Preliminary Report
of
The Hakuhō Maru Cruise KH-72-2
(The Southwest Japan Arc and Ryukyu Arc Areas)

October 24 - December 15, 1972

Ocean Research Institute
University of Tokyo
1975

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By

The Scientific Members of the Expedition

Edited by

Hideo KAGAMI

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Contents

Introduction

The principle object of the cruise KH-72-2 of Hakuho-Maru was to get geophysical and geological data from the continental margin of the northwest Philippine Sea. The area we have studied is considered to be a key area in the western Pacific, because there are observed convergence of several trenches, the intricate design of marginal sea plates, and the proximity of the Asian Continent.

The cruise contributes to basic study on marine geosciences and especially to the Geodynamics Project of Japan by which we are investigating movement and structure of the ocean floor and island arcs in the western Pacific. For the purpose of above-mentioned studies, following works are accomplished on the cruise: bathymetry and sub-bottom structure, gravity survey, magnetic measurement, ocean bottom earthquake observation, sediment coring, rock dredging, near bottom hydrocast. Approximately 9,000 nm was covered and 83 stations were carried out during the cruise beginning October 24 and ending December 15.

During proposal of this cruise, a symposium on geologic problems of the ocean floor around the Kyushu Island was held at Kyushu University in 1970. It is noteworthy to mention that attendants on that meeting were the nucleus of the scientific personnel of this cruise.

On behalf of all scientists aboard, I would like to express our thanks to Captain Ichiro Tadama and his crew of the Hakuho-Maru for their kind co-operation and devoted assistance. I also thank Mr. Senjiro Hirakawa and Dr. Asatomo Nohara for their kind guidance to Naha and Okinawa Island.

Most personnel have their study partly supported by a Scientific Research Fund from the Ministry of Education of Japan.

Hideo Kagami, Chief Scientist

The Ocean Research Institute,
University of Tokyo

I. LIST OF SCIENTISTS ON BOARD DURING THE CRUISE KH-72-2

Chief scientist

KAGAMI, Hideo, Ocean Research Institute, Marine Geology
Tracks A, B, C

Scientists from the Ocean Research Institute, University of Tokyo

KOBAYASHI, Kazuo, Marine Geophysics
A, B, C

SEGAWA, Jiro, Submarine Geophysics
A, B, C

HONZA, Eiichi, Marine Geology
A, B, C

OTOBE, Hirotaka, Physical Oceanography
A

IGARASHI, Chiaki, Marine Geology
B, C

NOHARA, Masato, Geochemistry
A, B, C

OTSUKA, Kenichi, Sedimentology
A, B, C

OKUDA, Yoshihisa, Marine Geology
A,

NOMURA, Masafumi, Paleomagnetism
A, B, C

BOWIN, Carl, Visiting researcher from Woods Hole Oceanographic Institution, U.S.A., Gravity Field
C

Visiting scientists

From Kyushu University

TAKAHASHI, Ryohei, Department of Geology, Faculty of Science, Coal Geology
C

SHUTO, Tsuguo, Department of Geology, Faculty of Science, Stratigraphy
A, B

ISHIBASHI, Kiyoshi, Department of Geology, Faculty of Science, Petrochemistry
A, B, C

KAMEYAMA, Tokuhiko, Department of Geology, Faculty of Science, Benthonic Foraminifer
A, B, C

OHARA, Jyonosuke, College of General Education, Sedimentology
A, B

YAMASHITA, Akio, Department of Mining, Faculty of Engineering, Engineering Geology
A, B, C

From Kagoshima University

OKADA, Hakuyu, Department of Geology, Sedimentology
C

From Kyoto University

SHIKI, Tsunemasa, Department of Geology, Faculty of Science, Sedimentology and Historical Geology
B, C

TOKUOKA, Takao, Department of Geology and Mineralogy, Faculty of Science, Sedimentary Geology
A, B, C

From Wakayama University

HARATA, Tetsuro, Faculty of Education, Geology and Sedimentology
A, B, C

From Doshisha University

SUZUKI, Hiroyuki, Department of Engineering, Stratigraphy
A

From Nara University of Education

NISHIDA, Shiro, Faculty of Education, Micropaleontology
A, B, C

From Toyama University

FUJII, Shoji, Department of Geology, Stratigraphy
A, B, C

From Kanazawa University

KONISHI, Kenji, Department of Earth Sciences, Faculty of Science, Stratigraphy and Paleontology
B, C

From University of Tokyo

ASADA, Toshi, Department of Geophysics, Seismology
B

AOSHIMA, Mutsuji, Department of Geology, Faculty of Science, Micropaleontology
A

From Tohoku University

TAGUCHI, Kazuo, Department of Mineralogy and Mining, Faculty of Science, Geochemistry
A

SHIOBARA, Manabu, Department of Mineralogy and Mining, Faculty of Science, Geochemistry
B, C

HAYASHIDA, Nobuo, Department of Mineralogy and Mining, Faculty of Science, Geochemistry
A, B, C

From Hokkaido University

SHIMAMURA, Hideki, Department of Geophysics, Seismology
A, B

MORITANI, Takeo, Department of Geophysics, Seismology
A, B

From National Science Museum

MURAUCHI, Sadanori, Department of Science and Technology, Seismology
C

ASANUMA, Toshio, Department of Science and Technology, Seismology
C

II. LIST OF CREW MEMBERS OF R/V HAKUHO-MARU

Captain	TADAMA, Ichiro
Chief Officer	IGARASHI, Hiroshi
1st Officer	SHIMAMUNE, Hideji
2nd Officer	UENO, Kiyohisa
Jr. 2nd Officer	TANAKA, Yutaka
3rd Officer	NANBA, Kiyoshi
Jr. 3rd Officer	INABA, Fujio
Chief Engineer	MURAKAMI, Akiyoshi
1st Engineer	TADAKI, Teruji
Jr. 1st Engineer	NOZAWA, Saburo
2nd Engineer	FURUYA, Akio
Jr. 2nd Engineer	KAWAGUCHI, Toshinori
3rd Engineer	MIYAZAKI, Yukio
Chief Radio Officer	TANAKA, Shigeo
2nd Radio Officer	TAKAZAWA, Toyoji
3rd Radio Officer	YONEDA, Hisashi
Clerk	MAKABE, Akira
Boatswain	ISE, Iwao
Head Quarter Master	TOMIOKA, Isamu
Store Keeper	YAMAGUCHI, Soji
Carpenter	OHASHI, Sanpei
Quarter Master	YAMADA, Shoichi
"	ARAI, MASAAKI
"	MORITA, Koichi
Sailor	NISHIURA, Rikio
"	KIRIGAYA, Shinichi
"	SATO, Shigeaki
"	YAMAMOTO, Yoichi
"	SUZUKI, Hiroe
"	SUZUKI, Akira
No. 1 Oiler	KUBOTA, Mamoru
No. 2 Oiler	BABA, Naojiro
No. 3 Oiler	SAITO, Toshio
No. 4 Oiler	OBATA, Toshio
No. 5 Oiler	KURODA, Tadao

No. 6 Oiler	NAITO, Hajime
No. 7 Oiler	KAWAMATA, Wataru
No. 8 Oiler	NAKAYAMA, Tomeo
No. 9 Oiler	NAKAZAWA, Kiyoshi
Machine Man	KONNO, Hiraku
"	HAGITA, Yukio
"	YAMAMOTO, Tomizo
"	IWAKIRI, Hisao
"	NINOMIYA, Toshihiro
Chief Steward	FUJIGAYA, Kazuo
Steward	MIZUMA, Koji
"	NOZAWA, Taichi
"	NOZAWA, Takayuki
"	NISHIOKA, Mitsuharu
"	SAKATA, Yoshiki
"	KAMIYA, Kenji
Purser	IIJIMA, Mitsuya

Fig. 1. Track chart of the cruise KH-72-2

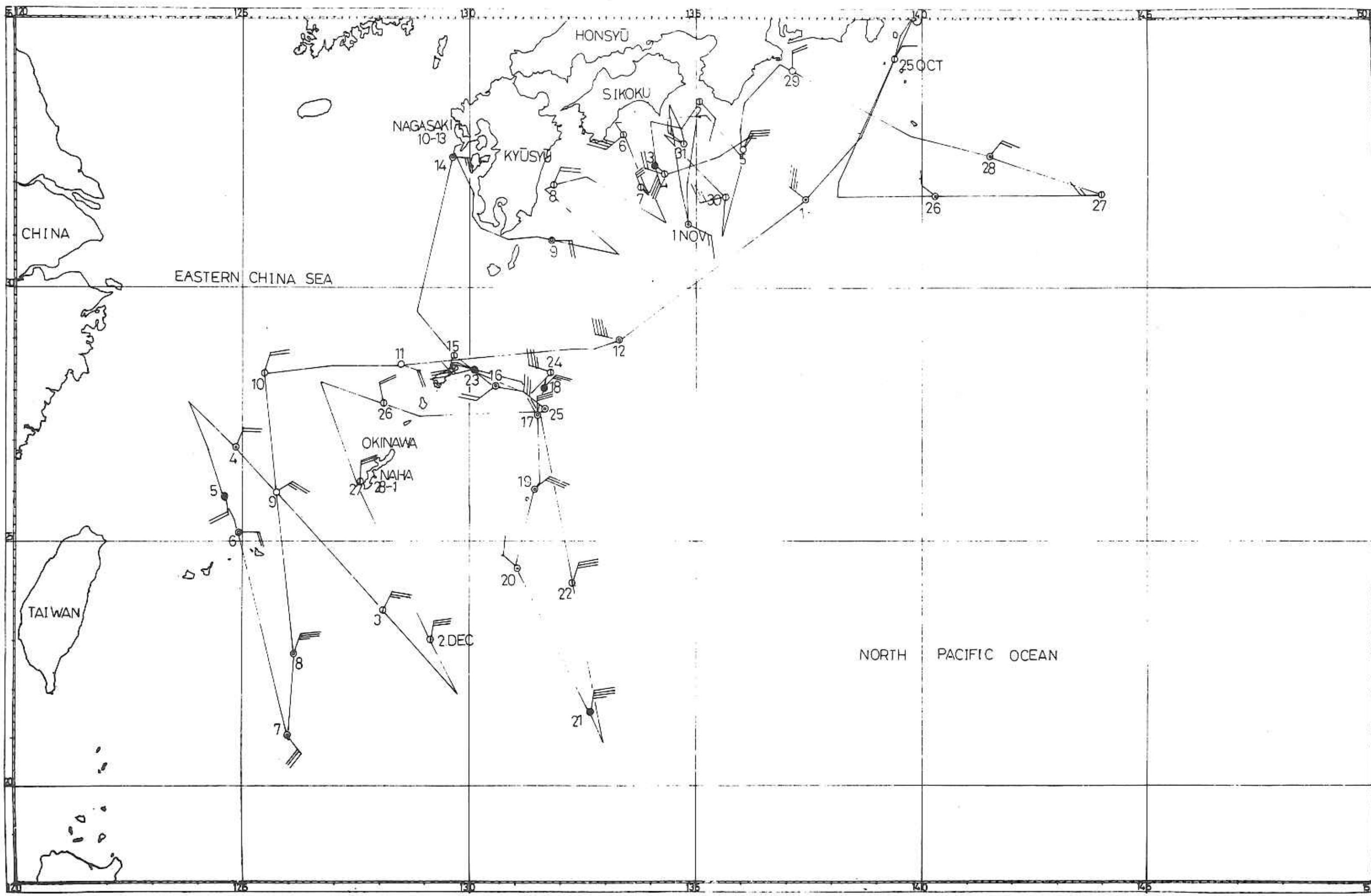
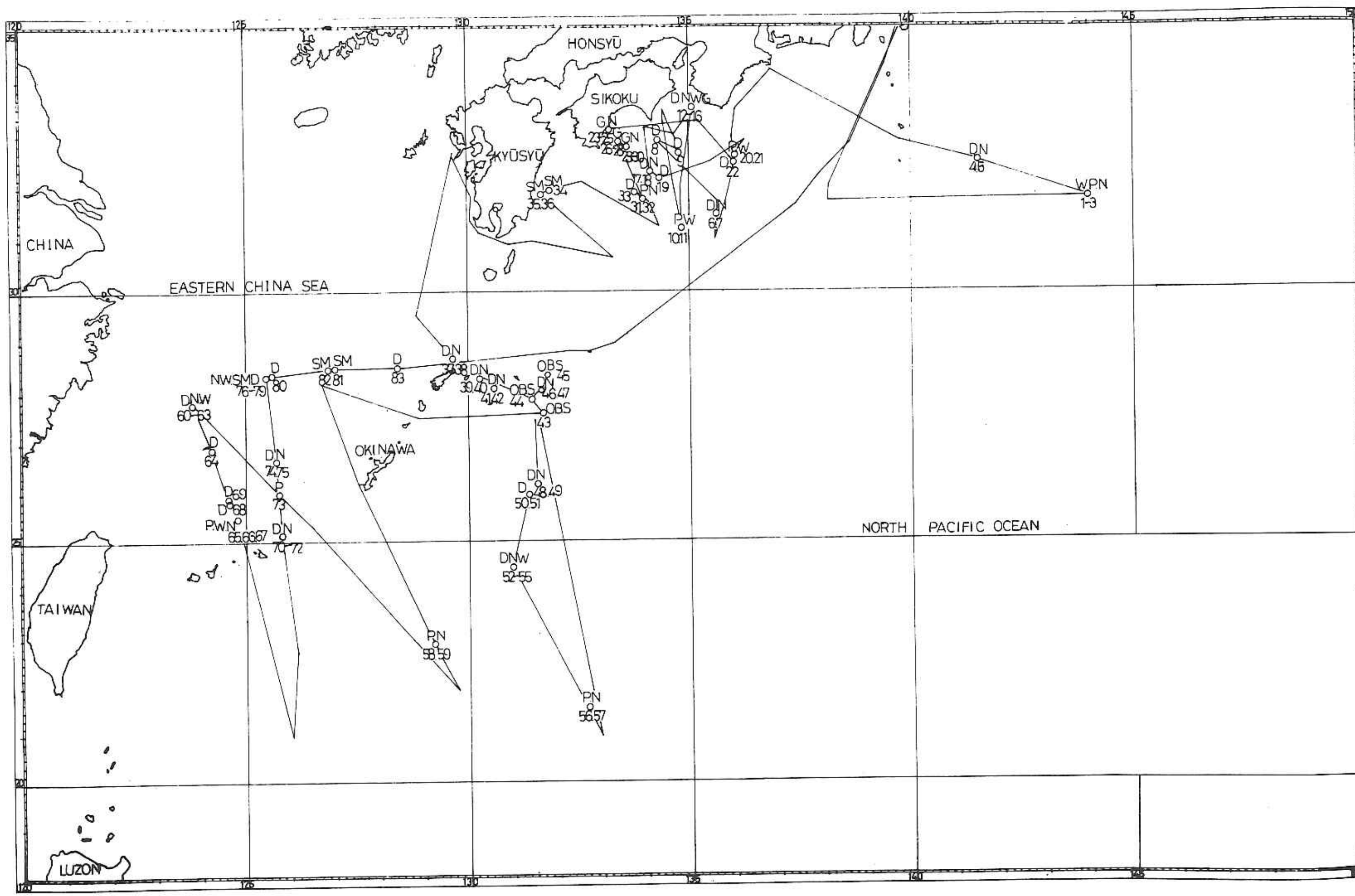


Fig. 2. Index map of stations during the cruise KH-72-2



III. GENERAL NAVIGATION RECORDS OF THE CRUISE KH-72-2

by I. Tadama and H. Igarashi

Date	Noon Position lat.	long.	Under way hours	miles	Propelling Tandem motion hours	miles	Ave. speed	Propelling separate motion hours	miles	Ave. speed	Var'ly porp hours	miles	Shifting hours	miles	Drifting hours	miles	Temp. anchoring	Wind direc.	force	Wea.	Baro.	Vis.	Sea Cond. sea	swell	Temperature air	sea	Remarks
Oct 24																		NE	2	bc	1023.5				19.0		
Oct 25	34°18.4 N	139°24.5 E	21.56	94.0	06.50	87.6					00.19	1.0	00.47	5.4			14.10	NNE	2	bc	1022.8	7	2	2	21.0	24.7	
Oct 26	33°44.8 N	140°17.0 E	24.00	282.6	19.20	239.4					04.40	43.2						NW	2	o	1023.8	7	3	3	23.0	24.8	
Oct 27	31°45.7 N	143°59.3 E	24.00	193.0							24.00	193.0						W	3	bc	1016.3	8	2	3	24.2	24.4	
Oct 28	32°30.3 N	141°31.4 E	24.00	160.8							24.00	160.8						NE	3	o	1016.0	7	2	3	23.6	24.3	
Oct 29	34°05.3 N	137°07.7 E	24.00	243.9	11.40	151.3					12.20	92.6						N	4	b	1007.6	8	4	4	20.2	24.2	
Oct 30	31°44.2 N	135°40.0 E	24.00	272.2	05.10	56.1					18.50	216.1						WSW	5	bc	1014.3	8	4	4	24.0	25.2	
Oct 31	32°45.2 N	135°44.3 E	24.00	174.2	05.40	53.1					18.20	121.1						NW	4	bc	1017.0	8	4	4	21.2	25.0	
Nov 1	31°15.4 N	134°50.8 E	24.00	197.5							24.00	197.5						ESE	3	o	1021.3	7	3	3	20.8	24.5	
Nov 2	33°31.2 N	135°04.6 E	24.00	147.5							24.00	147.5						SE	2	bc	1024.3	8	2	2	19.5	22.5	
Nov 3	32°19.0 N	134°05.5 E	24.00	153.2							24.00	153.2						SSE	8	r	1014.8	6	6	6	23.2	24.6	
Nov 4	32°10.0 N	134°17.0 E	24.00	68.1				02.40	18.5	6.9	14.30	37.8			06.50	11.8		WNW	4	bc	1015.8	8	3	3	23.2	24.5	
Nov 5	32°37.3 N	136°04.7 E	24.00	135.9	01.32	15.5	10.3				22.28	120.4						NNE	7	6	1021.3	8	5	5	20.8	24.5	
Nov 6	32°54.6 N	133°23.4 E	24.00	174.0	15.03	151.0	10.0				08.57	23.0						SW	7	bc	1011.2	8	5	5	23.5	22.5	
Nov 7	31°52.5 N	133°47.1 E	24.00	142.0	04.55	47.4	9.7				17.00	93.6			02.05	1.0		NNW	6	bc	1020.0	8	5	6	19.6	24.5	
Nov 8	31°58.4 N	131°53.8 E	24.00	152.2							24.00	152.2						NNE	4	bc	1026.3	8	4	4	16.6	22.9	
Nov 9	30°55.1 N	131°38.4 E	24.00	212.5							24.00	232.5						E	4	o	1023.3	8	3	3	21.1	25.3	
Nov 10	Nagasaki-ko		24.00	203.1	07.10	90.5	12.6	04.00	44.0	11.0	07.10	62.8	00.30	3.9	03.30	1.9	01.40	W	6	o	1007.8				23.0	21.5	1029 arrived at Nagasaki
Nov 11	"		24.00															NNE	3	bc	1022.7				17.4		
Nov 12	"		24.00															N	2	b	1024.6				16.8		
Nov 13	"																	WNW	2	bc	1023.3				20.0		
Nov 14	32°29.1 N	129°37.6 E	24.00	21.5	01.27	18.9	13.0						00.31	2.6				E	5	o	1024.1	7	2	2	18.8	21.8	1001 left Nagasaki
Nov 15	28°42.0 N	129°41.2 E	24.00	261.6	16.46	197.0	11.8	00.29	2.5	5.0	06.45	62.1						SSW	6	bc	1015.5	7	4	4	25.4	24.2	
Nov 16	28°06.5 N	130°34.2 E	24.00	176.5	03.58	43.3	10.9				20.02	133.2						SW	4	c	1015.8	7	3	3	25.3	25.5	
Nov 17	27°32.0 N	131°29.7 E	24.00	182.2	12.42	171.5	13.5				11.18	10.7						N	6	o	1018.7	7	4	4	23.2	25.0	
Nov 18	28°05.1 N	131°38.1 E	24.00	240.7	17.52	217.7	12.2	01.59	11.7	5.9	04.09	11.3						NNE	5	r	1022.3	6	4	4	20.2	24.8	
Nov 19	26°04.2 N	131.25.0 E	24.00	183.2	06.15	61.3	9.8				17.45	121.9						NNE	6	o	1017.8	7	5	4	23.6	26.1	
Nov 20	24°28.7 N	131°03.6 E	24.00	128.1	00.41	8.8	12.8				23.19	119.3						NW	2	c	1013.3	7	3	3	25.1	26.9	
Nov 21	21.34.4 N	132.42.3 E	24.00	199.2							24.00	199.2						NNE	7	r	1015.4	7	6	5	25.0	27.5	
Nov 22	24°12.2 N	132°16.3 E	24.00	243.9	21.14	239.3	11.3				02.46	4.6						NNE	6	bc	1019.8	7	4	5	23.4	26.7	
Nov 23	28°25.4 N	130°06.0 E	24.00	302.7	24.00	302.7	12.6											WSW	3	r	1019.7	7	2	2	19.2	24.4	
Nov 24	28°22.2 N	131°47.5 E	24.00	198.4	13.50	127.2	9.3				08.27	19.7					01.43	WNW	7	bc	1017.3	7	6	6	19.2	24.5	
Nov 25	27°38.8 N	131°39.5 E	24.00	77.3	01.22	18.5	13.5	01.43	18.3	10.7	20.55	40.5						NW	6	c	1020.0	7	6	6	18.5	24.0	
Nov 26	27°45.0 N	128°06.6 E	24.00	197.9							24.00	197.9						NNW	4	bc	1023.3	7	3	3	18.3	23.3	
Nov 27	26°14.0 N	127°35.8 E	24.00	222.9	23.26	220.7	9.4								00.34	2.2		N	6	c	1025.6	7	4	3	18.9	24.9	
Nov 28	Naha-ko		24.00	5.0									01.46	5.0			22.14	NNE	3	bc	1022.8				20.0		1341 arrived at Naha
Nov 29	"		24.00														24.00	ESE	2	c	1021.6				20.2		
Nov 30	"		24.00														24.00	N	7	r	1018.9				19.0		
Dec 1	"		24.00														24.00	N	6	c	1024.5				18.0		
Dec 2	23°03.5 N	129°08.0 E	24.00	220.0	00.44	5.4	7.4				20.36	209.2	00.15	5.4			02.25	NNE	6	bc	1021.4	7	5	4	22.2	26.0	1419 left Naha
Dec 3	23°38.0 N	128°04.6 E	24.00	205.9							24.00	205.9						NE	5	bc	1020.9	7	4	4	22.6	25.9	
Dec 4	26°53.1 N	124°51.0 E	24.00	262.0							24.00	262.0						NE	4	o	1020.4	7	3	2	20.9	23.0	
Dec 5	25°52.8 N	124°39.0 E	24.00	215.1							24.00	215.1						SSE	4	r	1017.3	5	3	4	20.9	24.8	
Dec 6	25.12.1 N	124°55.5 E	24.00	116.5							24.00	116.5						E	4	c	1016.3	7	3	3	23.6	24.7	
Dec 7	21°04.0 N	126°02.0 E	24.00	257.3							24.00	257.3						SE	6	c	1011.7	7	5	6	26.1	26.4	
Dec 8	22°46.2 N	126°07.7 E	24.00	229.0							24.00	229.0						NNE	7	o	1015.6	6	6	6	22.4	25.7	
Dec 9	25°58.5 N	125°44.1 E	24.00	200.9	03.08	29.3	9.4				20.52	171.6						NE	5	6	1020.5	8	4	4	20.4	24.7	
Dec 10	28°22.5 N	125°35.2 E	24.00	182.1							24.00	182.1						NNE	4	bc	1022.4	8	3	2	18.9	23.7	
Dec 11	28°31.5 N	128°31.2 E	24.00	210.2							24.00	210.2						ESE	4	b	1020.8	8	2	2	21.1	22.9	
Dec 12	29°10.3 N	133°18.3 E	24.00	263.6							21.15	258.1			02.45	5.5		WNW	9	o	1013.8	6	6	4	20.3	23.2	
Dec 13	31°42.4 N	137°25.6 E	24.00	265.6							24.00	265.6						NW	7	o	1017.3	6	6	6	11.6	20.8	
Dec 14	35°29.0 N	139°49.2 E	24.00	267.3	19.26	233.0	12.0	03.08	28.2	9.1	01.26	6.1						NW	2	6	1016.7	6	1	1	7.3	12.8	
Dec 15	Tokyo		21.50	12.0	00.21	2.2	6.3				00.23	4.0	01.03	5.8			20.03	W	2	b	1026.0				12.0	13.1	0947 arrived at Tokyo

IV. List of Research Stations (KH-72-2 Cruise)

Station No.	Research Operation	Date	Time (JST)	Position Lat.(N)	Position Long(E)	Depth Uncorr. (m)	Depth Corr. (m)	Remarks
1	Hydrocast	Oct 27	0914	31-45.5	144-00.2	5680	5718	Messenger down
2	Piston Corer	Oct 27	1401	31-47.8	144-00.7	5820	5872	Hit bottom
3	Norpac net	Oct 27	1553	31-48.6	144-01.0			Net in
4	Dredge haul	Oct 28	1258	32-30.9	141-31.0	4250	4253	Hit bottom
		Oct 28	1345	32-31.8	141-30.8	4210	4213	Leave bottom
5	Norpac net	Oct 28	1506	32-31.5	141-28.3			Net in
6	Dredge haul	Oct 30	1521	31-29.0	135-36.6	2930	2915	Hit bottom
		Oct 30	1545	31-29.0	135-36.6			Leave bottom
7	Norpac net	Oct 30	1700	31-29.0	135-28.0			Net in
		Oct 30	1721	31-29.1	135-28.1			Net out
8	Dredge haul	Oct 31	0824	32-54.5	134-16.1	1140	1133	Hit bottom
		Oct 31	0917	32-56.5	134-17.3	1080	1073	Leave bottom
9	Dredge haul	Oct 31	1520	32-40.5	134-46.6	3360	3349	Hit bottom
		Oct 31	1602	32-40.3	134-47.3	3560	3550	Leave bottom
10	Piston Corer	Nov 1	1412	31-13.5	134-49.7	4310	4313	Hit bottom
11	Hydrocast	Nov 1	1704	31-12.5	134-47.2	4290	4293	
12	Dredge haul	Nov 2	0902	33-31.25	135-05.45	1410	1399	Hit bottom
		Nov 2	1012	33-31.5	135-05.7	1220	1211	Leave bottom
13	Norpac net	Nov 2	1041	33-31.4	135-05.9			Net in
14	Hydrocast	Nov 2	1128	33-30.9	135-04.4	1300	1291	Messenger down
15	Gravity Corer	Nov 2	1326	33-31.5	135-05.1	1405	1394	Hit bottom
16	Hydrocast	Nov 2	1443	33-30.8	135-04.4	1423	1412	Messenger down
17	Dredge haul	Nov 4	0853	32-18.0	134-07.2	2335	2319	Hit bottom
		Nov 4	0952	32-18.4	134-09.5	2440	2424	Leave bottom
18	Norpac net	Nov 4	1040	32-18.6	134-11.3			Net in
		Nov 4	1106	32-18.3	134-12.4			Net out
19	Dredge haul	Nov 4	1350	32-09.2	134-19.0	3805	3797	Hit bottom
		Nov 4	1412	32-09.2	134-20.0	3740	3730	Leave bottom
20	Hydrocast	Nov 5	0732	32-38.0	136-01.4			Messenger down
21	Piston Corer	Nov 5	1121	32-37.0	136-04.2	4640	4653	Turbidites
22	Dredge haul	Nov 5	1603	32-51.3	136-01.4	3400	3389	Hit bottom
		Nov 5	1632	32-51.6	136-01.8	3480	3469	Leave bottom
23	Phleger Corer	Nov 6	0803	33-07.5	133-11.9	70	71	Hit bottom
24	Norpac net	Nov 6	0758	33-07.5	133-11.9			Net in
		Nov 6	0803	33-07.5	133-11.9			Net out
25	Gravity Corer	Nov 6	0944	33-02.5	133-16.8	123	124	Hit bottom
26	Gravity Corer	Nov 6	1100	32-57.5	133-21.4	202	202	Hit bottom
27	Gravity Corer	Nov 6	1248	32-52.1	133-25.6	390	390	Hit bottom
28	Gravity Corer	Nov 6	1408	32-50.8	133-26.0	475	473	Hit bottom
29	Gravity Corer	Nov 6	1626	32-43.8	133-30.4	808	803	Hit bottom
30	Norpac net	Nov 6	1705	32-44.0	133-30.8			Net in
			1720	32-44.0	133-31.1			Net out
31	Piston Corer	Nov 7	0905	31-47.1	133-56.0	4865	4882	Hit bottom
32	Norpac net	Nov 7	1035	31-49.2	133-55.5			Net in
		Nov 7	1052	31-49.5	133-55.5			Net out

33	Dredge haul	Nov 7	1419	31-51.2	133-46.9	4210	4210	Hit bottom
		Nov 7	1457	31-51.7	133-46.6	4150	4145	Leave bottom
34	Smith-McIntyre haul	Nov 8	1247	31-58.0	131-51.6	745	744	Hit bottom
35	Smith-McIntyre haul	Nov 8	1520	31-52.8	131-34.8	35	39	Hit bottom
36	Smith-McIntyre haul	Nov 8	1620	31-55.3	131-40.3	122	126	Hit bottom
37	Dredge haul	Nov 15	1255	28-40.8	129-41.7	315	319	Hit bottom
		Nov 15	1325	28040.7	129-41.6	400	404	Leave bottom
38	Norpac net	Nov 15	1340	28-41.0	129-41.7			Net in
		Nov 15	1402	28-41.8				Net out
39	Dredge haul	Nov 15	2052	28-18.4	130-15.4	1475	1466	Hit bottom
		Nov 15	2124	28-18.5	130-15.0	1480	1471	Leave bottom
40	Norpac net	Nov 15	2145	28-18.5	130-15.1			Net in
		Nov 15	2209	28-18.6	130-15.2			Net out
41	Dredge haul	Nov 16	1611	28-04.0	130-34.4	3940	3937	Hit bottom
		Nov 16	1813	28-04.7	130-34.2	3780	3775	Leave bottom
42	Norpac net	Nov 16	1942	28-05.2	130-33.9			Net in
		Nov 16	2001	28-05.2	130-34.0			Net out
43	OBS. C.	Nov 17	1010	27-27.4	131-29.1	5590	5629	Buoy in
		Nov 17	1159	27-32.0	131-29.7	5020	5045	OBS. in
44	OBS. A.	Nov 17	1420	27-54.9	131-19.5	4600	4609	Buoy in
		Nov 17	1558	27-54.3	131-19.3	4700	4713	OBS. in
45	OBS. B.	Nov 18	0824	28-14.2	131-41.6	3590	3583	Buoy in
		Nov 18	0909	28-17.5	131-42.3	3650	3645	OBS. in
46	Dredge haul	Nov 18	1205	28-05.9	131-38.0	1360	1353	Hit bottom
		Nov 18	1342	28-05.0	131-38.6	1260	1253	Leave bottom
47	Norpac net	Nov 18	1410	28-04.5	131-38.3			Net in
		Nov 18	1431	28-04.2	131-38.2			Net out
48	Dredge haul	Nov 19	0838	26-11.6	131-33.3	3040	3029	Hit bottom
		Nov 19	0955	26-11.7	131-32.0	2850	2838	Leave bottom
49	Norpac net	Nov 19	1045	26-12.3	131-31.2			Net in
		Nov 19	1115	26-10.6	131-30.7			Net out
50	Dredge haul	Nov 19	1335	25-59.4	131-21.4	1500	1491	Hit bottom
		Nov 19	1527	25-59.1	131-21.0	1875	1863	Leave bottom
51	Dredge haul	Nov 19	1708	25-56.9	131-21.4	930	127	Hit bottom
		Nov 19	1805	25057.2	131-20.8	500	502	Leave bottom
52	Dredge haul	Nov 20	0738	24-29.5	131-00.0	2510	2496	Hit bottom
		Nov 20	0824	24-29.3	131-00.3	2450	2436	Leave bottom
53	Dredge haul	Nov 20	1104	24-28.5	131-03.0	2490	2476	Hit bottom
		Nov 20	1239	24-28.7	131-03.1	2250	2237	Leave bottom
54	Norpac net	Nov 20	1300	24-28.7	131-03.0			Net in
		Nov 20	1325	24-28.5	131-03.1			Net out
55	Hydrocast	Nov 20	1451	24-28.1	131-03.0	2850	2838	Messenger down
56	Piston Corer	Nov 21	1201	21-34.4	132-42.3	5360	5393	Hit bottom
57	Norpac net	Nov 21	1403	21-36.8	132-43.8	4950	4970	Net in
		Nov 21	1424	21-37.0	132-43.8	4870	4890	Net out
(45)	OBS. B	Nov 24	1410	28-22.2	131-47.6	3930	3427	Leave bottom
		Nov 24	1546	28-20.6	131-50.3	3840	3837	OBS. Recovery
(44)	OBS. A	Nov 25	0810	27-53.2	131-25.0	4280	4286	Leave bottom
		Nov 25	1016	27-52.0	131-27.0	4250	4256	OBS. Recovery
(43)	OBS. C	Nov 25	1512	27-37.1	131-41.9	3040	3029	Leave bottom
		Nov 25	1631	27-37.3	131-43.2	3110	3099	OBS. Recovery

58	Piston Corer	Dec 2	1521	22-53.2	129-13.2	5300	5333	Hit bottom
59	Norpac net	Dec 2 Dec 2	1705 1729	22-53.4 22-53.5	129-13.1 129-13.0	5400		Net in Net out
60	Dredge haul	Dec 4 Dec 4	1922 1957	27-48.6 27-49.0	123-48.5 123-47.8	95 16	99 100	Hit bottom Leave bottom
61	Dredge haul	Dec 4 Dec 4	2050 2133	27-46.8 27-47.0	123-48.0 123-47.5	92 93	96 97	Hit bottom Leave bottom
62	Hydrocast	Dec 4	2217	27-47.2	123-47.1			Messenger down
63	Norpac net	Dec 4 Dec 4	2153 2221	27-47.1 27-47.2	123-47.2 123-47.1			Net in Net out
64	Dredge haul	Dec 5 Dec 5	0420 0455	26-53.6 26-53.6	124-15.0 124-14.7	124 124	128 128	Hit bottom Leave bottom
65	Piston Corer	Dec 5	1551	25-29.2	124-48.6	2090	2078	Hit bottom
66	Hydrocast	Dec 5	1752	25-30.8	129-51.1	2080	2068	Messenger down
67	Norpac net	Dec 5 Dec 5	1702 1732	25-30.4 25-30.4	129-49.5 129-50.2	2080	2068	Net in Net out
68	Dredge haul	Dec 5 Dec 6	2257 0107	25-48.4 25-49.4	124-35.5 124-36.4	1450 1340	1441 1333	Hit bottom Leave bottom
69	Dredge haul	Dec 6 Dec 6	0524 0624	25-55.9 25-57.2	124-40.2 124-40.2	910 650	907 649	Hit bottom Leave bottom
70	Dredge haul	Dec 9 Dec 9	0419 0433	25-10.5 25-10.6	125-49.2 125-49.3	208 180	212 184	Lost
71	Norpac net	Dec 9 Dec 9	0452 0505	25-10.8 25-10,8	125-49.7 125-49.8	160 160		Net in Net out
72	Dredge haul	Dec 9 Dec 9	0556 0655	25-09.6 25-10.1	125-48.4 125-48.6	290 230	294 234	Hit bottom Leave bottom
73	Piston Corer	Dec 9	1326	26-00.3	125-44.5	2116	2104	Hit bottom
74	Dredge haul	Dec 9 Dec 9	2043 2150	26-39.4 26-40.3	125-41.4 125-41.7	1300 160	1293 157	Hit bottom Leave bottom
75	Norpac net	Dec 9 Dec 9	2200 2227	26-40.5 26-41.3	125-41.8 125-41.9	910 900		Net in Net out
76	Norpac net	Dec 10 Dec 10	0813 0825	28-20.6 28-20.6	125-28.9 125-28.7	110 110		Net in Net out
77	Hydrocast	Dec 10	0837	28-20.5	125-28.5	110		Messenger down
78	Smith-McIntyre haul	Dec 10	0905	28-20.5	125-28.1	111	115	Hit bottom
79	Dredge haul	Dec 10 Dec 10	0922 0955	28-20.4 28-20.4	125-27.5 125-26.8	114 114	118 118	Hit bottom Leave bottom
80	Dredge haul	Dec 10 Dec 10	1110 1151	28-22.2 28-22.5	125-34.7 125-35.2	116 117	120 121	Hit bottom Leave bottom
81	Smith-McIntyre haul	Dec 10 Dec 10	1932 2011	28-29.1 28-30.0	126-59.8 126-59.8	241 410	245 412	Failed 2nd trial
82	Smith-McIntyre haul	Dec 10	2122	28-27.9	126-52.4	1060	1055	Hit bottom
83	Dredge haul	Dec 11 Dec 11	0938 1043	28-32.2 28-31.8	128=25.8 128-26.2	800 780	799 779	Hit bottom Leave bottom

I. Regional Problems (Preliminary Programme)

1. Izu-Ogasawara arc

by Eiichi Honza

Izu-Ogasawara (Bonin) arc is consisted of three redges which are almost parallel to the Izu-Ogasawara trench. They are Ogasawara ridge, Shichito-Iwoto ridge and Nishi-Shichito ridge from east to west.

Ogasawara ridge is consisted of andesitic volcanic rocks and Nummulitic limestone since Eocene age. Shichito-Iwoto ridge is consisted of andesitic and rhyolitic volcanic rocks which are very active in Recent. Nishi-Shichito ridge is a submarine ridge and there are no data on the geological composition of the ridge.

Southern extension of Izu-Ogasawara arc continues to Mariana arc. Mariana arc is also consisted of volcanic debris and sedimentary rocks since upper Eocene age (from Alutom formation in Guam Island). Middle Mariana ridge is consisted of andesitic, basaltic volcanic rocks and debris. Volcanism is active in Recent. Geological composition of West Mariana ridge is not well known, but obtained are some of dacitic volcanic rocks and debris and sedimentary rocks since late Miocene or early Pliocene age.

From these facts and topographical continuation, Izu-Ogasawara arc is well correlated to Mariana arc, which may suggest they have almost the same geological history and development.

Some of the different features between these two arcs are the radius of curvature and width of the inter-arc basins.

Izu-Ogasawara arc is an active arc, which is suggested by the Recent volcanic activity and deep focus seismic activity. The island arc activity in the area can be traced since early Tertiary. It is almost the same age as the beginning of the last island arc activity in the northwestern circum-Pacific island arcs. Izu-Ogasawara arc has not so complex a history compared with the Japan arc where at least a few island arc activity had been developed. Therefore, many essential frameworks of the island arc activity may be suggested in the arc.

A few basement high or ridge are recognized on the upper continental slope between Shichito-Iwoto ridge and Izu-Ogasawara trench. One of the high, perhaps western one may be the extend of Ogasawara ridge and the eastern high is the mid-slope basement high, which is suggested by Karig (1971) and Mogi (1970). The high distributes at the boundary area of upper gentle slope and lower steep slope.

Maximum more than 1000 meters thick of layered sediments distribute on the upper slope. A few tectonic stages are recognized in the distributional pattern of sediments.

A small bench or terrace is commonly observed at the middle of the lower continental slope. There are three cases for the formation of the bench structure. The first is formation by the normal step fault. The second is by subsidence of folded basement high which formed by the same mechanism as of the basement high at the upper continental slope. The third is attachment of seamount which reached by the trenchward movement of the oceanic plate.

However, most of the benches at the Japan trench and Kurile trench are formed by the normal step fault. Some of seamounts at the trenches show the deformed or destroyed feature and also low height (near trench level) benches. A few benches have a possibility of the formation by the folding.

Antithetic faults develop at the sea-side slope of the trench where tensional stress at the upper part of the oceanic plate is suggested.

On the other hand, compressional stress is suggested at the upper continental slope where a few basement high are recognized.

2. The continental margin of the southwest Japan arc

by Hideo Kagami

The continental margin of the southwest Japan is characterized by the presence of deep sea terraces and the Nankai trough, and by the absence of an inclined seismic zone and active volcanoes. These features suggest that, in terms of plate tectonics, underthrusting in southwest Japan started in recent time less than one million years ago.

Another underthrusting in the geologic past is estimated from facts that absence of turbidites in the abyssal floor of the Shikoku basin suggests possible evidence of trench before upper Miocene (DSDP, site 367), and that sparker survey at the Toki basin and Tosabae bank reveals unconformity between Tanabe formation (low--mid Miocene) and the overlying sediments.

This is not yet fully appreciated by Japanese scientists. Therefore, it is our preliminary programme to collect profiler records across the continental margin of this area and to obtain rock samples from the lower and middle slope.

3. The Okinawa trench area

by Ryohei Takahashi

Tracing of -500 m contour line in the area behind the Ryukyu islands has thrown a light on the figure of the Okinawa trough which is fringing the southern margin of the Tokai continental shelf. It has an extent of about 1200 km from Formosa to Kyushu and a width of about 120 km from north to south. According to the present knowledge on the geology of the Ryukyu islands, the strata composing of the islands are zonally distributed in a direction of NNE-SSW and traceable further to Kyushu. Detailed correlation of these zones both in Kyushu and Ryukyu seems to be still incomplete, but the middle Kyushu should be regarded as an uplifted zone, the correspondence to the frontal ridge, and therefore as a part of the frontal arc of the Southwest Japan.

In Kyushu the Tertiary is widely distributed in the northwestern and southeastern parts, putting apart the uplifted zone, the middle Kyushu. The Tertiary basin in the former part is therefore considered to be a "back-deep" and that in the latter a "vor-deep." Because the sedimentary basins of the Tertiary in both parts had gradually shifted to outer side respectively, corresponding to the upheaval movement of the middle Kyushu, the basins occured in the inner and outer sides of the Ryukyu islands might have shifted also in the same way.

Judging from topographical relationship, there might be older strata like the Amakusa and the Takashima group in the southern to middle part of the Okinawa trough, and younger ones like the Nojima and the Iki group in the northern to further northward area.

Recently the Tertiary System in the northwestern Kyushu is reinvestigated from a neotectonical point of view, having a special reference to the occurrence and the development of the Tertiary basins. In the later stage of the third cycle of sedimentation (Takahashi & Shuto), several small basins newly developed in the former uplifted basins, in which the Kurume and the Sekinan groups were deposited. These newly born basins might be "intra deeps" in the uplifted zone, but they were gradually upheaved and undulated.

According to seismic profiles, the Okinawa trough is said to have taken place in Pliocene. The small basins in Kyushu mentioned above are also of the same age. From a chronological and genetical aspect, they mgiht be, consequently, the same to the Okinawa trough. The only difference between them lies in the fact that the basins in Kyushu were filled up with deposits and the trough is covered with a small amount of the Pliocene.

The differences in scale and thickness of the deposit between the two basins might be originated from local difference in the moving velocity of continental plate; around Kyushu it might be not so intense as near Ryukyu area; and accordingly, it is presumed that the basins in the former are smaller than those in the latter.

According to the result obtained by the seismic profiling (Nasu et. al), there were many intrusives along the northern periphery of the Okinawa trough. Because these intrusives are lifting and damming shelf deposit, the Pliocene in the trough is more or less folded, but the shelf deposit is not so much folded. These facts give us doubtless much light to understand the process of the formation of the Okinawa trough, and further of the Ryukyu Island arc. But it has been remained unsolved whether the volcanics ranging from Danzyo-gunto to Goto islands and further to northern Kyushu are equivalent or not in age and characteristics to those of the northern periphery of the Okinawa trough. Rock samples taken up from near and around the Okinawa trough are really very few, being far from the completeness in discussing the problems. At present, it is for us a pressing need to collect rock samples as much as possible and to face the problems of the Ryukyu arc, taking account of the geology of the Tertiary in the northwestern Kyushu.

2. Submarine Topography

1. Note on the submarine topography of the Izu-Ogasawara trench, the Nankai trough and their adjacencies

by Hiroyuki Suzuki and Shoji Fujii

Profiles of the submarine topography of the Izu-Ogasawara trench and the Nankai trough (Southwest Japan trench) are shown in Figs. 4 and 5, and locations of traverses obtained from the cruise are shown in Fig. 3. These profiles were drawn along the ship's tracks and traced from the echograms of Precision Depth Recorder. The depths are uncorrected records directly read from the echograms. Locations of the ship were determined by Loran and astrometry method.

1) Izu-Ogasawara trench and its adjacency

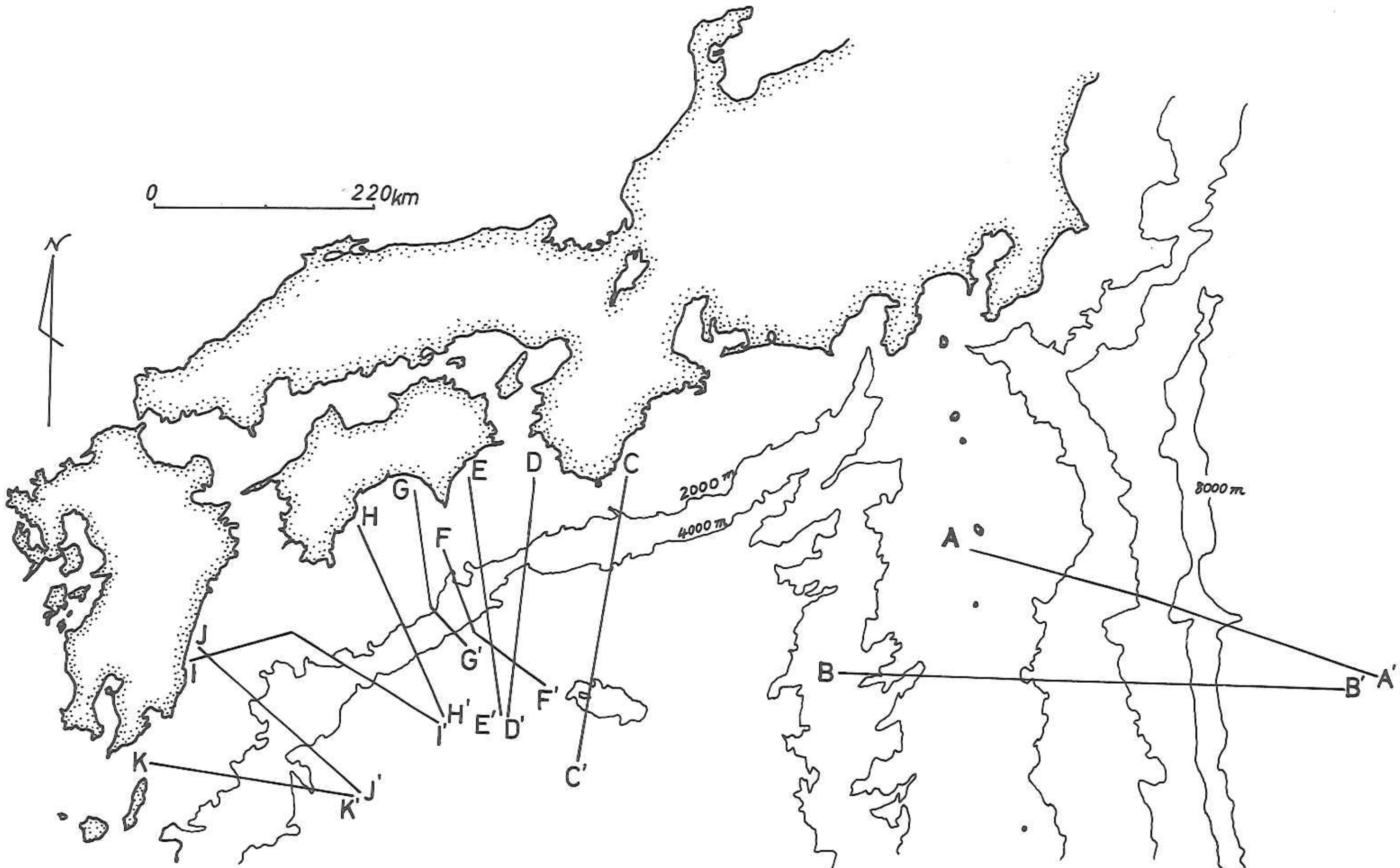
Deep sea terrace with 20 km width is found in the depth of 2600-2800 m on the continental slope and its outer margin marks a remarkable change in the inclination of continental slope. The rugged relief of outer margin of terrace will be the submarine continuation of the Ogasawara arc. The steep inner (arc side) wall of trench (at most about 20 degrees) is interrupted by a remarkable bench in the depth of 6800 m (section B-B') to 7400 m (section A-A'), which is 10-20 km in width and is bounded on the east by a narrow ridge of 150-200 m height. Much smaller benches are also found on the lowest part of trench wall. The floor of trench is narrow (3-10 km) and fairly flat. A few conspicuous small gravens or narrow depressions are found on the ocean side slope of trench which has a more gentle inclination (less than 5 degrees) than the inner wall. The gravens are 1.5-9 km in width and each cliff ranges from 100 to 300 m in height. The bottom slope of gravens has the same inclination as the ocean side slope of trench.

