37. X-RAY MINERALOGY DATA, NORTHEASTERN PART OF THE INDIAN OCEAN, LEG 22, DEEP SEA DRILLING PROJECT[1]

John C. Matti, Ivar Zemmels, and Harry E. Cook, University of California, Riverside, California

METHODS

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

The X-ray mineralogy results of this study are summarized in Tables 1 through 8. The mineralogy data are presented in Tables 9 through 16 and in Figures 1 through 24. Sediment ages, lithologic units, and nomenclature of the sediment types in Figures 1 through 24 and Tables 1 through 8 are from the DSDP Leg 22 Hole Summaries and from a subsequent update supplied by Dr. A.C. Pimm, DSDP. The stratigraphic position of samples submitted for X-ray diffraction analysis from Leg 22 are listed in Tables 1 through 8. The sample depth (in meters) below the sea floor in Tables 1 through 8 identifies the samples as they are reported in Tables 9 through 16 and Figures 1 through 24.

Results of X-ray diffraction analysis of squeezed residues for interstitial water studies at Site 218 are presented in Table 16 in the same format as other semiquantitative mineral data. The sample identification and the computed depth below the sea floor of the residues are given in Table 17. The squeezed residues were prepared for X-ray diffraction analysis by the same process used for all bulk X-ray mineralogy samples, and the two sets of data should be compatible.

Several unidentified minerals were detected in Leg 22 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%.

On Leg 22 the use of drilling mud containing montmorillonite and barite was after Core 52 at Site 214. There were no samples submitted for X-ray diffraction analysis which may have been exposed to drilling mud.

An unusual, expanding clay mineral was found to occur in rather pure form in the <2μm fraction at the top of Unit 3 (Cores 42-52) at Site 214. The unit consists of a complex of lignite and volcanogenic sediments, mainly pyritic silty sand and clay-pebble conglomerate. The mineral was tentatively identified as beidellite, a silica-rich smectite. The (060) spacing was measured to be 1.491 Å which differs from 1.500 Å for montmorillonite (Brown, 1961). The 001 diffraction peaks are broad and weak whereas the hk0 peaks are sharp and strong. The concentration of this mineral diminishes with depth in the unit giving way to montmorillonite.

ACKNOWLEDGMENTS

The authors wish to acknowledge the excellent work of Nicki D. Coursey in the analysis and the quantification of X-ray diffraction data, of Paul D. Johnson in X-ray data acquisition and data processing, and of Tom W. Halverson, Jr., in sample preparation.

REFERENCE

Brown, G., 1961. The X-ray identification and crystal structure of clay minerals: London (Mineralogical Society).

[1] Institute of Geophysics and Planetary Physics, University of California, Riverside, California, Contribution No. 73-28.

TABLE 1
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 211

Core, Section, Depth in Section (cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μm Fraction Major Constituent 1	2	3	<2μm Fraction Major Constituent 1	2	3
1-6, 86-88	8.4	Unit 1: Siliceous, clay ooze with volc. ash	Quat. to U. Plio.	Quar.	Mica	Mont.	Quar.	Plag.	Mica	Mont.	Mica	Kaol.
3-1, 90	57.9			Mica	Mont.	Quar.	Quar.	Mica	Plag.	Mont.	Mica	Kaol.
4-2, 70-72	97.2	Unit 2: Siliceous fossil-bearing, clay ooze	Plio.	Mica	Quar.	Mont.	Quar.	Mica	Plag.	Mont.		
5-6, 70-72	141.2			Mont.	Quar.	Kaol.	Mont.	Quar.	Plag.	Mont.	Quar.	Kaol.
6-6, 105-107	189.1			Mont.	Quar.	Kaol.	Mont.	Plag.	Quar.	Mont.		
10, CC	351.0	Unit 4: Clays and iron-oxide and ash facies	(?)	Mont.	Kaol.	Quar.	Insufficient residue			Mont.	Kaol.	Mica.
11, CC	398.0			K-Fe.	Paly.	Mont.	K-Fe.	Quar.	Mica	Mont.	K-Fe.	Paly.
12-1, 13-14	409.1	Unit 6: Variegated, nanno ooze and clay	Basal Campanian to Basal Maastrichtian	Paly.	Calc.	K-Fe.	K-Fe.	Quar.	Mica.	Paly.	Mont.	K-Fe.
12-2, 125-127	411.8			Calc.	K-Fe.	Quar.	K-Fe.	Quar.	Mica.	Mica.	K-Fe.	Hema.
12-2, 138-140	411.9			Calc.			K-Fe.	Quar.	Mica.	Mont.	Mica	K-Fe.
13-1, 63-64	418.6			Calc.	Paly.	K-Fe.	K-Fe.	Quar.	Mica.	Mont.	Paly.	Mica.
13-1, 147-148	419.5			Paly.	Calc.		Quar.	K-Fe.		Paly.	Mont.	K-Fe.
14-1, 59-61	428.1			Paly.	Quar.	K-Fe.	Quar.	K-Fe.		Paly.	K-Fe.	Quar.

TABLE 2
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 212

Core, Section Depth in Section (cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μm Fraction Major Constituent 1	2	3	<2μm Fraction Major Constituent 1	2	3
2-1, 121-123	10.7	Unit 1: Interbedded nanno ooze and clay	Mid. Plio.	Quar.	Mica.	Kaol.	Insufficient residue			Mont.	Kaol.	Quar.
10-6, 78-80	172.8	Unit 2: Nanno ooze and chalk with minor clay	Mid. and L. Mioc.	Calc.			Insufficient residue			Mont.	Kaol.	Mica.
12-5, 137-138	228.9			Calc.						Mont.	Kaol.	Mica.
15-1, 106-109	289.1	Unit 3: Claystone	(?)	Quar.	Mica.	K-Fe.	Insufficient residue			Mont.	Paly.	Kaol.
16-1	297.5			Quar.	Mont.	Kaol.	Quar.	Mica.	K-Fe.	Mont.	Kaol.	Quar.
18-3, 20-22	319.7	Unit 4: Nanno chalk	M. Eoc.	Clin.	Paly.	Quar.	Clin.	Phil.	Quar.	Mont.	Paly.	K-Fe.
27-1, 104-106	403.0	Unit 5: Claystone	(?)	Mont.	Mica.	Kaol.	Quar.	Mica.	K-Fe.	Mont.	Kaol.	Quar.
27-1, 130-132	403.3			Mont.	Quar.	Kaol.	Insufficient residue			Mont.	Kaol.	Quar.
27-4, 6-7	406.6			Mont.	Kaol.	Quar.				Mont.	Kaol.	Quar.
28-1, 16-18	411.7			Kaol.	Mica.	K-Fe.				Mont.	Kaol.	Mica.
29-1, 29-31	421.3			Kaol.	Mica.	K-Fe.				Mont.	Kaol.	Mica.
32-6, 45-46	457.5	Unit 6: Nanno chalk	Late Cret.	Calc.			Quar.	Clin.	Plag.	Mont.		
35-3, 84-86	481.8			Calc.			Insufficient residue			Mont.		
35-4, 84-86	483.3			Calc.						Mont.		
35-5, 12-14	484.1	Unit 7: Claystone	(?)	Mont.	Mica.	Quar.	Quar.	K-Fe.	Plag.	Mont.	Paly.	Quar.
35-5, 42-46	484.4			Mont.	Paly.	Quar.	Quar.	K-Fe.	Plag.	Mont.	Paly.	Quar.
36-1, 109-110	488.6			Paly.	Quar.	K-Fe.	Quar.	K-Fe.	Plag.	Paly.	Quar.	K-Fe.
37-1, 26-27	497.3			Paly.	Quar.	K-Fe.	Insufficient residue			Paly.	Quar.	Mont.
38-1, 72-73	507.2			Paly.	Clin.	Quar.	Clin.	Quar.	Mica.	Paly.	Clin.	Mica.
38-2, 20-21	508.2			Paly.	K-Fe.	Quar.	K-Fe.	Quar.	Mica.	Mont.	Paly.	K-Fe.

