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GEOCHEMICAL ANALYSIS OF TWO KIMMERIDGE CLAY
ROCK SAMPLES AND OF A CRUDE OIL FROM
WELL 2/5-7, NORWAY

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GEOCHEMICAL ANALYSIS OF TWO KIMMERIDGE CLAY ROCK
SAMPLES AND OF A CRUDE OIL FROM WELL 2/5-7, NORWAY.

1. INTRODUCTION

Geochemical analysis have been carried out on the following two rock samples and one crude oil sample from well 2/5-7 (Request telex for 240229 of 24.02.84):

- Crude oil sample, OMC 3250, 3300-3335 m, PT-1.
- Sidewall sample, Kimmeridge clay formation, 4112.5 m
- Sidewall sample, Kimmeridge clay formation, 4113.5 m

Since the sidewall samples were only of limited size not all typing parameters could be determined.

2. RESULTS AND DISCUSSION

The results, which are given in Tables 1-3 and Figs. 1-8, indicate the following:

Crude oil sample

The gas chromatogram of the saturated hydrocarbons (Fig.1) and the C7 alkane distribution (Fig.4) indicate that this crude oil sample has not been bacterially degraded.

The relatively low intensity of the non-N-alkanes in the C30 region of the gas chromatogram (Fig.1) and the C29 DOM value of 70 point to expulsion from a mature source rock. It should be kept in mind that the C29 DOM only has been calibrated between 56-66 and that values above and below this range has been obtained by extrapolation.

The shape of the gas chromatogram (Fig.1) and the C15- and C30 ringdistribution indicate that this oil was generated from a source rock containing structureless organic matter (S.O.M.). The sterane and triterpane fragmentograms (Figs. 6) indicate that the S.O.M. is probably of bacterially reworked phytoplanktonic origin.

The C7 alkane/naphthene distribution (Fig.4) points to a shaly environment of deposition of the source matter of this

crude oil.

Extracts of Kimmeridge clay formation

All data indicate that the extracts of both samples (4112.5 and 4113.5 m) are very similar.

The relatively low intensity of the non-n-alkanes in the C30 region of the gas chromatogram (Figs. 2-3) and the C29 DOM values (68) indicate that these extracts are mature. This is in agreement with the estimated DOM (65-68) obtained by a fluorescence measurement of liptinites. (Table 3).

The shape of the gas chromatograms (Figs. 2-3), the C15- and C30 ringdistributions (Fig.5) and the sterane and triterpane fragmentograms (Figs. 7-8) indicate that these samples contain structureless organic matter of probably bacterially reworked phytoplanktonic origin.

Correlation

All data indicate that the crude oil and the two extracts are rather similar.

3. CONCLUSIONS

The crude oil sample (Well 2/5-7, 3300-3335 m) has not been bacterially degraded and was expelled from a mature (shaly) source rock containing structureless organic matter of bacterially reworked phytoplanktonic origin.

Both rock samples (4112.5 and 4113.5 m), are rather similar and can be regarded as mature source rocks. They contain structureless organic matter probably of bacterially reworked phytoplanktonic origin.

The Kimmeridge Clay Formation as represented by the two samples investigated may well be the source of the crude found in this well.

Table-1 GEOCHEMICAL DATA OF CRUDE OIL
WELL 2/5-7 (3300-3335 M)
PT-1, OMC 3250

API	41.8
specific gravity	0.8162
%w. boil. 120°C	15.5
% sulphur	0.1
ppm V as metals	0
ppm Ni as metals	0
Pristane/phytane	1.4
Pristane/nC17	0.5
Phytane/nC18	0.5
C7-distribution	
C7-alkane	
nC7	53
monobranched	37
polybranched	10
C7-alk/naphthene	
nC7	28
naphthenes	46
branched alkanes	26
C7-alk/naphth/arom	
nC7	48
naphthenes	41
aromatics	11
C15-distribution	
1-ring	56
2-ring	32
3-ring	12
C30-distribution	
3-ring	33
4-ring	42
5-ring	25
C29 DOM	70
% asphaltenes	0
**	
% saturates	45
% aromatics	9
% heterocompounds	3
% rest	43
δ 13C ‰	-28.1

** Determined by column chromatography

Table-2 GEOCHEMICAL DATA OF EXTRACTS

	Kimmeridge Clay FM Well 2/5 - 7 Sidewall samples	
	4112.5 m	4113.5 m
% ethyl acetate extract	2.0	2.6
% organic carbon after extraction	7.0	6.6
% sulphur	ND	ND
ppm V as metals	ND	ND
ppm Ni as metals	ND	ND
Pristane/phytane	1.5	1.5
Pristane/Nc17	0.6	0.6
Phytane/nC18	0.5	0.5
C15 distribution		
1-ring	54	55
2-ring	32	30
3-ring	14	15
C30 distribution		
3-ring	24	32
4-ring	51	40
5-ring	25	28
C29 DOM	68	68
% saturates	39	43
% aromatics	46	40
% heterocompounds	15	17
$\delta^{13}\text{C}$ o/oo (extract)	ND	-29.8
$\delta^{13}\text{C}$ o/oo (kerogen)	-28.7	-29.3
extract/carbon	0.28	0.39

