Preliminary Report
of
The Hakuhō Maru Cruise KH-77-3
(Pegasus Expedition)

September 14-October 12, 1977

Pacific Ocean

Kagoshima Bay

Japan Sea

Ocean Research Institute

University of Tokyo

1981

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by

The Scientific Members of the Expedition

Edited by

Yoshio HORIBE

Contents

1. Outline of the cruise

The main purpose of the cruise was to study the chemical characteristics of the Japan Sea by newly developed technique of large volume water sampling and automatic nutrients analysis. The parameters to be obtained were

1) Vertical profiles of temperature, salinity, nutrients, and total carbon dioxide.
2) Distribution of heavy metals in sea water, plankton and sediment.
3) Vertical profiles of natural and man-made radionuclides (^{14}C, ^{90}Sr, ^{137}Cs, ^{222}Rn, ^{226}Ra, ^{228}Ra, ^{210}Pb).

Bottom sediment was taken at 8 stations with a piston corer for the chemical studies of interstitial water and paleoceanographic and paleontological studies.

Detailed survey of Kagoshima Bay was done with a CTD-system (Plessey Model 9006), and the temperature and salinity data of every one meter at 20 stations can be obtaiend in a printout format from the editor on request.

A large volume water sampler system was first used aboard the R/V "Hakuho Maru". The system had two PVC samplers of 230 liter capacity each, and could take water samples at two different depths successfully. An automatic nutrients analyzer, which was designed to analyze phosphate, silicate, and nitrate + nitrite at the same time with the double-beam spectrophotometers, was used for the first time aboard the R/V "Hakuho Maru". The analyzer was developed by the Auto-analyzer Working Group organized in 1975, and was funded by the Ministry of Education, Science, and Culture. (Special Project Research "Preservation of Marine Environment" Project No. 012008, 111304, 210509).

The location of stations and sample names were shown in Table 1 and Figure 1, and the CTD stations in Kagoshima Bay were shown in Table 2 and Figure 2.

The scientists aboard were grateful for the assistance given by Captain Tadama, officers and crew of the R/V "Hakuho Maru". The success of newly developed technique of handing large volume water samplers was due to their cooperation.

Table 1. Station and Sample Name[1)]

Location[2)]		Hydrocast	LV[3)]	Coring	Remark
latitude	longitude				
31.2N	137.2E	1	LV1		Pacific Ocean
30.8N	134.1E	2			
31.4N	133.7E	3			
32.2N	133.2E			L1	
31.5N	132.0E			L2	
33.9N	129.4E	11			Tsushima Strait
35.0N	131.1E	12			Japan Sea
36.4N	134.2E			M2	
36.8N	135.6E	13			
37.7N	135.2E	14(+bottom)[4)]	LV2	M4, L4	
39.3N	137.3E	15			
41.2N	140.0E	16			
40.8N	138.8E	17			
41.3N	137.4E	18(+bottom)	LV3	M5	
43.0N	138.5E	19(+bottom)	LV4	L4'	
39.6N	134.5E	22			
38.6N	134.8E	23	LV5		
37.6N	132.0E			M3	
37.3N	131.3E	24			
35.6N	130.3E	25			
36.0N	130.5E			M1	

1) CTD stations in Kagoshima Bay are in Table 2.

2) Accurate position for each station was recorded in the description of each oceanographic data.

3) 230 liters water sampling with a large volume water sampler system.

4) (+bottom) means near bottom casts for ^{222}Rn-profile.

Figure 1. Stations of Hydrocast, LV sampling, and Coring.

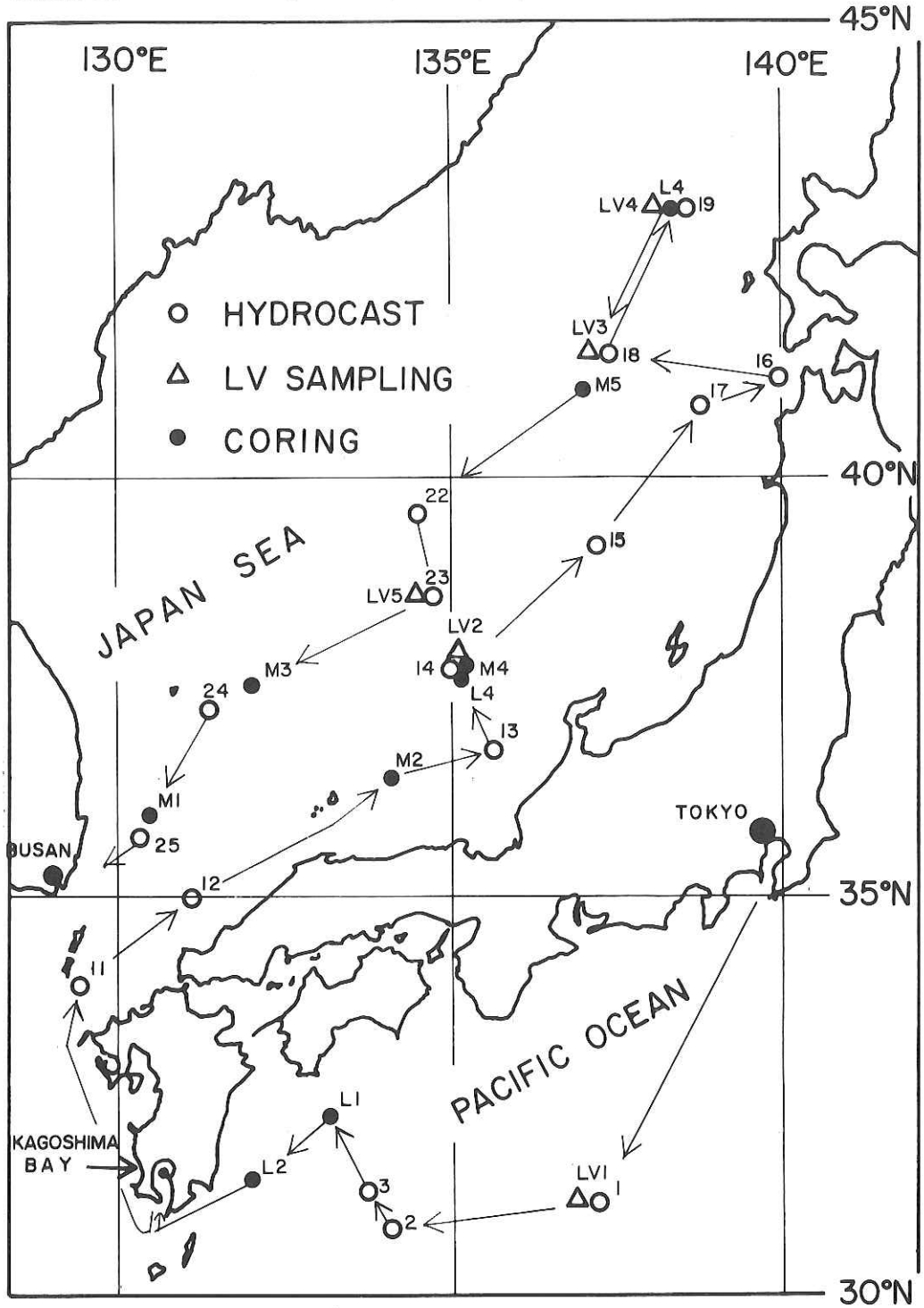
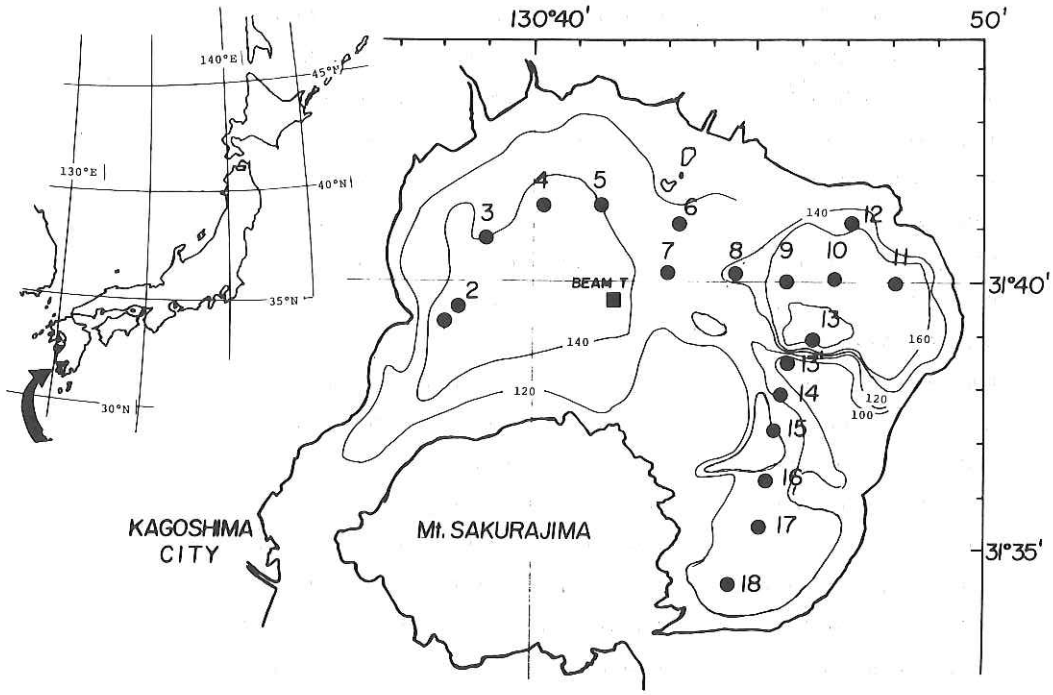


Table 2 CTD Stations in Kagoshima Bay

Station No.	Latitude (N)	Longitude (E)
K1	31°39.2'	130°38.0'
K2	31°39.5'	130°38.3'
K3	31°40.8'	130°38.9'
K4	31°41.4'	130°40.2'
K5	31.41.5'	130°41.5'
K6	31°41.1'	130°43.2'
K7	31°40.3'	130°43.0'
K8	31°40.3'	130°44.5'
K9	31°40.0'	130°45.6'
K10	31°40.1'	130°46.6'
K11	31°40.0'	130°48.1'
K12	31°41.1'	130°47.0'
K13	31°38.9'	130°46.1'
K13'	31°38.4'	130°45.6'
K14	31°37.9'	130°45.4'
K15	31°37.2'	130°45.3'
K16	31°36.2'	130°45.2'
K17	31°35.3'	130°45.0'
K18	31°34.2'	130°44.8'
K19	31°39.2'	130°44.3'

Figure 2. Kagoshima Bay.



2. Scientists Aboard

BABA, Yuji	Ocean Res. Inst., U. of Tokyo
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KANAMORI, Satoru	Water Res. Inst., Nagoya U.
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UEMATSU, Mitsuo	Faculty of Fisheries, Hokkaido U.

1) Chief Scientist

3. Hydrocast

Water samples were taken at 16 stations with NISKIN-type samplers of 23 and 2.7 liters capacity, which are made with PVC tube, acryl lids with O-rings, and stainless steel spring. Each sampler has two protected and one unprotected reversing thermometers. The spacing of the samplers on the three strand 6.4 mm steel wire were:

Shallow cast: Surface(1), 10, 30, 50, 75, 100, 125, 150, 200, 300, 400, 500, 600, 800, 1000, 1200 meters

Deep cast: 1200, 1500, 1750, 2000, 2250,, ..(every 250 meters).. bottom+10 meters.

A pinger (Benthos Model 2216) was attached at the top of the wire, and the distance between the pinger and sea floor was measured on the record of PDR. The distance between the deepest sampler and the pinger was usually one meter.

The corrected depth in the oceanographic data in pages 11 to 26 was calculated from the mean sound velocity, which was calculated from depth, temperature, and salinity data in the range of serial observation, sound velocity at the depth of deepest sampler, and the observed depth on PDR.

The reversing thermometers of low temperature ranges (scale: -0.5 to 2.2°C, 1/100°C division) were used for sampling of bottom water for Rn analysis, and the temperature reading was done in a ice bath. Unfortunately, about 30% of the reading was not satisfactory due to the incomplete movement of mercury in the capillary of the thermometers.

4. Oceanographic Data

Oceanographic data of 16 stations were shown in pages 11 to 26, and the potential temperature-salinity diagrams and nutrients-AOU diagrams were shown in Figures 4 to 14 (pages 27 to 32).

4.1. Temperature.

Seawater temperature was measured with two protected reversing thermometers attached to the sampler.

4.2. Salinity.

Salinity was measured on board with an AUTO LAB Mark III salinometer. Seawater samples of one station were measured successively using an ampoule of IAPSO Standard Seawater and the filtered surface sea water as substandard.

4.3. Dissolved Oxygen.

A modified Carpenter's method was adopted to improve the accuracy of analysis and to decrease the labor for analysis. Details of the analytical procedure and the results of comparison were reported in Appendix A. The data are expressed by μM/kg sea water.

4.4. Nutrients (nitrate + natrite, phosphate, and silicate)

An automatic nutrients analyzer system was used aboard the R/V "Hakuho Maru" for the first time. The system was designed by the Nutrients Working Group of the Executive Committee of the Special Project Research "Preservation of Marine Environment" funded by the Ministry of Education, Science and Culture, and was manufactured mainly by Nippon Bunko Co.

The system consists of an auto-sampler, pump for constant flow rate (Watson-Marlow Model MHRE 22 Delta), three grating double-beam spectrophotometers, WANG 600 desk-top computer with interfaces, IBM-output-typewriter, and three-pen stripchart recorder.

Silicate was analyzed by molybdenum-blue method. Phosphate was measured by molybdenum-ascorbic acid reduction method. Nitrate was reduced with copper-cadmium column and the sum of nitrate and nitrite was measured with Benschneider-Robinson method. The flow sheet of the analytical procedures was shown in Figure 15 (page 10), and the reagents used were listed in Table 3.

The system was designed to measure nutrients in the following concentration ranges and errors at the room temperature between 15 and 35°C.

Nutrients	Concentrations (μM)	Error
Silicate	0 - 200	±0.1 μM or ±1%
Phosphate	0 - 3	±0.01 μM or ±1%
Nitrate + Nitrite	0 - 50	±0.05 μM or ±1%

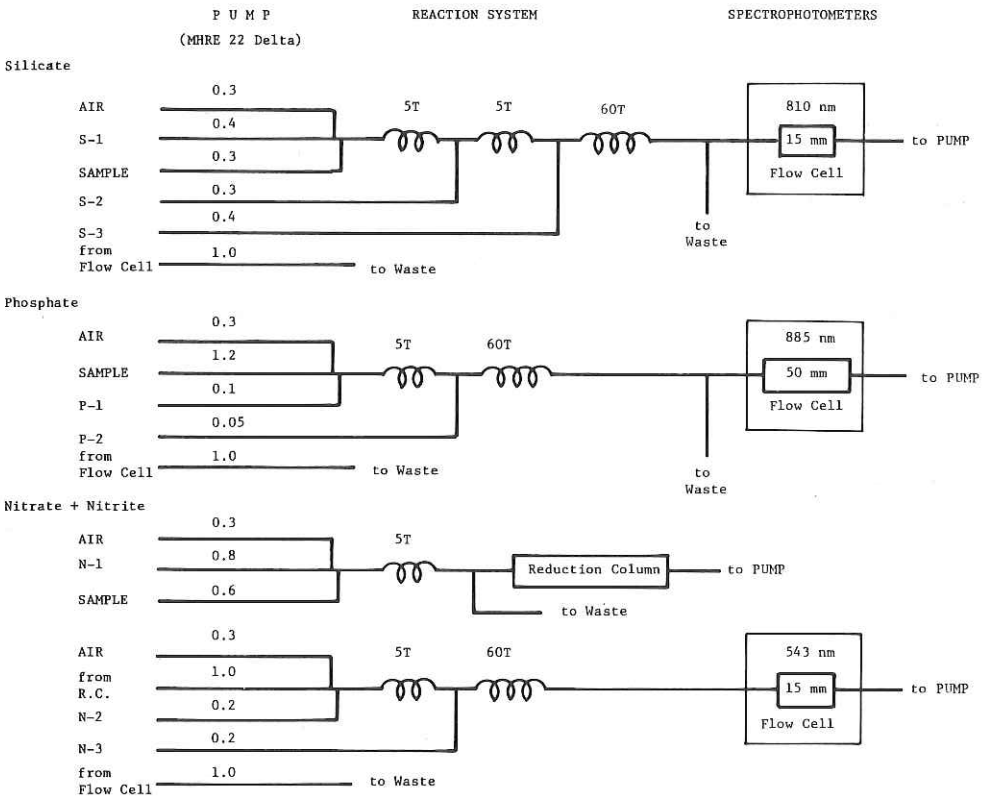
The details of the analyzer system and the method of analysis will be reported elsewhere.

