



R/V Kairei Cruise Report

KR13-05

Cruising project using a deep-sea ROV with the mass
media chosen through an open and competitive process
in the Japan Trench

Feb. 22, 2013 - Feb. 26, 2013

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

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1. Cruise Information

- Cruise ID: KR13-05
- Name of vessel: R/V KAIREI
- Title of the cruise: Cruising project using a deep-sea ROV with the mass media
chosen through an open and competitive process
- Title of proposal: Cruising project using a deep-sea ROV with the mass media (TV
station) chosen through an open and competitive process
- Cruise period: 22 February 2013 – 26 February 2013
- Ports of call: Shiogama, Sendai – Yokosuka, JAMSTEC
- Research area: Japan Trench

● Research Map:

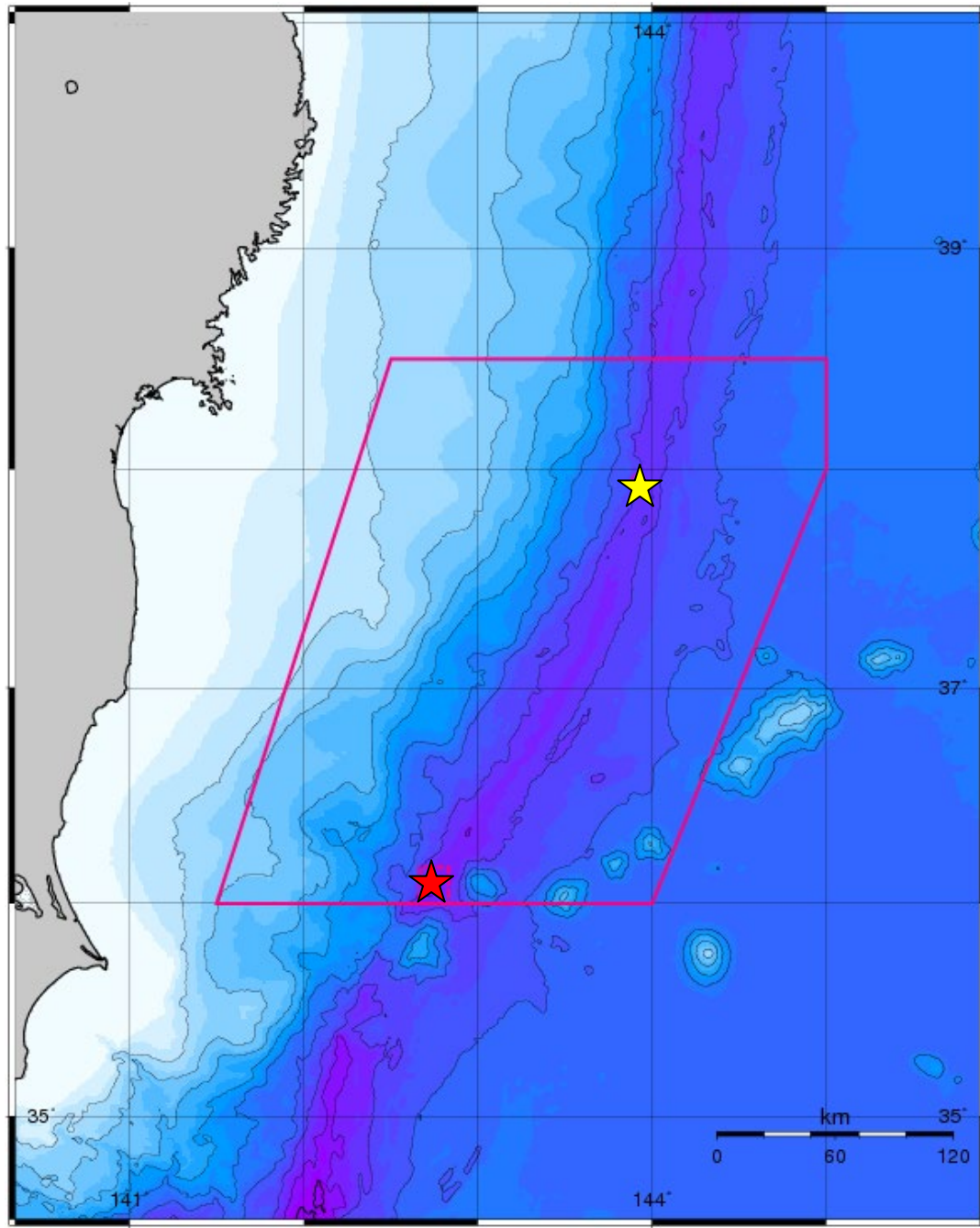


Fig. 1: Research map

The yellow star indicates the diving site of KAIKO 7000II, which is located at latitude 37°56'79.43" north and longitude 143°54'98.19" east and at a depth of 6,969.3 meters. The red star indicates the area we planned to install a mooring system for collection of hadal amphipods closely related to *Hirondellea gigas* - the area lying between latitude 36°00' and 36°10' north and longitude 142°40' and 142°50' east.

