IV. GRAIN-SIZE AND CARBON/CARBONATE ANALYSES, LEG 43

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GRAIN-SIZE ANALYSES

Sand-silt-clay distribution was determined at Scripps on 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 sand, silt, and clay boundaries based on the Wentworth (1922) scale. 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, sediment names used in this table may differ from those used elsewhere in this volume; for example, a silt composed of nannofossils in this table may be called a nannofossil ooze in a site 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 and, if necessary, hydrogen peroxide. Sediment samples which resisted the above treatment were not analyzed.

The sand fraction was removed by wet sieving using a 62.5 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, p. 95-96):

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

where

V = velocity, in cm/sec

t = time, in sec*

D = depth pipette is inserted, in cm

g = gravity, in cm/sec*

r = radius of individual particles, in cm*

d_1 = density of solid particles arbitrarily set at 2.65 g/cc

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)*

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

The reproducibility of the grain-size analyses 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 per cent (absolute). For detailed step-by-step procedures, see Volume 4 of the Initial Reports of the Deep Sea Drilling Project.

CARBON/CARBONATE ANALYSES

Leg 43 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-cc sediment samples were first dried at 105°-110°C and then ground to a homogeneous powder. The ground sediment was redried and two samples, a 0.1-g and a 0.5-g sample, were then weighed into LECO clay crucibles. The 0.5-g sample was acidified with a 10 per cent hydrochloric acid solution and then washed with distilled water. The sample was then dried and analyzed for acid-insoluble carbon, listed in Table 2 as "organic" carbon. The 0.1-g sample was analyzed for total carbon without further treatment. If the result showed less than 10 per cent $CaCO_3$, an additional 0.5-g sample was analyzed for greater accuracy.

The calcium carbonate percentages were calculated as follows:

$$(\%\ \text{total C} - \%\ \text{organic C}) \times 8.33 = \%\ CaCO_3$$

Although other carbonates may be present, all acid-soluble carbon was calculated as calcium carbonate. All results are given in weight per cent (Table 2).

For control purposes standard sediments were made up from Deep Sea Drilling material and analyzed for total carbon at predetermined intervals with the regular samples. Listed below are the statistical data for these standards.

DSDP Std.	No. of Samples	Total Carbon as % $CaCO_3$	Standard Deviation	Maximum Range
6	4	92.2	2.5%	5.8%
9	23	26.7	1.3%	4.0%

These data indicate the precision of the mechanical aspect of the LECO analysis and do not necessarily reflect the precision of the total analytical procedure, which may be affected by factors such as sampling techniques and contamination during sample preparation.

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

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TABLE 1
Grain-Size Analysis, DSDP LEG 43

