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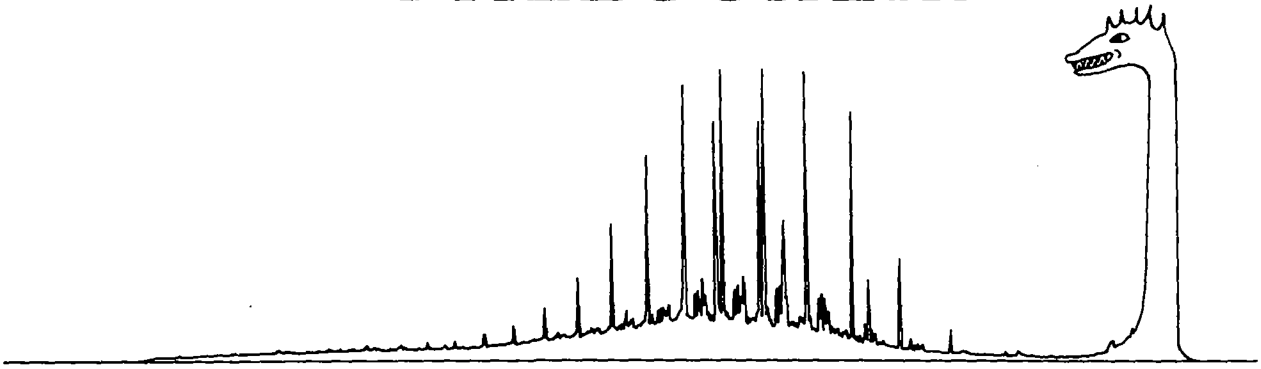

GEOCHEMICAL SOURCE ROCK EVALUATION OF SEDIMENTS FROM NOCS WELL: 30/2-1.

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PETROLEUM GEOCHEMISTRY REPORT

PREPARED FOR

STATOIL

Geochemical Source Rock Evaluation of Sediments from NOCS Well: 30/2-1.

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Contents

Summary

A total of nineteen cuttings samples and twenty-four sidewall core samples were used for a comprehensive geochemical study of Well: 30/2-1. Maturity estimations were severely hampered both by intense bitumen staining and two sections of turbo drilling, but it was inferred that the sediments are mature for hydrocarbon generation from 3599 m downwards. Sediments with good hydrocarbon potentials were observed in the Upper, Middle and Lower Jurassic section of the Well. Cretaceous, Kimmeridge/Heather boundary, Middle Jurassic and Lower Jurassic sediments were classed as being predominantly gas prone with subordinate potential to source liquid hydrocarbons. In contrast, Kimmeridgian sediments were demonstrated to have significant potential to source liquid hydrocarbons. However, it is suggested that these oil prone Kerogens have already generated most of their crude oils.

The greater depth of burial of the Kimmeridge Clay (KCF) Formation to the west of the rotated fault block, i.e. at 4 km to 5 km implies that oil generation in the deeper part of the U.K.C.S./N.O.C.S. was a former probably Lower Cretaceous event. Major gas generation is undoubtedly occurring present-day to the west of 30/2-1. On-structure the KCF is presently in the phase of peak oil generation with significant commencement of gas generation. Such generated and migrated gas may well displace formerly entrapped oil in this structure. The KCF, Heather coals and possible Brent coals would be expected to generate large volumes of gas, offstructure, which would displace a former oil charge at 30/2-1.

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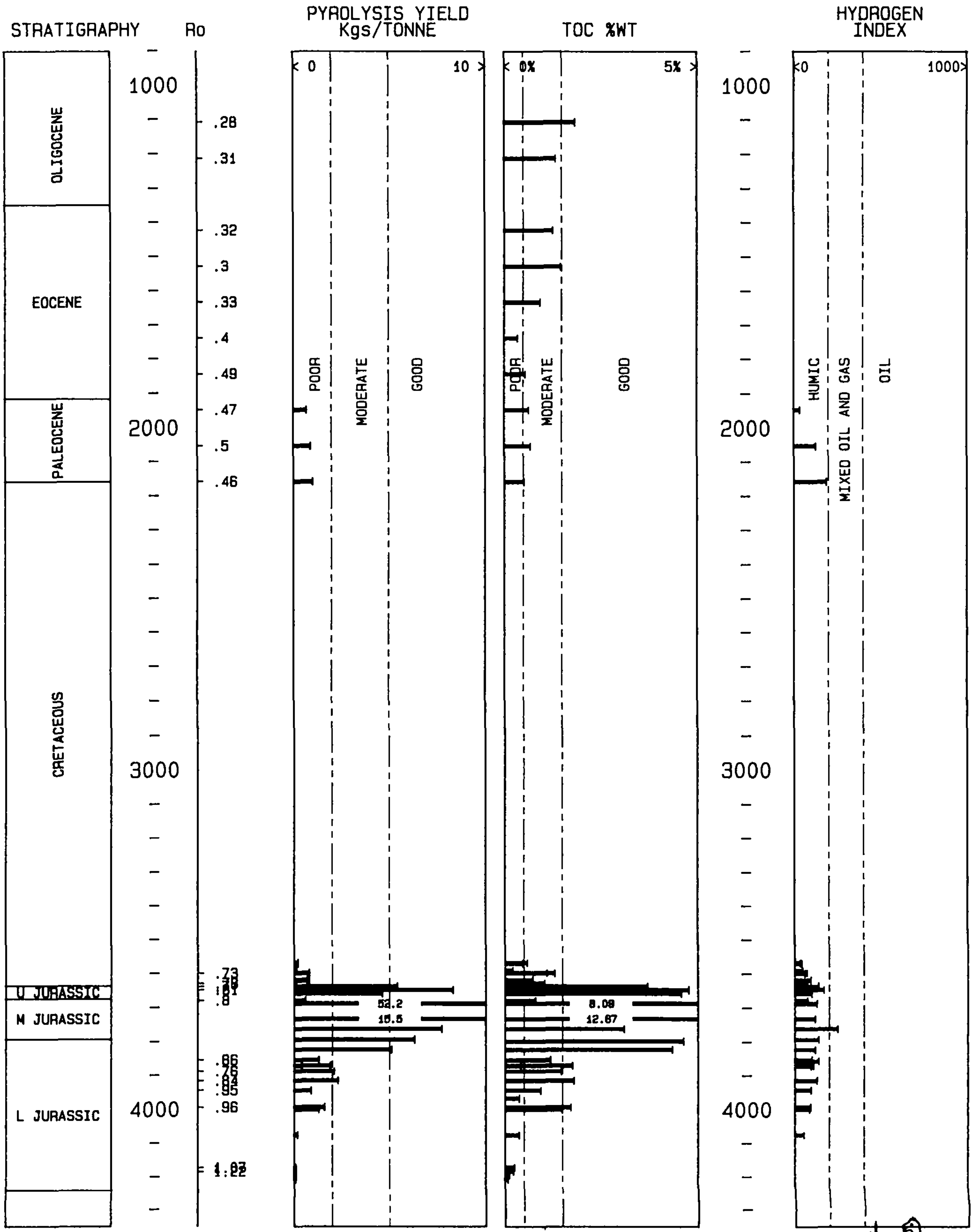
SHORT FORM GEOCHEMICAL LOG

WELL: 30/2-1



1. Introduction

A total of nineteen cuttings samples and twenty-four sidewall core samples from the depth interval 1100 m to 4208.5 m and dated Tertiary to Lower Jurassic (Statoil data) were used for a detailed geochemical study of NOCS Well: 30/2-1. Limitations were placed on this study due to the turbo drilling of two intervals at 2152 - 3501 m and 3836 - 4223 m.

Maturity estimations using Vitrinite Reflectance and Spore fluorescence measurements were completed throughout the interval examined in an attempt to establish a maturation profile for this well. Spore Colouration ratings from Visual Kerogen descriptions and Carbon Preference Indices from Soluble Extract studies were used to support the reflectance measurements, in assessing the true maturation levels.

Pyrolysis techniques were used to establish the hydrocarbon source potential and the likely hydrocarbon products or source oil and/or gas type where potentials were sufficiently high. Where possible hydrocarbon typing using pyrolysis was supported by Visual Kerogen descriptions completed at the same depth range. Total Organic Carbon was measured, to provide additional information concerning the richness of the sediments, as defined solely by their organic contents.

2. Samples and Techniques

All the cuttings samples were received in tin cans. The sidewall cores were received in glass 'Schlumberger' jars. The cuttings samples and the sidewall core samples were washed to remove all traces of drilling mud. All these washed samples were air dried under controlled conditions at 40°C. The samples were then carefully hand picked to remove obvious caved material and concentrate a single, potentially organic rich lithology (e.g. mudstones, calcareous mudstones etc).

Samples for Vitrinite Reflectance measurements were ground to a rock flour, mounted in an epoxy resin block, and polished. Reflectivity values were measured using a reflected light microscope, with an oil immersion objective. The results of these measurements are shown in Table 1.

Samples for Visual Kerogen description were treated with mineral acid. The remaining debris was sedimented onto a microscope slide and examined using a transmitted light microscope. The results of the Visual Kerogen description and assessments of Spore Colouration are shown in Table 2. The range of Spore Colouration is from 1 - 7 and the colour taken as representing the onset of liquid hydrocarbon generation is 3/4.

Samples for Total Organic Carbon measurements were finely ground and sieved to achieve homogeneity, then digested with fuming hydrochloric acid to remove mineral carbonate. The decarbonated samples were then combusted in a Carlo Erba 1106 Carbon, Hydrogen, Nitrogen analyser and their total organic carbon content determined, relative to those of calibrated standards. The results of these measurements are shown in Table 3.

Samples for Screening Pyrolysis were also ground and sieved and then examined using a modified Hewlett-Packard 5711 Gas Chromatograph, to measure their ultimate hydrocarbon potential. Samples were subjected to two initial isothermal heating periods of 150°C and 325°C and then ramped to 575°C. Two peaks of interpretive significance were evolved, which are conventionally referred to as P1 and P2 and were related to those of a calibrated standard. Three to four standards are run daily to ensure accuracy. The source quality index (hydrogen index/100 ratio) is derived from P2 and TOC values and is further used to characterise oil and/or gas Kerogens. The results of Screening Pyrolysis are shown in Table 4.

Ground samples for Extended Pyrolysis were extracted with dichloromethane before being heated to 550°C and examined using a modified Hewlett-Packard 5880 Gas Chromatograph. The hydrocarbons evolved were separated according to their boiling points on a non-polar column. This method is adopted in order to analyse the distribution of C_1 - C_5 gaseous hydrocarbons and C_5 to C_{36} + liquid hydrocarbons generated from the Kerogen. It complements the Visual Kerogen identification of oil and gas prone kerogens. The ratio of wet gases/oil components is a valuable method for volumetric studies of the amounts of paraffinic, naphthenic or naphtheno-aromatic hydrocarbons which a potential source-rock can generate at various levels of maturities. Thus, for kerogens which have $\frac{\Sigma C_1 - C_5}{\Sigma C_5 - C_{36+}}$ ratios the following classification is used:

Wet gases / oil	
≤ 0.25	oil prone type 1 kerogens (Source quality $>$ 4)
0.25 ≤ 0.7	mixed oil + gas prone kerogens (Source quality 2 to 4)
≥ 0.7	gas prone (humic coals) (Source quality $<$ 2)

Ground samples for Soluble Extract studies were extracted with geochemical grade dichloromethane, using a high velocity liquid mixer. Excess solvent was removed by evaporation and the remaining extract was separated on activated silica, to provide a saturate alkane fraction for gas chromatographic analysis. The saturate alkane fractions were examined by quartz capillary gas chromatography using a Carlo Erba 2151 Gas Chromatograph with Grob-type splitless injector system. The results of these measurements are represented in Table 5.

3. Results and Discussion

(a) Maturity

Various maturity threshold values based on Vitrinite Reflectance are quoted in the literature (1) but the threshold values adhered to by Paleochem and consequently used in this report are as follows:-

Onset of Liquid Hydrocarbon Generation	Ro = 0.55%
Onset of Gaseous Hydrocarbon Generation	Ro = 0.70% - 1.0%
Peak Oil Generation	Ro = 0.80% - 0.9%
Oil Floor	Ro = 1.3%
Gas Floor	Ro = 3.2%

Estimations of maturity using Vitrinite Reflectance measurements alone were impossible to assess due to the influence of turbo drilling in the interval 2165 - 3560 m. Turbo drilling has the effect of overmaturing the sediments.

