

Prepared for

**FINA EXPLORATION NORWAY INC**

**ANALYTICAL DATA FOR CRUDE OILS,  
NORWEGIAN CONTINENTAL SHELF**

**JULY 1993**

**Geochem Group Limited**

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## GENERAL COMMENT

Only limited amounts of sample material were available for this study. In consequence some analyses had to be omitted. Distillations were difficult with only 3g of crude oil.

It was not possible to perform the following analyses

- a) %S: HA 565
- b) % N<sub>2</sub>: HA 565
- c) Ni, V: HA 565
- d) Distillation:
- e) Carbon isotopes:

TABLE 1  
 CRUDE OIL COMPOSITION - PHYSICAL

JOB 8237						
GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	SPECIFIC GRAVITY (g/cc)	API GRAVITY	VISCOSITY (cp)	POUR POINT (°C)	DISTILLAT TO 210°C (%)

8237-015 HA 565

46.00

TABLE 2  
CRUDE OIL COMPOSITION - CHEMICAL

JOB 8237	DEPTH/ IDENTITY	WAX CONTENT (%)	WAX MELTING POINT (°C)	SULPHUR  (%)	NITROGEN  (%)	V  (ppm)	Ni  (ppm)
GEOCHEM SAMPLE NUMBER							
8237-015	HA 565	3	30				

TABLE 3  
COMPOSITION (NORMALISED %) OF C<sub>15+</sub> MATERIAL

JOB 8237 GEOCHEM SAMPLE NUMBER	L I T H O	DEPTH/ IDENTITY	HYDROCARBONS		NON HYDROCARBONS		
			Saturates	Aromatics	Preciptd. Asphaltenes	Eluted NSO's	Non-Eluted NSO's
8237-015		HA 565	61.11	25.59	2.62	10.39	0.28

TABLE 4  
SIGNIFICANT C<sub>15+</sub> RATIOS

JOB 8237	L I T H O	DEPTH/ IDENTITY	TOC (%)	mg/g TOC						HYDROCARBONS % TOTAL EXTRACT	SATURATES AROMATICCS
				TOTAL EXTRACT	SATURATES	AROMATICCS	TOTAL HYDROCARBONS	ELUTED NSO's	ASPHALTENES		

8237-015

HA 565

86.70

2.39

TABLE 5  
COMPOSITION (NORMALISED %) OF C<sub>15+</sub> SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	015
DEPTH	HA 565
SAMPLE TYPE	
nC15	10.00
nC16	9.51
nC17	8.83
nC18	8.09
nC19	7.91
nC20	7.48
nC21	6.78
nC22	5.78
nC23	5.85
nC24	5.32
nC25	4.72
nC26	4.01
nC27	3.41
nC28	2.91
nC29	2.55
nC30	2.13
nC31	1.95
nC32	1.49
nC33	0.74
nC34	0.39
nC35	0.15
Paraffin	22.66
Isoprenoid	2.87
Naphthene	74.47
CPI 1 Index	1.04
CPI 2 Index	1.04
CPI 3 Index	0.99
Prist/Phytane	1.40
Prist/nC17	0.49
Phytane/nC18	0.39

Job Number : 8237

$$C.P.I. 1 = \frac{1}{2} \left[ \frac{C_{21} + C_{23} + C_{25} + C_{27}}{C_{20} + C_{22} + C_{24} + C_{26}} + \frac{C_{21} + C_{23} + C_{25} + C_{27}}{C_{22} + C_{24} + C_{26} + C_{28}} \right]$$

$$C.P.I. 2 = \frac{1}{2} \left[ \frac{C_{25} + C_{27} + C_{29} + C_{31}}{C_{24} + C_{26} + C_{28} + C_{30}} + \frac{C_{25} + C_{27} + C_{29} + C_{31}}{C_{26} + C_{28} + C_{30} + C_{32}} \right]$$

