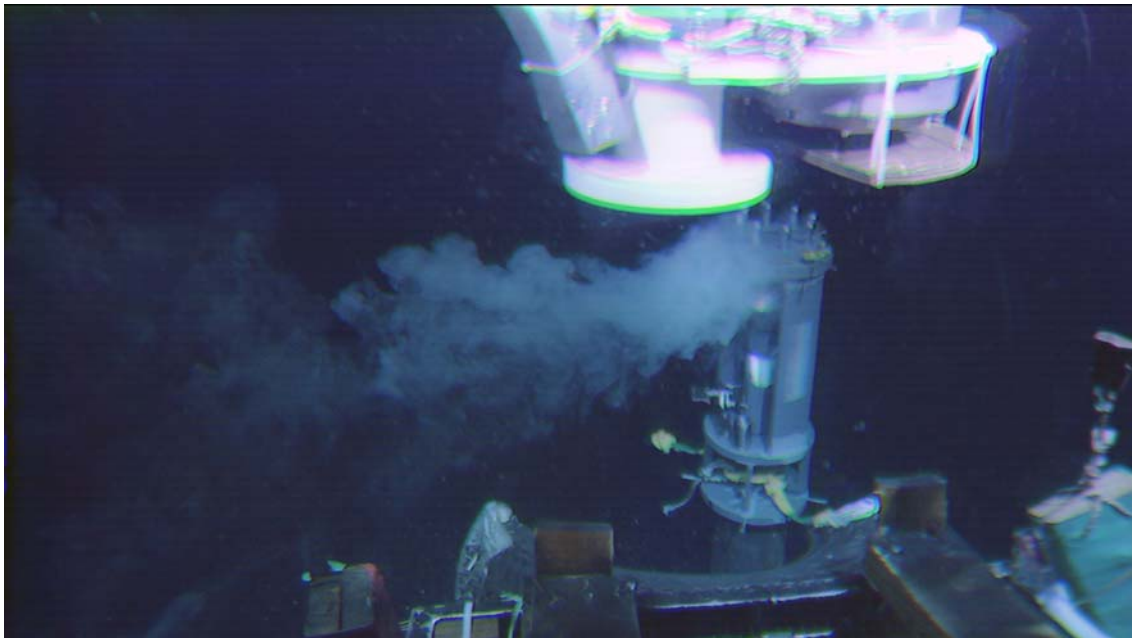


NT09-01 Deep Alkaline Serpentine Aquifer Exploration of South Chamorro Seamount

**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**



R/V Natsushima and ROV HyperDolphin

January 16, Saipan – January 28, Guam, 2009

Japan Agency for Marine-Earth Science & Technology

Scientific party

Chief Scientist

Dr. Ken Takai

Staff Scientists

Dr. Fumio Inagaki

Dr. Hisako Hirayama

Dr. Junichi Miyazaki

Dr. Tomoro Watsuji

Dr. Yuki Morono

Ms. Katsunori Yoshida

Prof. Dr. Geoff Wheat

Prof. Dr. Jeff Seewald

Prof. Dr. Craig Moyer

Dr. Tom Pettigrew

Dr. Bill Kirkwood

Mr. Sean McAllister

Mairne Technicians

Ms. Misumi Aoki

“HyperDolphin” Operation Team

Commander

Kazuya Mistufuji

“R/V Nastushima” Crew

Captain

Koji Samejima

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

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Shipboard Log of NT09-01

2009/01/15: Saipan sea port

Weather: bc/ Wind direction: East/ Wind force: 3/ Wave: 1m/ Swell: 1m/

Visibility: 7 nautical mile (12:00 Local = UTC+10h)

15:00 onboard

2009/01/16: Departure and transit

Weather: c/ Wind direction: East/ Wind force: 5/ Wave: 3m/ Swell: 2m/

Visibility: 7 nautical mile (12:00 Local = UTC+10h)

08:30-09:30 meeting

10:00 departure from Saipan port

11:00-11:40 briefing about onboard life and safety

13:30-14:00 boat station drill

15:30-16:10 meeting

16:45 Konnpira ceremony

19:00 arrive at South Chamoro Seamount

2009/01/17: around South Chamoro Seamount

Weather: bc/ Wind direction: ENE/ Wind force: 5/ Wave: 3m/ Swell: 2m/

Visibility: 7 nautical mile (12:00 Local = UTC+10h)

No dive

08:13-12:22 cable free fall

2009/01/18: South Chamoro Seamount

Weather: r/ Wind direction: ENE / Wind force: 6/ Wave: 5m/ Swell: 4m/

Visibility: 7 nautical mile (12:00 Local = UTC+10h)

No dive because of rough sea

2009/01/19: South Chamoro Seamount

Weather: bc/ Wind direction: East/ Wind force: 7/ Wave: 6m/ Swell: 5m/

Visibility: 7 nautical mile (12:00 Local = UTC+10h)

No dive because of rough sea

2009/01/20: South Chamoro Seamount

Weather: c/ Wind direction: ESE / Wind force: 4/ Wave: 3m/ Swell: 3m/
Visibility: 7 nautical mile (12:00 Local = UTC+10h)

HPD#941 dive

08:08	launching
08:19	start diving
10:10	landing (2,920m)
14:13	leaving (2,923m)
15:32	coming up to the surface
15:48	on deck