Sample (Interval in cm)	Depth (m)	Sand (%)	Silt (%)	Clay (%)	Classification
Site 382					
6-4, 15	255.19	0.0	22.8	77.2	Clay
8-1, 71	279.75	0.0	15.1	84.9	Clay
9-3, 68	291.88	0.0	18.3	81.7	Clay
10-2, 60	299.80	0.0	15.0	84.9	Clay
11-5, 66	314.46	0.0	16.7	83.2	Clay
12-4, 59	322.39	0.0	33.7	66.3	Silty clay
13-6, 97	335.26	0.0	18.7	81.3	Clay
14-5, 35	342.60	0.0	21.6	78.4	Clay
15-5, 81	352.69	0.0	5.9	94.1	Clay
16-5, 94	362.34	3.2	55.9	40.9	Clayey silt
17-3, 34	367.74	0.9	67.2	31.9	Clayey silt
18-1, 108	374.88	17.9	64.4	17.7	Sandy silt
18-2, 36	375.66	5.4	74.8	19.8	Clayey silt
18-4, 137	379.67	4.4	69.6	26.0	Clayey silt
20-2, 114	404.94	3.3	72.0	24.6	Clayey silt
21-2, 80	414.00	2.0	70.9	27.1	Clayey silt
21-3, 123	415.93	0.4	57.4	42.2	Clayey silt
22-1, 122	441.52	8.8	62.9	28.3	Clayey silt
Site 383					
1-1, 134	55.04	47.8	49.3	2.9	Sandy silt
1-2, 115	56.35	87.8	10.4	1.8	Sand
1-3, 110	57.80	94.4	4.5	1.0	Sand
1-4, 17	58.37	96.3	2.8	1.0	Sand
Site 384					
2-3, 120	64.90	2.3	36.4	61.3	Silty clay
4-1, 130	81.20	3.6	42.7	53.7	Silty clay
6-3, 142	103.02	1.6	31.6	66.9	Silty clay
7-3, 130	112.30	8.7	31.9	59.5	Silty clay
8-2, 77	119.57	0.6	30.4	69.0	Silty clay
9-3, 98	131.33	1.5	37.4	61.1	Silty clay
10-3, 61	140.01	6.5	35.4	58.1	Silty clay
11-2, 8	147.28	6.3	34.7	59.1	Silty clay
12-2, 63	157.13	8.7	35.3	56.0	Silty clay
13-2, 36	166.46	8.8	32.0	59.2	Silty clay
14-3, 81	177.41	3.7	31.8	64.4	Silty clay
15-6, 30	191.05	4.4	28.7	66.9	Silty clay
Site 385					
1-2, 89	24.69	0.0	13.5	86.5	Clay
1-4, 100	27.80	2.0	20.5	77.6	Clay
2-2, 120	63.55	0.1	19.5	80.4	Clay
2-5, 10	66.95	0.0	25.6	74.3	Silty clay
3-2, 90	101.20	0.0	18.1	81.9	Clay
3-5, 100	105.80	0.1	25.5	74.4	Silty clay
4-2, 100	139.00	1.7	14.1	84.2	Clay
5-2, 30	147.90	2.7	16.1	81.2	Clay
5-4, 50	151.10	6.1	15.2	78.6	Clay
8-5, 88	181.48	2.5	18.2	79.3	Clay
9-1, 94	185.04	2.8	19.3	77.9	Clay
10-1, 112	194.52	10.9	10.8	78.3	Clay
11-1, 143	204.43	0.4	22.4	77.2	Clay
12-2, 115	215.15	0.0	14.9	85.0	Clay
13-2, 90	234.00	0.0	12.6	87.4	Clay
Site 386					
1-2, 120	55.30	2.1	32.2	65.7	Silty clay
1-5, 100	59.60	5.8	17.6	76.6	Clay
3-1, 138	139.38	0.2	7.7	92.2	Clay
4-1, 106	148.26	7.0	36.4	56.5	Silty clay
4-2, 125	149.95	0.1	6.2	93.7	Clay
4-6, 82	155.52	41.3	33.7	25.0	Sand-silt-clay
5-2, 6	158.36	0.1	50.8	49.2	Clayey silt
5-2, 102	159.32	83.2	12.2	4.6	Sand
6-1, 99	167.29	67.8	25.6	6.7	Silty sand
6-2, 130	169.10	0.0	52.2	47.7	Clayey silt
6-3, 64	169.94	0.1	56.8	43.2	Clayey silt
7-1, 139	177.19	33.8	37.6	28.6	Sand-silt-clay
8-5, 101	192.31	60.3	18.9	20.8	Clayey sand
9-2, 7	205.87	35.1	33.9	31.0	Sand-silt-clay
12-2, 69	282.59	2.6	41.2	56.2	Silty clay
15-2, 5	348.95	12.8	56.1	31.1	Clayey silt
15-5, 49	353.89	0.3	29.5	70.2	Silty clay
16-5, 107	373.07	3.1	38.7	58.1	Silty clay
17-2, 86	387.86	3.6	66.4	30.0	Clayey silt
19-2, 81	415.91	0.0	39.1	60.9	Silty clay
28-2, 116	502.06	0.0	20.0	80.0	Clay
30-6, 89	526.79	0.1	19.0	80.9	Clay
32-5, 10	562.65	0.1	18.9	81.0	Clay
Site 387					
1-2, 65	33.95	0.0	3.6	96.3	Clay
6-3, 49	168.59	9.5	22.4	68.1	Silty clay
7-5, 70	181.65	2.8	30.5	66.7	Silty clay
8-1, 90	185.10	2.3	38.9	58.8	Silty clay
10-5, 77	210.37	3.8	37.6	58.6	Silty clay
11-1, 145	214.25	0.0	42.5	57.5	Silty clay
27-6, 123	449.98	0.0	37.0	62.9	Silty clay
29-2, 85	471.75	0.1	18.7	81.2	Clay
37-2, 62	576.42	0.3	19.5	80.3	Clay
37-2, 122	577.02	3.9	11.7	84.4	Clay

