doi : 10.17596/0002602

Preliminary Report
of
the *R/V KAIMEI* Cruise KM19-02

April 5 – 15, 2019

FY2019 Engineering Cruise

in the Kumano-nada, Northern part of Nankai Trough, Suruga-Bay,

Sagami-Bay and Izu-Ogasawara area

Institute for Marine-Earth Exploration and Engineering (MarE3)

Japan Agency for Marine-Earth Science and Technology

(JAMSTEC)

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PREFACE

In April, 2019, the KM19-02 cruise using *R/V KAIMEI* of JAMSTEC (Japan Agency for Marine-Earth Science and Technology) was carried out after her FY2018 dock construction. The purpose of this cruise is engineering experiment for the newly acquired second generation of Giant Piston Corer (GPC) equipped with acoustic release mechanism onboard the *R/V KAIMEI*.

To understand and practice the launch and recovery procedure for GPC was safely conducted during cruise, and KM19-02 cruise marked its first operation.

And also, hull mounted acoustic sensors including Multi Beam Echo Sounder (MBES), Sub-Bottom Profiler (SBP), and Acoustic Doppler Current Profiler (ADCP), and Acoustic Navigation System (ANS) were checked and confirmed their performance correctly.

1. Cruise Information

(1) Cruise ID: KM19-02

(2) **Vessel:** R/V KAIMEI

(3) **Cruise Title**

FY2019 R/V Kaimei Engineering cruise

(4) **Chief Scientist**

Fujio Yamamoto (JAMSTEC)

(5) **Representative of the Science Party**

KM19-02: Fujio Yamamoto (JAMSTEC)

TC19-KM-01: Hiroshi Uchida (JAMSTEC)

TC19-KM-02: Takuro Nunoura (JAMSTEC)

(6) **Research Titles**

KM19-02: FY2019 R/V Kaimei Engineering cruise

TC19-KM-01: Evaluation of pressure sensitivity for oceanographic sensors

TC19-KM-02: Sediment sampling for Open Innovation Platform (OIP)

(7) **Cruise Period**

2019/04/05 - 2019/04/15

(8) **Ports of departure/call/arrival**

Moji - Yokosuka

(9) **Research Area**

Kumano-nada, Northern part of Nankai trough, Suruga-bay, Sagami-bay and Izu-Ogasawara area

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

YAMAMOTO Fujio*	JAMSTEC
IIJIMA Koichi	JAMSTEC
KUMAGAI Yohei	JAMSTEC
YOSHIDA Mitsuhiro	JAMSTEC
TASUMI Eiji	JAMSTEC
TANAKA Ryuta	JAMSTEC

*Chief of the cruise

4/5-4/9 disembarked at SHIMIZU

SAKURAI Noriaki	JAMSTEC
Robert Luthwaite	OSIL
Richard Aplin	OSIL
SUGAWARA Daiki	KYOKUTO BOEKI KAISHA,LTD.
TOTSUKA Kensuke	Nippon Marine Enterprise Ltd.

4/9-4/15 boarded at SHIMIZU

YOKOKAWA Taichi	JAMSTEC
MIYAMOTO Norio	JAMSTEC
MIYAZAKI Masayuki	JAMSTEC
HIRAOKA Satoshi	JAMSTEC
KOZONO Isao	Nippon Marine Enterprise Ltd.
NAKANO Shinichi	Oki Seatec Co., Ltd

Marine Technician

HATAKWYAMA Ei	Marine Works Japan
MORI Naohito	Marine Works Japan
MIYAJIMA Yuki	Marine Works Japan
KATAYAMA Yohei	Marine Works Japan
FUKAHORI Kento	Marine Works Japan
SHINOMIYA Yuta	Marine Works Japan
ITO Rei	Marine Works Japan
KOBAYASHI Rio	Marine Works Japan
OGAWA Satomi	Nippon Marine Enterprise Ltd.
MAMEO Katsura	Nippon Marine Enterprise Ltd.
MORIOKA Miki	Nippon Marine Enterprise Ltd.

3. Specification of New Giant Piston Corer

The GPC is a state of the art, second generation coring tool capable of providing 40 meters of accurate and reliable geotechnical coring in water depths down to 11,000m. Core liner is inserted into outer barrel and its inner diameter is 110 mm which corresponds to actual core sample diameter.

