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Cruise Report

R/V NATSUSHIMA + ROV Hyper-Dolphin

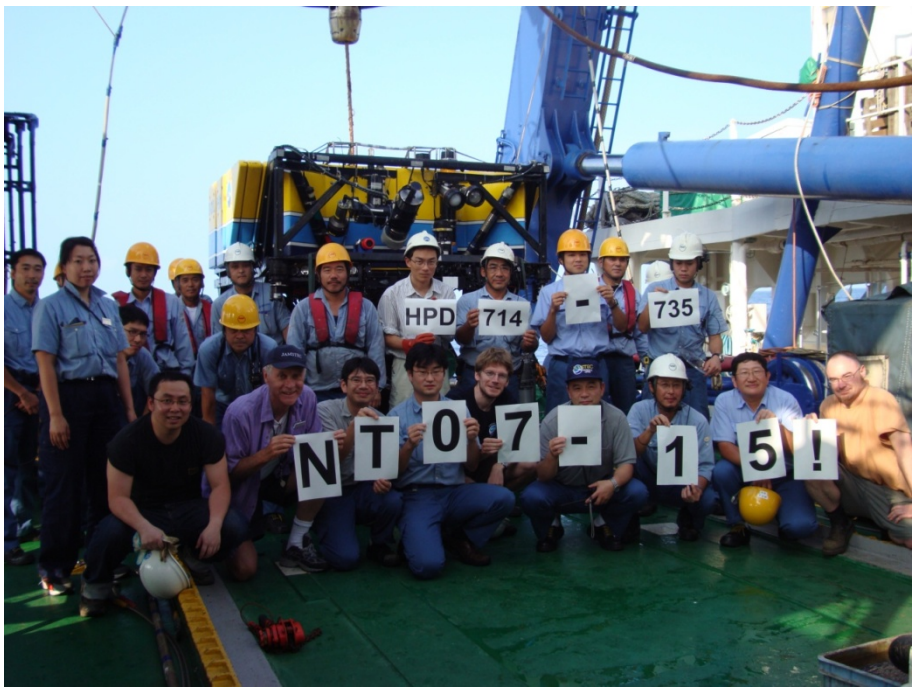
NT07-15

July 17, 2007 – August 1, 2007

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

Temporal and spatial evolution of the intra-oceanic arc crust:
Aiming to understand the genesis of the arc crust structure

Northern Izu-Bonin Arc



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List of cruise members:

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ROV Operator	Tomoe Kondo
ROV Operator	Atsumori Miura
ROV Operator	Homare Wakamatsu
ROV Operator	Teppei Kido
ROV Operator	Katsushi Chiba
ROV Operator	Atsushi Takenouchi
ROV Operator	Yudai Tayama

R/V NATSUSHIMA crew:

Captain	Masayoshi Ishiwata
Chief Officer	Koji Samejima
2nd Officer	Akihisa Tsuji
3rd Officer	Masaki Hayasi
Chief Engineer	Minoru Tsukada
1st Engineer	Koji Funae
2nd Engineer	Yoshinobu Hiratsuka
3rd Engineer	Fumihiko Natsui
Chief Radio Officer	Fukuo Suda
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3rd Radio Officer	Yohei Yamamoto

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Able Seamen	Kuniharu Kadoguchi
Able Seamen	Kazushiro Osako
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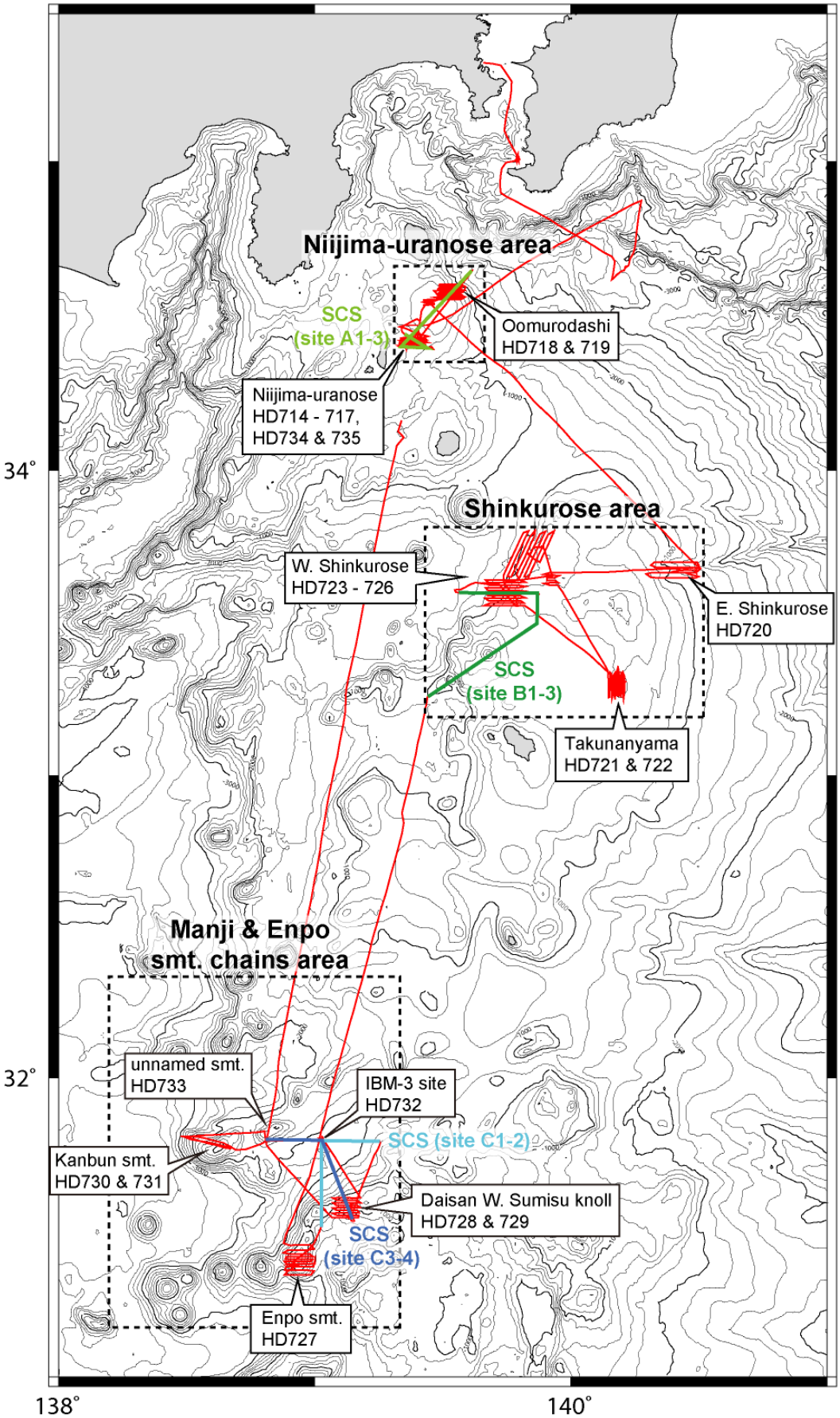
Sailer	Yoshiaki Matsuo
Sailer	Tomohiro Kimura
No.1 Oiler	Kiyoshi Yahata
Oiler	Takeshi Fukubara
Oiler	Kazuo Abe
Oiler	Masanori Sato
Oiler	Kyouya Taniguchi
Chief Steward	Takeshi Miyauchi
Steward	Hideyuki Mochiduki
Steward	Shigeta Ariyama
Steward	Futoshi Hatakeyama
Steward	Toshiharu Kinoshita

Acknowledgements

We are grateful to Captain Masayoshi Ishiwata and the crew of the R/V NATSUSHIMA, the Hyper-Dolphin operation team manager Kazuya Mitsufuji and the ROV operators for their professional and outstanding efforts to make this scientific cruise successful. We also thank Masataka Kinoshita and Yuka Masaki of IFREE, JAMSTEC for their helpful support related to the SAHF measurements.

Figure 1. NT07-15 survey ship track



Cruise Summary

R/V NATSUSHIMA and ROV Hyper-Dolphin cruise (NT07-15) was held from July 17, 2007 to August 1, 2007. The chief targets of the cruise were to investigate the geology and petrogenesis of the igneous and sedimentary rocks which comprise upper- to middle- crust of the Izu-Bonin arc. For these purposes, we have selected 3 survey area in the northern Izu-Bonin arc; Niijima-uranose area, Shinkurose area, and Manji & Enpo seamount chains area (Figure 1).

The cruise was extremely smooth and successful. We completed 22 Hyper-Dolphin dives in 12 days, collected over 333 rock and sediment samples and 6 heat flow measurements that fulfill our objectives. In addition, newly acquired SEABAT bathymetry data revealed a previously unrecognized caldera and volcano, accompanied with in situ collected rock samples for further investigations to understand the genesis of these structures. In between the Hyper-Dolphin dives, 10 detailed stratigraphic structures of the sediments were obtained from single-channel seismic (SCS) surveys.

This cruise was originally scheduled to last until August 2, but due to the approach of Typhoon No.5, we returned a day earlier to the JAMSTEC pier on August 1.

NT07-15 Shipboard Log:

Date	Time	Log
2007/7/17	13:00	Scientists embark on R/V NATSUSHIMA
	14:00	Leave JAMSTEC pier, Yokosuka, Japan
	16:15	Stopped engine & drifting at TATEYAMA
2007/7/18	1:15	Transit to off NOJIMA Free Fall point
	6:00	Arrived at Free Fall point
	7:00-9:43	arried out 1st Free Fall of umbilical cable
	9:43-12:21	Carried out 2nd Free Fall of umbilical cable
	17:57	Released XBT at 34-32.0982N, 139-35.4847E
	19:00	Begin SEABAT survey
2007/7/19	5:30	Finished SEABAT survey
	8:39	Launched ROV (HD714) @ Niijima-uranose
	9:12	ROV landed sea floor (D=130m)
	11:15	Floated ROV
	11:27	Recovered ROV & finished operation
	13:02	Launched ROV (HD715) @ Niijima-uranose
	13:36	ROV landed sea floor (D=217m)
	16:19	Floated ROV
	16:30	Recovered ROV & finished operation
	16:52	Begin SEABAT survey
	17:11	Finished above survey

	20:06	Begin SCS survey
2007/7/20	5:25	Finished SCS survey
	8:04	Launched ROV (HD716) @ Niijima-uranose
	8:46	ROV landed sea floor (D=316m)
	10:44	Floated ROV
	10:56	Recovered ROV & finished operation
	13:01	Launched ROV (HD717) @ Niijima-uranose
	13:46	ROV landed sea floor (D=309m)
	16:02	Floated ROV
	16:12	Recovered ROV & finished operation
	17:09	Begin SEABAT survey
2007/7/21	4:41	Finished SEABAT survey
	8:08	Launched ROV (HD718) @ Oomurodashi
	9:02	ROV landed sea floor (D=655m)
	11:31	Floated ROV
	11:43	Recovered ROV & finished operation
	13:03	Launched ROV (HD719) @ Oomurodashi
	13:27	ROV landed sea floor (D=309m)
	15:34	Floated ROV
	15:45	Recovered ROV & finished operation
	16:00	Transit to Shinkurose area
	23:15	Arrived at survey area
	23:20	Released XBT at 33-41.5467N, 140-29.3179E
	23:37	Begin SEABAT survey
2007/7/22	4:34	Finished SEABAT survey
	8:10	Launched ROV (HD720) @ E. Shinkurose
	10:18	ROV landed sea floor (D=1714m)
	13:37	Floated ROV
	13:50	Recovered ROV & finished operation
	16:58-19:10	SEABAT survey
	21:00	Begin SEABAT survey
2007/7/23	4:15	Finished SEABAT survey
	8:48	Launched ROV (HD721) @ Takunanyama
	9:32	ROV landed sea floor (D=516m)
	12:08	Floated ROV
	12:20	Recovered ROV & finished operation
	13:31	Launched ROV (HD722) @ Takunanyama
	14:10	ROV landed sea floor (D=461m)

	(15:43	Floated ROV
	15:56	Recovered ROV & finished operation
	18:20	Begin SEABAT survey
2007/7/24	4:20	Finished SEABAT survey
	8:06	Launched ROV (HD723) @ W. Shinkurose
	9:10	ROV landed sea floor (D=1223m)
	14:34	Floated ROV
	14:45	Recovered ROV & finished operation
	15:32	Launched ROV (HD724) @ W. Shinkurose
	16:14	ROV landed sea floor (D=595m)
	18:58	Floated ROV
	19:09	Recovered ROV & finished operation
	19:47	Begin SEABAT survey
2007/7/25	4:30	Finished SEABAT survey
	8:11	Launched ROV (HD725) @ W. Shinkurose
	8:53	ROV landed sea floor (D=458m)
	11:42	Floated ROV
	11:52	Recovered ROV & finished operation
	13:01	Launched ROV (HD726) @ W. Shinkurose
	13:43	ROV landed sea floor (D=538m)
	16:59	Floated ROV
	17:11	Recovered ROV & finished operation
	20:18	Begin SCS survey
2007/7/26	10:08	Finished SCS survey
	10:20	Transit to Manji & Enpo smt. chains area
	18:15	Arrived at survey area
	18:27	Released XBT
	20:03	Begin SEABAT survey
2007/7/27	4:20	Finished SEABAT survey
	8:06	Launched ROV (HD727) @ Enpo smt.
	9:06	ROV landed sea floor (D=1215m)
	17:22	Floated ROV
	17:35	Recovered ROV & finished operation
	19:47	Begin SCS survey
2007/7/28	4:19	Finished SCS survey
	8:04	Launched ROV (HD728) @ Daisan-West Sumisu knoll
	9:08	ROV landed sea floor (D=1277m)
	13:30	Floated ROV

	13:45	Recovered ROV & finished operation
	14:32	Launched ROV (HD729) @ Daisan-West Sumisu knoll
	15:20	ROV landed sea floor (D=657m)
	18:27	Floated ROV
	18:38	Recovered ROV & finished operation
	19:56	Begin SCS survey
2007/7/29	4:36	Finished SCS survey
	5:33-5:44	SEABAT survey
	6:25-6:38	SEABAT survey
	8:04	Launched ROV (HD730) @ Kanbun smt.
	9:06	ROV landed sea floor (D=1035m)
	13:30	Floated ROV
	13:41	Recovered ROV & finished operation
	14:41	Launched ROV (HD731) @ Kanbun smt.
	16:16	ROV landed sea floor (D=2145m)
	18:12	Floated ROV
	18:22	Recovered ROV & finished operation
	19:52-20:07	SEABAT survey
	22:02	Begin SEABAT survey
2007/7/30	4:38	Finished SEABAT survey
	8:06	Launched ROV (HD732) @ IBM-3 site
	9:54	ROV landed sea floor (D=2122m)
	12:56	Floated ROV
	13:11	Recovered ROV & finished operation
	14:30	Launched ROV (HD733) @ unnamed smt. in Manji smt. chain
	15:41	ROV landed sea floor (D=1472m)
	18:59	Floated ROV
	19:10	Recovered ROV & finished operation
	19:30	Transit to Niijima-uranose area
2007/7/31	8:00	Arrived at survey area
	8:49	Launched ROV (HD734) @ Niijima-uranose
	10:10	ROV landed sea floor (D=247m)
	12:46	Floated ROV
	12:57	Recovered ROV & finished operation
	13:59	Launched ROV (HD735) @ Niijima-uranose
	14:33	ROV landed sea floor (D=221m)
	16:18	Floated ROV
	16:29	Recovered ROV & finished operation

2007/8/1	8:30	Arrived at JAMSTEC pier, Yokosuka
	10:00	Scientists disembark from R/V NATSUSHIMA

1. Operations and data processing information

1.1 Stand-Alone Heat Flow meter (SAHF) measurements

The Stand-Alone Heat Flow meter (SAHF) is designed to measure heat flow from manned submersibles or ROVs (Fig. 2). Five thermistors are situated within the probe at 11 cm intervals. Since SAHF takes measurements as an “OFF LINE” system, heat flow can be measured while observer is conducting other tasks at that position or elsewhere.

While Hyper-Dolphin (HD) is descending or ascending, SAHF is set in a case beside the sample basket. After HD lands on the seafloor, SAHF is grasped by the HD’s left manipulator and takes a reference water temperature for 5 minutes. SAHF is then pushed vertically into the sediment and the temperature gradient is measured for at least 15 minutes. Thermal conductivity data is necessary to obtain a heat flow value, which is not available on current SAHF. We measured thermal conductivities after the cruise from the sediments sampled simultaneously using push-cores and MBARI-type cores from nearby (<1 m) sites.

The following are descriptions of SAHF.

Material	Titanium alloy
Weight	4.0 kg in air, 2.6 kg in seawater
Length of pressure case	294 mm
Diameter of pressure case	85 mm
Length of probe	600 mm
Diameter of probe	13.8 mm (filled by silicon oil inside)
Number of thermistors	5
Intervals of thermistors	110 mm
Accuracy	0.01 °C
Resolution	0.001 °C
External Interface	RS232C (9600bps, 8bit, Non-parity, 2 stop-bit)

Figure 2. Stand-Alone Heat Flow meter (SAHF)

1.2 Hyper-Dolphin survey

Geological observations, rock / sediment sampling, and heat flow measurements were conducted using the ROV Hyper-Dolphin. The general payload of the Hyper-Dolphin surveys was a large sample basket subdivided into 5 smaller baskets and 1 lidded box (Figure 3). In some dive sites, metal scoop, SHINKAI 2000-type push core, M-type core, and MBARI-type core were used. In dives 719 and 732, SAHF probe was used for heat flow measurement.

At least half of all rock / sediment samples are archived at IFREE, JAMSTEC. Sample lists and sample photos can be found in Appendix A and B, respectively. Samples distributed to members of the scientific party are also listed in Appendix A.

