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Preliminary Report
of
the *R/V KAIMEI* Cruise KM17-03

April 29 – May 4, 2017

Training cruise for Boring Machine System (BMS)

in the Sagami-Bay

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 April, 2017, the KM17-03 cruise using *R/V KAIMEI* of JAMSTEC (Japan Agency for Marine-Earth Science and Technology) was successfully carried out in the Sagami-Bay, 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. KM17-03 cruise marked its first scientific operation.

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

YAMAMOTO Fujio*	JAMSTEC/MARITEC
NANBU Yoshinobu	JAMSTEC/ MARITEC
MACHIYAMA Hideaki	JAMSTEC/SRRP
IIJIMA Koichi	JAMSTEC/SRRP
YAMAMOTO Hirofumi	JAMSTEC/SRRP
YAMAZAKI Yasuyuki	JAMSTEC/CDEX
YOKOYAMA Takahiro	JAMSTEC/CDEX
REUBEN Meikle	Cellula Robotics
PETER Hampton	Cellula Robotics
DANA Leslie	Cellula Robotics
SCOTT Bauer	Cellula Robotics
FURUTA Hirohide	Mitsubishi Heavy Industries, Ltd.
KOJIMA Itsuki	Nishiyama Ltd.

*Chief of the cruise

KM-ROV/BMS Operation Team

MIURA Atsumori	Submersible Op. Manager
UEKI Mitsuhiro	1st Submersible Tec. Officer
TORIGOE Mitsuru	2nd Submersible Tec. Officer
ISHITSUKA Tetsuya	2nd Submersible Tec. Officer
TAKENOUCHI Atsushi	2nd Submersible Tec. Officer
KATAGIRI Masaya	2nd Submersible Tec. Officer
KUMAGAI Shinosuke	3rd Submersible Tec. Officer
SUGIURA Shuya	3rd Submersible Tec. Officer

Marine technician

HATAKEYAMA Ei	MWJ
SATO Yusuke	MWJ
FUWA Yuji	MWJ
YAMAGUCHI Mika	MWJ
FUKABORI Kento	MWJ
KODERA Tohru	NME
HASHIMOTO Yasushi	NME
HORIUCHI Yoshiki	NME

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 3000m.

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.

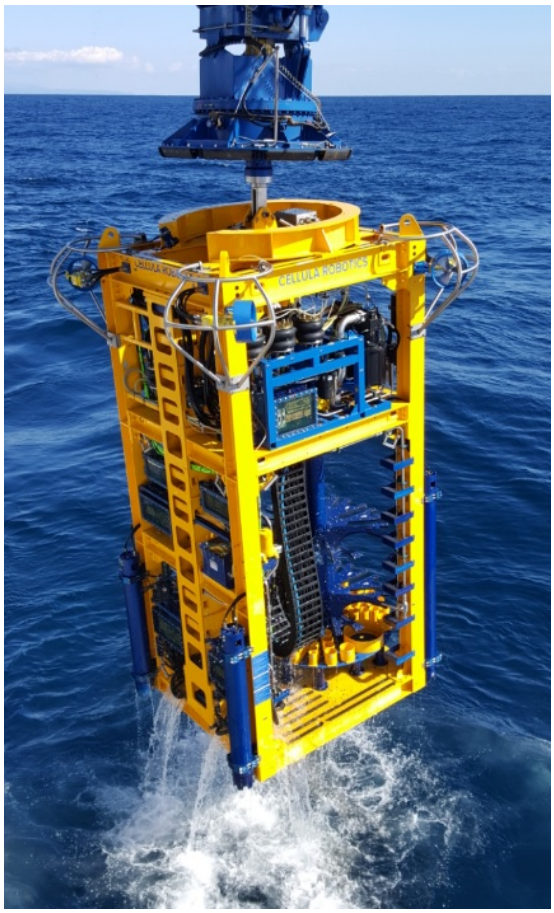


Fig. 1 BMS

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 planned survey point in Sagami-Bay. Proposed drilling site, Off Atagawa is shown in this figure.

