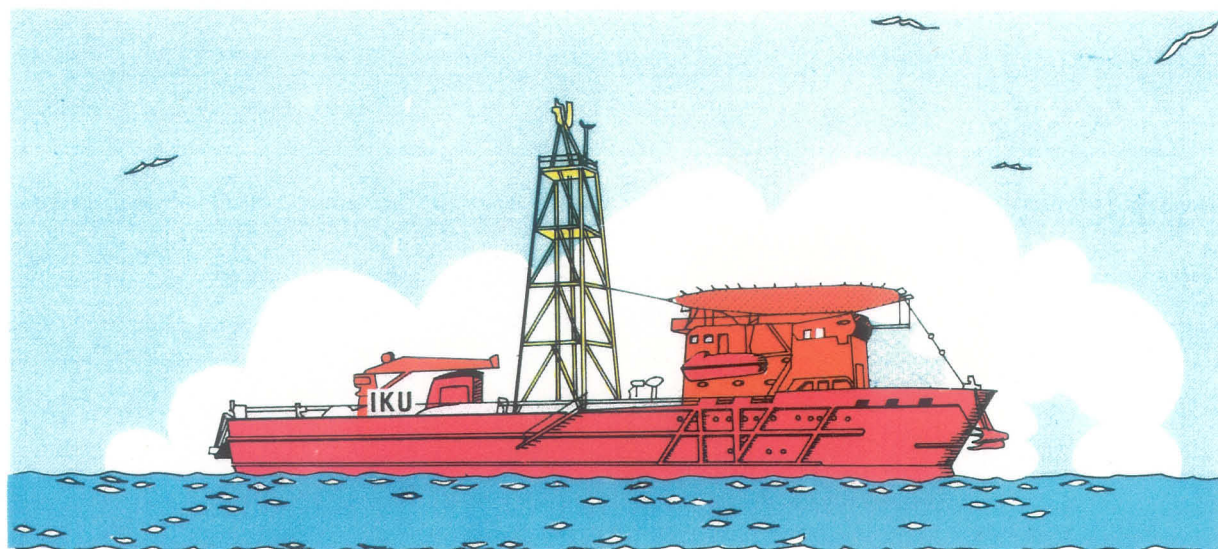
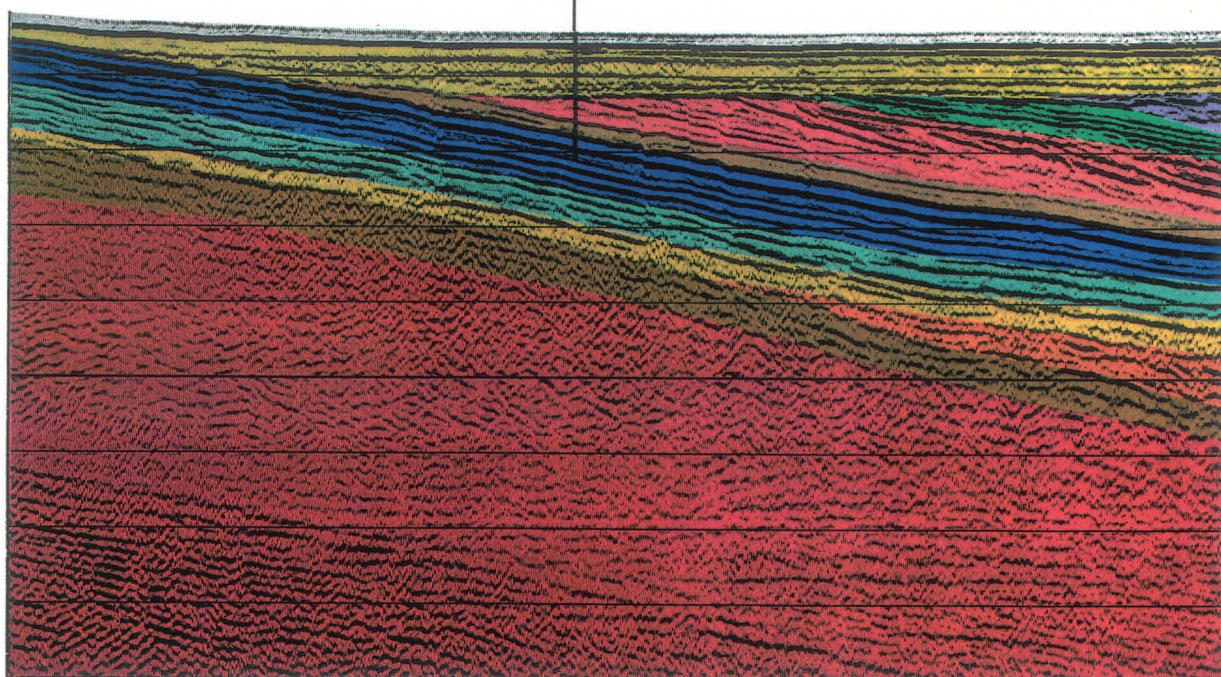




Shallow Drilling
Barents Sea 1988

Appendix volume 2
Organic geochemical data





Institutt for kontinentalsokkelundersøkelser og petroleumsteknologi A/S
Continental Shelf and Petroleum Technology Research Institute A/S

Håkon Magnussønsgt. 1B • P.O.Box 1883, Jarlesletta • N-7002 Trondheim, Norway
Tel.: + 47 7 920611 • Telex: 55 434 iku n • Telefax: + 47 7 92 09 24 (aut)

REPORT

REG. NO.:	ACCESSIBILITY:
89.022	Confidential

REPORT TITLE:

SHALLOW DRILLING BARENTS SEA 1988

APPENDIX VOLUME 2: ORGANIC GEOCHEMICAL DATA

REPORT NO.: 21.3444.00/03/89

AUTHORS:

Thomas Leslie Leith, Hermann Michael Weiss (eds.)

DATE:	NO. OF PAGES:	NO. OF APPENDICES:	PROJECT MANAGER:	SIGN:
15.02.89	462	--	Tom Bugge	<i>Tom Bugge</i>

CLIENT:

Amoco Norway Oil Company, A/S Norske Shell, BP Petroleum Dev. (Norway) Ltd. U.A., Conoco Norway Inc., Elf Aquitaine Norge A.S., Esso Norge a.s Expl. and Prod., Mobil Exploration Norway Inc., Norsk Agip A/S, Norsk Hydro a.s, Oljedirektoratet, Saga Petroleum a.s, Statoil, Total Marine Norsk A/S

SUMMARY:

This appendix volume contains:

- 1) Data obtained from the artificial maturation of a coal samples from Core 7430/07-U-01 and of a claystone sample from Core 7430/10-U-01 using hydrous pyrolysis. These data are accompanied by a descriptive text (Chapters I and II).
- 2) Tables and figures of the geochemical data obtained from the core samples drilled by IKU in the Finnmark East area and in the northwestern Barents Sea in 1988 (Chapter III).

The data are organised core by core, each section having its own table of contents. The text accompanying the data may be found in the main body of the report.

- 3) Tables and figures for the identification of steroids and triterpenoid hydrocarbons in the mass fragmentograms (Chapter IV).
- 4) A description of the experimental methods and interpretation levels (Chapter V).

KEY WORDS:	
Barents Sea	Source potential
Finnmark East	Maturation
Organic Geochemistry	Hydrous pyrolysis

PREFACE

This Appendix volume contains:

- 1) Data obtained from the artificial maturation of a coal samples from Core 7430/07-U-01 and of a claystone sample from Core 7430/10-U-01 using hydrous pyrolysis. These data are accompanied by a descriptive text (Chapters I and II).
- 2) Tables and figures of the geochemical data obtained from the core samples drilled by IKU in the Finnmark East area and in the northwestern Barents Sea in 1987 (Chapter III).

The data are organised core by core, each section having its own table of contents. The text accompanying the data may be found in the main body of the report.

- 3) Tables and figures for the identification of steroid and triterpenoid hydrocarbons in the mass fragmentograms (Chapter IV).
- 4) A description of the experimental methods and interpretation levels (Chapter V).

The following persons have contributed to this Appendix volume:

Laboratory work:	Kåre Aareskjold, Wenche Andersen, Jon Eldar Hammerås, Grete Haugen, Leif Husvik, Thomas Leslie Leith, Kristin Lind, Gunn Mangerud, Hilde Riksheim, Arnfinn Rømuld, Sølvi Stene, Bodil Thorvaldsen, Jorunn Os Vigran, Unni M. Wang.
Evaluation of GC-MS data:	Liv Schou
Drafting:	Tone Aas Heggenhougen
Typing:	Ann Merete Espås
Printing:	Geir Herje

CONTENTS

	Page
I ARTIFICIAL MATURATION OF A COAL SAMPLE FROM CORE 7430/07-U-01 USING HYDROUS PYROLYSIS	4
II ARTIFICIAL MATURATION OF A CLAYSTONE SAMPLE FROM CORE 7430/10-U-01 USING HYDROUS PYROLYSIS	29
III LABORATORY RESULTS	58
III.1 Core 7029/03-U-01	58
III.2 Core 7127/10-U-02	99
III.3 Core 7127/10-U-03	160
III.4 Core 7029/03-U-02	204
III.5 Core 7128/12-U-01	250
III.6 Core 7128/09-U-01	272
III.7 Core 7430/07-U-01	290
III.8 Core 7430/10-U-01	349
IV PEAK IDENTIFICATIONS FOR M/Z 191, 217, 218, 231 AND 253 GC-MS MASS CHROMATOGRAMS	441
V ANALYTICAL METHODS AND INTERPRETATION LEVELS	450

- I ARTIFICIAL MATURATION OF A
COAL SAMPLE FROM CORE
7430/07-U-01 USING HYDROUS
PYROLYSIS
- II ARTIFICIAL MATURATION OF A
CLAYSTONE SAMPLE FROM CORE
7430/10-U-01 USING HYDROUS
PYROLYSIS

III LABORATORY RESULTS

III.1 Core 7127/10-U-02

III.2 Core 7127/10-U-02

III.3 Core 7127/10-U-03

III.4 Core 7029/03-U-02

III.5 Core 7128/12-U-01

III.6 Core 7128/09-U-01

III.7 Core 7430/07-U-01

III.8 Core 7430/10-U-01

IV PEAK IDENTIFICATIONS FOR M/Z
191, 217, 128, 231 AND 253 GC-MS
MASS CHROMATOGRAMS

IV ANALYTICAL METHODS AND
INTERPRETATION LEVELS

APPENDIX A.I: TABLE OF CONTENTS

Artificial maturation of a coal sample from core 7430/07-U-01

TABLES

Table A.I.1:	Total organic carbon content and Rock-Eval pyrolysis data.
Table A.I.2:	Vitrinite reflectance data.
Table A.I.3a:	Weight of EOM/pyrolysate, asphaltenes and chromatographic fractions.
Table A.I.3b:	Concentration of EOM/pyrolysate, asphaltenes and chromatographic fractions, related to rock weight.
Table A.I.3c:	Concentration of EOM/pyrolysate, asphaltenes and chromatographic fractions, related to TOC weight.
Table A.I.3d:	Composition of EOM/pyrolysate.
Table A.I.4:	Summary table of hydrous pyrolysis results.
Table A.I.5:	Yield and composition of hydrous pyrolysis gas.
Table A.I.6:	Tabulation of data from the gas chromatograms.
Table A.I.7:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity characteristic ratios.
Table A.I.8:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity and source characteristic ratios.

FIGURES

Figure A.I.1:	Gas chromatogram of saturated hydrocarbons for original sample.
Figure A.I.2:	Gas chromatogram of aromatic hydrocarbons for original sample.
Figure A.I.3:	Mass fragmentograms of m/z 191, 205 (terpanes) for original sample.
Figure A.I.4:	Mass fragmentograms of m/z 217, 218 (steranes) for original sample.
Figure A.I.5a:	Whole oil gas chromatogram of expelled pyrolysate oil droplets.
Figure A.I.5b:	Whole oil gas chromatogram of expelled pyrolysate oil droplets: expanded view of C ₃ -C ₈ region.
Figure A.I.6:	Gas chromatogram of saturated hydrocarbons for expelled pyrolysate.
Figure A.I.7:	Gas chromatogram of saturated hydrocarbons for extracted pyrolysate.
Figure A.I.8:	Gas chromatogram of aromatic hydrocarbons for expelled pyrolysate.

- Figure A.I.9: Gas chromatogram of aromatic hydrocarbons for extracted pyrolysate.
- Figure A.I.10a: Mass fragmentograms of m/z 191, 205 (terpanes) for expelled pyrolysate.
- Figure A.I.10b: Mass fragmentograms of m/z 191, 205 (terpanes) for extracted pyrolysate.
- Figure A.I.11a: Mass fragmentograms of m/z 217, 218 (steranes) for expelled pyrolysate.
- Figure A.I.11b: Mass fragmentograms of m/z 217, 218 (steranes) for extracted pyrolysate.
- Figure A.I.12: Vitrinite reflectance histograms.

ARTIFICIAL MATURATION OF A COAL SAMPLE FROM CORE 7430/07-U-01

A composite sample taken over a representative interval of a coal seam containing relatively hydrogen-rich kerogen was selected for artificial maturation using hydrous pyrolysis techniques in order to study the hydrocarbon generation potential of such material in the cored succession.

The selected coal sample was characterised by a total organic carbon content of 70.7 wt% and a hydrogen index of 232 mg/gTOC (Table A.I.1). A Tmax value of 424°C and a mean vitrinite reflectance value of 0.43% (Table A.I.2) indicate that the kerogen in this sample is thermally immature. When viewed in reflected light, the coal proved to consist mainly of vitrinite and semi-fusinite, both macerals often showing gradational boundaries. Liptinitic material was abundant and often occurred in discrete bands. The liptinite consisted of green-fluorescing common cutinite and possible resinite beads, together with dull-fluorescing sporinite.

Extraction of the original sample indicated a high content of extractable organic material (EOM) of 51901 ppm, of which asphaltene compounds account for 67.5% (Table A.I.3). Saturated hydrocarbons accounted for only 2.6%, the remainder being equally divided between aromatic hydrocarbons and polar compounds. The saturated hydrocarbon gas chromatogram of the EOM showed a pattern of n-alkane peaks dominated by peaks representing C₂₃ to C₃₃ compounds (Figure A.I.1). A prominent pristane peak and a marked odd-carbon number predominance support a low thermal maturity level for this material. The gas chromatogram of the aromatic hydrocarbons show a moderately mature distribution of peaks representing, amongst others, the naphthalene and phenanthrene series (Figure A.I.2).

GC-MS analysis of the saturate fraction (Figures A.I.3-A.I.4) show a rather immature assemblage of triterpane and sterane peaks although, with the exception of a small terpene peak on the m/z 191 mass fragmentogram, the peaks represent the more geologically-stable forms of these compounds. The steranes are dominated by the C₂₉ regular and rearranged steranes, which is consistent with a local terrestrially-influenced source.

To carry out the artificial maturation, 8.73 g of sample was placed in a 45 ml "bomb", together with 15 ml of water, and heated at a temperature of 340°C for a total of 72 hours. On completion of this program, the gas was taken from the bomb, which was then opened and small globules of a thick oil (density = 0.976 g/ml) were collected. The interior of the bomb was also rinsed with an organic solvent to collect any residual oil which had adhered to the wall of the bomb. This material is referred to as "expelled pyrolysate" during the remainder of this chapter. The pyrolysed rock was then extracted in order to collect the "extracted pyrolysate".

The organic carbon content of the pyrolysed rock did not appear to have changed significantly during the pyrolysis process and had a TOC content of between 70.8 wt% and 72.9 wt% (Table A.I.4), the lower value being obtained from the extracted rock. The hydrogen index for the extracted pyrolysed rock of 65 mg/gTOC is approximately 30% of the value obtained from the unpyrolysed rock (Table A.I.1).

Examination of the rock under reflected light revealed an absence of the previously abundant fluorescent liptinite material. The coal itself had a rather "cokey" appearance, only vitrinite and inertinite macerals being readily recognizable. The vitrinite always showed evidence of heavy fracturing, although this could merely reflect the mechanical treatment of the sample during preparation. Evidence of vesiculation and possible "mosaic" pattern in the vitrinite particles are consistent with rapid heating. Due to difficulties in distinguishing vitrinite and semi-fusinite in the pyrolysed sample, the mean vitrinite reflectance value of 1.69% (Table A.I.2) may be a little high, but is consistent with the Tmax value of 481°C and suggests that the sample had been matured through the "oil window".

Artificial maturation of the coal sample yielded 274 ml of gas, of which 44.4% represented hydrocarbon compounds, the remainder being mostly carbon dioxide (Table A.I.5). The hydrocarbon gas consisted mainly of methane, ethane and propane, the other gaseous hydrocarbon compounds only being present in trace amounts. In addition, 376.5 mg of expelled liquid pyrolysate was recovered from the bomb, of which ca. 97.6 mg was collected as droplets of oil. Taken in relation to the carbon content of the original

unpyrolysed sample, this gives a gross pyrolysate product of 149.6 mg/g initial TOC (Table A.I.4).

It is interesting to note that there is little change in the extractability of the coal (Table A.I.3) before and after artificial maturation. The unpyrolysed rock was found to produce an EOM concentration of 51901 ppm or 73.4 mg/gTOC, whereas the pyrolysed rock yielded an EOM concentration of 49124 ppm or 69.6 mg/gTOC. In addition, there is relatively little change in the composition of the rock extracts before and after artificial maturation, the only significant difference being the lower asphaltene content and higher polar content of the pyrolysed rock extract.

In contrast, significant differences can be recognized between the expelled pyrolysate and the extracted pyrolysate. Saturated hydrocarbons account for 38% of the expelled pyrolysate fluid, which contrasts with only 3.5% saturated hydrocarbons in the extracted pyrolysate. The content of aromatic hydrocarbons is roughly similar in both the expelled and extracted pyrolysates i.e., 21.7% and 25.3%, respectively. There is, however, a significantly lower asphaltene content of 7.8% in the expelled pyrolysate. These differences probably reflect the influence of migration and expulsion processes on the solvent-soluble pyrolysate material.

The whole oil gas chromatogram of the oil droplets (Figure A.I.5) shows an extensive development of n-alkane compounds up to nC_{33} , although the most conspicuous component of the gas chromatogram is the appearance of a prominent group of peaks which elute between the C_9 and C_{17} n-alkanes. These peaks probably represent aromatic, branched and cyclic compounds which would reflect the terrestrial nature of the source kerogen.

The saturated hydrocarbon gas chromatograms of both the expelled and extracted pyrolysates (Figures A.I.6-A.I.7) show a marked predominance of the higher molecular weight n-alkanes, although, in contrast to the gas chromatogram of the unpyrolysed sample, there is no significant odd-carbon number predominance e.g., carbon preference indices = 1.1 and 1.2 (Table A.I.6). The gas chromatogram of the extracted pyrolysate shows a greater prominence of peaks in the "waxy" n-alkane range. There is also a marked reduction in the prominence of the pristane peak, especially in the gas chromatogram of the extracted pyrolysate. This is reflected in a reduction

in pristane/ nC_{17} ratio from 6.5 in the unpyrolysed sample to 1.7 in the expelled pyrolysate and 0.6 in the extracted pyrolysate. There is also a marked reduction in pristane/ phytane ratio from 9.2 in the unpyrolysed sample to 3.0 and 4.3 in the pyrolysates.

The aromatic hydrocarbon gas chromatograms of the two pyrolysates (Figures A.I.8-A.I.9) show roughly similar distributions dominated by the naphthalene and phenanthrene peaks, although the gas chromatogram of the extracted pyrolysate shows a number of higher molecular weight peaks which are not so prominent in the gas chromatogram of the expelled pyrolysate. Both of these gas chromatograms differ from that of the unpyrolysed sample in the reduced prominence of the higher molecular weight peaks, and a reduction in the relative prominence of the 'hump' of unresolved compounds. These changes are consistent with an increased thermal maturity level.

Analysis of the saturate fraction of the pyrolysates reveals little change in the distribution of the terpenoid compounds in the m/z 191 mass fragmentogram (Figure A.I.10). The only observable differences are a reduction in the prominence of the $17\beta(H)$ -trishnorhopane peak (B_2), an increased development of the 22S isomer relative to the 22R isomer of the C_{32+} extended hopanes (Tables A.I.7 and A.I.8) and development of a peak representing a C_{24} tetracyclic terpane (S).

Somewhat more variation could be seen in the sterane composition of the pyrolysates (Figure A.I.11) relative to that of the unpyrolysed sample. Both pyrolysates produced broadly similar m/z 217 mass fragmentograms, which differ from that of the unpyrolysed sample in a marked reduction in the prominence of the C_{29} $14\alpha(H),17\alpha(H)20R$ sterane (t) and the increased development of C_{27} and C_{28} diasteranes. These changes can be attributed to an increased thermal maturity in the pyrolysates. The relative prominence of the C_{29} diasteranes in the pyrolysates may reflect the original high input of C_{29} sterane compounds from the coal, rather than low thermal maturity levels. The C_{28} $14\alpha(H),17\alpha(H)20R$ sterane peak (p) could not be recognized in the sterane mass fragmentograms of the pyrolysates due to the apparent co-elution of an unidentified compound.

In conclusion, artificial maturation of a coal from this core indicates that the coal is capable of generating a rather heavy, naphthenic-paraffinic oil, together with a significant amount of hydrocarbon gases.

Project no.: 21344423
 Location : 7430/07-U-01
 Date : 89.02.17

Table A.I.1: DATA FROM ROCK EVAL PYROLYSIS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	S1 (mg/g rock)	S2 (mg/g rock)	S3 (%)	TOC (mg/g TOC)	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX	Tmax (°C)
										S1+S2	S1+S2	
F1281	ORIG SED	78.35	CORE	3.46	164.08	5.51	70.70	232	7	167.54	0.02	424
F1281	PYR SED	78.35	CORE				72.90	-1	-1			
F1281	PYR+EXTR	78.35	CORE	2.25	45.92	1.57	70.80	65	2	48.17	0.05	481

Legend

- 1 - No data available.
- PYR SED - pyrolysed sediment (residue), unextracted
- PYR+EXTR - pyrolysed and extracted sediment (residue)

Core-site Number: 7430/07-U-01
Reference number: 21.3444.23
(1/1)

Table A.I.2: VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
F-1281	-----	78.35	0.43 (30)	G	0.07	2-4
F-1281 (HY-PY)	-----	78.35	1.69 (30)	F	0.15	---

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor;
I = Inertinite. L = Liptinite or poor vitrinite particle.
R = Reworked material/inertinite.

Project no.: 21344423
Location : 7430/07-U-01
Date : 89.02.16

Table A.I.3a: WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ROCK EXTR. (g)	EOM (mg)	ASPH (mg)	SAT HC (mg)	ARO HC (mg)	POLAR COMP. (mg)	HC (mg)	NONHC (mg)	TOC (%)
F1281	EOM	78.35	CORE	15.1	783.2	528.8	20.7	110.0	85.7	130.7	652.5	70.70
F1281	EXP.PYR.	78.35	CORE	8.7*	251.0	19.5	95.4	63.4	52.6	158.8	92.2	70.70
F1281	EXTR.PYR	78.35	CORE	4.5	218.6	55.7	7.7	47.4	54.7	55.1	163.5	70.70

Table A.I.3b: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS
(Weight ppm of rock)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F1281	EOM	78.35	CORE	51901	35043	1374	7289	5676	8663	43238
F1281	EXP.PYR.	78.35	CORE	28751	2234	10923	7261	6020	18184	10567
F1281	EXTR.PYR	78.35	CORE	49124	12517	1724	10641	12290	12365	36759

Table A.I.3c: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS
(mg/g TOC)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F1281	EOM	78.35	CORE	73.4	49.6	1.9	10.3	8.0	12.2	61.2
F1281	EXP.PYR.	78.35	CORE	40.7	3.2	15.4	10.3	8.5	25.7	15.0
F1281	EXTR.PYR	78.35	CORE	69.5	17.7	2.4	15.1	17.4	17.5	52.0

Table A.I.3d: COMPOSITION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ASPH EOM (%)	SAT EOM (%)	ARO EOM (%)	HC EOM (%)	POLAR EOM (%)	SAT ARO x 100	HC NONHC x 100
F1281	EOM	78.35	CORE	67.5	2.6	14.0	16.6	10.9	18.9	20.0
F1281	EXP.PYR.	78.35	CORE	7.8	38.0	25.3	63.3	20.9	150.4	172.1
F1281	EXTR.PYR	78.35	CORE	25.5	3.5	21.7	25.2	25.0	16.2	33.6

Legend:

* - Not all the available EOM was used for MPLC.
-1- No data available.

Table A.I.4: Summary table for hydrous pyrolysis results

Coal sample from Core 7430/07-U-01, 78.35 m (F1281)

Experimental data:

Temperature (°C)	340
Duration (h)	72
Autoclave volume (ml)	45
Rock weight (g)	8.73
Water volume (ml)	15
Volume of gas generated (ml)	274
Volume of oil recovered (C15-,C15+)(µl)	100
Density of oil (g/ml)	0.976
Proportion of C15+ HC in oil (wt%) (from topping)	ca. 90 (n.d.p.)
Weight of "outwashed" hydrous pyrolysate (C15+)(mg)	251

Sum of organic products:

	mg/g rock	mg/g of initial TOC
HC gas	13.6	19.2
expelled pyrolysate fluid	43.1	61.0
extracted pyrolysate fluid	49.1	69.4
sum	105.8	149.6
minus EOM	51.9	73.4
net product	53.9	76.2

Table A.I.5: YIELD AND COMPOSITION OF HYDROUS PYROLYSIS GAS

IKU-NR	µl/g rock F1281	% volume of HC gas F1281	µg/g rock
COMPOUND			
Carbon dio	14731.52	-----	
Methane	6310.75	53.71	
Ethane	3565.78	30.35	
Propane	1350.29	11.49	
i-Butane	147.32	1.25	
Butene	21.35	0.18	
n-Butane	251.94	2.14	
? RI= 406	14.87	0.13	
? RI= 416	8.60	0.07	
? RI= 466	36.51	0.31	
? RI= 484	0.00	0.00	
n-Pentane	24.31	0.21	
? RI= 506	2.13	0.02	
? RI= 512	0.00	0.00	
? RI= 516	2.16	0.02	
? RI= 559	4.95	0.04	
CyC5	3.13	0.03	
3-MC5	1.11	0.01	
n-Hexane	1.72	0.01	
MCyC5	3.19	0.03	
SUM:	26481.7	100.00	
Non-HC	14731.6		
HC	11750.1		13559

COMPOSITION OF TOTAL HYDROUS PYROLYSIS GAS:

	% volume of total HyPy gas
CO2	55.6
HC	44.4

Data corrected for air contamination and deadvolume of autoclave.

Project no.: 21344423
 Location : 7430/07-U-01
 Date : 89.02.05

- 16 -



Table A.I.6:

RATIOS DERIVED FROM GAS CHROMATOGRAMS OF SATURATED HYDROCARBONS

IKUNO	FRAC NAME	DEPTH	Pri	Pri	Phy	A	n-C17	n-C31	CPI 1	CPI 2
			Phy	A=----- n-C17	B=----- n-C18	B	n-C27	n-C19		
F1281	EOM	78.35	9.2	6.5	0.6	10.0	0.2	2.0	1.6	1.5
F1281	EXP.PYR.	78.35	4.3	1.7	0.3	5.0	0.4	1.2	1.2	1.1
F1281	EXTR.PYR	78.35	3.0	0.6	0.2	3.3	0.8	0.7	1.1	1.0

-1 = No data available

Table A.I.7:

Molecular ratios from sterane and terpane mass chromatograms.

Maturity ratios.

Core 7430/07-U-01: Hydrous pyrolysis sample

Code		Depth (m)	$\alpha\beta / \alpha\beta + \beta\alpha^{1)}$	%22S ²⁾	% $\beta\beta^{3)}$	%20S ⁴⁾
F-1281	Original sample	78.35	0.74	57.3	54.0	11.2
F-1281	Expelled pyrolysate	78.35	0.79	55.9	96.4	28.6
F-1281	Extracted pyrolysate	78.35	0.63	56.0	-	-

1) $E/(E+F)$ in m/z 191.

2) Average % distribution between first and second eluting isomers of extended hopanes.

3) $100 * 2(r+s)/(q+t+2(r+s))$ in m/z 217.

4) $100 * q/(q+t)$ in m/z 217.

Table A.I.8:

Molecular ratios from terpane and sterane mass chromatograms.

Maturity and source characteristic ratios.

Core 7430/07-U-01: Hydrous pyrolysis sample.

Code		Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
F-1281	Original sample	78.35	-	-	0.03	0.19	0.53
F-1281	Expelled pyrolysate	78.35	-	-	-	0.09	0.52
F-1281	Extracted pyrolysate	78.35	-	-	-	0.08	0.52

¹⁾ Relative abundance of tricyclic terpanes (Q/E in m/z 191).

²⁾ B/A in m/z 191.

³⁾ Relative abundance of unknown (X/E in m/z 191).

⁴⁾ Relative abundance of bisnorhopane (Z/E in m/z 191).

⁵⁾ Relative abundance of C₂₇ rearranged steranes (a/(a+j) in m/z 217).

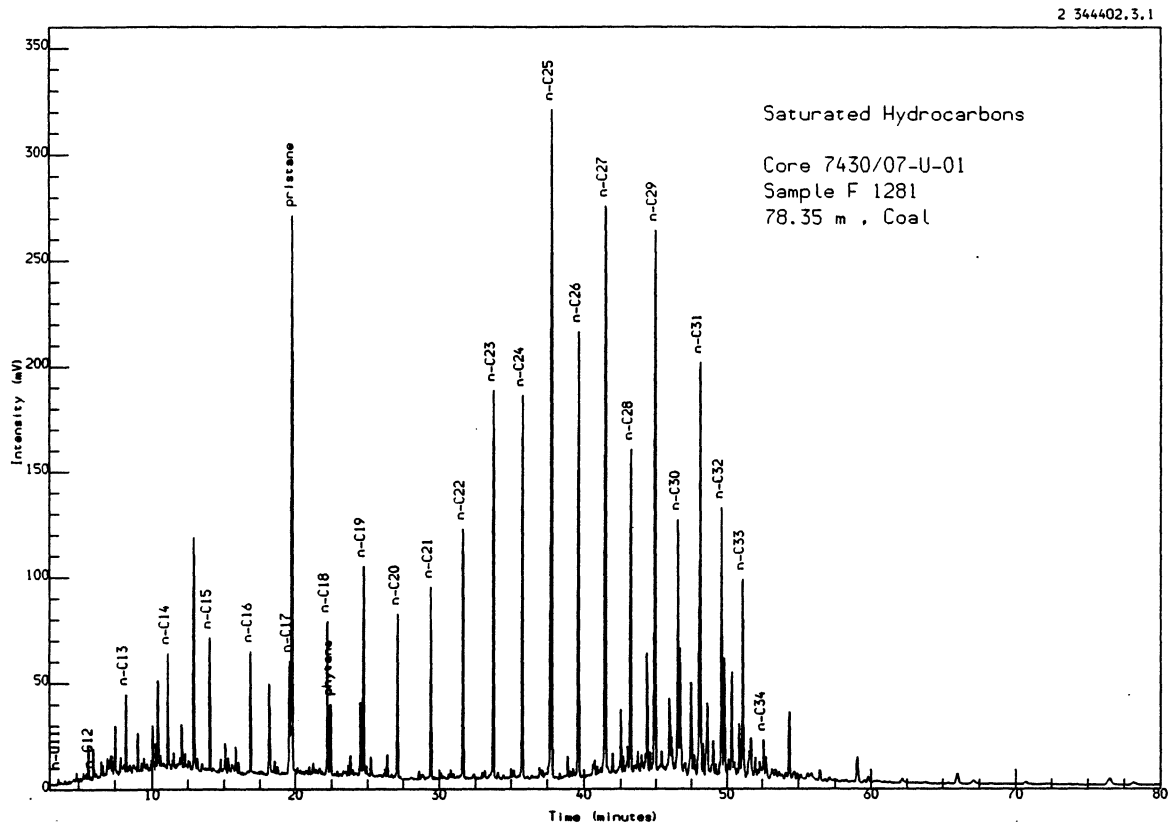


Figure A.I.1:

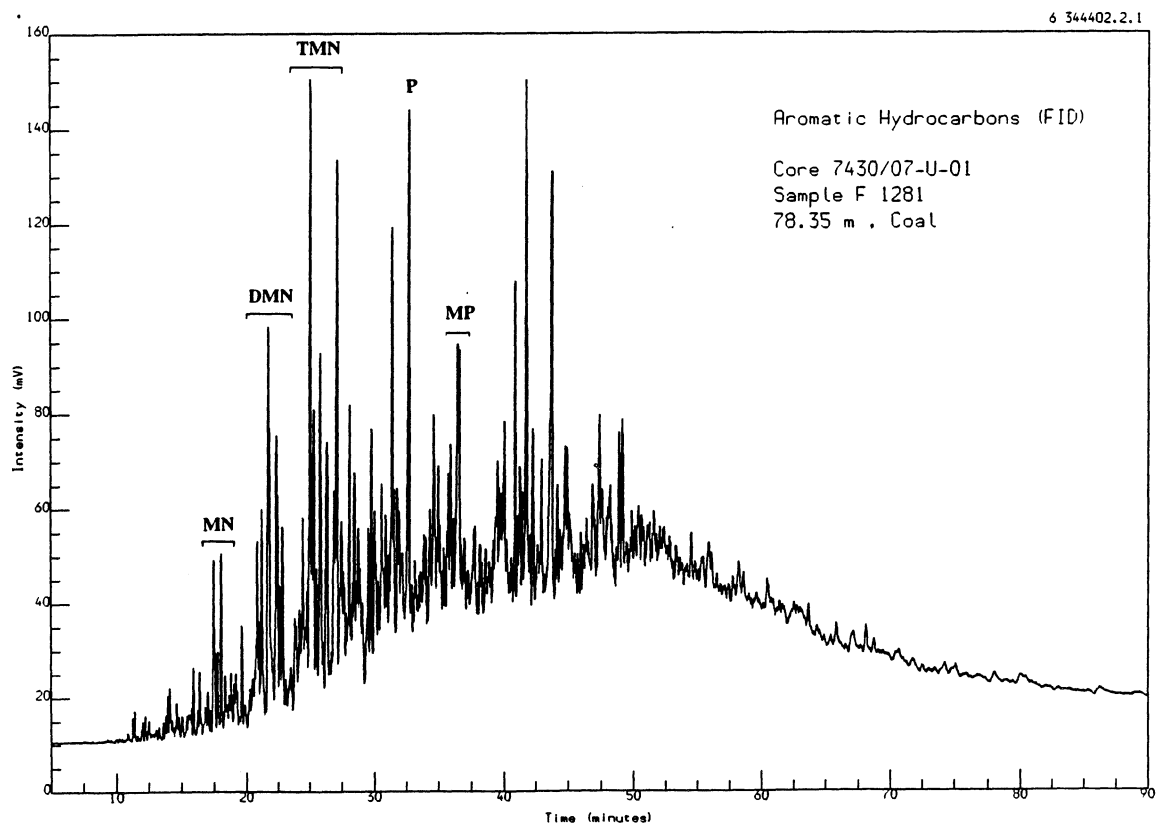


Figure A.I.2:

F1201 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F1201 7430/07-U-01 78.35 M CORAL

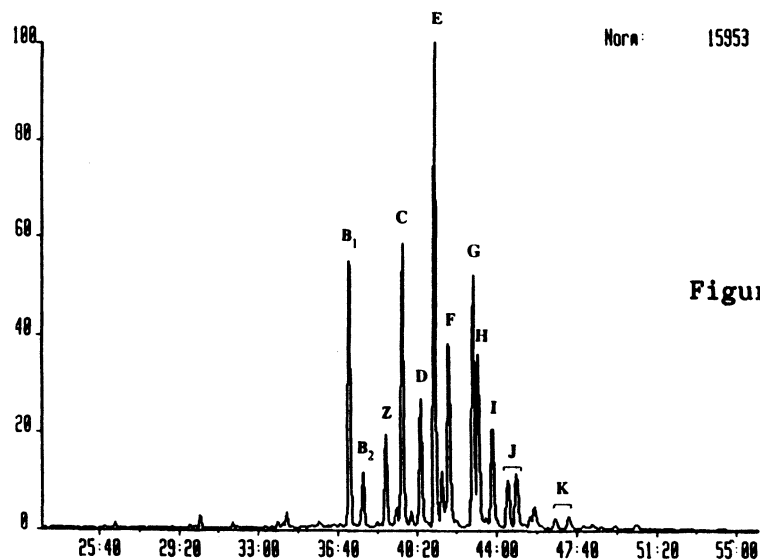


Figure A.I.3:

F1201 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F1201 7430/07-U-01 78.35 M CORAL

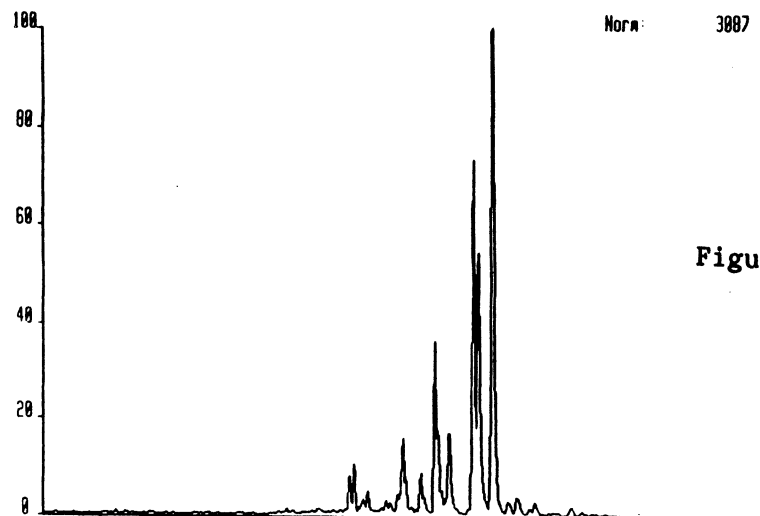
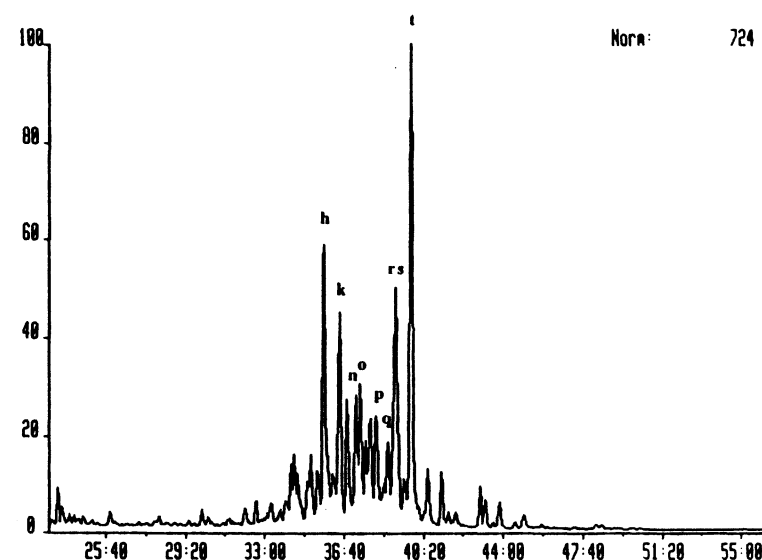
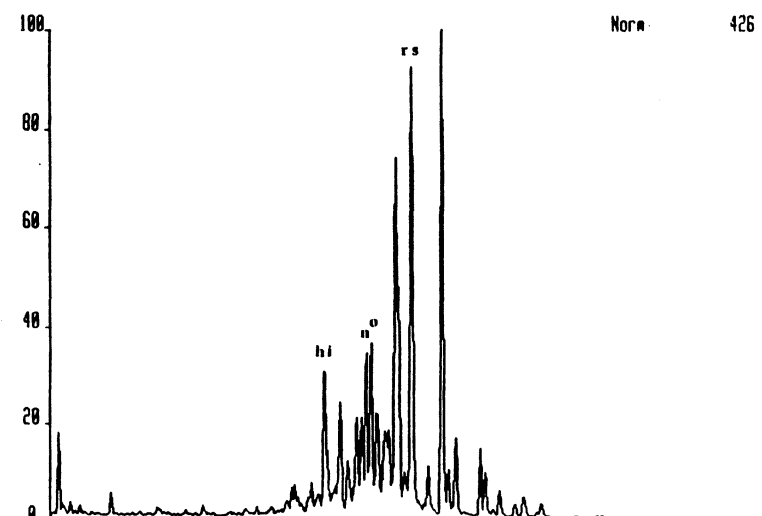


Figure A.I.4:

F1201 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F1201 7430/07-U-01 78.35 M CORAL



F1201 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 210.1000
 Text:F1201 7430/07-U-01 78.35 M CORAL



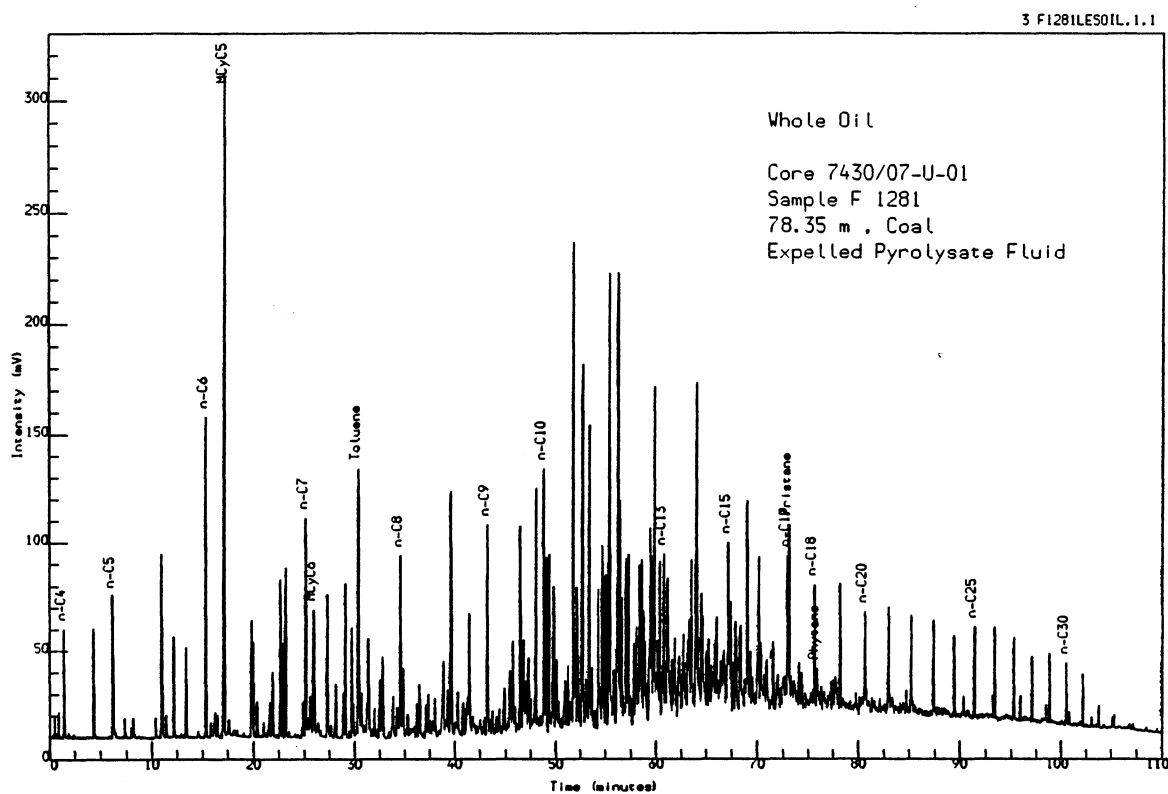


Figure A.I.5a:

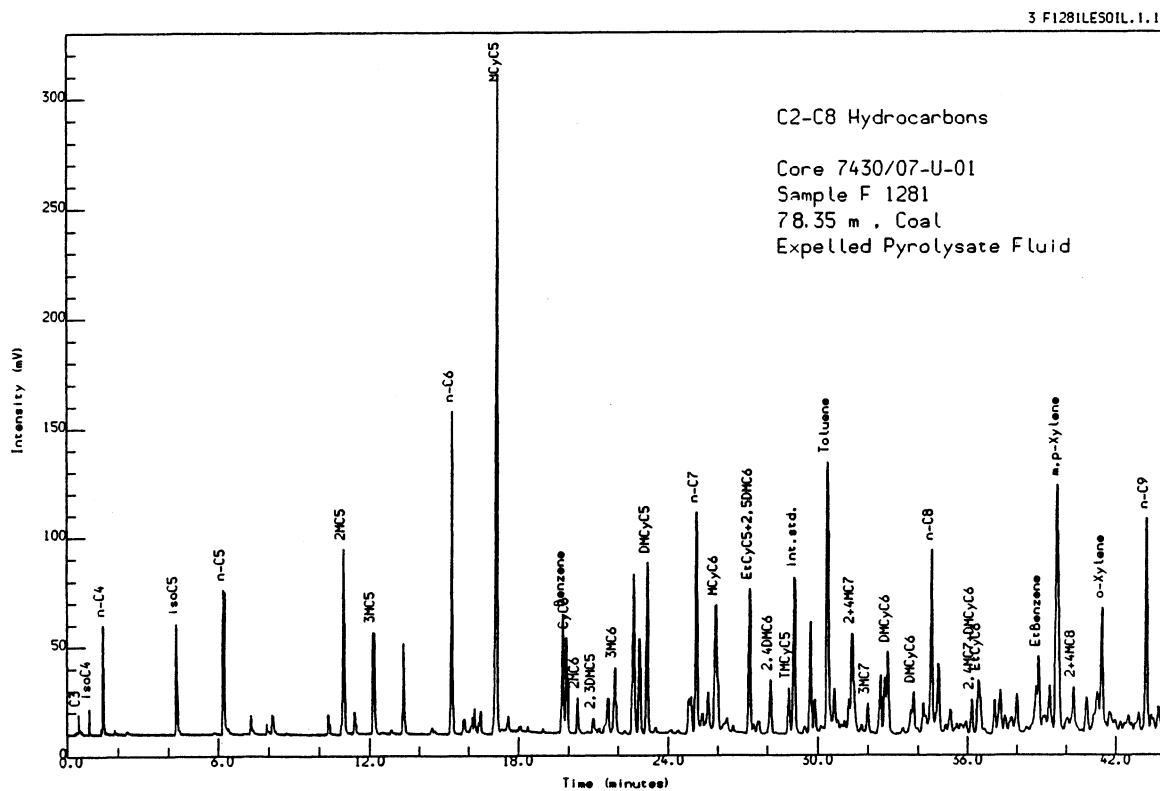


Figure A.I.5b:

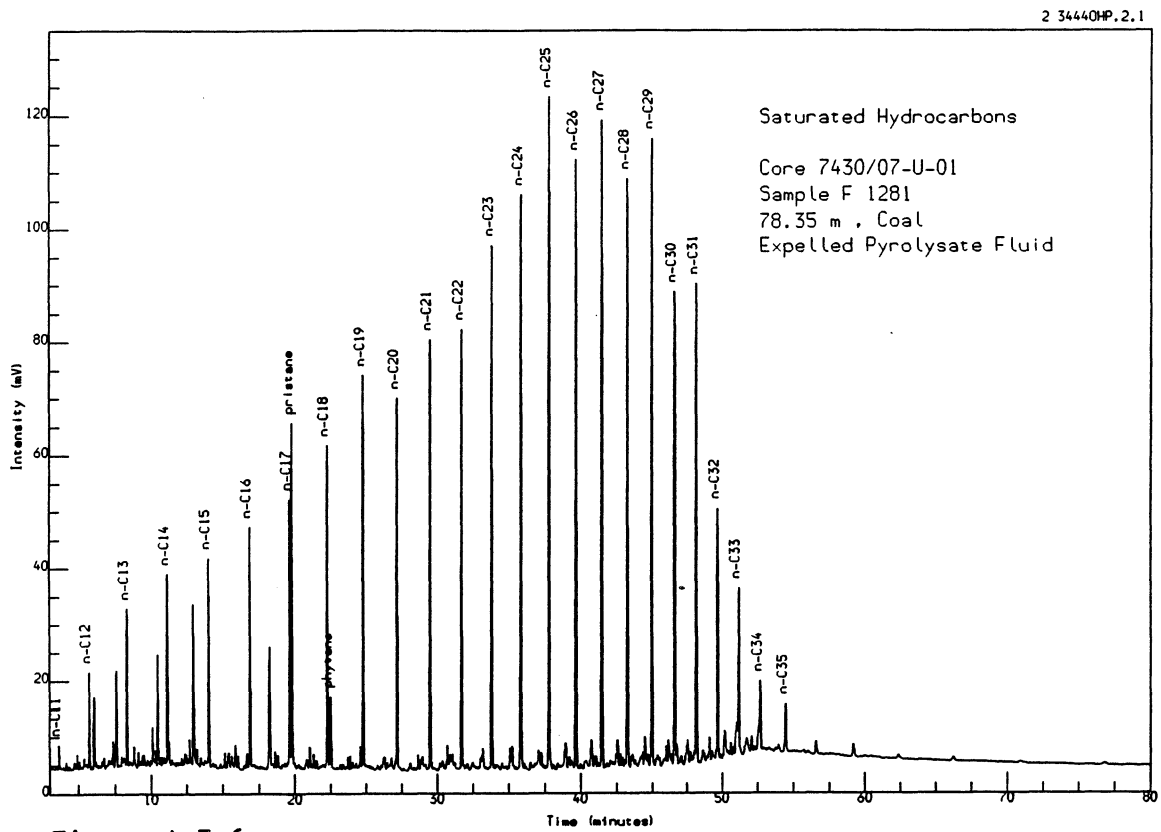


Figure A.I.6:

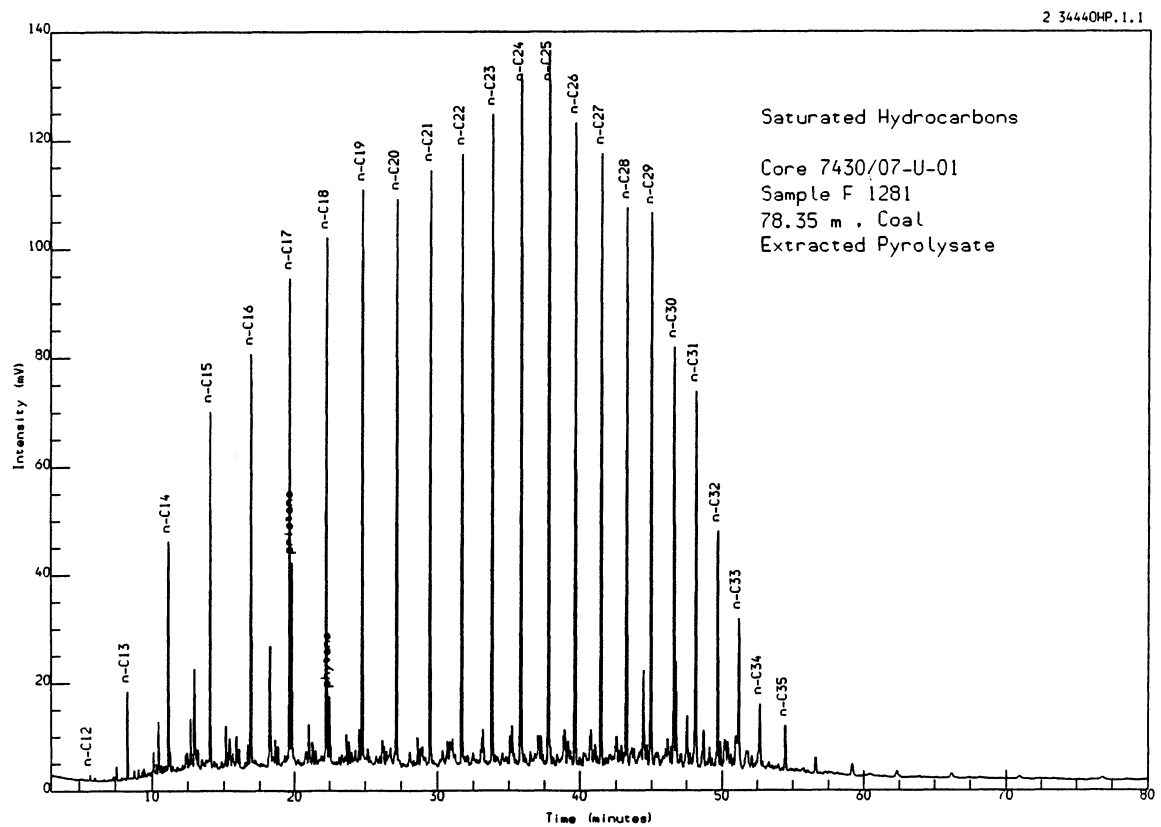


Figure A.I.7:

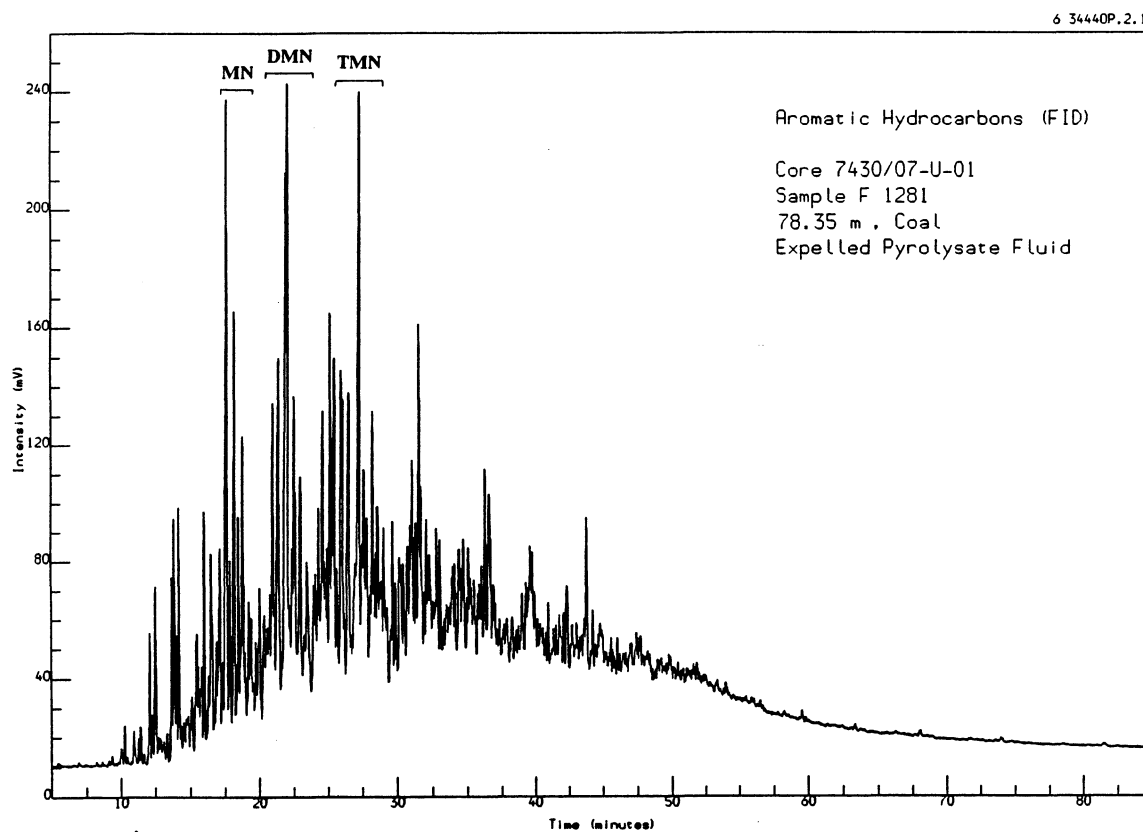


Figure A.I.8:

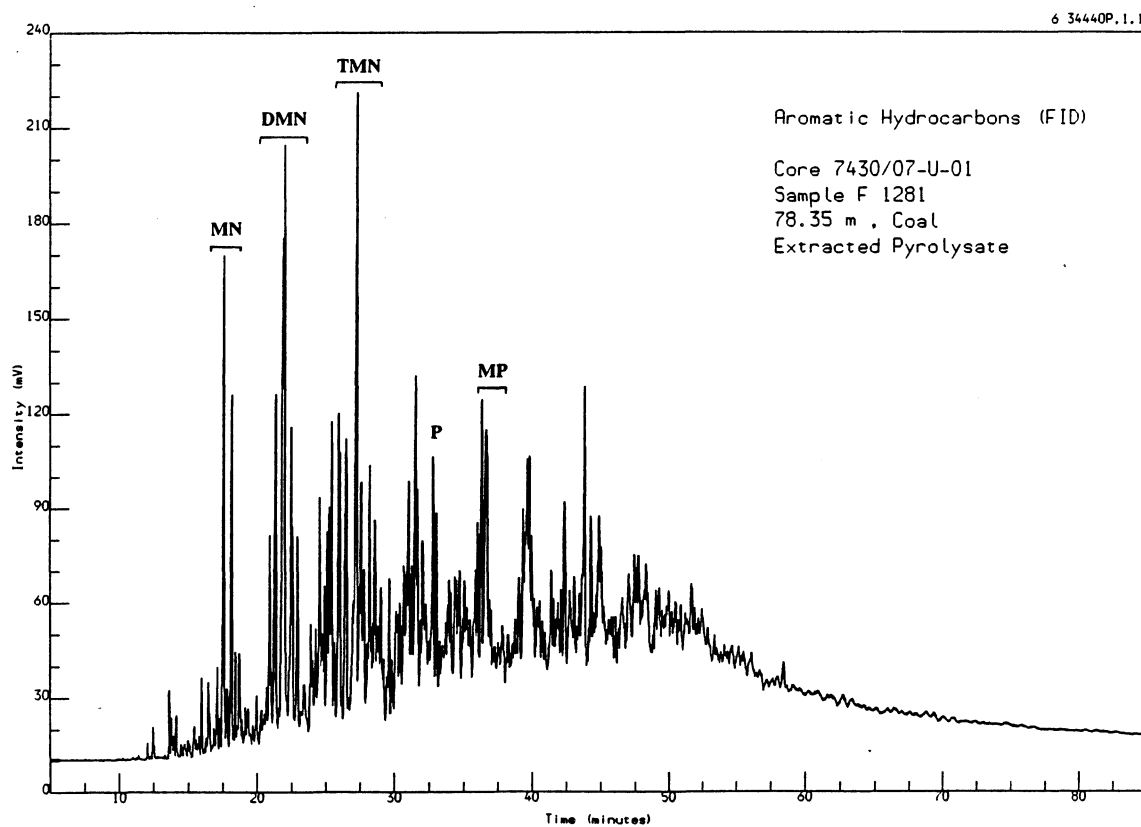
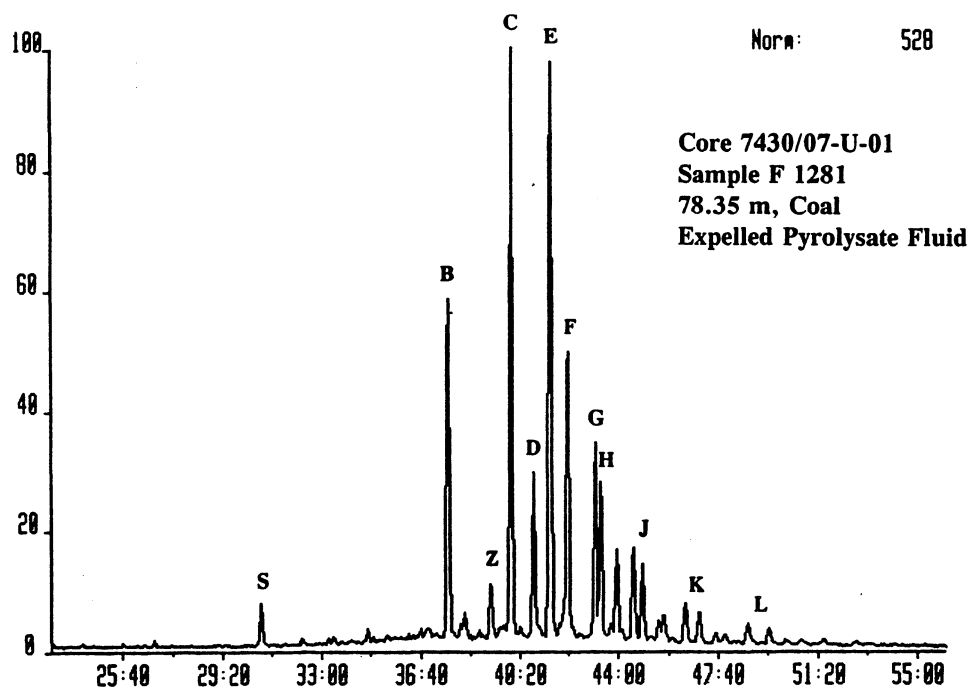


Figure A.I.9:

IKU2 7-FEB-89 Sir:Magnetic TS250 Acnt:GEOLAB System:IKU
Sample 1 Injection 1 Group 1 Mass 191.1800
Text: SAMPLE 1, SATURATED FRACTION



IKU2 7-FEB-89 Sir:Magnetic TS250 Acnt:GEOLAB System:IKU
Sample 1 Injection 1 Group 1 Mass 205.1956
Text: SAMPLE 1, SATURATED FRACTION

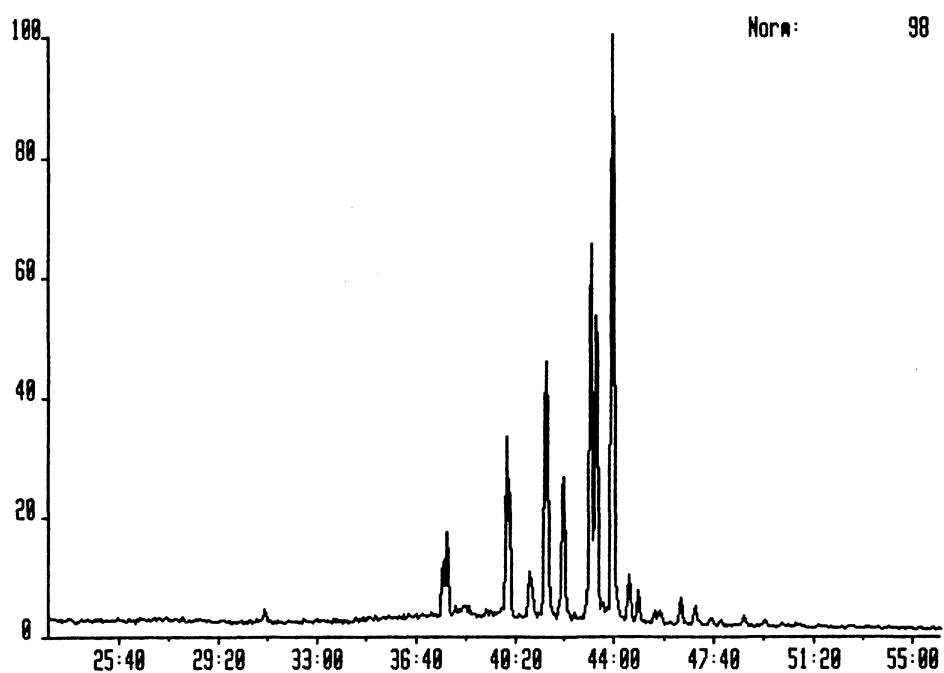
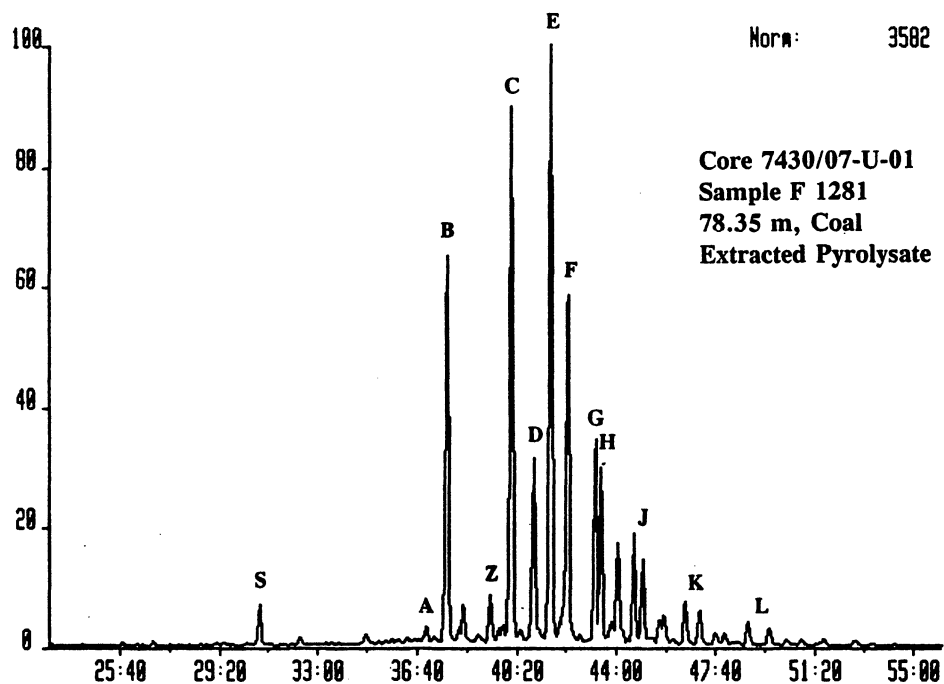


Figure A.I.10a:

IKU1 7-FEB-89 Sir:Magnetic TS250 Acnt:GEOLAB System:IKU
Sample 2 Injection 1 Group 1 Mass 191.1800
Text: SAMPLE 2, SATURATED FRACTION



IKU1 7-FEB-89 Sir:Magnetic TS250 Acnt:GEOLAB System:IKU
Sample 2 Injection 1 Group 1 Mass 205.1956
Text: SAMPLE 2, SATURATED FRACTION

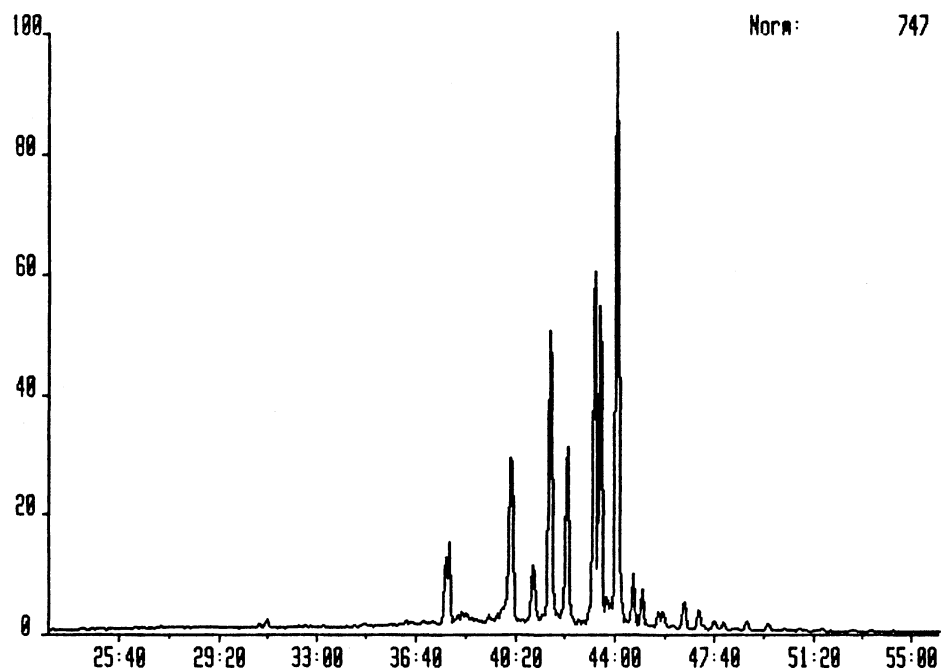
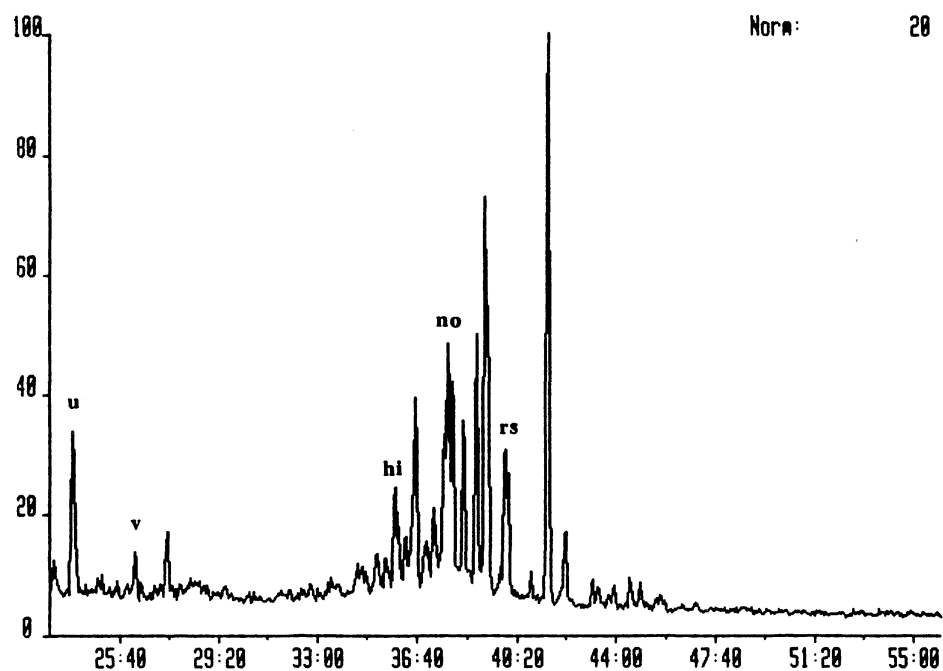
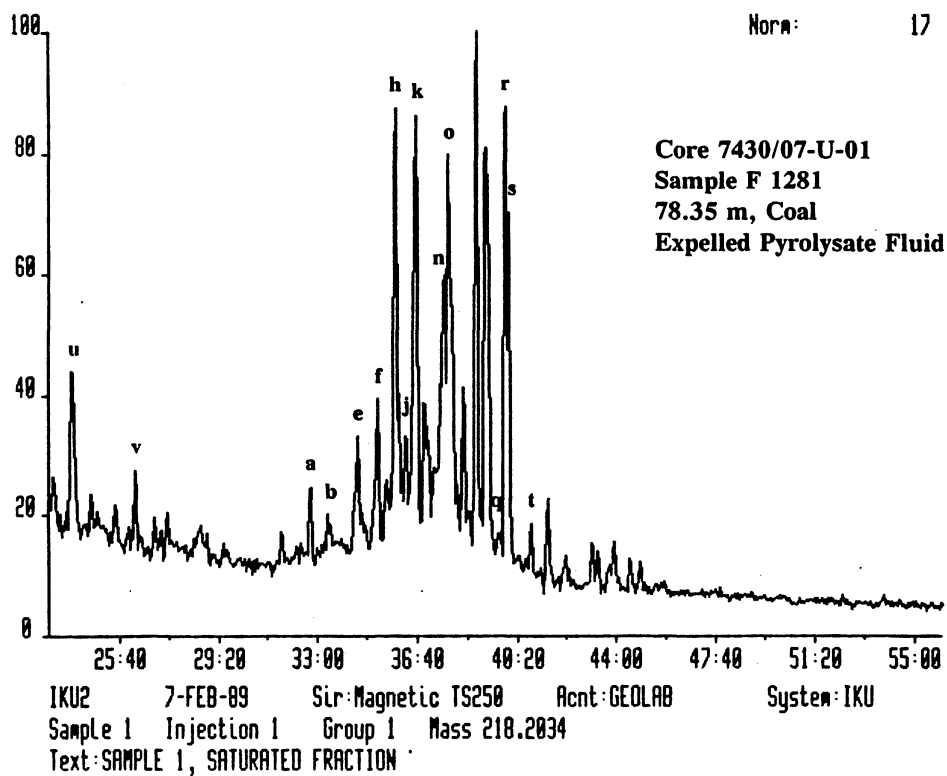
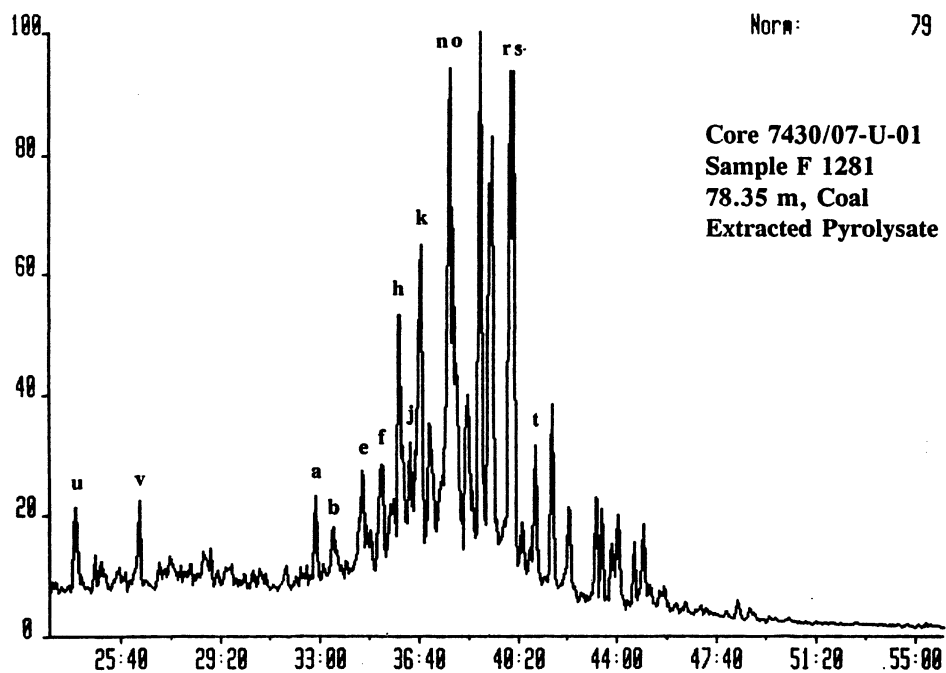


Figure A.I.10b:

IKU2 7-FEB-89 Sir:Magnetic TS250 Acnt:GEOLAB System:IKU
Sample 1 Injection 1 Group 1 Mass 217.1956
Text:SAMPLE 1, SATURATED FRACTION



IKU1 7-FEB-89 Sir:Magnetic TS250 Acnt:GEOLAB System:IKU
Sample 2 Injection 1 Group 1 Mass 217.1956
Text:SAMPLE 2, SATURATED FRACTION



IKU1 7-FEB-89 Sir:Magnetic TS250 Acnt:GEOLAB System:IKU
Sample 2 Injection 1 Group 1 Mass 218.2034
Text:SAMPLE 2, SATURATED FRACTION

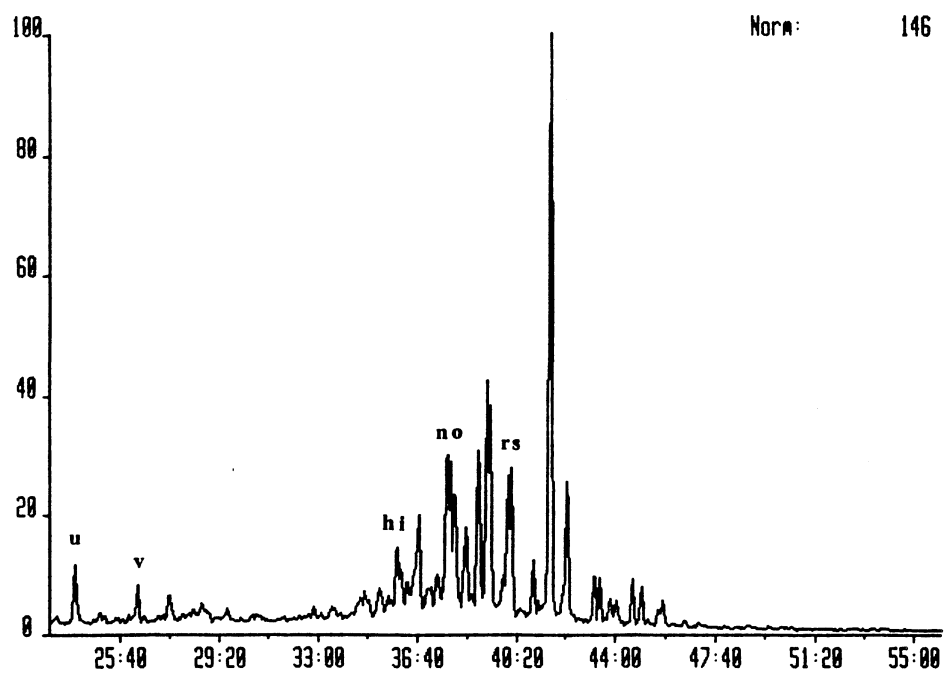
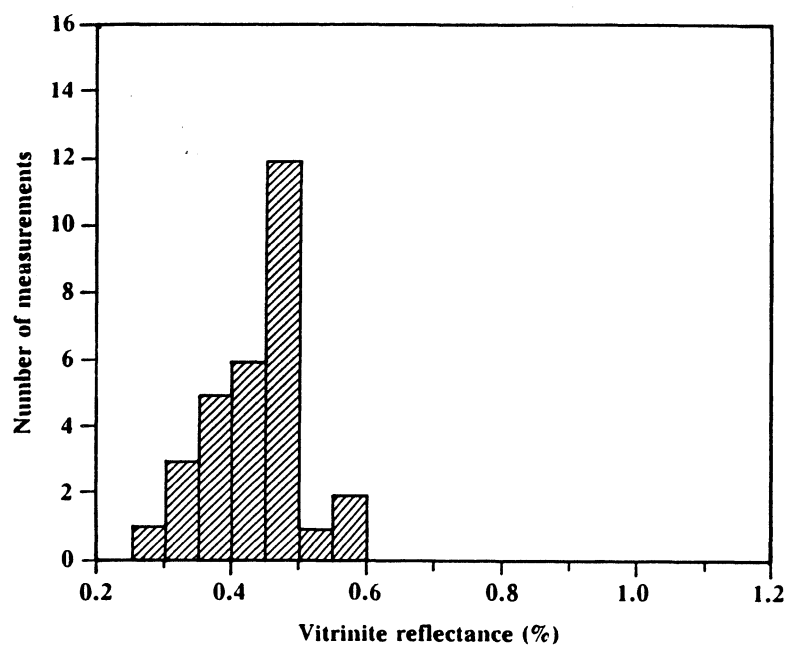


Figure A.I.11b:

Core no.: 7430/07-U-01

Sample no.: F-1281

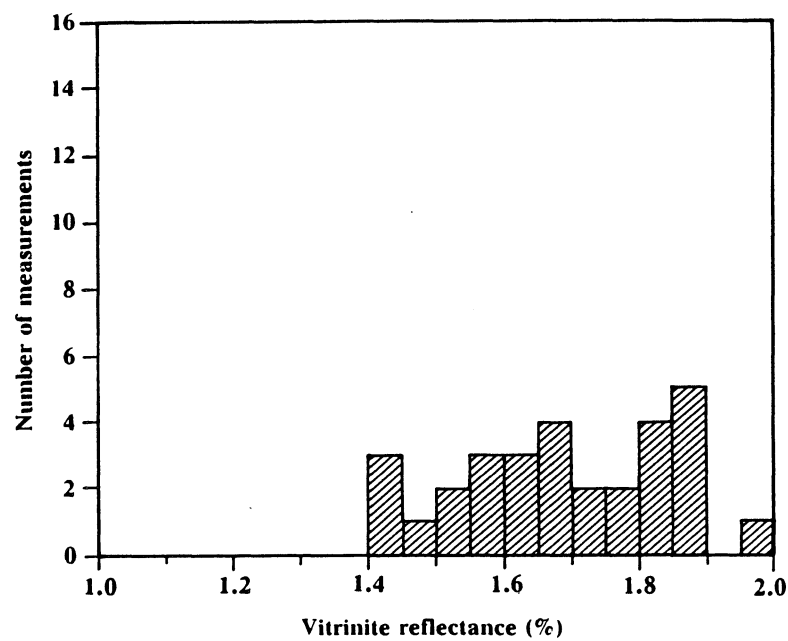
Depth: 78.35 m



RP = 0.43% n = 30

Core no.: 7430/07-U-01
Sample no.: F-1281 (Hy-Py)

Depth: 78.35 m



RP = 1.69% n = 30

Figure A.I.12:

APPENDIX A.II: TABLE OF CONTENTS

Artificial maturation of a claystone sample from core 7430/10-U-01

TABLES

Table A.II.1:	Total organic carbon content and Rock-Eval pyrolysis data.
Table A.II.2:	Vitrinite reflectance data.
Table A.II.3a:	Weight of EOM/pyrolysate, asphaltenes and chromatographic fractions.
Table A.II.3b:	Concentration of EOM/pyrolysate, asphaltenes and chromatographic fractions, related to rock weight.
Table A.II.3c:	Concentration of EOM/pyrolysate, asphaltenes and chromatographic fractions, related to TOC weight.
Table A.II.3d:	Composition of EOM/pyrolysate.
Table A.II.4:	Summary table of hydrous pyrolysis results.
Table A.II.5:	Yield and composition of hydrous pyrolysis gas.
Table A.II.6:	Tabulation of data from the gas chromatograms.
Table A.II.7:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity characteristic ratios.
Table A.II.8:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity and source characteristic ratios.

FIGURES

Figure A.II.1:	Gas chromatogram of saturated hydrocarbons for original sample.
Figure A.II.2a:	Gas chromatogram of aromatic hydrocarbons for original sample (FID).
Figure A.II.2b:	Gas chromatogram of aromatic hydrocarbons for original sample (FPD).
Figure A.II.3:	Mass fragmentograms of m/z 191, 205 (terpanes) for original sample.
Figure A.II.4:	Mass fragmentograms of m/z 217, 218 (steranes) for original sample.
Figure A.II.5a:	Whole oil gas chromatogram of expelled pyrolysate oil droplets.
Figure A.II.5b:	Whole oil gas chromatogram of expelled pyrolysate oil droplets: expanded view of C ₃ -C ₈ region.
Figure A.II.6:	Gas chromatogram of saturated hydrocarbons for expelled pyrolysate.
Figure A.II.7:	Gas chromatogram of saturated hydrocarbons for extracted pyrolysate.

- Figure A.II.8: Gas chromatogram of aromatic hydrocarbons for expelled pyrolysate (a=FID, b=FPD).
- Figure A.II.9: Gas chromatogram of aromatic hydrocarbons for extracted pyrolysate (a=FID, b=FPD).
- Figure A.II.10a: Mass fragmentograms of m/z 191, 205 (terpanes) for expelled pyrolysate.
- Figure A.II.10b: Mass fragmentograms of m/z 191, 205 (terpanes) for extracted pyrolysate.
- Figure A.II.11a: Mass fragmentograms of m/z 217, 218 (steranes) for expelled pyrolysate.
- Figure A.II.11b: Mass fragmentograms of m/z 217, 218 (steranes) for extracted pyrolysate.
- Figure A.II.12: Internal distribution of 14 α (H),17 α (H) 20R, C₂₇, C₂₈ and C₂₉ regular steranes (from m/z 217).
- Figure A.II.13a: Mass fragmentograms of m/z 231, 253 (aromatic steroid hydrocarbons) for expelled pyrolysate.
- Figure A.II.13b: Mass fragmentograms of m/z 231, 253 (aromatic steroid hydrocarbons) for extracted pyrolysate.
- Figure A.II.14: Vitrinite reflectance histograms.

A.II ARTIFICIAL MATURATION OF A CLAYSTONE FROM CORE 7430/10-U-01 USING HYDROUS PYROLYSIS

A claystone sample from the organic-rich upper section of the Late Kimmeridgian Hekkingen Formation of Core 7430/10-U-01 (48.98 m) was artificially matured using hydrous pyrolysis in order to examine the source potential of these rocks in greater detail. The organic geochemical data of this sample are presented together with the other data from Core 7430/10-U-01 in Section 3.8.5 of the main data report and section A.III.8 of the Appendix volume) but are also included in this chapter for convenience of the reader.

The claystone sample had a total organic carbon content of 17.5% and a Rock-Eval hydrogen index of 545 mg HC/g TOC, which characterised the kerogen as type II (Table A.II.1). The organic matter is immature as indicated by a mean vitrinite reflectance of 0.30% Ro and a Tmax value of 425°C. On extraction, the original rock yielded 13,000 ppm of an asphaltene-rich bitumen which contained 14% hydrocarbons. Saturated hydrocarbons accounted for only 3.4% of the bitumen.

The saturated fraction of the extracted bitumen showed a relatively smooth, slightly bimodal n-alkane distribution and was rich in the isoprenoids pristane and phytane, which were about five times as abundant as the neighbouring n-alkanes. The heavier n-alkanes showed a marked odd over even predominance, expressed by a CPI 1 value of 1.5.

The gas chromatogram of the aromatic hydrocarbon fraction showed relatively well-developed alkylnaphthalene peaks, of which a C₃-naphthalene was most prominent. Phenanthrene and its homologs were less abundant.

The relatively low ratio of 20S/20R C₂₉ regular steranes and the incomplete conversion of 17β(H),21α(H) into 17α(H),21αβ(H) hopanes suggested a low maturity for the original sample, although the m/z 217 mass fragmentogram showed relatively abundant rearranged steranes. Also the composition of the aromatic steroid hydrocarbons suggested a low maturity.

Twenty grams of the coarsely crushed rock sample (1-2 mm) were artificially matured in an autoclave of 54 ml volume in the presence of 18 ml water. The gas volume of the autoclave was filled with pure helium. The vessel was

kept at a constant temperature of 340°C for 72 hours. The pressure during the experiment was equivalent to the water vapour pressure at this temperature, which is about 146 bars. On completion of the experiment, the autoclave was depressurised, and the produced gas was collected and analysed for its content in light hydrocarbons and inorganic gases.

Then the autoclave was opened, and the oil droplets floating on the water surface were collected for total oil analysis. The rest of the expelled pyrolysate was collected by rinsing the solid residue of the rock and the interior of the autoclave with an organic solvent. An aliquot of the residual rock was extracted to obtain the extracted pyrolysate.

The pyrolysed residue gave a mean vitrinite reflectance of 1.21% Ro which indicates that the sample, in conventional terms, has reached late or post-oil window maturity (Table A.II.2 and Figure A.II.15). The vitrinite in the artificially matured sample tended to show a "lace-like" structure which appeared to reflect the degradation of liptinite particles during the artificial maturation process. In addition, possible evidence of vesiculation was observed in some vitrinite particles, reducing the quality of the particles for reflectance measurement.

The sample yielded 376 ml of gas on hydrous pyrolysis (Table A.II.5). The gas contained 41 vol% hydrocarbons and 59 vol% carbon dioxide, the largest part of which was probably formed by the desintegration of carbonate minerals in the rock. About half of the hydrocarbon gas fraction consisted of methane (48%), followed by ethane (35%), propane (12%) and butane + butene (4%), while all higher hydrocarbons occur in trace concentrations of less than 0.4%.

The expelled oil had a density of 0.96 g/ml and lost 17.2 wt% when topped at 210°C. This fraction contains mainly the C₁-C₁₄ compounds and is further referred to as the C₁₅₋ fraction. The total amount of expelled pyrolysate was determined as the sum of the weights of the oil (C₁₅₋ + C₁₅₊), of the solvent-collected pyrolysate (C₁₅₊) and the theoretical weight of its C₁₅₋-fraction which is lost during evaporation of the solvent.

In total, 830 mg of pyrolysate fluid were expelled from the rock sample. This corresponds to 41,000 ppm (4.1 %) of the rock weight, or 236 mg/g TOC, respectively. The C₁₅₊-fraction of this expelled pyrolysate contained ca.

48 % hydrocarbons, of which saturates accounted for ca. 30 % and aromatics for ca. 70 % (Table A.II.3a-d). This is in an obvious contrast with the extract of the unpyrolysed rock, which contained only 14 % hydrocarbons.

The residual rock yielded 45,500 ppm (4.55 %) bitumen on extraction, which is about three and a half times as much as the extract yield of the original rock. The bulk chemical composition of this extracted pyrolysate is between the one of the original EOM and that of the expelled pyrolysate. The gas chromatogram of the whole oil (Fig. A.II.5) shows a bimodal distribution of n-alkanes which extends up to ca. C_{25} (probably limited by technical reasons). The distribution shows maxima at nC_6 and C_{11} , respectively, and a moderate content in aromatic and naphthenic compounds. At low molecular weights, unsaturated compounds can be observed as well (e.g. hexene).

The saturated C_{15+} hydrocarbon fractions of the expelled and the extracted pyrolysate are quite similar and show smooth, front-biased n-alkane distributions which extend to about $n-C_{35}$. In contrast to the original rock extract, no significant odd over even predominance can be observed in the pyrolysate fractions (CPI 1 = 1.1). Pristane and phytane have drastically decreased in abundance, both in relation to the neighbouring n-alkanes and to the remaining acyclic isoprenoids.

A similar evolution towards a more light-end biased distribution is also indicated for the aromatic hydrocarbon fractions (Figures A.II.2,8 and 9). Although the chromatograms still show large "humps", strong peaks of alkylnaphthalenes and of less prominent alkylphenanthrenes can be observed. The composition of the steranes (m/z 217) in the expelled pyrolysate fluid differs from that of the unpyrolysed sediment extract by a strong increase of a $5\alpha(H)$ sterane which elutes early in the chromatogram (peak u), and by a predominance of rearranged over regular steranes (peaks a-i and j-t respectively). The proportion of 20S-diastereomers in the total C_{29} regular steranes in the pyrolysates has reached the equilibrium value of ca. 55 - 60 %.

The terpanes (m/z 191) from the expelled pyrolysate contain relatively higher concentrations of tri- and tetracyclics (peaks P-S), most pronounced in the expelled pyrolysate. The ratio 22S/22R of the extended hopanes (G/H, J1/J2) is slightly increased relative to the rock extract and close to the

equilibrium value of 60% 22S-steranes. The hopane/moretane ratio has also increased to its maximum value.

The composition of the triaromatic steroid hydrocarbons is characterised by a high abundance of C_{20} and C_{21} compounds and low intensities or missing peaks (triaromatics) at higher carbon numbers, which indicates that side-chain cracking has completed. Cracking ratios could not be calculated as some of the higher-molecular peaks were missing and the low-molecular ones were not unambiguously identified. No explanation has been found for the unusual distribution of the monoaromatics in the extracted pyrolysate as displayed in the m/z 253 mass fragmentogram.

In conclusion, the artificial maturation of this claystone sample yielded a significant concentration of a relatively heavy, but not particularly wax-rich oil and of a wet gas.

Project no.: 21344423
Location : 7430/10-U-01
Date : 89.02.14

Table A.II.1: DATA FROM ROCK EVAL PYROLYSIS

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F1329	ORIG SED	48.98	CORE	3.22	95.45	0.19	17.50	545	1	98.67	0.03	425
F1329	PYR SED	48.98	CORE	15.18	36.69	0.10	14.60	251	0	51.87	0.29	438
F1329	PYR+EXTR	48.98	CORE	0.13	10.28	0.38	10.20	100	3	10.41	0.01	450

Legend

- 1 - No data available.
- PYR SED - pyrolysed sediment (residue), unextracted
- PYR+EXTR- pyrolysed and extracted sediment (residue)

Core-site Number: 7430/10-U-01
Reference number: 21.3444.23
(1/1)

TABLE A.II.2: VITRINITE REFLECTANCE DATA

I IKU NO	I LOCATION	I DEPTH	I VITRINITE	I REL	I STANDARD	I FLUORE-	I
I	I	I (M)	I REFLECTANCE	I RAT	I DEVIATION	I SCENCE	I
I F-1329	I -----	I 48.98	I 0.30 (30)	I G	I 0.05	I 1-2	I
I F-1329	I -----	I 48.98	I 1.21 (21)	I F	I 0.12	I ---	I
I (HY-PY)	I	I	I 1.55 (6)	I R	I 0.05	I	I
I	I	I	I	I	I	I	I

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor;
I = Inertinite. L = Liptinite or poor vitrinite particle.
R = Reworked material/inertinite.

Project no.: 21344423
Location : 7430/10-U-01
Date : 89.02.13

- 37 -

Table A.II.3a: WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ROCK EXTR. (g)	EOM (mg)	ASPH (mg)	SAT HC (mg)	ARO HC (mg)	POLAR COMP. (mg)	HC (mg)	NONHC (mg)	TOC (%)
F1329	EOM	48.98	CORE	6.5	84.0	46.6	2.9	8.9	15.4	11.8	72.2	17.50
F1329	EXP.PYR.	48.98	CORE	20.1*	240.0	11.4	34.0	80.5	48.0	114.5	125.5	17.50
F1329	EXTR.PYR	48.98	CORE	10.4	471.0	153.8	22.4	118.7	119.5	141.1	329.9	17.50

Table A.II.3b: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS
(Weight ppm of rock)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F1329	EOM	48.98	CORE	13003	7214	441	1382	2380	1823	11180
F1329	EXP.PYR.	48.98	CORE	11940	567	1691	4005	2388	5696	6244
F1329	EXTR.PYR	48.98	CORE	45507	14860	2160	11470	11544	13630	31877

Table A.II.3c: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS
(mg/g TOC)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F1329	EOM	48.98	CORE	74.3	41.2	2.5	7.9	13.6	10.4	63.9
F1329	EXP.PYR.	48.98	CORE	68.2	3.2	9.7	22.9	13.6	32.6	35.6
F1329	EXTR.PYR	48.98	CORE	260.0	84.9	12.3	65.5	66.0	77.8	182.2

Table A.II.3d: COMPOSITION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ASPH	SAT	ARO	HC	POLAR	SAT	HC
				----	----	----	----	-----	----	-----
				EOM	EOM	EOM	EOM	EOM	ARO	NONHC
				(%)	(%)	(%)	(%)	(%)	x 100	x 100
F1329	EOM	48.98	CORE	55.5	3.4	10.6	14.0	18.3	31.9	16.3
F1329	EXP.PYR.	48.98	CORE	4.8	14.2	33.5	47.7	20.0	42.2	91.2
F1329	EXTR.PYR	48.98	CORE	32.7	4.7	25.2	29.9	25.4	18.8	42.8

Legend:

* - Not all the available EOM was used for MPLC.

-1- No data available.

Table A.II.4: Summary table for hydrous pyrolysis results

Coal sample from Core 7430/10-U-01, 48.98 m (F1329)

Experimental data

Temperature (°C)	340
Duration (h)	72
Autoclave volume (ml)	54
Rock weight (g)	20.1
Water volume (ml)	18
Volume of gas generated (ml)	376
Volume of oil recovered (C15-,C15+) (µl)	600
Density of oil (g/ml)	0.90
Proportion of C15+ HC in oil (wt%)(from topping)	82.8
Weight of "outwashed" expelled pyrolysate (C15+) (mg)	240

Sum of organic products:

	mg/g rock	mg/g of initial TOC
HC gas	7.6	43.4
expelled pyrolysate fluid	41.3	236
extracted pyrolysate fluid	45.3	258.9
sum	94.2	538.3
minus EOM	13.0	74.3
net product	81.2	464

Table A.II.5: YIELD AND COMPOSITION OF HYDROUS PYROLYSIS GAS

IKU-NR	µl/g rock F1329	% volume of HC gas F1329	µg/g rock
COMPOUND			
Carbon dio	9118.39	-----	
Methane	3006.21	47.74	
Ethane	2218.06	35.22	
Propane	730.99	11.61	
i-Butane	72.97	1.16	
Butene	19.56	0.31	
n-Butane	165.46	2.63	
? RI= 406	12.82	0.20	
? RI= 416	7.33	0.12	
? RI= 466	21.40	0.34	
? RI= 484	1.07	0.02	
n-Pentane	23.06	0.37	
? RI= 506	2.81	0.04	
? RI= 512	1.35	0.02	
? RI= 516	2.13	0.03	
? RI= 559	2.07	0.03	
CyC5	3.36	0.05	
3-MC5	1.20	0.02	
n-Hexane	3.40	0.05	
MCyC5	2.03	0.03	
SUM:	15415.6	100.00	
Non-HC	9118.3		
HC	6297.3		7612

COMPOSITION OF TOTAL HYDROUS PYROLYSIS GAS

% volume of
total HyPy gas

CO2	59.2
HC	40.8

Data corrected for air contamination and deadvolume of autoclave.

Project no.: 21344423
 Location : 7430/10-U-01
 Date : 89.02.05

Table A.II.6:

RATIOS DERIVED FROM GAS CHROMATOGRAMS OF SATURATED HYDROCARBONS

IKUNO	FRAC NAME	DEPTH	Pri	Pri	Phy	A	n-C17	n-C31	CPI 1	CPI 2
			--- Phy	A=----- n-C17	B=----- n-C18	---	----- n-C27	----- n-C19		
F1329	BULK	48.98	1.2	5.9	5.2	1.1	1.2	0.6	1.5	1.8
F1329	EXP.PYR.	48.98	1.8	0.7	0.5	1.5	5.7	0.1	1.1	1.0
F1329	EXTR.PYR	48.98	1.4	0.2	0.2	1.3	3.3	0.3	1.1	1.0

-1 = No data available

Table A.II.7:

Molecular ratios from sterane and terpane mass chromatograms.
Maturity ratios.

Core 7430/10-U-01

IKU no.	Depth (m)	$\alpha\beta/\alpha\beta+\beta\alpha^1)$	%22S ²⁾	% $\beta\beta^3)$	%20S ⁴⁾
F1329 EOM	48.98	0.73	50	57	24
F1329 EXP.PYR	48.98	0.84	53	79	67
F1329 EXTR.PYR	48.98	0.80	58	80	56

1) $E/(E+F)$ in m/z 191.

2) Average % distribution between first and second eluting isomers of extended hopanes.

3) $100 * 2(r+s)/(q+t+2(r+s))$ in m/z 217.

4) $100 * q/(q+t)$ in m/z 217.

Table A.II.8:

Molecular ratios from terpane and sterane mass chromatograms.
Maturity and source characteristic ratios.

Core 7430/10-U-01

IKU no.	Depth (m)	Q/E ¹⁾	T _m /T _s ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
F1329 EOM	48.98	0.09	26.00	0.02	0.00	0.58
F1329 EXP	48.98	0.50	22.50	0.00	0.00	0.92
F1329 EXT	48.98	0.23	24.20	0.00	0.00	0.85

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191).

2) B/A in m/z 191.

3) Relative abundance of unknown (X/E in m/z 191).

4) Relative abundance of bisnorhopane (Z/E in m/z 191).

5) Relative abundance of C₂₇ rearranged steranes (a/(a+j) in m/z 217).

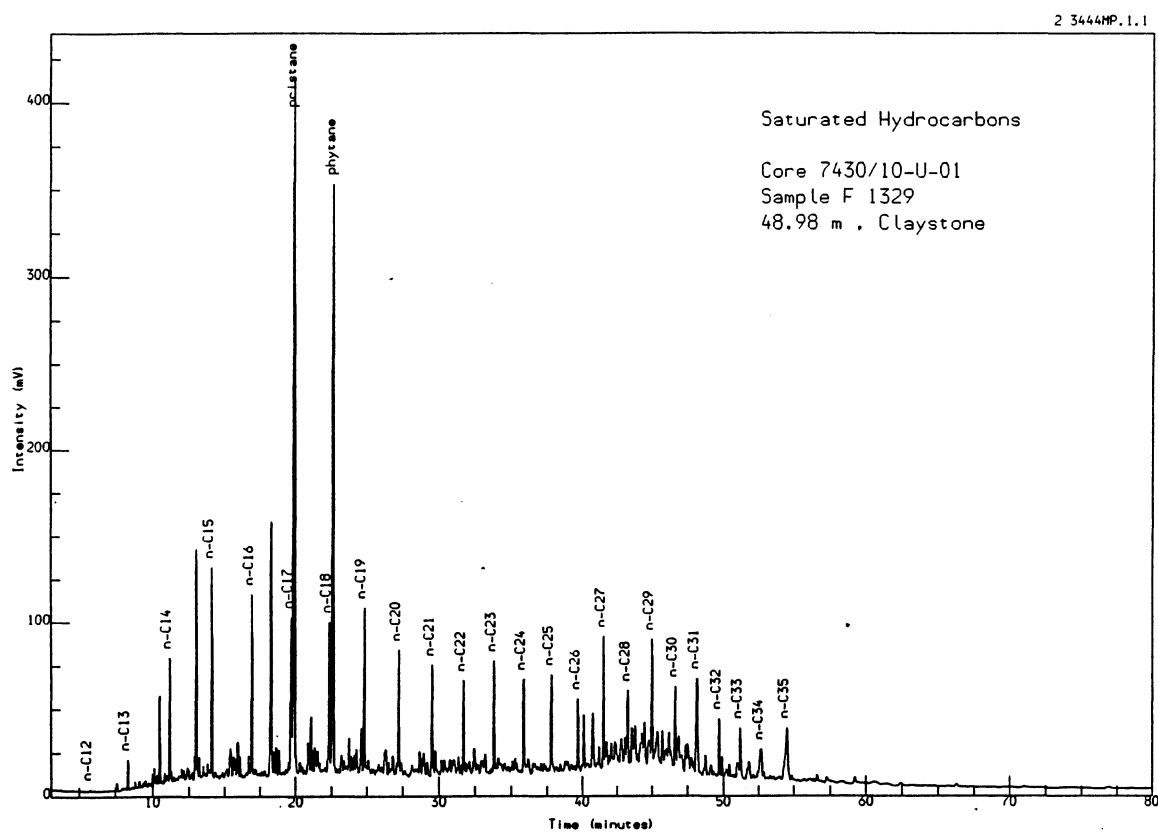


Figure A.II.1:

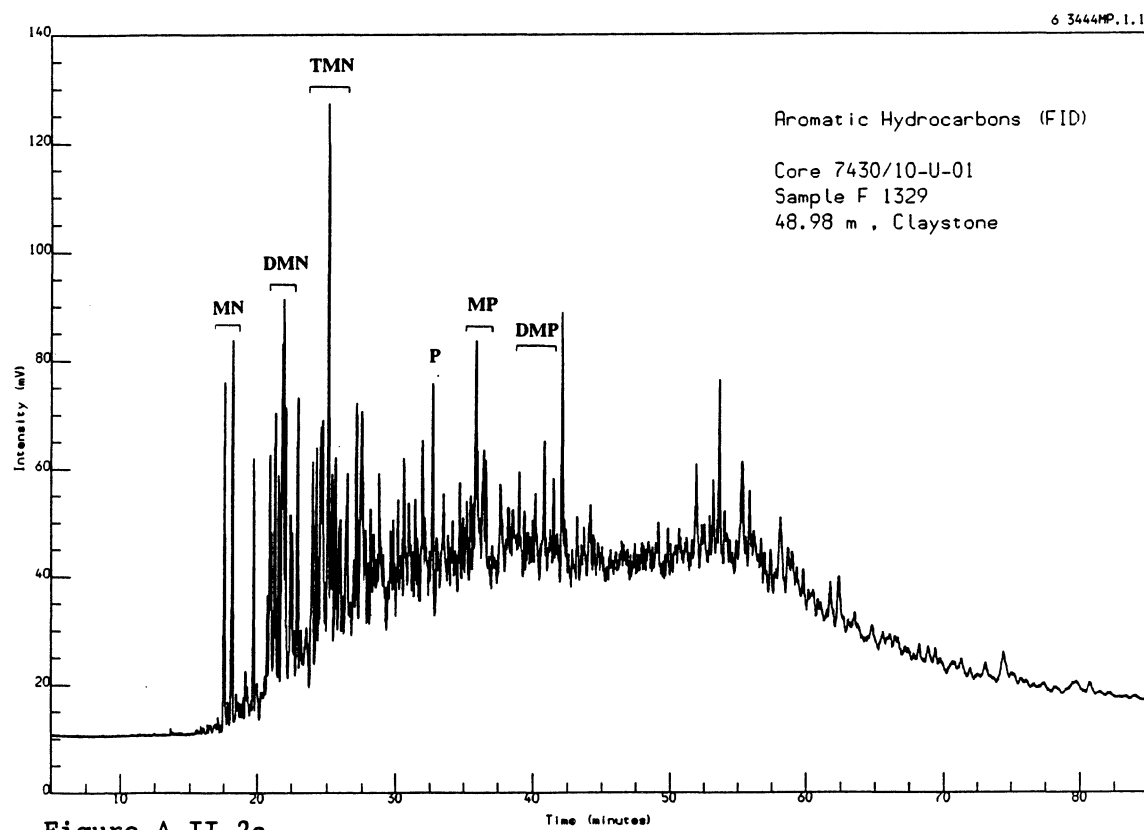


Figure A.II.2a

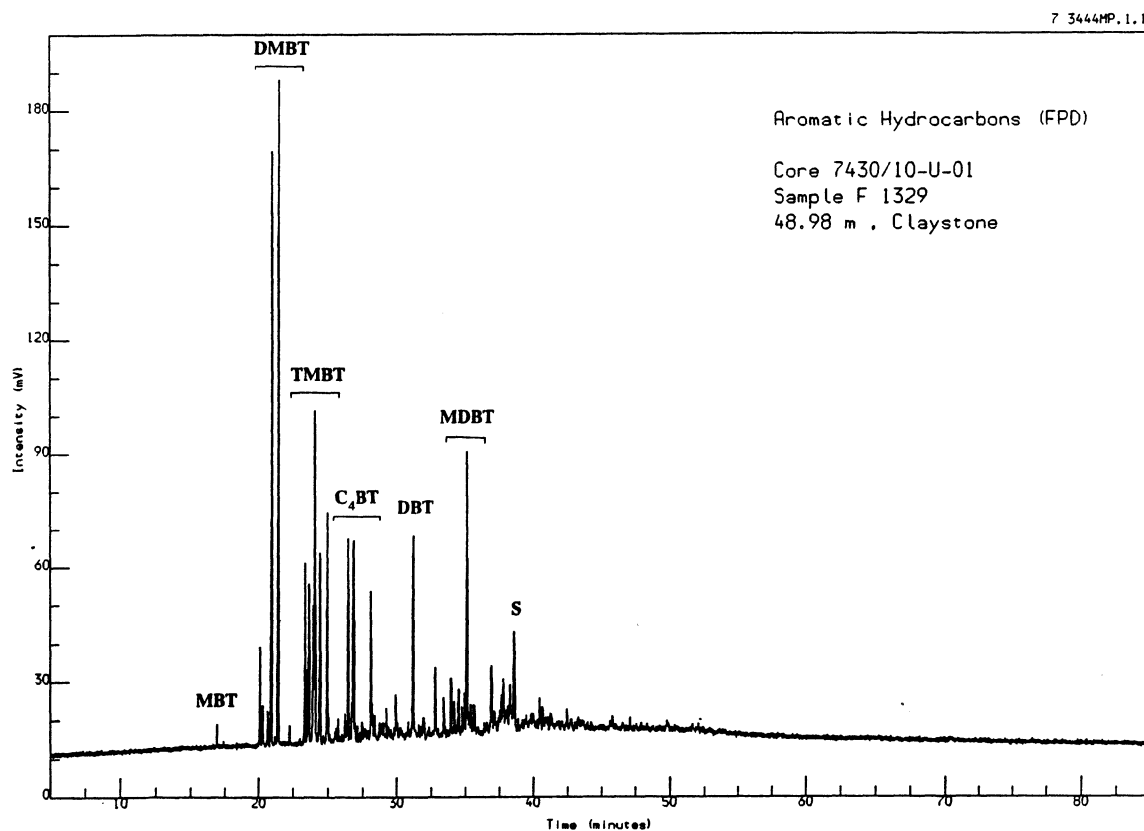
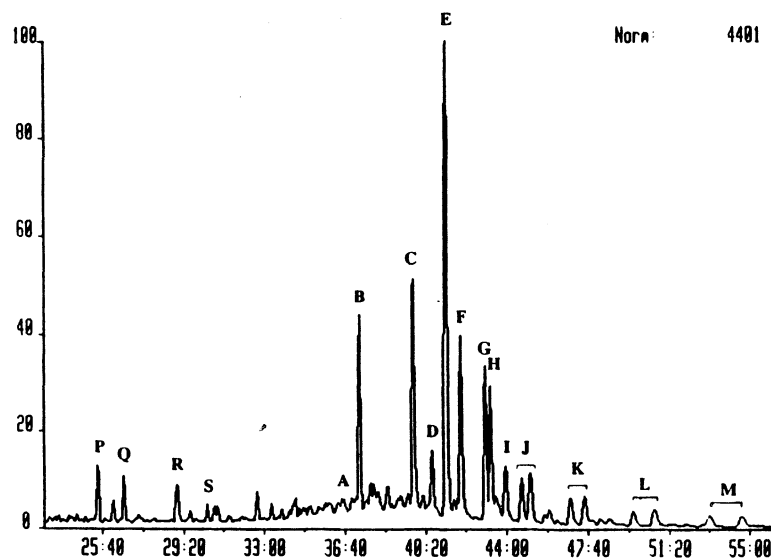


Figure A.II.2b

F1329A 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text: F1329 7430/10-U-01 40.90 M CLST F HY-PY 0.5-1 MM



F1329A 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text: F1329 7430/10-U-01 40.90 M CLST F HY-PY 0.5-1 MM

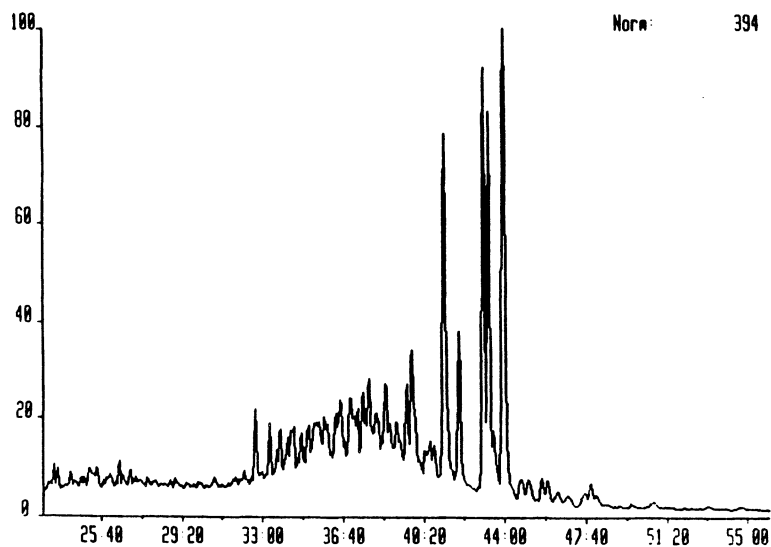
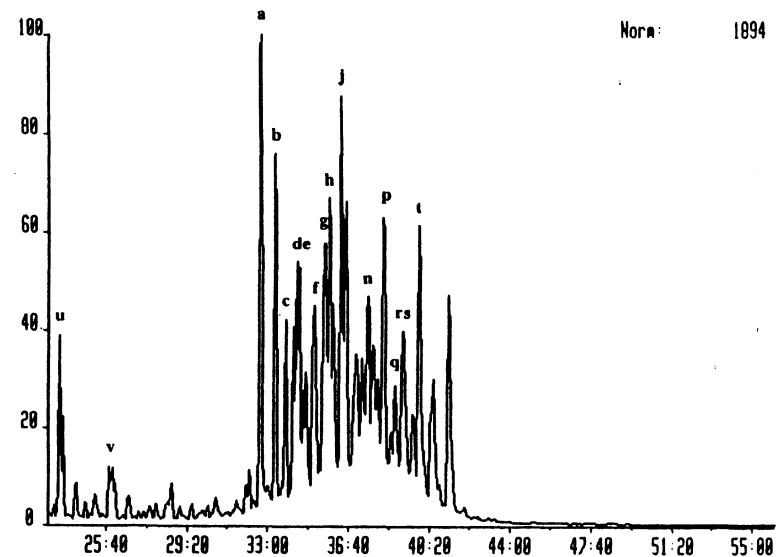


Figure A.II.3:

F1329A 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text: F1329 7430/10-U-01 40.90 M CLST F HY-PY 0.5-1 MM



F1329A 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text: F1329 7430/10-U-01 40.90 M CLST F HY-PY 0.5-1 MM

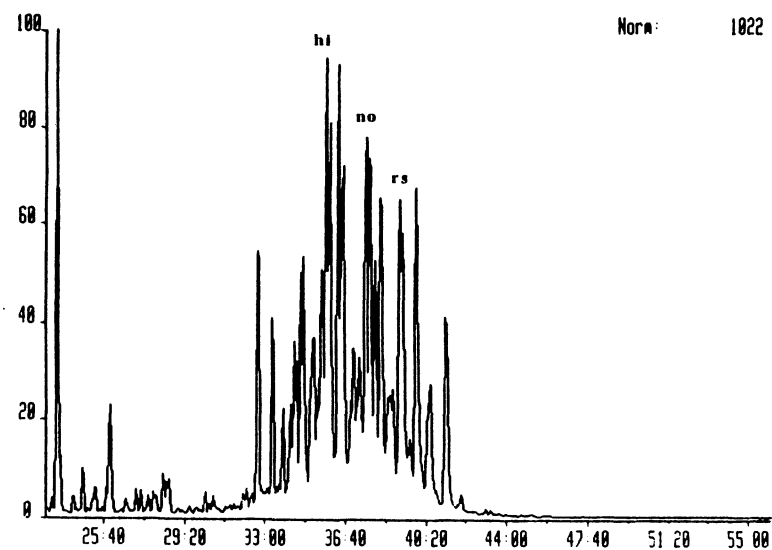


Figure A.II.4:

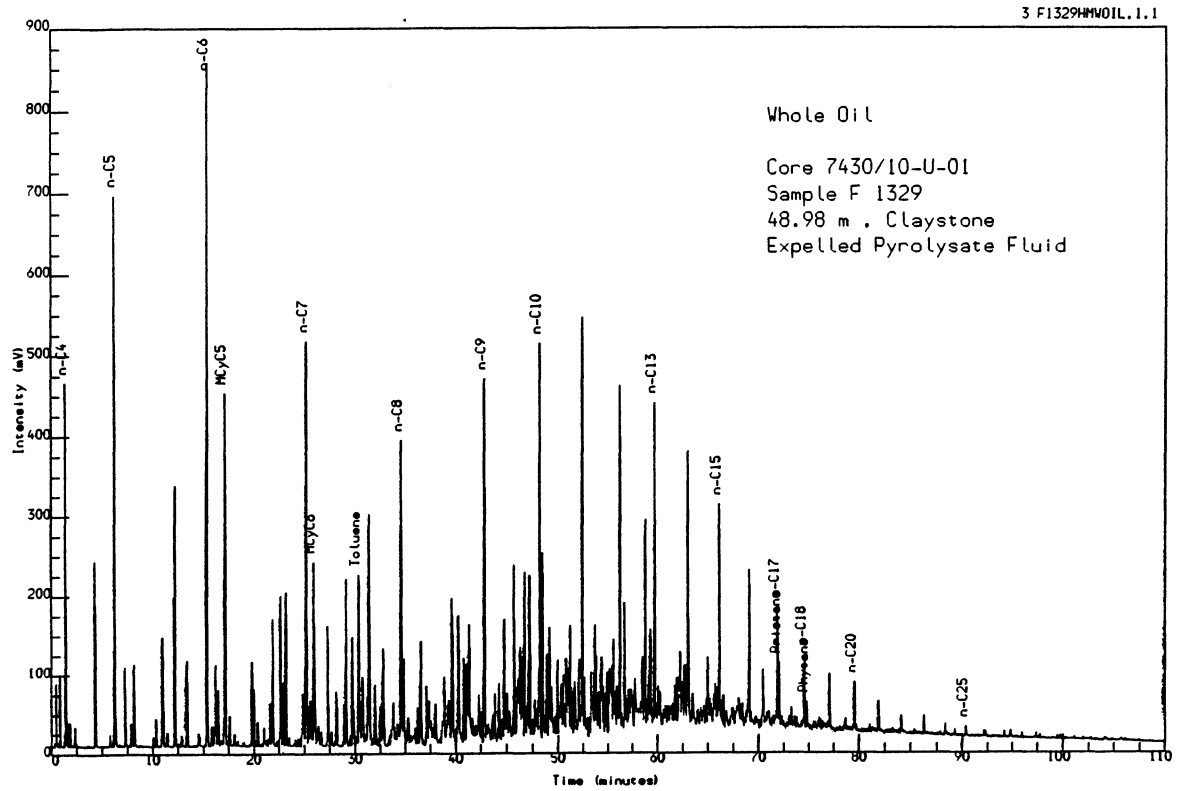


Figure A.II.5a

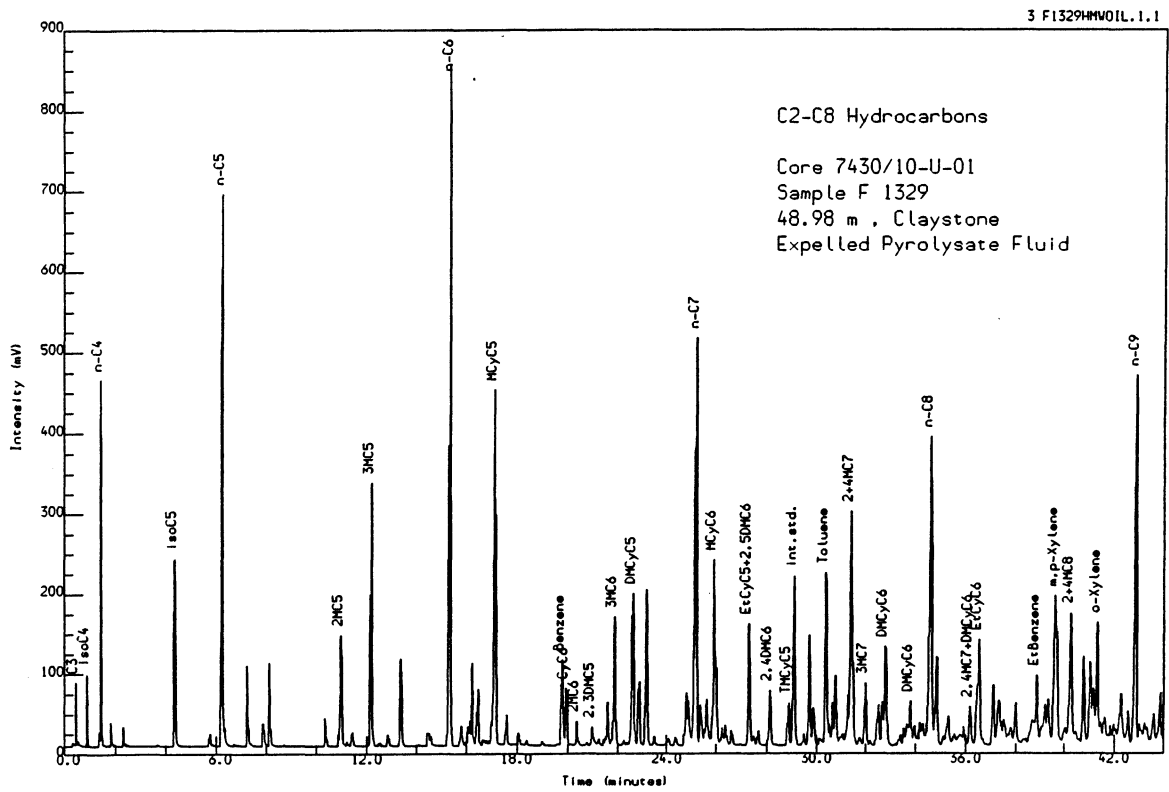


Figure A.II.5b:

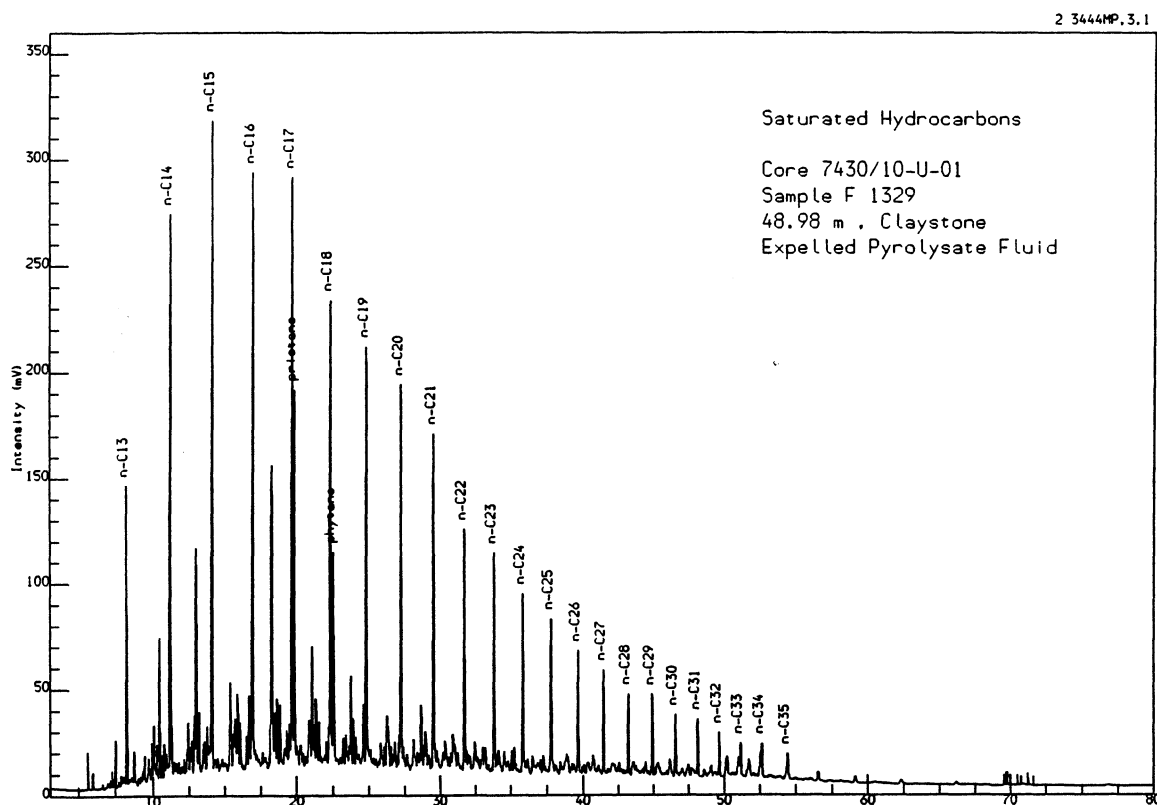


Figure A.II.6:

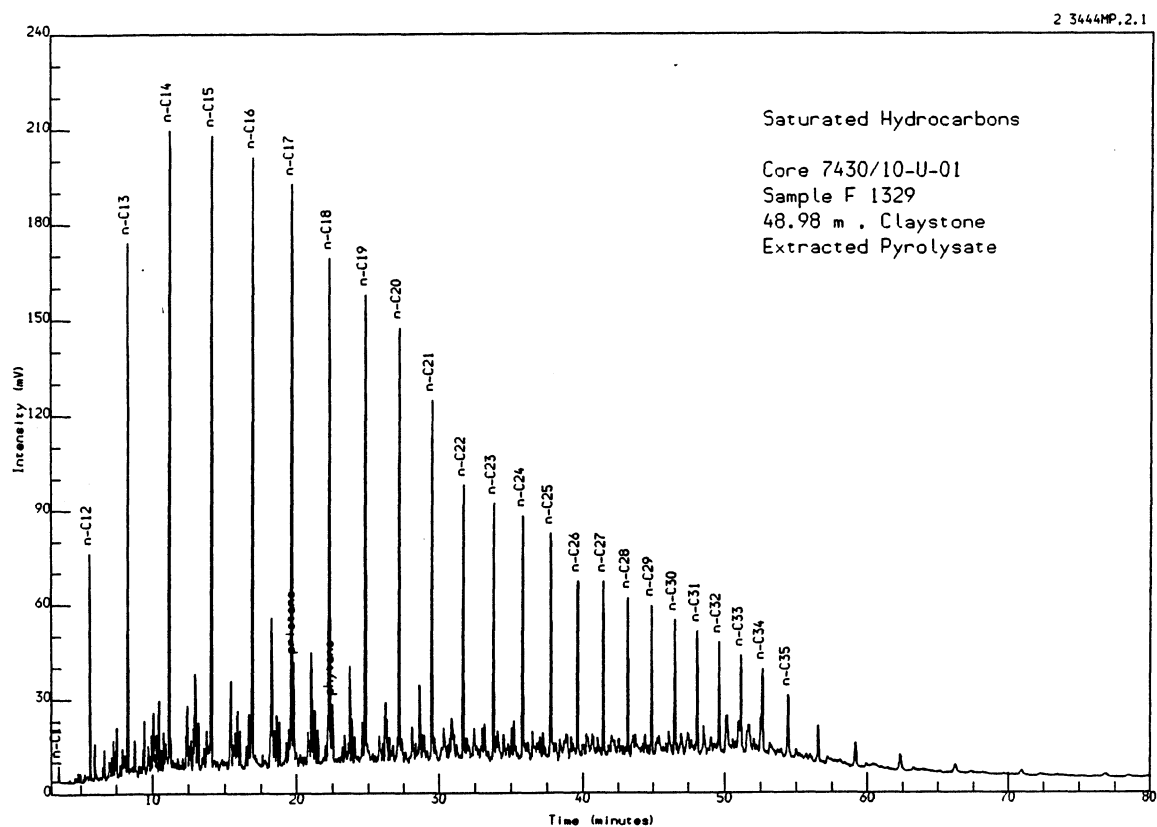


Figure A.II.7:

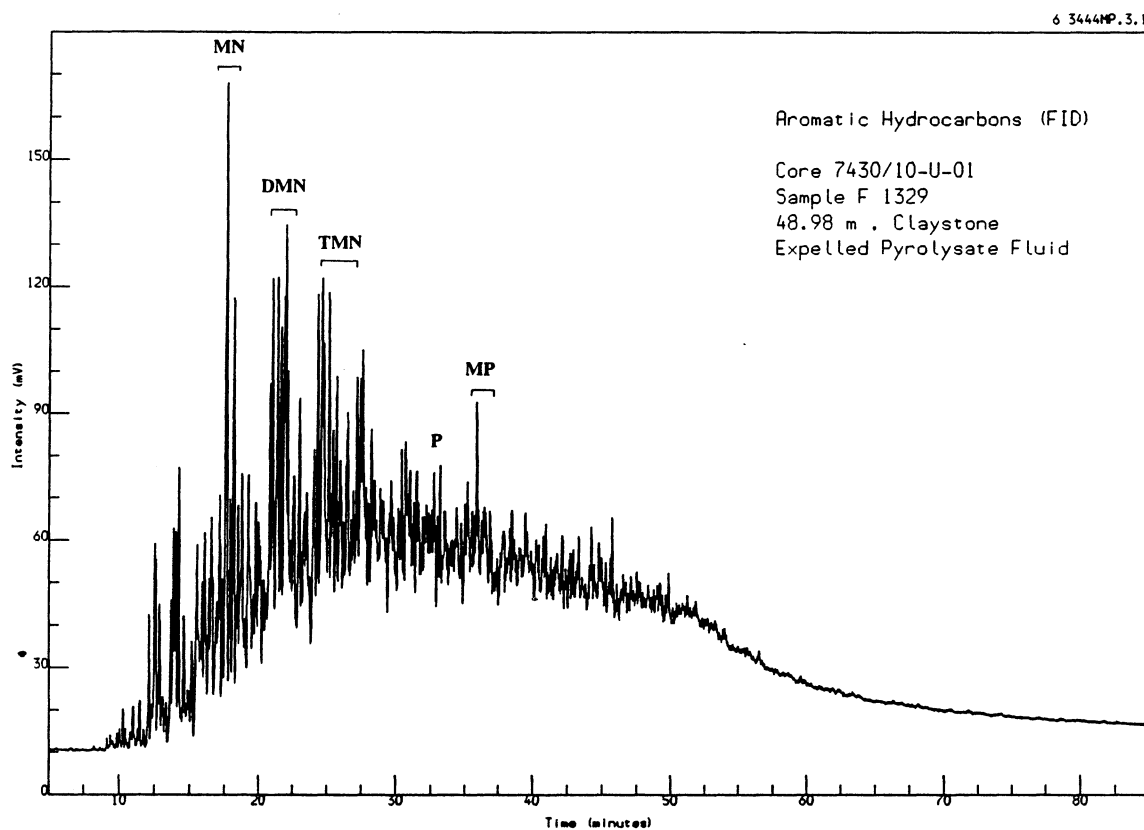


Figure A.II.8a

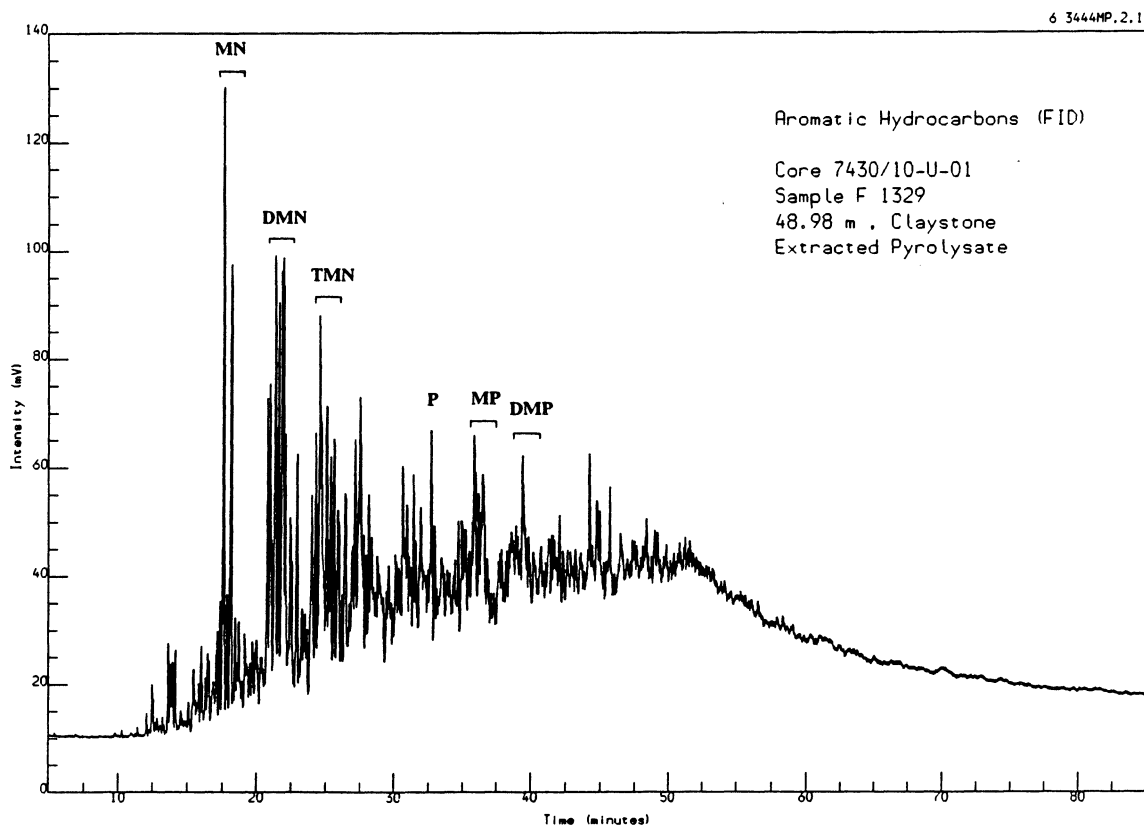


Figure A.II.9a

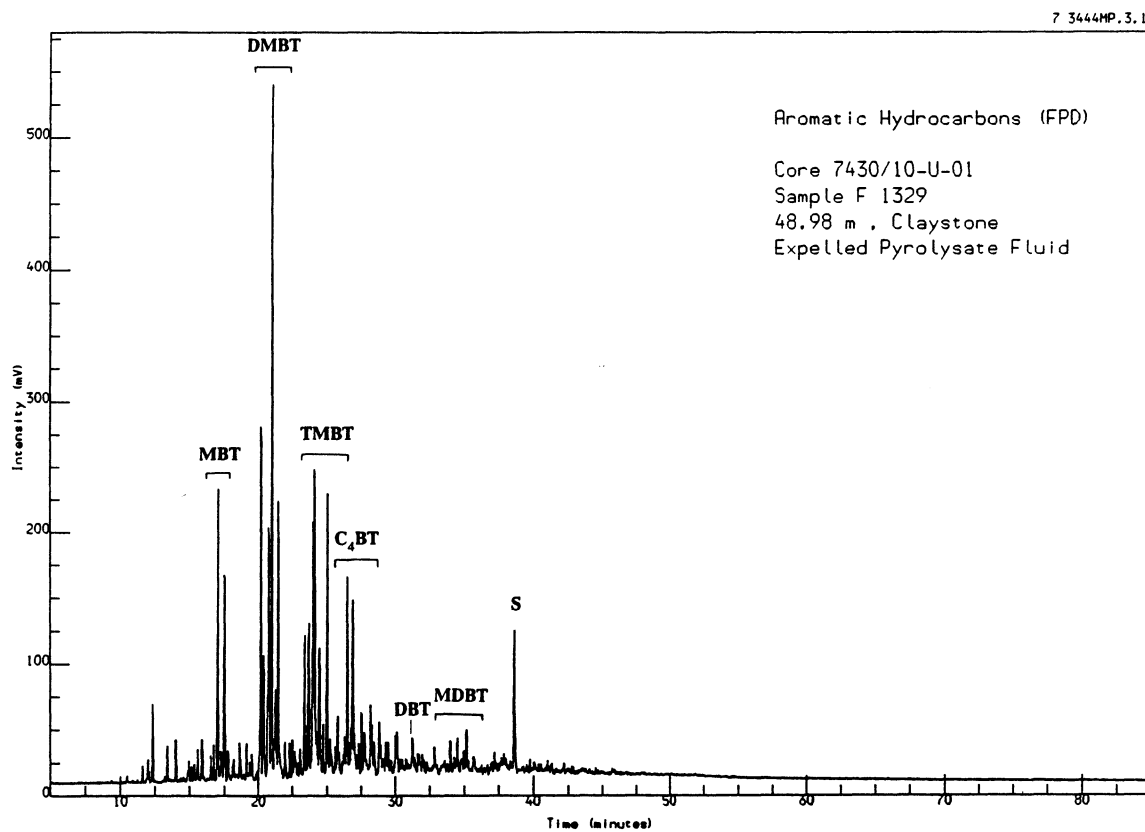


Figure A.II.8b

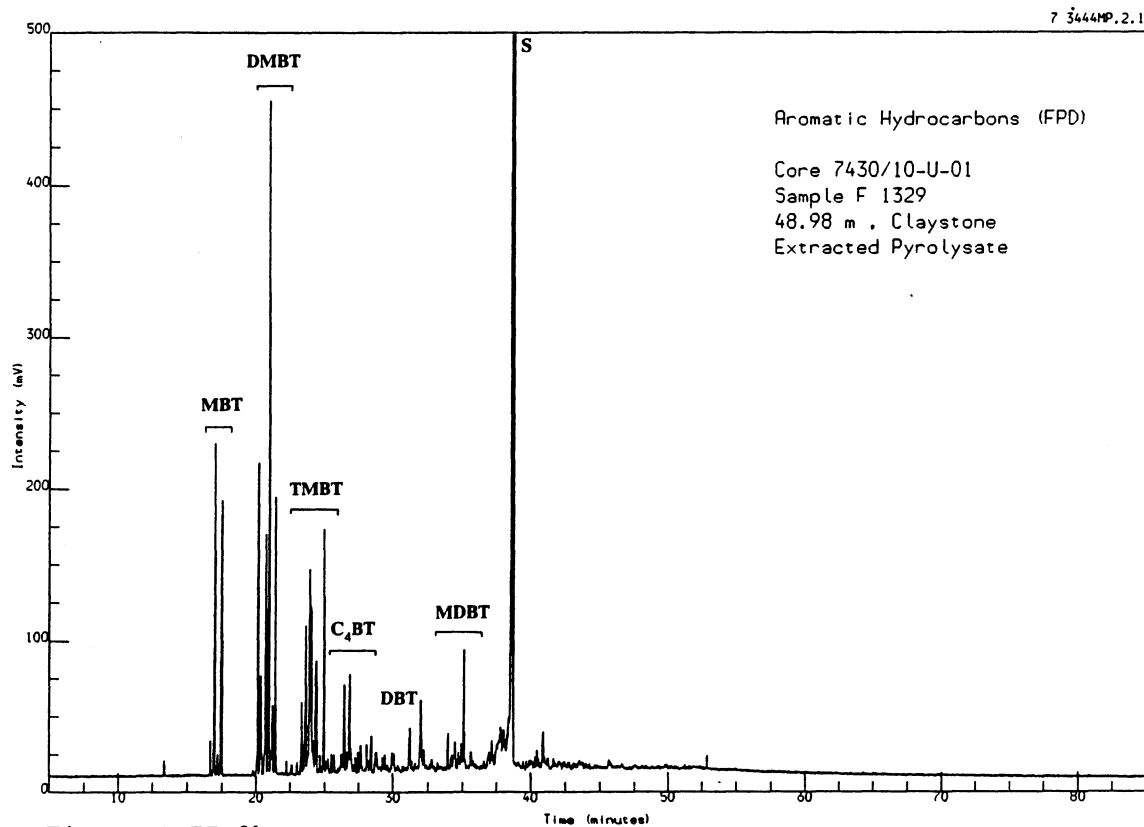
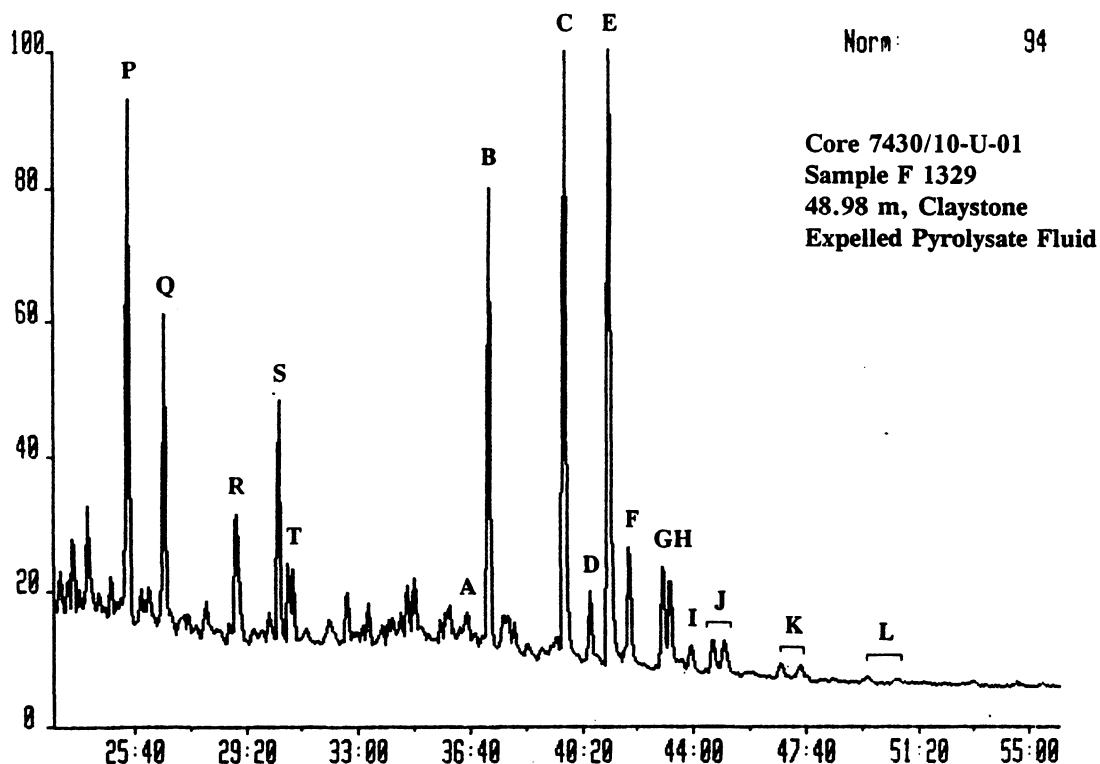


Figure A.II.9b

F1329EP 17-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 191.1000
Text:F1329 7430/10-U-01 48.98 M EXPELLED PYROLYSATE FLUID



F1329EP 17-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 205.1000
Text:F1329 7430/10-U-01 48.98 M EXPELLED PYROLYSATE FLUID

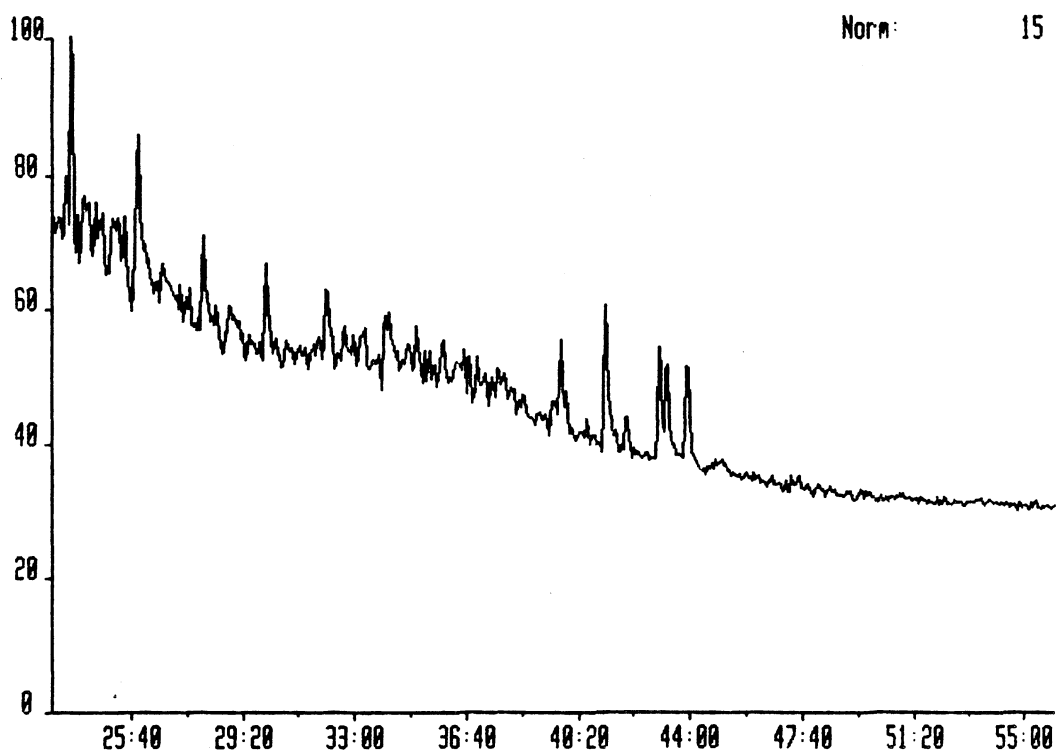
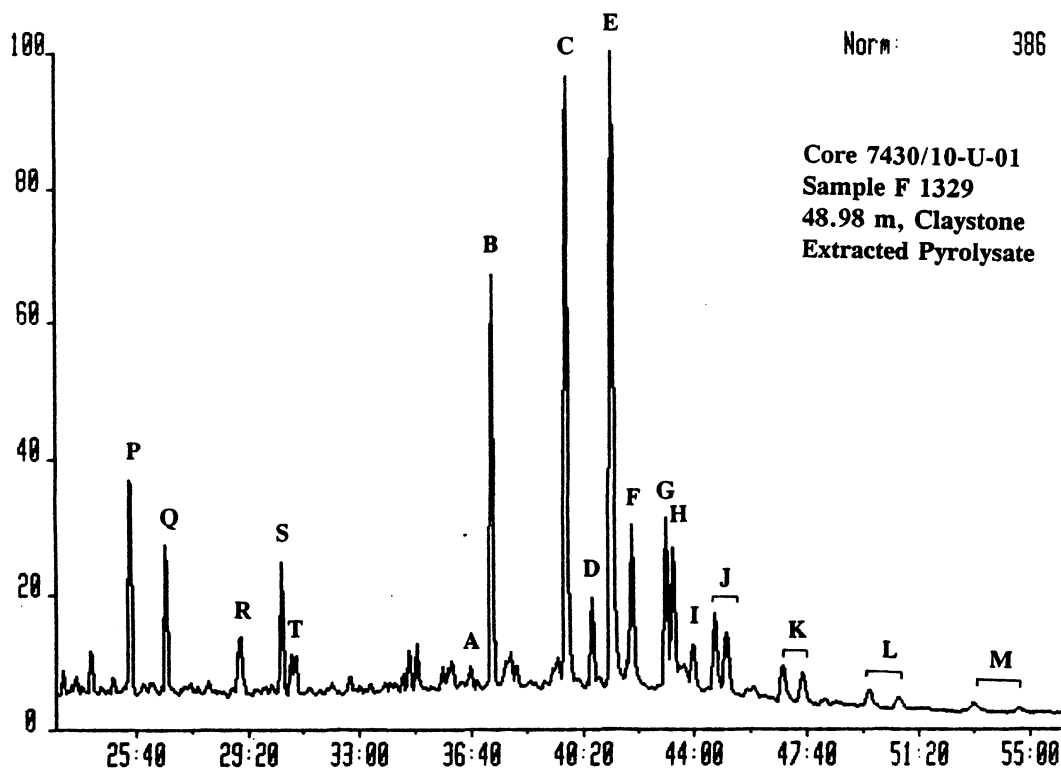


Figure A.II.10a:

F13298 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 191.1000
Text:F1329 7430/10-U-01 48.98 M F HY-PY 1-2 MM



F13298 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 205.1000
Text:F1329 7430/10-U-01 48.98 M F HY-PY 1-2 MM

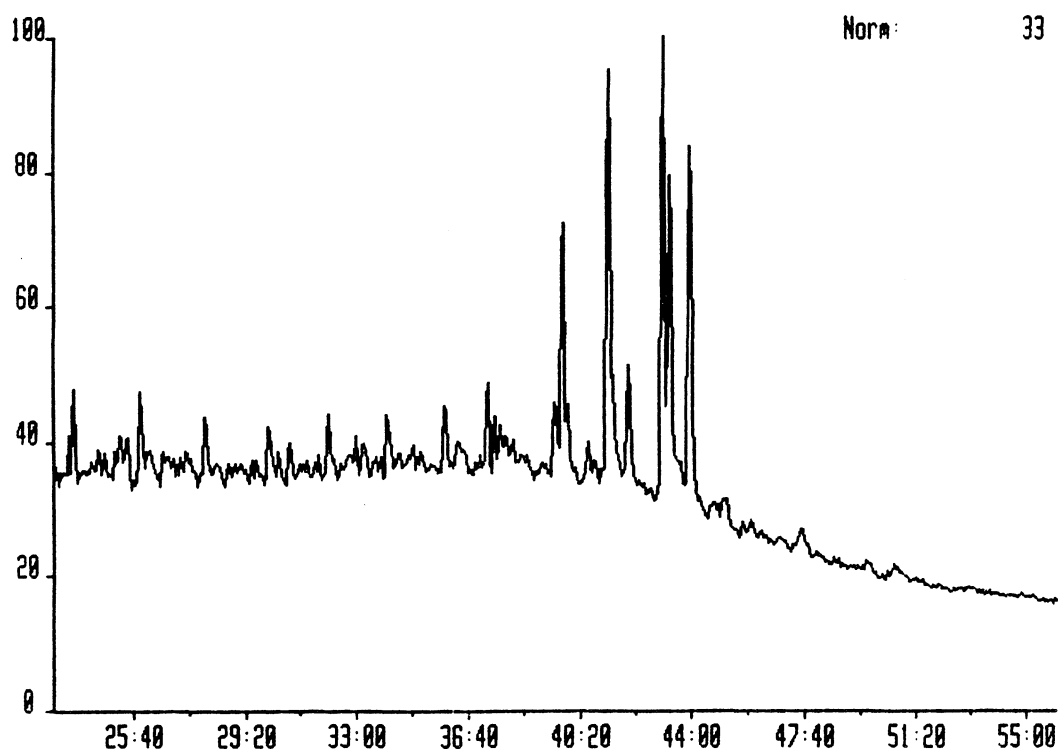
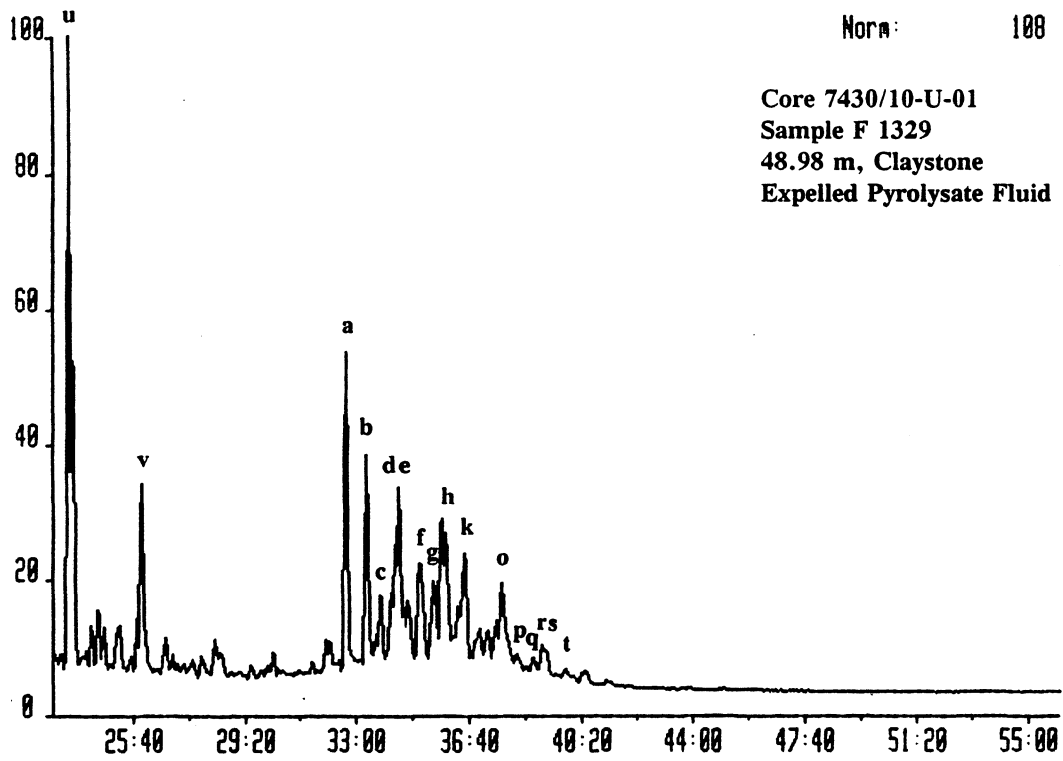


Figure A.II.10b:

F1329EP 17-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 217.1000
Text:F1329 7430/10-U-01 48.98 M EXPELLED PYROLYSATE FLUID



F1329EP 17-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 218.1000
Text:F1329 7430/10-U-01 48.98 M EXPELLED PYROLYSATE FLUID

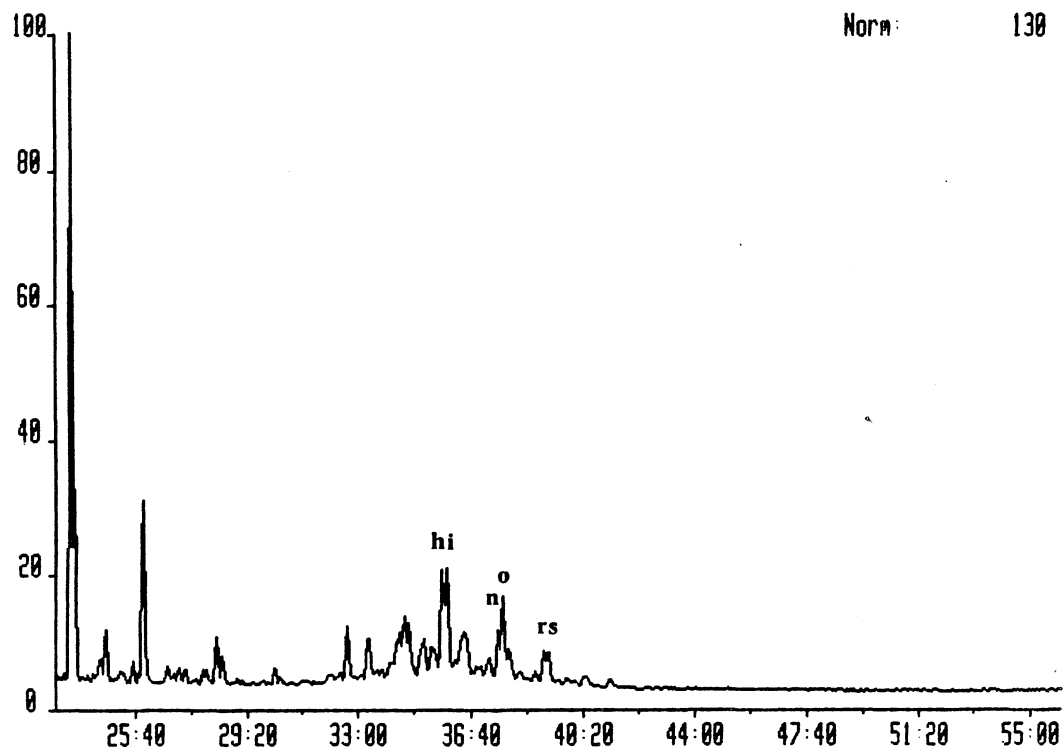
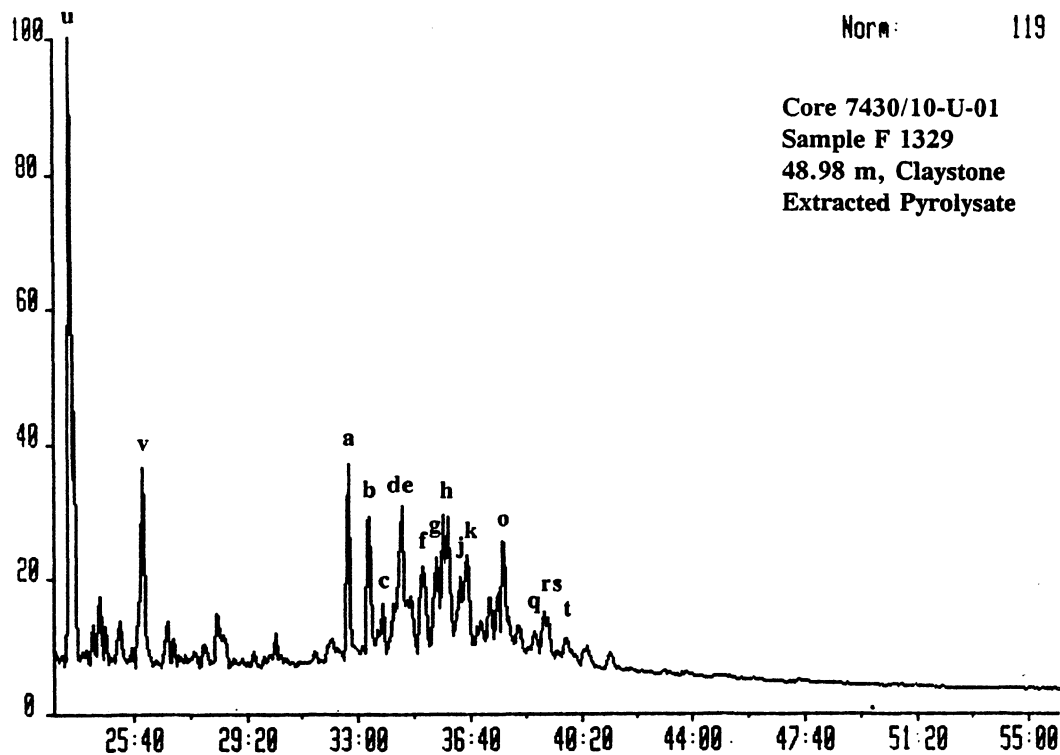


Figure A.II.11a:

F13298 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 217.1000
Text:F1329 7430/10-U-01 48.98 M F HY-PY 1-2 MM



F13298 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 218.1000
Text:F1329 7430/10-U-01 48.98 M F HY-PY 1-2 MM

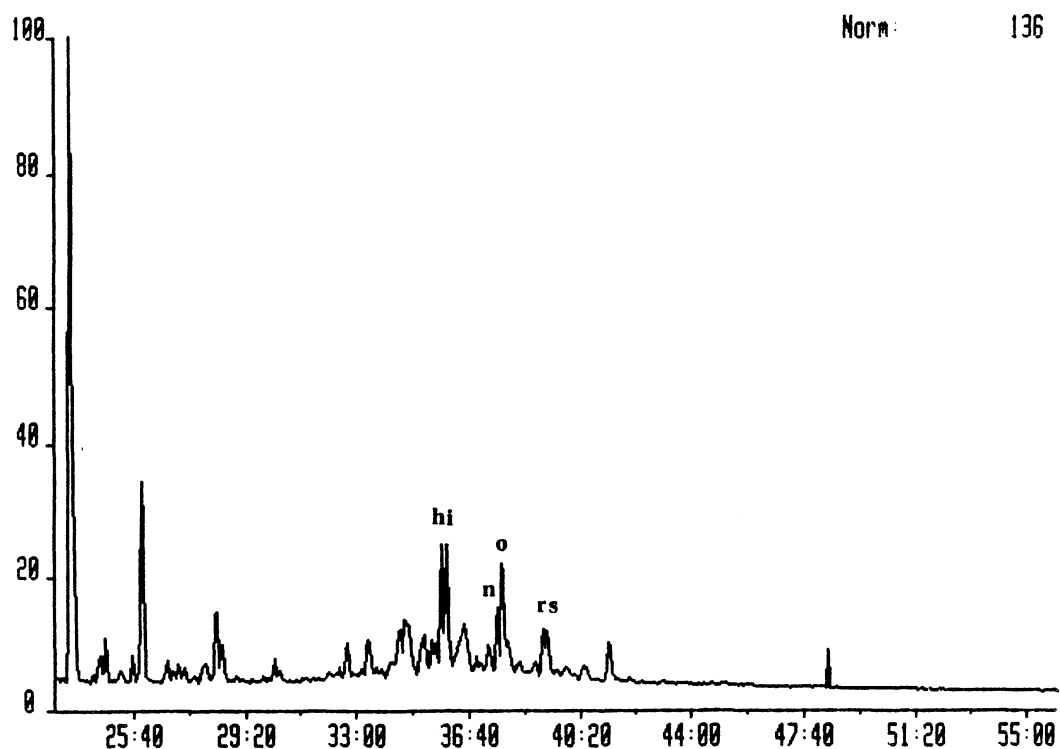
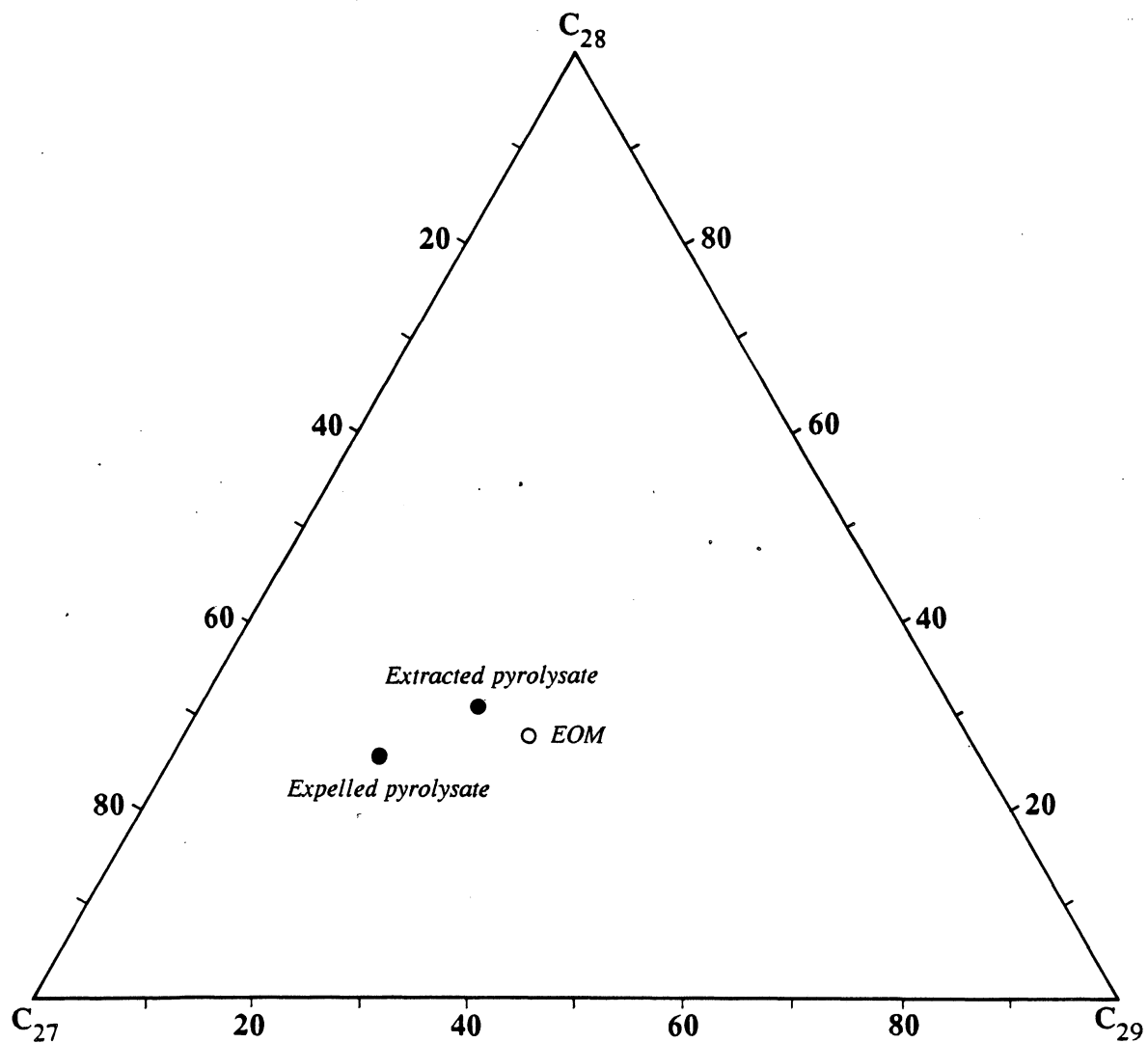


Figure A.II.11b:

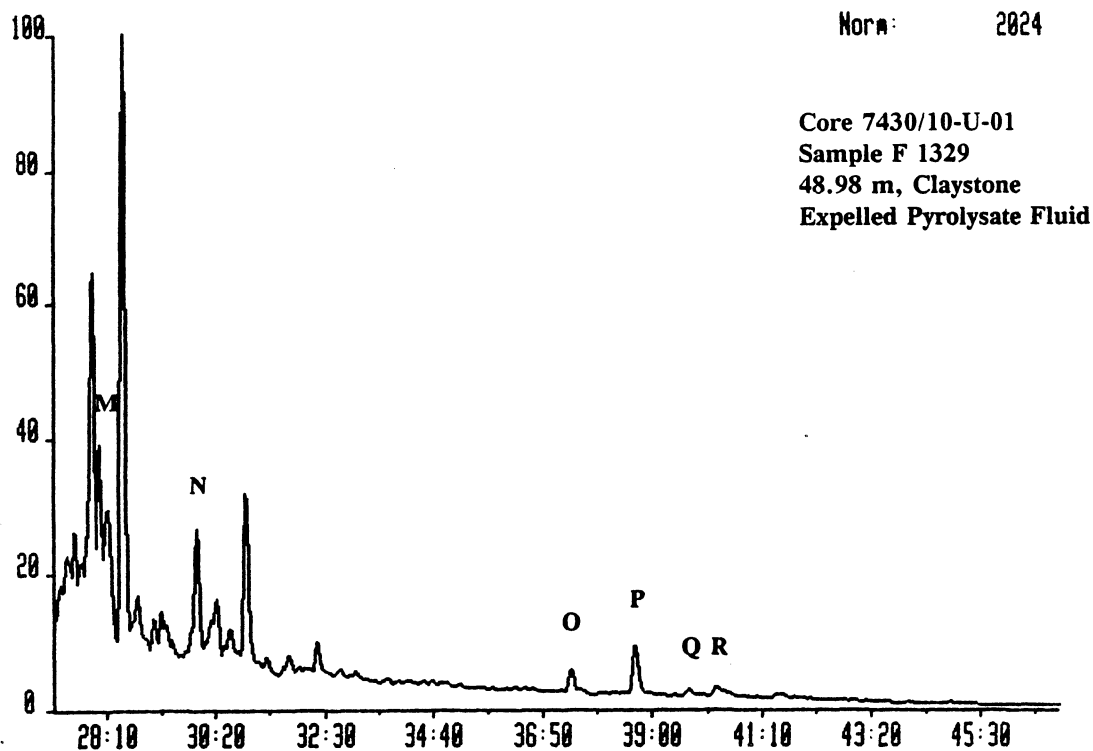
Claystone from core 7430/10-U-01, 48.98 m: EOM and hydrous pyrolysate.



Internal distribution of 14α(H), 17α(H) 20R, C₂₇, C₂₈ and C₂₉ regular steranes (from m/z 217)

Figure A.II.12:

F1329E1 31-JAN-89 Sir:Voltage 70-E Sys: TERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1329 ARO 7430/10-U-01 48.98 M EXPELLED PYROLYSATE FLUID



F1329E1 31-JAN-89 Sir:Voltage 70-E Sys: TERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1329 ARO 7430/10-U-01 48.98 M EXPELLED PYROLYSATE FLUID

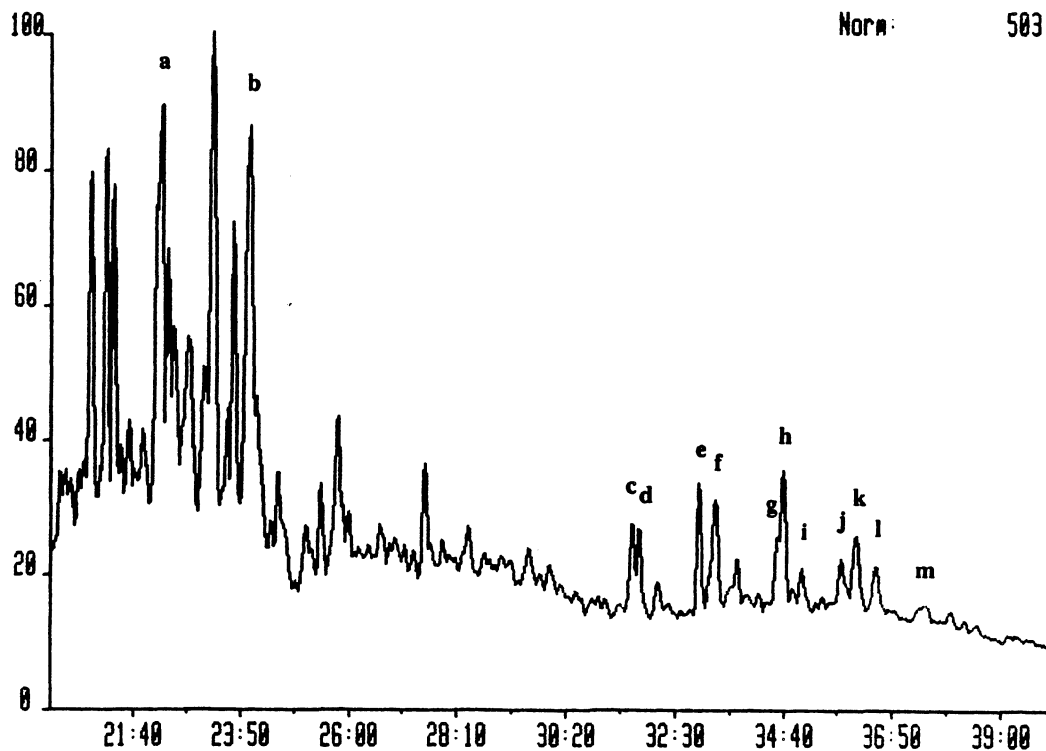
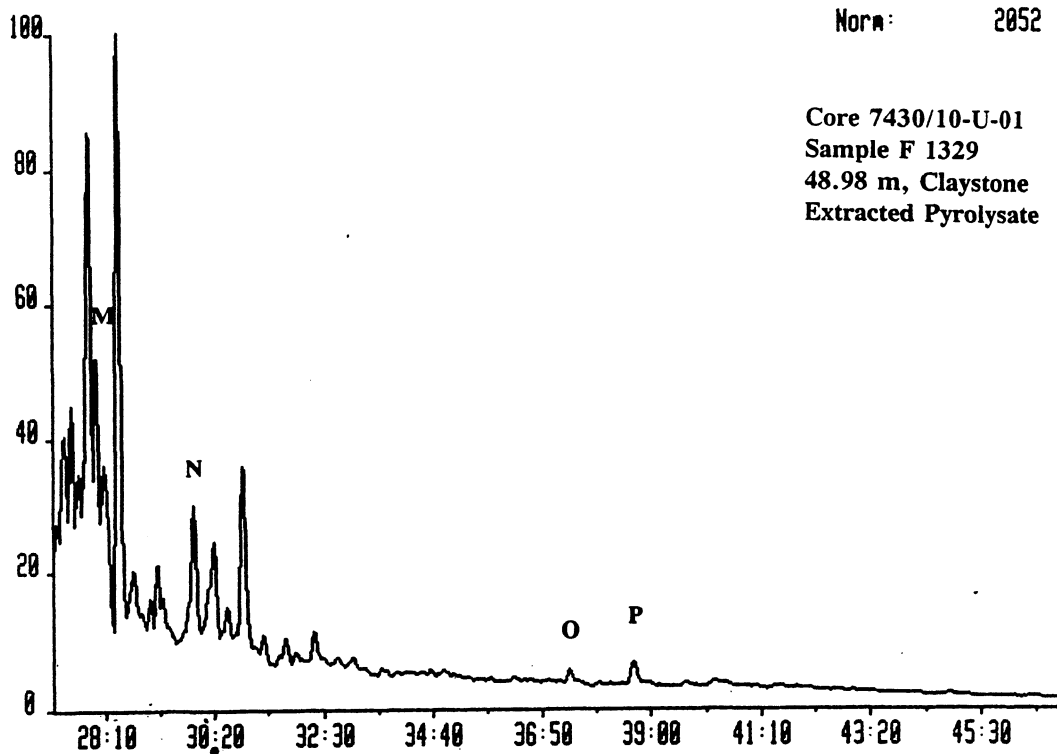


Figure A.II.13a:

F1329B1 1-FEB-89 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1329 ARO 7430/10-U-01 48.98 M CLST 1-2 MM



F1329B1 1-FEB-89 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1329 ARO 7430/10-U-01 48.98 M CLST 1-2 MM

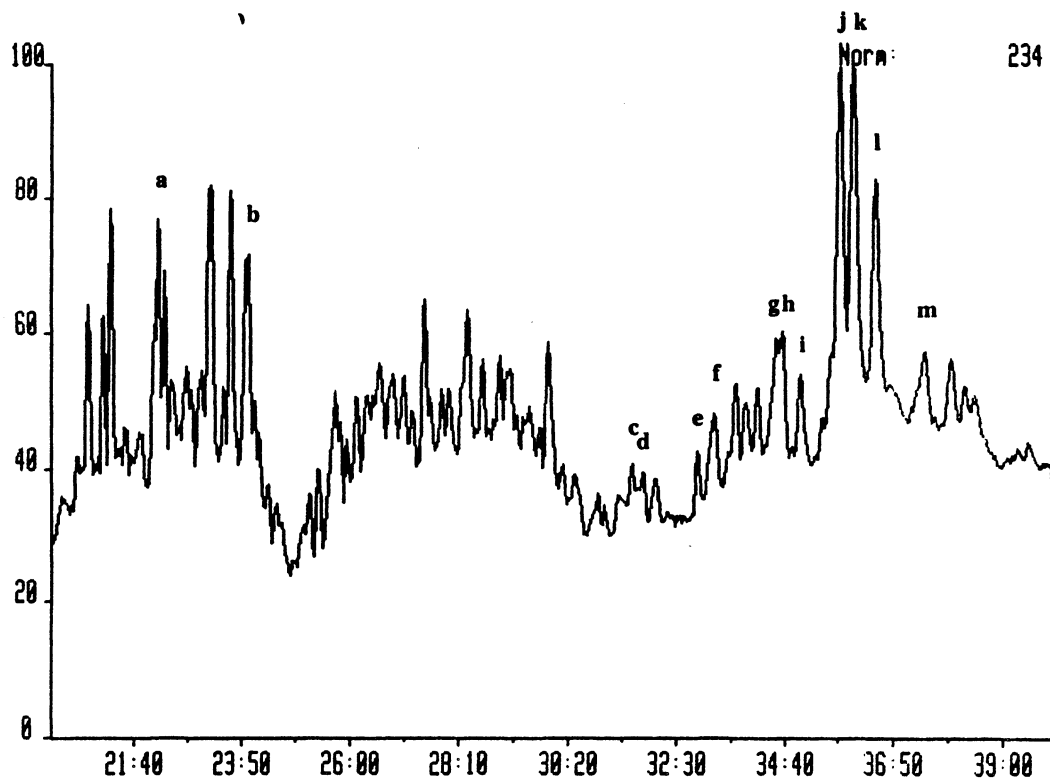
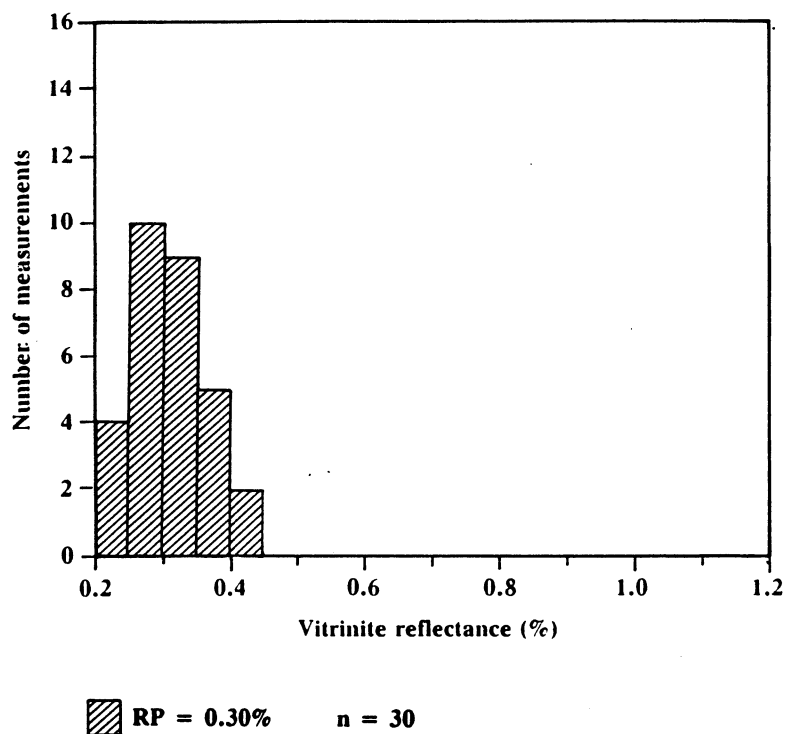


Figure A.II.13b:

Core no.: 7430/10-U-01

Sample no.: F-1329

Depth: 48.98 m



Core no.: 7430/10-U-01

Sample no.: F-1329 (Hy-Py)

Depth: 48.98 m

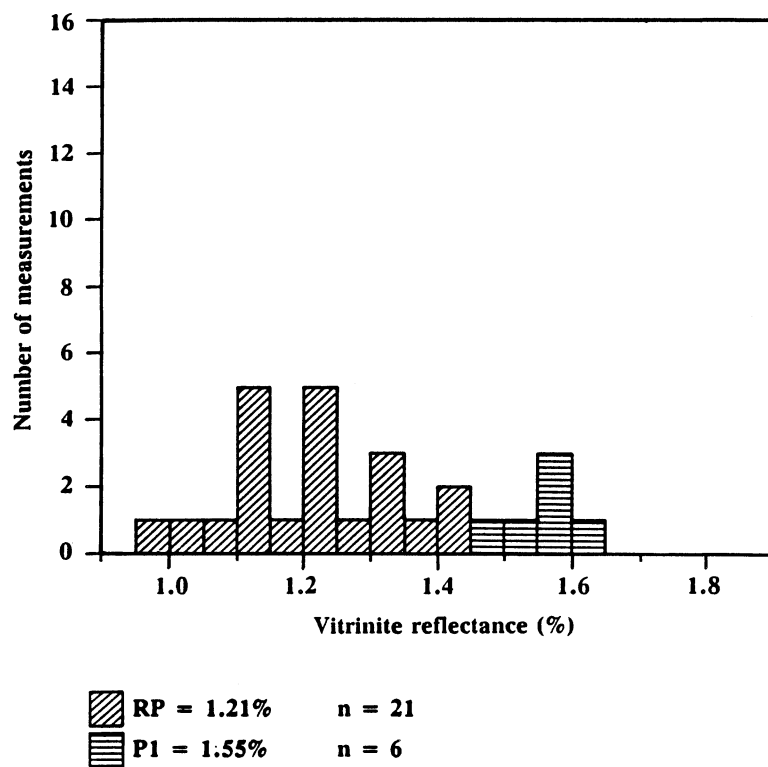


Figure A.II.14:

APPENDIX III.1: TABLE OF CONTENTS

Core 7029/03-U-01

TABLES

Table A.III.1.1a:	Concentration of C_1-C_{5+} hydrocarbons in headspace gas.
Table A.III.1.1b:	Concentration of C_1-C_{5+} hydrocarbons in occluded gas.
Table A.III.1.1c:	Concentration of C_1-C_{5+} hydrocarbons - summation.
Table A.III.1.2:	Total organic carbon content and data from Rock-Eval pyrolysis.
Table A.III.1.3:	Data from pyrolysis-gas chromatograms.
Table A.III.1.4:	Vitrinite reflectance data.
Table A.III.1.5:	Visual kerogen analysis.
Table A.III.1.6a:	Weight of EOM, asphaltenes and chromatographic fractions.
Table A.III.1.6b:	Concentration of EOM, asphaltenes and chromatographic fractions, related to rock weight.
Table A.III.1.6c:	Concentration of EOM, asphaltenes and chromatographic fractions, related to TOC weight.
Table A.III.1.6d:	Composition of material extracted from the rock.
Table A.III.1.7:	Tabulation of data from the gas chromatograms.
Table A.III.1.8a:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity characteristic ratios.
Table A.III.1.8b:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity and source characteristic ratios.
Table A.III.1.9:	Molecular ratios from aromatic sterane mass fragmentograms.
Table A.III.1.10:	Carbon isotope ratios of EOM and chromatographic fractions.

FIGURES

Figure A.III.1.1:	Pyrolysis-gas chromatograms (S2 peak)
Figure A.III.1.2:	Gas chromatograms of saturated and aromatic hydrocarbons.
Figure A.III.1.3:	Mass fragmentograms of m/z 191, 205 (terpanes) and m/z 217, 218 (steranes).

Figure A.III.1.4: Internal distribution of $14\alpha(H)$, $17\alpha(H)$ 20R, C_{27} , C_{28} and C_{29} regular steranes (from m/z 217).

Figure A.III.1.5: Mass fragmentograms of m/z 231, 253 (aromatic steroid hydrocarbons).

Figure A.III.1.6: Vitrinite reflectance histograms.

Figure A.III.1.7: Carbon isotope type curves of sediment extracts.