Video images (high definition & CCD cameras) and digital still-photographs (SEAMAX) from the dives are archived in JAMSTEC. Video images and photographs distributed to the scientific party are listed in Appendix C.

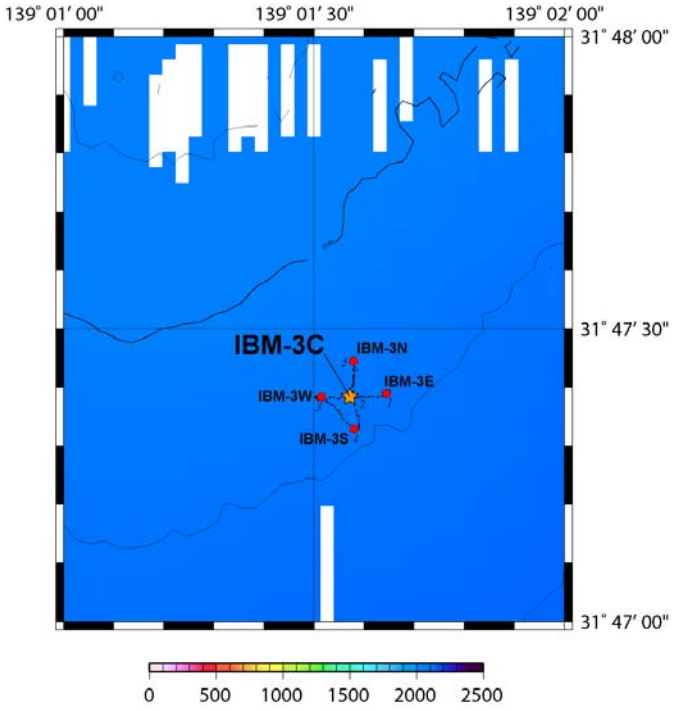
Figure 3. ROV Hyper-Dolphin with large sample basket

2. Scientific results

2.1 SAHF measurements

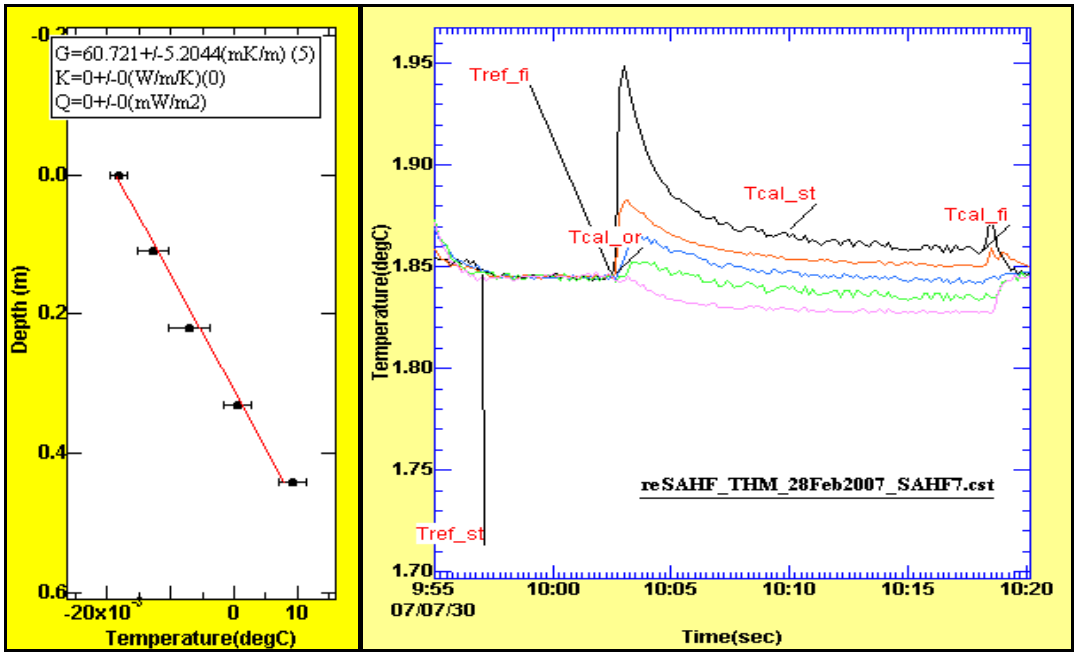
Five heat flow measurements were conducted using the SAHF probe during Dive HD732 at the IODP proposed IBM-3 site between the Manji and Enpo seamount chains (Figure 4).

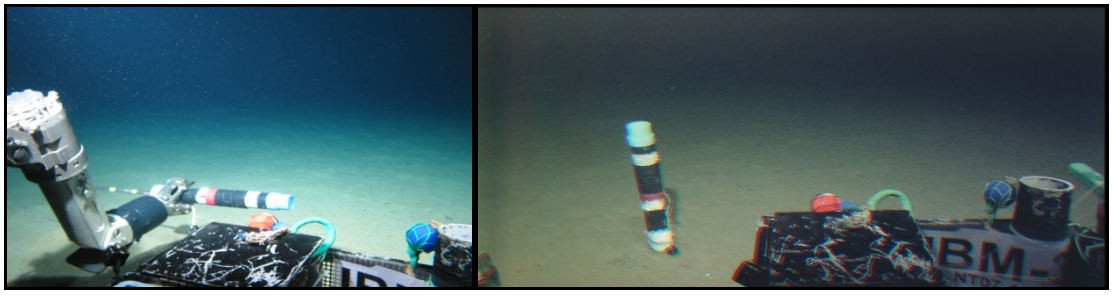
Figure 4. SAHF measurements in IBM-3 site (HD732).



2.1.1 IBM-3E site (HD732)

Date	2007/7/30
Area	Manji (IBM-3 site)
Point ID	IBM-3E
Lat.(N)	31° 47.39'
Lon.(E)	139° 1.645'
Depth (m)	2122
Measurement (W.Temp.)	10:03-10:18 (9:57-10:02)
Used themistors	#1 - #5
Facies	silt
Sample	
Geotherm (mK/m)	**60.721±5.2044**
Thermal conductivity (W/m*K)	**0.94**
Heat flow (mW/m^2)	**56.97**

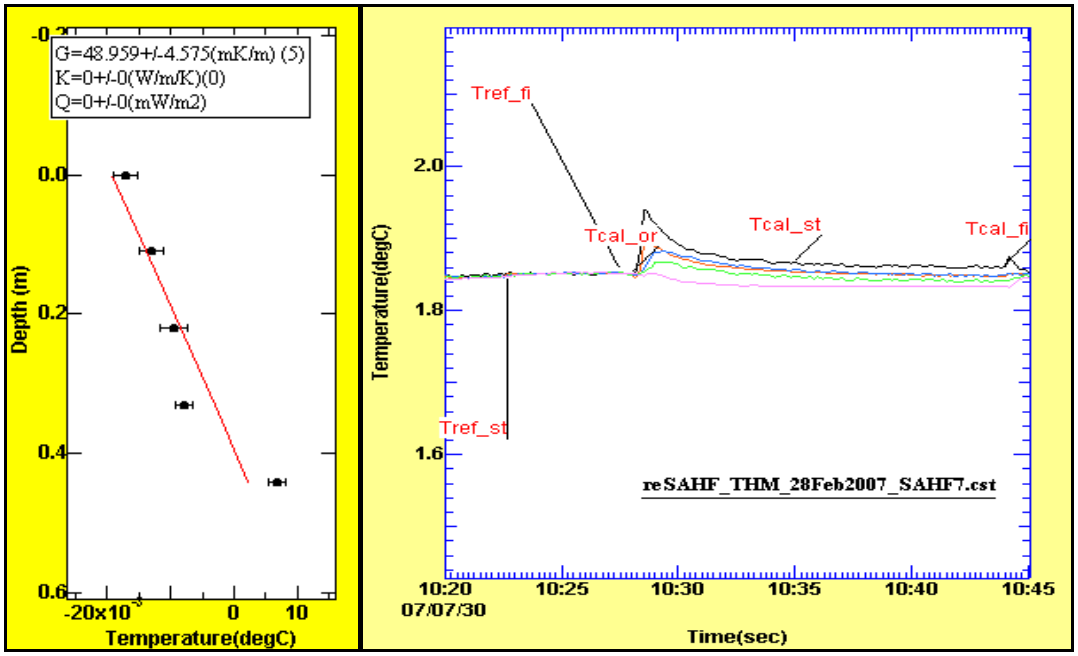


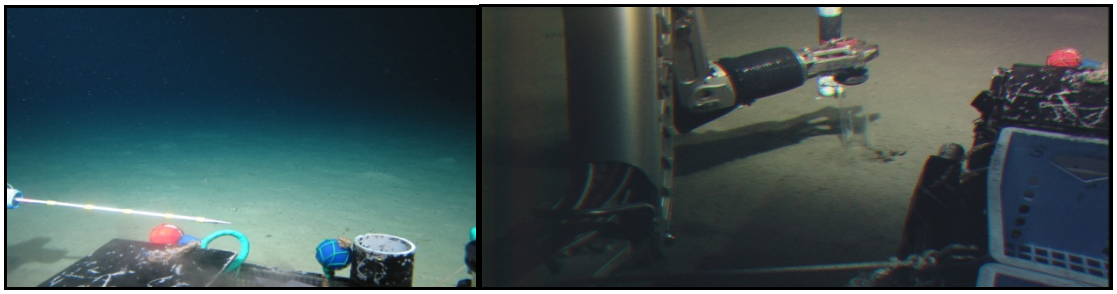


Water temperature measurement HF measurement

2.1.2 IBM-3C site (HD732)

Date	2007/7/30
Area	Manji (IBM-3 site)
Point ID	IBM-3C
Lat.(N)	31° 47.384'
Lon.(E)	139° 01.572'
Depth (m)	2120
Measurement (W.Temp.)	10:28 - 10:44 (10:23 - 10:28)
Used themistors	#1-#5
Facies	silt
Sample	HD732-S01/02
Geotherm (mK/m)	**48.959±4.575**
Thermal conductivity (W/m*K)	**0.94**
Heat flow (mW/m^2)	**45.93**



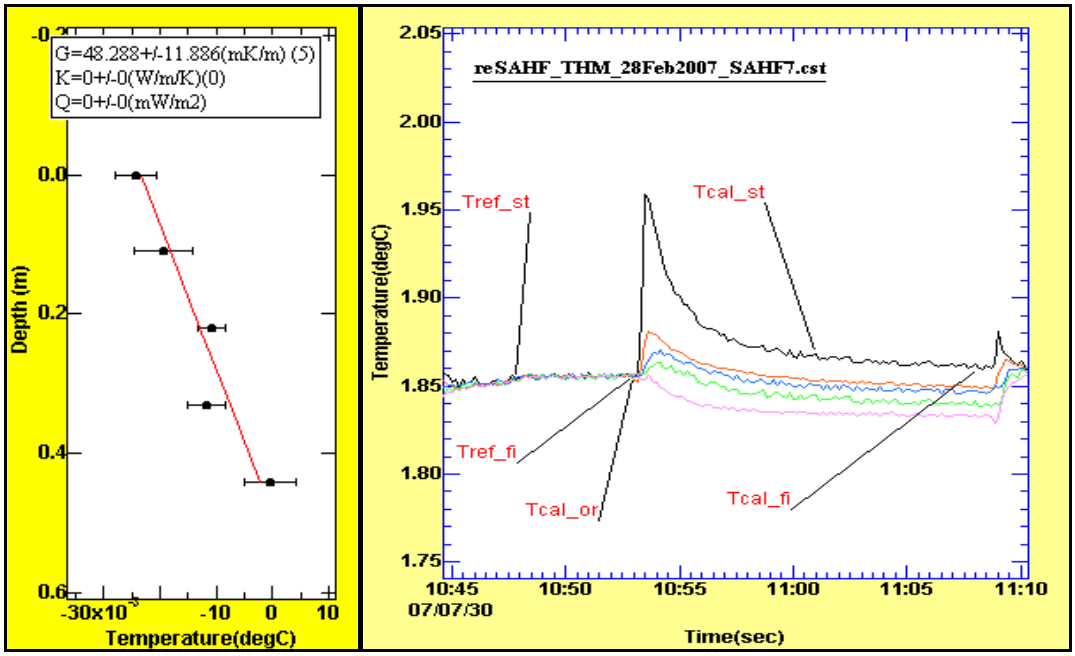


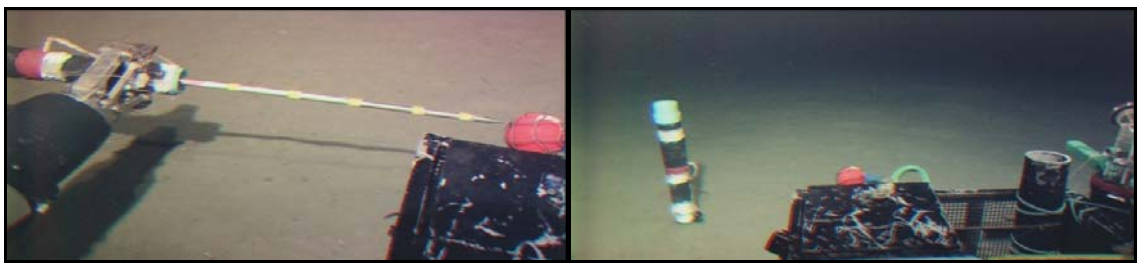
Water temperature measurement

Core sampling and HF measurement

2.1.3 IBM-3W site (HD732)

Date	2007/7/30
Area	Manji (IBM-3 site)
Point ID	IBM-3W
Lat.(N)	31° 47.384'
Lon.(E)	139° 01.515'
Depth (m)	2118
Measurement (W.Temp.)	10:53-11:08 (10:48-10:53)
Used themistors	#1-#5
Facies	silt
Sample	
Geotherm (mK/m)	**48.288±11.886**
Thermal conductivity (W/m*K)	**0.94**
Heat flow (mW/m^2)	**45.30**



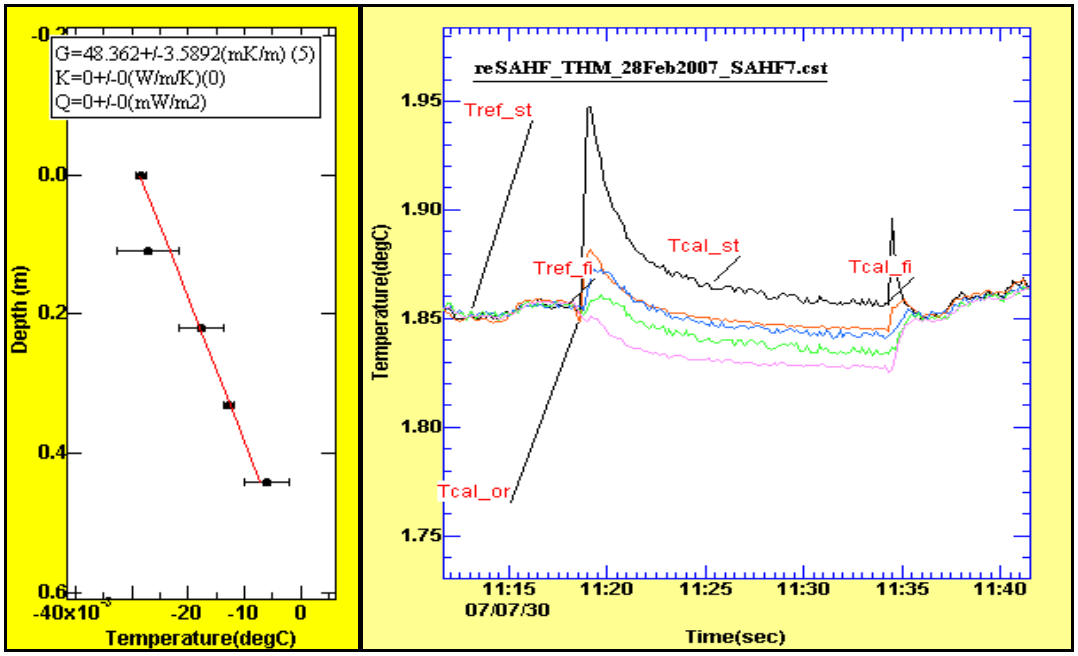


Water temperature measurement

HF measurement

2.1.4 IBM-3S site (HD732)

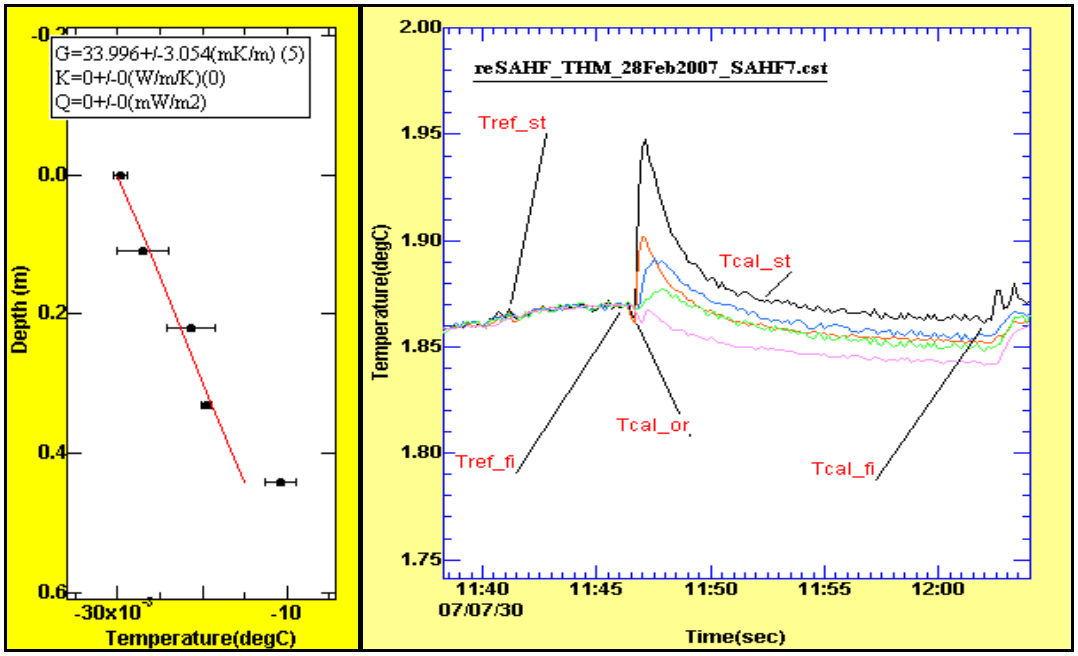
Date	2007/7/30
Area	Manji (IBM-3 site)
Point ID	IBM-3S
Lat.(N)	31° 47.329'
Lon.(E)	139° 01.581'
Depth (m)	2122
Measurement (W.Temp.)	11:19-11:34 (11:13-11:18)
Used themistors	#1-#5
Facies	silt
Sample	
Geotherm (mK/m)	**48.362±3.5982**
Thermal conductivity (W/m*K)	**0.94**
Heat flow (mW/m^2)	**45.37**