2009/01/21: South Chamoro Seamount

Weather: bc/ Wind direction: ENE/ Wind force: 3/ Wave: 3m/ Swell: 3m/
Visibility: 7 nautical mile (12:00 Local = UTC+10h)

HPD#942 dive

08:12	launching
09:55	landing (2,937m)
10:45	leaving (2,939m)
12:06	coming up to the surface
12:24	on deck

HPD#943 dive

13:47	launching
15:18	landing (2,936m)
16:22	leaving (2,941m)
17:47	coming up to the surface
18:02	on deck

2009/01/22: South Chamoro Seamount

Weather: bc/ Wind direction: East/ Wind force: 3/ Wave: 2m/ Swell: 2m/
Visibility: 7 nautical mile (12:00 Local = UTC+10h)

HPD#944 dive

08:11	launching
09:47	landing (2,939m)
15:03	leaving (2,946 m)
16:26	coming up to the surface

16:40 on deck

2009/01/23: South Chamoro Seamount

Weather: bc/ Wind direction: ESE/ Wind force: 5/ Wave: 3m/ Swell: 3m/

Visibility: 7 nautical mile (12:00 Local = UTC+10h)

HPD#945 dive

08:18 launching
10:13 landing (2,937m)
12:14 leaving (2,936m)
13:52 coming up to the surface
14:13 on deck

2009/01/24: South Chamoro Seamount

Weather: bc/ Wind direction: ENE/ Wind force: 5/ Wave: 3m/ Swell: 3m/

Visibility: 7 nautical mile (12:00 Local = UTC+10h)

HPD#946 dive

08:20 launching
10:07 landing (2,935m)
11:09 leaving (2,929m)
12:37 coming up to the surface
12:48 on deck

2009/01/25: South Chamoro Seamount

Weather: cb/ Wind direction: East/ Wind force: 4/ Wave: 3m/ Swell: 3m/

Visibility: 7 nautical mile (12:00 Local = UTC+10h)

HPD #947dive

12:58 launching
14:31 landing (2,938m)
16:22 leaving (2,946m)
17:43 coming up to the surface
18:02 on deck

2009/01/26: South Chamoro Seamount

Weather: bc/ Wind direction: ENE/ Wind force: 5/ Wave: 3m/ Swell: 3m/

Visibility: 7 nautical mile (12:00 Local = UTC+10h)

HPD #948dive

08:22 launching
09:59 landing (2,943m)
14:09 leaving (2,917m)
16:08: coming up to the surface
16:17 on deck

2009/01/27: South Chamoro Seamount

Weather: bc/ Wind direction: East/ Wind force: 5/ Wave: 5m/ Swell: 4m/
Visibility: 7 nautical mile (12:00 Local = UTC+10h)
on the way to Guam

2009/01/28: South Chamoro Seamount (Local = UTC+10h)

09:00 arrive at Apra port, Guam.
11:00 disembarkation

Weather

f= fine / bc=fine but cloudy / o=overcast / c=cloudy / r=rain

Wind speed index

0 = 0 - 0.2 m/sec. / 1 = 0.3 - 1.5 / 2 = 1.6 - 3.3 / 3 = 3.4 - 5.4 / 4 = 5.5 - 7.9 /
5 = 8.0 - 10.7 / 6 = 10.8 - 13.8 / 7 = 13.9 - 17.1 / 8 = 17.2 - 20.7
9 = 20.8 - 24.4 / 10 = 24.5 - 28.4 / 11 = 28.5 - 32.6 / 12 = 32.7 –

I. CRUISE SUMMARY

In this cruise, we succeeded in (1) pulling an old dummy logger, (2) replacing an new PVC manifold with pressure sensor socket, (3) deploying a flow meter, (4) collecting close to non-contaminated highly alkaline, deep crustal water, (5) undergoing SIP and RIP experiments and (6) deploying in situ colonization devices in the deep crustal fluid. The only thing not successfully carried out was collecting a deep source fluid at a depth of 150 m below seafloor by using a newly developed deep borehole fluid sampler (DEEP SAMPLER). The data obtained from the deployed tools at the seafloor and obtained from the future onshore investigation will be integrated with the ones that will be taken during the coming cruise planed in May, 2009. 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 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, 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 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 (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 seafloor 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 non-diluted subseafloor serpentinization-derived fluids. Using a JAMSTEC ROV HYPER-DOLPHIN, the pristine subseafloor fluids will be sampled by way of the CORK. In addition, the NT09-01 cruise will try to deploy the in situ colonization system down in the borehole. Although the seepage fluids from the CORK is expected to be nearly non-diluted 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 by another cruise planned in June, 2009 (NT01-XX). The 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, this research project will also investigate the chemosynthetic animal communities associated with the seepages in the South Chamorro Seamount. In addition, the ROV operation will include the exchange of sensors equipped with the CORK. These are important objectives for understanding of the entire geochemical and biological processes of the South Chamorro Seamount.

References:

Mottl, M. J., Komor, S. C., Fryer, P., and Moyer, C. L. (2003) Deep-slab fluids fuel extremophileic Archaea on a Mariana forearc serpentinite mud volcano: Ocean Drilling Program Leg 195. G-cubed 4: doi:10.1029/2003GC000588.

