



R/V *Yokosuka* Cruise Report
YK13-14

AUV survey for seafloor massive sulfide deposits
Okinawa Trough
Dec. 16 – Dec. 31, 2013



Japan Agency for Marine-Earth Science and Technology
(JAMSTEC)

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1. Cruise Information

- Cruise ID YK13-14
- Name of vessel R/V *Yokosuka*
- Title of the cruise AUV survey for seafloor massive sulfide deposits
- Chief scientist Hideaki MACHIYAMA (JAMSTEC)
- Representative of the Science Party Kentaro NAKAMURA (JAMSTEC)
- Cruise period Dec. 16 – Dec. 31, 2013
- Ports of call Naha (Okinawa Pref.) to Harumi (Tokyo Metro.)
- Research area Iheya – Izena Zone, Okinawa Trough
- Research Map (Fig. 1)

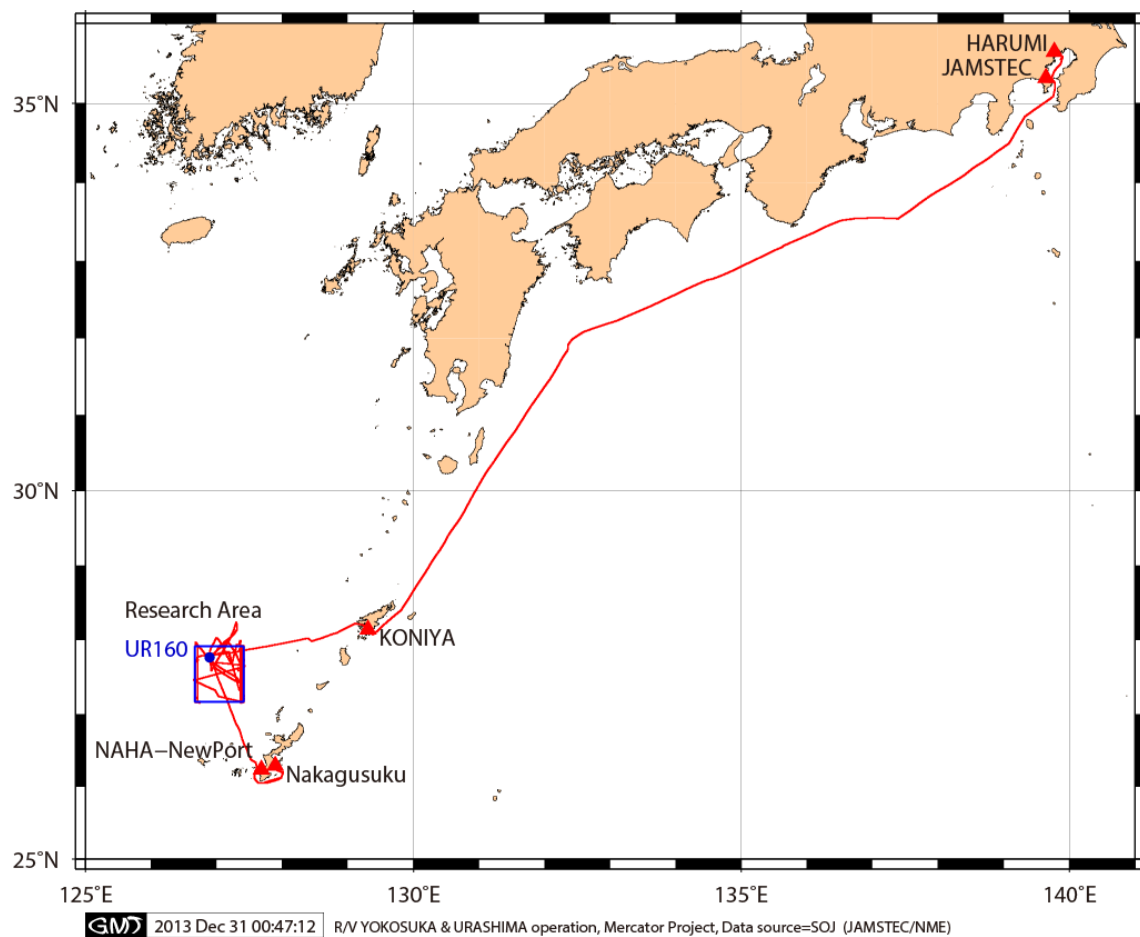


Figure 1 Ship track of YK13-14 Cruise.

