doi : 10.17596/0002866

YOKOSUKA “Cruise Report”

YK15-01

(Nansei-shoto)

Jan.7th, 2015-Jan.29th, 2015

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

YK15-01 cruise report Contents

1. Cruise Information

Cruise ID: YK15-01

Name of vessel: YOKOSUKA

Title of the cruise: “Project for wide-area earthquake research of the Nankai Trough”

: Paleoseismology in the slope to trench.

Chief scientist [Affiliation]: Toshiya Kanamatsu [CEAT-JAMSTEC]

Lead proponent [Affiliation] : Shuichi Kodaira [CEAT-JAMSTEC]

Title of proposal: “Project for wide-area earthquake research of the Nankai Trough”

: Paleoseismology in the slope to trench.

Cruise period: 7th, Jan – 29th, Jan 2015

Ports of call: Sumitomo, Yokosuka –Yokosuka (Fig.1-1)

Research area: Nanse-shoto

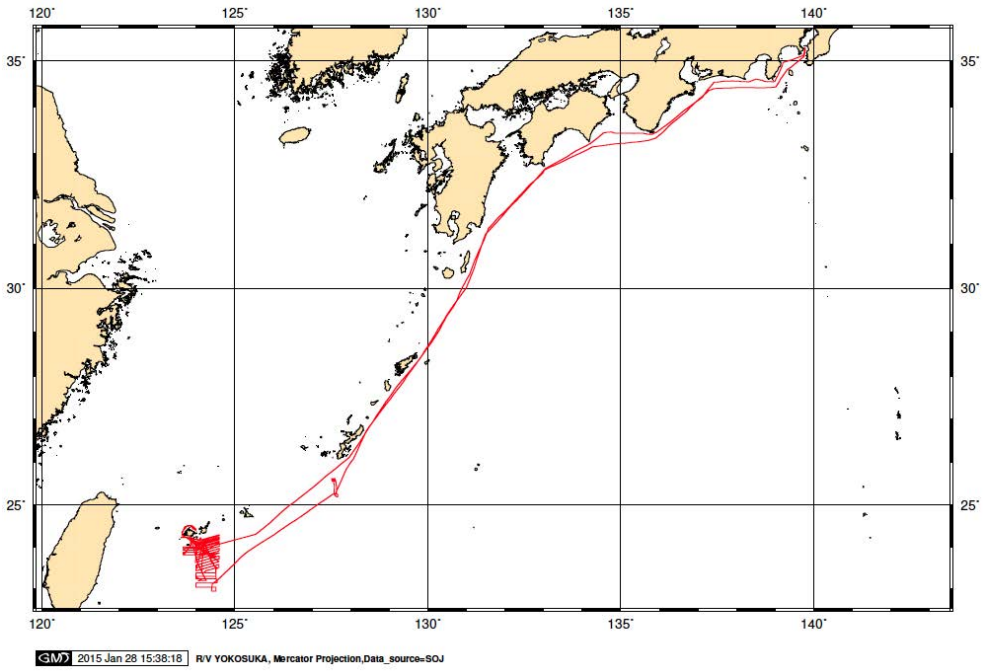


Figure 1-1 ship-track of YK15-01

2. Participant list

Scientific party

Toshiya Kanamatsu	JAMSTC
Ken Ikehara	AIST
Taku Ajioka	AIST
Kazuhiro Yoshida	Marine Works Japan Ltd
Hiroaki Hayashi	Marine Works Japan Ltd
Yuki Miyajima	Marine Works Japan Ltd
Keiko Fujino	Marine Works Japan Ltd

R/V YOKOSUKA Ship Crew

Captain	TAKAFUMI AOKI
2nd Officer	HIROYUKI KATO
2nd Officer	TOMOYUKI TAKAHASHI
3rd Officer	AKIRA SUZUKI
Chief Engineer	KIYONORI KAJINISHI
1st Engineer	DAISUKE GIBU
2nd Engineer	KATSUTO YAMAGUCHI
3rd Engineer	YOSHIHIRO OTSUGA
Chief Electronic op.	TAKEHITO HATTORI
2nd Elect. Op.	YOSHIKAZU KURAMOTO
3rd Elect. Op.	RYOSUKE KOMATSU
Boatswain	KOZO YATOGO
Quarter Master	KAZUMI OGASAWARA
Quarter Master	YUKI YOSHINO
Quarter Master	NAOKI IWASAKI
Sailor	JUN SHINODA
Sailor	RYOMA TAMURA
Sailor	SHINYA KOJIMA
No.1 Oiler	KAZUAKI NAKAI
Oiler	KAZUO SATO
Oiler	KOTA AIZAWA
Oiler	TOSHINORI MATSUI
Assistant Oiler	SHOTA SHIMOHATA
Assistant Oiler	ATSUMU HARA
Chief Steward	KATSUYUKI OMIYA
Steward	AKIO SUZUKI
Steward	HIRONOBU HODOKUMA
Steward	YOSHIE HIDAKA
Steward	KENTO OKAZAKI

3. Cruise Log

YK15-01 Cruise Log

Jan. 2014	
7	Left Yokosuka for the research area.
8	Transit
9	Transit onboard seminar by Ken Ikehara
10	Transit/ MBES
11	PC01 Piston coring at 23-56.30N, 124-04.40E (2750m) PS02 Piston coring at 23-50.20N, 124-24.10E (2500m) MBES&SBP (night time)
12	MBES&SBP and wait on weather off Kuroshima
13	MBES&SBP with 8knt off Ishigaki-shima Wait on weather off Iriomote-shima
14	Wait on weather off Iriomote-shima
15	Wait on weather off Iriomote-shima in the moring MBES&SBP in 8knt off Ishigaki-shima in the afternoon
16	Piston coring PC3 23-52.9N 124-11E (2850m) PC4 23-51N 124-10.6E (2950m) Night time: MBES&SBP in 8knt fore-arc basin area off Ishigaki-shima from the afternoon to the next morning.
17	Piston coring PC05 23-57.80N 124-04.40E (2750m) PC06 23-58.60N 124-05.70E (2650m) Night time: MBES&SBP in 8Knt fore-arc basin area off Ishigaki-shima from the afternoon to the next morning
18	Piston coring PC07 23-58.0N 124-07.7E (2650m) PC08 23-57.9N 124-08.50E (2650m) Night time: MBES&SBP in 8Knt trench floor off Ishigaki-shima from the afternoon to the next morning
19	PC09 124-10.85E 23-56.8N (2820m) MBES&SBP and Wait on weather off Ishigaki-shima in the afternoon
20	Multiple corer &Piston coring MC01 23-57.9N, 124-08.5E (2,665m)

	PC10 24-10.6N, 124-10.0E (1,090m) MBES&SBP with 8knt in trench floor off Ishigaki-shima from the afternoon to the next morning
21	Piston coring PC11 23-54.8 N 124-13.6E (2,820 m) PC12 24-10.5N 124-13.6 E (1,150m) MBES&SBP in 8knt trench floor off Hateruma-shima and wait on weather off Iriomote-shiam.
22	Multiple corer &Piston coring MC01 23-56.30N, 124-04.40E (2750m) PC13 23-50.20N, 124-24.10E (2500m)
23	PC14 23_12.0169N 124_08.9843E(6448)
24	PC15 23_08.0377N 124_24.9981E(6529)) failed
25	PC16 25_35.0077N 127_32.9978E(2521) PC17 25_15.2887N 127_35.8534E(2681)
26	transit
27	transit
28	transit
29	Arrived at port to Yokosuak

4. Objective and overview of observation

The objectives of this cruise are to explore the recurrence record of Large Tsunami and earthquake archived in deep-sea sediment in the Nansei-shoto as a part of the study of "Project for wide-area earthquake research of the Nankai Trough" funded by the Ministry of Education, Culture, Sports, Science, and Technology of Japan. In the Southwest Islands subduction zone, tracks of past large earthquakes and Tsunamis were observed. However, because of less information about the recurrence and location of Tsunami and earthquakes in comparison with the case of Nankai trough. General images of recurrence of Tsunami and earthquake should be figured out. We focuses on the area where are largely affected by 1771 Meiwa-tsunami and Yaeyama earthquake (Figure 4-1). Because Ujiie et al., (1997) reported that medium to course turbidites are intercalated in the cores which obtained from the deep sea fan developing in the south of Ishigaki-shima, we begun a intensive sampling from the fan. Because no detail topographic data in the survey area, we collected bathymetric data in order to design to coring plan in the south area of Ishigaki island from ca 1000m water depth to 6500 m (Figure 4-3). We recovered 14 piston cores, and two multicores. We found that a frequent intercalation of medium-coarse grain size turbidites in the collected cores (Figure 4-2). Post-cruise analyzing will provide us more detail information of the Nansei-shoto earthquake and Tsunami history.