Table 3. Reagents for the auto-analyzer

Name	Specifications
S-1	1% molybdenum ammonium in 0.1N sulfuric acid
S-2	5% oxalic acid aqueous solution
S-3	0.1M ascorbic acid aqueous solution with 5% aceton.
P-1	mixture of 2 part of 3% molybdenum ammonium solution 5 part of 5N sulfuric acid 1 part of 0.136% potassium antimonyl tartarate.
P-2	0.3M ascorbic acid aqueous solution
N-1	1% ammonium chloride solution, pH adjusted to 8.5 with aqueous ammonia
N-2	1% sulfanyl amide in 1.2N hydrochloric acid
N-3	0.1% N-(1-naphtyl)-ethylendiamine dihydrochloric acid
Reduction Column	copper-cadmium (32-64 mesh) in 2mm ID, 35cm long glass tube

Figure 3. Flowsheet of the auto-analyzer.

The numbers on lines of pump are the flowrate of reagents and sample sea water (ml/min).



KH77-3, STATION 1

4200 M (OBS.DEPTH) 4193 M (COR.DEPTH), 31.13.5 N 137.13.2 E, 16 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	27.90	34.088	200.5	0.0	0.11	0.1	8.282	27.899	21.764	201.9
2	10	27.98	34.083	200.5	0.2	0.10	0.0	8.289	27.977	21.734	201.7
3	29	27.80	34.183	200.0	0.3	0.14	0.0	8.284	27.792	21.867	202.2
4	49	26.17	34.186	206.5	0.0	0.10	0.4	8.267	26.158	22.389	207.7
5	74	22.42	34.519	190.1	3.3	0.28	2.8	8.198	22.404	23.755	221.2
6	98	19.30	34.558	195.6	4.1	0.39	4.5	8.162	19.281	24.626	234.1
7	123	16.74	34.587	174.1	9.5	0.72	10.8	8.086	16.719	25.277	245.8
8	147	15.16	34.576	171.0	11.7	0.86	14.5	8.051	15.136	25.629	253.7
9	196	13.08	34.472	157.0	16.2	1.16	23.4	7.976	13.052	25.987	264.8
10	294	9.03	34.330	123.4	25.9	1.88	48.2	7.809	8.997	26.609	289.3
11	392	6.99	34.292	103.4	31.0	2.27	67.6	7.713	6.951	26.884	303.2
12	491	5.48	34.267	83.4	35.5	2.58	84.8	7.633	5.437	27.060	314.2
13	591	4.74	34.304	76.0	37.2	2.72	97.3	7.605	4.692	27.175	319.8
14	791	3.60	34.377	62.1	39.8	2.91	119.7	7.563	3.542	27.353	328.7
15	992	3.17	34.456	72.5	39.6	2.88	128.4	7.584	3.099	27.457	332.1
16	1193	2.75	34.489	75.1	39.7	2.91	137.2	7.588	2.667	27.522	335.5
17	1133	2.82	34.491	76.4	39.6	2.90	135.2	7.586	2.741	27.517	334.9
18	1429	2.36	34.536	85.1	39.5	2.86	143.0	7.598	2.262	27.593	338.7
19	1675	2.09	34.577	99.9	38.8	2.83	146.9	7.623	1.975	27.647	341.0
20	1923	1.92	34.601	111.6	37.9	2.75	145.9	7.644	1.787	27.680	342.4
21	2171	1.80	34.622	122.0	37.4	2.71	144.9	7.659	1.647	27.706	343.4
22	2445	1.70	34.636	130.3	36.8	2.67	144.9	7.674	1.524	27.725	344.2
23	2667	1.62	34.643	137.2	36.6	2.62	143.0	7.682	1.426	27.736	344.9
24	2916	1.57	34.658	144.2	36.6	2.58	143.0	7.691	1.353	27.752	345.3
25	3164	1.53	34.666	148.9	36.0	2.57	143.0	7.696	1.289	27.761	345.7
26	3413	1.51	34.669	150.7	35.9	2.55	142.0	7.699	1.243	27.765	345.8
27	3910	1.53	34.674	155.0	35.7	2.54	141.0	7.763	1.208	27.768	345.7
28	4159	1.56	34.673	153.7	35.9	2.55	142.0	7.703	1.209	27.765	345.4

Corrected depth (COR.DEPTH) in the table should be added by 5 meters.

KH77-3, STATION 2

4450 M (OBS.DEPTH) 4459 M (COR.DEPTH), 30.46.6 N 136.07.5 E, 17 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	27.90	34.487	198.7	##.#	0.10	###.#	8.255	27.899	22.063	201.5
2	7	28.25	34.446	198.7	##.#	0.10	###.#	8.270	28.248	21.918	200.4
3	23	28.23	34.448	197.8	##.#	0.09	###.#	8.270	28.224	21.926	200.5
4	32	28.23	34.451	198.7	##.#	0.09	###.#	8.269	28.221	21.928	200.5
5	57	28.33	34.545	224.5	##.#	0.09	###.#	8.248	28.315	21.966	200.0
6	75	22.49	34.704	227.1	##.#	0.10	###.#	8.231	22.474	23.875	220.7
7	94	21.26	34.754	220.5	##.#	0.12	###.#	8.231	21.241	24.255	225.6
8	114	20.59	34.752	214.4	0.3	0.16	###.#	8.199	20.567	24.435	228.3
9	153	19.53	34.762	211.2	1.4	0.23	0.3	#.###	19.501	24.722	232.8
10	232	17.99	34.751	193.7	5.1	0.41	2.5	#.###	17.948	25.102	239.7
11	308	16.44	34.706	193.2	6.7	0.60	5.4	#.###	16.388	25.439	247.1
12	391	14.82	34.594	183.6	10.4	0.80	10.2	#.###	14.759	25.717	255.4
13	467	12.86	34.457	172.3	14.7	1.11	18.4	#.###	12.793	26.019	266.1
14	622	8.34	34.242	125.2	26.5	1.98	50.5	#.###	8.272	26.648	294.0
15	778	5.66	34.252	84.7	34.9	2.59	82.7	#.###	5.590	27.026	312.9
16	943	4.21	34.330	67.7	38.0	2.86	110.0	#.###	4.135	27.253	323.9
17	1340	2.91	34.463	72.9	39.5	2.94	134.3	#.###	2.813	27.487	334.2
18	1567	2.51	34.514	79.9	39.5	2.91	141.1	#.###	2.399	27.562	337.5
19	1757	2.24	34.534	92.5	39.1	2.89	144.9	#.###	2.116	27.601	339.8
20	1943	2.04	34.584	105.1	38.3	2.83	146.9	#.###	1.903	27.657	341.4
21	2139	1.87	34.602	115.5	37.6	2.79	145.9	#.###	1.719	27.685	342.8
22	2344	1.82	34.616	122.9	37.1	2.71	145.9	#.###	1.652	27.700	343.2
23	2547	1.73	34.623	131.6	36.7	2.70	144.0	#.###	1.545	27.712	344.0
24	2750	1.65	34.639	136.8	36.4	2.65	144.0	#.###	1.447	27.731	344.7
25	2968	1.60	34.647	139.4	35.9	2.64	144.0	#.###	1.377	27.741	345.1
26	3186	1.58	34.658	145.5	35.7	2.63	143.0	#.###	1.335	27.751	345.2
27	3411	1.52	34.664	150.7	35.4	2.60	143.0	7.703	1.253	27.760	345.8
28	3633	1.53	34.665	151.5	35.6	2.60	142.0	7.701	1.239	27.760	345.7
29	3865	1.55	34.672	152.0	35.6	2.61	142.0	7.704	1.233	27.765	345.5

Corrected depth (COR.DEPTH) in the table should be added by 5 meters.

KH77-3, STATION 3

4760 M (OBS.DEPTH) 4772 M (COR.DEPTH) 31.22.8 N 133.42.1 E, 17-18 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	27.70	34.263	201.3	##.#	0.04	###.#	8.255	27.699	21.960	202.4
2	10	27.74	34.252	201.8	0.0	0.05	###.#	8.260	27.737	21.939	202.3
3	29	27.79	34.254	201.3	0.0	0.05	###.#	8.263	27.782	21.924	202.1
4	48	27.76	34.255	200.5	0.0	0.05	###.#	8.265	27.747	21.934	202.2
5	73	25.85	34.479	195.5	0.7	0.06	0.3	8.229	25.832	22.709	208.5
6	97	24.30	34.677	190.2	2.5	0.13	0.6	8.204	24.278	23.329	213.8
7	120	22.01	34.725	185.7	3.2	0.26	2.2	8.170	21.985	24.026	222.6
8	140	20.85	34.739	185.2	3.9	0.35	3.0	8.152	20.822	24.355	227.3
9	182	18.40	34.638	171.6	7.7	0.62	8.6	8.083	18.367	24.915	238.0
10	264	14.94	34.573	167.1	12.2	0.92	16.1	8.007	14.898	25.675	254.8
11	345	12.21	34.460	153.1	17.4	1.32	27.6	7.921	12.162	26.149	269.7
12	425	9.70	34.346	131.3	23.5	1.78	43.9	7.813	9.649	26.512	285.0
13	504	7.93	34.260	121.3	27.4	2.01	55.6	7.737	7.876	26.724	296.7
14	658	5.46	34.271	84.3	34.6	2.57	87.4	7.619	5.402	27.065	314.4
15	811	4.28	34.336	68.6	37.5	2.76	108.0	7.568	4.216	27.251	323.3
16	970	3.57	34.395	62.5	39.6	2.91	125.5	7.550	3.497	27.370	328.9
17	664	5.53	34.377	66.4	38.5	2.88	118.7	7.555	5.471	27.140	313.6
18	891	3.86	34.391	68.6	38.0	2.81	118.7	7.558	3.792	27.338	326.6
19	980	3.51	34.395	62.1	39.6	2.93	129.4	7.538	3.437	27.376	329.4
20	1276	2.83	34.480	72.5	39.6	2.94	145.0	7.556	2.739	27.507	334.8
21	1553	2.41	34.533	85.1	39.2	2.90	152.7	7.577	2.301	27.586	338.3
22	1853	2.11	34.583	103.3	38.2	2.84	150.8	7.610	1.980	27.651	340.8
23	2109	1.92	34.605	113.8	37.8	2.78	149.8	7.629	1.771	27.683	342.4
24	2330	1.83	34.621	123.8	37.1	2.71	152.7	7.642	1.663	27.703	343.1
25	2550	1.77	34.634	129.8	36.9	2.69	151.7	7.658	1.583	27.718	343.6
26	2769	1.65	34.642	135.5	36.4	2.67	149.8	7.669	1.445	27.733	344.7
27	2996	1.60	34.657	143.3	36.1	2.64	148.8	7.678	1.374	27.749	345.1
28	3235	1.54	34.663	148.5	35.9	2.62	150.8	7.690	1.291	27.758	345.6
29	3455	1.52	34.666	150.2	35.9	2.59	147.8	7.696	1.249	27.762	345.8
30	3700	1.53	34.671	152.8	35.5	2.60	148.8	7.696	1.232	27.765	345.7
31	3946	1.56	34.673	154.2	35.8	2.59	148.8	7.696	1.233	27.765	345.4

Corrected depth (COR.DEPTH) in the table should be added by 5 meters.

KH77-3, STATION 11

115 M (OBS.DEPTH), 33.55.0 N 129.24.3 E, 22 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	24.70	33.785	209.1	0.3	0.12	3.9	8.223	24.699	22.537	213.5
2	10	24.89	33.778	209.1	0.0	0.08	1.1	8.226	24.887	22.474	212.8
3	30	24.95	33.778	208.7	0.0	0.12	###.#	8.228	24.943	22.456	212.6
4	50	24.85	33.923	203.8	0.1	0.08	0.0	8.214	24.838	22.596	212.7
5	75	19.52	34.523	171.6	6.7	0.55	8.4	8.096	19.505	24.543	233.2

KH77-3, STATION 12

35.01.0 N 131.04.8E, 22 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	23.90	33.686	211.7	##.#	#.##	0.2	8.199	23.899	22.699	216.6
2	10	24.00	33.675	211.2	##.#	#.##	0.2	8.213	23.997	22.662	216.2
3	30	24.03	33.675	211.2	##.#	0.01	0.2	8.216	24.023	22.653	216.1
4	50	20.75	34.134	176.5	4.1	0.30	6.5	8.113	20.740	23.923	228.5
5	75	18.67	34.253	165.5	6.5	0.47	10.5	8.071	18.656	24.554	237.3
6	100	17.33	34.314	164.6	8.0	0.63	12.5	8.049	17.312	24.929	243.4

KH77-3, STATION 13

1090 M (OBS.DEPTH) 1065 M (COR.DEPTH), 36.47.7 N 135.36.5 E, 23 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	23.40	33.601	217.3	0.0	#.##	1.0	8.208	23.399	22.781	218.6
2	9	23.19	33.592	218.2	0.1	#.##	1.1	8.223	23.188	22.835	219.4
3	29	22.19	33.975	228.1	0.2	#.##	2.3	8.203	22.183	23.408	222.8
4	48	19.24	34.163	213.1	2.0	0.10	4.6	8.151	19.231	24.341	234.9
5	72	15.81	34.368	214.6	4.7	0.21	8.5	8.110	15.798	25.324	250.7
6	96	13.55	34.403	245.8	2.6	0.21	5.2	8.115	13.536	25.838	262.4
7	120	10.50	34.297	255.3	4.7	0.33	4.6	8.080	10.485	26.337	280.1
8	144	7.50	34.138	261.3	7.6	0.55	7.5	8.008	7.485	26.691	295.9
9	193	3.48	34.038	246.0	15.7	1.18	23.9	7.821	3.467	27.095	330.4
10	288	0.75	34.031	227.2	23.0	1.71	43.9	7.643	0.737	27.304	354.3
11	383	0.44	34.035	226.8	23.3	1.81	###.#	7.619	0.424	27.326	357.2
12	478	0.32	34.039	224.2	23.8	1.84	51.2	7.611	0.300	27.335	358.3
13	574	0.27	34.041	221.6	24.1	1.85	56.5	7.601	0.246	27.340	358.8
14	753	0.22	34.051	219.8	24.4	1.88	63.9	7.597	0.187	27.350	359.2
15	954	0.17	34.048	218.1	25.4	1.83	69.8	7.589	0.127	27.351	359.7
16	1059	0.14	34.051	215.5	24.9	1.90	###.#	7.592	0.092	27.355	360.0

Corrected depth (COR.DEPTH) in the table should be added by 5 meters.

KH77-3, STATION 14

2975 M (OBS.DEPTH) 2925 M (COR.DEPTH), 37.43.8 N 135.12.3 E, 24 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	10	20.03	33.733	223.2	0.9	0.03	0.3	8.209	20.028	23.810	232.1
2	30	18.28	34.159	286.2	0.0	0.05	0.9	8.197	18.274	24.579	239.2
3	49	14.03	34.377	272.4	0.0	0.13	3.4	8.147	14.022	25.719	259.8
4	74	8.58	34.140	288.3	3.3	0.32	4.1	8.059	8.572	26.532	292.6
5	98	5.41	34.054	261.2	10.5	0.81	11.8	7.924	5.401	26.900	315.2
6	123	3.68	34.022	264.7	12.1	0.93	16.6	7.855	3.671	27.063	328.8
7	148	2.36	34.013	262.9	15.4	1.22	22.5	7.789	2.351	27.175	339.9
8	197	1.30	34.017	259.8	17.8	1.37	28.2	7.722	1.290	27.258	349.3
9	295	0.76	34.027	230.3	21.9	1.65	40.3	7.632	0.747	27.300	354.2
10	394	0.51	34.030	229.0	23.1	1.72	43.3	7.614	0.493	27.318	356.5
11	493	0.35	34.038	224.6	22.8	1.66	47.5	7.599	0.329	27.333	358.0
12	591	0.30	34.041	223.3	23.8	1.88	52.3	7.592	0.275	27.338	358.5
13	788	0.24	34.048	220.3	24.0	1.91	58.8	7.587	0.205	27.347	359.0
14	985	0.17	34.051	218.5	24.7	1.90	65.1	7.582	0.126	27.353	359.7
15	1184	0.14	34.048	219.8	24.7	1.93	69.0	7.587	0.085	27.352	360.0
16	1129	0.14	34.050	218.5	24.5	1.92	69.4	7.582	0.088	27.354	360.0
17	1437	0.12	34.046	219.4	24.6	1.83	71.1	7.587	0.050	27.352	360.2
18	1669	0.15	34.048	220.3	24.6	1.96	73.6	7.594	0.065	27.352	359.9
19	1916	0.16	34.049	222.0	##.#	#.##	###.#	7.597	0.058	27.352	359.8
20	2163	0.19	34.048	222.0	##.#	#.##	###.#	7.599	0.070	27.350	359.5
21	2408	0.19	34.045	223.7	24.4	1.94	76.4	7.599	0.051	27.347	359.5
22	2650	0.24	34.048	221.1	##.#	#.##	###.#	7.599	0.080	27.347	359.0
23	2906	0.24	34.052	222.4	##.#	#.##	###.#	7.597	0.059	27.350	359.0

Corrected depth (COR.DEPTH) in the table should be added by 5 meters.