TABLE 3
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 213

Core, Section, Depth in Section (cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μm Fraction Major Constituent 1	2	3	<2μm Fraction Major Constituent 1	2	3
1-1, 7-9	0.1	Unit 1: Radiolarian and diatom ooze with varying clay content	Upper Miocene through Quaternary	Quar.	Mica	Mont.	Insufficient residue			Mont.	Quar.	Kaol.
1-1, 72-74	0.7			Quar.	Mica	Kaol.				Mont.	Quar.	Mica
1-4, 130-132	5.8			Quar.	Mica	Kaol.				Quar.	Kaol.	Mont.
2-5, 31-33	15.3			Quar.	Mica	Kaol.				Mont.	Kaol.	Quar.
2-5, 51-53	15.5			Quar.	Mica	Kaol.				Mont.	Quar.	Kaol.
3-6, 13-15	26.1			Mica.	Quar.	Kaol.				Mont.	Kaol.	Mica
6-5, 70-72	53.7			Quar.	Mica	Kaol.				Mont.	Kaol.	Quar.
8-3, 12-14	69.1			Quar.	Mont.	Kaol.				Mont.	Kaol.	Quar.
8-6, 142-144	74.9			Mont.	Quar.	Mica				Mont.	Quar.	Kaol.
9-6, 82-84	89.2	Unit 2: Zeolitic clay	Mid. Mioc.	Mont.	Quar.	Mica	Insufficient residue			Mont.	Kaol.	
10-3, 72-74	88.7			Mont.	Phil.	Kaol.	Phil.	Quar.	Mont.	Mont.	Quar.	Kaol.
11-4, 70-72	99.7			Phil.	Mont.	Paly.	Phil.			Mont.	Paly.	Kaol.
13-3, 70-72	117.2			Phil.	Paly.	K-Fe.	Phil.	Quar.	Paly.	Phil.	Mont.	Quar.
14-2, 72-74	125.2			Paly.	K-Fe.	Mica.	K-Fe.	Quar.	Paly.	Mont.	Paly.	K-Fe.
16-2, 112-114	144.6	Unit 3: Nanno ooze	a	Calc.			Quar.	K-Fe.		U-2		
16-4, 142-144	147.9	Unit 4: Iron oxide and manganese facies	(?)	Paly.	K-Fe.	Calc.	K-Fe.	Quar.	Mica	Paly.	K-Fe.	Mont.

[a]Unit 3 is early Eocene and late Paleocene in age.

TABLE 4
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 214

Core, Section, Depth in Section (cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μm Fraction Major Constituent 1	2	3	<2μm Fraction Major Constituent 1	2	3
3-1, 28-30	19.3	Unit 1: Foram and nanno ooze	a	Calc.			Insufficient residue			Mont.	Quar.	Kaol.
3-3, 135-137	23.4			Calc.						Quar.	Mica	Kaol.
36-2, 10-12	334.6	Unit 2a: Glauconitic carbonate silt and sand	Paleocene	Plag.	Mont.	Apat.	Plag.	Mont.		Mont.	Plag.	Apat.
36-3, 54-56	336.5			Calc.	Clin.	Plag.	Clin.	Plag.		Mont.	Plag.	
37-2, 120-122	345.2			Calc.	Plag.		Plag.	Pyri.		Mont.	Plag.	
38-4, 0	356.5			Calc.	Plag.	Mont.	Mont.	Plag.	Pyri.	Mont.	Pyri.	Plag.
40-1, 108-110	372.1	Unit 2b: Glauconitic shelly carbonate silt	Paleocene	Plag.	Calc.	Mont.	Plag.	Mont.	Pyri.	Mont.	Plag.	
41-3, 98-100	384.5			Plag.	Pyri.	Mont.	Pyri.	Plag.	Mont.	Mont.		
41-3, 134-136	384.8			Mont.	Plag.	Pyri.	Pyri.	Plag.		Mont.		
42-1, 93-95	390.9	Unit 3: Lignite, volc. clay, tuff, and lapilli tuff	(?)	Clin.			Clin.	K-Fe.	Quar.	Beid.		
42-1, 108-110	391.1			Clin.			Clin.			Clin.	Pyri.	Beid.
44-1, 93-95	403.4			Mont.	K-Fe.	Pyri.	K-Fe.	Mont.	Pyri.	Mont.		
44-1, 110-112	403.6			K-Fe.	Kaol.	Quar.	K-Fe.	Quar.	Pyri.	Mica	Kaol.	K-Fe.
46-2, 27-29	423.3			K-Fe.	Mont.	Quar.	K-Fe.	Quar.		Mont.	K-Fe.	U-3
46-2, 143-145	424.4			Mont.	K-Fe.	Pyri.	K-Fe.	Pyri.	Mont.	Mont.		
52-1, 126	477.8			Mont.	K-Fe.		K-Fe.	Mont.	Side.	Mont.	Mica	

[a]Core 3 is Pleistocene or latest Pliocene in age.

TABLE 5
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 215

Core, Section, Depth in Section (cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μm Fraction Major Constituent 1	2	3	<2μm Fraction Major Constituent 1	2	3
1-5, 36-38	6.4	Unit 1:	Late Mio-	Mica	Quar.	Kaol.	Insufficient residue			Mica	Mont.	Quar.
4-1, 45-47	27.0	Rad and diatom	cene	Quar.	Mont.	Mica				Mont.	Kaol.	Quar.
6-2, 79-81	47.8	ooze, clay-rich	through	Mica	Quar.					Mica	Mont.	Quar.
7-2, 61-63	57.1	in places	Quaternary	Mica	Quar.	Mont.	Quar.	Plag.	Mica	Mont.	Quar.	Kaol.
8-2, 58-61	66.6	Unit 3:	Early Eoc.	Mont.	Quar.	Mica	Quar.	Mica	Mont.	Mont.	Quar.	
8-4, 23-25	69.2	Clay, zeolitic	through	Mica	Quar.	Mont.	Mica	Quar.	Plag.	Mica	Mont.	Quar.
9-1, 40-43	74.4	in part	late Mioc.	Paly.	Phil.	Mont.	Phil.	Quar.	K-Fe.	Paly.	Mont.	
9-2, 59-61	76.1			Paly.	Quar.		Insufficient residue			Paly.		
9-3, 40-43	77.4			Paly.	Quar.		Quar.	K-Fe.	Paly.	Paly.		
16-5, 132-134	147.8	Unit 4: Nanno ooze	Paleoc.	Calc.			Insufficient residue			Mont.	K-Fe.	

TABLE 6
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology Age, and X-Ray Diffraction Results, Site 216

Core, Section Depth in Section (cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-20μm Fraction Major Constituent 1	2	3	<2μm Fraction Major Constituent 1	2	3
4-1, 60-62	121.1	Unit 1a: Nanno ooze	a	Calc.			Insufficient residue			Paly.	Kaol.	Mica.
19-1, 109-110	292.6	Unit 1b:		Calc.	Paly.		Insufficient residue			Paly.		
21-2, 67-68	311.2	Nanno chalk		Calc.						Paly.	Mont.	
24-5, 92-94	345.9	Unit 1c[c]	c	Calc.			Clin.	Mont.		Mont.	Paly.	
25-4, 91-93	353.9	Unit 2a[d]	d	Calc.	Mont.		Mont.	Plag.	Clin.	Mont.		
26-2, 70-72	360.2			Mont.	Calc.	Anal.	Mont.	Anal.		Mont.		
30-1, 88	396.9	Unit 2b:	Late	Calc.	Augi.	Plag.	Augi.	Plag.	Pyri.	Mont.	Augi.	Plag.
31-1, 110-111	406.6	Intermixed	Maas-	Calc.	Plag.	Augi.	Augi.	Plag.	Pyri.	Mont.	Augi.	Pyri.
32-3, 2-3	418.0	volcanic clay	trichtian	Calc.			Augi.	Plag.	Mont.	Mont.	Pyri.	
33-1, 97-99	425.5	and micarb		Mont.	Phil.	Calc.	Mont.	Phil.	Augi.	Mont.		
34-1, 53-55	434.5	chalk with		Mont.	Calc.	Clin.	Mont.	Plag.	Clin.	Mont.		
34-4, 67-68	439.2	discrete beds		Calc.	Phil.	Mont.	Phil.	Mont.		Mont.	Phil.	
34-4, 71-72	439.2	of ash		Mica	Phil.	Mont.	Phil.	Mica	Mont.	Mica	Mont.	Phil.

[a]Unit 1a is Pleistocene to late Oligocene in age.
[b]Unit 1b is late Oligocene to Paleocene (Danian) in age.
[c]Unit 1c consists of glauconite-bearing, clay-rich, micarb chalk, and is late Maastrichtian in age.
[d]Unit 2a consists of glauconitic, volcanic, clay, micarb chalk, and is late Maastrichtian in age.

TABLE 7
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 217

Core, Section Depth in Section (cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-2μm Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
1-1, 40-42	0.4	Unit 1:	Recent	Calc.	Mica	Quar.	Insufficient residue			Mica	Mont.	Quar.
2-3, 70-72	43.7	Clay nanno-	to late	Calc.			Quar.	Mica	Plag.	Mont.	Mica.	Quar.
4-5, 62-64	122.6	fossil ooze	Miocene	Calc.			Insufficient residue			Mont.	Mica	Kaol.
34-1, 45-46	582.5	Unit 2d[a]	a	Calc.	Mont.		Mont.			Mont.		
37-1, 125-126	611.8	Unit 3: Dolarenite, chert, and claystone	Late Campanian	Dolo.	Calc.	Mont.	Clin.	Quar.	Bari.	Mont.		

