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Preliminary Report
of
the *R/V KAIMEI* Cruise KM17-13

December 3 – 10, 2017

Training cruise for Boring Machine System (BMS)

in the Off Higashi-Aogashima, Nankai Trough North

Marine Technology and Engineering Center (MARITEC)
R&D Center for Submarine Resources (SRRP)

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

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PREFACE

In December, 2017, the KM17-13 cruise using *R/V KAIMEI* of JAMSTEC (Japan Agency for Marine-Earth Science and Technology) was carried out in the Off Higashi-Aogashima and Nankai Trough North, Japan. The purpose of this cruise is training for the newly acquired Boring Machine System (BMS) onboard the *R/V KAIMEI*. To understand and practice the launch and recovery procedure for BMS was safely conducted during cruise. KM17-13 cruise marked its third scientific operation.

1. Participants aboard the *R/V KAIMEI* cruise

YAMAMOTO Fujio*	JAMSTEC
YANAGITANI Masanobu	JAMSTEC
MACHIYAMA Hideaki	JAMSTEC
YAMAMOTO Hirofumi	JAMSTEC
WATANABE Masayuki	JAMSTEC
TORIMOTO Junji	JAMSTEC
SHINMOTO Yuichi	JAMSTEC
SCOTT Bauer	Cellula Robotics
THOMAS Deaton	Cellula Robotics
OKAYAMA Harutaka	Japan Drilling Co., Ltd.
NAGAOKA Takuya	Japan Drilling Co., Ltd.
SHIGEYUKI Haruta	Daihatsu Diesel Nishinihon Co., Ltd.
YAMAZUMI Go	Mitsubishi Heavy Industries, Ltd.
HAYASHI Tomoe	Mitsubishi Heavy Industries, Ltd.
TORISAWA Yousuke	Nishiyama Corporation
KOBAYASHI Akikazu	Nishiyama Corporation
SATOU Sadayuki	YASKAWA Electric Manufacturing Co.
Mortn Dalum Hvit	MacArtney
Jens Christian Bojesen	MacArtney

*Chief of the cruise

KM-ROV/BMS Operation Team

MIURA Atsumori	Operation Manager
ONO Yoshinari	1st ROV Operator
WAKAMATSU Homare	1st ROV Operator
ISHITSUKA Tetsuya	2nd ROV Operator
KIKUYA Shigeru	2nd ROV Operator
TAKENOUCHI Atsushi	2nd ROV Operator
SHIGETAKE Seiji	2nd ROV Operator
KATAGIRI Masaya	2nd ROV Operator
KUMAGAI Shinosuke	3rd ROV Operator
SUGIURA Shuya	3rd ROV Operator

Marine technician

KODERA Tohru	Nippon Marine Enterprises, Ltd.
HAYASHI Hiroyuki	Nippon Marine Enterprises, Ltd.
HORIUCHI Yoshiki	Nippon Marine Enterprises, Ltd.
HATAKEYAMA Ei	Marine Works Japan Ltd.
NAKANO Yukihiko	Marine Works Japan Ltd.
SOEJIMA Hiromichi	Marine Works Japan Ltd.
KATAYAMA Yohei	Marine Works Japan Ltd.
IWASAKI Yu	Marine Works Japan Ltd.

2. Specification of the BMS

The BMS is a state of the art, fourth generation seafloor drill capable of providing a complete suite of accurate and reliable geotechnical coring. An integrated hydraulic power unit, thrusters, telemetry and control system enables the BMS to operate without any subsea support in water depths down to 3,000m.

A wireline tool system further enhances the speed of operation. The BMS includes H-size and 146T tools and a custom 450mm diameter casing system.