2. Researchers

- Chief scientist Hideaki MACHIYAMA (JAMSTEC)
- Representative of the Science Party Kentaro NAKAMURA (JAMSTEC)
- List of Participants

Researchers (Onboard)

Hideaki Machiyama	JAMSTEC
Shinsuke Kawaguchi	JAMSTEC
Kazuya Kitada	JAMSTEC
Yuka Masaki	JAMSTEC
Masayuki Toizumi	Nippon Marine Enterprises, LTD
Mitsuteru Kuno	Nippon Marine Enterprises, LTD

Researchers (Onshore)

Kentaro NAKAMURA	JAMSTEC
Hidenori KUMAGAI	JAMSTEC
Ken TAKAI	JAMSTEC
Yuta KONNO	JAMSTEC
Miho ASADA	JAMSTEC
Takafumi KASAYA	JAMSTEC
Yoshiro NISHIO	JAMSTEC
Koichi IJIMA	JAMSTEC
Jun-ichiro ISHIBASHI	JAMSTEC/Kyushu Univ.
Hiroyuki YAMAMOTO	JAMSTEC
Kei OKAMURA	Kochi Univ.
Fujio YAMAMOTO	JAMSTEC

R/V YOKOSUKA Crew List

Shinya Ryono	Captain
Naoto Kimura	Chief Officer
Takeshi Egashira	2nd Officer
Hiroharu Omae	3rd Officer
Eiji Sakaguchi	Chief Engineer
Kazunori Noguchi	1st Engineer
Daisuke Gibu	2nd Engineer
Kota Kataoka	3rd Engineer
Masamoto Takahashi	Chief Electronics Operator
Hiroki Ishiwata	2nd Electronics Operator

Ryosuke Komatsu	3rd Electronics Operator
Kozo Yatogo	Boat Swain
Kazumi Ogasawara	Able Seaman
Jiro Hanazawa	Able Seaman
Daisuke Yanagitani	Able Seaman
Sho Suzuki	Sailor
Shinya Kojima	Sailor
Kazuho Ikeda	Sailor
Mori Junji	No.1 Oiler
Kazuo Sato	Oiler
Shinya Sugi	Oiler
Tatsuomi Chino	Oiler
Toshinori Matsui	Oiler
Ryuei Takemura	Chief Steward
Shinsuke Tanaka	Steward
Toru Murakami	Steward
Masanao Kunita	Steward
Mizuki Nakano	Steward

URASHIMA Operation Team

Toshiaki Sakurai	Operation Manager
Shinobu Omika	1st Submersible Staff
Akihisa Ishikawa	2nd Submersible Staff
Takuma Onishi	2nd Submersible Staff
Yudai Sakakibara	2nd Submersible Staff
Ryo Saigo	2nd Submersible Staff
Ryu Asai	2nd Submersible Staff
Yudai Tayama	3rd Submersible Staff

3. Observation

- Summary

The purpose of this cruise is to clarify how many hydrothermal activities are present in the Iheya – Izena Zone, Mid-Okinawa Trough. We planned AUV *Urashima* diving surveys for high-resolution bathymetry and hydrothermal plume mapping using multi-beam echo sounder (MBES), side scan sonar, sub-bottom profiler, and other sensors (such as magnetometers, ORP, and turbidity).

Due to bad sea conditions, only one diving survey (Dive #160) was carried out at the middle to southern part of the Iheya Knoll. The result of AUV survey suggests the presence of several new hydrothermal vent sites at this area.

Regional geophysical survey by R/V *Yokosuka* was also carried out in this area.

- AUV *Urashima* dive

For the AUV survey, besides the standard acoustic apparatus on *Urashima* (i.e. SeaBat7125 MBES, Edgetech2000M Side Scan Sonar/Sub Bottom Profiler), following equipments were applied fluxgate magnetometer as the payload.

Three-axis flux gate magnetometers were mounted in the payload space on the *Urashima*. They were still under development as a fundamental tool for seafloor resource study (under a project funded by MEXT); then, their details will be reported elsewhere. One of three was attached to the head part of AUV in the syntactic from buoyancy medium, and other two were to the port and starboard side of the payload space. Appendix A shows the description of the magnetometer. Interpretation will be performed afterwards.