$$C.P.I. 3 = \frac{2 \times (C_{27})}{C_{26} + C_{28}}$$

CT - ditch cuttings CO - core SWC - sidewall core



TABLE 6  
COMPOSITION (PPM) OF C<sub>15+</sub> SATURATE (PARAFFIN - NAPHTHENE) HYDROCARBONS

GEOCHEM SAMPLE NUMBER	015
DEPTH	HA 565
SAMPLE TYPE	
nC15	22660
nC16	21550
nC17	20009
nC18	18332
nC19	17924
nC20	16950
nC21	15363
nC22	13097
nC23	13256
nC24	12055
nC25	10696
nC26	9087
nC27	7727
nC28	6594
nC29	5778
nC30	4827
nC31	4419
nC32	3376
nC33	1677
nC34	884
nC35	340
Paraffin	226600
Isoprenoid	28700
Naphthene	744700
CPI 1 Index	1.04
CPI 2 Index	1.04
CPI 3 Index	0.99
Prist/Phytane	1.40
Prist/nC17	0.49
Phytane/nC18	0.39

Job Number : 8237

$$C.P.I. 1 = \frac{1}{2} \left[ \frac{C_{21} + C_{23} + C_{25} + C_{27}}{C_{20} + C_{22} + C_{24} + C_{26}} + \frac{C_{21} + C_{23} + C_{25} + C_{27}}{C_{22} + C_{24} + C_{26} + C_{28}} \right]$$

$$C.P.I. 2 = \frac{1}{2} \left[ \frac{C_{25} + C_{27} + C_{29} + C_{31}}{C_{24} + C_{26} + C_{28} + C_{30}} + \frac{C_{25} + C_{27} + C_{29} + C_{31}}{C_{26} + C_{28} + C_{30} + C_{32}} \right]$$

$$C.P.I. 3 = \frac{2 \times (C_{27})}{C_{26} + C_{28}}$$

CT - ditch cuttings CO - core SWC - sidewall core

TABLE 7  
 CARBON ISOTOPE COMPOSITIONS (‰, PDB)

JOB 8237	DEPTH/ IDENTITY	TOTAL EXTRACT WHOLE OIL	SATURATES	AROMATICS	NSO	ASPHALTENES	KEROGEN	DISTILLATE
GEOCHEM SAMPLE NUMBER								

8237-015	HA 565	-29.16	-29.28	-28.35	-28.16	-28.41		-28.66
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TABLE 8

## HYDROGEN AND SULPHUR ISOTOPE COMPOSITIONS

GEOCHEM SAMPLE NUMBER	FINA IDENTIFICATION	$\delta D$ (‰, SMOW)	$\delta S$ (‰, CDT)
8327-015	HA 565	-135.0	ndp

( ) - small sample, treat data with caution

ndp - no determination possible, sample prepared and analysed, insufficient SO<sub>2</sub> to measure

TABLE 9  
DETAILED GASOLINE RANGE (C<sub>4</sub>-C<sub>7</sub>) COMPOSITION

GEOCHEM SAMPLE NUMBER	8237-015
DEPTH	HA 565
NORMALISED COMPOSITION	
isobutane	0.40
n-butane	2.49
isopentane	3.99
n-pentane	7.29
2,2-dimethylB	0.15
cyclopentane	1.17
2,3-dimethylB	0.63
2-methylP	5.02
3-methylP	3.11
n-hexane	10.77
methylCP	5.86
2,2-dimethylP	0.57
2,4-dimethylP	0.05
2,2,3-trimethylB	0.02
benzene	2.60
cyclohexane	7.40
3,3-dimethylP	0.00
1,1-dimethylCP	0.00
2-MH	5.26
2,3-dimethylP	0.51
3-MH	4.18
1,c,3-DMCP	1.33
1,t,3-DMCP	1.27
1,t,2-DMCP	2.58
3-ethylP	0.00
n-heptane(nC7)	12.67
methylCH	15.48
1,c,2-DMCP	0.00
toluene	5.20
ABUNDANCE	210782
nC7/C7NAPHTHENES	0.61
total MH/DMCP	1.82
1,t,2-/1,c,2-DMCP	0.00
nC6/methylCP	1.84
C6-C7 FRACTION	
%n-PARAFFINS	27.69
%iso-PARAFFINS	23.04
% NAPHTHENES	40.07
% AROMATICS	9.22