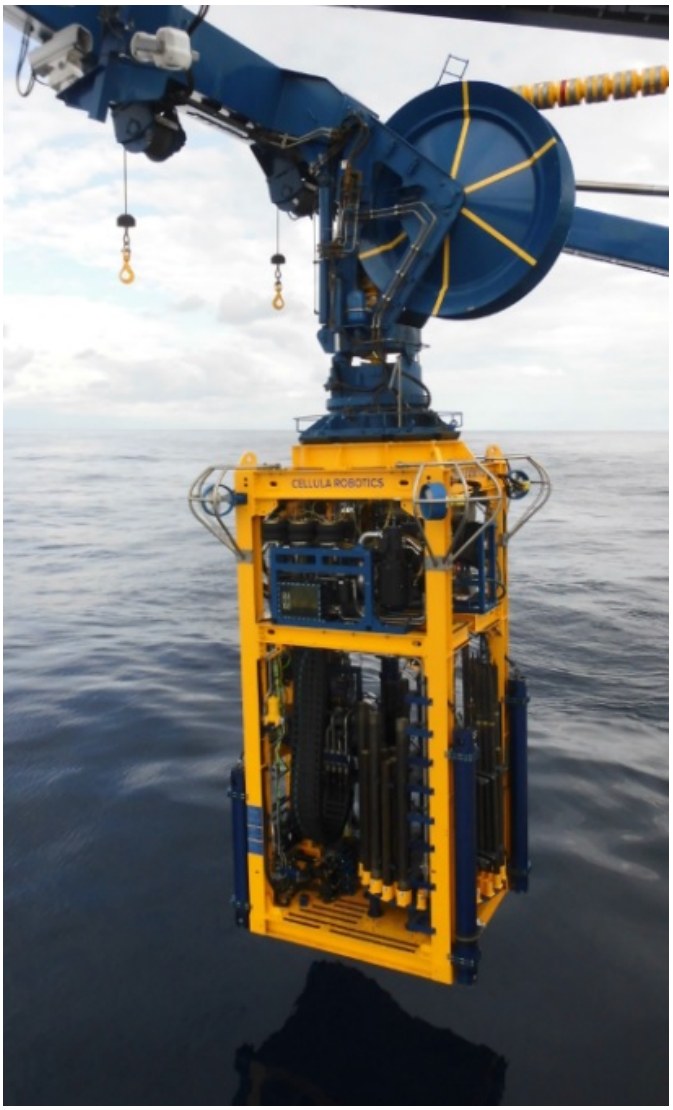

Fig. 1 BMS

During drilling and sampling, a full spread of cameras and sensors provide the operator with information on all of the sub-systems and enables user intervention as required.

Specifications of the BMS is as follows;

Specifications

(1) Physical
- 3,000 m operating depth
- 13,000 kg in air (with full tool suite)
- 10,300 kg in water
- 3.2 x 2.4 x 5.6 m (H x W x D)

(2) Drills
- Conventional (T146) or wire line (H-size)
- 100 kN push & pull force
- Up to 800 RPM

(3) Tools
- 30m continuous coring depth with 12m casing
- Industry standard H-size tooling
- 1.5 m rods and core samples
- 63.0 mm core diameter

(4) Control
- 20' ISO container control van
- Dual operator chairs
- Autonomous tool handling
- Real time telemetry and control
- Eight video channels & sensor feedback on all actuators
- Leveling legs up to 30° slopes
- Maneuvering thrusters

3. Survey area

Fig. 2 shows bathymetric map in the Off Higashi Aogashima. Both ROV dive site and drilling site are shown in this figure.

