PART II

XIII. CHEMICAL COMPOSITION OF SEDIMENTS IN THE GH78-1 AREA

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Seventeen components for 49 samples were analysed. Thirty-one samples of them are from surface of grabbed sediments and others are ones resampled in core from the same grabbed sediment samples by plastic tube. Sample preparation and the analysis were carried on in the same manner in KATO *et al.* (1979).

Results and discussion

The results of chemical analysis are shown in Table XIII-1. Contents of Co, Cu, Ni, Pb and Zn are shown in ppm, and the others are in %. The names of sediment determined by the microscopic observation (NAKAO and SUZUKI, in this volume) are shown together.

Some components largely vary. For instance, SiO_2 has a wide range from 59.0% to 2.12%. There are the same trend for Al_2O_3 (17.24–0.86%), CaO (46.08–1.48%) and CO_2 (41.07–0.07%). Of these various values, the content of carbonate which is estimated from CO_2 contents has influence on the various values of the other components.

The relation between the ratios CaO : CO_2 and MgO : CO_2 is shown on Fig. XIII-1. The samples containing of CO_2 less than 1% are neglected in the figure. Two lines in the figure mean the relations of them in $CaCO_3$ and $MgCO_3$. The ratio CaO : CO_2 plots in parallel with the line of $CaCO_3$, on the side slightly rich in CaO. On the other hand, that of MgO and CO_2 has an opposite inclination and crosses the distribution of $CaCO_3$ plots. From this figure it appears that carbonate in the sediment of this area is almost in the form of $CaCO_3$.

The distribution of ratio CaO : CO_2 are divided into two groups. One is the group which contains CO_2 more than 30%, and the other less than 20%. These values correspond to those more than about 70% and less than about 45% of $CaCO_3$ respectively. Four sediment groups based on $CaCO_3$ content estimated from CO_2 are established on the basis of the classification by PETTIJOHN (1975, Fig. 10–41).

Sediments of this area are newly classified on the bases of the above four groups and the coarse fraction analysis (Table XIII-2). These names are used in this report.

Chemical compositions in Table XIII-1 were recalculated on the carbonate and water free basis in order to eliminate their effects, and shown in Table XIII-3. The mean, standard deviation and coefficient of variation of each component are also shown in that table. It appears that the distribution ranges of SiO_2, Al_2O_3 and Fe_2O_3 become narrower by the elimination of $CaCO_3$ effect. However, the coefficients of variation of CaO and P_2O_5 are still large. The relations between both the components are shown in Fig. XIII-2, as well as the line of apatite (Ap). The points plotted, without ones for calcareous sediments, distribute subparallel along the apatite line, though they are partial to the side rich in CaO. Therefore it is considered that the variation of these components is reflected by the content of possible apatite minerals in the sediment.

Solid symbols in the Fig. XIII-2 mean the samples from flat bottom of basin and trough, and open ones from uneven topographic area abundant in seamounts and knolls. "Apatite" component is rather rich in the former area. Symbols with asterisk show the sample below the sea bottom surface. Of these two plots with asterisk tend to be extremely away from the distribution of others. The symbols richest and poorest in CaO are the cases in point. These two samples were both taken at the same station (St. 1058), and the depths below the bottom surface 10 cm and 20 cm, respectively. The former is extremely rich in CaO against to P_2O_5, and the latter *vice versa*. Selectional migration of those may exist in the sediment.

In addition to the two oxides mentioned above, MnO, Na_2O and K_2O have relatively high coefficient of variation. In regard to MnO, the main factor controlling the content may be the abundance of manganese micronodules in the sediments.

Na_2O and K_2O are frequently contained as clay or zeolitic (phillipsite) mud, no. 4 in Table XIII-3, is rich in K_2O. As there are no data for clay and zeolite minerals (contents, compositions, distributions, etc.) in the sediments of this area, this problem is left for the discussion in future.

Average chemical composition on the carbonate and water free basis of each sediment type is shown in Table XIII-4. Coefficients of variation for each sediment type become smaller than those for all samples. Therefore, it seems that this classification of sediment is significant within the area. However, CaO and P_2O_5 still have larger coefficient than the other oxides. It may be caused by independent supply of the apatite component (e.g. fish skeltal debris), which will be a major phase containing CaO and P_2O_5 other than carbonate, added to the normal sedimentation of this area.

