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REGISTRERT  
OLJEDIREKTORATET

30/6 - 7 WELL

(NORWAY)

ALPHA NORTH STRUCTURE

GEOCHEMICAL STUDY OF FLUIDS

(MFT 2 AND MFT 4)

P. CAILLEAUX

Boussens - Janvier 1985

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LISTE DE DIFFUSION

DESTINATAIRES HORS DEX :

EXPLORATION DIG EUROPE	1
EXPLORATION ELF AQUITAINE NORGE	8
S.I.D. BOUSSENS	2

A B S T R A C T

The main results of the geochemical analysis carried out on the MFT 2 and MFT 4 fluid samples from 30/6 - 7 well is as follows :  
the oils and the associated gases recovered by MFT 2 (2601 - 2643 m) and MFT 4 (2651 - 2676 m) in the Brent Formation are almost similar. They were sourced by a mature Upper Jurassic source rock as the previously studied 30/6 oils were.

7 pages  
2 tables  
6 figures

## C O N T E N T S

	<u>pages</u>
1 - OILS.....	1
2 - ASSOCIATED GASES.....	2
3 - CONCLUSION.....	2

## T A B L E S

Tab. 1 : 30/6 - 7 oils : compositions and indices

Tab. 2 : 30/6 - 7 gases : composition and isotopical data

## F I G U R E S

Fig. 1 and 1 bis : location map

Fig. 2 : 30/6 - 7 MFT 2 oil : chromatograms

Fig. 3 : 30/6 - 7 MFT 4 oil : chromatograms

Fig. 4 :  $C_1/(C_2 + C_3)$  vs  $\delta^{13}C$  (CH<sub>4</sub>)

Fig. 5 :  $\delta^{13}C$  (C<sub>2</sub> H<sub>6</sub>) vs  $\delta^{13}C$  (CH<sub>4</sub>)