Project no.: 21344423
Location : 7029/03-U-01
Date : 88.10.12

Table A.III.1.1: TABLE OF GAS RESULTS

a: Headspace gas (µl gas pr. kg rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0844	90.74	1579	0	0	0	0	0	1579	0	0.0	-1.00
F0846	94.08	55646	59	0	0	0	0	55705	59	0.1	-1.00
F0852	110.38	38579	34	0	0	0	0	38613	34	0.1	-1.00
F0854	112.90	69868	60	0	0	0	0	69928	60	0.1	-1.00
F0857	116.06	30645	18	0	0	0	0	30663	18	0.1	-1.00
F0875	125.71	37780	20	0	0	0	0	37800	20	0.1	-1.00
F0892	135.24	3947	0	0	0	0	0	3947	0	0.0	-1.00
F0893	137.99	7794	0	0	0	0	0	7794	0	0.0	-1.00
F0896	149.71	4240	0	0	0	0	0	4240	0	0.0	-1.00

b: Occluded gas (µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0844	90.74	1382	51	19	24	0	10	1476	94	6.4	-1.00
F0846	94.08	80177	582	0	0	0	0	80759	582	0.7	-1.00
F0852	110.38	53946	225	14	17	0	0	54202	256	0.5	-1.00
F0854	112.90	49573	211	24	20	2	0	49830	257	0.5	10.00
F0857	116.06	20886	93	13	13	0	0	21005	119	0.6	-1.00
F0875	125.71	9868	65	0	21	20	0	9974	106	1.1	1.05
F0892	135.24	4888	30	5	0	0	0	4923	35	0.7	-1.00
F0893	137.99	1656	25	12	3	0	0	1696	40	2.4	-1.00
F0896	149.71	719	10	5	0	0	0	734	15	2.0	-1.00

c: Summation of Headspace and Occluded gas
(µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0844	90.74	2961	51	19	24	0	10	3055	94	3.1	-1.00
F0846	94.08	135823	641	0	0	0	0	136464	641	0.5	-1.00
F0852	110.38	92525	259	14	17	0	0	92815	290	0.3	-1.00
F0854	112.90	119441	271	24	20	2	0	119758	317	0.3	10.00
F0857	116.06	51531	111	13	13	0	0	51668	137	0.3	-1.00
F0875	125.71	47648	85	0	21	20	0	47774	126	0.3	1.05
F0892	135.24	8835	30	5	0	0	0	8870	35	0.4	-1.00
F0893	137.99	9450	25	12	3	0	0	9490	40	0.4	-1.00
F0896	149.71	4959	10	5	0	0	0	4974	15	0.3	-1.00

Legend: -1 can not be determined

Project no.: 21344423
Location : 7029/03-U-01
Date : 88.11.18

Table A.III.1.2: DATA FROM ROCK EVAL PYROLYSIS

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F1233	BULK	73.11	CORE	0.00	0.15	0.20	0.72	20	27	0.15	0.00	426
F1232	BULK	73.84	CORE	0.40	54.48	7.75	70.00	77	11	54.88	0.00	426
F1234	BULK	75.03	CORE	0.02	0.11	0.21	0.96	11	21	0.13	0.15	(403)
F1235	BULK	76.70	CORE	0.00	0.15	0.19	0.39	38	48	0.15	0.00	430
F1236	BULK	77.90	CORE	-1.00	-1.00	-1.00	0.22	-1	-1	-1.00	-1.00	-1
F1237	BULK	79.41	CORE	0.02	0.20	0.05	0.21	95	23	0.22	0.09	413
F1238	BULK	85.59	CORE	-1.00	-1.00	-1.00	0.21	-1	-1	-1.00	-1.00	-1
F0844	BULK	90.74	CORE	-1.00	-1.00	-1.00	0.15	-1	-1	-1.00	-1.00	-1
F1239	BULK	92.21	CORE	0.08	0.79	0.11	1.26	62	8	0.87	0.09	(481)
F0846	BULK	94.08	CORE	0.16	7.50	2.33	30.50	24	7	7.66	0.02	433
F1244	BULK	96.95	CORE	0.21	1.73	0.45	5.95	29	7	1.94	0.10	449
F1246	BULK	100.76	CORE	0.02	0.24	0.15	0.36	66	41	0.26	0.07	(489)
F1245	BULK	100.88	CORE	0.13	5.24	1.43	22.90	22	6	5.37	0.02	437
F1249	BULK	102.78	CORE	0.00	0.06	0.81	0.27	22	300	0.06	0.00	432
F1250	BULK	105.46	CORE	0.04	0.25	0.68	1.56	16	43	0.29	0.13	(482)
F1251	BULK	106.92	CORE	0.00	0.11	0.64	0.68	16	94	0.11	0.00	(402)
F1252	BULK	108.09	CORE	0.03	0.59	0.87	3.99	14	21	0.62	0.04	426
F0851	BULK	108.36	CORE	0.02	0.48	0.93	3.99	12	23	0.50	0.04	431
F1253	BULK	109.86	CORE	0.09	2.76	1.22	10.70	25	11	2.85	0.03	428
F0852	BULK	110.38	CORE	0.04	1.90	0.91	9.11	20	9	1.94	0.02	432
F1254	BULK	110.82	CORE	0.07	2.70	1.63	13.80	19	11	2.77	0.02	430
F0853	BULK	112.40	CORE	0.07	3.44	1.65	13.60	25	12	3.51	0.01	431
F0854	BULK	112.90	CORE	0.00	2.31	1.50	10.80	21	13	2.31	0.00	432
F1256	BULK	113.45	CORE	0.00	0.22	0.81	1.90	11	42	0.22	0.00	(481)
F0856	BULK	114.44	CORE	0.03	1.00	0.73	5.48	18	13	1.03	0.02	431
F0858	BULK	115.04	CORE	0.02	0.74	0.70	4.28	17	16	0.76	0.02	428
F0857	BULK	116.06	CORE	0.00	1.18	0.84	4.64	25	18	1.18	0.00	428
F0971	BULK	116.50	CORE	0.02	1.35	1.20	5.05	26	23	1.37	0.01	428
F0860	BULK	117.29	CORE	0.03	0.90	0.89	4.17	21	21	0.93	0.03	430
F0972	BULK	117.76	CORE	0.01	0.98	0.83	4.31	22	19	0.99	0.01	423
F0861	BULK	118.41	CORE	0.01	0.68	1.04	3.54	19	29	0.69	0.01	428
F0973	BULK	119.06	CORE	0.00	0.84	0.84	4.17	20	20	0.84	0.00	428
F0864	BULK	119.66	CORE	0.02	0.47	0.91	3.20	14	28	0.49	0.04	426
F0974	BULK	119.98	CORE	0.01	0.63	0.80	3.61	17	22	0.64	0.01	426
F0865	BULK	120.46	CORE	0.03	0.83	0.90	3.92	21	22	0.86	0.03	428
F0866	BULK	121.51	CORE	0.05	0.62	0.89	4.07	15	21	0.67	0.07	427
F0977	BULK	122.00	CORE	0.02	0.46	1.18	2.78	16	42	0.48	0.04	425
F0867	BULK	122.45	CORE	0.04	0.70	0.80	4.05	17	19	0.74	0.05	428
F0869	BULK	123.71	CORE	0.02	0.34	0.68	2.74	12	24	0.36	0.05	426
F0870	BULK	124.36	CORE	0.02	0.48	0.43	3.13	15	13	0.50	0.04	424
F0872	BULK	124.76	CORE	0.03	0.57	0.46	3.83	14	12	0.60	0.05	424
F0873	BULK	125.43	CORE	0.03	0.36	0.59	2.71	13	21	0.39	0.07	420
F0875	BULK	125.71	CORE	0.00	0.50	0.68	4.05	12	16	0.50	0.00	421
F0877	BULK	126.44	CORE	0.02	0.39	0.43	2.76	14	15	0.41	0.04	418
F0878	BULK	127.06	CORE	0.04	0.28	0.27	1.53	18	17	0.32	0.12	417

Project no.: 21344423
Location : 7029/03-U-01
Date : 88.11.18

Table A.III.1.2 (cont'd):

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	S1 (mg/g rock)	S2 (mg/g rock)	S3 (mg/g rock)	TOC (%)	HYDR. INDEX (mg/g TOC)	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax (°C)
F0879	BULK	127.56	CORE	0.01	0.10	0.43	0.70	14	61	0.11	0.09	422
F0880	BULK	128.11	CORE	0.03	0.36	0.10	2.02	17	4	0.39	0.07	419
F0881	BULK	128.86	CORE	0.01	0.28	0.54	1.41	19	38	0.29	0.03	423
F0883	BULK	129.21	CORE	0.03	0.49	0.49	1.66	29	29	0.52	0.05	422
F0884	BULK	129.49	CORE	0.03	0.53	0.20	1.69	31	11	0.56	0.05	422
F0885	BULK	129.86	CORE	0.02	0.41	0.37	1.78	23	20	0.43	0.04	426
F0887	BULK	130.36	CORE	0.04	0.75	0.10	1.93	38	5	0.79	0.05	420
F1260	BULK	133.39	CORE	0.00	0.61	0.71	2.78	21	25	0.61	0.00	419
F0892	BULK	135.24	CORE	0.00	0.09	0.31	0.36	25	86	0.09	0.00	427
F0891	BULK	136.29	CORE	0.00	0.07	0.64	0.10	70	640	0.07	0.00	417
F0893	BULK	137.99	CORE	-1.00	-1.00	-1.00	0.10	-1	-1	-1.00	-1.00	-1
F1262	BULK	138.61	CORE	-1.00	-1.00	-1.00	0.09	-1	-1	-1.00	-1.00	-1
F0894	BULK	138.98	CORE	-1.00	-1.00	-1.00	0.09	-1	-1	-1.00	-1.00	-1
F0896	BULK	149.71	CORE	-1.00	-1.00	-1.00	0.08	-1	-1	-1.00	-1.00	-1
F0898	BULK	154.11	CORE	-1.00	-1.00	-1.00	0.09	-1	-1	-1.00	-1.00	-1

Legend:

-1 : Not determined or no data available

() : Tmax values of doubtful reliability (usually associated with poor S2 peaks)

Table A.III.1.3: Data from pyrolysis-gas chromatograms

Core 7029/03-U-01

IKU NO	DEPTH (m)	SAMPLE TYPE	LITHOLOGY	C1	C2-C6 percent of peak area	C6-C14	C15+
F1232	73.84	Core	Coal	39.6	32.5	26.6	1.3
F0853	112.40	Core	Siltstone	27.1	17.9	41.2	13.8
F0856	114.44	Core	Siltstone	17.6	28.9	41.2	12.3
F0866	121.51	Core	Claystone	31.6	56.5	11.8	0.0

Core-site Number: 7029/03-U-01
Reference number: 21.3444.23
(1/1)

Table A.III.1.4: VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
F- 836	-----	73.86	0.33 (25)	G	0.06	3
F- 926	-----	106.40	0.46 (30)	FR?	0.04	---
F- 971	-----	116.50	0.49 (19)	F	0.09	---
			0.85 (5)	R	0.11	
F- 862	-----	118.46	0.47 (14)	P	0.09	---
			0.76 (6)	R	0.07	
F-1258	-----	124.26	0.46 (12)	P	0.11	---
			0.83 (10)	R	0.07	

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor;
I = Inertinite. L = Liptinite or poor vitrinite particle.
R = Reworked material/inertinite.

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.1.5
CORE NO.: 7029/03-U-01

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index * NEW TAI	Remarks
F-835 **	73.27 _{si}	Am: <5 Lm: 80-90 W: 10 C: <5	F-M	Good	?	Liptinitic fraction dominated by spores.
F-901	73.53	Lm: x5 W: 20-30 C: 70-80	F-M-L	Good	5	Dominated by coaly fragments and dark woody material.
F-837	74.06 _{to}	Am: 30 Lm: <5 W: 30 C: 30-40	F-M	Fair-good	4-5	Amorphous matter is dominated by medium-sized grey clusters.
F-838 ***	78.36	Lm: <5 W: 15 C: 80-85	F-M	Good	5	Dominated by coaly fragments. The liptinitic fraction is dominated by spores.

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

*** Sieved sample was used in addition, as the total kerogen slide was dominated by minerals and therefore unsuitable for kerogen description.

** Sieved sample (>15 µm) examined as total kerogen slide not available.

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.1.5 (ctd)
CORE NO.: 7029/03-U-01

Sample	Depth (m)	Compo- sition of residue	Particle size	Preser- vation palyno- morphs	Thermal maturation index * NEW TAI	Remarks
F-1369 **	108.15	Lm: 10 W: 20 C: 70	F-M	Bad	4-5	Same as 108.23 m.
F-850	108.23	Lm: 5 W: 25 C: 70	F-M	Bad	4-5	Dominated by coaly fragments.
F-855	111.2	Lm: 10 W: 40 C: 40	F-M-L	Bad-Good	4-5	Same as 116.2 m.
F-1370 **	116.20	Lm: 10-15 W: 35-40 C: 40	F-M-L	Good	4-5	Dominated by coaly fragments and dark woody material. The liptinitic fraction is dominated by spores.

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)
** sieved sample (>15 µm) examined as total kerogen slide not available

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.1.5 (ctd)
CORE NO.: 7029/03-U-01

Sample	Depth (m)	Compo- sition of residue	Particle size	Preser- vation palyno- morphs	Thermal maturation index * NEW TAI	Remarks
F-863	118.58	Lm: 10 W: 20 C: 70	F-M	Good	4-5	Dominated by coaly fragments. The liptinitic fraction is dominated by spores.
F-1378	121.00	Lm: 10 W: 35 C: 55	F-M	Good	4-5	Same as sample 125.21 m.
F-1371 **	123.86	Am: 70 Lm: 10 W: 10 C: 10	F-M	Fair	5	Dominated by grey-yellow degraded (amorphous) matter, rich in pyrite. Only 1-2% show fluorescence. The liptinitic fraction is dominated by fungal remains.
F-876	125.21	Lm: 10 W: 35 C: 55	F-M	Fair-good	5	Dominated by coaly fragments and dark woody material.

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)
 ** sieved sample (>15 µm) examined as total kerogen slide not available

Project no.: 21344423
 Location : 7029/03-U-01
 Date : 89.02.04

- 68 -



Table A.III.1.6a: WEIGHT OF CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ROCK EXTR. (g)	EOM (mg)	ASPH (mg)	SAT HC (mg)	ARO HC (mg)	POLAR COMP. (mg)	HC (mg)	NONHC (mg)	TOC (%)
F1232	BULK	73.84	CORE	4.0	51.1	35.8	1.5	5.8	7.2	7.3	43.8	70.00
F0853	BULK	112.40	CORE	16.1	14.3	9.9	1.2	1.4	2.3	2.6	11.7	13.60
F0856	BULK	114.44	CORE	19.1	5.5	4.5	1.1	1.2	1.1	2.3	3.2	5.48
F0866	BULK	121.51	CORE	20.9	7.3	4.7	1.2	1.0	1.4	2.2	5.1	4.07
F0957	BULK	134.70	CORE	32.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.36

Legend:

- * - Not all the available EOM was used for MPLC.
- ? - MPLC results assumed more EOM than originally extracted.
- 1- No data available.

Table A.III.1.6b: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F1232	BULK	73.84	CORE	12837	8994	367	1468	1804	1835	11002
F0853	BULK	112.40	CORE	888	615	75	90	142	165	723
F0856	BULK	114.44	CORE	289	236	57	63	57	120	169
F0866	BULK	121.51	CORE	350	225	58	46	69	104	246
F0957	BULK	134.70	CORE	0	0	0	0	0	0	0

Legend:

- 1- No data available.

Project no.: 21344423
 Location : 7029/03-U-01
 Date : 89.02.04

- 69 -

Table A.III.1.6c: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS
 (mg/g TOC)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F1232	BULK	73.84	CORE	18.3	12.8	0.5	2.1	2.6	2.6	15.7
F0853	BULK	112.40	CORE	6.5	4.5	0.5	0.7	1.0	1.2	5.3
F0856	BULK	114.44	CORE	5.3	4.3	1.0	1.1	1.0	2.1	3.2
F0866	BULK	121.51	CORE	8.6	5.5	1.4	1.1	1.7	2.5	6.1
F0957	BULK	134.70	CORE	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Legend:

-1- No data available.

Table A.III.1.6d: COMPOSITION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ASPH ----- EOM (%)	SAT ----- EOM (%)	ARO ----- EOM (%)	HC ----- EOM (%)	POLAR ----- EOM (%)	SAT ----- ARO x 100	HC ----- NONHC x 100
F1232	BULK	73.84	CORE	70.1	2.9	11.4	14.3	14.1	25.0	16.7
F0853	BULK	112.40	CORE	69.2	8.4	10.1	18.5	16.0	83.3	22.7
F0856	BULK	114.44	CORE	81.8	19.7	21.8	41.5	19.7	90.0	70.9
F0866	BULK	121.51	CORE	64.4	16.5	13.2	29.7	19.8	125.0	42.1
F0957	BULK	134.70	CORE	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Legend:

-1- No data available.

Project no.: 21344423
 Location : 7029/03-U-01
 Date : 89.02.05

Table A.III.1.7:

RATIOS DERIVED FROM GAS CHROMATOGRAMS OF SATURATED HYDROCARBONS

IKUNO	FRAC NAME	DEPTH	Pri	Pri	Phy	A	n-C17	n-C31	CPI 1	CPI 2
			Phy	A= n-C17	B= n-C18	B	n-C27	n-C19		
F1232	BULK	73.84	2.4	0.9	0.4	2.4	0.3	0.5	2.1	2.9
F0853	BULK	112.40	0.9	1.1	0.7	1.7	0.3	0.7	1.3	1.5
F0856	BULK	114.44	0.9	0.7	0.6	1.3	0.8	0.4	1.6	1.6
F0866	BULK	121.51	1.1	1.2	0.8	1.6	0.3	1.2	1.4	1.5

-1 = No data available

Table A.III.1.8a:

Molecular ratios from sterane and terpane mass chromatograms.
Maturity ratios.

Core 7029/03-U-01

IKU no.	Depth (m)	$\alpha\beta/\alpha\beta+\beta\alpha^{1)}$	%22S ²⁾	% $\beta\beta^{3)}$	%20S ⁴⁾
F1232	73.84	0.44	12	62	4
F0856	114.44	0.44	20	64	6
F0866	121.51	0.55	26	59	5

1) $E/(E+F)$ in m/z 191.

2) Average % distribution between first and second eluting isomers of extended hopanes.

3) $100 * 2(r+s)/(q+t+2(r+s))$ in m/z 217.

4) $100 * q/(q+t)$ in m/z 217.

Table A.III.1.8b:

Molecular ratios from terpane and sterane mass chromatograms.
Maturity and source characteristic ratios.

Core 7029/03-U-01

IKU no.	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
F1232	73.84	0.06	6.00	0.11	0.00	0.64
F0856	114.44	0.10	67.00	0.04	0.00	0.50
F0866	121.51	0.12	58.00	0.00	0.00	0.37

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191).

2) B/A in m/z 191.

3) Relative abundance of unknown (X/E in m/z 191).

4) Relative abundance of bisnorhopane (Z/E in m/z 191).

5) Relative abundance of C₂₇ rearranged steranes (a/(a+j) in m/z 217).

Table A.III.1.9: Molecular ratios from mass fragmentograms of aromatic steroid hydrocarbons.

Core 7029/03-U-01

IKUNO	Depth m	Cracking ratios			Aromatisation ratios	
		20/20+27	20/20+28	21/21+28	27t/27t+28m	28t/28t+29m
		tri	tri	mono		
		1)	2)	3)	4)	5)
F1232	73.84	0.32	0.68	0.13	0.11	0.04
F0853	112.40	0.51	0.26	0.17	0.05	0.09
F0856	114.44	0.62	0.40	0.18	0.04	0.07

- 1) $M/(M+P)$ in m/z 231
- 2) $M/(M+S)$ in m/z 231
- 3) $a/(a+h)$ in m/z 253
- 4) $P/(P+h)$ in m/z 231 and m/z 253
- 5) $S/(S+m+(k*S/(S+R)))$ in m/z 231 and m/z 253

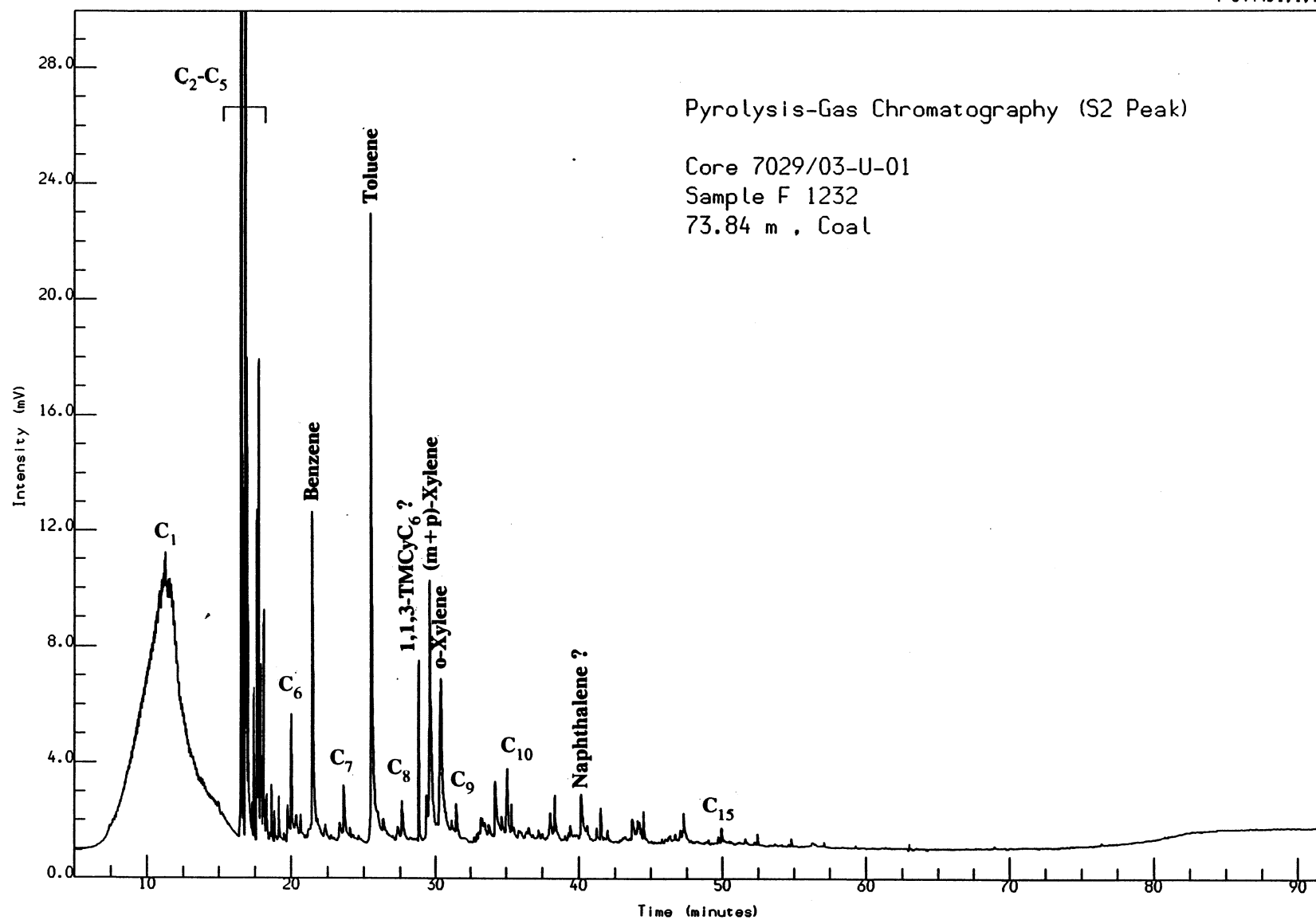
Table A.III.1.10: Carbon isotope ratios for EOM and extract fractions

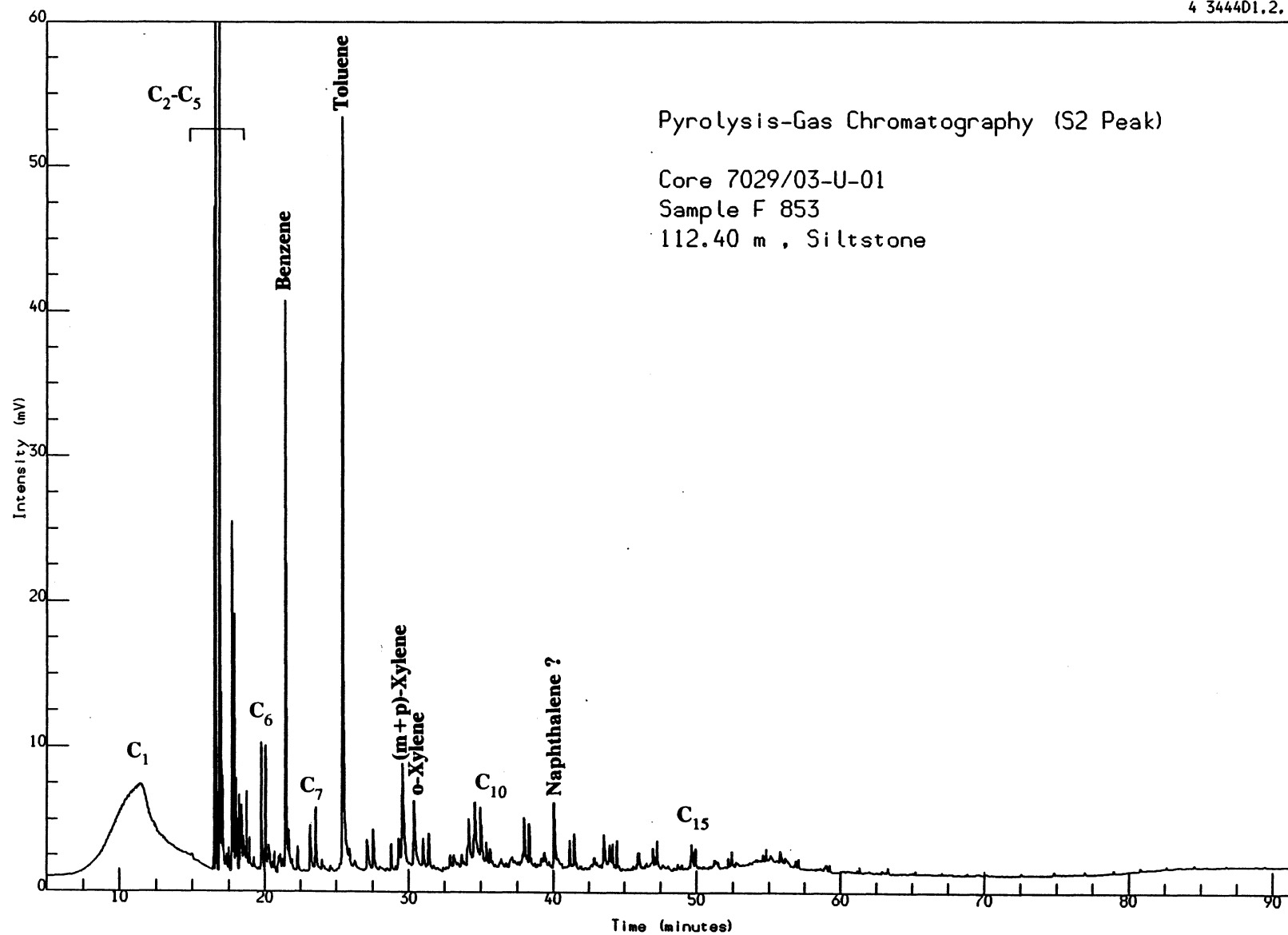
Core 7029/03-U-01

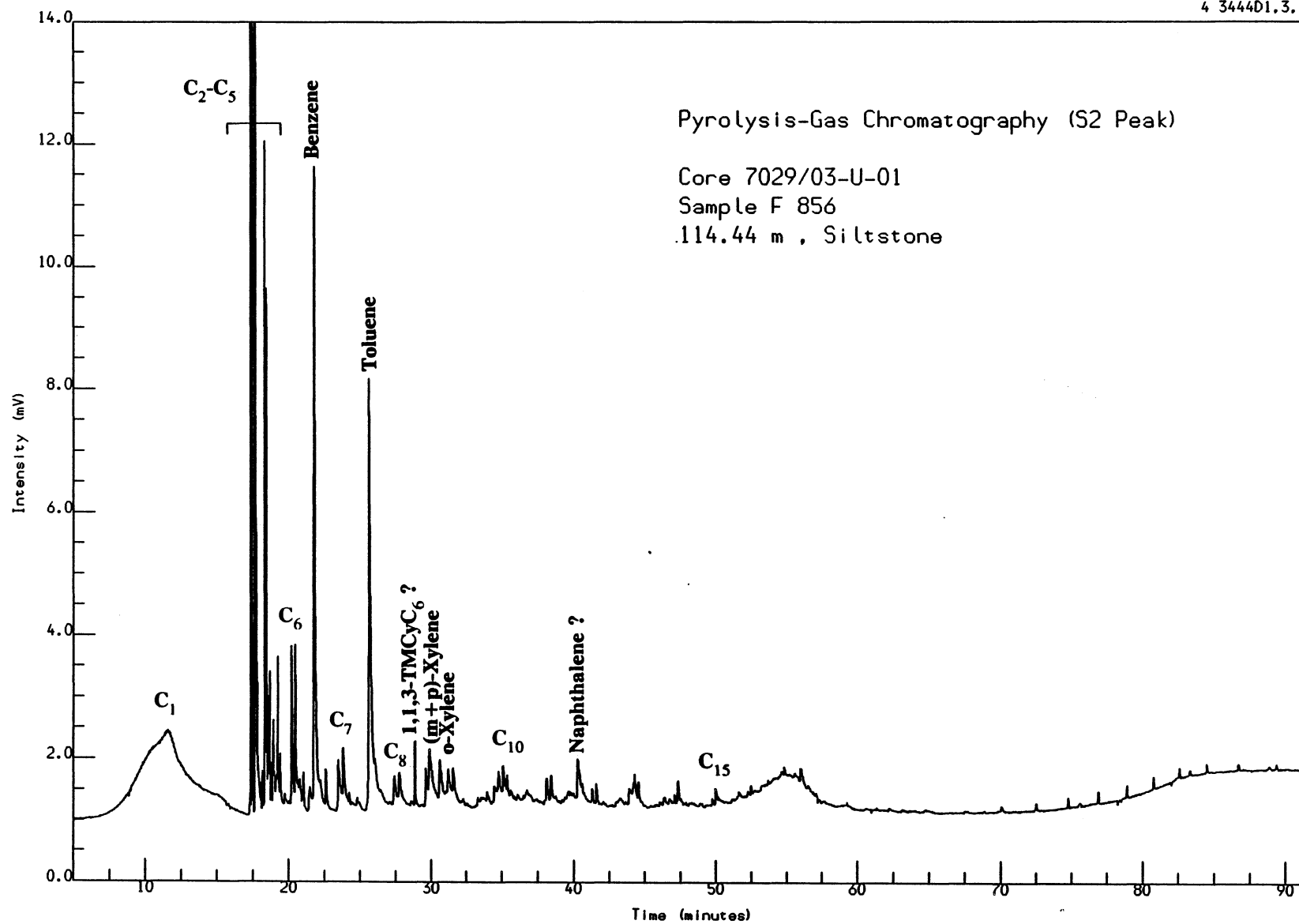
IKU no.	Depth (m)	SAT	d13C (0/00 PDB)			
			ARO	Polars	Asph.	EOM
F1232	73.84	-29.81	-26.65	-26.17	-24.14	-25.88

Figure A.III.1.1:

Pyrolysis-gas chromatograms (S2 peak)







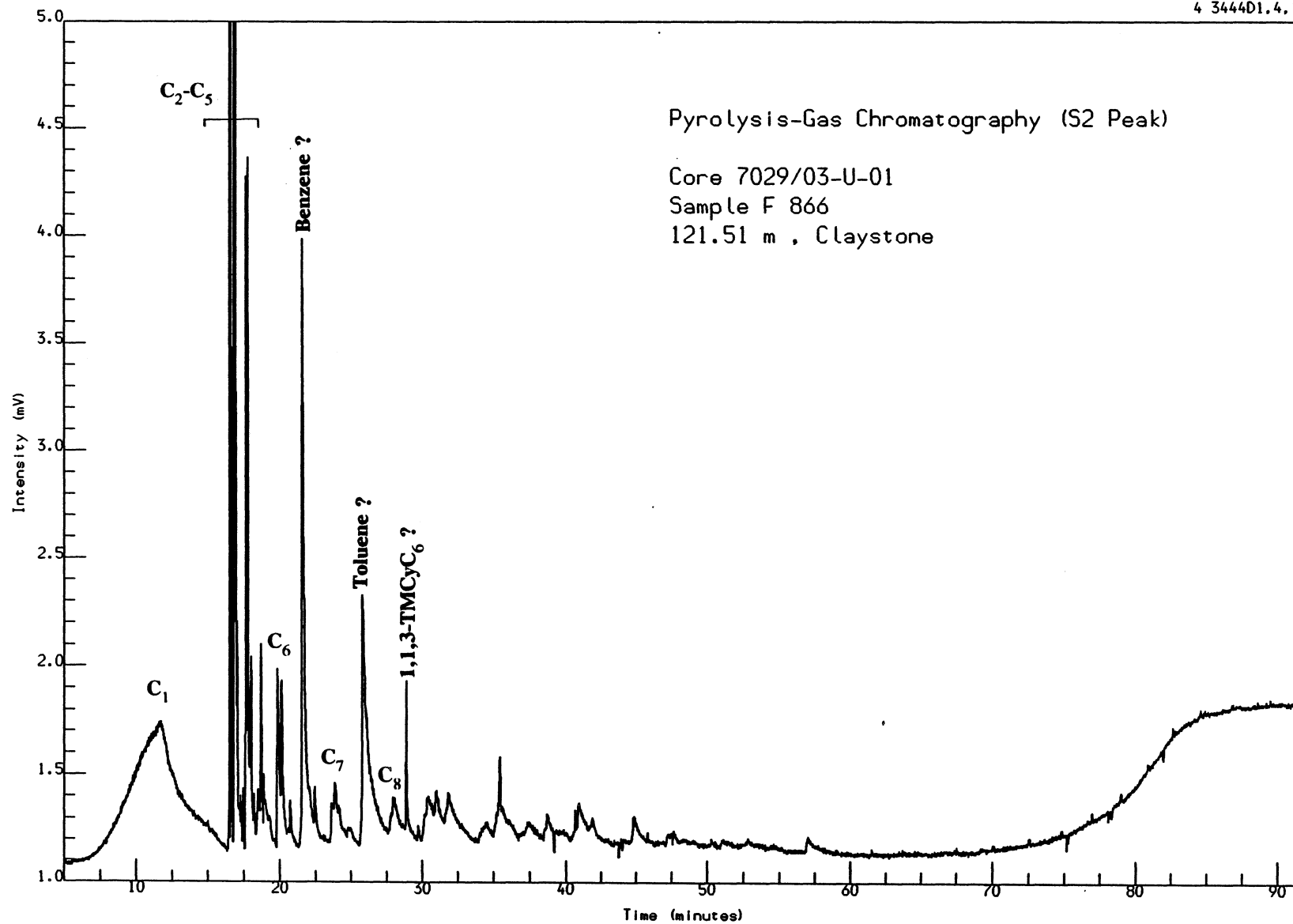
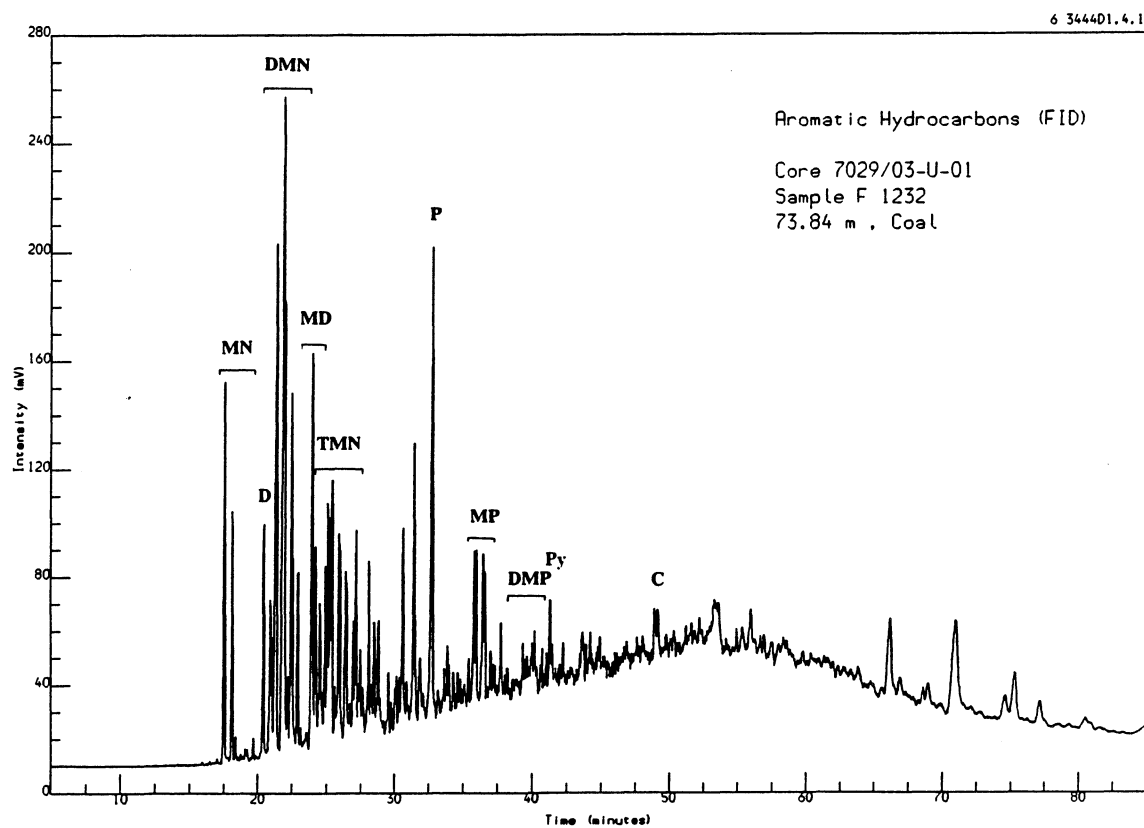
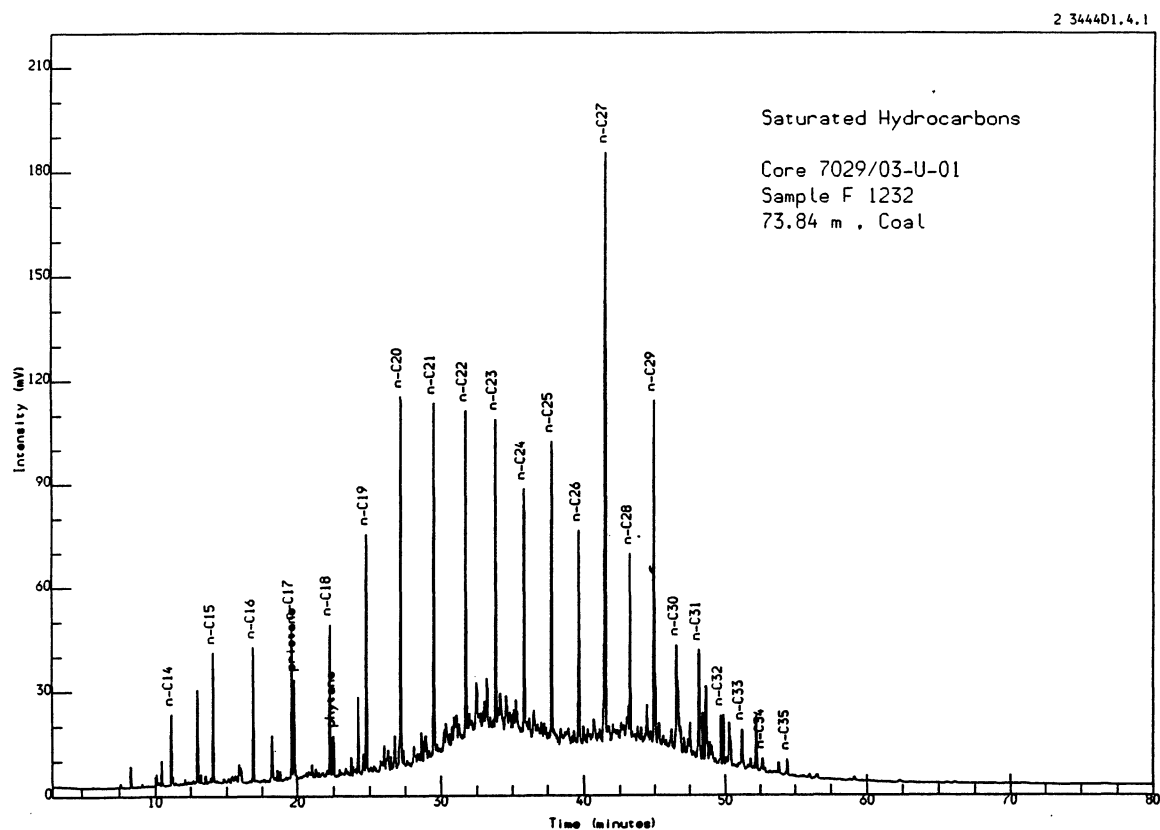


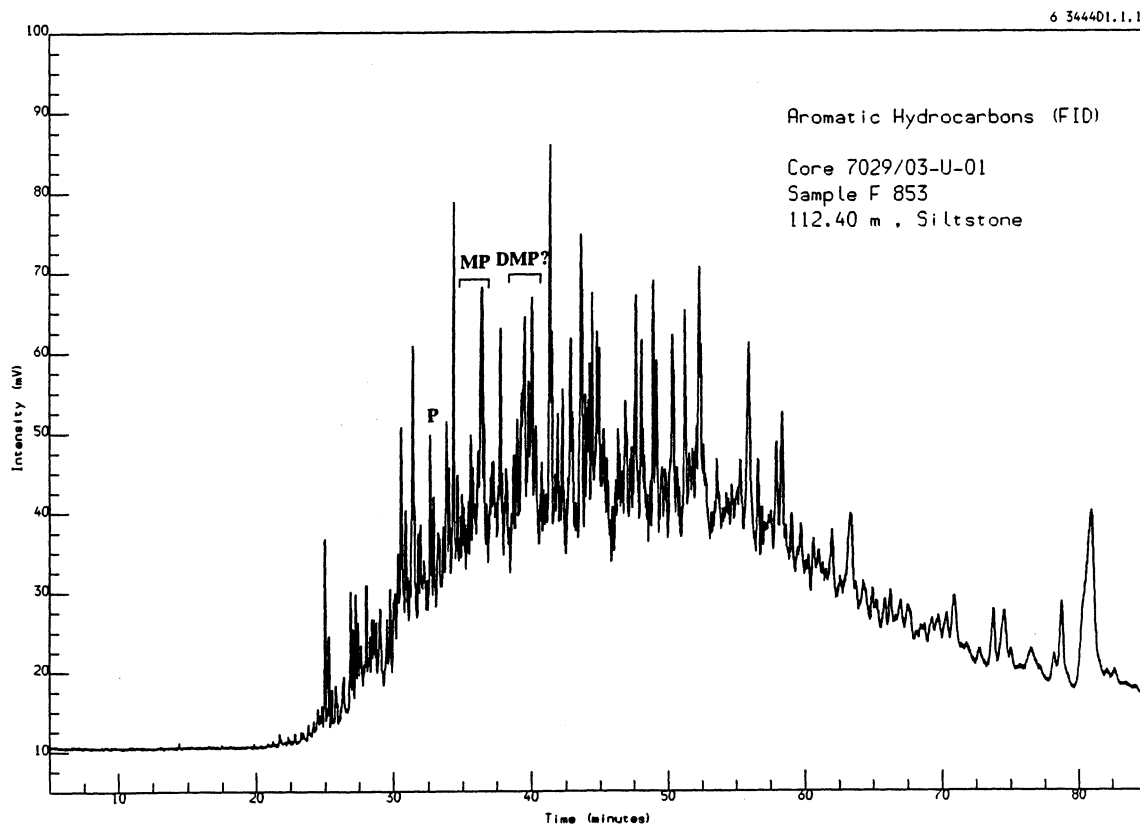
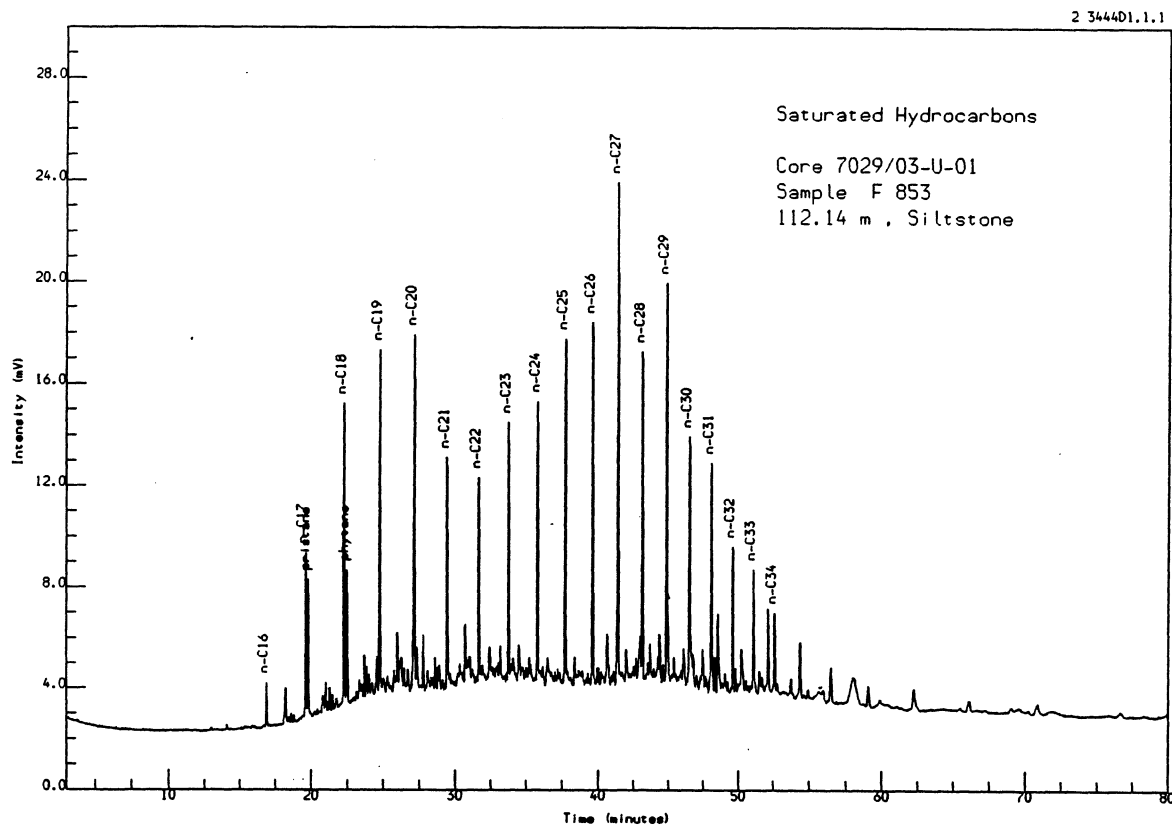
Figure A.III.1.2:

Gas chromatograms of saturated and aromatic hydrocarbons

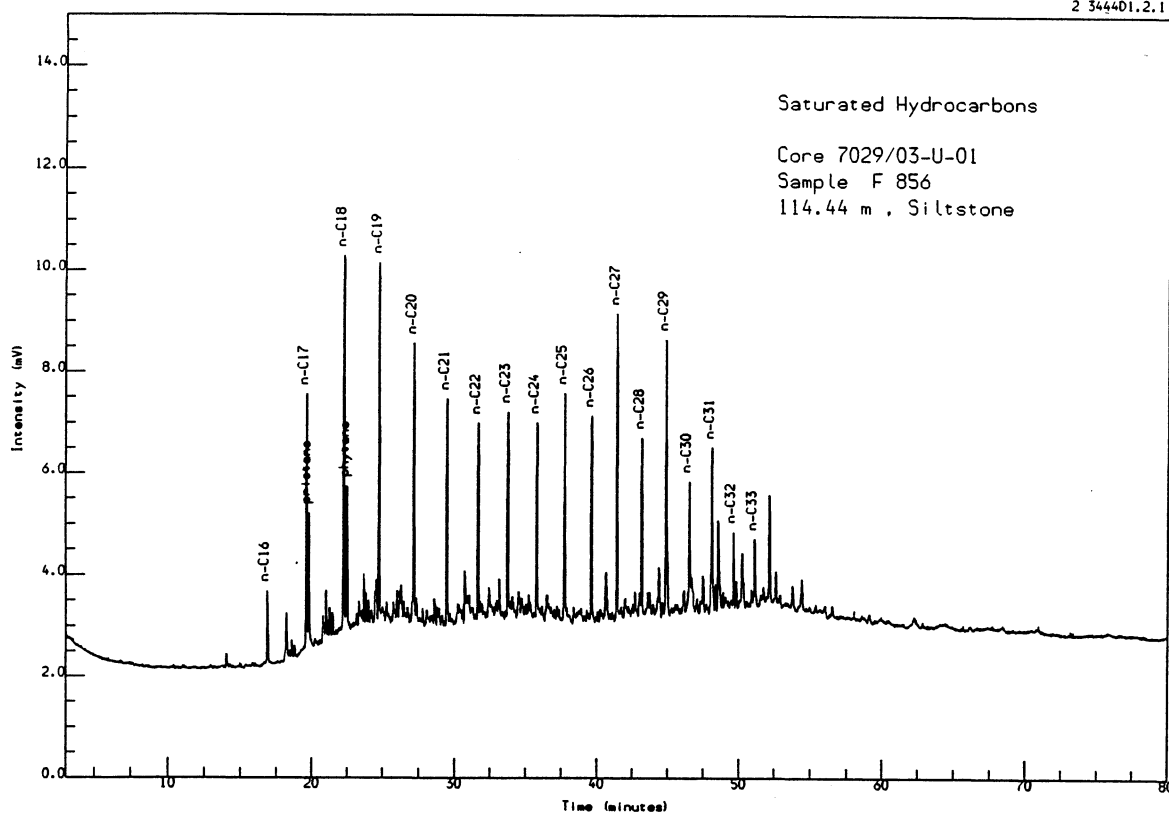
n-C₁₅ etc. - n-alkanes

N	- Naphthalene
MN	- Methylnaphthalenes
DMN	- Dimethylnaphthalenes
TMN	- C ₃ -naphthalenes
P	- Phenanthrene
PN	- Methylphenanthrenes
DMP	- Dimethylphenanthrenes

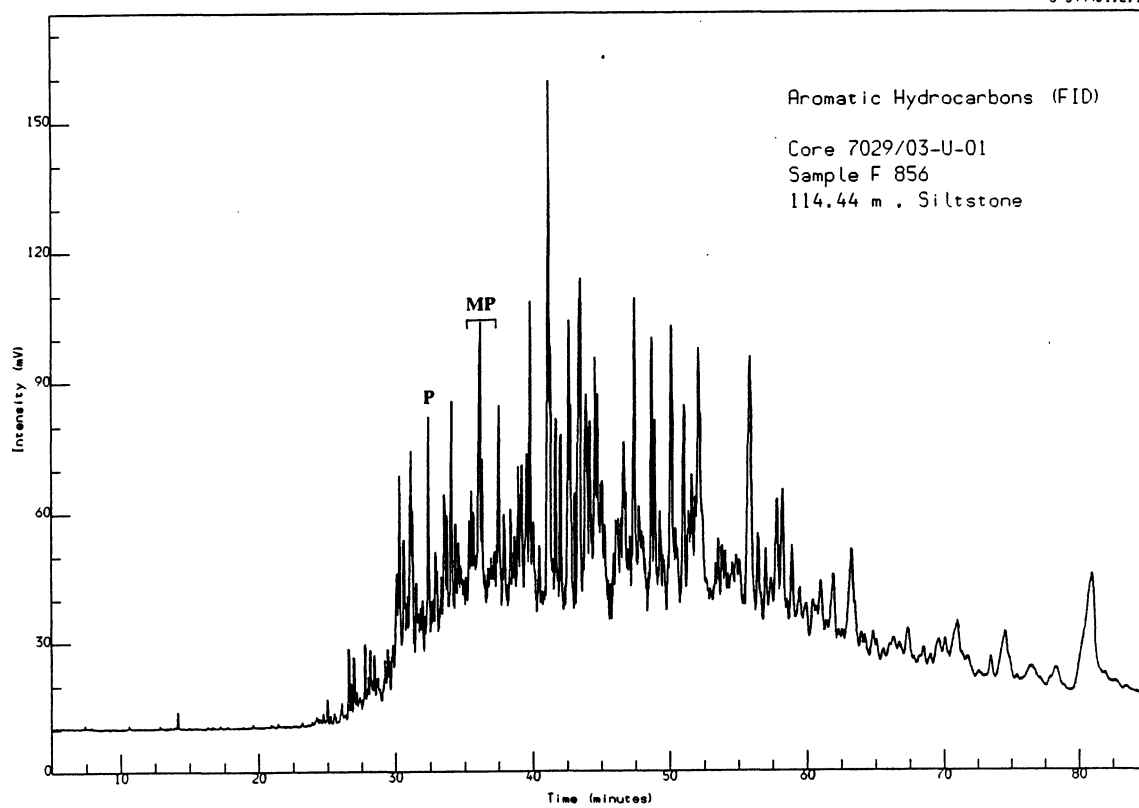




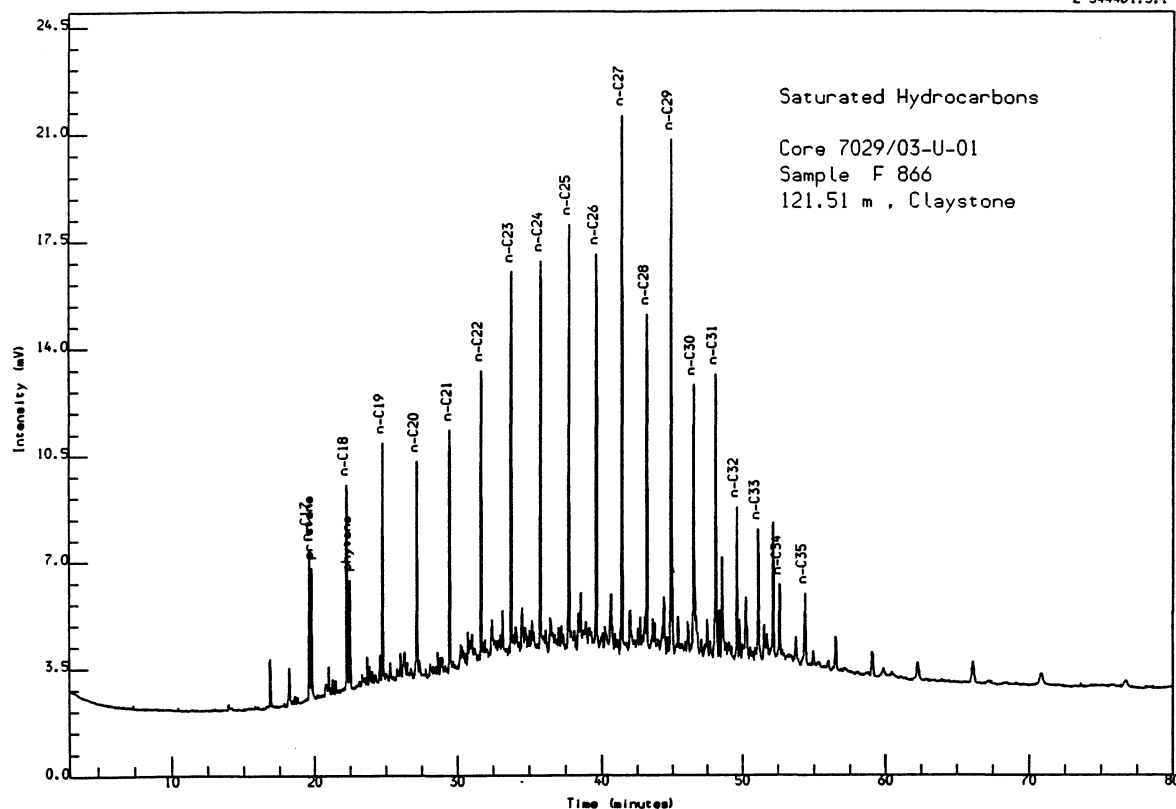
2 344401.2.1



6 344401.2.1



2 344401.3.1



6 344401.3.1

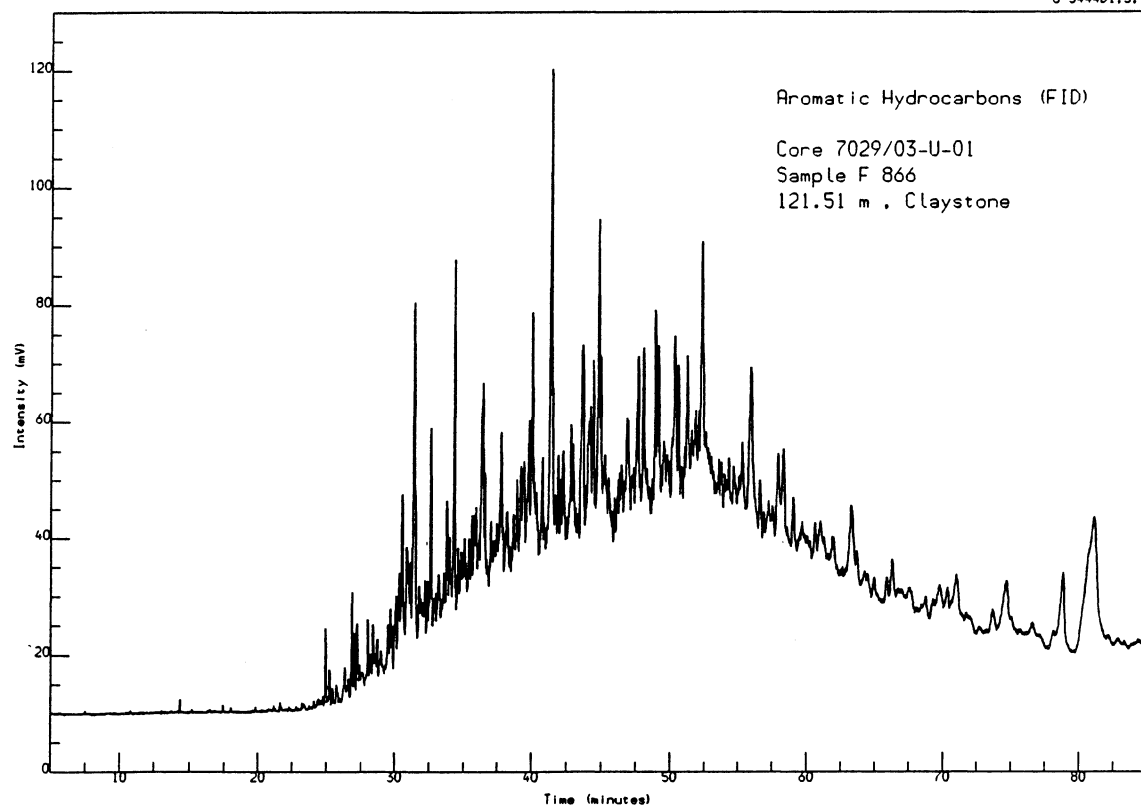
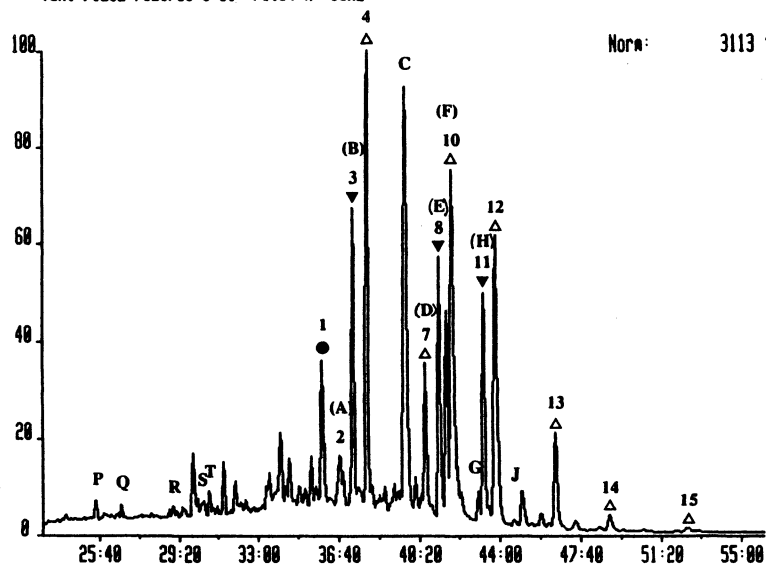


Figure A.III.1.3:

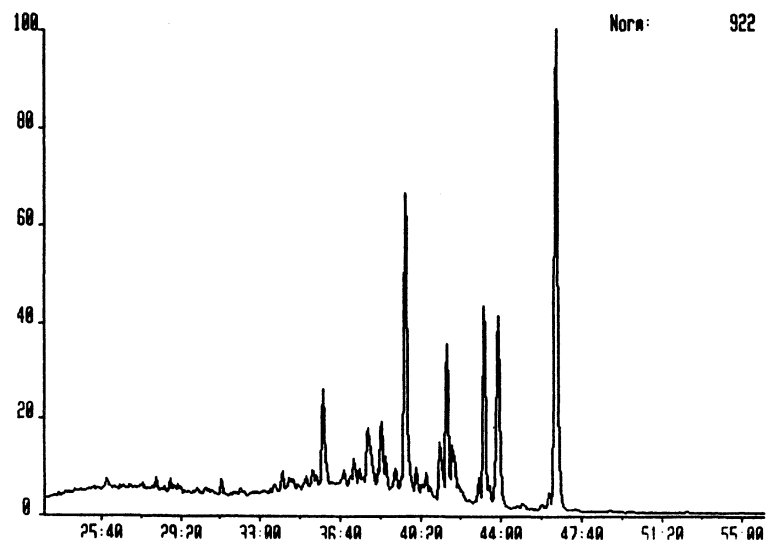
**Mass fragmentograms of m/z 191, 205 (terpanes)
and m/z 217, 218 (steranes).**

For peak identification see Chapter 4.

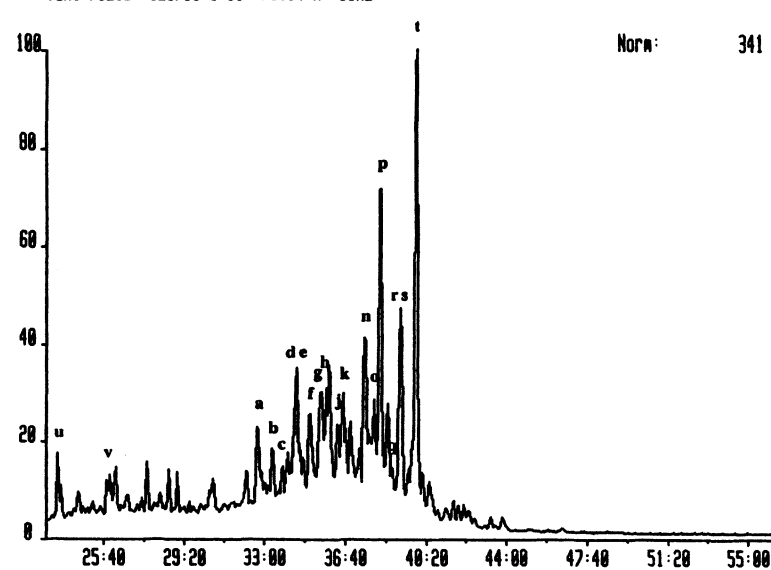
F1232 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F1232 7029/03-U-01 73.04 M CORAL



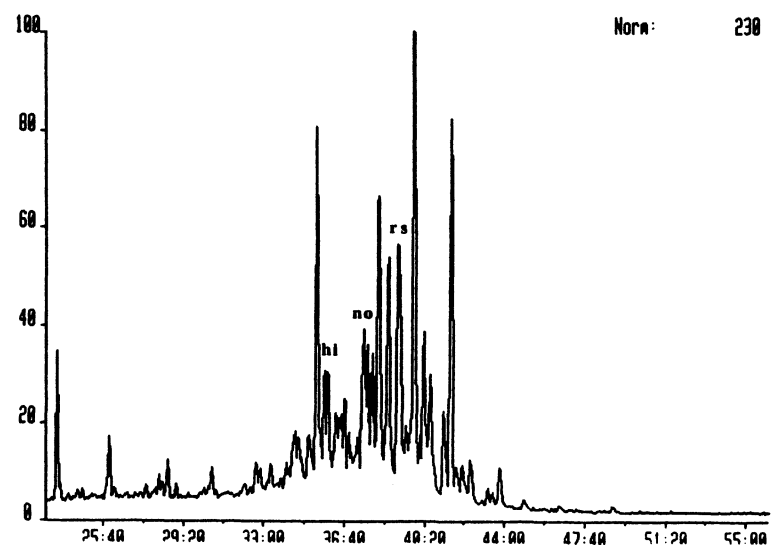
F1232 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F1232 7029/03-U-01 73.04 M CORAL



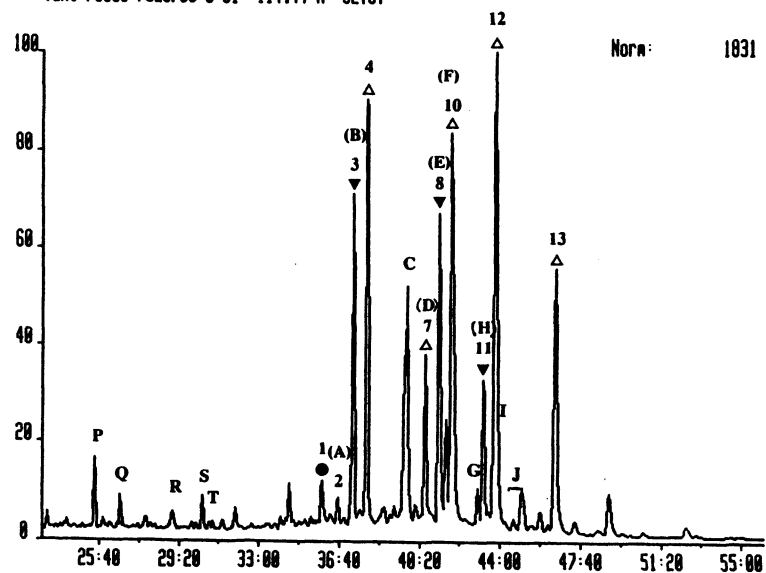
F1232 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F1232 7029/03-U-01 73.04 M CORAL



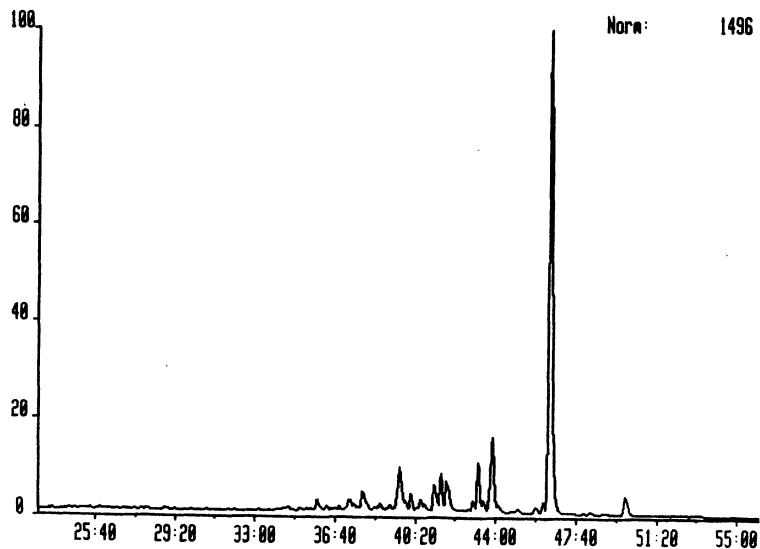
F1232 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F1232 7029/03-U-01 73.04 M CORAL



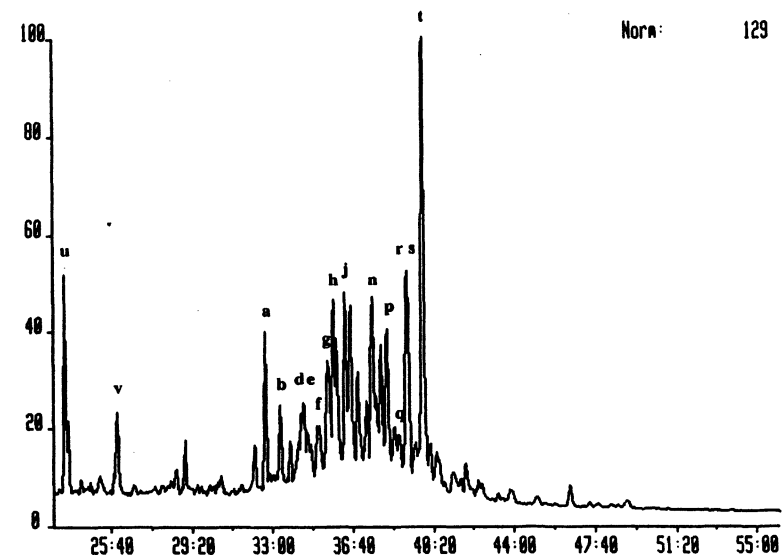
F0856 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0856 7029/03-U-01 114.44 M SLTST



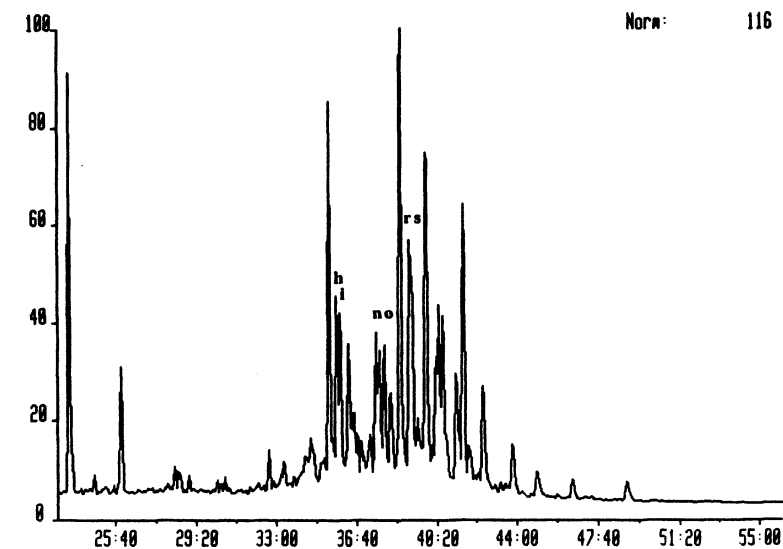
F0856 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0856 7029/03-U-01 114.44 M SLTST



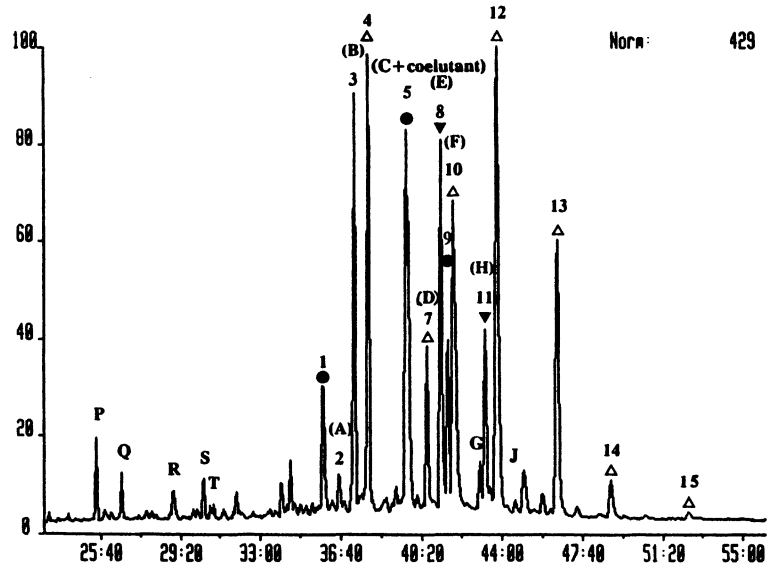
F0856 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0856 7029/03-U-01 114.44 M SLTST



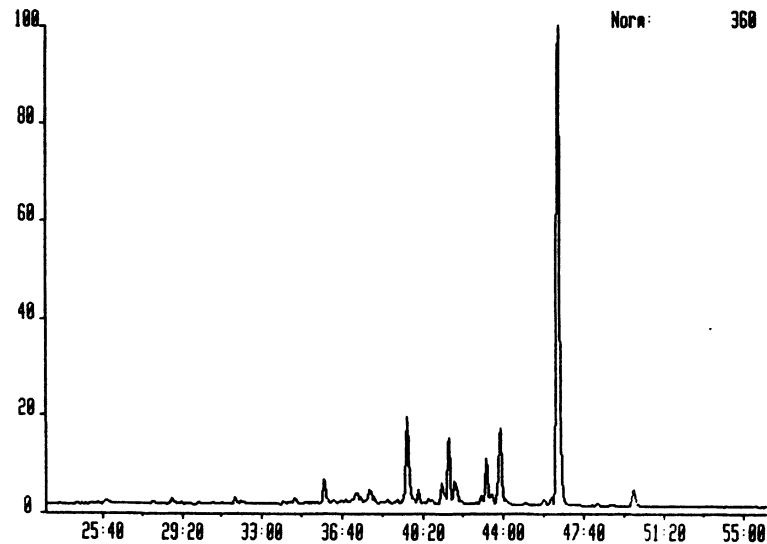
F0856 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0856 7029/03-U-01 114.44 M SLTST



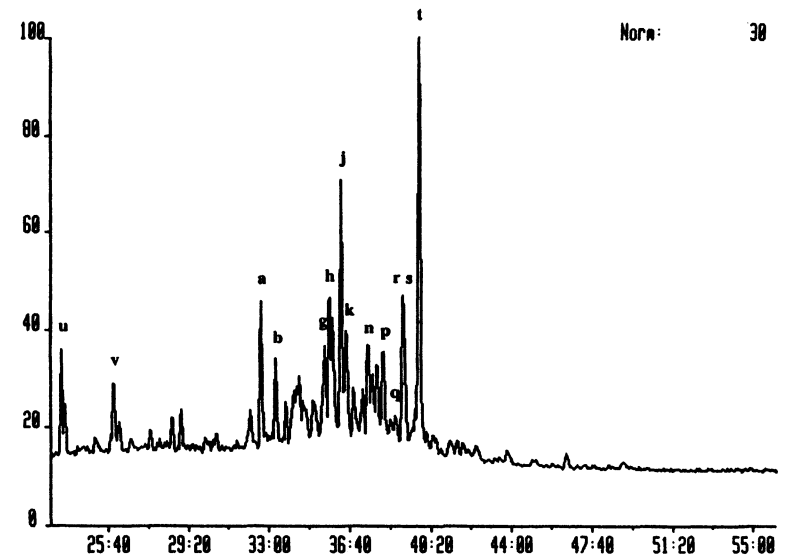
F0066 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0066 7029/03-U-01 121.51 M CLST



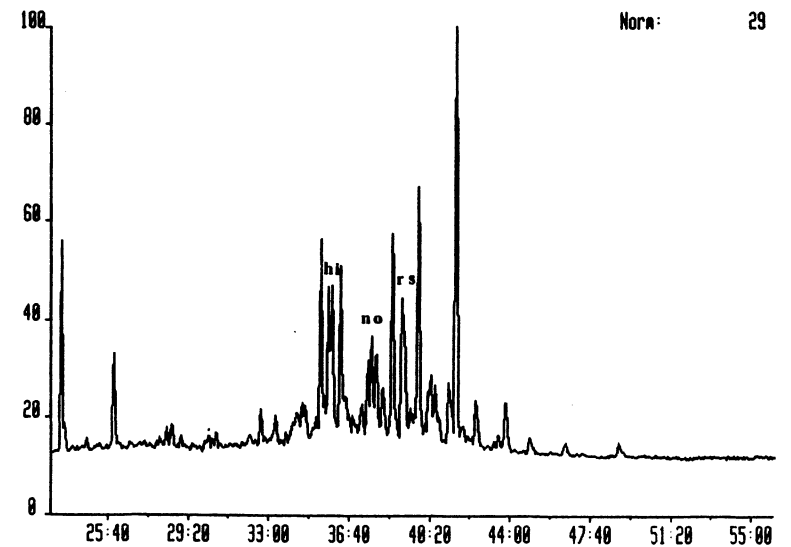
F0066 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0066 7029/03-U-01 121.51 M CLST



F0066 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0066 7029/03-U-01 121.51 M CLST



F0066 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0066 7029/03-U-01 121.51 M CLST



Core 7029/03-U-01

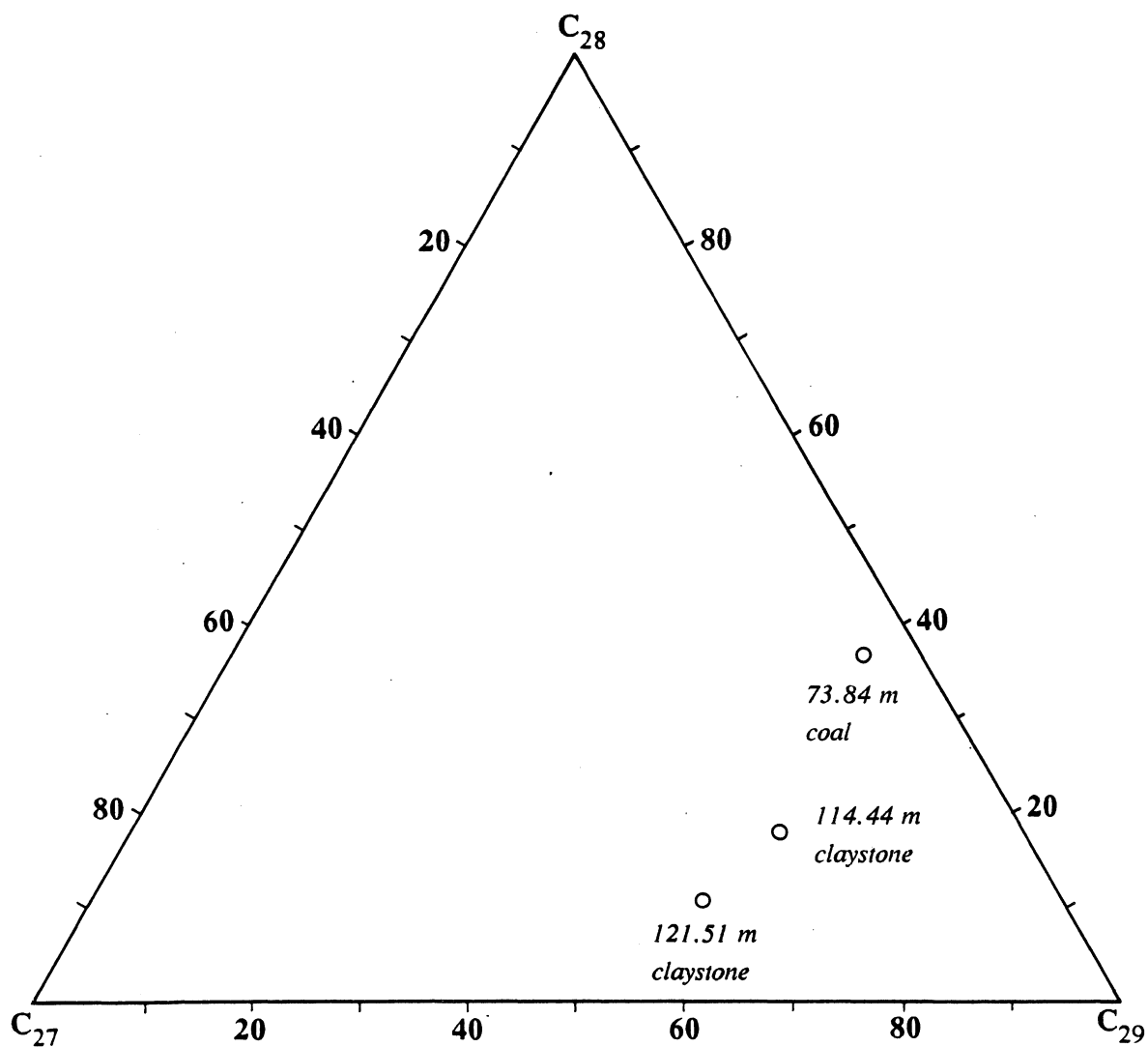


Figure A.III.1.4

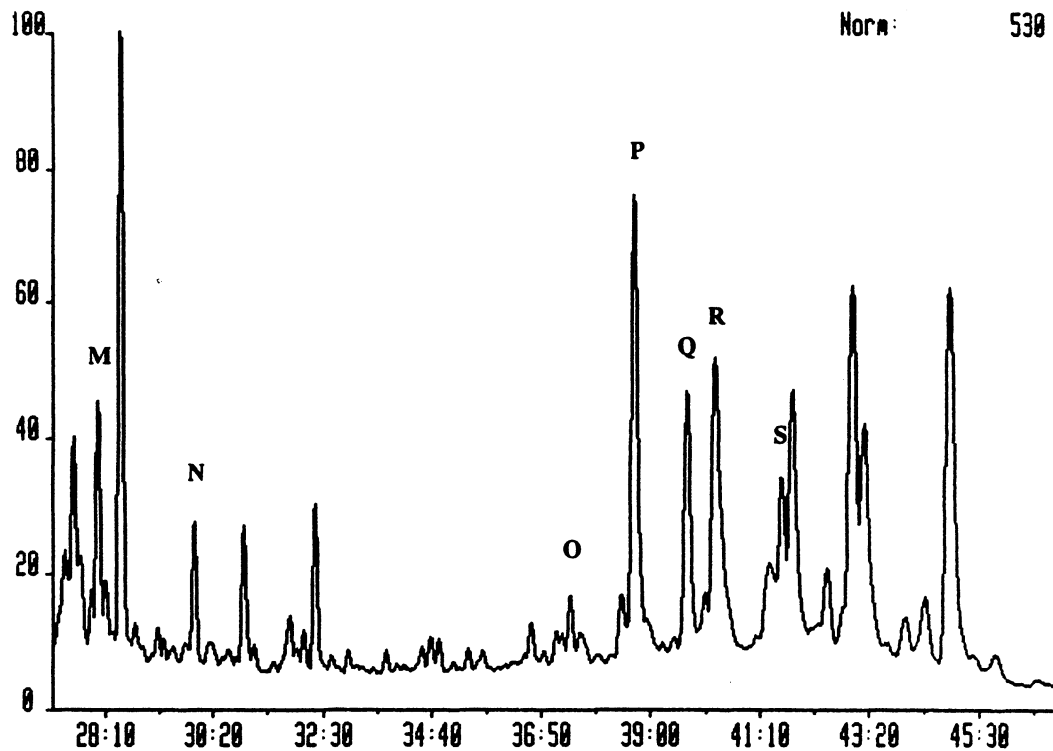
Internal distribution of 14 α (H), 17 α (H) 20R, C₂₇, C₂₈ and C₂₉ regular steranes (from m/z 217)

Figure A.III.1.5:

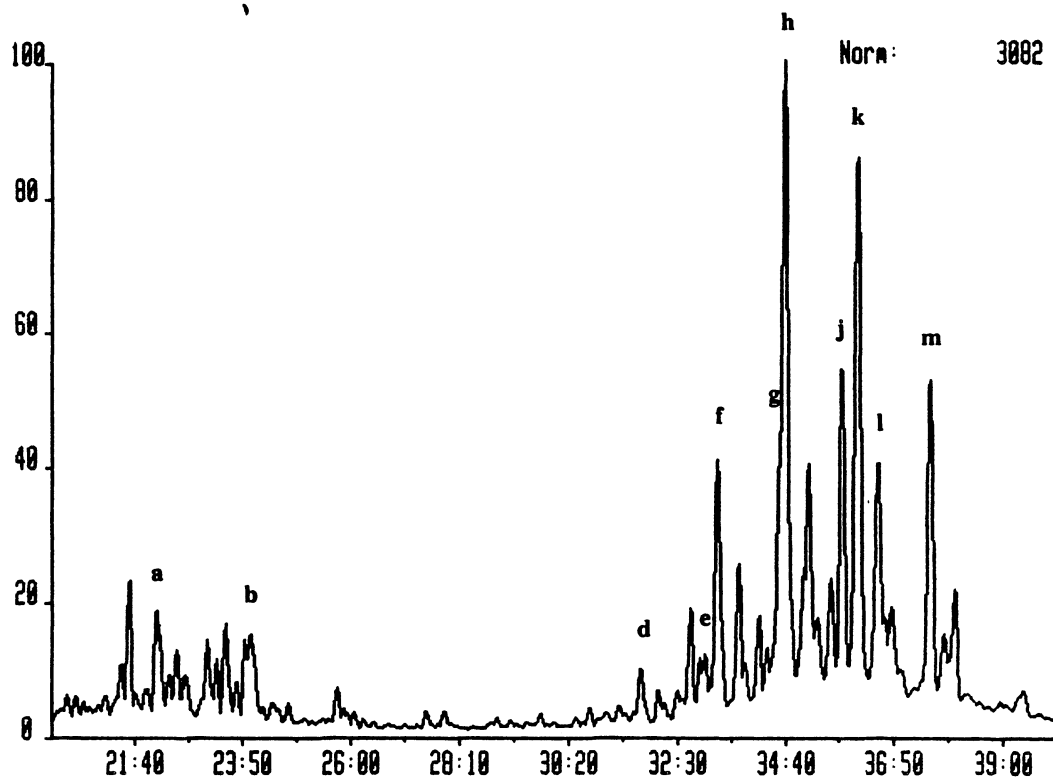
**Mass fragmentograms of m/z 231, 253
(aromatic steroid hydrocarbons)**

For peak identification see Chapter 4.

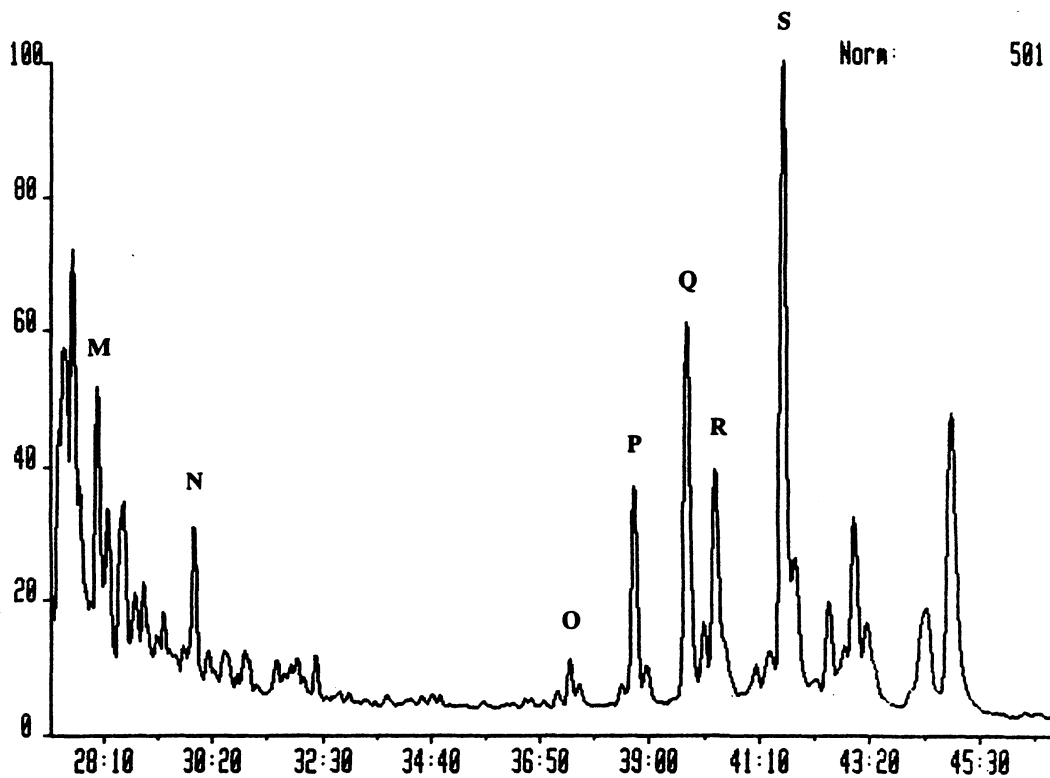
F1232AR 25-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1232 ARO 7029/03-U-01 73.84 M COAL



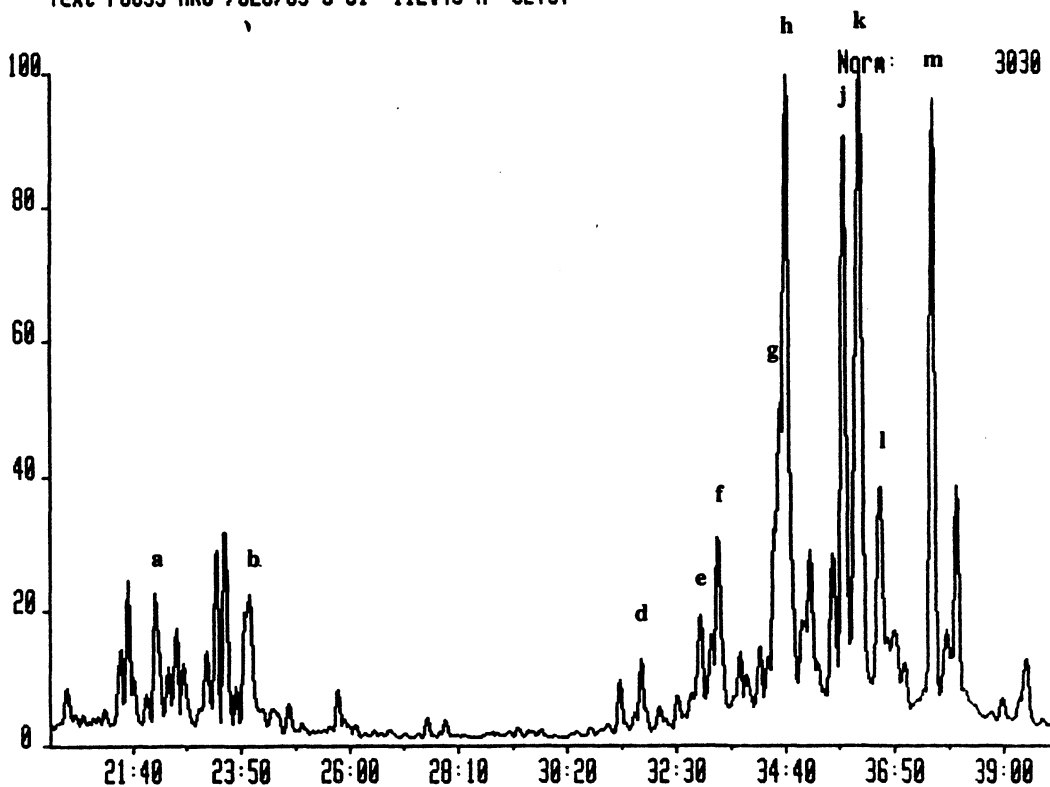
F1232AR 25-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1232 ARO 7029/03-U-01 73.84 M COAL



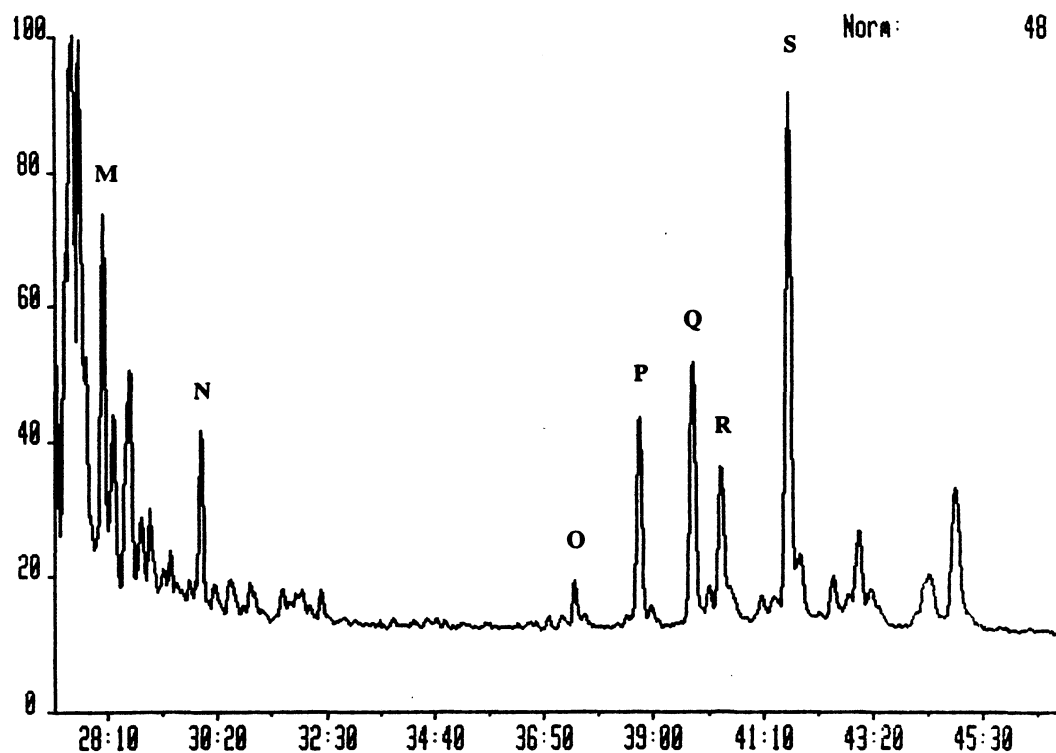
F0053AR 26-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0053 ARO 7029/03-U-01 112.40 M SLTST



F0053AR 26-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0053 ARO 7029/03-U-01 112.40 M SLTST



F0056AR 26-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0056 ARO 7029/03-U-01 114.44 M SLTST



F0056AR 26-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0056 ARO 7029/03-U-01 114.44 M SLTST

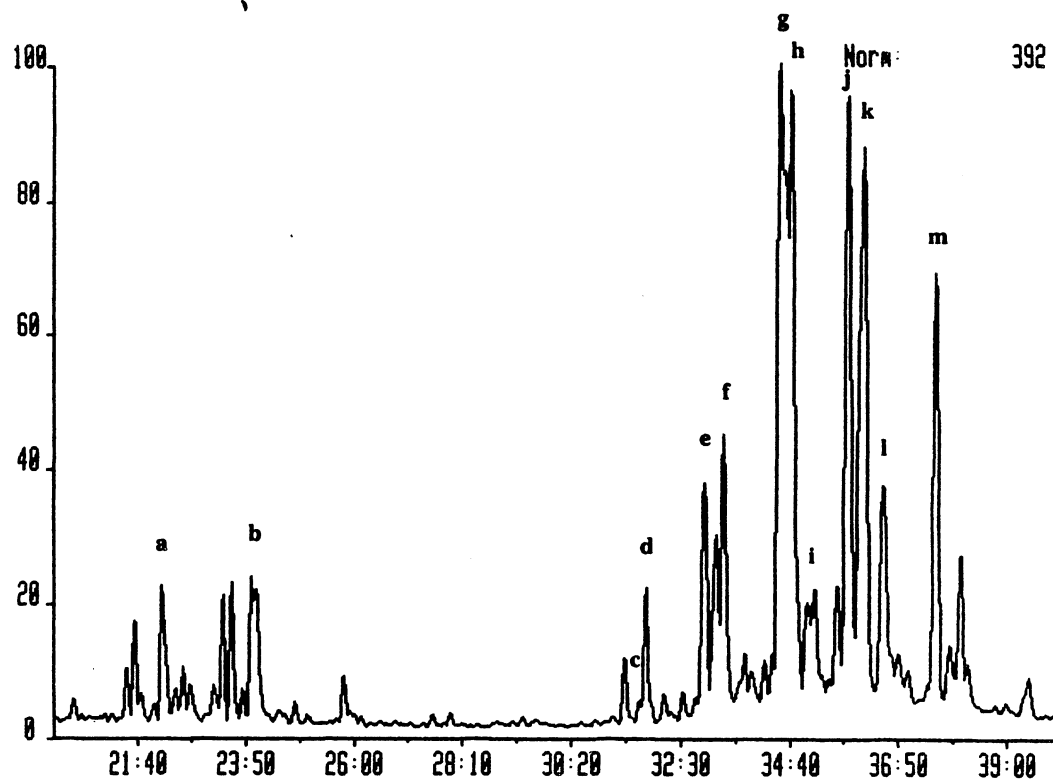
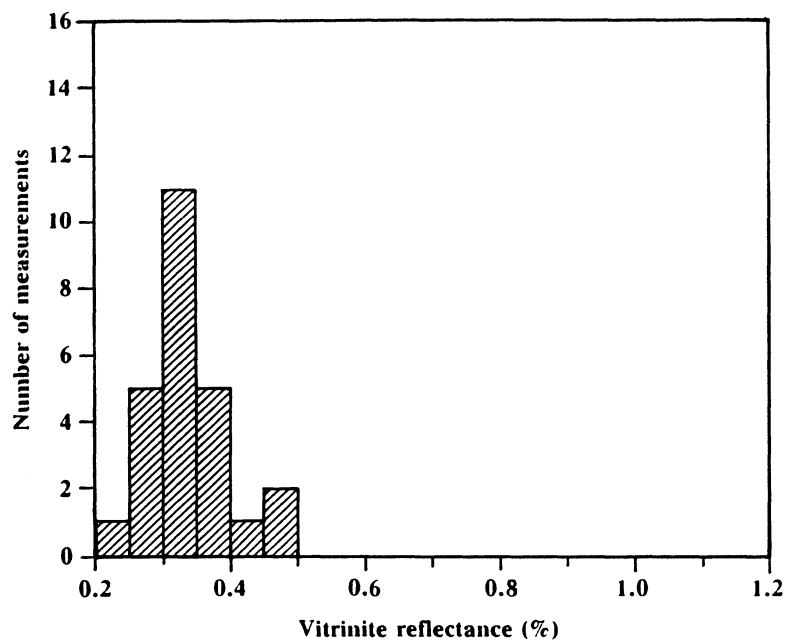


Figure A.III.1.6: Vitrinite reflectance histograms.

Core no.: 7029/03-U-01

Sample no.: F-836

Depth: 73.86 m

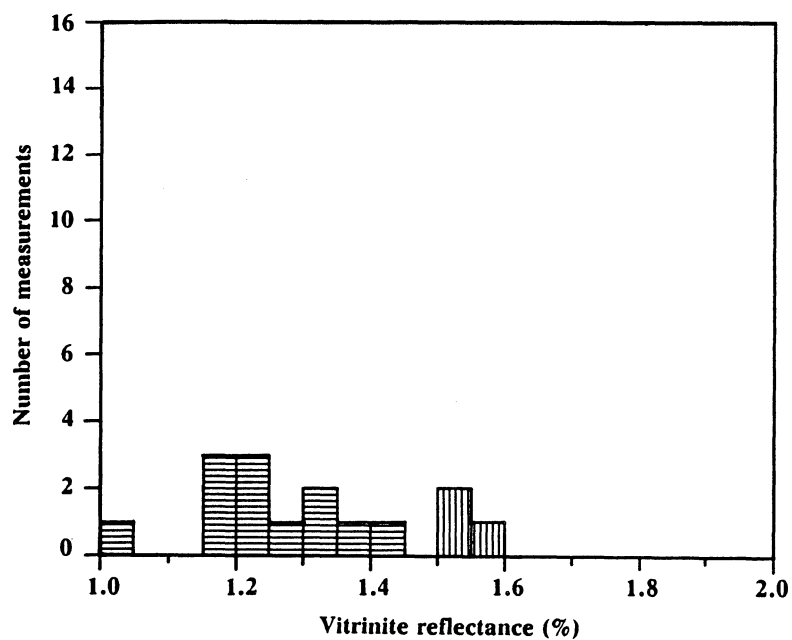


RP = 0.33% n = 25

Core no.: 7029/03-U-01

Sample no.: F-1090

Depth: 79.55 m



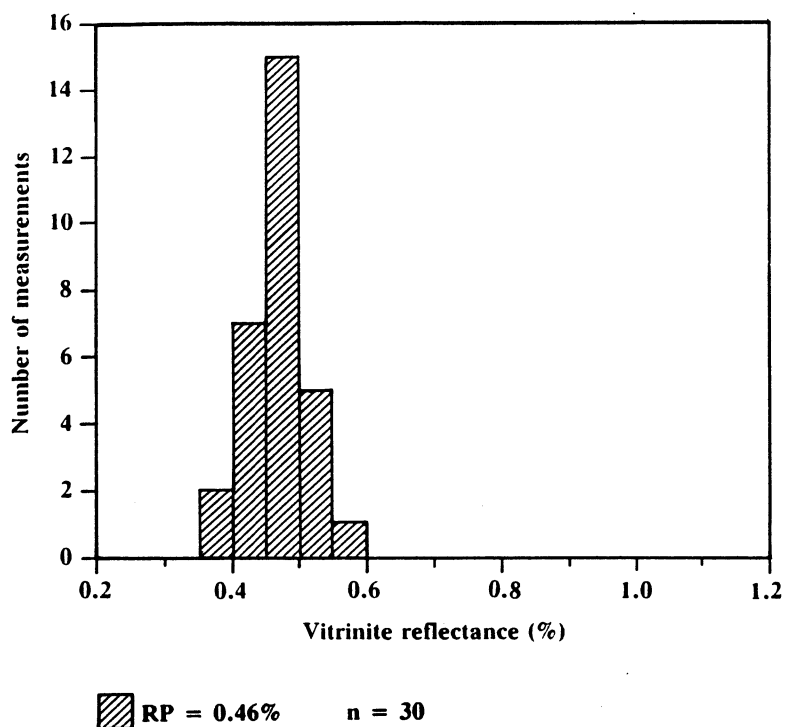
P1 = 1.24% n = 12

P2 = 1.54% n = 3

Core no.: 7029/03-U-01

Sample no.: F-926

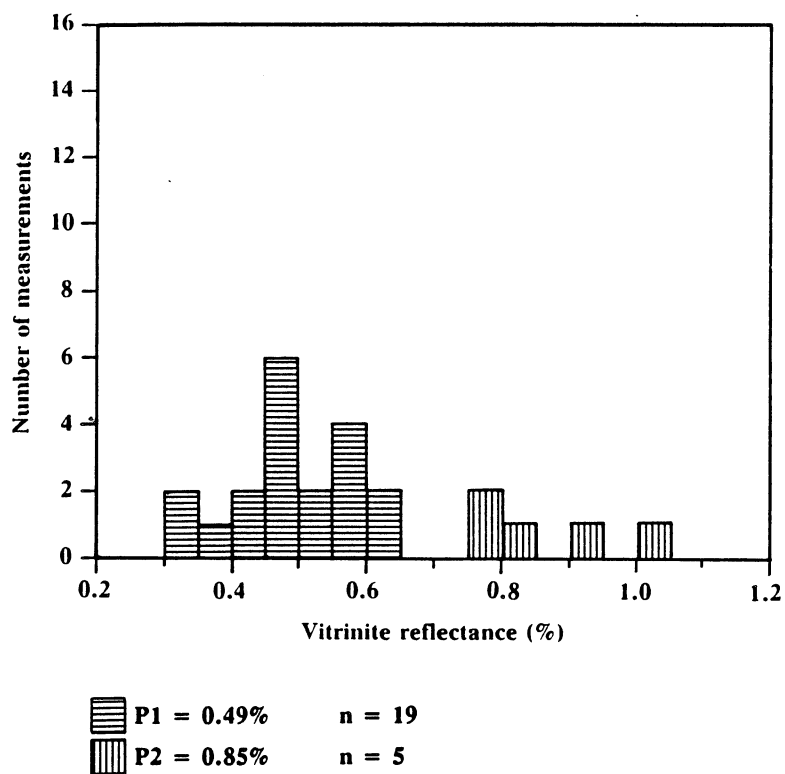
Depth: 106.40 m



Core no.: 7029/03-U-01

Sample no.: F-971

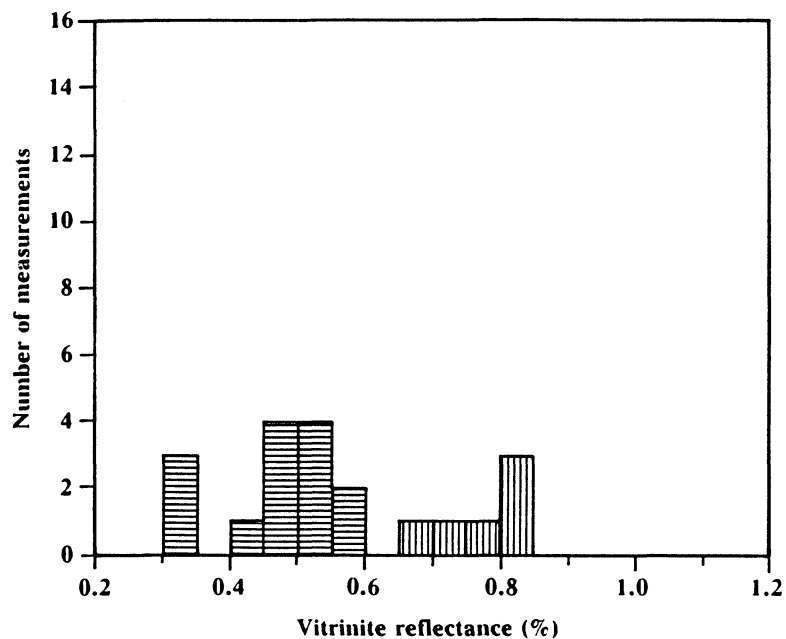
Depth: 116.50 m



Core no.: 7029/03-U-01

Sample no.: F-862

Depth: 118.46 m

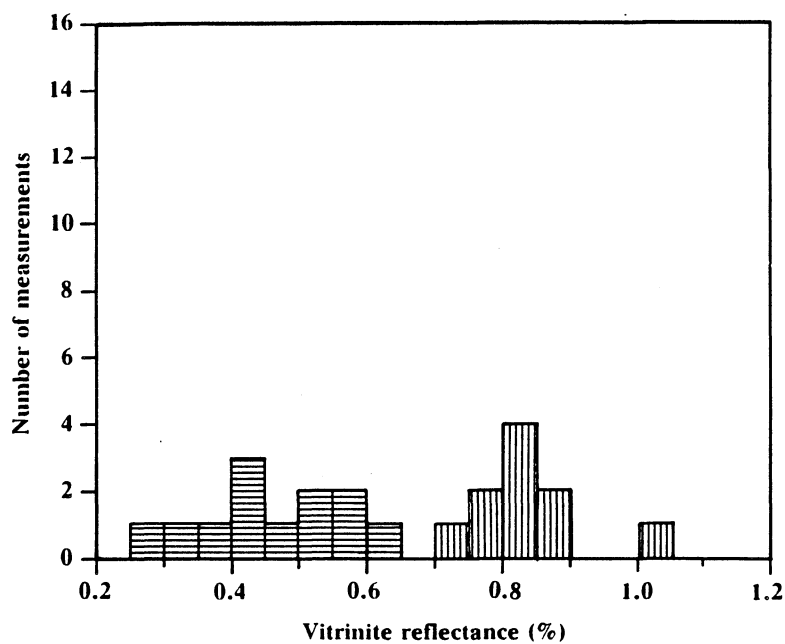


■ P1 = 0.47% n = 14
■ P2 = 0.76% n = 6

Core no.: 7029/03-U-01

Sample no.: F-1258

Depth: 124.26 m



■ P1 = 0.46% n = 12
■ P2 = 0.83% n = 10

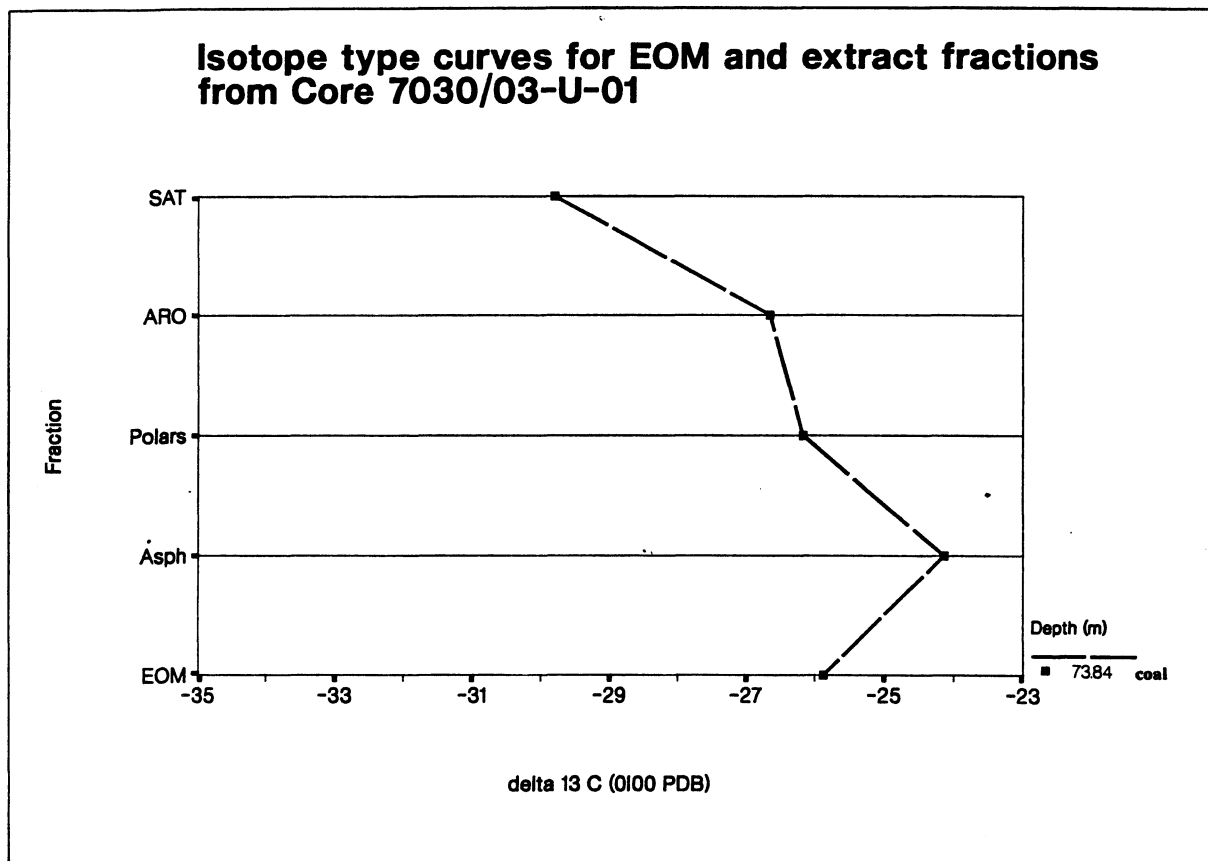


Figure A.III.1.7

APPENDIX III.2: TABLE OF CONTENTS

Core 7127/10-U-02

TABLES

Table A.III.2.1a:	Concentration of C_1-C_{5+} hydrocarbons in headspace gas.
Table A.III.2.1b:	Concentration of C_1-C_{5+} hydrocarbons in occluded gas.
Table A.III.2.1c:	Concentration of C_1-C_{5+} hydrocarbons - summation.
Table A.III.2.2:	Total organic carbon content and data from Rock-Eval pyrolysis.
Table A.III.2.3:	Data from pyrolysis-gas chromatograms.
Table A.III.2.4:	Vitrinite reflectance data.
Table A.III.2.5:	Visual kerogen analysis.
Table A.III.2.6a:	Weight of EOM, asphaltenes and chromatographic fractions.
Table A.III.2.6b:	Concentration of EOM, asphaltenes and chromatographic fractions, related to rock weight.
Table A.III.2.6c:	Concentration of EOM, asphaltenes and chromatographic fractions, related to TOC weight.
Table A.III.2.6d:	Composition of material extracted from the rock.
Table A.III.2.7:	Tabulation of data from the gas chromatograms.
Table A.III.2.8a:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity characteristic ratios.
Table A.III.2.8b:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity and source characteristic ratios.
Table A.III.2.9:	Molecular ratios from aromatic sterane mass fragmentograms.
Table A.III.2.10:	Carbon isotope ratios of EOM and chromatographic fractions.

FIGURES

Figure A.III.2.1:	Pyrolysis-gas chromatograms (S2 peak)
Figure A.III.2.2:	Gas chromatograms of saturated and aromatic hydrocarbons.
Figure A.III.2.3:	Mass fragmentograms of m/z 191, 205 (terpanes) and m/z 217, 218 (steranes).

- Figure A.III.2.4: Internal distribution of $14\alpha(\text{H}), 17\alpha(\text{H})$ 20R, C_{27} , C_{28} and C_{29} regular steranes (from m/z 217).
- Figure A.III.2.5: Mass fragmentograms of m/z 231, 253 (aromatic steroid hydrocarbons).
- Figure A.III.2.6: Vitrinite reflectance histograms.
- Figure A.III.2.7: Carbon isotope type curves of sediment extracts.

Project no.: 21344423
Location : 7127/10-U-02
Date : 88.10.12

Table A.III.2.1: TABLE OF GAS RESULTS

a: Headspace gas (µl gas pr. kg rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0318	74.52	8	0	0	0	0	0	8	0	0.0	-1.00
F0333	86.51	20	0	0	0	0	0	20	0	0.0	-1.00
F0342	98.02	118	11	3	0	0	0	132	14	10.6	-1.00
F0346	103.88	7	0	0	0	0	0	7	0	0.0	-1.00
F0356	113.54	7	0	0	0	0	0	7	0	0.0	-1.00
F0373	122.92	6	0	0	0	0	0	6	0	0.0	-1.00
F0385	131.84	10	0	0	0	0	0	10	0	0.0	-1.00
F0397	139.10	24	0	0	0	0	0	24	0	0.0	-1.00
F0413	149.58	0	0	0	0	0	0	0	0	-1.0	-1.00
F0429	160.62	29	0	0	0	0	0	29	0	0.0	-1.00
F0450	171.70	12	0	0	0	0	0	12	0	0.0	-1.00
F0462	177.70	6	0	0	0	0	0	6	0	0.0	-1.00
F0475	186.69	12	0	0	0	0	0	12	0	0.0	-1.00
F0489	194.31	6	0	0	0	0	0	6	0	0.0	-1.00
F0498	200.07	1475	170	36	0	0	0	1681	206	12.3	-1.00

b: Occluded gas (µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0318	74.52	240	40	6	0	0	0	286	46	16.1	-1.00
F0333	86.51	271	24	6	0	0	0	301	30	10.0	-1.00
F0342	98.02	574	36	5	0	0	0	615	41	6.7	-1.00
F0346	103.88	290	27	6	0	0	0	323	33	10.2	-1.00
F0356	113.54	181	26	8	0	0	0	215	34	15.8	-1.00
F0373	122.92	163	20	5	0	0	0	188	25	13.3	-1.00
F0385	131.84	123	10	0	0	0	0	133	10	7.5	-1.00
F0397	139.10	194	14	0	0	0	0	208	14	6.7	-1.00
F0413	149.58	216	25	2	0	0	0	243	27	11.1	-1.00
F0429	160.62	313	42	10	10	0	0	375	62	16.5	-1.00
F0450	171.70	219	20	5	0	0	0	244	25	10.2	-1.00
F0462	177.70	168	13	3	0	0	0	184	16	8.7	-1.00
F0475	186.69	170	20	5	0	0	0	195	25	12.8	-1.00
F0489	194.31	589	106	31	0	11	0	737	148	20.1	0.00
F0498	200.07	397	77	22	0	3	34	499	102	20.4	0.00

Legend: -1 can not be determined

Project no.: 21344423
 Location : 7127/10-U-02
 Date : 88.10.11

TABLE OF GAS RESULTS

c: Summation of Headspace and Occluded gas
 (µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0318	74.52	248	40	6	0	0	0	294	46	15.6	-1.00
F0333	86.51	291	24	6	0	0	0	321	30	9.3	-1.00
F0342	98.02	692	47	8	0	0	0	747	55	7.4	-1.00
F0346	103.88	297	27	6	0	0	0	330	33	10.0	-1.00
F0356	113.54	188	26	8	0	0	0	222	34	15.3	-1.00
F0373	122.92	169	20	5	0	0	0	194	25	12.9	-1.00
F0385	131.84	133	10	0	0	0	0	143	10	7.0	-1.00
F0397	139.10	218	14	0	0	0	0	232	14	6.0	-1.00
F0413	149.58	216	25	2	0	0	0	243	27	11.1	-1.00
F0429	160.62	342	42	10	10	0	0	404	62	15.3	-1.00
F0450	171.70	231	20	5	0	0	0	256	25	9.8	-1.00
F0462	177.70	174	13	3	0	0	0	190	16	8.4	-1.00
F0475	186.69	182	20	5	0	0	0	207	25	12.1	-1.00
F0489	194.31	595	106	31	0	11	0	743	148	19.9	0.00
F0498	200.07	1872	247	58	0	3	34	2180	308	14.1	0.00

Legend: -1 can not be determined

Project no.: 21344423
Location : 7127/10-U-02
Date : 88.11.25

Table A.III.2.2: DATA FROM ROCK EVAL PYROLYSIS

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F0312	BULK	70.59	CORE	0.14	41.47	9.70	45.20	91	21	41.61	0.00	422
F0315	BULK	71.71	CORE	1.20	61.92	2.90	25.40	243	11	63.12	0.01	418
F0320	BULK	73.47	CORE	0.06	4.49	0.63	3.98	112	15	4.55	0.01	422
F0318	BULK	74.52	CORE	-1	-1	-1	0.44	-1	-1	-1	-1	-1
F0324	BULK	77.44	CORE	0.52	61.01	3.52	26.40	231	13	61.53	0.00	421
F0327	BULK	79.65	CORE	0.79	102.85	6.19	50.00	205	12	103.64	0.00	420
F0331	BULK	82.85	CORE	0.53	32.89	2.00	15.20	216	13	33.42	0.01	415
F0333	BULK	86.51	CORE	-1	-1	-1	0.26	-1	-1	-1	-1	-1
F0336	BULK	89.72	CORE	0.29	36.50	4.04	25.40	143	15	36.79	0.00	418
F0338	BULK	90.82	CORE	0.28	46.57	5.14	36.10	129	14	46.85	0.00	419
F0341	BULK	92.01	CORE	0.20	66.00	7.80	66.40	99	11	66.20	0.00	423
F0342	BULK	98.02	CORE	-1	-1	-1	69.80	-1	-1	-1	-1	-1
F0349	BULK	102.83	CORE	0.28	68.11	6.95	49.60	137	14	68.39	0.00	424
F0352	BULK	105.83	CORE	0.06	1.19	0.21	1.92	61	10	1.25	0.04	426
F0354	BULK	109.89	CORE	0.00	44.82	5.53	48.50	92	11	44.82	0.00	423
F0358	BULK	111.19	CORE	0.12	11.82	1.82	11.90	99	15	11.94	0.01	418
F0360	BULK	113.39	CORE	0.21	18.23	1.14	9.55	190	11	18.44	0.01	417
F0364	BULK	114.95	CORE	0.20	46.63	6.14	48.70	95	12	46.83	0.00	422
F0366	BULK	117.46	CORE	0.18	32.61	3.72	27.40	119	13	32.79	0.00	422
F0369	BULK	121.72	CORE	0.29	56.53	6.33	50.60	111	12	56.82	0.00	420
F0371	BULK	122.04	CORE	0.03	0.74	0.27	1.59	46	16	0.77	0.03	433
F0374	BULK	124.07	CORE	0.04	0.95	0.12	1.67	56	7	0.99	0.04	429
F0380	BULK	127.85	CORE	0.04	1.35	0.42	2.71	49	15	1.39	0.02	423
F0386	BULK	131.94	CORE	0.08	2.51	0.46	3.58	70	12	2.59	0.03	426
F0395	BULK	135.38	CORE	0.02	0.96	0.16	1.96	48	8	0.98	0.02	425
F0392	BULK	137.93	CORE	0.08	10.00	0.91	7.65	130	11	10.08	0.00	418
F0401	BULK	140.21	CORE	0.41	32.99	2.78	18.00	183	15	33.40	0.01	413
F0404	BULK	141.95	CORE	0.21	14.66	0.84	6.65	220	12	14.87	0.01	424
F0405	BULK	143.82	CORE	0.05	1.76	0.03	1.85	95	1	1.81	0.02	424
F0409	BULK	145.84	CORE	0.14	43.66	2.67	31.50	138	8	43.80	0.00	422
F0416	BULK	147.68	CORE	0.07	4.16	0.74	5.13	81	14	4.23	0.01	420
F0414	BULK	148.48	CORE	0.22	63.33	6.22	68.70	92	9	63.55	0.00	421
F0417	BULK	153.10	CORE	0.68	42.28	3.78	30.50	138	12	42.96	0.01	420
F0424	BULK	157.24	CORE	0.00	52.20	5.40	43.80	119	12	52.20	0.00	425
F0428	BULK	159.14	CORE	0.06	1.44	0.26	2.97	48	8	1.50	0.04	428
F0435	BULK	162.09	CORE	0.67	40.33	2.99	35.70	112	8	41.00	0.01	421
F0436	BULK	164.02	CORE	0.51	44.37	2.29	19.70	225	11	44.88	0.01	424
F0443	BULK	165.87	CORE	0.00	20.00	4.51	29.70	67	15	20.00	0.00	424
F0439	BULK	167.93	CORE	0.54	81.63	6.54	34.20	238	19	82.17	0.00	426
F0446	BULK	169.89	CORE	0.35	51.25	5.89	44.00	116	13	51.60	0.00	426
F0447	BULK	171.17	CORE	0.04	0.46	0.14	1.23	37	11	0.50	0.08	475
F0451	BULK	173.01	CORE	0.05	1.94	0.37	2.71	71	13	1.99	0.02	425
F0456	BULK	175.20	CORE	0.04	6.81	1.49	9.96	68	14	6.85	0.00	427
F0460	BULK	177.20	CORE	0.04	1.22	0.33	2.88	42	11	1.26	0.03	426
F0466	BULK	178.87	CORE	0.58	68.82	10.58	70.00	98	15	69.40	0.00	427

Project no.: 21344423
Location : 7127/10-U-02
Date : 88.11.25

Table A.III.2.2 (cont'd):

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. Tmax INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)			S1+S2	S1+S2 (°C)
F0468	BULK	180.37	CORE	0.04	0.84	0.20	1.97	42	10	0.88	0.04	431
F0469	BULK	181.67	CORE	0.91	40.83	4.74	34.30	119	13	41.74	0.02	418
F0471	BULK	182.33	CORE	0.04	0.20	0.35	1.66	12	21	0.24	0.16	(412)
F0477	BULK	187.31	CORE	0.04	0.52	0.33	2.20	23	15	0.56	0.07	(470)
F0481	BULK	189.11	CORE	0.03	0.52	0.06	1.04	50	5	0.55	0.05	(460)
F0482	BULK	192.12	CORE	0.00	1.09	0.94	2.79	39	33	1.09	0.00	427
F0487	BULK	193.51	CORE	0.02	0.03	0.04	0.32	9	12	0.05	0.40	(303)
F0494	BULK	196.58	CORE	0.13	8.91	0.98	8.71	102	11	9.04	0.01	422
F0497	BULK	198.91	CORE	0.81	71.63	11.42	70.50	101	16	72.44	0.01	424
F0498	BULK	200.07	CORE	0.01	0.54	0.10	1.21	44	8	0.55	0.01	431

Legend:

-1 : Not determined or no data available

() : Tmax values of doubtful reliability (usually associated with poor S2 peaks)

Table A.III.2.3: Data from pyrolysis-gas chromatograms

Core 7127/10-U-02							
IKU NO	DEPTH (m)	SAMPLE TYPE	LITHOLOGY	C1	C2-C6 percent of peak area	C6-C14	C15+
F0315	71.71	Core	Claystone	10.0	12.3	33.7	44.0
F0341	92.01	Core	Coal	19.7	15.9	35.2	28.8
F0349	102.83	Core	Coal	12.8	14.1	35.6	37.6
F0360	113.39	Core	Siltst/Coal	11.6	10.2	41.5	36.4
F0404	141.95	Core	Claystone	10.6	19.6	40.2	29.6
F0439	167.93	Core	Claystone	9.5	11.8	35.3	43.4
F0494	196.58	Core	Siltstone	27.8	39.8	29.0	2.8
F0497	198.91	Core	Coal	19.5	18.8	37.8	23.9

Core-site Number: 7127/10-U-02
Reference number: 21.3444.23
(1/1)

Table A.III.2.4: VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
F- 317	-----	72.41	0.34 (30)	G	0.06	2-3
F- 350	-----	102.83	0.29 (27) 0.63 (3)	G R	0.04 0.10	1-3
F- 394	-----	138.03	0.34 (30)	G	0.05	2
F- 431	-----	159.86	0.34 (29)	G	0.07	2-3
F- 497	-----	198.91	0.31 (30)	G	0.05	1-2

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor;
I = Inertinite. L = Liptinite or poor vitrinite particle.
R = Reworked material/inertinite.

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.2.5
CORE NO.: 7127/10-U-02

Sample	Depth (m)	Compo- sition of residue	Particle size	Preser- vation palyno- morphs	Thermal maturation index * NEW TAI	Remarks
F-323	77.39	Lm: 40 W: 40 C: 20	F-M-L	fair	3 - 4	Dominated by cuticula/megaspore residues together with dark wood fragments.
F-329	81.60	Lm: 10 W: 10 C: 80	F-M-L	fair	1 - 2 (?)	Dominated by coaly fragments, often large pieces.
F-348	102.18	Lm: 10 W: 70 C: 20	F-M-L	fair	1 - 2	Wood contents dominated by tracheids and brown/black fragments.
F-377	125.97	Lm: 10 W: 70 C: 20	F-M-L	fair	2 - 3.5	As sample F-348

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.2.5 (ctd)
CORE NO.: 7127/10-U-02

Sample	Depth (m)	Compo- sition of residue	Particle size	Preser- vation palyno- morphs	Thermal maturation index * NEW TAI	Remarks
F-426	157.22	Lm: 5 W: 75 C: 20	F-M-L	poor-fair	1 - 2	Dominated by brown/black woody fragments.
F-441	165.87	Lm: 10 W: 80 C: 10	F-M-L	poor-fair	1 - 3?	As sample F-426
F-458	176.40	Lm: 10 W: 10 C: 80	F-M-L	fair-good	2 - 3.5	Dominated by coaly fragments (small).
F-472	182.34	Lm: 10 W: 10 C: 80	F-M-L	fair	1 - 3	As sample F-458
F-484	192.14	Lm: 10 W: 40 C: 50	F-M(L)	fair-good	1 - 3	Dominated by dark woody fragments together with smaller coal fragments.

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

Project no.: 21344423
 Location : 7127/10-U-02
 Date : 89.02.02

- 109 -



Table A.III.2.6a: WEIGHT OF CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ROCK EXTR. (g)	EOM (mg)	ASPH (mg)	SAT HC (mg)	ARO HC (mg)	POLAR COMP. (mg)	HC (mg)	NONHC (mg)	TOC (%)
F0315	BULK	71.71	CORE	14.2	73.0	48.8	3.7	12.1	11.4	15.8	57.2	25.40
F0341	BULK	92.01	CORE	6.2	109.7	75.8	2.2	10.7	11.7	12.9	96.8	66.40
F0349	BULK	102.83	CORE	15.6	148.5	92.8	5.7	25.6	18.6	31.3	117.2	49.60
F0360	BULK	113.39	CORE	22.3	69.6	46.4	2.2	9.4	7.8	11.6	58.0	9.55
F0364	BULK	114.95	CORE	22.3	139.3	84.9	3.7	25.5	22.1	29.2	110.1	48.70
F0404	BULK	141.95	CORE	22.2	50.6	28.2	2.3	7.7	5.7	10.0	40.6	6.65
F0439	BULK	167.93	CORE	10.0	126.2	84.0	22.9	18.5	11.6	41.4	84.8	34.20
F0446	BULK	169.89	CORE	16.5	145.0	85.3	4.3	23.6	16.2	27.9	117.1	44.00
F0494	BULK	196.58	CORE	10.0	26.5	17.8	0.8	3.8	4.2	4.6	21.9	8.71
F0497	BULK	198.91	CORE	1.5	31.4	20.1	0.8	3.4	4.8	4.2	27.2	70.50

Legend:

- * - Not all the available EOM was used for MPLC.
- ? - MPLC results assumed more EOM than originally extracted.
- 1- No data available.

Table A.III.2.6b: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F0315	BULK	71.71	CORE	5159	3449	261	852	808	1113	4046
F0341	BULK	92.01	CORE	17619	12174	356	1722	1880	2078	15541
F0349	BULK	102.83	CORE	9513	5945	365	1642	1190	2007	7506
F0360	BULK	113.39	CORE	3116	2078	99	422	351	521	2595
F0364	BULK	114.95	CORE	6249	3809	164	1145	993	1309	4940
F0404	BULK	141.95	CORE	2276	1269	104	345	258	449	1827
F0439	BULK	167.93	CORE	12674	8436	2302	1854	1170	4156	8518
F0446	BULK	169.89	CORE	8765	5156	261	1425	977	1686	7079
F0494	BULK	196.58	CORE	2642	1775	85	374	423	459	2183
F0497	BULK	198.91	CORE	20599	13186	555	2220	3172	2775	17824

Legend:

- 1- No data available.

Project no.: 21344423
Location : 7127/10-U-02
Date : 89.02.02

Table A.III.2.6c: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F0315	BULK	71.71	CORE	20.3	13.6	1.0	3.4	3.2	4.4	15.9
F0341	BULK	92.01	CORE	26.5	18.3	0.5	2.6	2.8	3.1	23.4
F0349	BULK	102.83	CORE	19.2	12.0	0.7	3.3	2.4	4.0	15.2
F0360	BULK	113.39	CORE	32.6	21.8	1.0	4.4	3.7	5.4	27.2
F0364	BULK	114.95	CORE	12.8	7.8	0.3	2.4	2.0	2.7	10.1
F0404	BULK	141.95	CORE	34.2	19.1	1.6	5.2	3.9	6.8	27.4
F0439	BULK	167.93	CORE	37.1	24.7	6.7	5.4	3.4	12.1	25.0
F0446	BULK	169.89	CORE	19.9	11.7	0.6	3.2	2.2	3.8	16.1
F0494	BULK	196.58	CORE	30.3	20.4	1.0	4.3	4.9	5.3	25.0
F0497	BULK	198.91	CORE	29.2	18.7	0.8	3.1	4.5	3.9	25.3

Legend:

-1- No data available.

Table A.III.2.6d: COMPOSITION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ASPH	SAT	ARO	HC	POLAR	SAT	HC
				EOM (%)	EOM (%)	EOM (%)	EOM (%)	EOM (%)	ARO x 100	NONHC x 100
F0315	BULK	71.71	CORE	66.8	5.1	16.5	21.6	15.7	30.6	27.5
F0341	BULK	92.01	CORE	69.1	2.0	9.8	11.8	10.7	20.7	13.4
F0349	BULK	102.83	CORE	62.5	3.8	17.3	21.1	12.5	22.2	26.7
F0360	BULK	113.39	CORE	66.7	3.2	13.6	16.8	11.3	23.4	20.1
F0364	BULK	114.95	CORE	60.9	2.6	18.3	20.9	15.9	14.4	26.5
F0404	BULK	141.95	CORE	55.7	4.6	15.2	19.8	11.3	30.2	24.6
F0439	BULK	167.93	CORE	66.6	18.2	14.6	32.8	9.2	124.2	48.8
F0446	BULK	169.89	CORE	58.8	3.0	16.3	19.3	11.2	18.3	23.8
F0494	BULK	196.58	CORE	67.2	3.2	14.2	17.4	16.0	22.6	21.0
F0497	BULK	198.91	CORE	64.0	2.7	10.8	13.5	15.4	25.0	15.6

Legend:

-1- No data available.

Project no.: 21344423
 Location : 7127/10-U-02
 Date : 89.02.05

- 111 -

Table A.III.2.7:

RATIOS DERIVED FROM GAS CHROMATOGRAMS OF SATURATED HYDROCARBONS

IKUNO	FRAC NAME	DEPTH	Pri	Pri	Phy	A	n-C17	n-C31	CPI 1	CPI 2
			Phy	A= n-C17	B= n-C18	B	n-C27	n-C19		
F0315	BULK	71.71	3.4	1.0	0.3	3.4	0.4	0.9	2.0	2.2
F0341	BULK	92.01	1.7	1.2	0.6	1.9	0.2	1.1	1.7	1.8
F0349	BULK	102.83	2.0	1.3	0.7	1.7	0.2	2.8	1.8	1.7
F0360	BULK	113.39	2.9	1.0	0.3	3.1	0.4	0.5	1.6	1.5
F0364	BULK	114.95	2.1	2.7	1.0	2.8	0.1	2.0	2.2	2.0
F0404	BULK	141.95	3.8	1.2	0.4	3.5	0.5	0.4	1.6	1.8
F0439	BULK	167.93	3.1	0.8	0.2	3.4	0.3	0.3	1.7	1.7
F0446	BULK	169.89	2.6	1.2	0.4	2.8	0.3	0.7	1.9	2.0
F0494	BULK	196.58	2.0	1.2	0.6	2.1	0.3	0.6	2.0	2.3
F0497	BULK	198.91	1.3	1.5	0.7	2.1	0.6	0.6	1.5	1.5

-1 = No data available

Table A.III.2.8a:

Molecular ratios from sterane and terpane mass chromatograms.

Maturity ratios.

Core 7127/10-U-02

Code	Depth (m)	$\alpha\beta/\alpha\beta+\beta\alpha^{1)}$	%22S ²⁾	% $\beta\beta^3)$	%20S ⁴⁾	30:1/30:0 ⁵⁾
F-315	71.71	0.41	3.0	65.9	11.2	1.96
F-341	92.01	0.36	5.8	66.1	26.0	2.09
F-349	102.83	0.40	4.3	69.6	28.6	2.25
F-360	113.39	0.44	3.3	62.1	36.4	1.67
F-364	114.95	0.42	5.1	58.7	15.9	1.14
F-439	167.93	0.45	26.2	59.0	21.9	1.84
F-446	169.89	0.47	22.4	60.5	11.8	1.02
F-494	196.58	0.55	12.6	69.0	27.8	1.37
F-498	198.91	0.55	8.6	69.0	20.3	1.46

¹⁾ E/(E+F) in m/z 191.

²⁾ Average % distribution between first and second eluting isomers of extended hopanes.

³⁾ $100 * 2(r+s)/(q+t+2(r+s))$ in m/z 217.

⁴⁾ $100 * q/(q+t)$ in m/z 217.

⁵⁾ 9/8 in m/z 191.

Table A.III.2.8b:

*Molecular ratios from terpane and sterane mass chromatograms.
Maturity and source characteristic ratios.
Core 7127/10-U-02*

Code	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
F-315	71.71	-	-	-	-	0.45
F-341	92.01	-	-	-	-	0.89
F-349	102.83	-	-	-	-	0.63
F-360	113.39	-	-	-	-	0.43
F-364	114.95	-	-	-	-	0.68
F-439	167.93	-	-	-	-	0.65
F-446	169.89	-	-	-	-	0.66
F-494	196.58	-	-	-	-	0.74
F-497	198.91	0.07	-	-	-	0.69

¹⁾ Relative abundance of tricyclic terpanes (Q/E in m/z 191).

²⁾ B/A in m/z 191.

³⁾ Relative abundance of unknown (X/E in m/z 191).

⁴⁾ Relative abundance of bisnorhopane (Z/E in m/z 191).

⁵⁾ Relative abundance of C₂₇ rearranged steranes (a/(a+j) in m/z 217).

Table A.III.2.9: Molecular ratios from mass fragmentograms of aromatic steroid hydrocarbons.

Core 7127/10-U-02

IKUNO	Depth m	Cracking ratios			Aromatisation ratios	
		20/20+27	20/20+28	21/21+28	27t/27t+28m	28t/28t+29m
		tri	tri	mono		
		1)	2)	3)	4)	5)
F0315	71.71	0.58	0.84	0.18	0.10	0.04
F0341	92.01	0.26	0.56	0.07	0.07	0.02
F0349	102.83	0.33	0.69	0.06	0.06	0.01
F0404	141.95	0.52	0.70	0.17	0.06	0.05
F0439	167.93	0.50	0.71	0.15	0.03	0.01
F0494	196.58	0.16	0.67	0.08	0.13	0.04
F0497	198.91	0.12	0.65	0.07	0.16	0.01

1) $M/(M+P)$ in m/z 231

2) $M/(M+S)$ in m/z 231

3) $a/(a+h)$ in m/z 253

4) $P/(P+h)$ in m/z 231 and m/z 253

5) $S/(S+m+(k*S/(S+R)))$ in m/z 231 and m/z 253

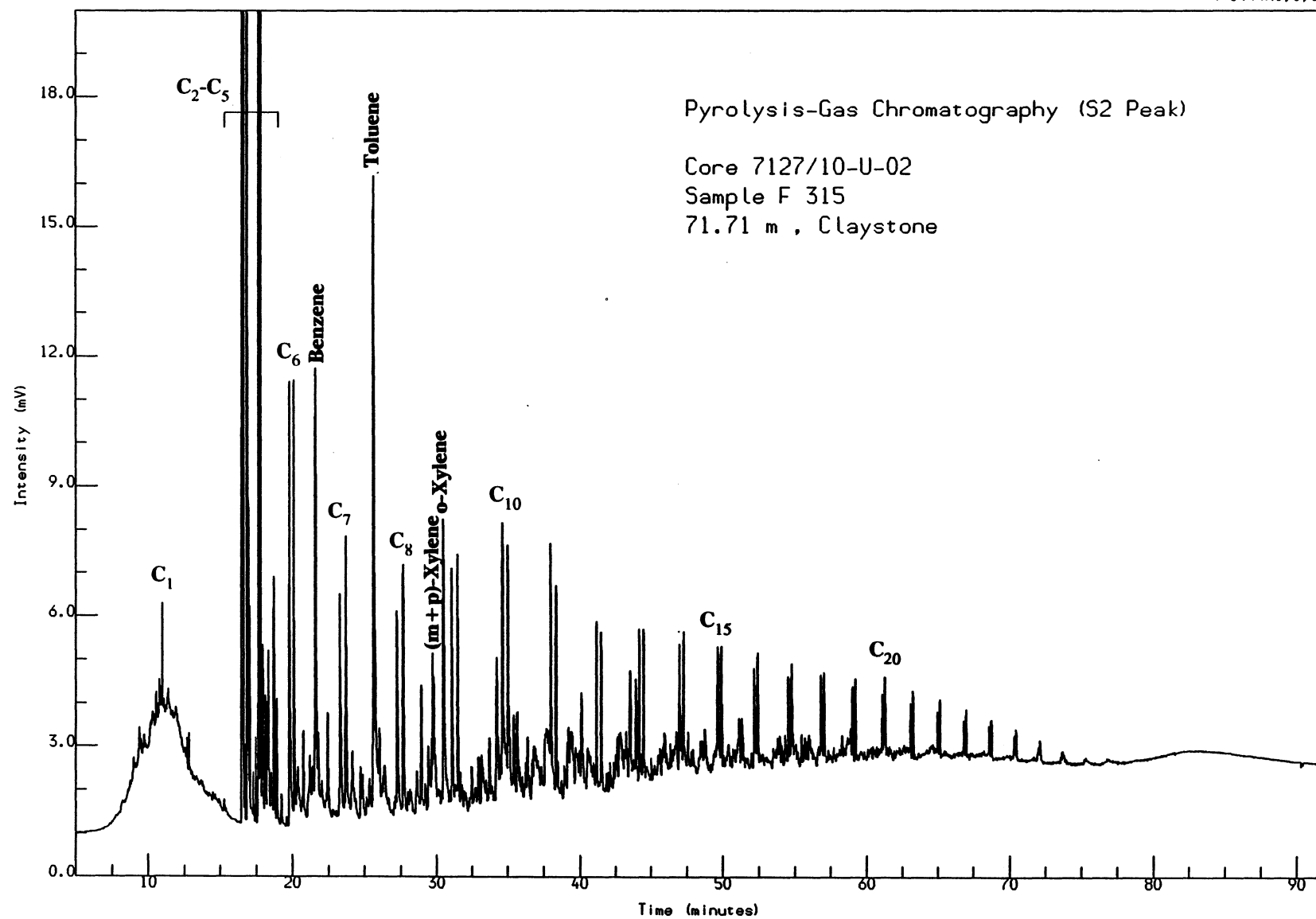
Table A.III.2.10: Carbon isotope ratios for EOM and extract fractions

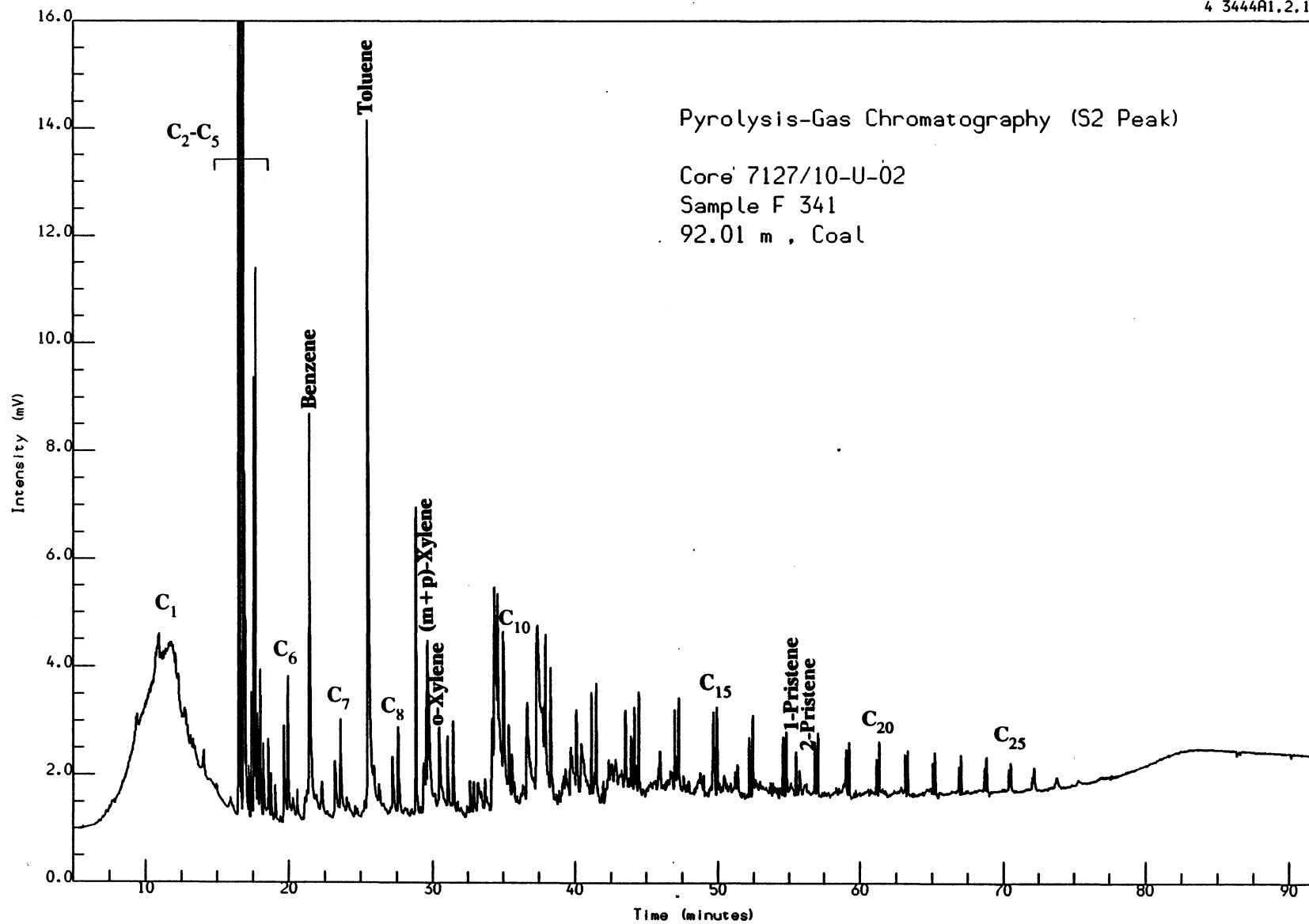
Core 7127/10-U-02

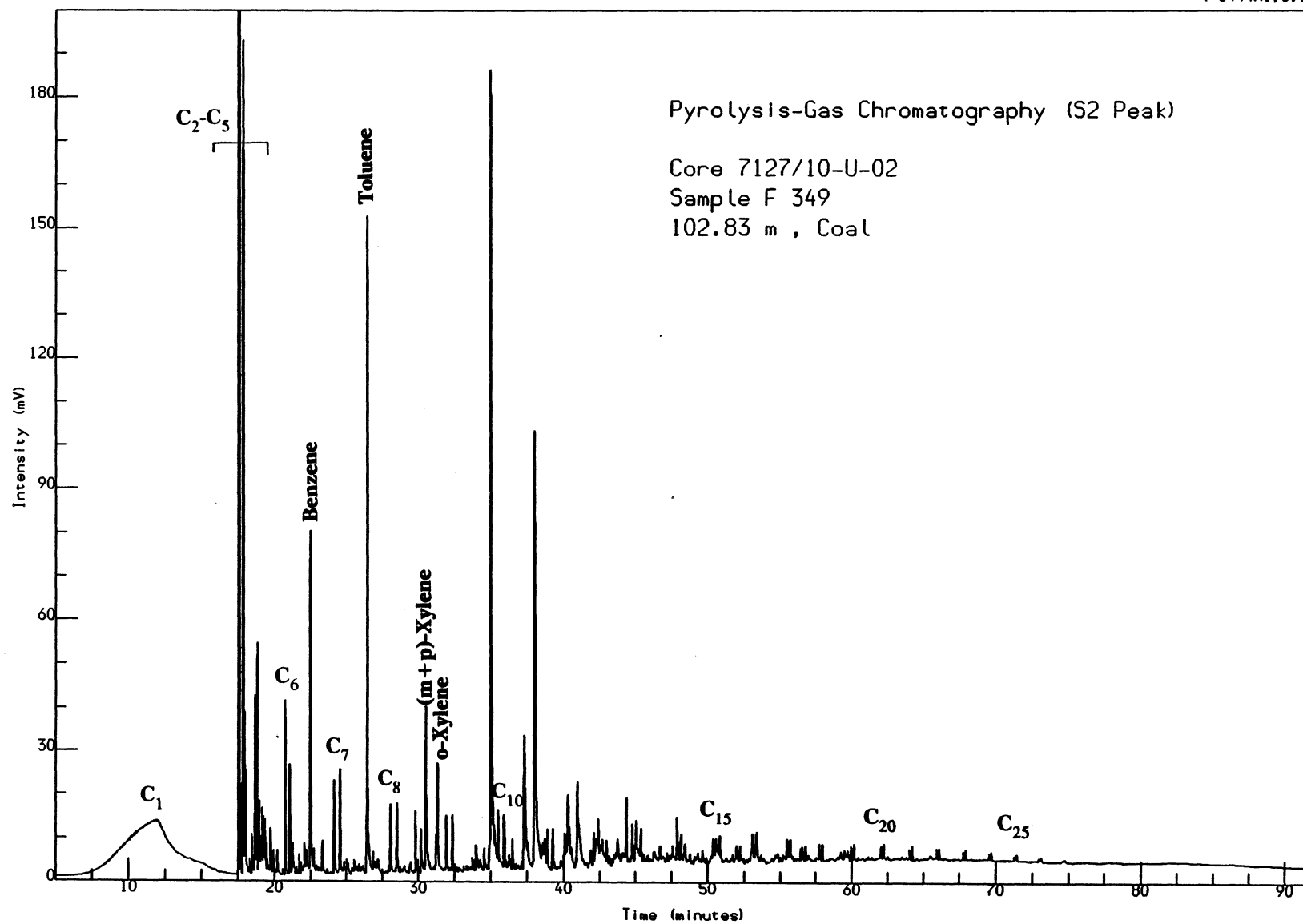
IKU no.	Depth (m)	SAT	d13C (0/00 PDB)			
			ARO	Polars	Asph.	EOM
F0349	102.83	-26.47	-24.33	-24.74	-23.50	-24.29
F0439	167.93	-29.79	-25.99	-26.47	-24.58	-25.34

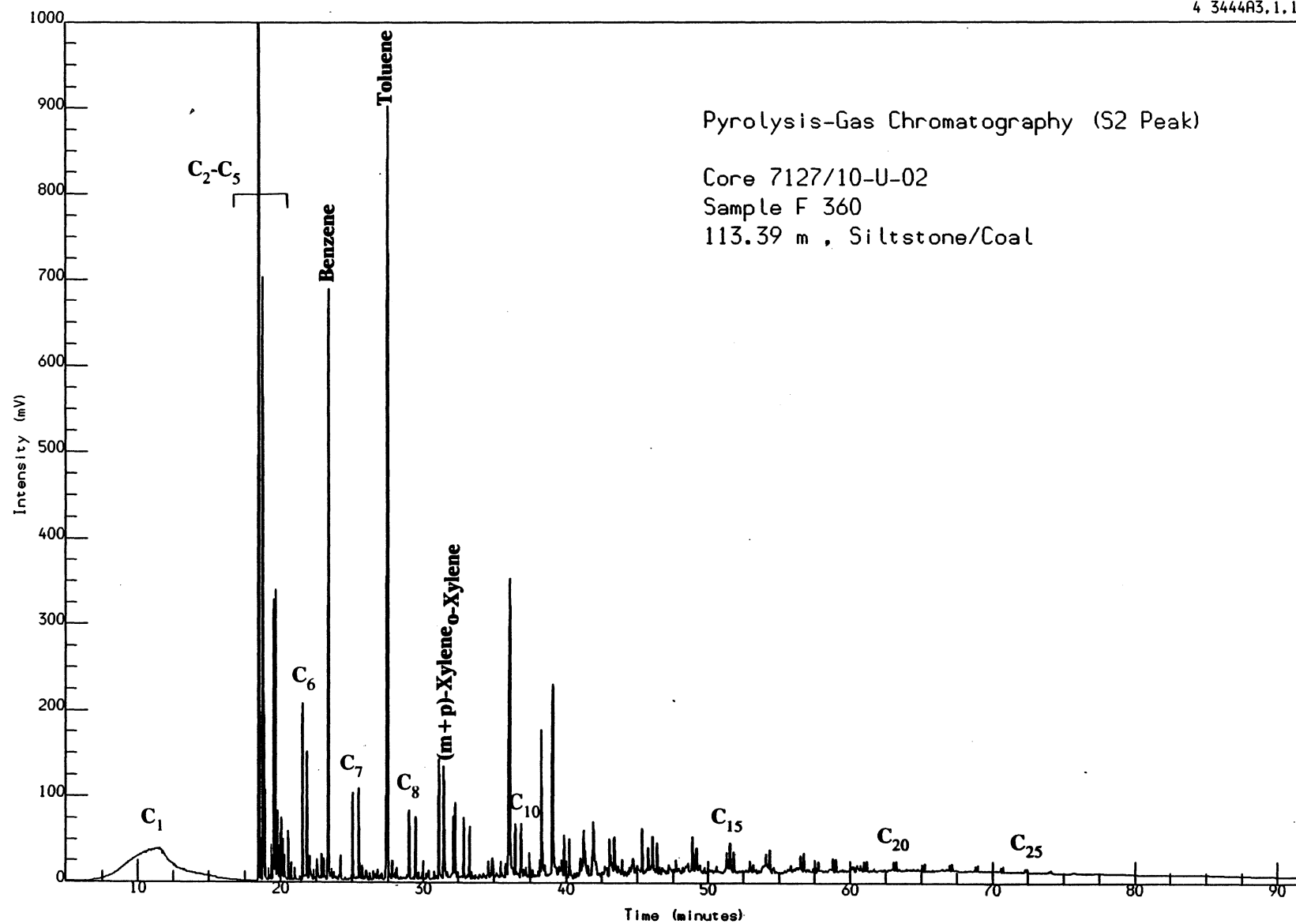
Figure A.III.2.1:

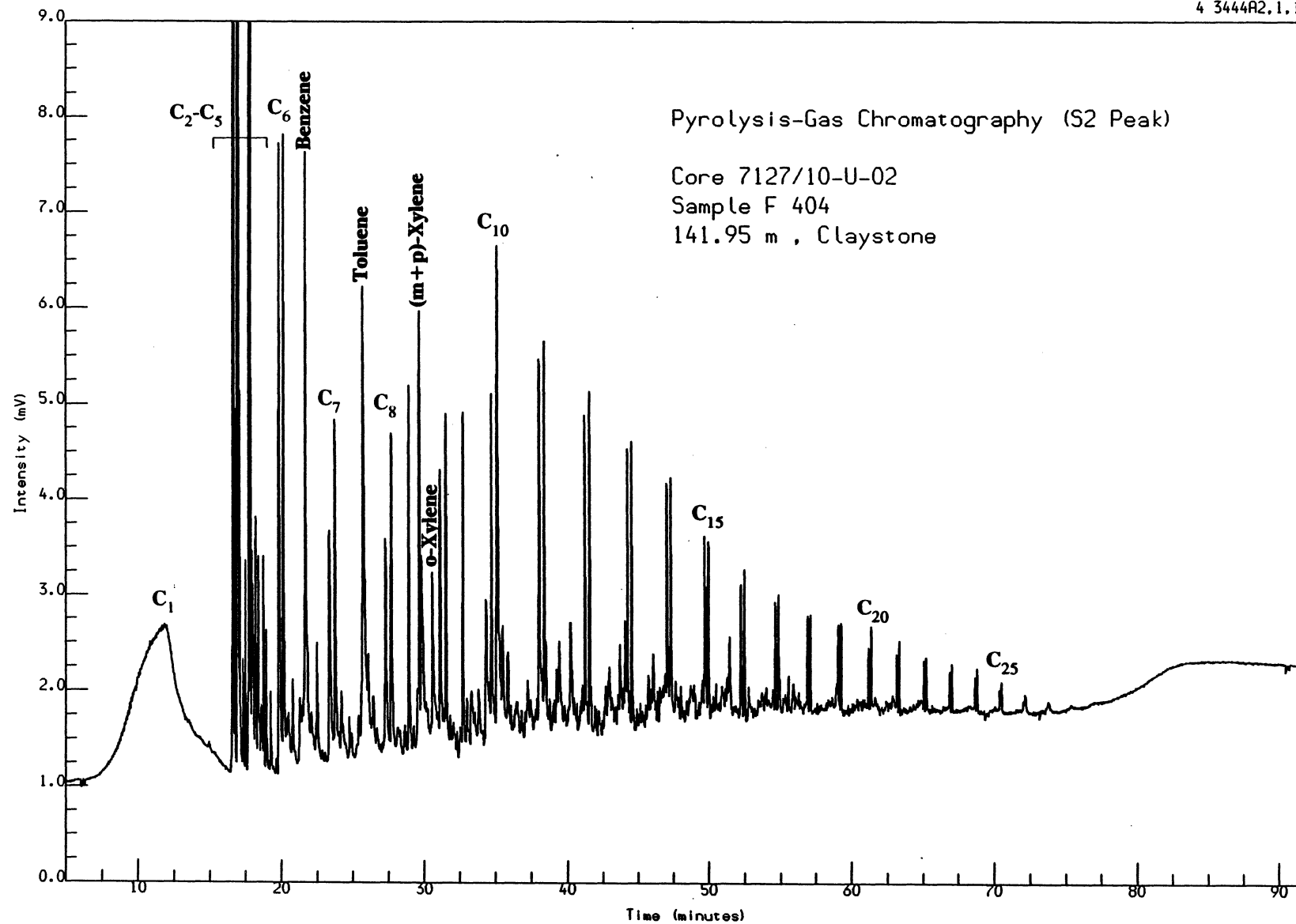
Pyrolysis-gas chromatograms (S2 peak)

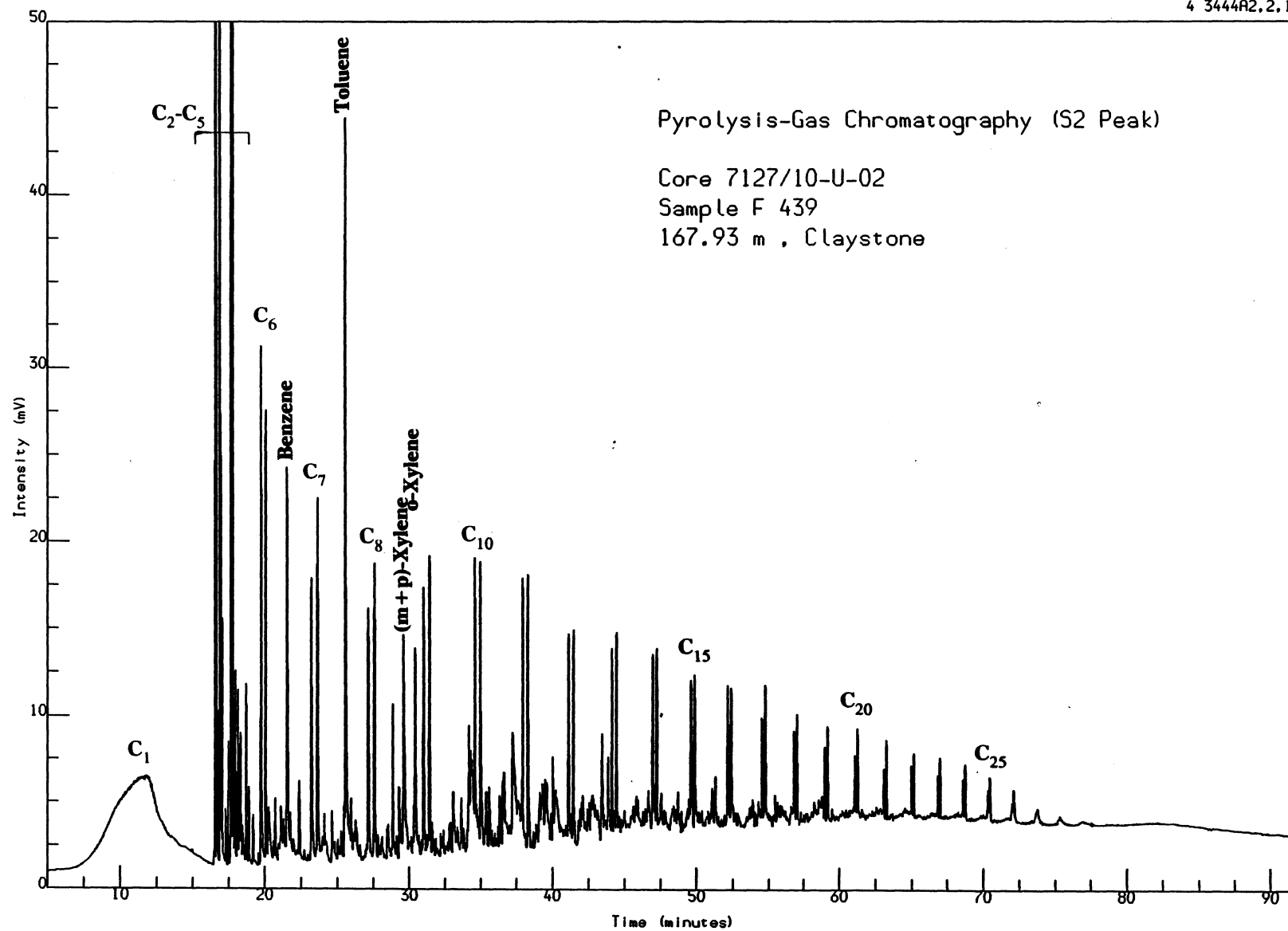


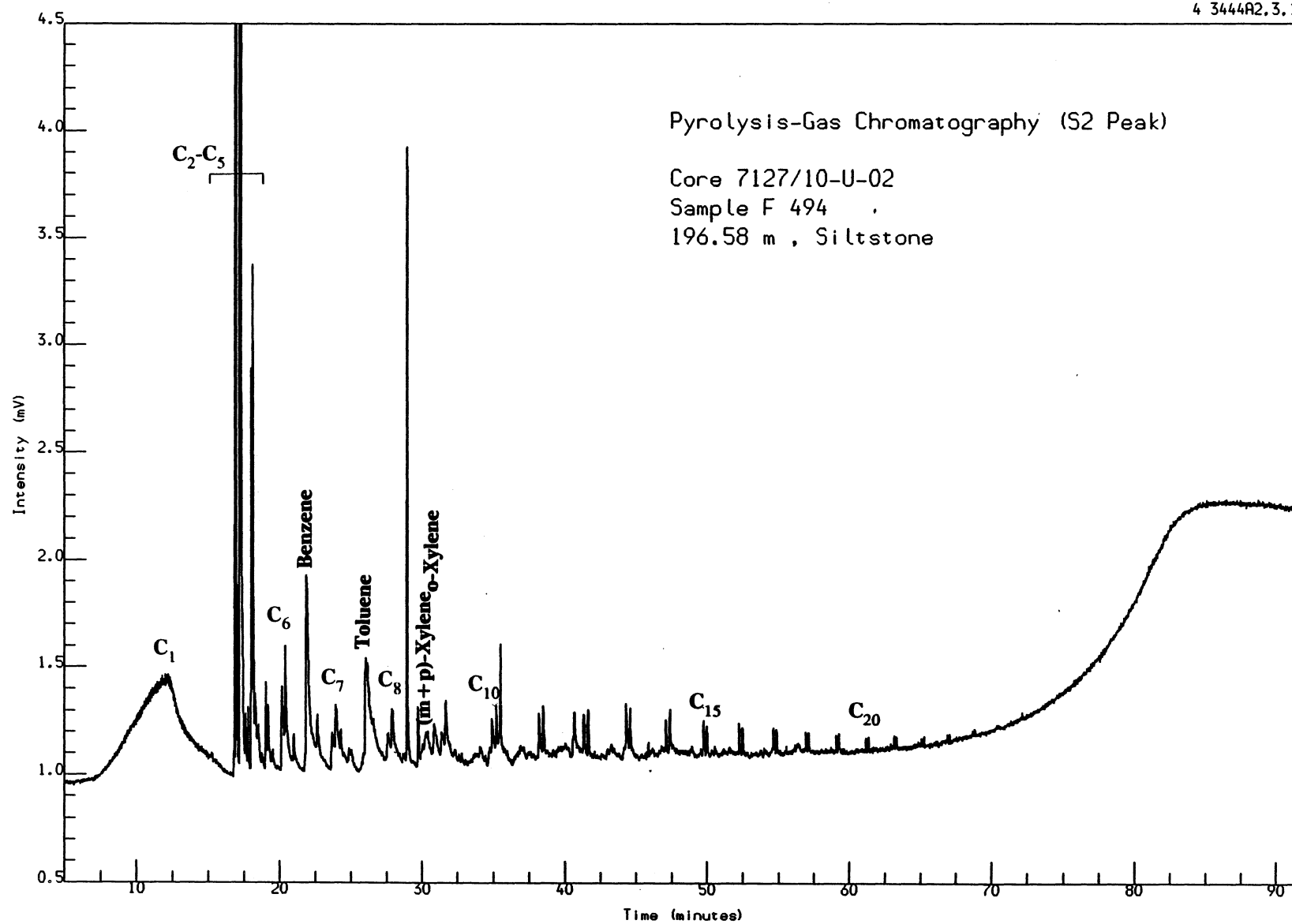












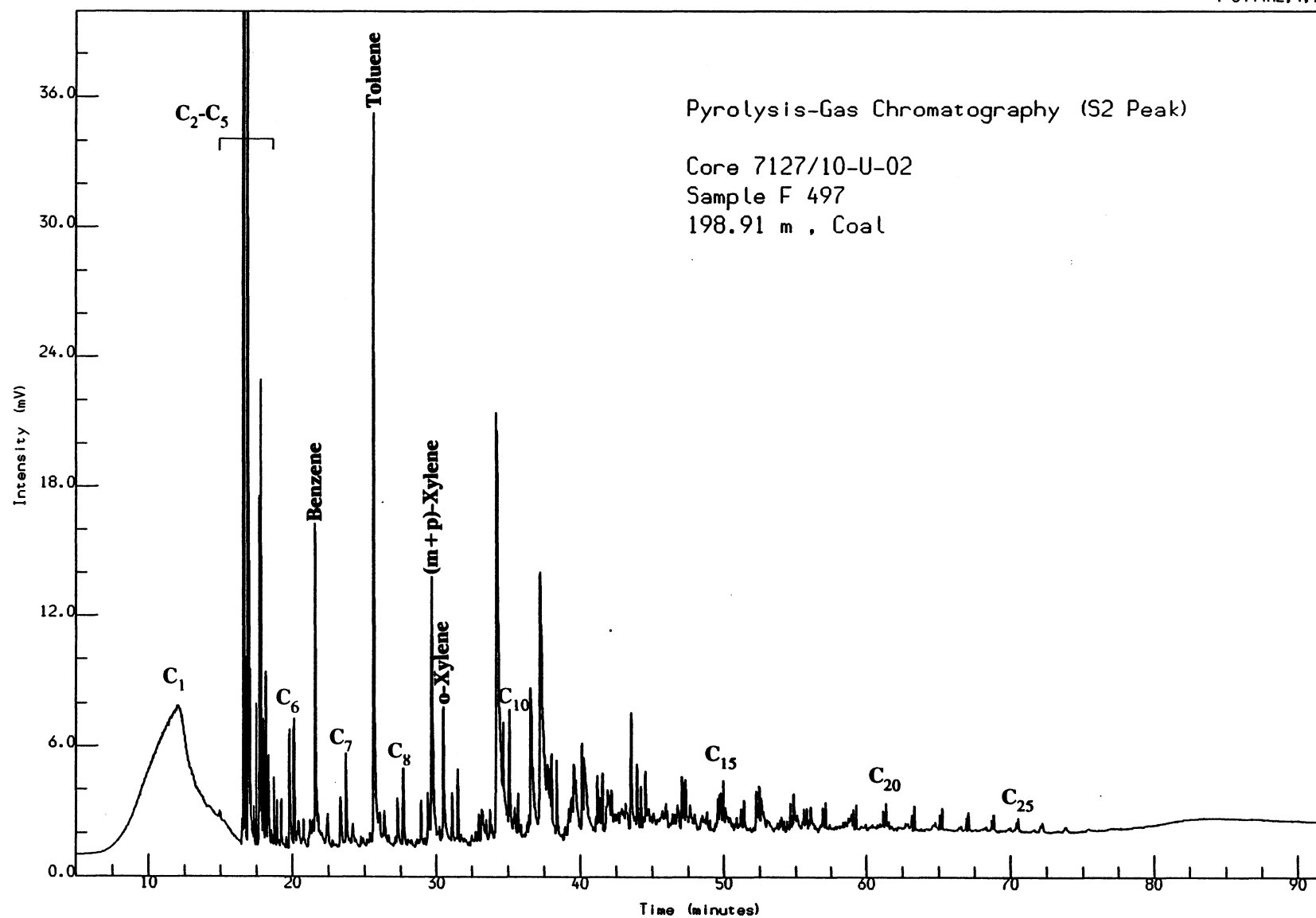
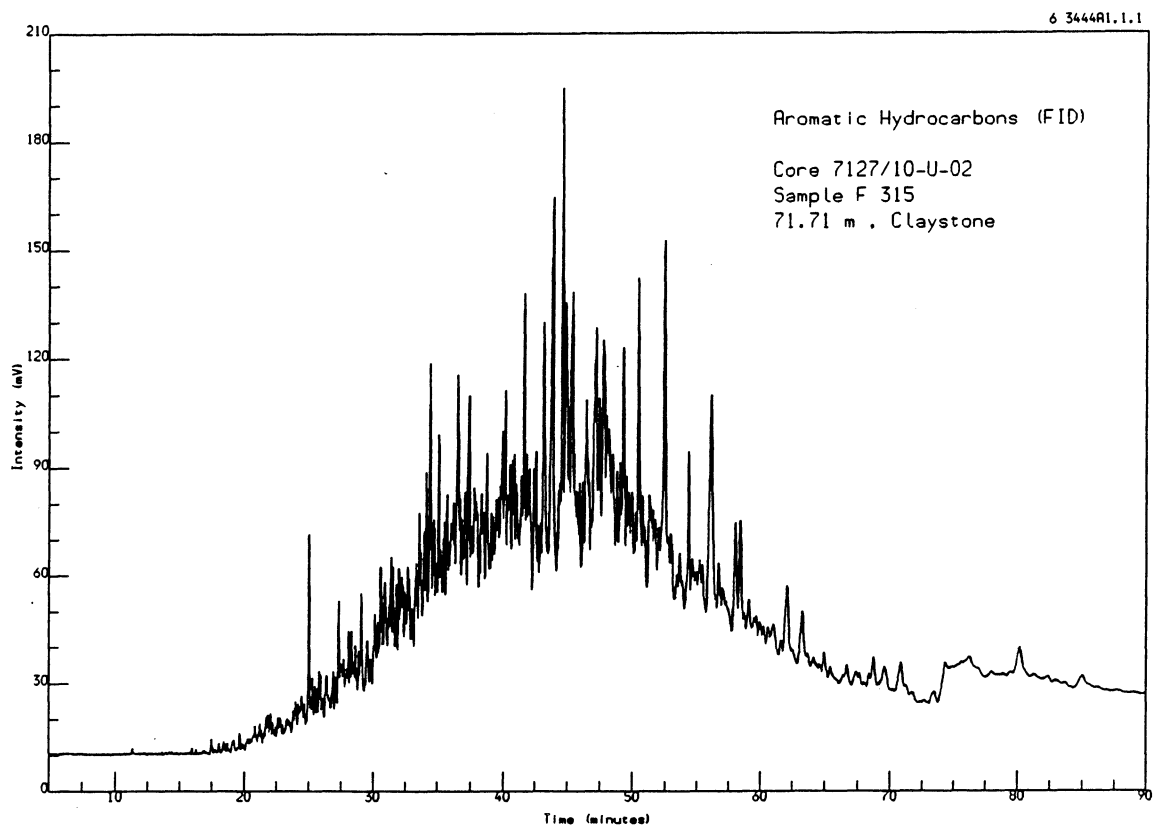
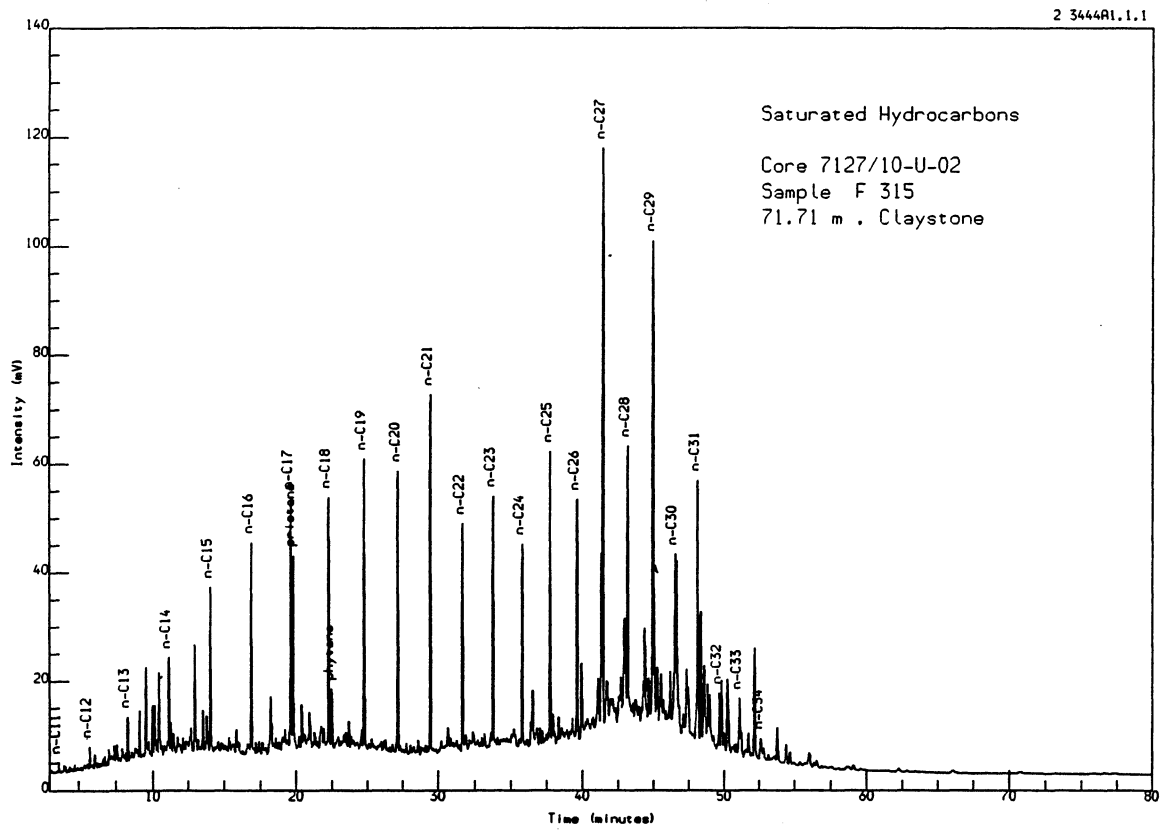


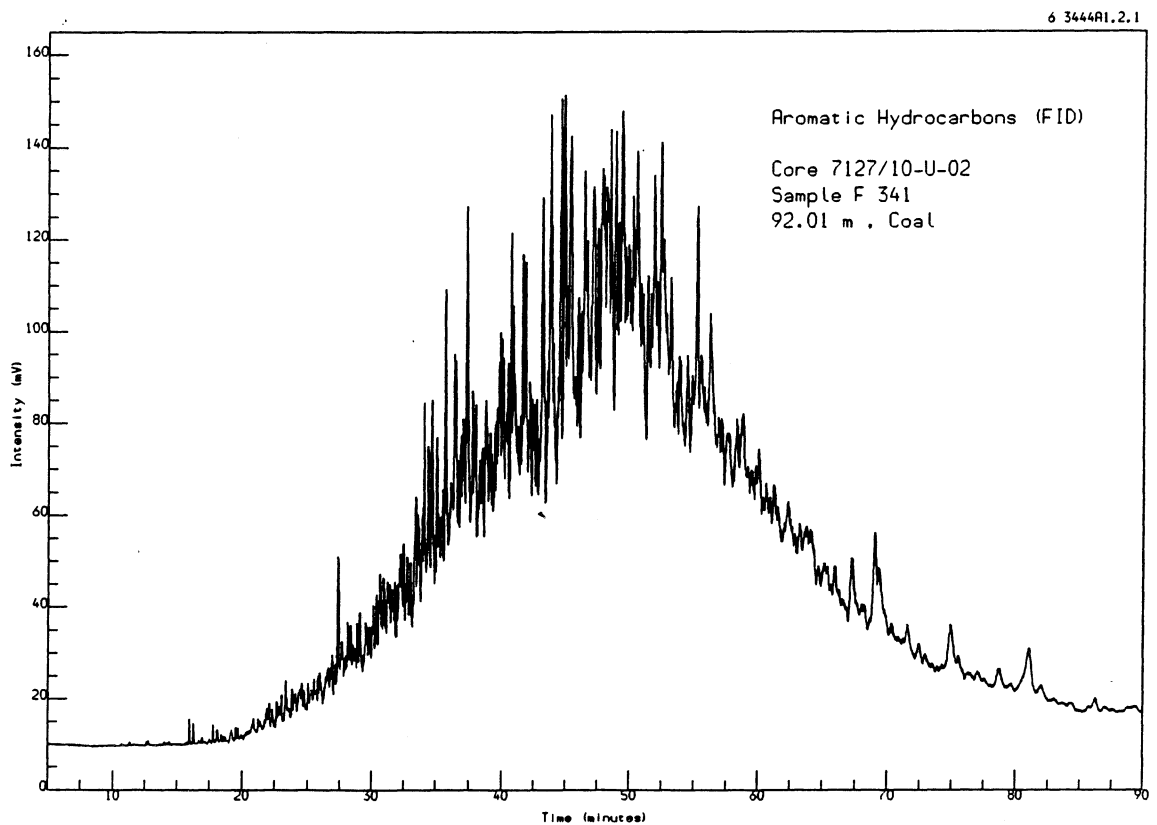
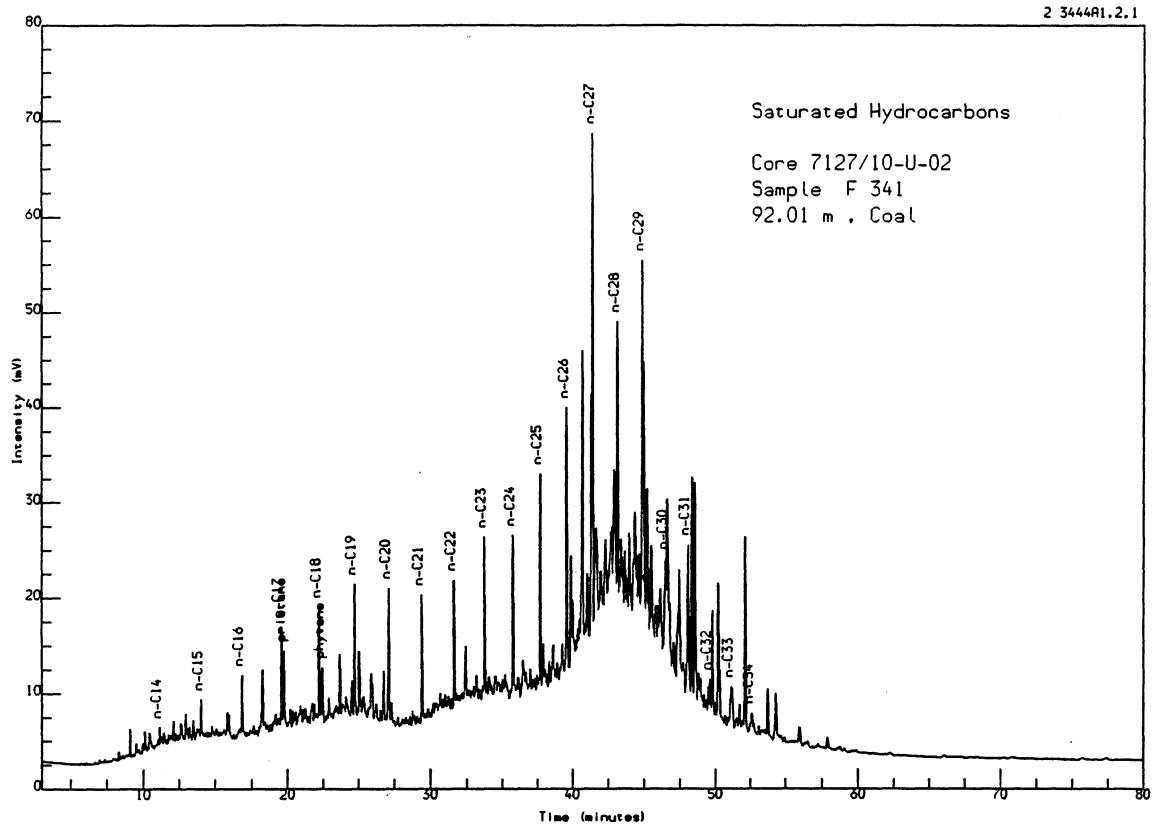
Figure A.III.2.2:

Gas chromatograms of saturated and aromatic hydrocarbons

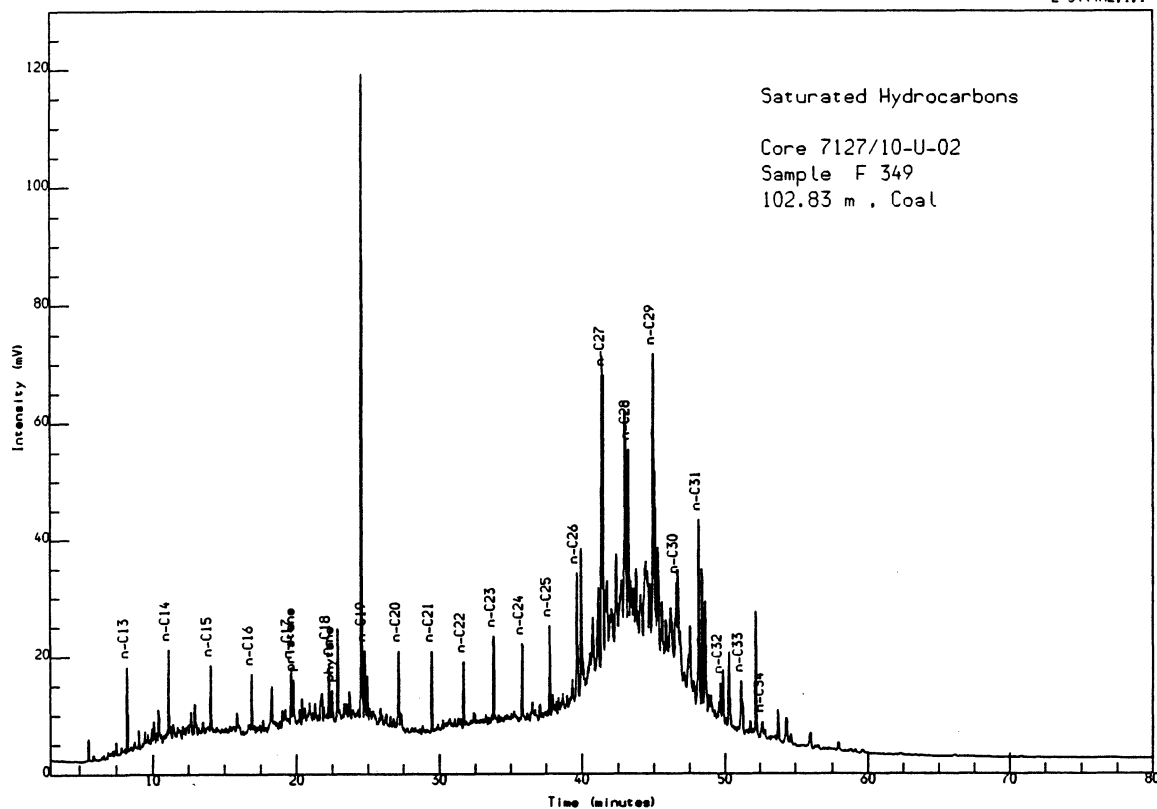
n-C₁₅ etc. - n-alkanes

N	- Naphthalene
MN	- Methylnaphthalenes
DMN	- Dimethylnaphthalenes
TMN	- C ₃ -naphthalenes
P	- Phenanthrene
PN	- Methylphenanthrenes
DMP	- Dimethylphenanthrenes

