APPENDIX III. X-RAY MINERALOGY DATA, ARABIAN AND RED SEAS– LEG 23 DEEP SEA DRILLING PROJECT[1]

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METHODS

Semiquantitative determinations of the mineral composition of bulk samples and 2-20 μ and $<2\mu$ fractions were performed according to the methods described in the reports of Legs 1 and 2 and in Appendix III of Volume IV. The mineral analyses of the 2-20 μ and $<2\mu$ fractions were performed on $CaCO_3$-free residues.

The X-ray mineralogy results of this study are summarized in Tables 1 through 11. The mineralogy data are presented in Tables 12 through 23. Sediment ages, lithologic units, and nomenclatures of the sediment types in Tables 1 through 11 are from the DSDP Leg 23 hole summaries and from a subsequent update supplied by O. E. Weser, DSDP. The stratigraphic position of samples submitted for X-ray diffraction analysis from Leg 23 are listed in Tables 1 through 11. The sample depth (in meters) below the sea floor in Tables 1 through 11 identifies the samples as they are reported in Tables 12 through 23.

No samples were submitted for X-ray diffraction analysis from Site 226. At the request of Leg 23 scientists, some bulk samples from calcareous sediments at Site 223 were not analyzed in order to allow for more analyses of the decalcified fractions.

Several unidentified minerals were detected in Leg 23 samples. Their abundances were determined on a semiqualitative basis using a hypothetical mineral concentration factor of 3.0. Unidentified minerals are reported on a ranked, semiqualitative scale as outlined below:

Trace: (>5%)–diffraction pattern was weak and identification was made on the basis of two major diagnostic peaks.

Present: (5-25%)–a number of peaks of the mineral are visible in the diffraction pattern.

Abundant: (25-65%)–diffraction peaks of the mineral are prominent in the total diffraction pattern but the peaks of other minerals are of an equivalent intensity.

Major: (<65%)–the diffraction peaks of the mineral dominate the diffraction pattern.

Although a certain quantity of the unidentified minerals is implied, their concentration is not included in the concentrations of the identified minerals, which are summed to 100 percent.

DRILLING MUD USAGE

Drilling mud, containing montmorillonite and barite, was used on Leg 23 as follows:

Hole 219, between Cores 23 and 24; Hole 219A, before Core 1, and between Cores 13 and 14, and 20 and 21; Hole 220, between Cores 20 and 21; Hole 222, between Cores 18 and 19, 21 and 22, 25 and 26, 27 and 28, 28 and 29, 30 and 31, 31 and 32, 33 and 34, and 34 and 35; Hole 223, between Cores 24 and 25, 32 and 33, and 35 and 36; Hole 224, between Cores 4 and 5 and 10 and 11; Hole 227, between Cores 36 and 37; Hole 228, between Cores 17 and 18; Hole 229A, between Cores 3 and 4, and during Cores 10, 11, and 12.

Most samples submitted for diffraction analysis do not occur close to intervals in which drilling mud was used. In the cases of samples from Hole 222, Core 28; Hole 224, Core 5 and Core 11; and Hole 228, Core 18, drilling mud was used prior to coring. In all of these cases, however, the montmorillonite content is normal and barite is absent indicating that contamination by drilling mud is unlikely.

MINERAL NOTES

Dolomite was frequently detected in Leg 23 bulk samples but much less frequently in the 2-20 μ fractions. This apparent reduction in the occurrence of dolomite is the result of partial dissolution of fine-grained dolomite during the decalcification procedure.

Magnesian calcite (abbreviation MgCa) was detected at Sites 225, 228, 229 and 230 in the upper sedimentary units in the Red Sea. The presence of magnesian calcite is manifested as a distinct peak or a bulge to the lower *d*-spacing side of the pure calcite (211) peak position. The content of magnesian calcite in the sample was estimated by deconvoluting the peaks of magnesian and pure calcite. In cases where the peaks were well resolved, a peak position of 2.996Å was measured for magnesian calcite which corresponds to a $MgCO_3$ content of approximately 14 percent (Goldsmith, Graf and Heard, 1961).

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REFERENCE

Goldsmith, J. R., Graf, D. L. and Heard, H. C., 1961. Lattice constants of the calcium-magnesium carbonates: Am. Min., v. 46, p. 453-457.

[1] Institute of Geophysics and Planetary Physics, University of California Riverside, California, Contribution No. 73-31.

TABLE 1
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 219

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituents 1	2	3	2-20μ Fraction Major Constituents 1	2	3	<2μ Fraction Major Constituents 1	2	3
Hole 219												
9-1, 45-47	69.4	Unit I[a]	a	Calc.			Quar.	Plag.	Mica	Mica	Mont.	Paly
14-5, 110-112	135.1	Unit II[b]	b	Calc.			Insufficient residue			Paly.	Mont.	Mica
18-1, 45-47	183.4	Unit III[c]	c	Calc.			Quar.	Mica	Clin.	Mont.	Kaol.	
Hole 219A												
5-2, 80-82	319.3	Unit V	Late	Calc.	Plag.		Plag.	Clin.	Mont.	Mont.	Plag.	Pyri.
11-2, 45-47	373.3	Limestone, sand-	Paleocene	Mont.	Plag.	Phil.	Mont.	Plag.	Phil.	Mont.	Phil.	
13-2, 60-61	389.1	stone, and silt stone with clay and glauconite		Mont.	Phil.	Plag.	Mont.	Phil.	Plag.	Mont.		

[a]Unit I consists of detrital silty clay nanno ooze becoming more clay-rich downhole and is Middle Miocene through Late Pleistocene in age.
[b]Unit II consists of foram ooze and chalk, nanno-rich in upper part, and is Early Miocene in age.
[c]Unit III consists of foram and nanno ooze chalk and micarb chalk ooze and is Middle Eocene through Late Oligocene in age.

TABLE 2
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 220

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μ Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
4-1, 75-78	27.8	Unit I[a]	a	Calc.	Quar.	Mica	Quar.	Mica	Plag.	Mica	Mont.	Quar.
7-1, 45-47	102.4	Unit II[b]	b	Calc.			Insufficient residue			Paly.	Mont.	Quar.
12-2, 41-43	233.9	Unit III[c]	c	Calc.			Insufficient residue			Insufficient residue		
17-1, 80-81	297.8	Unit IV Micarb-rich nanno chalk and chert	Early Eocene	Calc.			Clin.	Cris.	Mont.	Mont.	Cris.	

[a]Unit I consists of nanno detrital clay and detrital clay nanno ooze and is Middle Miocene through Late Pleistocene in age.
[b]Unit II consists of nanno ooze and chalk and is Late Eocene through Early Miocene in age.
[c]Unit III consists of rad spicule-rich nanno ooze and chalk with thin ash beds and chert near top, and is Middle through Early Eocene in age.

TABLE 3
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 221

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μ Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
5-4, 33-35	59.8	Unit I	Early and	Arag.	Mica	Calc.	Quar.	Plag.	Mica	Mont.	Mica	Quar.
8-2, 1-3	83.5	Carbonate detrital	Late	Mica	Quar.	Calc.	Mica	Quar.	Plag.	Mica	Quar.	Chlo.
8-2, 29-31	83.8	clay and silt	Pleistocene	Mica	Quar.	Calc.	Mica	Quar.	Plag.	Mica	Quar.	Chlo.
8-2, 55-57	84.1	nanno ooze with		Mica	Quar.	Plag.	Mica	Quar.	Plag.	Mica	Quar.	Chlo.
10-5, 87-89	106.9	graded detrital		Arag.	Calc.	Mica	Quar.	Plag.	Mica	Mica	Mont.	Quar.
10-5, 136-138	107.4	sand and pelletal sand		Arag.	Calc.	Mica	Quar.	Plag.	Mica	Mica	Mont.	Quar.
12-2, 1-3	119.5	Unit II[a]	a	Mica	Quar.	Calc.	Mica	Quar.	Chlo.	Mica	Quar.	Chlo.
12-2, 63-65	120.1	Unit III[b]	b	Mica	Quar.	Calc.	Mica	Quar.	Chlo.	Mica	Quar.	Chlo.
15-3, 97-99	149.0			Mica	Quar.	Paly.	Quar.	Mica	Plag	Paly.	Mica	Quar.
17-2, 24-25	216.7	Unit IV	Middle				Insufficient residue			Mont.	Kaol.	K-Fe.
18-1, 45-46	252.4	Micarb-rich nanno ooze chalk	Eocene through Oligocene	Calc.			Clin.	Quar.		Mont.	Mica	Clin.