In addition, bitumen and bitumen staining was observed in most of the sediments. This effect artificially lowers reflectivity values. Therefore, the observed Ro maturity levels represent minimum values, because of the extent by which the autochthonous values have been artificially altered. Strictly interpreted it can be seen from Table 1 that sediments from the Tertiary and Cretaceous, 1100 m to 2165 m are all immature for any hydrocarbon generation. Sediments from 3599 m to 3678.5 m and two sediments from the Drake Formation are mature for the onset of methane and wet gas generation and are approaching the Peak Oil Generation. The majority of sediments from the 3725 - 4184 m interval appear to have passed Peak Oil Generation although they are not yet at the Oil Floor.

No determination of Vitrinite Reflectance measurements was possible for sediments from the interval 4194.5 - 4208.5 m due to the complete absence of phytoclasts in these sediments.

The thermal alteration scale (Spore Colours) from Visual Kerogen Determinations used by Paleochem and its relationship to maturation parameters and hydrocarbon products is given below.

Thermal Alteration Scale	Spore Colour	Threshold Values
1	Pale yellow	
2	Yellow	
3	Yellow/Orange	
		3/4 Oil Generation
4	Orange	
		4/5 Gas Generation
5	Brown	5 Peak Oil Generation
		5/6 Oil Floor
6	Brown/Black	
7	Black	7 Dry Gas Floor

Spore Colouration Indices from Visual Kerogen descriptions were in general agreement with the Vitrinite Reflectance measurements. However, it was suggested that a Cretaceous sediment at 3560 - 75 m was mature for liquid hydrocarbon generation with a spore colouration rating of 3/4. To summarise, on-structure the Upper Jurassic, KCF and Heather Formations are in the oil window at peak oil generation present-day. The Middle through Lower Jurassic strata have maturities approaching the base of the OIL WINDOW (API oils $\leqslant 40^{o}$) present day at ca 4.2 km. Predicted maturities off-structure for top Jurassic require structure contours derived from seismic stratigraphy. Without the geologic database modelling of oil volumes generated and timing of expulsion cannot be attempted.

b) Source Potential

i) Hydrocarbon Potential

Samples having total organic carbon values below 0.5% are generally regarded as containing insufficient organic material to be of commercial value (2). Thus this value is used as a cut-off point in this report and sediments with organic values less than 0.5% are regarded as having no significant source potential. Source potential ratings based on conventional geochemical data are given below.

Poor Potential	Less than 0.5%
Moderate Potential	0.5% to 1.5%
Good Potential	Greater than 1.5%

Pyrolytic methods are widely used for estimating the generating capabilities of potential source rocks (3). Pyrolysis techniques have superseded the more traditional method of assessing hydrocarbon potential using organic carbon measurements, because they provide more meaningful data. Pyrolysis is not misled by the presence of non-productive organic matter (e.g. reworked, inertinite etc) present in source rocks, which adds to the organic carbon value, but has very limited or no hydrocarbon potential.

The first peak (P1) is often considered as representative of the quantity of free hydrocarbons that were present in the sediment at the time of sampling. The second peak (P2) is considered to be representative of the quantity of hydrocarbons present in the sediment and yet to be generated. The P2 peak is produced by conversion of the Kerogen in the rock sample by thermal cracking in the instrument. This is generally considered to be a reasonable estimate of the amount of hydrocarbons which could theoretically be generated by complete conversion of the Kerogen in the sediments were the sediments matured to beyond the gas floor. Both the P1 and P2 yields are expressed in Kg./tonne rock. Comparison of pyrolysis data with conventional geochemical data to provide a source potential rating gives the P2 hydrocarbon potential in practical exploration terms.

Poor	0.1 to 2.0 Kg hydrocarbons/tonne rock
Moderate	2.0 to 5.0 Kg hydrocarbons/tonne rock
Good	Greater than 5.0 to 15 kg/tonne rock
Excellent	>15 kg./tonne rock

Note: 1 kg. oil generated/tonne rock = 18 - 21 bbls oil/acre ft. (0.02 bbls/M^3 rock; SG 207).

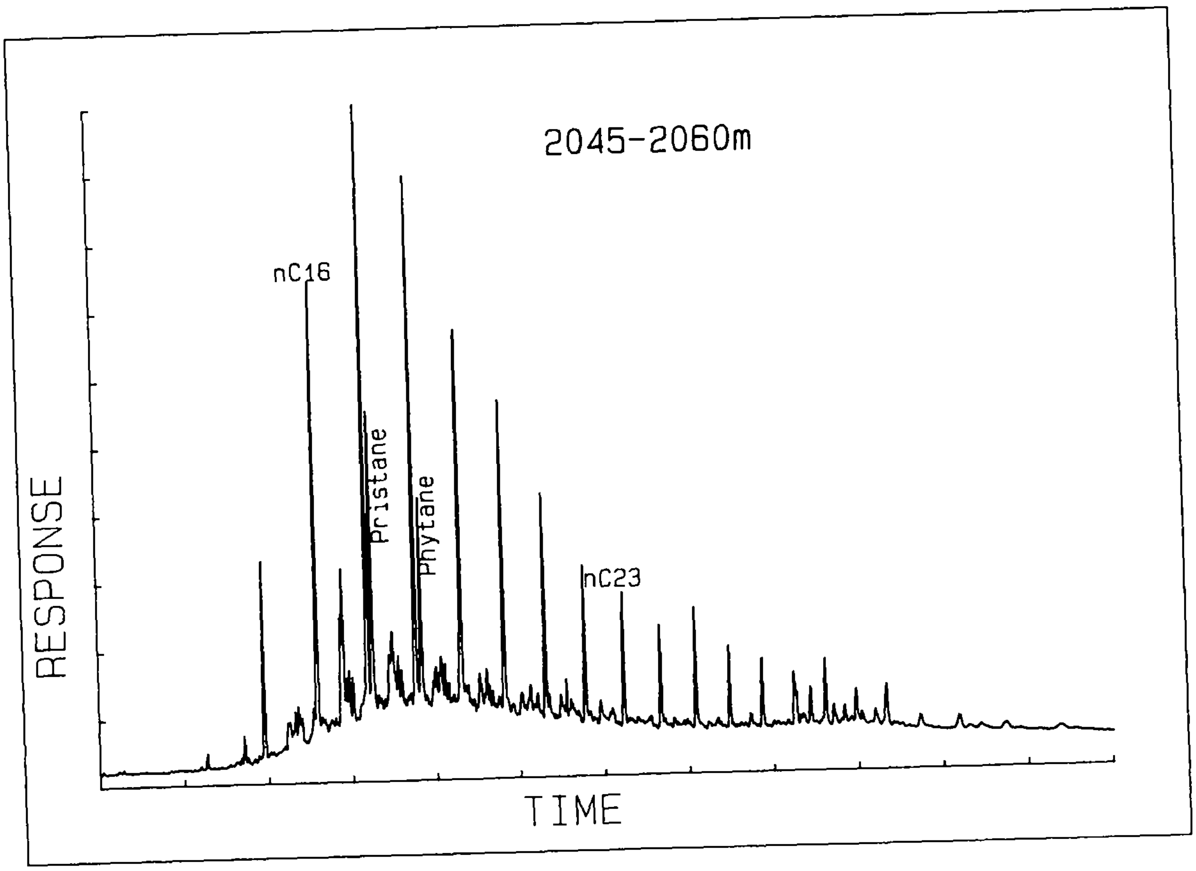
i) <u>Tertiary</u>

The Total Organic Carbon (TOC) content values obtained for Tertiary sediments (Oligocene - Paleocene, 1100 - 2060 m) ranged from poor to good (TOC % wt. 0.36 - 1.85) with the majority of the samples showing moderate organic richness. Source quality indices reveal that they would not represent source-rocks for gas even at requisite maturities.

Hydrocarbon potential ratings from Screening Pyrolysis measurements for three sediments from the Paleocene downrated the TOC measurements to only poor hydrocarbon potential (0.7 - 0.9 Kg./tonne). This downrating in source potential is probably due to the presence of significant quantities of inertinite and reworked material observed during reflected light microscopy studies. Reworked material and inertinite have limited and no hydrocarbon potential respectively.

Extended Pyrolysis measurements and Visual Kerogen descriptions were not completed on sediments from this stratigraphic interval due to their negligible source potential observed during screening pyrolysis measurements.

Soluble Extract studies completed on an Eocene sediment and on one Paleocene sediment showed n-alkane distributions and high CPI consistent with high land plant debris input. The n-alkane distribution of the Paleocene sediment at 2045 m extended beyond n-C_{27} carbon number range and showed a high pristane peak relative to the phytane peak, which is indicative of the high terrestrial plant input for low maturities.

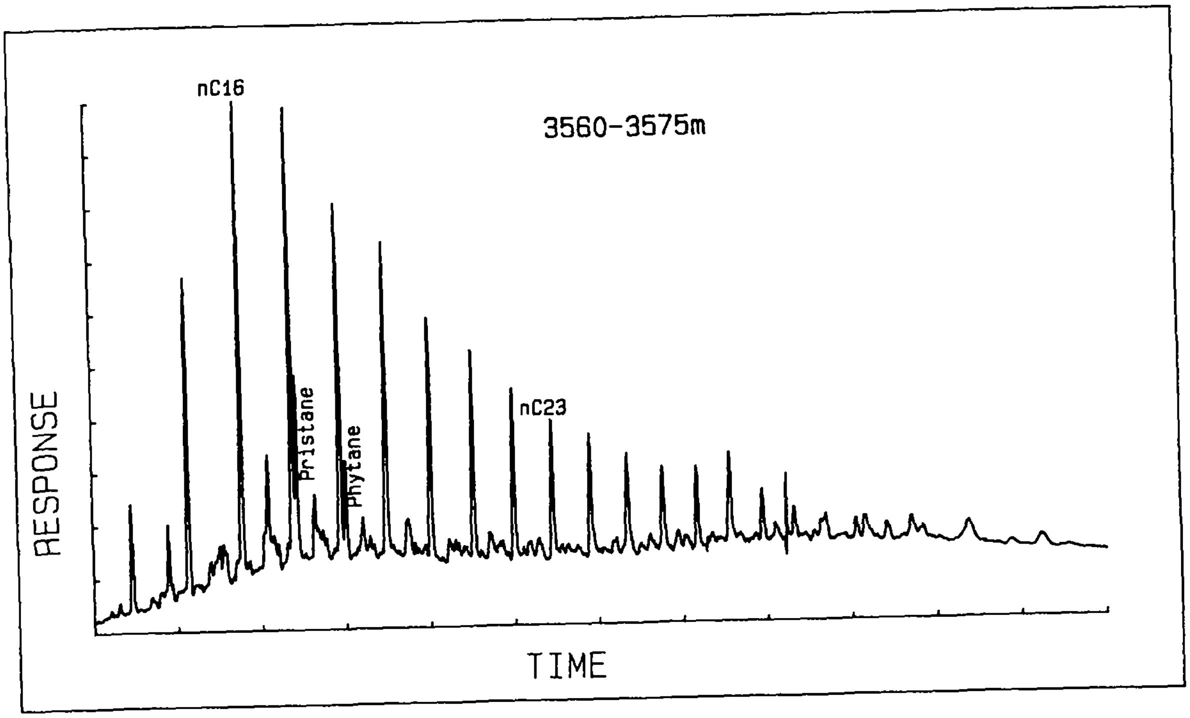


ii) Cretaceous

The Total Organic Carbon contents of the Cretaceous sediments 2150 m to 3635 m showed poor to moderate organic richness (0.06 - 1.3% wt. range). Screening Pyrolysis measurements downrated all the sediments from this stratigraphic interval to poor hydrocarbon source potential (0.1 - 1.0 Kg./tonne). Due to this limited source potential, Extended Pyrolysis measurements were not completed on any sediments from this stratigraphic interval, since they would not have potential even for significant gas generation.

Visual Kerogen descriptions were completed on four sediments from the Cretaceous at 3560 - 75 m, 3599 m and 3619 m. The descriptions suggested that if the sediments had any significant generative potential, they would be classified as being predominantly gas prone with subordinate potential to source some liquid hydrocarbons. This study complemented the interpretation based upon pyrolysis results.