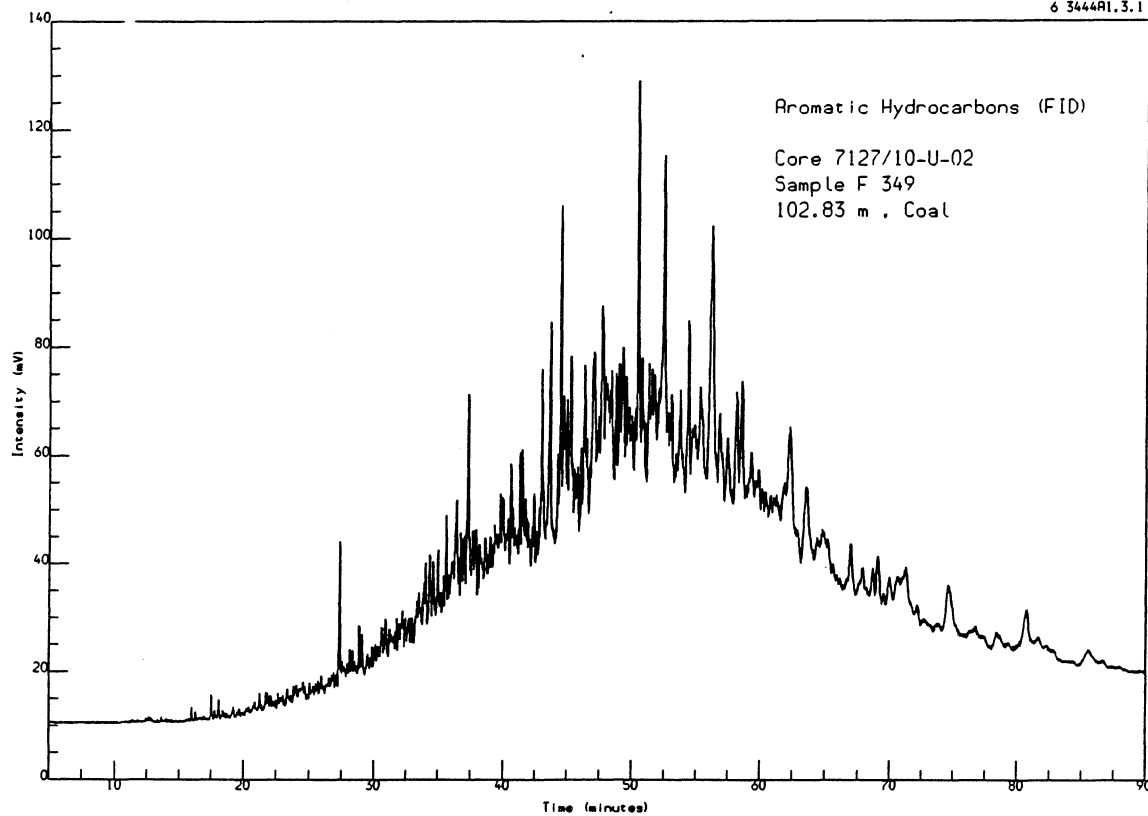


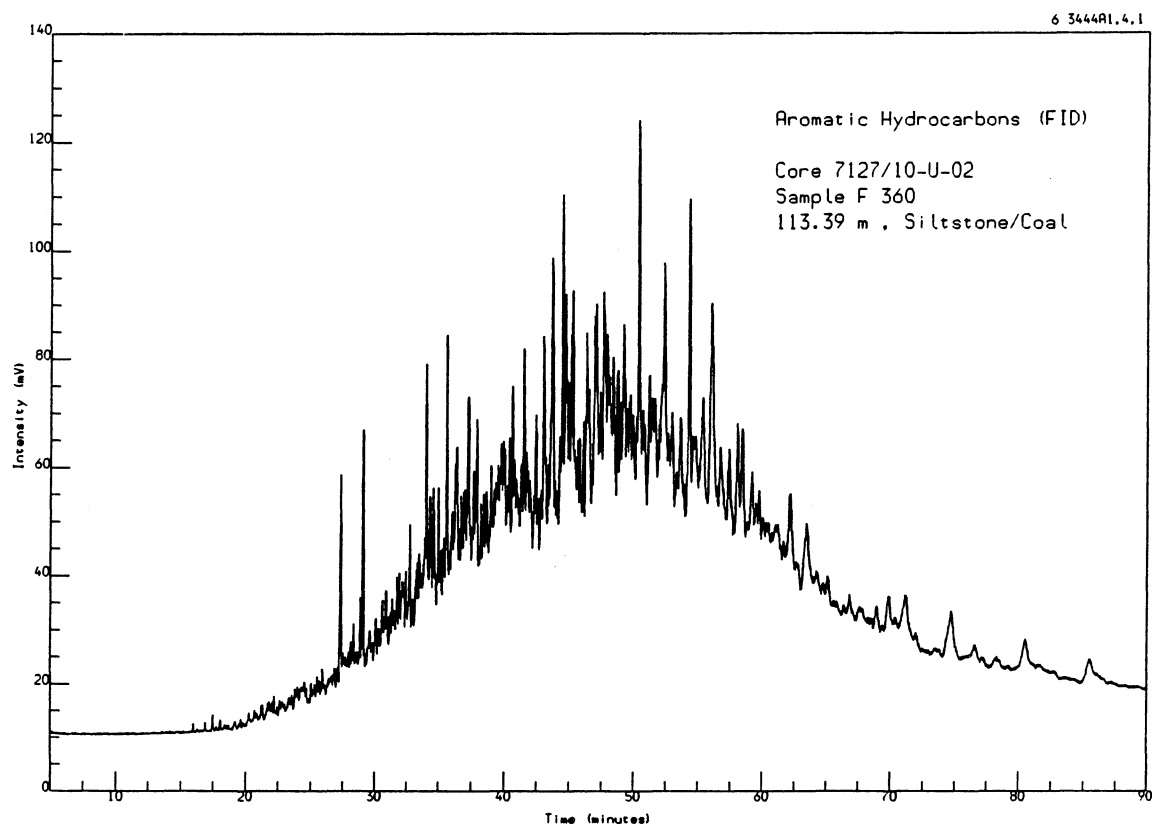
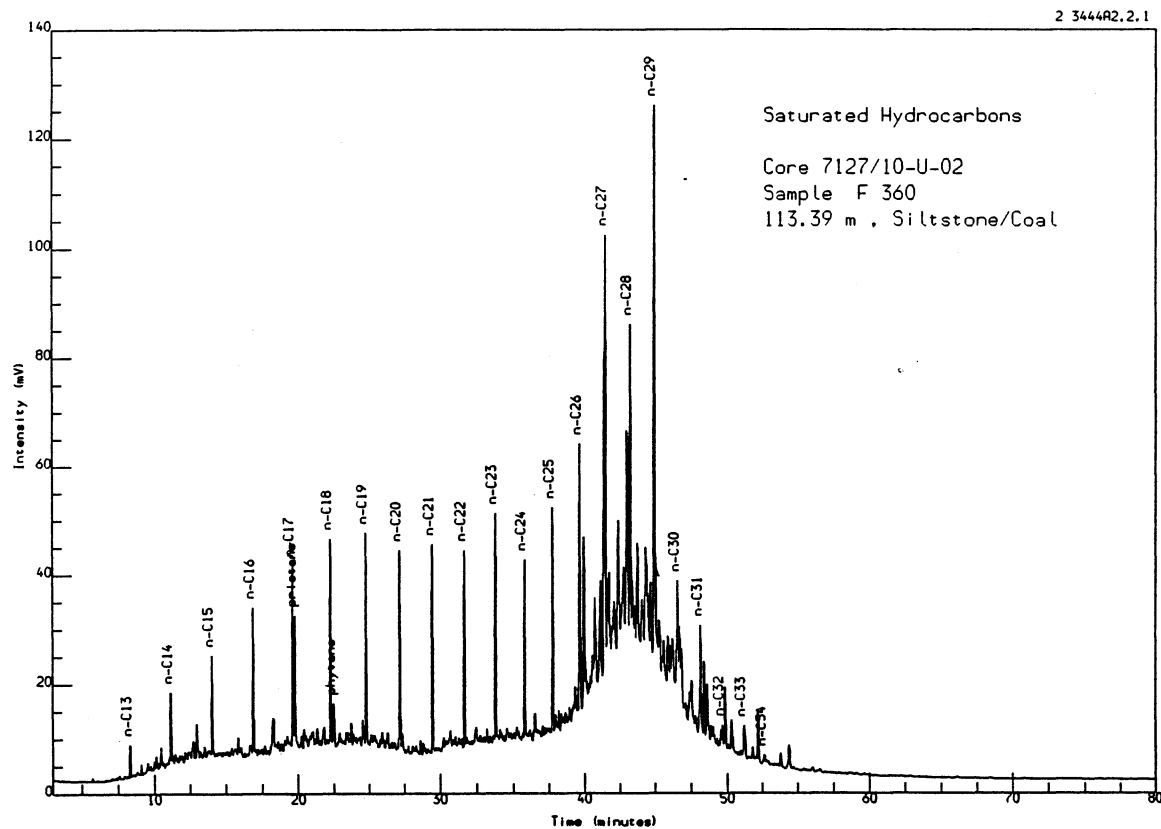


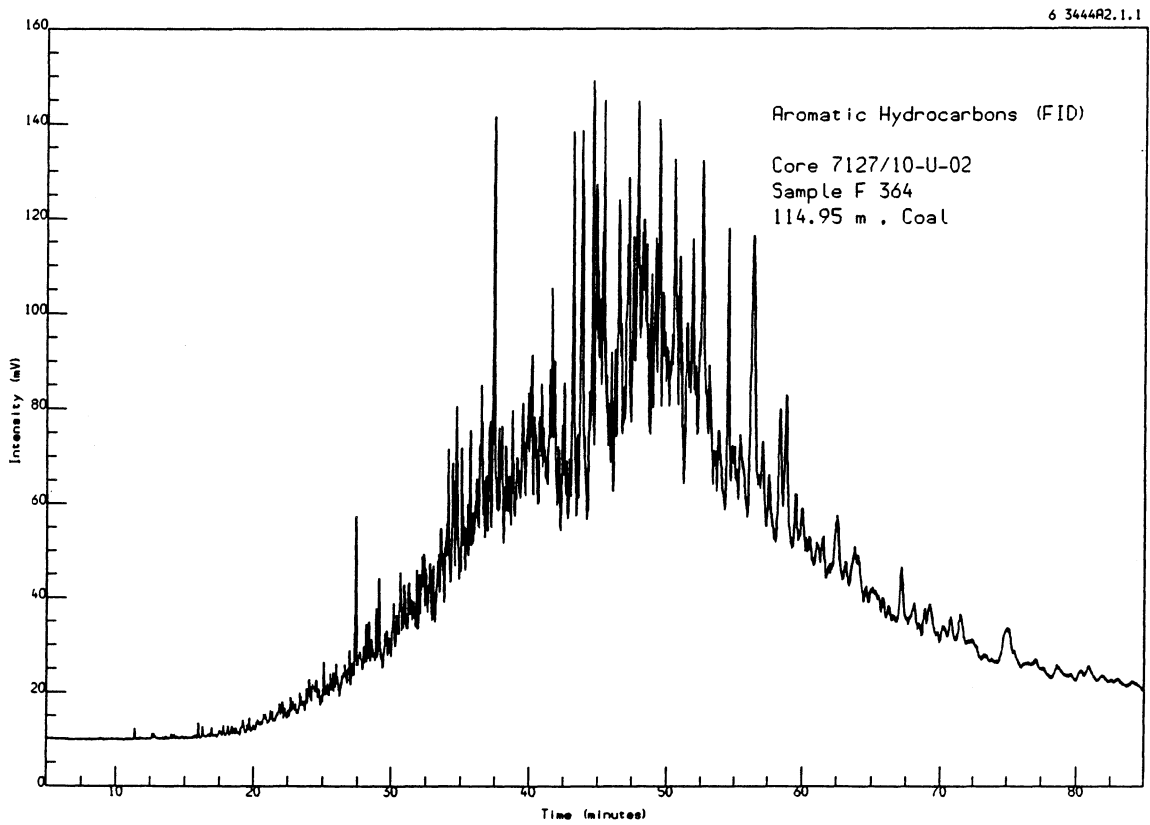
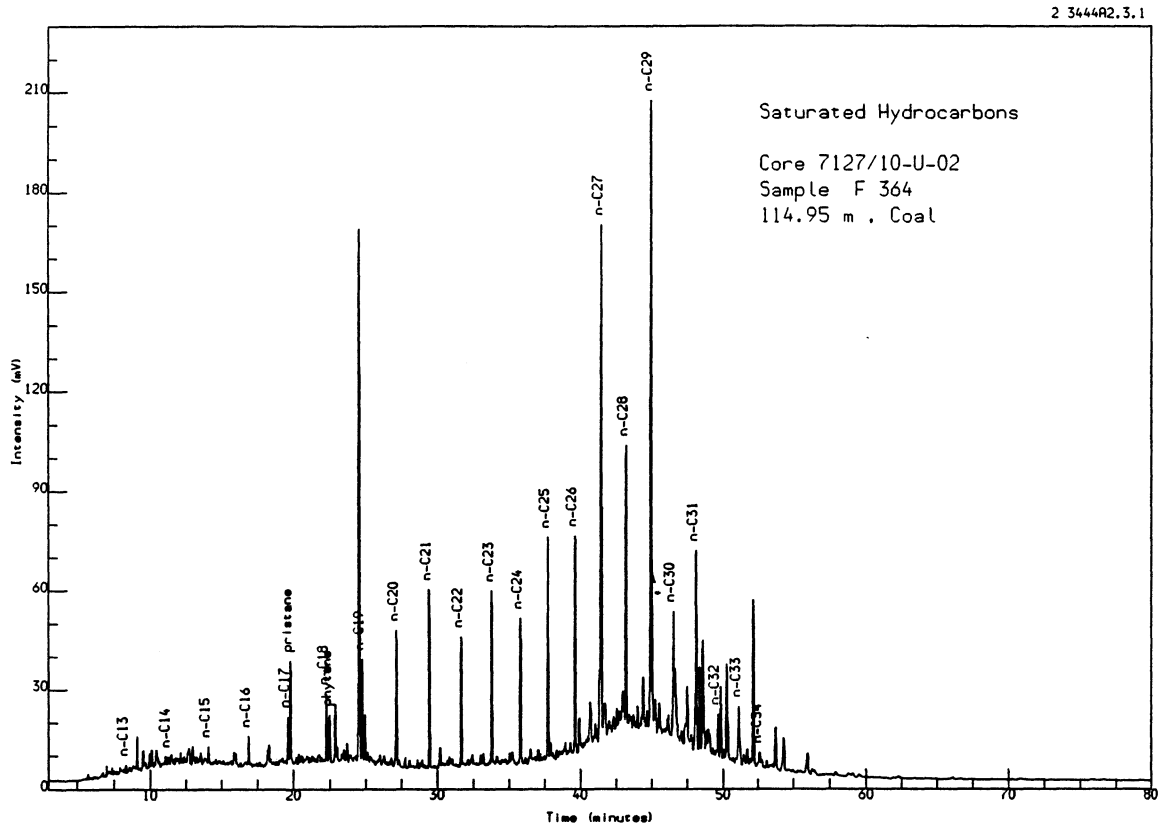
2 3444A2.1.1

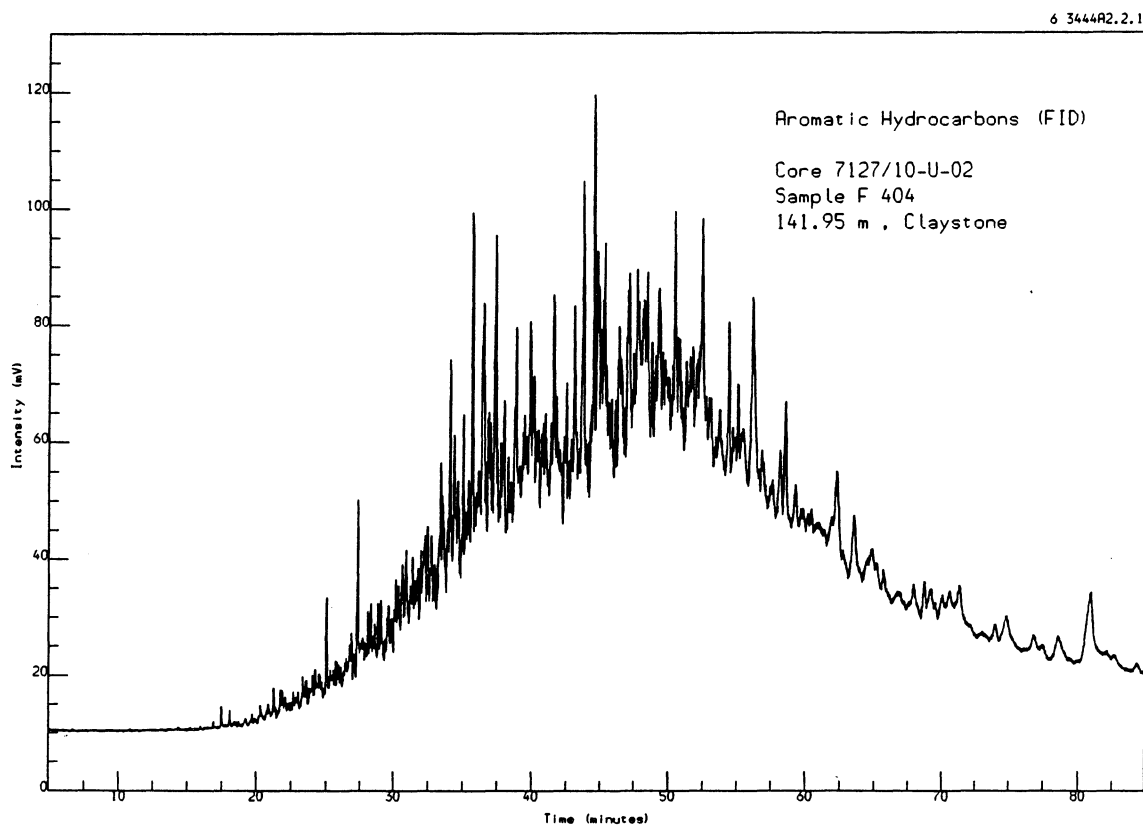
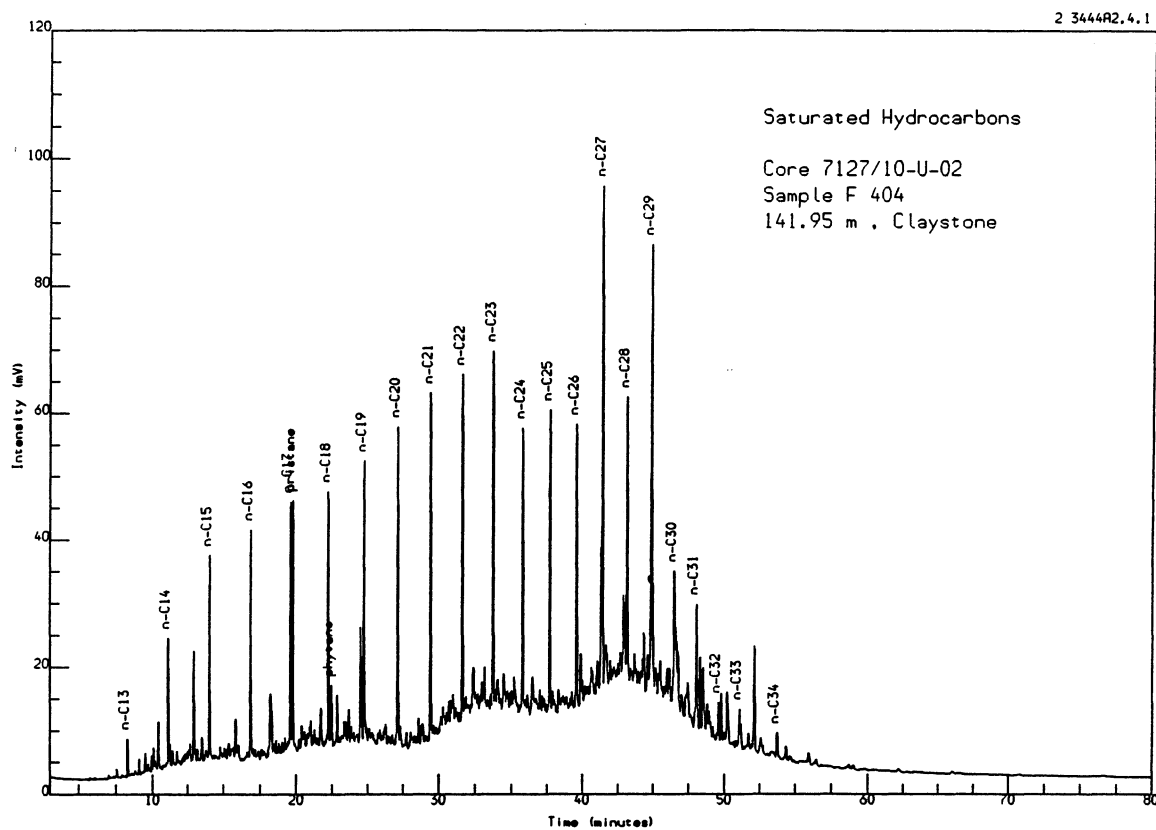


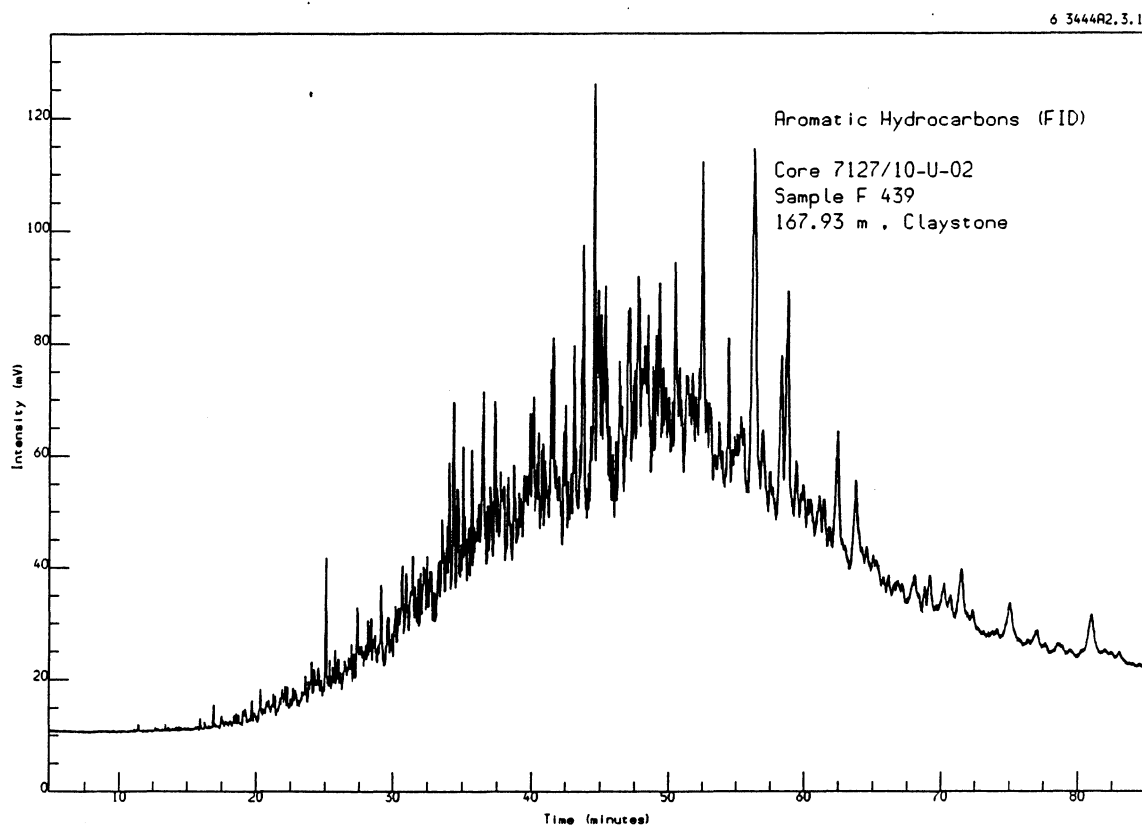
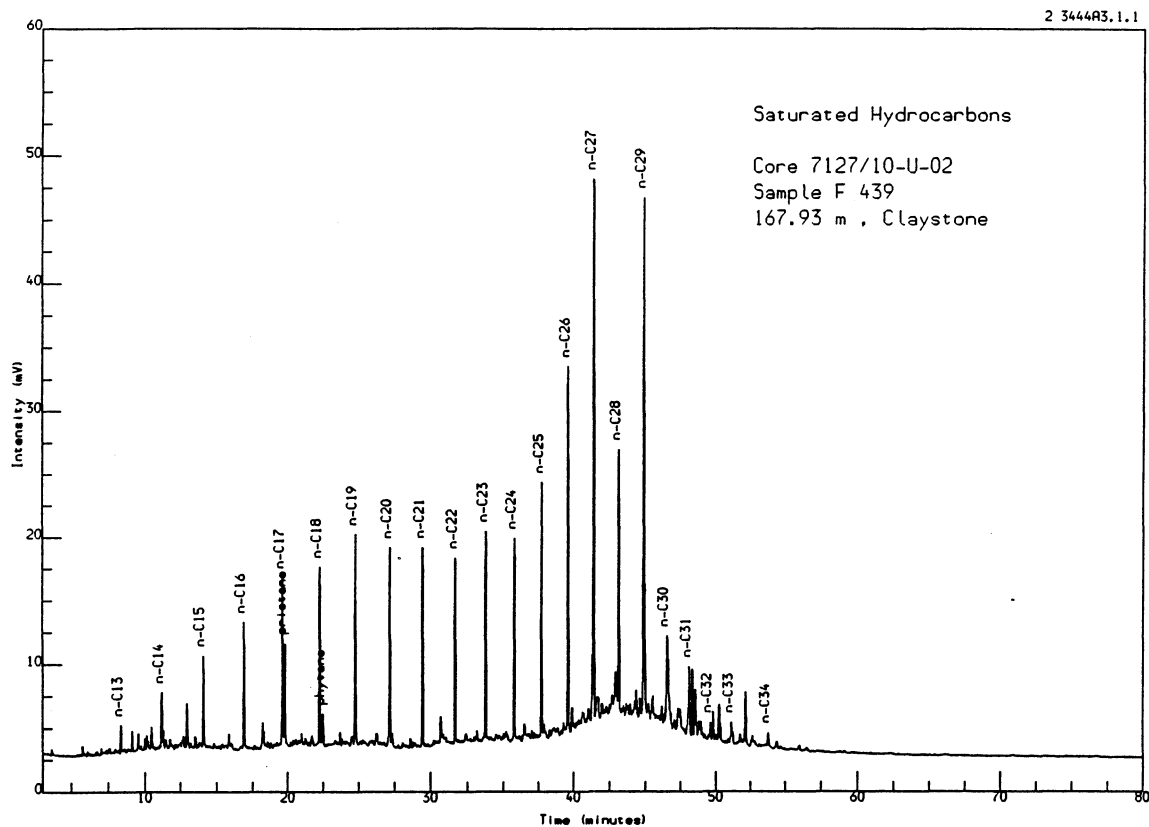
6 3444A1.3.1

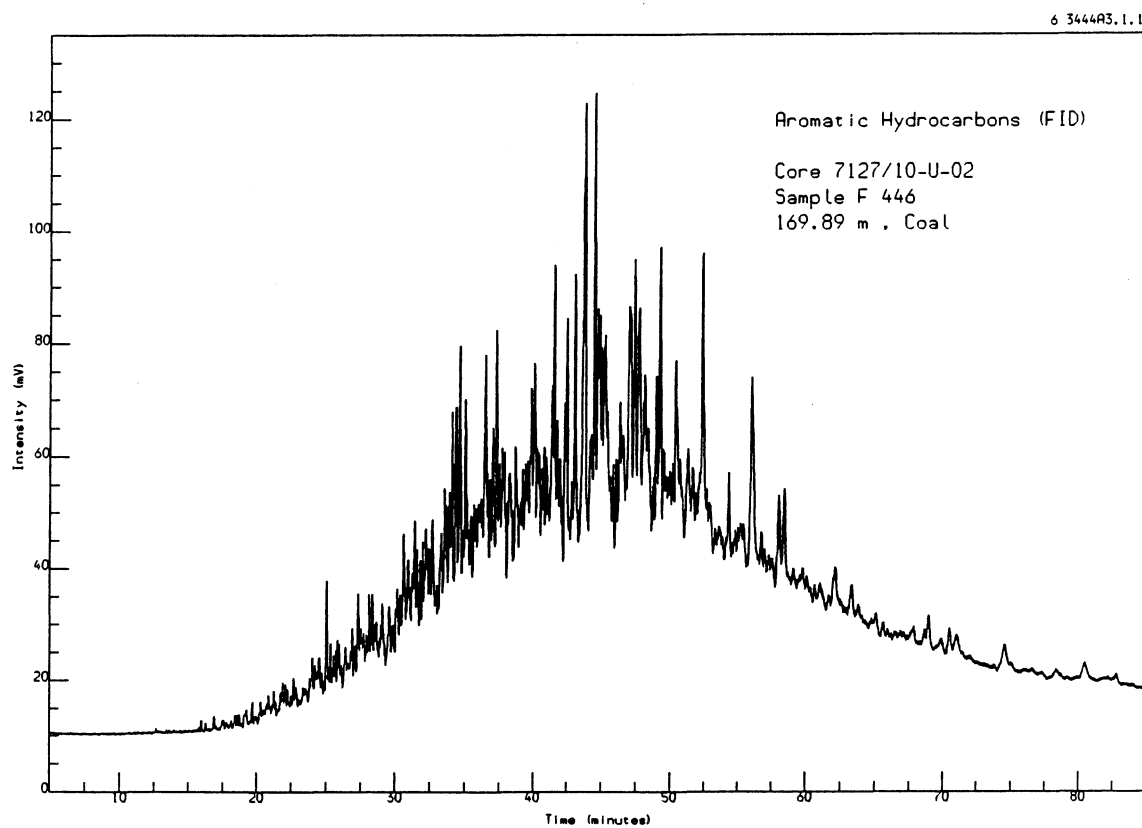
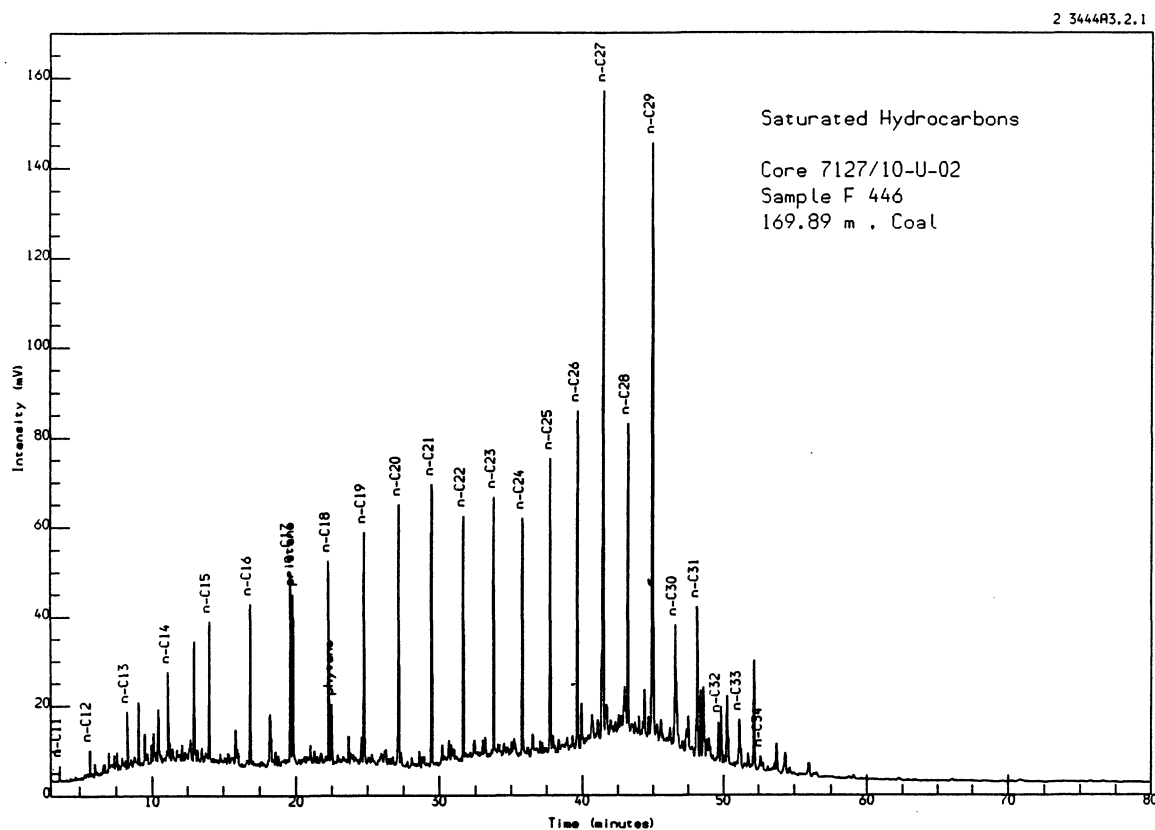


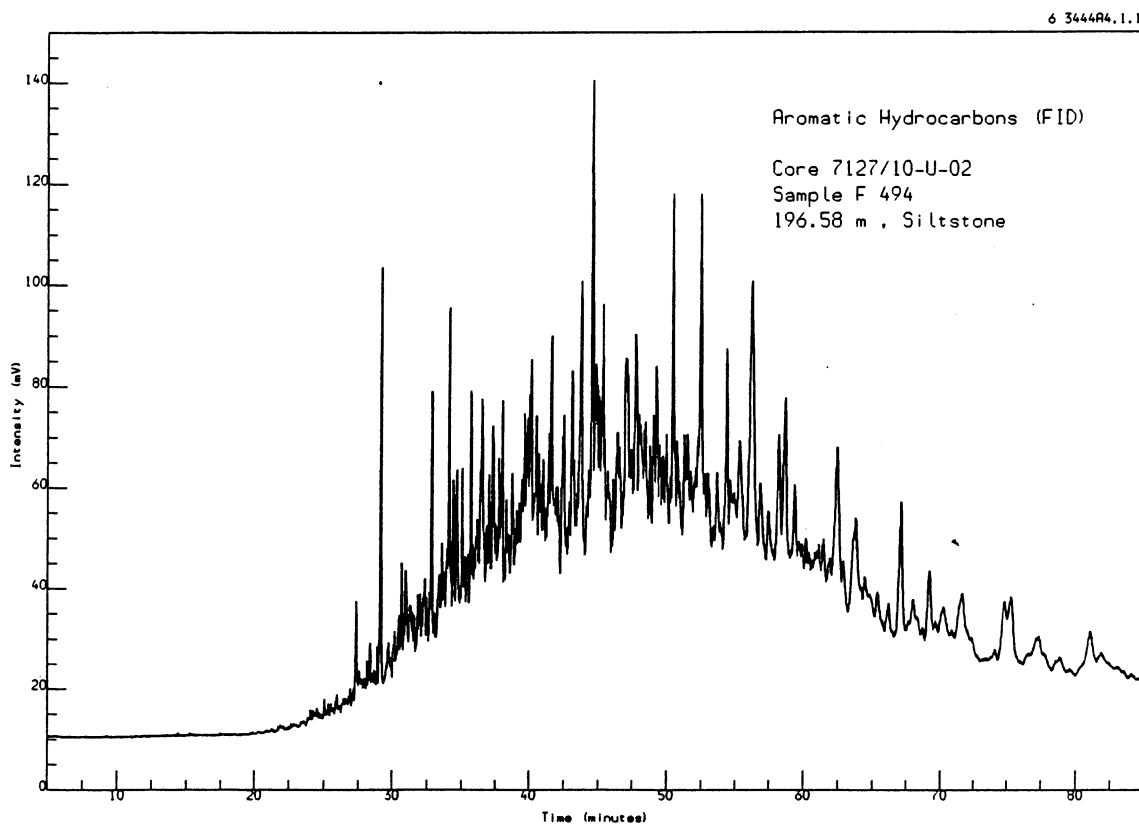
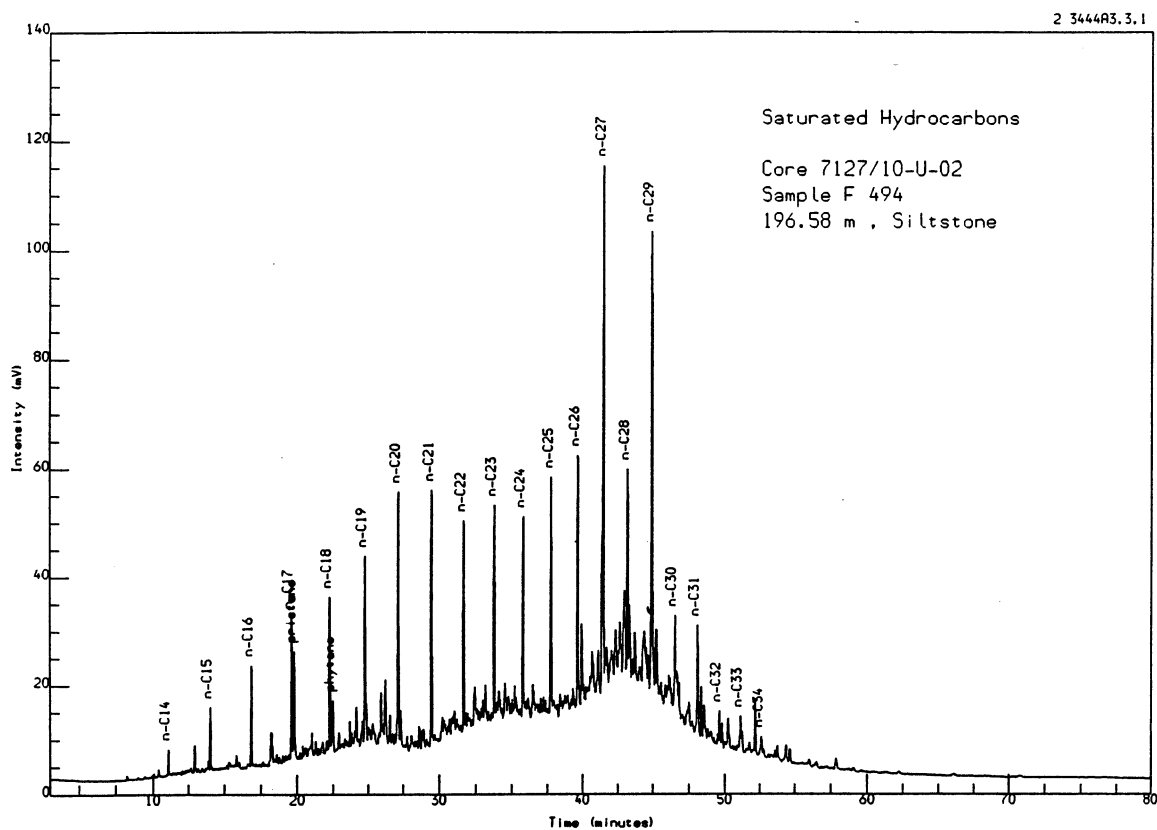




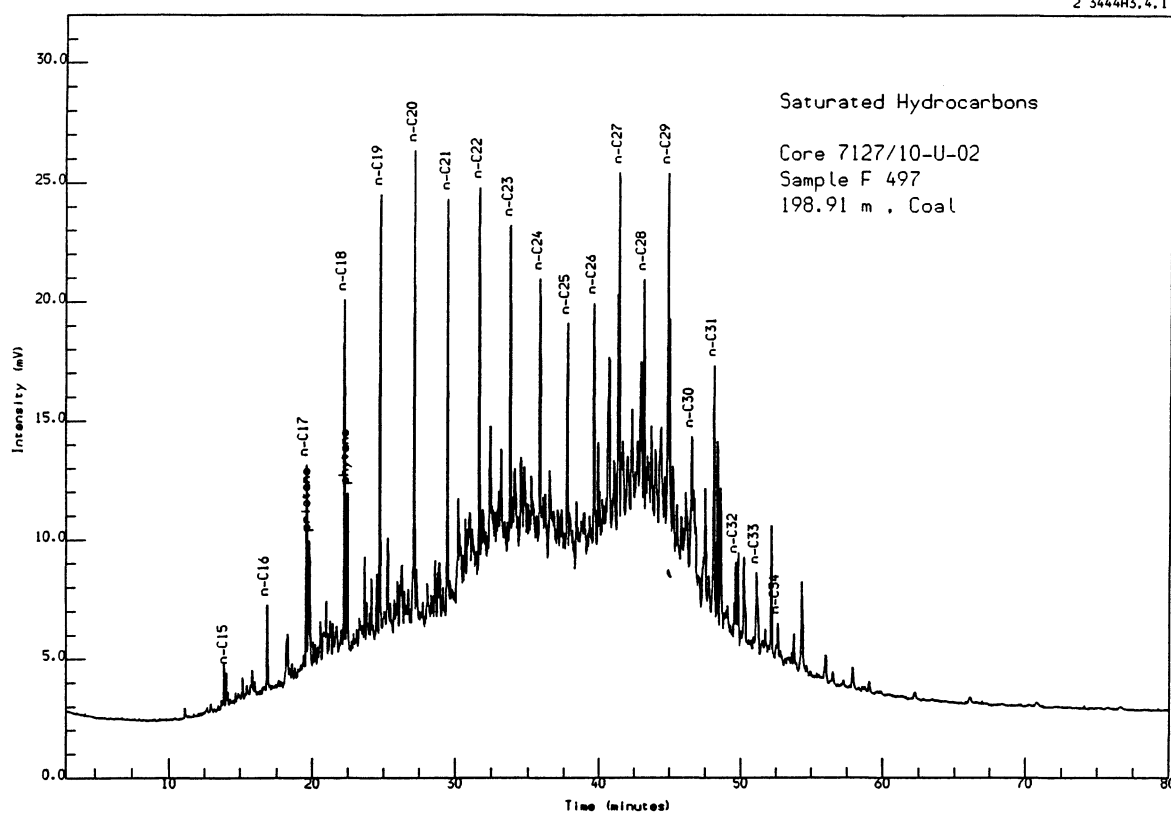








2 3444R3.4.1



6 3444R4.2.1

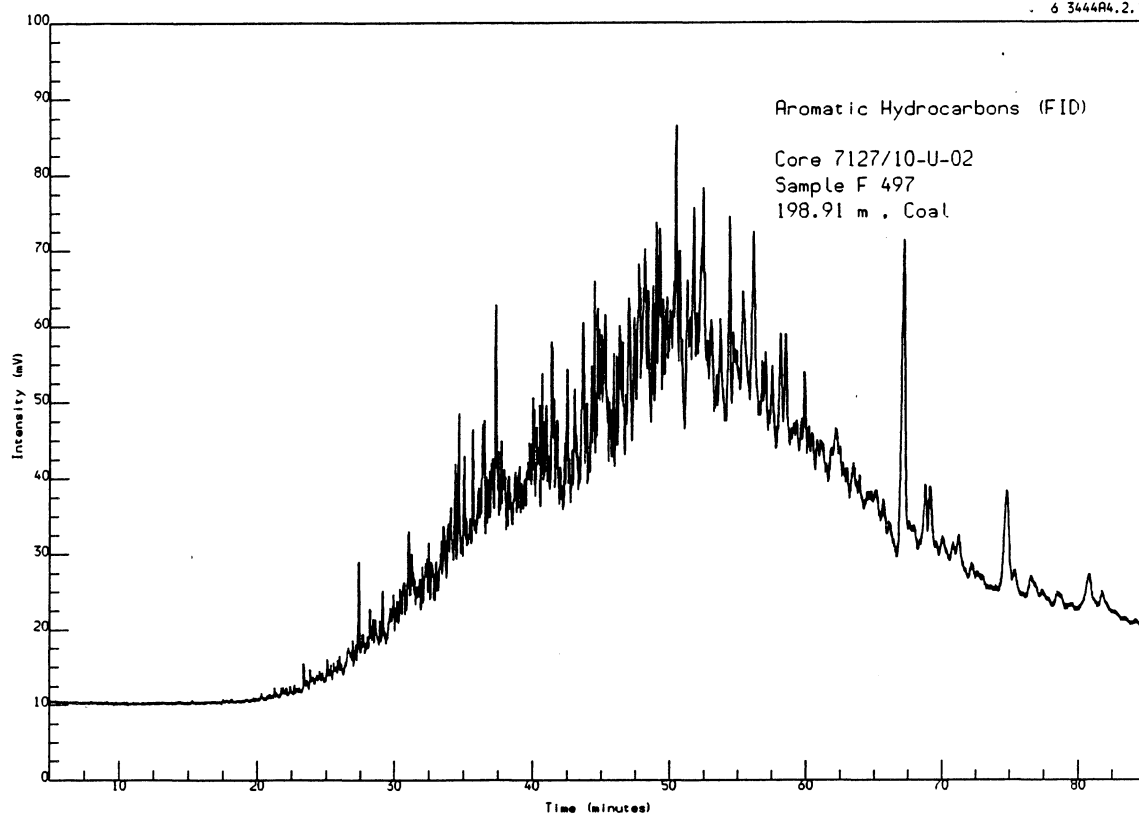
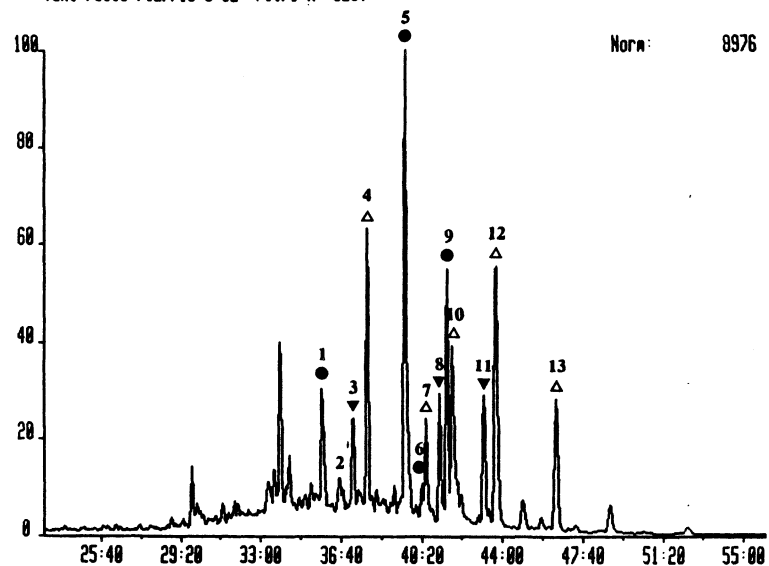


Figure A.III.2.3:

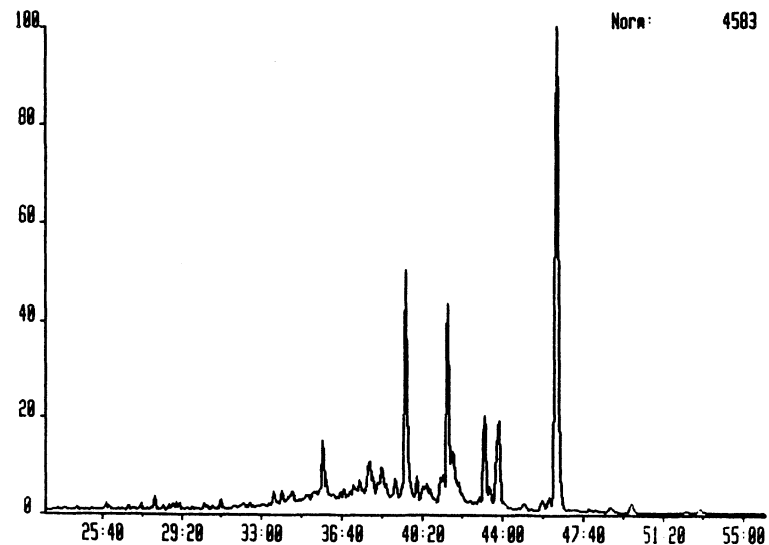
**Mass fragmentograms of m/z 191, 205 (terpanes)
and m/z 217, 218 (steranes).**

For peak identification see Chapter 4.

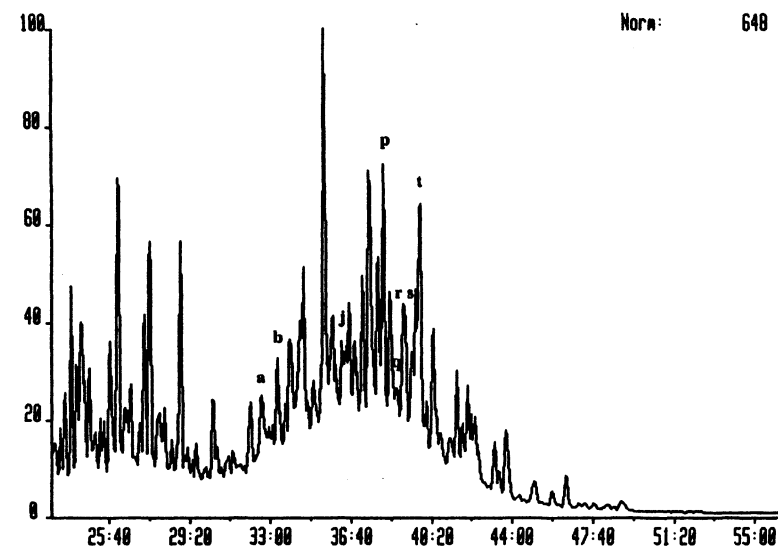
F0315 12-JAN-89 Str:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0315 7127/10-U-02 71.71 M CLST



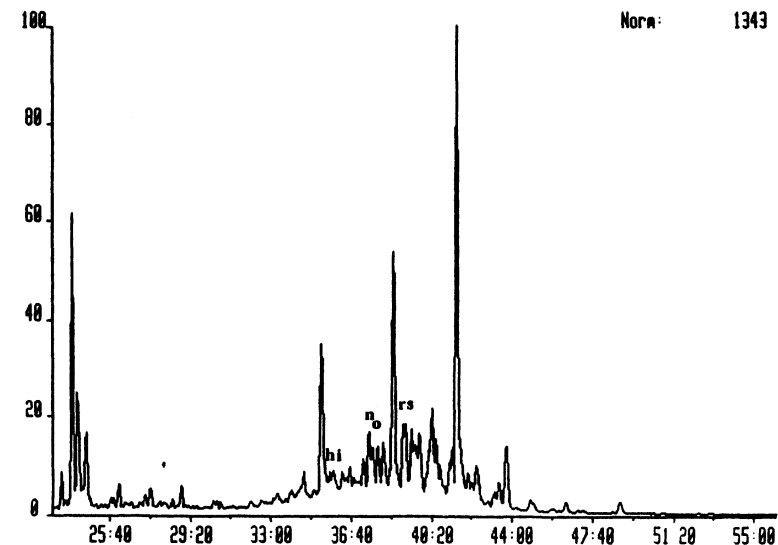
F0315 12-JAN-89 Str:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0315 7127/10-U-02 71.71 M CLST



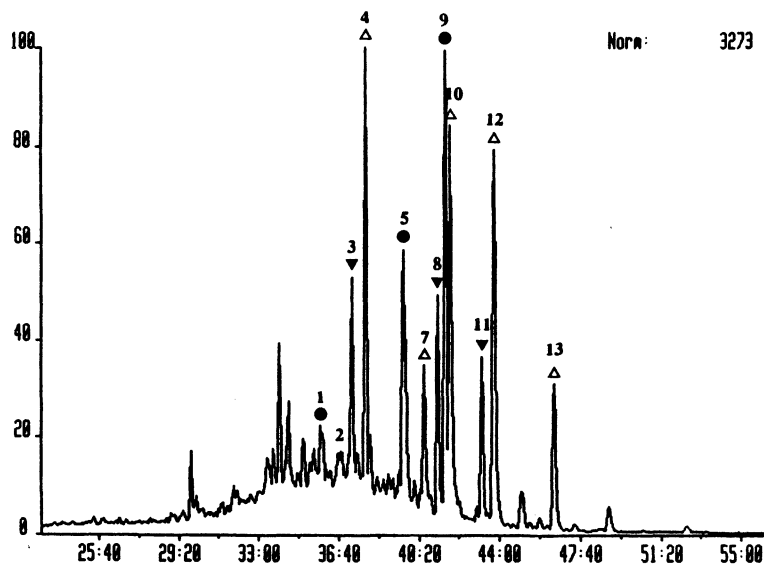
F0315 12-JAN-89 Str:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0315 7127/10-U-02 71.71 M CLST



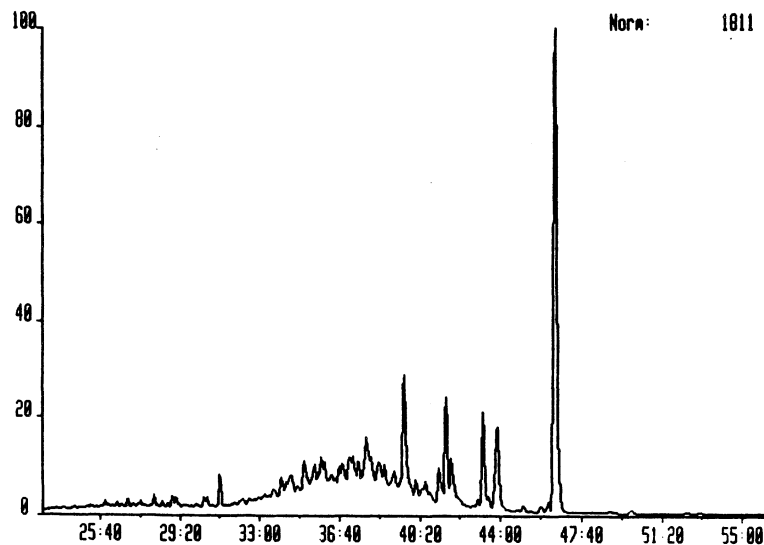
F0315 12-JAN-89 Str:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0315 7127/10-U-02 71.71 M CLST



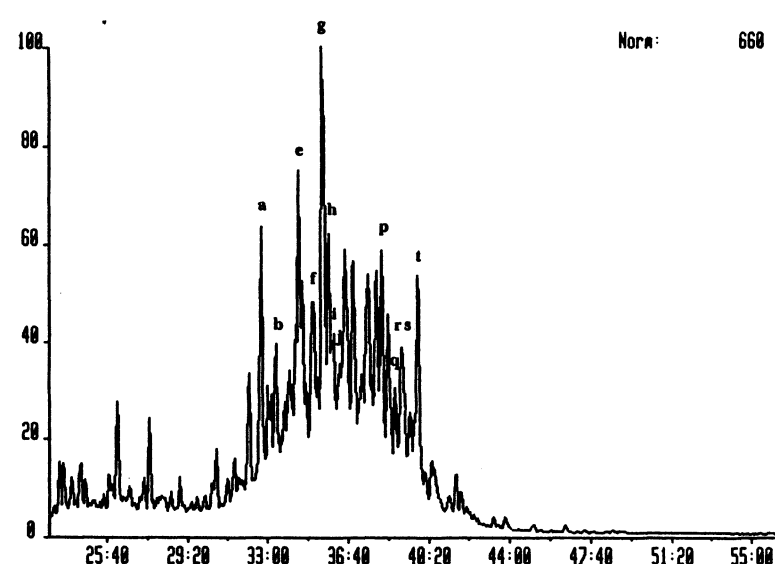
F0341 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0341 7127/10-U-02 92.01 M COAL



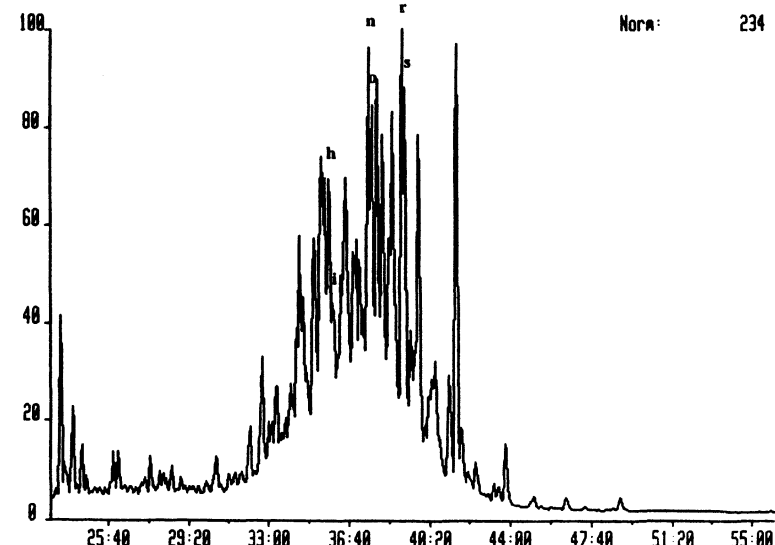
F0341 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0341 7127/10-U-02 92.01 M COAL



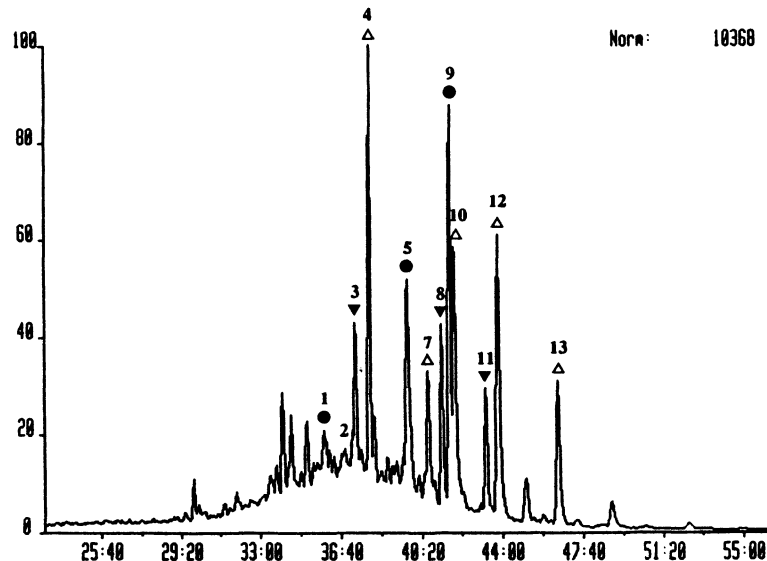
F0341 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0341 7127/10-U-02 92.01 M COAL



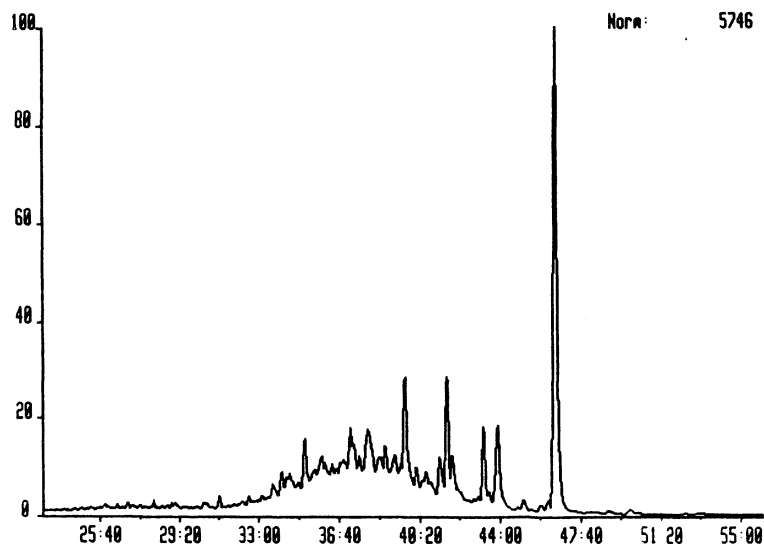
F0341 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0341 7127/10-U-02 92.01 M COAL



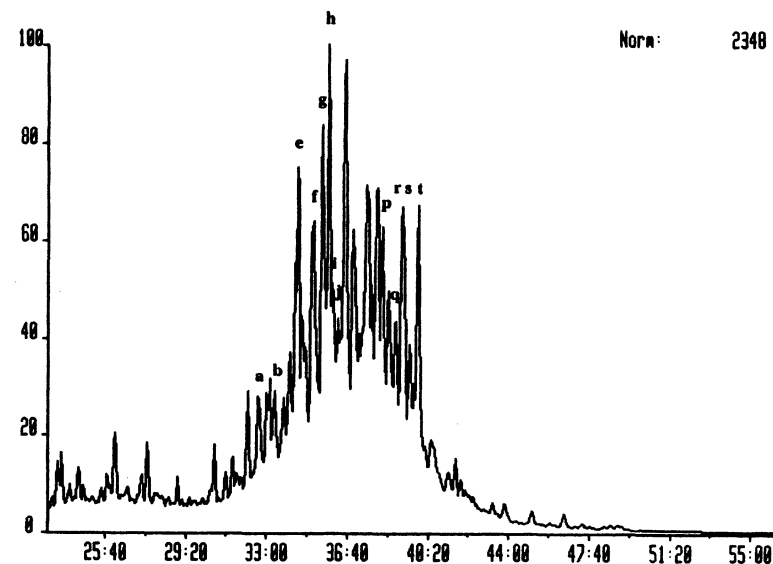
F0349 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0349 7127/10-U-02 102.03 M CORAL



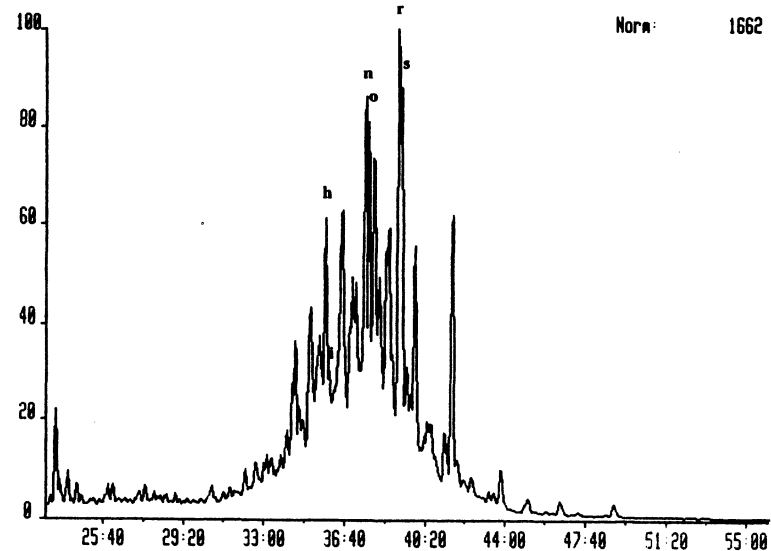
F0349 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0349 7127/10-U-02 102.03 M CORAL



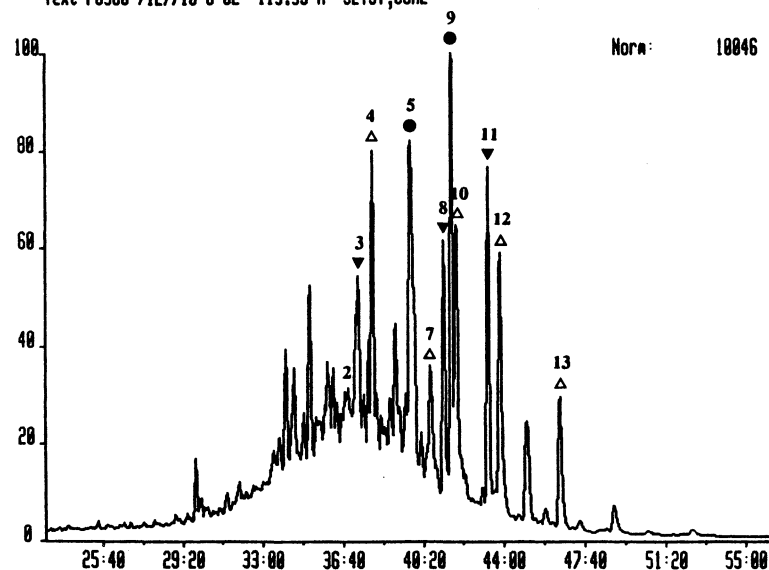
F0349 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0349 7127/10-U-02 102.03 M CORAL



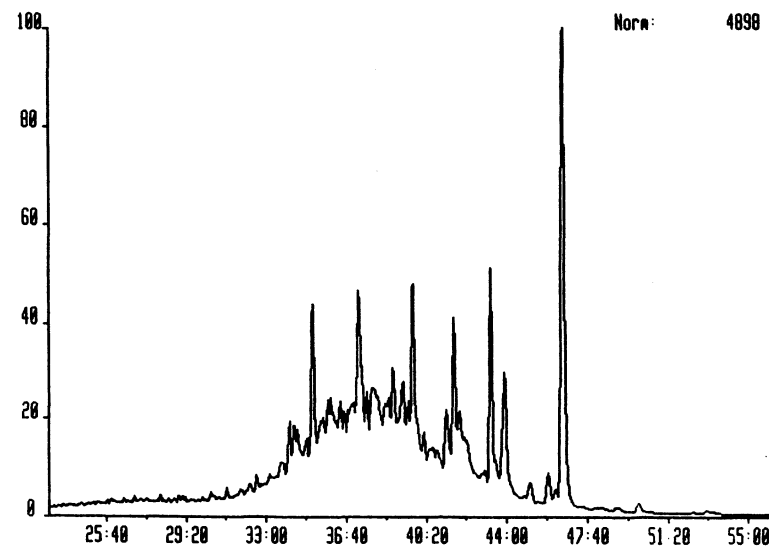
F0349 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 210.1000
 Text:F0349 7127/10-U-02 102.03 M CORAL



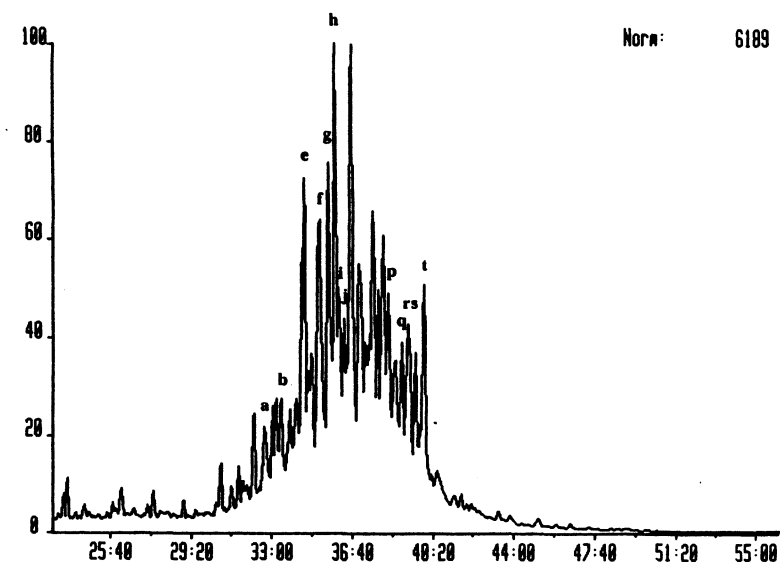
F0360 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0360 7127/10-U-02 113.39 M SLTST,CORAL



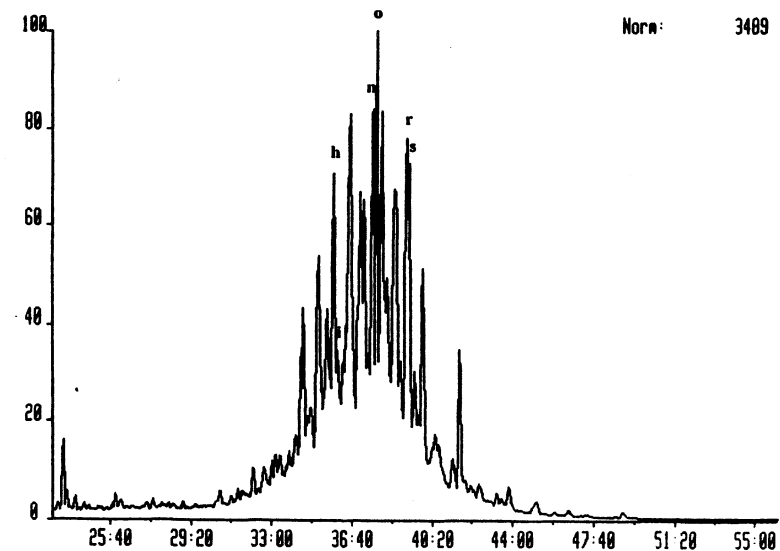
F0360 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0360 7127/10-U-02 113.39 M SLTST,CORAL



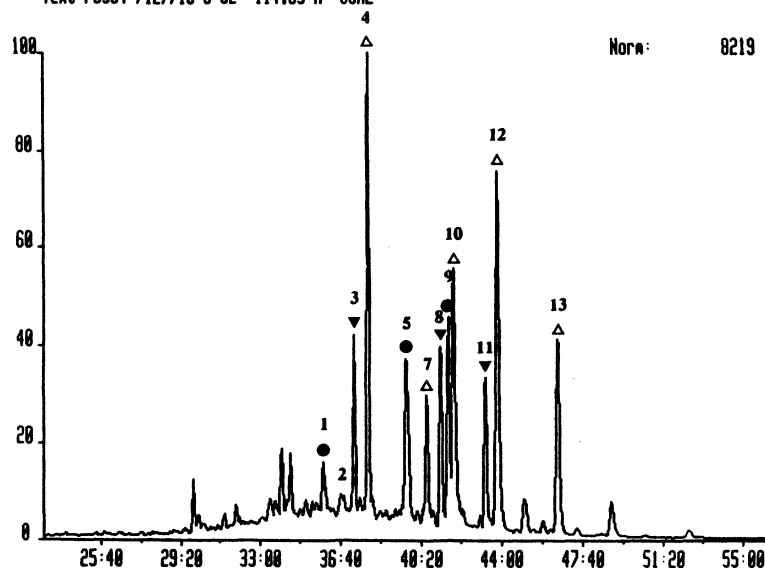
F0360 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0360 7127/10-U-02 113.39 M SLTST,CORAL



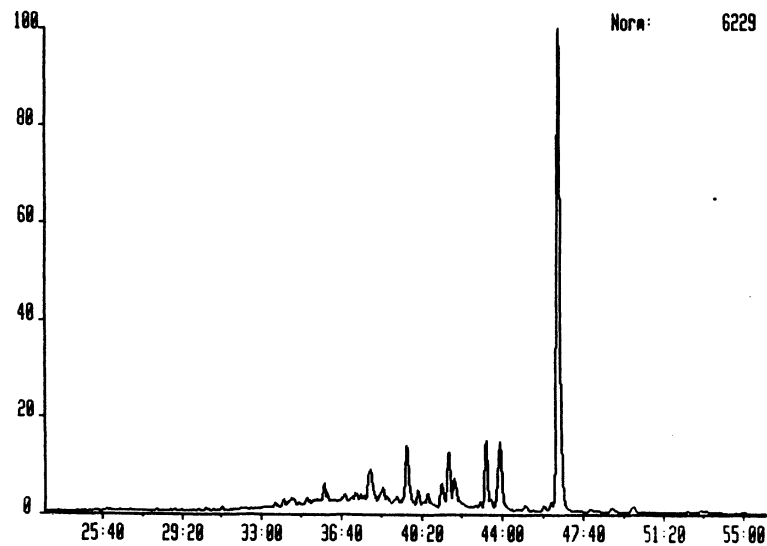
F0360 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0360 7127/10-U-02 113.39 M SLTST,CORAL



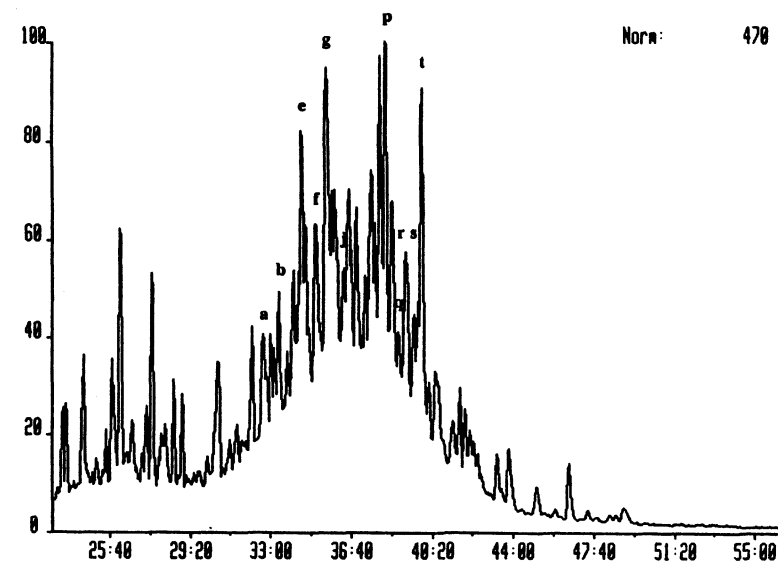
F0364 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0364 7127/10-U-02 114.95 M COAL



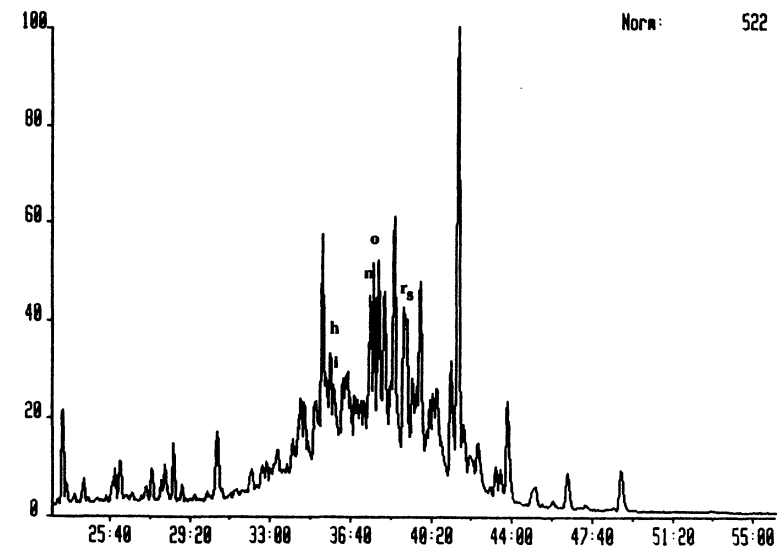
F0364 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0364 7127/10-U-02 114.95 M COAL



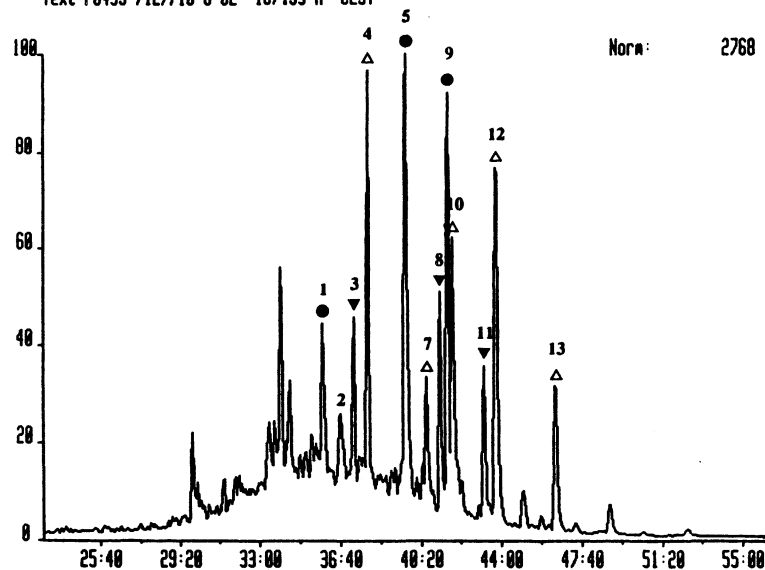
F0364 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0364 7127/10-U-02 114.95 M COAL



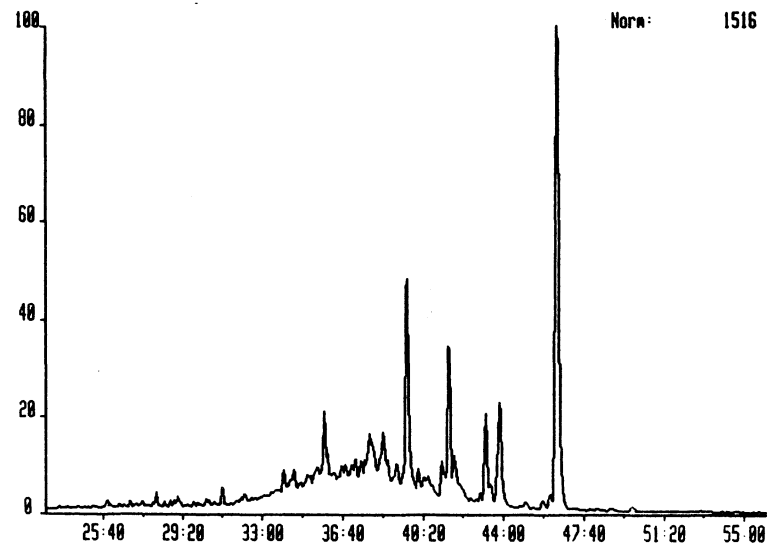
F0364 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 210.1000
 Text:F0364 7127/10-U-02 114.95 M COAL



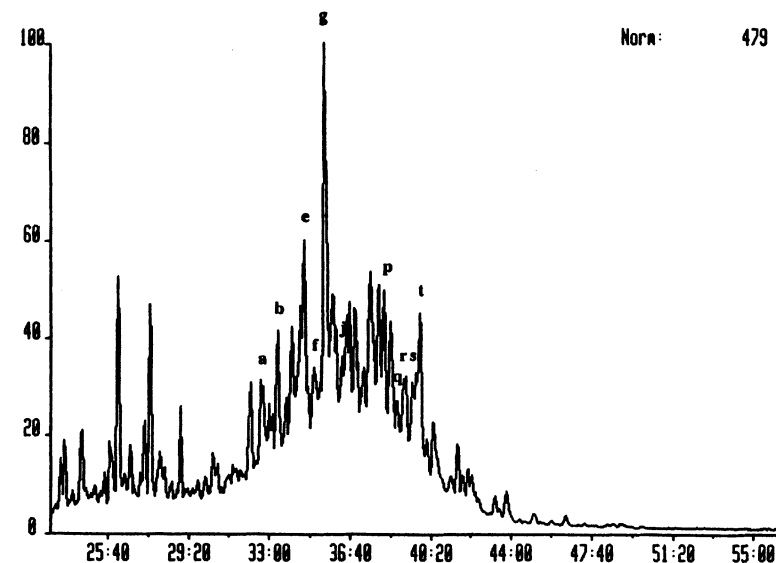
F0439 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0439 7127/10-U-02 167.93 M CLST



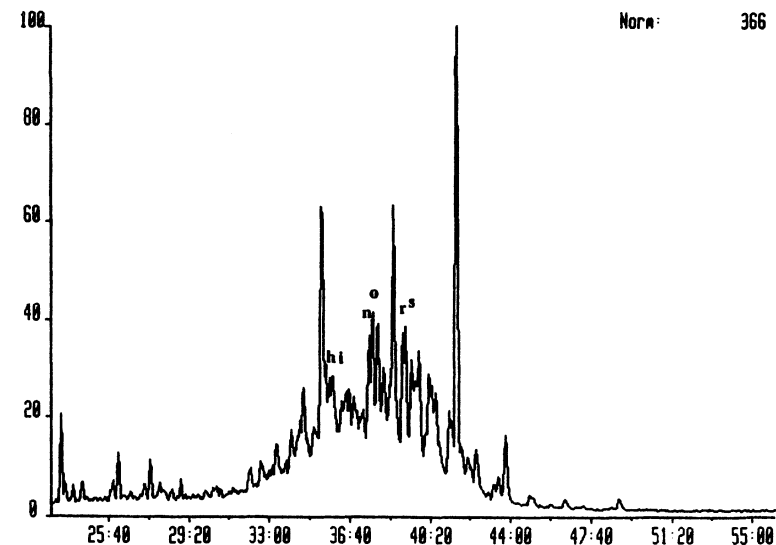
F0439 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0439 7127/10-U-02 167.93 M CLST



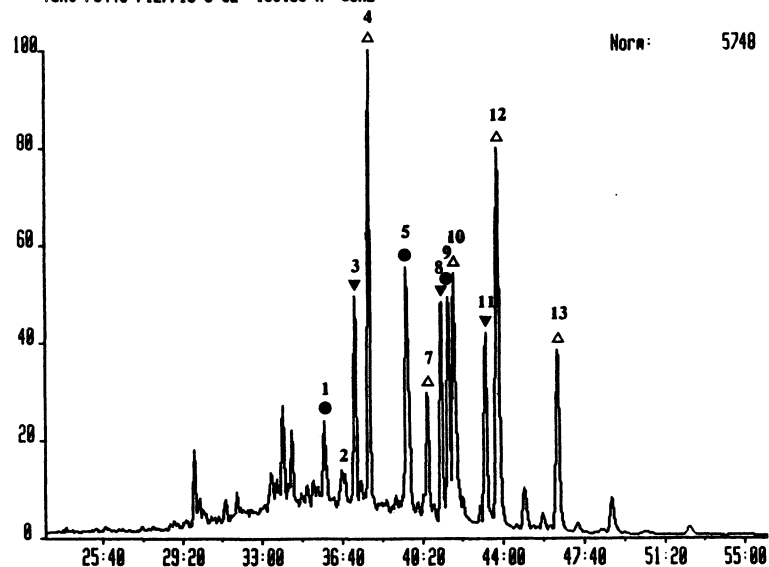
F0439 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0439 7127/10-U-02 167.93 M CLST



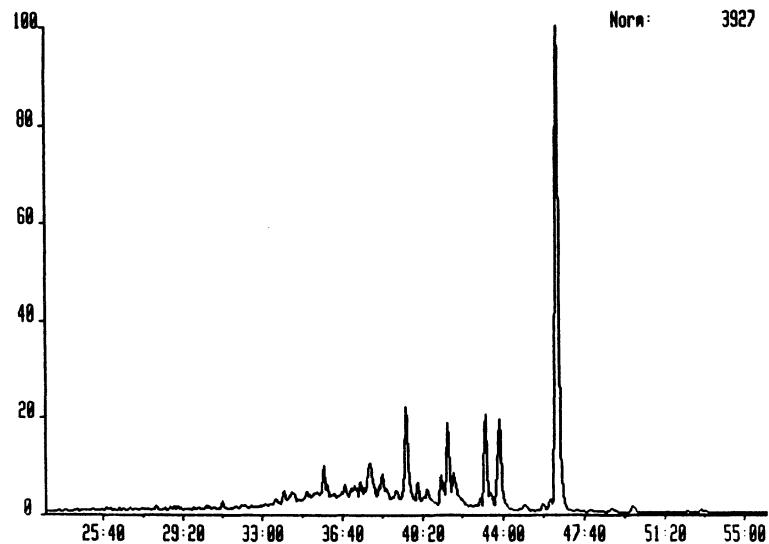
F0439 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0439 7127/10-U-02 167.93 M CLST



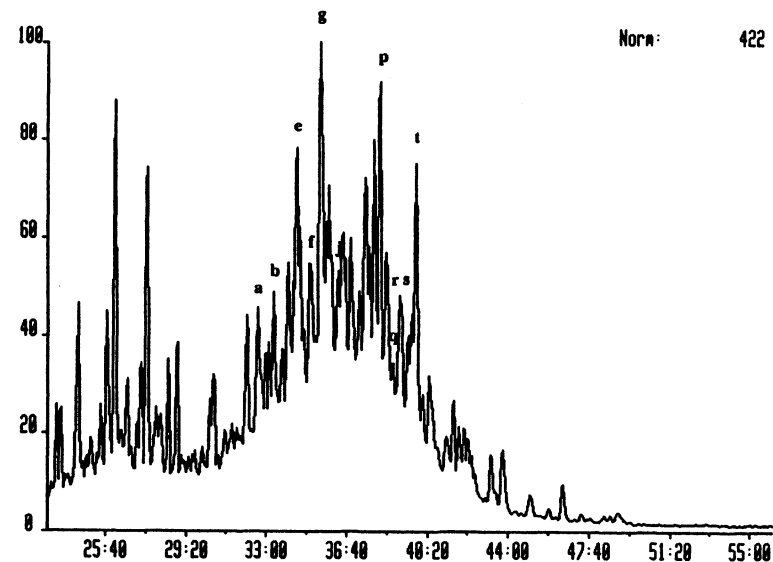
F0446 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0446 7127/10-U-02 169.89 M COAL



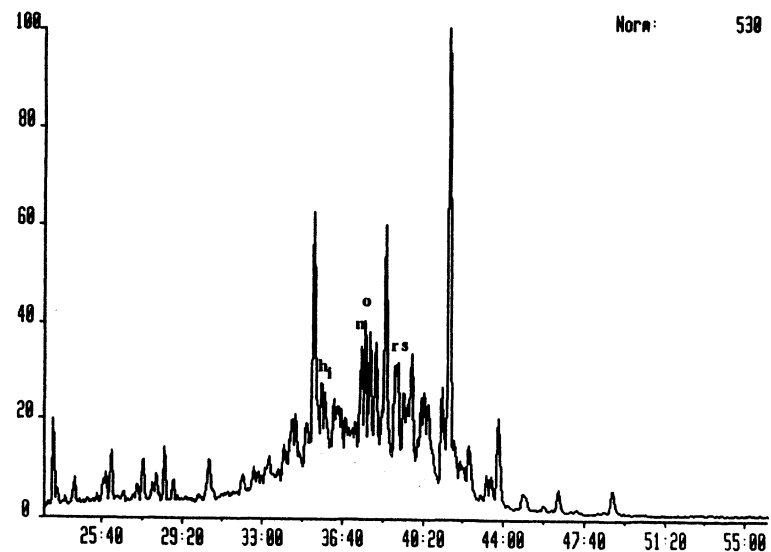
F0446 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0446 7127/10-U-02 169.89 M COAL



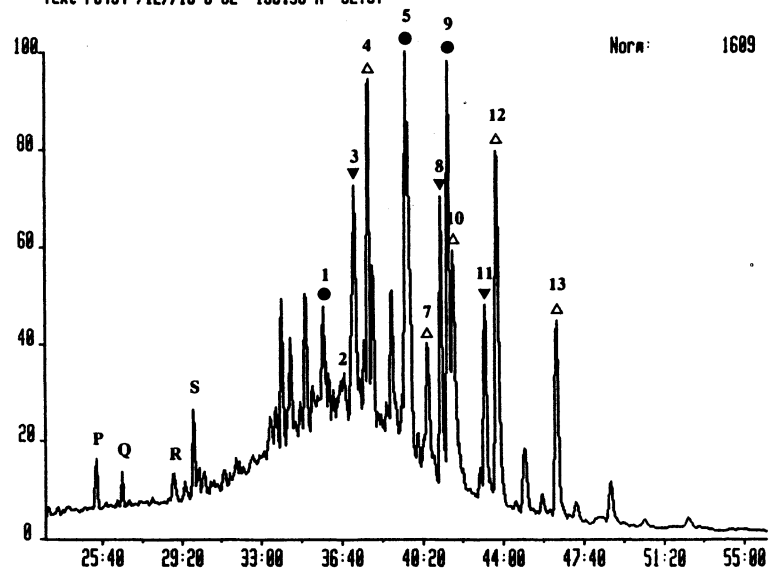
F0446 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0446 7127/10-U-02 169.89 M COAL



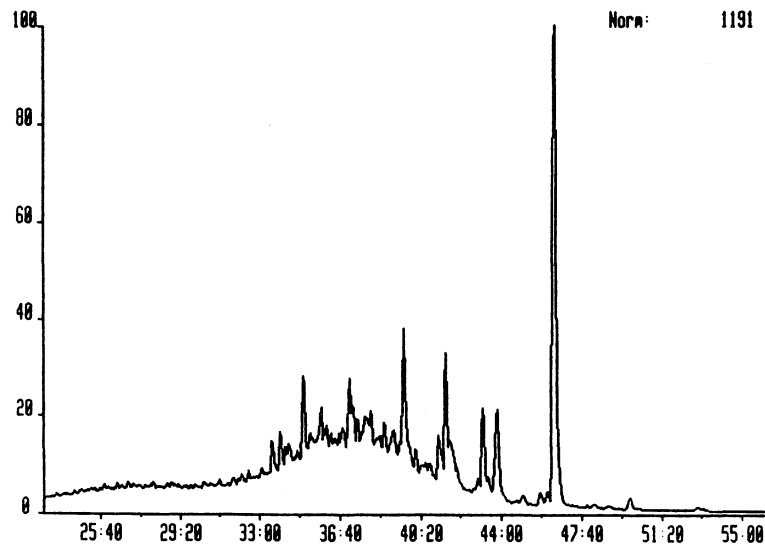
F0446 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0446 7127/10-U-02 169.89 M COAL



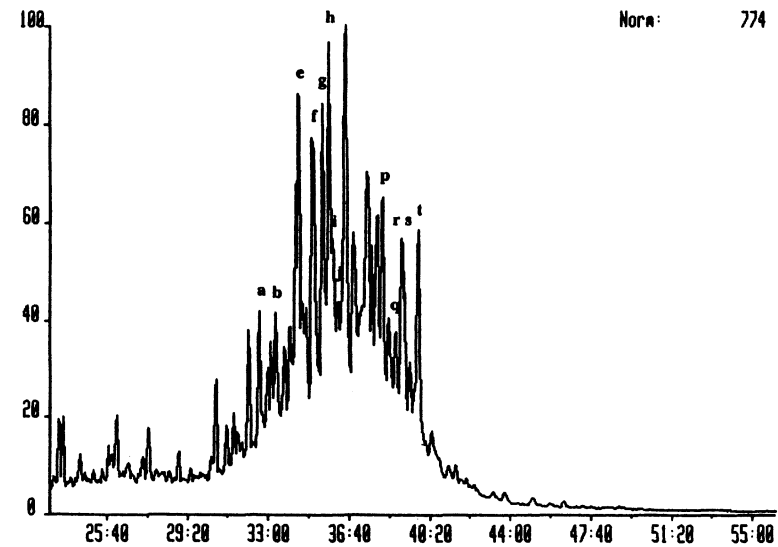
F0494 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0494 7127/10-U-02 196.58 M SLTST



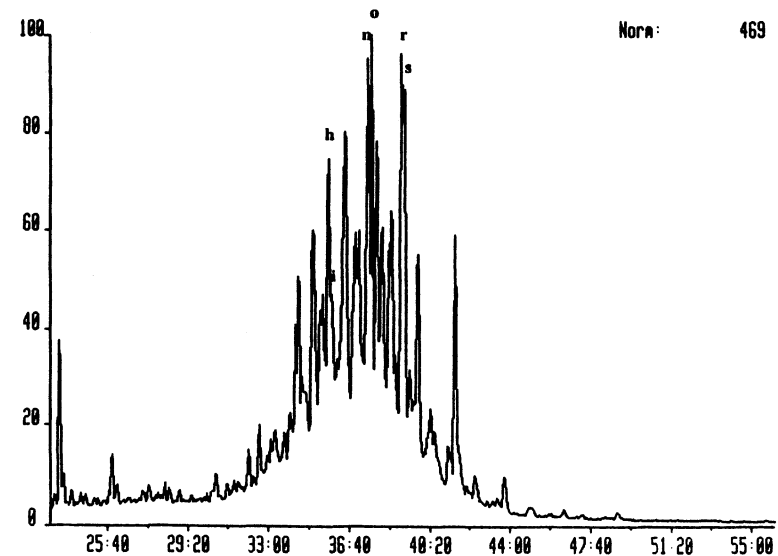
F0494 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0494 7127/10-U-02 196.58 M SLTST



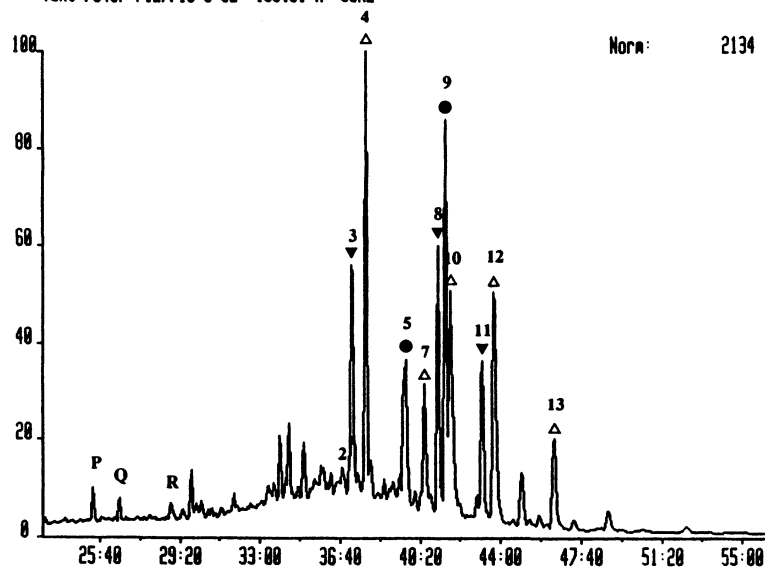
F0494 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0494 7127/10-U-02 196.58 M SLTST



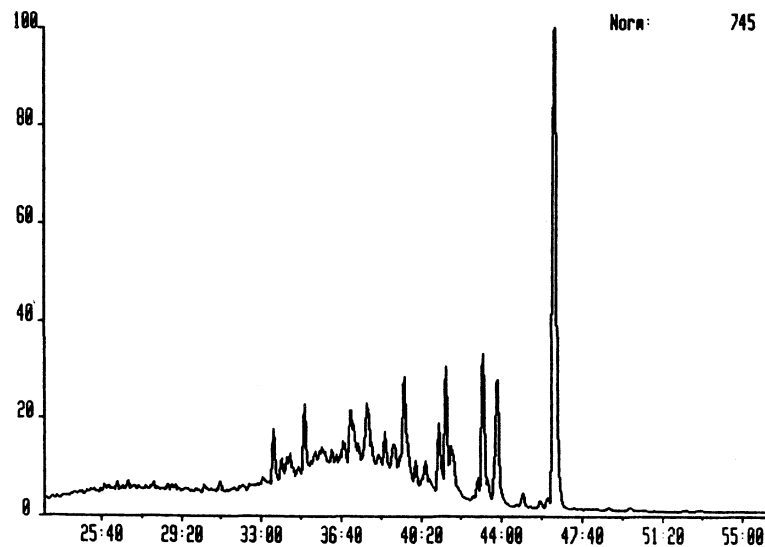
F0494 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0494 7127/10-U-02 196.58 M SLTST



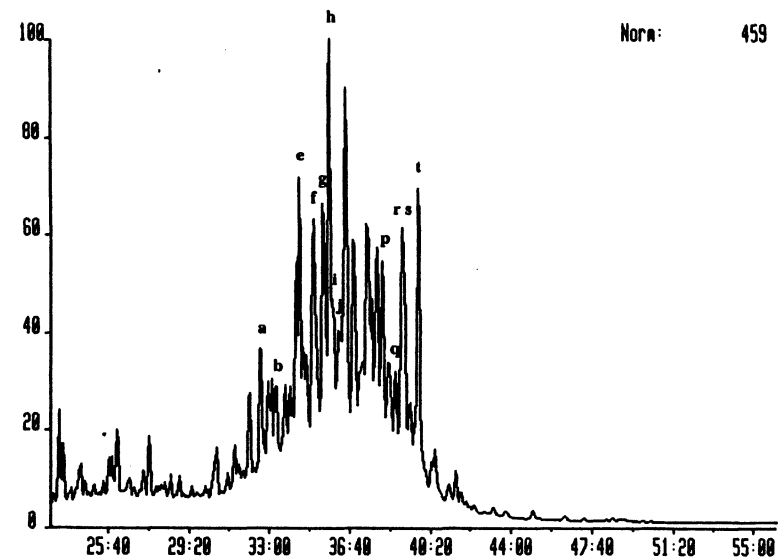
F0497 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0497 7127/10-U-02 190.91 M CORAL



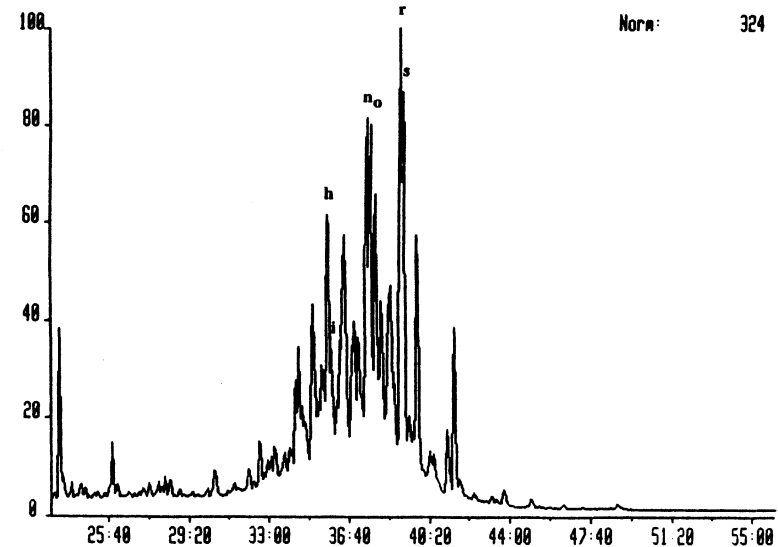
F0497 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0497 7127/10-U-02 190.91 M CORAL



F0497 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0497 7127/10-U-02 190.91 M CORAL



F0497 13-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0497 7127/10-U-02 190.91 M CORAL



Core 7127/10-U-02

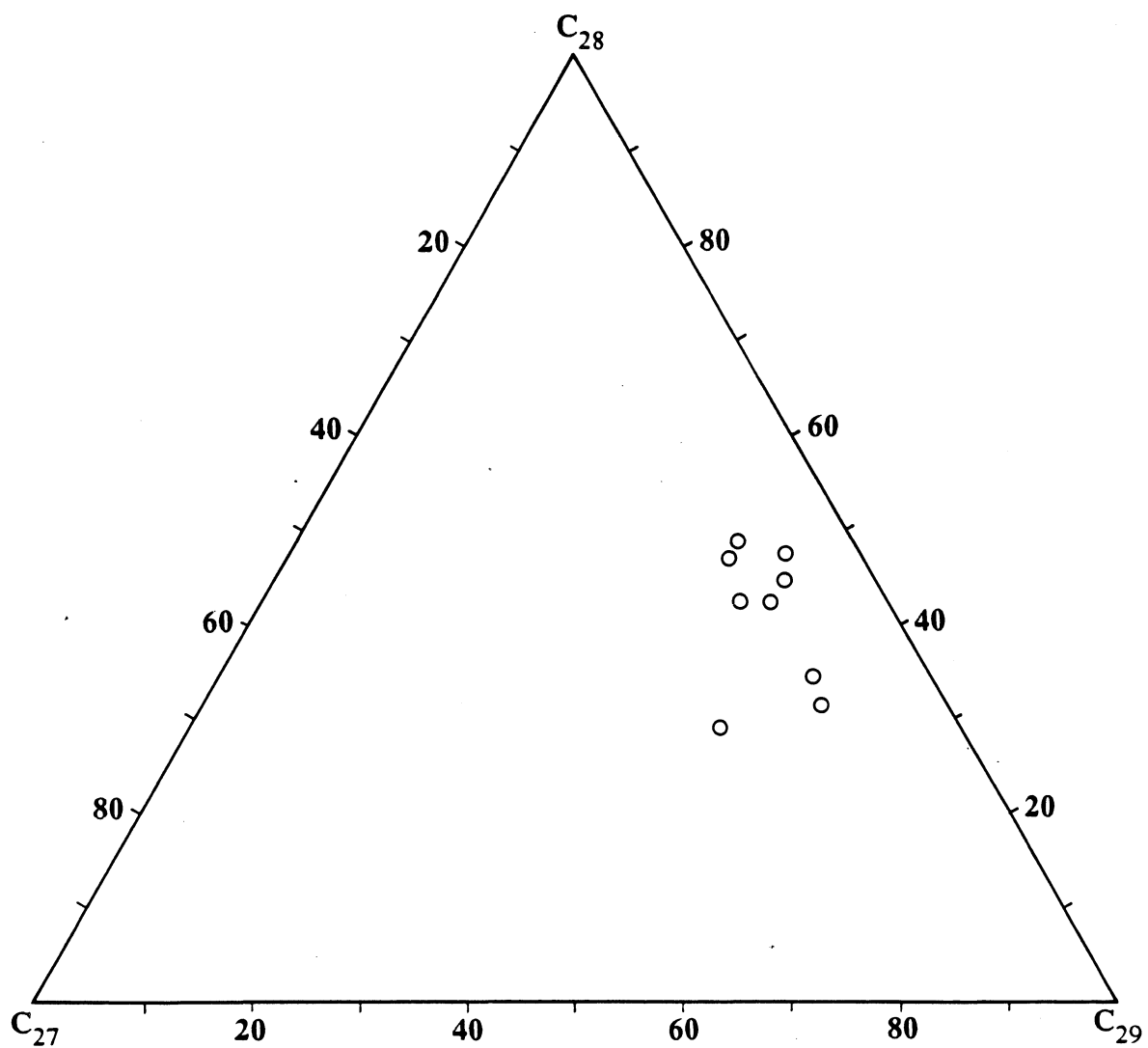


Figure A.III.2.4

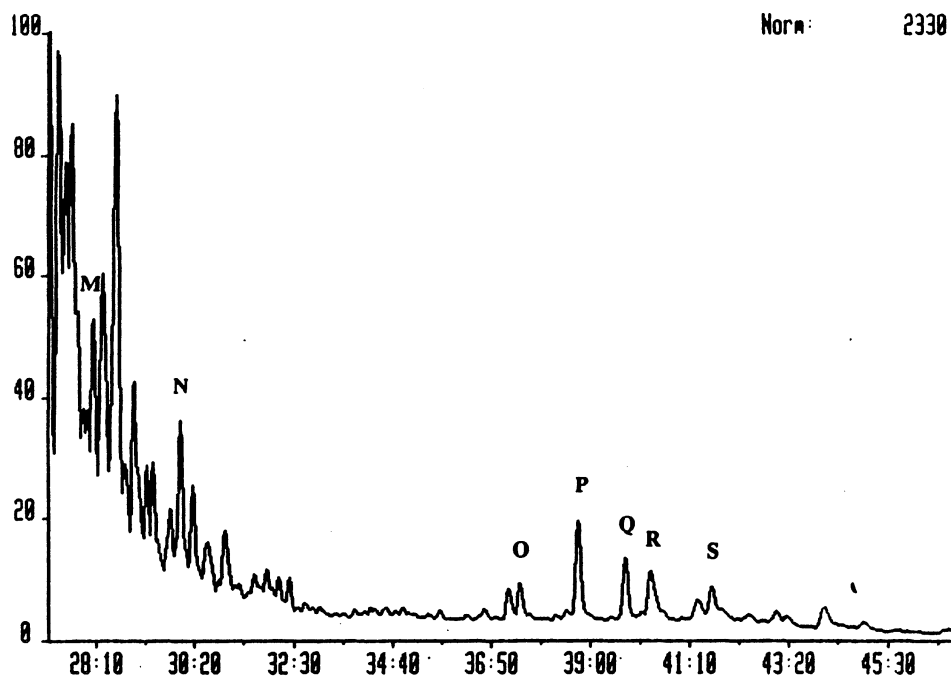
Internal distribution of 14α(H), 17α(H) 20R, C₂₇, C₂₈ and C₂₉ regular steranes (from m/z 217)

Figure A.III.2.5:

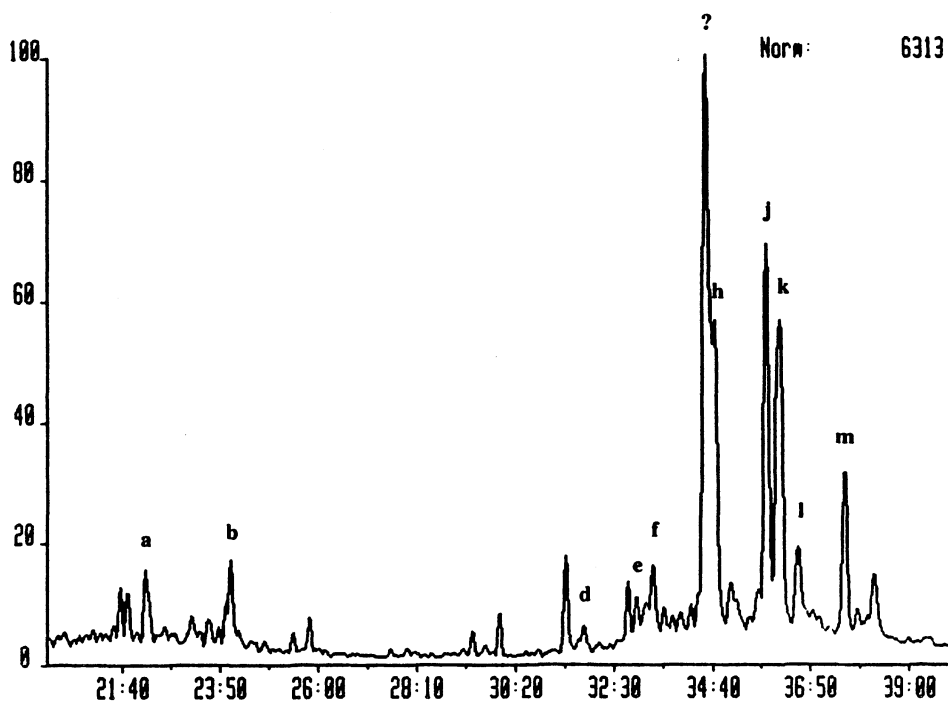
**Mass fragmentograms of m/z 231, 253
(aromatic steroid hydrocarbons)**

For peak identification see Chapter 4.

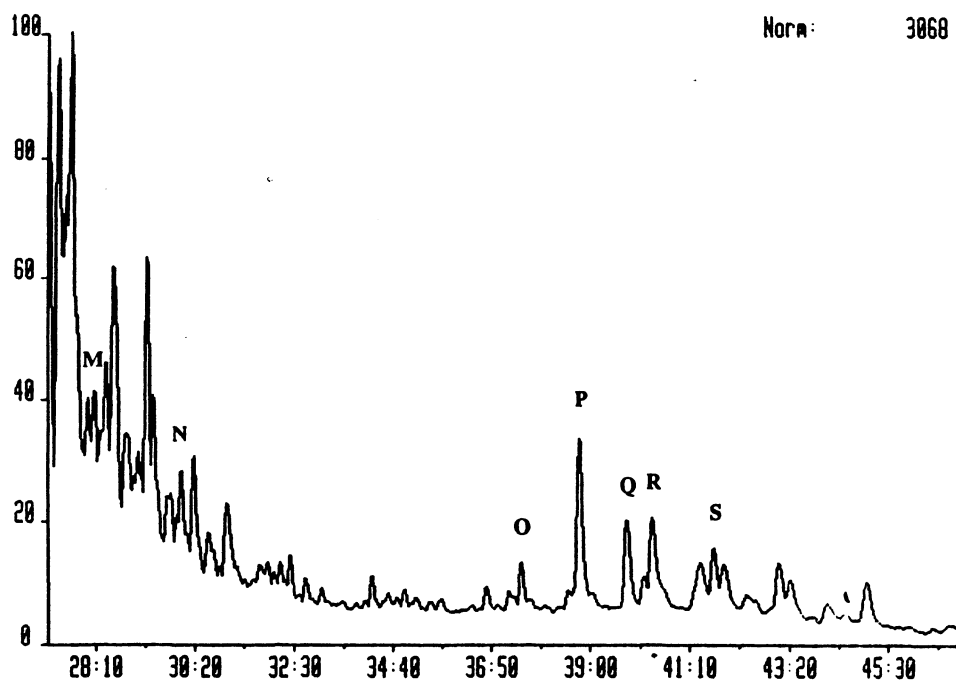
F0315AR 30-JAN-89 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0315 ARO 7127/10-U-02 71.71 M CLST



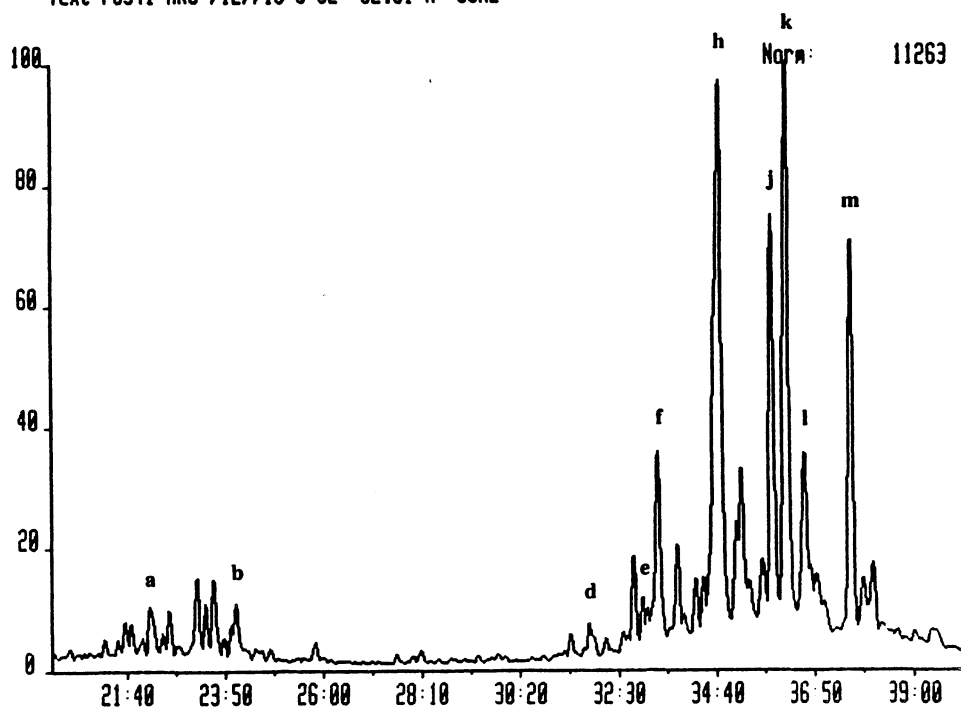
F0315AR 30-JAN-89 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0315 ARO 7127/10-U-02 71.71 M CLST



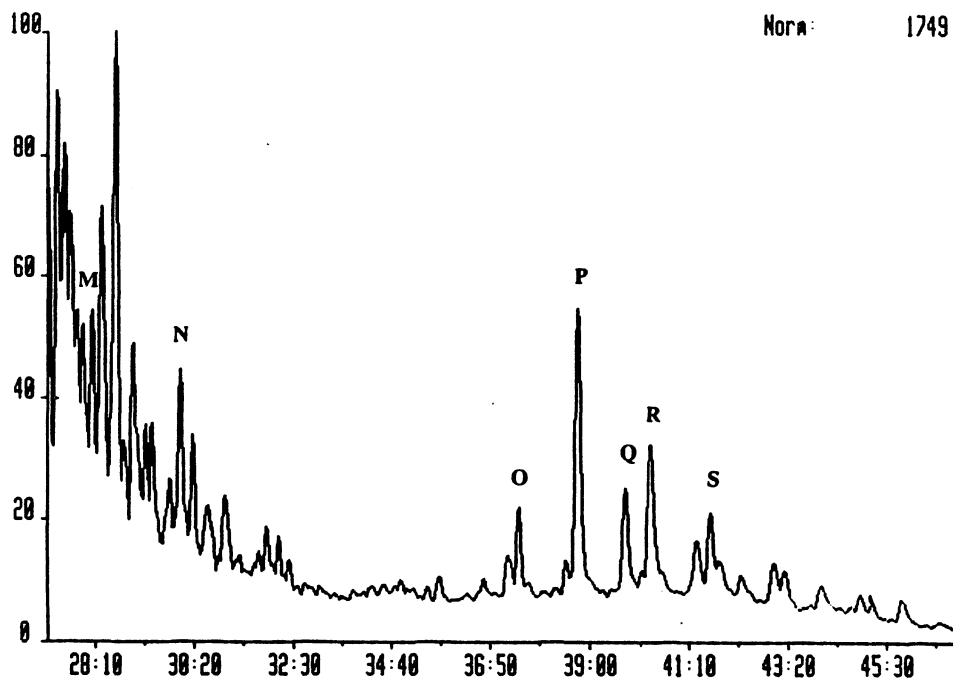
F0341AR 30-JAN-89 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0341 ARO 7127/10-U-02 92.01 M COAL



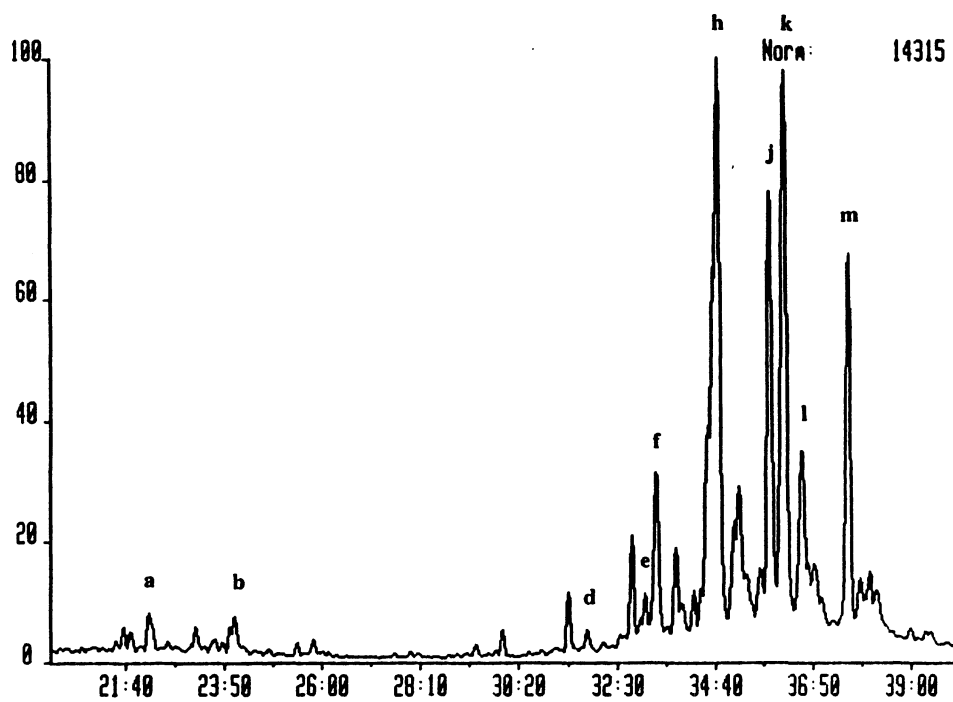
F0341AR 30-JAN-89 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0341 ARO 7127/10-U-02 92.01 M COAL



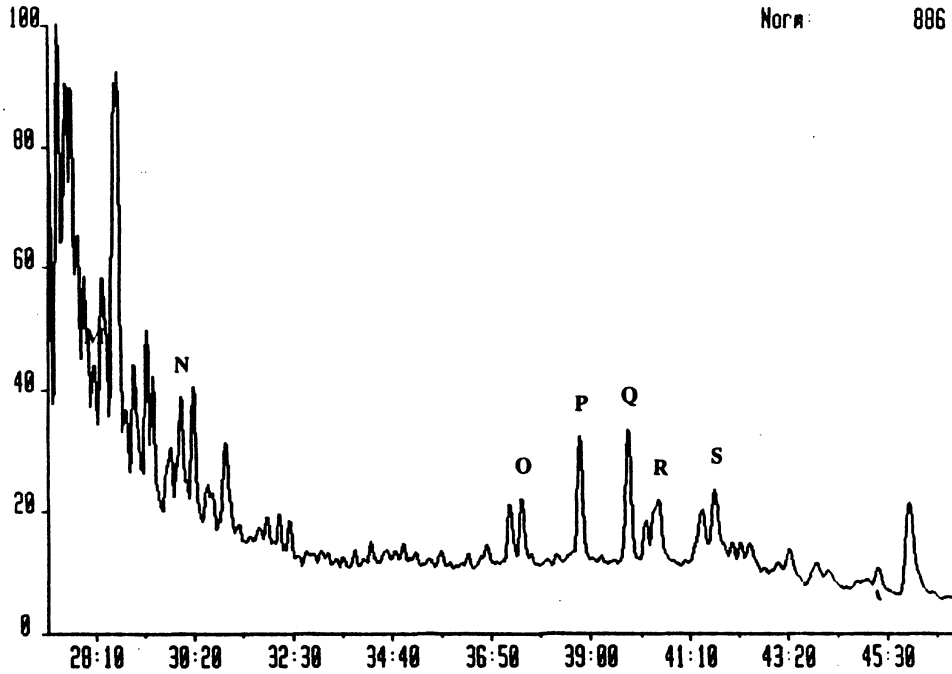
F0349AR 23-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0349 ARO 7127/10-U-02 102.03 M COAL



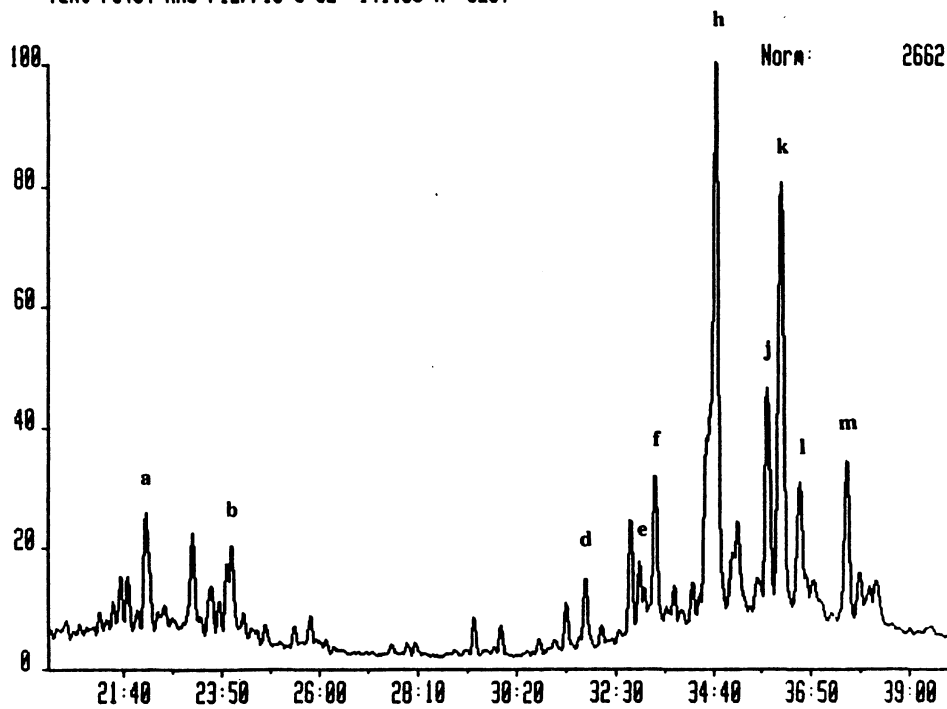
F0349AR 23-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0349 ARO 7127/10-U-02 102.03 M COAL



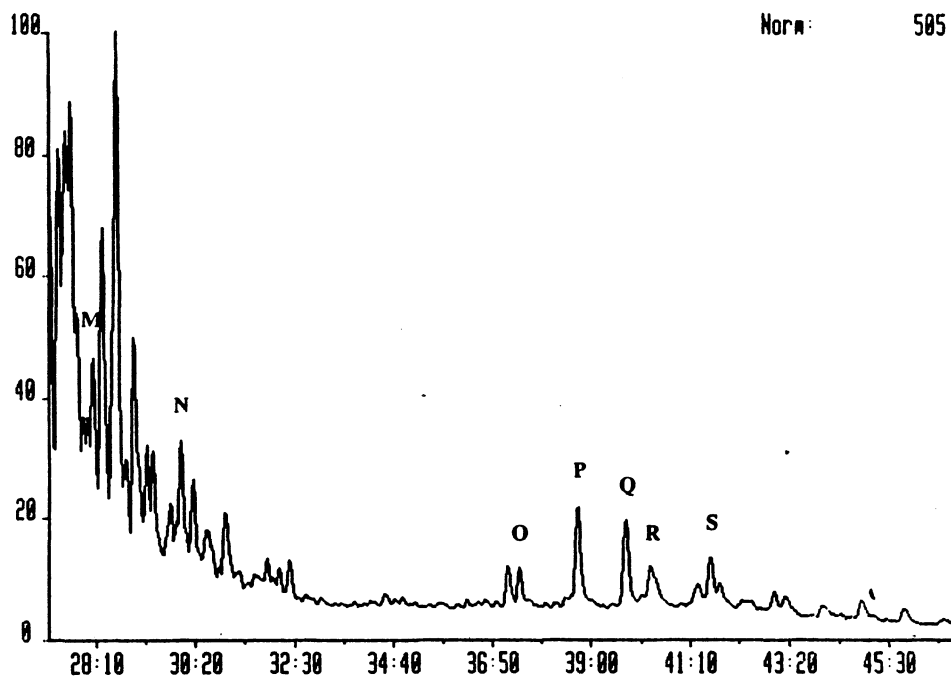
F0404AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0404 ARO 7127/10-U-02 141.95 M CLST



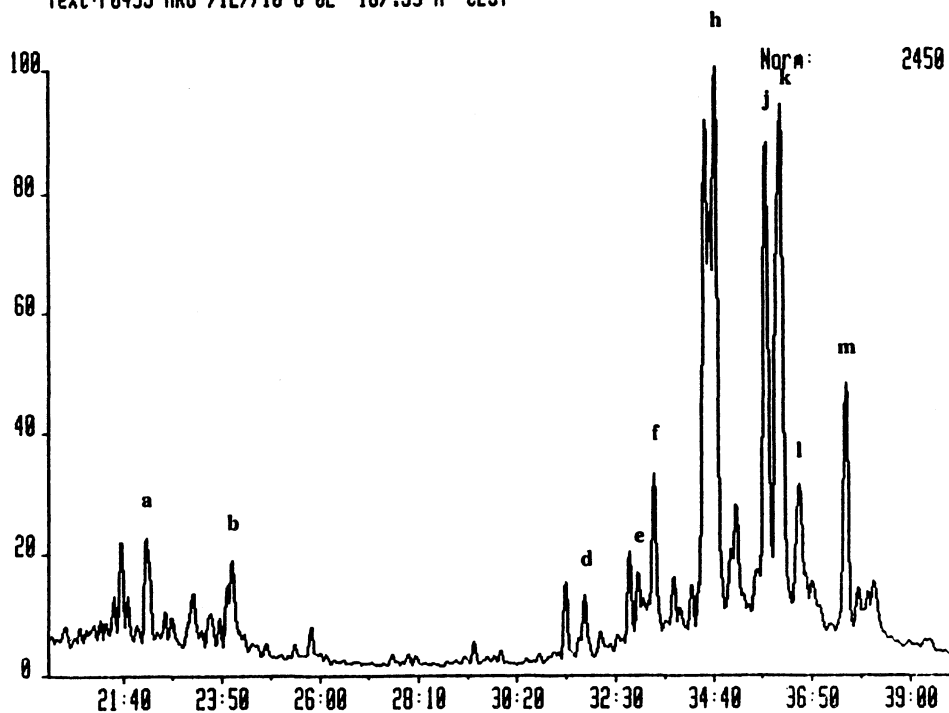
F0404AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0404 ARO 7127/10-U-02 141.95 M CLST



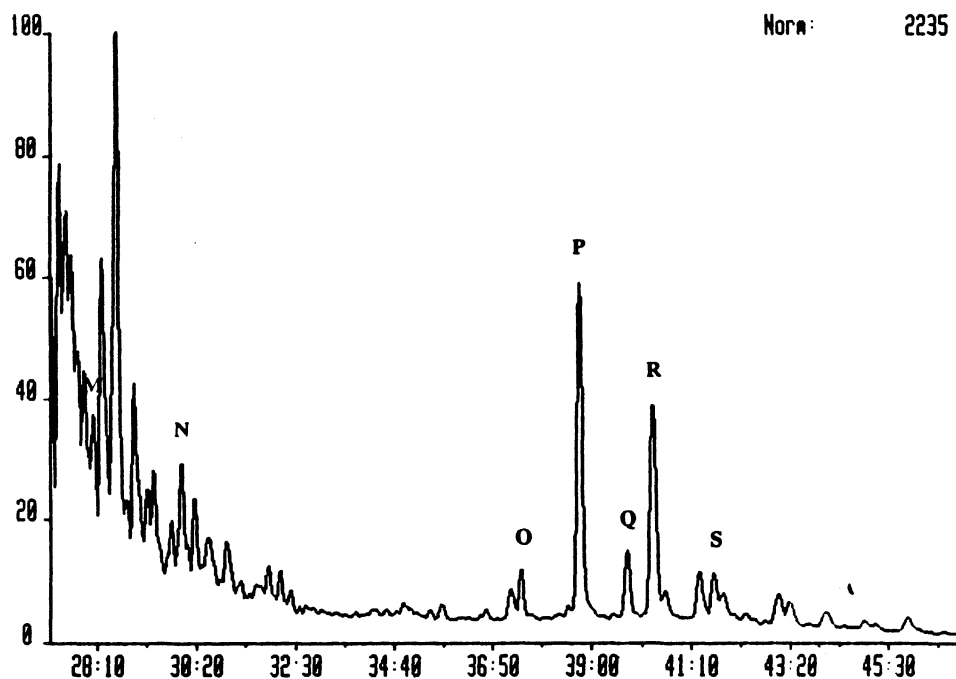
F0439AR 25-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0439 ARO 7127/10-U-02 167.93 M CLST



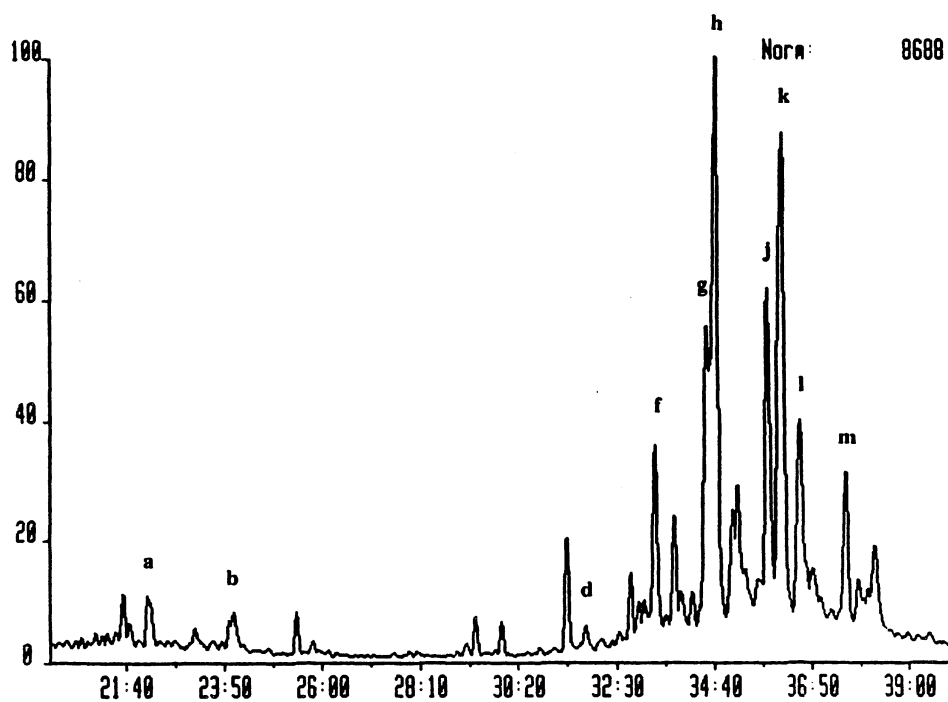
F0439AR 25-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0439 ARO 7127/10-U-02 167.93 M CLST



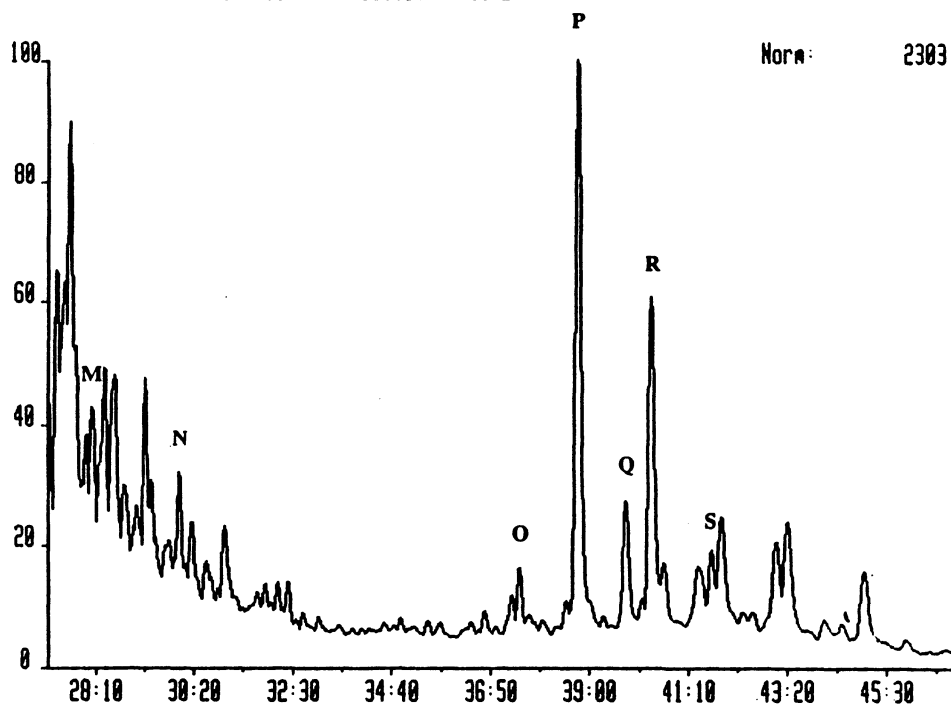
F0494AR 30-JAN-89 Sir:Voltage 70-E Sys: STERAMER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0494 ARO 7127/10-U-02 196.50 M SLTST



F0494AR 30-JAN-89 Sir:Voltage 70-E Sys: STERAMER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0494 ARO 7127/10-U-02 196.50 M SLTST



F0497AR 30-JAN-89 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0497 ARO 7127/10-U-02 198.91 M COAL



F0497AR 30-JAN-89 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0497 ARO 7127/10-U-02 198.91 M COAL

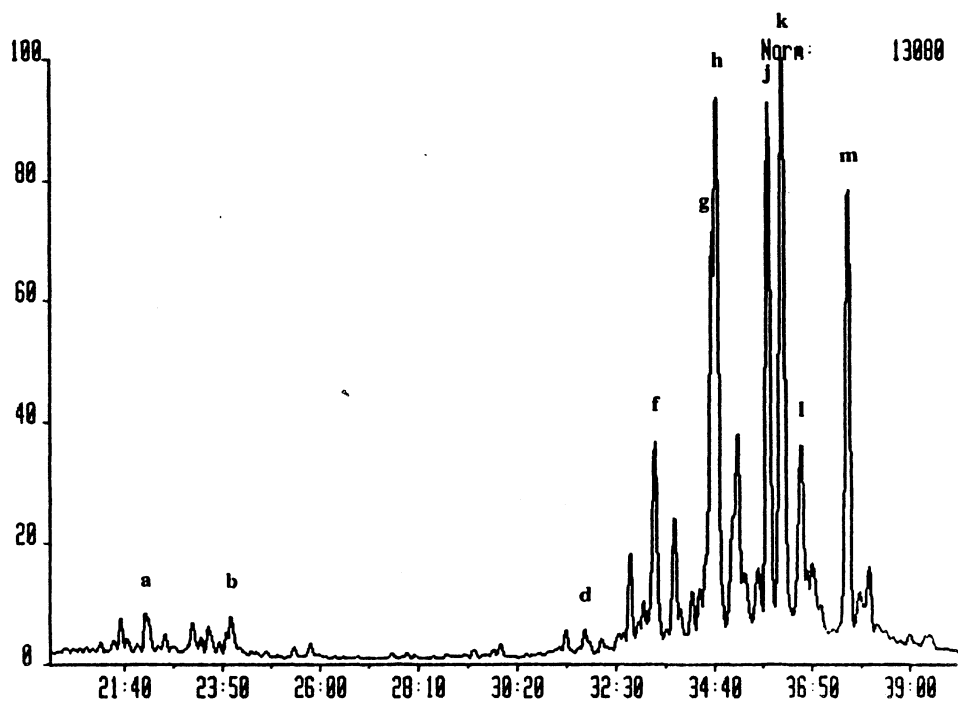
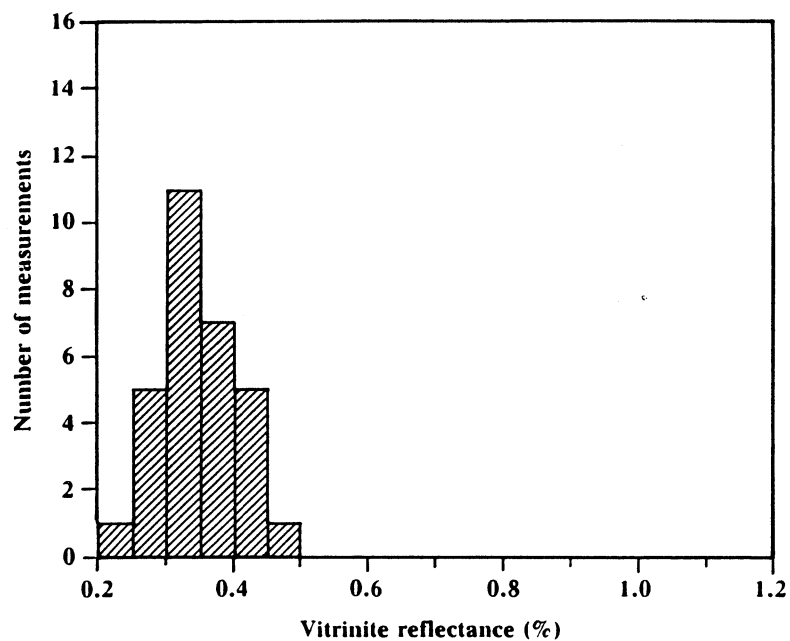


Figure A.III.2.6: Vitrinite reflectance histograms.

Core no.: 7127/10-U-02

Sample no.: F-317

Depth: 72.41 m

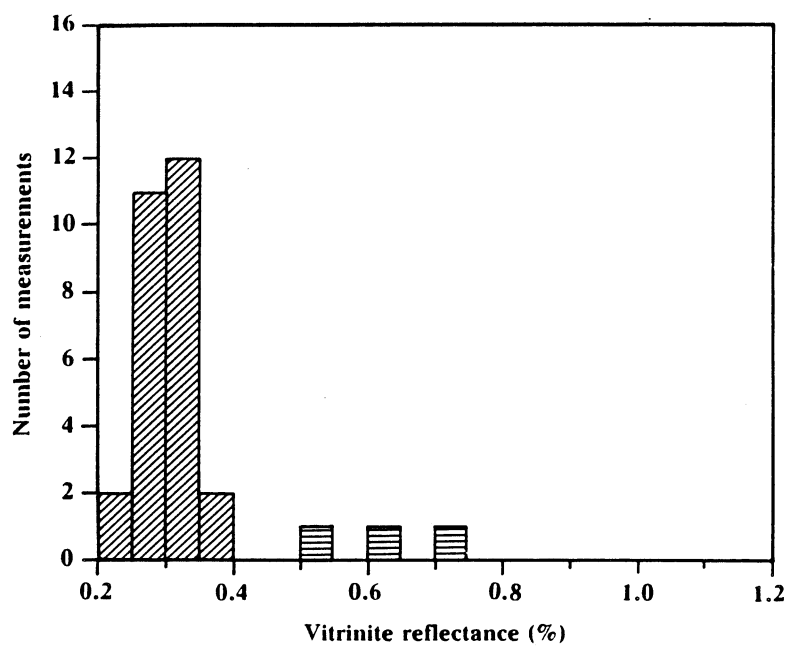


RP = 0.34% n = 30

Core no.: 7127/10-U-02

Sample no.: F-350

Depth: 102.83 m

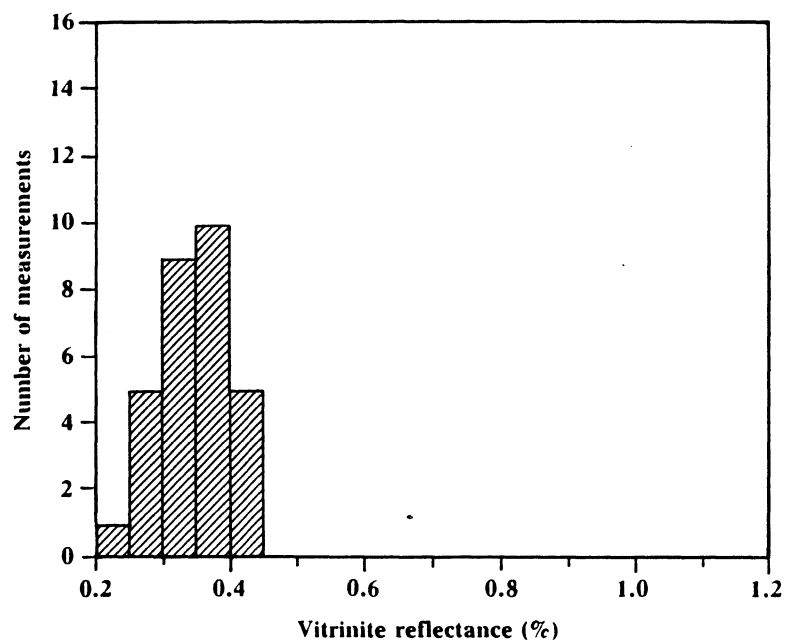


RP = 0.29% n = 27
P1 = 0.63% n = 3

Core no.: 7127/10-U-02

Sample no.: F-394

Depth: 138.03 m

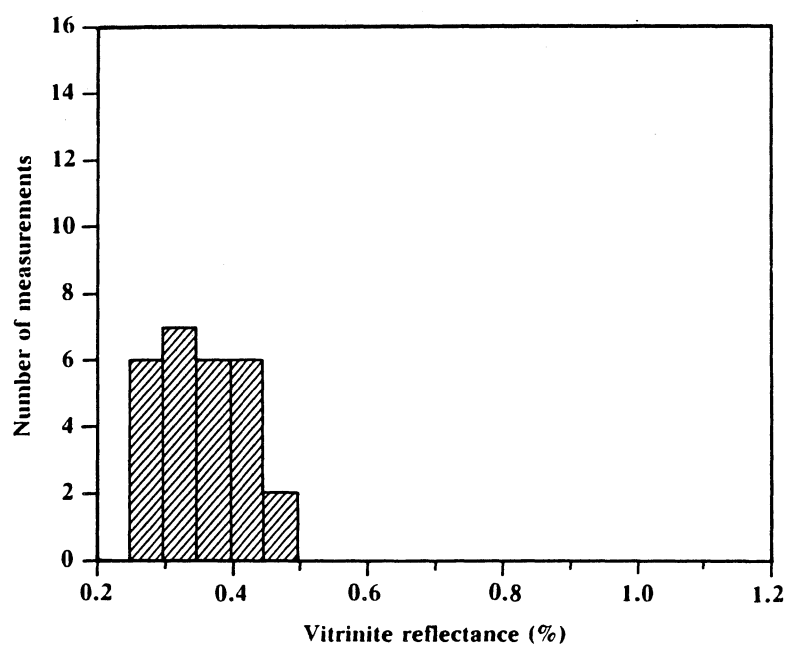


RP = 0.34% N = 30

Core no.: 7127/10-U-02

Sample no.: F-431

Depth: 159.86 m

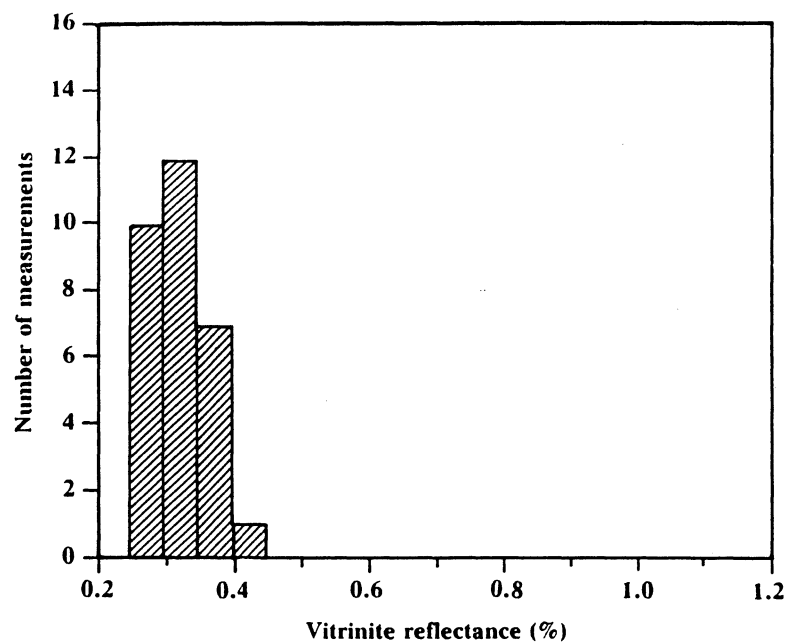


RP = 0.34% n = 29

Core no.: 7127/10-U-02

Sample no.: F-497

Depth: 198.91 m



RP = 0.31% n = 30

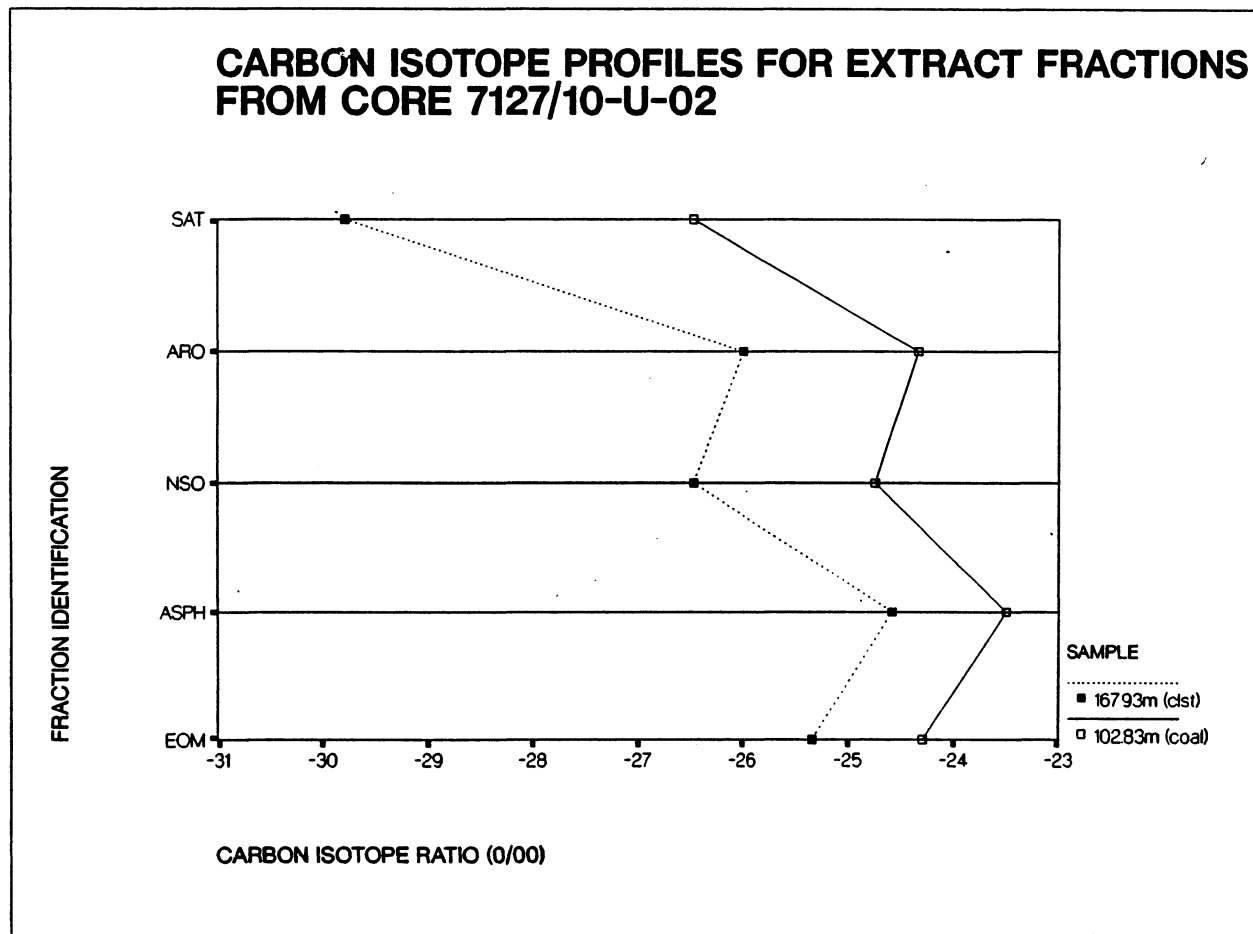


Figure A.III.2.7

APPENDIX III.3: TABLE OF CONTENTS

Core 7127/10-U-03

TABLES

Table A.III.3.1a:	Concentration of C_1-C_{5+} hydrocarbons in headspace gas.
Table A.III.3.1b:	Concentration of C_1-C_{5+} hydrocarbons in occluded gas.
Table A.III.3.1c:	Concentration of C_1-C_{5+} hydrocarbons - summation.
Table A.III.3.2:	Total organic carbon content and data from Rock-Eval pyrolysis.
Table A.III.3.3:	Data from pyrolysis-gas chromatograms.
Table A.III.3.4:	Vitrinite reflectance data.
Table A.III.3.5:	Visual kerogen analysis.
Table A.III.3.6a:	Weight of EOM, asphaltenes and chromatographic fractions.
Table A.III.3.6b:	Concentration of EOM, asphaltenes and chromatographic fractions, related to rock weight.
Table A.III.3.6c:	Concentration of EOM, asphaltenes and chromatographic fractions, related to TOC weight.
Table A.III.3.6d:	Composition of material extracted from the rock.
Table A.III.3.7:	Tabulation of data from the gas chromatograms.
Table A.III.3.8a:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity characteristic ratios.
Table A.III.3.8b:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity and source characteristic ratios.
Table A.III.3.9:	Molecular ratios from aromatic sterane mass fragmentograms.
Table A.III.3.10:	Carbon isotope ratios of EOM and chromatographic fractions.

FIGURES

Figure A.III.3.1:	Pyrolysis-gas chromatograms (S2 peak)
Figure A.III.3.2:	Gas chromatograms of saturated and aromatic hydrocarbons.
Figure A.III.3.3:	Mass fragmentograms of m/z 191, 205 (terpanes) and m/z 217, 218 (steranes).

- Figure A.III.3.4: Internal distribution of $14\alpha(H)$, $17\alpha(H)$ 20R, C_{27} , C_{28} and C_{29} regular steranes (from m/z 217).
- Figure A.III.3.5: Mass fragmentograms of m/z 231, 253 (aromatic steroid hydrocarbons).
- Figure A.III.3.6: Vitrinite reflectance histograms.
- Figure A.III.3.7: Carbon isotope type curves of sediment extracts.

Project no.: 21344423
 Location : 7127/10-U-03
 Date : 88.10.12

Table A.III.3.1: TABLE OF GAS RESULTS

a: Headspace gas (µl gas pr. kg rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0504	77.21	1969	0	0	0	0	0	1969	0	0.0	-1.00
F0515	88.85	7	0	0	0	0	0	7	0	0.0	-1.00
F0533	100.90	113	0	0	0	0	0	113	0	0.0	-1.00
F0547	111.31	80	0	0	0	0	0	80	0	0.0	-1.00
F0564	121.55	28	0	0	0	0	0	28	0	0.0	-1.00
F0576	132.01	46	0	0	0	0	0	46	0	0.0	-1.00
F0589	141.07	11	0	0	0	0	0	11	0	0.0	-1.00
F0605	152.01	13	0	0	0	0	0	13	0	0.0	-1.00

b: Occluded gas (µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0504	77.21	645	7	0	0	0	0	652	7	1.1	-1.00
F0515	88.85	186	20	5	0	0	0	211	25	11.8	-1.00
F0533	100.90	889	16	2	0	0	0	907	18	2.0	-1.00
F0547	111.31	266	42	6	0	2	0	316	50	15.8	0.00
F0564	121.55	251	17	10	0	0	0	278	27	9.7	-1.00
F0576	132.01	578	29	0	0	4	0	611	33	5.4	0.00
F0589	141.07	482	124	31	0	4	0	641	159	24.8	0.00
F0605	152.01	224	25	6	0	0	0	255	31	12.2	-1.00

c: Summation of Headspace and Occluded gas
(µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0504	77.21	2614	7	0	0	0	0	2621	7	0.3	-1.00
F0515	88.85	193	20	5	0	0	0	218	25	11.5	-1.00
F0533	100.90	1002	16	2	0	0	0	1020	18	1.8	-1.00
F0547	111.31	346	42	6	0	2	0	396	50	12.6	0.00
F0564	121.55	279	17	10	0	0	0	306	27	8.8	-1.00
F0576	132.01	624	29	0	0	4	0	657	33	5.0	0.00
F0589	141.07	493	124	31	0	4	0	652	159	24.4	0.00
F0605	152.01	237	25	6	0	0	0	268	31	11.6	-1.00

Legend: -1 can not be determined

Project no.: 21344423
Location : 7127/10-U-03
Date : 88.11.25

Table A.III.3.2: DATA FROM ROCK EVAL PYROLYSIS

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F0502	BULK	77.10	CORE	0.02	0.12	0.52	0.93	12	55	0.14	0.14	(359)
F0505	BULK	77.37	CORE	0.20	47.95	12.04	66.00	72	18	48.15	0.00	421
F0508	BULK	81.58	CORE	0.03	0.42	0.50	2.15	19	23	0.45	0.06	429
F0510	BULK	83.24	CORE	0.02	0.13	0.61	3.23	4	18	0.15	0.13	(374)
F0512	BULK	86.51	CORE	0.04	0.59	0.45	1.63	36	27	0.63	0.06	430
F0519	BULK	88.34	CORE	0.38	39.23	10.19	54.30	72	18	39.61	0.00	421
F0517	BULK	88.55	CORE	0.29	28.02	3.07	17.50	162	17	28.31	0.01	423
F0521	BULK	92.64	CORE	0.06	3.74	0.75	3.88	96	19	3.80	0.01	426
F0523	BULK	95.33	CORE	0.08	10.04	1.15	6.90	145	16	10.12	0.00	423
F0528	BULK	97.74	CORE	0.06	2.73	0.86	3.97	68	21	2.79	0.02	423
F0529	BULK	100.63	CORE	0.42	37.67	7.81	34.80	108	22	38.09	0.01	418
F0535	BULK	102.53	CORE	0.03	0.24	0.96	5.07	4	18	0.27	0.11	425
F0538	BULK	106.10	CORE	0.02	0.39	0.37	1.58	24	23	0.41	0.04	442
F0540	BULK	109.04	CORE	0.49	50.49	7.91	38.60	130	20	50.98	0.00	423
F0546	BULK	110.76	CORE	0.05	0.47	0.38	1.40	33	27	0.52	0.09	(471)
F0553	BULK	115.63	CORE	0.05	0.79	0.51	2.74	28	18	0.84	0.05	434
F0557	BULK	117.72	CORE	1.33	128.33	14.16	66.20	193	21	129.66	0.01	421
F0559	BULK	119.20	CORE	0.04	0.28	0.15	0.58	48	25	0.32	0.12	(473)
F0562	BULK	121.18	CORE	0.00	0.83	0.66	2.03	40	32	0.83	0.00	429
F0565	BULK	121.78	CORE	0.62	91.45	11.45	66.50	139	17	92.07	0.00	418
F0566	BULK	124.65	CORE	0.04	0.13	0.27	0.81	16	33	0.17	0.23	(376)
F0570	BULK	127.20	CORE	0.03	1.01	1.03	6.43	15	16	1.04	0.02	427
F0573	BULK	130.33	CORE	0.06	1.25	0.35	2.59	48	13	1.31	0.04	(505)
F0578	BULK	133.60	CORE	0.06	0.31	0.17	1.20	25	14	0.37	0.16	425
F0582	BULK	135.94	CORE	0.01	8.82	1.09	7.85	112	13	8.83	0.00	423
F0586	BULK	139.42	CORE	0.03	0.84	0.27	1.58	53	17	0.87	0.03	426
F0591	BULK	141.96	CORE	0.08	1.28	0.29	1.67	76	17	1.36	0.05	427
F0593	BULK	143.35	CORE	1.37	105.86	11.55	62.00	170	18	107.23	0.01	426
F0596	BULK	146.69	CORE	0.05	0.22	0.19	1.19	18	15	0.27	0.18	432
F0598	BULK	148.73	CORE	0.07	3.94	0.49	4.19	94	11	4.01	0.01	421
F0603	BULK	151.50	CORE	0.05	0.13	0.13	1.16	11	11	0.18	0.27	430

Legend:

-1 : Not determined or no data available

() : Tmax values of doubtful reliability (usually associated with poor S2 peaks)

Table A.III.3.3: Data from pyrolysis-gas chromatograms

Core 7127/10-U-03							
IKU NO	DEPTH (m)	SAMPLE TYPE	LITHOLOGY	C1	C2-C6 percent of peak area	C6-C14	C15+
F0519	88.34	Core	Coal	28.3	24.2	33.1	14.3
F0517	88.55	Core	Claystone	12.9	20.8	38.2	27.8
F0523	95.33	Core	Claystone	7.2	16.2	39.8	36.9
F0557	117.72	Core	Coal	12.7	17.4	38.1	31.8
F0593	143.35	Core	Coal	11.3	15.9	34.9	37.9

Core-site Number: 7127/10-U-03
Reference number: 21.3444.23
(1/1)

Table A.III.3.4: VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
F- 501	-----	76.75	0.33 (30)	G	0.05	1-3
F- 505	-----	77.37	0.28 (24)	G	0.05	1-2
F- 529	-----	100.63	0.32 (30)	G	0.05	1
F- 565	-----	121.78	0.26 (20)	F	0.04	2
F- 593	-----	143.35	0.32 (30)	G	0.05	2-3

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor;
I = Inertinite. L = Liptinite or poor vitrinite particle.
R = Reworked material/inertinite.

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.3.5
CORE NO.: 7127/10-U-03

Sample	Depth (m)	Composition of residue	Particle size	Preservation palyno- morphs	Thermal maturation index * NEW TAI	Remarks
F-522	95.31	Lm: 30 W: 30 C: 40	F-M-L	good	1 - 3	Lm consists of very good preserved spores. Woody material dark, often large pieces.
F-534	102.20	Lm: 25 W: 25 C: 50	F-M-(L)	fair	2 - 3.5	Lm consists of cuticle and terrestrial palynomorphs.
F-1382	124.65	Lm: 10 W: 20 C: 70	F-M-L	fair-good	2 - 3.5	Dominated by coaly fragments. Woody material dark pieces or tracheids.
F-571	127.35	Lm: 10 W: 20 C: 70	F-M	fair	3.5 - 4.0	As sample F-1382
F-594	146.28	Lm: 10 W: 20 C: 70	F-M	fair-good	3.5 - 4.0	As sample F-571

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

Project no.: 21344423
 Location : 7127/10-U-03
 Date : 89.02.02

- 167 -



Table A.III.3.6a: WEIGHT OF CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ROCK EXTR. (g)	EOM (mg)	ASPH (mg)	SAT HC (mg)	ARO HC (mg)	POLAR COMP. (mg)	HC (mg)	NONHC (mg)	TOC (%)
F0519	BULK	88.34	CORE	1.8	23.2	17.0	1.3	2.7	3.7	4.0	19.2	54.30
F0517	BULK	88.55	CORE	7.6	34.7	21.3	1.8	5.1	5.0	6.9	27.8	17.50
F0523	BULK	95.33	CORE	16.7	27.7	19.0	0.4	3.7	4.1	4.1	23.6	6.90
F0557	BULK	117.72	CORE	1.9	60.0	40.6	2.2	5.6	9.5	7.8	52.2	66.20
F0593	BULK	143.35	CORE	1.3	32.3	11.6	1.7	4.0	5.9	5.7	26.6	62.00

Legend:

- * - Not all the available EOM was used for MPLC.
- ? - MPLC results assumed more EOM than originally extracted.
- 1- No data available.

Table A.III.3.6b: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F0519	BULK	88.34	CORE	13179	9657	755	1510	2127	2265	10914
F0517	BULK	88.55	CORE	4539	2786	238	666	651	904	3635
F0523	BULK	95.33	CORE	1664	1141	22	225	247	247	1417
F0557	BULK	117.72	CORE	31746	21481	1162	2969	5034	4131	27615
F0593	BULK	143.35	CORE	25704	9231	1350	3183	4726	4533	21171

Legend:

- 1- No data available.

Project no.: 21344423
Location : 7127/10-U-03
Date : 89.02.02

- 168 -



Table A.III.3.6c: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS
(mg/g TOC)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F0519	BULK	88.34	CORE	24.3	17.8	1.4	2.8	3.9	4.2	20.1
F0517	BULK	88.55	CORE	25.9	15.9	1.4	3.8	3.7	5.2	20.7
F0523	BULK	95.33	CORE	24.1	16.5	0.3	3.3	3.6	3.6	20.5
F0557	BULK	117.72	CORE	48.0	32.4	1.8	4.5	7.6	6.3	41.7
F0593	BULK	143.35	CORE	41.5	14.9	2.2	5.1	7.6	7.3	34.2

Legend:

-1- No data available.

Table A.III.3.6d: COMPOSITION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ASPH EOM (%)	SAT EOM (%)	ARO EOM (%)	HC EOM (%)	POLAR EOM (%)	SAT ARO x 100	HC NONHC x 100
F0519	BULK	88.34	CORE	73.3	5.7	11.5	17.2	16.1	50.0	20.7
F0517	BULK	88.55	CORE	61.4	5.2	14.7	19.9	14.3	35.7	24.9
F0523	BULK	95.33	CORE	68.6	1.3	13.5	14.8	14.8	9.7	17.4
F0557	BULK	117.72	CORE	67.7	3.7	9.4	13.1	15.9	39.1	15.0
F0593	BULK	143.35	CORE	35.9	5.3	12.4	17.7	18.4	42.4	21.4

Legend:

-1- No data available.

Project no.: 21344423
 Location : 7127/10-U-03
 Date : 89.02.05

- 169 -

Table A.III.3.7:

RATIOS DERIVED FROM GAS CHROMATOGRAMS OF SATURATED HYDROCARBONS

IKUNO	FRAC NAME	DEPTH	Pri	Pri	Phy	A	n-C17	n-C31	CPI 1	CPI 2
			--- Phy	A=----- n-C17	B=----- n-C18	---	----- n-C27	----- n-C19		
F0519	BULK	88.34	1.1	1.0	0.6	1.7	1.2	0.3	1.5	2.0
F0517	BULK	88.55	1.6	0.6	0.3	2.0	0.2	0.4	2.1	2.1
F0523	BULK	95.33	0.8	0.3	0.3	0.9	0.7	0.2	1.7	1.7
F0557	BULK	117.72	1.2	0.9	0.6	1.4	0.3	0.8	2.1	3.1
F0593	BULK	143.35	1.6	0.7	0.6	1.3	3.4	0.4	1.0	0.9

-1 = No data available

Table A.III.3.8a:

Molecular ratios from sterane and terpane mass chromatograms.

Maturity ratios.

Core 7127/10-U-03

Code	Depth (m)	$\alpha\beta/\alpha\beta+\beta\alpha^{1)}$	%22S ²⁾	% $\beta\beta^{3)}$	%20S ⁴⁾	30:1/30:0 ⁵⁾
F-519	88.34	0.37	8.6	54.1	31.1	2.68
F-517	88.55	0.48	9.5	61.3	17.5	1.91
F-523	95.33	0.65	20.7	59.1	12.4	1.00
F-557	117.72	0.41	3.2	65.3	11.8	1.52
F-593	143.35	0.47	10.4	63.0	20.6	

1) $E/(E+F)$ in m/z 191.

2) Average % distribution between first and second eluting isomers of extended hopanes.

3) $100 * 2(r+s)/(q+t+2(r+s))$ in m/z 217.

4) $100 * q/(q+t)$ in m/z 217.

5) 9/8 in m/z 191.

Table A.III.3.8b:

*Molecular ratios from terpane and sterane mass chromatograms.
Maturity and source characteristic ratios.
7127/10-U-03*

Code	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
F-519	88.34	0.11	-	0.08	-	0.73
F-517	88.55	0.04	-	0.09	-	0.60
F-523	95.33	0.31	-	0.06	-	0.71
F-557	117.72	-	-	0.05	-	0.56
F-593	143.35	0.08	-	0.09	0.22	0.62

¹⁾ Relative abundance of tricyclic terpanes (Q/E in m/z 191).

²⁾ B/A in m/z 191.

³⁾ Relative abundance of unknown (X/E in m/z 191).

⁴⁾ Relative abundance of bisnorhopane (Z/E in m/z 191).

⁵⁾ Relative abundance of C₂₇ rearranged steranes (a/(a+j) in m/z 217).

Table A.III.3.9: Molecular ratios from mass fragmentograms of aromatic steroid hydrocarbons.

