24. CHEMICAL COMPOSITION OF SEDIMENTS[1]

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The chemical composition of oceanic bottom sediments depends upon many factors, including geographic and vertical zonality of the sedimentary processes. The distribution of such "abiogenic" components as TiO_2 and MnO is determined by the nature of mechanical differentiation. Abiogenic pelagic marine sediments form a continuous lithologic facies series, the end members of which are terrigenous and metal-bearing oozes. The state of the sediment in relation to this series also reflects its "degree of pelaginicity." We assume that the metal-bearing oozes are primarily formed by local hydrothermal exhalations or weathering of basalts. The chemical elements and compounds which occur in minor amounts in the sediments and do not form independent minerals pose a complicated problem. Whether they can be used as indicators of depositional environments has not yet been resolved.

In order to analyze the chemical composition of bottom sediments, we used several methods which enabled us to get information on a sufficiently wide spectrum of chemical elements and duplicate the determinations by various methods. We determined the content of the following elements and compounds and these data are presented in Tables 1-9. Techniques are described in the Initial Reports of the Deep Sea Drilling Project, Volume 6.

1) Spectral rational silicate analysis—SiO_2, Al_2O_3, CaO, MgO, TiO_2, Fe_2O_3, MnO (Table 1);

2) Flame photometry—K_2O, Na_2O, Li, Rb, Cs (Table 2);

3) Spectral—Ga, Cr, Ni, V, Zr, Y, Co;

4) Atomic absorption—Ni, Zn, Cu;

5) Neutron activation—Hf, Rb, Ta, Sm, Fe, Se, Co, La, Eu, Sb, Ce, Th, Cr, Cs, Ba (Table 3);

6) "Wet" chemistry—C_{org}, CO_2, SiO_2 amorph, Fe_2O_3, TiO_2, MnO, CaO, MgO, P_2O_5 (Tables 4-8);

7) Determinations ofC_{org} and C_{carb} by means of "LECO" analyzer (Table 9).

DISTRIBUTION OF MAJOR ELEMENTS IN BOTTOM SEDIMENTS

$CaCO_3$, CaO, MgO

Most of the samples obtained during Leg 35 were noncalcareous because this part of the Southeast Pacific Basin lies in a zone where production of biogenic carbonate is sharply curtailed, and the carbonate compensation depth (CCD) lies considerably shallower than the water depth of the sites. However, the Paleocene sediments of Site 323 contained interbedded layers of coccolith-rich sediment composed of 28%-29% $CaCO_3$. Typical deep-water pelagic oozes, which in some places resemble the metal-bearing oozes, were deposited above and below the zone of coccolith interbeds. At Site 323 sediment accumulated at depths close to the CCD, and therefore, small fluctuations of the CCD sufficed for the formation of discrete calcareous interlayers. Some interlayers of coccolith-containing sediments of Oligocene age were also encountered at Site 325.

CaO and MgO, except in the calcareous horizons, are abiogenic components of the sediments. The fluctuations in their concentration in space and time are determined by changes in the mineral composition. The average CaO and MgO concentrations and the CaO/MgO ratios are given in Table 10.

The sediments of the Bellingshausen Sea and adjacent areas differ from the typical pelagic sediments analyzed by El-Wakeel and Riley (1961). We recognize two areas based on variations of CaO and MgO content in the sediments: the western area (Sites 323 and 324) and the eastern area (Sites 322 and 325). In the sediments of the eastern area the CaO and MgO content approximates the average crustal composition of the silicic and terrigenous rocks, whereas in the sediments of the western area, the CaO content is similar to that of pelagic oozes, and MgO is somewhat lower. The values of the CaO/MgO ratio in coarse sediments are considerably higher than in the thin pelitic oozes.

SiO_2

The principal silica-containing components of the bottom sediments are abiogenic silicates, quartz, and biogenic remains of diatoms, radiolarians, silicoflagellates, and sponges. There is silicification in discrete interlayers as a result of diagenetic alterations.

To determine the content of biogenic silica we used the sodium carbonate extraction method, which generally yields somewhat lower results but permitted us to ascertain the trend of the changes in the accumulation of biogenic silica (Figure 1).

In the Upper Cretaceous and Paleogene sediments the content of amorphous silica rarely exceeded 2%. At the onset of the Neogene, the accumulation of biogenic opal greatly increased and sediments of Neogene and Pleistocene age contained 5%-10% and in some places even greater amounts of amorphous silica even though it comprises less than 2% in individual interlayers. This is caused by dilution of the biogenic opal with terrigenous material, whose supply was rather sporadic.

The content of the amorphous silica in bottom sediments can also be determined by the amount of accumulated SiO_2/Al_2O_3. Despite the fact that the area is characterized by a high production of biogenic siliceous material, we rarely encountered siliceous sediments because of their extensive dilution by terrigenous

[1]Translated from Russian.

TABLE 1
Content of Major Elements in Sediments and Sedimentary Rocks, in % of Dry Weight (Spectral Silicate Analysis)

Sample (Interval in cm)	Depth (m)	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO
Site 322								
1-2, 26-30	80	64	0.66	11	3.5	0.058	1.0	2.7
1-8, 70-76	81	66	1.0	12	5.7	0.10	2.6	2.3
3-1, 18-20	295	50	1.4	14	5.8	0.11	4.6	2.9
4-1, 65-67	353	54	1.2	13	6.7	0.11	4.0	2.6
4-2, 57-60	354	64	1.0	13	7.4	0.10	2.8	3.3
5-1, 81-85	391	56	1.3	15	6.2	0.14	2.1	3.4
6-1, 30-33	438	56	1.2	14	7.4	0.58	2.3	1.7
9-2, 143-146	469	57	1.0	15	5.1	0.084	2.0	4.8
10-1, 101-105	486	66	0.72	13	4.5	0.061	1.8	5.1
10-2, 43-46	487	62	0.92	12	4.6	0.072	1.6	3.7
11-2, 45-49	506	66	1.1	12	4.9	0.081	3.0	2.9
11-3, 24-32	507	68	1.6	14	5.6	0.090	2.6	2.9
11-4, 17-24	508	63	0.84	12	4.1	0.090	1.8	2.9
11-6, 109-115	512	58	1.4	20	11	>0.60	3.6	1.4
13-2	537	50	2.3	15	12	0.20	6.6	8.1
Site 323								
1-1, 50-60	76	56	0.32	8.0	1.9	0.16	0.7	1.4
1-1, 140-150	77	57	0.55	9.6	5.1	0.21	1.6	1.2
1-2, 34-43	79	56	0.65	12	7.1	0.13	2.4	1.0
1-3, 78-88	80	52	0.59	11	6.6	0.094	2.2	1.3
1-4, 118-127	81	54	0.58	10	5.9	0.074	2.0	1.0
3-1, 88-94	257	55	0.62	12	5.0	0.080	2.0	1.4
3-2, 14-20	258	58	0.40	9.6	2.9	0.060	1.0	1.8
3-2, 61-70	258	56	0.67	10	7.3	0.052	2.4	1.4
4-2,	315	55	0.32	9.8	2.9	0.075	1.0	1.8
7-2, 105-110	363	52	0.58	8.5	7.0	0.15	2.1	1.4
7-3, 18-24	364	58	0.60	10	6.6	0.14	2.4	1.6
10-1, 113-122	504	64	0.61	21	6.4	0.070	2.1	1.8
10-2, 75-85	505	60	0.55	10	6.8	0.093	2.3	1.2
10-3, 106-114	507	60	0.60	10	6.4	0.094	2.2	1.2
11-1, 22-32	551	55	0.63	14	6.2	0.10	2.2	1.0
11-2, 137-148	553	51	0.64	11	5.6	0.094	1.9	1.2
13-5, 106-115	624	47	0.59	10	5.5	0.13	2.1	1.0
13-6, 145-150	625	51	0.57	7.9	4.4	0.12	1.8	0.90
14-2, 1-8	637	52	0.51	8.4	4.5	0.10	1.4	1.0
14-2, 128-135	638	48	0.63	15	9.8	0.53	2.0	1.6
15-1, 52-60	656	45	0.60	10	8.5	0.53	2.3	1.3
15-2, 91-100	657	50	0.67	15	9.8	0.73	2.2	1.1
15-3, 29-36	658	47	0.51	14	8.3	0.52	2.2	1.0
15-4, 54-63	660	45	0.58	8.4	7.4	0.57	2.0	1.1
15-5, 89-98	661	46	0.55	9.8	7.7	0.60	1.7	1.0
15-6, 19-26	663	33	0.39	10	6.2	0.54	1.3	12
16-1, 57-62	665	34	0.49	7.8	5.1	0.65	1.7	10
16-3, 32-37	668	46	0.46	9.6	6.5	0.22	2.2	1.4
16-4, 83-92	669	61	0.63	12	7.9	0.53		1.8
18-2, 80-86	695	46	0.52	11	5.7	0.079	1.4	1.0
18-3, 130-139	697	45	0.55	10	5.6	0.070	1.4	1.2
18-4, 115-124	699	64	0.47	12	7.4	~1.0		1.3
18-5, 65-73	700	57	0.48	12	8.9	~1.0		1.3
Site 324								
1-2, 126-131	11	54	0.35	12	4.9	0.15	1.6	1.4
1-3, 124-132	13	60	0.69	8.4	5.5	0.14	1.7	1.3
1-4, 125-131	15	60	0.75	~10	5.5	0.72		1.7
1-6, 31-38	17	57	0.64	8.4	4.7	0.11	1.4	1.2
2-1, 83-92	48	54	0.77	9.4	5.6	0.075	1.4	0.96
2-2, 61-70	49	54	0.92	11	5.9	0.095	1.7	0.98
2-3, 52-61	50	58	0.75	11	6.4	0.066	1.8	1.1
2-4, 27-36	52	54	0.63	9.3	5.1	0.056	1.4	1.2
2-5, 35-45	53	60	0.63	9.0	4.8	0.054	1.7	1.2
2-6, 95-104	55	54	0.82	8.5	5.2	0.11	1.8	1.1
3-1, 137-146	77	58	1.2	13	5.5	0.087	1.6	1.2
3-2, 136-145	79	56	1.1	16	5.7	0.085	1.8	1.3
3-3, 67-77	80	52	1.0	16	6.1	0.095	2.1	1.5
3-4, 47-57	81	65	1.6	23	7.6	0.11	2.3	1.0

TABLE 1 – *Continued*

Sample (Interval in cm)	Depth (m)	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO
Site 324 – *Continued*								
3-5, 99-110	83	62	1.2	16	6.9	0.094	1.9	1.0
3-6, 138-148	85	67	1.1	16	6.8	0.063	1.8	1.5
4-2, 113-123	107	64	1.3	14	6.1	0.094	1.6	1.1
4-3, 30-40	108	60	1.2	15	6.0	0.10	1.6	1.4
4-4, 54-64	109	66	1.4	18	6.6	0.15	2.0	2.8
5-2, 66-83	135	62	1.8	18	6.9	0.12	2.7	1.2
5-3, 25-35	136	68	1.8	20	6.7	0.11	2.2	1.2
6-2, 19-30	144	60	1.3	16	6.2	0.085	1.8	1.4
7-1, 69-78	153	62	1.9	21	7.6	0.11	2.6	1.2
7-3, 110-121	156	58	1.3	18	6.5	0.75	1.6	1.2
7-6, 119-129	161	63	1.8	20	7.7	0.10	2.2	1.2
Site 325								
1-1, 49-59	34	50	0.94	9.1	6.9	0.098	2.1	2.1
1-1, 133-144	35	48	0.75	7.7	5.2	0.10	2.2	2.8
1-2, 26-36	36	47	0.83	8.4	6.1	0.11	2.5	2.5
1-4, 81-92	39	56	0.80	7.9	5.7	0.098	2.2	2.3
2-2, 39-49	168	50	0.58	6.1	4.5	0.10	2.0	2.1
3-2, 11-24	178	56	0.59	6.6	4.4	0.085	2.2	2.0
3-3, 76-87	180	63	0.55	6.2	4.0	0.073	1.4	2.1
3-4, 26-36	182	62	0.72	7.4	4.6	0.098	1.9	2.3
4-2, 90	293	64	0.69	11	5.1	0.14	2.2	2.6
4-3, 20-26	294	60	0.57	6.8	5.0	0.095	1.6	2.5
4-3, 130	295	58	0.79	9.0	5.3	0.11	2.0	2.6
4, CC	295	60	0.62	12	5.1	0.17	2.6	2.6
5-1, 55-57	404	57	0.77	9.3	6.1	0.11	2.4	2.1
8-1, 45-49	613	54	0.61	7.9	5.1	0.098	2.0	2.1
8-2, 119-128	615	58	0.56	8.2	5.2	0.14	2.2	4.6
8-3, 27-35	616	57	0.64	8.2	4.9	0.10	2.3	2.0
9-3, 90-98	645	53	0.81	10	6.4	0.10	2.4	2.2

sediments. More often, the siliceous sediments occurred as discrete layers. The amounts of SiO_2/Al_2O_3 and amorphous silica in the cores that we studied indicated that accumulation of biogenic opal began near the boundary between Paleogene and Neogene time.