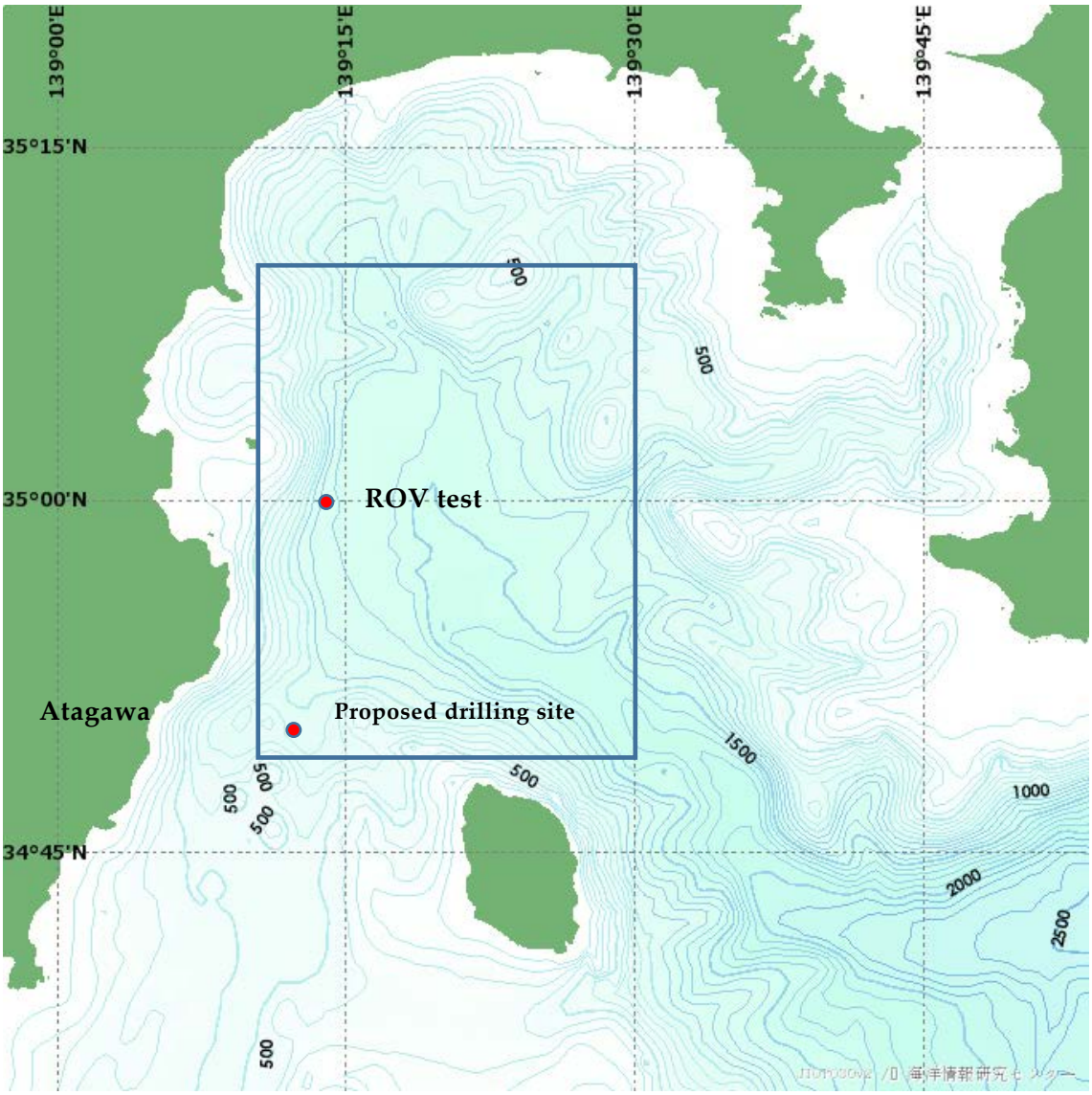


Fig. 2 Survey area

4. Cruise track

KM17-03 cruise was started from JAMSTEC pier on April 29 and then, the vessel went to the survey area. One ROV dive at proposed drilling site and 2 BMS dives were conducted at Off Atagawa, in the Sagami-Bay. Finally, the vessel arrived at Off Ito Port on May 4 and we ended KM17-03 cruise. Fig. 3 shows ship's tracks for the entire cruise and table 1 shows activity log during the cruise.