Water temperature measurement HF measurement

2.1.5 IBM-3N site (HD732)

Date	2007/7/30
Area	Manji (IBM-3 site)
Point ID	IBM-3N
Lat.(N)	31° 47.445'
Lon.(E)	139° 01.579'
Depth (m)	2117
Measurement (W.Temp.)	11:47-12:02 (11:41-11:46)
Used themistors	#1-#5
Facies	silt
Sample	
Geotherm (mK/m)	**33.996±3.054**
Thermal conductivity (W/m*K)	**0.94**
Heat flow (mW/m^2)	**31.90**



Water temperature measurement HF measurement

2.1.6 Thermal conductivity measurements

Thermal conductivity measurements of the collected sediments were done at IFREE, JAMSTEC by Yuka Masaki (IFREE1). One sediment sample was measured, HD732-S01 from IBM-3 site (IBM-3C). For calculating the heat flows of IBM-3E, 3W, 3S, and 3N sites, thermal conductivity data of IBM-3C site was used.

standard value

standard		#1	Measured	RealValue	#2	Measured Value	Real Value
1	102	glass	0.960	1.237	gom		
	105	gom	0.320	0.517	glass		
2	102	glass	0.877	1.237	gom		
	105	gom	0.337	0.517	glass		
3	102	glass	0.996	1.237	gom		
	105	gom	0.360	0.517	glass		
4	102	glass	1.019	1.237	gom		
	105	gom	0.378	0.517	glass		
5	102	glass	0.968	1.237	gom	0.3825	0.517
	105	gom	0.352	0.517	glass	1.0773	1.237

run value

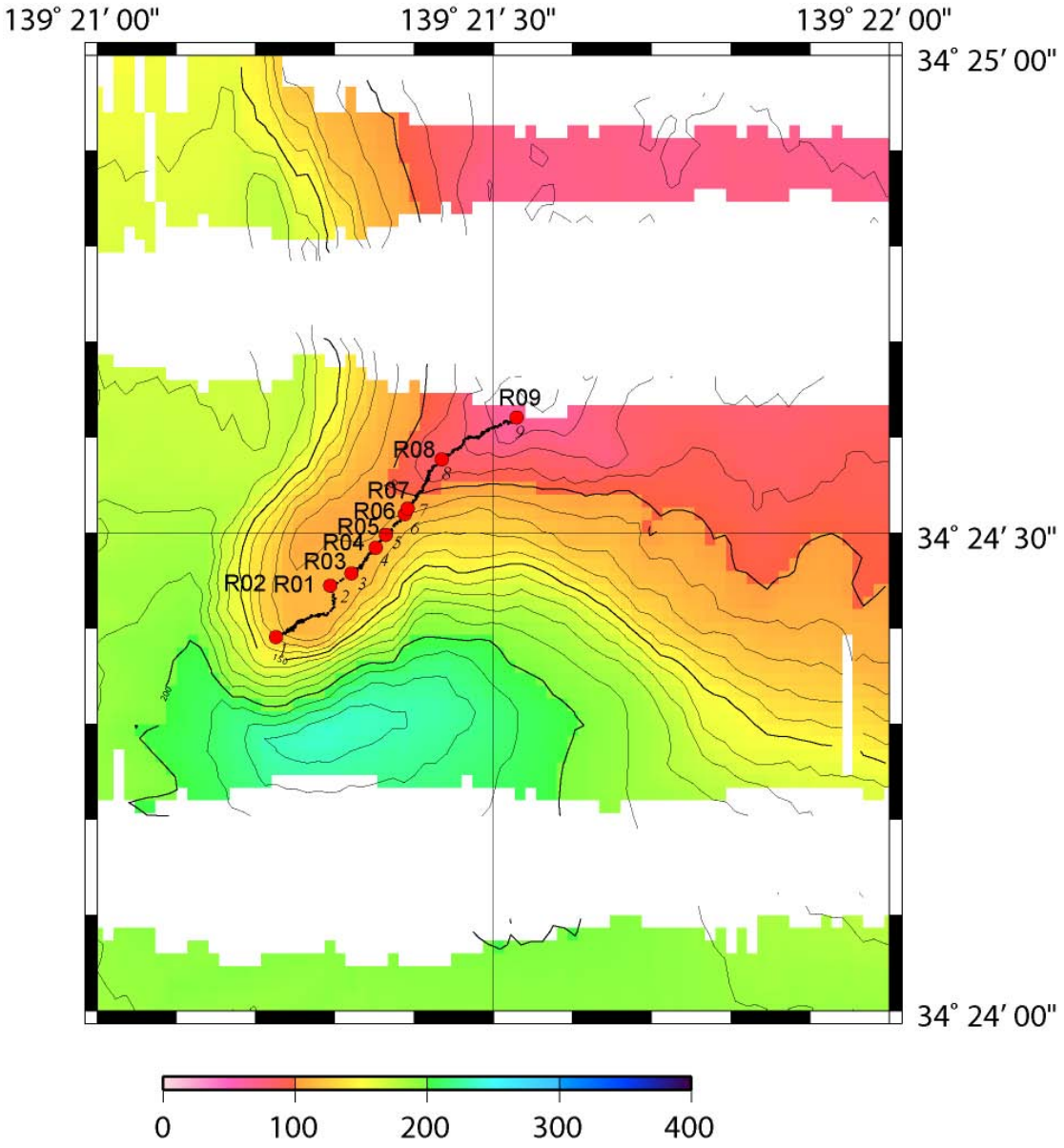
run		#1	Measured	RealValue	Date
1	105	HD732-S01	0.5160	0.7375	2007/8/9
2	105	HD732-S01	0.6500	0.9345	
3	102	HD732-S01	0.3114	0.4614	2007/8/10
	105	gom	0.3602		
4	102	HD732-S01	0.2957	0.4240	
	105	gom	0.3671		
5	102	gom	0.3480		
	105	HD732-S01	0.7925	0.9419	

Thermal conductivity	
HD719-S02 (Oomuro hole)	**1.06**
HD732-S01 (IBM-3C)	**0.94**

2.2 Hyper-Dolphin dive surveys

2.2.1 HD714 Dive

Hyper-Dolphin Dive: HD714



Date: 2007/07/19

Recorder: R. Fiske

Objective

Inspect the ridge structure which extends from southwestern slope of Niijima-uranose. Aiming to observe / sample tonalite outcrop which may consist part of Niijima-uranose. The dive originally was planned to observe the deeper (200 m – 100 m) portion of the ridge, but due to the strong current, the Hyper-Dolphin was unable to go to the planned site. Instead, shallower (<100 m) portion of the ridge was surveyed. The deeper part of the ridge was revisited by Dive HD735 on July 31.

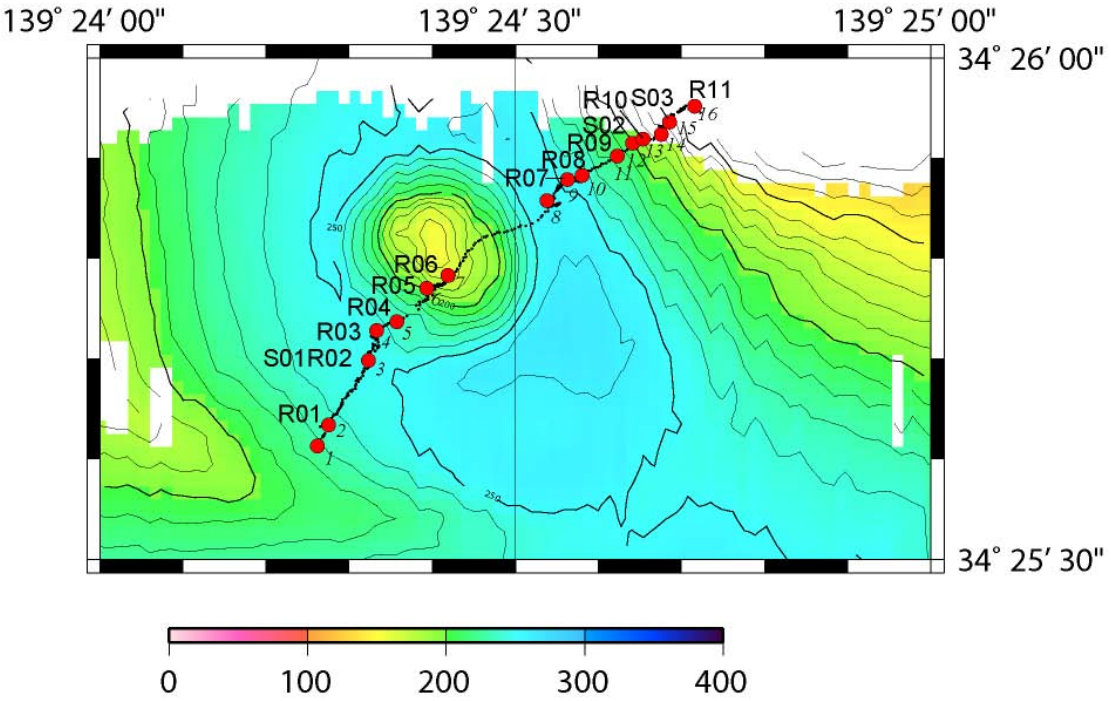
Dive Summary

Start: 34° 24.391’ N, 139° 21.226’ E (depth = 130 m)

Finish: 34° 24.621’ N, 139° 21.530’ E (depth = 57 m)

2.2.2 HD715 Dive

Hyper-Dolphin Dive: HD715



Date: 2007/07/19

Recorder: A. Nichols

Objective

Inspect the south-western slope of the newly recognized cone within the concave southern slopes of the Niijima-Uranose. Drop down from the top of the cone and then inspect the western slope of the eastern side of the Niijima-Uranose.

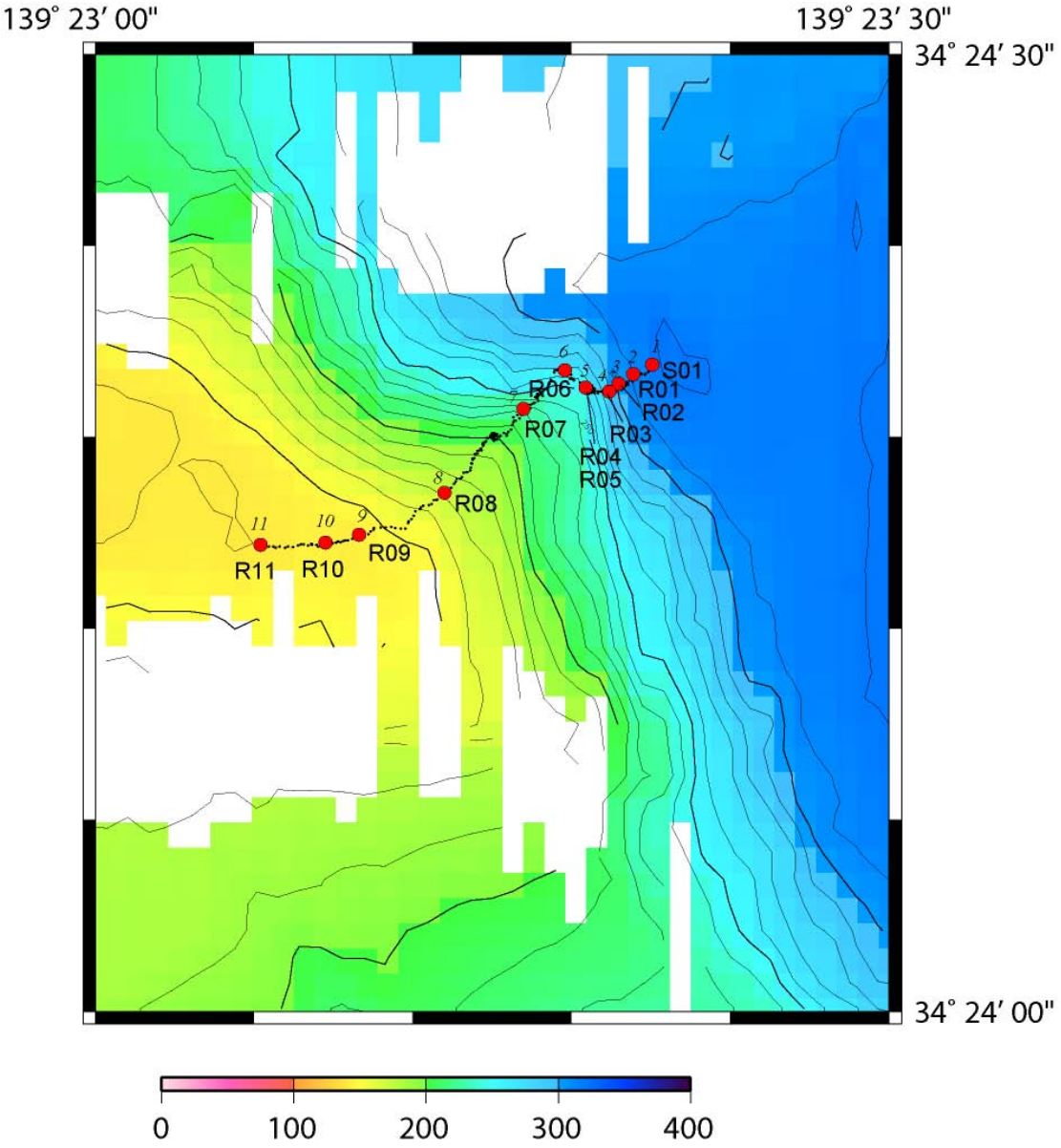
Dive Summary

Start: 34° 25.613’ N, 139° 24.262’ E (depth = 217 m)

Finish: 34° 25.952’ N, 139° 24.716’ E (depth = 126 m)

2.2.3 HD716 Dive

Hyper-Dolphin Dive: HD716



Date: 2007/07/20

Recorder: D. Dunkley

Objective

SW traverse up inner SW wall of newly recognized caldera on eastern slope of Niijima-uranose.

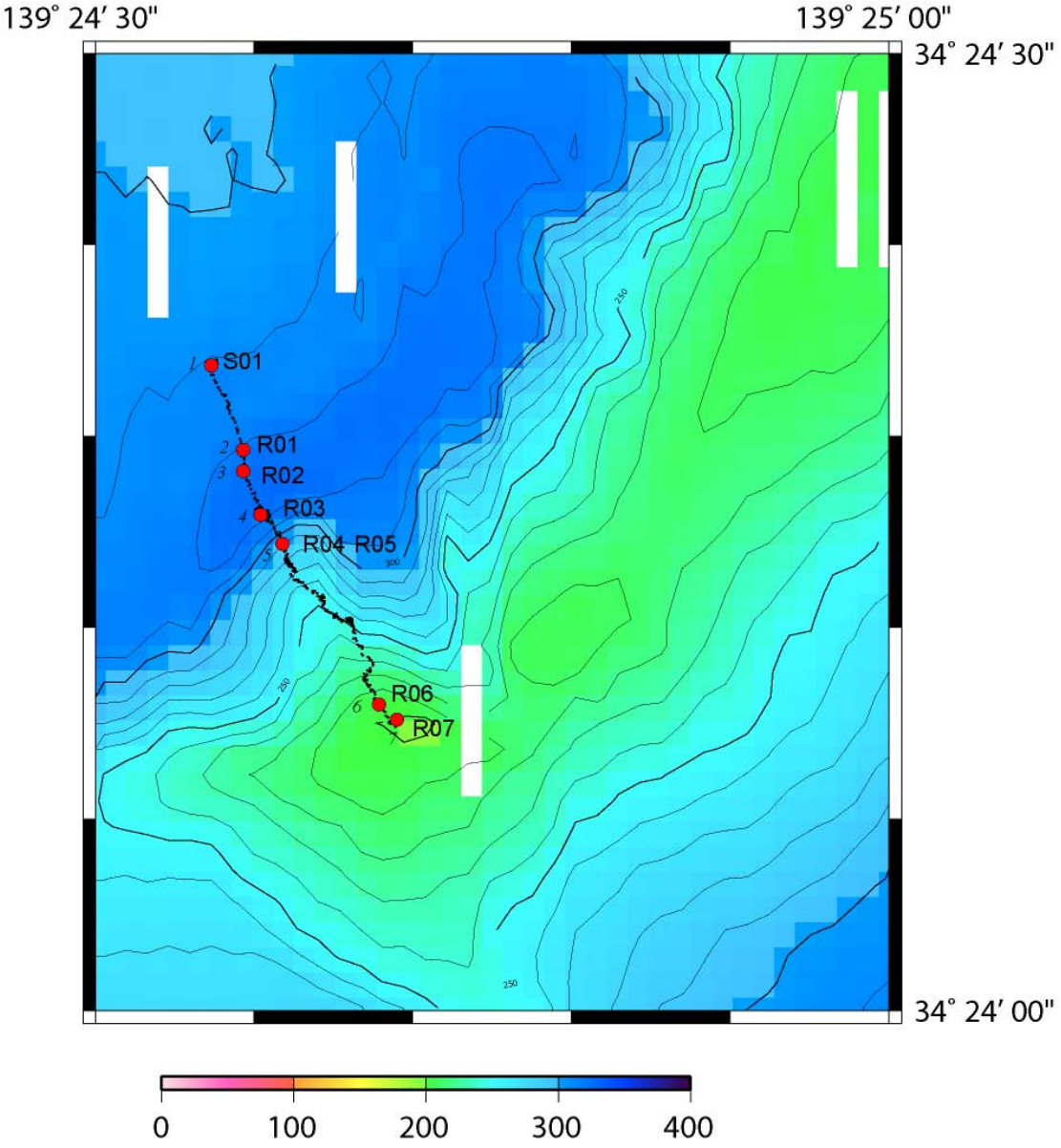
Dive Summary

Start: 34° 24.338’ N, 139° 23.351’ E (depth = 316 m)

Finish: 34° 24.244’ N, 139° 23.104’ E (depth = 139 m)

2.2.4 HD717 Dive

Hyper-Dolphin Dive: HD717



Date: 2007/07/20

Recorder: D. Dunkley

Objective

SSE traverse up inner SSW wall of newly recognized caldera structure on eastern slope of Niijima-uranose.

