



EP/S/EXP/Lab.Pau n° 89/216RP

Pau, Novembre 1989

WELL 25/1-10 - NORWAY

Follow-up organic geochemical study

EP/S/EXP/Lab.Pau n° 89/216RP

BA-90-94-1

11 JAN. 1990

REGISTRERT

OLJEDIREKTORATET

Auteur : K. LE TRAN

**CONFIDENTIEL  
REPRODUCTION INTERDITE**

AUTEUR : K. LE TRAN

TITRE : WELL 25/1-10 NORWAY  
Follow-up organic geochemical study

REFERENCES : EP/S/EXP/Lab.Pau n° 89-216RP

### S U M M A R Y

The cutting extracts of two beds in the Draupne and Heather Formations bear the hydrocarbon imprint of the contaminant used in mud additives in that well. This is well demonstrated by GC-MS biomarker analysis (terpanes) at a molecular level, but the rock extracts are globally not much influenced as suggested by the difference in the composition.

The indicators for thermal maturation based on molecular distribution are difficult to handle because of the influence of the contaminant, nevertheless the very low concentration of biomarkers added to the high dominance of rearranged steranes suggest a high level of thermal maturation.

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## 1 - INTRODUCTION

The results already obtained in screening analyses and optical study of the organic matter (report EP/S/EXP/Lab.Pau 89/074 RP) have shown that the Jurassic section in well 25/1-10 has undergone extensive thermal stress, so that the entire series is beyond the oil window. Indeed the amount of extractable organic matter is very small, making the analysis of liquid hydrocarbons very difficult or even impossible.

Nevertheless, in order to get information, on one hand, on the contaminant used in drilling mud additives in that well and, on the other hand, on rock extracts attaining high thermal maturity, three samples were selected on the basis of screening analyses and analysed in detail for hydrocarbon characterisation including GC, GC-MS and carbon isotopy.

The contaminant is the sample collected at 4210m, and the other two samples are the richest in organic extract content belonging to the Upper Jurassic, one in the Draupne Formation (4260-65m) and the other one in the Heather Formation (4365m).

## 2 - RESULTS

Results are listed in tables 1 and 2 for the main geochemical data and table 3 for the isotopic and chromatographic ratios.

Gas chromatograms of GC analysis are presented for each sample both in synoptic overview (annexes 1, 6 and 11) and individual traces for each fraction (annexes 2, 3, 7, 8, 12 and 13). GC-MS results are given in relative abundance (fragmentograms) and in quantitative data for various ratios on the steranes and terpanes (annexes 4, 5, 9, 10, 14 and 15).

### 2.1 - CONTAMINANT (SAMPLE 4210m)

The extract of the contaminant contains a small percentage of alkanes (8.4%) and aromatics (7.5%), the bulk (84.1%) being constituted by polar compounds.

The gas chromatogram of alkanes (annexes 1 and 2) shows a bimodal fingerprint with a first mode culminating at C14-C15 and a second mode, much higher, culminating at C27-C29.

The n-alkanes are, by far, the most abundant hydrocarbons as compared to iso and cyclo-alkanes, and in the C23-C33 range, there is a sharp odd preference in the n-alkanes : n-C25, n-C27, n-C29 and n-C31 are prominent (high wax range). Pristane/phytane ratio is slightly higher than 1 (1.18).

A compound, which is not a n-alkane, occurs in high abundance just before the n-C32. This compound appears in what follows to be a good marker of the pollutant; its structure has been identified by mass spectrometry as being that of the C31 a $\beta$ , 22R Homohopane or in short C31 a $\beta$ (R).

The aromatic hydrocarbon gas chromatogram (annexes 1 and 3) is dominated by dimethylnaphthalene (DMN) and shows high concentration of phenanthrene (P) and methylphenanthrenes (MP), the former one dominating the latter ones.

The methylphenanthrenes are dominated by the isomer 1 which predominates over the isomers 9, 2 and 3 in decreasing order. This seems to be typical of the product. The methylphenanthrene indexes MPI-1 and MPI-3 are 0.55 and 0.70 respectively.

The FPD sulfur aromatic trace (annexes 1 and 3) is dominated by the 4-methyldibenthiophene (4-MDBT) which predominates over the other isomers, 2+3 and 1-MDBT, in decreasing order. This is also typical of the product.

The terpane m/z 191 fragmentogram (annex 4) shows very high concentration of a single compound (X) which is highly prominent : this compound has been identified as being the C31 a $\beta$ , 22R Homohopane. Such a pattern is particularly typical and is, as a matter of coincidence, similar to that obtained on the lignite of Yallourn, Australia (Van Dorselaar, thesis, 1975).

The sterane m/z 217 fragmentogram (annex 4) is dominated by the C29 aaR regular sterane. The rearranged steranes are present, particularly the C27 ones (C27S dia and C27R dia), but their concentration is not high.

Carbon isotope measurement on the saturated fraction was not possible because of the very small amount of saturates which constitute only 8 % of the total extract.

## 2.2 - DRAUPNE AND HEATHER EXTRACTS (4260/65m AND 4365m)

The gas chromatogram of alkanes of the Draupne Fm sample (annexes 6 and 7) is dominated by n-alkanes in the lower range, culminating at n-C16. But the important features are, on one hand, the marked odd preference of n-alkanes in the higher range between C23 and C33 as already mentioned for the contaminant and, on the other hand, the presence in relatively high concentration of the (X) marker also above reported for the contaminant. Pristane/phytane ratio is close to that of the contaminant (1.27).

The gas chromatogram of the alkane fraction of the Heather Fm sample (annexes 11 and 12) is similar to the preceding one with however, the difference that the n-alkane odd preference in the C23-C33 range is not as sharp and the possible presence of the (X) marker is not obvious. Pristane/phytane ratio is 1.75, i.e. slightly higher than the Draupne sample and the contaminant. The A-B plot (figure 1) shows that this sample is slightly different from the above two other samples.

The gas chromatograms of the aromatic fraction as well as total aromatics (FID) than sulfur compounds (FPD), are very similar between the two samples (annexes 8 and 13) and also with the contaminant (annex 3). Methylphenanthrene indexes MPI1 and MPI3 increase from the Draupne sample to the Heather sample (0.60 to 0.65 for MPI1 and 0.71 to 0.75 for MPI3) and are slightly higher than the contaminant (0.55 and 0.70 respectively) as shown in figure 2.

The terpane m/z 191 fragmentogram of the sample from Draupne Fm (annex 9) is identical to the contaminant above described with a single prominent peak corresponding to the C31 a $\beta$  (R) Homohopane. The one of the sample from Heather Fm (annex 14) is somewhat different in that it contains C29 a $\beta$  Norhopane and C30 a $\beta$  Hopane in addition to the C31 a $\beta$  (R) Homohopane which is also present in significant concentration, but in lower concentration than in the other samples.

The sterane m/z 217 fragmentograms of the two extracts are very similar with the marked presence of rearranged steranes (C27 and C29 diasteranes) which dominate the trace background. This feature is different as compared with the contaminant where these compounds are present, but are not dominating.

### **3 - CONCLUSION**

The results obtained as well as gas chromatography of the saturated fraction and aromatic fractions than the GC-MS analysis of the biomarkers showed that the rock extracts of Draupne and Heather Formations are still influenced by the contaminant added repeatedly in large quantities from the lower Cretaceous, even after thorough washing of the ditch cuttings. The sample from the Draupne Fm appears to be more affected by the contaminant than the one from the Heather. The contaminant has been established as being a lignite of natural origin and not a refined product.

The contamination effect is all the more apparent as the amount of rock extract is small, which is the case for the Jurassic in this well. This is particularly true for the molecular imprint as detected by GC-MS analysis, which is sensitive at relatively low concentration level for each individual marker. In contrast, the bulk of the extracts is globally different when one examines their composition, thus suggesting indigenous nature for the extracts in the Jurassic. As a matter of fact, the latter contain much larger proportion of hydrocarbons, both saturates and aromatics, as compared to the contaminant (62 and 73% instead of 16%).

Because of the contamination effect above stated, the characterisation of hydrocarbons of the rock extracts and the assessment of thermal maturity based on detailed molecular analysis is difficult. Nevertheless, it can be inferred from the paucity of biomarkers and the sole presence of rearranged steranes, that a high maturation level has been attained.

T A B L E S



TABLE: 2 25/1-10

RESULTS OF ORGANIC INVENTORY ANALYSIS

Follow-up

SAMPLE TYPE	DEPTHS Metres		Q1	ROCK - EVAL							LECO		Q2	EOM	I A T R O S C A N					HC
				on	Tmax	S1	S2	S3	PI	HI	OI	TOC			IOC	100(EOM/TOC)	SAT	ARO	POL	
ND	4115.00	4145.00	N	RI_RT	#	.16	.27	.11	.37	36	14	.76	N	.068	8.9	53.8	17.8	28.4	3.02	.49
ND	4170.00	4195.00	N	RI_RT	#	.18	.73	.43	.20	47	28	1.56	N	.044	2.8	34.5	22.7	42.8	1.52	.25
ND	4200.00	4205.00	N	RI_RT	#	.08	.37	.20	.18	29	16	1.25	N	.021	1.7					
BO	4210.01		I	RT	433	3.50	47.66	30.32	.07	155	98	30.83	I	1.907	8.2	8.4	7.5	84.4	4.42	3.03
ND	4220.00	4225.00	N	RI_RT	#	.17	.31	.11	.36	29	10	1.05	N	.036	3.4	47.2	21.9	30.9	2.16	.25
ND	4230.00	4235.00	N	RI_RT	#	.15	.33	.14	.32	29	13	1.13	N	.037	3.3	39.6	21.3	39.1	1.86	.22
ND	4240.00	4245.00	N	RI_RT	#	.08	.23	.04	.27	22	4	1.03	N	.029	2.8	41.9	22.1	36.0	1.90	.19
ND	4250.00	4255.00	N	RI_RT	#	.18	.26	.13	.40	24	12	1.07	N	.021	2.0					
ND	4260.00	4265.00	N	RI_RT	436	.44	.79	.23	.36	46	13	1.71	N	.070	4.1	41.9	20.2	37.9	2.07	.44
ND	4275.00		N	RI_RT	#	.08	.17	.08	#	18	8	.95	N	.015	1.6					
ND	4280.00		N	RI_RT	#	.11	.20	.14	.35	20	14	.99	N	<S						
ND	4285.00		N	RI_RT	#	.07	.18	.08	#	19	9	.96	N	.012	1.3					
ND	4290.00		N	RI_RT	#	.12	.26	.10	.31	24	9	1.07	N	.010	.9					
ND	4295.00		N	RI_RT	#	.07	.20	.03	.25	21	3	.98	N	.012	1.2					
ND	4300.00		N	RI_RT	#	.06	.23	.04	.22	21	4	1.06	N	.012	1.1					
ND	4305.00		N	RI_RT	448	.11	.29	0.00	.27	24	0	1.23	N	.027	2.2					
ND	4310.00		N	RI_RT	449	.14	.28	0.00	.33	24	0	1.20	N	.030	2.5	51.0	17.4	31.6	2.93	.21
ND	4315.00		N	RI_RT	450	.18	.29	.10	.39	24	9	1.19	N	.026	2.2					
ND	4320.00		N	RI_RT	449	.11	.22	.02	.34	21	2	1.03	N	.018	1.7					
ND	4325.00		N	RI_RT	449	.17	.23	.07	.42	21	7	1.10	N	.024	2.2					
ND	4330.00		N	RI_RT	450	.27	.37	.06	.42	27	5	1.36	N	.043	3.2	51.0	15.6	33.4	3.27	.29
ND	4335.00		N	RI_RT	450	.11	.19	.08	#	18	8	1.04	N	.029	2.8					
ND	4340.00		N	RI_RT	449	.06	.17	.07	#	17	7	1.00	N	.021	2.1					
ND	4345.00		N	RI_RT	453	.06	.19	.07	#	20	8	.97	N	.018	1.9					
ND	4350.00		N	RI_RT	450	.11	.23	.11	.33	25	11	.92	N	.022	2.4					
ND	4355.00		N	RI_RT	446	.14	.18	.06	#	19	7	.94	N	.035	3.7	42.1	18.2	39.7	2.31	.21
ND	4360.00		N	RI_RT	#	.14	.17	.07	#	18	8	.93	N	.023	2.5					
ND	4365.00		N	RI_RT	446	.24	.26	.09	.48	25	8	1.05	N	.064	6.1	61.1	12.0	26.9	5.09	.47
ND	4370.00		N	RI_RT	450	.09	.15	.15	#	16	16	.94	N	.020	2.1					
ND	4375.00		N	RI_RT	447	.15	.19	.11	#	19	11	.98	N	.018	1.8					
ND	4380.00		N	RI_RT	451	.06	.18	.11	#	19	12	.92	N	.012	1.3					
ND	4385.00		N	RI_RT	453	.05	.17	.09	#	19	10	.91	N	.014	1.5					
ND	4390.00		N	RI_RT	453	.06	.16	.06	#	18	7	.86	N	.015	1.7					
ND	4395.00		N	RI_RT	455	.05	.15	.19	#	16	21	.89	N	.012	1.3					
ND	4400.00		N	RI_RT	452	.10	.19	.11	#	20	11	.96	N	.023	2.4					
ND	4405.00		N	RI_RT	444	.14	.22	.09	.39	23	9	.96	N	.017	1.8					
ND	4410.00		N	RI_RT	451	.11	.19	.03	#	20	3	.98	N	.025	2.6					
ND	4415.00		N	RI_RT	441	.29	.30	.17	.49	28	16	1.09	N	.035	3.2	46.5	18.6	34.9	2.50	.23
ND	4420.00	4425.00	N	RI_RT	442	.12	.17	.09	#	20	10	.86	N	.021	2.4					
ND	4430.00		N	RI_RT	444	.19	.21	.28	.47	22	29	.95	N	.022	2.3					
ND	4435.00	4445.00	N	RI_RT	443	.14	.24	.09	.36	26	9	.93	N	.026	2.8					
ND	4450.00		N	RI_RT	442	.07	.16	.09	#	19	11	.84	N	.022	2.6					
ND	4455.00		N	RI_RT	445	.11	.26	.11	.31	28	12	.93	N	.030	3.2	49.2	19.7	31.1	2.50	.21
ND	4465.00		N	RI_RT	441	.09	.22	.11	.29	24	13	.89	N	.022	2.5					
ND	4480.00		N	RI_RT	439	.15	.22	.05	.40	23	6	.98	N	.033	3.4	46.3	26.5	27.2	1.75	.24

