11. LITHOLOGY, MINERALOGY, AND GEOCHEMISTRY OF UPPER CENOZOIC SEDIMENTS AT 23°N NEAR THE MID-ATLANTIC RIDGE, DRILLED ON LEG 45

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INTRODUCTION

Study of the formation processes of upper Cenozoic sediments in the near-axial zone of the Mid-Atlantic Ridge was one of the principal tasks of DSDP Leg 45. The sediments were deposited in relatively small sedimentary basins on the western and eastern flanks of the ridge, in Site Survey areas AT-5 and AT-6, and were drilled at DSDP Sites 395 and 396 respectively. (See site chapters, this volume.) Acoustic profile data (Purdy et al., this volume) allowed recognition of a relatively complete section of sediments occurring on basalts. The preliminary shipboard study (Melson, Rabinowitz, et al., 1976) shows that the sediments overlying basalts of seismic Layer 2 consist of nearly homogeneous nannofossil ooze with varying amounts of foraminifer remains and a slight admixture of clay material. The sediments are pigmented by ferric hydroxides in various shades. Such external homogeneity of the sediments makes it necessary to use quantitative mineral identification and chemical methods to divide them into sub-units and to reveal differences in composition and processes of formation.

This study provides a more detailed subdivision of the two lithologic units described in the site chapters of this volume. The basis for this subdivision is given in Tables 1-8.

MATERIALS AND METHODS

Thin-section determination of the mineral composition of insoluble residues from the carbonate sediments, and X-ray diffraction, serve as the basis for interpretation of the chemical data. Tables 1 and 8 present brief lithologic and mineralogic descriptions of the samples analyzed.

X-ray study of clay minerals was performed on two size fractions, <0.01 mm and <0.001 mm, after treatment of carbonate sediments with diluted HCl. Because of the high dispersion of clay particles and the absence of appreciable differences in the mineral compositions of fractions <10 and <1 μm, the clay-mineral association was studied in the fraction <10 μm. The X-ray diffractograms were obtained on the Diffractometer DRON-I, radiation Cu_{K_α}, 35 Kv, 20 mA. The scanning rate was 20° per minute.

Compositions of sediments were determined by spectral analysis in the analytical laboratory of the Geological Institute of the USSR Academy of Sciences, by comparison with international reference standards.

IDENTIFICATION AND STRUCTURAL CHARACTERISTICS OF CLAY MINERALS

In the Miocene-Pleistocene clay-nannofossil oozes (the fraction <10 μm from both holes [395 and 396]), a mixed complex of clay minerals was identified: dioctahedral hydromica, trioctahedral chlorite, kaolinite, palygorskite, montmorillonite, and two types of mixed-layer minerals, montmorillonite-hydromica (M-H), with strong predominance of expandable layers, and hydromica-montmorillonite (H-M), with a small proportion of smectite.

Hydromica in diffractograms has a peak corresponding to d_{001} = 10 Å that does not change after treatment with glycerine, heating at 550°C, and treatment in HCl; this implies absence of expanding layers. A peak corresponding to d_{060} = 1.49 Å shows that the hydromica is a type of dioctahedral illite. Before determining the polytype modification of the hydromica by electron diffraction, we treated samples in 10 per cent HCl and then heated them at 550°C to remove chloritic and kaolinitic components. The IM polytype modification was identified.

Chlorite was identified by peaks at 14.3 Å, 7.09 Å, 4.72 Å, and 3.53 Å for the natural and saturated state, and by the peak at 13.8 Å, retained after heating of the specimen. Disappearance of these peaks after treatment in 10 per cent HCl indicates a trioctahedral structure.

Some samples heated at 550°C have a peak at d <13.8 Å. The lower value of the peak, compared with the value d = 13.8 to 14.0 Å representative of common chlorite, testifies to structural defects. Within this chlorite, brucite nets either have an appreciable water content, or are of an island structure (Sakharov and Khlibov, 1971).

Kaolinite was usually identified by peaks, at 7.15 Å and 3.56 Å, which remained after treatment of the sample in 10 per cent HCl, and disappeared after heating at 550°C.

Mg^{2+} is the main cation of the exchangeable complex of montmorillonite; after treatment in glycerine the d_{001} spacing is 14.38 Å. In general, however, montmorillonite found in Leg 45 nannofossil oozes is characterized by a diversity of exchange cations, among them calcium, sodium, and potassium.

The two types of mixed-layer minerals differ distinctly in composition and in the ratio of smectitic and micaceous components. There are no intermediate compositions.

TABLE 1
Lithologic Characteristics of Samples Selected for Geochemical Studies, Leg 45, Hole 395

Series	Zone	Unit	Lithologic Subdivision: Sub-unit	Lithologic Subdivision: Sequence	Core-Section, cm Interval	Depth Interval (m)	Sample Number (Interval in cm)	Lithologic Characteristics of Samples Selected for Chemical Analysis
PLEISTOCENE	*G. colida colida*		I-1		1-1, 00 to 1-3, 68	0.00 to 3.68	1-3, 66-68	Argillaceous ooze with small amounts of nannofossils and foraminifers and an admixture of basaltic vitroclastic material
			I-2	I-2A	1-3, 68 to 1-4, 80	3.68 to 5.30	1-3, 142-144	Nannofossil ooze, foraminiferal (35%), argillaceous
							1-4, 78-80	Similar to Sample 1-3, 142-144 cm
				I-2B	1-4, 80 to 2-1, 76	5.30 to 8.26	1-5, 82-84	Nannofossil ooze with unsorted foraminifers remains (20%), similar to Sample 1-3, 142-144 cm
	G. hess						2-1, 74-76	Nannofossil ooze, essentially argillaceous, without foraminiferal remains
				I-2C	2-1, 76 to 2-4, 132	8.26 to 13.32	2-3, 30-32	Ooze, foraminiferal (60%), marly nannofossil (30-40%), foraminifers 0.08-0.11 mm
	G. viola						2-3, 112-114	Arenaceous ooze, essentially foraminiferal, poorly sorted (0.4-0.7 mm)
							2-4, 76-78	Similar to Sample 2-3, 112-114 cm
							2-4, 130-132	Arenaceous ooze, foraminiferal (80%) with predominance of forms 0.08-0.1 mm; noteworthy are small nodules of Mn hydroxides (10%); cement siliceous-clayey
				I-2D	2-4, 132 to 3-3, 101	13.32 to 21.04	2-5, 139-141	Nannofossil ooze, argillaceous, foraminiferal (30%), with sandy-gravelly grains of serpentinites (1-7 mm) – 40%
PLIOCENE	*G. tosaensis*						2-6, 11-13	Nannofossil ooze, slightly foraminiferal (20%), with micronodules of Mn hydroxides
							2-6, 73-75	Arenaceous ooze, foraminiferal (60%, 0.05-0.10 mm), nannofossil, clayey
							3-1, 70-72	Nannofossil ooze, foraminiferal (30%) middle-sized (0.10-0.15 mm), with micronodules of iron hydroxides
							3-1, 115-117	Nannofossil ooze, argillaceous, foraminiferal (40%), with radiolarians (15%) and Mn hydroxides (5%)
							3-2, 75-77	Nannofossil ooze, argillaceous, foraminiferal (40%), with micronodules of Mn hydroxides (5%).
							3-3, 27-29	Nannofossil ooze, argillaceous, foraminiferal (35%) with radiolarians (10%), altered pyroclastic material
							3-3, 99-101	Nannofossil ooze, argillaceous, slightly foraminiferal (15%) with rare Mn hydroxides
				I-2E	3-3, 101 to 4-5, 72	21.04 to 33.29	3-4, 99-101	Nannofossil ooze, argillaceous, slightly foraminiferal (5%)
							3-5, 93-95	Nannofossil ooze, argillaceous with rare (2%) foraminifers. Admixture of altered pyroclastic material (7%).
							3-6, 90-92	Nannofossil ooze, argillaceous with rare foraminifers
							4-1, 10-12	Nannofossil ooze, argillaceous, slightly foraminiferal (20%), with rare patches of Mn
	/ / /						4-3, 60-62	Similar to Sample 4-1, 10-12 cm
							4-4, 21-23	Arenaceous ooze, foraminiferal (85%), forms sized 0.1-016 mm predominant; cement clayey, nannofossil
	G. Miocenica						4-4, 115-117	Nannofossil ooze, argillaceous, with rare foraminifers
							4-5, 70-72	Nannofossil ooze with unsorted foraminifers (20%)

TABLE 1 – *Continued*

Series	Zone	Unit	Lithologic Subdivision: Sub-unit	Lithologic Subdivision: Sequence	Core-Section, cm Interval	Depth Interval (m)	Sample Number (Interval in cm)	Lithologic Characteristics of Samples Selected for Chemical Analysis
PLIOCENE	*G. Miocenica*		I-3	I-3A	4-5, 72 down to 5-6, 41	33.29 to 44.01	4-6, 54-56	Nannofossil ooze, argillaceous, with dispersed C_{org} and Mn hydroxides
							5-1, 136-138	Similar to Sample 4-6, 54-56 cm; 10% foraminifers
							5-2, 57-59	Nannofossil ooze, argillaceous, slightly foraminiferal (30%), small foraminifers (0.05 mm) in abundance
							5-3, 67-69	Similar to Sample 5-2, 57-59 cm. Separation of fine (0.05 mm) and larger (0.1 mm) foraminifers in lumpy patches
							5-4, 80-82	Nannofossil ooze, argillaceous, with rare foraminiferal (5%); altered remains of vitroclastic material
							5-5, 80-82	Nannofossil ooze, argillaceous, slightly foraminiferal (30%), poorly sorted
							5-6, 39-41	Similar to Sample 5-4, 80-82 cm, with an admixture of altered vitroclastic material, organic matter, rare Mn hydroxides.
				I-3B	5-6, 41 to 7-4, 35	44.01 to 60.00	6-1, 116-118	Nannofossil ooze, argillaceous, with rare foraminifers; sandy-gravelly fragments of serpentinites present.
	G. margaritae evoluta						6-2, 68-70	Nannofossil ooze, argillaceous, with rare remains of foraminifers
							6-3, 47-49	Similar to Sample 6-2, 68-70 cm; foraminifers about 3%.
							7-1, 103-105	Nannofossil ooze, slightly foraminiferal (25%)
							7-2, 132-134	Similar to Sample 5-6, 39-41 cm
							7-3, 14-16	Nannofossil ooze, essentially argillaceous, with dispersed organic matter, sandy-gravelly particles of serpentinite
							7-4, 33-35	Nannofossil ooze, argillaceous, with dispersed organic matter and sandy particles of serpentinite
				I-3C	7-4, 35 to 8-1, 129	60.00 to 65.94	8-1, 127-129	Nannofossil ooze, argillaceous, with rare foraminifers (5-7%)
			I-4		8-1, 129 to 9-4, 110	65.94 to 80.03	8-2, 74-76	Nannofossil ooze, argillaceous, with rare foraminifers (5-7%), micronodules of Mn hydroxides
							8-3, 74-76	Similar to Sample 8-2, 74-76 cm; foraminifers 15-20%
UPPER MIOCENE – PLIOCENE	*G. margaritae margaritae* *G. margaritae evoluta*						8-4, 19-21	Similar to Sample 8-2, 74-76 cm; rare foraminifers (5-7%), dispersed Mn hydroxides
							8-5, 17-19	Similar to Sample 8-4, 19-21 cm; lumpy structure, patches of Mn hydroxides (5%)
							8-6, 122-124	Similar to Sample 8-5, 17-19 cm
							9-1, 86-88	Nannofossil ooze, argillaceous, with rare foraminifers (5%), dispersed Mn hydroxides
							9-2, 23-25	Similar to Sample 9-1, 86-88 cm
							9-3, 124-126	Nannofossil ooze with rare foraminifers, dispersed patches of Mn hydroxides
							9-4, 50-52	Similar to Sample 9-3, 124-126 cm
		II			9-4, 110 to 9-6, 150	80.03 to 83.43	9-5, 62-64	Clay, small amount of carbonate; siliceous; obscure relics of altered basaltic glass
							9-6, 17-19	Clay, small amount of carbonate; siliceous; indistinct relics of brown glass, pigmented with ferric hydroxides
							9-6, 128-130	Similar to Sample 9-6, 17-19 cm

TABLE 2
Chemical Composition of Upper Cenozoic Sediments, North Atlantic, Hole 395, Leg 45 (wt. % on air-dry basis)

Sample Number (Interval in cm)	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO	P_2O_5	Na_2O	K_2O	CO_2	$C_{org.}$
1-3, 66-68	25.65	0.51	8.76	5.12	0.14	0.35	26.21	1.84	0.13	2.03	1.58	19.70	<0.14
1-4, 78-80	9.46	0.12	3.52	1.97	Nil	0.07	42.99	0.36	0.08	1.82	0.79	33.15	<0.14
2-3, 30-32	5.91	0.13	1.86	2.07	Nil	0.10	48.01	0.68	0.09	1.56	0.43	36.80	<0.14
2-4, 76-78	3.14	0.11	0.97	0.70	0.17	0.06	49.94	0.68	0.08	1.61	0.28	39.05	<0.14
2-6, 11-13	14.06	0.34	5.19	2.80	Nil	0.22	38.62	0.85	0.10	1.46	0.95	29.70	<0.14
3-1, 70-72	2.62	0.11	0.85	0.76	0.11	0.04	51.11	0.33	0.04	1.24	0.26	39.70	<0.14
3-3, 27-29	12.51	0.30	4.35	2.64	0.14	0.21	41.06	0.62	0.09	1.46	0.84	31.50	<0.14
3-3, 99-101	4.91	0.08	1.98	1.43	Nil	0.08	48.39	0.28	0.07	1.24	0.41	37.75	<0.14
3-5, 93-95	5.86	0.18	2.19	1.55	0.11	0.16	47.37	0.51	0.08	1.24	0.44	37.50	<0.14
4-5, 70-72	5.22	0.20	1.98	2.06	Nil	0.09	48.47	0.19	0.07	1.24	0.43	37.30	<0.14
5-2, 57-59	4.93	0.08	1.74	1.66	0.07	0.07	49.25	0.38	0.09	1.18	0.39	37.40	<0.14
5-4, 80-82	5.94	0.16	2.21	1.49	Nil	0.14	47.42	0.36	0.08	1.18	0.46	34.50	
5-6, 39-41	5.52	0.14	2.18	1.50	Nil	0.15	47.67	0.54	0.08	1.18	0.43	36.95	<0.14
6-1, 116-118	5.92	0.14	2.24	1.36	0.11	0.14	47.60	0.62	0.08	1.01	0.43	36.80	<0.14
6-3, 47-49	5.65	0.13	2.13	1.89	Nil	0.15	47.99	0.62	0.08	1.18	0.44	36.85	<0.14
7-2, 132-134	6.94	0.14	2.27	1.87	0.06	0.15	45.94	1.60	0.08	1.13	0.43	35.40	<0.14
7-3, 14-16	8.90	0.14	2.15	2.13	0.11	0.15	42.75	4.19	0.07	1.07	0.40	33.85	<0.14
7-4, 33-35	5.15	0.12	1.95	1.34	0.14	0.15	48.28	0.54	0.07	1.13	0.39	37.10	<0.14
8-2, 74-76	4.86	0.08	2.11	1.85	Nil	0.09	48.26	0.39	0.09	1.45	0.48	37.10	<0.14
8-4, 19-21	7.83	0.21	5.17	0.64	Nil	0.09	44.09	2.37	0.02	1.35	0.66	34.45	<0.14
9-1, 86-88	6.16	0.13	1.77	1.49	0.17	0.16	46.79	1.68	0.08	1.40	0.38	36.10	<0.14
9-3, 124-126	9.03	0.25	3.45	3.12	Nil	0.32	43.44	0.61	0.14	1.55	0.74	33.15	<0.14
9-5, 62-64	16.26	0.37	6.32	5.52	Nil	0.52	33.34	1.30	0.24	1.50	1.11	25.20	<0.14

The first type of the disordered mixed-layer mineral montmorillonite-mica has a predominance of smectitic layers (up to 89 or 90%) and a small micaceous component. The dimensions of crystallites of this clay are rather small. The mixed-layer structure, finely dispersed state, and the presence of various cations (Mg, Ca, K, Na) in the montmorillonitic interlayers, were responsible for formation of broad maxima in diffractograms: 14.0 Å for an untreated specimen; 18.4 to 19.5 Å for those treated with glycerine; and 10.0 Å for heated specimens, with visible asymmetry on the lower angle side of the peak. However, presence of the 14.0 Å peak in untreated samples enables us to suggest that in interlayer spaces of montmorillonitic zones there are also cations, mostly Mg^{2+}.

