51. BASIC ORGANIC GEOCHEMICAL DATA OF LEG 48 MATERIAL

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INTRODUCTION

Composite samples from each of the sites drilled on DSDP Leg 48 were selected for examination by the shipboard geochemist. The samples were placed in carefully cleaned containers, supplied by British Petroleum Corporation. The canned samples were frozen immediately and maintained in this state throughout the leg and thereafter, prior to analysis. A list of the samples collected is given in Table 1 together with relevant characterization data from the summary log.

Additional samples from Site 402 were obtained from the IFP Laboratories in order to extend our coverage of the sampled intervals, particularly the more organic-rich Cretaceous shales. Details of these samples are also included in Table 1. Additional material supplied by the IFP Laboratories was in the form of dry, ground sediment.

EXPERIMENTAL METHODS AND RESULTS

The bulk of the water in the frozen samples was removed by freeze-drying, without disruption of the core material; residual water, remaining after this treatment, was removed by drying the samples over phosphorus pentoxide in a desiccator. Small portions of the dried cores were removed, mounted in resin and polished, and the reflectance of vitrinitic material present was determined by standard oil immersion procedures (Table 2). At this stage, small amounts of sample were also removed and used for kerogen preparation by hydrochloric acid/hydrofluoric acid treatment under nonoxidizing conditions. Visual microscopic examinations of the kerogen concentrates were made, the results of which are summarized in Table 3. Examination of the gross lithology and a brief X-ray diffraction analysis of each sample were made, the results of which are summarized in Table 4.

The remainder of each sample was then ground to <106 μm BSS and stored for further use in clean, dry bottles. The bottles, and all other glassware used throughout the work, were thoroughly cleaned by washing first with methylene chloride, then by immersion in chromic acid and, finally, by washing with doubly distilled water; drying in an oven followed.

If sufficient sample was available, 100 g of core material was solvent extracted. This operation was carried out for 48 hours in a Soxhlet extractor fitted with a glass fiber thimble. The thimble had been extracted extensively with methylene chloride, followed by heating at 450°C for 16 hours. The solvent used in these extractions, and at all other stages of this work, had been previously redistilled from Analar Reagent grade material in a 40-plate distillation apparatus. Each solvent was tested prior to use by evaporating 300 ml to dryness, dissolving in 10 μl of solvent, and injecting 0.4 μl of the solution directly into a gas chromatograph running at maximum usable sensitivity. Only solvents giving no peaks other than that of the solvent were used for this work.

The Soxhlet extracts were treated with copper powder to remove any elemental sulfur and filtered through a glass sinter. They were then evaporated to dryness by gentle blowing with filtered, dry nitrogen on a heated block maintained at 35°C. The residual total soluble extract (TSE) was weighed and then fractionated by liquid chromatography over silica gel. The $n + p$ (saturate alkane) fraction was eluted by n-heptane and the combined aromatics + heterocyclics (A + H) and residual material were eluted by benzene/methanol (3:1 v/v). The per cent weight TSE for each sample is given in Table 5 together with other data obtained on the sediment extracts.

Three grams of unextracted material from each core was decarbonated using the following procedure: 30 ml 2*N* HCl was added to the sample and the bulk of the liquid decanted after effervescence had ceased. A further 30 ml of 2*N* HCl was added until no further effervescence occurred. A final treatment with 10 ml concentrated HCl (13*N*) was given with the container in an ultrasonic bath for 2 hours at 40°C. The mixture was diluted with distilled water and repeatedly washed until neutral. The residue was dried in a vacuum oven and, finally, in a desiccator over phosphorus pentoxide. The difference in weight between the initial and final material was used to calculate the per cent weight HCl soluble material given in Table 5. The total organic carbon content (TOC) of the decarbonated sediment was then determined by a standard combustion procedure, and the values used to calculate the various indexes are given in Table 5.

The $n + p$ fractions obtained from the liquid chromatographic separations of the TSE were examined by gas chromatography. The columns used were SGE SCOT type with SE 30 as stationary phase and totally splitless injection was employed. Conditions for all runs were: initial hold for 12 minutes at 100°C, followed by programming at 3°C/minute up to the final hold at 290°C. Flame ionization detectors and injectors were maintained at 350°C. Examples of the chromatograms obtained are shown in Figures 1 to 8. Carbon preference indexes (CPI) were calculated for n-alkanes in the C_{18} to C_{32} range, together with the pristane/phytane ratio (Pr/Ph); these values are also included in Table 5. Distribution profiles of the n-alkanes were obtained from the quantitative date of the gas chromatograms and are illustrated in Figures 9 to 18.

A more detailed examination of a limited number of the $n + p$ fractions was undertaken by capillary column gas chromatography/mass spectrometry, in order to obtain data

TABLE 1
Samples Examined

	Core	Section	Interval (cm)	Depth (m)	Stage	Lithological Description From Summary Report
Hole 399	2	1	5-7; 60-62	63.05-63.62	Pleistocene	Marly calcareous ooze
	2	2	38-40; 114-116	64.88-65.65		
	2	3	20-22; 104-106	66.20-67.06		
Hole 400A	8	1	27-29	141.27-141.29	Upper Pliocene	Nannofossil ooze
	8	2	27-29	142.77-142.79		
	8	3	27-29	144.27-144.29		
	8	4	26-28	145.77-145.79		
	8	5	31-33	147.31-147.32		
	8	6	31-33	148.81-148.83		
	18	1-7	(composite)	236.0-245.5	Upper Miocene	Nannofossil chalk
	29	1	0-22	340.50-340.77	Middle Miocene	Nannofossil chalk Marly nannofossil chalk
	39	1	0-10	435.50-435.60	Lower Miocene	Marly nannofossil chalk
	39	2	0-10	437.0-437.1		
	39	3	0-10	438.50-438.60		Nannofossil chalk
	49	2	0-10	532.0-532.1	Middle Eocene	Siliceous marly chalk
	49	3	0-10	533.5-533.6		
	49	4	0-3	535.0-535.3		
Hole 401	5	1-5	All 0-5		Middle Eocene	Nannofossil chalk
	14	1	1-8	198.51-198.58	Upper Palaeocene	Nannofossil chalk
	14	2	1-8	200.01-200.08		
	14	3	1-6	201.51-201.56		
	14	4	1-6	203.01-203.06		
	14	5	1-7	204.01-204.07		
Hole 402	1	1	1-5	40.01-40.05	Pleistocene	Nannofossil marly ooze
	1	2	1-5	41.51-41.55		
	1	3	1-7	43.01-43.05		
	5	1	15-23	127.65-137.73	Upper Eocene	Siliceous marly nannofossil chalk
	5	2	10-17	129.10-139.17		
	5	3	0-9	130.50-130.59		
	5	4	0-9	132.00-132.09		
Hole 402A	4	1	6-15	165.06-165.15	Middle Eocene	Siliceous marly nannofossil chalk
	4	2	0-6	167.00-167.06		
	4	3	122-125	169.72-169.75		
	4	4	0-6	170.00-170.06		
	11	1			Lower Cretaceous	Calcareous mudstone
	16	1			Lower Cretaceous	Marly chalk
	16	2				
	18A	1			Lower Cretaceous	Carbonaceous marly limestone
	18A	2				
	18B	1			Lower Cretaceous	
	18B	2				
	18B	3				
	18B	4				
	32	2			Lower Cretaceous	Dolomitic marly limestone
	32	3				
	32	6				Carbonaceous calcareous mudstone
Hole 403	3	1	53-60	14.53-14.60	Pleistocene	Calcareous mudstone
	3	2	126-131	16.76-16.81		
	3	3	37-45	17.37-17.45		
	14	1	63-67, 125-129, 144-150	119.13-117.17, 119.75-119.77, 119.97-120.0	Upper Miocene	Nannofossil ooze
	14	2	0-8	120.0-120.08		
	26	1	0-6	232.50-232.56	Middle Eocene	Marly nannofossil chalk
	26	2	0-1	234.0-234.01		Siliceous nannofossil chalk
	26	3	0-6	235.50-235.56		
	26	4	0-6	237.00-237.06		
	29	1	9-17	261.09-261.17	Lower Eocene	Mudstone
	29	2	78-83	263.28-263.33		
	29	4	6-13	265.56-265.63		