Comparing some components, deep sea clay and zeolitic mud are slightly poor in SiO_2 and rich in Al_2O_3 contents. Both sediments have more alkaline component comparative to the others. As mentioned before, the mud contains much zeolite, which is rich in alkaline element. Being poor in SiO_2 and rich in Al_2O_3 of deep sea clay coincides with the observation that the fragment of radioralia is less in the clay. Moreover the deep sea clay is very fine-grained sediment, which has coarse fractions less than 10%, and it is expected to have high proportion of clay minerals. Alkaline components will be due to the clay minerals. Calcic sediments (limy and calcareous) has slightly less Fe_2O_3 and MnO than the siliceous and deep sea clays. Contents of the oxides other than those mentioned above have small variation in regard to sediment type, and near the mean values.

For the comparison of these results with the known composition of sediments, some data by RILEY and CHESTER (1971) and POLDERVAART (1955) are listed

Table XIII-1 Chemical compositions of sediment.

No.	Station & Sample No.	Sediment	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO
1	1036 G604	CSC	38.38	0.45	9.34	4.67	0.48	2.03	20.65
2	1037-1 G605-1	DC	43.41	0.53	10.64	5.28	0.40	2.39	15.87
3	1040 G608	DC	54.70	0.86	16.65	8.68	0.86	3.56	1.75
4	1041 G610	ZM	53.82	0.63	15.64	6.72	0.70	2.44	3.08
5	1042 G610	DC	54.56	0.70	16.77	7.27	0.58	2.87	2.13
6	1043 G611	DC	53.82	0.64	16.35	7.35	0.94	2.87	2.57
7	1044-1 G612-1	DC	55.10	0.77	16.38	8.03	0.73	3.44	2.00
8	1045 G613	DC	56.20	0.79	16.38	8.07	0.74	3.51	1.50
9	1046 G614	SC	54.62	0.61	13.51	7.72	1.25	3.63	3.64
10	1047 G615	SC	57.70	0.60	13.35	7.35	0.69	3.34	3.96
11	1048-1 G616-1	SC	54.46	0.66	14.05	7.07	0.70	3.12	4.54
12	1049 G617	DC	55.05	0.62	14.52	7.99	1.17	3.79	2.77
13	1050 G618	SC	55.94	0.77	16.07	8.32	0.77	3.53	1.50
14	1051 G619	DC	54.58	0.84	17.10	8.46	0.82	3.64	1.61
15	1052 G620	DC	55.42	0.70	16.08	7.57	0.62	3.10	2.19
16	1053 G621	DC	54.11	0.92	17.22	8.65	0.85	3.58	1.66
17	1054 G622	DC	46.60	0.78	14.39	7.08	0.62	3.05	9.72
18	1060 G623	DC	53.74	0.90	16.74	8.43	0.71	3.40	2.08
19	1061 G624	DC	55.32	0.72	16.38	7.70	0.62	3.16	1.90
20	1055 G625	DC	54.18	0.67	16.20	7.28	0.84	2.84	2.33
21	1056 G626	DC	56.23	0.78	15.97	8.29	0.72	3.54	1.50
22	1057-2 G627-2	DC	56.05	0.74	15.83	8.05	0.92	3.47	1.63
23	1058 G628	SC	38.54	0.45	9.79	5.13	0.52	2.51	19.43
24	1059 G629	SO	58.61	0.54	13.47	7.36	0.65	3.32	2.09
25	1065 G632	SC	59.00	0.68	14.44	7.50	0.59	3.11	1.70
26	1067 G634	SC	52.89	0.61	13.09	6.35	0.60	2.75	7.34
27	1070 G636	CSO	14.82	0.17	3.75	1.77	0.20	0.79	41.90
28	1071 G637	DC	34.19	0.40	8.30	4.19	0.34	1.83	24.07
29	1075 G639	CO	2.12	0.02	0.86	0.22	0.04	0.17	53.52
30	1038-A G640	SC	54.63	0.81	16.91	8.62	0.84	3.52	1.50
31	1039-A G641	SC	55.00	0.81	16.13	8.27	0.95	3.45	1.95
32	1037-1 G605-1(S)	DC	50.68	0.61	12.72	6.17	0.49	2.65	9.41
33	(10)	DC	35.30	0.44	8.80	4.37	0.33	1.94	23.08
34	(20)	DC	56.44	0.73	15.19	7.43	0.65	3.26	2.54
35	(30)	DC	46.54	0.58	11.71	5.61	0.53	2.49	12.68
36	1051 G619(S)	DC	54.71	0.83	16.99	8.17	0.81	3.56	1.65
37	(10)	DC	54.23	0.83	16.81	8.65	0.88	3.76	1.48
38	(20)	DC	55.99	0.76	16.03	7.33	0.61	3.02	2.27
39	1052 G620(S)	DC	54.23	0.86	17.08	8.49	0.87	3.71	1.51
40	(10)	DC	53.73	0.79	17.08	8.06	0.74	3.23	1.98
41	(20)	DC	54.18	0.76	16.64	7.47	0.80	3.01	2.18
42	1053 G621(S)	DC	53.83	0.98	16.97	8.53	0.86	3.50	1.75
43	(10)	DC	53.78	0.97	17.24	8.63	0.85	3.50	1.66
44	1058 G628(S)	SC	32.09	0.40	7.83	4.19	0.44	2.04	25.76
45	(10)	DC	12.12	0.16	3.37	1.66	0.20	0.93	43.95
46	(20)	DC	9.41	0.12	2.63	1.31	0.10	0.78	46.08
47	(30)	DC	9.74	0.12	2.78	1.38	0.12	0.80	45.79
48	1070 G636(S)	CSO	16.89	0.20	4.16	2.06	0.22	0.94	39.69
49	(10)	CSO	15.69	0.18	3.99	1.84	0.23	0.84	40.89

