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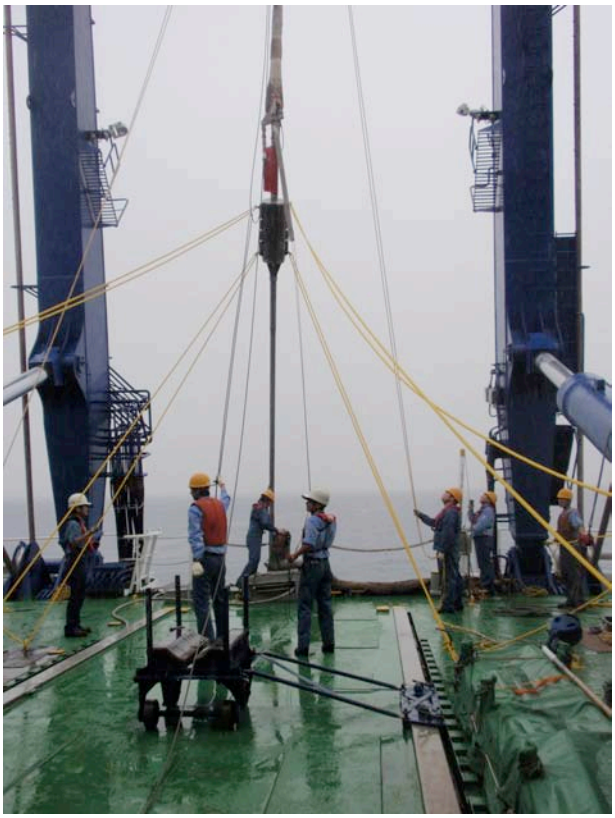
Cruise Report of R/V Yokosuka YK10-07 Cruise in the Japan Sea

Establishment of Quaternary tephrostratigraphy and application for paleoceanographical and sedimentological studies in the Japan Sea



26 July 2010

Shipboard Scientists of YK10-07 Cruise

Ken Ikehara, Hajime Katayama, Takuya Itaki, Takahiko Inoue, Kazuko Usami, Naohisa Nishida, Satoshi Okada, Shohei Taketomo, Ei Hatakeyama, Sayaka Kawamura and Yasumi Yamada

Contents

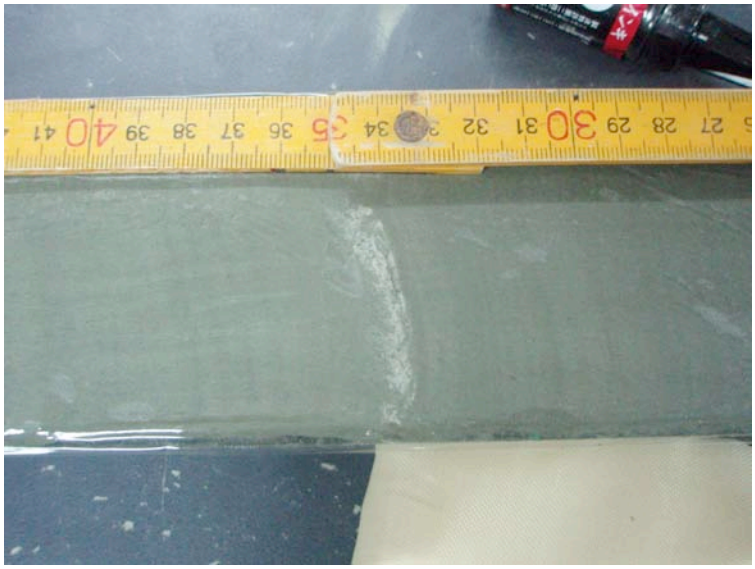
Piston Corer (Photo by K. Usami)

1 Introduction

The YK10-07 cruise by R/V Yokosuka of JAMSTEC was carried out from 24 June, 2010 to 3 July, 2010, a round trip from JAMSTEC pier in Yokosuka. Main purpose of the cruise is to recover 9 piston cores from 6 sites in the southern Mogami Trough, Sado Basin, and north of Noto Peninsula, and to obtain the detailed bathymetrical data at the landward slope of Sado Basin. Scientific objectives were; 1) to establish the late Quaternary tephrochronology in the central Japan Sea for the better understanding of paleoceanography and sedimentology of the Japan Sea, 2) to make a comparative study on the piston core technology using the different types of piston at the same sites, and 3) to obtain core samples to use in the J-DESC core school in Kochi (education and outreach purpose).

According to good sea conditions throughout the cruise, we completed all the planned surveys. A 10m-long piston corer was performed 6 times at all sites using normal O-ring type piston, and a 15-long piston corer was 3 times at 2 sites (NO-1 and NI-1) using swivel type and rubber plate type pistons. Full covered bathymetric data and 6 sub-bottom profiles at the outer shelf to slope off Teradomari were obtained.

This cruise was originally scheduled until 4 July, but due to the accomplishment of the planned surveys, we returned to JAMSTEC pier 1 day earlier.



Volcanic ash layer in a obtained core (Photo by K. Usami)

2 List of Cruise Members

Shipboard scientific party

Ken Ikehara (Chief scientist)	Geological Survey of Japan, AIST
Sedimentology, stratigraphy, age determination	
Hajime Katayama	Geological Survey of Japan, AIST
Sedimentology	
Takuya Itaki	Geological Survey of Japan, AIST
Micropaleontology (radiolaria)	
Takahiko Inoue	Geological Survey of Japan, AIST
Marine geology, sediment budget	
Kazuko Usami	Geological Survey of Japan, AIST
Micropaleontology (foraminifera), sedimentology	
Naohisa Nishida	Geological Survey of Japan, AIST
Sedimentology	
Satoshi Okada	Nippon Marine Enterprises
Shohei Taketomo	Marine Works Japan
Ei Hatakeyama	Marine Works Japan
Sayaka Kawamura	Marine Works Japan
Yasumi Yamada	Marine Works Japan

Shore-based scientific party (excluding shipboard member)

Yoshitaka Nagahashi	Fukushima University
Tephrochronology	
Toshio Hisamitsu	JAMSTEC
Core monitoring during the storage	
Takayuki Tomiyama	JAMSTEC
Core monitoring during the storage	
Hideaki Machiyama	JAMSTEC
Core monitoring during the storage	
Minoru Ikehara	Kochi University
Outreach (J-DESC core school)	
Tatsuhiko Sakamoto	JAMSTEC
Outreach (J-DESC core school)	

Captain, officer and crew

Captain	Eiko Ukekura
Chief Officer	Takafumi Aoki
2 nd Officer	Shintaro Hashimoto
3 rd Officer	Masashi Ito
Chief Engineer	Hiroyoshi Kikkawa
1 st Engineer	Kimio Matsukawa
2 nd Engineer	Saburo Sakaemura
3 rd Engineer	Kenta Ikeguchi
Chief Radio Officer	Hideyuki Akama
2 nd Radio Officer	Hiroki Ishiwata
Boat Swain	Shoichi Abe
Able Seaman	Naonori Iwasaki
Able Seaman	Tadahiko Toguchi
Able Seaman	Kuniji Kadoguchi
Able Seaman	Saikan Hirai
Sailor	Shun Abe
Sailor	Daiyo Yanagitani
No.1 Oiler	Kozo Miura
Oiler	Yoshinori Kawai
Oiler	Masami Ueda
Oiler	Daiki Sato
Chief Steward	Tomihisa Morita
Steward	Yoshinobu Hasatani
Steward	Koji Kirita
Steward	Kazuma Sonoda
Steward	Shigeto Ariyama

R/V Yokosuka at JAMSTEC pier

(Photo by K.Usami)

3 Cruise Information

Cruise Number: YK10-07
Ship Name: R/V Yokosuka
Cruise Period: 24 June 2010 – 3 July 2010
Port Call: Yokosuka (JAMSTEC) – Yokosuka (JAMSTEC)
Chief Scientist: Ken Ikehara (Geological Survey of Japan, AIST)
Title of Proposal: Establishment of Quaternary tephrostratigraphy and application for paleoceanogaphical and sedimentological studies in the Japan Sea
Survey Area: Japan Sea

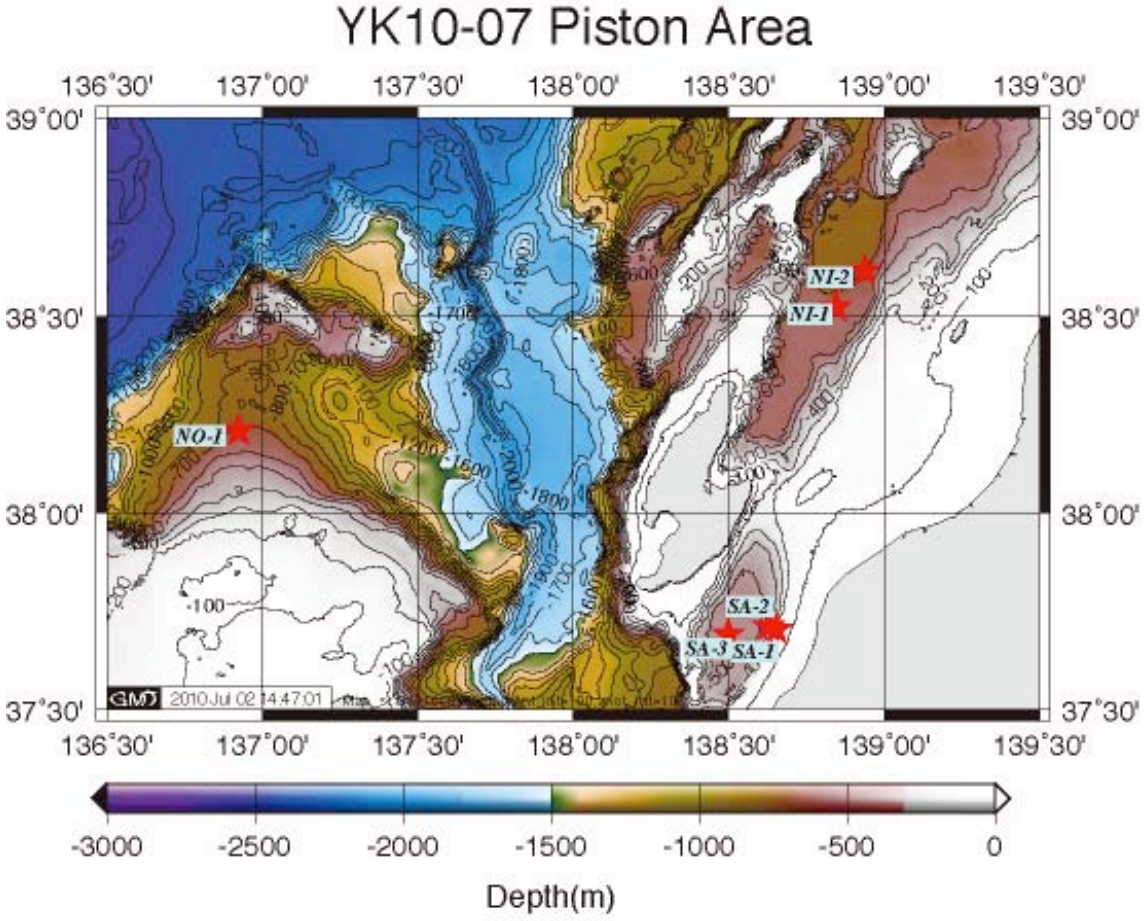


Fig. 3-1 Piston coring location during the YK10-07 cruise

Daily Activity:

24 June 2010:	Departure from JAMSTEC
25 June 2010:	Transit
26 June 2010:	Transit, Bathymetric survey at Sado Basin
27 June 2010:	Piston coring
	(PC01 at SA-1, PC02 at SA-3, PC03 at SA-2)
28 June 2010:	Piston coring (PC04-06 at NO-1)
29 June 2010:	Piston coring (PC07 and 08 at NI-1, PC09 at NI-2)
30 June 2010:	Bathymetric and SBP survey at Sado Basin
1 July 2010:	Transit
2 July 2010:	Transit
3 July 2010:	Arrival to JAMSTEC