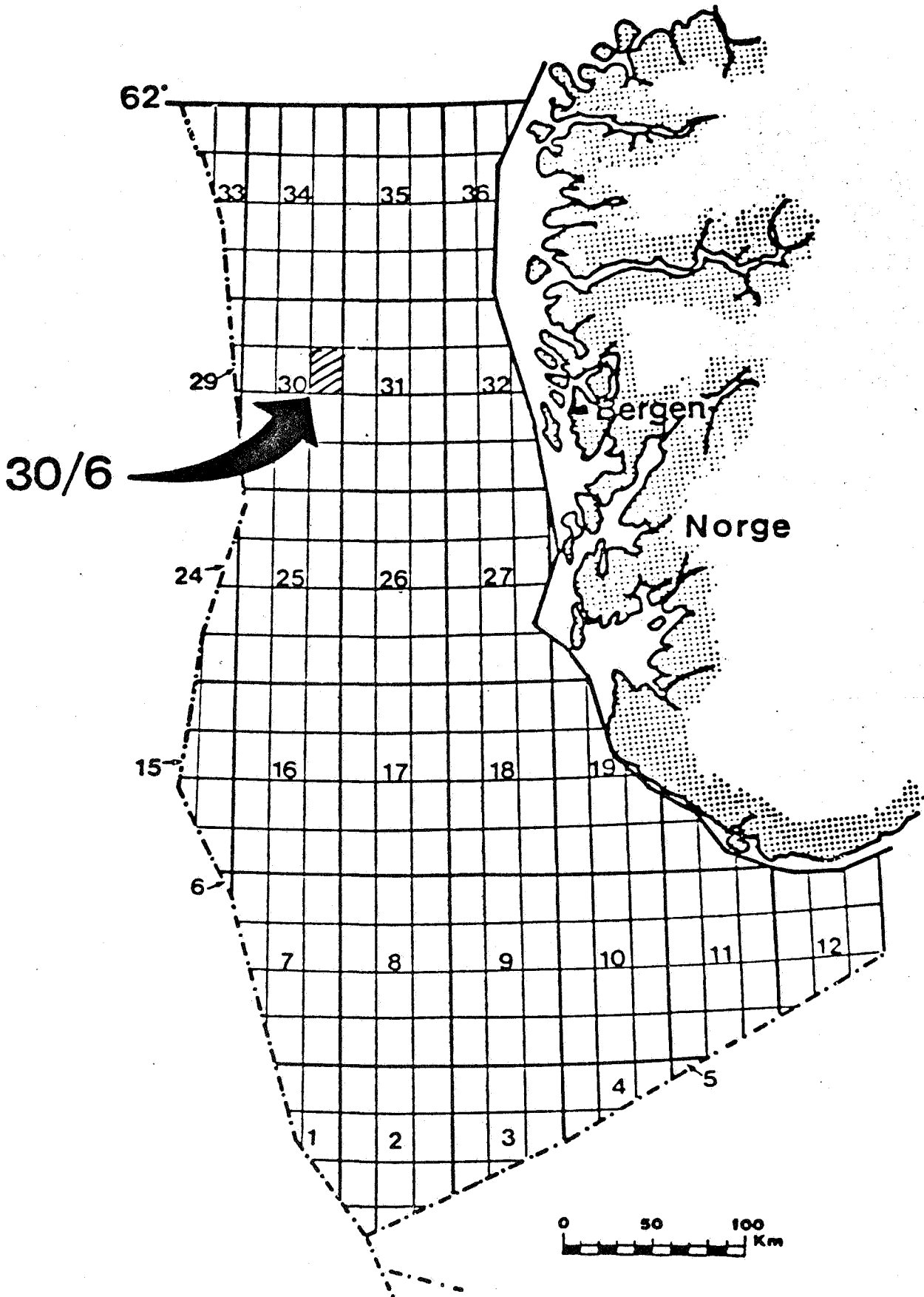


Fig. 1 - 30/6 - LOCATION MAP

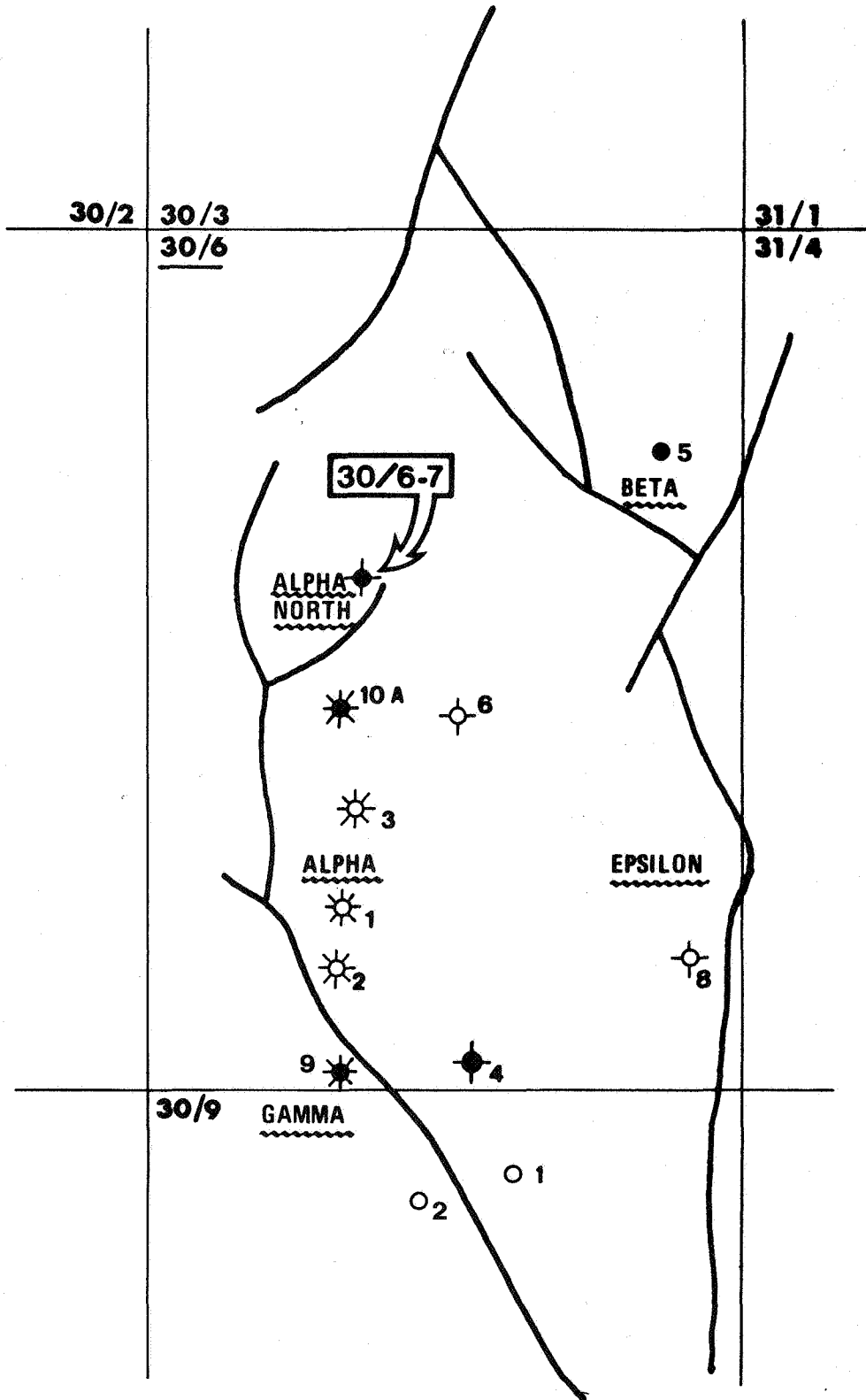


Fig. 1 bis - 30/6-7 - LOCATION MAP

Two oil and gas samples, recovered by MFT 2 (2601 - 2643 m) and 4 (2651 - 2676 m) in the Brent Formation of the 30/6 - 7 well Alpha North, have been analysed.

These two samples come from the only two bottles identified with assurance among the bottles sent by ELF NORGE.

Analytical results are given in the tables 1 and 2, the chromatograms of the thermovaporized, saturated and aromatic fractions of the oils are given in the plates 2 and 3.

1 - OILS (table 1)

The geochemical characteristics (gross composition and chromatograms) show the similarity of the two products. As for the previously studied oils from the 30/6 block\*, the A/B ratio = (Pristane/n-C17) / (Phytane/n-C18) = 1,5 is characteristic of an Upper Jurassic origin.

The indices defined on the C5 - C15 chromatograms (X1 = n-C6/methylcyclopentane and X2 = n-C7/dimethylcyclopentane) and on the C15+ fraction (Pristane/n-C17 and Phytane/n-C18) show the two oils have been sourced by a mature source rock in the second half of the oil generation zone.

Compared with 30/6 - 4 oils\*, the saturated fractions of 30/6 - 7 oils are slightly more mature (particularly lower Pr/n-C17 and Ph/n-C18, 0.5 vs 0.7 - 0.8 and 0.33 vs 0.5 respectively).

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\* 30/6 - 1 - 2 and 3 wells : Geochemical analysis of fluids (oil, condensates and gases) - P. CAILLEAUX - GEO/LAB Bss n° 1/2105 RP.

30/6 - 4 well : Biostratigraphy, sédimentology and organic geochemistry - P. CAILLEAUX, P. ROBERT, J. DUCAZEAUX, J.L. VOLAT - GEO/LAB Bss n° 2/2252 RP.

30/6 - 5 well : Geochemical study of oil - P. CAILLEAUX - GEO/LAB Bss n° 2/2318 RP.