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 10  
DETAILED GASOLINE RANGE (C<sub>4</sub>-C<sub>7</sub>) COMPOSITION

GEOCHEM SAMPLE NUMBER	8237-015
DEPTH	HA 565
PPM COMPOSITION	
isobutane	843
n-butane	5248
isopentane	8410
n-pentane	15366
2,2-dimethylB	316
cyclopentane	2466
2,3-dimethylB	1328
2-methylP	10581
3-methylP	6555
n-hexane	22701
methylCP	12352
2,2-dimethylP	1201
2,4-dimethylP	105
2,2,3-trimethylB	42
benzene	5480
cyclohexane	15598
3,3-dimethylP	0
1,1-dimethylCP	0
2-MH	11087
2,3-dimethylP	1075
3-MH	8811
1,c,3-DMCP	2803
1,t,3-DMCP	2677
1,t,2-DMCP	5438
3-ethylP	0
n-heptane(nc7)	26706
methylCH	32629
1,c,2-DMCP	0
toluene	10961
ABUNDANCE	210782
nC7/C7NAPHTHENES	0.61
total MH/DMCP	1.82
1,t,2-/1,c,2-DMCP	0.00
nC6/methylCP	1.84
C6-C7 FRACTION	
%n-PARAFFINS	27.69
%iso-PARAFFINS	23.04
% NAPHTHENES	40.07
% AROMATICS	9.22

DMCP dimethylcyclopentane MH methylhexane B butane CH cyclohexane CP cyclopentane H hexane P pentane

TABLE 11  
METHYLPHENANTHRENE INDICES (MPI)