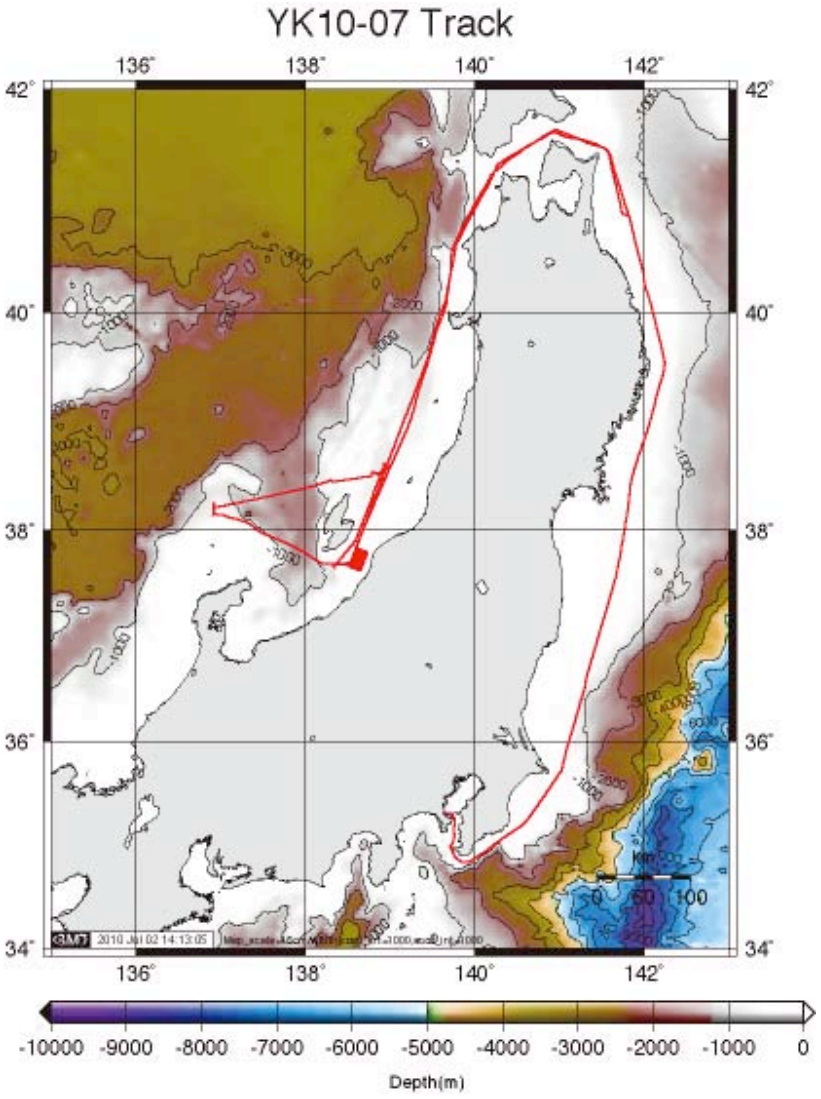


Fig. 3-2 Ship track of the YK10-07 cruise

4 Scientific results

Research Vessel Yokosuka

YK10-07 cruise was conducted by using R/V Yokosuka. R/V Yokosuka has silent engine an advanced acoustic navigation systems and an underwater telephone for its state of the art operations. The principal specifications of R/V Yokosuka were summarized as Table 4-1.

There are 4 laboratories on Yokosuka, No.1～No.3 laboratories and No.1 Study room. No.1 Lab. has dry space. Permanent installations are PC and printer. No.2 Lab. has semi - dry and wet space. There are two freezers (-40 & -80 deg.C), incubator, Milli-Q, fumigation chamber at dry one, and wet one has rock saw. No.3 Lab. has dry space with storage.No.1 Study room has dry space, there are gravity meter, data acquisition system of gravity meter, 3 axis fluxgate magnet meter and also proton magnet meter, work station for data processing, and A0 size plotter.

Table 4-1 The principal specifications of R/V Yokosuka

Length overall	105.2 m
Beam overall	16.0 m
Depth	7.3 m
Draft	4.5 m
Gross tonnage	4,439 tons
Service speed	16knot
Complement	
Crew	27 persons
Submersible operation staff	18 persons
Researchers	15 persons
Total	60persons
Main propulsion system	Diesel engines: 2,206kW x 2
Main propulsion method	Controllable pitch propeller x 2

4.1 Bathymetry and sub-bottom profiling

4.1.1 Instruments and operation

R/V Yokosuka is equipped with various kinds of underway

geophysical equipment, Multi Narrow Beam Echo Sounder (Sea Beam 2112.004, Sea Beam Instruments, Inc.), Sub Bottom Profiler (add on option the Sea Beam 2112.004, Sea Beam Instruments, Inc.), Gravity meter (Type S-63, LaCoste & Romberg Gravity Meters Inc.), Ship borne 3 axis magnet meter (Type SFG-1212, Tierra Technica Inc.), and Proton magnet meter (Type STC 10, Kawasaki Geological Engineering Co., Ltd.). During YK10-07 cruise, MBES system and sub-bottom profiler was used for bathymetric and sub-bottom profiling surveys. Specifications of MBES (Sea Beam 2112.004) and SBP were summarized as Table 4-1-1 and 4-1-2. MBES and SBP surveys were carried out along the planned survey lines with ship speed around 6 knots.

Table 4-1-1 The specifications of MBES

measurement depth (m)	100～11,000
measurement range (deg.)	90～150
measurement frequency(kHz)	12
measurement method	cross fan beam style
accuracy	0.2%(center)～0.5%(outer)
beam width(deg.)	2
beam interval(deg.)	1
Swath width(deg.)	150(～300m) 120(～4500m) 100(～8,000m) 90(～11,000m)
sampling rate(m sec.)	1.33 or 2.67
roll(deg.)	±20
pitch(deg.)	±7.5

Table 4-1-2 The specifications of SBP

measurement depth (m)	100～11,000
exploration depth (m)	75 (from bottom)
measurement frequency(kHz)	4
beam resolution	5° × 5°
pulse length(msec)	5,25,50,100
roll(deg.)	±20
pitch(deg.)	±7.5

4.1.2 Bathymetry of landward slope of Sado Basin, off Teradomari

Total 20 NNE-SSW trended bathymetric survey lines (Fig. 4-1-1) were planned to acquire the detailed bathymetric data on the landward slope of Sado Basin to outer shelf, off Teradomari, to analyze submarine morphology for sediment budget study on the shelf-slope area. Additional shore normal trended sub-bottom profiling (Fig. 4-1-1) was conducted along 7 lines. Fig. 4-1-2 is a tentative bathymetric map of the survey area.

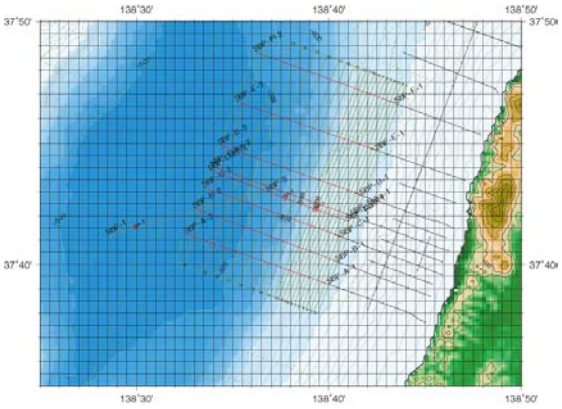


Fig. 4-1-1 Bathymetric (green) and SBP (red) survey lines off Teradomari

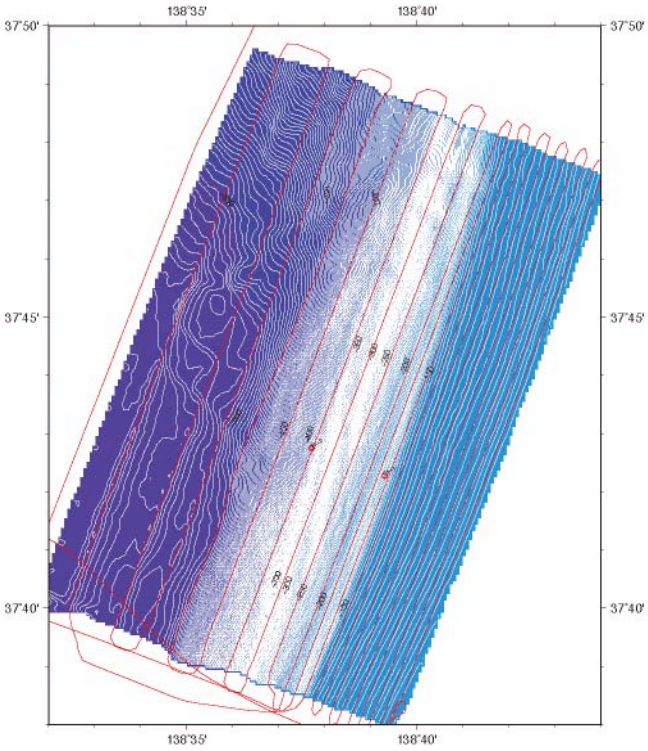


Fig. 4-1-2 Edited bathymetric map at outer shelf-slope, off Teradomari

4.2 Piston coring

4.2.1 Instruments and operation

Piston corer

Piston core sampler system (Fig. 4-2-1) consists of 0.9t-weight, 5m-long duralmin barrel with polycarbonate liner tube and a pilot core sampler. The inner diameter (I.D.) of polycarbonate liner tube is 74mm. The total weight of the system is approximately 1.2t in the air. The length of the core barrel was 10m and 15m, that was decided by site survey data and the results of the last time coring. We used a multiple-type pilot corer ("Ashura") or 74mm diameter type pilot corer for a pilot core sampler.

In this cruise, we used two types of polycarbonate liner tube, annealing polycarbonate and non anneal polycarbonate. When we divide the core in half, non anneal polycarbonate have transformation internally than annealing polycarbonate. Non anneal type was used onlyPC07.

Moreover, we used three types of piston, Normal type, Swivel type and Rubber plate type. Normal type piston is composing of stainless steel body and two O-rings (size: P63). We use this as usual. Swivel piston consists of stainless steel body installing 3packings, and the part of swivel. That was used only PC05. Then Rubber plate type piston is composing of stainless steel body and some rubber plates (Temper 50).There are some attach points of rubber, we can choose the number of rubber plate. That was used two times (PC06 and PC08).

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 3 minutes to reduce some pendulum motion of the system. After 3 minutes, the wire was stored out at a speed of 20 m/min., and we carefully watched a tension meter. When the corers hit the bottom, wire tension abruptly decreases by the loss of the corer weight. After that, wire out was stopped and winding of the wire was started at a speed of 20m/min. soon 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 (50m/min).

Operation results

Results of the PC are summarized in Table 4-2-1. On the other hand,

the liner tube transformations of each coring are shown by Fig. 4-2-2 to refer the depth of transformation by coring.

