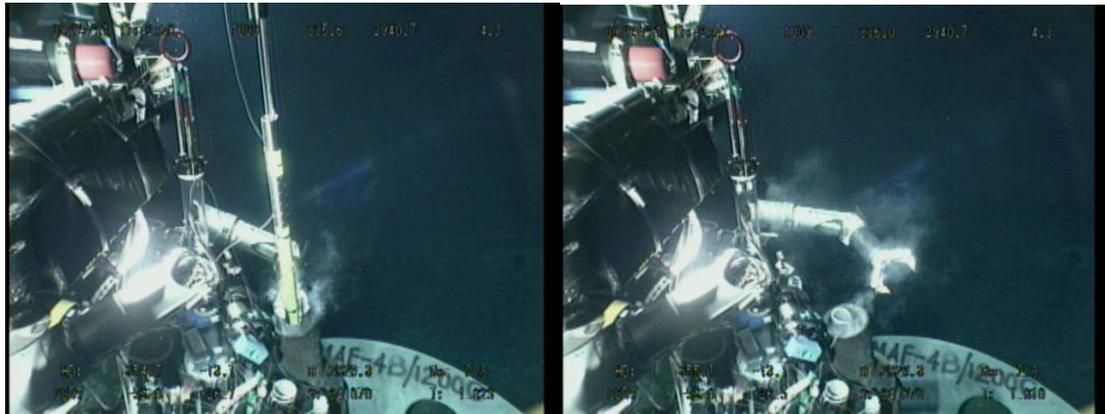


NT09-07 Deep Alkaline Serpentine Aquifer Exploration II of South Chamorro Seamount

**Is truly an active seafloor microbial community in deep serpentinite mud of the
South Chamorro Seamount?
Geochemical, Biogeochemical and Microbiological Investigation for the Mystery in
Deep Formation Fluid by CORK**



May 28, Guam – June 3, Guam, 2009

Japan Agency for Marine-Earth Science & Technology

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Captain

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Acknowledgements

We are grateful to Captain Mr. S. Ishida, Chief Officer Mr. Yoshida and Chief Engineer Mr. Yoshikawa for their safe navigation and their skillful handling of “R/V Nastushima”. Great thanks are due to Commander Mr. K. Mitsufuji and “HyperDolphin” operation team for their operations in sampling. We also thank Mr. S. Okada, Nippon Marine Enterprise, Ltd., for his attentive supports.

We thank all the JAMSTEC personnel who have supported us. We also thank Mr. Yoshiume, Mr. Watanabe, and Mr. Katsuhira (JAMSTEC) and Dr. Mastumoto (Syn Co. Ltd) for technical supports of DEEP SAMPLER & DEEP BIOSAMPLER.

Finally, we would like to appreciate all the person who supported directly or indirectly this cruise.

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Shipboard Log of NT09-07

Actual schedule (NT09-07 09/5/27 - 09/6/3)				Position/Weather/Wind/Sea condition (Noon)
Date	Time	Description	Remark	
28, May, 09	10:00	departure from Apra port		5/28 12:00(JST+1h)
	10:45	on board education	for safety NATSUSHIMA life	13-36.7N, 144-39.1E
				fine but cloudy
				E-4(Moderate breeze)
29, May, 09	5:30	arrived at research area		5/29 12:00(JST+1h)
	5:34	released XBT		13-47.0N, 146-00.2E
	8:16	launched HPD		cloudy
	8:30	started HPD Dive#1007		SE-4(Moderate breeze)
	10:01	arrived at bottom	D=2940m	
	13:18	leave the bottom	D=2945m	
	14:42	surfaced HPD		
	14:57	recovered HPD		
	15:04	recovered Flow meter		
30, May, 09	8:36	launched HPD		5/30 12:00(JST+1h)
	8:51	started HPD Dive#1008		13-47.0N, 146-00.2E
	10:20	arrived at bottom	D=2915m	fine but cloudy
	16:09	leave the bottom	D=2945m	SE-4(Moderate breeze)
	17:34	surfaced HPD		
	17:51	recovered HPD		
31, May, 09	8:21	launched HPD		5/31 12:00(JST+1h)
	8:34	started HPD Dive#1009		13-47.1N, 146-00.1E
	10:04	arrived at bottom	D=2937m	fine but cloudy
	16:33	leave the bottom	D=2947m	SE-3(Gentle breeze)
	17:55	surfaced HPD		
	18:20	recovered HPD		
01, Jun, 09	8:09	launched HPD		6/1 12:00(JST+1h)
	8:24	started HPD Dive#1010		13-47.1N, 146-00.1E
	9:52	arrived at bottom	D=2926m	fine but cloudy
	12:34	leave the bottom	D=2942m	SE-4(Moderate breeze)
	13:53	surfaced HPD		
	14:08	recovered HPD		
02, Jun, 09	12:30	carried out F.F. the U.B.C.		6/2 12:00(JST+1h)
	12:40	left the research area for Guam		13-47.8N, 146-03.0E
				fine but cloudy
				SE-3(Gentle breeze)
03, Jun, 09	9:00	arrived at Apra Port		6/3 12:00(JST+1h)
	13:00	disembarked science group		Apra Port

