73. X-RAY MINERALOGY DATA FROM THE FAMOUS AREA OF THE MID-ATLANTIC RIDGE—LEG 37 DEEP SEA DRILLING PROJECT[1]

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METHOD

Semiquantitative determinations of the mineral composition of bulk samples, 2-20 μm, and <2μm fractions were performed according to the methods described in the appendix of Volume 28.

The method of sample preparation, in brief, is as follows: Bulk samples are washed to remove seawater salts and are ground to less than 10 μm under butanol. A portion of the sediment is decalcified in a sodium-acetate-buffered, acetic-acid solution (*p*H 4.5). The residue is fractionated into 2-20 μm and <2 μm samples by wet-sieving and centrifugation. The 2-20 μm samples are ground to less than 10 μm. These three preparations are treated with trihexylamine acetate to expand the smectites. All samples are X-rayed as random powders.

The results of the X-ray diffraction analysis are presented in Tables 1 to 7. Table 8 contains the list of samples submitted for X-ray diffraction analysis, the subbottom depth of each sample which identifies the sample in Tables 1 to 7, a color description, and a sediment description of each sample.

The sediment description is based on a classification devised in the DSDP X-ray Mineralogy Lab for rapid smear-slide analysis of deep-sea sediments. The classification assumes four major sediment types: detrital (d), consisting of fragmented silicates and clay minerals; biogenous (b), consisting of skeletal debris; authigenic (a), common examples of which are zeolites and chert; and chemical (c), primarily the iron-manganese colloids. The sediment types are given equivalent rank. Operationally a sediment is detrital if volumetrically $d + b > a + c$ and $d > b$; biogenous if $d + b > a + c$ and $b > d$; authigenic if $a + c > d + b$ and $a > c$; chemical if $a + c > d + b$ and $c > a$. Detrital sediments are further subdivided on the basis of texture into sand, silt, mud, and clay according to Folk's (1968) scheme.

Biogenous sediments are subdivided into siliceous ooze, calcareous siliceous ooze, siliceous calcareous ooze, and calcareous ooze in 25% increments of the components. The prefix nanno or foram is used when the origin of the materials can be clearly seen.

Authigenic and chemical sediments are given only gross descriptive terms such as chert or iron manganese colloid.

Components of other groups which appear in the major sediment type are acknowledged by modifiers to the sediment name according to the following scheme: components in concentrations of 2%-10% are used as adjectives or in conjunction with "bearing" (i.e., clayey and clay-bearing are synonymous), 10%-25% concentrations are termed "rich," 25%-50% concentrations are termed "abundant."

Mudrocks were named according to the classification of Blatt et al. (1972), which uses textural criteria for silt, mud, and clay and differentiates between fissile and nonfissile rocks. Thus, if abundant silt is visible, we have silt-shale or siltstone; if a grittiness is felt when chewed or scraped, we have mud-shale or mudstone; if no grittiness is felt, we have clay-shale or claystone. The term "argillite" is reserved for nonfissile mudrocks which show signs of incipient metamorphism.

The percent amorphous is a measure of the weight fraction of amorphous material in each sample which commonly consists of biogenic silica, volcanic glass, palagonite, allophane, and organic material. The amorphous content is calculated from the total diffuse scatter of the sample. The method of calculation assumes that the diffuse scatter in excess of the diffuse scatter from the crystalline materials is proportional to the amorphous content. The diffuse scatter of the crystalline minerals is determined from the mineral calibration standards (see Volume 28). Ideally, the amorphous content varies between zero and 100%, but, in cases where the minerals in the sample have a higher degree of crystallinity than the calibration standards, negative values can result. The negative values are reported as blanks; these samples can be assumed to contain little or no amorphous material.

The amorphous content was reported as n.d. (no determination) in two circumstances in the Leg 37 mineralogy data tables. First, in the 2-20 μm samples in which a small amount of insoluble residue was recovered after decalcification and the sample-backing material (silver) constituted more than 10% of the peak area above the background, and, second, in the <2 μm samples which contained a large quantity of montmorillonite for which there was no calibration factor relating the (110,020) peak (4.5Å) to diffuse scattering of the montmorillonite (see Mineral Notes).

The crystalline minerals are quantified by the method of mutual ratios using peak heights and concentration factors derived from ratioing the diagnostic peaks of minerals with the major peak of quartz. Unquantifiable minerals, i.e., unidentified minerals and minerals for which standards are not available, are tentatively quantified using a hypothetical concentration factor of 3.0 which is applied to the major peak of the mineral. The concentrations of the quantifiable minerals are summed

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TABLE 1
Results of X-Ray Diffraction Analysis, Hole 332

Sample Depth Below Sea Floor (m)	Amor.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlo.	Mont.	Paly.	Goet.	Phil.	Bari.	Amph.	Augi.	Cris.
Bulk Samples																
2.7	17.4	99.0	1.0													
2.7	16.1	99.1	0.9													
4.1	11.3	99.5	0.5													
2-20 µm Fractions																
2.7	N.D.		33.0	11.8	24.5	–	10.3	2.1	–						18.3	TR
2.7	N.D.		17.5	12.1	20.6	–	6.6	2.2	26.4						14.6	PR
4.1	N.D.		25.3	17.0	28.1	0.8	18.6	2.6	–						7.6	TR
<2 µm Fractions																
2.7	N.D.		12.1	5.1	6.6	1.7	11.5	1.3	57.6	–	–	–	0.9	–	3.1	
2.7	N.D.		8.9	5.9	4.9	–	9.8	0.5	49.0	2.0	7.5	6.5	–	–	5.0	
4.1	N.D.		10.9	6.8	7.0	2.8	14.3	2.0	53.8	–	–	–	–	1.6	0.8	

to 100%. The amorphous content and the unquantifiable minerals are not included in the total. The unquantifiable minerals are reported on a qualitative scale as trace (less than 5%), present (5%-25%), abundant (25%-65%), and major (greater than 65%).