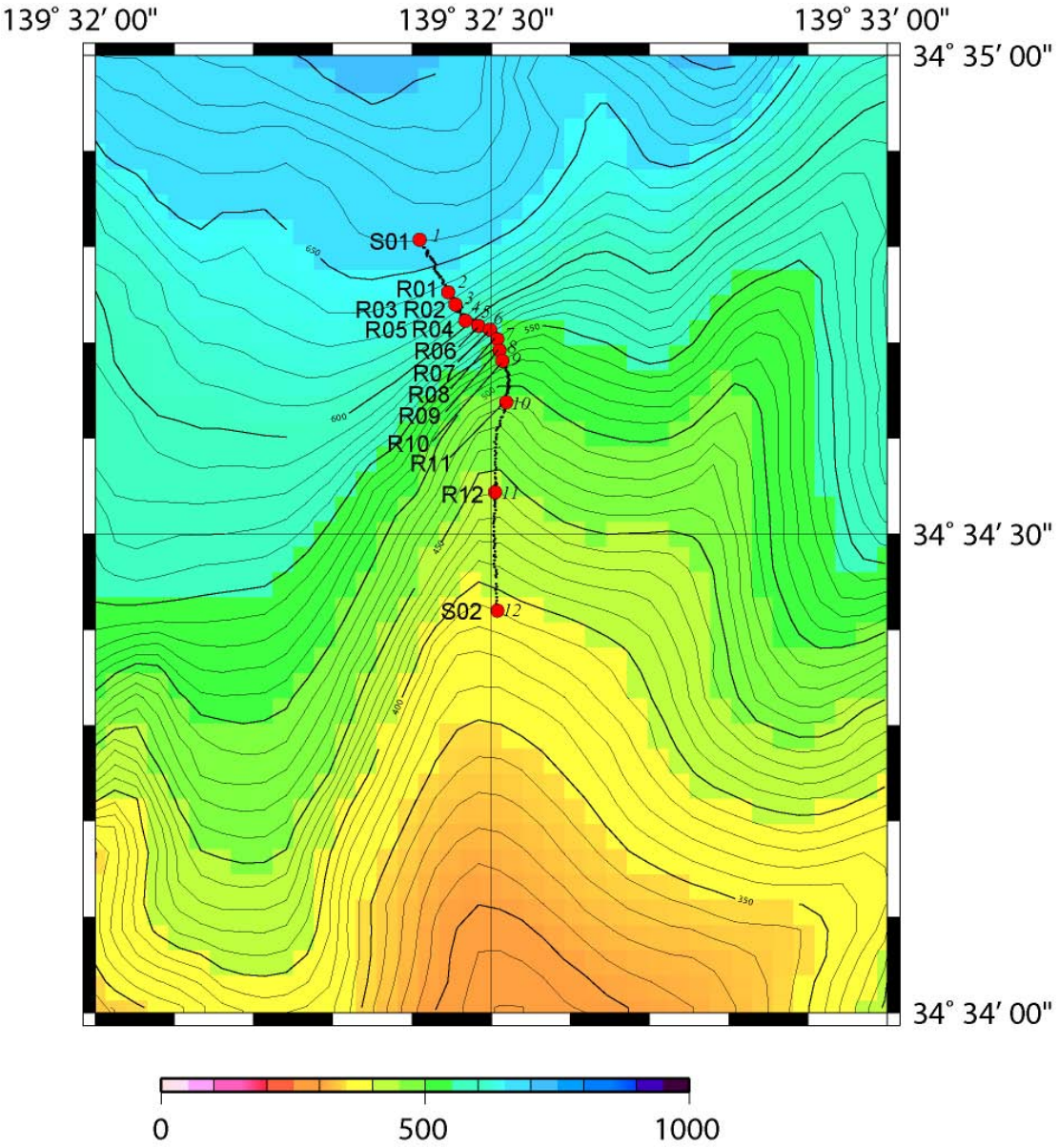
Dive Summary

Start: 34° 24.337’ N, 139° 24.573’ E (depth = 309 m)

Finish: 34° 24.152’ N, 139° 24.690’ E (depth =196 m)

2.2.5 HD718 Dive

Hyper-Dolphin Dive: HD718



Date: 2007/07/21

Recorder: A. Nichols

Objective

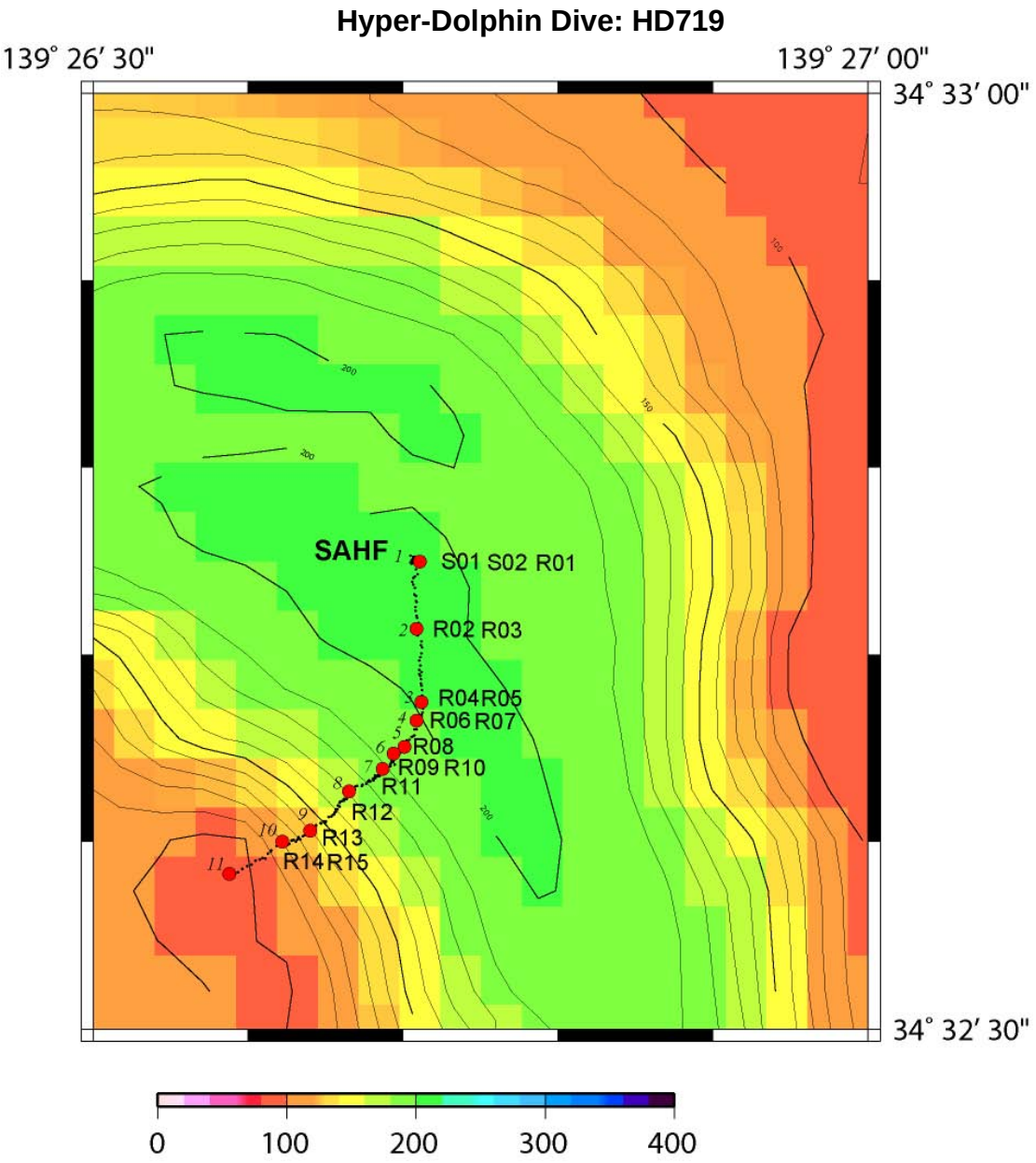
Traverse up the steeper eastern slope of Oomurodashi, at the arc front. Dive planned to start at a depth of 660 m, which is the upper part of the slope. The slope continues eastward into the trench.

Dive Summary

Start: 34° 34.808’ N, 139° 32.410’ E (depth = 655 m)

Finish: 34° 34.420’ N, 139° 32.508’ E (depth = 381 m)

2.2.6 HD719 Dive



Date: 2007/07/21

Recorder: A. Nichols

Objective

Traverse up the steeper south-western slope Oomuro Hole, a 100 m deep depression on the top of Oomurodashi, attempting to determine the origin of this feature. Dive commenced at bottom at a depth of 200 m and then traverses up the wall to a depth of 100 m.

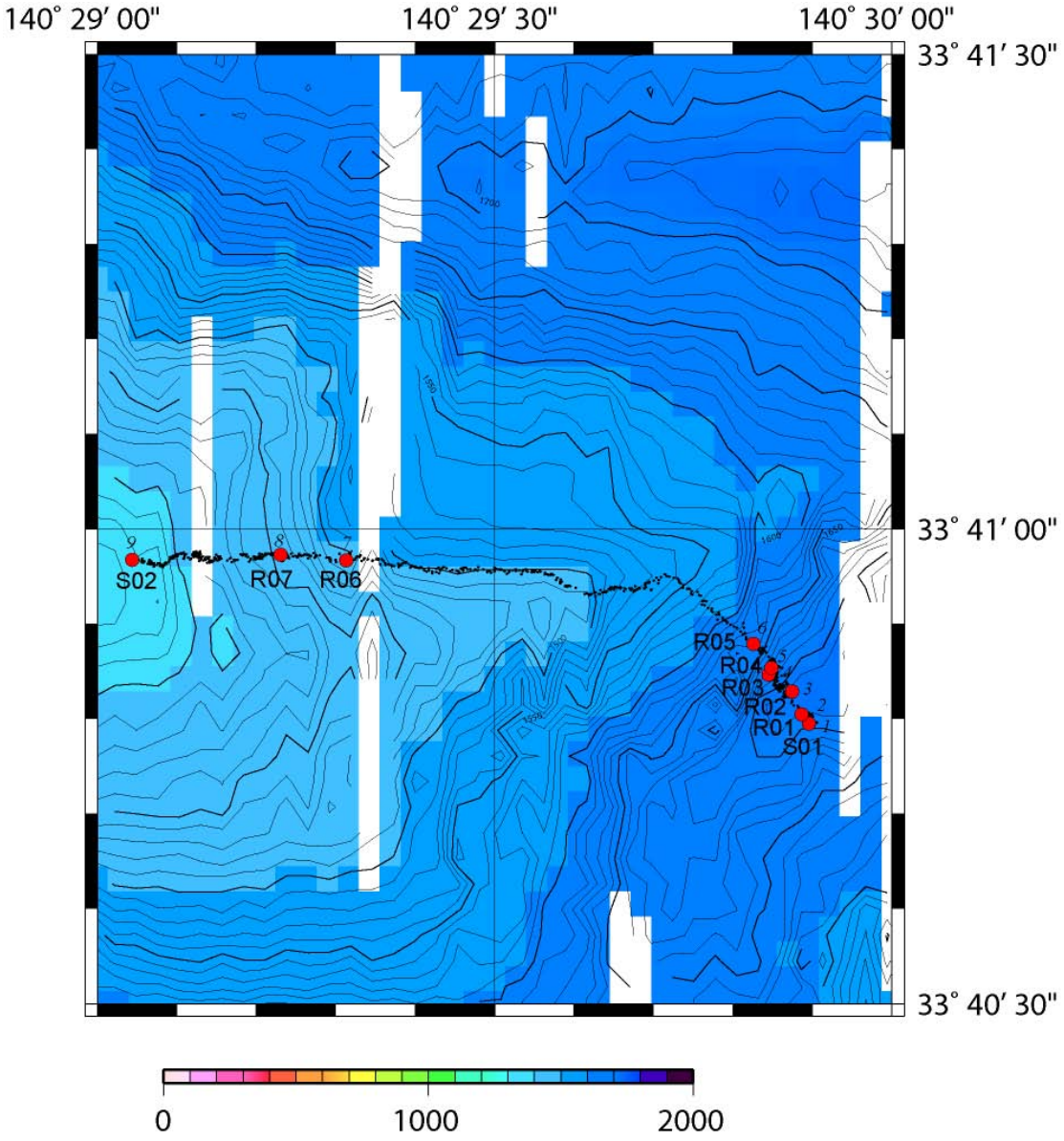
Dive Summary

Start: 34° 32.750’ N, 139° 26.711’ E (depth = 196 m)

Finish: 34° 32.583’ N, 139° 26.588’ E (depth = 94 m)

2.2.7 HD720 Dive

Hyper-Dolphin Dive: HD720



Date: 2007/07/22

Recorder: R. Fiske

Objective

Traverse up a submarine canyon which cut deeply into the western slope of the Shinkurose bank. Aiming to observe / collect samples from the outcrops that comprise the deeper, thus older sequence of the Shinkurose bank.

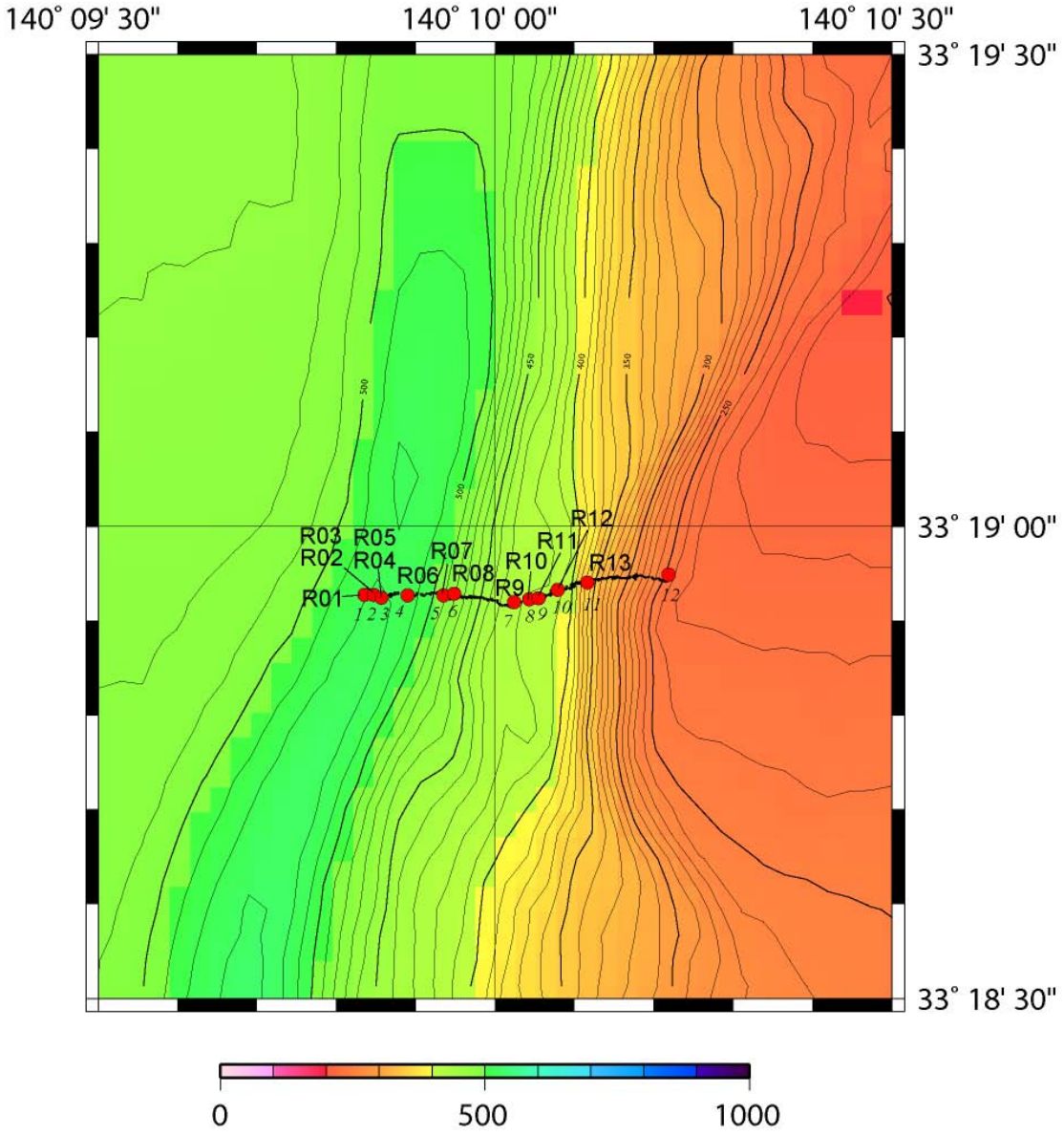
Dive Summary

Start: 33° 40.795’ N, 140° 29.896’ E (depth = 1714 m)