2) Nankai trough and its adjacency

a) Deep sea terrace: On the continental slope, deep sea terraces are found in the depth of 1000-1200 m and 1700-2000 m which are called the Tosa terrace and the Hyuga terrace respectively. Although they are extending over the whole area of the continental slope, the former having a vast horizontal plane occupies a wide area off the southern coast of Shikoku, while the latter develops especially well off the eastern coast of Kyushu. The surface configuration of Hyuga terrace is more complex than the Tosa terrace. Examining in detail, the Hyuga terrace consists of several small terraces with different depths. Beside these two terraces, another terrace is seen in the depth of 2500-2800 m off the eastern coast of southern Kyushu and it may be a depressed surface of Tosa terrace. Every terrace mentioned above is bounded on the ocean side by a narrow ridge or rugged hill.

b) Nankai trough: The relief of steep slope between the deep sea terrace and the trough is complicated and many ridges separated by narrow furrows are seen, which is a contrast to that of the Izu-Ogasawara trench. Comparing with the clear northern boundary, the southern limit of trough can not be well defined owing to the gentle slope of ocean side floor of trough. The bottom floor of trough with 6-10 km width declines toward the southwest along its axis. It will be another remarkable characteristic fact that there cannot be found any small graven or narrow depression on the ocean side slope of trough.

Fig. 3. Location map of profiles obtained from the cruise



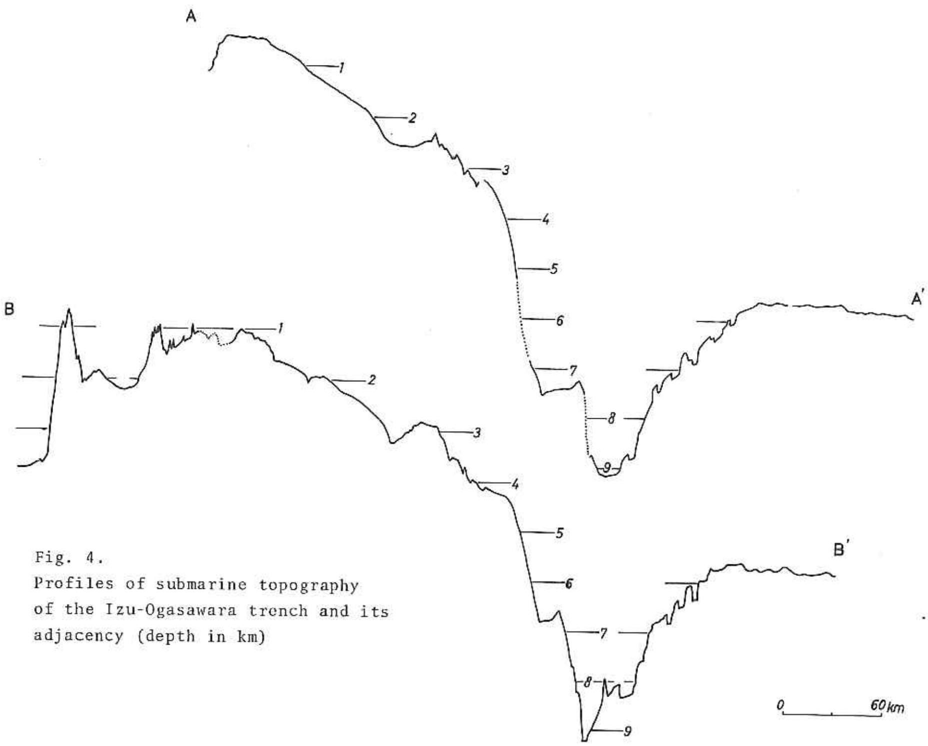


Fig. 4.
Profiles of submarine topography of the Izu-Ogasawara trench and its adjacency (depth in km)

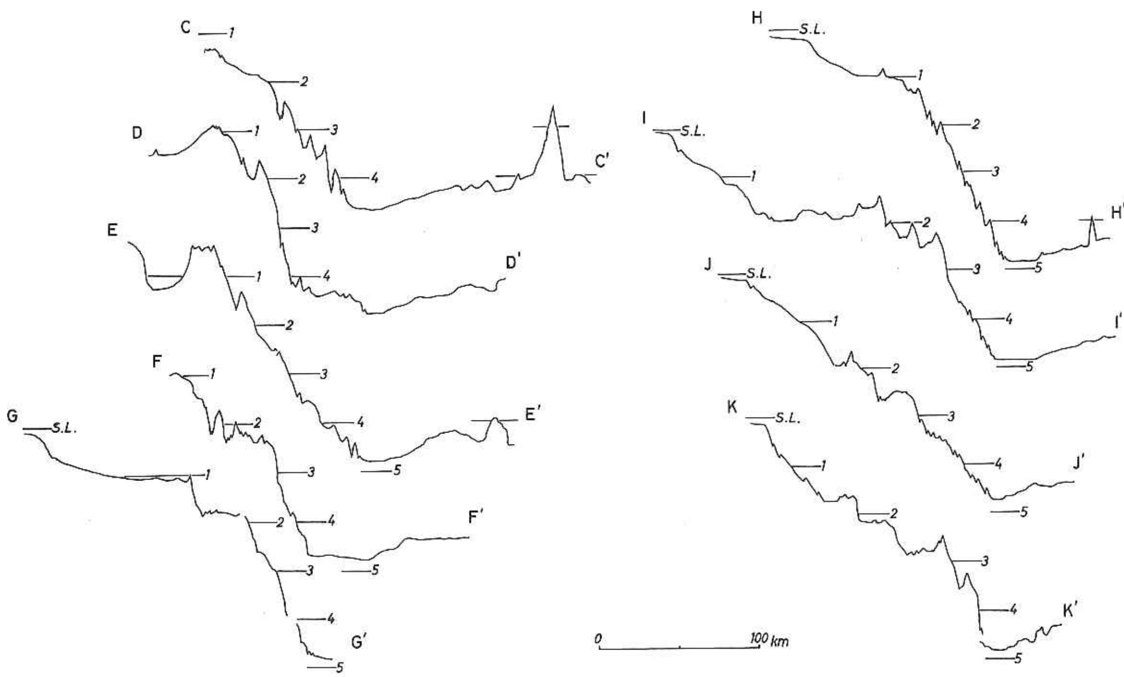


Fig. 5. Profiles of submarine topography of the Nankai trough and its adjacency (depth in km)

2. Note on the submarine topography from the East China Sea to the Philippine Sea

by Shoji Fujii and Takao Tokuoka

This report is based on 1000 m, 6000 m and 12000 m echo sounding graph by the precision depth recorder. The correction of the water depth for water temperature is not yet done.

The track of Hakuho-Maru and locations of topographical sections are shown in Fig. 6. The submarine topography is described along the ship track as following units: a) trough, b) trench, c) deep sea basin, d) sea plateau, e) seamounts, f) continental shelf. Locations of the ship were determined by Loran and astrometry method.

a) Trough

In Leg 2, Leg 3, we crossed the Okinawa trough six times at A, B,-- F lines. The cross sections are shown in Fig. 7.

The Okinawa trough becomes deep from north part to south part gradually. The slope of the continental side is rather gentle slope compared to that of the Ryukyu side, but the slope of the continental side becomes steep in the south part. Continental side of the Ryukyu arc has a small ridge which may be volcanic zone in the inner arc of the Ryukyu arc.

b) Trench

We crossed the Ryukyu trench six times at G, H,--L lines, which are shown in Fig. 8.

Two deep sea terraces are observed at continental side of the trench whose depth is about 1000 m and 2000 m respectively. The lower terrace is better in development than the upper terraces. A few benches develop in the continental side.

The deepest point of the trench is 7300 m in I section. The depth of the trench is not so different from depth of the Philippine Sea floor generally.

The Amami plateau is located in the northern oceanic side of the trench. In middle part of the trench area, oceanic side floor is not so irregular in topography as a floor of the southern part of the trench. We could not find the topographic graven zone in the oceanic side of the Ryukyu trench, although Izu-Bonin trench has fine graven zones in the Pacific Ocean side.

c) Deep sea floor

We had not crossed the deep sea floor so often. In M line, the Daito ridge and the Okinodaito ridge are distinguished; many small ridges are located near the Daito ridge in lines K and L (see Fig. 9).

d) Sea plateau

We crossed the Amami plateau several times for searching stations of the seismographic observation. Its detailed topography may be shown in a chapter: the ocean bottom seismographic observation.

e) Seamounts

There are few seamounts in these legs except the Daito ridge and the Okinodaito ridge. We can scarcely find table seamounts (guyot) in this area.

We wanted to collect samples from top of the seamount which is drawn in 23°20'N, 126°4'E in chart No. 6302 published by the Maritime Safety Agency of Japan. However, we could not find such a fine seamount in situ as shown in the chart.

f) Continental shelf

We crossed the East China continental shelf four times. The East China continental shelf has parallel ridges and troughs where it faces the Okinawa trough.

We could not so easily find the old river evidences (buried submarine channel) whichran on the continent during the Ice Age.

The determination of the edge of the continental shelf is very difficult in this region, because the profile of the continental shelf drew a smooth curve. The critical point of the continental shelf may lie in about 155--170 m depth. The profiles of the continental shelf are shown in Fig. 10.

Fig. 6.

Location map of topographical sections

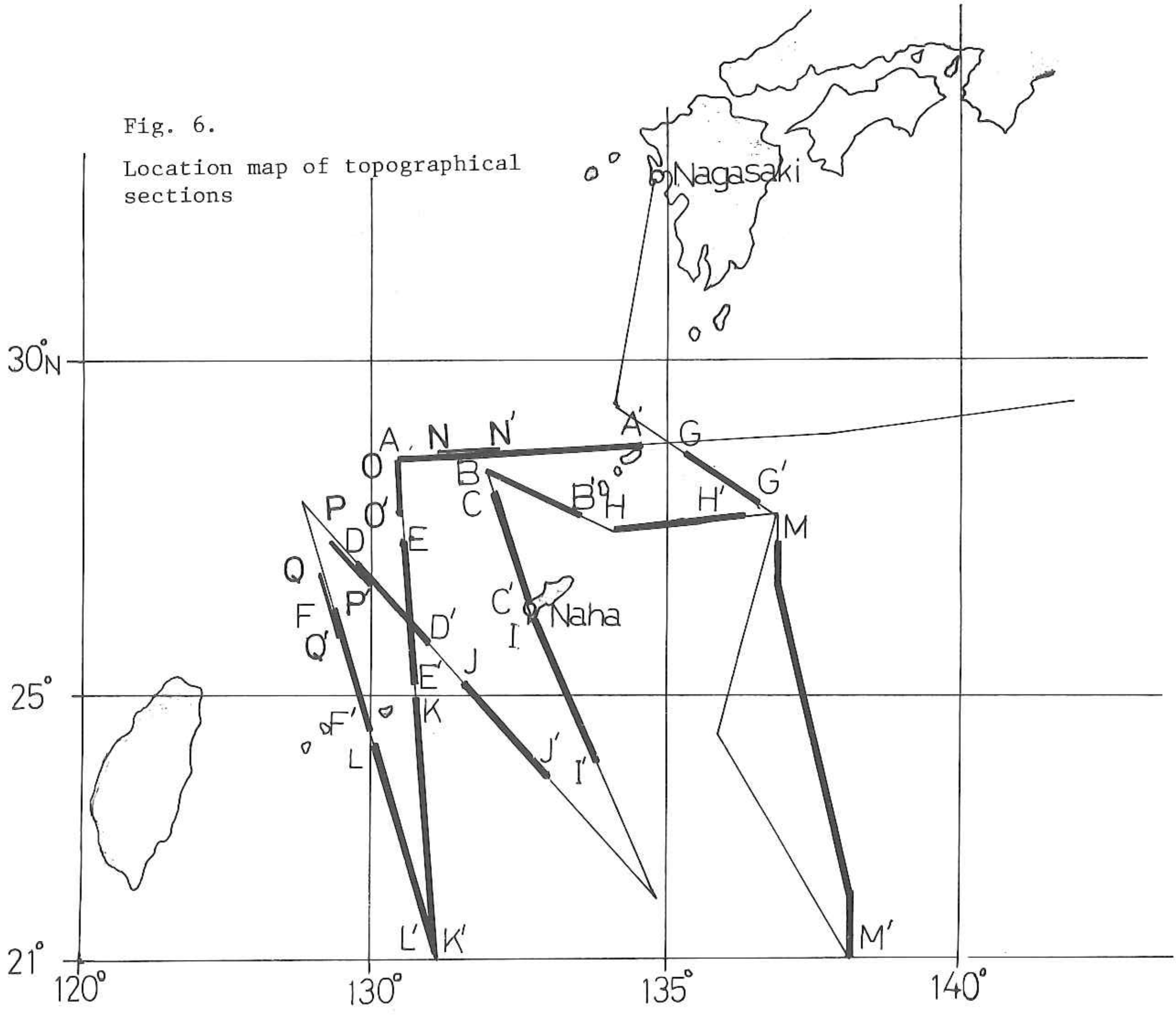


Fig. 7. Cross sections of submarine topography of the Okinawa trough

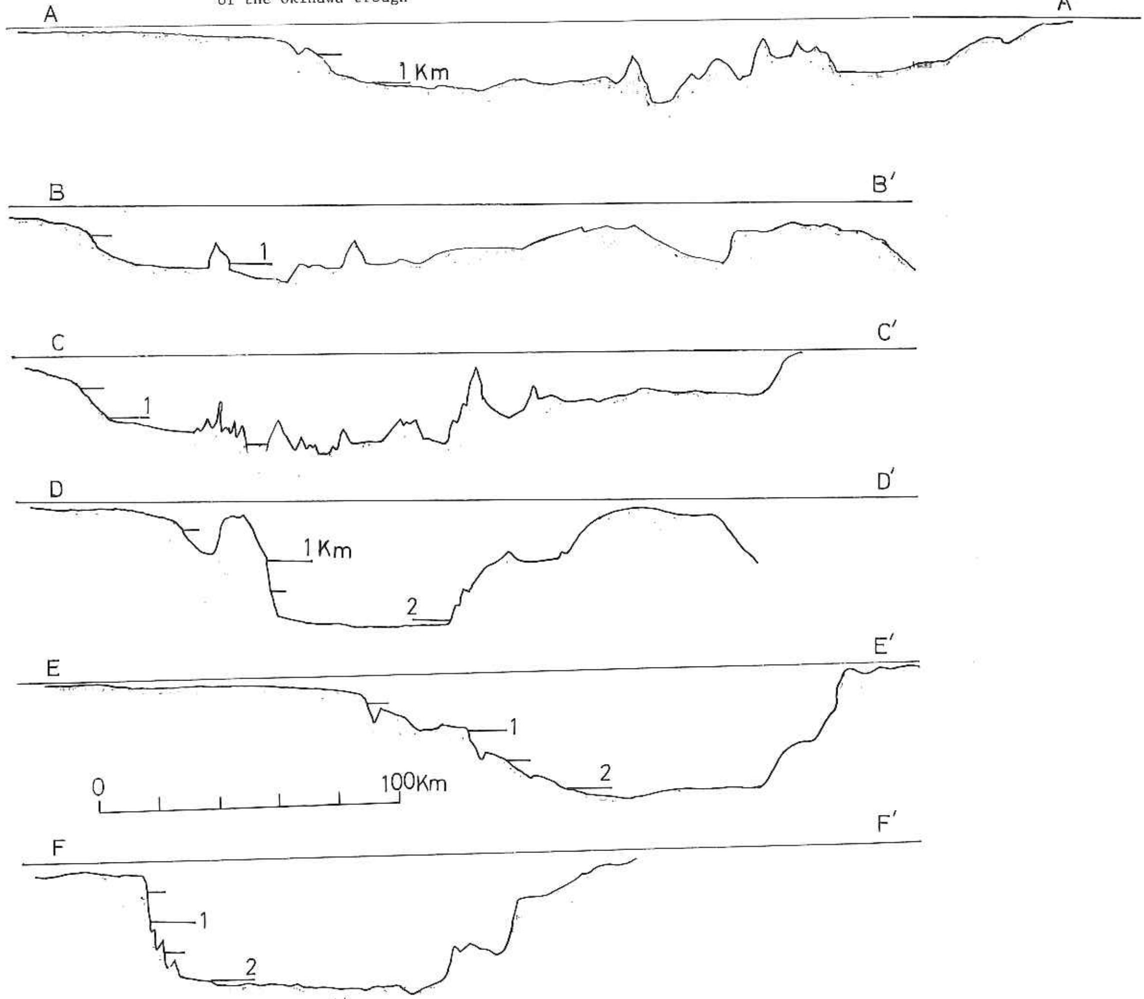


Fig. 8. Cross sections of submarine topography of the Ryukyu trench

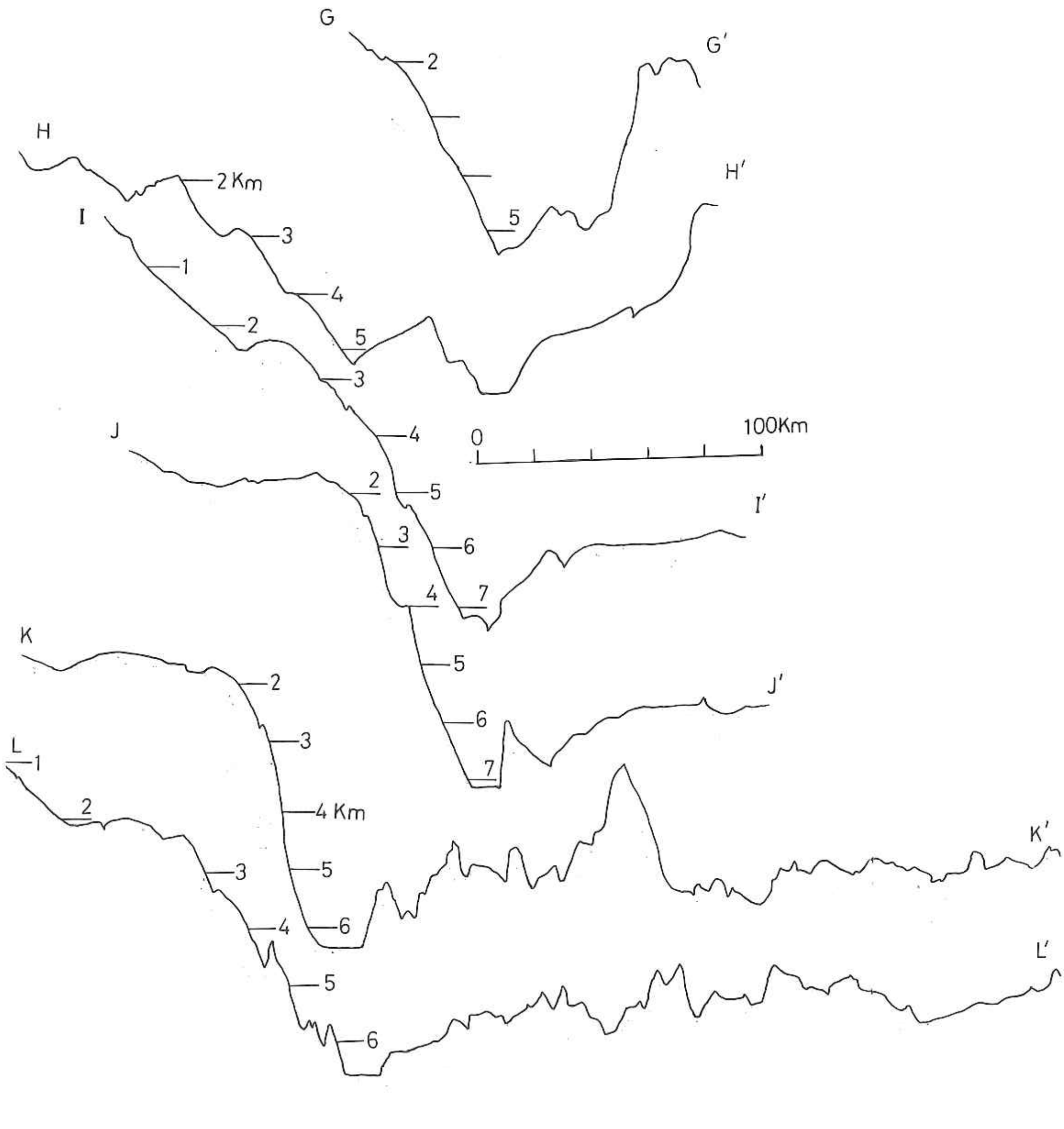


Fig. 9. Cross section of submarine topography of the Daito ridges

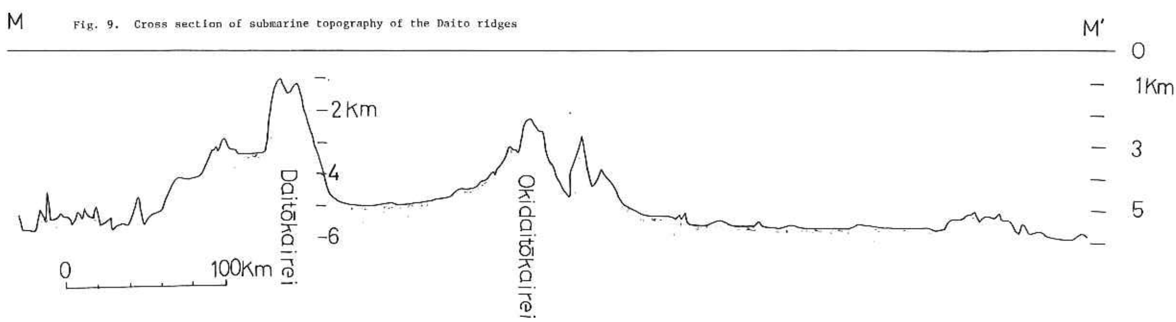
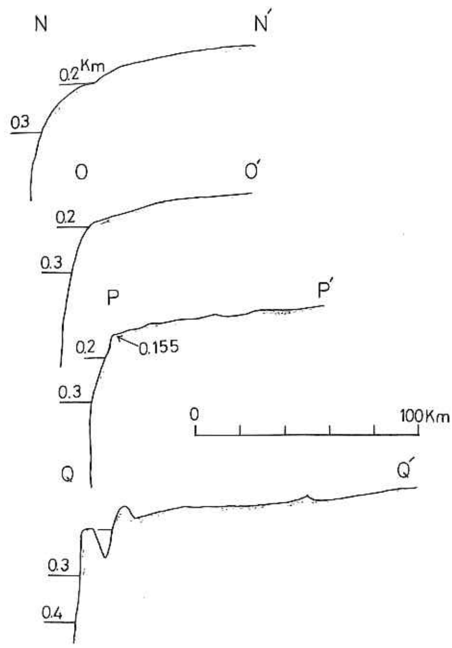


Fig. 10. Cross sections of submarine topography of the East China continental shelf



3. MEASUREMENT OF GRAVITY

by Jiro Segawa and Carl Bowin

1. Gravity measurement by the LaCoste & Romberg Gravity Meter

1) Characteristics of the LaCoste & Romberg Gravity Meter

A LaCoste & Romberg Gravity Meter was used together with a Tokyo Surface Ship Gravity Meter. The LaCoste & Romberg Air-Sea Gravity Meter (hereafter we use an abbreviation 'L & R Meter') was supplied by the Woods Hole Oceanographic Institution under a program of the US-Japan co-operative work.

The L & R Meter was set at a gravity meter room of the Hakuho-Maru as is shown in Fig. 11, and a block diagram of its operation is shown in Fig. 12.

Vertical accelerations sensed by a spring-type gravity meter unit are processed by an Automatic Reader and recorded by both an analogue and a digital recorder. This meter is so designed that gravity value is a function of time-averaged 'Spring tension,' 'Velocity of beam' and 'Cross coupling correction,' as is shown by equation

$$g = S + K\frac{dB}{dt} + CC ,$$

where S, B, K, and CC are spring tension, beam position, a constant of proportion and cross coupling correction, respectively.

A most remarkable characteristic of the meter is that the variation of gravity is measured by velocity of the beam of an overdamped vertical pendulum. Another characteristic lies in the low pass filtering. The meter incorporates electro-mechanical low pass filters consisting of feed back loops (differential potentio-meter--servo motor--tachometer). The gravity meter unit is temperature-controlled and hermetically sealed. The seal, however, is not perfect so that the meter is subjected to variation of ambient pressure, slightly.

The stabilized platform of the meter is composed of a pair of horizontal accelerometers (x, y), a pair of integrating gyroes (x, y) and a pair of DC servo motors (x, y). Error signals detected by horizontal accelerometers are amplified by Gyro precessors which feed to gyroes signals whose amplitude is proportional to (tilt + horizontal acceleration)

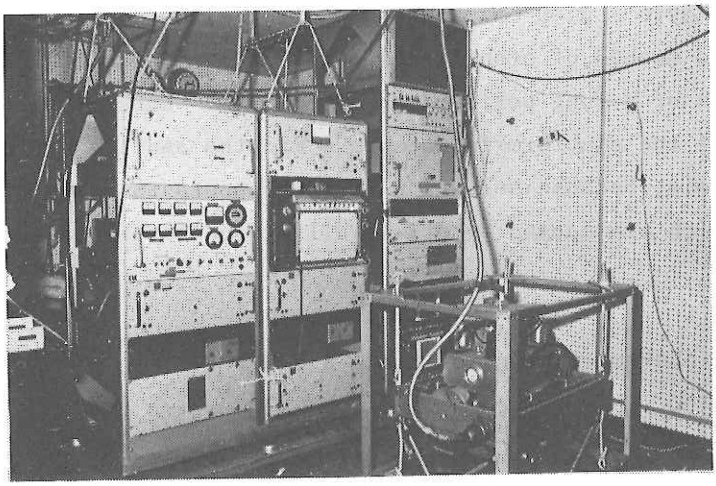


Fig. 11. LaCoste & Romberg Air-Sea Gravity Meter

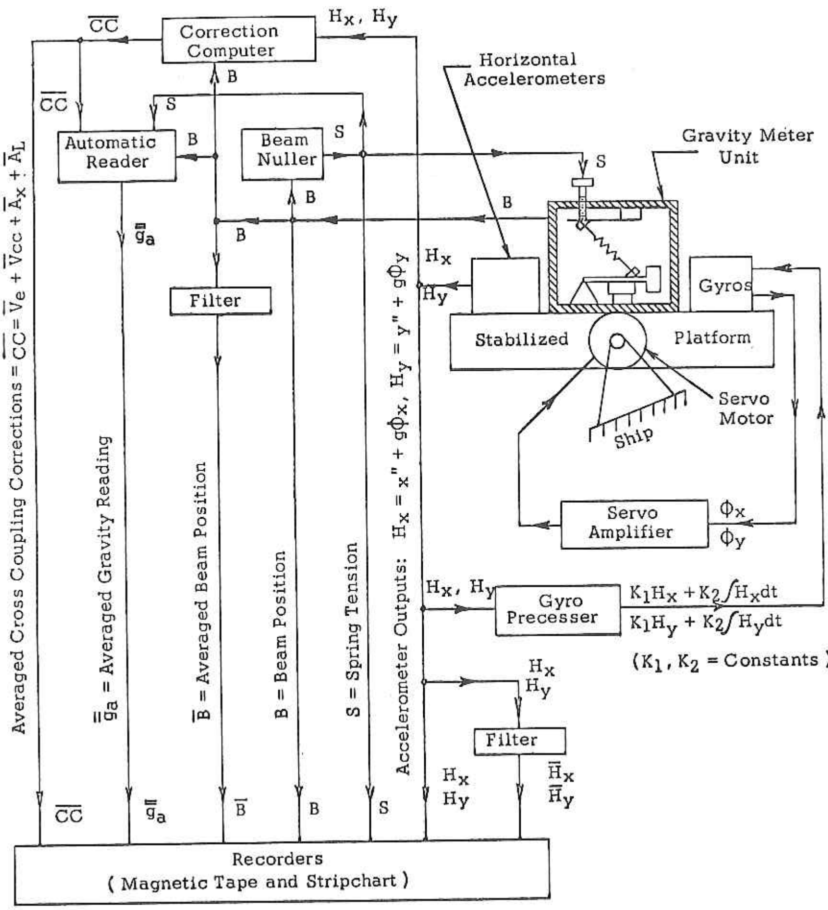


Fig. 12. Block diagram of the L & R Meter operation

mixed with its time integration. Gyroes in turn control servo motors by signals from the gyro's pick-off to reduce error signals of horizontal accelerometers. The method of stabilization like this yields the platform characteristics of a long period damped pendulum. Natural period and damping ratio of the platform in use are 4 minutes and $1/\sqrt{2}$ times critical, respectively, because selection of such constants makes minimum those errors which are caused by off-levelling and horizontal acceleration.

2) Comments on the characteristics of the L & R Meter

A: Errors of measurement when sea was very rough

Fig. 13 is an example of records on the strip chart recorder when sea was extremely rough. A thick solid line is gravity and a thin solid line is total correction. A broken line shows cross coupling correction. At this time the ship's disturbing acceleration exceeded 100 gal. As is seen in the figure the gravity curve fluctuates with the amplitude up to 15 mgal and of the period of about 10 min. There is a distinct correlation between gravity and total correction curves, but no distinct correlation of gravity with cross coupling correction.

B: Errors found by calibration made at ports of call

A LaCoste & Romberg land gravity meter was prepared in order to check the sea gravity meter at ports. Fig. 14 shows results of comparison of gravity values at Tokyo (Harumi pier), Nagasaki (Yanagi pier), Naha (Aja-shinko pier) and Tokyo. The abscissa and the ordinate indicate days elapsed since ship's departure from Tokyo and differences of gravity values between those obtained from the land and the sea gravity meters, respectively. The solid circles show differences of [sea meter-land meter]. But the open circles show differences of [sea meter-corrected land meter]. Drift of about 2 mgal of the land gravity meter was observed at the end of this cruise at Harumi pier, which presumably went on linearly with time. If reading of the land meter is corrected for this drift the differences will change as is shown by open circles. Discrepancies observed in this comparison are not remarkably improved even after such corrections. The differences of gravity reading is not linear with time, but show a zigzag form. When we checked the effect of

Fig. 13. Record of the L & R Meter

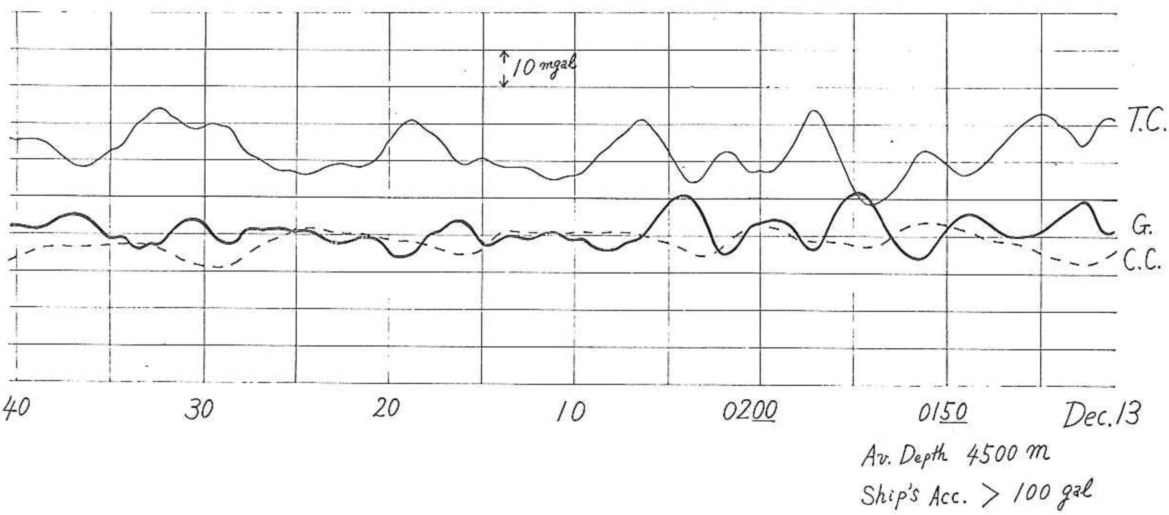
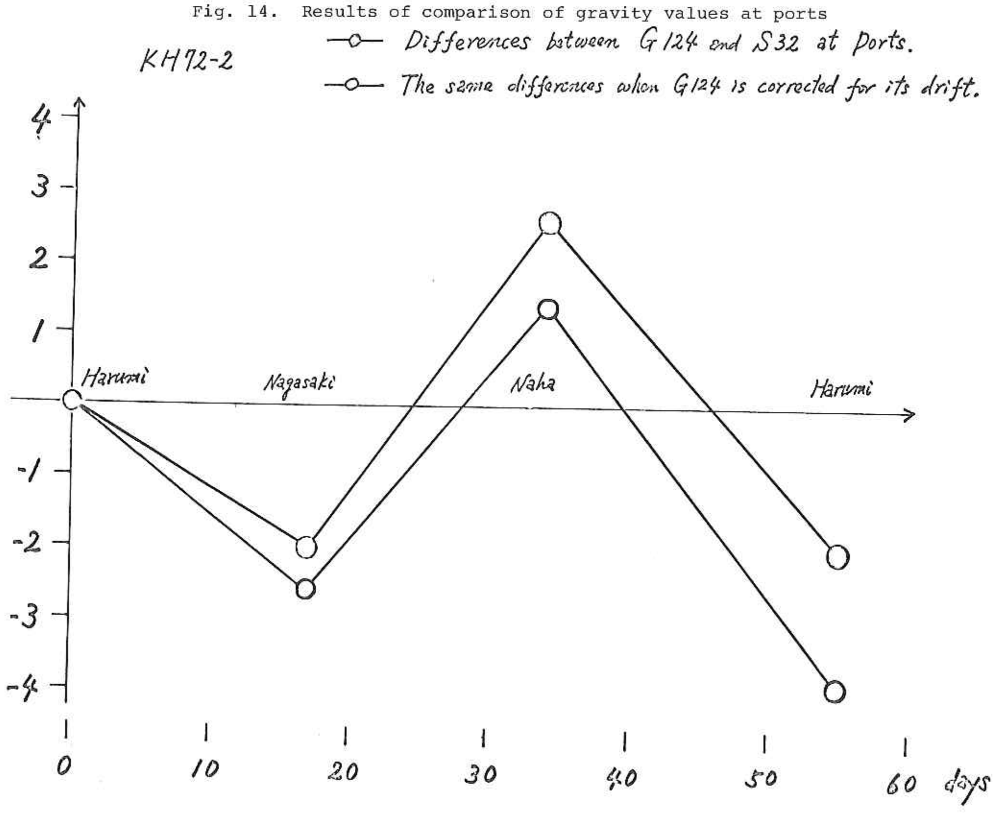


Fig. 14. Results of comparison of gravity values at ports



the scale factor of the sea meter reading we found that it has nothing to do. We are now of the opinion that irregularity of reading mentioned above may be due to mal-function of the Automatic reader of the sea meter.

2. Gravity measurement by the T.S.S.G. Gravity Meter using a new processor

1) A new processor PTL-72

Fig. 15 shows a T.S.S.G. gravity meter equipped with a new processor and an analogue recorder. The new processor is designed so that it can eliminate completely and at very low cost the non-linear rectification error which has been thought inherent with the T.S.S.G.

A block diagram of the new processor is shown in Fig. 16. This circuit uses a pulse train logics by which we can perform addition, subtraction, multiplication and division by means of frequency of pulses.

In this processor signals from the T.S.S.G. gravity pendulum are introduced to a counter and period of the signal are counted at the gate interval of about 10--20 msec. This interval is more than fifty times shorter than that taken in the conventional T.S.S.G. counter. By this device the non-linear rectification error can be reduced to as small as 0.1 mgal.

Values of digital form which represent 'period' of the signal are then introduced to a feed back loop composed of an up-down counter and rate multipliers. 'Period' of the signal is inverted and transformed into 'frequency' as well as its square. A constant times frequency, square of frequency and a constant are added together to form an equation of gravity (+ vertical acceleration), as

$$g = K_1(f^2 - K_2 f + K_3) \quad .$$

The signals whose frequency is proportional to gravity (+ vertical acceleration) are then fed to triple low pass filters which are also composed of three loops of up-down counters and rate multipliers. Time constant of this low pass filter is 80 sec. Output signal from this low pass filter is then fed to a final low pass and display circuit. Time constant of the final low pass filter is about 200 sec. Display circuit is composed of Nixe lamp display, an analogue recorder and a digital printer (optional).

2) Example of measurement

Fig. 17 shows an example of analogue record. The values of gravity are not corrected for the Eotvos effect. Full scale of the chart paper is 100 mgal.

3. Comparison measurement using a LaCoste & Romberg and a T.S.S.G. gravity meters

Fig. 18 shows examples of results of comparison measurement. The first example is profiles of gravity measured between 4th and 5th, Dec., and the second example is profiles of gravity measured on 11th, Dec. The abscissa represents hours, while the ordinate represents gravity in mgal. Solid circles show gravity measured by the T.S.S.G., and open circles show gravity measured by the L & R meter.

In this comparison measurement only parallelism of each profile is important. Absolute values of gravity is not compared strictly because there were breaks of measurement due to mal-function of the T.S.S.G.'s stabilized platform. Parallelism of two profiles in both examples looks satisfactory. Fluctuation of short period are mostly less than 1 mgal and in a fewer cases they exceeded 2 mgal.

4. Tentative profiles of gravity anomalies south of Shikoku and east of Kyushu islands

In most part of the areas traversed during this cruise gravity was measured by the use of the L & R meter because the T.S.S.G. could not give continuous profiles due to mal-functions of the gyro-stabilized platform. The data obtained is to be processed mainly at the Woods Hole Oceanographic Institution. The gravity anomalies given here, however, are those obtained by processings at the Ocean Research Institute, and therefore a tentative one.

In Fig. 19 are shown three profiles of free air gravity anomalies, two of which are extracted from the measurements south of Shikoku and one from the measurements east of Kyushu. From these profiles it is found that positive free air anomalies extend far south of Shikoku across the continental shelf (Tosa terrace), that minimum free air anomalies over the Nankai trough is -50 mgal, and that minimum value at the negative free air anomaly zone east of Kyushu is -125 mgal. Alphabets shown in Fig. 20 show locations of the profiles.

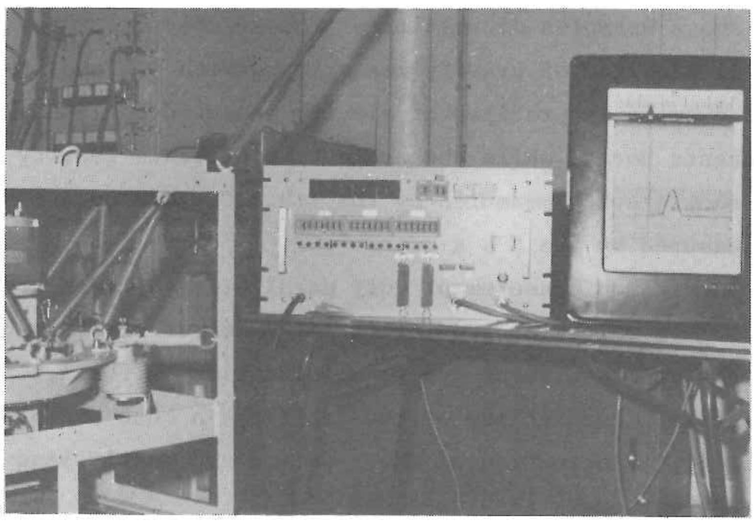
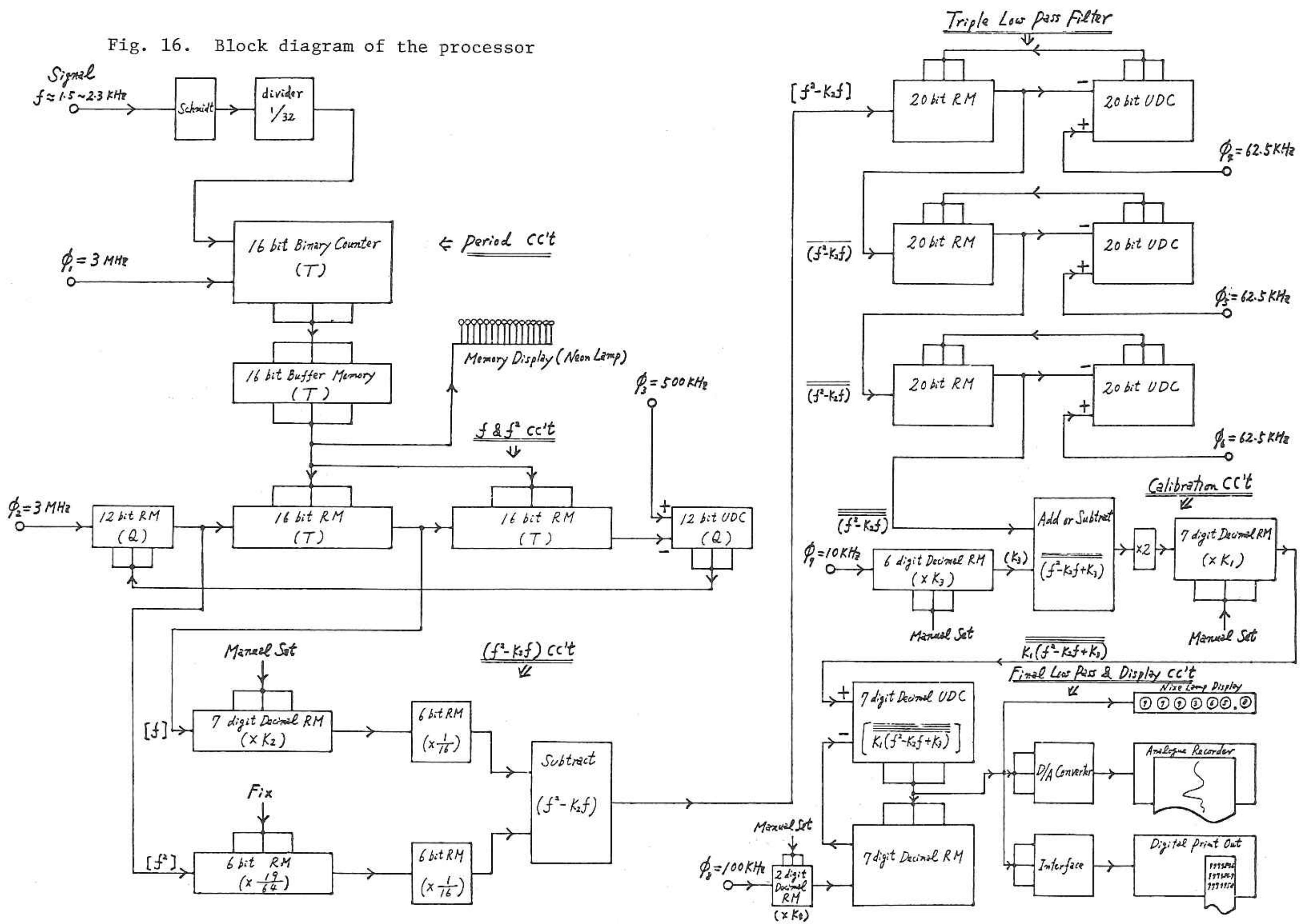


Fig. 15. T.S.S.G. gravity meter equipped with a New Processor

Fig. 16. Block diagram of the processor



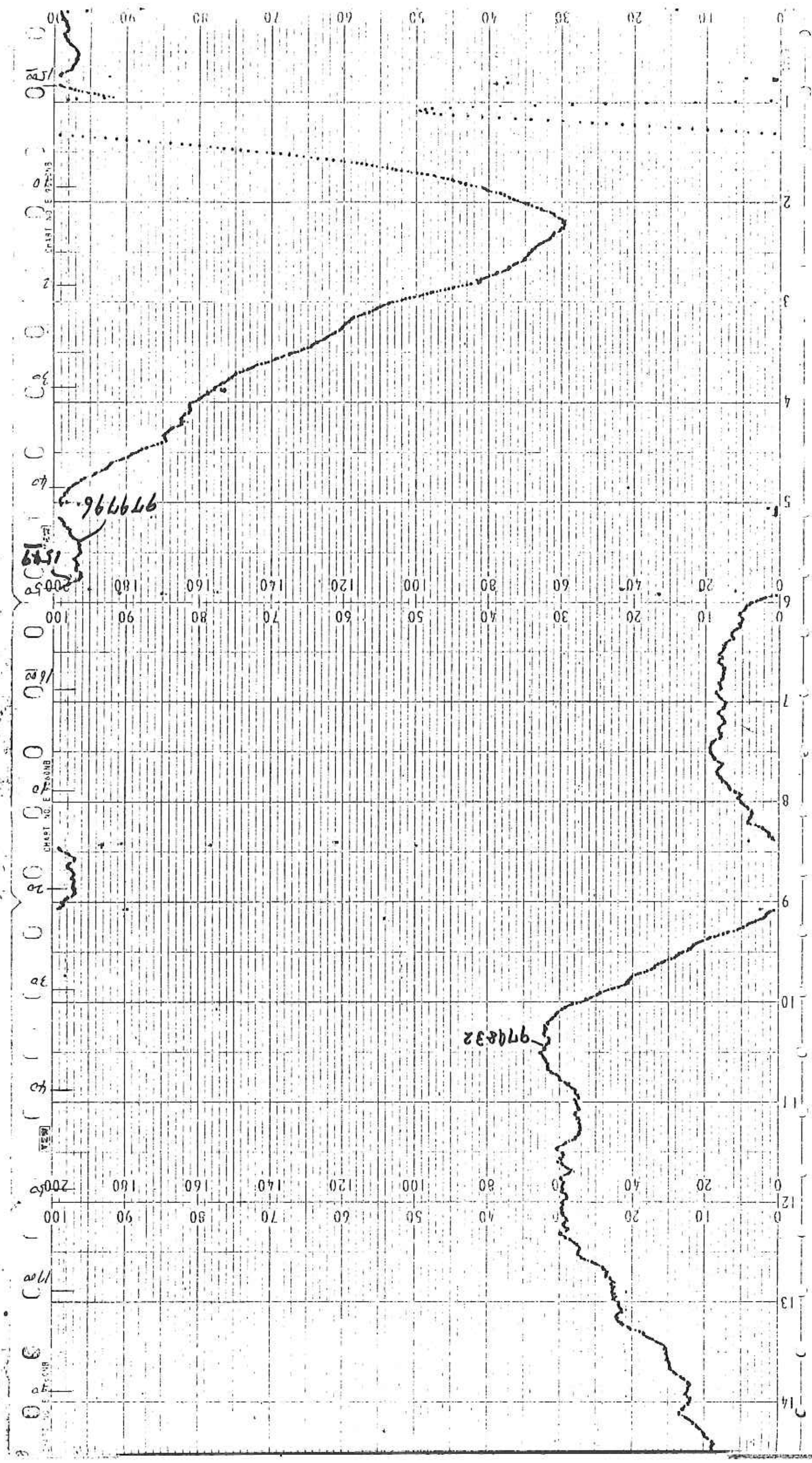
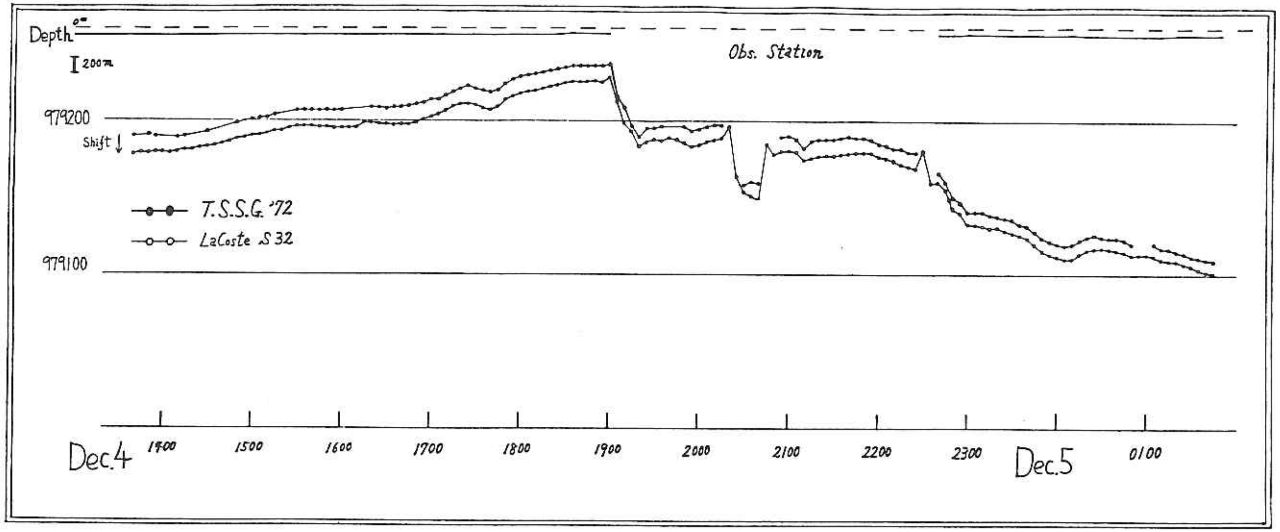
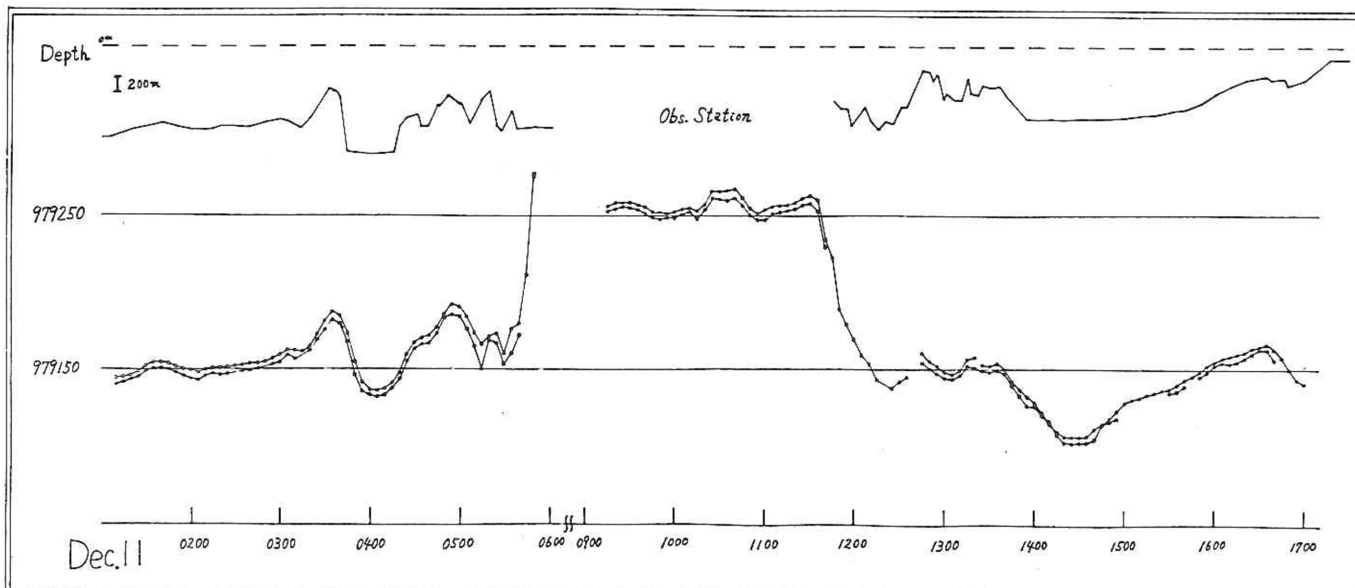