[a]Unit 2d is middle Maastrichtian to late Campanian in age and consists of micarb chalk, partly shelly, and chert.

TABLE 8
Summary of X-Ray Mineralogy Samples, Sample Depths, Lithology, Age, and X-Ray Diffraction Results, Site 218

Core, Section, Depth in Section (cm)	Sample Depth Below Sea Floor (m)	Lithology	Age	Bulk Sample Major Constituent 1	2	3	2-2μm Fraction Major Constituent 1	2	3	<2μ Fraction Major Constituent 1	2	3
2-1, 128-130	5.3	Unit 1:		Mica	Quar.	Calc.	Mica	Quar.	Plag.	Mica.	Mont.	Quar.
2-3, 120-122	8.2	Clay and silt-rich nanno ooze	Quat.	Mica	Quar.		Mica	Quar.	Plag.	Mica	Quar.	
5-1, 103-105	71.0	Unit 3:	Quat.-	Mica	Quar.		Mica	Quar.	Plag.	Mica	Quar.	Chlo.
6-2, 120-122	109.7	Calcareous	Plioc.	Calc.	Mica	Quar.	Quar.	Mica.	Plag.	Mont.	Mica	Quar.
8-2, 63-65	186.1	silty clay and clayey silt		Mica.	Quar.		Quar.	Mica	Plag.	Mica	Mont.	Quar.
13-2, 110-112	376.6	Unit 5:		Mica	Quar.	Calc.	Quar.	Mica	Plag.	Mica	Mont.	Quar
15-1, 95-98	451.0	Clayey silt	Upper	Mica	Quar.		Mica	Quar.		Mica	Quar.	Mont.
16-1, 140-142	460.9	and silty clay	Mioc.	Mica	Quar.		Mica	Quar.	Plag.	Mica	Quar.	Mont.
17-1, 135-138	470.4	Unit 6:		Mica	Quar.		Mica	Quar.	Plag.	Mica	Quar.	Chlo
19-1, 136-140	489.4	Interlaminated	Upper	Mica	Quar.		Mica	Quar.		Mica	Quar.	Mont.
20-1, 36-40	497.9	silt, clayey	Mioc.	Mica	Quar.		Mica	Quar.	Plag.	Mica	Quar.	Mont.
21-1, 88-92	536.4	silt, and sandy		Mica	Quar.		Quar.	Mica	Plag.	Mica	Quar.	Mont.
22-2, 65-68	575.7	silt		Mica	Quar.		Mica	Quar.	Plag.	Mica	Quar.	Mont.
23-1, 22-24	611.7	Unit 7[a]		Mica	Quar.	Chlo.	Mica	Quar.	Plag.	Mica	Quar.	Mont.
23-2, 78-80	613.8		a	Mont.	Mica	Quar.	Quar.	Mica	Plag	Mont.	Kaol.	Mica.
24-2, 82-84	651.8	Unit 8:		Mica	Quar.	Plag.	Mica	Quar.	Plag.	Mica	Quar.	Mont.
25-2, 95-97	690.0	Interlaminated	Middle	Mica	Quar.	Plag.	Mica	Quar.	Plag.	Mica	Mont.	Quar.
26-1, 120-122	726.7	silt, clayey silt	Mioc.	Mica	Quar.	Chlo.	Insufficient residue					
27-1, 130-132	764.8	and sandy silt		Mica	Quar.	Plag.						

[a]Unit 7 is upper Miocene in age and consists of clayey silt and nanno ooze.

TABLE 9
Results of X-Ray Diffraction Analysis from Hole 211

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.	Paly.	Hema.	Goet.	U-1[a]
Bulk Samples																	
1	0.0-9.0	8.4	88.1	81.4	–	–	29.9	2.1	8.2	6.8	27.6	1.8	23.6	–	–	–	–
3	57.0-66.0	57.9	86.0	78.2	–	–	23.8	3.9	11.3	5.2	27.5	2.8	25.6	–	–	–	–
4	95.0-104.5	97.2	81.2	70.7	–	–	26.4	4.7	9.9	2.6	37.7	2.1	16.5	–	–	–	–
5	133.0-142.5	141.2	88.6	82.2	–	–	22.7	4.4	10.0	12.8	9.7	–	40.5	–	–	–	–
6	180.5-190.5	189.1	91.1	86.1	–	–	12.9	4.4	11.9	12.0	8.6	–	50.2	–	–	–	–
10	342.0-351.0	351.0	81.6	71.3	–	–	16.5	8.2	2.1	20.9	8.5	1.4	42.4	–	–	–	P
11	389.5-398.0	398.0	89.5	83.6	–	–	13.0	35.6	–	1.8	12.8	1.5	14.7	16.9	3.7	P	T
12	409.0-418.5	409.1	84.3	75.4	34.4	–	7.6	11.8	–	0.3	4.9	1.0	2.3	37.9	–	–	T
		411.8	71.4	55.3	34.9	–	14.9	29.2	–	–	14.1	–	–	–	6.9	–	T
		411.9	72.3	56.8	81.5	–	4.8	6.7	–	–	7.0	–	–	–	–	–	T
13	418.5-428.0	418.6	87.9	81.1	32.6	–	9.5	15.5	–	–	4.0	–	10.2	28.2	–	–	P
		419.5	86.0	78.1	35.1	–	6.0	5.9	–	–	5.9	–	–	47.1	–	–	T
14	428.0-437.5	428.1	85.3	77.1	3.3	5.7	13.2	8.8	–	–	–	–	–	68.9	–	–	–
2-20μm Fraction																	
1	0.0-9.0	8.4	81.7	71.4			50.3	5.2	19.7	1.9	19.6	3.3	–	–	–		
3	57.0-66.0	57.9	82.6	72.8			42.7	6.7	19.9	2.0	25.9	2.9	–	–	–		
4	95.0-104.5	97.2	76.9	64.0			42.9	8.4	18.6	–	26.2	4.0	–	–	–		
5	133.0-142.5	141.2	87.1	79.9			24.9	5.7	16.3	10.4	9.2	–	33.4	–	–		
6	180.5-190.5	189.1	91.2	86.2			18.0	7.7	22.1	11.2	6.0	–	34.9	–	–		
11	389.5-398.0	398.0	78.6	66.5			20.3	59.9	–	–	12.8	1.4	–	–	5.7		
12	409.0-418.5	409.1	67.9	49.8			34.6	50.7	–	0.7	13.1	0.8	–	–	–		
		411.8	62.5	41.3			29.2	56.8	–	–	10.7	–	–	–	3.3		
		411.9	63.5	43.0			37.4	50.2	–	–	10.3	0.8	–	–	1.2		
13	418.5-428.0	418.6	84.5	75.7			35.3	45.6	–	–	9.6	–	–	9.5	–		
		419.5	69.4	52.2			51.0	43.0	–	–	6.0	–	–	–	–		
14	428.0-437.5	428.1	79.2	67.6			53.2	43.8	–	–	3.1	–	–	–	–		
<2μm Fraction																	
1	0.0-9.0	8.4	82.6	72.8			13.9	–	2.7	17.8	20.7	1.6	43.4	–	–	–	
3	57.0-66.0	57.9	83.3	73.9			13.6	1.1	4.5	15.0	17.3	1.5	47.1	–	–	–	
4	95.0-104.5	97.2	77.9	65.5			6.0	1.0	1.8	2.3	5.3	1.7	81.9	–	–	–	
5	133.0-142.5	141.2	86.7	79.2			11.2	–	4.9	10.0	6.6	–	67.2	–	–	–	
6	180.5-190.5	189.1	85.8	77.7			7.9	2.9	4.3	7.7	4.1	–	73.1	–	–	–	
10	342.0-351.0	351.0	79.4	67.8			10.4	5.7	1.0	21.8	10.7	–	50.3	–	–	–	
11	389.5-398.0	398.0	89.3	83.2			11.0	26.4	–	–	–	–	43.5	14.5	4.6	P	
12	409.0-418.5	409.1	90.5	85.2			7.8	8.6	–	1.9	4.9	1.3	11.9	63.5	–	–	
		411.8	80.5	69.6			15.8	28.3	–	–	32.4	–	2.4	–	21.0	–	
		411.9	90.9	85.8			14.9	16.9	–	–	29.7	2.1	32.7	–	3.7	–	
13	418.5-428.0	418.6	90.6	85.3			7.1	10.8	–	0.6	13.3	1.7	35.1	31.4	–	–	
		419.5	89.9	84.2			7.3	10.8	–	0.4	9.2	1.3	12.4	58.6	–	–	
14	428.0-437.5	428.1	82.5	72.7			14.0	16.3	–	–	4.4	–	2.4	62.8	–	–	

[a]U-1 Peak at 6.0 Å. P = present; t = trace.