T A B L E 1

30/6 - 7 OILS

GROSS COMPOSITION AND CHROMATOGRAPHICAL INDICES

	MFT 2	MFT 4	
TEST	MFT 2	MFT 4	
Depth	2501 - (43)	2051 - (76)	
G.O.R. (m <sup>3</sup> /m <sup>3</sup> )	140	135	
Spec. grav. 15°C (g/cm <sup>3</sup> )	0.852	0.851	
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Composition of the total product (%)	DISTILLATE = D	28,9	30,8
	ASPHALTENES	1,8	1,8
	RESINS	7,1	6,3
	SATURATED H.C. = S	38,5	37,0
	AROMATIC H.C. = A	23,6	24,1
	S / A	1,63	1,53
	S + D	67,4	67,8
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C15 <sup>-</sup> (T.V.)	X1 = n-C6/MCP	1,96	2,07
	X2 = n-C7/DMCP	6,40	4,91
	Y1 = n-C7/TOL	1,53	1,72
	Σ TV % P.T.	21	22
	n-Alk % TV	32	34
-----			
C15+	n-Alk % Sat.	12	10
	Pr/n-C17 = A	0,51	0,50
	Ph/n-C17 = B	0,33	0,33
	Pr/Ph	1,64	1,62
	A / B	1,53	1,50

*RTI/FMT*

MCP : methylcyclopentane  
DMCP : dimethylcyclopentane

TOL : toluene  
TV : thermovaporized fraction (C15<sup>-</sup>)  
Pr, Ph : Pristane, Phytane



**SNEA(P)**

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PAYS : NORWAY  
 Country : NORWAY  
 SONDAGE : 30 / 6 - 7 (α nord)  
 Well : 30 / 6 - 7 (α nord)

Huile / Oil : Cote / Depth : 2601 - 2643 m  
 Identification : MFT 2  
 Formation : BRENT Fm  
 Age : Age

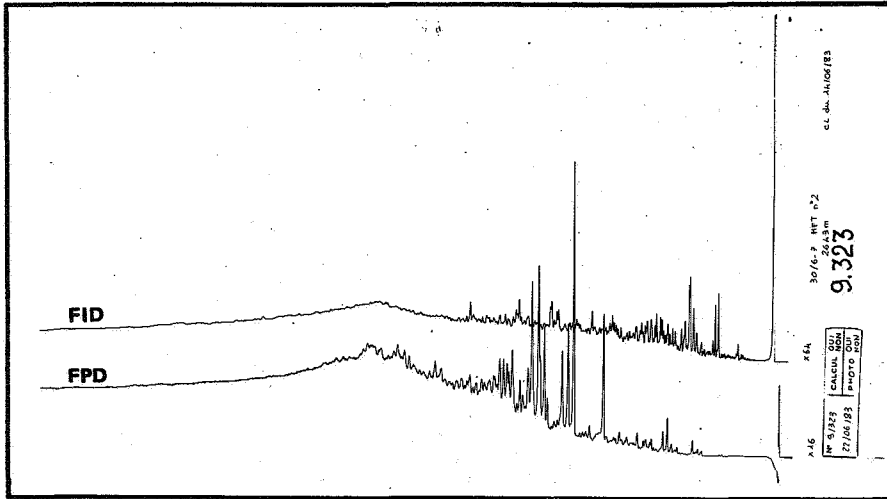
Fig. 2

Spec. gravity : 0,852

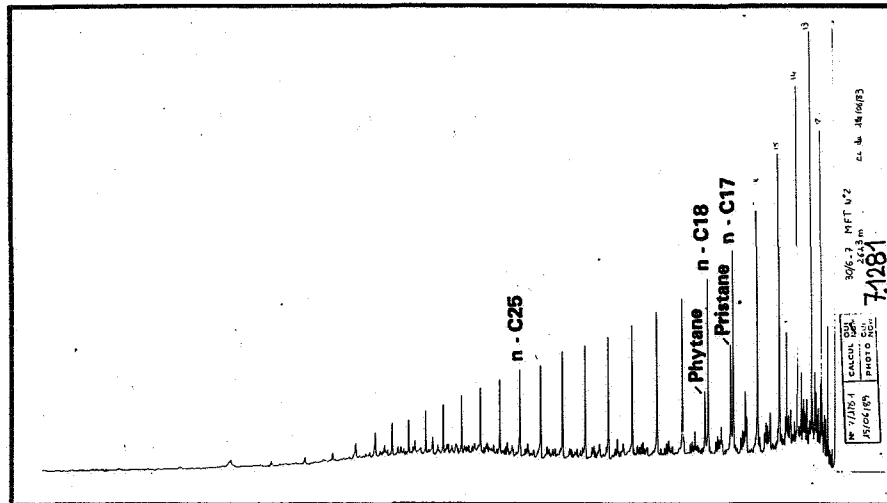
Composition du produit total (%)  
 Composition of total product