I. CRUISE SUMMARY

In this cruise, we succeeded in (1) recovery of flow meter, SIP incubation samples and in situ colonization devices deployed in the deep crustal fluid (2) collecting close to non-contaminated highly alkaline, deep crustal water, (3) undergoing SIP and RIP experiments again and (4) obtaining the deep crustal fluid beneath the seafloor by using DEEP-SAMPLER. The DEEP-SAMPLER was not fully successful because the depth of sampling the crustal fluid was still unclear (either 65-70 mbsf, 10 mbsf or 3 mbsf). The data obtained from the deployed tools and incubations at the seafloor and obtained from the future onshore investigation will be integrated with the ones that had been taken during the last cruise held in January, 2009 (NT09-01). The combined data from the two successive cruises with R/V Natsushima and ROV HyperDolphin will provide important insights into a key question: are the functionally microbial communities truly present in the serpentinized-derived, extremely alkaline deep crustal fluid flows?

II. Introduction

General background and objectives

The primary scientific objective of this research project (NT09-01 & NT09-07 cruises) is to clarify whether a true active seafloor microbial ecosystem is present and functioning in the seafloor environment of the Mariana Forearc South Chamorro Seamount or not.

In 2001, Ocean Drilling Program (ODP) expedition Leg#195 was conducted to obtain the samples of serpentinization-derived fluids, rocks and mud in the South Chamorro Seamount located in the Mariana Forearc, approx. 140 km east-northeast from the Guam Island (Salisbury et al., 2002). The geochemistry characterization of the pore-water samples demonstrated that the seafloor environment of the South Chamorro Seamount is an extreme environment of which pH reaches to pH12.5, among the strongest hyperalkaline in this planet (Mottl et al., 2003). Meanwhile, the microbiological exploration suggested interesting but somewhat contradicting image of the seafloor biosphere. Based on the culture-independent (lipid) surveys, there were detected hot spots of microbial populations at several depths (Mottl et al., 2003) while the culture-dependent surveys indicated the occurrence of active microbial communities in the very shallow subsurface (Takai et al., 2005). The seafloor environment under pH12.5 is marginal for the microbial habitability (the highest pH limit for microbial growth is known as pH12.4) (Takai et al., 2001). If the active microbial communities are present in the habitats, the communities might be sustained from oxidation of methane which was originally produced by the serpentinization of peridotite and the subsequent Fisher-Tropsch-Type reaction. In this case, methane might be oxidized only by sulfate derived from the deep seawater or the deep crustal fluid itself (sulfate-dependent anoxic methane oxidation: AMO). Thus, the previous microbiological investigations provided two important questions of the potential active seafloor microbial ecosystem in the South Chamorro Seamount:

- (1) Whether the active (living) microbial populations are truly present in the hyperalkaline seafloor environment (or not).
- (2) If the active biosphere is present, whether the ecosystem is sustained by AMO in the hyperalkaline seafloor environment (or not).