The presence of significant quantities of terrestrial plants was evident from the n-alkane distributions of two Cretaceous sediments at 3560 m and 3623.9 m. These sediments would therefore be conventionally classed as having some potential to source gas, thus supporting the Visual Kerogen descriptions, TOC and pyrolysis results.



iii) Upper Jurassic

The sediments from this stratigraphic interval (Kimmeridge Clay and Heather Formations, 3637 m - 3665 m) contained good to excellent organic carbon (TOC % wt. range 1.74 - 4.77%). Screening Pyrolysis measurements, however, downrated the sediment at 3647 - 3665 m to only moderate hydrocarbon potential. It is considered that this downrating in potential was partly due to the presence of inertinitic material identified by reflected light microscopy. Hydrocarbon typing using Visual Kerogen descriptions suggested that two Upper Jurassic sediments examined, at 3637 m and 3647 m would be predominantly oil prone. The sediment at 3647 m also showed subordinate potential to source gaseous hydrocarbons. In contrast, a sediment at 3650/3655 m, which straddles the Kimmeridge/ Heather Formation boundary, was classified as being predominantly gas prone with subordinate potential to source oil.

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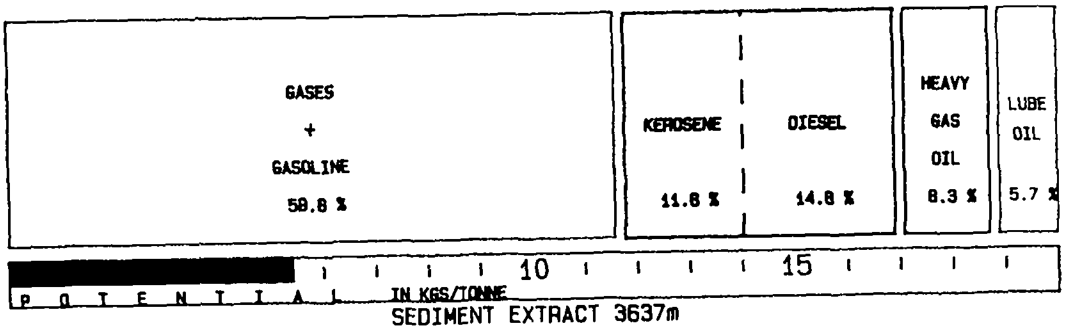
Extended Pyrolysis measurements completed on one sediment from the Upper Jurassic, however, demonstrated that the sediment at 3637 m would be predominantly gas prone. The relative amounts of gases and gasoline range Kerogen breakdown products was 59.6% as illustrated below.

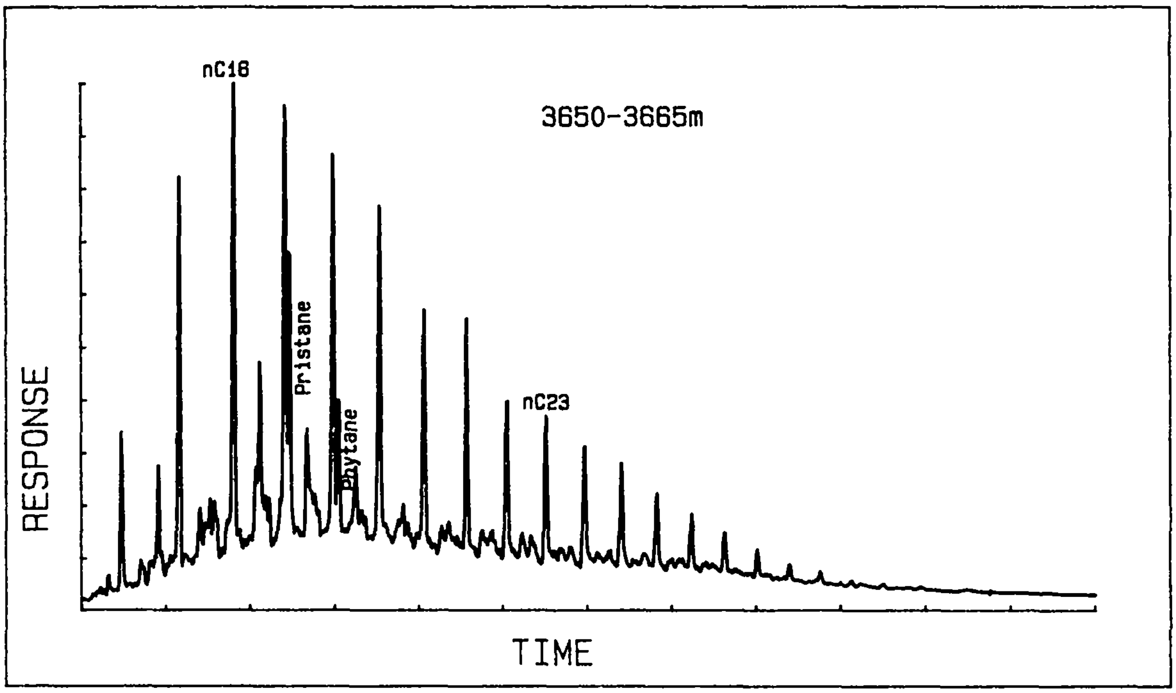


SEDIMENT EXTRACT 3637m

This suggests that the original oil prone Kerogen material identified by Visual Kerogen descriptions has generated its previous oil potential (Spore Colour Index 5), SQI 1.7 at some former stage, commencement probably in Late Cretaceous times as in the U.K.C.S. area to the west (in press). This accounts for the low Hydrogen Indices shown by the Upper Jurassic sediments (Source Quality Index x 100 = Hydrogen Index, Table 4).

It was observed that sediments from the KCF had TRANSFORMATION RATIOS of .34. This suggests that the amount of hydrocarbon generation that has occurred is $\geqslant$34%. During the past history of migration, these source rocks have generated a crude oil which has migrated out of the sequence leaving residual P1 values of 2.8 Kg./tonne for Kimmeridgian sediments.

Soluble Extract studies completed on two samples from the Upper Jurassic interval showed n-alkane distributions consistent with a mixed plant input, suggested from Visual Kerogen descriptions. The n-alkane distribution of the sediment at 3650 m shows alkane distributions extending beyond the n-C_{27} carbon number range and a high pristane peak relative to phytane peak, indicative of some significant terrestrial plant input, as illustrated below and increased Kerogen maturity. Volumetric predicitons of amounts of oil produced and expulsed can be determined upon request, if required.



iv) Middle Jurassic

Total Organic Carbon contents of sediments from the Ness, Etive and Rannoch Formations (3678.5 - 3800 m) showed moderate to excellent organic carbon (TOC % wt. range 0.80 - 12.67%) with all but one of the samples showing good hydrocarbon potential. Screening Pyrolysis measurements were in general agreement with the TOC measurements, but downrated the sidewall core sample at 3678.5 m to poor hydrocarbon source potential.

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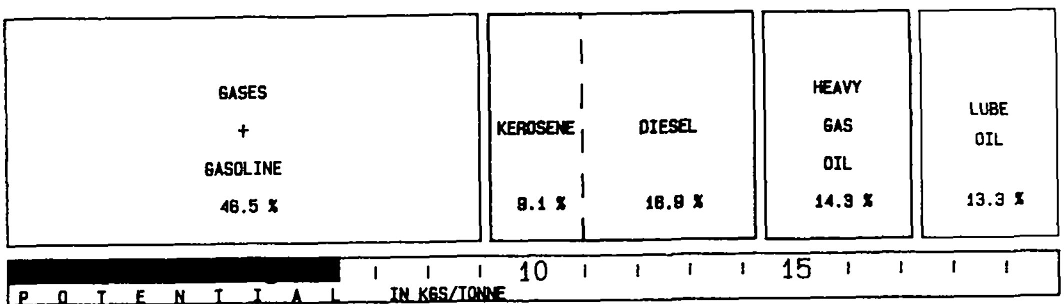
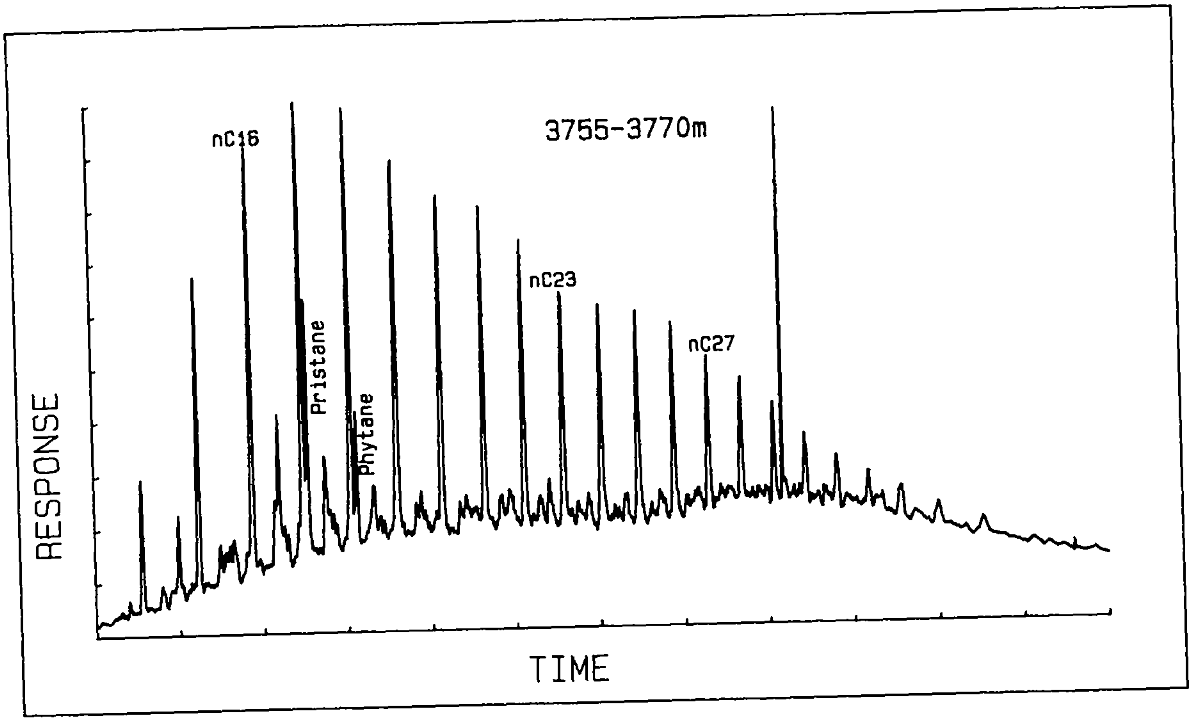
Hydrocarbon typing from Visual Kerogen descriptions showed the the predominant Kerogen type for this stratigraphic interval was black wood and inertinite with trace quantities of palynomorphs and dinoflagella cysts. From these observations, it was suggested that these sediments are predominantly gas prone with limited former potential to source liquid hydrocarbons.

Extended Pyrolysis measurements supported the view that these sediments have more gas and condensate potential than oil prone. The relative amounts of gases and gasoline range Kerogen breakdown products fell in the range (44.7 - 57.3), as illustrated below, where the production of a relatively high proportion of gases is confirmed.



SEDIMENT EXTRACT 3785-3800m

Soluble Extract studies completed on three sediments from the Middle Jurassic (Table 5) showed n-alkane distributions consistent with a mixed plant input, suggested from Visual Kerogen descriptions.



v) <u>Lower Jurassic</u>

Sediments from the Dunlin Group and the Statfjord Formation (3815 - 4208.5 m) showed Total Organic Carbon contents which ranged from poor to good (TOC % wt. range 0.09 - 4.35). The sequence in general displays poor organic carbon content.