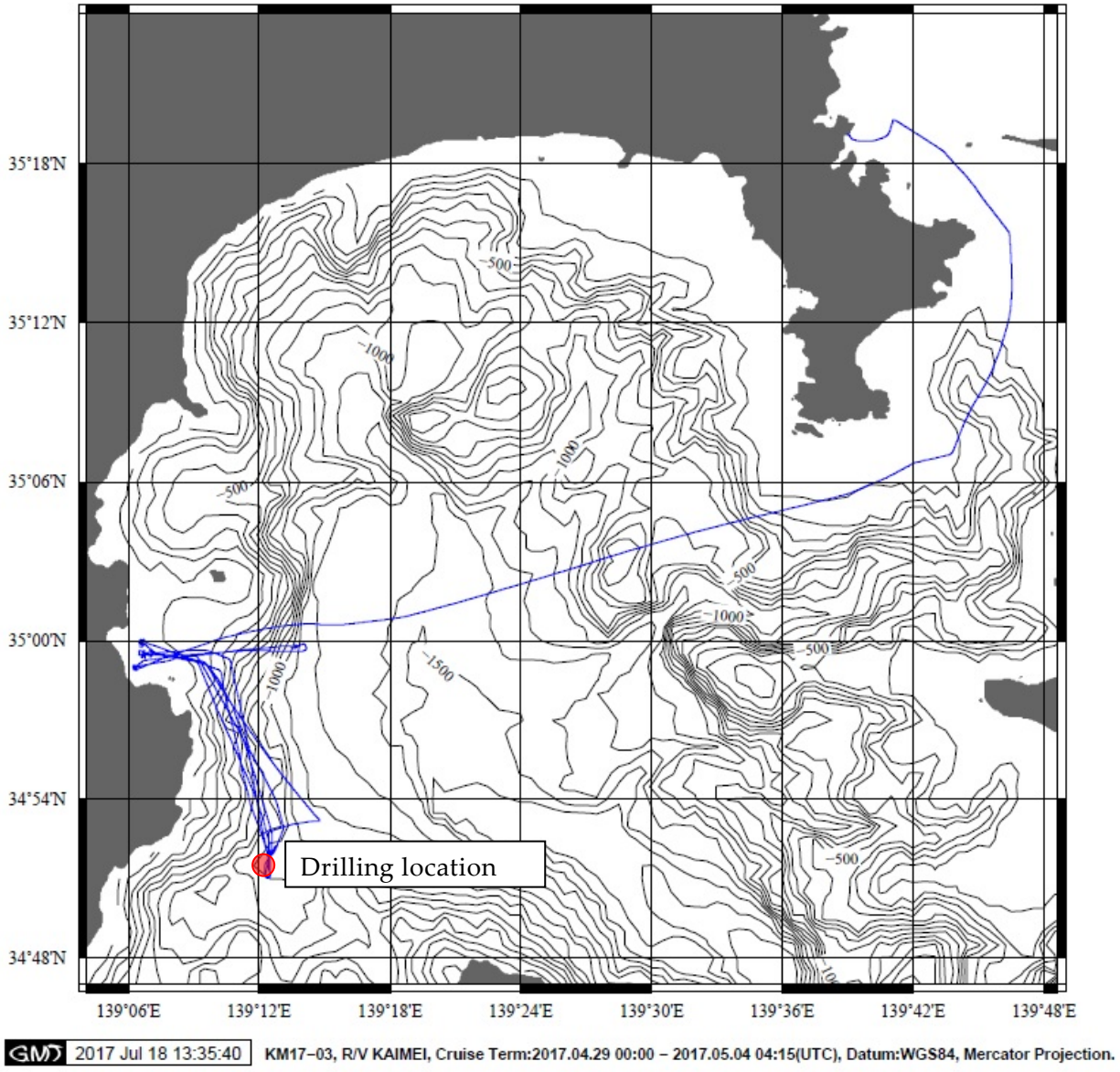


Fig. 3 Ship's tracks for the entire KM17-03 cruise

Table 1 Cruise log

Date	Local Time	Description	Position / Weather / Wind, Sea condition (Noon)
Sat. 29.Apr	08:00	Scientists party onboard R/V KAIMEI	SAGAMIWAN
	09:00	Let go all shore line & left JAMSTEC for YOKOSUKA Sec.4	35-09.0 N, 139-45.0 E
	11:00	Up & down starb'd anchor in 30m of water YOKOSUKA Sec.4	Fine but Cloudy
	11:03	Proceeded to SAGAMIWAN	N-4 (Moderate breeze)
	11:20-11:50	Carried out education & training for scientists	2 (Sea smooth)
	13:45	Arrived at test area (SAGAMIWAN)	2 (Low Swell Long)
	13:55	Released XBT at 35-00.6019N, 139-15.4159E	Visibly: 8'
	14:10	Proceeded to OFF ITO due to reparing BMS docking head	
	16:45	Let go starb'd anchor in 47m of water at OFF ITO	
	19:00-19:45	Meeting	
Sun. 30.Apr	08:00	Up & down starb'd anchor , soon heave up starb'd anchor	SAGAMIWAN
	08:06	Proceeded to dove point of finished the station	34-59.7 N,139-13.6 E
	09:15	Arrived at dove of the station	Blue sky
	10:17	Hoisteded up KM-ROV	SSE-4(Moderate breeze)
	10:26	Launched KM-ROV, then it dove & com'ced her operation #25(1)	2 (Sea smooth)
	11:29	Hoisteded up KM-ROV	1 (Low swell sea)
	11:35	Recovered KM-ROV due to finished maching then left & finished her operation	Visibly: 8'
	13:06	Hoisteded up KM-ROV	
	13:14	Launched KM-ROV, then it dove & com'ced her operation #26(2)	
	13:55	KM-ROV Landed on the sea bottom (D=1209m)	
	14:59	KM-ROV left, the sea bottom (D=1213m)	
	15:38	Hoisteded up KM-ROV	
	15:45	Recovered KM-ROV & finished her operation	
	16:15	Proceeded to OFF ITO	
	17:00	Arrived at OFF ITO	
	17:55-18:05	Meeting	
Mon. 01.May	05:00	Proceeded to test area (OFF Atagawa)	SAGAMIWAN
	05:55	Arrived at OFF Atagawa soon Released XBT at 35-00.6019N, 139-15.4159E	34-59.4 N,139-08.2 E
	6:24-6:34	Carried out MBES site survey	Fine but cloudy
	08:18	Hoisteded up KM-ROV	SSW-7(Near gale)
	08:25	Launched KM-ROV , then it dove & started her operation #27(3)	4 (Sea moderate)
	09:03	KM-ROV landed on the sea bottom (D=1010m)	2 (Low swell long)
	09:37	KM-ROV left the sea bottom (D=1012m)	Visibly: 8'
	10:11	Hoisteded up KM-ROV	
	10:16	Recovered KM-ROV & finished the operation	
	11:13-11:20	Carried out MBES site survey	
	12:20	Arrived at OFF ITO	
Tue. 02.May	07:00	Arrived at test area	SAGAMIWAN
	09:11	Hoisteded up BMS	34-51.8 N, 139-12.5 E
	09:22	Launched BMS, then it dove of com'ced her operation #1(1)	Fine but Cloudy
	11:00	BMS landed on the sea bottom (D=1008m)	ENE-2(Light breeze sea smooth)
	11:33	BMS com'ced digging the sea bottom	2(Sea smooth)
	15:20	BMS finished digging the sea bottom	2(Low swell long)
	15:21	BMS left the sea bottom (D=1008m)	Visibly: 8'
	16:05	Hoisted up BMS	
	16:16	Recovered BMS & finished the her operation	
	16:50	Com'ced procceded to OFF ITO	
	18:00	Arrived at OFF ITO	
Wed. 03.May	05:00	Proceeded to test area (OFF Atagawa)	SAGAMIWAN
	07:00	Arrived at test area	34-51.8 N, 139-12.4 E
	08:34	Hoisteded up BMS	Fine but Cloudy
	08:51	Launched BMS,then it dove of com'ced her operation #2(2)	SSE-4(Moderate breeze)
	10:03	BMS landed on the sea bottom (D=1007m)	2(Sea smooth)
	10:10	BMS com'ced digging the sea bottom	1(Low swell sea)
	14:17	BMS finished digging the sea bottom	Visibly: 8'
	14:24	BMS left the sea bottom (D=1007m)	
	15:06	Hoisted up BMS	
	15:16	Recovered BMS of finidhed the her operation	
	15:30	Left the test area (SAGAMIWAN) for OFF ITO	
Thu. 04.May	12:15	11 scientists and 9 crew disembaked , then 10 scientist boarded conpleted voyage KM17-03 and com'ced voyage KM17-04	OFF ITO
	14:00-14:40	Carried out education of training for scientists	34-59.0 N, 139-06.3 E
	15:50	Stationed for heaving up anchor	Fine but Cloudy
	15:52	Com'ced heaving starb'd anchor	E-4(Moderate breeze)
	16:00	Up & down starb'd anchor soon heave up starb'd anchor	2(Sea smooth)
	16:12	Procceeded to test area (NANKAI TROUGH)	1(Low swell sea)
	16:15	Pismisced the station	Visibly: 8'

5. Preliminary results

5-1. KM-ROV AutoTrack test

Function of AutoTrack mode for the KM-ROV was tested and was discontinued due to bad design for the AutoTrack data analysis using SSBL navigation data.

5-2. 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.

5-3. Drilling by BMS

Fig. 4 shows drilling locations of the BMS dive 1 and 2.