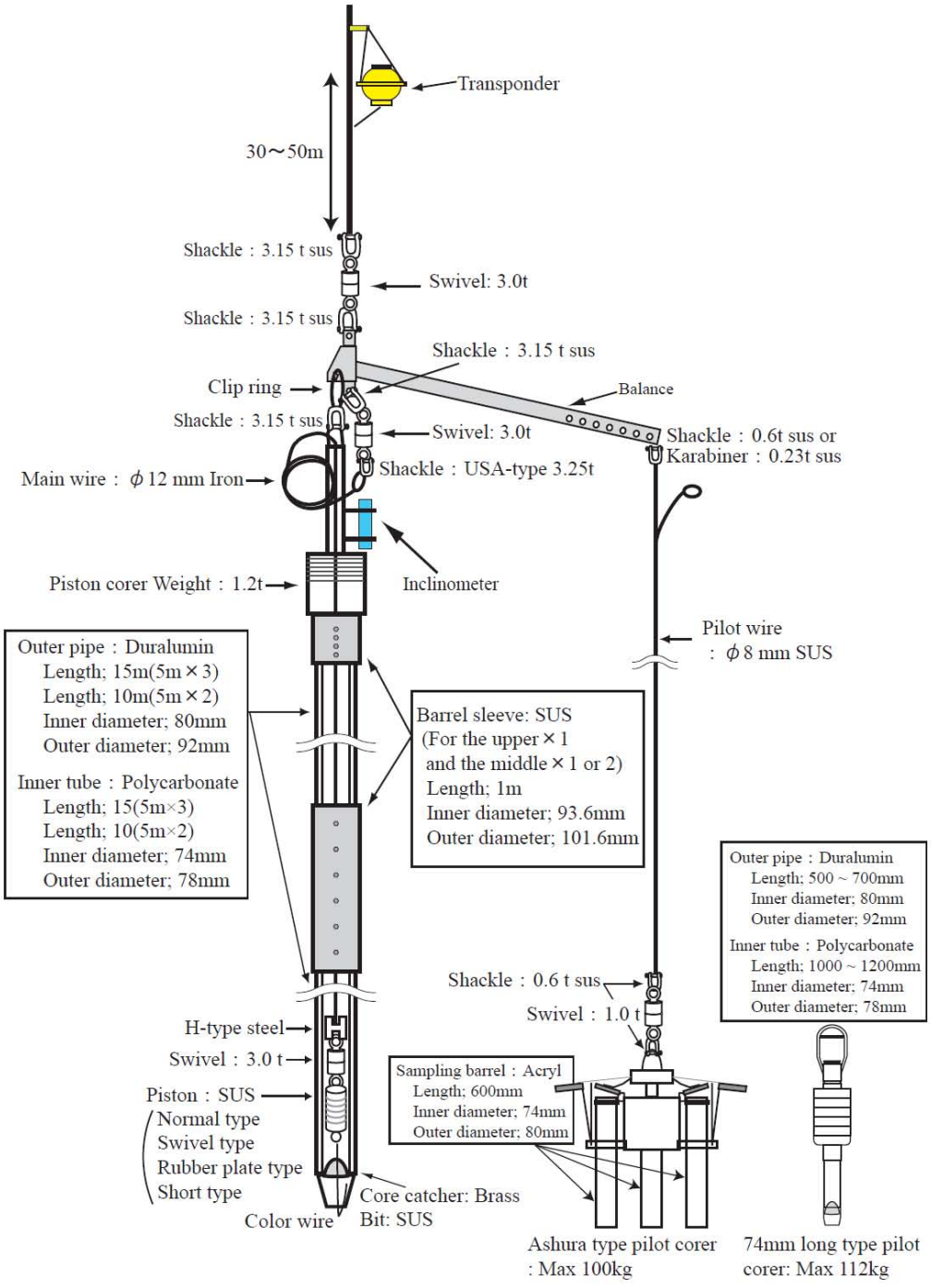


Fig. 4-2-1 YK10-07 Piston core sampler system (Weight is not 1.2t but 0.9t)

Table 4-2-1 Results of the piston coring (YK10-07)

		Results																	
Area	Core ID	Stn. No.	Date (UTC)	Latitude	Longitude	Depth (m)	Corer type	Weight (kg)	Pipe (m)	Penetration (m)	Recovery (m)	Rate (%)	Pl. wt. (kg)	Pl. recovery (cm)	Total weight in water(kg)	Facies	MAX. tension (kN)	Wire out (m)	Wire speed (m/s)
Sado Basin	PC01	SA-3	20100626	37-41.50N	138-29.93E	536	IN	900	10	10.00	8.105	81.05	100	32.5, 31, 34.5 /60	990.30	clay	20.00	496	0.33
	PC02	SA-1	20100627	37-42.26N	138-39.29E	189	IN	900	10	3.20	1.720	17.20	100	0, 9.5, 10.5 /60	990.30	very fine sand`silt	24.00	145	0.33
	PC03	SA-2	20100627	37-42.74N	138-37.70E	386	IN	900	10	9.20	5.000	50.00	100	25.5, 21, 31 /60	990.30	clay	24.63	371	0.33
Off Noto	PC04	NO-1	20100627	38-12.59N	136-55.44E	693	IN	900	10	11.00	8.624	86.24	100	29.5, 3, 18.5 /60	990.30	clay	24.90	676	0.33
	PC05	NO-1	20100628	38-12.59N	136-55.45E	690	IN	900	15	15.50	12.126	80.84	112	51/50	1036.94	clay, silt, palallel lamina	24.00	672	0.33
	PC06	NO-1	20100628	38-12.59N	136-55.45E	688	IN	900	15	15.70	12.165	81.10	112	93/70	1036.94	clay	25.12	672	0.33
Off Niigata	PC07	NI-1	20100628	38-31.39N	138-50.80E	763	IN	900	10	11.00	8.872	88.72	100	27.5, 27, 30.5 /60	990.30	clay	26.46	750	0.33
	PC08	NI-1	20100629	38-31.38N	138-50.80E	762	IN	900	15	12.70	5.815	38.77	112	64.5/70	1036.94	clay	30.00	746	0.33
	PC09	NI-2	20100629	38-36.89N	138-56.34E	738	IN	900	10	9.30	7.560	75.60	100	24, 15, 32 /60	990.30	clay, very fine sand	26.00	726	0.33

		Specification							Extraordinary					Circumstances					
Area	Core ID	Main wire (m)	Pilot wire (m)	F.F. (m)	M.W. extra. (m)	Piston type	Bit type	Inclinometer	Pipe bending	Liner transformation	Bit	Catcher	Gas material	Weather	Wave (m)	Wind (deg.)	Wind (m/s)	Current (deg.)	Current (knt.)
Sado Basin	PC01	18.80	18.60	4.7	1.8	normal	normal	APC-USB 004	–	5.00-5.18m, 7.14-7.51m	–	–	–	rain	0.5	194.0	5.3	98.7	0.2
	PC02	18.80	18.60	4.7	1.8	normal	normal	APC-USB 004	–	1.45-2.00m	–	–	–	rain	0.5	184.0	5.5	38.6	0.5
	PC03	18.80	18.60	4.7	1.8	normal	normal	APC-USB 004	–	3.65-4.20m	–	deformed	–	overcast	0.5	151.0	4.5	33.5	0.3
Off Noto	PC04	18.80	18.60	4.7	1.8	normal	normal	APC-USB 004	–	5.64-6.19m	–	–	H2S smell	overcast	1.0	218.0	5.8	79.0	0.1
	PC05	23.80	23.60	4.7	1.8	swivel (packing 3)	normal	APC-USB 004	–	7.30-7.65m, 10.24-11.60m	–	–	H2S smell	overcast	1.0	231.0	8.1	153.1	0.2
	PC06	23.80	23.60	4.7	1.8	rubber plate (50 2-1-2)	normal	APC-USB 004	–	6.91-7.95m, 10.00-11.20m	–	deformed	H2S smell	overcast	1.0	222.0	7.2	133.5	0.2
Off Niigata	PC07	18.80	18.60	4.7	1.8	normal	normal	APC-USB 004	–	4.60-5.00m, 5.30-5.71m	–	–	H2S smell	overcast	0.5	99.0	1.5	342.2	0.3
	PC08	23.80	23.60	4.7	1.8	rubber plate (50 1-1-1)	normal	APC-USB 004	–	8.00-8.30m	–	–	H2S smell	overcast	0.5	100.0	1.3	13.3	0.2
	PC09	18.80	18.60	4.7	1.8	normal	normal	APC-USB 004	–	3.60-5.00m, 8.00-9.00m	–	deformed	H2S smell	rain	0.5	215.0	11.0	286.0	0.4

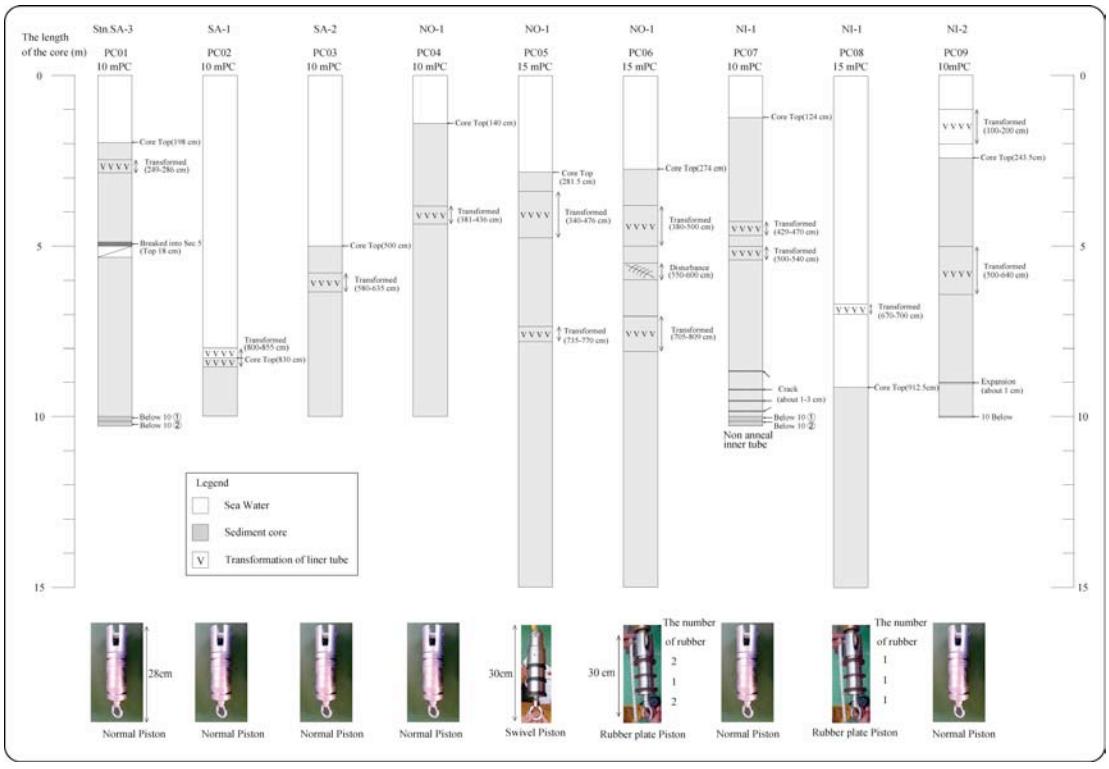


Fig. 4-2-2 Comparison of inner tube transformation for each coring

4.2.2 Sample preparation

Obtained piston core and pilot core samples were prepared on board as follows.

Piston cores

All piston core samples were separated every 1-m length, numbered as ascending order from top to bottom, and split vertically into two halves (Archive (A) half and Working (W) half). Plastic marker-pins were placed every 10-cm intervals along the side of both halves as the depth indicator in a section. Each section was processed on board along the workflow shown in Fig. 4-2-3. Sub-sampling works from W-half were performed for all sections of cores PC01, PC02, PC03, PC04, PC08 and 4 sections (sec. 12-15) of core PC08. No color measurement and VCD was conducted for PC07 and PC06, respectively.

1) A-half

+ Visual core description (VCD)

+ Core photo

2) W-half

+ Color measurement: Sediment color was measured every 1-cm intervals using Minolta CM-2022 spectrophotometer. Sediment color was expressed as L* (gray scale, black (0)-white (100)), a* (green(-)-red(+)) and b* (blue(-)-yellow(+)) values from 10 nm interval reflectance data. Sediment surface was scraped and carefully wrapped before measurement.

+ Slab sample for sedimentary structure analysis: Samples for soft-X radiography were collected continuously through the core in plastic cases (20 cm long, 5cm wide and 1cm thick). They were sealed and stored in the refrigerator.

+ Sample for radiolarian analysis: A 2-cm thick samples were taken in plastic bag from every 20-cm intervals, and stored in the refrigerator.

+ Sample for radiocarbon age determination: A 2-cm thick samples were taken in plastic bag from every 20-cm intervals. Additional 1-cm thick samples were obtained from just above and below of the ash layer. All discrete samples were stored in the refrigerator.

+ Sample for tephra analysis: Visible volcanic ash layer was sampled in

plastic bag.

Pilot cores

Two types of pilot corer were used in this cruise. A multi-type pilot corer (Ashura) has 3 sampling pipes. The longest core was used for VCD, color measurement and slab sampling. The other core samples were sliced every 1-cm intervals in plastic bag, and stored in the refrigerator. A gravity pilot core samples were processed the same as the piston core samples.