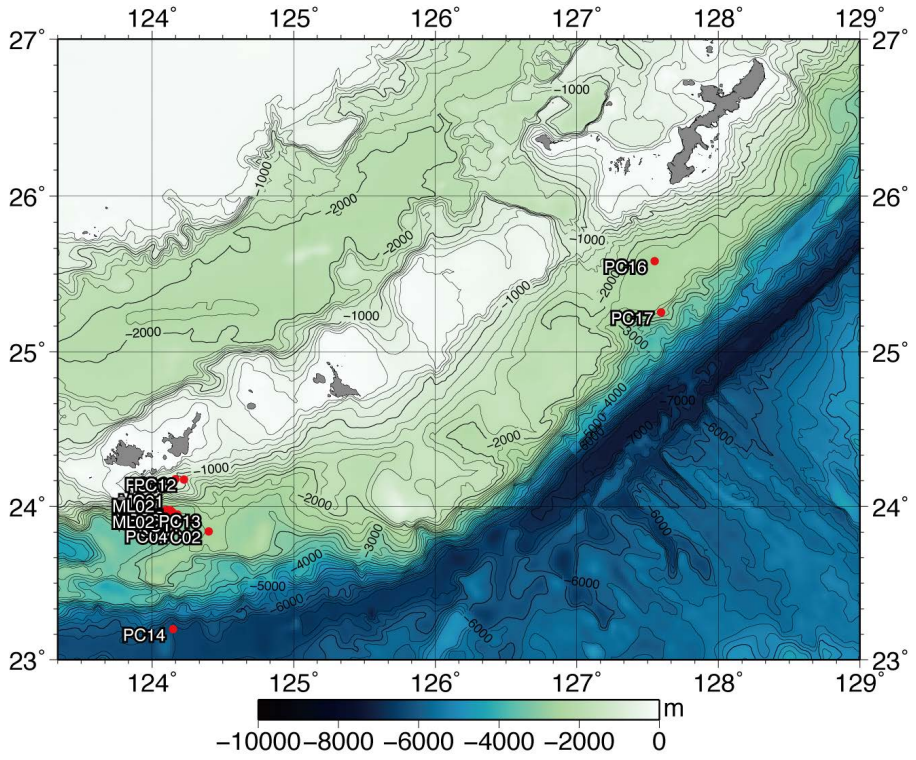


Fig. 4-1 Locations of cores obtained during YK15-01

Fig. 4-2 Photo of YK15-01 PC01 (23-56.3055'N, 124-04.4122'E, 2,765m). Note intervals of light color correspond to turbidites including shell and coral fragments.

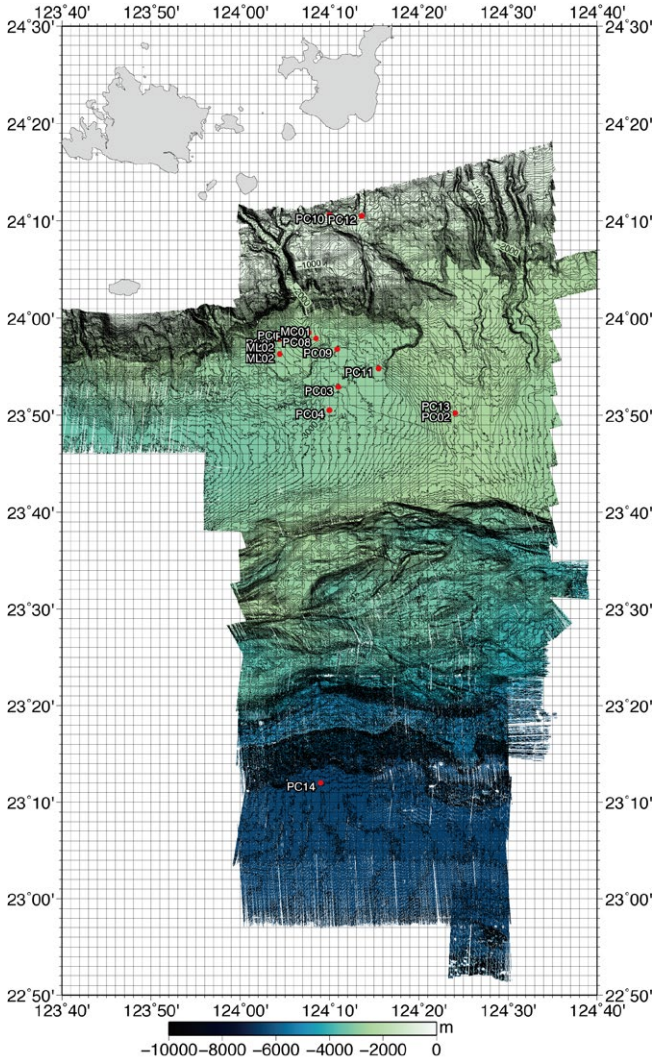


Fig. 4-3 Bathymetric map of the south area of Ishigaki Island.

5. Instruments and Operation of Piston corer (MWJ)

5-1. Piston corer (Figure 5 left)

Piston corer system (PC)

Piston corer system consists of 0.48 ton weight, 4 m and/or 6 m long stainless steel barrels trigger which works as the balance and a pilot core sampler. In addition, the polyvinyl chloride (PVC) liner tube is inside of the stainless steel barrel. The inner diameter (I.D.) of liner tube is 75 mm. The total weight of the system is approximately 0.7 ton. In this cruise, we used the piston for PVC liner tube. The PVC piston is composing of two or five O-rings (size: P63). For a pilot core sampler, we used a "74 mm diameter long-type pilot corer". Pilot corer consists of 112 kg weight, 70 cm long stainless steel barrel and polycarbonate liner tube. The I.D. of polycarbonate liner tube is 74 mm. The inclinometer (Alec-electronics ltd., APC-USB; maximum depth 7,000 m) was attached to the head of the PC weight to monitor the PC actions (including inclination, compass, acceleration and depth sensors). The transponder (Benthos ltd., XT-6001 10 inch; maximum depth 6,000 m) was attached to the winch wire above or over 50 m from the PC to monitor the PC position.

About "K-value"

"K-value" means the hardness barometer of the sea floor sediment.

K-value = pure pull out load / (outer diameter of outer pipe * penetration length).

Because of winding power of the winch, we were requested to choose pipe length with referring "K-value".

Winch operation

When we started lowering PC, a speed of wire out was set to be 20 m/min, and then gradually increased to the maximum of 50 m/min. The corers were stopped at a depth about 100 m above the seafloor for about 3 minutes to reduce some pendulum motion of the system. After the corers were stabilized, the wire was started out at a speed of 20 m/min, and we carefully watched a tension meter. When the corers touched the bottom, wire tension abruptly decreases by the loss of the corer weight. Immediately after confirmation that the corers hit the bottom, wire out was stopped and winding of the wire was started at a speed of 20 m/min, until the tension gauge indicates that the corers were lifted off the bottom. After leaving the bottom, winch wire was wound in at the maximum speed.

Core splitting

The sediment sections are longitudinally cut into working and archive halves by a splitting devise and a nylon lineInstruments and Operation of Multiple corer (MWJ)

5-2. Multiple corer (Figure 5 right)

Multiple corer (MC) consists of body (620 kg in weight) and four or eight sub-corer attachments. The

sediment coring pipes are used the acryl pipes, those are 60 cm in length, and the diameter is 74 mm. The transponder (Benthos ltd., XT-6001 10 inch; maximum depth 6,000 m) was attached to the winch wire above 50 m from the MC to monitor the MC position in MC03 and MC04.

Winch operation

When we started lowering MC, a speed of wire out was set to be 20 m/min, and then gradually increased to the maximum of 50 m/min. The corers were stopped at a depth about 50 m above the seafloor for about 3 minutes. After that, the wire is run in 20 m/min, and we carefully watched a tension meter. The changes of wire tension value are used whether MC arrive or leave from the sea floor. After leaving the bottom, winch wire was wound in at the maximum speed. The MC come back on the deck, sub-corer attachments are detached from the body.

Core splitting

The sediment sections are longitudinally cut into working and archive halves by a splitting devise and a nylon line or a stainless wire.

