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Pau , le July 1987

**WELL 30/6-10A
NORWAY**

*ALPHA STRUCTURE
Geochemical study of the oil,
condensate and gases (DST 1 and DST 4)*

EP/S/EXP/Lab.Pau N° 87/104RP

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TITLE : WELL 30/6-10A NORWAY - Alpha structure
Geochemical study of the oil, condensate and gases
(DST 1 and 4)

REFERENCE : EP/S/EXP/Lab.Pau N° 87/104RP

SUMMARY :

This report presents the results of geochemical analysis carried out on fluid samples (oil, condensate and gases) recovered by DST 1 and DST 4 from the Brent formation of well 30/6-10A.

The different fluids have the same origin, probably Upper Jurassic source rock near the end of the oil generation zone.

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This report presents the results of geochemical analyses carried out on fluid samples (oil, condensate and gases) recovered by DST 1 and DST 4 from the Brent Formation of well 30/6-10A (Alpha structure, location maps (Figures 1 and 1(a))).

The analytical results are given in tables 1 (oil and condensate) and 2 (gases), the chromatograms of the thermovaporised, saturated and aromatic fractions of the oil and condensate are given in figures 2 and 3.

1 - OIL AND CONDENSATE (DST 1 and DST 4) (Table 1)

The two liquid samples analysed are :

- the oil from DST 1 (2 600 - 2 602 m) with a GOR of $\sim 150 \text{ m}^3/\text{m}^3$,
- the condensate from DST 4 (2 480 - 2 486 m) with a GOR of $\sim 3 150 \text{ m}^3/\text{m}^3$.

These oil and condensate are similar in composition to the other oils and condensates of block 30/6, in particular to the oil from well 30/6-4.

The origin for these products is also thought to be Upper Jurassic.

With respect to the catagenetic indices (X_1 , X_2 , Z_1 , Pr/n-C17 and Ph/n-C18 (see Table 1 and Figure 4), the source rock of these oils and condensates is thought to be at the end of the oil formation zone.

* Wells 30/6-1, 2 and 3 fluids	: n° 1/2105 RP
Well 30/6-4	: n° 2/2252 RP
Well 30/6-5 oil	: n° 2/2318 RP
Well 30/6-7 fluids	: n° 1/3784 RP
Well 30/6-9 fluids	: in progress

2 - ASSOCIATED GASES (Table 2)

The molar compositions and isotopic data of the 2 gases from DST 1 and DST 4 are given in Table 2.

In the $\delta^{13}\text{C}(\text{C}_2\text{H}_6)$ vs $\delta^{13}\text{C}(\text{CH}_4)$ diagram (Fig. 6 and 6(a)), the two gases from well 30/6-10A are at the limit of the cogenetic zone (after SCHOELL 1983^{**}). Here, the methane and ethane are thought to be cogenetic ; however, a slight participation of biogenic gas (very light methane) cannot be ruled out.

The isotopic ratios :

- $\delta^{13}\text{C}(\text{CH}_4) = - 42,2 \text{ ‰}$ and $- 42,6 \text{ ‰}$,
- $\delta^{13}\text{C}(\text{C}_2\text{H}_6) = - 29,9 \text{ ‰}$ and $- 29,2 \text{ ‰}$,
- and the amount of methane,

suggest a thermogenic origin probably from material near 1 % Ro equivalent.

3 - CONCLUSION

The origin of the fluids is thought to be in the Upper Jurassic shales. The degree of maturation of these shales is estimated at 1 % Ro equivalent.

** M. SCHOELL

Genetic characterization of natural gases

A.A.P.G., V. 67, n° 12, Dec. 83

T A B L E S

Table 1

Well 30/6-10A

Oil and condensate

Gross composition and chromatographic incides

TEST		DST 1	DST 4	
Depth (m)		2 600 - 2 602	2 480 - 2 486	
G.O.R. (m ³ /m ³)		150	3 140	
Spec. Grav. 15°C g/cm ³		0,846	0,737	
Composition of the total product	DISTILLATE	%	32,0	84,0
	ASPHALTENES	%	2,0	-
	RESINS	%	6,3	0,2
	SATURATED H.C.	%	37,6	12,5
	AROMATIC H.C.	%	22,1	3,3
	S/A		1,7	3,72
	S + D		69,6	96,5
C ₁₅ ⁻	X ₁ = nC6/MCP		2,02	3,23
	X ₂ = nC7/DMCP		5,37	5,88
	Y ₁ ² = nC7/TOL		1,39	2,20
	Z ₁ ¹ = nC10/DMN		7,29	5,44
	Σ ¹ TV % total product		15	37
n Alk % TV		32	33	
C ₁₅ ⁺	n Alk % Sat.		14	20
	Pr/nC17 = A		0,58	0,64
	Ph/nC18 = B		0,44	0,45
	Pr/Ph		1,41	1,91
A/B		1,32	1,42	

(D)MCP = (di) methylcyclopentane
 DMN = dimethylnonane (isoprenoid)
 TOL = toluene