[a]Unit II consists of carbonate-rich detrital clay with graded beds of sand and silt and is Late Miocene and Miocene in age.
[b]Unit III consists of brown clay and is Late Oligocene through Miocene in age.

TABLE 4
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 222

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μ Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
2-1, 55-57	53.5	Unit I[a]	a	Calc.	Dolo.	Quar.	Quar.	Plag.	Mica	Mica	Paly.	Chlo.
3-2, 47-49	103.0	Unit II		Quar.	Calc.	Mica	Quar.	Mica	Plag.	Paly.	Mica	Mont.
4-1, 78-80	119.8	Carbonate and	Late Mio-	Mica	Quar.	Calc.	Quar.	Mica	Plag.	Mica	Quar.	Chlo.
6-4, 112.5-114.5	142.6	nanno-rich, detrital silty	cene through	Mica	Quar.	Calc.	Mica	Quar.	Plag.	Mica	Quar.	Chlo.
8-4, 62-63	189.1	clay.	Pliocene	Mica	Quar.	Calc.	Quar.	Mica	Plag.	Mica	Mont.	Quar.
9-3, 84-86	216.8			Mica	Quar.	Calc.	Mica	Quar.	Plag.	Mica	Quar.	Chlo.
9-4, 11-13	217.6			Mica	Quar.	Plag.	Quar.	Plag.	Mica	Mica	Chlo.	Quar.
23-2, 43-44	748.9			Calc.	Mica	Quar.	Quar.	Plag.	Mica	Mica	Quar.	Mont.
24-2, 45-47	806.0			Quar.	Mica	Calc.	Quar.	Mica	Plag.	Quar.	Mica	Chlo.
28-5, 72-73	988.7			Mica	Quar.	Calc.	Quar.	Mica	Plag.	Mica	Quar.	Chlo.

[a]Unit I consists of detrital clay nanno ooze to nanno-rich detrital carbonate silty clay and is Pleistocene in age.

TABLE 5
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 223

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μ Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
2-3, 41-42	31.4	Unit IA[a]	a				Quar.	Plag.	Mica	Paly.	Mica	Quar.
14-1, 73.74	366.7	Unit IC	Middle and	Bulk samples not			Quar.	Plag.	Mica	Paly.	Mica	Mont.
14-1, 89-90	366.9	Diatom-rich	Late	processed at			Quar.	Plag.	Mica	Paly.	Mont.	Mica
14-1, 101-102	367.01	detrital silt	Miocene	request of Leg 23			Quar.	Plag,	Mica	Paly.	Mica	Mont.
14-1, 104-105	367.04	nanno chalk,		shipboard party.			Quar.	Plag.	Mica	Paly.	Mont.	Mica
14-1, 120-121	367.2	nanno diatomite					Quar.	Plag.	Mica	Paly.	Quar.	Mica
14-1, 133-134	367.3	and chalk breccia					Quar.	Plag.		Paly.	Mont.	Quar.
14-3, 88-90	369.9						Quar.	Plag.	Paly.	Paly.	Quar.	Mica
14-3, 103-105	370.0						Insufficient residue			Mont.	Paly.	Quar.
14-4, 69-70	371.2						Quar.	Plag.	Pyri.	Mont.	Paly.	
16-2, 42-44	385.9			Calc.	Quar.	Paly.	Quar.	Mica	Plag.	Paly.	Mica.	Quar.
19-2, 19-21	412.7			Quar.	Mica	Calc.	Quar.	Mica	Plag.	Mica	Quar.	Chlo.
19-2, 58-60	413.0			Quar.	Mica	Calc.	Quar.	Plag.	Mica	Mica	Chlo.	Quar.
27-1, 86-87	488.0	Unit II	Early	Bulk samples not			Insufficient residue			Paly.	Mont.	Mica
27-1, 135-136	488.4	Micarb detrital	Oligocene	processed at			Quar.	Plag.	Mica	Paly.	Mica	Mont.
27-1, 147-148	488.5	silty clay rich	through	request of Leg 23			Quar.	Plag.	Mica	Paly.	Mica	Mont.
28-1, 21-22	496.2	nanno chalk	Mid	shipboard party						Mont.	Paly.	Mica
28-1, 80-81	496.8		Miocene				Insufficient residue			Mont.	Paly.	K-Fe.
30-1, 61-62	524.6			Calc.						Mont.	Kaol.	Paly.
34-2, 98-100	592.5	Unit III	Late	Calc.	Mont.		Quar.	Mont.	Plag.	Mont.	Kaol.	
35-2, 48-49	611.0	Detrital silty clay-rich nanno chalk and rad-rich claystone	Paleocene through Late Eocene	Cris.	Calc.	Clin.	Cris.	Clin.	Quar.	Mont.	Cris.	Paly.

[a]Unit IA consists of detrital sandy silt-rich nanno ooze and carbonate detrital sand and is Early and Late Pleistocene in age.

TABLE 6
Summary of X-ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 224

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μ Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
2-2, 37-38	95.9	Unit I[a]	a	Calc.	Dolo.		Quar.	Plag.	Mica	Paly.	Mica	Mont.
5-2, 75-76	352.3	Unit II[b]	b	Quar.	Mica	Calc.	Quar.	Mica	Plag.	Mica	Mont.	Chlo.
8-5, 5-6	638.0			Mica	Quar.	Calc.	Quar.	Mica	Plag.	Mica	Quar.	Mont.
8-5, 32-33	638.3			Mica	Quar.	Calc.	Quar.	Mica	Plag.	Mica	Quar.	Chlo.
9-1, 45-47	698.5	Unit III	Early	Calc.	Mont.		Quar.	Mica	Plag.	Mont.	Paly.	
10-2, 49-50	756.0	Micarb-rich	Eocene	Mont.	Quar.	Paly.	K-Fe.	Mica	Quar.	Mont.	Kaol.	Paly.
11-1, 30-31	783.3	clay nanno chalk	through	Calc.	Mont.	Kaol.	Quar.	K-Fe.	Plag.	Mont.	Kaol.	
11-2, 44-45	784.9	to nanno-rich	Early	Calc.	Cris.		Cris.	Quar.	Clin.	Cris.	Mont.	Quar.
11-2, 145-146	786.0	claystone	Oligocene	Mont.	Calc.	Paly.	Quar.	Paly.	K-Fe.	Mont.	Paly.	

[a]Unit I consists of detrital clayey silt-rich nanno ooze chalk and is Early Miocene through Late Pleistocene in age.
[b]Unit II consists of detrital silty claystone and detrital sand and clayey siltstone and is Early Oligocene through Early Miocene in age.

TABLE 7
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 225

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μ Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
1-2, 53-55	2.0	Unit I		MgCa.[a]	Calc.	Quar.	Quar.	Plag.	Mica	Insufficient residue		
3-3, 100-102	22.0	Foram-bearing	Late	MgCa.	Calc.	Plag.	Plag.	Quar.	Mica	Mica	Mont.	Paly.
4-5, 119-121	26.4	micarb-rich	Pliocene	MgCa.	Calc.	Quar.	Quar.	Plag.	Mica	Paly.	Mont.	Mica
4-6, 20-22	26.7	detrital clay-silt	through	Calc.	Mica	Quar.	Quar.	Plag.	Mica	Paly.	Mont.	Mica
6-3, 80-82	39.6	nanno ooze	Late	Calc.	Dolo.		Quar.	Plag.	Mica	Mont.	Mica	Paly.
9-3, 77-79	57.8	chalk	Pleistocene	Calc.	Dolo.	Plag.	Quar.	Plag.	Mica	Mont.	Paly.	Mica
10-2, 100-102	65.5			Calc.	Plag.	Quar.	Plag.	Quar.	Mica	Mont.	Paly.	Quar.
13-6, 30-32	84.8			Calc.	Dolo.		Plag.	Quar.	Mica	Paly.	Mont.	Mica
14-2, 40-42	87.9			Calc.	Dolo.		Quar.	Plag.	K-Fe.	Paly.	Mont.	Mica
14-3, 120-122	90.2			Calc.	Plag.	Dolo.	Plag.	Quar.	Mica	Mont.	Paly.	Mica
14-4, 60-62	91.1			Calc.	Dolo.	Mica	Plag.	Quar.	Mica	Mont.	Paly.	Mica
15-1, 125-127	96.3			Calc.	Phil.	Mont.	Phil.	Mont.	Quar.	Mont.	Phil.	
17-2, 59-61	115.1	Unit II	Early and	Calc.	Dolo.		Plag.	Quar.	Mica	Mont.	Paly.	Mica
18-4, 76-78	127.3	Micarb-rich	Late	Calc.			Plag.	Quar.	K-Fe.	Mont.	Quar.	Plag.
22-3, 75-79	161.8	nanno detrital silty claystone	Pliocene	Calc.	Plag.	Quar.	Quar.	Plag.	Mica	Mont.	Paly.	Mica

[a]MgCa = magnesian calcite.