To clarify these questions, this research project will focus on the seepage fluid from the subseafloor environment. In ODP Leg#195, a CORK (a kind of seal cap of a drilled hole) was deployed at one of the boreholes. The CORK had a valve through which we are able to obtain the potentially non-contaminated subseafloor serpentinization-derived fluids. Using a JAMSTEC ROV HYPER-DOLPHIN, the pristine subseafloor fluids were sampled in the NT09-01 cruise and will be sampled in the NT09-07 cruise by way of the CORK. In addition, the NT09-01 cruise deployed the in situ colonization system in the borehole. Although the seepage fluids from the CORK is expected to be nearly endmember crustal fluid, even a tiny amount of seawater contamination may result in the lethal microbial contamination. In order to prove the identical physical and chemical properties of the fluids sampled beneath and at the seafloor, the fluid and microbial samples will be obtained from both the seafloor CORK outlet and the deep down borehole. The recovery of in situ colonization system will be done in the NT09-07 cruise. In the NT09-01 cruise, the DEEP SAMPLER was tried to obtain the potentially endmember crustal fluid at a depth of 150 m below seafloor down in the borehole. The attempt was failed by the breakdown of the titanium wire of the SAMPLER. In the NT09-07 cruise, we tried to get the pure fluid again by using the modified DEEP SAMPLER. The obtained fluid samples will be applied to the detail geochemical analyses and microbiological characterizations. In particular, the fluids will be sampled as the in situ pressure preserved, and will be applied to onboard radioisotope-labeled experiments. These experiments are so sensitive that any of the trace activity of the subseafloor microbial communities could be detected and that they could provide us with answers to the above-mentioned questions.

Finally, the NT09-07 cruise will also investigate the chemosynthetic animal communities associated with the seepages in the South Chamorro Seamount. In addition, the ROV operation will include the recovery and deployment of sensors equipped with the CORK. These are important objectives for understanding of the entire geochemical and biological processes of the South Chamorro Seamount.

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Takai, K., Moyer, C. L., Miyazaki, M., Nogi, Y., Hirayama, H., Nealson, K. H., and Horikoshi, K. (2005) *Marinobacter alkaliphilus* sp. nov., a novel alkaliphilic bacterium isolated from subseafloor alkaline serpentine mud from Ocean Drilling Program Site 1200 at South Chamorro Seamount, Mariana Forearc. *Extremophiles* 9:17-27.

III. DIVE REPORTS

HPD#1007 DIVE (South Chamorro Seamount)	Dr. J. Miyazaki
HPD#1008 DIVE (South Chamorro Seamount)	Dr. Y. Morono
HPD#1009 DIVE (South Chamorro Seamount)	Dr. K. Takai
HPD#1010 DIVE (South Chamorro Seamount)	Dr. S. Kawagucci

Dive Report: HyperDolphin Dive #1007

Date: 28 May, 2009

Site: ODP#195 CORK at borehole 1200c site of South Chamoro Seamount

Landing: 10:01; 13°47.027'N, 146°00.143'E, 2939m

Leaving: 13:18; 13°47.051'N, 146°00.180'E, 2945m

Observer: Junichi Miyazaki (SUGAR Project, JAMSTEC)

Objectives:

The objectives of this dive are 1) Sampling water into WHATS, RI vacuum sampler and Bag sampler, 2) Recover the chimney with flow meter, in situ colonization systems, and 6 x 6 bag sampler, which were deployed at NT09-01 cruise, and 3) collect chimneys if bluesite chimneys were formed.