Screening Pyrolysis measurements in general downgraded the TOC measurements so that only the carbonaceous shale from the Drake Formation (3815 - 3830 m) showed good hydrocarbon potential (5.1 kg/tonne), and two sidewall core samples from the Drake Formation at 3886.5 m and 3943.5 m showed moderate hydrocarbon potential 2.1 and 2.3 kg./tonne respectively. The remaining sediments from the Lower Jurassic showed poor hydrocarbon source potential (0.1 - 1.9 kg./tonne). The

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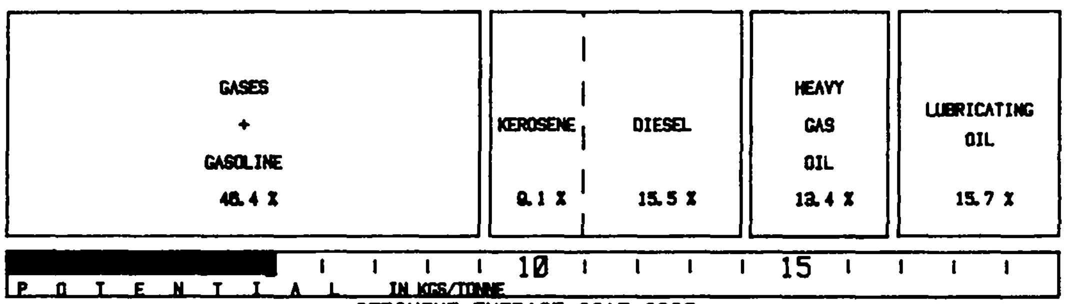
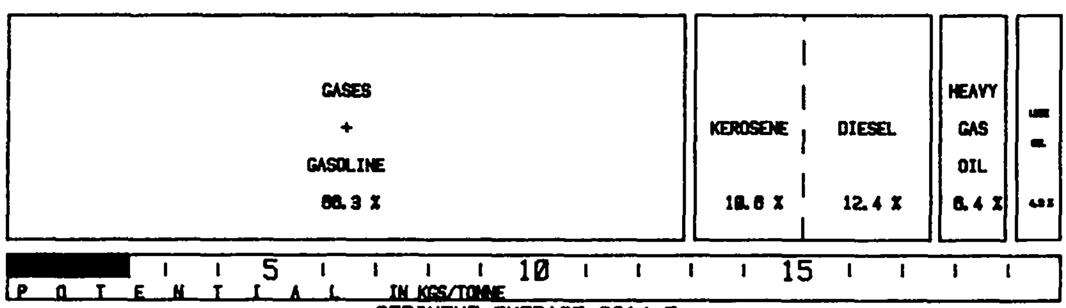
Dunlin and Statfjord Kerogens have already generated an estimated 15% to 20% of their original gas potential onstructure at equivalent reflectances up to 1.2% Ro.

Kerogen typing by Visual Kerogen descriptions of the sediments suggested that sediments at 3870 m and 3993 m were predominantly gas prone, but capable of generating additional liquid hydrocarbons. Sediments at 4184 m and 4194.5 m were virtually barren and showed negligible generative potential. Extended pyrolysis on two sediments from 3815 - 3830 m and 3914 m suggested that this interval was gas prone, with subordinate potential to source some condensate-like hydrocarbons. The relative amounts of gases and gasoline range Kerogen breakdown products were 46.4 and 66.3 respectively, as illustrated below.



SEDIMENT EXTRACT 3815-3830m



SEDIMENT EXTRACT 3914.5m

Soluble Extract studies completed on three sediments from this stratigraphic interval showed n-alkane distributions with poor resolution of the n-alkane peaks. Low extract yields demonstrated the negligible hydrocarbon source potential of the sediments as suggested by Visual Kerogen descriptions.

4. Conclusions

i) Maturity estimations completed on sediments from this Well were hampered due to the turbo drilling of two sections and also to the presence of intense bitumen staining. It was suggested that sediments from 1100 m to 2165 m are immature for any hydrocarbon generation. Sediments from 3599 m and 3678.5 m are mature for the onset of Gaseous Hydrocarbons, and are approaching Peak Oil Generation. The Middle Jurassic sediments and the Lower Jurassic sediments appear to have crossed the Peak Oil Generation threshold, and appear to be approaching the Oil Floor. These Kerogens have generated an estimated 15 - 20% of their original gas potential onstructure.

ii) Sediments rated as having good hydrocarbon potentials were identified in the Upper Jurassic, Middle Jurassic and Lower Jurassic section of this Well.

iii) Hydrocarbon typing suggested that sediments from the Cretaceous, Kimmeridge/Heather Boundary, Middle Jurassic and Lower Jurassic were predominantly gas prone, with subordinate potential to source liquid hydrocarbons. Sediments from the Kimmeridge Formation were considered to be formerly oil prone. Oil prone Kerogens of the KCF have already generated crude oil onstructure much of which has migrated out of the sequence.

iv) Offstructure to the west at depths $\geqslant$4.1 km, the KCF has generated its full oil potential. Commencement of oil generation in the Viking graben probably commenced in Late Cretaceous times. Active gas generation offstructure and continuing to the present day has probably displaced any former oil charge at 30/2-1.

References

1. Dow W.G. — J. Geochem. Expl. 7, pp. 79 - 99 (1977).

2. Ronov A.B. — Geochemistry No.5, pp. 510 - 536 (1958).

3. Clementz D.M. — Offshore Technology Conference, p. 465 (1979)

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VITRINITE REFLECTANCE DATA					
Depth m.	Reflectivity Ro (Ave)				
	Autochthonous			Allochthonous	
1100-1115		*0.28 (20)			
1205-1220		*0.31 (21)			
1415-1430		*0.32 (20)			
1520-1535		*0.30 (23)			
1625-1640		*0.33 (20)		0.49 (21)	
1730-1745		*0.40 (2)		0.54 (2)	
1835-1850		*0.49 (5)			
1940-1955	*0.31 (4)	0.47 (1)			
2045-2060	*0.34 (2)	0.50 (1)			
2150-2165	*0.29 (1)	0.46 (7)			
3560-3575				1.27 (20)	
3570					1.45 (12)
3599		*0.73 (1)	0.95 (19)		
3620-3635		*0.78			1.53 (9)
3637	*0.44 (1)	0.70 (2)			

Table 1.

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VITRINITE REFLECTANCE DATA				
Depth m.	Reflectivity $Ro_{(Ave)}$			
	Autochthonous			Allochthonous
3647	*$0.54_{(4)}$	$0.81_{(6)}$	$0.96_{(9)}$	
3678.5		$0.80_{(2)}$	$0.97_{(2)}$	$1.20_{(8)}$
3725-3740			$0.99_{(21)}$	
3785-3800			$1.03_{(20)}$	
3854		$0.86_{(20)}$		
3886.5	*$0.56_{(1)}$	$0.76_{(8)}$	$1.05_{(1)}$	
3914.5	*$0.49_{(2)}$	$0.84_{(19)}$		
3943.5	*$0.78_{(3)}$	$0.95_{(17)}$		
3993	*$0.67_{(1)}$	$0.96_{(19)}$		
4172		$1.07_{(3)}$		
4184		$1.22_{(7)}$		
4194.5		NDP		
4197		NDP		
4208.5		NDP		

Figures in parenthesis refer to the number of measurements completed.

Table 1 - Continued.

Well No: 30/2-1

VISUAL KEROGEN DATA

Depth m	Palynomorphs	Brown Wood	Black Wood & Inertinite	Amorphous	Predominant Source Type	Colour Maturation Rating
3560-75	Common*	-	Abundant	Trace	Gas/Sub.Oil	3/4
3570	Trace*	-	Common	-	Gas	-
3599	-	-	Abundant	-	None	4/5
3619	Common*	-	Common	-	Gas	4
3637	-	-	Trace	Abundant	Oil	4/5
3647	-	-	Trace	Abundant	Oil/Sub.Gas	5
3650-65	Trace	-	Common	Trace	Gas/Sub.Oil	4/5
3678.5	Common*	-	Common	-	Gas	-
3755-3770	Trace/ Common	Trace	Common	Trace	Gas/Sub.Oil	4/5
3870	Trace*	Common	Common	-	Gas/Sub.Oil	4/5
3914.5	-	Trace	Trace	Trace	Gas/Sub.Oil	4/5
3993	Trace	Common	Trace	-	Gas/Sub.Oil	5

Table 2.

Well No: 30/2-1

VISUAL KEROGEN DATA

Depth m	Palynomorphs	Brown Wood	Black Wood & Inertinite	Amorphous	Predominant Source Type	Colour Maturation Rating
4184	-	-	Trace	-	None	-
4194.5	-	-	-	-	None	-

* Dinoflagelata cysts.

Table 2 - continued.

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General Well Data

Sample Type	Age	Depth m.	Lithology	Total Organic Carbon Content (TOC) % wt.
Cuttings	Oligocene	1100-1115	Siltstone	1.85
Cuttings	Oligocene	1205-1220	Siltstone	1.35
Cuttings	Eocene	1415-1430	Siltstone	1.27
Cuttings	Eocene	1520-1535	Siltstone	1.48
Cuttings	Eocene	1625-1640	Mudstone	0.95
Cuttings	Eocene	1730-1745	Siltstone	0.36
Cuttings	Eocene	1835-1850	Mudstone	0.56
Cuttings	Paleocene	1940-1955	Mudstone	0.65
Cuttings	Paleocene	2045-2060	Mudstone	0.70 (0.69R)
Cuttings	Paleocene/ Cretaceous	2150-2165	Mudstone	0.52
Cuttings	Cretaceous	3560-3575	Shale	0.59
SWC	Cretaceous	3570	Shale	0.47
SWC	Cretaceous	3591	Shale	0.21 (0.23R)
Cuttings	Cretaceous	3590-3605	Shale	1.10 (1.10R)
SWC	Cretaceous	3599	Shale	1.30 (1.15R)
SWC	Cretaceous	3619	Shale	0.73
SWC	Cretaceous	3623.9	Siltstone	0.06
Cuttings	Cretaceous	3620-3635	Siltstone	1.04
SWC	Kimmeridge	3637	Siltstone	3.71

Table 3.

Well No: 30/2-1

General Well Data

Sample Type	Age	Depth m.	Lithology	Total Organic Carbon Content (TOC) % wt.
SWC	Kimmeridge	3647	Shale	4.77
Cuttings	Kimmeridge/ Heather	3650-3665	Siltstone	1.74
SWC	Heather	3658	Shale	4.58
SWC	Ness	3678.5	Siltstone	0.80
Cuttings	Ness	3680-3695	Siltstone	8.09
Cuttings	Ness	3725-3740	Carbonaceous Shale	12.67
Cuttings	Etive	3755-3770	Shale	3.1
Cuttings	Etive/ Rannoch	3785-3800	Shale	4.64
Cuttings	Drake	3815-3830	Carbonaceous Shale	4.35
SWC	Drake	3854	Shale	1.19
SWC	Drake	3870	Shale	1.76
SWC	Drake	3872	Shale	0.42
SWC	Drake	3886.5	Shale	1.47
SWC	Drake	3914.5	Shale	1.80
SWC	Drake	3943.5	Shale	0.94 (0.93R)
SWC	Cook	3967	Shale	0.38
SWC	Cook	3993	Shale	1.72

Table 3 - Continued.

Well No: 30/2-1

General Well Data

Sample Type	Age	Depth m.	Lithology	Total Organic Carbon Content (TOC) % wt.
SWC	Burton/ Amundsen	4000	Shale	1.50
SWC	Burton/ Amundsen	4076	Calcareous Sandstone	0.37
SWC	Statfjord	4172	Siltstone	0.25
SWC	Statfjord	4184	Shale	0.23
SWC	Statfjord	4194.5	Siltstone	0.12
SWC	Statfjord	4197	Mudstone	0.09
SWC	Statfjord	4208.5	Siltstone	0.09

SWC = Sidewall Core

R = Repeat Value

Table 3 - Continued.

Well No: 30/2-1

PYROLYSIS DATA

Depth m	Yield (Kg./tonne) P1 Peak	Yield (Kg./tonne) P2 Peak	Hydrogen Index
1940-1955	0.2	0.7	38
2045-2060	0.3	0.9	130
2150-2165	0.3	1.0	190
3560-3575	<0.1 (<0.1R)	0.2 (0.2R)	34
3570	<0.1	0.2	43
3591	0.2 (0.2R)	0.1 (0.1R)	47
3590-3605	0.2	0.8	73
3599	0.6 (0.3R)	0.8 (0.7R)	61
3619	0.5	0.7	95
3620-3635	0.2	0.8	76
3623.9	<0.1	<0.1	NDP
3637	2.8	5.4	140
3647	2.8	8.3	170
3650-3665	0.9 (0.8R)	1.5 (1.6R)	86
3658	1.8	4.6	100
3678.5	0.4	0.6	75
Coal 3680-3695	13.4	52.2	NDP
Siltstone 3680-3695	3.3	10.6	130
3725-3740	4.6	15.5	120
3755-3770	0.5	7.7	250
3785-3800	1.8	6.3	140
3815-3830	0.9	5.1	120

Table 4.