Finish: 33° 40.968’ N, 140° 29.044’ E (depth = 1370 m)

2.2.8 HD721 Dive

Hyper-Dolphin Dive: HD721



Date: 2007/07/23

Recorder: A. Nichols

Objective

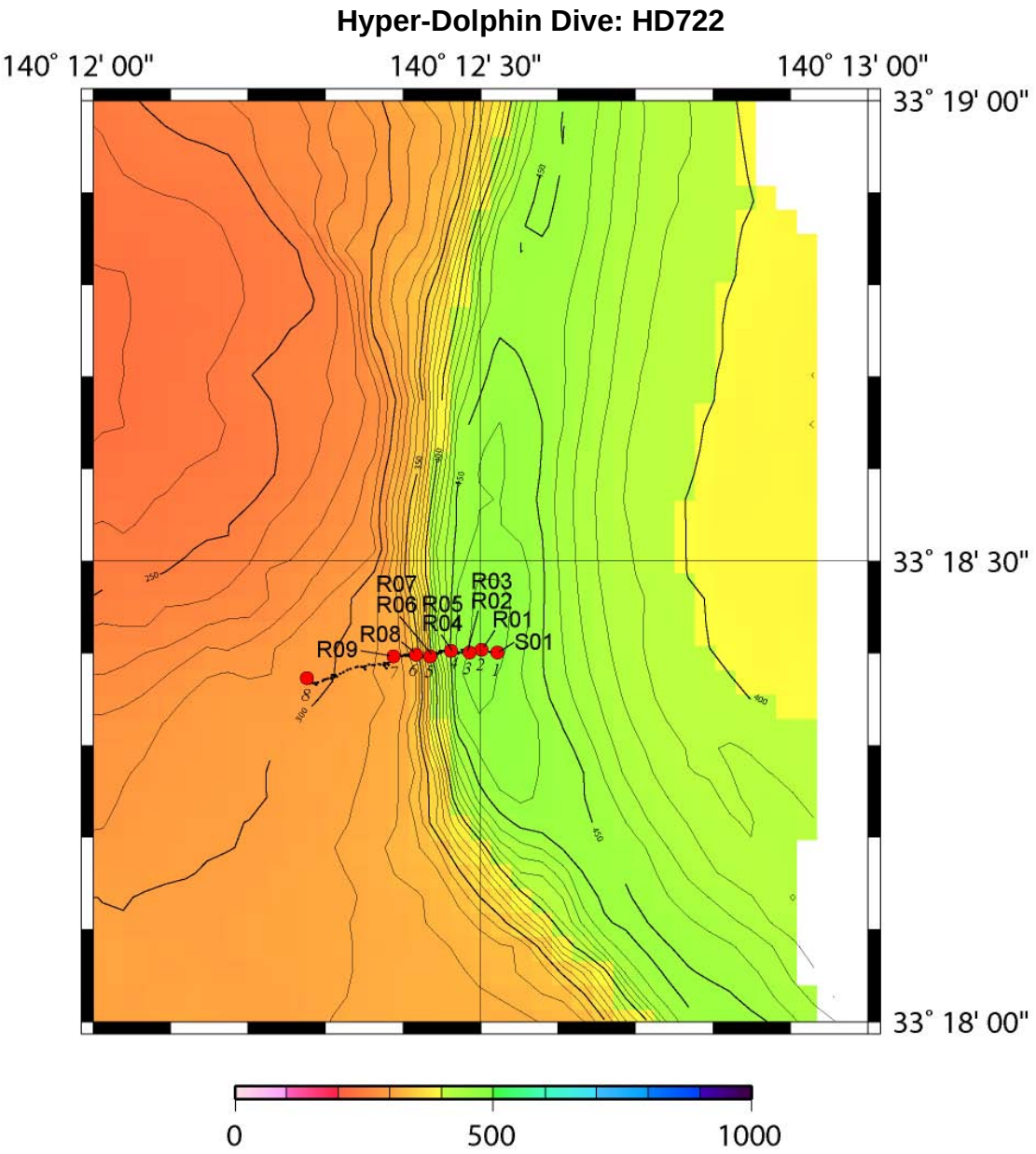
Traverse up the western slope of the structure, Takunanyama at the southern end of Shinkurose. If Takunanyama was a volcano, hope to find lava / intrusive. Dive will begin at the base, a depth of 520 m. The top of the dive will be at a depth of 250 m.

Dive Summary

Start: 33° 18.928’ N, 140° 09.836’ E (depth = 516 m)

Finish: 33° 18.949’ N, 140° 18.949’ E (depth = 231 m)

2.2.9 HD722 Dive



Date: 2007/07/23

Recorder: A. Nichols

Objective

Traverse up the eastern slope of the structure, Takunanyama, at the southern end of Shinkurose. Hope to find lava (or at least something igneous other than tuff). Dive will begin at the base, a depth of 470 m. The top of the dive will be at a depth of 300 m.

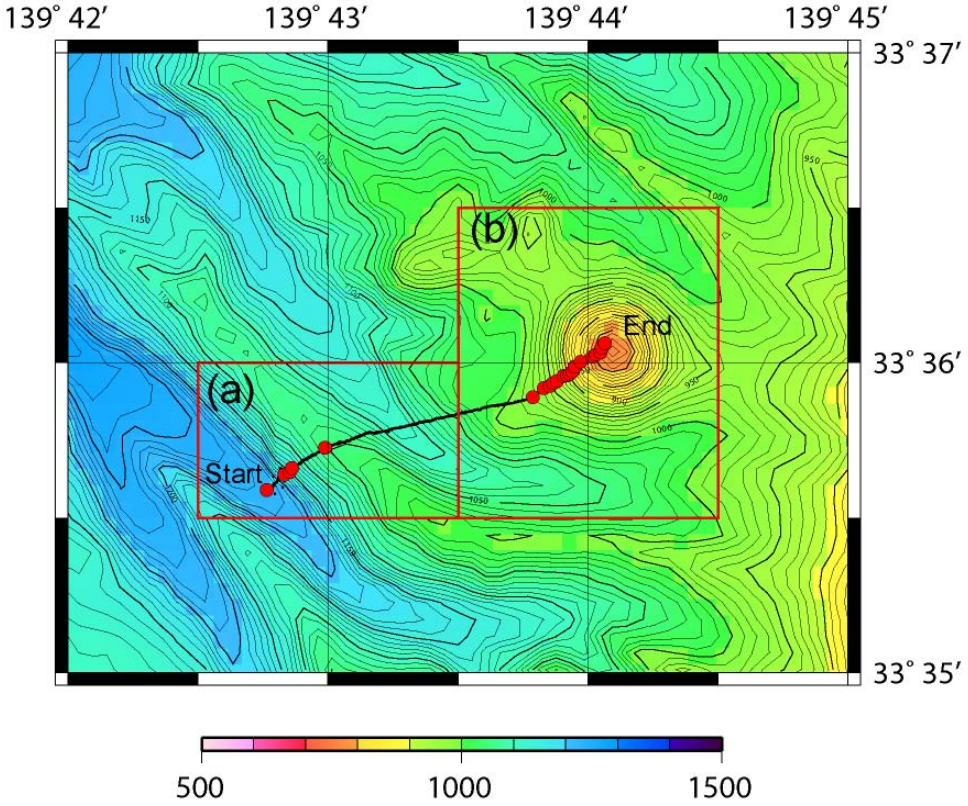
Dive Summary

Start: 33° 18.401' N, 140° 12.522' E (depth = 461 m)

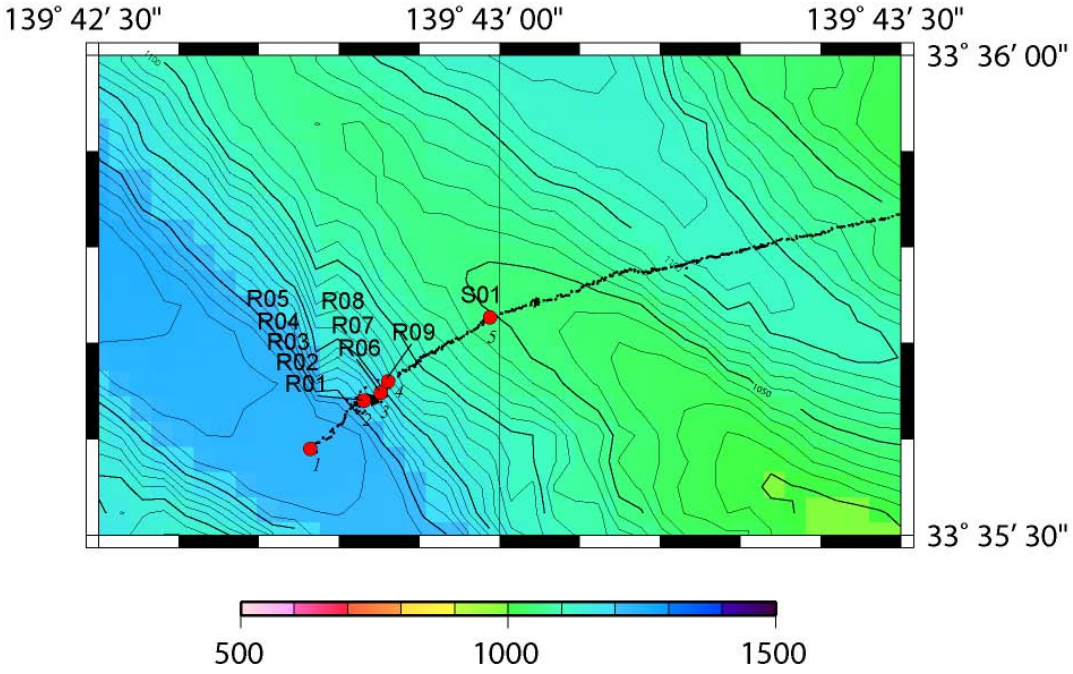
Finish: 33° 18.373' N, 140° 12.276' E (depth = 288 m)

2.2.10 HD723 Dive

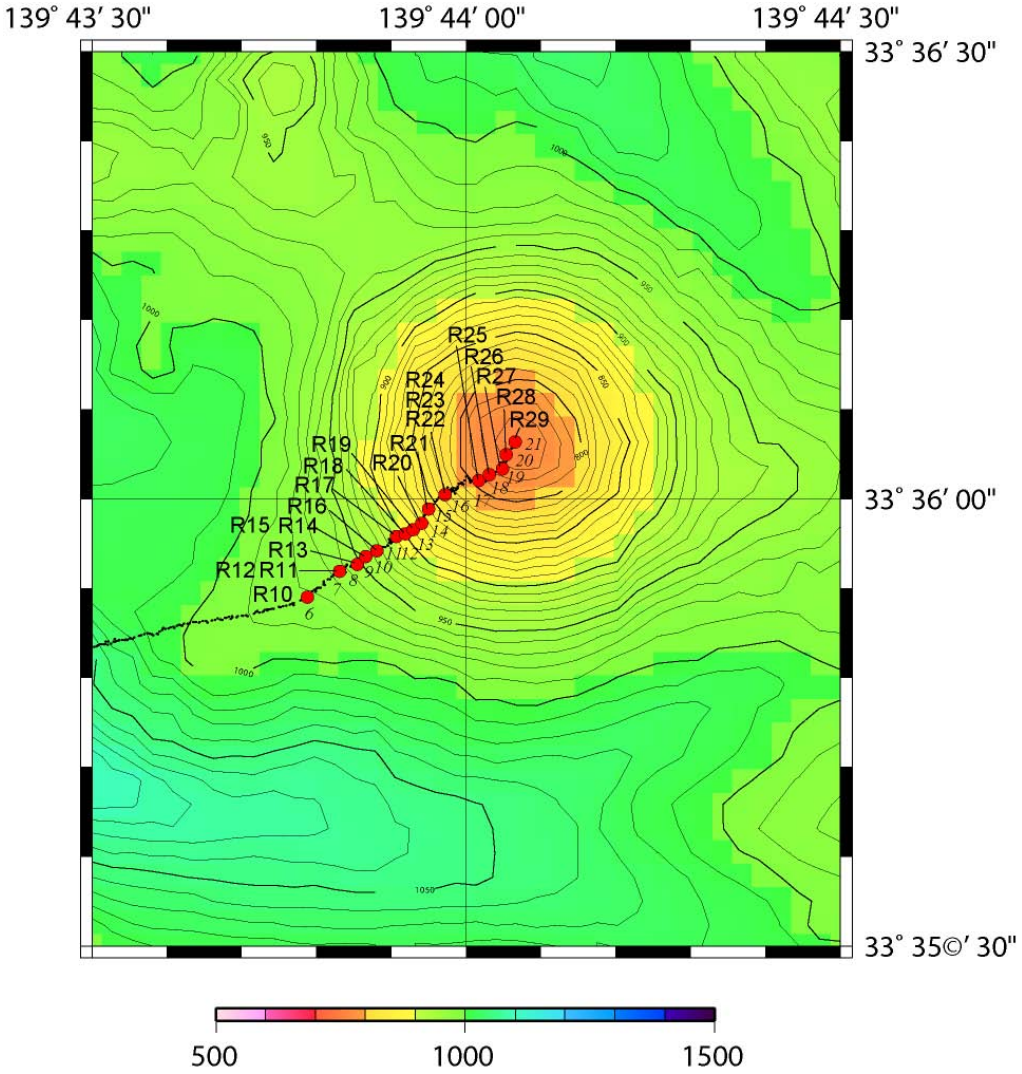
Hyper-Dolphin Dive: HD723



(a) Survey within the W. Shinkurose gully.



(b) Survey at the cone.



Date: 2007/07/23

Recorder: D. Dunkley

Objective

ENE traverse on western slope of Shinkurose bank in two segments, from NE-descending erosion gully to ridge top (a), then from base to top of volcanic cone (b). This cone was newly found by an overnight bathymetric survey from July 22 -23.

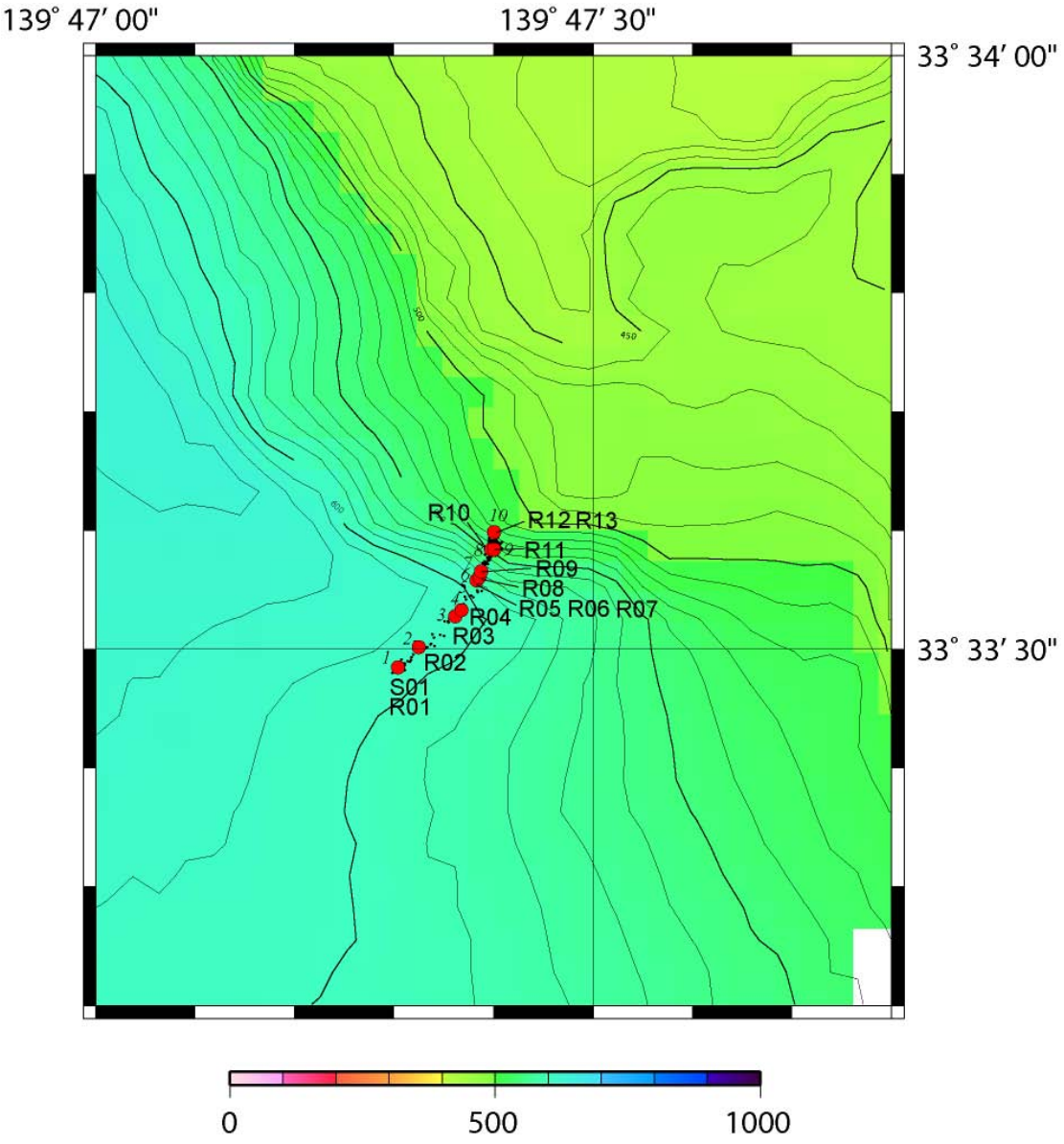
Dive Summary

Start: 33° 35.590’ N, 140° 42.764’ E (depth = 1223 m)

Finish: 33° 36.064’ N, 140° 44.066’ E (depth = 754 m)

2.2.11 HD724 Dive

Hyper-Dolphin Dive: HD724



Date: 2007/07/24

Recorder: A. Nichols

Objective

To investigate the western upper slopes of Shinkurose to compare with dives 721 and 722 on the eastern slope yesterday. Dive will commence at site 1, a depth of 610 m, and proceed up to site 2 at 530 m.