ND = Not detectable due to the small amount of material

MACERAL DESCRIPTION OF 1 SAMPLE FROM WELL 2/5-7

DEPTH IN M	SAMPLE TYPE
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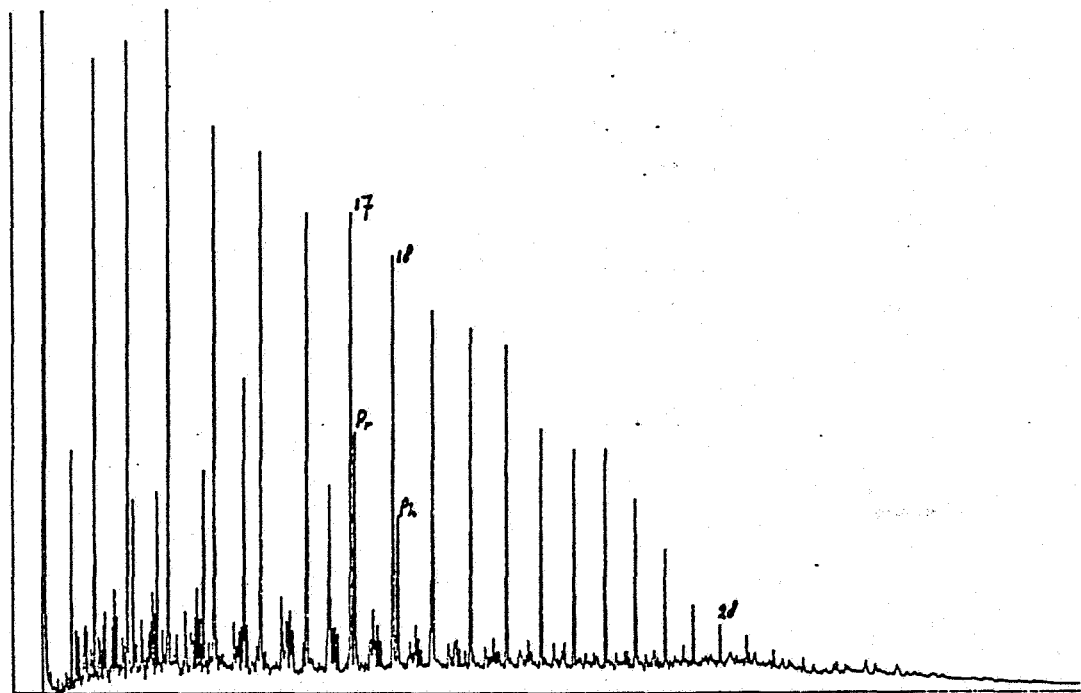
4112.5	S. W. S.
--------	----------

SAPROPELIC ORG. MATTER	ORGANIC										INORG.	
	VITR.	LIPTINITE						INERT.				
							ALGAE					
	TELOCOLLINITE											
	TELINITE											
	DESMOCOLLINITE											
	SPORINITE											
	CUTINITE											
	RESINITE											
	LIPTODETRINITE											
	BOTRYOCOCCUS											
	TASMANITES											
	OTHER ALGAE											
	MICROPLANKTON											
	EXSUDATINITE											
	SCLEROTINITE											
	FUSINITE											
	MAGRINITE											
	MICRINITE											
	UNDEFINED MINERALS											
	FRAMBOIDAL PYRITE											
	AGGREGATES OF PYRITE											
	CRYSTALS OF PYRITE											

+					+	/		-	/	+	*	+	/	-
---	--	--	--	--	---	---	--	---	---	---	---	---	---	---

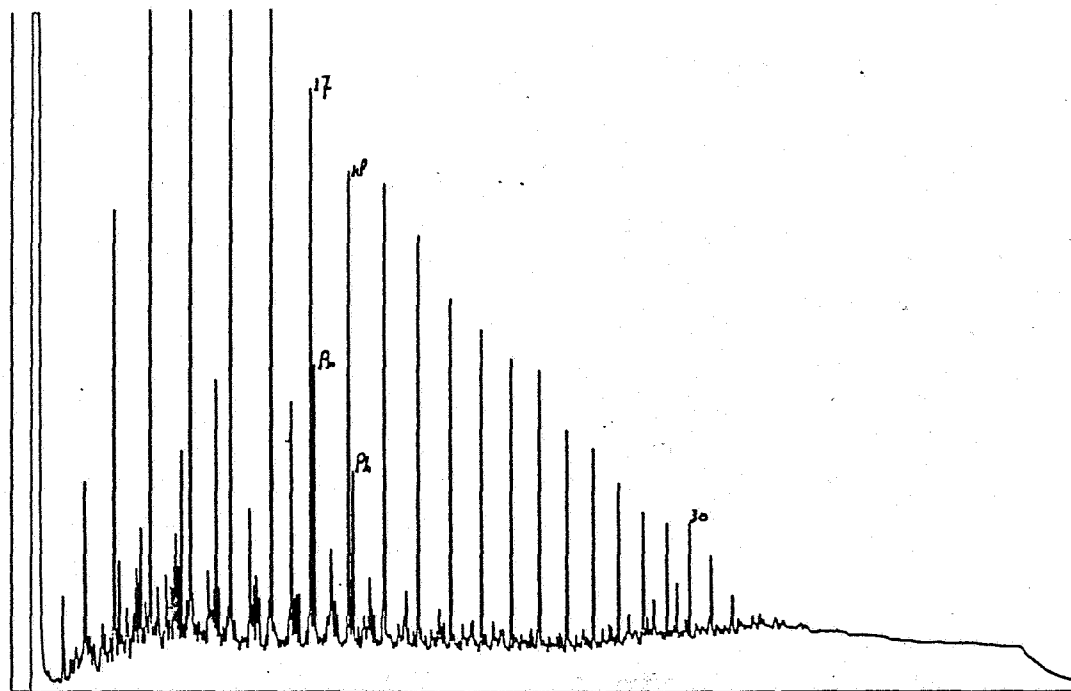
L E G E N D	
*	: ABUNDANT
+	: COMMON
/	: FEW
-	: RARE