Table 2

Well 30/6-10A

Gases

Molar composition and isotopic data *

TEST Depth (m) G.O.R. (m ³ /m ³)		DST 1 2 600 - 2 602 ~ 150	DST 4 2 480 - 2 486 ~ 3 140
N ₂	%	1,34	1,27
CO ₂	%	1,44	1,06
C ₁	%	82,45	85,11
C ₂	%	8,74	6,51
C ₃	%	3,97	3,33
iC ₄	%	0,48	0,44
nC ₄	%	0,94	0,88
iC ₅	%	0,20	0,28
nC ₅	%	0,25	0,17
C ₆ ⁺	%	0,19	0,95
C ₁ % Σ C _n		84,80	87,10
C ₁ /C ₂ +C ₃		6,49	8,65
iC ₄ /nC ₄		0,509	0,498
δ ¹³ C CH ₄ /PDB	‰	- 42,2	- 42,6
C ₂ H ₆ /PDB	‰	- 29,9	- 29,2
CO ₂ /PDB	‰	- 10,9	- 7,2
δ ¹⁸ O CO ₂ /SMOW	‰	+ 29,8	+ 29,3

* : PVT and isotopic analysis carried out in PAU (AUCLAIR - BARADAT).

FIGURES

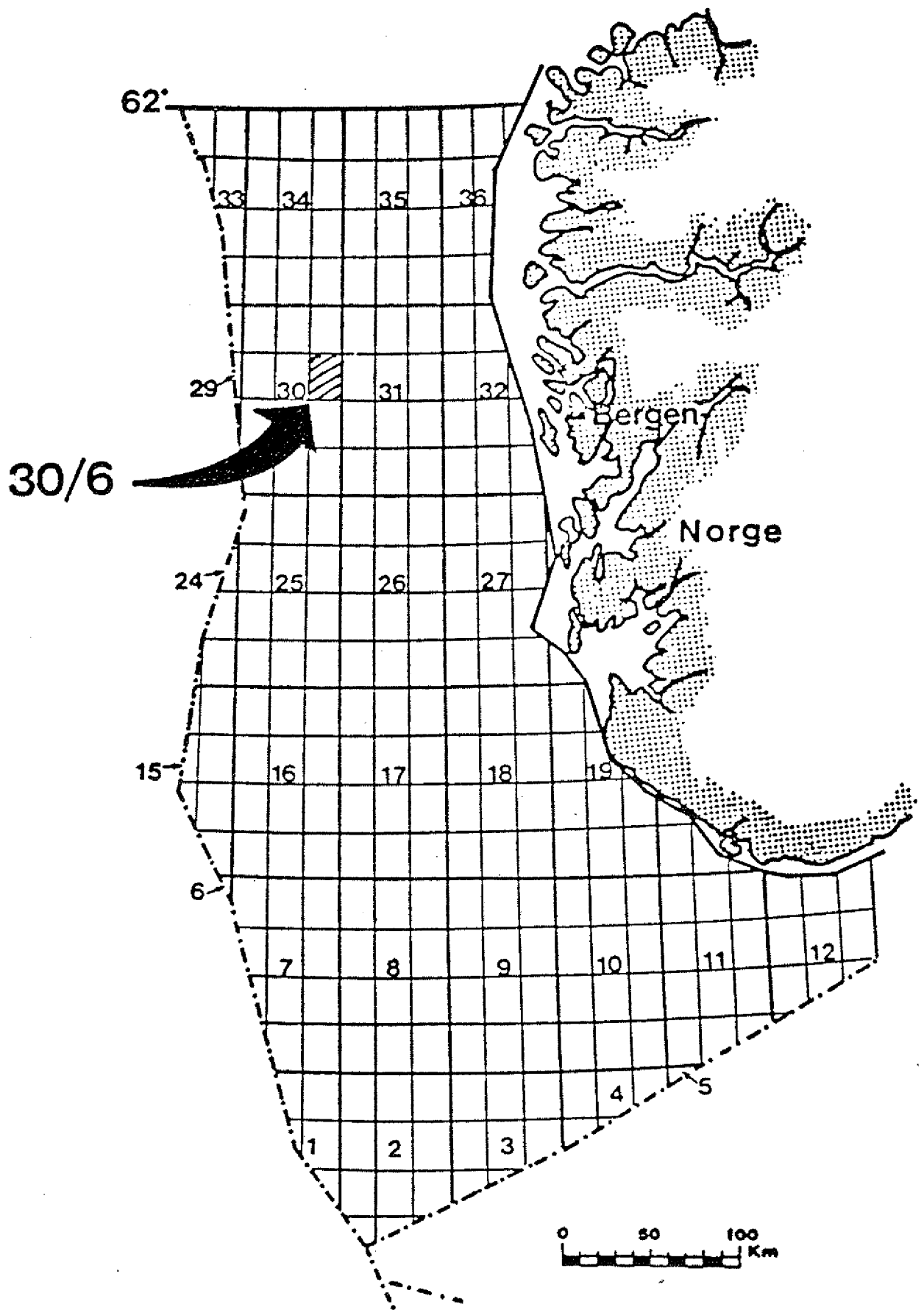


Fig. 1 - 30 / 6 - LOCATION MAP

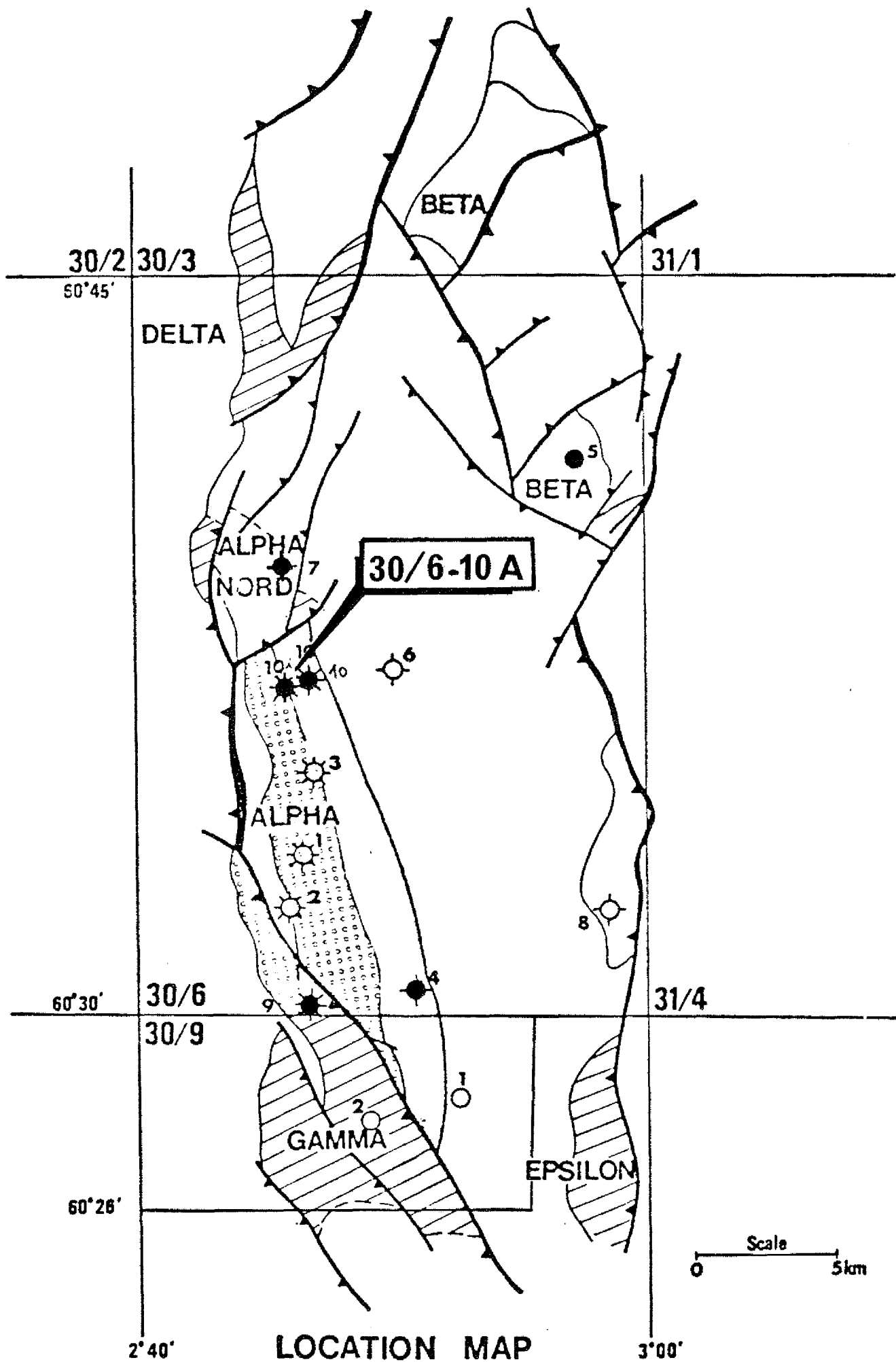
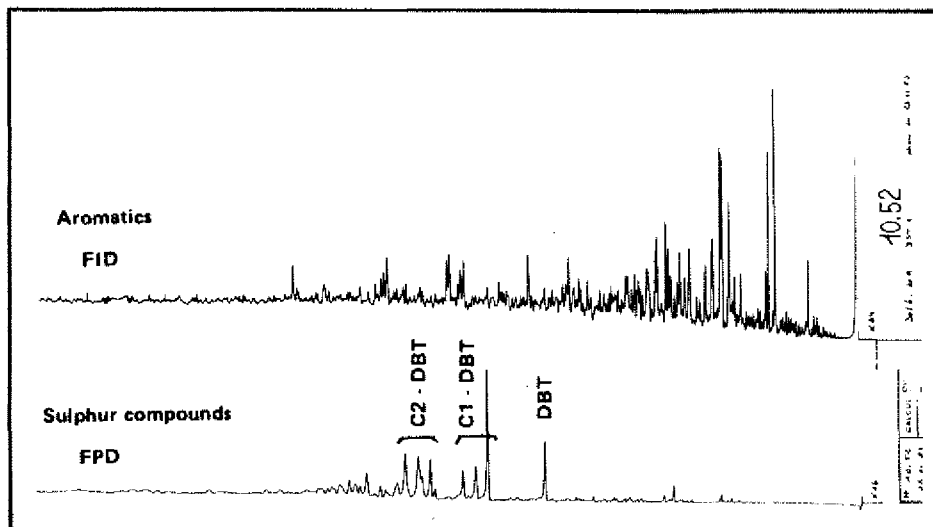