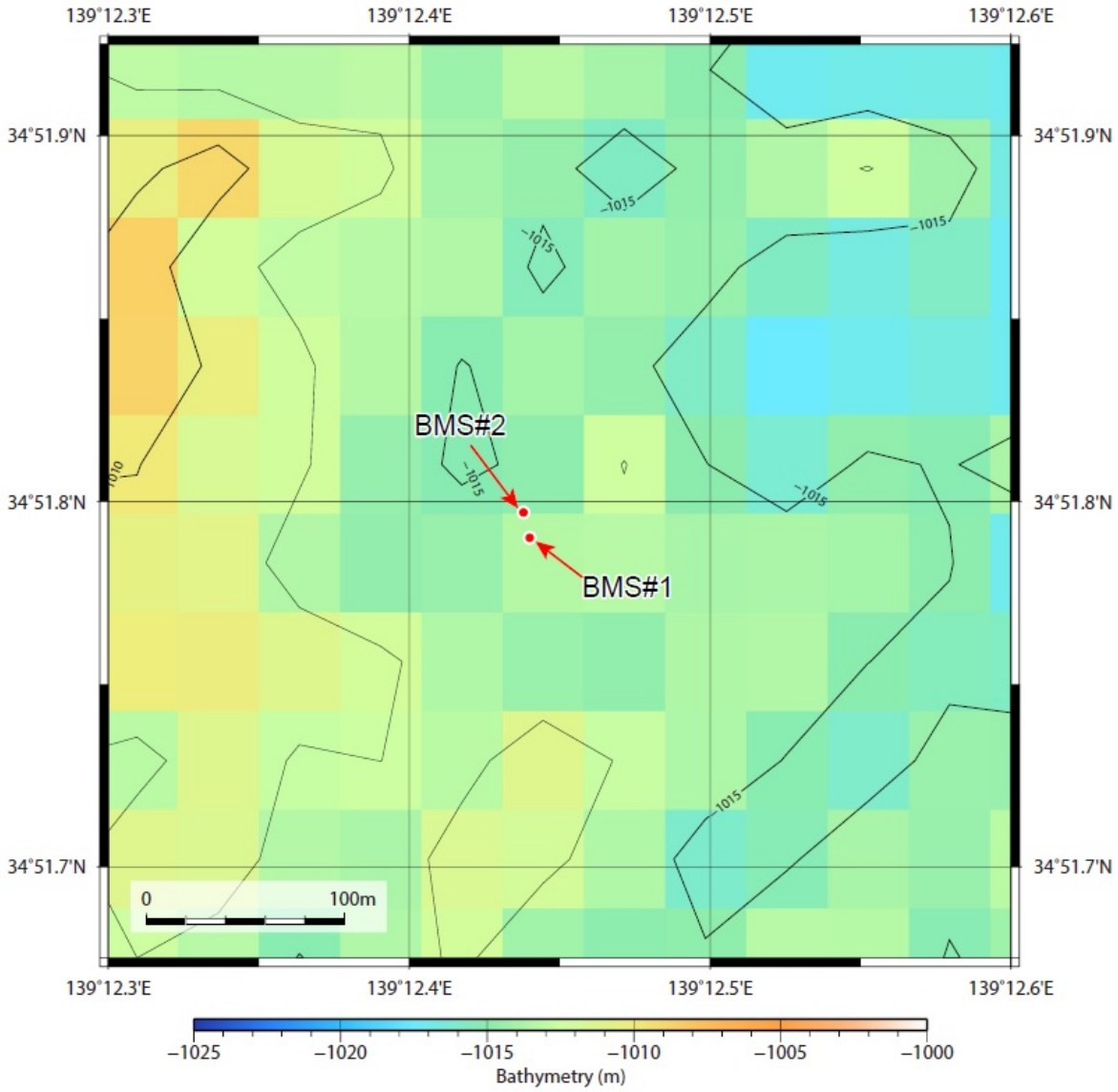


Fig. 4 BMS drilling locations (Dive #1, 2)

(1) Dive #1

H-size tools were used for coring in Dive #1.

Tabel 2 BMS Dive#1 coring record

Cruise ID	KM17-03				
BMS Dive No.	1				
Site	Off Atagawa,Sagami-bay				
Date	2017/5/1				
Position	34 51.797	139 12.438			
Depth [m]	1008				
Coring tool	H-size				
Section	Depth [mbsf]		Advance [m]	Core length [m]	Recovery [%]
1	0.00	1.60	1.60	0.685	43%
2	1.60	2.85	1.25	1.390	111%
3	2.85	4.40	1.55	1.784	115%

(2) Dive #2

T146 tools were used for coring in Dive #2.

Tabel 3 BMS Dive#2 coring record

Cruise ID	KM17-03				
BMS Dive No.	2				
Site	Off Atagawa,Sagami-bay				
Date	2017/5/2				
Position	34 51.796	139 12.441			
Depth [m]	1007				
Coring tool	T146				
Section	Depth[mbsf]		Advance[m]	Core length[m]	Recovery[%]
1	0.000	1.500	1.50	1.456	97%
2	1.500	2.954	1.45	1.653	114%
3	2.954	4.400	1.45	1.480	102%
4	4.400	5.776	1.38	1.457	106%

6. Acknowledgement

We thank Captain SUSAMI Satoshi, crew and technical staffs of our experiments conducted during the KM17-03 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.

APPENDIX

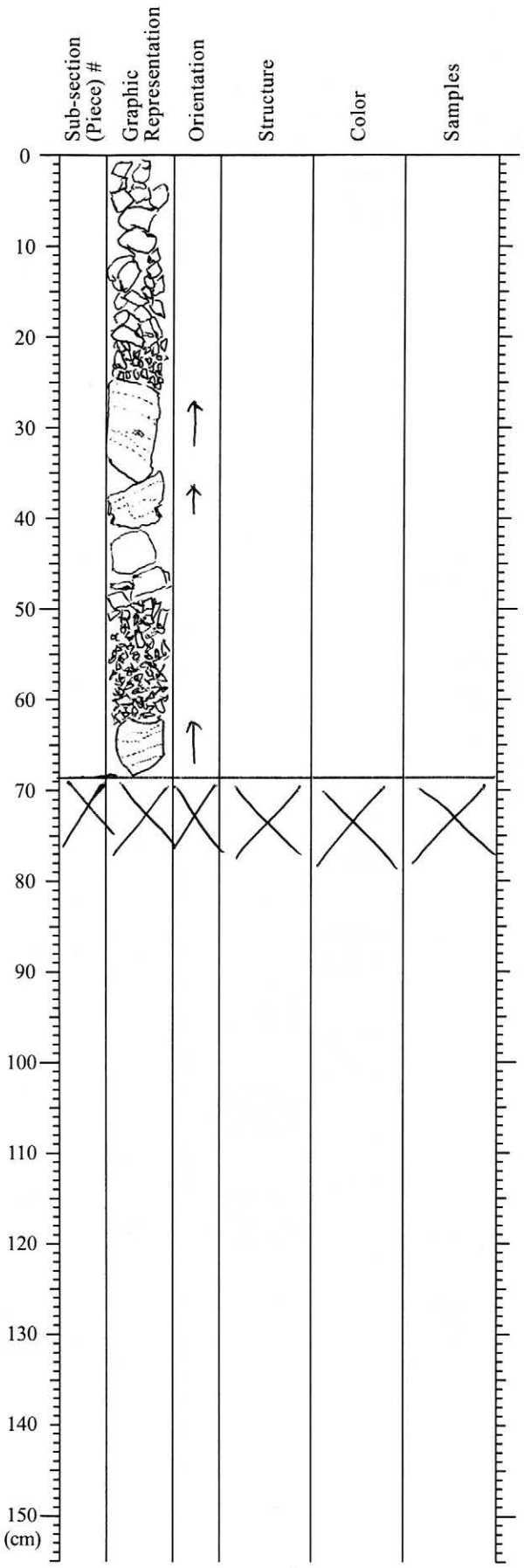
Dive #1:KM17-03_BMS01H_Visual Core Description

Dive #2:KM17-03_BMS02T_ Visual Core Description

Dive #1:KM17-03_BMS01H_Visual Core Description

Visual Core Description

Cruise	KM17-03		**BMS-H**
Core	BMS01H	Section	1 Ⓐ/W
Date	2017. 5. 5	Observer	K-I.