Fig. 1 GPC operation

Acoustic release mechanism is introduced into this second generation of GPC. This function will be performed if the barrel is stacked due to unexpected pull out tension. Specifications of the GPC is as follows;

GPC Specifications

(1) Corer head
- Weight 2.0 ～ 6.2 ton
- Material SUS304 with lead fill

(2) Barrel
- Length Max 40m (5m x 8ea (Max)
- Material CRMO

(3) Barrel coupler
- Material CRMO

(4) Core cutter
- Material SUS304

(5) Core catcher
- Material SUS304

(6) Piston
- Material SUS304 with O-ring

(7) Release type
- Triger arm (Material SUS304 and bronze)

(8) Additional tool and sensor
- Acoustic releaser and barrel release mechanism
- Capable to mount azimuth sensor

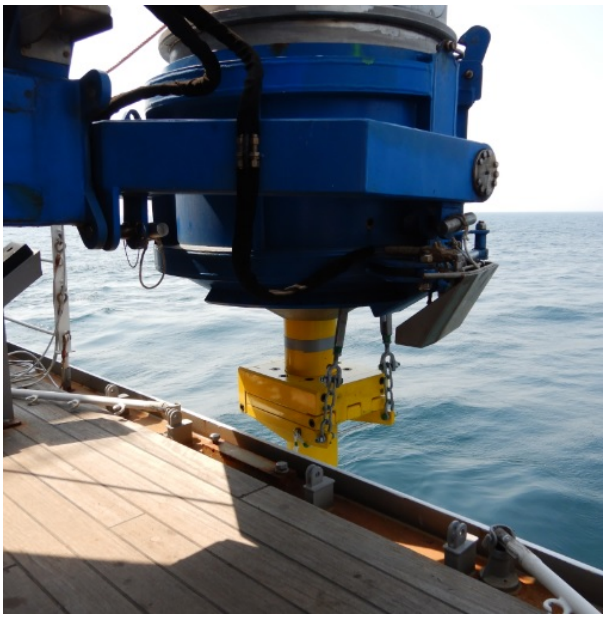

Fig. 2 Acoustic release mechanism

4. Survey area

Fig. 3 shows KM19-02 survey area. (A)Kumano-nada, (B)Northern part of Nankai Trough, (C)Suruga-Bay, (D)Sagami-Bay, and (E)Izu-Ogasawara area are shown in this figure.

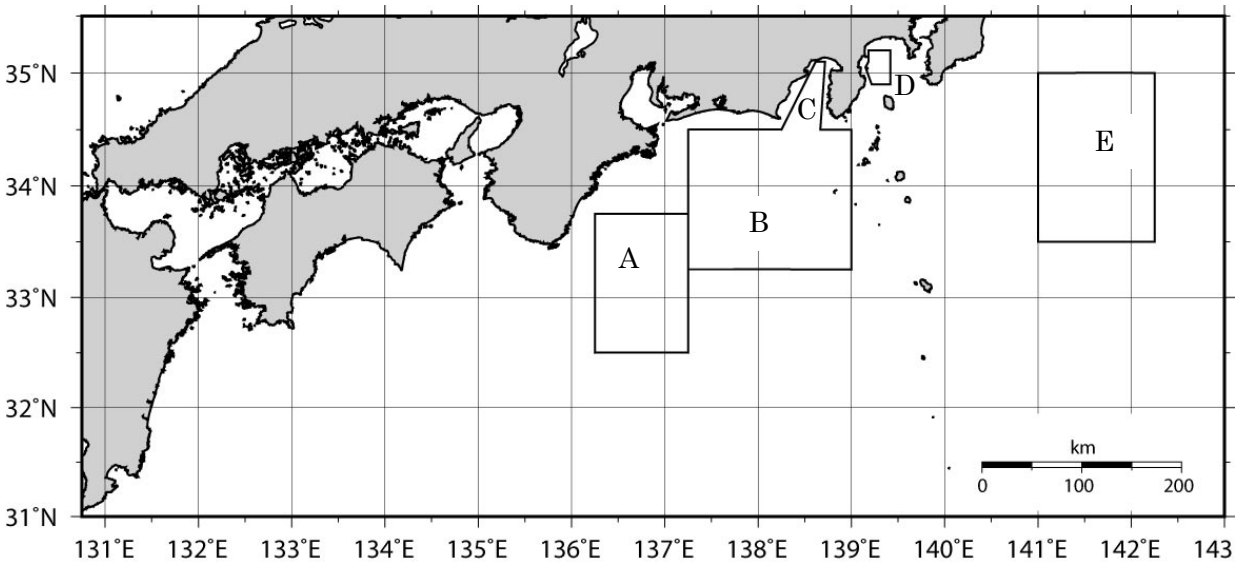

Fig. 3 Survey area

5. Cruise track

KM19-02 cruise was started from Moji port on April 5 and then, the vessel went to the proposed GPC point in Kumano-nada. 30 meters GPC coring was conducted in that location.