Fig. 1 (a) - WELL 30 / 6 - 10 A

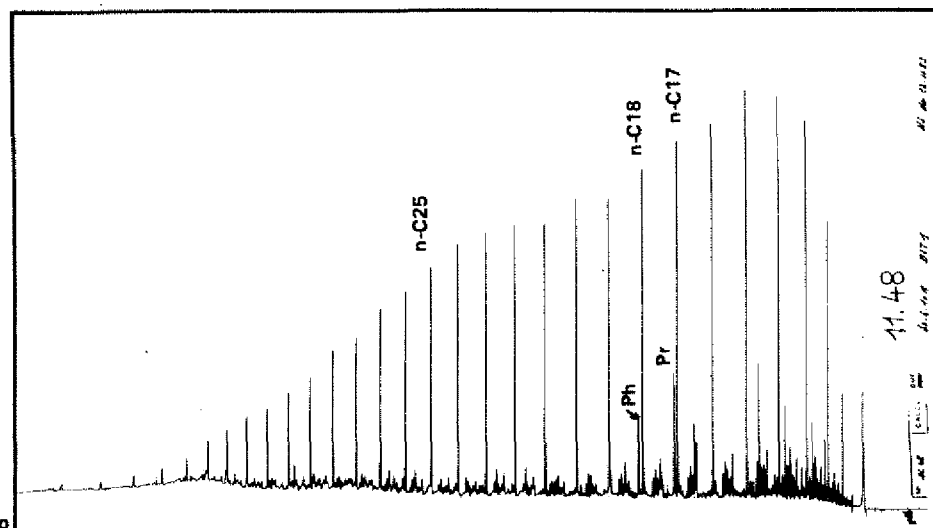
SNEA (P)

DIVISION RECHERCHES ET APPLICATIONS EN GEOLOGIE

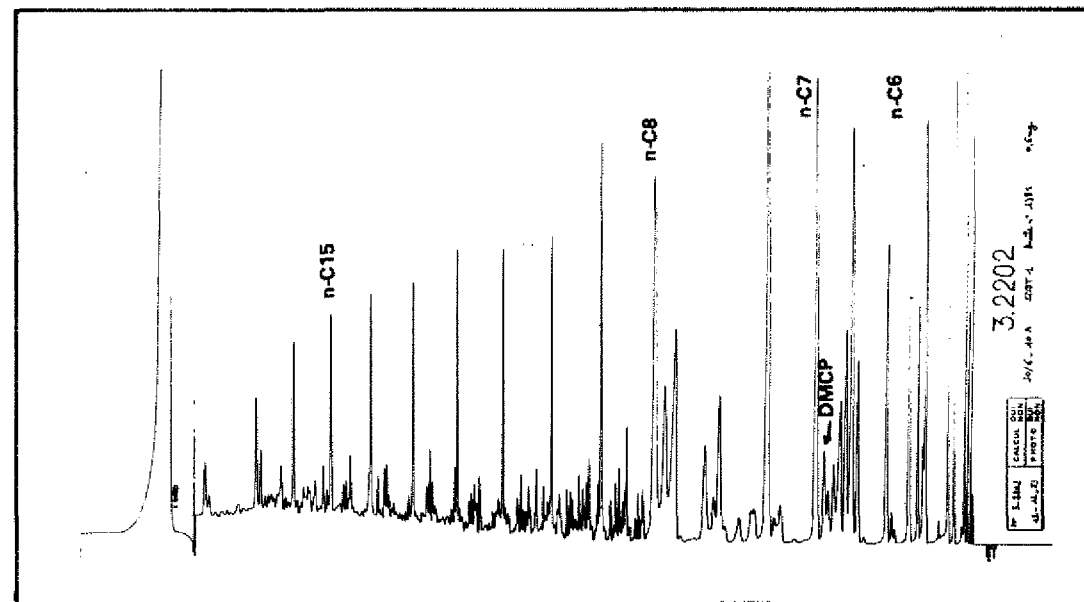
PAYS : NORWAY
 Country :
 SONDAGE : 30/6-10 A (α)
 Well :



HC AROMATIQUES AROMATIC HC



HC SATURES SATURATED HC



HC THERMOVAPORISES THERMOVAPORISED HC.