Fig. 17. Analogue record of the gravity meter

Fig. 18. Comparison measurement between the L & R and T.S.S.G. gravity meters





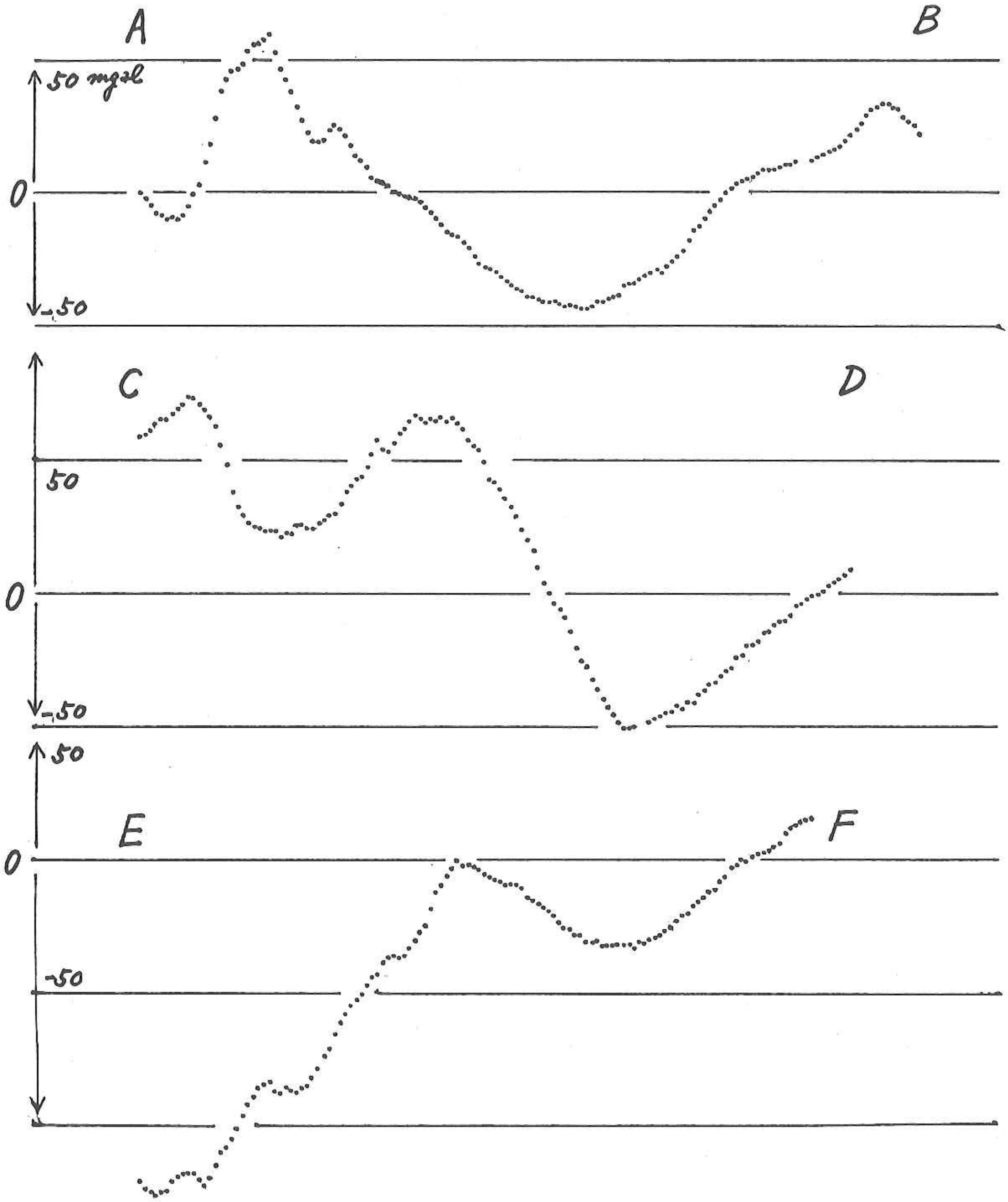


Fig. 19. Profiles of free air gravity anomalies

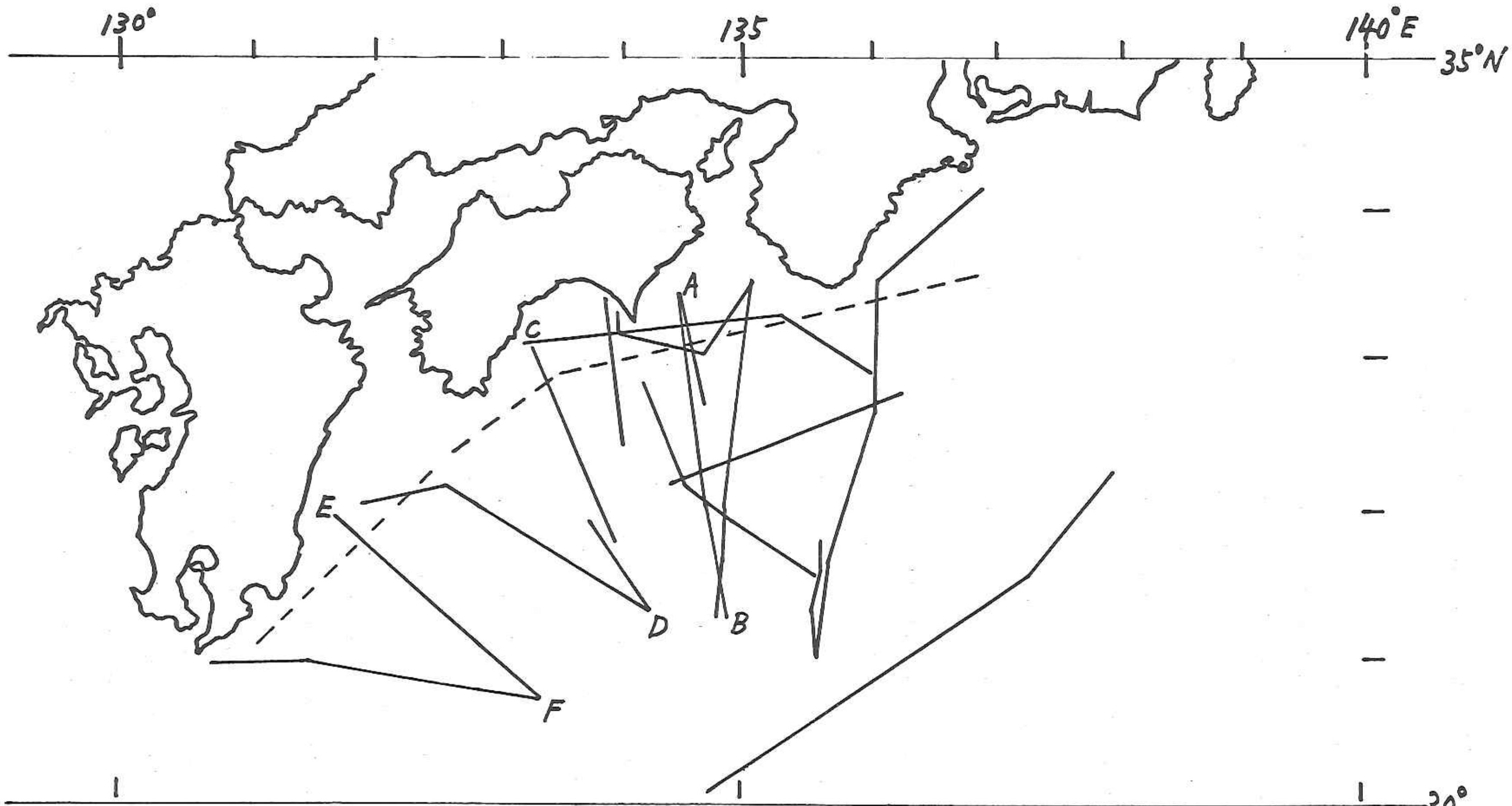


Fig. 20. Locations of the gravity profiles

4. Measurement of Geomagnetic Total Force

by Jiro Segawa

1. Method of measurement

A proton magnetometer Model 611 of the Kokusai Electronics Corporation, Japan, was used for the measurement. This instrument was originally designed for use on land, so it had to be modified for the measurement at sea. What were modified are increase of current and interval of polarization, increase of amplifier gain, addition of fine tuning circuits, etc.

2. Profiles of total magnetic force

Fig. 21 shows location of profiles across the Ryukyu island arc, the Ryukyu trench and the Ryukyu trough. Fig. 22 shows six profiles of geomagnetic total force and bathymetry whose locations are indicated by pairs of Alphabets in Fig. 21.

Profile AB: This profile runs from west to east passing north of the Amami island.

The region of the East China Sea and the Ryukyu arc can be separated by six zones which run paralle to each other in the direction NE to SW. The zones are from west to east the East China Sea continental shelf, the Taiwan-Sinzi folded zone (or Senkaku islands and its continuation), the Okinawa trough (Ryukyu trough), the Ryukyu folded zone (Ryukyu volcanic arc), the Ryukyu terrace (Ryukyu frontal zone) and the Ryukyu trench. These nomenclatures are taken after Emery et al. and after Konishi (names inside the parenthesis). These divisions are also indicated in Fig. 21.

The profile AB crosses the Taiwan-Sinzi folded zone, the Ryukyu trough, the Ryukyu folded zone and a northern part of the Ryukyu trench. Bottoms of the Ryukyu trench are very irregular compared to the bottom of other trenches, and generally are incized by two or more narrow valleys. The bottom shown in this profile which is near the northern end of the trench shoaling to about 5000 meters deep looks particularly rugged. Magnetic anomalies of the amplitude of 200 γ are observed in the place corresponding to the Taiwan-Sinzi folded zone and at the eastern side of the Ryukyu trough. Short period anomalies of the am-

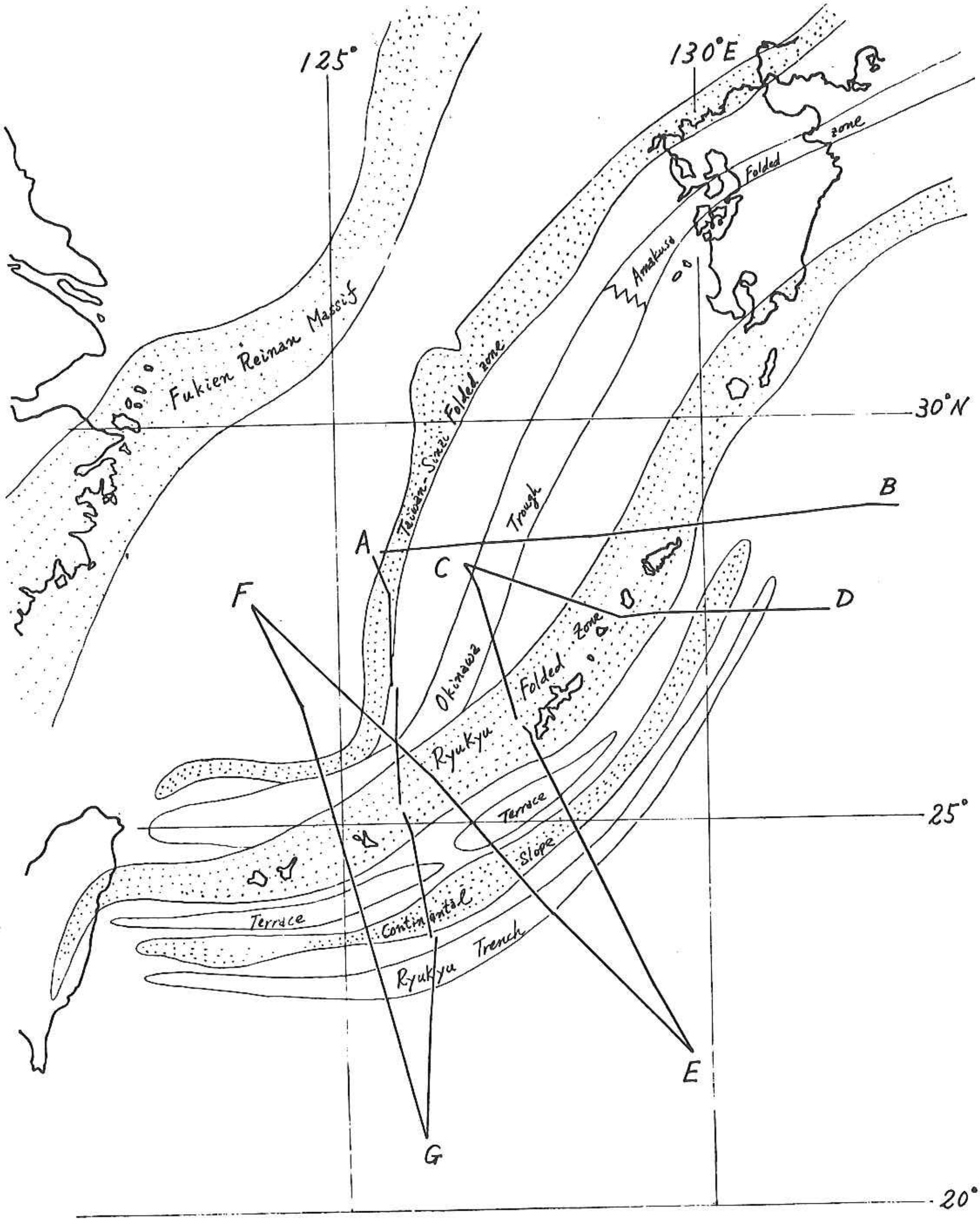


Fig. 21. Location map of geomagnetic profiles across the Ryukyu island arc

Fig. 22-1.

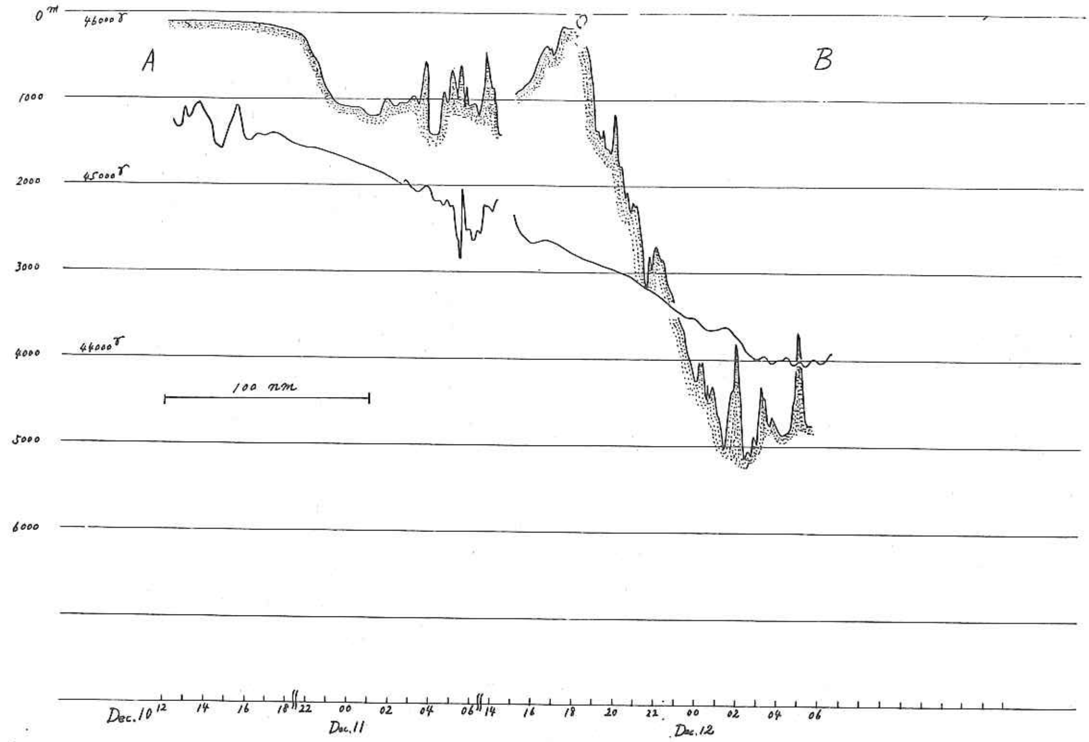


Fig. 22 (1-6). Profiles of geomagnetic total force and bathymetry across the Ryukyu island arc

Fig. 22-2.

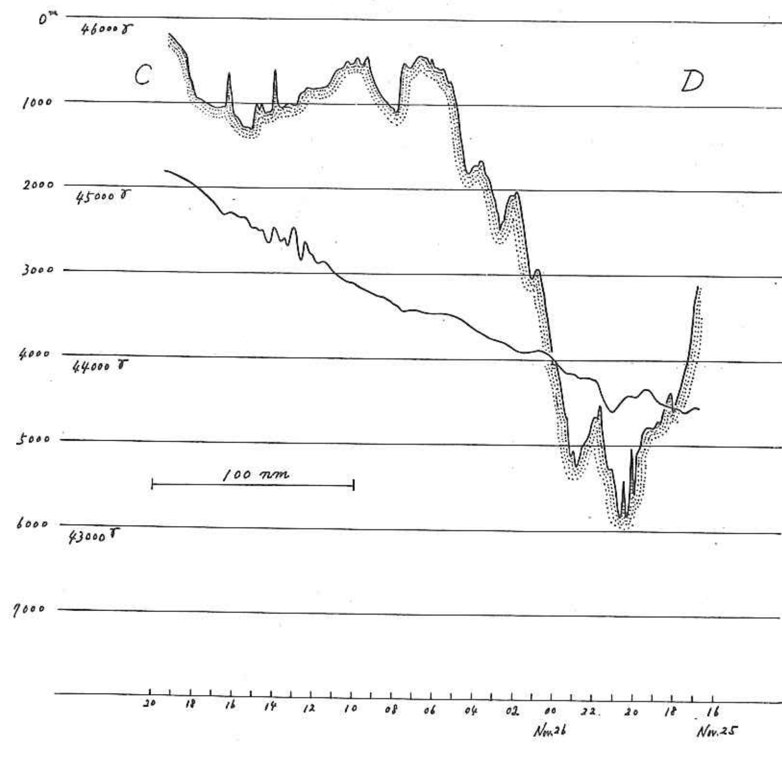


Fig. 22-3.

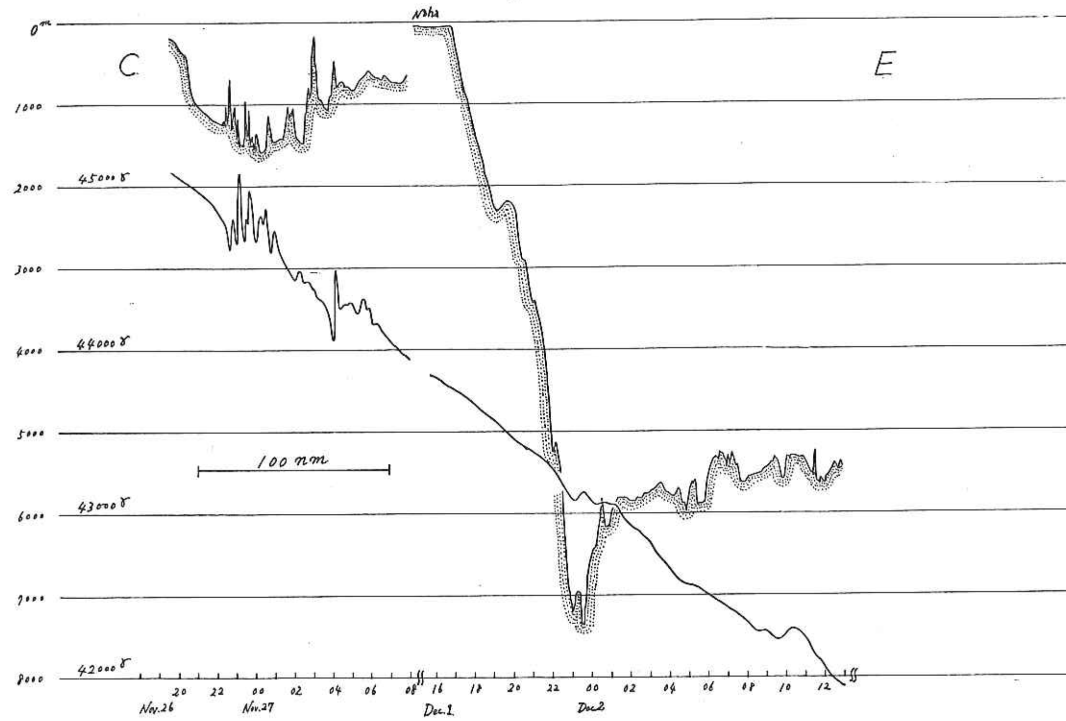


Fig. 22-4.

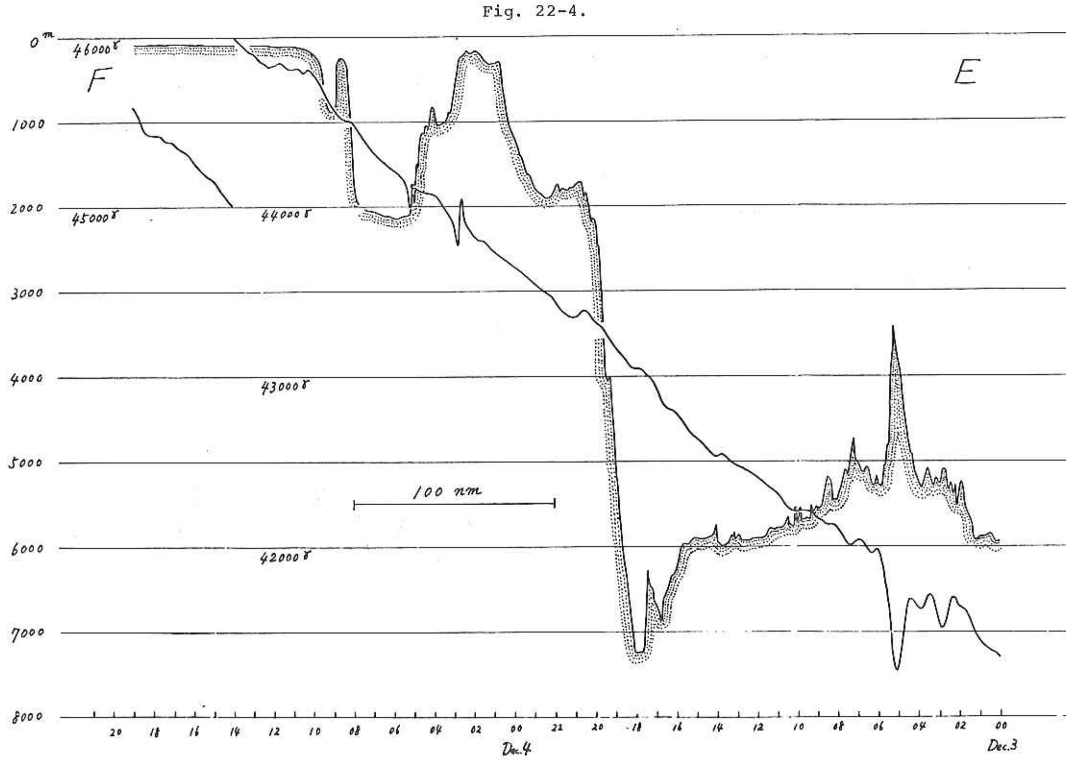


Fig. 22-5.

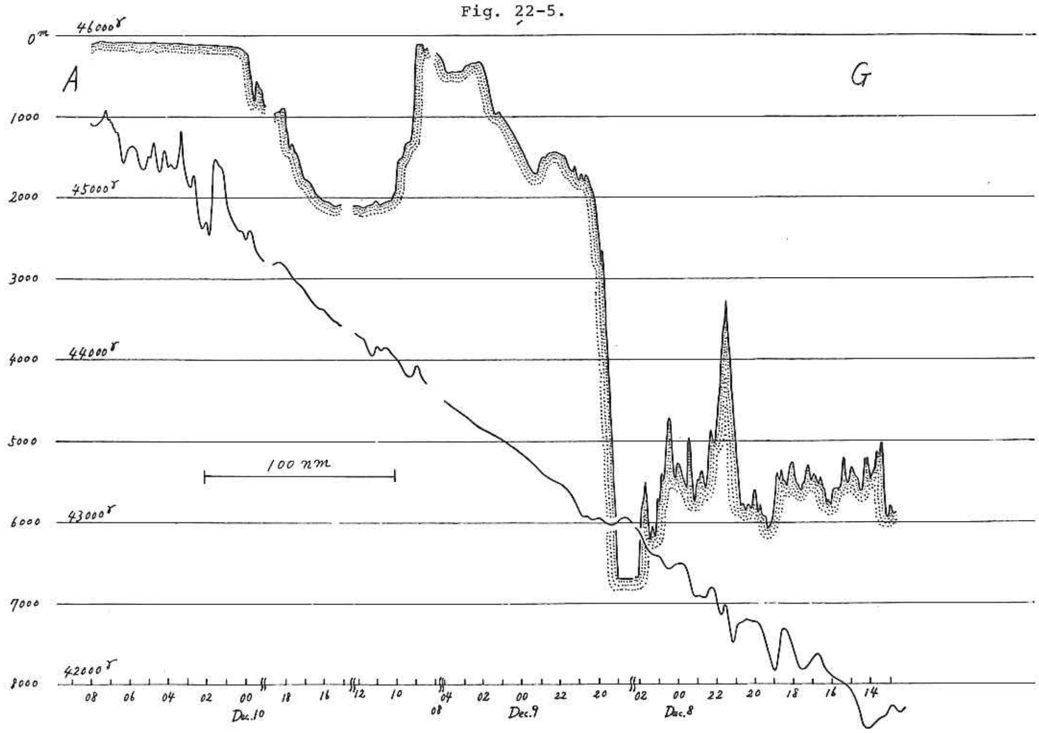
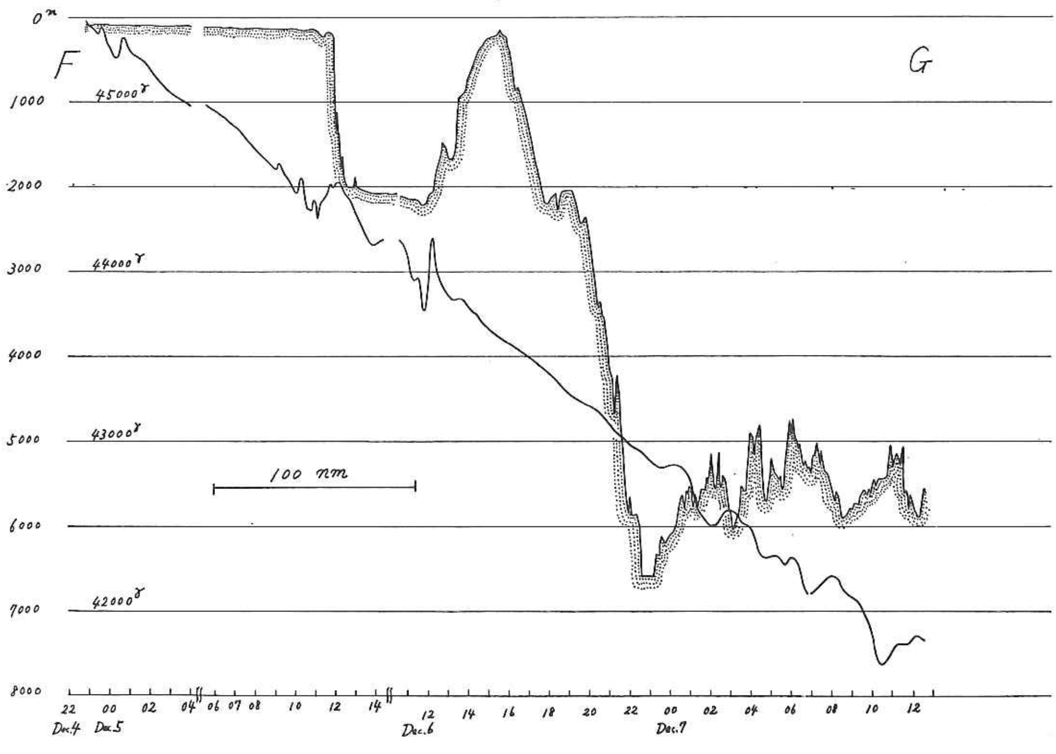


Fig. 22-6.



plitude of 50 γ are also observed at the bottom of the trench. In the regions at the western half of the Ryukyu trough and from the Ryukyu folded zone to the continental slope of the Ryukyu trench no magnetic anomalies are observed and they look magnetically smooth.

Profile CD: This profile crosses the Ryukyu trough, the Ryukyu folded zone south of the Tokunoshima island and the Ryukyu trench. Short period magnetic anomalies are observed at the eastern side of the Ryukyu trough and at the bottom of the Ryukyu trench, while the other areas including the Ryukyu folded zone are magnetically smooth. The trench is incised by two valleys. The shallow valley is 5200 meters deep, while the deeper one is 5800 meters deep. The Ryukyu trough shoals northeastward, showing the depth of 1300 meters at the section of this profile.

Profile CE: This profile crosses the Ryukyu trough, the Ryukyu folded zone south of the Okinawa island, the Ryukyu trench and the Philippine basin. The bottom of the Philippine basin is very rugged and deeper than 5000 meters. The ruggedness seems to continue to the bottom of the trench. The maximum depth of the trench in this part exceeds 7000 meters and it becomes larger than those in the previous profiles. So is the case with the Ryukyu trough which also becomes deeper southward, showing a maximum depth of 1500 meters in the case of this profile. There are long and short period magnetic anomalies in the middle part and eastern side of the Ryukyu trough. The Ryukyu folded zone including the Ryukyu frontal zone is very smooth magnetically. Beyond the trench are observed some amount of long period anomalies over the Philippine basin.

Profile FE: This is a profile crossing the East China Sea continental shelf, the Taiwan-Sinzi folded zone, the Ryukyu frontal arc, the Ryukyu trench and the Philippine Sea basin. This profile shows a typical section of the Ryukyu arc system. The profile of the Ryukyu trough represents a typical form, that is, very steep walls of both sides and a smooth bottom. Depth of the trough is about 2100 meters which is close to the maximum depth of 2200 meters.

There is a broad terrace in the middle of the slope to the trench. The bottom of the trench consists of double valleys, of which the deeper one shows a flat bottom, implying a thick sedimentary fill. The trench is neighboured by a ridge-like area of irregular bottom. Magnetic anomalies are comparatively smooth except for the areas at both sides of the Ryukyu trough, at the Ryukyu frontal arc and at the ridge-like area in the Philippine basin.

Profile AG: This profile is another typical section of the Ryukyu arc area. There are large magnetic anomalies at the area which corresponds to the Taiwan-Sinzi folded zone, while anomalies are comparatively small at the Ryukyu trough. When magnetic anomalies at the Ryukyu trough are further examined those of the amplitude of 50 γ are recognized at the eastern side of the trough. The Ryukyu folded zone including its frontal arc and the Ryukyu terrace are very smooth magnetically. Magnetic anomalies extending from the continental slope to the Philippine sea basin are 200 γ in the amplitude. The trench of this profile is also neighboured by very irregular bottom which resembles the mid-oceanic ridge. Unlike the other trenches magnetic anomalies of the basin trespasses the Ryukyu trench axis, reaching as far inside as the landward slope.

Profile FG: This profile crosses the East China Sea continental shelf, the Taiwan-Sinzi folded zone, the Ryukyu trough, the Ryukyu folded zone, the Ryukyu frontal arc, the Ryukyu trench and the Philippine basin. The Philippine basin of this profile is also rugged and the ruggedness continues as far as the seaward slope of the trench. Magnetic anomalies in the area from the Ryukyu folded zone to the landward slope of the trench are very smooth as is the case with the other profiles. Short period anomalies are observed at an area of the continental shelf and at both sides of the Ryukyu trough. The sedimentary fill of the Ryukyu trench looks remarkable, increasing the thickness towards the southern part of the trench.

Conclusion:

1) Ryukyu folded zone: The Ryukyu folded zone and its continental slope are everywhere magnetically smooth. This does not agree with a result obtained from petrological studies. The result shows that the Ryukyu island arc consists of either active or non-active volcanic islands with

intrusive rocks, that most of the volcanic rocks are composed of high alumina basalt with a few exceptions of tholeiite basalts. Present volcanic activity began in the Miocene age, suggesting that most of the volcanic rocks are younger than Miocene. The basement rocks, on the other hand, were formed before Miocene. The oldest basement rocks can be dated as old as 270 million years, when sink of the oceanic lithosphere or a similar movement may have occurred. As far as the present magnetic profiles are concerned, however, the Ryukyu folded zone and its frontal arc are the areas where the magnetic anomalies are smoothest. The same conclusion can be obtained from the measurements by K. O. Emery et al. The reason why no magnetic anomalies are observed at the Ryukyu island arc is either that there is no new volcanic intrusions in the areas except those areas which form islands or that the intrusive rocks are magnetically impervious.

2) Ryukyu trough: A typical trough which has a flat bottom about 2100 meters deep is confined to the area northwest of the Miyako, Ishigaki and Iriomote island arc, which is separated from northern part of the Ryukyu arc by a left-lateral fault named Miyako channel. The trough shoals to the north, its bottom becoming more irregular. Western side of the trough is comparatively smooth in both the northern and the southern parts, but from the axis of the trough to the eastern side the bottom is incised by valleys more irregularly in the northern part than in the southern part. According to the results of seismic profiling made by Emery et al., this rugged bathymetry is caused by outcrops of old igneous and metamorphic rocks (pre-Tertiary), remaining uncovered with thick (--1000 m) Neogene sediment. Thickness of the sediment is not appreciably different if it is compared between northern and southern parts of the trough. The differences of depth of the trough seems to be determined by the difference of the depth to the basement rocks.

Conspicuous magnetic anomalies are observed always at the eastern side of the trough in both the northern and the southern parts of it. These anomalies may be caused by the rugged basement rocks because variations of the magnetic anomalies show approximately the same wave length as that of the depth variation of basement rocks.

3) Ryukyu trench: The Ryukyu trench is characterized by its irregular

bathymetry. The bottom is usually incised by two or more narrow valleys which are filled with thick sediment. Bottoms of some parts of the trench are completely covered with sediments, showing a flat bathymetry. Irregularity of bottom continues over the seaward flank of the trench to the Philippine sea basin. Though it is nothing but a speculation the rugged bottom of this part of the Philippine sea looks like relics of a mid-oceanic ridge underthrusting the Ryukyu trench. This may account for conspicuous magnetic anomalies observed not only at the Philippine sea basin but also over the Ryukyu trench.

In the middle of the landward slope of the trench a deep sea terrace can be traced. This terrace shows a landward upthrust which makes the outer rim go upward to act as a dam for sedimentation. This zone is magnetically very inactive, forming magnetic smooth zones together with the Ryukyu folded arc.

5. Ocean Bottom Seismometer Observation at the Amami Plateau

by Toshi Asada, Hideki Shimamura and Takeo Moriya

1. General remarks

The present authors began to carry out seismological observation at ocean bottoms with encapusulated seismometers in 1969. In Fig. 23 sites of observations with our OBS during 1969 and 1972 are shown. The purposes of our OBS observations shown in Fig. 23 are not always the same at each station, but a thing in common is a study of the level of the seismicity in the inner sides of trenches.

2. Records of operation

Locations of sites of our OBS stations at the Amami plateau are shown in Fig. 24. Distance from the trench axis to the sites is less than 50 km. Time and locations of the sites of OBS are given in Table 1. The differences of the locations between the deployments and the recovery given in the station log of KH-72-2 are probably due to ocean current, because we are adopting the technique launching buoys first and seismometers at last.

Airgun was operated along the lines crossing the sites of OBS for more than one hour. The interval of detonations was adjusted to be about 1 minute. The towing speed of Hakuho-Maru was 11 knots along these lines.

3. Results and some geophysical aspects

The frequency of local earthquakes occurring around Ryukyu trench recorded with our OBS during the period of time shown in Table 1 is over two per one hour on the average. At the sites of OBS in the basin outside the Ogasawara and Kuril trenches about twenty-four local earthquakes were recorded by our OBS per day on the average. However, considering that the distance between these sites and the trench axis is about two hundred kilometers and that the sites at the Amami plateau are closer to the trench axis, the level of the seismicity in the deep seismic zone in Okinawas is concluded to be several times lower than those of the deep seismic zone in Ogasawaras and Kurils. It should be noted that the level of seismicity around the Okinawa trench is, nevertheless, higher than that of most of Japanese inland areas. The map of foci in this area determined with the JMA network is shown in Fig. 25 for reference. Detailed discussion about the seismicity near trench axis will be made in the near future.

The water waves from the airguns were recorded in the range from zero to 20 km. The frequency response of the recorder of these OBS is -6 db at 40 Hz. This may cause the decrease of the range of detection of the sound. Taking this effect, as well as the results obtained in the experiment in the Mariana Basins in 1971, into account, we may estimate the range of detection of Pn from airgun with OBS is over 20 km. Detailed study on the records of Pn from airgun detonations is now being made.

The level of seismicity in the inner side of trenches may be concluded to be much higher than the average level of seismicity in the inland area of Japan. This may have important implications in global tectonics.

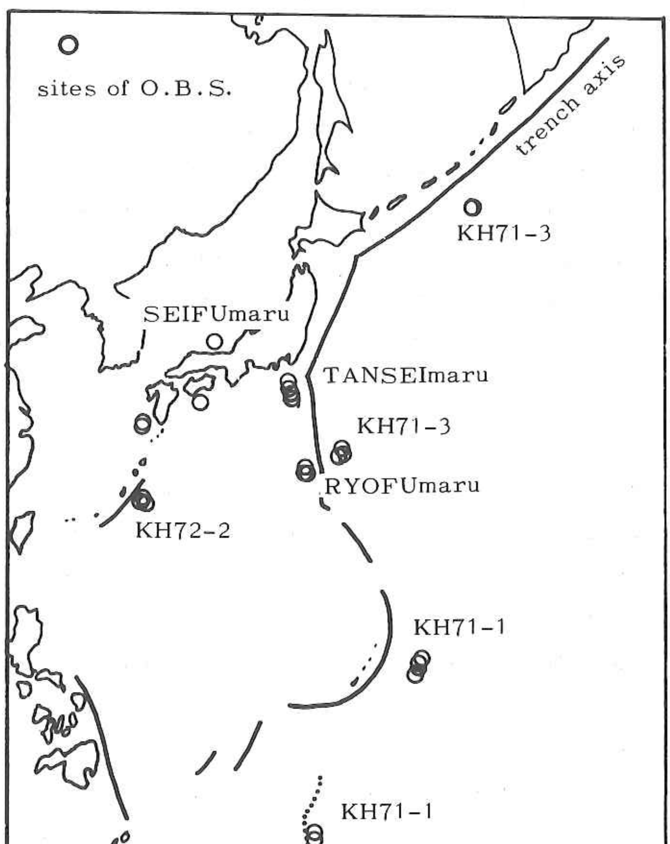


Fig. 23. Sites of O.B.S. observations during cruises from 1969 to 1972

Table 1. Record of O.B.S. stations

Site of OBS	Time* of Deployment**	Time* of Recovery***	Location**** Latitude	Longitude	Depth (m)
A	Nov 17, 15:58	Nov 25, 08:10	27°53.2'	131°25.0'	4280
B	Nov 18, 09:09	Nov 24, 14:10	28°22.2'	131°47.6'	3930
C	Nov 17, 11:59	Nov 25, 15:12	27°37.1'	131°41.9'	3040

* Japanese Standard Time
** Time when OBS were dropped from the ship
*** Time when OBS left bottom
**** Locations are determined by NNSS system.

Fig. 24. Locations of sites of O.B.S. stations at the Amami plateau

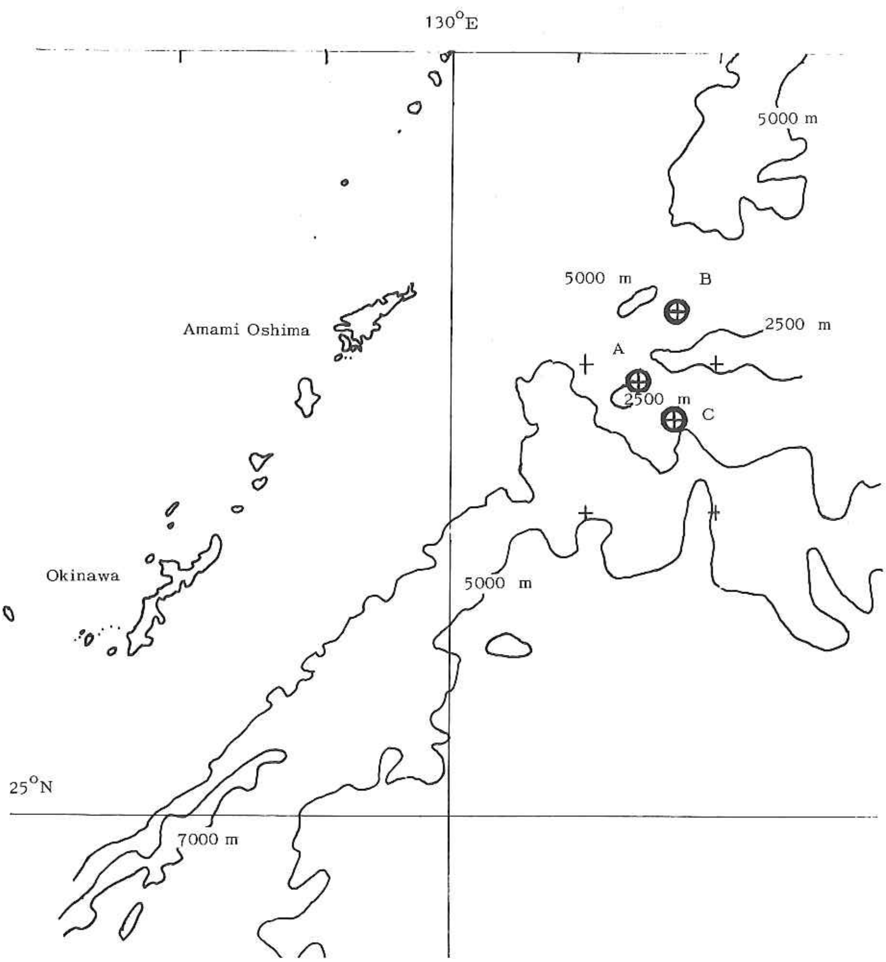
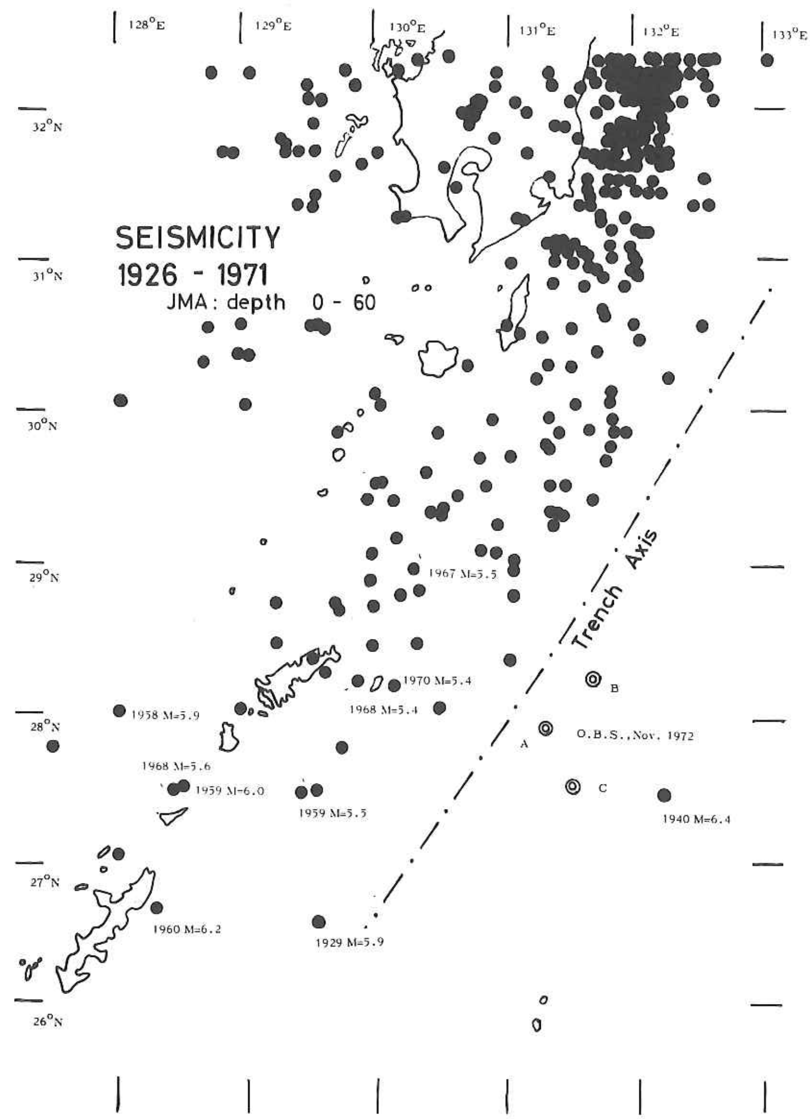


Fig. 25. Seismicity around the Okinawa trench between 1926 and 1971



6. Seismic Reflection Profiling Survey

1. General remarks

by Eiichi Honza and Akio Yamashita

A seismic reflection profiling survey was carried out at Izu-Ogasawara arc, southeast off Southwest Japan arc, Shikoku basin, Ryukyu arc, Okinawa trough, continental shelf of Yellow Sea and North Philippine Sea area.