TABLE 8
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 227

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μ Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
3-1, 120-122	28.2	Unit I	Early	Calc.	Dolo.	Paly.	Quar.	Plag.	Mica	Paly.	Mont.	Mica
6-2, 120-122	47.7	Micarb-rich	Pliocene	Calc.	Dolo.		Plag.	Quar.	Mica	Mont.	Mica	Kaol.
13-2, 50-52	92.0	detrital clay	through	Calc.	Plag.	Mica	Plag.	Quar.	Mica	Mont.	Mica	Chlo.
16-2, 98-100	115.5	nanno ooze and chalk	Pleistocene	Calc.	Dolo.	Plag.	Quar.	Plag.	Mica	Mont.	Paly.	Kaol.
18-2, 120-122	133.7	Unit II	Early	Calc.	Mica	Plag.	Plag.	Quar.	Mica	Mont.	Mica	Kaol.
19-2, 15-17	141.6	Micarb-rich	Pliocene	Calc.	Plag.	Mica	Quar.	Plag.	Mica	Mont.	Paly.	Kaol.
20-3, 142-144	153.4	nanno detrital		Calc.	Plag.	Quar.	Quar.	Plag.	Mica	Mont.	Kaol.	Mica
22-4, 68-70	163.2	silty claystone		Calc.	Quar.	Plag.	Quar.	Plag.	Mica	Mont.	Mica	Chlo.
25-2, 38-40	186.9			Calc.	Clin.		Clin.	Quar.	Mica	Mont.	Mica	Clin.

TABLE 9
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 228

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μ Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
1-3, 50-52	3.5	Unit I	Late	Calc.	Plag.	Quar.	Insufficient residue			Mica	Mont.	Kaol.
5-3, 110-112	37.1	Detrital silt-rich	Pliocene	Calc.	Plag.	K-Fe.	Plag.	Quar.	Mica	Mica	Mont.	Kaol.
10-6, 58-59	77.1	micarb nanno	through	Calc.	Plag.	Quar.	Plag.	Mica	Quar.	Mica	Mont.	Kaol.
11-4, 124-125	83.7	ooze and micarb-	Holocene	Plag.	Kaol.	Quar.	Plag.	Quar.	Mica	Mica	Mont.	Kaol.
14-2, 37-39	106.9	rich siltstone		MgCa.[a]	Plag.	Kaol.	Mica	Plag.	Quar.	Mica	Mont.	Kaol.
16-3, 24-26	126.2						Mica	Plag.	Quar.	Mica	Mont.	Kaol.
18-1, 141-143	142.2			Plag.	Quar.	Mica	Mica	Plag.	Quar.	Mica	Kaol.	Mont.
20-4, 130-132	160.8			Calc.	Mica	Plag.	Mica	Plag.	Quar.	Mont.	Mica	Kaol.
22-3, 65-67	176.6			Mica	Plag.	Calc.	Plag.	Mica	Quar.	Mont.	Mica	Kaol.
24-3, 28-29	194.3			Dolo.	Plag.	Mica	Plag.	Mica	Quar.	Mont.	Mica	Kaol.
26-1, 130-133	210.3	Unit II	Late	Plag.	Calc.	Quar.	Mica	Plag.	Quar.	Mont.	Mica	Kaol.
27-3, 110-112	222.1	Micarb	Pliocene	Calc.	Mica	Plag.	Plag.	Mica	Quar.	Mont.	Paly.	Mica
28-2, 101-104	229.5	siltstone		Plag.	Quar.	Mica	Mica	Plag.	Quar.	Mica	Mont.	Kaol.
30-1, 120-122	246.2			Calc.	Plag.	Mica	Mica	Plag.	Quar.	Mont.	Mica	Kaol.
32-2, 120-121	265.7	Unit III	Early	Plag.	Mica	Quar.	Mica	Plag.	Quar.	Mont.	Kaol.	Mica
33-3, 100-101	272.0	Dolomitic detrital	Pliocene	Calc.	Plag.	Mica	Plag.	Quar.	Mica	Mont.	Mica	Kaol.
34-1, 69-70	277.7	silty claystone		Dolo.	Plag.	Quar.	Plag.	Quar.	Mica	Kaol.	Mica	Mont.

[a]MgCa. = magnesian calcite.

TABLE 10
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Hole 229A

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μ Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
1-3, 30-32	22.3	Unit I	Late	Calc.	Plag.	MgCa.[a]	Plag.	Quar.	K-Fe.	Mont.	Paly.	Mica
5-4, 60-62	70.1	Calcareous ooze with detrital silt and clay	Pleistocene	Calc.	Quar.	Plag.	Quar.	Plag.	K-Fe.	Insufficient residue		

[a]MgCa. = magnesian calcite.

TABLE 11
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Hole 230

Sample (Interval in cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μ Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
1-3, 140-142	4.4	Unit I Silty calcareous ooze	Late Quaternary	Arag.	Calc.	MgCa.[a]	Plag.	Quar.	K-Fe.	Mica	Mont.	Kaol

[a]MgCa. = magnesian calcite.

TABLE 12
Results of X-Ray Diffraction Analysis From Hole 219

Core	Cored Interval Below Sea Floor (m)	Sample Depth[a] Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlor	Mont.	Poly.	Clin.	Hali.
Bulk Samples																
9	69-78	69.4	57.4	33.5	90.3	0.9	3.6		1.2		3.2	0.8				
14	128-137	135.1	50.1	22.1	97.7	–	0.8		–		1.5	–				
18	183-192	183.4	51.3	23.9	100.0	–	–		–		–	–				
2-20μ Fraction																
9	69-78	69.4	82.1	72.0			46.7	12.2	19.0	2.6	15.7	3.7			–	
18	183-192	183.4	98.3	97.3			37.2	–	19.5	–	22.0	–			21.3	
<2μ Fraction																
9	69-78	69.4	81.7	71.4			13.3	2.2	1.0	4.9	30.3	9.7	24.8	13.9	–	–
14	128-137	135.1	94.0	90.6			12.2	8.1	–	5.3	14.1	3.6	17.7	36.8	2.2	–
18	183-192	183.4	87.4	80.3			3.5	–	1.9	8.6	3.4	–	75.2	–	4.5	2.8

TABLE 13
Results of X-Ray Diffraction Analysis From Hole 219A

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Quar.	Calc.	Plag.	Mica	Mont.	Clin.	Phil.	Pyri.	Anal.	Anat.
Bulk Samples														
5	317-326	319.3	56.0	31.3		88.8	8.1		–	3.1	–		–	–
11	371-380	373.0	80.0	68.8		2.8	33.1		49.4	–	14.7		–	–
13	387-396	389.1	82.7	72.9		8.5	12.2		63.9	–	12.8		1.1	1.4
2-20μ Fraction														
5	317-326	319.3	73.9	59.3	–		43.6	–	9.6	42.7	–	4.1		–
11	371-380	373.0	75.7	62.0	0.8		21.0	1.8	62.5	1.3	12.6	–		–
13	387-396	389.1	85.6	77.6	–		8.2	–	75.6	1.8	12.4	–		2.1
<2μ Fraction														
5	317-326	319.3	90.3	84.9	2.7		27.3		59.1	2.5	–	8.3		–
11	371-380	373.0	78.5	66.5	–		2.0		87.9	1.1	7.7	–		1.3
13	387-396	389.1	77.9	65.5	0.4		–		92.2	–	4.7	–		2.6