Performance experiments for Deep -MBES, Deep -ADCP, and towed magneto meter were also performed at JAMSTEC common measurement line in Kumano-nada. Shallow –MBES and Shallow –ADCP were checked and confirmed correctly in the Suruga-Bay.

ROV performance test was done in the Northern part of Nankai Trough. Second GPC coring operation was conducted in Sagami-bay. Free fall for CTD cable was done in the Izu-Ogasawara area. However, planned CTD-water sampling cast was abandoned due to CTD cable trouble.

Finally, the vessel arrived at JAMSTEC pier on April 15 and we ended KM19-02 cruise. Fig. 4 shows ship's tracks for the entire cruise and table 1 shows activity log during the cruise.

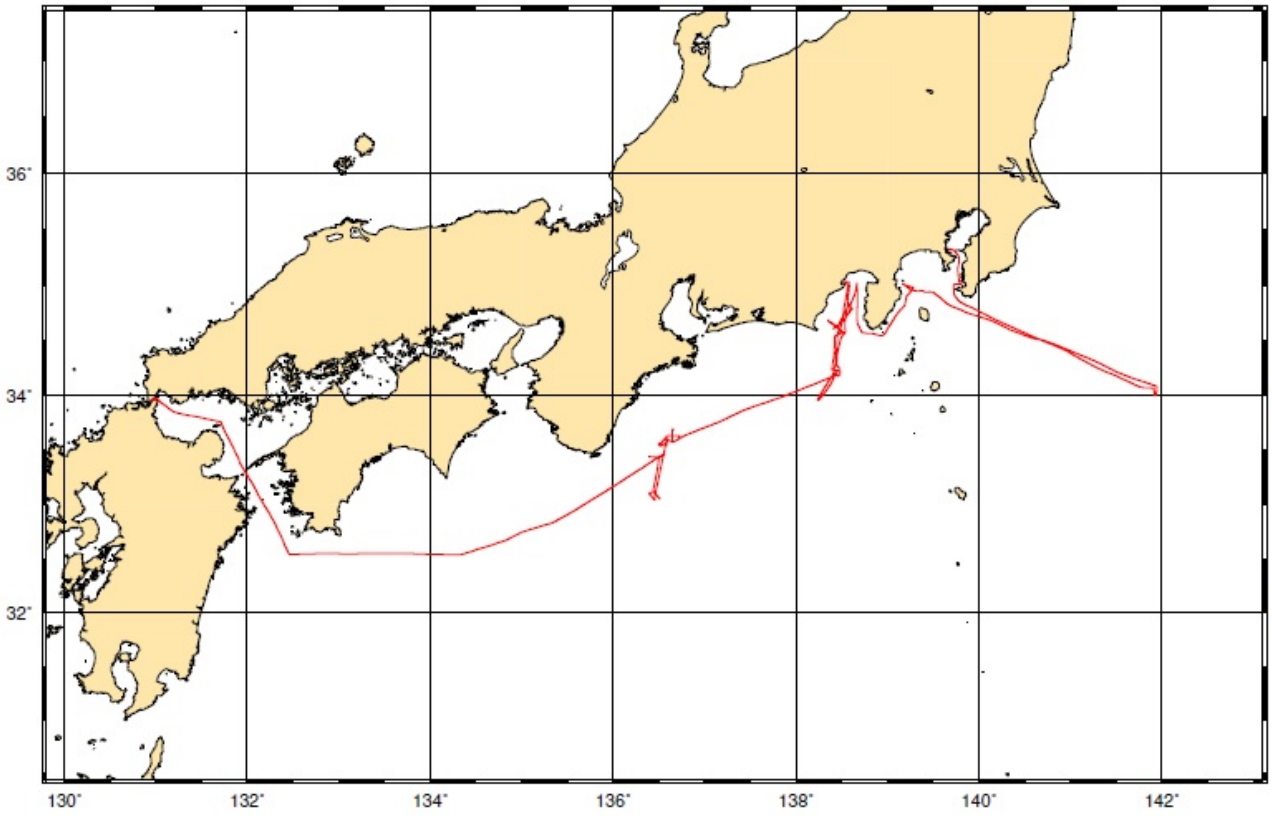

Fig. 4 Ship's tracks for the entire KM19-02 cruise

Table 1 Cruise log

2019/4/5	**KANMON-KO MOJI-KU (33-57.0N,130-57.7E)**	
Weather: Fine but cloudy / Wind direction: West / Wind force: 5 /Wave scale: 2 / Swell scale: 0 / Visibility: 7 miles (12:00 JST)		
	11:00	onboarded
	12:00	left KANMON Ko for research area
	14:00-14:50	carried out education and training for scientist
	18:00	scientific meeting
2019/4/6	**KUMANO (33-27.5N,136-32.0E)**	
Weather: Fine but cloudy / Wind direction: WSW / Wind force: 4 /Wave scale: 2 / Swell scale: 2 / Visibility: 7 miles (12:00 JST)		
	11:50	arrived at research area (KUMANO)
	11:55-12:04	carried out SBP mapping survey
	12:15	released XBT@ 33-27.8367N,136-32.8477E
	13:21-14:16	carried out GPC launching and recovering test
	14:42	water sampling by bucket @ 33-27.39940N ,136-32.37270E
	15:17-19:50	carried out GPC (30m) coring operation test
	19:56-20:11	carried out D-MBES sounding quality test
	20:49-21:58	carried out D-MBES roll bias test
2019/4/7	**KUMANO (33-34.0N,136-35.0E)**	
Weather: Overcast / Wind direction: SW / Wind force: 3 /Wave scale: 2 / Swell scale: 2 / Visibility: 7 miles (12:00 JST)		
	00:04-01:16	carried ou tracking test