KH77-3, STATION 15

2316 M (OBS.DEPTH) 2270 M (COR.DEPTH), 39.15.6 N 137.16.7 E, 25 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN (MICROMOLES/KG AT	NITRATE IN SITU TEMP.)	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
1	1	22.70	33.993	225.9	0.0	0.97	0.9	8.180	22.699	23.278	220.8
2	10	21.15	33.966	225.4	0.0	#.##	0.9	8.204	21.148	23.688	227.1
3	30	20.74	34.011	230.2	##.#	0.97	1.2	8.202	20.734	23.833	228.7
4	49	14.47	34.342	284.6	##.#	0.00	5.5	8.159	14.462	25.598	257.6
5	74	9.86	34.250	278.7	0.1	0.10	3.2	8.098	9.851	26.410	284.2
6	99	7.49	34.122	273.0	4.4	0.39	4.0	8.027	7.480	26.680	300.0
7	123	5.23	34.054	279.5	5.7	0.60	7.2	7.953	5.220	26.921	316.5
8	147	3.48	34.029	279.9	9.7	0.96	14.3	7.875	3.470	27.088	330.4
9	198	2.02	34.031	279.0	11.7	1.15	21.2	7.806	2.009	27.217	342.8
10	297	0.98	34.050	239.8	16.9	1.54	36.0	7.671	0.966	27.305	352.1
11	396	0.53	34.050	231.1	17.4	1.72	41.4	7.626	0.513	27.333	356.3
12	495	0.36	34.062	225.0	18.3	1.82	49.4	7.607	0.339	27.352	357.9
13	594	0.30	34.072	223.7	18.3	1.81	53.7	7.599	0.274	27.363	358.4
14	792	0.23	34.069	221.6	18.6	1.88	59.9	7.590	0.195	27.364	359.1
15	989	0.17	34.070	218.5	18.8	1.88	66.5	7.583	0.125	27.368	359.6
16	1186	0.15	34.075	217.7	19.0	1.90	68.7	7.583	0.095	27.373	359.8
17	964	0.16	34.079	217.7	19.3	1.89	65.9	7.583	0.117	27.376	359.7
18	1266	0.13	34.075	217.7	19.5	1.85	70.1	7.585	0.070	27.375	360.0
19	1513	0.13	34.078	221.1	19.4	1.73	73.3	7.589	0.055	27.377	360.0
20	1762	0.16	34.073	222.0	19.0	1.81	75.1	7.594	0.069	27.371	359.7
21	2009	0.18	34.073	221.6	19.1	1.86	76.3	7.599	0.071	27.370	359.5
22	2255	0.18	34.072	221.1	19.8	1.93	77.4	7.597	0.053	27.370	359.5

Corrected depth (COR.DEPTH) in the table should be added by 5 meters. As the observed distance between pinger and the bottom was 17 meters, the depth estimated from the depth of the deepest sampler was 2272 meters.

KH77-3, STATION 16

41.00.0 N 140.00.0 E, 26 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	22.20	33.615	222.5	0.1	0.00	0.7	8.223	22.199	23.133	223.3
2	10	22.05	33.600	223.3	0.2	0.00	0.7	8.223	22.047	23.163	223.9
3	29	21.97	33.637	224.6	0.3	0.01	0.8	8.220	21.964	23.214	224.1
4	49	20.56	33.964	239.3	0.2	0.05	0.9	8.208	20.550	23.845	229.5
5	74	13.25	34.448	244.5	3.0	0.16	4.5	8.108	13.239	25.934	263.9
6	98	9.26	34.225	268.3	4.4	0.18	3.7	8.056	9.248	26.490	288.0
7	106	8.88	34.203	269.1	5.1	0.25	4.1	8.063	8.868	26.534	290.5

KH77-3, STATION 17

3270 M (OBS.DEPTH) 3265 M (COR.DEPTH), 40.48.1 N 138.48.5 E, 25-26 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	21.10	33.898	227.2	0.1	0.97	0.2	8.199	21.099	23.650	227.4
2	10	20.99	33.890	227.6	0.1	0.02	1.1	8.199	20.988	23.674	227.8
3	30	16.23	34.317	271.7	0.1	0.13	3.2	8.174	16.225	25.189	248.7
4	49	11.58	34.334	271.9	2.2	0.33	3.8	8.115	11.573	26.170	273.6
5	74	7.66	34.101	301.3	2.6	0.42	3.3	8.061	7.652	26.639	298.9
6	98	5.17	34.047	284.3	8.8	0.85	8.5	7.954	5.162	26.923	317.0
7	122	3.52	34.034	274.7	13.0	1.14	17.9	7.867	3.511	27.088	330.1
8	147	2.34	34.001	297.2	12.9	1.18	16.4	7.848	2.331	27.167	340.1
9	196	0.98	34.023	285.0	17.1	1.46	25.6	7.762	0.971	27.284	352.2
10	294	0.58	34.040	284.6	8.8	0.85	8.4	7.951	0.567	27.322	355.8
11	392	0.43	34.045	276.8	19.7	1.73	33.2	7.717	0.413	27.334	357.2
12	490	0.34	34.050	264.2	21.2	1.80	37.6	7.678	0.319	27.343	358.1
13	588	0.30	34.053	246.8	22.8	1.97	44.6	7.641	0.275	27.348	358.4
14	783	0.26	34.051	238.5	23.7	2.04	52.2	7.621	0.225	27.348	358.8
15	978	0.19	34.055	234.2	24.1	2.08	57.5	7.607	0.146	27.355	359.5
16	1175	0.16	34.058	220.7	25.4	2.15	65.8	7.585	0.105	27.359	359.8
17	1247	0.15	34.060	220.7	25.5	2.11	67.4	7.582	0.091	27.361	359.8
18	1549	0.13	34.060	220.3	25.5	2.19	71.8	7.585	0.053	27.362	360.0
19	1788	0.15	34.060	221.6	25.5	2.18	72.8	7.590	0.057	27.361	359.8
20	2033	0.17	34.061	225.0	25.2	2.14	74.4	7.602	0.060	27.361	359.7
21	2280	0.19	34.064	227.6	25.2	2.11	76.7	7.607	0.061	27.363	359.5
22	2526	0.19	34.061	229.0	25.1	2.07	76.5	7.609	0.042	27.360	359.5
23	2771	0.21	34.064	229.0	25.1	2.07	75.0	7.607	0.041	27.361	359.3
24	3017	0.27	34.063	227.6	25.2	2.08	76.0	7.607	0.078	27.357	358.7
25	3264	0.26	34.061	228.5	25.1	2.04	75.0	7.609	0.046	27.356	358.8

Corrected depth (COR.DEPTH) in the table should be added by 5 meters. As the distance between pinger and the bottom was 14 meters, the depth estimated from the depth of the deepest sampler was 3278 meters.

KH77-3, STATION 18

3585 M (OBS.DEPTH) 3578 M (COR.DEPTH), 41.19.6 N 137.21.1 E, 26-27 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	18.00	33.762	237.9	0.0	0.12	0.8	8.139	17.999	24.345	241.1
2	10	18.75	33.748	237.1	0.1	0.14	0.7	8.149	18.748	24.149	237.7
3	29	12.54	33.906	329.9	0.1	0.28	1.5	8.103	12.536	25.656	268.8
4	49	4.38	33.992	338.6	6.3	0.71	1.9	7.970	4.376	26.967	323.3
5	74	2.71	34.029	304.6	11.7	1.00	16.2	7.875	2.705	27.159	336.9
6	98	1.66	34.032	302.9	14.0	1.18	20.6	7.829	1.655	27.244	346.0
7	123	1.13	34.042	299.4	15.2	1.22	23.3	7.804	1.124	27.289	350.8
8	148	0.94	34.046	298.1	15.7	1.29	23.9	7.794	0.933	27.305	352.5
9	197	0.74	34.049	294.1	16.7	1.39	26.2	7.767	0.731	27.319	354.3
10	296	0.56	34.056	282.0	18.3	1.52	29.7	7.731	0.547	27.336	356.0
11	394	0.45	34.053	258.9	21.1	1.81	36.5	7.682	0.433	27.340	357.0
12	493	0.35	34.051	251.1	22.3	1.87	40.3	7.657	0.329	27.343	358.0
13	592	0.31	34.051	245.0	23.0	1.98	45.1	7.635	0.284	27.346	358.4
14	789	0.26	34.051	232.9	24.1	2.03	53.7	7.613	0.225	27.348	358.8
15	987	0.19	34.052	225.5	25.0	2.12	60.3	7.591	0.145	27.353	359.5
16	1186	0.15	34.063	220.7	25.5	2.15	66.7	7.584	0.095	27.364	359.8
17	1107	0.15	34.065	220.7	25.6	2.13	65.9	7.584	0.099	27.365	359.8
18	1300	0.14	34.060	219.8	25.6	2.10	68.8	#.###	0.078	27.362	359.9
19	1600	0.15	34.060	222.0	25.5	2.14	70.1	7.593	0.069	27.361	359.8
20	1848	0.15	34.060	226.8	25.3	2.15	72.3	7.598	0.053	27.361	359.8
21	2095	0.16	34.065	230.3	25.0	2.10	74.6	7.611	0.045	27.365	359.7
22	2341	0.19	34.069	229.8	25.1	2.10	75.4	7.613	0.056	27.367	359.4
23	2587	0.20	34.065	230.3	24.9	2.10	75.0	7.615	0.046	27.363	359.4
24	2834	0.22	34.063	230.3	25.1	2.09	75.1	7.611	0.045	27.360	359.2
25	3081	0.27	34.065	229.0	25.1	2.10	74.9	7.611	0.072	27.359	358.7
26	3329	0.27	34.066	229.0	25.1	2.03	75.0	7.613	0.049	27.360	358.7
27	3577	0.28	34.069	230.3	25.1	2.03	75.2	7.598	0.035	27.362	358.6

Corrected depth (COR.DEPTH) in the table should be added by 5 meters. As the distance between pinger and the bottom was 5 meters, the depth estimated from the depth of the deepest sampler was3582 meters.

KH77-3, STATION 19

3511 M (OBS.DEPTH) 3515 M (COR.DEPTH), 43.02.3 N 138.32.0 E, 28 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN (MICROMOLES/KG AT IN SITU TEMP.)	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
1	1	17.80	34.006	244.8	0.1	0.08	0.1	8.125	17.799	24.580	241.7
2	10	17.75	33.998	256.6	0.1	0.10	0.1	8.152	17.748	24.586	241.9
3	29	10.16	33.973	358.9	0.1	0.22	1.1	8.110	10.156	26.144	282.8
4	49	6.42	34.040	322.1	2.0	0.51	3.3	8.044	6.415	26.762	307.7
5	73	4.12	34.028	285.1	11.0	1.02	12.5	7.902	4.114	27.023	325.3
6	98	2.74	34.026	279.8	14.2	1.27	19.3	7.831	2.734	27.154	336.6
7	122	1.93	34.023	305.9	14.0	1.21	19.1	7.820	1.923	27.217	343.6
8	147	1.37	34.038	274.2	17.5	1.47	27.1	7.751	1.362	27.270	348.6
9	195	0.90	34.042	268.1	19.2	1.61	30.8	7.712	0.891	27.304	352.9
10	292	0.59	34.044	266.3	20.1	1.69	33.4	7.699	0.577	27.324	355.7
11	389	0.46	34.049	273.3	20.1	1.68	33.0	7.700	0.443	27.336	356.9
12	487	0.37	34.055	255.9	21.9	1.83	38.6	7.665	0.349	27.346	357.8
13	585	0.33	34.054	238.5	23.5	1.98	44.4	7.628	0.305	27.347	358.2
14	781	0.26	34.055	229.4	24.5	2.06	53.7	7.604	0.225	27.352	358.8
15	977	0.20	34.056	225.9	25.0	2.07	58.3	7.579	0.156	27.356	359.4
16	1175	0.16	34.061	218.5	25.5	2.13	64.5	7.584	0.105	27.362	359.8
17	1238	0.16	34.061	220.7	25.6	2.14	67.1	7.582	0.101	27.362	359.8
18	1532	0.13	34.062	219.4	25.6	2.13	70.6	7.584	0.054	27.364	360.0
19	1777	0.16	34.064	220.3	25.9	2.11	72.6	7.587	0.068	27.364	359.7
20	2025	0.16	34.064	222.0	25.7	2.11	73.5	7.596	0.050	27.364	359.7
21	2268	0.19	34.065	224.6	25.8	2.12	75.3	7.601	0.062	27.363	359.5
22	2515	0.19	34.063	225.5	25.5	2.09	76.0	7.604	0.042	27.362	359.5
23	2763	0.22	34.067	225.9	25.4	2.10	75.3	7.607	0.051	27.363	359.2
24	3008	0.26	34.067	225.9	25.4	2.09	75.2	7.607	0.069	27.361	358.8
25	3255	0.27	34.068	226.3	25.4	2.05	75.4	7.607	0.056	27.361	358.7
26	3514	0.28	34.072	226.8	25.5	2.02	75.6	7.607	0.041	27.364	358.6

Corrected depth (COR.DEPTH) in the table should be added by 5 meters.

KH77-3, STATION 22

2041 M (OBS.DEPTH) 2037 M (COR.DEPTH), 39.35.1 N 134.30.0 E, 30 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	22.50	33.552	220.3	0.3	#.##	0.8	8.188	22.499	23.001	222.1
2	10	22.06	33.547	260.9	0.2	#.##	0.8	8.202	22.057	23.120	223.9
3	29	21.49	33.598	224.6	0.2	0.00	1.4	8.207	21.484	23.316	226.1
4	49	15.30	34.265	247.7	2.5	0.03	6.8	8.126	15.292	25.359	253.4
5	73	12.07	34.274	264.5	1.9	0.12	7.4	8.087	12.060	26.032	270.9
6	98	7.82	34.122	293.5	3.1	0.10	4.1	8.049	7.810	26.632	297.7
7	121	5.07	34.050	273.8	9.6	0.69	8.7	7.942	5.060	26.937	317.8
8	147	3.90	34.032	277.7	11.6	0.86	12.5	7.896	3.889	27.049	327.0
9	195	2.30	34.034	269.0	16.3	1.19	22.4	7.800	2.288	27.197	340.4
10	293	0.86	34.042	259.4	21.0	1.53	32.6	7.696	0.846	27.306	353.2
11	390	0.52	34.051	247.6	24.0	1.71	41.3	7.643	0.503	27.334	356.4
12	488	0.37	34.059	229.0	25.5	1.82	47.5	7.610	0.349	27.349	357.8
13	587	0.31	34.057	226.3	26.0	1.92	52.1	7.596	0.285	27.350	358.3
14	784	0.24	34.061	222.0	26.6	#.##	61.9	7.587	0.205	27.357	359.0
15	981	0.19	34.063	219.4	26.8	1.96	67.0	7.581	0.146	27.362	359.5
16	1178	0.16	34.067	217.7	27.2	1.94	71.4	7.577	0.105	27.367	359.7
17	993	0.18	34.065	220.7	26.6	1.92	68.3	7.584	0.135	27.364	359.6
18	1295	0.13	34.063	217.7	26.8	2.00	73.1	7.586	0.068	27.365	360.0
19	1542	0.15	34.063	217.7	26.9	1.99	75.5	7.587	0.073	27.364	359.8
20	1788	0.16	34.065	213.7	27.0	2.01	82.6	7.581	0.067	27.365	359.7
21	2036	0.18	34.066	212.4	27.1	1.99	84.5	7.574	0.069	27.365	359.5

Corrected depth (COR.DEPTH) in the table should be added by 5 meters. As the distance between pinger and the bottom was 9 meters, the depth estimated from the depth of the deepest sampler was 2045 meters.