Asphaltènes Asphaltenes	As	: 1,8
Résines Resins	R	: 7,1
HC saturés Saturated HC	S	: 38,5
HC aromatiques Aromatic HC	A	: 23,6
Distillat Distillate	D	: 28,9

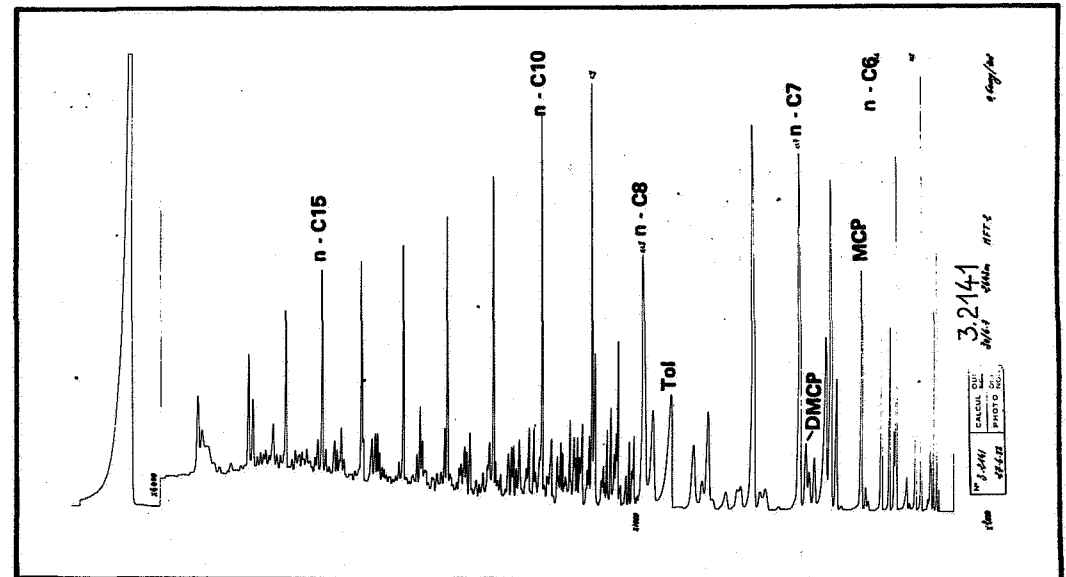
$$\frac{S}{A} = 1,63$$



HC AROMATIQUES AROMATIC HC.



HC SATURES SATURATED HC.



HC THERMOVAPORISES THERMOVAPORIZED HC.

**SNEA (P)**

**DIVISION RECHERCHES ET APPLICATIONS EN GEOLOGIE**

**PAYS : NORWAY**  
Country

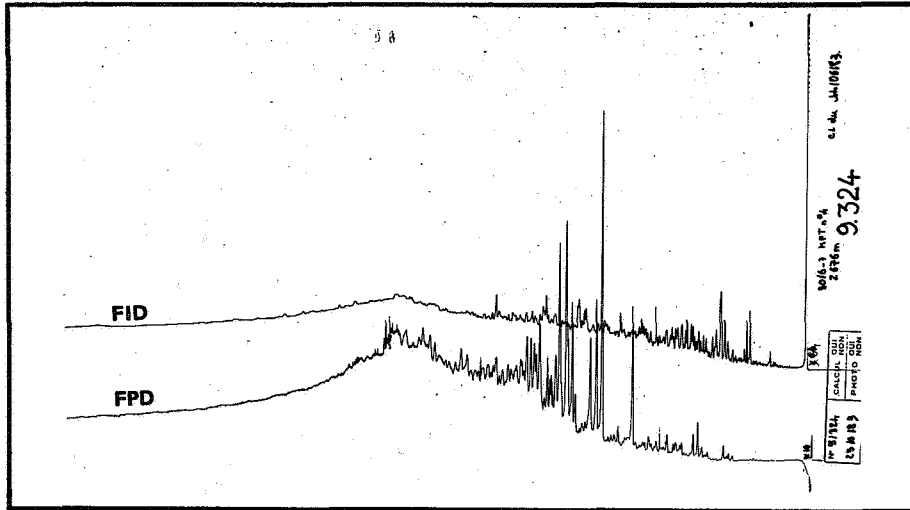
**SONDAGE : 30 / 6 - 7 (α nord)**  
Well