The surveyed lines are shown in Fig. 26. The survey was carried out with 10 to 12 knots ship speed by the low-high pressure balance type air-gun. The high pressure was 80 to 140 km per square cm. A recording filter is ranged almost from 37.5 to 150 Hz and there is no filtering tape recording in the whole surveyed lines.

The air-gun was towed about 30 meters away from the ship stern and the hydrophone array was towed about 150 meters away from the one.

There was a co-operative work with the members of the National Science Museum in Leg 3. Therefore, all of the co-operated profiling records are shown in Figs. 27-1, 2, 3 and 4.

2. Seismic reflection profiling survey in Leg 1

by Eiichi Honza, Akio Yamashita, Yoshihisa Okuda, Shoji Fujii, Kazuo Taguchi, Shiro Nishida, Hiroyuki Suzuki and Tokuhiko Kameyama

1) Izu-Ogasawara trench

Izu-Ogasawara island arc system has north-to-south trend where distributes Pacific basin, Izu-Ogasawara trench, Shichito-Iwoto ridge, Nishi-Shichito ridge from east to west.

Alternated sediments presumed in Neogene age distribute at the upper slope of the eastside of Shichito-Iwoto ridge. Bottom topography of the ridge and the upper slope is very rough and reflects the active structural movement during Neogene age. However, the upper slope off the east of Hachijo Island shows rather smooth topography.

A few canyons run on the upper slope cutting the uppermost layer. The canyons run along the structural low place, where is the axis of synclines or structural depressional area.

A basement high or ridge is observed at the mid-slope from where the continental slope become steeper. The high is composed of acoustic base-

Fig. 26. Location map of seismic reflection profiling survey

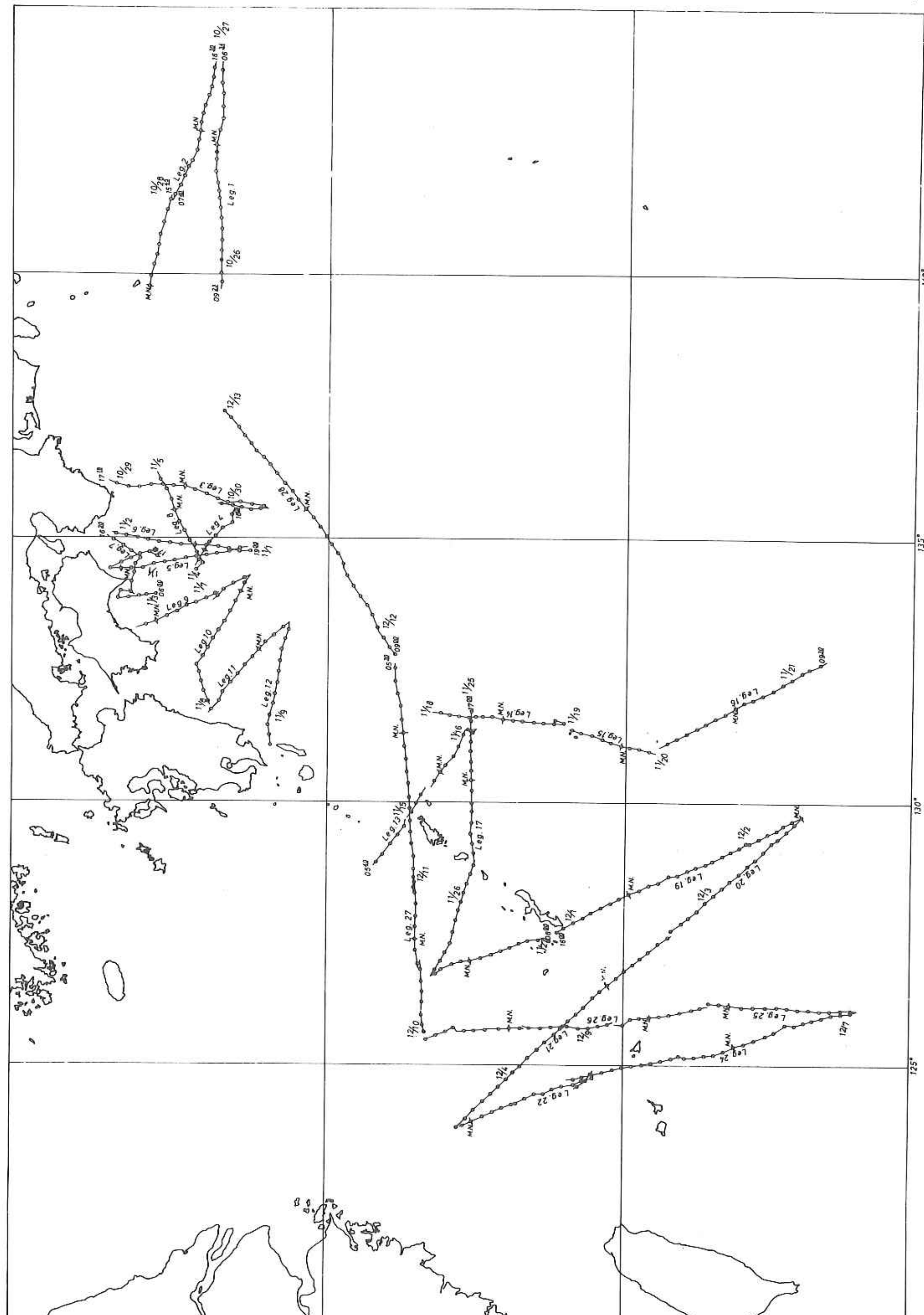


Fig. 27 (1-4).
Records of seismic reflection profiling survey

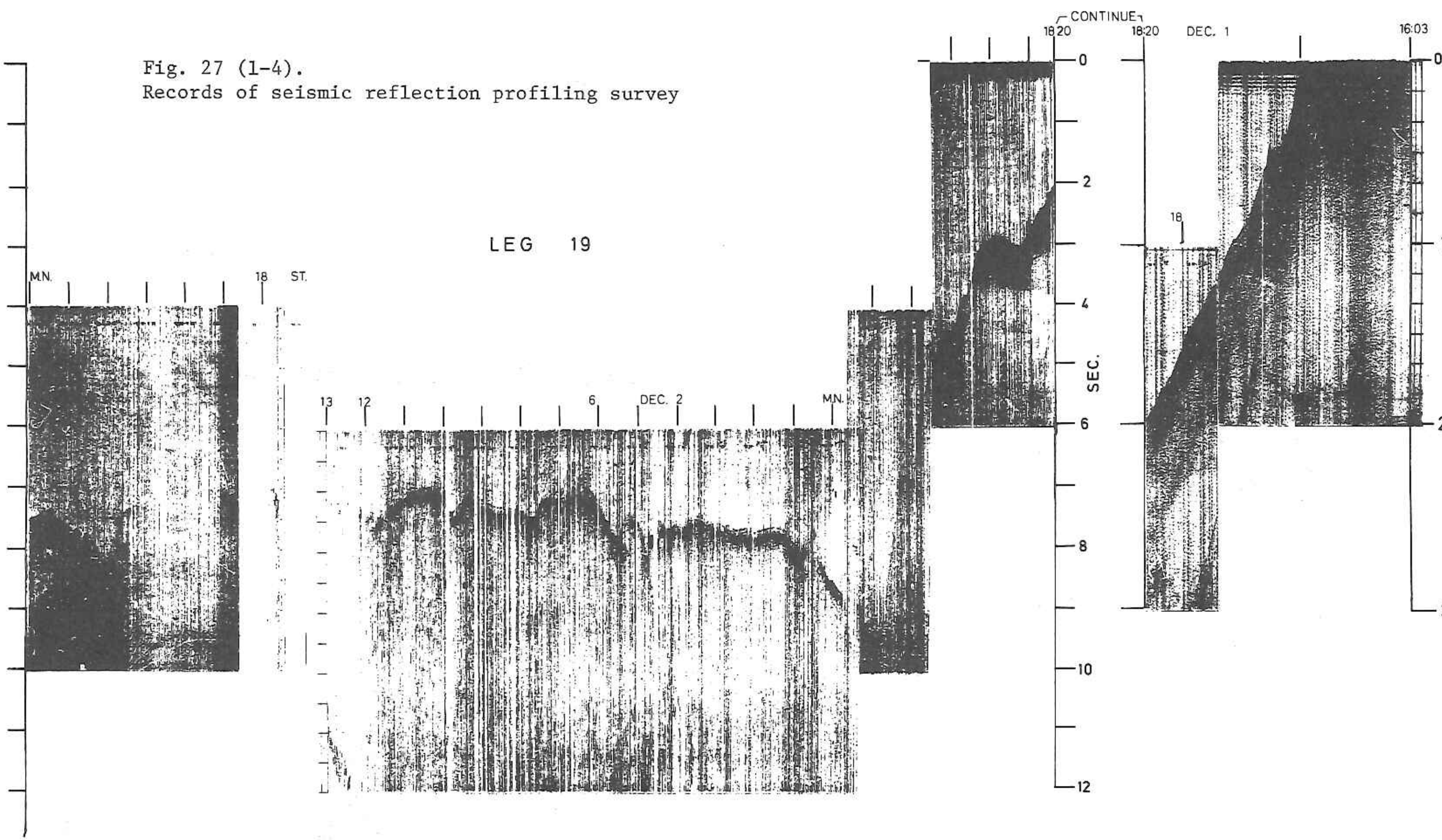
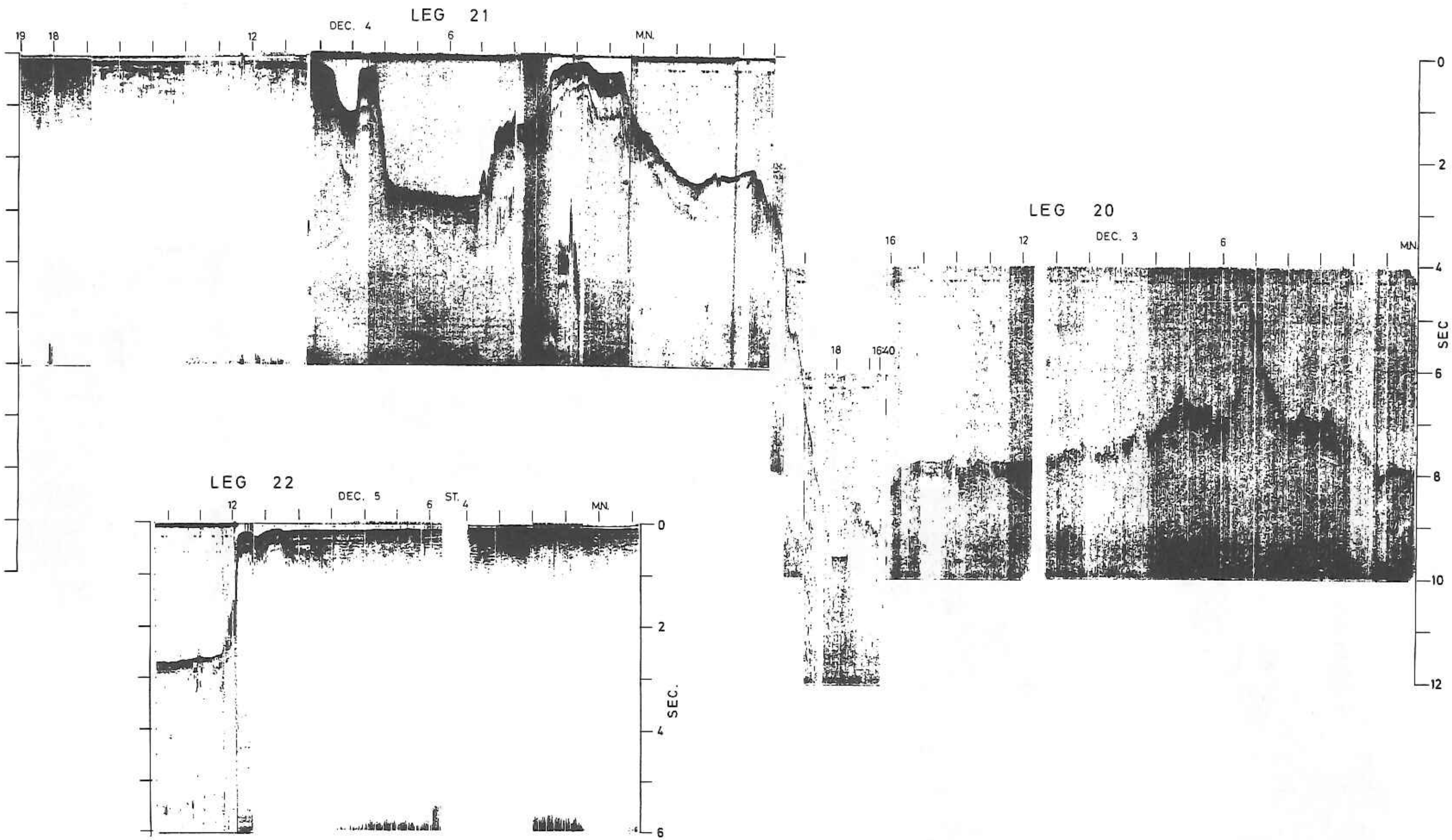


Fig. 27-1.


LEG 21
DEC. 4
19
18
12
6
M.N.
LEG 20
DEC. 3
16
12
6
M.N.
18
1640
SEC
0
2
4
6
8
10
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LEG 22
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12
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M.N.
SEC.
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6

Fig. 27-2.

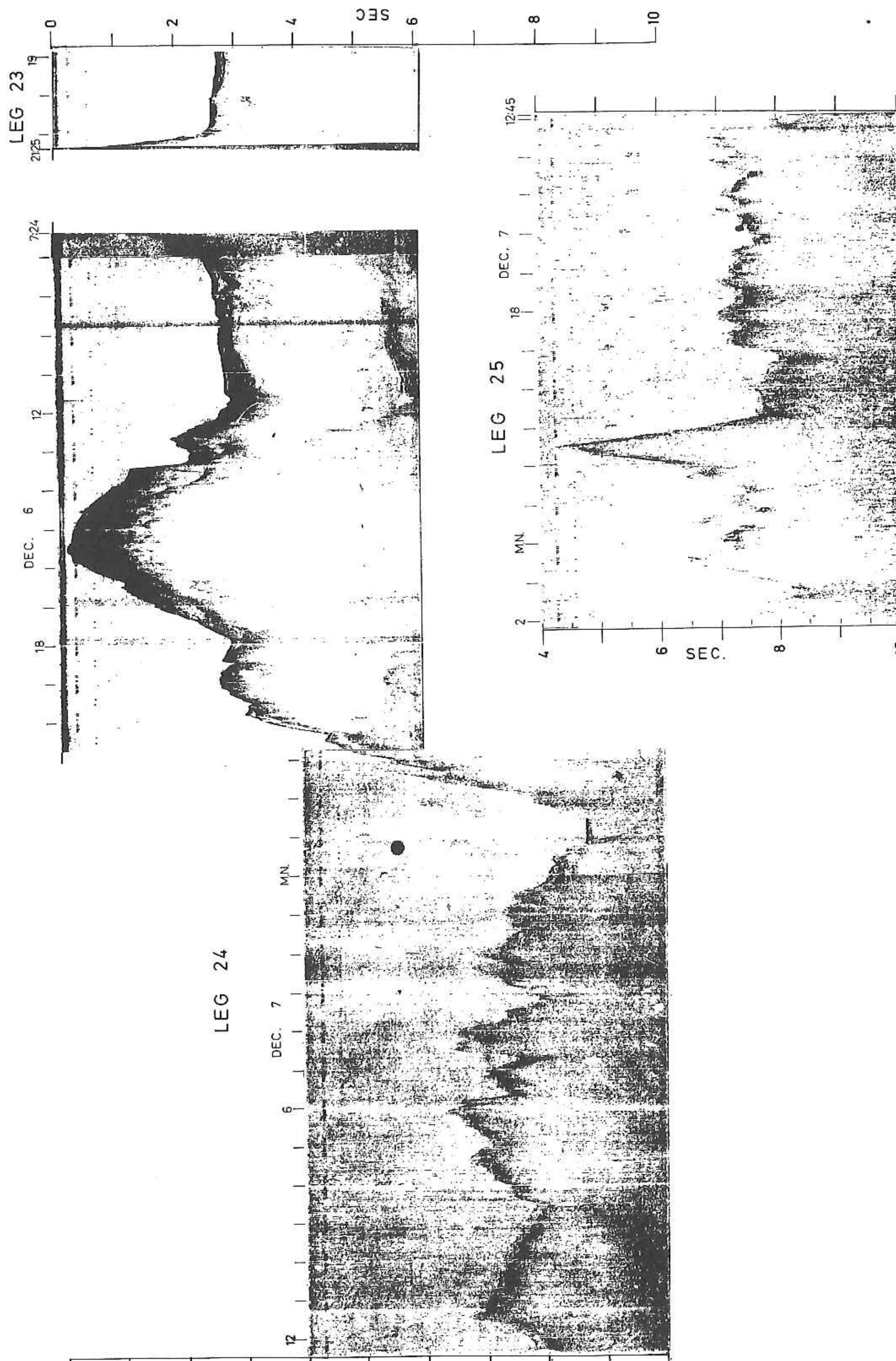
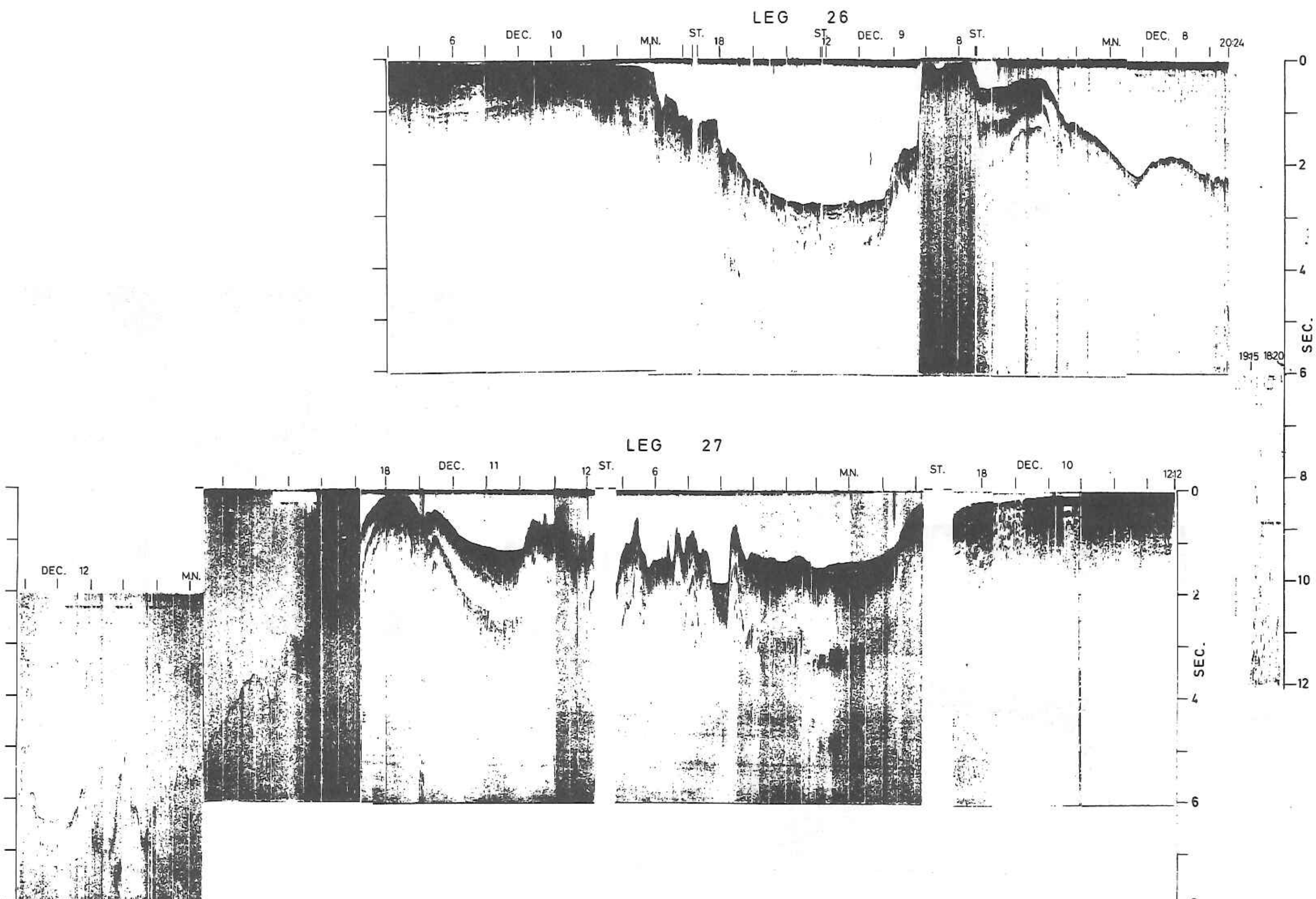


Fig. 27-3.


LEG 26
6
DEC. 10
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12
DEC. 9
8
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20:24
19:15
18:20
SEC.
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LEG 27
18
DEC. 11
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DEC. 10
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SEC.
0
2
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6
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DEC. 12
M.N.

Fig. 27-4.

ment at the north line and acoustic basement high with a cover of the upper layers at the south line.

Trench floor is V-shaped and shows more complex topography at the north line.

Acoustic tranparent layer distributes at the seaside slope of the trench where several faults (antithetic faults) develop.

2) Off Shikoku and Kyushu islands

Tosabae bank is consisted of a tilted block dipping towards north where alternated sediments overlie at the north side of the bank. The bank is composed of acoustic basement with the partly slight alternated one and thin cover of alternated layers on the surface.

The sedimentary layers at the upper continental slope off the west of Shikoku Island are divided in three layers. That is uppermost alternated one, folded alternation and acoustic basement of probably composed of sedimentary cock.

Bottom topography of the continental slope off the east coast of Kyushu Island is very rough where several ridges and troughs distribute. Seaside ridges from the center of the Bungo basin are mostly composed of acoustic basement; however, thick sedimentary layers overlie at the landside ridges of the one.

3) Nankai trough and Shikoku basin

Turbidites of maximum 1.8 second distribute on the pelagic sediments at the narrow depressional area of Nankai trough.

The trough floor shows a flat one. The floor increases in depth gradually towards southwest along the axis of the trough. Pelagic sediments which are indicated as the acoustic transparent layer shows a smooth surface of a little high level comparing adjacent turbidite level.

It may suggest the influence of turbidites which were supplied from higher latitude than from the neighbouring land area. Therefore, there may be two routes for the supply of the turbidites. The one is from adjacent land area and flows normal to the trough axis and the other is from northern land area and flows along the trough.

Thick pelagic sediments of maximum 1.2 second are seen at the Shikoku basin.

3. Seismic reflection profiling survey in Leg 2

by Eiichi Honza, Akio Yamashita, Chiaki Igarashi, Shoji Fujii, Tsuguo Shuto, Tsunemasa Shiki, Tokuhiko Kameyama, Masato Nohara, Kenichi Otsuka, Manabu Shiobara and Tsuguo Hayashida

1) Northern part of the Ryukyu arc

Alternated sediments of more than one second distribute at the northern marginal area of Okinawa trough. The sediments are interrupted by the many intrusives which show the topographic high of steep peak. The sediments at the trough decrease in thickness towards east and the upper layer thins out and the lower layer abuts on the acoustic basement of the western flank of Amami ridge.

Trough sediments at the northwest of Okinawa Island have more than 1.5 second thick and are folded by the structural movement.

The acoustic basement of Amami ridge may be composed of the sedimentary sequences which is suggested by the slight alternation pattern in the profiling record.

Several ridges and troughs distribute at the upper continental slope off the east of northern Ryukyu ridge where the sediments at the trough thin out towards the ridges.

Ryukyu trench floor shows a V-shaped one at the northern part. Several faults develop at the seaside slope of the trench where the upper transparent layer is deformed.

Trench floor is not a simple V-shaped one at the southeast line of Amami Oshima. A ridge on the foot of the land-side slope interrupts the flat floor of the trench bottom and has transparent layers on it.

From these facts, there is a possibility that the boundary between the oceanic crust and the continental crust may lie to the west of the ridge and the ridge has been subsiding beneath the continental crust.

2) Amami plateau, Daito and Oki-Daito ridges

Amami plateau, Daito and Oki-Daito ridges are composed of acoustic basement. Thin cover of the acoustic transparent layer distributes in the basins among the ridges and the plateau. However, scarce sediments are found out at the south slope and basin of the Amami plateau.

Sediments at the basin between the Daito and Oki-Daito ridge are rather thicker compared to the adjacent basin, but they vary in thickness in the area and are deformed by the structural movement.

Sediments off the south of the Oki-Daito ridge show rather uniform thickness and also suggest the acoustic opaque layer beneath the transparent layer.

3) Co-operative work with ocean bottom seismograph

Across the Amami plateau, refractive work using air-gun and ocean bottom seismograph was carried out during the setting of the three ocean bottom seismographs. The surveyed line run from C site to the basin south off the Amami plateau through B site.

The results may be discussed in the future report.

4. Seismic reflection profiling survey in Leg 3

by Eiichi Honza, Sadanori Murauchi, Toshio Asanuma, Akio Yamashita, Chiaki Igarashi, Ryohei Takahashi, Shoji Fujii, Kiyoshi Ishibashi, Tokuhiko Kameyama, Masato Nohara and Masashi Nomura

1) Ryukyu arc

Ryukyu arc system has northeast-to-southwest trend where distribute Ryukyu trench, Ryukyu frontal ridge, Ryukyu inner ridge, Okinawa trough, Taiwan-Sinzi zone and East China Sea continental shelf from east to west.

Ryukyu trench floor shows a V-shaped one and has no layered sediment at the northern part and flat floor with alternated sediment at the southern part.

Maximum 0.7 second thick (two way travel time) sediments distribute at the upper continental slope of the Ryukyu frontal ridge. The sediments are divided into two layers; the one is upper alternated layer and the other is lower massive layer. Both layers increase in thickness towards the deeper slope and show the maximum thickness at the western foot of mid-slope acoustic basement ridge or high where the layers show as to be deformed by the structural movement of relative uplift of the ridge.

There distributes no layered sediment and composed of acoustic basement at the lower slope of the Ryukyu frontal ridge. However, acoustic massive sediment distributes at the western line off the Miyako Island, which suggests the uplift of the mid-slope basement ridge may be rather a younger feature.

Ryukyu frontal ridge and inner ridge are composed of acoustic basements and vague alternated sediments on it. Thick alternated sediments distribute at the trough between Ryukyu ridges and partly a fault scarp is observed at the western flank of the frontal ridge.

2) Okinawa trough and continental shelf at East China Sea

Thick sediments of maximum 1.2 second thick are observed at Okinawa trough. The uppermost layer is dense alternated one and is a sequence of turbidites, which is indicated in the coring sample too (see Chapt. 7). The layer is thin at the western part of the trough and gradually increases in thickness towards east and limited in distribution almost rectangular to the basement high of the west slope of the Ryukyu inner ridge. The turbidites layers are much deformed by the structural movement to show the different feature as the usual turbidites which formed the abyssal plain.

Taiwan-Sinzi faulted zone distributes near and off the shelf edge of East China Sea and is formed by the tilted block movement of uplift of east side. Sediments are trapped at the west side of the block; however, partly younger sediments are mostly trapped at the small trough between the uplifted block and the shelf edge.

3) Northern Philippine basin

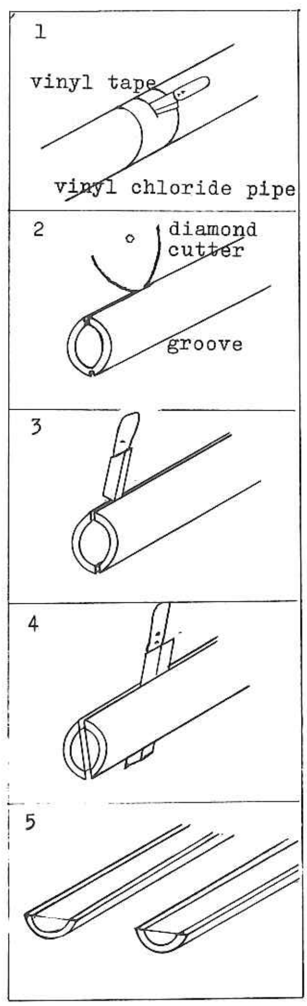
Bottom topography is very rough at northern Philippine basin. About 0.2 second thick of acoustic transparent layer is seen at the area. Moreover, almost the same thickness of the acoustic opaque layer is partly observed. Partly big faults which may be caused by the deeper part of the basement are observed.

7. Piston Cores

1. Cutting works

by Tetsuro Harata, Jyonosuke Ohara, Shiro Nishida, Takao Tokuoka and Nobuo Hayashida

The core samples in the inner tube were cut according to the following arrangements: 1. cutting across the inner tube; 2. grooving by the diamond cutter; 3. cutting off longitudinally the inner tube; 4. cutting off the core samples (Fig. 28).

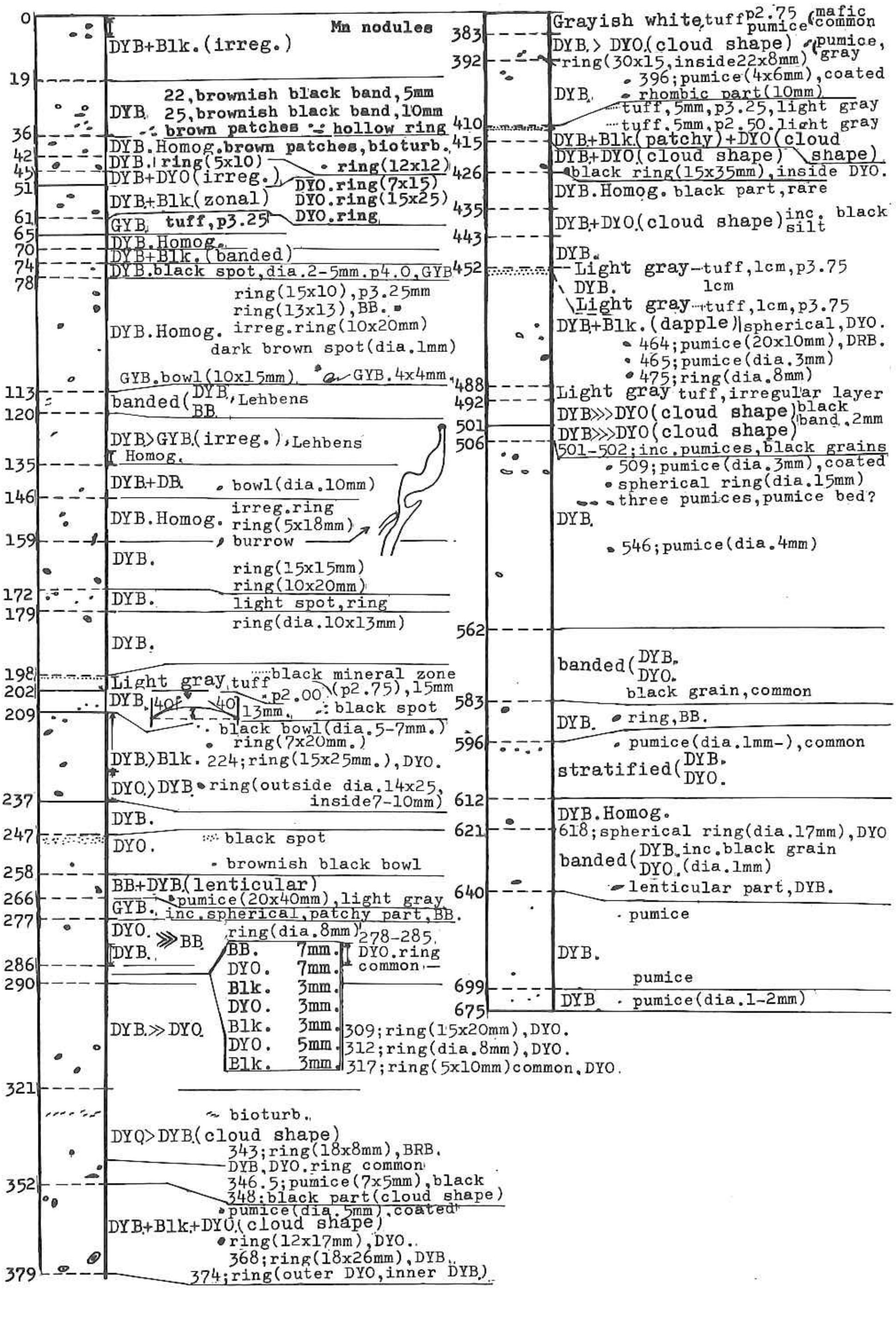


2. Visual core description

1) Columnar description of the core samples (Station 2)

by Tetsuro Harata, Jyonosuke Ohara and Takao Tokuoka

Fig. 29. Visual description of the core samples at St. 2



2) Columnar description of the core samples (Station 10)

by Tetsuro Harata, Jyonosuke Ohara and Takao Tokuoka

Fig. 30. Visual description of the core samples at St. 10

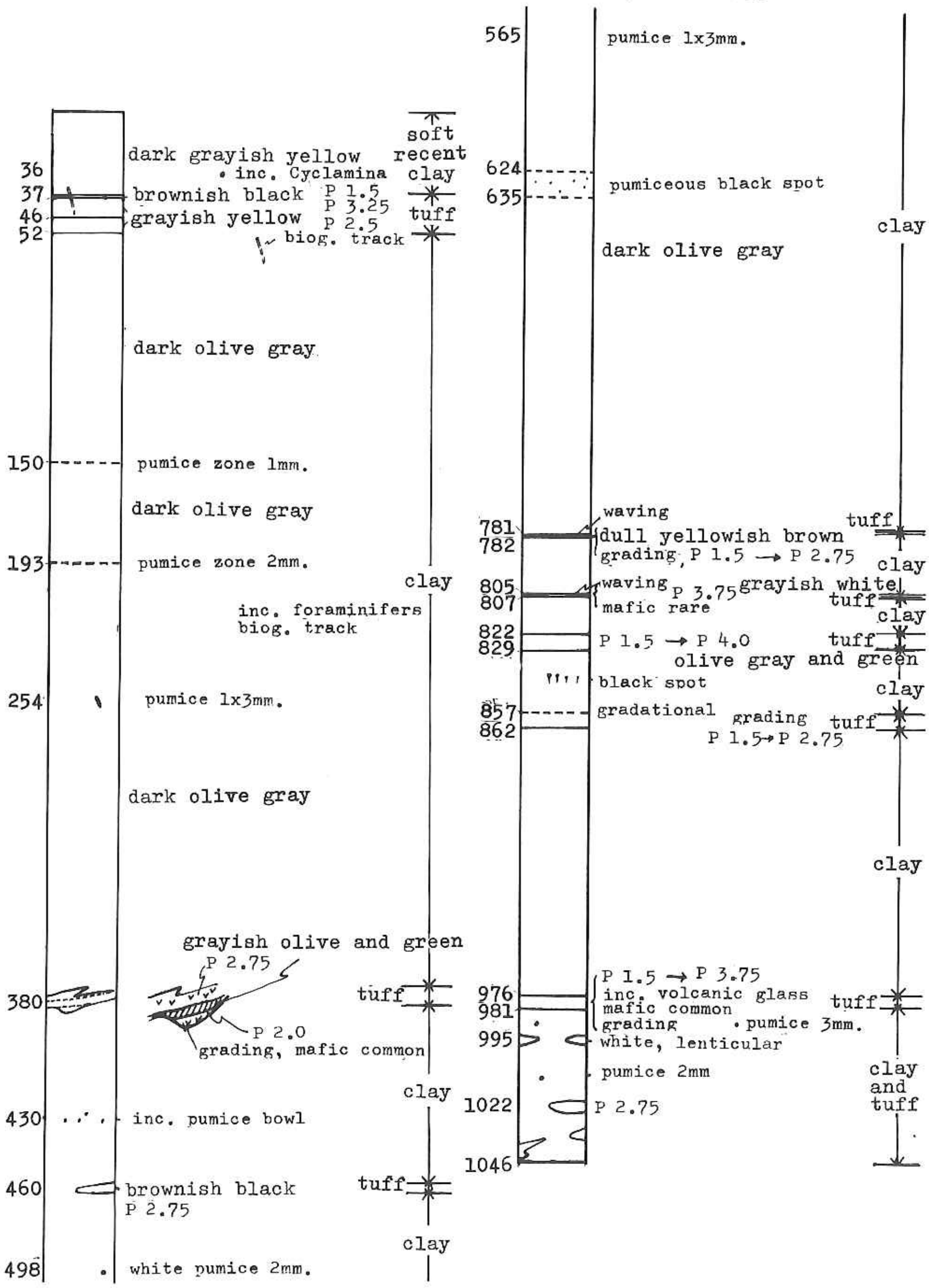
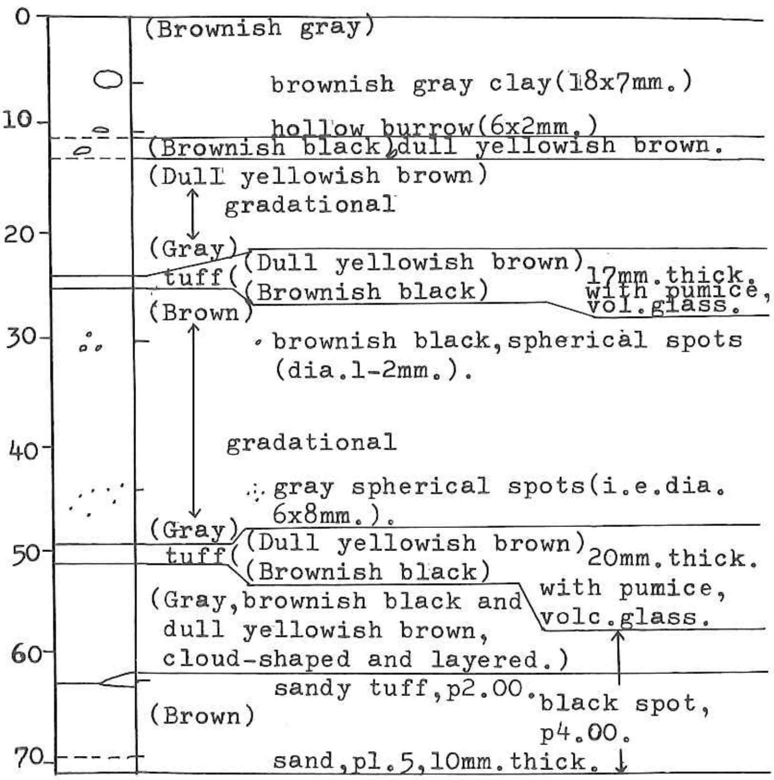


Fig. 31. Visual description of the pilot core sample at St. 10



3) Columnar description of the core samples (Station 21)

by Tetsuro Harata, Jyonosuke Ohara and Takao Tokuoka

Fig. 32 (1-4). Visual description of the core samples at St. 21

Fig. 32-1.

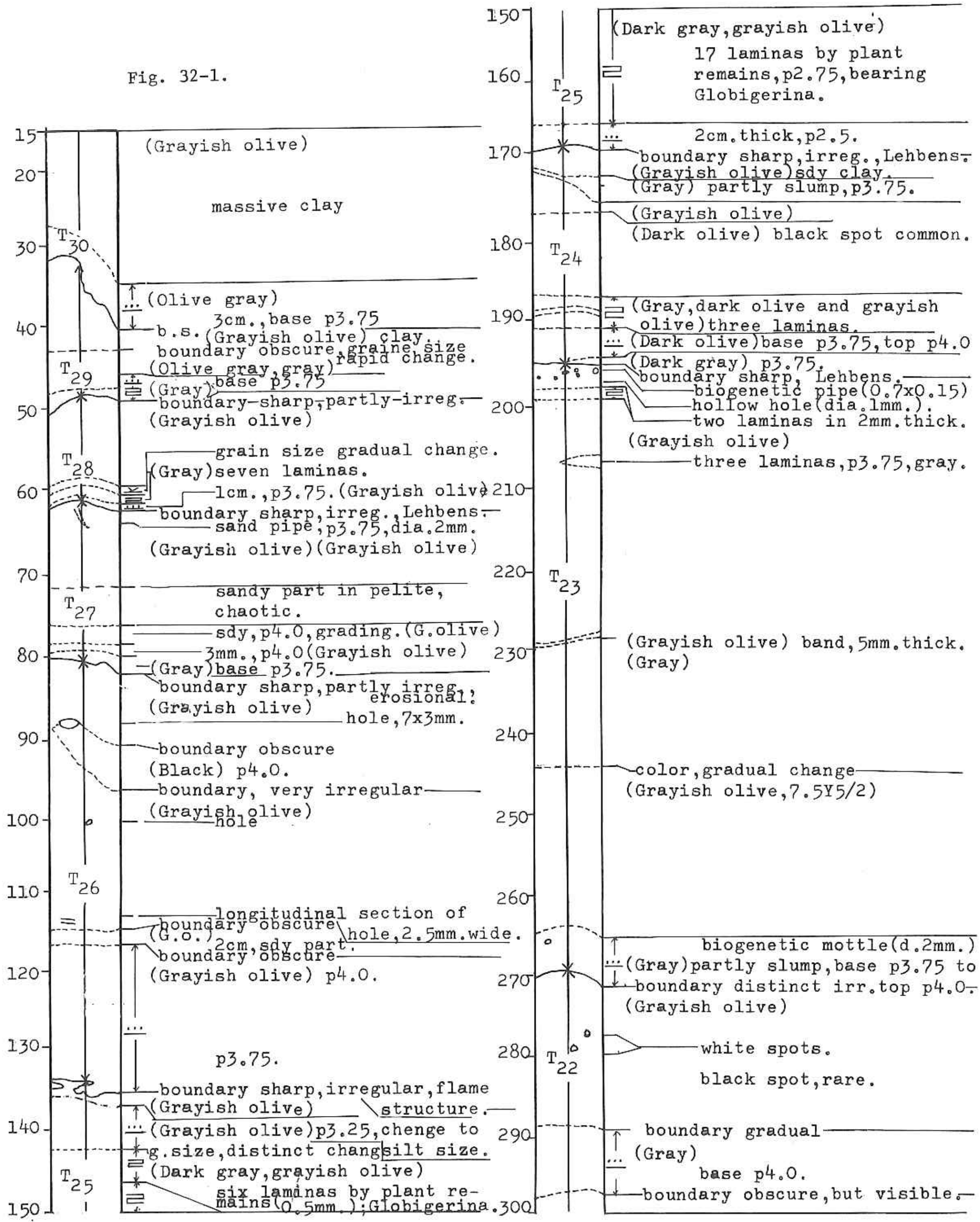


Fig. 32-2.

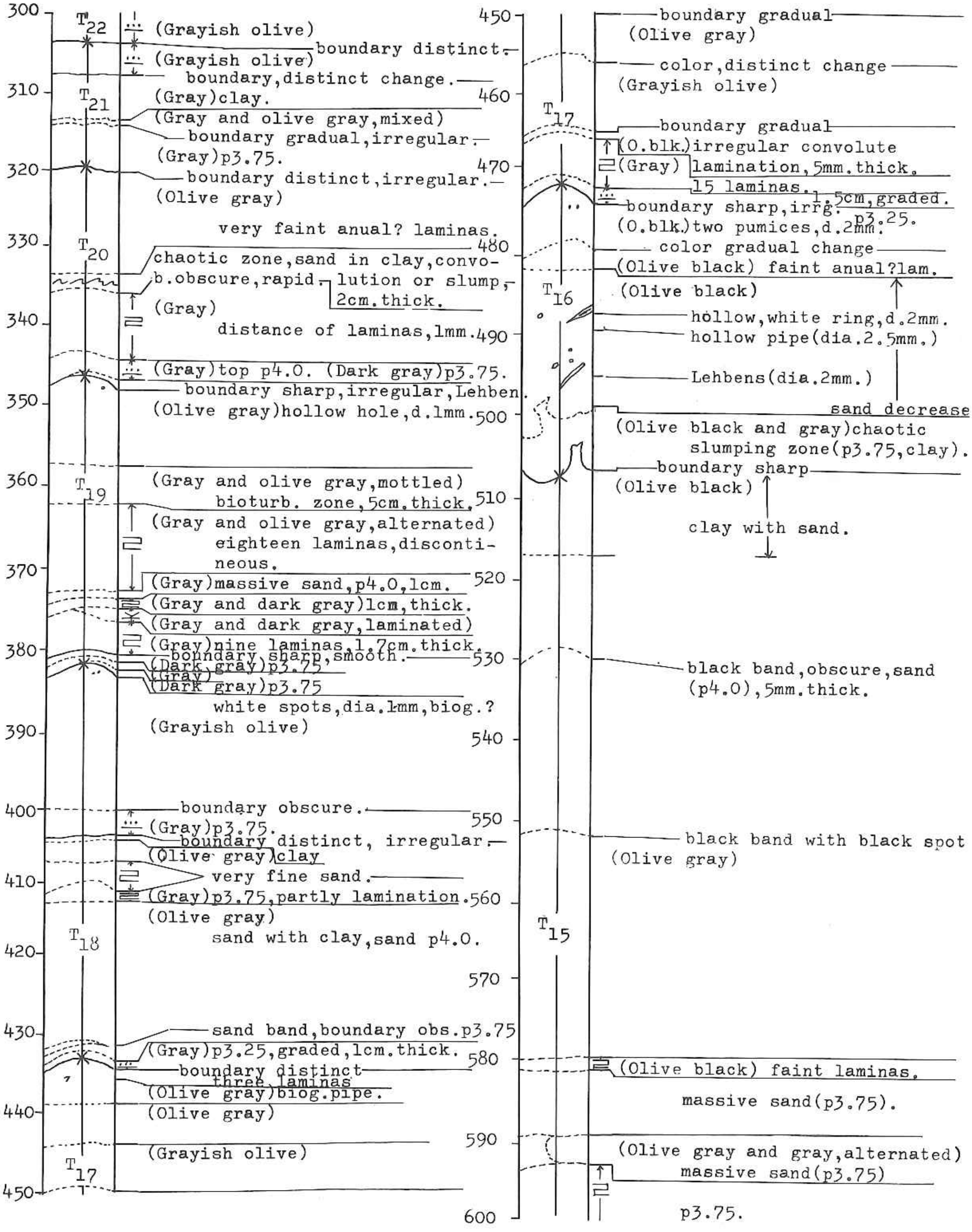

300
T_{22}
(Grayish olive)
boundary distinct.
(Grayish olive)
boundary,distinct change.
310
T_{21}
(Gray)clay.
(Gray and olive gray,mixed)
boundary gradual,irregular.
(Gray)p3.75.
320
boundary distinct,irregular.
(Olive gray)
very faint anual? laminas.
330
T_{20}
chaotic zone,sand in clay,convo-
b.obscure,rapid
lution or slump,
2cm.thick.
(Gray)
340
distance of laminas,1mm.
(Gray)top p4.0. (Dark gray)p3.75.
boundary sharp,irregular,Lehben.
350
(Olive gray)hollow hole,d.1mm.
360
T_{19}
(Gray and olive gray,mottled)
bioturb. zone,5cm.thick.
(Gray and olive gray,alternated)
eighteen laminas,disconti-
neous.
370
(Gray)massive sand,p4.0,1cm.
(Gray and dark gray)1cm,thick.
(Gray and dark gray,laminated)
(Gray)nine laminas,1.7cm.thick.
380
boundary sharp,smooth.
(Dark gray)p3.75
(Gray)
(Dark gray)p3.75
white spots,dia.1mm,biog.?
(Grayish olive)
390
400
boundary obscure.
(Gray)p3.75.
boundary distinct, irregular.
(Olive gray)clay
very fine sand.
410
(Gray)p3.75,partly lamination.
(Olive gray)
T_{18}
sand with clay,sand p4.0.
420
430
sand band,boundary obs.p3.75
(Gray)p3.25,graded,1cm.thick.
boundary distinct
three laminas
(Olive gray)biog.pipe.
440
(Olive gray)
(Grayish olive)
T_{17}
450
450
boundary gradual
(Olive gray)
color,distinct change
(Grayish olive)
460
T_{17}
boundary gradual
(O.blk.)irregular convolute
(Gray) lamination,5mm.thick.
470
15 laminas.
1.5cm,graded.
boundary sharp,irrg.
p3.25.
(O.blk.)two pumices,d.2mm.
480
color gradual change
(Olive black) faint anual?lam.
T_{16}
(Olive black)
hollow,white ring,d.2mm.
490
hollow pipe(dia.2.5mm.)
Lehbens(dia.2mm.)
sand decrease
500
(Olive black and gray)chaotic
slumping zone(p3.75,clay).
boundary sharp
(Olive black)
510
clay with sand.
520
530
black band,obscure,sand
(p4.0),5mm.thick.
540
550
black band with black spot
(Olive gray)
560
T_{15}
570
580
(Olive black) faint laminas.
massive sand(p3.75).
590
(Olive gray and gray,alternated)
massive sand(p3.75)
600
p3.75.