TABLE 1 – *Continued*

	Core	Section	Interval (cm)	Depth (m)	Stage	Lithological Description From Summary Report
	35	1	72-82	318.72-318.82	Lower Eocene	Mudstone
	35	2	89-96	320.39-320.46		
	35	3	128-136	322.28-322.36		
	35	4	39-46	322.89-322.96		
	40	2	10-13, 50-53	375.10-375.13,	Lower Eocene	Mudstone
			105-109	375.50-375.53,		
				376.05-376.09		
	40	3	0-5, 88-91	378.00-378.05,		
				378.88-378.91		
Hole 404	17	1	87-90	294.87-294.90	Lower Eocene	Mudstone
	17	2	20-33	295.70-295.83		
	17	3	0-11	297.00-297.11		
	21	2	0-10	333.50-333.60	Lower Eocene	Mudstone
	21	3	0-10	335.00-335.10		
	21	4	0-6	336.00-336.06		
	22	2	16-24	343.16-343.24	Lower Eocene	Mudstone
	22	3	110-120	345.60-345.70		
	22	5	35-42	347.35-347.42		
Hole 405	4	1	0-22	36.50-36.72	Pleistocene	Marly nannofossil ooze
	10	1-7	All 0-5	84.00-93.5	Middle/Lower Eocene	Nannofossil ooze
	13	2	1-9	114.01-114.09	Lower Eocene	Siliceous marly nannofossil chalk
	13	3	76-85	116.25-116.35		mudstone
	13	5	0-10	118.50-118.60		
	17	2	110-120	162.10-162.20	Lower Eocene	Siliceous calcareous mudstone
	17	3	110-120	162.60-162.70		
	17	4	50-60	164.50-164.60		
	17	5	50-60	165.50-165.60		
	40	1	7-12, 144-150	369.07-369.12	Lower Eocene	Siliceous calcareous mudstone
				370.44-370.55		
		2	29-33, 141-150	370.79-370.83		
				371.41-371.50		
	42	1	7-17	388.07-388.17	Lower Eocene	Siliceous calcareous mudstone
		3	18-27, 100-112	391.18-391.27		
				392.00-392.12		
Hole 406	2	2	98-107	64.48-64.57	Pleistocene	Marly nannofossil ooze
	2	3	107-122	66.07-66.22		
	2	4	0-7	66.50-66.57		
	13	1	138-140	452.88-452.90	Upper Miocene	Nannofossil chalk
	13	2	54-59	453.54-458.59		
	13	3	32-38	454.82-454.88		
	13	4	104-112	467.04-467.12		
	24	1	33-43	556.83-556.93	Middle Miocene	Siliceous chalk
	24	2	67-75	558.67-558.75		
	32	3	17-26, 12-15	633.67-633.76	Upper/Middle	Calcareous and siliceous chalk
				633.62-633.65	Oligocene	
	32	4	133-141	637.83-637.91		
	32	5	46-56	638.46-638.56		
	39	1	0-7	698.50-698.57	Upper Eocene	Calcareous and siliceous chalk
	39	2	59-74	700.09-700.24		
	39	3	26-34	701.26-701.34		
	39	4	17-24	702.67-702.74		
	39	5	69-70	704.69-704.70		
	47	1	100-104	775.00-775.04	Lower Eocene	Calcareous claystone
	47	2	40-51	776.40-776.51		
	47	3	93-99	778.43-778.49		

TABLE 2
Vitrinite Reflectance Measurements

Core	Mean Vitrinite Reflectance			
	Autochthonous	Allochthonous		
399-2	N.D.			
400A-8			0.86(6)	
400A-18	0.32(5)			1.27(10)
400A-29		0.49(1)		
400A-39			0.82(9)	1.38(1)
400A-49	N.D.			
401-5			0.89(3)	
401-14	N.D.			
402-1	0.33(19)		0.63(1)	
402-5	0.30(2)		0.92(1)	
402A-4	0.34(4)	0.57(1)	0.85(2)	
402A-11	0.37(9)	0.59(2)	0.84(9)	
402A-16	0.34(19)	0.58(2)		
402A-18A	N.D.			
402A-18B	0.34(20)			
402A-32	0.37(21)			
403-3		0.45(7)		
403-14	N.D.			
403-26	N.D.			
403-29	0.28(20)			
403-35	0.25(10)		0.81(1)	
403-40	0.32(19)		0.60(1)	
404-17	0.33(3)		0.86(2)	1.08(3)
404-21	0.33(2)		0.80(7)	
404-22	0.34(20)			
405-4			0.71(6)	1.20(5)
405-10	N.D.			
405-13		0.59(2)	0.77(1)	
405-17	0.28(2)	0.46(4)	0.71(1)	
405-40	0.33(5)			1.13(1)
405-42	0.36(9)	0.58(2)		
406-2	0.26(1)	0.45(5)	0.70(14)	
406-13	N.D.			
406-24	0.37(19)		0.82(1)	
406-32	0.32(2)			1.02(1)
406-39				1.06(1)
406-47	N.D.			

Note: Figures in parentheses are the number of separate determinations. N.D. = no determination possible.

on sterane and pentacyclane distributions. The results of these analyses are summarized in Tables 6 and 7.

The amount of soluble extract obtained from the various frozen composite shipboard samples was insufficient for stable carbon isotope determinations ($\delta^{13}C_{PDB\text{-}1}$) as well as for the other analyses normally undertaken. However, in the case of the larger samples subsequently made available from the IFP, sufficient extract was available for a comparison of the $\delta^{13}C$ values of the TSE and sediment kerogen, without precluding the other analyses. Extracts and kerogen concentrates were therefore quantitatively combusted to carbon dioxide and their $^{13}C/^{12}C$ ratios determined on a VG Micromass 602C Isotope Ratio Mass Spectrometer. Results of these measurements are given in Table 8.

ORGANIC GEOCHEMICAL SUMMARIES

Bay of Biscay

Site 399: Only shallow Pleistocene calcareous ooze examined. Low organic carbon content (~ 0.2 % wt.) Very low maturity, indicated by visual kerogen studies. Evidence for significant amounts of terrestrial plant debris as well as algal matter. Highly immature *n*-alkane distribution.

Site 400: Deepest sample collected by shipboard geochemist in middle Eocene at ~535 meters. Little autochthonous vitrinite evident in samples examined. Sample from Core 18 indicated low maturity with some evidence of reworked vitrinite present. Pliocene Core 8 showed evidence of terrestrial debris as well as algal matter, all of very low maturity. Very low organic carbon contents in highly calcareous samples. Generally low TSE/TOC ratios and low hydrocarbon contents, but *n*-alkanes had fairly low CPI values.

Site 401: No indications of autochthonous vitrinite. Both samples highly calcareous with very low organic carbon contents; *n*-alkanes had quite low CPI values.

Site 402: Shipboard samples only extended to middle Eocene, but were supplemented by IFP Lower Cretaceous samples. Low reflectivity autochthonous vitrinite present in nearly all samples indicating low maturity. Some evidence of reworked organic matter. Middle Eocene sample showed evidence of terrestrial debris and low maturity by visual kerogen studies. Lower Cretaceous shales showed marked evidence of terrestrially derived components and increased maturity compared with shallower samples. Organic carbon contents were moderate to good but hydrocarbon contents were low; *n*-alkanes still showed marked signs of immaturity. Sterane distribution patterns supported immature indications as did the pentacyclane distributions, with 17βH hopane as a major component. Extract/kerogen $\delta^{13}C$ values suggested a coaly-type component was present in significant quantities.

Rockall Plateau

Site 403: Low reflectivity autochthonous vitrinite in lower Eocene samples. Visual kerogen studies indicated some terrestrially derived components to be present. Color measurements suggested maturity fairly high, but still below level for significant hydrocarbon generation. Organic carbon contents all low to very low with generally low SAC/TOC values; *n*-alkanes generally had CPI values >1.0. Sterane and pentacyclane distributions indicated higher maturity than Site 402 Cretaceous samples with the pentacyclanes having 17αH hopane as the major component.

Site 404: Samples confined to lower Eocene mudstones. Low reflectivity autochthonous vitrinite suggested low maturity. Visual kerogen studies indicated significant contributions of terrestrial organic debris and maturity level comparable to Site 403. Organic carbon contents were very low with low extracts and very low hydrocarbon contents. CPI values of *n*-alkanes supported maturity indications.

Site 405: Little evidence of autochthonous vitrinite. Low reflectivity of lower Eocene material indicated immaturity. Visual kerogen studies again suggested significant contribution of terrestrially derived detritus, with maturity comparable to, or possibly slightly lower, than Sites 403 and 404. Organic carbon contents all very low, but some high TSE/TOC values were present. Hydrocarbon contents were generally quite low, but *n*-alkane CPI values supported immaturity, with a much more mature value in the deepest sample examined.