Dive information

Bathymetric and side scan data were collected in the survey area. Table 1 is the log of *Urashima* survey. Fig. 2 shows the track lines of *Urashima* survey. Interpretation will be performed afterwards.

Table 1 Log of AUV *Urashima* survey (Dive #160).

Date	Dec. 25, 2013					
Area	Iheya-North knoll, Okinawa Trough					
Time (LTC)	Description	Acoustic navigation (AUV)		Acousitic position (vessel)		Urashim a Depth
		Latitude	Longitude	Latitude	Longitude	
7:48	Urashima on surface			27_46.7630N	126_54.0701E	Z=
7:51	Start Dive	27_46.7981N	126_54.1323E	27_46.8446N	126_54.1834E	Z=65
8:17	Position up	27_46.9679N	126_54.4894E	27_46.9429N	126_54.3637E	Z=589
8:44	Start Line (1→2)	27_46.9915N	126_54.3206E	27_46.9297N	126_54.4037E	Z=980
9:16	End Line (1→2)	27_45.7049N	126_54.2977E	27_45.6369N	126_54.3767E	Z=889
9:22	Start Line (3→4)	27_45.7080N	126_54.2350E	27_45.7329N	126_54.3371E	Z=917
9:54	End Line (3→4)	27_47.0067N	126_54.1648E	27_46.9696N	126_54.3486E	Z=960
9:56	Start Line (5→6)	27_46.9506N	126_54.1581E	27_47.0498N	126_54.3424E	Z=977
10:27	End Line (5→6)	27_45.6877N	126_54.1460E	27_45.7023N	126_54.2510E	Z=964
10:32	Start Line (7→8)	27_45.6972N	126_54.0740E	27_45.8032N	126_54.1864E	Z=1004
11:05	End Line (7→8)	27_47.0082N	126_54.0552E	27_46.9916N	126_54.1539E	Z=1017
11:08	Start Line (9→10)	27_46.9914N	126_53.9717E	27_47.0217N	126_54.0347E	Z=993
11:45	End Line (9→10)	27_45.6907N	126_53.9792E	27_45.7193N	126_54.1017E	Z=954
11:48	Start Line (11→12)	27_45.7081N	126_53.9038E	27_45.7315N	126_54.0097E	Z=990
12:18	End Line (11→12)	27_47.0033N	126_53.8791E	27_47.0107N	126_53.9394E	Z=992
12:22	Start Line (13→14)	27_47.0006N	126_53.8149E	27_46.9786N	126_53.8627E	Z=973
12:57	End Line (13→14)	27_45.6930N	126_53.8059E	27_45.6872N	126_53.9220E	Z=877
13:01	Start Line (15→16)	27_45.6978N	126_53.7223E	27_45.7782N	126_53.8526E	Z=934
13:32	End Line (15→16)	27_47.0118N	126_53.7247E	27_47.0531N	126_53.8040E	Z=979
13:35	Start Line (17→18)	27_46.9953N	126_53.6519E	27_47.0339N	126_53.7441E	Z=993
14:09	End Line (17→18)	27_45.7012N	126_53.6549E	27_45.7740N	126_53.5566E	Z=969
14:19	Start Line (19→20)	27_45.8096N	126_53.7170E	27_45.7855N	126_53.6960E	Z=969
14:37	End Line (19→20)	27_46.2523N	126_54.3903E	27_46.2029N	126_54.3739E	Z=892
14:39	Start Line (21→22)	27_46.3195N	126_54.4187E	27_46.2497N	126_54.3650E	Z=904
14:41	drop weights					