The second type of mixed-layer clay is mica-montmorillonite with disordered alternation of layers. The montmorillonite component constitutes not over 10 or 15 per cent; it was identified by peaks at 10.3 Å and 4.96 Å for the untreated specimens, 10.0 Å for specimens treated in glycerine, and 4.98 Å for heated specimens. Dimensions of the crystallites of this mineral are not large; as in diffractograms of specimens treated with glycerine and heated samples, the peak corresponding to d_{001} = 10.0 Å is noticeably asymmetric on the low-angle side. For large crystallites this peak should be symmetrical and always less than 10 Å.

X-ray study of the <1 μm fraction of selected samples and comparison of its mineral composition with the composition of the <10 μm fraction did not reveal appreciable differences. This, together with structural features, testifies to rather high dispersion of clay minerals.

According to the X-ray data, the samples of Leg 45 contain in the <10 and <1 μm fractions, besides clay minerals, an admixture of fine grains of quartz and feldspars.

PECULIARITIES OF THE MINERAL COMPOSITION OF AN INSOLUBLE RESIDUE OF CARBONATE SEDIMENTS

Most of the sediments studied have a high carbonate content. The content of insoluble residue in these oozes averages 15 per cent (2 to 29%). It is represented mostly (74 to 99%) by aggregates with particles sized <0.01 mm. A considerably smaller part (1 to 26%) falls within a fine silty fraction with particles sized 0.05 to 0.01 mm. Mineral particles larger than 0.05 mm do not exceed 1 per cent.

The complex of clay minerals almost throughout the section of nannofossil oozes of both holes is polymineralic. It consists mainly of hydromica, chlorite, and kaolinite, but sometimes contains montmorillonite, palygorskite, and two types of mixed-layer minerals with a sharp predominance of either montmorillonitic or hydromicaceous (illitic) components.

The fine silty fraction of the insoluble residues of the oozes has a constant (in places predominant) presence of clay aggregates and firmly cemented iron hydroxides. Besides these aggregates, there are particles of quartz, and feldspars, and in some samples, plates of brown, green, and colorless micas, siliceous aggregates, and fragments of volcanic glasses. The admixture of heavy minerals is negligible. There are sporadic crystals of zircon, rutile, tourmaline, grains of epidote, zeolites, and minerals of the anatase-brookite group. In

TABLE 2 – *Continued*

H_2O_{total}	Cl	S	Σ_1	$-Cl_2$	Σ_2	Fe^{2+}	Fe^{3+}	Fe_{total}	Mn_{total}	P_{total}
6.56	1.76		93.78	0.39	93.39	0.11	3.58	3.69	0.27	0.06
						Nil	1.38	1.38	0.05	0.03
1.86	1.44		99.08	0.32	98.76	Nil	1.45	1.45	0.08	0.04
	1.58	0.12				0.03	0.49	0.52	0.05	0.03
	1.19	0.09				Nil	1.88	1.88	0.17	0.04
	1.16	0.1				Nil	0.53	0.53	0.03	0.02
3.38	1.16					0.11	1.85	1.96	0.16	0.04
						Nil	1.00	1.00	0.06	0.03
	1.13	0.08				0.01	1.08	1.09	0.12	0.03
						Nil	1.44	1.44	0.07	0.03
1.92	1.15		98.39	0.25	98.14	0.05	1.16	1.21	0.05	0.04
	1.17	0.08				Nil	0.97	0.97	0.11	0.03
	1.33	0.08				Nil	0.98	0.98	0.12	0.03
	1.04	0.08				0.01	0.95	0.96	0.11	0.03
1.92	1.20		98.31	0.26	98.05	Nil	1.32	1.32	0.12	0.03
	1.13	0.05				0.003	1.31	1.31	0.12	0.03
	1.10	0.07				0.02	1.49	1.51	0.12	0.03
	1.16	0.08				0.04	0.94	0.98	0.12	0.03
						Nil	1.29	1.29	0.07	0.04
2.97	1.13		98.07	0.25	97.82	Nil	0.45	0.45	0.07	0.01
	1.21	0.07				0.07	1.04	1.11	0.12	0.03
3.29	1.27		97.07	0.28	96.79	Nil	2.18	2.18	0.25	0.06
	1.07	0.09				Nil	3.78	3.78	0.40	0.10

some interbeds there are fragments of monoclinal pyroxene and green hornblende crystals.

In larger fractions (0.05 mm), sporadic grains of quartz, pyritized organic remains, and fragments of ferruginous crusts are present.

Diagenetic transformation of the oozes is expressed in partial dissolution of organic remains (coccoliths, in particular), in the appearance of homogeneous fine-grained, more magnesian carbonate in the lower part of the section (Figures 1 and 2), and in the occurrence of authigenic ferromanganese micronodules.

DISTRIBUTION OF CLAY MINERALS IN HOLES 395 AND 396

The most abundant component of the clay-mineral complex is, with few exceptions, mixed-layer mineral of the montmorillonite-hydromica type (M-H) (with a strong smectite component). The next most abundant clays are usually, in descending order, hydromica (illite), chlorite, kaolinite, palygorskite, and, less frequently, a mixed-layer mineral of the second type of the mica-montmorillonite composition (H-M). In Hole 396 this polymictic clay complex was identified in 20 of 25 studied samples (see Table 9).

In addition to the polymictic complex, three interbeds in Hole 396 can be distinguished, in which montmorillonite appears as an independent phase. The montmorillonite content in these interbeds varies from 10 to 30 per cent. The same interbeds are characterized by a higher chlorite content. The fine silty fraction (0.05 to 0.01 mm) of these interbeds contains grains of pyroclasts (pyroxene and/or amphiboles). This testifies to the possible formation of montmorillonite by alteration of volcanic material (including volcanic glass, relics of which seldom remain preserved in sediments). Along with the assumed volcanogenic material, however, an admixture of common components can be observed in the same interbeds: hydromica, kaolinite, palygorskite, and mixed-layer minerals, most frequently of the (H-M) type and less frequently of the (M-H) type, sometimes in amounts significantly lower than in a typical polymictic association. In two interbeds (Samples 396-14-0, 34-36 cm and 13-1, 68-70 cm), the polymictic association also includes a mixed-layer hydromicaceous (H-M) mineral. In four interbeds of the lower part of the section (Samples 14-2, 90-92 cm; 14-0, 34-36 cm; 13-3, 66-68 cm; and 2-5, 139-141 cm), an appreciable admixture of palygorskite was recognized under an electron microscope and through X-ray analysis. On the whole, an increase of hydromica (illite) may be noted higher in the section, from Sample 10-1, 132-134 cm upward.

In Hole 395 the distribution of clay minerals in the sediments is very similar to the distribution in Hole 396. The polymineral association was found here in 22 of 29 samples studied. There are, however, seven interlayers with montmorillonite in Hole 395, compared with three in Hole 396. The clay fraction of nannofossil oozes in Hole 395 is more typically enriched in palygorskite, found here in 14 interbeds (Table 7), whereas in Hole 396 there are only four of them. Much more frequently there occur interbeds in Hole 395 where a typically polymineral association is supplemented by a mixed-layer mineral (H-M) with predominant hydromica (illite). There are 11 such interbeds in Hole 395, only two in Hole 396.

TABLE 3
Average Chemical Compositions of Upper Cenozoic Sediments, North Atlantic, Hole 395, Leg 45

Lithologic Subdivisions: Unit	Sub-unit	Sequence	Depth Interval: Core-Section, cm Interval	(m)		Content (wt. %): SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO
	I-1		1-1, 00 to 1-3, 68	0.00 to 3.68		25.65	0.51	8.76	5.12	0.14	0.35	26.21	1.84
	I-2	I-2A	1-3, 68 to 1-4, 80	3.68 to 5.30		9.46	0.12	3.52	1.97	Nil	0.07	42.99	0.36
		I-2B	1-4, 80 to 2-1, 76	5.30 to 8.26									
		I-2C	2-1, 76 to 2-4, 132	8.26 to 13.32	No of anal. Min. seq. Max. seq. Aver. seq.	2 3.14 5.91 4.52	2 0.11 0.13 0.12	2 0.97 1.86 1.41	2 0.70 2.07 1.39	2 Nil 0.17 0.09	2 0.06 0.10 0.08	2 48.01 49.94 48.98	2 0.68
		I-2D	2-4, 132 to 3-3, 101	13.32 to 21-04	No of anal. Min. seq. Max. seq. Aver. seq.	4 2.62 14.06 8.52	4 0.08 0.34 0.21	4 0.85 5.19 3.09	4 0.76 2.80 1.91	4 Nil 0.14 0.06	4 0.04 0.22 0.14	4 38.62 51.11 35.14	4 0.28 0.85 0.52
I		I-2E	3-3, 101 to 4-5, 72	21.04 to 33.29	No. of anal. Min. seq. Max. seq. Aver. seq.	2 5.22 5.86 5.54	2 0.18 0.20 0.19	2 1.98 2.19 2.09	2 1.55 2.06 1.80	2 Nil 0.11 0.06	2 0.09 0.16 0.12	2 47.37 48.47 47.92	2 0.19 0.51 0.35
			1-1, 00 to 4-5, 72	0.00 to 33.29	No of anal. Min. sub-unit Max. sub-unit Aver. sub-unit	9 2.62 14.06 7.08	9 0.08 0.34 0.17	9 0.85 5.19 2.54	9 0.70 2.80 1.78	9 Nil 0.17 0.06	9 0.04 0.22 0.11	9 38.62 51.11 41.93	9 0.19 0.85 0.50
	I-3	I-3A	4-5, 72 to 5-6, 41	33.29 to 44.01	No of anal. Min. seq. Max. seq. Aver. seq.	3 4.93 5.94 5.46	3 0.08 0.16 0.13	3 1.74 2.21 2.04	3 1.49 1.66 1.55	3 Nil 0.07 0.02	3 0.07 0.15 0.12	3 47.42 49.25 48.11	3 0.36 0.54 0.43
		I-3B	5-6, 41 to 7-4, 35	44.01 to 60.00	No of anal. Min. seq. Max. seq. Aver. seq.	5 5.15 8.90 6.51	5 0.12 0.14 0.13	5 1.95 2.27 2.15	5 1.34 2.13 1.72	5 Nil 0.14 0.08	5 0.14 0.15 0.15	5 42.75 48.28 46.51	5 0.54 4.19 1.51
		I-3C	7-4, 35 to 8-1, 129	60.00 to 65.94									
		I-3	4-5, 72 to 8-1, 129	33.29 to 65.94	No of anal. Min. sub-unit Max. sub-unit Aver. sub-unit	8 4.93 8.90 6.12	8 0.08 0.16 0.13	8 1.74 2.27 2.11	8 1.34 2.13 1.66	8 Nil 0.14 0.06	8 0.07 0.15 0.14	8 42.75 49.25 47.11	8 0.36 4.19 1.11
	I-4		8-1, 129 to 9-4, 110	65.94 to 80.03	No. of anal. Min. sub-unit Max. sub-unit Aver. sub-unit	4 4.86 9.03 6.97	4 0.08 0.25 0.17	4 1.77 5.17 3.12	4 0.64 3.12 1.78	4 Nil 0.17 0.04	4 0.09 0.32 0.17	4 43.44 48.26 45.64	4 0.39 2.37 1.26
I			1-1, 00 to 9-4, 110	0.00 to 80.03	No of anal. Min. seq. Max. seq. Aver. seq.	22 2.62 14.06 7.55	22 0.08 0.51 0.17	22 0.85 8.76 2.77	22 0.64 5.12 1.88	22 Nil 0.17 0.06	22 0.04 0.35 0.14	22 26.21 49.25 30.98	22 0.19 4.19 0.92
II			9-4, 110 to 9-6, 150	80.03 to 83.43		16.26	0.37	6.32	5.52	Nil	0.52	33.34	1.30