2. Researchers

- Chief scientist: Toru Nishikawa (JAMSTEC)
- Representative of the science party: Kyohiko Mitsuzawa (JAMSTEC)
- Science party:

Onboard Scientists

KAORI KURUSHIMA	TBS
NORIYUKI HASUMI	TBS
MASAKAZU FUKUSHIMA	TBS
YURIKO SHIINO	TBS
KIHACHI HASEBE	JAMSTEC
SHUICHI KODAIRA	JAMSTEC
TAKAFUMI KASAYA	JAMSTEC
HIDETO TAKAMI	JAMSTEC
HIDEKI KOBAYASHI	JAMSTEC
WATARU ARAI	JAMSTEC
HISAKO IMAMURA	JAMSTEC
MIREI YAMAMOTO	JAMSTEC
KIYOSHI OTSUKA	JAMSTEC

Marine Technician

IKUMASA TERADA	Nippon Marine Enterprises, LTD.
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ROV KAIKO 7000II operation team

Operation Manager	ATSUMORI MIURA
2 nd ROV Operator	KIYOSHI TAKISHITA
2 nd ROV Operator	TOMOE KONDO
2 nd ROV Operator	TETSUYA ISHIZUKA
2 nd ROV Operator	ATSUSHI TAKENOUCHI
2 nd ROV Operator	SEIJI SHIGETAKE
3 rd ROV Operator	RYU ASAI
3 rd ROV Operator	TAKUMA GOTO

R/V KAIREI Officers and Crew

Captain	MASAYOSHI ISHIWATA
Chief Officer	HIROYUKI KATO

2nd Officer	MOTOI KATSUMATA
3rd Officer	YUKI DEGURA
Chief Engineer	TADASHI ABE
1st Engineer	KAZUNORI NOGUCHI
2nd Engineer	TAKAHIRO MORI
3rd Engineer	KOTA KATAOKA
Chief Electronics Operator	TOKINORI NASU
2nd Electronics Operator	MICHIYASU KATAGIRI
3rd Electronics Operator	TAKAYUKI MABARA
Boat Swain	TADAHIKO TOGUCHI
Able Seaman	YASUO KONNO
Able Seaman	YUKI YOSHINO
Able Seaman	HIROAKI MURASE
Sailor	SHUN ABE
Sailor	SHUN MIURA
Sailor	YASUNOBU KAWABE
Sailor	SHINYA KOJIMA
No.1 Oiler	HIROYUKI OISHI
Oiler	KAZUO SATO
Oiler	SHINYA SUGI
Oiler	MASANORI UEDA
Assistant Oiler	SHOTARO SUMITOMO
Chief Steward	TERUYUKI YOSHIKAWA
Steward	YOSHINOBU HASATANI
Steward	TORU WADA
Steward	KIYOTAKA KOSUJI
Steward	KANA YUASA

3. Observation

- (1) Cruising project using a deep-sea ROV with the mass media (TV station) chosen through an open and competitive process

The cruising was made to introduce and explain JAMSTEC's scientific objectives and highly-advanced facilities such as research vessels and vehicles in layman's terms in a series of TV programs widely known among the public, and thereby contribute to JAMSTEC PR activities.

Based on the proposal of Tokyo Broadcasting System (TBS) which had been chosen through an open and competitive process, KAIKO 7000II dived once in the Japan Trench at a site off Miyagi Prefecture which was located at latitude 37°56'79" north and longitude 143°54'98" east and at a depth of about 6,900 meters in order to observe the seafloor topography and collect an ocean bottom seismometer installed in the deep sea. Topographic changes were successfully observed around the seafloor, which we consider had made by the 2011 Great East Japan Earthquake and its aftershocks. As for the ocean bottom seismometer (OBS_JF1), unfortunately we could not find it despite intensive searching.

The seafloor we observed can be broadly categorized into the following three types. We have an assumption that the type of seabed topography depends on the slope angle of the seafloor.

Type A: Smooth seafloor – in gently slope areas

Type B: Seafloor where cracks and bumps tend to be formed – in a little steeper slope areas

Type C: Seafloor with many rocks – in steep slope areas

On the Type B seafloor, cracks were formed and extended from north to south, which we think indicates that the continental plate stretched in the east-west direction perpendicular to the trench axis. Cracks varied in size – up to about one meter wide and several tens of centimeters deep. We also observed some small linear cracks extending from east to west and obliquely crossing north-south oriented cracks. This suggests that the east-west stretching of the continental plate occurred separately in multiple locations. In addition, some cracks were filled with muddy sediments, suggesting that a large amount of muddy sediments had been deposited after the 2011 earthquake.