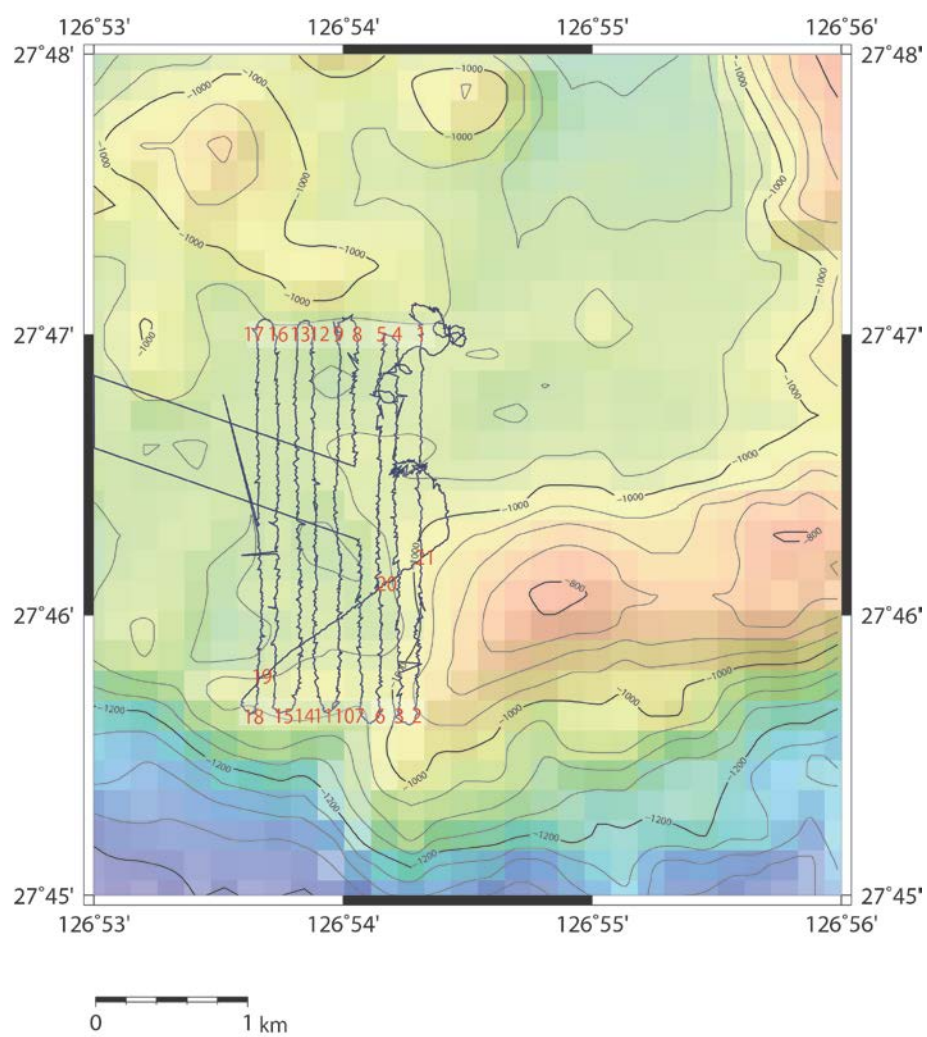


Figure 2 AUV survey track in *Urashima* Dive#160.

- Shipboard geophysical survey

During this cruise, geophysical survey, such as bathymetry, gravity, and magnetics data, were collected. Table 2 shows the track line list of geophysical survey data. Figure 3 shows the track lines of the survey.

Table 2 Track line list of geophysical survey.

Line Number	Time(UTC)		(UTC)	
	Start(Latitude • Longitude)		End (Latitude • Longitude)	
Line23	2013/12/22	08:20	2013/12/22	15:06
	27-54.9968N	127-21.6861E	27-10.0139N	127-21.7058E
Line24	2013/12/22	15:31	2013/12/22	17:15
	27-09.9962N	127-23.3084E	27-23.6537N	127-23.3489E
Pre survey for Dive160	2013/12/22	21:25	2013/12/22	21:33
	27-46.1417N	126-53.3354E	27-46.1311N	126-54.5522E
Line4	2013/12/23	03:08	2013/12/23	09:03
	27-55.0020N	127-42.8508E	27-09.8966N	126-40.6993E
Line3	2013/12/23	10:09	2013/12/23	12:31
	27-09.9067N	126-40.6993E	27-27.7554N	126-40.7222E
Line-EW2	2013/12/23	12:50	2013/12/23	18:02
	27-27.4224N	126-39.5938E	27-38.5314N	127-25.1888E
Line26	2013/12/24	02:11	2013/12/24	06:52
	27-50.1370N	127-11.4720E	27-19.9209N	127-20.5183E
Line24-2	2013/12/24	07:22	2013/12/24	13:05
	27-22.4092N	127-23.3070E	27-55.0519N	127-23.3638E
Line25	2013/12/24	13:21	2013/12/24	17:45
	27-55.1442N	127-25.0035E	27-24.5093N	127-24.9818E
Line A1	2013/12/25	13:13	2013/12/25	13:50
	27-30.1076N	127-22.5064E	27-25.0154N	127-22.5242E
Line A2	2013/12/25	14:57	2013/12/25	15:34
	27-24.9526N	127-24.1685E	27-30.0589N	127-24.1859E
Line25-2	2013/12/25	16:16	2013/12/25	18:33
	27-25.1316N	127-24.9907E	27-09.9834N	127-25.0245E
Line3-2	2013/12/25	22:15	2013/12/26	00:03
	27-26.7113N	126-40.7748E	27-41.2652N	126-40.7195E