KH77-3, STATION 23

2968 M (OBS.DEPTH) 2953 M (COR.DEPTH), 38.35.1 N 134.45.7 E, 30 SEPT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	22.50	33.702	221.2	0.1	0.97	0.3	8.203	22.499	23.114	221.9
2	10	22.47	33.699	220.7	0.1	0.00	0.3	8.205	22.467	23.121	222.1
3	29	22.27	33.700	224.7	0.2	0.04	0.3	8.217	22.263	23.178	222.9
4	49	15.32	34.405	252.9	0.2	0.16	5.5	8.136	15.312	25.462	253.1
5	74	12.23	34.393	250.6	3.8	0.35	4.7	8.099	12.220	26.093	269.7
6	98	9.39	34.239	266.6	5.5	0.44	3.7	8.061	9.378	26.480	287.2
7	123	6.56	34.085	273.0	8.2	0.64	6.1	7.985	6.548	26.779	306.6
8	147	4.66	34.042	275.6	10.5	0.89	10.8	7.911	4.648	26.977	321.0
9	197	2.57	34.038	259.0	16.5	1.35	24.4	7.781	2.558	27.178	338.0
10	296	0.81	34.043	244.6	21.6	1.71	37.3	7.667	0.796	27.310	353.7
11	394	0.51	34.048	229.0	23.5	1.87	44.5	7.623	0.493	27.332	356.5
12	492	0.36	34.053	225.0	24.2	1.91	49.3	7.606	0.339	27.345	357.9
13	590	0.29	34.058	232.4	24.5	1.94	54.3	7.599	0.265	27.352	358.5
14	786	0.24	34.059	221.1	24.7	1.99	61.8	7.596	0.205	27.356	359.0
15	982	0.18	34.061	221.6	25.2	2.00	67.1	7.582	0.136	27.361	359.6
16	1184	0.15	34.061	223.3	25.3	2.03	71.0	7.586	0.095	27.362	359.8
17	1197	0.15	34.062	229.8	25.2	2.03	70.7	7.584	0.094	27.363	359.8
18	1485	0.13	34.064	225.5	25.3	2.03	73.8	7.589	0.057	27.366	360.0
19	1728	0.15	34.066	221.6	25.3	1.99	76.0	7.594	0.061	27.366	359.8
20	1972	0.16	34.066	222.0	25.3	2.01	77.1	7.597	0.054	27.366	359.7
21	2216	0.18	34.066	222.4	25.2	1.95	78.0	7.601	0.056	27.365	359.5
22	2462	0.19	34.066	221.6	25.3	2.01	78.0	7.599	0.047	27.364	359.5
23	2706	0.22	34.066	223.3	25.1	1.98	77.9	7.599	0.056	27.363	359.2
24	2952	0.23	34.067	224.2	25.0	1.90	78.7	7.602	0.045	27.363	359.1

Corrected depth (COR.DEPTH) in the table should be added by ↄ meters. As the distance between pinger and the bottom was 20 meters, the depth estimated from the depth of the deepest sampler was 2972 meters.

KH77-3, STATION 24

2260 M (OBS.DEPTH) 2251 M (COR.DEPTH), 37.17.8 N 131.19.9 E, 1 OCT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	22.50	32.737	233.6	0.9	0.02	1.7	8.213	22.499	22.385	223.2
2	10	22.62	32.750	221.8	0.5	0.06	1.7	8.220	22.617	22.361	222.7
3	30	18.16	33.764	237.5	0.5	0.19	4.2	8.149	18.154	24.308	240.4
4	49	15.52	34.063	208.5	7.1	0.52	8.2	8.068	15.512	25.155	252.6
5	74	14.09	34.247	182.8	10.7	0.84	13.6	8.012	14.079	25.606	259.7
6	98	13.07	34.343	192.3	10.1	0.81	14.3	7.009	13.056	25.889	265.1
7	123	9.24	34.133	267.4	3.2	0.34	0.9	8.068	9.226	26.422	288.3
8	147	8.22	34.095	271.3	6.1	0.46	0.8	8.046	8.204	26.552	295.1
9	196	6.15	34.074	264.7	10.2	0.81	7.2	7.960	6.132	26.824	309.6
10	295	1.41	33.996	275.0	17.1	1.40	20.8	7.780	1.395	27.233	348.3
11	393	0.69	34.018	268.9	19.9	1.59	27.0	7.727	0.672	27.297	354.9
12	492	0.49	34.040	250.7	19.4	1.77	34.6	7.668	0.468	27.327	356.7
13	591	0.39	34.048	239.8	23.9	1.88	40.5	7.636	0.364	27.339	357.6
14	788	0.28	34.051	235.5	25.5	1.94	49.2	7.623	0.245	27.347	358.6
15	986	0.21	34.052	227.2	26.2	2.00	58.1	7.597	0.165	27.352	359.3
16	1022	0.18	34.053	226.3	25.7	2.04	59.6	7.596	0.133	27.354	359.6
17	1218	0.16	34.054	219.8	26.1	2.07	65.9	7.587	0.103	27.356	359.8
18	1513	0.17	34.058	219.0	26.6	2.07	71.3	7.587	0.095	27.359	359.7
19	1758	0.15	34.060	219.8	27.8	2.09	74.7	7.589	0.059	27.361	359.8
20	2004	0.16	34.060	220.7	26.0	2.11	77.9	7.591	0.052	27.361	359.8
21	2240	0.17	34.060	222.9	25.9	2.08	78.1	7.597	0.044	27.360	359.7
22	2250	0.18	34.061	222.4	27.6	2.07	78.1	7.597	0.053	27.361	359.6

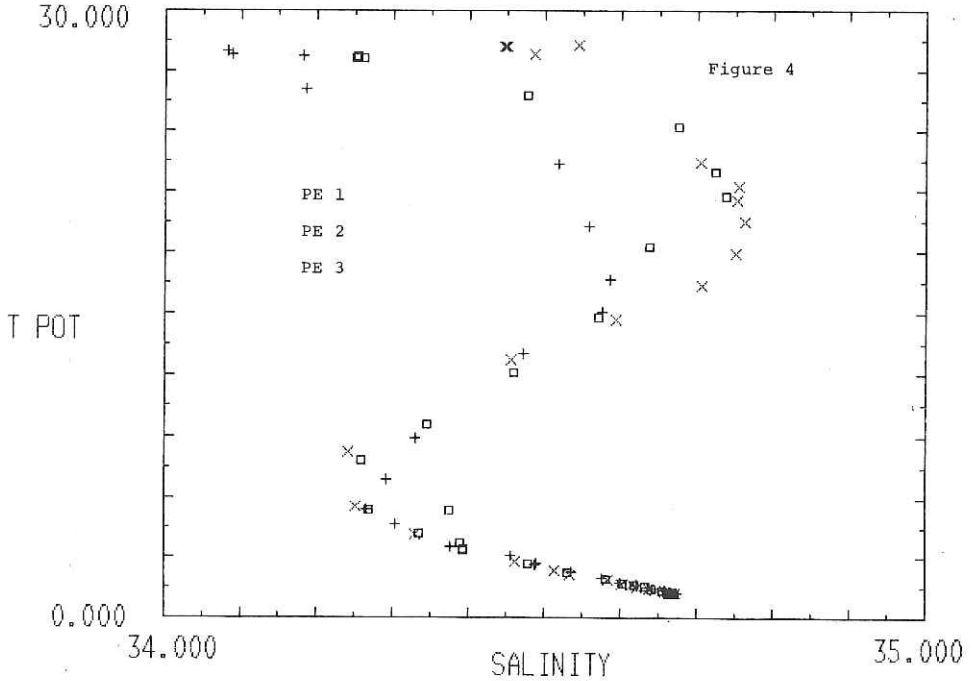
Corrected depth (COR.DEPTH) in the table should be added by 5 meters.

KH77-3, STATION 25

1470 M (OBS.DEPTH), 1439 M (COR.DEPTH), 35.56.0 N 130.15.6 E, 2 OCT., 1977

N	DEPTH (METER)	TEMP. (DEG.C)	SALINITY (PERMIL)	OXYGEN	NITRATE	PHOSPHATE	SILICATE	PH	T POT (DEG.C)	SIGMA T	SAT.02
				(MICROMOLES/KG AT IN SITU TEMP.)							
1	1	24.10	33.432	214.3	0.2	0.09	0.9	8.204	24.099	22.449	216.1
2	10	24.19	33.427	215.6	0.4	0.10	1.0	8.224	24.187	22.419	215.8
3	30	24.10	33.406	215.6	0.3	0.05	1.2	8.223	24.093	22.430	216.2
4	49	17.20	34.086	209.5	3.0	0.41	6.1	8.103	17.191	24.786	244.4
5	74	15.31	34.327	182.8	9.4	0.76	11.8	8.039	15.298	25.404	253.3
6	99	13.96	34.413	179.7	11.2	0.87	15.0	8.006	13.945	25.761	260.2
7	123	10.10	34.188	256.6	4.4	0.39	1.9	8.077	10.085	26.321	282.8
8	148	8.57	34.109	273.9	4.6	0.37	0.0	8.072	8.554	26.509	292.7
9	197	8.10	34.096	273.1	5.6	0.51	1.4	8.052	8.079	26.570	295.9
10	295	2.69	34.037	261.2	15.5	1.28	19.7	7.809	2.672	27.167	337.0
11	393	0.69	34.045	245.9	21.6	1.74	33.0	7.668	0.672	27.319	354.8
12	492	0.42	34.052	238.5	23.3	1.89	39.4	7.636	0.399	27.340	357.3
13	590	0.34	34.057	234.2	24.0	1.94	43.9	7.618	0.314	27.349	358.1
14	788	0.25	34.061	231.6	24.3	1.94	52.3	7.610	0.215	27.357	358.9
15	987	0.20	34.063	224.2	25.5	2.04	68.5	7.593	0.155	27.361	359.4
16	1186	0.16	34.065	218.1	25.2	1.98	60.6	7.583	0.104	27.365	359.7
17	1385	0.14	34.066	215.0	25.6	2.04	74.8	7.581	0.073	27.367	359.9

Corrected depth (COR.DEPTH) in the table should be added by 5 meters.


30.000
Figure 4
PE 1
PE 2
PE 3
T POT
0.000
34.000
SALINITY
35.000

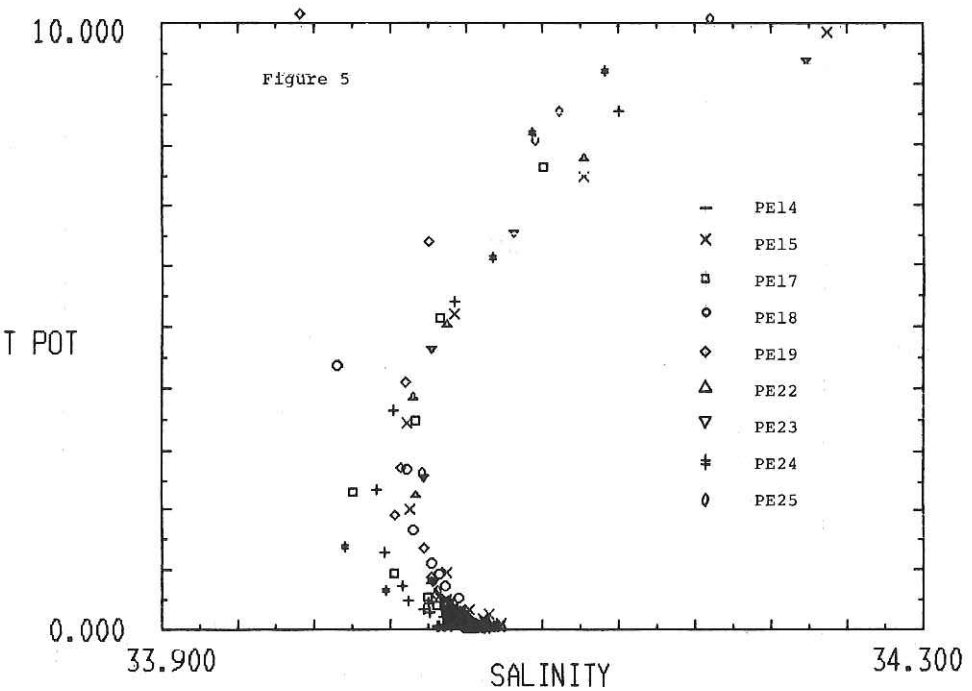

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Figure 5
PE14
PE15
PE17
PE18
PE19
PE22
PE23
PE24
PE25
T POT
0.000
33.900
SALINITY
34.300

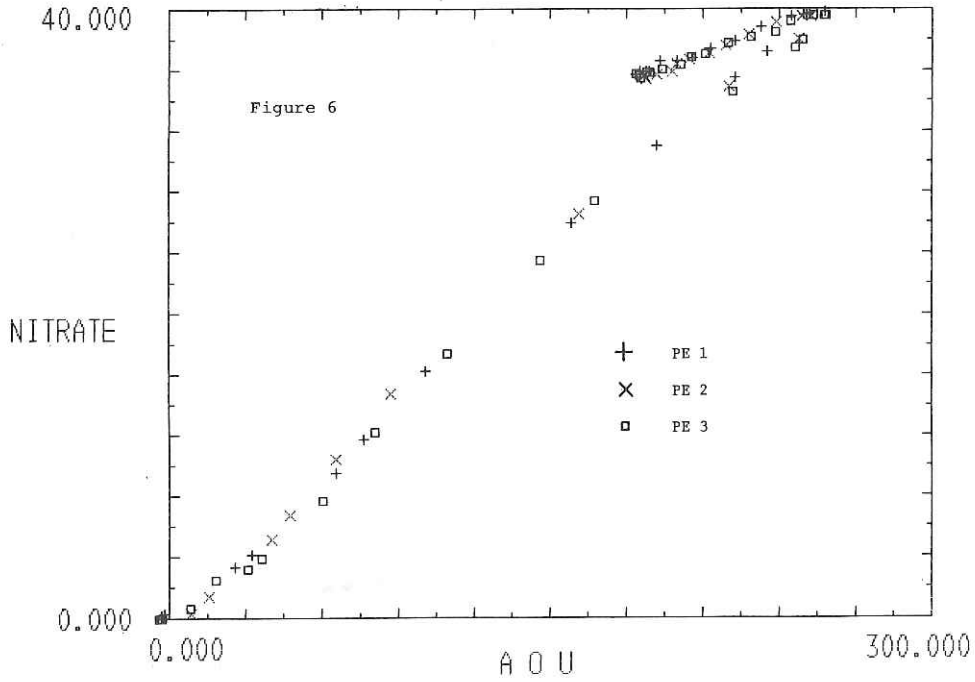
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Figure 6
NITRATE
PE 1
PE 2
PE 3
0.000
0.000
300.000
A O U

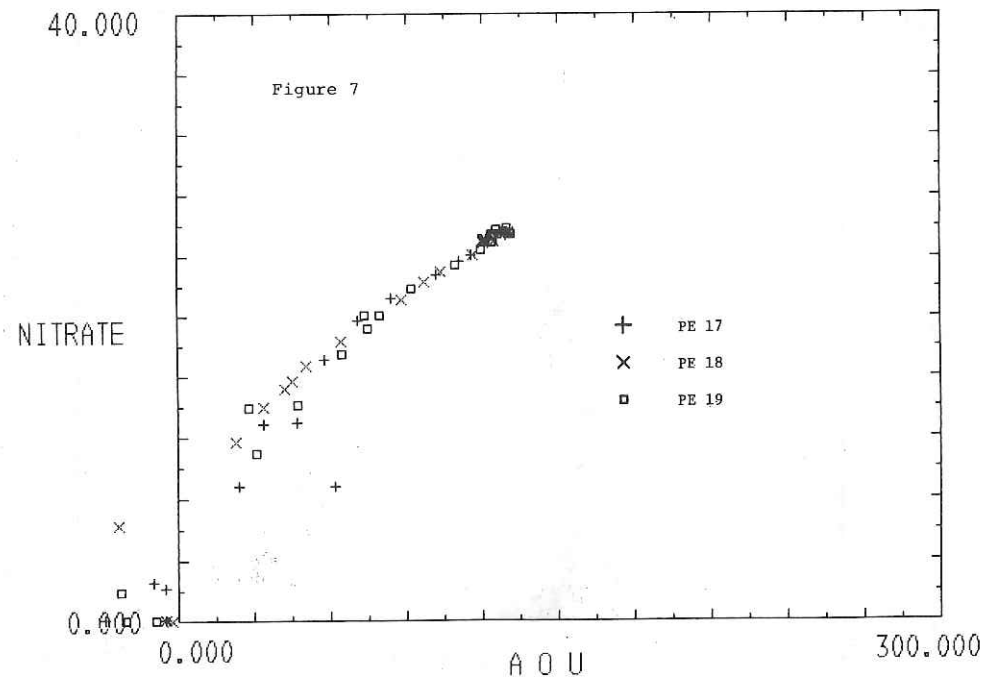
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Figure 7
NITRATE
PE 17
PE 18
PE 19
0.000
0.000
300.000
A O U