TABLE 3
Visual Kerogen Descriptions

Site Core	Miospores: Trace/Rare, Common, Frequent, Abundant (1-2 3 4 5)	Phytoplankton excluding Tasmanitids (1-2 3 4 5)	Tasmanitids (1 2 3)	Reworking	Vascular Plant Debris: Cuticles (1-2 3 4 5)	Brown "Wood" (lignite) (1-2 3 4 5)	Black "Wood" (vitrain fusain) (1-2 3 4 5)	Finely Disseminated (1-2 3 4 5)	Sapropelized (1-2 3 4 5)	Amorphous (algal) (1-2 3 4 5)	Preservation: Good, Fair, Poor	Color/Maturation: Threshold? (1 2 3 4 5 6 7)	Source Potential	Depositional Environment: Marine Undifferentiated, Open Marine, Near-shore Marine, Restricted Marine, Nonmarine, Unknown
Site 399														
Core 2	•	•		•	•	•		•	•	•	•	•	—	•?
Hole 400A														
Core 8	•	•			•		•	•		•	•	•	—	•
Site 402														
Core 1	•		•	•		• •		•	•		•	•	—	•?
Hole 402A														
Core 4	•		•		•		•	•			•	•	—	•
Core 18B	•	•			•	•	•	•			•	•	? GAS	•
Core 11	•	•			•	•	•	•			•	•	? GAS	•
Core 16	•	•			•	•	•	•			•	•	? GAS	•
Core 18A	Barren													
Core 32	•	•			•	•	•	•			•	•	? GAS	•
Site 403														
Core 29	•	•			•	•	•		•		•	•	GAS	•?
Core 40	•	•			•	•	•		•		•	•	GAS	•?
Site 404														
Core 21	•	•			•	•	•	•	•		•	•	GAS	•?
Core 22	•	•			•	•	•	•	•		•	•	GAS	•?
Site 405														
Core 40	•		•		•	•	•	•	•	•	•	•	—	•
Core 42	•		•		•	•	•	•	•	•	•	•	—	•
Site 406														
Core 24	•		•		•	•	•	•	?•	•?	•	•		•

Site 406: Autochthonous vitrinite reflectance values suggested some increase in maturity with depth, but all samples examined were immature. Visual kerogen studies on middle Miocene siliceous chalks indicated some terrestrially derived components as well as significant amounts of algal matter. Maturity of middle Miocene samples appeared quite low. Organic carbon contents were very low with low extracts and hydrocarbon contents. CPI values of *n*-alkanes were >1, but sterane/pentacyclane distributions were similar to Site 403.

Generally, all samples displayed immaturity and kerogens were dominantly gas prone. Eocene organic matter at Sites 403, 404, 405, and 406 appeared mature, or possibly in some components, more mature than organic matter in the Lower Cretaceous shales/mudstones from Site 402.

TABLE 4
Observed Core Lithology (major components) of Selected Samples

	Hole	Core	Description of Hand Specimen	X-Ray Diffraction Results		
				Abundant	Present	Trace
North Margin, Bay of Biscay	399	2	Mudstone, calcareous, soft, gray	Calcite, quartz	Illite, kaolinite	Dolomite
	400A	8	Mudstone, calcareous, soft, light gray	na	na	na
	400A	18	Mudstone, calcareous, soft, gray-white	Calcite	–	Quartz, illite
	400A	29	Lime mudstone, argillaceous, soft, chalky, light gray-white	Calcite	–	–
	400A	39	Lime mudstone, argillaceous, soft, chalky, light gray-white	na	na	na
	400A	49	Lime mudstone, argillaceous, soft, chalky, flaky, light gray-green to buff	na	na	na
	401	5	Lime mudstone, slightly argillaceous, soft, chalky, light greenish white	Calcite	Quartz, illite	–
	401	14	Lime mudstone, slightly argillaceous, soft, chalky, light buff	Calcite	Quartz, illite	Kaolinite, dolomite
	402	1	Lime mudstone, argillaceous, soft, chalky, light gray	Calcite, quartz	Illite, kaolinite	Chlorite, dolomite
	402	5	Lime mudstone, slightly argillaceous, soft, greenish white	na	na	na
	402A	4	Lime mudstone, slightly argillaceous, soft, greenish white	Calcite	Quartz, illite	–
West Margin, Rockall Plateau	403	3	Mudstone, calcareous, gray, soft, chalky	Calcite	Quartz, illite	Kaolinite
	403	14	Lime mudstone, chalky, soft, white	Calcite	–	–
	403	26	Lime mudstone, chalky, soft, cream	Calcite	–	–
	403	29	Mudstone, gray, friable, slightly micaceous and calcareous	Plagioclase, quartz	Illite/montmorillonite (M.L.) and heulandite	–
	403	35	Mudstone, gray-green friable, silty texture, calcareous In thin section, abundant devitrified volcanic glass debris	Plagioclase, quartz	Illite/montmorillonite (M.L.) and heulandite	Calcite
	403	40	Mudstone, gray, calcareous	Plagioclase, quartz	Illite/montmorillonite (M.L.) and heulandite	Calcite
	404	17	Mudstone, dark gray calcareous	na	na	na
	404	21	Mudstone, dark gray, calcareous	Quartz	Illite/montmorillonite (M.L.) plagioclase	Kaolinite, heulandite
	404	22	Mudstone, mid gray, (calcareous), micaceous	na	na	na
Southern Margin, Rockall Plateau	405	4	Lime mudstone, buff, soft, chalky, fossiliferous, argillaceous	Quartz, calcite	Illite, plagioclase	Kaolinite
	405	10	Lime mudstone, light buff brown, chalky	Calcite	Plagioclase	Heulandite
	405	13	Lime mudstone, buff, chalky, argillaceous	na	na	na
	405	17	Mudstone, light gray, calcareous, chalky, soft	Calcite	Montmorillonite	Plagioclase
	405	40	Shale, calcareous, hard, light gray green with silicified bands	Calcite	Plagioclase, montmorillonite	–
	405	42	Shale, light gray-green, calcareous, hard, fissile (XRD42S) with burrows filled with green swelling clay (XRD42G)	42S Calcite 42G Montmorillonite (?nontronite)	Plagioclase, montmorillonite –	– –
	406	2	Clay, highly calcareous, light gray	Calcite	Plagioclase, illite	Kaolinite
	406	13	Lime mudstone, white, chalky, compact	Calcite	–	–
	406	24	Lime mudstone, gray, soft, chalky	Calcite	–	–
	406	32	Mudstone, calcareous, light gray, hard, fissile	Calcite	–	–
	406	39	Mudstone, light gray, calcareous, microfossiliferous with black clay-filled burrows and patches (SEM)			
	406	47	Shale, (47 Gy) mid gray, soft, good fissility with thin black clay filled trace fossil tracks. Patches of green mudstone (47 Grn)	(47 GY) Calcite (47GRN) Plagioclase	Montmorillonite/illite Montmorillonite/illite	– –

Note: na: not analyzed.

TABLE 5
Organic Carbon and Soluble Extract Data

Core	HCl Solubles (% wt.)	TOC (% wt.)	TSE (% wt.)	TSE/TOC (‰)	$n+p$ (% wt.)	SAC/TOC (‰)	CPI	Pr/Ph
399-2	59.3	0.224	0.0109	49	16.8	8	2.45	0.89
400A-8	58.7	0.244	0.0033	14	16.5	2	1.22	0.19
400A-18	71.3	0.095	0.0013	14	15.7	2	1.24	0.43
400A-29	86.6	0.046	0.0019	42	14.3	6	1.08	0.40
400A-39	61.9	0.084	0.0026	31	17.80	6	1.30	0.52
400A-49	21.4	0.063	0.0017	27	30.9	8	1.13	0.60
401-5	58.2	0.062	0.0019	31	20.2	6	1.11	0.43
401-14	56.0	0.055	0.0017	30	13.8	4	1.13	0.47
402-1	33.7	0.431	0.0036	8	23.3	2	2.34	1.19
402-5	62.7	0.131	0.0023	18	8.6	2	1.12	0.59
402A-4	45.1	0.148	0.0004	3	10.71	0.8	1.27	0.34
402A-11	34.8	0.700	0.0027	4	5.7	0.2	1.26	1.05
402A-16	24.9	1.21	0.0053	4	10.2	0.4	1.65	1.55
402A-18A	93.3	0.009	0.0020	222	6.3	14	0.97	1.09
402A-18B	29.9	1.35	0.0052	4	6.8	0.3	1.79	1.70
402A-32	22.0	1.23	0.0065	5	4.4	0.2	1.90	1.54
403-3	58.2	0.129	0.0017	13	11.8	1.5	1.77	0.41
403-14	97.4	0.022	0.0021	94	35.1	33	1.18	0.77
403-26	85.5	0.028	0.0024	87	16.1	14	1.15	0.78
403-29	16.1	0.394	0.0016	4	12.8	0.5	1.89	0.36
403-35	38.4	0.068	0.0012	17	9.6	1.7	1.43	0.37
403-40	24.1	0.342	0.0030	9	5.8	0.5	1.26	0.29
404-17	23.6	0.092	0.0010	10	10.4	1.0	1.11	0.48
404-21	19.2	0.105	0.0011	10	5.1	0.5	1.46	0.38
404-22	17.5	0.239	0.0012	5	7.2	0.4	1.52	0.66
405-4	51.0	0.074	0.0025	34	26.4	9	1.76	0.39
405-10	47.5	0.042	0.0045	108	5.6	6	1.15	0.48
405-13	42.4	0.092	0.0056	60	14.4	9	1.18	0.49
405-17	30.0	0.154	0.0016	10	23.0	2.3	1.32	0.57
405-40	20.6	0.159	0.0011	7	3.4	0.2	1.13	0.54
405-42	35.2	0.207	0.0020	9	2.6	0.2	1.08	0.72
406-2	31.3	0.117	0.0056	48	35.0	17	1.36	0.85
406-13	88.5	0.051	0.0010	20	10.4	2.1	1.27	0.63
406-24	67.6	0.214	0.0029	14	11.3	1.6	1.23	0.52
406-32	79.5	0.033	0.0005	14	14.3	2.0	1.19	0.32
406-39	75.4	0.059	0.0004	12	8.3	1.0	1.20	0.47
406-47	30.5	0.090	0.0006	7	9.3	0.7	1.29	0.50