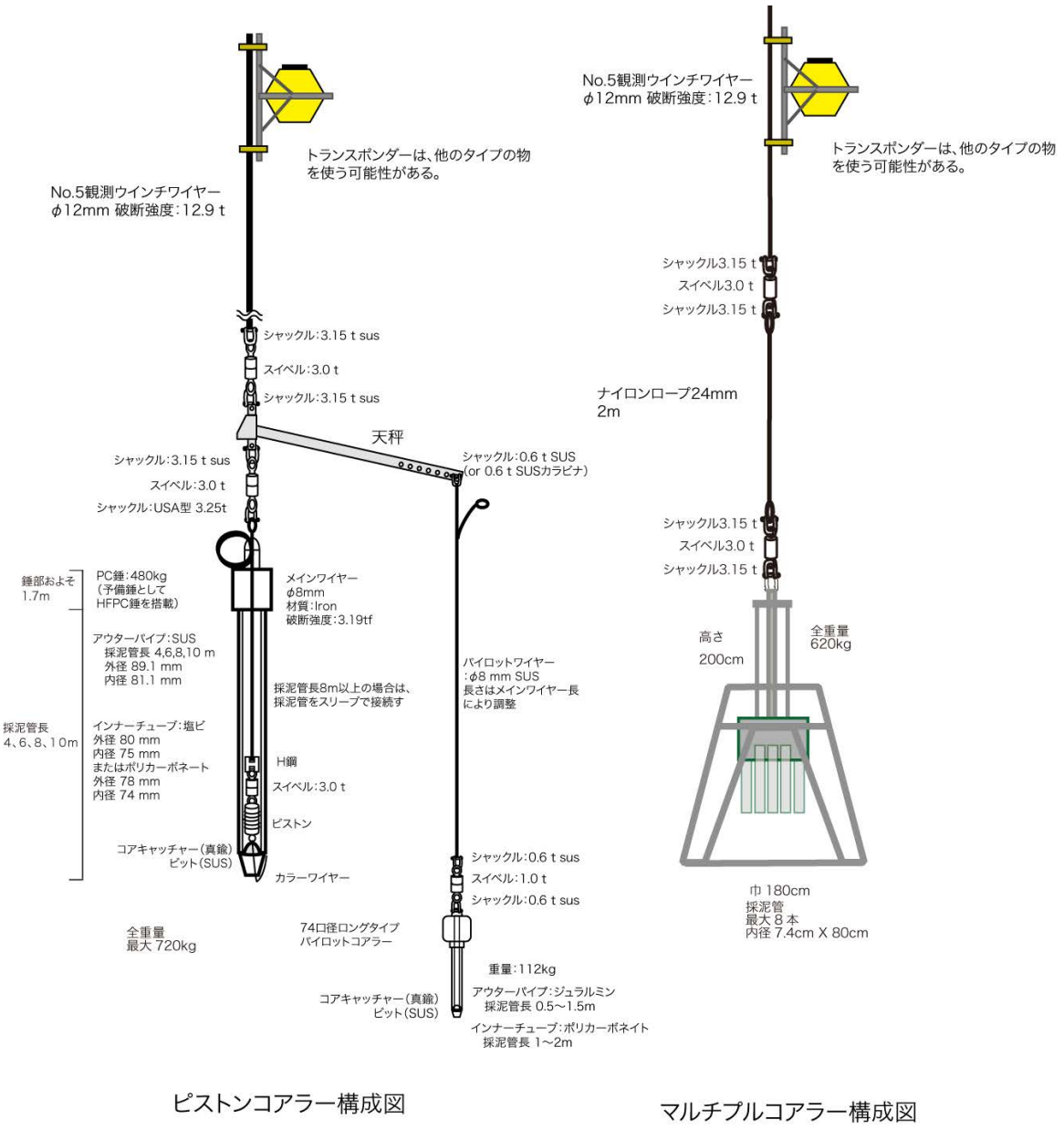


Figure 5 Piston corer and multiple corer systems

5-3. Multi-narrow beam and subbottom profiler

Kongsberg EM122 Multi beam Echo sounder system, and EdgeTec 3300-HM SBP systems were used to collect bathymetric and subbottom image data in the study area. General specifications data are followings

EM 122 performance data

Operating frequency: 12 kHz（10.5kHz～13kHz）

288 beams with width of 2°

EdgeTec 3300-HM performance data

Frequency range: 2～16kHz, Center Frequency

Pulse type: FM

Puls length 5～100ms

XBP measurement

The sound velocity profile of the local water column, which was used for calibration of depth, was estimated from a temperature profile based on in-situ XBT (Expendable Bathythermograph) measurements. We made 12 XBT measurements during the cruise (**table 5-3-1**).

Table 5-3-1 Positions of XBT measurement

Data Num	Date	time	Lat	Long	Probe Type	Max depth (m)
107	20150110	105508	24-170932N	125-281368E	T07	761
108	20150110	223245	23-562566N	124-042594E	T05	1831
109	20150111	40330	23-503915N	124-260611E	T05	1831
110	20150112	25104	24-085549N	124-285725E	T07	761
111	20150112	105824	24-111527N	124-183282E	T07	761
112	20150116	22135	23-513695N	124-105050E	T05	1831
113	20150116	130151	23-352204N	124-044043E	T07	761
114	20150118	145026	23-304490N	124-339436E	T07	761
115	20150121	84948	23-554947N	123-435942E	T07	761
116	20150123	12838	23-118775N	124-087981E	T05	1831
117	20150123	123403	23-084997N	124-296650E	T07	761
118	20150124	235253	25-349389N	127-330295E	T05	1831

6. Piston core preliminary Results

6-1. Summary of Piston coring Operation and Section length of each core

We made 17 piston coring operation and 2 multiple coring operations. Detail information are summarized following tables (**Table 6-1-1 and Table 6-1-2**). Each section length are summarized in **Table 6-1-3**

Table 6-1-1: Coring Summary of YK15-01 cruise

Date (UTC) yyyy/mm/dd	Core ID	Water Depth (m)	Position		Core length（m）		Tension MAX (kN)	K value
			Latitude	Longitude	PC	PL		
2015/1/11	PC01	2,765	23_56.3055N	124_04.4122E	2.877 /4	0	28	0.27
2015/1/11	PC02	2,502	23_50.2047N	124_24.1047E	2.447 /4	0.255	26	0.22
2015/1/16	PC03	2,886	23_52.9100N	124_11.0074E	3.380 /4	0.085	28	0.19
2015/1/16	PC04	2,933	23_50.9964N	124_10.6016E	3.065 /4	0.340	26	0.19
2015/1/17	PC05	2,748	23_57.8103N	124_04.4275E	3.814 /6	0	30	0.30
2015/1/17	PC06	2,674	23_58.5892N	124_05.6789E	3.308 /6	0	26	0.53
2015/1/18	PC07	2,637	23_58.5118N	124_07.7061E	4.058 /6	0	27	0.26
2015/1/18	PC08	2,667	23_57.8957N	124_08.5161E	4.435 /6	0.185	28	0.15
2015/1/19	PC09	2,821	23_56.8099N	124_10.8693E	4.698 /6	0.230	33	0.26
2015/1/20	PC10	1,121	24_10.5934N	124_09.9869E	2.120 /4	0	21	0.38
2015/1/21	PC11	2,823	23_54.7831N	124_15.5360E	4.733 /6	0.380	32	0.27
2015/1/21	PC12	1,150	24_10.4888N	124_13.6063E	1.834 /4	0	16	0.37
2015/1/22	PC13	2,520	23_50.1469N	124_24.1241E	4.961 /6	0.507	30	0.20
2015/1/23	PC14	6,448	23_12.0169N	124_08.9843E	2.633 /4	0.240	50	0.29
2015/1/24	PC15	6,529	23_08.0377N	124_24.9981E	0 /6	0	45	-
2015/1/25	PC16	2,521	25_35.0077N	127_32.9978E	3.341 /6	0.275	30	0.36
2015/1/25	PC17	2,681	25_15.2887N	127_35.8534E	4.344 /6	0.360	33	0.27

PC weight is 592 kg with inner type piston corer. See section 5 for details

K value = pure pull out load / (outer diameter of outer pipe * penetration length). See section 5 for details. Position were measured by transponder

Table 6-1-2: YK15-01 Multiple core Position

Date (UTC) yyyy/mm/dd	Core ID	Water Depth (m)	Position		Core length（m） (m) / HAND	No.	Tension MAX (kN)
			Latitude	Longitude			
2015/1/20	MC01	2,667	23_57.9044N	124_08.5459E	0.295	1	28
					0.305	4	
					0.295	5	
					0.310	8	
2015/1/22	MC02	2,766	23_56.3217N	124_04.4508E	0.265	1	27
					0.275	4	
					0.270	5	
					0.275	8	

Corer 620kg, Corer Acrylie type, Position were measured by transponder.