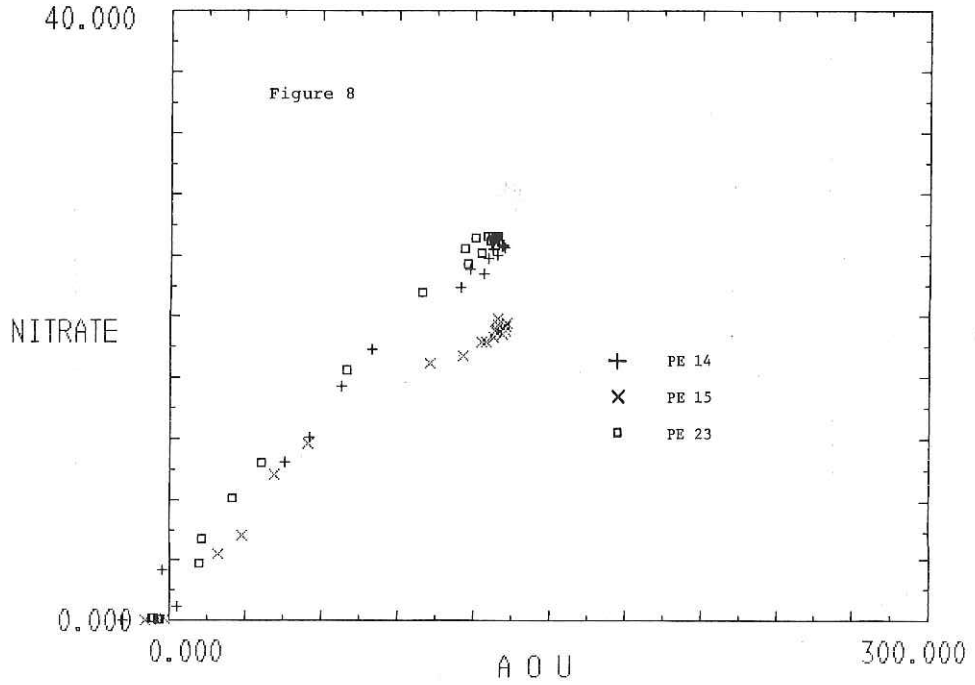
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Figure 8
NITRATE
PE 14
PE 15
PE 23
0.000
0.000
300.000
A O U

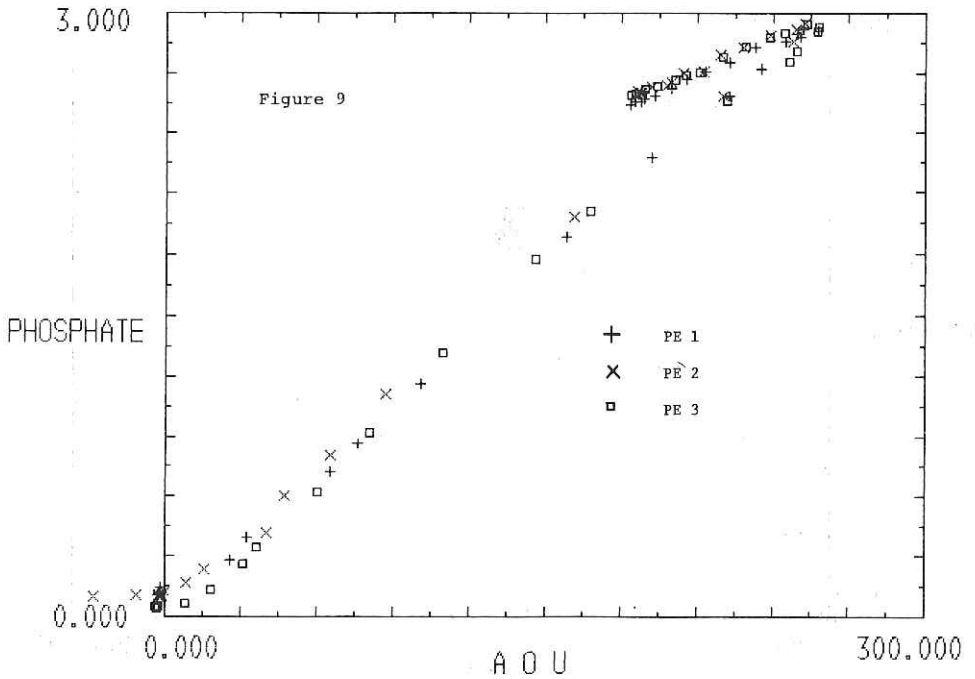
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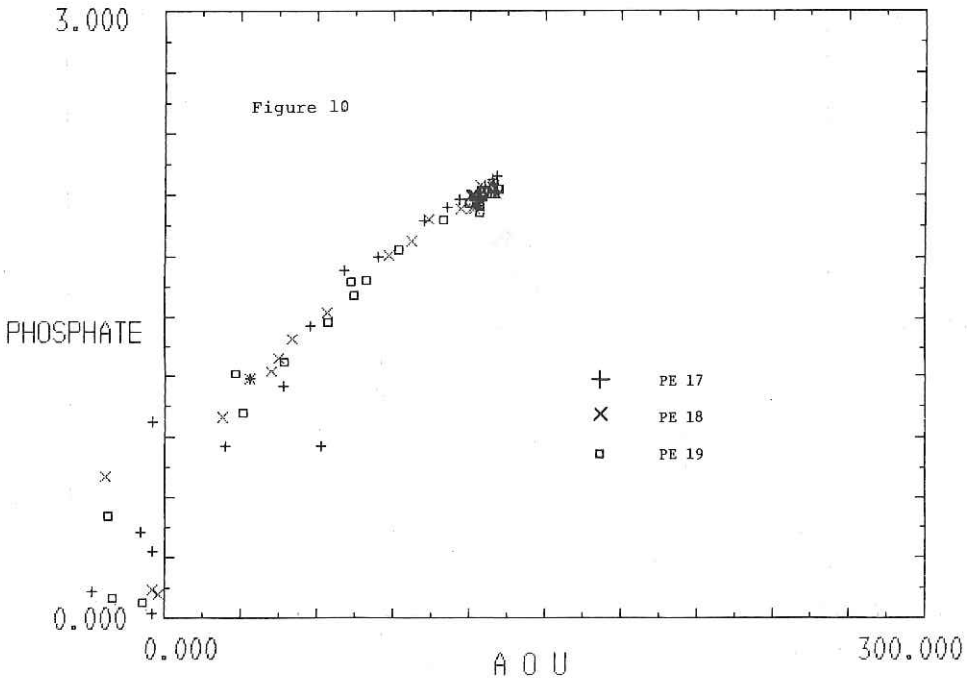
Figure 9
PHOSPHATE
PE 1
PE 2
PE 3
0.000
0.000
300.000
A O U


3.000
Figure 10
PHOSPHATE
PE 17
PE 18
PE 19
0.000
0.000
A O U
300.000

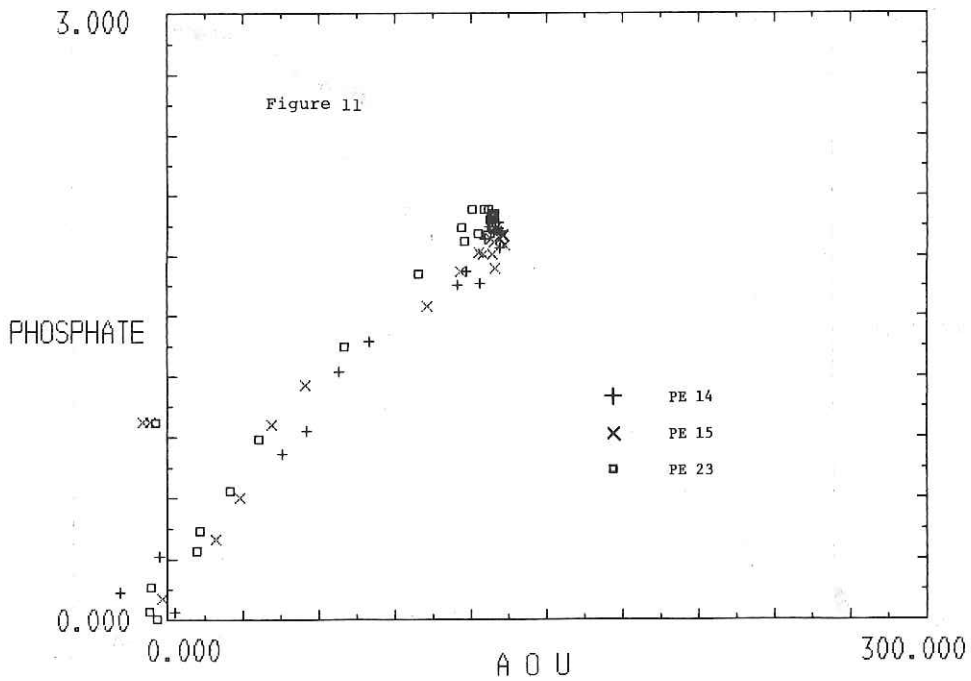

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Figure 11
PHOSPHATE
PE 14
PE 15
PE 23
0.000
0.000
A O U
300.000

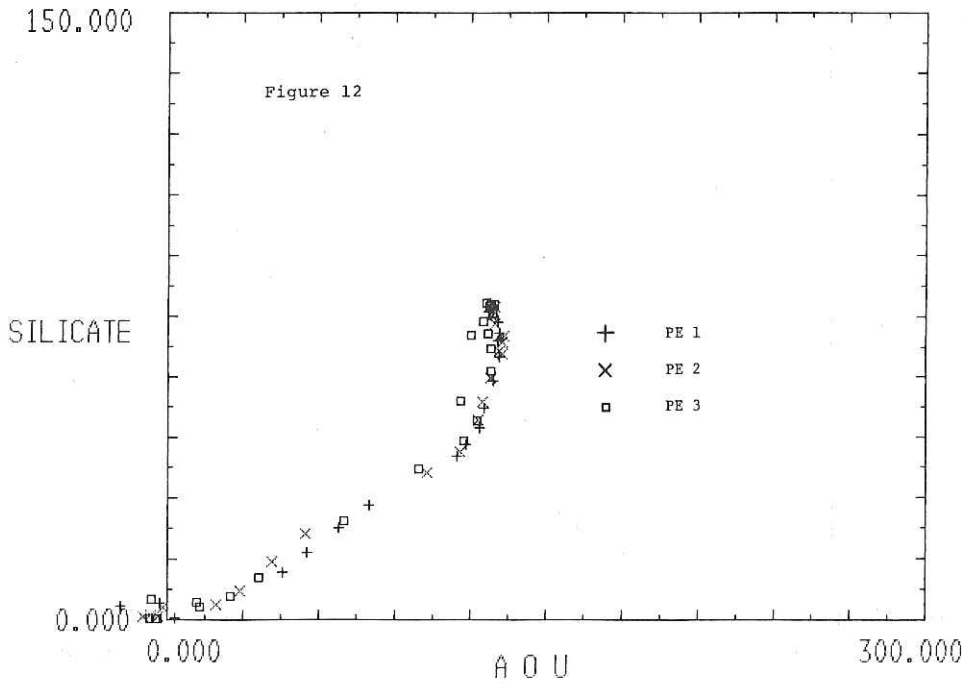
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Figure 12
SILICATE
PE 1
PE 2
PE 3
0.000
0.000
300.000
A O U

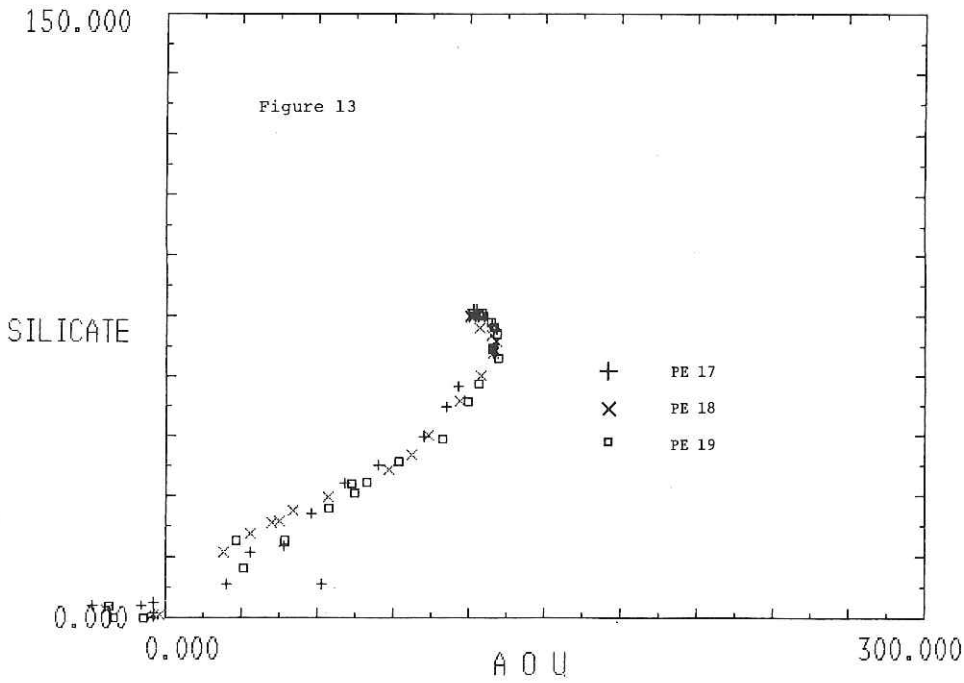
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Figure 13
SILICATE
PE 17
PE 18
PE 19
0.000
0.000
300.000
A O U

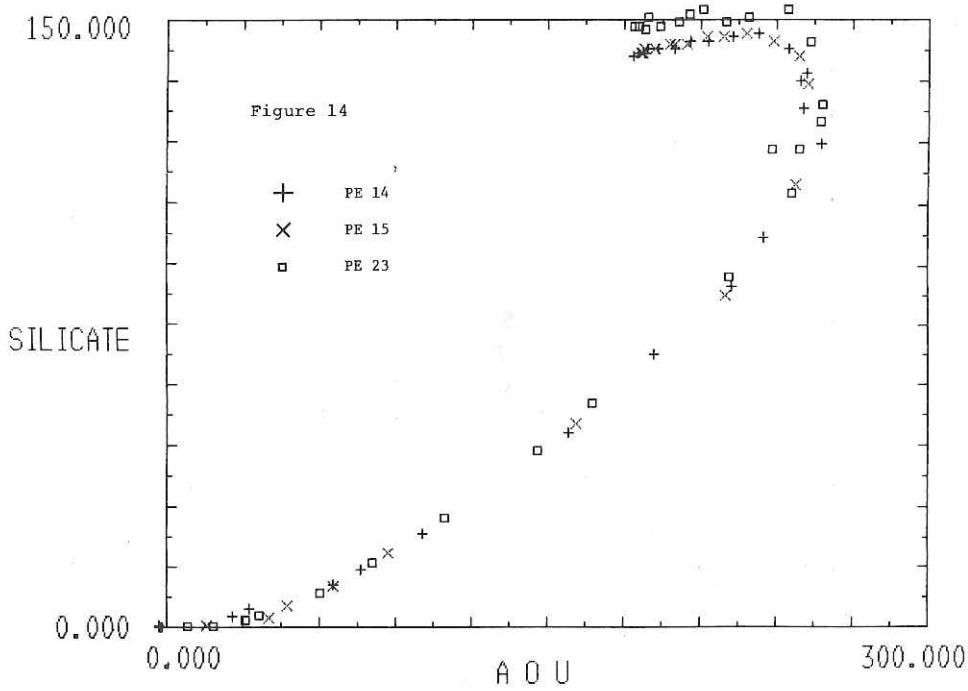


Figure 14

5. Large Volume Water Sampling.

Seawater samples of more than 200 liters are necessary for the analysis of natural and man-made radionuclides in sea water, and two sets of large volume water sampler system were used at 5 stations.