TABLE 3 – *Continued*

(Content (wt. %)												
P_2O_5	Na_2O	K_2O	CO_2	$C_{org.}$	H_2O_{total}	Cl	S	Fe^{2+}	Fe^{3+}	F_{total}	Mn_{total}	P_{total}
0.13	2.03	1.58	19.70	<0.14	6.56	1.76	–	0.11	3.58	3.69	0.27	0.06
0.08	1.82	0.79	33.15	<0.14				Nil	1.38	1.38	0.05	0.03
2	2	2	2	2		2		2	2	2	2	2
0.08	1.56	0.28	36.80			1.44		Nil	0.49	0.52	0.05	0.03
0.09	1.61	0.43	39.05			1.58		0.03	1.45	1.45	0.08	0.04
0.09	1.59	0.36	37.92	<0.14		1.51		0.01	0.97	0.99	0.07	0.03
4	4	4	4	4		3	2	4	4	4	4	4
0.04	1.24	0.26	29.70			1.16	0.09	Nil	0.53	0.53	0.03	0.02
0.10	1.46	0.95	39.70			1.19	0.1	0.11	1.88	1.96	0.17	0.04
0.08	1.35	0.61	34.66	<0.14		1.17	0.1	0.03	1.31	1.34	0.10	0.03
2	2	2	2					2	2	2	2	2
0.07		0.43	37.30					Nil	1.08	1.09	0.07	
0.08		0.44	37.50					0.01	1.44	1.44	0.12	
0.08	1.24	0.43	37.40	<0.14				0.005	1.26	1.27	0.10	0.03
9	9	9	9	9		6	4	9	9	9	9	9
0.04	1.24	0.26	29.70			1.13	0.08	Nil	0.49	0.52	0.03	0.02
0.10	1.82	0.95	39.70			1.58	0.12	0.11	1.88	1.96	0.17	0.04
0.08	1.43	0.54	35.83	<0.14		1.28	0.10	0.02	1.23	1.25	0.09	0.03
3	3	3	3	2	1	3	2	3	3	3	3	3
0.08		0.39	34.50			1.15		Nil	0.97	0.97	0.05	0.03
0.09		0.46	37.40			1.33		0.05	1.16	1.21	0.12	0.04
0.08	1.18	0.43	36.28	<0.14	1.92	1.22	0.08	0.02	1.04	1.05	0.09	0.03
5	5	5	5	5	1	5	3	5	5	5	5	5
0.07	1.01	0.39	33.85			0.05	0.07	Nil	0.94	0.96	0.11	
0.08	1.18	0.44	37.10			1.20	0.08	0.04	1.49	1.51	0.12	
0.08	1.10	0.42	36.00	<0.14	1.92	0.91	0.08	0.01	1.20	1.22	0.12	0.03
8	8	8	8	7	2	8	5	8	8	8	8	8
0.07	1.01	0.39	33.85			0.05	0.07	Nil	0.94	0.96	0.05	0.03
0.09	1.18	0.46	37.40			1.33	0.08	0.05	1.49	1.51	0.12	0.04
0.08	1.13	0.42	36.11	<0.14	1.92	1.02	0.08	0.01	1.14	1.15	0.11	0.03
4	4	4	4	4	3	3		4	4	4	4	4
0.02	1.35	0.38	33.15		1.21	0.07		Nil	0.45	0.45	0.07	0.01
0.14	1.55	0.74	37.10		3.29	1.27		0.07	2.18	2.18	0.25	0.06
0.08	1.44	0.57	35.20	<0.14	2.49	0.82		0.02	1.24	1.26	0.13	0.03
22	22	22	22	22	6	18	9	22	22	22	22	22
0.02	1.01	0.26	19.70		1.21	0.07	0.07	Nil	0.45	0.45	0.03	0.01
0.14	2.03	1.58	39.70		6.56	1.92	0.12	0.11	3.58	3.69	0.27	0.06
0.08	1.35	0.55	35.08	<0.14	2.98	1.12	0.08	0.02	1.31	1.33	0.11	0.03
0.24	1.50	1.11	25.20	<0.14		1.07	0.09	Nil	3.78	3.78	0.40	0.10

TABLE 4
Content of Normative Molecules $CaCO_3$, $MgCO_3$, NaCl, Fe_2S in Upper Cenozoic Sediments, North Atlantic, Hole 395, Leg 45 (wt.%)

Sample Number (Interval in cm)	Content						
		Carbonate Molecule					
	CO_2	$CaCO_2$	$MgCO_3$	Cl	NaCl	S	Fe_2S
1-3, 66-68	19.70	44.808		1.76	2.902		
1-4, 78-80	33.15	75.401					
2-3, 30-32	36.80	83.765		1.44	2.374		
2-4, 76-78	39.05	88.821		1.58	2.605	0.12	0.224
2-6, 11-13	29.70	67.554		1.19	1.962	0.09	0.168
3-1, 70-72	39.70	90.299		1.16	1.913	0.1	0.187
3-3, 27-29	31.50	71.648		1.16	1.913		
3-3, 99-101	37.75	85.864					
3-5, 93-95	37.50	84.536	0.640	1.13	1.863	0.08	0.150
4-5, 70-72	37.30	84.840					
5-2, 57-59	37.40	85.068		1.15	1.896		
5-4, 80-82	34.50	78.471		1.17	1.929	0.08	0.150
5-6, 39-41	36.95	84.044		1.33	2.193	0.08	0.150
6-1, 116-118	36.80	83.703		1.04	1.715	0.08	0.150
6-3, 47-49	36.85	83.816		1.20	1.978		
7-2, 132-134	35.40	80.519		1.13	1.863	0.05	0.093
7-3, 14-16	33.85	76.291	0.592	1.10	1.813	0.07	0.131
7-4, 33-35	37.10	84.385		1.16	1.913	0.08	0.150
8-2, 74-76	37.10	84.385					
8-4, 19-21	34.45	78.357		1.13	1.863		
9-1, 86-88	36.10	82.110		1.21	1.995	0.07	0.131
9-3, 124-126	33.15	75.401		1.27	2.094		
9-5, 62-64	25.20	57.319		1.07	1.764	0.09	0.168

GENESIS OF CLAY MINERALS IN NANNOFOSSIL OOZES OF HOLES 395 AND 396

We can discuss the genesis of clay minerals only tentatively. Formation of the sediments was controlled mostly by biological factors; the main part of the sediments is nannofossil-foraminifer ooze. One can assume that almost the whole polymineral complex of clay minerals is detrital, except for montmorillonite that is developing from volcanogenic products. The major part of this ubiquitous mineral complex consists of hydromica, kaolinite, chlorite, and, in some cases, a mixed-layer mineral (M-H) with predominant smectitic layers. These minerals are most probably of eolian origin; this is indicated by the diversity of minerals in this association and their occurrence in almost equal amounts. Their proportions are surprisingly constant. Among accessory minerals the stable ones (zircon and tourmaline) are associated with slightly stable minerals (epidote and zoisite), and all of these are of continental rather than marine provenance. In sediments penetrated by Holes 395 and 396, quartz, even in the most finely dispersed clay fraction (<1 μm, is always accompanied by feldspar. The prevailing (especially strong winter) winds are southwesterly (Gerasimov, 1964), indicating that the supply of these minerals into the region of Holes 395 and 396 is from the northwestern part of Africa through eolian suspension. This conclusion accords with the data of Goldberg and Griffin (1964), and indicates the significant role of wind in transportation of detrital clay particles of hydromica, kaolinite, chlorite, and other minerals into the central, pelagic zones of the Atlantic Ocean.

The summary of the data on tropospheric and local transportation phenomena (A. P. Lisitzin, 1974) showed that in the Atlantic regions affected by arid climate, the clastic and pelitic material of the sediments contains 25 to 75 per cent (average 50%) eolian material. The accumulation rate of pelagic clay on the bottom of the Atlantic Ocean (Delany et al., 1967) is 0.6 mm per 1000 years, and is attributable to material transported by wind from the Sahara.

Oceanic currents could also play a significant role in formation of the polymineral complex of clay minerals in upper Cenozoic nannofossil oozes penetrated by Holes 395 and 396. The oceanic currents may explain, first of all, the admixtures of palygorskite, the presence of the mixed-layer mineral (H-M) with strongly predominant hydromica, and sometimes even the higher amounts of kaolinite which in some interbeds supplement the polymineral complex. Goldberg and Griffin (1964) relate the wide distribution of muscovite and chlorite in the clayey part of Atlantic Ocean sediments to the platey shape of these minerals, which allows them to be transported by wind over long distances. The authors also state that illite, the most abundant component of the Atlantic sediments, is detrital, supplied from the European and African continents. Potassium-argon absolute age determinations of illite derived from the upper layers of Atlantic sediments (Hurley et al., 1963) give values of some hundred million years.

Thus, the clay mineral complexes in the insoluble residues of nannofossil oozes from Holes 395 and 396 were formed under the various influences of oceanic sedimentation, including eolian transportation, oceanic currents, and both sea floor and sub-aerial volcanism.

ACCUMULATION OF UPPER CENOZOIC SEDIMENTS

In both holes the sediments are clearly divided into two lithologic units: (a) the upper unit, composed of nannofossil-foraminifer oozes, and (b) the lower one, red-brown basal clays with an appreciable admixture of nannofossil oozes (see Tables 1, 5, 8, 10, 11, Figures 1, 2). The distribution of $CaCO_3$ contents, however, indicates the absence of appreciable compositional changes in any given major oxide component in the upper units of both holes (see Tables 4, 5, 10, 11, Figures 1, 2). Only in the lower part of Unit I, Hole 396, lower Pliocene, do there occur appreciable amounts of $MgCO_3$, which could be related to diagenesis.

The clay mineral components of the insoluble residue do not show any pronounced changes in their distribution in either hole (see Tables 7, 9). Indirect evidence of a quantitative change of the aluminosilicate admixture in sediments might be the Al_2O_3 content (see Tables 2, 3, 12, 13). The Al_2O_3 content in Unit I varies rather slightly, however, owing to intense dilution with carbonate material (see Figure 3). Upper Pleistocene deposits with an appreciable admixture of the basic pyroclastic material and fine-silty clastic material (basaltic and serpentinitic sands of local origin) are an exception.

TABLE 5
Average Contents of $CaCO_3$, $MgCO_3$, NaCl, FeS_2 in the Lithologic Subdivisions of Upper Cenozoic Sediments, North Atlantic, Hole 395, Leg 45

Lithologic Subdivisions			Depth Interval			Contents						
							Carbonate Molecule					
Unit	Sub-unit	Sequence	Core-Section, cm Interval	(m)		CO_2	$CaCO_3$	$MgCO_3$	Cl	NaCl	S	FeS_2
I	I-1		1-1, 00 to 1-3, 68	0.00- 3.68		19.70	44.808		1.76	2.902		
	I-2	I-2A	1-3, 68 to 1-4, 80	3.68- 5.30		33.15	75.401					
		I-2B	1-4, 80 to 2-1, 76	5.30- 8.26								
		I-2C	2-1, 76 to 2-4, 132	8.26 13.32	No. of anal. Min. seq. Max. seq. Aver. seq.	2 36.80 39.05 37.92	2 83.765 88.821 86.293		2 1.44 1.58 1.51	2 2.374 2.605 2.490	1 0.12	1 0.224
		I-2D	2-4, 132 to 3-3, 101	13.32- 21.04	No. of anal. Min. seq. Max. seq. Aver. seq.	4 29.70 39.70 34.66	4 67.554 90.299 78.841		3 1.16 1.19 1.17	3 1.913 1.962 1.929	2 0.09 0.1 0.10	2 0.168 0.187 0.178
		I-2E	3-3, 101 to 4-5, 72	21.04- 33.29	No. of anal. Min. seq. Max. seq. Aver. seq.	2 37.30 37.50 37.40	2 84.536 84.840 84.688	1 0.640	1 1.13	1 1.863	1 0.08	1 0.150
			1-3, 68 to 4-5, 72	3.68- 33.29	No. of anal. Min. sub-unit Max. sub-unit Aver. sub-unit	9 29.70 39.70 35.83	9 67.554 90.299 81.418	1 0.640	6 1.13 1.58 1.28	6 1.863 2.605 2.105	4 0.08 0.12 0.10	4 0.150 0.224 0.182
	I-3	I-3A	4-5, 72 to 5-6, 41	33.29- 44.01	No. of anal. Min. seq. Max. seq. Aver. seq.	3 34.50 37.40 36.28	3 78.471 85.068 82.528		3 1.15 1.33 1.22	3 1.896 2.193 2.006	2 0.08	2 0.150
		I-3B	5-6, 41 to 7-4, 35	44.01- 60.00	No. of anal. Min. seq. Max. anal. Aver. seq.	5 33.85 36.85 36.00	5 76.291 84.385 81.743	1 0.592	5 1.04 1.20 1.13	5 1.715 1.978 1.856	4 0.05 0.08 0.07	4 0.093 0.150 0.131
		I-3C	7-4, 35 to 8-1, 129	60.00- 65.94								
			4-5, 72 to 8-1, 129	33.29- 65.94	No. of anal. Min. sub-unit Max. sub-unit Aver. sub-unit	8 33.85 37.40 36.11	8 76.291 85.068 82.037	1 0.592	8 1.04 1.33 1.16	8 1.715 2.193 1.912	6 0.05 0.08 0.07	6 0.093 0.150 0.137
	I-4		8-1, 129 to 9-4, 110	65.94- 80.03	No. of anal. Min. sub-unit Max. sub-unit Aver. sub-unit	4 33.15 37.10 35.20	4 75.401 84.385 80.063		3 1.13 1.27 1.20	3 1.863 2.094 1.984	1 0.07	1 0.131
			1-1, 00 to 9-4, 110	0.00- 80.03	No. of anal. Min. unit Max. unit Aver. unit	22 19.70 39.70 35.08	22 44.808 90.299 79.732	2 0.592 0.640 0.616	18 1.04 1.76 1.24	18 1.715 2.902 2.044	11 0.05 0.12 0.08	11 0.093 0.224 0.153
II			9-4, 110 to 9-6, 150	80.03- 83.43	Sample 9-5, 62-64 cm	25.20	57.319		1.07	1.764	0.09	0.168

As already mentioned, accumulation of upper Cenozoic sediments occurred in relatively small sediment ponds. Correlation of deposits of these ponds on the basis of the biozonal subdivision of foraminiferal assemblages (Krasheninnikov, this volume) shows that, despite the common character of the sediment types, the phenomena of sedimentation in these ponds differed appreciably. Thus, in Hole 395 the major part of turbidite sediments are Pleistocene (see Tables 1, 6). These sediments are represented by foraminiferal sands, or by nannofossil oozes containing considerable amounts of foraminifers. Despite extreme deformation in the process of drilling, thin sections of these sediments clearly show microbrecciated structures: lithified particles of foraminiferal sand are cemented by nannofossil-micritic material. In Hole 396, however, foraminiferal sands and turbidites are most abundant in the Pliocene (Table 14).

