3045.259	-1.3	-1.7	0.14	-1.75	2	0.041	108835.000	
6	06:17:57	3045.238	-2.1	-1.5	0.24	-1.76	0	0.039	108838.000	
7	06:21:08	3045.236	-3.1	-2.7	0.15	-1.76	0	0.035	108836.000	
8	06:24:25	3045.210	-5.6	-2.6	0.13	-1.76	0	0.033	108835.000	
9										
10										

※ 機器設定及びデータ選択においては設定やデータを採用した場合に「○」を選択。

6. 絶対重力値算出

岸壁の絶対値		岸壁の高さへ高度補正					キャリブレーション後の値		船上重力計値
979758.370 mgal	＋	(0.3086 mgal	×	-0.17 m	)	=	979758.319 mgal	⇔	108835.000 mgal

※計測に使用した絶対重力値

場所	絶対重力値	備考
JAMSTEC専用岸壁旧6番ビット	979758.370　±0.04　mgal	2014/04/18現在

7.備考

8.絶対重力値情報

No	場所	絶対重力値			最終計測日	備考
1	JAMSTEC専用岸壁新9番ビット	979758.370		mgal	2014/04/15	測定回数1回
2	JAMSTEC専用岸壁旧6番ビット	979758.370	±0.04	mgal	2014/04/18	
3	住重東岸壁北側	979755.770	±0.01	mgal	2014/03/17	
4	住重東岸壁南側	979756.240	±0.01	mgal	2014/03/17	
5	住重東岸壁南側建屋	979756.490	±0.01	mgal	2014/03/17	
6	黒潮公園	979727.490	±0.01	mgal	2013/12/16	測定回数2回
7	新宮港佐野1号岸壁	979727.450		mgal	2013/12/16	測定回数1回
8	和歌山新港中埠頭	979683.230	±0.01	mgal	2013/12/17	
9	川重神戸工場北浜岸壁	979702.670	±0.02	mgal	2014/04/08	
10	横浜新港	979741.810		mgal	2013/09/30	測定回数1回
11	山下埠頭市営9号上屋	979742.540		mgal	2013/07/10	測定回数1回
12	山下埠頭市営10号上屋	979742.510		mgal	2013/07/10	測定回数1回
13				mgal		
14				mgal		
15	固定点実施なし	Nan	Nan	mgal	Nan	

※絶対重力値の±表記は、今までの計測したデータの中央値(絶対重力値)からの差を示す。

9.その他

(1) 用語および値算出説明

参照場所	説明
1	機器高:3-①②③の平均値**(脚上部からセンサー位置の高さ8.9cm済)**
3-①	前脚のポータブル重力計機器高さ**(脚上部からセンサー位置の高さ8.9cmは加算しない)**
3-②	右奥脚のポータブル重力計機器高さ**(脚上部からセンサー位置の高さ8.9cmは加算しない)**
3-③	左奥脚のポータブル重力計機器高さ**(脚上部からセンサー位置の高さ8.9cmは加算しない)**
3-④	岸壁からポータブル重力計センサー位置の高さ(三脚の平均+センサー高)
3-⑤	船上重力計から岸壁の面位置までの高さ(自動計算)
3-⑥	海面から岸壁の高さ
3-⑦	船底から海面の高さ
3-⑧	船底から船上重力計センサー位置の高さ(「かいれい」4.7【第二甲板】+0.4m【機器高】、「よこすか」7.3【第二甲板】+0.465m【機器高】)
6	岸壁の高さへ高度補正:0.3086mgal(1m当たりの重力値)×3-⑤の高さ

(2) 計測に関する諸注意

・測定は、岸壁→固定点→岸壁の順番で往復計測する事。

・「機器高」は地面からポータブル重力計底面までの高さ。(右図赤矢印部分)

・測定は、測定値が安定するまで行う。(精度0.01mGalなのでその範囲で安定するまで。)

・ポータブル重力計の安定のため、設置後すぐに測定せず、10分間待機した後、測定する事。

・ポータブル重力計の水平は、X,Yが±2以内に収まるように合わせる。

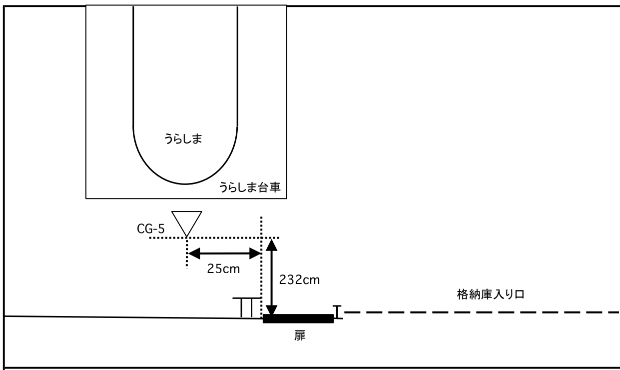
※質問事項等有る場合は、横浜研究所データ管理グループまで連絡の事。

重力検定データ

1.計測情報

計測場所	潜水船格納庫内 うらしま台車前			気象(天気、風等)	晴れ
機器名	CG-5 [SCINTREX]			気温	32 ℃
計測日[UTC]	2014/07/28			機器高(センサー高8.9cm加算済)	25.2 cm
緯度	35 °	― 19.20 '	N	[35.32]	引用基準点	–
経度	139 °	― 42.00 '	E	[139.70]	計測者	倉本 小松

2.計測値の概略図



潜水船格納庫内 うらしま台車前

3.機器高補正図(①～③は脚上部からセンサー位置の高さ8.9cmは加算しない)

①	16.4 cm
②	16.3 cm
③	16.3 cm

※①が正面

4.機器設定

Mode:	FLD.GRV	SEISMIC FILTER:	○	CONT.TILT CORR:	○	AUTO REJECTION:	○
Read Time:	120 sec	TIDE CORRECTION:	○	AUTO-RECORD:		AUTO-REPEAT:	

5. 計測値

No	時刻(UTC)	読み取り重力値[mgal]	X	Y	SD	Temp(mK)	RJ	E.T.C	船上重力計[mgal]	選択
1	05:21:27	3045.271	-4.4	0.4	0.09	-1.79	0	0.082		
2	05:25:35	3045.277	-2.0	-1.2	0.10	-1.77	0	0.079		
3	05:28:43	3045.296	-2.0	-1.4	0.28	-1.77	1	0.077		
4	05:32:03	3045.280	-2.0	-1.9	0.43	-1.78	0	0.074		
5	05:35:52	3045.285	-2.5	-2.4	0.12	-1.79	1	0.072		
6	05:39:54	3045.285	-2.1	-2.4	0.10	-1.79	0	0.069		
7	05:44:18	3045.286	0.2	1.2	0.09	-1.79	0	0.065		
8										
9										
10										

※ 機器設定及びデータ選択においては設定やデータを採用した場合に「○」を選択。

6. 絶対重力値算出

計測点の絶対値	mgal

7.備考

8.その他(計測に関する諸注意)

・測定は、岸壁→固定点→岸壁の順番で往復計測する事。

・「機器高」は地面からポータブル重力計底面までの高さ。(右図赤矢印部分)

・測定は、測定値が安定するまで行う。(精度0.01mGalなのでその範囲で安定するまで。)

・ポータブル重力計の安定のため、設置後すぐに測定せず、10分間待機した後、測定する事。

・ポータブル重力計の水平は、X,Yが±2以内に収まるように合わせる。

※質問事項等有る場合は、横浜研究所データ管理グループまで連絡の事。

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