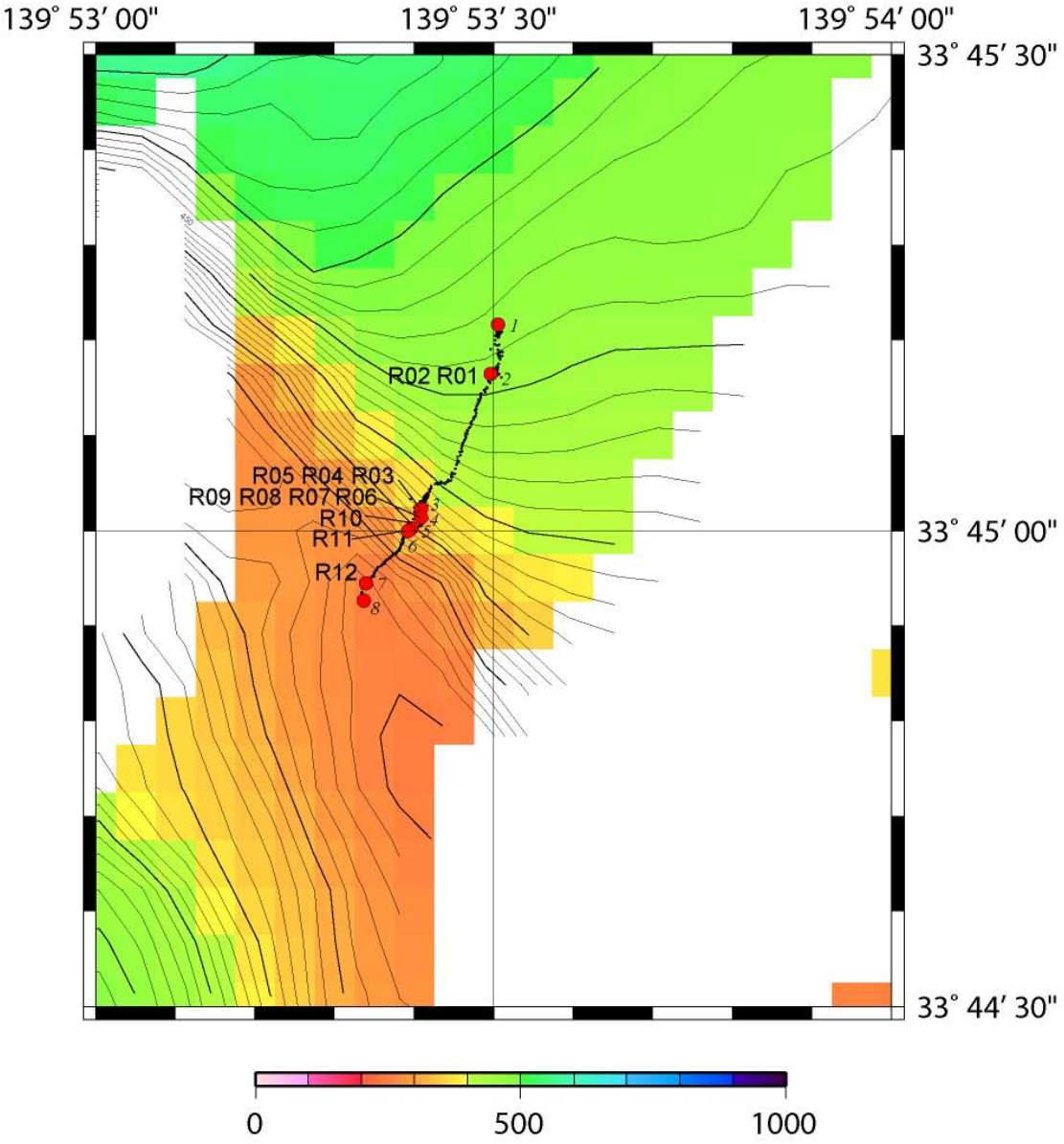
Dive Summary

Start: 33° 33.502’ N, 139° 47.325’ E (depth = 595 m)

Finish: 33° 33.599’ N, 139° 47.401’ E (depth = 515 m)

2.2.12 HD725 Dive

Hyper-Dolphin Dive: HD725



Date: 2007/07/23

Recorder: D. Dunkley

Objective

Inspect shallower portion of the ridge structure extending northeast at west Shinkurose. Traverse SSW up steep slope of the ridge to the top. Aiming to collect lava / plutonic clasts from the conglomerate layers. The presence of shallow conglomerate layers has been recognized from the yesterday's HD724 dive.

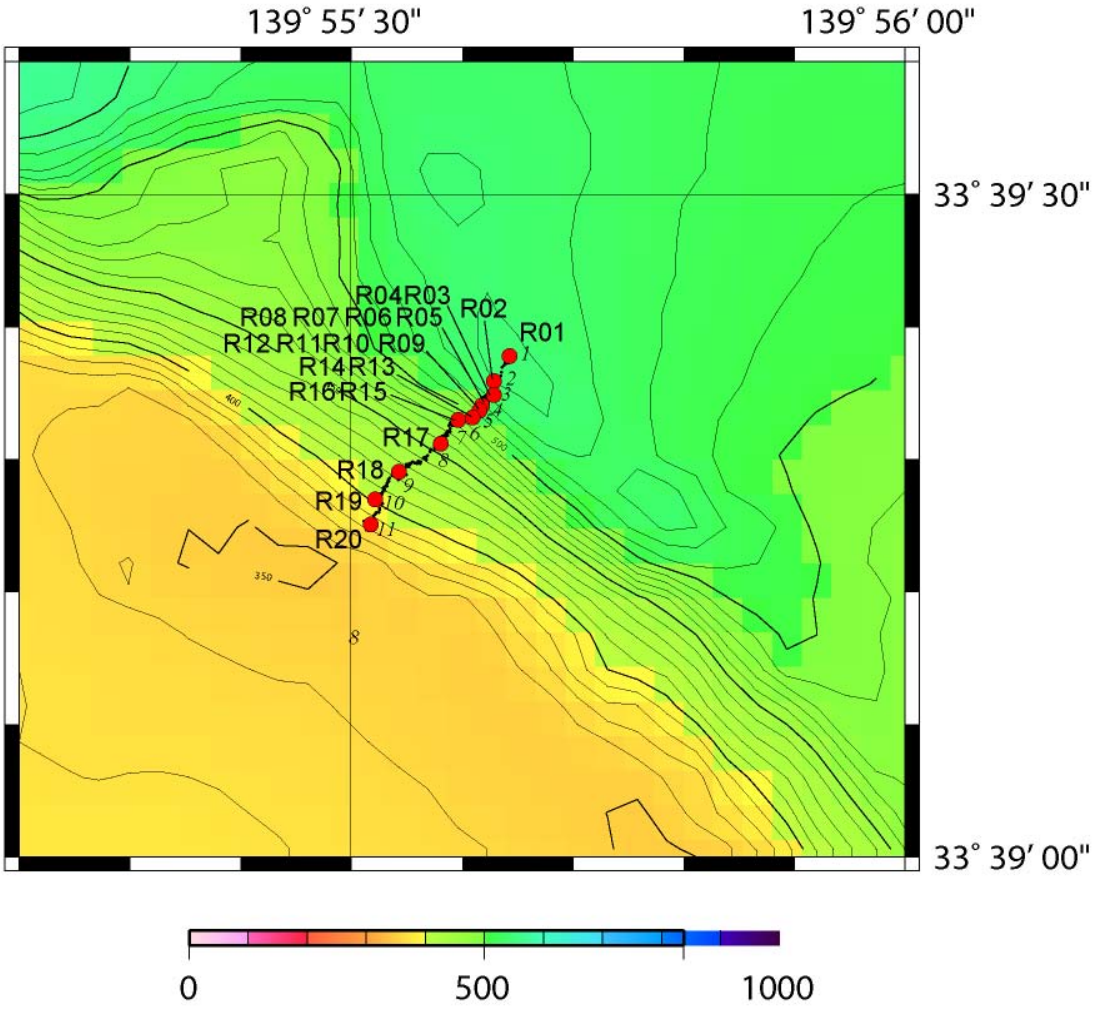
Dive Summary

Start: 33° 45.217’ N, 139° 53.506’ E (depth = 458 m)

Finish: 33° 44.927’ N, 139° 53.337’ E (depth = 242 m)

2.2.13 HD726 Dive

Hyper-Dolphin Dive: HD726



Date: 2007/07/25

Recorder: A. Nichols

Objective

Investigating upper northwestern slope of Shinkurose. Starting at the base of depression/embayment within western slope, at a depth of 540 m. We will climb the depression wall to top of promontory overlooking the depression at a depth of 350 m. Expect to encounter more conglomerate. Hope to find lava amongst the clasts.

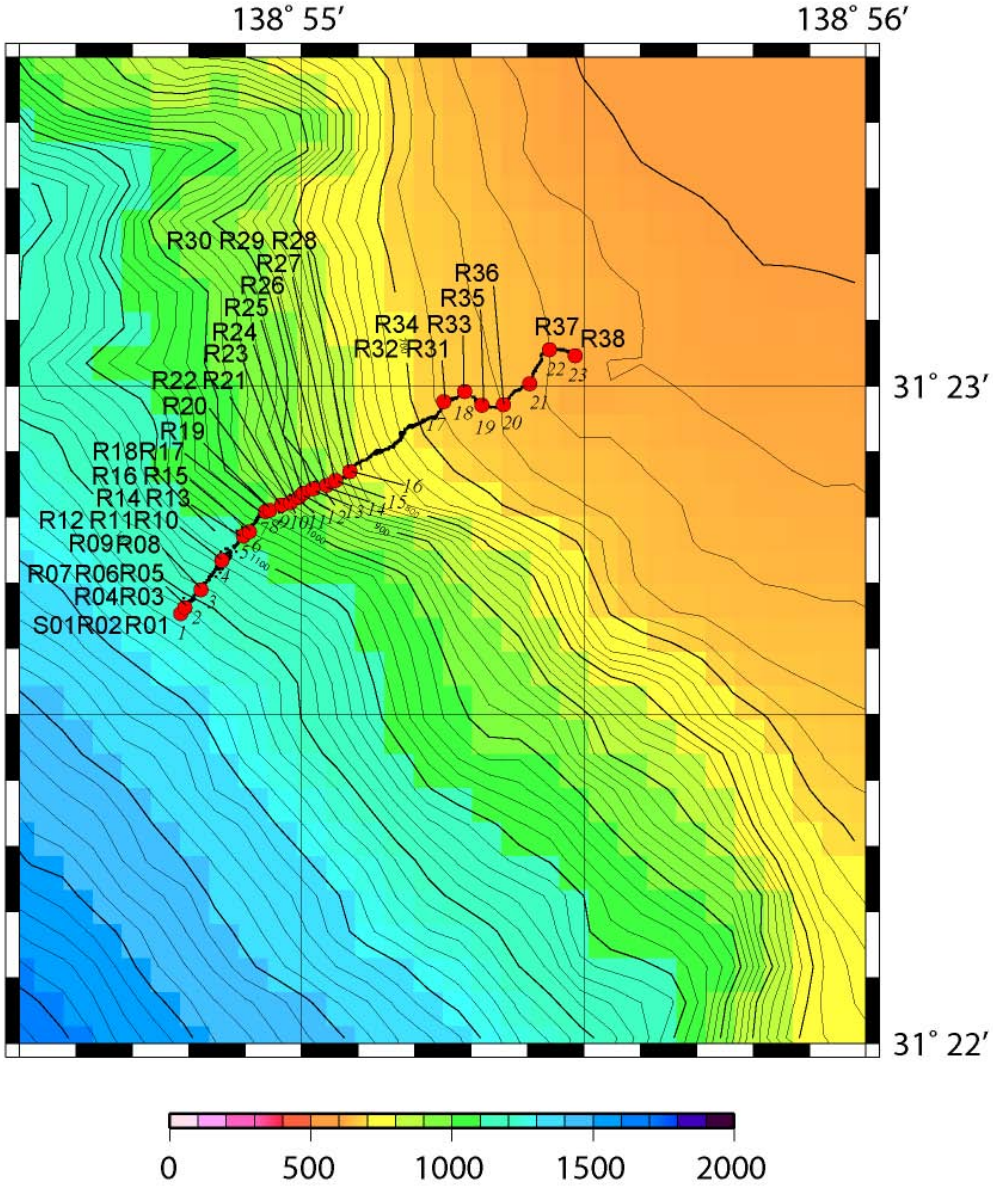
Dive Summary

Start: 33° 39.378’ N, 139° 55.643’ E (depth = 538 m)

Finish: 33° 39.251’ N, 139° 55.518’ E (depth = 363 m)

2.2.14 HD727 Dive

Hyper-Dolphin Dive: HD727



Date: 2007/07/27

Recorder: A. Nichols

Objective

To investigate the Enpo seamount, which is a 1600+ m high seamount (from 2100+ m to 500 m) within the Enpo seamount chain. The dive will begin on the upper slopes of the seamount at 1230 m and will traverse up to the summit at a depth of 590 m.

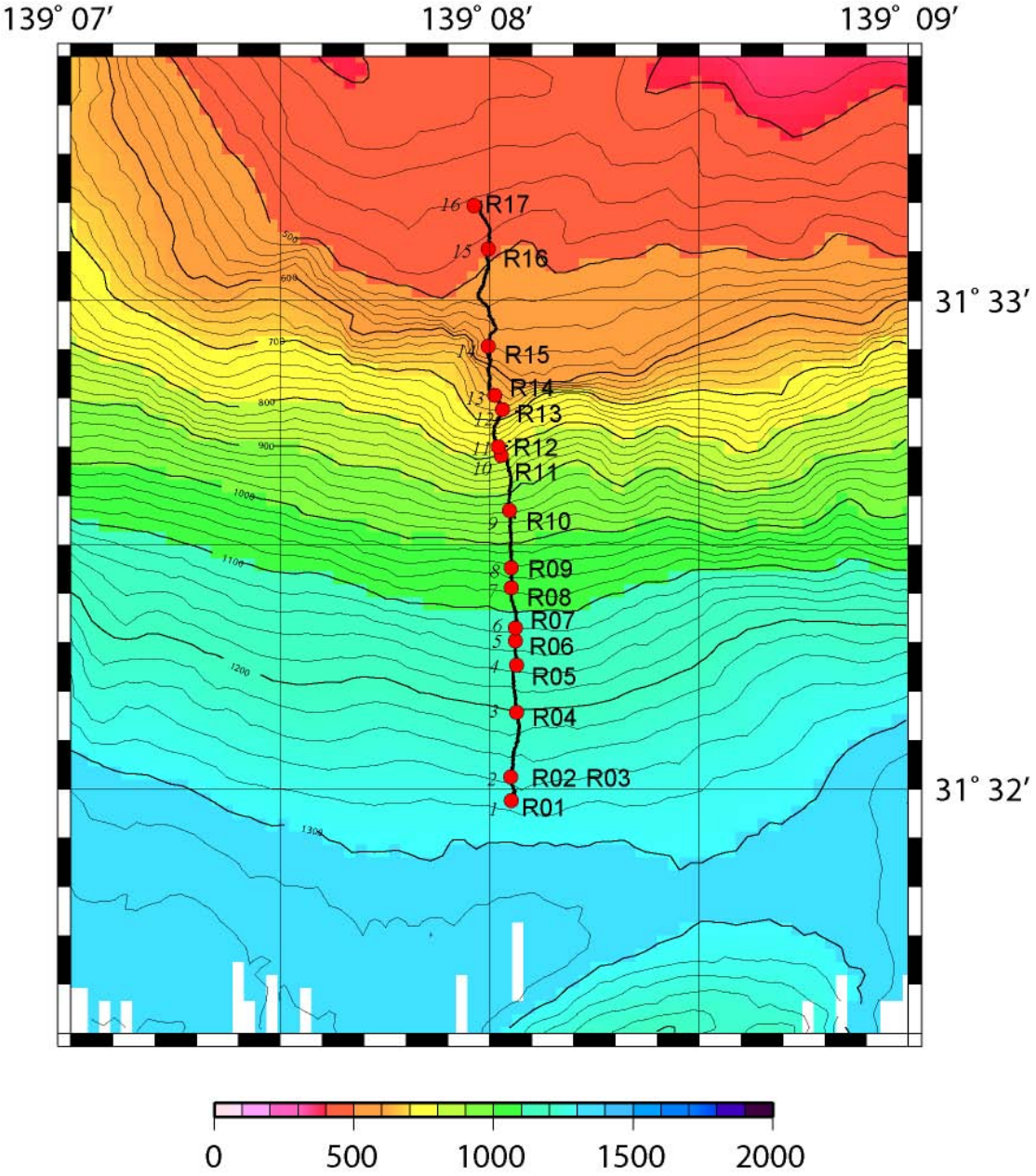
Dive Summary

Start: 31° 22.654’ N, 138° 54.786’ E (depth = 1215 m)

Finish: 31° 23.046’ N, 138° 55.485’ E (depth = 611 m)

2.2.15 HD728 Dive

Hyper-Dolphin Dive: HD728



Date: 2007/07/28

Recorder: D. Dunkley

Objective

Traverse N up southern slope of unnamed flat-topped seamount. Aiming to find plutonic rock exposure at the summit.