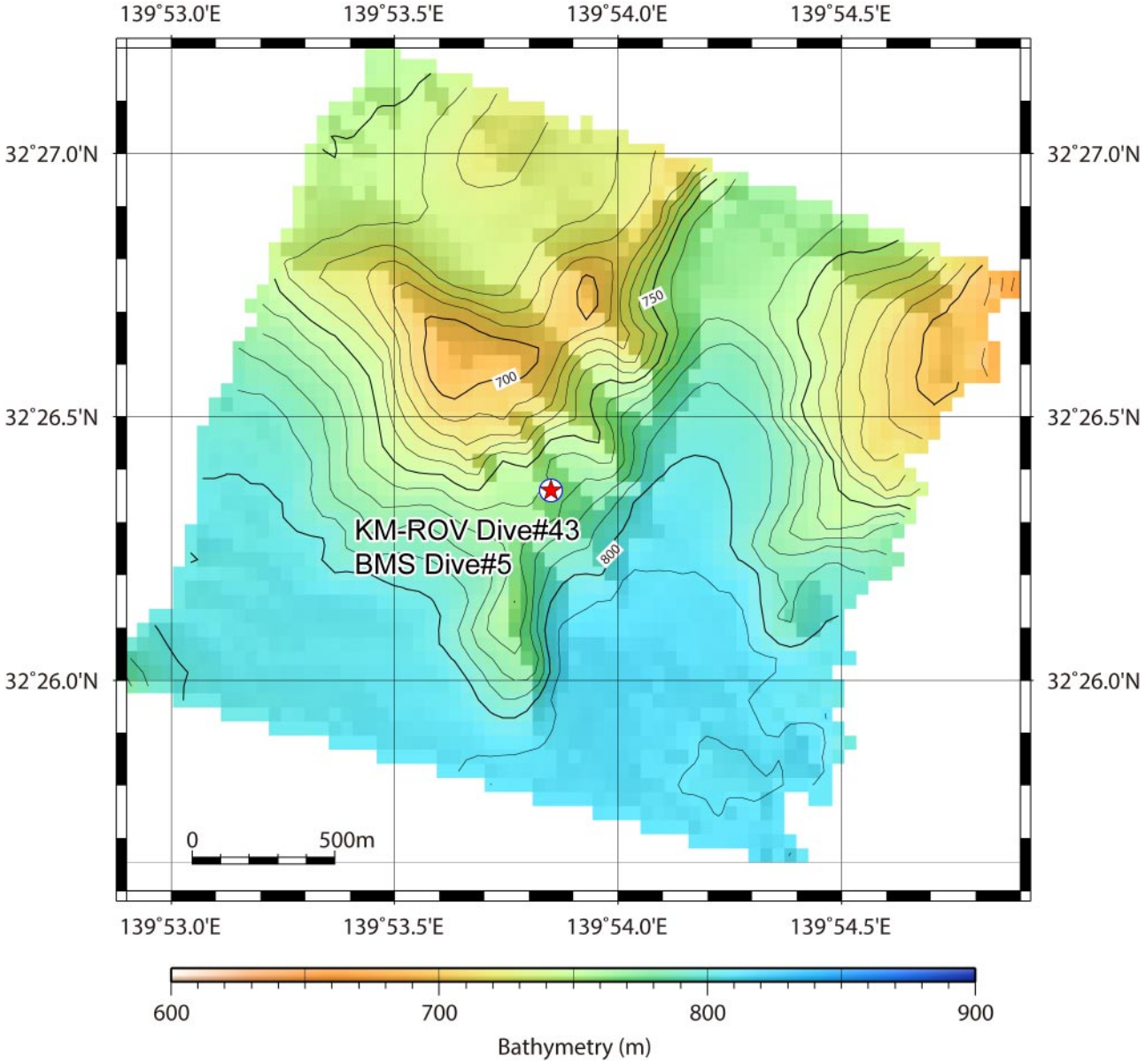

Fig. 2 Bathymetric map in the Off Higashi Aogashima

Fig. 3 shows bathymetric map in the Nankai Trough North. Both ROV dive site and drilling site are also shown in this figure.