TABLE 2
Carbon/Carbonate Analyses, DSDP LEG 43

Sample (Interval in cm)	Depth (m)	Total Carbon	Organic Carbon	$CaCO_3$
Site 382				
1-1, 50	51.5	1.5	0.4	10
16-2, 4	356.9	1.1	0.0	9
17-4, 116	370.1	0.3	0.0	2
20-5, 148	409.8	0.1	0.0	0
Site 384				
1-3, 80	54.6	6.3	0.1	52
2-1, 90	61.6	5.7	0.0	47
2-2, 50	62.7	6.2	0.1	51
2-4, 50	65.7	6.5	0.0	54
2-5, 100	67.7	6.3	0.0	52
2-6, 80	69.0	6.7	0.0	56
3-1, 50	70.5	6.9	0.1	57
4-1, 60	80.5	6.8	0.0	56
4-2, 100	82.4	6.3	0.0	52
4-4, 100	85.4	6.6	0.0	55
4-5, 90	86.8	7.5	0.0	62
4-6, 139	88.8	8.3	0.0	69
5-1, 120	90.2	9.5	0.0	79
6-1, 118	99.8	8.9	0.0	74
6-3, 10	101.7	8.8	0.0	73
7-3, 88	111.9	9.5	0.0	79
7-6, 96	116.5	8.6	0.0	72
8-2, 25	119.1	9.2	0.0	76
8-5, 46	123.8	9.2	0.0	76
9-3, 116	131.5	7.0	0.0	58
9-5, 82	134.2	8.4	0.0	70
10-2, 61	138.5	8.2	0.0	68
10-3, 75	140.2	9.1	0.0	75
10-6, 140	145.3	8.3	0.0	69
11-2, 71	147.9	7.7	0.0	64
11-4, 16	150.4	8.4	0.0	70
12-2, 39	156.9	8.9	0.0	74
12-5, 5	161.1	9.1	0.0	76
13-2, 62	166.7	10.3	0.0	85
13-4, 18	169.3	10.8	0.0	90
13-5, 75	171.4	10.7	0.0	89
14-2, 60	175.7	11.0	0.0	91
15-1, 66	183.9	11.0	0.0	91
15-6, 125	192.0	10.5	0.0	87
Site 385				
1-2, 50	24.3	0.2	0.2	0
1-4, 75	27.6	0.1	0.1	0
2-2, 80	63.2	0.2	0.2	0
3-2, 100	101.3	0.2	0.2	0
3-5, 75	105.6	0.3	0.2	0
4-2, 68	138.7	0.1	0.1	0
5-2, 80	148.4	0.1	0.1	0
8-5, 113	181.7	0.1	0.1	0
9-1, 115	185.3	0.0	0.1	0
10-1, 133	194.7	0.1	0.1	0
11-2, 70	205.2	0.3	0.1	2
12-2, 70	214.7	3.4	0.1	28
13-2, 95	234.1	5.4	0.1	44
13-4, 77	236.9	6.1	0.9	44
14-2, 84	252.9	0.1	0.1	0
15-1, 80	270.4	0.1	0.1	0