The precision of the mineral determination is approximately ±1 weight percent of the amount present. Because of differences between the crystallinity of the mineral calibration standards and the minerals in the samples and also because of diffraction peak interferences, the accuracy of the reported concentrations is often less than the precision of the method allows. In terms of the reported concentration, smectites may vary ±50%; micas, chlorites, cristobalite, tridymite, goethite may vary ±20%; kaolinite, amphibole, augite, the feldspars, the zeolites, palygorskite, sepiolite, apatite may vary ±10%; the minerals which have stable crystal lattices and are not members of solid-solution series (or typically have limited crystal-lattice substitution in the sedimentary environment) such as quartz, low-magnesium calcite, aragonite, dolomite, rhodochrosite, siderite, gibbsite, talc, barite, anatase, gypsum, anhydrite, halite, pyrite, hematite, magnetite, will vary less than ±5%.

The user of the X-ray mineralogy data should bear in mind that (1) the reported values are relative concentrations and that some adjustment has to be made for the amorphous content and the unquantifiable minerals to obtain the absolute concentrations, (2) in a homogeneous system of minerals, the mineral concentration trends are reliable because of the precision, but when comparing mineral concentrations between different geographic regions or lithologic units additional information regarding the crystallinity of the minerals is required, (3) the representativeness of the samples selected for X-ray diffraction analysis is the responsibility of the shipboard scientists, and any questions pertaining to this aspect should be directed to them.

MINERAL NOTES

The montmorillonites from Leg 37 showed poorly developed (001) peaks. The (110,020) peak (4.4Å) and (060) peak (1.50Å) were of high intensity and indicated the presence of substantial amounts of montmorillonite. The loss of intensity of the (001) peaks was tentatively attributed to the extensive decalcification procedure which was necessary to concentrate the insoluble residues from the calcareous oozes recovered by Leg 37.

To quantify the montmorillonite, the (110,020) peak was selected as the diagnostic peak. An intensity factor of 25, determined from a variety of montmorillonites, was used.

Cristobalite was detected in numerous samples. The major peak of this mineral is at 4.10Å, which is intermediate between high and low cristobalite, but coincides exactly with the d-spacing of most cristobalites found in marine cherts. The material found in Leg 37 differs from most cristobalite found in cherts in that the diffraction peak is much sharper. Inasmuch as our intensity factor for cristobalite was determined on cristobalite from chert, it was felt that a large error would be introduced if this factor were applied to the cristobalite in Leg 37 materials and the mineral was reported qualitatively.

DRILLING MUD USAGE

Drilling mud, containing montmorillonite and barite, was used in Hole 332B between Cores 5 and 6, between Cores 18 and 19, and between Cores 30 and 31; in Hole 332A, between Cores 2 and 3; in Hole 335 between Cores 9 and 10. None of the samples submitted for X-ray diffraction analysis were directly exposed to the drilling mud.

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TABLE 2
Results of X-Ray Diffraction Analysis, Hole 332A

Sample Depth Below Sea Floor (m)	Amor.	Calc.	Quar.	Anat.	K-Fe.	Plag.	Kaol.	Mica	Chlo.	Mont.	Paly.	Phil.	Anal.	Pyri.	Augi.	Cris.	U-1[a]
Bulk Samples																	
7.9	13.5	100.0	–									–					
66.2	8.5	100.0	–									–					
67.8	9.4	100.0	–									–					
69.2	10.4	99.6	0.4									–					
70.7	8.9	100.0	–									–					
77.5	8.5	100.0	–									–					
78.7	7.6	100.0	–									–					
87.4	7.6	100.0	–									–					
88.3	7.9	100.0	–									–					
89.8	8.2	100.0	–									–					
94.7	7.7	100.0	–									–					
96.3	7.4	100.0	–									–					
98.1	8.9	100.0	–									–					
99.3	10.3	100.0	–									–					
100.7	7.6	100.0	–									–					
101.1	10.3	100.0	–									–					
103.0	9.7	100.0	–									–					
104.2	12.2	96.5	0.2									3.3					
2-20 μm Fractions																	
7.9	N.D.		12.5		17.5	9.9	2.0	44.5	1.3	–	–	12.3		–	–	PR	
66.2	83.9		16.3		16.2	30.2	0.7	9.1	0.4	–	–	6.1		–	21.2	PR	
67.8	81.7		28.8		10.0	25.6	–	15.4	–	–	–	–		1.6	18.5	TR	
69.2	80.1		24.9		9.5	16.0	4.1	11.1	1.0	14.8	2.3	–		1.4	14.8	PR	
70.7	84.0		11.7		12.7	15.6	0.9	8.0	0.3	32.0	1.2	4.0		0.7	13.0	PR	
77.5	72.9		5.2		40.3	19.8	–	10.6	–	17.6	–	3.5		3.0	–	PR	
78.7	N.D.		8.7		24.2	34.1	–	22.3	–	–	–	–		1.3	9.4	PR	
87.4	81.4		10.4		20.5	17.9	–	11.5	–	23.0	–	7.7		0.7	8.3	PR	
88.3	N.D.		15.5		23.1	26.2	–	13.0	–	–	–	5.8		–	16.6	PR	
89.8	N.D.		8.8		19.9	26.3	–	16.4	–	19.3	–	–		–	9.3	PR	
94.7	N.D.		4.6		21.7	14.4	–	59.4	–	–	–	–		–	–	–	
96.3	N.D.		11.5		17.8	19.1	1.4	8.2	0.8	28.8	1.3	–		0.8	10.4	PR	
98.1	80.3		11.6		13.2	16.3	–	9.2	–	28.6	–	8.2		–	13.0	PR	
99.3	84.4		13.1		16.0	23.3	1.6	9.4	1.0	28.1	–	–		–	7.6	PR	
100.7	N.D.		11.0		28.5	29.7	–	18.7	0.9	–	–	–		–	11.2	PR	
101.1	N.D.		12.7		30.2	23.7	–	21.3	–	–	–	12.2		–	–	PR	
103.0	N.D.		4.0		7.3	18.4	–	8.9	–	–	1.2	43.6		–	16.6	–	
104.2	46.5		3.4		18.2	10.3	–	1.9	–	–	–	64.9		–	1.3	–	
<2 μm Fractions																	
7.9	N.D.		7.3	0.5	8.5	6.0	1.2	8.3	0.8	63.9	–	2.8	0.6	–	0.1		–
66.2	N.D.		8.2	–	7.4	6.0	0.6	19.4	0.4	49.9	–	5.5	0.6	–	1.9		–
67.8	N.D.		11.2	–	7.6	5.9	3.6	10.9	1.3	58.2	–	–	–	–	1.3		–
69.2	N.D.		6.5	–	3.8	3.8	2.8	9.7	0.5	70.9	1.1	–	–	–	0.8		–
70.7	N.D.		6.9	–	6.0	5.3	1.4	10.3	0.9	61.8	1.3	4.1	–	0.4	1.6		–
77.5	N.D.		1.3	–	5.2	3.5	–	5.7	–	82.6	–	–	–	1.7	–		–
78.7	N.D.		5.3	–	3.3	4.9	–	6.8	–	58.9	5.6	9.1	–	0.4	5.8		–
87.4	N.D.		5.5	–	3.3	6.1	0.5	10.8	0.3	60.3	–	8.6	–	–	4.6		–
88.3	N.D.		6.9	–	5.8	4.5	2.6	9.3	1.6	56.0	7.2	4.7	–	–	1.4		–
89.8	N.D.		7.0	–	10.2	5.8	3.0	15.1	1.9	53.7	–	–	–	–	3.3		–
94.7	N.D.		6.6	–	13.9	9.6	–	7.4	–	58.9	3.6	–	–	–	–		–
96.3	N.D.		4.8	–	6.2	4.5	1.0	6.9	0.6	68.9	4.2	–	–	1.3	1.6		–
98.1	N.D.		5.2	–	6.1	3.5	–	12.9	–	64.6	–	6.5	–	–	1.3		–
99.3	N.D.		6.5	–	7.9	6.2	2.6	6.7	1.3	65.5	1.2	–	–	–	2.1		–
100.7	N.D.		6.0	–	7.4	6.3	–	8.7	–	69.7	1.8	–	–	–	–		A
101.1	N.D.		4.4	–	3.9	3.5	–	6.9	–	64.6	2.8	13.8	–	–	–		A
103.0	N.D.		1.6	–	4.0	5.2	–	4.7	–	63.3	1.1	18.6	–	–	1.3		–
104.2	N.D.		2.6	–	5.6	3.2	–	2.5	–	58.8	–	25.5	–	–	1.8		–