This suggests that the intensity of the bottom currents and the pattern of general hydrodynamics dif-

TABLE 6
Foraminifers, $CaCO_3$, Insoluble Mineral Residue in Upper Cenozoic Sediments, Hole 395, Leg 45 (wt. %)

Series	Zone	Unit	Sub-unit	Sequence	Core-Section (Interval in cm)	$CaCO_3$ Content	Fraction <0.05 mm: Insoluble Residue: Fraction <0.01 mm	Fraction 0.05-0.01 mm	Foraminifer Content in Fraction >0.05 mm: Fraction >0.25 mm	Fraction 0.25-0.1	Fraction 0.1-0.05 mm	Total Foraminifer Content in Fraction >0.05 mm
c	j	I	I-1		1-3, 142-144	97.71	2.09	0.2	0.57	7.42	4.78	12.77
			I-2	I-2B	1-5, 82-84	71.19	25.68	3.13	3.05	9.79	8.42	21.26
	i				2-1, 74-76	87.55	10.33	2.12	0.01	0.20	0.14	0.35
	h			I-2C	2-4, 130-132	92.61	6.0	1.39	9.56	44.69	14.22	68.47
					2-5, 67-69	81.06	15.05	3.89	45.15	12.19	6.08	63.42
					2-5, 139-141	84.68	12.39	2.93	4.0	10.46	4.39	18.85
b	g			I-2D	2-6, 73-75	94.31	4.98	0.71	0.11	21.60	38.15	59.86
					2-2, 69-71	86.51	10.75	2.74	0.09	0.14	0.1	0.33
					2-3, 112-114	92.63	6.55	0.82	4.27	34.35	29.74	68.36
					3-1, 115-117	83.09	14.8	2.11	2.13	7.84	3.53	13.50
					3-2, 75-77	93.12	5.5	1.38	3.68	12.1	6.78	22.56
				I-2E	3-4, 99-101	89.72	9.37	0.91	0.67	3.63	1.75	6.05
					4-1, 10-12	87.61	11.08	1.31	2.62	10.71	5.98	19.31
	?				4-3, 60-62	89.88	8.63	1.49	1.56	7.84	3.99	13.39
					4-4, 115-117	91.57	7.52	0.91	0.01	0.10	0.22	0.33
	f		I-3	I-3A	4-4, 21-23	95.52	4.0	0.48	1.69	45.39	21.07	68.15
					4-6, 54-56	91.26	7.49	1.25	0.16	0.16	0.16	0.16
					5-1, 136-138	89.33	8.76	1.91	0.38	1.63	3.16	5.17
					5-3, 67-69	89.86	8.78	1.36	0.01	1.96	5.68	7.65
					5-5, 80-82	90.85	7.98	1.17	0.84	6.40	3.42	10.66
	e			I-3B	6-2, 68-70	90.86	7.83	1.31	0.07	0.19	0.06	0.32
					7-1, 103-105	91.96	6.60	1.44	6.68	9.85	4.51	21.04
				I-3C	8-1, 127-129	90.86	7.59	1.55	0.49	1.70	2.09	4.28
a	d		I-4		8-3, 74-76	93.24	5.93	0.83	1.25	4.40	3.21	8.86
					8-5, 17-19	90.25	8.67	1.08	0.86	2.63	1.93	5.42
					8-6, 122-124	80.90	16.81	2.29	0.13	0.42	0.45	1.0
					9-2, 23-25	89.45	9.48	1.07	0.58	2.17	2.40	5.15
					9-4, 50-52	91.25	7.83	0.92	0.07	0.42	0.44	0.93
		II			9-6, 17-19	63.36	31.71	4.93	0.05	0.35	0.6	0.46
					9-6, 128-130	81.84	16.61	1.55	0.21	1.14	0.94	2.29

Note: a = Upper Miocene-Pliocene; b = Pliocene; c = Pleistocene; d = G. margaritae margaritae-G. margaritae evoluta; e = G. margaritae-G. evoluta; f = G. miocenica; g = G. tosaensis; h = G. viola; i = G. hessi; j = G. calida calida.

fered significantly in the late Cenozoic for the western and eastern flanks of the Mid-Atlantic Ridge area. These effects could have been greatly influenced by local topography and the proximity of nearby ridges.

The nearby axial zone of the Mid-Atlantic Ridge has among the highest endogenic activities of the oceans (Boström et al., 1971; Rona, 1976). The results of such endogenic hydrothermal influence on sedimentation in this region are thus to be expected. The intensity of accumulation of biogenic components of the sediments studied was so great, however, that the lithologic-mineralogical and chemical methods of study of this paper do not allow us to evaluate this influence properly. It is worth pointing out, though, that at the Pliocene/Pleistocene boundary a relatively intense coloring of sediments with ferric hydroxides occurs. These sediments contain locally higher concentrations of Fe_2O_3 (see Tables 2, 3, 12, 13).

Thus, in the two holes, higher concentrations of ferric iron were recorded at two stratigraphic levels: in the basal Unit II (Hole 395, upper Miocene-Pliocene; in Hole 396, upper Miocene-Pliocene-middle Miocene), as well as at the interval of the Pleistocene/Pliocene boundary.

In summary, most of the sediments studied were deposited as turbidites. They consist mostly of redeposited autochthonous (organogenic carbonate) material that was transported in suspension. Most of the pelitic portion was probably brought into the area by wind; in some periods ashy volcanic material could have been deposited. The differences between the two holes appear to arise because accumulation of sediments was proceeding in isolated basins differing in hydrological regime, particularly with reference to bottom currents. Enrichments in iron oxides occur in the basal sediments and at the Pliocene/Pleistocene boundary in both holes.

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TABLE 7
X-ray Analyses of Clay Minerals, Hole 395, Leg 45

Series	Zone	Sample (Interval in cm)	Genetic Type	Clay Minerals of the <10 μm Fraction	Associations of Clay Minerals	Facies
c	j	1-3, 142-144	Nannofossil ooze with foraminifers of various sizes	Hydromica (dioctahedral), kaolinite, chlorite (trioctahedral), a small admixture of the mixed-layer mineral of the (M-H) type (with predominance of expanding packets M)	Polymineral	Facies of organogenic sediments of the zone of quiet sedimentation
		1-5, 82-84	Nannofossil ooze with foraminifers of various sizes	Montmorillonite ~ 25%, chlorite ~ 15%, kaolinite ~ 30%, hydromica ~ 25%, palygorskite up to 5%	Montmorillonite-chloritic with hydromica and kaolinite	
	i	2-1, 74-76	Nannofossil with sporadic foraminifers	Mixed-layer mineral (M-H), hydromica, kaolinite, chlorite, quartz, feldspars	Polymineral	
		2-2, 69-71		Montmorillonite, chlorite, kaolinite, mixed-layer mineral H-M, a slight admixture of M-H, palygorskite, quartz, and feldspars	Montmorillonite-chloritic with kaolinite	
	h	2-3, 112-114	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), kaolinite, chlorite, a slight admixture of palygorskite, quartz, and feldspars	Polymineral	
		2-4, 130-132	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), chlorite, kaolinite, quartz, feldspars		
		2-5, 67-69	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), hydromica, kaolinite, chlorite, a slight admixture of palygorskite, quartz, and feldspars		
b	g	2-6, 73-75	Nannofossil with foraminifers of various sizes	Mixed-layer mineral (M-H) ~ 25%, hydromica ~ 25%, chlorite ~ 25%, kaolinite, ~ 10%, palygorskite up to 10%, quartz, feldspars		
		3-2, 75-77	Nannofossil with foraminifers of various sizes	Mixed-layer mineral (M-H) 25%, hydromica 25%, kaolinite 25%, chlorite 25%, quartz, feldspars		
		3-4, 99-101	Nannofossil ooze with a small amount of foraminifers	Mixed-layer mineral (M-H), kaolinite, chlorite, quartz, feldspars		
		3-6, 90-92	Nannofossil ooze with sporadic foraminifers	Mixed-layer mineral (M-H), kaolinite (abundant), chlorite (little), quartz, feldspars		
		4-1, 10-12	Nannofossil ooze with foraminifers of various sizes	Mixed-layer mineral (M-H), hydromica, kaolinite, chlorite, a slight admixture of palygorskite, quartz, and feldspars		
		4-3, 60-62	Nannofossil ooze with foraminifers	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, a small admixture of palygorskite, quartz, and feldspars		
		4-4, 21-23	Foraminiferal nannofossil ooze	Montmorillonite, chlorite, kaolinite, a small admixture of mixed-layer mineral (M-H), palygorskite, quartz, and feldspars	Montmorillonite-chlorite with kaolinite	
	f	4-4, 115-117	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), kaolinite, chlorite (imperfect), a slight admixture of palygorskite, quartz, and feldspars	Polymineral	
		5-1, 136-138	Nannofossil ooze with a small amount of foraminifers	Mixed-layer mineral (M-H), kaolinite (abundant), chlorite (imperfect) (little), quartz, feldspars		
		5-5, 80-82	Nannofossil ooze with foraminifers of various sizes	Mixed-layer mineral (M-H), kaolinite, chlorite, a small admixture of palygorskite, quartz, and feldspars		
	e	6-2, 68-70	Nannofossil ooze with sporadic foraminifers	Montmorillonite, mixed-layer mineral (M-H) and (H-M) up to 30%, kaolinite up to 20%, hydromica 20%, chlorite 10%, and an admixture of quartz and feldspars	Montmorillonite-chloritic with montmorillonite and hydromica	
		7-1, 103-105	Nannofossil ooze with foraminifers of various sizes	Montmorillonite up to 15%, chlorite <10%, kaolinite up to 40%, hydromica up to 25%, palygorskite <10%	Polymineral with an admixture of H-M	
		8-1, 127-129	Nannofossil ooze with foraminifers of various sizes	Mixed-layer mineral (M-H) and (H-M), hydromica, kaolinite, chlorite, quartz, feldspars		
		8-3, 74-76	Nannofossil ooze with foraminifers of various sizes	Mixed-layer mineral (M-H) and (H-M), hydromica, kaolinite, chlorite, quartz, feldspars		
a	d	8-5, 17-19	Nannofossil ooze with a small amount of foraminifers	Mixed-layer mineral (M-H) and (H-M), hydromica, kaolinite, chlorite, quartz, feldspars		
		8-6, 122-124	Nannofossil ooze with a small amount of foraminifers	Mixed-layer mineral (M-H) and (H-M), hydromica, kaolinite, chlorite, quartz, feldspars		
		9-1, 115-117	Nannofossil ooze enriched in foraminifers in some interlayers	Mixed-layer mineral (M-H) and (H-M), kaolinite, chlorite, a small admixture of palygorskite, quartz and feldspars		
		9-2, 23-25	Nannofossil ooze enriched in foraminifers in some interlayers	Mixed-layer mineral (M-H) and (H-M), kaolinite, chlorite, a small admixture of palygorskite, quartz and feldspars		Facies of organogenic clay sediments of the zone of unstable dynamics of the aqueous medium
		9-4, 50-52	Nannofossil ooze enriched in foraminifers in some interlayers	Mixed-layer mineral (M-H), kaolinite, chlorite, a small admixture of palygorskite, quartz, and feldspars		
		9-6, 17-19	Nannofossil ooze enriched in foraminifers in some interlayers	Mixed-layer mineral M-H and H-M, kaolinite, a small admixture of chlorite, palygorskite, quartz, and feldspars		
		9-6, 128-130	Nannofossil marl	Montmorillonite up to 30%, mixed-layer mineral (H-M) up to 20%, kaolinite up to 30%, chlorite ~ 10%, palygorskite 10%	Montmorillonite-chloritic with kaolinite and mixed-layer phase of type (H-M)	

Note: a = Upper Miocene – Pliocene; b = Pliocene; c = Pleistocene; d = G. margaritae margaritae, G. margaritae evoluta; e = G. margaritae evoluta; f = G. miocenica; g = G. tosaensis; h = G. viola; i = G. hessi; j = G. calida calida.

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TABLE 8
Lithological Characteristics of Samples Selected for Geochemical Studies, Leg 45, Hole 396

Stratigraphic Subdivision		Lithologic Subdivision			Depth Interval			
Series	Zone	Unit	Sub-unit	Sequence	Core-Section, cm Interval	(m)	Sample (Interval in cm)	Lithological Characteristics of Samples
Pleistocene	G. hessi	I	I-1	I-1-A	1.00, 00 to 4-6, 00	0.00 to 20.18	1-1, 69-71	Nannofossil ooze, slightly foraminiferal (15%), argillaceous-siliceous
							1-1, 139-141	Nannofossil ooze, slightly foraminiferal (25%), with radiolarians and admixture of clay material
							1-2, 32-34	Similar to Sample 1-1, 139-141 cm
							1-2, 121-123	Similar to Sample 1-1, 139-141; finely dispersed particles of Fe hydroxides
							1-3, 72-74	Nannofossil ooze, clayey, slightly foraminiferal (7%), with patches of clay matter
							1-4, 145-147	Similar to Sample 1-3, 72-74 cm, with appreciable silicification
							1-5, 69-71	Nannofossil ooze, foraminiferal (20%), middle-sized (0.048 mm), with an admixture of radiolarians (10%); argillaceous
							1-5, 144-146	Similar to Sample 1-5, 69-71 cm
							2-1, 123-125	Nannofossil ooze, argillaceous, slightly foraminiferal (2%), with patches of Fe hydroxides
							2-2, 121-123	Nannofossil ooze, argillaceous
							2-3, 93-95	Nannofossil ooze, slightly argillaceous, siliceous, with rare foraminifers (5%)
							2-4, 83-85	Nannofossil ooze, appreciably argillaceous, with cloddy accumulations of foraminifers and coccoliths
	G. viola						2-5, 139-141	Nannofossil ooze, argillaceous, appreciably foraminiferal (30%)
							2-6, 76-78	Nannofossil ooze, argillaceous, with rare foraminifers and radiolarians
							3-1, 87-89	Similar to Sample 2-6, 76-78
							3-2, 94-96	Similar to Sample 2-6, 76-78 cm; rare (5%) relatively large foraminifers (0.25 mm)
							3-3, 86-88	Nannofossil ooze, appreciably argillaceous, with a small (7%) amount of foraminifers
?	?						3-4, 138-140	Similar to sample 3-3, 86-88 cm, with small (0.1–0.3 mm) foraminifers (~ 15%)
				I-1-B	5-1, 00 to 6-1, 150	20.18 to 43.87	5-1, 116-118	Nannofossil ooze, argillaceous, with small (5%) amounts of foraminifers, dispersed Mn hydroxides
							5-2, 73-75	Similar to Sample 5-1, 116-118 cm
Pliocene	G. tosaensis						5-3, 100-102	Nannofossil ooze, with uneven foraminifer patches (20%), rare micronodules of manganese
							5-3, 125-127	Nannofossil ooze, slightly foraminiferal (30%), argillaceous-siliceous
							5-4, 80-82	Argillaceous nannofossil ooze with appreciable clay admixture and organic matter
							5-5, 74-76	Similar to Sample 5-4, 80-82 cm
							5-6, 61-63	Similar to Sample 5-4, 80-82 cm
							6-2, 82-84	Nannofossil ooze, argillaceous, with gravelly, cloddy, lumpy patches of foraminifers
							6-3, 67-69	Nannofossil ooze, argillaceous, with a small (10%) amount of small (0.1 mm) foraminifers

