APPENDIX I. GRAIN-SIZE AND CARBON/CARBONATE ANALYSES, LEG 77[1]

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GRAIN-SIZE ANALYSES

Sand-silt-clay distribution was determined on 10-cm^3 sediment samples collected at the time the cores were split and described. The results are listed in Table 1.

The sediment classification used here is that of Shepard (1954), with the sand, silt, and clay boundaries based on the Wentworth (1922) scale (Fig. 1). Thus, the sand, silt, and clay fractions are composed of particles whose diameters range from 2000 to 62.5 μm, 62.5 to 3.91 μm, and less than 3.91 μm, respectively. This classification is applied regardless of sediment type and origin; therefore, the sediment names used in table may differ from those used elsewhere in this volume, e.g., a silt composed of nannofossils in this table may be called a nannofossil ooze in a site-summary chapter.

Standard sieve and pipette methods were used to determine the grain-size distribution. The sediment sample was dried and dispersed in a Calgon solution. If a sediment sample failed to disaggregate, it was treated with a sonic probe. Sediment samples that resisted this treatment were not analyzed.

The sand fraction was removed by wet sieving, using a 63-μm sieve, and the silt and clay fractions were analyzed by standard pipette analysis. Sampling depths and times were calculated using equations derived from Stokes' settling-velocity equation (Krumbein and Pettijohn, 1938, pp. 95–96):

$$\frac{D}{t} = V = \frac{2gr^2 (d_1 - d_2)}{9\eta},$$

$$t = \frac{9D\eta}{2gr^2 (d_1 - d_2)},$$

where

V = velocity, in cm/s
t = time, in seconds*
D = depth pipette is inserted, in cm
g = gravity, in cm/s^2*
r = radius of individual particles, in cm*
d_1 = density of solid particles arbitrarily set at 2.675 g/cm^3
d_2 = absolute density of distilled water at different temperatures (Hodgman et al., 1960, p. 2129)
η = viscosity of distilled water in poises at different temperatures (Hodgman et al., 1960, p. 2181).

Table 1. Grain-size analyses, Site 536.

Sample (core-section, level in cm)	Sub-bottom depth (m)	Sand (%)	Silt (%)	Clay (%)	Classification
Hole 536					
2-2, 50	6.00	7.3	22.0	70.7	Silty clay
7-3, 50	55.00	11.7	37.7	50.6	Silty clay
8-3, 50	64.50	8.6	44.1	47.3	Silty clay
9-3, 60	74.10	9.7	36.6	53.7	Silty clay
9-5, 25	76.75	7.1	23.2	69.7	Silty clay

The reproducibility of the grain-size analysis has been previously tested (Boyce, 1972), and it was found that over a period of time with several operators the reproducibility for the sand–silt–clay fractions is ±2.5% (absolute). For detailed, step-by-step procedures, see Volume 4 of the *Initial Reports of the Deep Sea Drilling Project*.

CARBON AND CARBONATE ANALYSES

Leg 77 sediments were analyzed for total carbon and acid-insoluble (organic) carbon, using a Leco WR-12 analyzer, according to the standard technique outlined below.

The 3-cm^3 sediment samples were first dried and ground into a homogeneous powder. The ground sediment was redried at 105 to 110°C, and two samples, a 0.1-g and a 0.5-g sample, were weighed into Leco clay crucibles. The 0.5-g sample was acidified with 10% hydrochloric acid and washed with distilled water. The sample was then dried and analyzed for acid-insoluble carbon. The 0.1-g sample was analyzed for total carbon without further treatment. If the sample contained less than 10% $CaCO_3$, an additional 0.5-g sample was analyzed for greater accuracy. The calcium carbonate percentages were calculated as follows: (% total C − % organic C) × 8.33 = % $CaCO_3$. Although other carbonates may be present, all acid-soluble carbon was calculated as calcium carbonate. All results are given in weight percent (Table 2).

Detailed descriptions of the technique and theory may be found in Bader, Gerard, and others (1970) and Boyce and Bode (1972).

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* Five figures were used in calculations to avoid rounding off variations.