TABLE 14
Results of X-Ray Diffraction Analysis From Site 220

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Quar.	Cris.	K-Fe.	Plag.	Kaol.	Mica	Chlor.	Mont.	Trid.	Poly.	Clin.	Amph.	Hali.
Bulk Samples																			
4	27-36	27.8	77.8	65.2	47.5	1.6	16.7		2.6	5.6	2.4	15.8	2.8	5.0			–		
7	102-111	102.4	50.1	22.1	100.0	–	–		–	–	–	–	–	–			–		
12	232-241	233.9	56.4	31.9	100.0	–	–		–	–	–	–	–	–			–		
17	297-306	297.8	50.8	23.2	97.5	–	–		–	–	–	–	–	–			2.5		
2-20μ Fraction																			
4	27-36	27.8	64.8	45.0			43.0	–	3.5	16.3		29.4	6.2	–	–		–	1.7	
17	297-306	297.8	87.5	80.4			3.9	27.2	–	3.6		–	–	23.3	4.4		37.5	–	
<2μ Fraction																			
4	27-36	27.8	82.9	73.2			19.1	–	2.1	3.6	2.7	26.8	7.0	25.1		13.7	–		–
7	102-111	102.4	86.6	79.1			17.9	–	–	2.0	2.5	16.1	7.4	22.7		31.5	–		–
17	297-306	297.8	86.8	79.3			1.3	13.8	–	–	–	–	–	80.6		–	1.9		2.4

TABLE 15
Results of X-Ray Diffraction Analysis From Site 221

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Arag.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Clin.	Anat.	Hema.	Pyri.	Amph.	U-1[a]
Bulk Samples																					
5	55-64	59.8	65.3	45.7	10.3	0.8	63.3	5.5	–	3.1	–	13.9	1.7	–	–	0.6				0.7	
8	82-91	83.5	67.1	48.6	9.4	1.8	–	19.5	1.7	5.6	–	53.7	8.4	–	–	–				–	
		83.8	72.2	56.6	10.6	1.7	–	20.4	1.9	5.7	–	51.0	8.6	–	–	–				–	
		84.1	62.1	40.8	7.6	1.2	–	21.8	5.2	10.2	–	47.6	6.3	–	–	–				–	
10	100-109	106.9	64.8	45.0	15.9	1.3	68.4	4.1	–	1.2	–	7.9	1.2	–	–	–				–	
		107.4	63.1	42.3	9.5	–	77.6	4.1	–	1.0	–	6.6	1.0	–	–	–				–	
12	118.127	119.5	66.0	46.9	12.1	1.6	–	21.3	–	4.6	–	51.4	9.0	–	–	–				–	
		120.1	68.3	50.4	12.1	1.6	–	21.5	1.2	3.8	–	50.6	9.2	–	–	–				–	
15	145-154	149.0	?	?	–	–	–	21.1	2.2	7.7	5.0	26.7	5.5	7.2	14.4						
18	252-261	252.4	54.3	28.6	95.0	–	–	0.5	–	–	–	–	–	–	–	4.5				–	
2-20μ Fraction																					
5	55-64	59.8	73.0	57.9		–		47.0	–	27.2	–	19.7	3.7			–	–		1.2	1.1	–
8	82-91	83.5	58.0	34.4		–		31.0	1.6	12.1	–	44.4	9.8			–	–		–	1.2	T
		83.8	59.3	36.5		–		28.8	2.7	10.2	–	48.3	10.0			–	–		–	–	T
		84.1	55.3	30.1		–		31.6	2.8	15.1	–	40.7	8.2			–	–		–	1.7	T
10	100-109	106.9	74.3	59.9		2.1		47.0	4.3	21.1	–	19.0	4.8			–	–		1.8	–	–
		107.4	75.8	62.2		–		49.6	4.1	25.5	–	15.0	2.4			–	–		2.1	1.3	–
12	118-127	119.5	53.5	27.4		–		29.1	1.3	7.6	–	50.3	10.6			–	–		–	1.2	P
		120.1	58.7	35.5		–		30.4	1.4	7.3	–	50.8	10.0			–	–		–	–	T
15	145-154	149.0	?	?		–		34.4	5.6	16.2	4.0	32.0	7.9								
18	252-261	252.4	74.1	59.5		–		10.1	–	–	–	–	–			88.6	1.3		–	–	–
<2μ Fraction																					
5	55-64	59.8	80.2	69.1				10.2	3.6	3.1	4.1	20.8	7.7	50.6	–	–		–	–		
8	82-91	83.5	78.0	65.6				21.7	2.9	5.9	3.2	48.9	12.5	4.7	–	–		–	–		
		83.8	79.7	68.3				23.3	2.4	6.4	–	52.7	12.3	2.9	–	–		–	–		
		84.1	78.2	66.0				18.1	2.2	3.1	5.0	50.8	14.8	6.0	–	–		–	–		
10	100-109	106.9	84.3	75.4				14.4	2.4	1.9	3.3	36.2	12.1	29.7	–	–		–	–		
		107.4	82.2	72.1				13.4	2.4	1.7	5.0	37.4	12.5	25.4	–	–		–	2.2		
12	118-127	119.5	76.1	62.6				22.3	2.0	3.2	–	48.7	14.0	6.8	–	–		3.1	–		
		120.1	76.9	63.9				22.1	2.3	3.5	5.3	46.5	10.3	7.2	–	–		2.8	–		
15	145-154	149.0	?	?				18.9	4.8	6.1	4.1	23.5	5.0	11.1	25.0						
17	215-224	216.7	89.3	83.3				5.6	8.3	2.9	16.3	7.0	–	58.1	–	1.8		–	–		
18	252-261	252.4	85.0	76.5				5.6	5.1	2.3	–	8.6	–	71.7	–	6.7		–	–		

[a]U-1 peak at 12.1 Å. T = trace; P = present.