Fryer, P. (1992) A synthesis of Leg 125 drilling of serpentine seamounts on the Mariana and Izu-Bonin forearcs. Proc. ODP Sci. Results 125:593-614.

Salisbury, M. H., and ODP Leg 195 Shipboard Scientific Party (2002) Site 1200. Proc. ODP Init. Rep. 195.

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#941 DIVE (South Chamorro Seamount)	Dr. K. Takai
HPD#942 DIVE (South Chamorro Seamount)	Dr. J. Miyazaki
HPD#943 DIVE (South Chamorro Seamount)	Dr. J. Miyazaki
HPD#944 DIVE (South Chamorro Seamount)	Dr. H. Hirayama
HPD#945 DIVE (South Chamorro Seamount)	Dr. T. Watsuji
HPD#946 DIVE (South Chamorro Seamount)	Dr. Y. Monoro
HPD#947 DIVE (South Chamorro Seamount)	Dr. H. Hirayama
HPD#948 DIVE (South Chamorro Seamount)	Dr. J. Miyazaki

Dive Report: HyperDolphin Dive #941

Date: 20 January, 2009

Site: South Chamorro Seamount ODP#195 CORK & Fryer site

Landing: 10:12; 13°46.981'N, 146°00.163'E, 2927m

Leaving: 16:00; 12°42.7892'N, 143°32.3407' E, 2911m

Observer: Ken Takai (SUGAR Project, JAMSTEC)

Objectives:

The objectives of this dive are 1) seafloor observation of animal communities at the Fryer site, 2) collection of deep serpentinized crustal water by through the valve of the CORK head pipe and 3) collection of some animal specimens from the Fryer site if possible.

Dive Summary:

We landed at approximately 120m south from the CORK in the South Chamorro Seamount (13°46.981'N, 146°00.163'E, 2927m). We head to the 6K marker deployed at the Fryer animal community. We could not find the Fryer site but found directly the CORK (13°47.051'N, 146°00.180'E, 2943m). After landing, we tried to settle the valve manifold. Once successful deployment and opening the valve, black smoker came up. After several trials and errors of deployment, we successfully deployed the valve manifold. Using the manifold deployed, first 20 L of deep crustal water was sampled. But 2nd bag was leaking. Next, we obtained 6 L x 6 bag water. No. 1 bag looked like leaking. After the bag sampler, the deep crustal water was obtained by using WHATS. Among 4 bottles, No. 3 bottle did not work. After sampling by WHATS, HPD went down to the seafloor. Then, the 6L x 6 sampler left on the seafloor. After deploying the 6L x 6 sampler, we went back to the CORK platform. Then we took 2 x WHOI samplers using the manifold. After finishing all the operation on the CORK platform, we recovered the valve connector and manifold from the platform. Then we head south to the Fryer site. At the 6K marker#74, several living mussels were found. We collected them and went south to the ODP marker B351. We found another animal community there. But most of them looked dead. After sampling several animals, we left the bottom.

Payloads:

- 1) WHATS without a temperature probe
- 2) 20L bag x 2
- 3) 6L x 6 SIP bag
- 4) WHOI sampler (No. 1 & No. 2)
- 5) valve manifold

Location of Events:

Time	Position	Depth	Event
10:12	13°46.981'N, 146°00.163'E,	2927m	Landing on serpentine mud
10:24	13°47.051'N, 146°00.180'E,	2943m	Landing on the CORK
10:35	13°47.051'N, 146°00.180'E,	2943m	Try to connect the valve manifold
10:45	13°47.051'N, 146°00.180'E,	2943m	Manifold successfully attached and open the T valve in the CORK
11:45	13°47.051'N, 146°00.180'E,	2943m	Collect water by Bag 1
11:50	13°47.051'N, 146°00.180'E,	2943m	Collect water by Bag 2 but it failed
12:15	13°47.051'N, 146°00.180'E,	2943m	Collect water by 6L x 6 bags
12:30	13°47.051'N, 146°00.180'E,	2943m	Collect water by WHATS
12:40	13°47.047'N, 146°00.188'E,	2946m	Deploy 6L x 6 sampler on the seafloor
12:55	13°47.051'N, 146°00.180'E,	2943m	Collect water by WHOI sampler 1 st (T = 2.9 °C 0.9 °C higher than the ambient seawater)
13:00	13°47.051'N, 146°00.180'E,	2943m	Collect water by WHOI sampler 2 nd (T = 2.9 °C 0.9 °C higher than the ambient seawater)
13:20	13°47.051'N, 146°00.180'E,	2943m	remove the valve connector and manifold
13:45	13°47.035'N, 146°00.213'E	2929m	Find an animal community at the 6K marker #74 and

individuals			collected	several
			of mussels	
14:05	13°46.999'N, 146°00.215'E	2923m	Find	another animal colony
				at the ODP marker B351
14:05	13°47.000'N, 146°00.202'E	2923m	Left the bottom	

Dive Report: Hyper Dolphin Dive #942

Date: 20 January 2009

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

Landing: 13°47.025'N, 146°00.149'E, 9:55, 2937m

Leaving: 13°47.051'N, 146°00.171'E, 10:45, 2941m

Observer: Junichi Miyazaki (SUGAR project, JAMSTEC)

Objectives:

The objective of the dive #942 is to pull up the CORK's dummy logger which was a cap to prevent the deep subsurface fluid of the south chamoro seamount from spreading. If we are succeeded in pulling up the dummy logger, we will be able to deploy PVC manifold to sample the pure fluids from deep subseafloor, and will be able to deploy the pressure-tight *in situ* fluid sampler (Deep sampler) and subsurface *in situ* colonization system (Deep Bio Sampler) in the following dives.