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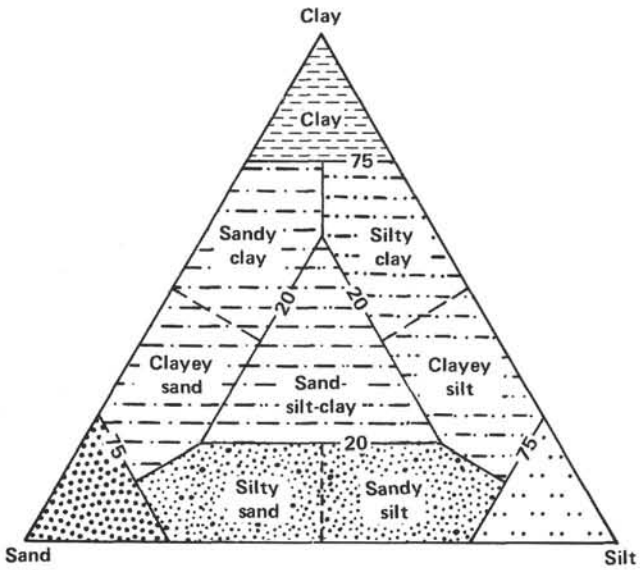

Figure 1. Sediment classification after Shepard (1954), with the sand, silt, and clay size fractions based on the Wentworth (1922) grade scale: sand, silt, and clay particles having respective diameters of 2000 to 62.5 to 3.91, and less than 3.91 μm. Shepard's (1954) sediment classification is a function of sand, silt, and clay percentages, not of composition.

Table 2. Carbon and carbonate analyses, Sites 535, 536, 538, and 540, Leg 77.

Core-Section	Sub-bottom depth (m)	Total carbon (%)	Organic carbon (%)	$CaCO^3$ (%)
Hole 535				
12-2	99.96	5.8	0.8	42
13-2	109.94	2.6	1.2	12
18-2	156.67	11.1	0.4	89
20-2	175.81	10.9	0.4	88
21-4	187.82	10.0	0.4	80
21-4	188.32	10.1	0.4	81
22-4	197.99	11.4	0.5	91
23-5	208.02	10.6	0.7	83
24-4	216.87	10.3	0.5	82
25-1	221.94	10.9	0.4	87
26-1	230.71	10.2	0.4	81
27-3	244.02	9.4	0.5	75
28-6	257.10	9.5	0.4	76

Table 2. (Continued).

Core-Section	Sub-bottom depth (m)	Total carbon (%)	Organic carbon (%)	$CaCO^3$ (%)
Hole 535 (Cont.)				
30-1	269.96	9.6	0.4	77
30-4	273.69	7.8	0.5	61
31-3	281.19	10.4	0.3	85
31-6	285.59	7.1	0.9	51
32-3	290.59	9.5	0.6	74
33-1	297.74	8.4	0.5	66
34-2	308.47	10.0	0.3	81
35-4	320.86	11.7	0.2	96
35-5	322.15	11.1	5.8	44
36-1	326.04	9.2	1.0	68
37-3	338.49	11.4	0.4	92
38-1	345.13	11.3	0.5	90
39-5	360.56	11.8	0.4	95
40-1	364.56	11.5	0.4	93
41-5	380.20	13.3	4.0	78
42-5	388.71	14.2	5.5	73
43-1	392.12	10.5	0.6	83
43-3	395.17	16.8	7.2	80
43-3	395.20	15.6	6.4	77
44-1	401.81	10.6	2.6	67
46-2	420.74	8.3	2.1	52
46-2	420.91	11.6	0.4	93
47-1	428.96	8.7	3.6	42
48-1	437.51	9.5	2.4	58
49-3	449.91	8.6	2.9	47
50-2	457.25	8.9	4.7	35
50-3	458.27	9.1	5.1	34
51-2	465.77	9.8	3.5	52
52-1	473.64	8.7	1.6	60
54-2	489.47	11.8	0.6	94
54-6	495.02	10.1	3.3	57
55-1	497.32	10.4	0.3	84
56-3	510.31	11.4	0.4	92
56-4	511.11	11.3	3.9	61
56-5	512.78	9.6	5.1	38
57-3	518.52	10.2	1.6	71
57-3	518.69	9.0	2.5	54
57-4	520.84	11.3	0.4	91
58-2	527.59	13.0	5.6	62
58-4	529.56	10.9	0.5	86
58-4	529.63	10.9	1.8	76
59-2	536.38	8.5	1.7	56
60-6	551.17	9.3	2.0	61
61-1	552.49	13.0	6.7	52
61-6	560.16	10.3	1.4	74
62-1	562.06	10.6	0.4	84
62-2	563.16	9.6	2.1	62
62-5	568.33	9.8	3.1	56
63-4	575.54	8.5	4.8	31
64-4	584.06	15.5	7.6	65
64-5	585.12	11.3	0.4	91
65-2	589.88	11.0	0.2	90
65-2	590.71	11.0	0.5	88
65-2	590.82	10.8	1.5	78
65-2	590.95	9.6	3.0	56
65-4	592.70	11.1	0.2	91
66-2	598.85	10.5	3.7	57
66-4	601.65	10.6	1.4	77
66-5	603.57	11.1	0.2	91
67-1	607.06	11.1	0.4	89
67-2	608.84	9.6	2.2	62
67-3	609.75	5.1	2.3	23
68-5	617.54	8.2	2.3	49
69-1	620.13	10.1	0.6	79
69-6	627.87	8.1	2.4	48
70-3	632.91	8.5	2.1	53

Table 2. (Continued).