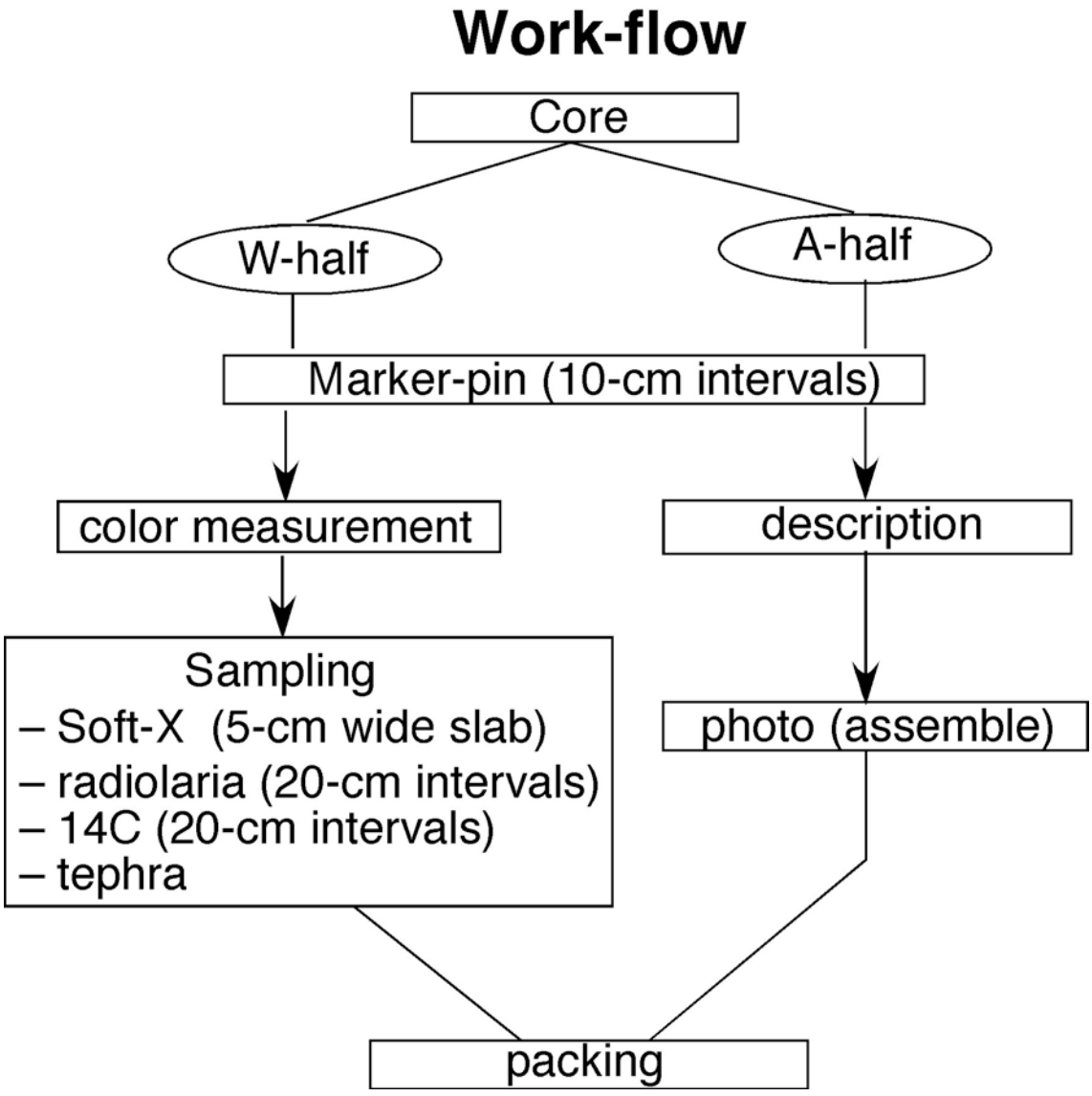


Fig. 4-2-3 Work-flow for piston cores during the YK10-07 cruise

4.2.3 Site and core description

Nine piston cores were collected from 6 sites during the cruise (Fig. 4-2-4). Locations and water depths of the coring sites and obtained core lengths were listed in Table 4-2-1 and 4-2-2, respectively. Sediment lithology of the obtained cores were summarized in Fig. 4-2-5. Followings are brief summary and descriptions of each coring site and core.

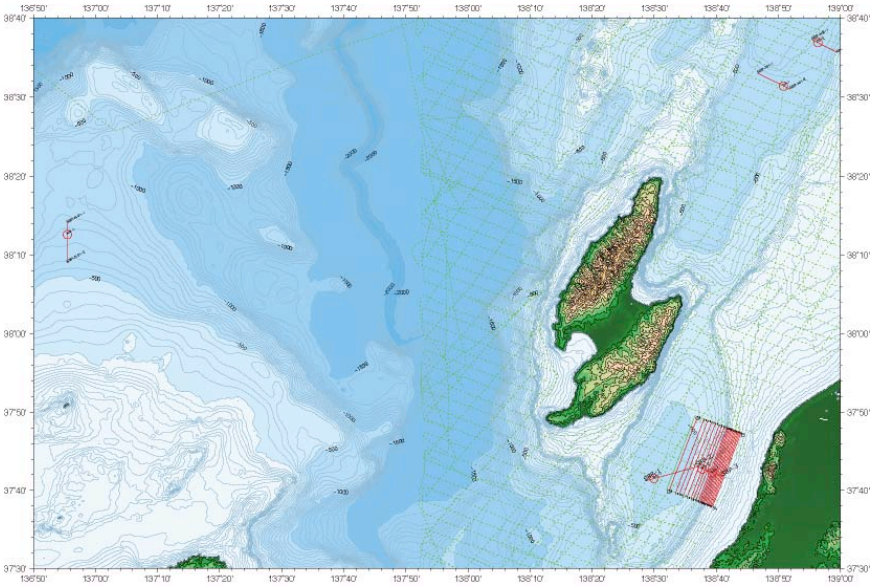


Fig. 4-2-4 Piston coring locations during YK10-07 cruise

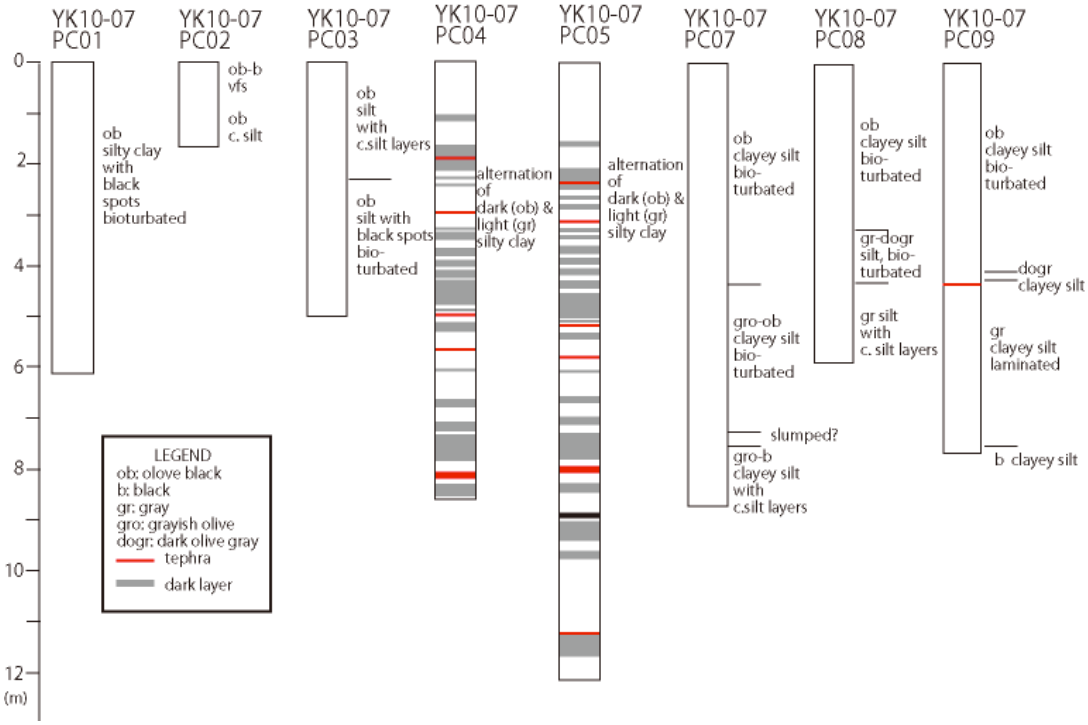


Fig. 4-2-5 Columnar sections of the obtained cores

Table 4-2-2 List of the obtained core length

Core	Section	Length (cm)	Core	Section	Length (cm)	Core	Section	Length (cm)
PC01	pilot	33	PC02	pilot	10	PC03	pilot	29.5
	3	104.5		9	71		6	100
	4	117.5		10	98.5		7	99.5
	5	100		Total	169.5		8	100.5
	6	67.5					9	100
	7	97.5					10	100
	8	100.5					Total	500
	9	100						
	10	99.8						
	10.1	4						
	10.2	12						
	Total	803.3						
Core	PC04	Length (cm)	Core	Section	Length (cm)	Core	Section	Length (cm)
PC04	pilot	29.5	PC05	pilot	46	PC06	pilot	91
	2	61		3	18.5		3	
	3	100		4	92		4	
	4	99.5		5	100		5	
	5	99.8		6	100		6	
	6	99.5		7	100		7	
	7	100.5		8	100		8	
	8	100		9	100		9	
	9	100		10	100		10	
	10	96		11	100		11	
	Total	856.3		12	100		12	
				13	100		13	
				14	100		14	
				15	97.5		15	
				Total	1208		Total	
Core	Section	Length (cm)	Core	Section	Length (cm)	Core	Section	Length (cm)
PC07	pilot	30	PC08	pilot	65	PC09	pilot	31.5
	2	66.5		10	83		3	55.5
	3	101.5		11	99		4	100
	4	99.5		12	100		5	100
	5	99		13	102		6	99
	5.1	2.5		14	99.5		7	98.5
	6	101		15	99		8	103
	7	99.5		Total	582.5		9	99.5
	8	100					9.1	2
	9	97.5					10	99
	10	89.8					10.1	6
	10.1	3.5					Total	762.5
	10.2	11.5						
	Total	871.8						

4.2.3.1 Sado Basin (sites SA-1, SA-2 and SA-3)

Three sites were planned for piston coring in the Sado Basin. Two sites (SA-2 and SA-3) are located on the upper and mid slope, and another site (SA-1) is on the basin floor (Fig. 4-2-6). Objectives of two slope sites were to examine changes of sedimentary environments and sediment budgets according to human activities (open of a new river mouth of River Shinano-gawa at Teradomari), based on tephrochronological age controls. Another core plans to examine the tephrostratigraphy after the last glacial maximum in the Sado Basin.

Recovered cores have no visible tephra layer (Fig. 4-2-5). Basin floor core (PC01: 806.8cm long) was collected from flat basin floor with finely stratified acoustic facies in SBP profile (Fig. 4-2-7), and composed of highly bioturbated clayey silt with numerous black spots. Core PC02 (169.5cm long) was collected from upper slope with acoustically transparent layer (Fig. 4-2-8), and composed of very fine sand in upper part, and of coarse silt in lower part. Some thin layers of fine silt occurred at the lower part. Mid slope core (PC03: 500cm long) composed of relatively sandy silt with several coarse silt layers in upper part and highly bioturbated silt with numerous black spots in lower part. Acoustic facies of this site was weakly stratified (Fig. 4-2-9). Lithology of the lower part of PC03 is similar to that of basin floor sediments (PC01) suggesting change of sedimentary environments between the upper and lower part of PC03. Color profiles of each core show in Figs. 4-2-10 - 12.