SC: siliceous clay, SO: siliceous ooze, CO: calcareous ooze, CSC: calcareous-siliceous clay, parentheses mean the sampling position from the core; s: surface, 10: 10 cm lower part of

Types of sediment are as follows

Na_2O	K_2O	P_2O_5	H_2O+	CO_2	Co	Cu	Ni	Pb	Zn	Total
0.96	1.54	0.32	5.71	15.18	66	278	125	30	90	99.77
1.13	1.90	0.26	6.35	11.59	63	284	128	32	117	99.81
1.54	2.85	0.56	7.60	0.15	114	407	188	46	162	99.85
3.09	4.28	1.79	7.45	0.11	87	391	205	27	137	99.83
2.44	3.70	1.01	7.63	0.08	92	403	177	33	138	99.82
2.37	3.64	1.37	7.64	0.16	113	420	220	35	148	99.81
1.67	2.88	0.81	7.82	0.08	102	438	185	29	160	99.84
1.44	2.63	0.51	7.90	0.08	109	474	194	31	162	99.81
1.68	2.83	2.05	7.99	0.18	123	552	370	45	219	99.84
1.46	2.03	1.59	8.49	0.18	85	531	178	35	162	99.84
1.46	2.26	0.42	8.54	2.53	98	395	185	41	142	99.90
1.53	2.50	1.42	8.26	0.17	115	585	269	44	181	99.91
1.46	2.52	0.48	8.33	0.11	105	450	174	38	154	99.89
1.49	2.84	0.53	7.79	0.09	115	491	209	45	165	99.89
1.95	3.13	1.00	7.45	0.65	89	412	156	85	144	99.95
1.54	3.30	0.58	7.19	0.07	120	389	231	41	164	99.76
1.33	2.74	0.53	6.60	6.43	102	311	166	40	136	99.95
1.75	3.28	0.93	7.80	0.15	108	393	175	41	162	100.00
2.04	3.35	0.85	7.63	0.14	90	437	163	30	142	99.90
2.50	3.73	1.21	7.78	0.18	91	483	217	35	146	99.84
1.67	2.58	0.46	8.08	0.07	103	456	163	41	155	99.98
1.49	2.39	0.55	8.60	0.08	121	482	215	41	156	99.90
0.86	1.42	0.64	6.51	14.03	65	385	142	30	127	99.90
1.38	1.86	1.05	9.43	0.14	78	632	153	23	153	100.00
1.45	2.08	0.68	8.57	0.07	86	419	126	33	137	99.95
1.37	2.02	0.46	7.59	4.63	76	379	151	26	131	99.78
0.43	0.61	0.19	2.95	32.32	34	125	59	21	44	99.93
0.86	1.45	0.29	5.95	18.05	51	232	100	24	90	99.97
0.19	0.09	0.08	1.44	41.07	20	26	18	20	16	99.83
1.43	2.56	0.47	8.33	0.07	105	483	166	49	157	99.79
1.56	2.74	0.77	7.96	0.08	114	510	223	34	164	99.77
1.25	2.14	0.35	6.87	6.39	71	332	136	29	131	99.80
0.88	1.57	0.21	5.71	17.28	50	246	91	23	92	99.96
1.52	2.60	0.34	8.12	0.87	80	418	160	29	147	99.77
1.23	2.06	0.32	7.19	8.77	70	332	121	31	113	99.78
1.52	2.83	0.59	7.92	0.11	111	485	195	40	164	99.79
1.46	2.89	0.49	8.10	0.07	117	546	220	43	176	99.76
2.02	3.20	1.08	7.30	0.14	88	419	148	31	144	99.83
1.60	2.98	0.53	7.74	0.09	116	550	234	43	176	99.80
1.99	3.29	0.89	7.82	0.09	99	454	178	38	151	99.78
2.22	3.48	1.08	7.79	0.12	105	448	206	30	141	99.82
1.55	3.28	0.64	7.76	0.08	115	400	218	48	167	99.83
1.65	3.35	0.63	7.40	0.08	122	432	224	38	171	99.84
0.67	1.17	0.58	5.66	19.08	60	335	126	28	99	99.97
0.28	0.46	0.23	2.82	33.74	35	148	67	18	46	99.95
0.24	0.37	0.16	2.43	36.18	28	102	81	23	44	99.84
0.24	0.37	0.19	2.70	35.68	29	109	50	25	56	99.94
0.53	0.73	0.20	3.61	30.61	36	149	66	30	55	99.87
0.49	0.65	0.20	3.43	31.44	39	128	62	26	50	99.90