TABLE 3

## ISOTOPIC AND CHROMATOGRAPHIC RATIOS

LAB REF.	DEPTH (m)	CARBON ISOTOPIC RATIOS	CHROMATOGRAPHIC RATIOS						
			SAT	SATURATED HC				AROMATIC HC	
				PR/ nC17	PH/ nC18	PR/PH	A/B	MPI1	MPI3
B13780	4210	#	.38	.35	1.18	1.08	.55	.70	1.89
B13728	4260-4265	-28.5	.39	.33	1.27	1.16	.60	.71	2.20
B13747	4365	-27.4	.35	.21	1.75	1.66	.65	.75	2.37

## CARBON ISOTOPIC RATIOS :

UNITS ARE IN PER MIL / PDB

SAT = SATURATED FRACTION

# = ANALYSIS NOT POSSIBLE

## SATURATED HYDROCARBON RATIOS :

PR = PRISTANE ; PH = PHYTANE

A = PRISTANE/nC17 ; B = PHYTANE/nC18

## AROMATIC HYDROCARBON RATIOS :

MPI1 =  $1.5(2MP+3MP)/(P+1MP+9MP)$ MPI3 =  $(2-MP+3-MP)/(1-MP+9-MP)$ 

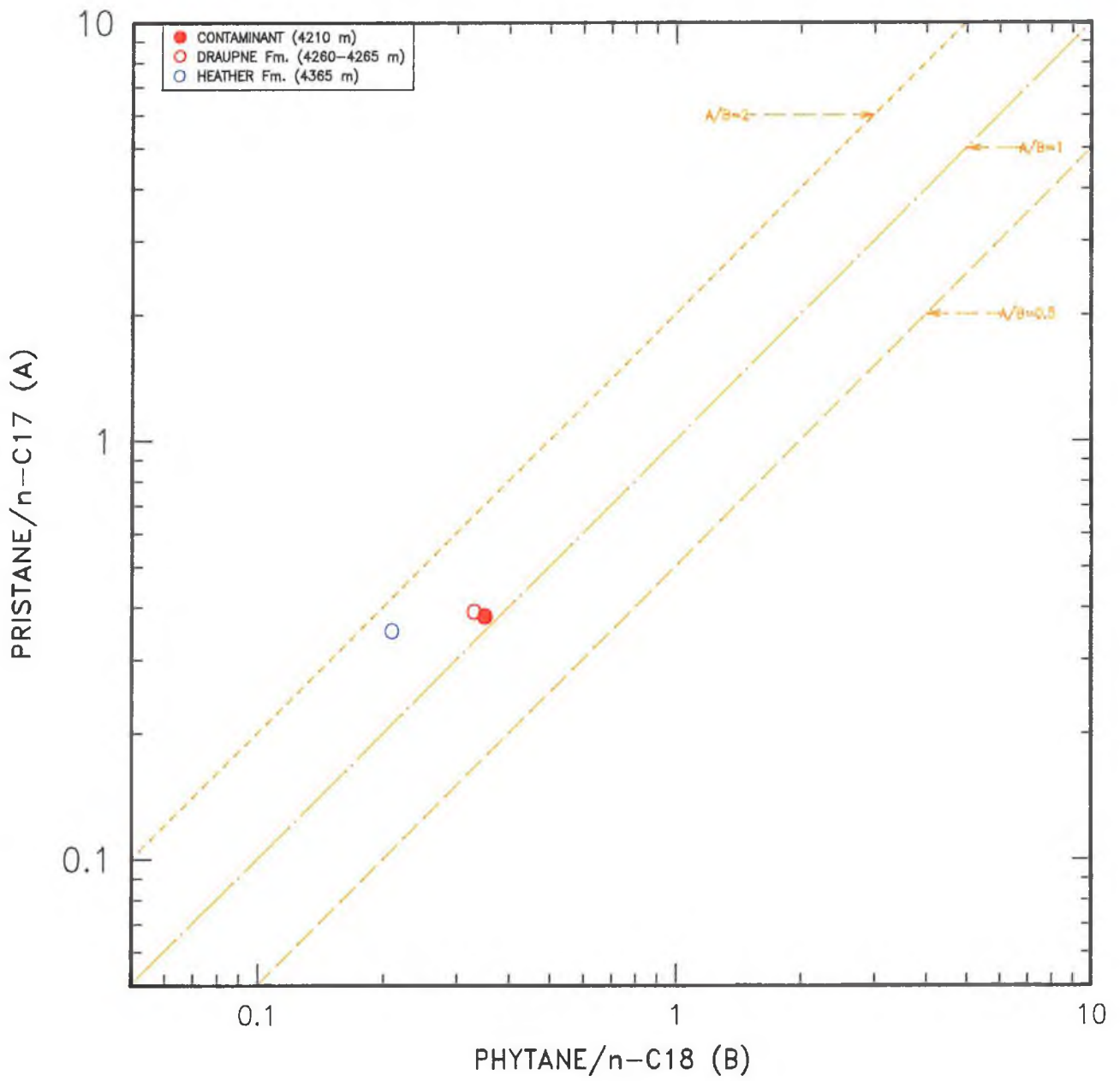
MP/P = SUM OF METHYL-PHENANTHRENES/PHENANTHRENE

**F I G U R E S**



### PRISTANE/n-C17 vs. PHYTANE/n-C18

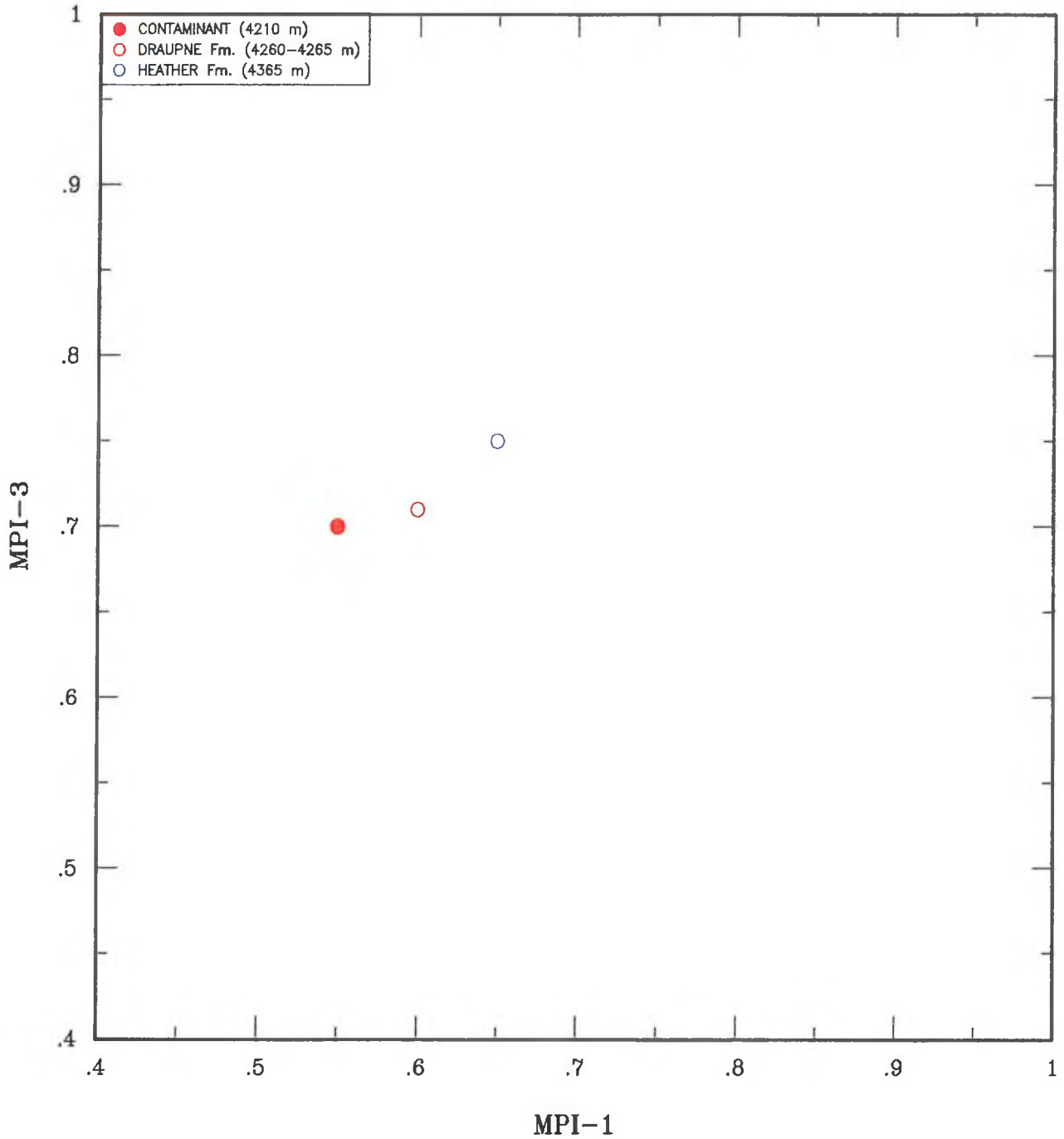
25/1-10





# METHYLPHENANTHRENE INDEX

25/1-10



**A N N E X E S**

COUNTRY : NORVEGE

WELL : 25/1-10

IDENTIFICATION : CONTAMINANT

DEPTH : 4210m

Composition of total product (%)