[a]U-1 sharp peaks at 5.46Å, 3.08Å, and 3.00Å. Possibly ferrian variscite (JCPDS NO. 7-69). None detected in 2-20μm fraction, thus may be a contaminant.

TABLE 3
Results of X-Ray Diffraction Analysis, Hole 332B

Sample Depth Below Sea Floor (m)	Amor.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlo.	Mont.	Paly.	Phil.	Anal.	Augi.	Cris.
Bulk Samples														
139.7	8.7	100.0												
141.3	10.3	100.0												
142.7	10.3	100.0												
144.2	10.2	100.0												
145.3	10.2	100.0												
2-20 µm Fractions														
139.7	N.D.		13.6	38.7	29.3		11.3	–	–		–	–	7.1	PR
141.3	N.D.		8.9	25.4	20.4		33.3	–	–		–	–	12.0	PR
142.7	81.0		6.2	37.0	32.8		5.1	0.8	16.2		–	–	1.9	PR
144.2	N.D.		7.9	35.1	34.4		6.4	–	–		–	2.2	14.1	TR
145.3	90.1		15.7	22.0	34.0		9.6	–	–		6.4	–	12.2	PR
<2 µm Fractions														
139.7	N.D.		12.1	12.1	8.6	2.6	8.9	1.4	51.7	–			2.6	
141.3	N.D.		6.6	14.0	10.2	2.6	7.9	1.6	55.1	1.2			0.8	
142.7	N.D.		6.4	18.0	18.9	1.6	7.4	1.4	44.4	–			1.8	
144.2	N.D.		7.7	9.5	14.5	3.4	9.6	1.6	46.0	–			7.8	
145.3	N.D.		8.8	7.2	7.2	3.5	7.9	1.5	63.1	–			0.8	