Dive Summary:

At 9:55, we landed on the bottom which was covered with serpentine mud. We immediately head to the CORK to insert the deployed dummy logger into the pulling tool on payload. At 10:05, we arrived at CORK and inserted the dummy logger into the pulling tool. At 10:32, to confirm dummy logger was completely inserted, we lifted up the pulling tool and observed white-smoker-like fluids from the CORK. Therefore, we judged the pulling tool connected well enough to pull up the dummy logger. To completely pull up the dummy logger, we connected ROV to pulling tool with fuse wire and we went ahead to the surface (10:45). We confirmed that the dummy logger was completely removed from CORK when Hyper Dolphin was recovered. We observed black attachments to the surface of the collected dummy logger on board.

Payloads:

- 1) Pulling tool
- 2) Fuse wire
- 3) WHATS (Water and Hydrothermal-fluid Atsuryoku Tight Sampler)
- 4) Bag sampler (20 L)

Location of Events:

Time	Position	Depth	Event
9:55	13°47.025'N, 146°00.149'E,	2937m	Landing on the bottom
10:05	13°47.051'N, 146°00.171'E,	2941m	Arriving at CORK and inserted dummy logger into pulling tool
10:17	13°47.051'N, 146°00.171'E,	2941m	Cutting the loop connecting ROV to pulling tool
10:32	13°47.051'N, 146°00.171'E,	2941m	Lifting up the pulling tool. We observed white smoker.
10:37	13°47.051'N, 146°00.171'E,	2941m	Connecting ROV to docked pulling tool with fuse wire.
10:45	13°47.051'N, 146°00.171'E,	2941m	Leaving the CORK and

Dive Report: Hyper Dolphin Dive #943

Date: 20 January 2009

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

Landing: 13°47.030'N, 146°00.171'E, 15:18, 2936m

Leaving: 13°47.054'N, 146°00.164'E, 16:22, 2941m

Observer: Junichi Miyazaki (SUGAR project, JAMSTEC)

Objectives:

The objectives of the dive #943 are (1) to put the pressure measurement tool on the platform of CORK, (2) to sample deep crustal water from dummy logger removed CORK by RI vacuum sampler, (3) to sample seawater to use as a reference.

Dive Summary:

At 15:18, we landed on almost the same position with dive #942. We immediately head to the CORK. We arrived at the CORK and observed white-smoker-like fluids from top of the CORK as same as we observed at dive #942. We first put the pressure measurement tool on the platform of the CORK. Then, we sampled seawater to bag (20 L) and WHATS to use as a reference of this cruise. The seawater temperature was 1.57°C. Finally, we sampled deep crustal water from dummy logger removed CORK by RI vacuum sampler. We left the bottom and went to the surface (16:22).

Payloads:

- 5) Pressure measurement
- 6) WHATS (Water and Hydrothermal-fluid Atsuryoku Tight Sampler) x 3
- 7) Bag sampler (20 L)
- 8) RI vacuum sampler x 2

Location of Events:

Time	Position	Depth	Event
15:18	13°47.025'N, 146°00.149'E,	2937m	Landing the bottom
15:21	13°47.056'N, 146°00.166'E,	2942m	Landing platform of the CORK
15:23	13°47.056'N, 146°00.166'E,	2942m	Putting pressure measurement tool on

			platform
15:30	13°47.056'N, 146°00.166'E,	2943m	Bag sampling (Temp 1.57°C, 15:37 finish)
15:40	13°47.056'N, 146°00.166'E,	2943m	WHATS 1 (15:43 finish)
15:45	13°47.056'N, 146°00.166'E,	2943m	WHATS 2 (15:47 finish)
15:49	13°47.056'N, 146°00.166'E,	2943m	WHATS 3 (15:51 finish)
16:01	13°47.056'N, 146°00.171'E,	2941m	Sampling to RI bottle (Red)
16:16	13°47.055'N, 146°00.169'E,	2941m	Sampling to RI bottle (Green)
16:22	13°47.054'N, 146°00.164'E	2941m	Leaving the bottom

Dive Report: Hyper Dolphin Dive #944

Date: 22 January 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: Hisako Hirayama (SUGAR project, JAMSTEC)

Objectives:

The objectives of the dive #944 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 RI vacuum sampler,

Dive Summary:

We landed near the CORK and immediately headed to the CORK. From the top of the CORK, white smoker-like fluid was welling up. We first started to 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 more than 1.5 hour to put the DEEP Sample about 150 m down the borehole. At about 150 m down the borehole, we stopped reeling out. We took deep serpentinized crustal water with the DEEP Sampler by sinking a weight. After that, we took 3 bottles of white smoker-like fluid of deep serpentinized crustal water by RI vacuum sampler at the top of the borehole. Finally, we started to wind up the wire to recover the DEEP sampler from the borehole. However, the accident has happened. The wire was cut off during winding up!! As a result, the DEEP Sampler was left in the borehole. We found it hard to tear ourselves away from the CORK, but left the bottom.