CSO: calcareous-siliceous ooze, DC: deep sea clay, ZM: zeolitic mud. S nad numbers in surface. (analyst: K. KATO)

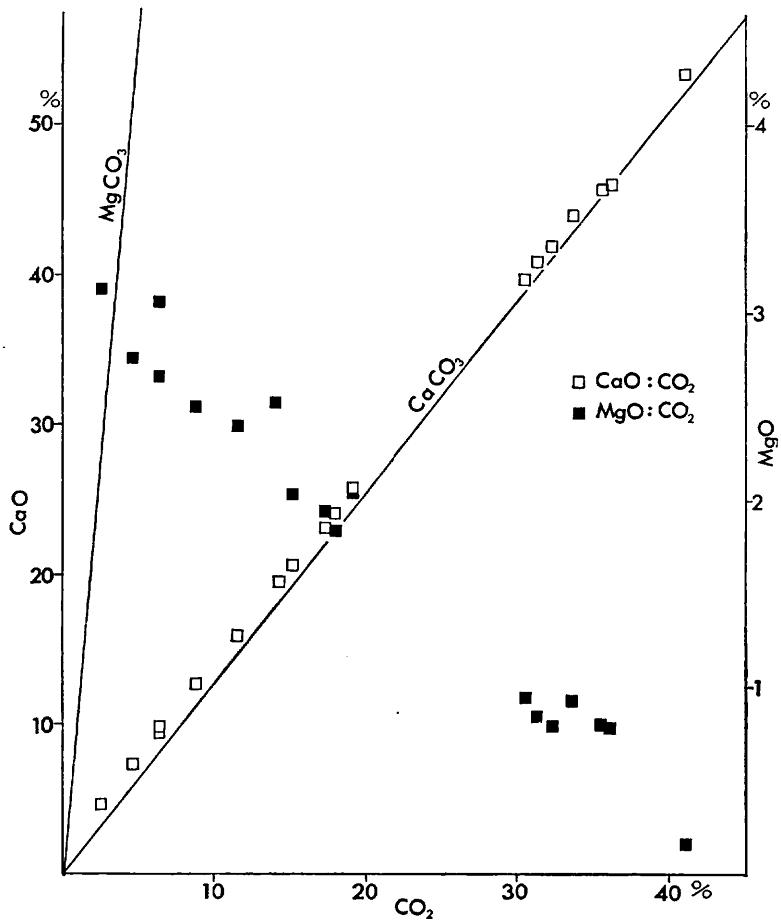

Fig. XIII-1 Relations between CaO and CO_2, and MgO and CO_2 contents of the sediment in this area.
Lines $CaCO_3$ and $MgCO_3$ show the ratios of CaO and CO_2 in $CaCO_3$, and MgO and CO_2 in $MgCO_3$, respectively.