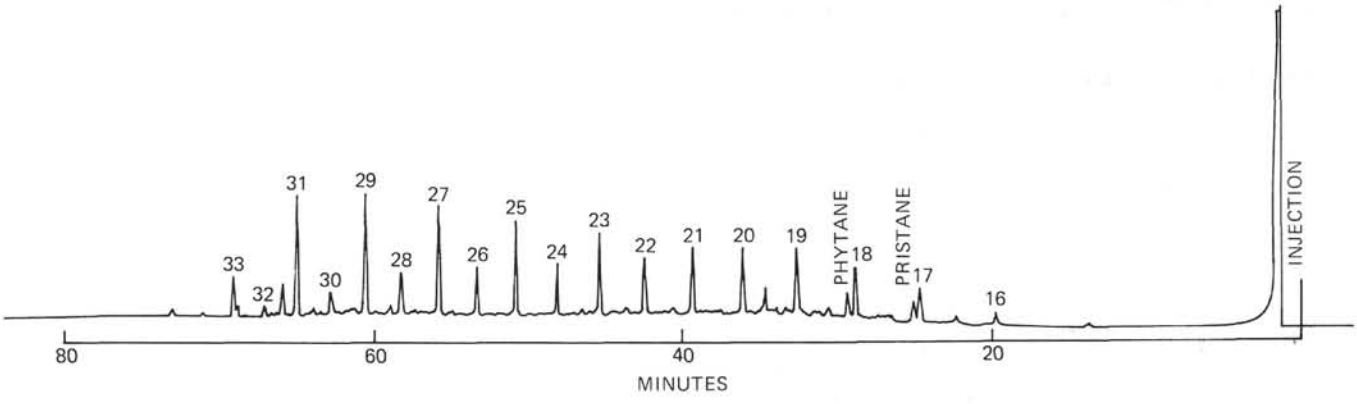

Figure 1. *Gas chromatogram of* n + p *fraction, Site 399, Core 2.*

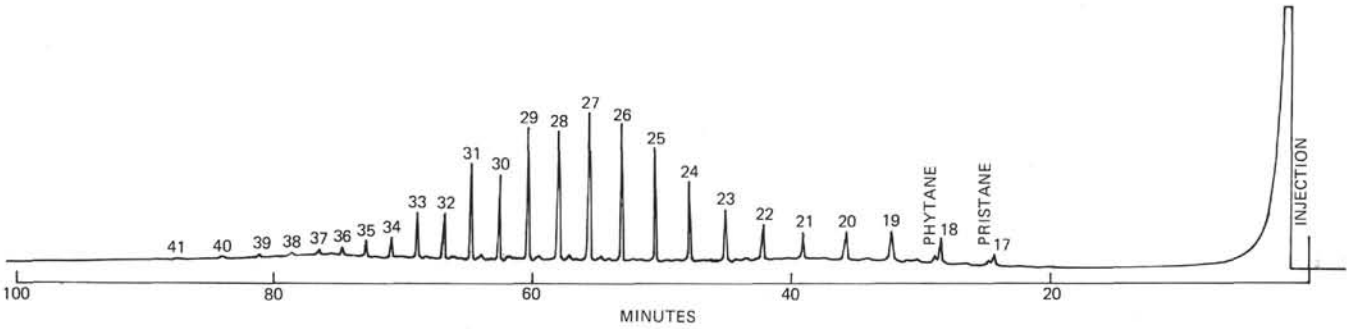

Figure 2. *Gas chromatogram of* n + p *fraction, Hole 400A, Core 49.*

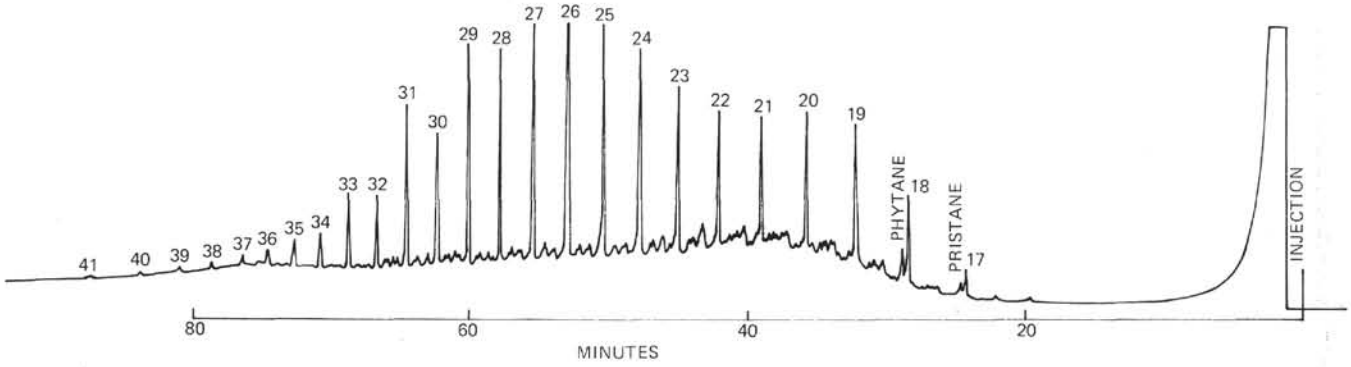

Figure 3. *Gas chromatogram of* n + p *fraction, Site 401, Core 5.*

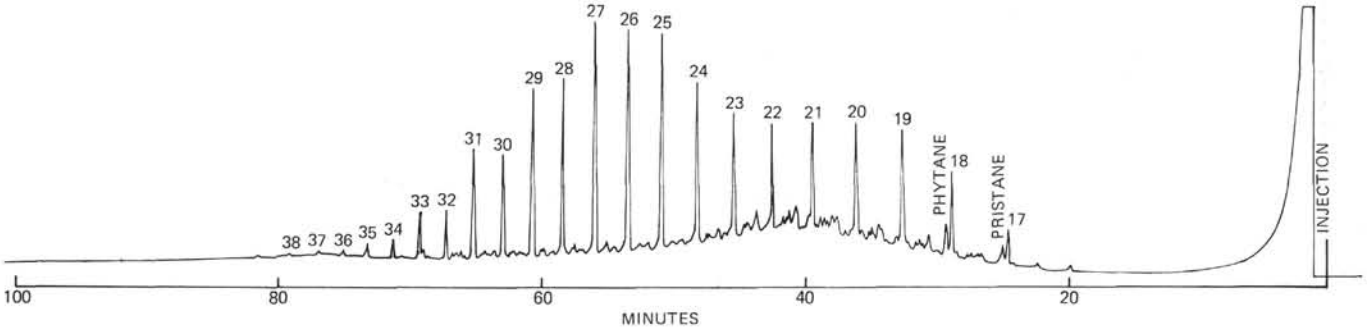

Figure 4. *Gas chromatogram of* n + p *fraction, Site 402, Core 5.*

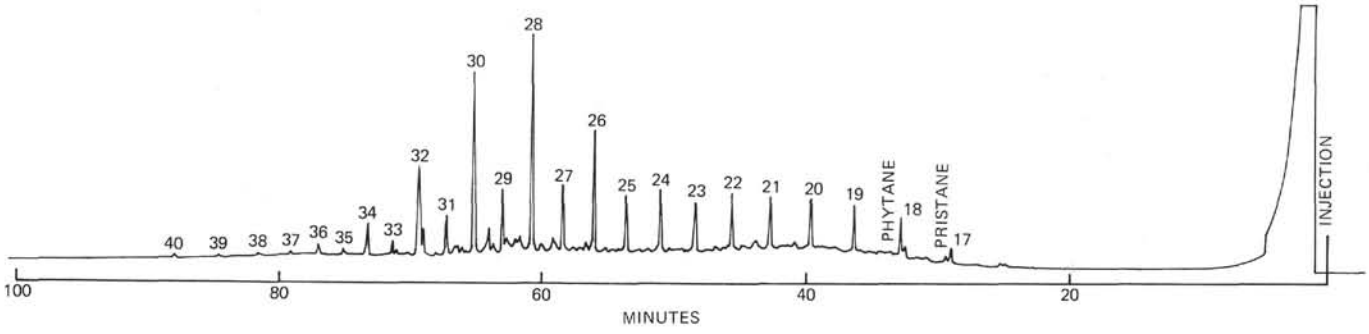

Figure 5. *Gas chromatogram of* n + p *fraction, Site 403, Core 29.*