Core 7127/10-U-03

IKUNO	Depth m	Cracking ratios			Aromatisation ratios	
		20/20+27	20/20+28	21/21+28	27t/27t+28m	28t/28t+29m
		tri	tri	mono		
		1)	2)	3)	4)	5)
F0519	88.34	0.35	0.44	0.13	0.05	0.04
F0517	88.55	0.50	0.59	0.19	0.04	0.04
F0523	95.33	0.67	0.86	0.43	0.13	0.05
F0557	117.72	0.37	0.36	0.09	0.05	0.04
F0593	143.35	0.36	0.43	0.13	0.05	0.04

1) $M/(M+P)$ in m/z 231

2) $M/(M+S)$ in m/z 231

3) $a/(a+h)$ in m/z 253

4) $P/(P+h)$ in m/z 231 and m/z 253

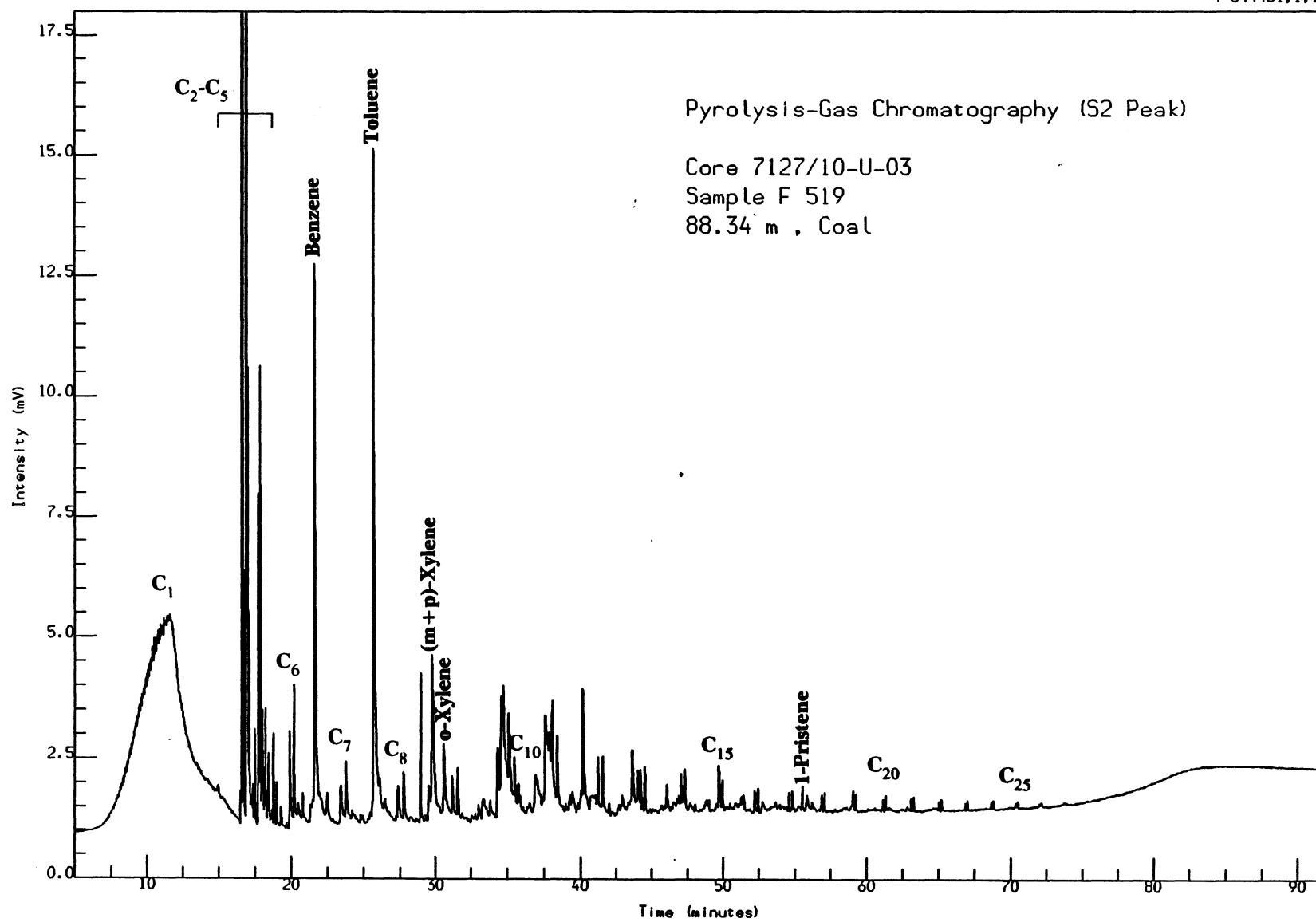
5) $S/(S+m+(k*S/(S+R)))$ in m/z 231 and m/z 253

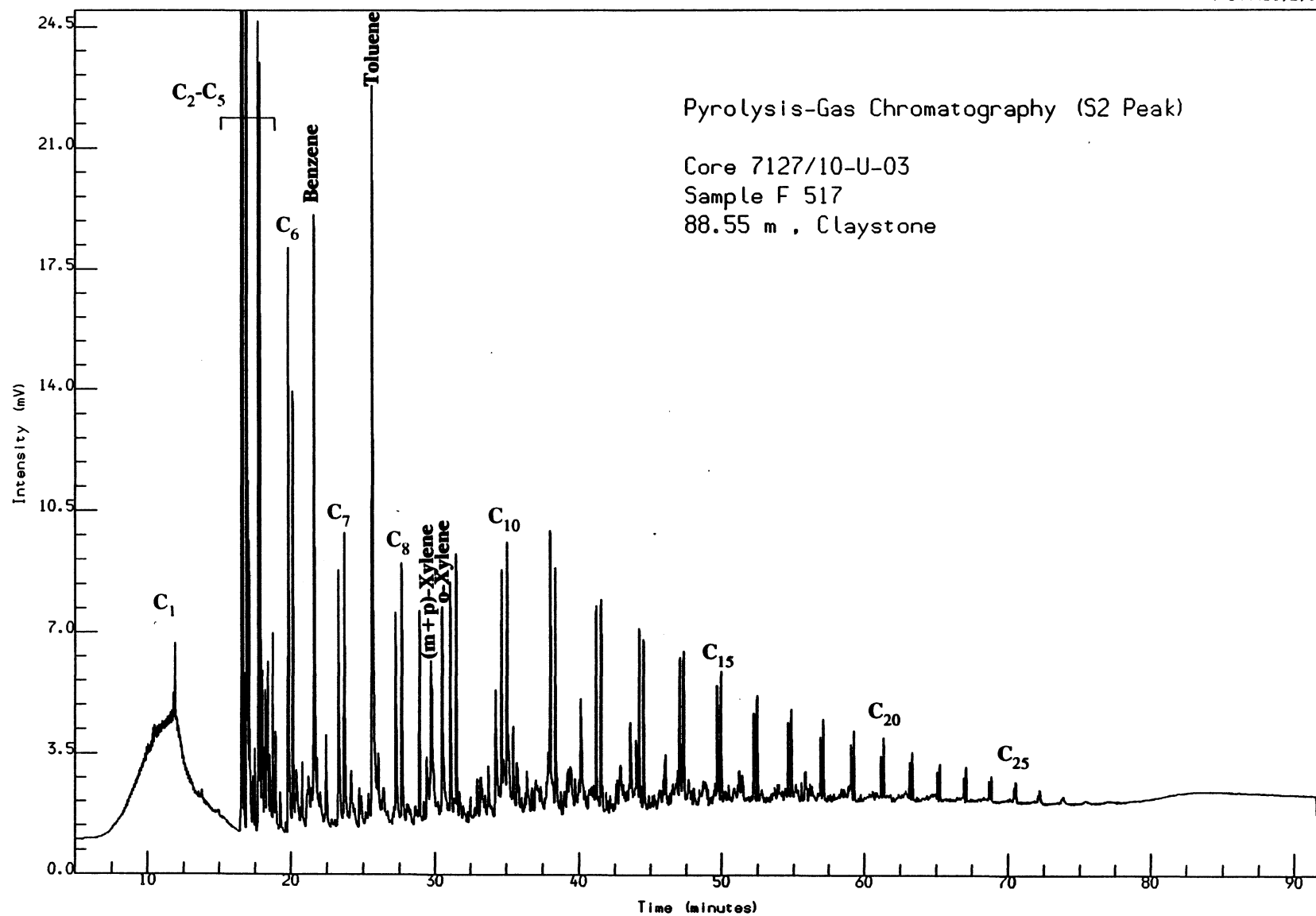
Core 7127/10-U-03

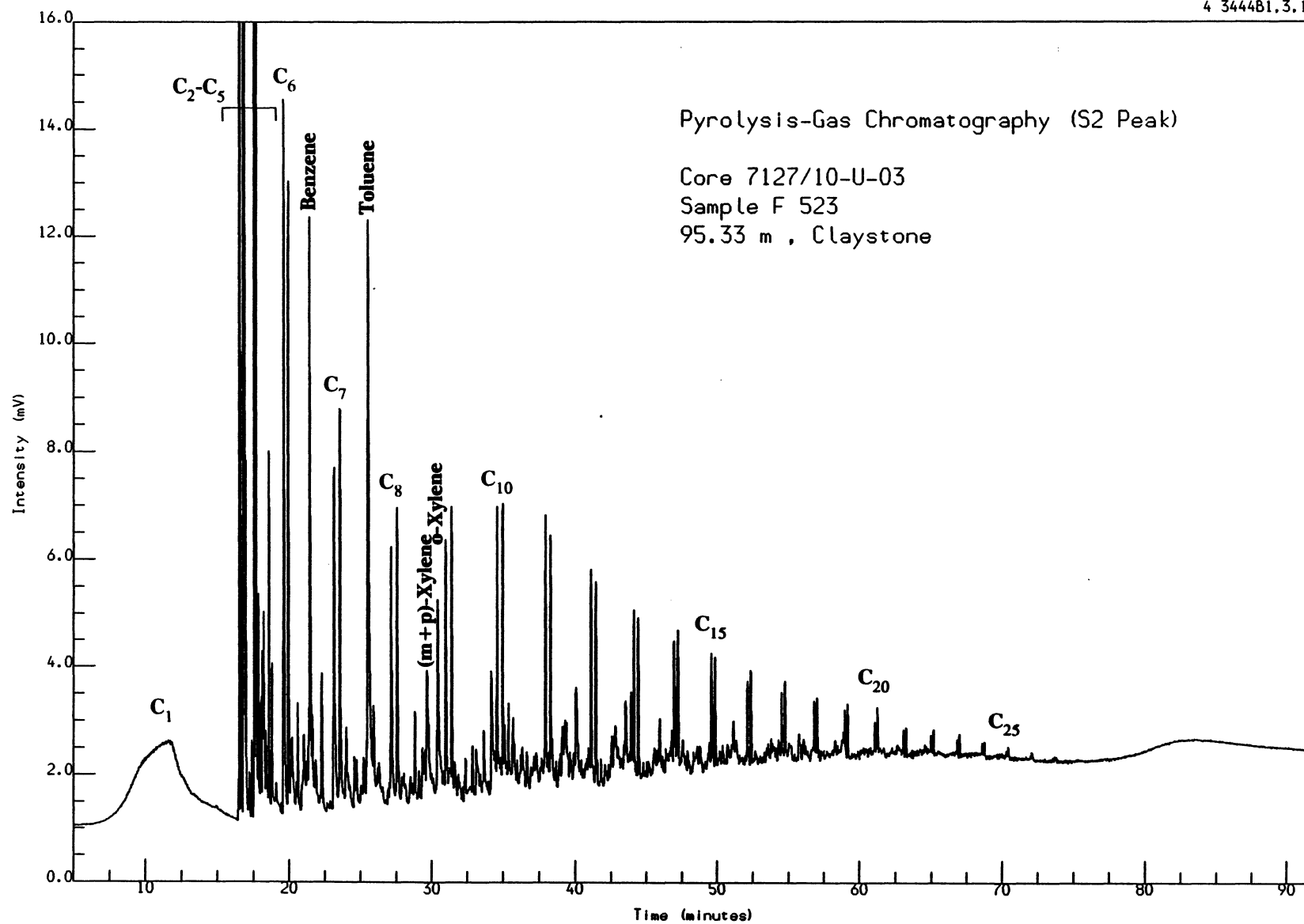
IKU no.	Depth (m)	SAT	d13C (0/00 PDB)			EOM
			ARO	Polars	Asph.	
F0557	117.72	-30.09	-25.87	-26.49	-24.18	n.d.
n.d. - not determined						

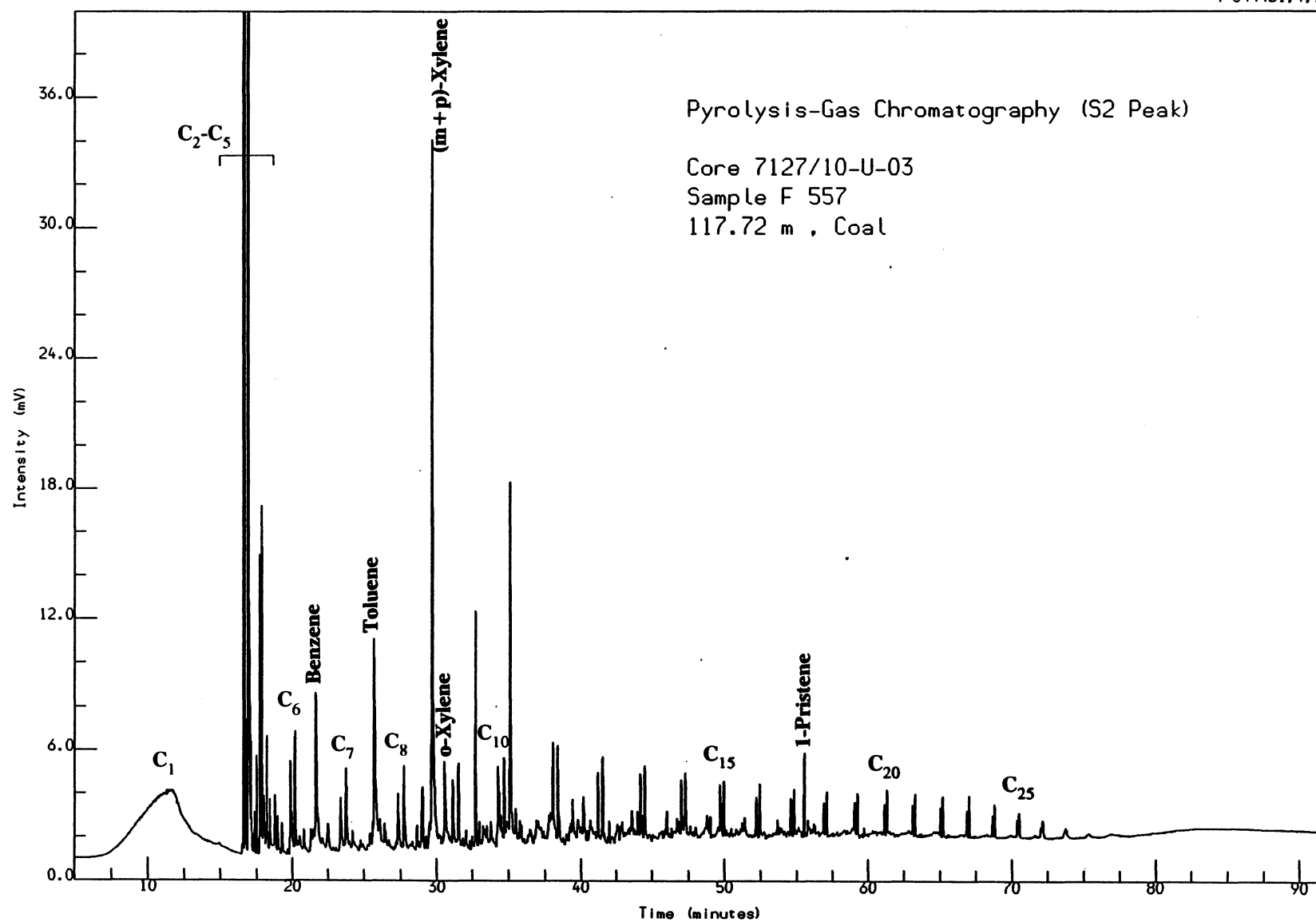
Figure A.III.3.1:

Pyrolysis-gas chromatograms (S2 peak)









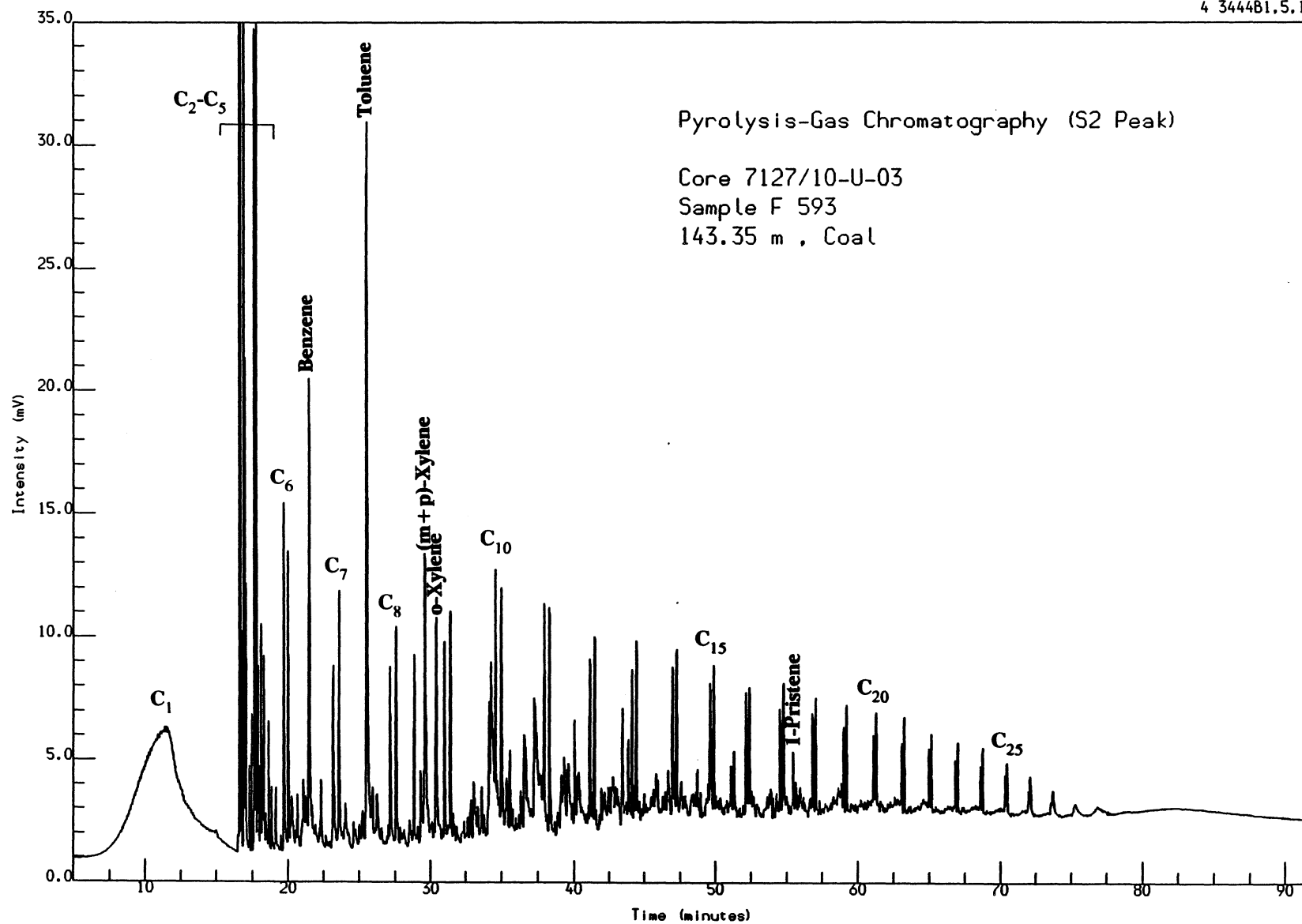


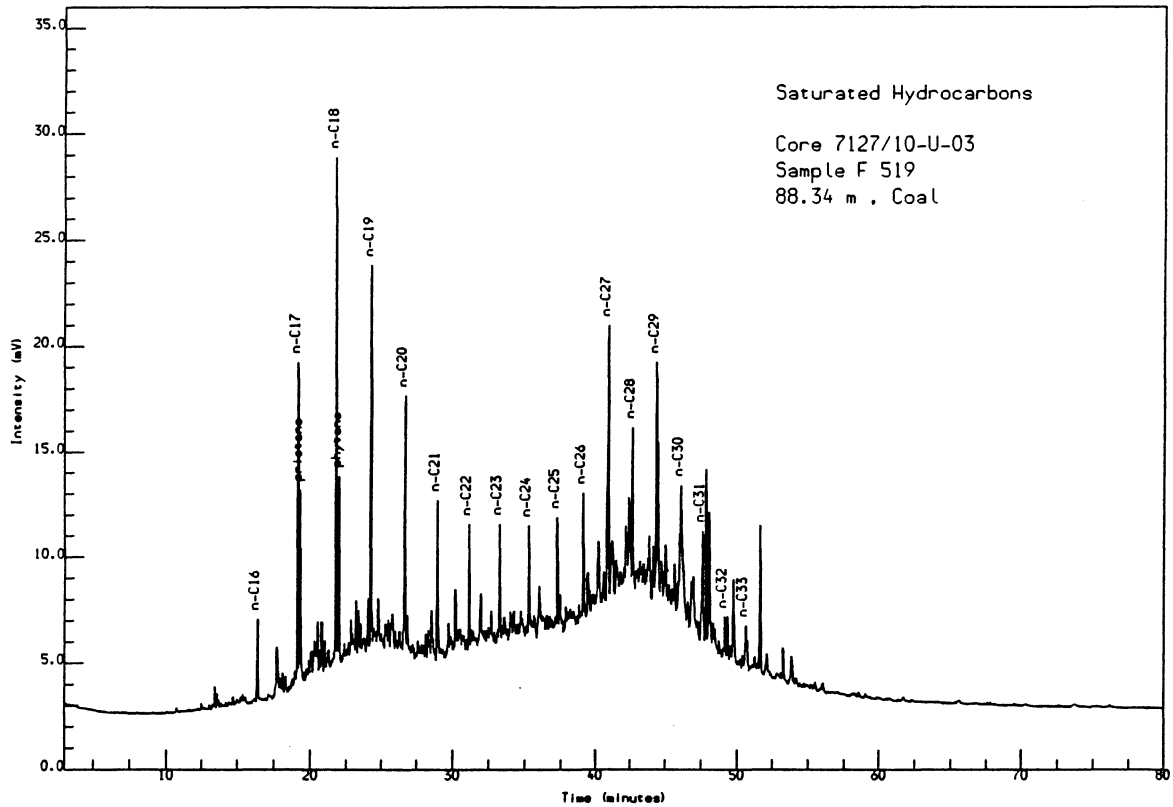
Figure A.III.3.2:

Gas chromatograms of saturated and aromatic hydrocarbons

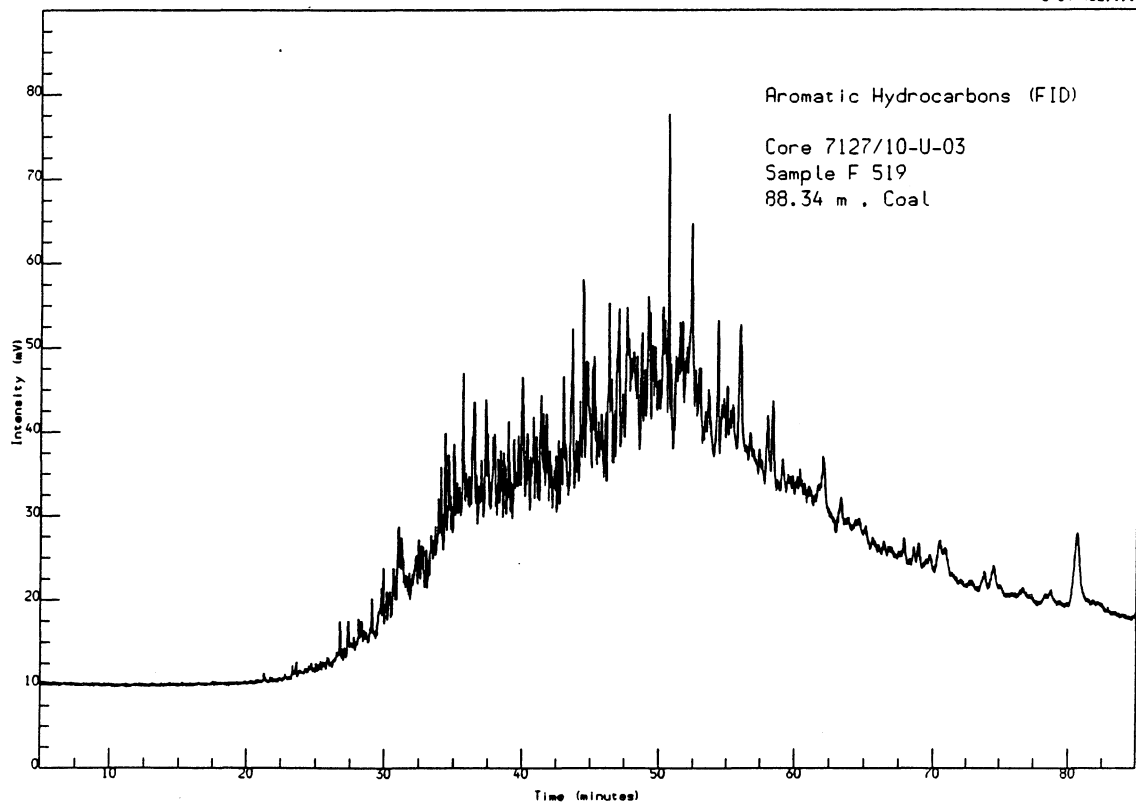
n-C₁₅ etc. - n-alkanes

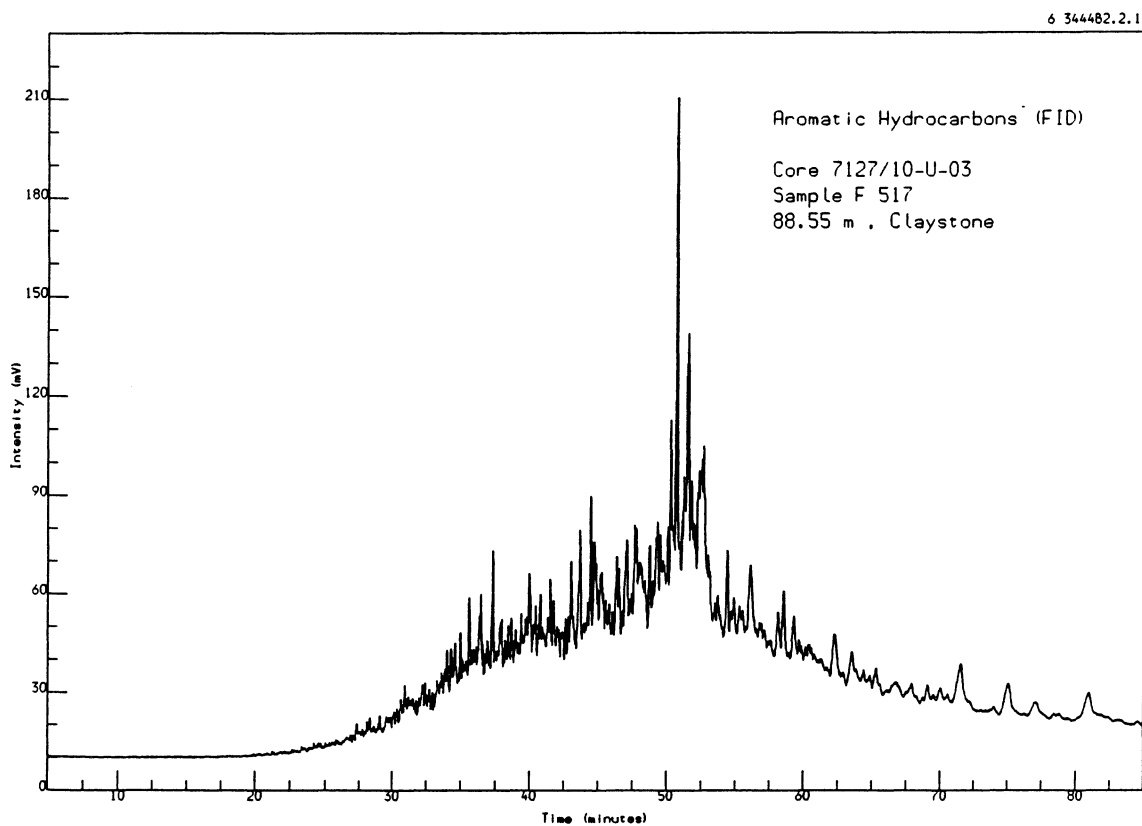
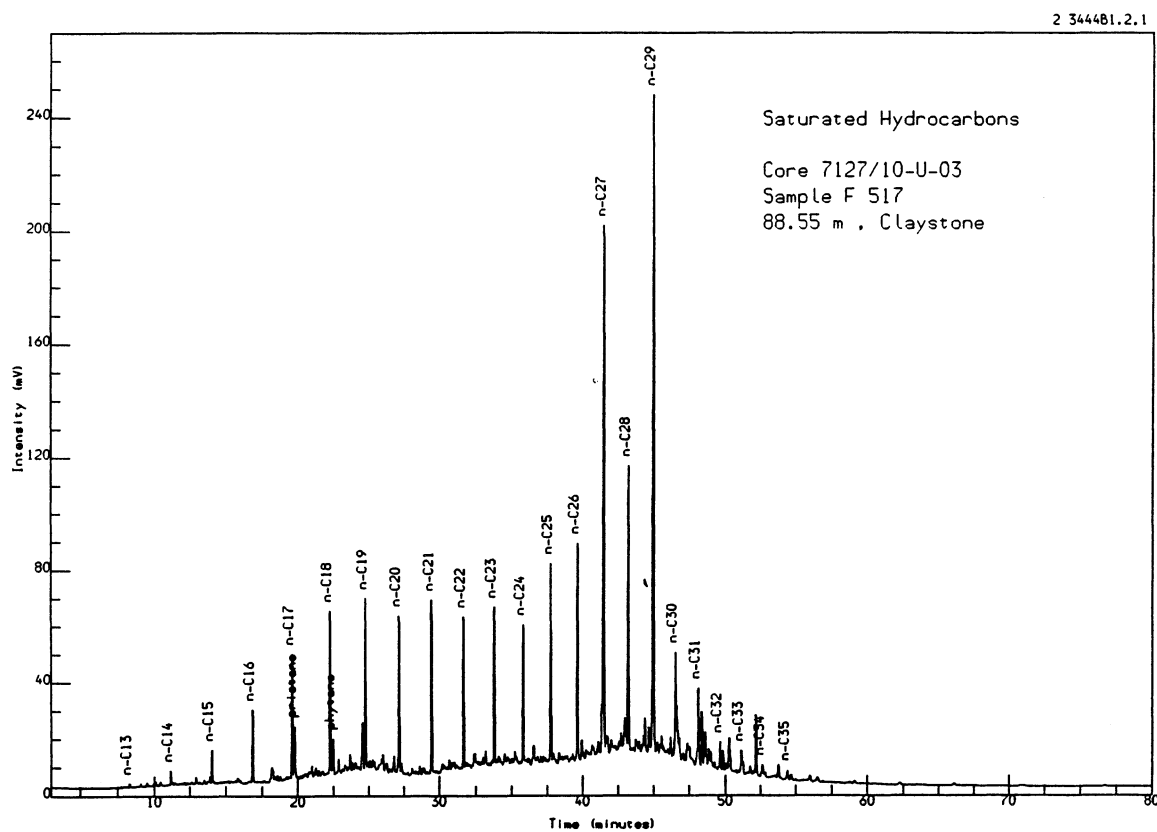
N	- Naphthalene
MN	- Methylnaphthalenes
DMN	- Dimethylnaphthalenes
TMN	- C ₃ -naphthalenes
P	- Phenanthrene
PN	- Methylphenanthrenes
DMP	- Dimethylphenanthrenes

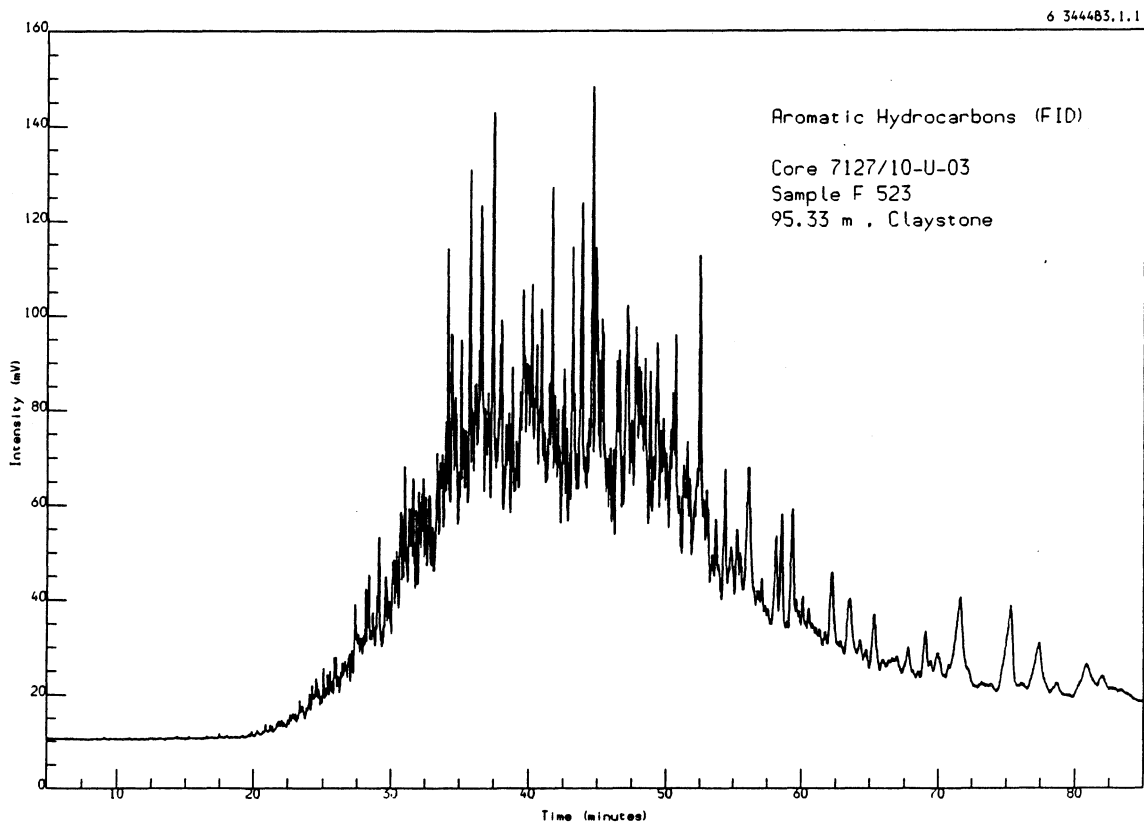
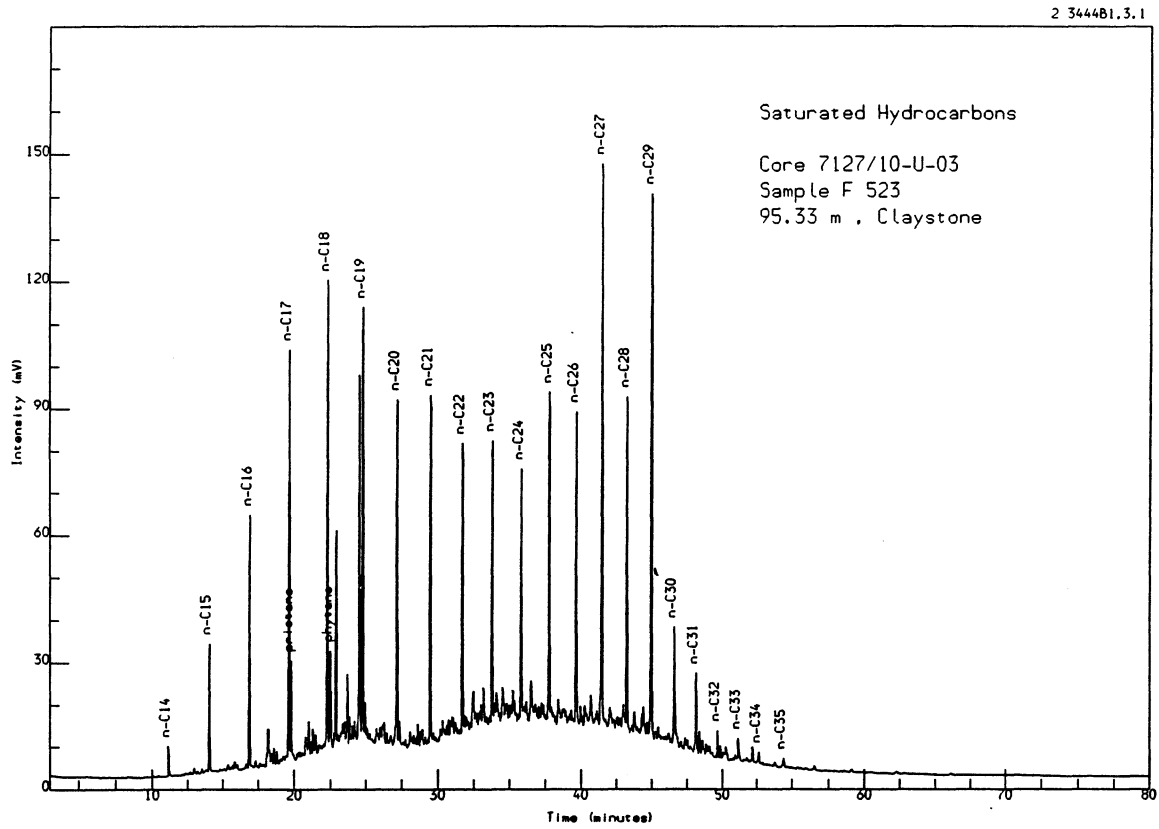
2 344481.1.1



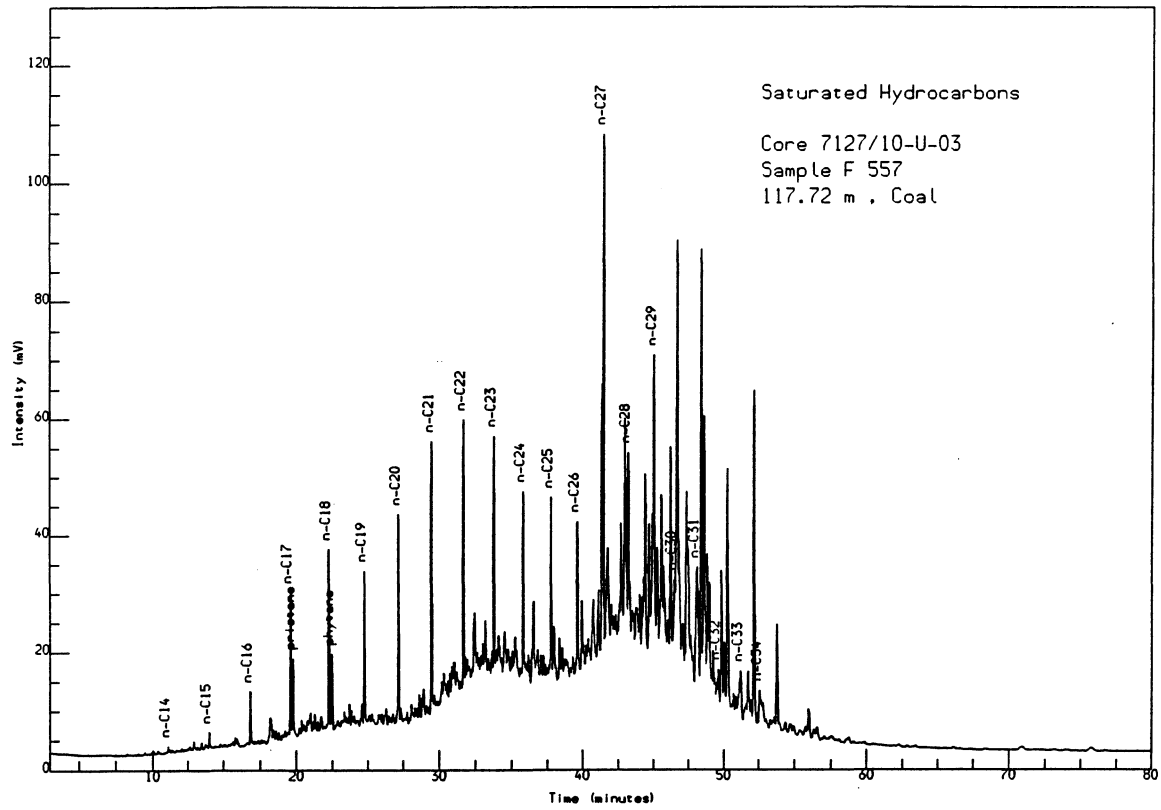
6 344482.1.1



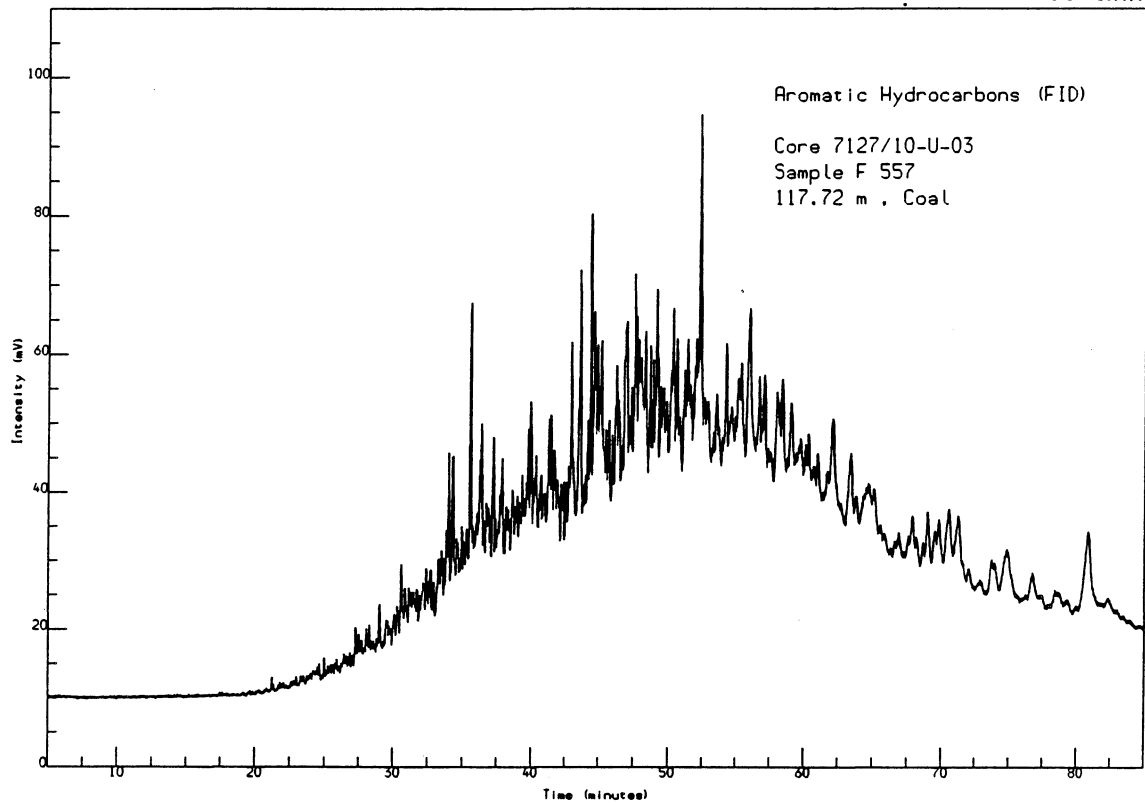




2 344481.4.1



6 344481.1.1



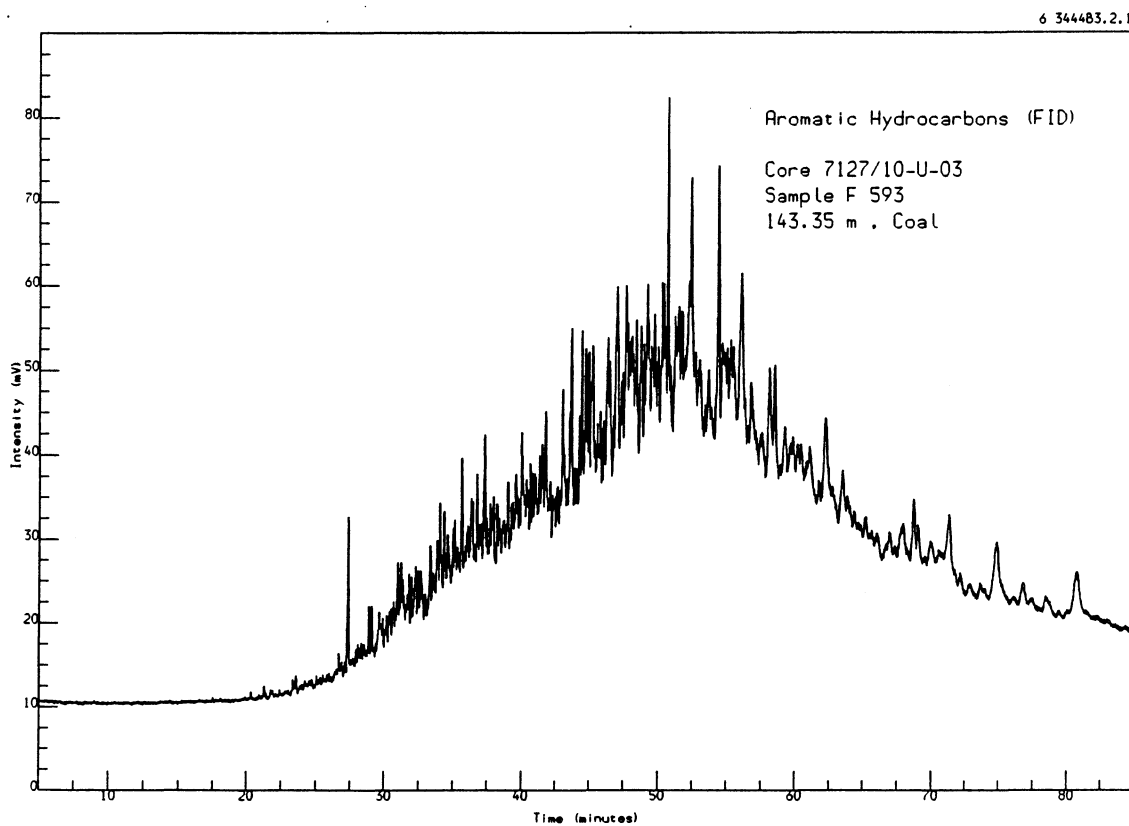
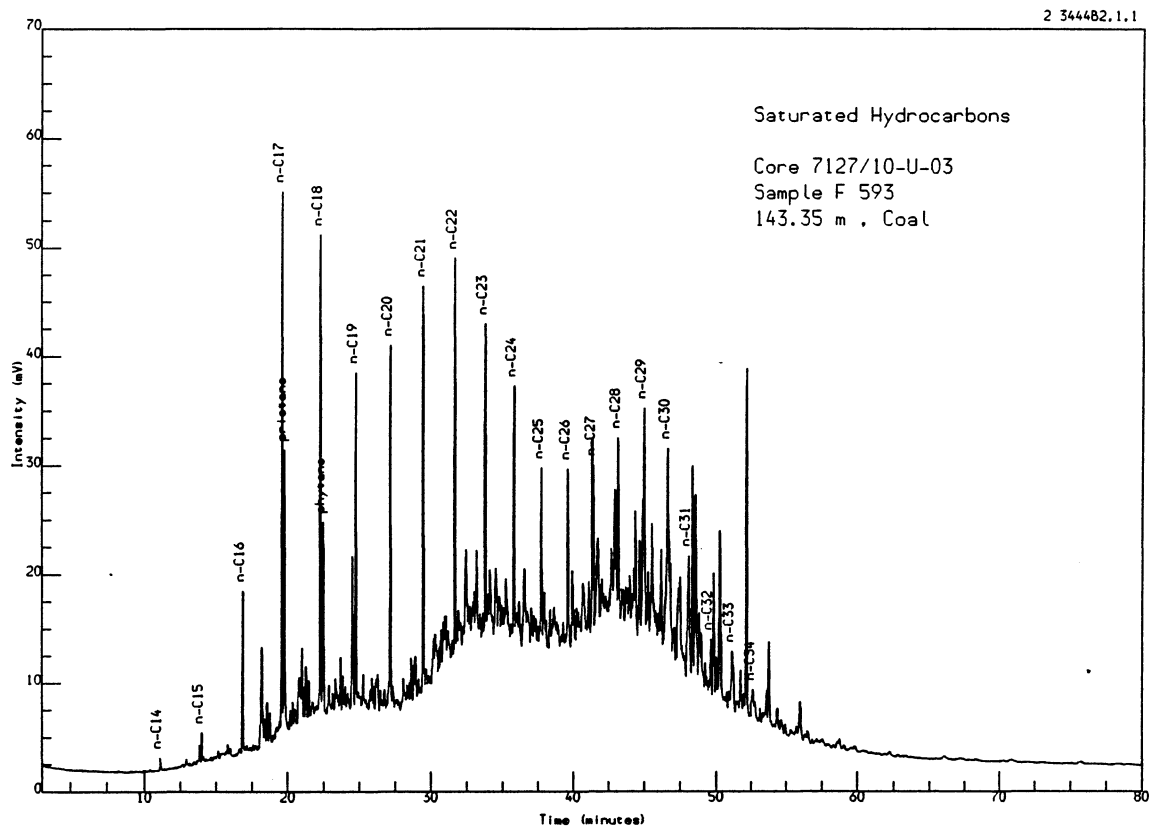
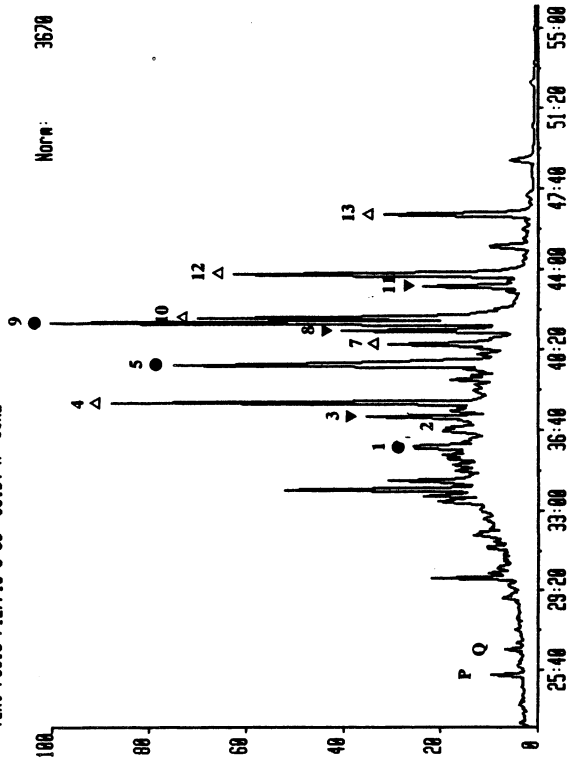


Figure A.III.3.3:

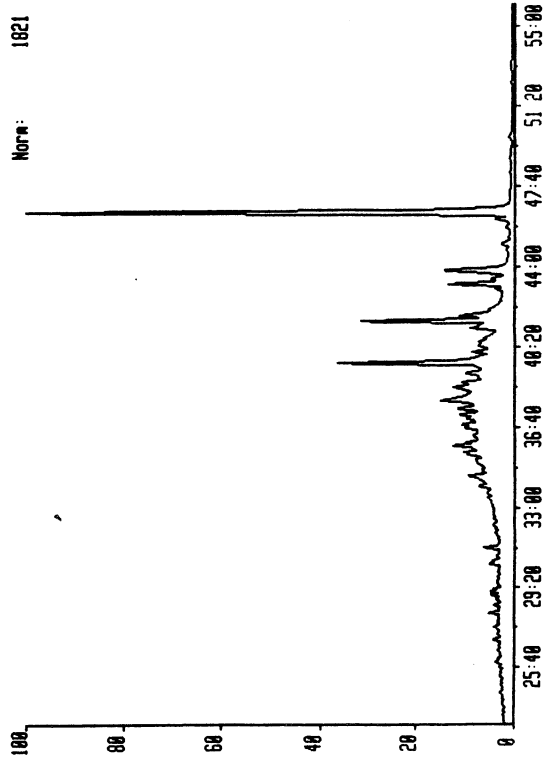
Mass fragmentograms of m/z 191, 205 (terpanes)
and m/z 217, 218 (steranes).

For peak identification see Chapter 4.

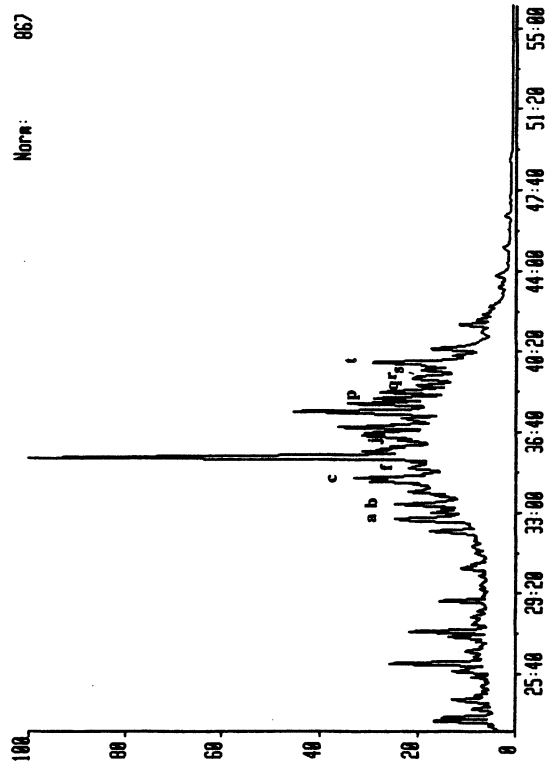
F0519 12-JAN-89 Sir-Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 191.1000
Text: F0519 7127/10-U-83 88.34 N CORL



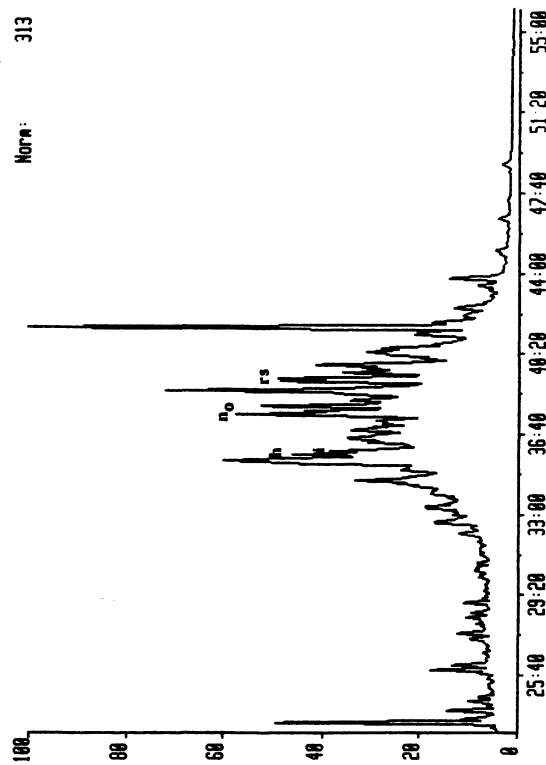
F0519 12-JAN-89 Sir-Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 205.1000
Text: F0519 7127/10-U-83 88.34 N CORL



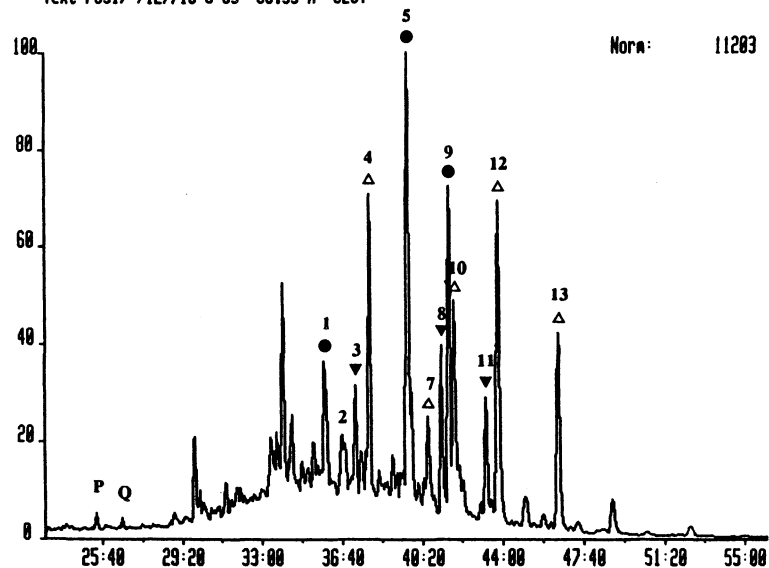
F0519 12-JAN-89 Sir-Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 217.1000
Text: F0519 7127/10-U-83 88.34 N CORL



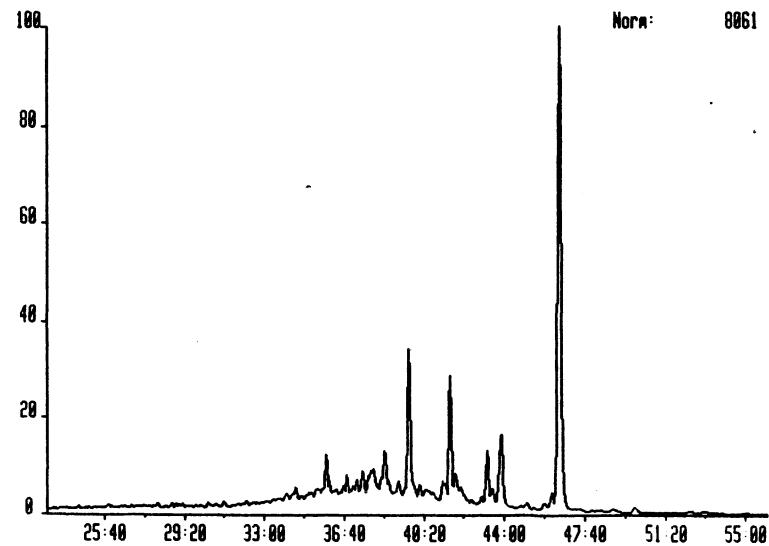
F0519 12-JAN-89 Sir-Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 218.1000
Text: F0519 7127/10-U-83 88.34 N CORL



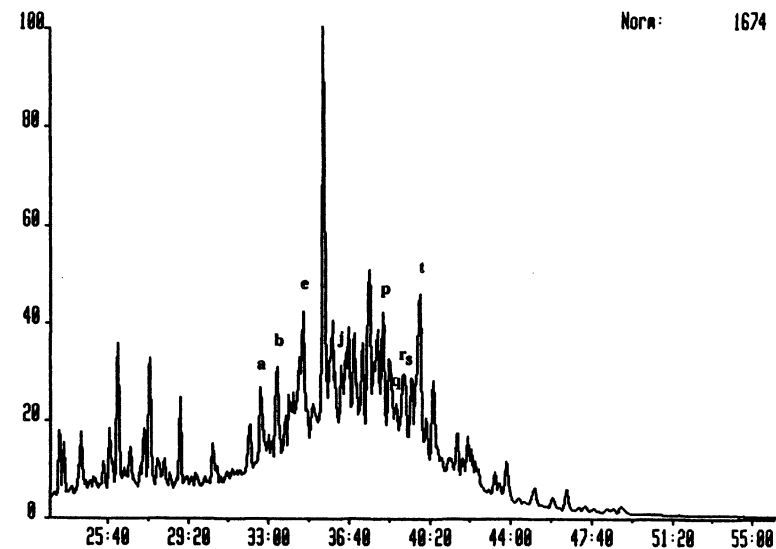
F0517 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0517 7127/10-U-03 00.55 M CLST



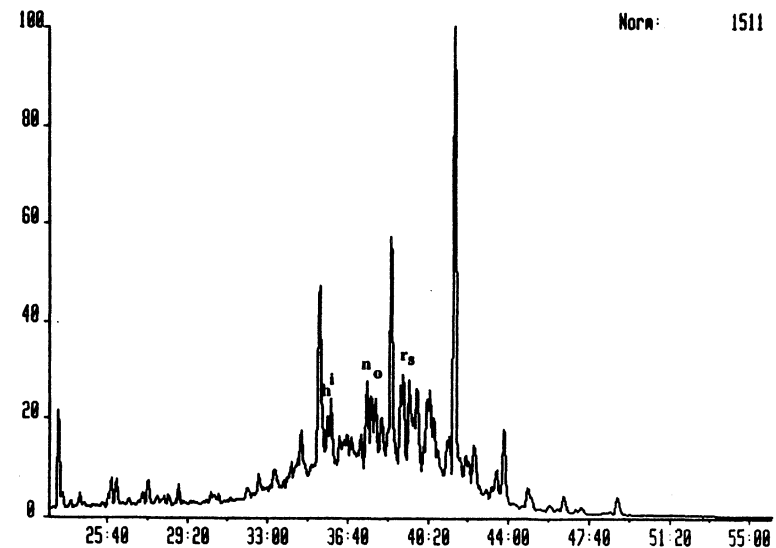
F0517 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0517 7127/10-U-03 00.55 M CLST



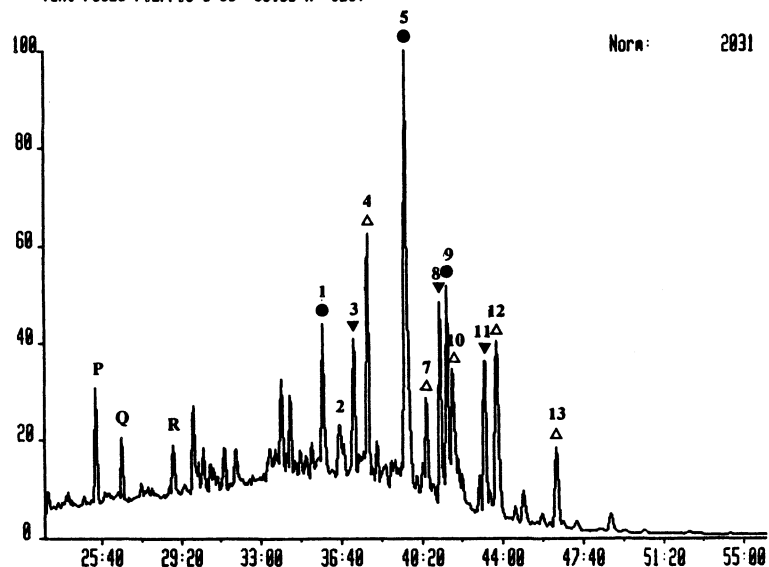
F0517 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0517 7127/10-U-03 00.55 M CLST



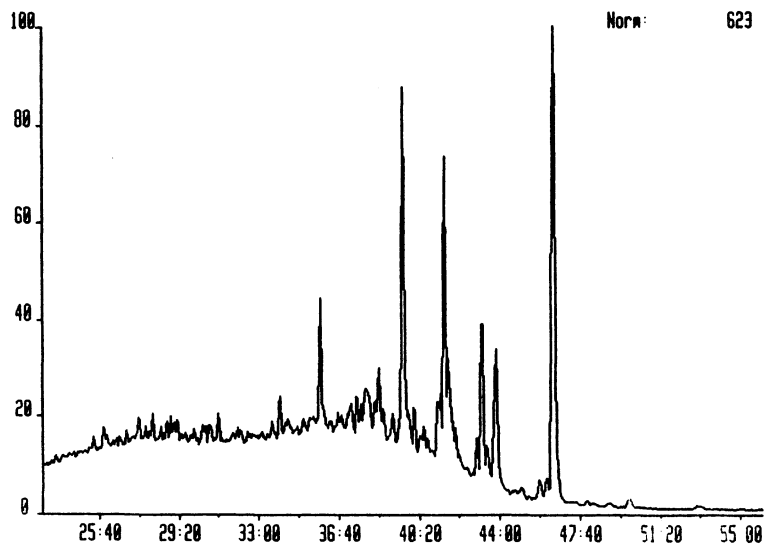
F0517 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0517 7127/10-U-03 00.55 M CLST



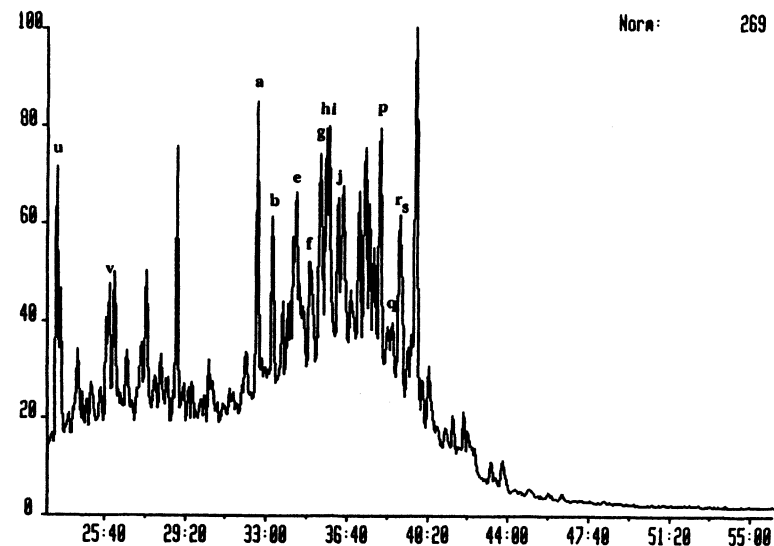
F0523 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0523 7127/10-U-03 95.33 M CLST



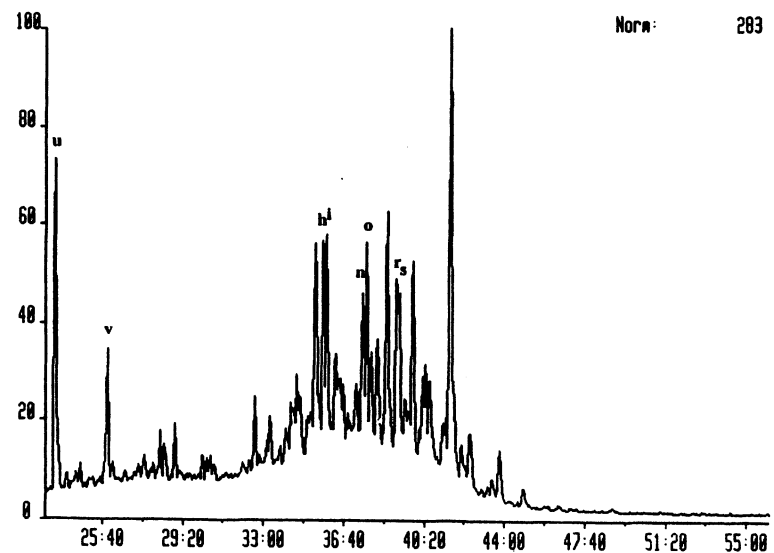
F0523 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0523 7127/10-U-03 95.33 M CLST



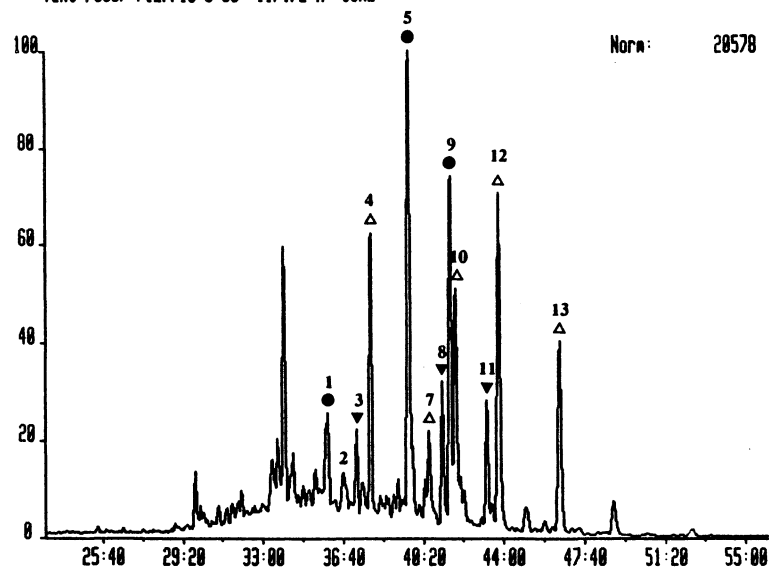
F0523 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0523 7127/10-U-03 95.33 M CLST



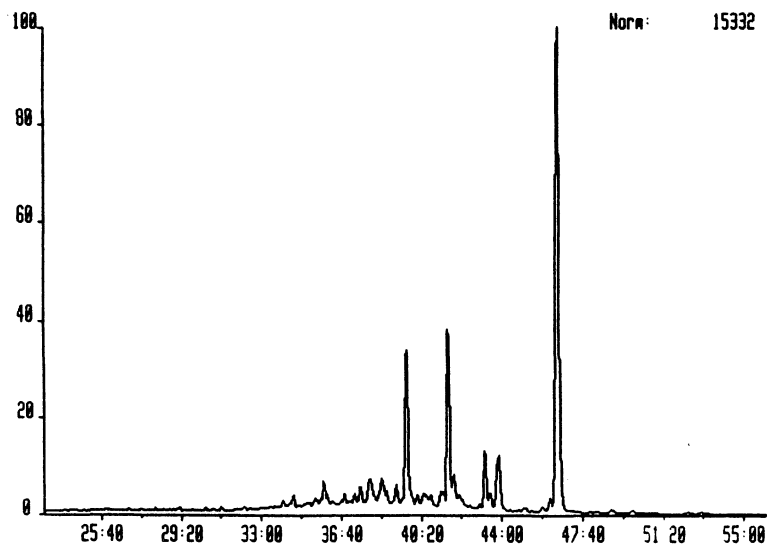
F0523 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0523 7127/10-U-03 95.33 M CLST



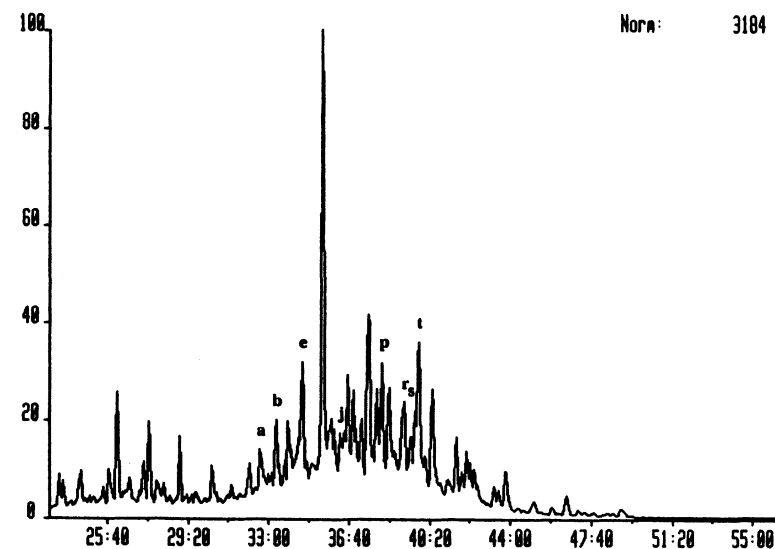
F0557 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0557 7127/10-U-03 117.72 M COAL



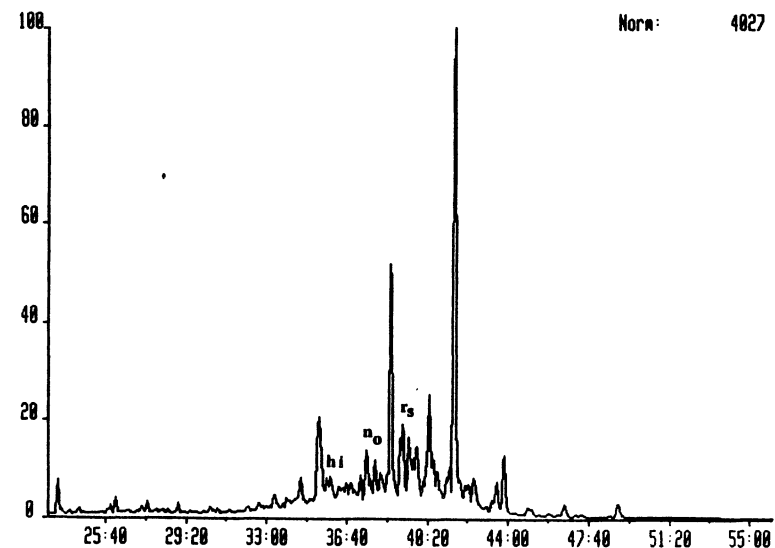
F0557 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0557 7127/10-U-03 117.72 M COAL



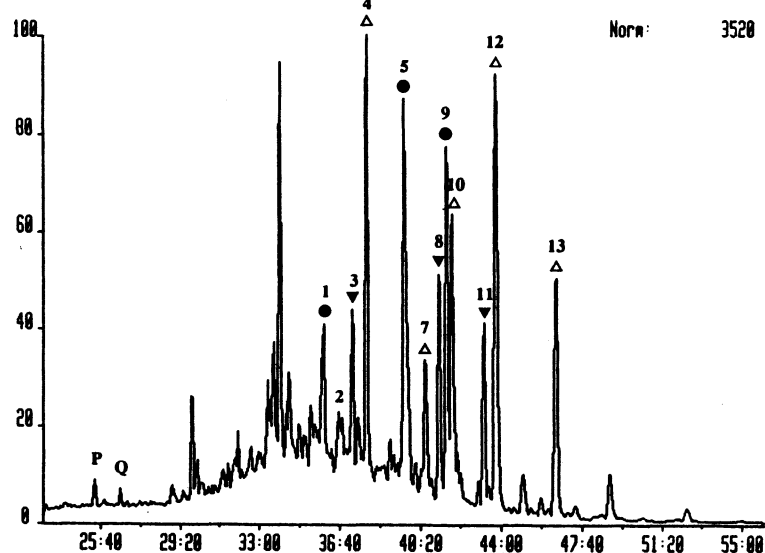
F0557 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0557 7127/10-U-03 117.72 M COAL



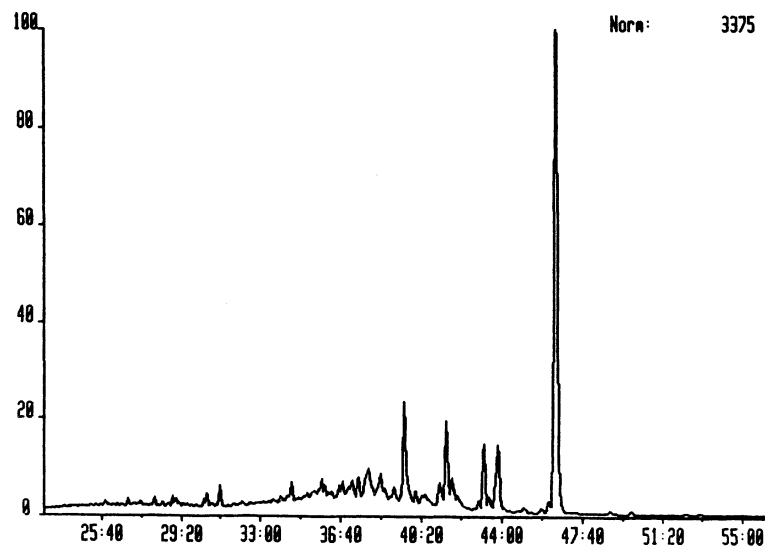
F0557 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0557 7127/10-U-03 117.72 M COAL



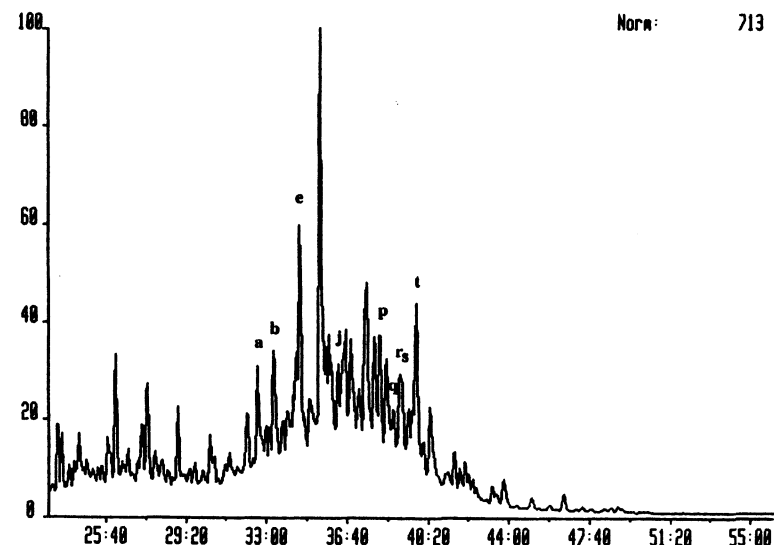
F0593 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0593 7127/10-U-03 143.35 M CORAL



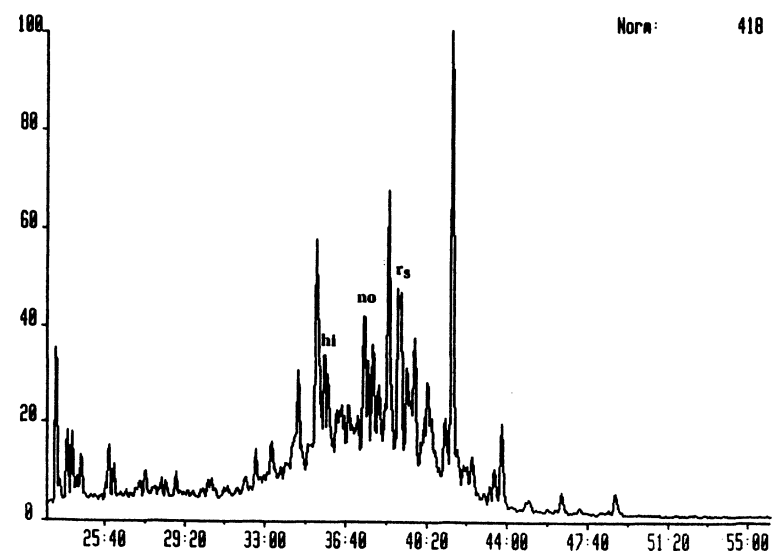
F0593 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0593 7127/10-U-03 143.35 M CORAL



F0593 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0593 7127/10-U-03 143.35 M CORAL



F0593 12-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0593 7127/10-U-03 143.35 M CORAL



Core 7127/10-U-03

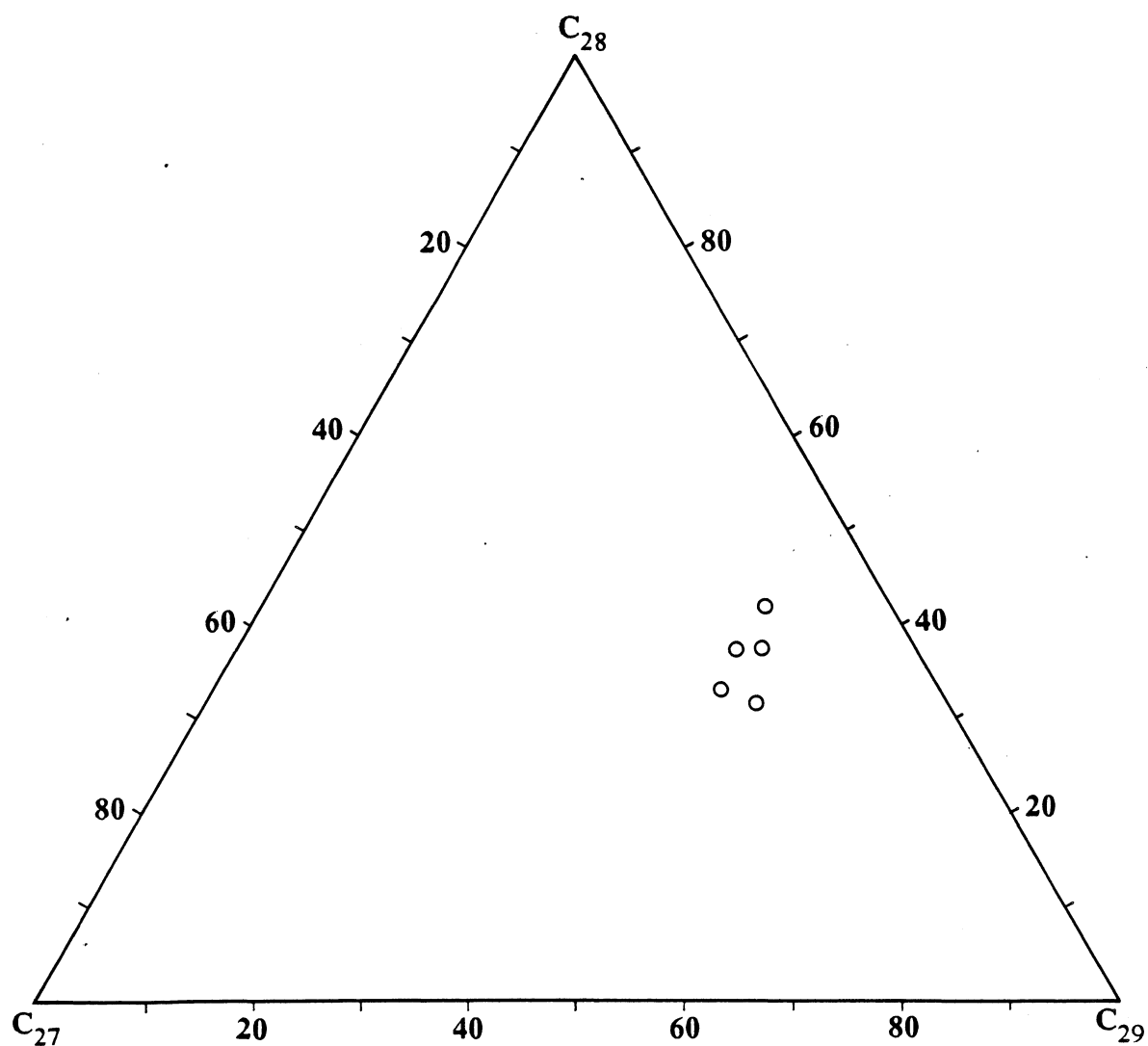


Figure A.III.3.4

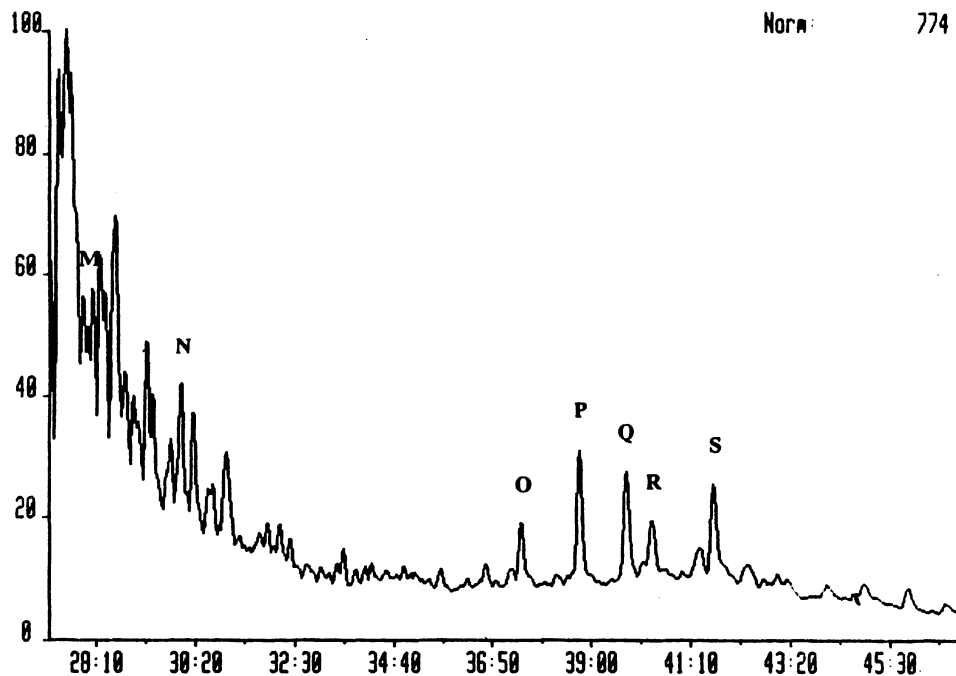
Internal distribution of 14α(H), 17α(H) 20R, C₂₇, C₂₈ and C₂₉ regular steranes
(from m/z 217)

Figure A.III.3.5:

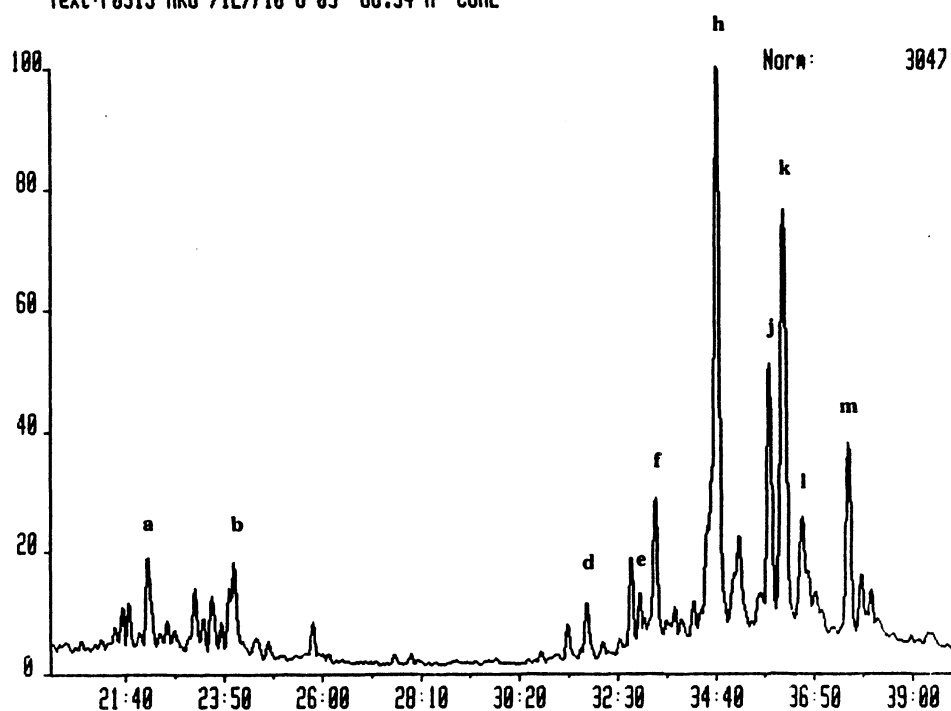
Mass fragmentograms of m/z 231, 253
(aromatic steroid hydrocarbons)

For peak identification see Chapter 4.

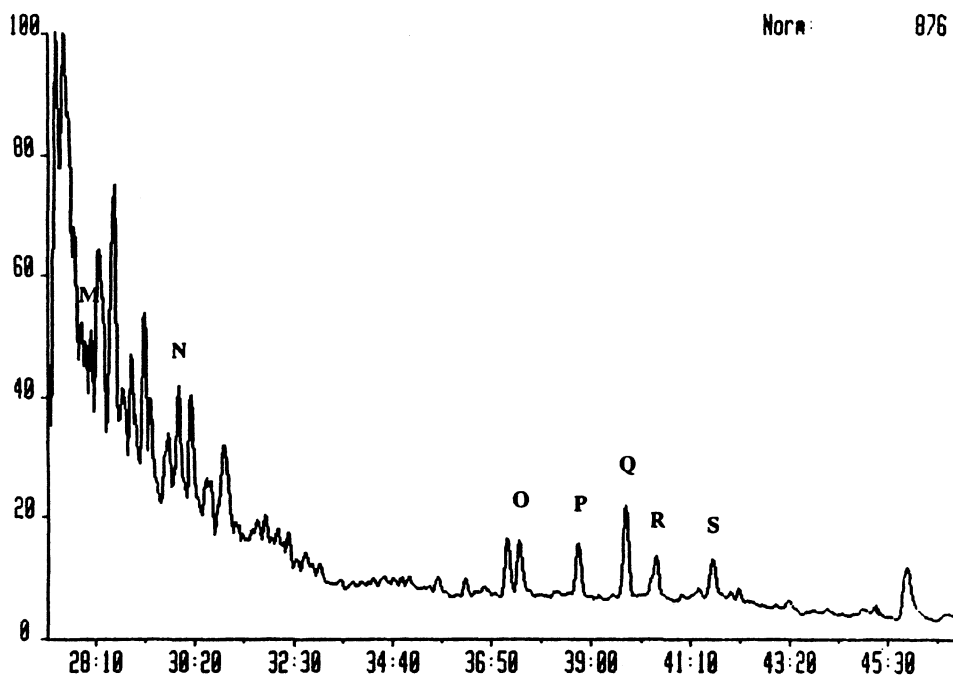
F0519AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0519 ARO 7127/10-U-03 88.34 M COAL



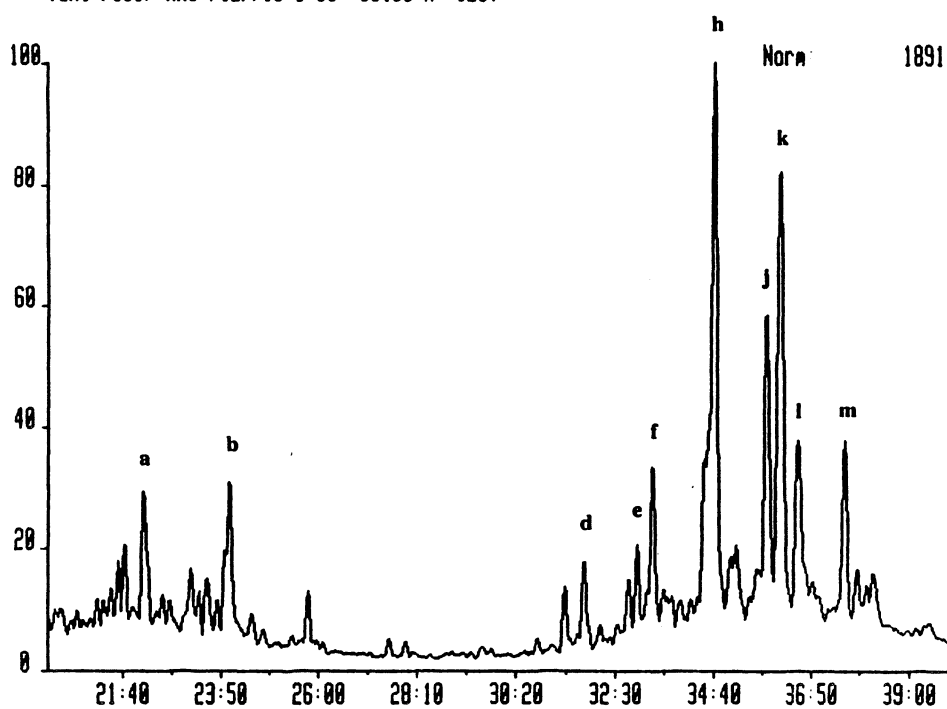
F0519AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0519 ARO 7127/10-U-03 88.34 M COAL



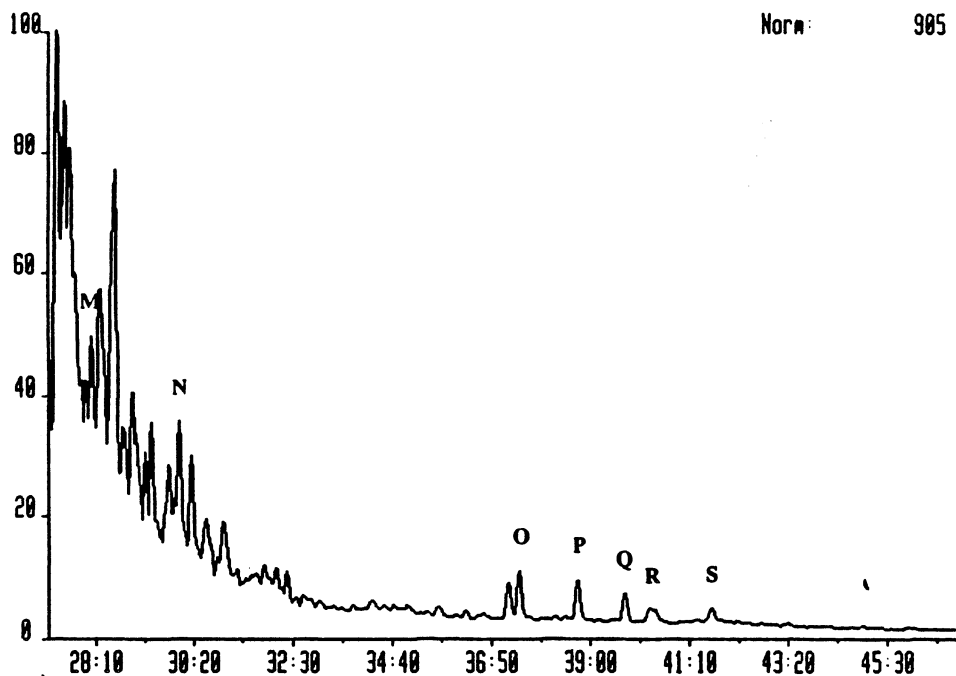
F0517AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0517 ARO 7127/10-U-03 88.55 M CLST



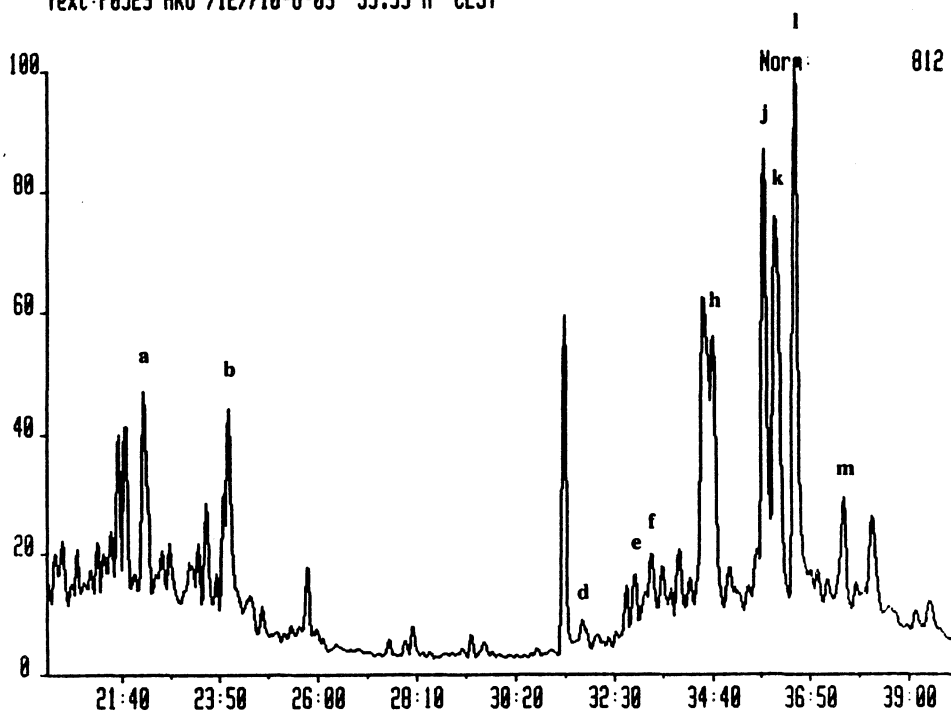
F0517AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0517 ARO 7127/10-U-03 88.55 M CLST



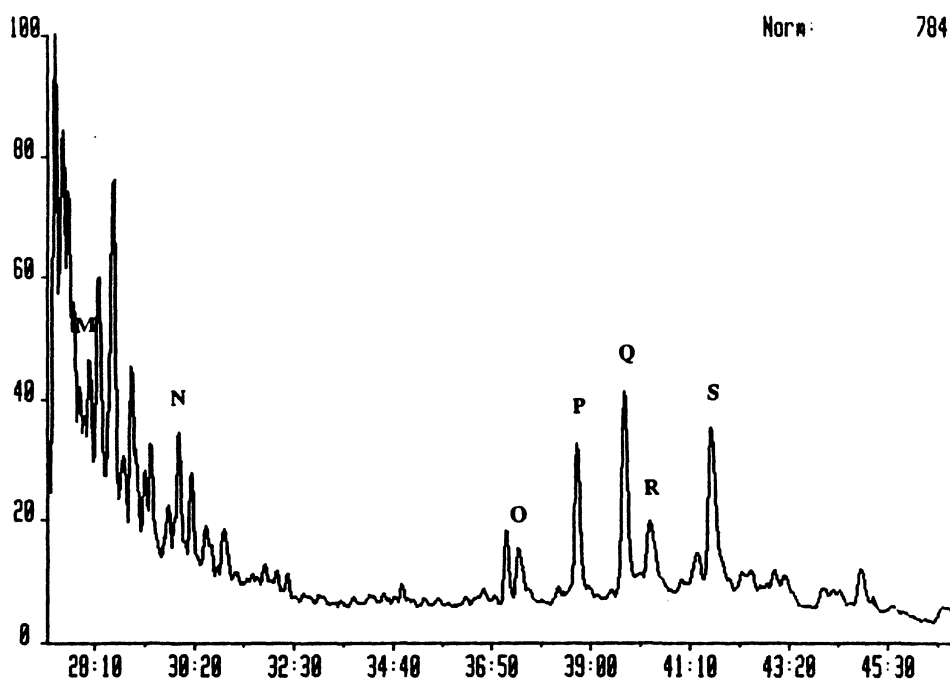
F0523AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0523 ARO 7127/10-U-03 95.33 M CLST



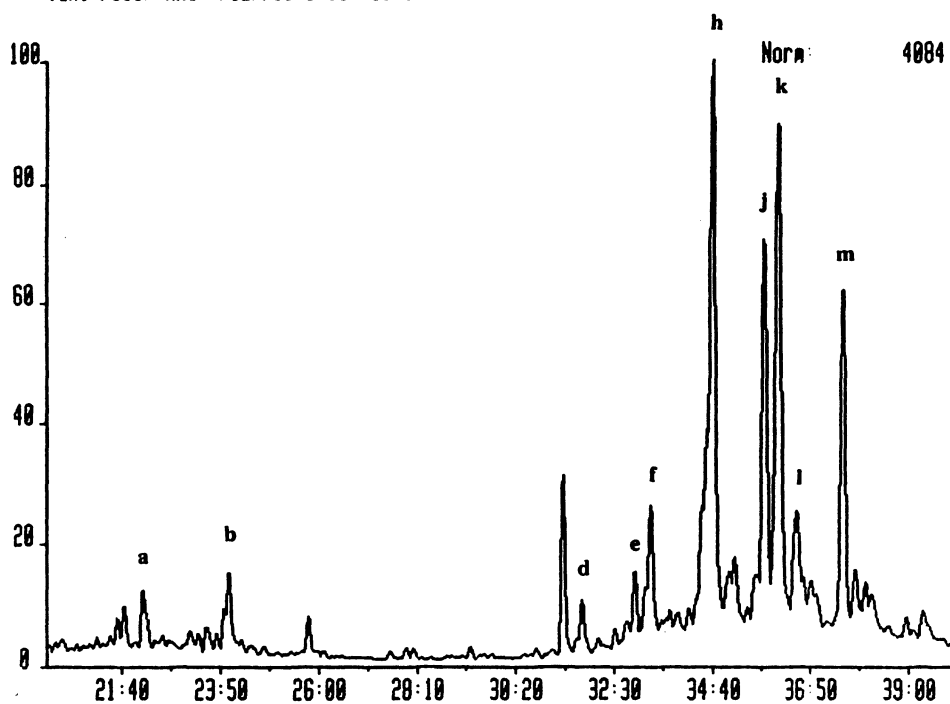
F0523AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0523 ARO 7127/10-U-03 95.33 M CLST



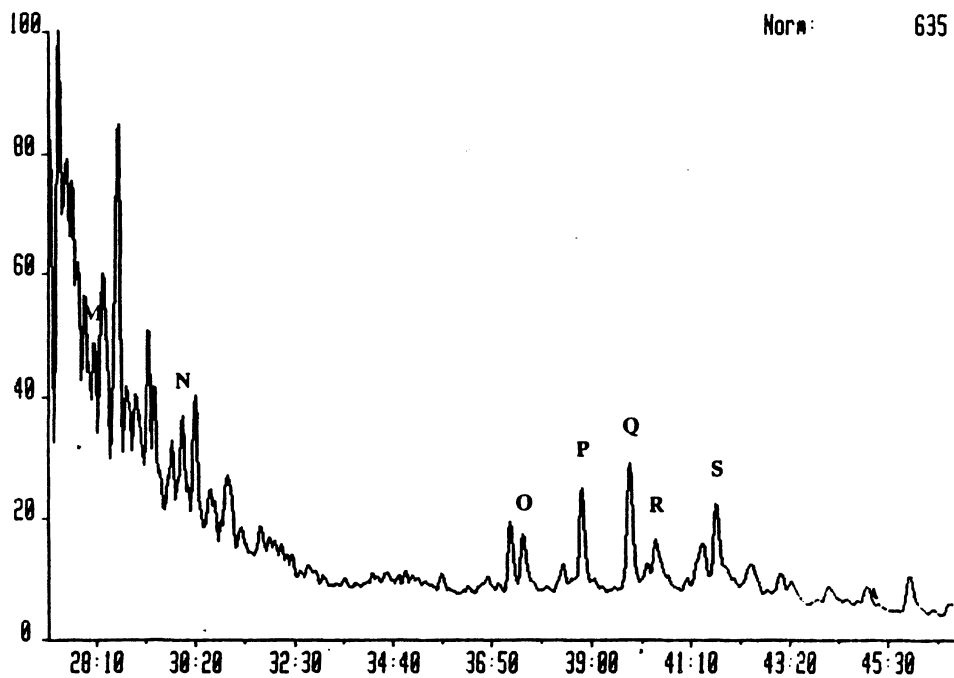
F0557AR 25-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0557 ARD 7127/10-U-03 117.72 M COAL



F0557AR 25-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0557 ARD 7127/10-U-03 117.72 M COAL



F0593AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0593 ARO 7127/10-U-03 143.35 M COAL



F0593AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0593 ARO 7127/10-U-03 143.35 M COAL

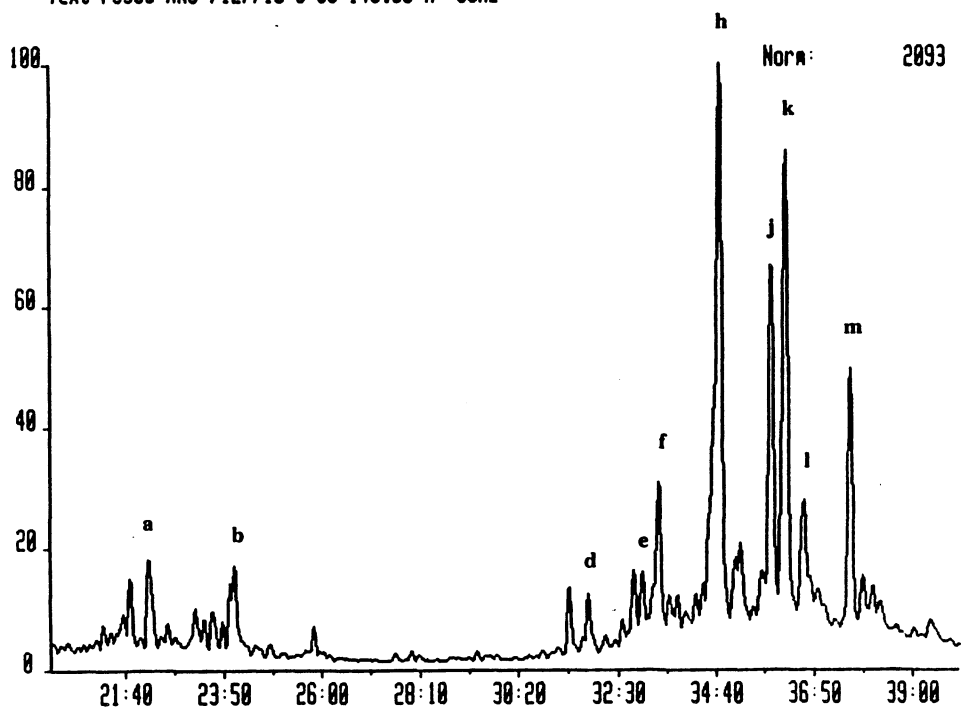
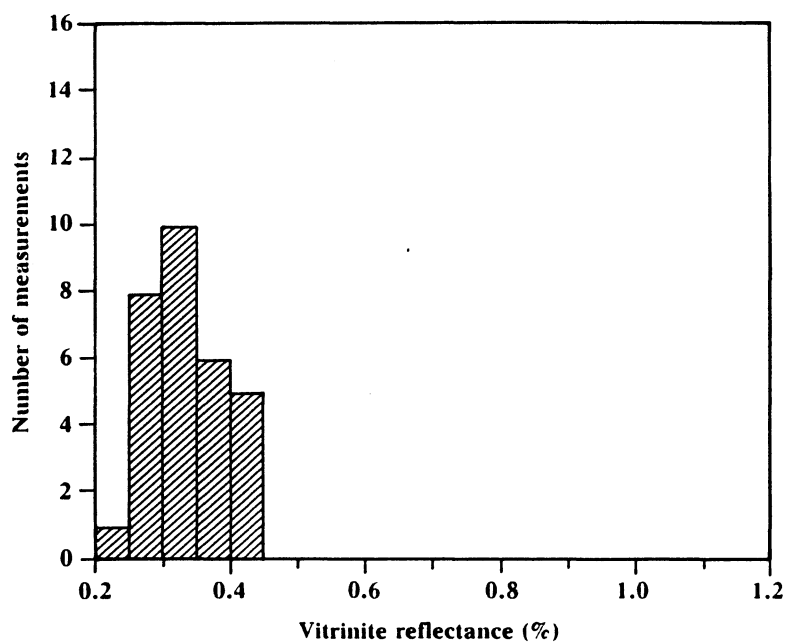


Figure A.III.3.6: Vitrinite reflectance histograms.

Core no.: 7127/10-U-03

Sample no.: F-501

Depth: 76.75 m

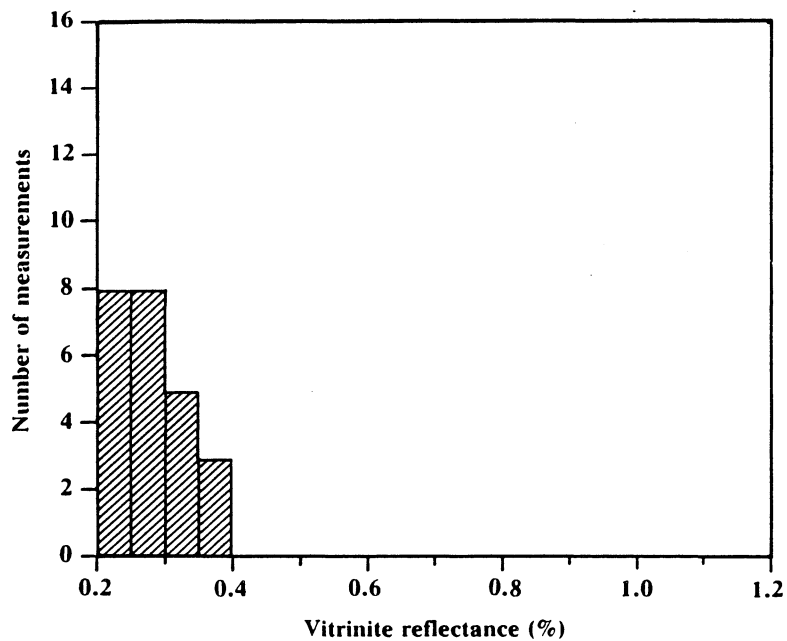


RP = 0.33% n = 30

Core no.: 7127/10-U-03

Sample no.: F-505

Depth: 77.37 m

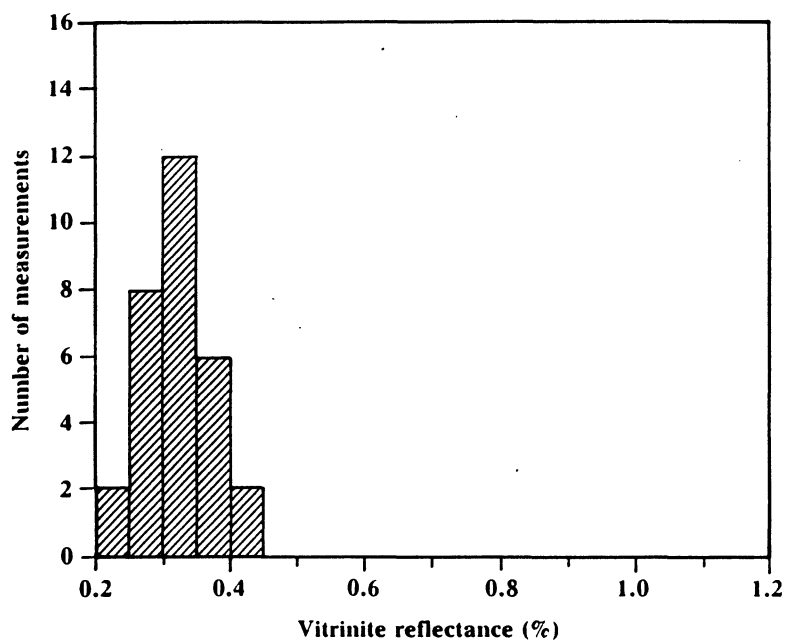


RP = 0.28% n = 24

Core no.: 7127/10-U-03

Sample no.: F-529

Depth: 100.63 m

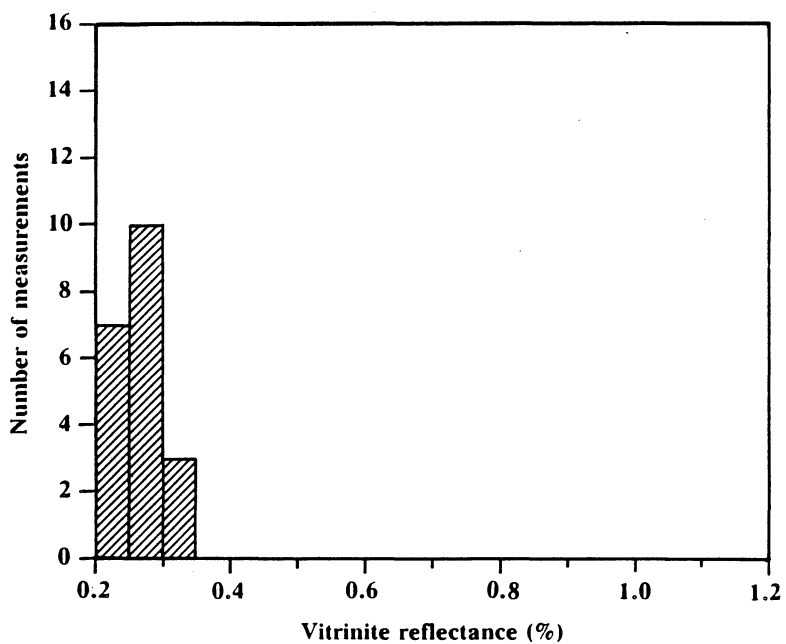


RP = 0.32% n = 30

Core no.: 7127/10-U-03

Sample no.: F-565

Depth: 121.78 m

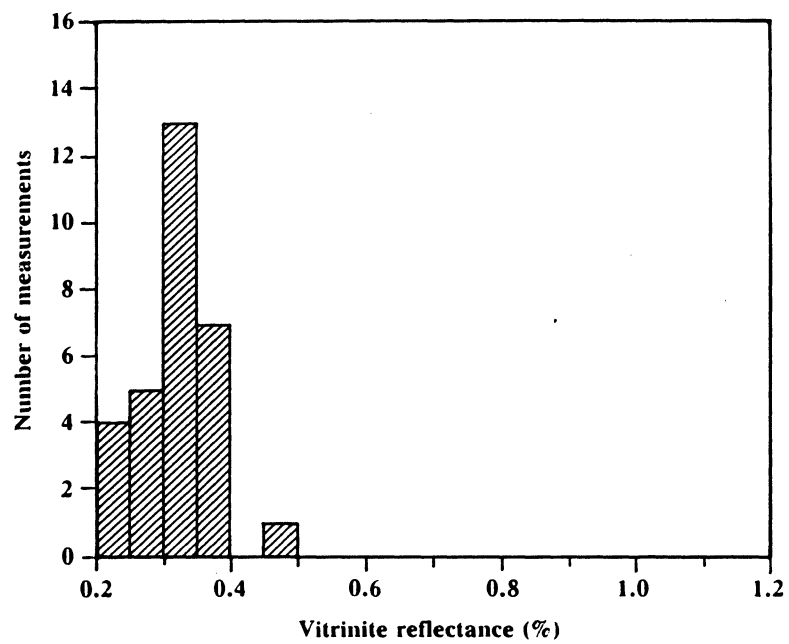


RP = 0.26% n = 20

Core no.: 7127/10-U-03

Sample no.: F-593

Depth: 143.35 m



RP = 0.32% n = 30

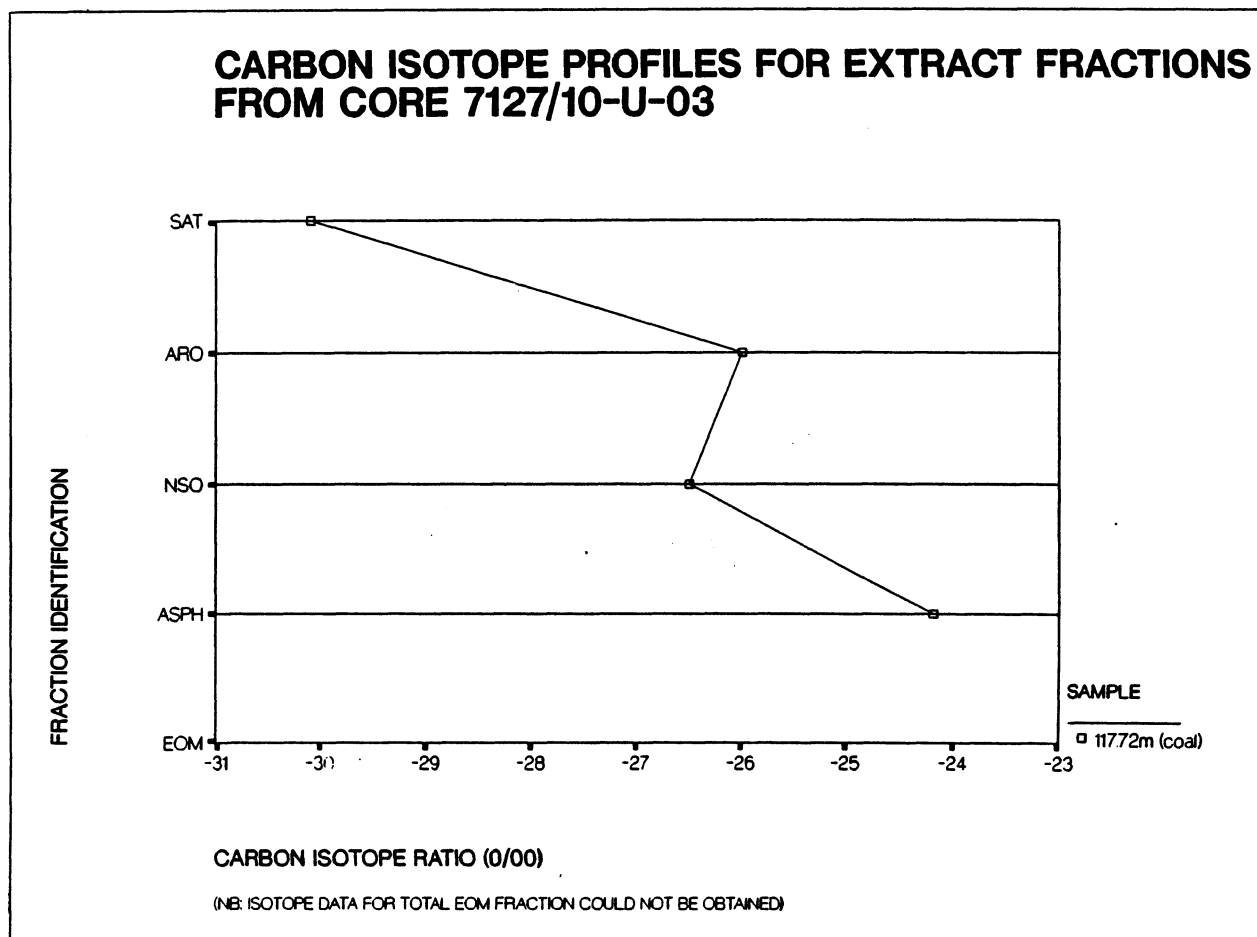


Figure A.III.3.7

APPENDIX III.4: TABLE OF CONTENTS

Core 7029/03-U-02

TABLES

Table A.III.4.1a:	Concentration of C_1-C_{5+} hydrocarbons in headspace gas.
Table A.III.4.1b:	Concentration of C_1-C_{5+} hydrocarbons in occluded gas.
Table A.III.4.1c:	Concentration of C_1-C_{5+} hydrocarbons - summation.
Table A.III.4.2:	Total organic carbon content and data from Rock-Eval pyrolysis.
Table A.III.4.3:	Data from pyrolysis-gas chromatograms.
Table A.III.4.4:	Vitrinite reflectance data.
Table A.III.4.5:	Visual kerogen analysis.
Table A.III.4.6a:	Weight of EOM, asphaltenes and chromatographic fractions.
Table A.III.4.6b:	Concentration of EOM, asphaltenes and chromatographic fractions, related to rock weight.
Table A.III.4.6c:	Concentration of EOM, asphaltenes and chromatographic fractions, related to TOC weight.
Table A.III.4.6d:	Composition of material extracted from the rock.
Table A.III.4.7:	Tabulation of data from the gas chromatograms.
Table A.III.4.8a:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity characteristic ratios.
Table A.III.4.8b:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity and source characteristic ratios.
Table A.III.4.9:	Molecular ratios from aromatic sterane mass fragmentograms.
Table A.III.4.10:	Carbon isotope ratios of EOM and chromatographic fractions.

FIGURES

Figure A.III.4.1:	Pyrolysis-gas chromatograms (S2 peak)
Figure A.III.4.2:	Gas chromatograms of saturated and aromatic hydrocarbons.
Figure A.III.4.3:	Mass fragmentograms of m/z 191, 205 (terpanes) and m/z 217, 218 (steranes).

- Figure A.III.4.4: Internal distribution of $14\alpha(H)$, $17\alpha(H)$ 20R, C_{27} , C_{28} and C_{29} regular steranes (from m/z 217).
- Figure A.III.4.5: Mass fragmentograms of m/z 231, 253 (aromatic steroid hydrocarbons).
- Figure A.III.4.6: Vitrinite reflectance histograms.
- Figure A.III.4.7: Carbon isotope type curves of sediment extracts.

Project no.: 21344423
Location : 7029/03-U-02
Date : 88.10.12

Table A.III.4.1: TABLE OF GAS RESULTS

a: Headspace gas (µl gas pr. kg rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0982	34.62	66	2	0	0	0	0	68	2	2.9	-1.00
F0995	40.50	86	5	0	0	0	0	91	5	5.5	-1.00
F1015	49.68	61	3	0	0	0	0	64	3	4.7	-1.00
F1016	54.43	23	0	0	0	0	0	23	0	0.0	-1.00
F1202	60.41	14	0	0	0	0	0	14	0	0.0	-1.00
F1056	61.79	21	3	0	0	0	0	24	3	12.5	-1.00
F1069	78.82	44	0	0	0	0	0	44	0	0.0	-1.00
F1086	79.22	16	0	0	0	0	0	16	0	0.0	-1.00
F1093	84.60	45	0	0	0	0	0	45	0	0.0	-1.00
F1102	86.96	13	0	0	0	0	0	13	0	0.0	-1.00
F1104	89.93	150	26	13	0	0	0	189	39	20.6	-1.00
F1115	94.47	5	0	0	0	0	0	5	0	0.0	-1.00
F1118	113.65	17	0	0	0	0	0	17	0	0.0	-1.00
F1120	125.04	13	0	0	0	0	0	13	0	0.0	-1.00
F1122	131.10	4	0	0	0	0	0	4	0	0.0	-1.00
F1125	136.68	18	0	0	0	0	0	18	0	0.0	-1.00
F1146	148.80	11	0	0	0	0	0	11	0	0.0	-1.00
F1147	149.64	55	1	0	0	0	0	56	1	1.8	-1.00
F1154	157.23	16	0	0	0	0	0	16	0	0.0	-1.00
F1161	162.65	11	0	0	0	0	0	11	0	0.0	-1.00
F1179	182.27	26	0	0	0	0	0	26	0	0.0	-1.00
F1203	189.21	13	0	0	0	0	0	13	0	0.0	-1.00

Legend: -1 can not be determined

Project no.: 21344423
Location : 7029/03-U-02
Date : 88.10.12

Table A.III.4.1 (cont'd):

b: Occluded gas (µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0982	34.62	411	18	8	0	0	0	437	26	5.9	-1.00
F0995	40.50	8	1	0	0	0	0	9	1	11.1	-1.00
F1015	49.68	18	1	0	0	0	0	19	1	5.3	-1.00
F1016	54.43	179	12	0	0	0	0	191	12	6.3	-1.00
F1202	60.41	223	13	2	0	0	0	238	15	6.3	-1.00
F1056	61.79	112	24	17	0	0	99	153	41	26.8	-1.00
F1069	78.82	549	42	0	0	0	0	591	42	7.1	-1.00
F1086	79.22	140	16	0	0	0	0	156	16	10.3	-1.00
F1093	84.60	221	22	7	0	0	0	250	29	11.6	-1.00
F1102	86.96	199	35	21	0	0	0	255	56	22.0	-1.00
F1104	89.93	206	11	0	0	0	0	217	11	5.1	-1.00
F1115	94.47	1983	188	127	38	64	638	2400	417	17.4	0.59
F1118	113.65	503	44	21	0	0	0	568	65	11.4	-1.00
F1120	125.04	271	14	0	0	0	0	285	14	4.9	-1.00
F1122	131.10	832	30	6	0	0	0	868	36	4.1	-1.00
F1125	136.68	28	3	1	0	0	0	32	4	12.5	-1.00
F1146	148.80	758	51	14	0	0	0	823	65	7.9	-1.00
F1147	149.64	946	47	13	0	0	0	1006	60	6.0	-1.00
F1154	157.23	601	54	19	0	0	0	674	73	10.8	-1.00
F1161	162.65	429	17	6	0	0	0	452	23	5.1	-1.00
F1179	182.27	505	24	5	0	0	0	534	29	5.4	-1.00
F1203	189.21	466	19	0	0	0	0	485	19	3.9	-1.00

Legend: -1 can not be determined

Project no.: 21344423
Location : 7029/03-U-02
Date : 88.10.11

Table A.III.4.1 (cont'd):

c: Summation of Headspace and Occluded gas

(µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0982	34.62	477	20	8	0	0	0	505	28	5.5	-1.00
F0995	40.50	94	6	0	0	0	0	100	6	6.0	-1.00
F1015	49.68	79	4	0	0	0	0	83	4	4.8	-1.00
F1016	54.43	202	12	0	0	0	0	214	12	5.6	-1.00
F1202	60.41	237	13	2	0	0	0	252	15	6.0	-1.00
F1056	61.79	133	27	17	0	0	99	177	44	24.9	-1.00
F1069	78.82	593	42	0	0	0	0	635	42	6.6	-1.00
F1086	79.22	156	16	0	0	0	0	172	16	9.3	-1.00
F1093	84.60	266	22	7	0	0	0	295	29	9.8	-1.00
F1102	86.96	212	35	21	0	0	0	268	56	20.9	-1.00
F1104	89.93	356	37	13	0	0	0	406	50	12.3	-1.00
F1115	94.47	1988	188	127	38	64	638	2405	417	17.3	0.59
F1118	113.65	520	44	21	0	0	0	585	65	11.1	-1.00
F1120	125.04	284	14	0	0	0	0	298	14	4.7	-1.00
F1122	131.10	836	30	6	0	0	0	872	36	4.1	-1.00
F1125	136.68	46	3	1	0	0	0	50	4	8.0	-1.00
F1146	148.80	769	51	14	0	0	0	834	65	7.8	-1.00
F1147	149.64	1001	48	13	0	0	0	1062	61	5.7	-1.00
F1154	157.23	617	54	19	0	0	0	690	73	10.6	-1.00
F1161	162.65	440	17	6	0	0	0	463	23	5.0	-1.00
F1179	182.27	531	24	5	0	0	0	560	29	5.2	-1.00
F1203	189.21	479	19	0	0	0	0	498	19	3.8	-1.00

Legend: -1 can not be determined

Project no.: 21344423
Location : 7029/03-U-02
Date : 88.11.18

Table A.III.4.2: DATA FROM ROCK EVAL PYROLYSIS

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F1313	BULK	12.77	CORE	0.24	6.22	0.48	2.41	258	19	6.46	0.03	411
F1030	BULK	12.82	CORE	0.23	5.54	0.78	2.52	219	30	5.77	0.03	415
F1314	BULK	18.33	CORE	-1.00	-1.00	-1.00	0.18	-1	-1	-1.00	-1.00	-1
F1315	BULK	20.58	CORE	0.00	0.06	0.47	0.20	30	235	0.06	0.00	(496)
F1316	BULK	22.20	CORE	-1.00	-1.00	-1.00	0.12	-1	-1	-1.00	-1.00	-1
F1317	BULK	23.53	CORE	-1.00	-1.00	-1.00	0.12	-1	-1	-1.00	-1.00	-1
F0981	BULK	33.47	CORE	0.00	0.01	1.11	0.24	4	462	0.01	0.00	431
F0982	BULK	34.62	CORE	-1.00	-1.00	-1.00	0.13	-1	-1	-1.00	-1.00	-1
F0991	BULK	38.00	CORE	0.00	0.15	0.37	0.18	83	205	0.15	0.00	424
F1318	BULK	39.14	CORE	-1.00	-1.00	-1.00	0.12	-1	-1	-1.00	-1.00	-1
F0992	BULK	39.48	CORE	0.04	0.00	0.77	0.12	0	641	0.04	1.00	-1
F0995	BULK	40.50	CORE	-1.00	-1.00	-1.00	0.12	-1	-1	-1.00	-1.00	-1
F0999	BULK	42.37	CORE	0.04	0.14	0.75	0.60	23	125	0.18	0.22	(391)
F0994	BULK	44.07	CORE	0.00	0.00	1.10	0.11	0	1000	0.00	0.00	-1
F0996	BULK	45.50	CORE	-1.00	-1.00	-1.00	0.10	-1	-1	-1.00	-1.00	-1
F1333	BULK	47.74	CORE	0.04	0.00	0.45	0.23	0	200	0.04	1.00	422
F1009	BULK	48.41	CORE	0.00	0.22	1.61	1.26	17	127	0.22	0.00	411
F1015	BULK	49.68	CORE	-1.00	-1.00	-1.00	0.13	-1	-1	-1.00	-1.00	-1
F1319	BULK	49.82	CORE	0.00	0.09	0.52	0.32	28	162	0.09	0.00	-1
F1012	BULK	50.13	CORE	-1.00	-1.00	-1.00	0.17	-1	-1	-1.00	-1.00	-1
F1016	BULK	54.43	CORE	-1.00	-1.00	-1.00	0.20	-1	-1	-1.00	-1.00	-1
F1025	BULK	55.78	CORE	0.00	0.24	1.83	1.22	19	150	0.24	0.00	414
F1026	BULK	59.08	CORE	0.08	3.65	0.55	2.46	148	22	3.73	0.02	423
F1202	BULK	60.41	CORE	-1.00	-1.00	-1.00	0.14	-1	-1	-1.00	-1.00	-1
F1027	BULK	61.06	CORE	0.00	0.04	0.80	0.22	18	363	0.04	0.00	(480)
F1056	BULK	61.79	CORE	0.03	0.93	0.20	1.34	69	14	0.96	0.03	419
F1031	BULK	62.03	CORE	0.00	0.15	0.73	0.45	33	162	0.15	0.00	409
F1320	BULK	62.39	CORE	0.04	1.81	0.46	1.51	119	30	1.85	0.02	420
F1029	BULK	63.24	CORE	0.11	3.71	0.63	1.69	219	37	3.82	0.02	417
F1321	BULK	73.92	CORE	-1.00	-1.00	-1.00	0.13	-1	-1	-1.00	-1.00	-1
F1071	BULK	78.80	CORE	0.00	0.05	0.78	0.32	15	243	0.05	0.00	424
F1069	BULK	78.82	CORE	-1.00	-1.00	-1.00	0.21	-1	-1	-1.00	-1.00	-1
F1086	BULK	79.22	CORE	0.00	0.15	0.33	0.46	32	71	0.15	0.00	(482)
F1323	BULK	79.76	CORE	0.00	0.21	0.60	0.40	52	150	0.21	0.00	(480)
F1092	BULK	82.72	CORE	0.00	0.08	1.04	0.59	13	176	0.08	0.00	411
F1093	BULK	84.60	CORE	0.01	0.14	0.31	0.28	50	110	0.15	0.06	422
F1102	BULK	86.96	CORE	0.00	0.09	0.11	0.23	39	47	0.09	0.00	(504)
F1104	BULK	89.93	CORE	-1.00	-1.00	-1.00	0.10	-1	-1	-1.00	-1.00	-1
F1111	BULK	93.34	CORE	0.00	0.02	1.19	0.23	8	517	0.02	0.00	410
F1115	BULK	95.47	CORE	-1.00	-1.00	-1.00	0.14	-1	-1	-1.00	-1.00	-1
F1326	BULK	99.45	CORE	-1.00	-1.00	-1.00	0.18	-1	-1	-1.00	-1.00	-1
F1328	BULK	107.96	CORE	-1.00	-1.00	-1.00	0.10	-1	-1	-1.00	-1.00	-1
F1118	BULK	113.65	CORE	-1.00	-1.00	-1.00	0.08	-1	-1	-1.00	-1.00	-1
F1120	BULK	125.04	CORE	-1.00	-1.00	-1.00	0.11	-1	-1	-1.00	-1.00	-1
F1122	BULK	131.10	CORE	-1.00	-1.00	-1.00	0.10	-1	-1	-1.00	-1.00	-1
F1124	BULK	135.27	CORE	0.00	0.00	1.09	0.09	0	1211	0.00	0.00	-1
F1125	BULK	136.68	CORE	-1.00	-1.00	-1.00	0.10	-1	-1	-1.00	-1.00	-1
F1145	BULK	144.43	CORE	0.00	0.14	0.43	0.11	127	390	0.14	0.00	(510)

Legend:

-1 : Not determined or no data available

(): Tmax values of doubtful reliability (usually associated with poor S2 peaks)

Project no.: 21344423
Location : 7029/03-U-02
Date : 88.11.18

Table A.III.4.2 (cont'd):

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F1146	BULK	148.80	CORE	-1.00	-1.00	-1.00	0.09	-1	-1	-1.00	-1.00	-1
F1147	BULK	149.64	CORE	-1.00	-1.00	-1.00	0.11	-1	-1	-1.00	-1.00	-1
F1150	BULK	151.74	CORE	0.00	0.13	0.51	0.09	144	566	0.13	0.00	(483)
F1154	BULK	157.23	CORE	-1.00	-1.00	-1.00	0.09	-1	-1	-1.00	-1.00	-1
F1157	BULK	160.08	CORE	0.00	0.26	0.55	0.09	288	611	0.26	0.00	(494)
F1161	BULK	162.65	CORE	-1.00	-1.00	-1.00	0.11	-1	-1	-1.00	-1.00	-1
F1160	BULK	167.10	CORE	0.00	0.16	0.71	0.12	133	591	0.16	0.00	(471)
F1179	BULK	182.27	CORE	-1.00	-1.00	-1.00	0.09	-1	-1	-1.00	-1.00	-1
F1203	BULK	189.21	CORE	-1.00	-1.00	-1.00	0.08	-1	-1	-1.00	-1.00	-1

Legend:

-1 : Not determined or no data available

(): Tmax values of doubtful reliability (usually associated with poor S2 peaks)

Table A.III.4.3: Data from pyrolysis-gas chromatograms

Core 7029/03-U-02							
IKU NO	DEPTH (m)	SAMPLE TYPE	LITHOLOGY	C1	C2-C6 percent of peak area	C6-C14	C15+
F1313	12.77	Core	Limestone	2.0	4.0	39.2	54.2
F1026	59.08	Core	Dolomite	2.6	8.1	36.6	51.8
F1320	62.39	Core	Siltstone	5.7	21.1	51.9	21.3

Core-site Number: 7029/03-U-02
Reference number: 21.3444.23
(1/1)

Table A.III.4.4: VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
F- 993	-----	42.08	0.30 (21) 0.58 (4)	F R	0.07 0.04	2-4
F-1028	-----	61.79	0.55 (18) 0.98 (2)	R R	0.12 0.10	3?
F-1087	-----	78.83	0.37 (1) 1.34 (7)	P R	0.00 0.17	---
F-1090	-----	79.55	1.24 (12) 1.54 (3)	R R	0.10 0.02	---
F-1325	-----	92.28	1.33 (10)	R	0.19	2-3
F-1327	-----	107.70	0.31 (2) 0.72 (1) 1.04 (1)	P R R	0.04 0.00 0.00	---

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor;
I = Inertinite. L = Liptinite or poor vitrinite particle.
R = Reworked material/inertinite.

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.4.5
WELL NO.: 7029/03-U-02

Sample	Depth (m)	Compo- sition of residue	Particle size	Preser- vation palyno- morphs	Thermal maturation index *	Remarks
F-1313/2	12.82	Am: <5 Al: 10-20 Lm: 80 W: <5 C: <1	F-M-L		3	Dominated by fine to medium sized, very de- graded liptinitic material. Parts of this fraction might be of algal origin.
F-1026/2	59.08	Am: 70-80 Lm: 10-20 W: <5 C: <5	F-M-L		3-4	The amorphous fraction is considered to be very degraded liptinitic and woody material.
F-1029/2	63.24	Am: 5-10 Lm: 70-80 W: 15-20	F-M-L		3-4	The liptinitic fraction is degraded and very eroded.

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* see experimental

ANL_WP22/RAPPORT/BG5/ame/16/19-FEB-89

Project no.: 21344423
 Location : 7029/03-U-02
 Date : 89.02.04

- 214 -



Table A.III.4.6a: WEIGHT OF CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ROCK EXTR. (g)	EOM (mg)	ASPH (mg)	SAT HC (mg)	ARO HC (mg)	POLAR COMP. (mg)	HC (mg)	NONHC (mg)	TOC (%)
F1313	BULK	12.77	CORE	22.9	50.9	36.0	1.1	7.4	4.5	8.5	42.4	2.41
F1316	BULK	22.20	CORE	63.5	6.6							0.12
F1026	BULK	59.08	CORE	8.9	31.3	25.1	2.5	3.9	3.5	6.4	24.9	2.46
F1320	BULK	62.39	CORE	28.8	28.7	21.1	1.8	5.1	5.3	6.9	21.8	1.51

Legend:

- * - Not all the available EOM was used for MPLC.
- ? - MPLC results assumed more EOM than originally extracted.
- 1- No data available.

Table A.III.4.6b: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F1313	BULK	12.77	CORE	2226	1574	48	324	196	372	1854
F1316	BULK	22.20	CORE	104						
F1026	BULK	59.08	CORE	3514	2818	285	435	394	720	2794
F1320	BULK	62.39	CORE	995	732	63	176	184	239	756

Legend:

- 1- No data available.

Project no.: 21344423
 Location : 7029/03-U-02
 Date : 89.02.04

- 215 -

Table A.III.4.6c: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS
 (mg/g TOC)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F1313	BULK	12.77	CORE	92.4	65.3	2.0	13.4	8.1	15.4	77.0
F1316	BULK	22.20	CORE	83.3						
F1026	BULK	59.08	CORE	142.8	114.6	11.6	17.7	16.0	29.3	113.5
F1320	BULK	62.39	CORE	65.9	48.5	4.2	11.7	12.2	15.9	50.0

Legend:

-1- No data available.

Table A.III.4.6d: COMPOSITION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ASPH EOM (%)	SAT EOM (%)	ARO EOM (%)	HC EOM (%)	POLAR EOM (%)	SAT ARO x 100	HC NONHC x 100
F1313	BULK	12.77	CORE	70.7	2.1	14.5	16.6	8.8	14.8	20.0
F1316	BULK	22.20	CORE							
F1026	BULK	59.08	CORE	80.2	8.1	12.4	20.5	11.2	65.6	25.8
F1320	BULK	62.39	CORE	73.5	6.3	17.7	24.0	18.5	35.7	31.6

Legend:

-1- No data available.

Project no.: 21344423
 Location : 7029/03-U-02
 Date : 89.02.05

Table A.III.4.7:

RATIOS DERIVED FROM GAS CHROMATOGRAMS OF SATURATED HYDROCARBONS

IKUNO	FRAC NAME	DEPTH	Pri	Pri	Phy	A	n-C17	n-C31	CPI 1	CPI 2
			Phy	A= n-C17	B= n-C18	B	n-C27	n-C19		
F1313	BULK	12.77	0.9	1.2	0.9	1.3	1.1	0.6	1.1	1.0
F1026	BULK	59.08	1.1	0.7	0.5	1.5	0.8	0.7	1.1	1.0
F1320	BULK	62.39	0.9	1.1	1.1	1.0	1.4	0.7	1.5	1.5

-1 = No data available

Table A.III.4.8a:

Molecular ratios from sterane and terpane mass chromatograms.
Maturity ratios.

Core 7029/03-U-02

IKU no.	Depth (m)	$\alpha\beta/\alpha\beta+\beta\alpha^1)$	%22S ²⁾	% $\beta\beta^3)$	%20S ⁴⁾
F1313	12.77	0.85	46	47	7
F1026	59.08	0.89	51	43	9
F1320	62.39	0.89	53	48	11

1) $E/(E+F)$ in m/z 191.

2) Average % distribution between first and second eluting isomers of extended hopanes.

3) $100 * 2(r+s)/(q+t+2(r+s))$ in m/z 217.

4) $100 * q/(q+t)$ in m/z 217.

Table A.III.4.8b:

Molecular ratios from terpane and sterane mass chromatograms.
Maturity and source characteristic ratios.

Core 7029/03-U-02

IKU no.	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
F1313	12.77	0.03	12.40	0.00	0.00	0.19
F1026	59.08	0.04	2.85	0.00	0.00	0.39
F1320	62.39	0.07	3.35	0.00	0.00	0.08

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191).

2) B/A in m/z 191.

3) Relative abundance of unknown (X/E in m/z 191).

4) Relative abundance of bisnorhopane (Z/E in m/z 191).

5) Relative abundance of C₂₇ rearranged steranes (a/(a+j) in m/z 217).

Table A.III.4.9: Molecular ratios from mass fragmentograms of aromatic steroid hydrocarbons.

Core 7029/03-U-02

IKUNO	Depth m	Cracking ratios			Aromatisation ratios	
		20/20+27	20/20+28	21/21+28	27t/27t+28m	28t/28t+29m
		tri	tri	mono		
		1)	2)	3)	4)	5)
F1313	12.77	0.39	0.58	0.16	0.01	0.01
F1026	59.08	0.66	0.73	0.30	0.02	0.02
F1320	62.39	0.39	0.57	0.19	0.03	0.02

1) $M/(M+P)$ in m/z 231

2) $M/(M+S)$ in m/z 231

3) $a/(a+h)$ in m/z 253

4) $P/(P+h)$ in m/z 231 and m/z 253

5) $S/(S+m+(k*S/(S+R)))$ in m/z 231 and m/z 253

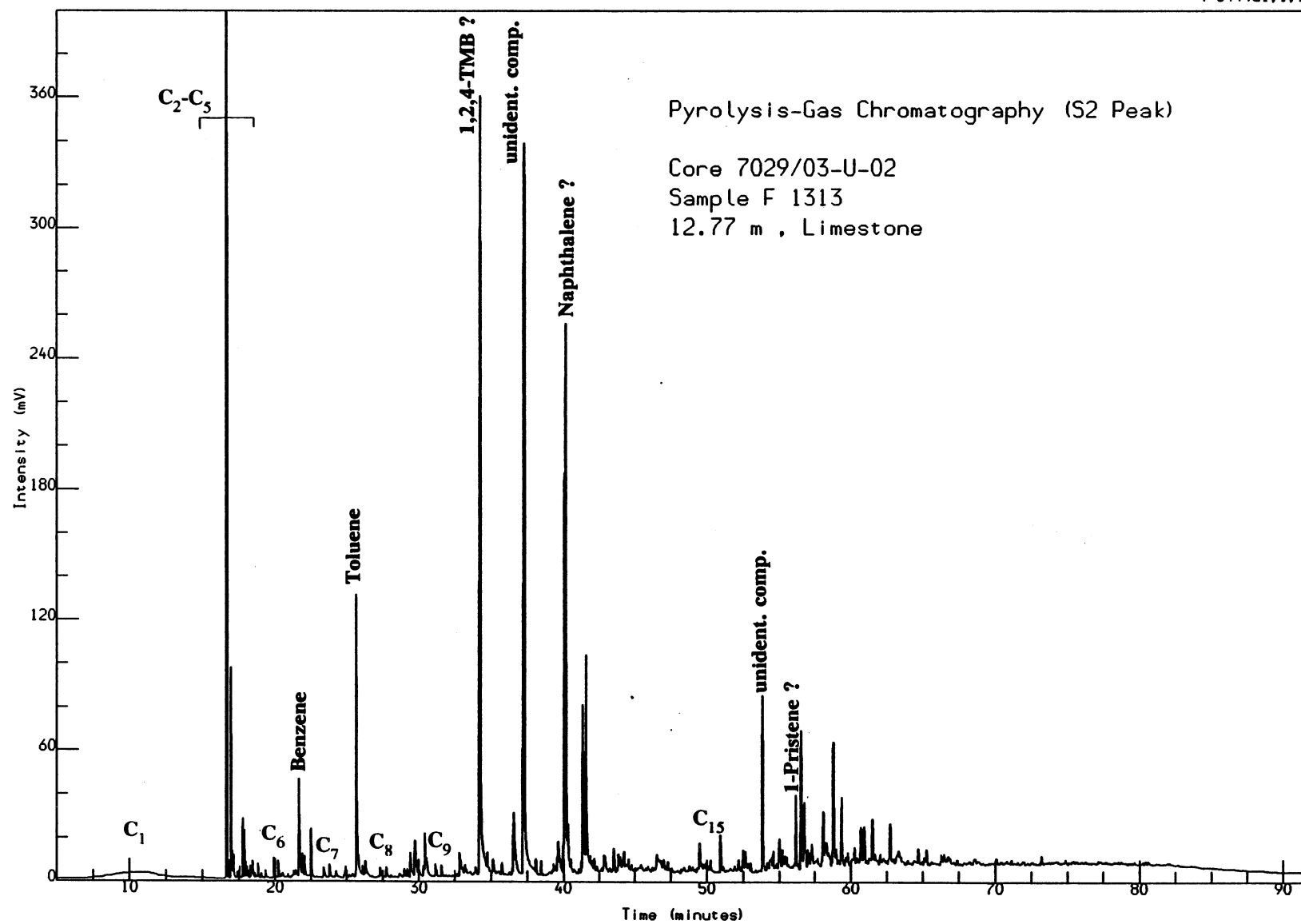
Table A.III.4.10: Carbon isotope ratios for EOM and extract fractions

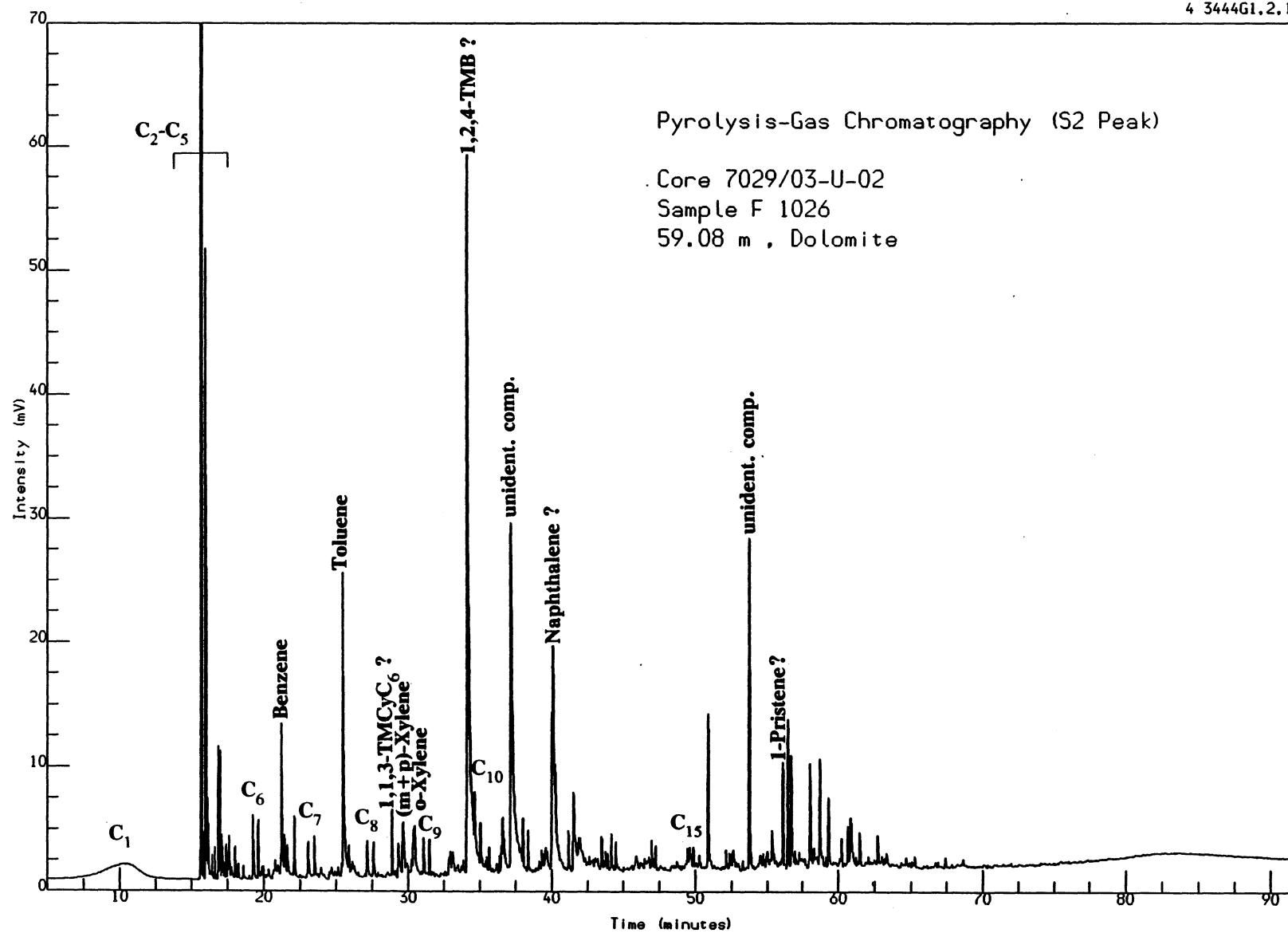
Core 7029/03-U-02

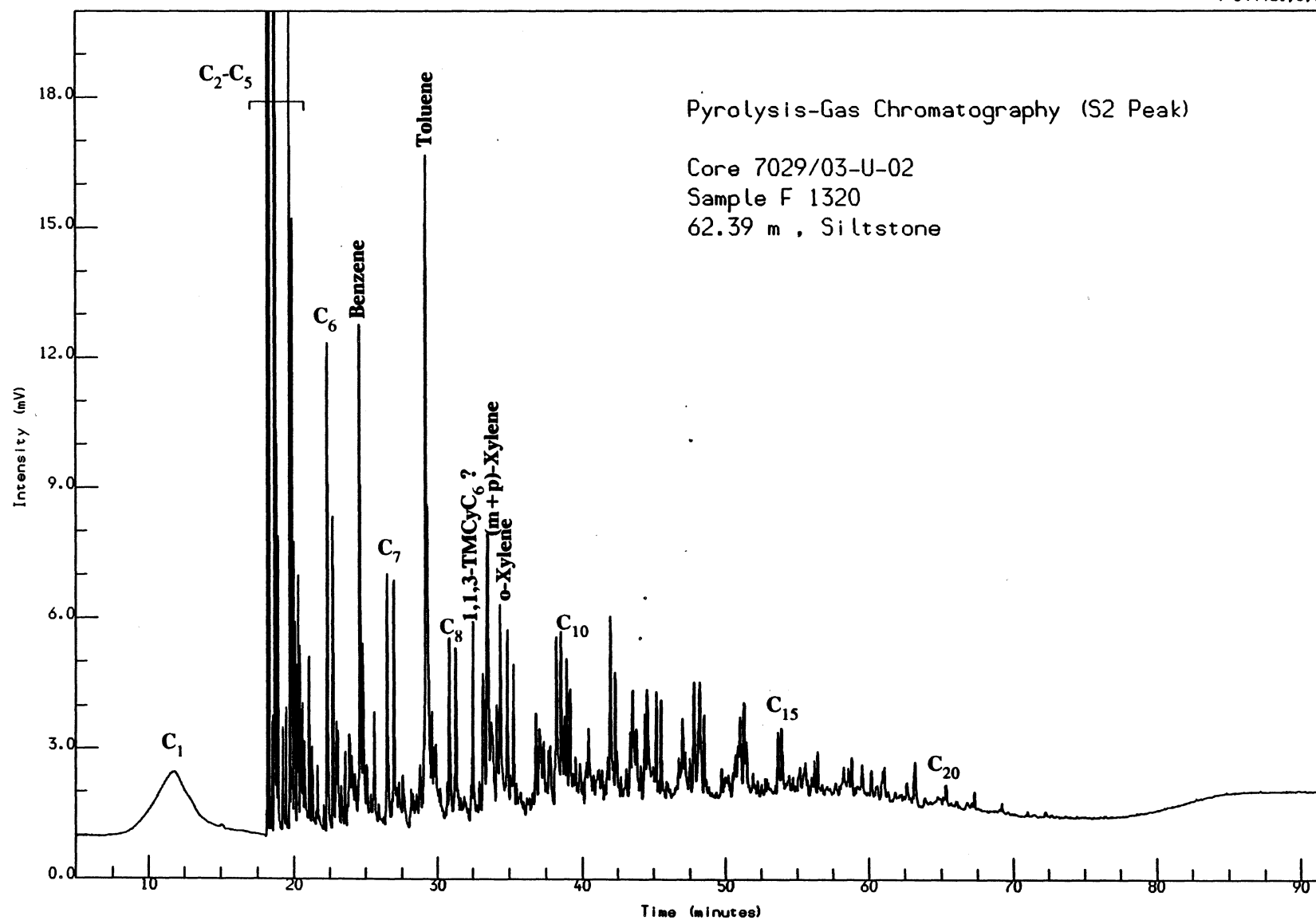
IKU no.	Depth (m)	SAT	d13C (0/00 PDB)			
			ARO	Polars	Asph.	EOM
F1313	12.77	-29.78	-32.05	-30.40	-30.63	-30.87
F1026	59.08	-28.33	-28.54	-29.04	-29.05	-28.97
F1320	62.39	-29.19	-29.26	-28.77	-28.12	-28.50

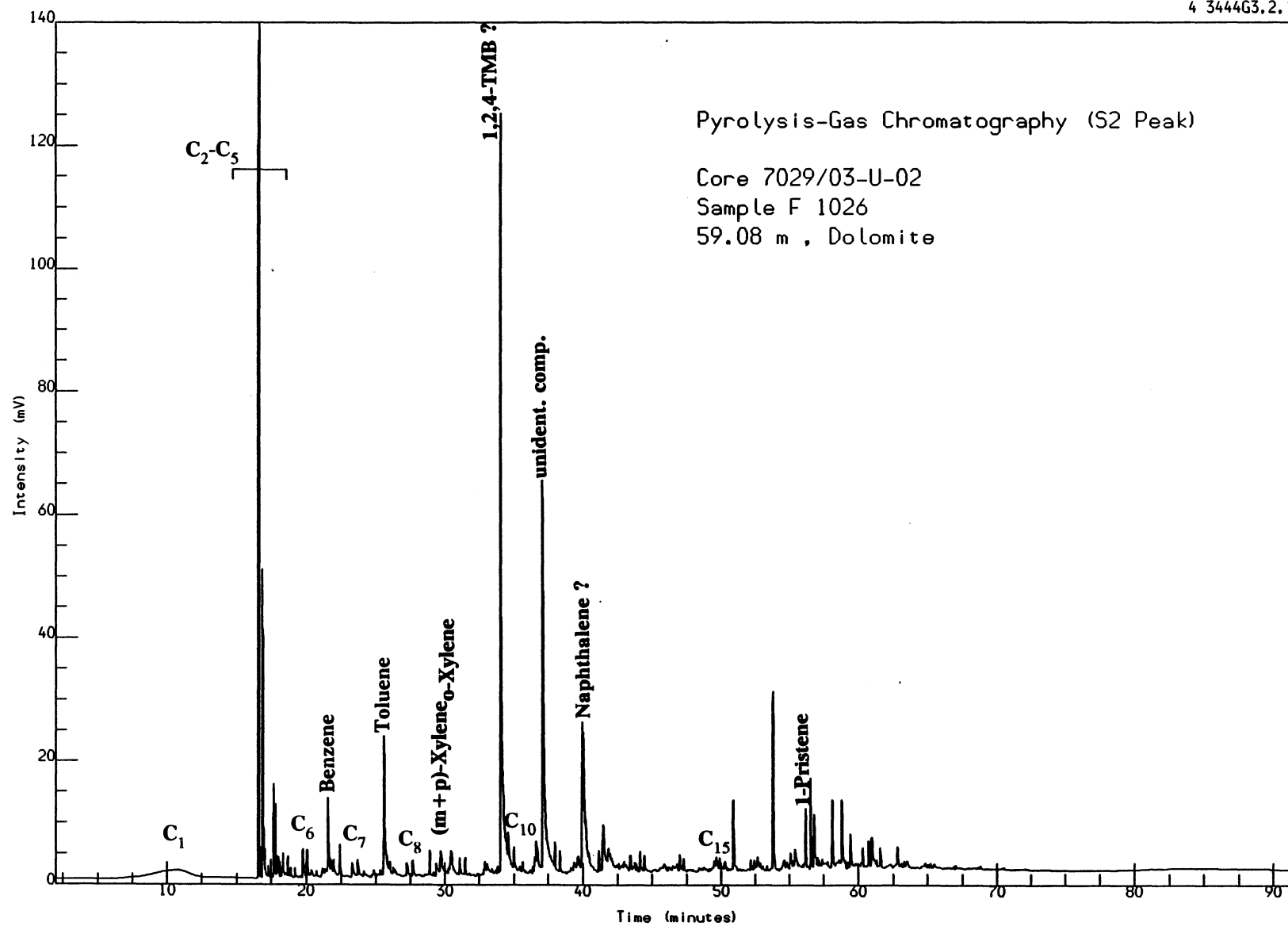
Figure A.III.4.1:

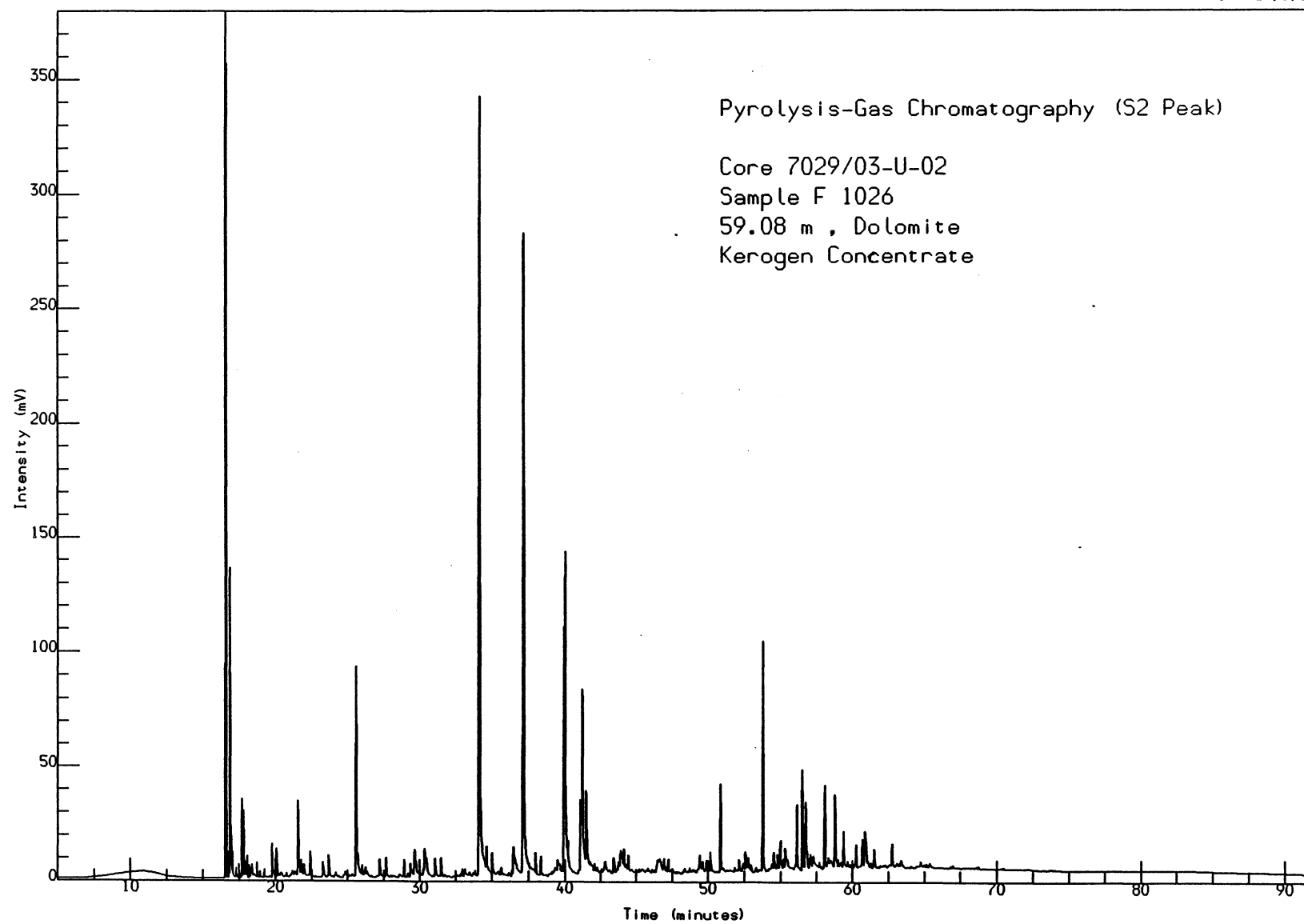
Pyrolysis-gas chromatograms (S2 peak)

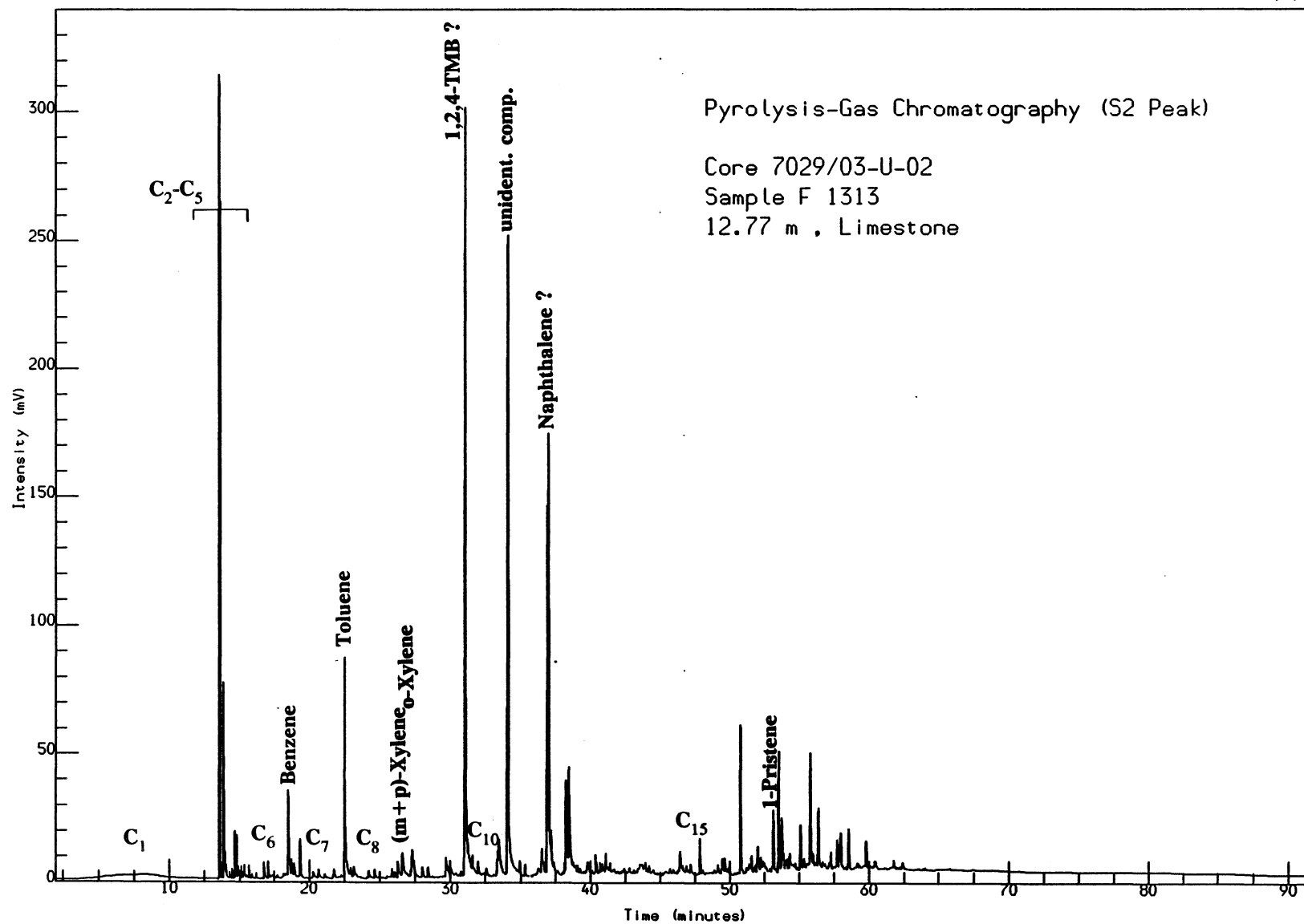












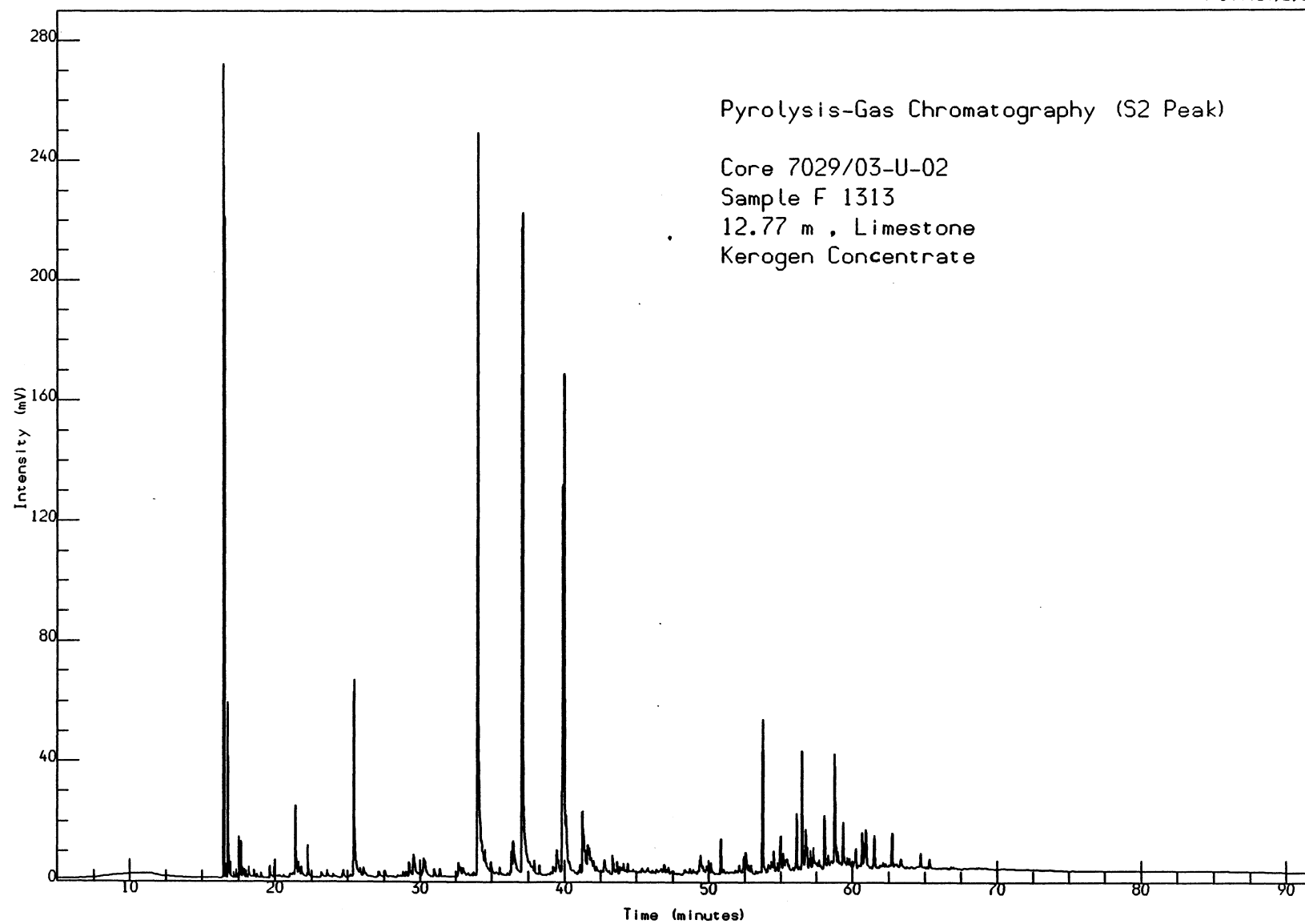
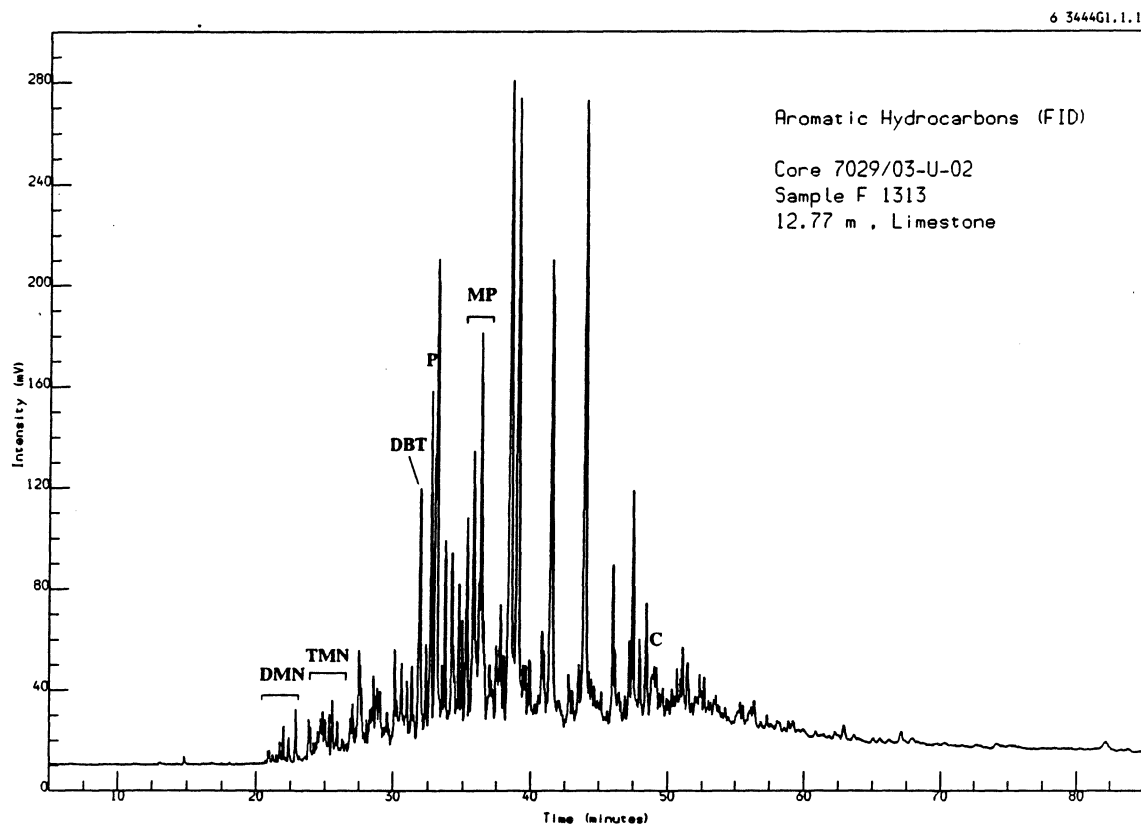
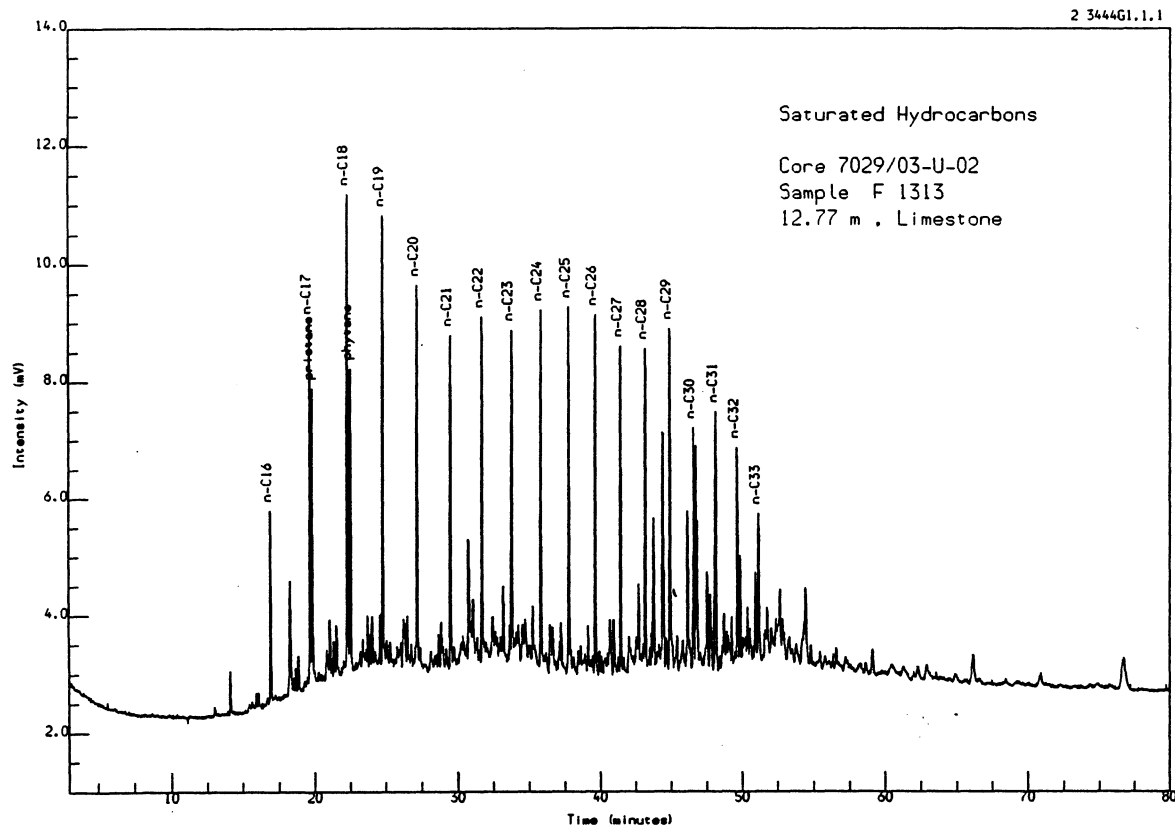


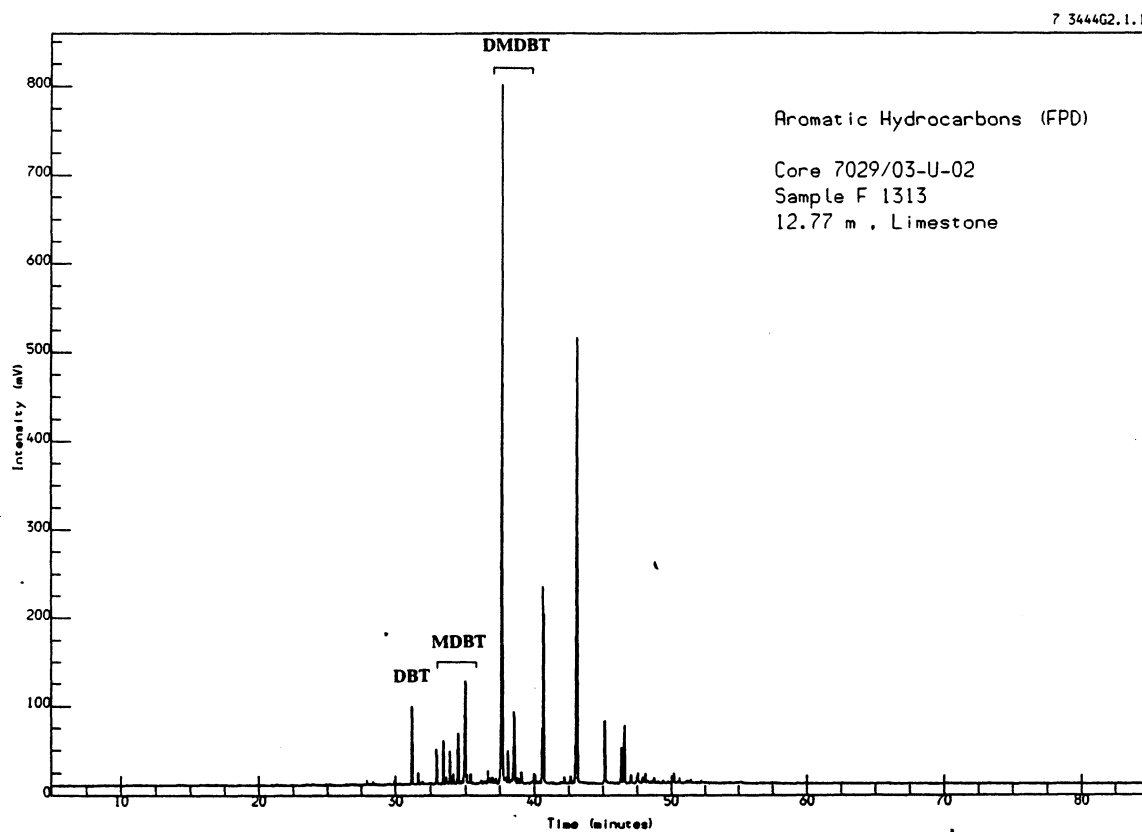
Figure A.III.4.2:

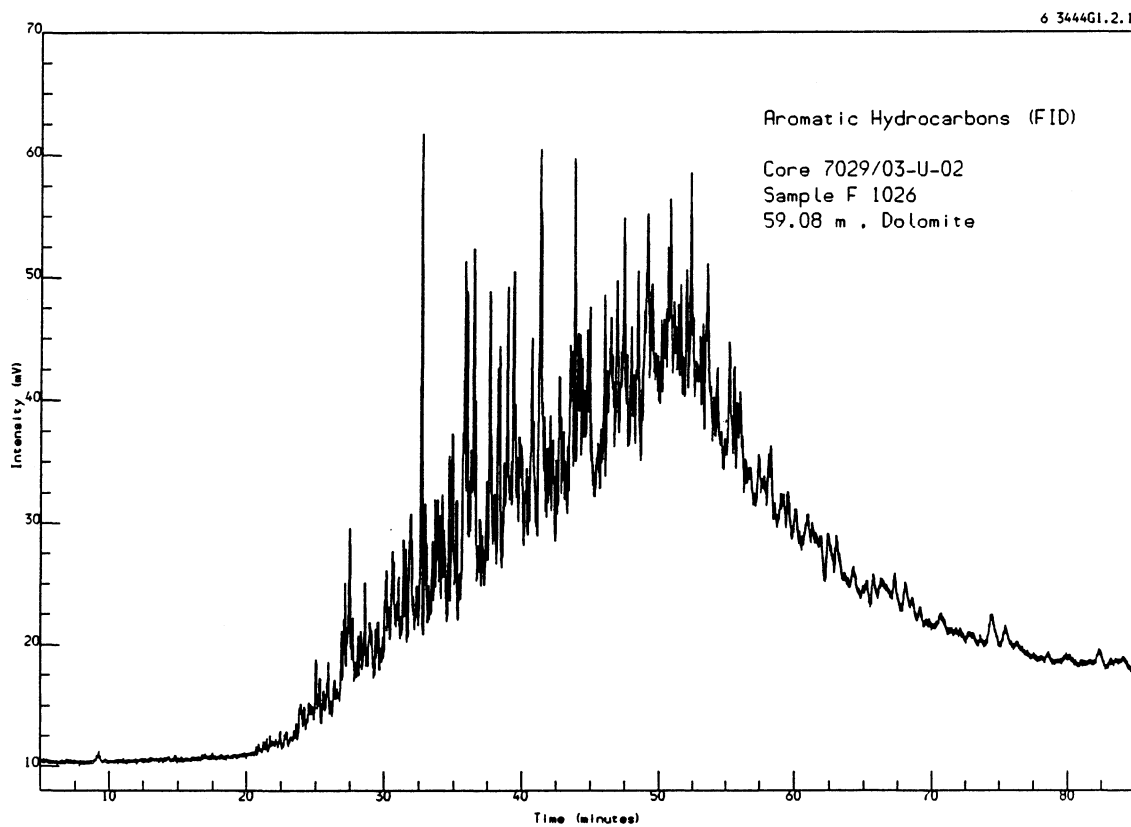
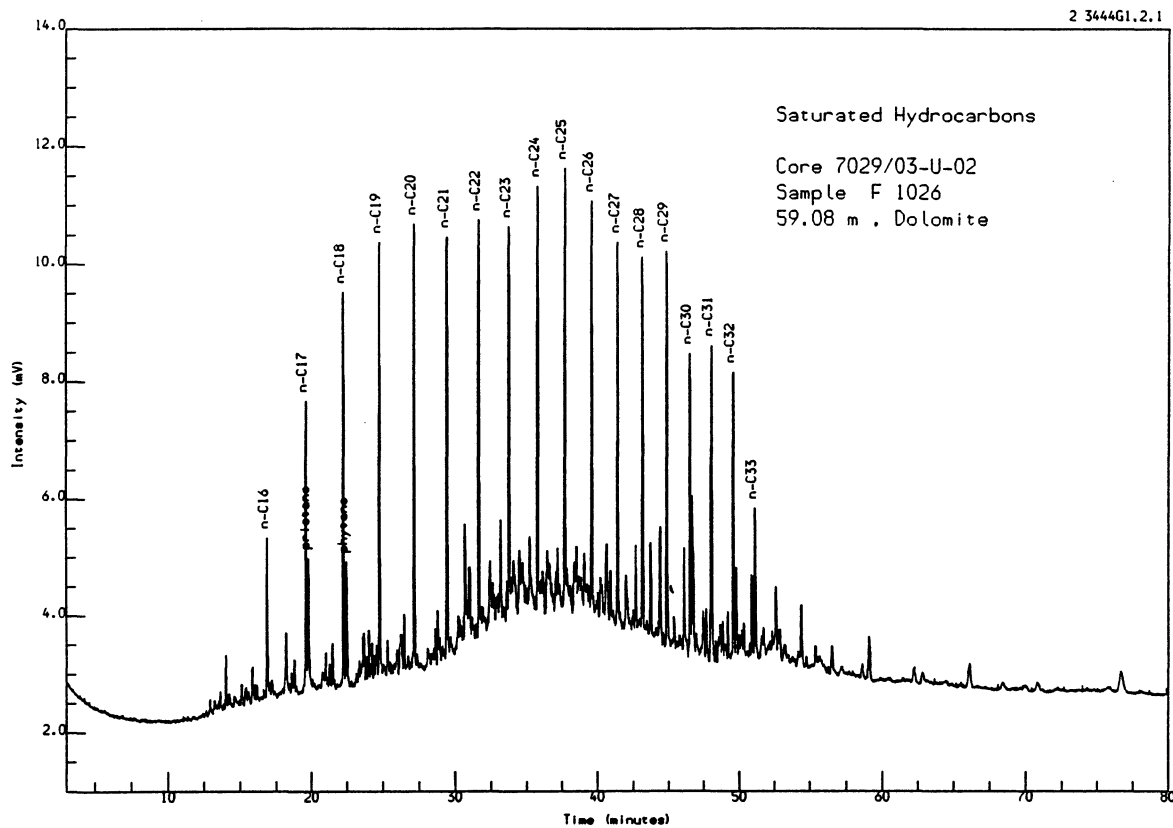
Gas chromatograms of saturated and aromatic hydrocarbons

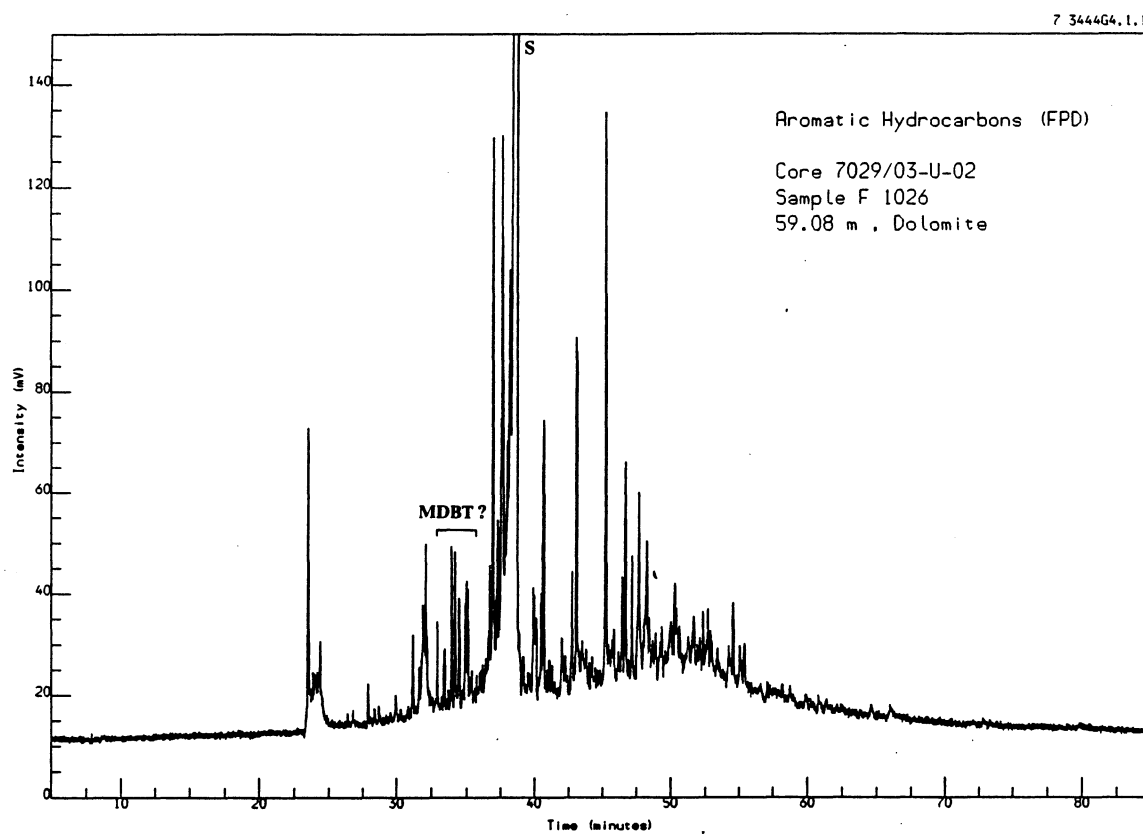
n-C₁₅ etc. - n-alkanes

N	- Naphthalene
MN	- Methylnaphthalenes
DMN	- Dimethylnaphthalenes
TMN	- C ₃ -naphthalenes
P	- Phenanthrene
PN	- Methylphenanthrenes
DMP	- Dimethylphenanthrenes
D	- Diphenyl
Py	- Pyrene
C	- Chrysene
BT	- Benzothiophene
MBT	- C ₁ -benzothiophenes
DMBT	- C ₂ -benzothiophene
TMBT	- C ₃ -benzothiophene
C ₄ BT	- C ₄ -benzothiophene
DBT	- Dibenzothiophene
MDBT	- Methyl dibenzothiophenes
DMDBT	- C ₂ -dibenzothiophenes
TMDBT	- C ₃ -dibenzothiophenes

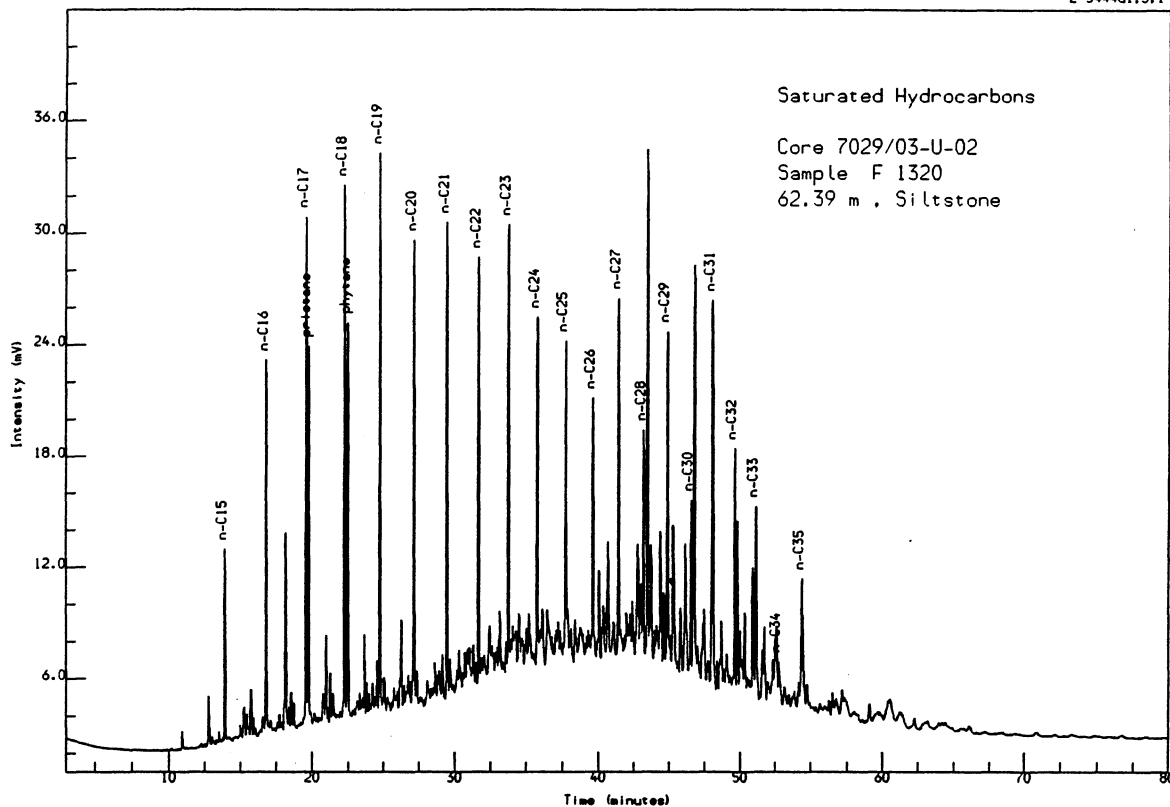




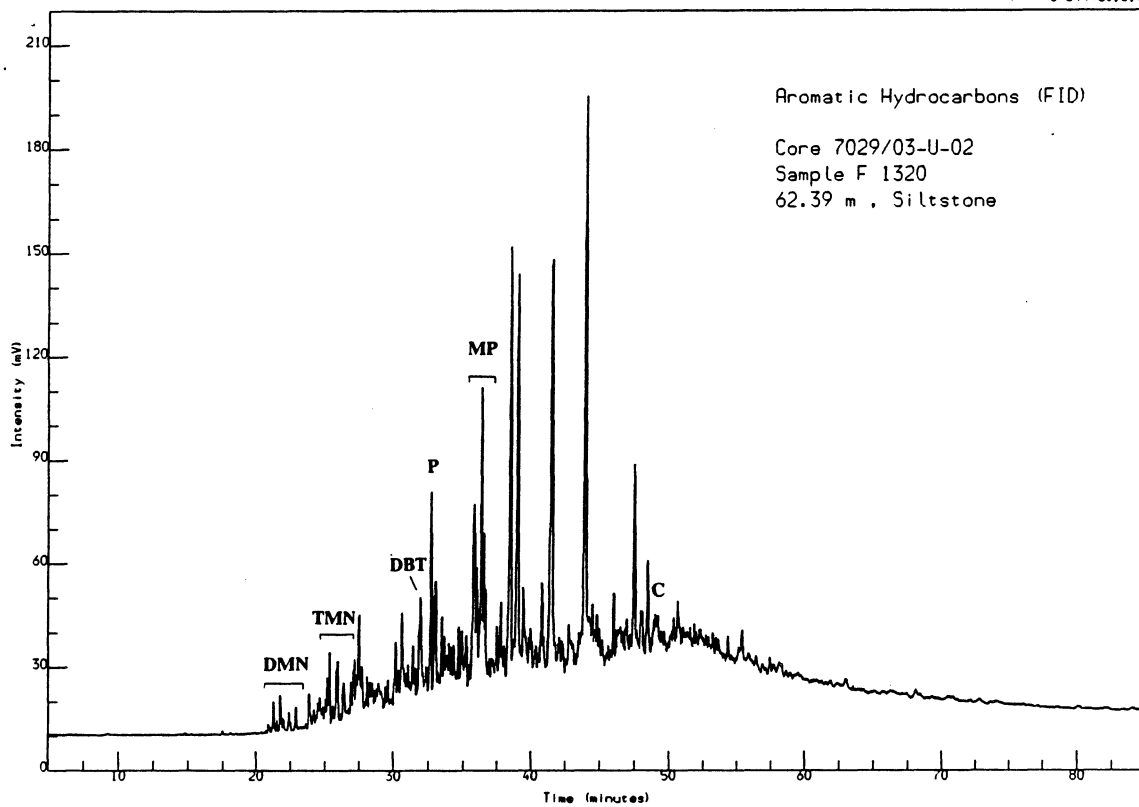




2 3444G1.3.1



6 3444G1.3.1



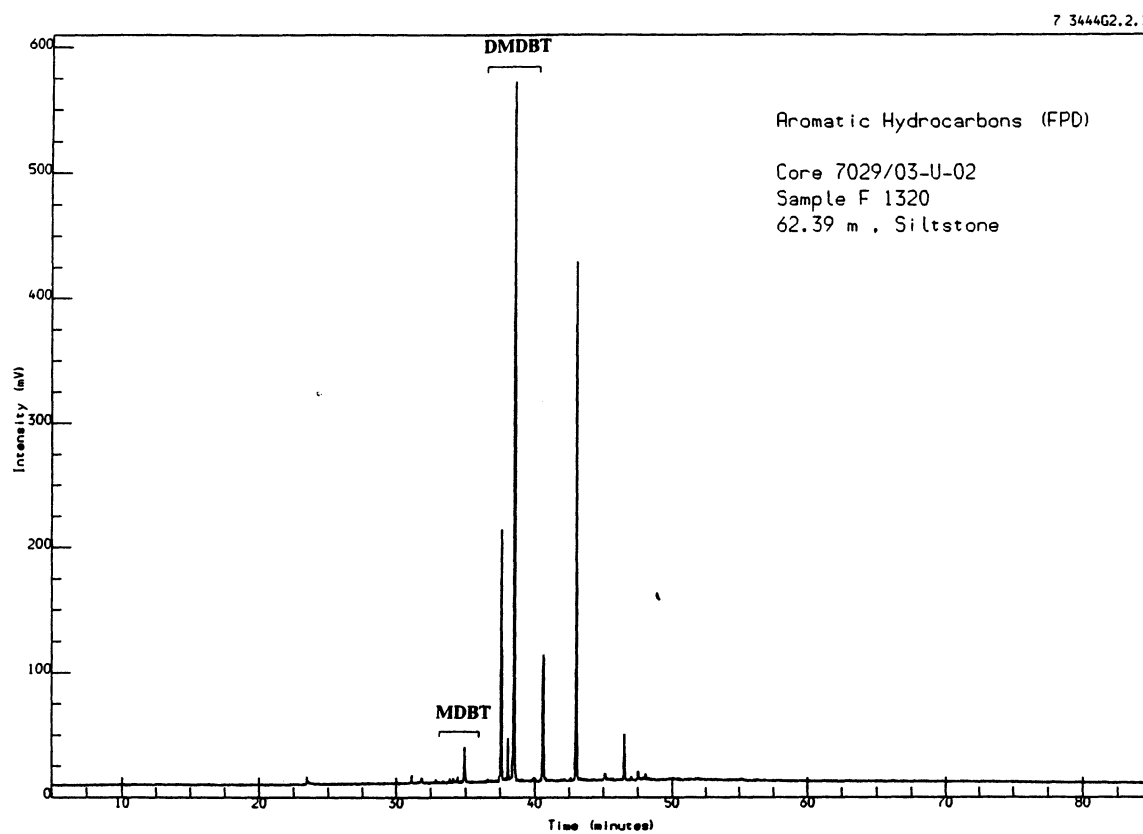
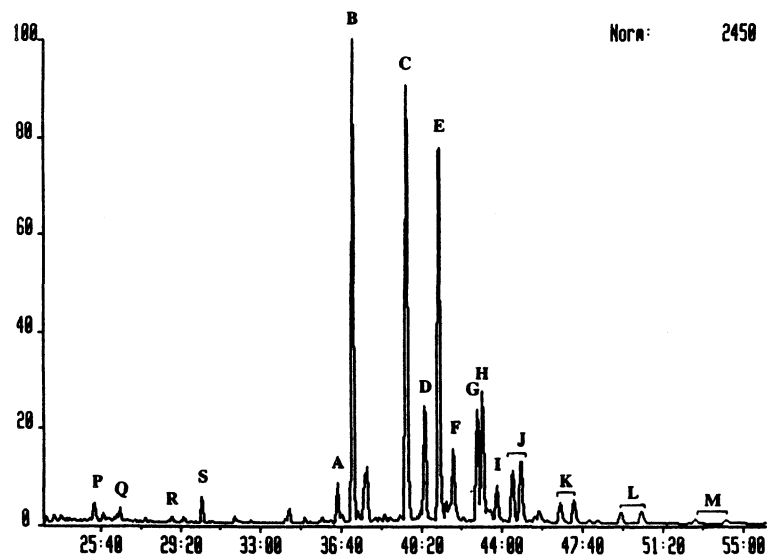


Figure A.III.4.3:

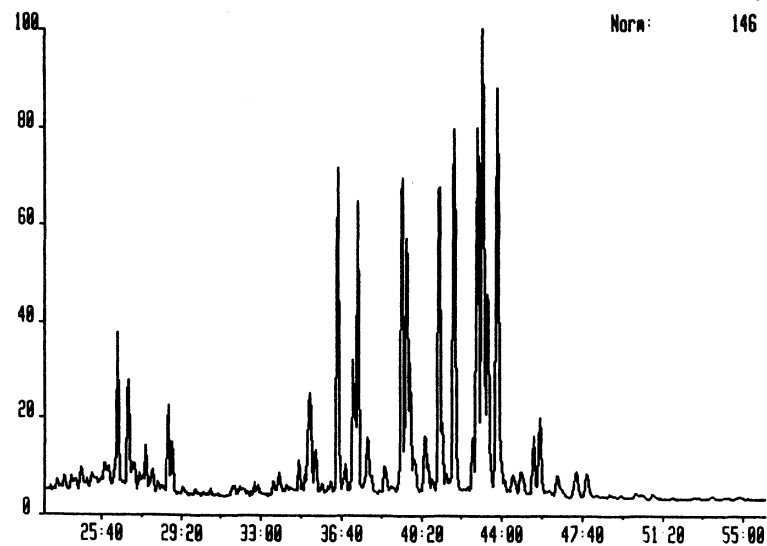
**Mass fragmentograms of m/z 191, 205 (terpanes)
and m/z 217, 218 (steranes).**

For peak identification see Chapter 4.