PALEOCHEM

Well No: 30/2-1

PYROLYSIS DATA

Depth m	Yield (Kg./tonne) P1 Peak	P2 Peak	Hydrogen Index
3854 x	0.6 (0.7R)	1.3 (1.3R)	100
3870	0.9	1.9	110
3872	0.4	0.4	95
3886.5	1.0	2.1	140
3914.5	1.4	2.3	130
3943.5	0.5 (0.4R)	0.9 (0.7R)	95
3993	0.7	1.6	93
4000	0.7	1.3	87
4076	0.1	0.2	54
4172	<0.1	<0.1	NDP
4184	<0.1	<0.1	NDP
4194.5	<0.1	<0.1	NDP
4197	<0.1	<0.1	NDP
4208.5	<0.1	<0.1	NDP

NDP = No determination possible

Table 4. - continued.

Well No: 30/2-1

SOLUBLE EXTRACT DATA

Depth m	Total Soluble Extract (TSE) % wt.	Saturate Alkane Content (SAC) % wt.	Carbon Preference Index (CPI)
1520-35	0.024	7.9	*
2045-60	0.034	6.2	1.1
3560-75	0.015	70.4	1.0
3623	0.012	28.5	1.1
3647	0.742	41.5	1.0
3650-65	0.207	31.5	1.1
3678.5	0.070	5.5	1.0
3755-70	0.237	30.3	1.0
3872	0.369	15.0	1.0
4184	0.058	40.9	*
4194.5	0.018	83.2	*
4208.5	0.013	60.5	*

Table 5

Well No: 30/2-1

KEROGEN BREAKDOWN PRODUCTS

Depth m	Gases + Gasoline	Kerosene	Diesel	Heavy Gas Oil	Lubricating Oil
3657	59.6	11.6	14.8	8.3	5.7
Coal 3680-3695	50.7	9.0	12.8	12.8	14.7
Siltstone 3680-3695	47.0	8.2	13.9	13.2	17.5
3725-3740	44.8	8.9	11.6	13.7	20.9
3755-3770	57.3	11.3	13.5	10.5	7.3
3785-3800	46.5	9.1	16.9	14.3	13.3
3815-3830	46.4	9.1	15.5	13.4	15.7
3914.5	66.3	10.6	12.4	6.4	4.3

Table 6

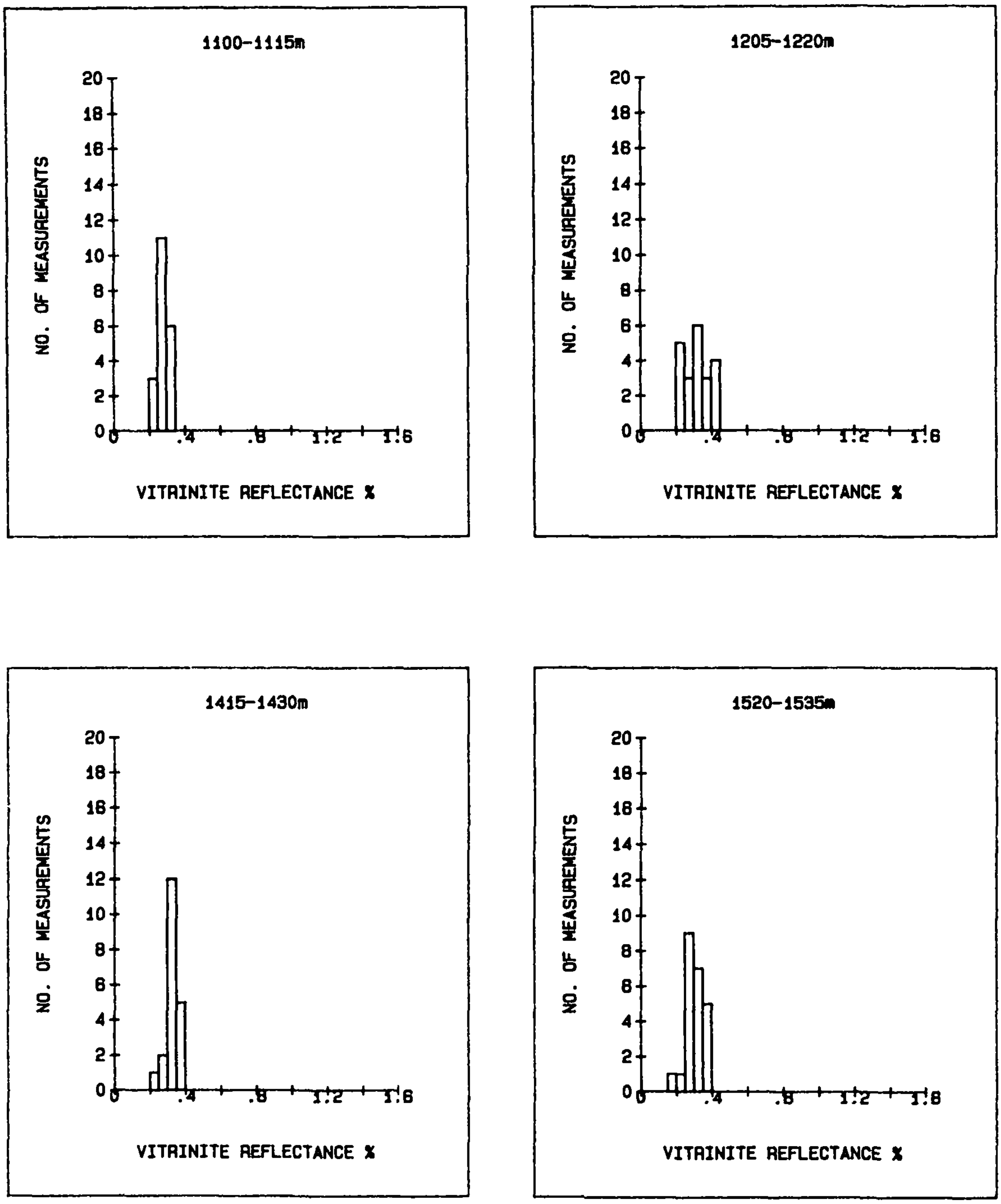

1100-1115m
1205-1220m
1415-1430m
1520-1535m
NO. OF MEASUREMENTS
20
18
16
14
12
10
8
6
4
2
0
0
.4
.8
1.2
1.6
VITRINITE REFLECTANCE %

Figure 1.

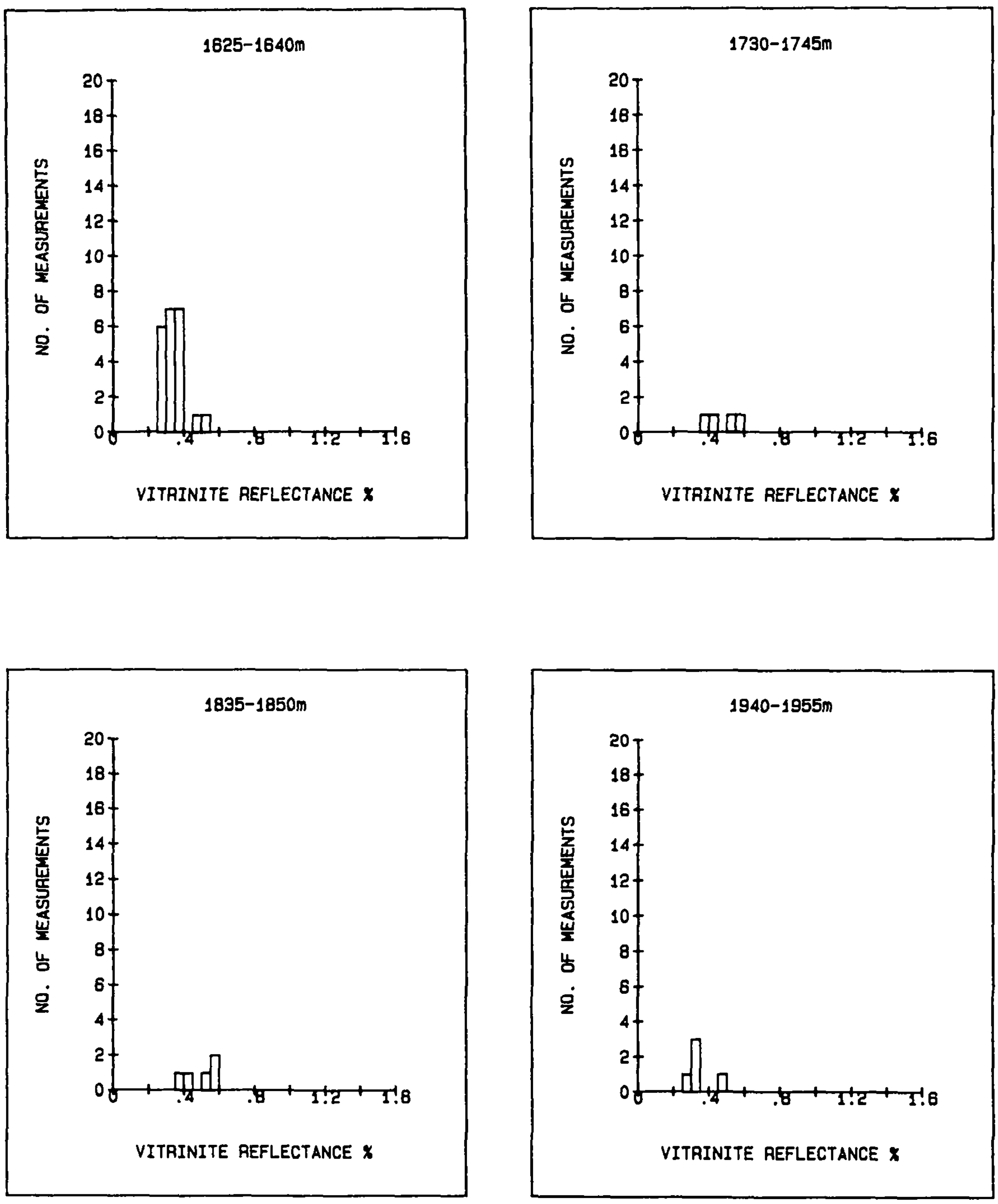

1625-1640m
1730-1745m
1835-1850m
1940-1955m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
0
2
4
6
8
10
12
14
16
18
20
.4
.8
1.2
1.6

Figure 2.