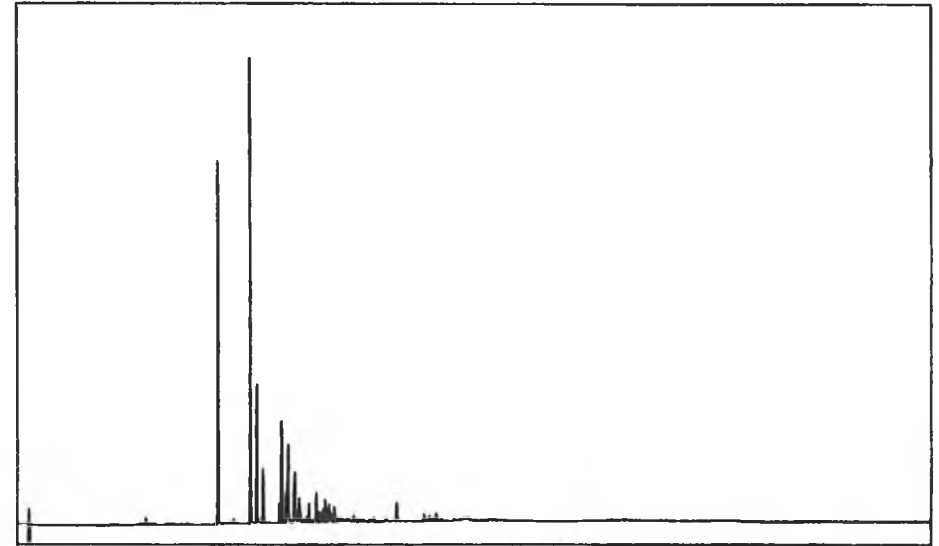
ASPHALTENES

AROMATIC HC : 7.5

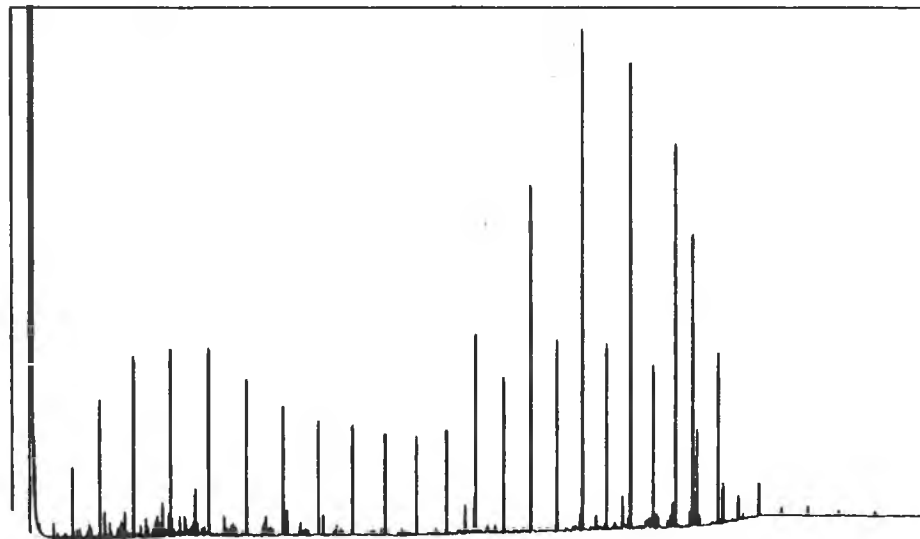
RESINS : 84.1

SATURATED HC : 8.4

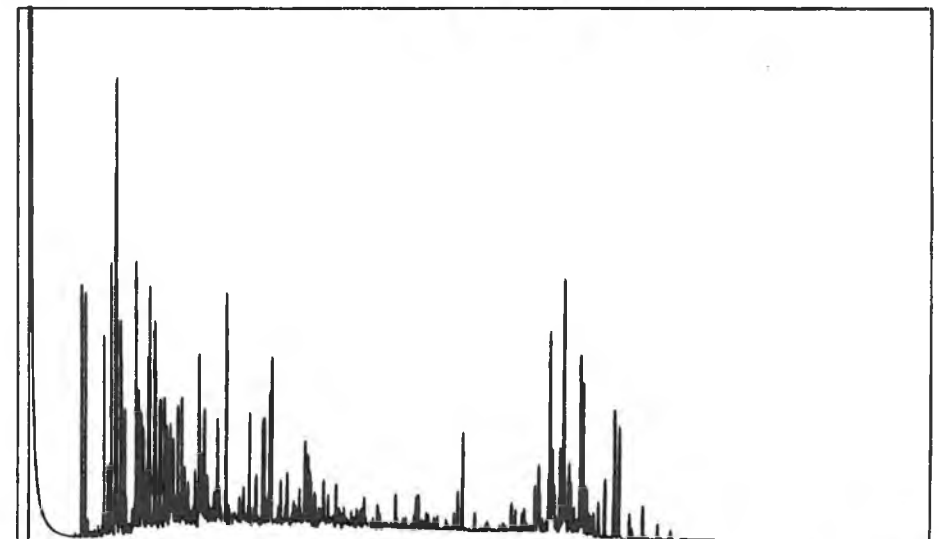
S/A : 1.12



SULFUR COMPOUNDS



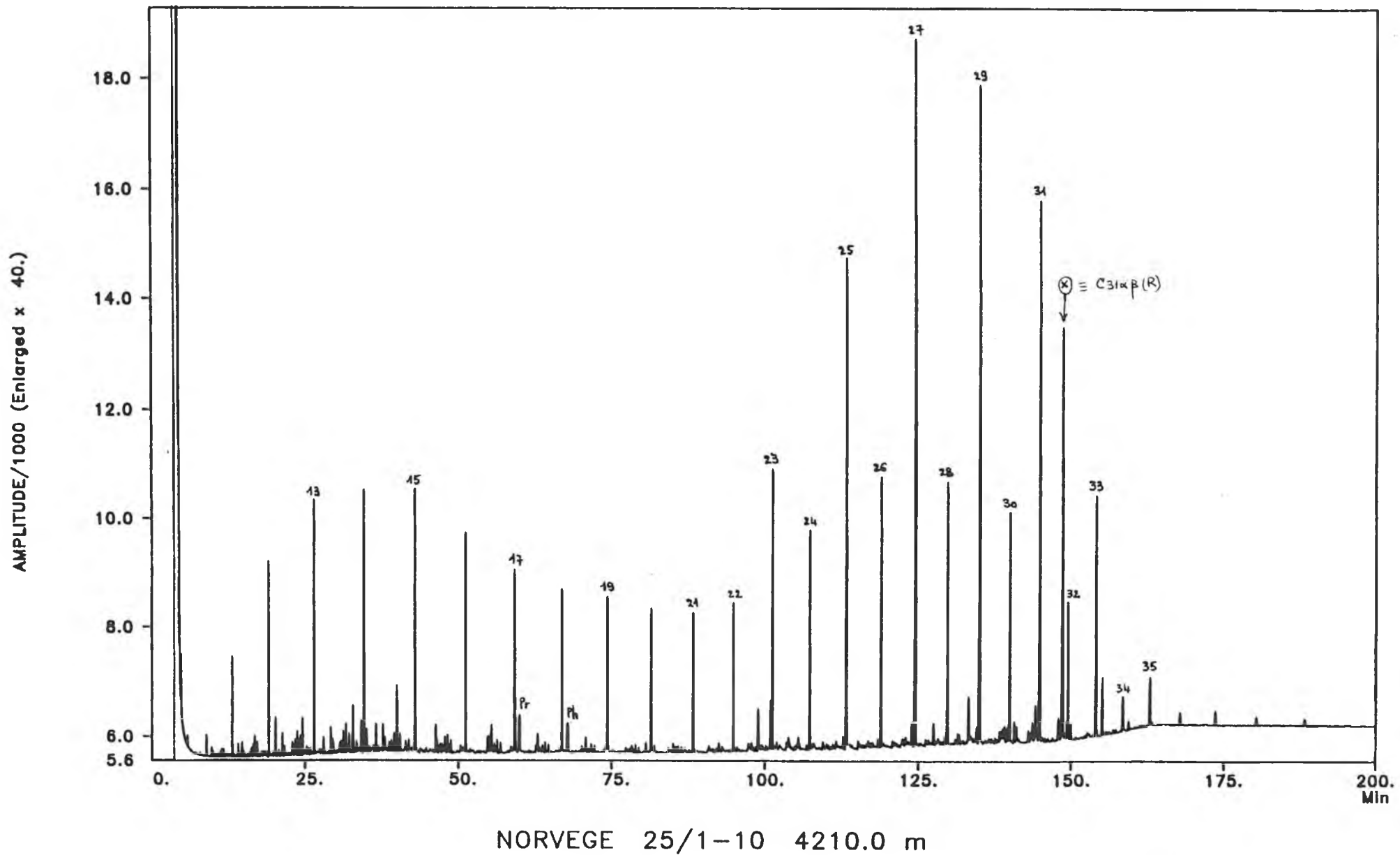
SATURATED HC



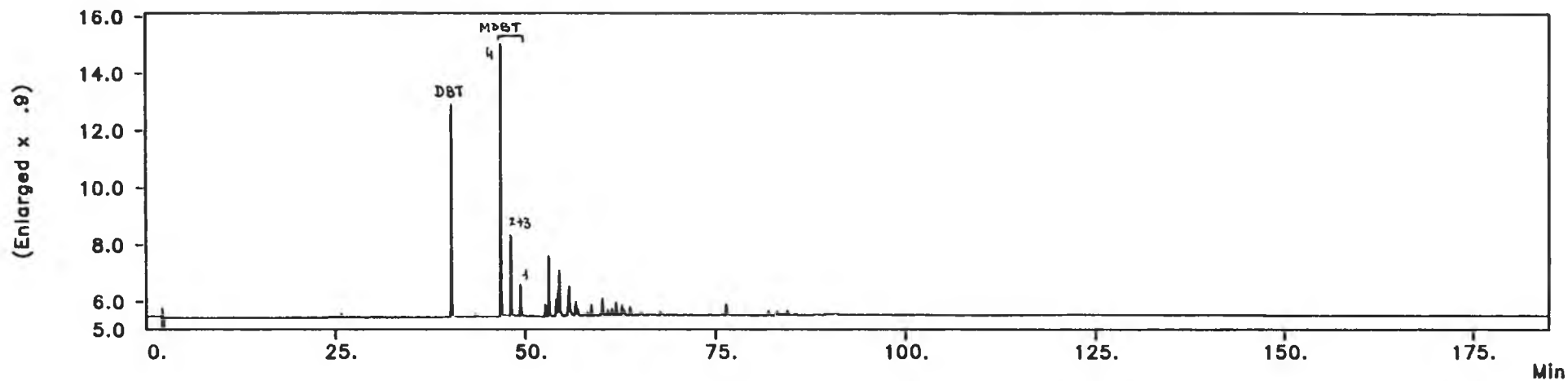
AROMATIC HC

INFORM

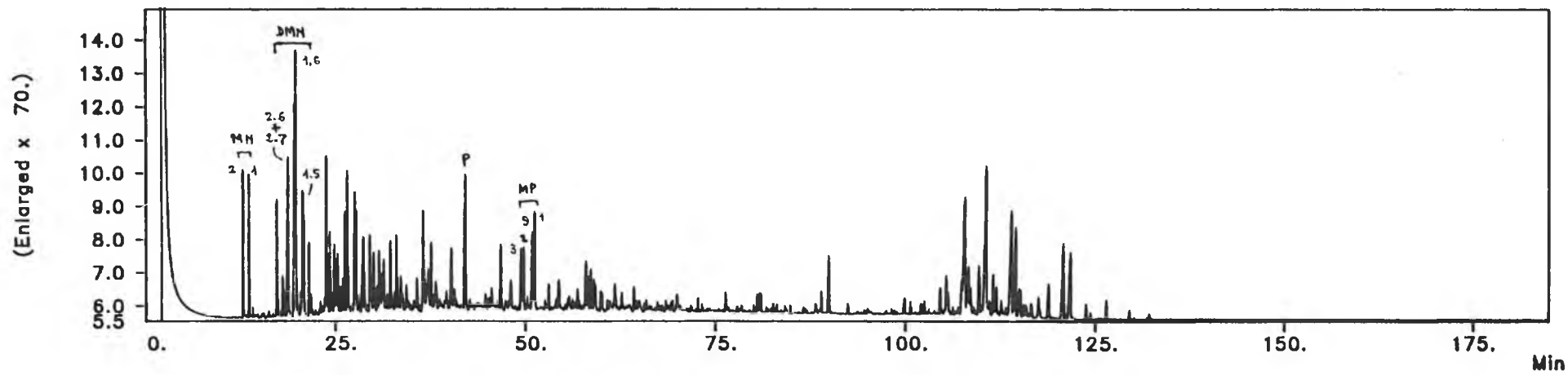
# CHROMATOGRAM OF THE SATURATED HC







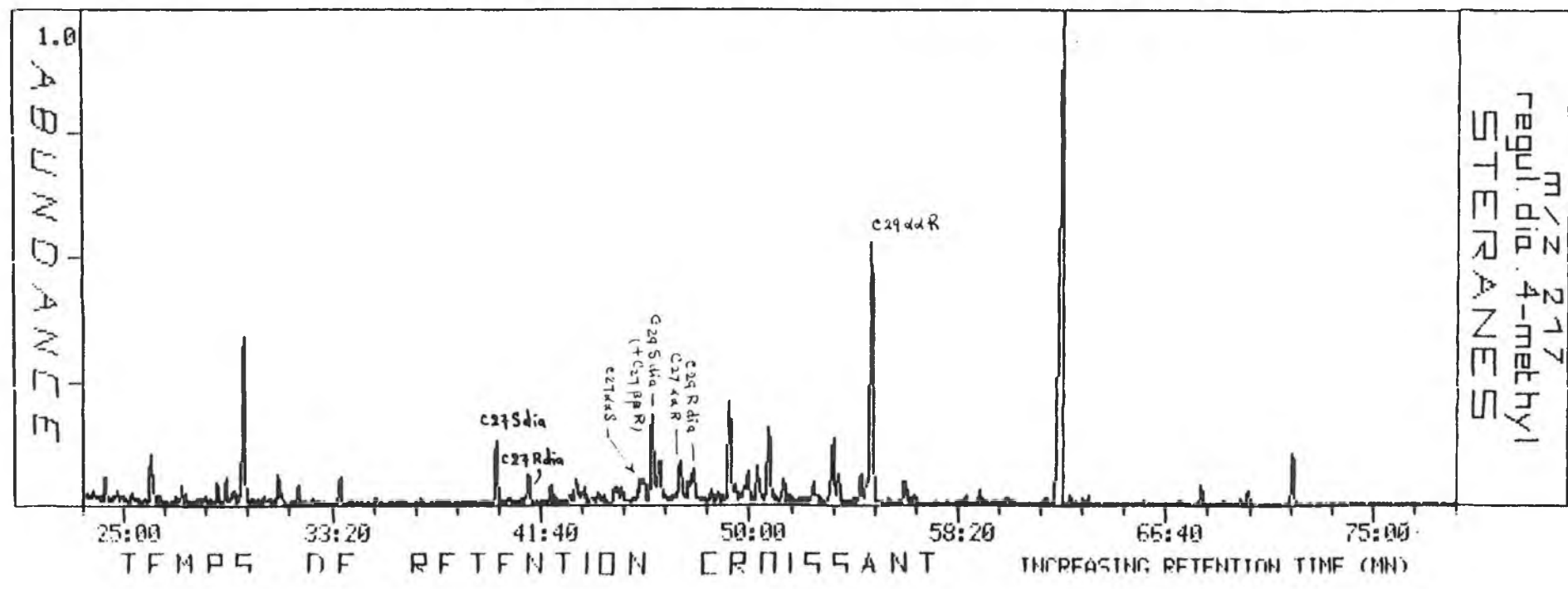
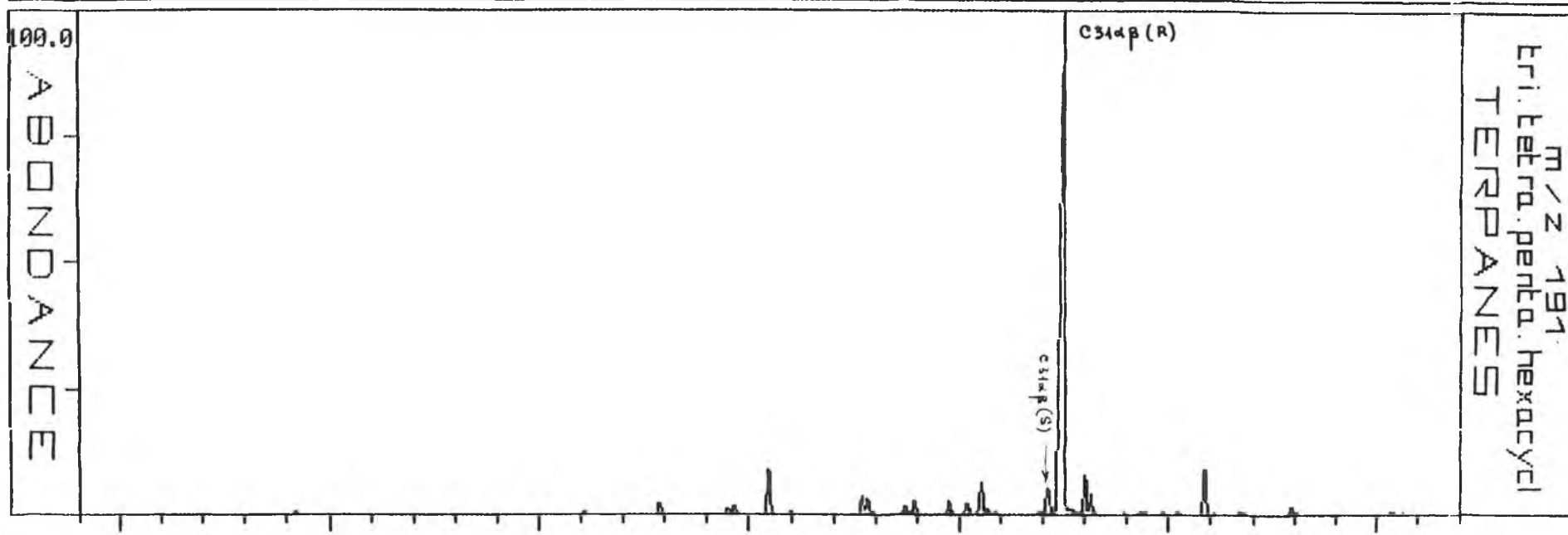
FPB13780NO



FIB13780NO

25/1-10 4210.0 m

PAYS / COUNTRY	SONDAGE / ALL	IDENTIFICATION	COTE / DEPTH
NO	25/1-10	B0 B137805T	4210.0 -4210.0 M



S N E A (P) Organic Geochemistry  
 Computerized GC/MS Analytical Report on Steranes and Terpanes nr. 1806

Sample..... : 25/1-10 B13780. BO NO  
 Well Depth..... : 4210.0 (Meters)  
 Particularities II. : /  
 Acquisition File Name : B13780STM Mag tape /  
 Submitted by..... : KT september 21. , 1989.  
 Particularities I. : ND

S T E R A N E S		Areas	T E R P A N E S		Areas
C21	Sterane.....	nd	C23	tricyclic.....	ns
C22	4-Methyl Sterane	nd	C24	tetracyclic.....	ns
C23	Sterane.....	nd	Ts.....		nd
C27	S Diasterane.....	nd	Tm.....		nd
C27	aa S Sterane.....	1117.	29	ab Hopane.....	84742.
C27	bb R Sterane.....	3240.	30	ab Hopane.....	59410.
C27	bb S Sterane.....	2011.	30	ba Hopane.....	nd
C27	aa R Sterane.....	1788.	31	ab S Homohopane..	nd
C29	aa S Sterane.....	980.	31	ab R Homohopane..	nd
C29	bb R Sterane.....	3222.	32	ab S Homohopane..	nd