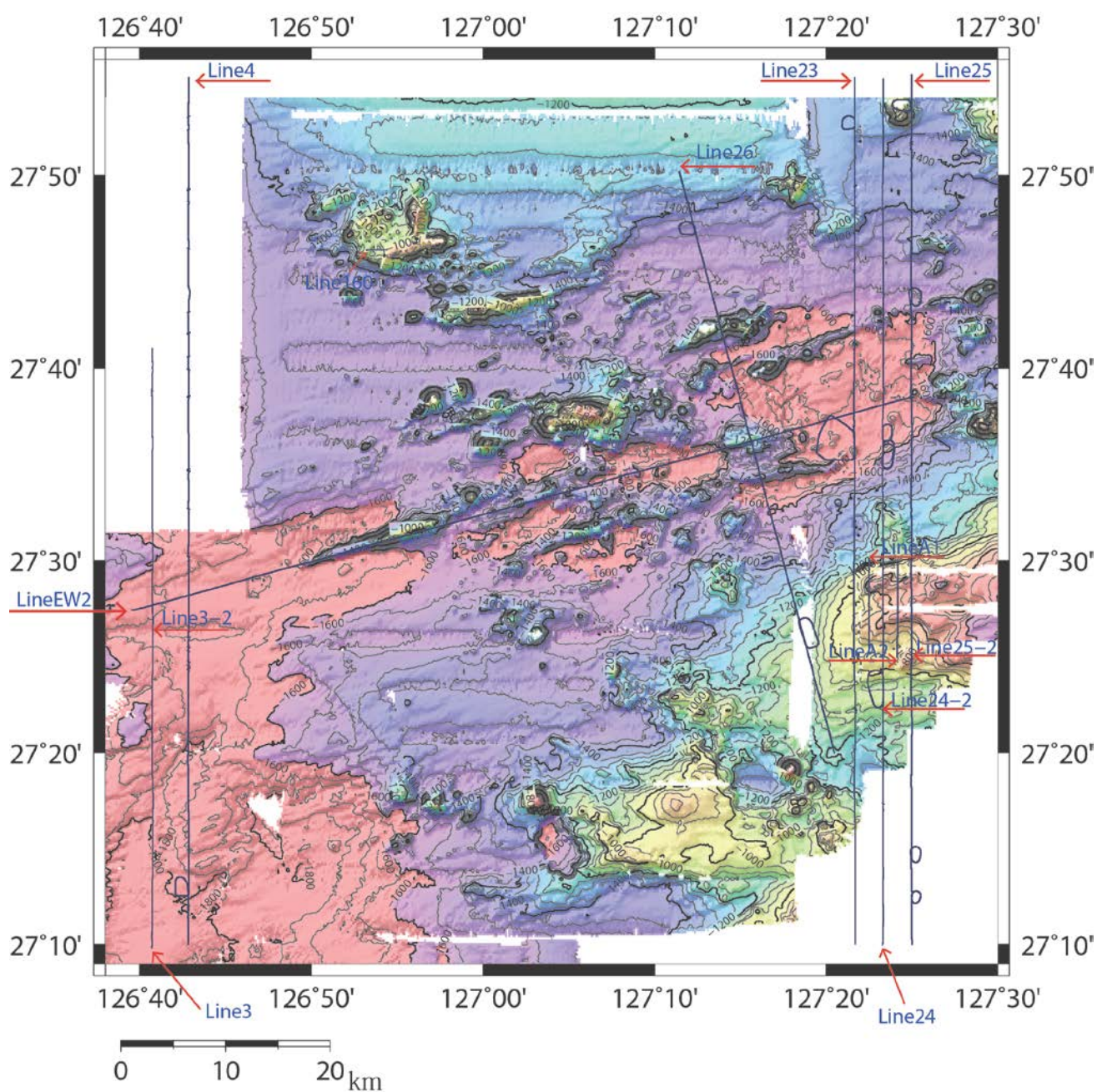


Figure 3 Track lines of the geophysical survey.