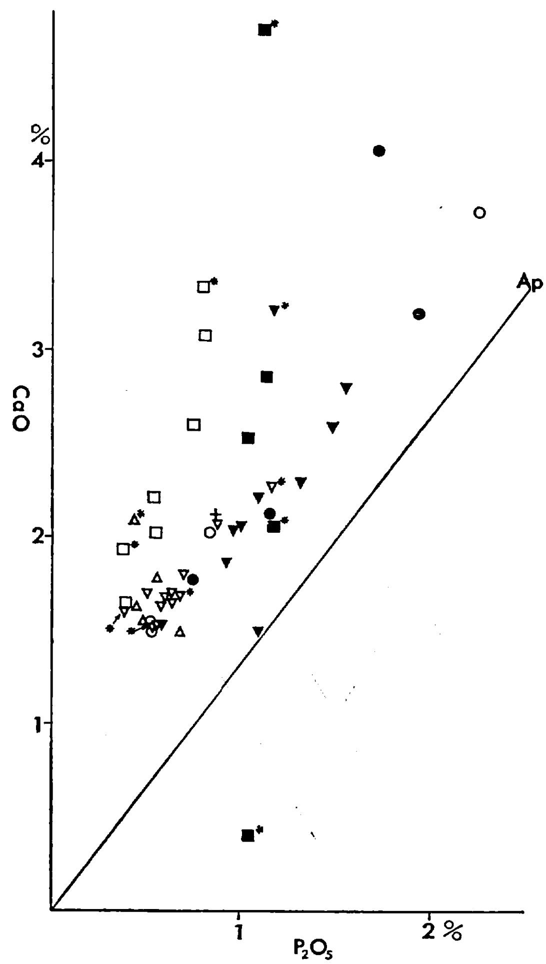

Fig. XIII-2 Relation between CaO and P_2O_5 contents of the sediment in this area. Symbols are as follows; circle: siliceous clay and ooze, square: limy and calcareous clay and ooze, triangle: calcarepus-siliceous clay and ooze, and calcareous-deep sea clay, reverse triangle: deep sea clay, circle with horizontal line: zeolitic mud, cross: average of all sediment, solid symbol: sample from flat bottom of basin and trough, open symbol: sample from seamount and knoll area, symbol with asterisk: sample under the bottom surface, line Ap: ratios of CaO and P_2O_5 in apatite (norm).

Table XIII-2 Re-classification of sediment in this area

Co^2 / NAKAO (this vol.)	less than 2.2% ($CaCO_3$ 5%>)	$2.2\% \leqslant CO_2 < 11\%$ ($5\% \leqslant CaCO_3 < 25\%$)	$11\% \leqslant CO_2 < 28.6\%$ ($25\% \leqslant CaCO_3 < 65\%$)	more than 28.6% ($CaCo_3$ 65%⩽)
deep sea clay (DC)	deep sea clay (DC)	calcareous-deep sea clay (CDC)	calcareous clay, ooze (CC)	limy clay, ooze (LC)
siliceous clay, ooze (SC, SO)	siliceous clay, ooze (SC)	calcareous-siliceous clay, ooze (CSC)	calcareous clay, ooze (CC)	limy clay, ooze (LC)
calcareous-siliceous clay, ooze (CSC, CSO)	——	——	calcareous clay, ooze (CC)	limy clay, ooze (LC)
calcareous ooze (CO) (calcareous clay)	——	——	calcareous clay, ooze (CC)	limy clay, ooze (LC)
zeolitic mud (ZM)	zeolitic mud (ZM)	——	——	——
plots of figures	deep sea clay, siliceous clay, ooze, and zeolitic mud	calcareous-deep sea and -siliceous clay, ooze	calcareous clay, ooze	