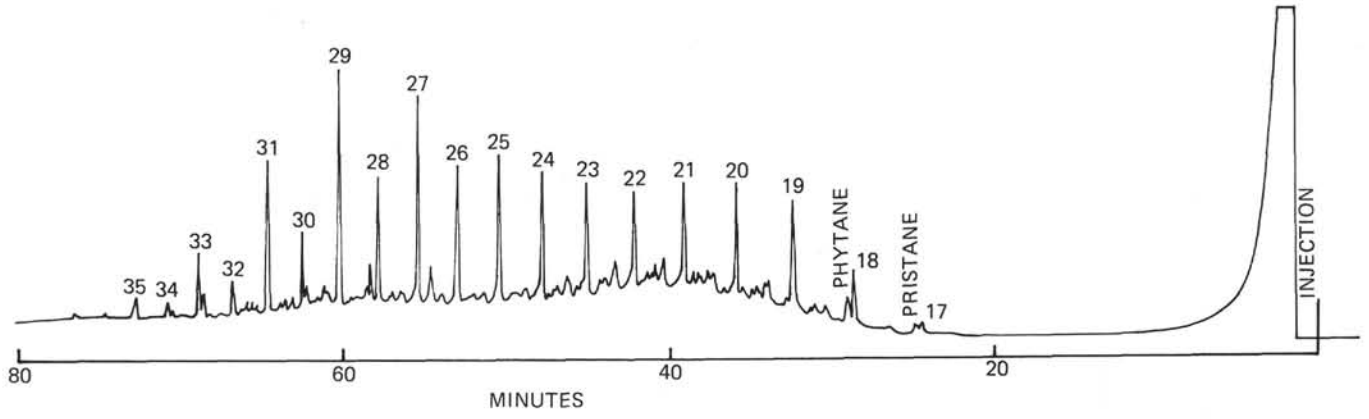

Figure 6. *Gas chromatogram of* n + p *fraction, Site 404, Core 21.*

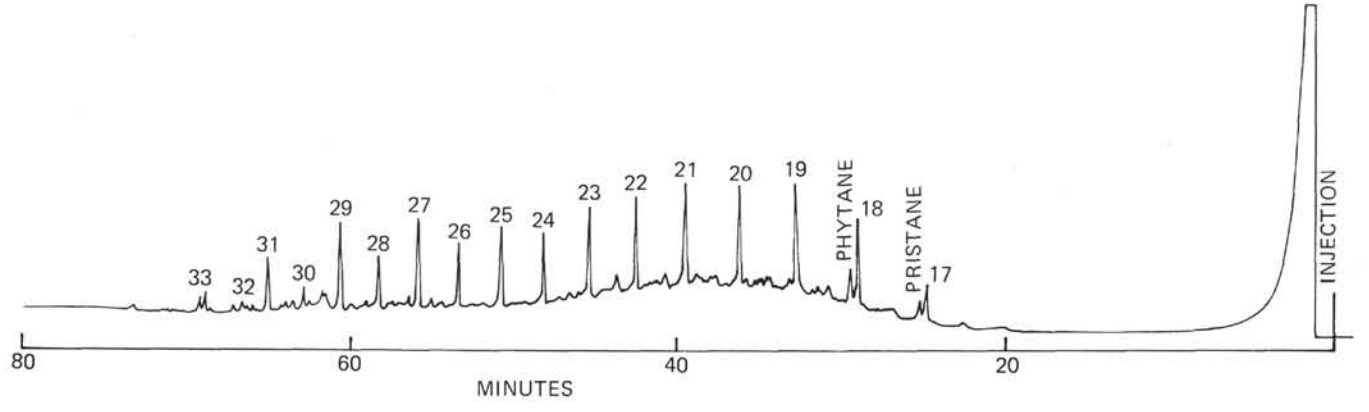

Figure 7. *Gas chromatogram of* n + p *fraction, Site 405, Core 42.*

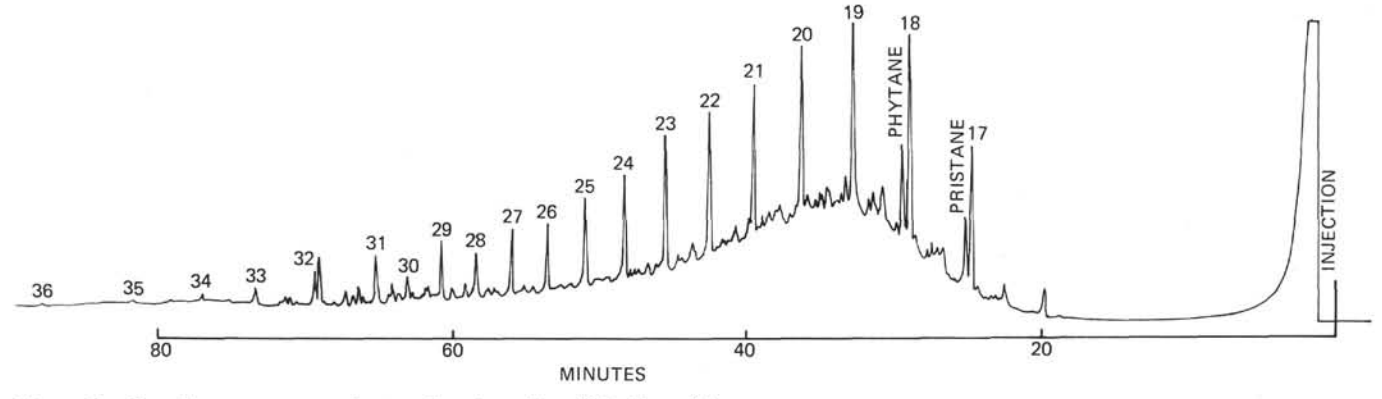

Figure 8. *Gas chromatogram of* n + p *fraction, Site 406, Core 47.*

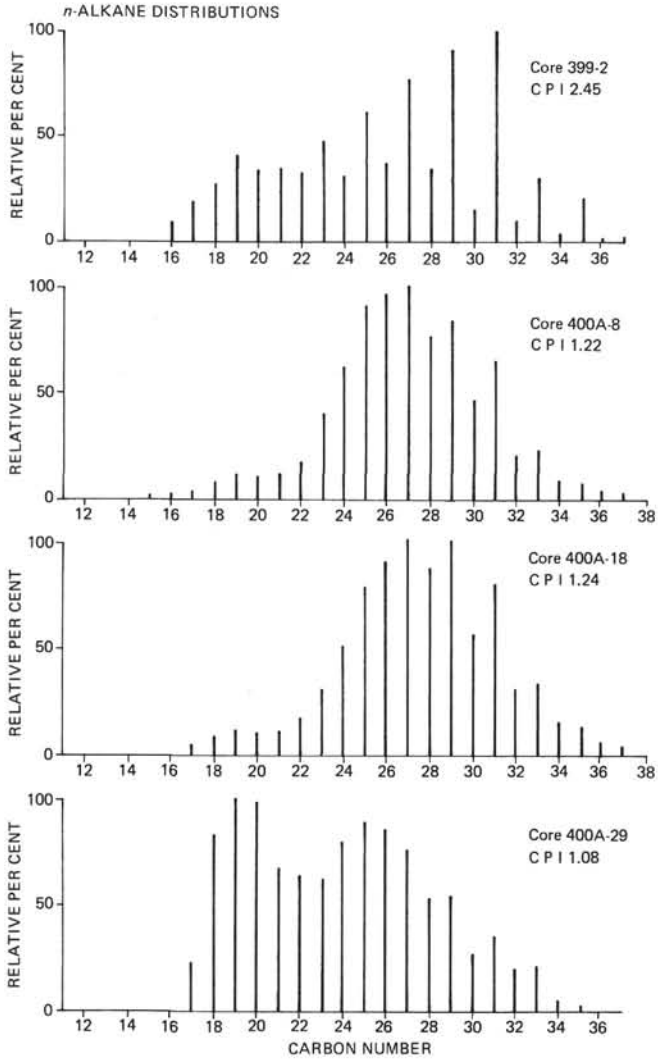

Figure 9. *Distribution profiles of* n-*alkanes derived from gas chromatograms for Cores 399-2, 400A-8, 400A-18, and 400A-29.*