TABLE 4
Results of X-Ray Diffraction Analysis, Hole 333

Sample Depth Below Sea Floor (m)	Amor.	Calc.	Arag.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlo.	Mont.	Paly.	Phil.	Anal.	Pyri.	Amph.	Augi.	Cris.
Bulk Samples																	
1.2	18.1	97.7	2.3	–										–			
146.5	12.1	100.0	–	–										–			
148.0	11.6	100.0	–	–										–			
149.6	11.0	100.0	–	–										–			
151.0	21.8	97.9	–	0.8										1.3			
154.0	13.2	100.0	–	–										–			
165.6	10.3	100.0	–	–										–			
167.1	10.8	100.0	–	–										–			
168.6	17.2	99.3	–	0.7										–			
170.0	10.3	100.0	–	–										–			
171.6	11.1	100.0	–	–										–			
173.1	9.8	100.0	–	–										–			
184.3	8.4	100.0	–	–										–			
185.8	8.5	100.0	–	–										–			
187.3	6.8	100.0	–	–										–			
188.8	10.8	100.0	–	–										–			
190.3	5.6	100.0	–	–										–			
195.3	8.2	100.0	–	–										–			
198.3	5.8	100.0	–	–										–			
203.3	6.9	100.0	–	–										–			
204.8	7.9	100.0	–	–										–			
214.3	9.5	100.0	–	–										–			
2-20 μm Fractions																	
1.2	N.D.			9.8	30.5	32.6	–	7.1	–	–		–	–	–	–	20.1	PR
146.5	N.D.			7.7	22.0	25.0	0.9	12.5	0.5	27.0		–	–	–	–	4.4	PR
148.0	N.D.			7.5	44.9	28.3	–	9.8	–	–		–	–	3.2	–	6.3	PR
149.6	N.D.			7.0	14.1	27.0	–	21.4	–	23.4		–	–	–	–	7.1	PR
151.0	63.0			18.7	14.0	11.9	1.2	7.9	1.8	26.3		–	–	16.6	–	1.5	PR
154.0	N.D.			8.1	27.1	20.3	0.8	16.9	0.5	22.5		–	–	2.8	–	1.0	PR
165.6	N.D.			8.3	25.7	31.2	–	22.9	–	–		–	–	1.8	–	10.1	PR
167.1	78.9			11.1	9.2	23.3	–	13.0	1.5	29.7		–	–	1.0	–	11.2	PR
168.6	74.3			20.0	14.2	13.7	2.6	10.1	1.2	34.5		–	–	0.5	–	3.2	PR
170.0	N.D.			6.3	17.2	21.6	1.5	18.3	0.5	23.4		–	1.1	1.8	1.5	6.9	PR
171.6	80.5			8.3	9.7	26.4	1.1	9.3	1.2	27.2		–	0.8	1.3	–	14.7	TR
173.1	N.D.			7.8	–	44.2	0.6	17.3	0.8	–		–	–	1.5	1.7	25.9	TR
184.3	N.D.			12.9	8.9	33.3	–	23.4	1.3	–		–	–	2.2	–	18.1	TR
185.8	N.D.			16.0	15.6	26.0	–	12.0	1.3	–		9.6	–	0.4	–	18.9	TR
187.3	N.D.			8.3	11.6	34.1	–	37.4	–	–		–	–	1.5	–	7.1	TR
188.8	N.D.			14.4	–	48.5	2.7	14.3	1.1	–		–	–	–	–	19.0	TR
190.3	N.D.			4.7	–	47.5	–	11.1	–	–		–	–	1.6	–	35.2	–
195.3	N.D.			5.5	8.5	20.0	–	61.7	–	–		–	–	–	–	4.3	TR
198.3	N.D.			5.1	–	50.0	–	11.0	–	–		5.5	–	1.5	–	26.9	TR
203.3	N.D.			8.0	–	46.7	–	15.6	–	–		–	–	–	–	29.7	PR
204.8	N.D.			5.0	–	31.9	–	16.2	–	25.2		14.4	–	1.3	–	6.0	–
214.3	49.1			3.0	–	17.8	–	3.4	–	19.2		35.7	–	–	–	20.9	–
<2 μm Fractions																	
1.2	N.D.			6.8	15.6	13.5	2.4	9.5	1.9	43.6	–	–	–	–	–	6.7	
146.5	N.D.			9.3	14.5	10.6	3.5	14.5	2.2	44.7	–	–	–	–	–	0.7	
148.0	N.D.			11.6	34.3	27.0	4.6	17.3	2.9	–	–	–	–	–	–	2.3	
149.6	N.D.			8.9	14.7	14.5	3.2	11.2	2.0	40.6	–	–	–	–	–	5.0	
151.0	N.D.			11.7	7.4	5.3	2.7	9.7	1.9	53.0	–	–	–	7.6	–	0.5	
154.0	N.D.			8.9	10.5	11.4	2.6	9.9	1.6	49.3	4.0	–	–	1.8	–	–	
165.6	N.D.			6.1	8.7	8.2	2.1	12.4	1.1	61.0	–	–	–	0.4	–	–	
167.1	N.D.			6.6	7.2	5.8	2.1	9.5	1.5	66.3	–	–	0.7	0.3	–	–	
168.6	N.D.			8.5	4.3	4.0	3.0	10.0	0.9	66.7	1.0	–	–	0.3	–	1.3	
170.0	N.D.			6.5	6.6	7.5	2.2	14.9	1.0	59.4	–	–	–	0.9	0.7	0.2	
171.6	N.D.			4.4	3.5	6.8	2.2	15.8	0.8	63.2	1.2	–	0.5	0.3	1.2	–	
173.1	N.D.			4.8	–	7.7	–	15.6	–	58.1	1.4	8.9	0.5	0.4	–	2.4	
184.3	N.D.			10.0	3.0	7.9	2.8	15.5	1.5	54.5	2.2	–	–	–	–	2.5	
185.8	N.D.			6.7	3.0	5.0	2.4	7.3	0.7	70.3	1.5	–	–	–	–	3.2	
187.3	N.D.			4.4	6.3	5.8	1.4	10.3	0.6	69.9	–	–	–	–	–	1.4	
188.8	N.D.			4.4	2.8	6.3	2.0	7.6	1.1	70.2	3.8	–	0.7	–	–	1.2	
190.3	N.D.			3.3	–	12.0	–	17.9	–	61.0	–	–	0.8	–	–	4.9	
195.3	N.D.			4.2	–	5.7	–	27.3	–	52.5	–	8.1	0.9	–	0.6	0.8	
198.3	N.D.			3.7	–	7.7	–	12.5	–	68.0	–	3.6	–	–	–	4.5	
203.3	N.D.			5.5	–	9.7	–	12.6	–	53.8	2.2	7.2	0.4	0.7	–	8.0	
204.8	N.D.			2.3	4.4	5.1	–	15.8	–	68.5	3.2	–	0.6	–	–	–	
214.3	N.D.			2.0	3.6	3.2	–	4.1	–	69.6	1.0	13.2	–	–	–	3.2	