Payloads:

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

Location of Events:

Time	Position	Depth	Event
9:47	13°47.033'N, 146°00.151'E,	2939m	Landing near the CORK.

9:51	13°47.056'N, 146°00.167'E,	2941m	Approach the platform of CORK. The top of the pipe is smoking.
9:57	13°47.056'N, 146°00.178'E,	2941m	Start to deploy the DEEP Sampler.
9:59	13°47.056'N, 146°00.178'E,	2941m	Drop the DEEP Sampler into the borehole.
10:16	13°47.056'N, 146°00.178'E,	2941m	Settle the reel of wire on the top of the pipe of borehole.
10:21	13°47.056'N, 146°00.178'E,	2941m	Start to reel out the wire.
13:05	13°47.056'N, 146°00.178'E,	2941m	Stop the reel.
13:06	13°47.056'N, 146°00.178'E,	2941m	Sink a weight.
13:13	13°47.056'N, 146°00.178'E,	2941m	Take fluid by RI vacuum sampler (black).
13:33	13°47.056'N, 146°00.178'E,	2941m	Take fluid by RI vacuum sampler (blue).
13:55	13°47.056'N, 146°00.178'E,	2941m	Take fluid by RI vacuum sampler (white).
14:05	13°47.056'N, 146°00.178'E,	2941m	Start to wind up the wire.
14:50	13°47.056'N, 146°00.178'E,	2941m	Find the wire of the DEEP Sampler cut off during winding up the wire.
15:03	13°47.060'N, 146°00.182'E,	2946m	Leave the bottom.

Dive Report: HyperDolphin Dive #945

Date: 23 January, 2009

Site: South Chamorro Seamount ODP#195 CORK

Landing: 10:13; 13°47.059'N, 146°00.157'E, 2937m

Leaving: 12:14; 13°47.057'N, 146°00.177'E, 2936m

Observer: Tomoo Watsuji (SUGAR Project, JAMSTEC)

Objectives:

The objectives of this dive are 1) deployment of PVC manifold with Fryer and BIO sampler to a drilling hole on the CORK and 2) collection of deep serpentinized crustal water from the top hole of the PVC manifold

Dive Summary:

We stood PVC manifold that was attached to the bottom of ROV perpendicularly before landing. We landed near the CORK and headed to the CORK (13°47.057'N, 146°00.177'E, 2943m). We tried to settle the PVC manifold with Fryer and BIO sampler in the upper part of CORK. The PVC manifold having a length of 4.6 meter was skillfully deployed to the hole of the CORK. Using the manifold deployed, first crustal water was sampled by 2 x WHOI. Next, we obtained crustal water by using WHATS. Among 4 bottles, No. 2 bottle did not work. Then, we obtained 20 L x 1 bag water. After collecting crustal water, we removed rubber cover of the top of the PVC manifold and left the bottom.

Payloads:

- 1) PVC manifold with Fryer and BIO sampler
- 2) WHOI sampler (No. 1 & No. 2)
- 3) WHATS without a temperature probe
- 4) 20L bag x 1

Location of Events:

Time	Position	Depth	Event
09:53	13°47.059'N, 146°00.157'E,	2931m	standing of the manifold
10:13	13°47.059'N, 146°00.157'E,	2937m	Landing near the CORK
10:14	13°47.059'N, 146°00.157'E,	2937m	Heading to the CORK

10:19	13°47.057'N, 146°00.177'E,	2933m	Try to settle the PVC manifold in the CORK
10:27	13°47.057'N, 146°00.177'E,	2946m	Landing on serpentine mud
10:35	13°47.057'N, 146°00.177'E,	2941m	Landing on the CORK
10:41	13°47.057'N, 146°00.177'E,	2943m	Landing on the CORK platform
11:02	13°47.057'N, 146°00.177'E,	2940m	Collect water by WHOI sampler 1 st (T = 2.5 °C 0.8 °C higher than the ambient seawater1.7)
11:14	13°47.057'N, 146°00.177'E,	2940m	Collect water by WHOI sampler 2 nd (T = 3.2 °C 1.5 °C higher than the ambient seawater)
11:28	13°47.057'N, 146°00.177'E,	2940m	Collect water by WHATS
11:49	13°47.057'N, 146°00.177'E,	2940m	Collect water by 20L Bag 1
12:05	13°47.057'N, 146°00.177'E,	2940m	Remove the top cover on the manifold
12:14	13°47.057'N, 146°00.177'E,	2936m	Left the bottom

Dive Report: HyperDolphin Dive #946

Date: 24 January, 2009

Site: South Chamorro Seamount ODP#195 CORK & Fryer site

Landing: 10:10; 13°47.053'N, 146°00.169'E, 2945m

Leaving: 11:09; 13°47.039'N, 146°00.170'E, 2930m

Observer: Yuki Morono (KCC, JAMSTEC)

Objectives:

The objectives of this dive are 1) deployment of chimney with flowmoter on the top of the PVC manifold, 2) collection of deep serpentinized crustal water from the top of the chimney and 3) on-site filtration of the deep serpentinized crustal water with imperer pump.