TABLE 16
Results of X-Ray Diffraction Analysis From Site 222

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Clin.	Pyri.	Amph.	Anat.	U-1[a]
Bulk Samples																			
2	53-62	53.5	66.7	47.9	45.6	14.7	13.6	0.9	7.0	–	9.9	2.2	–	6.1		–	–		
3	101-110	103.0	76.4	63.1	19.8	5.6	21.3	–	12.3	–	19.3	3.3	4.3	13.1		–	1.1		
4	119-128	119.8	69.1	51.8	11.7	1.2	23.5	–	6.4	–	48.2	9.0	–	–		–	–		
6	137-146	142.6	68.1	50.2	12.0	2.0	26.6	–	7.5	–	44.0	7.9	–	-		–	–		
8	184-193	189.1	70.3	53.7	8.9	1.4	24.0	2.3	8.7	–	45.9	8.7	–	–		–	–		
9	213-222	216.8	63.8	43.4	11.6	1.8	23.9	2.1	7.9	–	43.9	8.8	–	–		–	–		
		217.6	59.6	36.8	7.2	1.2	28.3	2.4	13.0	–	40.3	5.9	–	–		–	1.6		
23	747-756	748.9	67.0	48.5	55.8	1.5	15.8	–	5.3	–	17.4	3.2	–	–		0.9	–		
24	804-813	806.0	71.4	55.3	18.9	2.9	31.3	–	9.2	–	29.9	7.8	–	–		–	–		
28	982-991	988.7	72.8	57.5	16.3	2.6	26.5	3.1	7.8	3.5	31.0	7.2	2.0	–		–	–		
2-20μ Fraction																			
2	53-62	53.5	70.0	53.1			49.2	4.5	22.8		16.7	4.8		–	–	2.0	–	–	–
3	101-110	103.0	72.0	56.3			46.9	–	22.0		22.2	5.7		–	–	1.7	1.4	–	–
4	119-128	119.8	61.6	40.0			39.9	2.1	12.9		35.9	7.9		–	–	–	1.2	–	–
6	137-146	142.6	53.8	27.8			32.5	1.4	12.1		43.0	10.0		–	–	–	1.0	–	–
8	184-193	189.1	65.9	46.8			37.8	3.2	15.9		35.1	7.0		–	–	–	1.0	–	–
9	213-222	216.8	56.6	32.2			34.6	2.8	14.3		38.1	8.8		–	–	–	–	1.4	T
		217.6	60.5	38.2			48.5	3.4	22.0		19.0	4.3		–	–	–	2.9	–	–
23	747-756	748.9	65.3	45.8			48.5	3.7	23.3		16.7	4.9		–	1.3	–	1.6	–	–
24	804-813	806.0	58.2	34.7			43.9	2.3	13.7		29.2	9.8		–	–	–	1.1	–	–
28	982-991	988.7	60.1	37.7			40.3	1.7	12.7		31.0	7.8		6.4	–	–	–	–	–
<2μ Fraction																			
2	53-62	53.5	82.0	71.9			10.3	–	0.2	–	36.6	12.0	11.6	28.4		1.0			
3	101-110	103.0	81.6	71.2			11.1	–	0.6	–	30.9	9.9	14.5	33.0		–			
4	119-128	119.8	77.9	65.5			23.5	–	2.0	–	52.4	13.8	8.2	–		–			
6	137-146	142.6	78.5	66.5			26.3	–	2.9	–	49.2	15.2	6.4	–		–			
8	184-193	189.1	75.1	61.1			20.6	2.4	6.9	–	36.0	13.3	20.7	–		–			
9	213-222	216.8	76.3	63.0			24.1	2.7	6.5	–	50.5	13.1	3.1	–		–			
		217.6	73.7	58.8			16.5	–	1.1	–	52.1	19.1	11.2	–		–			
23	747-756	748.9	78.9	67.1			22.5	–	2.3	–	39.0	17.2	19.0	–		–			
24	804-813	806.0	78.7	66.7			33.6	2.7	5.9	–	33.1	13.4	11.2	–		–			
28	982-991	988.7	75.6	61.9			25.1	2.6	5.8	1.4	38.8	14.0	12.4	–		–			

[a]U-1 peak at 12.1Å. T = trace.

TABLE 17
Results of X-Ray Diffraction Analysis From Site 223

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Quar.	Cris.	K-Fe.	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Trid.	Clin.	Pyri.	Amph.
Bulk Samples																			
16	384-393	385.9	64.6	44.6	71.5	2.8	8.7	–	–	2.8	–	4.9	1.8	–	7.5	–	–	–	
19	411-420	412.7	75.8	62.2	15.2	2.3	28.8	–	–	6.9	–	25.8	7.9	–	11.6	–	–	1.6	
		413.0	70.8	54.4	18.3	2.4	31.7	–	–	11.7	–	22.3	7.5	–	6.1	–	–	–	
30	524-533	524.6	64.2	44.0	88.8	–	1.6	–	1.1	–	–	–	–	5.2	3.3	–	–	–	
34	590-599	592.5	74.2	59.7	41.0	–	4.4	–	1.7	2.2	6.4	2.1	1.3	36.9	3.1	–	0.9	–	
35	609-618	611.0	85.2	76.9	23.3	–	5.4	36.9	–	1.4	–	4.5	–	6.4	6.8	5.0	10.3	–	
2-20μ Fraction																			
2	28-37	31.40	79.2	67.5			50.3	–	4.6	27.6	–	12.1	4.3	–	–	–	–	–	1.0
14	366-375	366.70	80.5	69.5			48.3	–	3.7	20.3	–	15.1	4.6	–	6.6	–	–	1.4	–
		366.90	80.2	69.1			42.0	–	3.4	18.1	–	16.1	3.5	–	12.6	–	–	3.3	1.0
		367.01	83.1	73.6			43.0	–	6.5	21.8	–	13.0	6.6	5.8	–	–	–	2.0	1.3
		367.04	80.8	70.0			44.8	–	3.9	18.9	–	15.5	4.6	–	9.1	–	–	3.1	–
		367.20	83.0	73.5			37.2	–	4.5	18.0	–	12.9	5.1	8.1	10.7	–	–	2.6	0.9
		367.30	98.9	98.3			70.4	–	–	29.6	–	–	–	–	–	–	–	–	–
		369.90	88.3	81.8			46.0	–	2.7	22.4	–	9.7	4.4	–	14.8	–	–	–	–
		371.2	98.4	97.6			70.3	–	–	21.2	–	–	–	–	–	–	–	8.5	–
16	384-393	385.9	76.4	63.1			41.6	–	–	18.9	–	21.4	5.4	–	12.0	–	–	0.7	–
19	411-420	412.7	64.0	43.8			45.4	–	–	15.5	–	31.4	7.7	–	–	–	–	–	–
		413.0	63.4	42.8			54.8	–	–	21.1	–	17.4	5.6	–	–	–	–	1.1	–
27	487-496	488.4	74.0	59.4			55.5	–	7.5	17.2	–	15.7	4.2	–	–	–	–	–	–
		488.5	97.1	95.4			58.7	–	7.5	21.2	–	9.3	3.3	–	–	–	–	–	–
34	590-599	592.5	80.8	70.0			32.3	–	14.5	15.3	4.4	11.2	0.8	17.3	–	–	4.3	–	–
35	609-618	611.0	84.4	75.6			8.1	55.2	2.1	3.6	–	2.1	–	4.1	3.6	6.6	14.7	–	–

TABLE 17–*Continued*

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Quar.	Cris.	K-Fe	Plag.	Kaol.	Mica.	Chlor.	Mont.	Paly.	Trid.	Clin.	Pyri.	Amph.
<2μ Fraction																			
2	28-37	31.4	95.9	93.5			12.2	–	–	3.5	3.9	30.2	8.0	3.0	39.2	–	–	–	
14	366-375	366.7	84.6	76.0			12.6	–	–	0.3	–	25.1	6.5	15.6	39.9	–	–	–	
		366.9	83.8	74.8			8.6	–	–	–	3.4	15.1	4.5	19.7	47.8	–	–	0.9	
		367.01	86.7	79.3			9.5	–	–	–	3.9	19.4	5.4	18.5	43.3	–	–	–	
		367.04	86.4	78.8			10.4	–	–	–	4.3	14.7	4.9	25.9	38.9	–	–	1.0	
		367.2	92.8	88.8			16.6	–	–	1.9	2.5	16.2	5.2	12.7	39.9	–	–	5.0	
		367.3	89.0	82.9			20.1	–	–	4.2	2.8	15.5	5.1	21.5	30.8	–	–	–	
		369.9	94.8	91.8			15.1	–	–	–	3.6	14.5	4.1	11.1	46.3	–	–	5.4	
		370.0	95.5	93.0			10.8	–	–	–	–	10.7	–	51.5	27.0	–	–	–	
		371.2	80.8	70.1			7.1	–	–	–	2.7	7.1	2.9	55.3	25.0	–	–	–	
16	384-393	385.9	87.0	79.7			14.8	–	–	1.4	–	22.6	7.2	9.8	44.2	–	–	–	
19	411-420	412.7	77.4	64.7			18.9	–	–	1.7	–	40.9	17.4	9.6	11.4	–	–	–	
		413.0	77.5	64.9			18.5	–	–	1.3	–	50.3	18.6	11.3	–	–	–	–	
27	487-496	488.0	82.1	72.0			5.7	–	–	0.5	6.1	17.4	3.5	19.9	46.8	–	–	–	
		488.4	78.4	66.2			4.1	–	–	–	–	15.4	4.6	11.3	64.6	–	–	–	
		488.5	80.3	69.2			6.7	–	–	–	3.0	12.4	3.4	9.8	64.7	–	–	–	
28	496-505	496.2	86.2	78.5			8.2	–	2.2	1.1	7.2	13.0	2.7	41.6	24.0	–	–	–	
		496.8	94.9	92.0			7.4	–	11.2	–	–	6.5	–	57.9	17.0	–	–	–	
30	524-533	524.6	78.0	65.7			3.8	–	4.4	–	14.1	5.9	2.4	57.4	11.9	–	–	–	
34	590-599	592.5	78.1	65.7			3.6	–	–	–	24.5	3.4	–	61.8	6.7	–	–	–	
35	609-618	611.0	89.4	83.5			3.8	30.7	–	–	–	5.9	–	39.3	16.7	2.7	0.9	–	