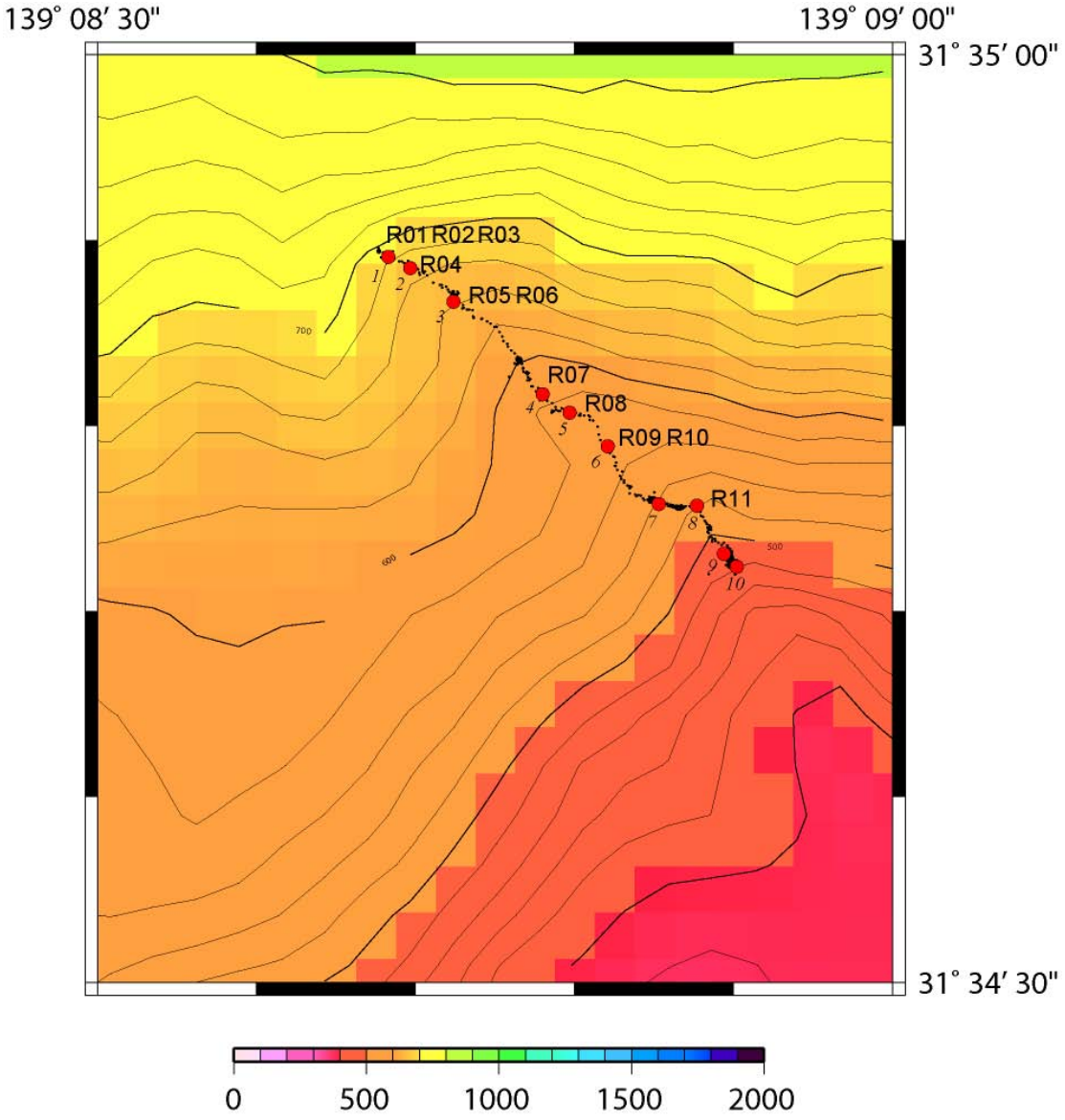
Dive Summary

Start: 31° 31.976’ N, 139° 08.053’ E (depth = 1277 m)

Finish: 31° 33.194’ N, 139° 07.964’ E (depth = 462 m)

2.2.16 HD729 Dive

Hyper-Dolphin Dive: HD729



Date: 2007/07/28

Recorder: D. Dunkley

Objective

Traverse S up northern slope of unnamed flat-topped seamount (same as Dive 728).

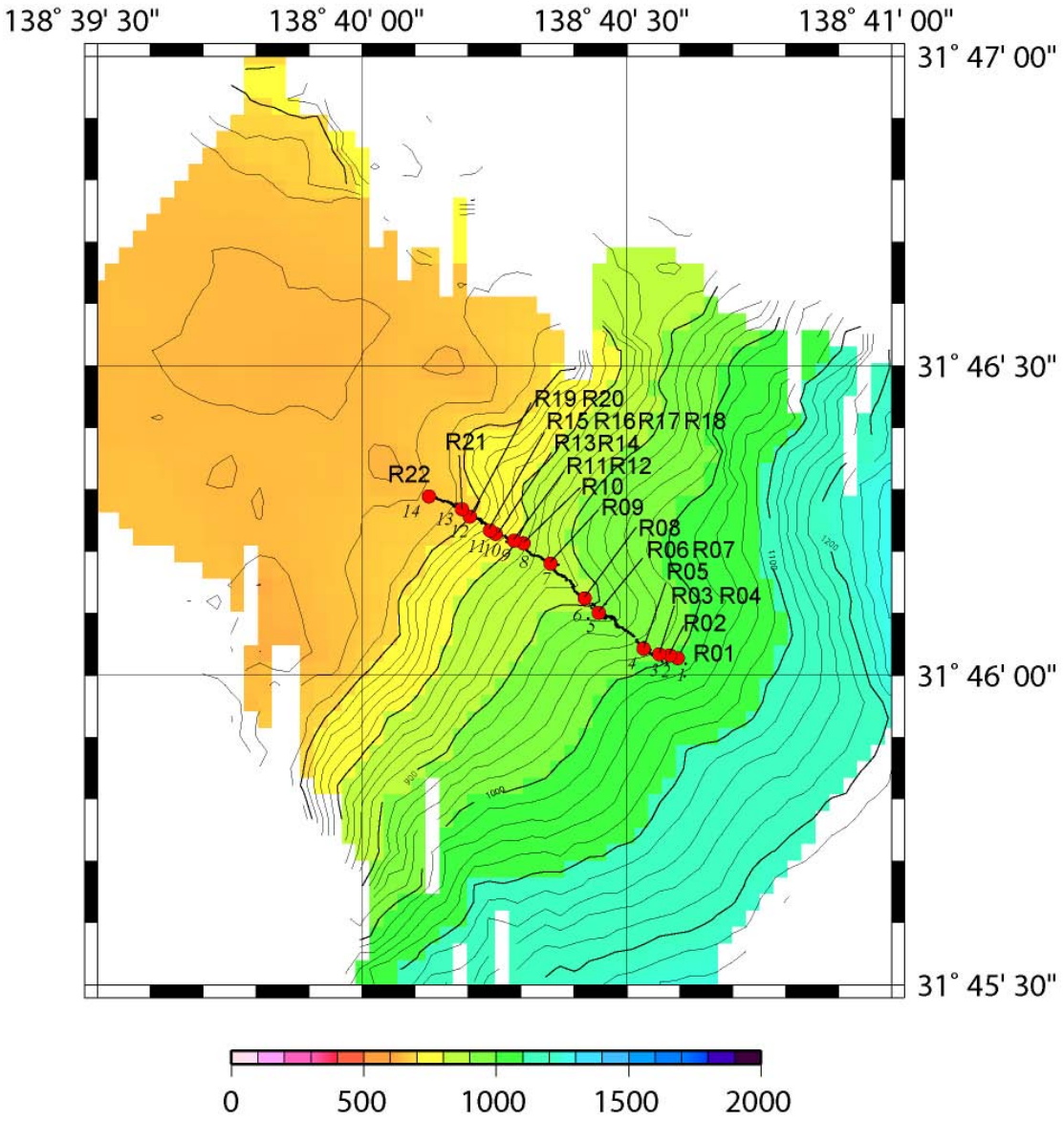
Dive Summary

Start: 31° 34.891’ N, 139° 08.683’ E (depth = 655 m)

Finish: 31° 34.724’ N, 139° 08.902’ E (depth = 428 m)

2.2.17 HD730 Dive

Hyper-Dolphin Dive: HD730



Date: 2007/07/29

Recorder: A. Nichols

Objective

We are now in the Manji seamount chain. Today we will dive on the westernmost seamount in the chain, known as Kanbun seamount. This morning's dive will be on its eastern slope, starting at a depth of 1015 m and ending on the flat-top summit at 635 m.

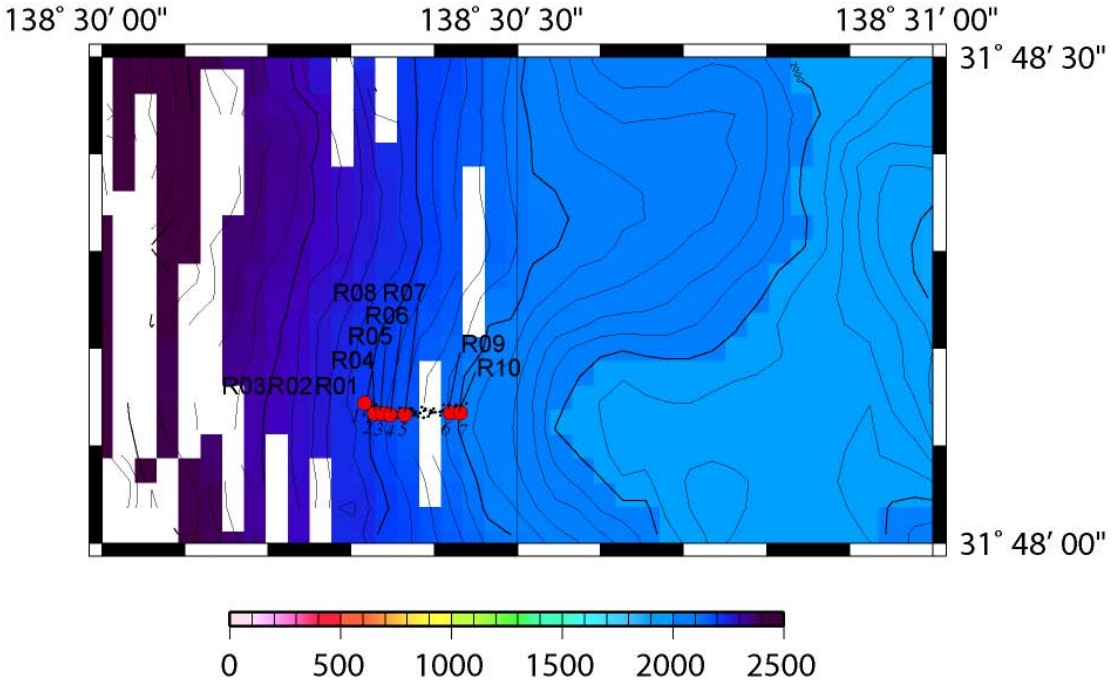
Dive Summary

Start: 31° 46.028' N, 138° 40.596' E (depth = 1035 m)

Finish: 31° 46.289' N, 138° 40.127' E (depth = 680 m)

2.2.18 HD731 Dive

Hyper-Dolphin Dive: HD731



Date: 2007/07/29

Recorder: A. Nichols

Objective

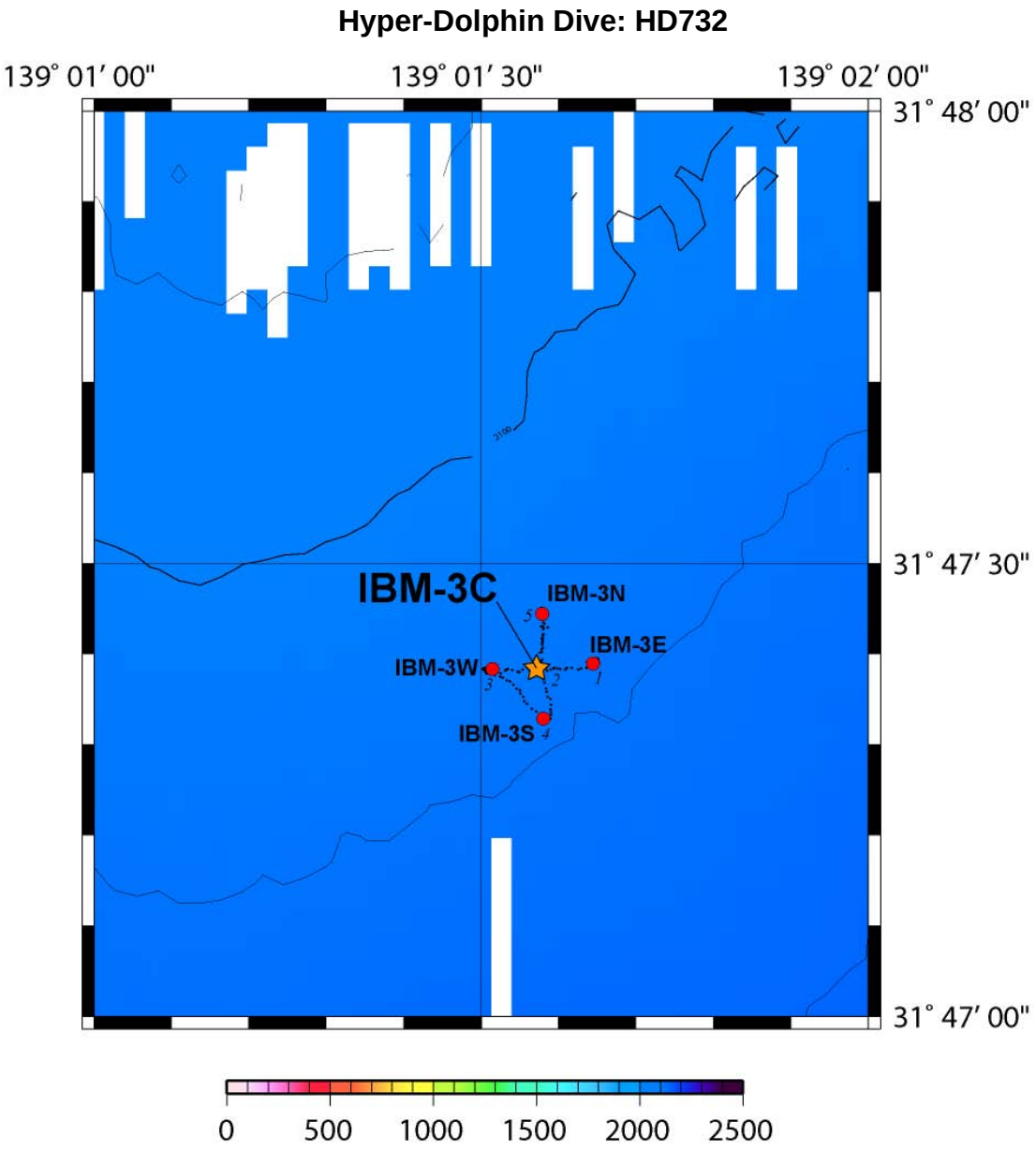
The afternoon dive will begin at 2220 m on the deeper section of west Kanbun seamount slope and move up to 1900 m.

Dive Summary

Start: 31° 48.144’ N, 138° 30.316’ E (depth = 2145 m)

Finish: 31° 48.134’ N, 138° 30.432’ E (depth = 2049 m)

2.2.19 HD732 Dive



Date: 2007/07/30

Recorder: A. Nichols

Objective

To measure the heat flow with the Stand-Alone Heat Flow probe (SAHF) at the site proposed for the IBM-3 drill site. Heat flow measurements will be conducted at 5 points, and sediment cores needed for thermal conductivity measurement will be taken at point 2.

Dive Summary

Point 1 (IBM-3E): 31° 47.390’ N, 139° 01.645’ E (depth = 2122 m)

Point 2 (IBM-3C): 31° 47.390’ N, 139° 01.572’ E (depth = 2120 m)

Point 3 (IBM-3W): 31° 47.384’ N, 139° 01.515’ E (depth = 2118 m)

Point 4 (IBM-3S): 31° 47.329’ N, 139° 01.581’ E (depth = 2122 m)

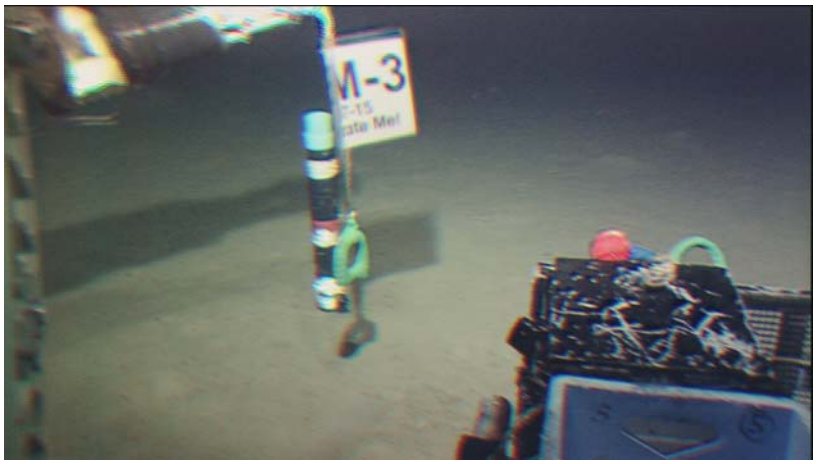
Point 5 (IBM-3N): 31° 47.445’ N, 139° 01.579’ E (depth = 2117 m)

At all 5 points initial inferences from data suggest that the heat flow is very low at the proposed IBM-3 drill site (IBM-3C, point 2). The water temperature ranged from 1.86 (points 1, 2, 3, and 4) to 1.88 °C (point 5). The top thermocouple in the sediment recorded the lowest temperature, 1.78 (points 1, 2, 3, and 4) to 1.80 °C (point 5). The bottom thermocouple, at a depth of about 0.42 m, measured the highest temperature, 1.87 (points 1, 2, 3, and 4) to 1.88 °C (point 5).