TiO_2

Titantium, as well as aluminum, is considered by many investigators to be an indicator of sediments from a terrigenous source. The sediments and sedimentary rocks recovered during DSDP Leg 35 contain considerably more titanium than do pelagic oozes. A direct correlation between amounts of Al and Ti in the sediments could not be established. The Al_2O_3/TiO_2 ratio varied from 9 to 34; in the coarser grained sediments it was sometimes greater and in other cases it remained similar to the values established for clayey oozes. An increase of silicate detritus in the silt and sand fraction results in an increase of the aluminum content and an increase of the Al_2O_3/TiO_2 ratio. In these cases, when quartz is the predominant constituent of the coarse fractions and the content of silicates is relatively small, the value of Al_2O_3/TiO_2 remains closely equivalent to the value established for pelitic oozes.

Fe_2O_3 and MnO

Iron and manganese occur in sediments in various forms; the two most common forms are in crystalline lattices of detrital and clayey minerals, and in the free state—most frequently in the form of hydroxides which form independent colloidal, aggregates, or as occlusions on mineral particles.

The content of iron and manganese in the sediments decreased with increased grain size and varied in the pelitic oozes. At Sites 322 and 323, there are interlayers in Paleogene sediments which are considerably enriched in iron and manganese.

The Fe_2O_3/MnO ratio varies from 9 to 140. High values characterize the terrigenous sediments, but the values are markedly less in metal-bearing oozes (Figure 2).

C_{org} and P

Because of the distinctive distribution of the organic carbon, phosphorous, and values of C_{org}/P, the contact between the Paleogene and Neogene is clearly discernible. The amount of organic carbon in the Upper Cretaceous and Paleogene sediments was relatively small but increased during the Neogene. The concentration of phosphorous, in contrast, was high in the lower part of the sedimentary sequence, gradually increased toward the upper layer of the Paleogene sediments, and in the Neogene abruptly decreased. The lower part of the sedimentary sequence is characterized by C_{org}/P values of less than 1 (and which in some places are less than 0.1), whereas in the Neogene and Pleistocene sediments, values are usually considerably higher than 1.

From evaluation of the lithologic composition of the sediments and distribution of the chemical indicators, we believe that during the Upper Cretaceous and Paleogene, the depositional environment in the southeast Pacific Basin was similar to that presently found in the ocean under the arid climatic zones (10°-

TABLE 2
Content of Na_2O, K_2O, Li, Rb, and Cs in the Sediments of Sedimentary Rocks in % of Dry Weight (Flame Photometry)

Sample (Interval in cm)	Depth (m)	Na_2O	K_2O	Li	Rb	Cs
Site 322						
1-2, 26-30	80	4.00	1.89	0.0012	0.007	
1-3, 70-76	81	3.87	2.16	0.0022	0.009	
3-1, 18-20	295	3.46	2.34	0.0036	0.0105	
4-1, 65-67	353	3.22	2.22	0.0026	0.0082	0.0001
4-2, 57-60	354	3.22	1.95	0.0019	0.0137	
5-1, 81-85	391	3.00	2.43	0.0027	0.0087	
6-1, 30-33	438	2.72	2.70	0.003	0.019	0.0007
9-2, 143-146	469	3.65	1.53	0.0009	0.0055	
10-1, 101-105	486	3.57	1.53	0.0011	0.005	
10-2, 43-46	487	3.57	1.41	0.0012	0.005	
11-2, 45-49	506	3.15	1.50	0.0009	0.0042	
11-3, 24-32	507	3.50	1.74	0.0012	0.0042	
11-4, 17-24	508	3.57	1.81	0.00125	0.0045	
11-6, 109-115	512	1.72	3.75	0.00375	0.01775	0.00035
13-2	537	2.45	1.14	0.0010	0.00175	
Site 323						
1-1, 50-60	76	4.05	2.37	0.0011	0.0115	0.0003
1-1, 140-150	77	4.39	2.94	0.0025	0.018	0.0018
1-2, 34-43	79	3.95	3.27	0.0033	0.0197	0.0018
1-3, 78-88	80	2.97	2.70	0.0027	0.0132	0.0007
1-4, 118-127	81	4.76	2.70	0.0029	0.0152	0.0014
3-1, 88-94	257	4.35	2.88	0.0027	0.0145	0.0007
3-2, 14-20	258	4.05	2.16	0.0019	0.012	0.0003
3-2, 61-70	258	4.23	2.88	0.0046	0.018	0.0010
4-2,	315	4.35	3.03	0.0017	0.014	0.0003
7-2, 105-110	363	3.88	2.10	0.0033	0.015	0.0010
7-3, 18-24	364	3.88	2.55	0.0033	0.0145	0.0007
10-1, 113-122	504	3.71	2.61	0.0031	0.0127	0.0007
10-2, 75-85	505	3.65	3.03	0.0031	0.0170	0.0007
10-3, 106-114	507	3.71	2.34	0.0029	0.0172	0.0007
11-1, 22-32	551	3.51	3.69	0.0031	0.020	0.0010
11-2, 137-148	553	3.37	3.09	0.0027	0.0172	0.0010
13-5, 106-115	624	2.77	3.36	0.0046	0.0175	0.0007
13-6, 145-150	625	2.43	3.27	0.0029	0.016	0.0003
14-2, 1-8	637	2.56	3.42	0.0036	0.0172	0.0007
14-2, 128-135	638	2.56	2.52	0.0063	0.009	0.0003
15-1, 52-60	656	2.43	2.82	0.007	0.0092	
15-2, 91-100	657	2.43	3.15	0.0066	0.0115	0.0003
15-3, 29-36	658	2.26	3.01	0.007	0.0115	0.0003
15-4, 54-63	660	2.43	3.24	0.0072	0.0115	0.0001
15-5, 89-98	661	2.90	3.42	0.0068	0.012	
15-6, 19-26	663	1.03	2.34	0.0044	0.0077	
16-1, 57-62	665	1.37	2.34	0.0030	0.0077	
16-3, 32-37	668	2.42	2.70	0.0028	0.0087	
16-4, 83-92	669	2.70	2.91	0.0025	0.0102	
18-2, 80-86	695	2.25	3.15	0.0025	0.009	0.0003
18-3, 130-139	697	2.65	3.24	0.0026	0.016	0.0003
18-4, 115-124	699	2.57	2.34	0.0028	0.011	0.0003
18-5, 65-73	700	2.42	2.34	0.0026	0.0092	0.0003
Site 324						
1-2, 126-131	11	3.42	3.00	0.0031	0.0159	0.00015
1-3, 124-132	13	2.95	3.06	0.003	0.01525	0.00015
1-4, 125-131	15	2.75	3.72	0.0033	0.019	0.0003
1-6, 31-38	17	2.85	3.12	0.0026	0.0145	
2-1, 83-92	48	2.40	3.96	0.0036	0.0225	0.0004
2-2, 61-70	49	2.40	3.81	0.004	0.023	0.00055
2-3, 52-61	50	2.50	3.37	0.0041	0.0185	0.0003
2-4, 27-36	52	2.67	3.30	0.0033	0.0192	0.0004
2-5, 35-45	53	2.57	3.51	0.0037	0.0205	0.00055
2-6, 95-104	55	2.57	3.48	0.0035	0.0192	0.00055
3-1, 137-146	77	2.57	3.57	0.003	0.019	0.00015
3-2, 136-145	79	2.50	3.48	0.0035	0.0182	
3-3, 67-77	80	2.40	3.42	0.0043	0.0189	0.00015

TABLE 2 – *Continued*

Sample (Interval in cm)	Depth (m)	Na_2O	K_2O	Li	Rb	Cs
Site 324 – *Continued*						
3-4, 47-57	81	2.40	3.57	0.00415	0.01975	0.0004
3-5, 99-110	83	2.50	3.81	0.0039	0.02025	0.0004
3-6, 138-148	85	2.75	3.00	0.0033	0.0155	0.0004
4-2, 113-123	107	2.50	3.00	0.0038	0.018	0.0006
4-3, 30-40	108	2.57	3.42	0.00365	0.020	0.0005
4-4, 56-64	109	2.15	2.88	0.0033	0.0155	0.0003
5-2, 66-83	135	2.57	3.00	0.0033	0.01775	0.0004
5-3, 25-35	136	2.32	3.15	0.0033	0.0205	0.0003
6-2, 19-30	144	2.15	3.75	0.00365	0.02325	0.0005
7-1, 69-78	153	2.10	3.48	0.00385	0.02225	0.0004
7-3, 110-121	156	2.15	3.48	0.00365	0.02325	0.0005
7-6, 119-129	161	2.10	3.57	0.00385	0.0235	0.0005
8-3, 61-71	174	2.22	4.20	0.00355	0.023	0.0004
Site 325						
1-1, 49-59	34	2.87	2.58	0.0031	0.009	
1-1, 133-144	35	3.00	2.16	0.0032	0.0085	0.0001
1-2, 26-36	36	3.05	2.28	0.0032	0.009	
1-4, 81-92	39	3.15	2.07	0.0026	0.0067	
2-2, 39-49	168	2.92	1.98	0.0017	0.0055	
3-2, 11-24	178	2.72	1.77	0.0025	0.0082	0.0001
3-3, 76-87	180	3.02	1.56	0.00165	0.0065	
3-4, 26-36	182	3.10	1.84	0.00175	0.007	
4-2, 90	293	3.17	1.92	0.0016	0.007	
4-3, 20-26	294	3.10	1.68	0.0017	0.0065	
4-3, 130	295	3.37	1.80	0.0016	0.0065	
4, CC	295	3.17	1.87	0.0016	0.007	
5-1, 55-57	404	3.02	2.175	0.00295	0.0095	
8-1, 45-49	613	2.70	1.84	0.0026	0.00775	
8-2, 119-128	615	2.40	1.95	0.0025	0.010	
8-3, 27-35	616	2.62	2.22	0.00275	0.01025	
9-3, 90-98	645	2.82	2.07	0.00275	0.010	

30°N, 0°-30°S) and that conditions changed abruptly at the boundary between the Paleogene and the Neogene.

Trace Elements

The distribution of trace elements in the DSDP Leg 35 cores shows that their accumulation during various geological periods was rather sporadic. In the Upper Cretaceous and Paleogene at Sites 322 and 323, we encountered deposits resembling the metal-bearing sediments of the Bauer depression. At Site 322 these deposits, which overlie the basalts, were approximately 11 meters thick, whereas at Site 323 they were over 40 meters thick. The relatively low concentrations of Si, Al, and Ti, the high content of Fe and, especially, of Mn, as well as the presence of interbedded coccolith ooze indicate a minor terrigenous contribution to the sediment which was deposited under arid latitude conditions. High concentrations of Ni, Co, Sc, rare earth elements, V, and Ba were found in Cretaceous and Paleogene sediments which contained only minor amounts of hydrolysates (Ga, Zr, Hf, Th), Cr, and alkaline metal. The concentrations of Ti, Rb, Cs, and Ba in the sediments were usually lower than their average crustal concentrations. The increased concentration of barium in the sediments is due to the formation of barite, as a result of hydrothermal interactions between Ba^{+2} and sulfates contained in seawater. At Site 322 we had only one sample of metal-bearing sediment, and consequently we analyzed the entire sequence from the cores of Site 323. Profiles of selected trace element, iron, and manganese concentrations at Site 323 are presented in Figure 3.

The basalts were leached upon contact with cold water which greatly influenced the chemical composition of the sediments forming above the basalts. Iron and manganese precipitated from the leached basalts in the form of hydrous oxides simultaneously with the other elements adsorbed by them. Further accumulation of bottom sediments occurred under conditions of a minimal influx of terrigenous material similar to the sedimentary process presently occurring in the ocean under arid zones. Toward the end of the Paleogene the hydrothermal activity increased. Hydrothermal solutions entered the lower part of the sedimentary strata and percolated upward through the sediment interstices. In some cases, authigenic barite was precipitated where mixing of hydrothermal and interstitial waters occurred. This was noted only in the lower horizons of the unit. The upward diffusion of the hydrothermal solutions caused a gradual change in pH and Eh and thus changes in the physical and chemical environment.

In other cases, the hydrothermal solutions reached the sea-floor surface, oxidized, and formed a distinctive sediment which was enriched with hydrous ferric oxides, Fe, Mn, and trace elements. This material could have been carried by bottom currents to considerable distances.