	01:39-02:08	carried out D-MBES heading bias test
	5:00	arrived at ANS test point
	08:37-08:44	deployed transponder mooring system
	09:08-15:35	carried out calibration test of ANS
	16:16	recovered transponder mooring system
	16:35-17:11	commenced towing cesium magnetometer
	17:24-18:02	carried out eight figure running
	18:44-22:52	carried out test of MBES and D-ADCP
	23:00	left research area (I (NANKAI Trough Northern part)
2019/4/8	**SURUGA Bay (34-40.0N,138-22.0E)**	
Weather: Fine but cloudy / Wind direction: SSE / Wind force: 3 /Wave scale: 2 / Swell scale: 2 / Visibility: 8 miles (12:00 JST)		
	7:00	arrived at site C (N/ SURUGA Bay)
	07:15-07:45	carried out eight figure running
	7:48	released XBT@ 34-11.3390N, 138-27.8998E
	08:05-08:21	finished towing cesium magnetometer
	8:32	water sampling by bucket @ 34-13.33150N ,138-29.19170E
	08:56-09:03	carried out MBES mapping survey at KM-ROV diving point
	10:54	released XBT@ 34-34.0598N, 138-29.8834E
	11:45-13:32	carried out S-MBES roll bias test
	13:57-14:00	carried out S-MBES sounding quality test
	14:35	commenced to S-MBES pitch bias test and yaw bias test
	15:50-16:43	S-ADCP bottom tracking test
	18:12	finished above test, the shifted to drift area (Sagami bay)
	19:45	arrived at drift area
2019/4/9	**SURUGA Bay Southern part (34-28.0N,138-27.0E)**	
Weather: Fine but cloudy / Wind direction: SW / Wind force: 3 /Wave scale: 2 / Swell scale: 1 / Visibility: 9 miles (12:00 JST)		
	06:30-07:45	shifted to off SHIMIZU
	9:13	10 scientists boarded by traffic boat
	9:18	6 scientists disembarked by above traffic boat
	14:34	KM-ROV dove and started her operation (Dive94)
	15:59	launched on the sea bottom (Depth = 2989m)
	16:51	left sea bottom (Depth = 2989m)
	17:59	water sampling by bucket @ 34-14.00670N ,138-24.99310E
	18:25	recovered "KM-ROV" and finished her operation
	18:30-23:50	commenced to measuring S-ADCP and D-ADCP background noise