TABLE 10
Results of X-Ray Diffraction Analysis from Hole 212

Core	Cored Interval Below Sea Floor (m)	Sample Depth[a] Below Sea Floor (m)	Diff.	Amorp.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica.	Chlor.	Mont.	Paly.	Clin.	Phil.	Hema.	Goet.	U-1[a]
Bulk Sample																		
2	9.5-18.0	10.7	88.1	81.5	–	34.8	5.3	7.4	20.7	21.2	–	10.6	–	–	–	–	–	–
10	164.5-174.0	172.8	52.7	26.1	99.0	1.0	–	–	–	–	–	–	–	–	–	–	–	–
12	221.5-231.0	228.9	51.8	24.7	98.1	0.8	–	–	–	1.1	–	–	–	–	–	–	–	–
15	288.0-297.5	289.1	90.4	84.9	–	28.0	19.4	8.9	9.1	24.8	1.5	8.3	–	–	–	–	–	–
16	297.5-307.0	297.5	88.7	82.4	–	29.5	12.2	4.6	18.3	17.0	–	18.4	–	–	–	–	–	–
18	316.5-326.0	319.7	84.5	75.8	–	8.2	5.9	2.8	2.2	5.9	–	6.5	16.4	44.2	7.9	–	–	T
27	402.0-411.5	403.0	89.5	83.6	–	15.8	10.2	3.3	19.6	20.0	–	31.1	–	–	–	–	–	–
		403.3	86.3	78.5	3.3	18.3	13.8	5.8	17.7	14.1	–	27.0	–	–	–	–	–	–
		406.6	88.9	82.6	–	18.2	11.4	3.5	22.0	12.1	–	32.8	–	–	–	–	–	–
28	411.5-421.0	411.7	88.3	81.7	–	14.0	14.3	5.0	20.5	19.0	10.3	7.7	9.3	–	–	–	P	P
29	421.0-430.5	421.3	90.4	85.0	–	12.0	14.2	4.9	28.2	23.3	11.5	5.9	–	–	–	–	P	–
32	449.5-459.0	457.5	57.0	32.8	97.4	0.9	–	–	–	–	–	1.7	–	–	–	–	–	–
35	478.0-487.5	481.8	57.5	33.6	92.0	1.1	1.5	1.3	–	2.0	–	2.2	–	–	–	–	–	–
		483.3	58.5	35.1	94.0	1.1	1.5	–	–	1.7	–	1.8	–	–	–	–	–	–
		484.1	83.9	74.8	–	12.6	11.5	6.4	2.9	13.2	1.1	42.9	9.4	–	–	–	–	–
		484.4	90.2	84.7	–	17.1	15.9	6.0	5.3	8.2	1.4	21.6	21.1	–	–	3.4	–	T
36	487.5-497.0	488.6	86.4	78.8	–	23.7	15.6	8.2	2.8	13.4	1.6	8.8	25.8	–	–	–	–	–
37	497.0-506.5	497.3	87.6	80.7	–	23.5	13.9	1.6	–	7.7	–	5.2	48.0	–	–	–	–	–
38	506.5-516.0	507.2	87.2	80.0	–	13.2	–	–	–	4.9	–	10.7	51.9	19.2	–	–	–	T
		508.2	90.0	84.4	–	18.8	33.9	–	–	11.8	–	–	35.6	–	–	–	P	P
2-20μm Fraction																		
16	297.5-307.0	297.5	76.5	63.3		53.6	15.0	9.2	2.3	18.8	1.1		–	–	–			
18	316.5-326.0	319.7	63.7	43.3		8.4	5.7	–	–	2.2	–		5.6	60.7	17.4			
27	402.0-411.5	403.0	82.2	72.2		29.9	22.1	17.9	3.3	25.2	1.7		–	–	–			
32	449.5-459.0	457.5	85.9	78.0		32.3	17.1	19.4	–	10.2	–		–	21.0	–			
35	478.0-487.5	484.1	93.7	90.2		44.6	22.0	18.4	–	13.8	1.3		–	–	–			
		484.4	88.2	81.5		31.4	26.3	16.1	–	15.8	1.7		8.7	–	–			
36	487.5-497.0	488.6	68.5	50.8		49.7	18.8	17.5	–	13.1	1.0		–	–	–			
38	506.5-516.0	507.2	59.9	37.4		25.9	7.1	8.7	–	11.9	–		–	46.5	–			
		508.2	87.6	80.7		37.6	50.5	–	–	11.9	–		–	–	–			

TABLE 10 – *Continued*

Core	Cored Interval Below Sea Floor (m)	Sample Depth[a] Below Sea Floor (m)	Diff.	Amor.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica.	Chlor.	Mont.	Paly.	Clin.	Phil.	Hema.	Goet.	U-1[a]
<2μm Fraction																		
2	9.5-18.0	10.7	88.0	81.2		18.7	7.0	5.0	27.1	11.4	–	30.8	–	–			–	
10	164.5-174.0	172.8	82.8	73.2		7.6	3.5	1.9	13.5	12.9	–	54.3	6.3	–			–	
12	221.5-231.0	228.9	83.3	73.9		8.9	4.8	2.2	15.6	10.1	–	58.4	–	–			–	
15	288.0-297.5	289.1	87.7	80.8		13.8	8.3	3.4	13.0	10.3	–	33.6	17.6	–			–	
16	297.5-307.0	297.5	86.9	79.5		19.6	6.5	1.7	21.8	14.6	–	35.8	–	–			–	
18	316.5-326.0	319.7	89.6	83.7		8.8	12.2	–	–	10.5	–	39.7	21.5	7.3			–	
27	402.0-411.5	403.0	85.5	77.3		9.0	3.9	3.1	14.0	7.9	2.4	59.8	–	–			–	
		403.3	80.3	69.2		9.7	4.9	2.1	16.6	9.5	2.1	55.0	–	–			–	
		406.6	86.5	78.9		12.1	4.8	1.9	15.1	8.0	–	58.1	–	–			–	
28	411.5-421.0	411.7	84.3	75.4		10.3	4.3	–	24.1	11.6	6.4	36.9	6.5	–			P	
29	421.0-430.5	421.3	88.0	81.3		8.9	7.1	1.2	29.4	12.4	6.1	34.9	–	–			–	
32	449.5-459.0	457.5	81.1	70.5		4.8	3.8	1.9	1.1	4.8	–	81.9	–	2.3			–	
35	478.0-487.5	481.8	81.4	71.0		6.1	4.5	1.4	–	5.0	–	83.0	–	–			–	
		483.3	79.5	68.0		5.3	2.8	1.3	–	5.0	–	78.9	6.8	–			–	
		484.1	86.3	78.6		12.4	7.4	1.9	1.8	7.1	2.3	45.8	21.3	–			–	
		484.4	86.6	79.0		14.7	11.7	–	–	3.9	2.2	47.4	20.1	–			–	
36	487.5-497.0	488.6	90.2	84.8		21.3	16.1	–	7.8	15.3	2.0	–	37.5	–			–	
37	497.0-506.5	497.3	88.9	82.7		14.9	10.8	–	1.3	8.5	1.3	11.2	52.1	–			–	
38	506.5-516.0	507.2	87.4	80.4		9.3	8.5	1.1	–	11.3	–	–	52.6	17.3			–	
		508.2	88.0	81.2		10.1	18.9	–	–	7.5	–	36.8	26.7	–			P	

[a]U-1 Peak at 6.00 Å. T = trace; P = present.