TABLE 3
Content of Trace Elements in Sediments in 10^{-4}% of Dry Weight

Sample	Depth	Spectral Analysis							Atomic Absorption			Neutron-Activation Analyses														
(Interval in cm)	(m)	Ga	Cr	Ni	Y	Fr	Y	Co	Ni	Zn	Cu	Hf	Rb	Ta	Sm	Fe%	Sc	Co	La	Eu	Sb	Ce	Th	Cr	Cs	Ba
Site 322																										
1-2, 28-30	80	11	20	3	38	52	12	12	12	48	18	2.95	38.6	0.6	3.9	2.8	14.1	8.7	25.2	1.3	0.66	30.7	5.53	18.8	1.69	470
1-3, 70-76	81	20	47	11	58	58	12	13	16	83	70	3.35	57.0	1.1	4.15	4.3	22.3	13.8	26.8	1.5	0.94	53.1	8.1	33.5	3.1	430
3-1, 18-20	295	16	28	16	80	55	14	17	20	104	60	3.4	65.0	0.96	4.15	6.3	29.2	20.2	36.7	1.6	0.01	56.0	11.0	46.5	5.7	560
4-1, 65-67	353	19	32	11	84	45	27	14	21	99	43	3.53	86.0	0.4	5.1	6.7	34.7	26.1	39.5	2.37	1.3	44.0	8.31	52.8	3.92	930
4-2, 57-60	354	12	32	6	73	56	12	12	12	83	41	2.93	35.7	0.85	4.6	5.8	25.0	11.5	27.9	1.6	0.01	49.0	7.0	28.9	2.07	378
5-1, 81-85	391	24	38	23	77	70	16	18	26	103	56	2.27	53.0	0.85	5.3	4.7	20.7	19.3	32.9	1.8	0.9	46.0	7.8	34.8	2.96	467
6-1, 30-33	438	24	24	22	42	82	17	14	40	122	88	3.14	103	0.95	6.1	5.4	26.7	21.8	40.7	1.6	0.47	89.0	17.9	41.2	9.0	940
9-2, 143-146	469	10	40	4	42	35	12	9	20	75	32	2.88	24.0	0.4	4.3	4.3	19.8	10.0	24.2	1.6	0.25	33.4	55	24.3	2.44	224
10-1, 101-105	486	10	52	5	40	49	12	11	18	60	31	2.57	26.0	0.41	2.92	2.8	14.5	10.1	18.3	1.3	0.01		5.2	18.9	1.70	370
10-2, 43-46	487	10	46	4	42	55	12	9	5	49	20	2.42	22.7	0.17	3.3	3.2	18.9	10.4	18.1	1.5	0.9	25.8	4.30	18.6	0.89	272
11-2, 45-49	506	10	40	4	50	85	12	7	18	55	23	2.19	26.4	0.1	3.9	4.1	18.6	13.3	22.7	1.37	1.5	25.7	4.20	25.4	1.66	331
11-3, 24-32	507	12	49	7	56	64	11	10	12	55	22	2.97	11.0	0.1	3.46	4.1	22.4	12.9	20.8	1.37	0.44	31.9	5.35	24.8	0.64	348
11-4, 17-24	508	11	10	7	58	40	12	14	16	55	28	3.12	35.7	1.5	4.5	2.8	18.6	23.8	24.3	1.35	0.9	34.7	6.37	25.2		510
11-6, 109-115	512	18	14	105	120	94	47	40	162	190	245	3.39	132	0.4	13.9	8.5	24.7	82.7	84.3	4.4	2.7	125.0	17.5	30.3	8.5	670
13-2	537	10	110	33	140	45	17	23	71	110	65															
Site 323																										
1-1, 50-60	76	8	40	3	29	54		2	15	47	16	8.7	98.8	0.30	3.5	1.3	7.8	49.3	18.2	1.01	0.71	32.8	4.5	13.6	3.4	551
1-1, 140-150	77	27	33	13	120	68		7	21	114	106	4.2	119.0	0.9	6.4	3.2	15.0	13.3	29.7	1.3	1.63	54.1	10.6	19.1	22.4	438
1-2, 34-43	79	29	25	19	150	80		12	34	115	46	4.2	155.0	0.50	5.7	5.1	21.7	15.	27.7	1.1	1.52	69.2	12.9	31.8	32.3	906
1-3, 78-88	80	23	27	18	200	75		12	30	115	34	3.4	23.9	0.20	4.5	3.8	17.0	18.9	20.2	1.16	0.85	48.0	7.1	18.5	10.5	754
1-4, 118-127	81	24	24	16	200	120		8	33	108	60	3.2	160.0	0.90	6.1	4.1	25.0	18.2	29.4	1.10	2.00	65.0	10.5	28.1	22.0	119
3-1, 88-94	257	15	44	10	200	110		5	15	108	22	2.2	122.5	0.3	4.8	3.0	13.3	8.7	21.2	1.2	0.60	42.2	9.5	9.3	20.4	464
3-2, 14-20	258	12	70	4	64	150		2	17	55	14	4.3	91.3	0.3	3.8	1.3	6.1	3.9	16.1	0.6	0.40	31.5	4.4	8.1	3.9	364
3-2, 61-70	258	24	21	21	170	120		10	26	142	83	2.9	154	0.4	5.4	4.2	20.5	11.8	12.4	1.1	0.91	49.1	8.3	35.3	20.5	926
4-2	315	14	78	3	24	26		2	6	62	16	4.6	101.0	0.30	1.8	2.1	8.5	6.6	16.6	0.8	0.70	36.7	6.0	9.6	3.7	659
7-2, 105-110	363	16	30	28	140	90		14	50	92	113	4.1	112.2	0.5	6.0	4.5	17.0	15.5	29.9	1.3	1.12	60.5	9.1	33.2	14.9	976
7-3, 18-24	364	19	21	19	140	80		12	34	115	94	3.7	159	0.28	6.4	4.5	20.1	13.5	34.7	1.61	0.59	76.2	9.7	48.8	22.9	789
10-1, 113-122	504	18	31	14	220	140		4	26	105	90	34.6	111.0	0.44	5.0	3.8	22.1	11.1	23.1	1.11	0.71	63.2	8.7	35	12.1	603
10-2, 75-85	505	19	22	19	180	60		15	38	97	305	3.5	137.0	0.3	4.4	4.3	15.9	19.5	18.1	0.90	1.39	34.5	7.9	159	16.6	373
10-3, 106-114	507	16	27	12	150	110		10	16	94	48	4.1	157.5	0.53	4.5	4.9	20.9	11.4	22.6	1.43	1.05	46.3	7.6	25	21.0	513
11-1, 22-32	551	22	36	8	210	90		4	26	105	39	1.5	180.5	0.40	6.6	3.7	14.7	9.7	32.9	1.29	2.06	6.76	10.3	63	29.1	916
11-2, 137-148	553	25	35	8	150	110		6	25	97	36	4.8	131.3	0.7	6.0	2.6	13.4	11.4	25.8	1.0	0.9	56.9	10.0	30.9	19.0	437
13-5, 106-115	624	27	27	27	120	110		15	45	135	51	6.5	130.1	0.67	6.7	4.8	20.6	18.8	35.1	1.66	0.86	63.9	8.5	25.5	15.9	425
13-6, 145-150	625	11	31	20	120	180		12	62	85	44	5.9	124.2	0.66	6.4	3.7	15.1	12.9	30.7	1.20	0.26	58.6	8.5	22.9	14.2	436
14-2, 1-8	637	16	40	36	180	180		18	42	85	60	5.3	133.5	0.30	6.3	3.4	13.7	16.3	26.9	1.6	1.27	58.7	9.6	4.8	13.7	269
14-2, 128-135	638	17	18	180	290	150		58	220	205	372	6.4	54.3	0.40	20.1	7.0	36.6	64	83.1	5.6	2.49	143	10.3	14.9	41.5	655
15-1, 52-60	656	17	20	160	180	80		23	325	310	340	6.8	49.7	0.30	19.8	8.9	35.5	75.9	89.0	5.2	3.53	149	9.3	5.7	27.4	789
15-2, 91-100	657	15	20	96	240	78		23	195	230	195	5.1	63.4	0.30	11.6	6.3	24.6	42.8	59.3	2.7	2.40	94.8	9.0	6.9	17.8	354
15-3, 29-36	658	10	20	74	310	100		22	127	210	194	6.2	124.3	0.43	10.9	6.4	26.3	35.6	58.2	2.67	2.35	106.7	7.7	11.1	4.4	502
15-4, 54-63	660	8	20	82	340	65		25	140	230	190	3.6	89.9	0.30	10.0	5.5	22.1	34.6	46.1	1.8	1.8	82.3	7.7	14.7	4.8	259
15-5, 88-98	661	13	20	49	190	56		20	109	230	197	3.5	84.8	0.50	9.2	5.5	19.0	33.8	43	1.8	1.3	84.3	10.0	27.5	7.3	708
15-6, 19-26	663	4	20	36	280	60		12	63	170	120	2.3	74.9	0.2	6.5	1.4	11.0	20.5	31.4	1.7	0.7	49.7	6.0	6.4	3.7	262
16-1, 57-62	665	5	19	28	210	65		20	42	149	104	2.9	72.4	0.36	5.9	4.4	17.4	34.6	30.5	1.52	1.28	47.9	5.6	18.1	2.8	744
16-3, 32-37	668	15	20	34	130	46		17	84	190	148	5.4	76.3	0.32	6.5	6.6	24.9	38.5	34.0	2.01	1.11	89.2	5.5	21.8	2.9	148
16-4, 83-92	669	16	20	29	120	54		12	63	210	163	4.9	70.2	0.30	7.8	4.0	23.9	21.4	42.9	2.1	0.60	60.9	5.0	15.3	5.11	182
18-2, 80-86	695	20	16	28	67	38		8	42	180	117	4.6		0.47	6.8	4.4	24.4	20.4	42.6	1.39	0.47	68	9.4	31.6	10.8	1302
18-3, 130-139	697	25	16	17	70	71		6	38	180	163	4.5	77.3	0.29	6.6	6.0	23.3	15.0	37.5	1.82	0.95	66.0	9.4	17.7	18.0	4176
18-4, 115-124	699	26	19	34	110	78		4	50	200	485	6.0	60.6	0.48	8.1	5.6	31.6	16.4	44.3	2.49	2.31	47.0	5.9	36.2	3.9	10560
18-5, 65-73	700	14	20	49	180	75		5	102	195	495	0.3	61.6	0.3	10.5	5.7	21.9	20.5	28.5	2.9	0.30	62.4	5.6	33.9	1.7	1204
Site 324																										
1-2, 126-131	11	14	35	13	56	78	18	10	25	102	56	5.33	138	1.65	7.9	3.6	16.2	15.2	48.5	1.69	0.081	77.2	15.0	34.1		1040
1-3, 124-132	13	14	32	12	54	46	17	3	28	103	30	5.43	150		6.65	4.1		11.1	38.9	1.54	0.02	80.0	18.8	35.8	6.5	750
1-4, 125-131	15	13	35	9	58	65	16	5	30	115	14	4.98	142	0.7	8.65	4.8	17.7	14.0	51.0	1.86	0.03	85.0	21.6	34.7	7.0	730
1-6, 31-38	17	9	45	9	52	78	21	9	13	85	23	6.72	130	0.9	7.9	3.8	16.4	12.9	44.3	2.0	0.02	74.0	18.4	33.6	6.5	740
2-1, 83-92	48	15	37	12	46	100	24	9	13	125	13	8.8	640	2.2	12.7	4.1	14.0	14.7	76.1	2.0	0.04	121.0	32.7	45.1	14.8	780
2-2, 61-70	49	16	35	12	46	80	23	6	17	118	8	7.45	166	2.2	14.4	3.8	13.7	14.0	75.0	2.3	0.04	124.0	33.8	53.4	14.9	670
2-3, 52-61	50	14	45	16	68	68	23	8	28	112	28	6.15	158		9.35	4.6	17.1	16.0	51.0	1.92	0.015	95.0	23.8	41.8	10.6	820
2-4, 27-36	52	12	35	10	40	73	21	5	15	103	17	7.18	145	2.2	9.45	4.1	13.6	13.3	58.5	2.13	0.03	101.0	23.7	45.0	10.4	650
2-5, 35-45	53	12	33	10	48	53	21	6	14	118	23	6.50	158	1.7	11.5	3.96	16.3	14.5	67.6	2.14	0.03	107.0	28.0	45.0	9.1	570
2-6, 95-104	55	10	39	8	44	58	19	6	28	118	18	6.40	127	1.44	9.9	3.3	13.8	12.5	56.0	1.75	0.03	96.0	23.5	42.0	8.9	470
3-1, 137-146	77	12	32	9	44	60	23	7	12	102	10	7.45	148	2.2	12.2	3.6	13.9	12.2	66.0	1.74	0.02	99.0	26.2	42.3	10.5	590
3-2, 136-145	79	12	48	10	54	68	23	8	36	104	19	6.84	155	2.2	11.7	3.8	15.6	12.3	65.5	1.92	0.03	99.0	26.1	46.7	8.6	670
3-3, 67-77	80	18	44	10	52	94	19	14	14	112	14	5.60	135	1.54	11.9	4.8	18.9	16.5	69.0	1.97		104.0	25.1	43.7	8.6	790
3-4, 47-57	81	12	39	12	37	45	20	4	15	110	15	6.60	132	2.2	10.2	4.8	19.6	14.2	62.2	2.2		106.0	25.2	51.0	10.6	650
3-5, 99-110	83	16	45	12	37	60	21	6	9	116	9	6.8	138	0.95	13.7	4.4	20.1	16.6	82.0	1.9	2.1	102.0	28.3	46.0	11.1	1610
3-6, 138-148	85	10	32	12	48	62	18	4	12	110	30	5.0	78.0	1.08	8.05	4.6	19.0	12.1	47.1	1.98	0.56	81.0	16.1	39.8	5.4	860
4-2, 113-123	107	13	43	13	54	66	24	9	16	368	10	5.21	134	2.2	9.0	3.4	19.5	13.6	67.0	2.4	0.1	102	22.1	45.0	9.7	494