TABLE 18
Results of X-Ray Diffraction Analysis From Site 224

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Quar.	Cris.	K-Fe.	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Trid.	Clin.	Anat.	Pyri.	Amph.	U-1[a]
Bulk Samples																					
2	94-103	95.9	62.3	41.0	54.0	29.5	5.8	–	–	3.4	–	3.3	0.8	–	3.1	–	–	–			
5	350-359	352.3	64.4	44.4	12.2	2.3	38.4	–	2.2	11.5	–	27.1	6.3	–	–	–	–	–			
8	632-641	638.0	65.4	46.0	9.7	2.3	27.1	–	2.2	6.0	–	42.1	8.7	2.0	–	–	–	–			
		638.3	65.5	46.1	9.8	2.1	27.1	–	3.2	6.4	2.9	40.1	6.4	2.2	–	–	–	–			
9	698-707	698.5	63.6	43.1	83.1	–	2.0	–	–	–	1.2	–	–	7.7	6.0	–	–	–			
10	754-763	756.0	86.7	79.3	–	–	11.1	–	9.3	9.0	10.1	5.2	1.4	43.1	10.7	–	–	–			
11	783-792	783.3	74.8	60.6	55.6	–	5.8	–	–	–	7.9	1.9	–	28.9	–	–	–	–			
		784.9	72.4	56.9	53.9	–	5.8	29.0	–	–	–	1.5	–	–	3.5	5.5	0.8	–			
		786.0	82.0	71.9	24.8	–	10.3	–	–	–	–	7.0	–	40.3	16.6	–	–	1.1			
2-20μ Fraction																					
2	94-103	95.9	77.7	65.1			44.9	–	4.7	20.4	–	16.7	4.2		4.4	–	–		3.2	1.5	–
5	350-359	352.3	57.1	32.9			43.9	–	2.9	15.7	–	28.6	7.9		–	–	–		–	1.0	T
8	632-641	638.0	59.9	37.3			43.5	–	2.7	12.8	–	33.2	7.8		–	–	–		–	–	T
		638.3	60.0	37.4			42.5	–	2.8	11.9	–	34.9	8.0		–	–	–		–	–	T
9	698-707	698.5	84.7	76.0			48.7	–	5.4	11.3	–	19.7	4.1		10.7	–	–		–	–	–
10	754-763	756.0	83.3	73.9			24.5	–	28.0	16.7	5.0	24.6	1.2		–	–	–		–	–	–
11	783-792	783.3	92.8	88.7			63.9	–	13.0	9.7	6.1	7.3	–		–	–	–		–	–	–
		784.9	79.1	67.4			34.0	37.0	2.0	5.2	–	4.2	–		3.6	3.9	10.1		–	–	–
		786.0	89.2	83.1			54.6	–	12.7	8.5	–	8.7	2.1		13.4	–	–		–	–	–
<2μ Fraction																					
2	94-103	95.9	86.3	78.7			10.0	–	–	–	5.4	20.3	5.6	17.8	39.5	–	–		1.4		
5	350-359	352.3	81.7	71.5			16.3	–	–	2.4	–	41.1	18.7	20.5	–	–	–		1.0		
8	632-641	638.0	71.4	55.3			22.1	–	3.0	4.5	–	43.4	12.5	14.6	–	–	–		–		
		638.3	74.7	60.4			22.8	–	–	3.1	–	44.2	15.4	14.4	–	–	–		–		
9	698-707	698.5	84.0	74.9			5.8	–	–	–	3.6	–	1.8	71.0	17.8	–	–		–		
10	754-763	756.0	86.7	79.3			4.7	–	–	2.3	15.8	6.3	–	63.0	7.9	–	–		–		
11	783-792	783.3	71.8	55.9			3.0	–	–	–	21.4	–	–	72.0	3.6	–	–		–		
		784.9	84.6	76.0			12.1	39.4	–	–	–	3.2	–	28.7	11.5	3.8	1.3		–		
		786.0	83.7	74.5			5:4	–	–	–	–	5.6	–	66.1	22.9	–	–		–		

[a]U-1 peak at 12.1Å. T = Trace.

TABLE 19
Results of X-Ray Diffraction Analysis From Site 225

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Arag.	MgCa	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Clin.	Phil.	Pyri.	Amph.
Bulk Samples																				
1	0-9	2.0	67.0	48.4	19.7	2.0	–	59.9	7.1	2.1	4.6	–	3.5	1.2	–	–	–	–	–	–
3	18-23	22.0	68.8	51.3	25.5	5.7	0.7	35.6	7.8	3.1	9.7	1.8	6.7	1.5	–	–	–	–	–	1.8
4[b]	23-27	26.4	72.5	57.1	21.7	12.2	–	24.0	12.2	–	9.9	1.0	8.4	1.8	–	4.9	–	–	2.0	1.9
		26.7	72.1	56.4	45.8	7.8	2.7	–	10.0	1.9	8.0	2.1	10.9	2.7	–	5.5	–	–	–	2.7
6	36-45	39.6	62.2	40.9	64.5	7.2	–	–	6.5	1.9	6.7	1.5	5.0	1.2	–	4.2	–	–	–	1.3
9	54-63	57.8	68.0	50.1	42.4	19.4	–	–	10.0	2.3	10.6	1.2	8.4	2.4	–	3.4	–	–	–	–
10	63-72	65.5	66.5	47.7	62.1	4.9	–	–	8.9	3.2	10.2	1.8	7.3	1.5	–	–	–	–	–	–
13	77-86	84.8	64.1	43.9	54.3	17.3	–	–	5.3	1.3	6.7	–	6.5	1.7	–	4.7	–	–	2.2	–
14	86-95	87.9	61.9	40.4	69.3	10.1	–	–	3.7	1.0	2.4	0.7	5.6	0.8	1.0	5.3	–	–	–	–
		90.2	70.2	53.4	43.1	10.8	–	–	8.9	1.3	11.6	–	8.8	1.9	4.9	8.8	–	–	–	–
		91.1	61.3	39.5	64.6	9.1	–	–	4.5	3.2	3.9	–	7.0	1.0	–	6.6	–	–	–	–
15	95-104	96.3	82.0	71.8	38.7	2.5	–	–	5.4	–	6.1	–	1.8	–	13.2	–	1.4	28.6	2.2	–
17	113-122	115.1	61.5	39.9	62.5	8.3	–	–	5.5	7.0	4.8	–	5.7	1.2	–	5.0	–	–	–	–
18	122-131	127.3	63.4	42.8	82.6	1.9	–	–	2.7	2.2	3.0	–	2.7	1.3	0.9	–	–	–	2.7	–
22	158-167	161.8	74.4	60.1	24.5	10.8	–	–	14.4	3.6	15.4	0.6	13.4	2.2	9.3	–	2.9	–	2.9	–
2-20μ Fraction																				
1	0-9	2.0	97.6	96.3					43.8	9.4	30.8	–	10.8	3.2	–		–	–	2.1	–
3	18-23	22.0	75.2	61.2					30.3	9.9	30.6	–	19.1	5.9	–		–	–	–	4.0
4	23-27	26.4	78.7	66.7					33.0	7.0	29.9	–	17.4	4.6	–		–	–	5.5	2.6
		26.7	76.4	63.1					35.2	6.5	29.9	–	16.6	3.1	–		–	–	2.6	6.0
6	36-45	39.6	76.7	63.5					33.5	6.7	32.8	–	17.8	5.4	–		–	–	–	3.7
9	54-63	57.8	74.0	59.4					32.2	7.5	30.8	–	17.8	6.5	–		–	–	2.7	2.6
10	63-72	65.5	82.1	72.0					29.6	10.1	32.7	3.7	16.3	5.4	–		–	–	–	2.3
13	77-86	84.8	78.8	66.9					24.7	7.2	30.0	–	18.6	5.4	–		–	–	14.1	–
14	86-95	87.9	97.8	96.6					40.4	12.4	31.3	–	9.3	6.6	–		–	–	–	–
		90.2	73.9	59.3					30.5	7.2	32.7	–	20.0	4.8	–		–	–	3.6	1.2
		91.1	78.2	66.0					29.8	6.4	34.1	–	20.2	6.8	–		–	–	–	2.7