TABLE 11
Results of X-Ray Diffraction Analysis from Hole 213

Core	Cored Interval Below Sea Floor (m)	Sample Depth[a] Below Sea Floor (m)	Diff.	Amorp.	Calc.	Quar.	K-Fe	Plag.	Kaol.	Mica	Chlor.	Mont.	Paly.	Phil.	Amph.	Goet.	U-2[a]
Bulk Sample																	
1	0.0-9.0	0.1	93.3	89.6	–	27.9	4.5	12.1	15.2	23.7	–	16.7	–	–	–	–	–
		0.7	92.6	88.4	–	31.3	–	13.6	18.6	25.0	–	11.4	–	–	–	–	–
		5.8	93.9	90.5	–	35.7	–	10.8	21.4	23.6	–	8.4	–	–	–	–	–
2	9.0-18.5	15.3	92.3	87.9	–	31.0	3.8	15.0	16.3	22.7	–	11.1	–	–	–	–	–
		15.5	91.7	87.0	–	34.8	–	11.7	18.2	22.6	–	12.7	–	–	–	–	–
3	18.5-28.0	26.1	92.4	88.1	–	26.1	–	7.9	19.4	29.7	–	17.0	–	–	–	–	–
6	47.0-56.5	53.7	91.6	86.9	–	26.3	3.4	11.4	17.8	25.1	–	15.9	–	–	–	–	–
8	66.0-75.5	69.1	91.2	86.3	–	28.9	–	10.4	19.0	16.1	–	25.6	–	–	–	–	–
		74.9	86.9	79.6	–	15.2	3.2	7.1	10.6	13.9	–	50.1	–	–	–	–	–
9	75.5-85.0	83.8	89.2	83.1	–	12.8	10.6	6.5	11.2	12.6	–	36.3	–	10.2	–	–	–
10	85.0-94.5	88.7	89.4	83.4	–	14.5	–	9.1	14.5	9.1	–	37.4	–	15.5	–	–	–
11	94.5-104.0	99.7	89.5	83.7	–	9.4	4.7	6.3	4.2	6.7	–	14.9	14.3	38.1	1.4	–	–
13	113.5-123.0	117.2	88.2	81.6	–	10.3	10.3	–	–	7.0	–	5.4	19.8	47.1	–	–	–
14	123.0-132.5	125.2	89.8	84.1	–	12.9	24.6	–	0.9	13.5	2.4	10.5	35.3	–	–	–	–
16	142.0-151.5	144.6	44.8	13.7	100.0	–	–	–	–	–	–	–	–	–	–	–	T
		147.9	91.3	86.3	12.5	11.0	15.5	–	3.9	–	–	2.6	54.5	–	–	P	–
2-20μm Fraction																	
10	85.0-94.5	88.7	95.6	93.1		30.3	–	4.2	–	–	–	24.5	–	41.1		–	–
11	94.5-104.0	99.7	71.4	55.4		6.4	7.1	–	–	2.9	–	–	–	83.6		–	–
13	113.5-123.0	117.2	73.5	58.5		8.6	5.9	–	–	7.2	–	–	8.0	70.2		–	–
14	123.0-132.5	125.2	85.1	76.7		28.7	31.6	–	–	10.9	1.5	–	27.4	–		–	–
16	142.0-151.5	144.6	85.1	76.8		57.6	42.4	–	–	–	–	–	–	–		–	M
		147.9	85.7	77.6		22.1	43.8	–	1.7	17.8	1.4	–	13.1	–		P	–
<2μm Fraction																	
1	0.0-9.0	0.1	90.0	84.4		19.1	7.1	7.3	16.4	16.5	–	33.6	–	–		–	–
		0.7	91.1	86.2		22.0	–	8.1	17.7	19.2	–	33.0	–	–		–	–
		5.8	92.0	87.6		27.3	–	5.6	26.4	14.8	–	25.9	–	–		–	–
2	9.0-18.5	15.3	88.3	81.8		18.6	3.7	5.9	19.9	16.8	–	35.1	–	–		–	–
		15.5	89.6	83.7		26.9	–	9.9	20.2	14.3	–	28.7	–	–		–	–
3	18.5-28.0	26.1	88.7	82.3		11.8	4.0	3.7	19.0	12.4	–	49.2	–	–		–	–
6	47.0-56.5	53.7	88.1	81.4		14.9	5.0	4.0	22.4	13.9	–	39.7	–	–		–	–
8	66.0-75.5	69.1	86.4	78.7		13.5	–	6.0	19.0	7.8	–	53.6	–	–		–	–
		74.9	84.1	75.2		12.0	5.0	3.6	11.6	–	–	67.9	–	–		–	–
9	75.5-85.0	83.8	83.8	74.7		6.5	4.1	1.4	10.2	3.7	–	64.8	5.7	3.5		–	–
10	85.0-94.5	88.7	83.3	73.9		9.3	–	4.9	8.6	3.8	–	73.4	–	–		–	–
11	94.5-104.0	99.7	88.0	81.3		12.5	9.9	–	12.2	8.1	–	41.3	12.5	3.5		–	–
13	113.5-123.0	117.2	86.3	78.6		12.0	11.7	–	–	10.5	–	18.1	11.4	36.4		–	–
14	123.0-132.5	125.2	90.7	85.4		9.1	12.5	–	1.4	7.1	2.1	38.1	29.6	–		–	–
16	142.0-151.5	144.6	57.0	32.8		–	–	–	–	–	–	–	–	–		–	M
		147.9	91.8	87.1		7.7	17.0	–	6.0	–	–	12.0	57.3	–		P	–

[a]U-2 Peaks at 3.02Å, 7.81Å, 3.96Å, 5.33Å, 2.67Å, and about 50 others. M = major; P = present; T = trace.

TABLE 12
Results of X-Ray Diffraction Analysis from Hole 214

Core	Cored Interval Below Sea Floor (m)	Sample Depth[a] Below Sea Floor (m)	Diff.	Amorp.	Calc.	Arag.	Side.	Quar.	K-Fe.	Plag.	Kaol.	Mica.	Mont.	Clin.	Anal.	Pyri.	Apat.	Gibb.	Goet.	Beid.[a]	U-3[b]
Bulk Sample																					
3	19.0-28.5	19.3	50.1	22.0	100.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
		23.4	49.3	20.8	100.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
36	333.0-342.5	334.6	78.6	66.5	–	–	–	–	–	40.5	–	–	38.6	–	–	–	20.9	–	T	–	
		336.5	76.9	63.9	55.4	–	–	–	–	12.3	–	3.9	6.4	21.9	–	–	–	–	T	–	
37	342.5-352.0	345.2	68.9	51.5	87.8	–	–	–	–	8.0	–	–	2.9	–	–	1.3	–	–	–	–	
38	352.0-361.5	356.5	75.2	61.3	76.5	–	–	–	–	12.8	–	–	8.7	–	–	1.9	–	–	–	–	
40	371.0-380.5	372.1	81.7	71.5	26.2	12.0	–	1.1	–	39.7	–	–	15.2	–	–	5.7	–	–	–	–	
41	380.5-390.0	384.5	72.4	56.8	12.1	–	–	0.7	–	38.9	–	–	21.4	–	–	26.8	–	–	–	–	
		384.8	70.8	54.4	7.1	–	–	–	–	30.6	–	–	38.5	–	–	23.9	–	–	–	–	
42	390.0-399.5	390.9	88.3	81.6	–	–	–	–	–	–	–	–	–	100.0	–	–	–	–	–	M	
		391.1	83.6	74.3	–	–	–	2.5	–	–	–	–	–	91.1	1.9	4.5	–	–	–	P	
44	402.5-412.0	403.4	85.4	77.2	–	–	–	–	17.1	4.6	3.7	–	56.1	–	–	14.5	–	3.9	–	A	
		403.6	88.4	81.9	–	–	–	12.9	59.6	–	20.6	–	–	–	–	6.9	–	–	–	A	
46	421.5-431.0	423.3	76.4	63.1	–	–	–	10.2	53.5	–	–	–	33.9	–	–	2.4	–	–	–	P	
		424.4	86.0	78.1	–	–	–	3.8	15.7	–	–	–	65.1	–	–	15.5	–	–	–	P	
52	476.5-486.0	477.8	90.6	85.3	6.3	–	5.4	2.7	23.0	–	–	–	62.6	–	–	–	–	–	–	P	
2-20μm Fraction																					
36	333.0-342.5	334.6	94.7	91.7			–	2.6	–	74.2	–		12.2	3.4		–	7.6	–	T	–	
		336.5	58.5	35.1			–	–	–	21.9	–		–	78.1		–	–	–	–	–	
37	342.5-352.0	345.2	88.3	81.7			–	2.2	–	69.0	–		–	2.1		26.8	–	–	–	–	
38	352.0-361.5	356.5	84.4	75.6			–	–	–	42.0	–		45.6	–		12.3	–	–	–	–	
40	371.0-380.5	372.1	79.1	67.3			–	0.5	–	44.7	–		34.9	–		19.9	–	–	–	–	
41	380.5-390.0	384.5	61.8	40.3			–	0.3	–	28.7	–		11.1	1.0		58.9	–	–	–	–	
		384.8	56.0	31.2			–	–	–	31.3	–		6.6	–		62.1	–	–	–	–	
42	390.0-399.5	390.9	92.4	88.2			–	10.5	24.0	–	–		–	56.0		9.5	–	–	–	A	
		391.1	63.8	43.5			–	1.7	–	–	–		–	96.9		1.4	–	–	–	–	
44	402.5-412.0	403.4	79.6	68.1			–	2.3	35.0	7.4	1.7		28.4	–		18.0	–	7.2	–	P	
		403.6	74.1	59.5			–	16.9	73.6	–	–		–	–		9.5	–	–	–	–	
46	421.5-431.0	423.3	63.9	43.6			–	14.4	82.6	–	–		–	–		3.1	–	–	–	–	
		424.4	83.6	74.4			4.8	10.2	42.7	–	–		16.0	–		26.3	–	–	–	–	
52	476.5-486.0	477.8	88.9	82.7			9.0	5.0	58.1	–	–		24.5	–		3.4	–	–	–	P	