Huile Oil Cote Depth 2600 - 2602 m
 Identification Identification DST 1
 Formation Formation Brent Fm
 Age Age

Composition du produit total (%)
 Composition of total product

Asphaltènes Asphaltenes	As	: 2,0	
Résines Resins	R	: 6,3	
HC saturés Saturated HC	S	: 37,6	$\frac{S}{A} = 1,70$
HC aromatiques Aromatic HC	A	: 22,1	
Distillat Distillate	D	: 32,0	

Fig. 2

A. 42436

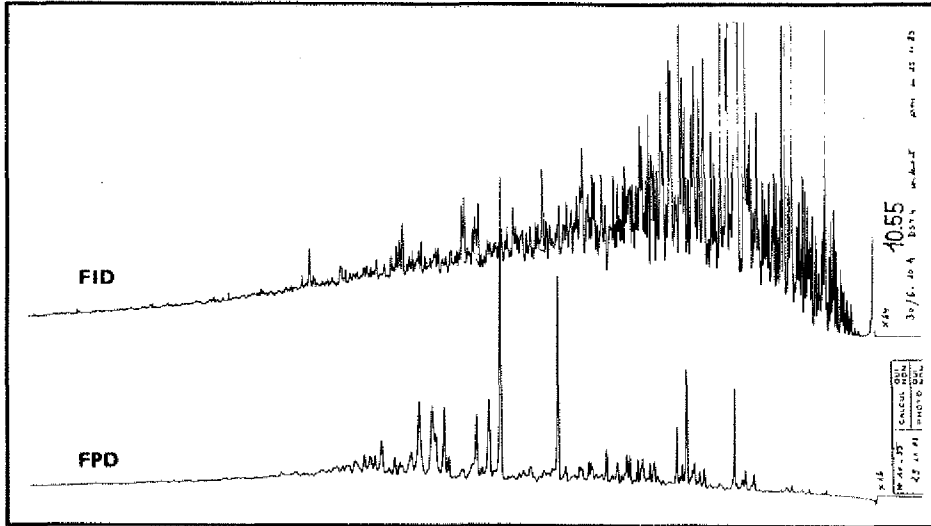
SNEA (P)

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PAYS : **NORWAY**
 Country
 SONDAGE : **30 / 6 - 10 A (α)**
 Well

Fig. 3

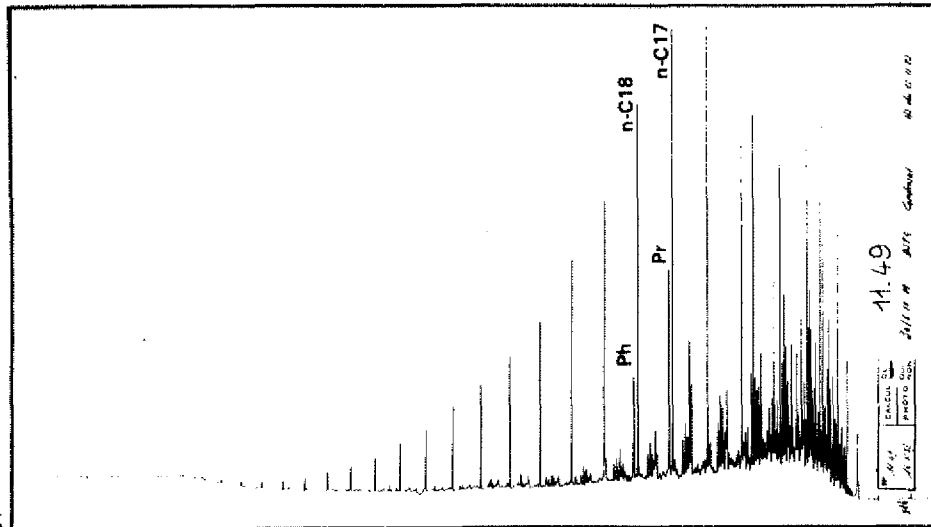
Cote : **2480 - 2486 m**
 Depth
 Condensat Identification : **DST 4**
 Condensate Identification
 Formation : **Brent Fm**
 Formation
 Age