2019/4/10	**SURUGA Bay (34-47.0N,138-37.0E)**	
Weather: Rain / Wind direction: NNE / Wind force: 5 /Wave scale: 4 / Swell scale: 1 / Visibility: 4 miles (12:00 JST)		
	6:07	released XBT@ 34-46.9557N,138-36.9450E
	8:13	KM-ROV dove and started her operation (Dive95)
	9:07	launched on the sea bottom (Depth = 1730m)
	11:28	left sea bottom (Depth = 1730m)
	13:38	recovered "KM-ROV" and finished her operation
	16:39-18:17	carried out S-ADCP misalignment measurement
2019/4/11	**SURUGA Bay (34-49.0N,138-40.5E)**	
Weather: Fine but cloudy / Wind direction: WSW / Wind force: 3 /Wave scale: 2 / Swell scale:2 / Visibility: 8 miles (12:00 JST)		
	11:00	left research area (: (SAGAMI Bay)
	15:30	arrived at research area (SAGAMI Bay)
	15:32	released XBT@ 34-55.1862N, 139-13.7989E
	15:43-15:57	carried out MBES and SBP mapping site survey
2019/4/12	**SAGAMI Bay (34-57.5N,139-16.0E)**	
Weather: Overcast / Wind direction: NNE / Wind force: 5 /Wave scale: 3 / Swell scale: 1 / Visibility: 8 miles (12:00 JST)		
	6:30	arrived at GPC operation point
	08:43-11:35	carried out GPC (20m) coring operation
	16:15	left research area (: (IZU-OGASAWARA Trench)
2019/4/13	**IZU- OGASAWARA Trench (34-01.0N ,141-55.0E)**	
Weather: Fine but cloudy / Wind direction: NNE / Wind force: 5 /Wave scale: 4 / Swell scale: 4 / Visibility: 8 miles (12:00 JST)		
	3:30	arrived at IZU-OGASAWARA Trench †
	5:52	released XBT@ 34-00.4705N,141-55.2613E
	06:24-13:04	carried out Free Fall of CTD cable
	8:02	water sampling by bucket @ 34-01.20560N ,141-55.06980E
	16:30	water sampling by bucket @ 34-02.52510N ,141-55.11550E
	18:00-18:33	carried out eight figure running
	18:40	left research area for YOKOSUKA
2019/4/14	**YOKOSUKA-KO (35-19.8N ,139-40.5E)**	
Weather: Overcast / Wind direction: SSW / Wind force: 4 /Wave scale: 2 / Swell scale: 0 / Visibility: 8 miles (12:00 JST)		
	8:03	water sampling by bucket @ 35-00.47930N ,139-48.51990E
	12:00	arrived at YOKOSUKA-KO section 4
	15:03	water sampling by bucket @ 35-19.79210N ,139-40.42240E
2019/4/15	**Arrived at JAMSTEC**	
	7:00	left YOKOSUKA-KO section 4 for JAMSTEC
	9:00	arrived at JAMSTEC
	10:00	disembarked KAIMEI at JAMSTEC
	finished KM19-02 cruise	
#Wind Scale		
0	Calm	0～0.2m/s
1	Light air	0.3～1.5m/s
2	Light breeze	1.6～3.3m/s
3	gentle breeze	3.4～5.4m/s
4	Moderate	5.5～7.9m/s
5	Fresh breeze	8.0～10.7m/s
6	Strong breeze	10.8～13.8m/s
#Wave scale		
0	Calm (Glassy)	0.0m
1	Calm (Ripp	0～1/10m
2	Smooth (\	1/10～1/2m
3	Slight	1/2～1 1/4m
4	Moderate	1 1/4～2 1/2m
#SWELL SCALE		
0	No Swell	
1	Low Swell	< 2m
2	Low Swell Long	< 2m
3	Moderate Short	2m～4m

6. Preliminary results

6-1. GPC coring

(1) GPC01 in the Kumano-nada

30m GPC operation was done in Kumano-nada. Unfortunately, barrel around 13 meters from the bottom was bent, but we could get about 9 meters core sample.