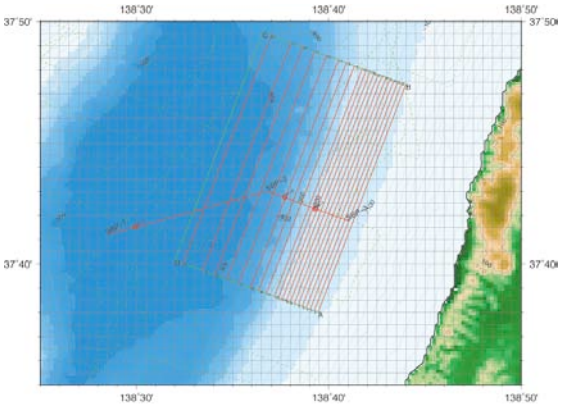


Fig. 4-2-6 Piston core sites in the Sado Basin (SA-1~SA-3)

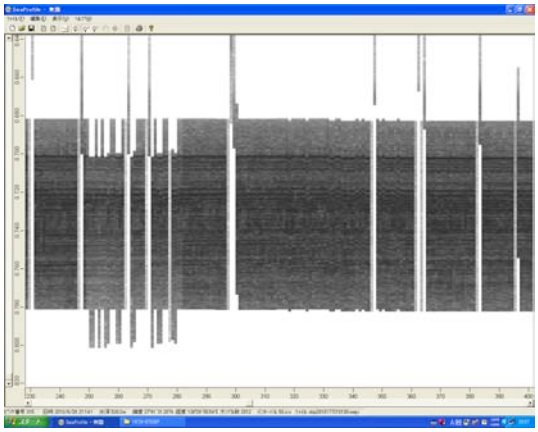


Fig. 4-2-7 SBP profile crossing site SA-1 (PC01)

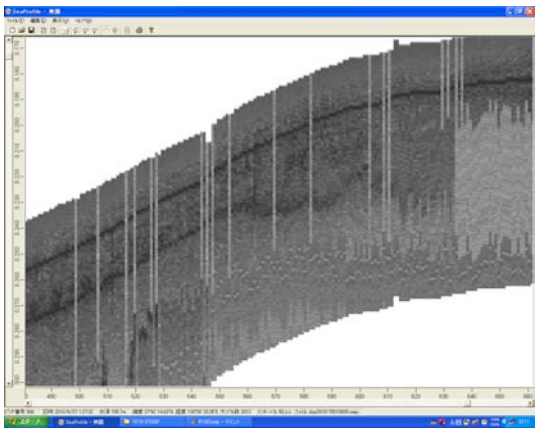


Fig. 4-2-8 SBP profile crossing site SA-3 (PC02)

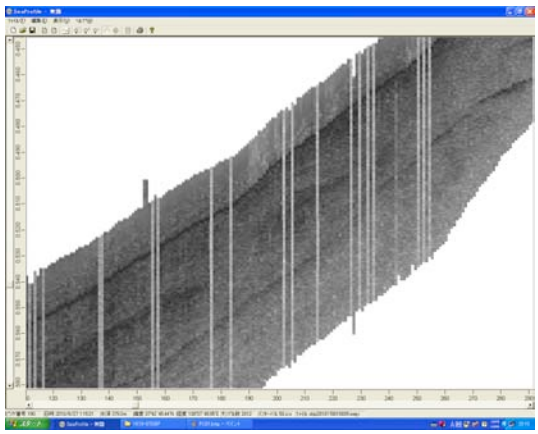


Fig. 4-2-9 SBP profile crossing site SA-2 (PC03)

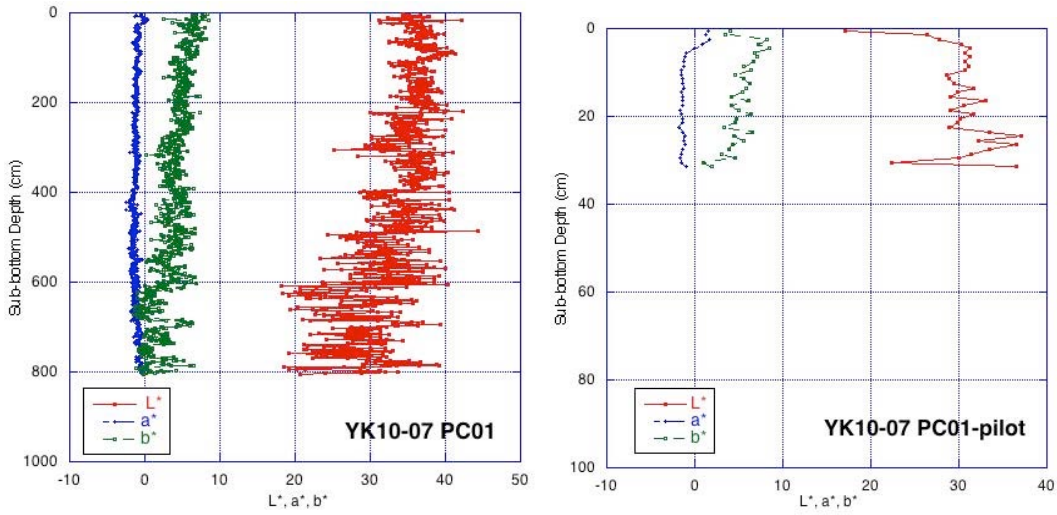


Fig. 4-2-10 Color profiles of PC01 and its pilot core

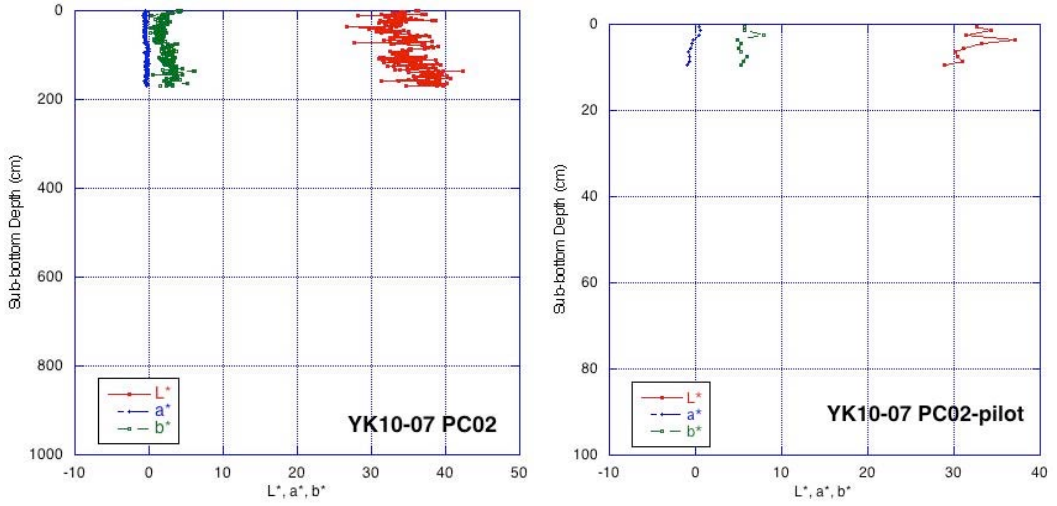


Fig. 4-2-11 Color profiles of PC02 and its pilot core

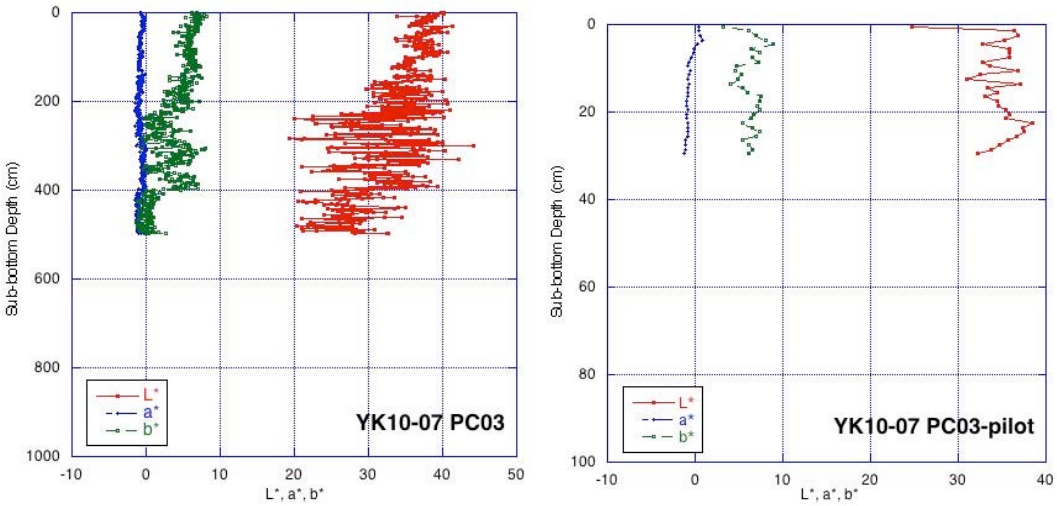


Fig. 4-2-12 Color profiles of PC03 and its pilot core

4.2.3.2 North of Noto Peninsula (site NO-1)

Three piston cores were recovered from a site located north of Noto Peninsula. The site locates gentle topographic high between Noto Peninsula and Hakusan-se Bank (Figs. 4-2-4 and -13). Sub-bottom profile indicates finely stratified acoustic facies (Fig. 4-2-14) suggesting hemipelagic deposition and tephra intercalation. A 10-m long piston corer with normal O-ring type piston (PC04), and a 15-m long piston corer with swivel type piston (PC05) and with rubber plate type piston (PC06) was used for core sampling (pistons used are shown in Fig. 4-2-2). All of three cores show typical lithostratigraphic sequence in the late Quaternary Japan Sea intercalated several volcanic ash layers (Fig. 4-2-5), some of which are biotubated, and the other of which has layered structure. Color profiles of three cores (Figs. 4-2-15 – 17) are easily correlated each other (Fig. 4-2-18). This correlation suggests the core disturbance in the uppermost part of PC01 and upper part of PC02, miss of the uppermost sediments in PC03. Tentative correlation of lithology of the obtained cores with standard lithostratigraphy suggests that the core bottom age of PC04 is around 90 ka (below Aso-4 ash), and ages of PC05 and PC06 are MIS 6.

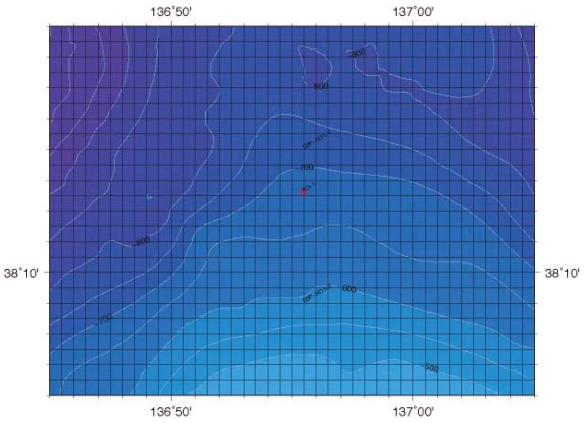


Fig. 4-2-13 Piston core site (NO-1) at north of Noto Peninsula

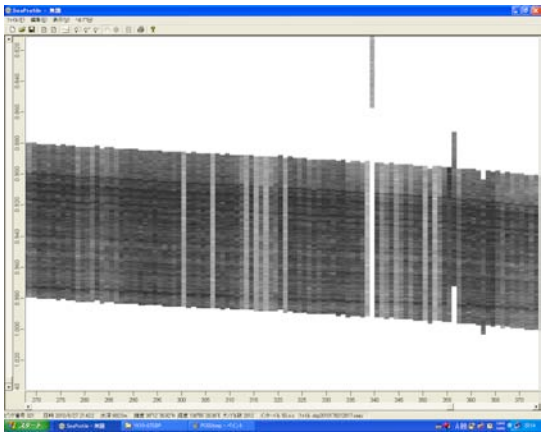


Fig. 4-2-14 SBP profile crossing site NO-1 (PC04-06)