4112.5 M : S.O.M. PARTLY MICRINISED
FOSSIL REMAINS
DARK FLUORESCENT LIPTINITES (MATURE)
DOM ABOUT 65-68 ?



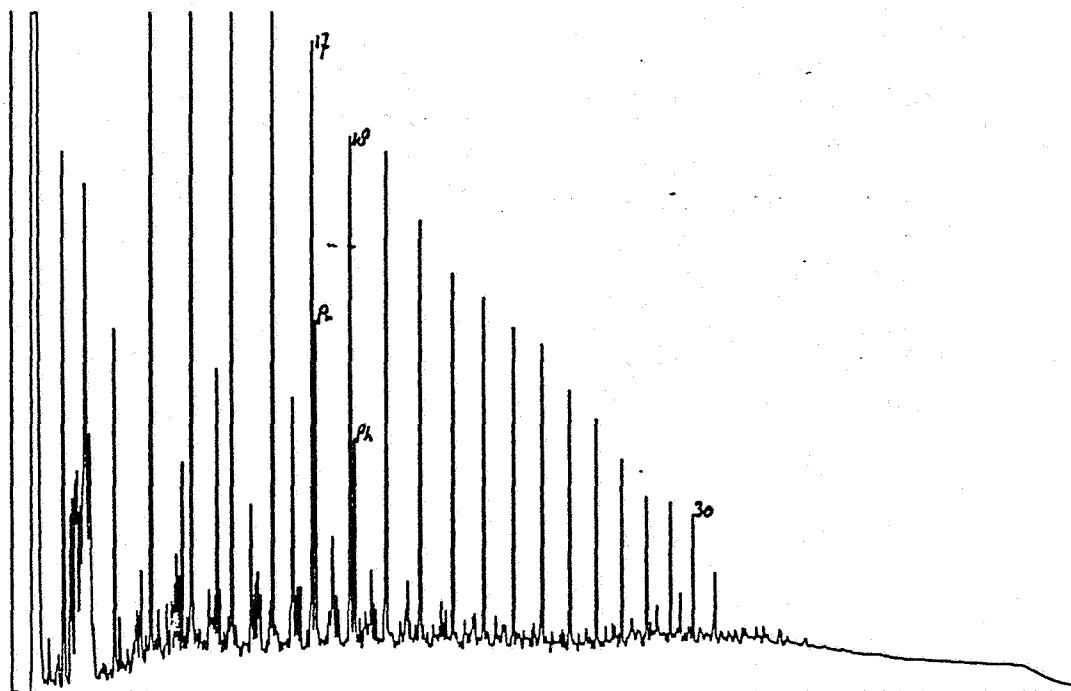
GAS CHROMATOGRAM OF SATURATED HYDROCARBONS