**Huile Oil** Cote Depth **2651 - 2676 m**  
Identification **MFT 4**  
Formation **BRENT Fm**  
Age

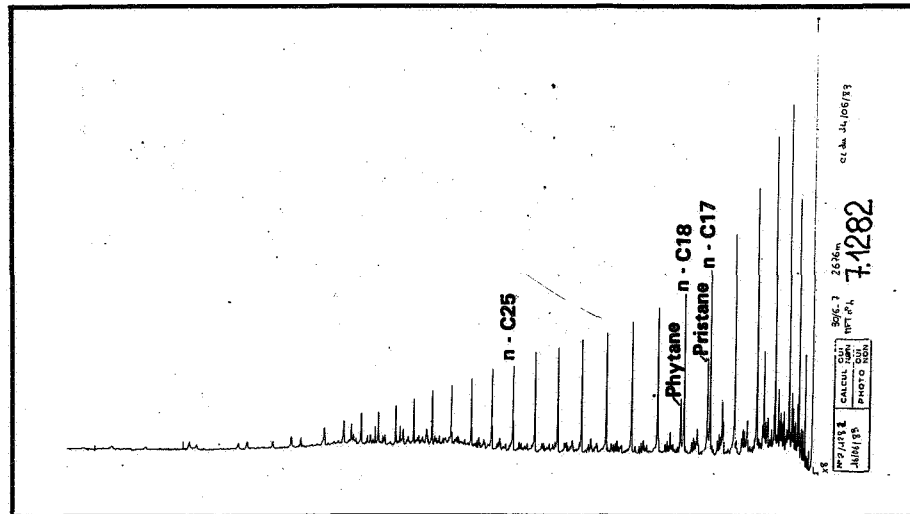
Spec. gravity : 0,851

**Composition du produit total (%)**  
Composition of total product

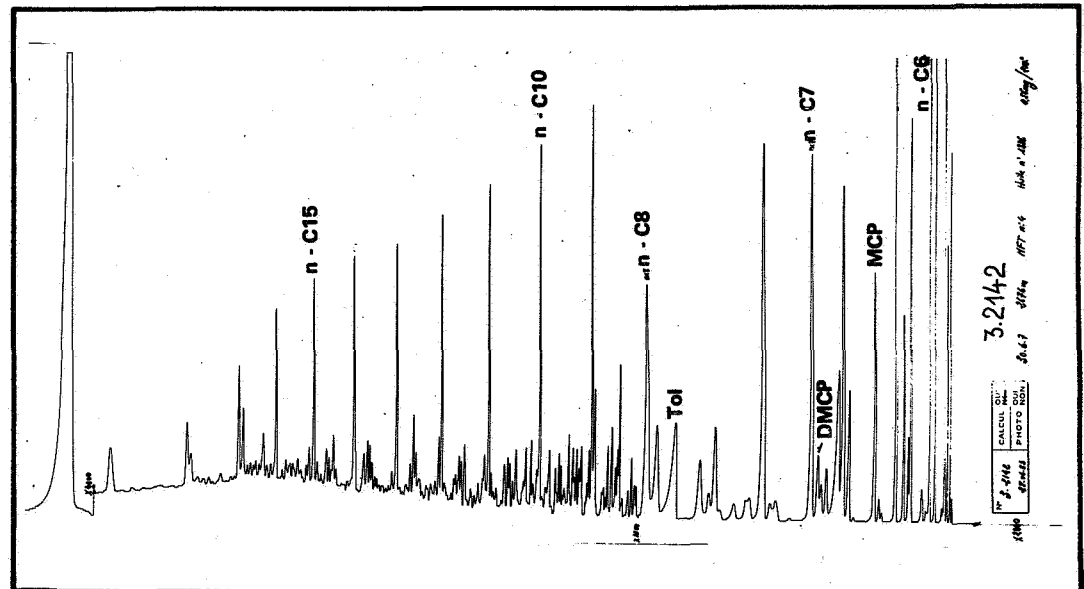
<b>Asphaltènes</b> Asphaltenes	<b>As</b>	<b>: 1,8</b>	
<b>Résines</b> Resins	<b>R</b>	<b>: 6,3</b>	
<b>HC saturés</b> Saturated HC	<b>S</b>	<b>: 37,0</b>	$\frac{S}{A} = 1,53$
<b>HC aromatiques</b> Aromatic HC	<b>A</b>	<b>: 24,1</b>	
<b>Distillat</b> Distillate	<b>D</b>	<b>: 30,8</b>	