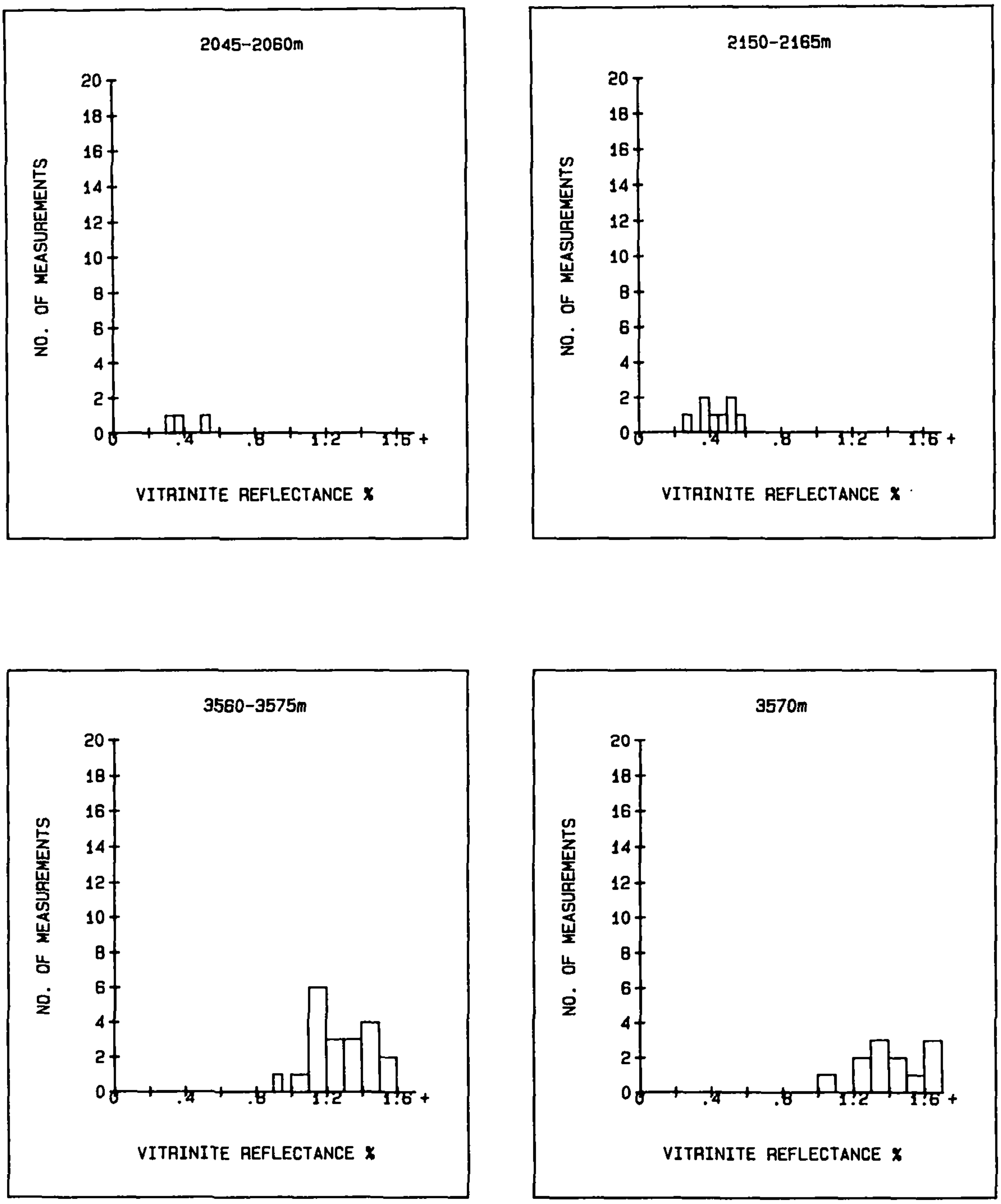

2045-2060m
2150-2165m
3560-3575m
3570m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
20
18
16
14
12
10
8
6
4
2
0
0
.4
.8
1.2
1.6
+

Figure 3.

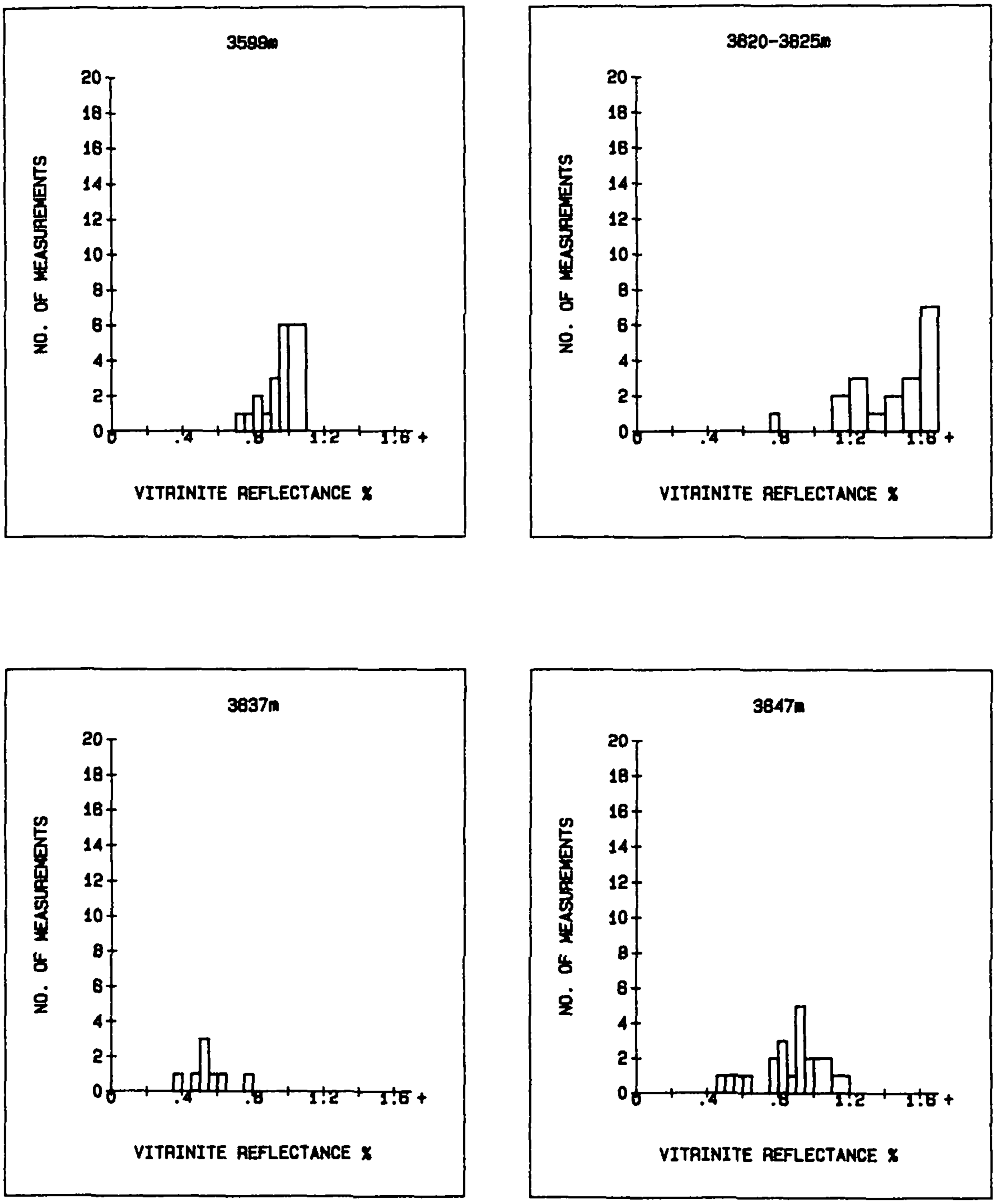

3599m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
3620-3625m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
3637m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
3647m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %

Figure 4.

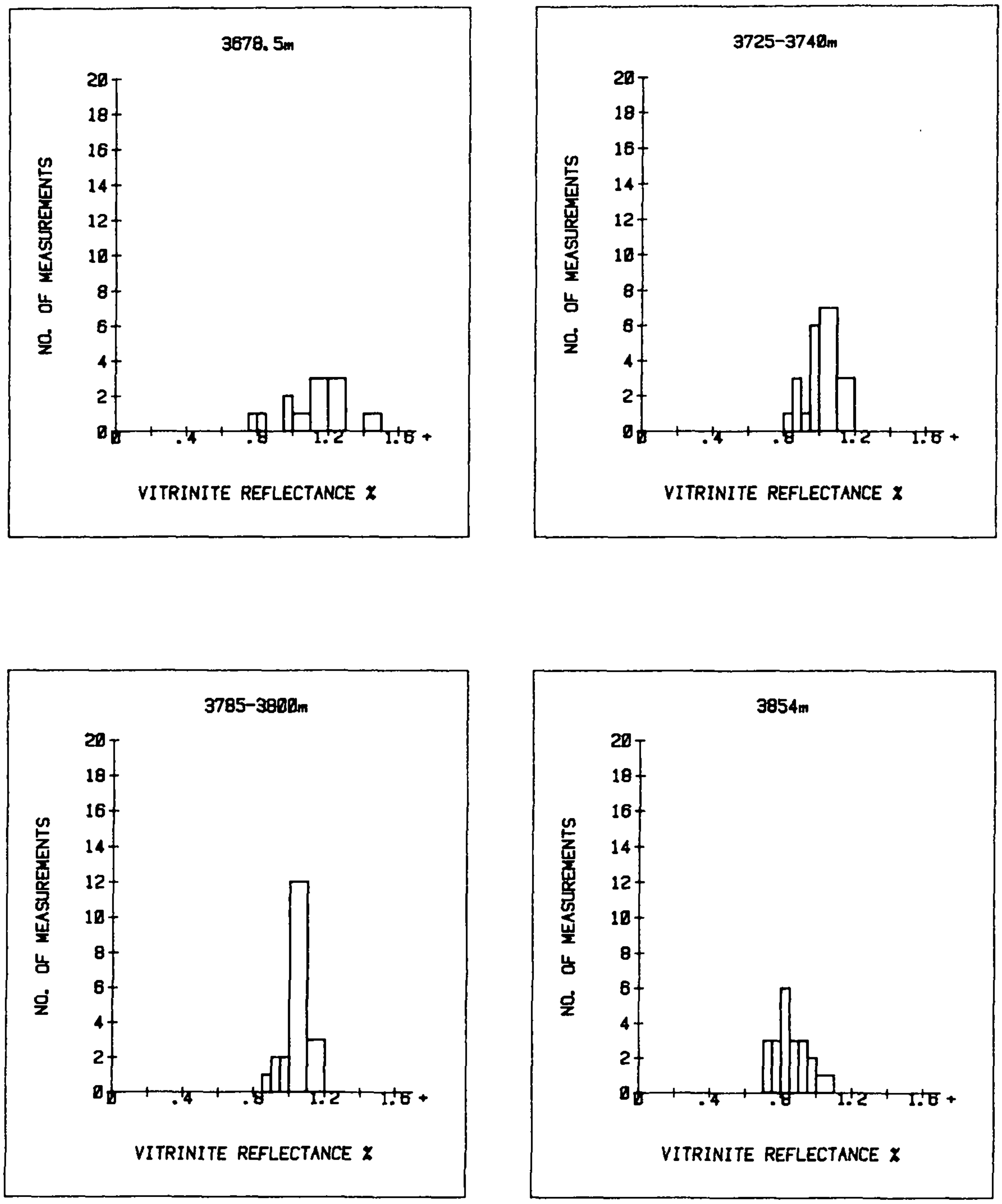

3678.5m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
3725-3740m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
3785-3800m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
3854m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %

Figure 5.