DB 8237 GEOCHEM SAMPLE NUMBER	DEPTH/ IDENTITY	SAMPLE TYPE	MPI 1		Rcalc		MPI 2	
			AREA	HEIGHT	AREA	HEIGHT	AREA	HEIGHT

8237-015	HA 565		0.78	0.81		0.86	0.91
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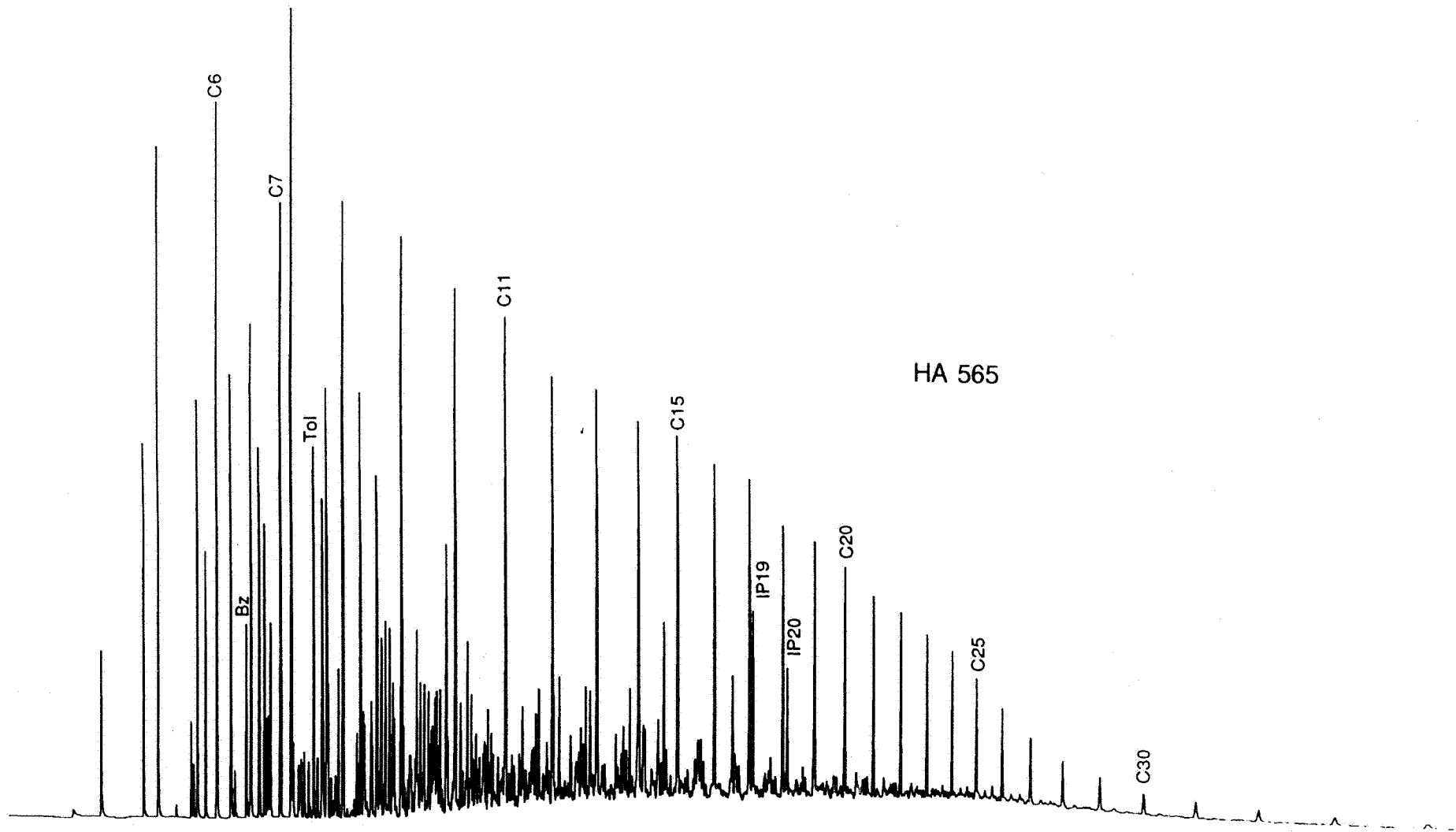
$$MPI\ 1 = \frac{1.5(2-MP + 3-MP)}{P + 1-MP + 9-MP}$$