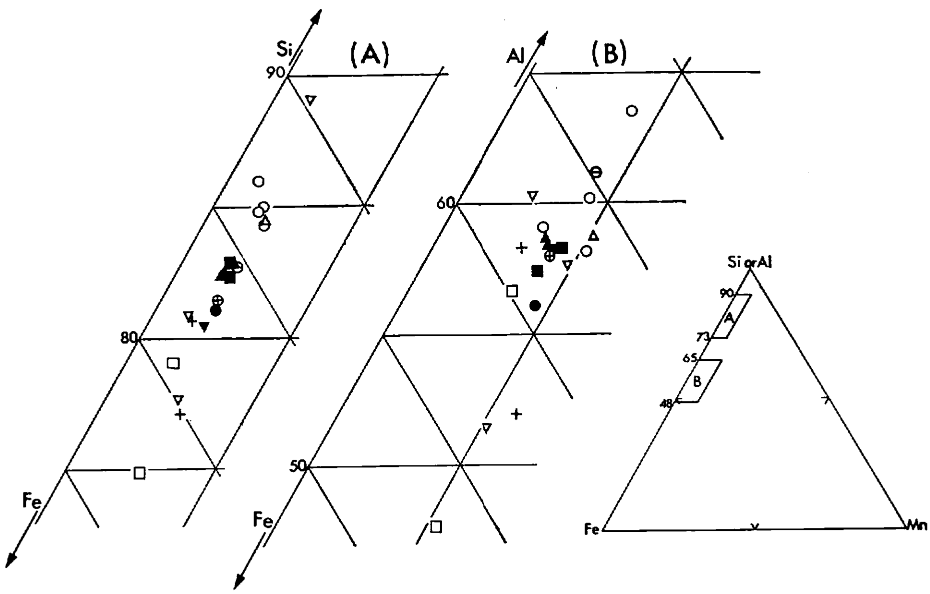

Fig. XIII-3 Si-Fe-Mn(A) and Al-Fe-Mn(B) diagrams of the sediments from this and other areas.
Symbols are as follows; solid symbol: from this area, open symbol: other area, circle: average siliceous, square: average calcareous (calcareous and limy), triangle: calcareous-siliceous and calcareous-deep sea, reverse triangle: deep sea clay and red clay, circle with cross: average composition of this area, circle with horizontal line: zeolitic mud, cross: average composition of sediment of the other areas.
Data of the other areas are from RILEY and CHESTER (1971), POLDERVAART (1955), and NOHARA (1979).

Table XIII-3 Chemical compositions on carbonate- and water-free basis (weight % oxides). Sediment types, are on the basis of microscopic observation by Nakao and Suzuki (in this volume).

No.		SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5
1	CC	64.53	0.76	15.70	7.85	0.81	3.41	2.20	1.61	2.59	0.54
2	CC	64.74	0.79	15.87	7.88	0.60	3.57	1.64	1.69	2.83	0.39
3	DC	59.57	0.94	18.13	9.45	0.94	3.88	1.70	1.68	3.10	0.61
4	ZM	58.48	0.68	16.99	7.30	0.76	2.65	3.19	3.36	4.65	1.94
5	DC	59.36	0.76	18.24	7.91	0.63	3.12	2.21	2.65	4.02	1.10
6	DC	58.69	0.70	17.83	8.01	1.02	3.13	2.58	2.58	3.97	1.49
7	DC	60.05	0.84	17.85	8.80	0.80	3.75	2.07	1.82	3.14	0.88
8	DC	61.33	0.86	17.88	8.76	0.81	3.83	1.53	1.57	2.87	0.56
9	SC	59.81	0.67	14.80	8.45	1.37	3.98	3.73	1.84	3.10	2.25
10	SC	62.83	0.65	14.54	8.00	0.75	3.64	4.06	1.59	2.21	1.73
11	CSC	63.68	0.77	16.43	8.27	0.82	3.65	1.54	1.71	2.64	0.49
12	DC	60.40	0.68	15.93	8.77	1.28	4.16	2.80	1.68	2.74	1.56
13	SC	61.33	0.84	17.62	9.12	0.84	3.87	1.49	1.60	2.76	0.53
14	DC	59.45	0.92	18.63	9.22	0.89	3.97	1.63	1.62	3.09	0.58
15	DC	60.95	0.77	17.68	8.33	0.68	3.41	1.50	2.14	3.44	1.10
16	DC	58.61	1.00	18.65	9.37	0.92	3.88	1.70	1.67	3.57	0.63
17	CDC	59.53	1.00	18.38	9.04	0.79	3.90	1.48	1.70	3.50	0.68
18	DC	58.57	0.98	18.24	9.19	0.77	3.70	2.06	1.91	3.57	1.01
19	DC	60.23	0.78	17.83	8.38	0.67	3.44	1.87	2.22	3.65	0.93
20	DC	59.19	0.73	17.70	7.95	0.92	3.10	2.29	2.73	4.07	1.32
21	DC	61.35	0.85	17.42	9.05	0.79	3.86	1.54	1.82	2.82	0.50
22	DC	61.59	0.81	17.39	8.84	1.01	3.81	1.68	1.64	2.63	0.60
23	CC	62.77	0.73	15.94	8.35	0.85	4.09	2.52	1.40	2.31	1.04
24	SC	65.02	0.60	14.95	8.16	0.72	3.68	2.12	1.53	2.06	1.16
25	SC	64.73	0.75	15.84	8.23	0.65	3.41	1.77	1.59	2.28	0.75
26	CSC	64.82	0.75	16.05	7.78	0.74	3.37	1.77	1.68	2.48	0.56
27	LC	63.21	0.72	15.99	7.55	0.85	3.37	3.07	1.83	2.60	0.81
28	CC	64.60	0.76	15.68	7.92	0.64	3.46	2.02	1.63	2.74	0.55
29	LC	42.56	0.40	17.27	4.42	0.80	3.41	23.90	3.82	1.81	1.61
30	SC	59.89	0.89	18.54	9.45	0.92	3.86	1.55	1.57	2.81	0.52
31	SC	60.10	0.88	17.62	9.04	1.04	3.77	2.02	1.70	2.99	0.84
32	CDC	64.69	0.78	16.24	7.88	0.63	3.38	1.62	1.60	2.73	0.45
33	CC	64.31	0.80	16.03	7.96	0.60	3.53	1.93	1.60	2.86	0.38
34	DC	62.99	0.81	16.96	8.29	0.73	3.64	1.60	1.70	2.90	0.38
35	CDC	64.13	0.80	16.13	7.73	0.73	3.43	2.08	1.69	2.84	0.44
36	DC	59.78	0.91	18.56	8.93	0.89	3.89	1.65	1.66	3.09	0.64
37	DC	59.35	0.91	18.39	9.46	0.96	4.11	1.52	1.60	3.16	0.54
38	DC	60.78	0.82	17.40	7.96	0.66	3.28	2.27	2.19	3.47	1.17
39	DC	59.10	0.94	18.62	9.25	0.95	4.04	1.53	1.74	3.25	0.58
40	DC	58.62	0.86	18.63	8.79	0.81	3.52	2.04	2.17	3.59	0.97
41	DC	59.11	0.83	18.15	8.15	0.87	3.28	3.21	2.42	3.80	1.18
42	DC	58.64	1.07	18.49	9.29	0.94	3.81	1.80	1.69	3.57	0.70
43	DC	58.37	1.05	18.71	9.36	0.92	3.80	1.69	1.79	3.63	0.68
44	CC	63.08	0.79	15.40	8.24	0.87	4.01	2.85	1.32	2.30	1.14
45	LC	59.50	0.79	16.54	8.15	0.98	4.57	4.71	1.37	2.26	1.13
46	LC	61.98	0.79	17.33	8.63	0.66	5.14	0.40	1.58	2.44	1.05
47	LC	60.61	0.75	17.30	8.59	0.75	4.98	2.05	1.49	2.30	1.18
48	LC	63.45	0.75	15.63	7.74	0.83	3.53	2.59	1.99	2.74	0.75
49	LC	62.91	0.72	16.00	7.38	0.92	3.37	3.33	1.96	2.61	0.80
Av.*		61.27	0.82	17.10	8.46	0.83	3.71	2.11	1.82	3.02	0.87
S.D.**		2.19	0.10	1.21	0.61	0.16	0.44	0.76	0.39	0.57	0.42
C.V.***		3.57	12.35	7.08	7.21	19.28	11.86	36.02	21.43	18.87	48.28