Table 6-1-3: YK15-01 Section Length

Core	Section No.	Section Length (cm)	Total Length (cm)
PC	2	91.0	
	3	99.2	
	4	97.5	
			287.7
PL	1	0.0	
			0.0
PC	2	46.5	
	3	101.2	
	4	97.0	
			244.7
PL	1	25.5	
			25.5
PC	1	40.0	
	2	100.0	
	3	100.3	
	4	97.7	
			338.0
PL	1	8.5	
			8.5
PC	1	7.5	
	2	100.0	
	3	100.0	
	4	99.0	
			306.5
PL	1	34.0	
			34.0
PC	3	84.5	
	4	98.7	
	5	100.5	
	6	97.7	
			381.4
PL	1	0.0	
			0.0

Core	Section No.	Section Length (cm)	Total Length (cm)
PC0	3	34.5	
	4	100.0	
	5	100.0	
	6	96.3	
			330.8
PL0	1	0.0	
			0.0
PC0	2	14.0	
	3	97.5	
	4	97.8	
	5	99.8	
	6	97.7	
			406.8
PL0	1	0.0	
			0.0
PC0	2	47.0	
	3	100.3	
	4	98.7	
	5	100.0	
	6	97.5	
			443.5
PL0	1	18.5	
			18.5
PC0	2	82.0	
	3	100.3	
	4	100.0	
	5	93.0	
	6	94.5	
			469.8
PL0	1	23.0	
			23.0

Table 6-1-3 (continued from the previous page): YK15-01 Section Length

Core	Section No.	Section Length (cm)	Total Length (cm)
PC	2	15.3	
	3	98.7	
	4	98.0	
			212.0
PL	1	0.0	
			0.0
PC	2	77.8	
	3	100.0	
	4	100.5	
	5	100.0	
	6	95.0	
	cc	15.0	
			488.3
PL	1	38.0	
			38.0
PC	2	1.5	(plast
	3	86.5	
	4	96.9	
			184.9
PL	1	0.0	
			0.0
PC	1	1.0	(plast
	2	98.0	
	3	100.0	
	4	100.0	
	5	99.3	
	6	98.8	
			497.1
PL	1	47.7	
	cc	3.0	
			50.7

Core	Section No.	Section Length (cm)	Total Length (cm)
PC1	2	64.0	
	3	100.0	
	4	99.3	
			263.3
PL1	1	0.0	
			0.0
PC1	4	0.0	
			0.0
PL1	1	0.0	
			0.0
PC1	3	36.9	
	4	99.7	
	5	100.0	
	6	97.5	
			334.1
PL1	1	27.5	
			27.5
PC1	2	35.0	
	3	100.0	
	4	100.4	
	5	99.7	
	6	99.3	
			434.4
PL1	1	36.0	
			36.0
MC01		29.5	HAND
			29.5
MC02		26.5	HAND
			26.5

6-2. Lithology and core photos of Piston and multiple cores

lithologic columns of cores obtained during the cruise are simplified in the following Fig.6-2.

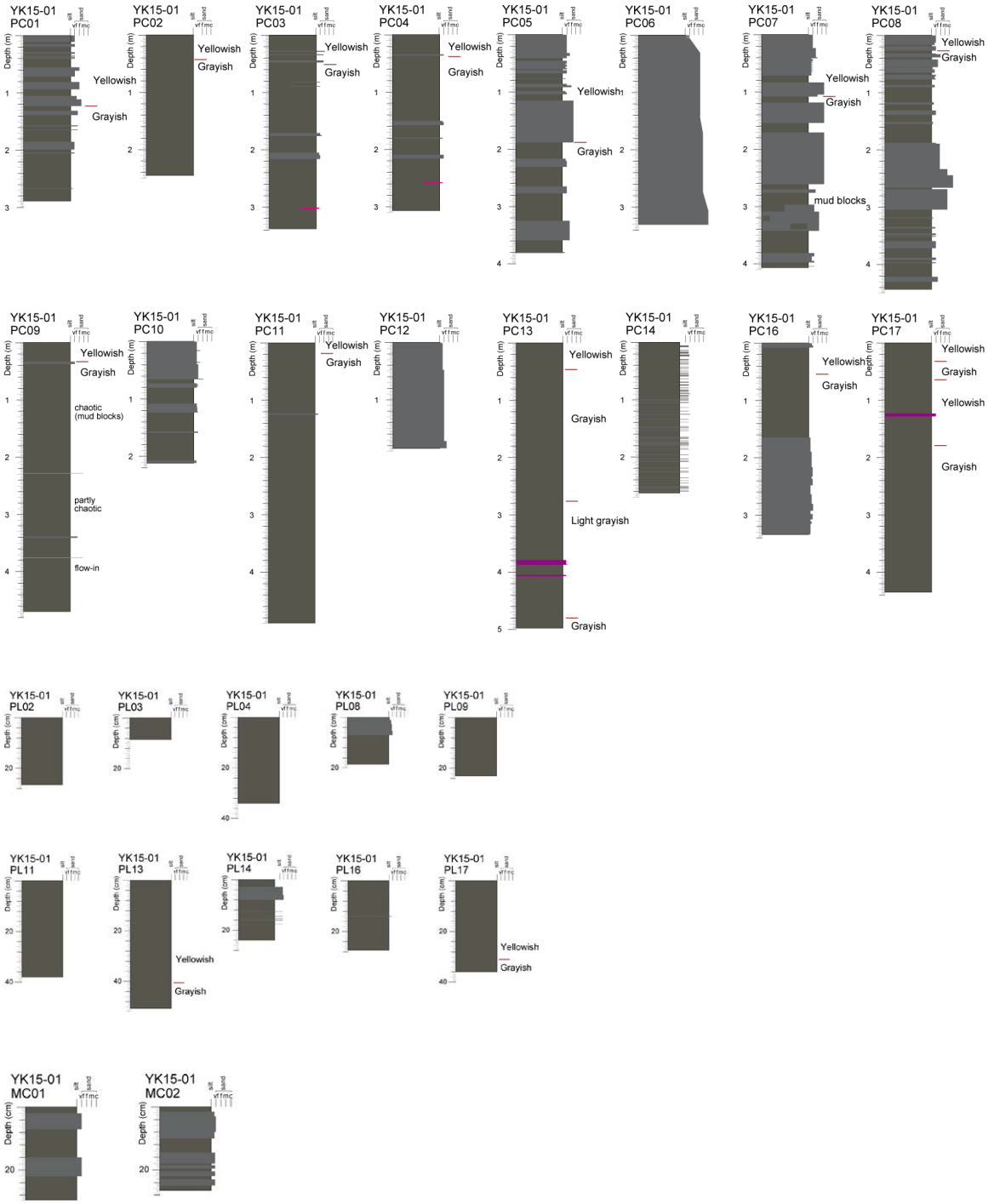


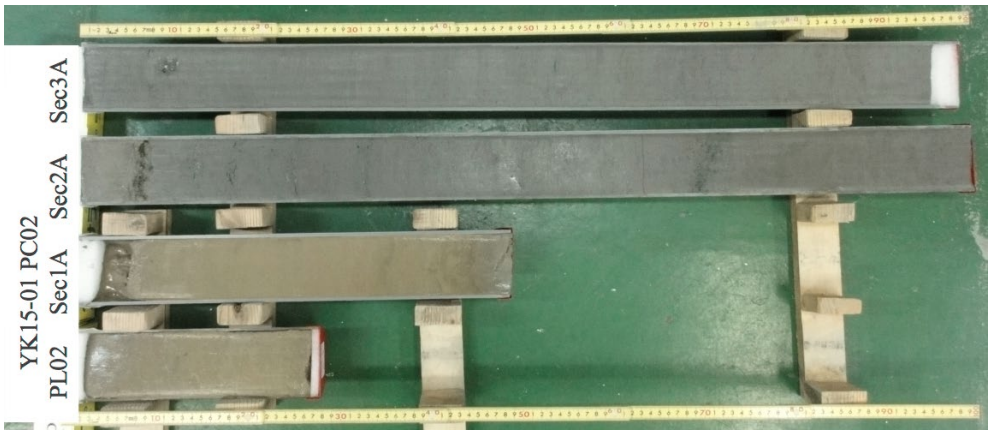
Figure 6-2 lithologic columns of cores obtained during the cruise.

6-3. Core photos of Piston and multiple cores

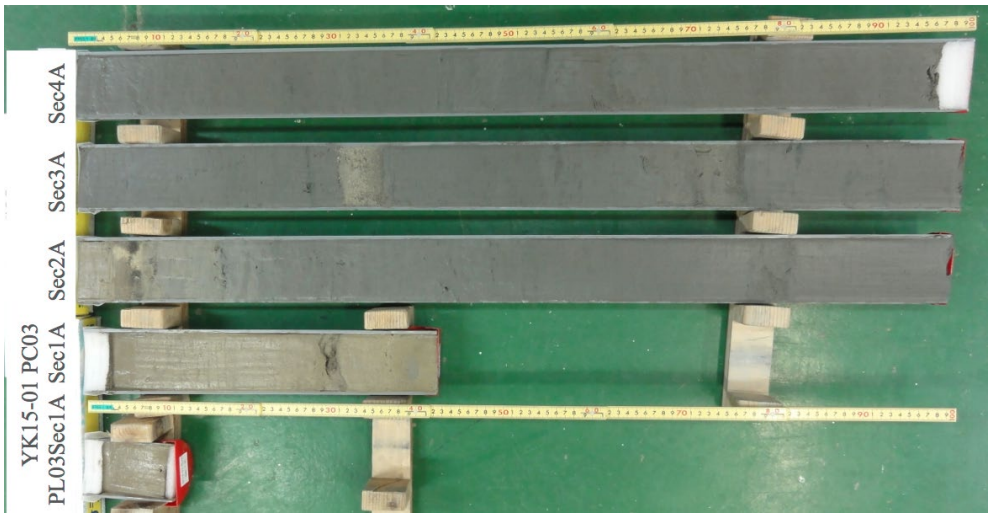
Core photos are attached in the following figures.