$$MPI\ 2 = \frac{3(2-MP)}{P + 1-MP + 9-MP}$$

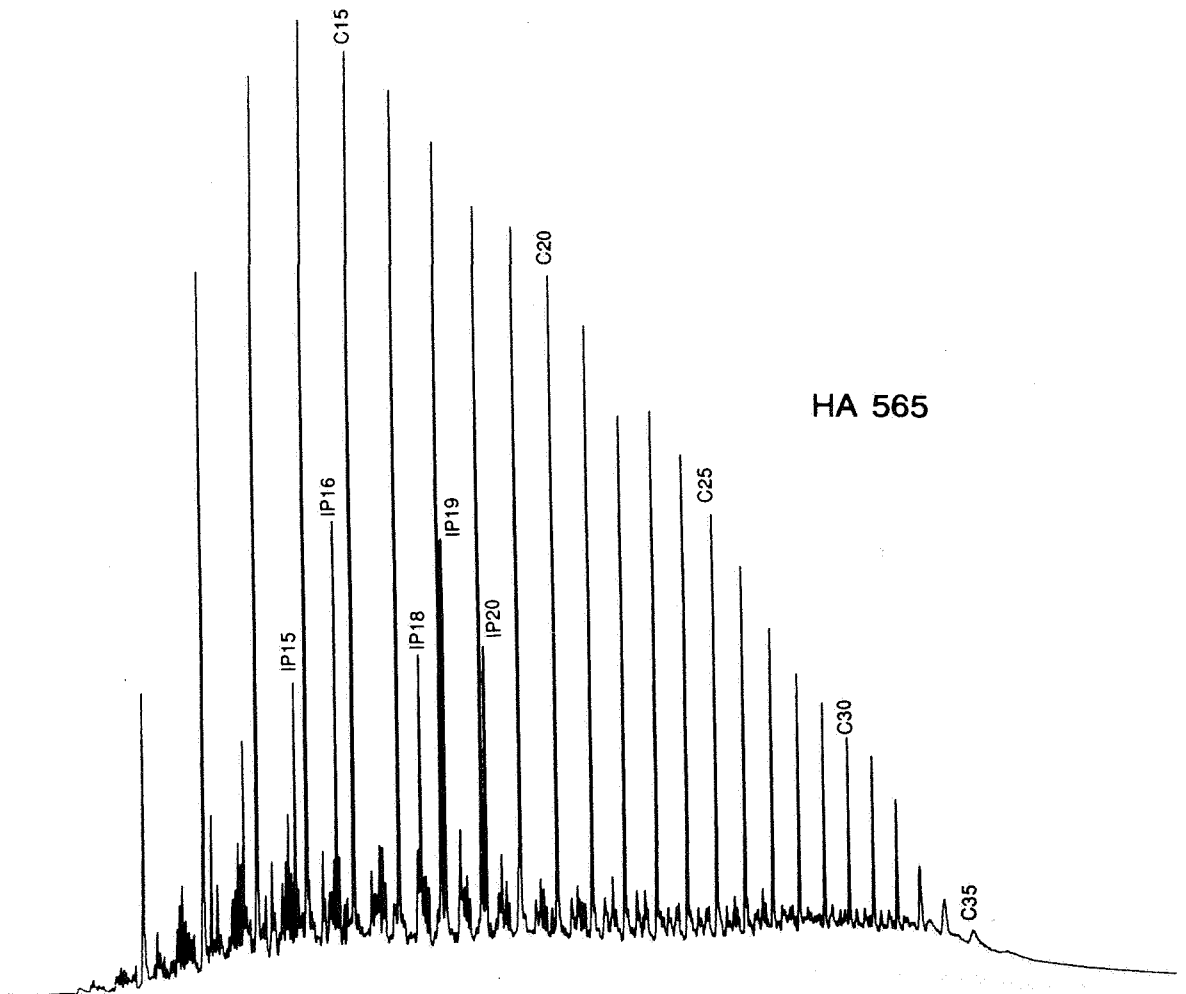
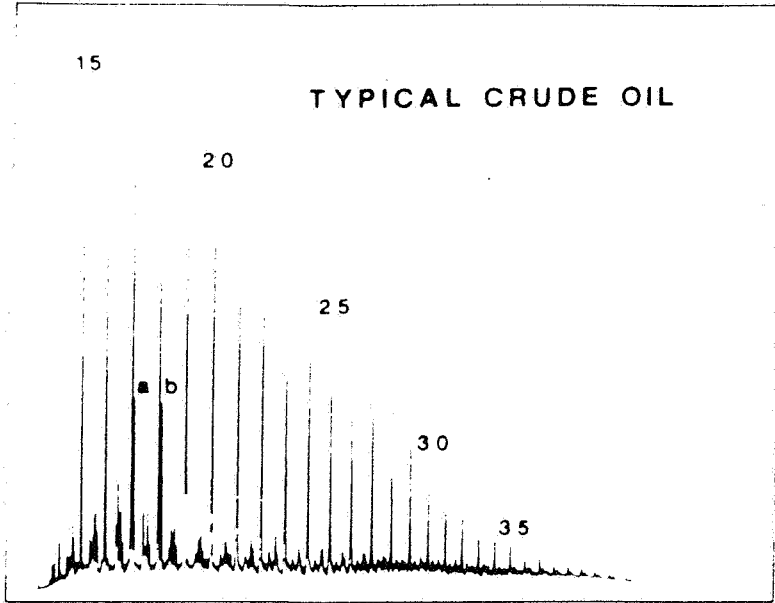
$$Rcalc = \begin{cases} 0.60(MPI\ 1) + 0.40 & \text{( if } Ro < 1.35\% \text{ )} \\ -0.60(MPI\ 1) + 2.30 & \text{( if } Ro > 1.35\% \text{ )} \end{cases}$$