**HC AROMATIQUES AROMATIC HC.**



**HC SATURES SATURATED HC.**



**HC THERMOVAPORISES THERMOVAPORIZED HC.**

## 2 - ASSOCIATED GASES

As the oils, the two associated gases (GOR ~ 140) are very similar. Taking into account the isotopical ratios, these wet gases (C<sub>2+</sub> = 20 % of total hydrocarbons) are thought to have an origin in a non humic material (Upper Jurassic) and to have a thermogenic origin (i-C<sub>4</sub>/n-C<sub>4</sub>, C<sub>1</sub>/C<sub>2</sub> + C<sub>3</sub>,  $\delta^{13}\text{C}(\text{CH}_4)$ ), cf. diagram on fig. 4).

Compared with the 30/6 - 1, 2 and 3 gases\*, the representative points of 30/6 - 7 gases, in the  $\delta^{13}\text{C}(\text{C}_2\text{H}_6)$  vs  $\delta^{13}\text{C}(\text{CH}_4)$  diagram (Fig. 5), are located toward the lighter values of  $\delta^{13}\text{C}(\text{CH}_4)$ . Therefore a very slight input of biogenic gas or a very slight migration effect (STAHL et al. 1975) may not be left out.

Owing to the lack of references on gases, the oxygen data are not explained.

## 3 - CONCLUSION

The fluids recovered by the MFT 2 and MFT 4 in 30/6 - 7 are very similar and were sourced by a mature Upper Jurassic source rock as the 30/6 oils previously studied.

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\* Report already mentionned.

T A B L E 2

30/6 - 7 ASSOCIATED GASES

MOLAR COMPOSITION AND ISOTOPICAL DATA

TEST	MFT 2	MFT 4
DEPTH	2601 - 2643	2651 - 2676
G.O.R. (m <sup>3</sup> /m <sup>3</sup> )	140	135
N <sub>2</sub>	3.70	1.76
CO <sub>2</sub>	0.76	0.81
C <sub>1</sub>	76.61	77.58
C <sub>2</sub>	10.90	10.70
C <sub>3</sub>	5.79	6.29
i-C <sub>4</sub>	0.65	0.79
n-C <sub>4</sub>	1.15	1.46
i-C <sub>5</sub>	0.21	0.29
n-C <sub>5</sub>	0.23	0.31
C <sub>6</sub> +	—	—
C <sub>1</sub> % $\Sigma$ C <sub>n</sub>	80.2	79.6
C <sub>1</sub> /C <sub>2</sub> + C <sub>3</sub>	4.6	4.6
i-C <sub>4</sub> /n-C <sub>4</sub>	0.565	0.541
$\delta^{13}\text{C}$ CH <sub>4</sub> /PDB ‰	-43.3	-43.05
C <sub>2</sub> H <sub>6</sub> /PDB ‰	-28.86	-28.30
CO <sub>2</sub> /PDB ‰	-10.9	-10.6
$\delta^{18}\text{C}$ CO <sub>2</sub> /SMOW ‰	+28.8	+27.8

C<sub>1</sub> %  $\Sigma$  C<sub>n</sub> = methane % of the total hydrocarbons.