4-3, 30-40	108	9	45	13	46	53	17	7	18	119	23	5.28	124.0	2.9	10.5	4.34	19.4	17.6	60.0	2.1	0.49	110.0	24.8	38.0	9.6	600
4-4, 54-64	109	12	43	13	46	53	24	6	20	113	17	6.76	124.0	3.1	13.7	4.5	21.8	18.4	83.1	2.2	1.2	118	22.5	47.2	8.9	1300
5-2, 66-83	135	25	35	7	47	85	18	11	5	112	24	5.32	111.0	2.2	9.3	4.65	19.8	13.2	55.4	2.0	1.44	90.0	22.5		8.0	550
5-3, 25-35	136	22	35	5	34	110	19	9	4	107	11	7.40	161	2.4	10.0	3.6	13.1	11.9	76.1	1.95	0.01	118	28.8	44.1	10.3	750
6-2, 19-30	144	27	35	11	39	110	19	12	10	108	23	3.10	164	2.0	11.9	4.9	18.0	16.6	77.4	2.7	1.76	105	30.3	49.8	12.0	560
7-1, 69-78	153	15	14	7	42	87	15	12	20	119	18	5.60	156	1.05	11.5	4.8	18.5	19.1	73.1	2.8	1.5	100	29.2	54.0	12.0	640
7-3, 110-121	156	20	43	16	52	94	19	16	16	130	20	4.73	160	1.7	10.4	5.1	18.1	19.8	67.1	2.3	1.3	95	26.4			520
7-6, 119-129	161	13	37	15	47	90	16	13	20	122	20	4.50	150	1.8	10.1	4.2	15.8	19.7	65.3	1.97	0.6	104	28.5	48.7	10.4	540
8-3, 61-71	174	17	36	18	56	110	19	14	17	119	15	3.67	141	1.4	9.4	4.3	15.8	15.4	57.0	1.86	0.74	93.0	26.9	48.5	9.3	580
Site 325																										
1-1, 49-59	34	9	28	12	130	46		10		97	18	3.2	73.4	0.4	4.2	4.7	21.6	11.8	15.1	1.0	0.60	33.6	6.0	31.3	9.6	378
1-1, 133-144	35	10	50	15	75	46	17	11		118	41	4.6	100	0.5	4.6	5.0	24.2	17.4	19.1	1.4	0.45	34.5	4.8	22.9	7.9	534
1-2, 26-36	36	9	56	14	56	36	10	5		118	26	5.5	111.0	0.03		4.8	18.7	16.8	20.0	0.8	0.5	42.6	5.0	21.6	11.0	622
1-4, 81-92	39	12	39	12	64	41	18	7		105	26	3.5	90.1	0.2	4.0	3.8	19.0	11.6	17.7	1.1	0.99	34.1	5.4	29.4	6.6	450
2-2, 39-49	168	9	46	9	52	46	16	5		94	26	4.6	62.3	0.2	3.9	3.6	16.7	7.1	13.5	1.1	0.40	32.9	3.5	22.2	1.7	366
3-2, 11-24	178	8	52	13	60	46	17	8		97	25	2.6	56.3	0.3	3.8	3.8	18.9	10.3	11.7	0.9	0.55	32.0	3.9	35.9	1.5	141
3-3, 76-87	180	8	48	7	56	66	16	6		92	23	3.0	52.2	0.4	3.8	3.2	17.1	6.9	13.9	0.9	0.4	23.7	3.8	22.3	5.4	307
3-4, 26-36	182	9	39	9	60	47	17	5		94	24	3.3	74.4	0.2	3.4	3.3	17.6	7.5	11.9	0.7	0.5	30.5	3.8	27.0	5.8	339
4-2, 90	293	10	53	8	40	32	14	6		92	26	3.9	50.9	0.3	3.0	3.8	19.4	10.5	11.9	1.0	0.5	33.3	4.1	27.1	1.8	382
4-3, 20-26	294	12	52	8	56	36	17	8		97	30	8.2	1.4	0.28	3.5	4.7	13.7	12.9	14.0	1.29	4.5	48.2	4.1	21.0	14.2	249
4-3, 130	295	7	53	8	45	32	14	5		90	27	2.9	45.8	0.09	3.5	3.1	17.8	11.3	12.0	0.8	0.8	29.4	3.9	23.9	1.1	273
4, CC	295	10	20	7	36	22	10	5		103	33	4.1	49.5	0.2	3.5	4.0	16.1	11.5	10.4	0.9	0.64	35.2	4.1	82.4	23.6	341
5-1, 55-57	404	13	35	10	70	50	14	5		105	48	4.6	63.7	0.3	4.8	4.7	21.2	8.8	19.9	1.0	7.1	48.5	6.8	1.9	9.1	566
8-1, 45-49	613	12	26	10	70	39	16	8		87	39	2.9	80.5	0.4		4.1	19.3	10.9	17.9	1.0	0.78	46.5	3.1	20.5	8.8	281
8-2, 119-128	615	12	30	8	82	44	18	6		69	46	3.4	106.0	0.20	4.7	3.6	18.9	7.4	21.9	0.82	0.94	46.1	5.6	32.4	10.5	492
8-3, 27-35	616	12	35	10	70	40	15	7		115	43	2.8	90.2	0.20	4.3	4.3	15.7	12.1	17.3	1.0	0.50	30.5	4.7	15.5	11.7	247
9-3, 90-98	645	10	35	8	64	33	12	5		90	41	2.5	105.2	0.3	3.6	3.7	20.1	9.9	13.6	0.8	0.8	34.0	4.2	21.3	9.8	431

TABLE 4
Content of C_{org} and $CaCO_3$ in Sediments and Sedimentary Rocks, in % of Dry Weight (Wet Chemistry)

Sample (Interval in cm)	Depth (m)	CO_2	C_{org}	$CaCO_3$
Site 322				
1-2, 26-30	80		0.03	
1-3, 70-76	81	0.03	0.07	0.07
2-2, 113-116	193	0.16	0.37	0.36
3-1, 18-20	295		0.08	
4-1, 65-67	353	0.11	0.30	0.25
4-2, 57-60	354	0.03	0.20	0.07
5-1, 81-85	391	0.34	0.22	0.77
6-1, 30-33	438	0.25	0.03	0.57
9-2, 143-146	469	0.04	0.12	0.09
10-1, 101-105	486	0.08	0.07	0.18
10-2, 43-46	487		0.04	
11-1, 42-46	505	0.03	0.09	0.07
11-2, 45-49	506	0.08	0.06	0.18
11-3, 24-32	507	0.11	0.06	0.25
11-4, 17-24	508	0.18	0.06	0.41
11-5, 36-40	510	0.08	0.05	0.18
11-6, 109-115	512	0.13	0.02	0.30
13-2,	537	0.12	0.02	0.27
Site 323				
1-1, 50-60	76	0.04	0.07	0.09
1-1, 140-150	77	0.26	0.07	0.59
1-2, 34-43	79	0.36	0.07	0.82
1-3, 78-88	80		0.15	
1-4, 118-127	81	0.06	0.14	0.14
2-1, 128-130	162		0.05	
3-1, 88-94	257	0.06	0.40	0.14
3-2, 14-20	258	0.22	0.13	0.50
3-2, 61-70	258	0.10	0.06	0.23
4-2,	315	0.40	0.05	0.91
6-1, 100-110	343	0.09	0.23	0.21
6-1, 140-142	343	0.03	0.05	0.07
7-1, 141-143	362		0.08	
7-2, 105-110	363		0.09	
7-3, 18-24	364	0.06	0.08	0.14
8-1, 133-143	409		0.55	
10-1, 113-122	504	0.04	0.06	0.09
10-2, 75-85	505	0.08	0.14	0.18
10-3, 106-114	507	0.05	0.10	0.11
11-1, 22-32	551	0.20	0.23	0.45
11-2, 137-148	553	0.18	0.32	0.41
12-1, 110-114	599		0.56	
12-2, 9-18	599	0.29	0.12	0.66
12-2, 73-77	600		0.05	
12-2, 100-104	600		0.26	
13-5, 63-70	623	0.53	0.11	1.20
13-5, 105-115	624	0.08	0.06	0.18
13-6, 145-150	625	0.50	0.04	1.14
14-2, 1-8	637	0.08	0.03	0.18
14-2, 65-73	638	0.26	0.05	0.59
14-2, 128-135	638	0.07	0.04	0.16
15-1, 52-60	656			
15-2, 91-100	657	0.08	0.03	0.18
15-3, 29-36	658	0.18		0.41
15-4, 54-63	660	0.14		0.31
15-5, 89-98	661	0.12	0.03	0.27
15-6, 19-26	663	12.95	0.05	29.5
16-1, 57-62	665	12.74	0.05	28.8
16-3, 32-37	668	0.14	0.04	0.31
16-4, 83-92	669	0.06	0.05	0.14
18-2, 80-86	695		0.08	
18-3, 130-139	697		0.05	
18-4, 115-124	699	0.12	0.02	0.27
18-5, 14-20	700	0.03	0.03	0.07
18-5, 65-73	700	0.04	0.15	0.09
Site 324				
1-2, 121-131	11		0.06	
1-3, 124-132	13	0.47	0.11	1.06
1-4, 125-131	15		0.19	
1-6, 31-38	17	0.05	0.04	0.11
2-1, 83-92	48		0.22	
2-2, 61-70	49		0.40	
2-3, 52-61	50	0.06	0.08	0.14
2-4, 27-36	52	0.04	0.07	0.09
2-5, 35-45	53	0.03	0.37	0.07
2-6, 95-104	55	0.31	0.37	0.71
3-1, 137-146	77	0.15	0.28	0.34
3-2, 136-145	79	0.18	0.40	0.41
3-3, 67-77	80	0.38	0.40	0.84
3-4, 47-57	81	0.48	0.40	1.09
3-5, 99-110	83	0.13	0.40	0.29
3-6, 138-148	85		0.08	
4-2, 113-123	107	0.34	0.38	0.77
4-3, 30-40	108	0.31	0.38	0.71
4-4, 54-64	109	0.64	0.43	1.45
5-2, 66-83	135	0.21	0.44	0.48
5-3, 25-35	136	0.10	0.09	0.23
6-2, 19-30	144	0.80	0.42	1.81
7-1, 69-78	153	0.41	0.34	0.93
7-3, 110-121	156	0.57	0.32	1.30
7-6, 119-129	161	0.62	0.36	1.41
8-3, 61-71	174	0.73	0.27	1.66
Site 325				
1-1, 49-59	34	0.20	0.09	0.45
1-1, 133-144	35	0.91	0.08	2.08
1-2, 26-36	36	0.14	0.05	0.31
1-4, 81-92	39	0.28	0.10	0.64
2-2, 39-49	168	0.14	0.15	0.31
3-2, 11-24	178	0.04	0.19	0.09
3-3, 76-87	180	0.08	0.17	0.18
3-4, 26-36	182	0.10	0.17	0.23
4-2, 90	293	0.64	0.05	1.46
4-3, 20-26	294	0.40	0.09	0.91
4-3, 130	295	0.30	0.08	0.68
4, CC	295	0.38	0.08	0.84
5, CC	407	0.04	0.14	0.09
6-1, 145-150	482		0.31	
7-1, 131-135	520	0.04	0.15	0.09
7-2, 138-142	521	0.17	0.18	0.39
8-1, 45-49	613		0.23	
8-2, 119-128	615	6.31	0.19	14.40
8-3, 27-35	616	0.21	0.08	0.48
9-3, 90-98	645		0.15	
10-1, 35-39	709	0.13	0.15	0.29
10-3, 99-102	713	0.29	0.05	0.66