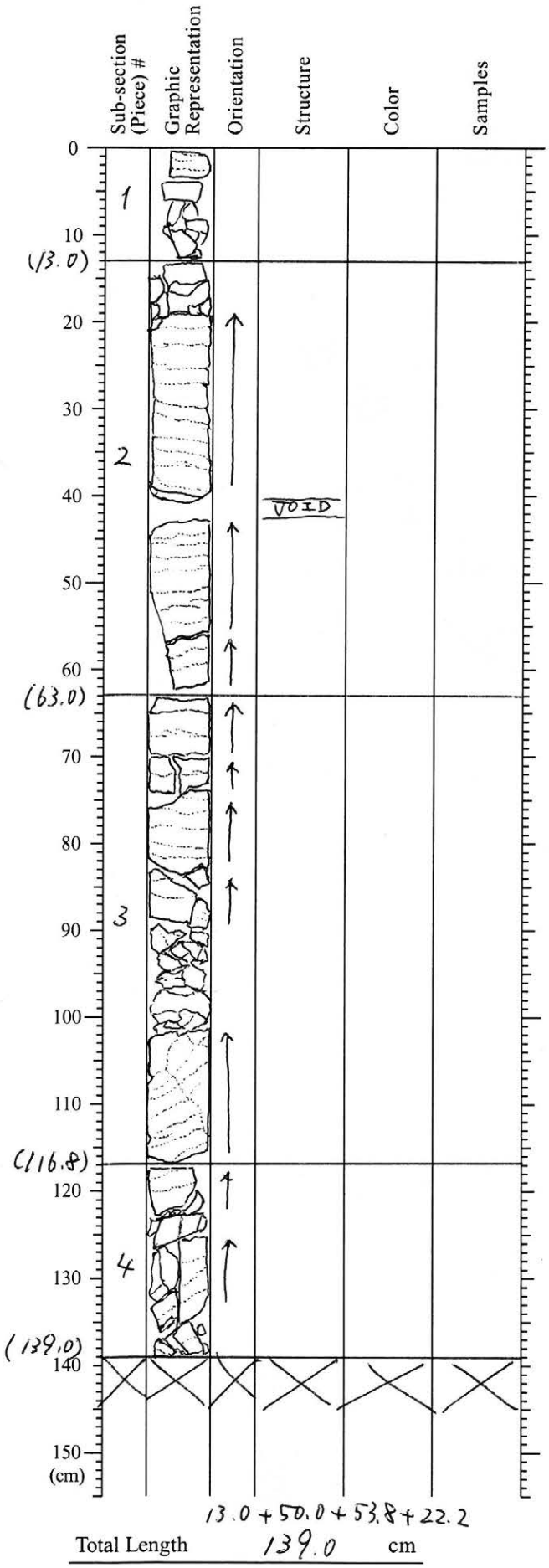
Total Length 68.5 cm

Basalt (pillow lava)

0~25cm, 47~62cm : fractured

Visual Core Description

Cruise	KM17-03			**BMS-H**
Core	BMS01H	Section	2	(A) / W
Date	2017.5.5	Observer	I.C-I.	

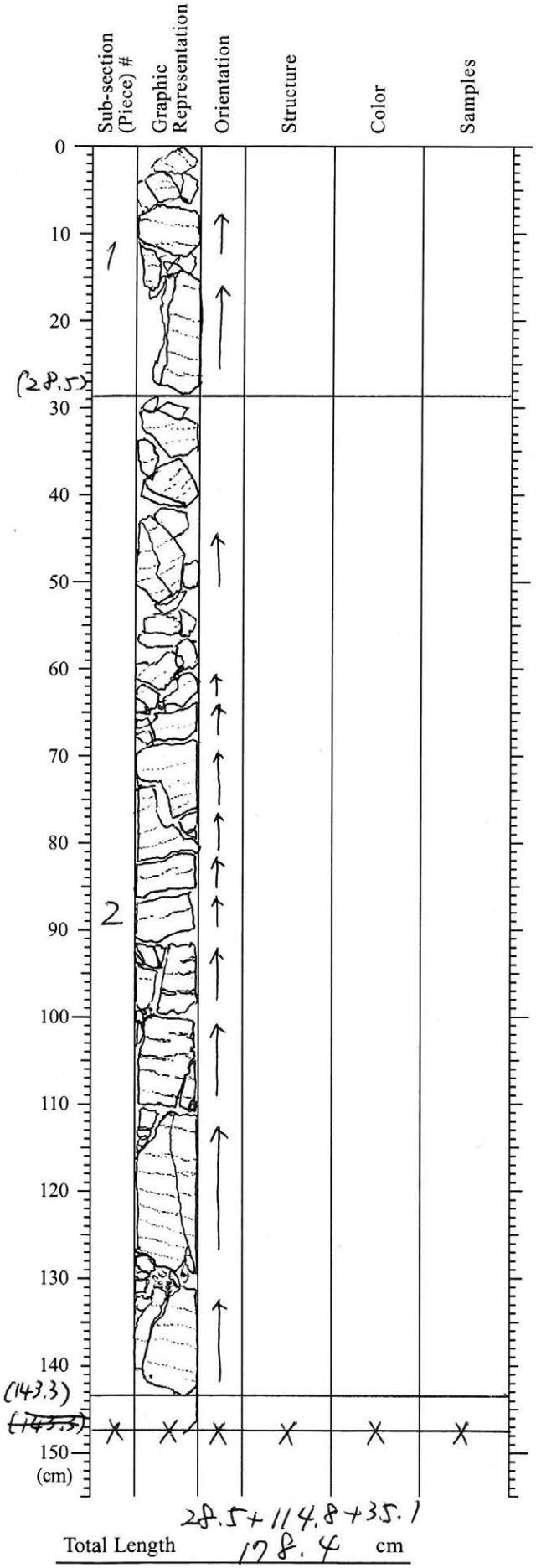


13.0 + 50.0 + 53.8 + 22.2

Total Length 139.0 cm

Visual Core Description

Cruise	KM17-03		**BMS-H**
Core	BMS01H	Section	3-1,2 (A) W
Date	2017.5.5	Observer	K-I.