As for many rocks observed on the Type C seafloor, we think that landslides

occurred on steep slopes.

We expect that studying distribution of these topographical features as well as orientation and size of cracks in detail will help us unravel various phenomena caused by and associated with the 2011 Great East Japan Earthquake near the trench axis – the edge of the North American plate.

The program on the cruising was shown on TBS in March 2013. The program is expected to contribute to better understanding of JAMSTEC research activities related to the 2011 earthquake.

An MBARI core sample was collected from Type A smooth seafloor by KAICO 7000II during this dive. The core sample was brownish-red or dark-gray muddy sediments that showed little sedimentary structure. A clear uneven boundary was observed in a section about 10 centimeters from the top (seafloor) of the core sample. We consider that this boundary is a part of eroded seafloor, suggesting that turbidity currents and/or landslides triggered by the 2011 earthquake eroded the seafloor, and muddy sediments carried by such currents and/or landslides deposited on the seafloor at the time of the earthquake or its aftershocks. The core sample will be utilized in Science School lectures for high school students.

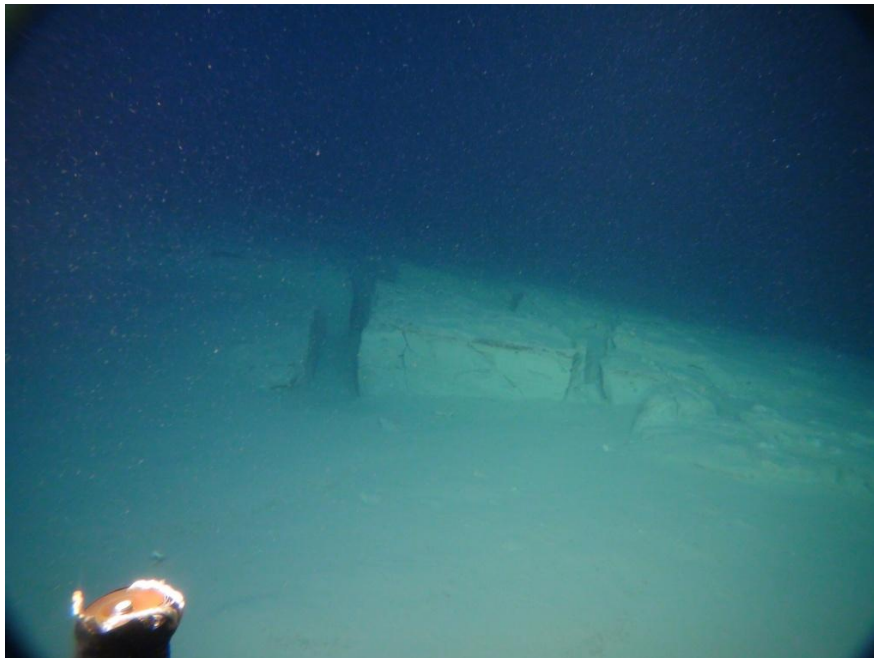


Fig. 2: Relatively smooth seafloor (Type A: front) and seafloor with cracks (Type B: back) near the landing point

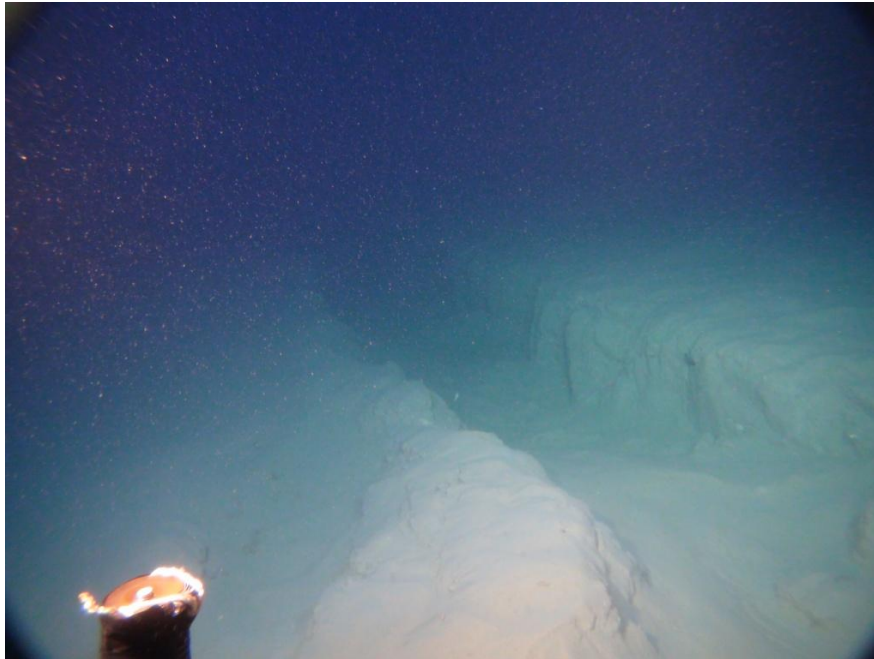


Fig 3: A long crack on the Type B seafloor near the landing point



Fig. 4: Rocks on the Type C seafloor assumed to have been deposited by landslides along the slope.