C29	bb S Sterane.....	1681.	32	ab R Homohopane..	nd
C29	aa R Sterane.....	11910.	TOTAL	TERPANES.....	5187590.
TOTAL	STERANES.....	74072.			

OPTIONAL ANALYSIS		Areas	OPTIONAL ANALYSIS		Areas
C30	tricyclic, 22 S..	ns	C35	ab S Homohopane.	nd
C30	tricyclic, 22 R..	ns	C35	ab R Homohopane.	nd
29	Desmethyl Hopane.	ns			
C28	Bisnorhopane.....	ns			
C29/5	(RT. > 29 ab)..	90151.			
18	a(H) Oleanane.....	ns			
Gammacerane.....		ns			
C33	ab S Homohopane.	nd			
C33	ab R Homohopane.	nd			
C35	Hexacyclic.....	ns			

## RESULTS :

27 bb S / 27 aa R ..	1.12	C29 DHop / C29 Hop .	v. low.
27 aa S / 27 aa R --	0.62	C28 BNHop / C29 Hop-	v. low.
27 S dia / 27 aa R	N / A	C29/5 / C29 Hop.....	1.06
22 4-Me st / 27 aa R	N / A	18 aH Olean/C30 Hop.	v. low.
% 20 S C27 .....	38.35	Gammacerane/C30 Hop.	v. low.
% bb C27 .....	64.37	30/3(R&S) / C29 Hop-	v. low.
		30/3(R&S) / 23/3.....	N / A
29 bb S / 29 aa R...	0.14	2. 35Hex/C35Hop (R&S).	N / A
29 aa S / 29 aa R...	0.08	C35H(R&S)/C33H(R&S).	N / A
27 S dia / 29 aa R..	N / A	29+30Hop/C35 H(R&S).	N / A
22 4-Me st / 29 aa R	N / A		
% 20 S C29 .....	14.95		
% bb C29 .....	27.55		
21 st / 22 st .....	N / A		
22 4-Me st / 22 st--	N / A		
C29 H / C30 H .....	1.42		
Tm / Ts .....	N / A		
23/3 / 24/4 .....	N / A		
% 22 S C31 .....	N / A		
% 22 S C32 .....	N / A		
ba / ab ---- X 100 -	N / A		
23/3 / 21 st .....	N / A		
TT / ST .....	70.03		

Country NO  
25/1-10

Identification ND  
4260 4265 M  
(Lab. Ref. B13728)