YK15-01 PC-01

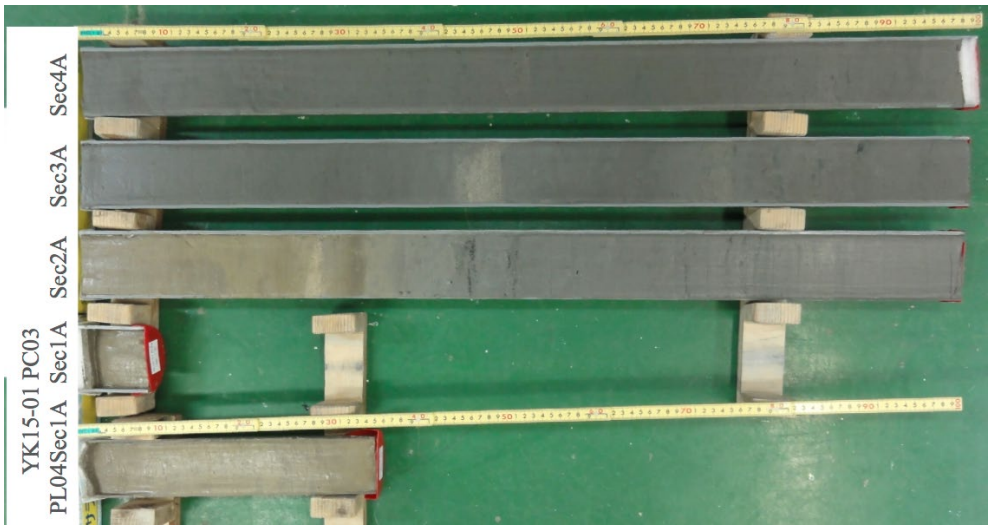
YK15-01 PC-02



YK15-01 PC-03

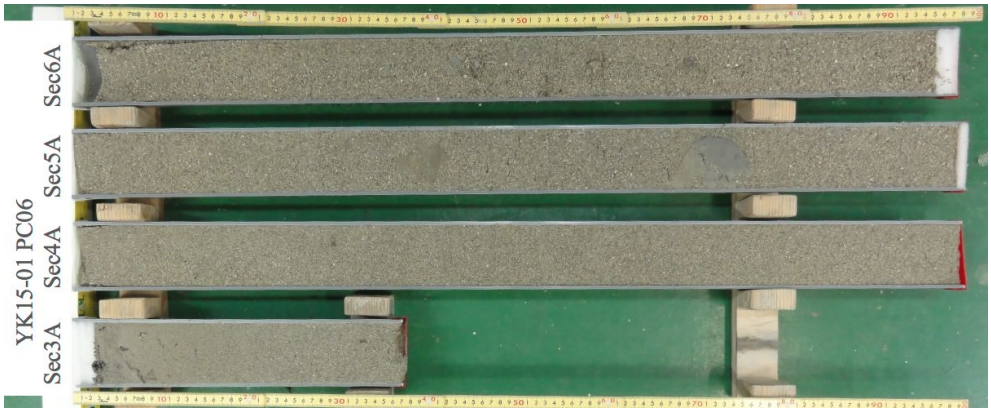


YK15-01 PC-04



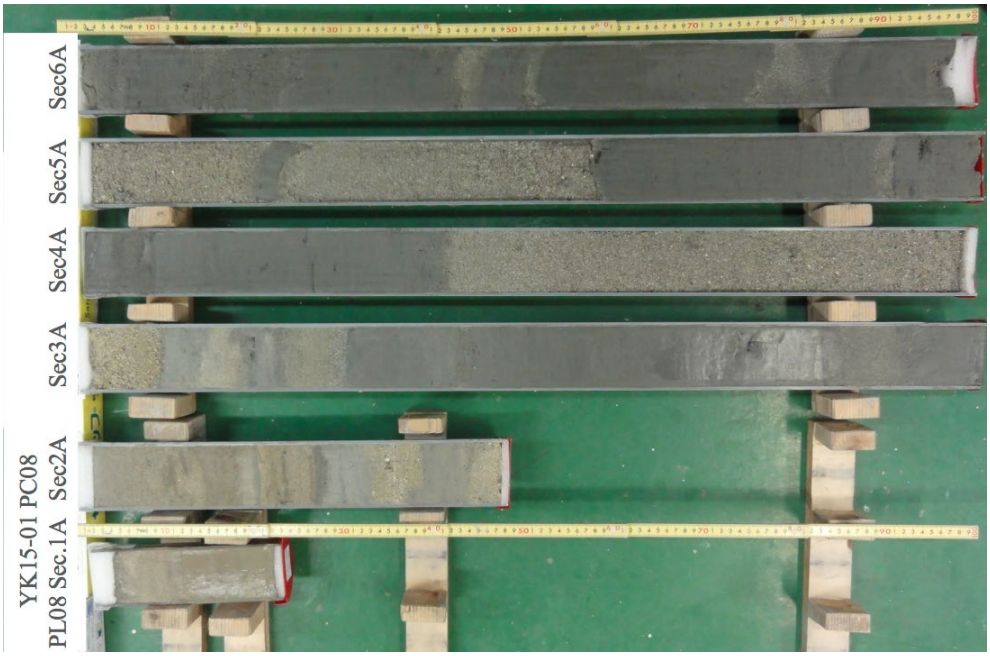
YK15-01 PC-05

YK15-01 PC-06



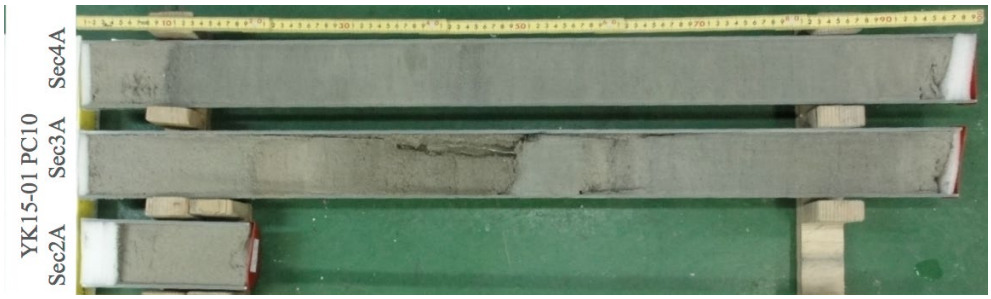
YK15-01 PC-07

YK15-01 PC-08

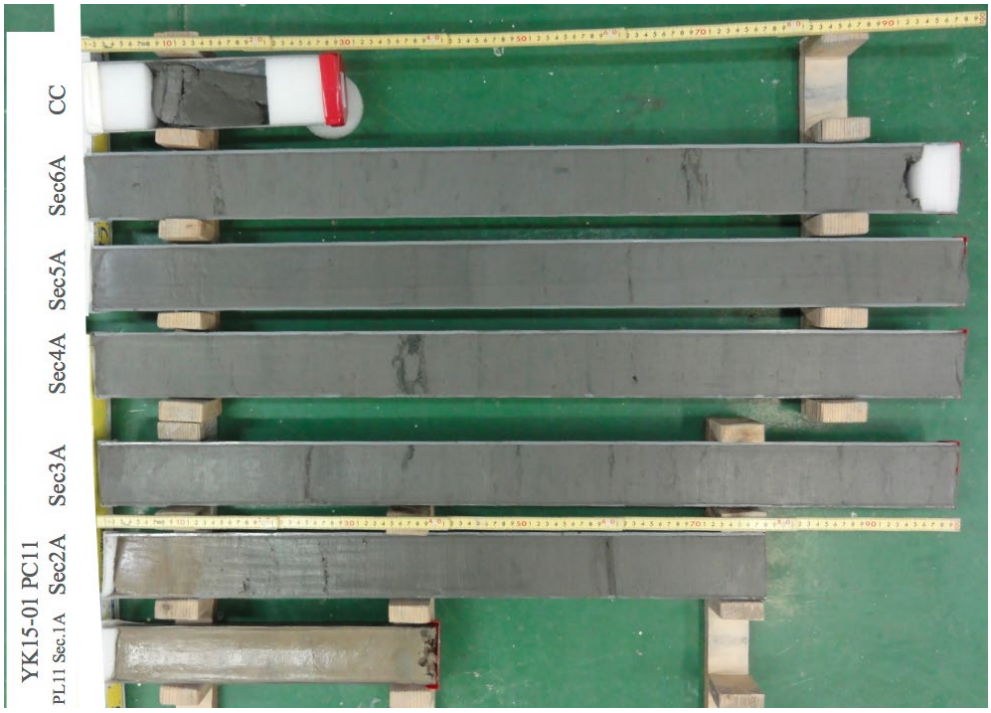


YK15-01 PC-09

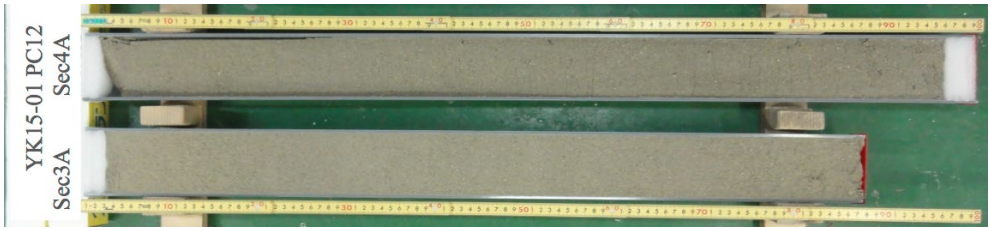
YK15-01 PC-10



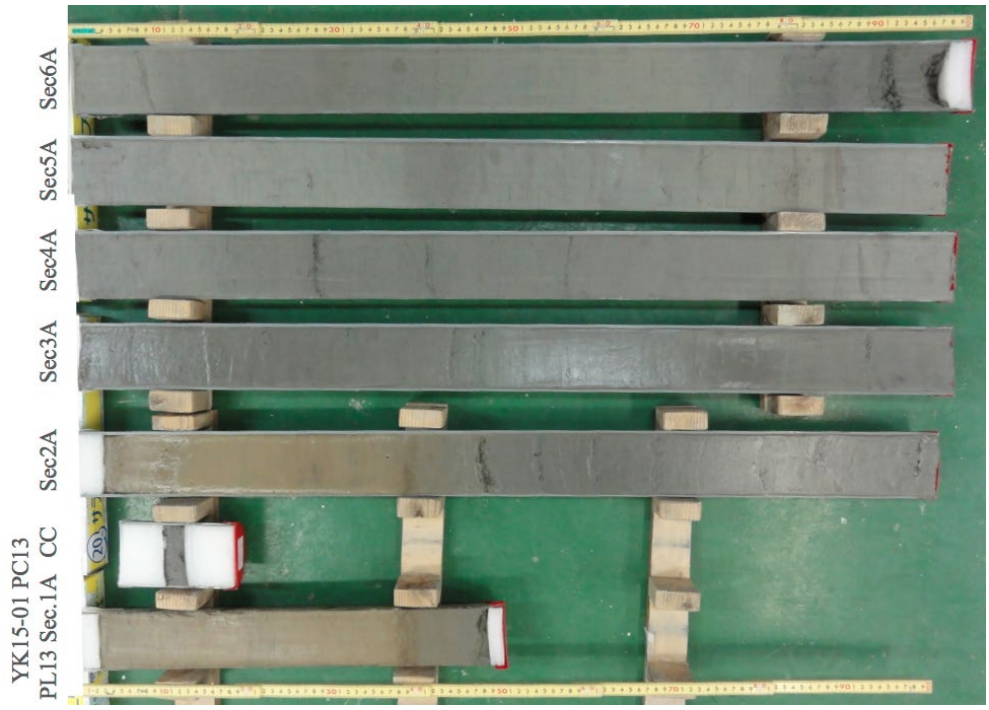
YK15-01 PC-11



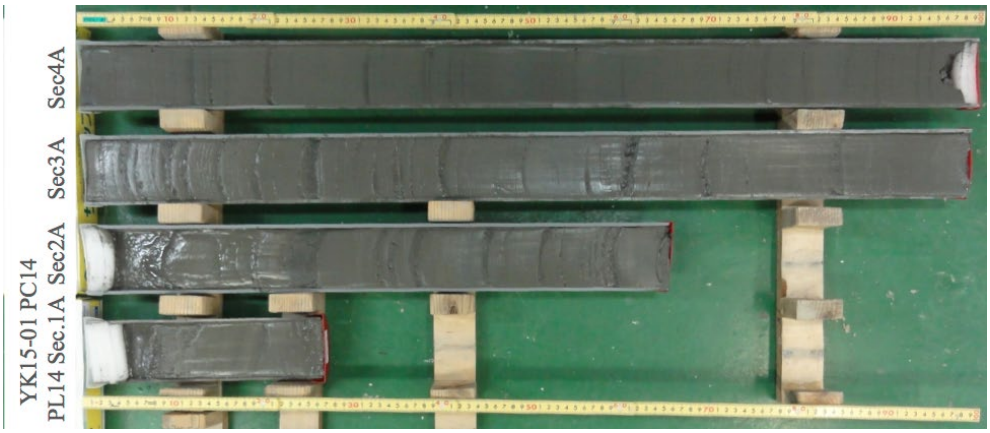
YK15-01 PC-12



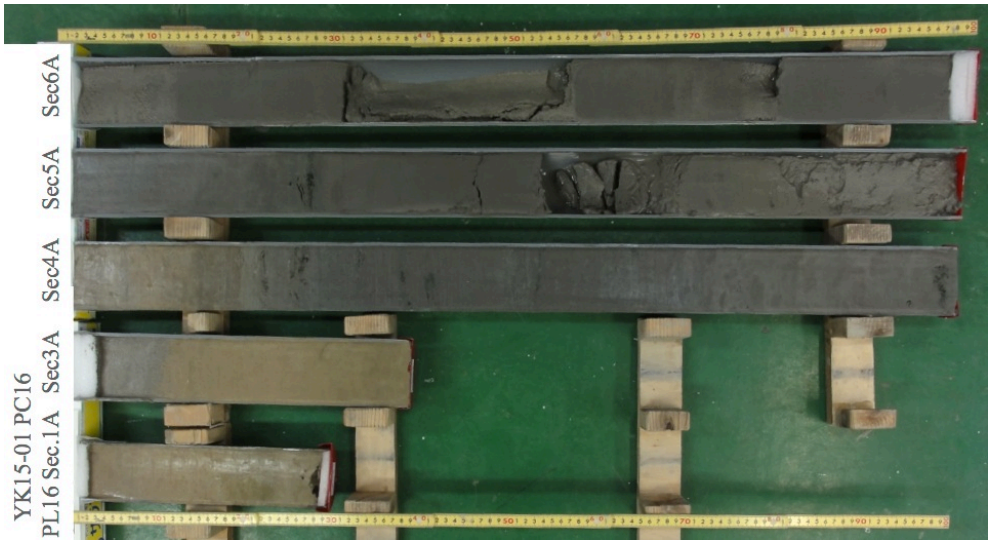
YK15-01 PC-13



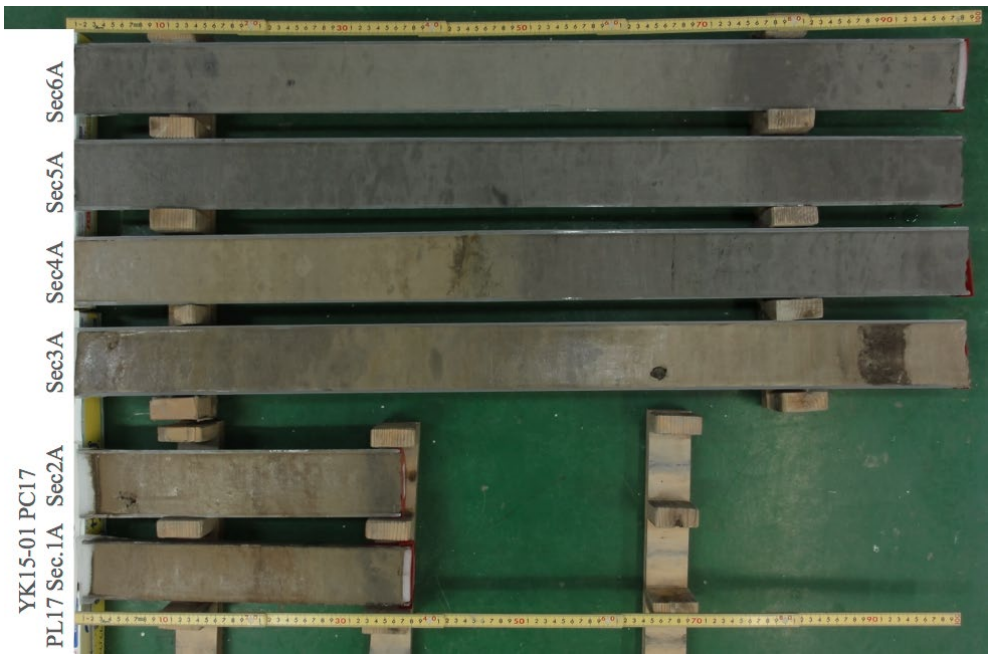
YK15-01 PC-14