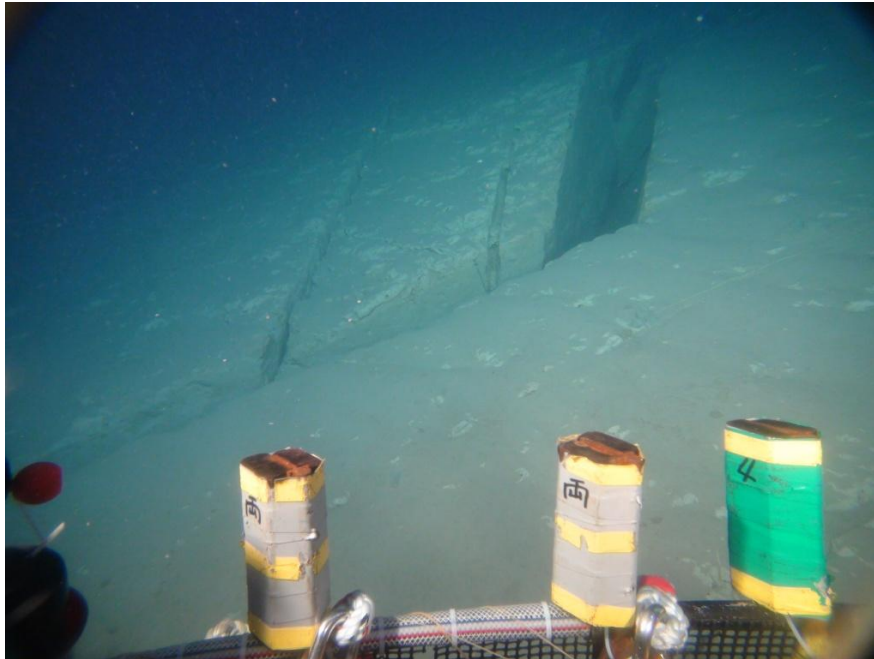


Fig. 5: Obliquely crossing cracks on the Type B seafloor
The vertical cracks on the upper side of the photo are oriented in the north-south direction, while a linear crack is obliquely crossing them.

(2) Sampling of hadal amphipods

- Purpose, Objectives, background

In this cruise, one of purposes is capturing hadal sea lives to isolate their DNA and RNA. Main target organism is amphipod closely related to *Hirondellea gigas*, which is living in the deepest point of the Challenger Deep in the Mariana Trench. We reported *H. gigas* had a novel cellulase, which was very useful for production of glucose from cellulose (i). However, we cannot isolate complete DNA or RNA, because of degradation caused by leaving at room temperature for a while. So, we try immediate isolation of DNA and RNA from amphipods as soon as possible in this cruise.

(i) Kobayashi H, Hatada Y, Tsubouchi T, Nagahama T, Takami H (2012) The Hadal Amphipod *Hirondellea gigas* Possessing a Unique Cellulase for Digesting Wooden Debris Buried in the Deepest Seafloor. PLoS ONE 7(8): e42727. doi:10.1371/journal.pone.0042727

- Methods, Instruments

We attached 8 baited traps (baits: fish filets) at a mooring system. The baited traps have a cooling material, and are covered by insulation to keep low temperature.

- Research results

We tried sinking a mooring system to the bottom of Japan Trench. However, this try was not executed because of bad sea condition.

- Future plans

We should try capturing hadal sea lives at the Challenger Deep in the Mariana Trench.

4. Dive information

(1) Cruising project using a deep-sea ROV with the mass media (TV station) chosen through an open and competitive process

- R/V KAIKO 7000II
- Dive number: #594
- Dive point information: 37°56'79"N143°54'98"E
- Sampling: One MBARI core sample
- Dive tracks: Refer to Appendixes 1 to 3 – Dive Track of KAIKO 7000II
- Dive Log:

Dive Log of

KAIKO7000II Dive #594

Japan Trench

2013/02/23

Time (JST)	Dep. (m)	Alt. (m)	Head (Deg)	Description	Remarks
09:28				KAIKO was hoisted up with a crane.	
09:35				KAIKO was put onto the sea surface.	
12:13	6868			Launcher released Vehicle.	
12:28	6985	2	308	A bump was observed on the seabed.	
12:31	6985	2	20.6	A crack was observed.	
12:40	6978	0	258.2	Vehicle landed. D=6978 (37-56.7286N 143-55.1516E)	Site 1 Fig. 2
12:43				The 7kHz acoustic system stopped.	
12:48				The 14kHz acoustic system started.	
12:57				The 14kHz system stopped.	
12:59				The 7kHz system started.	
13:00				Vehicle started cruising.	Fig. 3
13:07	6974	0	10.75	A large crack was observed.	
13:13	6976	0	27	A deep crack was observed.	
13:15	6978	0	31	Many rocks which had perhaps collapsed and slid down were observed.	
13:22	6987	1	278	Vehicle turned to the west.	