Dive Summary:

At 10:55, we landed on the bottom which was covered with serpentine mud. We immediately head to the CORK which were deployed PVC manifold and the chimney with flow-meter in NT09-01 cruise. We reached the CORK and observed white-smoker from the chimney. And also we observed the blusite at the top of the chimney and microbial mats at the surface of the chimney. But we judged we could not sample the blusite by manipulators. We try to sample water using hooked sampler into WHATS, 4 x RI vacuum sampler and 20 L bag sampler. Except for one of two 20 L bags, we successfully sampled water. Next, we tried to recover the chimney with flow-meter. But unfortunately the PVC manifold was broken when the chimney lifted up. Therefore, we landed on serpentine mud with the chimney with a part of PVC manifold. We separated the chimney from a part of PVC manifold and recovered both the Fryer's *in situ* colonization system and Bio sampler. At this time, the cover of Bio sampler was closed by pushing down with manipulator. Next, we recovered 6 x 6 L Koshi's SIP bag sampler which were deployed at NT09-01 cruise and putted on sample baskets of ROV. Finally, we recovered the chimney with flow-meter by fuse wire and left the bottom (13:18).

Payloads:

- 1) WHATS without a temperature probe
- 2) 20L bag x 2

- 3) RI vacuum water sampler x 4 with 6 L bag sampler
- 4) MBARI
- 5) Sample Box
- 6) Fuse wire

Location of Events:

Time	Position	Depth	Event
10:01	13°47.027'N, 146°00.143'E,	2939m	Landing on serpentine mud
10:03	13°47.036'N, 146°00.153'E,	2940m	Finding Marker #76
10:07	13°47.052'N, 146°00.153'E,	2943m	Finding CORK. White-smoker was observed.
10:15	13°47.052'N, 146°00.154'E,	2943m	Landing on the platform of the CORK
10:17	13°47.052'N, 146°00.154'E,	2943m	Put the heavy weights on the platform
10:26	13°47.052'N, 146°00.154'E,	2943m	Hanging sampling tubes
10:28	13°47.052'N, 146°00.154'E,	2940m	Finding Microbial mats on chimney
10:30	13°47.052'N, 146°00.154'E,	2940m	Collect water by WHATS(1)
10:40	13°47.052'N, 146°00.154'E,	2940m	Collect water by WHATS(2)
10:45	13°47.052'N, 146°00.154'E,	2940m	Collect water by WHATS(3)
10:51	13°47.052'N, 146°00.154'E,	2940m	Collect water by WHATS(4) (High speed)
11:11	13°47.051'N, 146°00.180'E,	2943m	Collect water into RI-bottle (Green)
11:15	13°47.051'N, 146°00.180'E,	2943m	Collect water into RI-bottle (White)

11:16	13°47.051'N, 146°00.180'E, RI-bottle	2943m Collect water into (Red)
11:18	13°47.051'N, 146°00.180'E, RI-bottle	2943m Collect water into (Blue)
11:26	13°47.051'N, 146°00.180'E,	2943m Sampling water into 20 L bag (No. 1)
11:42	13°47.051'N, 146°00.180'E, (No.	2943m Finish the bag sampler 1)
11:45	13°47.051'N, 146°00.180'E, sampler	2943m Fail to take the bag (No. 2)
11:50	13°47.051'N, 146°00.180'E,	2943m Remove the the sampling tube from chimney
11:45	13°47.051'N, 146°00.180'E	2929m Recover the chimney, but broken the PVC manifold
12:40	13°47.051'N, 146°00.180'E situ	2945m Recover the Fryer's in colonization system
12:50	13°47.051'N, 146°00.180'E	2945m Recover the Bio sampler
12:57	13°47.054'N, 146°00.159'E	2945m Recover the 6 x 6 Bag sampler
13:18	13°47.051'N, 146°00.180'E	2945m Recover the Chimney by fuse wire.
13:18	13°47.051'N, 146°00.180'E	2945m Left the bottom

Dive Report: HyperDolphin Dive #1008

Date: 30 May, 2009

Site: ODP#195 CORK at borehole 1200c site of South Chamoro Seamount

Landing: 10:21; 13°46.934'N, 146°00.201'E, 2912m

Leaving: 16:40; 13 47.052'N, 146 00.150'E, 2945m

Observer: Yuki Morono (Kochi Core Center, JAMSTEC)

Objectives:

The objectives of this dive are 1) Sampling water of mussels colony and deep crustal water into WHATS, 2) Collect mussel individuals, 3) testing DEEP sampler, and (4) in situ filtration of deep crustal water.