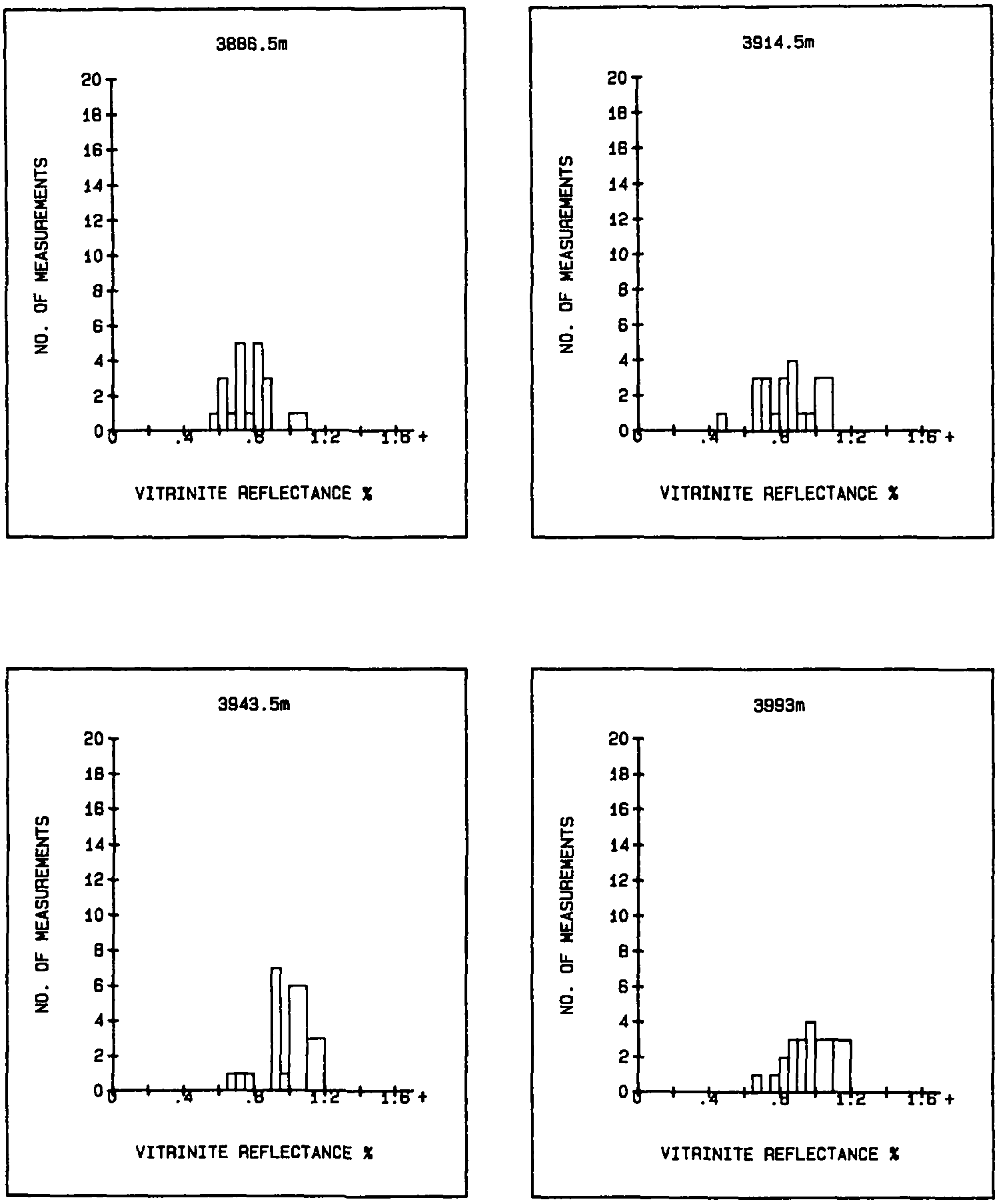
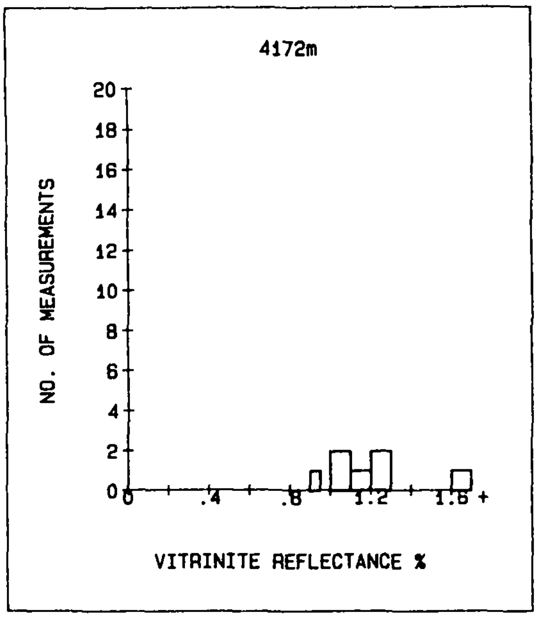

3886.5m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
3914.5m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
3943.5m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %
3993m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %

Figure 6.


4172m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %

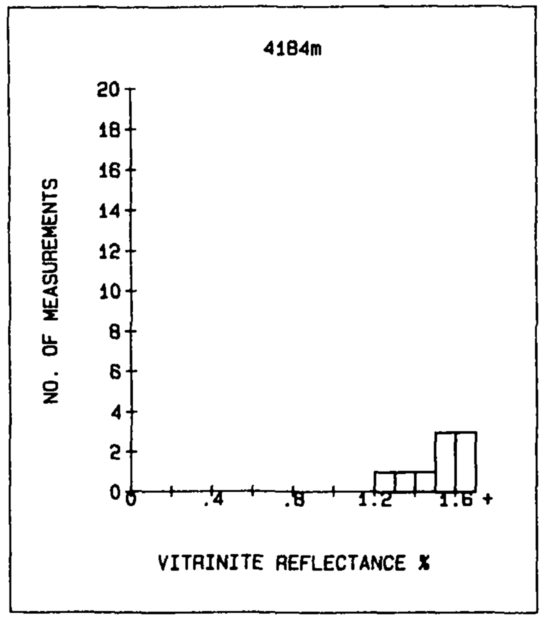

4184m
NO. OF MEASUREMENTS
VITRINITE REFLECTANCE %

Figure 7.

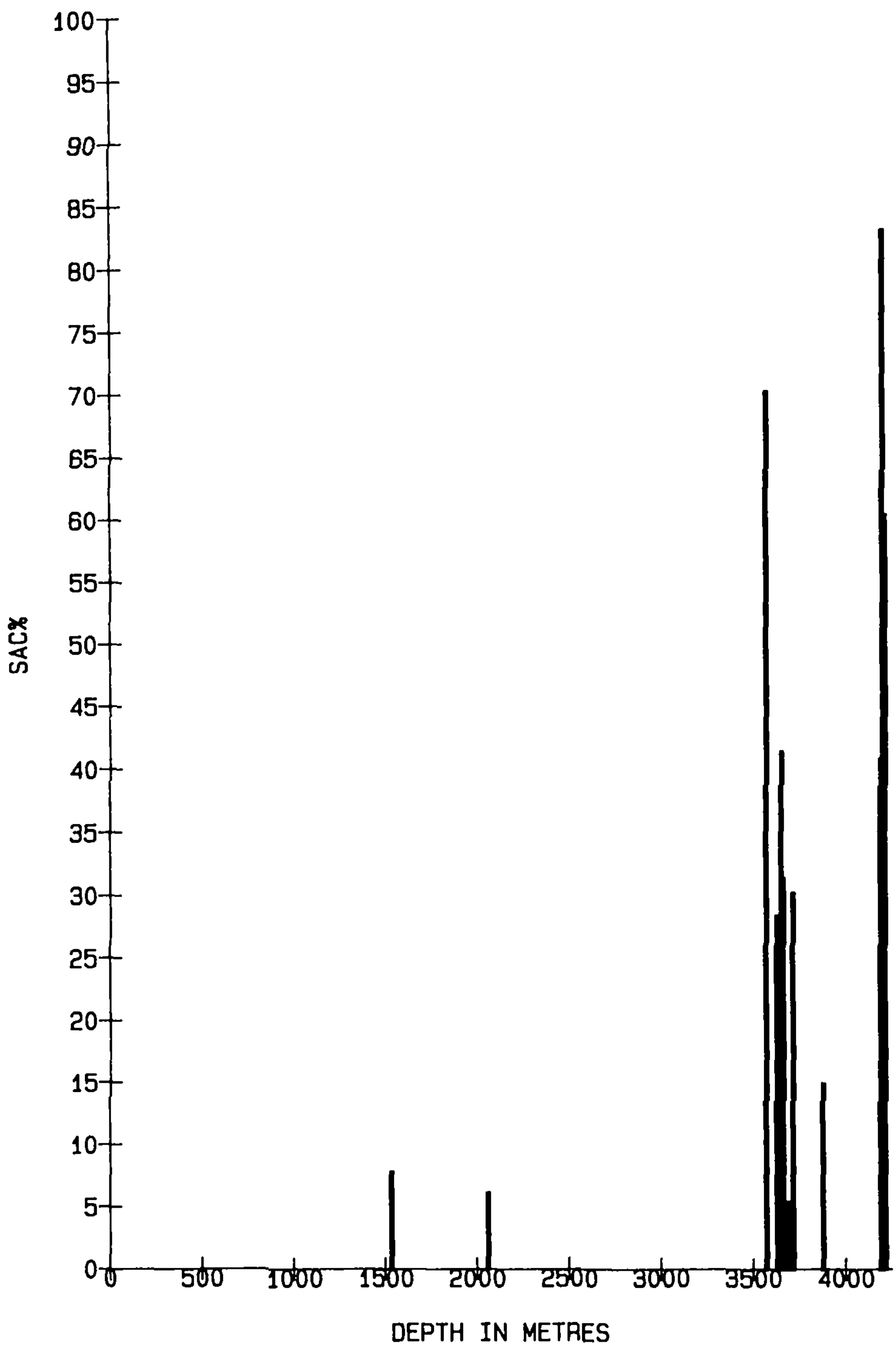

100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
SAC%
0
500
1000
1500
2000
2500
3000
3500
4000
DEPTH IN METRES

Figure 8.

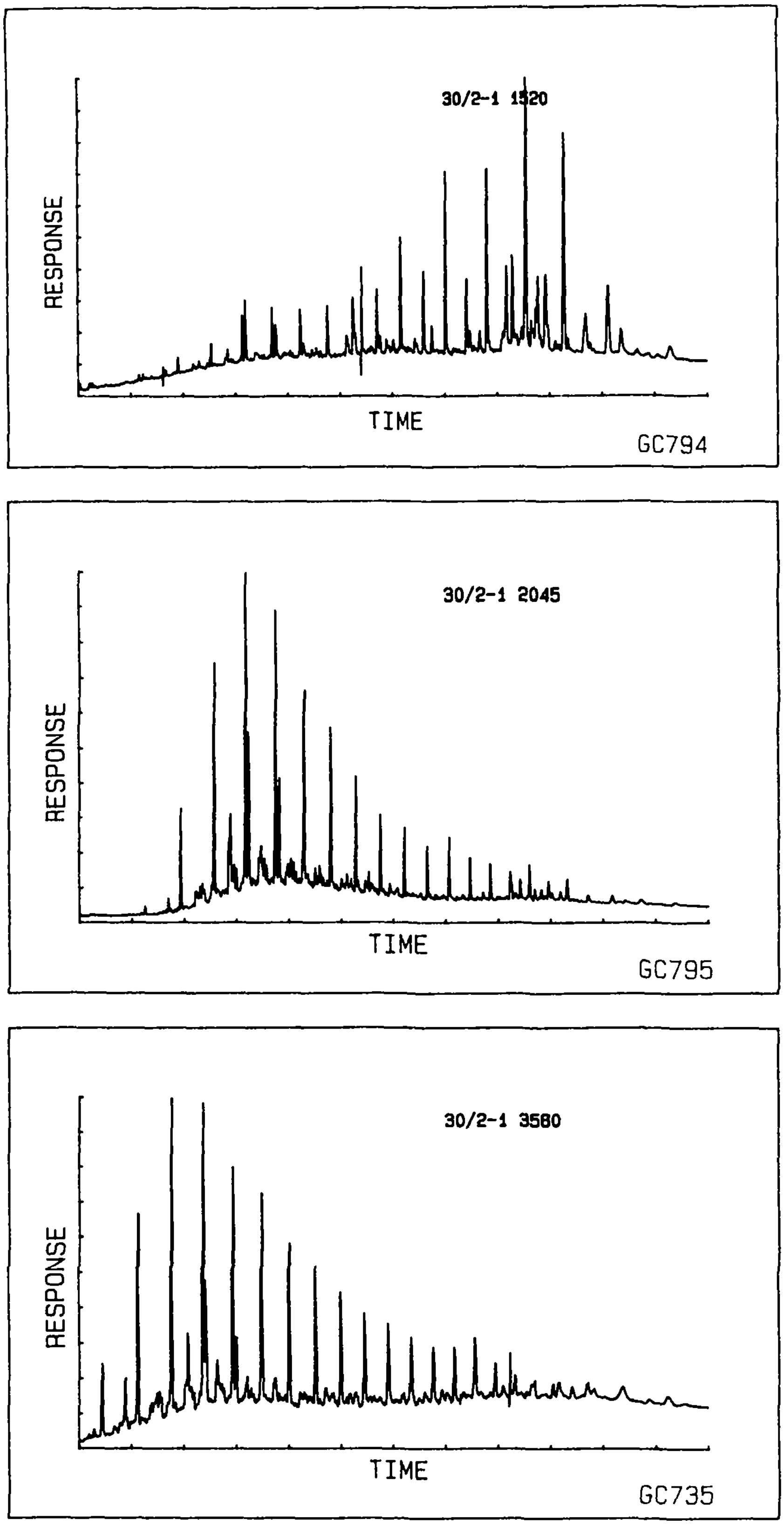
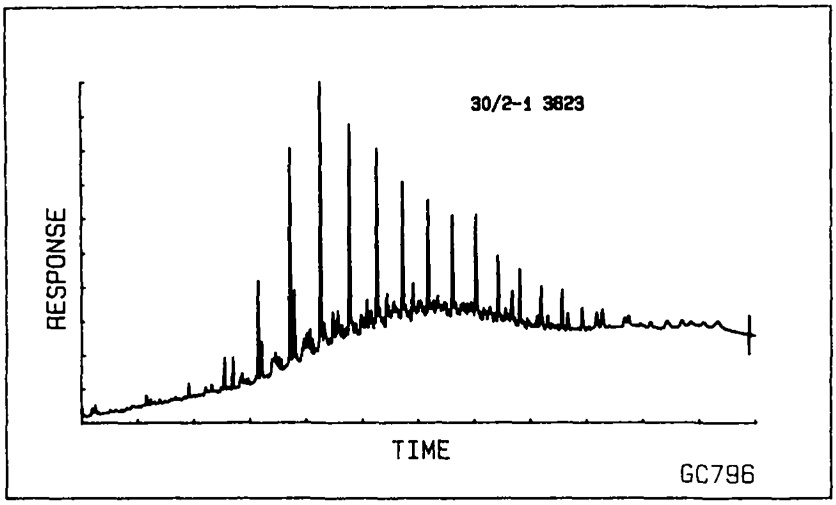
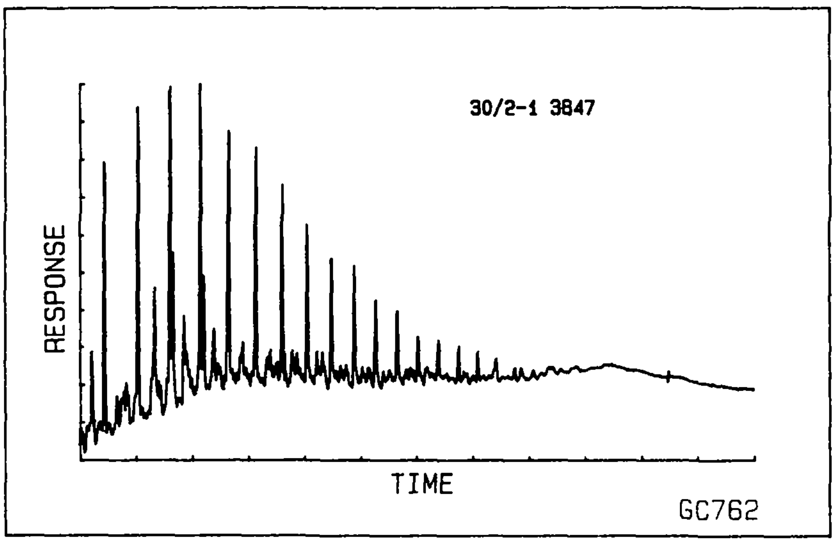