FIG. 1. NORWAY, 2/5-7, 3300-3335M, OMC 3250, PT-1



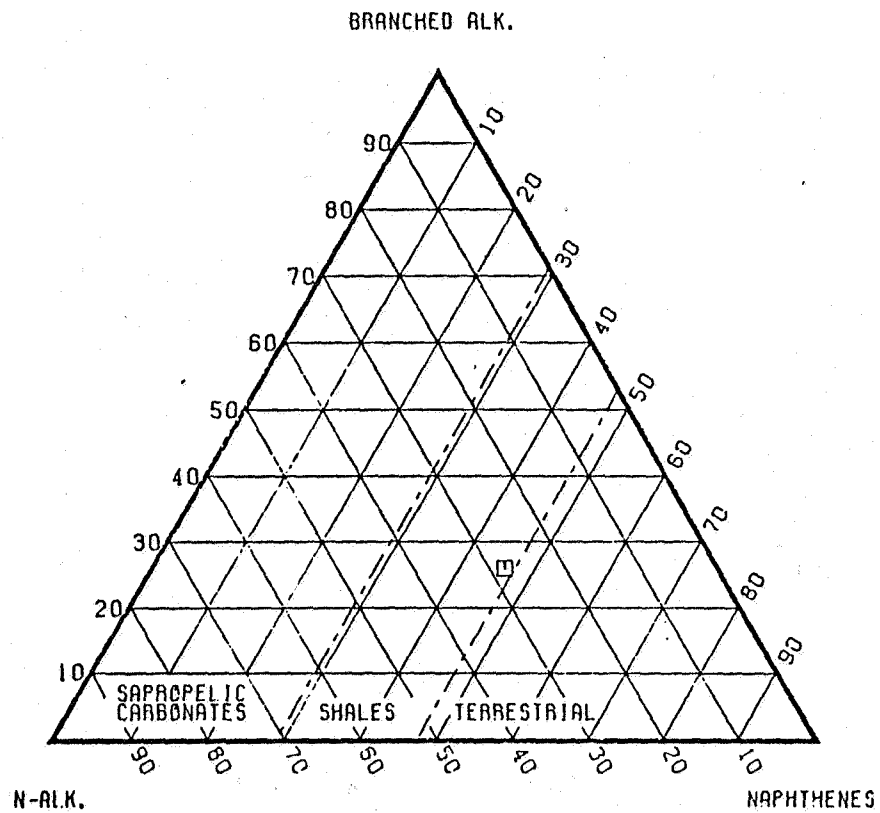
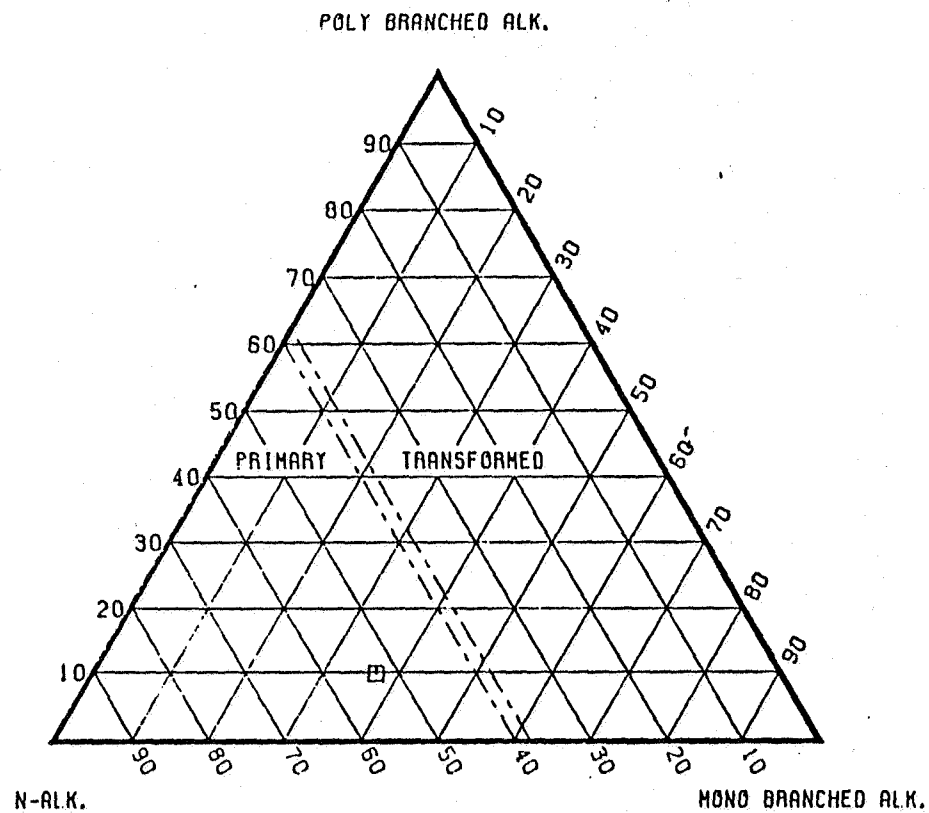
GAS CHROMATOGRAM OF SATURATED HYDROCARBONS

FIG. 2. NORWAY 2/5-7 4112. 5M KIMM. CLAY, SWS



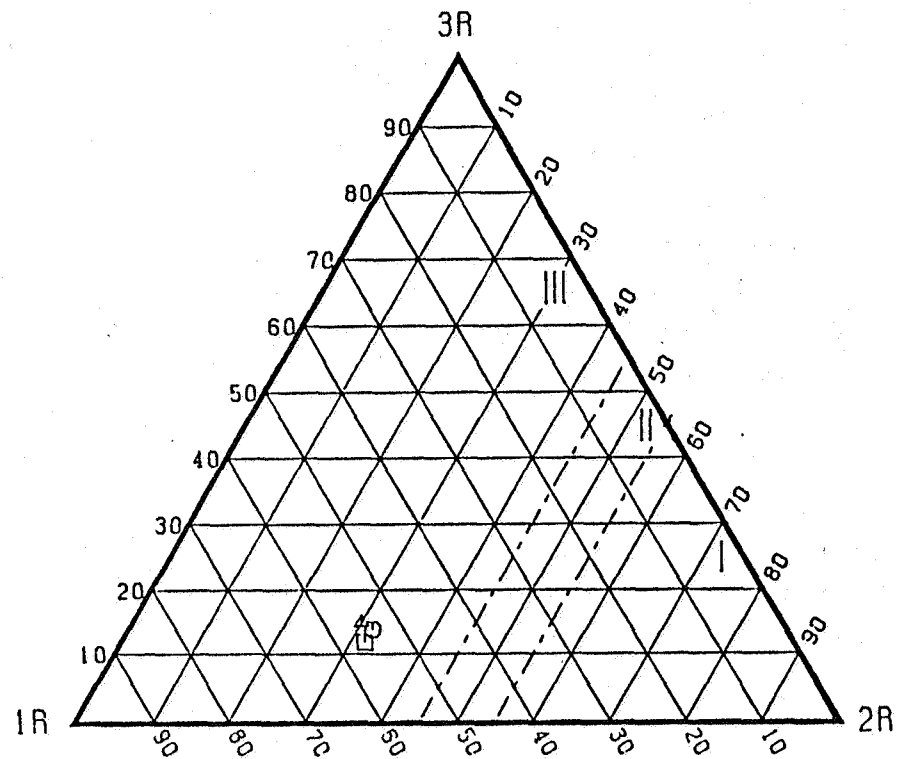
GAS CHROMATOGRAM OF SATURATED HYDROCARBONS