Dive Summary:

At 10:21, we reached to the bottom which was covered with serpentine mud. We immediately head to the summit site where mussels colonizing. Though we started to sample water close to one mussel individual, failures occurred at the bulb action (lower bulbs of WHATS#1, #3, #4, and upper bulb of WHATS #2, #4) and had to give up to collect water while keeping the pressure. Then we started to collect mussel individuals and succeeded in collecting around 10 of individuals. While we tried to find another mussels colony around the site, we could not find any, then we headed to Fryer's site and collected few more mussels. After that, we moved to CORK and started in situ filtration. The temperature of the crustal water was measured as 1.7 degree-C. We then picked up pressure sensor, placed it on the seafloor, and went up to 100 m above the seafloor to test DEEP sampler. It took about 30 min to roll out 50 m of the wire. After dropping the weight, we started rolling up the wire. After 34 min, we stopped rolling up, checked DEEP sampler, and found that the test was very much successful. Then we backed to the bottom and after pick up pressure sensor and hooking PVC manifold, we left the bottom.

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Payloads:

- 7) WHATS with a temperature probe
- 8) Suction sampler
- 9) DEEP Sampler

10) In situ filtration device

11) Pressure sensor

Location of Events:

Time	Position	Depth	Event
10:21	13°46.934'N, 146°00.201'E,	2912m	Reached to the bottom
10:32	13°46.920'N, 146°00.238'E,	2915m	Found Marker #165-1
10:33	13°46.920'N, 146°00.238'E,	2917m	Landed on the bottom close to the mussels colony
10:38	13°46.923'N, 146°00.239'E,	2917m	Collect water close to mussel to WHATS (1)
10:49	13°46.923'N, 146°00.239'E,	2917m	Collect water close to mussel to WHATS (2)
10:55	13°46.923'N, 146°00.239'E,	2917m	Collect water close to mussel to WHATS (3)
11:03	13°46.923'N, 146°00.239'E,	2917m	Collect water close to mussel to WHATS (4)
11:16	13°46.890'N, 146°00.179'E,	2917m	Collect mussel individuals
11:57	13°46.998'N, 146°00.191'E,	2922m	Arrive at Fryer's site
12:08	13 47.004'N, 146 00.197'E,	2922m	Collect mussel individuals
12:19	13 47.004'N, 146 00.197'E,	2922m	Finish mussel sampling
12:29	13 47.049'N, 146 00.185'E	2940m	Arrive at the CORK
12:43	13 47.049'N, 146 00.185'E	2940m	In situ filtration started
13:13	13 47.049'N, 146 00.185'E	2940m	In situ filtration finished
13:25	13 47.049'N, 146 00.185'E	2940m	Recover pressure sensor
13:59	13 47.052'N, 146 00.156'E	2850m	Started the test of DEEP Sampler
14:04	13 47.052'N, 146 00.156'E	2850m	Started to roll out
14:35	13 47.052'N, 146 00.156'E	2850m	Stopped to roll out (50m)
14:38	13 47.052'N, 146 00.156'E	2850m	Drop weight
14:41	13 47.052'N, 146 00.156'E	2850m	Started to roll up
15:15	13 47.052'N, 146 00.156'E	2850m	Stopped to roll up
15:57	13 47.052'N, 146 00.150'E	2945m	Picked up PVC manifold
16:10	13 47.052'N, 146 00.150'E	2945m	Hooked pressure sensor
16:10	13 47.052'N, 146 00.150'E	2945m	Left the bottom

Dive Report: Hyper Dolphin Dive #1009

Date: 31 May 2009

Site Name: ODP#195 CORK at borehole 1200c site in South Chamoro Seamount

Landing: 13°47.033'N, 146°00.151'E, 9:47, 2939m

Leaving: 13°47.060'N, 146°00.182'E, 15:03, 2946m

Observer: Ken Takai (SUGAR program, JAMSTEC)

Objectives:

The objectives of the dive #1009 are (1) to take deep serpentinized crustal water from the deep in CORK by the DEEP Sampler, (2) to take deep serpentinized crustal water by WHATS and RI vacuum sampler.