<2μm Fraction

3	19.0-28.5	19.3	96.0	93.8	19.3	–	7.7	18.4	13.2	41.4	–	–	–	–	–	–	–
		23.4	98.1	97.0	30.5	–	8.0	25.2	29.6	6.7	–	–	–	–	–	–	–
36	333.0-342.5	334.6	92.5	88.2	–	–	27.7	–	–	50.3	2.0	–	20.0	–	P	–	–
		336.5	91.9	87.4	–	–	37.6	–	–	51.9	3.9	–	6.5	–	P	–	–
37	342.5-352.0	345.2	84.4	75.6	–	–	17.1	–	–	77.7	–	5.2	–	–	–	–	–
38	352.0-361.5	356.5	88.4	81.8	–	–	8.7	–	–	82.0	–	9.3	–	–	–	–	–
40	371.0-380.5	372.1	86.0	78.1	–	–	11.7	–	–	84.3	–	4.1	–	–	–	–	–
41	380.5-390.0	384.5	80.7	69.9	–	–	2.3	–	–	92.7	–	5.0	–	–	–	–	–
		384.8	78.0	65.7	–	–	4.1	–	–	91.8	–	4.1	–	–	–	–	–
42	390.0-399.5	390.9	89.5	83.6	–	–	–	–	–	–	–	–	–	–	–	M	–
		391.1	93.7	90.1	–	–	–	–	–	–	81.7	18.3	–	–	–	M	–
44	402.5-412.0	403.4	83.8	74.7	–	–	–	4.5	–	93.2	–	–	–	2.3	–	P	–
		403.6	91.7	87.0	6.7	15.3	–	20.1	48.2	–	–	9.7	–	–	–	A	–
46	421.5-431.0	423.3	76.5	63.3	4.8	18.4	–	–	–	76.8	–	–	–	–	–	–	A
		424.4	85.4	77.3	1.4	5.4	–	3.0	–	87.9	–	2.3	–	–	–	P	–
52	476.5-486.0	477.8	89.7	83.8	–	–	–	–	10.5	89.5	–	–	–	–	–	P	–

Note: T = trace; M = major; P - present; A = abundant.

[a]Beid = Beidellite.

[b]U-3 Peaks at 4.42 Å (very narrow), 4.65 Å (narrow), 3.80 Å (broad), and others.

TABLE 13
Results of X-Ray Diffraction Analysis from Hole 215

Core	Cored Interval Below Sea Floor (m)	Sample Depth[a] Below Sea Floor (m)	Diff.	Amorp.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica.	Chlor.	Mont.	Paly.	Clin.	Phil.	Hali.
Bulk Sample																
1	0.0-9.5	6.4	92.8	88.8	–	23.9	–	9.1	16.7	35.0	–	15.3	–		–	–
4	26.5-36.0	27.0	93.8	90.3	–	26.7	–	5.9	19.4	23.6	–	24.4	–		–	–
6	45.5-55.0	47.8	71.2	55.1	–	20.4	1.9	3.9	–	60.7	6.3	6.7	–		–	–
7	55.0-64.5	57.1	92.8	88.8	–	28.0	–	7.8	15.9	28.2	–	20.1	–		–	–
8	64.5-74.0	66.6	84.3	75.4	–	18.8	–	8.7	6.9	15.2	–	50.5	–		–	–
		69.2	75.9	62.3	–	25.4	2.8	6.1	1.1	51.9	5.5	7.3	–		–	–
9	74.0-83.5	74.4	88.1	81.4	–	9.8	7.6	–	–	6.4	–	12.7	36.1		27.3	–
		76.1	85.6	77.5	–	8.5	–	–	–	–	–	–	91.5		–	–
		77.4	81.6	71.3	–	6.8	–	–	–	–	–	–	88.6		–	4.6
16	140.5-150.0	147.8	52.6	25.9	100.0	–	–	–	–	–	–	–	–		–	–
2-20μm Fraction																
7	55.0-64.5	57.1	91.0	85.9		54.2	–	20.5	7.2	18.1	–	–	–	–	–	
8	64.5-74.0	66.6	82.7	72.9		29.9	2.9	12.4	5.4	26.2	–	23.2	–	–	–	
		69.2	64.9	45.2		32.6	3.0	9.3	–	49.2	5.9	–	–	–	–	
9	74.0-83.5	74.4	80.5	69.6		15.9	13.7	6.1	–	8.8	–	–	7.0	1.2	47.3	
		77.4	97.9	96.7		54.2	17.5	13.8	–	–	–	–	14.4	–	–	
<2μm Fraction																
1	0.0-9.5	6.4	92.9	88.8		14.1	–	3.5	12.9	35.4	–	34.1	–		–	–
4	26.5-36.0	27.0	90.3	84.8		14.2	–	3.7	20.6	12.6	–	48.9	–		–	–
6	45.5-55.0	47.8	76.6	63.5		17.4	–	1.7	5.4	42.4	5.8	27.3	–		–	–
7	55.0-64.5	57.1	88.0	81.3		15.7	–	4.6	15.6	11.3	–	52.8	–		–	–
8	64.5-74.0	66.6	83.5	74.2		9.1	–	2.1	6.0	5.7	–	77.2	–		–	–
		69.2	80.8	69.9		16.8	1.2	3.3	8.2	38.6	2.8	29.0	–		–	–
9	74.0-83.5	74.4	88.2	81.5		5.1	–	–	2.2	–	–	43.9	44.1		4.7	–
		76.1	89.3	83.3		4.3	–	–	–	–	–	5.7	88.3		–	1.7
		77.4	87.6	80.6		6.1	–	–	–	–	–	2.9	87.5		–	3.6
16	140.5-150.0	147.8	92.2	87.8		–	9.6	–	6.4	–	–	84.0	–		–	–