TABLE 8 – *Continued*

Stratigraphic Subdivision		Lithologic Subdivision			Depth Interval			
Series	Zone	Unit	Sub-unit	Sequence	Core-Section, cm Interval	(m)	Sample (Interval in cm)	Lithological Characteristics of Samples
Pliocene	G. tosaensis	I-2		I-2-A	6-2, 00 to 8-4, 150	43.87 to 67.16	6-4, 105-107	Similar to Sample 6-3, 67-69 cm; poorly sorted foraminifers (15%)
							6-5, 49-50	Similar to Sample 6-3, 67-69 cm; dispersed Fe hydroxides
							6-6, 86-88	Similar to Sample 6-5, 49-50 cm, with small (0.05-0.08 mm) foraminifers (20%)
							7-1, 99-101	Similar to Sample 6-6, 86-88 cm
							7-2, 96-98	Similar to 6-6, 86-88 cm, with foraminifers (25%) and admixture of altered pyroclastic material
							7-3, 118-120	Similar to Sample 7-2, 96-98 cm
							7-4, 64-66	Nannofossil ooze, with gravelly clusters of foraminifers (80%), well sorted (0.08-0.11 mm)
							7-5, 40-42	Nannofossil ooze, foraminiferal (30%), predominant forms 0.08-0.11 mm to 0.64 mm; radiolarians present
							7-6, 74-76	Similar to Sample 7-5, 40-42 cm, with small foraminifers (20%)
	G. miocenica						8-2, 73-75	Similar to Sample 7-5, 40-42 cm, with small (0.05 mm) foraminifers (25%) and sporadic large forms (0.7 mm)
							8-3, 41-43	Similar to Sample 8-2, 73-75 cm, sporadic radiolarians
							8-4, 74-76	Similar to Sample 8-3, 41-43 cm
				I-2-B	8-5, 00 to 10-2, 150	67.16 to 84.14	8-5, 60-62	Nannofossil ooze, argillaceous-siliceous, with rare foraminifers (5%) and sporadic radiolarians
							8-6, 83-85	Clayey nannofossil ooze, slightly foraminiferal (20%) small forms predominant (0.08 mm)
							8-6, 119-121	Similar to Sample 8-6, 83-85 cm
							9-1, 141-143	Nannofossil ooze, argillaceous, with an admixture of fine-silty altered particles of ultrabasites
							9-2, 8-10	Nannofossil ooze, argilaceous, slightly foraminiferal (15%), with dispersed vitroclastic particles, altered ultrabasites
							9-3, 89-91	Nannofossil ooze, argillaceous, with rare small foraminifers (~ 1%)
							9-4, 64-66	Similar to Sample 9-3, 89-91 cm
							9-5, 122-124	Similar to Sample 9-3, 89-91 cm
							10-1, 132-134	Similar to Sample 9-3, 89-91 cm, with dispersed siliceous matter; diatoms
							10-2, 41-43	Similar to Sample 9-3, 89-91 cm
				I-2-C	10-3, 00 to 10-6, 150	84.14 to 89.18	10-3, 29-31	Similar to Sample 9-3, 89-91 cm
							10-3, 120-122	Nannofossil ooze, foraminiferal (50%), slightly argillaceous. Good sorting of foraminifers (0.08-0.11 mm)
							10-4, 86-88	Foraminiferal (75%) nannofossil ooze. Predominant are foraminifers sized 0.11 mm. Admixture of silty clastic material.
							10-5, 108-110	Nannofossil ooze, argillaceous, with areas rich in foraminifers (75%)
							10-6, 53-55	Ooze, appreciably foraminiferal, nannofossil, argillaceous, gravelly-sandy structure

TABLE 8 – *Continued*

Stratigraphic Subdivision		Lithologic Subdivision			Depth Interval			
Series	Zone	Unit	Sub-unit	Sequence	Core-Section cm Interval	(m)	Sample (Interval in cm)	Lithological Characteristics of Samples
Pliocene	G. miocenica						11-1, 113-115	Nannofossil ooze, appreciably argillaceous, with an admixture of dispersed organic matter
							11-2, 113-115	Similar to Sample 11-2, 113-115 cm
							11-3, 88-90	Nannofossil ooze, argillaceous, with dispersed organic matter and sporadic foraminifers
							11-4, 43-45	Similar to Sample 11-3, 88-90 cm; some pieces are enriched in small (0.08) foraminifers (40%)
							11-4, 108-110	Ooze, appreciably foraminiferal (35%), nannofossil, argillaceous (50-80%), with an admixture (5%) of silty volcanic clastic material
							11-4, 134-136	Nannofossil argillaceous ooze, with rare foraminifers (5%), radiolarians
	G. margaritae evoluta						11-5, 34-36	Similar to Sample 11-4, 134-136 cm
							11-6, 89-91	Similar to Sample 11-4, 134-136 cm
							12-2, 110-112	Similar to Sample 11-4, 134-136 cm
							12-3, 110-112	Similar to Sample 11-4, 134-136 cm
							12-4, 110-112	Similar to Sample 11-4, 134-136 cm
					11-1, 00 to 13-6, 00	89.18 to 117.15	12-5, 74-76	Ooze, appreciably foraminiferal (70%), with an admixture of nannofossils (20-30%); small forms (0.08 mm) are predominant; by texture is similar to breccia of slumping
							12-6, 63-64	Nannofossil ooze, argillaceous, with rare foraminifers (2%) and coccoliths
							13-1, 68-70	Similar to Sample 12-6, 62-64 cm
							13-2, 66-68	Similar to Sample 12-6, 62-64 cm
		I	I-2	I-2-D			13-3, 66-68	Similar to Sample 12-6, 62-64 cm; the amount of foraminifers increases up to 5%; an admixture of fine-silty volcanoclastic material
							13-4, 66-68	Similar to Sample 13-3, 66-68 cm
							13-5, 37-39	Similar to Sample 13-3, 66-68 cm
							13-5, 109-111	Ooze, appreciably foraminiferal (60%) and nannofossil. Well-sorted (0.11 mm) foraminifers are predominant; admixture of opal-chalcedony and fine-silty volcanoclastic material
Pliocene-Upper Miocene							13-6, 66-68	Nannofossil ooze, argillaceous, with a small amount (6%) of foraminifers
							13-6, 146-148	Similar to Sample 13-6, 66-68 cm
							14-0, 34-36	Argillaceous nannofossil ooze, siliceous, pigmented with dispersed Fe hydroxides. Silicification and impregnation with Fe oxides is spotty
							14-1, 21-23	Similar to Sample 14-0, 34-36 cm
					13-6, 00 to 14-5, 150	117.15 to (121.41)-125.34	14-2, 90-92	Clay with an admixture of nannofossils, patches of silty particles, Fe hydroxides
							14-3, 69-71	Clay with an appreciable admixture of nannofossils impregnated with Fe hydroxides. Admixture of basaltic glass, ultrabasites
Middle Miocene	G. fohsi						14-3, 99-101	Nannofossil ooze, appreciably argillaceous, with an admixture of particles of basaltic glass, dispersed Fe hydroxides (2%)
							14-4, 72-74	Similar to Sample 14-3, 99-101 cm
		II	I-2	I-2-D	13-6, 00 to 14-5, 150	117.15 to (121.41)-125.34	14-5, 48-50	Similar to Sample 14-3, 99-101 cm; appreciable admixture of basaltic glass
							14-5, 144-146	Similar to Sample 14-3, 99-101 cm

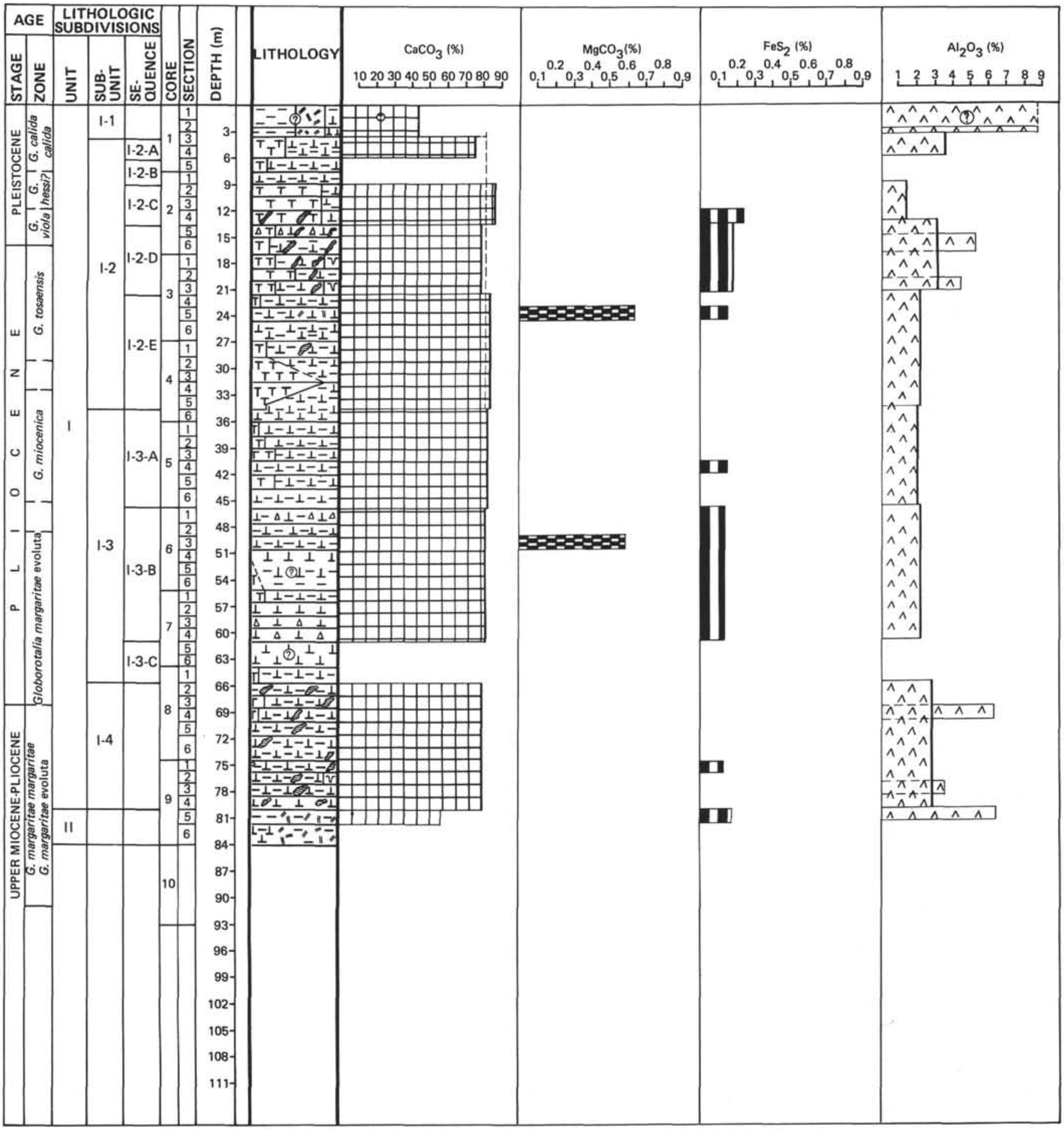

Figure 1. *Distribution of normative molecules $CaCO_3$, $MgCO_3$, FeS_2, and Al_2O_3 (weight, %, calculated to an air-dry weight) in a section of upper cenozoic sediments, region of the Mid-Atlantic Ridge, Hole 395, Leg 45.*

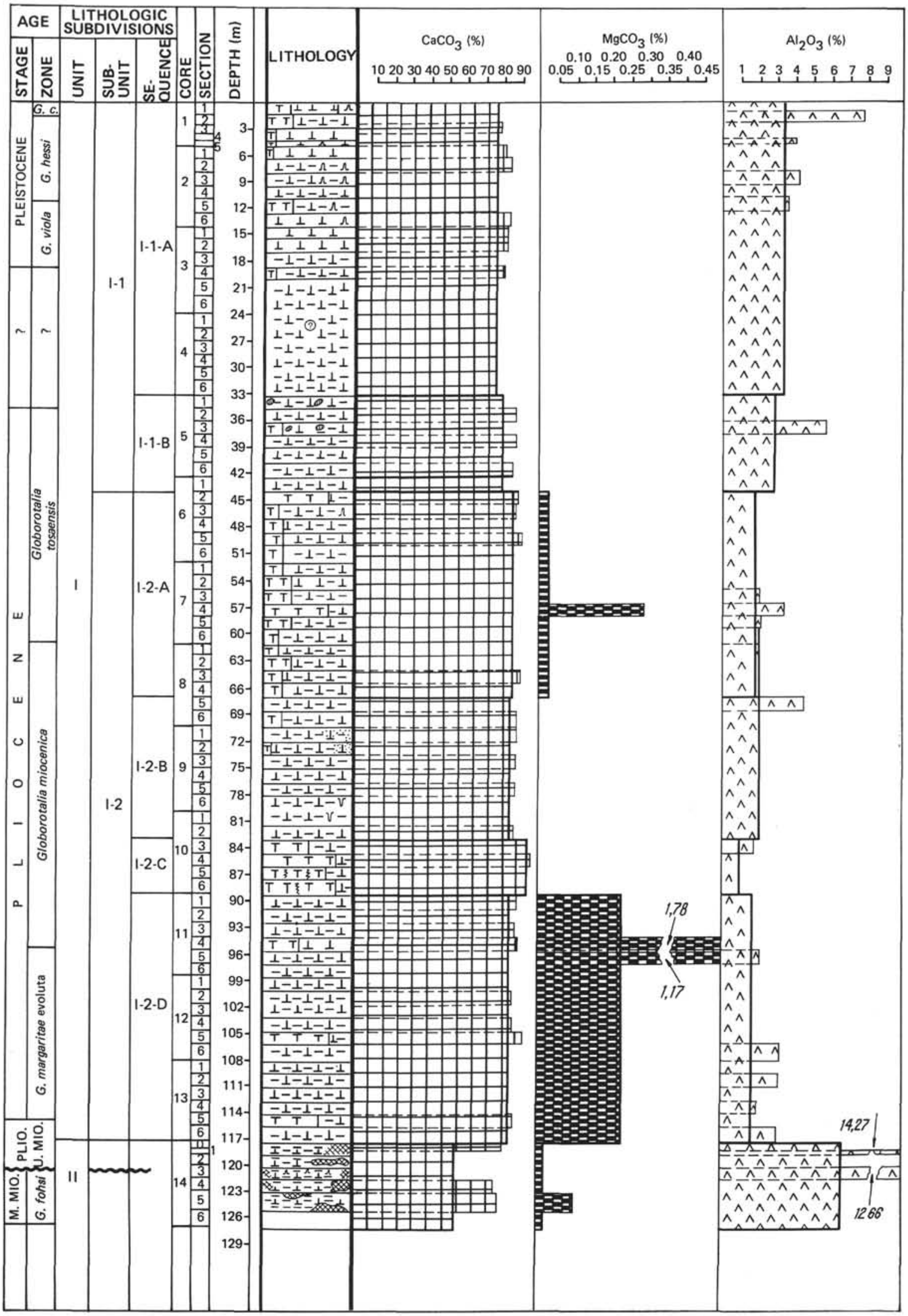

Figure 2. *Distribution of normative molecules* $CaCO_3$, $MgCO_3$, *and* Al_2O_3 *(weight, %, calculated to an air-dry weight) in a section of upper Cenozoic sediments, region of the Mid-Atlantic Ridge, Hole 396, Leg 45.*