Dive Summary:

We landed near the CORK and immediately headed to the CORK. We first collected the deep crustal fluid by WHATS (4 bottles), RI-WHATS (2 bottles) and Bag sampler (a 3 L). Then we deploy the DEEP Sampler. The DEEP Sampler, which was wired to the reel, was dropped into the borehole. Then the reel was settled on the top of the pipe of borehole, and the wire was started to reel out. Because the speed of reeling out the wire was slow, it took about 1.5 hour to put the DEEP Sample about 100 m down the borehole. At about 100 m down the borehole, we stopped reeling out. We took deep surpentinized crustal water with the DEEP Sampler by sinking a messenger (3 kg of weight) along the wire. When the weight arrive at the Sampler, the spring equipped at the top of the reel becomes shorten. This time, we did not confirm the signal. There is a possibility that the weight may be stacked somewhere in the borehole. We should have checked the possibility by moving the reel compartment. Anyway, we started to wind up the wire to recover the DEEP sampler from the borehole. At a depth of 65-70 m below seafloor, the signal for the stacking was found. We repeated to reel out and in many times, and finally we successfully continued to reel in the sampler. When the sampler came up to 3 m below seafloor, the second stacking occurred. This time, the repeated reeling in and out did not work well. When we reel out the sampler at up to 10 m below seafloor and moved up reel compartment, we saw the weight still present just below the reel compartment. Yes, the weight did not fall in the borehole. After the movement, the weight fell down the borehole. Then, we could completely reel in the sampler this time. Finally, the sampler was successfully recovered and the HPD left the

bottom.

The important question is how deep the DEEP-SAMPLER took the deep crustal water. There would be 3 possible depths. (1) 65-70 m below seafloor at the time of the first stacking; (2) 10 m below seafloor at the time of the weight falling down and (3) 3 m below seafloor at the time of the second stacking. The chemical measurement (pH and alkalinity) of the DEEP-SAMPLER water represented the almost the same value of the water obtained by the WHATS today. Thus, it is still uncertain at this moment. However, today's dive strongly suggested that the concept and system of the DEEP-SAMPLER would be very fine and would work very effectively as a new subseafloor fluid sampler. The future onboard chemical and microbiology characterizations will clarify the where the fluid taken by the DEEP-SAMPLER comes from.

Payloads:

- 1) DEEP Sampler
- 2) RI Vacuum sampler (x 2)
- 3) WHATS
- 4) Bag sampler

Location of Events:

Time	Position	Depth	Event
10:05	13°47.076'N, 146°00.146'E,	2936m	Landing near the CORK.
10:09	13°47.072'N, 146°00.150'E,	2940m	Stop at the platform of CORK.
10:17	13°47.072'N, 146°00.150'E,	2940m	Start to collect crustal fluid by WHATS (No. 1) (T = 1.4 °C).
10:24	13°47.072'N, 146°00.150'E,	2940m	WHATS (No. 2) (T = 1.4 °C).
10:30	13°47.072'N, 146°00.150'E,	2940m	WHATS (No. 3) (T = 1.4 °C)..
10:35	13°47.072'N, 146°00.150'E,	2940m	WHATS (No. 4) (T = 1.6 °C) and RI vacuum sampler (X 2)
11:01	13°47.072'N, 146°00.150'E,	2940m	Finish WHATS (No. 4) (T = 1.6 °C) and RI vacuum sampler (X 2).
11:12	13°47.072'N, 146°00.150'E,	2940m	Finish Bag sampler
11:38	13°47.072'N, 146°00.150'E,	2940m	Start the DEEP SAMPLER
11:55	13°47.072'N, 146°00.150'E,	2940m	Set the winch reel.
12:08	13°47.072'N, 146°00.150'E,	2940m	Hang down the DEEP SAMPLER.