TOC (%) 1.71  
S2 (mg/g) .79  
HI (mg/g) 46  
PI .36

Tmax (C) 436

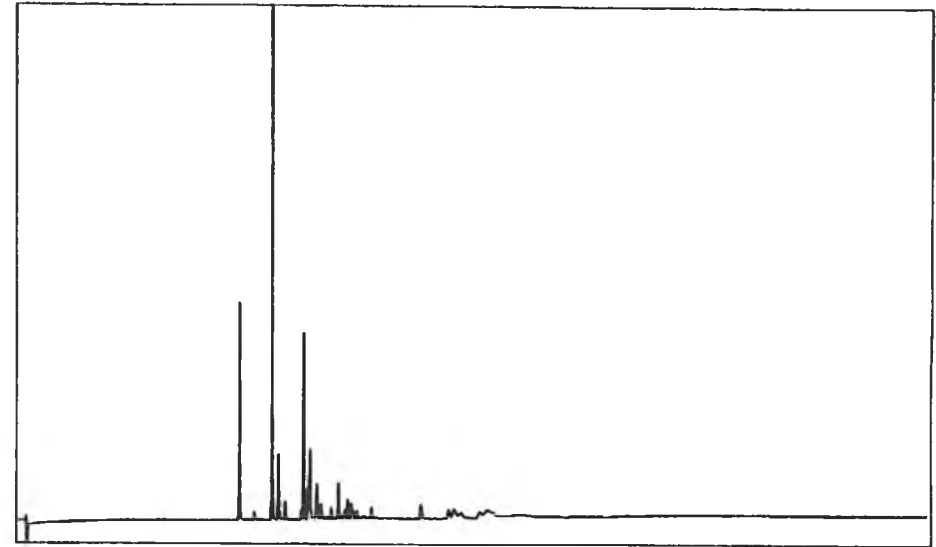
EOM .0967

SAT HC 35.80 (% EOM)  
ARO HC 15.80 (% EOM)  
NSO 48.40 (% EOM)

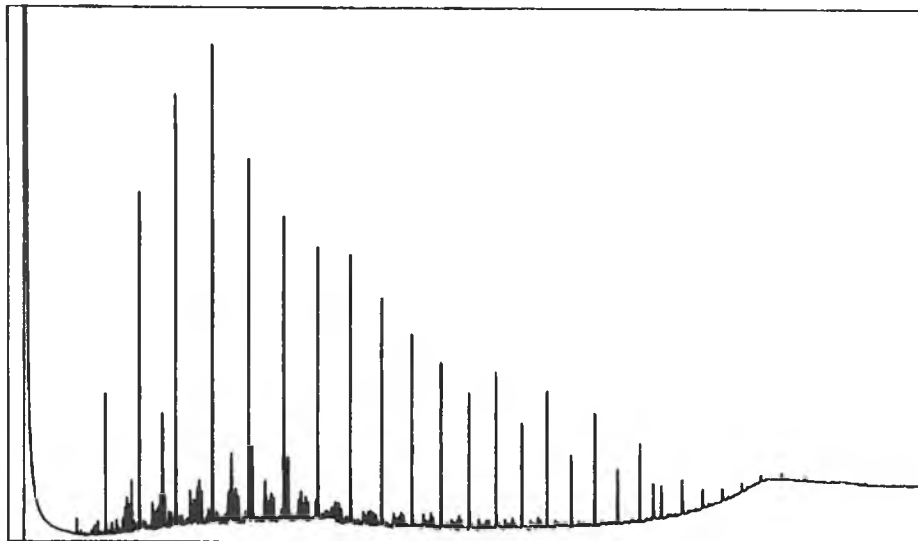
Age/Formation DRAUPNE Fm

d13C SAT -28.5

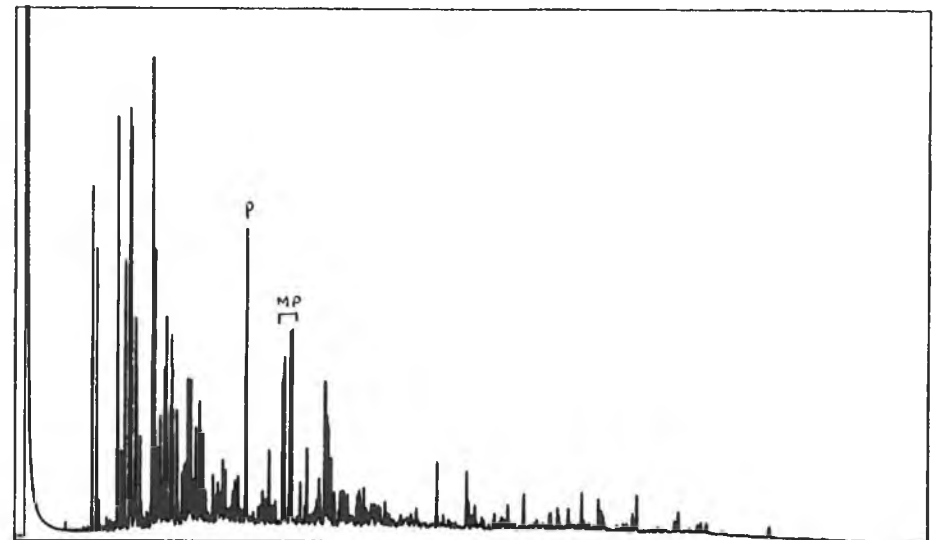
Lithology SHALE GREY-BROWNISH GREY, SLIGHTLY SILTY-SILTY, MICROMICACEOUS