FIG. 3. NORWAY 2/5-7 4113. 5M KIMM. CLAY, SWS

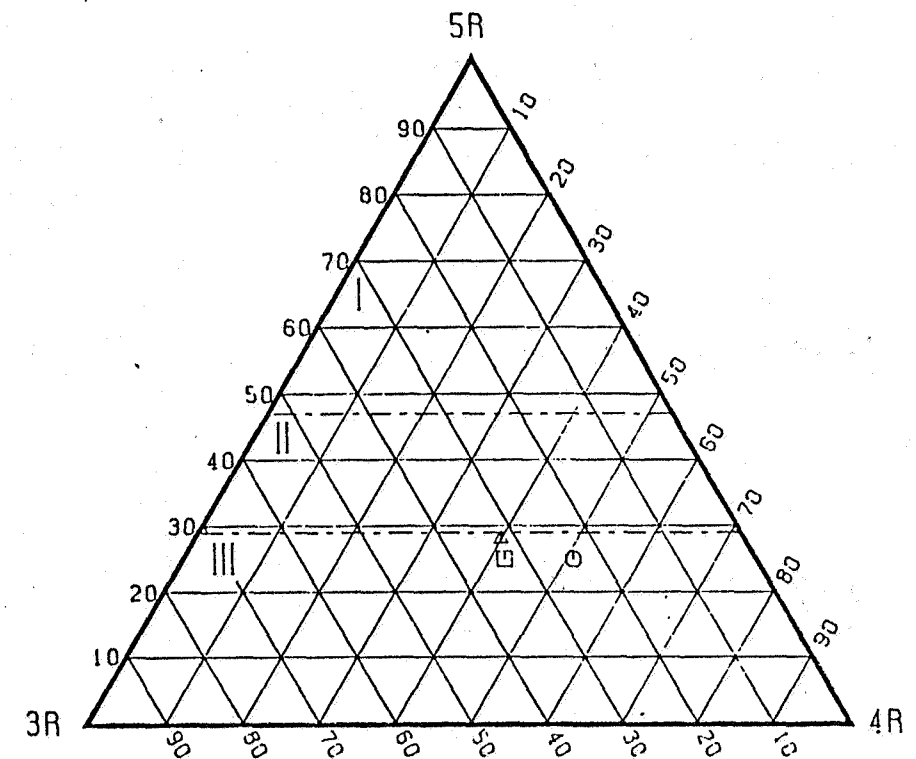


LEGEND
□ - 2/5-7, 3300-3335M, P1-1, OMC 3250, NORWAY

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LEGEND	
□	2/5-7, 3300-3335M, OMC 3250, NORWAY
○	2/5-7, 4112. 5M, SNS, KIMMERIDGE CLAY, NORWAY
△	2/5-7, 4113. 5M, SNS, KIMMERIDGE CLAY, NORWAY