Fig. 32-3.

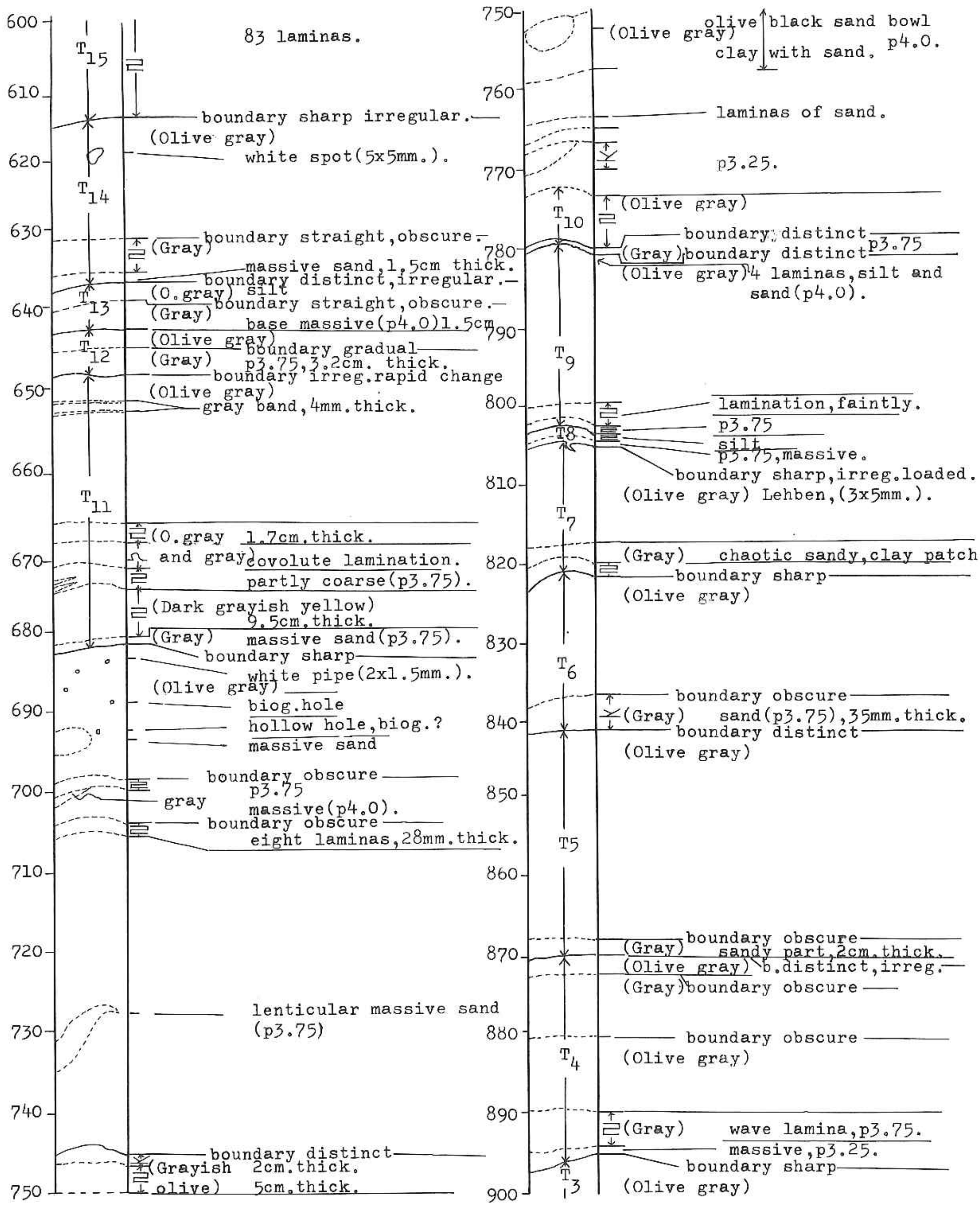
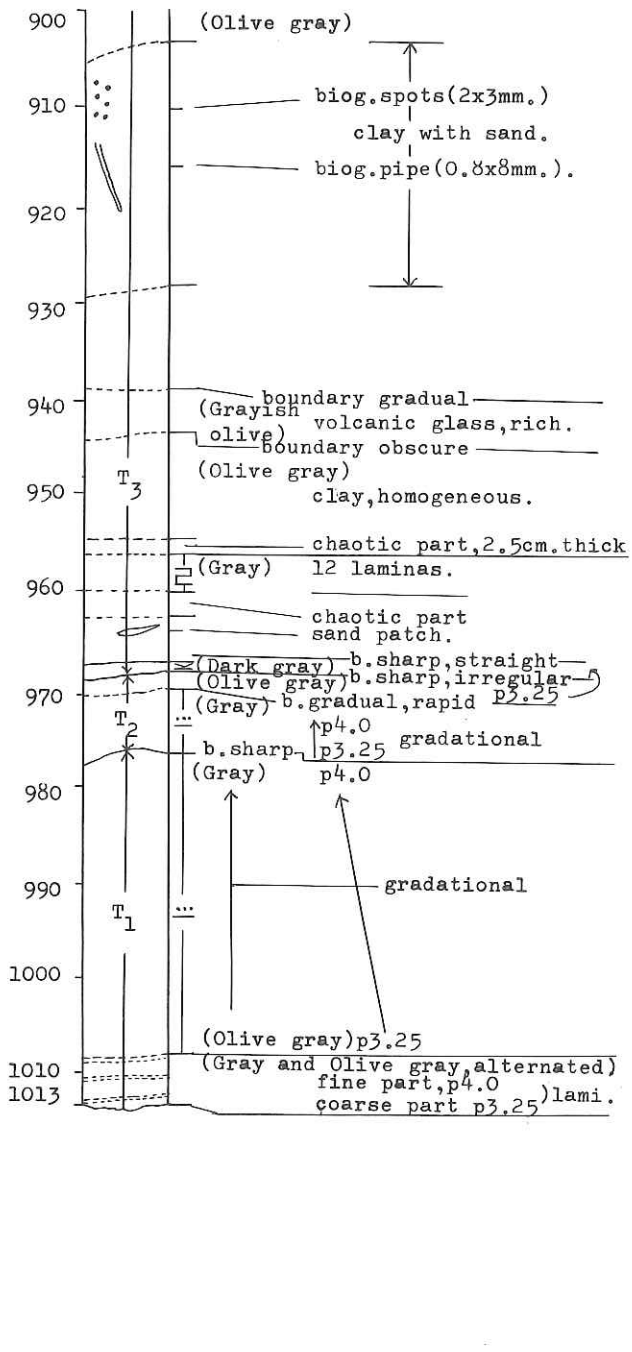

600
610
620
630
640
650
660
670
680
690
700
710
720
730
740
750
T_{15}
83 laminas.
boundary sharp irregular.
(Olive gray)
white spot(5x5mm.).
T_{14}
(Gray) boundary straight,obscure.
massive sand,1,5cm thick.
boundary distinct,irregular.
(O.gray) silt
T_{13}
(Gray) boundary straight,obscure.
base massive(p4.0)1.5cm
(Olive gray) boundary gradual
T_{12}
(Gray) p3.75,3.2cm. thick.
boundary irreg.rapid change
(Olive gray)
gray band,4mm.thick.
T_{11}
(O.gray 1.7cm.thick.
and gray) covolute lamination.
partly coarse(p3.75).
(Dark grayish yellow)
9.5cm.thick.
(Gray) massive sand(p3.75).
boundary sharp
white pipe(2x1.5mm.).
(Olive gray)
biog.hole
hollow hole,biog.?
massive sand
boundary obscure
p3.75
gray
massive(p4.0).
boundary obscure
eight laminas,28mm.thick.
lenticular massive sand
(p3.75)
boundary distinct
(Grayish 2cm.thick.
olive) 5cm.thick.
750
760
770
780
790
800
810
820
830
840
850
860
870
880
890
900
(Olive gray) olive black sand bowl
clay with sand. p4.0.
laminas of sand.
p3.25.
T_{10}
(Olive gray)
boundary distinct
(Gray) boundary distinct p3.75
(Olive gray) 4 laminas,silt and
sand(p4.0).
T_9
lamination,faintly.
p3.75
T8
silt
p3.75,massive.
boundary sharp,irreg.loaded.
(Olive gray) Lehben,(3x5mm.).
T_7
(Gray) chaotic sandy,clay patch
boundary sharp
(Olive gray)
T_6
boundary obscure
(Gray) sand(p3.75),35mm.thick.
boundary distinct
(Olive gray)
T5
boundary obscure
(Gray) sandy part,2cm.thick.
(Olive gray) b.distinct,irreg.
(Gray) boundary obscure
boundary obscure
T_4
(Olive gray)
(Gray) wave lamina,p3.75.
massive,p3.25.
boundary sharp
T_3
(Olive gray)

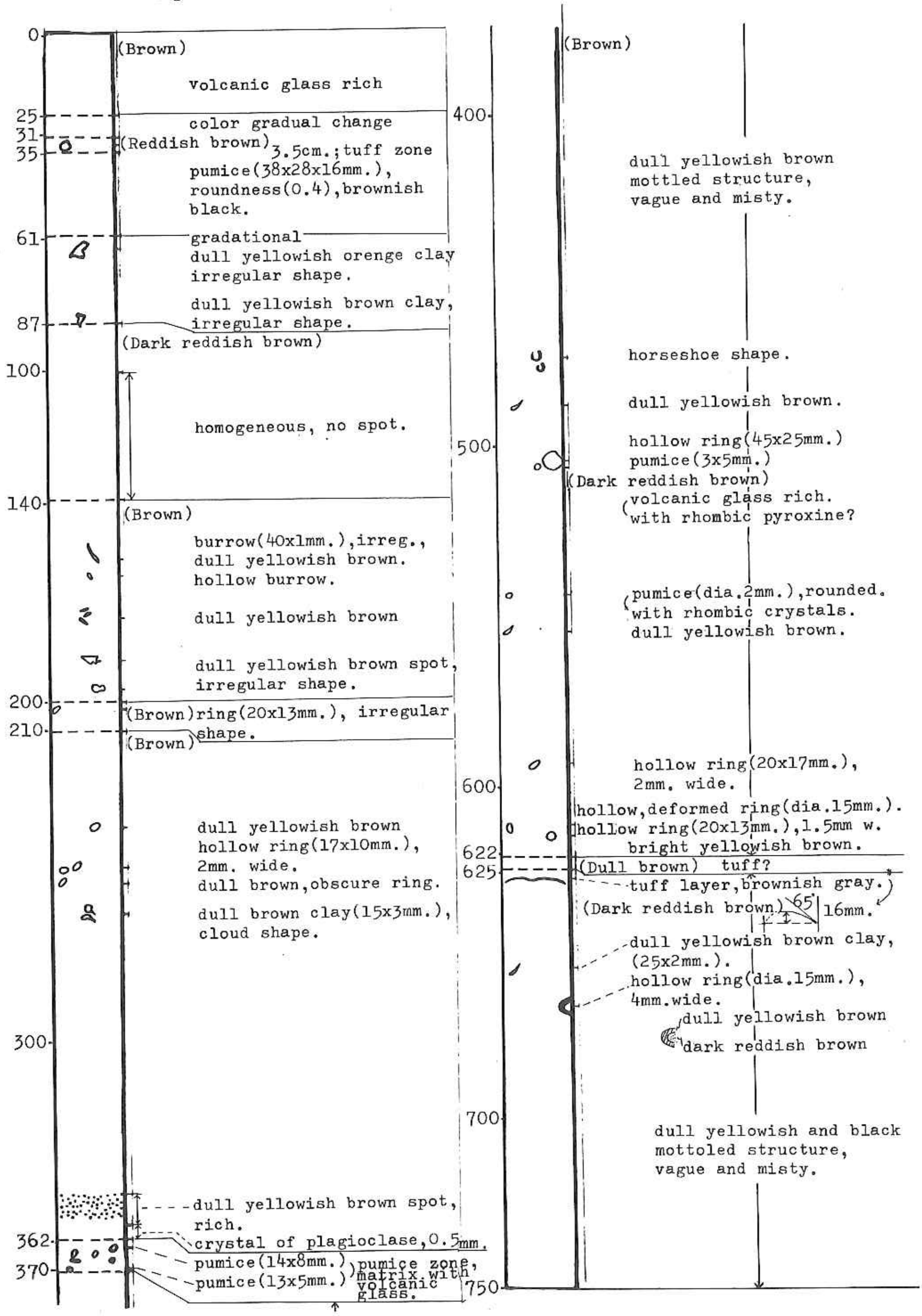
Fig. 32-4.


900
910
920
930
940
950
960
970
980
990
1000
1010
1013
T3
T2
T1
(Olive gray)
biog.spots(2x3mm.)
clay with sand.
biog.pipe(0.8x8mm.).
boundary gradual
(Grayish olive)
volcanic glass,rich.
boundary obscure
(Olive gray)
clay,homogeneous.
chaotic part,2.5cm.thick
(Gray) 12 laminas.
chaotic part
sand patch.
(Dark gray) b.sharp,straight
(Olive gray) b.sharp,irregular
(Gray) b.gradual,rapid
p3.25
p4.0
b.sharp
p3.25
gradational
(Gray)
p4.0
gradational
(Olive gray)p3.25
(Gray and Olive gray,alternated)
fine part,p4.0
coarse part p3.25
)lami.

4) Columnar description of the core samples (Station 56)

by Tetsuro Harata, Jyonosuke Ohara and Takao Tokuoka

Fig. 33. Visual description of the core samples at St. 56



5) Description of the core samples (Stations 58, 65 and 73)

by Tsunemasa Shiki, Hakuyu Okada, Kenichi Otsuka and Nobuo Hayashida

Station 58: This site is located at the water depth of 5340 m at the northwestern margin of the abyssal plain in the Philippine basin. The recovery of sediments is about 750 cm long.

The whole sequence of the core is composed of "red clay," which is considerably disturbed by organisms. A few layers of acid to intermediate tuff are intercalated. Fossils cannot be found, but a number of pellets are well preserved. A discovery to call a special attention is of a small lump of "chalk" at the lowermost part of the core (Fig. 34).

Station 65: A 390 cm long core was obtained at the water depth of 2090 m at the southeastern margin of the Okinawa trough. Much of the sediments is highly calcareous and is characterized by turbidites, which consist at least of 10 graded beds. The thickness of these beds ranges from 3 to 30 cm. Many unit beds begin either with Division B or with Division D and end with Division E. Coarsest grains of graded beds are of medium sand size. Not a few grains of sands indicate a well-rounded nature. It is also noteworthy that the sand layers are lacking in clay matrix.

Foraminifera and nannoplanktons are detected throughout the core. A large cylindrical structure of organic origin occurs at the basal part of the core.

Station 73: A 670 cm long core was sampled at the depth of 2120 m in the axial part of the Okinawa trough.

Turbidite features are hardly recognizable in this core, except for the upper 190 cm of the core where several graded beds are discernible. The sediments are as a whole rich in glass. Such heavy minerals as iron minerals, hornblende, and pyroxene, are concentrated in some sandy to silty layers. Nannoplanktons are found throughout the whole sequence.

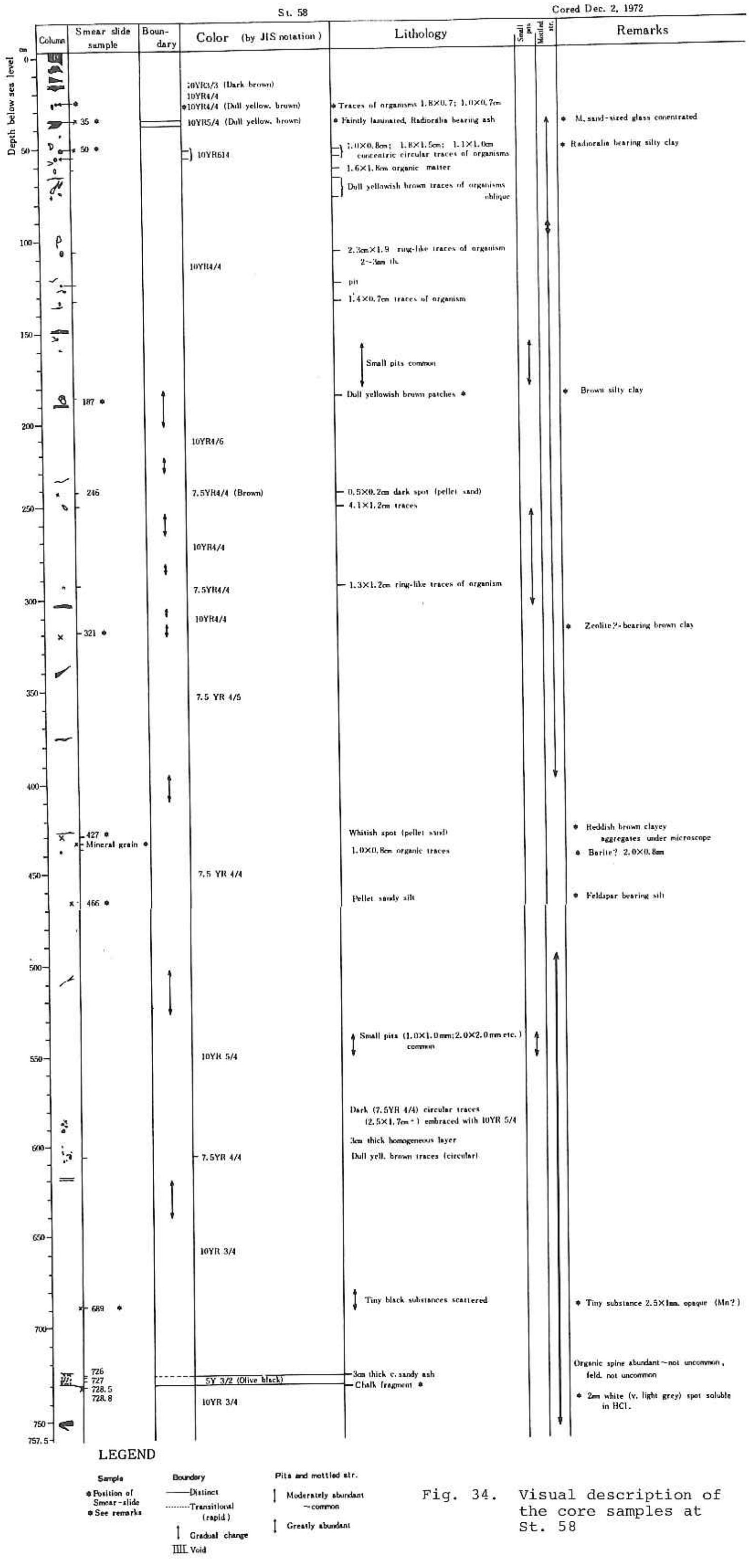


Fig. 34. Visual description of the core samples at St. 58

3. Mineralogical studies of core samples

1) Stations 2, 10 and 56

by Jyonosuke Ohara

Mineralogical studies of the core samples were carried out and the results are shown in the following table (Table 2).

Method: Silt in the sample (2-5 gr) is washed out by water sieve and light matter is separated from heavy matter by panning method. The light matter and the heavy matter are individually mounted by Canada balsam in slide glass and then they are observed under the polarized microscope.

Results: Hornblende and pyroxene are generally dominant. These minerals will be brought from volcanic activity.

2) Stations 58, 65 and 73

by Hakuyu Okada

Mineralogical compositions of the examined samples cored at Stations 58, 65 and 73 are shown in Table 3.

Station 58: The sediments are characterized by pellet mud, and are lacking in nannoplankton and other calcareous microfossils. Throughout the whole sequence, acidic to intermediate glass shards are abundant. A tiny fragment of calcareous microfossil chalk was found at the basal part of the core.

Station 65: This core is characterized by frequent intercalations of graded beds. The fine-grained, upper sequence of unit graded beds consists generally of microfossil-bearing calcareous clay. The coarse-grained, lower sequence of the beds is composed of more or less sorted, coarse silt or sand. Sand and coarse silt grains are in many samples feldspathic and considerably rounded. Especially, the sample 234 contains well-sorted purple zircon and rutile. As heavy minerals are commonly found green hornblende, zircon, rutile, tourmaline, and apatite(?). Another feature is that the upper half of the core is characterized by light-colored glass shards.

Station 73: The sediments consists of interbeds of nanno-ooze or nanno-rich clay, feldspathic sand and silt, and ash. It is interesting that light-colored glass and zeolitic substance tend to be rich in the upper sequence of the core. Diagnostic heavy minerals are green hornblende and clinopyroxene.

Station Number	Sample Number	Volume of Coarse Fraction	Light Matter: Volume	Light Matter: Sorting	Light Matter: Pumice	Light Matter: Glass Shard	Organisms: Diatom	Organisms: Radiolaria	Organisms: Foraminifera	Organisms: others	Heavy Matter: Volume	Heavy Matter: Sorting	Zircon: colorless	Zircon: brown	Zircon: purple	Tourmaline: green	Tourmaline: brown	Tourmaline: greenish brown	Tourmaline: dark green	Augite	Hypersthene	rhombic Pyroxene	Garnet	Hornblende: green	Hornblende: brown	Hornblende: greenish brown	Hornblende: light green	alkali amphibole	Rutile	Anatase	Monazite	Titanite	Epdote	Muscovite	Biotite: green	Biotite: greenish brown	Biotite: brown	Chlorite	Glauconite	Magnetite	Pyrite	remarks
	50 *	◎	◎	P	◎	○	○	○		○	◎	P								◎	○			○		○											○			○		
	220	◎	◎	W	○	◎		○			◎	P								◎	○	?				○											○			◎		
2	470	◎	◎	P	◎	○		○			○	W								◎	○					○										○				◎		
	585	◎	○	P	◎	○		◎			◎	W	?							◎	○					○									○					○		
	675	○	○	P	◎	○		○			○	W								○	○					○											◎			○		
	30	○	○	P	○	◎		◎		○	○	W									○	○				◎											○			◎		
	32	◎	◎	W	·	◎	○	○			○	W								○	◎				○	○														◎		
	40~47	◎	◎	W	○	◎	○	○			○	W								○	◎	○			○	○											○			◎		
	100	○	○	W	○	○	○	◎	○	○	·	W								○	◎	○		○	○	○		○							○		○		?	◎	○	
	300	○	○	W	◎	○	○	◎	○	○	·	W	○							○	◎	○	○	○	?	○									○		○		○	◎	○	
	380	◎	◎	W	○	◎		○			·	W	○							○	◎	○				○									○				○	◎	·	tuff
	500	○	○	W	○	○	○	◎	○	○	·	W	○							◎	○			○	○	○		○							○		○		○	○	○	
10	700	·	·	W	·	○	○	◎	○		·	W	○						○	◎	○	○		○	?	○	?								○		○		○	○	○	
	783	◎	◎	P	○	◎	○	○			◎	W								○	◎	○	?	○	○	○											○			◎	·	tuff
	808	◎	◎	W	◎	○	○	○		○	·	W								○		○				◎														○		
	825	◎	◎	W	○	◎					○	W								◎	◎	○				○														◎		tuff
	860	◎	◎	P	○	◎	○	◎			·	W								○	◎	○			○	○													?	○	·	do.
	900	○	○	W	◎	○	○	◎	○	○	·	W								○	◎	○		○		○				?						○			?	○		
	980	◎	◎	P	○	◎	○	◎			◎	W								○	○	○			○	◎														·		
	1022	◎	◎	W	◎	○	○	○	○	○	○	W	○							○	◎	○	?	○	○	○													○	○	○	tuff
	1040	○	○	W	◎	○	○	◎	○	○	·	W	○						○	○	○	◎		○	○	○									○				○	○	○	
	30 cm from the bottom	○	○	P	○	◎	?	◎		○	·	W	○							○	○	○			○	◎										○	○			○		core of pilot
	20 cm from the bottom	◎	◎	P	○	◎		○		○	·	W	○							○	○	○		○	○	◎											○			◎		do.
	0	·	·	W	○	◎		◎	○	○	·	W	○							○	○	○			○	◎														·		
	20	○	○	W	·	◎		○			○	W	○							○	○	○			○	○														○		
56	200	·	·	W		○		○	○	○	·	W	○							○	○	○			○	◎														○		
	400	·	·	W	·	◎		○	○	○	·	W	○							○		○			○	◎										○				○		
	600	○	○	W	○				○		·	W	○							○		○		○	○	◎										○	○			○		
	620	◎	◎	P					○		·	W	○							○		○	?		○	◎										○	○			·		
	bottom	○	○	W		·			○		·	W	○							○		○		○	○	◎											○			○		

LEGEND ; ◎ : Dominant, ○ : Common, · : rare, W : Well, P : Poor, * cm from the top, o: present (in heavy minerals),

Table 2. Constituent of the core samples of St. 2, 10 and 56

Smear Slide Analysis of the Samples cored at Stations Nos. 58, 65, and 73, KH72-2

		SAND : SILT : CLAY RATIO			CHIEF CONSTITUENTS																					
STATION NO.	SMEAR SLIDE	SAND	SILT	CLAY	QUARTZ	FELDSPAR	CHLORITE	BIOTITE	DARK GLASS	LIGHT GLASS	PALAGONITE	GLAUCONITE	CARBONATE FRAGMENTS	CLAY MINERALS	PHILLIPSITE	OTHER ZEOLITES	TRANSPARENT HEAVY MINERALS	OPAQUES	DIATOM	RADIOLARIAN	SPICULES	FORAMINIFERA	NANNOS	PELLET	UNKNOWN ORGANISMS	REMARKS
58	35	100	0	0	5	5		2		80							5	2		2						Radiolaria-bearing ash
	50	30	20	50	5	5				30			tr	50	tr	tr	tr	tr		10						Radiolaria-rich, glass sandy mud
	246	80	15	5	tr			tr		5	5					?	tr	10			tr			80		Pellet sand
	321	5	30	65	tr	3				5	15					5	5	30						35		Pellet silty clay
	427	95	5	0	tr	5		tr		10	tr					tr								85		Pellet sand
	466	35	45	20	7	8			5	25	3					tr	3	15						35		Pellet sandy silt
	700	40	10	50	tr	5				20	20					3	5	10						40		Pellet sandy silt
	726	50	40	10	tr	5			10	50	tr						2	20			10					Spicule-bearing ash
	727	90	10	0	tr	5				20							1	40			30					Spicule-rich sand
	728.5	80	20	0	7	8			5	30	5			10		tr		30		tr	3					Glassy sand
	728.8	20	80	0	tr	5										tr	tr	3							90	Unknown microfossil ooze(calcareous)
65	30	0	30	70	10	5	1			3	tr		40	35			1	3	tr	tr	tr	tr	tr			Nanno- and radiolaria-trace, calcareous silty clay
	34	10	65	25	5	10	5			10			20	25			tr	5	2	3	1	7	10			Foram-bearing, nanno-rich, calcareous clayey silt
	35	3	62	35	4	4	3			10	tr		10	34			tr	3	15	tr	10	2	10			Nanno- & diatom-bearing clayey silt
	40	5	80	15	tr	tr				30			10					3	15	tr	20	20	5			Nanno-bearing, diatom- & foram-rich glass silt
	52.5	15	70	15	tr	2	1		tr	35			10	15			tr	3	15		5	5	10			Nanno- & diatom-rich glassy silt
	57.5	95	5	0	tr	2	1			90								tr	tr			5	tr			Nanno- & diatom-trace, foram-bearing ash
	60	tr	30	70			2		tr	2	tr		10				tr	2	tr	tr	2		5			Diatom- & nanno-trace, silty clay
	82f	5	95	0	60	15	5			5	tr		10				tr	5				tr	tr			Nanno- & foram-trace silt
	82c	30	70	0	25	40	10	tr	tr	tr	tr	3	15				tr	2	tr			tr	tr			Foram, nanno- & diatom-trace, feldspathic sandy silt
	89.5	2	25	73	10	10	tr			tr	tr	tr	30					2			2		5			Nanno-bearing, calcareous silty clay
	99.5	5	40	55	10	10	15				5		20	30		tr		7	tr	tr		1	1			Nanno- & foram-trace, calcareous silty clay
	102.5	20	70	10	20	15	10			30			20				tr	5	tr			tr	tr			Diatom-, foram- & nanno-trace, calcareous sandy silt
	105	5	65	30	10	5	15	tr		5	tr		20	30			3	5	1	tr	tr	1	5			Foram-trace, nanno-bearing, clayey silt
	106	tr	70	30	5	5	10			15	tr		25				tr	25	tr		2	tr	5			Nanno-bearing, clayey silt
	118.5	70	30		25	15	30*		tr	2			10				tr	5	8			5	tr			Foram- & diatom-bearing, chlorite-rich silty sand
	122	80	20	0	30	40	10			5			17				1	3	tr			1	tr			Foram-trace, feldspathic fine sand
	123	0	10	90	5	10							3	40				5	2		2		30			Diatom-trace, nanno-bearing, pellet clay
	137	90	10	0	30	35	tr						10				3	5	tr		tr	15	tr			Diatom- & nanno-trace,foram-rich, feldspathic fine sand
	147	40	60	0	25	30	7			3			25				3	5	1		tr	tr	tr			Foram-, nanno- & diatom-trace, calcareous sandy silt
	148	25	60	15	30	35	2			20			5		?		tr	2	2			tr	tr			Foram- & nanno-trace, diatom-bearing, sandy silt
	161	90	10	0	20	15	10	tr		2			20				tr	2	tr		2	25	tr			Diatom- & nanno-trace, foram-rich, calcareous sand
	173	30	40	30	15	10	10		tr	20			10	20				3	5		2	10				Diatom-bearing, foram-rich, sandy mud
	183	95	5	0	20	27	10*			5							tr	3	tr			30	tr			Nanno- & diatom-trace, foram-rich, feldspathic fine sand
	185	0	10	90	tr	tr	tr						15					3	tr				10			Nanno-rich clay
	213	25	45	30	35	30	10				tr		3				10	3	3		2	15	tr			Nanno-trace, diatom-bearing, foram-rich sandy mud
	214	tr	40	60	15	15	10							50			tr	3	5		tr	tr	3			Foram-trace, nanno- & diatom-bearing silty clay
	234	10	90	0	40	35	2						20				5	2					tr			Nanno-trace, sandy silt
	237	5	30	65	5	5							10	65			tr	5	1			3	6			Diatom-trace, foram- & nanno-bearing silty clay
	276	tr	100	0	30	35	20			tr			5				4	3	1			tr	tr			Foram-, nanno- & diatom-trace, very coarse silt
	299	15	85	0	35	40	10*						10				1	2	tr				tr			Diatom- and nanno-trace, sandy silt
	305	5	45	50	5	20	10						10	25			tr	3	20			tr	5			Nanno-bearing, diatom-rich silty clay
	362	95	5	0	35	25	30*						2				2	3					tr			Nanno-trace, lithic fine sand
	374A				tr	tr							10						20		20		50			Diatom-rich, nanno-ooze
	374B	10	30	60	5	10	tr						15				tr	tr	20		tr	tr	50			Diatom-rich, nanno-ooze
73	9	30	60	10	5	10			20	30			tr			10	tr	5			20					Zeolitic(?) ash
	12	10	40	50	5	5	5							13		5	5	3	1		5	3	50			Diatom-trace, foram-bearing, nanno-ooze
	30	0	40	60	5	5	10						20	20		5	1	4	5				30			Diatom-bearing, muddy nanno-ooze
	43.5	0	60	40	2	1				50	40					5	2	tr	tr				tr			Nanno- & diatom-trace, palagonitic(?) ash
	54	100	0	0						100																Ash
	55	5	20	75	5	5	5			20			10	50		tr			2		3		3			Diatom- & nanno-trace, tuffaceous silty clay
	81	95	5	0	35	25							10				2	3				25	tr			Nanno-trace, foram-rich fine sand
	92.5	0	60	40	5	5			10	30						10	tr	3	tr							Tuffaceous mud
	100	95	5	0	tr	3				75							2	20								Ash
	104	0	5	95	tr	tr	5						tr	90							tr		tr			Nanno-trace clay
	105	5	20	75	tr	1	tr			tr			20			tr	tr	1	2		1	5	20			Diatom- & foram-bearing, nanno-rich silty clay
	110	10	40	50	10	10	3			tr			30				tr	1	1		1	3	20			Diatom-trace, foram-bearing, nanno-rich calcareous mud
	112.5	95	5	0	20	35	15*	tr					5				10	5				10	tr			Nanno-trace, foram-rich, feldspathic sand
	134	3	37	60	tr	3	10			tr			7	60			1	2	5		tr	10	3			Diatom- & nanno-bearing silty clay
	136	25	55	20	5	5				40	tr		3	20		10	10	15					tr			Nanno-trace, tuffaceous sandy mud
	139	80	20	0		30		tr		50						5	3	10	tr							Diatom-trace, feldspathic ash
	141.5	90	10	tr	5	10			6	20			3				10	45	tr				1			Diatom- & nanno-trace, glass-rich, heavy mineral sand
	144.5	90	10	0	tr	3				85			tr				2	10	tr		tr	tr	tr			Diatom-, nanno-, & foram-trace ash
	163.5	90	10	0	5	10				5			20					10			3	45	2	tr		Nanno-trace, foram sand
	185	60	30	10	5	20				20			10				18	25				2	tr			Nanno-trace, foram-bearing, silty sand
	221.5	30	60	10	5	5	5			40	tr			25			2	3	tr		tr	10	5			Diatom-trace, nanno- & foram-rich, tuffaceous mud
	265	10	90	0	15	50	10						10				10	5	tr		tr	tr	tr			Diatom-, nanno- & foram-trace, hornblende-rich feldspathic sand
	305	10	70	20	10	30	20				tr		5	19			3	5	5				3			Nanno- & diatom-bearing clayey silt
	342.5	20	50	30	10	20	5						10	30			2	3	tr		tr		20			Diatom-trace, nanno-bearing, sandy mud
	375	20	80	0	15	35	10						15				15	10	tr			1	tr			Diatom-, nanno- & foram-trace, feldspathic silt
	400	20	50	30	20	35	9						19				1	10	3				3			Diatom- & nanno-bearing, feldspathic sandy mud
	490	0	70	30	15	30	10							25			tr	5	10				5			Nanno- & foram-rich, clayey silt
	510	30	70	0	10	40	20			tr		tr	15				5	5	2			tr	3			Foram-trace, nanno- & diatom-bearing, feldspathic sandy silt
	650	20	60	20	10	20			tr				10	10			tr	5	10		5	tr	30			Diatom-rich, nanno mud

* Including lithic fragments.

4. Micropaleontological studies of core samples

1) Nannoplanktons

by Shiro Nishida

This preliminary report is the study of fourteen samples taken from the core catcher or apex of piston and gravity corers. Smear slides were prepared and light-microscope techniques were used to identify nannoplankton species. Identified nannoplanktons are as follows.

St. 2, mud in core catcher: barren.

St. 10, mud in core catcher: unidentified nannoplanktons.

St. 15, mud adhered to pilot corer: *Cyclococcolithus leptoporus*, *Gephyrocapsa oceanica*, *Helicopontosphaera kamptneri* and unidentified nannoplanktons.

St. 21, mud in core catcher: *Gephyrocapsa oceanica* and unidentified nannoplanktons.

St. 23, sand in core catcher: *Cyclococcolithus leptoporus*, *Gephyrocapsa oceanica*, *Helicopotosphaera kamptneri* and unidentified nannoplanktons.

St. 25, apex of gravity corer: *Cyclococcolithus leptoporus*, *Gephyrocapsa oceanica*, *Helicopotosphaera kamptneri* and unidentified nannoplanktons.

St. 26, apex of gravity corer: *Cyclococcolithus leptoporus*, *Gephyrocapsa oceanica*, *Helicopontosphaera kamptneri* and unidentified nannoplanktons.

St. 27, apex of gravity corer: *Cyclococcolithus leptoporus*, *Gephyrocapsa oceanica*, *Helicopontosphaera kamptneri* and unidentified nannoplanktons.

St. 28, apex of gravity corer: *Cyclococcolithus leptoporus*, *Coccolithus pelagicus*, *Gephyrocapsa oceanica*, *Helicopontosphaera kamptneri* and unidentified nannoplanktons.

St. 29, apex of gravity corer: *Cyclococcolithus leptoporus*, *Gephyrocapsa oceanica*, *Helicopontosphaera kamptneri*, *Pontosphaera japonica* and unidentified nannoplanktons.

St. 31, mud adhered to core catcher: barren.

St. 56, mud in core catcher: barren.

St. 65, mud in core catcher: *Cyclococcolithus leptoporus*, *Gephyro-*

capsa oceanica, Helicopontosphaera kamptneri and unidentified nannoplanktons.

St. 73, mud in core catcher: *Gephyrocapsa oceanica* and unidentified nannoplanktons.

2) Benthonic foraminifera

by Tokuhiko Kameyama

The quater core samples of St. 23-1, 23-2, 25, 26, 27, 28 and 29 are divided into three parts vertically, and one of them is sampled for the study of benthonic foraminifera. The others are used for the sedimentological study and the further study.

The samples for the benthonic foraminiferal study are used under the following purposes: (1) The research of relation between arrangements of sand grains and benthonic foraminifera to discriminate between autochthonous and allochthonous assemblages and to know the living positions of benthonic foraminifera; (2) The study of benthonic foraminiferal assemblages.

Each core sample is cut off at 3 cm length from the top of core, numbered as zero, and then the remained core samples are cut off at 5 cm length interval and numbered as 1, 2, 3, ..., n, from 3 cm to the bottom of cores, respectively. Zero and odd numbered cut samples are used for the study of benthonic foraminiferal assemblages and the others are for the research of relation between the arrangements of sand grains and benthonic foraminifera. The formers are washed through the sieve of 200 mesh and the latters are used to make many lacquer peels of vertical and horizontal sections.

5. Organic matter geochemistry

by Kazuo Taguchi and Nobuo Hayashida (Stations 2, 10, 23),
Nobuo Hayashida and Manabu Shiobara (Stations 56, 58)

A total of 156 core samples by the gravity and the piston corers was collected from 5 stations as listed below for the study of organic geochemistry. The core samples taken were divided into three or four parts and then were cut off at intervals of about 20 centimeters for the analysis.

All samples were frozen immediately after collection and were preserved for the future studies which will be covered by the analyses of organic carbon, various hydrocarbons, amino acids and porphyrin compounds.

The results of macroscopic and microscopic observations on those samples are described in other parts of this report.

Station	Corer	Core Length	No. of Samples
2	Piston	660 cm	25
10	Piston	1046	53
23	Gravity	80	4
56	Piston	745	37
58	Piston	757	38

6. pH, Eh measurements

by Masato Nohara

The values of pH and oxidation-reduction potential, Eh, were measured with Hitachi-Horiba Model F5 pH meter.

A glass and calomel (3.5 M Kcl internal soln.) elctrodes, a platinum and calomel (satu. Kcl internal soln.) elctrodes were used for measurement of pH and Eh, respectively.

The pH values which were measured at several points of the core showed about 7.0 to 7.9 pH.

The Eh values showed oxidation state or reduction state reflecting chemical characteristic condition of each core.

The result of measurements are shown in Table 4.

Table 4

pH & Eh measurements

Station							
St. 2	Depth (cm)*	0	20	100	300	600	680
	pH	7.6	7.5	7.5	7.5	7.4	7.4
	Eh (mv)	+250	+250	+150	+150	+130	+130
St. 21	Depth (cm)	0	200	400	600	800	1010
	pH	7.4	7.4	7.4	7.4	7.4	7.4
	Eh (mv)	-160	-175	-150	-160	-170	-170
St. 56	Depth (cm)	0	295				
	pH	7.1	7.0				
	Eh (mv)	+500	+475				
St. 58	Depth (cm)	0	70	230	407	617	
	pH	no measurement					
	Eh (mv)	+ 5	+150	+130	+180	+100	
St. 65	Depth (cm)	0	200	400			
	pH	7.8	7.8	7.9			
	Eh (mv)	- 50	-170	-100			
St. 73	Depth (cm)	200	400	600	670		
	pH	7.7	7.5	7.7	7.7		
	Eh (mv)	-140	-160	-115	-100		

* Depth (cm) from the top of the core

7. Soft X-ray

by Tetsuro Harata, Hideo Kagami, Kenichi Otsuka and Chiaki Igarashi

Soft X-ray radiography was used to observe sedimentary structures in the samples cored at Stations 2, 21 and 65.

Apparatus: Fuji-Röntogen Type K-2 (A.C. 100V, 60 KVP, 5 mA, 0.4 A)

Type of film: Fuji Softex Film, High speed

Developer: Fuji Sofdole

Fixing bath: Fujifix

Station 2: Two parts, 10 to 30 cm and 160 to 180 cm from the top, were radiographed. The radiograph (160 to 180 cm) showed many mottled structures by burrowing organisms.

Station 21: A 615 cm long half core was radiographed on seven films. Many sedimentary structures such as parallel lamination, cross lamination and convolution, which were indiscernible to the naked eye, were observed. (See Fig. 35.)

Station 65: A 390 cm long half core was radiographed on 15 films. Many sedimentary structures, which were invisible to the naked eye, were observed.

8. Shear strength measurements

by Hideo Kagami

The fall cone penetration apparatus of the Geonor, Norway was adapted to measure shear strength of the piston core samples. A cone of a certain weight and apex-angle is suspended vertically over and just touching the surface of the clay samples. When the cone is released, it penetrates into the sample. The depth of the penetration gives a measure of the undrained shear strength of the clay.

Since the measurement is carried out without confining loads, the strength shows, in general, a cohesion of the clay samples.

The investigation indicates the importance of the measured shear strength values of the abyssal clays as well as the importance of relating the fall cone test to the type of sampler used or to the disturbance of samples during its operation.

The core sample from St. 2 is taken by the Aluminium Piston Corer. The results of the fall cone measurement is shown in Fig. 36 and Table 5.

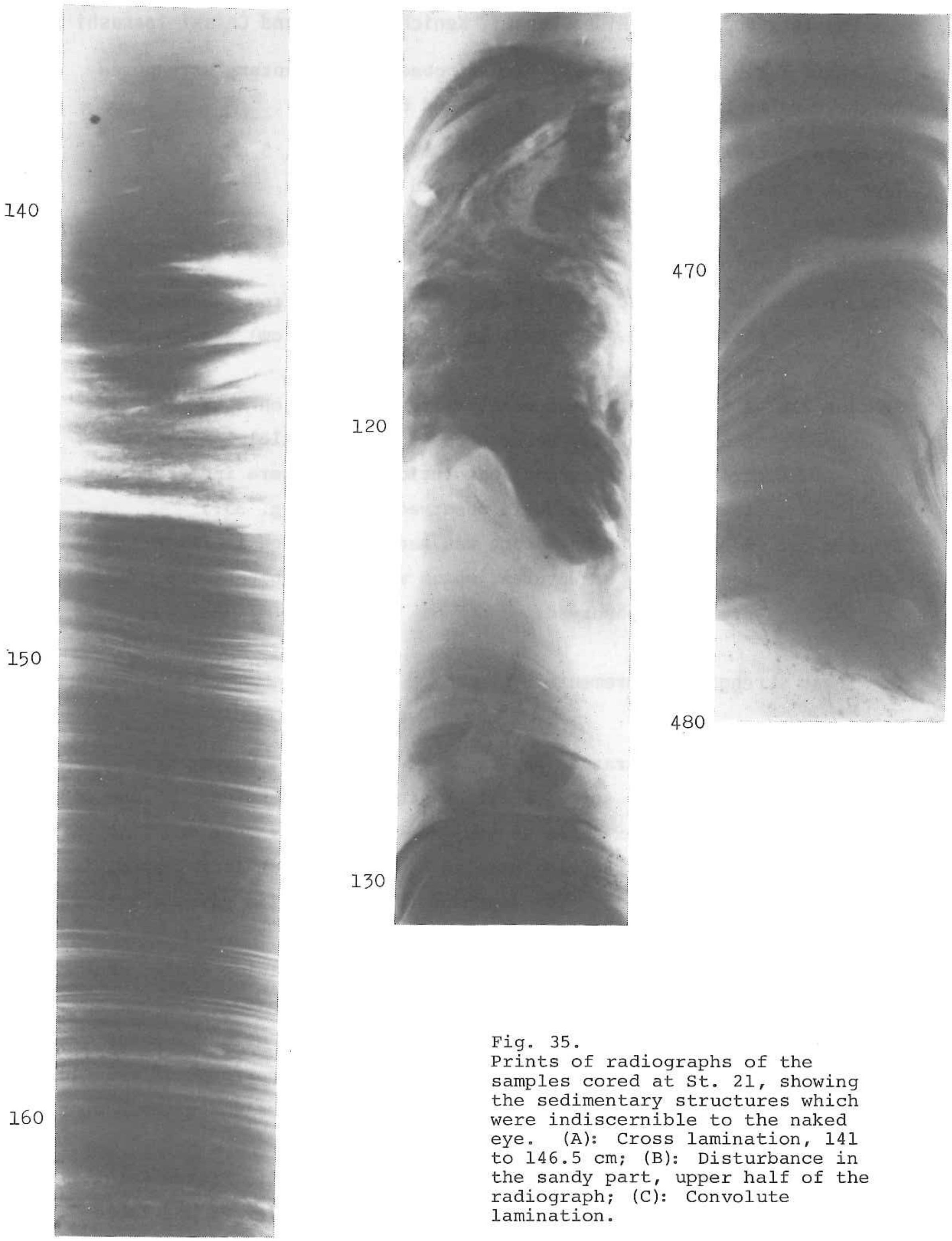


Fig. 35.
Prints of radiographs of the samples cored at St. 21, showing the sedimentary structures which were indiscernible to the naked eye. (A): Cross lamination, 141 to 146.5 cm; (B): Disturbance in the sandy part, upper half of the radiograph; (C): Convolute lamination.

Measured values of the upper 300 cm show somehow disturbance of the core samples during the operations. Those of the lower 300 cm show a typical red clay value (Fig. 36).

The fall cone measurement of total seven stations were carried out duirng the cruise.

Fig. 36.

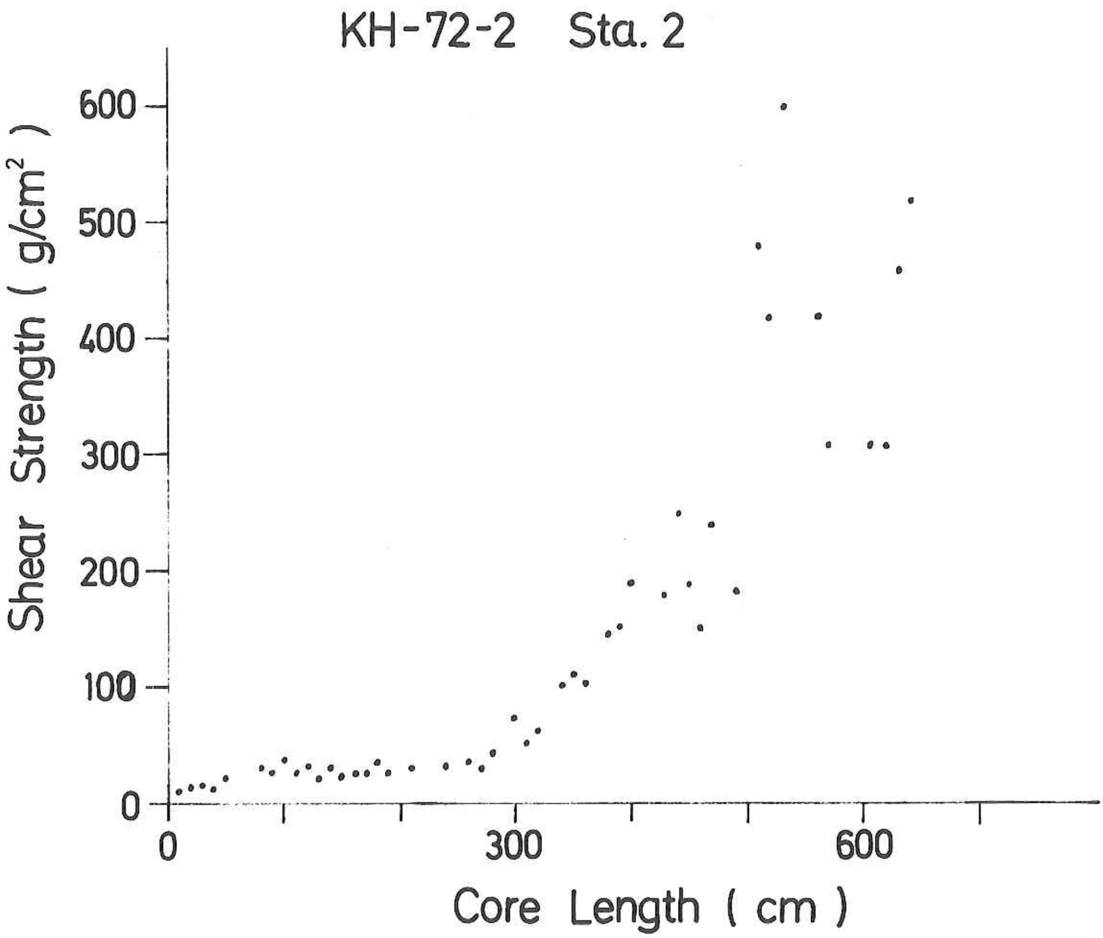


Table 5. Shear strength measurement of
CORE NO. KH-72-2, Sta. 2

Latitude: 31°47.8'N Longitude: 144°00.2'E

Date: Oct. 27, 1972 Time: Oct. 27, 1972

P.D.R. depth: 5790 m Profiler Sheet No.:

Depth to sub-bottom reflections on P.D.R.:

Geographic Location: Northwest Pacific Basin east off Izu-Bonin trench

Bottom Topography: slightly rough

Remarks: Corer pipe bent at 6 m 50 cm from the cutting edge, edge O.K.