Dive Summary:

We landed at near the CORK in the South Chamorro Seamount (13°47.053'N, 146°00.169'E, 2945m). First we picked up the chimney with flow meter and headed to the CORK. Although we could attach the chimney on the PVC manifold, we saw leaking of deep crustal water from the connection part. After several trials, we could successfully and tightly deploy the chimney on PVC manifold by grabbing and squeezing the connection part with manipulators. When we next tried to deploy the pressure sensor, hydraulic system down, then we left the seafloor.

Payloads:

- 1) Chimney with flowmotor
- 2) WHOI sampler (x 2)
- 3) Imperer filtration
- 4) WHATS (x4)
- 5) Recovered 6L x 6 bag

Location of Events:

Time	Position	Depth	Event
10:10	13°47.053'N, 146°00.169'E,	2945m	Landing on serpentine mud
10:14	13°47.053'N, 146°00.169'E,	2945m	Pick up the chimney

10:21	13°47.060'N, 146°00.170'E,	2940m	Try to deploy the chimney
10:24	13°47.051'N, 146°00.180'E,	2940m	Chimney is attached on the PVC manifold
10:58	13°47.053'N, 146°00.165'E,	2940m	Chimney is tightly deployed
11:09	13°47.039'N, 146°00.170'E,	2930m	Hydraulic system down, leave seafloor

Dive Report: Hyper Dolphin Dive #947

Date: 25 January 2009

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

Landing: 13°47.033'N, 146°00.150'E, 14:31, 2938m

Leaving: 13°47.040'N, 146°00.181'E, 16:22, 2946m

Observer: Hisako Hirayama (SUGAR project, JAMSTEC)

Objectives:

The objectives of the dive #947 are to take deep serpentinized crustal waters by: (1) WHTAS sampler, (2) by WHOI sampler, (3) by RI vacuum sampler, and (4) 6L bag sampler. In addition, we'll do (5) impeller filtration of deep serpentinized crustal water, and (6) 6L x 6 bag recovery.

Dive Summary:

We landed near the CORK and immediately moved to beside the CORK. The inlet to take water was inserted into the top of the CORK, where smoker-like fluid was welling up but seemed to become less vigorous. We took deep serpentinized crustal waters in the following order: (1) WHATS (No.1 bottle), (2) WHOI (No. 5 sampler), (3) RI vacuum sampler (red), (4) RI vacuum sampler (yellow), (5) RI vacuum sampler (blue), (6) RI vacuum sampler (white), (7) WHATS (No.2 bottle), (8) WHOI (No. 6 sampler), (9) WHATS (No. 3 bottle), (10) WHATS (No. 4 bottle). After that, we tried to take water by 6L bag sampler but couldn't, although the impeller pump was working well. Then we did in situ impeller filtration of deep serpentinized crustal. Finally we recovered the 6L x 6 bag water that was deployed in HPD #941 dive, and then left the bottom.

Payloads:

- 1) WHATS (x 4)
- 2) WHOI sampler (x 2)
- 3) RI Vacuum sampler (x 3)
- 4) Impeller filtration
- 5) Recovery 6L x 6 bag
- 6) 6L bag sampler (x 1)

Location of Events:

Time	Position	Depth	Event
14:31	13°47.033'N, 146°00.150'E,	2938m	Landing near the CORK.
14:33	13°47.055'N, 146°00.171'E,	2942m	Recognize the CORK.
14:44	13°47.052'N, 146°00.172'E,	2941m	Take WHATS (No.1).
14:55	13°47.052'N, 146°00.172'E,	2941m	Take WHOI (No.5).
15:00	13°47.052'N, 146°00.172'E,	2941m	Take RI samplwe (red).
15:03	13°47.052'N, 146°00.172'E,	2941m	Take RI samplwe (yellow).
15:05	13°47.052'N, 146°00.172'E,	2941m	Take RI samplwe (blue).
15:09	13°47.052'N, 146°00.172'E,	2941m	Take RI samplwe (white).
15:09	13°47.052'N, 146°00.172'E,	2941m	Stop WHATS pump (No. 1).
15:11	13°47.052'N, 146°00.172'E,	2941m	Start WHATS (No.2).
15:19	13°47.052'N, 146°00.172'E,	2941m	Take WHOI (No.6).
15:23	13°47.052'N, 146°00.172'E,	2941m	Finish WHATS (No.2).
15:24	13°47.052'N, 146°00.172'E,	2941m	Start WHATS (No.3).
15:27	13°47.052'N, 146°00.172'E,	2941m	Finishi WHATS (No.3).
15:29	13°47.052'N, 146°00.172'E,	2941m	Start WHATS (No.4).
15:32	13°47.052'N, 146°00.172'E,	2941m	Finishi WHATS (No.4).
15:37	13°47.052'N, 146°00.172'E,	2941m	Start impeller pump for 6L Bag
	water		sampling, but couldn't.
15:46	13°47.052'N, 146°00.172'E,	2941m	Start impeller filtration.
16:06	13°47.052'N, 146°00.172'E,	2941m	Finish impeller filtration.
16:22	13°47.040'N, 146°00.181'E,	2946m	Recover 6L x 6 bag and leave the
			bottom.