TABLE 5
Results of X-Ray Diffraction Analysis, Hole 333A

Sample Depth Below Sea Floor (m)	Amor.	Calc.	Quar.	K-Fe.	Plag.	Mica	Anal.	Mont.	Phil.	Pyri.	Cris.	Augi.
Bulk Samples												
217.8	6.9	100.0										
2-20 μm Fractions												
217.8	N.D.		10.4		53.3	32.4	1.5			2.4	TR	
<2 μm Fractions												
217.8	N.D.		3.8	7.1	9.0	10.4		58.3	8.3	1.2		1.8

TABLE 6
Results of X-Ray Diffraction Analysis, Site 334

Sample Depth Below Sea Floor (m)	Amor.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlo.	Mont.	Paly.	Phil.	Anal.	Pyri.	Augi.	Cris.
Bulk Samples															
2.3	20.2	97.4	1.8		–		0.8								
130.6	4.8	100.0	–		–		–								
132.1	6.8	100.0	–		–		–								
133.6	10.3	100.0	–		–		–								
135.1	8.7	100.0	–		–		–								
136.6	8.7	100.0	–		–		–								
138.1	7.4	100.0	–		–		–								
141.3	6.9	100.0	–		–		–								
149.3	4.8	100.0	–		–		–								
160.7	25.6	100.0	–		–		–								
161.8	25.3	100.0	–		–		–								
163.3	46.1	93.0	0.6		6.4		–								
168.3	40.8	97.7	–		2.3		–								
169.8	37.1	97.4	–		2.6		–								
178.2	32.7	100.0	–		–		–								
179.7	31.8	100.0	–		–		–								
181.2	30.8	100.0	–		–		–								
182.7	34.8	100.0	–		–		–								
184.2	32.4	100.0	–		–		–								
185.7	33.4	100.0	–		–		–								
187.1	47.6	100.0	–		–		–								
188.9	43.5	100.0	–		–		–								
198.5	25.8	96.3	–		–		3.7								
199.8	29.4	100.0	–		–		–								
201.4	25.3	100.0	–		–		–								
211.0	11.1	100.0	–		–		–								
217.3	11.6	100.0	–		–		–								
218.8	11.6	100.0	–		–		–								
220.3	11.0	100.0	–		–		–								
226.8	13.7	100.0	–		–		–								
228.3	17.9	100.0	–		–		–								
229.8	17.6	100.0	–		–		–								
236.6	13.9	100.0	–		–		–								
239.6	17.3	99.7	0.3		–		–								
241.0	16.0	100.0	–		–		–								
242.5	14.4	100.0	–		–		–								
244.4	17.6	100.0	–		–		–								
2-20 μm Fractions															
2.3	N.D.		35.7	18.9	18.2	1.1	24.8	1.4	–	–	–	–	–	–	TR
130.6	N.D.		7.3	–	16.7	–	12.3	–	24.6	–	31.7	–	–	7.3	–
132.1	N.D.		5.0	–	62.2	–	3.5	–	–	–	27.7	1.6	–	–	–
133.6	60.4		2.8	–	29.6	–	4.4	–	28.4	3.3	28.4	0.8	–	2.1	–
135.1	58.4		2.0	–	42.1	–	2.2	–	26.9	–	22.4	1.0	–	3.3	–
136.6	67.6		4.7	–	32.5	–	5.6	–	26.3	–	30.1	0.9	–	–	–
138.1	N.D.		5.6	–	28.6	–	7.5	–	29.9	1.3	21.3	1.0	–	4.8	–
141.3	45.5		2.0	–	25.1	–	16.7	–	12.7	–	38.1	1.5	–	3.9	–
149.3	N.D.		3.6	–	38.1	–	21.5	–	–	–	–	–	–	36.8	–
160.7	79.8		2.8	–	37.3	–	8.3	–	–	–	–	2.2	–	49.5	TR
161.8	85.9		4.9	–	31.9	–	22.3	–	–	–	–	2.5	–	38.4	PR
163.3	78.3		2.4	–	25.9	–	7.5	–	26.2	–	–	3.0	–	34.9	–
168.3	90.2		2.0	–	28.1	–	7.7	–	24.8	–	–	4.2	–	33.1	TR
169.8	N.D.		3.9	–	37.3	–	14.4	–	–	–	–	–	–	44.4	TR
178.2	90.1		2.8	–	15.2	–	10.2	–	37.0	–	11.1	3.8	2.4	17.4	TR
179.7	89.7		3.4	–	18.0	–	4.8	–	34.8	–	7.7	4.9	1.8	24.7	PR
181.2	88.6		5.0	–	15.1	–	8.5	–	37.9	–	7.6	2.6	2.1	21.2	–
182.7	91.0		1.7	–	14.4	–	8.1	–	46.7	3.3	3.6	4.1	–	18.2	PR
184.2	87.8		2.9	–	18.3	–	4.5	–	43.3	–	3.6	3.7	1.0	22.7	–
185.7	85.6		1.9	–	19.7	–	7.1	–	34.6	–	–	6.5	0.6	29.6	–
187.1	89.5		1.7	–	17.6	–	6.3	–	41.8	–	–	4.8	1.9	25.8	–
188.9	88.6		2.2	–	19.1	–	6.0	–	44.3	–	–	2.3	1.6	24.5	TR
198.5	90.6		4.0	–	13.8	–	11.0	–	48.3	–	4.4	4.0	–	14.6	PR
199.8	85.5		5.0	–	19.1	–	5.6	–	41.3	–	–	3.4	1.0	24.6	–
201.4	88.6		3.9	–	16.9	–	5.7	–	50.5	–	–	2.6	–	20.4	TR
211.0	N.D.		14.7	–	60.0	–	9.0	–	–	–	–	3.1	–	13.3	TR