SULFUR COMPOUNDS



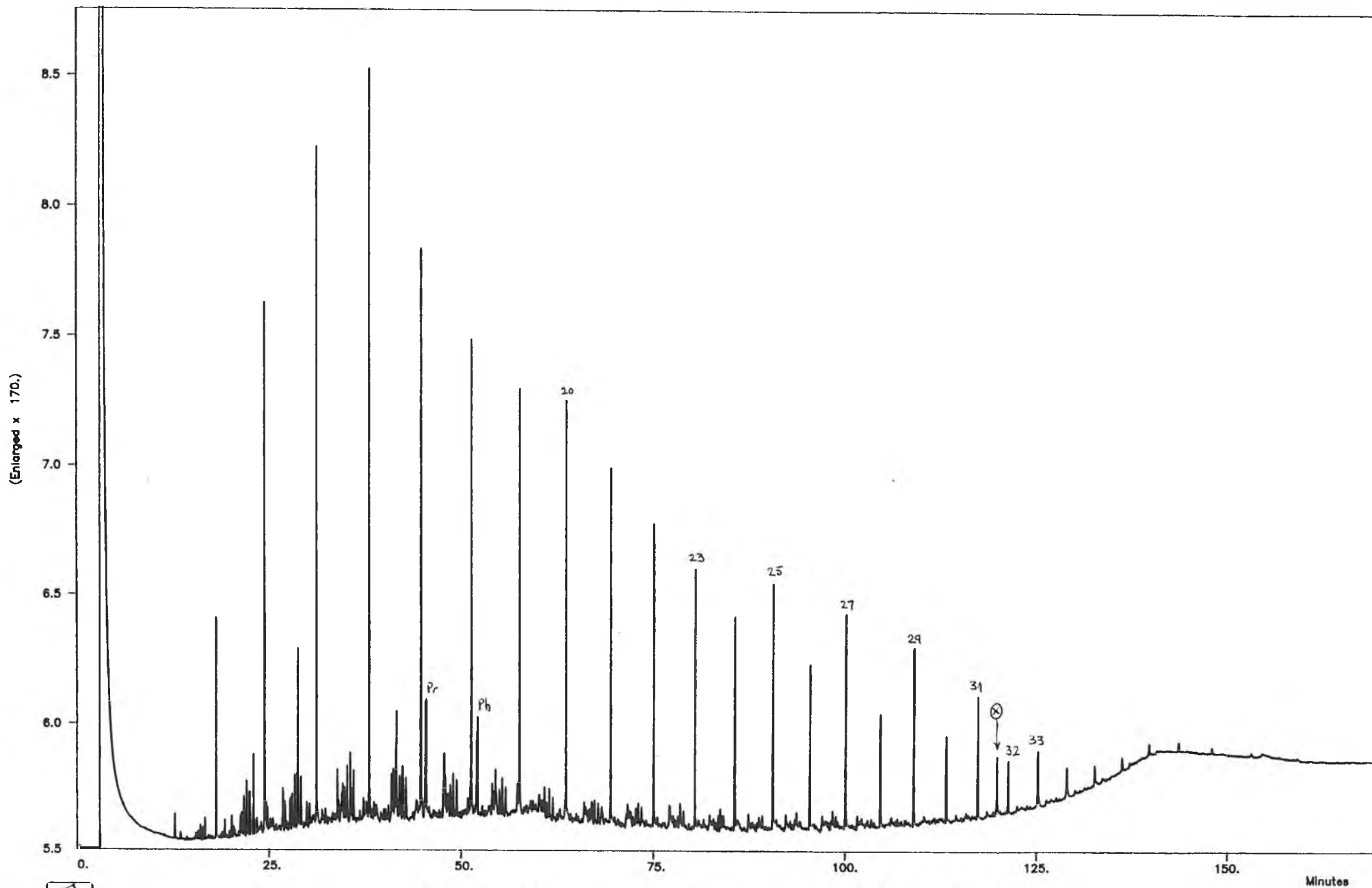
SATURATED HC



AROMATIC HC



elf aquitaine



CHROMATOGRAMME DES HC SATURES / CHROMATOGRAM OF SATURATED HC



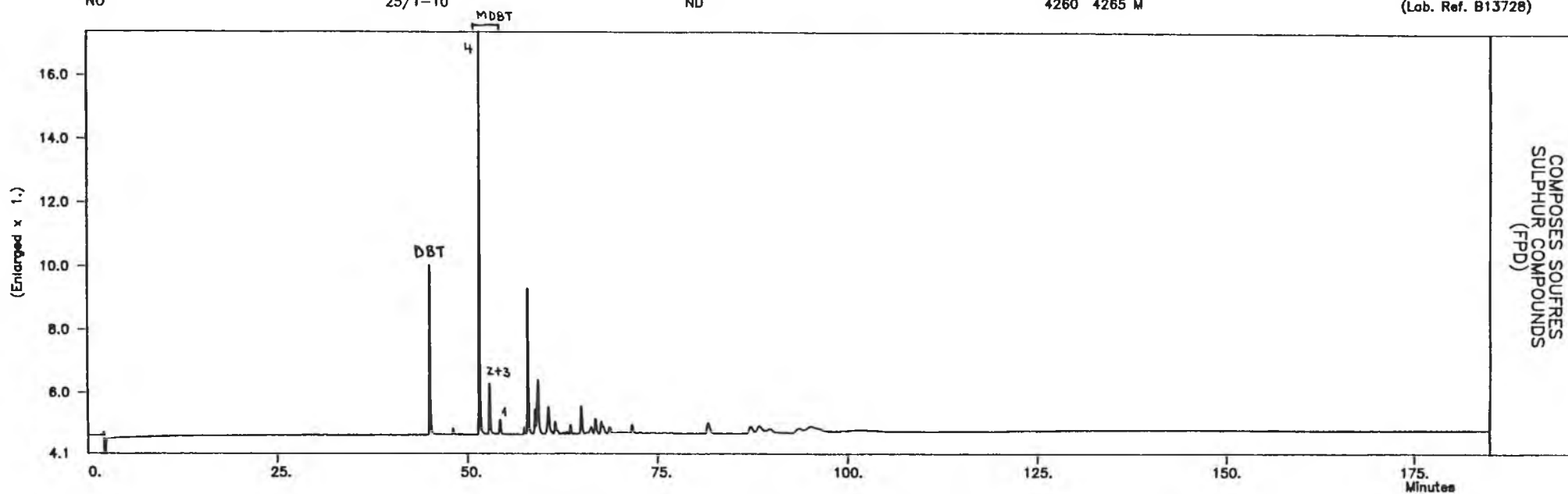
NO

25/1-10

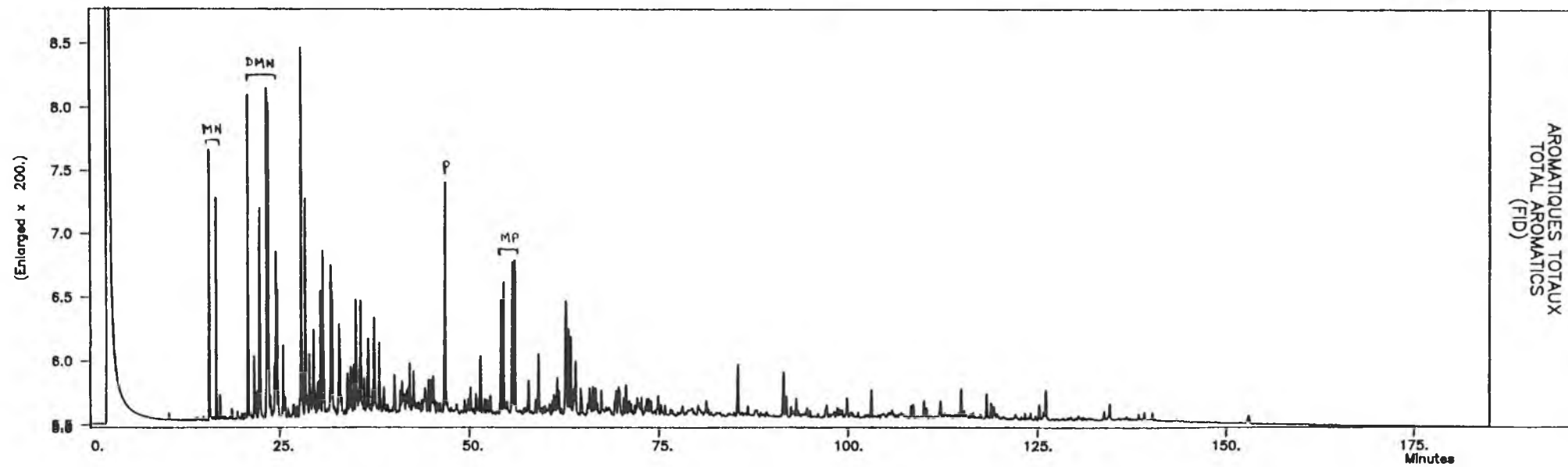
ND

4260 4265 M

(Lab. Ref. B13728)



COMPOSES SULFURES  
SULPHUR COMPOUNDS  
(FPD)

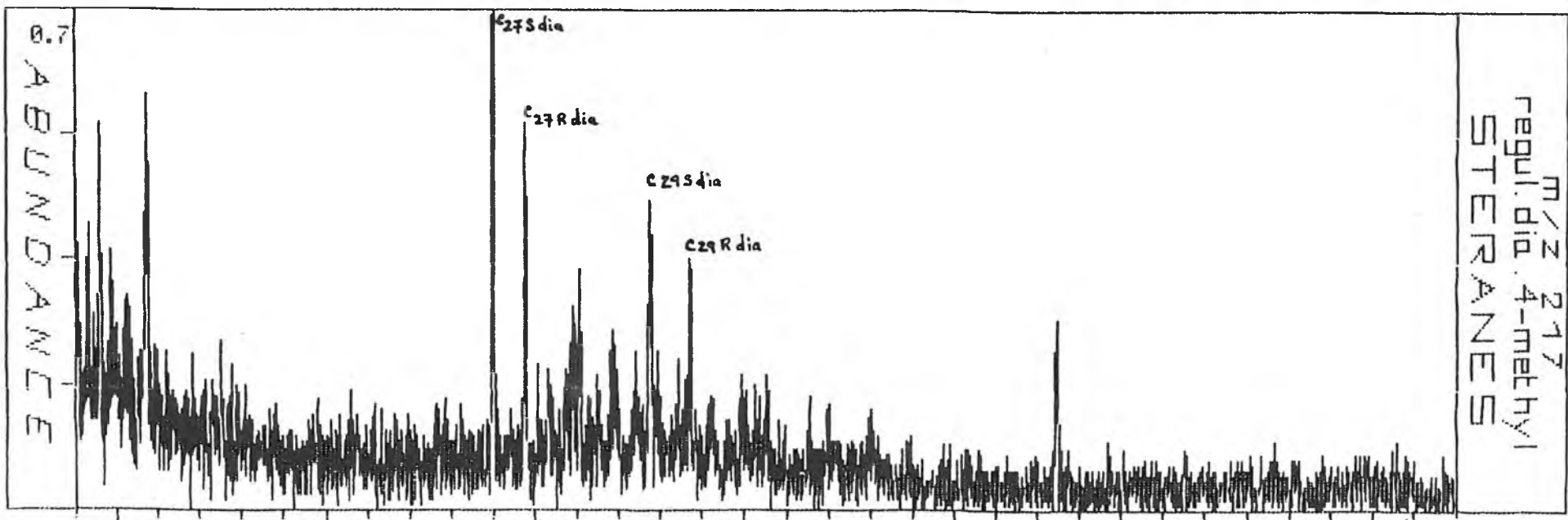
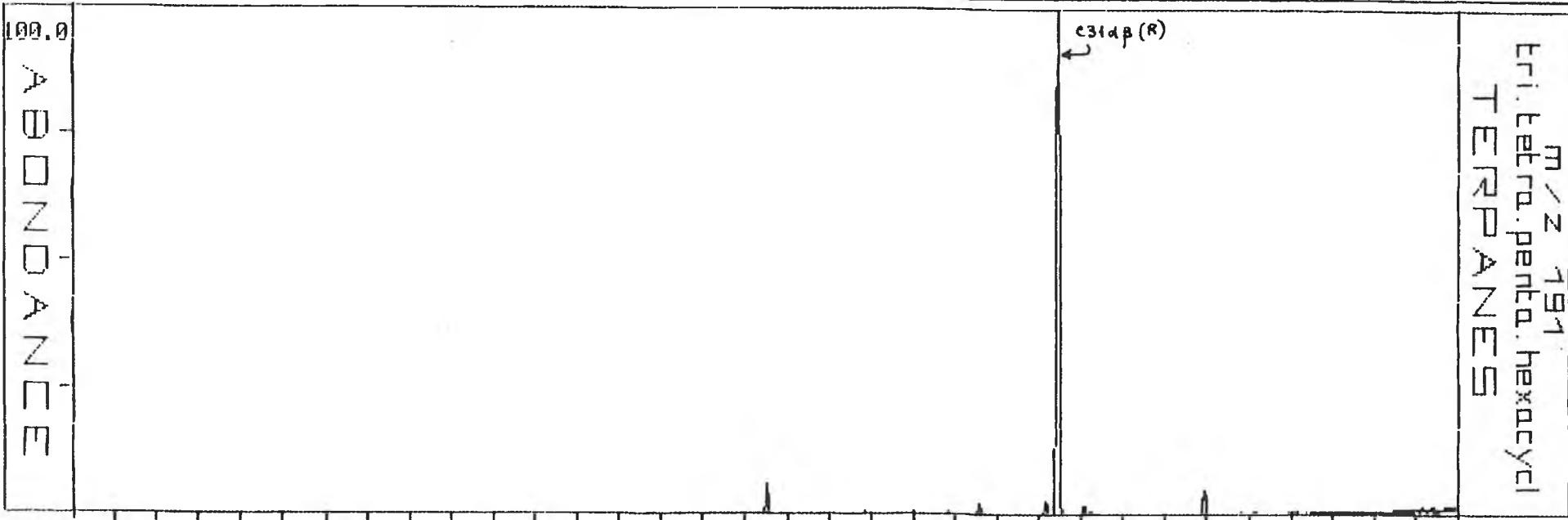


AROMATIQUES TOTAUX  
TOTAL AROMATICS  
(FID)

CHROMATOGRAMME DES HC AROMATIQUES/ CHROMATOGRAM OF AROMATIC HC



PLANT / COUNTRY	SONDAGE / WELL	IDENTIFICATION	DATE / DEPTH
NO	25/1-10	8137285T	4260-4265 M



S N E A (P) Organic Geochemistry  
 Computerized GC/MS Analytical Report on Steranes and Terpanes nr. 1804

Sample..... : 25/1-10 B13728. ST NO  
 Well Depth..... : 4260. to 4265. (Meters)  
 Particularities II. : /  
 Acquisition File Name : B13728STM Mag tape /  
 Submitted by..... : KT september 21. , 1989.  
 Particularities I. : ND

S T E R A N E S		Areas	T E R P A N E S		Areas
C21	Sterane.....	nd	C23	tricyclic.....	ns
C22	4-Methyl Sterane	nd	C24	tetracyclic.....	ns
C22	Sterane.....	nd	Ts.....		ns
C27	S Diasterane....	666.	Tm.....		ns
C27	aa S Sterane.....	nd	29	ab Hopane.....	ns
C27	bb R Sterane.....	nd	30	ab Hopane.....	ns
C27	bb S Sterane.....	nd	30	ba Hopane.....	ns
C27	aa R Sterane.....	nd	31	ab S Homohopane..	ns
C29	aa S Sterane.....	nd	31	ab R Homohopane..	ns
C29	bb R Sterane.....	nd	32	ab S Homohopane..	ns
C29	bb S Sterane.....	nd	32	ab R Homohopane..	ns
C29	aa R Sterane.....	nd	TOTAL TERPANES		146963.
TOTAL STERANES		5664.			

OPTIONAL ANALYSIS		Areas	OPTIONAL ANALYSIS		Areas
C30	tricyclic, 22 S..	ns	C35	ab S Homohopane.	nd
C30	tricyclic, 22 R..	ns	C35	ab R Homohopane.	nd
C29	Desmethyl Hopane.	ns			
C28	Bisnorhopane....	ns			
C29/5	(RT. > 29 ab)..	ns			
18	a(H) Oleanane....	ns			
Gammacerane	.....	ns			
C33	ab S Homohopane.	nd			
C33	ab R Homohopane.	nd			
C35	Hexacyclic.....	ns			

## RESULTS :

27 bb S / 27 aa R ..	N / A	C29 DHop / C29 Hop .	N / A
27 aa S / 27 aa R --	N / A	C28 BNHop / C29 Hop-	N / A
27 S dia / 27 aa R	N / A	C29/5 / C29 Hop.....	N / A
22 4-Me st / 27 aa R	N / A	18 aH Olean/C30 Hop.	N / A
% 20 S C27 .....	N / A	Gammacerane/C30 Hop.	N / A
% bb C27 .....	N / A	30/3(R&S) / C29 Hop-	N / A
		30/3(R&S) / 23/3.....	N / A
29 bb S / 29 aa R...	N / A	2. 35Hex/C35Hop(R&S).	N / A
29 aa S / 29 aa R...	N / A	C35H(R&S)/C33H(R&S).	N / A
27 S dia / 29 aa R..	N / A	29+30Hop/C35 H(R&S).	N / A
22 4-Me st / 29 aa R	N / A		
% 20 S C29 .....	N / A		
% bb C29 .....	N / A		
21 st / 22 st .....	N / A		
22 4-Me st / 22 st--	N / A		
C29 H / C30 H .....	N / A		
Tm / Ts .....	N / A		
23/3 / 24/4 .....	N / A		
% 22 S C31 .....	N / A		
% 22 S C32 .....	N / A		
ba / ab ----- X 100 -	N / A		
23/3 / 21 st .....	N / A		
TT / ST .....	25.94		



Country NO  
25/1-10

Identification ND  
4365 M  
(Lab. Ref. B13747)