13:06	13°47.072'N, 146°00.150'E,	2940m	75 m down in the hole.
13:36	13°47.072'N, 146°00.150'E,	2940m	100 m down in the hole
13:58	13°47.072'N, 146°00.150'E,	2940m	Roll up the wire.
14:35	13°47.072'N, 146°00.150'E,	2940m	Stacked.
14:36	13°47.072'N, 146°00.150'E,	2940m	Clear.
15:43	13°47.072'N, 146°00.150'E,	2940m	Last 3 m but stacked.
16:15	13°47.072'N, 146°00.150'E,	2940m	finish the sampling.
16:30	13°47.072'N, 146°00.150'E,	2940m	Leave the bottom

Dive Report: Hyper Dolphin Dive #1010

Date: 1 June 2009

Site Name: ODP#195 CORK at borehole 1200c site in South Chamoro Seamount

Landing: 13°47.033'N, 146°00.151'E, 9:47, 2939m

Leaving: 13°47.060'N, 146°00.182'E, 15:03, 2946m

Observer: Shinsuke Kawagucci (Precambrian Ecosystem Laboratory, JAMSTEC)

Objectives:

The objectives of the dive #1010 are (1) to take serpentinized crustal water from the CORK by WHATS, (2) to take serpentinized crustal water into SIP incubator and deploy it at seafloor, (3) to take reference ambient seawater using Bag, (4) to carry out Craig's in-situ filtration, and (5) to recover the scrapped rope and chain.

Dive Summary:

We landed near the CORK and immediately headed to the CORK. We first collected the deep crustal fluid into WHATS (4 bottles), SIP Incubator (3 Bags), and Bag sampler (1 Bag). Then Craig's in-situ filtration of deep crustal fluid was done for 30 min.. After taking video image of broken pipe, ROV left the CORK platform and landed on seafloor near the CORK. Bag sampling to take reference ambient seawater was done at the seafloor. The SIP incubator was deployed on the seafloor. Scrapped rope and chain were picked up.

Payloads:

- (1) WHATS water sampler (x 4 bottles)
- (2) Bag sampler (x 2)
- (3) Craig's in situ filtration (x 2)
- (4) SIP incubator (x3)

Location of Events:

Time	Position	Depth	Event
09:52	13°47.066'N, 146°00.179'E,	2936m	Landing near the CORK.
09:59	13°47.073'N, 146°00.152'E,	2940m	Stop at the top of CORK.
10:01	13°47.073'N, 146°00.152'E,	2940m	Start to collect crustal fluid by

		WHATS (No. 1).
10:07	13°47.073'N, 146°00.152'E,	2940m WHATS (No. 2).
10:13	13°47.073'N, 146°00.152'E,	2940m WHATS (No. 3).
10:18	13°47.073'N, 146°00.152'E,	2940m WHATS (No. 4) valve open.
10:24	13°47.073'N, 146°00.152'E,	2940m SIP incubator (No. 1).
10:41	13°47.073'N, 146°00.152'E,	2940m SIP incubator (No.3).
10:59	13°47.073'N, 146°00.152'E,	2940m SIP incubator (No.2) Fluid: 1.7°C, Seawater: 1.4°C.
11:15	13°47.073'N, 146°00.152'E,	2940m Finish WHATS No.4 sampling.
11:21	13°47.073'N, 146°00.152'E,	2940m Bag (No. 1).
11:30	13°47.073'N, 146°00.152'E,	2940m Craig's filtration (30 min.).
12:04	13°47.073'N, 146°00.152'E,	2940m Taking video image of broken pipe
12:07	13°47.073'N, 146°00.154'E,	2946m Landing seafloor.
12:08	13°47.073'N, 146°00.154'E,	2946m Bag (No. 2) as reference seawater.
12:19	13°47.073'N, 146°00.154'E,	2946m Deploy the SIP incubator.
12:24	13°47.073'N, 146°00.154'E,	2946m Pick up a rope.
12:33	13°47.073'N, 146°00.152'E,	2940m Pick up the chain.
12:36	13°47.073'N, 146°00.152'E,	2940m Leave the bottom.