* average composition except no. 29.
** standard deviation except no. 29.
*** coefficient of variation except no. 29.

Table XIII-4 Average chemical composition of each sediment type

		SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	Si	Fe	Mn	Al	Fe	Mn
limy clay, ooze (7)	Wt.%	61.94	0.75	16.47	8.01	0.83	4.16	2.69	1.70	2.49	0.95	82.3	15.9	1.8	58.3	37.4	4.3
	S.D.	1.58	0.03	0.72	0.53	0.12	0.83	1.44	0.26	0.19	0.19						
	C.V.	2.6	4.0	4.3	6.7	13.8	20.0	53.3	15.2	7.6	20.0						
calcareous clay, ooze (6)	Wt.%	64.01	0.77	15.77	8.03	0.73	3.68	2.19	1.54	2.61	0.67	82.9	15.5	1.6	57.4	38.7	3.9
	S.D.	0.85	0.03	0.23	0.21	0.13	0.29	0.43	0.15	0.25	0.33						
	C.V.	1.3	3.4	1.4	2.6	17.6	8.0	19.8	9.5	9.6	49.3						
calcareous-siliceous clay, ooze (2)	Wt.%	64.25	0.76	16.24	8.03	0.78	3.51	1.66	1.70	2.56	0.53	82.8	15.5	1.7	58.0	37.9	4.1
	S.D.	0.81	0.01	0.27	0.35	0.06	0.20	0.16	0.02	0.11	0.05						
	C.V.	1.3	1.9	1.7	4.3	7.3	5.6	9.8	1.3	4.4	9.4						
calcareous-deep sea clay(3)	Wt.%	62.78	0.86	16.92	8.22	0.72	3.57	1.73	1.66	3.02	0.52	82.3	16.1	1.6	58.7	37.7	3.6
	S.D.	2.83	0.12	1.27	0.72	0.08	0.29	0.31	0.06	0.42	0.14						
	C.V.	4.5	14.2	7.5	8.7	11.3	8.0	18.2	3.3	13.8	25.9						
calc.sili. clay, ooze+calc. d. s. clay (5)	Wt.%	63.37	0.82	16.65	8.14	0.74	3.55	1.70	1.68	2.84	0.52	82.5	15.9	1.6	58.4	37.8	3.8
	S.D.	2.19	0.10	0.98	0.55	0.07	0.23	0.24	0.04	0.39	0.10						
	C.V.	3.5	12.5	5.9	6.7	9.8	6.4	14.1	2.6	13.8	18.9						
siliceous clay, ooze (7)	Wt.%	61.96	0.75	16.27	8.64	0.90	3.74	2.39	1.63	2.60	1.11	81.1	16.9	2.0	56.1	39.4	4.5
	S.D.	2.26	0.12	1.63	0.56	0.25	0.19	1.06	0.11	0.41	0.65						
	C.V.	3.6	15.6	10.0	6.5	27.3	5.0	44.2	6.5	15.8	58.9						
deep sea clay (23)	Wt.%	59.83	0.86	17.97	8.76	0.86	3.67	1.93	1.94	3.35	0.86	80.5	17.6	1.9	58.3	37.6	4.1
	S.D.	1.2	0.11	0.66	0.53	0.15	0.32	0.45	0.37	0.42	0.33						
	C.V.	2.0	12.2	3.7	6.1	16.9	8.8	23.5	18.8	12.5	39.0						
zeolitic mud	Wt.%	58.48	0.68	16.99	7.30	0.76	2.65	3.19	3.36	4.65	1.94	82.8	15.4	1.8	61.2	34.8	4.0