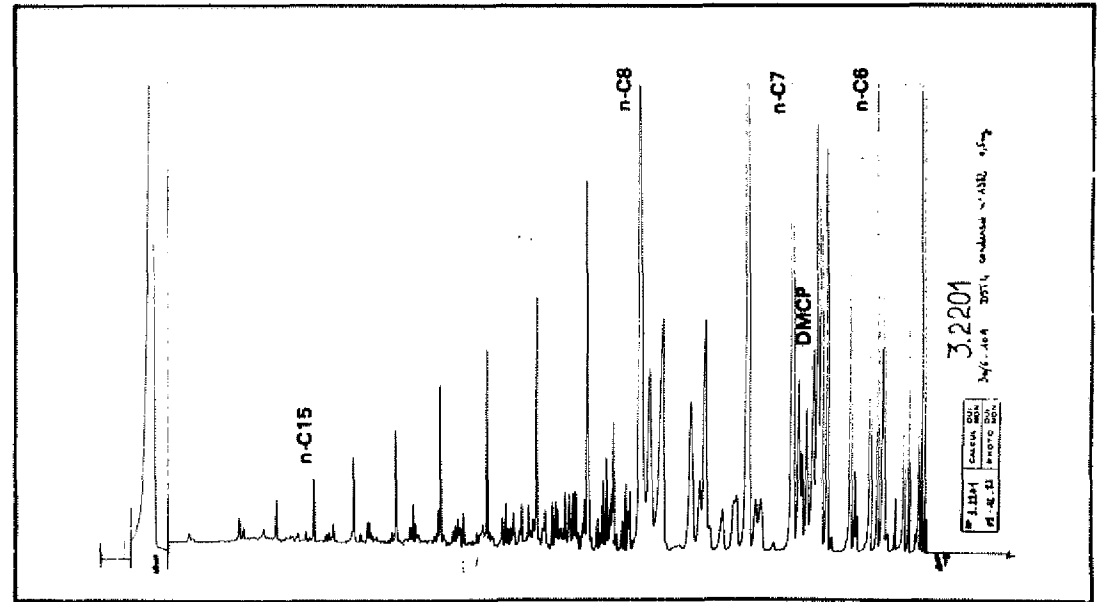
HC AROMATIQUES AROMATIC HC

Composition du produit total (%)
 Composition of total product

Asphaltènes <i>Asphaltenes</i>	As	:		
Résines <i>Resins</i>	R	:	0,2	
HC saturés <i>Saturated HC</i>	S	:	12,5	$\frac{S}{A} = 3,70$
HC aromatiques <i>Aromatic HC</i>	A	:	3,3	
Distillat <i>Distillate</i>	D	:	84,0	



HC SATURES SATURATED HC



HC THERMOVAPORISES THERMOVAPORISED HC.