FIG. 6 GC-MS ANALYSIS WELL 2/5-7, 3300-3350M, PT-1
CRUDE OIL SAMPLE, OMC 3250

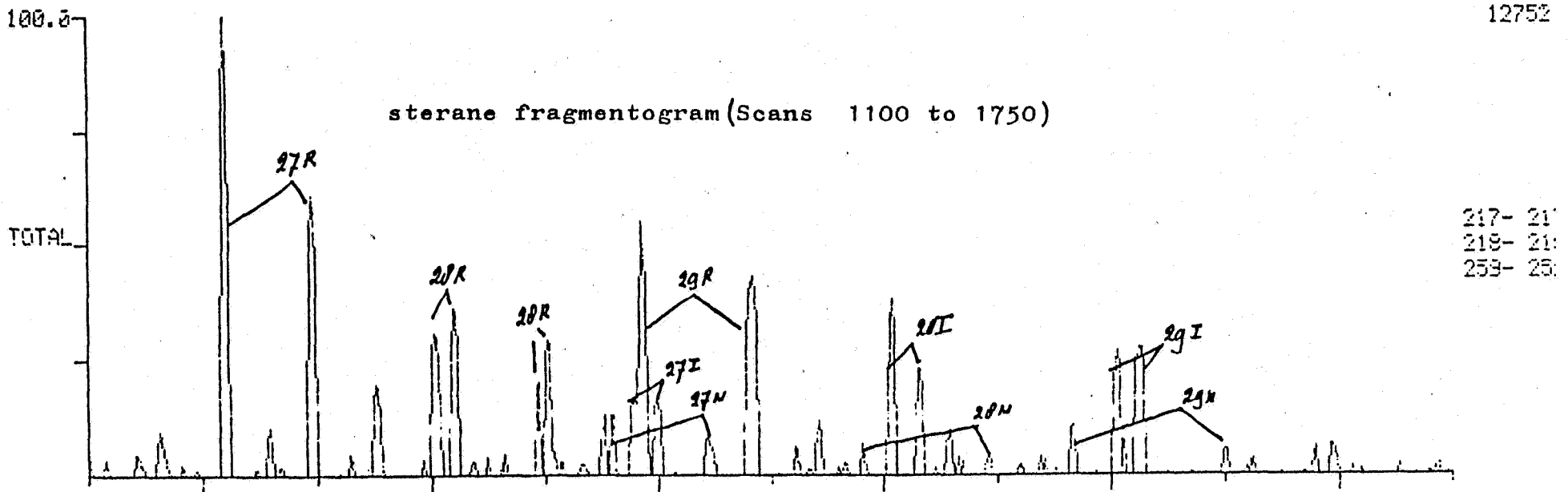
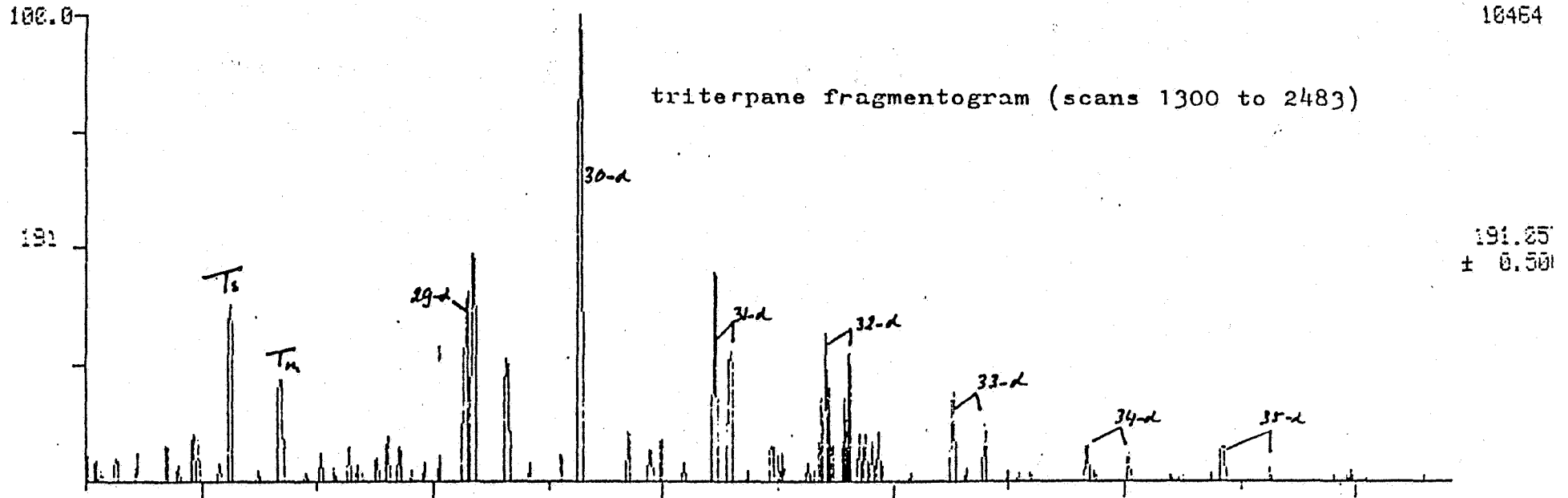