● Cruise log

Date	Local Time	Note	Position/Weather/Wind/Sea condition
16-Dec-13		Sail out, proceeding to research area	12/16 12:00 (UTC+9h)
	11:00-11:30	Briefing about ship's life and safety	26-14.2'N, 127-40.8'E
	12:15	Boarded at NAHA New port.	NAHA new port
	13:00	Let go all shore line, left NAHA for NAKAGUSUKU wan.	o (Overcast (cloud 10))
	17:10	Arrived at NAKAGUSUKU want, then stopped engine & commenced drifting.	SE-4 (Moderate breeze)
			2 (Sea smooth)
			0 (No swell)
			Visibly: 8'
17-Dec-13		Avoided rough sea at Nakagusuku wan.	12/17 12:00 (UTC+9h)
	10:00-10:30	Meeting (Urashima team and Scientist).	26-17.5'N, 127-53.6'E
			Nakagusuku wan
			r (Rain)
			South-6 (Strong breeze)
			4 (Moderate)
			1 (Low swell Short or Average)
			Visibly: 8'
18-Dec-13		Avoided rough sea at Nakagusuku wan. "URASHIMA" Operation test.	12/18 12:00 (UTC+9h)
	09:40-11:20	"URASHIMA" operation test into the seawater.	26-17.5'N, 127-53.6'E
			Nakagusuku wan
			c (Cloudy)
			SW-5 (Fresh breeze)
			3 (Sea slight)
			1 (Low swell Short or Average)
			Visibly: 8'
19-Dec-13		Avoided rough sea at Nakagusuku wan.	12/19 12:00 (UTC+9h)
			26-17.5'N, 127-53.6'E
			Nakagusuku wan
			bc (Fine but Cloudy)
			North-3 (Gentle breeze)

Date	Local Time	Note	Position/Weather/Wind/Sea condition
			2 (Sea smooth)
			2 (Long swell Long)
			Visibly: 8'
20-Dec-13		Proceeded to research area.	12/20 12:00 (UTC+9h)
	06:00	Left Nakagusuku wan, proceed to research area.	26-27.0°N, 127-30.0°E
			North-northwest of Naha
			bc (Fine but Cloudy)
			NNW-6 (Strong breeze)
			5 (Rough)
			4 (Moderate Average)
			Visibly: 8'
21-Dec-13		Arrived at research area and Drifting.	12/21 12:00 (UTC+9h)
	05:30	Arrived at research area.	27-59.6°N, 127-09.0°E
		Released XBT at <39-25.6815°N, 142-17.2404°E>	IHEYA/IZENA area
			o (Overcast (cloud 10))
			East-6 (Strong breeze)
			5 (Rough)
			4 (Moderate Average)
			Visibly: 8'
22-Dec-13		Geophysical survey.	12/22 12:00 (UTC+9h)
	05:30	Arrived at research area.	27-43.7°N, 127-14.9°E
	16:00	Deployed proton magnetometer.	IHEYA/IZENA area
	17:20	Commenced Geophysical survey.	bc (Fine but Cloudy)
		[MBES, SBP, gravity, Three components and proton magnetometer]	North-5 (Fresh breeze)
			5 (Rough)
			4 (Moderate Average)
			Visibly: 8'
23-Dec-13		Geophysical survey.	12/23 12:00 (UTC+9h)
	02:15	Finished Geophysical survey.	27-55.9°N, 126-42.9°E
	06:06	Recovered proton magnetometer.	IHEYA/IZENA area
		Arrived at research area.	c (Cloudy)
	06:25-06:35	MBES mapping survey for "URASHIMA" dive.	North-5 (Fresh breeze)
	11:09-11:29	8-figure tracking for magnetometer.	5 (Rough)