Core-Section	Sub-bottom depth (m)	Total carbon (%)	Organic carbon (%)	$CaCO^3$ (%)
Hole 535 (Cont.)				
70-5	635.08	8.0	0.7	61
71-1	638.59	8.7	1.0	64
71-3	641.47	10.9	6.5	36
71-4	642.33	11.3	0.1	94
72-4	651.84	10.7	4.6	51
73-1	656.42	8.4	6.2	19
73-3	658.93	9.9	0.8	76
74-2	667.19	8.3	3.0	44
75-3	677.66	9.3	2.0	61
76-2	684.97	11.3	2.5	73
77-2	693.20	8.3	1.7	55
78-1	696.36	8.5	1.0	63
Hole 536				
3-2	15.40	9.4	0.1	77
7-3	55.10	4.1	0.1	33
8-3	64.60	10.2	0.1	84
9-3	74.10	9.7	0.1	80
Hole 538A				
3-2	14.31	10.6	0.1	87
16-5	141.75	8.7	2.7	50
16-5	142.10	2.8	2.0	6
19-2	165.64	5.8	0.1	47
20-1	174.03	10.3	0.1	85
20-2	176.32	10.5	0.0	87
20-3	177.66	9.9	0.1	82
21-1	183.14	9.9	0.1	82
21-3	186.07	11.0	0.0	91
21-4	187.50	0.7	0.0	5
21-5	189.05	0.1	0.1	0
22-1	192.89	12.8	2.0	90
Hole 540				
8-6	69.10	10.5	0.1	87
10-4	85.76	10.3	0.1	84
11-5	96.13	8.9	0.1	73
12-5	105.67	9.6	0.1	79
14-5	125.98	8.8	0.4	70
16-6	145.70	7.4	0.1	61
17-3	151.48	7.0	0.2	57
20-1	176.53	6.2	0.1	51
24-1	213.95	5.5	0.1	45
29-1	261.56	8.4	0.3	68

Table 2. (Continued).

Core-Section	Sub-bottom depth (m)	Total carbon (%)	Organic carbon (%)	$CaCO^3$ (%)
Hole 540 (Cont.)				
30-2	272.80	9.0	0.2	74
31-2	281.77	6.2	0.4	48
32-2	291.34	11.0	0.5	88
33-1	300.19	9.9	0.2	81
36-1	328.21	12.5	1.8	89
37-1	337.72	13.1	2.9	85
37-2	339.07	13.5	3.3	85
41-1	376.20	11.1	0.7	87
42-1	385.10	13.0	2.5	87
43-2	395.83	14.0	3.8	85
45-1	413.18	12.8	3.1	81
46-2	424.10	14.2	4.2	84
47-1	432.77	11.9	1.6	86
48-1	442.95	13.9	3.9	83
50-1	461.10	11.3	1.2	84
51-1	470.05	11.7	0.5	93
52-2	481.37	8.6	0.5	68
53-1	489.38	11.6	0.4	94
54-2	500.74	11.5	0.4	92
56-1	518.80	11.7	0.4	95
56-2	520.44	11.3	0.5	90
59-1	546.32	11.1	1.4	81
60-2	558.11	11.3	0.6	89
61-1	565.36	11.6	0.4	93
62-2	576.41	11.4	0.5	91
63-1	584.86	11.8	1.7	84
64-1	594.26	11.1	1.1	84
65-1	604.47	11.7	0.4	94
66-3	615.97	11.1	0.8	86
67-3	625.69	10.8	1.0	82
68-3	634.51	10.6	0.7	82
69-1	641.23	11.9	1.1	90
70-4	655.62	7.6	0.7	57
70-6	658.88	5.5	0.9	39
71-1	660.99	8.6	0.5	68
72-2	672.05	10.9	0.3	88
73-1	680.05	9.9	0.4	79
73-4	684.53	11.6	0.4	94
74-2	690.87	11.8	0.4	95
75-1	698.96	11.8	0.5	95
76-2	709.70	11.8	0.3	96
77-3	721.31	8.4	0.9	62
78-3	729.61	8.9	0.9	67
79-1	736.76	10.1	0.4	81