13:35			273	Rocks were kept observed.	
13:37	6960	2	275	Rocks got smaller.	
13:44	6944	2	251	Vehicle landed.	
13:45			290	Vehicle turned to 290°.	
13:54	6903	4	275	Vehicle changed direction.	
13:57	6893	5	190	Vehicle turned to the south.	
14:07	6945	3		Vehicle landed. D=6945 (37-56.7856N 143-55.0382E)	Fig. 4
14:08				The 7kHz acoustic system stopped.	
14:10				The 14kHz system started.	
14:18				The 14kHz system stopped.	
14:20				The 7kHz system started.	
14:22	6942	6	262	Vehicle started cruising.	
14:24	6954	3	130	Vehicle turned to 130°.	
14:31				Vehicle turned around to 310°.	
14:36	6969	2	270	Sonar detected some signals. Vehicle turned to 270°.	
14:40	6958	3	330	Vehicle turned to 330°.	
14:53	6933	6	351	Something like a cliff was observed.	
15:09	6868	6		Sonar scanned 360 degrees.	
15:12			0	North: No signal	
15:15			90	East: No signal	
15:16	6879	3	180	South	
15:21	6834			Vehicle landed. D=6884 (37-56.8663N 143-55.0164E)	Site 3 Fig. 5
15:22				The 7kHz acoustic system stopped.	
15:37				The 14kHz system stopped. The 50-60m in the direction of 100 ° from the ANS JF1.	
15:38				The 7kHz acoustic system started.	
15:43	6884	1	173	Vehicle started cruising to the site specified by ANS.	
16:00	6986	0	90	East: No signal	

16:03	6986	0	176	South: No signal	
16:05	6986	2	254	West: No signal	
16:07	6983	4	350	North: Some signals at 300°	
16:12	6985	1	298	Vehicle turned and headed to 300°.	
16:21	6971	4	220	No signal was detected any more. Vehicle headed to the area east of JF1 - 220°.	
16:33	6977	2	102	Vehicle was directly east of JF1. Sonar scanned 360 degrees.	
16:34	6975	3	0	North: No signal	
16:36	6976	3	90	East: No signal	
16:38	6976	4	180	South: No signal	
16:40	6977	2	269	West: No signal	
16:42	6979	2	260	Vehicle headed to JF1.	
17:19	6922	6	244	Vehicle was around JF1.	
17:24	6924	2	261	Vehicle turned to 270° (west) because it had yet to conduct a search in the area west of JF1.	
17:28			310	Vehicle turned to 310°.	
17:38	6861	3	288	Vehicle stopped searching, and started collecting an MBARI core sample.	
17:39	6861	0	291	Vehicle landed. D=6861 (37-56.8497N 143-54.9604E) Vehicle grabbed the MBARI container.	Site 4
17:40	6862	0	300	Vehicle inserted the container into the seabed.	
17:42	6862	0	300	Vehicle put the container into the basket.	
17:49	6862	0	309	Vehicle started ascending.	
18:07				Vehicle was connected with Launcher.	
20:42				KAIKO was drained.	
20:51				KAIKO was recovered.	

(2) Sampling of hadal amphipods

No operation was conducted.

5. Sampling Information

(1) Cruising project using a deep-sea ROV with the mass media (TV station) chosen through an open and competitive process

- MBARI core sample: one

Sampled at latitude 37°56'84.97" north and longitude 143°54'96.04" east and at a depth of 6,861 meters



Fig. 6: Collected core sample
The arrow points to the boundary.

(2) Sampling of hadal amphipods

No operation was conducted.

6. Acknowledgment

We would like to express our sincere gratitude to the members of the Research Fleet Department, Marine Technology and Engineering Center who arranged this cruise, all the judges who chose a media's project through an open process, and all others who were involved in the cruise.