Depth	Cone	Penetration	Shear Strength	Remarks
10 cm	60g 60°	11.9	11 g/cm^2	
20		10.3	14	
30		9.6	16	
40		10.2	14	
50		8.3	22	
60				
70				
80		7.0	31	
90		7.3	28	
100		6.2	39	
110		7.3	28	
120		6.6	34	
130		7.9	24	
140		6.7	33	

CORE NO. KH-72-2, Sta. 2

Depth	Cone	Penetration	Shear Strength	Remarks
150 cm		7.7	25 g/cm^2	
160		7.5	27	
170		7.3	28	
180		6.2	39	
190		7.3	28	
200		1.5	/	
210		6.9	32	
220				
230				
240		6.6	34	
250	100g 30°	20	(25)	
260	60g 60°	6.3	38	
270		6.7	33	
280		5.7	46	
290		3.2, 3.3		
300		4.4	77	
310		5.4	51	
320		4.8	65	
330		3.7		
340	100g 30°	9.9	103	
350		9.5	112	
360		9.8	105	

CORE NO. KH-72-2, Sta. 2

Depth	Cone	Penetration	Shear Strength	Remarks
370 cm		11.6	75 g/cm^2	
380		8.3	147	
390		8.2	151	
400		7.3	190	
410				
420				
430		7.5	180	
440		6.3	250	
450		7.3	190	
460		8.2	151	
470		6.5	240	
480				
490		7.4	185	
500		3.5		
510		4.6	480	
520		4.9	420	
530		4.1	600	
540		3.9		
550		2.9		
560		4.9	420	
570		5.7	310	
580				
590				

CORE NO. KH-72-2, Sta. 2

Depth	Cone	Penetration	Shear Strength	Remarks
600 cm				
605		5.7	310 g/cm^2	
620		5.7	310	
630		4.7	460	
640		4.4	520	
650		6.1	270	

9. List of distribution of samples

by Tetsuro Harata

Station	For preservation	Tokyo Univ. (Kobayashi)	Kyushu Univ. (Ohara)	Tohoku Univ. (Taguchi)	Kansai Group (Nishida)
Sta. 2	1/2-m	m	5/16	1/8	1/16
Sta. 10	1/2-m	m	1/6	1/6	1/6
Sta. 21	1/2-m	m			1/2 (Harata)
Sta. 31					5 gr.
Sta. 56	1/2-m	m	1/6	1/6	1/6
Sta. 58	1/2-m	m	1/6	1/6	1/6
Sta. 65	1/2-m	m			1/2 (Shiki)
Sta. 73	1/2-m	m			1/2 (Shiki)

10. Records of Piston core log

Core Log

Date: Nov. 1, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 10

Location: Shikoku Basin

Bottom Topography: Gentle slope in the basin south of an abyssal hill

Weather: Overcast Wind: 2 m W Sea: Smooth-wavelets, Moderate swell

Type of Corer: Chûkôkei Piston Corer (610 kg)

Barrel Length: 4 m Number of Barrel: 3

I.D. of Barrel: 83 m.m. I.D. of Inner Tube: 75 m.m.

Core Head Weight: 500 kg Trigger Weight: 50 kg

Length Main Wire: 19.3 m Length Trigger Wire: 18.7 m

Free Fall Length: 4.0 m Scope Length: 5.8 m

Time Lowered: 12:43 PDR Depth: 4440 m Depth Corr. 9 m

Time Hit: 14:12 Wire Out: 4365 m Wire Angle: 0°

Response of Hit: Good

PDR Depth: 4310 m Corr. Water Depth: 4313 m

Ship Position: Lat. 31°13.5'N; Long. 134°49.7'E

Condition of Pulling Out: Good, max. tension 5.2 ton

Time Surface: 15:26 Trigger Core Length: 66 cm

Penetration Length: 1115 cm Core Length: 1046 cm

Recovery Condition: Good

Length of Stored Core:

Number of Samples for Paleomagnetism:

Remarks:

Core Log

Date: Oct 27, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 2

Location: Northwest Pacific Basin east off Izu-Bonin trench

Bottom Topography: slightly rough

Weather: partly cloudy Wind: WSW 3.5 m Sea: smooth, wavelets, moderate swell

Type of Corer: Aluminium Piston Corer

Barrel Length: 12 m Number of Barrel: 1

I.D. of Barrel: 68 m.m. I.D. of Inner Tube: -- m.m.

Core Head Weight: 550 kg Trigger Weight: 60 kg

Length Main Wire: 20 m Length Trigger Wire: 20 m

Free Fall Length: 7 m Scope Length: -- m

Time Lowered: 12:10 PDR Depth: 5790 m Depth Corr.: 44 m

Time Hit: 14:01 Wire Out: 5902 m Wire Angle: 1°

Response of Hit: clear

PDR Depth: 5820 m Corr. Water Depth: 5872 m

Ship Position: Lat. 31°47.8'N; Long. 144°00.2'E

Condition of Pulling Out: clear

Time Surface: 15:45 Trigger Core Length: 57 cm

Penetration Length: appr. 600 cm Core Length: 692 cm

Recovery Condition:

Length of Stored Core: (1) (Top) 74 cm; (2) 151 cm; (3) 183.3 cm; (4) 188 cm; (5) 87 cm; (6) -- cm; (7) -- cm

Number of Samples for Paleomagnetism: 292 (No. 12700--No. 12992)

Remarks: Corer pipe bent at 6 m 50 cm from the cutting edge, edge OK

Core Log

Date: Nov. 7, 1972   Ship: Hakuho-Maru   Cruise: KH-72-2   Station: 31

Location: Nankai trough, off Shikoku

Bottom Topography: Flat

Weather: Cloudy   Wind: NNW 12 m   Sea: Rough, high swell

Type of Corer: Chûkôkei Piston Corer (610 kg)

Barrel Length: 4 m   Number of Barrel: 3

I.D. of Barrel: 83 m.m.   I.D. of Inner Tube: 75 m.m.

Core Head Weight: 500 kg   Trigger Weight: 50 kg

Length Main Wire: 19.3 m   Length Trigger Wire: 18.7 m

Free Fall Length: 4.0 m   Scope Length: 5.8 m

Time Lowered: 07:11   PDR Depth: 4860 m   Depth Corr.: 17 m

Time Hit: 09:05   Wire Out: 5070 m   Wire Angle: 11°

Response of Hit: Poor

PDR Depth: 4865 m   Corr. Water Depth: 4882 m

Ship Position: Lat. 31°47.1 N; Long. 133°56.0 E

Condition of Pulling Out: Poor

Time Surface: 10:40   Trigger Core Length: 0 cm

Penetration Length: 202 cm   Core Length: 0 cm

Recovery Condition:

Length of Stored Core: (1) (Top) 0 cm

Number of Samples for Paleomagnetism:

Remarks: Failed because trigger worked before hitting the bottom

Core Log

Date: Nov. 5, 1972   Ship: Hakuho-Maru   Cruise: KH-72-2   Station: 21

Location: Nankai trough off Shiono-misaki

Bottom Topography: Flat trough floor

Weather: Blue sky   Wind: NE 14 m   Sea: Rough sea, moderate swell

Type of Corer: Chûkôkei Piston Corer (610 kg)

Barrel Length: 4 m   Number of Barrel: 3

I.D. of Barrel: 83 m.m.   I.D. of Inner Tube: 75 m.m.

Core Head Weight: 500 kg   Trigger Weight: 50 kg

Length Main Wire: 19.3 m   Length Trigger Wire: 18.7 m

Free Fall Length: 4 m   Scope Length: 5.8 m

Time Lowered: 09:33   PDR Depth: 4610 m   Depth Corr.: 9 m

Time Hit: 11:20   Wire Out: 4693 m   Wire Angle: 6°

Response of Hit: clear

PDR Depth: 4640 m   Corr. Water Depth: 4653 m

Ship Position: Lat. 32°37.0 N; Long. 136°04.2 E

Condition of Pulling Out: Max. tension 4.5 ton

Time Surface: 12:44   Trigger Core Length: 0 cm

Penetration Length: 955 cm   Core Length: 1013 cm

Recovery Condition: Good

Length of Stored Core:

Number of Samples for Paleomagnetism:

Remarks: Turbidites

Core Log

Date: Dec. 2, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 58

Location: Northwest Philippine Basin

Bottom Topography: Rugged

Weather: Partly cloudy Wind: NNE 10 m Sea: Rough, moderate swell

Type of Corer: Aluminium Piston Corer

Barrel Length: 12 m Number of Barrel: 1

I.D. of Barrel: 680 m.m. I.D. of Inner Tube:

Core Head Weight: 550 kg Trigger Weight: 70 kg

Length Main Wire: 20 m Length Trigger Wire: 20 m

Free Fall Length: 7 m Scope Length:

Time Lowered: 13;32 PDR Depth: 5380 m Depth Corr.: 33 m

Time Hit: 15;21 Wire Out: 5395 m Wire Angle: 0°

Response of Hit: Clear

PDR Depth: 5300 m Corr. Water Depth: 5333 m

Ship Position: Lat. 22°53.2'N; Long. 129°13.2 E

Condition of Pulling OUt: Large Tension

Time Surface: 17:03 Trigger Core Lenth: 0 cm

Penetration Length: 600 cm Core Length: 755 cm

Recovery Condition: Core barrel bent at 7 m from the cutting edge

Length of Stored Core: (1) (Top) 65 cm; (2) 226 cm; (3) 425 cm; (4) 617 cm; (5) 748 cm;

Number of Samples for Paleomagnetism:

Remarks:

Core Log

Date: Nov. 21, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 56

Location: West Philippine Sea

Bottom Topography: Rugged

Weather: Rain Wind: NNW 13 m Sea: Very rough, high swell

Type of Corer: Aluminium Piston Corer

Barrel Length: 12 m Number of Barrel: 1

I.D. of Barrel: 680 m.m. I.D. of Inner Tube: --m.m.

Core Head Weight: 550 kg Trigger Weight: 70 kg

Length Main Wire: 20 m Length Trigger Wire: 20 m

Free Fall Length: 7 m Scope Length:

Time Lowered: 10:05 PDR Depth: 5390 m Depth Corr.: 33 m

Time Hit: 12:01 Wire Out: Wire Angle: 0°

Response of Hit: Clear

PDR Depth: 5360 m Corr. Water Depth: 5393 m

Ship Position: Lat. 21°34.4 N; Long. 132°42.3 E

Condition of Pulling OUt:

Time Surface: 13:30 Trigger Core Length: 0 cm

Penetration Length: 560 cm Core Length: 745 cm

Recovery Condition: Core barrel bent at 6 m from the cutting edge

Length of Stored Core: (1) (Top) 140 cm; (2) 290 cm; (3) 480 cm; (4) 675 cm; (5) 745 cm;

Number of Samples for Paleomagnetism:

Remarks:

Core Log

Date: Dec. 9, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Staiton: 73
Location: Okinawa Trough
Bottom Topography: Gently undulating trough floor
Weather: Blue sky Wind: NE 7 m Sea: Moderate, moderate swell
Type of Corer: Chûkôkei Piston Corer (600 kg)
  Barrel Length: 4 m Number of Barrel: 2
  I.D. of Barrel: I.D. of Inner Tube: 750 m.m.
  Core Head Weight: 550 kg Trigger Weight: 70 kg
  Length Main Wire: 15.2 m Length Trigger Wire: 14.7 m
  Free Fall Length: 4 m Scope Length: 5.8 m
Time Lowered: 12;38 PDR Depth: 2130 m Depth Corr.: -12 m
Time Hit: 13;26 Wire Out: 2136 m Wire Angle: 1°
  Response of Hit: Good
  PDR Depth: 2116 m Corr. Water Depth: 2104 m
  Ship Position: Lat. 26°00.3 N; Long. 125°44.5 E
  Condition of Pulling Out: 2120 m, 2.3 ton
Time Surface: 14;10 Trigger Core Length: none
  Penetration Length: 750 cm Core Length: 670 cm
  Recovery Condition: Good
Length of Stored Core:
Number of Samples for Paleomagnetism:
Remarks:

Core Log

Date: Dec. 5, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 65
Location: Okinawa Trough
Bottom Topography: Flat bottom, gently undulating
Weather: partly cloudy Wind: SSE 5 m Sea: Rough, moderate swell
Type of Corer: Chûkôkei Piston Corer (600 kg)
  Barrel Length: 4 m Number of Barrel: 3
  I.D. of Barrel: 83 m.m. I.D. of Inner Tube: 750 m.m.
  Core Head Weight: 550 kg Trigger Weight: 60 kg
  Length Main Wire: 19.3 m Length Trigger Wire: 18.7 m
  Free Fall Length: 4 m Scope Length: 5.8 m
Time Lowered: 14:49 PDR Depth: 2090 m Depth Corr.: -12 m
Time Hit: 15:51 Wire Out: 2093 m Wire Angle: 3°
  Response of Hit: Clear
  PDR Depth: 2090 m Corr. Water Depth: 2078 m
  Ship Position: Lat. 25°29.2 N; Long. 124°48.6 E
  Condition of Pulling Out: Poor, tension 2 ton
Time Surface: 16:39 Trigger Core Length: 0 cm
  Penetration Length: Core Length: 400 cm
  Recovery Condition: Barrel bent at 4.3 m from the cutting edge
Length of Stored Core:
Number of Samples for Paleomagnetism:
Remarks:

8. Cravity Cores

1. Visual core description

by Tetsuro Harata, Jyonosuke Ohara and Takao Tokuoka

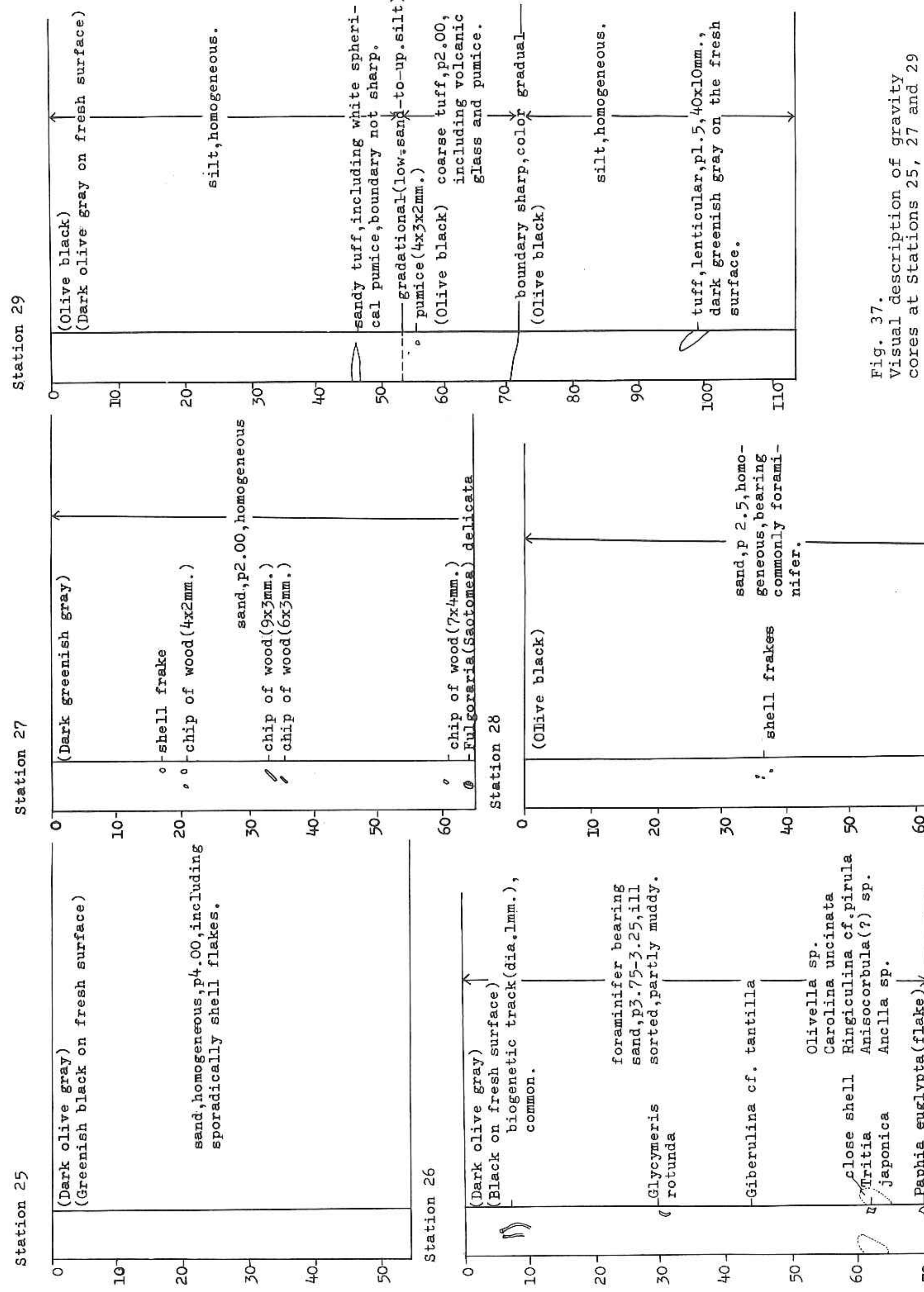


Fig. 37.
Visual description of gravity cores at Stations 25, 27 and 29

2. Mineralogical studies of core samples (Stations 23, 25, 26, 27, 28 and 29)

by Jyonosuke Ohara

Mineralogical studies of the core samples were carried out and the results are shown in the following table (Table 6).

The method of observation is shown in 7-3-1.

Results: Hornblende and pyroxene will be brought from volcanic ash and zircon and tourmaline, etc. will come from the rocks of the land. The formation of pyrite and glauconite is noteworthy.

Table 6. Constituent of the core samples of St.23,25-29.

Station Number	Sample Number	Volume of Coarse Fraction	Light Matter								Heavy Matter																													
							Organisms						Heavy Minerals																											
													ZIRCON			TOURMALINE								HORNBLENDE										BIOTITE						
			Volume	Sorting	Pumice	Glass Shard	Diatom	Radiolaria	Foraminifera	others	Volume	Sorting	colorless	brown	purple	green	brown	greenish brown	dark green	AUGITE	HYPERSTHENE	rhombic PYROXENE	GARNET	green	brown	greenish brown	light green	alkali amphibole	RUTILE	ANATASE	MONAZITE	TITANITE	EPDOTE	MUSCOVITE	green	greenish brown	brown	CHLORITE	GLAUCONITE	MAGNETITE	PYRITE	remarks
23		◎	◎	P		·	?	○	◎	○	◎	W	○			○		○		○		○	○	○	○			○					?						○			silty fine sand spl. of f layer
25	30 *	◎	◎	W	·	·		○	◎	○	◎	W	○					○		○	○	◎	○	○		○									○				○	·		
26	23	◎	◎	P	·	·		○	◎	○	◎	W	○							◎	◎	○	?	○		○					?								○	◎		
27	5 from the bottom	◎	◎	P	·	·			◎	○	◎	W	○	○					○	○	◎	○	○	○	○	○									○		○		○	◎		
28	20	◎	◎	P	·	·		○	◎	○	○	W	○				○			○	◎	○	○	○	○	○											○		?	◎	·	
29	50	◎	◎	P	◎			○	◎	○	◎	W								◎	◎	○		○		○									○		○			○	·	
29	62	◎	◎	P	◎				◎	○	○	W	○					○		○	◎	○		○	○	○											○		○	○	·	

LEGEND ; ◎ : Dominant , c : Common , · : rare , ○ : present (in heavy minerals) , W : Well , P : Poor

* cut from the Top.

3. Micropaleontological studies of core samples: foraminifera (Stations 24-29)

by Mutsuji Aoshima

Living populations of the benthonic foraminifera collected by the Phleger type core sampler which was used as the pilot of the gravity corer were analysed. Uppermost 1 cm of the core samples were cut off and fixed by the neutralized solution of 10% formalin. After the fixation, samples were washed with water by 200 mesh sieve. In order to distinguish living individuals, washed materials were immersed in Rose Bengal solution (1g/L) for 24 hours for staining the protoplasms. After staining, the samples were washed with hot water in order to wash off Rose Bengal. Then, the samples were dried and all the "living" individuals were picked up and identified. Characteristic species of each sample are as follows:

St. 24: *Bolivina robusta* Brady, *B.* cf. *costatus* d'Orbigny *B.* cf. *pacifica* Cushman & McCulloch, *Uvigerina schencki* Asano, *Rectobolivina raphana* (Parker & Jones), *Florilus manpukujiensis japonicus* (Asano), *Cancris auriculus* (Fichtel & Moll), *Cibicides aknerianus* (d'Orbigny), *Rosalina vilardeboana* d'Orbigny, *Cassidulina carinata* Silvestri, *Fursenkoina* cf. *schreibersiana* (Czjzek), *Saccammina* cf. *longicollis* (Wiesner).

St. 25: *Bulimina marginata* d'Orbigny, *Cancris auriculus, Pseudoeponides japonicus* Uchio, *Cassidulina* sp.

St. 26: *Bulimina marginata, Bolivina robusta, Bolivina spissa* Cushman, *Bolivina bradyi* Asano, *Nonionella globosa* Ishiwada, *Gyroidinoides nipponicus* (Ishizaki), *Fursenkoina* cf. *schreibersiana, Chilostomella ovoidea* Reuss.

St. 27: *Trifarina kokozuraensis* (Asano), *Cassidulina carinata, Nonion nicobarensis* Cushman, *Globocassidulina subglobosa* Brady, *Gyroidinoides nipponicus, Cassidulinoides parkerianus* (Brady), *Buccela* cf. *inusitata* Andersen.

St. 28: *Bolivina pacifica, Trifarina kokozuraensis, Nonion nicobarensis, Cassidulina carinata, Gyroidinoides nipponicus, Chilostomella ovoidea, Saccammina* cf. *longicollis*.

St. 29: *Bulimina striata* d'Orbigny, *Cassidulina carinata, Gyroidinoides nipponicus, Pullenia bulloides* (d'Orbigny), *Reophax scorpiurus* Montfort, *Phizammina indivisa* Brady.

4. List of distribution

by Tetsuro Harata

Station		Quantity of distribution	University and group (representative)
Sta. 23	No. 1	the upper part (3 cm)	Tokyo Univ. (Aoshima)
		the half cut lengthwise	Kyushu Univ. (Kameyama)
		"	Kwansai Group (Nishida)
	No. 2	all	Kwansai Group (Nishida)
	No. 4	all	Tokyo Univ., for preservation
	No. 5	the half cut lengthwise	Kyushu Univ. (Kameyama)
		"	Kwansai Group (Nishida)
Sta. 25 26 27 28		the upper part (3 cm)	Tokyo Univ. (Aoshima)
		the half cut lengthwise	Tokyo Univ., for preservation
		the one fourth cut lengthwise	Kyushu Univ. (Kameyama)
		"	Kwansai Group (Nishida)
Sta. 29		the one fourth cut lengthwise	Tohoku Univ. (Taguchi)
		"	Tokyo Univ., for preservation
		"	Kyushu Univ. (Kameyama)
		"	Kwansai Group (Nishida)

5. Records of gravity core log

Gravity Core Log

Date: Nov. 6, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 23

Location: Continental shelf off Ashizuri Misaki, Shikoku

Bottom Topography: Flat

Weather: rain Wind: SSE 6 m Sea: Slight wave, moderate swell

Type of Corer: Phleger corer

Barrel Length: 44 m Number of Barrel: 1

I.D. of Barrel: 41 m.m. I.D. of Inner Tube: 36 m.m.

Core Head Weight: 20 kg Trigger Weight:

Length Main Wire: Length Trigger Wire:

Free Fall Length: Scope Length:

Time Lowered: 07:42 PDR Depth: 70 m Wire Angle: 0°

Response of Hit: Clear

PDR Depth: 70 m Corr. Water Depth: 71 m

Ship Position: Lat. 33°07.5 N; Long. 133°11.9 E

Condition of Pulling Out: Clear

Time Surface: 08:30 Trigger Core Length:

Penetration Length: Core Length:

Recovery Condition: Good

Length of Core: (1) 25 cm; (2) 0 cm; (3) 17 cm; (4) 22.5 cm;
(5) 17 cm

Number of Samples for Paleomagnetism:

Remarks:

Gravity Core Log

Date: Nov. 2, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 15

Location: Kii Strait

Bottom Topography: Flat floor of Hidaka submarine canyon

Weather: Partly cloudy Wind: SE 3 m Sea: Smooth sea, weak swell

Type of Corer: Gravity corer (120 kg)

Barrel Length: 2 m Number of Barrel: 1

I.D. of Barrel: 70 m.m. I.D. of Inner Tube: 63 m.m.

Core Head Weight: 120 kg Trigger Weight: 20 kg

Length Main Wire: 11.8 m Length Trigger Wire: 11.5 m

Free Fall Length: 9 m Scope Length:

Time Lowered: 12:34 PDR Depth: 1420 m Depth Corr.: 9 m

Time Hit: 13:24 Wire Out: 1470 m Wire Angle: 3°

Response of Hit: vague

PDR Depth: 1405 m Corr. Water Depth: 1394 m

Ship Position: Lat. 33°31.5 N; Long. 135°05.1 E

Condition of Pulling Out: vague

Time Surface: 14:06 Trigger Core Length: 26 cm

Penetration Length: Core Length: 0 cm

Recovery Condition:

Length of Stored Core:

Number of Samples for Paleomagnetism:

Remarks: Phleger corer was used for trigger.

Gravity Core Log

Date: Nov. 6, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 26

Location: Continental slope off Ashizuri Misaki, Shikoku

Bottom Topography: Flat

Weather: Cloudy Wind: SSE 19 m Sea: Rough sea, moderate swell

Type of Corer: Gravity corer (120 kg)

Barrel Length: 2 m Number of Barrel: 1

I.D. of Barrel: 70 m.m. I.D. of Inner Tube: 63 m.m.

Core Head Weight: 120 kg Trigger Weight: 20 kg

Length Main Wire: Length Trigger Wire:

Free Fall Length: Scope Length:

Time Lowered: 11:01 PDR Depth: 202 m Depth Corr.: 0 m

Time Hit: 11:10 Wire Out: 215 m Wire Angle: 5°

Response of Hit: Clear

PDR Depth: 202 m Corr. Water Depth: 202 m

Ship Position: Lat. 32°57.5 N; Long. 133°21.4 E

Condition of Pulling Out:

Time Surface: 11:20 Trigger Core Length: 15 cm

Penetration Length: 130 cm Core Length: 69 cm

Recovery Condition:

Length of Stored Core: (1) (Top) 69 cm

Number of Samples for Paleomagnetism:

Remarks: Phleger corer was used for trigger.

Gravity Core Log

Date: Nov. 6, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 25

Location: Continental shelf off Ashizuri Misaki, Shikoku

Bottom Topography: Flat

Weather: Overcast Wind: SSE 15 m Sea: Moderate sea, moderate swell

Type of Corer: Gravity corer (120 kg)

Barrel Length: 2 m Number of Barrel: 1

I.D. of Barrel: 70 m.m. I.D. of Inner Tube: 63 m.m.

Core Head Weight: 120 kg Trigger Weight: 20 kg

Length Main Wire: 11.8 m Length Trigger Wire: 11.5 m

Free Fall Length: Scope Length:

Time Lowered: 09:36 PDR Depth: 123 m Depth Corr.: 1 m

Time Hit: 09:44 Wire Out: 125 m Wire Angle: 5°

Response of Hit: Clear

PDR Depth: 123 m Corr. Water Depth: 124 m

Ship Position: Lat. 33°02.5 N; Long. 133°16.8 E

Condition of Pulling Out:

Time Surface: 09:50 Trigger Core Length: 19 cm

Penetration Length: 119 cm Core Length: 55 cm

Recovery Condition:

Length of Stored Core: (1) (Top) 55 cm

Number of Samples for Paleomagnetism:

Remarks: Phleger corer was used for trigger.

Gravity Core Log

Date: Nov. 6, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 27
Location: Continental slope off Ashizuri Misaki, Shikoku
Bottom Topography: Flat
Weather: Partly cloudy Wind: SW 15 m Sea: Rough sea, moderate swell
Type of Corer: Gravity corer (120 kg)
  Barrel Length: 2 m Number of Barrel: 1
  I.D. of Barrel: 70 m.m. I.D. of Inner Tube: 63 m.m.
  Core Head Weight: 120 kg Trigger Weight: 20 kg
  Length Main Wire: Length Trigger Wire:
  Free Fall Length: Scope Length:
Time Lowered: 12:32 PDR Depth: 370 m Depth Corr.: 0 m
Time Hit: 12:48 Wire Out: 427 m Wire Angle: 10°
  Response of Hit: Clear
  PDR Depth: 390 m Corr. Water Depth: 390 m
  Ship Position: Lat. 32°52.1 N; Long. 133°25.6 E
  Condition of Pulling Out:
Time Surface: 13:01 Trigger Core Length: 11 cm
  Penetration Length: 97 cm Core Length: 65 cm
  Recovery Condition:
Length of Stored Core: (1) (Top) 65 cm
Number of Samples for Paleomagnetism:
Remarks: Phleger corer was used for trigger.

Gravity Core Log

Date: Nov. 6, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 28
Location: Continental slope off Ashizuri Misaki, Shikoku
Bottom Topography: Gentle slope
Weather: Partly cloudy Wind: SW 15 m Sea: Rough sea, moderate swell
Type of Corer: Gravity corer (120 kg)
  Barrel Length: 2 m Number of Barrel: 1
  I.D. of Barrel: 70 m.m. I.D. of Inner Tube: 63 m.m.
  Core Head Weight: 120 kg Trigger Weight: 20 kg
  Length Main Wire: Length Trigger Wire:
  Free Fall Length: Scope Length:
Time Lowered: 13:50 PDR Depth: 495 m Depth Corr.: -2 m
Time Hit: 14:08 Wire Out: 523 m Wire Angle: 10°
  Response of Hit: Clear
  PDR Depth: 475 m Corr. Water Depth: 473 m
  Ship Position: Lat. 32°50.8 N; Long. 133°26.0 E
  Condition of Pulling Out:
Time Surface: 14:30 Trigger Core Length: 18 cm
  Penetration Length: 115 cm Core Length: 70 cm
  Recovery Condition:
Length of Stored Core: (1) (Top) 70 cm
Number of Samples for Paleomagnetism:
Remarks: The first trial failed to lose Ewing pilot corer.

Gravity Core Log

Date: Nov. 6, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 29

Location: Continental slope off Ashizuri Misaki, Shikoku

Bottom Topography: Gentle slope

Weather: Partly cloudy Wind: WSW 15 m Sea: Very rough, moderate swell

Type of Corer: Gravity corer (120 kg)

Barrel Length: 2 m Number of Barrel: 1

I.D. of Barrel: 70 m.m. I.D. of Inner Tube: 63 m.m.

Core Head Weight: 120 kg Trigger Weight: 20 kg

Length Main Wire: Length Trigger Wire:

Free Fall Length: Scope Length:

Time Lowered: 15:52 PDR Depth: 800 m Depth Corr.: -5 m

Time Hit: 16:26 Wire Out: 902 m Wire Angle: 5°

Response of Hit:

PDR Depth: 808 m Corr. Water Depth: 803 m

Ship Position: Lat. 32°43.8 N; Long. 133°30.4 E

Condition of Pulling Out: Tension raised

Time Surface: 16:59 Trigger Core Length: 19.5 cm

Penetration Length: 190 cm Core Length: 114 cm

Recovery Condition:

Length of Stored Core: (1) (Top) 114 cm

Number of Samples for Paleomagnetism:

Remarks: 1/4 sample was stored

9. Dredging the Ocean Floor

1. Purpose and main results (Okinawa trough)

by Rhyohei Takahashi and Kiyoshi Ishibashi

In Kyushu, the Tertiary is widely distributed both in the northwestern and southeastern sides, setting apart the middle Kyushu.

The middle part of Kyushu seems to be continuously uplifted since the late Cretaceous, and corresponding to this upheaval movement, the Tertiary basins had gradually shifted to outer side respectively. As this movement seems to be of an expression of the Ryukyu arc, the Tertiary ranging from the Amakusa to the Nojima group on land might intensely be developed in the inner area of the Ryukyu arc, particularly near and around the Okinawa trough. To assure the presumption described above and to interpret mechanism of the creation of the Okinawa trough, it is necessary without doubt to take up trough-making solid rock from the trough itself. As the northern wall of the trough appears to be covered with just thin recent sediments, stations for dredge are chosen at 68, 69, 74 and 83.

While only recent deposits consisting of greenish blue clay and sandy silt are obtained at St. 68, many pieces of solid rock are obtained at other three stations.

At St. 69, a great amount of sandstones are obtained. They are pale blue, massive, homogeneous, well sorted, fine to medium grained sandstones; nearly the same nature. Under the naked eyes, muscovite is predominant. A lot of small coal grains predominate too, which scatter homogeneously but sometimes arrange linearly, displaying thin beds. Because these coal grains might be coalified in sandstone, not because of drift origin, diagenetic grade could be determined with measurement of reflectance on polished surface of coal grains. In hand-piece scale, turbidity structure is occationally observed. Compaction of sandstone is not so intense. Because they are rather calcareous, paleontological study will be carried out in future.

At St. 74 three kinds of solid rock are obtained. One is white-pale bluish semi-solid siltstone. It rarely contains small fragments of molluscan fossils. The second sort is white and very porous rhyolitic pumice. The third one is manganese-coated pebble. Most of them are sedimentary; the only one exception is two-pyroxene andesite. Sedimentary rocks are fine grained, well sorted, matrix-rich sandstones. As on the surfaces of these pebbles, impressions of molluscan fossils remained; the geological age of these pebbles might be determined by further paleontological investigation.

At St. 83 a great amount of pumice is picked up. Although they have a little different appearance, once compact, once porous, they might be the same rhyolitic pumices.

2. Ferromanganese nodules

by Masato Nohara and Kenji Konishi

It has never been reported that many ferromanganese nodules exist in southwestern Japan. During the cruise, ferromanganese nodules or carbonates coated with mangan oxides are collected at the Sts. 2, 46 and 52.

The nodules at St. 2 are brownish and ellipsoidal in shape and large, about 5 cm in diameter. No core materials exist in the nodules. Micro-nodules are found at the near top of the same core sample with altered pumices.

The nodules dredged at St. 46, Amami plateau, are dark brownish and spherical ellipsoidal, irregular in shape. Most of the nodules contain phosphatic carbonates as nuclei which are moderately altered and replaced with oxides partly. In addition, volcanic and detrital materials are observed in the nodules as nuclei.

Especially, volcanic nucleus, two-pyroxene andesite (see petrographic description) which is very high in maturity seems to be important as to an origin of the nodules in this region (see the division of the carbonate sediments and carbonate rocks with regard to the carbonates coated with mangan oxides).

Preliminary chemical analyses are carried out on the nodules at St. 46 in laboratory. The results of the analyses are shown in Table 7 with another data of nodules in the deep-sea and the Pacific Ocean. Element weight percentages are expressed on a dry weight basis. The Fe contents are higher than Mn contents.

According to the results reported already, a nodule collected from shallow marine or near continental borderland or lake has following characteristics. They are more abundant in Fe than in Mn, the same as shown in the table.

The Co contents vary from 0.2% to 0.3% and those of Ni from 0.2% to 0.5%. The average values of Zn and Pb contents are somewhat higher than those of the deep-sea nodules. The Cu contents, however, are markedly lower.

It is notable that the contents of trace element are higher than those of another shallow-marine nodules which have generally lower value in the elements of Cu, Zn, Co, etc.

Table 7

Results of preliminary analysis

Element	St. 46 average (%)	Deep-sea nodule average (%)	Pacific nodule average (%)
Mn	13.28	18.97	17.03
Fe	21.89	11.68	12.17
Cu	0.087	0.400	0.310
Pb	0.209	0.100	0.017
Zn	0.081	0.055	-
Co	0.262	0.280	0.100
Ni	0.429	0.580	0.280
Sr	0.015	-	-
Ca	0.145	-	-

3. Mineralogical studies of dredge samples

1) Legs 1 and 2

by Jyonosuke Ohara

Mineralogical studies of the dredge samples at Legs 1 and 2 were carried out and the results are shown in the following table (Table 8). The method of observation is shown in 7-3-1.

Results: Hornblende and pyroxene will be brought from volcanic ash. Zircon and tourmaline, etc. will come from the land. Formation of pyrite is noteworthy in the samples of Sts. 9, 12 and 19.

Table 8 Constituent of the dredge samples of the Legs 1 and 2.

Light Matter and Heavy Matter (volume, sorting)

Station Number	Sample Number	Volume of Coarse Fraction	Light Matter: Volume	Light Matter: Sorting	Pumice	Glass Shard	Organisms: Diatom	Organisms: Radiolaria	Organisms: Foraminifera	Organisms: others	Heavy Matter: Volume	Heavy Matter: Sorting
4	coarse	◎	◎	P	◎	○	○	○		○	◎	P
	mixture	◎	◎	P	◎	○	○	◎	○	○	○	W
6	gray	◎	◎	W	○	○	?	○	◎	○	○	W
	brown (coarse)	◎	◎	W	○	○	○	○	◎	○	○	W
8		·	·	W	·	○	○	◎	◎	○	·	W
9	A	○	○	P	·	·	○	○	○		○	W
	B	○	○	W	·	·	○	○	○	○	○	W
	B(2)	◎	◎	P	○	·	○	○	◎	○	·	W
12	A brown	◎	○	W	·	·	◎	○	○	○	○	W
	A gray	◎	◎	P	·	·	◎	○	○	○	·	W
	B blue	◎	◎	P	·	·	○	○	◎	○	·	W
	B hard	◎	◎	P	·	·		○	○	○	·	W
	chain A	◎	◎	P	○	·	○	○	○	○	○	W
17	A	◎	◎	P	◎	○	○	○	○		◎	W
	B yellow	○	○	P	○	○	○	◎	○	○	◎	W
	B brown	◎	◎	W	○	○	○	○	○	○	◎	W
19	A	◎	◎	W	◎	○	○	○	○	○	◎	W
22	A	·	·	W	◎	○	○	○	◎	○	·	W
33	B	◎	◎	P	◎	○	○	◎		○	◎	W
37	A	◎	◎	P	○	○	○		◎	○	·	W
	B	/	/	/		○	○	○	◎	○	/	/
39	A	◎	◎	W	○	◎	○	○	◎	○	○	W
	B, gray	◎	◎	W	○	○	○	○	◎	○	◎	W
41	chain	·	·	W	○	◎	○	○	○	○	·	W
	A, brown	○	○	W	◎	○	○	◎	○	○	○	W
	B, brown	○	○	W	○	◎	○	◎	○	○	◎	W
	A, gray (1)	◎	○	P	○	○	○	○	◎	○	·	W
	A, gray (2)	○	○	P	○	○		○	◎	○	·	W
46		/	/	P					○	○	/	W
48	A	◎	◎	P	·	○		○	◎	○	·	W
50	A	◎	◎	W	○	○		○	◎	○	·	W
	B	◎	◎	P	○	○		○	◎	○	·	W
51	A	◎	◎	P		·			◎	○	·	W
52	A	◎	◎	W	○	○		○	◎	○	·	W
	B	◎	◎	W	○	○		○	◎	○	·	W
53	A	◎	◎	W	○	○		○	◎	○	·	W
	B	◎	◎	P		○		○	◎	○	·	W

Heavy Matter: Heavy Minerals

Station Number	Sample Number	ZIRCON colorless	ZIRCON brown	ZIRCON purple	TOURMALINE green	TOURMALINE brown	TOURMALINE greenish brown	TOURMALINE dark green	AUGITE	HYPERSTHENE	rhombic PYROXENE	GARNET	HORNBLENDE green	HORNBLENDE brown	HORNBLENDE greenish brown	HORNBLENDE light green	alkali amphibole	RUTILE	ANATASE	MONAZITE	TITANITE	EPIDOTE	MUSCOVITE	BIOTITE green	BIOTITE greenish brown	BIOTITE brown	CHLORITE	GLAUCONITE	MAGNETITE	PYRITE	remarks
4	coarse								○	◎															○				◎		
	mixture								◎	◎						○										○			◎		
6	gray								◎	◎			○	○	○											○			◎		
	brown (coarse)								?	○			◎		○											○			◎		
8									○	○			○											○	○			?	·		
9	A	○					?		○		○	○	◎	○	◎	○		○	?					○		○	?		○	○	
	B	○							○	○		○	◎		◎		○							○		○			·		
	B(2)	○							○	○	○	○	◎	○	◎	○									○	○			·		* white part of mud
12	A brown	○				○			?	○	◎	○		○	◎	○								○		○			·		
	A gray	○	○	○	○				◎	○	◎	○	◎		◎		?		?					○		○	?		·	○	
	B blue	○				○			○	○	◎	○	○	○	○		○									○	○		·	○	
	B hard	○				○			○	○	◎	○	○	○			○								○	○		○	·	◎	
	chain A	○			○		○		○	○	◎	○	○	○	○		○							○		○		○		○	
17	A	○				○			○	◎	○	○	○		○											○			◎		
	B yellow	○			○				○	◎	○			○	○											○		?	◎		
	B brown	○							◎	◎	○		○	○	○											○		?	○		
19	A	○			○				◎	◎			○	○	○									○		○			·	◎	
22	A	○							◎	○	○	?	○	○	○										○	○		?	·		
33	B	○							◎	○	○			○	○			?								○			◎		
37	A								○	◎	○		○		○								○		○			?	·		shell sand
	B								○	◎													?	○		○			◎		residue of panning
39	A	○						○		◎	○		○	○	○							?				○		○	○		
	B, gray	○							○	◎	○		○	○	○			?		?					○	○		○	·		
41	chain	○				○	○		○	◎	○		○	○	○						?					○		?	·		
	A, brown	○							○	◎	○		○	○	○										○	○			○		
	B, brown	○							○	◎	○		○	○	○										○				○		
	A, gray (1)						○		◎	○	○		○	○	○									?		○			·		
	A, gray (2)		○			○	○		◎	○			○	○	○											○			·		
46									○	◎					○														◎		sand of cylinder
48	A								○	◎	○		○	○	◎														○		
50	A								◎	○	○			○	○														○		
	B	○							○	○	○		○	○	◎											○			○		
51	A								○	◎					○														○		
52	A								○	○	○			○	◎														○		
	B								○	○	○			○	◎														○		
53	A	○							○	○	○			○	◎														○		
	B	○							○	○	○		○	○	◎														○		

LEGEND, ◎ : Dominant , ○ : Common , · : rare, ○: present W : Well P : Poor

2) Leg 3

by Hakuyu Okada

The sediments dredged on the shelf (Stations 60, 61 and 64; see Table 9) consist mostly of well-sorted, fine to medium sands. They are characterized by the presence of considerably rounded grains, in which well-rounded purple zircon was also recognized. Generally, opaque mineral grains tend to be better rounded than others. Another characteristic feature is that microcline is often detected among feldspar grains. Diagnostic heavy minerals are a suite of deep-green hornblende and clinopyroxene, some of which show worn outlines.

The sediments sampled on the Okinawa trough (Stations 68 and 69; Table 9) are characterized by calcareous nannoplankton ooze of grayish green color (5G 4/2). They are more or less sandy to silty. Coarser fractions contain such heavy minerals as green hornblende, clinopyroxene, zircon, garnet, and so forth.

4. Micropaleontological studies of dredge samples

1) Nannoplanktons

by Shiro Nishida

This report is the study of over thirty-one dredge samples taken for shipboard investigation during KH-72-2 Cruise. Smear slides were prepared for this purpose. Light-microscope techniques were used to identify nannoplanktons. Identified calcareous nannoplankton species are as follows (Table 10).

Table 9

Smear Slide Analysis of the Samples dredged at Stations Nos. 60, 61, 64, 68 and 69

Station No.	Sand : silt : clay ratio			Chief constituents																						Remarks
	Sand	Silt	Clay	Quartz	Feldspar	Chlorite & lithic fragments	Glass	Palagonite	Glauconite	Carbonate fragments	Zeolite	Hornblende	Clinopyroxene	Zircon	Garnet	Tourmaline	Other minerals	Opaques	Foraminifera	Nannos	Diatoms	Radiolarians	Spicules	Silicoflagellates	Pellets	
60	100	tr	tr	35	15	15						6	4	tr		tr	tr	24	1	tr			tr			Nanno- & foram-trace, well-sorted fine sand
61	95	5	tr	30	10	20				2		3	2		tr	tr	tr	30	3	tr			tr			Nanno-trace, foram-bearing fine sand
64	100	tr	tr	35	10	15	tr			tr		4	2	tr			tr	30	3	tr						Nanno-trace, foram-bearing, well-sorted medium sand
68(f)	0	30	70	1	2	tr		tr		10								4	tr	80	1		2			Foram- & diatom-trace nanno-ooze
68(c)	10	20	70	tr	tr					3								tr	2	70					25	Foram-bearing, pellet-rich nanno-ooze
69	30	20	50	15	13	7						2	1	tr	tr			5	5	50	tr		2	tr		Diatom-trace, foram-bearing nanno-ooze

f: fine-grained portion, c: coarse-grained portion.

Table 10. Calcareous nannoplankton species

dredge samples \ nannoplankton species	*Braarudosphaera bigelowi*	*Ceratolithus cristus*	*Cyclococcolithus leptoporus*	*Cycl. macintyrei*	*Coccolithus pelagicus*	*Discoaster brouweri*	*D. neorectus*	*D. pentaradiatus*	*D. surculus*	*D. variabilis*	*D. sp.*	*Gephyrocapsa oceanica*	*Helicopontosphaera kamptneri*	*Pontosphaera japonica*	*P. sp.*	*Pseudoemilia lacunosa*	*Rhabdosphaera clavigera*	unidentified nannoplankton	tentative age assignment
St. 4 pure									barren										
siltstone									barren										
St. 6			+		+							+	+				+	+	Pleisto. or after
St. 8			+		+							+	+					+	Pleisto. or after
St. 9 A-recent			+									+	+				+	+	Pleisto. or after
A-blue					+							+	+				+	+	Pleisto. or after
A-brown									barren										
B-blue					+							+						+	Pleisto. or after
St.12 siltstone adhered to weight									barren										
B-recent			+									+	+					+	Pleisto. or after
B-gray									barren										
B-brown					+							+						+	Pleisto. or after
St.17 chain bag			+									+	+					+	Pleisto. or after
A-recent			+		+							+	+					+	Pleisto. or after
A-yellow			+										+					+	
A-gray			+										+					+	
B-recent			+									+	+					+	Pleisto. or after
B-gray			+		+								+					+	
St.19 A-recent			+		+							+	+					+	Pleisto. or after
B-recent			+									+	+					+	Pleisto. or after
B-blue coarse			+									+	+					+	Pleisto. or after
St.22 A-recent													+					+	
B-recent			+									+	+					+	Pleisto. or after
St.33 A-recent									barren										
B-recent									barren										
chain bag-light gray									barren										
chain bag-gray			+															+	
St.37 A			+									+	+		+	+	+	+	Pleisto. or after
St.39 A			+									+	+	+	+		+	+	Pleisto. or after
St.41 chain bag			+		+	+							+					+	l. Plio.
A-brown									barren										
A-gray				+	+	+	+	+		+			+	+		+	+	+	l. Mio.-m. Plio.
A-gray'		+		+	+	+					+		+					+	m.-l. Plio.
A-gray pure				+	+	+		+					+					+	m.-l. Plio.
B-brown						+						+						+	
St.43 mud adhered to OBS-C					+													+	
St.44 mud adhered to OBS-A									barren										
St.45 mud adhered to OBS-B			+		+													+	
St.46 mud adhered to manganese nodules		+	+									+	+				+	+	Pleisto. or after
St.48 A			+									+	+				+	+	Pleisto. or after
St.50 A		+	+									+	+	+			+	+	Pleisto. or after
St.51 mixed		+										+	+				+	+	Pleisto. or after
St.52 mixed		+		+		+		+					+		+		+	+	m.-l. Plio.
A			+		+							+	+		+		+	+	Pleisto. or after
St.53 mixed		+	+									+	+		+		+	+	Pleisto. or after
A			+					+	+				+		+		+	+	m. Plio.
B			+					+					+		+		+	+	m.-l. Plio.
St.60 recent												+	+					+	Pleisto. or after
St.61 recent												+	+					+	Pleisto. or after
St.64			+									+	+					+	Pleisto. or after
St.68 gray mud			+									+	+					+	Pleisto. or after
gray sandstone				+	+								+		+		+	+	
light gray sandstone				+	+							+	+					+	Pleisto.
St.69 foraminiferous hard sandstone	+		+									+	+					+	Pleisto.
hard gray mudstone									barren										
gray mud			+									+	+		+			+	Pleisto. or after
light gray mud			+									+	+					+	Pleisto. or after
St.72																		+	
St.74 foraminiferous sand					+								+					+	
mud			+									+	+		+			+	Pleisto. or after
shell bearing siltstone									barren										
St.79 sand	+		+									+	+					+	Pleisto. or after
St.80			+									+	+					+	Pleisto. or after
St.83 foraminiferous sand			+									+	+					+	Pleisto. or after

e:early, m:middle, l:late, Mio:Miocene, Plio:Pliocene, Pleisto:Pleistocene.