TABLE 5
Content of P_2O_5 (in % of Dry Weight) and Value of C_{org}/P Ratio in Sediments and Sedimentary Rocks

Sample (Interval in cm)	Depth (m)	P_2O_5	P	C_{org}	C_{org}/P
Site 322					
1-2, 26-30	80	0.12	0.05	0.03	0.60
1-3, 70-76	81	0.12	0.05	0.07	1.40
2-2, 113-116	193	0.16	0.07	0.37	5.30
3-1, 18-20	295	0.14	0.06	0.08	1.34
4-1, 65-67	353	0.26	0.11	0.30	2.72
4-2, 57-60	354	0.16	0.07	0.20	2.85
5-1, 81-85	391	0.19	0.08	0.22	2.75
6-1, 30-33	438	0.18	0.08	0.03	0.37
9-2, 143-146	469	0.17	0.07	0.12	1.71
10-1, 101-105	486	0.20	0.09	0.07	0.78
10-2, 43-46	487	0.14	0.06	0.04	0.67
11-1, 42-46	505	0.13	0.06	0.09	1.50
11-2, 45-49	506	0.14	0.06	0.06	1.00
11-3, 24-32	507	0.16	0.07	0.06	0.86
11-4, 17-24	508	0.13	0.06	0.06	1.00
11-5, 36-40	510	0.23	0.10	0.05	0.50
11-6, 109-115	512	0.42	0.18	0.02	0.11
13-2, 537	537	0.24	0.10	0.02	0.20
Site 323					
1-1, 50-60	76	0.12	0.05	0.07	1.40
1-1, 140-150	77	0.15	0.06	0.07	1.16
1-2, 34-43	79	0.13	0.06	0.07	1.16
1-3, 78-88	80	0.14	0.06	0.15	2.50
1-4, 118-127	81	0.08	0.03	0.14	4.66
2-1, 128-130	162	0.13	0.06	0.05	0.83
3-1, 88-94	257	0.20	0.09	0.40	4.45
3-2, 14-20	258	0.13	0.06	0.13	2.17
3-2, 61-70	258	0.15	0.06	0.06	1.00
6-1, 100-110	343	0.14	0.06	0.23	3.84
6-1, 140-142	343	0.11	0.05	0.05	1.00
7-1, 141-143	362	0.24	0.10	0.08	0.80
7-2, 105-110	363	0.23	0.10	0.09	0.90
7-3, 18-24	364	0.22	0.10	0.08	0.80
8-1, 133-143	409	0.14	0.06	0.55	9.20
10-1, 113-122	504	0.14	0.06	0.06	1.00
10-2, 75-85	505	0.16	0.07	0.14	2.00
10-3, 106-114	507	0.15	0.06	0.10	1.66
11-1, 22-32	551	0.18	0.08	0.23	2.88
11-2, 137-148	553	0.16	0.07	0.32	4.55
12-1, 110-114	599	0.14	0.06	0.56	9.32
12-2, 9-18	599	0.19	0.08	0.12	1.50
12-2, 73-77	600	0.16	0.07	0.05	0.72
12-2, 100-104	600	0.20	0.09	0.26	2.88
13-5, 63-70	623	0.15	0.06	0.11	1.84
13-5, 106-115	624	0.28	0.12	0.06	0.50
13-6, 145-150	625	0.18	0.08	0.04	0.50
14-2, 1-8	637	0.16	0.07	0.03	0.43
14-2, 65-73	638	0.11	0.05	0.05	1.00
14-2, 128-135	638	0.73	0.32	0.04	0.13
15-1, 52-60	656	0.73	0.32		
15-2, 91-100	657	0.54	0.24	0.03	0.13
15-3, 29-36	658	0.43	0.19		
15-4, 54-65	660	0.38	0.17		
15-5, 89-98	661	0.38	0.17	0.03	0.18
15-6, 19-26	663	0.34	0.15	0.05	3.35
16-1, 57-62	665	0.16	0.07	0.05	0.72

TABLE 5 – *Continued*

Sample (Interval in cm)	Depth (m)	P_2O_5	P	C_{org}	C_{org}/P
16-3, 32-37	668	0.33	0.14	0.04	0.29
16-4, 83-92	669	0.27	0.12	0.05	4.17
18-2, 80-86	695	0.19	0.08	0.08	1.00
18-3, 130-139	697	0.14	0.06	0.05	0.75
18-4, 115-124	699	0.20	0.09	0.02	0.22
18-5, 14-20	700	0.19	0.08	0.03	0.37
18-5, 65-73	700	0.30	0.13	0.15	1.15
Site 324					
1-2, 126-131	11	0.18	0.08	0.06	0.75
1-3, 124-132	13	0.20	0.09	0.11	1.22
1-4, 125-131	15	0.19	0.08	0.19	2.39
1-6, 31-38	17	0.22	0.10	0.04	0.40
2-1, 83-92	48	0.22	0.10	0.22	2.20
2-2, 61-70	49	0.32	0.14	0.40	2.85
2-3, 52-61	50	0.21	0.09	0.08	0.89
2-4, 27-36	52	0.19	0.08	0.07	0.88
2-5, 35-45	53	0.19	0.08	0.37	4.63
2-6, 95-104	55	0.21	0.09	0.37	4.12
3-1, 137-146	77	0.20	0.09	0.28	3.12
3-2, 136-145	79	0.18	0.08	0.40	5.00
3-3, 67-77	80	0.20	0.09	0.40	4.45
3-4, 45-57	81	0.22	0.10	0.40	4.00
3-5, 99-110	83	0.19	0.08	0.40	5.00
3-6, 138-148	85	0.16	0.07	0.08	1.14
4-2, 113-123	107	0.21	0.09	0.38	4.21
4-3, 30-40	108	0.20	0.09	0.38	4.21
4-4, 54-64	109	1.28	0.57	0.43	0.75
5-2, 66-83	135	0.21	0.09	0.44	4.90
5-3, 25-35	136	0.24	0.10	0.09	0.90
6-2, 19-30	144	0.19	0.08	0.42	5.25
7-1, 69-78	153	0.20	0.09	0.34	3.80
7-3, 110-120	156	0.20	0.09	0.32	3.55
7-6, 119-129	161	0.19	0.08	0.36	4.50
8-3, 61-71	174	0.25	0.11	0.27	2.46
Site 325					
1-1, 49-59	34	0.21	0.09	0.09	1.00
1-1, 133-144	35	0.17	0.07	0.08	1.14
1-2, 26-36	36	0.17	0.07	0.05	0.72
1-4, 81-92	39	0.21	0.09	0.10	1.11
2-2, 39-49	168	0.21	0.09	0.15	1.66
3-2, 11-24	178	0.21	0.09	0.19	2.12
3-3, 76-87	180	0.19	0.08	0.17	2.13
3-4, 26-36	182	0.21	0.09	0.17	1.88
4-2, 90	293	0.19	0.08	0.05	0.63
4-2,	293	0.13	0.06		
4-3, 20-26	294	0.17	0.07	0.09	1.29
4-3, 130	295	0.19	0.08	0.08	1.00
4, CC	295	0.19	0.08	0.08	1.00
5-1, 55-57	404	0.18	0.08		
5, CC	407	0.17	0.07	0.14	2.00
6-1, 145-150	482	0.21	0.09	0.32	3.45
7-1, 131-135	520	0.14	0.06	0.15	2.50
7-2, 138-142	521	0.15	0.06	0.18	3.00
8-1, 45-49	613	0.17	0.07	0.23	3.29
8-2, 119-128	615	0.19	0.08	0.19	2.37
8-3, 27-35	616	0.14	0.06	0.08	1.33
9-3, 90-98	645	0.20	0.09	0.15	1.67
10-1, 35-39	709	0.16	0.07	0.15	2.15
10-2, 26-30	710	0.47	0.20		
10-3, 99-102	713	0.12	0.05	0.05	1.00

TABLE 6
Content of SiO_2 (Amorph) in Sediments and Sedimentary Rocks (in % of Dry Weight)

Sample (Interval in cm)	Depth (m)	SiO_2 (Amorph)	Total SiO_2	SiO_2 (Amorph)/ ΣSiO_2
Site 322				
1-2, 26-30	80	1.32	64	2.1
1-3, 70-76	81	5.74	66	8.7
2-2, 113-116	193	12.42		
3-1, 18-20	295	3.72	50	7.5
4-1, 65-67	353	4.80	54	8.9
4-2, 57-60	354	4.36	64	6.9
5-1, 81-85	391	1.90	56	3.4
6-1, 30-33	438	3.21	56	5.8
9-2, 143-146	469	2.00	57	3.5
10-1, 101-105	486	1.86	66	2.8
10-2, 43-46	487	1.30	62	2.1
11-1, 42-46	505	0.88		
11-2, 45-49	506	0.90	66	1.4
11-3, 24-32	507	1.04	68	1.5
11-4, 17-24	508	1.20	63	1.9
11-5, 36-40	510	1.13		
11-6, 109-115	512	0.70	58	1.2
13-2,	537	0.60	50	1.2
Site 323				
1-1, 50-60	76	1.70	56	3.1
1-1, 140-150	77	4.60	57	8.1
1-2, 34-43	79	7.45	56	1.3
1-3, 78-88	80	12.00	52	23
1-4, 118-127	81	12.80	54	25
2-1, 128-130	162	6.55		
2-2, 61-70	162	3.22		
3-1, 88-94	257	4.49	55	8.1
3-2, 14-20	258	2.39	58	4.1
3-2, 61-70	258	4.76	56	8.5
4-2,	315	1.32	55	2.4
6-1, 100-110	343	10.67		
7-1, 141-143	362	4.55		
7-2, 105-110	363	5.20	52	10
7-3, 18-24	364	5.23	58	9.1
8-1, 133-143	409	10.62		
10-1, 113-122	504	2.04	64	3.2
10-2, 75-85	505	4.48	60	7.5
10-3, 106-114	507	2.85	60	4.8
11-1, 22-32	551	4.80	55	8.7
11-2, 137-148	553	5.12	51	10
12-1, 110-114	599	1.90		
12-2, 9-18	599	1.50		
12-2, 73-77	600	1.00		
12-2, 100-104	600	0.73		
13-5, 63-70	623	4.53		
13-5, 106-115	624	1.70	47	3.6
13-6, 145-150	625	1.35	51	2.6
14-2, 1-8	637	1.90	52	3.6
14-2, 65-73	638	0.77		
14-2, 128-135	638	1.40	48	2.9
15-1, 52-60	656	1.20	45	2.7
15-2, 91-100	657	0.83	50	1.7
15-3, 29-36	658	1.16	47	2.5
15-4, 54-65	660	1.23	45	2.7
15-5, 89-98	661	0.84	46	1.8
15-6, 19-26	663	0.80	33	2.4

TABLE 6 – *Continued*

Sample (Interval in cm)	Depth (m)	SiO_2 amorph	SiO_2	%SiO_2 amorph from SiO_2
16-1, 57-62	665	1.22	34	3.6
16-3, 32-37	668	1.33	46	2.9
16-4, 83-92	669	2.30	61	3.8
18-2, 80-86	695	1.55	46	3.4
18-3, 130-139	697	2.30	45	5.1
18-4, 115-124	699	5.58	64	8.7
18-5, 14-20	700	2.86		
18-5, 65-73	700	2.51	57	4.4
Site 324				
1-2, 126-131	11	4.34	54	8.1
1-3, 124-132	13	2.10	60	3.5
1-4, 125-131	15	1.30	60	2.2
1-6, 31-38	17	1.35	57	2.4
2-1, 83-92	48	1.00	54	1.9
2-2, 61-70	49	1.20	54	2.2
2-3, 52-61	50	1.20	58	2.1
2-4, 27-36	52	1.00	54	1.9
2-5, 35-45	53	1.92	60	3.2
2-6, 95-104	55	2.00	54	3.7
3-1, 137-146	77	1.05	58	1.8
3-2, 136-145	79	2.00	56	3.6
3-3, 67-77	80	1.70	52	3.3
3-4, 47-57	81	1.70	65	2.6
3-5, 99-110	83	1.00	62	1.6
3-6, 138-148	85	1.28	67	1.9
4-2, 113-123	107	1.70	64	2.7
4-3, 30-40	108	2.00	60	3.3
4-4, 54-64	109	1.70	66	2.6
5-2, 66-83	135	2.00	62	3.2
5-3, 25-35	136	1.00	68	1.5
6-2, 19-30	144	0.70	60	1.2
7-1, 69-78	153	1.00	62	1.6
7-3, 110-121	156	1.15	58	2.0
7-6, 119-129	161	1.00	63	1.6
8-3, 61-71	174	1.25		
Site 325				
1-1, 49-59	34	2.00	50	4.0
1-1, 133-144	35	2.70	48	5.6
1-2, 26-36	36	3.20	47	6.8
1-4, 81-92	39	1.87	56	3.3
2-2, 39-49	168	11.40	50	2.3
3-2, 11-24	178	10.30	56	18
3-3, 76-87	180	9.60	63	15
3-4, 26-36	182	10.00	62	16
4-2, 90	293	1.45	64	2.3
4-3, 20-26	294	1.65	60	2.8
4-3, 130	295	1.49	58	2.6
4, CC	295	1.50	60	2.5
5-1, 55-57	405	5.17	57	9.1
5, CC	407	7.64		
6-1, 145-150	482	13.47		
7-1, 131-135	520	5.74		
7-2, 138-142	521	5.80		
8-1, 45-49	613	11.51	54	21
8-2, 119-128	615	9.88	58	17
8-3, 24-35	616	8.70	57	15
9-3, 90-98	645	1.80	53	3.4
10-1, 35-39	709	1.44		