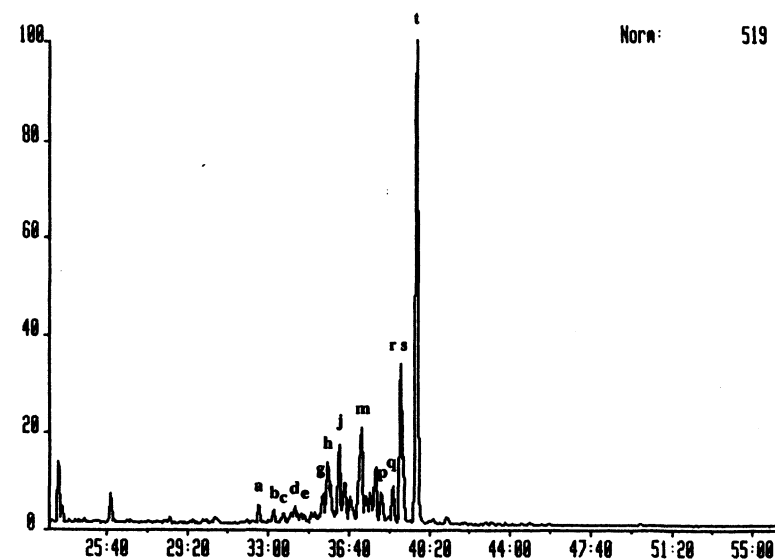
F1313 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:7029/03-U-02



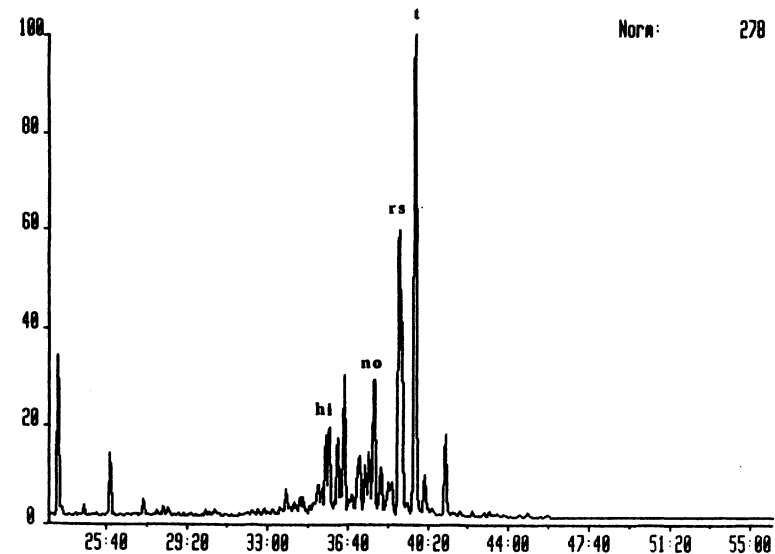
F1313 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:7029/03-U-02



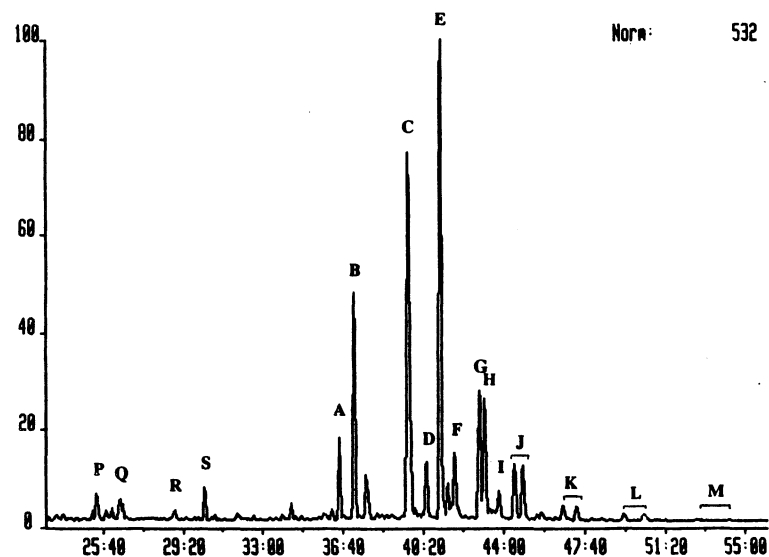
F1313 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:7029/03-U-02



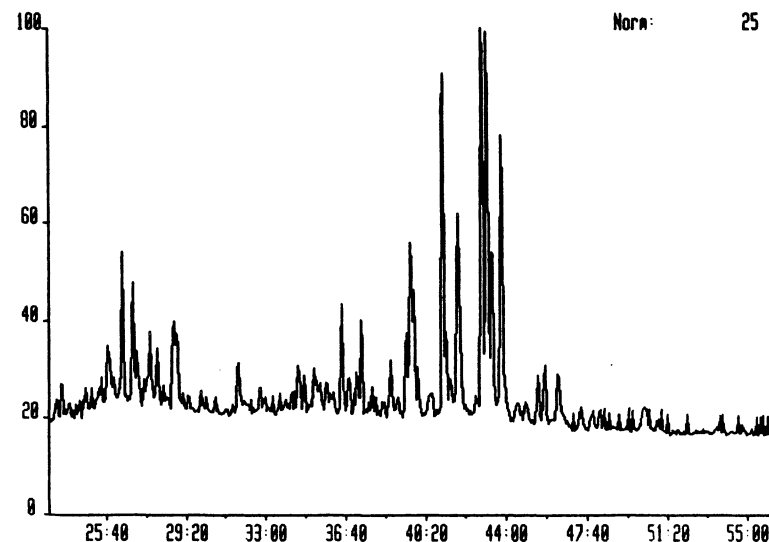
F1313 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:7029/03-U-02



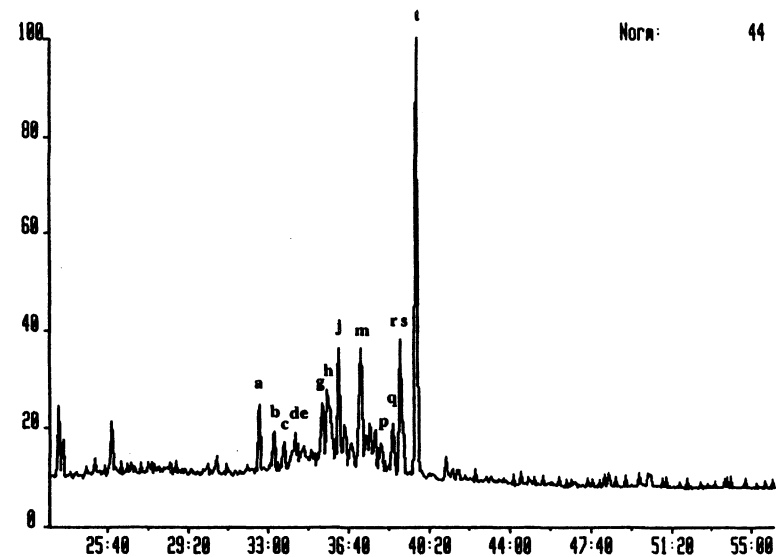
F1026 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:7029/03-U-02



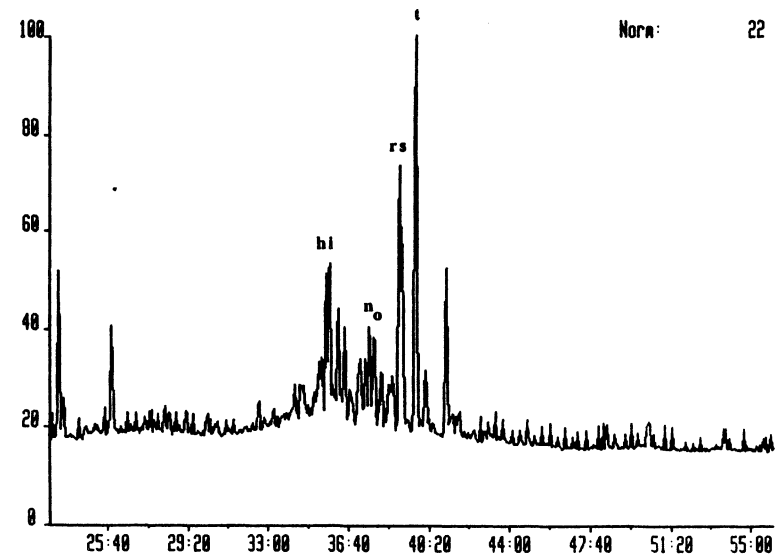
F1026 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:7029/03-U-02



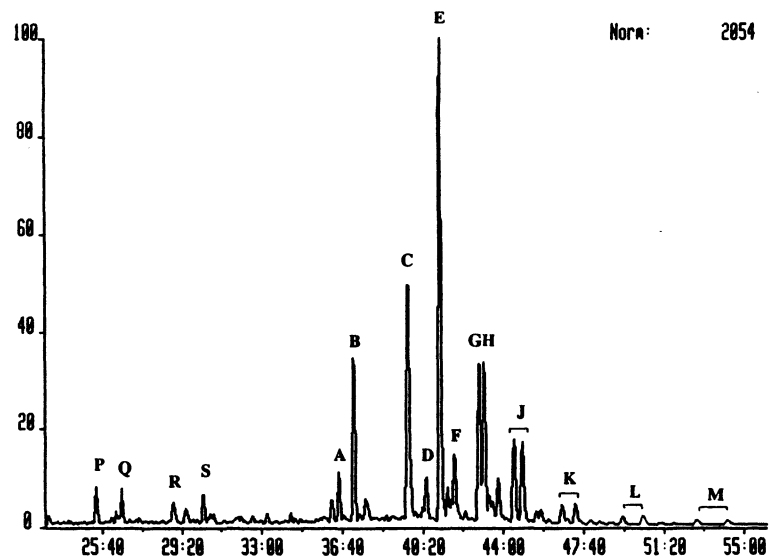
F1026 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:7029/03-U-02



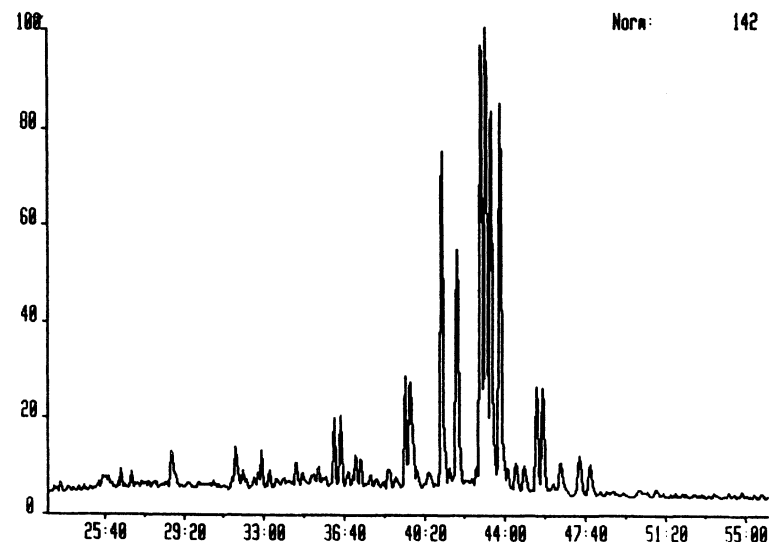
F1026 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:7029/03-U-02



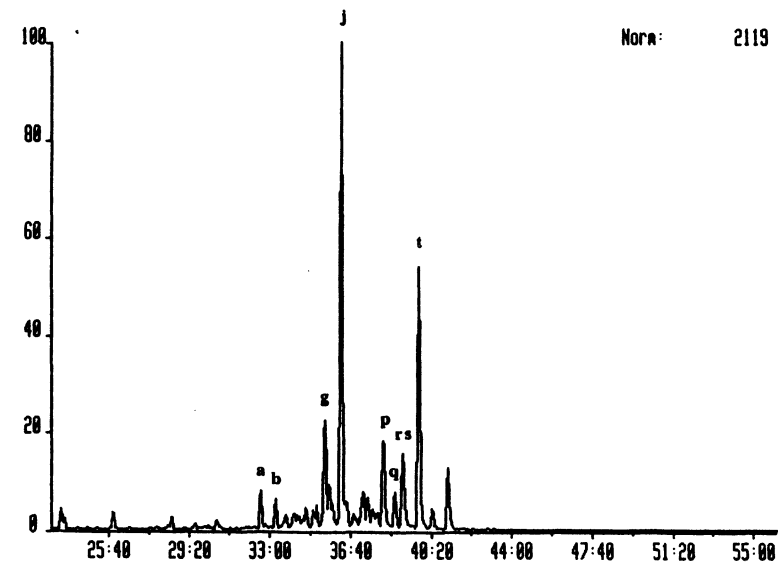
F1320 6-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:7029/03-U-02



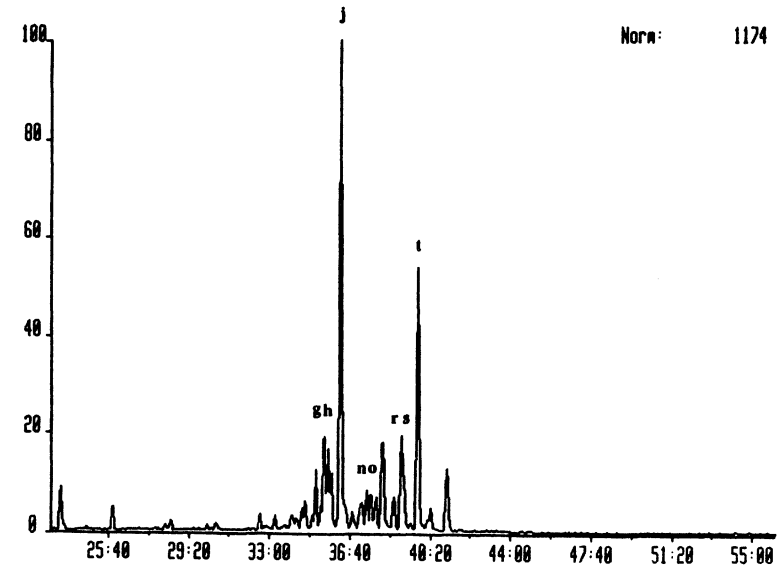
F1320 6-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:7029/03-U-02



F1320 6-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:7029/03-U-02



F1320 6-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:7029/03-U-02



Core 7029/03-U-02

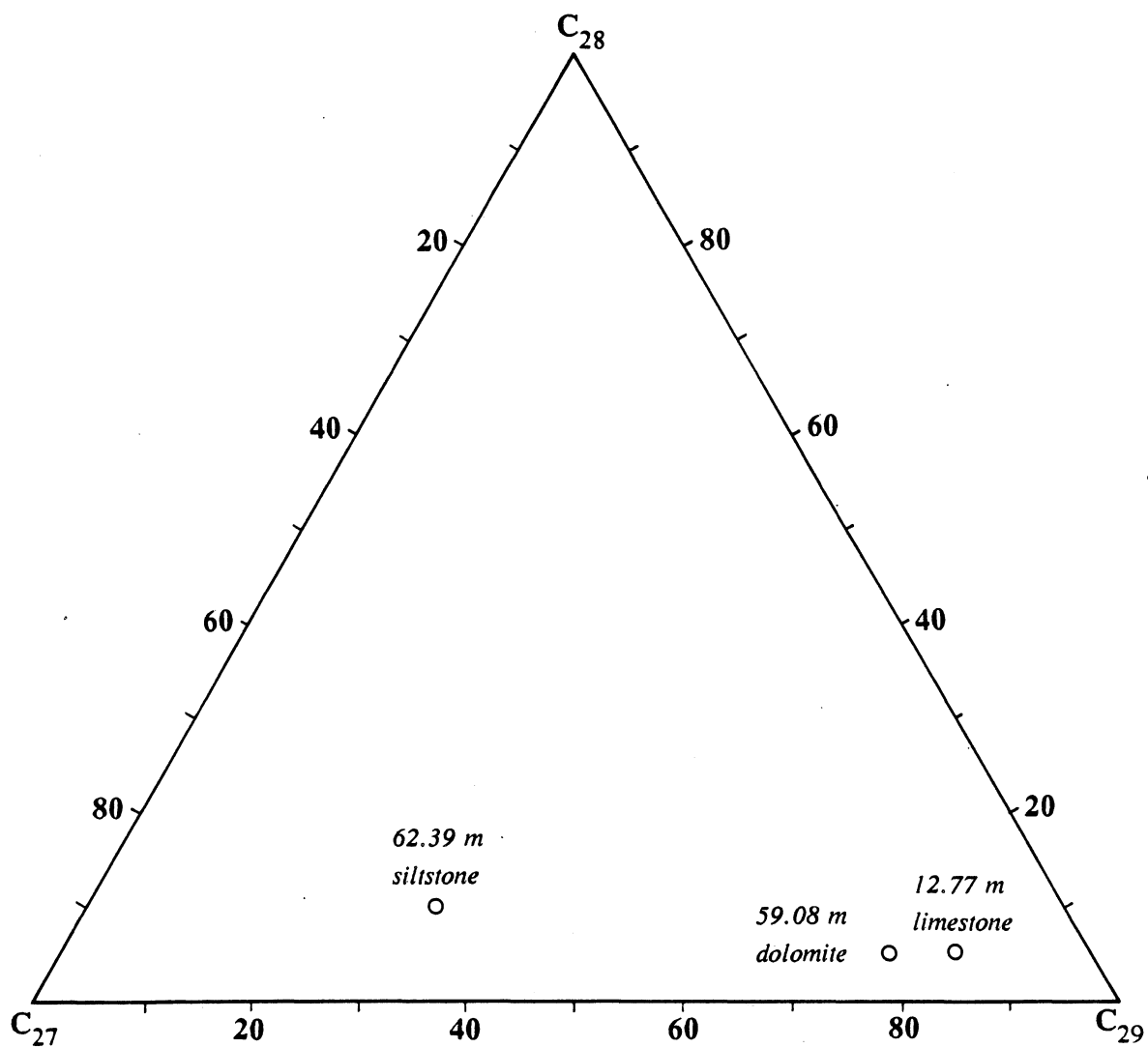


Figure A.III.4.4

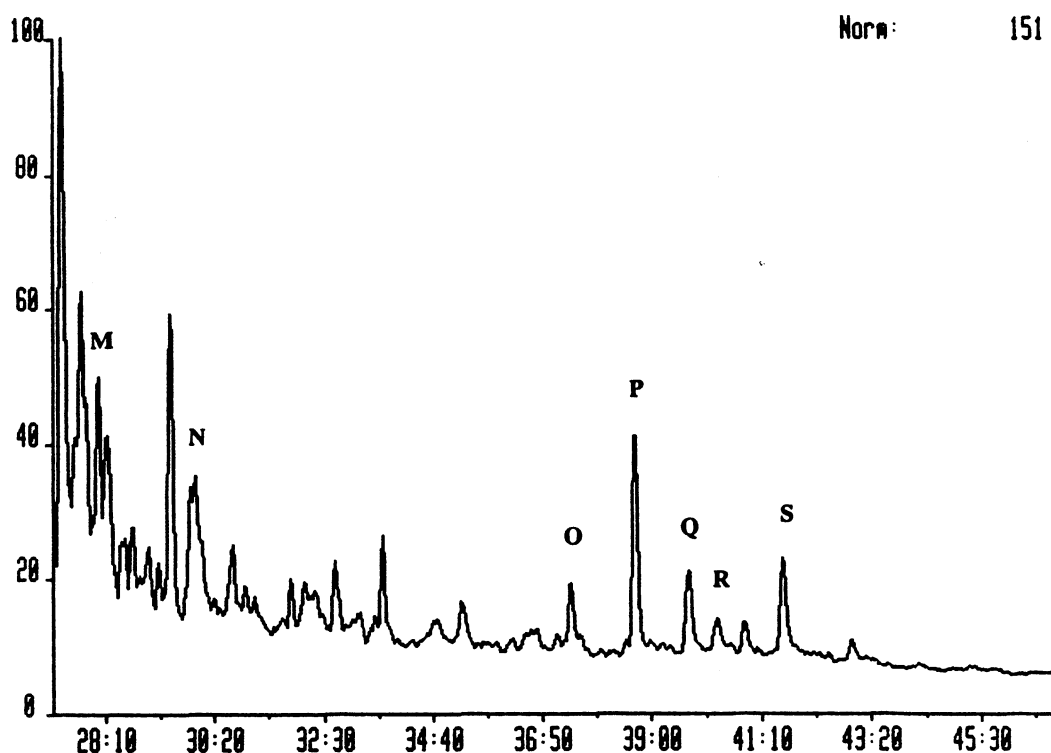
Internal distribution of 14 α (H), 17 α (H) 20R, C₂₇, C₂₈ and C₂₉ regular steranes (from m/z 217)

Figure A.III.4.5:

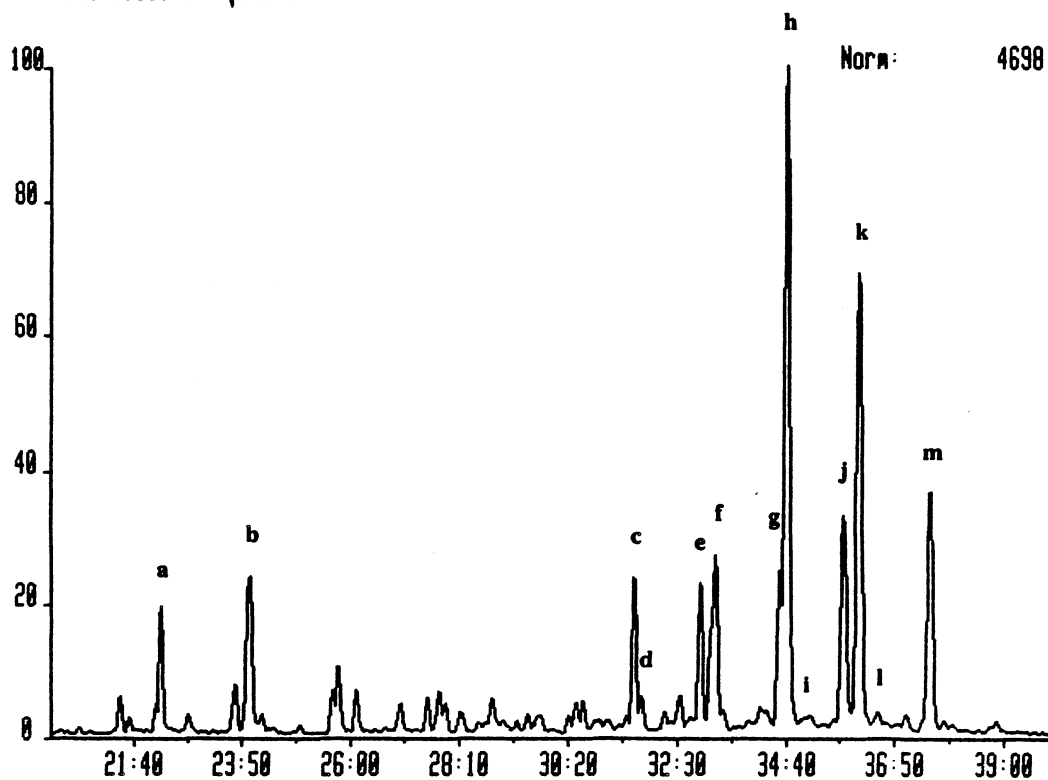
**Mass fragmentograms of m/z 231, 253
(aromatic steroid hydrocarbons)**

For peak identification see Chapter 4.

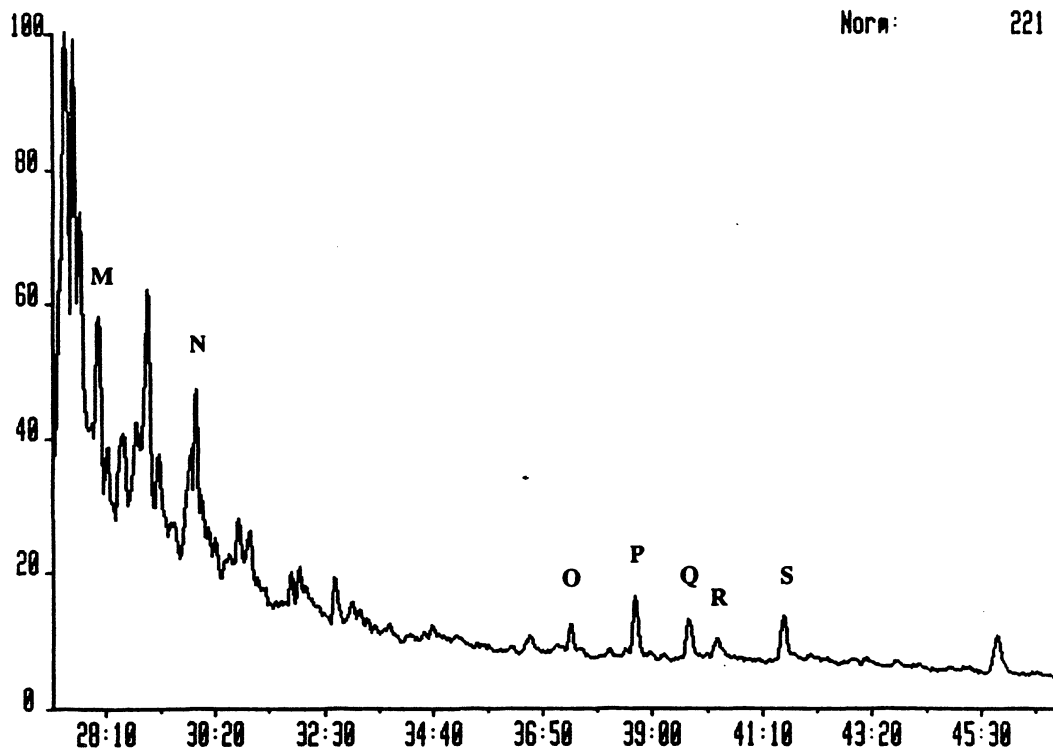
F1313AR 25-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1313 ARO 7029/03-U-02 12.77 M LST



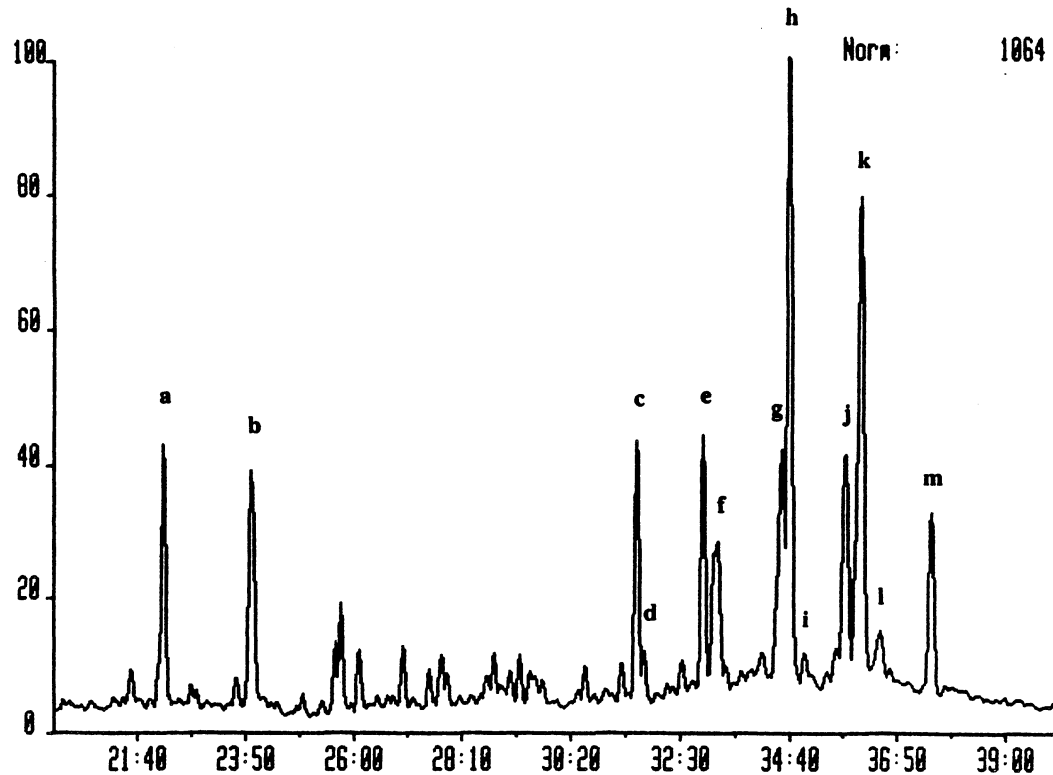
F1313AR 25-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1313 ARO 7029/03-U-02 12.77 M LST



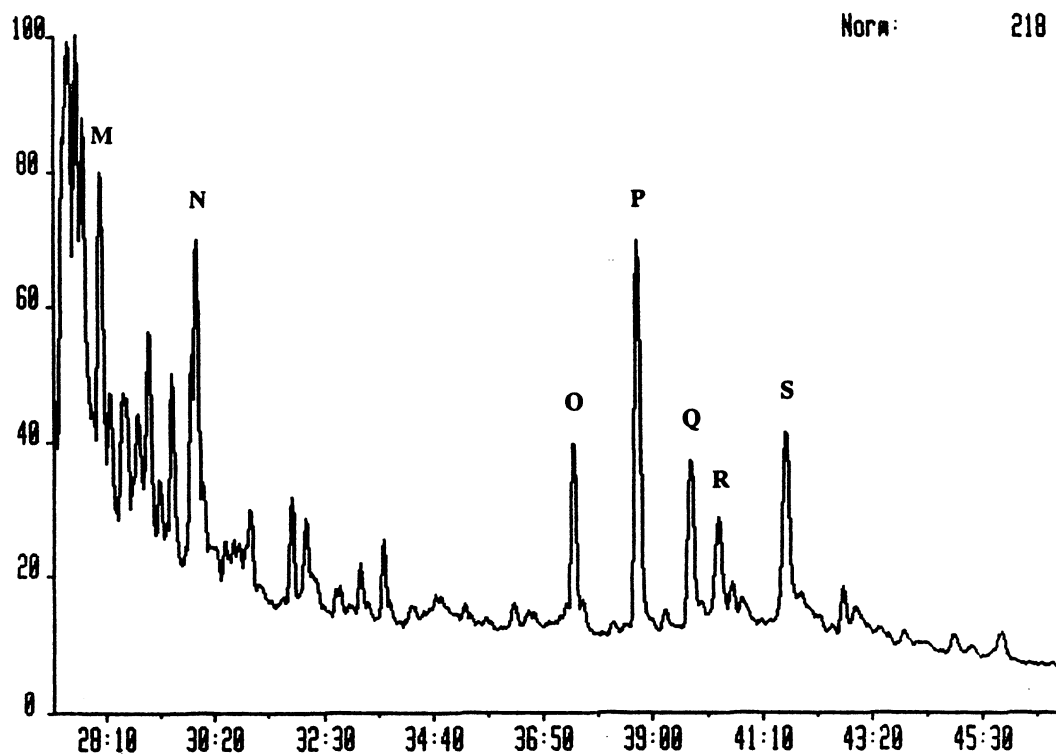
F1026AR 25-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1026 ARO 7029/03-U-02 59.00 M DOL



F1026AR 25-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1026 ARO 7029/03-U-02 59.00 M DOL



F1320AR 26-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1320 ARO 7029/03-U-02 62.39 M SLTST



F1320AR 26-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1320 ARO 7029/03-U-02 62.39 M SLTST

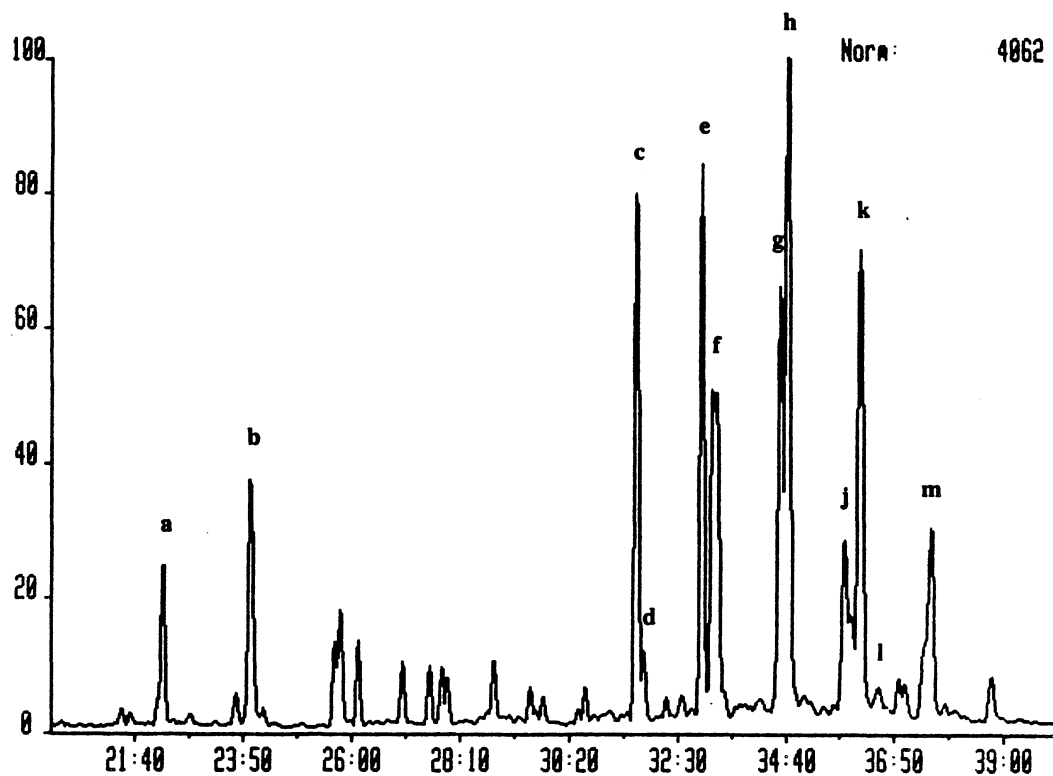
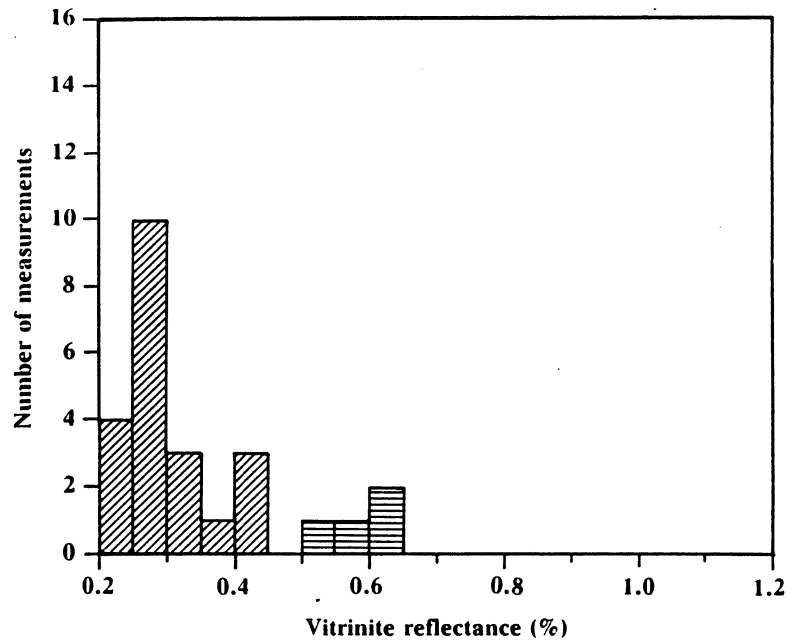


Figure A.III.4.6: Vitrinite reflectance histograms.

Core no.: 7029/03-U-02

Sample no.: F-993

Depth: 42.08 m

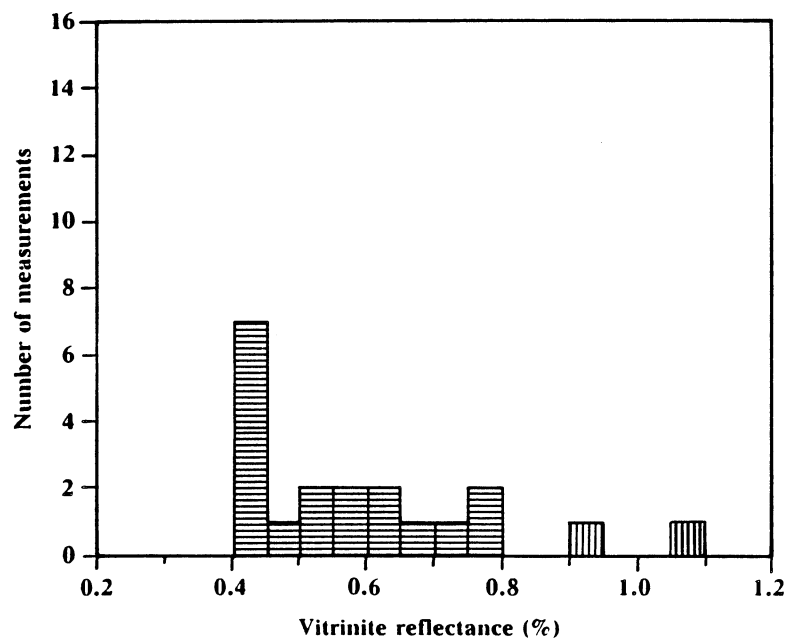


RP = 0.30% n = 21
P1 = 0.58% n = 4

Core no.: 7029/03-U-02

Sample no.: F-1028

Depth: 61.79 m

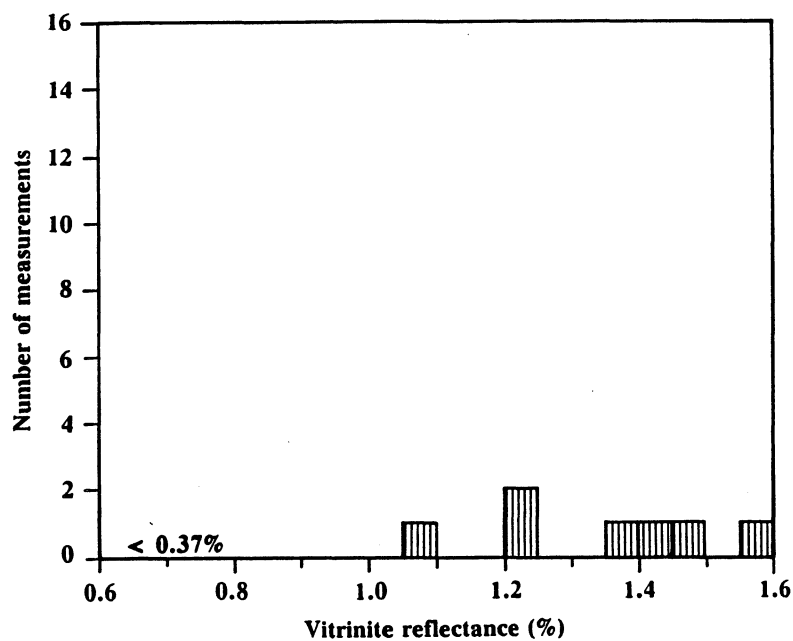


P1 = 0.55% n = 18
P2 = 0.98% n = 2

Core no.: 7029/03-U-02

Sample no.: F-1087

Depth: 78.83 m



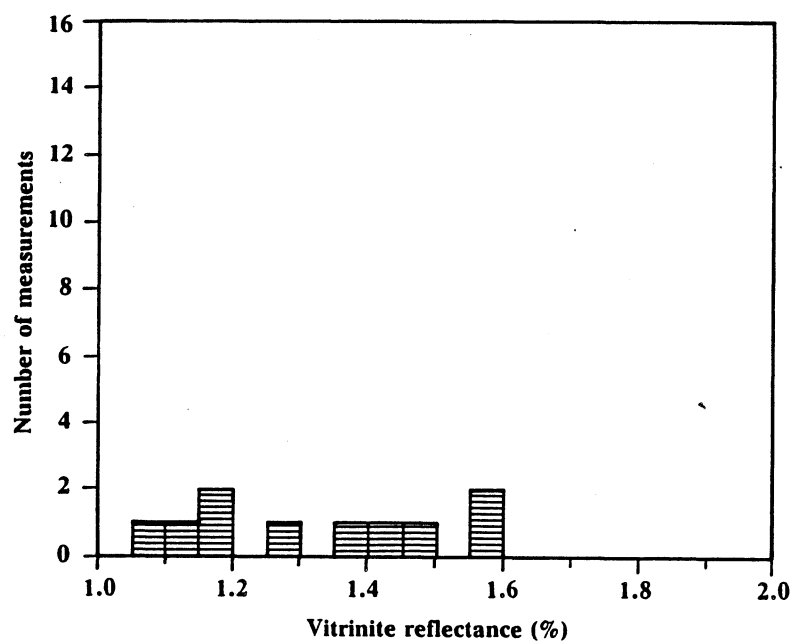
P1 = 0.37% n = 1

P2 = 1.35% n = 7

Core no.: 7029/03-U-02

Sample no.: F-1325

Depth: 92.28 m

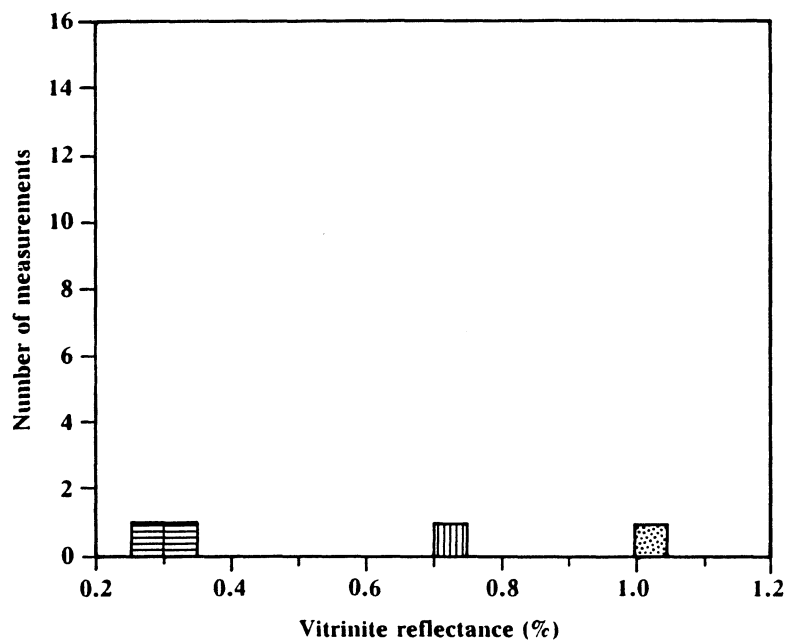


P1 = 1.33% n = 10

Core no.: 7029/03-U-02

Sample no.: F-1327

Depth: 107.70 m



	P1 = 0.31%	n = 2
	P2 = 0.72%	n = 1
	P3 = 1.04%	n = 1

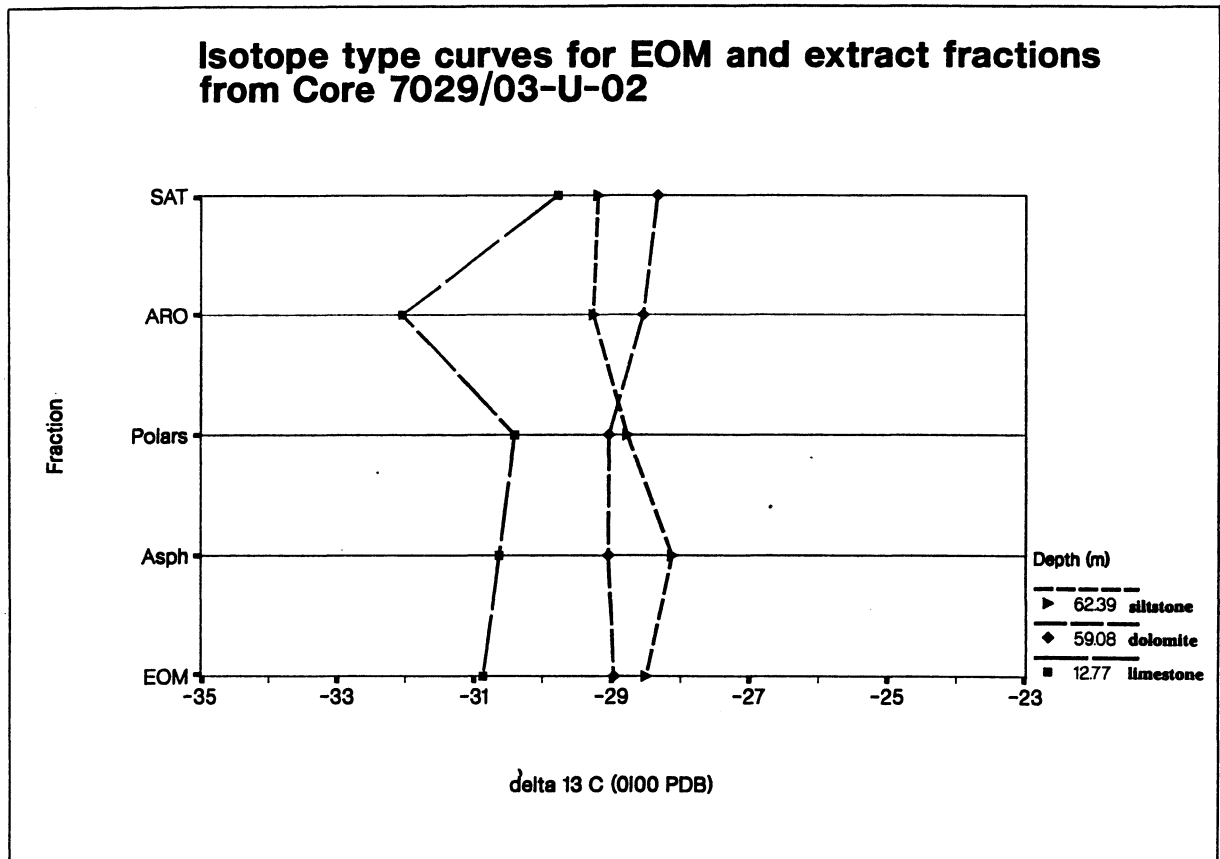


Figure A.III.4.7

APPENDIX III.5: TABLE OF CONTENTS

Core 7128/12-U-01

TABLES

Table A.III.5.1a:	Concentration of C_1 - C_{5+} hydrocarbons in headspace gas.
Table A.III.5.1b:	Concentration of C_1 - C_{5+} hydrocarbons in occluded gas.
Table A.III.5.1c:	Concentration of C_1 - C_{5+} hydrocarbons - summation.
Table A.III.5.2:	Total organic carbon content and data from Rock-Eval pyrolysis.
Table A.III.5.3:	Vitrinite reflectance data.
Table A.III.5.4:	Visual kerogen analysis.
Table A.III.5.5a:	Weight of EOM, asphaltenes and chromatographic fractions.
Table A.III.5.5b:	Concentration of EOM, asphaltenes and chromatographic fractions, related to rock weight.
Table A.III.5.5c:	Concentration of EOM, asphaltenes and chromatographic fractions, related to TOC weight.
Table A.III.5.5d:	Composition of material extracted from the rock.
Table A.III.5.6:	Tabulation of data from the gas chromatograms.
Table A.III.5.7a:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity characteristic ratios.
Table A.III.5.7b:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity and source characteristic ratios.

FIGURES

Figure A.III.5.1:	Gas chromatograms of saturated and aromatic hydrocarbons.
Figure A.III.5.2:	Mass fragmentograms of m/z 191, 205 (terpanes) and m/z 217, 218 (steranes).
Figure A.III.5.3:	Internal distribution of $14\alpha(H)$, $17\alpha(H)$ 20R, C_{27} , C_{28} and C_{29} regular steranes (from m/z 217).
Figure A.III.5.4:	Vitrinite reflectance histograms.

Project no.: 21344423
Location : 7128/12-U-01
Date : 88.10.12

Table A.III.5.1: TABLE OF GAS RESULTS

a: Headspace gas (µl gas pr. kg rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0616	70.38	13	0	0	0	0	0	13	0	0.0	-1.00
F0629	82.39	4620	0	0	0	0	0	4620	0	0.0	-1.00
F0643	91.58	4857	0	0	0	0	0	4857	0	0.0	-1.00
F0654	100.71	6463	0	0	0	0	0	6463	0	0.0	-1.00
F0664	108.12	12852	0	0	0	0	0	12852	0	0.0	-1.00
F0682	118.62	21325	0	0	0	0	0	21325	0	0.0	-1.00
F0692	139.12	6333	0	0	0	0	0	6333	0	0.0	-1.00

b: Occluded gas (µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0616	70.38	161	15	0	0	0	0	176	15	8.5	-1.00
F0629	82.39	1198	26	5	0	0	0	1229	31	2.5	-1.00
F0643	91.58	2711	11	0	0	0	0	2722	11	0.4	-1.00
F0654	100.71	2050	10	0	0	0	0	2060	10	0.5	-1.00
F0664	108.12	2411	7	0	0	0	0	2418	7	0.3	-1.00
F0682	118.62	1769	11	0	0	0	0	1780	11	0.6	-1.00
F0692	139.12	1510	7	0	0	0	0	1517	7	0.5	-1.00

c: Summation of Headspace and Occluded gas
(µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0616	70.38	174	15	0	0	0	0	189	15	7.9	-1.00
F0629	82.39	5818	26	5	0	0	0	5849	31	0.5	-1.00
F0643	91.58	7568	11	0	0	0	0	7579	11	0.1	-1.00
F0654	100.71	8513	10	0	0	0	0	8523	10	0.1	-1.00
F0664	108.12	15263	7	0	0	0	0	15270	7	0.0	-1.00
F0682	118.62	23094	11	0	0	0	0	23105	11	0.0	-1.00
F0692	139.12	7843	7	0	0	0	0	7850	7	0.1	-1.00

Legend: -1 can not be determined

Project no.: 21344423
Location : 7128/12-U-01
Date : 88.11.18

Table A.III.5.2: DATA FROM ROCK EVAL PYROLYSIS

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F0609	BULK	64.54	CORE	0.00	0.02	0.90	0.20	10	450	0.02	0.00	-1
F0613	BULK	68.68	CORE	0.00	0.05	0.59	0.28	17	210	0.05	0.00	(368)
F0616	BULK	70.38	CORE	0.00	0.13	0.23	0.33	39	69	0.13	0.00	434
F1296	BULK	72.02	CORE	0.00	0.23	0.53	0.54	42	98	0.23	0.00	428
F1297	BULK	74.50	CORE	0.01	0.49	0.93	1.15	42	80	0.50	0.02	440
F0620	BULK	76.54	CORE	0.00	0.02	0.35	0.21	9	166	0.02	0.00	-1
F0622	BULK	77.87	CORE	0.00	0.19	0.38	0.35	54	108	0.19	0.00	426
F0625	BULK	79.17	CORE	0.00	0.06	0.39	0.26	23	150	0.06	0.00	(356)
F1299	BULK	81.87	CORE	0.00	0.18	0.44	0.34	52	129	0.18	0.00	(476)
F0629	BULK	82.39	CORE	0.00	0.16	0.21	0.44	36	47	0.16	0.00	(479)
F0632	BULK	85.09	CORE	0.00	0.00	0.50	0.23	0	217	0.00	0.00	-1
F1300	BULK	86.17	CORE	0.02	0.19	0.42	0.27	70	155	0.21	0.09	(388)
F0637	BULK	88.27	CORE	0.00	0.05	0.36	0.25	20	144	0.05	0.00	(391)
F0641	BULK	91.01	CORE	0.00	0.04	0.36	0.24	16	150	0.04	0.00	-1
F0643	BULK	91.58	CORE	0.00	0.11	0.14	0.30	36	46	0.11	0.00	(381)
F0645	BULK	93.42	CORE	0.00	0.01	0.30	0.27	3	111	0.01	0.00	-1
F0650	BULK	95.35	CORE	0.00	0.04	0.09	0.17	23	52	0.04	0.00	(397)
F0652	BULK	100.12	CORE	0.00	0.03	0.19	0.18	16	105	0.03	0.00	424
F0654	BULK	100.71	CORE	0.00	0.14	0.06	0.23	60	26	0.14	0.00	(490)
F0656	BULK	103.13	CORE	0.01	0.01	0.19	0.15	6	126	0.02	0.50	-1
F0659	BULK	105.15	CORE	0.00	0.03	0.08	0.20	15	40	0.03	0.00	(319)
F0662	BULK	106.44	CORE	0.00	0.03	0.09	0.24	12	37	0.03	0.00	-1
F0664	BULK	108.12	CORE	0.00	0.17	0.03	0.27	62	11	0.17	0.00	(503)
F0666	BULK	108.41	CORE	0.00	0.07	0.06	0.19	36	31	0.07	0.00	-1
F0668	BULK	109.65	CORE	0.00	0.04	0.25	0.23	17	108	0.04	0.00	432
F0670	BULK	112.30	CORE	0.00	0.04	0.24	0.26	15	92	0.04	0.00	(332)
F1306	BULK	113.38	CORE	0.05	0.45	0.52	1.03	43	50	0.50	0.10	437
F1307	BULK	113.94	CORE	0.05	0.59	0.40	0.64	92	62	0.64	0.07	-1
F0672	BULK	114.67	CORE	0.00	0.16	0.63	0.22	72	286	0.16	0.00	-1
F1308	BULK	116.04	CORE	0.01	0.36	0.91	0.31	116	293	0.37	0.02	(556)
F0675	BULK	116.48	CORE	0.00	0.03	0.36	0.20	15	180	0.03	0.00	424
F0682	BULK	118.62	CORE	-1.00	-1.00	-1.00	0.22	-1	-1	-1.00	-1.00	-1
F0686	BULK	137.75	CORE	0.00	0.00	1.02	0.21	0	485	0.00	0.00	-1
F0692	BULK	139.12	CORE	0.00	0.12	0.15	0.33	36	45	0.12	0.00	(480)
F0689	BULK	139.21	CORE	0.00	0.08	0.81	0.47	17	172	0.08	0.00	(481)
F0691	BULK	140.78	CORE	0.00	0.18	0.94	0.49	36	191	0.18	0.00	(479)
F0696	BULK	142.41	CORE	0.04	0.44	1.04	0.81	54	128	0.48	0.08	414
F0698	BULK	144.93	CORE	0.03	0.48	0.65	0.78	61	83	0.51	0.05	414
F1310	BULK	145.86	CORE	-1.00	-1.00	-1.00	1.28	-1	-1	-1.00	-1.00	-1
F0702	BULK	146.87	CORE	0.00	0.08	1.10	1.00	8	110	0.08	0.00	418
F0706	BULK	148.34	CORE	0.00	0.10	0.91	0.60	16	151	0.10	0.00	415

Legend:

-1 : Not determined or no data available

() : Tmax values of doubtful reliability (usually associated with poor S2 peaks)

Core-site Number: 7128/12-U-01
Reference number: 21.3444.23
(1/1)

Table A.III.5.3: VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
F-1298	-----	75.67	0.38 (26) 0.75 (4)	F R	0.09 0.07	6?
F- 767	-----	81.30	0.62 (24)	I	0.05	---
F-1303	-----	109.05	0.89 (1)	R	0.00	2?
F-1305	-----	113.31	0.37 (21) 0.68 (3)	F R	0.09 0.06	---
F-1311	-----	146.19	0.85 (5)	R	0.11	2-3

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor;
I = Inertinite. L = Liptinite or poor vitrinite particle.
R = Reworked material/inertinite.

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.5.4
CORE NO.: 7128/12-U-01

Sample	Depth (m)	Compo- sition of residue	Particle size	Preser- vation palyno- morphs	Thermal maturation index * NEW TAI	Remarks
F-683	136.38	W: 10-20 C: 80-90	F-M	?	?	
F-684	137.75	Lm: <5 W: 15-20 C: 80	F-M	Fair	?	
F-685	139.07	Lm: <5 W: 10-15 C: 85	F-M	Poor-Fair	2	

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.5.4 (ctd)
CORE NO.: 7128/12-U-01

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index * NEW TAI	Remarks
F-689	139.21	Lm: <5 W: 15-20 C: 80	F-M	Good	2-3	Same as sample 144.93 m.
F-785	139.49	Lm: <5 W: 15-20 C: 80	F-M	Fair-Good	2-3	Dominated by small sized, coaly fragments.
F-700	144.93	Lm: <5 W: 15-20 C: 80	F-M	Good	2-3	Dominated by fine to medium sized coaly fragments.
F-704	146.87	Lm: 5-10 W: 30-35 C: 60	F-M	Fair-Good	2-3	Dominated by coaly fragments (medium sized) and dark wood. The liptinitic fraction is dominated by palynomorphs.

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.5.4 (ctd)
CORENO.: 7128/12-U-01

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index * NEW TAI	Remarks
F-788	148.49	Lm: <5 W: 15-20 C: 80	F-M	Fair-Good	3	Same as sample 153.01 m.
F-707	148.54	Am: ? Lm: <5 W: 25-30 C: 70	F-M	Fair	2-3	Same as sample 153.01 m, but the coaly material is more in the medium-sized fraction.
F-789	148.66	Lm: <5 W: 5-10 C: 90	F	Poor	?	Same as sample 153.01 m
F-790	153.01	Lm: <5 W: 15-20 C: 80	F	Poor	?	The sample is dominated by fine sized coaly fragments.

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

Project no.: 21344423
 Location : 7128/12-U-01
 Date : 89.02.02

- 257 -



Table A.III.5.5a: WEIGHT OF CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ROCK EXTR. (g)	EOM (mg)	ASPH (mg)	SAT HC (mg)	ARO HC (mg)	POLAR COMP. (mg)	HC (mg)	NONHC (mg)	TOC (%)
F0696	BULK	142.41	CORE	16.3	9.3	5.0	1.1	1.2	1.8	2.3	7.0	0.81
F0698	BULK	144.93	CORE	111.8	6.6	2.2	1.0	0.8	2.8	1.8	4.8	0.78

Legend:

- * - Not all the available EOM was used for MPLC.
- ? - MPLC results assumed more EOM than originally extracted.
- 1- No data available.

Table A.III.5.5b: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F0696	BULK	142.41	CORE	570	306	66	74	111	140	430
F0698	BULK	144.93	CORE	59	20	9	8	25	17	42

Legend:

- 1- No data available.

Project no.: 21344423
 Location : 7128/12-U-01
 Date : 89.02.02

- 258 -

Table A.III.5.5c: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F0696	BULK	142.41	CORE	70.3	37.8	8.2	9.1	13.6	17.3	53.0
F0698	BULK	144.93	CORE	7.6	2.5	1.1	1.0	3.2	2.1	5.5

Legend:

-1- No data available.

Table A.III.5.5d: COMPOSITION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ASPH EOM (%)	SAT EOM (%)	ARO EOM (%)	HC EOM (%)	POLAR EOM (%)	SAT ARO x 100	HC NONHC x 100
F0696	BULK	142.41	CORE	53.8	11.6	12.9	24.5	19.4	90.0	32.6
F0698	BULK	144.93	CORE	33.3	14.6	12.8	27.4	41.9	114.3	37.7

Legend:

-1- No data available.

Project no.: 21344423
 Location : 7128/12-U-01
 Date : 89.02.05

- 259 -



Table A.III.5.6:

RATIOS DERIVED FROM GAS CHROMATOGRAMS OF SATURATED HYDROCARBONS

IKUNO	FRAC NAME	DEPTH	Pri	Pri	Phy	A	n-C17	n-C31	CPI 1	CPI 2
			--- Phy	A=--- n-C17	B=--- n-C18	--- B	--- n-C27	--- n-C19		
F0696	BULK	142.41	1.4	0.8	0.6	1.3	1.2	0.5	1.6	1.6
F0698	BULK	144.93	1.5	0.7	0.6	1.2	1.9	0.5	1.3	1.1

-1 = No data available

Table A.III.5.7a:

Molecular ratios from sterane and terpane mass chromatograms.

Maturity ratios.

Core 7128/12-U-01

IKU no.	Depth (m)	$\alpha\beta/\alpha\beta+\beta\alpha^{1)}$	%22S ²⁾	% $\beta\beta^3)$	%20S ⁴⁾
F0696	142.41	0.76	47	60	16

1) E/(E+F) in m/z 191.

2) Average % distribution between first and second eluting isomers of extended hopanes.

3) $100 * 2(r+s)/(q+t+2(r+s))$ in m/z 217.

4) $100 * q/(q+t)$ in m/z 217.

Table A.III.5.7b:

Molecular ratios from terpane and sterane mass chromatograms.
Maturity and source characteristic ratios.

Core 7128/12-U-01

IKU no.	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
F0696	142.41	0.28	3.38	0.03	0.11	0.54

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191).

2) B/A in m/z 191.

3) Relative abundance of unknown (X/E in m/z 191).

4) Relative abundance of bisnorhopane (Z/E in m/z 191).

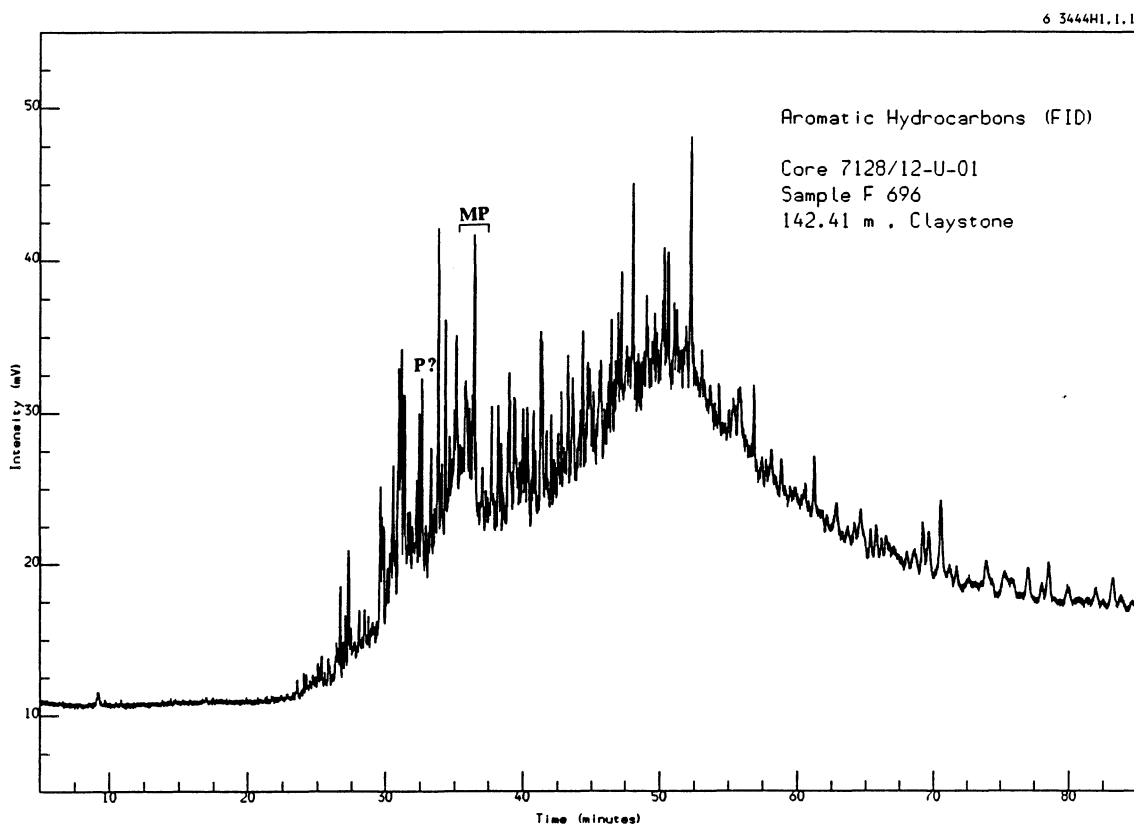
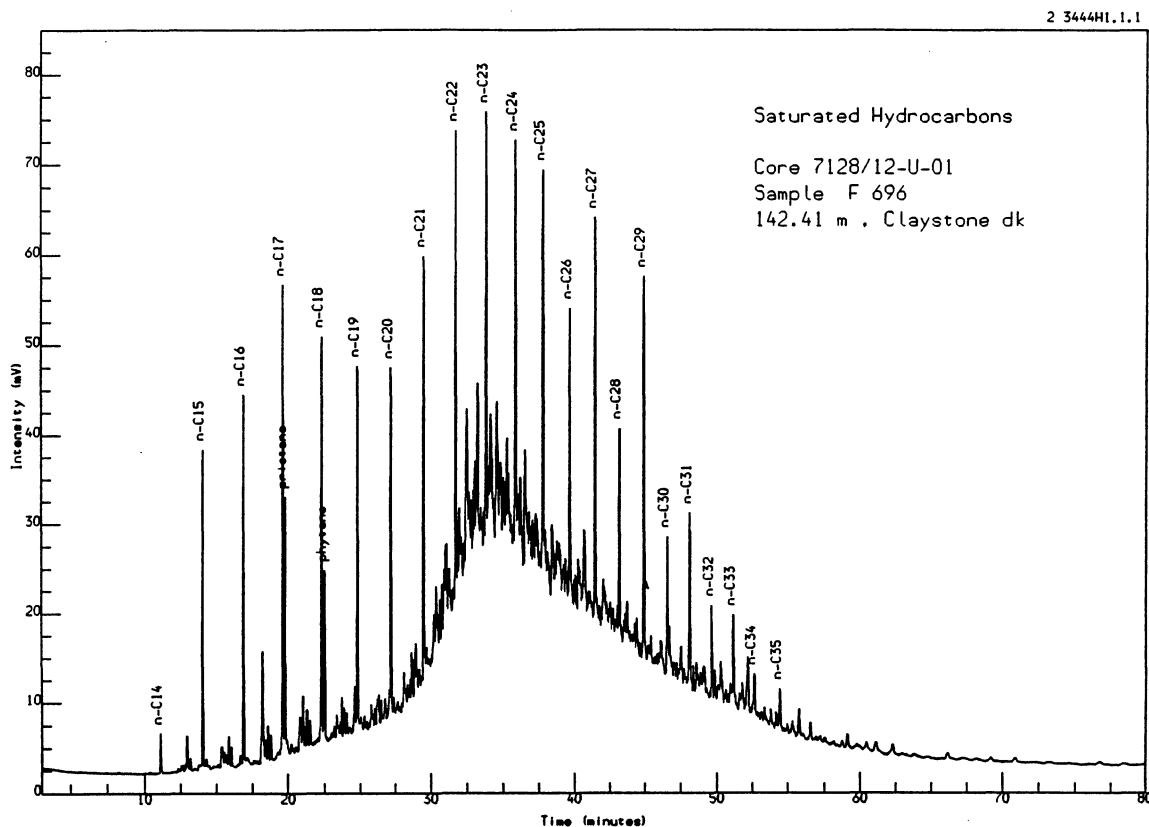
5) Relative abundance of C₂₇ rearranged steranes (a/(a+j) in m/z 217).

Figure A.III.5.1:

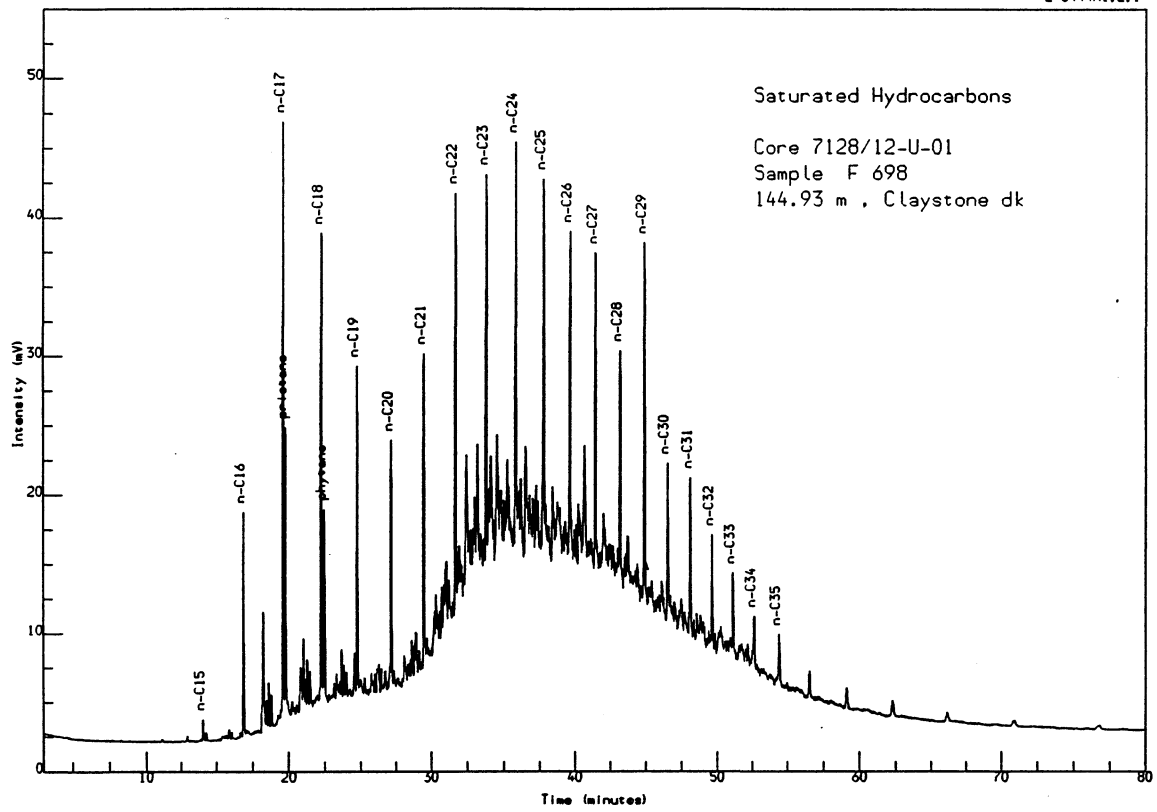
Gas chromatograms of saturated and aromatic hydrocarbons

n-C₁₅ etc. - n-alkanes

N	- Naphthalene
MN	- Methylnaphthalenes
DMN	- Dimethylnaphthalenes
TMN	- C ₃ -naphthalenes
P	- Phenanthrene
PN	- Methylphenanthrenes
DMP	- Dimethylphenanthrenes



2 3444H1.2.1



6 3444H1.2.1

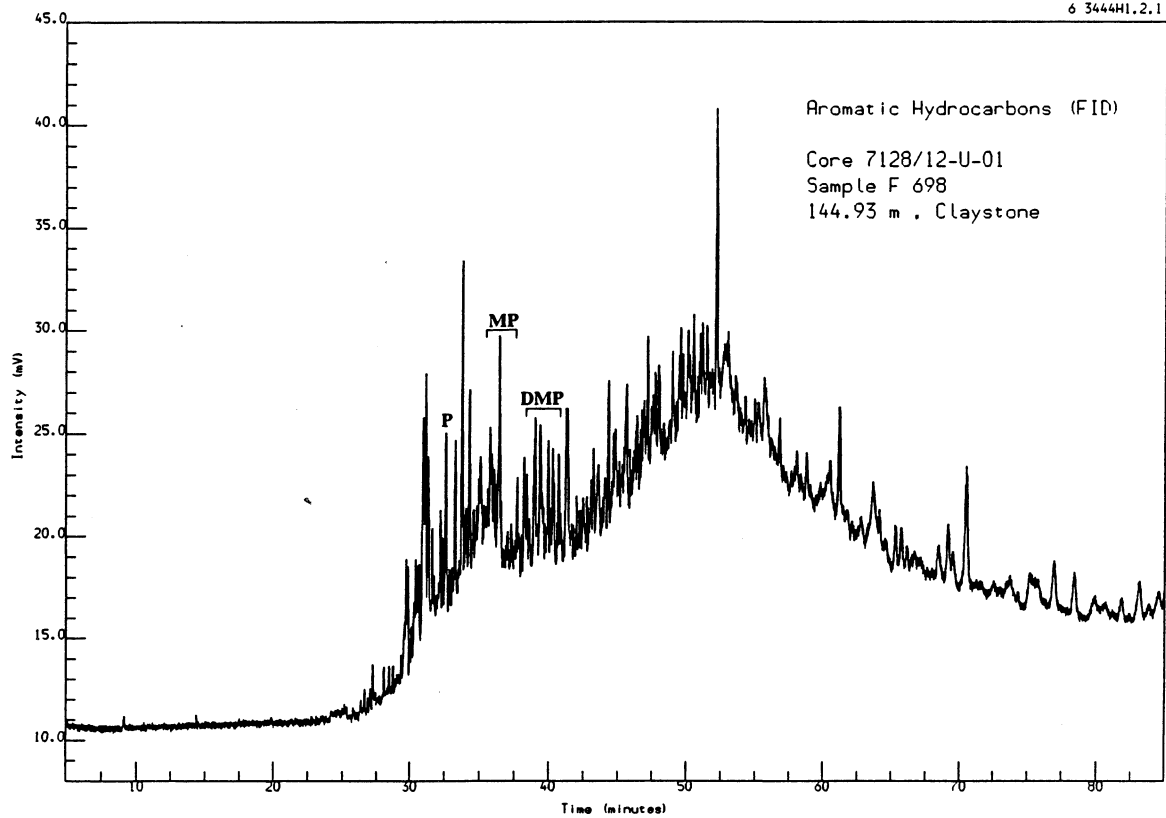
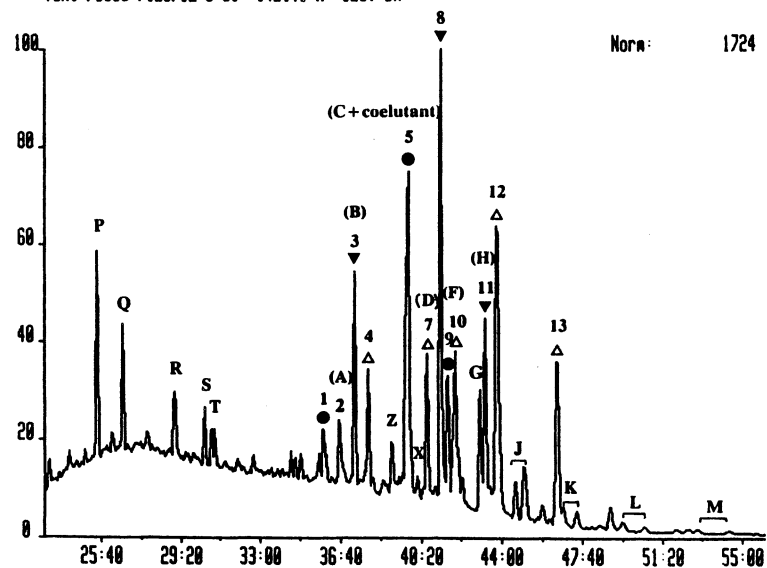


Figure A.III.5.2:

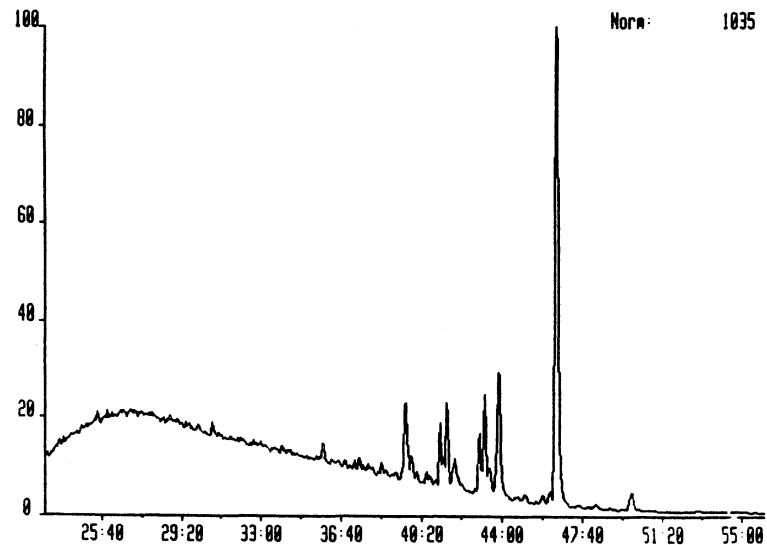
**Mass fragmentograms of m/z 191, 205 (terpanes)
and m/z 217, 218 (steranes).**

For peak identification see Chapter 4.

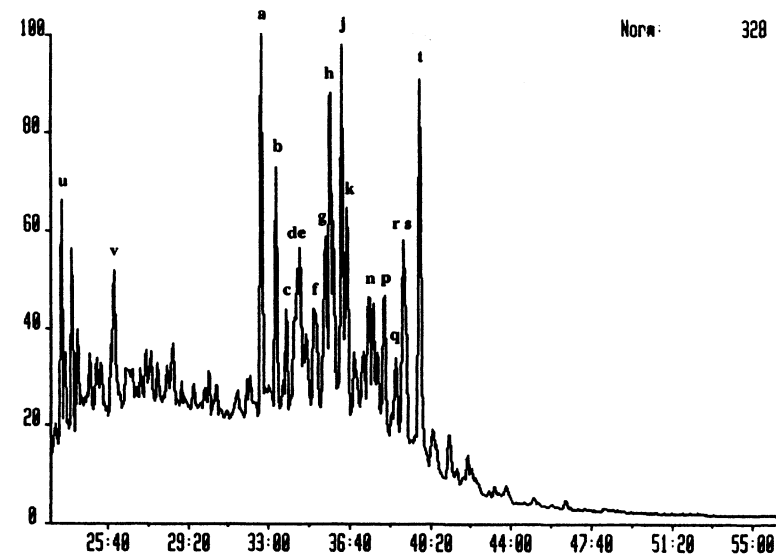
F0696 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0696 7120/12-U-01 142.41 M CLST DK (E)



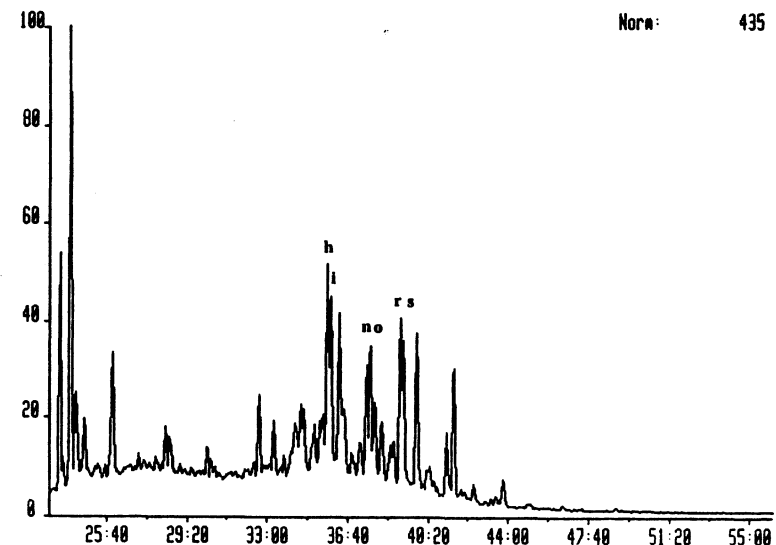
F0696 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0696 7120/12-U-01 142.41 M CLST DK



F0696 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0696 7120/12-U-01 142.41 M CLST DK



F0696 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0696 7120/12-U-01 142.41 M CLST DK



Core 7128/12-U-01

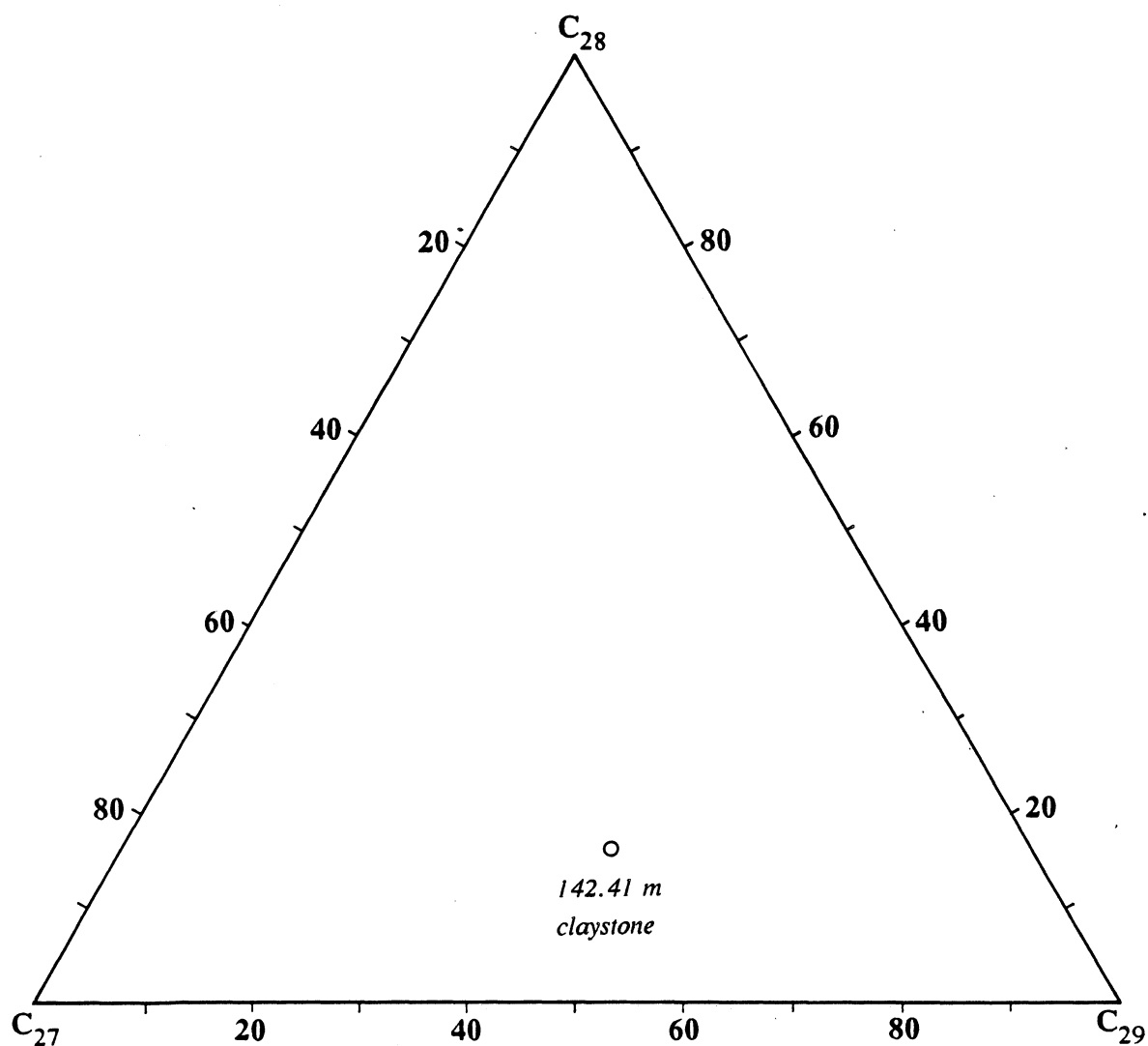


Figure A.III.5.3

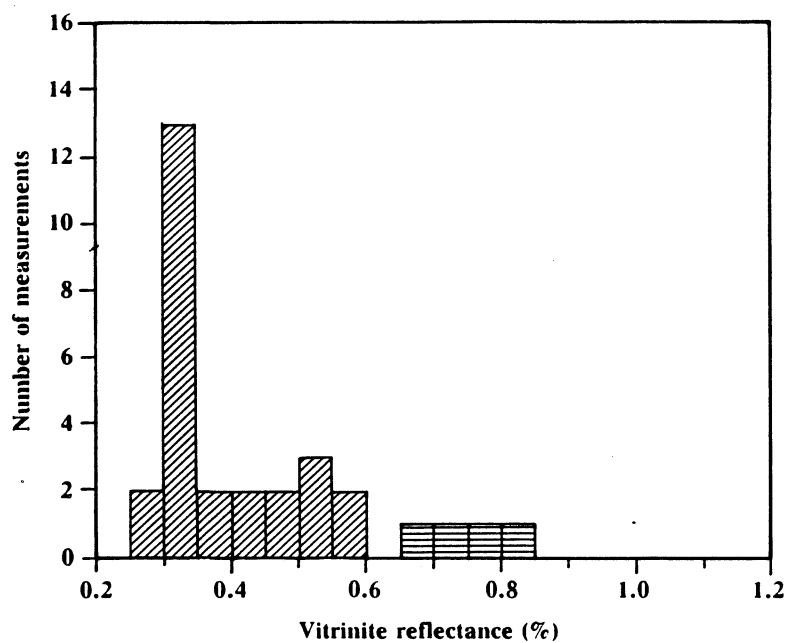
Internal distribution of 14α(H), 17α(H) 20R, C₂₇, C₂₈ and C₂₉ regular steranes (from m/z 217)

Figure A.III.5.4: Vitrinite reflectance histograms.

Core no.: 7128/12-U-01

Sample no.: F-1298

Depth: 75.67 m

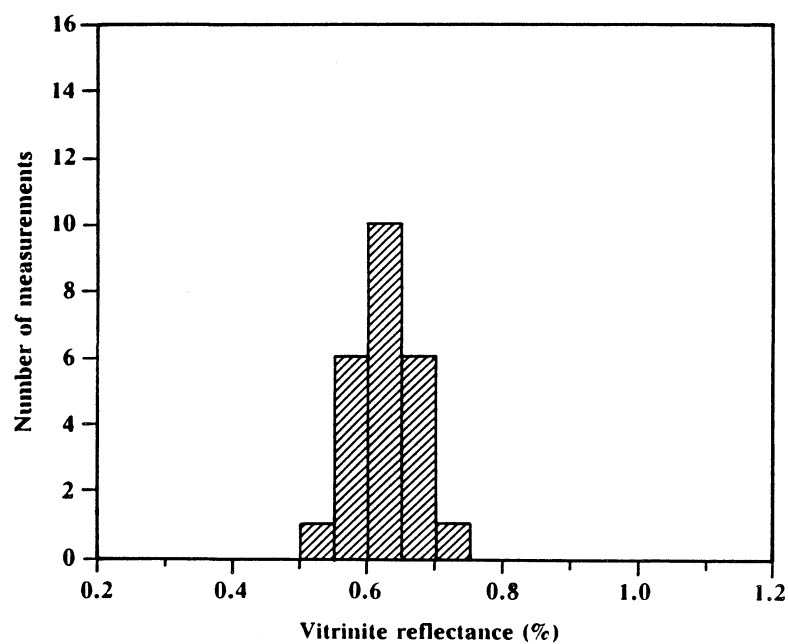


RP = 0.35% n = 26
P1 = 0.75% n = 4

Core no.: 7128/12-U-01

Sample no.: F-767

Depth: 81.30 m

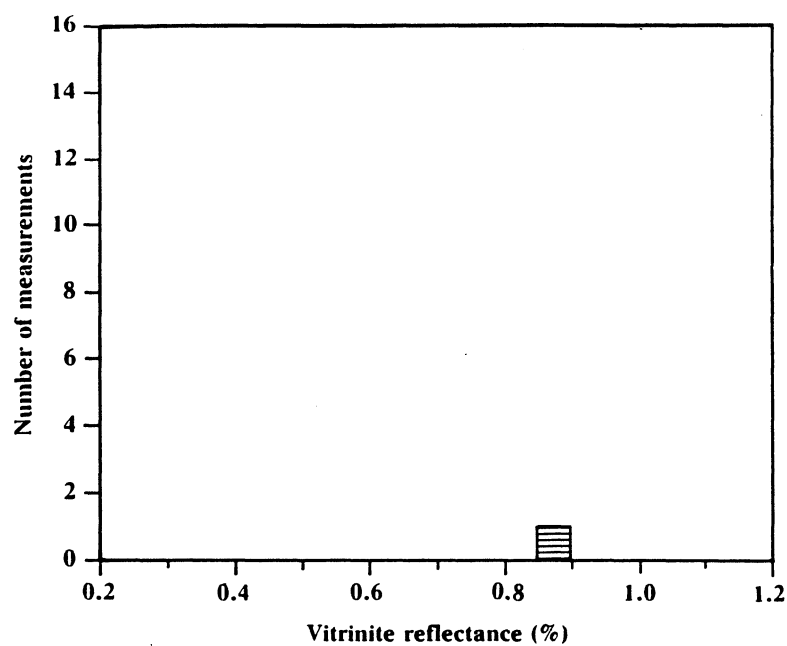


IP = 0.62% n = 24

Core no.: 7128/12-U-01

Sample no.: F-1303

Depth: 109.05 m

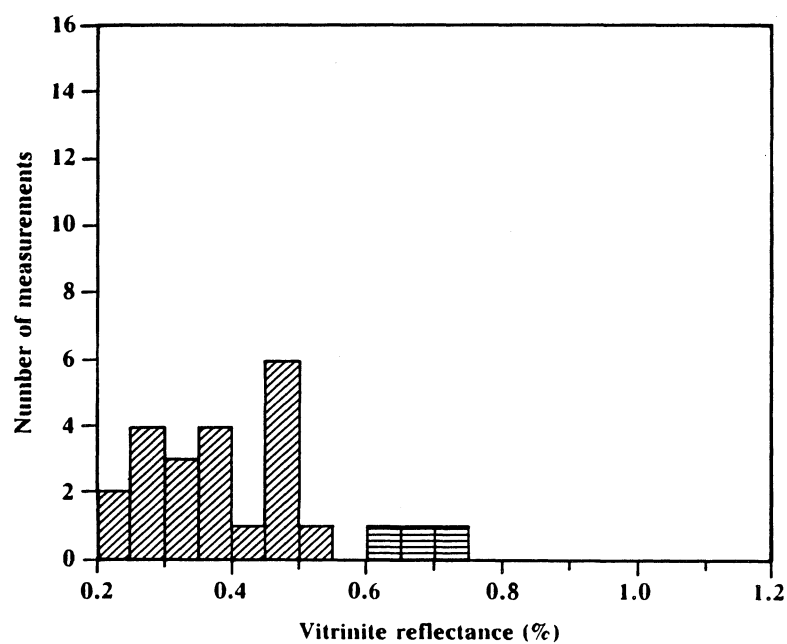


 P1 = 0.89% n = 1

Core no.: 7128/12-U-01

Sample no.: F-1305

Depth: 113.31 m

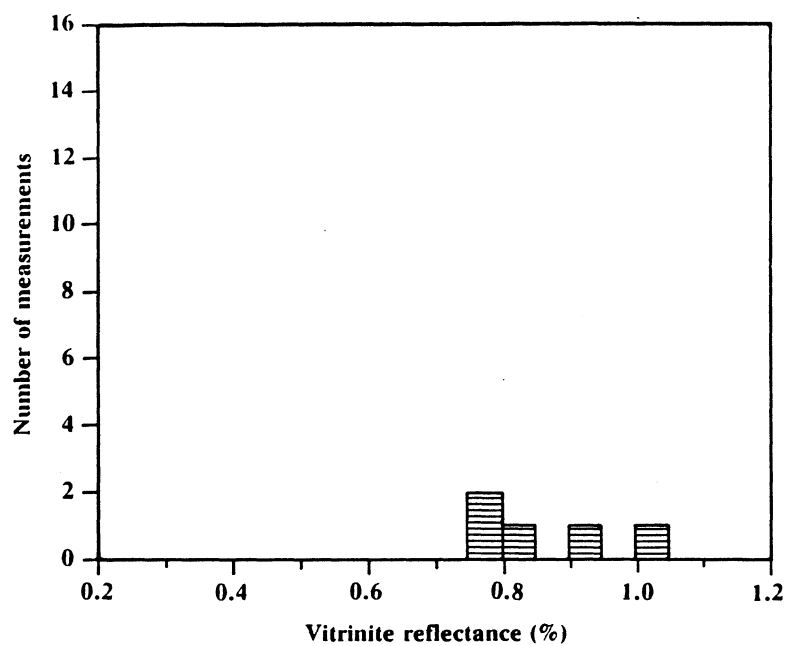


 RP = 0.37% n = 21
 P1 = 0.68% n = 3

Core no.: 7128/12-U-01

Sample no.: F-1311

Depth: 146.19 m



 P1 = 0.85% n = 5

APPENDIX III.6: TABLE OF CONTENTS

Core 7128/09-U-01

TABLES

Table A.III.6.1a:	Concentration of C_1-C_{5+} hydrocarbons in headspace gas.
Table A.III.6.1b:	Concentration of C_1-C_{5+} hydrocarbons in occluded gas.
Table A.III.6.1c:	Concentration of C_1-C_{5+} hydrocarbons - summation.
Table A.III.6.2:	Total organic carbon content and data from Rock-Eval pyrolysis.
Table A.III.6.3:	Vitrinite reflectance data.
Table A.III.6.4a:	Weight of EOM, asphaltenes and chromatographic fractions.
Table A.III.6.4b:	Concentration of EOM, asphaltenes and chromatographic fractions, related to rock weight.
Table A.III.6.4c:	Concentration of EOM, asphaltenes and chromatographic fractions, related to TOC weight.
Table A.III.6.4d:	Composition of material extracted from the rock.
Table A.III.6.5:	Tabulation of data from the gas chromatograms.
Table A.III.6.6a:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity characteristic ratios.
Table A.III.6.6b:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity and source characteristic ratios.
Table A.III.6.7:	Molecular ratios from aromatic sterane mass fragmentograms.

FIGURES

Figure A.III.6.1:	Gas chromatograms of saturated and aromatic hydrocarbons.
Figure A.III.6.2:	Mass fragmentograms of m/z 191, 205 (terpanes) and m/z 217, 218 (steranes).
Figure A.III.6.3:	Internal distribution of $14\alpha(H)$, $17\alpha(H)$ 20R, C_{27} , C_{28} and C_{29} regular steranes (from m/z 217).
Figure A.III.6.4:	Mass fragmentograms of m/z 231, 253 (aromatic steroid hydrocarbons).
Figure A.III.6.5:	Vitrinite reflectance histograms.

Project no.: 21344423
Location : 7128/09-U-01
Date : 88.10.12

Table A.III.6.1: TABLE OF GAS RESULTS

a: Headspace gas (µl gas pr. kg rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F1204	71.20	24	0	0	0	0	0	24	0	0.0	-1.00
F0811	86.58	13	0	0	0	0	0	13	0	0.0	-1.00

b: Occluded gas (µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F1204	71.20	215	13	0	0	0	0	228	13	5.7	-1.00
F0811	86.58	336	22	0	0	0	0	358	22	6.1	-1.00

c: Summation of Headspace and Occluded gas
(µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F1204	71.20	239	13	0	0	0	0	252	13	5.2	-1.00
F0811	86.58	349	22	0	0	0	0	371	22	5.9	-1.00

Legend: -1 can not be determined

Project no.: 21344423
Location : 7128/09-U-01
Date : 88.11.25

Table A.III.6.2: DATA FROM ROCK EVAL PYROLYSIS

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F0800	BULK	70.00	CORE	-1	-1	-1	0.15	-1	-1	-1	-1	-1
F1204	BULK	71.20	CORE	-1	-1	-1	0.16	-1	-1	-1	-1	-1
F0804	BULK	72.63	CORE	-1	-1	-1	0.16	-1	-1	-1	-1	-1
F0805	BULK	72.93	CORE	-1	-1	-1	0.17	-1	-1	-1	-1	-1
F1263	BULK	75.31	CORE	0.00	0.13	0.07	0.22	59	31	0.13	0.00	438
F1264	BULK	75.61	CORE	-1	-1	-1	0.21	-1	-1	-1	-1	-1
F0809	BULK	78.37	CORE	-1	-1	-1	0.20	-1	-1	-1	-1	-1
F0810	BULK	81.81	CORE	0.00	0.13	0.06	0.22	59	27	0.13	0.00	427
F0812	BULK	86.56	CORE	0.03	0.58	0.03	0.21	276	14	0.61	0.04	(516)

Legend:

-1 : Not determined or no data available

(): Tmax values of doubtful reliability (usually associated with poor S2 peaks)

Core-site Number: 7128/09-U-01
Reference number: 21.3444.23
(1/1)

Table A.III.6.3: VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
F-1263	-----	75.31	0.37 (4)	P	0.03	---
F-1312	-----	76.23	N.D.P.	-	----	---

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor;
I = Inertinite. L = Liptinite or poor vitrinite particle.
R = Reworked material/inertinite.

Project no.: 21344423
 Location : 7128/09-U-01
 Date : 89.02.02

- 276 -



Table A.III.6.4a: WEIGHT OF CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ROCK EXTR. (g)	EOM (mg)	ASPH (mg)	SAT HC (mg)	ARO HC (mg)	POLAR COMP. (mg)	HC (mg)	NONHC (mg)	TOC (%)
F0812	BULK	86.56	CORE	13.9	5.2	3.6	0.8	0.7	2.4	1.5	3.7	0.21

Table A.III.6.4b: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F0812	BULK	86.56	CORE	374	259	60	52	173	112	262

Table A.III.6.4c: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F0812	BULK	86.56	CORE	177.9	123.2	28.8	24.7	82.3	53.5	124.4

Table A.III.6.4d: COMPOSITION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ASPH EOM (%)	SAT EOM (%)	ARO EOM (%)	HC EOM (%)	POLAR EOM (%)	SAT ARO x 100	HC NONHC x 100
F0812	BULK	86.56	CORE	69.2	16.2	13.9	30.1	46.3	116.7	43.0

Legend:

-1- No data available.

Project no.: 21344423
 Location : 7128/09-U-01
 Date : 89.02.05

- 277 -



Table A.III.6.5:

RATIOS DERIVED FROM GAS CHROMATOGRAMS OF SATURATED HYDROCARBONS

IKUNO FRAC NAME	DEPTH	Pri	Pri	Phy	A	n-C17	n-C31	CPI 1	CPI 2
		--- Phy	A=----- n-C17	B=----- n-C18	--- B	----- n-C27	----- n-C19		
F0812 BULK	86.56	0.7	0.9	0.7	1.2	0.3	0.6	1.1	0.9

-1 = No data available

Table A.III.6.6a:

Molecular ratios from sterane and terpane mass chromatograms.

Maturity ratios.

Core 7128/09-U-01

Code	Depth (m)	$\alpha\beta / \alpha\beta + \beta\alpha^{1)}$	%22S ²⁾	% $\beta\beta^3)$	%20S ⁴⁾
F-812	86.56	0.88	56.9	73.0	35.3

1) $E / (E + F)$ in m/z 191.

2) Average % distribution between first and second eluting isomers of extended hopanes.

3) $100 * 2(r+s) / (q+t+2(r+s))$ in m/z 217.

4) $100 * q / (q+t)$ in m/z 217.

Table A.III.6.6b:

*Molecular ratios from terpane and sterane mass chromatograms.
Maturity and source characteristic ratios.
Core 7128/09-U-01*

Code	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
F-812	86.56	0.67	19.0	0.08	0.18	0.78

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191).

2) B/A in m/z 191.

3) Relative abundance of unknown (X/E in m/z 191).

4) Relative abundance of bisnorhopane (Z/E in m/z 191).

5) Relative abundance of C₂₇ rearranged steranes (a/(a+j) in m/z 217).

Table A.III.6.7: Molecular ratios from mass fragmentograms of aromatic steroid hydrocarbons.

Core 7128/09-U-01

IKUNO	Depth m	Cracking ratios			Aromatisation ratios	
		20/20+27	20/20+28	21/21+28	27t/27t+28m	28t/28t+29m
		tri	tri	mono		
		1)	2)	3)	4)	5)
F0812	86.56	0.40	0.75	0.13	0.23	0.16

1) $M/(M+P)$ in m/z 231

2) $M/(M+S)$ in m/z 231

3) $a/(a+h)$ in m/z 253

4) $P/(P+h)$ in m/z 231 and m/z 253

5) $S/(S+m+(k*S/(S+R)))$ in m/z 231 and m/z 253

Figure A.III.6.1:

Gas chromatograms of saturated and aromatic hydrocarbons

n-C₁₅ etc. - n-alkanes

N	- Naphthalene
MN	- Methylnaphthalenes
DMN	- Dimethylnaphthalenes
TMN	- C ₃ -naphthalenes
P	- Phenanthrene
PN	- Methylphenanthrenes
DMP	- Dimethylphenanthrenes
D	- Diphenyl
Py	- Pyrene
C	- Chrysene

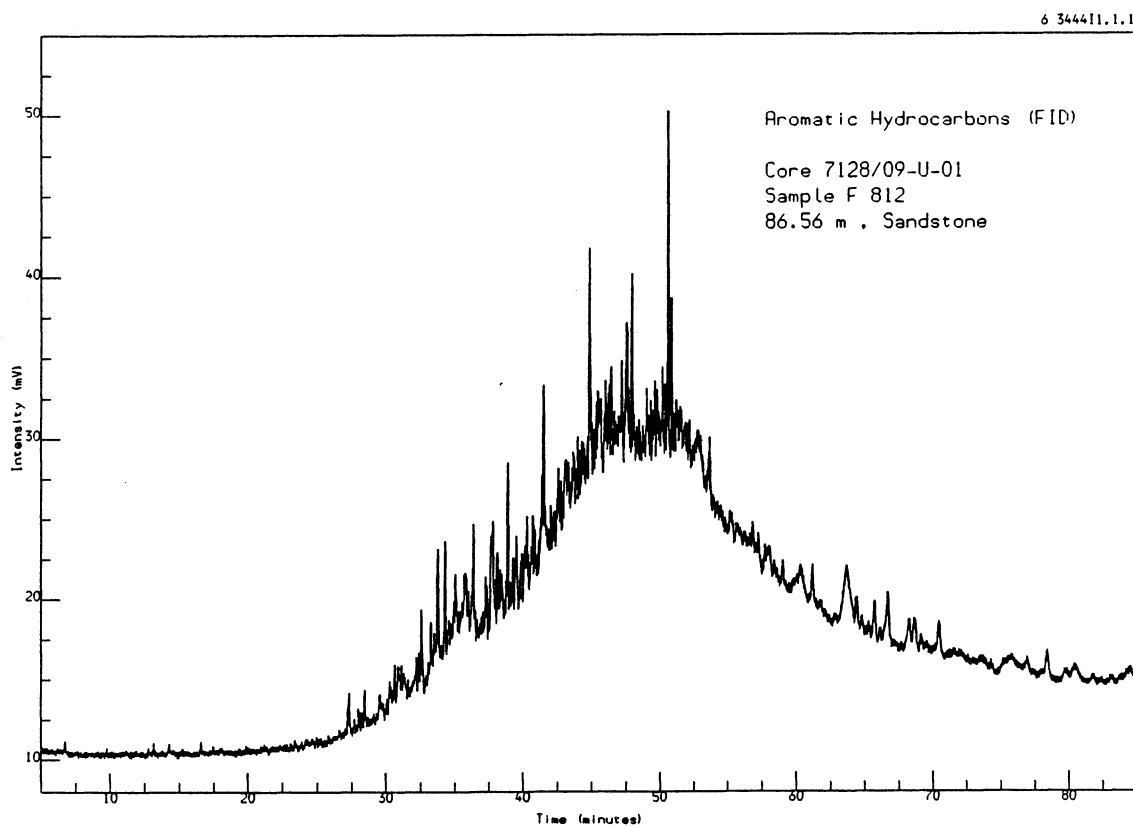
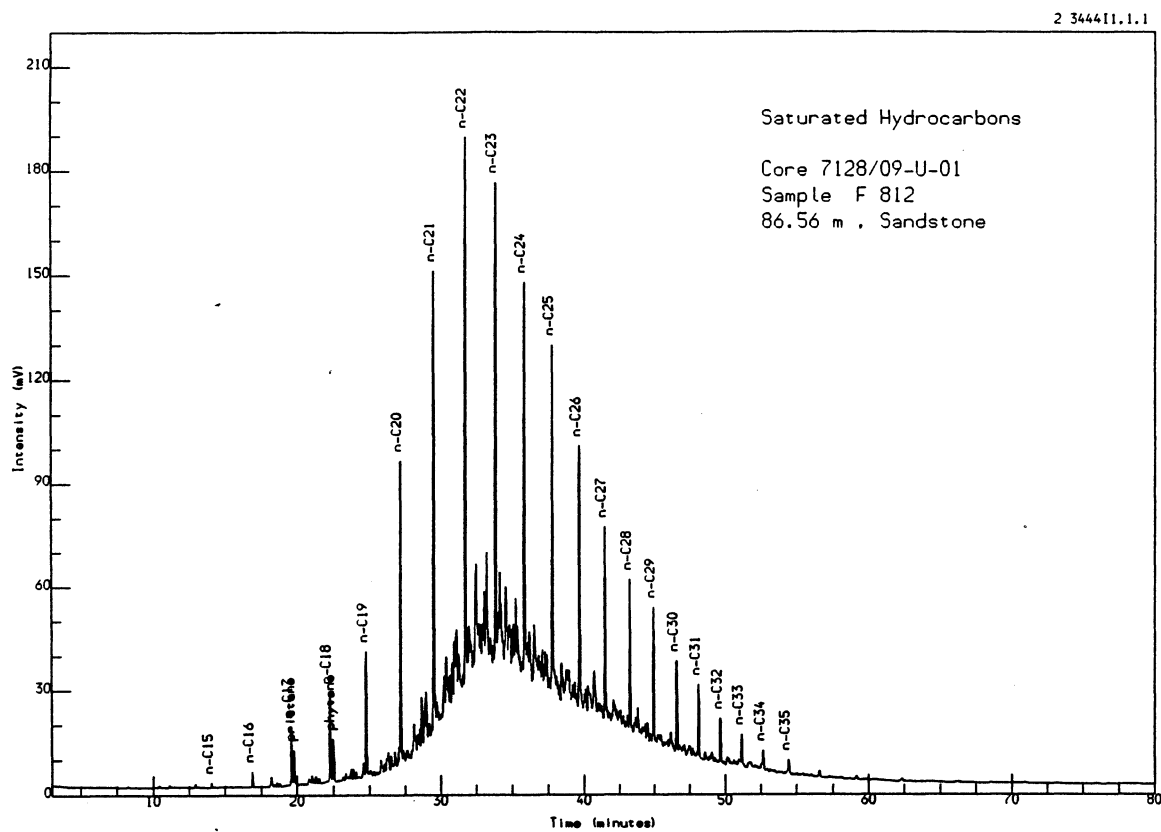
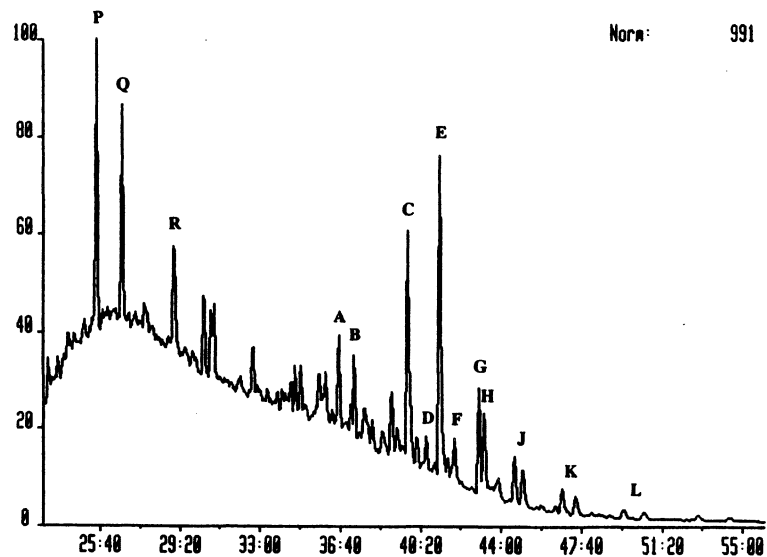


Figure A.III.6.2:

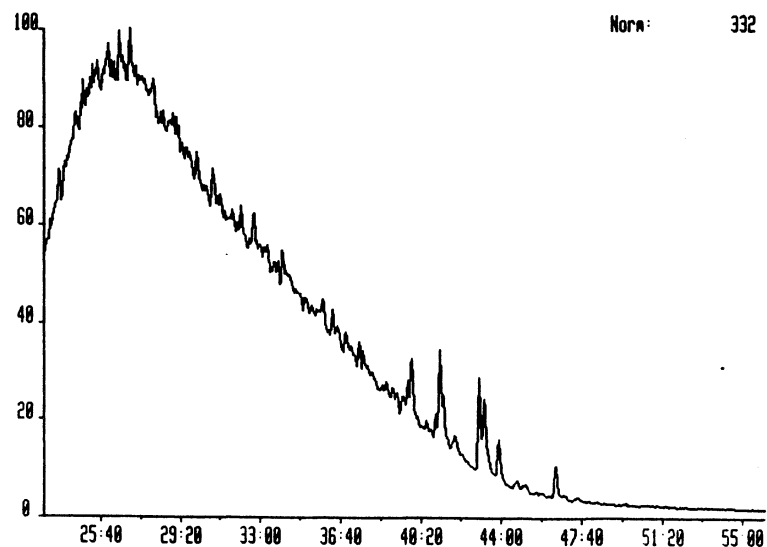
Mass fragmentograms of m/z 191, 205 (terpanes)
and m/z 217, 218 (steranes).

For peak identification see Chapter 4.

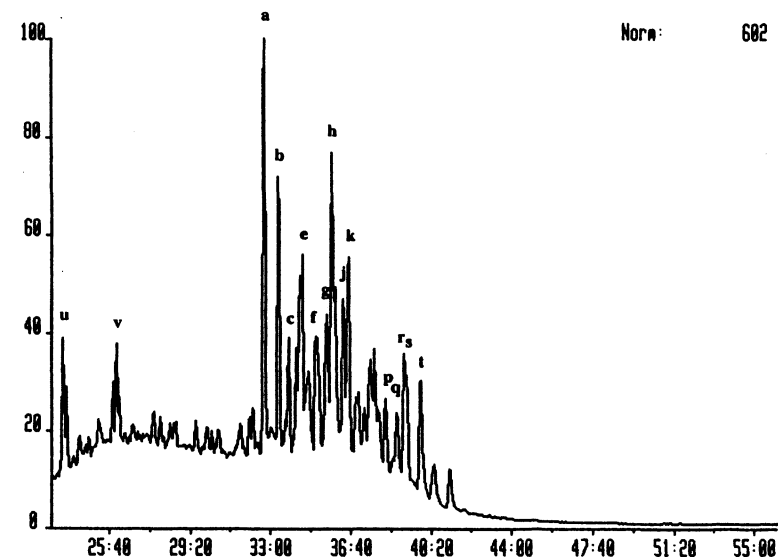
F0012 11-JAN-89 Sir:Voltage 70-E Sys: B10MARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0012 7120/89-U-01 86.56 M SST



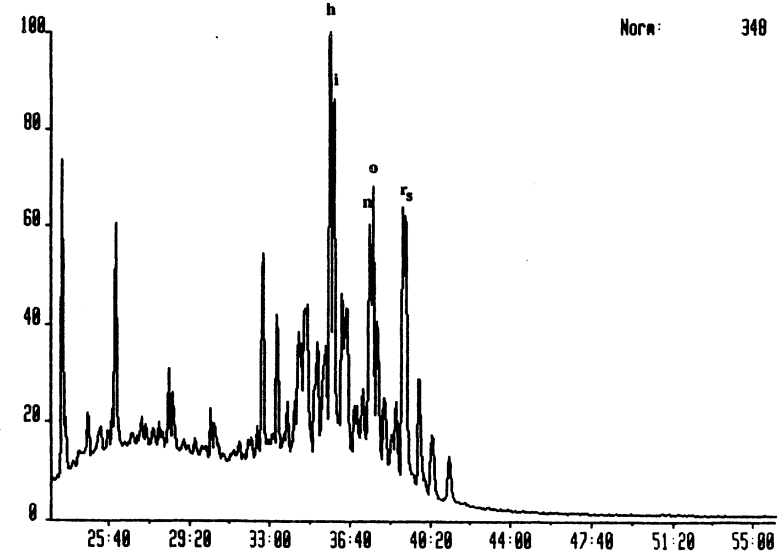
F0012 11-JAN-89 Sir:Voltage 70-E Sys: B10MARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0012 7120/89-U-01 86.56 M SST



F0012 11-JAN-89 Sir:Voltage 70-E Sys: B10MARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0012 7120/89-U-01 86.56 M SST



F0012 11-JAN-89 Sir:Voltage 70-E Sys: B10MARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0012 7120/89-U-01 86.56 M SST



Core 7128/09-U-01

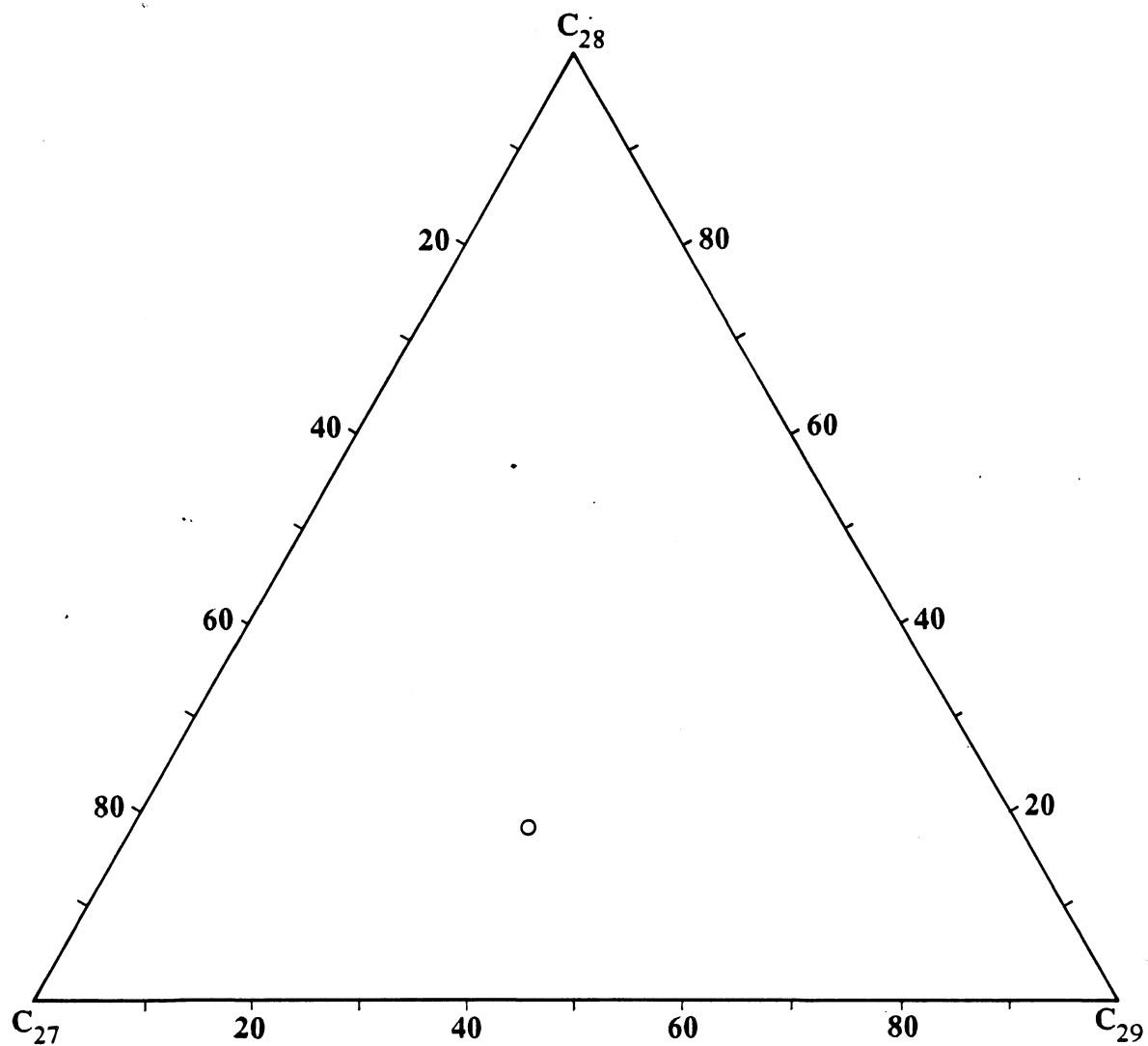


Figure A.III.6.3

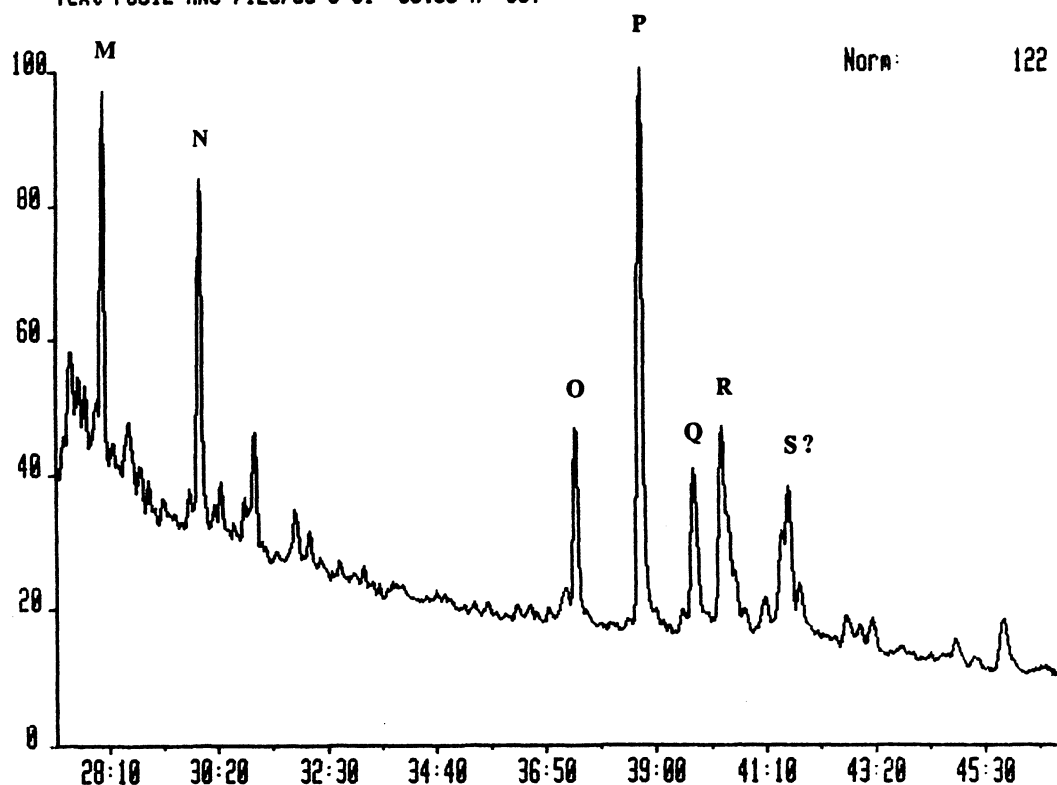
Internal distribution of 14α(H), 17α(H) 20R, C₂₇, C₂₈ and C₂₉ regular steranes (from m/z 217)

Figure A.III.6.4:

**Mass fragmentograms of m/z 231, 253
(aromatic steroid hydrocarbons)**

For peak identification see Chapter 4.

F0012AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0012 ARO 7120/09-U-01 06.56 M SST



F0012AR 27-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0012 ARO 7120/09-U-01 06.56 M SST

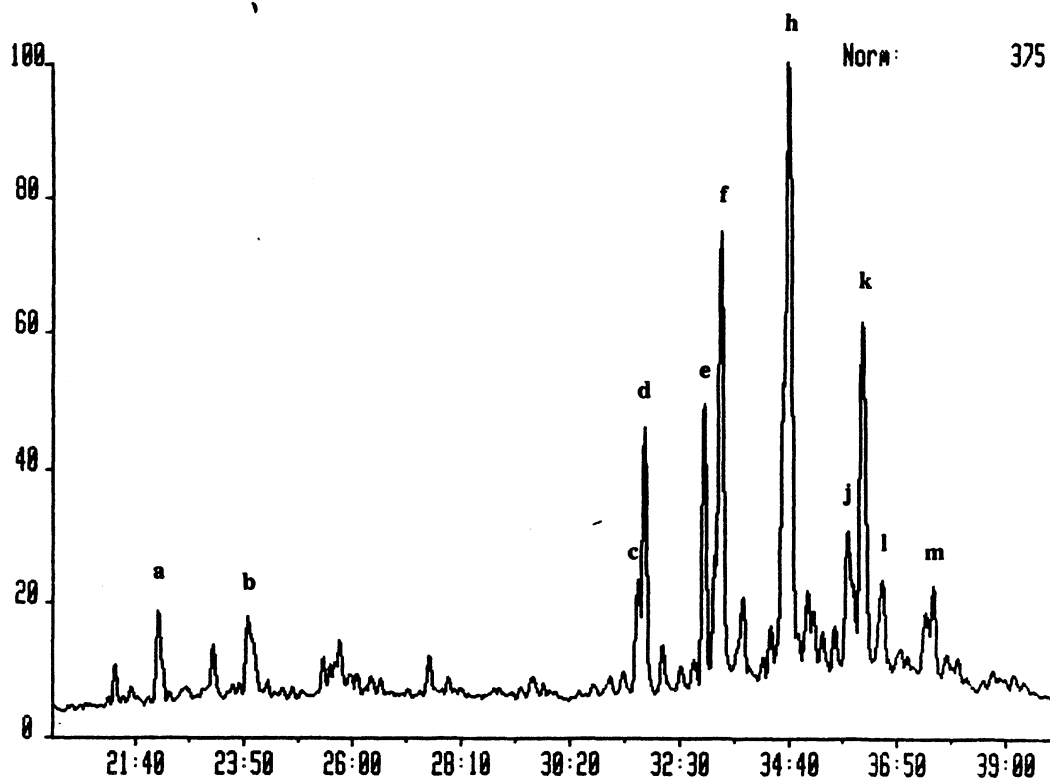
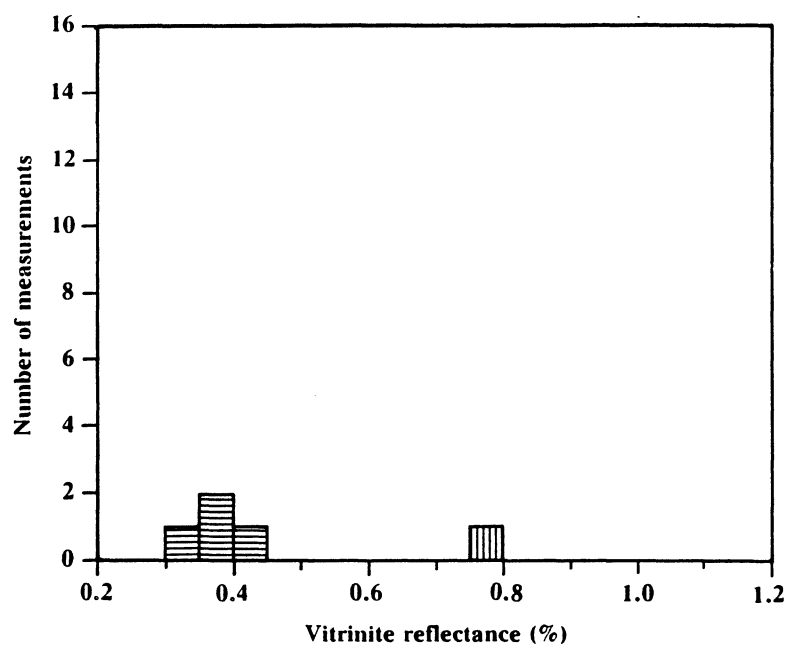


Figure A.III.6.5: Vitrinite reflectance histograms.

Core no.: 7128/09-U-01

Sample no.: F-1263

Depth: 75.31 m



	P1 = 0.37%	n = 4
	P2 = 0.79%	n = 1

APPENDIX III.7: TABLE OF CONTENTS

Core 7430/07-U-01

TABLES

Table A.III.7.1a:	Concentration of C_1-C_{5+} hydrocarbons in headspace gas.
Table A.III.7.1b:	Concentration of C_1-C_{5+} hydrocarbons in occluded gas.
Table A.III.7.1c:	Concentration of C_1-C_{5+} hydrocarbons - summation.
Table A.III.7.2:	Total organic carbon content and data from Rock-Eval pyrolysis.
Table A.III.7.3:	Data from pyrolysis-gas chromatograms.
Table A.III.7.4:	Vitrinite reflectance data.
Table A.III.7.5:	Visual kerogen analysis.
Table A.III.7.6a:	Weight of EOM, asphaltenes and chromatographic fractions.
Table A.III.7.6b:	Concentration of EOM, asphaltenes and chromatographic fractions, related to rock weight.
Table A.III.7.6c:	Concentration of EOM, asphaltenes and chromatographic fractions, related to TOC weight.
Table A.III.7.6d:	Composition of material extracted from the rock.
Table A.III.7.7:	Tabulation of data from the gas chromatograms.
Table A.III.7.8a:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity characteristic ratios.
Table A.III.7.8b:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity and source characteristic ratios.
Table A.III.7.9:	Molecular ratios from aromatic sterane mass fragmentograms.
Table A.III.7.10:	Carbon isotope ratios of EOM and chromatographic fractions.

FIGURES

Figure A.III.7.1:	Pyrolysis-gas chromatograms (S2 peak)
Figure A.III.7.2:	Gas chromatograms of saturated and aromatic hydrocarbons.
Figure A.III.7.3:	Mass fragmentograms of m/z 191, 205 (terpanes) and m/z 217, 218 (steranes).

Figure A.III.7.4: Internal distribution of $14\alpha(H)$, $17\alpha(H)$ 20R, C_{27} , C_{28} and C_{29} regular steranes (from m/z 217).

Figure A.III.7.5: Mass fragmentograms of m/z 231, 253 (aromatic steroid hydrocarbons).

Figure A.III.7.6: Vitrinite reflectance histograms.

Figure A.III.7.7: Carbon isotope type curves of sediment extracts.

Project no.: 21344423
Location : 7430/07-U-01
Date : 88.10.12

Table A.III.7.1: TABLE OF GAS RESULTS

a: Headspace gas (µl gas pr. kg rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0101	9.30	2628	0	0	0	0	0	2628	0	0.0	-1.00
F0106	13.98	15738	0	0	0	0	0	15738	0	0.0	-1.00
F0120	30.33	9278	13	0	0	0	0	9291	13	0.1	-1.00
F0121	32.10	13884	0	0	0	0	0	13884	0	0.0	-1.00
F0122	33.38	17453	19	0	0	0	0	17472	19	0.1	-1.00
F0123	34.78	17397	0	0	0	0	0	17397	0	0.0	-1.00
F0132	39.53	44633	7	0	0	0	0	44640	7	0.0	-1.00
F0140	44.38	100066	36	0	0	0	0	100102	36	0.0	-1.00
F0151	55.23	67612	19	0	0	0	0	67631	19	0.0	-1.00
F0155	66.49	16328	0	0	0	0	0	16328	0	0.0	-1.00
F0161	72.07	14764	0	0	0	0	0	14764	0	0.0	-1.00
F0182	97.38	565779	598	0	0	0	0	566377	598	0.1	-1.00
F0189	104.56	34057	6	18	0	0	0	34081	24	0.1	-1.00
F0197	111.80	13664	0	0	0	0	0	13664	0	0.0	-1.00

b: Occluded gas (µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0101	9.30	727	20	0	0	0	0	747	20	2.7	-1.00
F0106	13.98	6016	316	163	0	70	201	6565	549	8.4	0.00
F0120	30.33	2484	97	65	19	12	0	2677	193	7.2	1.58
F0121	32.10	2074	22	11	14	0	0	2121	47	2.2	-1.00
F0122	33.38	255	14	6	10	8	0	293	38	13.0	1.25
F0123	34.78	362	15	0	0	0	0	377	15	4.0	-1.00
F0132	39.53	2084	18	0	16	4	0	2122	38	1.8	4.00
F0140	44.38	3178	53	0	85	0	0	3316	138	4.2	-1.00
F0151	55.23	11561	100	10	134	14	0	11819	258	2.2	9.57
F0155	66.49	1723	16	0	5	0	0	1744	21	1.2	-1.00
F0161	72.07	4568	16	0	0	0	0	4584	16	0.3	-1.00
F0167	77.90	63553	553	7	0	0	0	64113	560	0.9	-1.00
F0182	97.38	73631	398	0	0	0	0	74029	398	0.5	-1.00
F0189	104.56	6743	32	183	43	43	107	7044	301	4.3	1.00
F0197	111.80	1943	14	9	0	0	0	1966	23	1.2	-1.00

Legend: -1 can not be determined

Project no.: 21344423
Location : 7430/07-U-01
Date : 88.10.11

Table A.III.7.1 (cont'd):

c: Summation of Headspace and Occluded gas

(μ l gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
FO101	9.30	3355	20	0	0	0	0	3375	20	0.6	-1.00
FO106	13.98	21754	316	163	0	70	201	22303	549	2.5	0.00
FO120	30.33	11762	110	65	19	12	0	11968	206	1.7	1.58
FO121	32.10	15958	22	11	14	0	0	16005	47	0.3	-1.00
FO122	33.38	17708	33	6	10	8	0	17765	57	0.3	1.25
FO123	34.78	17759	15	0	0	0	0	17774	15	0.1	-1.00
FO132	39.53	46717	25	0	16	4	0	46762	45	0.1	4.00
FO140	44.38	103244	89	0	85	0	0	103418	174	0.2	-1.00
FO151	55.23	79173	119	10	134	14	0	79450	277	0.3	9.57
FO155	66.49	18051	16	0	5	0	0	18072	21	0.1	-1.00
FO161	72.07	19332	16	0	0	0	0	19348	16	0.1	-1.00
FO167	77.90	63553	553	7	0	0	0	64113	560	0.9	-1.00
FO182	97.38	639410	996	0	0	0	0	640406	996	0.2	-1.00
FO189	104.56	40800	38	201	43	43	107	41125	325	0.8	1.00
FO197	111.80	15607	14	9	0	0	0	15630	23	0.1	-1.00

Project no.: 21344423
Location : 7430/07-U-01
Date : 88.11.25

Table A.III.7.2: DATA FROM ROCK EVAL PYROLYSIS

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F1265	BULK	10.10	CORE	-1	-1	-1	0.20	-1	-1	-1	-1	-1
F1266	BULK	11.21	CORE	0.04	0.21	0.12	0.28	75	42	0.25	0.16	(496)
F0106	BULK	13.98	CORE	-1	-1	-1	0.16	-1	-1	-1	-1	-1
F0110	BULK	15.86	CORE	0.07	0.83	0.41	1.28	64	32	0.90	0.07	433
F0113	BULK	19.08	CORE	0.00	0.17	0.58	0.41	41	141	0.17	0.00	424
F1268	BULK	21.07	CORE	-1	-1	-1	0.21	-1	-1	-1	-1	-1
F1269	BULK	23.31	CORE	-1	-1	-1	0.14	-1	-1	-1	-1	-1
F1270	BULK	25.46	CORE	-1	-1	-1	0.24	-1	-1	-1	-1	-1
F0120	BULK	30.33	CORE	-1	-1	-1	0.23	-1	-1	-1	-1	-1
F1271	BULK	31.87	CORE	-1	-1	-1	0.25	-1	-1	-1	-1	-1
F0123	BULK	34.78	CORE	-1	-1	-1	0.33	-1	-1	-1	-1	-1
F0126	BULK	37.81	CORE	1.49	79.37	2.93	26.00	305	11	80.86	0.01	432
F0129	BULK	38.88	CORE	3.44	133.11	3.44	47.90	277	7	136.55	0.02	430
F0130	BULK	38.98	CORE	0.00	0.38	0.58	1.40	27	41	0.38	0.00	436
F1273	CLST	42.82	CORE	0.03	1.95	0.66	1.92	101	34	1.98	0.01	437
F1273	SLTST	42.82	CORE	0.03	1.07	0.65	1.29	82	50	1.10	0.02	438
F0134	BULK	43.55	CORE	0.12	4.50	0.84	3.16	142	26	4.62	0.02	440
F0138	BULK	44.28	CORE	0.03	2.22	0.27	2.74	81	9	2.25	0.01	439
F0145	BULK	50.24	CORE	1.12	70.04	1.62	30.80	227	5	71.16	0.01	432
F0146	BULK	50.33	CORE	0.02	2.44	0.63	3.62	67	17	2.46	0.00	436
F1274	SLTST	52.90	CORE	0.01	0.85	0.46	0.89	95	51	0.86	0.01	439
F1274	CLST	52.90	CORE	0.04	1.59	0.71	1.76	90	40	1.63	0.02	436
F0150	BULK	54.58	CORE	0.01	0.94	1.80	1.31	71	137	0.95	0.01	434
F1275	BULK	56.33	CORE	-1	-1	-1	0.13	-1	-1	-1	-1	-1
F1276	CLST	57.89	CORE	0.03	1.65	0.93	1.63	101	57	1.68	0.01	435
F1276	SLTST	57.89	CORE	0.01	0.85	0.94	0.99	85	94	0.86	0.01	435
F0153	BULK	59.83	CORE	0.07	0.84	2.39	1.43	58	167	0.91	0.07	438
F0154	BULK	64.74	CORE	2.88	132.88	5.55	50.00	265	11	135.76	0.02	430
F1278	BULK	67.84	CORE	0.02	1.53	1.01	2.60	58	38	1.55	0.01	436
F0159	BULK	70.74	CORE	0.03	1.23	0.83	1.62	75	51	1.26	0.02	435
F1279	BULK	73.53	CORE	0.01	1.05	0.12	1.18	88	10	1.06	0.00	434
F0163	BULK	75.15	CORE	0.00	0.30	0.20	0.98	30	20	0.30	0.00	429
F1280	BULK	76.11	CORE	0.74	41.14	0.74	16.80	244	4	41.88	0.01	433
F0165	BULK	77.23	CORE	0.27	17.50	0.45	7.40	236	6	17.77	0.01	428
F1281	BULK	78.35	CORE	3.46	164.08	5.51	70.70	232	7	167.54	0.02	424
F1282	BULK	77.58	CORE	0.24	19.95	0.69	8.20	243	8	20.19	0.01	430
F0168	BULK	77.95	CORE	2.56	118.17	3.41	47.80	247	7	120.73	0.02	422
F0172	BULK	80.40	CORE	0.06	0.75	2.35	1.41	53	166	0.81	0.07	439
F0173	BULK	83.08	CORE	0.61	57.65	2.19	27.54	220	8	58.26	0.01	429
F1283	BULK	83.22	CORE	0.50	46.03	0.84	22.80	201	3	46.53	0.01	428
F1284	BULK	83.60	CORE	0.00	0.21	0.92	0.30	70	306	0.21	0.00	(482)
F0174	BULK	86.20	CORE	0.01	0.16	0.81	0.31	51	261	0.17	0.05	438
F1285	BULK	87.94	CORE	0.03	0.48	0.47	0.48	100	97	0.51	0.05	434
F0178	BULK	89.84	CORE	0.00	0.31	0.31	0.46	67	67	0.31	0.00	(473)
F1287	BULK	92.97	CORE	-1	-1	-1	0.14	-1	-1	-1	-1	-1

Project no.: 21344423
Location : 7430/07-U-01
Date : 88.11.25

Table A.III.7.2 (cont'd):

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F1288	BULK	95.94	CORE	-1	-1	-1	0.31	-1	-1	-1	-1	-1
F1289	BULK	97.73	CORE	2.62	107.04	2.45	50.50	211	4	109.66	0.02	424
F0185	BULK	99.85	CORE	0.00	0.22	0.23	0.50	44	46	0.22	0.00	441
F0187	BULK	102.05	CORE	0.00	0.48	0.16	0.59	81	27	0.48	0.00	(470)
F0189	BULK	104.56	CORE	0.01	0.43	0.11	0.64	67	17	0.44	0.02	(452)
F0191	BULK	105.86	CORE	0.15	6.39	0.30	3.28	194	9	6.54	0.02	434
F1290	BULK	106.75	CORE	0.99	46.67	0.62	21.80	205	2	47.66	0.02	426
F1291	BULK	107.23	CORE	0.10	2.51	0.53	1.96	128	27	2.61	0.03	436
F1292	BULK	107.96	CORE	0.14	7.89	0.75	4.27	184	17	8.03	0.01	430
F0195	BULK	109.28	CORE	0.11	2.27	0.18	2.30	98	7	2.38	0.04	437
F1293	BULK	110.32	CORE	-1	-1	-1	0.40	-1	-1	-1	-1	-1
F0199	BULK	113.72	CORE	0.11	4.95	0.39	3.88	127	10	5.06	0.02	430
F1294	BULK	114.12	CORE	-1	-1	-1	0.23	-1	-1	-1	-1	-1
F0201	BULK	115.20	CORE	0.06	1.75	1.04	2.29	76	45	1.81	0.03	437
F0204	BULK	117.17	CORE	0.33	11.50	2.09	5.88	195	35	11.83	0.02	432

Legend:

-1 : Not determined or no data available

(): Tmax values of doubtful reliability (usually associated with poor S2 peaks)

Table A.III.7.3: Data from pyrolysis-gas chromatograms

Core 7430/07-U-01							
IKU NO	DEPTH (m)	SAMPLE TYPE	LITHOLOGY	C1	C2-C6 percent of peak area	C6-C14	C15+
F0126	37.81	Core	Coal/Clayst.	6.8	16.9	36.1	40.2
F1273	42.82	Core	Claystone	25.5	21.8	44.8	7.9
F1273	42.82	Core	Siltstone	22.4	33.9	42.6	1.2
F0165	77.23	Core	Siltstone	13.4	11.3	43.6	31.7
F1281	78.35	Core	Coal	17.0	10.8	32.5	39.7
F1290	106.75	Core	Coal	9.9	15.1	27.7	47.3
F1292	107.96	Core	Claystone	18.2	17.3	42.9	21.6
F0204	117.17	Core	Claystone	18.4	17.2	40.3	24.1

Core-site Number: 7430/07-U-01
Reference number: 21.3444.23
(1/1)

Table A.III.7.4: VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
F- 124	-----	37.81	0.45 (25)	G	0.07	2-4
F- 129	-----	38.88	0.40 (25)	F	0.06	2-4
F- 144	-----	50.23	0.40 (25)	F	0.07	2-4,5
F- 145	-----	50.24	0.37 (30)	F	0.06	2-5
F- 154	-----	64.74	0.58 (29)	?	0.08	4-7
F-1281	-----	78.35	0.43 (30)	G	0.07	2-4
F-1283	-----	83.22	0.36 (23)	G	0.07	2-4
F-1290	-----	106.75	0.38 (30)	G	0.06	2-4

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor;
I = Inertinite. L = Liptinite or poor vitrinite particle.
R = Reworked material/inertinite.

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.7.5
CORE NO.: 7430/07-U-01

Sample	Depth (m)	Compo- sition of residue %	Particle size	Preser- vation palyno- morphs	Thermal maturation index * New TAI	Remarks
F-125	37.83	Lm: 10 W: 60 C: 30	F-M-L	fair-good	4.0-4.5	Wood brown/black, dominating, often large particles. Lm consists of terrestrial palynomorphs.
F-128	38.13	Am: 40(?) Lm: 10 W: 40 C: 10	F-M-L	good	4.0-4.5	Dominated by fine-particulate amorphous matter (?) together with brown-black woody fragments.
F-1332	42.90 m	Lm: 5-10 W: 30 C: 50-60	F-M	good	2 - 3	The liptinitic fraction is dominated by palynomorphs.
F-1331	42.91 m	Lm: <5 W: 5-10 C: 80-90	F-M		2 - 3	
F-142	50.21	Lm: 10 W: 50 C: 10	F-M	fair	4.0-4.5	Dominated by large sheets and brown-black wood together with coaly fragments. Liptinic material consists mostly of thinwalled spores.

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

ANL WP22/RAPPORT/BG5/ame/1/19-FEB-89

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.7.5 (ctd)
CORE NO.: 7430/07-U-01

Sample	Depth (m)	Composition of residue %	Particle size	Preservation palynomorphs	Thermal maturation index * New TAI	Remarks
F-156	73.76	Lm: <5 W: ≈50 C: ≈50	F-M-L	fair	4.0-4.5	Wood and coal fragments degraded ? (Pollutions!)
F-1281	78.15- 78.35	Lm: <1 W: 5-10 C: 90-95	F-M-L		3 - 4	Dominated by black coaly fragments.
F-177	88.23	Lm: 50 W: 10 C: 40	F-M	good/ excellent	4.0-4.5	Dominated by core preserved spores (monolites) together with coaly fragments.
F-200	113.72	Am: 20 Lm: 10 W: 50 C: 20	F-M-L	good	4.5-5.5	Wood fragments consists of large sheets. Amorphous matter fineparticulate. Lm consists of terr. palyn.
F-202	115.20	Lm: 10 W: 70 C: 20	F-M-L	fair-good	4.0-4.5	Wood fragments dominating, consist mainly of large sheets.

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

Project no.: 21344423
 Location : 7430/07-U-01
 Date : 89.02.02

Table A.III.7.6a: WEIGHT OF CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ROCK EXTR. (g)	EOM (mg)	ASPH (mg)	SAT HC (mg)	ARO HC (mg)	POLAR COMP. (mg)	HC (mg)	NONHC (mg)	TOC (%)
FO126	BULK	37.81	CORE	10.7	97.5	48.7	6.6	18.8	16.2	25.4	72.1	26.00
F1273	CLST	42.82	CORE	13.4	25.6	15.4	2.1	2.7	4.2	4.8	20.8	1.92
F1273	SLTST	42.82	CORE	3.2	7.8	5.2	0.6	1.6	1.7	2.2	5.6	1.29
FO165	BULK	77.23	CORE	16.3	84.8	53.5	6.4	11.4	10.2	17.8	67.0	7.40
F1281	BULK	78.35	CORE	15.1	783.2	528.8	20.7	110.0	85.7	130.7	652.5	70.70
F1289	BULK	97.73	CORE	13.4	428.6	291.4	10.8	51.0	38.3	61.8	366.8	50.50
F1290	BULK	106.75	CORE	22.5	220.6	116.3	12.8	23.6	33.7	36.4	184.2	21.80
F1292	BULK	107.96	CORE	9.1	30.2	20.4	1.3	3.1	4.1	4.4	25.8	4.27
FO204	BULK	117.17	CORE	16.4	82.0	57.3	3.1	7.6	7.9	10.7	71.3	5.88

Legend:

- * - Not all the available EOM was used for MPLC.
 ? - MPLC results assumed more EOM than originally extracted.
 -1- No data available.

Table A.III.7.6b: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
FO126	BULK	37.81	CORE	9104	4547	616	1754	1510	2370	6734
F1273	CLST	42.82	CORE	1912	1150	153	199	316	352	1560
F1273	SLTST	42.82	CORE	2430	1620	187	487	524	674	1756
FO165	BULK	77.23	CORE	5207	3285	392	702	626	1094	4113
F1281	BULK	78.35	CORE	51901	35043	1374	7289	5676	8663	43238
F1289	BULK	97.73	CORE	31978	21741	808	3809	2856	4617	27361
F1290	BULK	106.75	CORE	9811	5172	568	1048	1498	1616	8195
F1292	BULK	107.96	CORE	3312	2237	146	345	451	491	2821
FO204	BULK	117.17	CORE	4991	3488	186	461	483	647	4344

Legend:

- 1- No data available.

Project no.: 21344423
Location : 7430/07-U-01
Date : 89.02.02

Table A.III.7.6c: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F0126	BULK	37.81	CORE	35.0	17.5	2.4	6.7	5.8	9.1	25.9
F1273	CLST	42.82	CORE	99.6	59.9	8.0	10.3	16.4	18.3	81.3
F1273	SLTST	42.82	CORE	188.4	125.6	14.5	37.7	40.6	52.2	136.2
F0165	BULK	77.23	CORE	70.4	44.4	5.3	9.5	8.5	14.8	55.6
F1281	BULK	78.35	CORE	73.4	49.6	1.9	10.3	8.0	12.2	61.2
F1289	BULK	97.73	CORE	63.3	43.1	1.6	7.5	5.7	9.1	54.2
F1290	BULK	106.75	CORE	45.0	23.7	2.6	4.8	6.9	7.4	37.6
F1292	BULK	107.96	CORE	77.6	52.4	3.4	8.1	10.6	11.5	66.1
F0204	BULK	117.17	CORE	84.9	59.3	3.2	7.8	8.2	11.0	73.9

Legend:

-1- No data available.

Table A.III.7.6d: COMPOSITION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ASPH ----- EOM (%)	SAT --- EOM (%)	ARO --- EOM (%)	HC --- EOM (%)	POLAR ----- EOM (%)	SAT --- ARO x 100	HC ----- NONHC x 100
F0126	BULK	37.81	CORE	49.9	6.8	19.3	26.1	16.6	35.1	35.2
F1273	CLST	42.82	CORE	60.2	8.0	10.4	18.4	16.5	77.3	22.6
F1273	SLTST	42.82	CORE	66.7	7.7	20.0	27.7	21.6	38.5	38.4
F0165	BULK	77.23	CORE	63.1	7.5	13.5	21.0	12.0	55.9	26.6
F1281	BULK	78.35	CORE	67.5	2.6	14.0	16.6	10.9	18.9	20.0
F1289	BULK	97.73	CORE	68.0	2.5	11.9	14.4	8.9	21.2	16.9
F1290	BULK	106.75	CORE	52.7	5.8	10.7	16.5	15.3	54.2	19.7
F1292	BULK	107.96	CORE	67.5	4.4	10.4	14.8	13.6	42.3	17.4
F0204	BULK	117.17	CORE	69.9	3.7	9.2	12.9	9.7	40.3	14.9

Legend:

-1- No data available.

Project no.: 21344423
Location : 7430/07-U-01
Date : 89.02.05

Table A.III.7.7:

RATIOS DERIVED FROM GAS CHROMATOGRAMS OF SATURATED HYDROCARBONS

IKUNO	FRAC NAME	DEPTH	Pri	Pri	Phy	A	n-C17	n-C31	CPI 1	CPI 2
			--- Phy	A=--- n-C17	B=--- n-C18	---	---	---		
F0126	BULK	37.81	6.8	2.2	0.3	7.0	0.6	0.6	1.6	1.8
F1273	SLST	42.82	1.7	1.9	0.7	2.7	0.5	0.5	1.5	1.5
F1273	CLST	42.82	2.8	2.5	0.5	4.6	0.2	1.2	1.4	1.4
F0165	BULK	77.23	5.6	2.0	0.3	5.8	0.3	0.9	2.0	2.2
F1281	BULK	78.35	9.2	6.5	0.6	10.0	0.2	2.0	1.6	1.5
F1281	EXTPY	78.35	3.0	0.6	0.2	3.3	0.8	0.7	1.1	1.0
F1281	EXPPY	78.35	4.3	1.7	0.3	5.0	0.4	1.2	1.2	1.1
F1289	BULK	97.73	6.9	3.9	0.5	7.2	0.2	0.8	2.1	2.7
F1290	BULK	106.75	7.4	3.6	0.5	7.6	0.2	0.8	2.1	2.3
F1292	BULK	107.96	4.3	3.2	0.6	5.0	0.2	1.8	2.0	2.2
F0204	BULK	117.17	4.5	2.5	0.6	4.4	0.3	0.9	2.2	2.6

-1 = No data available

Table A.III.7.8a:

Molecular ratios from sterane and terpane mass chromatograms.

Maturity ratios.

Core 7430/07-U-01

Code	Depth (m)	$\alpha\beta/\alpha\beta+\beta\alpha^{1)}$	%22S ²⁾	% $\beta\beta^{3)}$	%20S ⁴⁾
F-126	37.81	0.77	52.5	54.9	11.8
F-1273d	42.82	0.76	48.9	68.4	14.6
F-1273sl	42.82	0.76	51.9	65.8	21.1
F-165	77.23	0.78	54.5	52.5	12.9
F-1281	78.35	0.74	57.3	54.0	11.2
F-1290	106.75	0.76	54.7	59.4	13.9
F-1292	107.96	0.80	53.3	58.5	13.4

1) $E/(E+F)$ in m/z 191.

2) Average % distribution between first and second eluting isomers of extended hopanes.

3) $100 * 2(r+s)/(q+t+2(r+s))$ in m/z 217.

4) $100 * q/(q+t)$ in m/z 217.

Table A.III.7.8b:

*Molecular ratios from terpane and sterane mass chromatograms.
Maturity and source characteristic ratios.
Core 7430/07-U-01*

Code	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
F-126	37.81	-	-	0.07	0.13	-
F-1273d	42.82	0.10	-	0.04	1.01	0.80
F-1273s1	42.82	0.15	-	0.04	0.77	0.71
F-165	77.23	-	-	0.05	0.20	0.57
F-1281	78.35	-	-	0.03	0.19	0.53
F-1290	106.75	-	-	0.05	0.35	0.56
F-1292	107.96	-	-	0.04	0.48	0.66

¹⁾ Relative abundance of tricyclic terpanes (Q/E in m/z 191).

²⁾ B/A in m/z 191.

³⁾ Relative abundance of unknown (X/E in m/z 191).

⁴⁾ Relative abundance of bisnorhopane (Z/E in m/z 191).

⁵⁾ Relative abundance of C₂₇ rearranged steranes (a/(a+j) in m/z 217).

Table A.III.7.9: Molecular ratios from mass fragmentograms of aromatic steroid hydrocarbons.

Core 7430/07-U-01

IKUNO	Depth m	Cracking ratios			Aromatisation ratios	
		20/20+27	20/20+28	21/21+28	27t/27t+28m	28t/28t+29m
		tri	tri	mono		
		1)	2)	3)	4)	5)
F1026	37.81	0.28	0.34	0.11	0.14	0.14
F1273 Clst	42.82	0.68	0.70	0.21	0.07	0.09
F1273 Sltst	42.82	0.45	0.63	0.16	0.08	0.07
F0165	77.23	0.28	0.22	0.06	0.07	0.13
F1281	78.35	0.42	0.43	0.13	0.10	0.14
F1290	106.75	0.59	0.60	0.17	0.09	0.11
F1292	107.96	0.53	0.51	0.16	0.08	0.12

1) $M/(M+P)$ in m/z 231

2) $M/(M+S)$ in m/z 231

3) $a/(a+h)$ in m/z 253

4) $P/(P+h)$ in m/z 231 and m/z 253

5) $S/(S+m+(k*S/(S+R)))$ in m/z 231 and m/z 253

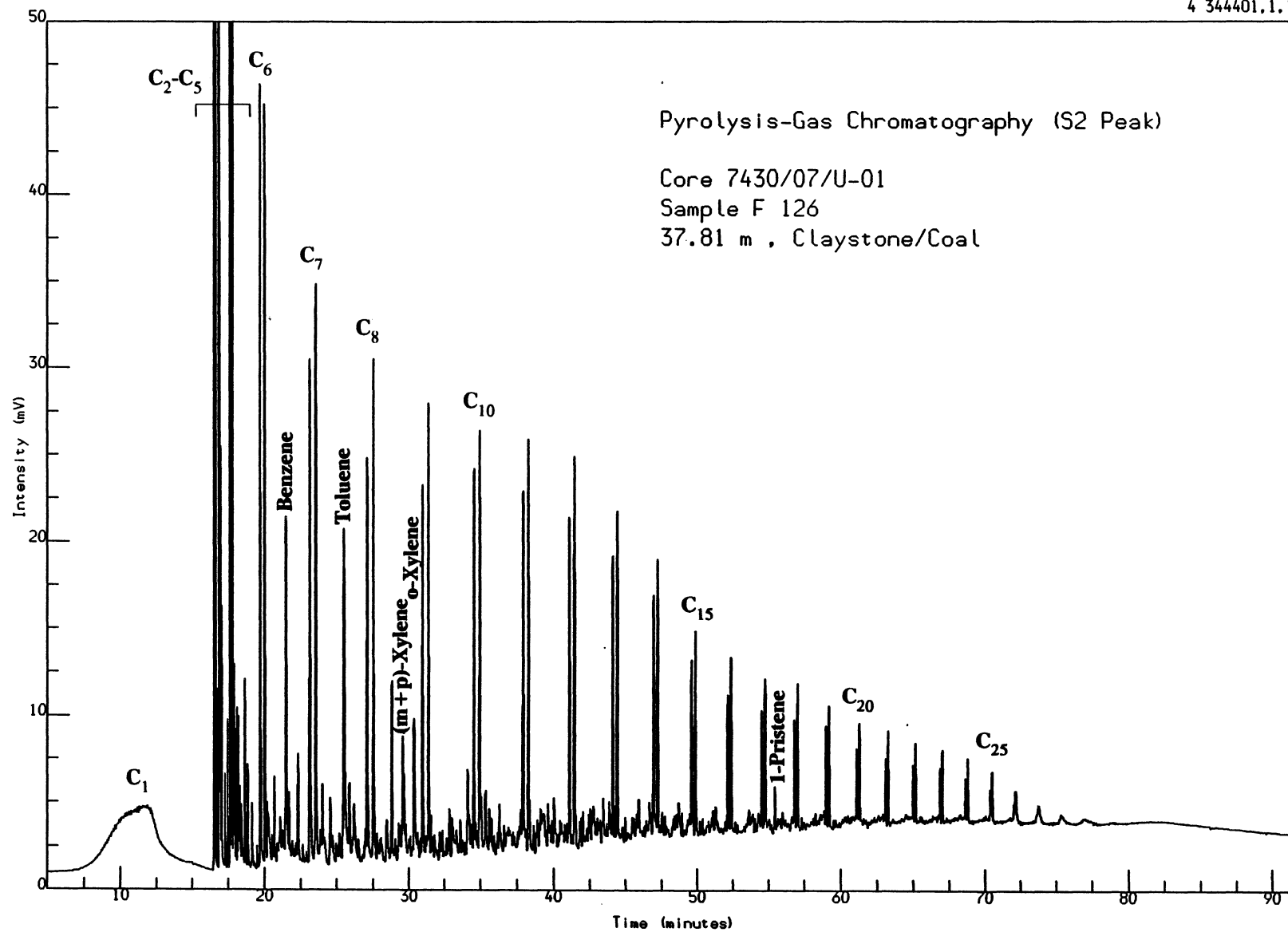
Table A.III.7.10: Carbon isotope ratios for EOM and extract fractions

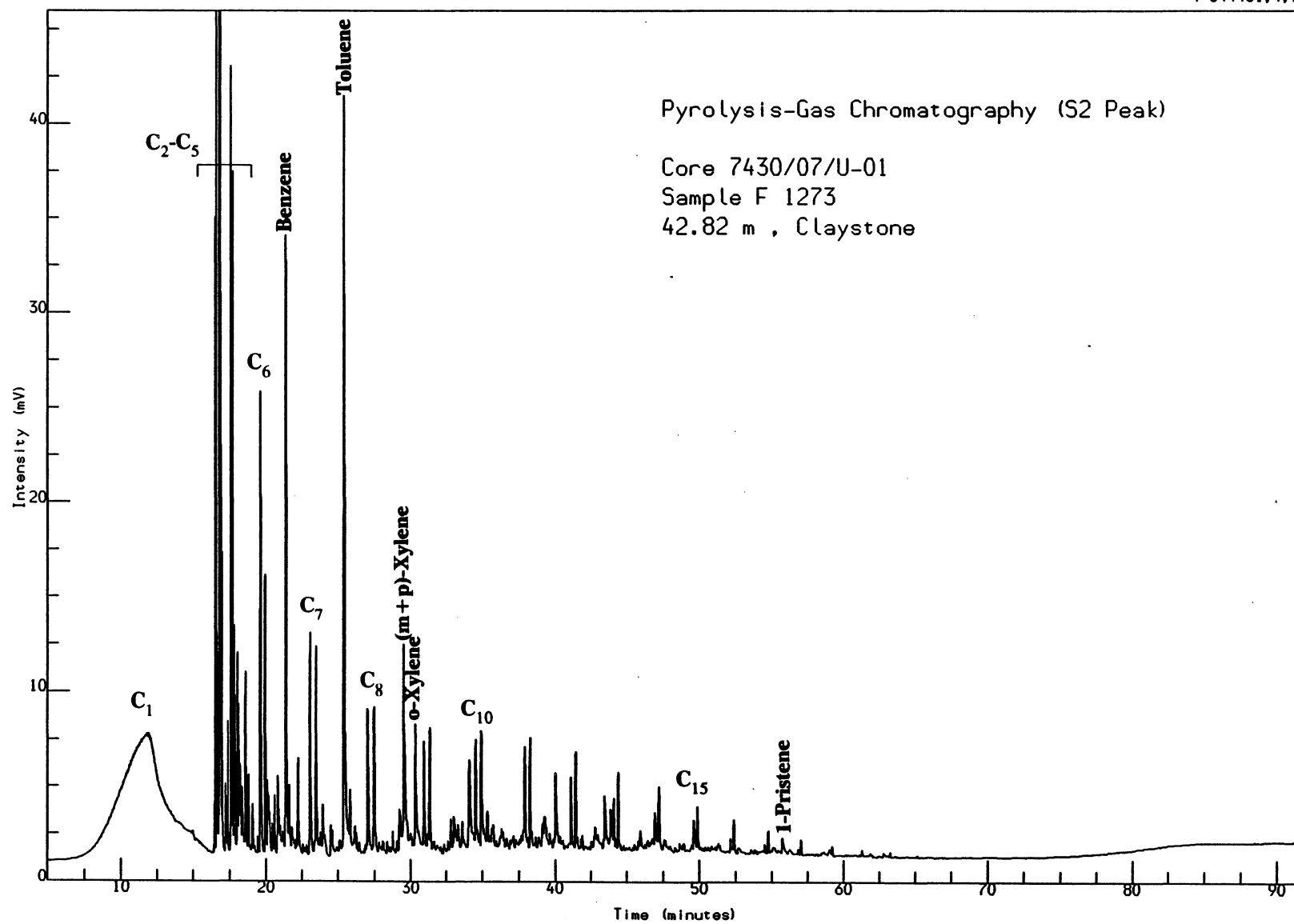
Core 7430/07-U-01

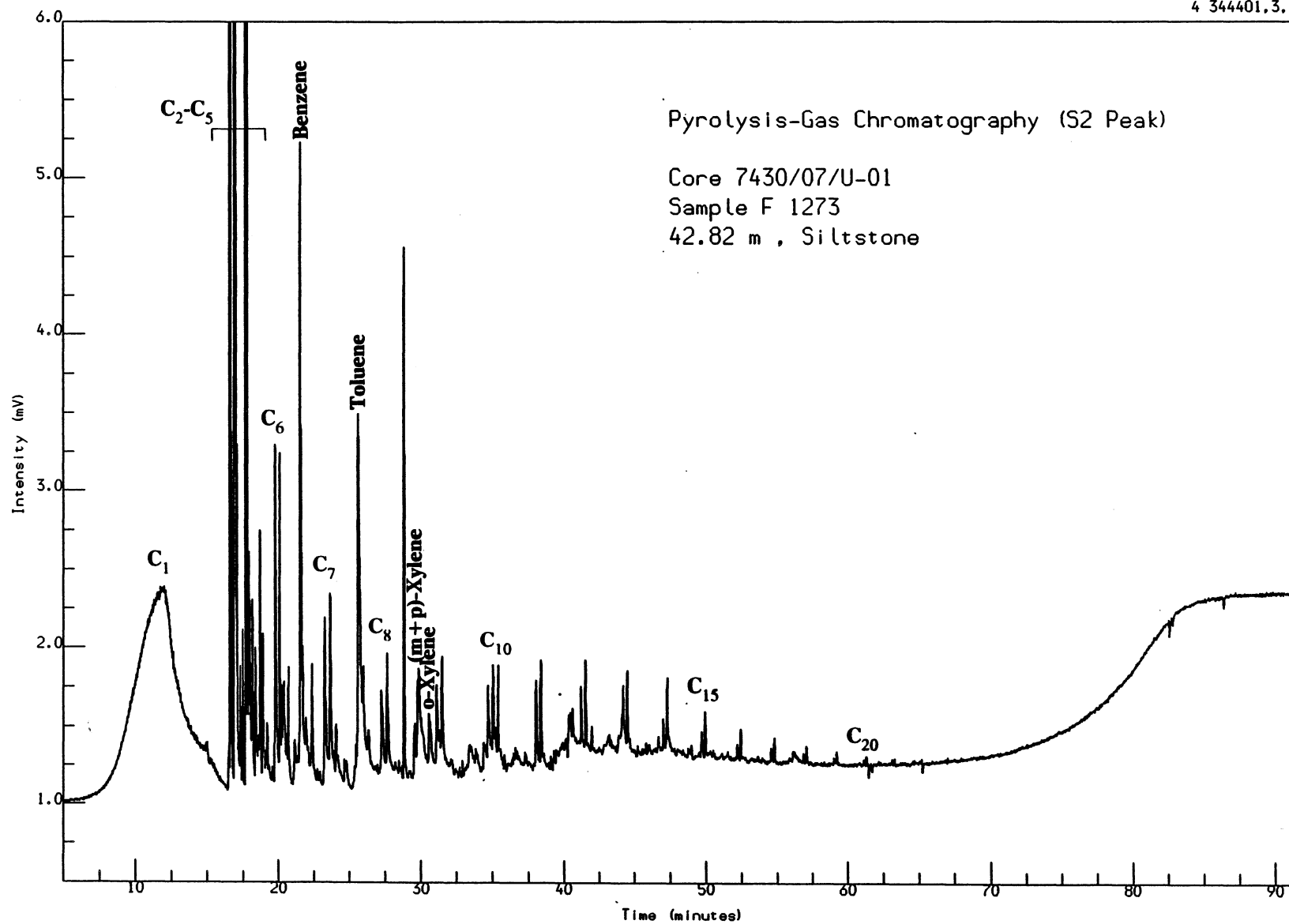
IKU no.	Depth (m)	SAT	d13C (0/00 PDB)			
			ARO	Polars	Asph.	EOM
F0126	37.81	-29.49	-27.35	-26.77	-25.28	-26.17
F1281	78.35	-27.45	-25.57	-25.37	-24.56	-24.58

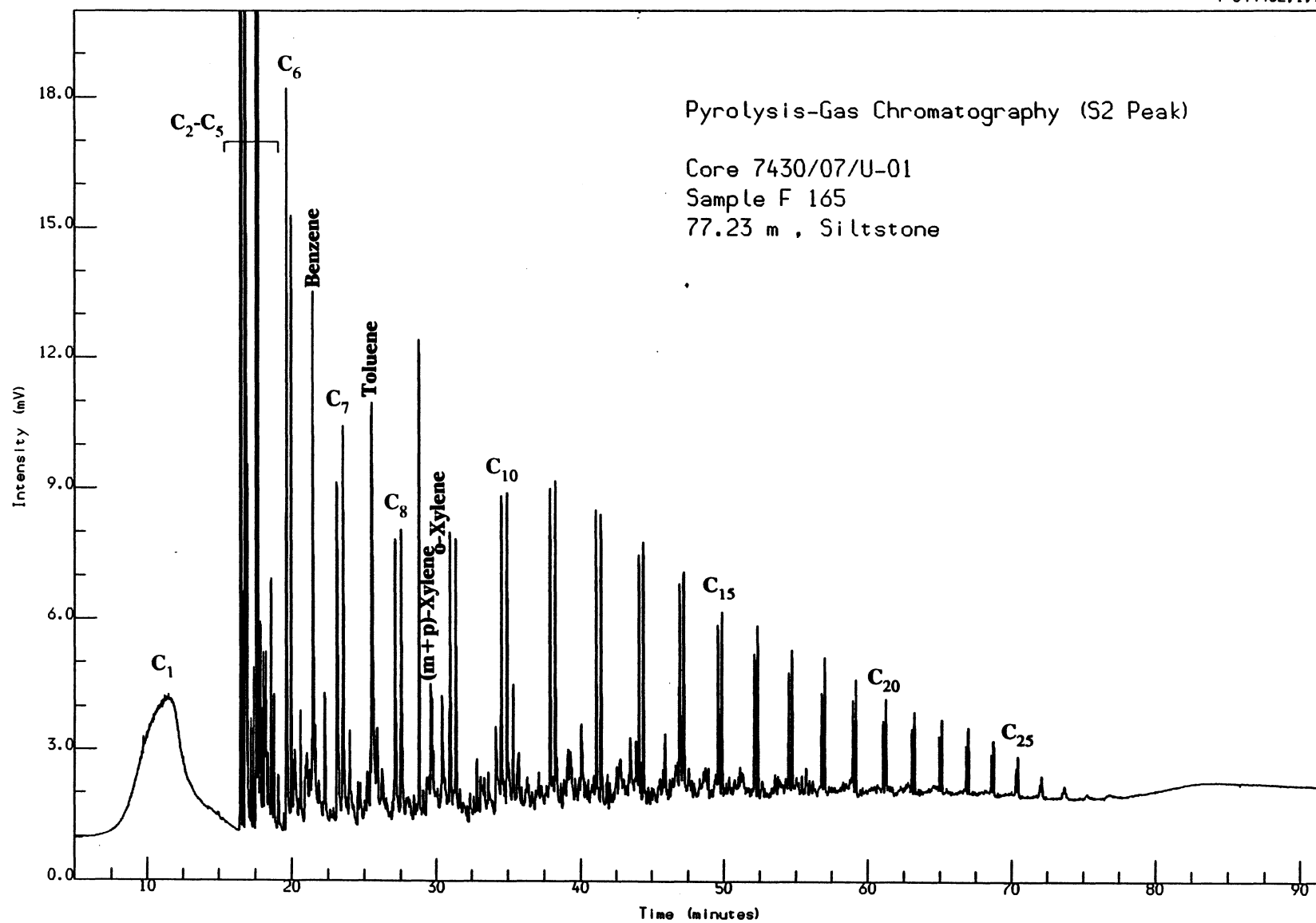
Figure A.III.7.1:

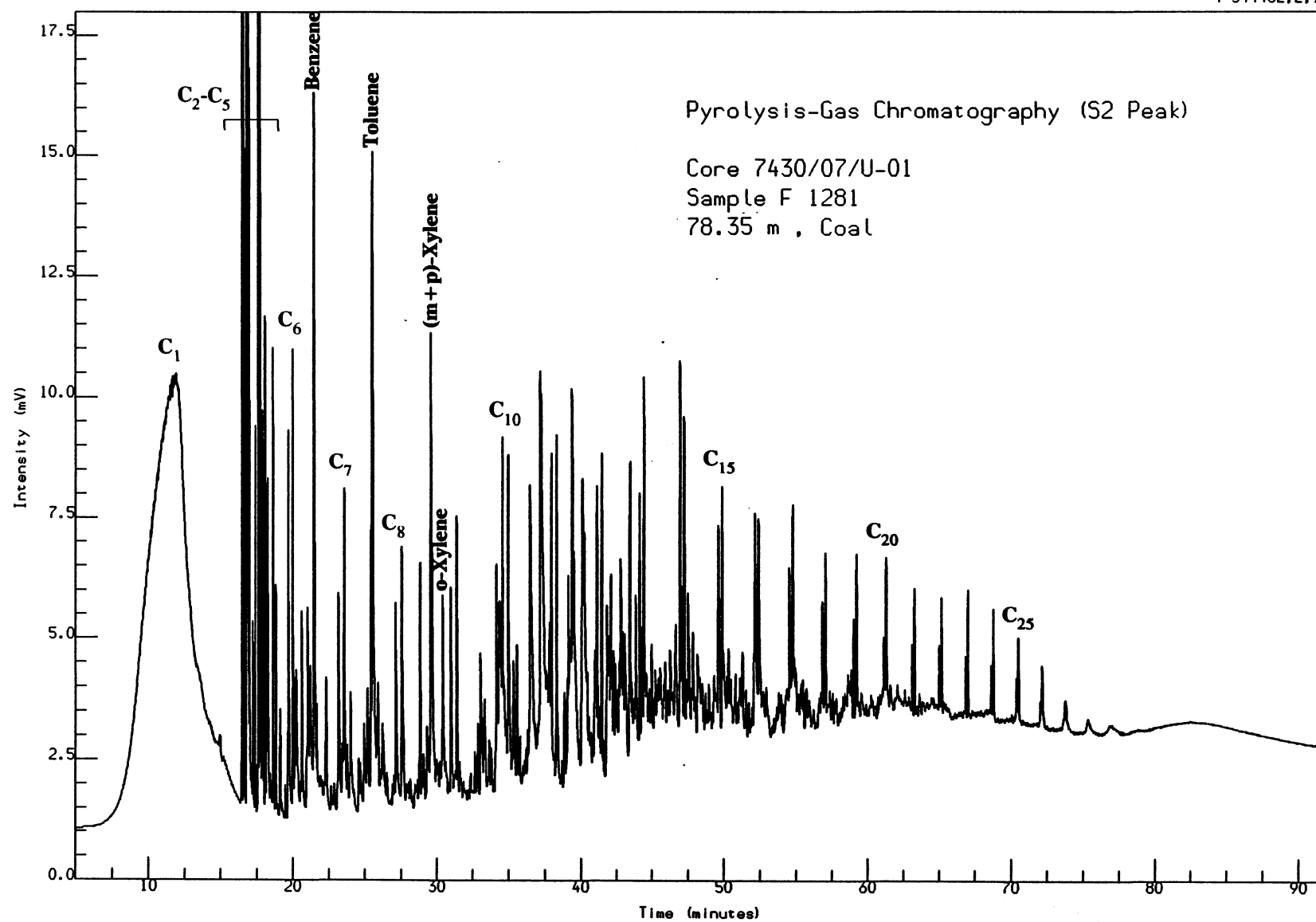
Pyrolysis-gas chromatograms (S2 peak)

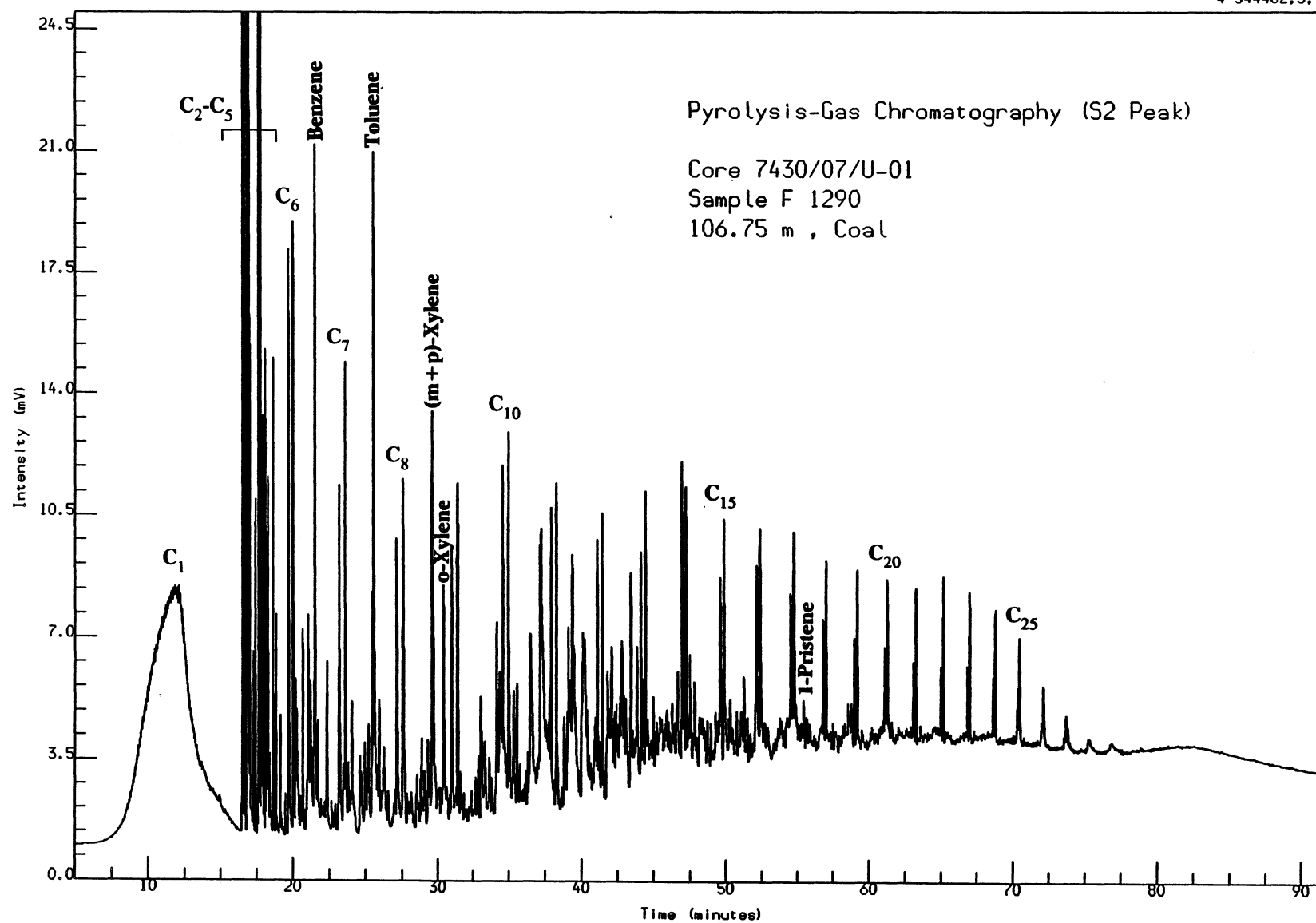


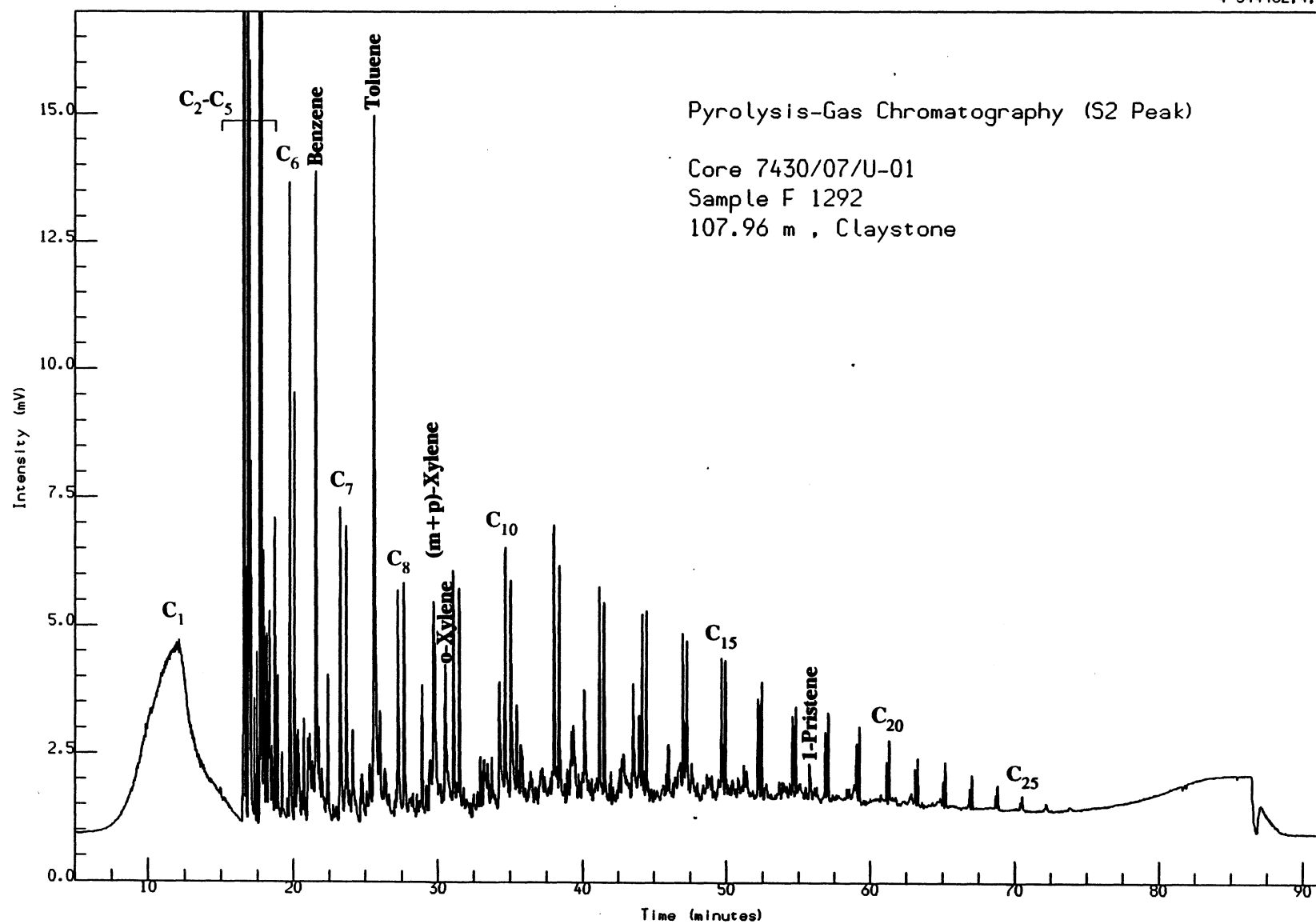












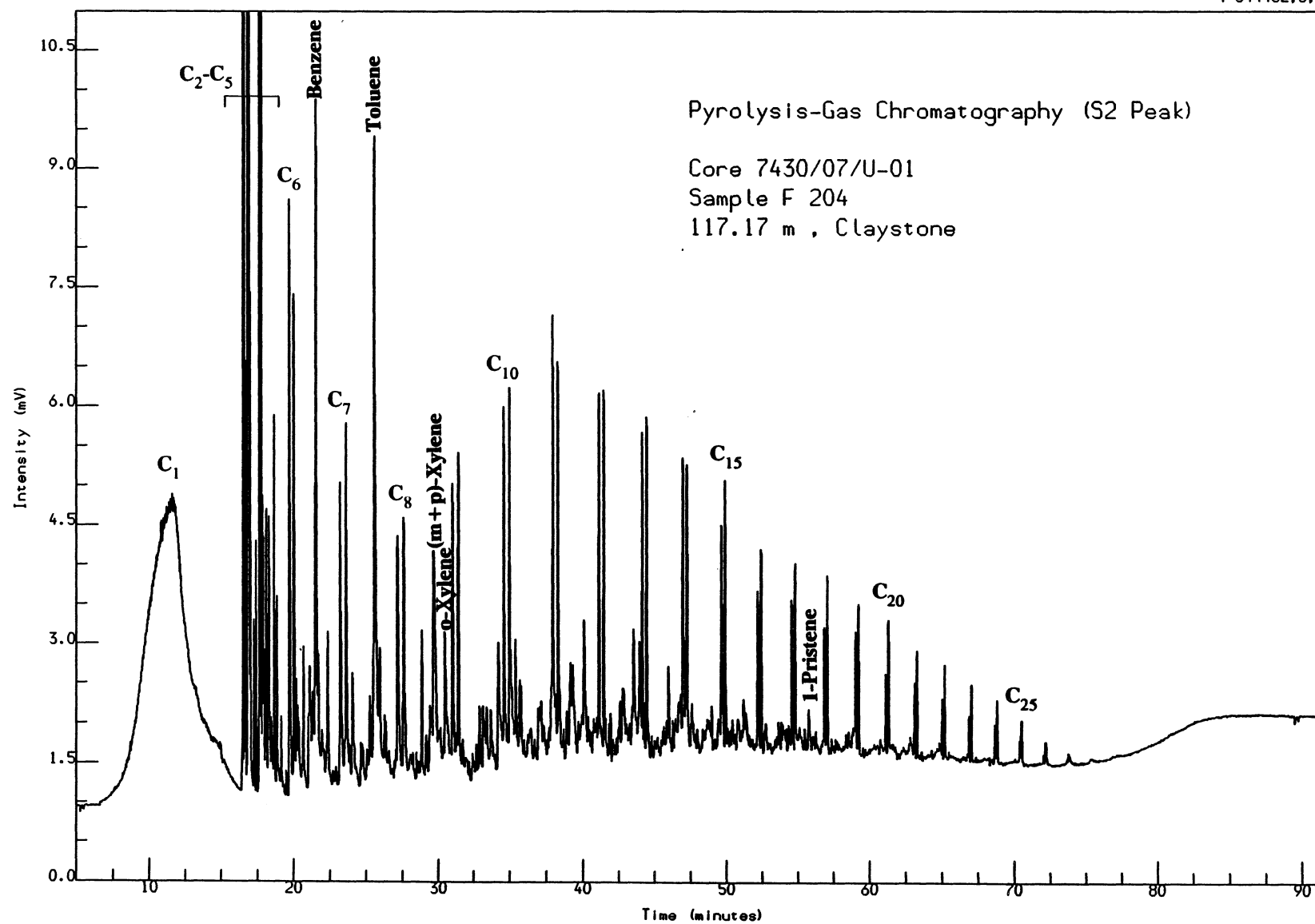
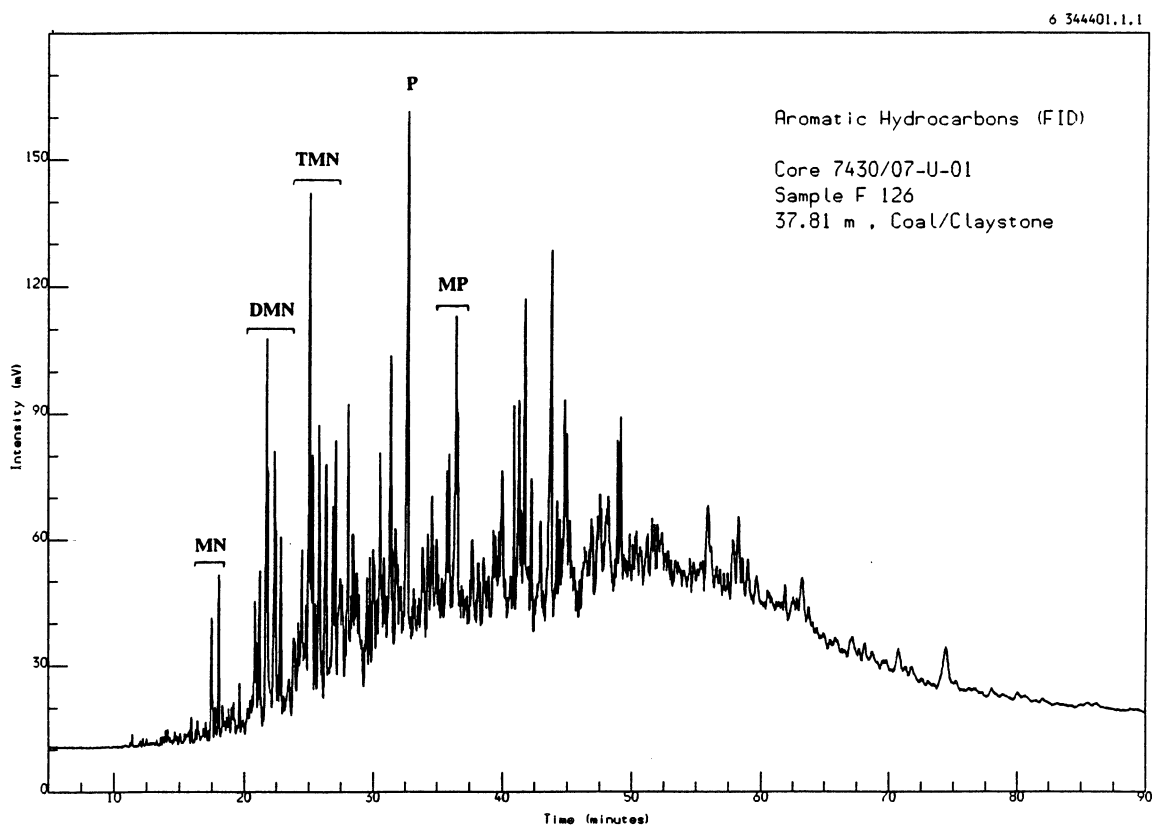
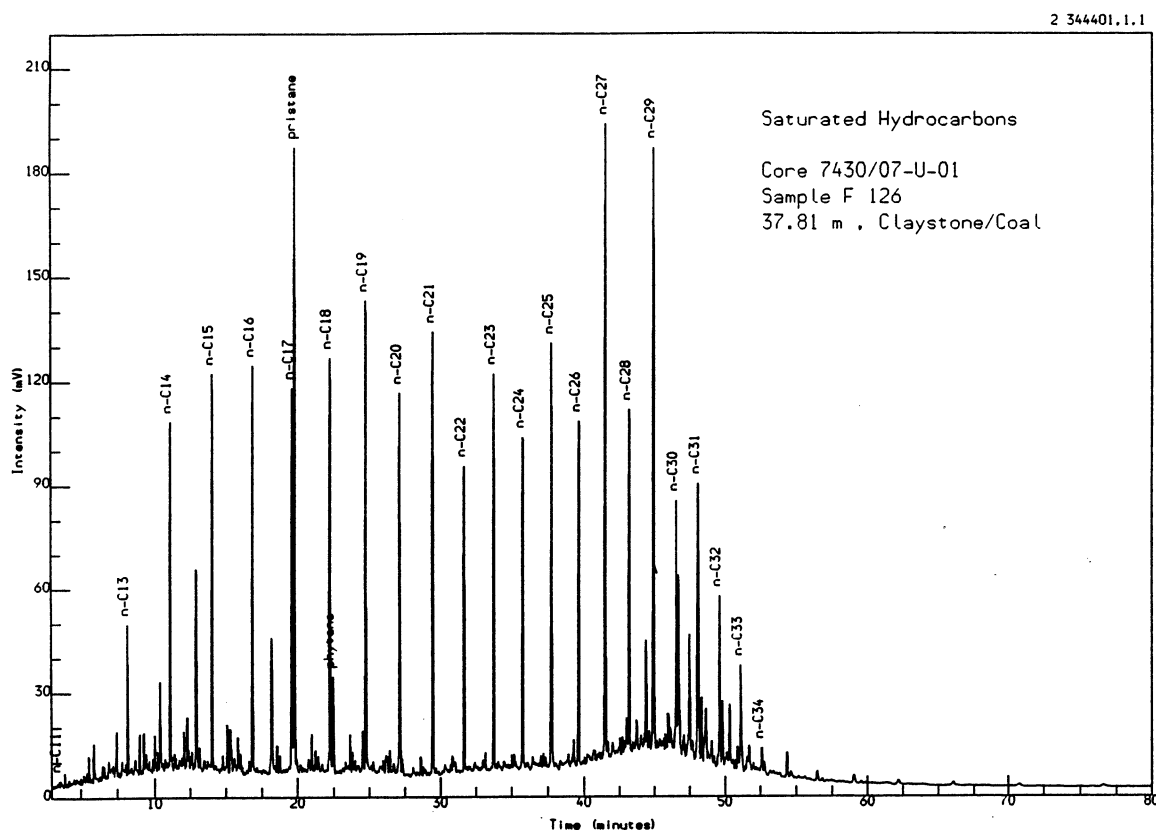