TABLE 2 – *Continued*

Sample (Interval in cm)	Depth (m)	Total Carbon	Organic Carbon	$CaCO_3$
Site 386				
1-2, 70	54.8	2.0	0.2	15
1-5, 80	59.4	8.2	0.1	68
1-6, 80	60.9	0.1	0.1	0
2-5, 91	107.0	0.3	0.2	0
3-1, 118	139.2	0.9	0.2	6
4-1, 120	148.4	0.1	0.1	0
4-2, 80	149.5	0.1	0.1	0
4-4, 80	152.5	3.9	0.1	32
5-2, 130	159.6	0.1	0.0	0
5-4, 90	162.2	0.1	0.1	0
6-1, 101	167.3	1.0	0.0	8
6-3, 70	170.0	2.3	0.0	19
8-1, 100	186.3	1.9	0.1	15
9-2, 33	206.1	1.4	0.1	12
11-2, 73	254.1	2.4	0.1	19
11-3, 113	256.0	3.5	0.1	29
12-2, 103	282.9	2.7	0.1	22
13-3, 69	312.7	0.2	0.0	1
14-2, 25	330.3	2.1	0.3	15
14-6, 135	337.4	3.2	0.3	25
15-2, 121	350.1	3.4	0.2	27
15-5, 89	354.3	3.3	0.1	26
16-3, 34	369.3	1.2	0.3	8
16-3, 46	369.5	3.1	0.1	25
17-3, 61	389.1	1.3	0.7	5
17-5, 51	392.0	1.9	0.5	12
18-1, 27	404.4	1.5	0.7	7
19-2, 88	416.0	2.9	0.2	23
20-3, 122	427.3	3.1	0.5	22
21-2, 123	435.4	1.6	0.3	10
21-5, 9	438.8	10.2	0.1	84
22-1, 110	443.2	2.4	1.0	12
22-4, 105	447.7	3.3	0.4	24
23-2, 141	454.6	3.6	0.5	26
23-4, 15	456.4	1.9	0.6	11
24-2, 118	463.9	3.7	0.4	27
24-4, 69	466.4	5.9	0.1	49
25-1, 51	471.8	0.4	0.2	2
25-5, 2	477.3	1.7	0.8	8
26-2, 131	483.1	3.2	0.3	24
26-5, 87	487.2	0.8	0.7	1
27-2, 60	491.9	1.5	0.6	7
27-4, 30	494.6	0.8	0.4	3
28-2, 79	501.7	3.6	0.1	29
29-2, 60	511.0	4.0	0.2	32
30-2, 20	520.1	1.1	0.7	3
31-1, 30	538.1	0.1	0.1	0
31-6, 80	546.1	2.1	0.3	16
32-2, 119	559.2	2.4	0.1	19
32-5, 52	563.1	0.1	0.1	0
32-5, 149	564.0	2.5	0.2	20
33-2, 67	577.4	3.3	0.1	27
34-2, 88	606.5	1.6	0.1	12
34-6, 23	611.9	0.7	0.1	5
35-4, 46	637.0	7.6	0.1	63
35-5, 119	639.2	0.1	0.1	0
36-3, 58	645.1	0.2	0.1	1
36-5, 56	648.1	0.3	0.1	2
38-3, 6	692.5	0.1	0.0	0
38-5, 7	695.5	0.1	0.0	1

TABLE 2 – *Continued*

Sample (Interval in cm)	Depth (m)	Total Carbon	Organic Carbon	$CaCO_3$
39-1, 11	699.1	0.1	0.0	0
39-6, 7	706.5	0.1	0.0	0
39-6, 30	706.8	0.1	0.1	1
40-3, 130	712.3	0.1	0.0	1
41-1, 119	718.7	0.0	0.0	0
41-5, 78	724.3	0.1	0.1	0
42-4, 54	732.0	0.1	0.1	0
43-2, 14	737.9	0.2	0.1	1
43-2, 135	739.2	13.5	11.5	17
44-2, 82	748.1	2.1	2.0	1
44-3, 126	750.1	1.6	0.2	12
45-1, 63	766.0	4.0	1.9	17
45-1, 100	766.4	0.2	0.1	1
45-2, 102	767.9	8.2	1.9	52
45-6, 93	773.8	0.1	0.1	0
46-2, 42	776.3	0.1	0.1	0
46-5, 53	780.9	0.2	0.2	0
47-3, 88	787.7	0.1	0.1	0
47-4, 58	788.9	0.7	0.6	1
48-2, 145	796.3	5.9	0.5	45
49-3, 145	807.3	1.8	0.8	8
49-4, 66	808.0	4.1	0.2	33
50-3, 31	815.6	3.4	1.6	15
50-5, 134	819.6	9.6	2.8	57
51-1, 105	823.4	4.0	1.7	20
51-5, 57	828.9	10.3	2.4	66
52-2, 83	833.7	5.3	1.8	29
52-6, 100	839.9	5.5	1.5	33
53-2, 67	843.1	8.0	0.7	61
53-4, 59	846.0	0.9	0.6	2
54-3, 24	853.9	4.2	1.3	25
54-3, 86	854.5	0.9	0.4	4
55-1, 92	860.8	2.2	1.0	9
55-6, 49	867.9	8.9	2.2	56
56-3, 47	872.8	6.8	1.7	43
56-4, 121	875.0	3.7	1.7	16
57-1, 53	879.4	2.3	1.3	8
57-6, 94	887.3	6.3	1.2	43
58-1, 85	889.4	3.0	0.3	23
58-2, 65	890.7	6.4	1.9	38
59-3, 98	901.7	6.7	1.4	44
59-5, 49	904.2	6.0	2.2	32
60-2, 127	910.0	0.5	0.5	0
60-4, 23	911.9	8.1	4.0	34
61-2, 56	918.9	1.1	1.1	0
61-4, 65	921.9	0.4	0.3	0
62-2, 117	929.0	1.4	1.2	2
62-6, 54	934.3	3.0	2.9	1
63-3, 114	939.9	1.8	1.8	0
63-4, 140	941.7	0.1	0.1	0
64-2, 108	947.9	0.1	0.1	0
64-4, 61	950.4	1.5	1.4	1
65-1, 81	955.6	3.6	3.5	1
65-2, 60	956.9	0.2	0.2	0
Site 387				
1-2, 85	34.2	0.1	0.1	0
1-6, 117	40.5	0.2	0.1	0
2-2, 100	101.0	0.2	0.1	0
2-5, 60	105.1	0.1	0.1	0