2) Foraminifera (Leg 1)

by Mutsuji Aoshima

About 5 ml of the dredge samples were washed with water by 200 mesh sieve. After drying, the samples were divided into proper volume and all the individuals contained in the split-part were picked up. Identification of them are now in progress. Here, the general characteristics of the foraminiferal assemblage of each sample are described.

St. 4: Calcium carbonate of the foraminiferal test is apt to dissolve and most individuals are the species of the agglutinated test. Characteristic species of the benthonic foraminifera are *Phabdemmina abyssorum*, *Phizammina indivisa*, *Marsipella elongata* and *Bathysiphon minuta*.

St. 6: The dissolution of the calcareous test is scarcely observed. The ratio of the benthonic to the planktonic foraminifera is about 1:10. Most individuals of the benthos are the calcareous species. Characteristic species are *Nonion* cf. *nicobarensis*, *Planulina wuellerstorfi*, *Epistominella* sp., *Pullenia bulloides*, *Globocassidulina subglobosa* and *Sigmoilopsis schlumbergeri*.

St. 8: Most individuals are planktonic species. The ratio of the benthos to the plankton is about 1:20. As to the benthos agglutinated species is very rare. The characteristic species are *Cassidulina carinata*, *C. depressa*, *Bulimina aculeata*, *Cibicides pseudoungerianus* and *Epistominella* sp.

St. 9: Dissolution of the calcium carbonate is observed. Most individuals are agglutinated benthonic species. The characteristic species are *Phabdammina abyssorum*, *Marsipella elongata*, *Phizamina indivisa*, *Hoeglundina elegans* and *Tosaia hanzawai*.

St. 12: The rate of the benthos is comparatively high and most individuals are calcareous species. Characteristic species are *Cassidulina carinata*, *Bulimina aculeata*, *Cibicides pseudoungerianus*, *Chilostemella ovoidea* and *Haplophragmoides* sp.

St. 17: The ratio of the benthos to the plankton is 1:17 and most benthonic individuals are agglutinated species. Characteristic species are *Phabdammina abyssorum*, *Marsipella cylindrica*, *M. elongata* and *Nonion* cf. *nicobarensis*.

Samples of St. 19, St. 22 and St. 34 were not studied in detail, but the general characteristics of the assemblage resemble those of

St. 4 and St. 9.

5. Molluscan shells both present-day and fossils recovered by dredging

1) Molluscs from the Daito ridge and Sekibisho bank

by Shoji Fujii and Tsuguo Shuto

Two samples of Molluscan shells were entrusted to examine in this cruise. However, there are other samples of molluscan shells which were collected by Smith-McIntyre bottom sampler and were collected by cylindrical dredging bag on the East China Sea shelf. These samples may be described respectively in each section.

St. 51: Off Kitadaitojima

Ostrea denselamellosa Liscke
O. circumpicta Pilsbry
Chama iostoma Conrad
Pseudocypraea adansoni (Sowerby)
Gemmula cosmoi (Sykes)
Cuverina columnella (Rang)

Shells dwelling in shallow sea have been collected from about 1000 m depth. This fact shows us that shallow sea dwelling species fall into the deep basin by the current or other actions.

St. 69: West side of the Okinawa trough near Sekibisho

Akebiconcha kawamurai Kuroda
Calyptogena soyoae Okutani

2) Molluscs collected from the continental shelf of the East China Sea by a pipe dredge

by Shoji Fujii and Hideo Kagami

We have obtained molluscan samples by a pipe dredge from five locations on the continental shelf of the East China Sea.

Samples were collected for the sake of examining the sea level changes of the last thirty thousand years. Because tidal zone and brackish molluscs such as *Anadara* and *Corbicula* are reported from the end of the continental shelf. Perhaps they lived in low sea level during Glacial Time.

Species names are going to be distinguished. Some of them are listed in Table 11.

A few molluscs are determined on tidal zones one such as *Anadara subcrenata*, etc. Molluscs lived on tidal zone less found than one of the Northwest part of the continental shelf.

This list shall be added more species names and revised in near future after distinguishing species names carefully.

Table 11

Molluscs from the continental shelf of the East China Sea

Station Number	60	61	64	79	80
Depth (m)	95	92	100	109	116
N. latitude	27°48.6'	27°46.8'	26°53.6'	28°20.4'	28°22.2'
E. longitude	123°48.5'	123°48.0'	124°15.0'	125°27.5'	125°35.0'
Emarginula crassicostata (t)*			2		
Tristichotrochus aculaetum (30-50 fm)	13		2	3	2
Minolia elegantisculpta (100 m)	16	6		3	4
Tristichotrochus shinagawaensis (5-50 m)					2
Neocollonia pilula (t)			4		
Turitella fascialis (5-10 fm)		5	2	10	13
Siliquaria cumingii	2	2	5		2
Epitonium stigmaticum (5-10 fm)	2		1	1	5
Onustus exutus (10-20 fm)	30	10	12	VA**	VA
Calyptrea sp.		5	5		
Proterato callosa (t.-2 fm)	1			1	
Neverita didyma (t)		6	3	30	35
Ficus subintermedia (5-10 fm)	7		1		1
Murex sobrinus (10-20 fm)		19	10	3	6
Olivella inornata (100-200 m)		3	5	31	32
Nassarius caelatus (5-10 fm)		5	6	VA	VA
Glycymeris rotunda	VA	VA	VA	VA	VA
Acila insignis (50-100 m)	VA	VA	VA	VA	VA
Sacella confusa (5-10 fm)	VA		10	VA	VA
Sarepta speciosa (50-350 m)	VA	VA	VA	VA	VA
Bentharca aculptilis (100 m)			VA		
Hawaiarca unwaensis (20-450 m)		VA	VA	7	
Anadara tricenicosta (t -5)	1				
A. subcrenata (t)				1	6
Oblimopa forskalii (50-100 fm)			VA	VA	VA
Modiolus nipponicus (t)	5	3		2	

	60	61	64	79	80
Parvamussium caducum (80-100 f)			VA	3	
Propeamussium intercostatum (80-100 fm)		VA	VA	2	
Pecten albicans (20-30 fm)	15	1	1	5	10
Chlamys sp.		7	13		
Cryptopecten vesculus (10-20 fm)	10	11	23	2	7
Plicatula muricata (t)	20	6	VA		
Notostrea musashiana (50-400 m)			4	VA	VA
Anomia lischkei (t)				3	10
Ctenoides lischkei (t -5 fm)				1	1
Crassatellites japonica (70-750 m)	8	6	3	1	
Glans hirasei (10-20 fm)	15	VA	VA	24	
Vasticardium alteranatum (t -5 fm)	3	5	1		1
Frigidocardium exasperatum (10-20 fm)				24	
Callista chinensis					1
Venus foveolata (t)	VA	7	5	VA	VA
Paphia euglypta (t)					1
P. exerta (t)	1	1		3	2
Placamen tiara (t)	1	3	4	10	20
Pitar guttata (100-200 m)		3	2	7	
Cardilia semisulcata (10-30 m)			10	1	1
Abrina lunella (10-100 m)		20	6	VA	
Semelangulus myatensis (10-30 m)		VA	VA	3	
Bathytellina citrocarnea (150-300 m)		23		7	
Verticordia japonica (70-750 m)	13	6	13	1	1
Mactra sulcatalia (t)	VA	8	3	VA	VA
Solecurtus divaricatus (t)	4	4		4	4
Solen sp.		2		8	
Entalinopsis nivosum (50-500 m)	VA	VA	VA	VA	VA
Graptacme buccinulum (10-40 m)	14	4	1	5	

*living depth t: tidal zone fm: fathom m: meter

**VA: Very Abundant

6. Organic matter geochemistry in some dredge samples

by Kazuo Taguchi, Nobuo Hayashida and Manabu Shiobara

A total of 19 dredge samples was collected from 19 stations including stations 4, 8, 9, 12, 17, 19, 22, 33, 39, 41, 53, 60, 61, 64, 68, 69, 74, 79 and 80.

All samples were frozen immediately after collecting and preserved for future studies of organic carbon, various hydrocarbons, amino acids and porphyrin compounds.

Thirteen samples selected as in Table 12 were examined for the analysis of bitumen tentatively on board. Mud samples, which caked upon drying, were pulverized to a particle size of 150 mesh or less. The powdered sample was refluxed with a mixture of 90 per cent benzene and 10 per cent methanol. After refluxing at the boiling point of the solvent for about 10 hours, the mixture was colled and preserved for all subsequent analyses.

Table 12

The samples used in bitumen analysis and the description on the color of bitumen

Station	Bitumen	Station	Bitumen
4	-	33	+
8	-	39	+
9	++	41	-
12	+++	53	-
17	+	64	+++
19	++	68	+++
22	++		

+++: Brown (Very abundant bitumen)
++: Light brown (Abundant)
+: Yellow (Less abundant)
-: Light yellow to colorless (Very poor)

7. Description of some rocks recovered from Amami plateau and Daito and Okinodaito ridges

1) From Amami plateau to Okinodaito ridge

by Kenji Konishi

Two sets of the aseismic submarine to nearly submarine ridges (= remnant arcs of Karig, 1972) characterize a major geotectonic feature of the Philippine sea basin, that is, a peculiar marginal sea bordered by three active island arc systems, Izu-Bonin-Mariana to the east and south, Nankai-Ryukyu to the north, and Taiwan-Luzon to the west. The Kyushu-Palau ridge running parallel to the West Mariana to the east, and to the active arc of the Mariana to the further east separates the West Philippine Sea Basin from the series of the interarc basins, Parce Vela-Shikoku, West Mariana, and Mariana to the east, and appears to truncate the southeastern ends of the three northwest-southeast trending inactive ridges, Okidaito, Daito and Amami, which are parallel to the Philippine ridge (Ben-Avraham, Segawa and Bowin, 1973; Central Basin Fault of Hell, 1948), an extinct mid-oceanic ridge.

Besides the Quaternary emerged reefy sediments capping the isles of the Borodino (Kita- and Minami-daito) and Rasa (Okinodaito), the sole direct stratigraphic control now available comes from the deep subsurface drilling of the total depth of 431.67 m at Kita-daito. The drilling terminated still within the shallow water carbonates indicates that the thick Lower Miocene sequence is unconformably overlain by the Pleistocene intact, dolomitized atoll complex of some 100 m in thickness (Hanzawa, 1941). A fairly thick layer with a velocity of 6.0 km/sec has been mapped beneath the Okinodaito ridge from seismic refraction survey (Murauchi et al., 1968).

So far, various interpretations have been presented to the nature of the three inactive ridges at the northeastern corner of the West Philippine Sea basin:

(1) a relict of an old geanticline (Hess, 1948);

(2) an orogenic mountain range where volcanism has played only a minor role (Dietz, 1954);

(3) a submarine massif in Cenozoic geosynclinal region (Puscharovsky and Udintzev, 1970);

(4) Cretaceous to Paleogene volcanic chains with or without capping of the contemporaneous reefy complex (Konishi, 1965);

(5) the western extension of the Darwin Rise (Mogi, 1969);

or,

(6) ancient arc systems associated with the Mesozoic Philippine mid-oceanic ridge (Ben-Avraham et al., ibid.).

The geomorphological relations just described suggest that the development of the three ridges predates the generation of the Kyushu-Palau ridge. According to Karig (1971), the Kyushu-Palau ridge formed probably during Eocene, prior to the early Miocene opening of the Parce Vela basin to the east. The conclusion that the Philippine ridge was active during Mesozoic (Cretaceous?), therefore, could be an independent supporting evidence to the temporal relation between the aseismic ridges in the Philippine basin as suggested from the geomorphology.

Regardless to whether the three ridges represent a relict of ancient continent split and drifted during the Mesozoic from the south to the north, or a sunken remnant of an island arc system where the plate originated from the Philippine ridge was once being consumed, the rocks forming the "basement" of the ridges would be expected to be either contemporaneous to, or even older than, the period while the Philippine ridge was still active. In this connection, an intriguing hypothesis of Southern Land (Tokuoka, 1967; Harata et al., 1970) which was advocated to interpret the provenance of orthoquartzite pebbles found from Kii peninsula (Honshu), Muroto peninsula (Shikoku), Nichinan area (Kyushu), Yakushima, and Kasari peninsula (Amami-oshima), may attract our interest keenly, as a very similar, if not the identical, orthoquartzite pebbles were recently found in the Paleogene sequence of Okinawa-jima (Konishi et al., 1973), so far representing its southernmost locality.

However, there may still be another alternative to account for the origin of the three ridges. These ridges might have been resulted from a volcanism which was activated or rejuvenated later in the process of the "secondary" gragmentation of older "continental block or island arcs," as, according to Mogi (1970), a northwest-southeast trending structure next to the Amami plateau could be a rather young even, which might even postdate the generation of the present-day Ryukyu trench.

In brief, our present knowledge strongly suggests that the West

Philippine basin represents an older oceanic unit, which is distinctly separable from the younger arc-and-interarc basin system of the East Philippine basin to the east. Therefore, it is the logical step to concentrate our survey, both geological and geophysical, on these three aseismic ridges at its northeastern corner with the hope that the result will supply essential clues to solve the various problems involved in the geotectonic frameworks of this remnant ocean within the marginal sea.

2) Igneous rocks collected from the Daito, Okinodaito ridges and from the Okinawa trough

by Kiyoshi Ishibashi

It is well known that many volcanic rocks, such as pyroxene andesites, exist in Yaeyama, Senkaku and To-kara districts of Ryukyu arc, southwestern Japan. However, the submarine distribution of the volcanic rocks is not well known.

Among the purposes of our navigation, the first is to make clear the distribution of volcanic rocks under sea water near Ryukyu arc and the second is to make clear the compositional difference between volcanic rocks of oceanic bottom, oceanic rises and land volcanic rocks. For this reason, the following stations are selected.

Station No.	Areas	Results
St. 46	Amami plateau	Mn-nodule only
		Among the samples, two samples have a core of two pyroxene andesite
St. 48	Kita-daito ridge	Pumice, Pyroxene andesite
St. 50		Hornblende andesite
St. 51		Pyroxene andesite tuff and Tuff breccia and Dacite (?)
St. 52	Okino-daito ridge	Pumice and Pyroxene andesite
St. 53		
St. 69	Okinawa trough	Pyroxene andesite

Collected samples are cut immediately in laboratory by 10-inch Maruto's diamond cutter and some of the chips are used for a thin section.

To make rock slices, the ordinary method was used for fresh samples; however, altered or loose samples were solidified by using cyanobond or lakeside cement before grinding.

Description of rock (St. 46, No. 375)

Occurrence: the core of Mn-nodule

Rock name: two pyroxene andesite

The rock is gray to brownish gray and porphyritic with plagioclase and pyroxene phenocrysts. In this section, phenocrysts consist of orthopyroxene, plagioclase and clinopyroxene of augite composition. Orthopyroxene is euhedral crystals up to 2-3 mm in diameter. The cleavages are well developed and very weak pleochroism is recognizable. Plagioclase is lath shape up to 3mm in length with albite and carldsbad twin. Compositional zoning of the plagioclase is not strong. Clinopyroxene is euhedral to subhedral crystals, not so abundant as orthopyroxene in the rock. Ground-mass show intersertal to glomeroporphyritic texture and consists of lath shape plagioclase, orthopyroxene, clinopyroxene, magnetite, ilmenite, apatite, brown cyrstallite, calcite and volcanic glass. The margin of maffic minerals changes to chloritic mineral or bowlingitic minerals. Volcanic glass is changed to palagonitic materials.

As for microscopic observations, the two pyroxene andesite (St. 46, No. 375) is not so different from the volcanic rocks of Ryukyu arc. However, it is very interesting to note that apart from the recent volcanic regions, such as Daito-jima Okino-daito jima areas, andesite volcanism occurred post Miocene time near sea mountains.

8. Records of dredge log

Dredge Log

Date: Oct. 30, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 6

Location: Upper slope of Kosyu Seamount, south off Shikoku

Bottom Topography: Rugged

Weather: Partly cloudy Wind: 10 m WSW Sea: Moderate wave, moderate swell

Type of Dredge: Chain bag (Nalwalk type) Weight: 3 x 100 kg

Winch No.: No. 5

Time Lowered: 14:16 PDR Depth: 2880 m

Time Bottom Hit: 15:21 Wire Out: 2990 m Wire Angle: 3°

PDR Depth: 2930 m Corr. Water Depth: 2915 m

Ship Position: Lat. 31°29.0 N; Long. 135°36.6 E

Direction of Haul: 90° Ship Speed: 0.9 kt

Condition of Haul: Soft to moderate shock once

Time Leave Bottom: 15:45 Wire Out: 3000 m Wire Angle: 11°

PDR Depth: 2870 m Corr. Water Depth: 2855 m

Ship Position: Lat. 31°29.0 N; Long. 135°36.6 E

Time Surface: 17:45 PDR Depth:

Dredged Samples: Gray mud with 3 cm thick brown layer and 2 cm thick gray layer, total 6 kg in weight

Remarks:

Dredge Log

Date: Oct. 28, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 4

Location: Izu-Bonin ridge

Bottom Topography: Steep slope

Weather: Cloudy Wind: 6 m NE Sea: Slight sea, moderate swell

Type of Dredge: Chain bag equipped with pinger Weight: 3 x 100 kg

Winch No.: No. 1

Time Lowered: 9:09 PDR Depth: 4350 m

Time Bottom Hit: 12:58 Wire Out: 4410 m Wire Angle: 12°

PDR Depth: 4250 m Corr. Water Depth: 4253 m

Ship Position: Lat. 32°30.9 N; Long. 141°31.0 E

Direction of Haul: 338° Ship Speed: Engine 20 RPM ahead

Condition of Haul: Maximum tension 2.6 ton, approximately 1852 m across the bottom

Time Leave Bottom: 13:45 Wire Out: 4380 m Wire Angle: 9°

PDR Depth: 4210 m Corr. Water Depth:

Ship Position: Lat. 32°31.8 N; Long. 141°30.8 E

Time Surface: 15:03 PDR Depth:

Dredged Samples: Subangular to subround tuffaceous siltstone (8.8 x 7.7 x 3.8 cm)

Recent mud (10 YR 3/3), Medium sand, and slightly indurated silty clay (10 YR 5/2), total 6 kg in weight

Remarks:

Dredge Log

Date: Oct. 31, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 9

Location: Off Shikoku

Bottom Topography: Steep slope on the southern part of Tosabai Bank

Weather: Partly cloudy Wind: 8 m NW Sea: Moderate wave, moderate swell

Type of Dredge: Chain bag with two cylinder dredges Weight: 3 x 100 kg

Winch No.: No. 5

Time Lowered: PDR Depth:

Time Bottom Hit: 15:20 Wire Out: 4180 m Wire Angle: 15°

PDR Depth: 3360 m Corr. Water Depth: 3349 m

Ship Position: Lat. 32°40.5 N; Long. 134°46.6 E

Direction of Haul: 95° Ship Speed: Drift

Condition of Haul: Maximum tension 1.8 ton

Time Leave Bottom: 16:02 Wire Out: 4244 m Wire Angle: 19°

PDR Depth: 3560 m Corr. Water Depth: 3550 m

Ship Position: Lat. 32°40.3 N; Long. 134°47.3 E

Time Surface: 17:20 PDR Depth:

Dredged Samples: Angular siltstone (7.9 x 4.6 x 1.0; 11.5 x 6.5 x 1.5)

Mud 6 kg (2.5 Y 6/3, 10 G 5/5, 10 YR 5/3)

Remarks:

Dredge Log

Date: Oct. 31, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 8

Location: Off Shikoku

Bottom Topography: Eastern slope of Muroto Submarine Peninsula

Weather: Partly cloudy Wind: 8 m NNW Sea: Moderate wave, moderate swell

Type of Dredge: Chain bag Weight: 2 x 100 kg

Winch No.: No. 5

Time Lowered: 07:27 PDR Depth: 1180 m

Time Bottom Hit: 08:24 Wire Out: 1520 m Wire Angle: 42°

PDR Depth: 1140 m Corr. Water Depth: 1133 m

Ship Position: Lat. 32°54.5 N, Long. 134°16.1 E

Direction of Haul: 325 ° Ship Speed: 1.5 kt

Condition of Haul:

Time Leave Bottom: 09:17 Wire Out: 1570 m Wire Angle: 60°

PDR Depth: 1080 m Corr. Water Depth: 1073 m

Ship Position: Lat. 32°56.5 N; Long. 134°17.3 E

Time Surface: 09:51 PDR Depth:

Dredged Samples: Mud (5 Y 4/2)

Remarks:

Dredge Log

Date: Nov. 4, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 17

Location: Off Shikoku

Bottom Topography: Outer slope of the Tosa Deep-sea Terrace

Weather: Partly cloudy Wind: 9 m NE Sea: Moderate wave, moderate swell

Type of Dredge: Chain bag with the cylinder dredges Weight: 3 x 100 kg

Winch No.: No. 5

Time Lowered: 07:03 PDR Depth: 2660 m

Time Bottom Hit: 08:53 Wire Out: 3250 m Wire Angle: 18°

PDR Depth: 2335 m Corr. Water Depth: 2319 m

Ship Position: Lat. 32°18.0 N; Long. 134°07.2 E

Direction of Haul: 45° Ship Speed: 1.3 kt

Condition of Haul: Max. tension 1.8 ton

Time Leave Bottom: 09:52 Wire Out: 2730 m Wire Angle: 32°

PDR Depth: 2440 m Corr. Water Depth: 2424 m

Ship Position: Lat. 32°18.4 N; Long. 134°09.5 E

Time Surface: 10:43 PDR Depth:

Dredged Samples: Angular--subangular gravels (max 14.5 x 9.1 x 5.0 cm) of sedimentary rocks, 18 samples

Mud (2.5 Y 5/5; 5 Y 6.5/1), 9 kg in weight

Remarks:

Dredge Log

Date: Nov. 2, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 12

Location: Kii Strait

Bottom Topography: Easterly slope of Hidaka Submarine Canyon

Weather: Partly cloudy Wind: 4.5 m NE Sea: Slight wave, moderate swell

Type of Dredge: Chain bag with two cylinder dredges Weight: 3 x 100 kg

Winch No.: No. 5

Time Lowered: 08:21 PDR Depth: 1260 m

Time Bottom Hit: 09:02 Wire Out: 1460 m Wire Angle: 3°

PDR Depth: 1410 m Corr. Water Depth: 1399 m

Ship Position: Lat. 33°31.25 N; Long. 135°05.45 E

Direction of Haul: 47° Ship Speed: Drift

Condition of Haul: Maximum tension 1 ton

Time Leave Bottom: 10:12 Wire Out: 1320 m Wire Angle: 3°

PDR Depth: 1220 m Corr. Water Depth: 1211 m

Ship Posiiton: Lat. 33°31.5 N; Long. 135°05.7 E

Time Surface: 10:30 PDR Depth: 1330 m

Dredged Samples: Round gravel (max. 11.5 x 6.0 x 4.0)

Subangular siltstone

Mud 30 kg (7.5 GY 4/1; 7.5 Y 5/3; N 6/0)

Remarks:

Dredge Log

Date: Nov. 5, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 22

Location: Off Shiono-misaki

Bottom Topography: Steep slope on the lower part of the continental slope

Weather: Blue sky Wind: 10.5 m NE Sea: Moderate wave, moderete swell

Type of Dredge: Chain bag with two cylinder dredges Weight: 3 x 100 kg

Winch No.: No. 5

Time Lowered: 14:43 PDR Depth: 3300 m

Time Bottom Hit: 16:03 Wire Out: 3733 m Wire Angle: 10°

PDR Depth: 3400 m Corr. Water Depth: 3389 m

Ship Position: Lat. 32°51.3 N; Long. 136°01.4 E

Direction of Haul: 350° Ship Speed: 20 RPM

Condition of Haul:

Time Leave Bottom: 16:32 Wire Out: 3835 m Wire ANgle: 15°

PDR Depth: 3480 m Corr. Water Depth: 3469 m

Ship Position: Lat. 32°51.6 N; Long. 136°01.8 E

Time Surface: 19:10 PDR Depth:

Dredged Samples: Mud (2.5 GY 4/1, 10 YR 3/4), 5.5 kg in weight

Remarks:

Dredge Log

Date: Nov. 4, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 19

Location: Off Shikoku

Bottom Topography: Canyon wall near the Nankai Trough

Weather: Cloudy Wind: 6 m NW Sea: Slight wave, moderate swell

Type of Dredge: Chain bag with two cylinder dredges Weight: 3 x 100 kg

Winch No.: No. 5

Time Lowered: 12:20 PDR Depth: 3850 m

Time Bottom Hit: 13:50 Wire Out: 4520 m Wire Angle: 22°

PDR Depth: 3805 m Corr. Water Depth: 3797 m

Ship Position: Lat. 32°09.2 N; Long. 134°19.0 E

Direction of Haul: 103° Ship Speed: Drift

Condition of Haul:

Time Leave Bottom: 14:12 Wire Out: 4745 m Wire Angle: 18°

PDR Depth: 3740 m Corr. Water Depth: 3730 m

Ship Position: Lat. 32°09.2 N; Long. 134°20.0 E

Time Surface: 17:26 PDR Depth:

Dredged Samples: Mud (5GY 5/1, 10 YR 4/3), 10 kg in weight

Remarks:

Dredge Log

Date: No. 15, 1972   Ship: Hakuho-Maru   Cruise: KH-72-2   Station: 37

Location: Off Amami Oshima

Bottom Topography: Shell slope at the Okinawa Trough

Weather: Partly cloudy   Wind: 5m SW   Sea: Moderate wave, moderate swell

Type of Dredge: Chain bag with cylinder dredges   Weight: 2 x 100 kg

Winch No.: No. 5

Time Lowered: 11:17   PDR Depth: 285 m

Time Bottom Hit: 12:55   Wire Out: 450 m   Wire Angle: 12°

PDR Depth: 315 m   Corr. Water Depth: 319 m

Ship Position: Lat. 28°40.8 N; Long. 129°41.7 E

Direction of Haul: 120°   Ship Speed: 1.5 kt

Condition of Haul: Max. tension + 2 ton

Time Leave Bottom: 13:25   Wire Out: 430 m   Wire Angle: 5°

PDR Depth: 400 m   Corr. Water Depth: 404 m

Ship Position: Lat. 28°40.7 N; Long. 129°41.6 E

Time Surface: 13:35   PDR Depth:

Dredged Samples:

Sand, coarse-grained, coquinaceous, dark yellowish brown (10 YR 4/2), poorly sorted, coated with iron hydroxides, contains a few very angular to angular pebbles up to 5 cm of the longest diameter, of diverse origins, such as limestone, crustose coralline algae ("algal balls"; 2.5 to 4.0 in diameter), pumice fragments (subangular and slightly altered: 1.5 and 2.0 cm in diameter) and molluscan shells; the pebbles are encrusted with silici-sponge, serpulids and ectoprocts. Probably only very few molluscan (small snails and pteropods) and foraminiferal fragments are of the present-day origin, and mostly of Middle-Early Holocene or even older. Predominance of Ectoprocta and benthonic foraminifera may be the characteristic of this sediment.

Recovered ca. 500 g in two cylinder dredges attached to the bottom of the chain bag. About 100 g of the sample were assigned to Kansai Group (Dr. Nishida, Nara Univ. of Education, for micropaleontological studies), 50 g to Kyushu Univ. Group (Dr. Obara, for mineralogical stuides), and the rest was stored for further studies. The pumice fragments were transferred to Dr. Kobayashi for paleomagnetic studies.

Remarks: This site was selected to secure either the pre-Miocene basement complex consisting the frontal arc, or the volcanic rocks of the associated chain of the Ryukyu Arc. As described above, the recovered sediments are the typical example of the "marginal reefy facies" (Schlanger and Konishi, 1966).

Dredge Log

Date: Nov. 7, 1972   Ship: Hakuho-Maru   Cruise: KH-72-2   Station: 33

Location: Off Shikoku

Bottom Topography: Lower continental slope off Ashizuri

Weather: Partly cloudy   Wind: 7.5 m NW   Sea: Moderate wave, moderate swell

Type of Dredge: Chain bag with two cylinder dredges   Weight: 3 x 100 kg

Winch No.: No. 5

Time Lowered: 12:48   PDR Depth: 4280 m

Time Bottom Hit: 14:19   Wire Out: 4850 m   Wire Angle: 20°

PDR Depth: 4210 m   Corr. Water Depth: 4210 m

Ship Position: Lat. 31°51.2 N; Long. 133°46.9 E

Direction of Haul: 278°   Ship Speed: 25 RPM

Condition of Haul:

Time Leave Bottom: 14:57   Wire Out: 5000 m   Wire ANgle: 21°

PDR Depth: 4150 m   Corr. Water Depth: 4145 m

Ship Position: Lat. 31°51.7 N; Long. 133°46.6 E

Time Surface: 17:44   PDR Depth:

Dredged Samples: Mud (10 YR 5/4), 5.5 kg in weight

Remarks:

Dredge Log

Date: Nov. 16, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 41

Location: Off Amami Oshima

Bottom Topography: Lower continental slope, gentle slope

Weather: Overcast Wind: 8 m SW Sea: Slight wave, moderate swell

Type of Dredge: Chain bag with two cylinder dredges Weight: 3 x 100 kg

Winch No.: No. 1

Time Lowered: 10:37 PDR Depth: 4000 m

Time Bottom Hit: 16:11 Wire Out: 4800 m Wire Angle: 18°

PDR Depth: 3940 m Corr. Water Depth: 3937 m

Ship Position: Lat. 28°04.0 N; Long. 130°34.4 E

Direction of Haul: 330° Ship Speed: 1.5 kt

Condition of Haul:

Time Leave Bottom: 18:13 Wire Out: 4700 m Wire Angle: 10°

PDR Depth: 3780 m Corr. Water Depth: 3775 m

Ship Position: Lat. 28°04.7 N; Long. 130°34.2 E

Time Surface: 19:40 PDR Depth:

Dredged Samples: Silt, partly clayey or sandy, moderate brown (5 YYR 4/4) on watery surface and olive brown (25 Y4.4) on inside fresh surface, fossiliferous (mostly radiolarian tests and sponge spicules in association with planktonic foraminifera) and tuffaceous (volcanic glass shards and lithic fragments-volcanic rocks and pumice are abundant in fine and very fine sand fractions), fairly compact. Mudstone pellets composed of clayey particles are common in some grey (olive brown) part. Grey (olive brown) silt recovered in the chain bag as well as in the cylinder (A) differs slightly from the brown part of the same cylinder in the more abundance and better preservation of planktonic foraminifera (Globigerinids and Globorotalids) and less amount of terrigenous (inclusive volcanic) mineral grains. Two pieces of pumice, very coarse pebble size and subround were found in the cylinder (A) dredge haul. The lithologies may suggest a succession of thin interlayers of sandy silt and clayey silt in different mineralogical and paleontological compositions, probably in the Pliocene beds correlative to the Shimajiri Group on land.

Recovered 10.5 kg of the dredge haul from the smaller cylinder dredge (A), 15.0 kg from the larger one (B), and 0.7 kg from the chain-bag.

500 g of the brown part in the (A) sample to Tohoku Univ., 300 g to Kansai Group (Dr. Nishida), 400 g to Kyushu Univ. (Drs. Obara, Shuto and Mr. Kameyama) and 150 g to Toyama Univ. 50 g of the "grey" (olive brown) part in the same cylinder (A) to Kansai Group (Dr. Nishida), 30 g to Kyushu Univ. (Dr. Obara). Besides some 10 g of pelletoidal mud (apparently microbreccia-like texture) part in the "grey" part were assigned to Kansai Group (Dr. Nishida) and Kyushu Univ. (Dr. Obara), respectively.

500 g of the cylinder (B) sample to Tohoku Univ., 300 g to Kansai Group (Dr. Nishida), 50 g to Kyushu Univ. (Dr. Obara), 200 g to Toyama Univ. Rest of the dredge hauls including the whole sample of the chain-bag were stored for further studies.

Remarks: Again, according to Wageman et al. (1970), this dredge site is located even below the midslope basement high of the Ryukyu Trench, hence this dredging was planned to obtain the rock samples of their "acoustic basement." As the critical examination of our record of the air-gun survey confirms, the dredge samples proved the Neogene sediments of some scores of meters in thickness, veneering the basement in accordance to the submarine topographic relief.

Dredge Log

Date: Nov. 15, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 39

Location: Off Amami Oshima

Bottom Topography: Upper continental slope

Weather: Partly cloudy Wind: 7 m SW Sea: Slight wave, moderate swell

Type of Dredge: Chain bag with two cylinder dredges Weight: 3 x 100 kg

Winch No.: No. 5

Time Lowered: 18:18 PDR Depth: 1650 m

Time Bottom Hit: 20:52 Wire Out: 1750 m Wire Angle: 5°

PDR Depth: 1475 m Corr. Water Depth: 1466 m

Ship Position: Lat. 28°18.4 N; Long. 130°15.4 E

Direction of Haul: 320° Ship Speed: 0.8 kt

Condiiton of Haul:

Time Leave Bottom: 21:24 Wire Out: 1750 m Wire Angle: 25°

PDR Depth: 1480 m Corr. Water Depth: 1471 m

Ship Position: Lat. 28°18.5 N; Long. 130°15.0 E

Time Surface: 22:00 PDR Depth:

Dredged Samples: Silt, sandy due to tests of planktonic and arenaceous foraminifera, i.e. foraminiferal (globigerinid) ooze, dark yellowish brown (10 YR 4/2) on watery surface, light olive grey (5Y 5/2) on inside fresh surface; besides foraminifera, tests of calcareous nannoplankton and radiolarians and sponge spicules are abundant among biogenic components.

Recovered 9 kg from the smaller cylinder (A) and 15 kg from the larger one (B). Assigned 1000 g to Tohoku Univ. (Mr. Hayashida on behalf of Dr. Taguchi, for organic geochemical studies), 1000 g to Kansai Group (Dr. Nishida), 300 g to Kyushu Univ. Group (Dr. Obara), 100 g to Toyama Univ. (Dr. Fujii). The rest of the (A) sample was stored together with all the (B).

Remarks: Previous "air-gun" survey by Wageman et al. (1970) indicated the boundary between a thick pile of the "Undifferentiated sediments" and "Acoustic basement" along the continental slope about this depth. It was expected to sample either the pre-Neogene basement rocks or the Neogene (equivalent of the Shimajiri Group on land-nearby Kikai-jima) throguh this dredging. In fact, a few foraminifera and calcareous nannoplanktons (Discoasters) in the recovered sediments are of reworked origin.

Dredge Log

Date: Nov. 19, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 48

Location: Kita-daito Ridge

Bottom Topography: Northern slope of Kita-daito Ridge

Weather: Overcast Wind: 10 m NNE Sea: Rough wave, moderate swell

Type of Dredge: Cylinder chain bag with two cylinder dredges

Weight: 3 x 100 kg

Winch No.: No. 5

Time Lowered: 07:38 PDR Depth: 3000 m

Time Bottom Hit: 08:38 Wire Out: 3130 m Wire ANgle: 15°

PDR Depth: 3040 m Corr. Water Depth: 3029 m

Ship Position: Lat. 26°11.6 N; Long. 131°33.3 E

Direction of Haul: 10° to 260° Ship Speed: 0.4--0.7 kt

Condition of Haul:

Time Leave Bottom: 09:55 Wire Out: 3250 m Wire Angle: 20°

PDR Depth: 2850 m Corr. Water Depth: 2838 m

Ship Position: Lat. 26°11.7 N; Long. 131°32.0 E

Time Surface: 11:00 PDR Depth:

Dredged Samples: Sand, muddy, calcareous, poorly sorted, light yellow (2.5 Y 7/4), essentially planktonic foraminiferal tests; volcanic glass shards abundant in fine and very fine sand fractions. A pumice fragment of pebble size was found in the dredge haul of the cylinder (B).

Recovered 9.5 kg of the muddy sand in the two cylinder dredges. 340 g of the cylinder (A) sample were assigned to Kansai Group (Drs. Nishida & Shiki), 300 g to Kyushu Univ. Group (Dr. Obara and Mr. Kameyama), and 110 g to Toyama Univ. (Dr. Fujii). 160 g of the cylinder (B) sample were also assigned to Kansai Group (Dr. Nishida), and the rest of both cylinder samples was stored for further studies.

Dredge Log

Date: Nov. 18, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 46

Location: Amami Plateau

Bottom Topography: Steep slope at the northern slope of the ridge

Weather: Rain Wind: 11m NNE Sea: Moderate wave, moderate swell

Type of Dredge: Cylinder chain bag with two cylinder dredges

Weight: 2 x 100 kg

Winch No.: No. 5

Time Lowered: 11:22 PDR Depth: 1550 m

Time Bottom Hit: 12:05 Wire Out: 1595 m Wire Angle: 30°

PDR Depth: 1360 m Corr. Water Depth: 1353 m

Ship Position: Lat. 28°05.9 N; Long. 131°38.0 E

Direction of Haul: 245° Ship Speed: 0.5 kt

Condition of Haul: Max. tension 2 ton

Time Leave Bottom: 13:42 Wire Out: 1500 m Wire Angle: 10°

PDR Depth: 1260 m Corr. Water Depth: 1253 m

Ship Position: Lat. 28°05.0 N; Long. 131°38.6 E

Time Surface: 14:12 PDR Depth:

Dredged Samples: Ferromanganese nodules, varying in size from large cobble to coarse pebble, and in shape from almost ideally spheroidal form with concentric "growth rings" to irregularly mammilated crust covering flat-bottom gravels (nuclei). Some gravels are indurated Globigerinid ooze containing subordinate amount of volcanic ejecta. Besides these nodules, there are 14 subangular to subrounded cobbles of pumice, which were escaped from the manganese encrustation.

Recovered about 120 kg of rock samples almost exclusively consisting of the ferromanganese nodules in the chain bag. Two cylinder dredges samples less than 3 g of foraminiferal (planktonic) sand together with broken pieces of the nodules. Including the broken pieces as well as the pumice cobbles, all the specimens were numbered up to 547.

Remarks: This site was selected to get a stratigraphic control of the O.B.S. survey area, which occupies the southwestern corner of the Amami Plateau.

Dredge Log

Date: Nov. 19, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 51

Location: Daito Ridge

Bottom Topography: Southern slope off Kita-daito Island

Weather: Overcast Wind: 10 m NNE Sea: Rough wave, moderate swell

Type of Dredge: Cylinder chain bag with two cylinder dredges

Weight: 2 x 100 kg Winch No.: No. 5

Time Lowered: 16:48 PDR Depth: 1100 m

Time Bottom Hit: 17:08 Wire Out: 1070 m Wire Angle: 11°

PDR Depth: 930 m Corr. Water Depth: 927 m

Ship Position: Lat. 25°56.9 N; Long. 131°21.4 E

Direction of Haul: 37° Ship Speed: 0.5 kt

Condition of Haul: Max tension 4 ton; fuse wire with diameter of 6 m/m was broken.

Time Leave Bottom: 18:05 Wire Out: 980 m Wire Angle:

PDR Depth: 500 m Corr. Water Depth: 502 m

Ship Position: Lat. 25°57.2 N; Long. 131°20.8 E

Time Surface: 18:19 PDR Depth:

Dredged SAmples: Eight angular cobbles of either coralline fragments or limestone were recovered together with one angular cobble of a possible pyroclastic(?) rock in the total weight of 3.1 kg from the chain bag. Thirty-nine angular to subangular pebbles of a similar lithologic variation were found within the cylinder dredge hauls in which about 13 kg of calcareous sand were sampled. The sand, coarse-sand in grain size, is moderate yellowish brown (10YR 5/4), and essentially planktonic foraminiferal ooze with small amount of volcanic glass shards, radiolarian tests and terrigenous mineral grains. Coralline and molluscan debris with considerable amount of lithic fragments are common in fine-pebble and granule fractions.

Residues after washing the cylinder dredges to Kansai Group (Dr. Nishida), 250 g of the calcareous sand to Kyushu Univ. (Dr. Obara and Mr. Kameyama) and 150 g to Toyama Univ. (Dr. Fujii). Three pelecypod and six gastropod shells were assigned to Dr. Fujii.

Dredge Log

Date: Nov. 19, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 50

Location: Kita-daito Ridge

Bottom Topography: Northeastern slope off Kita-daito Island

Weather: Cloudy Wind: 9 m ENE Sea: Rough wave, moderate swell

Type of Dredge: Cylinder chain bag with two cylinder dredges

Weight: 2 x 100 kg

Winch No.: No. 5

Time Lowered: 12:50 PDR Depth: 1700 m

Time Bottom Hit: 13:35 Wire Out: 2350 m Wire Angle: 32°

PDR Depth: 1500 m Corr. Water Depth: 1491 m

Ship Position: Lat. 25°59.4 N; Long. 131°21.4 E

Direction of Haul: 126° Ship Speed: 0.8 kt

Condition of Haul: Max. tension 2.5 ton

Time Leave Bottom: 15:27 Wire Out: 2000 m Wire Angle:

PDR Depth: 1875 m Corr. Water Depth: 1863 m

Ship Position: Lat. 25°59.1 N; Long. 131°21.0 E

Time Surface: 16:00 PDR Depth:

Dredged Samples: Two subrounded cobbles and one subangular pebble of the total weight of 760 were recovered in the chain bag. Thirteen medium pebbles with smaller roundness were picked out from the cylinder dredge hauls represented by 13.5 kg of calcareous sand. Lithologies of these gravels range from pumice, pyroclastics to limestone. Some of them appear to be encrusted with ferromanganese film. The sand is muddy, moderate yellowish brown (10 YR 5/4); sand grains are mostly tests of planktonic foraminifera with subordinate amount of molluscan debris, sponge spicules, ostracoda carapaces and lithic fragments in coarse and medium sand fractions, and of radiolarian tests, glass shards, lithic fragments and terrigenous minerals in fine fraction.

400 g of the sand were assigned to Kansai Group (Dr. Nishida), 320 g to Kyushu Univ. Group (Dr. Obara and Mr. Kameyama) and 110 g to Toyama Univ. (Dr. Fujii).

Dredge Log

Date: Nov. 20, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 53

Location: Okino-daito Ridge

Bottom Topography: South slope of ridge, west of Okino-daito Island

Weather: Overcast Wind: 5 m WSW Sea: Slight wave, moderate swell

Type of Dredge: Cylinder chain bag with two cylinder dredges

Weight: 3 x 100 kg Winch No.: No. 5

Time Lowered: 10:10 PDR Depth: 2680 m

Time Bottom Hit: 11:04 Wire Out: 2800 m Wire Angle: 10°

PDR Depth: 2490 m Corr. Water Depth: 2476 m

Ship Position: Lat. 24°28.5 N; Long. 131°03.0 E

Direction of Haul: 26° Ship Speed: 0.5 kt

Condiiton of Haul: Max tension 2.5 ton

Time Leave Bottom: 12:39 Wire Out: 2503 m Wire Angle: 10°

PDR Depth: 2250 m Corr. Water Depth: 2237 m

Ship Position: Lat. 24°28.7 N; Long. 131°03.1 E

Time Surface: 13:21 PDR Depth:

Dredged Samples: In the chain bag, thirteen very angular to subangular gravels of the total weight of about 2.3 kg, ranging in size from large cobble to very coarse pebble were recovered together with a very coarse pebble of pumice. These gravels except the pumice pebble are either a piece of ferromanganese crust or pyroclastic(?) basement rocks veneered with the crust. Six very angular to subangular pebbles were also found in the dredge haul of the cylinder (B), which, with the other cylinder (A), recovered 12.5 kg of calcareous mud. The calcareous mud, medium to very fine sandy due to tests of foraminifera, moderately yellowish brown (10 YR 5/4), and poorly sorted, composed of, in medium to very fine sand size, grains of essentially planktonic foraminifera in association with small amounts of volcanic glass shards, sponge spicules, radiolarian tests, lithic fragments and terrigenous mineral grains in decreasing order.

500 g of the calcareous mud in the cylinder (A) to Tohoku Univ., 400 g to Kansai Group, 320 g to Kyushu Univ. Group, 170 g to Toyama Univ. and 250 g to Mr. Nohara (Ocean Res. Inst.). Also 30 g of the cylinder (B) to Kyushu Univ. Group (Dr. Obara). Rests of both cylinder samples were stored for future studies on land.

Dredge Log

Date: Nov. 20, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 52

Location: Okino-daito Ridge

Bottom Topography: South slope of ridge, west of Okino-daito Island

Weather: Wind: Sea:

Type of Dredge: Cylinder chain bag with two cylinder dredges

Weight: 3 x 100 kg Winch No.: No. 5

Time Lowered: 05:46 PDR Depth: 2850 m

Time Bottom Hit: 07:38 Wire Out: 2750 m Wire Angle: 0°

PDR Depth: 2510 m Corr. Water Depth: 2496 m

Ship Position: Lat. 24°29.5 N; Long. 131°00.0 E

Direction of Haul: 60° Ship Speed: 0.3 kt

Condition of Haul: Max tension 3.5 ton

Time Leave Bottom: 08:24 Wire Out: 2554 m Wire Angle: 13°

PDR Depth: 2450 m Corr. Water Depth: 2436 m

Ship Position: Lat. 24°29.3 N; Long. 131°00.3 E

Time Surface: 09:05 PDR Depth:

Dredged Samples: Mud, sandy due to planktonic foraminifera tests, moderate yellowish brown (10 YR 5/4), sponge spicules also common: finer the grain size (fine and very fine sand or even finer fraction), more volcanic glass shards, radiolarian tests and terrigenous mineral grains.

Recovered 16.5 kg of the mud from the two cylinder dredges. 400 g of the cylinder (A) sample were assigned to Kansai Group (Dr. Nishida), 260 g to Kyushu Univ. Group (Dr. Obara and Mr. Kameyama), and 150 g to Toyama Univ. (Dr. Fujii). 160 g of the cylinder (B) sample to Kyushu Univ. Group.

Dredge Log

Date: Dec. 4, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 61
Location: Tokai Continental Shelf
Bottom Topography: Flat
Weather: Rain Wind: 7m E Sea: Slight wave, moderate swell
Type of Dredge: Pipe dredge Weight: 1 x 100 kg
Winch No.: No. 5
Time Lowered: 20:47 PDR Depth: 96 m
Time Bottom Hit: 20:50 Wire Out: 99 m Wire Angle: 17°
PDR Depth: 92 m Corr. Water Depth: 96 m
Ship Position: Lat. 27°46.8 N; Long. 123°48.0 E
Direction of Haul: 300° Ship Speed: 1--1.3 kt
Condition of Haul:
Time Leave Bottom: 21:33 Wire Out: 120 m Wire Angle: 25°
PDR Depth: 93 m Corr. Water Depth: 97 m
Ship Position: Lat. 27°47.0 N; Long. 123°47.5 E
Time Surface: 21:42 PDR Depth:

Dredged Samples: Sand, olive grey (5 Y 3/2), fossiliferous, fine sand of terrigenous grains; otherwise very similar to the sand of Station 60.

Recovered about 45 kg the sediment in the pipe dredge. About 200 g of biogenic grains larger than very coarse sand fractions were sieved out from some 30 kg of the recovered sediment. Dr. Fujii identified 27 species of molluscs, of which only two were represented with live shells. These molluscan shells and biogenic grains were assigned to Toyama Univ.; 1.0 kg of the sediment to Tohoku Univ., 900 g to Kansai Group (Drs. Nishida, Shiki & Tokuoka), 500 g to Kyushu Univ. (Drs. Ishibashi and Kameyama), 1.5 kg to Kagoshima Univ. (Dr. Okada) and the rest was stored at the Ocean Research Institute, Univ. of Tokyo.