TABLE 19–*Continued*

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Arag.	MgCa.[a]	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Clin.	Phil.	Pyri.	Amph.
15	95-104	96.3	73.8	59.1					13.0	–	7.5	–	6.1	2.0	13.3		4.1	52.0	1.9	–
17	113-122	115.1	84.7	76.1					35.2	5.1	38.5	–	13.7	3.3	–		–	–	0.9	3.3
18	122-131	127.3	85.0	76.6					23.7	18.7	27.6	–	11.3	4.1	–		–	–	14.5	–
22	158-167	161.8	67.9	49.9					22.6	6.9	22.4	–	21.8	6.5	10.9		1.4	–	7.5	–
<2μ Fraction																				
3	18-23	22.0	83.1	73.6					7.5	0.5	1.1	–	31.2	11.7	26.1	21.8		–	–	–
4	23-27	26.4	81.6	71.3					4.9	–	–	10.5	18.7	8.7	28.4	28.7		–	–	–
		26.7	82.9	73.2					5.2	–	–	–	22.4	10.2	22.6	39.5		–	–	–
6	36-45	39.6	83.8	74.6					5.9	4.1	4.4	12.6	22.0	11.9	22.5	16.7		–	–	–
9	54-63	57.8	82.2	72.2					5.2	1.7	0.9	8.6	14.3	10.6	30.1	28.6		–	–	–
10	63-72	65.5	98.2	97.2					11.5	8.7	7.3	10.5	10.4	3.8	25.2	18.4		–	–	4.3
13	77-86	84.8	82.3	72.3					5.4	1.4	1.5	–	17.3	12.8	25.6	34.9		–	1.0	–
14	86-95	87.9	80.0	68.7					4.3	–	–	3.4	10.1	3.6	38.5	40.0			–	–
		90.2	84.2	75.3					4.1	–	–	–	16.9	7.8	37.7	33.5		–	–	–
		91.1	82.0	71.9					2.8	–	–	–	11.0	4.7	44.2	37.3		–	–	–
15	95-104	96.3	79.0	67.2					3.2	–	–	–	3.6	–	73.5	4.3		15.4	–	–
17	113-122	115.1	85.7	77.7					5.6	–	4.3	16.6	20.5	6.3	25.2	21.6		–	–	–
18	122-131	127.3	87.8	81.0					14.9	9.3	13.4	7.7	13.0	5.3	21.5	–		–	14.9	–
22	158-167	161.8	82.7	72.9					8.6	–	5.5	5.4	12.8	7.7	45.9	13.2		–	0.9	–

[a]Peak at 2.996Å was multiplied by the calcite factor of 1.65 to determine magnesian calcite percentage.

[b]To fit in cored interval, depths of 30.2 meters and 30.7 meters were proportionately changed to 26.4 meters and 26.7 meters.

TABLE 20
Results of X-Ray Diffraction Analysis From Site 227

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Clin.	Pyri.	Amph.
Bulk Samples																	
3	27-36	28.2	62.2	40.9	60.3	16.0	4.8	1.0	2.7	1.3	4.6	1.1	–	8.3	–	–	–
6	45-54	47.7	67.7	49.5	57.1	12.3	6.6	1.7	6.8	1.1	6.8	2.3	–	5.4	–	–	–
13	90-99	92.0	72.8	57.5	32.9	2.6	14.3	2.9	18.4	1.1	11.4	3.2	7.2	4.0	2.0	–	–
16	113-122	115.5	63.2	42.5	62.1	10.9	4.1	–	8.3	1.4	6.7	1.0	1.2	4.4	–	–	–
18	131-140	133.7	72.5	57.1	31.6	10.1	12.8	5.0	15.9	–	18.2	4.5	2.0	–	–	–	–
19	140-149	141.6	69.6	52.6	42.2	6.2	10.6	5.1	13.0	2.0	11.3	2.5	1.6	3.2	–	1.3	1.1
20	149-158	153.4	77.2	64.4	29.2	3.1	16.8	4.6	19.9	3.7	14.6	2.8	5.2	–	–	–	–
22	158-167	163.2	71.4	55.3	28.0	2.4	19.8	6.6	19.6	–	12.5	3.5	4.6	2.9	–	–	–
25	185-194	186.9	70.5	54.0	56.2	–	6.0	–	2.8	–	6.0	1.9	5.6	–	18.7	2.8	–
2-20μ Fraction																	
3	27-36	28.2	80.6	69.6			42.4	8.9	29.7	–	14.0	4.9			–	–	–
6	45-54	47.7	80.7	69.9			32.8	7.9	34.7	–	15.8	4.3			–	1.4	3.2
13	90-99	92.0	71.2	55.0			27.9	9.1	31.5	–	20.4	7.1			–	4.0	–
16	113-122	115.5	89.8	84.1			33.7	8.7	33.4	–	17.5	5.2			–	–	1.5
18	131-140	133.7	72.6	57.2			26.6	10.0	28.1	1.2	23.9	5.9			–	2.5	1.8
19	140-149	141.6	75.1	61.2			38.6	7.7	31.8	–	14.2	4.2			–	1.4	2.1
20	149-158	153.4	74.0	59.4			33.5	6.3	30.0	5.0	21.2	4.0			–	–	–
22	158-167	163.2	74.0	59.4			32.0	7.4	29.8	–	22.3	7.0			–	1.5	–
25	185-194	186.9	68.2	50.4			16.0	–	9.5	–	9.8	3.1			51.8	9.7	–
<2μ Fraction																	
3	27-36	28.2	80.3	69.3			4.8	–	0.5	5.8	15.6	5.3	17.9	50.0	–	–	
6	45-54	47.7	86.0	78.1			10.3	6.7	6.6	15.3	15.6	6.8	24.7	14.0	–	–	
13	90-99	92.0	78.7	66.8			4.9	3.2	3.3	7.2	10.2	9.2	52.3	8.4	–	1.2	
16	113-122	115.5	76.3	63.0			4.0	–	0.9	13.9	11.9	6.2	32.9	30.3	–	–	
18	131-140	133.7	85.5	77.4			8.2	–	5.7	17.3	19.2	9.9	29.2	9.7	–	0.8	
19	140-149	141.6	84.7	76.1			6.2	–	2.4	17.6	7.4	5.1	43.3	18.1	–	–	
20	149-158	153.4	81.9	71.8			10.4	–	5.3	23.5	14.6	6.0	40.3	–	–	–	
22	158-167	163.2	76.9	63.9			5.2	–	1.9	–	11.2	9.7	60.9	7.7	–	3.3	
25	185-194	186.9	78.8	66.9			6.4	–	4.2	–	10.9	4.9	63.0	–	9.4	1.1	