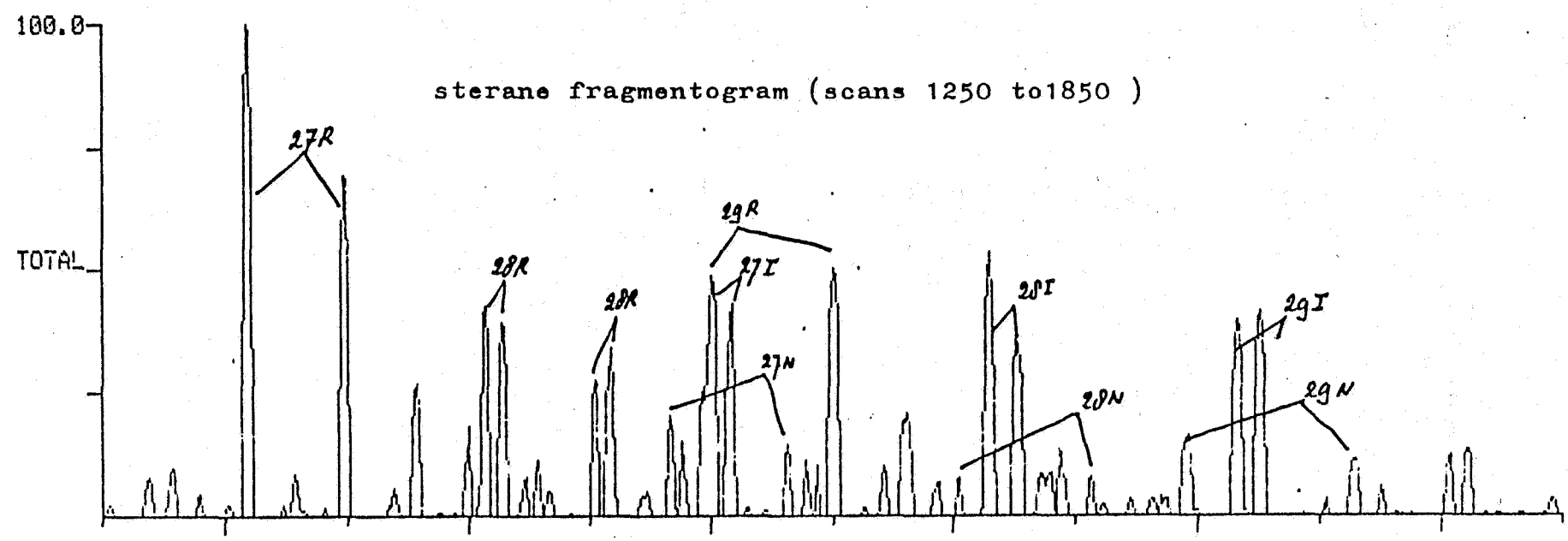
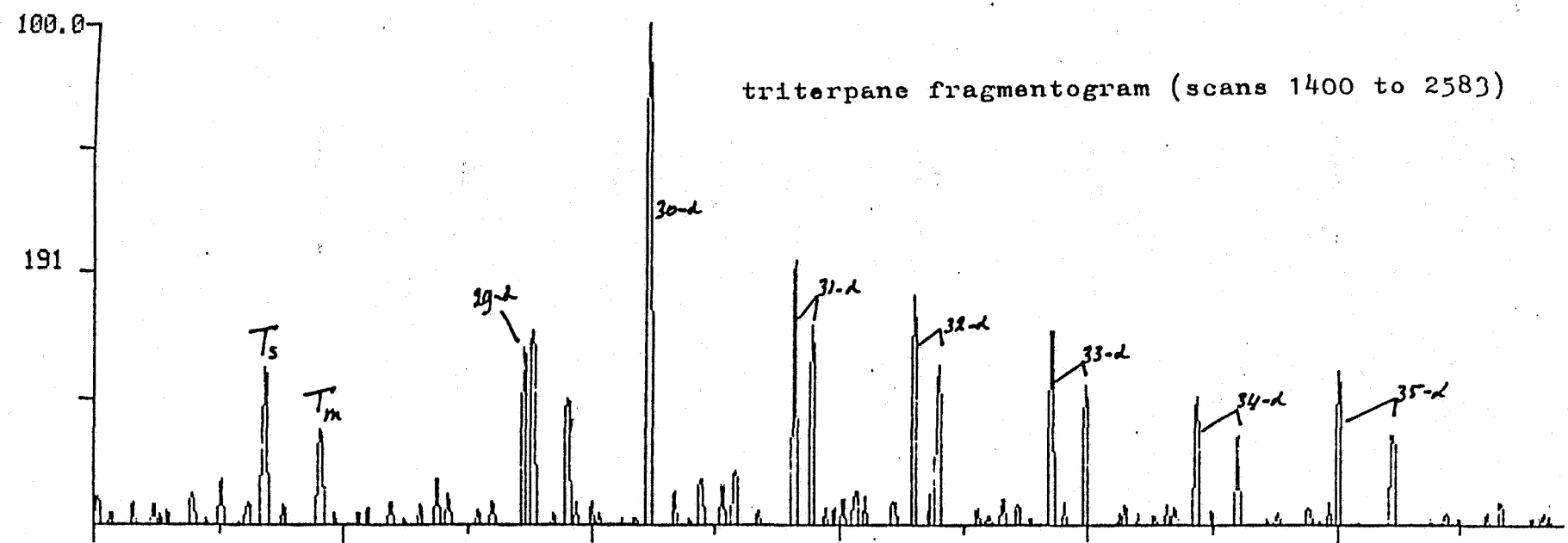
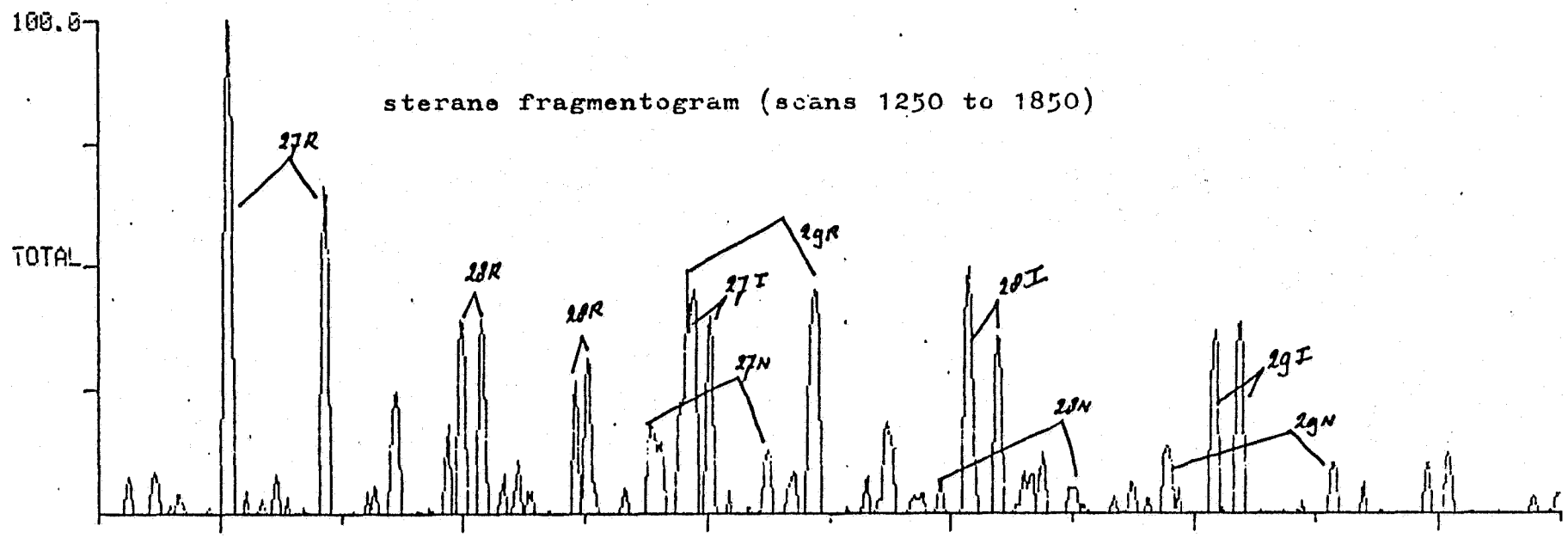
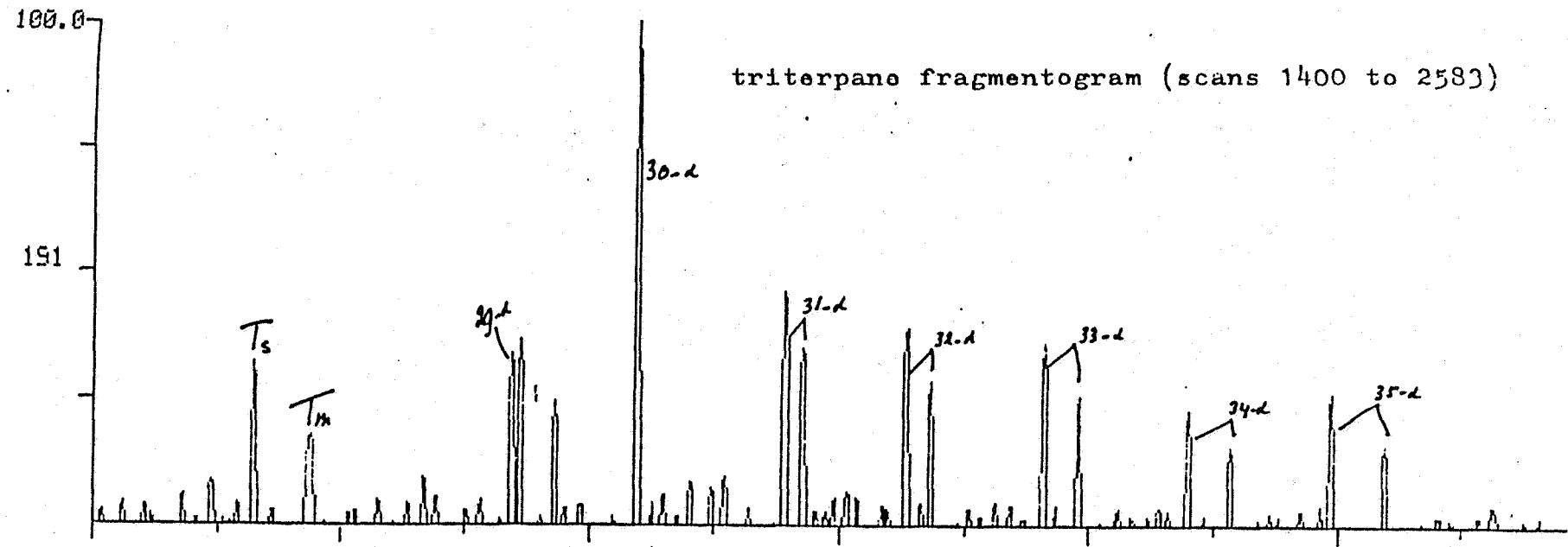


FIG. 7 GC-MS ANALYSIS WELL 2/5-7, 4112.5M, KIMMERIDGE CLAY
SIDEWALL SAMPLE



GC-MS ANALYSIS WELL 2/5-7, 4113.5M, KIMBERIDGE CLAY
SIDEWALL SAMPLE



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