TABLE 9
X-Ray Analyses of Clay Minerals From Hole 396

Series	Zone	Sample (Interval in cm)	Genetic Type	Clay Minerals of the Fraction <10 μm	Associations of Clay Minerals	Facies
Pleistocene	G. hessi	1-2, 121-123	Foraminiferal nannofossil ooze	Mixed layer mineral (M-H), hydromica (dioctahedral), chlorite (trioctahedral), a slight admixture of quartz and feldspars	Polymineral (mixed-layer mineral M-H, hydromica, chlorite, and kaolinite)	
		1-4, 145-147	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), hydromica, an admixture of mixed-layer phase (H-M), chlorite, kaolinite. A small admixture of quartz and feldspars		
		2-1, 123-125	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars		
		2-2, 121-123	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars		
		2-4, 83-85	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars		
	G. viola	2-5, 139-141	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), hydromica, chlorite (imperfect, a slight admixture of kaolinite, palygorskite, quartz, and feldspars		
		2-6, 76-78	Foraminiferal nannofossil ooze with an admixture of volcanogenic material	Chlorite, an admixture of montmorillonite, mixed-layer mineral of the M-H type, kaolinite, a slight admixture of quartz and feldspars	Chlorite-montmorillonitic with the mixed-layer (M-H) and kaolinite	Facies of organogenic sediments of the zone of unstable dynamics of aqueous medium
		3-3, 86-88	Nannofossil oozes, sometimes marl, sporadic foraminifers	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars	Polymineral	
?	?	5-1, 116-118	Nannofossil oozes, sometimes marl, sporadic foraminifers	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars		
Pliocene	G. tosaensis	5-5, 74-76	Nannofossil oozes, sometimes marl, sporadic foraminifers	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars		
		7-2, 96-98	Nannofossil oozes, sometimes marl, sporadic foraminifers	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars		
		7-4, 64-66	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars		
		7-6, 74-76	Foraminiferal nannofossil ooze	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars		
	G. miocenica	8-2, 73-75	Nannofossil ooze with sporadic foraminifers	Montmorillonite (25%), hydromica (25%), kaolinite (25%), chlorite (25%)	Montmorillonite-chloritic with hydromica and kaolinite	
		9-2, 8-10	Nannofossil ooze with sporadic foraminifers	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars	Polymineral	
		10-1, 132-134	Nannofossil ooze	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars	Polymineral with superposition of the second type of mixed-layer mineral (H-M)	
		10-5, 108-110	Nannofossil ooze enriched in foraminifers	Two types of mixed-layer minerals (M-H) up to 30% and (H-M) up to 30%, chlorite ~ 10 to 15%, kaolinite ~20%, an admixture of quartz and feldspars		
		11-2, 113-115	Nannofossil ooze	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars	Polymineral	
	G. margaritae evoluta	11-6, 89-91	Nannofossil ooze with an admixture of volcanogenic material	Chlorite ~ 25%, hydromica ~ 25%, kaolinite ~ 25%, montmorillonite ~ 15%, mixed-layer mineral (H-M) up to 10%	Chlorite-montmorillonitic with hydromica and kaolinite	
		12-3, 110-112	Nannofossil ooze	Mixed-layer mineral (M-H), hydromica, chlorite, kaolinite, quartz, feldspars		
		13-1, 68-70		Mixed-layer mineral (M-H), chlorite, kaolinite, quartz, feldspars		
		13-3, 66-68	Nannofossil ooze	Mixed-layer mineral (M-H), admixture (H-M), a slight admixture of palygorskite, chlorite, kaolinite, quartz, and feldspars	Polymineral superimposed on the second type of the mixed-layer mineral (H-M) and palygorskite	Facies of organogenic sediments with an admixture of clay matter of the zone of unstable dynamics of the aqueous medium
Pliocene-Upper Miocene		14-0, 34-36	Nannofossil marl with foraminifers	Mixed-layer mineral (with predominance of expanding packets of M and H), a slight admixture of palygorskite		
		14-2, 90-92	Nannofossil marl with foraminifers	Mixed-layer mineral (with predominance of expanding packets of M), hydromica, a slight admixture of palygorskite		
Middle Miocene	G. fohsi	14-5, 144-146	Nannofossil ooze with large foraminifers	Much chlorite and amorphous phase, an admixture of mixed-layer mineral (M-H), quartz, and feldspars	Chloritic with an admixture of amorphous substances and mixed-layer phase	

Note: (M-H) – mixed-layer mineral montmorillonite-hydromica with predominant expanding packets – M.
(H-M) – mixed-layer mineral hydromica-montmorillonite with predominant expanding hydromicaceous packets – H.

TABLE 10
Contents of $CaCO_3$, $MgCO_3$, and NaCl in Upper Cenozoic Sediments, North Atlantic, Hole 396, Leg 45 (wt. %)

Sample Number (Interval in cm)	CO_2	Carbonate Molecules		Cl	NaCl
		$CaCO_3$	$MgCO_3$		
1-1, 69-71	33.15	75.401		1.69	2.787
1-2, 32-34	22.60	51.405		1.50	2.473
1-3, 72-74	34.80	79.154		1.16	1.913
1-5, 144-146	30.45	69.259		1.50	2.473
2-1, 123-125	35.85	81.542			
2-2, 121-123	37.20	84.613			
2-3, 93-95	31.20	70.966		1.32	2.177
2-5, 139-141	33.85	76.993			
2-6, 76-78	37.00	84.158			
3-1, 87-88	36.60	83.248			
3-2, 94-96	36.50	83.020		1.02	1.682
3-4, 138-140	35.70	81.201		1.08	1.781
5-2, 73-75	38.10	86.660		1.02	1.682
5-3, 100-102	26.90	61.185		1.16	1.913
5-4, 80-82	38.55	87.684		0.99	1.632
5-6, 61-63	37.90	86.205		1.07	1.764
6-2, 82-84	38.80	88.253			
6-3, 67-69	38.50	87.570		1.13	1.863
6-5, 49-50	39.80	90.527		1.18	1.946
7-1, 99-101	37.80	85.978		1.46	2.407
7-3, 118-120	37.50	85.295		1.17	1.929
7-4, 64-66	35.55	80.521	0.286		
7-5, 40-42	38.20	86.888			
7-6, 74-76	37.20	84.613			
8-3, 41-43	39.65	90.185			
8-5, 60-62	31.50	71.648			
8-6, 83-85	38.60	87.798			
9-1, 141-143	38.70	88.025		1.12	1.847
9-3, 89-91	38.45	87.456		0.93	1.533
9-5, 122-124	38.45	87.456		1.16	1.913
10-2, 41-43	38.00	86.433		1.14	1.880
10-3, 29-31	37.60	85.523		1.10	1.813
10-4, 86-88	39.85	90.640		1.27	2.094
10-6, 53-55	40.35	91.778			
11-1, 113-115	38.95	88.594		0.96	1.583
11-3, 88-90	38.50	87.570		1.02	1.682
11-4, 43-45	39.05	86.713	1.777	1.06	1.748
11-4, 108-110	39.10	88.934		1.39	2.292
11-5, 34-36	36.50	81.628	1.173	1.39	2.292
12-2, 110-112	37.50	85.295		1.14	1.880
12-4, 110-112	37.85	86.091		1.11	1.830
12-5, 74-76	40.55	92.233			
12-6, 62-64	35.50	80.746			
13-2, 68-70	33.60	76.425		0.89	1.467
13-4, 66-68	36.50	83.020		0.96	1.583
13-5, 37-39	38.15	86.774		0.95	1.566
13-6, 66-68	33.75	76.766		0.95	1.566
14-0, 24-26	35.90	81.656		1.14	1.880
14-1, 21-23	6.05	13.761			
14-3, 69-71	11.70	26.612			
14-4, 72-74	33.85	76.993			
14-5, 48-50	34.70	78.807	0.102	1.40	2.308

TABLE 11
Average Content of $CaCO_3$, $MgCO_3$, NaCl in Lithologic Subdivisions of the Section of Upper Cenozoic Deposits, Hole 396, Leg 45 (wt. %)

Lithologic Subdivisions			Depth Interval			Content				
							Carbonate Molecules			
Unit	Sub-unit	Sequence	Core-Section, cm Interval	(m)		CO_2	$CaCO_3$	$MgCO_3$	Cl	NaCl
I	I-1	I-1A	1-00, 00 to 4-6, 00	0.00 to 20.18	No. of anal.	12	12		7	7
					Min. sequen.	22.60	51.405		1.02	1.682
					Max. sequen.	37.20	84.613		1.69	2.787
					Aver. sequen.	33.74	76.747		1.32	2.184
		I-1B	5-1, 00 to 6-1, 150	20.18 to 43.87	No. of anal.	4	4		4	4
					Min. sequen.	26.90	61.185		0.99	1.632
					Max. sequen.	38.55	87.684		1.16	1.913
					Aver. sequen.	35.36	80.433		1.06	1.748
					No. of anal.	16	16		11	11
					Min. sequen.	22.60	51.405		0.99	1.632
					Max. sequen.	38.55	87.684		1.69	2.787
					Aver. sequen.	34.15	77.668		1.23	2.025
	I-2	I-2A	6-2, 00 to 8-4, 150	43.87 to 67.16	No. of anal.	9	9	9	4	4
					Min. sequen.	35.50	80.521		1.13	1.863
					Max. sequen.	39.80	90.527		1.46	2.407
					Aver. sequen.	38.11	86.648	0.032	1.23	2.036
		I-2B	8-5, 00 to 10-2, 150	67.16 to 84.14	No. of anal.	6	6		4	4
					Min. sequen.	31.50	71.648		0.93	1.533
					Max. sequen.	38.70	88.025		1.16	1.913
					Aver. sequen.	37.28	84.803		1.09	1.793
		I-2C	10-3, 00 to 10-6, 150	84.14 to 89.18	No. of anal.	3	3		2	2
					Min. sequen.	37.60	85.523		1.10	1.813
					Max. sequen.	40.35	91.778		1.27	2.094
					Aver. sequen.	39.27	89.314		1.19	1.953
		I-2D	11-1, 00 to 13-6, 00	89.18 to 117.15	No. of anal.	13	13	13	11	11
					Min. sequen.	33.60	76.425	Nil	0.89	1.467
					Max. sequen.	40.55	92.233	1.777	1.39	2.292
					Aver. sequen.	37.35	84.676	0.227	1.07	1.772
					No. of anal.	31	31	31	21	21
					Min. subunit	31.50	71.648	Nil	0.89	1.467
					Max. subunit	40.55	92.233	1.777	1.46	2.407
					Aver. subunit	37.74	85.722	0.104	1.12	1.843
					No. of anal.	47	47	47	32	32
					Min. unit	22.60	51.405	Nil	0.89	1.467
					Max. unit	40.55	92.233	1.777	1.69	2.787
					Aver. unit	36.578	82.980	0.069	1.16	1.906
II			13-6, 00 to 14-5, 150	117.15 to (121.41) 125.34	No. of anal.	5	5	5	2	2
					Min. unit	6.05	13.761	Nil	1.14	1.880
					Max. unit	35.90	81.656	0.102	1.40	2.308
					Aver. unit	24.44	55.566	0.020	1.27	2.094

TABLE 12
Chemical Compositions of Upper Cenozoic Sediments, North Atlantic, Hole 396, Leg 45
(wt. % on air-dry basis)