TABLE 6 – *Continued*

Sample Depth Below Sea Floor (m)	Amor.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlo.	Mont.	Paly.	Phil.	Anal.	Pyri.	Augi.	Cris.
217.3	N.D.		7.4	–	22.1	–	4.3	–	34.7	–	10.4	2.0	–	19.1	PR
218.8	87.9		6.5	–	15.6	–	19.3	–	35.1	–	10.5	1.6	–	11.3	PR
220.3	N.D.		5.8	–	19.4	–	17.5	–	35.1	–	11.7	–	–	10.6	PR
226.8	N.D.		6.5	–	29.9	–	9.6	–	26.9	–	–	3.5	–	23.6	TR
228.3	N.D.		5.8	–	26.3	–	7.3	–	23.2	–	5.8	2.0	3.2	26.4	TR
229.8	76.7		3.4	–	22.1	–	4.2	–	36.4	–	–	5.8	1.8	26.4	PR
236.6	N.D.		5.5	–	25.3	–	12.0	–	30.9	–	–	2.7	2.6	21.0	PR
239.6	74.2		7.8	–	18.4	–	26.5	–	19.6	–	8.4	3.2	–	16.1	PR
241.0	72.1		8.0	–	19.3	–	14.2	–	34.9	–	–	4.0	0.8	18.8	TR
242.5	N.D.		4.3	–	32.8	–	5.4	–	17.3	1.3	26.0	2.5	1.2	9.0	–
244.4	N.D.		7.1	–	22.2	–	7.2	–	32.1	–	–	3.7	3.0	24.7	TR
<2 μm Fractions															
2.3	N.D.		13.5	6.4	7.3	4.7	15.8	1.5	50.7	–	–	–	–	–	
130.6	N.D.		4.2	4.4	4.7	–	8.7	–	66.5	–	11.6	–	–	–	
132.1	N.D.		3.2	14.5	8.3	–	7.2	–	47.7	–	19.1	–	–	–	
133.6	N.D.		0.9	–	4.6	–	3.6	–	71.4	4.4	14.3	0.8	–	–	
135.1	N.D.		1.0	–	4.8	–	–	–	78.9	–	14.8	0.6	–	–	
136.6	N.D.		1.9	–	5.8	–	7.5	–	66.0	–	18.0	0.7	–	–	
138.1	N.D.		1.5	5.2	4.6	–	5.9	–	61.8	1.5	19.0	0.5	–	–	
141.3	N.D.		2.0	–	9.4	–	–	–	72.4	–	14.5	1.7	–	–	
149.3	N.D.		2.3	–	8.6	–	5.4	–	72.3	2.2	–	–	–	9.2	
160.7	N.D.		1.6	–	9.6	–	6.0	–	72.5	–	–	–	–	10.2	
161.8	N.D.		3.3	–	7.0	–	8.1	–	73.2	–	–	–	–	8.4	
163.3	N.D.		1.3	–	5.1	–	6.3	–	81.4	–	–	1.1	–	4.9	
168.3	N.D.		2.1	–	6.8	–	6.5	–	78.1	–	–	1.8	–	4.8	
169.8	N.D.		4.2	–	8.7	–	14.4	–	57.8	–	–	–	–	14.9	
178.2	N.D.		1.4	–	3.3	–	7.7	–	75.0	–	8.8	2.5	1.2	–	
179.7	N.D.		1.7	–	3.2	–	4.2	–	80.2	–	8.4	1.4	0.8	–	
181.2	N.D.		2.3	–	2.9	–	7.7	–	84.9	–	–	1.8	0.4	–	
182.7	N.D.		1.1	–	2.4	–	13.8	–	71.9	10.2	–	0.6	–	–	
184.2	N.D.		2.2	–	5.9	–	8.3	–	77.0	–	–	–	–	6.6	
185.7	N.D.		1.8	–	7.1	–	6.9	–	71.6	–	–	3.1	–	9.5	
187.1	N.D.		1.5	–	4.5	–	4.6	–	83.0	–	–	2.1	0.9	3.4	
188.9	N.D.		1.5	–	3.9	–	6.1	–	78.8	–	–	2.1	1.1	6.5	
198.5	N.D.		2.3	–	2.9	–	5.6	–	88.8	–	–	–	0.4	–	
199.8	N.D.		2.0	–	5.3	–	7.1	–	81.2	–	–	1.6	–	2.8	
201.4	N.D.		2.3	–	3.4	–	4.0	–	89.8	–	–	–	0.5	–	
211.0	N.D.		4.4	–	3.6	–	7.2	–	81.5	–	–	1.1	–	2.2	
217.3	N.D.		3.8	–	2.9	–	8.0	–	80.0	–	5.3	–	–	–	
218.8	N.D.		3.3	–	3.2	–	9.8	–	83.6	–	–	–	–	–	
220.3	N.D.		3.2	–	2.5	–	14.3	–	80.0	–	–	–	–	–	
226.8	N.D.		4.0	–	4.8	–	11.2	–	72.9	–	–	1.9	–	5.1	
228.3	N.D.		2.9	–	5.5	–	11.2	–	67.3	–	5.6	2.6	–	5.0	
229.8	N.D.		2.2	–	4.8	–	5.0	–	80.1	–	–	0.9	–	7.0	
236.6	N.D.		3.3	–	4.1	–	9.5	–	70.5	3.3	–	1.2	–	8.1	
239.6	N.D.		3.5	–	2.7	–	3.1	–	78.7	–	6.3	0.7	–	4.9	
241.0	N.D.		2.6	–	2.8	–	4.3	–	81.1	–	4.3	0.5	–	4.6	
242.5	N.D.		2.5	–	5.0	–	10.0	–	74.6	7.1	–	–	–	0.8	
244.4	N.D.		3.1	–	3.4	–	6.5	–	83.0	–	–	–	–	4.0	