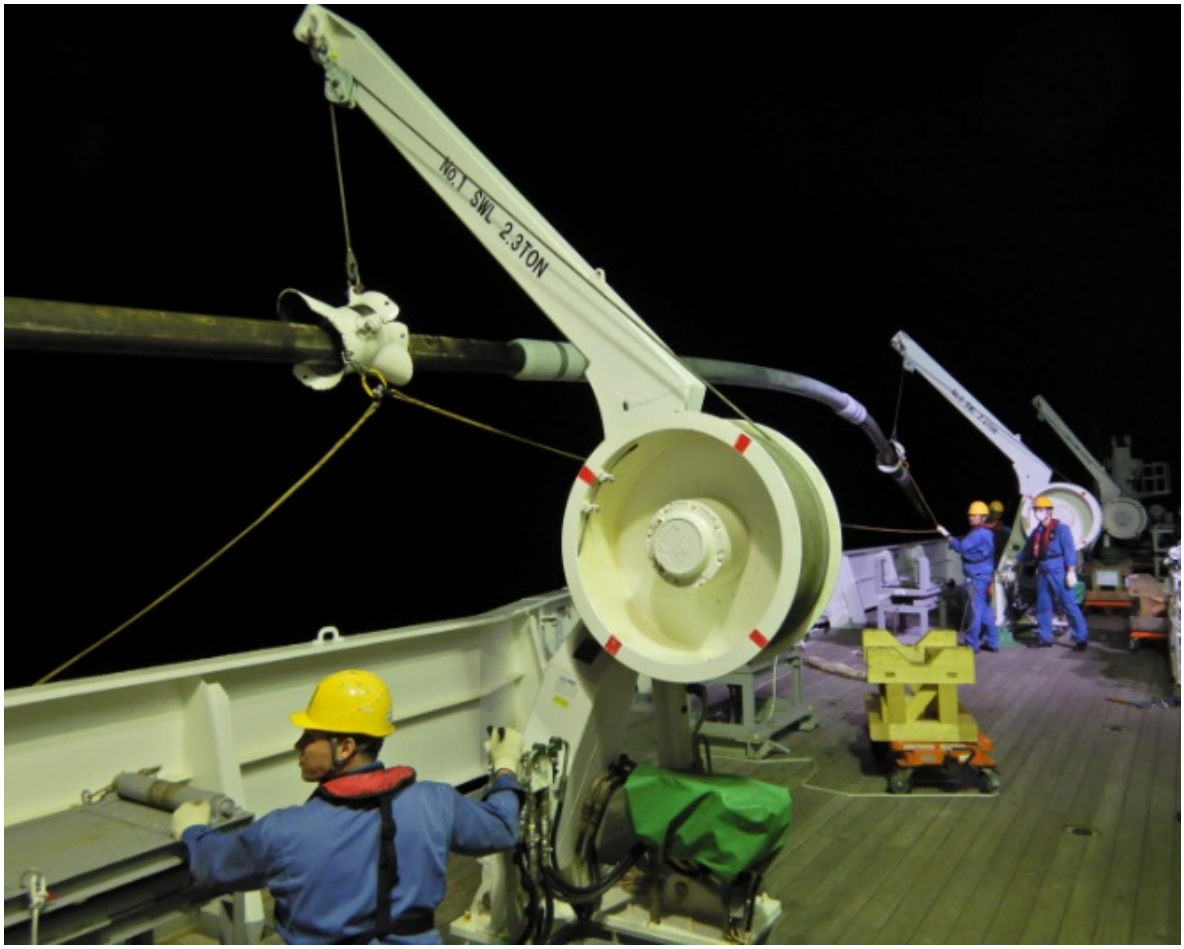

Fig. 5 Bending barrel

(2) GPC02 in the Sagami-bay

20m GPC operation was done in Sagami-bay. The barrel was not bent in this time. 16 meters core sample was recovered.