TABLE 14
Results of X-Ray Diffraction Analysis from Hole 216

Core	Cored Interval Below Sea Floor (m)	Sample Depth[a] Below Sea Floor (m)	Diff.	Amorp.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica.	Chlor.	Mont.	Paly.	Clin.	Phil.	Anal.	Pyri.	Holi.	Augi.	Anat.	Chab.[a]	U-4[b]	U-5[c]	U-6[c]
Bulk Samples																								
4	120.5-130.0	121.1	51.3	23.9	100.0	–		–		–		–	–	–	–	–	–		–		–		–	–
19	291.5-301.0	292.6	50.5	22.6	87.5	0.5		–		–		–	12.0	–	–	–	–		–		–		–	–
21	310.5-320.0	311.2	44.5	13.4	99.4	0.6		–		–		–	–	–	–	–	–		–		–		–	–
24	339.0-348.5	345.9	63.6	43.1	94.6	0.5		–		–		–	–	4.9	–	–	–		–		–		–	–
25	348.5-358.0	353.9	77.3	64.6	47.8	–		6.2		–		45.1	–	1.0	–	–	–		–		–		–	–
26	358.0-367.5	360.2	76.5	63.3	27.1	0.4		–		–		57.5	–	–	–	15.0	–		–		P		–	–
30	396.0-405.5	396.9	82.7	72.9	69.4	0.8		11.6		–		2.0	–	–	–	–	3.2		13.0		–		–	–
31	405.5-415.0	406.6	82.3	72.3	71.7	–		14.0		–		–	–	–	–	–	2.2		12.1		–		–	–
32	415.0-424.5	418.0	76.0	62.4	87.2	0.6		3.1		–		3.6	–	–	–	–	1.2		4.3		–		–	–
33	424.5-434.0	425.5	79.9	68.5	14.8	–		4.3		–		48.8	–	2.7	17.7	–	0.8		10.9		–		T	–
34	434.0-443.5	434.5	71.8	56.0	36.9	–		6.4		–		37.5	–	17.3	–	–	1.9		–		–		T	–
		439.2	70.4	53.7	48.7	0.7		7.1		–		19.8	–	–	22.8	–	0.9		–		–		–	–
		439.2	87.5	80.5	–	–		–		53.2		23.3	–	–	23.5	–	–		–		–		–	P
2-20μm Fraction																								
24	339.0-348.5	345.9	81.3	70.7		7.6	5.7	6.4		3.9		11.9	4.2	60.3	–	–	–		–		–			
25	348.5-358.0	353.9	78.7	66.7		1.2	–	24.5		2.3		60.4	–	9.9	–	–	1.7		–		–			
26	358.0-367.5	360.2	74.2	59.7		–	–	3.5		–		61.5	–	–	–	32.5	–		2.5		A			
30	396.0-405.5	396.9	89.2	83.1		2.1	–	38.4		–		–	–	–	–	–	10.9		48.6		–			
31	405.5-415.0	406.6	90.4	85.0		1.8	–	29.7		–		–	–	–	–	–	17.6		50.9		–			
32	415.0-424.5	418.0	90.9	85.8		1.9	–	30.9		–		22.4	–	–	–	–	10.7		34.1		–			
33	424.5-434.0	425.5	76.0	62.5		–	–	8.0		–		45.2	–	6.0	25.4	–	2.6		12.9		–			
34	434.0-443.5	434.5	76.1	62.6		–	–	28.2		–		47.4	–	16.9	–	–	7.5		–		–			
		439.2	76.1	62.7		1.2	–	4.8		–		26.3	–	–	65.0	–	2.7		–		–			
		439.2	89.4	83.5		–	–	–		19.4		18.0	–	–	62.7	–	–		–		–			
<2μ Fraction																								
4	120.5-130.0	121.1	90.4	84.9		17.6		–	21.6	20.4	9.1	–	31.3	–	–	–	–	–	–	–	–	–	–	
19	291.5-301.0	292.6	82.3	72.3		3.4		–	–	–	–	–	92.0	–	–	–	–	4.6	–	–	–	P	–	
21	310.5-320.0	311.2	93.0	89.1		8.3		–	–	–	–	33.6	56.0	2.1	–	–	–	–	–	–	–	–	–	
24	339.0-348.5	345.9	92.8	88.7		6.1		–	–	–	–	67.9	22.2	3.8	–	–	–	–	–	–	–	–	–	
25	348.5-358.0	353.9	80.5	69.5		–		7.4	–	–	–	92.6	–	–	–	–	–	–	–	–	–	–	–	

TABLE 14 – *Continued*

Core	Cored Interval Below Sea Floor (m)	Sample Depth[a] Below Sea Floor (m)	Diff.	Amorp.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica.	Chlor.	Mont.	Paly.	Clin.	Phil.	Anal.	Pyri.	Holi.	Augi.	Anat.	Chab.[a]	U-r[b]	U-5[c]	U-6[d]
<2μm Fraction – *Continued*																								
26	358.0-367.5	360.2	81.9	71.7		–		–	–	–	–	91.9	–	–	–	8.1	–	–	–	–	T	–	–	
30	396.0-405.5	396.9	93.4	89.7		–		24.2	–	–	–	47.2	–	–	–	–	–	–	28.6	–	–	–	–	
31	405.5-415.0	406.6	90.6	85.3		–		12.7	–	–	–	47.2	–	–	–	–	16.5	–	23.6	–	–	–	–	
32	415.0-424.5	418.0	91.6	86.8		–		7.5	–	–	–	80.7	–	–	–	–	11.8	–	–	–	–	–	–	
33	424.5-434.0	425.5	82.4	72.6		–		3.9	–	–	–	89.1	–	–	5.7	–	1.4	–	–	–	–	–	T	
34	434.0-443.5	434.5	80.1	68.9		–		6.9	–	–	–	90.3	–	–	–	–	2.0	–	–	0.8	–	–	T	
		439.2	81.2	70.7		–		–	–	–	–	65.2	–	–	29.8	–	2.1	–	–	2.9	–	–	–	
		439.2	87.0	79.6		–		-	–	67.0	–	22.6	–	–	10.4	–	–	–	–	–	–	–	–	

[a]Chab = Chabazite. P = present; T = trace; A = abundant.
[b]U-4 peaks at 6.89 Å, 8.25 Å, and 3.07 Å, among others.
[c]U-5 peak at 3.45 Å (broad).
[d]U-6 peaks at 3.63 Å, 3.08 Å, and 2.04 Å, among others.

TABLE 15
Results of X-Ray Diffraction Analysis from Hole 217

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.	Clin.	Pyri.	Bari.
Bulk Samples																
1	0.0-9.5	0.4	67.2	48.7	68.8	–	11.1		2.9	2.2	13.7	1.3	–			
2	40.0-49.5	43.7	61.4	39.7	87.6	–	4.1		1.1	–	6.0	–	1.1			
4	116.0-125.5	122.6	64.0	43.8	86.3	–	3.7		1.2	2.1	3.5	–	3.2			
34	582.0-591.5	582.5	60.2	37.8	85.2	–	–		–	–	–	–	14.8			
37	610.5-614.5	611.8	57.5	33.6	12.1	80.0	0.5		–	–	–	–	7.5			
2-20μm Fraction																
2	40.0-49.5	43.7	78.1	65.8			47.0	3.9	15.6	4.1	26.8	2.6	–	–	–	–
34	582.0-591.5	582.5	79.7	68.2			2.5	–	–	–	4.9	–	75.4	6.8	5.6	4.8
37	610.5-614.5	611.8	99.0	98.4			27.3	–	–	–	–	–	–	31.7	19.6	21.3
<2μm Fraction																
1	0.0-9.5	0.4	82.7	73.0			19.1	2.2	2.9	4.4	37.8	7.3	26.4	–	–	–
2	40.0-49.5	43.7	78.4	66.2			16.0	–	1.8	10.1	31.2	5.0	35.9	–	–	–
4	116.0-125.5	122.6	79.5	67.9			11.0	1.8	1.1	11.4	23.1	3.6	48.0	–	–	–
34	582.0-591.5	582.5	78.8	66.8			0.7	–	–	–	–	–	91.8	2.0	2.4	3.1
37	610.5-614.5	611.8	81.3	70.8			6.5	–	–	–	4.3	–	81.1	5.4	2.7	–