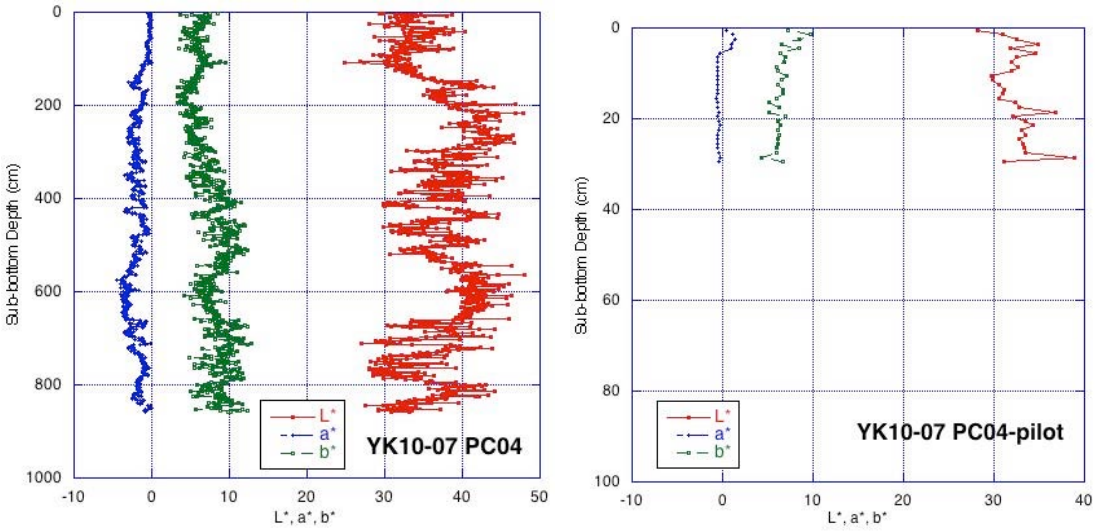


Fig. 4-2-15 Color profiles of PC04 and its pilot core

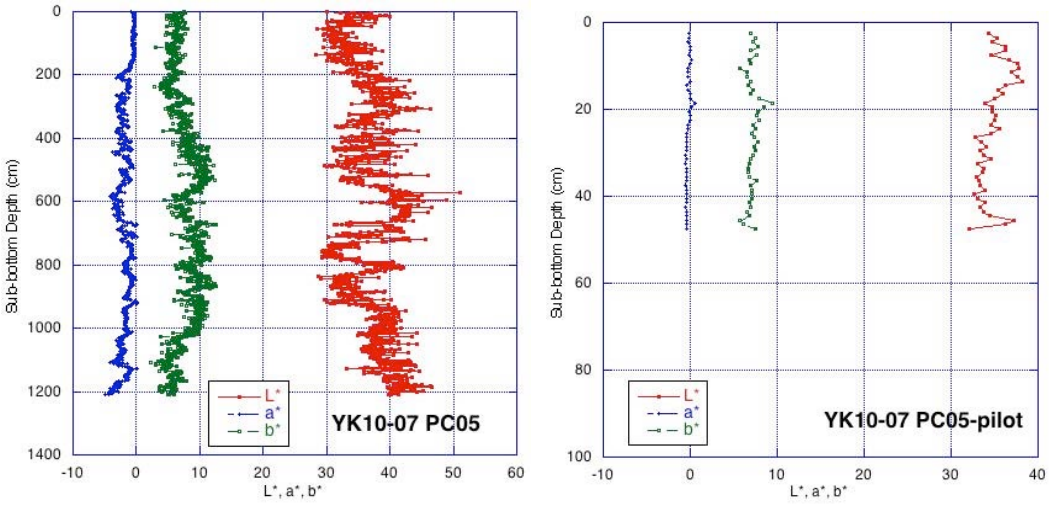


Fig.4-2-16 Color profiles of PC05 and its pilot core

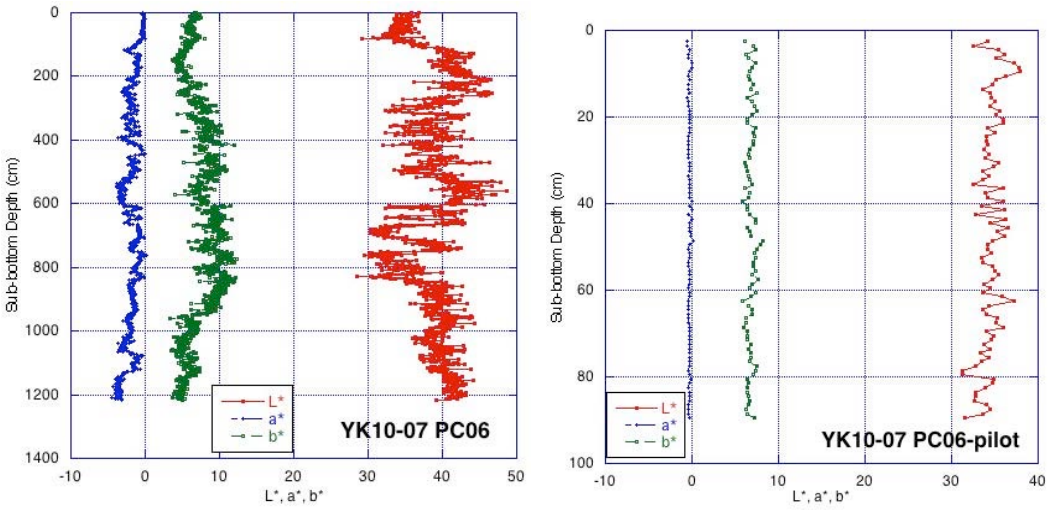


Fig. 4-2-17 Color profiles of PC06 and its pilot core

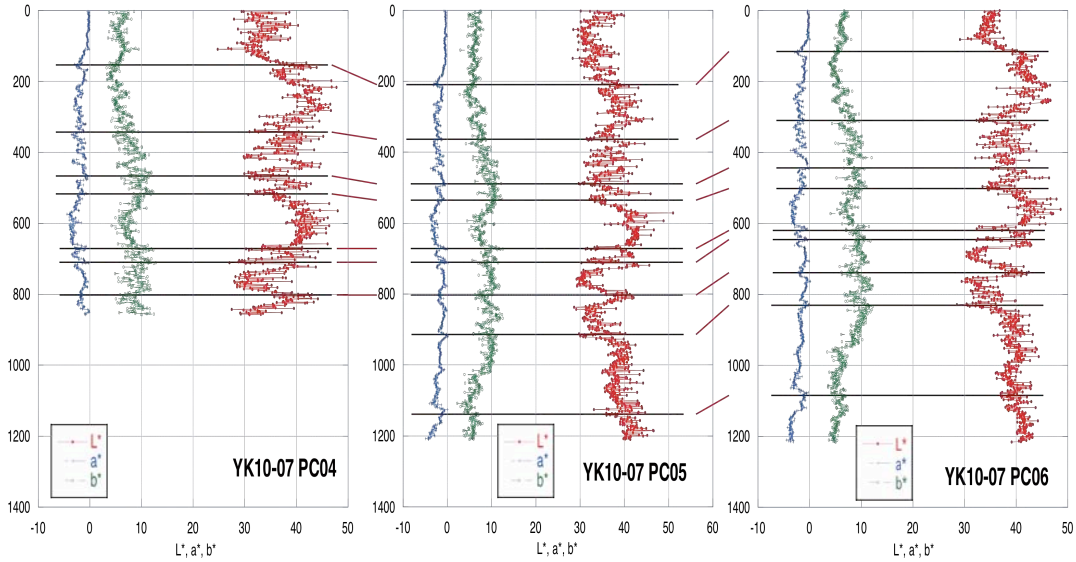


Fig. 4-2-18 Color based core correlation among PC04-PC06

4.2.3.3 Southern Mogami Trough (sites NI-1 and NI-2)

Three piston cores from two sites (NI-1 and NI-2) were recovered from southern Mogami Trough (Fig. 4-2-4 and -19). Site NI-1 locates near the center of the Trough, but site NI-2 locates near the foot-of-slope. Acoustic

facies of surface layer at both sites show transparent pattern, although finely stratified facies is found in the lower part of site NI-2. Occurrence of some acoustically chaotic layers indicates the presence of submarine debris flow deposits. Cores PC07 and PC08 at site NI-1 composed of highly bioturbated silty clay in the upper part, but many intercalations of thin silty layers found in the lower part. The lowermost part of core PC08 was characterized by fine alternation of black and dark gray silt and thin coarse silt-very fine sand layers. Slump-like distorted structure occurred in the lower part of core PC07. Core PC09 at site NI-2 composed of clayey silt in the upper part and laminated clayey silt in the lower part. Small slump-like distorted structures were observed in the lower laminated horizon. Some woody remains were occurred in the laminated clayey silt. A thin volcanic ash layer was intercalated in the uppermost part of the laminated clayey silt. Many gas-expansion cracks were found in the lower parts of all cores in this area suggesting the occurrence of relatively coarse-grained gravity flow deposits and high sedimentation rates.

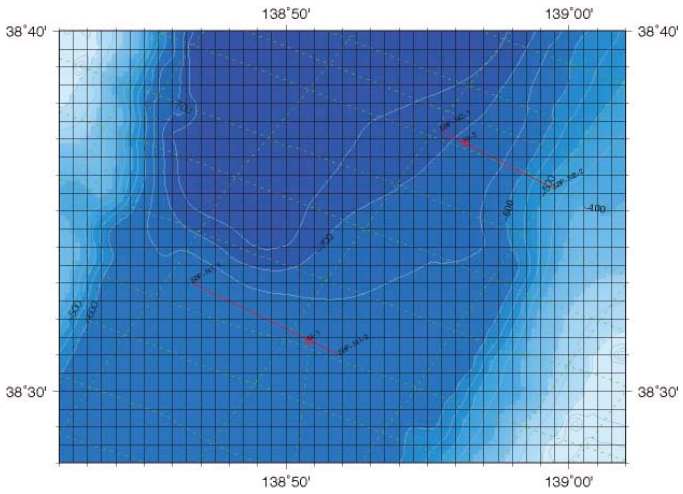


Fig. 4-2-19 Piston coring site (NI-1 and NI-2) in the southern Mogami Trough

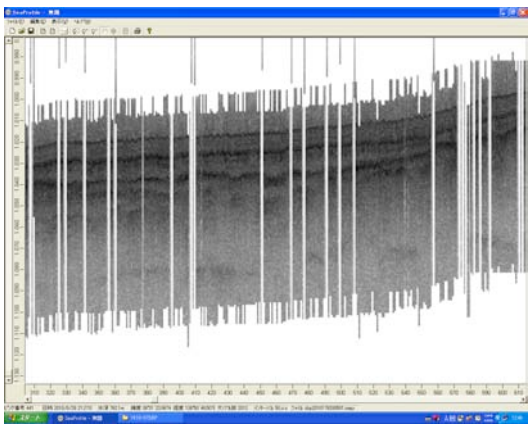


Fig. 4-2-20 SBP profile crossing site NI-1 (PC07 and PC08)

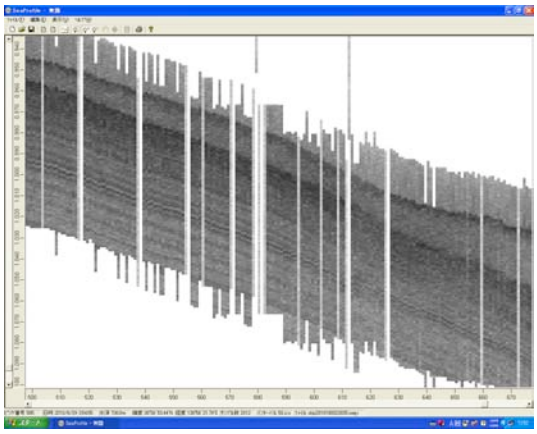


Fig. 4-2-21 SBP profile crossing site NI-2 (PC09)