Remarks: Same as Station 60, this site was selected to establish an ancient shore line during postglacial time by means of radiocarbon dating of the biogenic grains.

Dredge Log

Date: Dec. 4, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 60
Location: Tokai Continental Shelf
Bottom Topography: Flat
Weather: Rain Wind: 5 m E Sea: Slight wave, moderate swell
Type of Dredge: Pipe dredge Weight: 1 x 100 kg
Winch No.: No. 5
Time Lowered: 19:17 PDR Depth: 95 m
Time Bottom Hit: 19:22 Wire Out: 104 m Wire Angle: 25°
PDR Depth: 95 m Corr. Water Depth: 99 m
Ship Position: Lat. 27°48.6 N; Long. 123°48.5 E
Direction of Haul: 295° Ship Speed: 1--1.3 kt
Condition of Haul:
Time Leave Bottom: 19:57 Wire Out: 115 m Wire Angle: 30°
PDR Depth: 96 m Corr. Water Depth: 100 m
Ship Position: Lat. 27°49.0 N; Long. 123°47.8 E
Time Surface: 20:05 PDR Depth:

Dredged Samples: Sand, olive grey (5 Y 3/2) to dark greenish grey (5 GY 4/1), fossiliferous poorly sorted due to abundance of biogenic grains--molluscan shells, tests of benthonic foraminifera, Ectoprocts, Flabellid corals and echinoids--in gravel and very coarse sand fractions; otherwise well-sorted medium-sand containing terrigenous mineral grains of quartz, plagioclase, potash feldspars, mica, chlorite(?) and dark-colored lichic fragments. Planktonic foraminifera and ostracod carapaces, and alcyonarian coral spicules tend to be found in medium sand and finer fractions.

Recovered about 50 kg of the sand in the pipe dredge. Some 40 kg of the wet sample were sieved with 5 mm and 1 mm mesh in order to separate fossils of gravel and very coarse sand fractions. Dr. Fujii identified 40 molluscan species, mostly of litthoral hatitat and some of them will be dated by radiocarbon method. These shells and other biogenic grains together with 500 g of the sediment were assigned to Toyama Univ. (Dr. Fujii); 1.5 kg to Tohoku Univ. (Mr. Hayashida), 200 g to Kansai Group (Dr. Nishida), 200 g to Kyushu Univ. (Drs. Ishibashi and Kameyama), 100 g to Kagoshima Univ. (Dr. Okada) and the rest was stored for further studies.

This site was selected to establish a location of past strand line during postglacial time (Early Holocene?).

Dredge Log

Date: Dec. 5, 1972   Ship: Hakuho-Maru   Cruise: KH-72-2   Station: 68

Location: Sekibi-sho

Bottom Topography: Steep slope, southwest of Sekibi-sho

Weather: Partly cloudy   Wind: 9 m SE   Sea: Moderate wave, moderate swell

Type of Dredge: Cylinder chain bag with two cylinder dredges

Weight: 1 x 200 kg   Winch No.: No. 5

Time Lowered: 22:29   PDR Depth: 1565 m

Time Bottom Hit: 22:57   Wire Out: 1588 m   Wire Angle: 6°

PDR Depth: 1450 m   Corr. Water Depth: 1441 m

Ship Position: Lat. 25°48.4 N; Long. 124°35.5 E

Direction of Haul: 335°   Ship Speed: 1 kt

Condition of Haul: Max tension 4 ton; lost two cylinder dredges.

Time Leave Bottom: 01:07   Wire Out: 1450 m   Wire Angle: 15°

PDR Depth: 1340 m   Corr. Water Depth: 1333 m

Ship Position: Lat. 25°49.4 N; Long. 124°36.4 E

Time Surface: 01:33   PDR Depth:

Dredged Samples:

Remarks:

Dredge Log

Date: Dec. 5, 1972   Ship: Hakuho-Maru   Cruise: KH-72-2   Station: 64

Location: Tokai Continental Shelf

Bottom Topography: Gently sloping, shelf edge

Weather: Rain   Wind: 9 m ENE   Sea: Moderate wave, moderate swell

Type of Dredge: Pipe dredge with the cylinder dredges

Weight: 1 x 100 kg   Winch No.: No. 5

Time Lowered: 04:15   PDR Depth: 124 m

Time Bottom Hit: 04:20   Wire Out: 129 m   Wire Angle: 30°

PDR Depth: 124 m   Corr. Water Depth: 128 m

Ship Position: Lat. 26°53.6 n; Long. 124°15.0 E

Direction of Haul: 60°   Ship Speed: 1.3 kt

Condition of Haul:

Time Leave Bottom: 04:55   Wire Out: 150 m   Wire Angle: 20°

PDR Depth: 124 m   Corr. Water Depth: 128 m

Ship Position: Lat. 26°53.6 N; Long. 124°14.7 E

Time Surface: 05:00   PDR Depth:

Dredged Samples:

Remarks:

Dredge Log

Date: Dec. 9, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 70

Location: Off Miyako Island

Bottom Topography:

Weather: Partly cloudy Wind: 10 m NE Sea: Rough wave, moderate swell

Type of Dredge: Cylinder chain bag with two pipe dredges

Weight: 1 x 100 kg Winch No.: No. 5

Time Lowered: 04:13 PDR Depth: 260 m

Time Bottom Hit: 04:19 Wire Out: 280 m Wire Angle: 27°

PDR Depth: 208 m Corr. Water Depth: 212 m

Ship Position: Lat. 25°10.5 N; Long. 125°49.2 E

Direction of Haul: 37° Ship Speed: 1.0 kt

Condition of Haul: Max tension 3.5 ton; No. 5 winch wire broke off at the end socket; lost all equipment

Time Leave Bottom: 04:33 Wire Out: 360 m Wire Angle: 35°

PDR Depth: 180 m Corr. Water Depth: 184 m

Ship Position: Lat. 25°10.6 N; Long. 125°49.3 E

Time Surface: 04:50 PDR Depth:

Dredged Samples: No samples

Remarks:

Dredge Log

Date: Dec. 6, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 69

Location: Sekibi-sho

Bottom Topography: Steep trough wall, southeast of Sekibi-sho

Weather: Partly cloudy Wind: 4 m SE Sea: Slight wave, moderate swell

Type of Dredge: Cylinder chain bag with two pipe dredges

Weight: 2 x 100 kg Winch No.: No. 5

Time Lowered: 02:32 PDR Depth: 1220 m

Time Bottom Hit: 05:24 Wire Out: 1200 m Wire Angle: 35°

PDR Depth: 910 m Corr. Water Depth: 907 m

Ship Position: Lat. 25°55.9 N; Long. 124°40.2 E

Direction of Haul: 330° Ship Speed: 1--1.5 kt

Condition of Haul: Max tension 3 ton; lost one cylinder dredge

Time Leave Bottom: 06:24 Wire Out: 961 m Wire Angle: 45°

PDR Depth: 650 m Corr. Water Depth: 649 m

Ship Position: Lat. 25°57.2 N; Long. 124°40.2 E

Time Surface: 06:38 PDR Depth:

Dredged Samples:

Remarks:

Dredge Log

Date: Dec. 9, 1972 Ship: Hakuho-Maru Curise: KH-72-2 Station: 74
Location: Northern wall of Okinawa Trough
Bottom Topography: Steep slope between 1300 and 940 m
Weather: Blue sky Wind: 7 m E Sea: Slight wave, moderate swell
Type of Dredge: Norwalk dredge with two pipe dredges
Weight: 2 x 100 kg Winch No.: No. 5
Time Lowered: 20:16 PDR Depth: 1310 m
Time Bottom Hit: 20:43 Wire Out: 1440 m Wire Angle: 10°
PDR Depth: 1300 m Corr. Water Depth: 1293 m
Ship Position: Lat. 26°39.4 N; Long. 125°41.4 E
Direction of Haul: 20° Ship Speed: 0.3-- -1.5 kt
Condition of Haul: Max tension 2 ton
Time Leave Bottom: 21:50 Wire Out: 1215 m Wire Angle: 28°
PDR Depth: 960 m Corr. Water Depth: 957 m
Ship Position: Lat. 26°40.3 N; Long. 125°41.7 E
Time Surface: 22:14 PDR Depth:
Dredged Samples:
Remarks:

Dredge Log

Date: Dec. 9, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 72
Location: Off Miyako Island
Bottom Topography: Bank slope
Weather: Partly cloudy Wind: 10 m NE Sea: Rough wave, moderate swell
Type of Dredge: Norwalk dredge with two small pipe dredges
Weight: 1 x 200 kg Winch No.: No. 1
Time Lowered: 05:48 PDR Depth: 313 m
Time Bottom Hit: 05:56 Wire Out: 325 m Wire Angle: 16°
PDR Depth: 290 m Corr. Water Depth: 294 m
Ship Position: Lat. 25°09.6 N; Long. 125°48.4 E
Direction of Haul: 37° Ship Speed: 0.8--1.3 kt
Condition of Haul:
Time Leave Bottom: 06:55 Wire Out: 246 m Wire Angle: 13°
PDR Depth: 230 m Corr. Water Depth: 234 m
Ship Position: Lat. 25°10.1 N; Long. 125°48.6 E
Time Surface: 07:02 PDR Depth:
Dredged Samples:
Remarks:

Dredge Log

Date: Dec. 10, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 80

Location: Tokai Continental Shelf

Bottom Topography: Flat (buried channel)

Weather: Partly cloudy Wind: 7 m NW Sea: Slight wave, weak swell

Type of Dredge: Pipe dredge Weight: 1 x 100 kg

Winch No.: No. 5

Time Lowered: 11:06 PDR Depth: 116 m

Time Bottom Hit: 11:10 Wire Out: 129 m Wire Angle: 5°

PDR Depth: 116 m Corr. Water Depth: 120 m

Ship Position: Lat. 28°22.2 N; Long. 125°34.7 E

Direction of Haul: 109° Ship Speed: 1.0 kt

Condiiton of Haul:

Time Leave Bottom: 11:51 Wire Out: 185 m Wire Angle: 60°

PDR Depth: 117 m Corr. Water Depth: 121 m

Ship Position: Lat. 28°22.5 N; Long. 125°35.2 E

Time Surface: 11:56 PDR Depth:

Dredged Samples:

Remarks:

Dredge Log

Date: Dec. 10, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 79

Location: Tokai Continental Shelf

Bottom Topography: Flat

Weather: Cloudy Wind: 6.5 m NNE Sea: Smooth-wavelets wave, weak swell

Type of Dredge: Pipe dredge Weight: 1 x 100 kg

Winch No.: No. 5

Time Lowered: 09:17 PDR Depth: 114 m

Time Bottom Hit: 09:22 Wire Out: 122 m Wire Angle: 12°

PDR Depth: 114 m Corr. Water Depth: 118 m

Ship Position: Lat. 28°20.4 N; Long. 125°27.5 E

Direction of Haul: 285° Ship Speed: 0.5 kt

Condition of Haul:

Time Leave Bottom: 09:55 Wire Out: 130 m Wire Angle: 20°

PDR Depth: 114 m Corr. Water Depth: 118 m

Ship Position: Lat. 28°20.4 N; Long. 125°26.8 E

Time Surface: 10:00 PDR Depth:

Dredged Samples:

Remarks:

Dredge Log

Date: Dec. 11, 1972 Ship: Hakuho-Maru Cruise: KH-72-2 Station: 83

Location: Off Yokoate Island

Bottom Topography: Western slope of a submarine peak near the volcanic chain

Weather: Blue sky Wind: 6 m ESE Sea: Slight wave, weak swell

Type of Dredge: Norwalk with two pipe dredges Weight: 1 x 200 kg

Winch No.: No. 5

Time Lowered: 09:13 PDR Depth: 800 m

Time Bottom Hit: 09:38 Wire Out: 885 m Wire Angle: 5°

PDR Depth: 800 m Corr. Water Depth: 799 m

Ship Position: Lat. 28°32.2 N; Long. 128°25.8 E

Direction of Haul: 80° Ship Speed: 0.5--0.9 kt

Condition of Haul: Max tension 2.5 ton

Time Leave Bottom: 10:43 Wire Out: 814 m Wire Angle: 3°

PDR Depth: 780 m Corr. Water Depth: 779 m

Ship Position: Lat. 28°31.8 N; Long. 128°26.2 E

Time Surface: 11:20 PDR Depth:

Dredged Samples:

Remarks:

10. Smith-McIntyre Bottom Sampler

1. General remarks

by Tsuguo Shuto

Smith-McIntyre sampler was used to obtain bottom samples from the particular area including from the edge of the shelf to the continental slope to check how benthonic organisms, especially those with shells, and their remains are distributed in that geographical part. Under the limitation of the schedule we could not afford enough number of locations. Under this circumstance the present work is regarded as a preliminary one. Stations were selected off Miyazaki (Sts. 34, 35 and 36) in Leg 1 and shelf-edge of East China Sea and its neighbouring continental slope of Okinawa trough (Sts. 78, 81 and 82) (Table 13).

The sampler was operated through the following procedure. The wire was paid out at a speed of 0.8 m per second until the wire length became equal to the depth, when winch was stopped to make the dip of the wire minimum. Then the wire was again paid out at a speed of 1.5 m per second until the sampler reached the bottom. The hoisting began at a low speed until the tension-meter indicated detach of the sampler from the bottom. Afterward hoisting speed was maintained at 0.8 m per second.

It was found that the sampler reflected the phonic wave by its upper surface and verified a similar effect of sounding as is expected by use of the pinger. Namely we could recognize accurately the sinking process of the sampler to the bottom.

All the samples contain few marco benthos, although some of the samples (for example, St. 36) contain abundant remains of shelled organisms. This fact indicates difficulty of contitative comparison of living organisms between samples. At least samples of two hauls at each station is desirable for the original purpose.

List of Distribution of Samples

Ohara:	10 g each from all the samples
Nishida:	20 g each from all the samples
Shuto:	Remainder part of the samples

Table 13. Sampling location and description of samples

St.	Date	Loc.	Depth (m)	Time start	Time finish	OW (m)	Dip (degrees)	Substratum	Thick-ness (cm)	Temp. (degrees)
Leg 1										
34	Nov 8	31-58.0, 131-51.6	745	12:25	12:47	793	5	mud with sporadic granules	15	6.8
35	Nov 8	31-52.8, 131-34.8	35	15:06	15:08					
			35	15:17	15:20	41	4	fine sand	10	20.1
36	Nov 8	31-55.3, 131-40.3	120	16:05	16:09					
			122	16:17	16:21	130	2.5	muddy sand with organic remains	12	16.1
Leg 3										
78	Dec 10	28-20.5, 125-28.1	116	08:53	08:57					
			117	09:01	)9:05	-	-	sand	8	-
81	Dec 10	28-30.0, 126-59.8	476	19:16	19:32	-	-	mud	16	-
			548	19:53	20:10	-	-	mud	16	-
82	Dec 10	28-27.9, 126-52.4	258	21:13	22:25	-	-	mud	16	-

2. Mineralogical studies of samples

by Jyonosuke Ohara

Mineralogical studies of the samples were carried out and the results are shown in the following table (Table 14). The method of observation is shown in 7-3-1.

Results: Hornblende and pyroxene will be brought from volcanic ash. Zircon and tourmaline, etc. will come from the land. Formation of glauconite is noteworthy.

Table 14. Constituent of the samples of Smith-McIntyre Sampler

	(Station No.)		34*	35**	36***
	Volume of Coarse Fraction		D	D	D
Light Matters	Volume		D	D	D
	Sorting		P	W	W
	Pumice		C		C
	Glass Shard		D	R	C
Organisms	Diatom		C	C	
	Radiolaria		C	C	
	Foraminifera		D		C
	Others		C		C
Heavy Minerals	Volume		D	D	D
	Sorting		W	W	W
	ZIRCON	colorless	Pr	Pr	Pr
		brown		Pr	
		purple		Pr	
	TOUR-MARINE	green			
		brown			
		greenish brown	Pr	Pr	
		dark green			
	AUGITE		Pr	Pr	Pr
	HYPERSTHENE		D	D	D
	rhombic PYROXENE		Pr	Pr	Pr
	GARNET				Pr
	HORN-blende	green	Pr	Pr	Pr
		brown	Pr	Pr	Pr
		greenish brown	Pr	Pr	Pr
		light green			
		alkali amphibole			
Heavy Minerals	RUTILE			Pr	
	ANATASE			?	
	MONAZITE			Pr	
	TITANITE				
	EPDOTE				
	MUSCOVITE				
	BIO-TITE	green			
		greenish brown			
		brown	Pr		
	CHLORITE				
	GLAUCONITE		Pr	?	Pr
	MAGNETITE		R	R	R
	PYRITE				

LEGEND. D: Dominant C: Common R: Rare Pr: Present
W: Well P: Poor

*greenish gray mud **very fine sand ***muddy very fine sand

3. Nannoplanktons

by Shiro Nishida

Smear slides were prepared for this and light-microscope techniques were used to identify nannoplanktons. Identified calcareous nannoplankton species are as follows:

St. 34: *Cyclococcolithus leptoporus*, *Gephyrocapsa oceanica*, *Helicopontosphaera kamptneri*, *Phabdosphaera clavigera* and unidentified nannoplanktons.

St. 35: *Gephyrocapsa oceanica* and unidentified nannoplanktons.

St. 36: *Gephyrocapsa oceanica*, *Helicopontosphaera kamptneri* and unidentified nannoplanktons.

St. 78: *Cyclococcolithus leptoporus*, *Gephyrocapsa oceanica*, *Helicopontosphaera kamptneri* and unidentified nannoplanktons.

St. 81: *Cyclococcolithus leptoporus*, *Gephyrocapsa oceanica*, *Helicopontosphaera kamptneri* and unidentified nannoplanktons.

St. 82: *Cyclococcolithus leptoporus*, *Gephyrocapsa oceanica*, *Helicopontosphaera kamptneri* and unidentified nannoplanktons.

II. Plankton Sampling with Norpac Net

by Tsuguo Shuto and Tokuhiko Kameyama

Benthic marine molluscs, like other benthic invertebrates, generally spend planktonic life during their larval stage. Their life form, especially of gastropods, is, however, diversified in several types in correspondence with their trophic types. Namely they include innumerous variations from long pelagic planktotrophic type to direct developing lecithotrophic one. The above-mentioned ecomorphic types of larvae of molluscan species are directly related to ability of their dispersion and geographical distribution. Furthermore, it is acceptable from the genetical view point that the ecomorphic types of larvae are related intimately to delivery and dispersal ability of genes of species. Accordingly it is very important to grasp the facts of the lives of molluscan larvae.

The purpose of the plankton sampling with Norpac net during the present cruise is to obtain basic data about the distribution and density of planktonic larvae of molluscs in the oceanic water of the West Pacific, as is suggested by the foregoing paragraph.

In general, two vertical hauls were tried at each station in wire-out of 100 m and 300 m with some modification controled by shallow depth or other conditions at the stations 24, 30, 42, 49 and 76 (Table 15).

Hoisting speed was maintained at 0.8 m per second in every haul. This speed, however, seems to be too fast judging from the result of the calibration. Ratios of sifted water at all the stations are larger than 1.00 ranging from 1.02 to 2.22. Larger part of water which once flowed in the net, appears not to have passed through the net but to have flowed backward through the outer zone of the aperture. Accordingly calculation of individuals per unit volume of water is meaningless in these samples.

Individual number of the molluscan larvae in each sample is at most one per cent of the total number of individuals according to the preliminary calculation ranging from 15 to 60 per sample. However, the larvae consist of more species than expected and indicate several species spend long pelagic larval lives. Among the molluscan larvae, gastropods predominate over bivalves both in number of individuals and species.

List of distribution of samples

St. 5, 300 m, St. 7, 300 m, St. 13, 300 m, St. 18, 300 m and St. 32, 300 m . . . one half, Shuto and another half, Aoshima. All the other samples to Shuto.

Table 15. Sampling locaiton and description of samples

St. Leg 1	Loc. Start	End	W O (m)	Dip (degrees)	Fm	Sw	V (m)
3	(32°31.5, 141°28.2)	(-32.0, -28.3)	100	15	995	1.44	23.04
			300	6	2550	1.23	59.04
5	(31°48.6, 144°01.0)	(-48.9, -01.1)	100	18	1175	1.71	27.36
			300	28	3090	1.46	70.08
7	(31°29.0, 135°28.0)	(-29.1, -28.1)	100	17	1070	1.56	24.96
			300	33	3490	1.65	79.20
13	(33°31.4, 135°05.9)	(-31.3, -06.0)	100	6	1060	1.54	24.64
			300	4	2550	1.20	57.60
18	(32°18.6, 133°11.3)	(-18.3, -12.4)	100	20	1075	1.56	24.96
			300	22	3070	1.45	69.60
24	(33°07.5, 133°11.9)	(-07.5, -11.9)	60	12	670	1.62	15.55
			60	8	635	1.52	14.59
30	(32°44.0, 133°30.8)	(-44.0, -31.1)	200	57	3045	2.22	71.04
32	(31°49.2, 133°55.5)	(-49.5, -55.5)	100	9	1020	1.48	23.68
			300	22	2890	1.36	65.28
St. Leg 2							
38	(28°41.0, 129°41.7)	(-40.9, -41.8)	100	22	1040	1.51	24.16
			300	28	3010	1.42	68.16
40	(28°18.5, 130°15.1)	(-18.6, -15.2)	100	18	1045	1.52	24.32
			300	17	2865	1.35	64.80
42	(28°15.2, 130°33.9)	(-05.2, -34.0)	100	18	1175	1.71	27.36
			100	18	1140	1.65	26.40
47	(28°04.5, 131°38.3)	(-04.2, -38.2)	100	30	1110	1.61	25.76
			300	41	3925	1.85	88.80
49	(26°12.3, 131°31.2)	(-10.6, -30.7)	100	25	1230	1.79	28.64
			200	31	2470	1.80	57.60
			300	42	3740	1.77	84.96
54	(24°28.7, 131°03.0)	(-28.5, -03.1)	100	0	710	1.03	16.48
			300	5	2165	1.02	48.96
57	(21°36.8, 132°43.8)	(-37.0, -43.8)	100	27	1025	1.48	23.68
			300	39	3965	1,87	89.76
St. Leg 3							
59	(22°53.4, 129°13.1)	(-53.5, -13.0)	100	30	880	1.28	20.48
			300	33	3465	1.64	78.72
67	(25°30.4, 129°49.5)	(-30.4, -50.2)	100	16	1060	1.54	24.64
			300	13	2960	1.40	67.20
71	(25°10.8, 125°49.7)	(-10.8, -49.8)	100	5	995	1.44	23.04
75	(26°40.5, 125°41.8)	(-41.3, -41.9)	100	45	1345	1.96	31.36
			300	10	2860	1.35	64.80
76	(28°20.6, 125°28.9)	(-20.6, -28.7)	90	20	980	1.58	22.75

Calibration: St. 65, wire out of 80 m, dip 14 degrees.
Fm: Q_1 = 565, Q_2 = 468, Q_3 = 590, Q_4 = 510, and Q_5 = 610. Q_m = 548.6

12. HYDROCAST

1. Records of operation

by Masato Nohara, Kenichi Otsuka, Hirotaka Otobe and Hideo Kagami

Water samples were collected at nine stations throughout the cruise, which are shown in Table 16.

All water samples were taken with 12-liter Van Dorn, and 2-liter Nansen sampler at stations No. 1, 11, 14, 16, 20, 55, 66, and two 12-liter Van Dorn samplers at stations No. 62, 77 respectively.

In combination of sonar pinger (E-G and -G Model 220) and echo sounder on board, we could recognize exactly the distance between sonar pinger and sea bottom floor and could obtain bottom water samples as near as possible. The sonar pinger was set up at the end of the wire, and 12-liter Van Dorn sampler was stalled at 1 meter above the sonar pinger, Nansen sampler 4 meter upper Van Dorn sampler. Two protected reversing thermometers and one unprotected reversing thermometer attached to the Nansen sampler.

The signal from sonar pinger was very clear, except at station No. 14, where water sample could not be obtained, because of the sonar pinger accident.

Two-liter water sample in Nansen sampler was used for routine analyses of salinity, dissolved oxygen, oxidation potential, pH and others. Water of Van Dorn sampler were used for suspended matters and Ca, Mg, Sr analyses and partly for salinity.

Table 16. Station of water sampling

St.	Position		Time		Depth
No.	Longitude	Latitude	Date	Hour	(m)
1	144°00.2 E	31°45.5 N	Oct. 27, 1972	0710-1104	5680
11	134°47.2 E	31°12.5 N	Nov. 1, 1972	1546-1825	4290
14	135°05.0 E	33°31.3 N	Nov. 2, 1972	1128-1217	1300
16	135°05.0 E	33°30.8 N	Nov. 2, 1972	1411-1601	1423
20	136°01.4 E	32°38.0 N	Nov. 5, 1972	0600-0918	4610
55	131°03.0 E	24°28.1 N	Nov. 20, 1972	1340-1552	2850
62	123°47.1 E	27°47.2 N	Dec. 4, 1972	2140-2217	95
66	129°51.1 E	25°30.8 N	Dec. 5, 1972	1700-1835	2080

2. Some physical and chemical data of sea water

by Masato Nohara and Hirotaka Otobe

The main object of bottom water sampling is to obtain information as to physico-chemical environments of sea-floor in which all different sorts of chemical interactions, for example, manganese nodules formation, are occurring at present.

Salinity was measured with Auto Lab Model 601 MK 111 salinometer. 120 ml sea water was put in a brown glass bottle already washed with fresh water and its temperature was adjusted to room temperature. I.A.P.O.'s was used as standard sea water.

The pH values were measured with Hitachi-Horiba Model F-5 pH meter according to the method described in "A Manual of Sea Water Analysis" by D. H. Strickland and T. R. Parsons (Bulletin No. 125, 29-36, 1965, Fish. Res. Bd. Canada). Hitachi-Horiba glass electrod and calomel electrod were used in pH measurements. Two buffer solution, pH 4.7 (made by Hitachi-Horiba, Co. Ltd.) were used for standardization.

The sample was taken into a 100-ml glass bottle directly from Nansen sampler and after its temperature became equal to room temperature, the electrodes were immersed directly into the sample to read out pH values.

The amount of dissolved oxygen was determined by the Winkler method using Metrom piston buret of 10 ml capacity. Titration was done within 24 hours after the addition of manganese chloride and potassium iodide solution. Reagents were prepared according to the manual described in "Oceanographical Society of Japan."

The oxidation potential was measured with the same instrument used in determining pH values.

The inert electrode used was bright platinum and the reference electrode usually used in Eh measurement was the saturated calomel electrode (both made by Beckman, Co. Ltd.).

The results of routine analyses are shown in Table 17.

Table 17. The analytical results of bottom water samples

Station Number	O_2 ml/1	Salinity (‰)	pH	Eh (mv)
1	3.68	34.699	7.8	+250
11	3.45	34.687	7.8	+205
16	1.23	34.531	7.6	+210
20	3.53	34.689	7.8	+210
55	3.07	35.748	7.7	+200
66	1.68	38.456	7.9	+ 0.40

3. Suspended matter in sea water

by Kenichi Otsuka

Sediment-water interface processes occupy very important position within whole sedimentation phenomena even at very deep sea floor. In order to obtain more data on suspended sediments at near bottom layer, concentration of suspended matter of bottom and surface water was measured at 8 water-sampling stations (Sts. 1, 11, 16, 20, 55, 62, 66, 77; Table 18), and that of surface water samples was measured at further 15 stations also (in Table 19).

Bottom water samples were collected using a couple of 6-l Van Dorn water samplers attached 1 m above the sonar pinger of the end of the hydrographic wire. However, at St. 1, the sampler was 5 m above the sonar pinger exceptionally. And the sonar pinger was allowed to approach the bottom as near as possible during sampling. Surface water samples were collected with a clean rinsed plastic bucket.

Upon recovery aboard the ship, measured volumes of 4 to 11-l of water samples were filtered through a pair of 47 mm diameter preweighed membrana filters, having mean pore size of 0.45μ, under negative pressure condition by an aspirator.

Following filtration, the filters were washed with distilled water several times, then they were dried in a desicator for several days at room temperature, and stored in plastic containers. The change in weight of the lower filter was used as a blank correction base for the weight of suspended

Table 18. Suspended matter concentration in surface and bottom water

St. No.	Lat.	Long.	Depth (m)	Suspended matter (mg/1)		Remarks
1	31°45.5 N	144°00.2 E	5680	s.w.	0.07	Western Pacific Ocean Floor
				b.w.	0.25	
11	31°12.5 N	134°47.2 E	4290	s.w.	0.12	Shikoku Basin
				b.w.	0.11	
16	33°30.8 N	135°04.4 E	1423	s.w.	0.20	Toki Basin, Canyon floor off Kii Strait
				b.w.	0.11	
20	32°38.0 N	136°01.4 E	4610	s.w.	0.09	Nankai Trough off Shionomisaki
				b.w.	0.17	
55	24°28.1 N	131°03.0 E	2850	s.w.	0.10	Oki Daito Ridge
				b.w.	0.20	
62	27°47.2 N	123°47.1 E	90	s.w.	0.14	East China Sea Shelf
				b.w.	0.56	
66	25°30.8 N	124°51.1 E	2080	s.w.	0.18	Okinawa Trough Basin floor
				b.w.	0.37	
77	28°20.5 N	125°28.5 E	110	s.w.	0.15	East China Sea Shelf
				b.w.	0.34	

s.w.: Concentration value of surface water sample
b.w.: Concentration value of bottom water sample

Table 19. Suspended matter concentration in surface water

St. No.	Lat.	Long.	Depth	Suspended matter (mg/1)	Remarks
6	31°29.0 N	135°36.6 E		0.12	Shikoku Basin
9	32°40.8 N	134°45.4 E	3557	0.07	Koshu Sea Mount off Shikoku
19	32°09.2 N	134°20.0 E	3740	0.13	Off Shikoku
23	33°07.5 N	133°11.9 E	70	0.56	Off Shikoku
28	32°50.8 N	133°26.0 E	475	0.19	Off Shikoku
29	32°43.8 N	133°30.4 E	808	0.14	Off Shikoku
31	31°47.1 N	133°56.0 E	4865	0.15	Nankai Trough off Miyazaki
35	31°52.8 N	131°34.8 E	35	0.46	Off Miyazaki
37	28°41.9 N	129°41.6 E	380	0.16	Off Amami Oshima
39	28°18.5 N	130°16.2 E	1520	0.08	Off Amami Oshima
41	38°06.6 N	130°33.8 E	3560	0.37	Off Amami Oshima
56	21°34.4 N	132°42.3 E	5360	0.10	Philippine Sea
69	25°53.7 N	124°40.2 E	1230	0.28	Okinawa Trough
73	26°00.3 E	125°44.5 E	2120	0.17	Okinawa Trough

matter trapped on the upper filter. However, in some case of samples collected during the later leg of the cruise, this method was not used, and only a single filter was used.

The weight change of filters was corrected by average change ratio calculated from other blank filters.

Results are shown in Table 18 and 19. Concentration of suspended matter of surface water ranges from 0.07 mg/l to 0.56 mg/l, and increases toward land coast abruptly (Sts. 23, 34, 35). However, concentration values of surface samples are 0.2 mg/l to 0.1 mg/l or so at most stations. Concentration values of suspended matter of bottom water are rather high, from 0.11 mg/l to 0.56 mg/l. At each station the value is 2 to 4 times as much as that of the surface water suspended matter concentration, except St. 11 and St. 16. This high concentration of suspended matter at bottom is especially distinct at East China Sea shelf, Okinawa trough basin, and Pacific Ocean floor (St. 1). These results suggest active sedimentation processes near bottom layer in various environments from shelf to deep ocean floor, and importance of water-sediment interface phenomena. Nevertheless, St. 16 is situated at a canyon axis and rather near to land coast; the bottom water sample indicates very low concentration value of suspended matter. This may be due to some particular water mass environment.

4. Nannoplanktons in surface sea water

by Shiro Nishida

Living nannoplanktons were collected in the following ways: seventy-eight of spot samples of surface water were taken using the surface filtering, plastic Milipore filter. This is the plain white, 47 mm diameter, 0.8μ pore size, type AA filter. The filter was placed in a stainless steel funnel and a minimum 1 liter of sample passed through using a vacuum pump and reservoir system. Before this, sea water was filtered through 200 mesh, 74μ opening, stainless steel sieve. Ordinarily, 4 liters of sea water were used. This was followed by 1/2 liter distilled water to remove salt. Finally, the filter was dried and placed in a numbered plastic case. In the laboratory, these nannoplankton samples obtained will be observed with transmission and scanning electronmicroscope techniques. Living nannoplankton sample locations are as follows (Table 20).

Table 20. Locations of sampling nannofossils

No.	Lat.	Long.	Date	Time	Temp.	Remarks
1	31°44.3 N	139°25.6 E	Oct. 26	07:30	24.1°C	
2	31°48.7 N	141°27.0 E	Oct. 26	18:00	24.0°C	
3	31°45.4 N	144°00.2 E	Oct. 27	09:30	24.1°C	
4	32°30.3 N	141°31.4 E	Oct. 28	09:30	24.1°C	
5	31°39.0 N	135°36.6 E	Oct. 30	14.30	24.2°C	
6	32°56.5 N	134°17.3 E	Oct. 31	09:30	24.2°C.	
7	31°13.5 N	134°49.7 E	Nov. 1	13:00	24.2°C	
8	31°12.9 N	134°47.4 E	Nov. 2	16:00	24.1°C	
9	32°18.0 N	134°07.8 E	Nov. 3	14:00	25.1°C	
10	32°09.2 N	139°20.1 E	Nov. 4	14:30	25.1°C	
11	32°38.0 N	136°01.4 E	Nov. 5	08:00	24.5°C	
12	32°50.8 N	133°26.0 E	Nov. 6	14:00	23.5°C	
13	31°52.5 N	133°47.1 E	Nov. 7	12:00	24.0°C	
14	31°52.9 N	131°35.1 E	Nov. 8	15:00	22.5°C	
15	30°56.2 N	131°04.4 E	Nov. 9	15:00	23.5°C	
16	28°42.2 N	129°42.2 E	Nov. 15	11:30	24.5°C	
17	28°18.5 N	130°15.3 E	Nov. 15	21:30	25.0°C	
18	28°06.6 N	130°33.8 E	Nov. 16	11:00	25.5°C	
19	28°14.3 N	131°41.5 E	Nov. 18	08:00	25.0°C	
20	28°05.1 N	131°38.1 E	Nov. 18	12:30	25.0°C	
21	26°11.6 N	131°33.3 E	Nov. 19	08:00	26.5°C	
22	25°59.3 N	131°21.6 E	Nov. 19	13:00	26.0°C	
23	24°29.5 N	131°00.0 E	Nov. 20	06:45	26.5°C	
24	21°34.5 N	131°42.1 E	Nov. 21	10:00	27.5°C	
25	27°53.1 N	131°23.3 E	Nov. 23	06:00	24.5°C	
26	28°21.6 N	131°47.7 E	Nov. 24	09:00	24.5°C	
27	28°22.2 N	131°47.5 E	Nov. 24	12:00	24.5°C	
28	28°21.6 N	131°49.0 E	Nov. 24	15:00	24.5°C	
29	27°53.2 N	131°25.0 E	Nov. 25	08:00	24.0°C	
30	27°52.3 N	131°26.4 E	Nov. 25	10:00	24.0°C	
31	27°37.7 N	131°42.5 E	Nov. 25	13:00	24.0°C	
33	26°12.2 N	127°31.5 E	Nov. 27	09:00	25.0°C	
34	22°53.0 N	129°13.3 E	Dec. 2	14:00	25.5°C	

No.	Lat.	Long.	Date	Time	Temp.	Remarks
35	22°52.3 N	129°12.8 E	Dec. 2	17:30	25.5°C	
36	27°48.0 N	123°49.5 E	Dec. 4	19:00	25.0°C	
37	27°46.8 N	123°48.0 E	Dec. 4	21:00	25.0°C	
38	26°29.3 N	124°48.3 E	Dec. 5	15:00	24.5°C	
39	26°30.8 N	124°51.1 E	Dec. 5	18:00	24.0°C	
40	25°48.1 N	124°35.2 E	Dec. 5	22:00	25.0°C	
41	25°49.5 N	124°36.5 E	Dec. 6	01:00	25.0°C	
42	25°54.5 N	124°39.8 E	Dec. 6	04:00	24.5°C	
43	20°59.0 N	126°03.1 E	Dec. 7	12:30	26.0°C	
44	22°46.5 N	126°07.9 E	Dec. 8	10:30	25.5°C	
45	25°10.3 N	125°50.3 E	Dec. 9	06:00	25.0°C	
46	25°10.1 N	125°48.6 E	Dec. 9	07:00	25.0°C	
47	25°16.6 N	125°46.4 E	Dec. 9	08:00	25.0°C	
48	25°27.3 N	125°44.8 E	Dec. 9	09:00	24.8°C	
49	25°37.3 N	125°43.5 E	Dec. 9	10:00	24.5°C	
50	25°47.8 N	125°43.3 E	Dec. 9	11:00	24.3°C	
51	25°58.5 N	125°44.1 E	Dec. 9	12:00	24.5°C	
52	26°00.5 N	125°43.6 E	Dec. 9	13:00	24.5°C	
53	26°00.3 N	125°44.5 E	Dec. 9	14:00	24.5°C	
54	26°02.6 N	125°43.4 E	Dec. 9	15:00	24.5°C	
55	26°14.3 N	125°43.3 E	Dec. 9	16:00	24.5°C	
56	26°26.5 N	125°42.5 E	Dec. 9	17:00	24.5°C	
57	26°38.4 N	125°42.3 E	Dec. 9	18:00	24.5°C	
58	26°43.1 N	125°45.0 E	Dec. 9	19:00	24.5°C	
59	26°40.0 N	125°42.5 E	Dec. 9	20:00	24.5°C	
60	26°39.8 N	125°41.4 E	Dec. 9	21:00	24.8°C	
61	26°40.5 N	125°41.8 E	Dec. 9	22:00	24.8°C	
62	28°20.5 N	125°28.1 E	Dec. 10	09:00	22.5°C	
63	28°22.5 N	125°35.2 E	Dec. 10	12:00	23.5°C	
64	28°24.5 N	126°11.3 E	Dec. 10	15:00	23.5°C	
65	28°26.1 N	126°47.8 E	Dec. 10	18:00	22.7°C	
66	28°27.9 N	126°54.3 E	Dec. 10	21:00	22.5°C	
67	28°32.6 N	128°20.7 E	Dec. 11	08:00	22.5°C	
68 a	28°32.3 N	128°26.0 E	Dec. 11	10:00	22.5°C	1 lit. suction
68 b	28°32.3 N	128°26.0 E	Dec. 11	10:00	22.5°C	2 lit.

No.	Lat.	Long.	Date	Time	Temp.	Remarks
68 c	28°32.3 N	128°26.0 E	Dec. 11	10:00	22.5°C	4 lit.
68 d	28°32.3 N	128°26.0 E	Dec. 11	10:00	22.5°C	8 lit.
68 e	28°32.3 N	128°26.0 E	Dec. 11	10:00	22.5°C	16 lit.
69	28°37.8 N	128°25.0 E	Dec. 11	16:00	22.5°C	
70	28°37.5 N	128°51.8 E	Dec. 11	18:00	22.5°C	
71	28°40.9 N	130°33.8 E	Dec. 11	21:00	23.5°C	
72	28°50.6 N	132°42.0 E	Dec. 12	07:00	23.0°C	
73	29°10.3 N	133°18.3 E	Dec. 12	12:00	23.0°C	
74	29°40.2 N	134°18.8 E	Dec. 12	17:00	21.5°C	
75	31°16.4 N	136°48.7 E	Dec. 13	08:00	20.5°C	
76	31°34.0 N	137°17.5 E	Dec. 13	11:00	20.5°C	
77	31°56.2 N	137°36.6 E	Dec. 13	14:00	20.5°C	
78	32°24.5 N	138°07.2 E	Dec. 13	17:00	20.5°C	

13. Sighting Record: Sea Birds Observed in the Seas of Southwest of Japan

by Yutaka Tanaka, Kiyoshi Nanba and Fujio Inaba

This report is based on the observation in the southwest of Japan. From the 24th of October to the 15th of December, 1972, Hakuho-Maru had the research cruising. At that time, we observed sea birds. Map (Fig. 38) shows cruise track, ship's noon position, air temperature and sea temperature.

Method: We observed and calculated all the sea birds in the field of visible (radius, about 7 sea miles) from the bridge (height 11 meters), and used binoculars so as to identify species in the distance. Usually sea birds were observed at interval of one hour from 08:00 to 16:00 and large flocks were calculated on all such occasions. However, for the purpose of the cruise, during observation the ship was drifting a few hour and more on one point, during running the ship set speed 10 knot for researching bottom topography and geomagnetic survey.

Table 21 shows all numbers of sea birds observed in cruise area and the running hours and the drifting hours.

Results: Nine species were observed in all waters except the sort of gull. As a result, the following is summarized about each species:

a) STREAKED SHEARWATER, Calonectris leucomelas

This species was identified in a large number near Izu-shoto, off Shikoku and off Kii Peninsula especially between the end of October and the first of November, when it took more than 50% of this species, but was hardly seen near Izu-shoto about in the middle of December.

b) ALBATROSSES, Diomedea Sp.

SHORT-TAILED ALBATROSS, Diomedea albatrus was observed, only one, off Shikoku and BLACK-FOOTED ALBATROSS, Diomedea nigripes were found in the east area of 140 E but were not observed on the more western waters of the 140 E.

c) BOOBIES, Sula sp.

It was to the extent of off the port of Nagasaki that BROWN BOOBY, Sula leucogaster were observed. BLUE-FACED BOOBY, Sula dactylatra was not

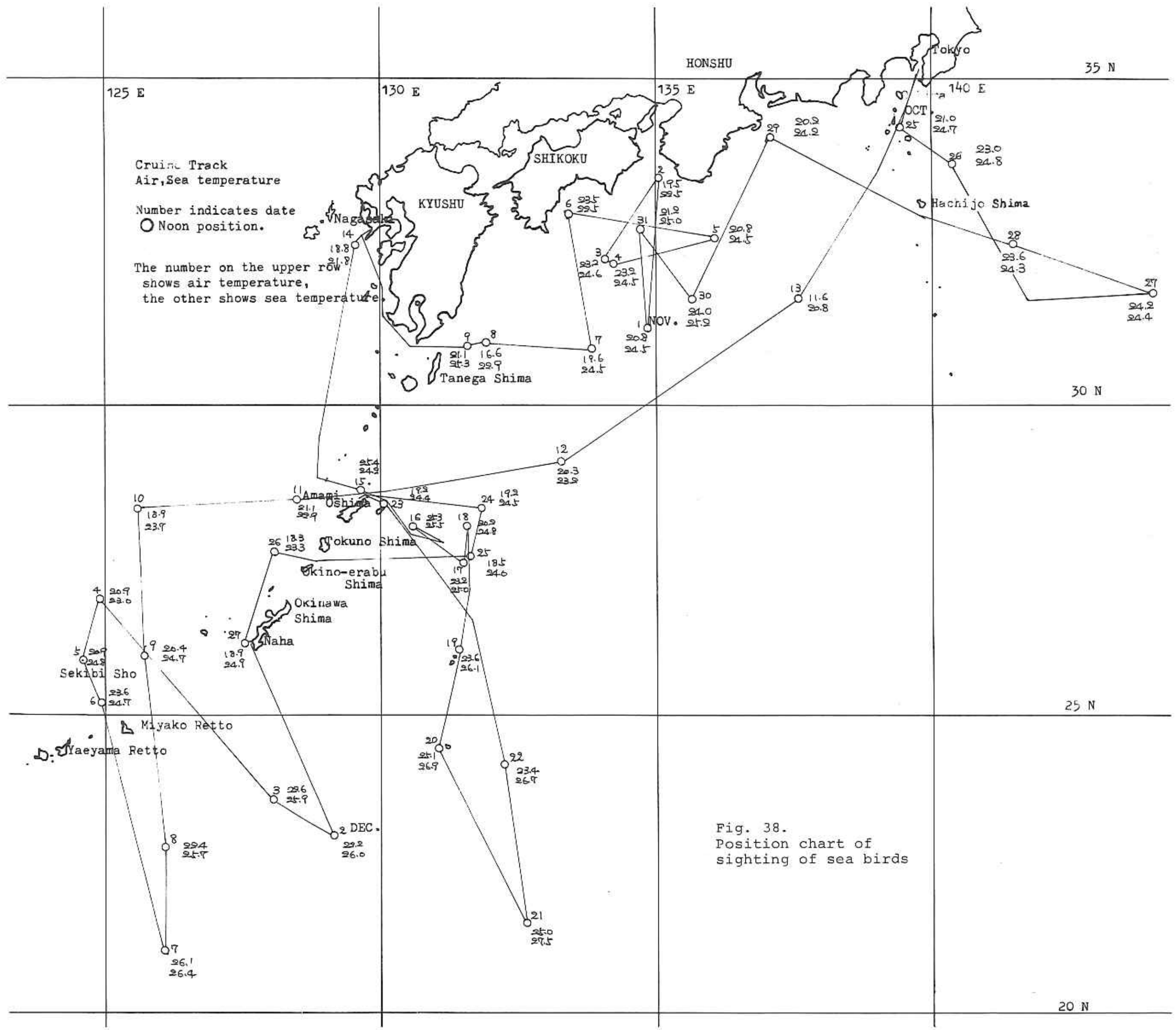


Fig. 38.
Position chart of sighting of sea birds

seen at all near Nansei-shoto at about the end of July, but this time 5 BLUE-FACED BOOBY were observed at approximately 9 miles from Sekibi-sho belonging to Senkaku-shoto.

Table 21. Data of daily observation of sea birds

Date	Temperature air	sea	*Calonectris leucomelas*	*Puffinus pacificus*	*Pterodroma hypoleuca*	*Oceanodroma castro*	*Diomedea nigripes*	*Diomedea albatrus*	*Sula leucogaster*	*Sula dactylatra*	*Larinae*	Shearwater	Others	Total	Running observed hour	Drifting observed hour
10-25	21.0	24.7	237											237	8	0
10-26	23.0	24.8	3			5								8	5	0
10-27	24.2	24.4				1	2							3	0	6
10-28	23.6	24.3	4				1							5	0	3
10-29	20.2	24.2	47											47	4	0
10-30	24.0	25.2												0	6	2
10-31	21.2	25.0												0	2	2
11- 1	20.8	24.5												0	4	2
11- 2	19.5	22.5									1			1	0	5
11- 3	23.2	24.6												0	0	4
11- 4	23.2	24.5						1						1	1	3
11- 5	20.8	24.5	3								1			4	0	3
11- 6	23.5	22.5	61								1			62	2	2
11- 7	19.6	24.5	2											2	1	3
11- 8	16.6	22.9	6								4			10	6	2
11- 9	21.1	25.3	2											2	5	0
11-10	23.7	21.4							4		50			54	1	0
11-14	18.8	21.8												0	4	0
11-15	25.4	24.2	2											2	4	3
11-16	25.3	25.5										2	2	4	3	6
11-17	23.2	25.0									3			3	4	2
11-18	20.2	24.8												0	3	4

(Table 21, continued)

Date	Temperature air	Temperature sea	*Calonectris leucomelas*	*Puffinus pacificus*	*Pterodroma hypoleuca*	*Oceanodroma castro*	*Diomedea nigripes*	*Diomedea albatrus*	*Sula leucogaster*	*Sula dactylatra*	*Larinae*	Shearwater	Others	Total	Running observed hour	Drifting observed hour
11-19	23.6	26.1	1											1	1	7
11-20	25.1	26.9	12	7										19	2	8
11-21	25.0	27.5		1									2	3	2	5
11-22	23.4	26.7	2											2	6	0
11-23	19.2	24.4	8											8	7	0
11-24	19.2	24.5												0	3	0
11-25	18.5	24.0												0	2	2
11-26	18.3	23.3											2	2	9	0
12- 2	22.2	26.0												0	5	3
12- 3	22.6	25.9	3											3	8	0
12- 4	20.9	23.0	2											2	6	0
12- 5	20.9	24.8	2							4				6	4	2
12- 6	23.6	24.7								1	1			2	8	0
12- 7	26.1	26.4												0	6	0
12- 8	22.4	25.7	1		2									3	4	5
12- 9	20.4	24.7									1			1	6	2
12-10	18.9	23.7												0	5	3
12-11	21.1	22.9	2											2	6	2
12-12	20.3	23.2	1											1	7	1
12-13	11.6	20.8		1										1	8	0
	Total		401	9	2	6	3	1	4	5	62	2	6			
	Grand total													501		