Figure A.III.7.2:

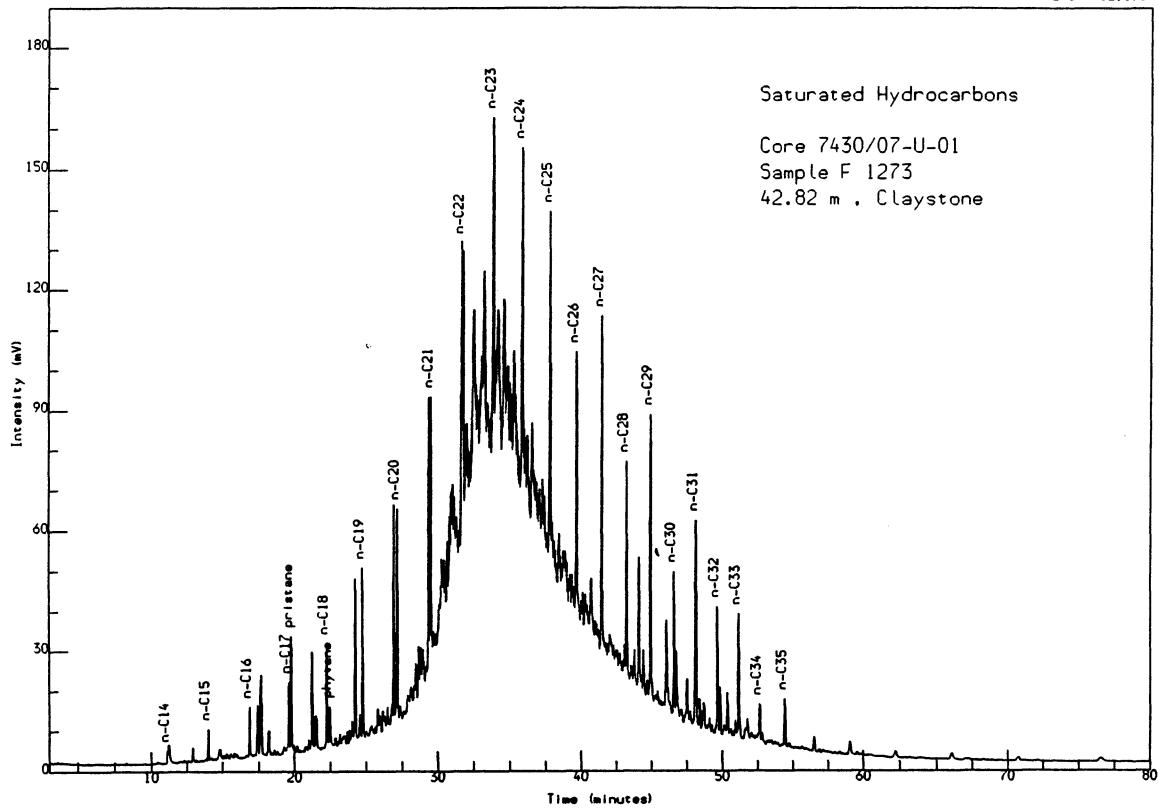
Gas chromatograms of saturated and aromatic hydrocarbons

n-C₁₅ etc. - n-alkanes

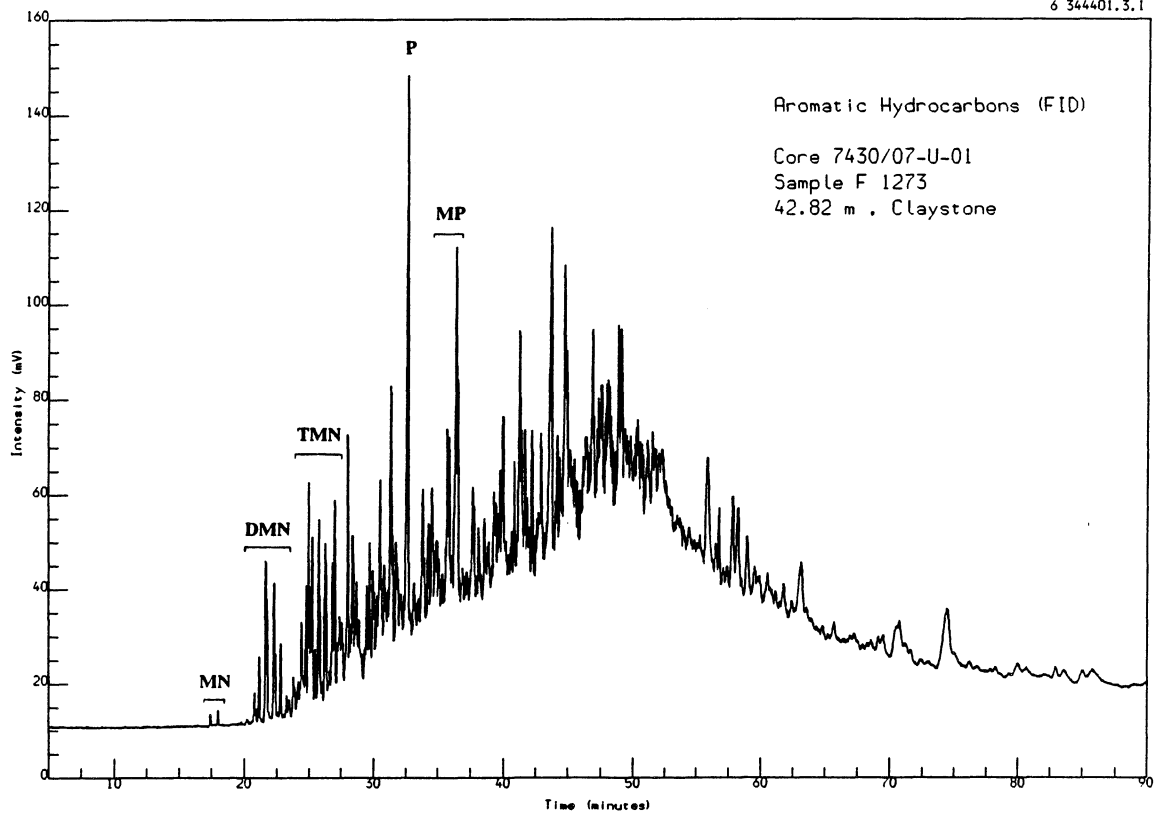
N	- Naphthalene
MN	- Methylnaphthalenes
DMN	- Dimethylnaphthalenes
TMN	- C ₃ -naphthalenes
P	- Phenanthrene
PN	- Methylphenanthrenes
DMP	- Dimethylphenanthrenes
D	- Diphenyl
Py	- Pyrene
C	- Chrysene



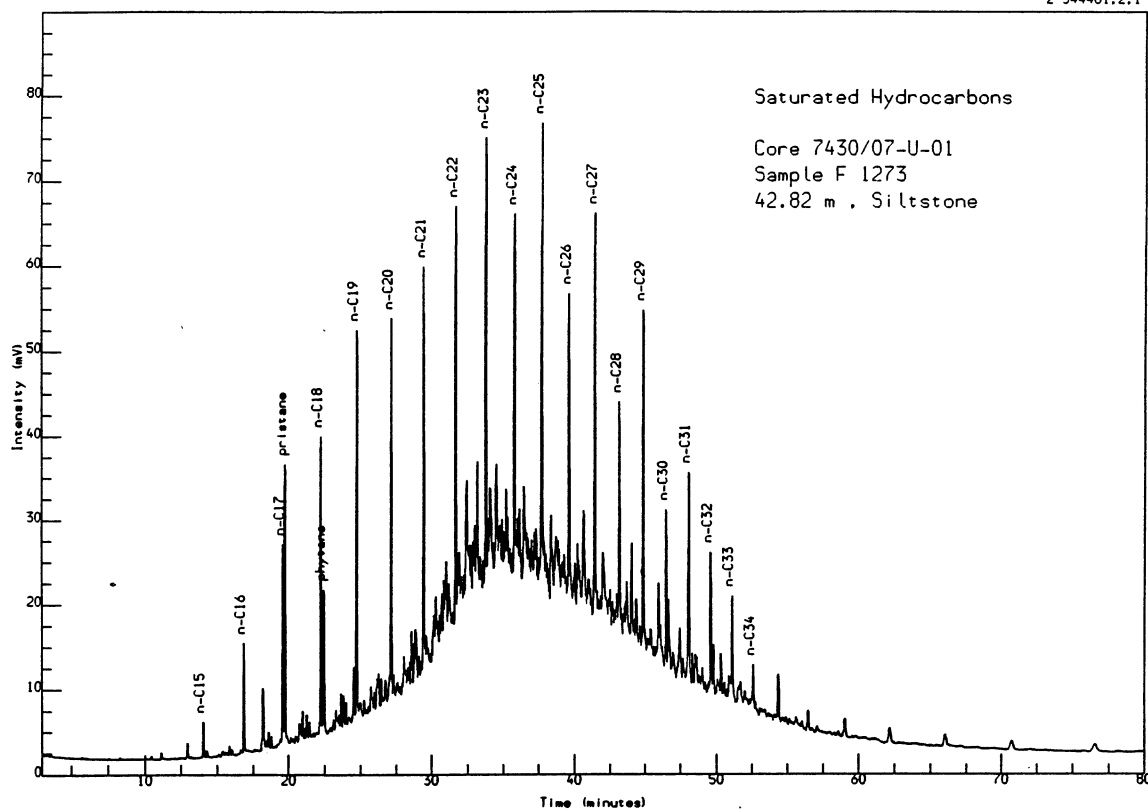
2 344402.1.1



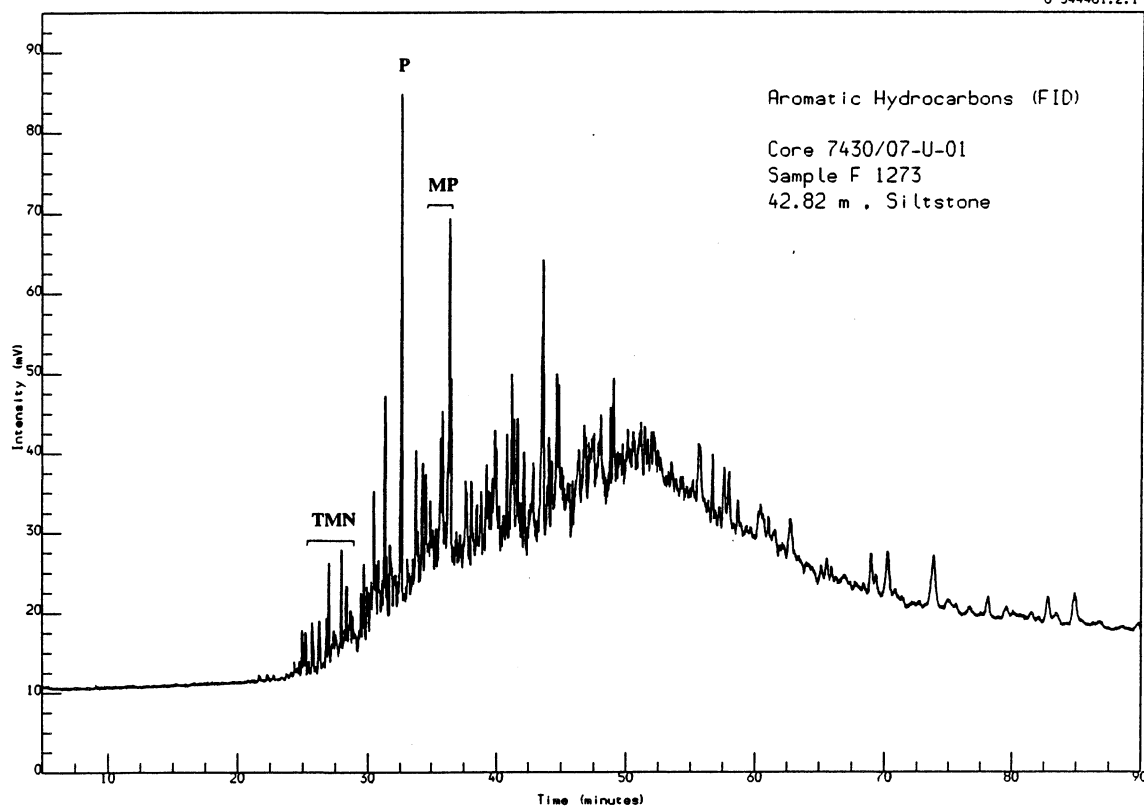
6 344401.3.1

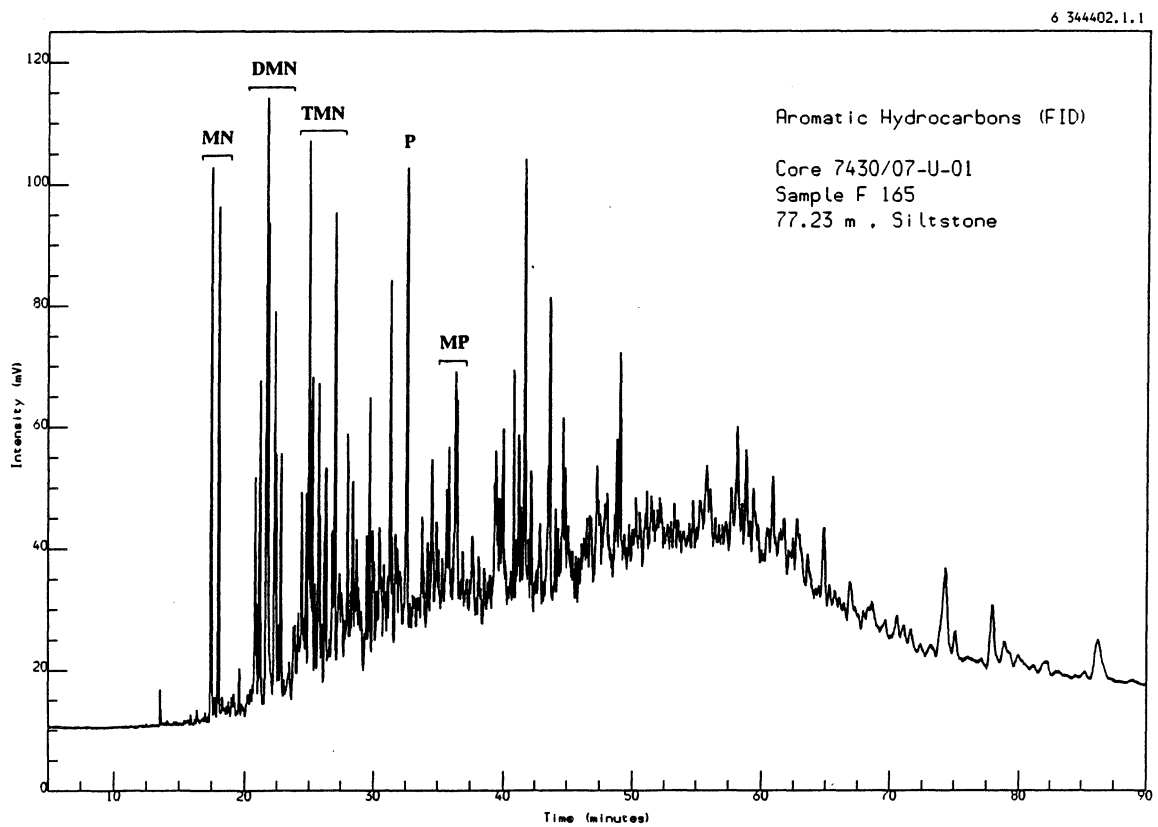
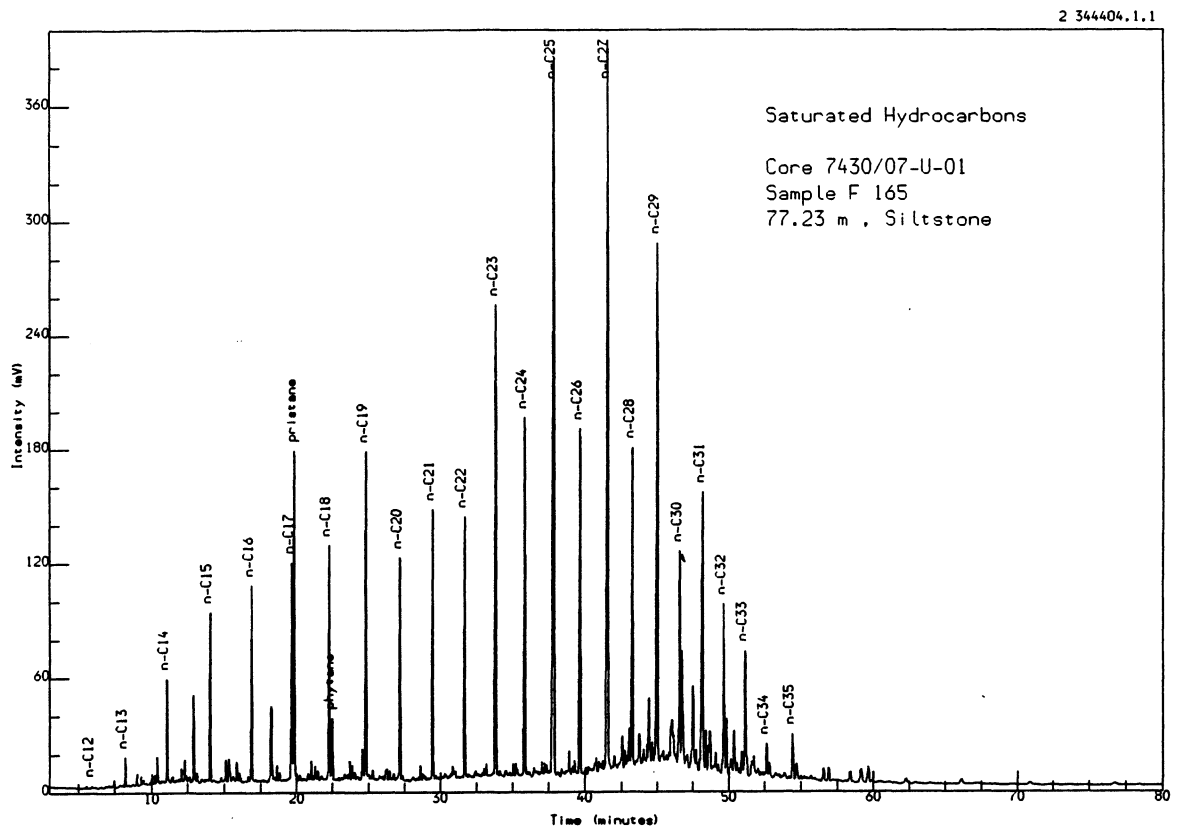


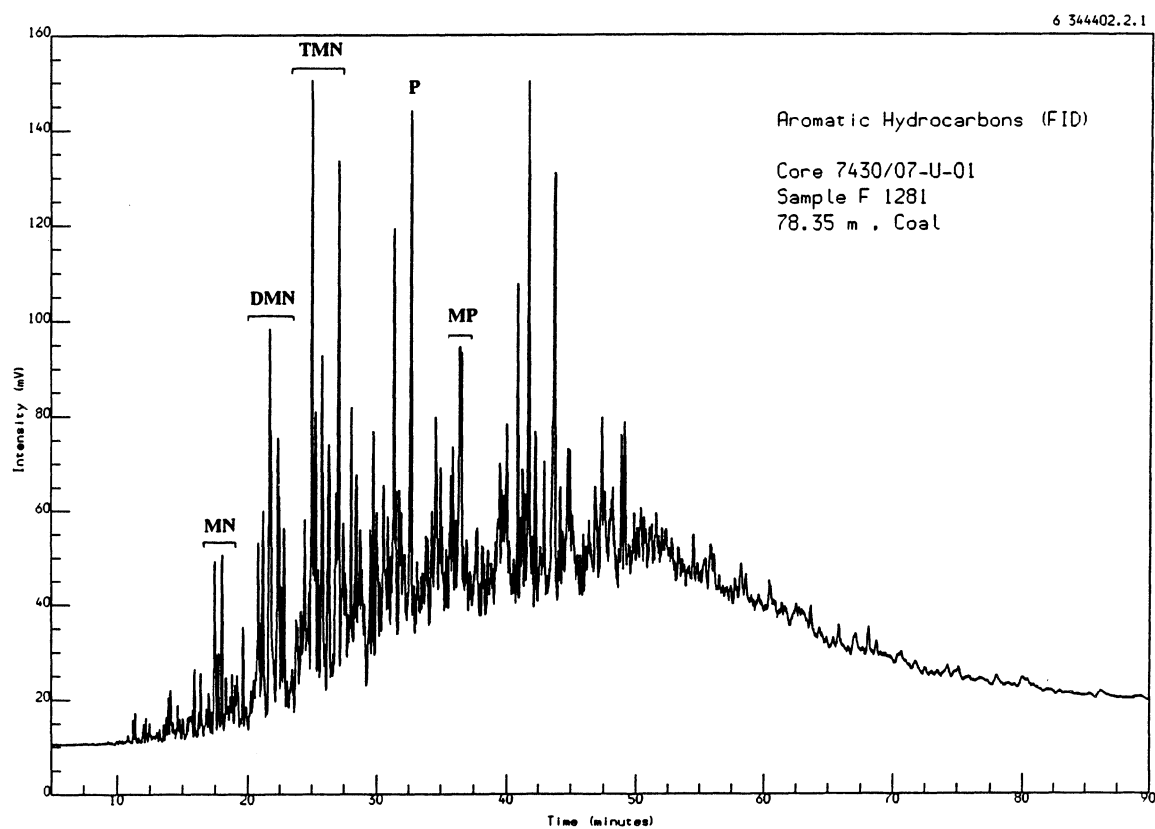
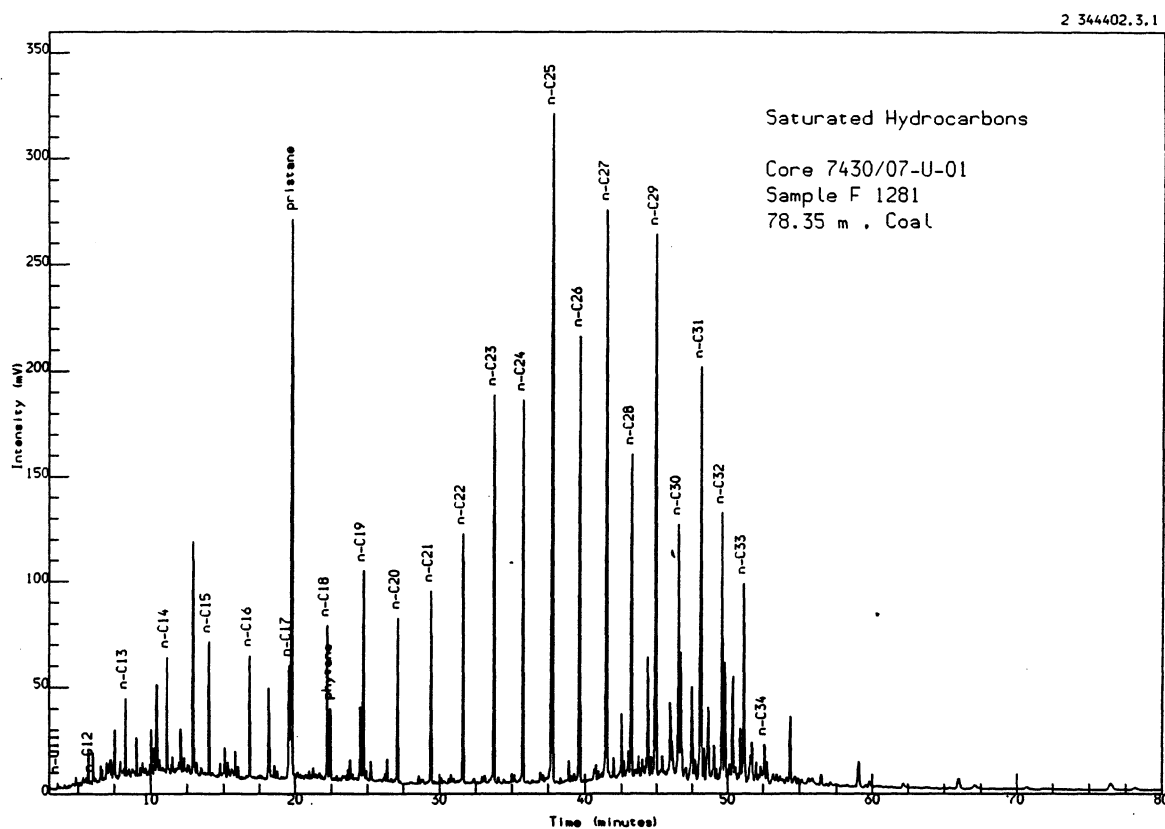
2 344401.2.1

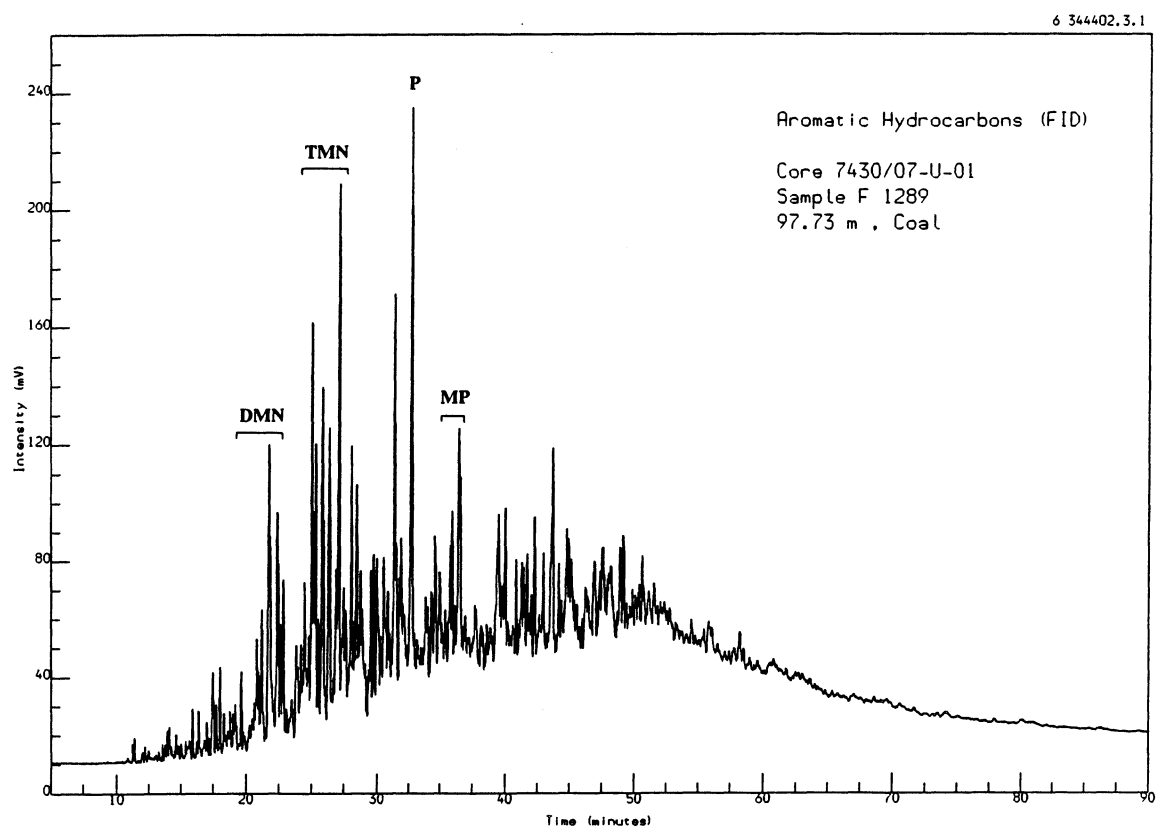
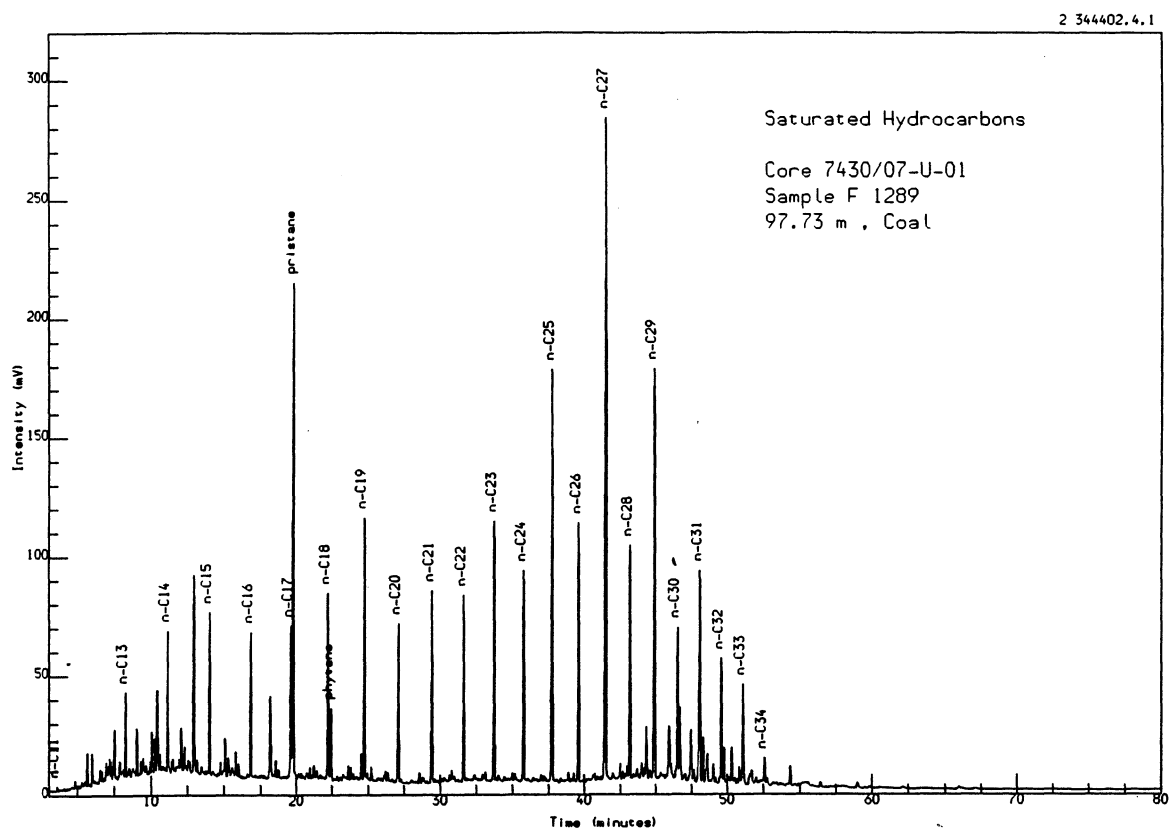


6 344401.2.1

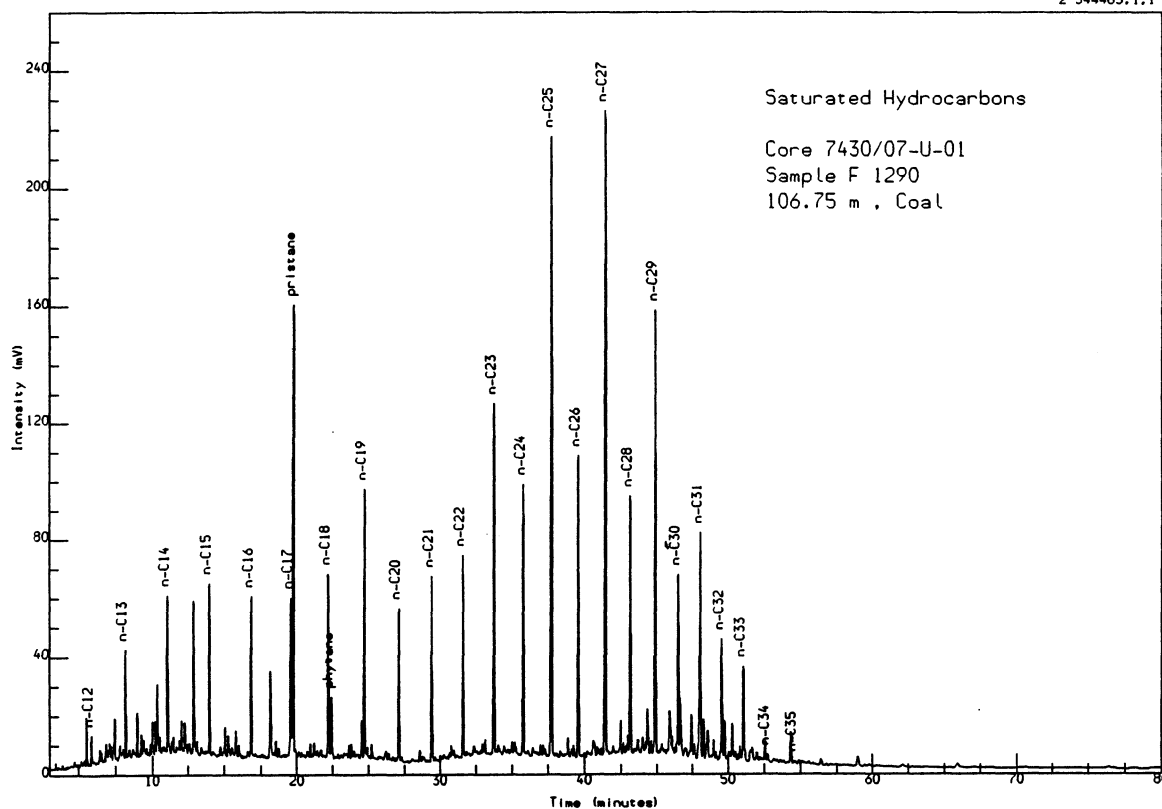




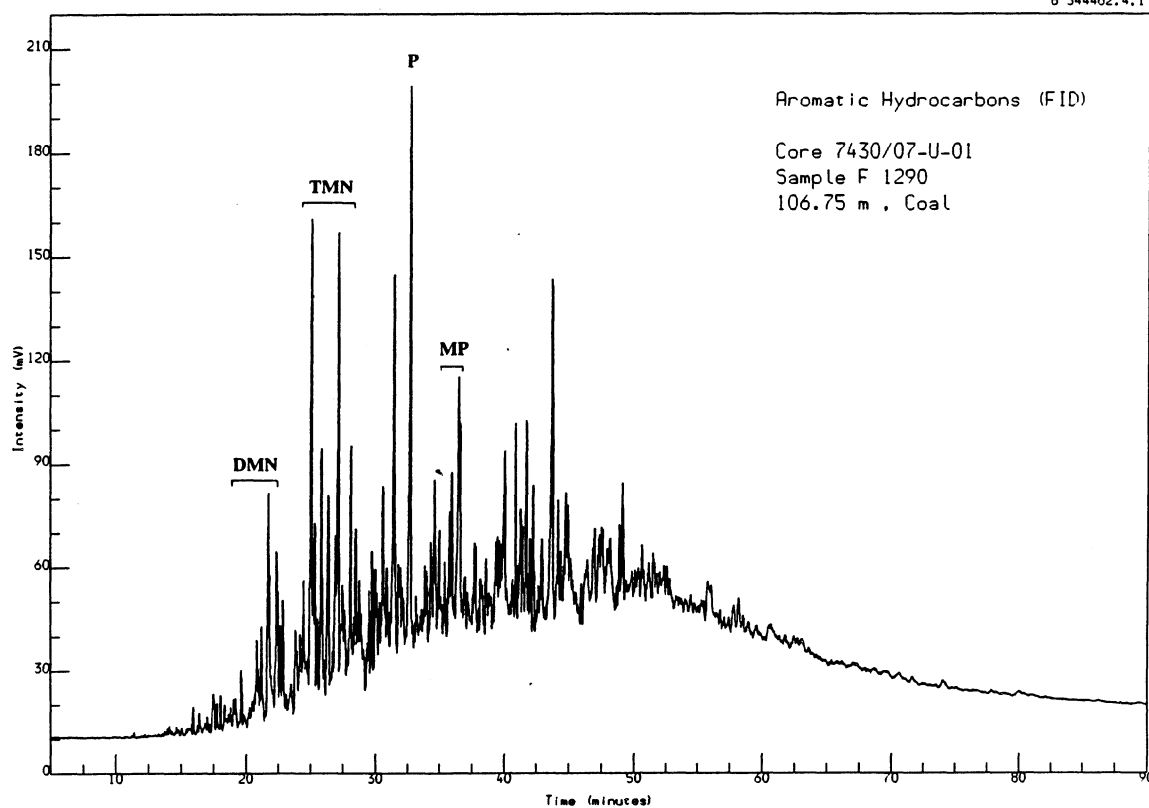


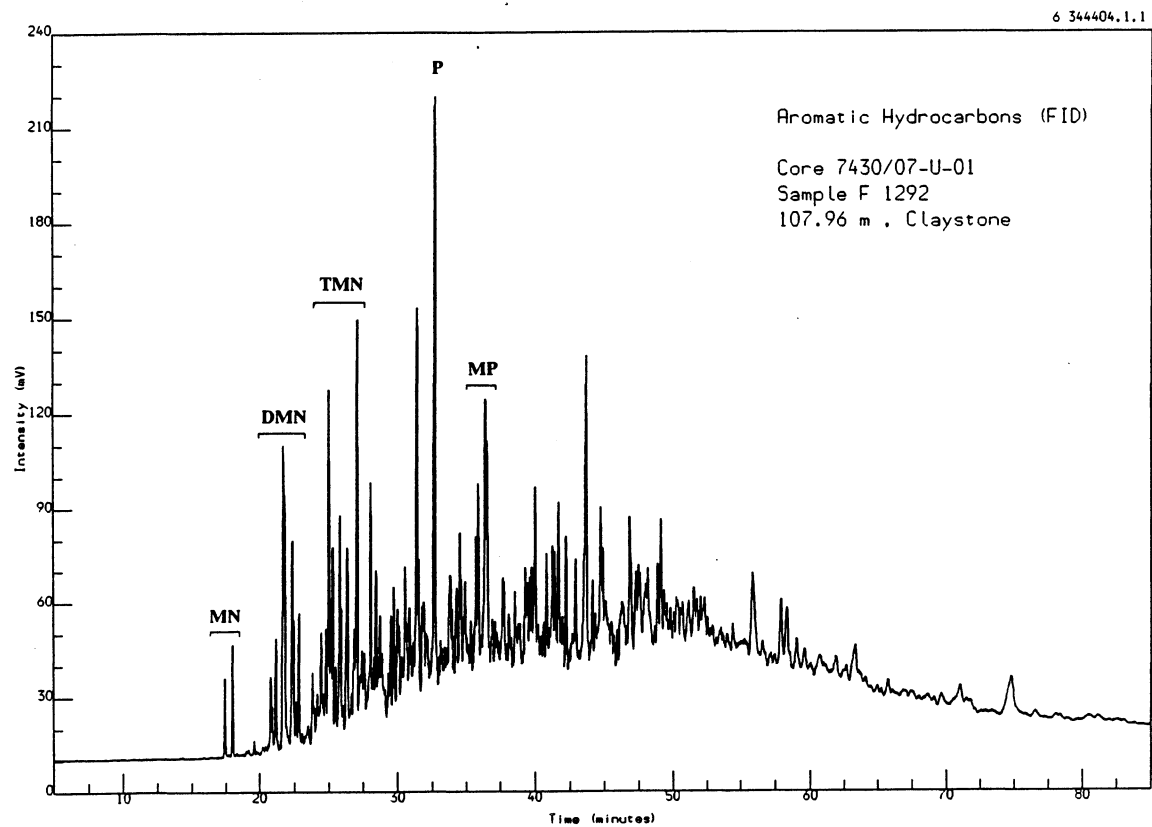
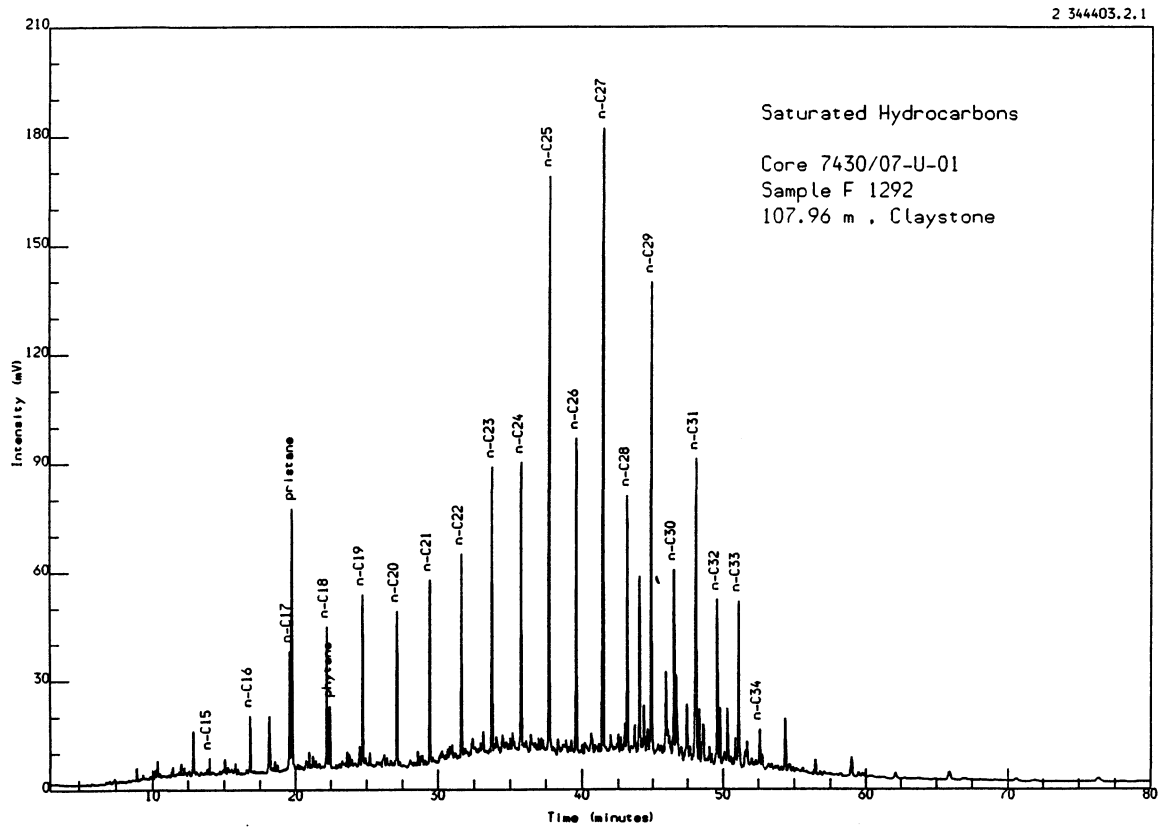


2 344403.1.1

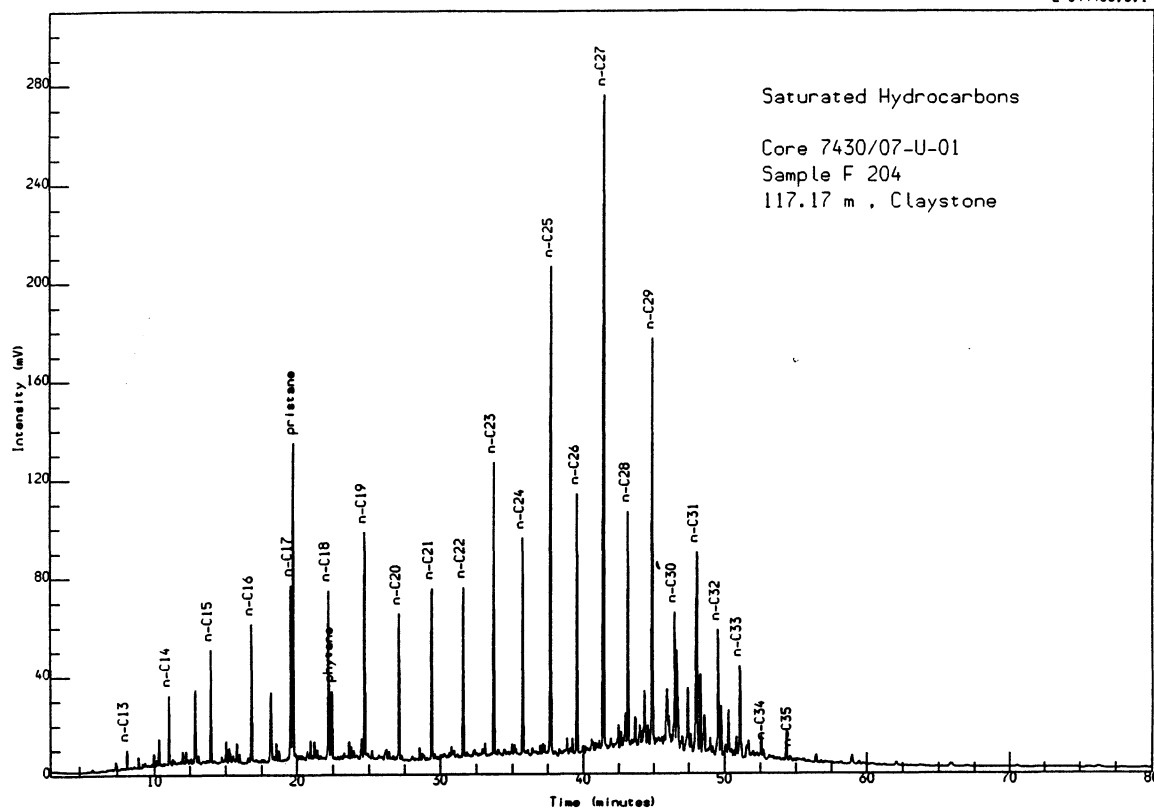


6 344402.4.1





2 344403.3.1



6 344403.2.1

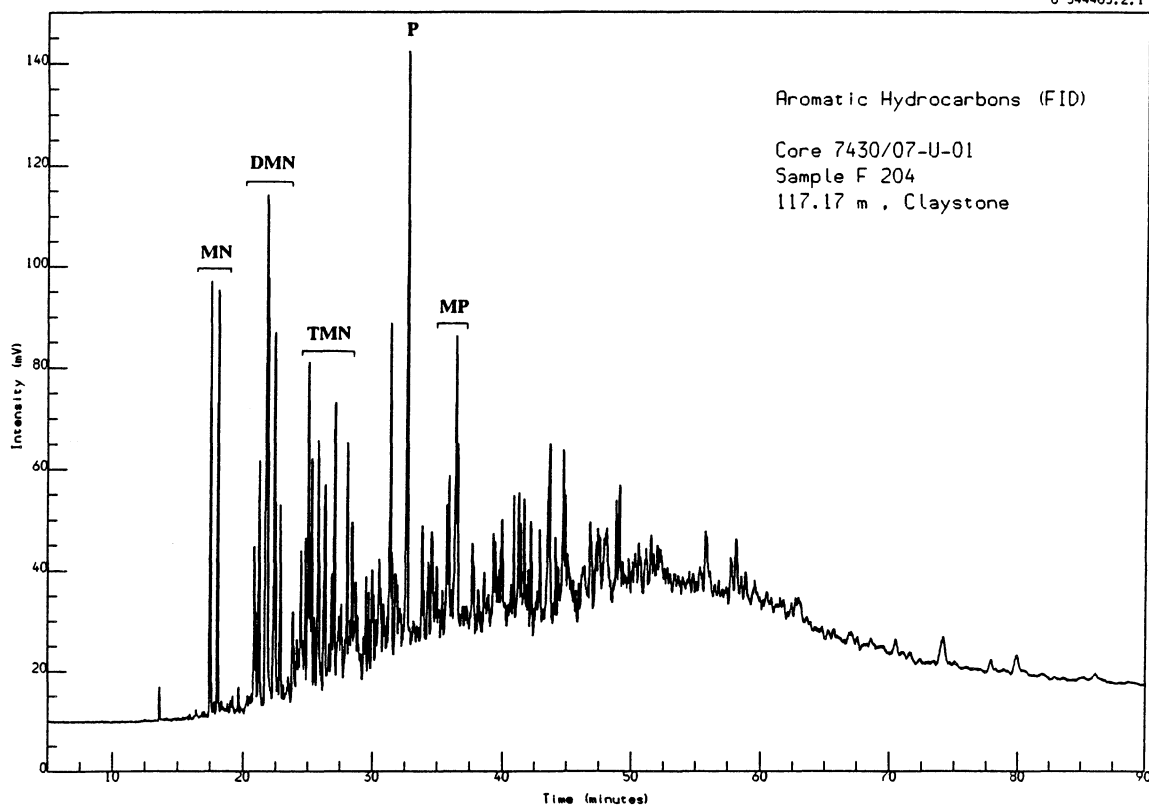
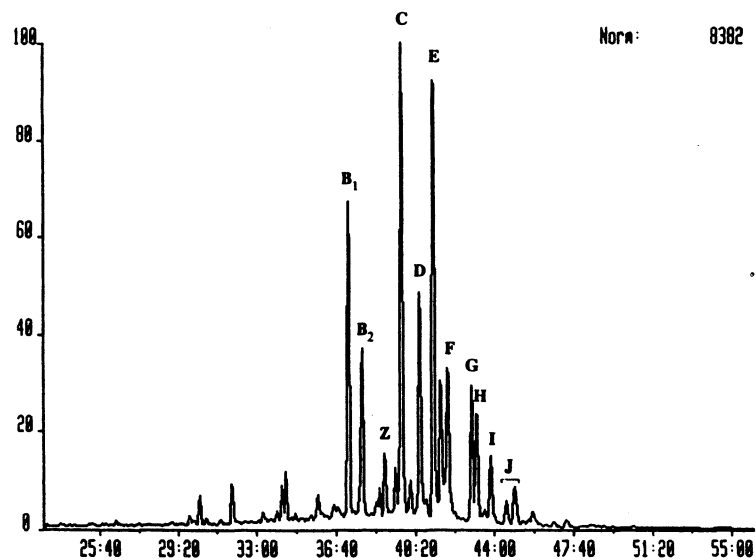


Figure A.III.7.3:

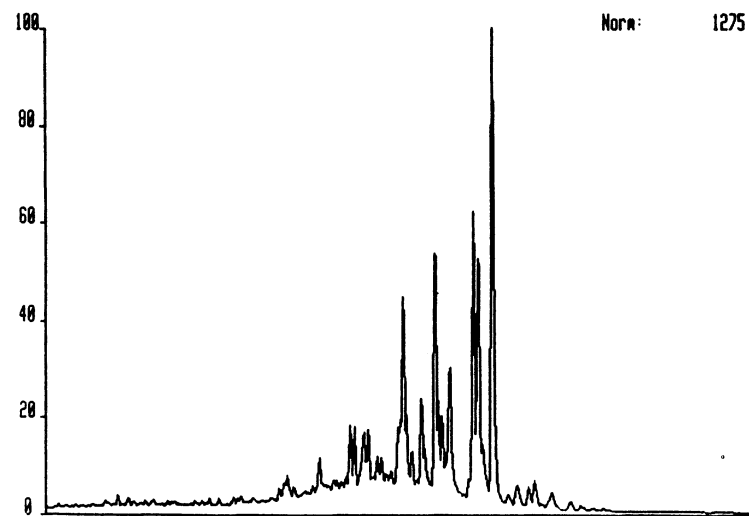
**Mass fragmentograms of m/z 191, 205 (terpanes)
and m/z 217, 218 (steranes).**

For peak identification see Chapter 4.

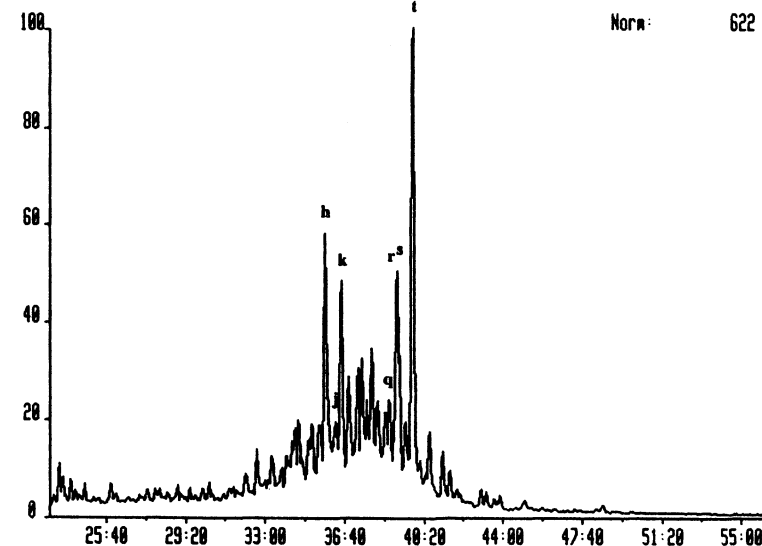
F0126 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0126 7430/07-U-01 37.81 M CORAL/CLST



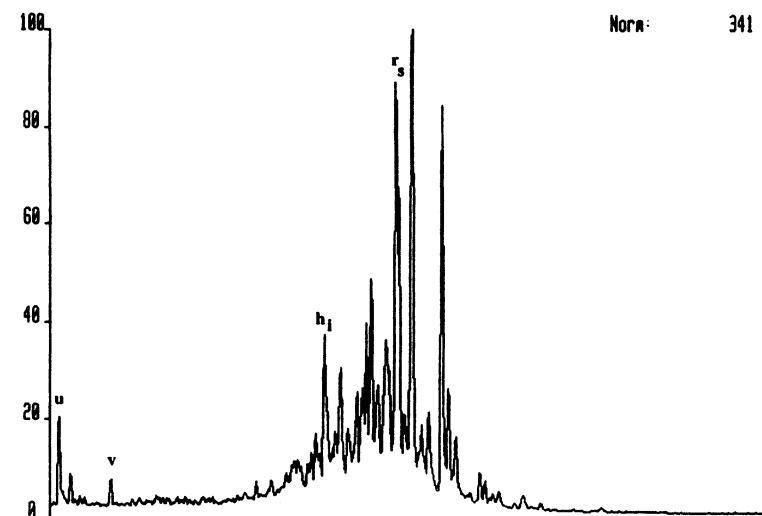
F0126 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0126 7430/07-U-01 37.81 M CORAL/CLST



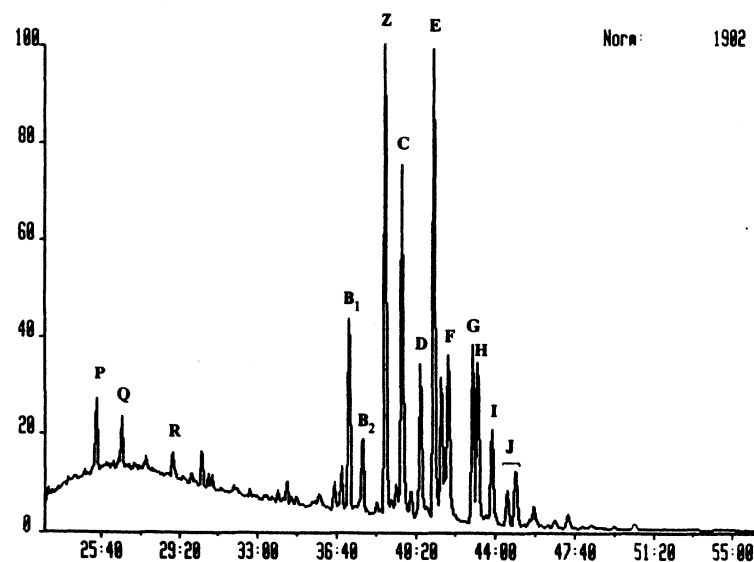
F0126 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0126 7430/07-U-01 37.81 M CORAL/CLST



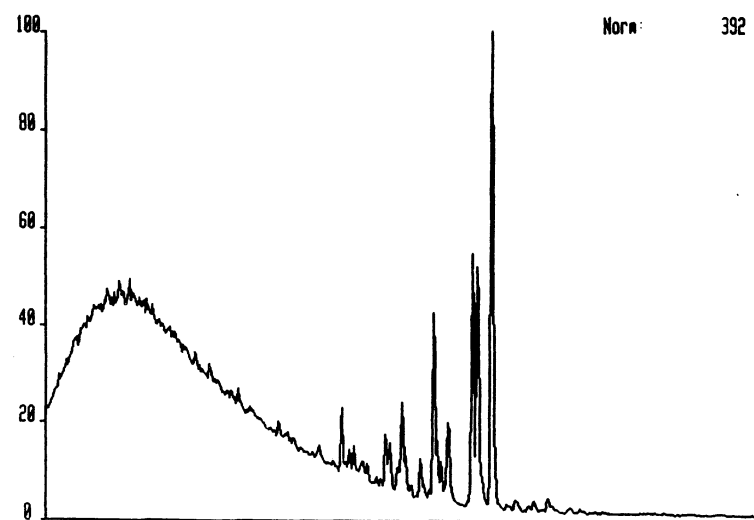
F0126 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0126 7430/07-U-01 37.81 M CORAL/CLST



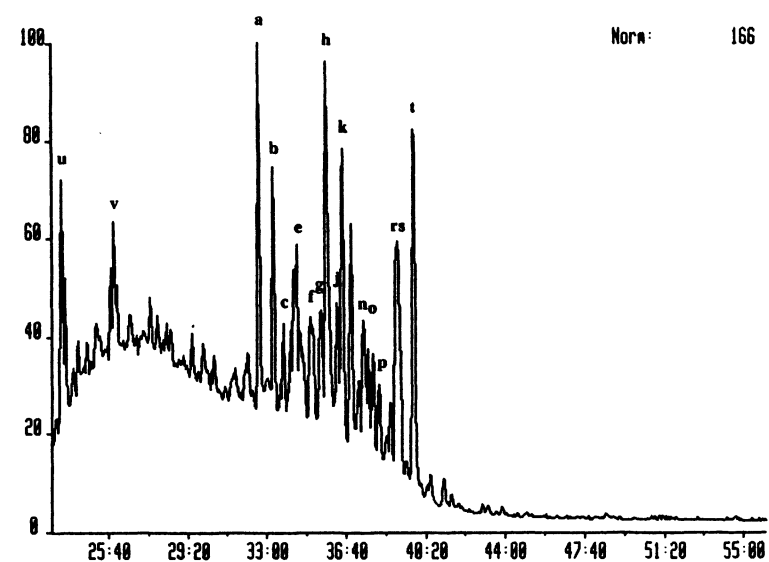
F1273CL 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F1273CL 7430/07-U-01 42.82 M CLST



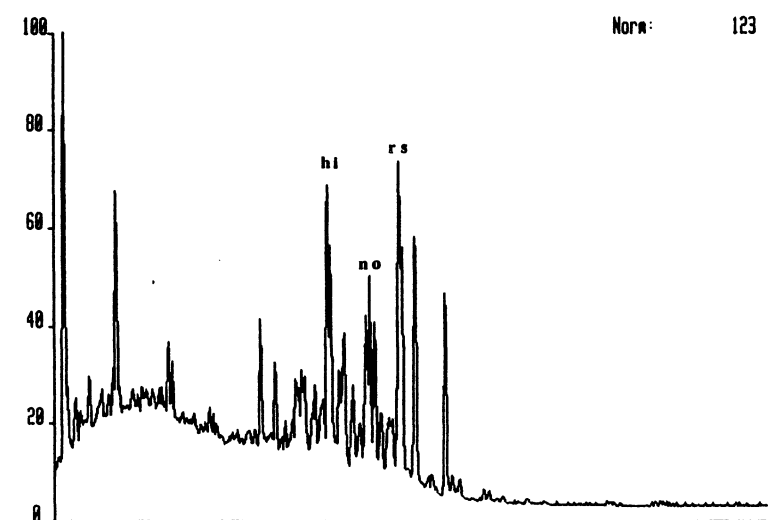
F1273CL 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F1273CL 7430/07-U-01 42.82 M CLST



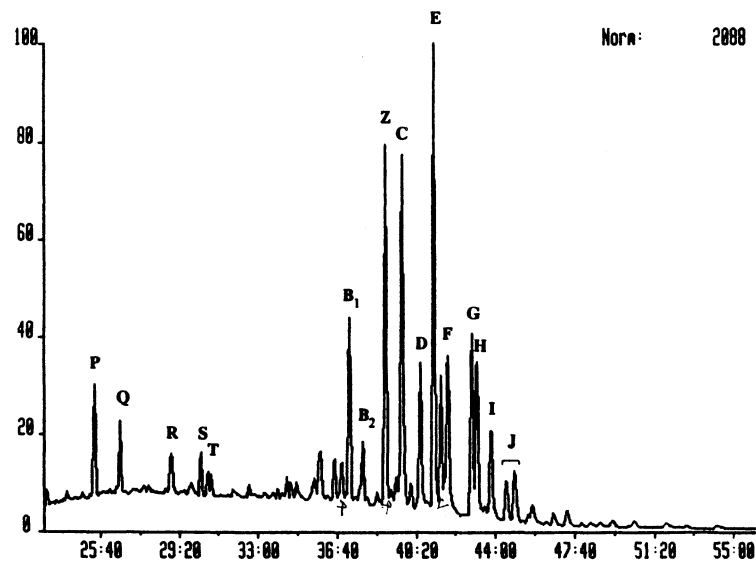
F1273CL 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F1273CL 7430/07-U-01 42.82 M CLST



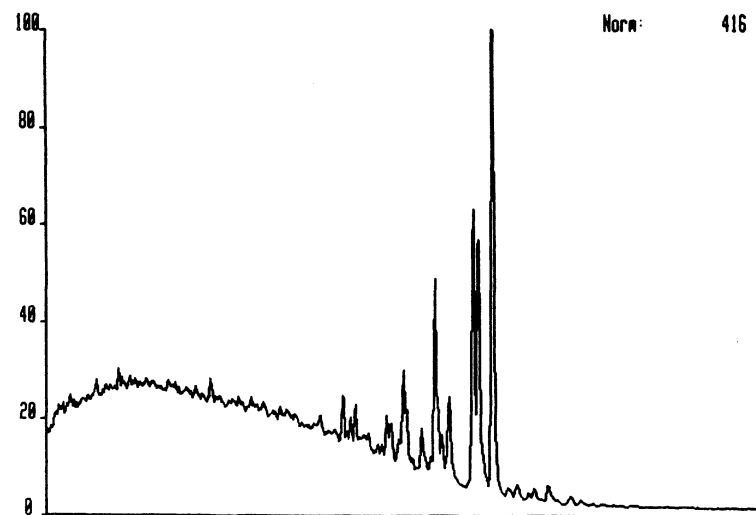
F1273CL 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F1273CL 7430/07-U-01 42.82 M CLST



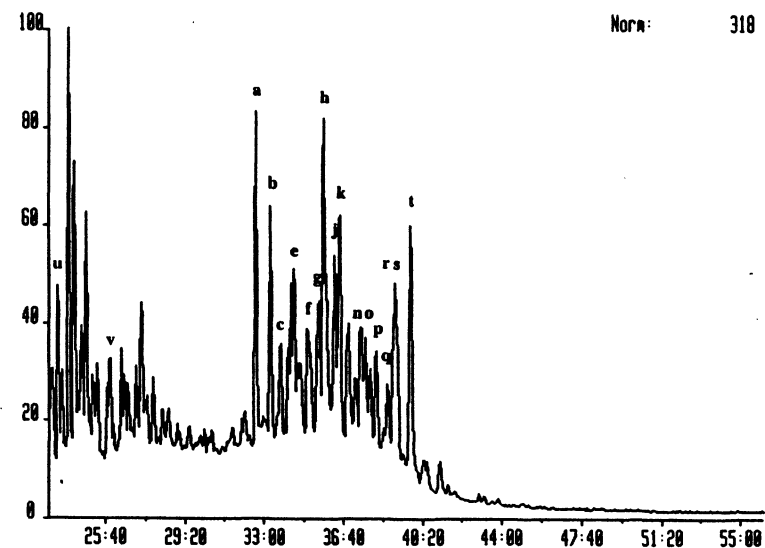
F1273SL 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F1273SL 7430/07-U-01 42.02 M SLTST



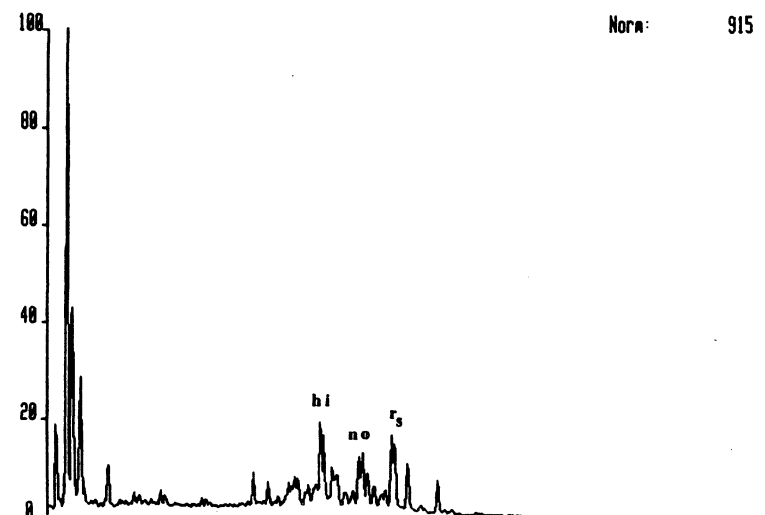
F1273SL 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F1273SL 7430/07-U-01 42.02 M SLTST



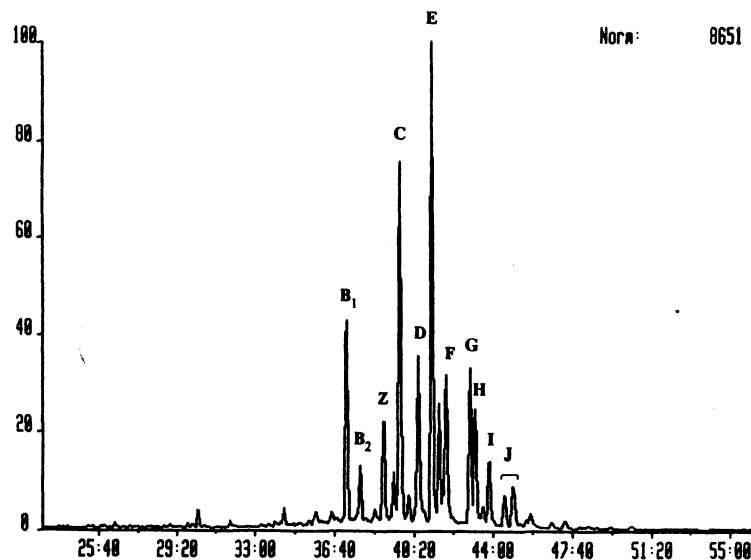
F1273SL 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F1273SL 7430/07-U-01 42.02 M SLTST



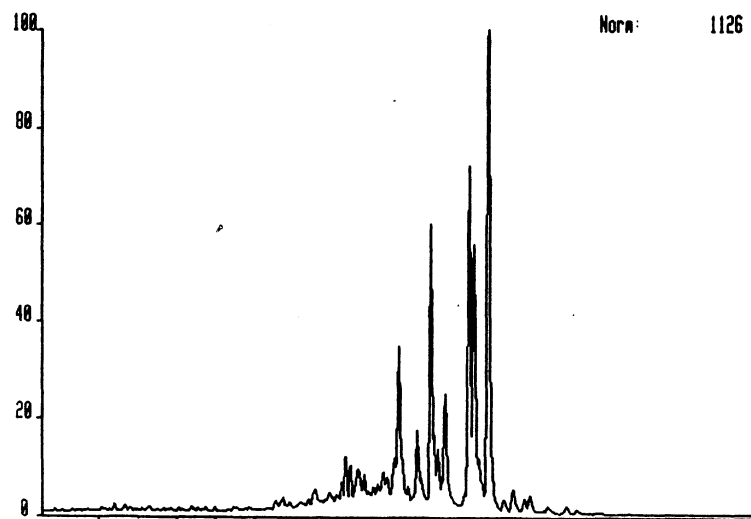
F1273SL 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F1273SL 7430/07-U-01 42.02 M SLTST



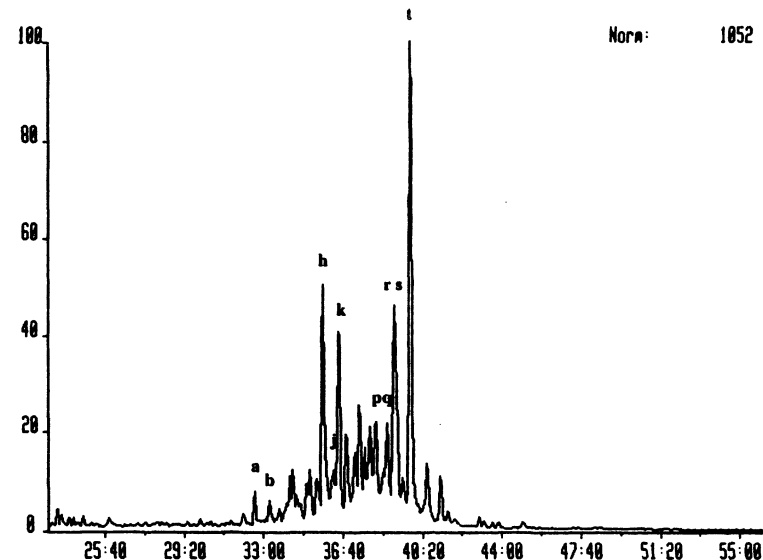
F0165 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0165 7430/07-U-01 77.23 SLTST



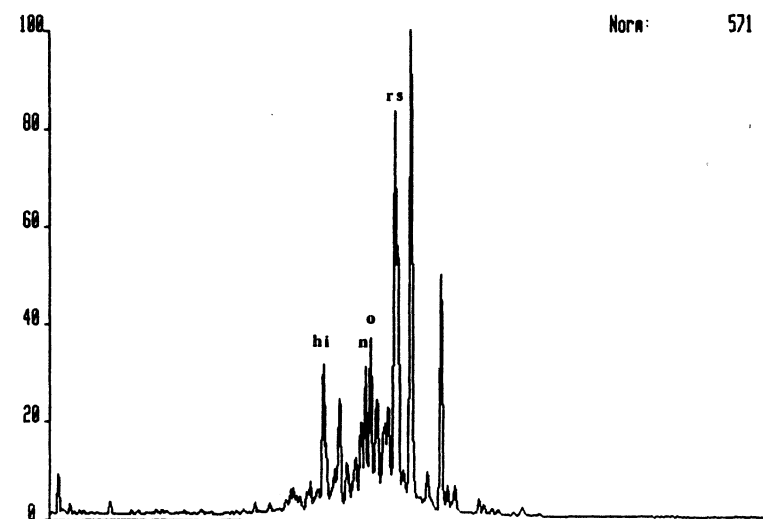
F0165 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0165 7430/07-U-01 77.23 SLTST



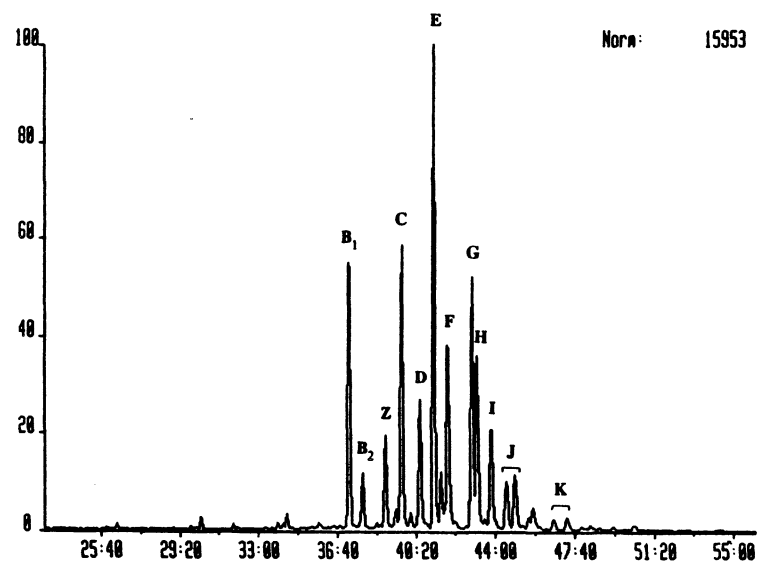
F0165 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0165 7430/07-U-01 77.23 SLTST



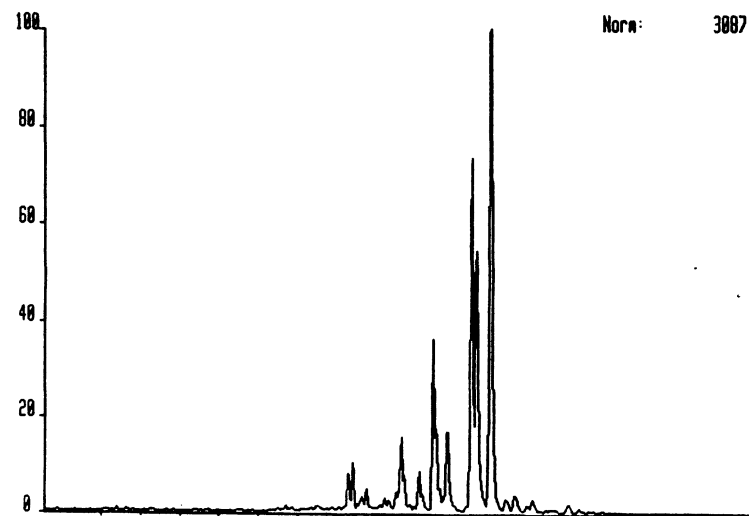
F0165 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0165 7430/07-U-01 77.23 SLTST



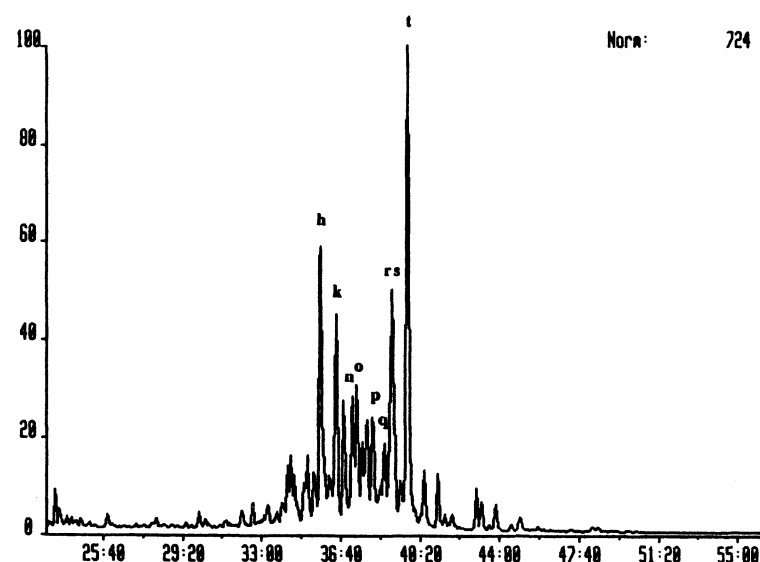
F1201 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F1201 7430/07-U-01 78.35 M COAL



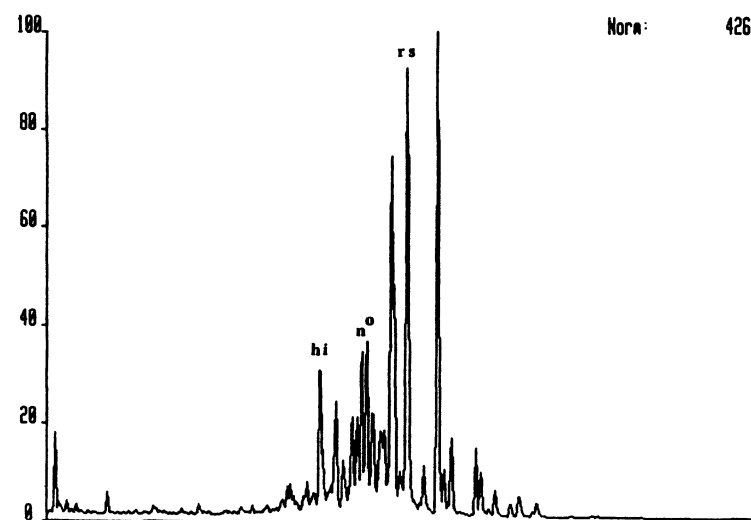
F1201 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F1201 7430/07-U-01 78.35 M COAL



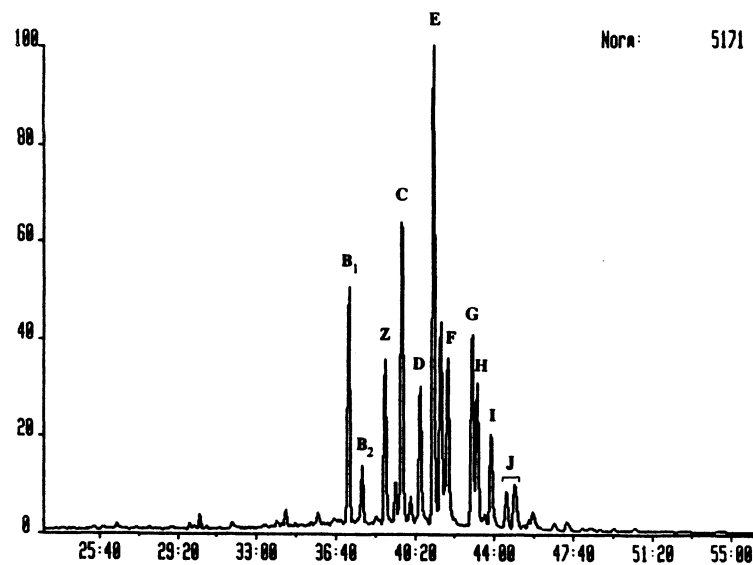
F1201 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F1201 7430/07-U-01 78.35 M COAL



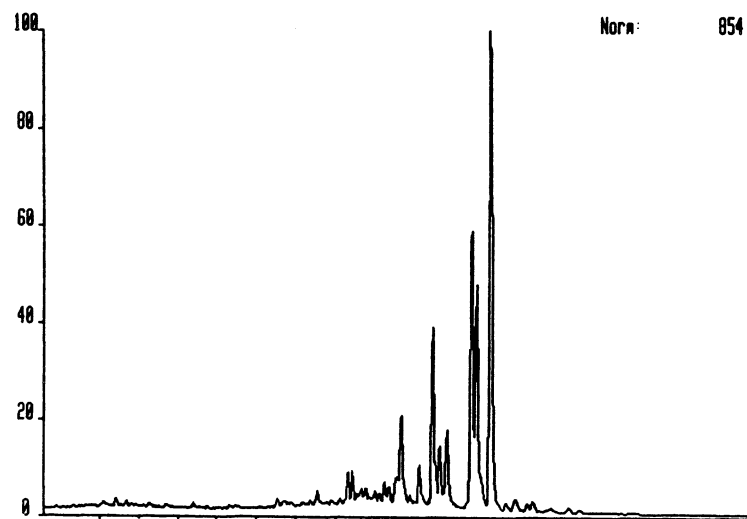
F1201 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F1201 7430/07-U-01 78.35 M COAL



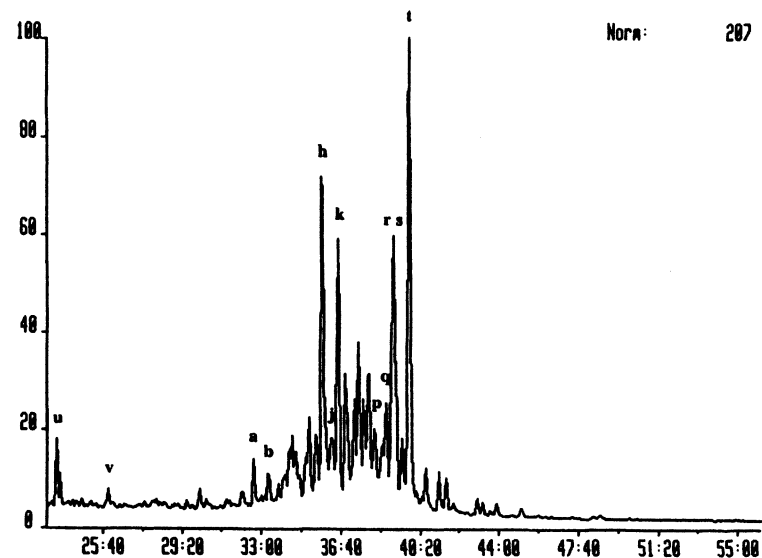
F1290 10-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F1290 7430/07-U-01 106.75 M COAL



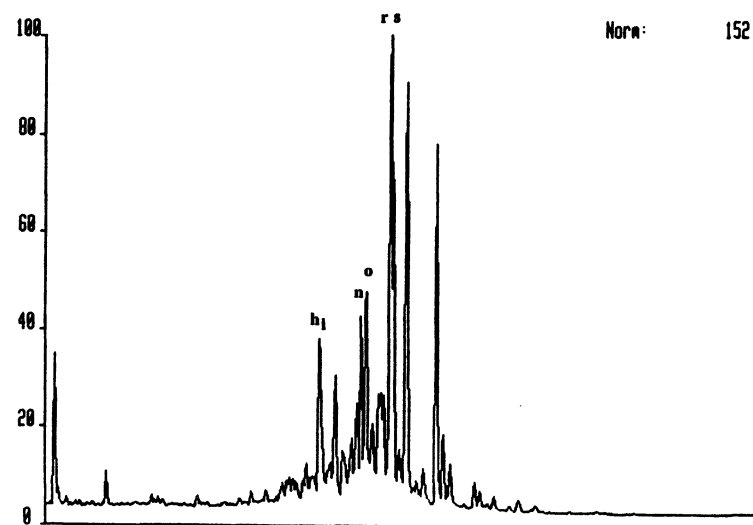
F1290 10-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F1290 7430/07-U-01 106.75 M COAL



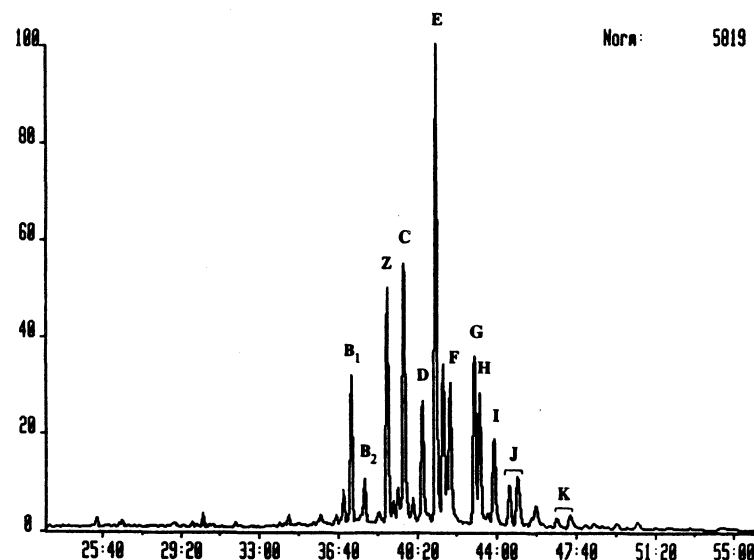
F1290 10-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F1290 7430/07-U-01 106.75 M COAL



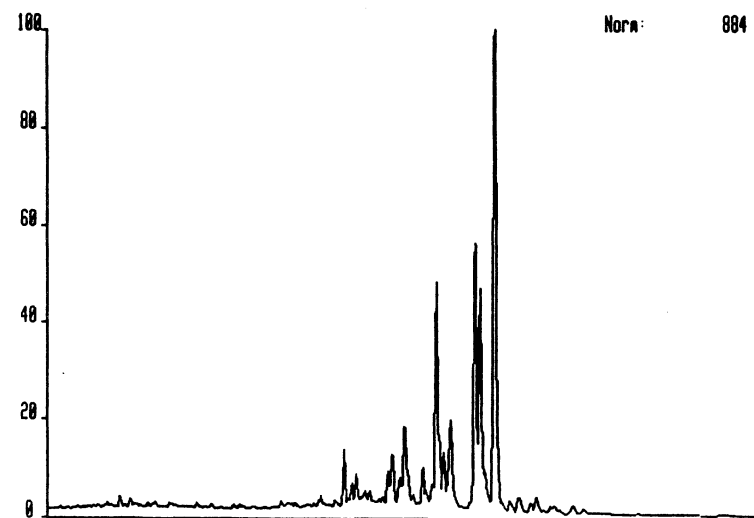
F1290 10-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 210.1000
 Text:F1290 7430/07-U-01 106.75 M COAL



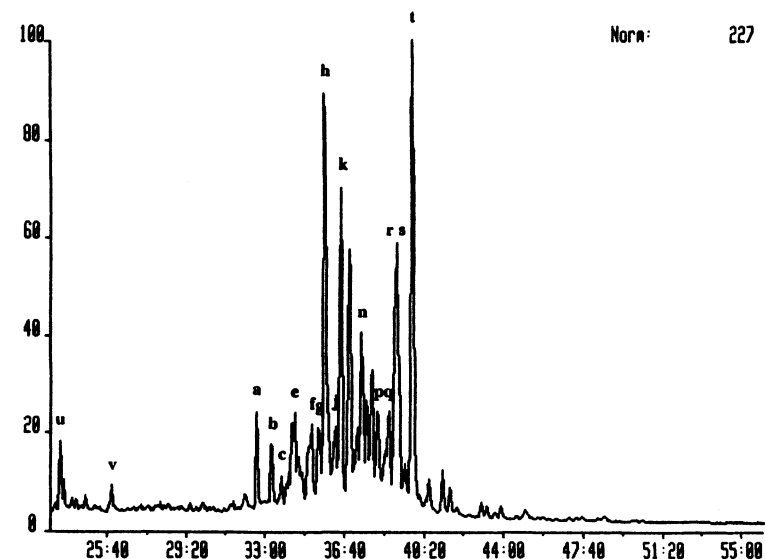
F1292 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F1292 7430/07-U-01 107.96 M CLST



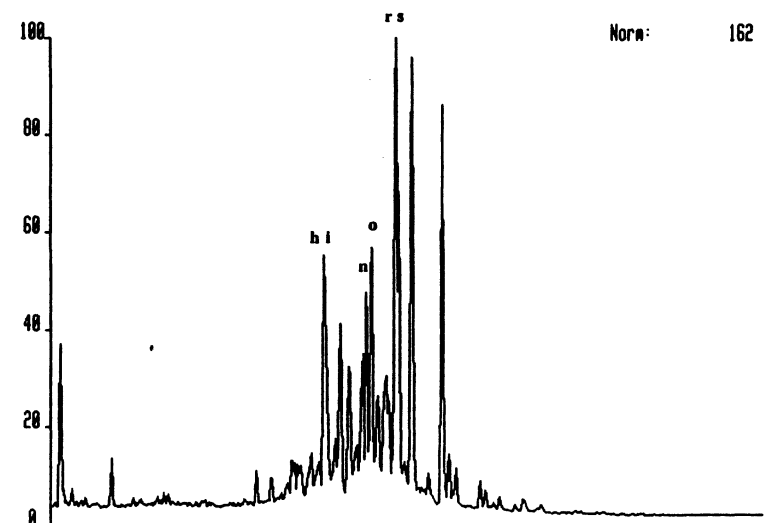
F1292 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F1292 7430/07-U-01 107.96 M CLST



F1292 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F1292 7430/07-U-01 107.96 M CLST



F1292 10-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F1292 7430/07-U-01 107.96 M CLST



Core 7430/07-U-01

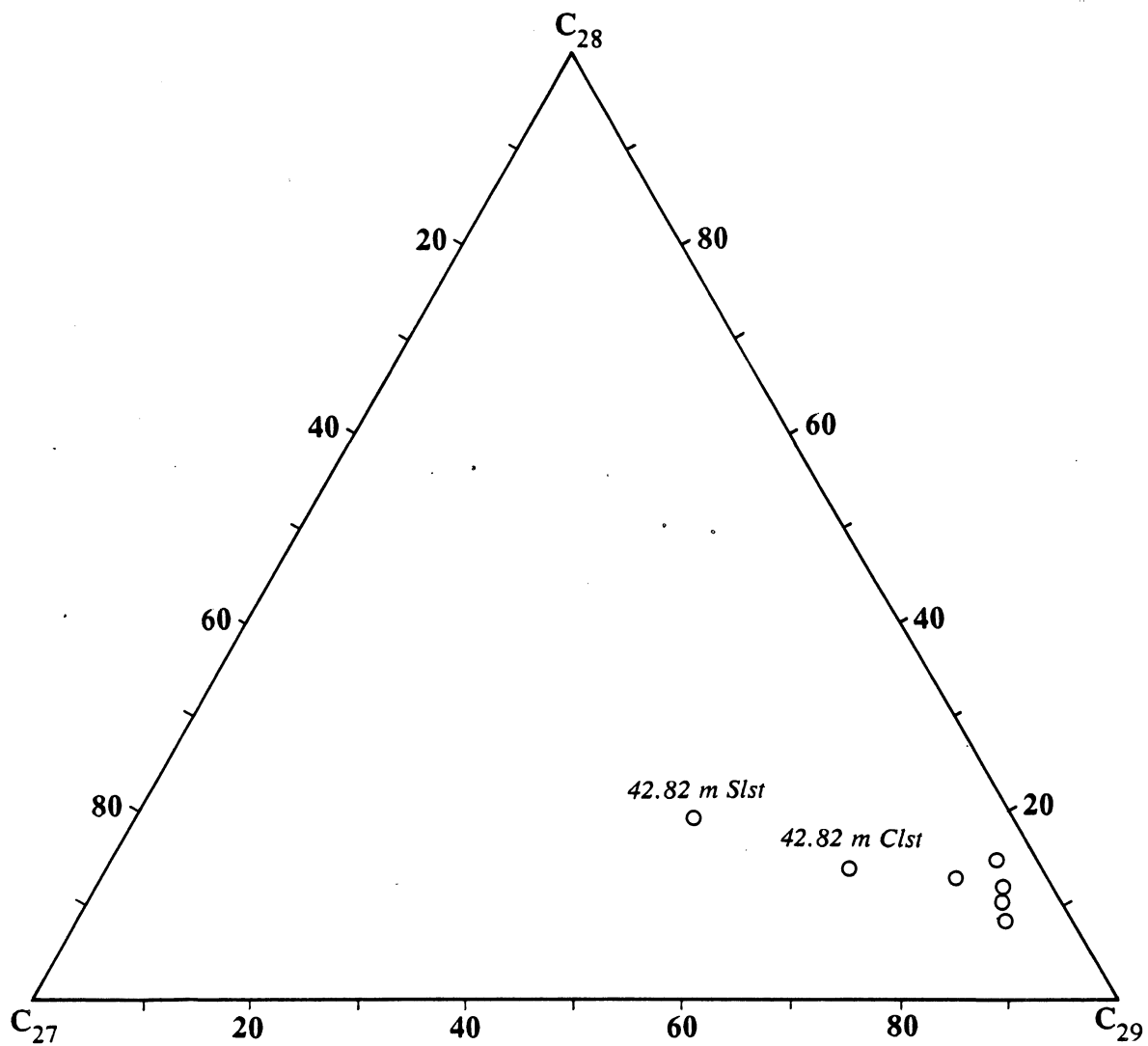


Figure A.III.7.4

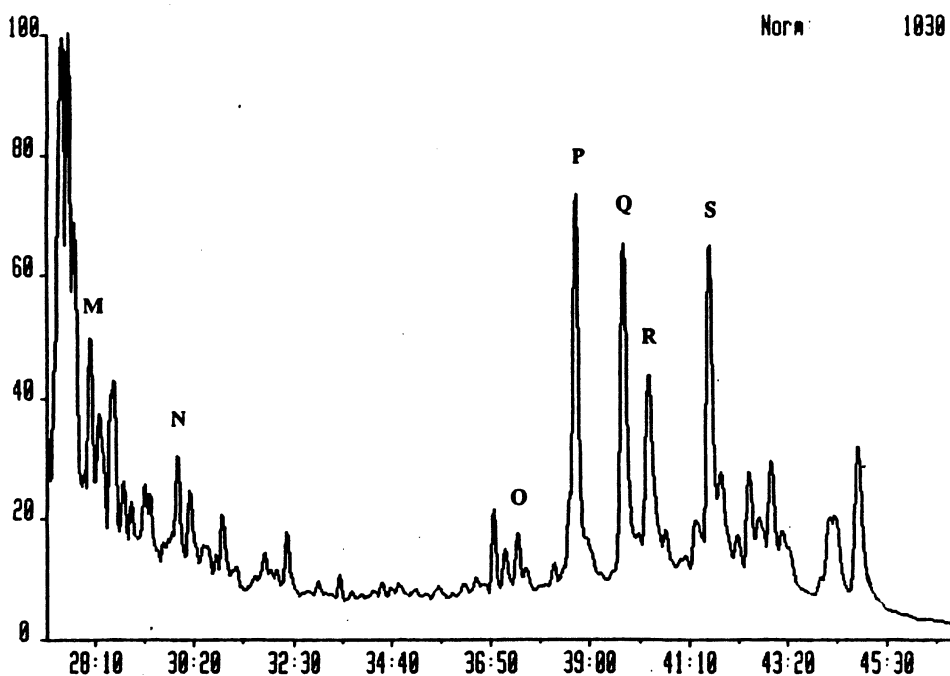
Internal distribution of 14 α (H), 17 α (H) 20R, C₂₇, C₂₈ and C₂₉ regular steranes (from m/z 217)

Figure A.III.7.5:

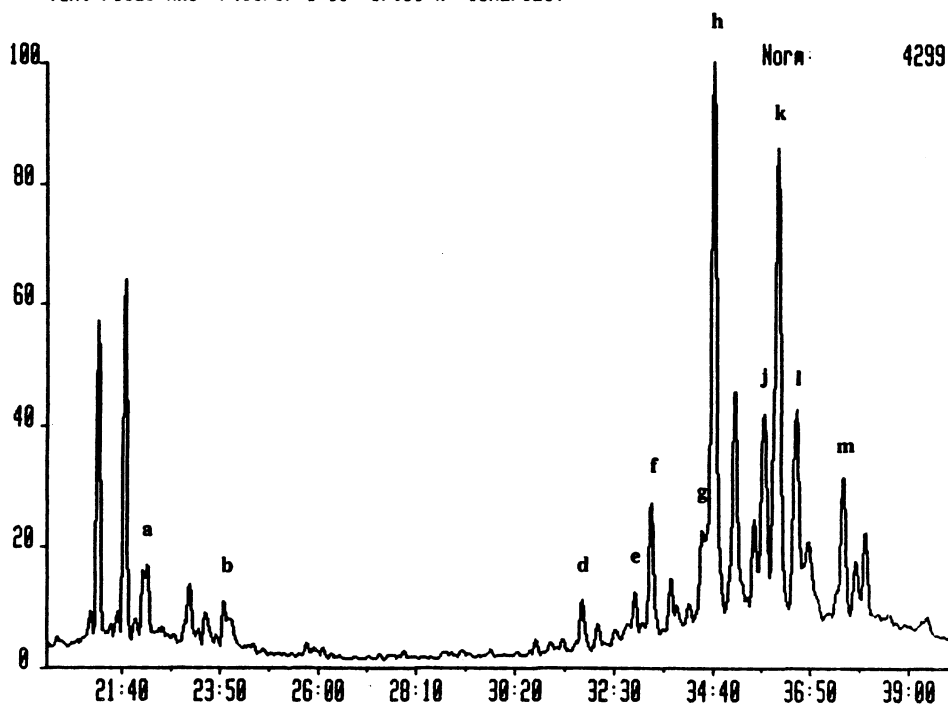
**Mass fragmentograms of m/z 231, 253
(aromatic steroid hydrocarbons)**

For peak identification see Chapter 4.

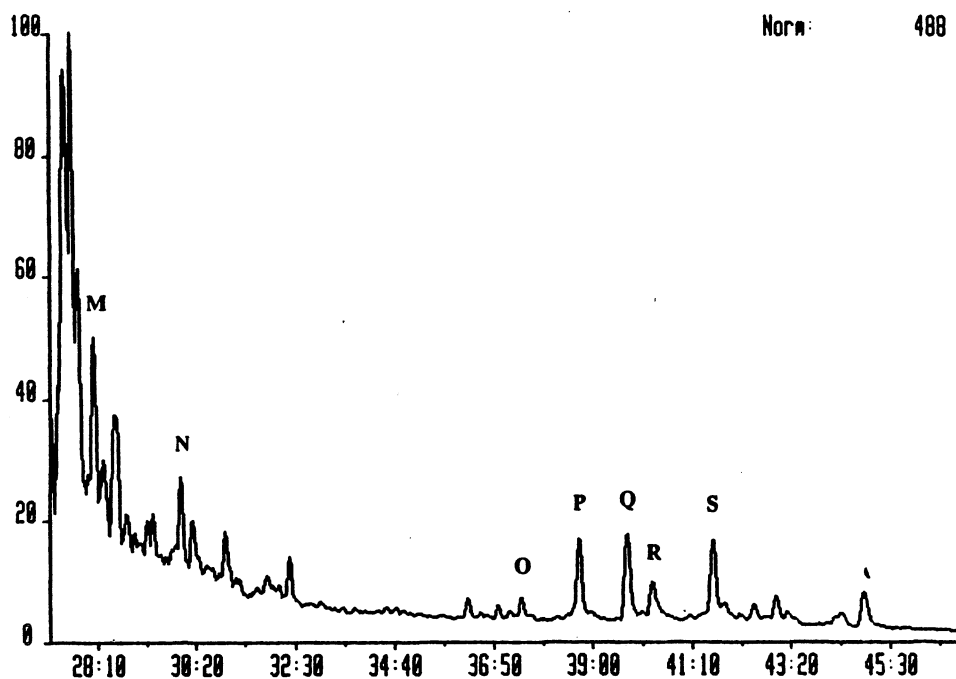
F0126AR 20-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0126 AR0 7430/07-U-01 37.81 M COAL/CLST



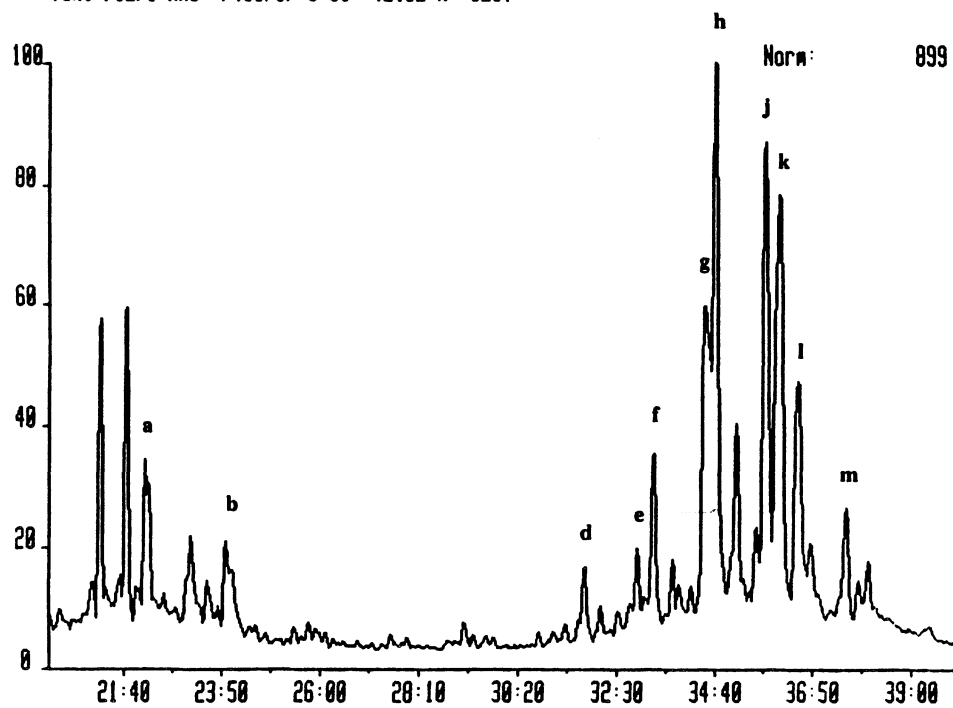
F0126AR 20-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0126 AR0 7430/07-U-01 37.81 M COAL/CLST



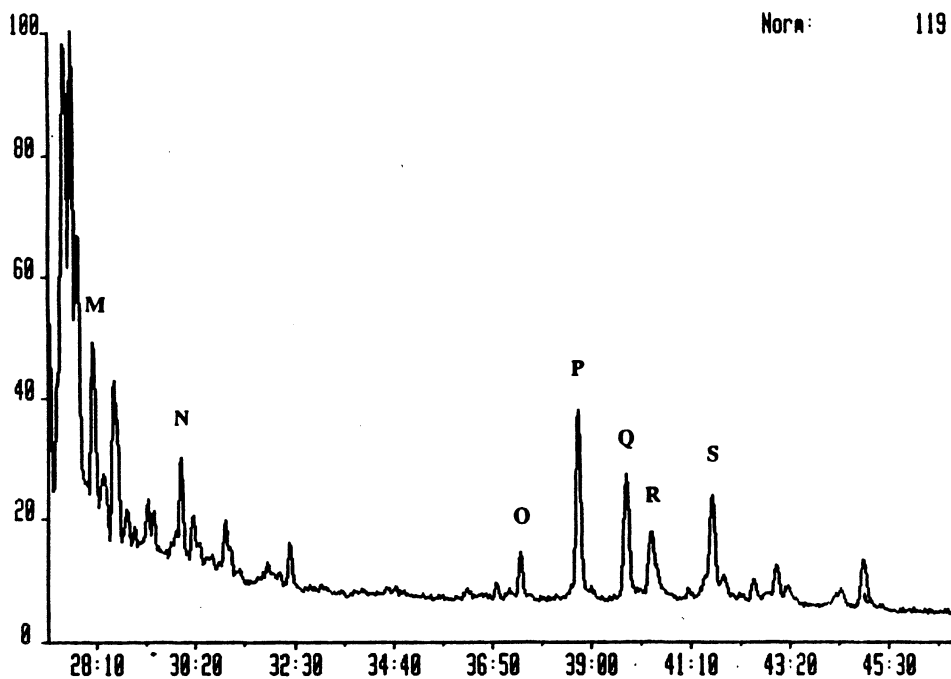
F1273CA 25-JAN-88 Sir:Voltage 70-E Sys: STERAMER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1273 ARO 7430/07-U-01 42.02 M CLST



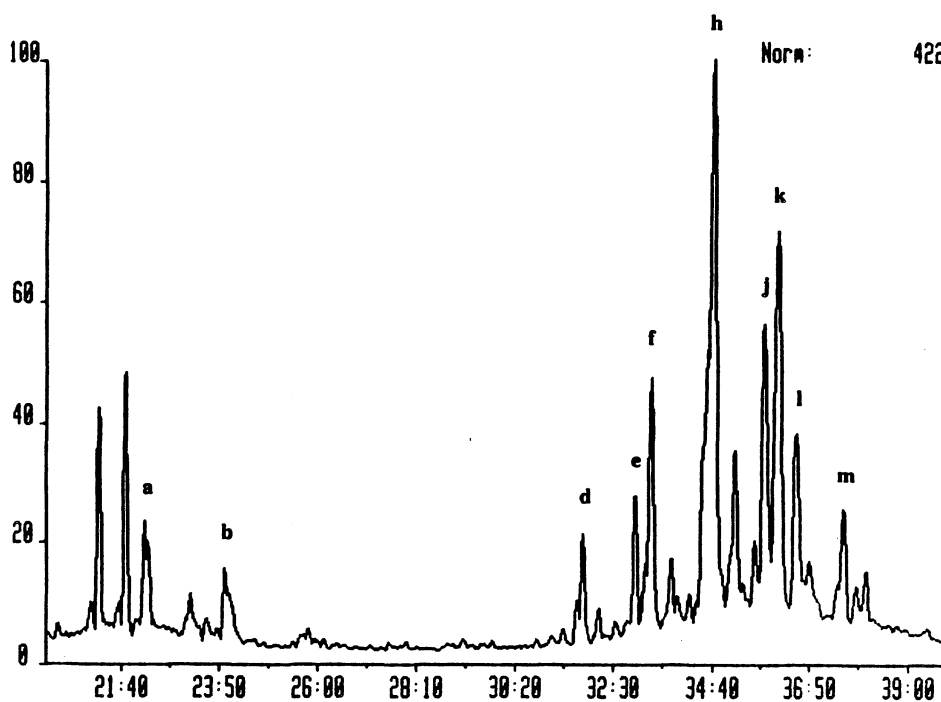
F1273CA 25-JAN-88 Sir:Voltage 70-E Sys: STERAMER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1273 ARO 7430/07-U-01 42.02 M CLST



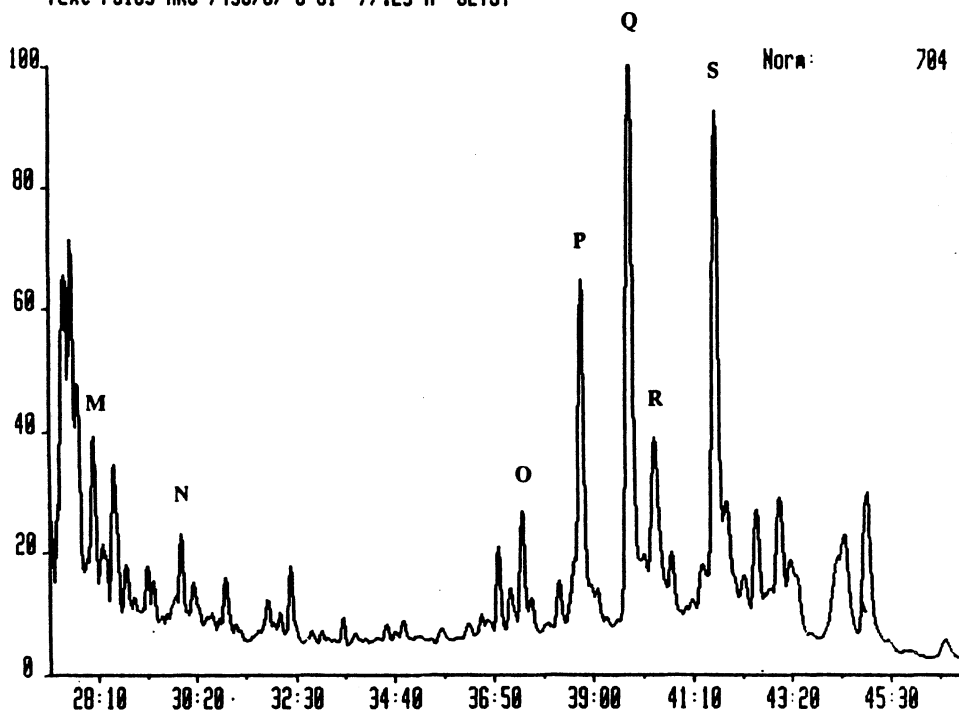
F1273SA 26-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1273 ARO 7430/07-U-01 42.02 M SLST



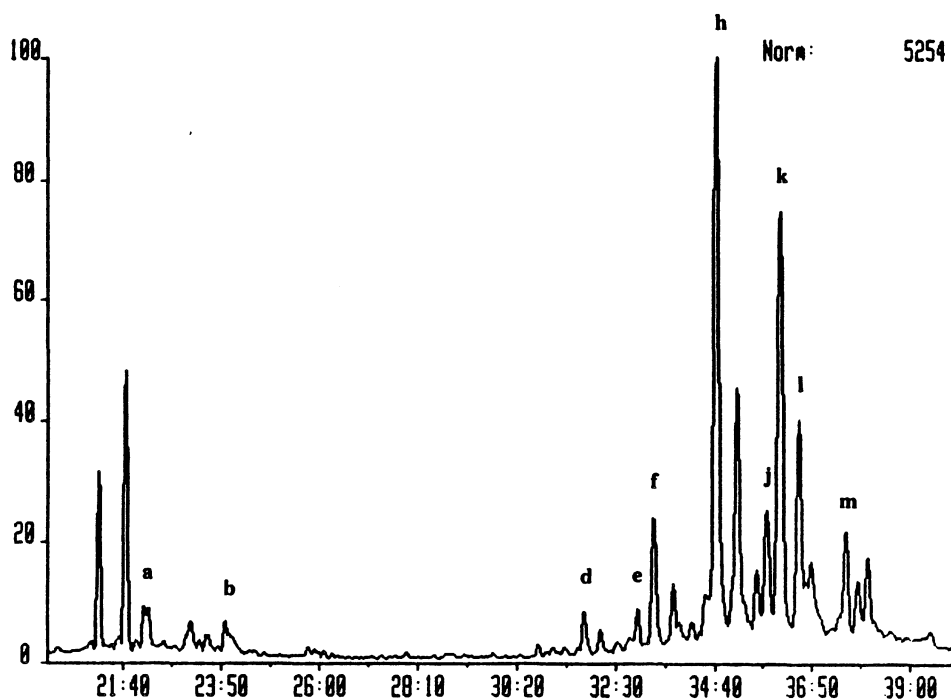
F1273SA 26-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1273 ARO 7430/07-U-01 42.02 M SLST



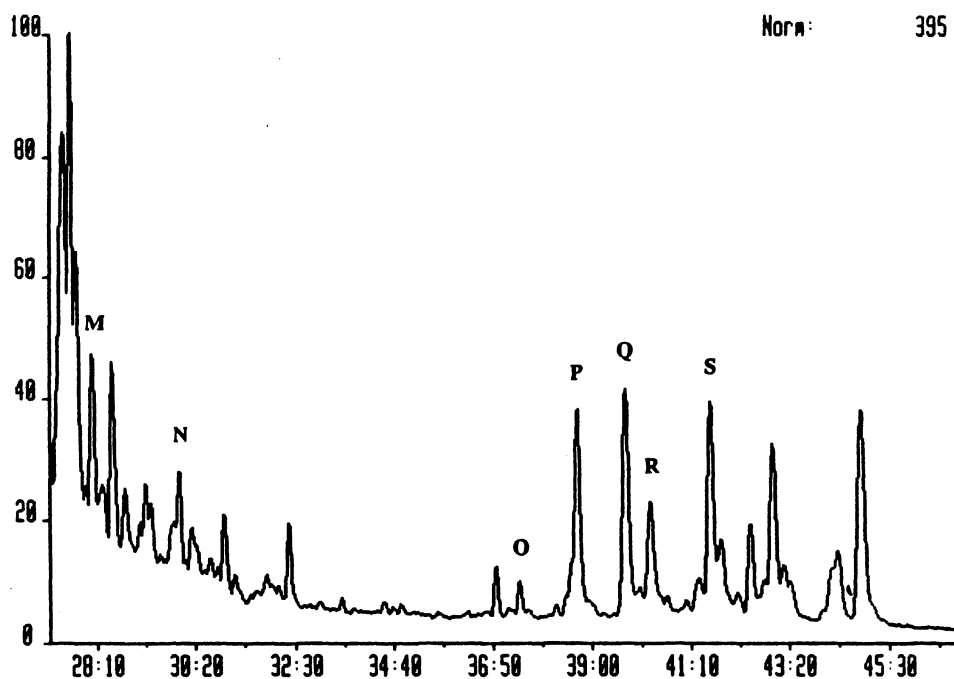
F0165AR 26-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0165 ARO 7430/07-U-01 77.23 M SLTST



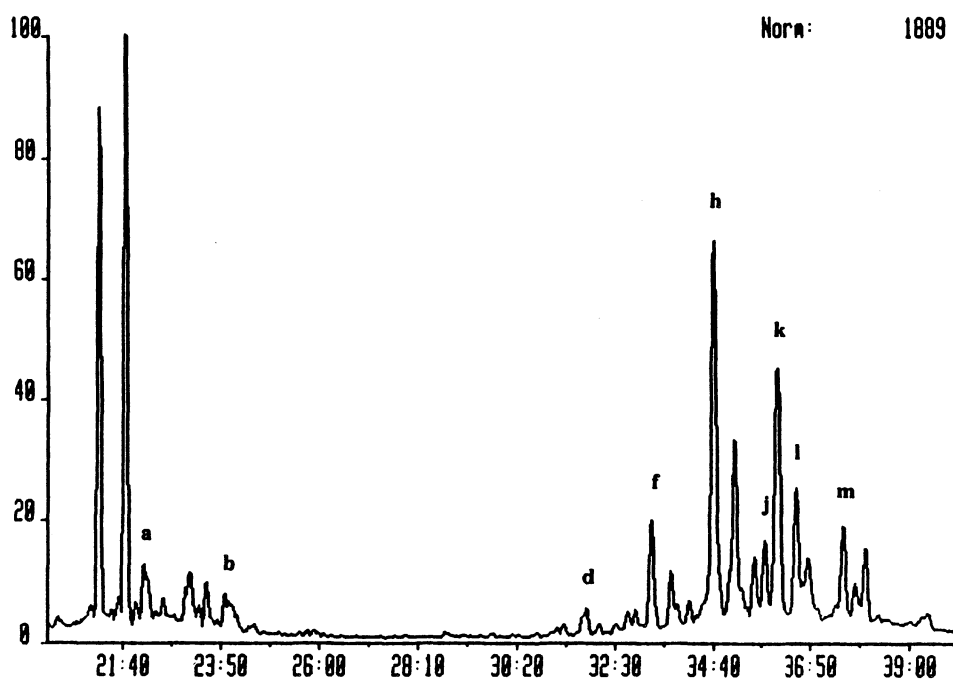
F0165AR 26-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0165 ARO 7430/07-U-01 77.23 M SLTST



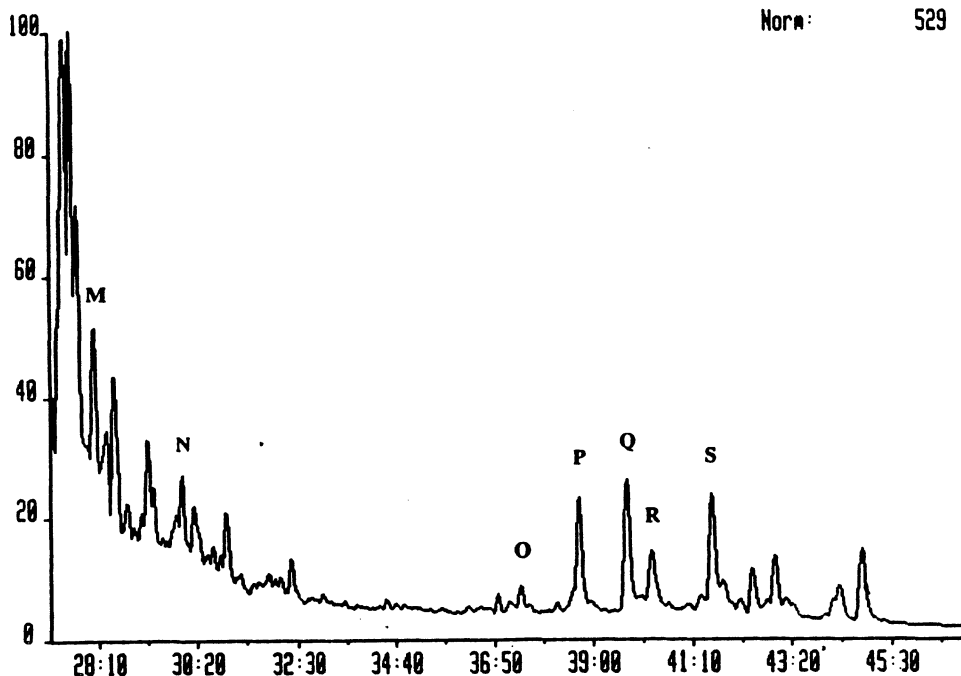
F1201AR 20-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1201 ARO 7430/07-U-01 78.35 M COAL



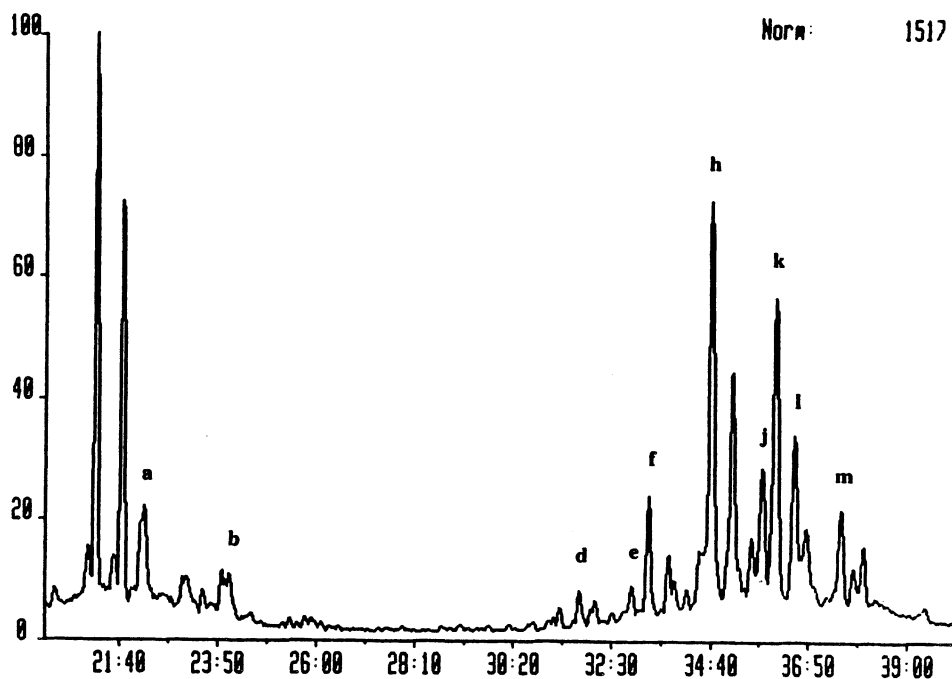
F1201AR 20-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1201 ARO 7430/07-U-01 78.35 M COAL



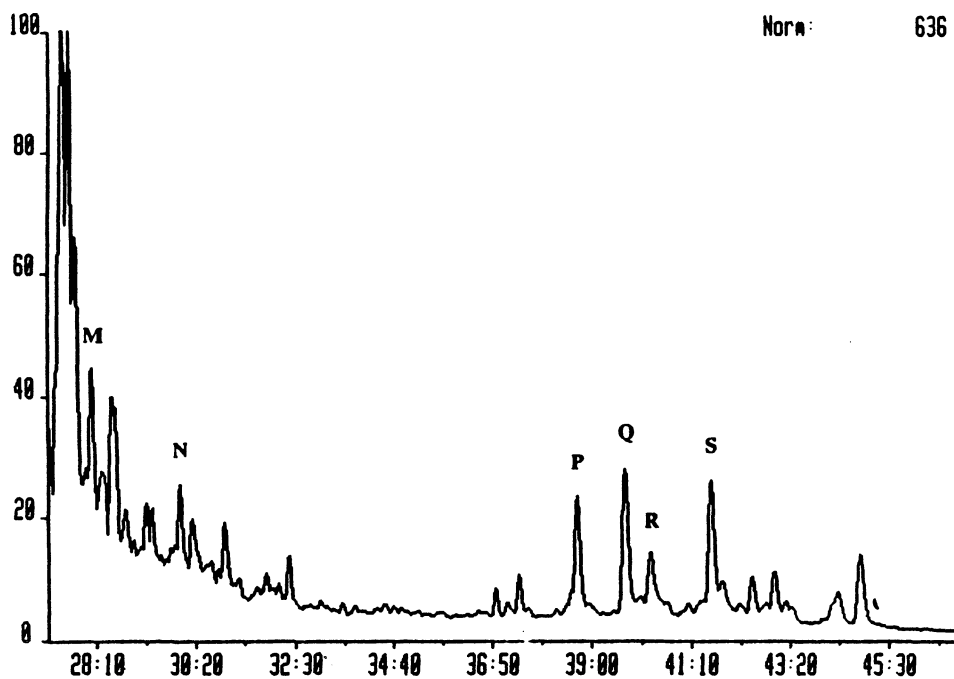
F1290AR 20-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1290 ARO 7430/07-U-01 106.75 M COAL



F1290AR 20-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1290 ARO 7430/07-U-01 106.75 M COAL



F1292AR 20-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1292 ARO 7430/07-U-01 107.96 M CLST



F1292AR 20-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1292 ARO 7430/07-U-01 107.96 M CLST

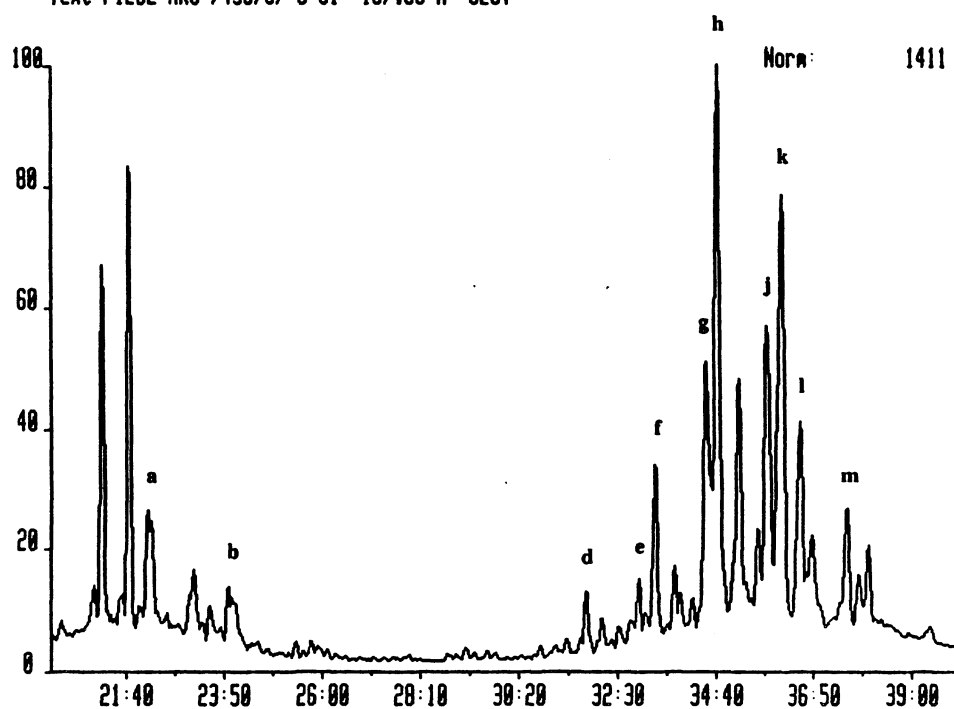
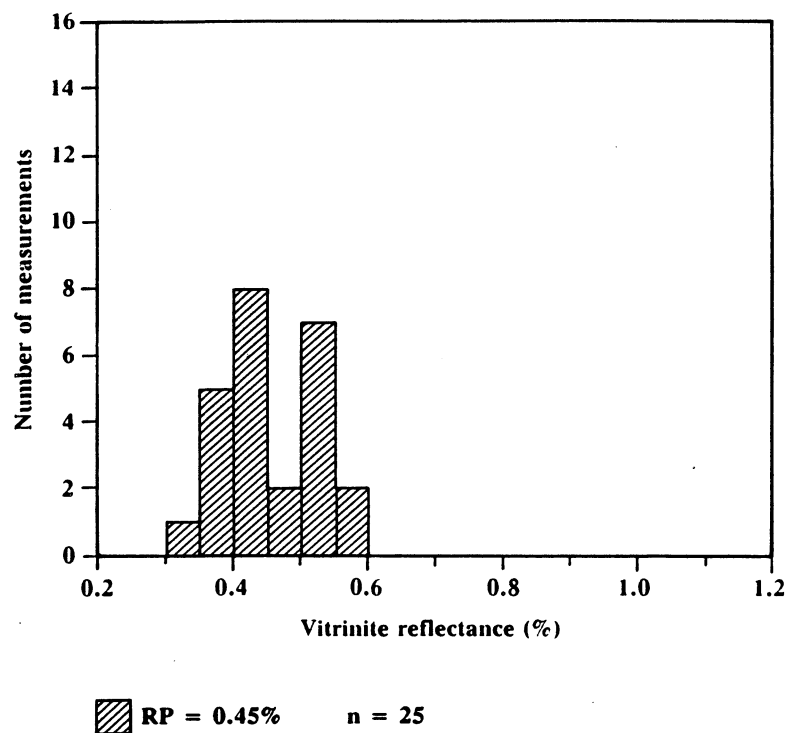


Figure A.III.7.6: Vitrinite reflectance histograms.

Core no.: 7430/07-U-01

Sample no.: F-124

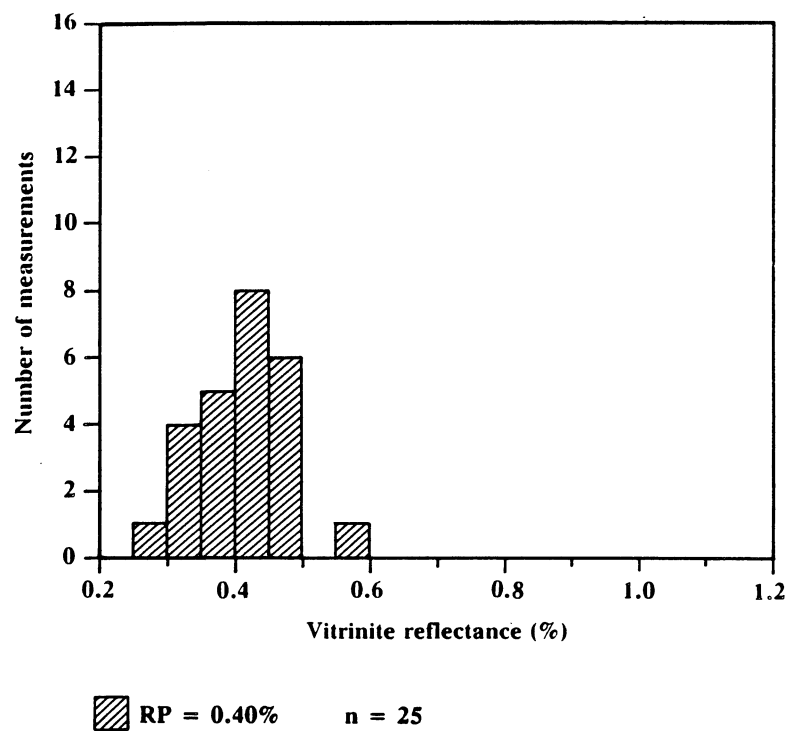
Depth: 37.81 m



Core no.: 7430/07-U-01

Sample no.: F-129

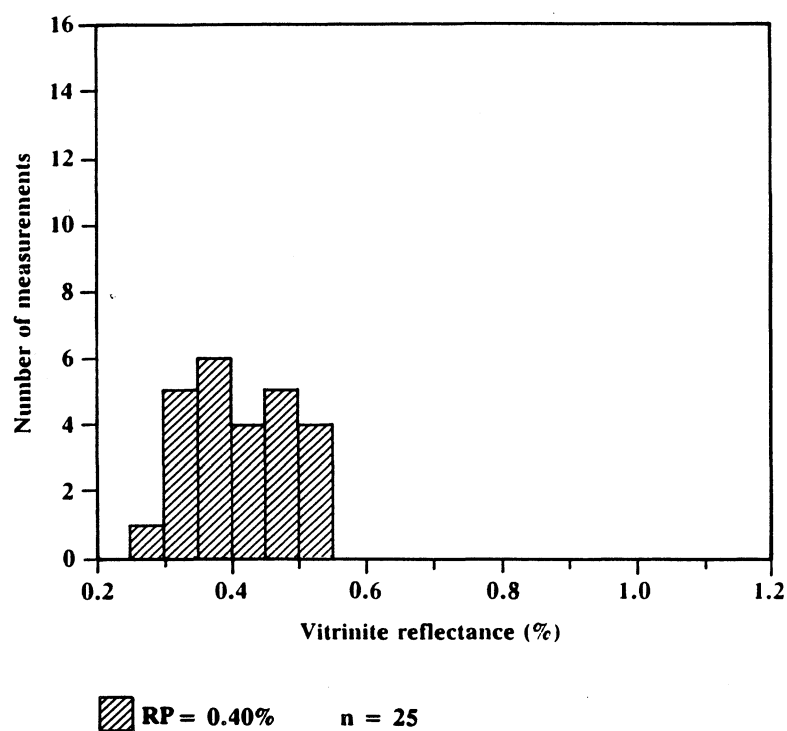
Depth: 38.88 m



Core no.: 7430/07-U-01

Sample no.: F-144

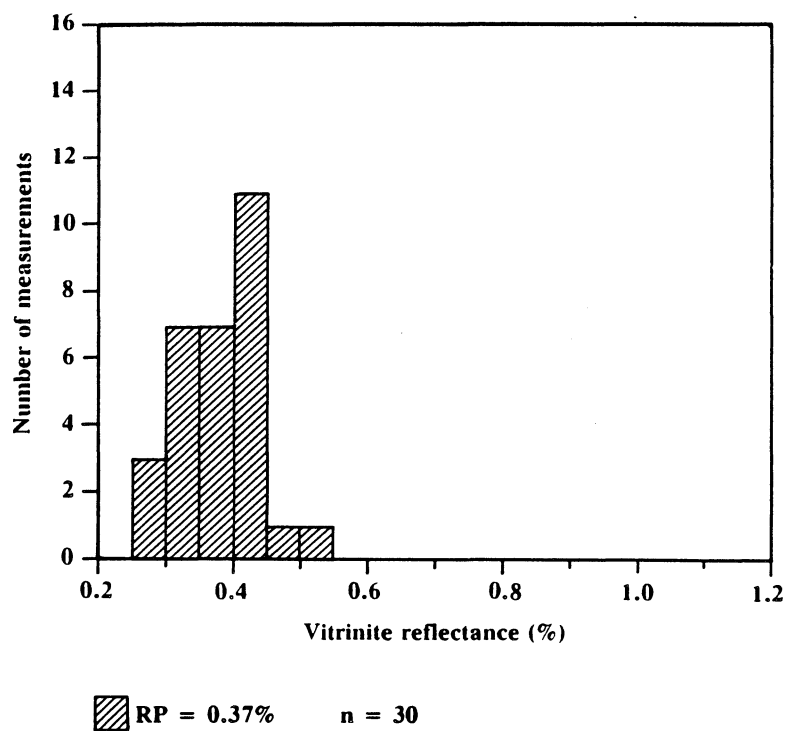
Depth: 50.23 m



Core no.: 7430/07-U-01

Sample no.: F-145

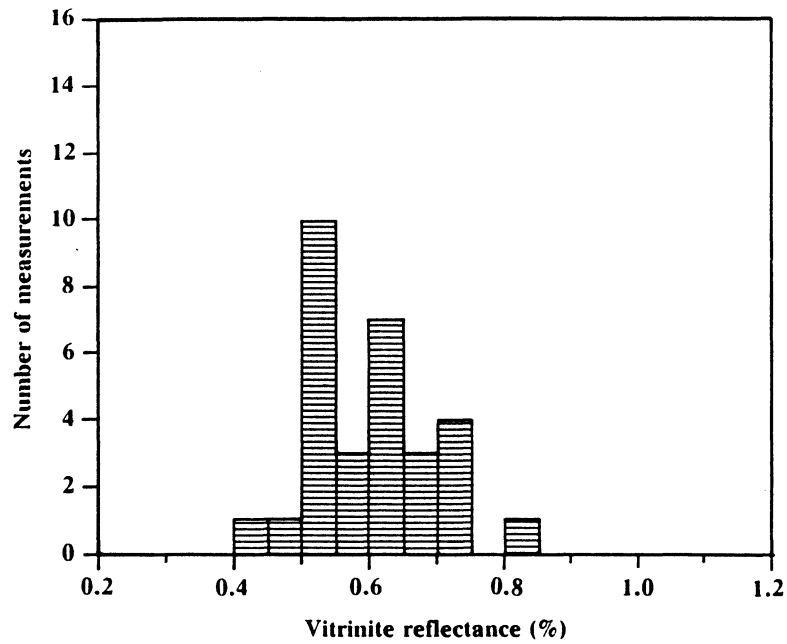
Depth: 50.24 m



Core no.: 7430/07-U-01

Sample no.: F-154

Depth: 64.74 m

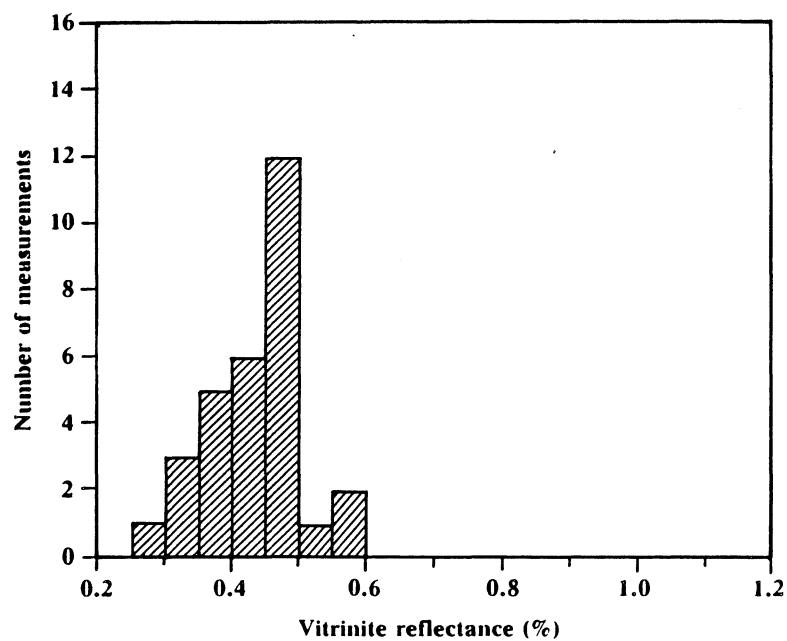


▨ P1 = 0.58% n = 29

Core no.: 7430/07-U-01

Sample no.: F-1281

Depth: 78.35 m

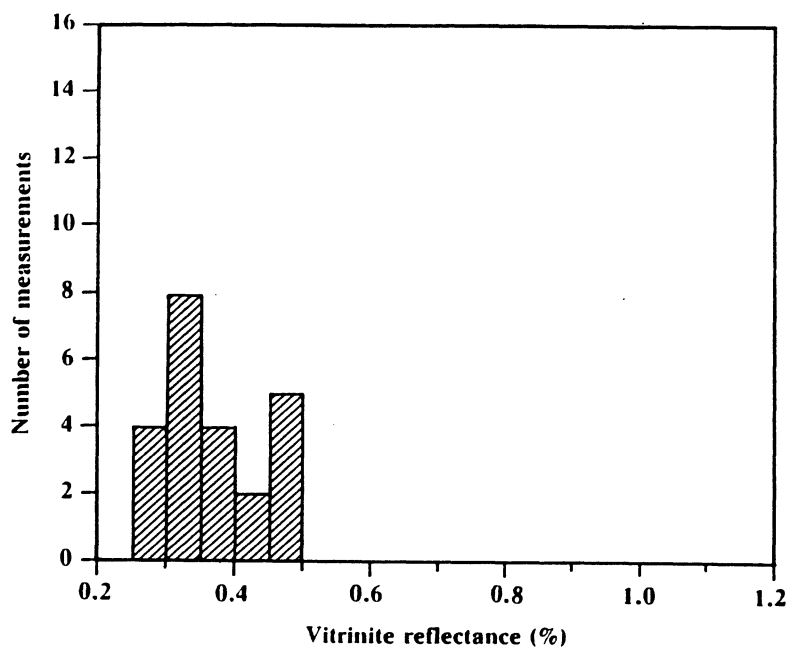


▨ RP = 0.43% n = 30

Core no.: 7430/07-U-01

Sample no.: F-1283

Depth: 83.22 m

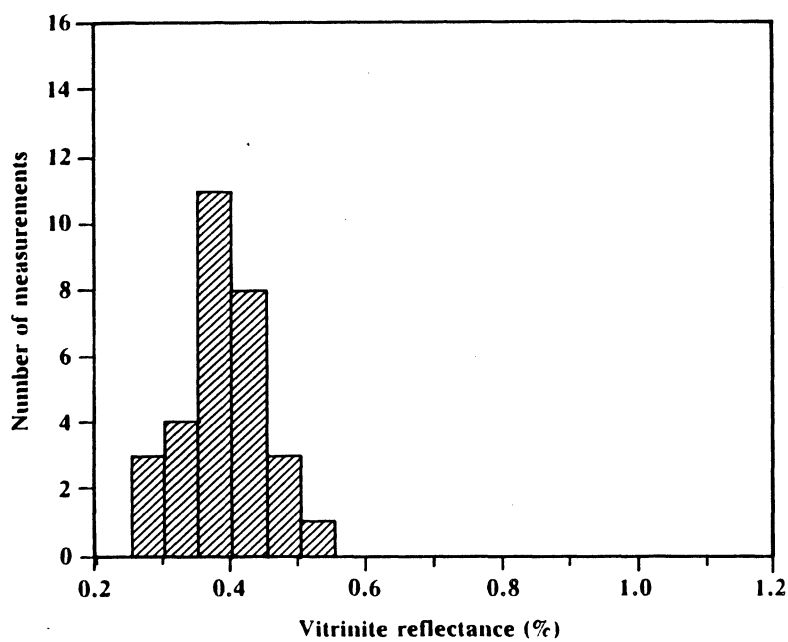


RP = 0.36% n = 23

Core no.: 7430/07-U-01

Sample no.: F-1290

Depth: 106.75 m



RP = 0.38% n = 30

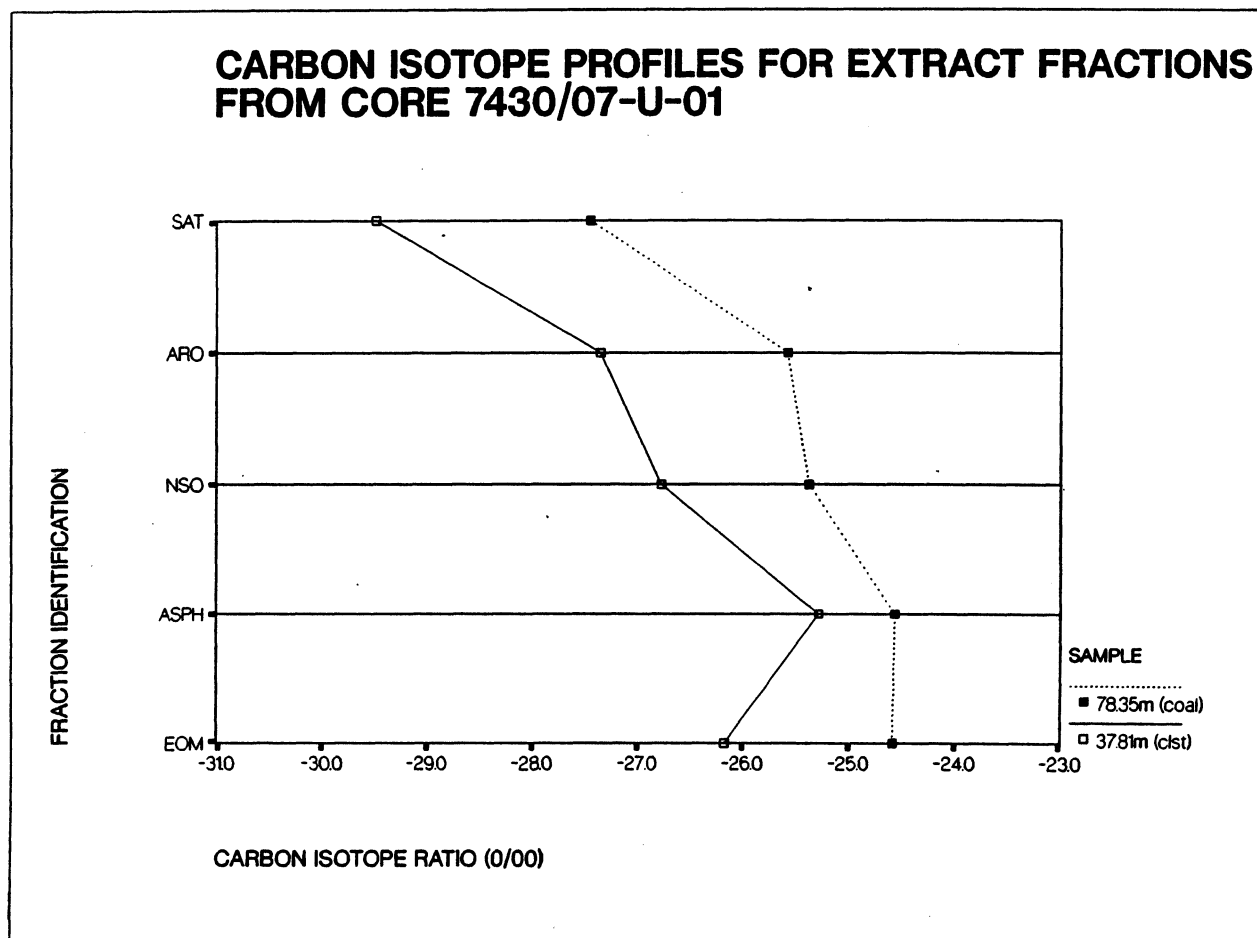


Figure A.III.7.7

APPENDIX III.8: TABLE OF CONTENTS

Core 7430/10-U-01

TABLES

Table A.III.8.1a:	Concentration of C_1-C_{5+} hydrocarbons in headspace gas.
Table A.III.8.1b:	Concentration of C_1-C_{5+} hydrocarbons in occluded gas.
Table A.III.8.1c:	Concentration of C_1-C_{5+} hydrocarbons - summation.
Table A.III.8.2:	Total organic carbon content and data from Rock-Eval pyrolysis.
Table A.III.8.3:	Data from pyrolysis-gas chromatograms.
Table A.III.8.4:	Vitrinite reflectance data.
Table A.III.8.5:	Visual kerogen analysis.
Table A.III.8.6a:	Weight of EOM, asphaltenes and chromatographic fractions.
Table A.III.8.6b:	Concentration of EOM, asphaltenes and chromatographic fractions, related to rock weight.
Table A.III.8.6c:	Concentration of EOM, asphaltenes and chromatographic fractions, related to TOC weight.
Table A.III.8.6d:	Composition of material extracted from the rock.
Table A.III.8.7:	Tabulation of data from the gas chromatograms.
Table A.III.8.8a:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity characteristic ratios.
Table A.III.8.8b:	Molecular ratios from sterane and terpane mass fragmentograms. Maturity and source characteristic ratios.
Table A.III.8.9:	Molecular ratios from aromatic sterane mass fragmentograms.
Table A.III.8.10:	Carbon isotope ratios of EOM and chromatographic fractions.

FIGURES

Figure A.III.8.1:	Pyrolysis-gas chromatograms (S2 peak)
Figure A.III.8.2:	Gas chromatograms of saturated and aromatic hydrocarbons.
Figure A.III.8.3:	Mass fragmentograms of m/z 191, 205 (terpanes) and m/z 217, 218 (steranes).

- Figure A.III.8.4: Internal distribution of $14\alpha(H)$, $17\alpha(H)$ 20R, C_{27} , C_{28} and C_{29} regular steranes (from m/z 217).
- Figure A.III.8.5: Mass fragmentograms of m/z 231, 253 (aromatic steroid hydrocarbons).
- Figure A.III.8.6: Vitrinite reflectance histograms.
- Figure A.III.8.7: Carbon isotope type curves of sediment extracts.

Project no.: 21344423
 Location : 7430/10-U-01
 Date : 88.10.12

Table A.III.8.1: TABLE OF GAS RESULTS

a: Headspace gas (µl gas pr. kg rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0006	16.30	67160	18	0	0	0	0	67178	18	0.0	-1.00
F0025	32.62	16582	0	0	0	0	0	16582	0	0.0	-1.00
F0038	41.70	5446	0	0	0	0	0	5446	0	0.0	-1.00
F0042	44.10	221102	301	13	97	0	0	221513	411	0.2	-1.00
F0050	48.92	220154	838	546	154	154	0	221846	1692	0.8	1.00
F0052	50.95	102056	4042	815	90	101	34	107104	5048	4.7	0.89
F0070	64.07	93130	4907	758	84	88	25	98967	5837	5.9	0.95

b: Occluded gas (µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0006	16.30	2376	37	0	0	0	0	2413	37	1.5	-1.00
F0025	32.62	832	17	0	0	0	0	849	17	2.0	-1.00
F0038	41.70	1654	58	27	10	0	0	1749	95	5.4	-1.00
F0042	44.10	82243	1587	159	1378	47	511	85414	3171	3.7	29.32
F0050	48.92	78006	2876	5102	1681	1941	1598	89606	11600	12.9	0.87
F0052	50.95	16323	10	18	5	5	0	16361	38	0.2	1.00
F0070	64.07	51757	17604	10814	1694	2256	2365	84125	32368	38.5	0.75

c: Summation of Headspace and Occluded gas
(µl gas pr. kg dry rock)

IKUNO	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET- NESS (%)	iC4 --- nC4
F0006	16.30	69536	55	0	0	0	0	69591	55	0.1	-1.00
F0025	32.62	17414	17	0	0	0	0	17431	17	0.1	-1.00
F0038	41.70	7100	58	27	10	0	0	7195	95	1.3	-1.00
F0042	44.10	303345	1888	172	1475	47	511	306927	3582	1.2	31.38
F0050	48.92	298160	3714	5648	1835	2095	1598	311452	13292	4.3	0.88
F0052	50.95	118379	4052	833	95	106	34	123465	5086	4.1	0.90
F0070	64.07	144887	22511	11572	1778	2344	2390	183092	38205	20.9	0.76

Legend: -1 can not be determined

Project no.: 21344423
 Location : 7430/10-U-01
 Date : 88.11.18

Table A.III.8.2: DATA FROM ROCK EVAL PYROLYSIS

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F0002	BULK	13.10	CORE	0.06	0.44	1.17	1.37	32	85	0.50	0.12	428
F0004	BULK	14.90	CORE	0.00	0.34	3.12	1.08	31	288	0.34	0.00	429
F0006	BULK	16.30	CORE	0.00	0.54	0.33	1.19	45	27	0.54	0.00	436
F0007	BULK	17.18	CORE	0.00	0.46	1.49	1.17	39	127	0.46	0.00	428
F0009	BULK	18.45	CORE	0.00	0.95	0.30	1.34	70	22	0.95	0.00	437
F0010	BULK	19.40	CORE	0.00	0.27	1.07	0.89	30	120	0.27	0.00	424
F1207	BULK	20.45	CORE	0.02	0.81	0.63	1.26	64	50	0.83	0.02	433
F0012	BULK	21.80	CORE	0.01	0.30	0.77	0.96	31	80	0.31	0.03	424
F0014	BULK	23.40	CORE	0.01	0.31	0.72	0.90	34	80	0.32	0.03	423
F0015	BULK	24.10	CORE	0.06	0.05	0.55	0.60	8	91	0.11	0.54	426
F0018	BULK	26.20	CORE	0.01	0.31	0.62	1.02	30	60	0.32	0.03	426
F0020	BULK	28.42	CORE	0.01	0.29	0.61	1.10	26	55	0.30	0.03	424
F0022	BULK	30.02	CORE	0.02	0.31	0.38	1.00	31	38	0.33	0.06	421
F0023	BULK	31.92	CORE	0.07	0.04	0.26	0.95	4	27	0.11	0.63	(390)
F0025	BULK	32.62	CORE	0.00	0.26	0.07	0.87	29	8	0.26	0.00	430
F0028	BULK	33.74	CORE	0.09	3.92	1.00	3.68	106	27	4.01	0.02	430
F0029	BULK	35.00	CORE	0.00	0.04	1.31	0.29	13	451	0.04	0.00	(373)
F0033	BULK	39.45	CORE	0.00	0.02	0.83	0.12	16	691	0.02	0.00	431
F1208	BULK	40.07	CORE	-1.00	-1.00	-1.00	0.16	-1	-1	-1.00	-1.00	-1
F0036	BULK	41.45	CORE	0.00	0.00	1.02	0.15	0	680	0.00	0.00	-1
F0038	BULK	41.70	CORE	-1.00	-1.00	-1.00	0.13	-1	-1	-1.00	-1.00	-1
F1209	BULK	42.64	CORE	0.00	0.19	0.72	0.26	73	276	0.19	0.00	(499)
F1210	BULK	42.90	CORE	0.10	1.38	0.54	1.36	101	39	1.48	0.06	428
F1211	BULK	43.07	CORE	2.27	70.52	1.94	19.80	356	9	72.79	0.03	422
F1213	BULK	43.60	CORE	0.05	0.84	0.37	0.97	86	38	0.89	0.05	426
F0042	BULK	44.10	CORE	3.21	85.99	2.48	25.30	339	9	89.20	0.03	424
F1214	BULK	44.46	CORE	1.95	62.99	1.52	17.20	366	8	64.94	0.03	425
F0044	BULK	45.35	CORE	0.30	13.86	0.53	4.60	301	11	14.16	0.02	428
F1215	BULK	46.13	CORE	1.25	38.07	0.89	11.00	346	8	39.32	0.03	422
F0046	BULK	46.85	CORE	4.35	71.67	1.18	18.20	393	6	76.02	0.05	415
F1216	BULK	47.54	CORE	0.35	15.41	0.83	4.89	315	16	15.76	0.02	422
F0049	BULK	48.22	CORE	2.77	57.40	0.88	13.40	428	6	60.17	0.04	418
F0050	BULK	48.92	CORE	2.45	75.95	1.45	20.60	368	7	78.40	0.03	429
F1329	BULK	48.98	CORE	3.22	95.45	0.19	17.50	545	1	98.67	0.03	425
F0051	BULK	49.62	CORE	0.44	19.60	0.82	5.41	362	15	20.04	0.02	429
F1217	BULK	50.66	CORE	2.57	87.88	2.00	21.30	412	9	90.45	0.02	429
F0052	BULK	50.95	CORE	0.64	32.19	0.74	8.72	369	8	32.83	0.01	428
F0053	BULK	51.05	CORE	2.40	61.49	1.71	15.40	399	11	63.89	0.03	423
F1218	BULK	51.55	CORE	0.82	27.26	0.91	8.34	326	10	28.08	0.02	428
F0054	BULK	52.15	CORE	1.25	34.28	1.18	9.60	357	12	35.53	0.03	420
F1219	BULK	52.68	CORE	0.91	30.92	0.79	9.42	328	8	31.83	0.02	426
F0055	BULK	53.10	CORE	2.09	60.87	1.71	15.70	387	10	62.96	0.03	425
F1220	BULK	53.57	CORE	1.10	29.87	0.97	9.31	320	10	30.97	0.03	419

Project no.: 21344423
Location : 7430/10-U-01
Date : 88.11.18

Table A.III.8.2 (cont'd):

IKUNO	FRAC NAME	DEPTH	SAMPLE TYPE	S1	S2	S3	TOC	HYDR. INDEX	OXYG. INDEX	PETR. POTEN.	PROD. INDEX S1	Tmax
		(m)		(mg/g rock)			(%)	(mg/g TOC)		S1+S2	S1+S2	(°C)
F0056	BULK	53.93	CORE	2.17	43.62	0.95	10.10	431	9	45.79	0.04	417
F1221	BULK	54.30	CORE	1.14	29.51	1.06	9.29	317	11	30.65	0.03	422
F0057	BULK	54.73	CORE	0.69	19.90	1.15	5.95	334	19	20.59	0.03	420
F1222	BULK	55.12	CORE	0.95	21.94	0.22	7.77	282	2	22.89	0.04	420
F0058	BULK	55.63	CORE	0.58	18.95	1.13	5.94	319	19	19.53	0.02	423
F1223	BULK	56.03	CORE	0.54	21.05	0.61	6.04	348	10	21.59	0.02	421
F0059	BULK	56.63	CORE	0.39	15.25	0.89	4.97	306	17	15.64	0.02	426
F0061	BULK	57.03	CORE	1.26	32.74	1.26	10.40	314	12	34.00	0.03	419
F1224	BULK	57.70	CORE	0.83	27.45	0.87	8.68	316	10	28.28	0.02	423
F0063	BULK	58.41	CORE	0.88	31.89	1.49	8.84	360	16	32.77	0.02	423
F1225	BULK	59.08	CORE	1.58	46.37	1.04	13.30	348	7	47.95	0.03	421
F0064	BULK	59.58	CORE	1.30	31.00	0.72	8.47	365	8	32.30	0.04	420
F1226	BULK	59.93	CORE	1.32	33.83	0.94	11.10	304	8	35.15	0.03	417
F0065	BULK	60.78	CORE	1.19	20.29	1.49	10.80	187	13	21.48	0.05	416
F1227	BULK	61.20	CORE	0.94	29.53	1.31	10.40	283	12	30.47	0.03	417
F0067	BULK	61.88	CORE	1.02	26.71	1.22	10.20	261	11	27.73	0.03	421
F0068	BULK	62.57	CORE	0.52	18.35	1.08	7.64	240	14	18.87	0.02	424
F1228	BULK	63.15	CORE	0.75	24.72	0.83	9.97	247	8	25.47	0.02	421
F0069	BULK	63.57	CORE	0.52	16.62	1.10	7.77	213	14	17.14	0.03	424
F0070	BULK	64.07	CORE	0.41	17.45	0.62	7.57	230	8	17.86	0.02	422
F0071	BULK	64.60	CORE	0.42	14.16	1.21	7.10	199	17	14.58	0.02	424
F1229	BULK	65.00	CORE	0.47	17.81	0.80	8.06	220	9	18.28	0.02	424
F0072	BULK	65.65	CORE	0.46	15.27	1.22	7.24	210	16	15.73	0.02	425
F1230	BULK	66.00	CORE	0.54	20.43	0.73	8.54	239	8	20.97	0.02	421
F0074	BULK	66.60	CORE	0.96	24.87	1.52	10.50	236	14	25.83	0.03	418
F1231	BULK	67.03	CORE	0.82	27.27	1.12	10.80	252	10	28.09	0.02	418
F0075	BULK	67.55	CORE	2.07	35.46	0.99	12.10	293	8	37.53	0.05	413

Legend:

- 1 : Not determined or no data available
- () : Tmax values of doubtful reliability (usually associated with poor S2 peaks)

Table A.III.8.3: Data from pyrolysis-gas chromatograms

Core 7430/10-U-01							
IKU NO	DEPTH (m)	SAMPLE TYPE	LITHOLOGY	C1	C2-C6 percent of peak area	C6-C14	C15+
F0012	21.80	Core	Claystone	18.6	46.5	26.3	8.6
F0028	33.74	Core	Claystone	7.7	22.6	43.2	26.5
F1211	43.07	Core	Claystone	6.3	6.5	31.4	55.8
F0046	46.85	Core	Claystone	5.3	14.3	30.5	49.8
F1216	47.54	Core	Siltstone	3.6	13.2	33.6	49.5
F1329	48.98	Core	Claystone	4.4	12.7	30.3	52.7
F0051	49.62	Core	Claystone	4.4	8.5	37.1	50.1
F0053	51.05	Core	Claystone	4.9	13.0	30.9	51.3
F0056	53.93	Core	Claystone	5.4	10.8	31.1	52.6
F0064	59.58	Core	Claystone	5.6	13.9	33.2	47.4
F0065	60.78	Core	Claystone	11.5	15.8	45.6	27.1
F0069	63.57	Core	Claystone	11.5	25.0	41.9	21.7
F0072	65.65	Core	Claystone	8.4	17.4	38.7	35.4

Core-site Number: 7430/10-U-01
 Reference number: 21.3444.23
 (1/1)

Table A.III.8.4: VITRINITE REFLECTANCE DATA

IKU NO	LOCATION	DEPTH (M)	VITRINITE REFLECTANCE	REL RAT	STANDARD DEVIATION	FLUORE- SCENCE
F- 11	-----	20.05	N.D.P.	-	----	3-4
F- 16	-----	25.10	0.55 (3) 0.74 (6) 1.03 (5)	R R R	0.05 0.03 0.07	2?
F- 28	-----	33.74	0.40 (11) 0.66 (2) 0.86 (3)	F R R	0.06 0.04 0.06	3?
F-1329	-----	48.98	0.30 (30)	G	0.05	1-2
F- 78	-----	55.20	0.35 (24)	F	0.06	2-3
F-1228	-----	63.15	0.39 (26) 0.69 (2) 0.91 (2)	F R R	0.07 0.02 0.05	1-4

REL RAT (Reliability Rating): G = Good; F = Fair; P = Poor;
 I = Inertinite. L = Liptinite or poor vitrinite particle.
 R = Reworked material/inertinite.

VISUAL KEROGEN ANALYSIS
TABLE NO.: A.III.8.5
CORE NO.: 7430/10-U-01

Sample	Depth (m)	Compo- sition of residue	Particle size	Preser- vation palyno- morphs	Thermal maturation index * NEW TAI	Remarks
F-1435	13.25	Lm: 20-25 W: 20-25 C: >50	F-M		2	
F-1439	23.00	Lm: 20-30 W: 60 C: 10-20	F-M		2	
F-1440	29.00	Lm: <5 W: 5-10 C: 90	F-M		2	
F-27	33.74	Am: 60 Lm: <5 W: 20 C: 10-25	F-M-L		2	

ABBREVIATIONS:

Am = Amorphous
 Al = Algae
 W = Woody material
 C = Coaly fragments
 Lm = Liptinitic material

F = Fine
 M = Medium
 L = Large

* 1-10 scale (see experimental)

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.8.5 (ctd)
CORE NO.: 7430/10-U-01

Sample	Depth (m)	Compo- sition of residue	Particle size	Preser- vation palyno- morphs	Thermal maturation index * NEW TAI	Remarks
F-1442	41.00	Lm: <5 C: >90	F-M			
F-89	42.65	Lm: <5 W: 35-40 C: 60	F-M		20	Contains only black, coaly fragments and woody material
F-41	43.85	Am: 15-20 Lm: <5 W: 50 C: 30	F-M			
F-0095	47.50	Am: 60 Lm: 5 W: 20 C: 15-20	F-M		20	
F-47	47.87	Am: 70 Lm: <5 W: 15-20 C: 10	F-M-L			Same as sample 67.6 m

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

ANL_WP22/RAPPORT/BG5/ame/8/19-FEB-89

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.8.5 (ctd)
CORE NO.: 7430/10-U-01

Sample	Depth (m)	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index * NEW TAI	Remarks
F-1445	51.0 m	Am: 70 Lm: <5 W: 15-20 C: 10	F-M-L			Same as sample 67.6 m
F-1447	55.0 m	Am: 70 Lm: <5 W: 10-15 C: 15	F-M-L		?	Same as sample 67.6 m, except that the amorphous material mainly is in the fine-medium fraction.
F-1448	58.0 m	Am: 75 Lm: <5 W: 10 C: 10-15	F-M-L		2	Same as sample 67.6 m
F-1449	60.0 m	Am: 70 Lm: <5 W: 10-15 C: 15	F-M-L		?	Same as sample 67.6 m

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

VISUAL KEROGEN ANALYSIS

TABLE NO.: A.III.8.5 (ctd)
CORE NO.: 7430/10-U-01

Sample	Depth (m)	Compo- sition of residue	Particle size	Preser- vation palyno- morphs	Thermal maturation index * NEW TAI	Remarks
F-1450	63.00	Am: 60 Lm: <5 W: 30 C: 5-10	F-M-L		?	Same as sample 67.55 m.
F-1451	65.00	Am: 80 Lm: <5 W: 10 C: 5-10	F-M-L		?	Same as sample 67.60 m.
F-0087	67.55	Am: 60 Lm: <5 W: 15-20 C: 20	F-M-L		2 - 3	Dark woody material and coaly fragments dominate together with amorphous aggregates considered to be degraded wood material.
F-1452	67.60	Am: 80 Lm: <5 W: 10-15 C: 5	F-M-L		2 - 3	The amorphous material is dominated by large sized aggregates, considered to be degraded wood material.

ABBREVIATIONS:

Am = Amorphous
Al = Algae
W = Woody material
C = Coaly fragments
Lm = Liptinitic material

F = Fine
M = Medium
L = Large

* 1-10 scale (see experimental)

ANL_WP22/RAPPORT/BG5/ame/6/19-FEB-89

Project no.: 21344423
Location : 7430/10-U-01
Date : 89.02.05

- 360 -



Table A.III.8.6a: WEIGHT OF CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ROCK EXTR. (g)	EOM (mg)	ASPH (mg)	SAT HC (mg)	ARO HC (mg)	POLAR COMP. (mg)	HC (mg)	NONHC (mg)	TOC (%)
F0012	BULK	21.80	CORE	76.6	23.1	13.0	2.2	3.8	4.7	6.0	17.1	0.96
F0028	BULK	33.74	CORE	12.0	19.7	12.5	1.8	2.4	3.5	4.2	15.5	3.68
F1211	BULK	43.07	CORE	19.0?	356.5	194.1	20.8	66.1	80.8	86.9	269.6	19.80
F0042	BULK	44.10	CORE	10.0	196.7	109.9	11.1	28.2	41.7	39.3	157.4	25.30
F0046	BULK	46.85	CORE	23.6	370.5	249.5	19.3	60.6	76.4	79.9	290.6	18.20
F1216	BULK	47.54	CORE	19.5	81.0	43.3	3.3	10.5	13.8	13.8	67.2	4.89
F1329	BULK	48.98	CORE	6.5	84.0	46.6	2.9	8.9	15.4	11.8	72.2	17.50
F0051	BULK	49.62	CORE	10.4	42.1	26.6	1.8	5.0	7.4	6.8	35.3	5.41
F0053	BULK	51.05	CORE	22.4	329.0	197.6	14.8	55.8	60.8	70.6	258.4	15.40
F0056	BULK	53.93	CORE	22.8	216.4	133.0	10.5	26.2	38.4	36.7	179.7	10.10
F0061	BULK	57.03	CORE	22.5	180.3	102.8	9.8	24.9	32.8	34.7	145.6	10.40
F0064	BULK	59.58	CORE	19.6	114.8	62.5	9.0	16.3	22.7	25.3	89.5	8.47
F0065	BULK	60.78	CORE	20.5	201.0	138.1	5.5	28.5	26.1	34.0	167.0	10.80
F0069	BULK	63.57	CORE	14.2	51.3	29.7	2.2	7.8	8.4	10.0	41.3	7.77
F0072	BULK	65.65	CORE	17.7	48.0	28.3	2.6	9.5	8.0	12.1	35.9	7.24

Legend:

- * - Not all the available EOM was used for MPLC.
- ? - MPLC results assumed more EOM than originally extracted.
- 1- No data available.

Table A.III.8.6b: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(Weight ppm of rock)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
F0012	BULK	21.80	CORE	301	170	28	49	62	77	224
F0028	BULK	33.74	CORE	1635	1038	150	200	290	350	1285
F1211	BULK	43.07	CORE	18776	10223	1096	3481	4255	4577	14199
F0042	BULK	44.10	CORE	19644	10975	1111	2816	4165	3927	15717
F0046	BULK	46.85	CORE	15697	10570	817	2566	3236	3383	12314
F1216	BULK	47.54	CORE	4143	2215	170	536	706	706	3437
F1329	BULK	48.98	CORE	13003	7214	441	1382	2380	1823	11180
F0051	BULK	49.62	CORE	4060	2566	176	480	715	656	3404
F0053	BULK	51.05	CORE	14697	8827	662	2491	2716	3153	11544
F0056	BULK	53.93	CORE	9484	5829	462	1146	1682	1608	7876
F0061	BULK	57.03	CORE	8018	4572	434	1105	1461	1539	6479
F0064	BULK	59.58	CORE	5847	3183	459	829	1154	1288	4559
F0065	BULK	60.78	CORE	9817	6745	268	1391	1277	1659	8158
F0069	BULK	63.57	CORE	3611	2091	155	549	592	704	2907
F0072	BULK	65.65	CORE	2705	1595	144	536	454	680	2025

Legend:

- 1- No data available.

Project no.: 21344423
 Location : 7430/10-U-01
 Date : 89.02.05

- 361 -



Table A.III.8.6c: CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	EOM	ASPH	SAT HC	ARO HC	POLAR COMP.	HC	NONHC
FO012	BULK	21.80	CORE	31.4	17.7	3.0	5.1	6.4	8.1	23.3
FO028	BULK	33.74	CORE	44.4	28.2	4.1	5.4	7.9	9.5	34.9
F1211	BULK	43.07	CORE	94.8	51.6	5.5	17.6	21.5	23.1	71.7
FO042	BULK	44.10	CORE	77.6	43.4	4.4	11.1	16.5	15.5	62.1
FO046	BULK	46.85	CORE	86.2	58.1	4.5	14.1	17.8	18.6	67.6
F1216	BULK	47.54	CORE	84.7	45.3	3.5	11.0	14.4	14.5	70.2
F1329	BULK	48.98	CORE	74.3	41.2	2.5	7.9	13.6	10.4	63.9
FO051	BULK	49.62	CORE	75.1	47.4	3.2	8.9	13.2	12.1	63.0
FO053	BULK	51.05	CORE	95.4	57.3	4.3	16.2	17.6	20.5	74.9
FO056	BULK	53.93	CORE	93.9	57.7	4.6	11.3	16.7	15.9	78.0
FO061	BULK	57.03	CORE	77.1	44.0	4.2	10.6	14.0	14.8	62.3
FO064	BULK	59.58	CORE	69.0	37.6	5.4	9.8	13.6	15.2	53.8
FO065	BULK	60.78	CORE	90.9	62.4	2.5	12.9	11.8	15.4	75.5
FO069	BULK	63.57	CORE	46.5	26.9	2.0	7.1	7.6	9.1	37.4
FO072	BULK	65.65	CORE	37.4	22.0	2.0	7.4	6.3	9.4	28.0

Legend:

-1- No data available.

Table A.III.8.6d: COMPOSITION OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKUNO	FRAC NAME	DEPTH (m)	SAMPLE TYPE	ASPH EOM (%)	SAT EOM (%)	ARO EOM (%)	HC EOM (%)	POLAR EOM (%)	SAT ARO x 100	HC NONHC x 100
FO012	BULK	21.80	CORE	56.3	9.4	16.2	25.6	20.4	58.1	34.5
FO028	BULK	33.74	CORE	63.5	9.2	12.2	21.4	17.8	75.0	27.3
F1211	BULK	43.07	CORE	54.4	5.8	18.5	24.3	22.7	31.5	32.2
FO042	BULK	44.10	CORE	55.9	5.7	14.3	20.0	21.2	39.4	25.0
FO046	BULK	46.85	CORE	67.3	5.2	16.3	21.5	20.6	31.8	27.5
F1216	BULK	47.54	CORE	53.5	4.1	12.9	17.0	17.0	31.8	20.5
F1329	BULK	48.98	CORE	55.5	3.4	10.6	14.0	18.3	31.9	16.3
FO051	BULK	49.62	CORE	63.2	4.3	11.8	16.1	17.6	36.6	19.3
FO053	BULK	51.05	CORE	60.1	4.5	17.0	21.5	18.5	26.6	27.3
FO056	BULK	53.93	CORE	61.5	4.9	12.1	17.0	17.7	40.3	20.4
FO061	BULK	57.03	CORE	57.0	5.4	13.8	19.2	18.2	39.3	23.8
FO064	BULK	59.58	CORE	54.4	7.9	14.2	22.1	19.7	55.4	28.3
FO065	BULK	60.78	CORE	68.7	2.7	14.2	16.9	13.0	19.2	20.3
FO069	BULK	63.57	CORE	57.9	4.3	15.2	19.5	16.4	28.1	24.2
FO072	BULK	65.65	CORE	59.0	5.3	19.8	25.1	16.8	26.9	33.6

Legend:

-1- No data available.

Project no.: 21344423
Location : 7430/10-U-01
Date : 89.02.05

- 362 -



Table A.III.8.7:

RATIOS DERIVED FROM GAS CHROMATOGRAMS OF SATURATED HYDROCARBONS

IKUNO	FRAC NAME	DEPTH	Pri	Pri	Phy	A	n-C17	n-C31	CPI 1	CPI 2
			Phy	A=----- n-C17	B=----- n-C18	B	n-C27	n-C19		
F0012	BULK	21.80	2.5	0.9	0.4	2.2	1.4	0.5	1.5	1.6
F0028	BULK	33.74	0.9	2.5	1.5	1.7	0.3	0.6	1.3	1.7
F1211	BULK	43.07	1.6	6.2	5.4	1.1	1.5	0.4	1.5	1.6
F0042	BULK	44.10	1.5	4.9	4.2	1.2	1.1	0.7	1.6	1.8
F0046	BULK	46.85	1.2	5.1	5.8	0.9	1.3	0.5	1.4	1.8
F1216	BULK	47.54	1.3	5.6	4.3	1.3	1.2	0.4	1.4	1.6
F1329	BULK	48.98	1.2	5.9	5.2	1.1	1.2	0.6	1.5	1.8
F1329	EXTPY	48.98	1.4	0.2	0.2	1.3	3.3	0.3	1.1	1.0
F1329	EXPPY	48.98	1.8	0.7	0.5	1.5	5.7	0.1	1.1	1.0
F0051	BULK	49.62	1.5	5.7	4.6	1.2	1.1	0.6	1.5	1.7
F0053	BULK	51.05	1.9	6.1	4.6	1.3	2.6	0.3	1.4	1.5
F0056	BULK	53.93	1.2	4.9	5.3	0.9	1.8	0.5	1.4	1.5
F0061	BULK	57.03	1.7	4.6	3.5	1.3	1.2	0.6	1.4	1.5
F0064	BULK	59.58	1.2	4.1	4.4	0.9	0.8	1.2	1.4	1.6
F0065	BULK	60.78	1.5	6.6	5.7	1.2	0.9	0.5	1.8	1.9
F0069	BULK	63.57	1.8	5.3	3.6	1.5	0.6	1.0	1.5	1.7
F0072	BULK	65.65	2.0	4.5	2.4	1.9	0.7	0.6	1.4	1.5

-1 = No data available

Table A.III.8.8a:

Molecular ratios from sterane and terpane mass chromatograms.
Maturity ratios.

Core 7430/10-U-01

IKU no.	Depth (m)	$\alpha\beta/\alpha\beta+\beta\alpha^{1)}$	%22S ²⁾	% $\beta\beta^3)$	%20S ⁴⁾
F0012	21.80	0.66	30	54	5
F0028	33.74	0.70	31	56	6
F1211	43.07	0.68	42	49	16
F0046	46.85	0.71	42	54	23
F1216	47.54	0.74	44	56	21
F1329	48.98	0.73	50	57	24
F0051	49.62	0.74	47	59	21
F0053	51.05	0.75	48	55	24
F0056	53.93	0.74	41	47	21
F0064	59.58	0.75	40	41	17
F0065	60.78	0.73	41	55	15

¹⁾ E/(E+F) in m/z 191.

²⁾ Average % distribution between first and second eluting isomers of extended hopanes.

³⁾ $100 * 2(r+s)/(q+t+2(r+s))$ in m/z 217.

⁴⁾ $100 * q/(q+t)$ in m/z 217.

Table A.III.8.8b:

Molecular ratios from terpane and sterane mass chromatograms.
Maturity and source characteristic ratios.

Core 7430/10-U-01

IKU no.	Depth (m)	Q/E ¹⁾	Tm/Ts ²⁾	X/E ³⁾	Z/E ⁴⁾	a/a+j ⁵⁾
F0012	21.80	0.03	40.70	0.00	0.00	0.31
F0028	33.74	0.04	23.50	0.00	0.00	0.22
F1211	43.07	0.12	13.00	0.04	0.14	0.43
F0046	46.85	0.11	-1.00	0.00	0.00	0.49
F1216	47.54	0.07	-1.00	0.03	0.00	0.59
F1329	48.98	0.09	26.00	0.02	0.00	0.58
F0051	49.62	0.06	-1.00	0.03	0.01	0.57
F0053	51.05	0.06	-1.00	0.02	0.00	0.57
F0056	53.93	0.07	10.75	0.04	0.00	0.47
F0064	59.58	0.03	3.55	0.03	0.00	0.38
F0065	60.78	0.05	10.57	0.05	0.00	0.62

1) Relative abundance of tricyclic terpanes (Q/E in m/z 191).

2) B/A in m/z 191.

3) Relative abundance of unknown (X/E in m/z 191).

4) Relative abundance of bisnorhopane (Z/E in m/z 191).

5) Relative abundance of C₂₇ rearranged steranes (a/(a+j) in m/z 217).

Table A.III.8.9: Molecular ratios from mass fragmentograms of aromatic steroid hydrocarbons.