TABLE 7
Results of X-Ray Diffraction Analysis, Site 335

Sample Depth Below Sea Floor (m)	Amor.	Calc.	Quar.	K-Fe.	Plag.	Kaol.	Mica	Chlo.	Mont.	Paly.	Phil.	Anal.	Pyri.	Augi.	Cris.
Bulk Samples															
89.3	16.2	97.5	1.3				1.2								
90.8	15.5	99.6	0.4				–								
92.3	10.1	98.8	0.2				1.0								
127.3	9.0	100.0	–				–								
128.8	10.0	100.0	–				–								
130.3	8.2	100.0	–				–								
131.8	10.0	100.0	–				–								
220.8	7.1	100.0	–				–								
317.3	10.0	100.0	–				–								
318.8	9.8	100.0	–				–								
2-20 μm Fractions															
89.3	60.4		24.4	8.9	10.9	3.7	16.7	1.8	33.5		–	–	–	–	–
90.8	N.D.		16.2	23.3	16.8	3.1	20.0	1.3	18.8		–	0.5	–	–	TR
92.3	N.D.		13.6	26.7	21.7	1.1	12.5	2.1	20.0		–	0.6	0.9	0.7	PR
127.3	N.D.		18.2	19.7	18.0	1.9	17.2	2.0	23.0		–	–	–	–	–
128.8	N.D.		15.6	19.2	19.1	1.4	20.5	1.3	18.9		–	–	–	3.9	TR
130.3	N.D.		13.9	11.4	19.9	–	7.5	–	12.8		34.2	–	–	0.2	–
131.8	N.D.		17.7	18.3	40.3	4.1	17.3	2.2	–		–	–	–	–	–
220.8	N.D.		18.6	12.8	24.8	–	26.6	–	–		16.8	–	0.5	–	–
317.3	N.D.		6.5	–	14.0	–	71.4	–	–		3.7	–	2.4	1.9	–
318.8	N.D.		12.1	10.2	12.5	–	55.5	–	–		8.9	–	0.8	–	–
<2 μm Fractions															
89.3	N.D.		10.2	3.7	4.8	1.9	9.3	1.2	67.9	1.0	–			–	
90.8	N.D.		7.7	3.0	5.6	2.2	10.1	1.2	66.2	1.8	–			2.2	
92.3	N.D.		8.0	4.3	8.0	2.1	10.8	1.7	61.6	1.9	–			1.7	
127.3	N.D.		10.1	3.5	8.7	3.7	11.0	0.8	58.5	–	–			3.8	
128.8	N.D.		9.0	7.7	6.5	3.7	10.9	0.9	60.5	–	–			0.8	
130.3	N.D.		9.1	10.0	8.2	5.8	19.0	1.2	46.7	–	–			–	
131.8	N.D.		7.2	9.7	8.7	–	15.0	–	40.1	9.2	10.0			–	
220.8	N.D.		8.0	8.3	7.6	1.3	17.6	0.8	41.1	3.6	11.7			–	
317.3	N.D.		8.8	9.8	7.9	–	14.7	–	44.1	–	14.7			–	
318.8	N.D.		8.3	8.8	6.6	3.4	17.2	2.1	53.6	–	–			–	

TABLE 8
Samples Submitted for X-Ray Diffraction Analysis, Leg 37

Sample (Interval in cm)	Depth Below Sea Floor (m)	GSA Color	GSA Color Code Number	Sediment Description
Hole 332				
1-2, 119-121	2.7	Grayish-orange	10 YR 7/4	Foram-bearing nanno ooze
1-2, 122-124	2.7	Grayish-orange	10 YR 7/4	Foram-bearing nanno ooze
1-3, 108-110	4.1	Pinkish-gray	5 YR 8/1	Foram-bearing nanno ooze
Hole 332A				
1-1, 90-92	7.9	Grayish-orange	10 YR 7/4	Foram-rich nanno ooze
2-2, 70-72	66.2	Pinkish-gray	5 YR 8/1	Nanno ooze
2-3, 75-77	67.8	Very light gray	N8	Nanno ooze
2-4, 73-75	69.2	Very light gray	N8	Nanno ooze
2-5, 69-71	70.7	White	N9	Nanno ooze
3-3, 101-103	77.5	Pinkish-gray	5 YR 8/1	Foram-bearing nanno ooze
3-4, 70-72	78.7	White	N9	Foram-bearing nanno ooze
4-3, 142-144	87.4	White	N9	Nanno ooze
4-4, 76-77	88.3	White	N9	Nanno ooze
4-5, 77-79	89.8	White	N9	Foram-bearing nanno ooze
5-2, 72-74	94.7	White	N9	Nanno ooze
5-3, 76-78	96.3	White	N9	Nanno ooze
5-4, 105-107	98.1	White	N9	Nanno ooze
5-5, 76-78	99.3	White	N9	Nanno ooze
5-6, 73-75	100.7	White	N9	Nanno ooze
5-6, 109-111	101.1	White	N9	Nanno ooze
6-1, 95-97	103.0	Very pale orange	10 YR 8/2	Nanno ooze
6-2, 70-72	104.2	Very pale orange	10 YR 8/2	Volcanic glass, foram-bearing nanno ooze
Hole 332B				
1-1, 73-75	139.7	Very light gray	N8	Nanno ooze
1-2, 75-77	141.3	White	N9	Nanno ooze
1-3, 70-72	142.7	White	N9	Nanno ooze
1-4, 70-72	144.2	White	N9	Nanno ooze
1-5, 25-27	145.3	White	N9	Nanno ooze
Site 333				
1-1, 115-117	1.2	Grayish-orange	10 YR 7/4	Nanno ooze
2-1, 83-85	146.5	White	N9	Nanno ooze
2-2, 83-85	148.0	White	N9	Nanno ooze
2-3, 93-95	149.6	White	N9	Nanno ooze
2-4, 83-85	151.0	Light gray	N8	Nanno ooze
2-6, 83-85	154.0	Light gray	N8	Nanno ooze
3-1, 83-85	165.6	White	N9	Nanno ooze
3-2, 83-85	167.1	Light gray	N8	Nanno ooze
3-3, 83-85	168.6	Light gray	N8	Nanno ooze
3-4, 66-68	170.0	White	N9	Nanno ooze
3-5, 83-85	171.6	White	N9	Nanno ooze
3-6, 83-85	173.1	White	N9	Nanno ooze
4-1, 83-85	184.3	White	N9	Nanno ooze
4-2, 83-85	185.8	White	N9	Nanno ooze
4-3, 83-85	187.3	White	N9	Nanno ooze
4-4, 83-85	188.8	Light gray	N8	Nanno ooze
4-5, 83-85	190.3	White	N9	Nanno ooze
5-2, 83-85	195.3	Light gray	N8	Nanno ooze
5-4, 83-85	198.3	Light gray	N8	Nanno ooze
6-1, 83-85	203.3	White	N9	Nanno ooze
6-2, 83-85	204.8	Light gray	N8	Nanno ooze
7-2, 83-85	214.3	Pinkish-gray	5 YR 8/1	Nanno ooze
Hole 333A				
1-1, 83-85	217.8	Light gray	N8	Nanno ooze
Site 334				
1-2, 83-85	2.3	Grayish-orange	10 YR 7/4	Clayey, foram-bearing nanno ooze
2-1, 83-85	130.6	White	N9	Nanno ooze