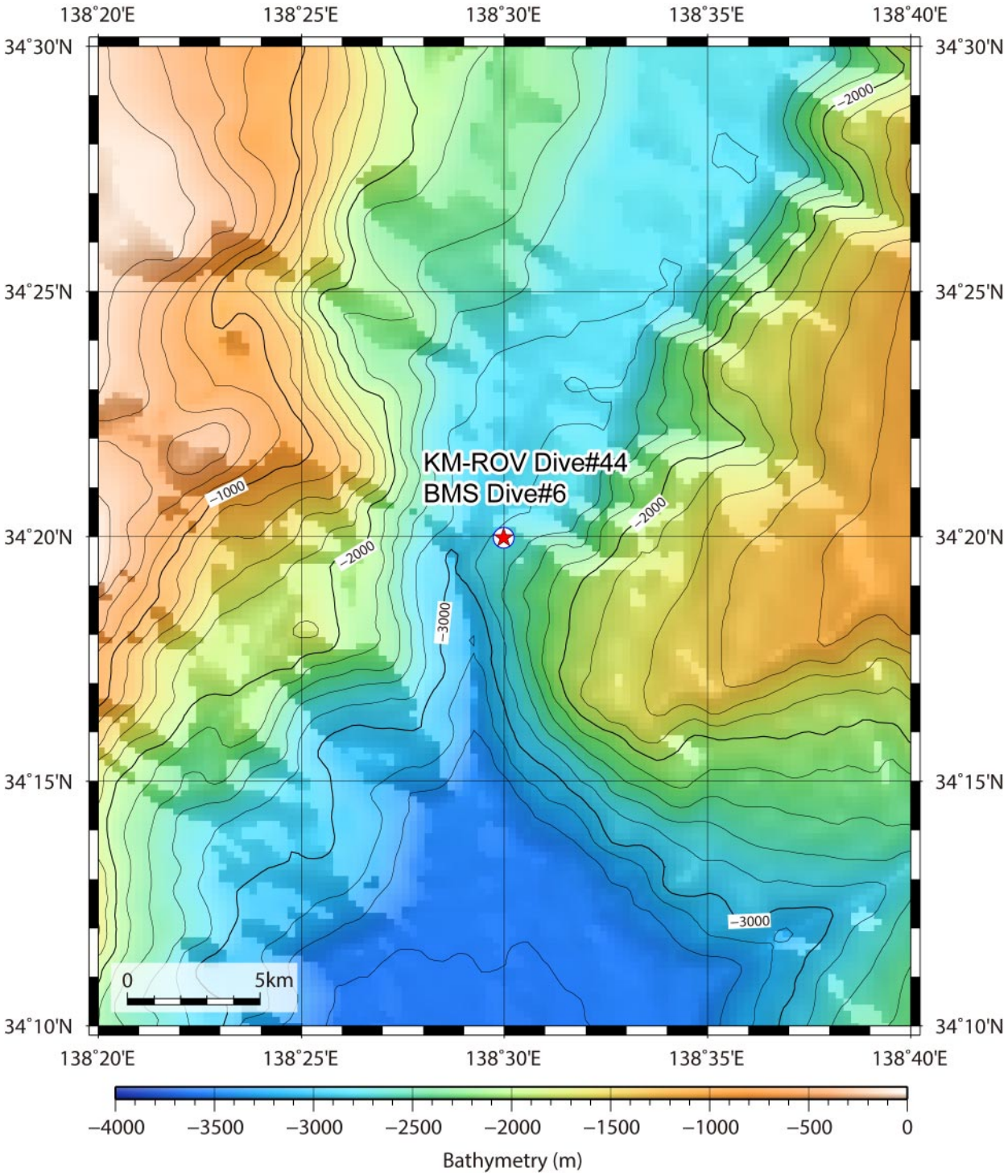

Fig. 3 Bathymetric map in the Nankai Trough North

4. Cruise log

KM17-13 cruise was started from JAMSTEC pier on December 3 and then, the vessel went to the survey area. 2 BMS dives were conducted in the Higashi Aogashima and Nankai Trough North. Finally, the vessel arrived at JAMSTEC pier on December 10 and we ended KM17-13 cruise. Table 1 shows activity log during the cruise.

Table 1 Cruise log

R/V "KAIMEI"KM17-13 Cruise Log

Date & Time (JST: UTC +9h)	Description	Weather / Wind / Sea Condition
2017/12/03 Sun.	Noon Position: 34-47.0'N, 139-40.3'E (off South SUZAKI)	bc / SW-2 / 2
08:00	Onboard "KAIMEI" at JAMSTEC	
09:00	"KAIMEI" departured from JAMSTEC, Commenced KM17-13	
10:08-11:10	Carried out Shipboard education & traning for scientist	
17:30-18:00	Scientist meeting	
23:00	Arrived at HIGASHI AOGA SHIMA CALDERA	
2017/12/04 Mon.	Noon Position: 32-25.2'N,139-53.6'E (off East AOGA SHIMA)	bc / S-2 / 2
04:47	Released XBT@(32-26.5'N,139-53.9'E)	
5:08-5:28	Carried out MBES mapping survey (Pre-dive survey)	
08:03	Hoisted up KM-ROV	
08:09	Launched KM-ROV Started operation# 43	
08:47	KM-ROV landed on the sea bottom (D=754m)	
09:44	KM-ROV left the sea bottom (D=757m)	
10:10	Hoisted up KM-ROV	
10:15	Recovered KM-ROV & finished the operation	
13:10	Hoisted up BMS	
13:16	Launched BMS Started operation# 5	
14:56	BMS landed on the sea bottom (D=757m)	
15:09	BMS com'ced digging the sea floor	
19:36	BMS left the sea bottom (D=757m)	
20:09	Hoisted up BMS	
20:17	Recovered BMS & finished the operation	
21:30	Proceeded to off SHIMIZU	
2017/12/05 Tue.	Noon Position: 35-02.0'N,138-32.1'E (off SHIMIZU)	bc / SSW-5 / 3
10:40	Arrived at off SHIMIZU	
10:50	1 scientist disembarked by traffic boat	
12:30	Proceeded to SURUGA WAN	
12:45-13:30	Removed coresample	
13:30	Arrived at off MIHO	
17:30-17:40	Scientist meeting	
2017/12/06 Wed.	Noon Position: 34-40.2'N,138-22.5'E (SURUGA WAN)	bc / WSW-7 / 5
11:45	Suspended KM-ROV diving operation due to rough sea	
16:00-16:25	Scientist meeting	