7. 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

かいこう 7000Ⅱ 潜航記録

平成 25 年

KR13-05 行動

記載者 近藤 友栄

潜航年月日 2013 年 02/23

着底予定位置

潜航回数 1 回

緯度 37° 56.79' N

通算潜航回数 594 回

経度 143° 54.98' E

測地系 WGS-84

潜航海域 三陸沖

日本海溝

潜航目的 調査潜航

マスメディア (TV) 公募型大深度探査機利用企画航海

調査主任 西川 徹

ランチャー PILOT 重竹 誠二

所属 海洋研究開発機構

PILOT 近藤 友栄

COPILLOT 浅井 隆

作業経過時刻		
吊揚		09:28
着水		09:35
離脱		12:13
着底		12:40
離底		17:49
結合		18:07
水切		20:42
揚収完了		20:51

累計時間	
潜航時間	11: 7
前回潜航	3763:19
通算潜航	3774:26

ケーブル使用時間		ケーブル番号別使用時間	
1次使用時間	11:23	1次番号	2
1次前回時間	3916:33	1次番号別前回時間	3003:18
1次通算時間	3927:56	1次番号別通算時間	3014:41
2次使用時間	5:54	2次番号	S2
2次前回時間	1826:59	2次番号別前回時間	66:35
2次通算時間	1832:53	2次番号別通算時間	72:29