Dive Report: Hyper Dolphin Dive #948

Date: 26 January 2009

Site Name: ODP#195 CORK & Summit site in South Chamoro Seamount

Landing: 13°47.026'N, 146°00.160'E, 9:59, 2934m

Leaving: 13°46.933'N, 146°00.251'E, 14:07, 2917m

Observer: Junichi Miyazaki (SUGAR project, JAMSTEC)

Objectives:

The objectives of the dive #948 which is the final dive of this NT09-01 cruise are (1) to sample deep crustal water by RI vacuum sampler, (2) to sample the deep crustal water for Kochi's SIP 6 x 6 L bags and then deploy them near CORK, (3) to filter the deep crustal water by using impeller pump, (4) to sample mussels at Summit site, and (5) to sample seawater above mussels colony. And if there are carbonates in Summit site, sampling carbonates also becomes an object of this dive.

Dive Summary:

In the final dive of this cruise, #948, we landed on same point as previous dives. We headed to the chimney-deployed CORK. The white-smoker-like fluids were observed from top of the chimney, but those looked like weaker than previous dives. First, by using the hooked sampling pipe, we sampled deep crustal water from deployed chimney into RI vacuum bottle through the pump of WHATS. When we finished sampling into the first RI vacuum bottle (Red), white smoker disappear at the exit of WHATS line. The reason was that labor tube was broken. We next tried to sampling into 6 L bags, but we could not obtain water because entrance of bags might be closed. Then we sampled the deep crustal water into Kochi's 6 x 6 L bags, but we failed to sample into bags No.2, 4, 5, and 6, probably breaking the tube. We next performed filtration of the deep crustal water by using the impeller pump for 30 min. To deploy 6 x 6L Kochi's bags on the bottom, we moved to the bottom near borehole 1200c.

We left the CORK and headed to the 6K#74 on Flyer site (13°47.036'N, 146°00.222'E, 2929m). We sampled water previously sampling point where mussel colonies were observed. And also we found living mussels, then we sampled mussels.

We next went to the summit site which is the top of South Chamoro seamount. We observed many of ditch-like structure until we arrived at site Kaiko #165. When we arrived at site Kaiko #165 (13°46.925'N, 146°00.256'E, 2916m), we found mussels

colonies and clams colonies among the ditch. We sampled water above one of the mussels colony by WHATS. Then, we sampled mussels and clams by suction sampler. And also we crushed carbonates and observed black-colored structure in carbonates. We sampled several pieces of carbonates. We left the bottom at 14:07.

Payloads:

- 9) WHATS (Water and Hydrothermal-fluid Atsuryoku Tight Sampler) x 4
- 10) RI vacuum sampler x 3 (White, Red, Blue)
- 11) Suction sampler
- 12) Kochi's SIP 6 x 6L bags
- 13) 6L Bag sampler
- 14) Impeller filter

Location of Events:

Time	Position	Depth	Event
09:59	13°47.026'N, 146°00.160'E,	2934m	Landing the bottom
10:02	13°47.050'N, 146°00.181'E,	2945m	Landing the bottom near CORK. Globing hooked sampling pipe.
10:10	13°47.057'N, 146°00.177'E,	2938m	Hanging the hooked sampling pipe on chimney.
10:11	13°47.050'N, 146°00.171'E,	2941m	Attaching the CORK
10:24	13°47.050'N, 146°00.171'E,	2941m	Sampling deep crustal water into RI vacuum bottle (Red) through WHATS
10:33	13°47.050'N, 146°00.171'E,	2941m	Sampling deep crustal water into RI vacuum bottle (Blue) through WHATS
10:38	13°47.050'N, 146°00.171'E,	2941m	Sampling deep crustal water into RI vacuum bottle (White) through WHATS
10:39	13°47.050'N, 146°00.171'E,	2941m	Stopping WHATS1
10:43	13°47.050'N, 146°00.171'E,	2941m	Sampling into 6 L bag.
10:51	13°47.050'N, 146°00.171'E,	2941m	Sampling into 6 x 6 L bags
11:20	13°47.050'N, 146°00.171'E	2941m	Starting filtration of deep

			crustal water	
11:50	13°47.050'N, 146°00.171'E,	2941m	Finishing filtration	
11:55	13°47.049'N, 146°00.177'E,	2939m	Recovering the hooked sampling pipe	
11:57	13°47.052'N, 146°00.177'E,	2945m	Moving to the bottom.	
12:08	13°47.052'N, 146°00.177'E,	2945m	Deployment of Kochi's Bags	
12:12	13°47.052'N, 146°00.177'E,	2941m	Heading to the 6K#74	
12:19	13°47.036'N, 146°00.222'E,	2929m	Arriving at 6K#74	
12:25	13°47.034'N, 146°00.222'E,	2929m	Sampling water above mussels colony by WHATS2	
12:39	13°47.039'N, 146°00.226'E,	2929m	Sampling mussels	
12:51	13°47.039'N, 146°00.226'E,	2929m	Moving to Kaiko#165	
13:04	13°46.923'N, 146°00.247'E,	2916m	Finding Kaiko#165	
13:07	13°46.925'N, 146°00.256'E,	2916m	Landing near mussel colony	
13:14	13°46.925'N, 146°00.253'E,	2917m	Sampling water above Clams and mussels by WHATS3	
13:27	13°46.925'N, 146°00.256'E,	2917m	Sampling Mussels and Clams	
13:41	13°46.925'N, 146°00.256'E,	2916m	Sampling carbonate	
13:49	13°46.933'N, 146°00.251'E,	2917m	Sampling Mussels, and carbonates	Clams
14:07	13°46.933'N, 146°00.251'E,	2917m	Leaving the bottom.	