CT - ditch cuttings CO - core SWC - sidewall core

# WHOLE OIL CHROMATOGRAMS



# C<sub>15</sub>+ SATURATES CHROMATOGRAMS



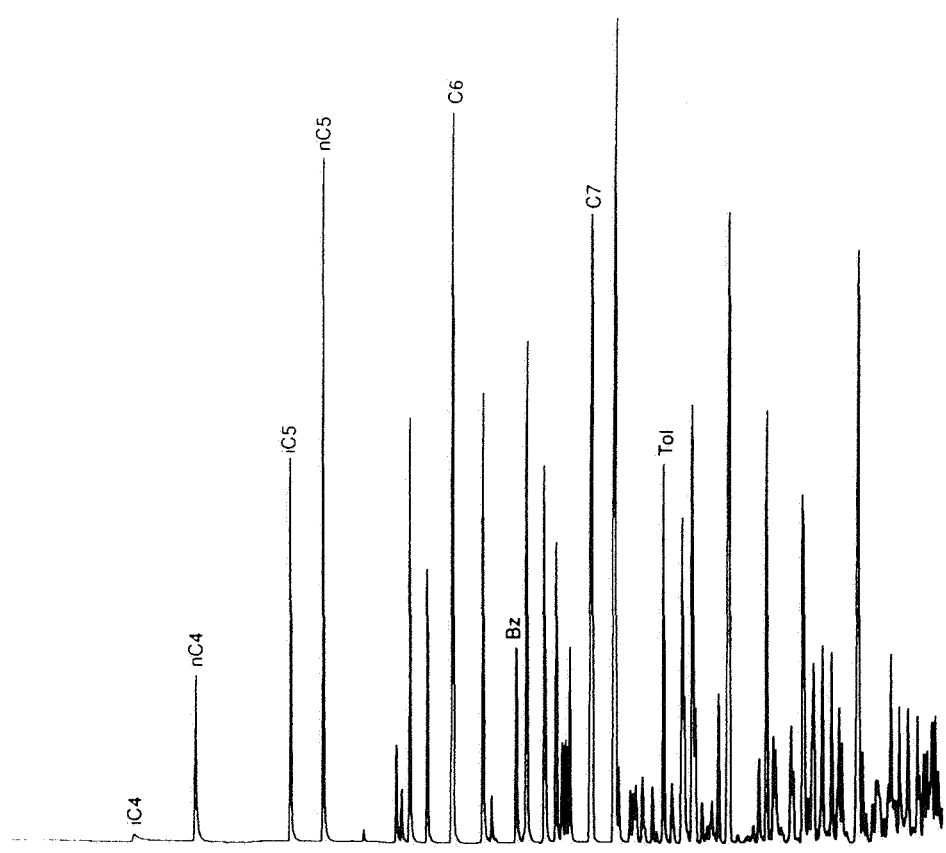
a = PRISTANE

b = PHYTANE

CARBON NUMBERS OF NORMAL PARAFFINS INDICATED (20 - nC 20)