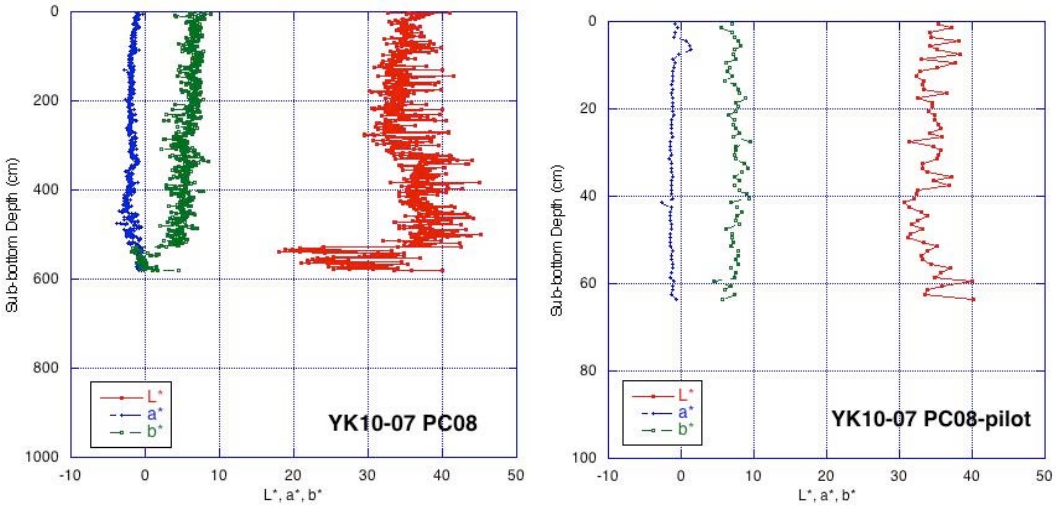


Fig. 4-2-22 Color profiles of PC08 and its pilot core

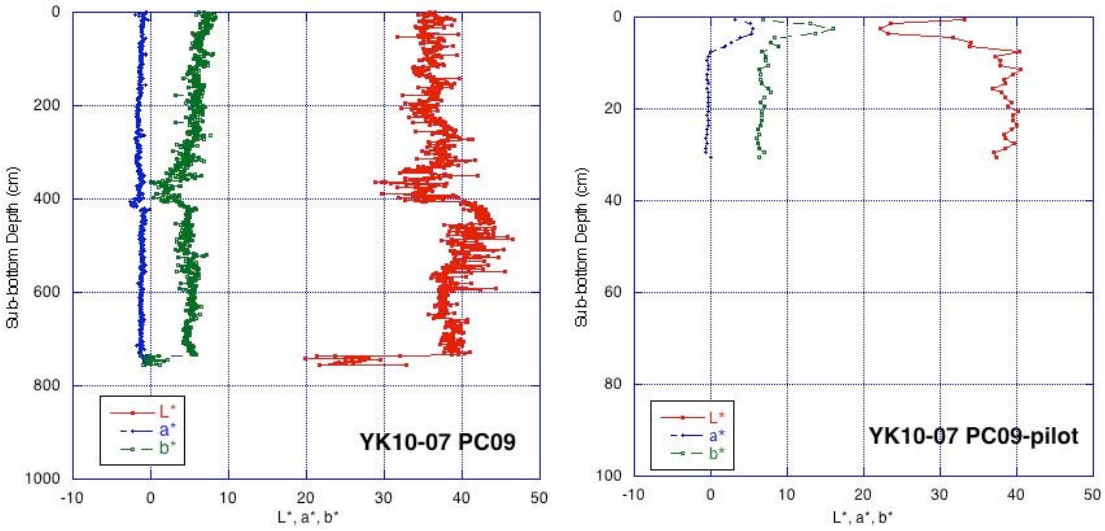
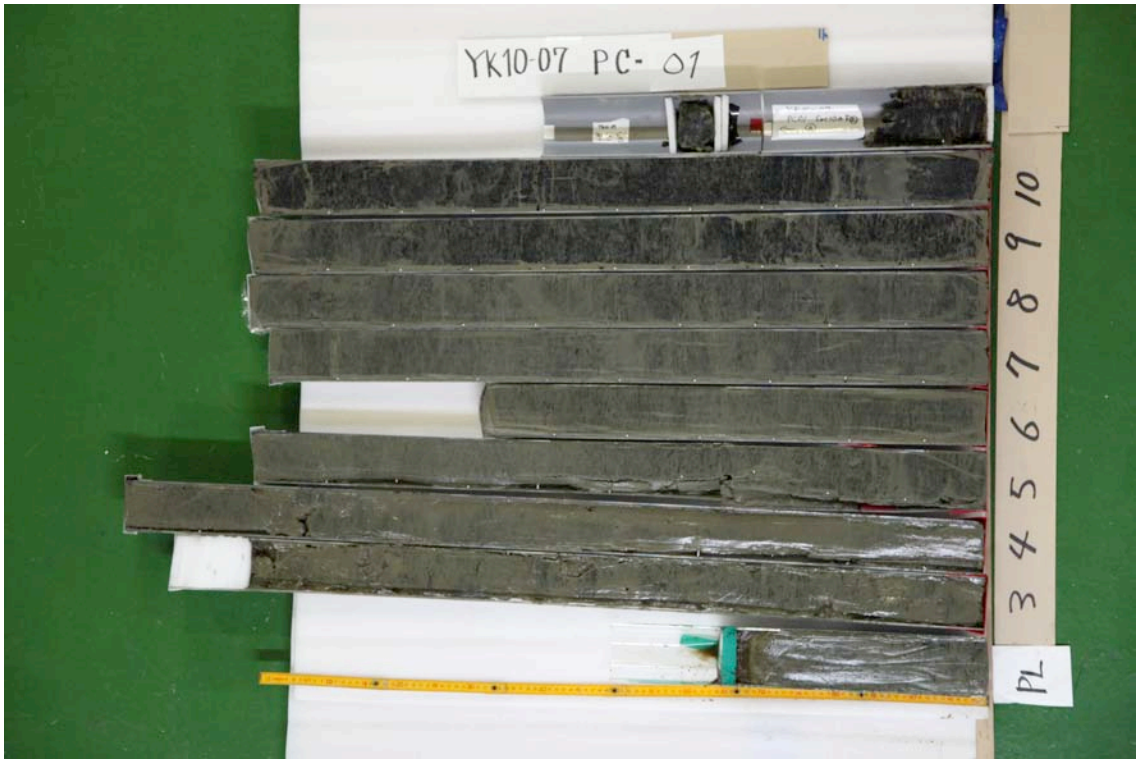
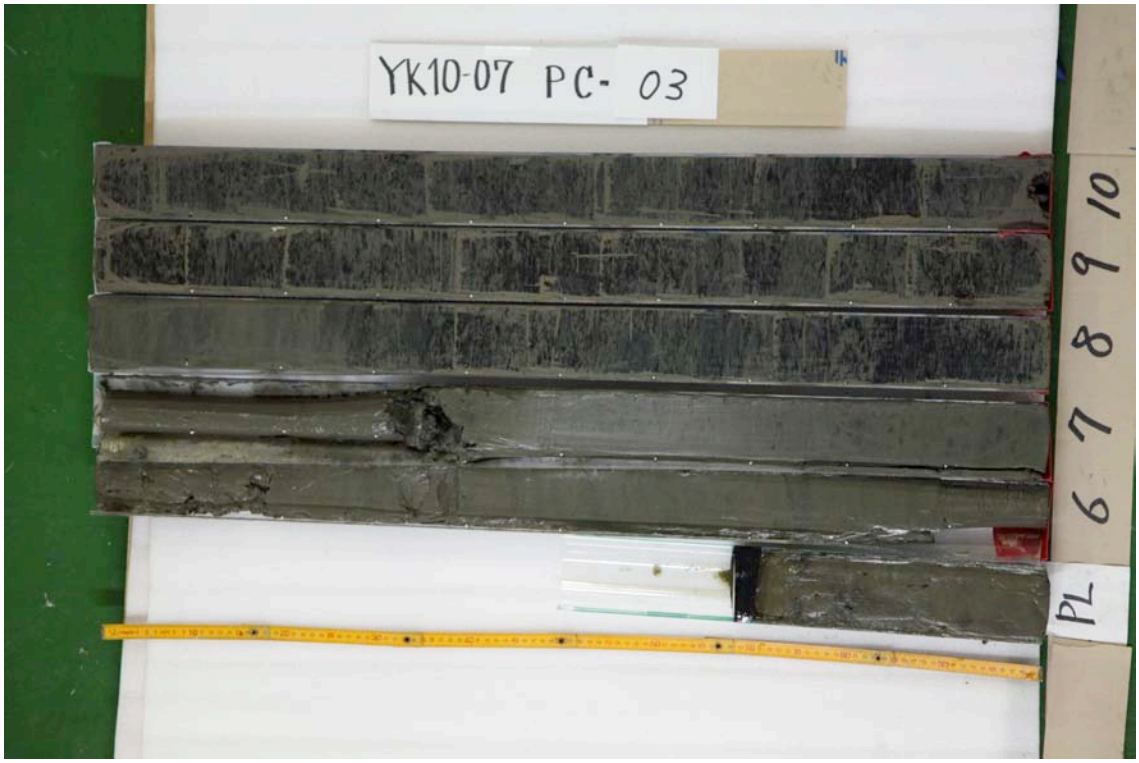
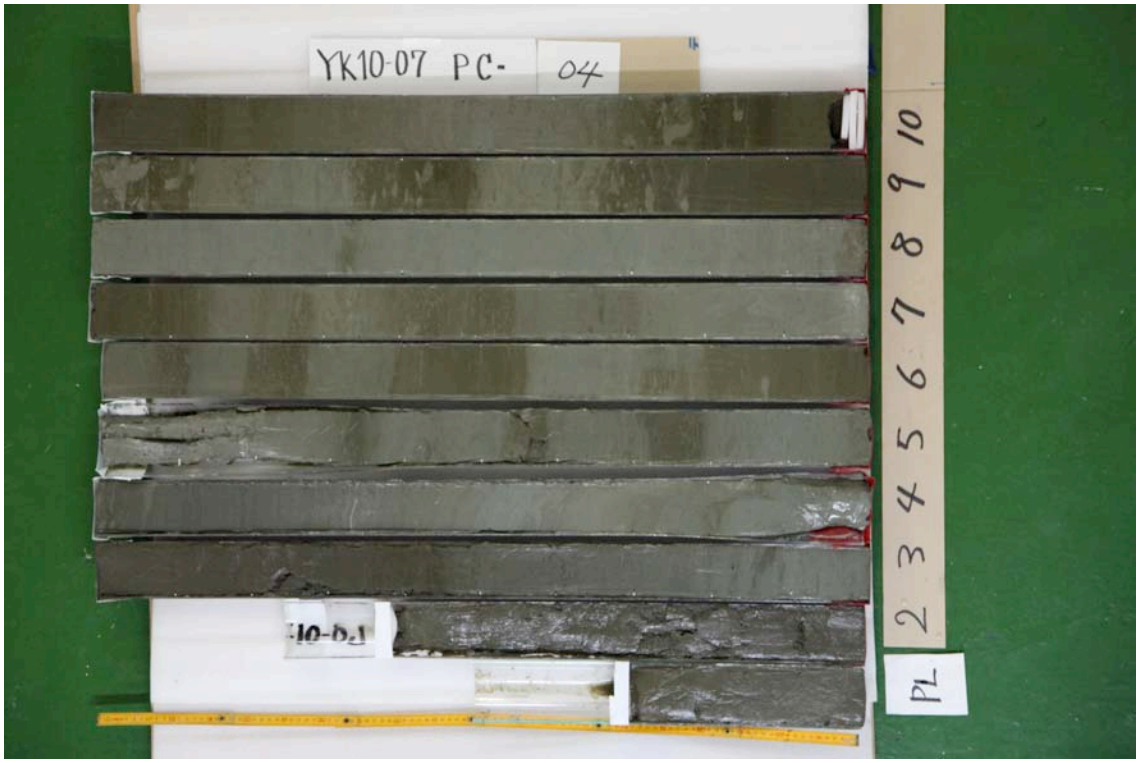