Sample	Content										
(Interval in cm)	SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	NnO	CaO	MgO	P_2O_5	Na_2O	K_2O
1-1, 69-71	9.58	0.25	3.03	2.20	0.13	0.17	43.85	0.78	0.09	1.95	0.69
1-2, 32-34	22.13	0.46	7.79	3.98	0.14	0.30	30.15	1.55	0.11	2.0	1.42
1-3, 72-74	8.27	0.21	2.89	1.80	0.07	0.13	45.31	0.67	0.07	1.40	0.64
1-5, 144-146	12.91	0.30	4.12	3.41	0.07	0.24	40.08	1.25	0.09	1.75	0.90
2-1, 123-125	6.82	0.10	2.79	1.55	Nil	0.08	46.96	0.34	Nil	1.13	0.58
2-2, 121-123	6.08	0.16	2.56	1.50	Nil	0.05	48.01	0.40	Nil	1.07	0.54
2-3, 93-95	12.10	0.30	4.23	2.61	0.14	0.18	41.29	0.83	0.09	1.60	0.90
2-5, 139-141	9.63	0.13	3.58	1.90	Nil	0.08	44.32	0.36	Nil	1.41	0.75
2-6, 76-78	5.49	0.07	2.22	1.15	Nil	0.05	48.00	0.22	Nil	1.07	0.45
3-1, 87-88	5.82	0.08	2.32	1.25	Nil	0.07	47.58	0.35	Nil	1.07	0.49
3-2, 94-96	6.51	0.13	2.48	1.48	0.07	0.11	47.41	0.26	0.07	1.20	0.51
3-4, 138-140	8.11	0.30	2.81	2.07	Nil	0.14	45.74	0.71	0.08	1.20	0.54
5-2, 73-75	4.79	0.13	1.90	1.70	Nil	0.14	49.04	0.38	0.07	1.20	0.42
5-3, 100-102	15.33	0.34	5.67	4.58	Nil	0.48	35.28	1.35	0.27	1.50	1.14
5-4, 80-82	5.07	0.15	1.88	1.15	0.14	0.07	49.37	0.45	0.04	1.14	0.42
5-6, 61-63	5.09	0.15	2.00	1.56	0.14	0.06	49.36	0.22	0.06	1.09	0.38
6-2, 82-84	3.79	0.08	1.29	0.77	Nil	0.02	50.36	0.29	Nil	1.13	0.37
6-3, 67-69	4.90	0.13	1.84	0.92	0.20	0.07	49.58	0.37	0.04	1.09	0.38
6-5, 49-50	3.06	0.16	0.92	0.11	0.22	0.06	51.77	0.22	0.03	1.25	0.31
7-1, 99-101	4.83	0.15	1.85	0.82	0.14	0.07	49.14	0.53	0.05	1.45	0.45
7-3, 118-120	5.89	0.17	2.08	2.29	0.14	0.07	48.63	0.29	0.07	1.25	0.48
7-4, 64-66	8.04	0.11	3.37	1.63	Nil	0.01	45.12	0.31	Nil	1.24	0.66
7-5, 40-42	4.78	0.16	2.14	1.43	Nil	0.01	49.73	0.29	Nil	1.07	0.47
7-6, 74-76	5.24	0.08	2.02	1.39	Nil	0.05	48.85	0.34	Nil	1.07	0.45
8-3, 41-43	3.63	0.14	1.77	1.00	Nil	0.04	50.73	0.29	0.06	1.20	0.35
8-5, 60-62	12.06	0.21	4.47	2.49	Nil	0.05	40.89	0.77	0.07	1.40	0.87
8-6, 83-85	3.66	0.15	1.73	0.99	Nil	0.01	50.14	0.16	0.06	1.04	0.26
9-1, 141-143	3.98	0.17	1.55	1.31	0.14	0.13	50.44	0.34	0.05	1.09	0.36
9-3, 89-91	4.28	0.15	1.47	1.38	0.07	0.11	50.30	0.11	0.06	1.01	0.42
9-5, 122-124	3.88	0.17	1.55	0.98	0.14	0.11	50.10	0.60	0.07	1.24	0.37
10-2, 41-43	4.39	0.15	1.72	1.22	0.07	0.13	49.92	0.34	0.05	1.24	0.82
10-3, 29-31	4.42	0.13	1.77	1.55	0.07	0.11	50.05	0.35	0.07	1.24	0.44
10-4, 86-88	1.40	0.08	0.50	1.54	0.07	0.04	53.10	0.23	0.08	1.41	0.24
10-6, 53-55	1.43	0.04	0.61	0.46	Nil	0.01	52.36	0.17	0.04	1.46	0.24
11-1, 113-115	3.18	0.13	0.62	1.70	Nil	0.05	49.77	1.01	0.02	1.07	0.37
11-3, 88-90	3.29	0.13	1.08	2.55	Nil	0.06	49.73	1.34	0.02	1.13	0.38
11-4, 43-45	2.43	0.21	1.35	1.79	0.07	0.07	48.59	1.09	0.01	1.18	0.45
11-4, 108-110	2.21	0.08	0.44	0.93	0.07	0.02	51.10	0.50	0.02	1.35	0.30
11-5, 34-36	6.18	0.21	2.08	3.47	0.07	0.08	45.74	0.98	0.02	1.35	0.58
12-2, 110-112	1.90	0.17	1.65	2.20	0.14	0.07	49.46	0.64	0.01	1.18	0.42
12-4, 110-112	3.79	0.21	0.96	1.55	Nil	0.04	49.05	0.85	0.01	1.13	0.45
12-5, 74-76	2.18	0.18	1.23	1.79	Nil	0.04	52.26	0.36	Nil	1.01	0.24
12-6, 62-64	6.83	0.14	3.22	1.54	Nil	0.04	46.56	0.39	0.07	1.24	0.54
13-2, 68-70	8.53	0.21	3.18	2.46	Nil	0.08	43.74	2.10	0.09	1.18	0.71
13-4, 66-68	5.29	0.21	1.97	1.20	Nil	0.05	48.23	0.75	0.01	1.13	0.44
13-5, 37-39	3.77	0.14	0.77	1.70	Nil	0.07	49.75	0.30	0.02	1.07	0.42
13-6, 66-68	7.83	0.21	3.10	3.09	Nil	0.08	44.16	1.34	0.07	1.13	0.70
14-0, 24-26	6.28	0.21	1.46	1.87	Nil	0.05	45.81	0.90	0.02	1.29	0.54
14-1, 21-23	36.03	0.65	14.87	10.56	Nil	0.80	8.06	3.37	0.41	1.84	2.32
14-3, 69-71	31.19	0.46	12.66	8.50	Nil	0.81	15.25	1.41	0.41	1.73	2.00
14-4, 72-74	5.85	0.08	2.33	3.46	Nil	0.16	43.34	0.41	0.16	1.68	0.56
14-5, 48-50	6.37	0.21	1.87	3.64	Nil	0.10	44.16	1.49	0.02	1.57	0.52

TABLE 12 – *Continued*

Sample (Interval in cm)	(wt. %)											
	CO_2	C_{org}	H_2O_{total}	Cl	E_1	$O{=}Cl_2$	E_2	Fe^{2+}	Fe^{3+}	Fe_{total}	Mn_{total}	P_{total}
1-1, 69-71	33.15	<0.14	2.92	1.69	97.56	0.37	97.19	0.10	1.54	1.64	0.13	0.04
1-2, 32-34	22.60	<0.14	5.80	1.50	94.13	0.33	93.80	0.11	2.78	2.89	0.23	0.05
1-3, 72-74	34.80	<0.14	2.46	1.16	97.42	0.25	97.17	0.05	1.26	1.31	0.10	0.03
1-5, 144-146	30.45	<0.14	3.60	1.50	97.07	0.33	96.74	0.05	2.38	2.43	0.19	0.04
2-1, 123-125	35.85	0.32						Nil	1.08	1.08	0.06	Nil
2-2, 121-123	37.20	0.38						Nil	1.05	1.05	0.04	Nil
2-3, 93-95	31.20	<0.14	3.36	1.32	96.79	0.29	96.50	0.11	1.82	1.93	0.14	0.04
2-5, 139-141	33.85	<0.14						Nil	1.33	1.33	0.06	Nil
2-6, 76-78	37.00	0.22						Nil	0.80	0.80	0.04	Nil
3-1, 87-88	36.60	<0.14						Nil	0.87	0.87	0.05	Nil
3-2, 94-96	36.50	<0.14	2.17	1.02	97.75	0.22	97.53	0.05	1.03	1.08	0.08	0.03
3-4, 138-140	35.70	<0.14	2.31	1.08	98.48	0.24	98.24	Nil	1.45	1.45	0.11	0.03
5-2, 73-75	38.10	<0.14	1.85	1.02	98.89	0.22	98.67	Nil	1.19	1.19	0.11	0.03
5-3, 100-102	26.90	<0.14	6.63	1.16	94.00	0.25	93.75	Nil	3.20	3.20	0.37	0.12
5-4, 80-82	38.55	<0.14	1.37	0.99	99.42	0.22	99.20	0.11	0.80	0.91	0.05	0.02
5-6, 61-63	37.90	<0.14		1.07	99.08	0.23	98.85	0.11	1.09	1.20	0.05	0.03
6-2, 82-84	38.80	0.35						Nil	0.54	0.54	0.01	Nil
6-3, 67-69	38.50	<0.14		1.13	99.15	0.25	98.90	0.16	0.64	0.80	0.05	0.02
6-5, 49-50	39.80	<0.14		1.18	99.09	0.26	98.83	0.17	0.08	0.25	0.05	0.01
7-1, 99-101	37.80	0.19		1.46	98.74	0.32	98.42	0.11	0.57	0.68	0.05	0.02
7-3, 118-120	37.50	<0.14		1.17	100.03	0.26	99.77	0.11	1.60	1.71	0.05	0.03
7-4, 64-66	35.55	<0.14						Nil	1.14	1.14	0.01	Nil
7-5, 40-42	38.20	0.12						Nil	1.00	1.00	0.01	Nil
7-6, 74-76	37.20	0.04						Nil	0.97	0.97	0.04	Nil
8-3, 41-43	39.65	<0.14						Nil	0.70	0.70	0.03	0.03
8-5, 60-62	31.50	<0.14						Nil	1.74	1.74	0.04	0.03
8-6, 83-85	38.60	<0.14						Nil	0.69	0.69	0.01	0.03
9-1, 141-143	38.70	<0.14		1.12	99.38	0.22	99.16	0.11	0.92	1.03	0.10	0.02
9-3, 89-91	38.45	<0.14		0.93	99.06	0.20	98.86	0.05	0.97	1.02	0.09	0.03
9-5, 122-124	38.45	<0.14		1.16	98.82	0.25	98.57	0.11	0.68	0.79	0.08	0.03
10-2, 41-43	38.00	<0.14		1.14	99.19	0.25	98.94	0.05	0.85	0.90	0.10	0.02
10-3, 29-31	37.60	<0.14		1.10	98.90	0.24	98.66	0.05	1.08	1.13	0.08	0.03
10-4, 86-88	39.85	<0.14		1.27	99.81	0.28	99.53	0.05	1.08	1.13	0.03	0.03
10-6, 53-55	40.35	<0.14						Nil	0.32	0.32	0.01	0.02
11-1, 113-115	38.95	<0.14	1.36	0.96		0.21	97.76	Nil	1.19	1.19	0.04	0.01
11-3, 88-90	38.50	<0.14	1.45	1.02		0.22	99.01	Nil	1.78	1.78	0.05	0.02
11-4, 43-45	39.05	<0.14	2.0	1.06		0.23	97.12	0.05	1.25	1.30	0.05	0.004
11-4, 108-110	39.10	<0.14	1.36	1.39		0.31	97.20	0.05	0.65	0.70	0.01	0.01
11-5, 34-36	36.50	<0.14	2.34	1.39		0.31	98.34	0.05	2.43	2.48	0.06	0.01
12-2, 110-112	37.50	0.45	2.03	1.14		0.25	96.68	0.11	1.54	1.65	0.05	0.004
12-4, 110-112	37.85	<0.14	1.78	1.11		0.24	96.76	Nil	1.08	1.08	0.03	0.004
12-5, 74-76	40.55	1.06						Nil	1.25	1.25	0.03	Nil
12-6, 62-64	35.50	<0.14						Nil	1.08	1.08	0.03	0.03
13-2, 68-70	33.60	<0.14	3.42	0.89		0.20	96.57	Nil	1.72	1.72	0.06	0.04
13-4, 66-68	36.50	<0.14	3.33	0.96		0.21	96.53	Nil	0.84	0.84	0.04	0.004
13-5, 37-39	38.15	<0.14	2.04	0.95		0.21	96.93	Nil	1.19	1.19	0.05	0.01
13-6, 66-68	33.75	0.24	3.16	0.95		0.21	96.44	Nil	2.16	2.16	0.06	0.03
14-0, 24-26	35.90	<0.14	2.65	1.14		0.25	95.22	Nil	1.31	1.31	0.04	0.01
14-1, 21-23	6.05	<0.14	14.68					Nil	7.39	7.39	0.62	0.18
14-3, 69-71	11.70	<0.14	11.41					Nil	5.94	5.94	0.63	0.18
14-4, 72-74	33.85	<0.14	4.29					Nil	2.42	2.42	0.12	0.07
14-5, 48-50	34.70	<0.14	4.23	1.40		0.31	95.74	Nil	2.55	2.55	0.08	0.01

TABLE 13
Average Chemical Compositions of Lithologic Subdivisions of the Section of Upper Cenozoic Deposits, North Atlantic, Hole 396, Leg 45 (wt. %, recalculated to air-dry weight)

Lithologic Subdivision			Depth Interval			Contents							
Unit	Sub-unit	Sequence	Core-Section, cm Interval	(m)		SiO_2	TiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	MgO
I	I-1	I-1A	1-00, 00	0.00	No. of anal.	12	12	12	12	12	12	12	12
			to	to	Min. sequen.	5.49	0.07	2.22	1.15	Nil	0.05	30.15	0.22
			4-6, 00	20.18	Max. sequen.	22.13	0.46	7.79	3.98	0.14	0.30	48.01	1.55
					Aver. sequen.	9.45	0.21	3.40	2.08	0.05	0.13	44.06	0.64
		I-1B	5-1, 00	20.18	No. of anal.	4	4	4	4	4	4	4	4
			to	to	Min. sequen.	4.79	0.13	1.88	1.15	Nil	0.06	35.28	0.22
			6-1, 150	43.87	Max. sequen.	15.33	0.34	5.67	4.58	0.14	0.48	49.37	1.35
					Aver. sequen.	8.98	0.20	3.27	2.12	0.06	0.15	44.48	0.84
					No. of anal.	16	16	16	16	16	16	16	16
					Min. sub-unit	4.79	0.07	1.88	1.15	Nil	0.05	30.15	0.22
					Max. sub-unit	22.13	0.46	7.79	4.58	0.14	0.48	49.37	1.55
					Aver. sub-unit	8.98	0.20	3.27	2.12	0.06	0.15	44.48	0.84
	I-2	I-2A	6-2, 00	43.87	No. of anal.	9	9	9	9	9	9	9	9
			to	to	Min. sequen.	3.06	0.08	0.92	0.11	Nil	0.01	45.12	0.22
			8-4, 150	67.16	Max. sequen.	8.04	0.17	3.37	2.29	0.22	0.07	51.77	0.53
					Aver. sequen.	4.91	0.13	1.92	1.15	0.08	0.04	49.32	0.33
		I-2B	8-5, 00	67.16	No. of anal.	6	6	6	6	6	6	6	6
			to	to	Min. sequen.	3.66	0.15	1.47	0.98	Nil	0.01	40.89	0.11
			10-2, 150	84.14	Max. sequen.	12.06	0.21	4.47	2.49	0.14	0.13	50.44	0.77
					Aver. sequen.	5.38	0.17	2.06	1.40	0.07	0.09	48.63	0.39
		I-2C	10-3, 00	84.14	No. of anal.	3	3	3	3	3	3	3	3
			to	to	Min. sequen.	1.40	0.04	0.50	0.46	Nil	0.01	50.05	0.17
			10-6, 150	89.18	Max. sequen.	4.42	0.13	1.77	1.55	0.07	0.11	53.10	0.35
					Aver. sequen.	2.42	0.08	0.96	1.18	0.05	0.05	51.84	0.25
		I-2D	11-1, 00	89.18	No. of anal.	13	13	13	13	13	13	13	13
			to	to	Min. sequen.	1.90	0.08	0.44	0.93	Nil	0.02	43.74	0.30
			13-6, 00	117.15	Max. sequen.	8.53	0.21	3.22	3.47	0.14	0.08	52.26	2.10
					Aver. sequen.	4.42	0.17	1.67	2.00	0.03	0.06	48.32	0.90
					No. of anal.	31	31	31	31	31	31	31	31
					Min. sub-unit	1.40	0.04	0.44	0.11	Nil	0.01	40.89	0.11
					Max. sub-unit	12.04	0.21	4.47	3.47	0.22	0.13	53.10	2.10
					Aver. sub-unit	4.55	0.15	1.75	1.56	0.05	0.06	49.01	0.57
					No. of anal.	47	47	47	47	47	47	47	47
					Min. unit	1.40	0.04	0.44	0.11	Nil	0.01	30.15	0.11
					Max. unit	22.13	0.46	7.79	4.58	0.22	0.48	53.10	2.10
					Aver. unit	6.06	0.17	2.27	1.75	0.05	0.09	47.47	0.59
II			13-6, 00	117.15	No. of anal.	5	5	5	5	5	5	5	5
			to	to	Min. unit	5.85	0.08	1.46	1.87		0.10	8.06	0.41
			17-5, 150	(121.41)	Max. unit	36.03	0.65	14.87	10.56		0.81	45.81	3.37
				125.34	Aver. unit	17.14	0.32	6.64	5.61	Nil	0.38	31.32	1.52