The uncertainty in the temperature recorded by the SAHF probe is 0.01 °C.

Video highlights (HD camera)

10:28 (2120 mbsl) SAHF measurement at point 2 (IBM-3C).



10:33 (2120 mbsl) Placing “IBM-3” marker at point 2 (IBM-3C).

Hyper Dolphin Dive HD732 Log (HD and CCD Camera)

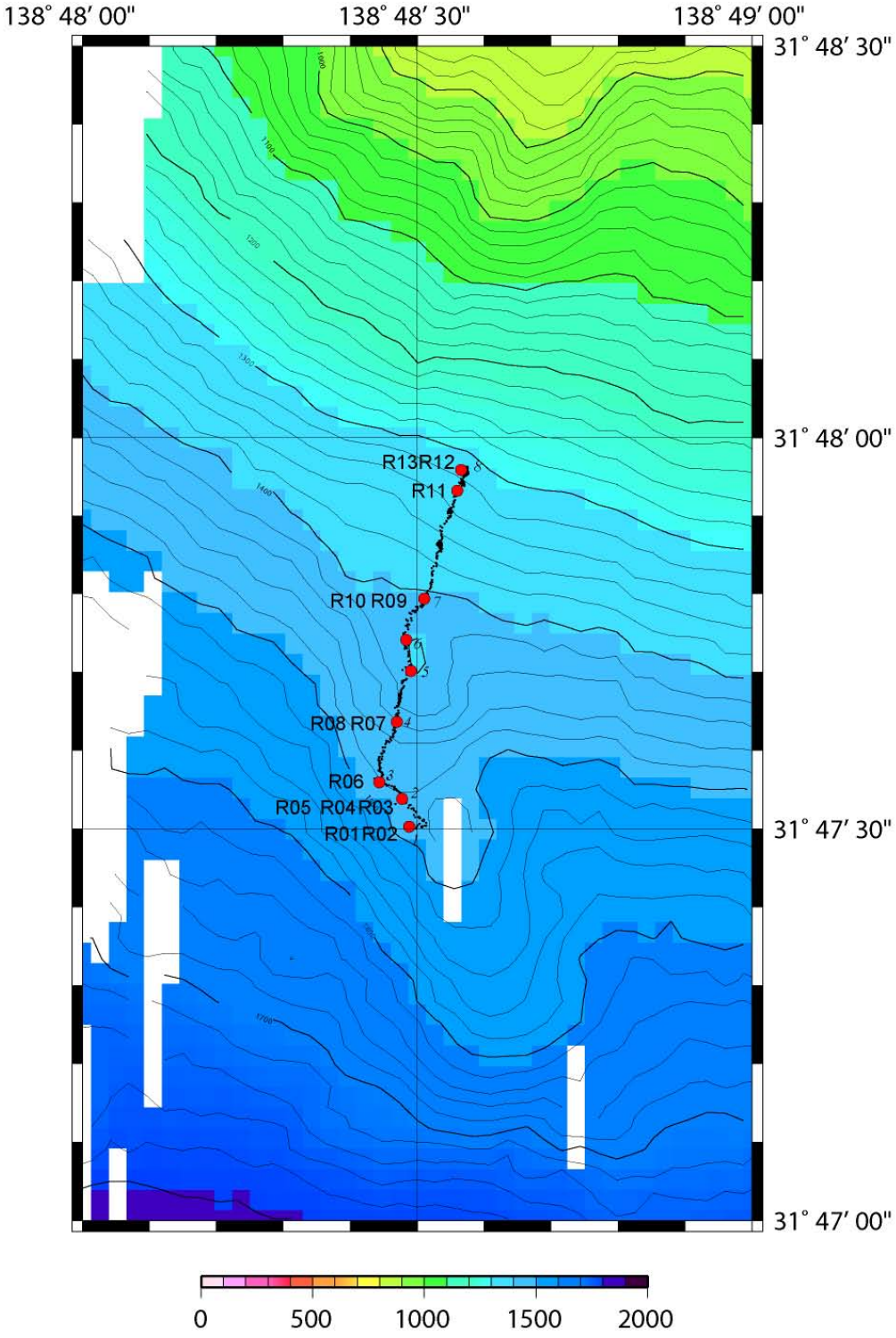
Time	Depth	Heading	Descriptions	Samples
08:06			Hyper Dolphin launched.	
09:54	2122	338	Landed on sandy sea floor at point 1. Dump ballast.	

Time	Depth	Heading	Descriptions	Samples
09:58	2122	338	Begin heat flow measurement at **point 1** by measuring water temperature for 5 minutes.	
10:03	2122	338	Start heat flow measurement in sediment at point 3 for 15 minutes. Probe easily penetrates soft sand. Particles suspended in seawater flowing left to right across camera view (from ~ 248°), at about 10 to 20 cm/s, indicating current flow.	
10:18	2122	338	Measurement complete. Head to point 2, main site.	
10:22	2120	269	Landed at **point 2**, start seawater measurement for 5 minutes. Particles suspended in seawater flowing towards camera (from ~ 269°), at about 10 to 20 cm/s.	
10:28	2120	269	Probe easily penetrates soft sediment. Start sediment heat flow measurement for 15 minutes.	
10:29	2120	269	Take sediment core with MBARI core sampler. Easily penetrates and full sample recovered.	HD732-S01
10:31	2120	269	Take sediment core with 2K-type corer. Easily penetrates and full sample recovered.	HD732-S02
10:33	2120	269	Place IBM-3 “penetrate” marker on sea floor. Trouble to get the sign positioned correctly.	
10:36	2120	269	Sign lying face down.	
10:38	2120	269	With the exception of what is in the ‘sea snow’, no obvious life seen as yet; no fish, not even a shrimp.	
10:44	2120	269	Heat flow measurement complete. Sign left lying face down! Heading to point 3.	
10:48	2118	282	Landed at **point 3**, start seawater measurement for 5 minutes. Particles suspended in seawater flowing towards camera (from ~ 281°), at about 10 to 20 cm/s. Fish swims past, very, very slowly, looks like some kind of eel.	
10:53	2118	281	Probe easily penetrates soft sediment. Start heat flow measurement in sediment for 15 minutes.	
10:55	2118	281	One stem-like creature growing out of the sediment.	
11:09	2118	282	Remove probe. Measurement complete. Move to point 4.	
11:13	2123	130	Landed at **point 4,** start seawater measurement for 5 minutes. Particles suspended in seawater flowing right to left across camera view (from ~ 309°), at about 10 to 20 cm/s.	
11:18	2123	130	Probe easily penetrates soft sediment. Start heat flow	

Time	Depth	Heading	Descriptions	Samples
			measurement in sediment for 15 minutes.	
11:30	2123	130	Another weird creature anchored to sea floor, looks like a light bulb.	
11:34	2123	130	Measurement complete. Remove probe. Move to point 5.	
11:37	2117	001	Moving through cloud of sediment.	
11:41	2117	001	Landed at **point 5,** start seawater measurement for 5 minutes. Particles suspended in seawater flowing left to right across camera view (from ~ 271°), at about 10 to 20 cm/s. Some sort of workings in the sand (visible on CCD camera), animal tracks?	
11:46	2117	001	Start heat flow measurement in sediment for 15 minutes. Probe easily penetrates soft sediment.	
11:50	2117	001	Hummocky sand in the distance, as far as the Hyper Dolphin's illumination penetrates.	
12:00	2117	001	Red shrimp swims past.	
12:02	2117	001	End of measurement and that concludes the dive.	
12:04	2117	001	Leave the floor.	

2.2.20 HD733 Dive

Hyper-Dolphin Dive: HD733



Date: 2007/07/30

Recorder: D. Dunkley / R. Fiske

Objective

Traverse N up southwestern slope of unnamed seamount in Manji seamount chain.

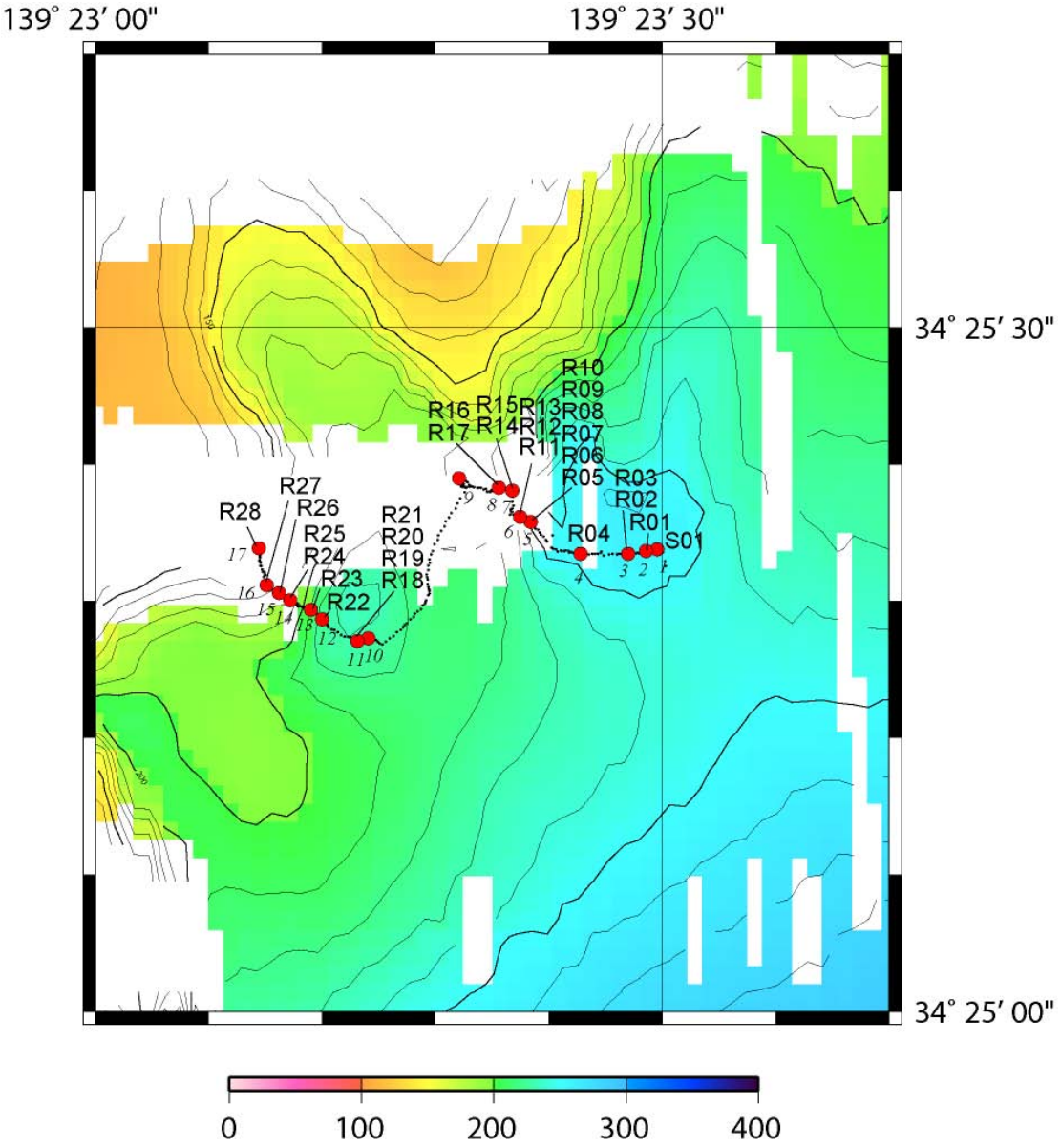
Dive Summary

Start: 31° 47.503’ N, 138° 48.488’ E (depth = 1472 m)

Finish: 31° 47.959’ N, 138° 48.566’ E (depth = 1300 m)

2.2.21 HD734 Dive

Hyper-Dolphin Dive: HD734



Date: 2007/07/31

Recorder: A. Nichols

Objective

In order to stay ahead of an approaching typhoon No. 5, we have returned to the Niijima-Uranose area. We will conduct another dive on the caldera structure that was discovered in the bathymetry we carried out in this area, and investigated in dives 716 and 717. In these dives we climbed the south-western and eastern caldera walls, respectively. This time we will conduct two traverses of the north wall, with a transit in between. Firstly, we will climb north-westwards up the slopes of a knoll in the crater wall from 255 m to 125 m. We will then drop to the bottom, 225 m, of another knoll, to the south, and climb north-westwards once more, to 118 m.

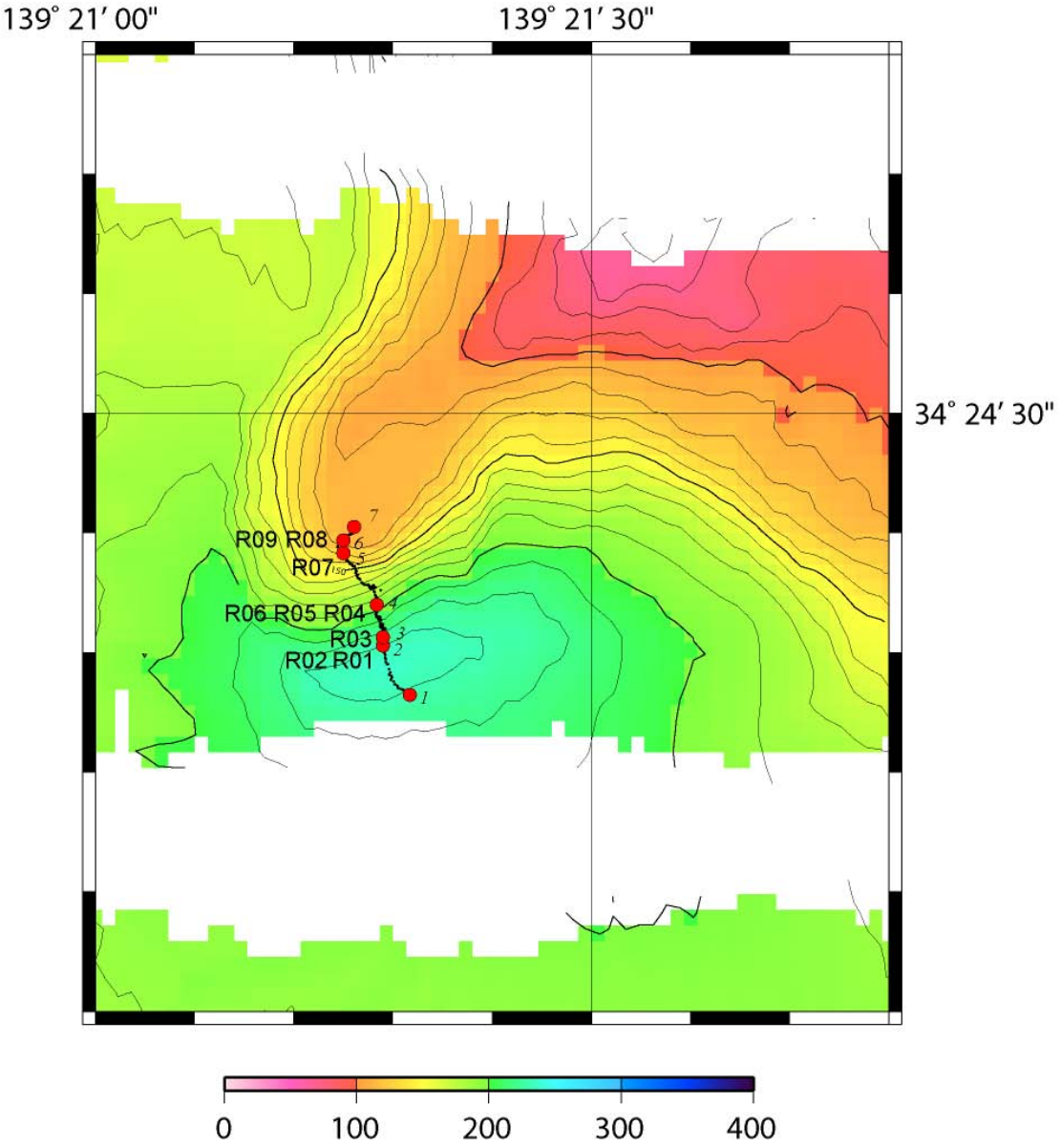
Dive Summary

Start: 34° 25.338’ N, 139° 23.496’ E (depth = 247 m)

Finish: 34° 25.339’ N, 139° 23.144’ E (depth = 140 m)

2.2.22 HD735 Dive

Hyper-Dolphin Dive: HD735



Date: 2007/07/31

Recorder: A. Nichols

Objective

One last dive in the Niijima-Uranose area. Will traverse southwest extending ridge of Uranose from 220 to 110 m. We tried to dive on this slope on July 19 at the beginning of Dive HD714, but it had to be shifted to a shallower zone owing to the strong current while launching the Hyper Dolphin. We hope that the current is not so strong this time and in the deeper water the biogenic cover is thinner.

Dive Summary

Start: 34° 24.265’ N, 139° 21.317’ E (depth = 221 m)

Finish: 34° 24.405’ N, 139° 21.261’ E (depth = 105 m)

3. Notice on using this cruise report

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