IV. APENDIX

Sample list for Microbiology, Biology and Geochemistry

HPD #941 Sample list

Sample	No.	Volume	JAMSTEC	ÆSUGAR	JAMSTEC	ÆKochi	Univ. of Alaska	W.H.O.I	Western Washington
WHATS	1	150 mL	Cultivation: 80mL				Chemical analysis:15mL	Chemical analysis:15mL	Cultivation; 40 mL
	2	150 mL	Gas Extraction; 150mL						
	3	Failure							
	4	150 mL	Fixation: 100mL, Chemical analysis: 50mL						
WHOI-sampler	5								
	6								
Bag (20L)	1	12L	filtration: 1.8L, Chemical analysis:50mL		Filtration: 5L		Chemical analysis:15mL		Filtration: 4L
	2	Failure							
Bag (6L)	1	Failure							
	2	6L			Deployed				
	3	6L			Deployed				
	4	6L			Deployed				
	5	6L			Deployed				
	6	6L			Deployed				
Carbonate	1	30 g	Cultivation 10g, fixation 3g, DNA extraction: 17g						
	2	10 g	Cultivation 5g, fixation 1g, DNA extraction: 4g						
Mussel	20		20						

HPD #943 Sample list

Sample	No.	Volume	JAMSTEC	ÆSUGAR	JAMSTEC	ÆKochi	Univ. of Alaska	W.H.O.I	Western Washington
WHATS	1	150 mL	Gas extraction; 20 mL, Chemical analysis; 100 mL				Chemical analysis:15mL		
	2	150 mL	Fixation; 100 mL						
	3	150 mL	Cultivation;100						Cultivation; 50 mL
Bag (20L)	1	8.5L	filtration: 3.5L		Filtration: 1L		Chemical analysis:15mL		Filtration: 4L
RI vacuum bottole	Red	150 mL	Incuvation						
	Green	150 mL	Incuvation						
Pressure measurement tool	Deployed								

HPD #944 Sample list

Sample	No.	Volume	JAMSTEC	ÆSUGAR	JAMSTEC	ÆKochi	Univ. of Alaska	W.H.O.I	Western Washington
RI vacuum bottle	Black	150 mL	Incuvation						
	Blue	150 mL	Incuvation						
	White	150 mL	Incuvation						
Deep sampler		Lost							

HPD #945 Sample list

Sample	No.	Volume	JAMSTEC	ÆSUGAR	JAMSTEC	ÆKochi	Univ. of Alaska	W.H.O.I	Western Washington
WHATS	1	150 mL	Gas extraction; 150 mL						
	3	150 mL	Chemical analysis; 50 mL, Fixation; 50 mL				Chemical analysis:15mL		Cultivation; 35 mL
	4	150 mL	Cultivation; 150						
WHOI-sampler	5	150 mL					Chemical analysis:15mL	Gas extraction;	
	6	150 mL					Chemical analysis:15mL	Gas extraction;	
Bag (20L)	1	13.5L	filtration: 8L, Chemical analysis:50mL, Fixation; 100 mL, Cultivation: 100				Chemical analysis:15mL		Filtration: 5L
PVC manifold		Deployed							
Deep sampler		Deployed							
Fryer sausage		Deployed							

HPD #947 Sample list

Sample	No.	Volume	JAMSTEC	ÆSUGAR	JAMSTEC	ÆKochi	Univ. of Alaska	W.H.O.I	Western Washington			
WHATS	1	150 mL	Gas extraction; 150 mL Fixation; 50 ml, Chemical analysis; 50 mL Cultivation; 150 Incuvation; 150									
	2	150 mL								Chemical analysis:15mL		Cultivation; 35 mL
	3	150 mL										
	4	150 mL										
WHOI-sampler	5	150 mL				Chemical analysis:15mL	Gas extraction;					
	6	150 mL							Chemical analysis:15mL	Gas extraction;		
RI vacuum bottle	Red		Incuvation									
	Yellow		Incuvation									
	Blue		Incuvation									
	White		Incuvation									
Impeller filter	1 & 2	2							1 & 2			
Bag (6L) (#941 deployed)	1	Failure										
	2	6L			Filtration							
	3	6L			Filtration							
	4	6L			Filtration							
	5	6L			Filtration							
	6	6L			Filtration							

HPD #948 Sample list

Sample	No.	Volume	JAMSTEC	ÆSUGAR	JAMSTEC	ÆKochi	Univ. of Alaska	W.H.O.I	Western Washington
WHATS	1	150 mL	Chemical analysis; 50 mL, Cultivation; 80 mL, Gas Chemical analysis; 50 mL, Cultivation; 80 mL, Gas		Fixation; 150 ml				
	2	150 mL							
	3	150 mL							
Bag (6L)	1	Failure							
SIP Bag (6L)	1	6L			Deployed				
	2	Failure							
	3	6L			Deployed				
	4	Failure							
	5	Failure							
	6	Failure							
RI vacuum bottle	White		Incuvation						
	Red		Incuvation						
	Blue		Incuvation						
Mussel		50	50						
Clams		10	10						
Carbonate		520 g	500 g						20 g
Impeller filter	1 & 2	2							1 & 2