Date & Time (JST: UTC +9h)	Description	Weather / Wind / Sea Condition
2017/12/07 Thu.	Noon Position: 34-20.0'N, 138-30.0'E (off SouthEast Omaezaki)	bc / West-5 / 4
02:00	Com'ced proceeding to KM-ROV dive point	
04:00	Arrived at KM-ROV dive point	
05:10	Released XBT@(34-20.0'N, 138-29.9'E)	
06:35	Hoisted up KM-ROV	
06:41	Launched KM-ROV Started operation#44	
08:02	KM-ROV landed on the sea bottom (D=2803m)	
09:01	KM-ROV left the sea bottom (D=2801m)	
11:01	Hoisted up KM-ROV	
11:06	Recovered KM-ROV & finished the operation	
15:02	Hoisted up BMS	
15:08	Launched BMS Started operation#6	
16:51	BMS landed on the sea bottom (D=2793m)	
17:07	BMS com'ced digging the sea floor	
19:55	BMS finished, digging the sea floor (D=4.491m), due to electical trouble	
20:26	BMS left the sea bottom (D=2793m)	
21:32	Hoisted up BMS	
21:37	Recovered BMS & finished the operation	
23:15	Proceeded to off OMAEZAKI	
2017/12/08 Fri.	Noon Position: 35-57.0'N, 138-30.0'E (SURUGA WAN)	bc / WSW-5 / 4
01:00	Arrived at off OMAEZAKI	
07:00-12:30	Shifted to off MIHO	
2017/12/09 Sat.	Noon Position: 34-56.0'N, 138-38.0'E (SURUGA WAN)	bc / NNW-1 / 2
07:25	8 Scientist came onboard	
07:50-08:20	Carried out Shipboard education & traning for scientist	
9:21:00-20:00	Carried out free fall of BMS winch	
2017/12/10 Sun.		
09:00	Arrived at YOKOSUKA(JAMSTEC),then completed voy. No.KM17-13	

5. Preliminary results

5-1. Site survey at proposed drilling site by KM-ROV

ROV was dived into proposed drilling site and collected some rock samples. And finally, BMS landing points were confirmed. BMS core catcher was considered based on the samples.

5-2. Drilling operation

2 BMS dives were conducted during cruise.

(1) Dive #5

H-size tools were used for coring in Dive #5.

Tabel 2 BMS Dive#5 coring record

Cruise ID	KM17-13				
BMS Dive No.	5				
Site	Aogashima				
Date	2017/12/4				
Position	32 26.382 N	139 53.866 E			
Depth [m]	757				
Coring tool	H				
Section	Depth[mbsf]		Advance[m]	Core length[m]	Recovery[%]
1	0.00	1.69	1.69	0.27	16%
2	1.69	3.53	1.84	0.02	1%
3	3.53	4.86	1.33	0.24	18%

(2) Dive #6

T146 tools were used for coring in Dive #6.

Tabel 3 BMS Dive#6 coring record

Cruise ID	KM17-13				
BMS Dive No.	6				
Site	Nankai Trough North				
Date	2017/12/7				
Position	34 19.979 N	139 29.983 E			
Depth [m]	2793				
Coring tool	T146				
Section	Depth[mbsf]		Advance[m]	Core length[m]	Recovery[%]
1	0.00	1.50	1.50	1.03	69%
2	1.50	3.00	1.50	0.93	62%
3	3.00	4.49	1.50	0.80	53%

6. Acknowledgement

We thank Captain YOSHIDA Rikita, crew and technical staffs of our experiments conducted during the KM17-13 cruise, for their kind and thoughtful supports during the cruise.

※ 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 Integration and Analysis Group (DIAG) of JAMSTEC.