Each sampler system has two 230 liter plastic(PVC) barrels, which has large openings at the top and the bottom, and they are closed by triggering with messengers. The bottom opening is closed tightly by three pistons to prevent the leakage of sample seawater, as is shown in Figure 15. The system equipped with a two stage trigger which closes the openings of two barrels at different depth by messengers.

The list of the seawater samples taken with the systems was shown in Table 4.

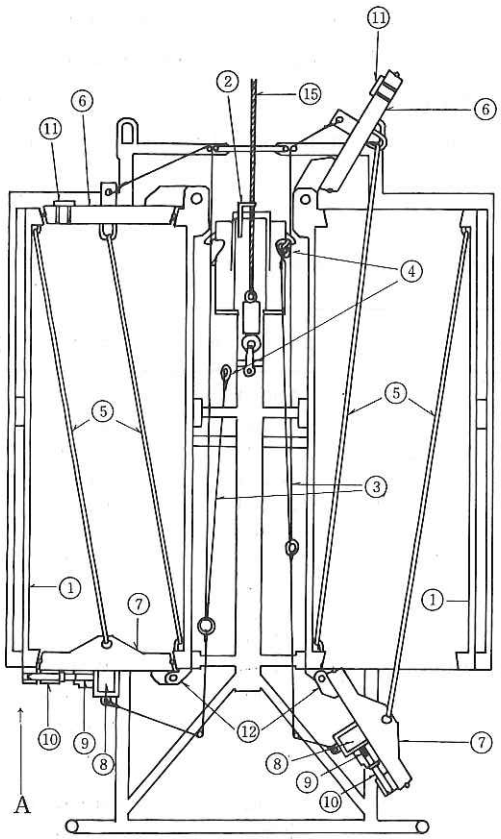
The system was developed by Large Volume Working Group of the Executive Committee of the Special Project Research "Preservation of Marine Environment" funded by the Ministry of Education, Science and Culture, and was manufactured by Nichiyu Giken Kogyo Co.

Table 4. Large Volume Water samples.

Station		Depth (m)	Temp.(°C)	Salinity(‰)
LV1	31°14N, 137°07E	(2000)	-	34.610
		3823	1.54	34.666
LV2	37°44N, 135°12E	500	0.33	34.043
		(1000)	0.20	34.046
		(2000)	0.12	34.052
		2880	0.23	34.051
LV3	41°20N, 137°20E	496	0.34	34.083
		989	0.18	34.064
		(3000)	-	34.069
		(3550)	-	34.067
LV4	43°04N, 138°33E	496	0.34	34.054
		990	0.18	34.057
		3057?	0.24	34.066
		3405	0.27	34.068
LV5	38°35N, 134°45E	500	0.34	
		992	0.16	
		2483	0.18	
		2916	0.25	34.068

Figure 15. Large Volume Water Sampler System.

Right barrel is open, and left barrel is closed.
1) plastic barrel of 230 liters capacity
2) trigger
3) wire which connects the trigger and the openings of the barrel
4) wire ring which is connected to trigger
5) rubber tubing to close the opening
6) top opening
7) bottom opening
8) batteries to fire the gas generator
9) gas generator
10) piston
11) air vent
12) bottom opening hinge
13) magnetic switch
14) coupler for the withdrawal of sample sea water
15) winch wire



6. Piston Coring

Sediment samples were collected using a piston corer with an aluminum pipe (I.D. = 65 mm, wall thickness = 7.5 mm, length = 12 m). Details of corer were reported in "Preliminary Report of the Hakuho Maru Cruise KH-68-3, Ocean Research Institute, University of Tokyo, 1968", and the detailed description of samples are in pages 36 to 52.

The description was done by Kitazato and Oba.

LEGEND


massive clay


weakly laminated clay

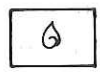

thin-laminated clay


sand layer

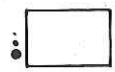

tuff

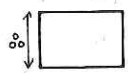

burrow(Type-1)


burrow(Type-2)


molluscs


no sample


graded bedding


foraminifera rich horizon

ABBREVIATIONS

w:	white
v.f.:	very fine-grained
f.:	fine-grained
m.:	medium-grained
pum.:	pumiceous
sdy.:	sandy
foram.:	foraminiferal
Tf.:	tuff
Ah:	Akahoya Tuff(6400yB.P.)
Oki:	Oki Tuff(ca 9500-10000yB.P.)
AT:	Aira-Tanzawa Tuff(22000yB.P.)
Aso-4:	Aso Volcano, no 4 Tuff(ca 50000-55000yB.P.)

CORE LOG

Date 10/2,1977 R.V. "Hakuho Maru" Cruise KH- 77 - 3 Station M-1

Latitude 35 59.2'N Longitude 130 27.8'E

Location

Sea Weather

Bottom Topography

Profiler

Length of Core Pipe 12 m
No. of Pipe Material Al
I.D. of Pipe 65 mm
Wall Thickness 7.5 mm
Core Head Weight 500 kg
Trigger Weight 55 kg
Length of Trigger Line 20 m
Length of Main Line 20 m
Length of Free Fall 6 m
Response at Hit clear
Response at Pull-out clear

Time Lowered 13 h 30 min
Uncorrected Water Depth 1550 m
Time Hit 14 h 11 min
Uncorrected Water Depth 1580 m
Wire Angle at Hit 0 °
Wire-out at Hit 1542 m
Time Surfaced 14 h 50 min
Uncorrected Water Depth 1580 m

Core Length 1184 cm

Trigger Core Length 12 cm

Method of Storage

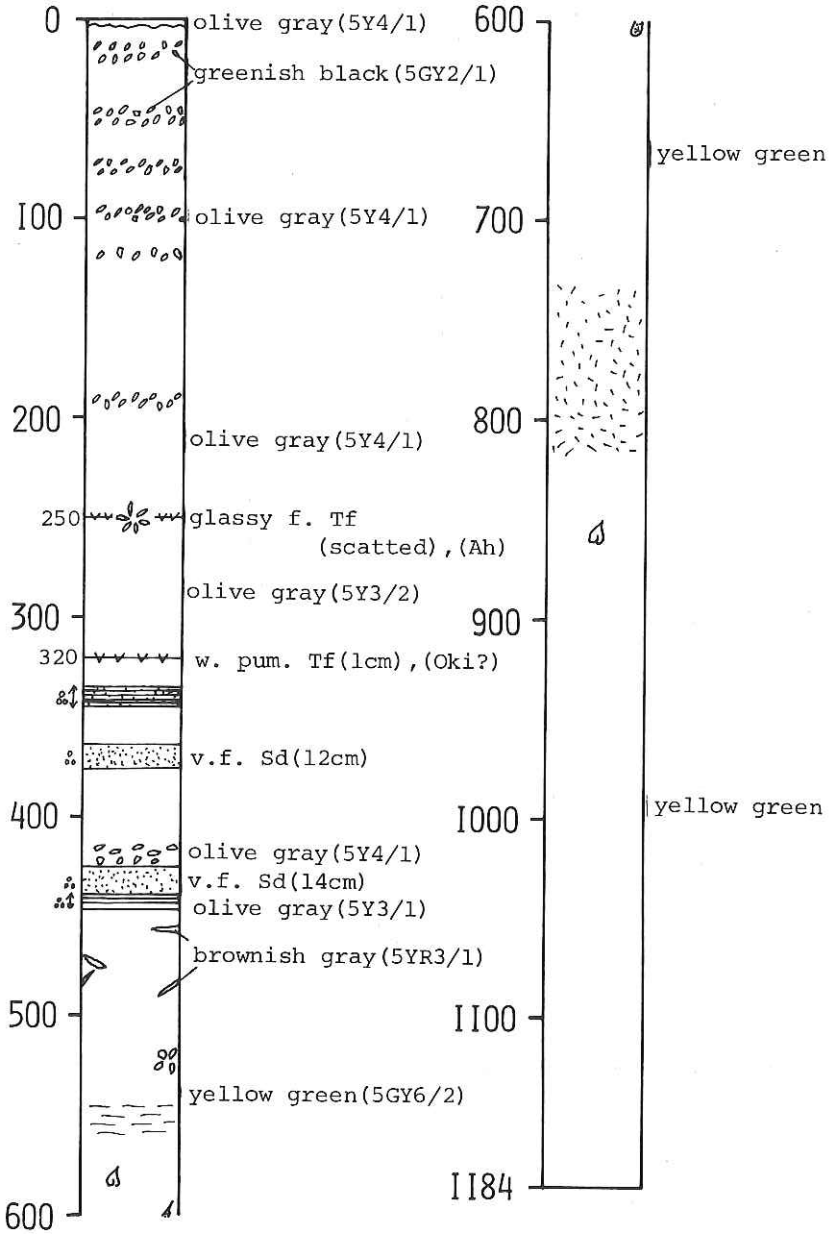
Length of Cores in Pipe 1. 184 cm, 2. 180 cm, 3. 190 cm
4. 180 cm, 5. 178 cm, 6. 173 cm
7. 99 cm

No. of Pipe Filled

No. of Cubic Samples for Paleomagnetism (No. -No.)

Note:

KH77-3,M-I


0
100
200
250
300
320
400
500
600
olive gray(5Y4/1)
greenish black(5GY2/1)
olive gray(5Y4/1)
olive gray(5Y4/1)
glassy f. Tf
(scatted),(Ah)
olive gray(5Y3/2)
w. pum. Tf(1cm),(Oki?)
v.f. Sd(12cm)
olive gray(5Y4/1)
v.f. Sd(14cm)
olive gray(5Y3/1)
brownish gray(5YR3/1)
yellow green(5GY6/2)
600
700
800
900
1000
1100
1184
yellow green
yellow green

CORE LOG

Date 9/23,1977 R.V. "Hakuho Maru" Cruise KH- 77-3 Station M-2

Latitude 36 25.6'N Longitude 134 10.0'E

Location _____

Sea _____ Weather _____

Bottom Topography _____

Profiler _____

Length of Core Pipe 12 m — No. of Pipe ____ Material Al

I.D. of Pipe 65 mm — Wall Thickness 7.5 mm

Core Head Weight 500 kg — Trigger Weight 55 kg

Length of Trigger Line 20.02m — Length of Main Line 19.94 m

Length of Free Fall 6 m — Response at Hit clear

Response at Pull-out clear

Time Lowered 10 h 47 min — Uncorrected Water Depth 1120 m

Time Hit 11 h 24 min — Uncorrected Water Depth 1115 m

Wire Angle at Hit 0 ° — Wire-out at Hit 1083 m

Time Surfaced 12 h 00 min — Uncorrected Water Depth 1120 m

Core Length 950 cm

Trigger Core Length 81 cm

Method of Storage _____

Length of Cores in Pipe 1. 188 cm, 2. 194 cm, 3. 196 cm

4. 190 cm, 5. 159 cm, 6. 23 cm

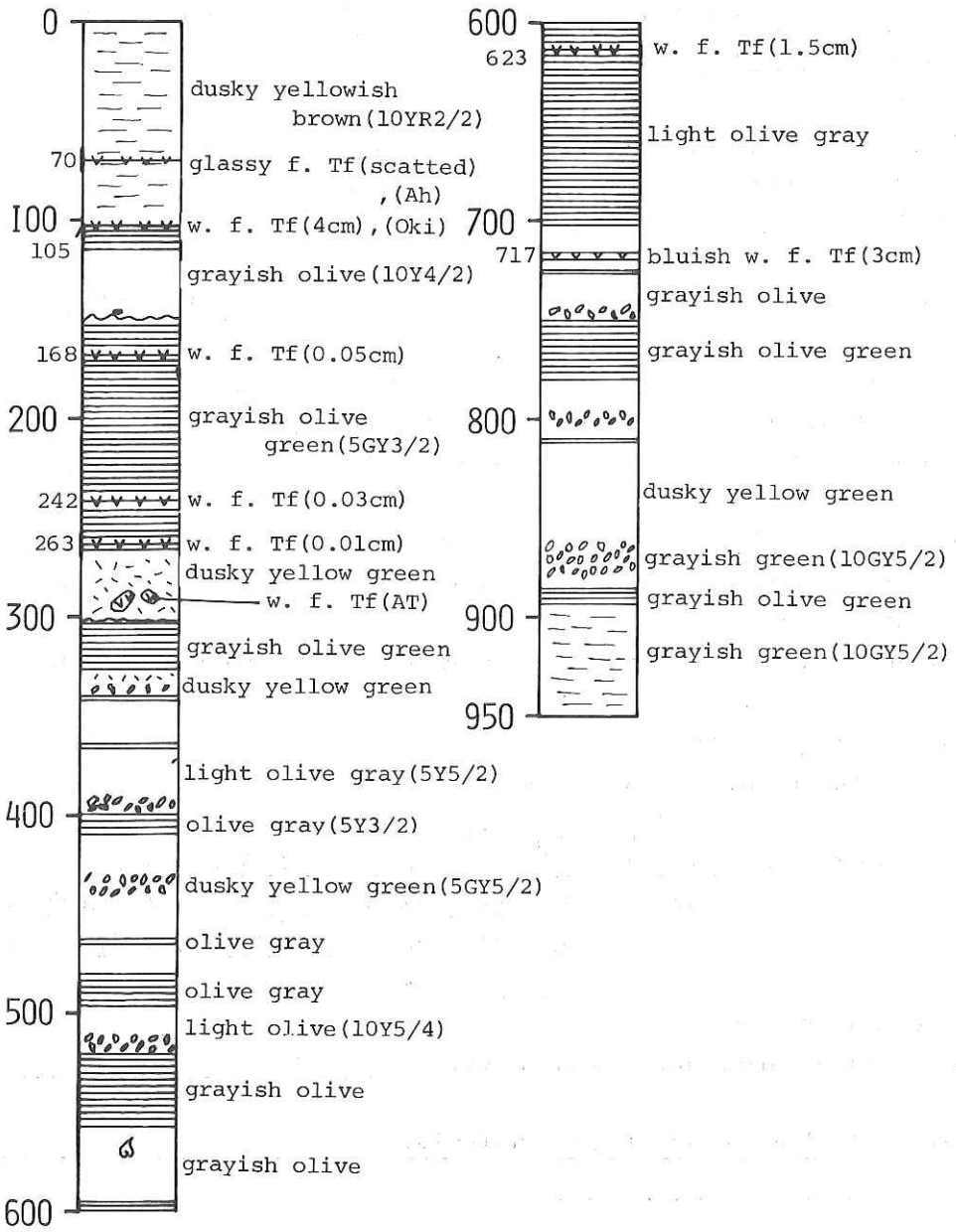
7. _____ cm

No. of Pipe Filled _____

No. of Cubic Samples for Paleomagnetism _____ (No. _____ -No. _____)

Note: _____

KH77-3,M-2


0
70
100
105
168
200
242
263
300
400
500
600
dusky yellowish brown(10YR2/2)
glassy f. Tf(scatted),(Ah)
w. f. Tf(4cm),(Oki)
grayish olive(10Y4/2)
w. f. Tf(0.05cm)
grayish olive green(5GY3/2)
w. f. Tf(0.03cm)
w. f. Tf(0.01cm)
dusky yellow green
w. f. Tf(AT)
grayish olive green
dusky yellow green
light olive gray(5Y5/2)
olive gray(5Y3/2)
dusky yellow green(5GY5/2)
olive gray
olive gray
light olive(10Y5/4)
grayish olive
grayish olive
600
623
700
717
800
900
950
w. f. Tf(1.5cm)
light olive gray
bluish w. f. Tf(3cm)
grayish olive
grayish olive green
dusky yellow green
grayish green(10GY5/2)
grayish olive green
grayish green(10GY5/2)