28.5+114.8+35.1

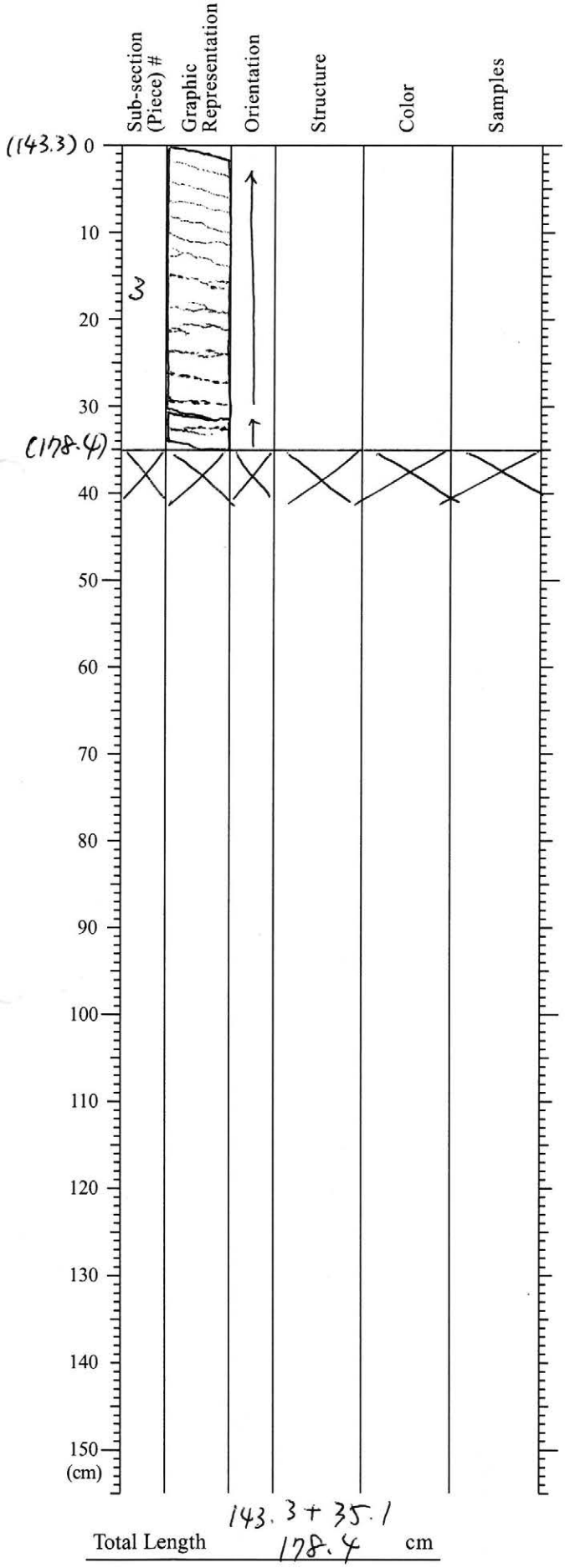
Total Length 178.4 cm

continued to 3-3

Visual Core Description

Cruise	KM17-03	**BMS-H**	
Core	BMS01H	Section	3-3 (A) W
Date	2017.5.5	Observer	K.I.

continued from 3-2



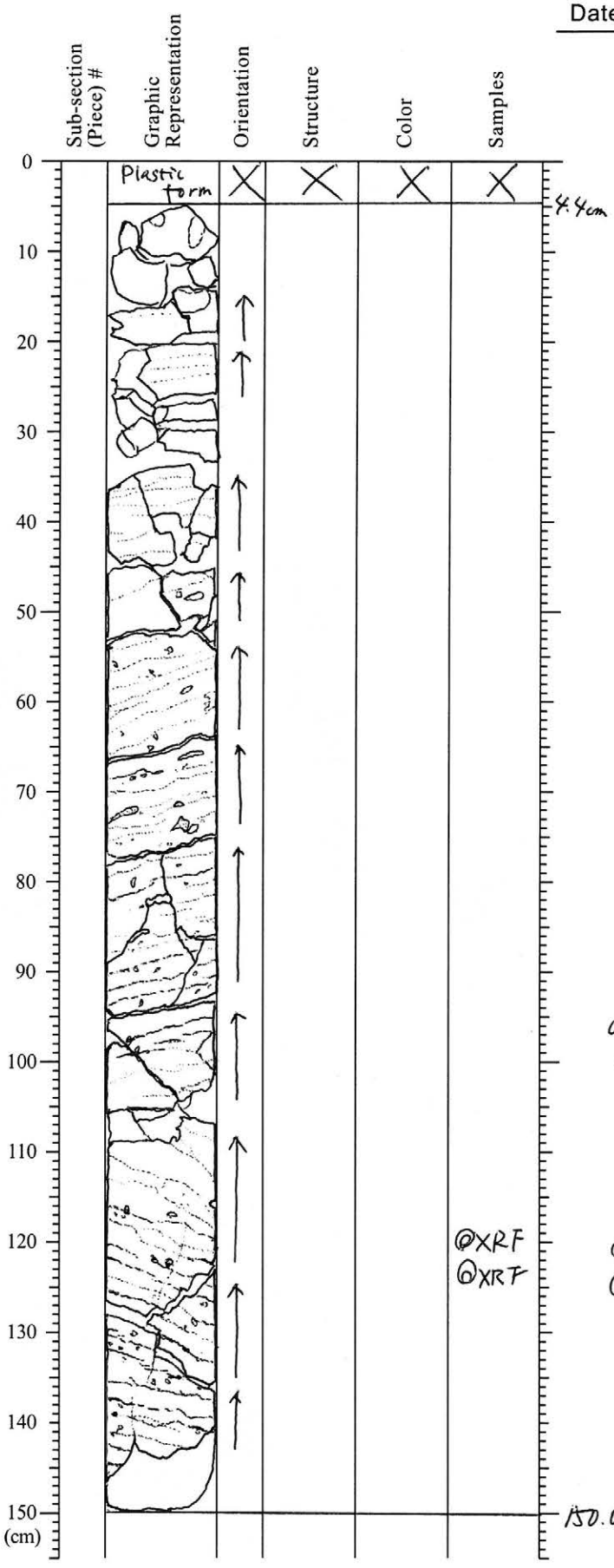
143.3 + 35.1

Total Length 178.4 cm

Dive #2:KM17-03_ BMS02T_Visual Core Description

Visual Core Description

Cruise	KM17-03			**BMS-T**
Core	BMS02T	Section	1	(A) W
Date	2017.5.6	Observer	K.I.	