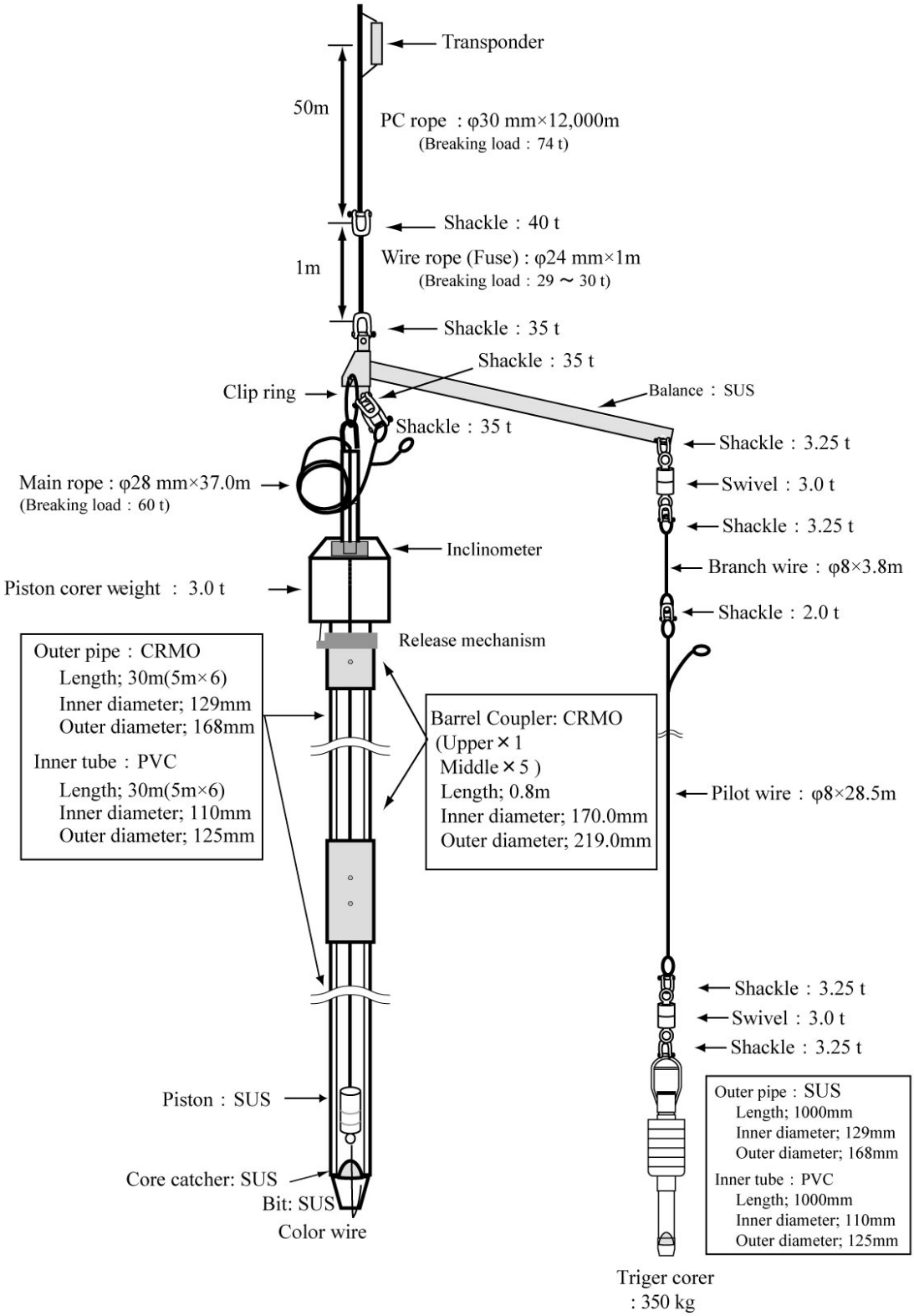

Fig. 6 GPC (30m) configuration

Table 2 shows coring information acquired during cruise. MSCL measurements for core samples were also conducted at No.1 MSCL container onboard *R/V KAIMEI*. Further processing will be done onshore.

Table 2 Coring information

Coring Information KM19-02

Date (UTC) yyyymmdd	Core ID	Location	Water Depth (m)	Positon			Total weight		Barrel length (m)	Main rope length (m)	Pilot wire length (※) (m)	Free Fall (m)	Wire jump (m)	Penetration (m)	Core length		Tension (t)
				Latitude	Longitude	Type	Corer (t)	Barrel (t)							PC (m)	PL (m)	
20190406	GPC01	Kumano-Nada	2,064	33-27.4588N	136-32.3333E	Ship	3.0	2.7	30.0	37.0	32.3	0.4	4.2	10.2	8.98	1.03	16.8
20190412	GPC02	Sagami-Bay	1,349	34-57.4998N	139-16.1173E	Transponder	3.0	1.8	20.0	27.0	22.3	0.4	3.2	18.9	16.04	0.98	13.6

※Pilot wire length is included branch wire length. Branch wire length is 3.8m.

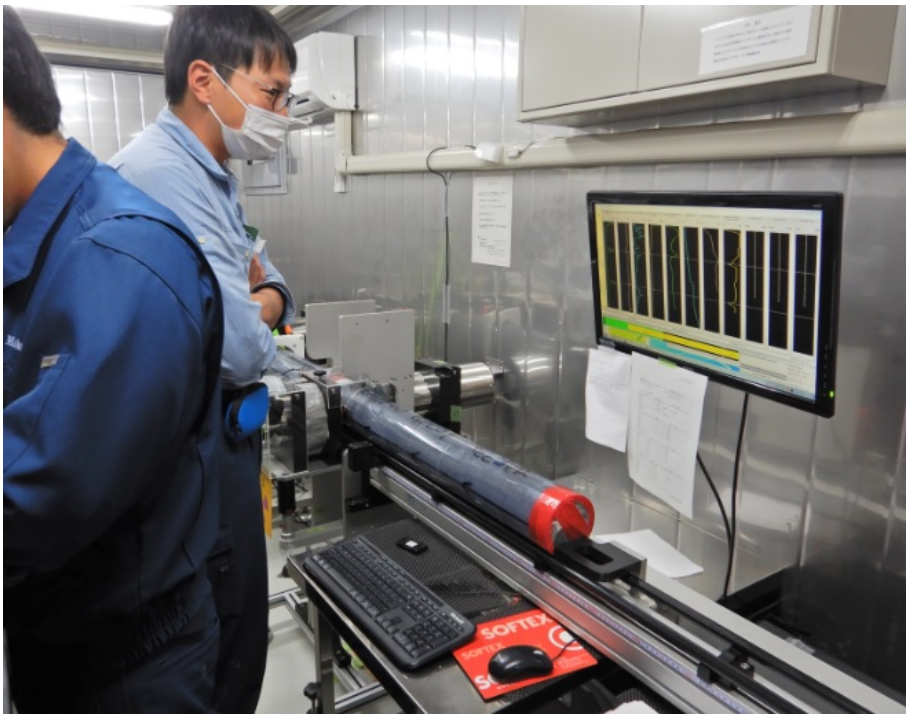

Fig. 7 MSCL measurements

6-2. KM-ROV

ROV was dived to check its performance in Northern part of Nankai Trough. Water depth was 2950 meters. ROV was functioned and performed correctly.