Fig. 4-2-23 Color profiles of PC09 and its pilot core

4.2.4 Core photographs




YK10-07 PC- 03
6 7 8 9 10
PL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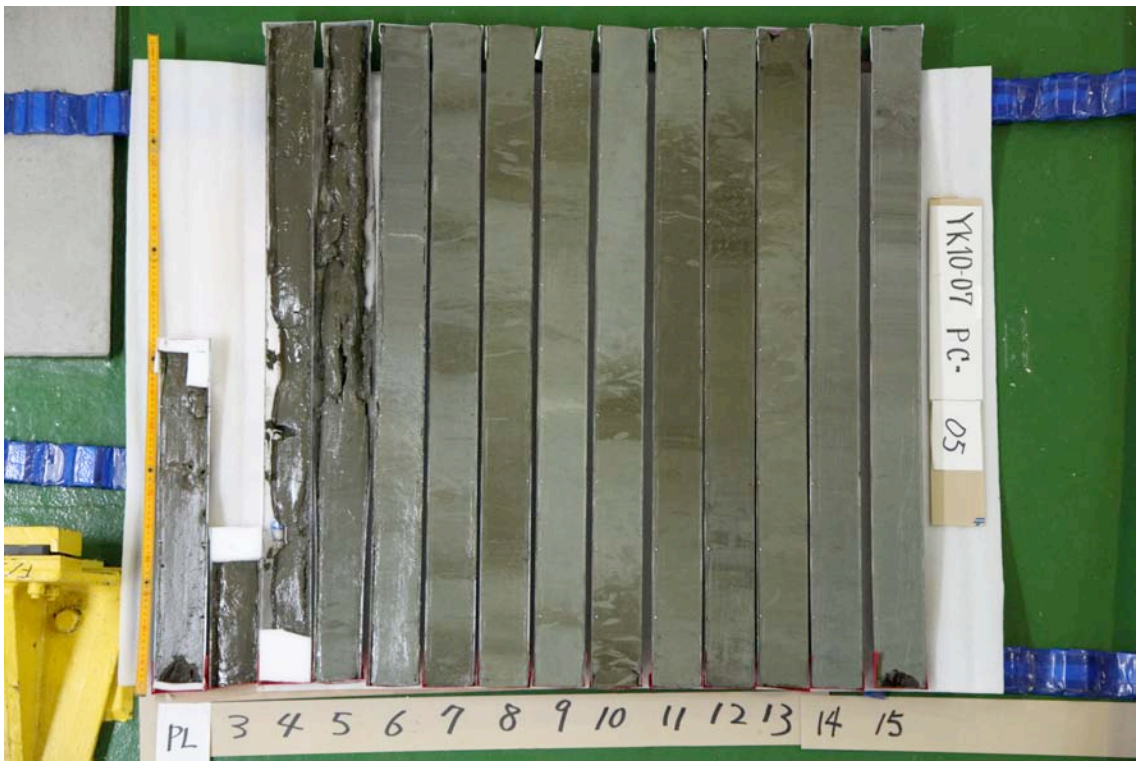
2 3 4 5 6 7 8 9 10
PL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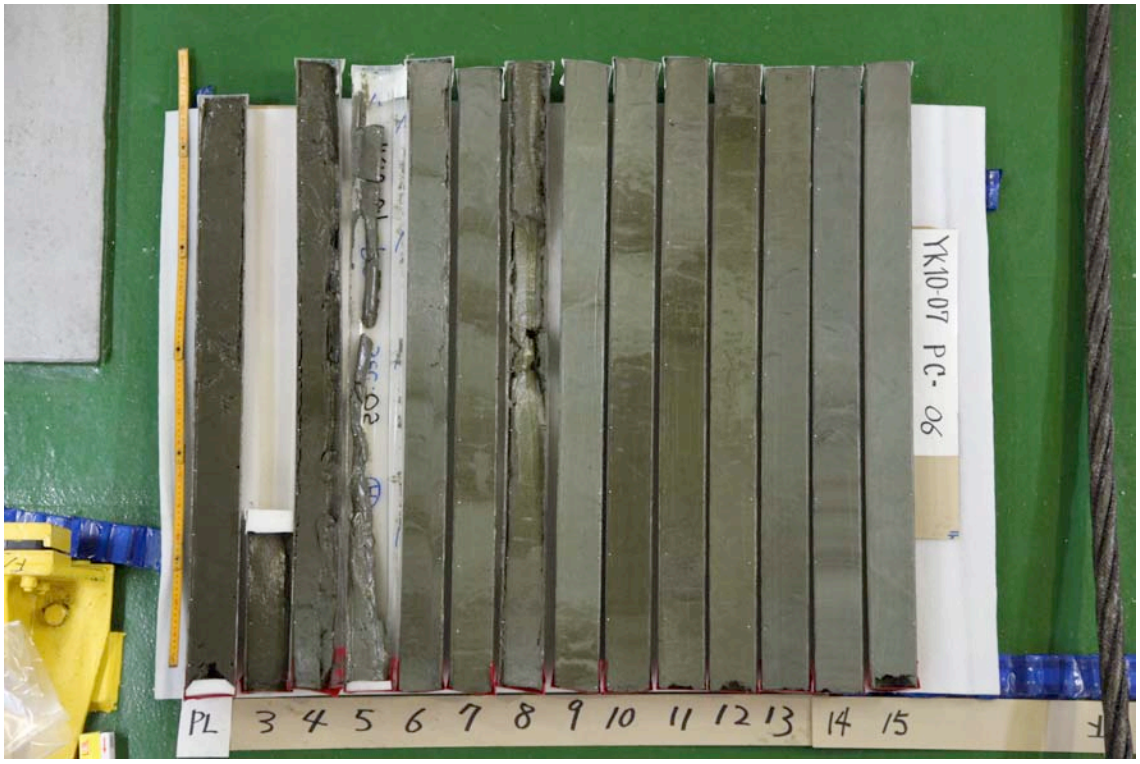
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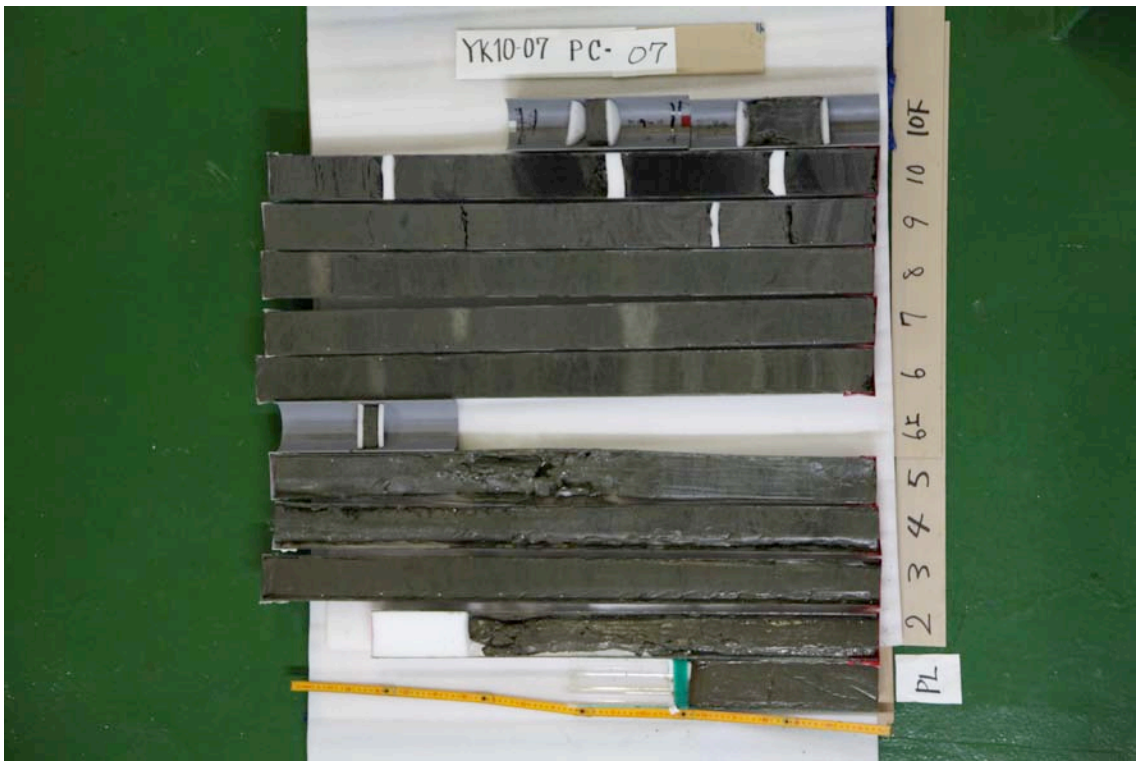
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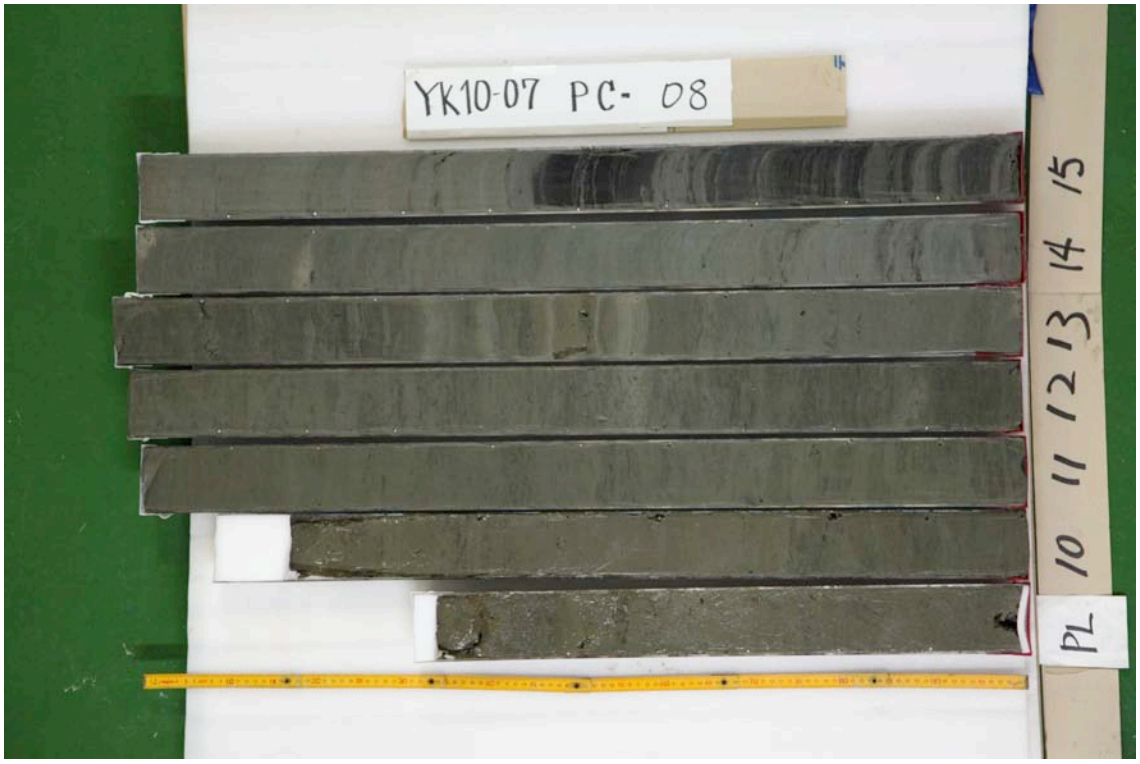
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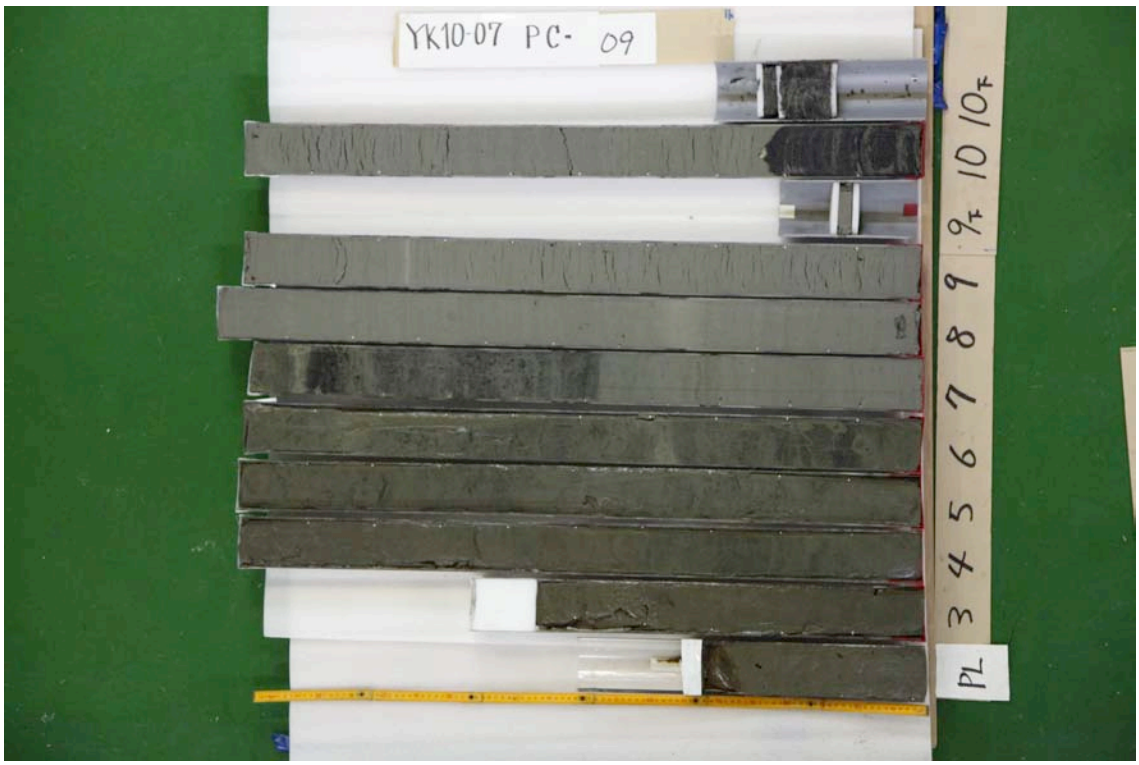

4.3 Future use of the obtained piston cores for marine geology education

Some cores obtained at site NO-1 will be used for core monitoring study during the storage of marine cores under the close relation between the shipboard scientists and KCC and CDEX of JAMSTEC. This is an important and basic study for better understanding of storage methods not only piston cores but also drilled cores by DSDP-ODP-IODP. Also, some cores will be used for outreach activities such as J-DESC core school held at Kochi University. The cores will be very useful for such a kind of education for graduate and undergraduate students who have interests on marine geology and marine sciences.

5 Acknowledgement

We are grateful to Captain Eiko Ukekura and the crew of the R/V Yokosuka for their professional efforts to make this scientific cruise successful. We also thank members of JAMSTEC ship operation division for their support.

Piston corer recovery (Photo by K. Usami)