TOC (%) 1.05  
S2 (mg/g) .26  
HI (mg/g) 25  
PI .48

Tmax (C) 446

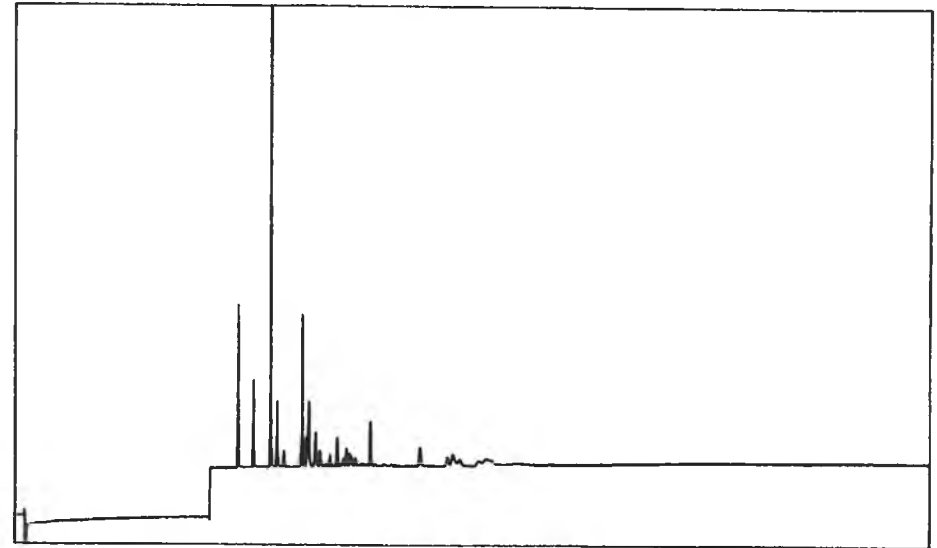
EOM .0738

SAT HC 57.70 (% EOM)  
ARO HC 11.70 (% EOM)  
NSO 30.80 (% EOM)