Core 7430/10-U-01

IKUNO	Depth m	Cracking ratios			Aromatisation ratios	
		20/20+27	20/20+28	21/21+28	27t/27t+28m	28t/28t+29m
		tri	tri	mono		
		1)	2)	3)	4)	5)
F0012	21.80	0.13	0.41	0.75	0.93	0.83
F0042	44.10	0.09	0.28	0.09	0.21	0.14
F0046	46.85	0.08	0.29	0.02	0.06	0.20
F1211	43.07	0.12	0.34	0.13	0.14	0.09
F1216	47.54	0.10	0.30	0.11	0.17	0.13
F1329	48.98	0.10	0.00	-1.00	-1.00	0.00
F0053	51.05	0.10	0.31	0.11	0.17	0.15
F0065	60.78	0.15	0.39	0.12	0.10	0.08
F0069	63.57	0.10	0.33	0.10	0.16	0.12
F0072	65.65	0.11	0.28	0.11	0.15	0.13

1) $M/(M+P)$ in m/z 231

2) $M/(M+S)$ in m/z 231

3) $a/(a+h)$ in m/z 253

4) $P/(P+h)$ in m/z 231 and m/z 253

5) $S/(S+m+(k*S/(S+R)))$ in m/z 231 and m/z 253

Table A.III.8.10: Carbon isotope ratios for EOM and extract fractions

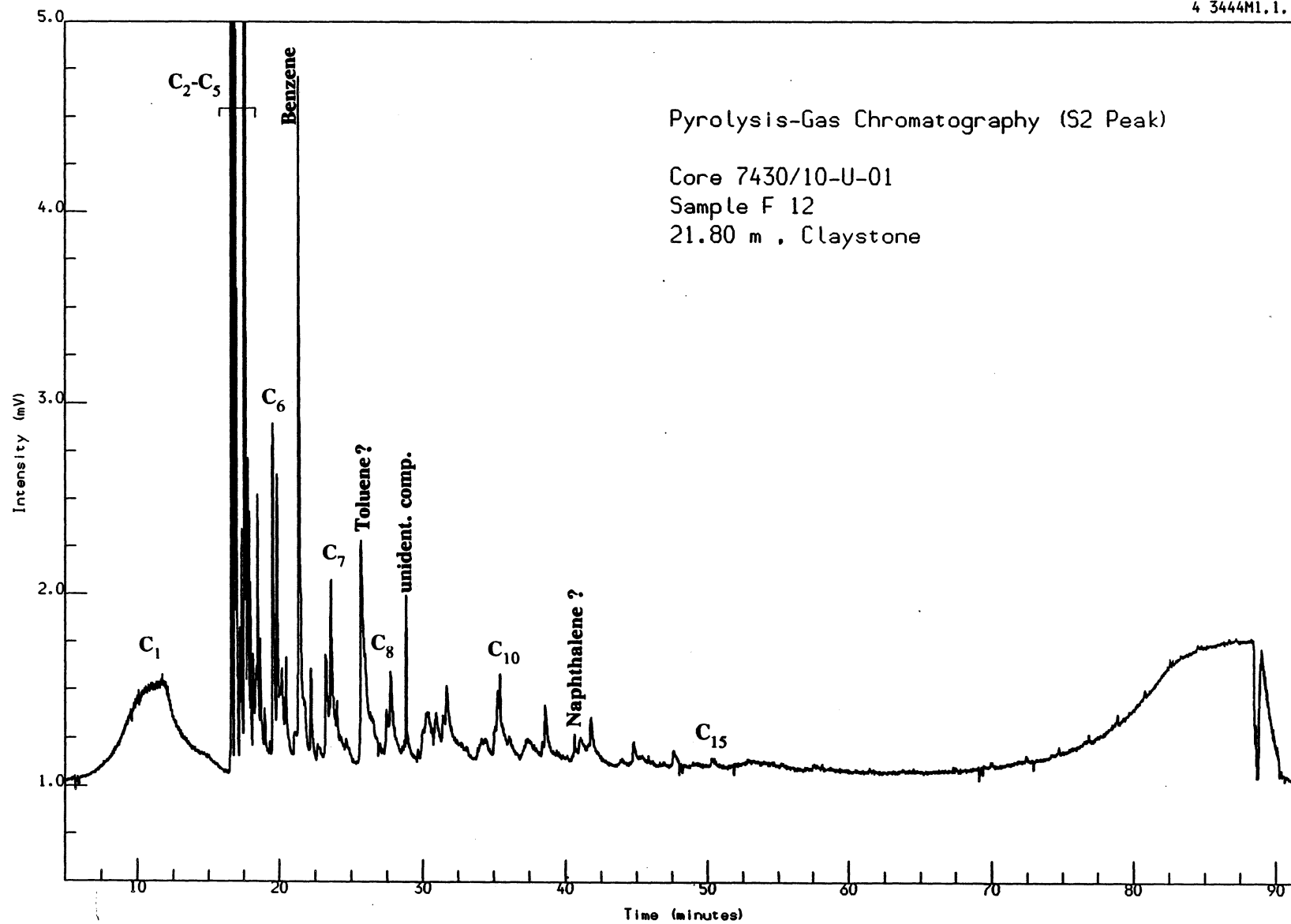
Core 7430/10-U-01

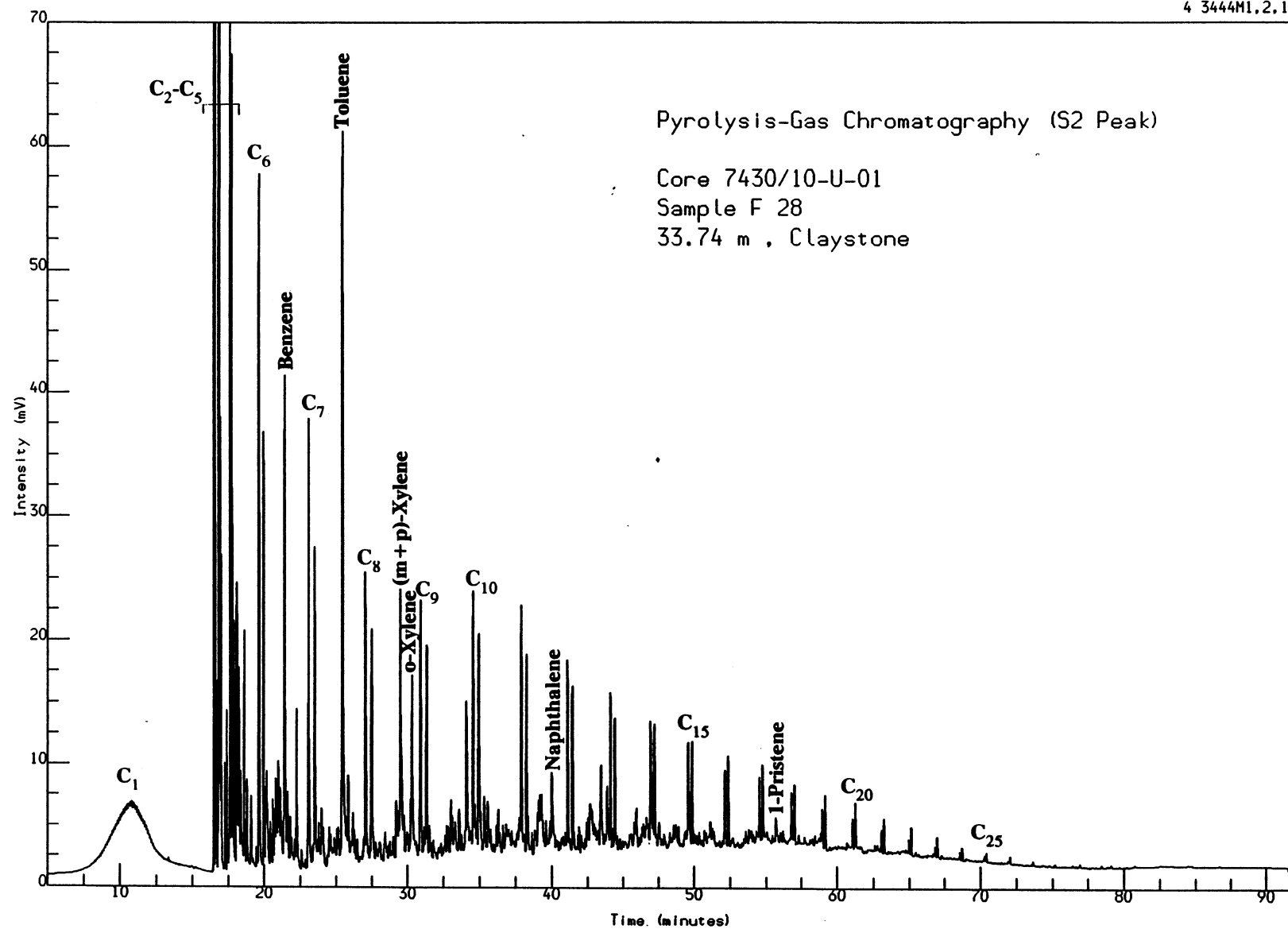
IKU no.	Depth (m)	SAT	d13C (0/00 PDB)			EOM
			ARO	Polars	Asph.	
F0012	21.80	-29.54	-29.42	-30.51	-29.00	n.d.
F1211	43.07	-34.24	-33.71	-33.26	-32.72	-33.16
F0042	44.10	-33.96	-33.97	-33.21	-32.41	-33.25
F0046	46.85	-34.06	-33.52	-32.90	-31.27	-32.77
F0051	49.62	-32.79	-32.32	-31.98	-31.38	-31.45
F0056	53.93	-33.53	-32.52	-32.26	-31.20	-31.95
F0061	57.03	-31.60	-30.77	-30.52	-29.38	-30.30
F0064	59.58	-31.99	-31.17	-30.96	-29.75	-30.40
F0065	60.78	-31.28	-30.66	-30.41	-29.50	-29.98
F0069	63.57	-30.28	-28.98	-29.41	-28.28	-29.06

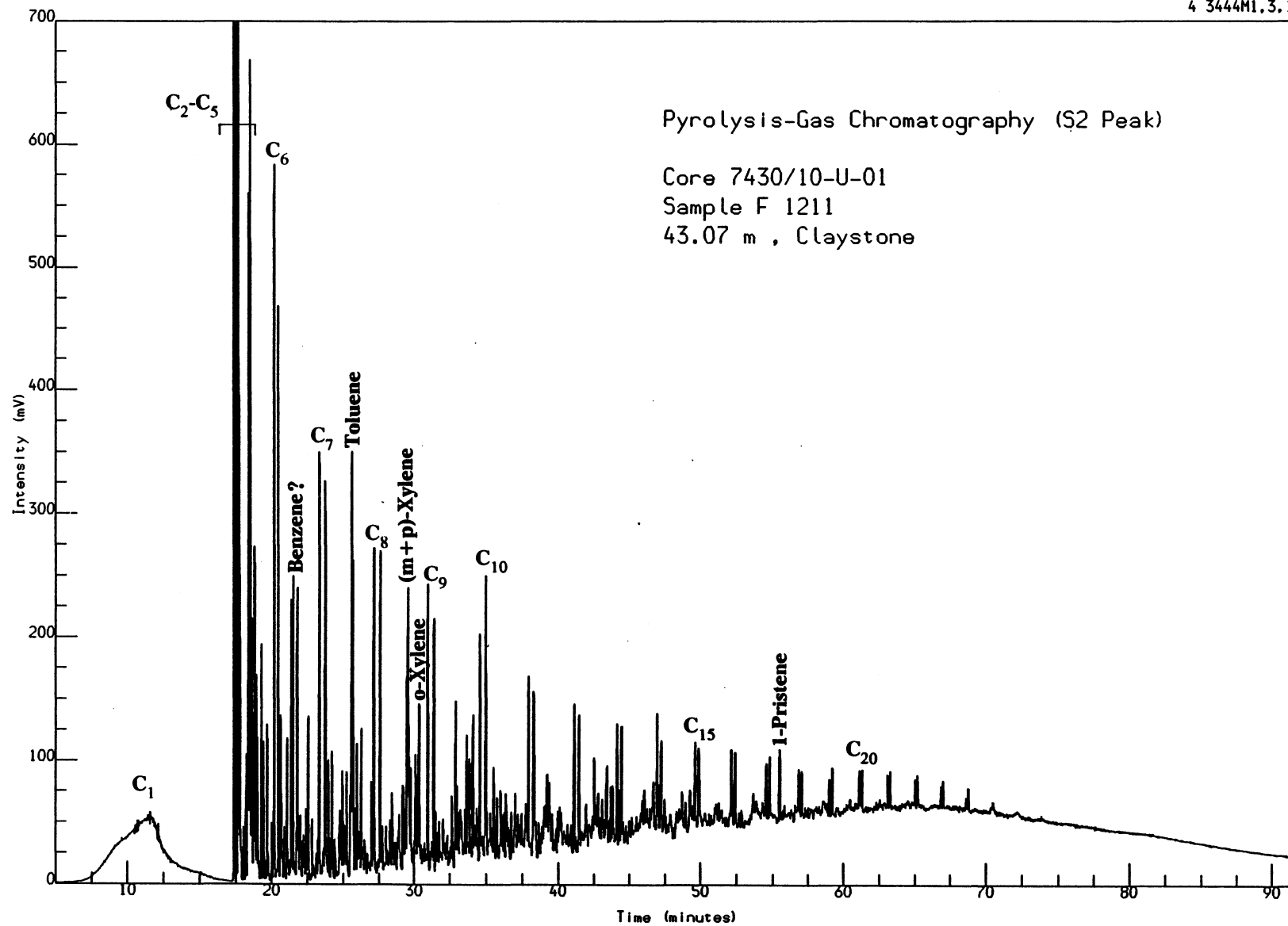
n.d. - not determined

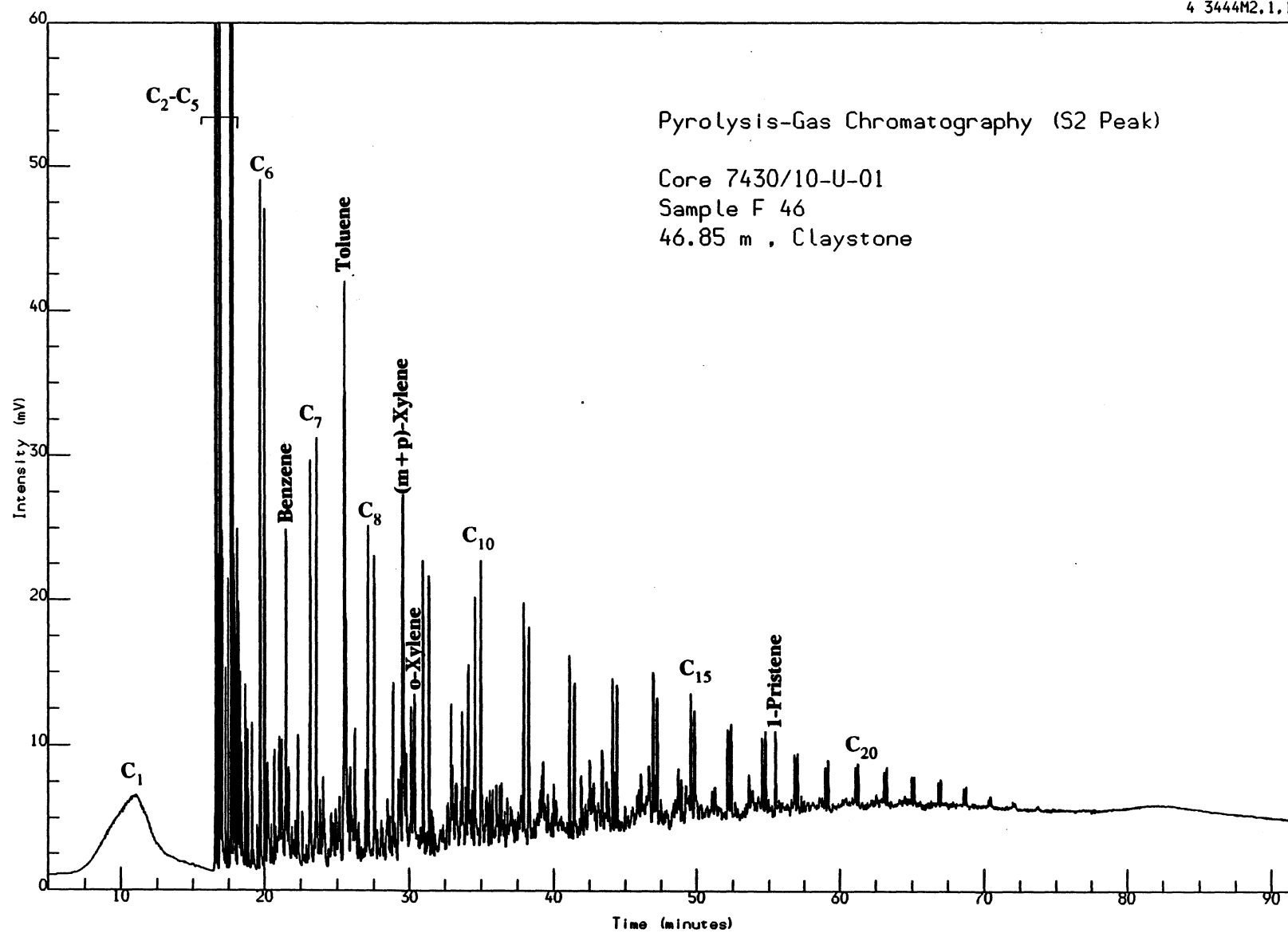
Figure A.III.8.1:

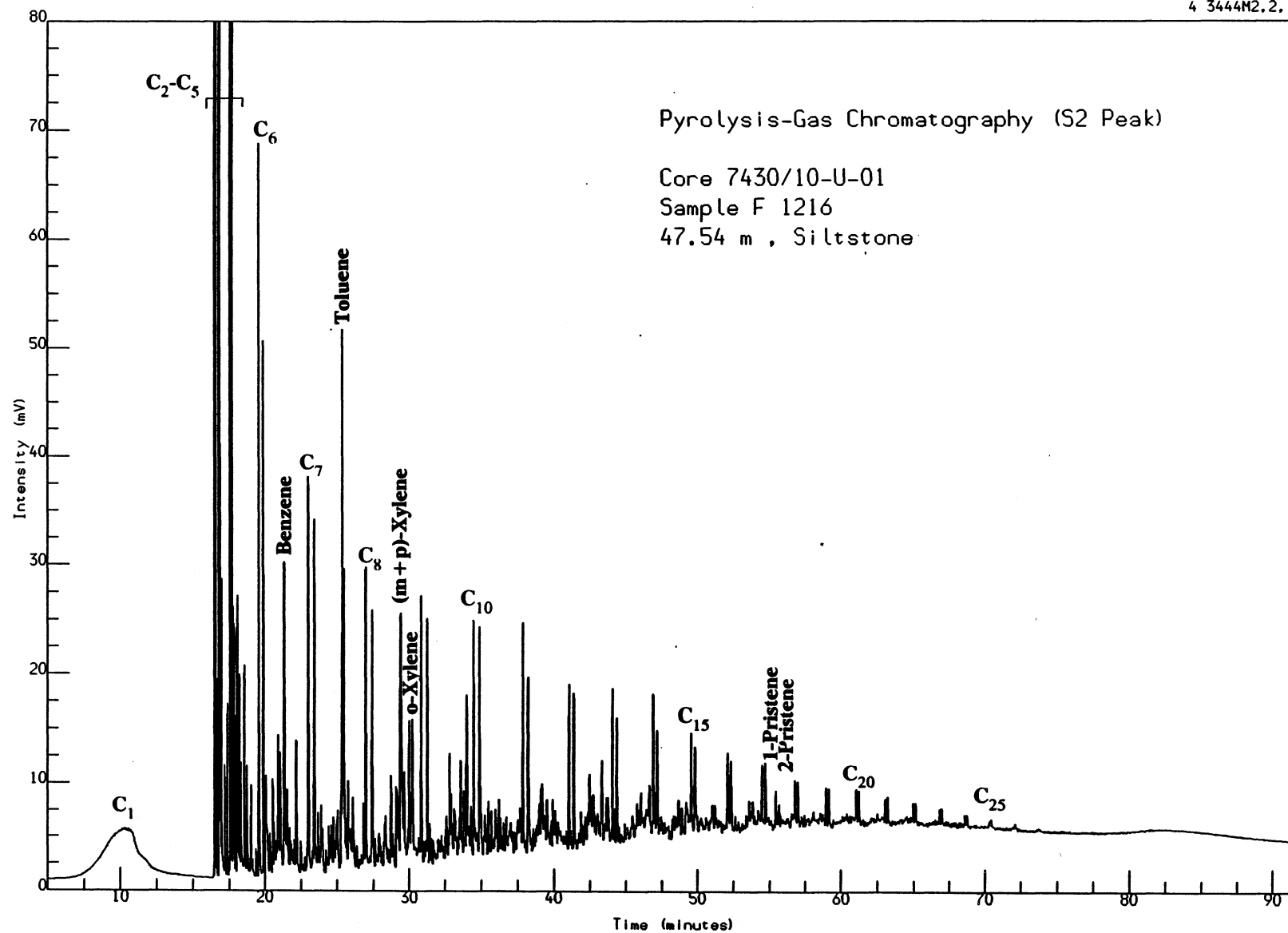
Pyrolysis-gas chromatograms (S2 peak)

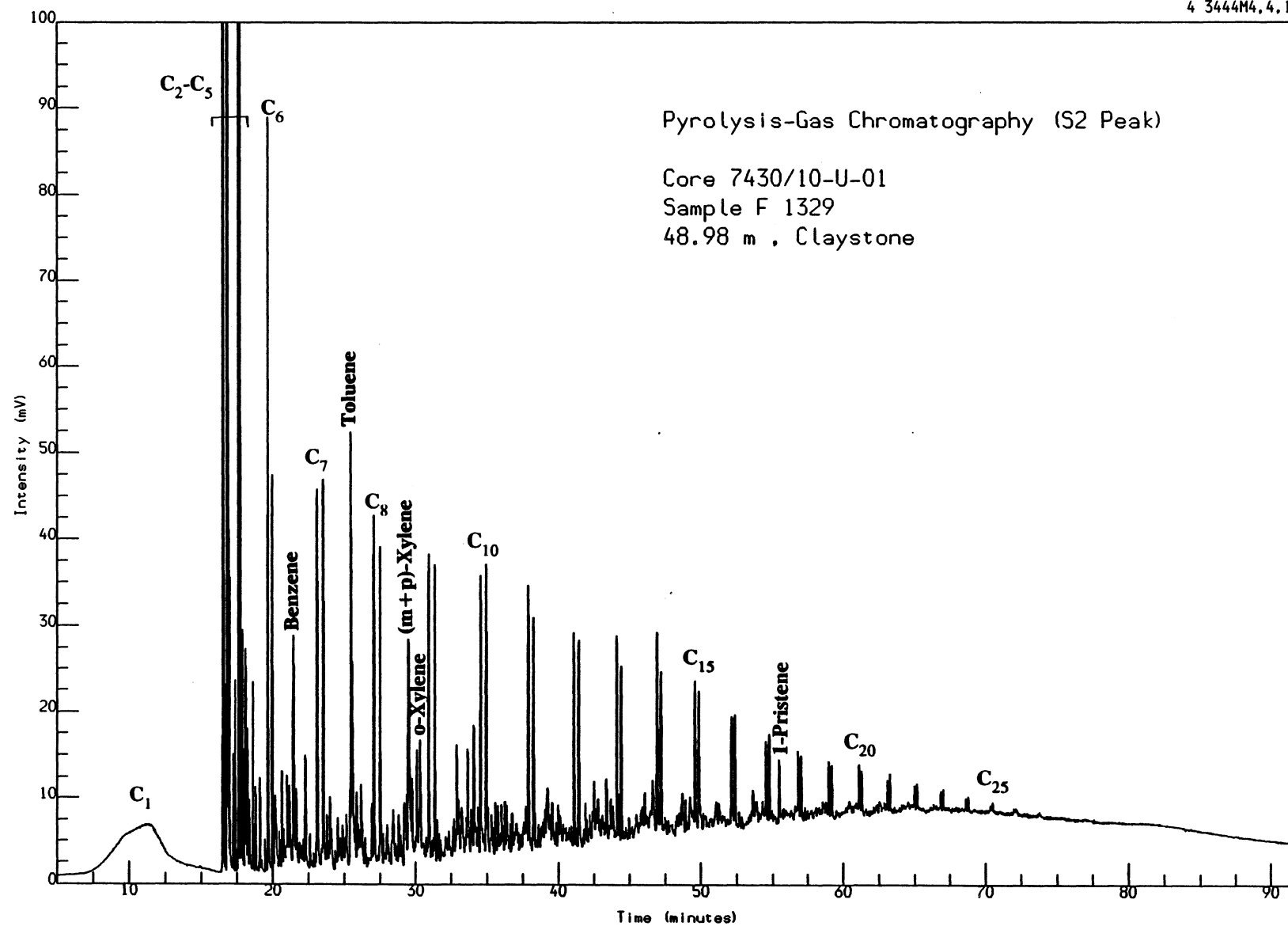


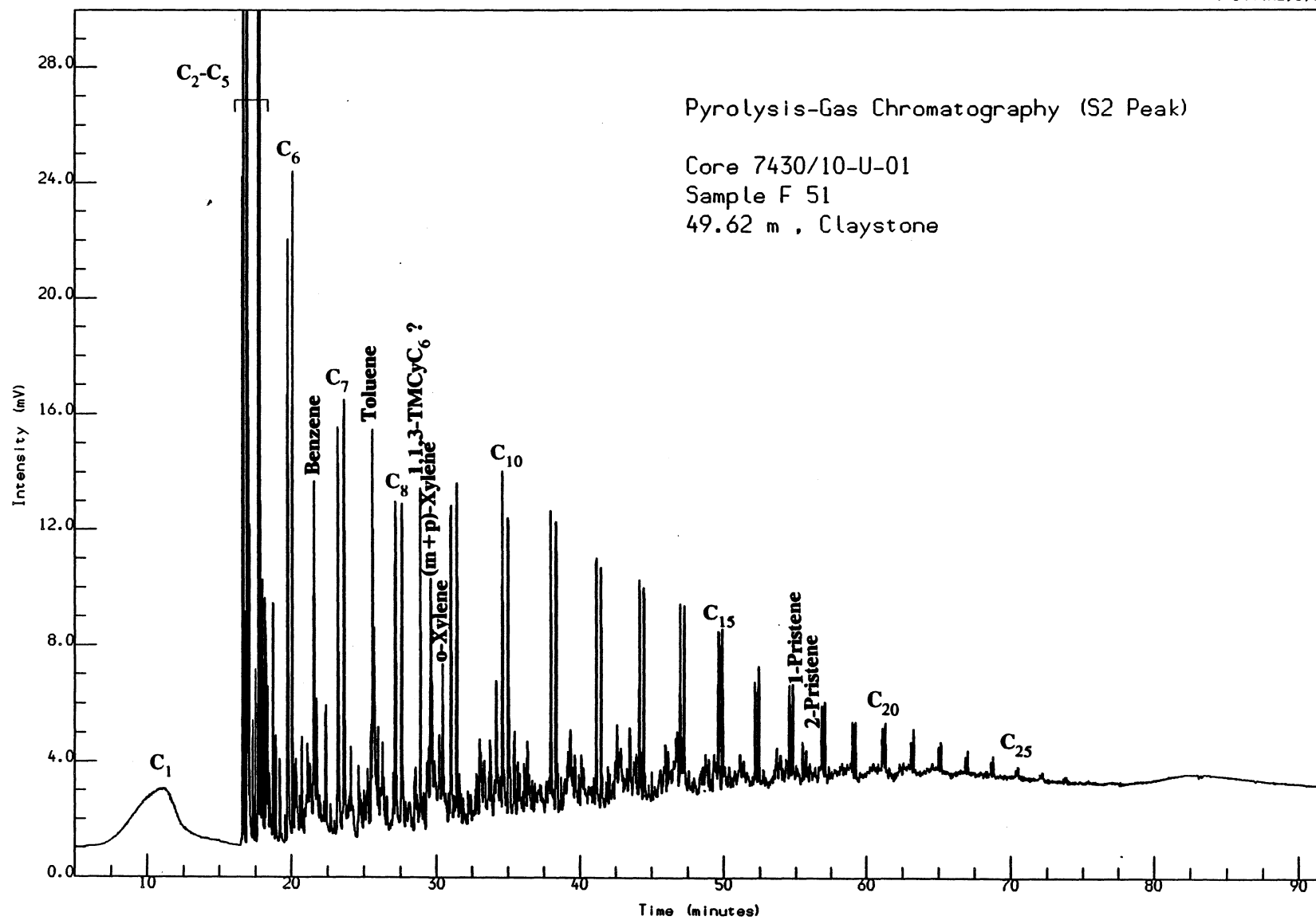


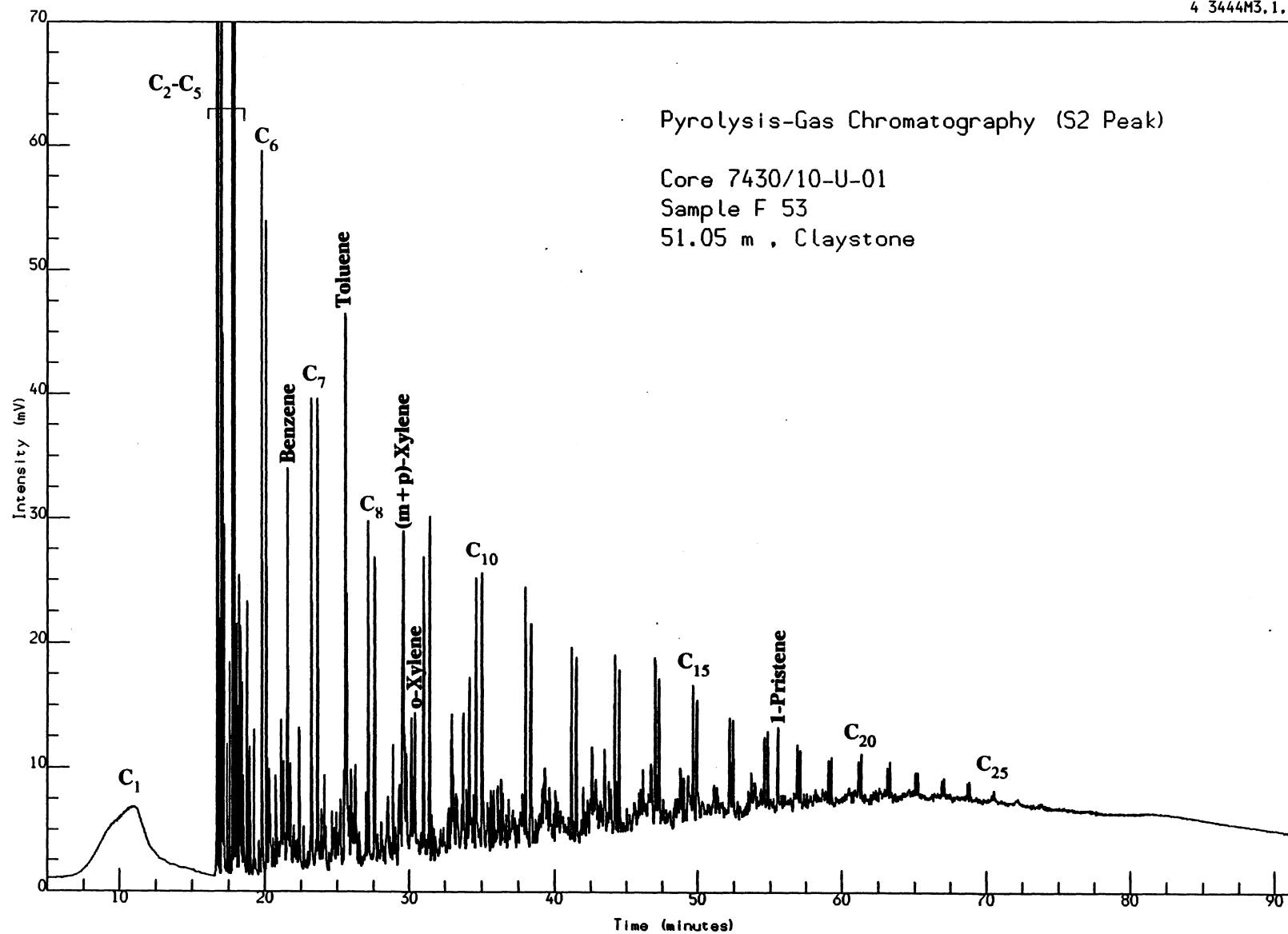


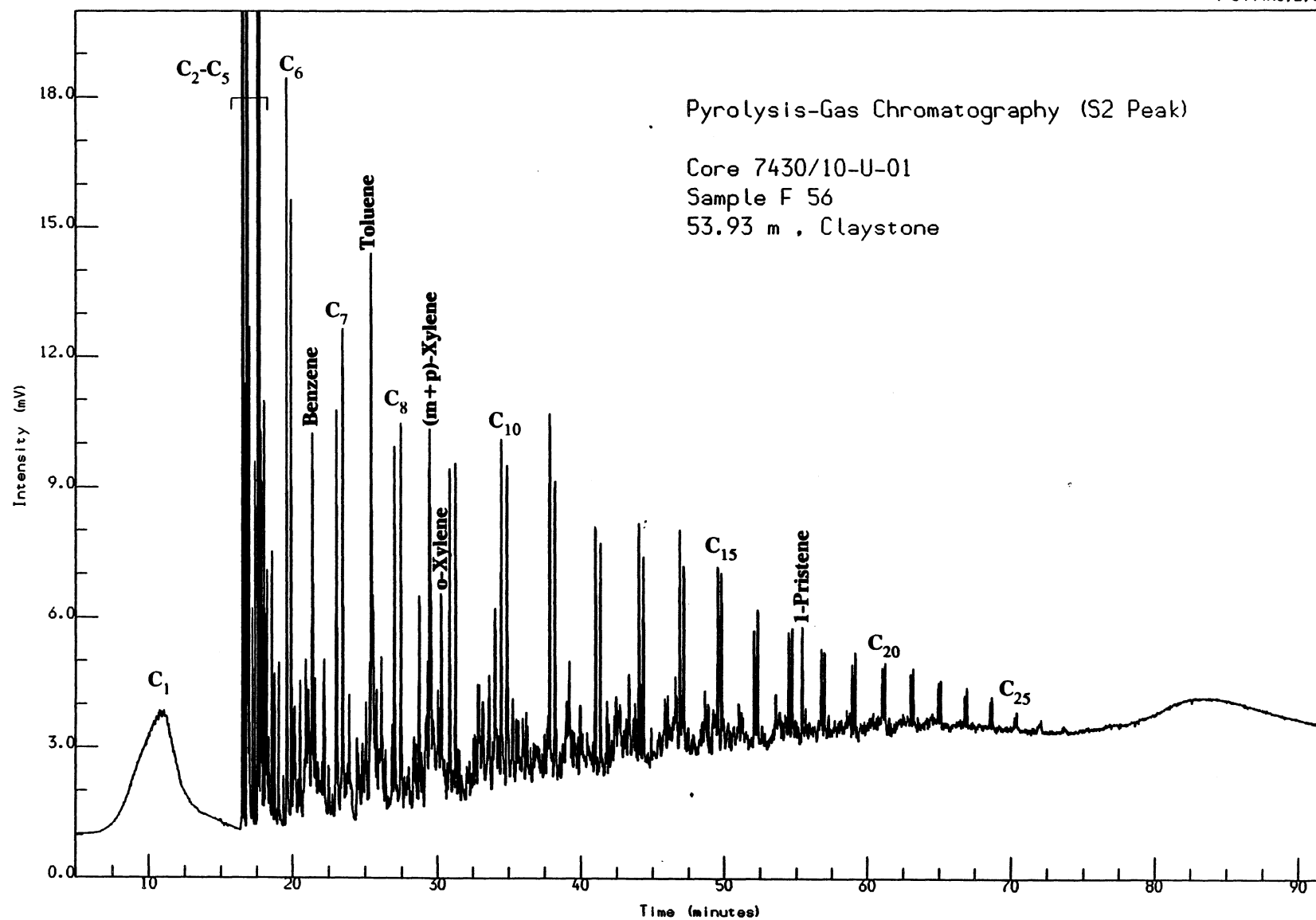


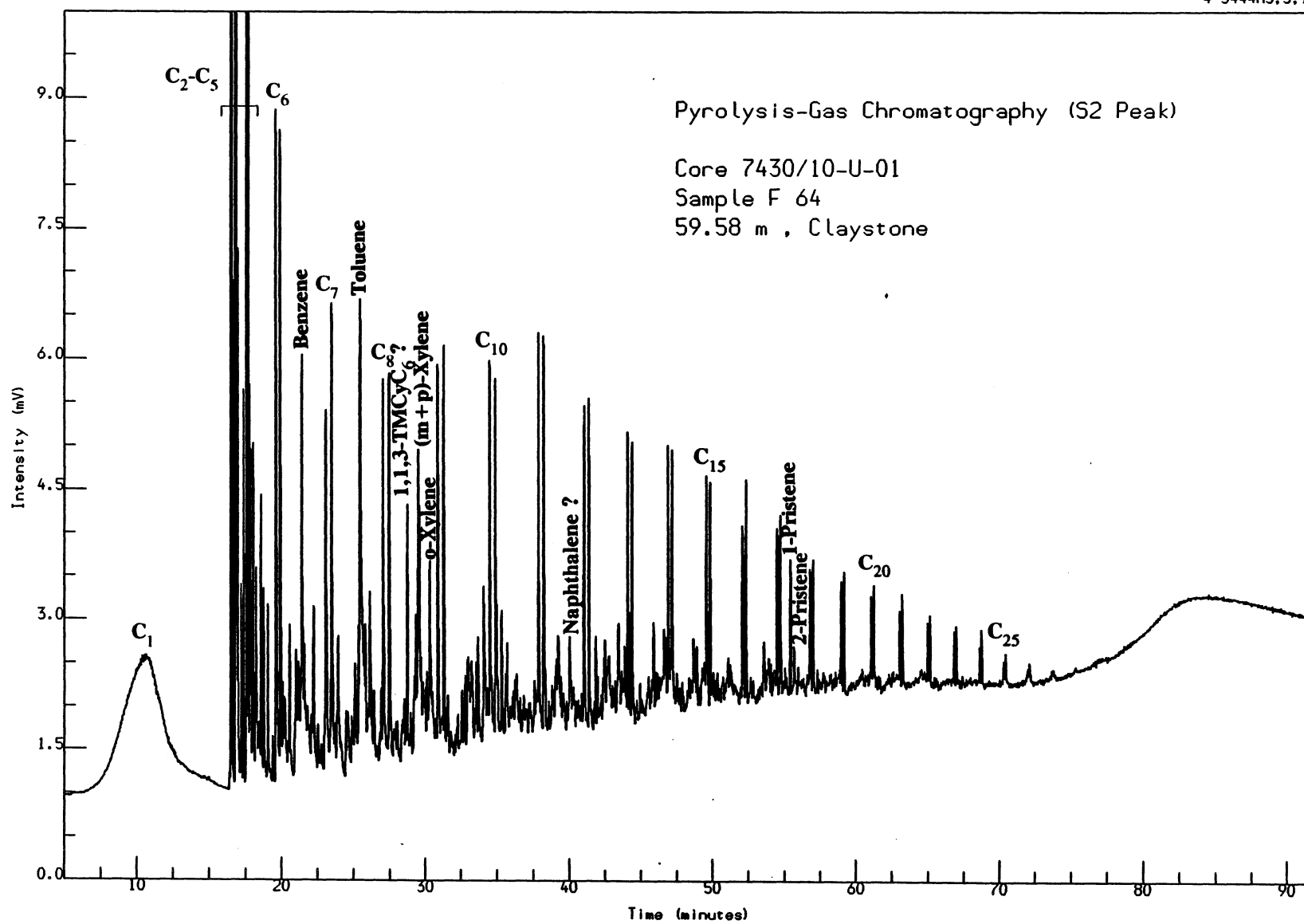


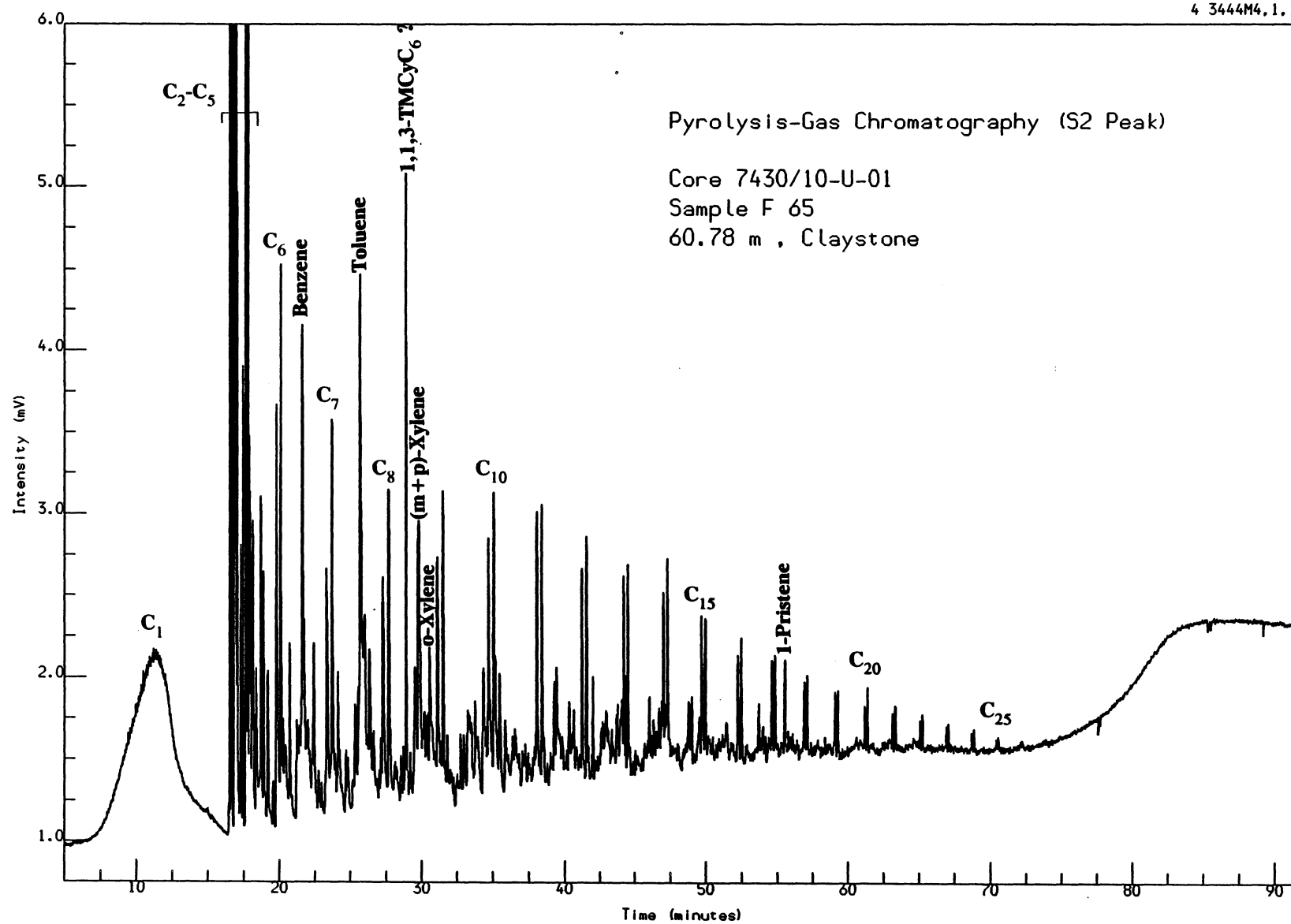


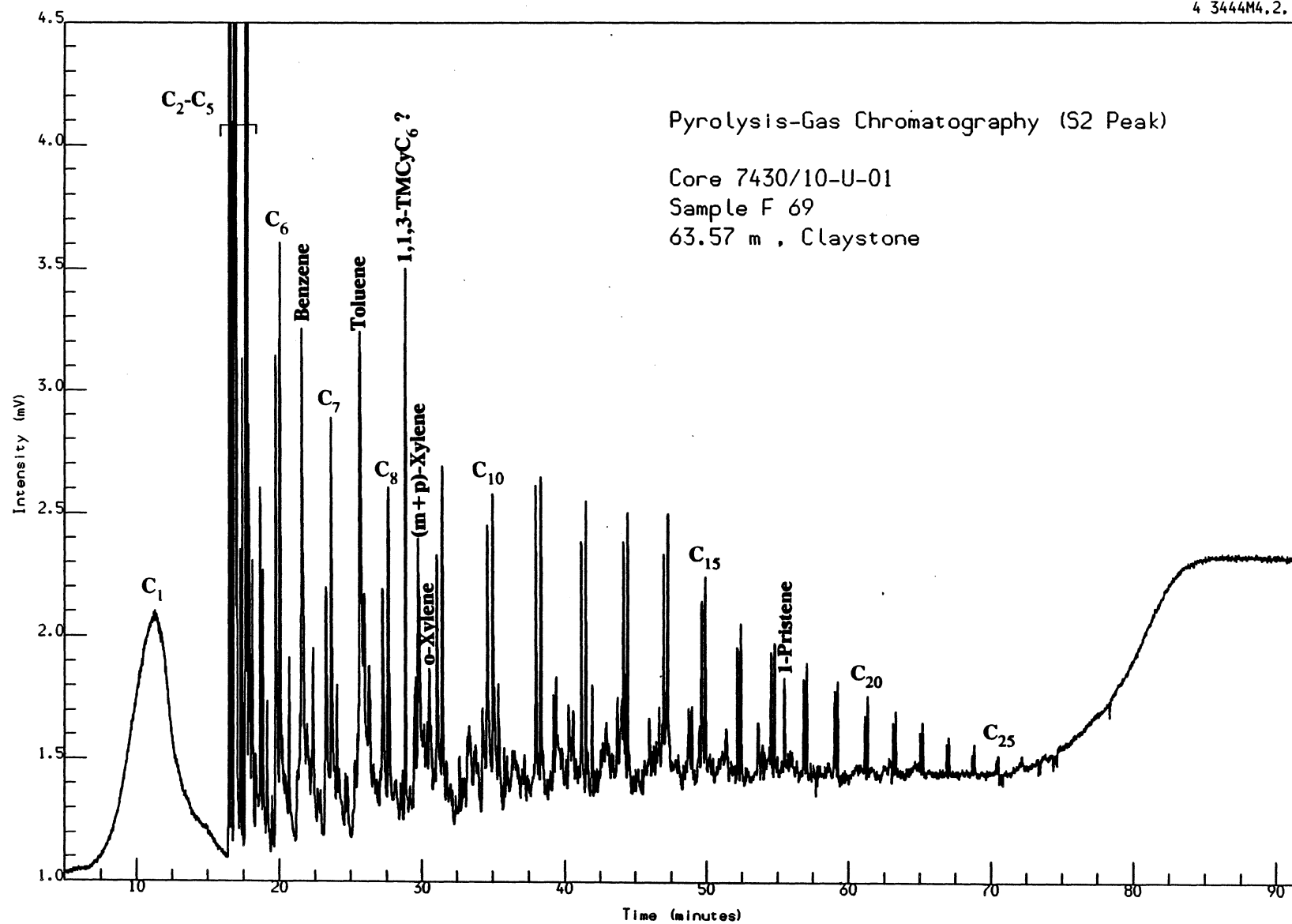












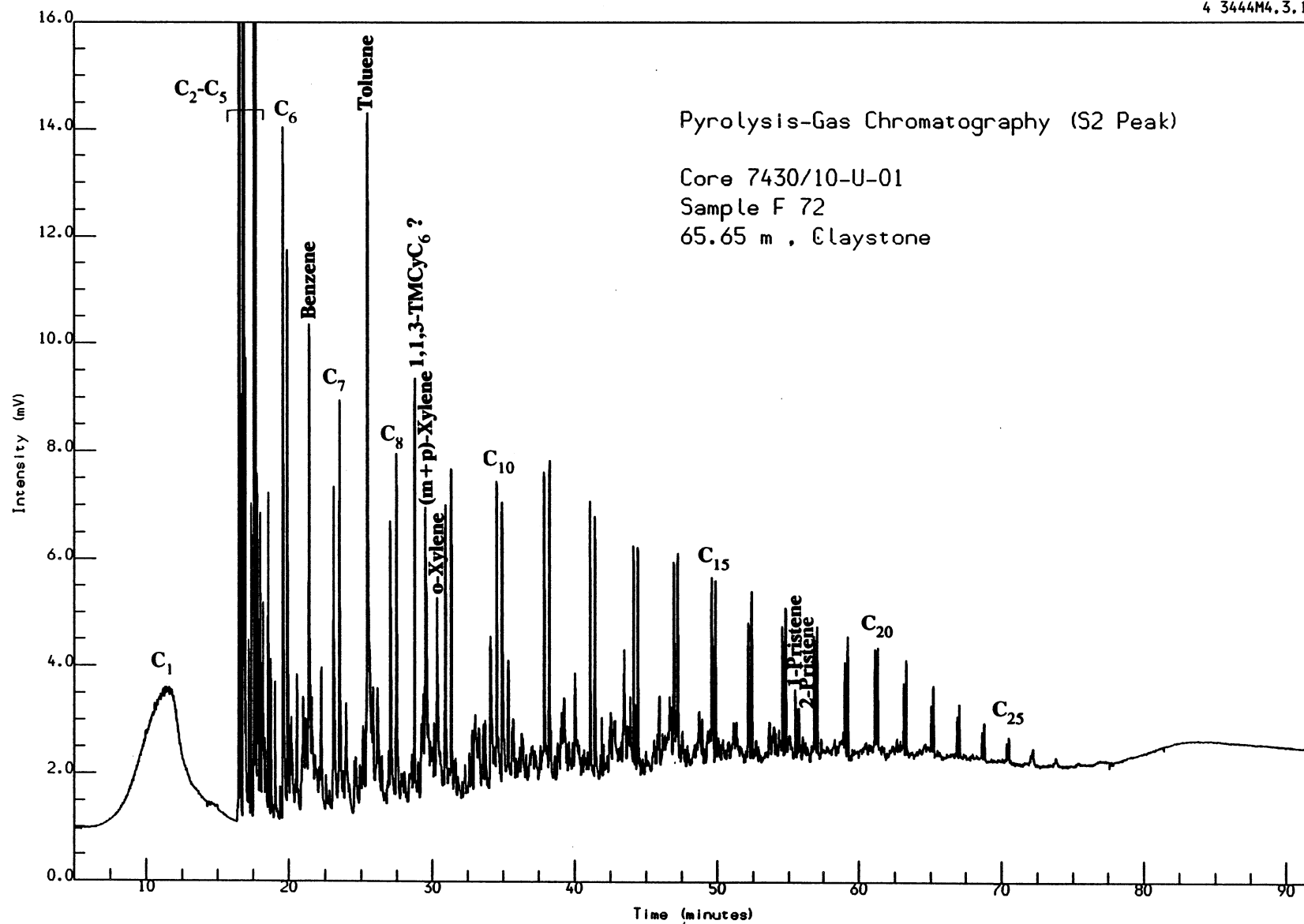


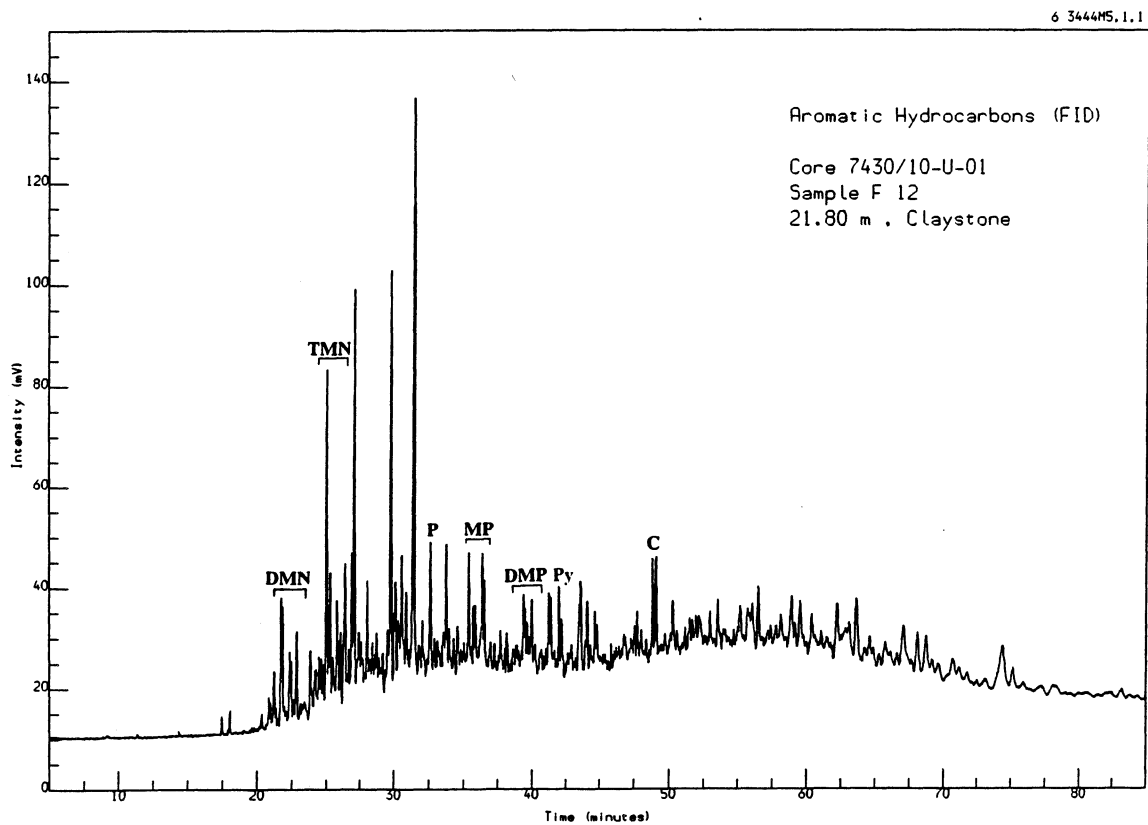
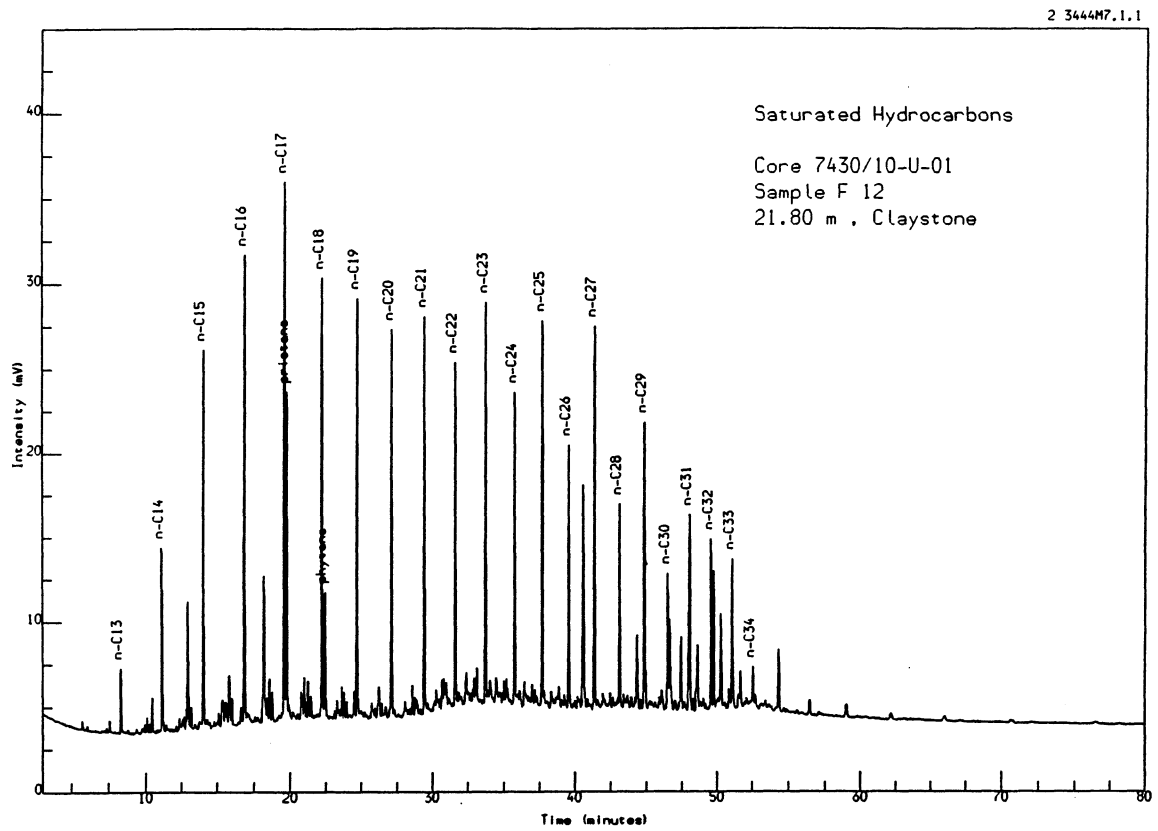
Figure A.III.8.2:

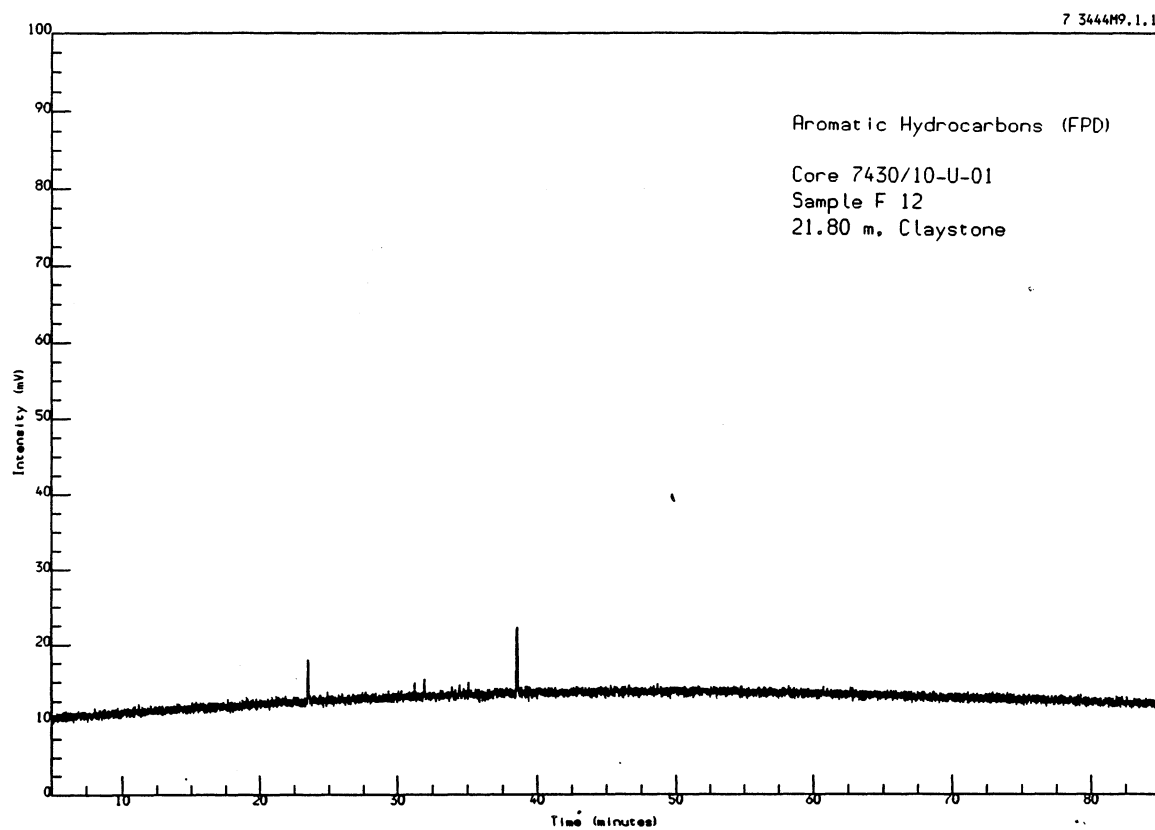
Gas chromatograms of saturated and aromatic hydrocarbons

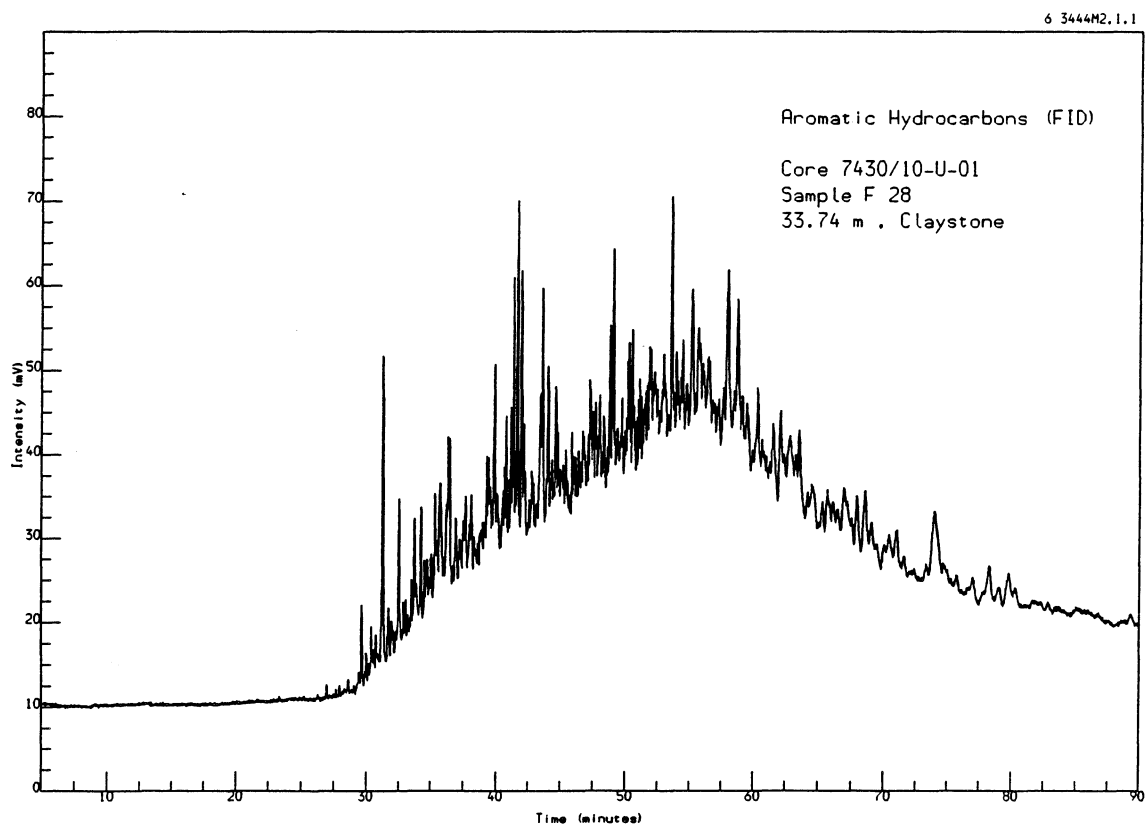
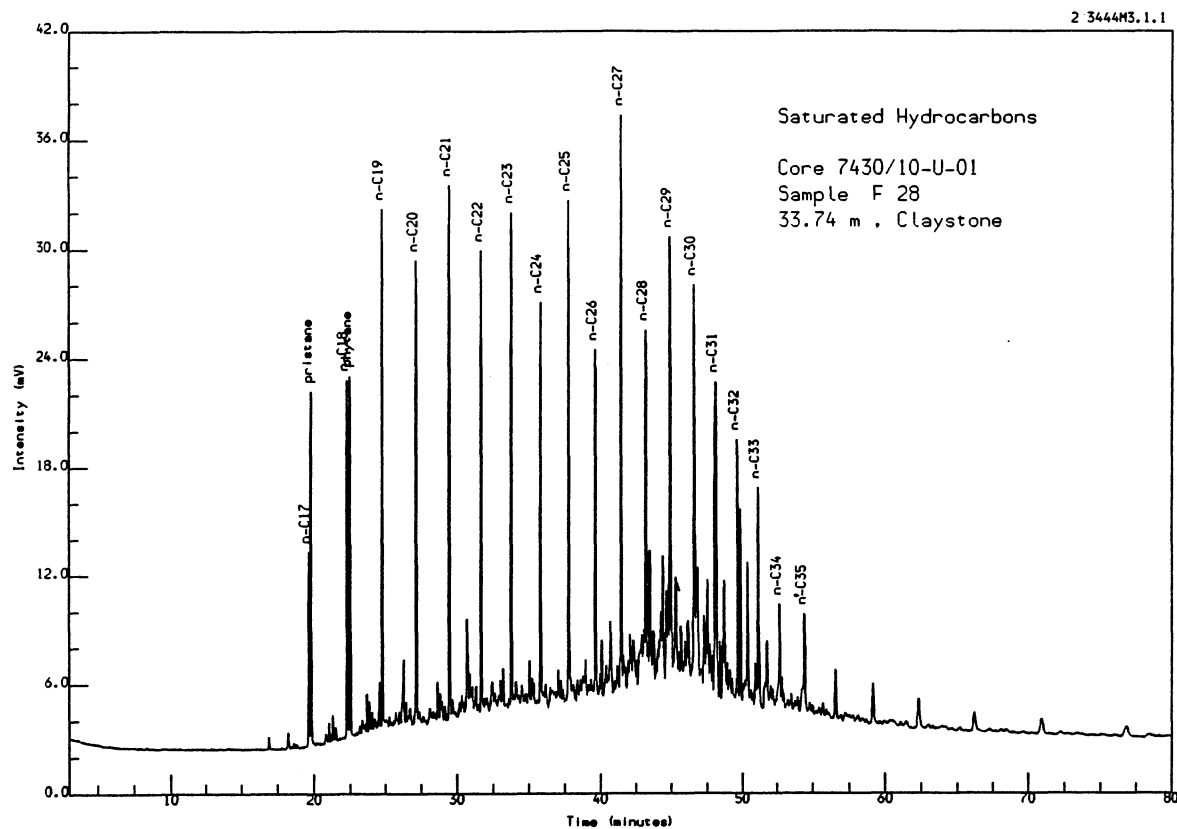
n-C₁₅ etc. - n-alkanes

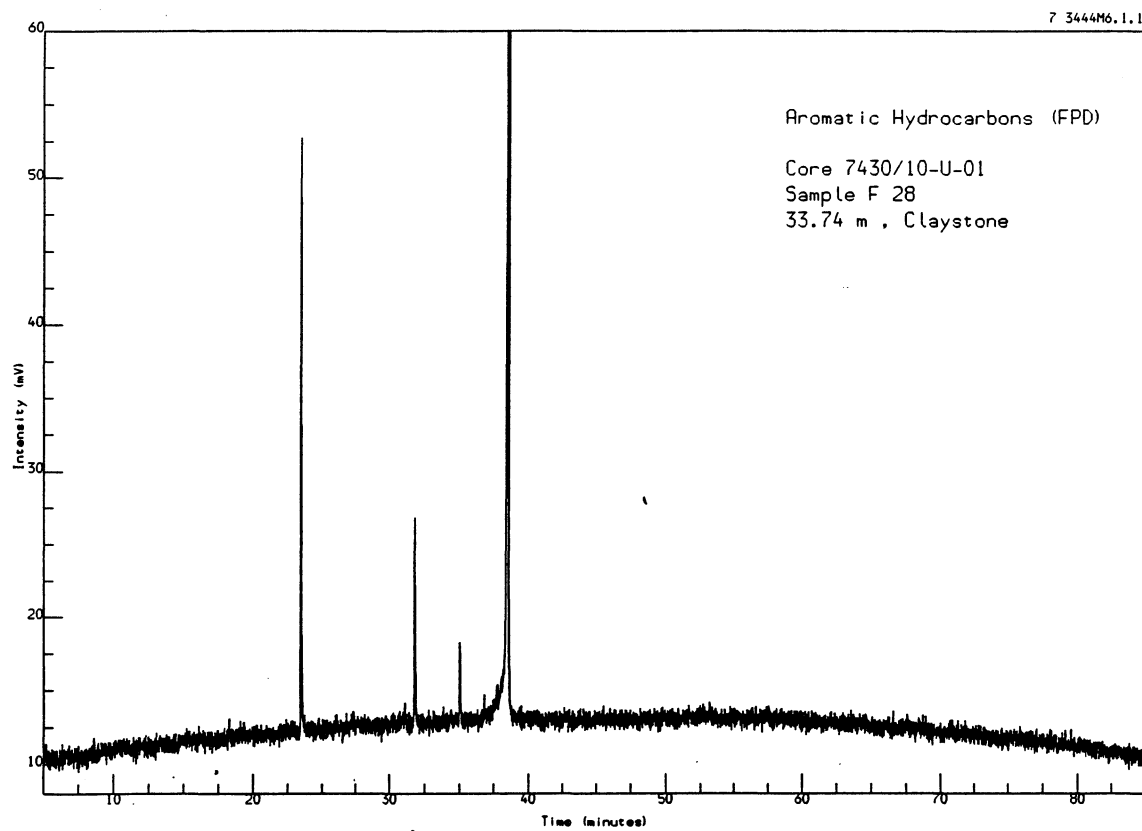
N	- Naphthalene
MN	- Methylnaphthalenes
DMN	- Dimethylnaphthalenes
TMN	- C ₃ -naphthalenes
P	- Phenanthrene
PN	- Methylphenanthrenes
DMP	- Dimethylphenanthrenes

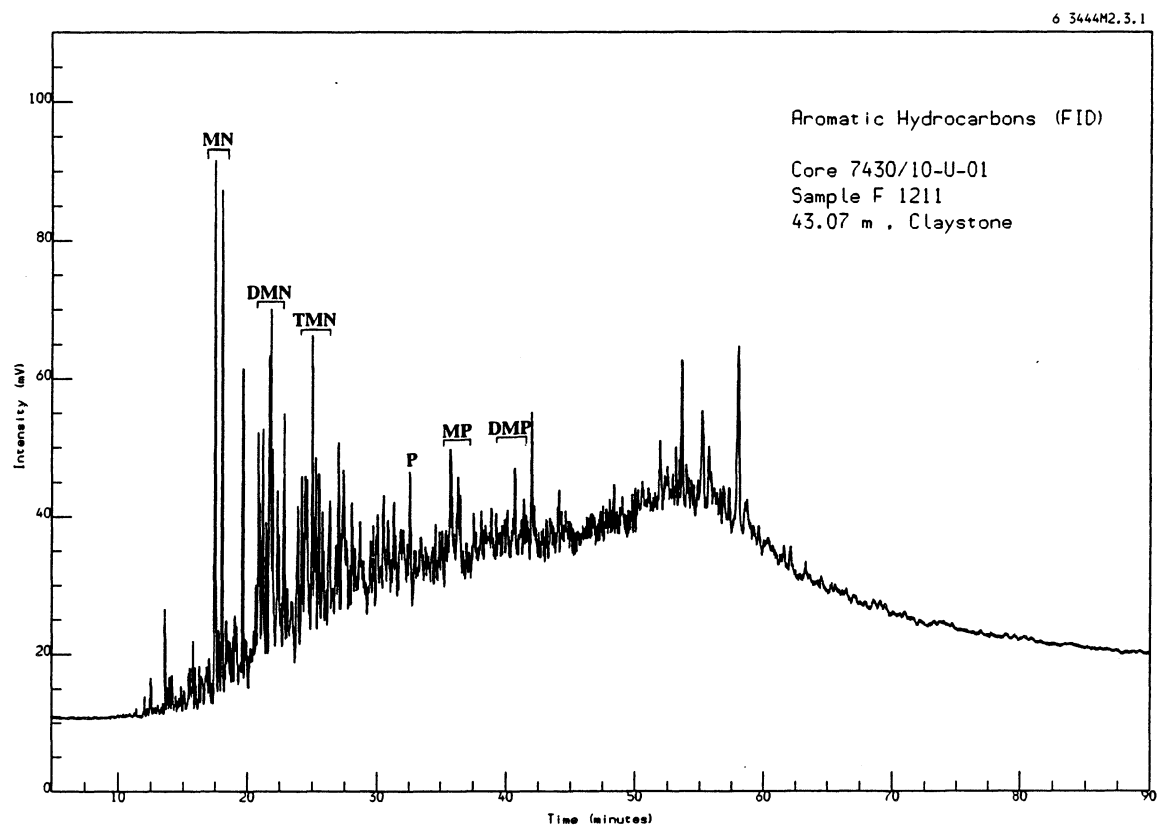
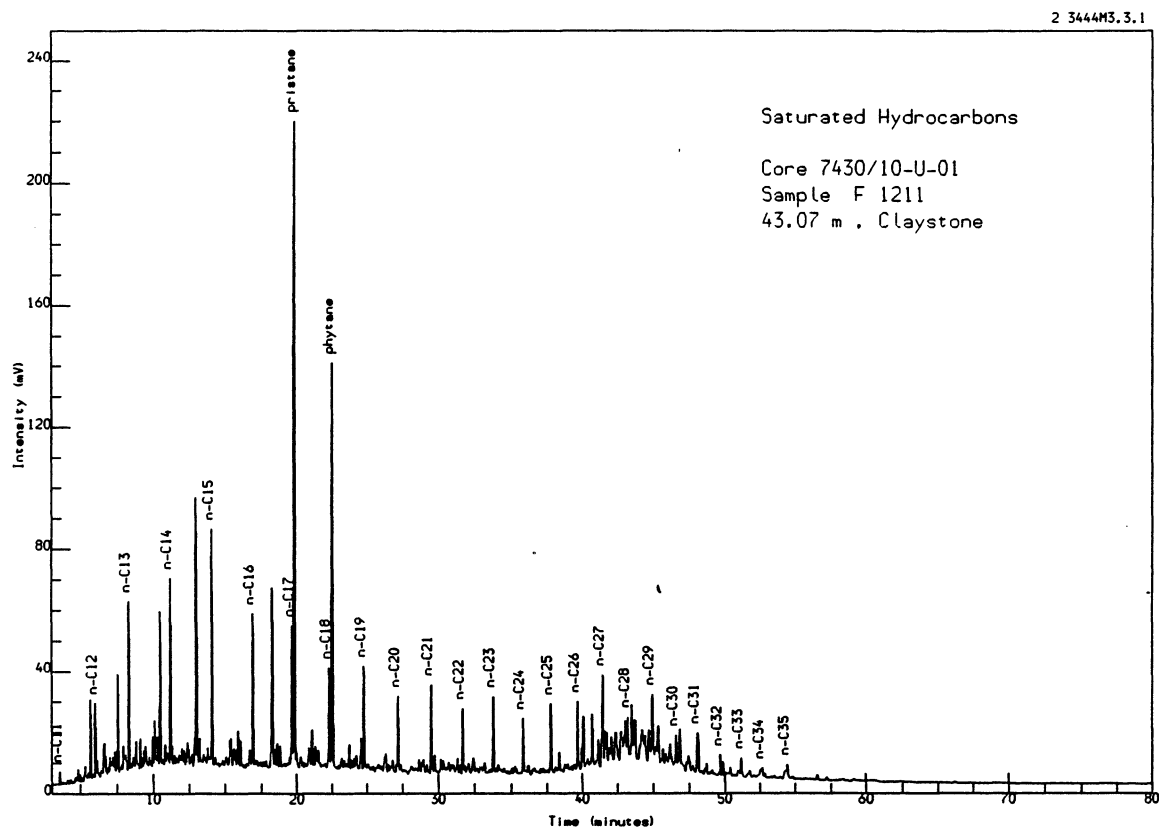
BT	- Benzothiophene
MBT	- C ₁ -benzothiophenes
DMBT	- C ₂ -benzothiophene
TMBT	- C ₃ -benzothiophene
C ₄ BT	- C ₄ -benzothiophene
DBT	- Dibenzothiophene
MDBT	- Methyl dibenzothiophenes
DMDBT	- C ₂ -dibenzothiophenes
TMDBT	- C ₃ -dibenzothiophenes

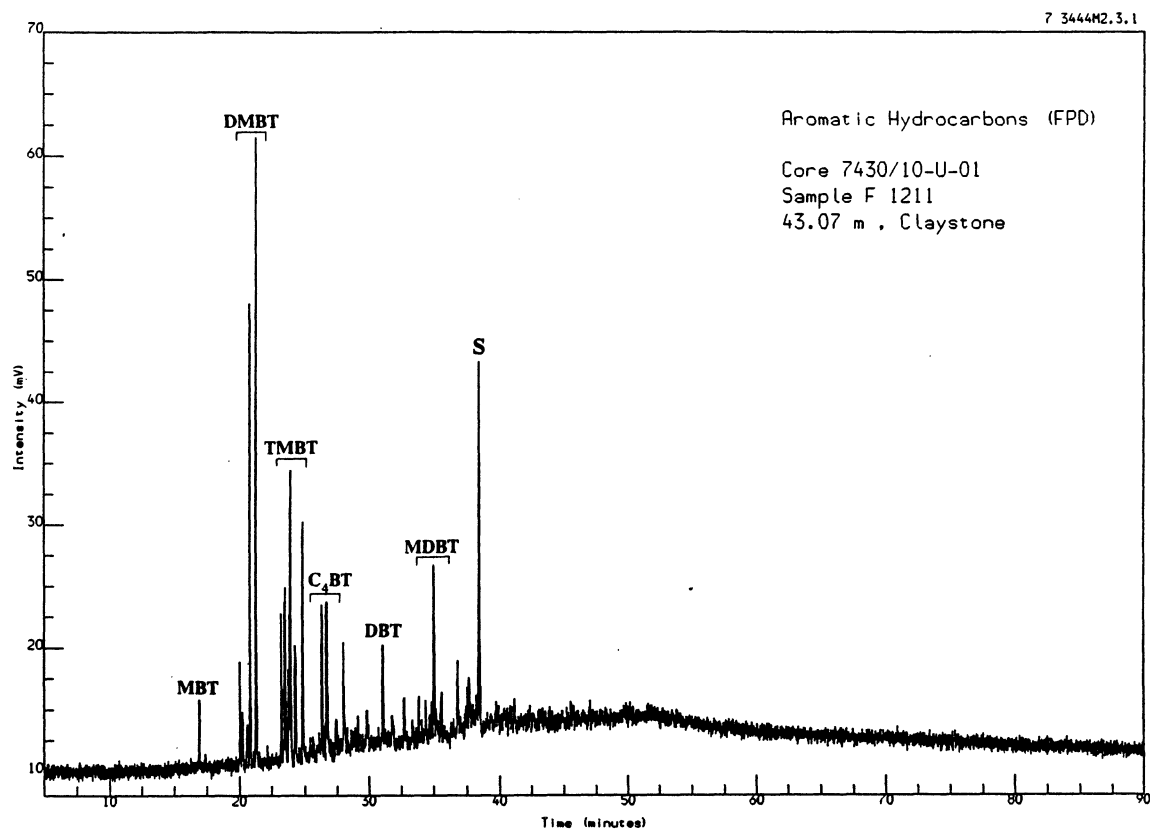


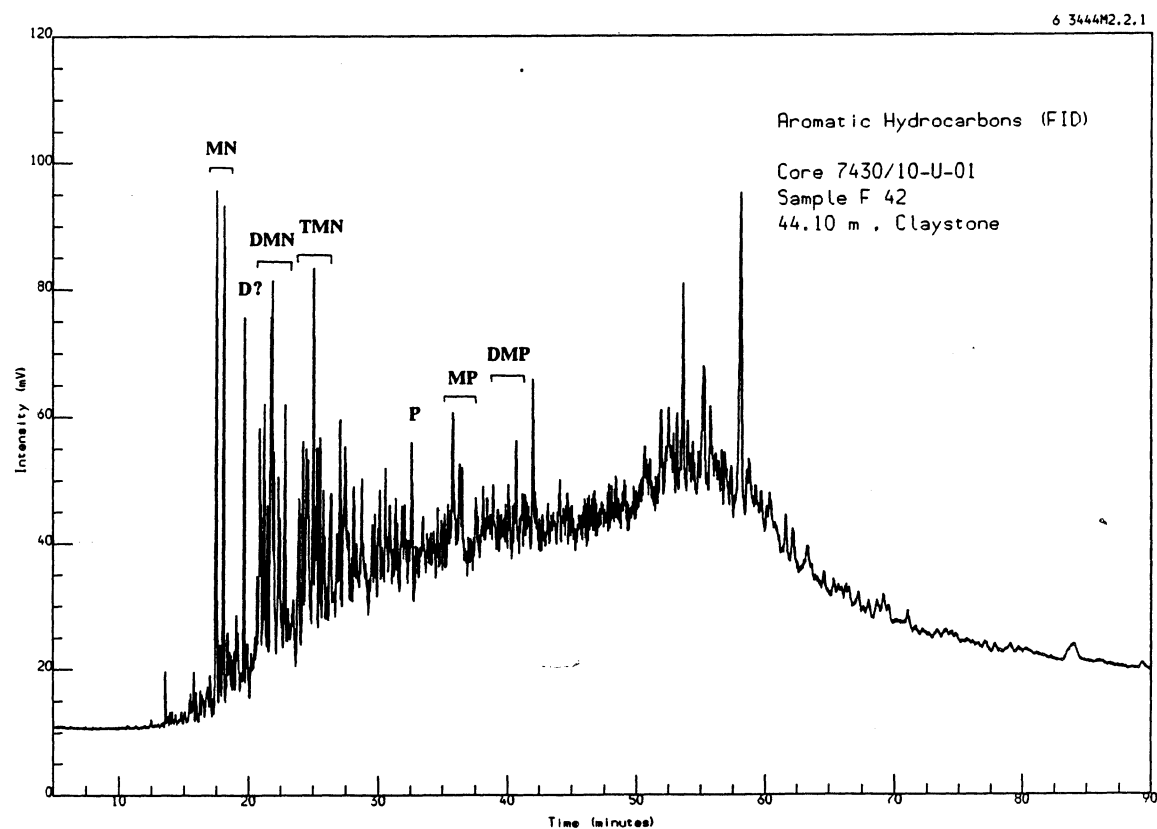
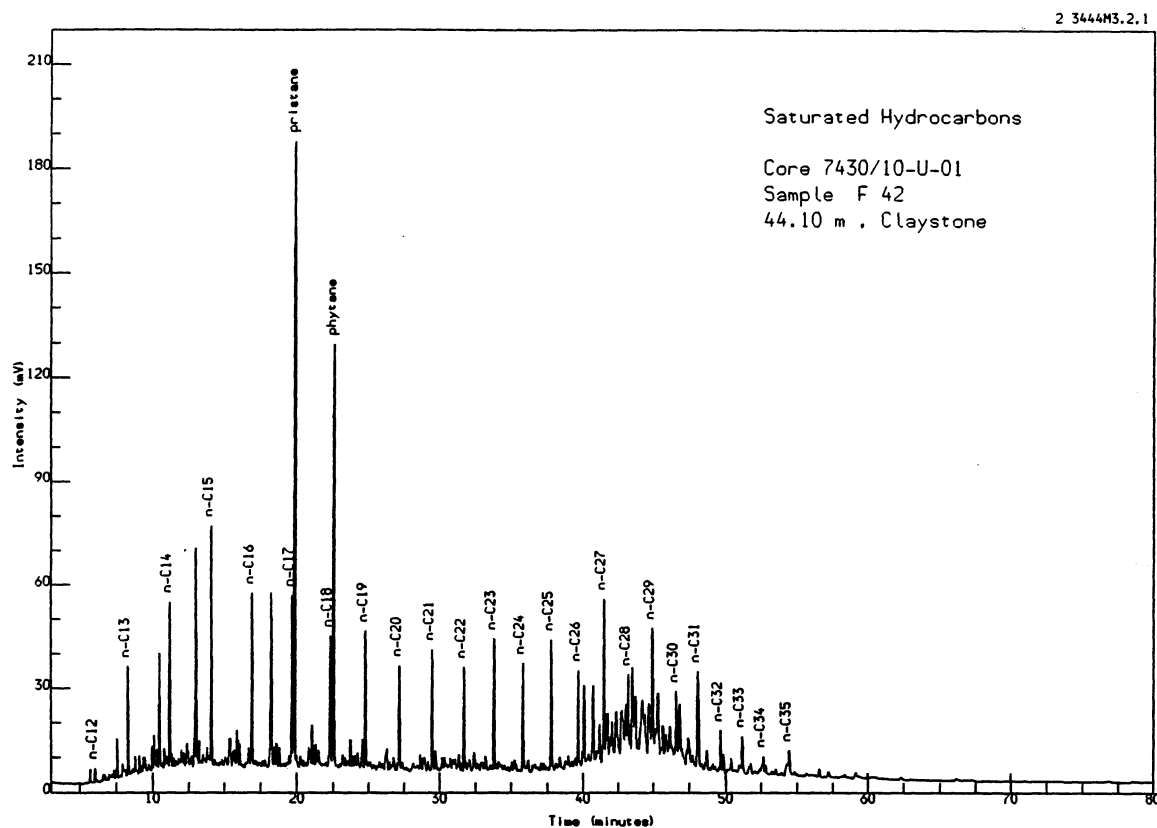


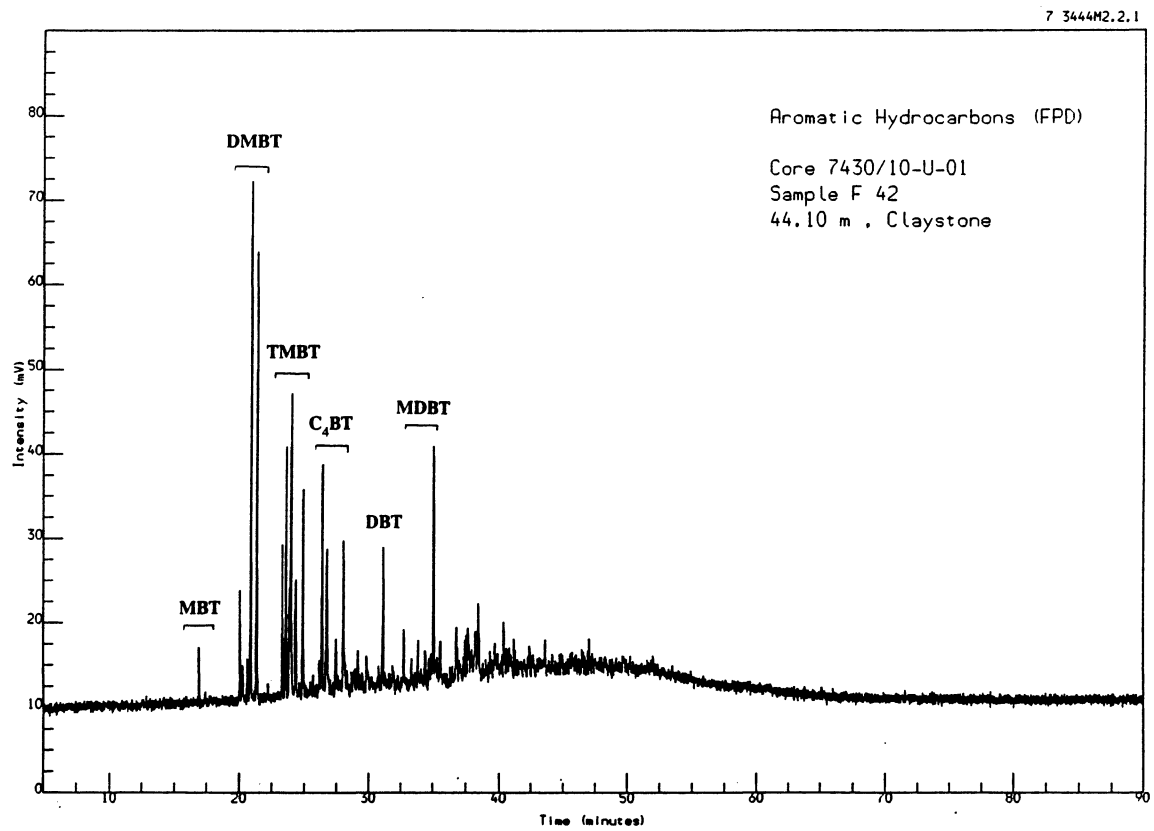


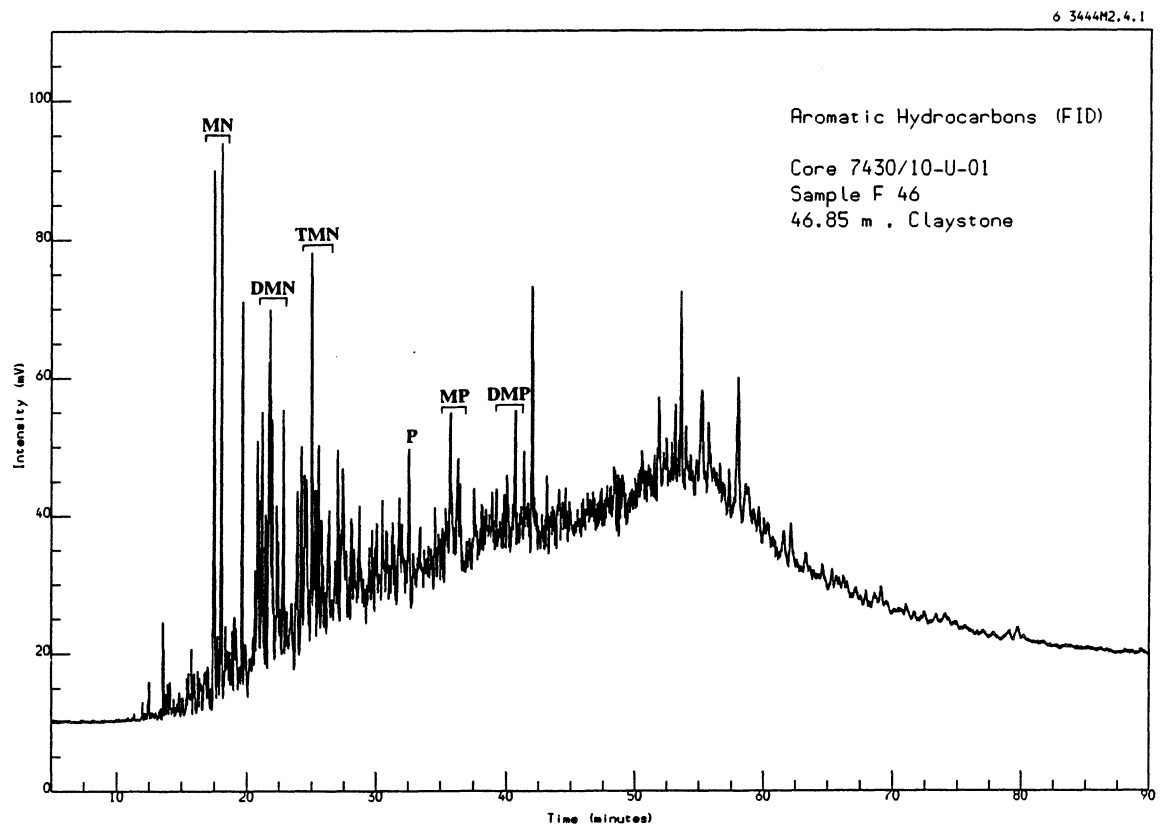
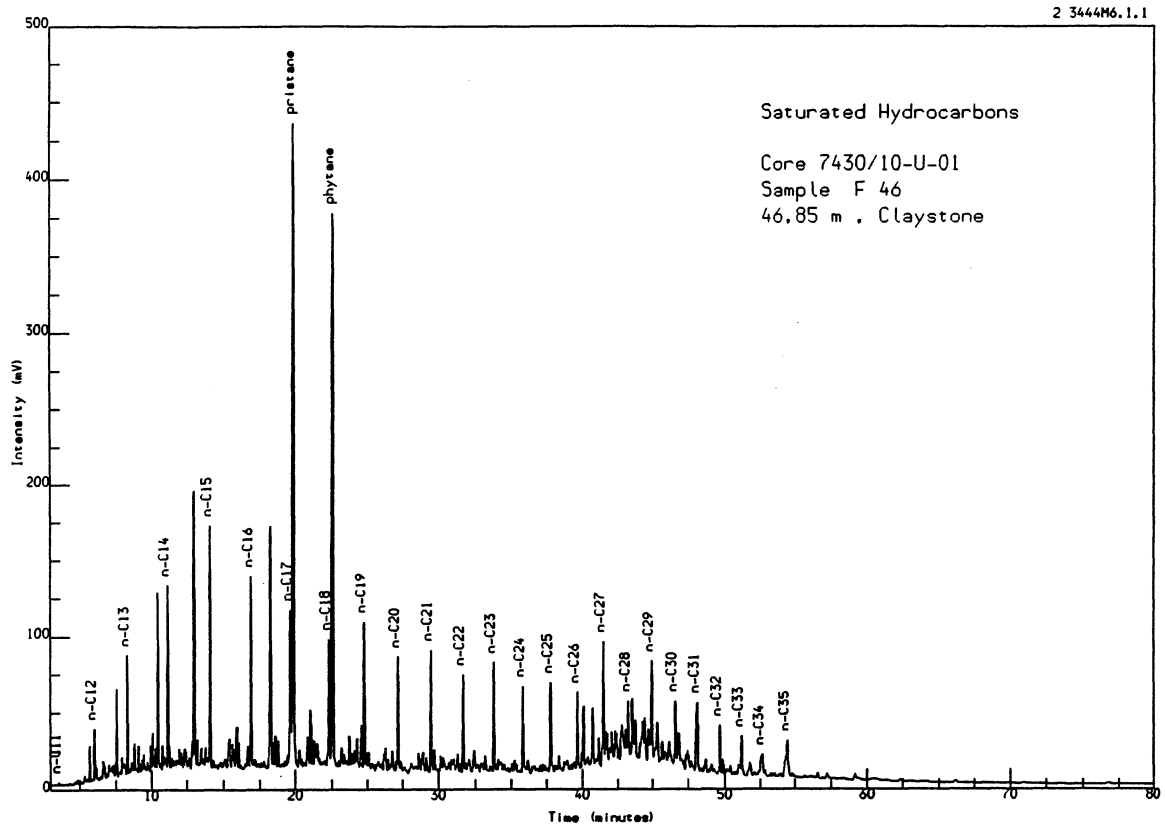


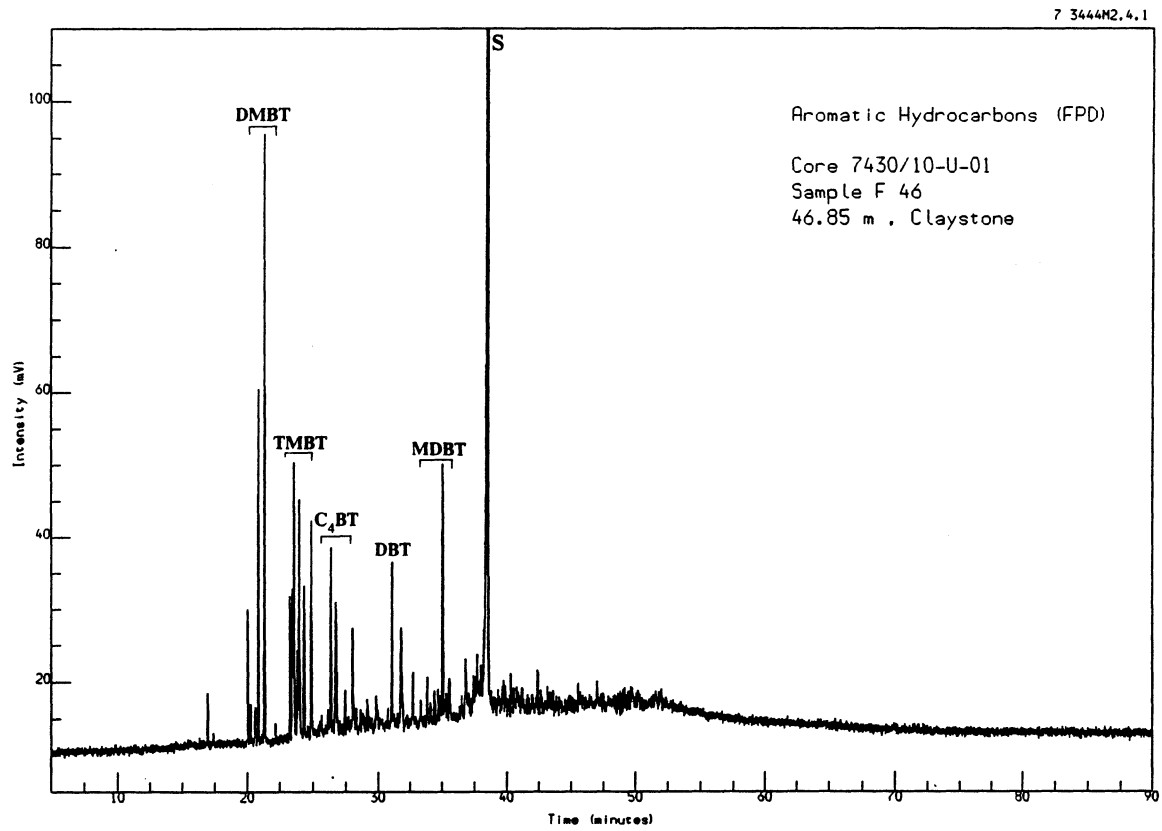


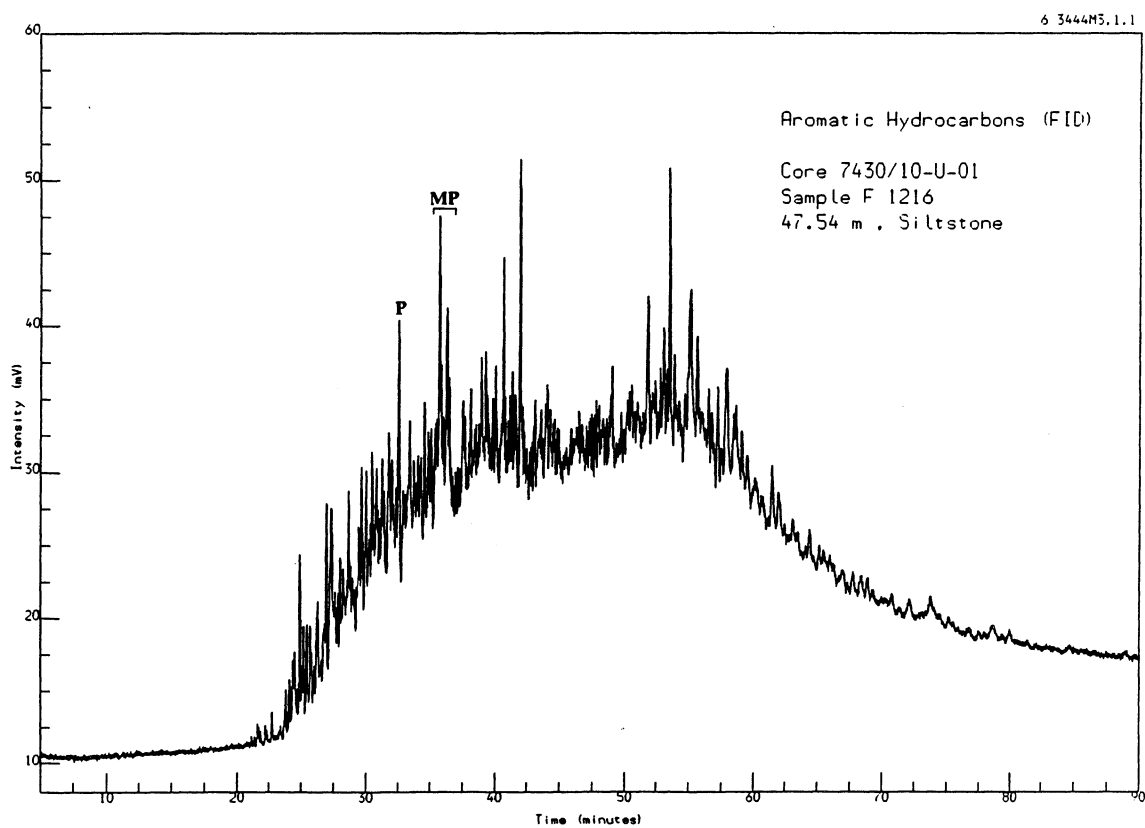
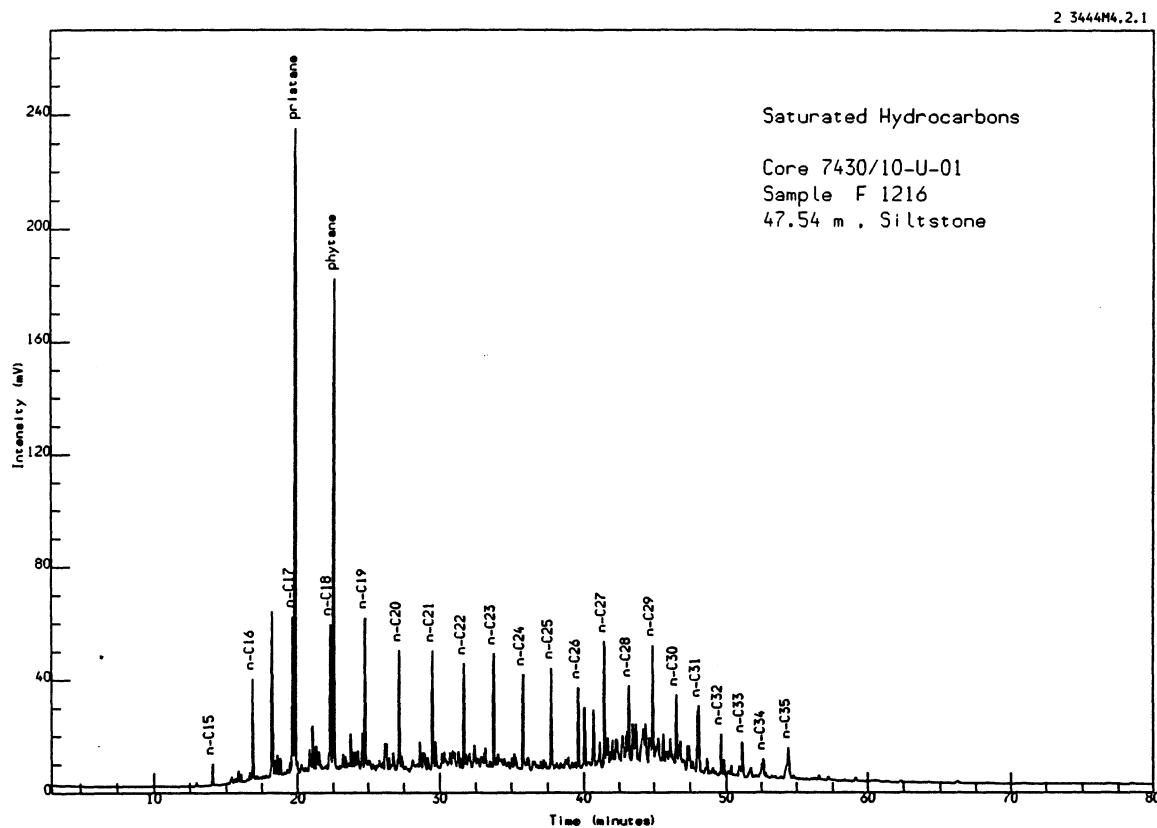


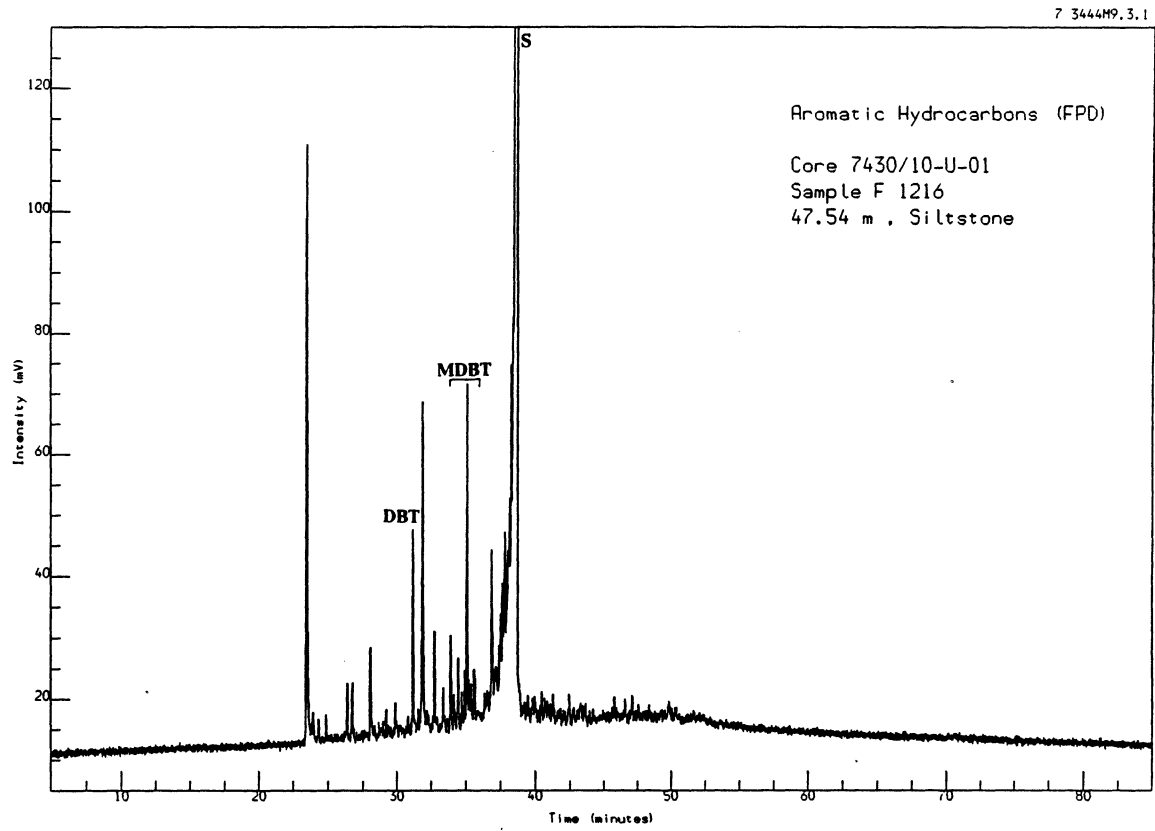


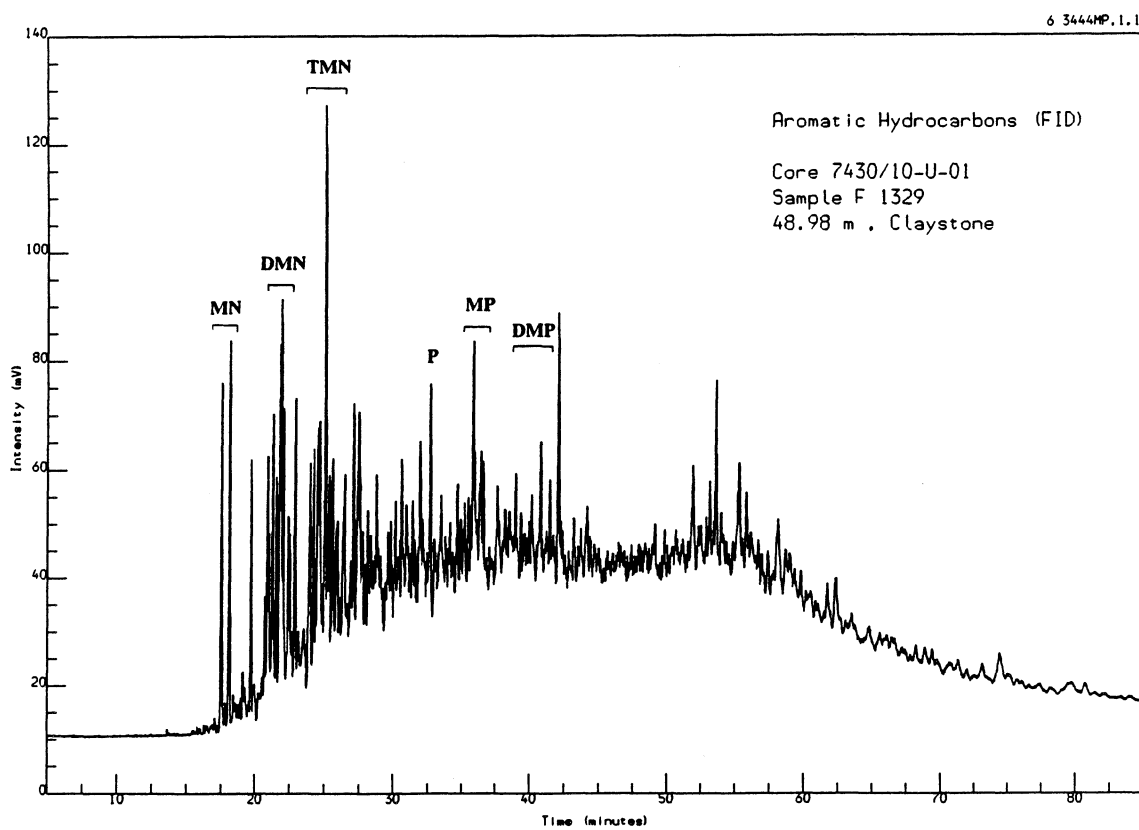
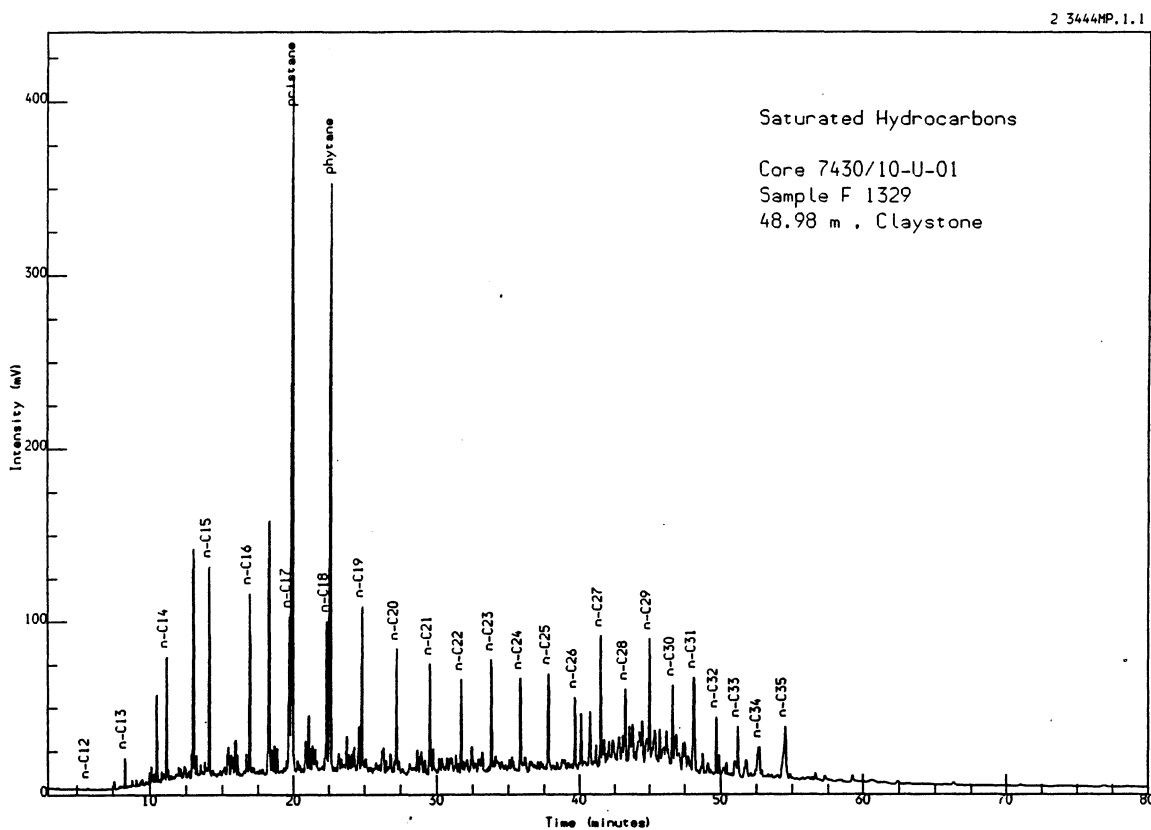


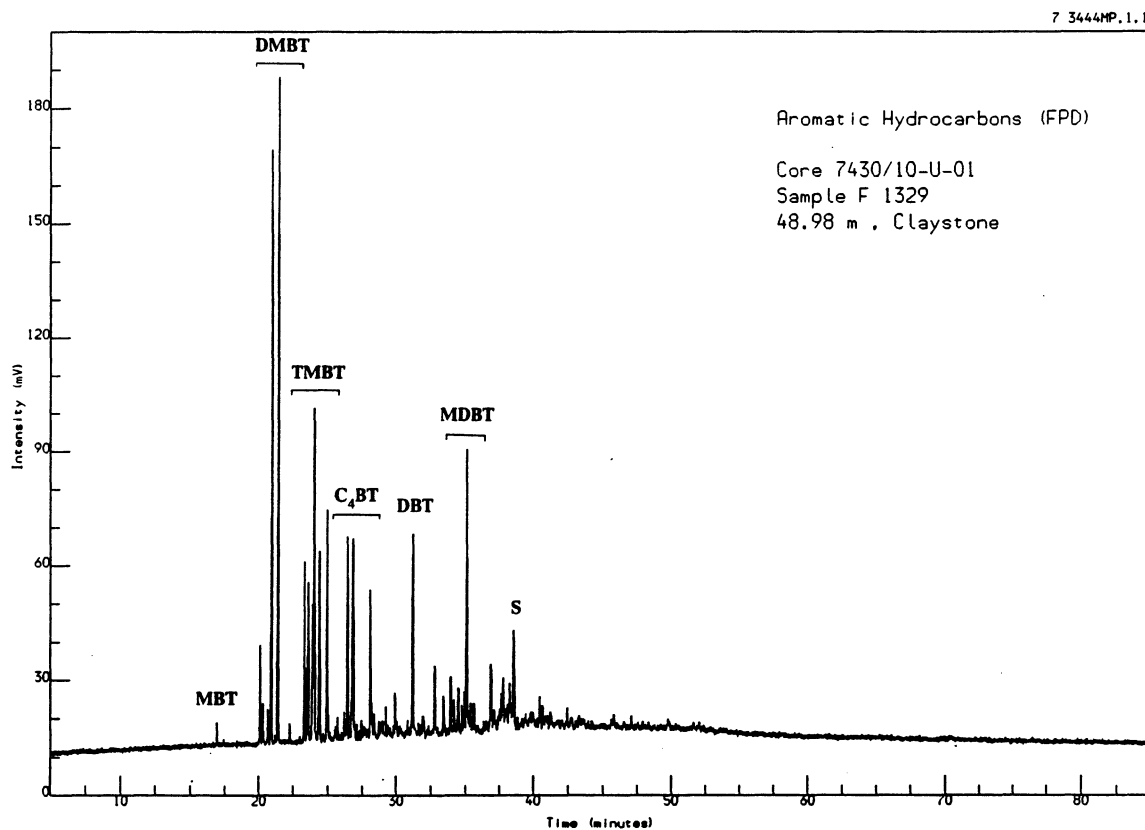




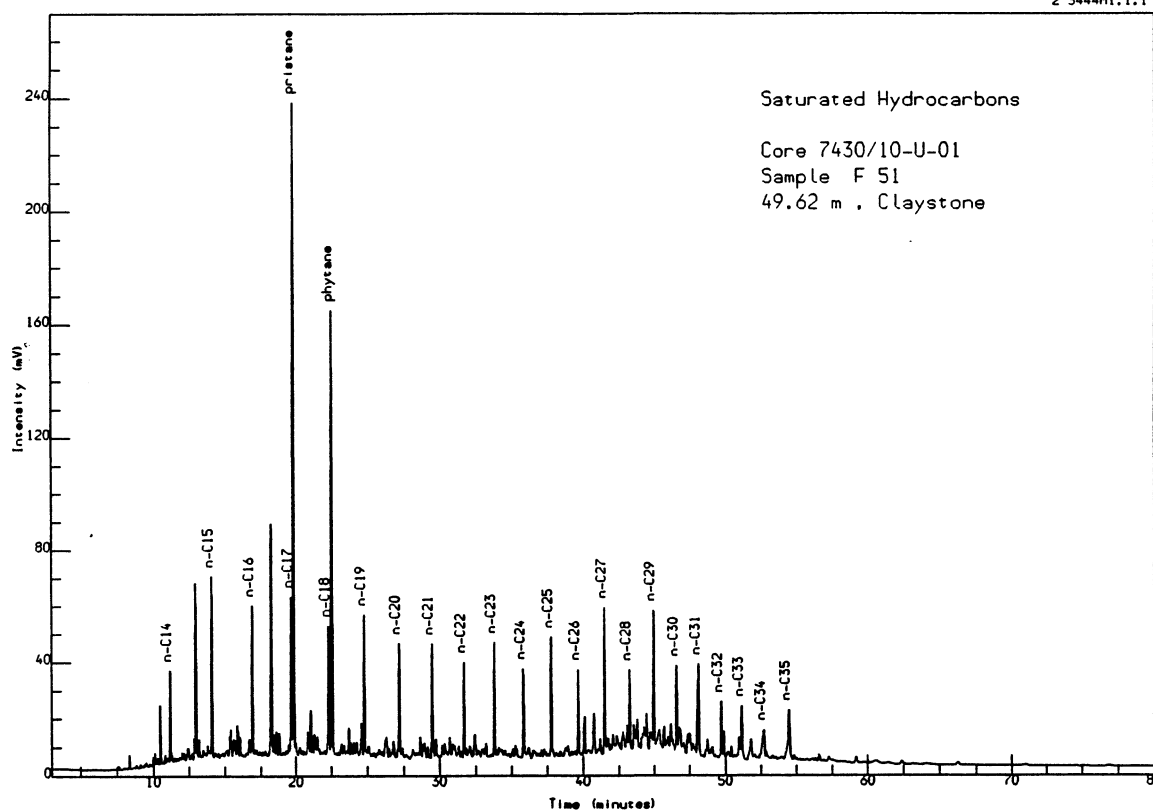




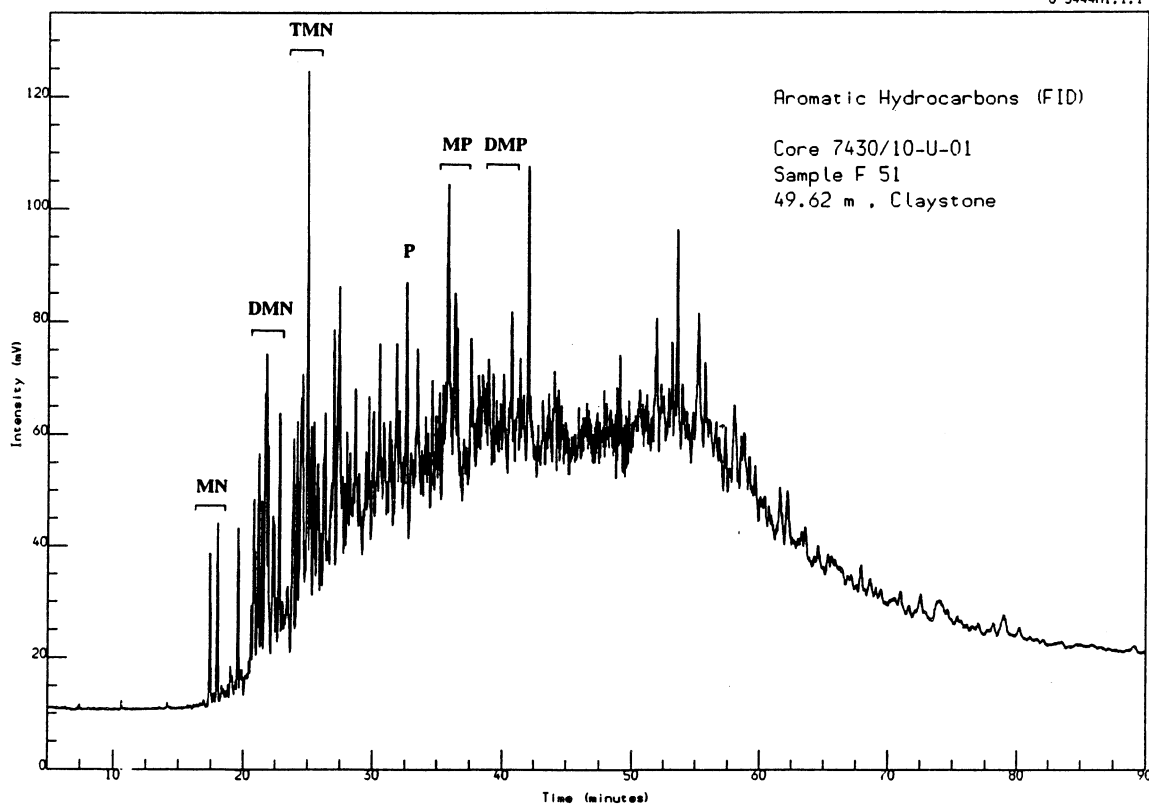


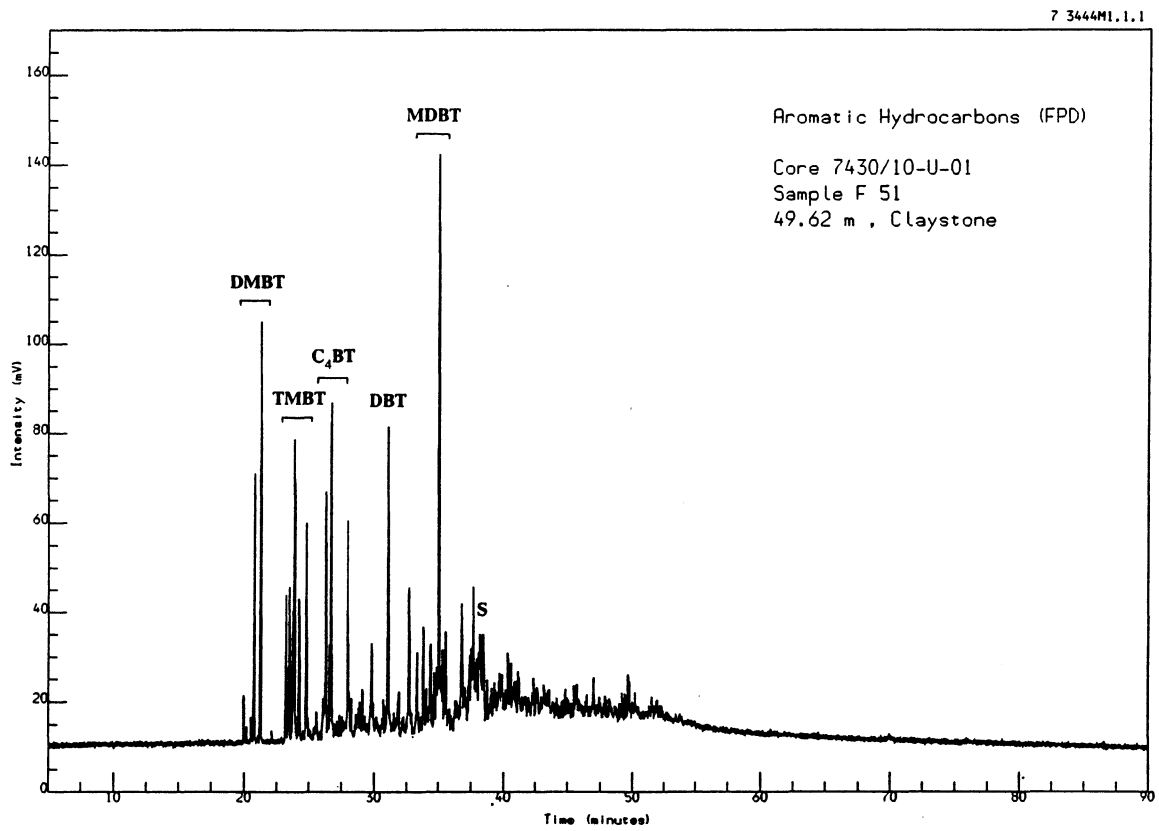


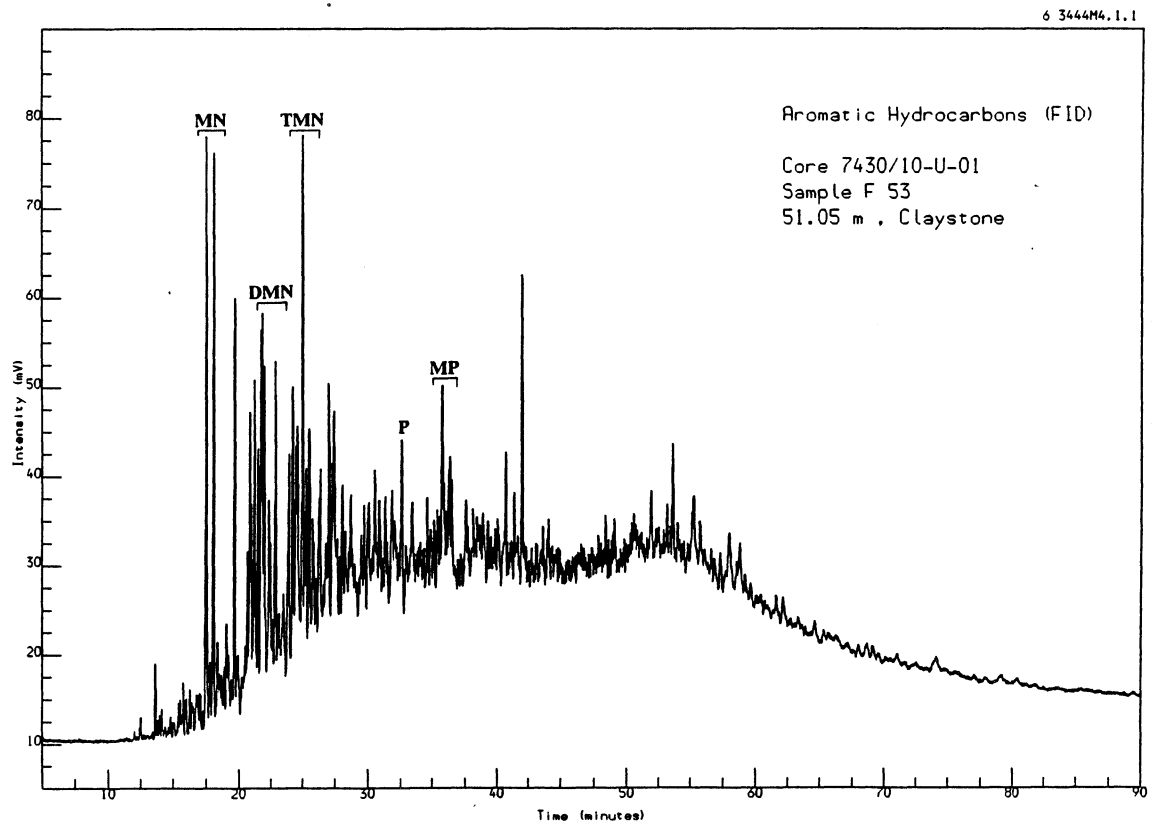
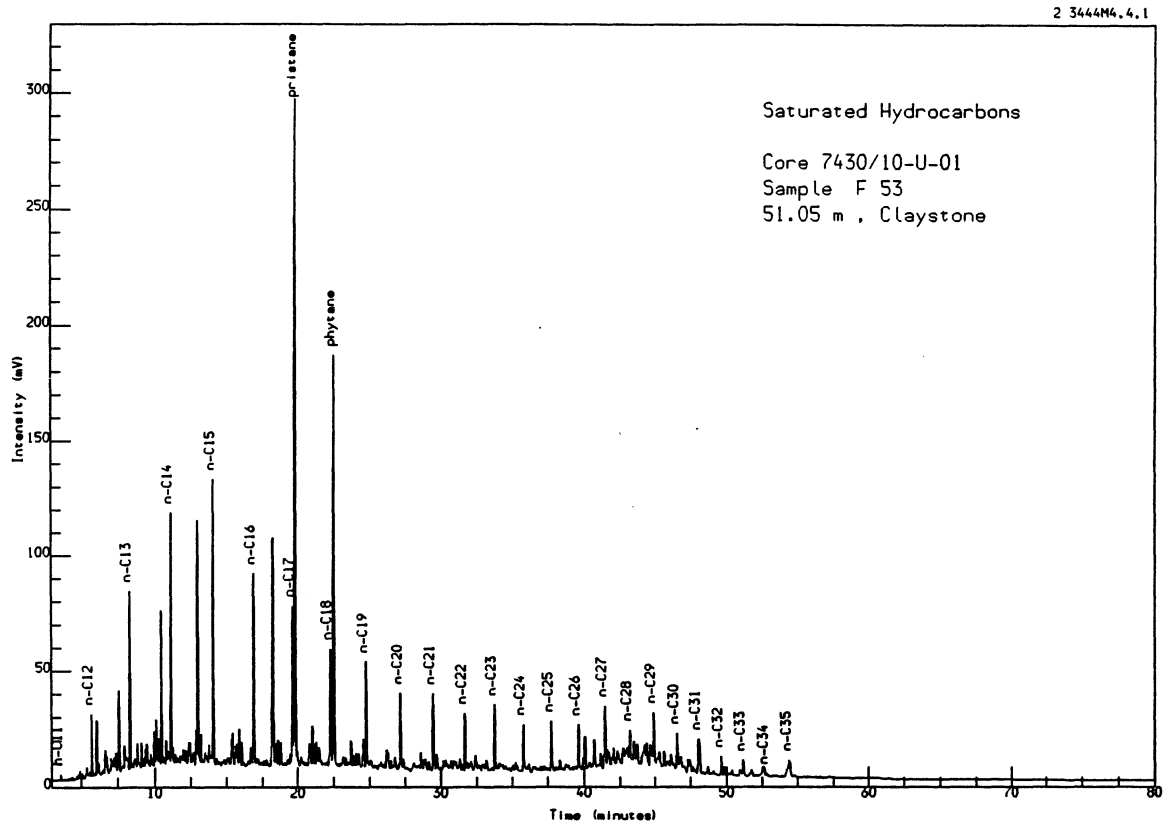
2 3444M1.1.1

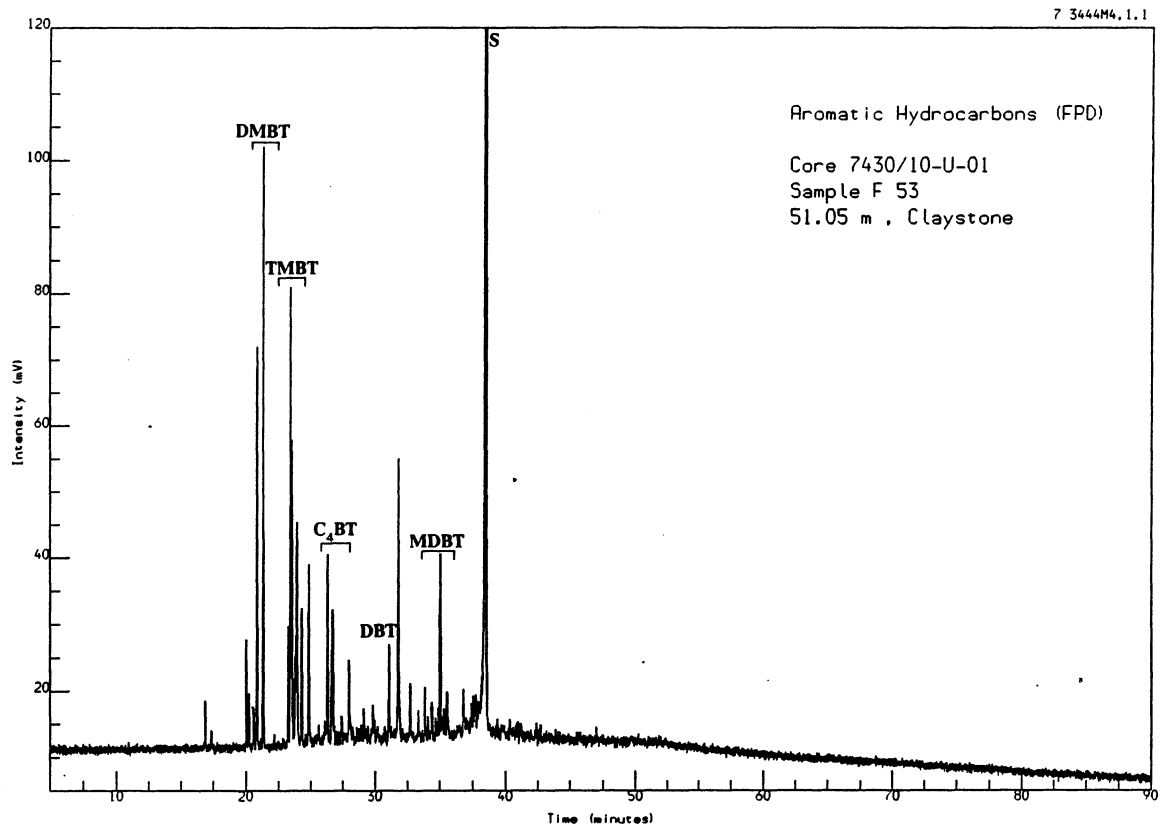


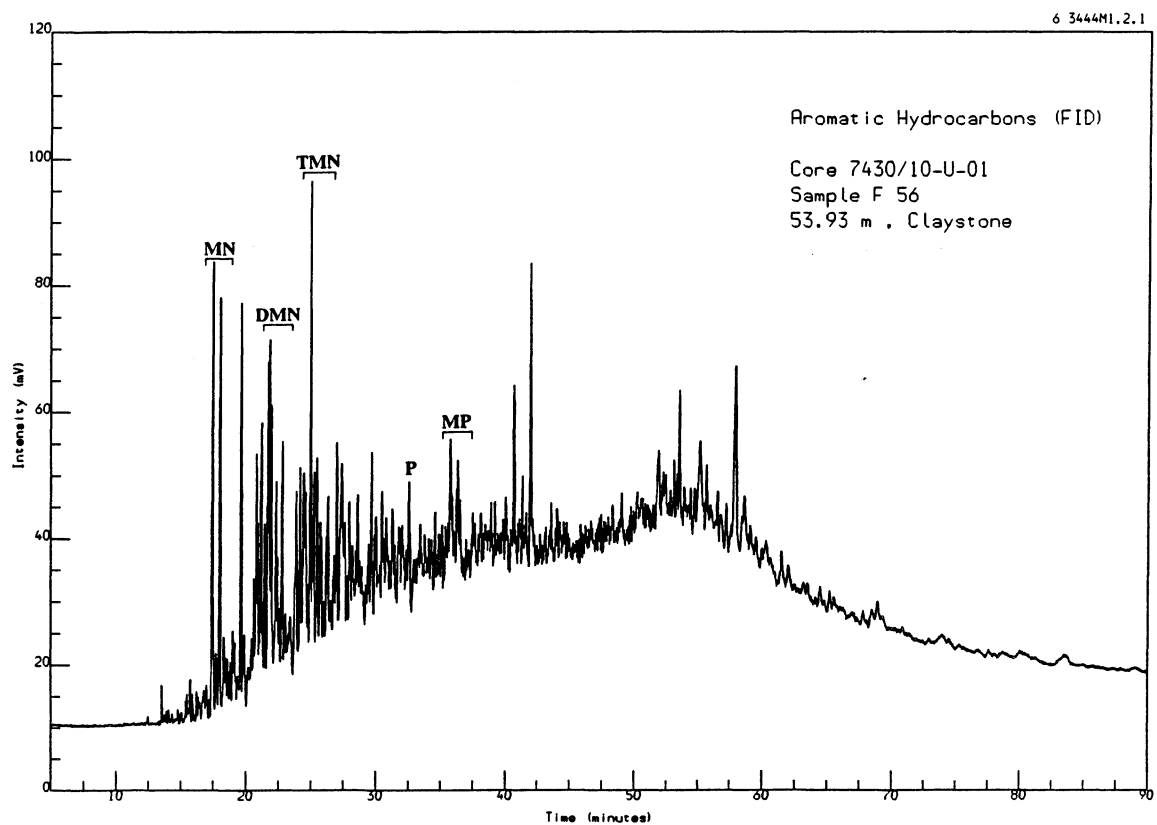
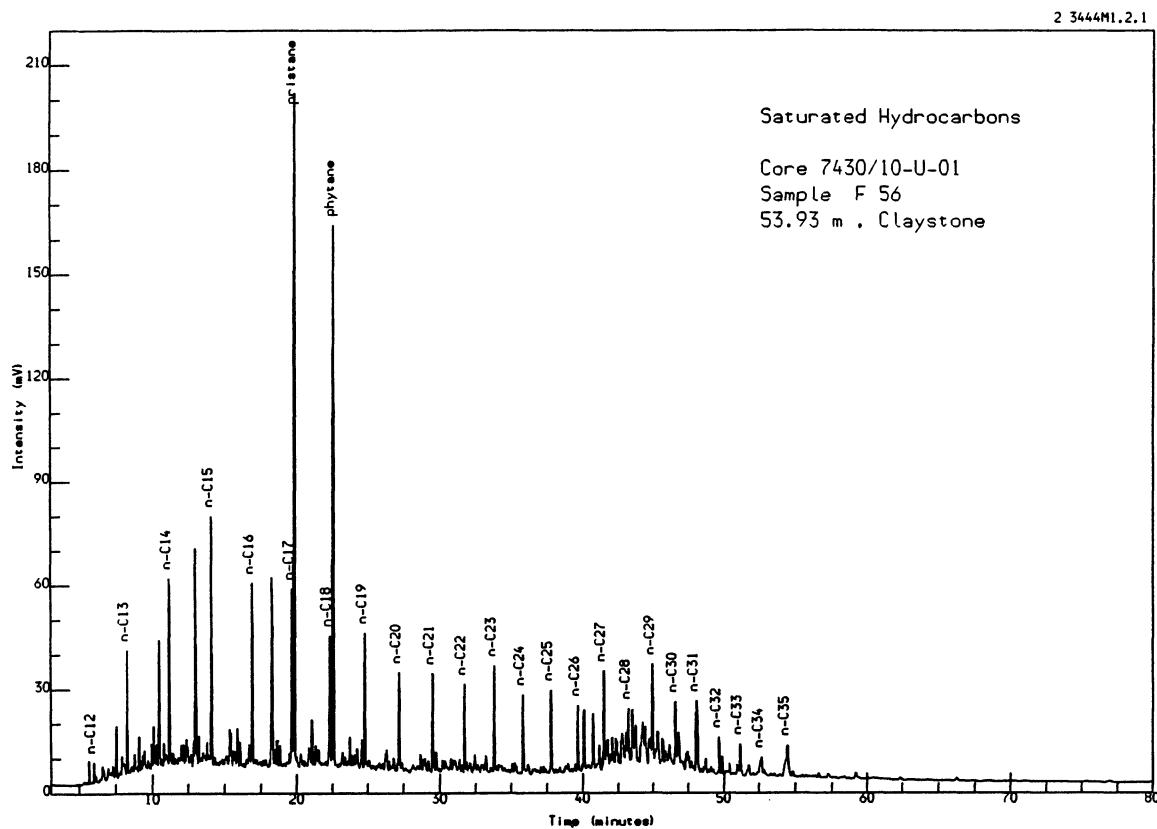
6 3444M1.1.1

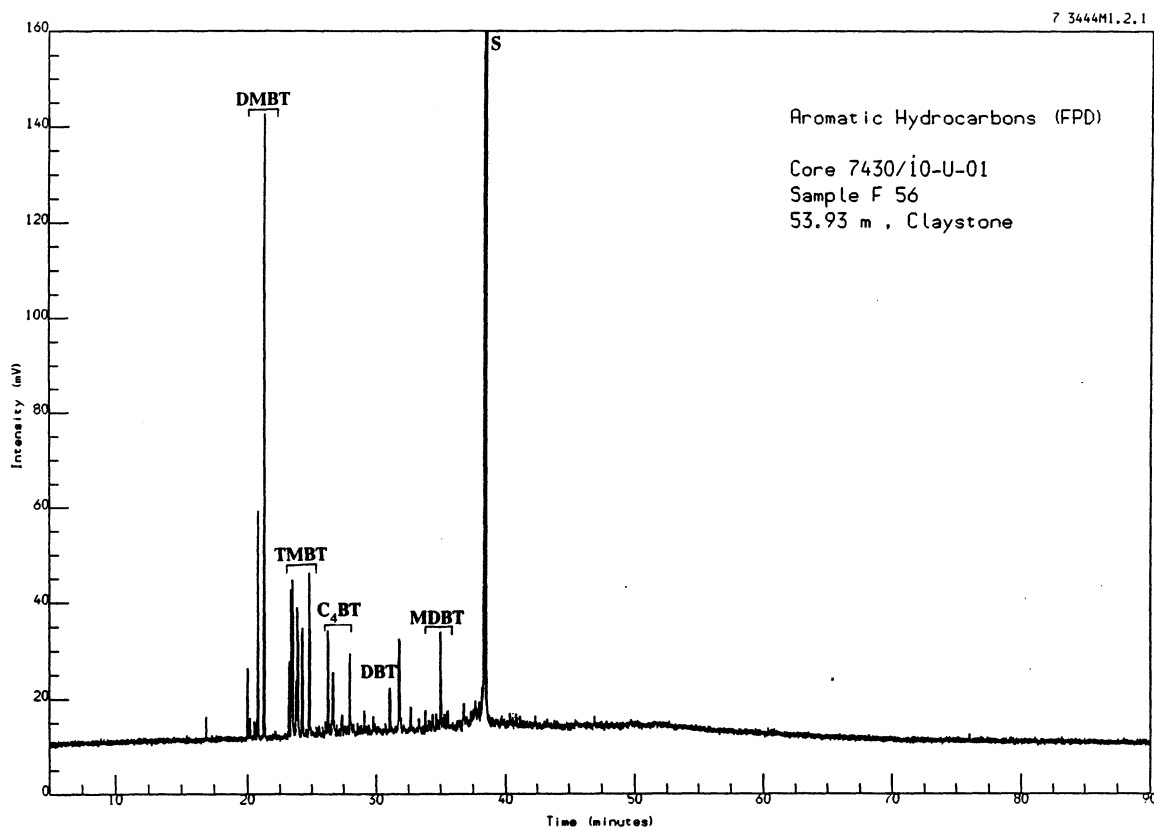


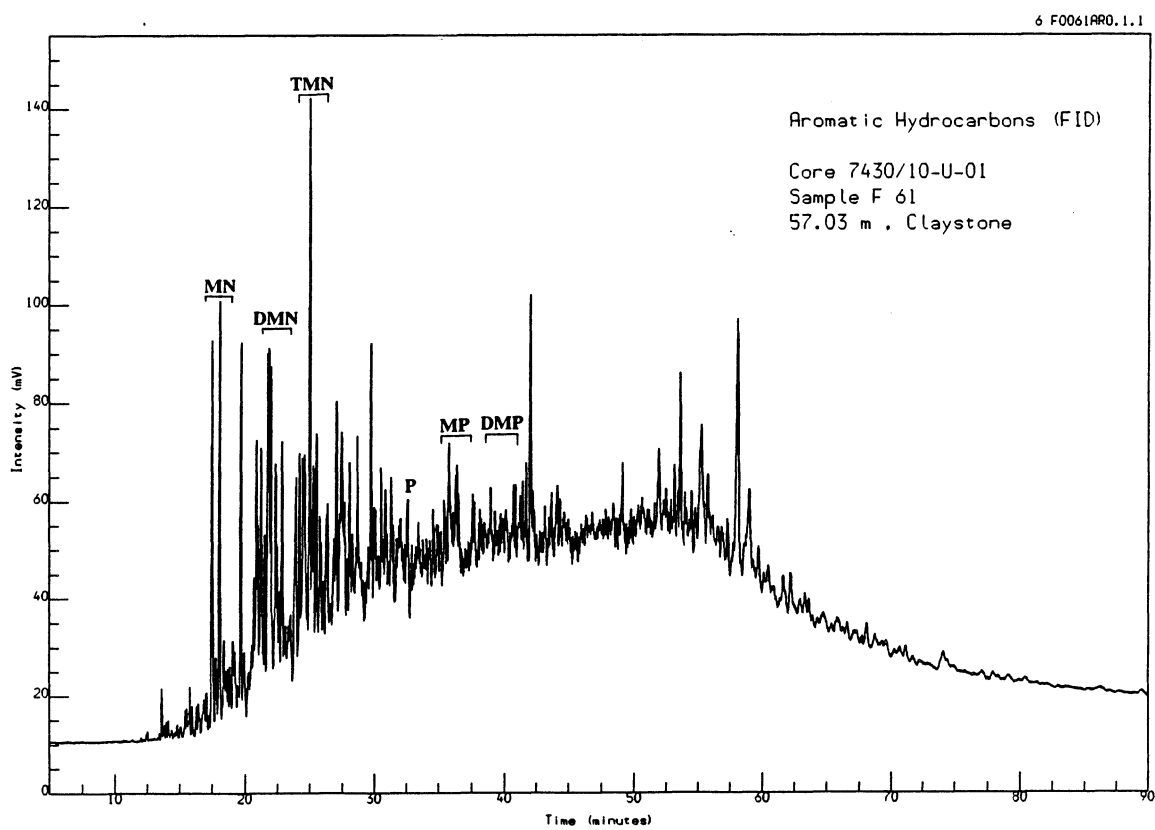
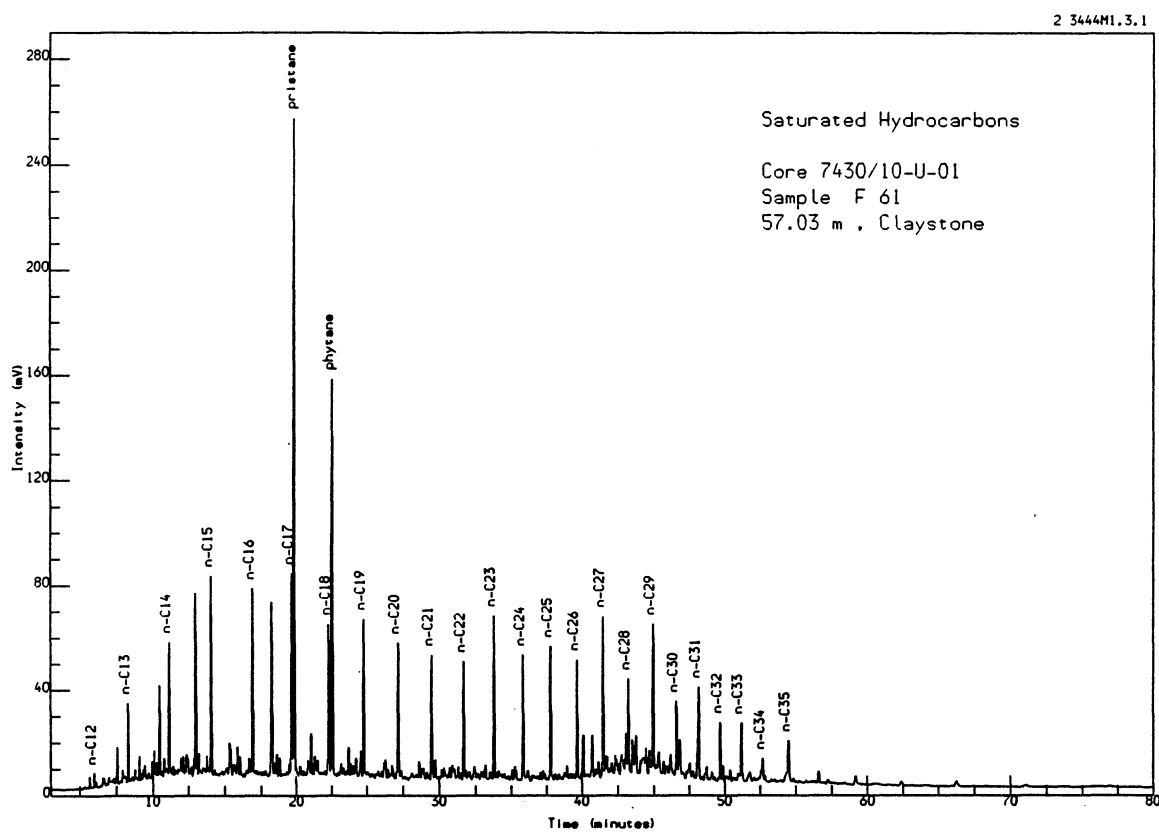


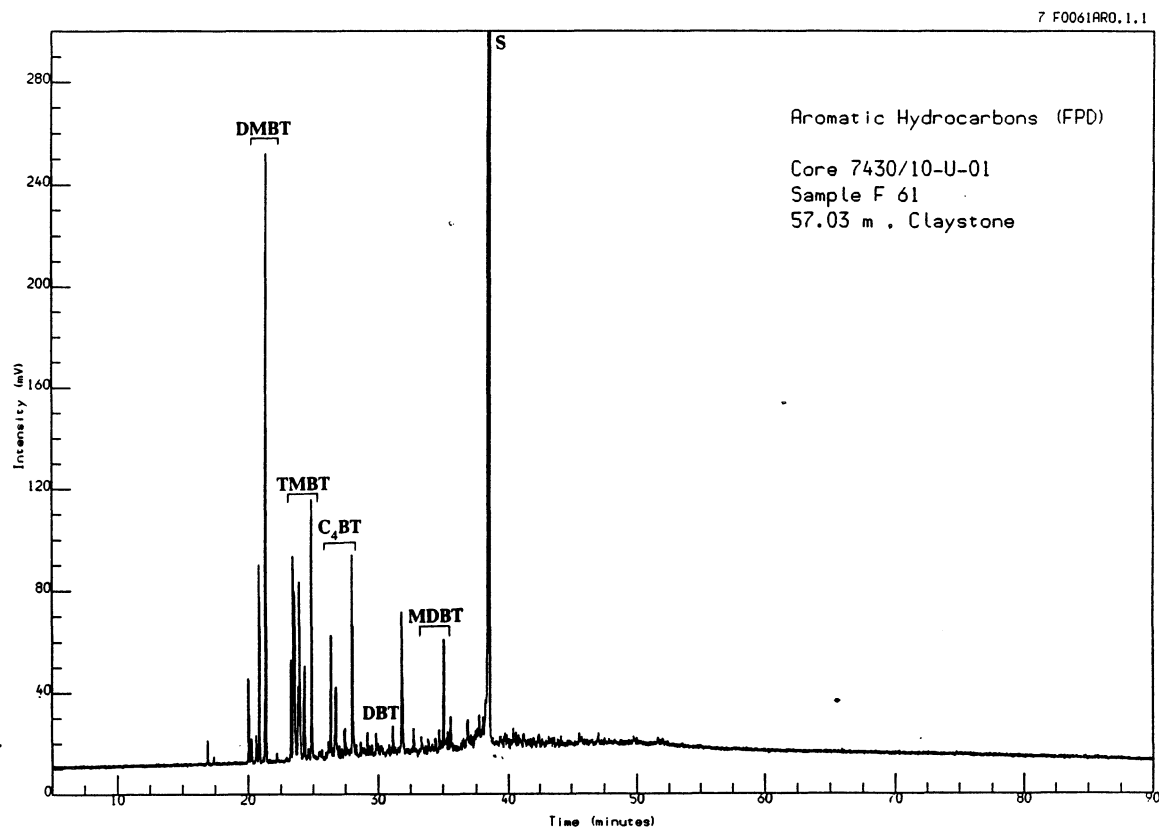


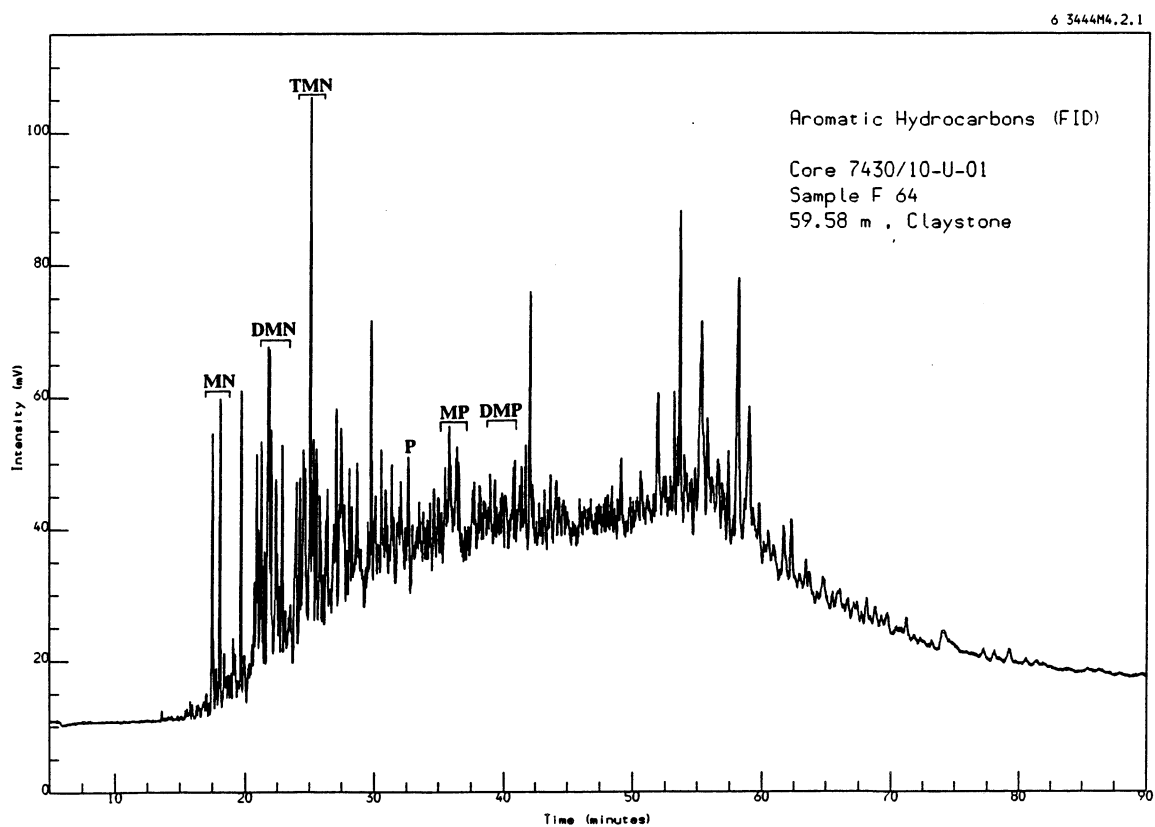
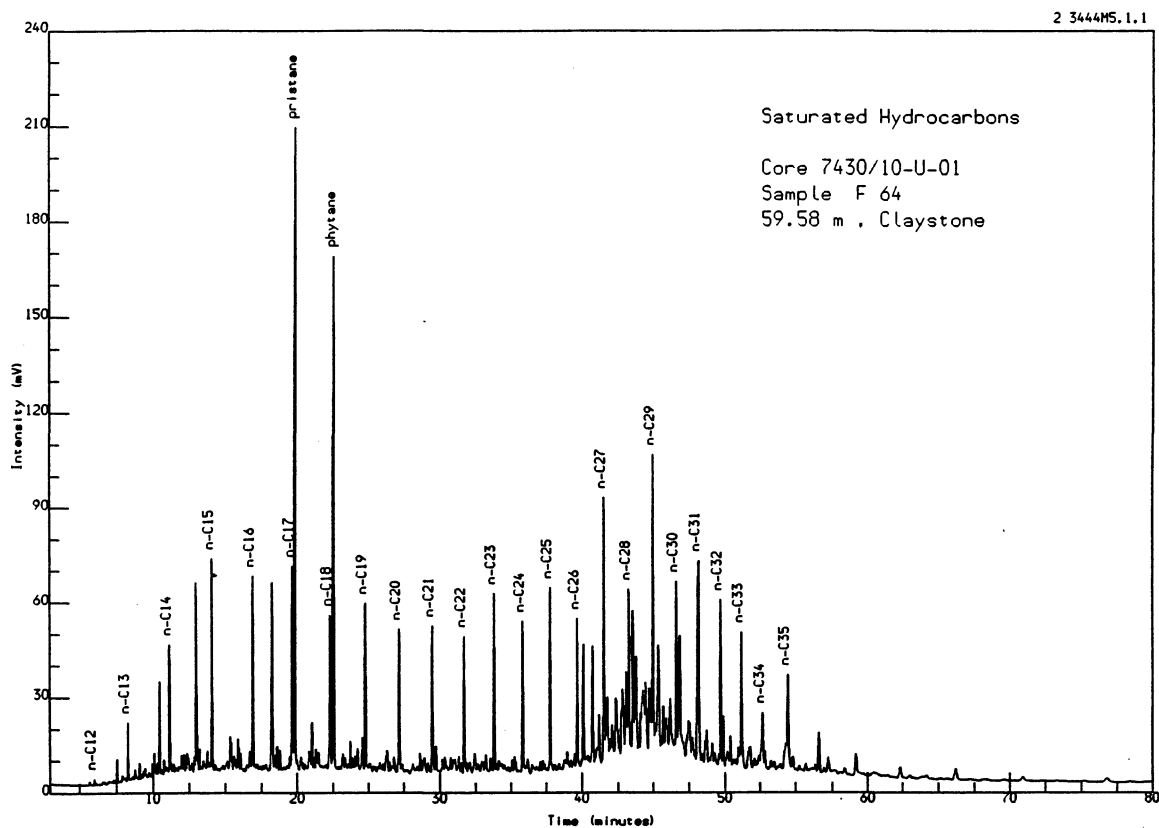


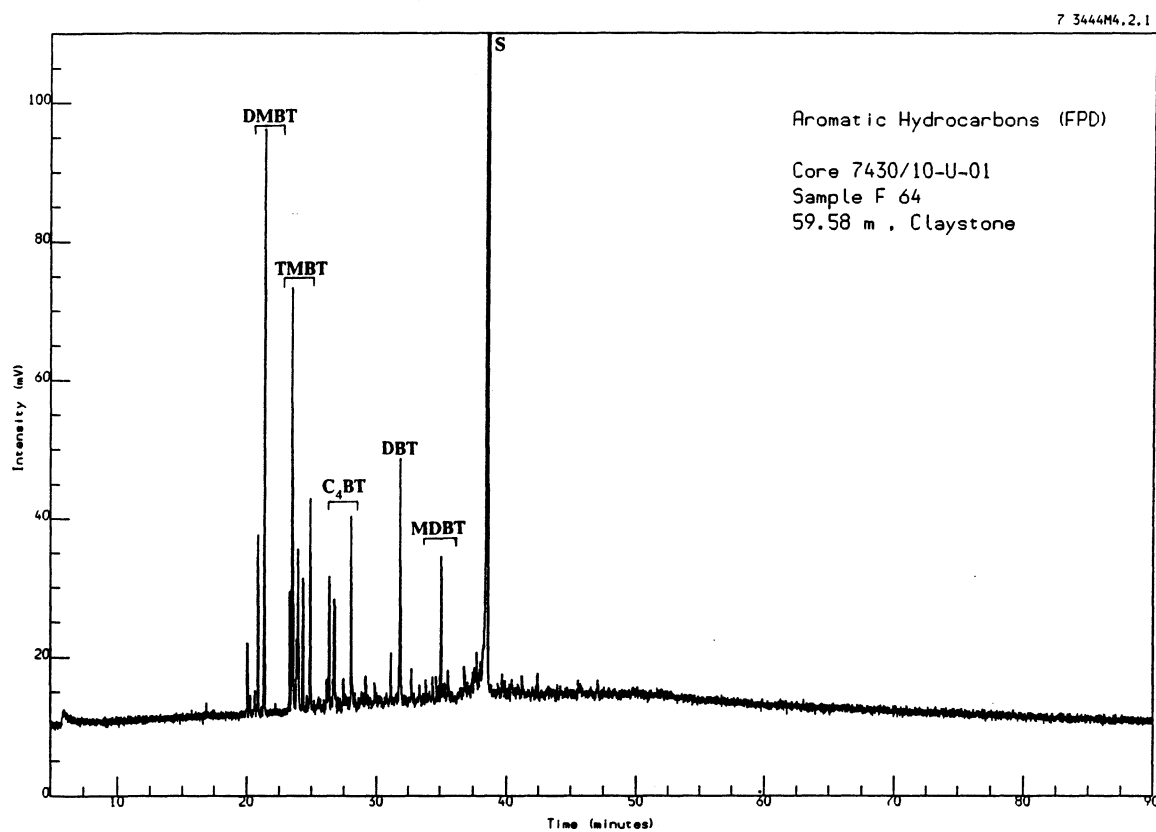


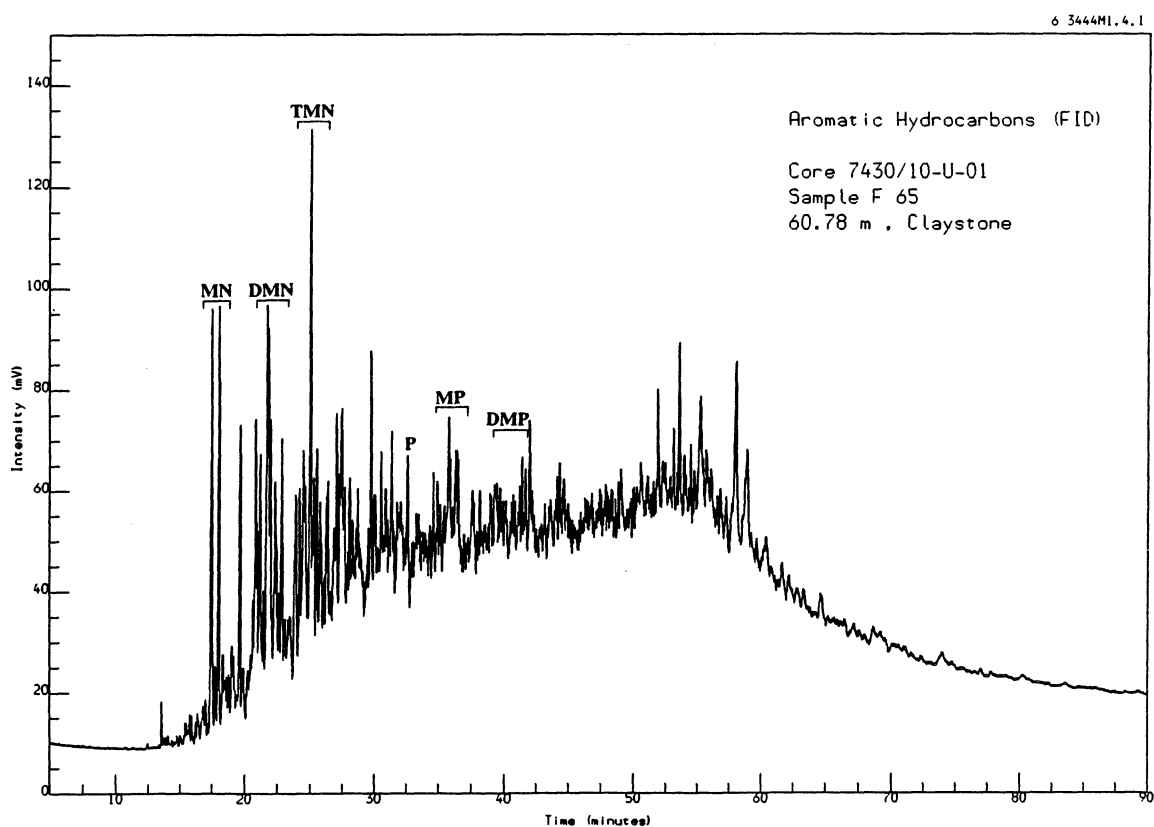
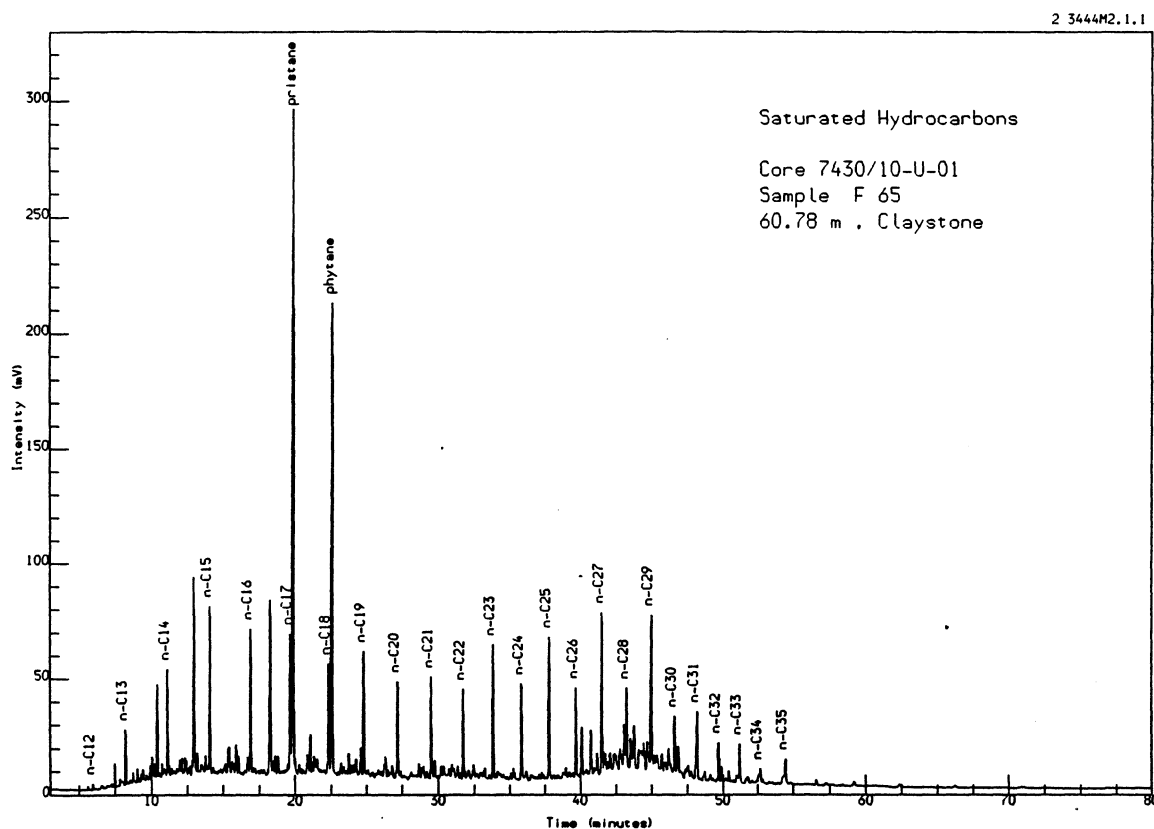


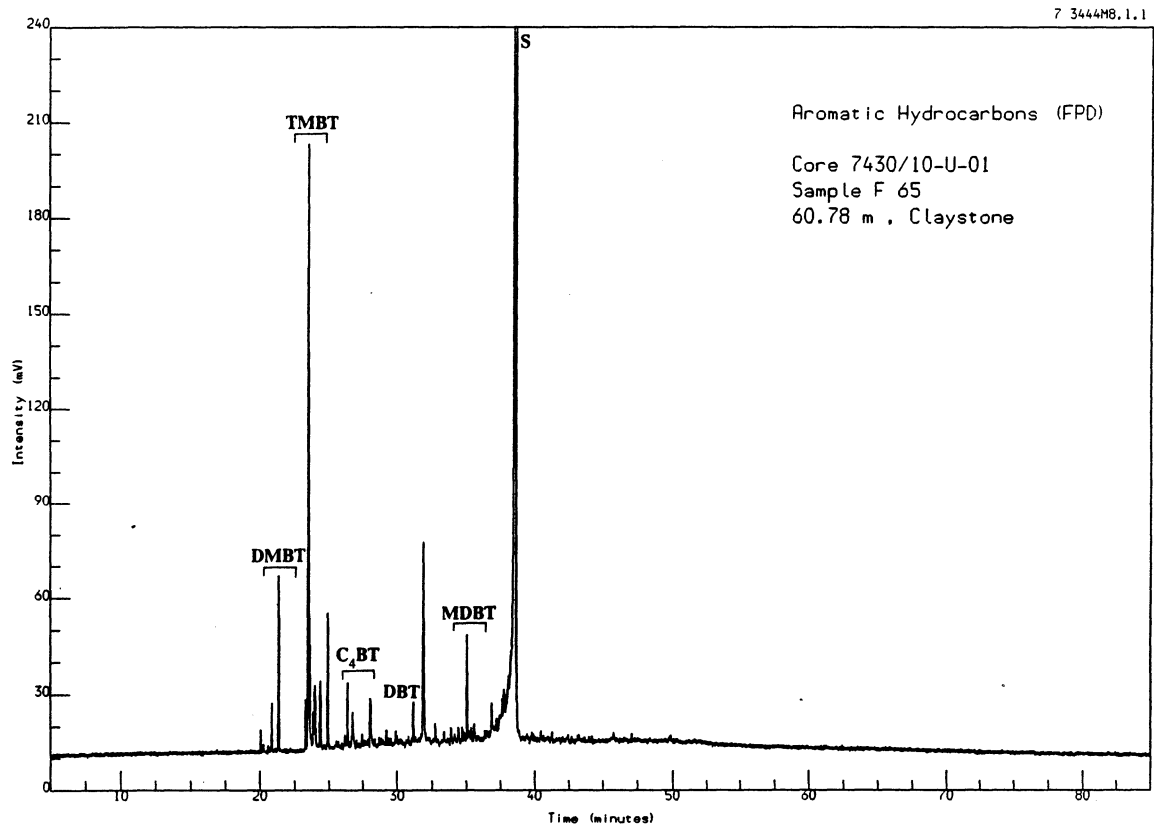


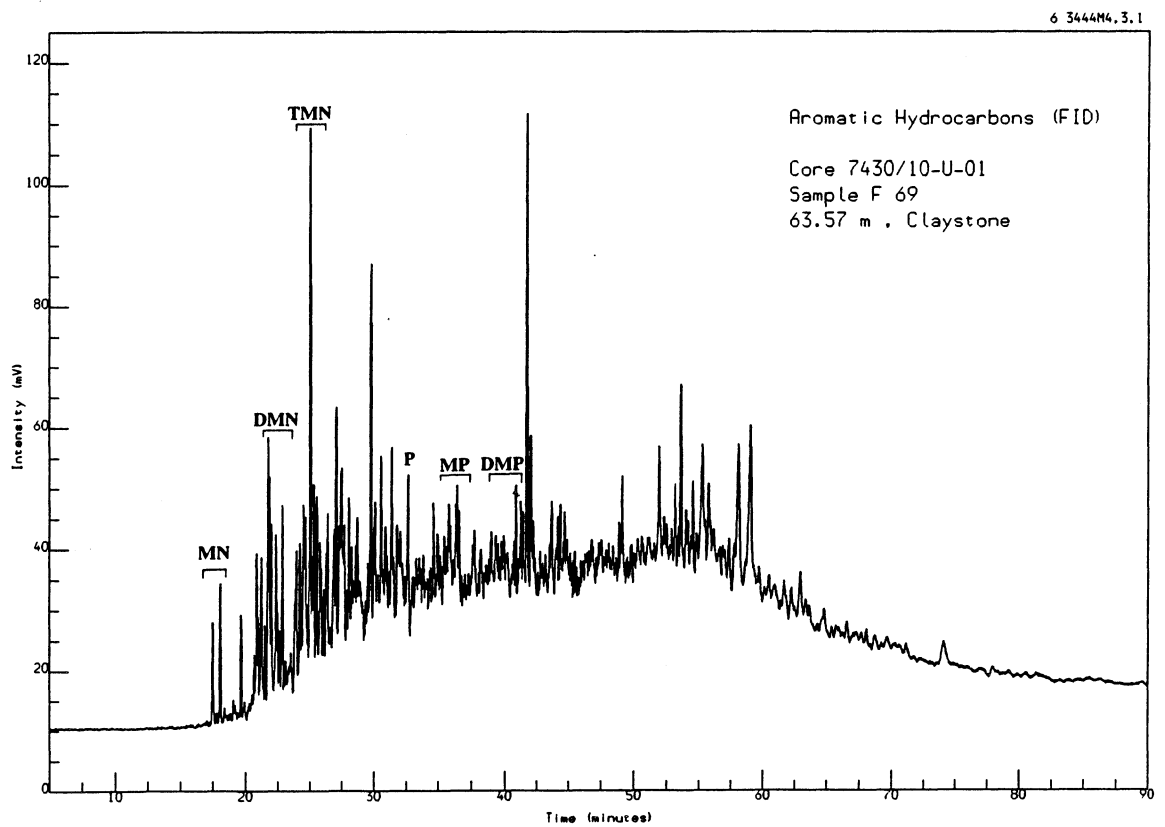
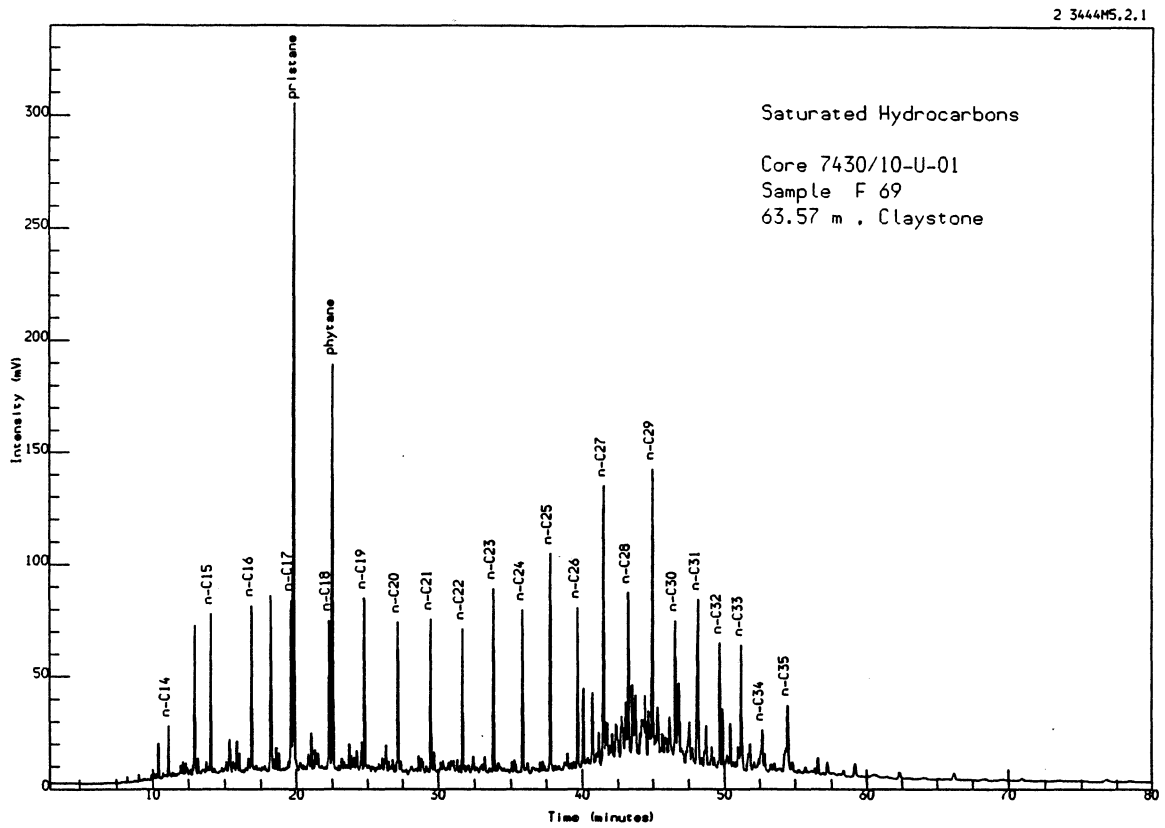


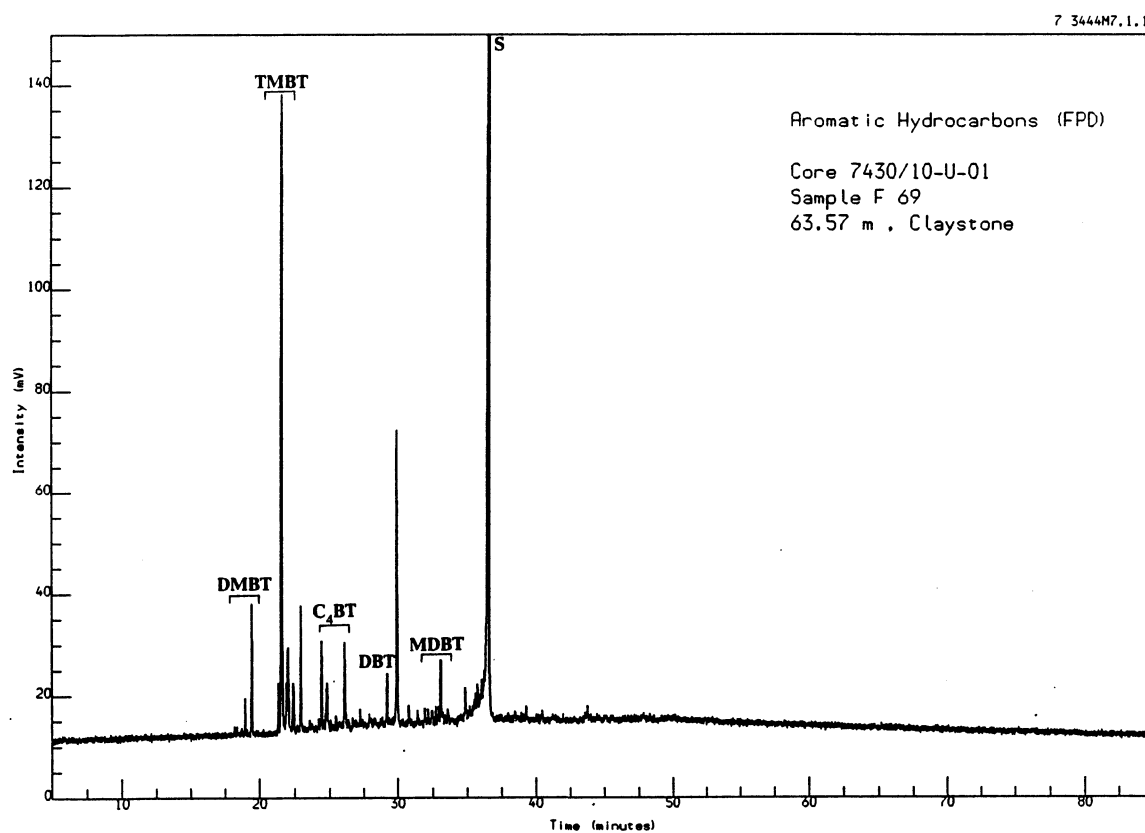


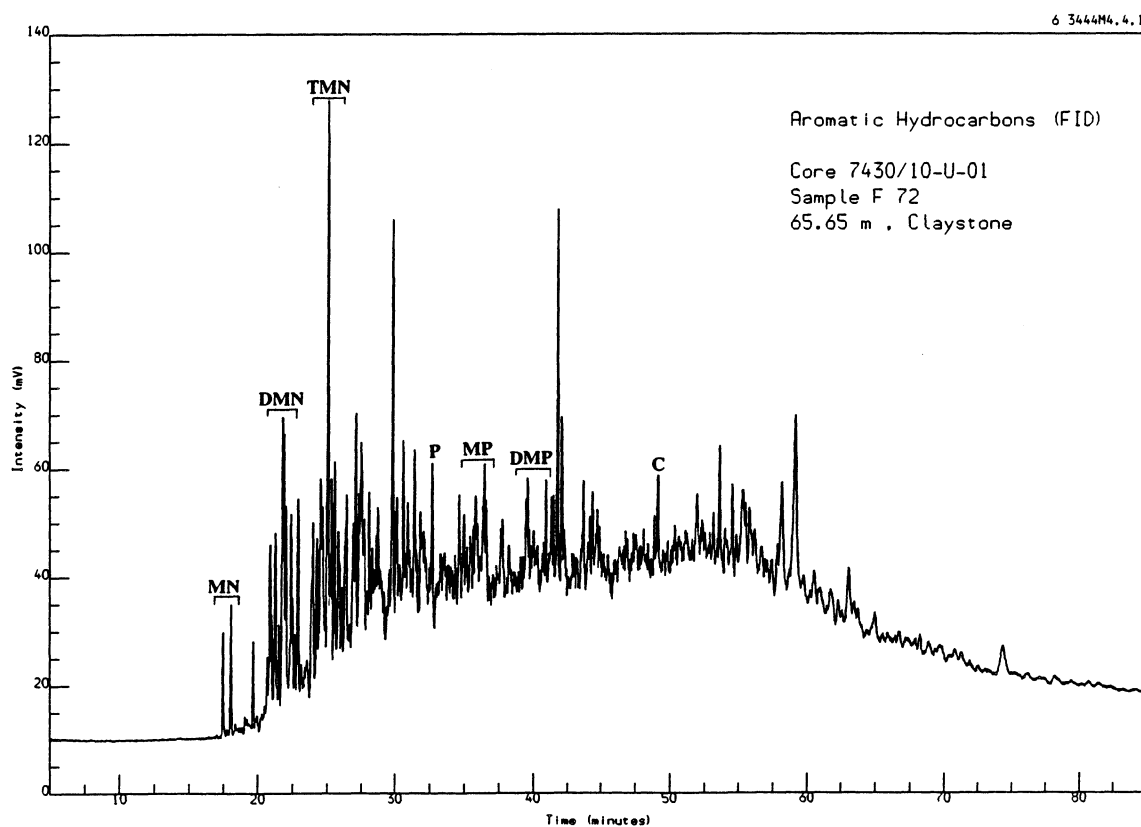
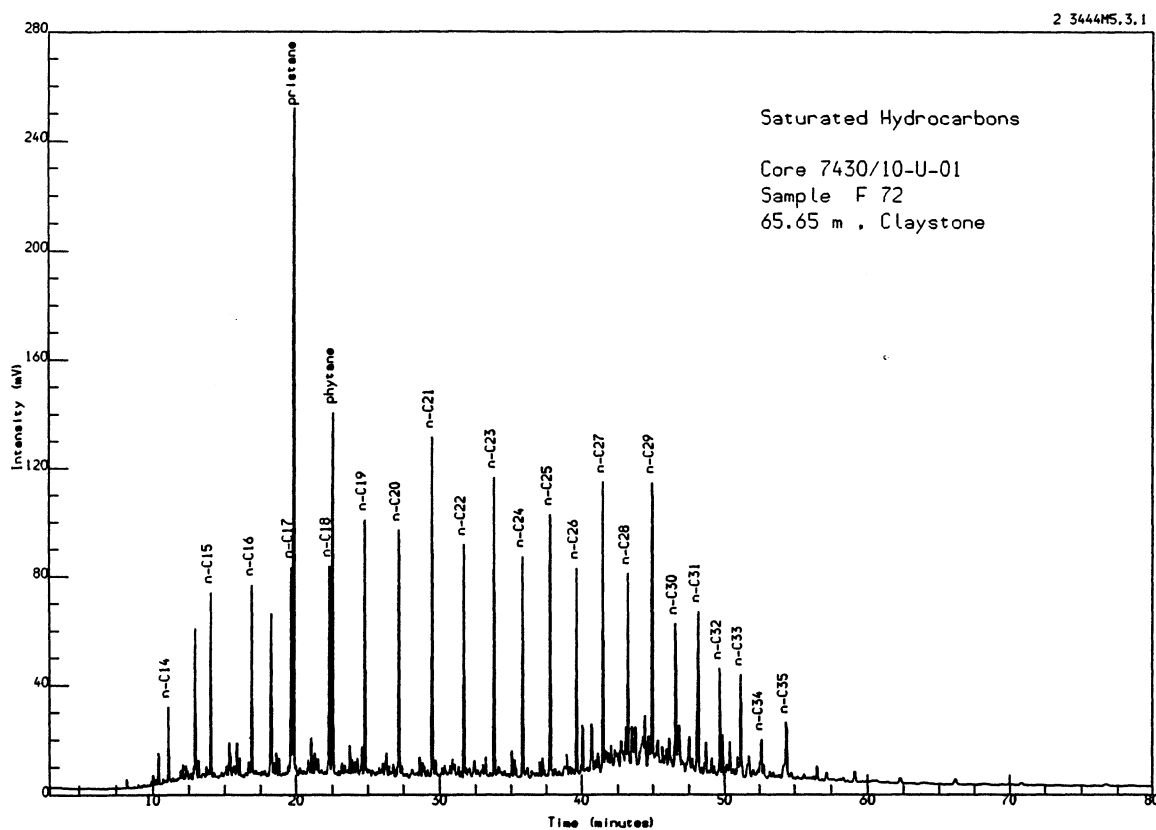












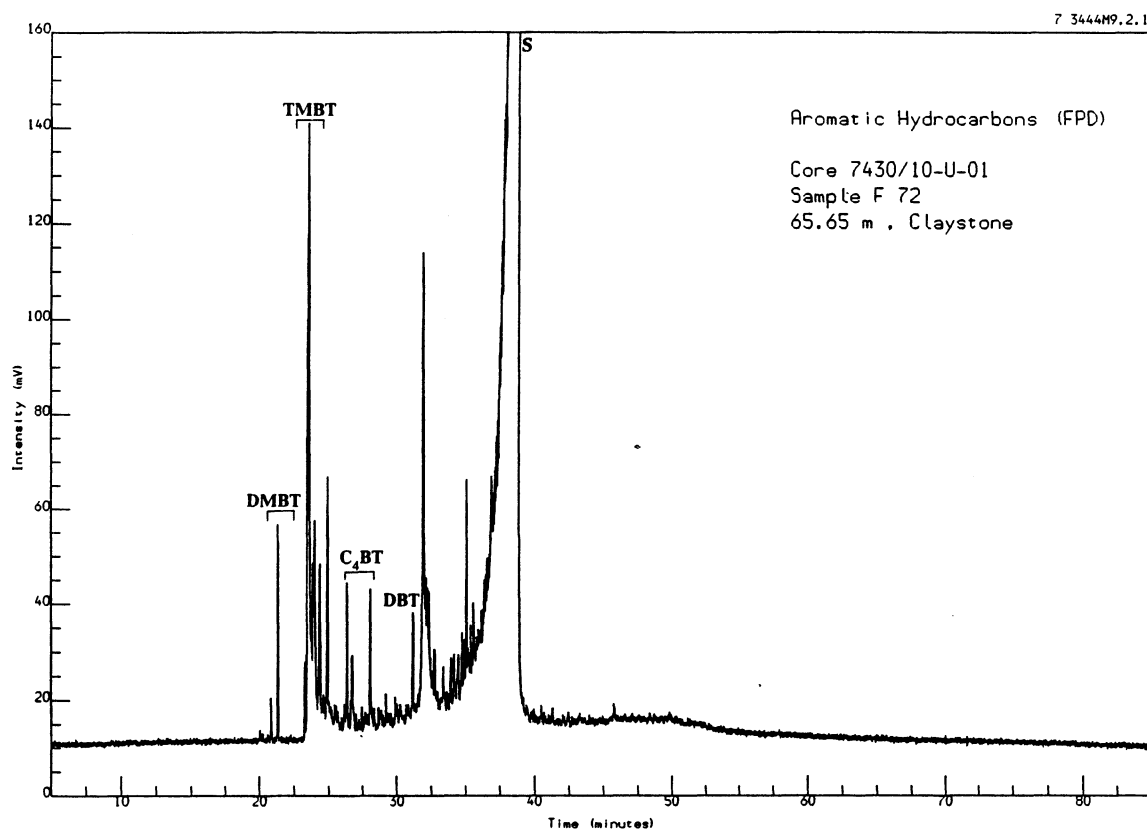
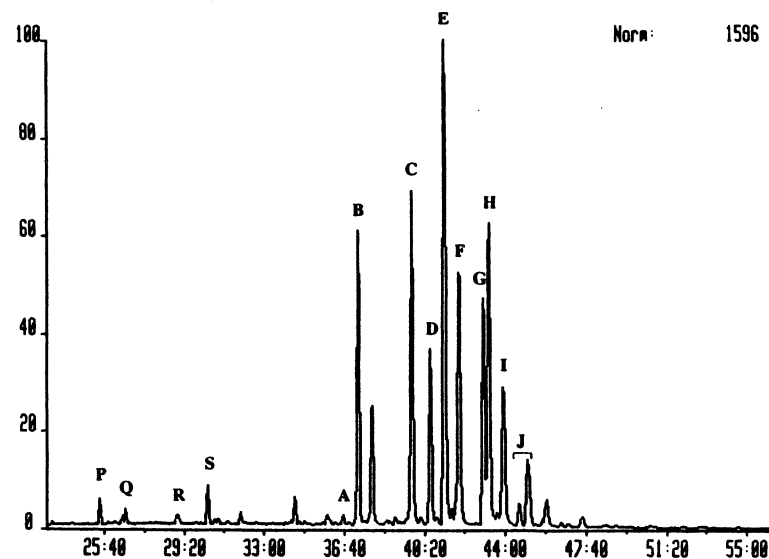


Figure A.III.8.3:

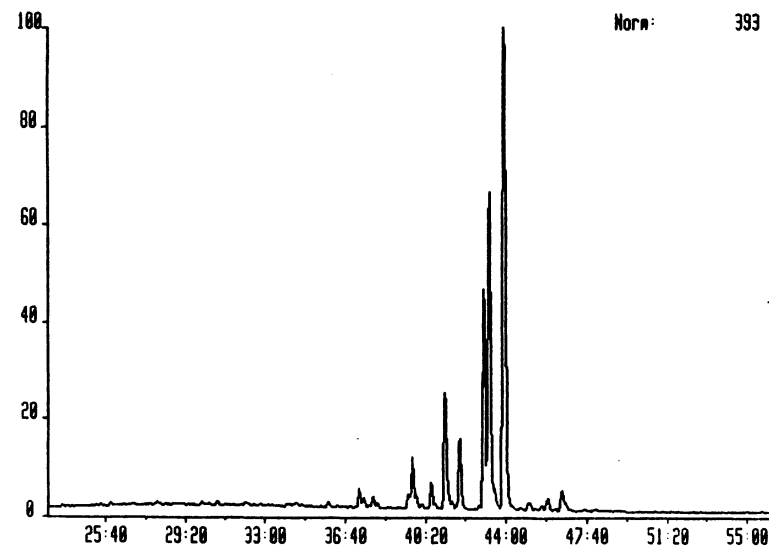
**Mass fragmentograms of m/z 191, 205 (terpanes)
and m/z 217, 218 (steranes).**

For peak identification see Chapter 4.