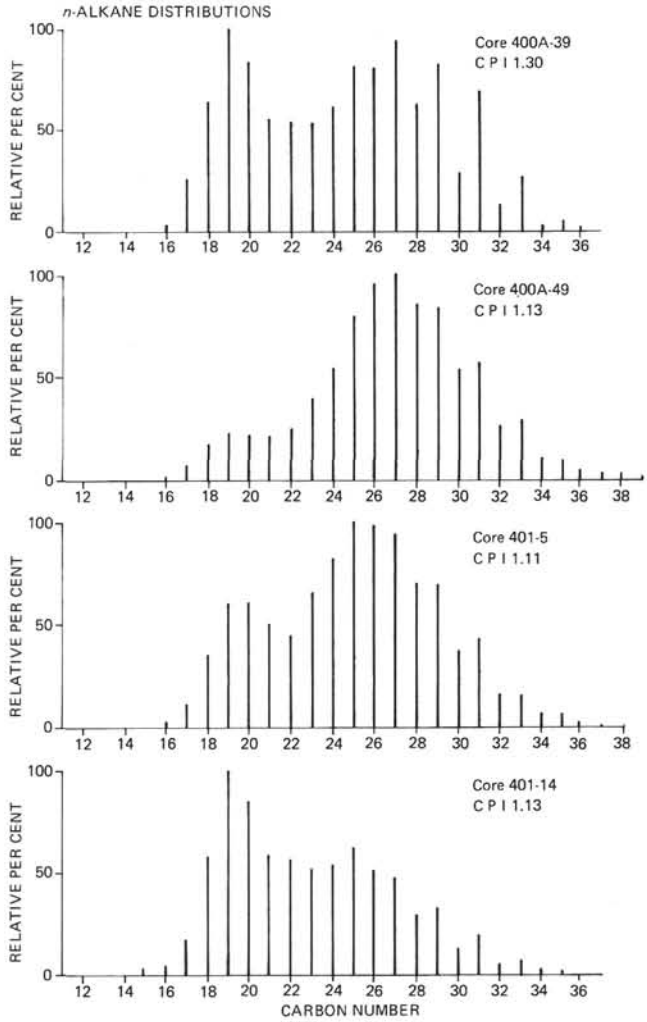

Figure 10. *Distribution profiles of* n-*alkanes derived from gas chromatograms for Cores 400A-39, 400A-49, 401-5, and 401-14.*

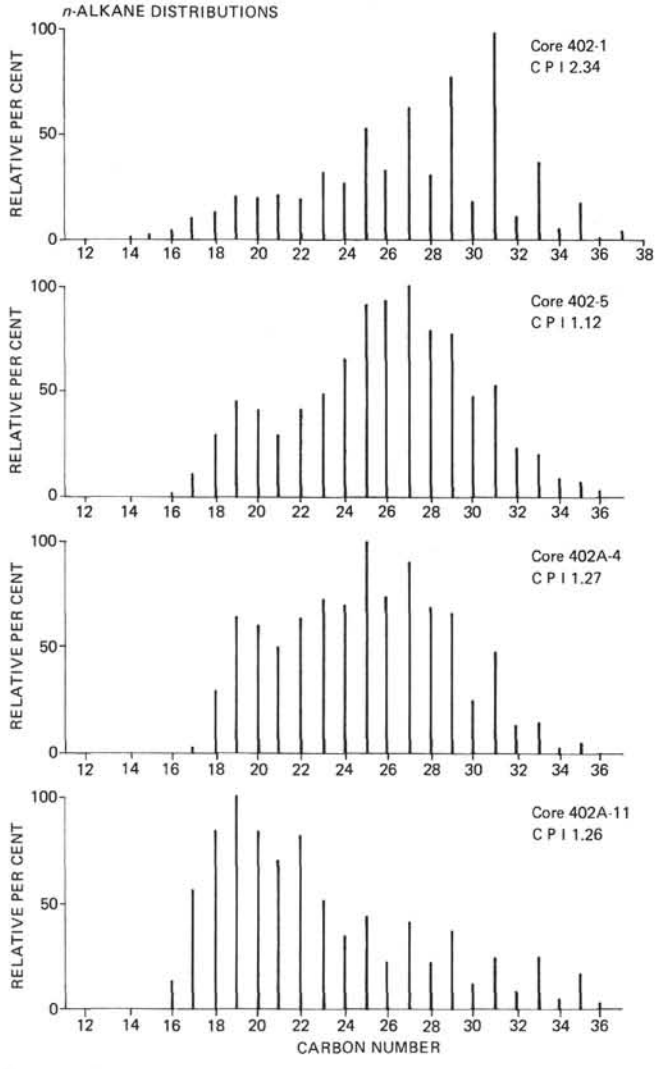

Figure 11. *Distribution profiles of* n-*alkanes derived from gas chromatograms for Cores 402-1, 402-5, 402A-4, 402A-11.*

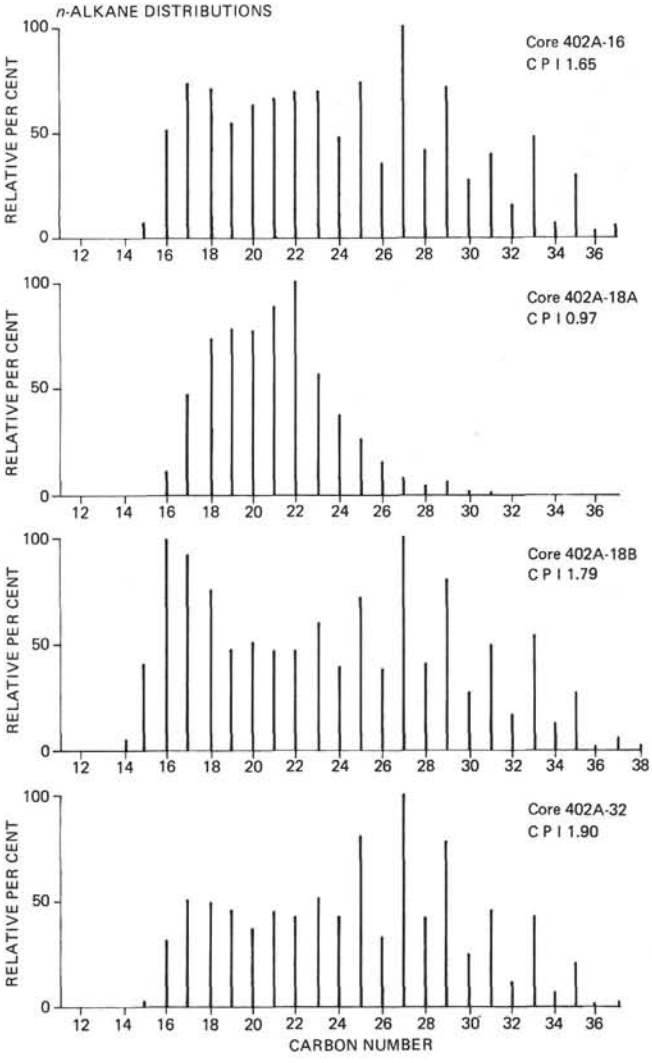

Figure 12. *Distribution profiles of* n-*alkanes derived from gas chromatograms for Cores 402A-16, 402A-18A, 402A-18B, and 402A-32.*