TABLE 7
Content of CaO and MgO (in % of Dry Weight) and the Values of the CaO/MgO Ratio in Sediments and Sedimentary Rocks

Sample (Interval in cm)	Depth (m)	CaO	MgO	CaO/MgO
Site 322				
1-2, 26-30	80	0.80	0.54	1.48
1-3, 70-76	81	0.96	1.25	0.77
2-2, 113-116	193	0.90	1.55	0.58
3-1, 18-20	295	1.28	1.48	0.87
4-1, 65-67	353	1.34	2.62	0.51
4-2, 57-60	354	1.24	1.75	0.71
5-1, 81-85	391	1.04	1.41	0.74
6-1, 30-33	438	0.96	1.25	0.77
9-2, 143-146	469	1.32	0.83	1.59
10-1, 101-105	486	0.94	0.95	0.99
10-2, 43-46	487	0.82	0.69	1.19
11-1, 42-46	505	1.02	1.57	0.65
11-2, 45-49	506	0.68	1.53	0.44
11-3, 24-32	507	1.00	1.60	0.62
11-4, 17-24	508	1.04	1.09	0.95
11-5, 36-40	510	0.92	1.18	0.78
11-6, 109-115	512	1.00	1.06	0.94
13-2,	537	1.20	0.91	1.32
Site 323				
1-1, 50-60	76	0.54	0.41	1.32
1-1, 140-150	77	0.66	1.18	0.56
1-2, 34-43	79	0.60	1.50	0.40
1-3, 78-88	80	0.80	1.54	0.52
1-4, 118-127	81	0.56	1.24	0.45
2-1, 128-130	162	0.54	1.44	0.37
2-2, 61-70	162	0.94	1.34	0.70
3-1, 88-94	257	0.80	1.80	0.45
3-2, 14-20	258	0.66	0.50	1.32
3-2, 61-70	258	0.80	1.09	0.74
4-2,	315	0.92	0.46	2.00
6-1, 140-142	343	0.76	1.01	0.75
7-1, 141-143	362	1.22	1.04	1.17
7-2, 105-110	363	0.92	1.23	0.75
7-3, 18-24	364	0.90	1.27	0.71
8-1, 133-143	409	1.38	0.90	1.53
10-1, 113-122?	504	0.64	1.07	0.60
10-2, 75-85	505	0.52	0.99	0.53
10-3, 106-114	507	0.70	1.02	0.69
11-1, 22-32	551	0.60	1.14	0.53
11-2, 137-148	553	0.58	1.00	0.58
12-1, 110-114	599	0.44	0.92	0.48
12-2, 9-18	599	0.90	0.81	1.11
12-2, 73-77	600	0.60	0.78	0.77
12-2, 100-104	600	1.14	1.01	1.13
13-5, 63-70	623	1.24	0.98	1.26
13-5, 106-115	624	0.70	1.08	0.65
13-6, 145-150	625	0.60	0.83	0.72
14-2, 1-8	637	0.58	0.77	0.75
14-2, 65-73	638	5.32	1.49	3.60
14-2, 128-135	638	1.60	1.17	1.37
15-1, 52-60	656	1.56	0.86	1.82
15-2, 91-100	657	1.52	0.82	1.86
15-3, 29-36	658	1.14	0.74	1.54
15-4, 54-63	660	1.06	0.82	1.29
15-5, 89-98	661	1.18	0.69	1.72
15-6, 19-26	663	20.20	0.62	32.60

TABLE 7 – *Continued*

Sample (Interval in cm)	Depth (m)	CaO	MgO	CaO/MgO
16-1, 57-62	665	14.46	0.80	18.00
16-3, 32-37	668	1.20	0.69	1.74
16-4, 83-92	669	1.00	0.67	1.49
18-2, 80-96	695	0.98	0.61	1.61
18-3, 130-139	697	0.72	0.40	1.80
18-4, 115-124	699	0.80	0.81	0.99
18-5, 14-20	700	1.16	0.58	2.00
18-5, 65-73	700	1.00	1.12	0.90
Site 324				
1-2, 126-131	11	0.70	1.52	0.46
1-3, 124-132	13	0.80	1.44	0.56
1-4, 125-131	15	0.80	0.93	0.86
1-6, 31-38	17	0.65	1.23	0.53
2-1, 83-92	48	0.64	1.24	0.52
2-2, 61-70	49	0.68	1.04	0.65
2-3, 52-61	50	0.96	1.28	0.75
2-4, 27-36	52	0.72	0.83	0.87
2-5, 35-45	53	0.82	1.41	0.58
2-6, 95-104	55	0.80	1.48	0.54
3-1, 137-146	77	0.72	1.15	0.63
3-2, 136-145	79	1.24	1.23	1.01
3-3, 67-77	80	0.90	1.14	0.79
3-4, 45-47	81	0.90	1.34	0.67
3-5, 99-110	83	0.50	1.37	0.36
3-6, 138-148	85	0.60	1.03	0.58
4-2, 113-123	107	0.52	1.21	0.43
4-3, 30-40	108	0.86	1.04	0.83
4-4, 54-64	109	2.52	1.24	2.04
5-2, 66-83	135	0.74	1.08	0.69
5-3, 25-35	136	0.60	1.36	0.44
6-2, 19-30	144	1.28	1.14	1.12
7-1, 69-78	153	1.00	1.09	0.92
7-3, 110-121	156	0.56	1.28	0.44
7-6, 119-129	161	1.00	1.48	0.68
8-3, 61-71	174	1.31	1.16	1.13
Site 325				
1-1, 49-59	34	1.18	1.77	0.67
1-1, 133-144	35	2.46	1.74	1.41
1-2, 26-36	36	1.14	1.72	0.66
1-4, 81-92	39	0.90	1.51	0.59
2-2, 39-49	168	1.30	1.23	1.05
3-2, 11-24	178	1.00	1.37	0.73
3-3, 76-87	180	0.79	1.06	0.74
3-4, 26-36	182	0.84	1.07	0.79
4-2, 90	293	1.44	0.70	2.06
4-3, 20-26	294	1.40	0.52	2.70
4-3, 130	295	1.18	0.60	1.97
4, CC	295	1.52	0.82	1.85
5-1, 55-57	405	1.50	1.45	1.04
5, CC	407	1.30	1.33	0.98
6-1, 145-150	482	1.50	1.26	1.19
7-1, 131-135	520	1.42	0.99	1.44
7-2, 138-142	521	1.70	1.18	1.44
8-1, 45-49	613	1.32	1.24	1.06
8-2, 119-128	615	9.56	1.04	9.2
8-3, 27-35	616	1.54	1.24	1.24
9-3, 90-98	645	1.16	1.93	0.60
10-1, 35-39	709	1.12	1.82	0.62
10-2, 26-30	711	3.26	1.17	2.79
10-3, 99-102	713	1.04	2.41	0.43

TABLE 8
Content of Fe_2O_3, TiO_2, and MnO (in % of Dry Weight) and Values of the Fe_2O_3/MnO Ratio in Sediments and Sedimentary Rocks

Sample (Interval in cm)	Depth (m)	Fe_2O_3	TiO_2	MnO	Fe_2O_3/MnO
Site 322					
1-2, 26-30	80	3.84	0.48	0.06	63
1-3, 70-76	81	5.60	0.58	0.08	70
2-2, 113-116	193	6.51	0.56	0.10	65
3-1, 18-20	295	6.90	0.72	0.10	69
4-1, 65-67	353	8.07	0.72	0.12	67
4-2, 57-60	354	7.54	0.70	0.11	69
5-1, 81-85	391	7.50	0.85	0.30	25
6-1, 30-33	438	7.63	0.67	0.87	8.8
9-2, 143-146	469	5.88	0.64	0.10	59
10-1, 101-105	486	4.93	0.56	0.08	61
10-2, 43-46	487	4.61	0.56	0.07	66
11-1, 42-46	505	4.93	0.64	0.07	71
11-2, 45-49	506	5.07	0.62	0.08	63
11-3, 24-32	507	5.05	0.64	0.08	63
11-4, 17-24	508	4.70	0.64	0.09	52
11-5, 36-40	510	8.64	0.68	1.08	8.0
11-6, 109-115	512	9.54	0.64	1.13	8.4
13-2,	537	12.72	1.60	0.17	75
Site 323					
1-1, 50-60	76	2.69	0.40	0.09	30
1-1, 140-150	77	5.48	0.60	0.06	15
1-2, 34-43	79	7.13	0.62	0.09	79
1-3, 78-88	80	6.68	0.60	0.09	74
1-4, 118-127	81	6.48	0.60	0.08	81
2-1, 128-130	162	8.27	0.60	0.12	69
2-2, 61-70	163	7.13	0.58	0.06	119
3-1, 88-94	257	6.09	0.62	0.09	68
3-2, 14-20	258	3.43	0.44	0.05	69
3-2, 61-70	258	7.02	0.64	0.04	17
4-2,	315	3.99	0.40	0.09	45
6-1, 100-110	343	5.60	0.52	0.12	47
7-1, 141-143	362	8.93	0.50	0.16	56
7-2, 105-110	363	7.98	0.62	0.13	61
7-3, 18-24	364	7.18	0.62	0.14	51
8-1, 133-143	409	5.05	0.51	0.06	84
10-1, 113-122	504	6.92	0.64	0.07	99
10-2, 75-85	505	7.12	0.70	0.07	102
10-3, 106-114	507	6.96	0.64	0.06	105
11-1, 22-32	551	6.12	0.64	0.11	56
11-2, 137-148	553	5.56	0.64	0.10	56
12-1, 110-114	599	5.99	0.66	0.06	100
12-2, 9-18	599	5.70	0.67	0.06	95
12-2, 73-77	600	6.12	0.64	0.14	44
12-2, 100-104	600	6.00	0.64	0.07	86
13-5, 63-70	623	7.22	0.61	0.33	22
13-5, 106-115	624	7.18	0.72	0.21	34
13-6, 145-150	625	5.64	0.74	0.12	47
14-2, 1-8	637	5.75	0.60	0.12	48
14-2, 65-73	638	4.80	0.66	0.16	30
14-2, 128-135	638	10.51	0.74	1.92	55
15-1, 52-60	656	12.17	0.74	2.56	4.7
15-2, 91-100	657	10.77	0.76	1.56	6.9
15-3, 29-36	658	10.93	0.76	1.55	7.1
15-4, 54-63	660	11.03	0.78	1.55	7.1
15-5, 89-98	661	10.67	0.64	1.87	5.7
15-6, 19-26	663	7.71	0.42	1.33	5.8
16-1, 57-62	665	6.46	0.58	2.41	2.7