CORE LOG

Date 10/1,1977 R.V. "Hakuho Maru" Cruise KH-77-3 Station M-3

Latitude 37 34.6'N Longitude 131 58.9'E

Location

Sea Weather

Bottom Topography

Profiler

Length of Core Pipe 12 m — No. of Pipe — Material Al

I.D. of Pipe 65 mm — Wall Thickness 7.5 mm

Core Head Weight 500 kg — Trigger Weight 55 kg

Length of Trigger Line 20 m — Length of Main Line 20 m

Length of Free Fall 6 m — Response at Hit clear

Response at Pull-out clear

Time Lowered 10 h 30 min — Uncorrected Water Depth 2360 m

Time Hit 11 h 17 min — Uncorrected Water Depth 2365 m

Wire Angle at Hit 0 ° — Wire-out at Hit 2337 m

Time Surfaced 12 h 05 min — Uncorrected Water Depth 2360 m

Core Length 1068 cm

Trigger Core Length 35 cm

Method of Storage lack of sample*1 125-165, 411-426, 666-681 & 921-936 cm

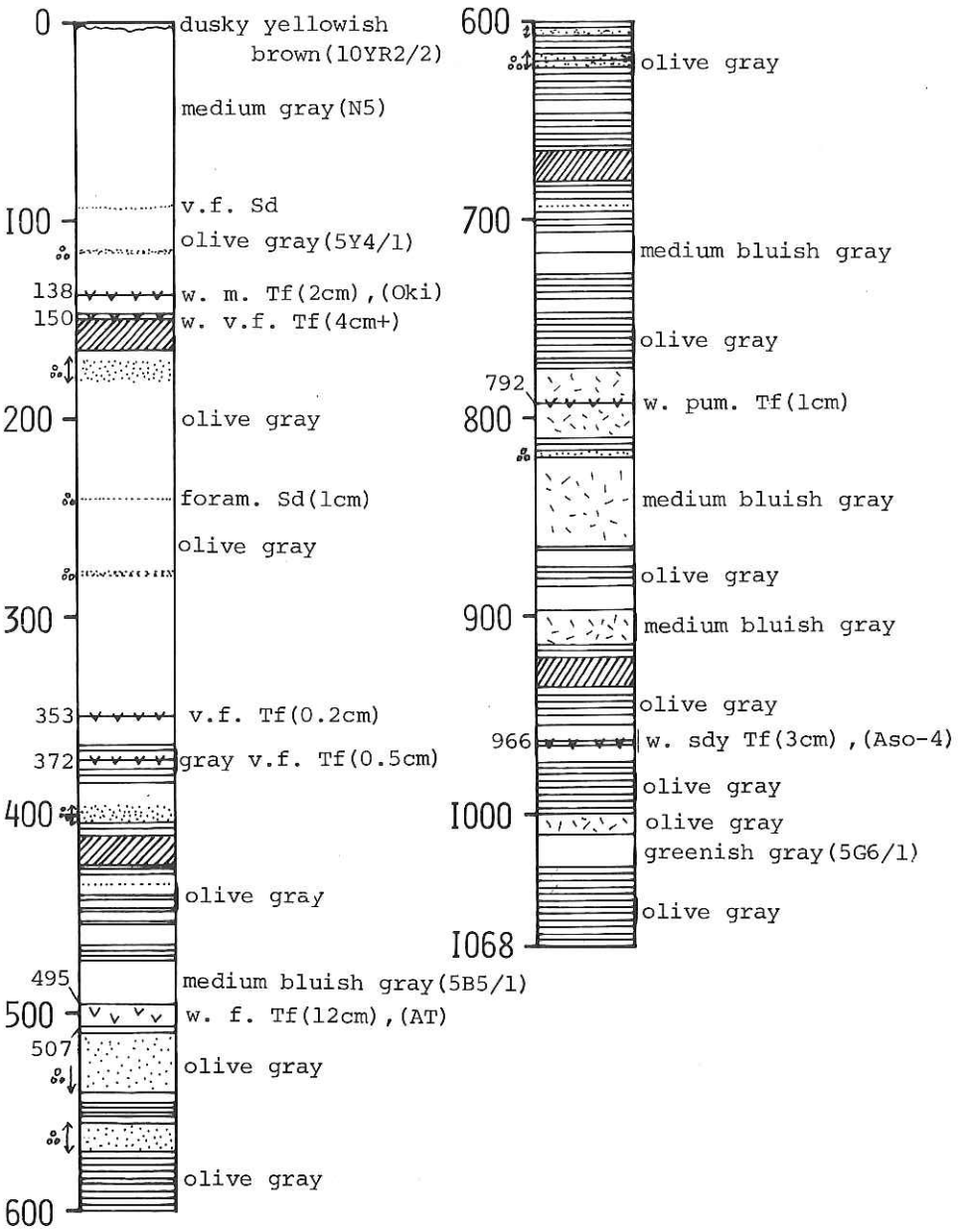
Length of Cores in Pipe 1. 125 cm, 2. 197 cm, 3. 197 cm
4. 191 cm, 5. 181 cm, 6. 49 + 43cm
7. cm

No. of Pipe Filled

No. of Cubic Samples for Paleomagnetism (No. -No.)

Note: *1 For study of gas analysis.

KH77-3,M-3


0
dusky yellowish brown(10YR2/2)
medium gray(N5)
100
v.f. Sd
olive gray(5Y4/1)
138
w. m. Tf(2cm),(Oki)
150
w. v.f. Tf(4cm+)
200
olive gray
foram. Sd(1cm)
olive gray
300
353
v.f. Tf(0.2cm)
372
gray v.f. Tf(0.5cm)
400
olive gray
495
medium bluish gray(5B5/1)
500
w. f. Tf(12cm),(AT)
507
olive gray
olive gray
600
600
olive gray
700
medium bluish gray
olive gray
792
w. pum. Tf(1cm)
800
medium bluish gray
olive gray
900
medium bluish gray
olive gray
966
w. sdy Tf(3cm),(Aso-4)
olive gray
1000
olive gray
greenish gray(5G6/1)
olive gray
1068

CORE LOG

Date 9/24,1977 R.V. "Hakuho Maru" Cruise KH-77-3 Station M-4

Latitude 37 43.8'N Longitude 135 10.7'E

Location

Sea Weather

Bottom Topography flat

Profiler

Length of Core Pipe 12 m No. of Pipe Material Al

I.D. of Pipe 65 mm Wall Thickness 7.5 mm

Core Head Weight 500 kg Trigger Weight 55 kg

Length of Trigger Line 20.02m Length of Main Line 19.94 m

Length of Free Fall 6 m Response at Hit clear

Response at Pull-out clear

Time Lowered 06 h 34 min Uncorrected Water Depth 2960 m

Time Hit 07 h 26 min Uncorrected Water Depth 2980 m

Wire Angle at Hit 0 ° Wire-out at Hit 2934 m

Time Surfaced 08 h 40 min Uncorrected Water Depth 2980 m

Core Length 1076 cm

Trigger Core Length 53 cm

Method of Storage lack of sample*1 No sample stored*2
183-198, 445-460, 697-712 & 948-963 cm

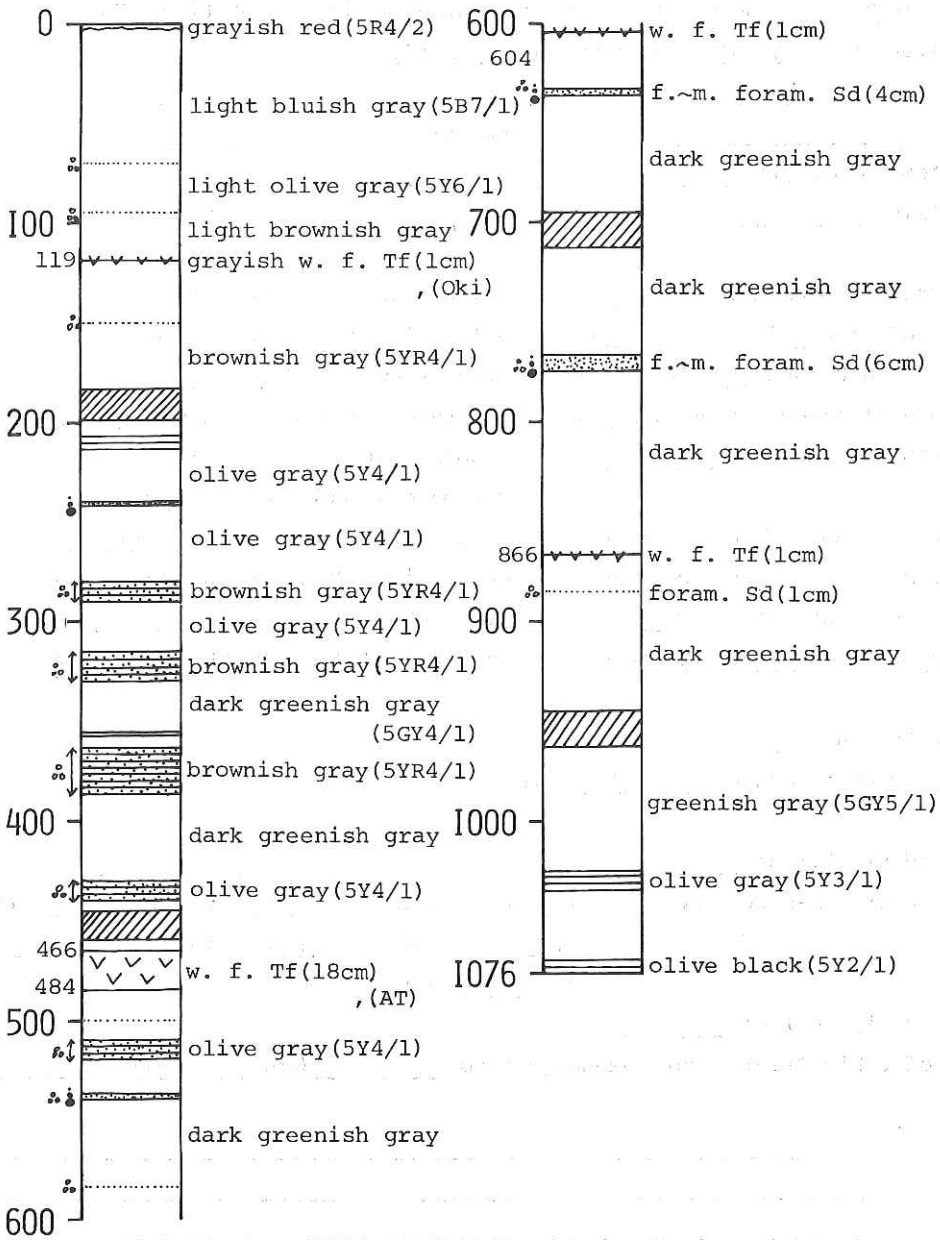
Length of Cores in Pipe 1. cm, 2. cm, 3. cm
4. cm, 5. cm, 6. cm
7. cm

No. of Pipe Filled

No. of Cubic Samples for Paleomagnetism (No. -No.)

Note: *1 For study of gas analysis.
*2 For study of interstitial water.

KH77-3,M-4


0
grayish red(5R4/2)
light bluish gray(5B7/1)
light olive gray(5Y6/1)
100
light brownish gray
119
grayish w. f. Tf(1cm)
,(Oki)
brownish gray(5YR4/1)
200
olive gray(5Y4/1)
olive gray(5Y4/1)
brownish gray(5YR4/1)
300
olive gray(5Y4/1)
brownish gray(5YR4/1)
dark greenish gray
(5GY4/1)
brownish gray(5YR4/1)
400
dark greenish gray
olive gray(5Y4/1)
466
484
w. f. Tf(18cm)
,(AT)
500
olive gray(5Y4/1)
dark greenish gray
600
600
604
w. f. Tf(1cm)
f.~m. foram. Sd(4cm)
dark greenish gray
700
dark greenish gray
f.~m. foram. Sd(6cm)
800
dark greenish gray
866
w. f. Tf(1cm)
foram. Sd(1cm)
900
dark greenish gray
greenish gray(5GY5/1)
1000
olive gray(5Y3/1)
1076
olive black(5Y2/1)

CORE LOG

Date 9/29,1977 R.V. "Hakuho Maru" Cruise KH-77-3 Station M-5

Latitude 41 00.3'N Longitude 137 01.1'E

Location

Sea Weather

Bottom Topography

Profiler

Length of Core Pipe 12 m — No. of Pipe — Material Al

I.D. of Pipe 65 mm — Wall Thickness 7.5 mm

Core Head Weight 500 kg — Trigger Weight 55 kg

Length of Trigger Line 20.02 m — Length of Main Line 19.94 m

Length of Free Fall 6 m — Response at Hit clear

Response at Pull-out clear

Time Lowered 12 h 44 min — Uncorrected Water Depth 3300 m

Time Hit 13 h 42 min — Uncorrected Water Depth 3300 m

Wire Angle at Hit 0 ° — Wire-out at Hit 3272 m

Time Surfaced 14 h 35 min — Uncorrected Water Depth 3300 m

Core Length 974 cm

Trigger Core Length 0 cm

Method of Storage

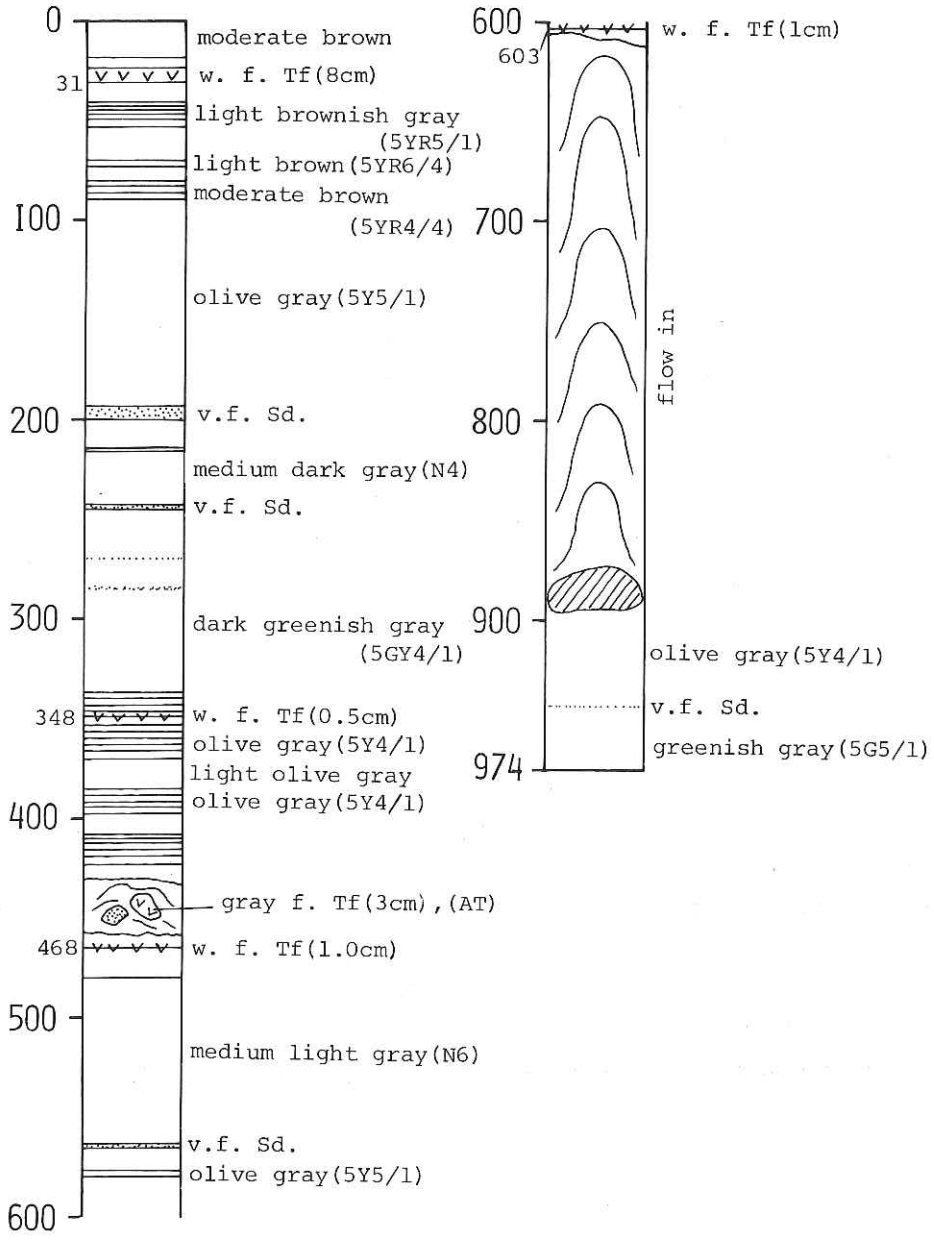
Length of Cores in Pipe 1. 179 cm, 2. 189 cm, 3. 187 cm
4. 176 cm, 5. 187 cm, 6. 56 cm
7. cm

No. of Pipe Filled

No. of Cubic Samples for Paleomagnetism (No. -No.)