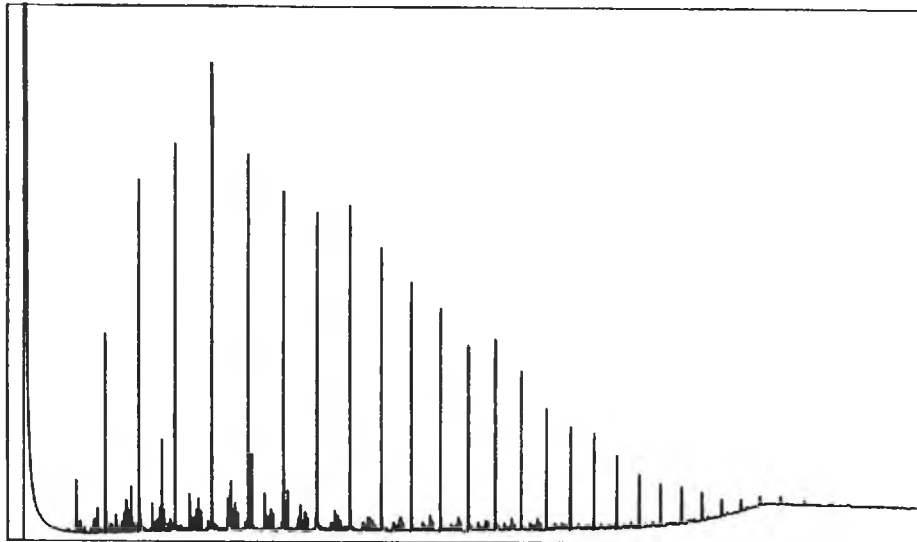
Age/Formation HEATHER Fm

Lithology SHALE GREY-BROWNISH GREY, SLIGHTLY SILTY-SILTY, MICROMICACEOUS

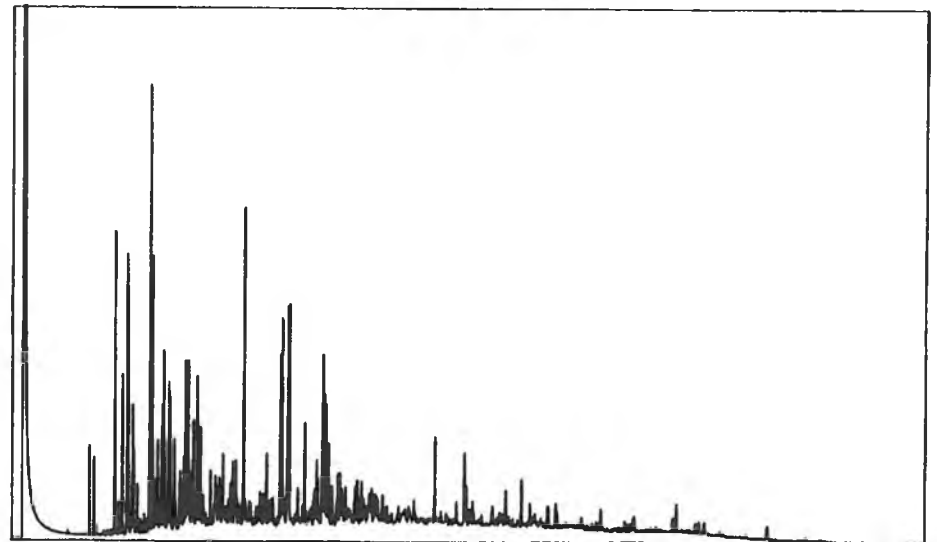
$\delta^{13}C$  SAT -27.4



SULFUR COMPOUNDS



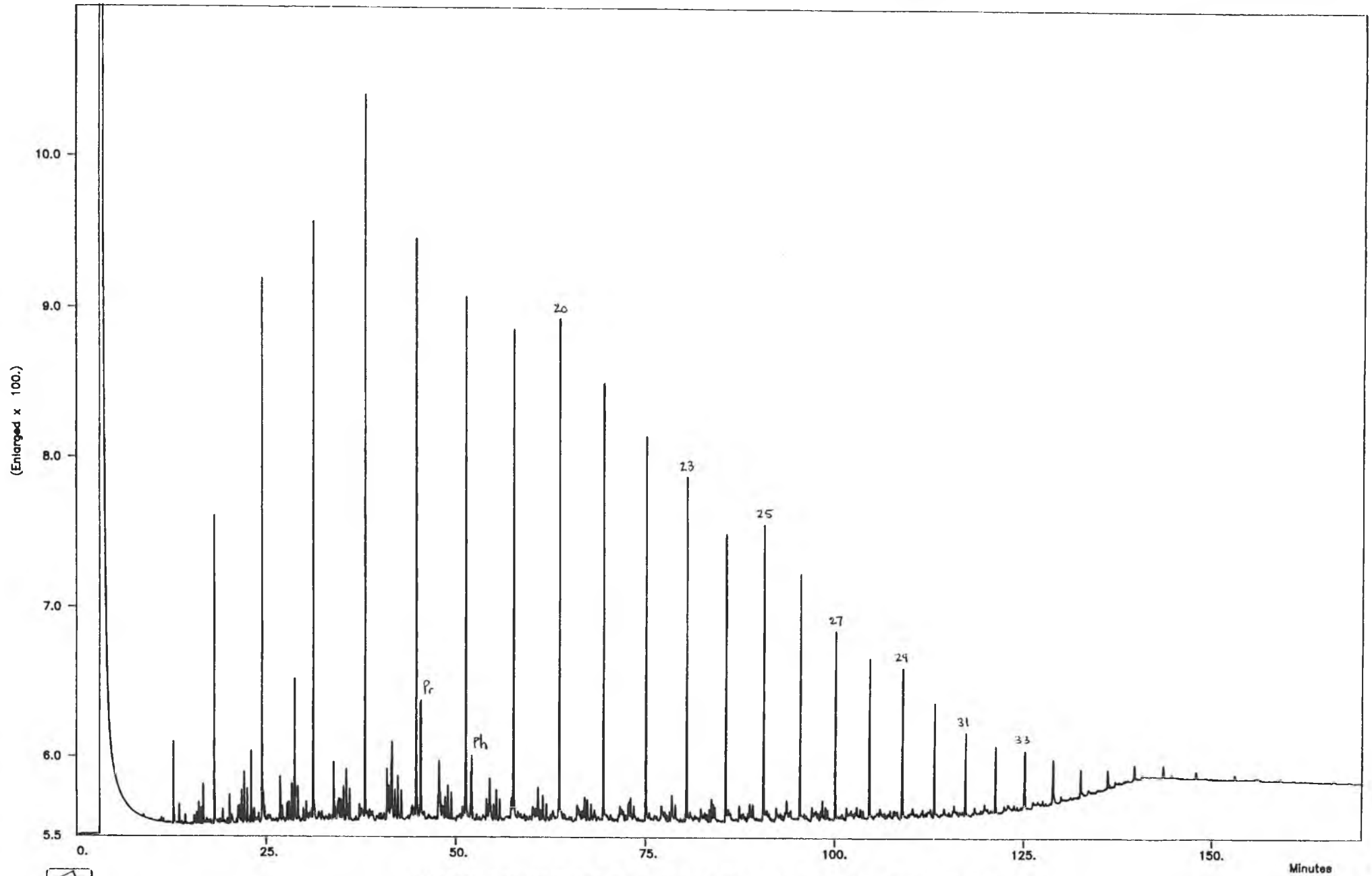
SATURATED HC



AROMATIC HC



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CHROMATOGRAMME DES HC SATURES / CHROMATOGRAM OF SATURATED HC



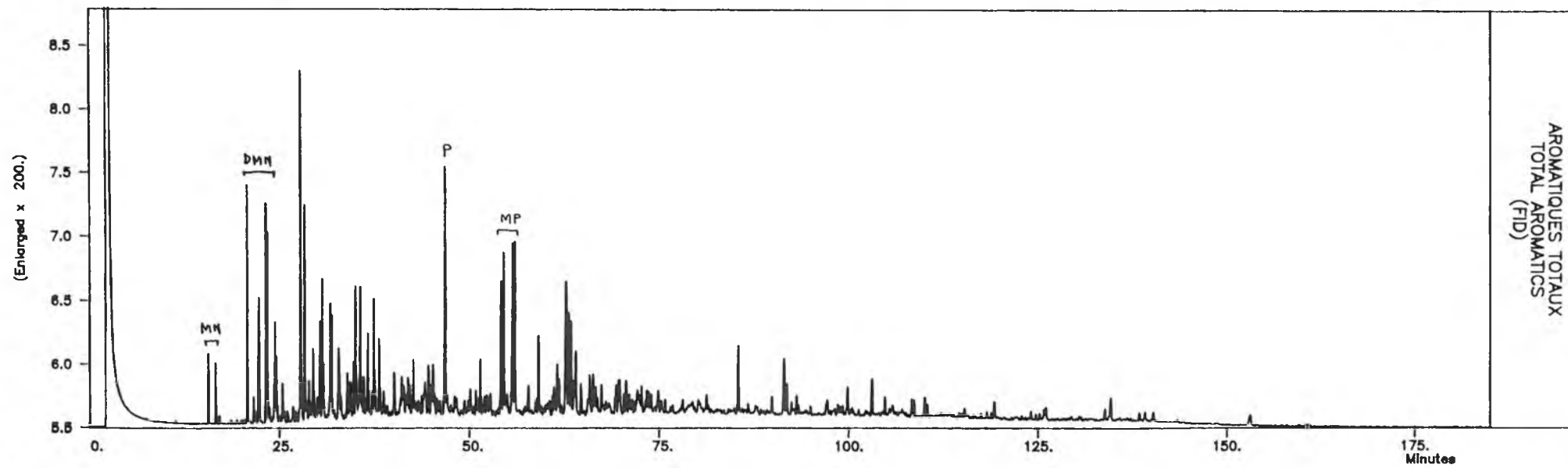
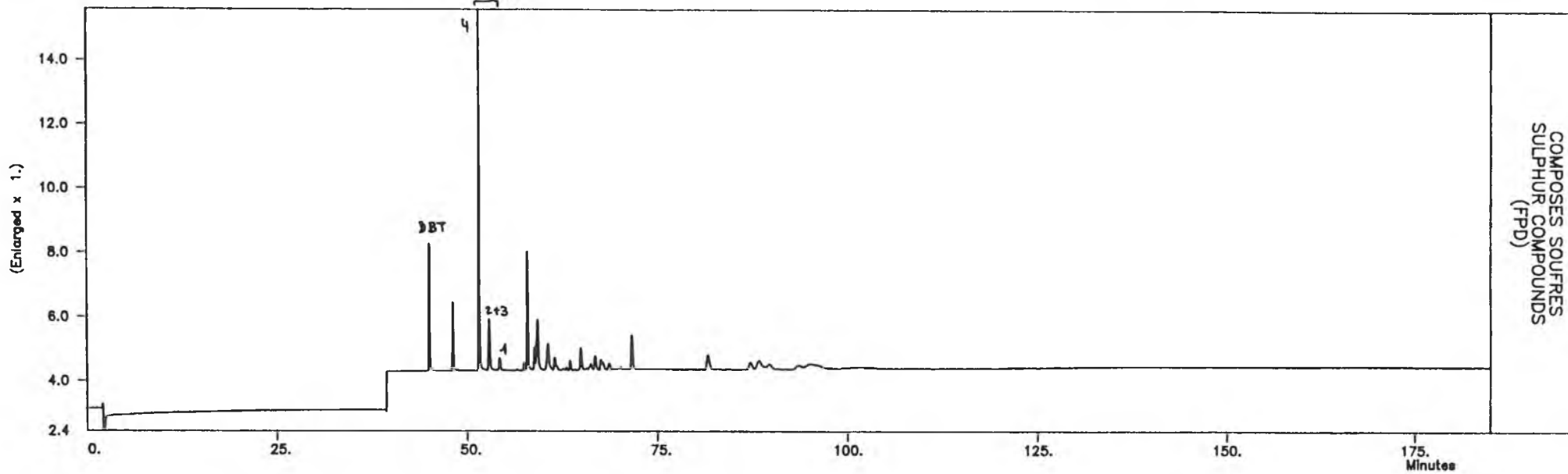
NO

25/1-10

ND

4365 M

(Lab. Ref. B13747)

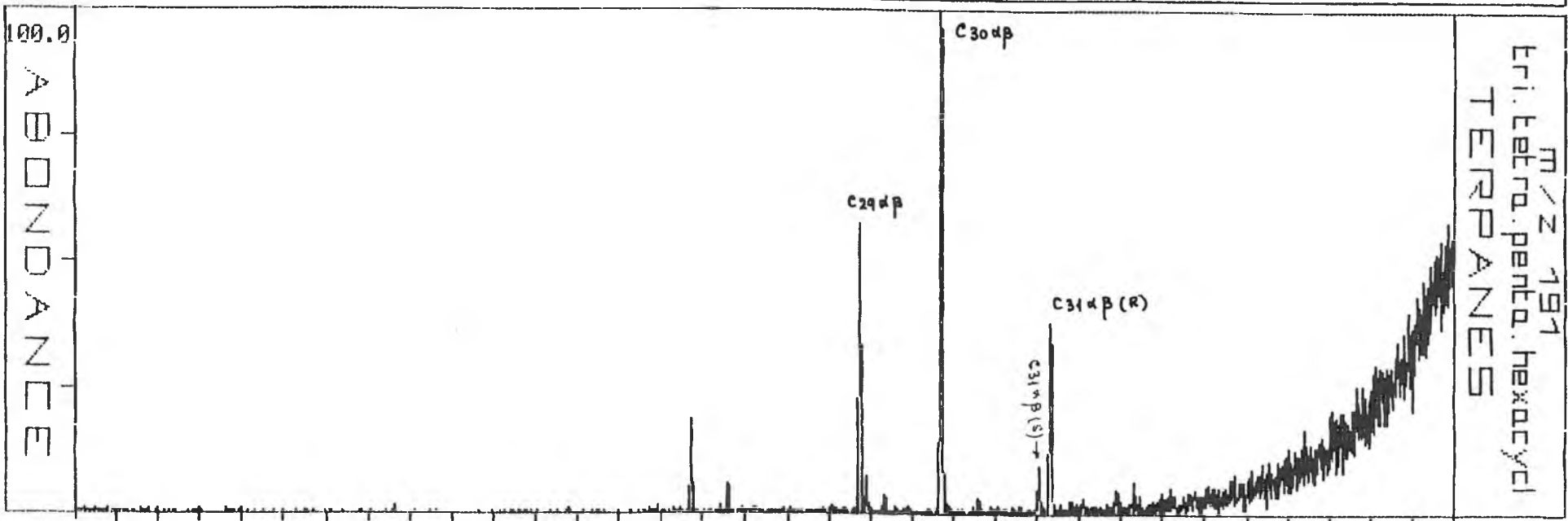


CHROMATOGRAMME DES HC AROMATIQUES/ CHROMATOGRAM OF AROMATIC HC

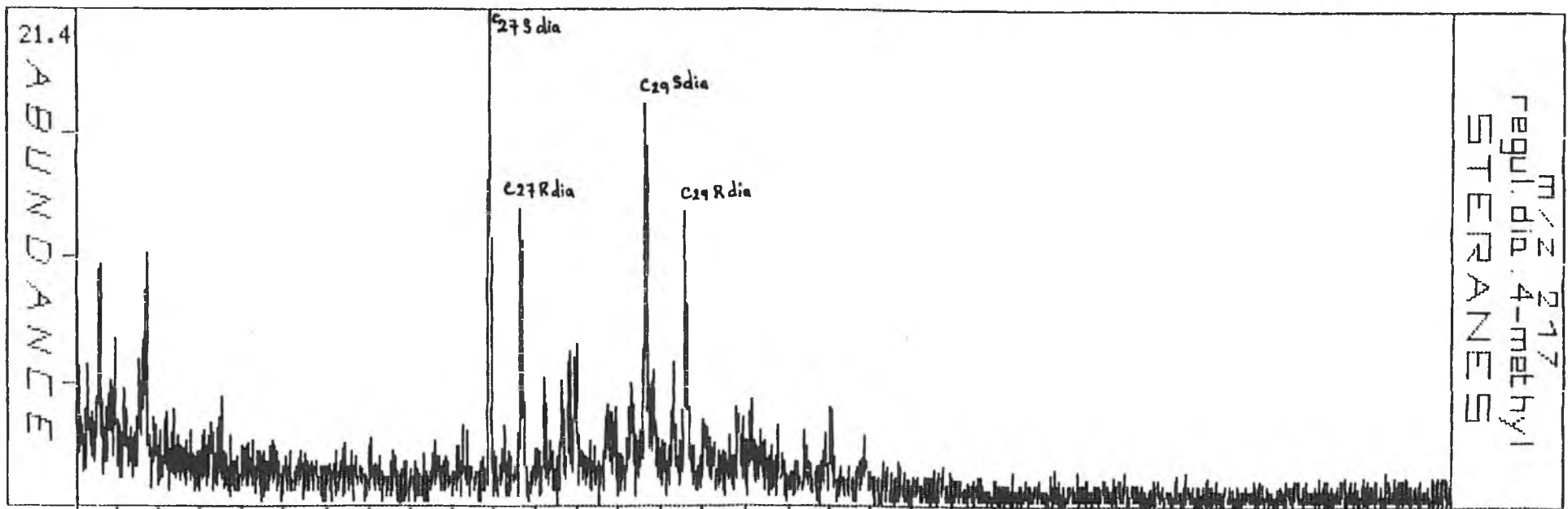


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PLATE / COUNTRY	SUNDAGE / LL	IDENTIFICATION	COTE / DEPTH
NO	25/1-10	B13747ST ND	4365.M



M/Z 191  
tri. tetr. penta. hexacycl  
TERPANES



M/Z 217  
regul. dia. 4-methyl  
STERANES

25:00 33:20 41:40 50:00 58:20 66:40 75:00  
RETENTION TIME (MIN)

S N E A (P) Organic Geochemistry  
 Computerized GC/MS Analytical Report on Steranes and Terpanes nr. 1805

Sample..... : 25/1-10 B13747. ST NO  
 Well Depth..... : 4365. to 4365. (Meters)  
 Particularities II. : /  
 Acquisition File Name : B13747STM Mag tape /  
 Submitted by..... : KT september 21. , 1989.  
 Particularities I. : ND

S T E R A N E S		Areas	T E R P A N E S		Areas
C21	Sterane.....	nd	C23	tricyclic.....	ns
C22	4-Methyl Sterane	nd	C24	tetracyclic.....	ns
C23	Sterane.....	nd	Ts.....		834.
C27	S Diasterane.....	1146.	Tm.....		258.
C27	aa S Sterane.....	nd	29	ab Hopane.....	2646.
C27	bb R Sterane.....	nd	30	ab Hopane.....	4600.
C27	bb S Sterane.....	nd	30	ba Hopane.....	ns
C27	aa R Sterane.....	nd	31	ab S Homohopane..	431.
C27	aa S Sterane.....	nd	31	ab R Homohopane..	1696.
C29	bb R Sterane.....	nd	32	ab S Homohopane..	ns
C29	bb S Sterane.....	nd	32	ab R Homohopane..	ns
C29	aa R Sterane.....	nd	TOTAL	TERPANES.....	13998.
TOTAL	STERANES.....	12990.			

OPTIONAL ANALYSIS		Areas	OPTIONAL ANALYSIS		Areas
C30	tricyclic, 22 S..	ns	C35	ab S Homohopane.	nd
C30	tricyclic, 22 R..	ns	C35	ab R Homohopane.	nd
29	Desmethyl Hopane.	ns			
C28	Bisnorhopane....	ns			
C29/5	(RT. > 29 ab)...	345.			
18	a(H) Oleanane....	ns			
	Gammacerane.....	ns			
C33	ab S Homohopane.	nd			
C33	ab R Homohopane.	nd			
C35	Hexacyclic.....	ns			

## RESULTS :

27	bb S / 27	aa R ..	N / A	C29	DHop / C29 Hop .	v. low.
27	aa S / 27	aa R --	N / A	C28	BNHop / C29 Hop-	v. low.
27	S dia / 27	aa R	N / A	C29/5	/ C29 Hop.....	0.13
22	4-Me st / 27	aa R	N / A	18	aH Olean/C30 Hop.	v. low.
%	20 S C27		N / A	Gammacerane/C30	Hop.	v. low.
%	bb C27		N / A	30/3(R&S) / C29	Hop-	v. low.
29	bb S / 29	aa R...	N / A	30/3(R&S) / 23/3		N / A
29	aa S / 29	aa R...	N / A	2.35Hex/C35Hop	(R&S).	N / A
27	S dia / 29	aa R..	N / A	C35H(R&S)/C33H	(R&S).	N / A
22	4-Me st / 29	aa R	N / A	29+30Hop/C35	H(R&S).	N / A
%	20 S C29		N / A			
%	bb C29		N / A			
21	st / 22	st .....	N / A			
22	4-Me st / 22	st--	N / A			
C29	H / C30	H .....	0.57			
Tm	/ Ts		0.30			
23/3	/ 24/4		N / A			
%	22 S C31		20.27			
%	22 S C32		N / A			
ba	/ ab	---- X 100 -	N / A			
23/3	/ 21	st .....	N / A			
TT	/ ST		1.07			