海象・気象

天候	風向	風力	波浪	うねり	視程
bc	WNW	6	4	3	8

最大潜航深度 6986 m

着底深度 6978 m

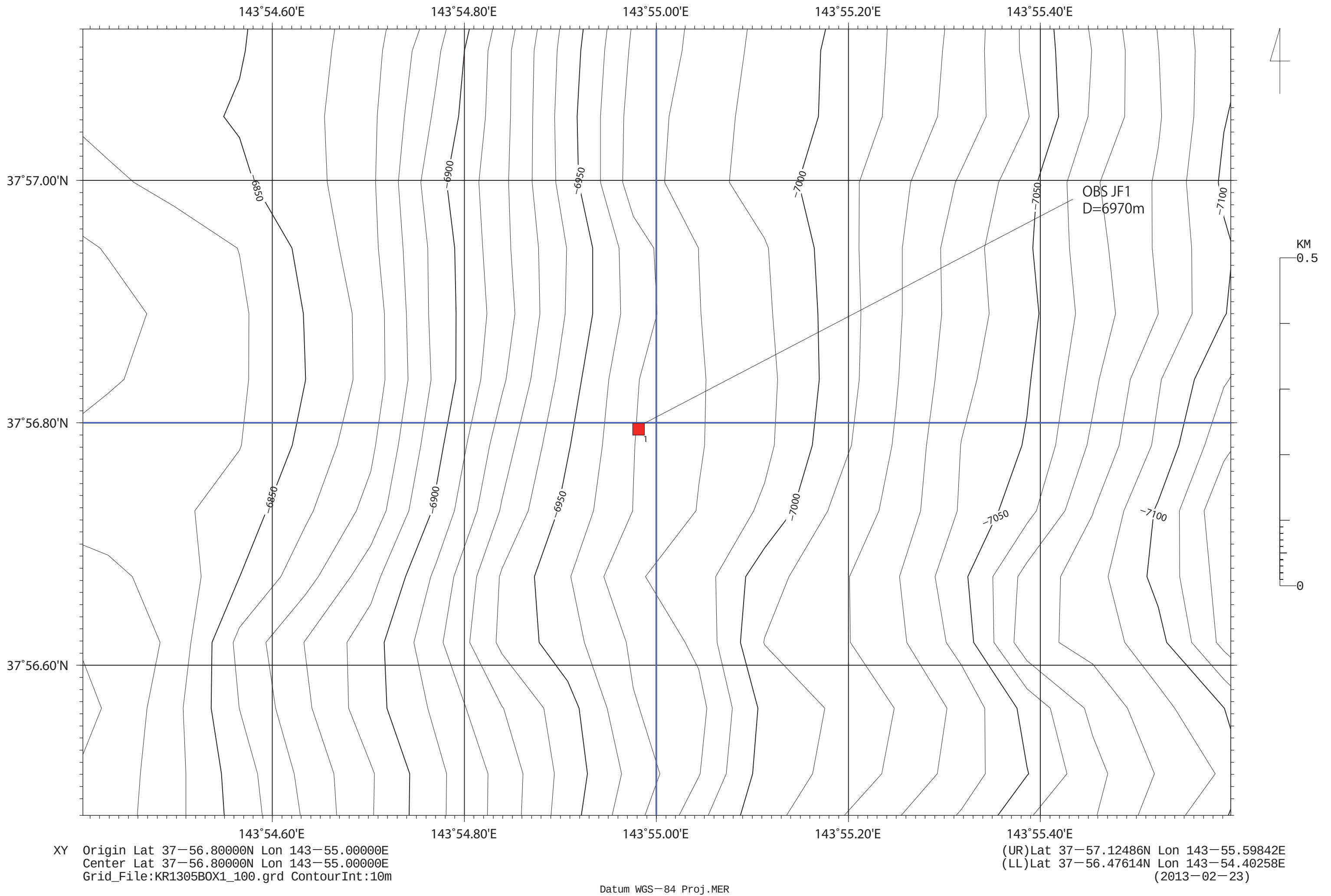
着底底質 泥

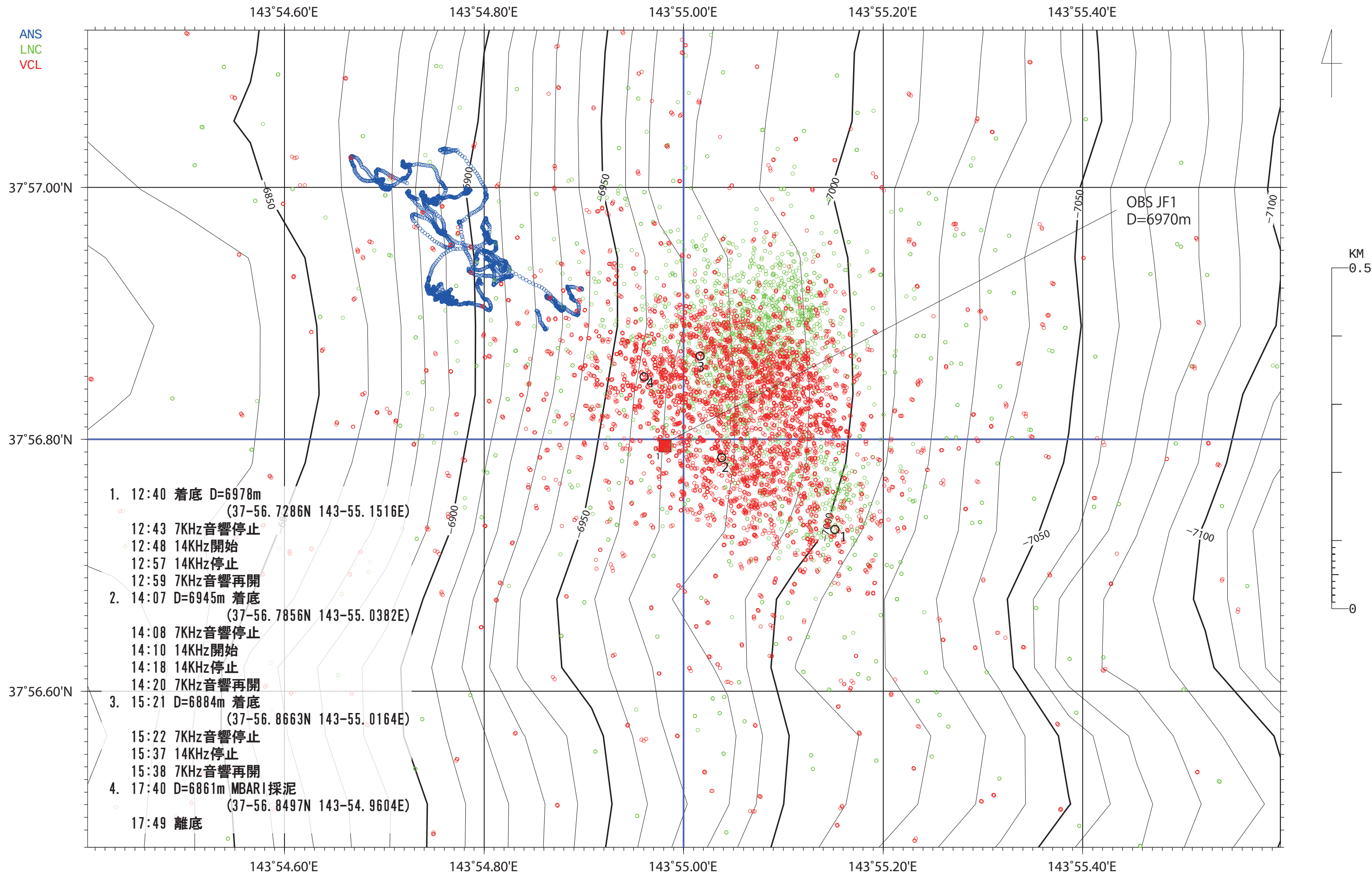
離底深度 6862 m

離底底質 泥

記事

東北地方太平洋沖地震域の海底を観察しながら航走し、MBARI 採泥1本を行った。また、回収予定であったOBS_JF1の探索を行ったが発見には至らなかった。

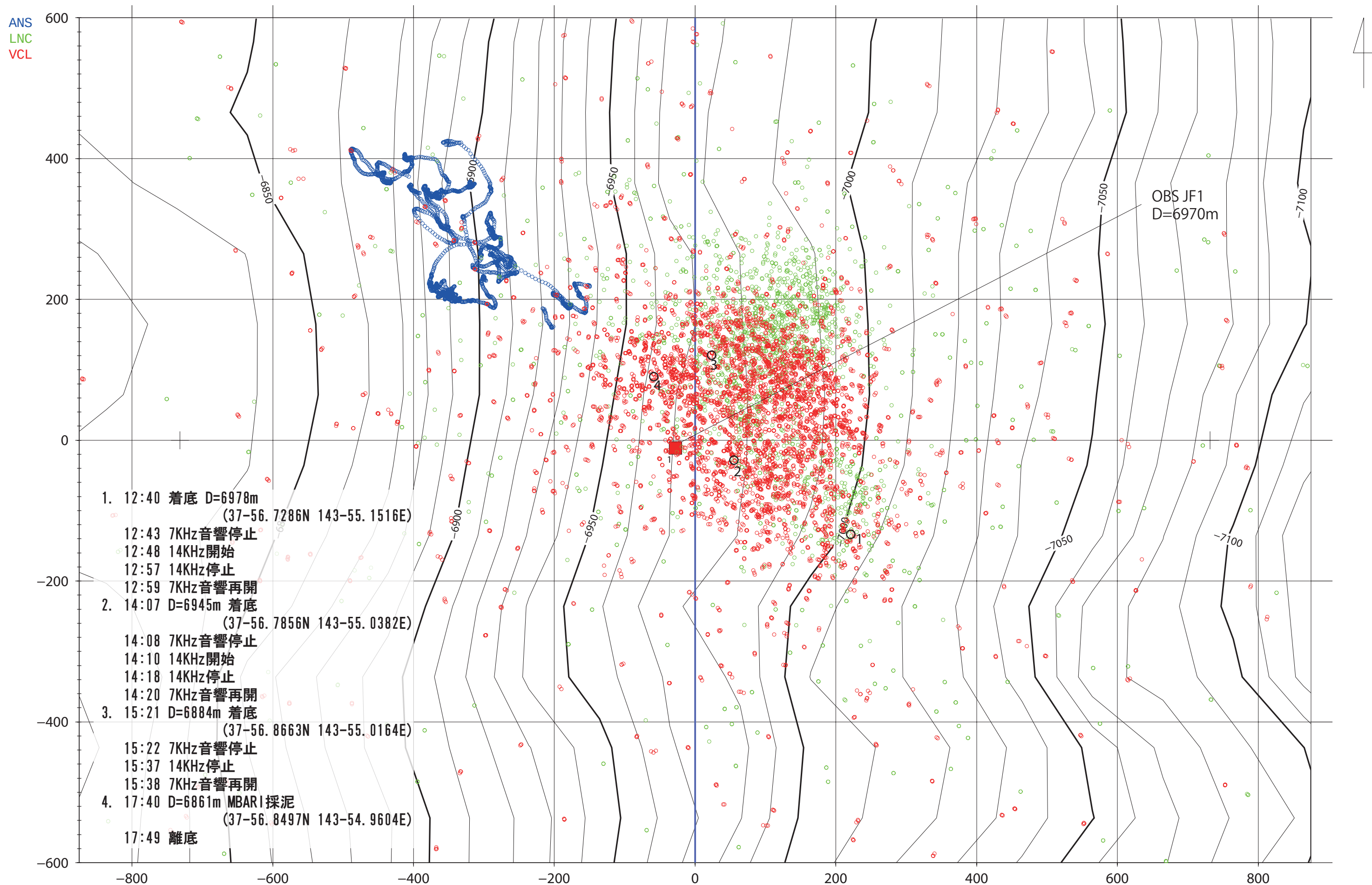




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Datum WGS-84 Proj.MER

(UR)Lat 37-57.12486N Lon 143-55.59842E
(LL)Lat 37-56.47614N Lon 143-54.40258E
(2013-02-23)



1. 12:40 着底 D=6978m
(37-56.7286N 143-55.1516E)
12:43 7KHz音響停止
12:48 14KHz開始
12:57 14KHz停止
12:59 7KHz音響再開
2. 14:07 D=6945m 着底
(37-56.7856N 143-55.0382E)
14:08 7KHz音響停止
14:10 14KHz開始
14:18 14KHz停止
14:20 7KHz音響再開
3. 15:21 D=6884m 着底
(37-56.8663N 143-55.0164E)
15:22 7KHz音響停止
15:37 14KHz停止
15:38 7KHz音響再開
4. 17:40 D=6861m MBARI採泥
(37-56.8497N 143-54.9604E)
17:49 離底

XY Origin Lat 37-56.80000N Lon 143-55.00000E
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(UR)Lat 37-57.12486N Lon 143-55.59842E
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(2013-02-23)

Datum WGS-84 Proj.LTM

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