Numbers in parentheses are the number of samples.
S.D.: standard deviation, C.V.: coefficient of variation, "calc.-sili. clay, ooze + calc. d. s. clay" means the sum of calcareous-siliceous clay, ooze and calcareous-deep sea clay.

Table XIII-5 Comparison of average compositions by Riley and Chester (1971) (upper), Poldervaart (1955) (middle) and this area (lower)

	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	Si	Fe	Mn	Al	Fe	Mn
calcareous sediment	59.86	0.94	18.34	9.77	0.75	1.04	3.05	2.50	3.29	0.46	79.1	19.3	1.6	56.7	39.9	3.4
lithogenous sediment	60.44	0.92	19.06	8.93	0.52	1.01	3.73	1.67	3.56	0.16	80.9	17.9	1.2	60.3	37.3	2.4
siliceous sediment	70.61	0.72	14.72	7.08	0.55	0.83	2.17	0.93	2.09	0.30	86.0	13.0	1.0	59.1	37.6	3.3
oceanic average	61.52	0.90	18.12	9.09	0.64	1.00	3.19	1.98	3.23	0.33	80.7	17.9	1.4	58.3	38.7	3.0
calcareous sands, oozes	58.4	0.9	15.8	11.8	1.2	4.4	3.1	1.6	2.2	0.6	74.8	22.6	2.6	47.7	47.0	5.3
red clay	59.0	1.0	18.3	10.1	1.1	3.3	2.0	1.9	3.0	0.3	77.7	19.9	2.4	51.4	43.4	5.2
siliceous oozes	65.8	0.6	17.9	6.9	0.8	2.7	1.1	1.2	2.6	0.4	85.0	13.3	1.7	63.5	32.4	4.1
average pelagic sediment	59.5	0.8	16.9	10.4	1.3	3.8	2.7	1.7	2.5	0.4	77.1	20.1	2.8	51.9	42.2	5.9
average, this area	61.72	0.82	17.10	8.46	0.83	3.71	2.11	1.82	3.02	0.87	81.4	16.8	1.8	58.0	37.9	4.1

in Table XIII-5 with the average of the present contents. Si, Al, Fe and Mn are selected as components which relatively small coefficient of variation, and the ratios Si : Fe : Mn and Al : Fe : Mn are plotted in Fig. XIII-3, as well as the data from GH76-1 area (NOHARA, 1979). Those for the sediments of this area plot in the middle area among all and the variation of the ratios for each sediment type is rather small. This will mean that the sediment, consisting of sedimentary particles except the carbonate and phosphate which show the heterogeneous distribution, has almost homogeneous composition.

On the other hand, despite the composition of sediment in this area is so homogeneous (NAKAO and SUZUKI, in this volume). From that figure it appears that the distribution of nodules is characteristically prejudiced, rich in the mountainous area. This fact will realistically show that the seamount has some relation with the genesis of manganese nodules.

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