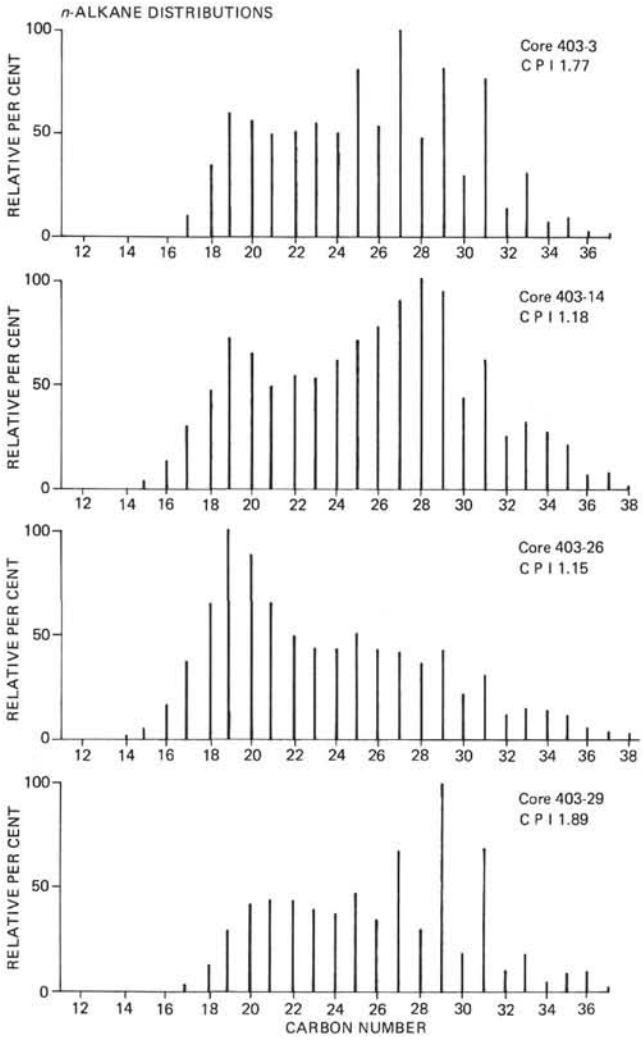

Figure 13. *Distribution profiles for* n-*alkanes derived from gas chromatograms for Cores 403-13, 403-14, 403-26, and 403-29.*

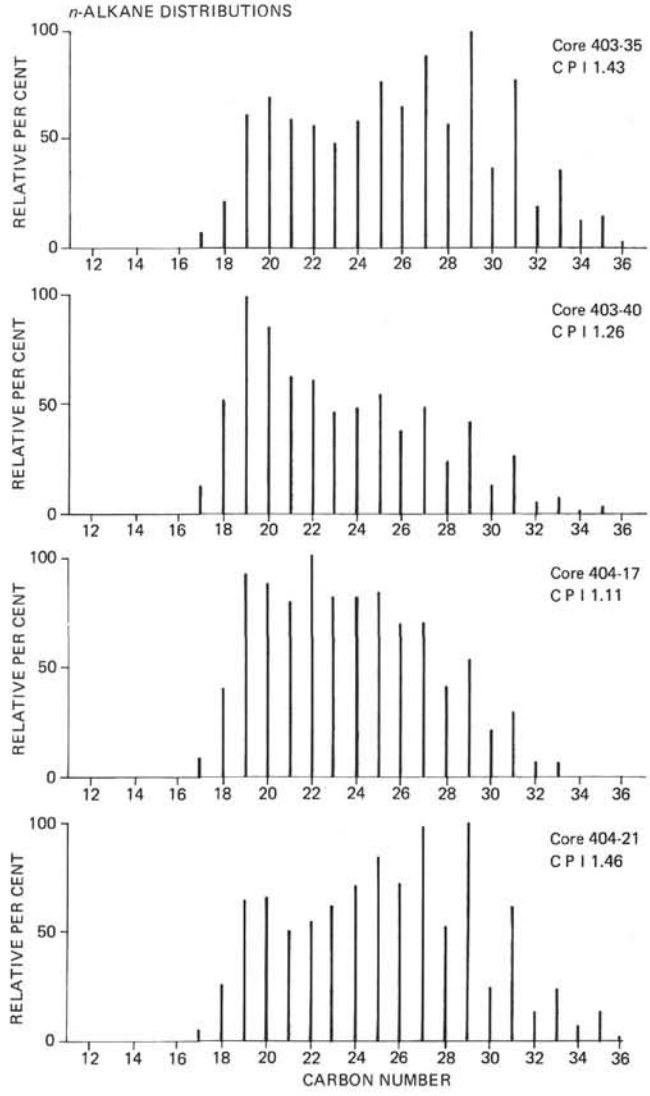

Figure 14. *Distribution profiles for* n-*alkanes derived from gas chromatograms for Cores 403-35, 403-40, 404-17, 404-21.*

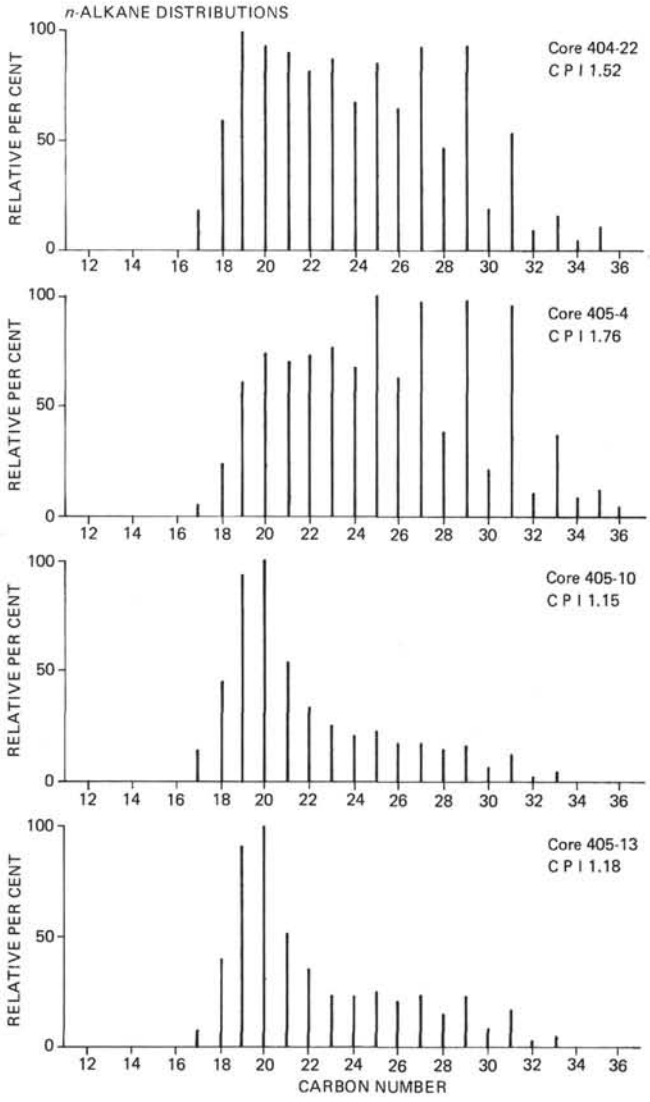

Figure 15. *Distribution profiles for* n-*alkanes derived from gas chromatograms for Cores 404-32, 405-4, 405-10, 405-13.*

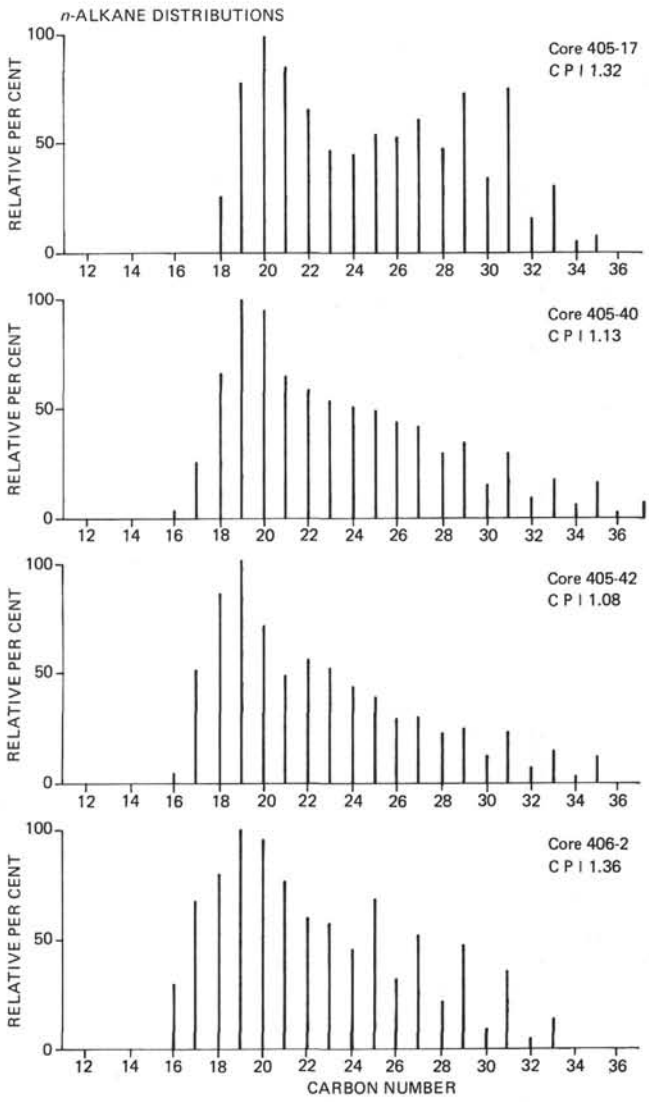

Figure 16. *Distribution profiles for* n-*alkanes derived from gas chromatograms for Cores 405-17, 405-40, 405-42, and 406-2.*