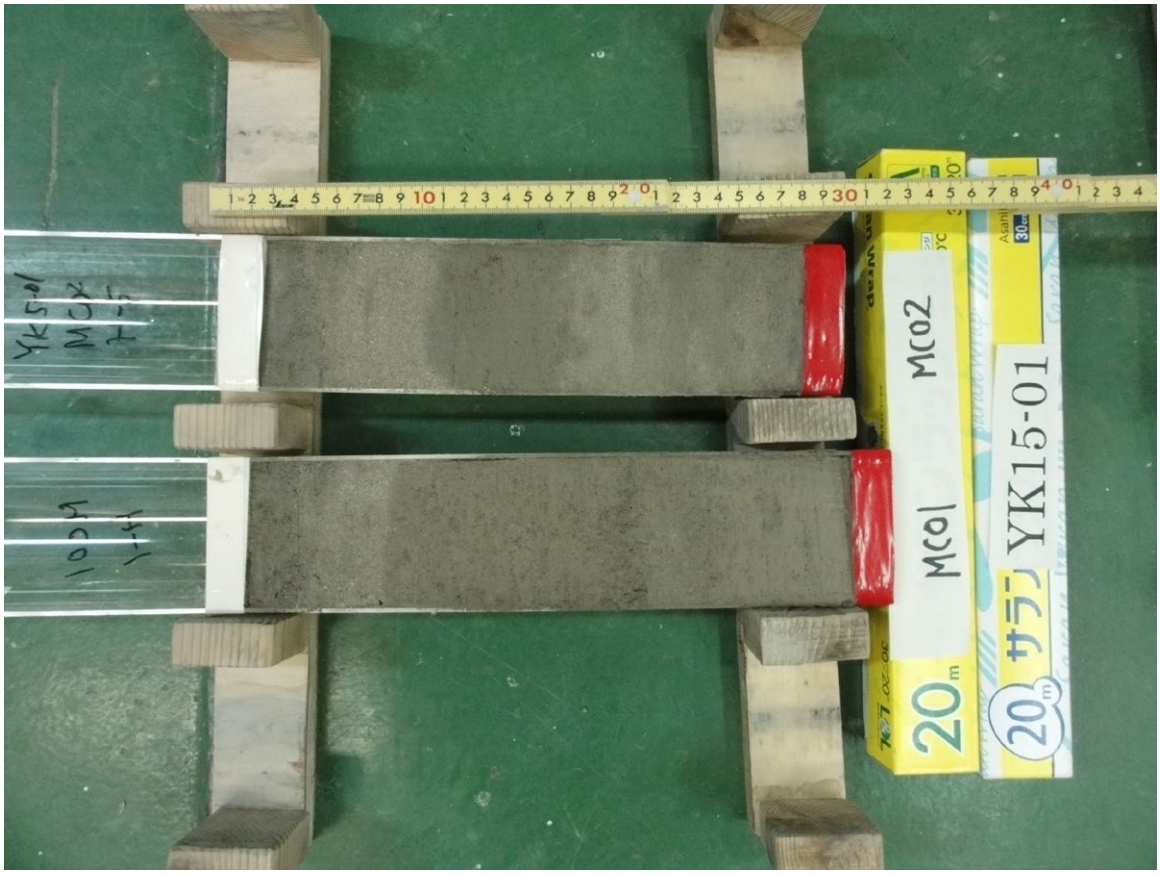
YK15-01 PC-16



YK15-01 PC-17



Multiple core MC01 and MC02



6-4 Core color

The cores of cores PC13 and PC17 were measured for their reflectance spectra on fresh surfaces of the split core with Konica Minolta CM-700d. The colorimetric information was recorded in the L*a*b* color space systems which expressed color as a function of lightness (L*) and color values a* and b* as mentioned on the Methods Section. The initial observations of the data plotted versus depth for each core show that small-scale variability at a centimeter scale dominates the signals. Longer-period trends are also