A.12437

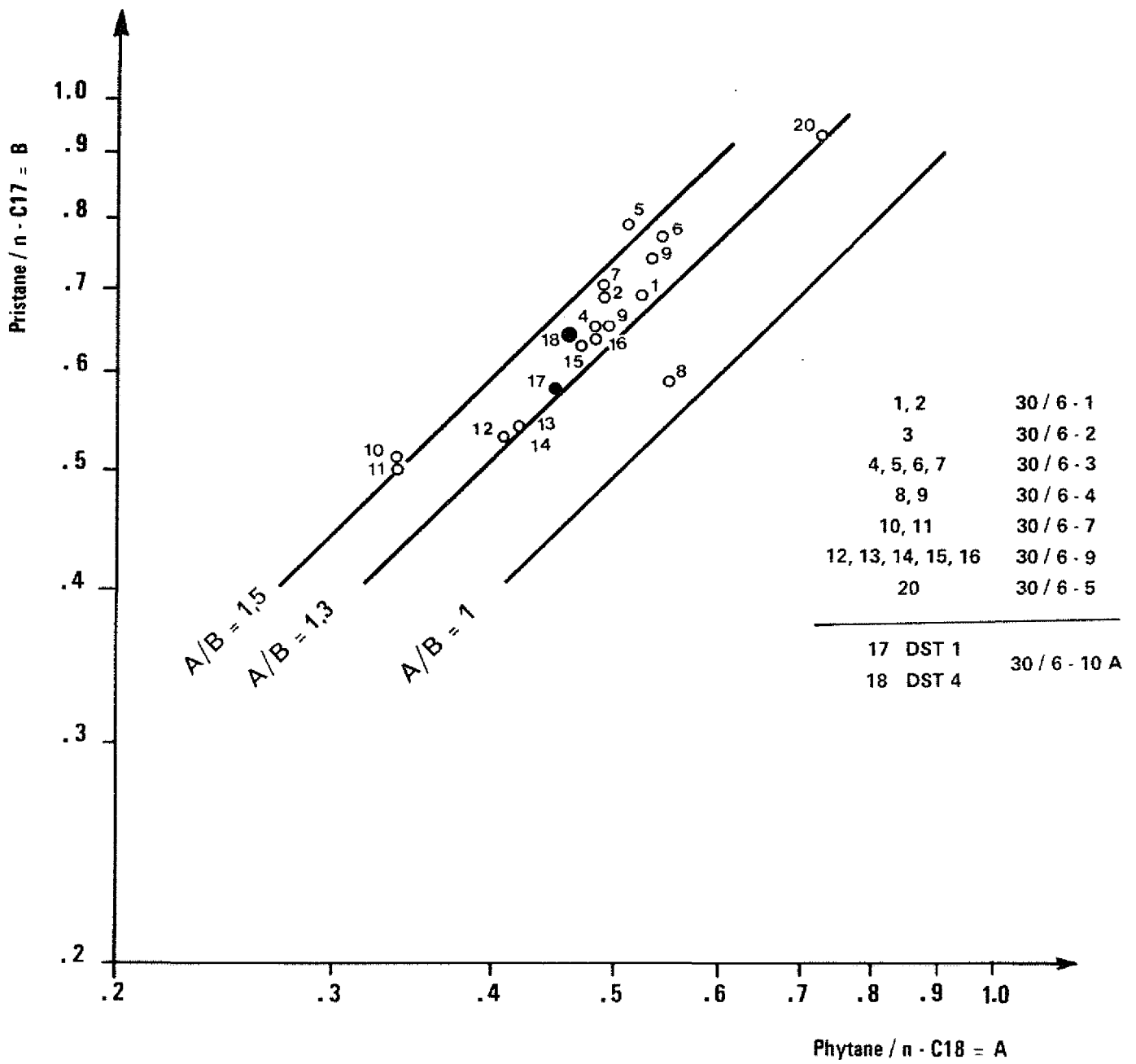
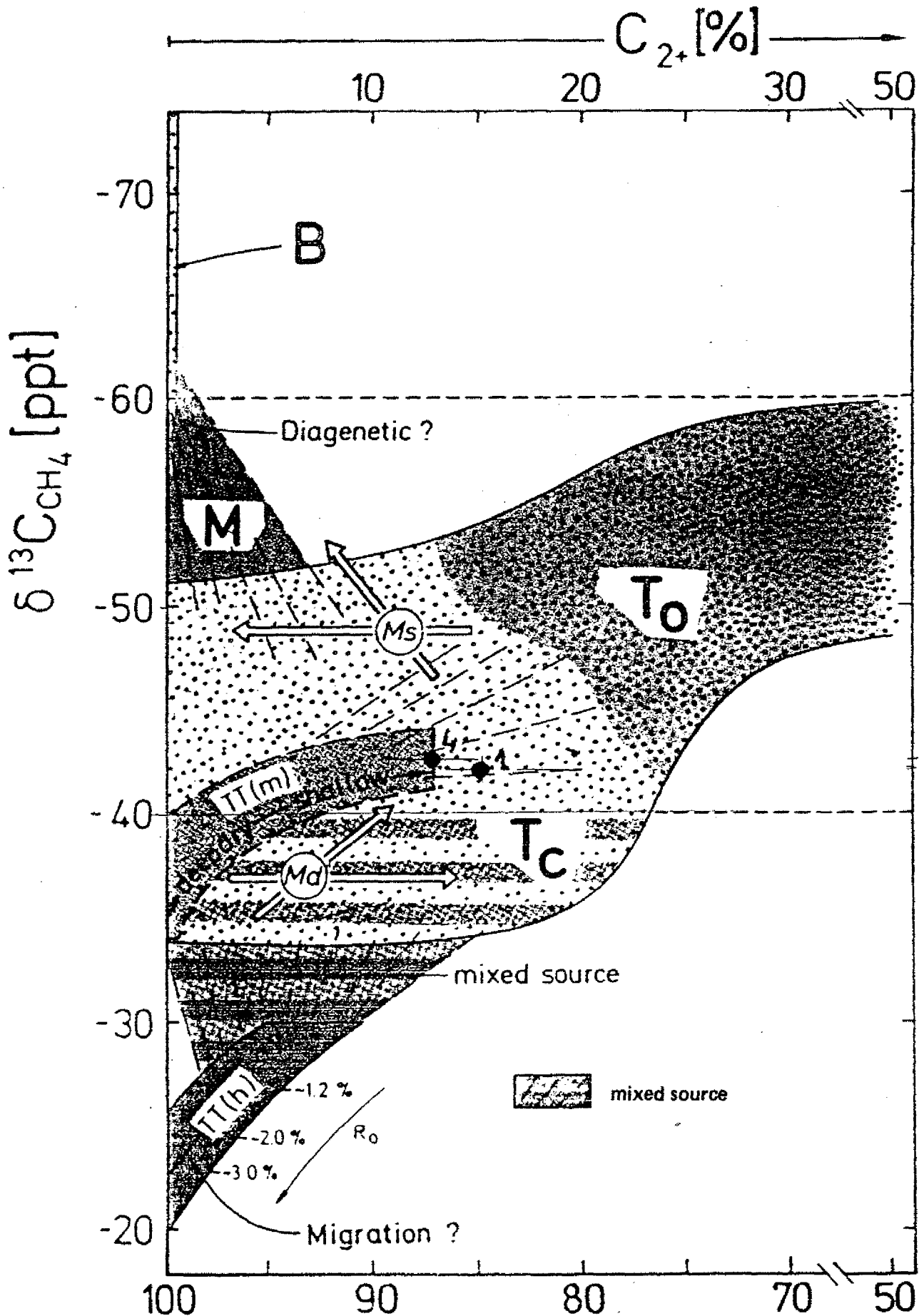