TABLE 16
Results of X-Ray Diffraction Analysis from Hole 218

Core	Cored Interval Below Sea Floor (m)	Sample Depth[a] Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Side.	Quar.	K-Fe.	Plag.	Kaol.	Mica.	Chlor.	Mont.	Amph.
Bulk Sample															
2	4.0-13.5	5.3	73.9	59.3	8.1	–	–	21.1	2.7	6.7	–	55.5	4.8	–	1.1
		8.2	76.6	63.4	–	–	–	19.4	3.2	6.4	–	65.2	5.6	–	–
5	70.0-79.5	71.0	75.6	61.9	–	–	–	25.7	–	5.8	–	60.8	7.8	–	–
6	108.0-117.5	109.7	74.6	60.3	49.7	–	–	14.2	–	3.1	2.5	20.5	2.5	7.5	–
8	184.0-193.5	186.1	77.8	65.4	6.8	–	–	21.6	–	4.4	3.1	53.1	6.1	4.8	–
13	374.0-383.5	376.6	66.1	47.0	8.2	1.9	–	23.8	3.3	7.8	–	49.0	4.6	1.5	–
15	450.0-459.5	451.0	70.8	54.4	4.2	1.9	–	20.8	–	3.2	–	62.7	7.3	–	–
16	459.5-469.0	460.9	70.5	54.0	3.9	1.7	–	21.6	2.1	5.9	–	56.5	5.8	2.5	–
17	469.0-478.5	470.4	73.4	58.4	3.9	2.3	–	24.1	–	5.6	3.0	52.7	6.7	1.7	–
19	488.0-497.5	489.4	72.3	56.7	4.2	1.6	2.1	24.2	3.2	4.8	2.1	50.9	5.9	0.9	–
20	497.5-507.0	497.9	70.7	54.3	3.2	–	–	26.8	2.5	4.9	–	52.3	7.8	2.5	–
21	535.5-545.0	536.4	64.5	44.5	5.2	–	–	25.6	2.4	6.2	–	52.2	7.1	1.2	–
22	573.5-583.0	575.7	69.5	52.4	4.7	2.0	–	25.4	2.9	6.3	–	51.4	7.2	–	–
23	611.5-621.0	611.7	71.2	55.0	3.7	2.6	–	23.4	2.7	6.1	–	51.6	8.4	1.3	–
		613.8	74.0	59.3	–	–	–	21.0	3.0	7.5	5.8	27.0	4.3	31.5	–
24	649.5-659.0	651.8	59.8	37.2	3.1	1.3	–	30.4	3.5	10.7	–	46.9	4.1	–	–
25	687.5-697.0	690.0	64.2	44.1	5.3	3.0	–	27.4	3.0	8.3	–	45.6	5.4	2.1	–
26	725.5-735.0	726.7	67.3	48.9	6.7	2.3	–	21.6	2.7	4.4	–	54.3	8.1	–	–
27	763.5-773.0	764.8	62.0	40.7	6.6	2.2	–	30.6	3.2	8.2	–	43.9	5.3	–	–
2-20μm Fraction															
2	4.0-13.5	5.3	64.9	45.2				35.1	6.0	13.8	–	38.4	5.4	–	1.4
		8.2	63.9	43.6				27.3	4.6	11.1	–	49.8	6.0	–	1.1
5	70.0-79.5	71.0	62.2	40.9				35.4	2.1	9.8	–	46.0	6.8	–	–
6	108.0-117.5	109.7	70.7	54.2				46.1	3.7	14.6	1.4	29.5	4.8	–	–
8	184.0-193.5	186.1	68.2	50.3				40.5	3.3	12.6	–	37.8	5.7	–	–
13	374.0-383.5	376.6	56.8	32.5				39.2	5.7	13.3	–	37.3	4.5	–	–
15	450.0-459.5	451.0	58.2	34.7				28.5	2.4	7.0	–	54.9	7.3	–	–
16	459.5-469.0	460.9	52.7	26.1				34.3	2.9	9.2	–	46.5	7.2	–	–
17	469.0-478.5	470.4	59.0	36.0				32.2	3.3	8.5	–	48.1	7.8	–	–
19	488.0-497.5	489.4	65.4	45.9				33.3	3.5	6.9	–	48.6	7.8	–	–
20	497.5-507.0	497.9	58.7	35.5				34.0	2.3	11.3	–	45.4	7.0	–	–
21	535.5-545.0	536.4	57.6	33.8				41.1	3.7	12.4	–	38.2	4.6	–	–
22	573.5-583.0	575.7	53.0	26.5				36.6	2.1	14.1	–	40.7	6.4	–	–
23	611.5-621.0	611.7	58.7	35.5				29.4	3.2	8.6	–	50.8	8.0	–	–
		613.8	76.5	63.2				34.7	5.3	11.6	2.1	32.6	3.7	10.1	–
24	649.5-659.0	651.8	54.1	28.3				31.2	2.1	8.7	–	51.7	6.4	–	–
25	687.5-697.0	690.0	54.5	28.9				33.3	2.7	9.8	–	47.3	6.9	–	–

TABLE 16 – *Continued*

Core	Cored Interval Below Sea Floor (m)	Sample Depth[a] Below Sea Floor (m)	Diff.	Amorp.	Calc.	Dolo.	Side.	Quar.	K-Fe.	Plag.	Kaol.	Mica.	Chlor.	Mont.	Amph.
<2μm Fraction															
2	4.0-13.5	5.3	79.4	67.9				18.4	–	3.5	1.4	49.6	8.3	18.8	
		8.2	80.5	69.5				17.6	2.1	5.7	2.6	57.9	7.2	6.8	
5	70.0-79.5	71.0	80.9	70.2				20.6	–	2.0	–	54.3	11.8	11.3	
6	108.0-117.5	109.7	83.0	73.4				16.7	–	2.9	6.9	26.5	7.1	39.8	
8	184.0-193.5	186.1	79.3	67.6				16.9	–	3.7	3.0	42.1	9.1	25.3	
13	374.0-383.5	376.6	74.0	59.4				15.2	–	0.4	5.1	44.6	10.0	24.7	
15	450.0-459.5	451.0	77.4	64.6				19.8	2.0	2.2	2.5	53.1	8.6	11.7	
16	459.5-469.0	460.9	76.5	63.2				17.9	–	1.7	1.8	55.6	9.0	14.0	
17	469.0-478.5	470.4	76.7	63.6				22.8	–	4.0	1.1	53.0	9.5	9.7	
19	488.0-497.5	489.4	78.8	66.9				23.4	1.9	3.9	3.6	48.5	7.4	11.3	
20	497.5-507.0	497.9	75.6	61.9				21.7	2.0	2.5	3.8	52.0	8.5	9.4	
21	535.5-545.0	536.4	71.7	55.7				16.0	1.8	1.4	5.5	55.2	7.3	12.9	
22	573.5-583.0	575.7	76.1	62.6				18.5	2.2	3.1	4.7	49.8	8.1	13.6	
23	611.5-621.0	611.7	77.2	64.4				21.0	3.2	2.9	4.8	49.3	7.3	11.5	
		613.8	77.5	64.8				7.9	2.8	1.7	10.6	8.1	3.3	65.5	
24	649.5-659.0	651.8	71.1	54.9				16.1	–	0.9	–	55.5	11.6	15.8	
25	687.5-697.0	690.0	71.9	56.2				16.1	–	1.5	–	49.7	9.4	23.4	
Interstitial Water Samples															
2	4.0-13.5	8.9	71.3	55.1	11.9	–	–	20.7	2.7	7.9	1.3	50.1	3.8	1.5	
3	13.5-23.0	15.1	65.8	46.5	–	–	–	23.9	3.1	8.2	–	59.6	5.2	–	
4	41.5-51.0	43.3	69.8	52.8	–	0.9	–	22.9	3.3	6.6	–	61.4	4.9	–	
5	70.0-79.5	71.9	69.3	52.1	–	0.7	–	22.4	4.1	7.0	–	60.1	5.7	–	
6	108.0-117.5	109.0	63.0	42.1	87.1	–	–	4.0	–	1.0	1.7	3.9	0.5	1.8	
8	184.0-193.5	187.3	72.6	57.1	24.0	–	–	29.5	2.8	9.7	1.8	23.9	4.1	4.3	
9	222.0-231.5	231.5	72.8	57.5	–	1.8	–	26.0	2.8	6.5	1.4	54.8	6.6	–	
11	298.0-307.5	299.8	55.6	30.6	–	1.1	–	36.7	11.9	14.0	–	33.8	2.5	–	
13	374.0-383.5	375.8	66.9	48.3	46.2	–	–	11.8	1.5	1.6	1.3	29.8	2.3	5.4	
14	412.0-421.5	421.5	65.7	46.4	24.4	1.4	–	18.7	2.3	4.7	–	41.8	5.1	1.6	
15	450.0-459.5	450.2	63.1	42.3	6.0	1.9	–	22.3	2.9	4.5	–	54.7	7.7	–	
16	459.5-469.0	460.3	60.7	38.6	4.4	1.4	–	30.3	3.5	11.3	–	45.4	3.7	–	
18	478.5-488.0	488.0	67.6	49.4	13.7	1.8	3.9	23.3	–	5.8	–	45.0	5.3	1.3	
21	535.5-545.0	538.8	64.5	44.5	5.5	2.2	–	24.9	1.5	6.1	–	53.2	6.6	–	
22	573.5-583.0	575.3	58.9	35.8	5.0	2.3	–	30.6	3.3	12.2	–	42.2	4.3	–	
23	611.5-621.0	613.3	71.4	55.3	5.6	1.5	–	22.7	2.3	4.6	1.9	46.3	5.7	9.3	
24	649.5-659.0	651.3	72.4	57.0	3.8	1.1	–	24.3	2.4	6.3	2.9	39.4	5.9	13.8	
25	687.5-697.0	689.3	63.1	42.3	1.3	1.5	–	33.0	1.8	9.2	–	47.6	5.6	–	
26	725.5-735.0	727.3	63.9	43.5	6.2	2.4	–	31.0	3.2	11.9	–	40.6	4.7	–	
27	763.5-773.0	765.3	71.8	55.9	5.1	2.6	–	24.6	2.3	5.5	–	50.4	8.0	1.5	

TABLE 17
Sample Positions for Site 218 Interstitial Water Analysis

Core/Section	Depth in Section (cm)	Depth Below Sea Floor (m)
2-4	0-20	8.9
3-2	0-10	15.1
4-2	20-30	43.3
5-2	20-40	71.9
6-1	104-110	109.0
8-3	0-20	187.3
9, CC	–	231.5
11-2	20-30	299.8
13-2	20-30	375.8
14, CC	–	421.5
15-1	20-27	450.2
16-2	20-30	460.3
18, CC	–	488.0
21-3	0-20	538.8
22-2	20-30	575.3
23-2	20-30	613.3
24-2	20-30	651.3
25-2	20-30	689.3
26-2	20-30	727.3
27-2	20-30	765.3