TABLE 8 – *Continued*

Sample (Interval in cm)	Depth Below Sea Floor (m)	GSA Color	GSA Color Code Number	Sediment Description
Site 334 – *Continued*				
2-2, 83-85	132.1	Light gray	N8	Nanno ooze
2-3, 83-85	133.6	Light gray	N8	Nanno ooze
2-4, 83-85	135.1	Light gray	N8	Nanno ooze
2-5, 83-85	136.6	White	N9	Nanno ooze
2-6, 83-85	138.1	White	N9	Nanno ooze
3-2, 83-85	141.3	Light gray	N8	Nanno ooze
4-1, 83-85	149.3	Light gray	N8	Nanno ooze
5-2, 116-118	160.7	Light olive-gray	5 Y 6/1	Silty nanno ooze
5-3, 83-85	161.8	Yellowish-gray	5 Y 7/2	Volcanic glass, foram-bearing nanno ooze
5-4, 83-85	163.3	Light olive-gray	5 Y 5/2	Volcanic glass, foram-bearing nanno ooze
6-1, 83-85	168.3	Light olive-gray	5 Y 5/2	Volcanic glass, foram-bearing nanno ooze
6-2, 83-85	169.8	Light olive-gray	5 Y 5/2	Volcanic glass, foram-bearing nanno ooze
7-1, 83-85	178.2	Light olive-gray	5 Y 6/1	Volcanic glass, foram-bearing nanno ooze
7-2, 88-90	179.7	Light olive-gray	5 Y 6/1	Volcanic glass, foram-bearing nanno ooze
7-3, 83-85	181.2	Light olive-gray	5 Y 6/1	Volcanic glass, foram-bearing nanno ooze
7-4, 83-85	182.7	Light olive-gray	5 Y 6/1	Volcanic glass, foram-bearing nanno ooze
7-5, 83-85	184.2	Light olive-gray	5 Y 6/1	Volcanic glass, foram-bearing nanno ooze
7-6, 83-85	185.7	Light olive-gray	5 Y 6/1	Volcanic glass, foram-bearing nanno ooze
8-1, 54-56	187.1	Light olive-gray	5 Y 6/1	Volcanic glass, foram-bearing nanno ooze
8-2, 91-93	188.9	Light olive-gray	5 Y 6/1	Volcanic glass, foram-bearing nanno ooze
9-2, 94-96	198.5	Light olive-gray	5 Y 6/1	Radiolaria, volcanic glass, foram-bearing nanno ooze
9-3, 83-85	199.8	Light olive-gray	5 Y 6/1	Radiolaria, volcanic glass, foram-bearing nanno ooze
9-4, 85-87	201.4	Light olive-gray	5 Y 6/1	Radiolaria, volcanic glass, foram-bearing nanno ooze
10-4, 94-96	211.0	Light olive-gray	5 Y 6/1	Volcanic glass, foram-bearing nanno ooze
11-2, 83-85	217.3	Very pale orange	10 YR 8/2	Radiolaria, foram-bearing nanno ooze
11-3, 83-85	218.8	Yellowish-gray	5 Y 8/1	Foram-bearing nanno ooze
11-4, 83-85	220.3	Yellowish-gray	5 Y 8/1	Foram-bearing nanno ooze
12-2, 83-85	226.8	Yellowish-gray	5 Y 8/1	Foram-bearing nanno ooze
12-3, 83-85	228.3	Yellowish-gray	5 Y 8/1	Foram-bearing nanno ooze
12-4, 83-85	229.8	Yellowish-gray	5 Y 8/1	Foram-bearing nanno ooze
13-2, 86-88	236.6	Yellowish-gray	5 Y 8/1	Foram-bearing nanno ooze
13-4, 93-95	239.6	Yellowish-gray	5 Y 8/1	Foram-bearing nanno ooze
13-5, 83-85	241.0	Yellowish-gray	5 Y 8/1	Foram-bearing nanno ooze
13-6, 83-85	242.5	Yellowish-gray	5 Y 8/1	Foram-bearing nanno ooze
14-1, 91-93	244.4	Very pale brown	10 YR 8/3	Foram-bearing nanno ooze
Site 335				
1-2, 83-85	89.3	Pinkish-gray	5 YR 8/1	Foram-bearing nanno ooze
1-3, 83-85	90.8	Pinkish-gray	5 YR 8/1	Foram-bearing nanno ooze
1-4, 83-85	92.3	White	N9	Foram-bearing nanno ooze
2-2, 83-85	127.3	White	N9	Foram-bearing nanno ooze
2-3, 83-85	128.8	White	N9	Foram-bearing nanno ooze
2-4, 83-85	130.3	White	N9	Foram-bearing nanno ooze
2-5, 83-85	131.8	White	N9	Foram-bearing nanno ooze
3-1, 83-85	220.8	White	N9	Foram-bearing nanno ooze
4-2, 82-84	317.3	White	N9	Foram-bearing nanno ooze
4-3, 83-85	318.8	White	N9	Foram-bearing nanno ooze