revealed at the several–ten and hundred of centimeter core length. Post-cruise analyses will extract more detailed information about these measurements. All results of shipboard color measurements are presented in the following figures (**Figure 6-4-1 and Figure 6-4-2**).

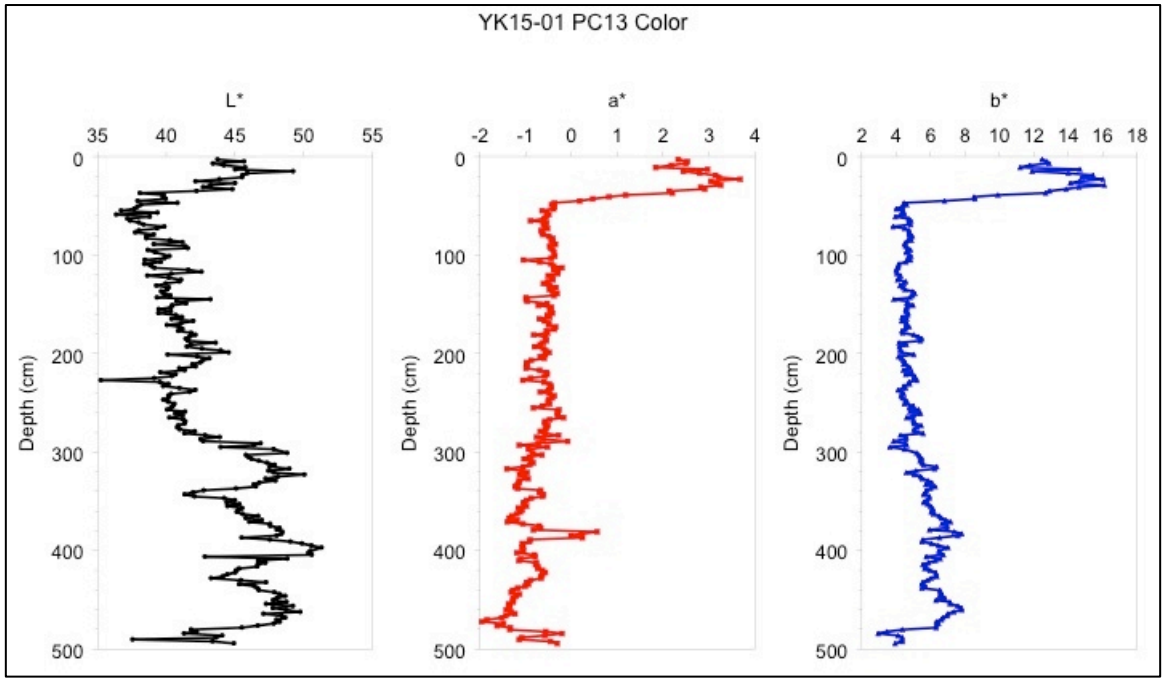


Figure 6-4-1 L*, a*, and b* values for YK15-01 PC13

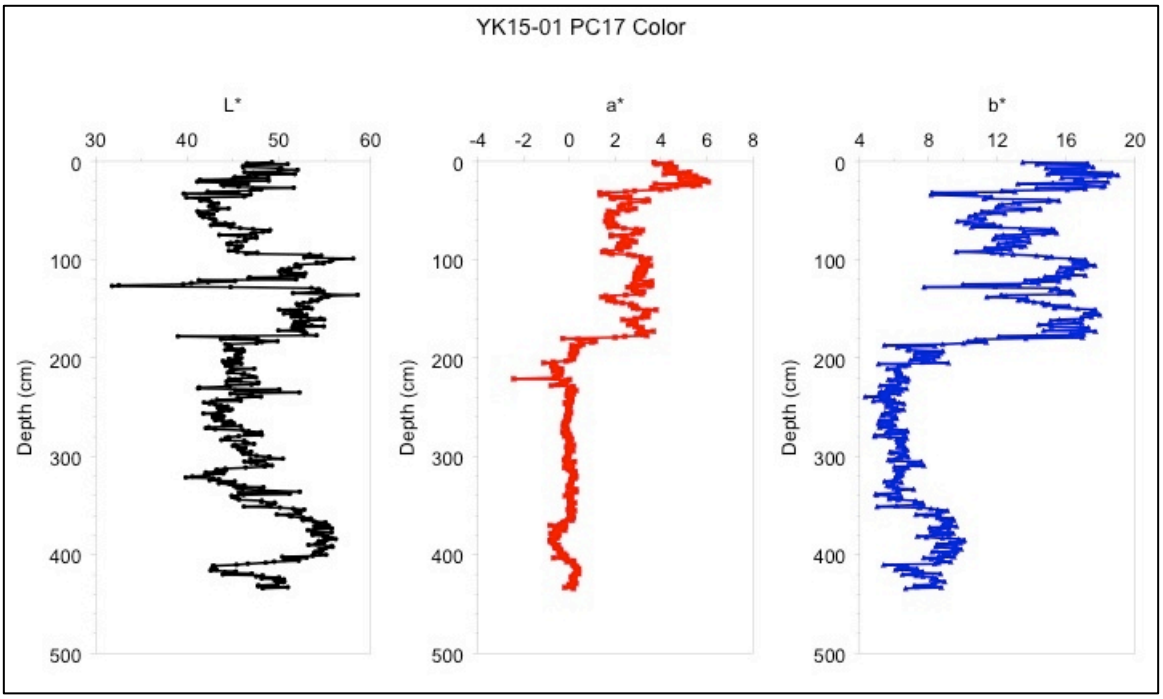


Figure 6-4-2 L*, a*, and b* values for YK15-01 PC17

7. Multi-beam bathymetry

Bathymetric data were collected by a hull-mounted multi-narrow beam mapping system. **Figure 7-1**, and 7-2 show the mapped areas during the cruise.