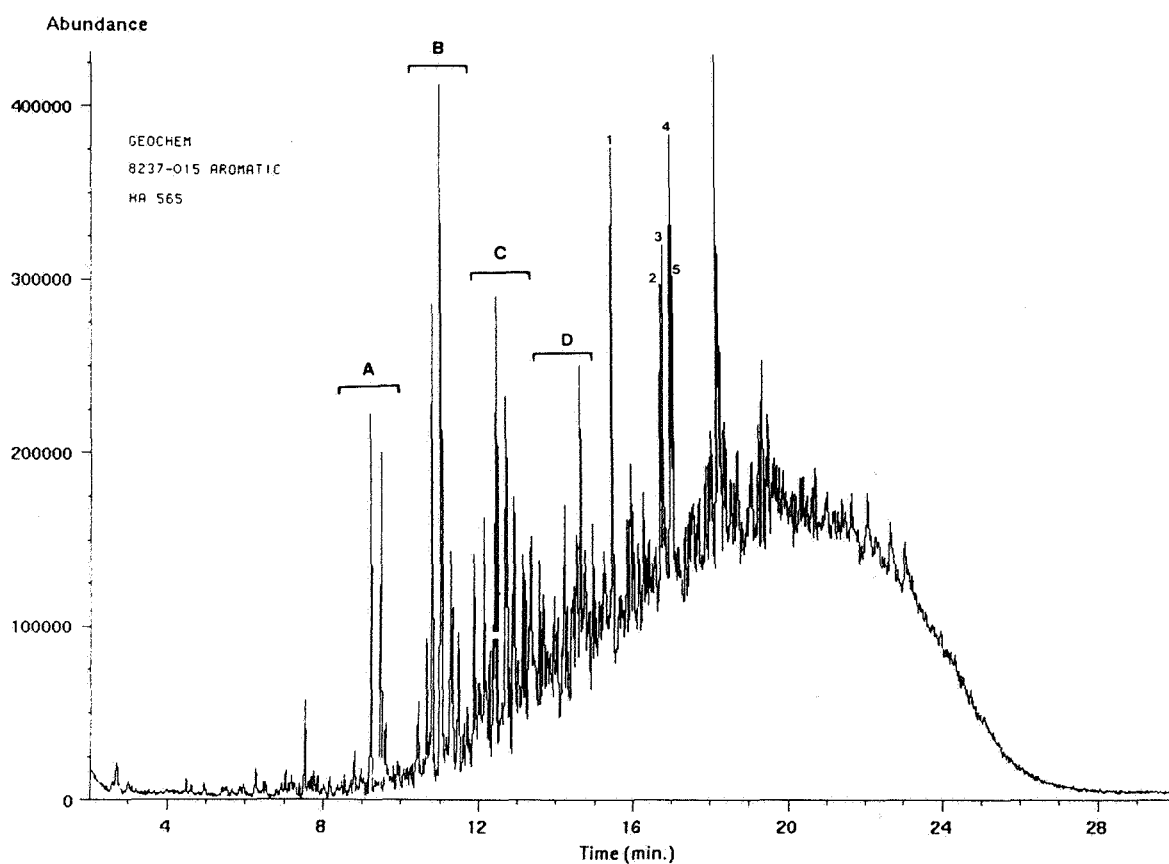
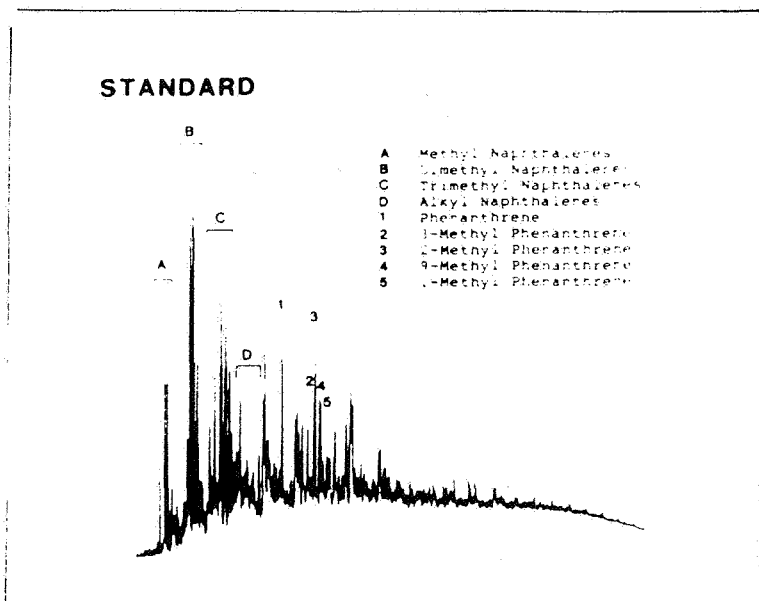


# GASOLINE RANGE CHROMATOGRAMS



HA 565

# C<sub>15</sub>+ AROMATIC CHROMATOGRAMS



# C<sub>15+</sub> ORGANOSULPHUR CHROMATOGRAMS