30/2-1 1520
RESPONSE
TIME
GC794
30/2-1 2045
RESPONSE
TIME
GC795
30/2-1 3580
RESPONSE
TIME
GC735

Figure 9.


30/2-1 3823
RESPONSE
TIME
GC796


30/2-1 3847
RESPONSE
TIME
GC762

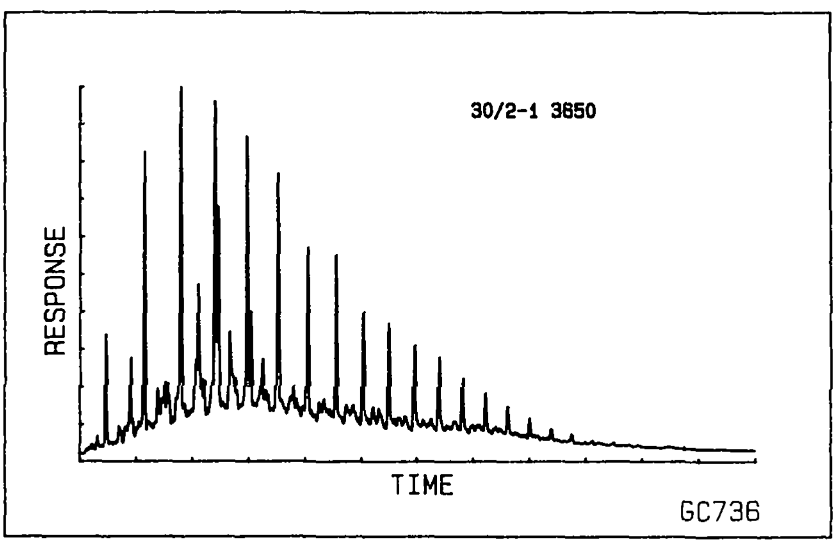

30/2-1 3850
RESPONSE
TIME
GC736

Figure 10.

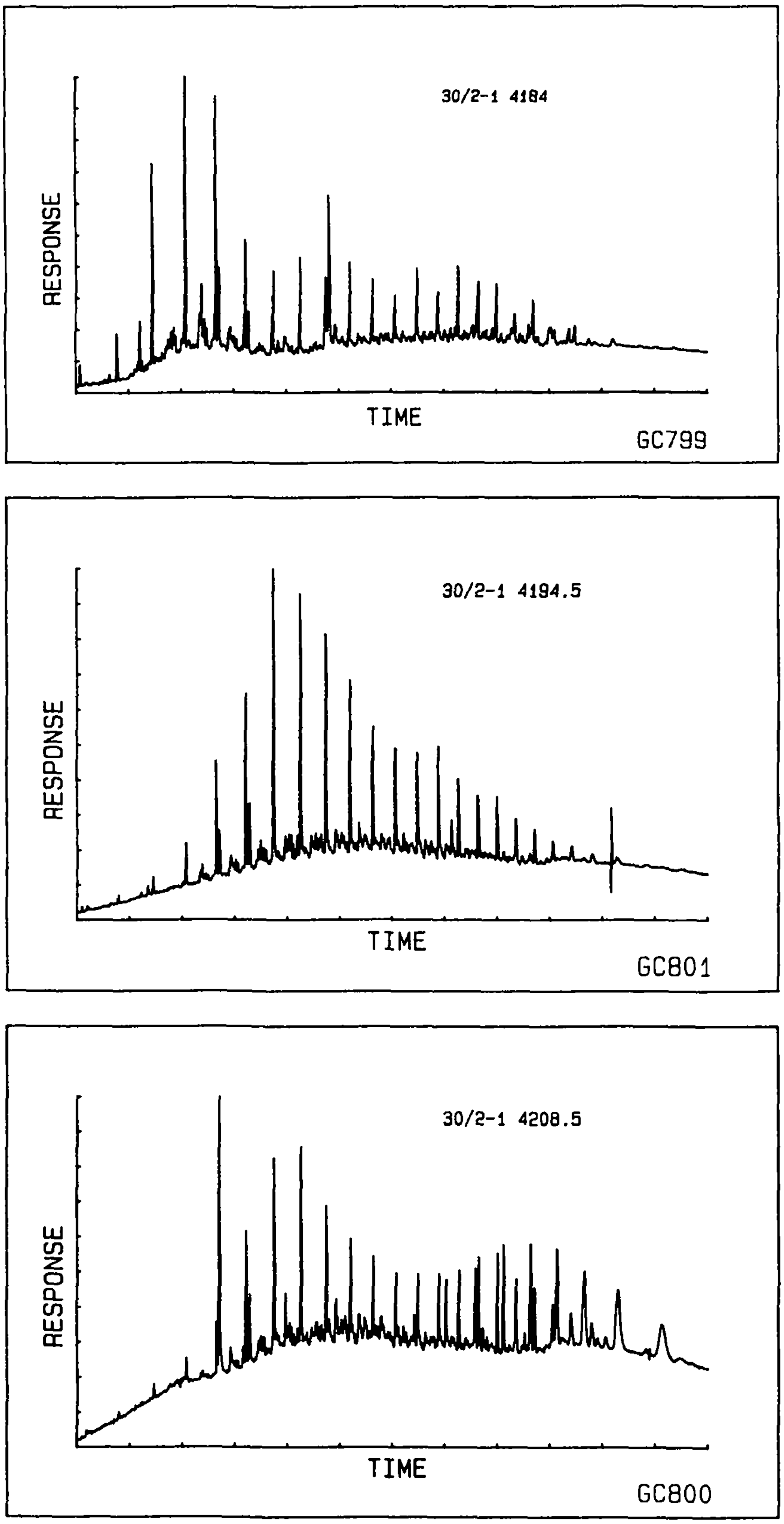

30/2-1 4184
RESPONSE
TIME
GC799
30/2-1 4194.5
RESPONSE
TIME
GC801
30/2-1 4208.5
RESPONSE
TIME
GC800

Figure 12.

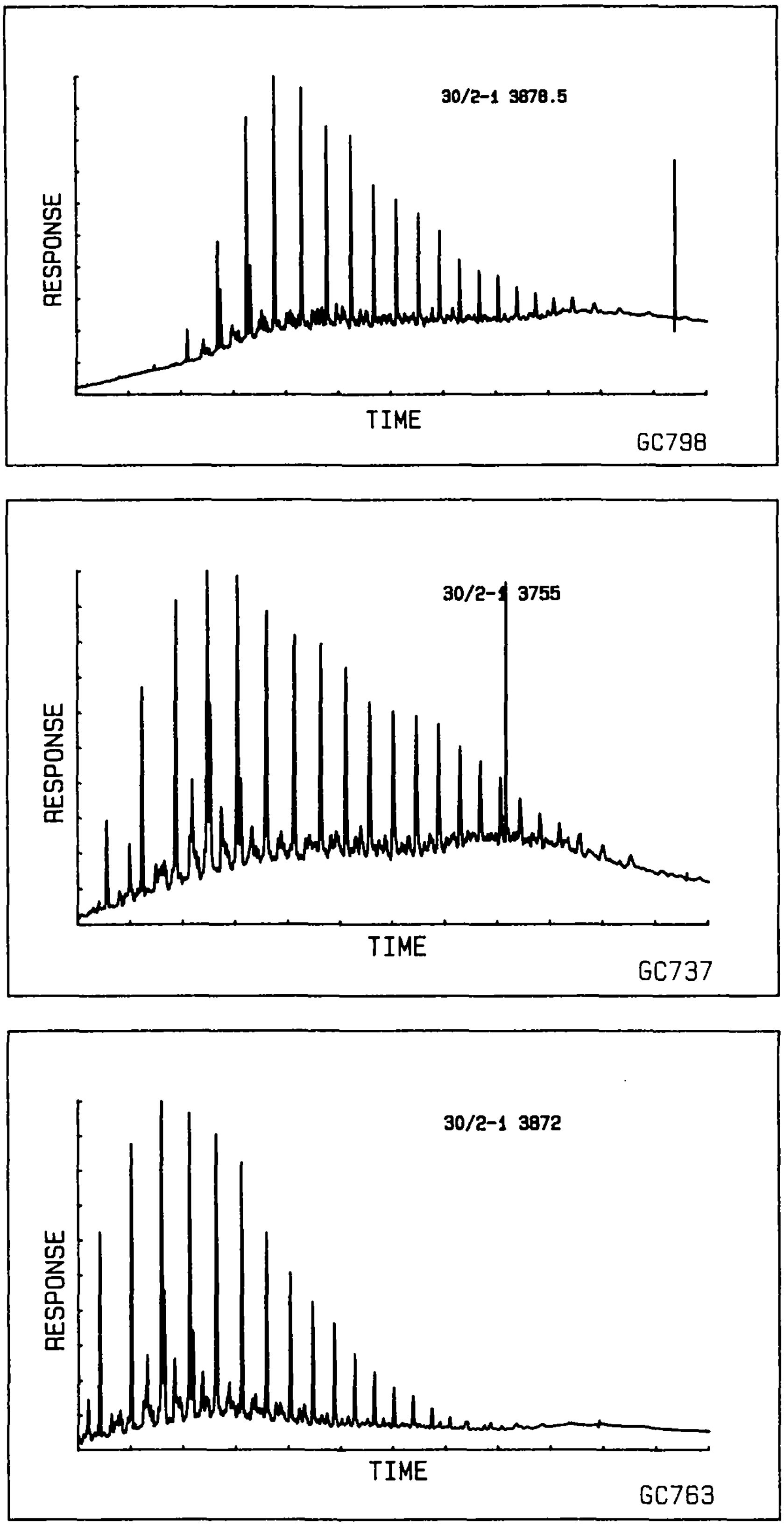

30/2-1 3878.5
RESPONSE
TIME
GC798
30/2-1 3755
RESPONSE
TIME
GC737
30/2-1 3872
RESPONSE
TIME
GC763

Figure 11.