TABLE 2 – *Continued*

Sample (Interval in cm)	Depth (m)	Total Carbon	Organic Carbon	$CaCO_3$
3-2, 110	139.2	0.1	0.1	0
4-1, 70	146.8	0.2	0.1	1
5,CC,10	155.7	0.2	0.1	1
6-3, 90	169.0	0.2	0.1	1
7-1, 90	175.9	0.3	0.3	0
7-5, 90	181.9	0.2	0.1	1
8-1, 70	184.9	0.2	0.1	1
8-2, 9	185.8	2.8	0.2	21
9-2, 40	196.0	0.1	0.1	0
9-6, 40	202.0	2.5	0.1	19
10-4, 130	209.4	0.9	0.2	6
10-5, 70	210.3	1.5	0.1	12
11-1, 135	214.1	0.1	0.1	0
12-1, 132	223.6	0.2	0.2	0
13-1, 74	232.5	2.1	0.6	13
14-2, 42	243.2	1.1	0.2	7
16-1, 139	261.5	1.4	0.1	10
17-1, 95	270.6	0.5	0.4	1
18-1, 32	289.0	0.1	0.1	0
19-2, 65	309.9	0.5	0.1	3
19-3, 111	311.8	0.8	0.1	6
20-1, 132	328.0	0.6	0.2	4
20-3, 65	330.4	2.1	0.2	15
21-1, 128	347.0	3.2	0.1	26
21-2, 89	348.1	1.6	0.5	9
22-2, 29	357.0	2.2	0.3	16
22-2, 79	357.5	2.5	0.1	20
23-1, 29	374.6	3.6	0.1	30
24-1, 140	394.7	2.5	1.3	9
25-3, 73	406.5	0.4	0.1	2
26-2, 21	413.9	0.2	0.1	0
27-1, 64	441.9	1.0	1.0	0
28-1, 116	461.1	5.6	0.7	41
29-2, 71	471.6	4.2	0.1	34
29-3, 88	473.3	0.1	0.0	0
30-1, 136	489.9	13.1	11.3	15
31-1, 138	508.9	0.1	0.1	0
32-1, 111	518.6	0.1	0.1	0
32-2, 79	519.8	0.7	0.7	0
33-2, 60	528.7	0.5	0.5	0
34-2, 71	538.4	0.5	0.5	0
34-4, 33	541.0	0.3	0.3	0
35-3, 69	549.4	2.9	2.8	1
35-5, 90	552.6	0.1	0.1	0
36-1, 80	556.1	0.1	0.1	0
36-3, 80	559.1	4.2	3.7	5
37-2, 127	577.1	0.2	0.2	0
38-1, 65	593.8	11.4	0.9	88
39-2, 68	623.8	11.0	3.1	66
39-2, 113	624.2	10.3	0.4	82
40-1, 90	632.0	9.6	2.6	59
41-1, 68	641.3	8.8	3.0	48
42-1, 93	651.1	11.0	4.8	51
44-1, 76	679.5	9.5	3.8	48
45-1, 125	699.0	11.0	1.5	79
46-1, 125	727.3	11.5	0.3	94
46-2, 56	728.1	11.4	0.0	94
47-1, 140	746.3	10.3	1.6	72
48-1, 85	764.6	10.9	0.7	85
49-2, 89	784.8	8.4	1.5	58
49-5, 111	789.5	8.0	1.1	57