TABLE 8 – *Continued*

Sample (Interval in cm)	Depth (m)	Fe_2O_3	TiO_2	MnO	Fe_2O_3/MnO
16-3, 32-37	668	9.47	0.66	0.80	11.9
16-4, 83-92	669	10.00	0.68	0.57	16.7
18-2, 80-86	695	7.85	0.74	0.11	71
18-3, 130-139	697	7.47	0.60	0.09	83
18-4, 115-124	699	7.87	0.56	1.12	7.1
18-5, 14-20	700	7.94	0.51	0.27	29
18-5, 65-73	700	9.71	0.56	1.68	5.8
Site 324					
1-2, 126-131	11	6.04	0.64	0.11	55
1-3, 124-132	13	6.07	0.68	0.20	30
1-4, 125-131	15	5.82	0.67	0.10	58
1-6, 31-38	17	5.34	0.63	0.17	31
2-1, 83-92	48	6.55	0.83	0.07	93
2-2, 61-70	49	7.00	0.80	0.08	88
2-3, 52-61	50	6.42	0.72	0.07	92
2-4, 27-36	52	6.61	0.67	0.06	110
2-5, 35-45	53	6.04	0.75	0.07	86
2-6, 95-104	55	6.07	0.69	0.11	55
3-1, 137-146	77	6.13	0.78	0.08	77
3-2, 136-145	79	6.36	0.72	0.10	64
3-3, 67-77	80	6.10	0.72	0.11	55
3-4, 47-57	81	6.58	0.77	0.10	66
3-5, 99-110	83	6.61	0.75	0.09	74
3-6, 138-148	85	6.84	0.64	0.06	114
4-2, 113-123	107	6.30	0.78	0.11	57
4-3, 30-40	108	6.40	0.71	0.11	58
4-4, 54-64	109	5.78	0.72	0.16	36
5-2, 66-83	135	5.98	0.70	0.08	75
5-3, 25-35	136	6.90	0.80	0.08	86
6-2, 19-30	144	6.36	0.77	0.10	64
7-1, 69-78	153	6.33	0.72	0.10	63
7-3, 110-120	156	6.10	0.72	0.10	61
7-6, 119-129	161	6.52	0.80	0.12	54
8-3, 61-71	174	6.13	0.74	0.08	77
Site 325					
1-1, 49-59	34	7.71	0.80	0.13	59
1-1, 133-144	35	7.29	0.80	0.12	61
1-2, 26-36	36	7.25	0.80	0.11	66
1-4, 81-92	39	6.52	0.76	0.09	73
2-2, 39-49	168	6.01	0.68	0.11	55
3-2, 11-24	178	6.68	0.74	0.09	74
3-3, 76-87	180	5.72	0.66	0.09	63
3-4, 26-36	182	5.72	0.64	0.09	63
4-2, 90	293	6.14	0.72	0.09	68
4-3, 20-26	294	6.52	0.74	0.11	59
4-3, 130	295	6.54	0.76	0.12	55
4, CC	295	6.68	0.74	0.13	51
5-1, 55-57	405	7.21	0.78	0.10	72
5, CC	407	7.52	0.64	0.07	108
6-1, 145-150	482	7.35	0.70	0.08	92
7-1, 131-135	520	6.94	0.56	0.07	99
7-2, 138-142	521	7.13	0.64	0.08	89
8-1, 45-49	613	6.83	0.68	0.10	68
8-2, 119-128	615	6.76	0.64	0.12	56
8-3, 27-35	616	7.34	0.70	0.09	81
9-3, 90-98	645	7.42	0.76	0.11	67
10-1, 35-39	709	8.31	0.72	0.10	83
10-2, 26-30	711	6.98	0.64	0.10	70
10-3, 99-102	713	8.25	0.64	0.10	83

TABLE 9
Content of C_{org} and $CaCO_3$ in the Sediments and Sedimentary Rocks (in % of Dry Weight)

Sample (Interval in cm)	Depth (m)	C_{org}	C_{carb}	$CaCO_3$
Site 322				
1-2, 26-30	80	0.04	–	–
1-3, 70-76	81	0.06	0.05	0.416
3-1, 18-20	295	0.06	0.07	0.583
4-1, 65-67	353	0.25	0.06	0.50
4-2, 57-60	354	0.16	0.04	0.334
5-1, 81-85	391	0.25	0.06	0.50
6-1, 30-33	438	0.06	–	–
9-2, 143-146	469	0.07	0.05	0.416
10-1, 101-105	486	0.03	0.05	0.416
10-2, 43-46	487	0.04	0.01	0.0835
11-2, 45-49	506	0.03	–	–
11-3, 24-32	507	0.03	0.05	0.416
11-4, 17-24	508	0.08	0.01	0.0835
11-6, 109-115	512	0.06	–	–
13-2,	537	0.02	0.01	0.0835
Site 323				
1-1, 50-60	76	0.03	0.06	0.500
1-1, 140-150	77	0.08	0.07	0.583
1-2, 34-43	79	0.08	0.01	0.0835
1-3, 78-83	80	0.022	0.068	0.566
1-4, 118-127	81	0.107	0.023	0.192
3-1, 88-94	257	0.2	0.04	0.334
3-2, 14-20	258	0.016	0.034	0.284
3-2, 61-70	258	0.033	0.017	0.014
4-2,	315	0.016	0.064	0.533
7-2, 105-110	363	0.017	0.083	0.691
7-3, 18-24	364	0.015	0.095	0.79
10-1, 113-122	504	0.021	0.1	1.075
10-2, 75-85	505	0.023	0.137	1.14
10-3, 106-114	507	0.025	0.105	0.876
11-1, 22-32	551	0.45	–	–
11-2, 137-148	553	0.38	–	–
13-5, 106-115	599	0.023	0.077	0.64
13-6, 145-150	625	0.025	0.075	0.625
14-2, 1-8	637	0.018	0.062	0.516
14-2, 128-135	638	0.021	0.029	0.242
15-1, 52-60	656	0.019	0.041	0.342
15-2, 91-100	657	0.012	0.048	0.400
15-3, 29-36	658	0.018	0.032	0.267
15-4, 54-63	660	0.014	0.036	0.300
15-5, 89-98	661	0.019	0.031	0.258
15-6, 19-26	663	0.08	3.94	32.8
16-1, 57-62	665	0.02	2.74	22.8
16-3, 32-37	668	0.016	0.054	0.45
16-4, 83-92	669	0.026	0.037	0.309
18-2, 80-86	695	0.017	0.043	0.358
18-3, 130-139	697	0.023	0.017	0.142
18-4, 115-124	699	0.025	0.035	0.292
18-5, 65-73	700	0.029	0.021	0.175
Site 324				
1-2, 126-131	11	0.10	–	–
1-3, 124-132	13	0.07	–	–
1-4, 125-131	15	0.17	–	–
1-6, 31-38	17	0.08	–	–
2-1, 83-92	48	0.30	–	–
2-2, 61-70	49	0.40	–	–
2-3, 52-61	50	0.12	–	–
2-4, 27-36	52	0.09	0.01	0.0834
2-5, 35-45	53	0.44	–	–
2-6, 95-104	55	0.39	0.03	0.25
3-1, 137-146	77	0.44	0.01	0.083
3-2, 136-145	79	0.50	–	–
3-3, 67-77	80	0.48	–	–

TABLE 9 – *Continued*

Sample (Interval in cm)	Depth (m)	C_{org}	C_{carb}	$CaCO_3$
Site 324 – *Continued*				
3-4, 47-57	81	0.51	0.01	0.083
3-5, 99-110	83	0.45	0.02	0.167
3-6, 138-148	85	0.17	–	–
4-2, 113-123	107	0.43	–	–
4-3, 30-40	108	0.41	0.03	0.25
4-4, 54-64	109	0.44	0.07	0.588
5-2, 66-83	135	0.43	0.01	0.083
5-3, 25-35	136	0.34	0.01	0.083
6-2, 19-30	144	0.39	0.06	0.5
7-1, 69-78	153	0.43	0.06	0.5
7-3, 110-121	156	0.44	0.03	0.25
7-6, 119-129	161	0.41	0.08	0.666
8-3, 61-71	174	0.35	0.12	0.1
Site 325				
1-1, 49-59	34	0.10	0.07	0.583
1-1, 133-144	35	0.34	–	–
1-2, 26-36	36	0.11	0.04	0.333
1-4, 81-92	39	0.09	0.05	0.416
2-2, 39-49	168	0.21	0.06	0.5
3-2, 11-24	178	0.19	0.06	0.5
3-3, 76-87	180	0.13	0.09	0.75
3-4, 26-36	182	0.13	0.07	0.583
4-2, 90	293	0.11	0.08	0.666
4-3, 20-26	294	0.10	0.08	0.666
4-3, 130	295	0.07	0.07	0.583
4, CC	295	0.12	0.06	0.5
5-1, 55-57	405	0.15	0.06	0.5
8-1, 45-49	613	0.14	0.04	0.333
8-2, 119-128	615	0.88	0.21	0.175
8-3, 27-35	616	0.12	0.07	0.583
9-3, 90-98	645	0.11	0.04	0.333

Thus in the cores of Site 323, two processes occur toward the end of the Paleogene. The highest concentrations of Fe, Mn, Ni, Co, Cu, and rare earths were found in the uppermost horizons of the Paleogene sediments. At the boundary between the Paleogene and Neogene time an unusual change in the depositional environment occurred within 1 meter of sediment and the concentrations of all elements drastically decreased, whereas the concentrations of Cr and alkaline metals increased. The concentrations of trace elements were minimal in Neogene sediments from all Leg 35 sites. The range of variation in concentrations corresponds to that found in present-day iceberg deposits containing sediments of various textural composition (pelitic oozes to sands). The fluctuations in the trace element concentrations in the Neogene and Pleistocene sediments are apparently due to changes in intensity of terrigenous load which is related to periodic climatic changes. Evidence of such climatic changes was noted by Angino (1966) in the sediments of the Pacific and Atlantic sectors of the Antarctic region.

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Angino E.E., 1966. Geochemistry of Antarctic pelagic sediments: Geochim. Cosmochim. Acta, v. 30, p. 939-962.

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TABLE 10
Content of CaO and MgO in Pelagic Sediments and in Other Widely Distributed Rocks[a]

Geologic Formations	Carbonates			Noncarbonates (converted to noncalcareous oxides)			Total Content		
	CaO	Mg	CaO/MgO	CaO	MgO	CaO/MgO	CaO	MgO	CaO/MgO
Oceanic sediments									
Carbonate sediments	28.05	1.03	27.2	1.04	3.05	0.34	28.35	2.35	12.2
Siliceous sediments	0.61	0.49	1.2	0.83	2.17	0.38	1.36	2.44	0.56
Pelitic oozes	0.44	0.40	1.1	1.01	3.73	0.27	1.37	3.82	0.36
Average of ocean	13.95	0.72	19.4	1.00	3.19	0.31	14.55	2.90	5.0
Ultrabasic rocks	–	–	–	–	–	–	1.0	43.1	0.02
Basic rocks	–	–	–	–	–	–	9.4	7.5	1.3
Intermediate rocks	–	–	–	–	–	–	6.5	3.6	1.8
Acid rocks	–	–	–	–	–	–	2.2	0.9	2.4
Sedimentary rocks	–	–	–	–	–	–	3.5	2.2	1.6
Soil	–	–	–	–	–	–	2.9	1.0	1.9

[a]According to Wakeel and Riley, 1961; Vinogradov, 1962; Malyuga, 1963.

Malyuga, D.P., 1963. Biochemical method of the exploration of ore deposits: Publication of the Academy of Sciences USSR, Moscow.

Vinogradov, A.P., 1962. Average content of chemical elements in the main types of volcanic rocks of the earth's crust: Geochemistry, No. 7.