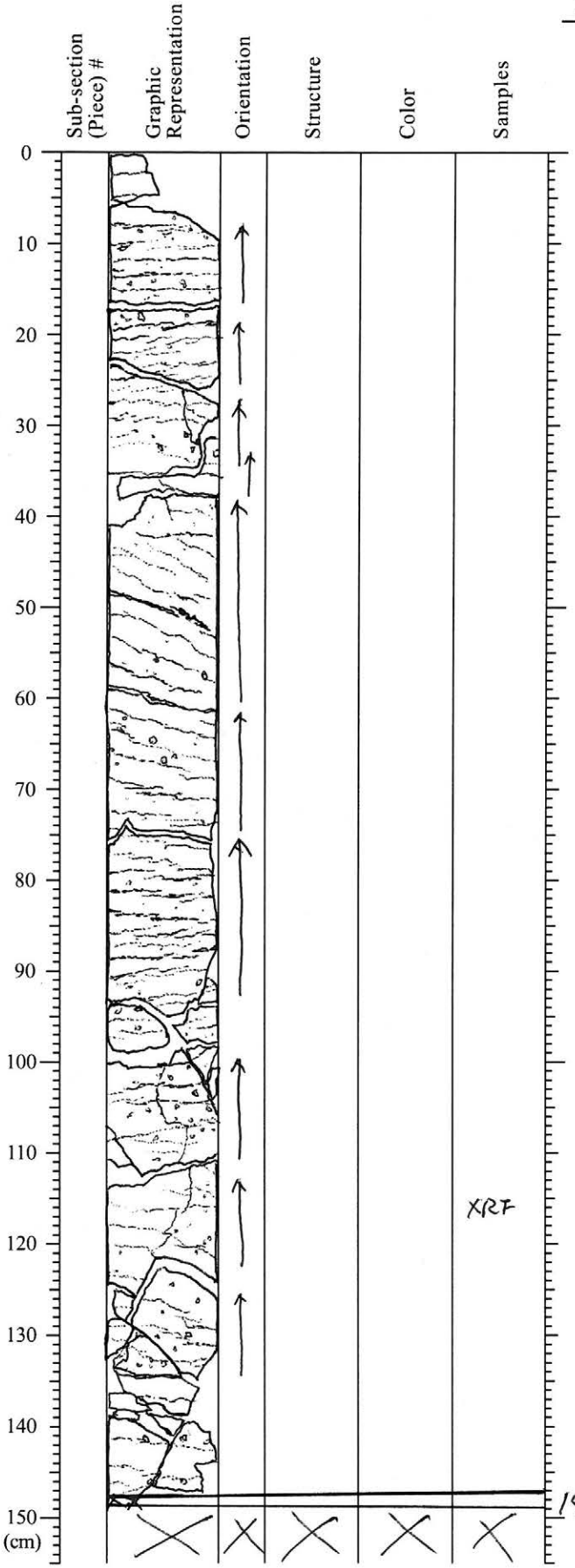
olivine
@116.5, 132.5, 141.5

Niton
@XRF analysis @120.0cm massive
@ " @123.0cm plagioclase crystal

Total Length 145.6 cm

Visual Core Description

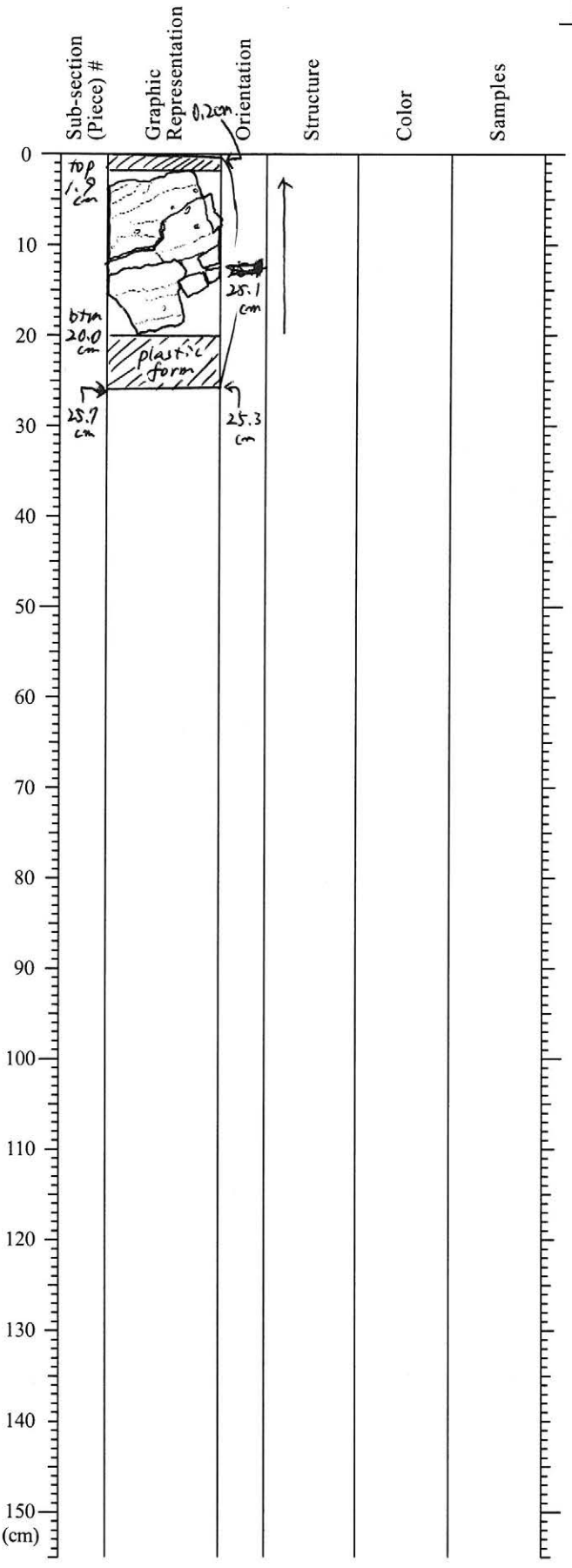
Cruise	KM17-03			**BMS-T**
Core	BMS02T	Section	2-1	(A)/ W
Date	2017.5.6	Observer	K. I	