Date	Local Time	Note	Position/Weather/Wind/Sea condition
	11:33	Deployed proton magnetometer.	3 (Low swell long)
	12:08	Commenced Geophysical survey.	Visibly: 8'
	18:15-18:35	8-figure tracking for magnetometer.	
24-Dec-13		Geophysical survey.	12/24 12:00 (UTC+9h)
	03:02	Finished Geophysical survey.	27-44.1'N, 127-13.3'E
	06:06	Recovered proton magnetometer.	IHEYA/IZENA area
		Arrived at research area.	o (Overcast (Cloud 10))
	09:52	Deployed proton magnetometer.	North-5 (Fresh breeze)
	11:11	Commenced Geophysical survey.	4 (Sea Moderate)
			3 (Low swell long)
			Visibly: 8'
25-Dec-13		"URASHIMA" operation and Geophysical survey.	12/25 12:00 (UTC+9h)
	02:45	Finished Geophysical survey.	27-46.0'N, 126-54.0'E
	06:09	Recovered proton magnetometer.	IHEYA/IZENA area
		Arrived at research area.	c (Cloudy)
	07:51	Lunched "AUV-URASHIMA".[#160]	NE-4 (Moderate breeze)
	08:05	URASHIMA tracked 8-figure for magnetometer [500m].	3 (Sea Slight)
	08:36	Commenced "AUV-URASHIMA" operation.	3 (Low swell long)
	14:42	Left the sea bottom [896m].	Visibly: 8'
	15:16	Refloated "AUV-URASHIMA".	
	15:51	Finished "AUV-URASHIMA" operation.	
	16:33	Deployed proton magnetometer.	
	22:13	Commenced Geophysical survey.	
26-Dec-13		Geophysical survey.	12/26 12:00 (UTC+9h)
	03:33	Finished Geophysical survey.	27-49.7'N, 127-13.9'E
	07:15	Deployed proton magnetometer.	IHEYA/IZENA area
	09:03	Geophysical survey.	o (Overcast Cloud 10)
	11:00	Finished the operation and proceeded to KONIYA.	North-7 (Near gale)
	21:10	Arrived at KONIYA gulf, then stopped engine & commenced drifting.	5 (Sea Rough)
			4 (Moderate Average)
			Visibly: 8'
27-Dec-13		Avoided for rough sea at KONIYA & a part of scientists disembarked	12/27 12:00 (UTC+9h)

Date	Local Time	Note	Position/Weather/Wind/Sea condition
	09:00	A part of scientists disembarked by boat.	28-08.3'N, 129-18.3'E
			KONIYA-gulf
			r (Rain)
			NW-7 (Bear gale)
			4 (Sea Moderate)
			2 (No swell)
			Visibly: 8'
28-Dec-13		Some crew disembarked & proceeding to HARUMI port.	12/28 12:00 (UTC+9h)
	08:30	A part of UR-Team & Marine technician disembarked by boat.	28-26.8'N, 129-50.7'E
	09:00	Left KONIYA gulf, proceed to KEIHIN port [HARUMI].	Off Eastward of Amamioshima
			c (Cloudy)
			NW-6 (Strong breeze)
			5 (Sea Rough)
			4 (Moderate Average)
			Visibly: 8'
29-Dec-13		Proceeding to HARUMI port.	12/29 12:00 (UTC+9h)
	08:10-08:29	8-figure tracking for magnetometer.	32-22.5'N, 133-29.8'E
	23:40	Commenced 8-figure tracking for magnetometer.	Off Ashizuri-knoll
			c (Cloudy)
			NW-6 (Strong breeze)
			5 (Sea Rough)
			3 (Moderate Short)
			Visibly: 8'
30-Dec-13		Proceeding to HARUMI port.	12/30 12:00 (UTC+9h)
	00:01	Finished 8-figure tracking for magnetometer.	32-12.0'N, 134-51.0'E
	20:00	Arrived at TOKYO bay, then stopped engine & commenced drifting.	Off Kamiko-motojima
			bc (Fine but Cloudy)
			North-8 (Gale)
			6 (Sea Very rough)
			4 (Moderate Average)
			Visibly: 8'
31-Dec-13		Disembarked at HARUMI port	