IV. APENDIX

Sample list for Microbiology, Biology and Geochemistry

HPD#1007

		JAMSTEC SUGA	JAMSTEC Kochi	Geoff Wheat	Craig Moyer	Treatments or Objects
WHATS	1	150ml	150ml			Gas Extraction
	2	150ml		Failures		
	3	150ml		Failures		
	4	150ml	135ml		15 ml	Chemical analysis
RI vacuum samplk	1	150ml	150ml			Activity measurements
	2	150ml	150ml			Activity measurements
	3	150ml	150ml			Activity measurements
	4	150ml	150ml			Activity measurements
RI Bag sampler (6L)	5L	2.2L	2L		15ml	Filtration & Fixation
Bag sampler (20L)	1	15L	5L			10L Filtration & Fixation
	2	0L	Failures			
Bio Sampler	150 ml	150ml				Cultivation
Fryer's sampler						all Cultivation?
Koshi's SIP samp	1	6L	6L			Filtration & Fixation
	2	6L	Failures			
	3	6L	6L			Filtration & Fixation
	4	6L	Failures			
	5	6L	Failures			
	6	6L	Failures			

WHATS, RI vacuum sampler, RI Bag sampler, Bag Sampler: Sampling deep crustal fluid from CORK chimney with flow meter
 Bio sampler, Fryer's sampler: Collecting & incubating microorganisms in deep crustal water for 4 month
 Kochi's SIP sampler: At NT09-01 cruise, sampling deep crustal water and incubated at seafloor with stable isotopes

HPD#1008

		JAMSTEC SUGA	JAMSTEC Kochi	Geoff Wheat	Craig Moyer	Treatments or Objects
WHATS	1	150ml	150ml			Gas extraction
	2	150ml		Failures		
	3	150ml	135ml		15ml	Chemical analysis
	4	150ml		Failures		
Deep sampler	200ml	200 ml				Chemical analysis
Impeller filter	1				All	DNA Extraction
	2				All	DNA Extraction
Mussels		7				Activity measurements

WHATS: Sampling water above the mussels colony at summit site of Suoth Chamoro SeaMt.
 Deep sampler: Testing before sampling water from deep subsurface of borehole 1200c and collecting deep sea water
 Impellar filte: Collecting microorganisms from deep crustal fluid
 Mussels: Sampling from summit site and Fryer site of South Chamoro SeaMt.

HPD#1009

	JAMSTEC	SUGA	JAMSTEC	Kochi	Geoff	Wheat	Craig	Moyer	Treatments or Objects
WHATS	1	150ml	150ml						Gas extraction
	2	150ml	150ml						Chemical analysis
	3	150ml	150ml						Chemical analysis
	4	150ml		150ml					Fixation
RI vacuum sample	1	150ml	150ml						Activity measurements
	2	150ml	150ml						Activity measurements
RI Bag sampler (6L)	5L	2.5L		2.5L					Filtration & Fixation
Bag sampler (20L)	1 5L			5L		15ml			Filtration & Fixation
Deep Sampler	200ml	180ml				20ml			Geochemical analysis and cultivation

WHATS, RI vacuum sampler, RI Bag sampler, Bag Sampler: Sampling deep crustal fluid from CORK
 Deep sampler: Sampling deep crustal water from deep subsurface of borehole 1200c

HPD#1010

	JAMSTEC	SUGA	JAMSTEC	Kochi	Geoff	Wheat	Craig	Moyer	Treatments or Objects
WHATS	1	150ml	150ml						Filtration & chemical analysis
	2	150ml	150ml						Filtration & chemical analysis
	3	150ml	150ml						Filtration & chemical analysis
	4	150ml		150ml					Fixation and Filtration
Bag sampler (20L)	1	15L	10L			15ml			5L Fixation and Filtration
	2	15L				15ml			15L Fixation and Filtration
Impeller filter	1						All		DNA Extraction
	2						All		DNA Extraction
3 x SIP 6L Bags	1		Deployed						
	2		Deployed						
	3		Deployed						

WHATS, Bag Sampler2: Sampling deep crustal fluid from CORK
 Bag Sampler1: Sampling reference sea water
 3 x SIP 6L Bags: Sampling deep crustal fluids and deployed with stable isotopes