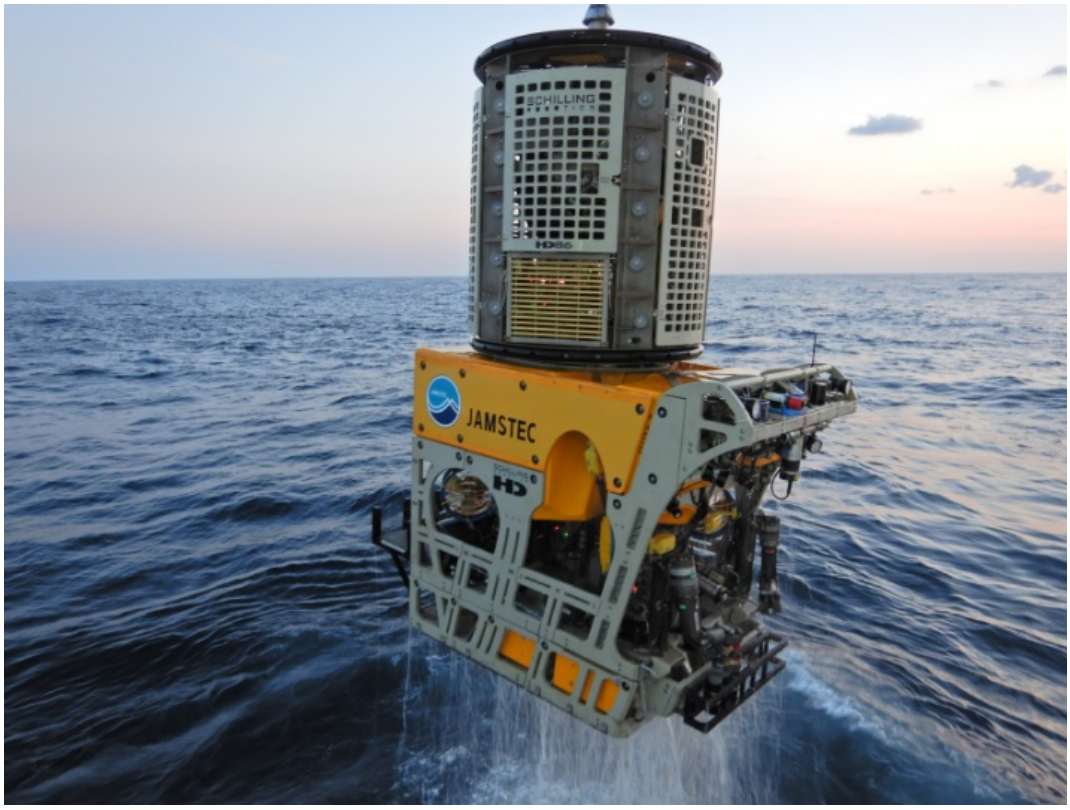

Fig. 8 KM-ROV recovery

6-3. Shipboard sensors and towed magneto meter

All sensors including hull mounted acoustic sensors (MBES, ADCP, SBP, ANS), gravity and magneto meter installed on the vessel were checked and confirmed their performance correctly. We collected pitch, yaw and roll bias and applied to systems. Finally, bathymetric survey was conducted and confirmed their specifications.

6-4. Sediment sampling for Open Innovation Platform (OIP)

OIP provides microbiological and environmental genetic resources such as microbial strains, deep-sea sediments for isolation of microbes and for environmental DNA, and environmental DNA sequences, to industry and academy for industrial purposes. During this cruise, OIP takes deep-sea sediment samples for the resources and samples for environmental parameters associated with them such as pore-water geochemistry, sediment organic geochemistry, microbial and meiofaunal diversity.

6-5. Evaluation of pressure sensitivity for oceanographic sensors

No observation was carried out for this proposal due to rough weather and the CTD cable's damage.

7. Acknowledgement

We thank Captain YOSHIDA Rikita, crew and technical staffs of our experiments conducted during the KM17-05 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.