TABLE 13 – *Continued*

Contents											
P_2O_5	Na_2O	K_2O	CO_2	C_{org}	H_2O_{total}	Cl	Fe^{2+}	Fe^{3+}	Fe_{total}	Mn_{total}	P_t
12	12	12	12	12	7	7	12	12	12	12	12
Nil	1.07	0.45	22.60	<0.14	2.17	1.02	Nil	0.80	0.80	0.04	Nil
0.11	2.00	1.42	37.20	0.38	5.80	1.69	0.11	2.78	2.89	0.23	0.05
0.05	1.40	0.70	33.74	<0.18	3.23	1.33	0.04	1.45	1.49	0.10	0.02
4	4	4	4	4	3	4	4	4	4	4	4
0.04	1.09	0.38	26.90		1.37	0.99	Nil	0.80	0.91	0.05	0.02
0.27	1.50	1.14	38.55		6.63	1.16	0.11	3.20	3.20	0.37	0.12
0.07	1.36	0.67	34.15	<0.17	3.25	1.23	0.04	1.48	1.52	0.11	0.03
16	16	16	16	16	10	11	16	16	16	16	16
Nil	1.07	0.38	22.60	<0.14	1.37	0.99	Nil	0.80	0.80	0.04	Nil
0.27	2.00	1.42	38.55	0.38	6.63	1.69	0.11	3.20	3.29	0.37	0.12
0.07	1.36	0.67	34.15	<0.17	3.25	1.23	0.04	1.48	1.52	0.11	0.03
9	9	9	9	9		4	9	9	9	9	9
Nil	1.07	0.31	35.55	0.04		1.13	Nil	0.08	0.25	0.01	Nil
0.07	1.45	0.66	39.80	0.33		1.46	0.17	1.60	1.71	0.05	0.03
0.03	1.19	0.44	38.11	0.15		1.23	0.06	0.80	0.87	0.03	0.01
6	6	6	6	6		4	6	6	6	6	6
0.05	1.01	0.26	31.50			0.93	Nil	0.68	0.69	0.01	0.02
0.07	1.40	0.87	38.70			1.16	0.11	1.74	1.74	0.10	0.03
0.06	1.17	0.52	37.28	<0.14		1.09	0.05	0.98	1.03	0.07	0.03
3	3	3	3	3		2	3	3	3	3	3
0.04	1.24	0.24	37.60			1.10	Nil	0.32	0.32	0.01	0.02
0.08	1.46	0.44	40.35			1.27	0.05	1.08	1.13	0.08	0.03
0.06	1.37	0.31	39.27	<0.14		1.19	0.03	0.83	0.86	0.04	0.03
13	13	13	13	13	11	11	13	13	13	13	13
Nil	1.01	0.24	33.60	<0.14	1.36	0.89	Nil	0.65	0.70	0.01	0.004
0.09	1.35	0.71	40.55	1.06	3.42	1.39	0.11	2.43	2.48	0.06	0.04
0.03	1.17	0.46	37.35	<0.24	2.21	1.07	0.02	1.40	1.42	0.04	0.02
31	31	31	31	31	11	21	31	31	31	31	31
Nil	1.01	0.24	31.50	0.04	1.36	0.89	Nil	0.08	0.25	0.01	Nil
0.09	1.46	0.87	40.55	1.06	3.42	1.46	0.17	1.74	2.48	0.10	0.04
0.04	1.19	0.45	37.74	0.19	2.21	1.12	0.04	1.09	1.13	0.04	0.02
47	47	47	47	47	21	32	47	47	47	47	47
Nil	1.01	0.24	22.60	0.04	1.36	0.89	Nil	0.08	0.25	0.01	Nil
0.27	2.00	1.42	40.55	1.06	6.63	1.69	0.17	3.20	3.29	0.37	0.12
0.05	1.25	0.53	36.52	0.18	2.70	1.16	0.04	1.22	1.26	0.07	0.02
5	5	5	5	5	5	2	5	5	5	5	5
0.02	1.29	0.52	6.05		2.65	1.14		1.31	1.31	0.04	0.01
0.41	1.84	2.32	35.90		14.68	1.40		7.39	7.39	0.63	0.18
0.20	1.62	1.19	24.44	<0.14	7.45	1.27	Nil	3.92	3.92	0.30	0.09

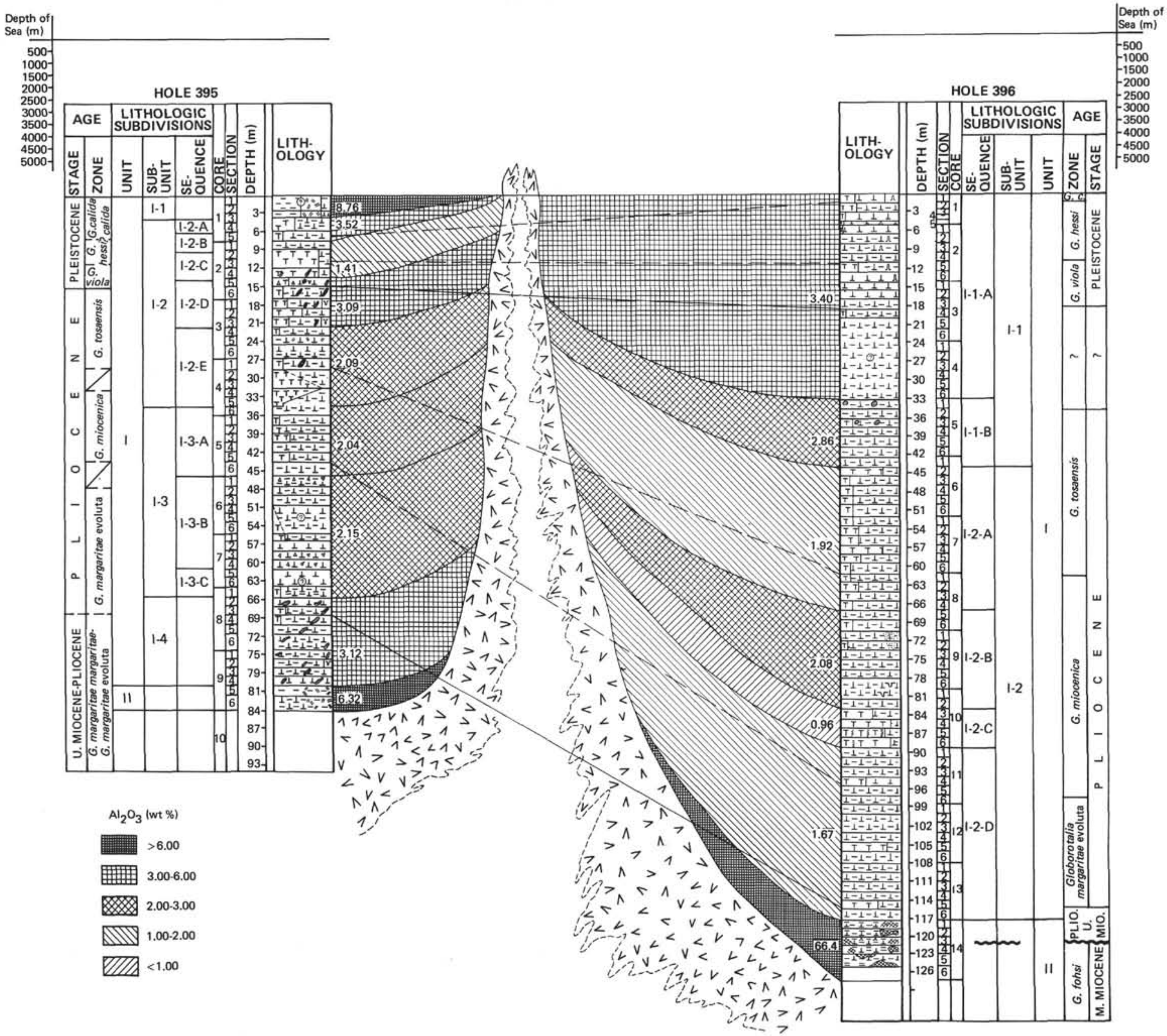

Figure 3. *Schematic profile of distribution of Al_2O_3 in upper cenozoic sediments, region of the Mid-Atlantic Ridge, Leg 45, (weight, %, calculated to an air-dry weight).*

TABLE 14
Content of Foraminifers, $CaCO_3$, Mineral Insoluble Residue, in Fractions of Upper Cenozoic Sediments, North Atlantic, Hole 396, Leg 45 (wt. %)

							Fraction <0.05 mm					
								Insoluble Residue		Fraction >0.05 mm		Total Content of Foraminifers
Series	Zone	Unit	Sub-unit	Sequence	Sample (Interval in cm)	$CaCO_3$ Content (%)	Fraction <0.01 mm	Fraction 0.05-0.01 mm	Fraction >0.25 mm	Fraction 0.25-0.1 mm	Fraction 0.1-0.05 mm	Fraction >0.05 mm (%)
Pleistocene	*G. hessi*	I	I-1	I-1A	1-1, 139-141	81	1.52	17.48	3.22	9.89	9.89	23.0
					1-3, 72-77	71	2.32	26.68	1.43	5.72	3.85	11.0
					1-4, 145-147	83	0.17	16.83	0.45	1.77	0.78	3
					1-5, 69-71	90	2.6	7.4	56.44	24.07	2.49	83
					2-2, 121-123	87	1.3	11.7	0.06	0.22	0.12	0.4
					2-4, 83-85	85	1.2	13.8	4.0	8.64	3.36	16.0
	G. viola				2-5, 139-141	82	2.7	15.3	14.04	19.5	5.46	39.0
					3-1, 87-89	85	1.5	13.5	0.39	0.22	0.39	1.0
					3-3, 86-88	87	0.78	12.22	0.17	0.41	0.42	1.0
?	?			I-1B	5-1, 116-118	91	1.35	7.65	0.02	0.296	0.084	0.4
Pliocene	*G. tosaensis*				5-3, 100-102	91	0.54	8.46	1.35	5.1	8.55	15.0
					5-5, 74-76	90	0.6	9.4	0.056	0.256	0.088	0.4
			I-2	I-2-A	6-2, 82-84	93	2.17	4.83	–	0.88	21.12	22.0
					6-4, 105-107	92	1.92	6.08	0.7	2.1	2.2	5.0
					6-6, 86-88	91	1.89	7.11	0.3	0.46	1.24	2.0
					7-2, 96-98	92	1.52	6.48	0.3	1.2	1.5	3.0
					7-4, 64-66	88	0.36	11.64	2.4	6.72	2.88	12.0
					7-5, 40-42	91	2.34	6.66	3.36	8.0	4.64	16.0
					7-6, 74-76	90	1.7	8.3	0.12	0.6	0.28	1.0
	G. miocenica				8-2, 73-75	99	0.13	0.87	1.17	4.23	3.6	9.0
					8-4, 74-76	86	3.68	11.84	1.19	2.45	3.36	7.0
				I-2-B	8-6, 83-85	75	7.0	18.0	0.06	3.84	2.1	6.0
					9-2, 8-10	92	1.28	6.72	0.05	0.45	4.5	5.0
					9-4, 64-66	91	0.99	8.01	–	0.1	0.1	0.2
					10-1, 132-134	91	0.9	8.1	–	0.057	0.043	0.1
				I-2-C	10-3, 120-122	95	0.9	4.1	–	2.59	34.41	37.0
					10-5, 108-110	98	0.34	1.66	–	13.92	34.08	48.0
				I-2-D	11-2, 113-115	94	0.6	5.4	0.09	0.073	0.018	0.1
					11-4, 134-136	87	2.6	10.4	0.52	1.8	1.68	4.0
	G. margaritae evoluta				11-6, 89-91	90	1.4	8.6	0.36	1.47	1.17	3.0
					12-3, 110-112	91	1.62	7.38	0.078	0.177	0.045	0.3
					12-5, 74-76	95	0.9	4.1	4.1	15.58	21.32	41.0
					13-1, 68-70	91	0.72	8.28	0.34	1.04	0.62	2.0
					13-3, 66-68	88	1.44	10.56	0.22	0.94	0.84	2.0
					13-5, 37-39	94	1.2	4.8	3.5	16.8	14.7	35.0
Middle Pliocene-Upper Miocene	*G. fohsi*	II			14-0, 34-36	37	3.15	59.85	0.024	0.1	0.076	0.2
					14-2, 90-92	68	5.12	26.88	0.065	0.265	0.17	0.5
					14-3, 69-71	83	2.04	14.96	0.51	1.59	0.9	3.0
					14-5, 48-50	89	1.1	9.9	0.56	2.2	1.24	4.0