Note:

KH77-3,M-5


0
31
100
200
300
348
400
468
500
600
moderate brown
w. f. Tf(8cm)
light brownish gray (5YR5/1)
light brown(5YR6/4)
moderate brown (5YR4/4)
olive gray(5Y5/1)
v.f. Sd.
medium dark gray(N4)
v.f. Sd.
dark greenish gray (5GY4/1)
w. f. Tf(0.5cm)
olive gray(5Y4/1)
light olive gray
olive gray(5Y4/1)
gray f. Tf(3cm),(AT)
w. f. Tf(1.0cm)
medium light gray(N6)
v.f. Sd.
olive gray(5Y5/1)
600
603
700
800
900
974
w. f. Tf(1cm)
flow in
olive gray(5Y4/1)
v.f. Sd.
greenish gray(5G5/1)

CORE LOG

Date 9/24,1977 R.V. "Hakuho Maru" Cruise KH-77-3 Station L-4

Latitude 37 44.4'N Longitude 135 11.8'E

Location

Sea Weather

Bottom Topography

Profiler

Length of Core Pipe 6 m — No. of Pipe — Material Al

I.D. of Pipe 136 mm — Wall Thickness 7 mm

Core Head Weight 500 kg — Trigger Weight 55 kg

Length of Trigger Line 12 m — Length of Main Line 12 m

Length of Free Fall 4 m — Response at Hit clear

Response at Pull-out clear

Time Lowered 15 h 35 min — Uncorrected Water Depth 2970 m

Time Hit 16 h 24 min — Uncorrected Water Depth 2970 m

Wire Angle at Hit 0 ° — Wire-out at Hit 2947 m

Time Surfaced 17 h 10 min — Uncorrected Water Depth 2970 m

Core Length 495 cm

Trigger Core Length 54 cm

Method of Storage

Length of Cores in Pipe 1. 130 cm, 2. 196 cm, 3. 169 cm

4. cm, 5. cm, 6. cm

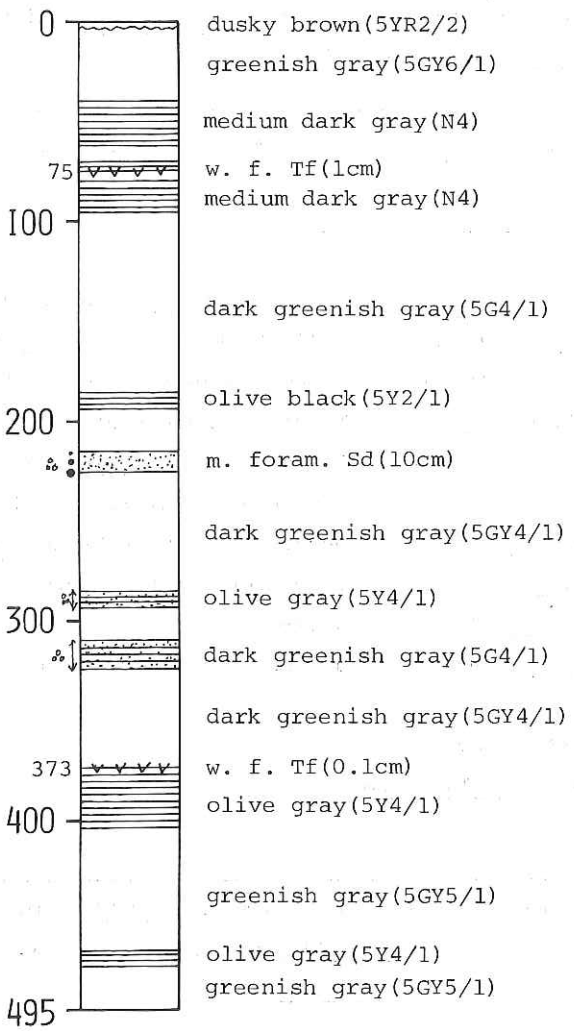
7. cm

No. of Pipe Filled

No. of Cubic Samples for Paleomagnetism (No. -No.)

Note:

KH77-3,L-4


0
75
100
200
300
373
400
495
dusky brown(5YR2/2)
greenish gray(5GY6/1)
medium dark gray(N4)
w. f. Tf(1cm)
medium dark gray(N4)
dark greenish gray(5G4/1)
olive black(5Y2/1)
m. foram. Sd(10cm)
dark greenish gray(5GY4/1)
olive gray(5Y4/1)
dark greenish gray(5G4/1)
dark greenish gray(5GY4/1)
w. f. Tf(0.1cm)
olive gray(5Y4/1)
greenish gray(5GY5/1)
olive gray(5Y4/1)
greenish gray(5GY5/1)

CORE LOG

Date 9/28,1977 R.V. "Hakuho Maru" Cruise KH- 77 - 3 Station L-4'

Latitude 43 00.3'N Longitude 138 28.1'E

Location

Sea Weather

Bottom Topography

Profiler

Length of Core Pipe 12 m
No. of Pipe Material Al
I.D. of Pipe 136 mm
Wall Thickness 7 mm
Core Head Weight 500 kg
Trigger Weight 55 kg
Length of Trigger Line 12 m
Length of Main Line 12 m
Length of Free Fall 4 m
Response at Hit clear
Response at Pull-out clear

Time Lowered 06 h 30 min
Uncorrected Water Depth 3610 m
Time Hit 07 h 37 min
Uncorrected Water Depth 3540 m
Wire Angle at Hit 0 °
Wire-out at Hit 3527 m
Time Surfaced 08 h 35 min
Uncorrected Water Depth 3540 m

Core Length 528 cm
Trigger Core Length 44 cm

Method of Storage

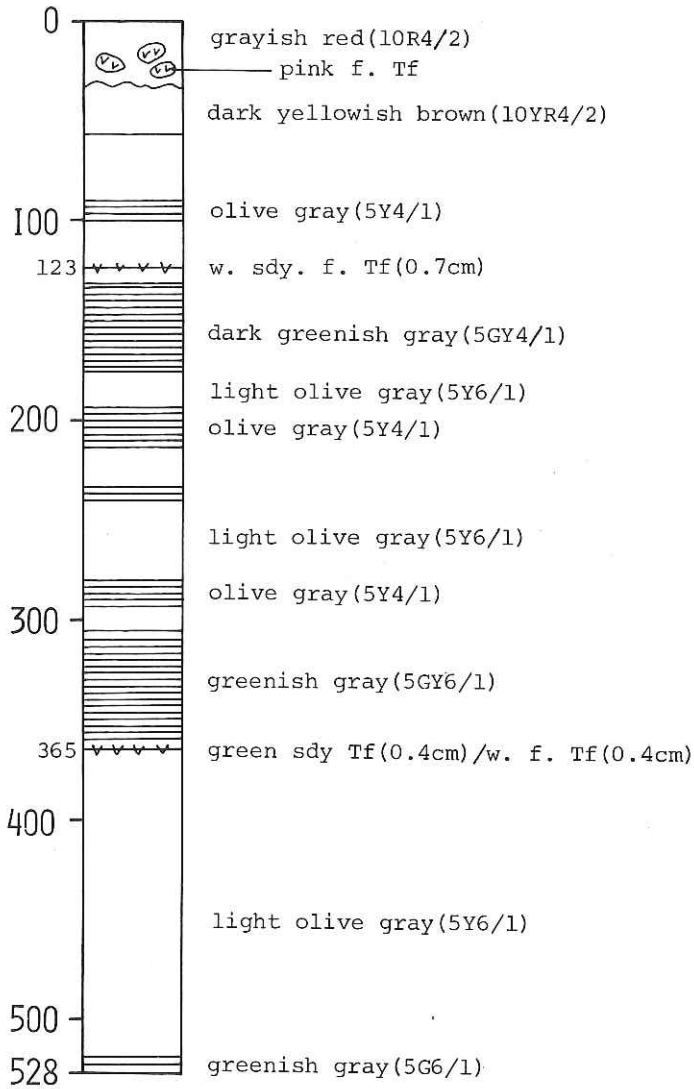
Length of Cores in Pipe 1. 135 cm, 2. 178 cm, 3. 181 cm
4. 34 cm, 5. cm, 6. cm
7. cm

No. of Pipe Filled

No. of Cubic Samples for Paleomagnetism (No. -No.)

Note:

KH77-3, L-4'


0
100
123
200
300
365
400
500
528
grayish red(10R4/2)
pink f. Tf
dark yellowish brown(10YR4/2)
olive gray(5Y4/1)
w. sdy. f. Tf(0.7cm)
dark greenish gray(5GY4/1)
light olive gray(5Y6/1)
olive gray(5Y4/1)
light olive gray(5Y6/1)
olive gray(5Y4/1)
greenish gray(5GY6/1)
green sdy Tf(0.4cm)/w. f. Tf(0.4cm)
light olive gray(5Y6/1)
greenish gray(5G6/1)

CORE LOG

Date 9/18,1977 R.V. "Hakuho Maru" Cruise KH- 77- 3 Station L-2

Latitude 31 28.2'N Longitude 131 58.6'E

Location

Sea Weather

Bottom Topography

Profiler

Length of Core Pipe 12 m No. of Pipe Material Al

I.D. of Pipe 65 mm Wall Thickness 7.5 mm

Core Head Weight 480 kg Trigger Weight 55 kg

Length of Trigger Line 18 m Length of Main Line 18 m

Length of Free Fall 4 m Response at Hit undistinct

Response at Pull-out undistinct

Time Lowered 16 h 25 min Uncorrected Water Depth 1220 m

Time Hit 16 h 53 min Uncorrected Water Depth 1220 m

Wire Angle at Hit 0 ° Wire-out at Hit 1215 m

Time Surfaced 17 h 20 min Uncorrected Water Depth 1220 m

Core Length 225 cm

Trigger Core Length 0 cm

Method of Storage

Length of Cores in Pipe 1. 193 cm, 2. 32 cm, 3. cm

4. cm, 5. cm, 6. cm

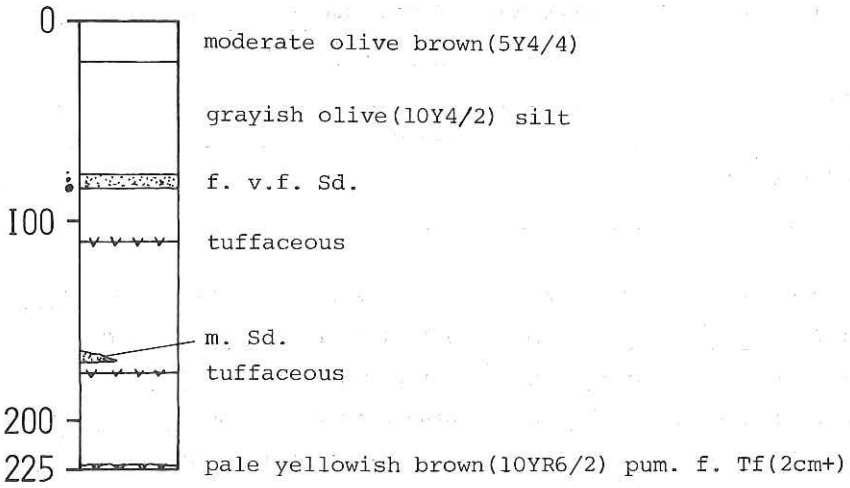
7. cm

No. of Pipe Filled

No. of Cubic Samples for Paleomagnetism (No. -No.)

Note:

KH77-3, L-2


0
100
200
225
moderate olive brown(5Y4/4)
grayish olive(10Y4/2) silt
f. v.f. Sd.
tuffaceous
m. Sd.
tuffaceous
pale yellowish brown(10YR6/2) pum. f. Tf(2cm+)

CORE LOG

Date 9/18,1977 R.V. "Hakuho Maru" Cruise KH-77-3 Station L-1

Latitude 32 14.7'N Longitude 133 10.7'E

Location

Sea Weather

Bottom Topography

Profiler

Length of Core Pipe 12 m — No. of Pipe — Material Al

I.D. of Pipe 136 mm — Wall Thickness 7 mm

Core Head Weight 480 kg — Trigger Weight 55 kg

Length of Trigger Line 11.81m — Length of Main Line 12.04 m

Length of Free Fall 4.8 m — Response at Hit week

Response at Pull-out undistinct

Time Lowered 07 h 50 min — Uncorrected Water Depth 1070 m

Time Hit 08 h 28 min — Uncorrected Water Depth 1070 m

Wire Angle at Hit 0 ° — Wire-out at Hit 1084 m

Time Surfaced 09 h 10 min — Uncorrected Water Depth 1070 m

Core Length 0 cm

Trigger Core Length 53 cm

Method of Storage

Length of Cores in Pipe 1.____cm, 2. ____cm, 3.____cm

4.____cm, 5.____cm, 6.____cm

7.____cm

No. of Pipe Filled

No. of Cubic Samples for Paleomagnetism (No. -No.)

Note:

Appendix A. Modified Carpenter's Method

by

Y.Horibe, and T.Gamo

A modified Winkler's method was used until 1976 for the analysis of dissolved oxygen aboard R/V "Hakuho Maru"[1a,b]. In 1977, a newly designed oxygen bottle was introduced to minimize the evaporation loss of iodine, and also to decrease the labor for the analysis on board.

The new analytical procedures were almost the same as that of Carpenter's method[2] except the following two points.

1. Concentration of KI in the oxygen bottle is 2×10^{-2}M, which is one half of NaI solution by Carpenter's method, and is about 6 times higher than that of the modified Winker's method used previously by us[1b].
2. A newly designed oxygen bottle of 50 cm^3 capacity has an extra volume of more than 20 cm^3 above the stopper for titration with a 5 ml piston burette (Metrohm Model E274-5), and is shown in Figure A1. The extra volume eliminated the procedure of transferring the acidified manganese solution to another beaker as was done by the modified Winkler's method[1b]. The oxygen bottle was dried before use to minimize the possible contamination of dissolved oxygen in the remaining water in the bottle. Also, the correction was added for the oxygen in the added reagents.

The comparison of the results obtained by the modified Carpenter's method and by the modified Winkler's method is shown in Figure A2. Two sets of seawater samples were analyzed by two methods, and the Winkler's method showed slightly lower values than Carpenter's method by 0.8%. This could be attributed to the loss of iodine in the process of transferring the solution to another beaker in the Winkler's method.

Dissolved oxygen were also measured by shipboard gas chromatography, and the modified Carpenter's method gave lower values than gas chromatography by 0.6%[3].

References

(1) a) Meteorological Agency edited, "Manual of Oceanographic Observations", 174-181, Oceanographical Society of Japan, 1970.
b) Y.Horibe, Y.Kodama, and K.Shigehara, J.Oceanogr.Soc.Japan, 28, 203-206, 1972.

(2) J.H.Carpenter, Limnol.Oceanogr., 10, 141-143, 1965.

(3) T.Gamo, and Y.Horibe, Bull.Chem.Soc.Jpn., 53, 2839-42, 1980.

Figure A1. Oxygen bottle.

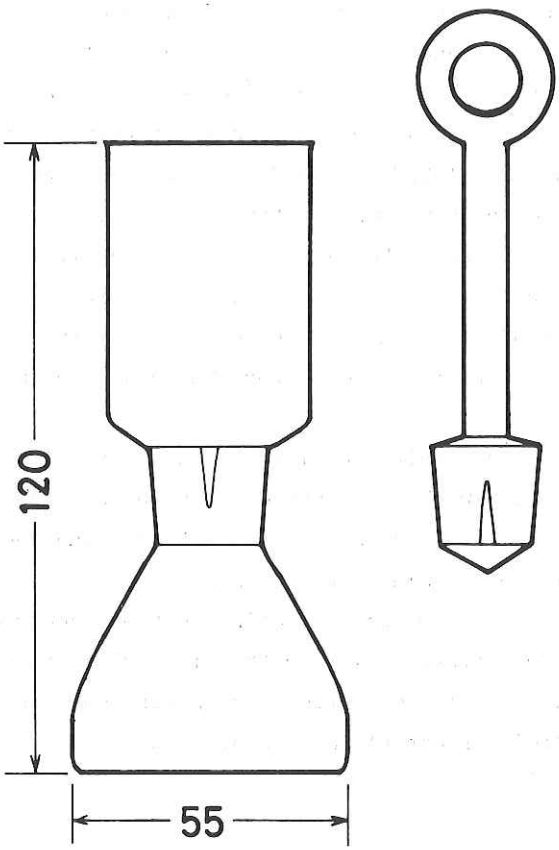


Figure A2. Comparison of the results.