TABLE 21
Results of X-Ray Diffraction Analysis From Site 228

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Arag.	MgCa.[a]	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Anal.	Pyri.	Amph.	U-1[b]
Bulk Samples																				
1	0-5	3.5	70.4	53.8	58.9	–	2.2	–	9.0	3.9	14.4	7.9	1.5	–	2.2	–		–	–	
5	33-42	37.1	66.8	48.1	40.1	–	1.7	6.0	11.0	11.1	13.8	8.7	1.5	3.9	2.3	–		–	–	
10	69-78	77.1	73.9	59.2	46.7	–	1.2	–	14.2	4.2	17.0	11.6	2.0	–	3.1	–		–	–	
11	78-87	83.7	74.1	59.5	13.2	–	2.3	8.8	17.1	6.6	25.0	18.8	1.5	–	6.8	–		–	–	
14	105-114	106.9	69.8	52.8	15.8	0.8	–	22.2	14.4	6.1	19.1	16.2	2.0	–	3.4	–		–	–	
18	141-150	142.4	73.0	57.8	11.2	–	–	1.5	21.7	6.7	32.1	–	19.6	1.5	–	–		–	5.6	
20	155-164	160.8	74.1	59.5	40.8	–	6.3	7.0	7.5	2.8	8.6	2.1	13.7	2.4	5.8	3.0		–	–	
22	173-182	176.6	71.4	55.3	20.8	–	–	1.6	16.5	6.7	23.1	0.3	24.6	3.1	–	–		–	3.2	
24	191-200	194.3	67.6	49.4	8.7	26.1	–	–	15.2	4.3	20.2	–	18.2	2.8	–	–		3.0	1.3	
26	209-218	210.3	69.1	51.8	24.1	–	–	–	19.3	5.7	24.8	–	21.4	1.7	–	–		–	3.0	
27	218-227	222.1	74.4	60.1	35.8	6.1	–	–	11.3	–	13.7	2.4	16.9	2.3	3.2	7.1		1.1	–	
28	227-236	229.5	70.9	54.6	16.3	3.0	–	–	21.9	6.4	28.1		19.1	1.3	–	–		–	3.8	
30	245-254	246.2	70.0	53.1	30.1	7.5	–	–	11.1	6.6	20.8	–	19.6	1.7	1.0	–		–	1.6	
32	263-268	265.7	76.2	62.9	–	–	–	–	25.8	9.8	29.4	–	25.9	3.0	4.6	–		–	1.4	
33	268-277	272.8	62.5	41.4	64.5	6.9	–	–	7.0	2.4	9.4	–	8.2	1.6	–	–		–	–	
34	277-286	277.7	66.0	46.9	–	37.3	–	–	16.9	5.7	20.8	1.7	14.0	2.6	–	–		0.9	–	
2-20μ Fraction																				
5	33-42	37.1	76.4	63.1		–			26.8	7.6	34.0	–	21.7	5.2			–	–	4.7	–
10	69-78	77.1	73.7	58.9		–			25.8	–	32.9	–	31.3	5.6			–	–	4.5	–
11	78-87	83.7	69.7	52.7		–			24.7	8.5	33.4	–	22.9	4.1			–	1.8	4.6	–
14	105-114	106.9	72.2	56.5		–			23.9	8.6	27.8	–	28.3	6.7			–	1.4	3.3	–
16	123-132	126.2	70.0	53.1		–			21.6	6.1	27.9	–	32.4	6.6			–	1.1	4.2	–
18	141-150	142.4	72.1	56.4		–			22.0	5.2	27.1	–	35.8	5.9			–	–	3.9	–
20	155-164	160.8	72.4	56.9		–			24.5	9.2	26.8	–	30.3	6.7			–	1.2	1.3	–
22	173-182	176.6	71.6	55.6		–			24.1	6.8	32.5	–	28.6	5.0			–	–	3.0	–

TABLE 21—*Continued*

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Arag.	MgCa.[a]	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Anal.	Pyri.	Amph.	U-1[b]
24	191-200	194.3	70.5	53.9		–			22.1	7.4	28.0	–	27.2	6.0			–	8.2	1.1	–
26	209-218	210.3	69.3	52.0		–			22.5	4.2	27.2	–	34.6	6.5			–	1.1	3.8	–
27	218-227	222.1	71.9	56.2		–			25.6	8.4	28.3	–	27.1	6.3			–	3.2	1.1	–
28	227-236	229.5	72.5	57.0		–			26.4	4.7	28.4	–	32.7	5.1			–	–	2.8	–
30	245-254	246.2	71.5	55.5		–			25.2	7.1	28.7	–	31.5	6.1			–	–	1.4	–
32	263-268	265.7	75.2	61.2		–			23.2	5.1	26.9	–	36.4	6.8			–	1.7	–	T
33	268-277	272.0	71.7	55.7		–			26.9	8.2	29.5	–	23.1	6.0			4.1	2.3	–	–
34	277-286	277.7	71.2	55.0		6.7			26.6	6.3	28.0	1.1	22.9	3.8			–	4.7	–	–
<2μ Fraction																				
1	0-5	3.5	87.1	79.9		–			9.9	6.1	7.2	13.9	24.9	11.9	24.9	–		1.2		
5	33-42	37.1	79.1	67.4		–			6.5	–	1.5	16.7	25.3	13.1	23.2	13.6		–		
10	69-78	77.1	84.2	75.3		–			7.4	–	1.8	22.2	35.2	11.0	22.4	–		–		
11	78-87	83.7	85.9	77.9		–			6.8	–	–	17.6	35.5	15.0	25.1	–		–		
14	105-114	106.9	86.6	79.1		–			7.5	–	7.1	19.0	24.9	15.8	23.6	–		2.1		
16	123-132	126.2	81.1	70.4		–			7.6	–	4.1	19.8	34.6	6.9	24.9	–		2.0		
18	141-150	142.4	79.6	68.1		–			7.4	2.0	4.0	22.3	35.3	11.3	17.7	–		–		
20	155-164	160.8	77.9	65.4		–			7.9	4.9	5.7	12.7	21.9	7.9	32.1	5.4		1.6		
22	173-182	176.6	81.2	70.6		–			6.2	–	1.9	15.1	21.7	7.0	48.1	–		–		
24	191-200	194.3	79.3	67.6		–			7.9	–	6.3	16.9	27.9	10.8	30.1	–		–		
26	209-218	210.3	82.2	72.1		–			5.8	–	4.8	20.5	22.3	8.3	38.2	–		–		
27	218-227	222.1	83.4	74.1		–			4.6	–	2.2	12.2	15.2	7.9	40.2	15.7		2.0		
28	227-236	229.5	88.0	81.2		–			5.4	2.9	6.1	11.7	37.7	9.2	27.1	–		–		
30	245-254	246.2	75.4	61.5		–			6.2	2.7	3.9	16.3	25.7	8.7	36.6	–		–		
32	263-268	265.7	80.1	69.0		–			5.2	–	–	21.6	14.3	7.7	51.2	–		–		
33	268-277	272.0	79.4	67.7		–			5.5	2.0	1.7	18.9	21.8	8.6	38.0	–		3.4		
34	277-286	277.7	82.8	73.1		1.6			5.0	2.9	1.5	28.2	24.6	10.0	18.6	5.8		1.9		

[a]Peak at 2.996Å was multiplied by the calcite factor of 1.65 to determine magnesian calcite percentage.
[b]U-1 peak at 12.1Å. T = trace.

TABLE 22
Results of X-Ray Diffraction Analysis From Hole 229A

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Arag.	MgCa.[a]	Quar.	K-Fe	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Pyri.	Amph.	U-1[b]
Bulk Samples																			
1	19-28	22.3	76.6	63.4	26.1	2.0	13.1	13.7	13.5	2.8	14.2		5.7	1.4		4.9	0.9	1.7	
5	65-74	70.1	93.0	89.0	34.4	3.4	4.8	–	16.4	4.8	14.0		7.3	2.3		9.1	3.7	–	
2-20μ Fraction																			
1	19-28	22.3	82.3	72.3		1.3			29.5	15.4	29.6		11.2	3.2		3.2	4.5	2.1	T
5	65-74	70.2	95.2	92.4		–			31.5	14.6	29.6		10.5	2.3		–	8.9	2.7	–
<2μ Fraction																			
1	19-28	22.3	83.4	74.1					6.4		4.8	10.0	13.1	8.7	32.8	22.2	2.0		

[a]Peak at 2.996Å was multiplied by the calcite factor of 1.65 to determine magnesian calcite percentage.
[b]U-1 peak at 12.1Å. T = trace.

TABLE 23
Results of X-Ray Diffraction Analysis From Hole 230

Core	Cored Interval Below Sea Floor (m)	Sample Depth Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo	Arag.	MgCa.[a]	Quar.	K-Fe	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Amph.	Pyri.
Bulk Samples																		
1	0-9	4.4	65.9	46.7	36.2	3.1	42.0	8.4	2.3		1.7		2.3			2.6	1.0	
2-20μ Fraction																		
1	0-9	4.4	85.2	77.0					30.2	12.1	32.8		11.9	5.8			3.3	3.9
<2μ Fraction																		
1	0-9	4.4	88.6	82.2					11.9	6.4	6.2	11.9	21.7	7.5	18.7	10.4		5.4

[a]Peak at 2.996Å was multiplied by the calcite factor of 1.65 to determine magnesian calcite percentage.