Total Length 147.2 cm

Visual Core Description

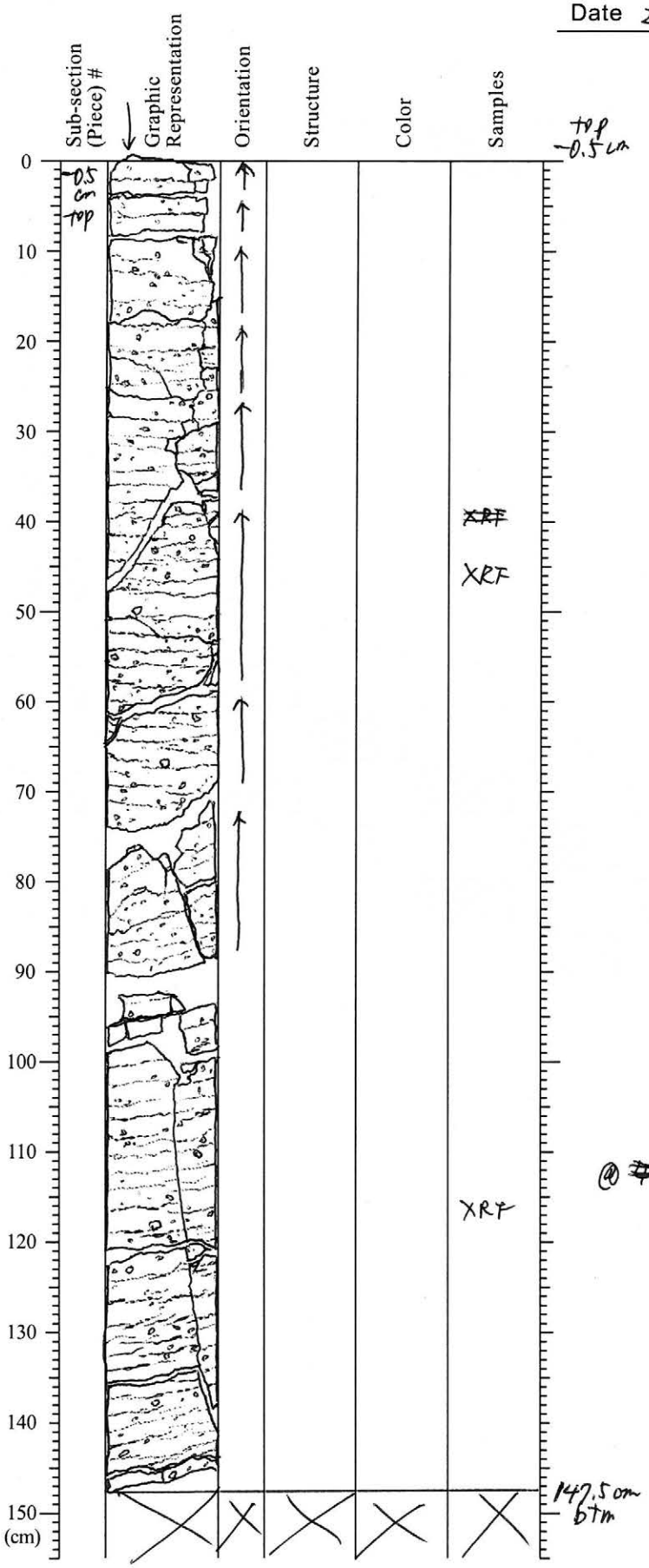
Cruise	KM17-03		**BMS-T**
Core	BMS027	Section 2-2	Ⓐ W
Date	2017.5.6	Observer	K. I.



Total Length 18.1 cm

Visual Core Description

Cruise	KM17-03			**BMS-T**
Core	BMS02T	Section	3	A / W
Date	2017.5.6	Observer	K.I.	

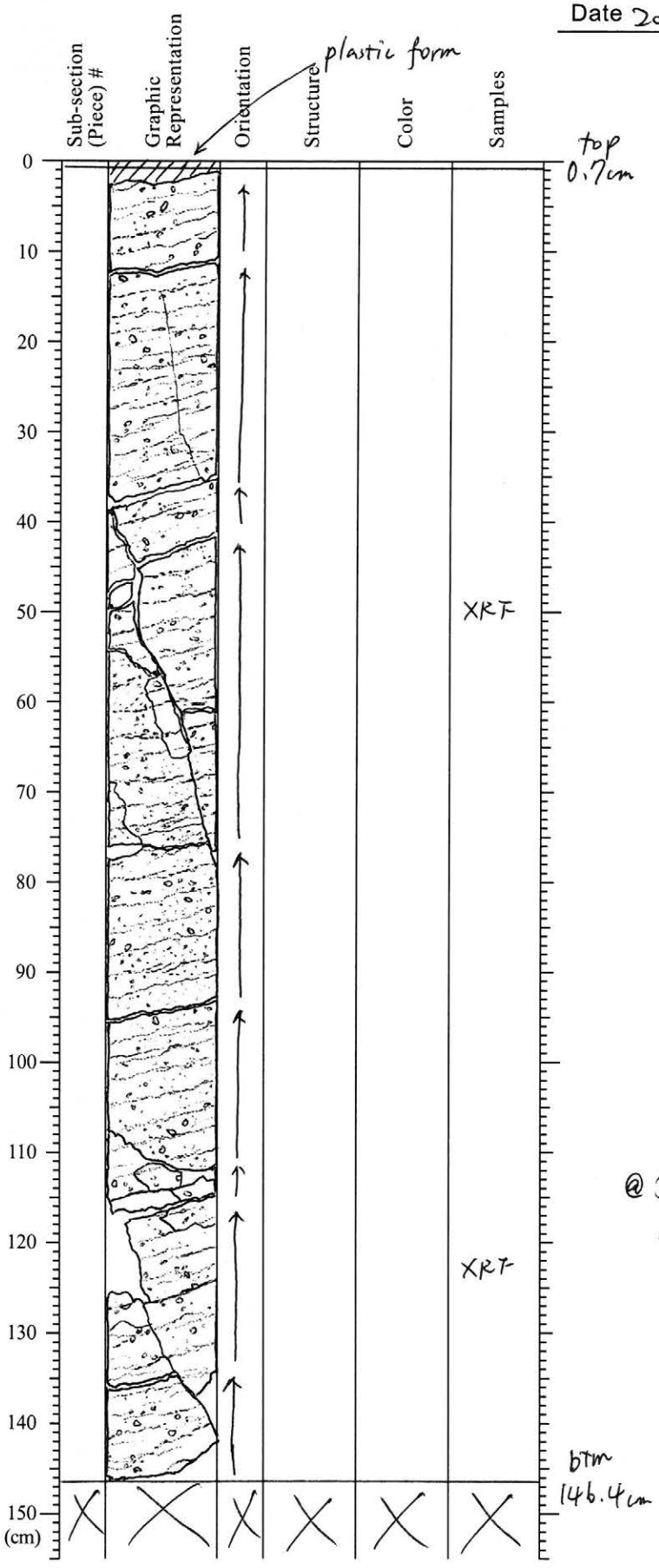


olivin?
@ ~~48~~ 46 cm, 118 cm
Niton XRF Measurement

Total Length 148.0 cm

Visual Core Description

Cruise	KM17-03			**BMS-T**
Core	BMS02T	Section	4	(A) W
Date	2017.5.7	Observer	K.I.	



@50, 123cm
Niton XRF Measurement

Total Length 145.7 cm