Date	Local Time	Note	Position/Weather/Wind/Sea condition
	08:30	Left TOKYO bay, proceed at HARUMI port.	
	10:00	Disembarked at HARUMI port	

Notice on Using

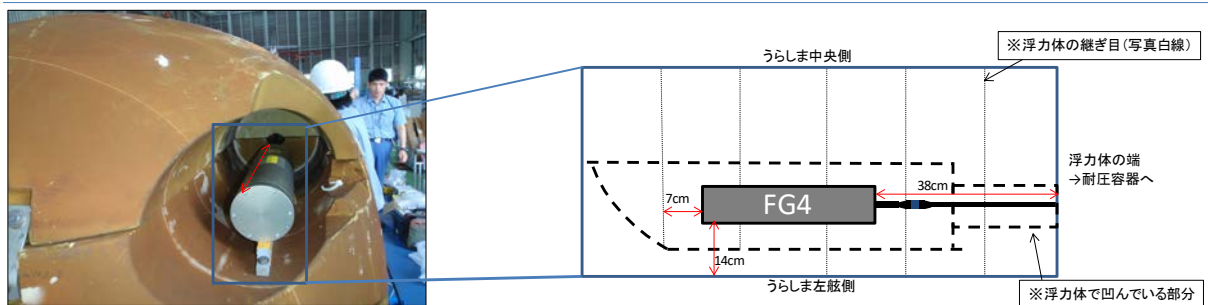
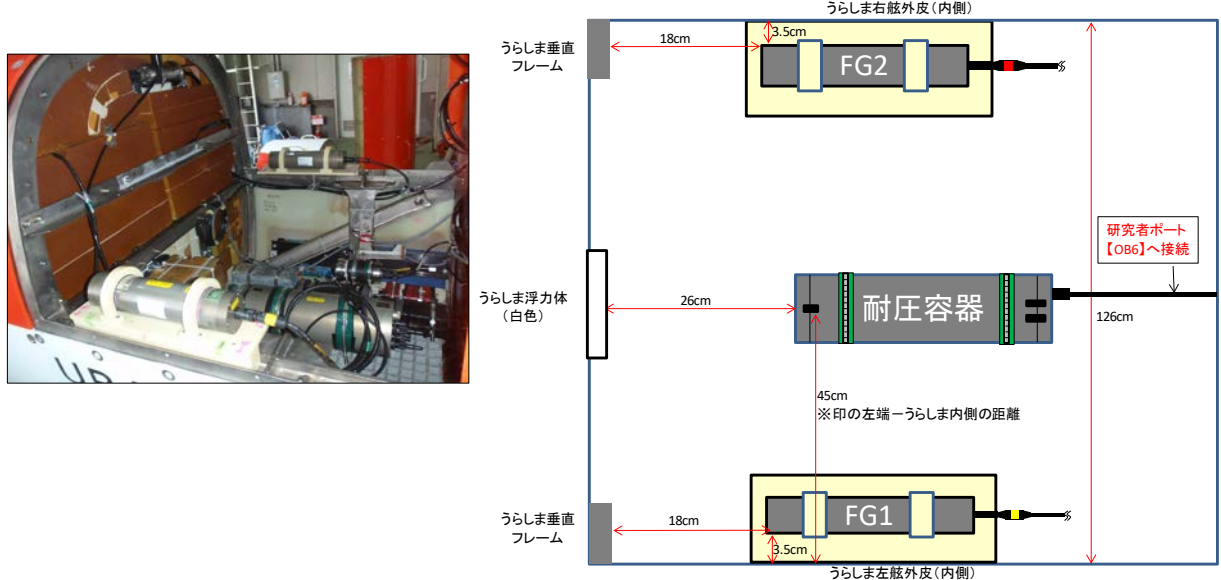
This cruise report is a preliminary documentation as of the end of the cruise. This report may not be corrected even if changes on contents (i.e. taxonomic classifications) may be found after its publication. This report may also be changed without notice. Data on this cruise report may be raw or unprocessed. If you are going to use or refer to the data written on this report, please ask the Chief Scientist for latest information.

Users of data or results on this cruise report are requested to submit their results to the Data Management Group of JAMSTEC.

Appendix A

General description of Three-axis flux gate magnetometers.

FG三成分磁力計 取り付け位置: YK13-22航海



FG3成分磁力計