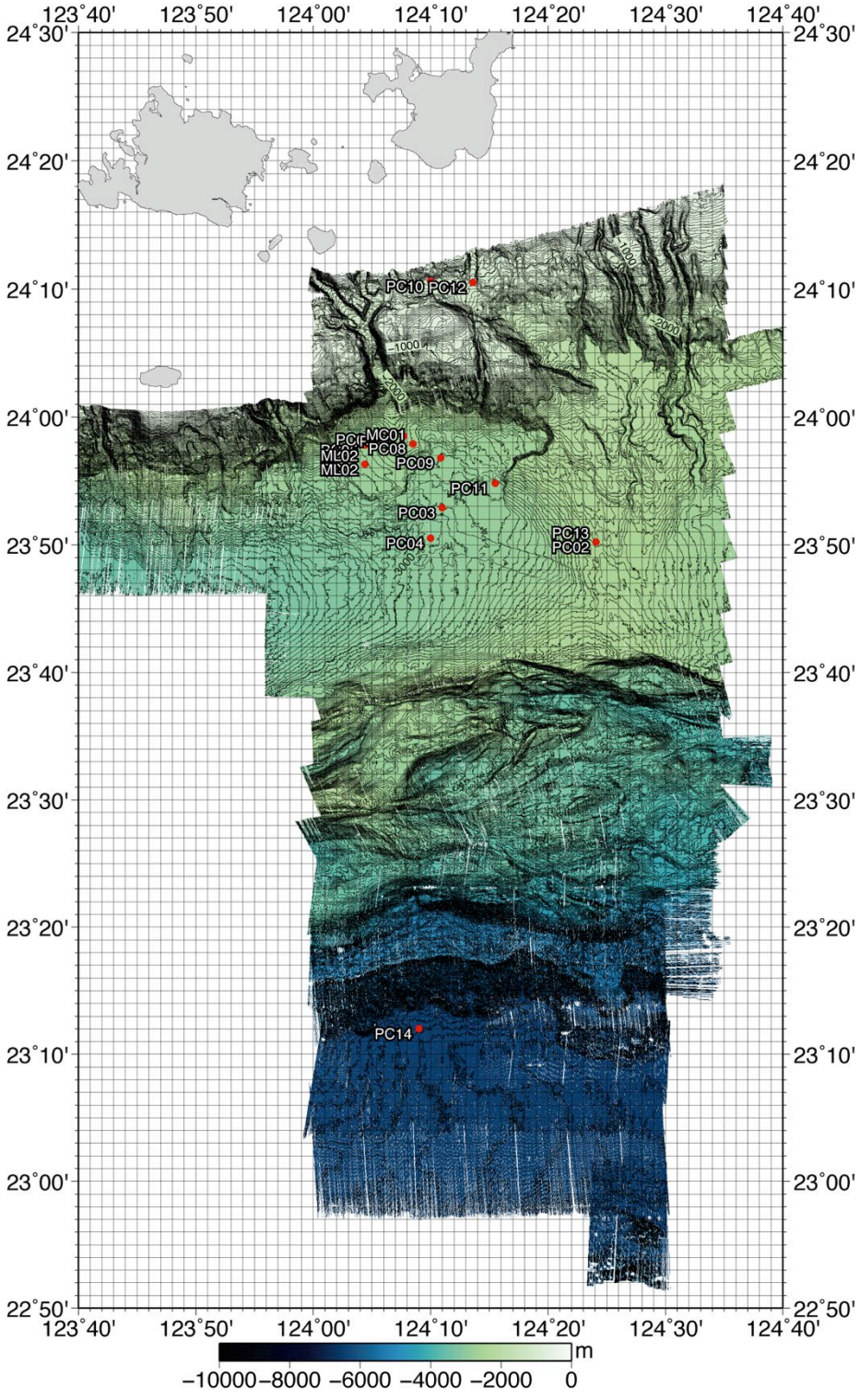


Figure 7-1 Bathymetric data in the south of Ishigaki Island

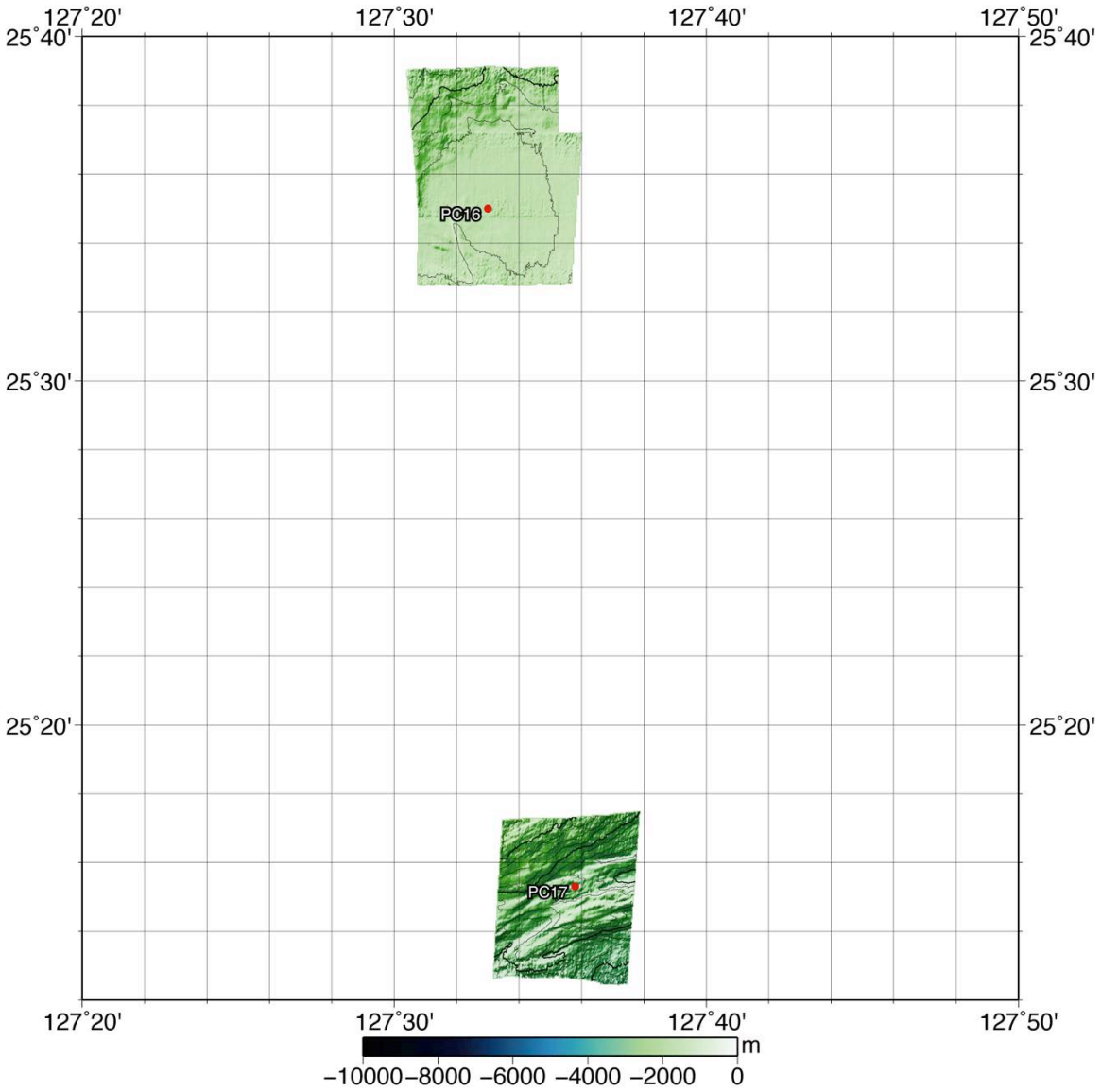


Figure 7-2 Bathymetric data in the south of Okinawa Island

8. Acknowledgement

We gratefully recognize the efforts of Cap. Aoki and his crew during the cruise. We thank all the support from staffs in Research Fleet Department, JAMSTEC. Especially thanks to Mr. Masanobu Yanagitani.

9. Notice on Using

Notice on using: Insert the following notice to users regarding the data and samples obtained.