Fig. 4 - WELL 30 / 6 - 10 A OIL AND CONDENSATE
Pristane / n - C17 vs Phytane / n - C18 diagram

Fig. 5 - WELL 30 / 6 - 10 A

Characterisation of the gases by compositional and isotopic variations

(after M. Schoell, 1983)



M : Mixtures of gases

To, Tc : Gases associated with oil, condensate

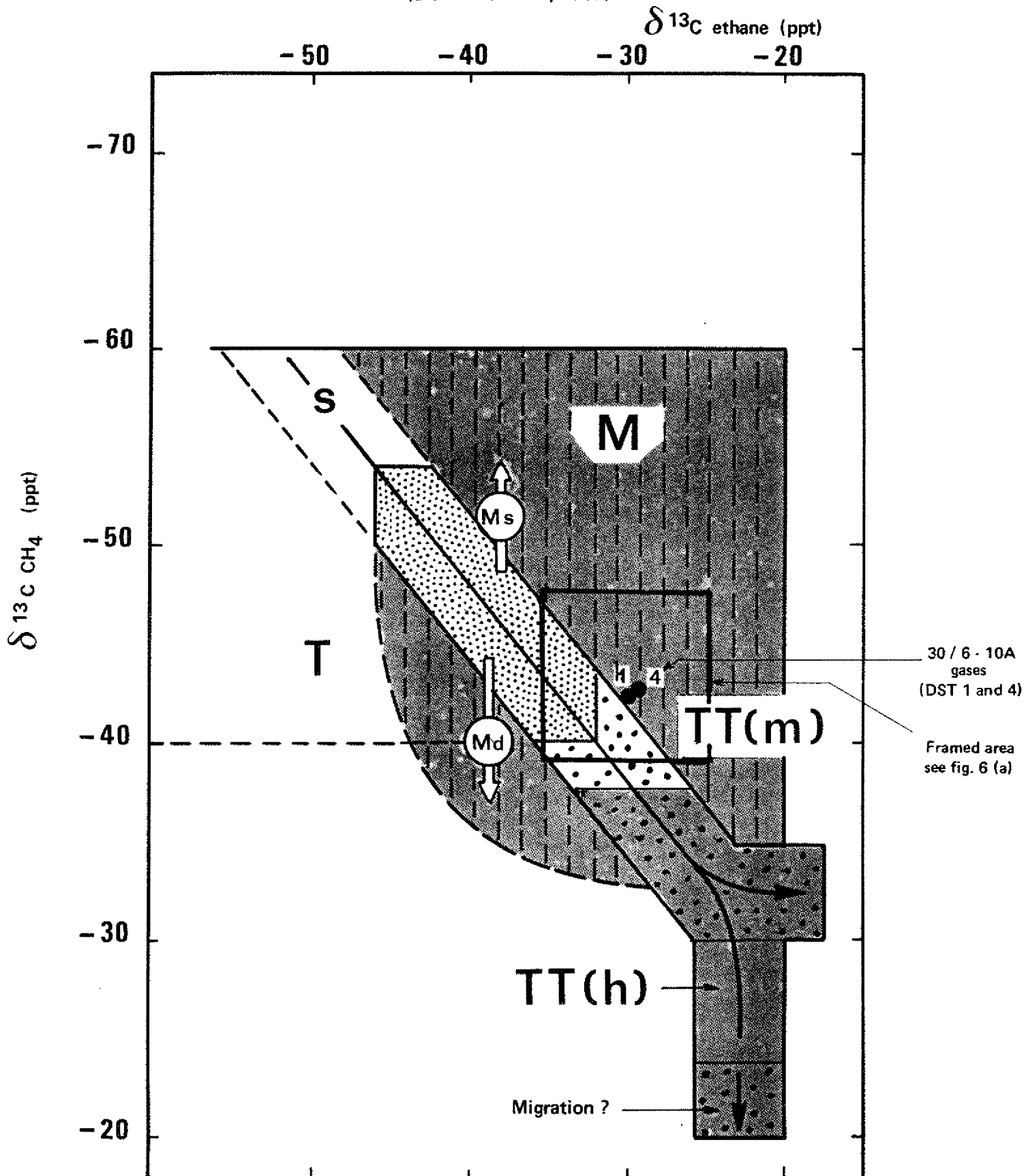
Ms, Md : Changes due to migration

TTm : Gases from leptinetic O.M.

TTh : Gases from humic O.M.

Fig. 6 - WELL 30 / 6 - 10 A

Carbon isotope variations in ethane related to methane
(after M. Schoell, 1983)



- M : Mixtures of gases
- T : Associated gases
- TTm : Gases from leptinic O.M.
- TT(h) : Gases from humic O.M.
- Ms, Md : Changes due to mixing

Fig. 6 (a) - WELL 30 / 6 - 10 A

Carbon isotope variations in ethane related to methane

(detail of the fig. 6)