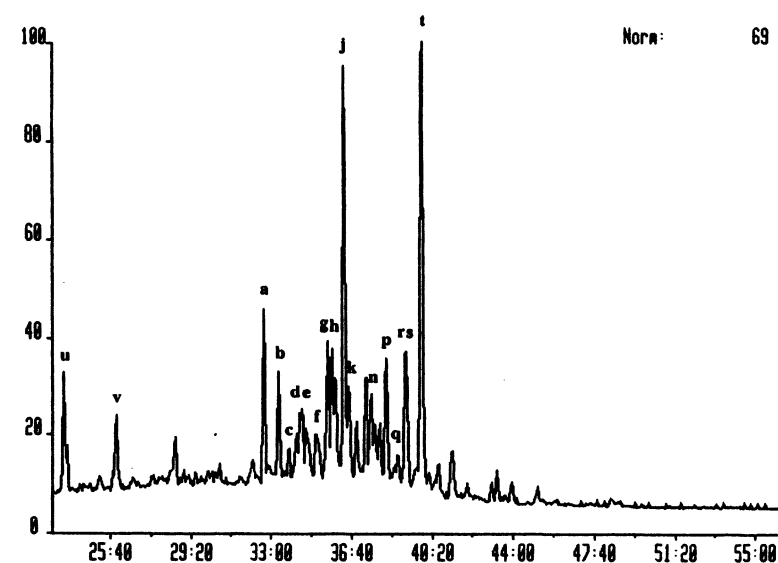
F0012 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0012 7430/10-U-01 21.00 M CLST



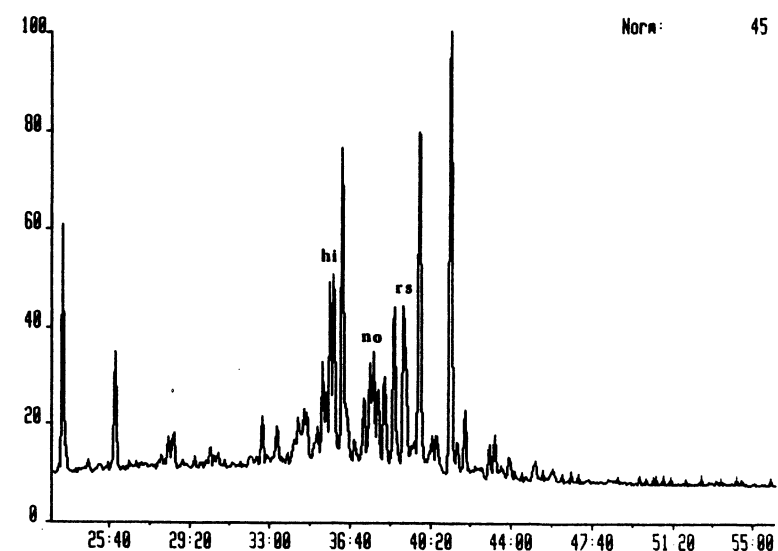
F0012 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0012 7430/10-U-01 21.00 M CLST



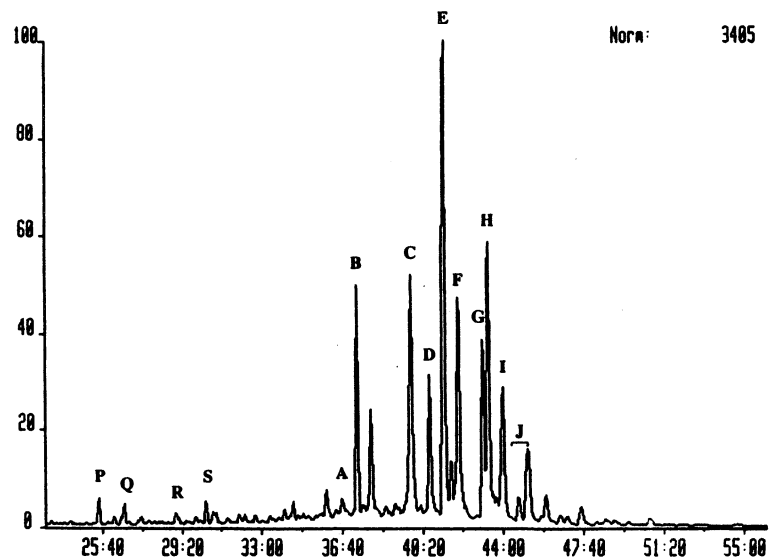
F0012 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0012 7430/10-U-01 21.00 M CLST



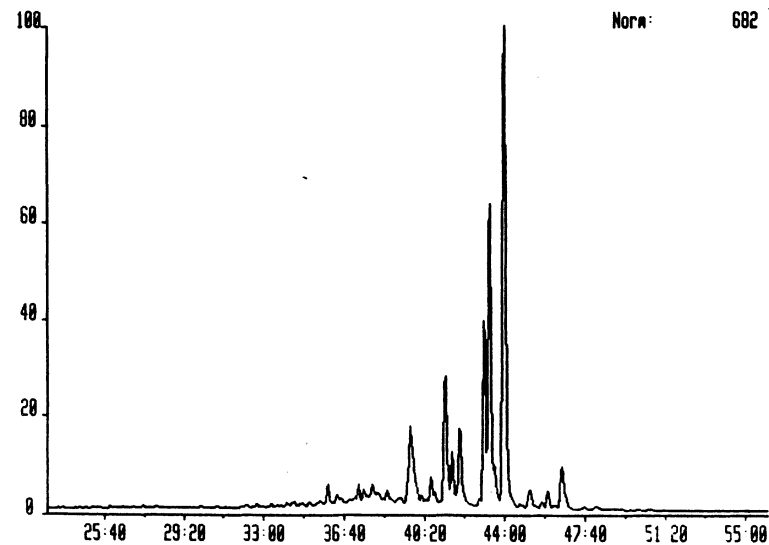
F0012 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0012 7430/10-U-01 21.00 M CLST



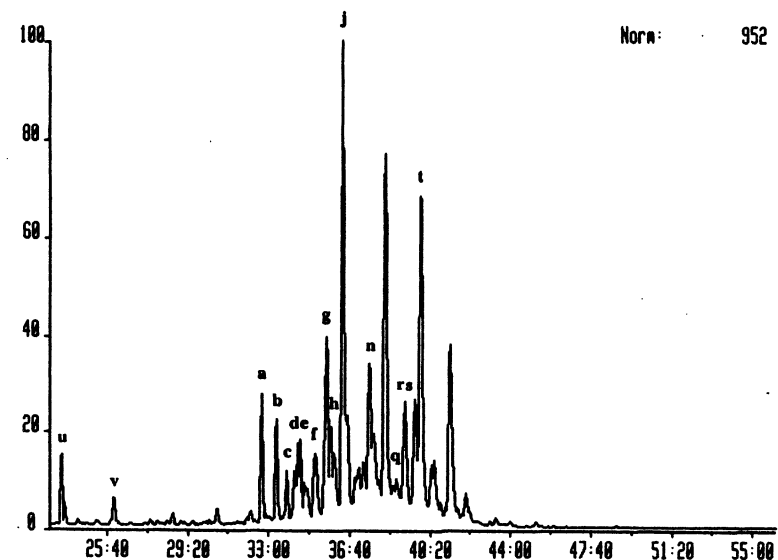
F0020 17-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0020 7430/10-U-01 33.74 M CLST



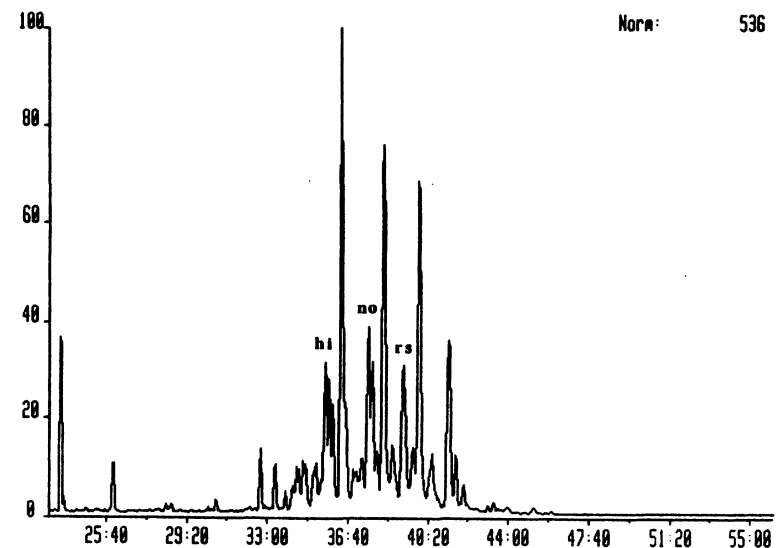
F0020 17-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0020 7430/10-U-01 33.74 M CLST



F0020 17-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0020 7430/10-U-01 33.74 M CLST

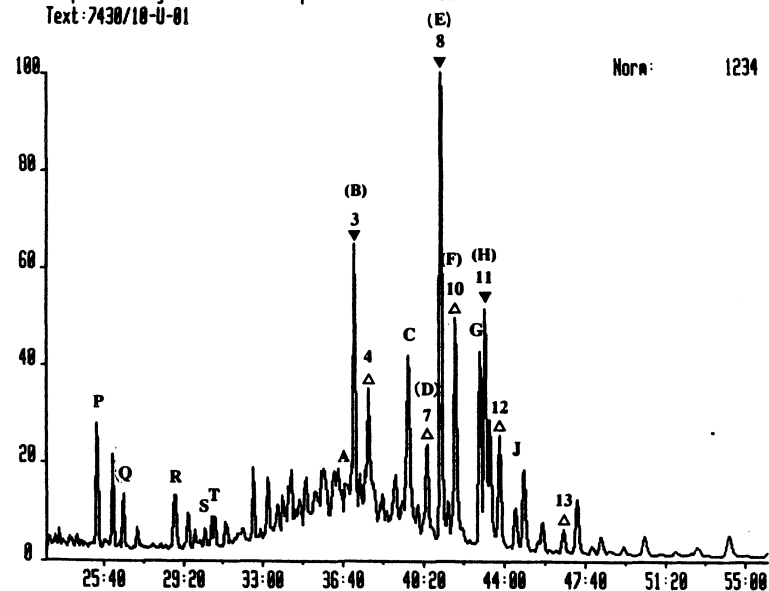


F0020 17-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0020 7430/10-U-01 33.74 M CLST

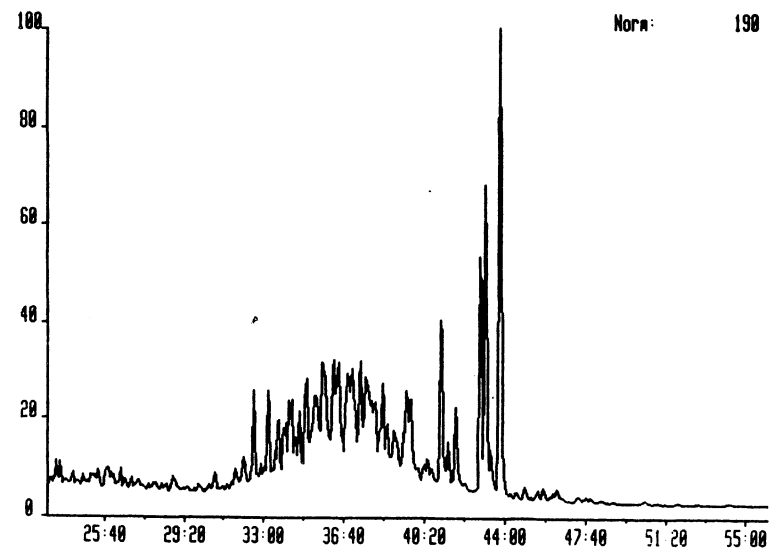


414

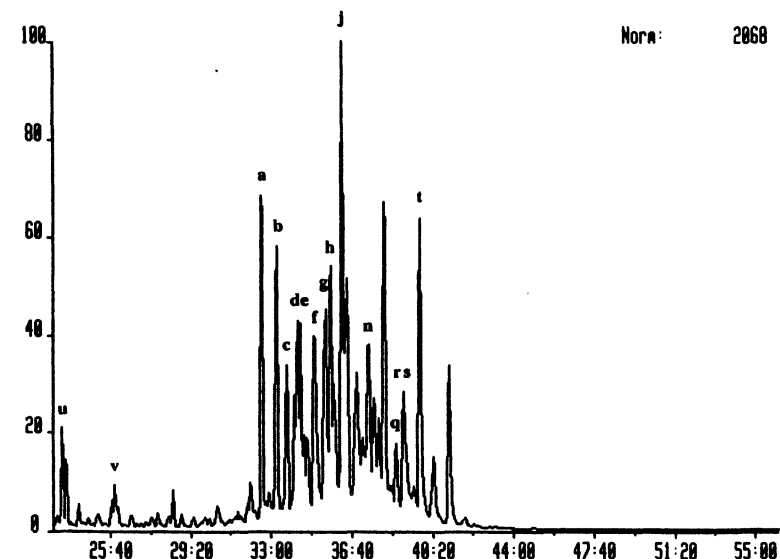
F1211 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:7430/10-U-01



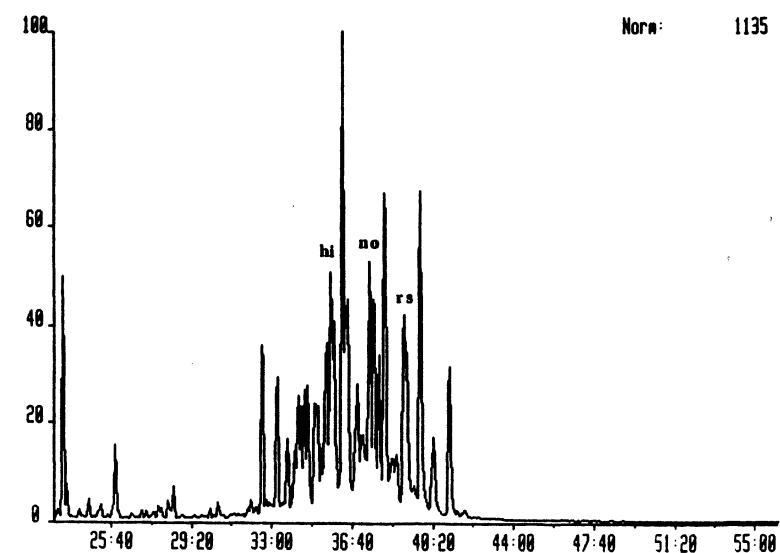
F1211 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:7430/10-U-01



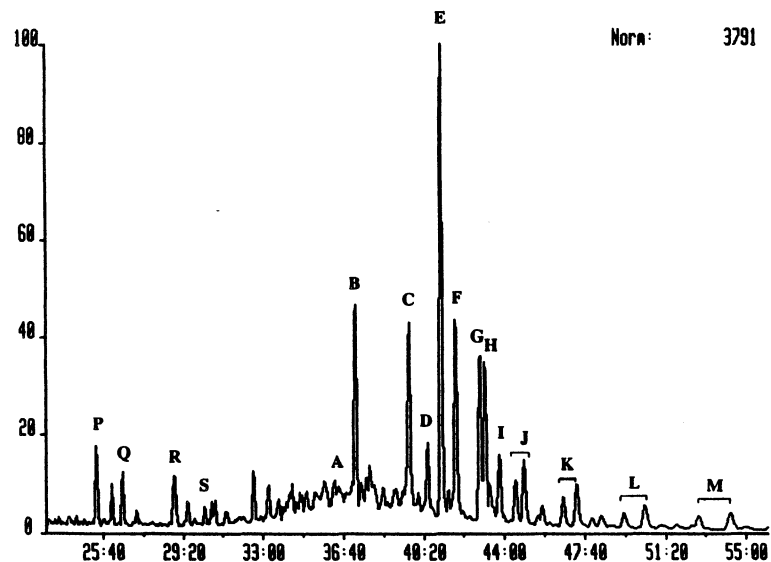
F1211 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:7430/10-U-01



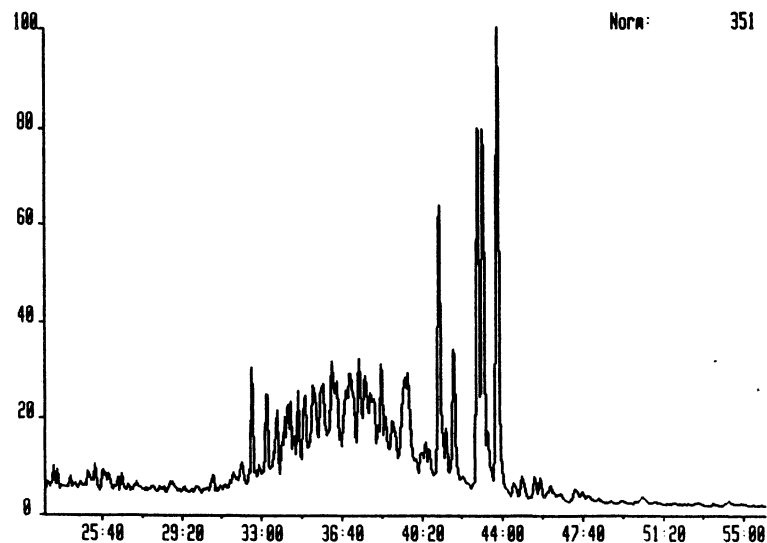
F1211 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:7430/10-U-01



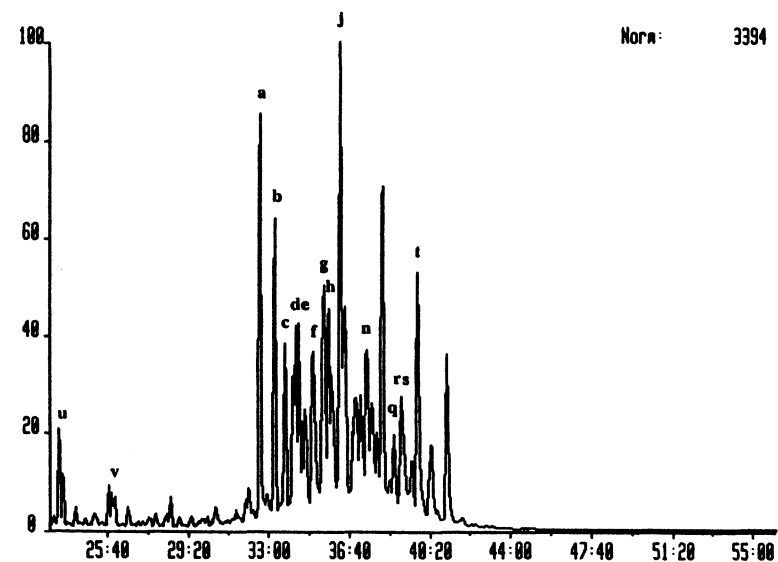
F0046 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0046 7430/10-U-01 46.85 M CLST



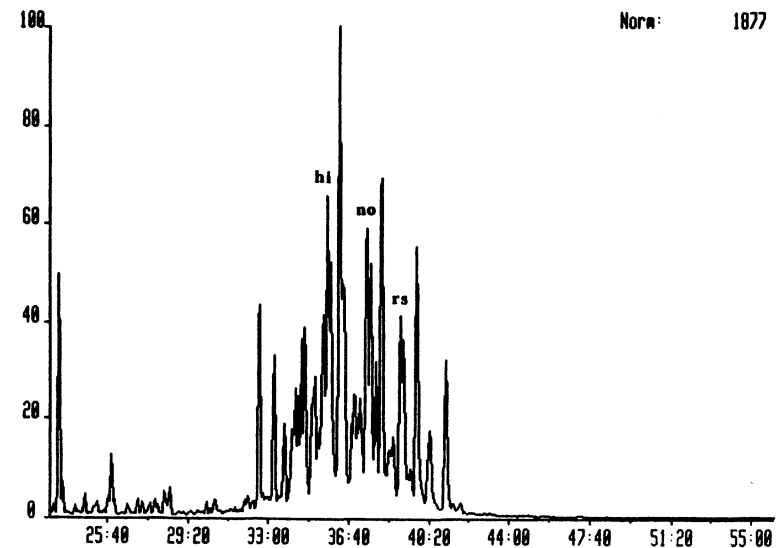
F0046 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0046 7430/10-U-01 46.85 M CLST



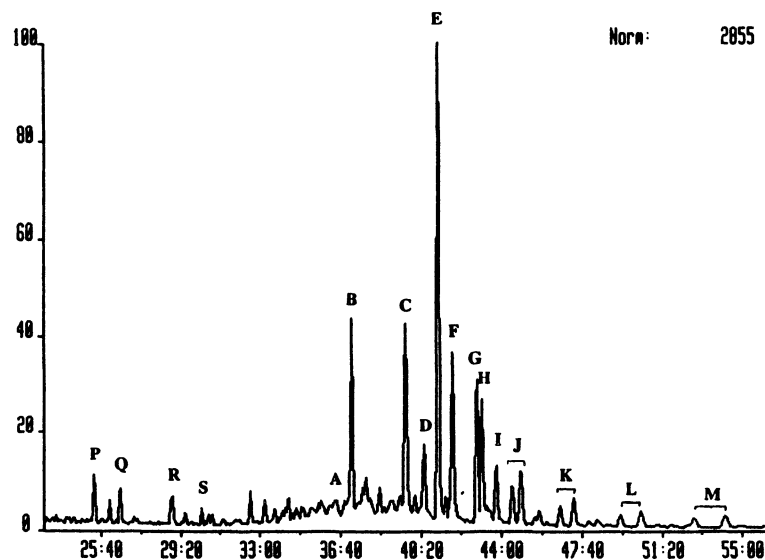
F0046 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0046 7430/10-U-01 46.85 M CLST



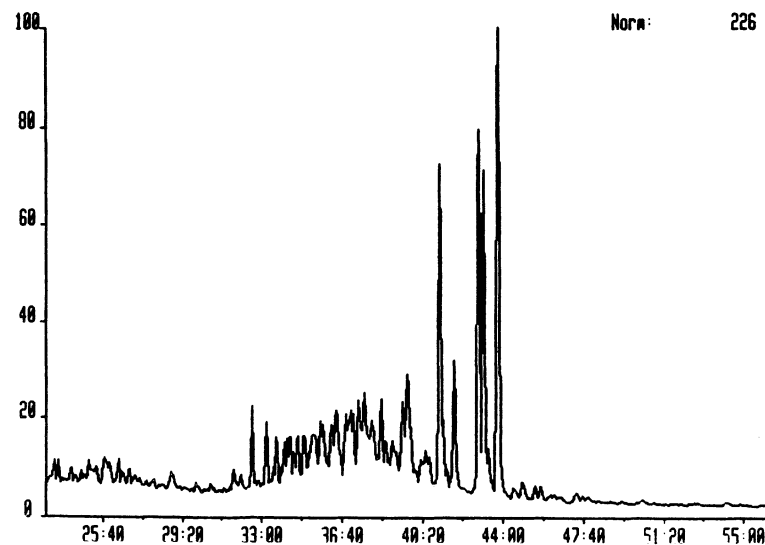
F0046 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0046 7430/10-U-01 46.85 M CLST



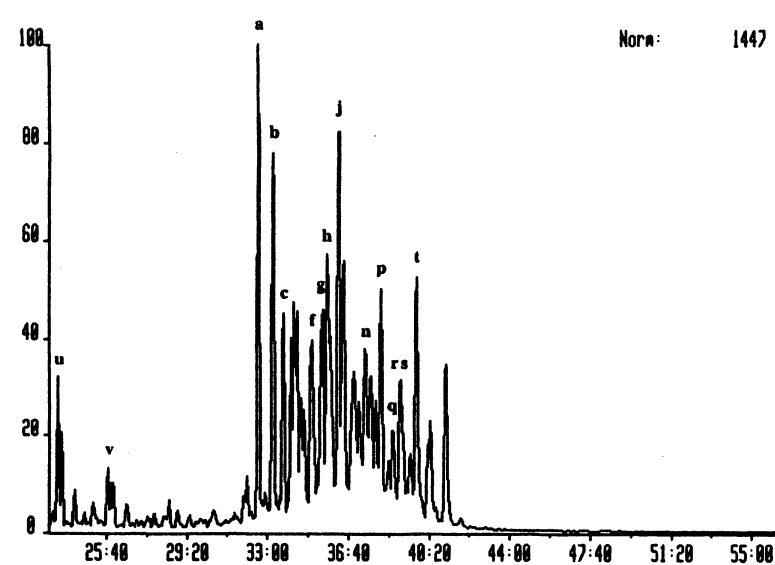
F1216 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F1216 7430/10-U-01 47.54 M SLTST



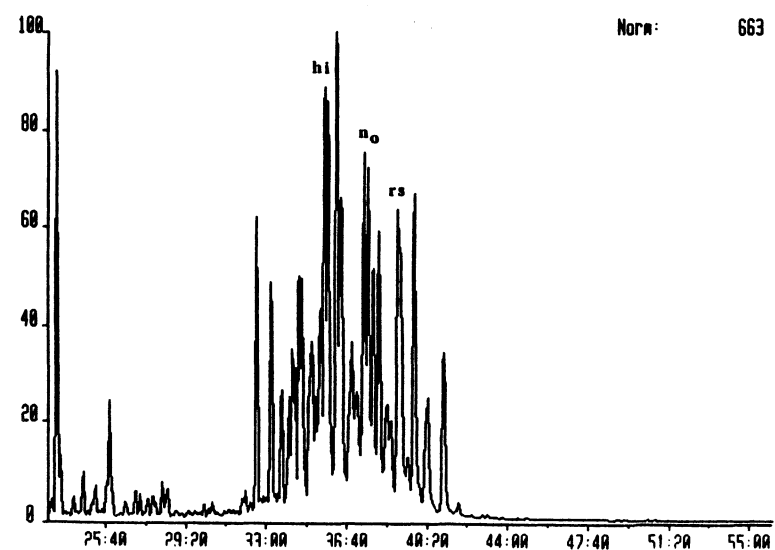
F1216 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F1216 7430/10-U-01 47.54 M SLTST



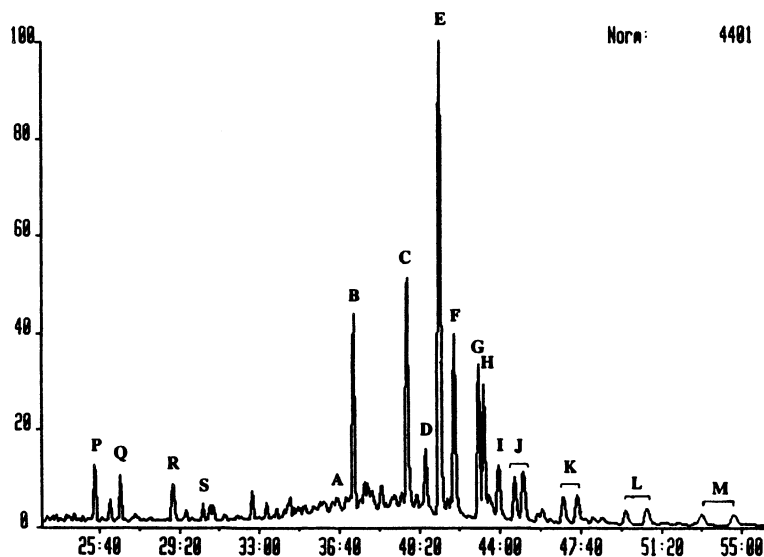
F1216 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F1216 7430/10-U-01 47.54 M SLTST



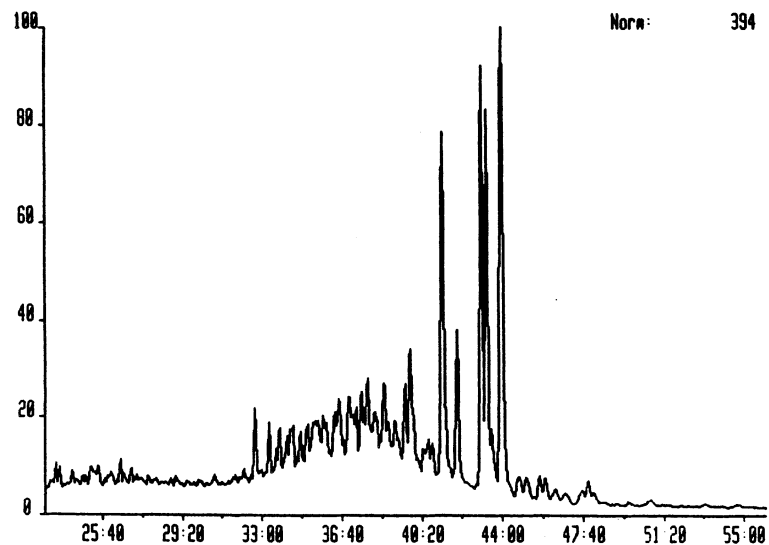
F1216 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F1216 7430/10-U-01 47.54 M SLTST



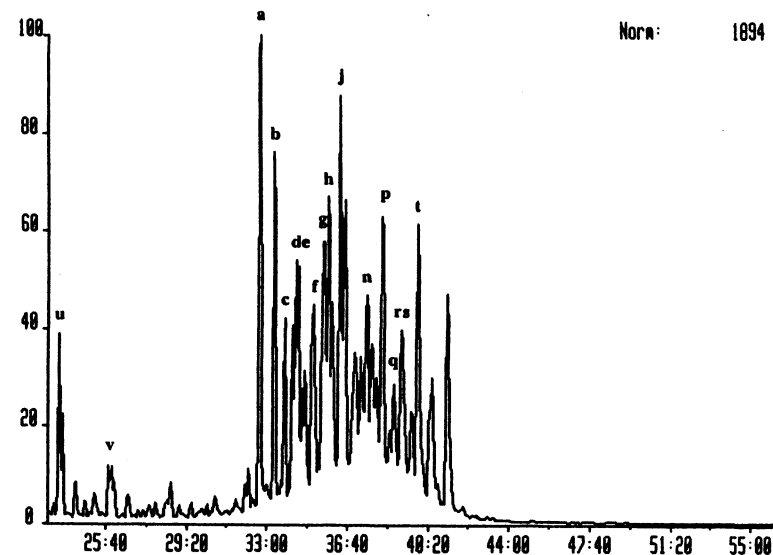
F1329A 16-JAN-89 Sir:Voltage 70-E Sys: BIONARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text: F1329 7430/10-U-01 40.90 M CLST F HY-PY 0.5-1 MM



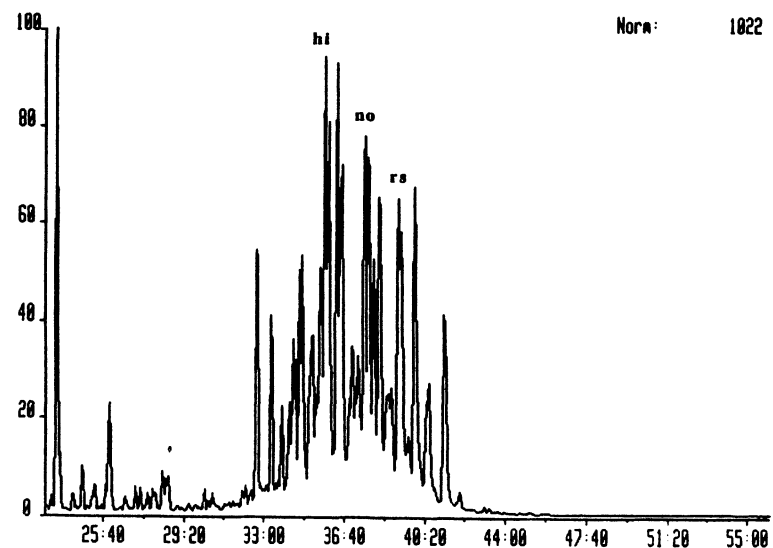
F1329A 16-JAN-89 Sir:Voltage 70-E Sys: BIONARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text: F1329 7430/10-U-01 40.90 M CLST F HY-PY 0.5-1 MM



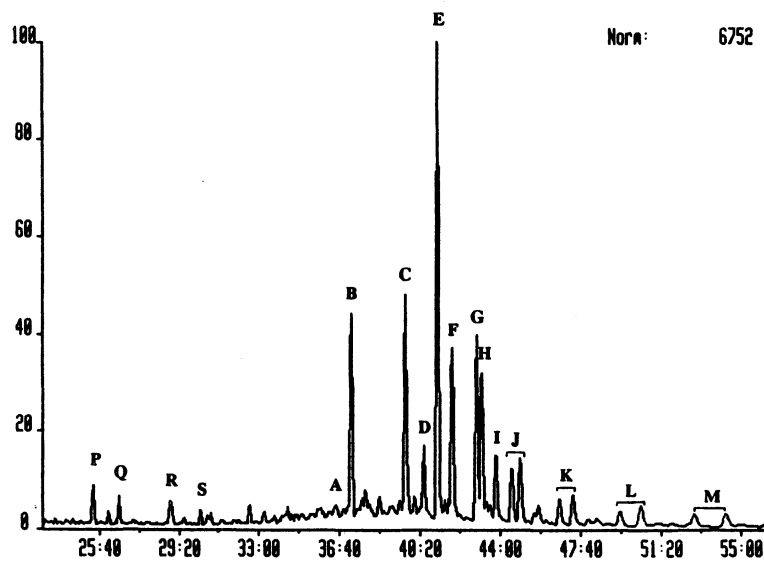
F1329A 16-JAN-89 Sir:Voltage 70-E Sys: BIONARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text: F1329 7430/10-U-01 40.90 M CLST F HY-PY 0.5-1 MM



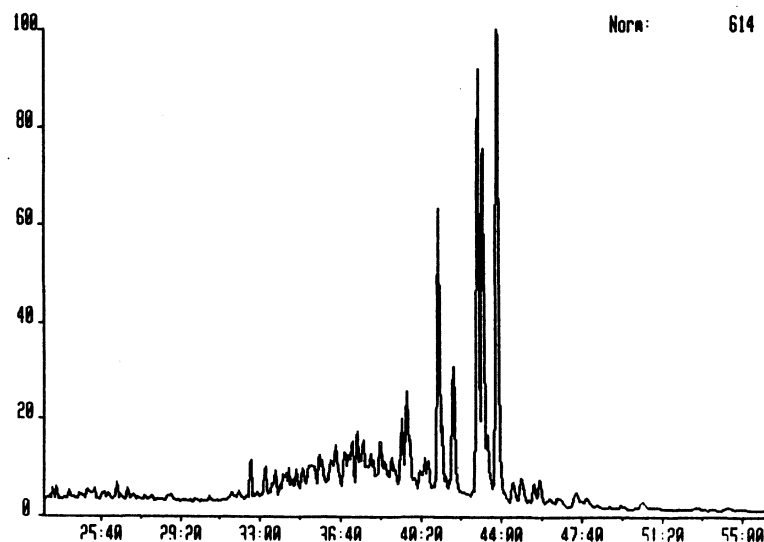
F1329A 16-JAN-89 Sir:Voltage 70-E Sys: BIONARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text: F1329 7430/10-U-01 40.90 M CLST F HY-PY 0.5-1 MM



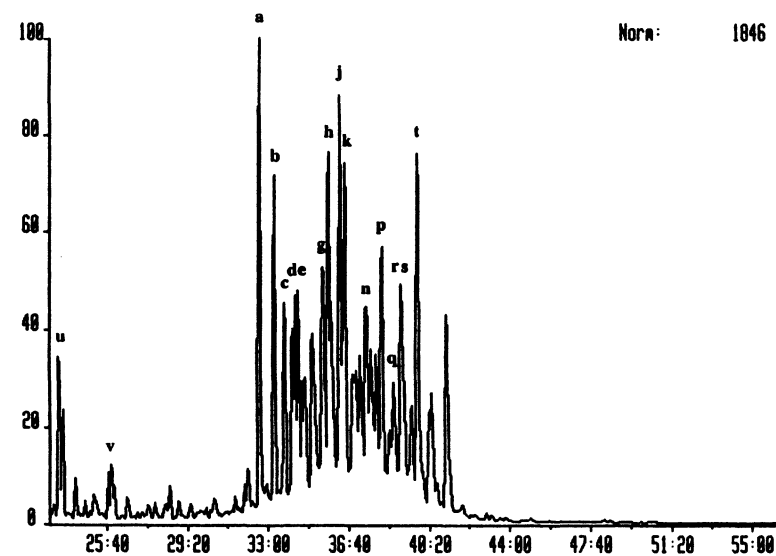
F0051 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0051 7430/10-U-01 49.62 M CLST



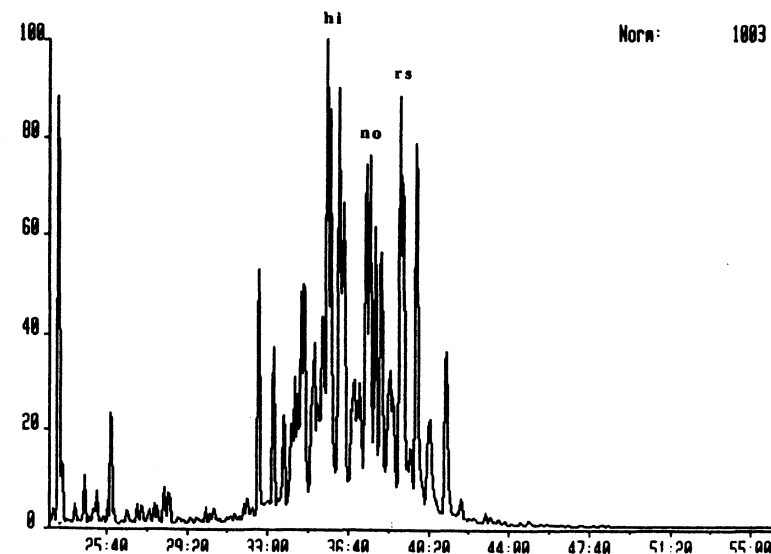
F0051 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0051 7430/10-U-01 49.62 M CLST



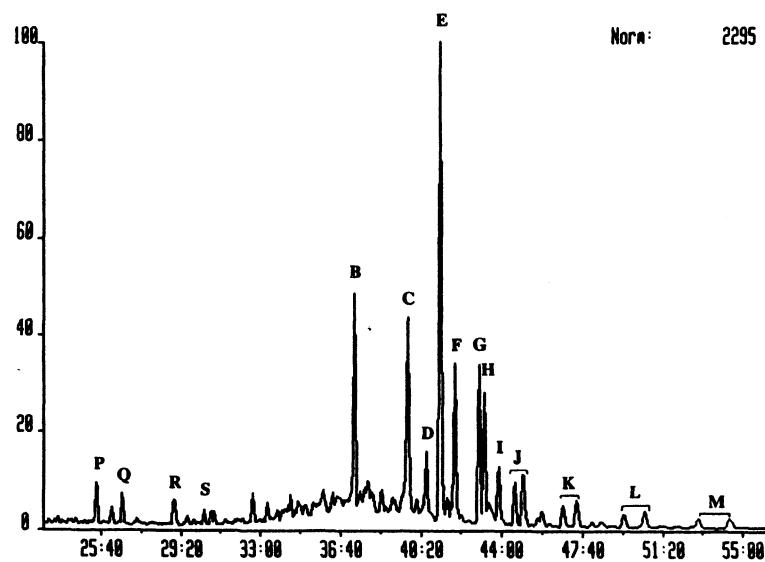
F0051 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0051 7430/10-U-01 49.62 M CLST



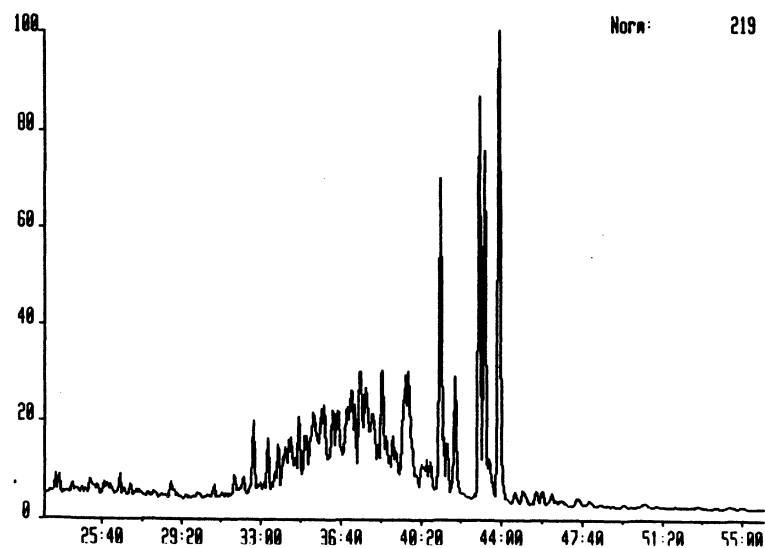
F0051 6-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0051 7430/10-U-01 49.62 M CLST



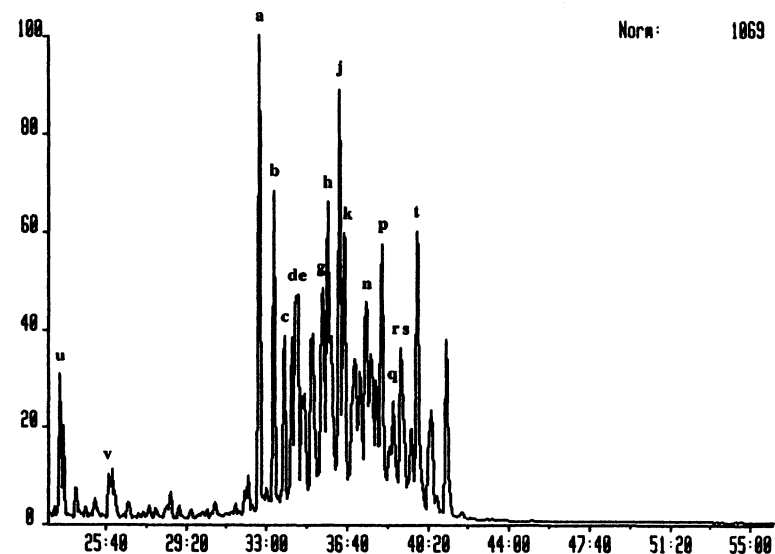
F0053 9-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0053 7430/10-U-01 51.05 M CLST



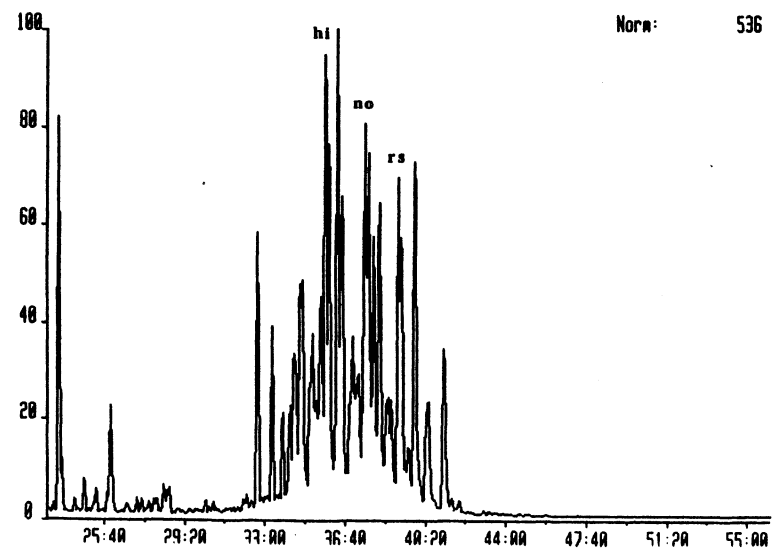
F0053 9-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0053 7430/10-U-01 51.05 M CLST



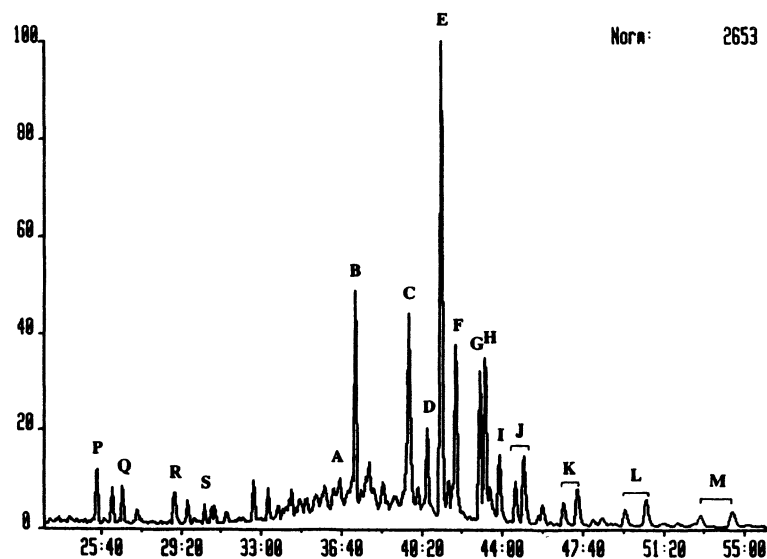
F0053 9-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0053 7430/10-U-01 51.05 M CLST



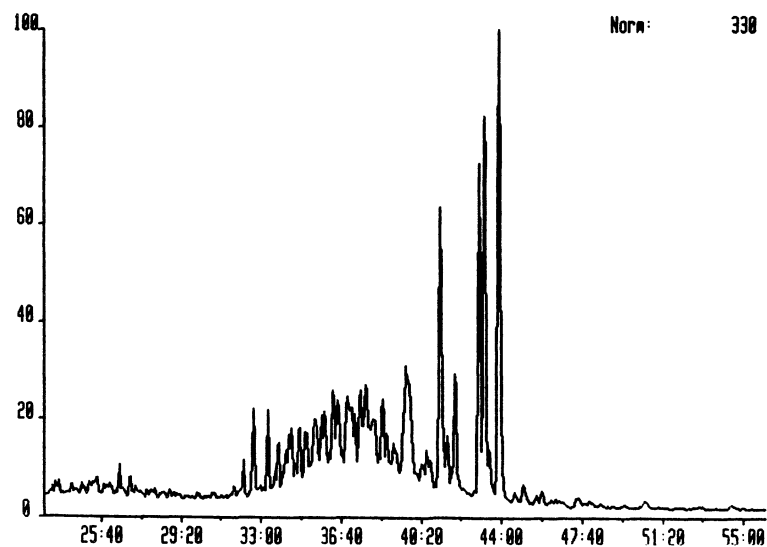
F0053 9-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0053 7430/10-U-01 51.05 M CLST



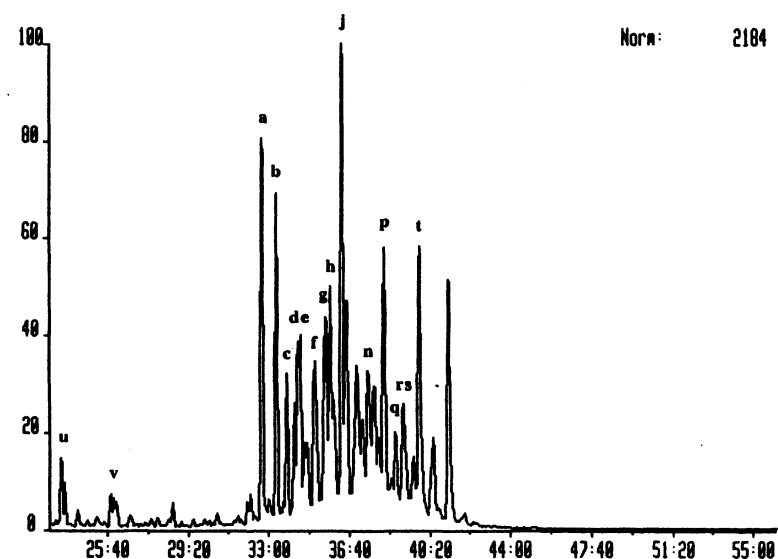
F0056 9-JAN-09 Sir:Voltage 70-E Sys: BIONARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0056 7430/10-U-01 53.93 M CLST



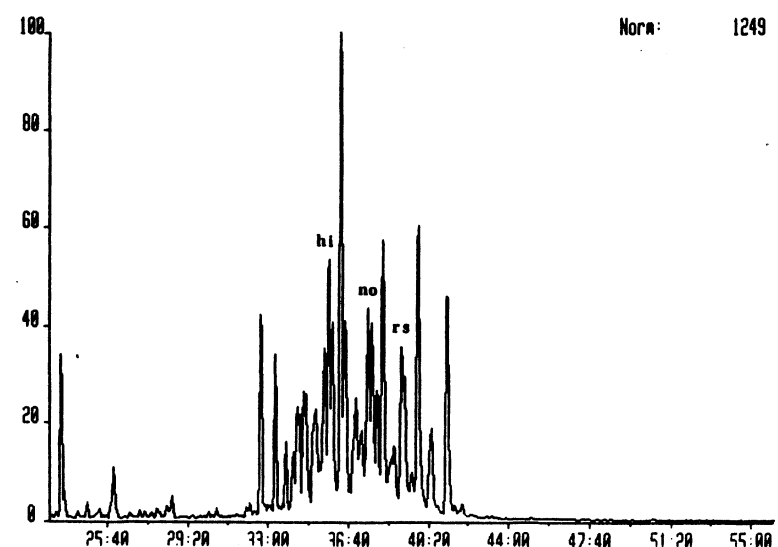
F0056 9-JAN-09 Sir:Voltage 70-E Sys: BIONARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0056 7430/10-U-01 53.93 M CLST



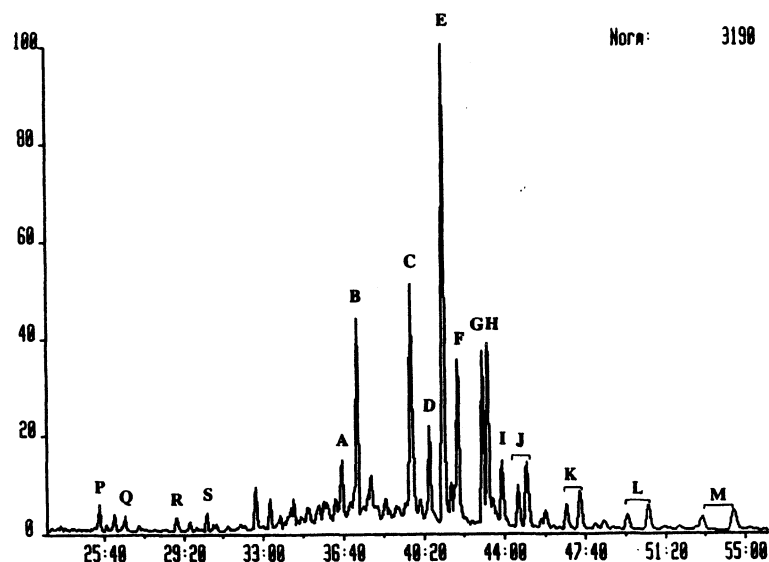
F0056 9-JAN-09 Sir:Voltage 70-E Sys: BIONARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0056 7430/10-U-01 53.93 M CLST



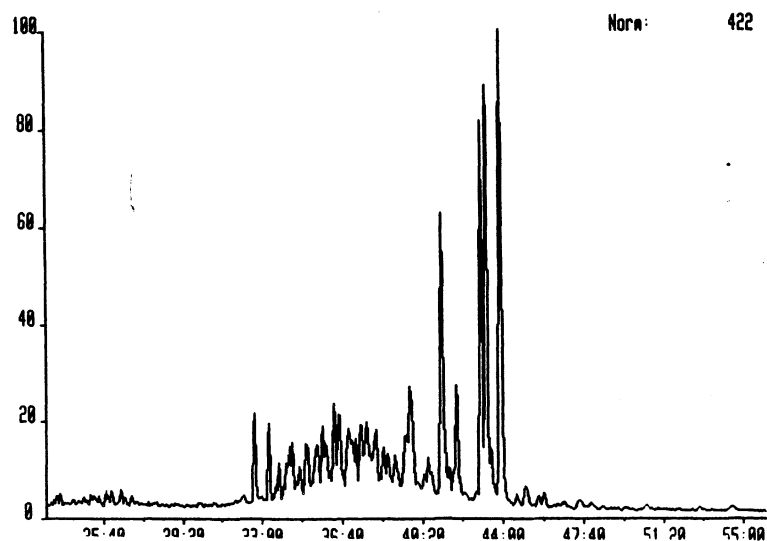
F0056 9-JAN-09 Sir:Voltage 70-E Sys: BIONARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0056 7430/10-U-01 53.93 M CLST



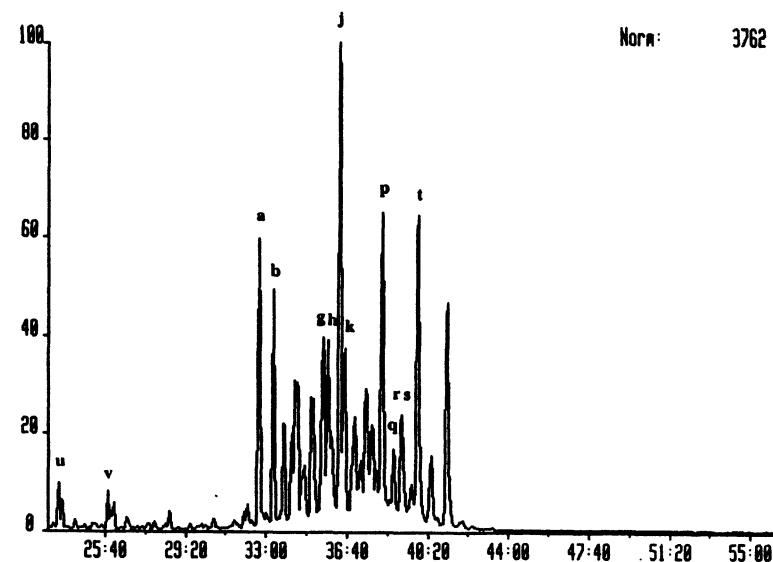
F0064 9-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0064 7430/10-U-01 59.50 M CLST



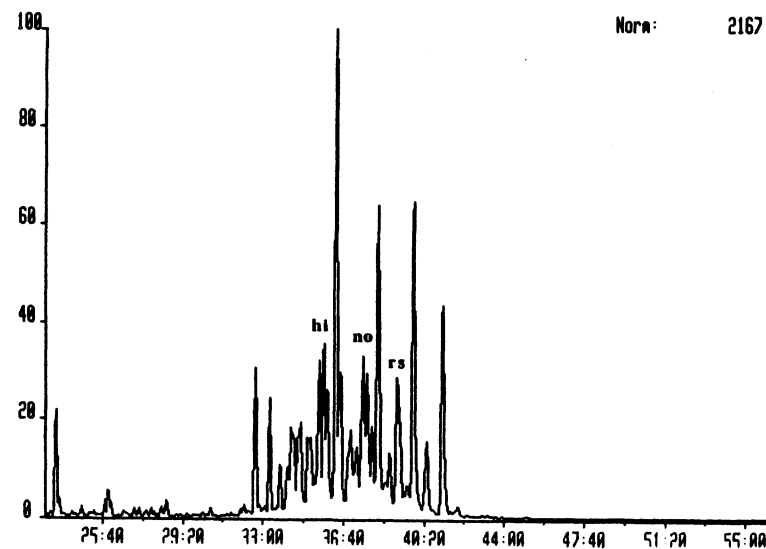
F0064 9-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0064 7430/10-U-01 59.50 M CLST



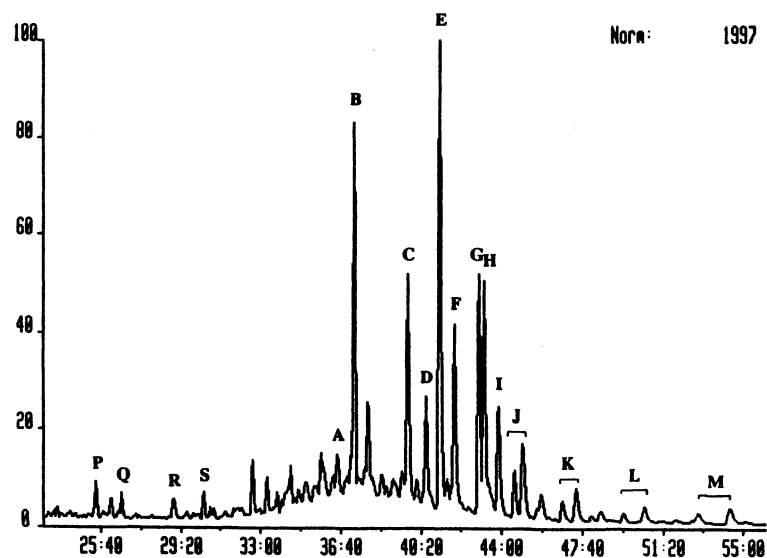
F0064 9-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0064 7430/10-U-01 59.50 M CLST



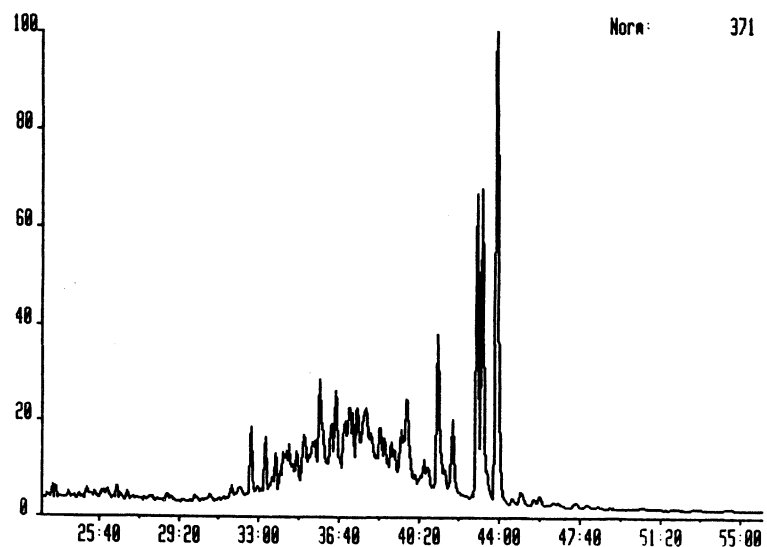
F0064 9-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0064 7430/10-U-01 59.50 M CLST



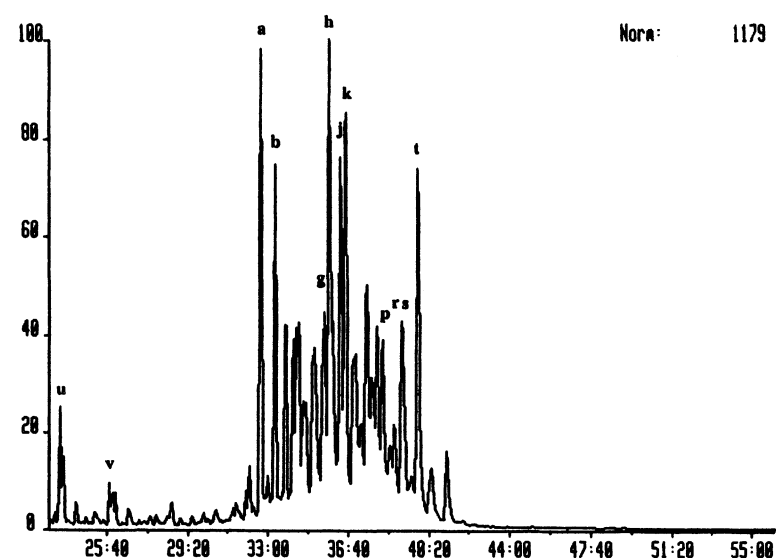
F0065 10-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 191.1000
 Text:F0065 7430/10-U-01 60.70 N CLST



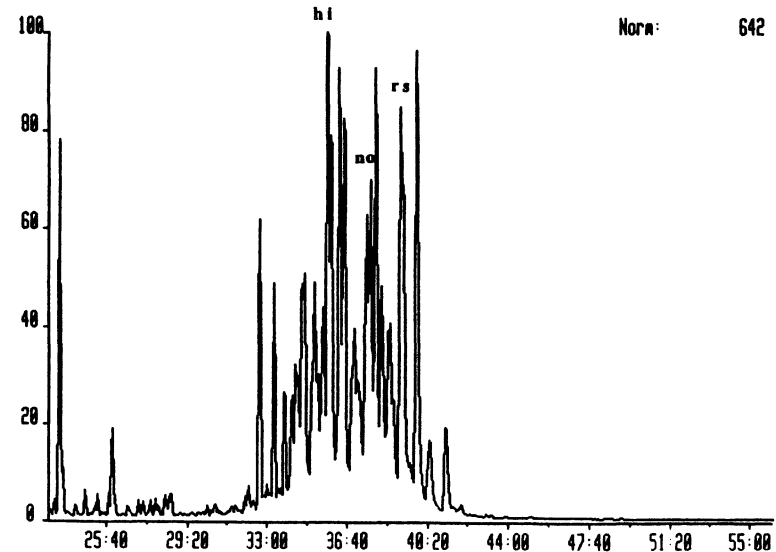
F0065 10-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 205.1000
 Text:F0065 7430/10-U-01 60.70 N CLST



F0065 10-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 217.1000
 Text:F0065 7430/10-U-01 60.70 N CLST



F0065 10-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
 Sample 1 Injection 1 Group 1 Mass 218.1000
 Text:F0065 7430/10-U-01 60.70 N CLST



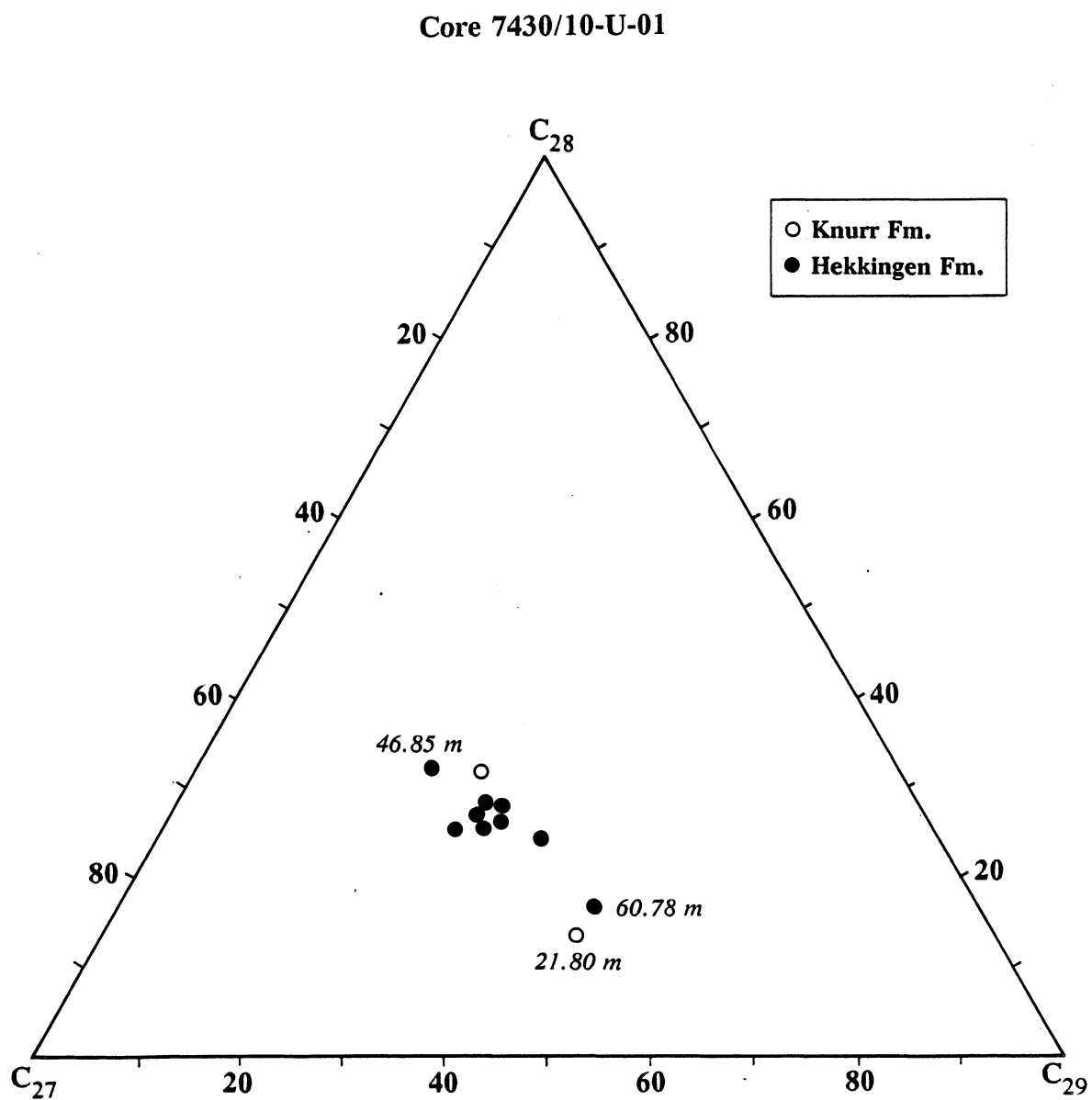


Figure A.III.8.4

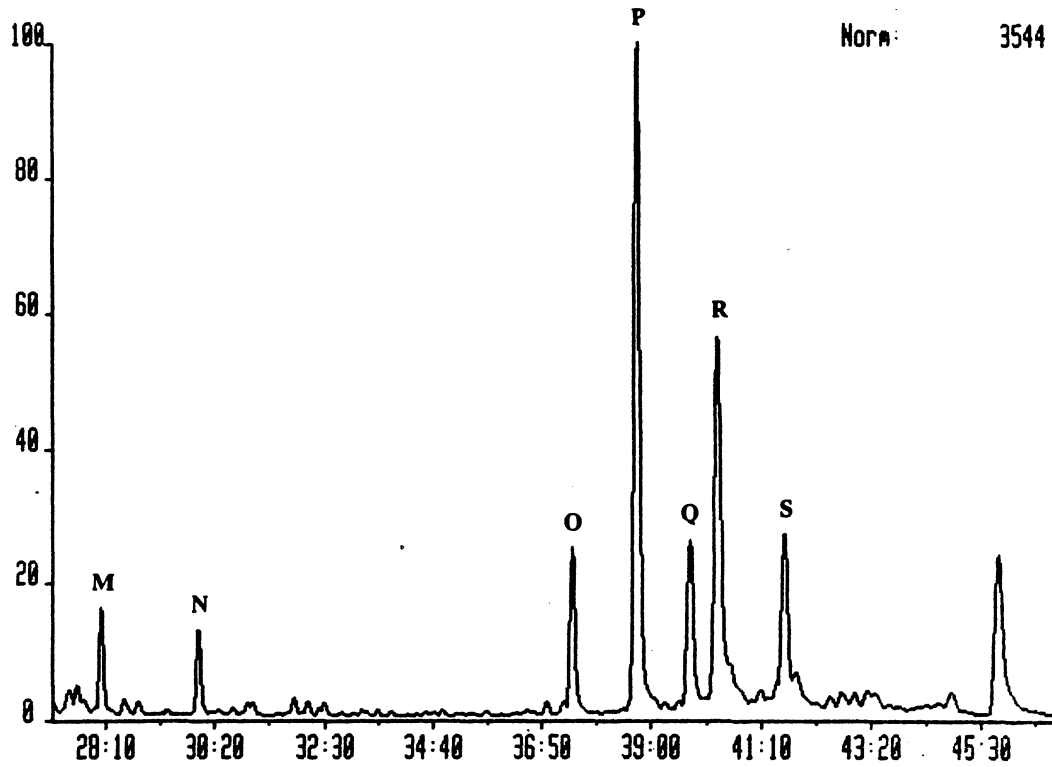
Internal distribution of $14\alpha(H)$, $17\alpha(H)$ 20R, C_{27} , C_{28} and C_{29} regular steranes (from m/z 217)

Figure A.III.8.5:

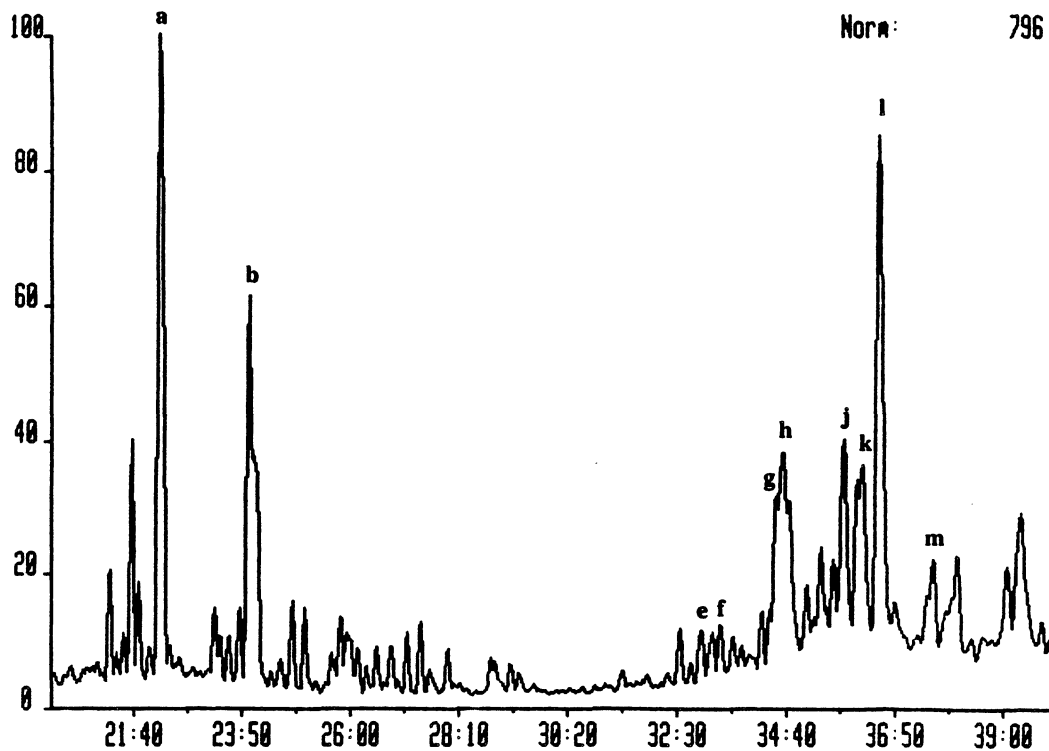
**Mass fragmentograms of m/z 231, 253
(aromatic steroid hydrocarbons)**

For peak identification see Chapter 4.

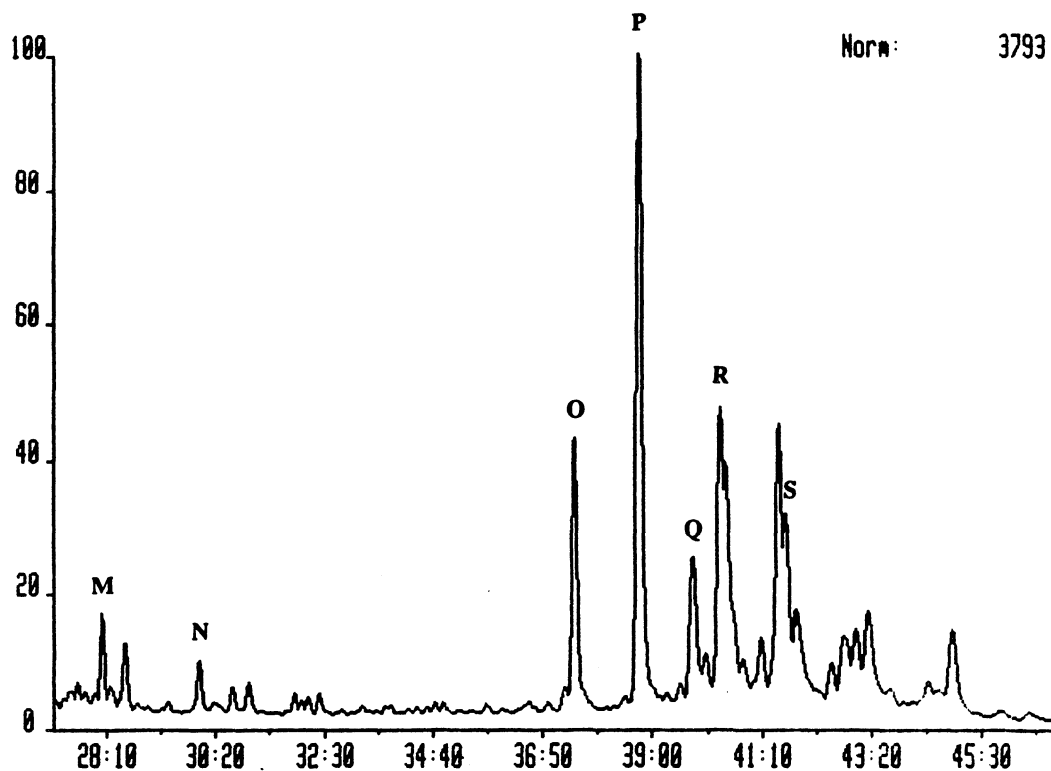
F0012AR 23-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0012 ARO 7430/10-U-01 21.80 M CLST



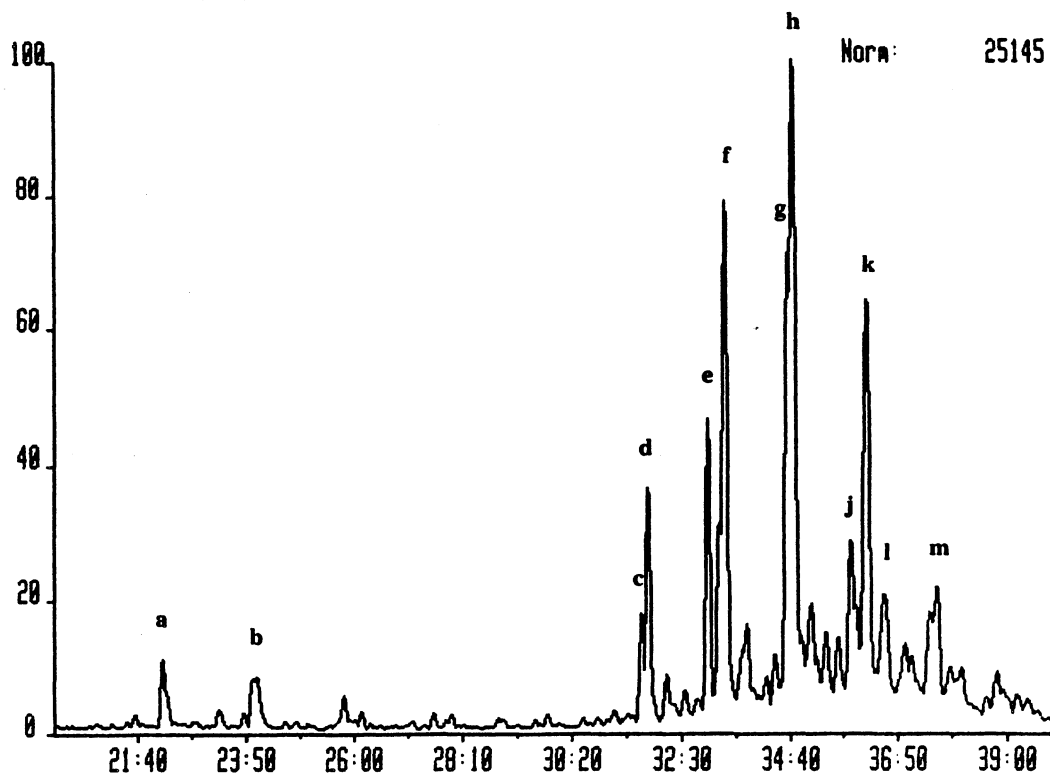
F0012AR 23-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0012 ARO 7430/10-U-01 21.80 M CLST



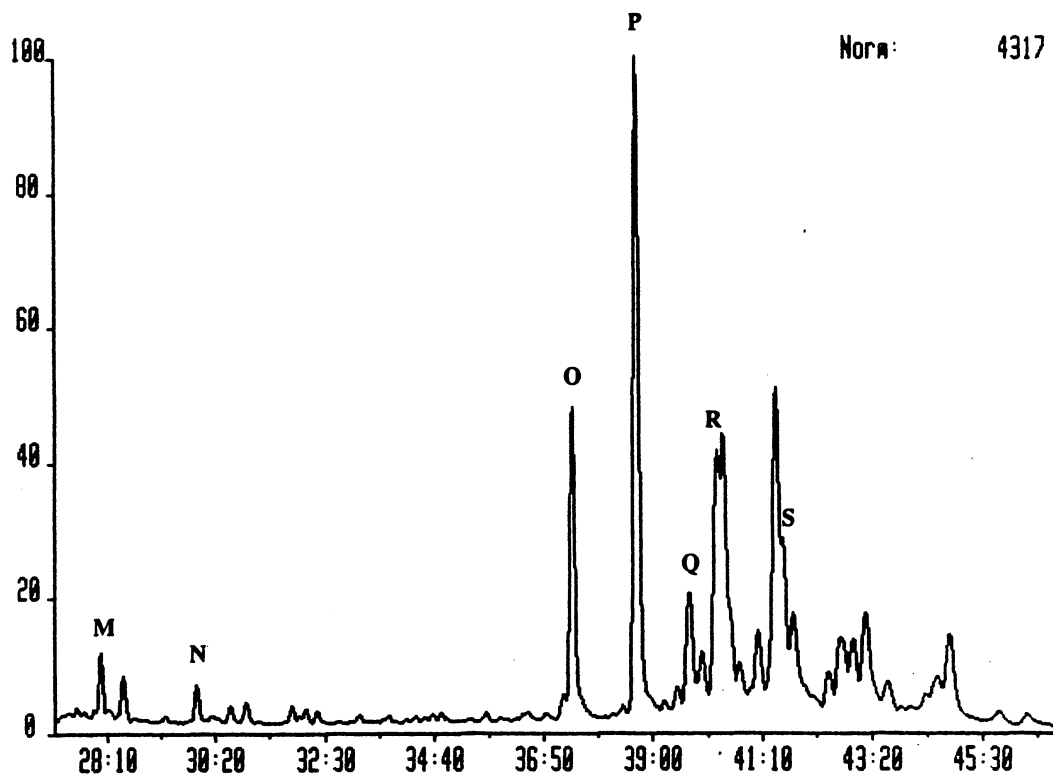
F1211AR 23-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1211 ARO 7430/10-U-01 43.07 M CLST



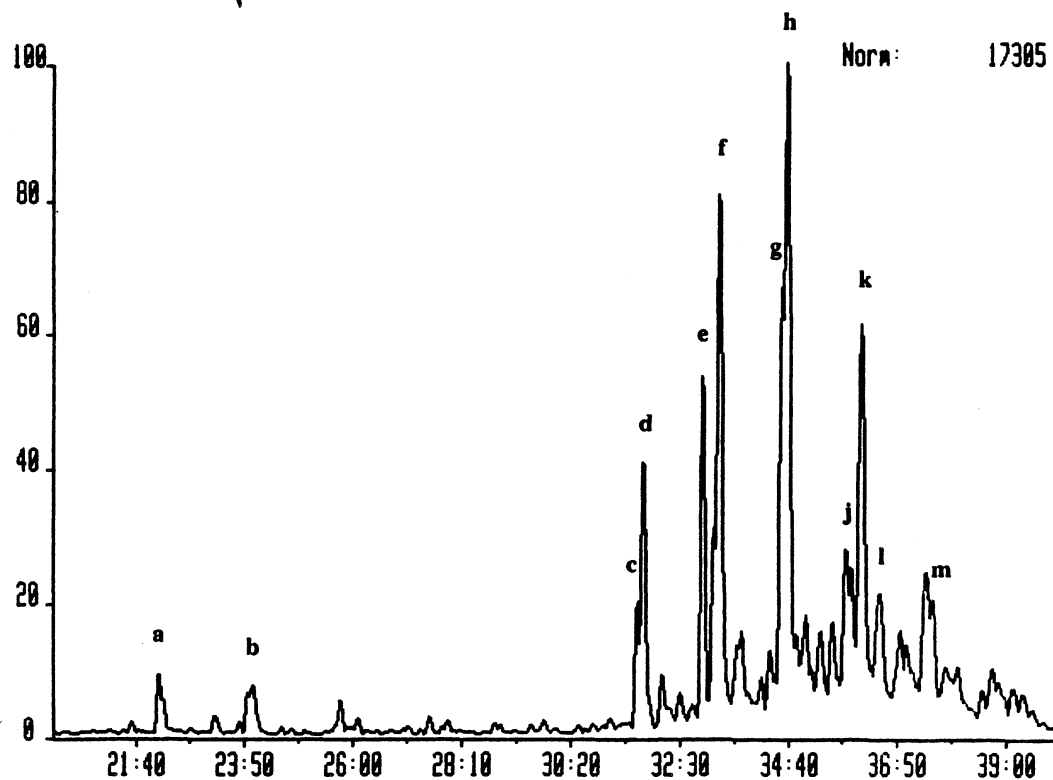
F1211AR 23-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1211 ARO 7430/10-U-01 43.07 M CLST



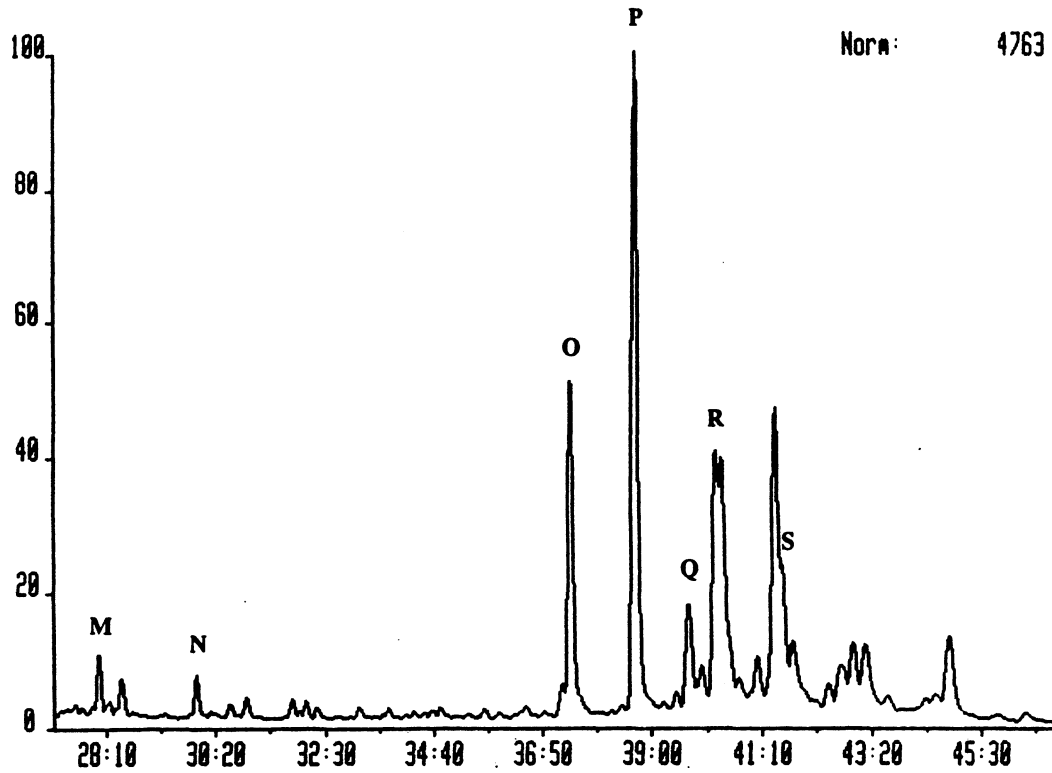
F0042AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0042 ARO 7430/10-U-01 44.10 M CLST



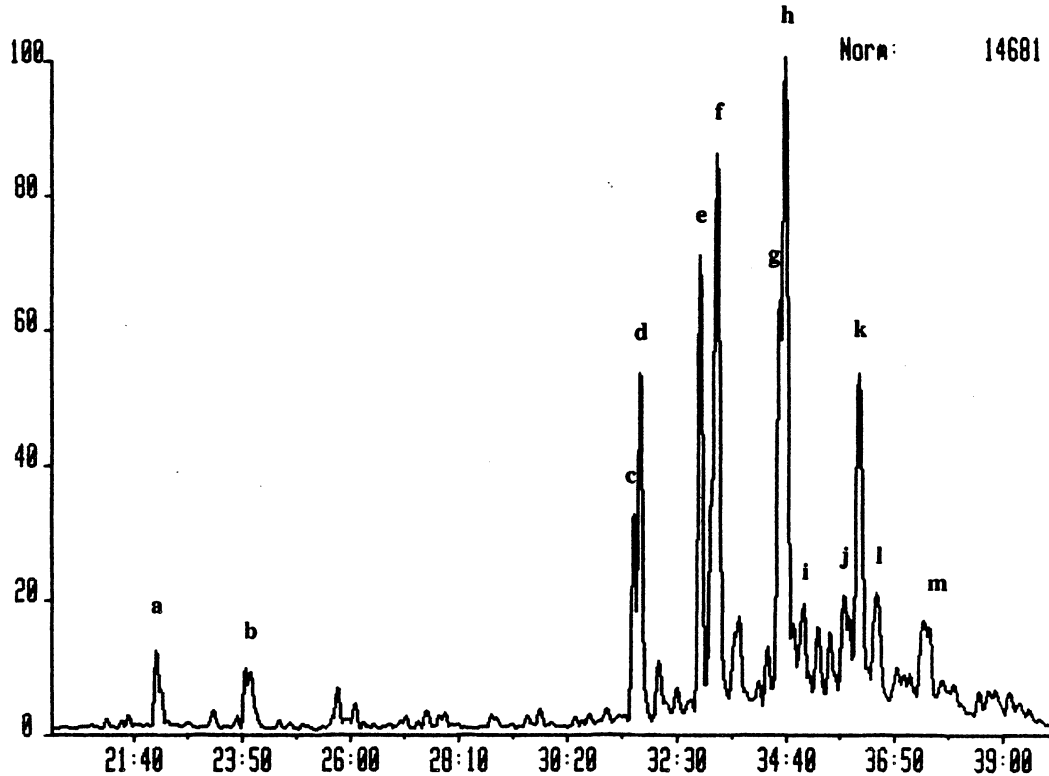
F0042AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0042 ARO 7430/10-U-01 44.10 M CLST



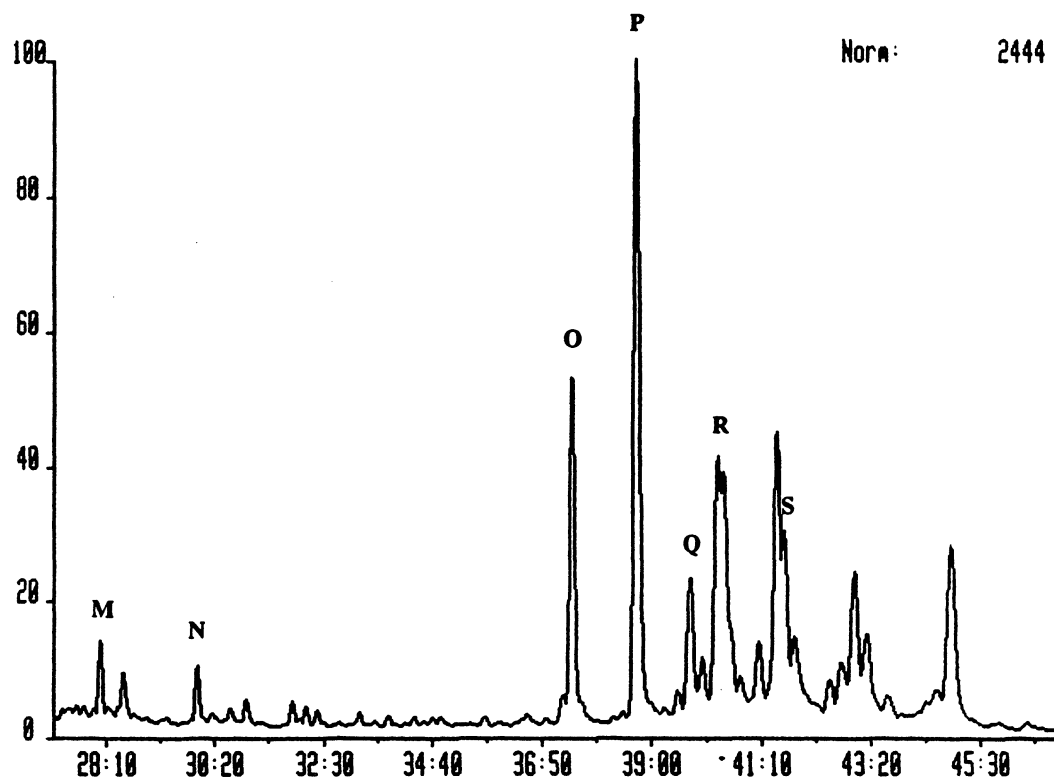
F0046AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0046 ARD 7430/10-U-01 46.05 M CLST



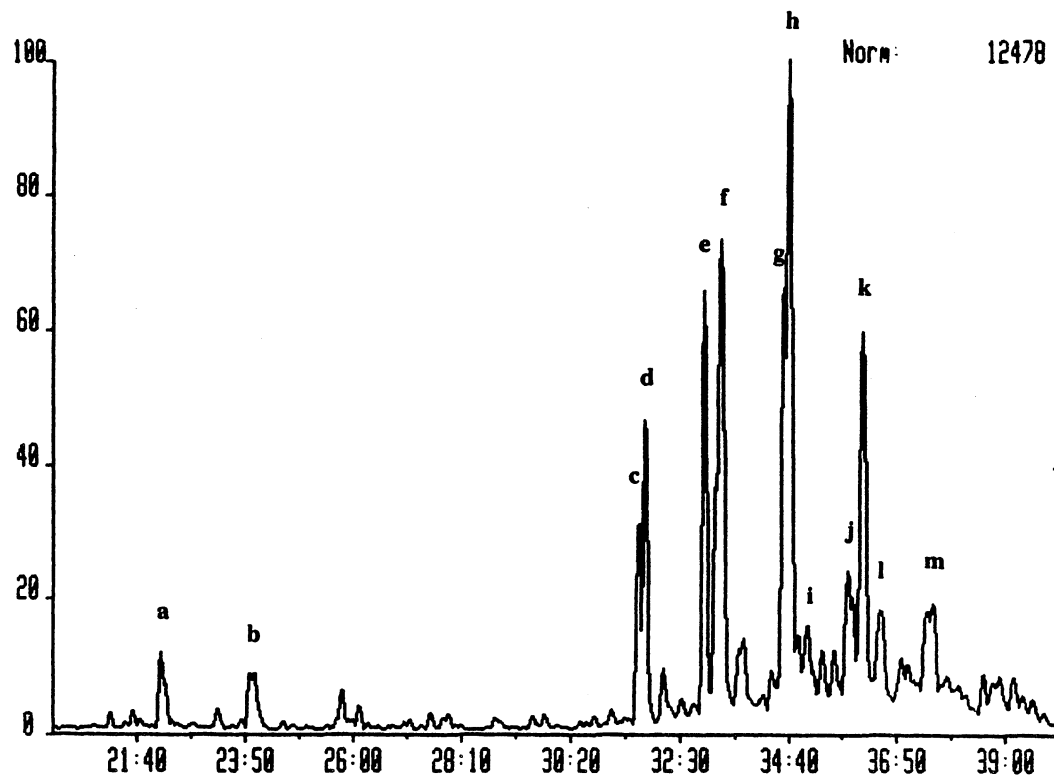
F0046AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0046 ARD 7430/10-U-01 46.05 M CLST



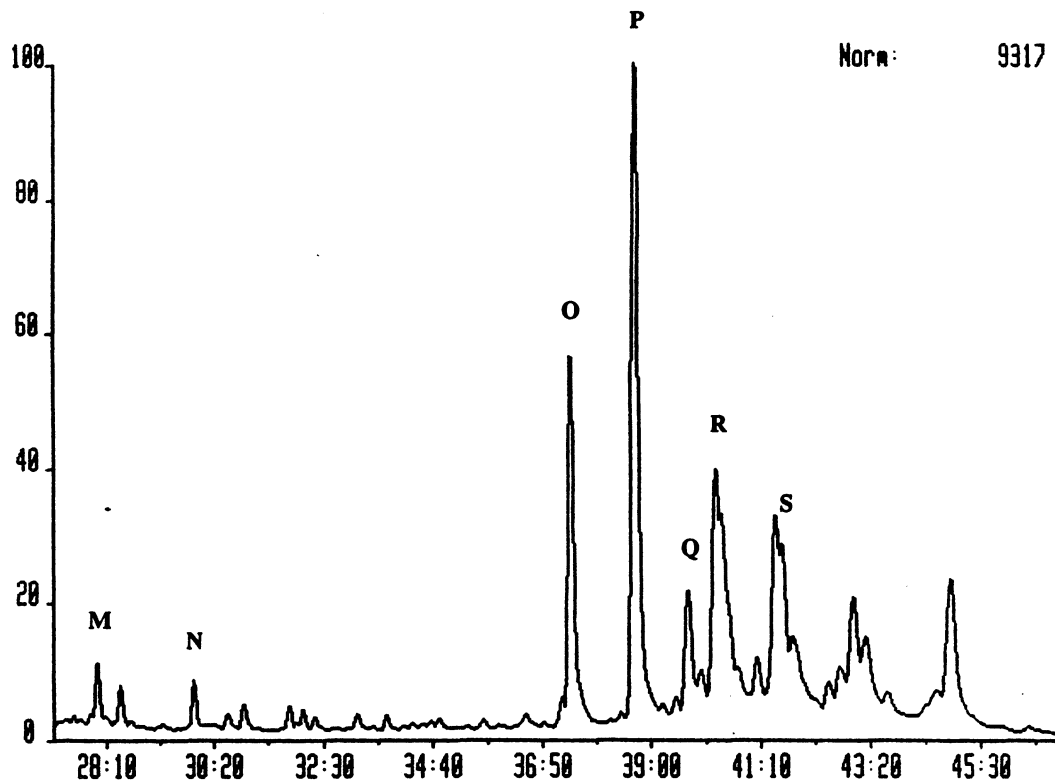
F1216AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1216 ARO 7430/10-U-01 47.54 M SLTST



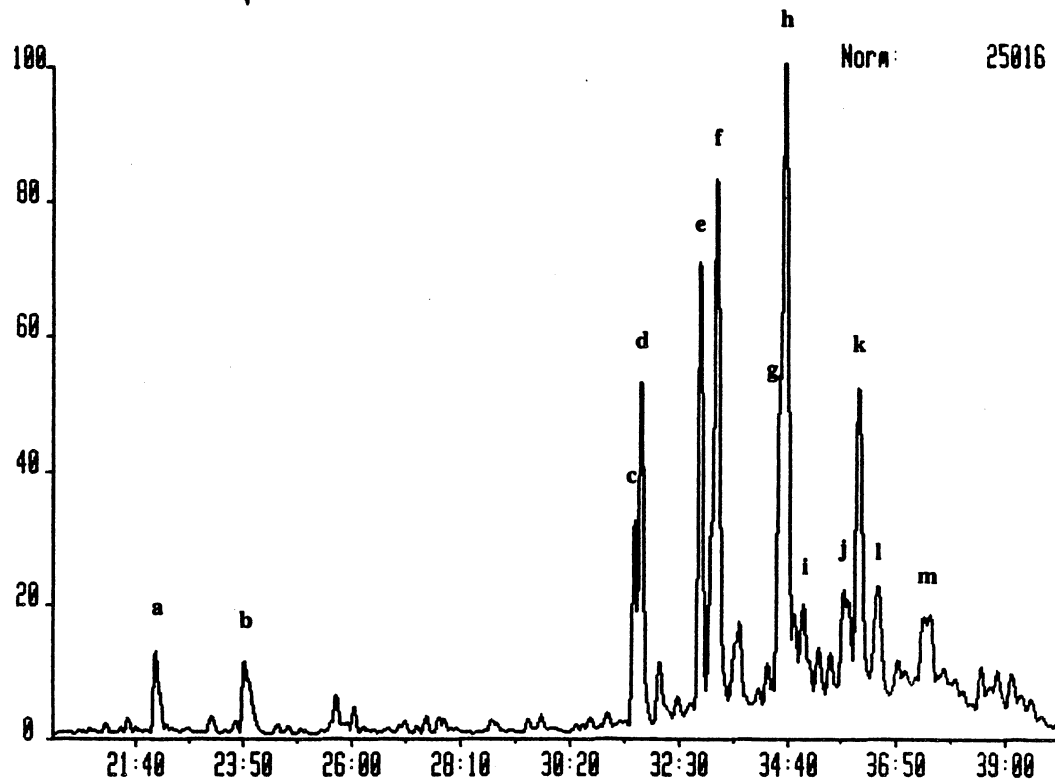
F1216AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1216 ARO 7430/10-U-01 47.54 M SLTST



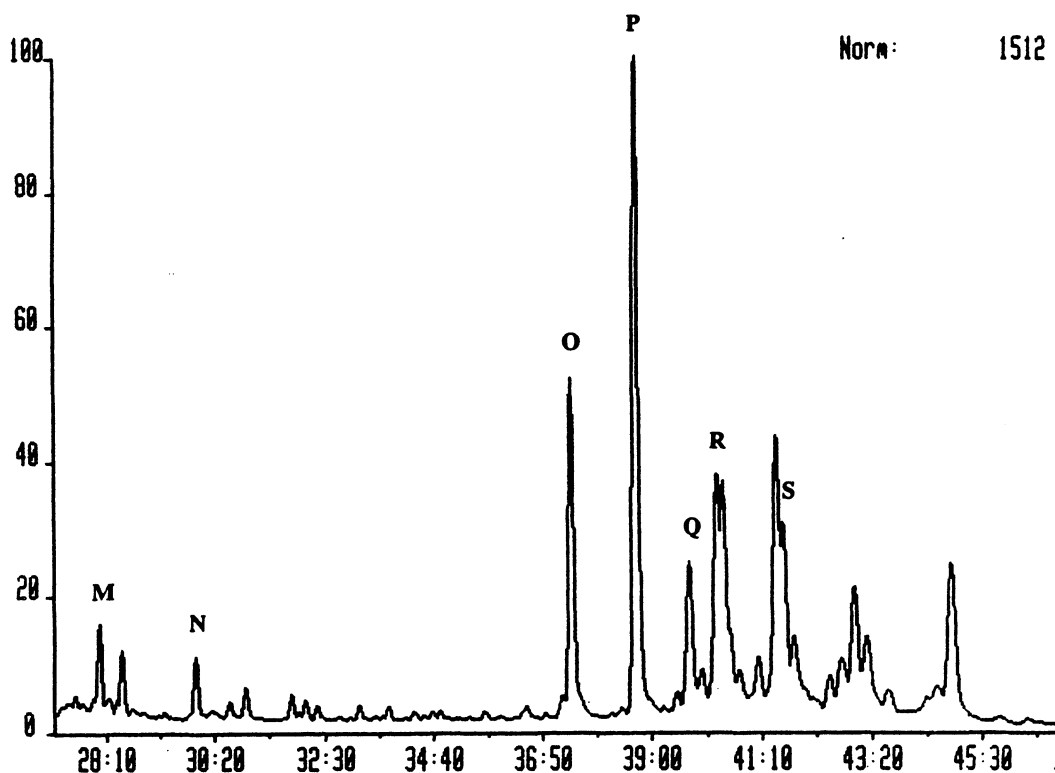
F1329A1 1-FEB-89 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F1329 ARO 7430/10-U-01 40.90 M CLST 0.5-1 MM



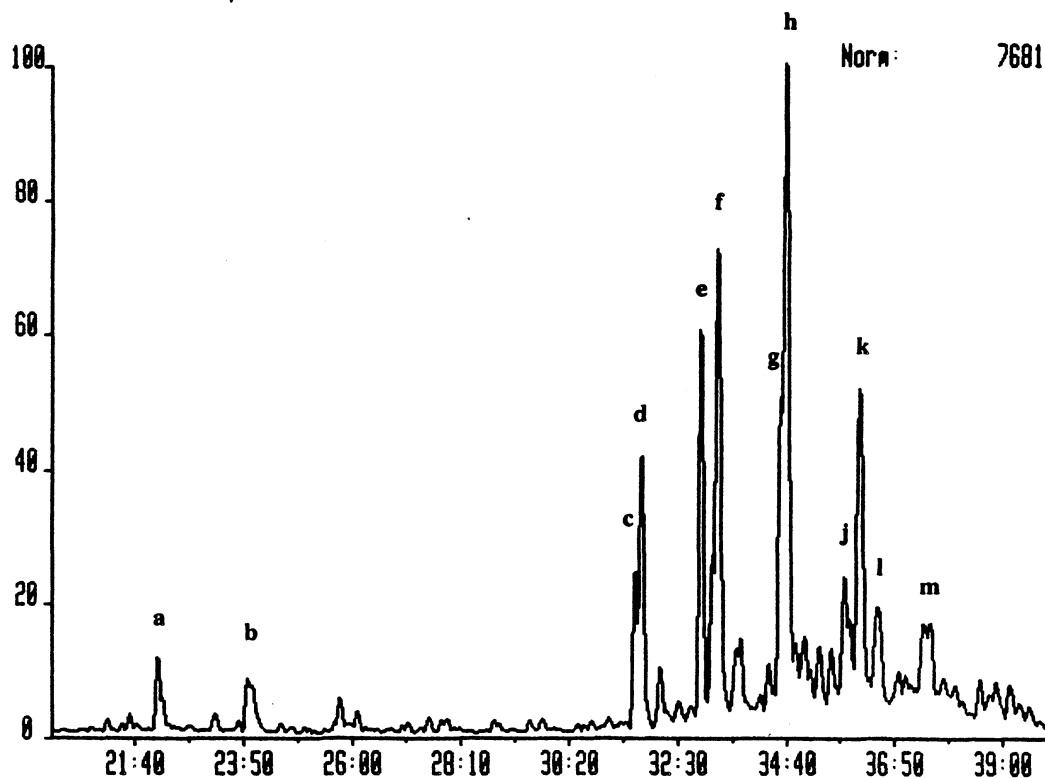
F1329A1 1-FEB-89 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F1329 ARO 7430/10-U-01 40.90 M CLST 0.5-1 MM



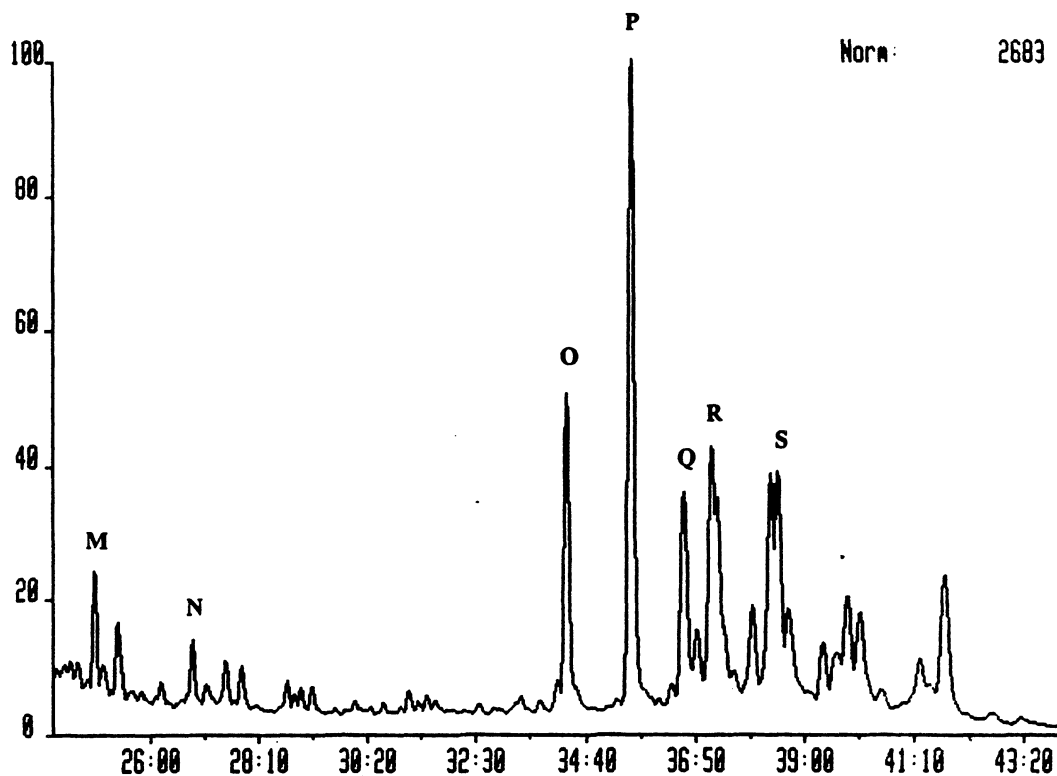
F0053AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0053 ARO 7430/10-U-01 51.05 M CLST



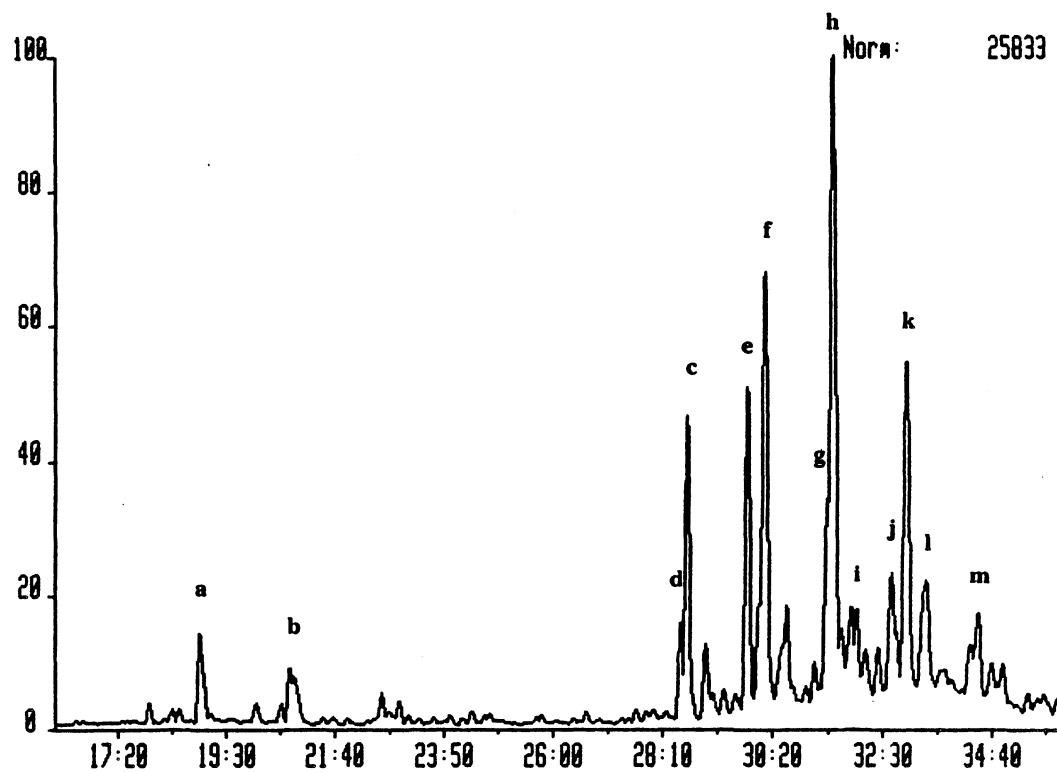
F0053AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0053 ARO 7430/10-U-01 51.05 M CLST



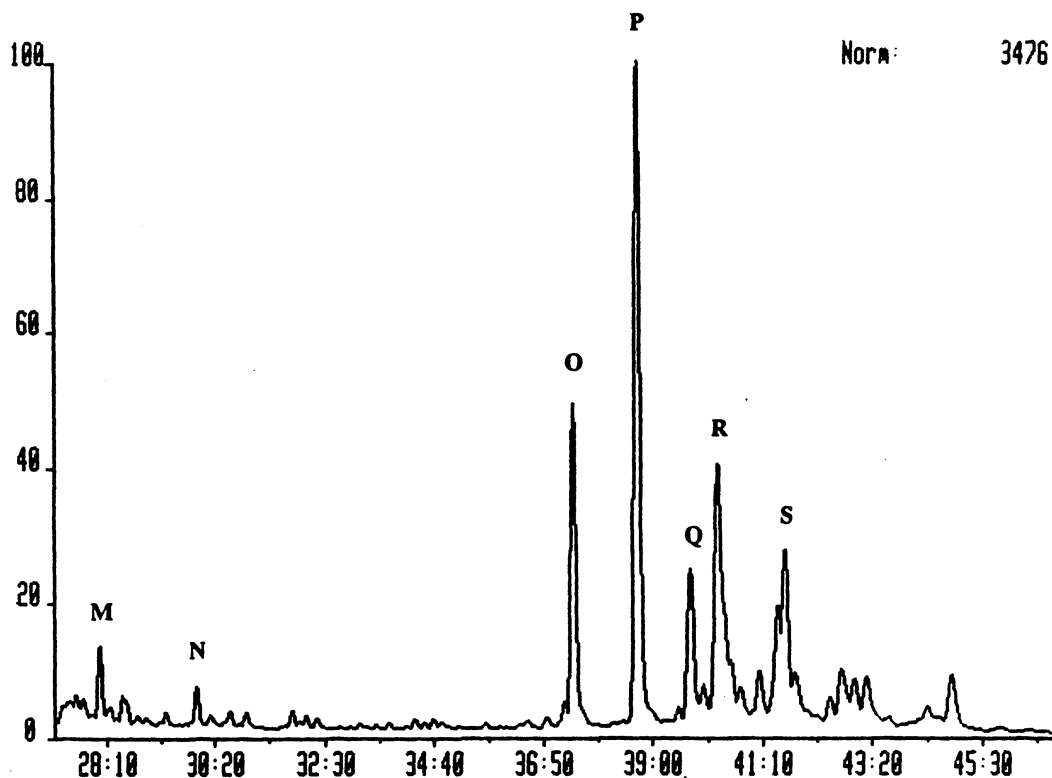
F0065A1 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0065 ARO 7430/10-U-01 60.70 M CLST



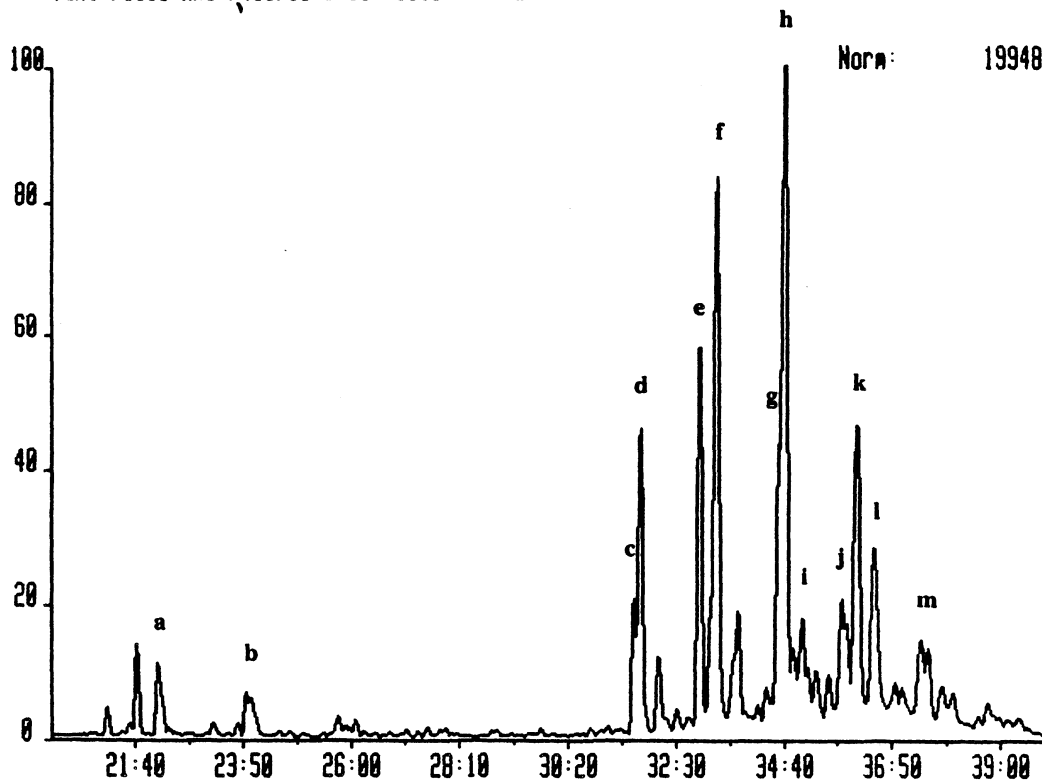
F0065A1 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0065 ARO 7430/10-U-01 60.70 M CLST



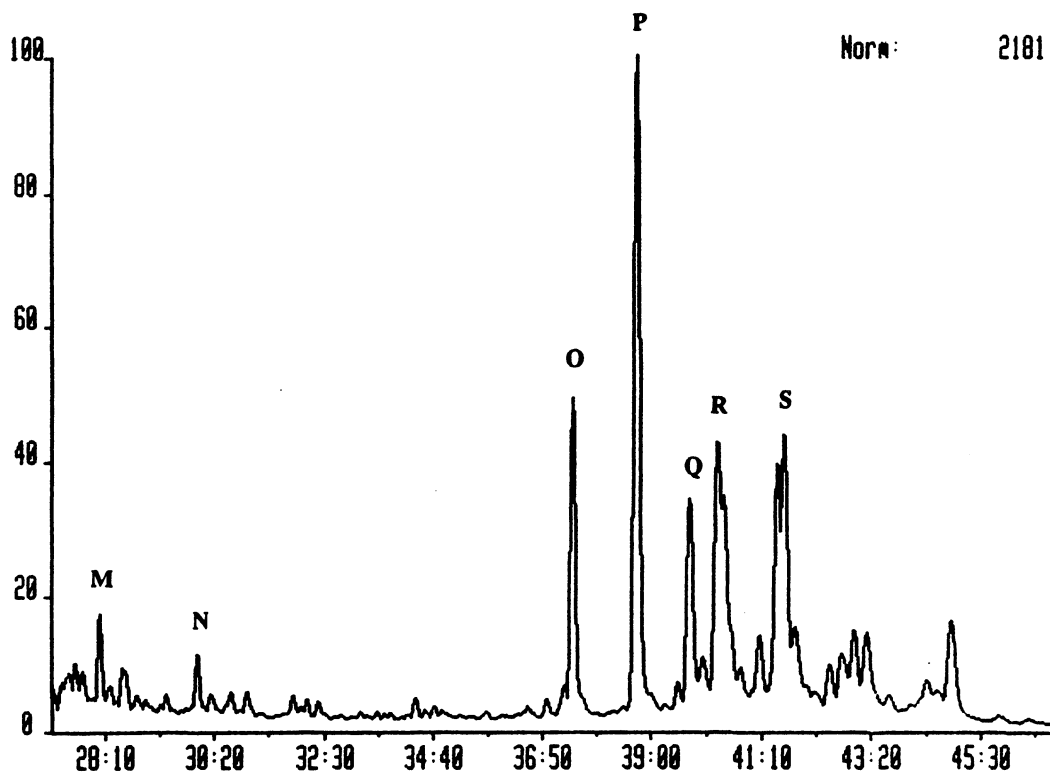
F0069AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0069 ARO 7430/10-U-01 63.57 M CLST



F0069AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0069 ARO 7430/10-U-01 63.57 M CLST



F0072AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0072 ARO 7430/10-U-01 65.65 M CLST



F0072AR 24-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0072 ARO 7430/10-U-01 65.65 M CLST

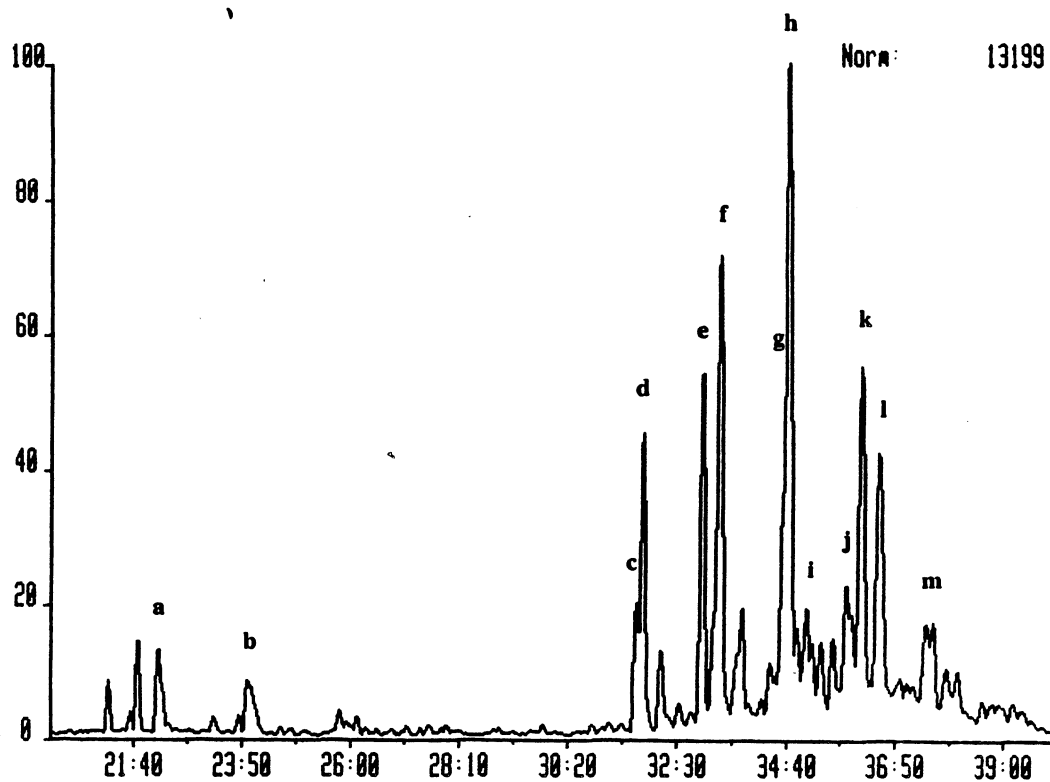
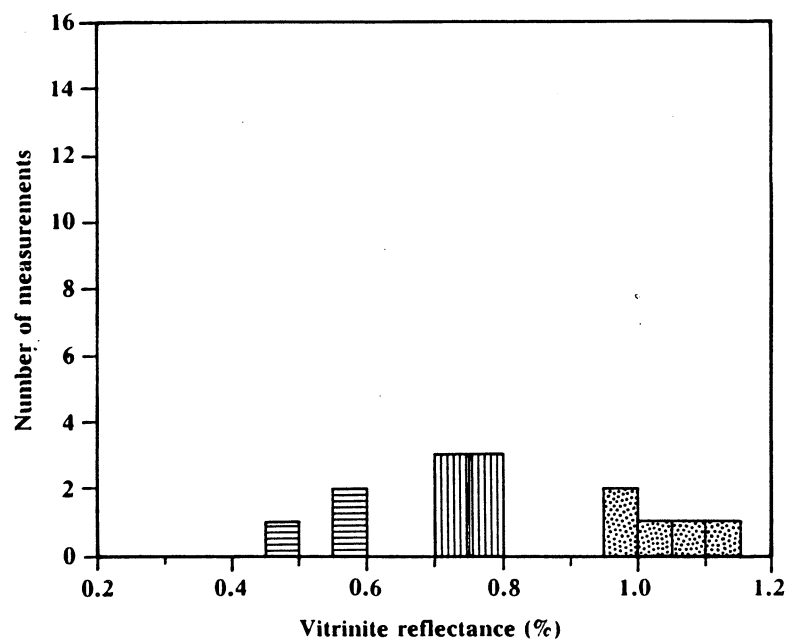


Figure A.III.8.6: Vitrinite reflectance histograms.

Core no.: 7430/10-U-01

Sample no.: F-16

Depth: 25.10 m

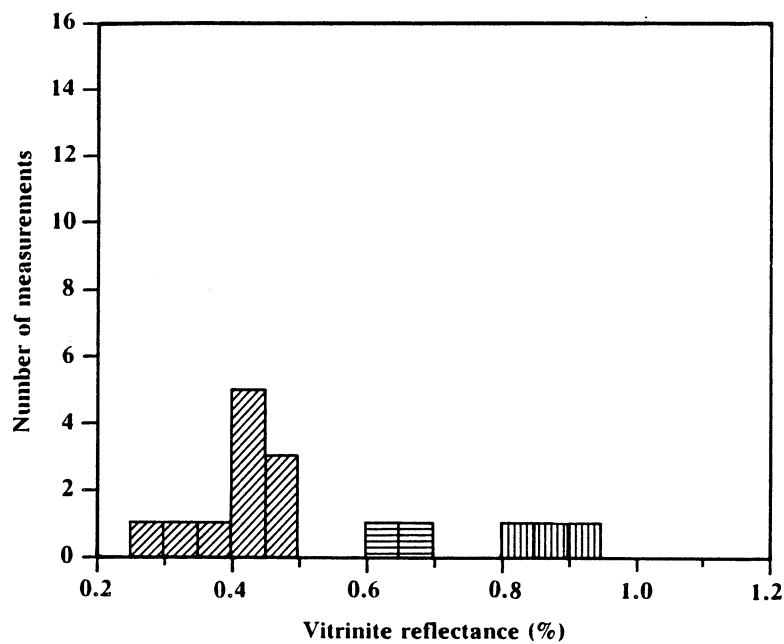


P1 = 0.55% n = 3
 P2 = 0.74% n = 6
 P3 = 1.03% n = 5

Core no.: 7430/10-U-01

Sample no.: F-28

Depth: 33.74 m

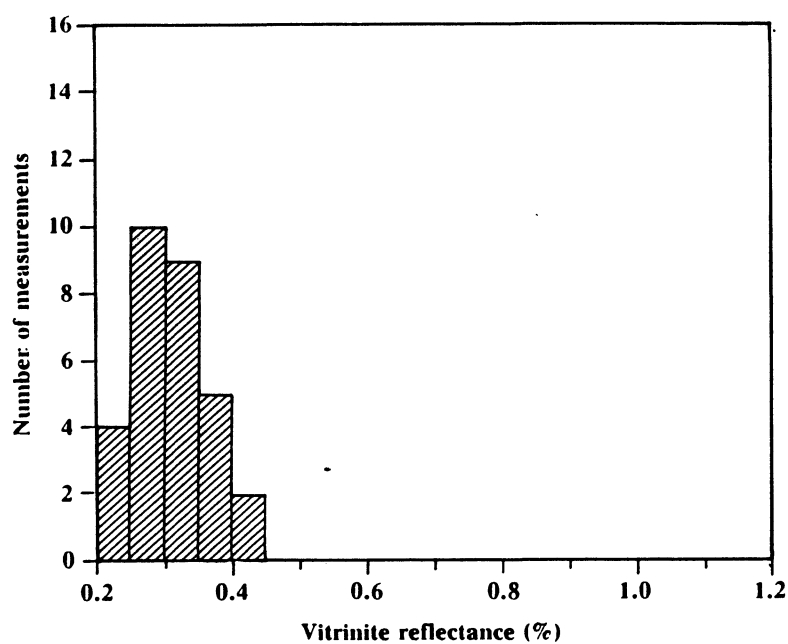


RP = 0.40% n = 11
 P1 = 0.66% n = 2
 P2 = 0.86% n = 3

Core no.: 7430/10-U-01

Sample no.: F-1329

Depth: 48.98 m

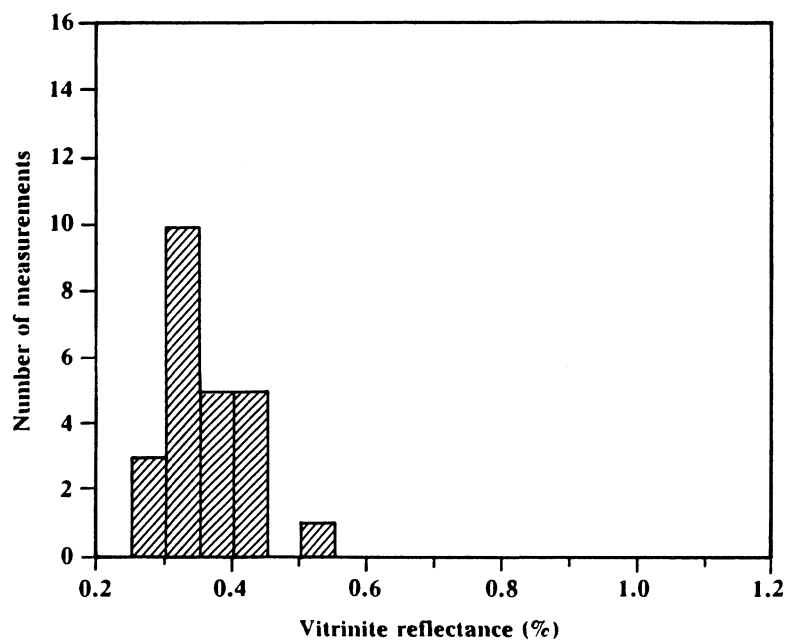


RP = 0.30% n = 30

Core no.: 7430/10-U-01

Sample no.: F-78

Depth: 55.20 m

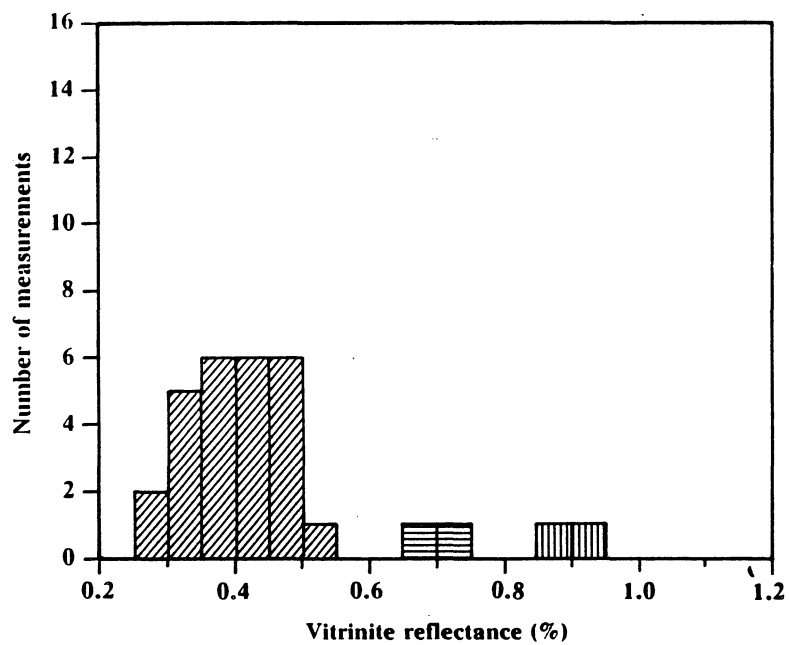


RP = 0.35% n = 24

Core no.: 7430/10-U-01

Sample no.: F-1228

Depth: 63.15 m



RP = 0.39%	n = 26
P1 = 0.69%	n = 2
P2 = 0.91%	n = 2

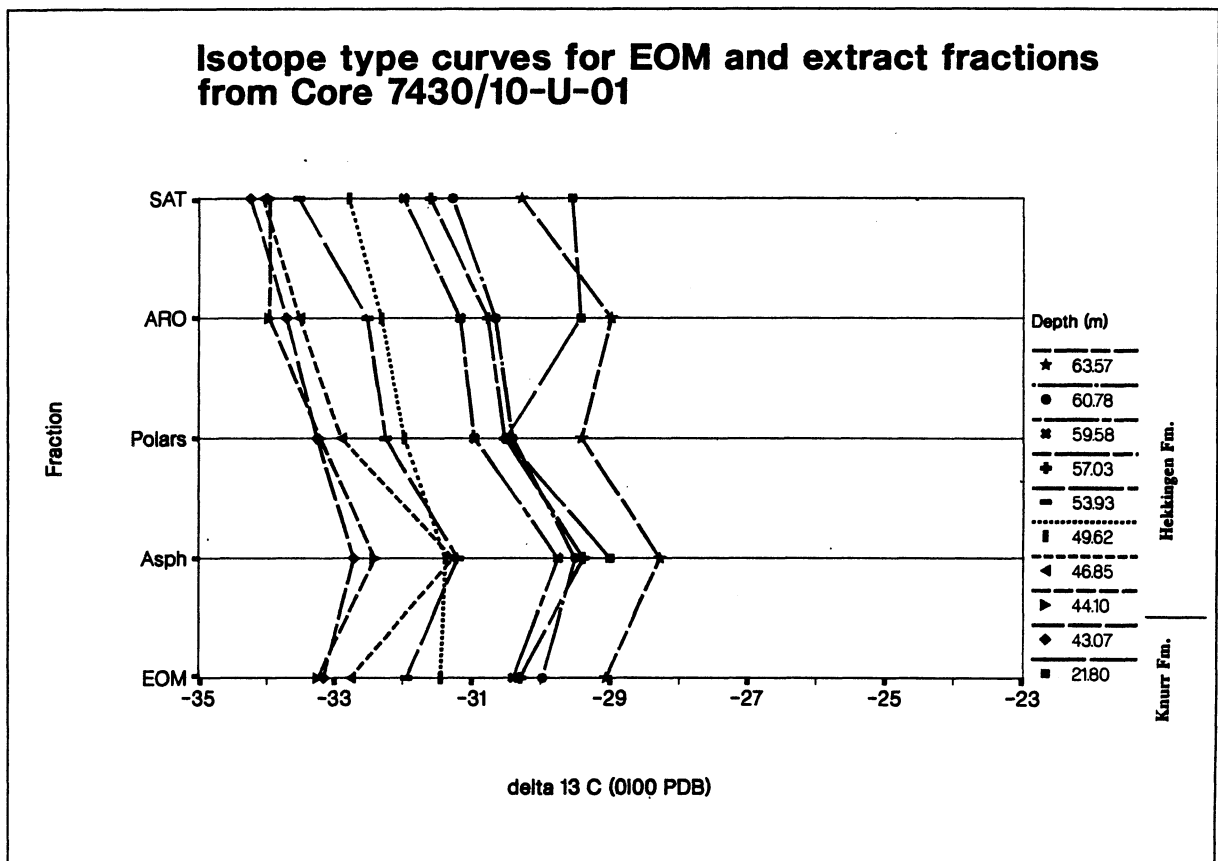


Figure A.III.8.7

SECTION A.IV

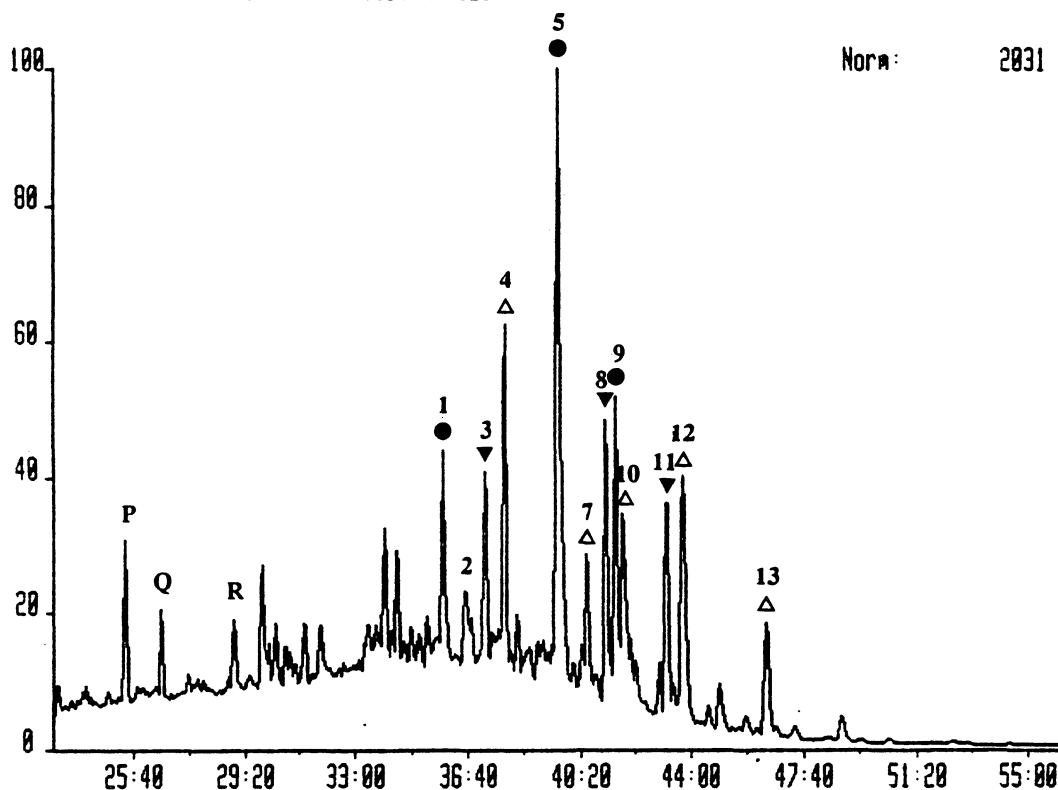
PEAK IDENTIFICATIONS FOR
M/Z 191, 217, 218, 231 AND 253
GC-MS MASS CHROMATOGRAMS

Table A.IV.1 Pentacyclic compounds identified in m/z 191 mass fragments of immature extracts e.g., cores 7127/10-U-02 and 7127/10-U-03.

A series of unusual peaks occur on the m/z 191 mass chromatograms of certain extracts, particularly from the Viséan succession penetrated by cores 7127/10-U-02 and 10-U-03, and 7029/03-U-01. A new identification system was therefore adopted and is outlined below. This new identification system is used alongside the previously established IKU system, where necessary. The old system is used with those samples which contain a more geologically normal distribution of terpanoid compounds.

Peak N°.	Identification
1	C ₂₇ hopene (C _{27:1})
2	18α(H)-trishnorhopane, Ts (?) (C _{27:0})
3	17α(H)-trishnorhopane, Tm (C _{27:0})
4	17β(H)-trishnorhopane, (C _{27:0})
5	nor-hop-Δ ¹³⁽¹⁸⁾ -ene (C _{29:1})
6	hop-Δ ¹⁷⁽²¹⁾ -ene (C _{30:1})
7	17β(H),21α(H)-norhopane (C _{29:0})
8	17α(H),21β(H)-hopane (C _{30:0})
9	hop-Δ ¹³⁽¹⁸⁾ -ene (C _{30:1})
10	17β(H),21β(H)-norhopane (C _{29:0}) + 17β(H),21α(H)-hopane (C _{30:0})
11	17α(H),21β(H)-homohopane (C _{31:0})
12	17β(H),21β(H)-hopane (C _{30:0})
13	17β(H),21β(H)-homohopane (C _{31:0})
14	17β(H),21β(H)-bishomohopane (C _{32:0})
15	17β(H),21β(H)-trihomohopane (C _{33:0})
P	C ₂₃ tricyclic terpane
Q	C ₂₄ tricyclic terpane
R	C ₂₅ tricyclic terpane (17R,17S)
S	C ₂₄ tetracyclic terpane
T	C ₂₆ tricyclic terpane (17R,17S)

F0523 12-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 191.1000
Text:F0523 7127/10-U-03 95.33 M CLST



F0523 12-JAN-09 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 205.1000
Text:F0523 7127/10-U-03 95.33 M CLST

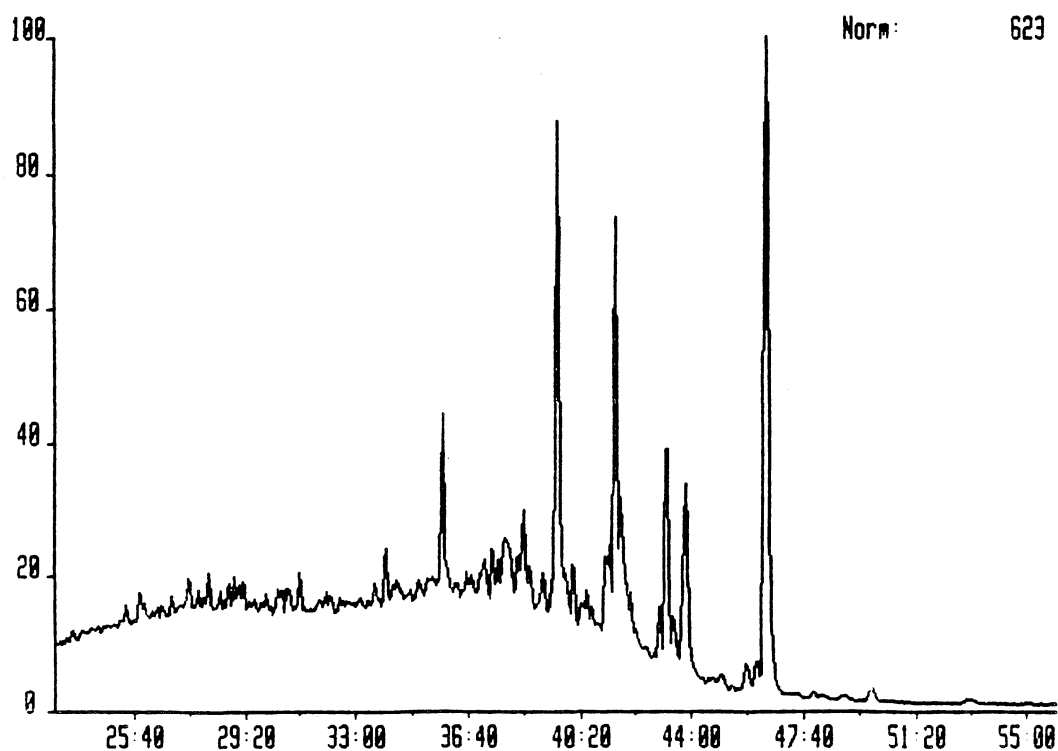
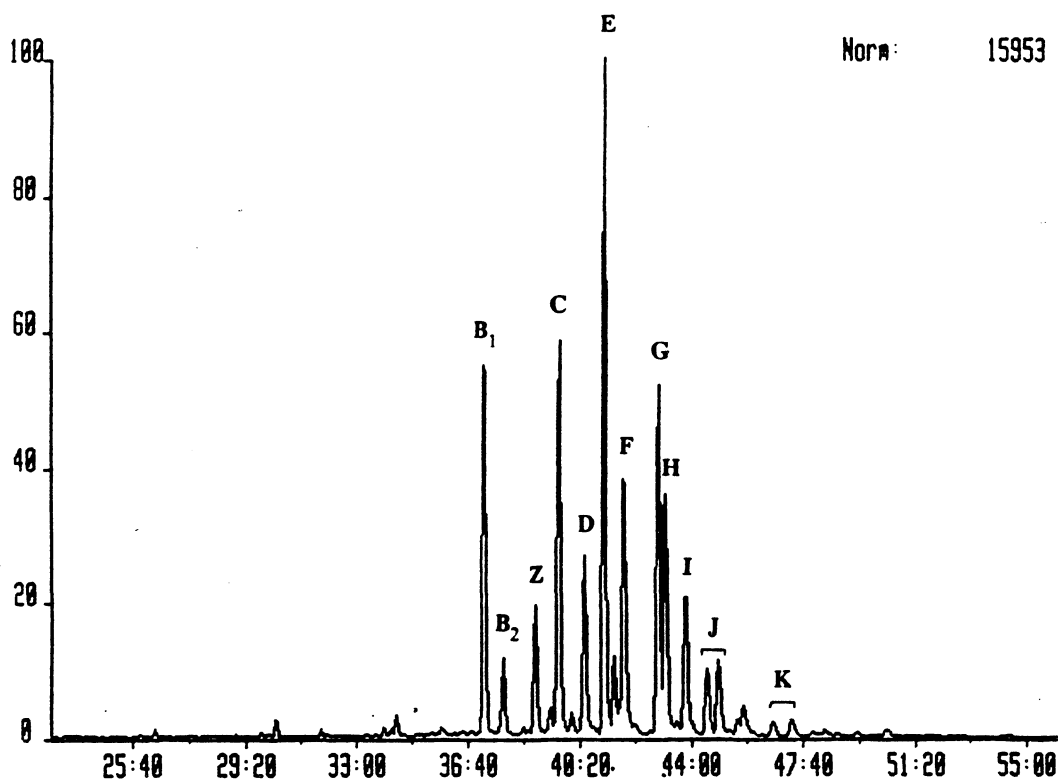


Table A.IV.2 Pentacyclic compounds identified in m/z 191 mass fragments

Peak N°	Identification	
P	C ₂₃ tricyclic terpane	
Q	C ₂₄ tricyclic terpane	
R	C ₂₅ tricyclic terpane (17R,17S)	
S	C ₂₄ tetracyclic terpane	
T	C ₂₆ tricyclic terpane (17R,17S)	
A	18 α (H)-trisnorneohopane (Ts)	(C ₂₇ H ₄₆)
B ₁	17 α (H)-trisorhopane (Tm)	(C ₂₇ H ₄₆)
B ₂	17 β (H)-trisorhopane	(C ₂₆ H ₄₆)
Z	28,30-bisorhopane	(C ₂₈ H ₄₈)
C	17 α (H)-norhopane	(C ₂₉ H ₅₀)
X	Unknown triterpane	(C ₃₀ H ₅₂)
D	17 β (H)-normoretane	(C ₂₉ H ₅₀)
E	17 α (H)-hopane	(C ₃₀ H ₅₂)
F	17 β (H)-moretane	(C ₃₀ H ₅₂)
G	17 α (H)-homohopane (22S)	(C ₃₁ H ₅₄)
H	17 α (H)-homohopane (22R)+ unknown triterpane	(C ₃₁ H ₅₄)
I	17 β (H)-homomoretane	(C ₃₁ H ₅₄)
J	17 α (H)-bishomohopane (22S,22R)	(C ₃₂ H ₅₆)
K	17 α (H)-trishomohopane (22S,22R)	(C ₃₃ H ₅₈)
L	17 α (H)-tetrakishomohopane (22S,22R)	(C ₃₄ H ₆₀)
M	17 α (H)-pentakishomohopane (22S,22R)	(C ₃₅ H ₆₂)

F1281 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 191.1000
Text:F1281 7430/07-U-01 77.35 M COAL



F1281 11-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 205.1000
Text:F1281 7430/07-U-01 77.35 M COAL

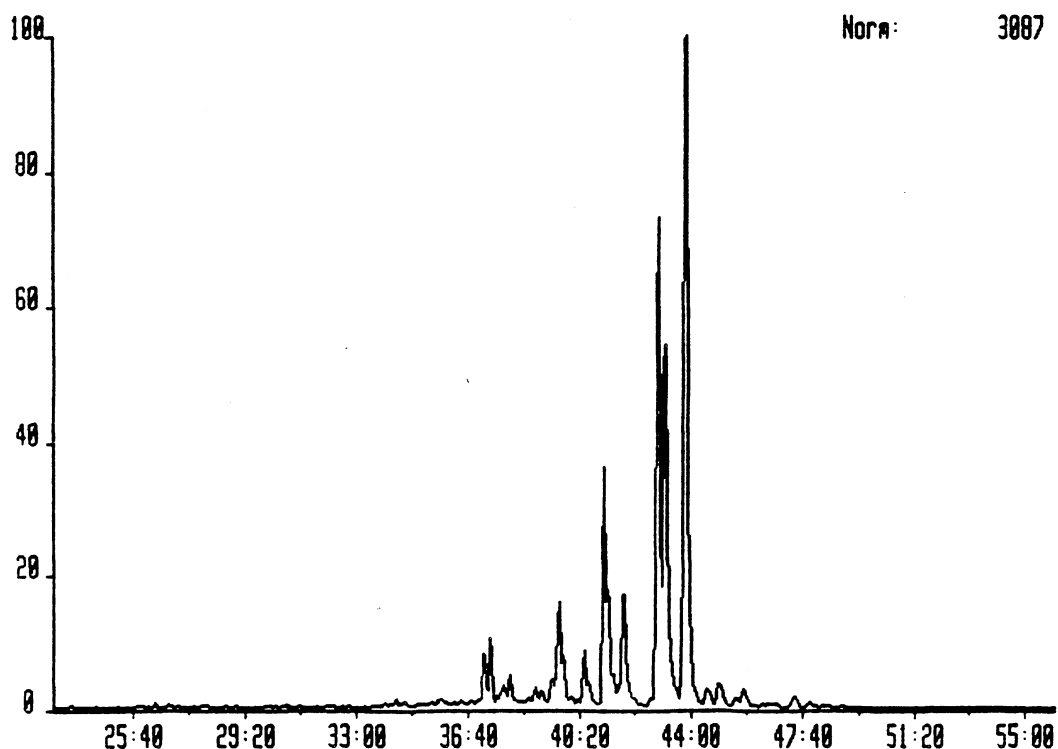
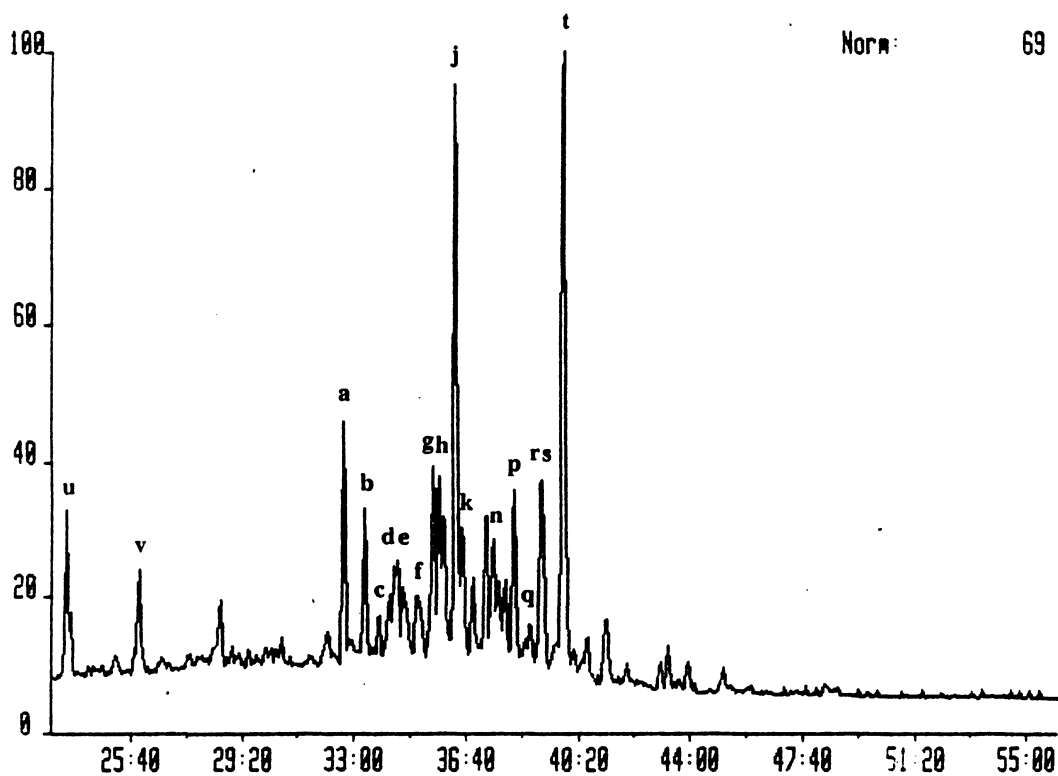


Table A.IV.3 Sterane peaks recognised on m/z 217 and m/z 218 mass chromatograms

Peak N°	Identification	
u	5 α (H)-sterane	(C ₂₁ H ₃₆)
v	5 α (H)-sterane	(C ₂₂ H ₃₈)
a	13 β (H),17 α (H)-diasterane (20S)	(C ₂₇ H ₄₈)
b	13 β (H),17 α (H)-diasterane (20R)	(C ₂₇ H ₄₈)
c	13 α (H),17 β (H)-diasterane (20S)	(C ₂₇ H ₄₈)
d	13 α (H),17 β (H)-diasterane (20R)	(C ₂₇ H ₄₈)
e	13 β (H),17 α (H)-diasterane (20S)	(C ₂₈ H ₅₀)
f	13 β (H),17 α (H)-diasterane (20R)	(C ₂₈ H ₅₀)
g	13 α (H),17 β (H)-diasterane (20S)	(C ₂₈ H ₅₀)
	+ 14 α (H),17 α (H)-sterane (20S)	(C ₂₇ H ₄₈)
h	13 β (H),17 α (H)-diasterane (20S)	(C ₂₉ H ₅₂)
	+ 14 β (H),17 β (H)-sterane (20R)	(C ₂₇ H ₄₈)
i	14 β (H),17 β (H)-sterane (20S)	(C ₂₇ H ₄₈)
	+ 13 α (H),17 β (H)-diasterane (20R)	(C ₂₈ H ₅₀)
j	14 α (H),17 α (H)-sterane (20R)	(C ₂₇ H ₄₈)
k	13 β (H),17 α (H)-diasterane (20R)	(C ₂₉ H ₅₂)
l	13 α (H),17 β (H)-diasterane (20S)	(C ₂₉ H ₅₂)
m	14 α (H),17 α (H)-sterane (20S)	(C ₂₈ H ₅₀)
n	13 α (H),17 β (H)-diasterane (20R)	(C ₂₉ H ₅₂)
	+ 14 β (H),17 β (H)-sterane (20R)	(C ₂₈ H ₅₀)
o	14 β (H),17 β (H)-sterane (20S)	(C ₂₈ H ₅₀)
p	14 α (H),17 α (H)-sterane (20R)	(C ₂₈ H ₅₀)
q	14 α (H),17 α (H)-sterane (20S)	(C ₂₉ H ₅₂)
r	14 β (H),17 β (H)-sterane (20R)	(C ₂₉ H ₅₂)
	+ unknown sterane	
s	14 β (H),17 β (H)-sterane (20S)	(C ₂₉ H ₅₂)
t	14 α (H),17 α (H)-sterane (20R)	(C ₂₉ H ₅₂)

F0012 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 217.1000
Text:F0012 7430/10-U-01 21.00 M CLST



F0012 16-JAN-89 Sir:Voltage 70-E Sys: BIOMARKER
Sample 1 Injection 1 Group 1 Mass 218.1000
Text:F0012 7430/10-U-01 21.00 M CLST

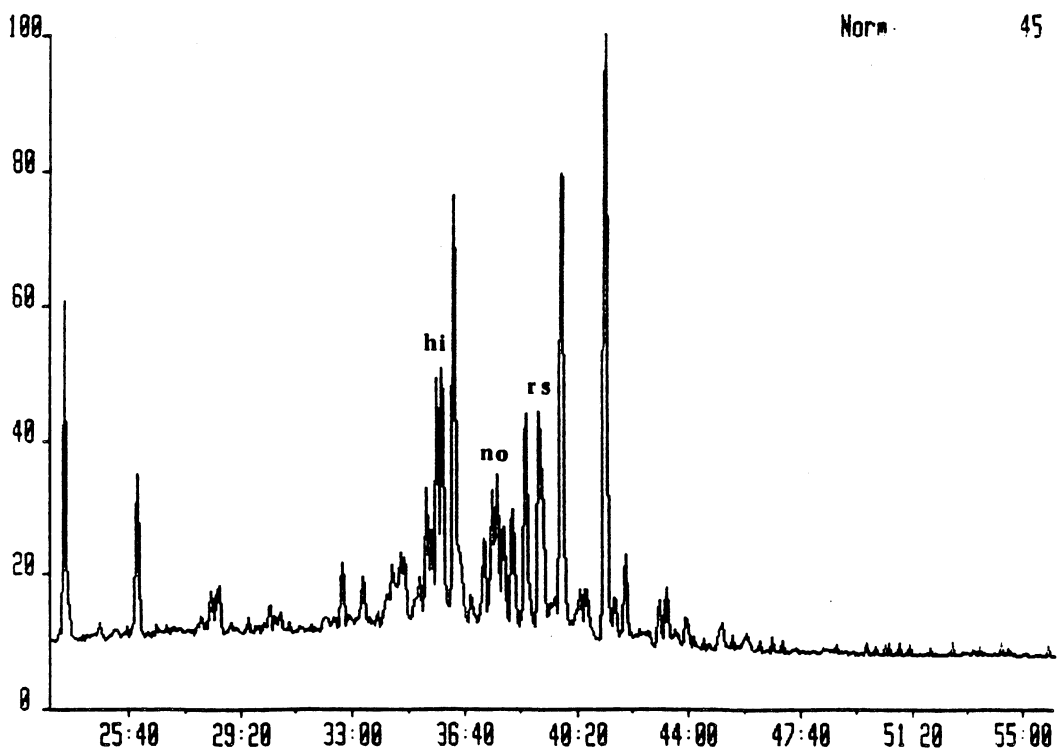


Table A.IV.4 Aromatic steroid compounds recognised in the m/z 231 (tri-aromatic steroids) and m/z 251 (mono-aromatic steroids) mass chromatograms

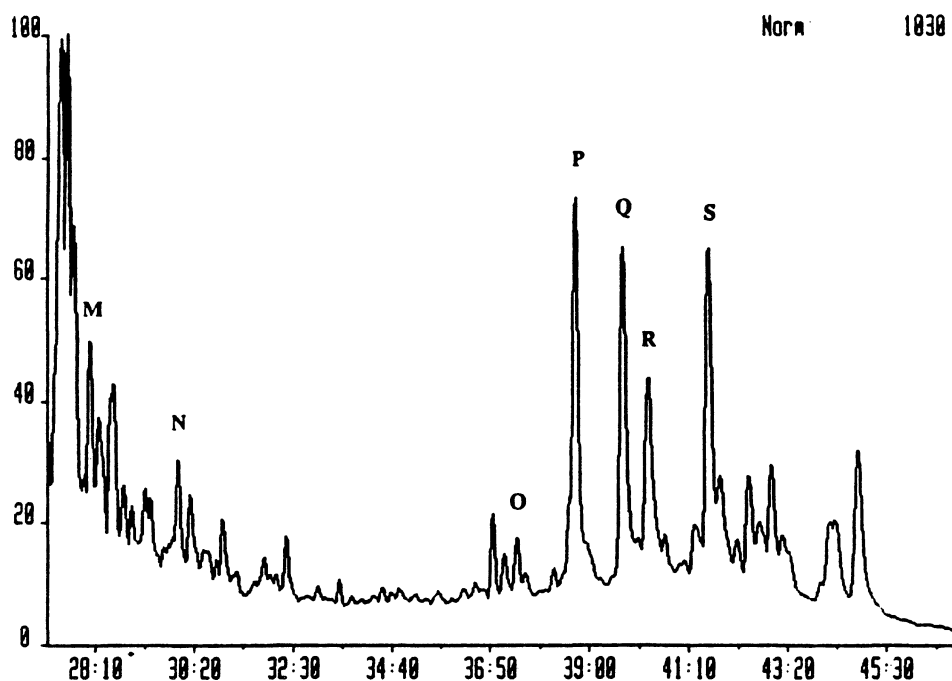
m/z 231 (tri-aromatic steroids)

Peak N°.	Identification
M	C ₂₀ tri-aromatic steroid
N	C ₂₁ tri-aromatic steroid
O	C ₂₆ tri-aromatic steroid
P	C ₂₆ +C ₂₇ tri-aromatic steroids
Q	C ₂₈ tri-aromatic steroid
R	C ₂₇ tri-aromatic steroid
S	C ₂₈ tri-aromatic steroid

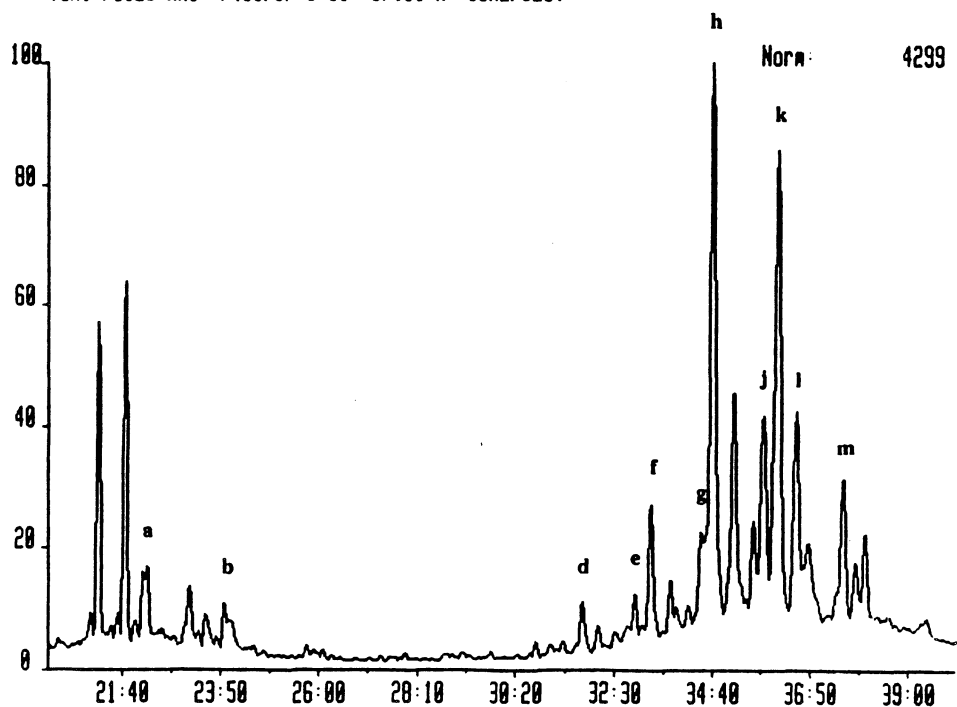
m/z 253 (mono-aromatic steroids)

Peak N°.	Identification
a	C ₂₁ mono-aromatic steroid
b	C ₂₂ mono-aromatic steroid
c	unidentified compound
d	C ₂₇ mono-aromatic steroid
e	C ₂₇ mono-aromatic steroid
f	C ₂₈ mono-aromatic steroid
g	C ₂₇ mono-aromatic steroid
h	C ₂₈ +C ₂₉ mono-aromatic steroids
i	C ₂₉ mono-aromatic steroids
j	C ₂₉ mono-aromatic steroids
k	unidentified compound
l	unidentified compound

F0126AR 20-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 231.1000
Text:F0126 ARO 7430/07-U-01 37.81 M COAL/CLST



F0126AR 20-JAN-88 Sir:Voltage 70-E Sys: STERANER
Sample 1 Injection 1 Group 1 Mass 253.1000
Text:F0126 ARO 7430/07-U-01 37.81 M COAL/CLST



ANALYTICAL METHODS

Gas analyses

Hydrous pyrolysis gas (full analysis of hydrocarbons and inert gases):

The gas samples from hydrous pyrolysis were analysed on an HP 5880 gas chromatograph equipped with a capillary column and an FID for hydrocarbon analysis and two packed columns and a TCD for analysis of the inert gases (N_2 , O_2 , CO_2):

- 50 m x 0.2 mm i.d. fused silica column, coated with 0.5 μ m OV-101.
- 3 ft steel column packed with molecular sieve 13x, 80/100 mesh.
- 6 ft steel column packed with Porapak T x 4 ft steel column packed with Porapak Q, 80/100 mesh.

Temperature programme: 30°C (12 min.) - 8°C/min. - 150°C (5 min.).

Standard gas samples containing methane, ethane, propane, n-butane, n-pentane, n-hexane and hydrogen, oxygen, nitrogen, carbon monoxide, carbon dioxide and methane, respectively, were used for quantification.

The concentrations were corrected for air contamination by assuming that the pyrolysis gas is oxygen-free.

Headspace gas:

A septum was attached to the can and a sample of the headspace gas was taken for analysis of C_1 , C_2 , C_3 , i- C_4 , n- C_4 and C_{5+} hydrocarbons.

This analysis was performed on Carlo Erba Fractovap 2150 and 2350 gas chromatographs equipped with 2 m x 1/8" stainless steel columns filled with Porapak Q on Chromosorb using nitrogen as carrier gas. An oven temperature of 150°C was used. After elution of n-butane, the column was back-flushed and C_{5+} compounds were recorded as one peak. A standard gas sample containing methane, ethane, propane, n-butane, n-pentane and n-hexane (100 ppm each) was used for quantification.

The can was then opened and headspace volume, water volume, and sample weight were measured. The canned samples were washed with warm water

(30-40°C) on 4.0, 2.0 and 0.125 mm sieves to remove drilling mud and were then dried at 35°C.

Occluded gas:

Prior to drying, an aliquot of the 1-4 mm fraction of each sample was crushed in water for 10 minutes using a gas-tight ball mill. The evolved gas was analysed as described for headspace gas.

Total Organic Carbon

Bulk samples were crushed in a disk mill or mortar. Aliquots of the samples were then weighed into Leco crucibles, then treated three times with hot 10% HCl in order to remove carbonate, and finally washed four times with distilled water in order to remove any traces of HCl. The crucibles were then placed on a hot plate (60°C) and dried for 24 hours. The total organic carbon (TOC) content of the dried samples was determined using a CS 244 carbon/sulphur analyser.

The total carbon (TC) content was determined on untreated rock powder.

The instrument was calibrated using a sediment standard with 2.72% carbon. Calibration and blank runs were carried out every 15th measurement.

Rock-Eval pyrolysis

Powdered sample (100 mg shale, 5-10 mg coal) was weighed into a platinum crucible (the base and cover of which are made of sintered steel), and analysed on a Rock-Eval II pyrolyser (Girdel/IFP) under standard conditions (Carrier gas: helium; flow rate: 100 ml/min.; temperature programme: 300°C (3 min.) - 25°C/min. - 550°C). Part of the Rock-Eval analyses were carried out by Geolab Nor, Trondheim, on an Oil Show Analyzer which uses the same standard conditions.

Preparation of kerogen concentrates

The powdered and pre-extracted rock sample was treated overnight with concentrated HCl (200 ml), followed by treatment with hot 40% HF (100 ml,

50°C, overnight). The acids were removed by decanting and repeated washing with hot water (2 hours), 10% ammonium carbonate solution (>2 hours), and cold water (2x2 hours).

The kerogen was further purified by extraction with methanol, methanol/DCM (1:1) and hexane/DCM (1:1).

Pyrolysis Gas Chromatography (Py-GC Programmed)

Thermal extraction (S1)

The whole rock sample (20-30 mg) was placed in a boat-shaped sample probe and thermo-extracted in a stream of helium at 340°C for 4 minutes.

Pyrolysis-Gas Chromatography (S2)

The thermo-extracted sample was pyrolysed in a helium atmosphere using a furnace type pyrolyser as described by Solli et al. (1984). The pyrolysis temperature program was 340°C - 50°C/min. - 550°C. The outlet of the furnace was directly connected to a splitter (30:1) which enabled the pyrolysis products to be simultaneously recorded as a bulk "S2" peak by an FID and passed into a gas chromatograph. The pyrolysis products were trapped on the chromatographic column by cooling the front part of the column with liquid nitrogen. On completion of the pyrolysis programme, the collected pyrolysis products were injected on to the column by removing the nitrogen bath. The GC conditions are outlined below.

GC conditions

Column: 30 m DB-1, i.d. 0.32 mm, fused silica capillary column.

Carrier gas: Helium, inlet pressure 7.5. psi; flow rate 1.5 ml/min.

Temp. programme: -10°C (16 min.) - 5°C/min. - 320°C (10 min.)

Extractable Organic Matter

Powdered rock was extracted in a Soxhlet apparatus for 18 hours. Boiling dichloromethane (DCM) containing 7% (v/v) methanol was used as a solvent.

DCM of organic geochemical grade was used and blank analyses indicated that the occurrence of contaminating hydrocarbons was negligible. Activated copper fillings were used in order to remove any free sulfur from the samples.

After extraction, the solvent was evaporated using a Büchi Rotavapor and the amount of extracted organic matter (EOM) was determined.

Evaporation of the light components in fluid samples

The oil samples from hydrous pyrolysis were heated to 210°C at atmospheric pressure until constant weight was obtained. The fraction of light components was determined as the weight difference between the original sample and the residuum left after heating.

Medium-pressure liquid chromatography (MPLC)

The EOM or oil (>210°C) sample was diluted in DCM (1:3 mg/μl) and the asphaltenes were precipitated using excess n-pentane (40:1 pentane:(DCM+EOM)). The asphaltene fraction was weighed after drying at 50°C for 12 hours.

The remaining maltenes were separated into saturated, aromatic and non-hydrocarbon fractions using an MPLC system with n-hexane as eluant (Radke et al. 1980). The various fractions were concentrated using a Büchi Rotavapor. Then they were transferred to glass vials. The remaining solvent was removed.

Gas chromatographic analysis

The whole oil samples from hydrous pyrolysis were analysed using a Varian 3700 gas chromatograph fitted with a 15 m DB-5 fused silica column. 0.2 μl of sample solution were injected in split mode (split ratio 1:10). Hydrogen with a flow rate of 2.5 ml/min. was used as a carrier gas, and the temperature programme used was -60°C (2 min.) - 2°C/min. - 15°C - 4°C/min - 280°C.

The saturated fractions were diluted with n-hexane and analysed on an HP 5730A gas chromatograph equipped with a 15 m DB-1 fused silica column. Hydrogen was used as a carrier gas with a flow rate of about 1.5 ml/min. Injections were performed in split mode (split ratio 1:10). The temperature program used was 80°C (2 min.) - 4°C/min. - 280°C.

The total aromatic fractions were diluted with n-hexane and analysed on a Varian 3700 gas chromatograph, fitted with a DB-5 fused silica column (30 m x 0.25 mm i.d.), and equipped with an FID and a sulphur-specific dual-flame FPD detector. Hydrogen with a flow rate of 2.5 ml/min was used as carrier gas. The injection split ratio was 1:10. The temperature programme used was 60°C (2 min.) - 4°C/min. - 280°C.

All the data from the GC analyses were processed on a VG Multichrom lab data system.

Gas chromatography - mass spectrometry (GC-MS)

GC-MS analyses were performed on a VG Micromass 70-70H GC-MS-DS system. A Varian Series 3700 GC was fitted with a fused silica DB-5 capillary column (30 m x 0.3 mm i.d.). Helium (1.5 ml/min.) was used as a carrier gas and the injections were performed in split mode (1.5 µl, split ratio 1:15).

The GC oven was programmed from 120°C (2 min.) to 280°C at 4°C/min. for analysis of the saturated and aromatic hydrocarbons.

The hydrocarbons were analysed in multiple ion mode (MID) at a scan cycle time of approximately 2 secs. The mass spectrometers operated at 70eV electron energy with an ion source temperature of 200°C. Data acquisition was performed using VG data systems.

Peaks were identified by comparison with elution patterns in certain mass chromatograms. Peak ratios were calculated from peak heights in the appropriate mass chromatograms.

Vitrinite Reflectance

Vitrinite reflectance measurements were carried out on whole-rock samples as follows: the rock samples were broken up if necessary, and mounted in a

fast-setting synthetic resin. Temperatures in excess of 50°C were avoided as these can result in alteration of the organic material. Once the resin was set, the sample plugs were ground on coarse silicon carbide paper in order to expose an area of sample for polishing. The samples were then ground on 600 and 280 grade silicon carbide paper to remove any coarse scratches.

Where clastic sediments were involved, grinding and polishing was carried out using propan-2-ol to avoid swelling of any clay minerals in the sample. If coals were to be measured, then water was used.

After coarse grinding, the samples are polished on Selvyt-covered laps using 5/20 and gamma grade alumina powder. Following polishing, the surface of the sample plugs was carefully cleaned to remove any traces of the polishing powders.

Reflectance measurements were carried out using a Leitz MPV-Compact microscope and photo-multiplier combination. The measurements were made under oil immersion, using an oil with a refractive index of 1.518 at a wavelength of 546 nm. The surface of the sample was examined for suitable vitrinite particles, and measurements were taken on these. The reflectance of a vitrinite particle was determined relative to an optical glass standard with a known reflectance of a similar order to that of the sample.

If possible, a minimum of twenty reflectance measurements was taken on each sample. Coals and carbonaceous claystone samples provide the most reliable data, while sandstones and carbonates provide the least reliable data.

The samples were also examined in ultra-violet light in order to better determine the composition and colour of the fluorescent material present in the sample. The colour of certain liptinite macerals in ultra-violet light can be related to the thermal maturity of the sample kerogen. A scale comparing vitrinite reflectance measurements and sporinite fluorescence to thermal maturity is shown in Table 3 of the interpretation levels.

Evaluation of kerogen type and thermal maturity in transmitted light

The rock samples were crushed and treated with hydrochloric acid and hydrofluoric acid in order to remove the mineral matter and isolate the kerogen.

The isolated kerogen was mounted in glycerine jelly on microscope slides as a strew-mount.

The treatment of the isolated kerogen varied according to the requirements and preservation of the samples. This included:

T-slide: total acid residue.
O-slide: kerogen debris remaining after flotation in ZnBr_2 to remove heavy minerals.
Si-slide: sieved residue.
X-slide: oxidised residue.

T- and/or O-slides were necessary in order to evaluate the kerogen composition/palynofacies of the samples.

Si- and/or X-slides were required if it was necessary to concentrate larger kerogen fragments or spores/pollen for spore colouration and/or age determination, respectively, (N.B.: oxidised residue is not used for spore colour determination as oxidation will alter the colour).

The samples were examined using a Leitz Dialux microscope with a white halogen light source. Objective lenses of 10x and 63x magnification were used. The higher magnification allowed a more detailed description of the kerogen, with resolution down to $2\mu\text{m}$ diameter.

Thermal alteration indices (TAI) were measured from the colour of spores and pollen. The techniques used for this are adapted from Staplin (1969) and Burgess (1974). IKU has used a 1-10 scale for thermal alteration index (TAI)/Spore colouration index (SCI) since December, 1986.

Kerogen terminology

The following kerogen terminology is used:

1. Amorphous material - degraded, unstructured material of unidentified origin.
2. Algal material - particles of recognisably algal origin.
3. Liptinitic material - recognisable spores, pollen, cuticle and cysts.
4. Woody material - structured and unstructured woody tissue.
5. Coaly material - black, reworked or oxidised material.

Comparison of microscopic thermal maturation systems at IKU

SPORE COLOUR		VITRINITE REFLECTANCE	SPORINITE FLUORESCENCE
TAI	NEW TAI	%	
1 - 2-	1.0- 3.5	0.25-0.40	1-4
2- - 2	3.5- 4.0	0.40-0.60	4-6
2 - 2+	4.0- 4.5	0.60-0.80	6-7
2+ - 3-	4.5- 5.5	0.80-1.00	7-8
3- - 3	5.5- 6.0	1.00-1.20	8-9
3 - 5	6.0-10.0	<1.20	Absent

At IKU, TAI determination is generally undertaken on bisaccates.

Relation between fluorescence colour and sporinite fluorescence zones:

EXC. 400 nm										
BAR. 530 nm	colour	G	G/Y	Y	Y/O	L.O	M.O.	D.O.	O/R	R
	zone	1	2	3	4	5	6	7	8	9

Isotope analyses

The carbon isotope analyses were performed by Geochemische Analysen, Manfred Schmitt (GCA) in Lehrte, F.R.G.

The samples were filled in a glass capillary and transferred into a combustion system, where they were quantitatively oxidised over copper(I) / copper(II) oxide at 900°C. The reaction products were flushed in a stream of ultrapure helium and oxygen through silver wool (450°C) in order to remove traces of halogens and sulphur dioxide. The cleaned CO₂ was trapped in a cool trap. After removal of the carrier gas by high vacuum, CO₂ was sealed in 6 mm glass tubes.

The $^{13}\text{C}/^{12}\text{C}$ -isotope ratio was measured in a high-resolution mass spectrometer Finnigan MAT 251. Precision of the preparation lines and of the mass spectrometer was daily controlled by measurements of standard substances and by double analyses.

The isotope ratios are given as delta values (del) and calculated versus PDB:

$$\text{del (\%)} = ((R \text{ sample} - R \text{ stand.}) / (R \text{ stand.})) * 1000$$

INTERPRETATION LEVELS

1. TOTAL ORGANIC CARBON (TOC)

TOC (wt%)	Richness of source rock
<0.5	Poor Source Rock
0.5-1	Fair Source Rock
1-2	Good Source Rock
>2	Rich Source Rock

2. ROCK-EVAL PYROLYSIS

a) Data Supplied

S1	Free hydrocarbons (mg/g rock).
S2	Potential or pyrolysable hydrocarbons of kerogen (mg/g rock).
S3	Oxygen content of kerogen (mg CO ₂ /g rock).
Hydrogen Index	S2/TOC x 100 (mg hydrocarbons/g TOC).
Oxygen Index	S3/TOC x 100 (mg CO ₂ /g TOC).
Petroleum Potential	S1+S2 (mg HC/g rock).
Production Index	S1/(S1+S2).
Tmax	Temperature at which the S2 peak is at maximum (°C).

b) Interpretation

Kerogen type	Hydrogen Index (mg HC/g TOC)
Type I	>650
Type II	400-650
Type II/III	200-400
Type III	50-200
Type IV	<50 and up to 100 where oxygen index is very high.

N.B.

Hydrogen and particularly oxygen indices are affected by organic carbon and carbonate mineral contents. Thus decreasing TOC contents, where the same organic matter type is present, can result in reduced hydrogen and increased oxygen indices (Katz 1983 and Espitalié et al. 1984). Hence oxygen indices are not used.

Petroleum Potential	S1+S2 (mg HC/g rock) *)
Poor	<1
Fair	1-5
Good	5-10
Rich	>10

S1 and S2 values can be raised by the presence of migrated bitumens.

Production Index	S1/(S1+S2) *)
Primary bitumen	<0.1
Generated or migrated hydrocarbons	0.1-0.5
Predominantly migrated Hydrocarbons or stain	>0.5

Tmax

Variations in values can occur due to maturity, kerogen type, migrated bitumens or low S2 peaks. The following maturity boundaries are therefore only approximate.

Tmax (°C)	Maturity stages of type II kerogens	Equivalent vitrinite reflectance in coals (% Ro)
425	Immature	0.5
435		0.7
450	Oil generation zone	1.0
>450		
	Gas generation zone	

3. COMPARISON OF MICROSCOPIC THERMAL MATURATION SYSTEMS AT IKU

MATURATION LEVEL	SPORE COLOUR TAI	VITRINITE REFLECTANCE %Ro	SPORINITE FLUORESCENCE
IMMATURE	1.0 - 3.5	0.25 - 0.40	1 - 4
EARLY MATURITY	3.5 - 4.0	0.40 - 0.60	4 - 6
MODERATE MATURITY	4.0 - 4.5	0.60 - 0.80	6 - 7
MATURITY	4.5 - 5.5	0.80 - 1.00	7 - 8
LATE MATURITY	5.5 - 6.0	1.00 - 1.20	8 - 9
POST-MATURE	6.0 -10.0	>1.20	Absent

*) Only approximate guide and not intended to indicate absolute limits.

4. EXTRACTABLE ORGANIC MATTER (OR SOLUBLE BITUMEN)

a) Data Supplied

Weight of extracted rock	(g)
EOM extractable organic matter	(mg, mg/g of rock, mg/g TOC)
Sat saturated hydrocarbons	(mg, mg/g of rock, mg/g TOC, wt% of EOM)
Aro aromatic hydrocarbons	(mg, mg/g of rock, mg/g TOC, wt% of EOM)
HC/EOM = (Sat+Aro)/EOM	(wt%)
Non-HC/EOM	(wt%)
HC/non-HC x 100	
Sat/Aro x 100	

b) Interpretation of source-rock richness based on hydrocarbon content.

Hydrocarbon content is dependent on maturity, total organic carbon content and kerogen type as well as being influenced by migrated hydrocarbons. The values should therefore be treated as a rough guide only.

Source rock richness	HC (ppm of rock)
Poor	<100
Fair	100-250
Good	250-500
Rich	>500

Shallow Drilling Barents Sea 1988

Appendix volume 2

Organic geochemical data



IKU
SINTEF GROUP