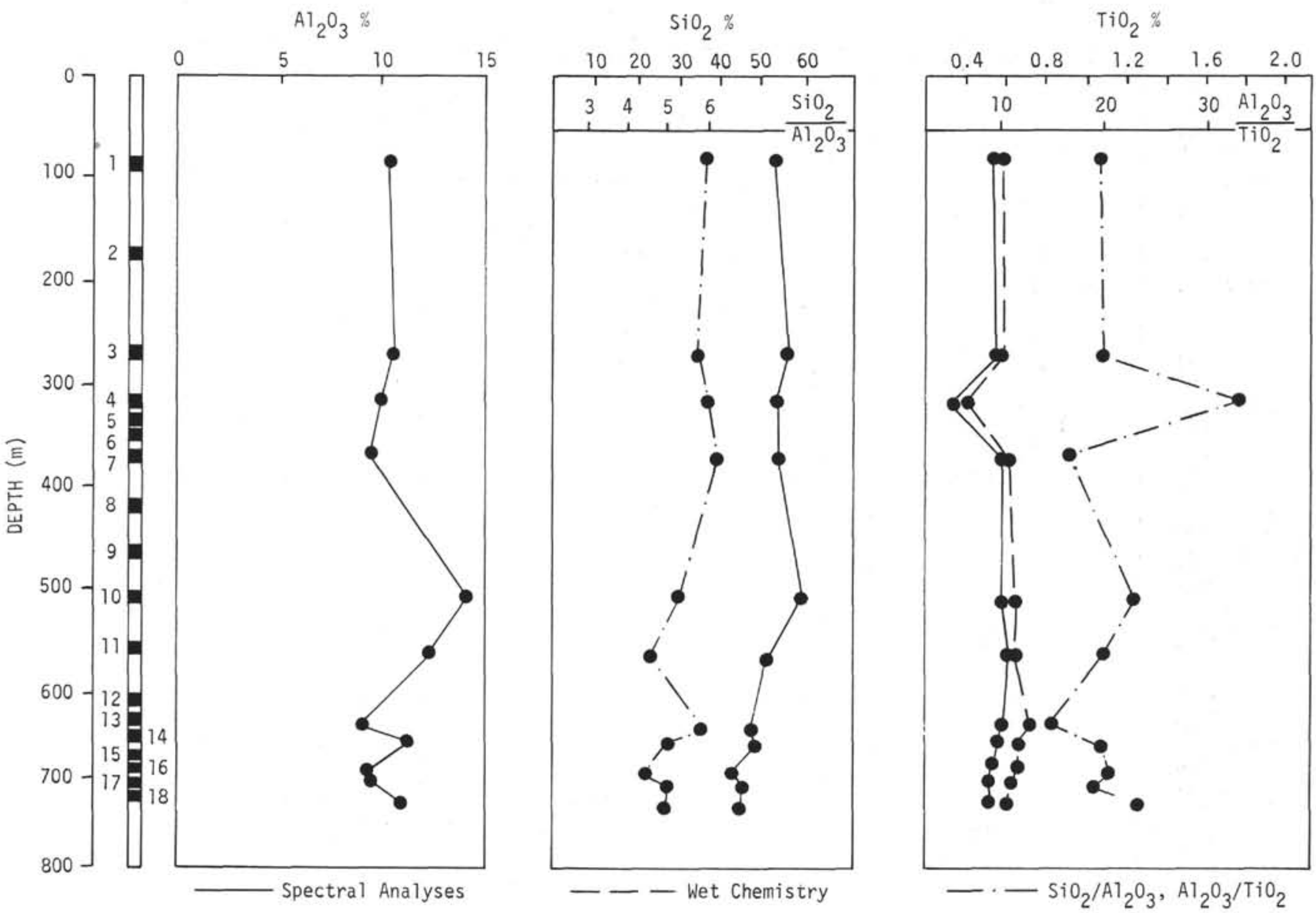

Figure 1. *Analyses of Al_2O_3, SiO_2, and TiO_2 for Site 323. Values are the average for each core and are given in percent.*

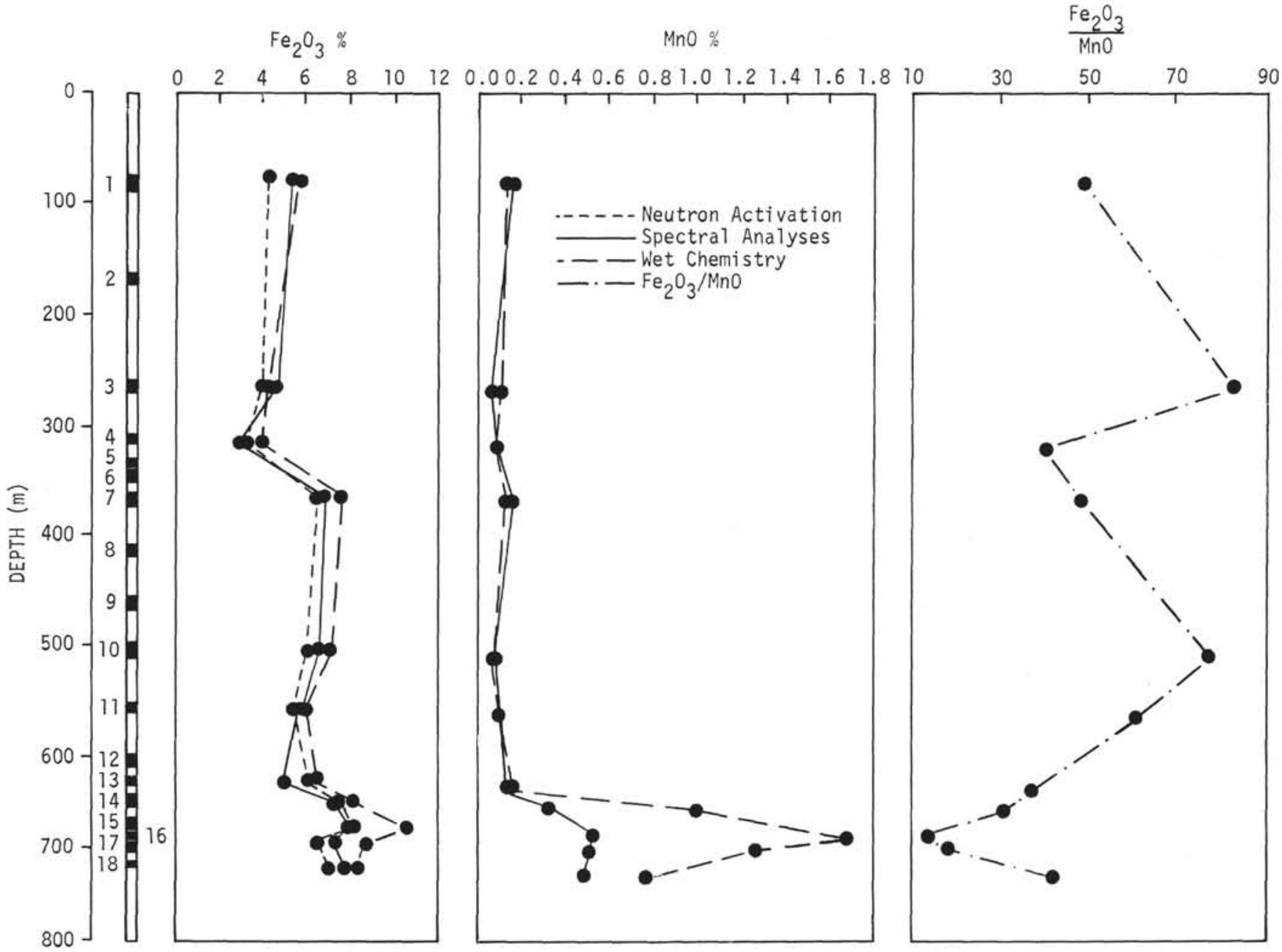

Figure 2. *Analyses of* Fe_2O_3 *and MnO for Site 323. Values are the average for each core and are given in percent.*

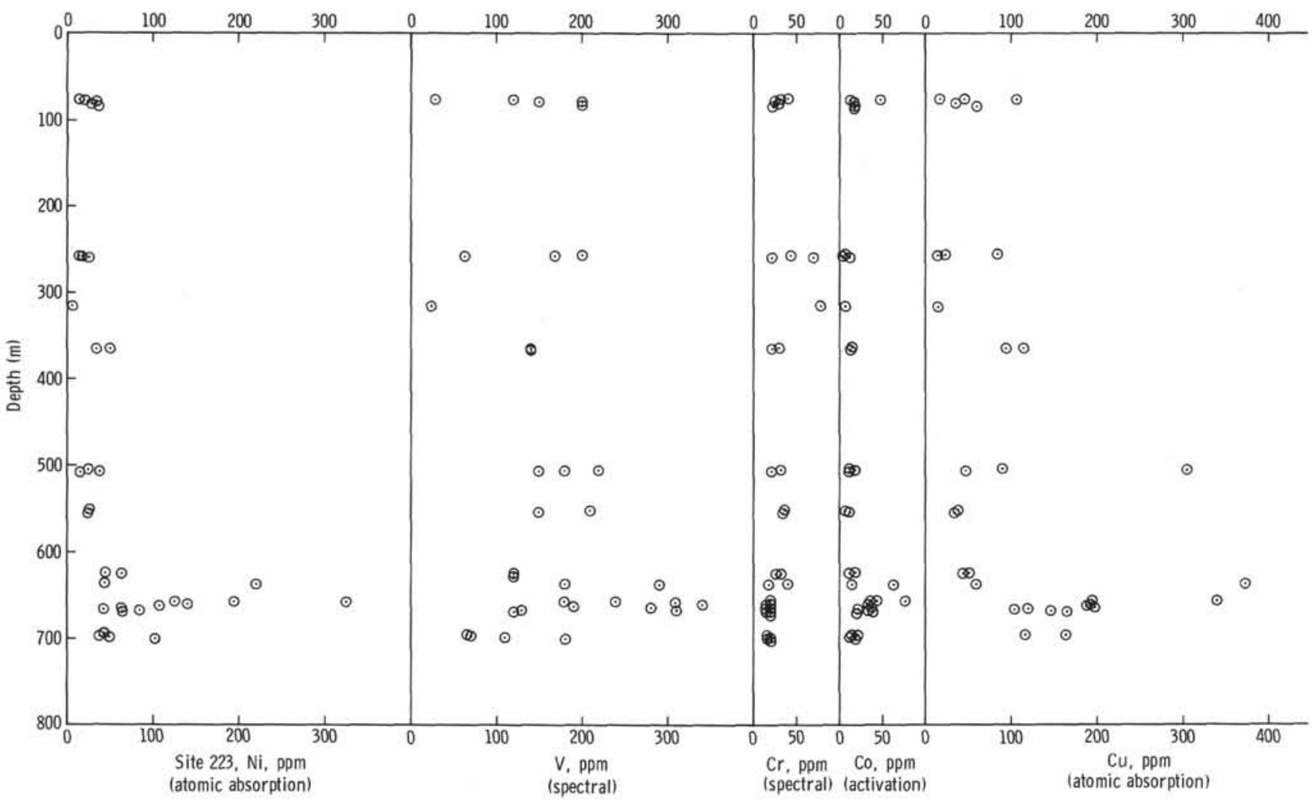

Figure 3. *Analyses of selected trace elements, Fe, and Mn for Site 323. Values are plotted from Tables 1 and 3.*

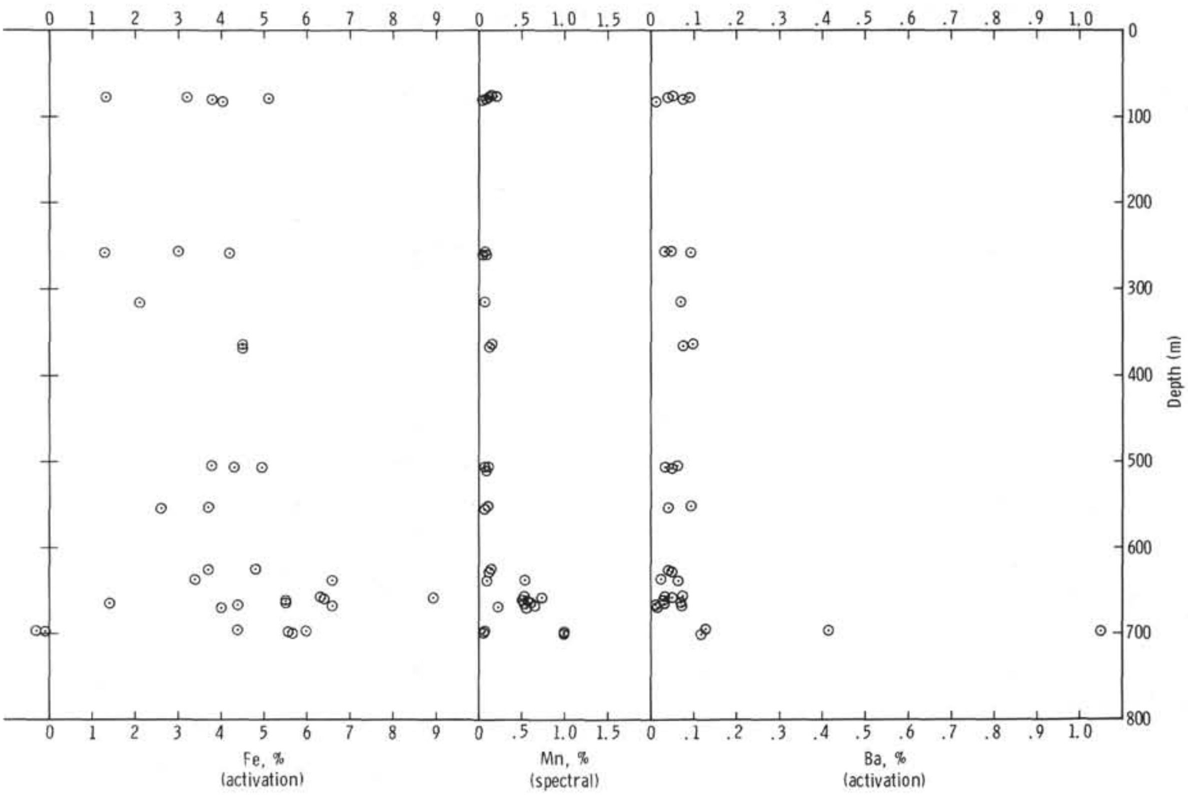

Figure 3. *(Continued).*