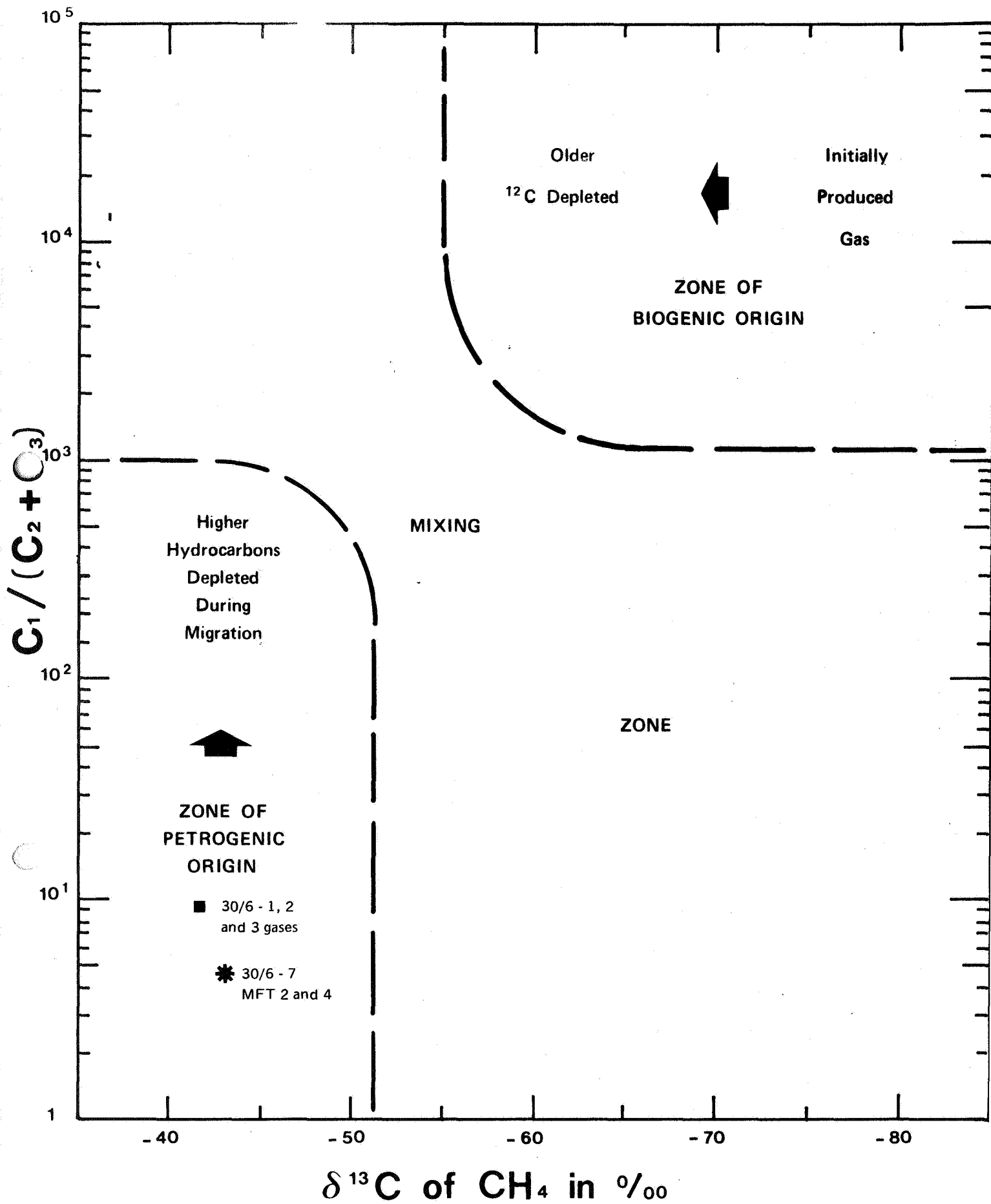


Fig. 4 - 30 / 6 - 7 -  $\delta^{13}\text{C}$  ( $\text{CH}_4$ ) / PDB -  $\frac{C_1}{(C_2 + C_3)}$

After Bernard and al, 1977

Fig. 5 - 30 / 6 - 7 GASES (COMPARISON WITH 30 / 6 - 1, 2 AND 3 GASES)