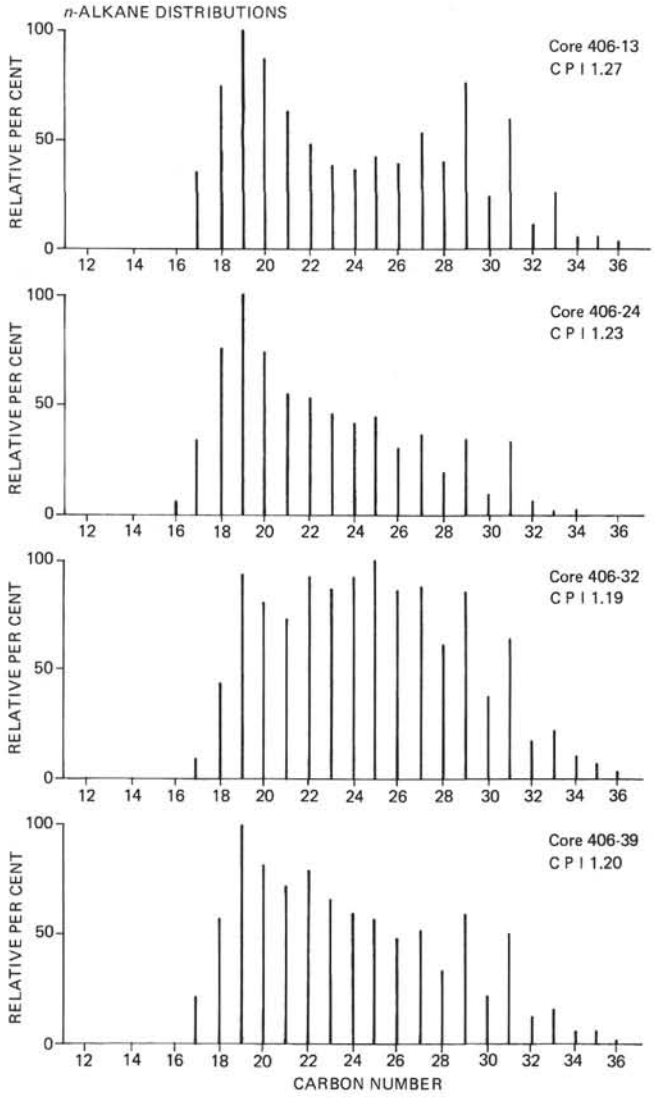

Figure 17. *Distribution profiles for* n-*alkanes derived from gas chromatograms for Cores 406-13, 406-24, 406-32, and 406-39.*

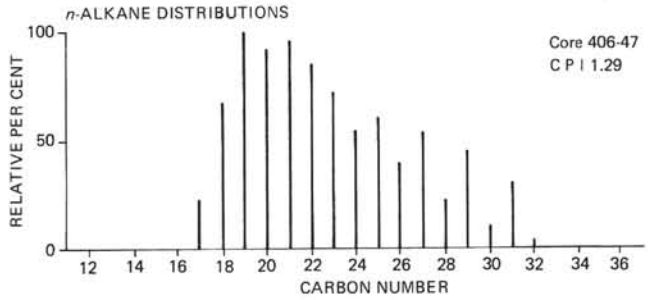

Figure 18. *Distribution profile for* n-*alkanes derived from gas chromatogram for Core 406-47.*

TABLE 6
Relative Distributions of 5α Type Steranes in Selected Samples From Leg 48

Relative Carbon No.[a]	Sterane Designation	Core						
		402A-16	402A-32	402A-18B	402-1	403-35	403-14	406-32
20.8	S_1						20	12
21.1	S_2						20	14
21.6	S_3	43	33	6	40		37	40
21.7	S_4						21	13
22.6	S_5	19	17		18		15	24
23.6	S_6		10					
24.0	S_7	61	100	65	90			
24.4	S_8		18		15			
24.75	S_9	26	16		14			
24.9	S_{10}	56	36	38	40			
26.0	S_{11}	27.5	21	6	33	58	98	63
26.3	S_{12}	24	18	13	36	52	81	50
26.6	S_{13}					23	40	19
26.75	S_{14}					23	61	36
26.8	S_{15}						57	31
27.4	S_{16}	30	32	21	35	49	46	30
27.5	S_{17}	39	29	29	76	100	100	70
27.6	S_{18}	36	46	35	34	48	45	61
27.65	S_{19}						45	51
27.8	S_{20}	55	43	48	62	58	58	77
28	S_{21}	24	21		62	72	83	41
28.25	S_{22}	56	60	29				
28.4	S_{23}	32	37	28				
28.5	S_{24}	54	52	42	65	64	79	68
28.6	S_{25}	42.5	32	19	29	45	47	43
28.7	S_{26}				32	40	40	37
28.9	S_{27}	31	22	32	41	35	46	50
29.2	S_{28}	17	16	18	18	68	52	50
29.4	S_{29}	49	51	51	82	88	59	59
29.6	S_{30}	40	62	35	76	74	63	62
29.8	S_{31}	100	74	100	100	99	74	100
30.65	S_{32}	32	36	30	20	8		
30.8	S_{33}	20	21	22				
31.1	S_{34}	17	26					
31.6	S_{35}	21	13					

[a]Values in relation to normal alkane eluting on 20-meter OV1 Jaeggi column; temperature programmed 80 to 260 at 4°C/min, 12 psi He.

TABLE 7
Relative Distributions of Pentacyclic Triterpanes From Selected Samples From Leg 48

Relative Carbon No.[a]	Tentative Identification	Core						
		402A-16	402A-32	402A-18B	402-1	403-35	403-14	406-32
27.00	C_{27} Mono unsaturated triterpene	26	23	21				9
27.21	Unknown							19
27.39	Unknown					20	24	
27.43	Unknown					20		19
27.76	17-α H-Trisnorhopane	11	9	14	12	26	27	33
28.11	17-β H-Trisnorhopane	38	34	45	27	25	9	20
29.11	C_{29} Mono unsaturated triterpene	55	56	41	8			
29.20	17-α H-Norhopane	26		11	24	73	72	78
29.69	30-Normoretine	24	15	26	17	32	16	26
30.05	17-α H-Hopane	35	21	35	41	100	100	100
30.21	Mono unsaturated triterpene	27	27	19	10			
30.34	17-β H-Norhopane	54	38	64	31	19		16
30.43	C_{29} Saturated triterpane	22	16	15	11	22	15	24
31.05	C_{-22} Diastereoisomer of 17-α H-homohopane	6			18	33	31	33
31.19	C_{22} Diastereoisomer of 17-α H-homohopane	72	45	80	100	74	23	62
31.40	17-β H-Hopane	100	100	78	47	37		37
31.53	Homomoretane	12		15		28		12
31.90	C_{22} Diastereoisomer of 17-α homohopane				9	26	11	23
31.20	17-α H-Bishomohopane						12	21
32.46	Unknown					30		
32.63	17-β Homohopane	68	53	100	83	40		52
32.87	C_{22} Diastereoisomer of 17-α H-trishomohopane					28	7	14
33.17	C_{22} Diastereoisomer of 17-α H-trishomohopane					35	7	12
33.58	17-β H-Bishomohopane	15	10	15				

[a]Values in relation to normal alkane eluting on 20-meter OV1 Jaeggi column temperature programmed 80 to 260 at 4°C/min, 12 psi He.

TABLE 8
Stable Carbon Isotope Values of Kerogens and Extracts From Hole 402A, Leg 48

IFP Sample No.	Core	Section	δ^{13}‰ of Total Soluble Extract	δ^{13}C‰ of Kerogen
24168	18	1-4	- 28.1	- 22.9
24169	11	1	- 27.1	- 23.4
24171	16	1-2	- 27.6	- 23.7
24172	18	1-2	- 26.1	- 24.0
24176	32	2, 3, 6	- 26.4	- 22.7