V 153

elf aquitaine

Box 131 No 5321

DIRECTION GÉNÉRALE DES PRODUCTIONS

sneap

CONFIDENTIEL

RESULTS OF CUTTINGS GAS ANALYSIS FROM 25/2-5 WELL (Norway)

P.R.S.T. n°1.02.1.030

DÉLÉGATION A LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE

DR-DGP

SNEA (P)
D.G.P. - D. EXPLOR.
LABORATOIRE DE GEOLOGIE DE PAU
-
GEO/LAB.PAU n° 182/78 RS

/rj

RESULTS OF CUTTINGS GAS ANALYSIS FROM 25/2-5 WELL (Norway)

P.R.S.T. n°1.02.1.030

GEO/LAB.PAU n°182/78 RS

K. LE TRAN
14 Septembre 1978

Calculation : 622.67.4007

Enclosures : 9 fig., 2 Tab.

Technical assistance P. QUILLACQ

LISTE DE DIFFUSION

DESTINATAIRES

DR. D.G.P. (7 ex.)

MM.COTTENCON - GUYONNET

COUSTAU H.

DIVISION GEOLOGIE

Division Géologie Paris puis D.C.E.G. Paris pour archivage

Division Géologie PAU puis retour GEO/LAB.PAU

Laboratoire BOUSSENS pour archivage

SUMMARY

Cuttings ranging from 1550m to 3997m from 25/2-5 borehole (Norway) were analysed for gaseous hydrocarbons by mechanical extraction.

Results obtained show the presence of fair quantities of cuttings gas in the Paleocene (Lower Sand/Shale Group) within the 2200-2400m interval and very high amounts of cuttings gas in the Jurassic (Brent sands, upper part of the Lias and Statfjord Sands) associated with high organic carbon contents.

These gases contain of a good deal of higher homologs C_4 and C_5 indicating that the relevant series are within the oil window. On the other hand tertiary sediments down to 2000m are immature and triassic sediments are very poor both in cuttings gas and in organic carbon.

The main conclusions from this study are in agreement with the results from a geochemical study of the Jurassic of that well (Report GEO/LAB.BSS n°7/1492 RP) and from a petrological study of the organic matter within the 2000-4000 range (report not yet issued).

INTRODUCTION

25/2-5 well (location in figure 1), drilled down to 4000m with the Jurassic sands as targets, encountered oil in the Brent sands and Statfjord sands (figure 2).

For the purpose of characterizing the hydrocarbon potential of the sediments, seventy-four samples of unwashed cuttings were taken from 1500m to 3997m and submitted for analysis in the same way as described in the previous report dealing with 15/3-1 well (GEO/LAB.PAU n°5/78 RP).

The main data are tabulated in tables I and II and the reduced gas chromatograms are presented in figure 3.

CUTTINGS GAS FROM TERTIARY and CRETACEOUS SEDIMENTS

Samples from the Eocene down to 2000m are poor in dry cuttings gas (figures 4 and 5), though the organic carbon content is not very low (figure 9). These data indicate that the sediments from depths shallower than 2000m are from immature facies.

In the lower Eocene, within the 2000-2200m interval, there appears a slight increase in the concentration of cuttings gas, yet a strong increase in their degree of wetness, due principally to the prominent presence of C_5 (chromatograms of figure 3).

These wet gases precede the fairly high quantities of extremely wet gases from the Paleocene, within the 2200-2400m interval, where the proportion of higher homologues C_4 + C_5 makes up nearly 90 % of the gas mixture (figures 5 and 6 and chromatograms of figure 3). Such a degree of wetness is rather exceptional. A similar wetness affects, in the same well, the tremendous quantities of cuttings gas one thousand metres below, within the Jurassic section. It is possible that this feature is related to the overpressured and undercompacted nature of the sediments from the relevant horizons.

The presence of unsaturated hydrocarbons in these wet gases is to be noticed (chromatograms from figure 3), in particular the relatively high concentration of ethylene as compared to ethane is obvious.

From 2450m to 3300m, lower Tertiary and upper Cretaceous sediments are again poor in cuttings gas. In this interval the gas is growing increasingly dry, but the amounts are anyhow very low, particularly in the lower part of the interval, making the data unreliable for interpretation in terms of wetness and degree of catagenesis. The poorness of cuttings gas within the lower six hundred meters is concomitant with the low content of organic carbon (essentially carbonate sediments from 2700m to 2880m and shales in the lowermost four hundred meters).

CUTTINGS GAS FROM JURASSIC SEDIMENTS

A very sharp break occurs at the top of the Jurassic with the sample at 3315m
A similar feature has already been found for the Jurassic from the well 15/3-1.

It seems that the sample at 3310m is not representative of the Jurassic, but more likely of the overlying Cretaceous.

The increase in cuttings gas from sample 3310m to sample 3315m is overwhelming, confirming a strong reservoir effect at the top of the Jurassic and a good seal at the unconformity between the Jurassic and the Cretaceous.

Furthermore, the gas is drastically wet, compatible with the occurrence of oil.

High yields of wet cuttings gas are recorded throughout the 3315-3572m interval, with particular intensity in the lower part of the Dogger (Brent sands) and at the top of the Lias. Then obviously, there is a decrease, and again an increase within the Starfjord sands where the amounts of cuttings gas are however smaller than in the Brent sands.

The high concentrations of cuttings gas in the Jurassic are linked with high insoluble organic carbon contents which vary from 2.5 % to 4 % for most of the samples. Even higher values of IOC are recorded in the 3438-3495m range (fig.9).

CUTTINGS GAS FROM TRIASSIC SEDIMENTS

The samples from the Triassic are very poor in both cuttings gas and organic carbon content. As a result, it is not possible to ascertain the degree of catagenesis of the relevant layers which, in any case, present no interest.

CONCLUSIONS

Great amounts of wet cuttings gas associated with high organic carbon contents are detected throughout the whole section of the Jurassic with particular intensity within the 3315-3580m interval. It is felt that the bulk of sediment from these layers, rich in organic matters (shales), is the source rock for the hydrocarbons encountered.

The lower part of the Dogger, where great values in both cuttings gas and organic carbon content are recorded, has a high hydrocarbon potential.

The sands within the Jurassic series (Brent Sands and Statfjord Sands) constitute effective and efficient reservoirs for hydrocarbons generated by the shales in these series. Difference in temperature explains the change in the gas composition between the two reservoirs, the lowermost reservoir (Statfjord Sands) having lower proportion of $C_4 + C_5$, yet the gas is still very wet, compatible with liquid hydrocarbon occurrence.

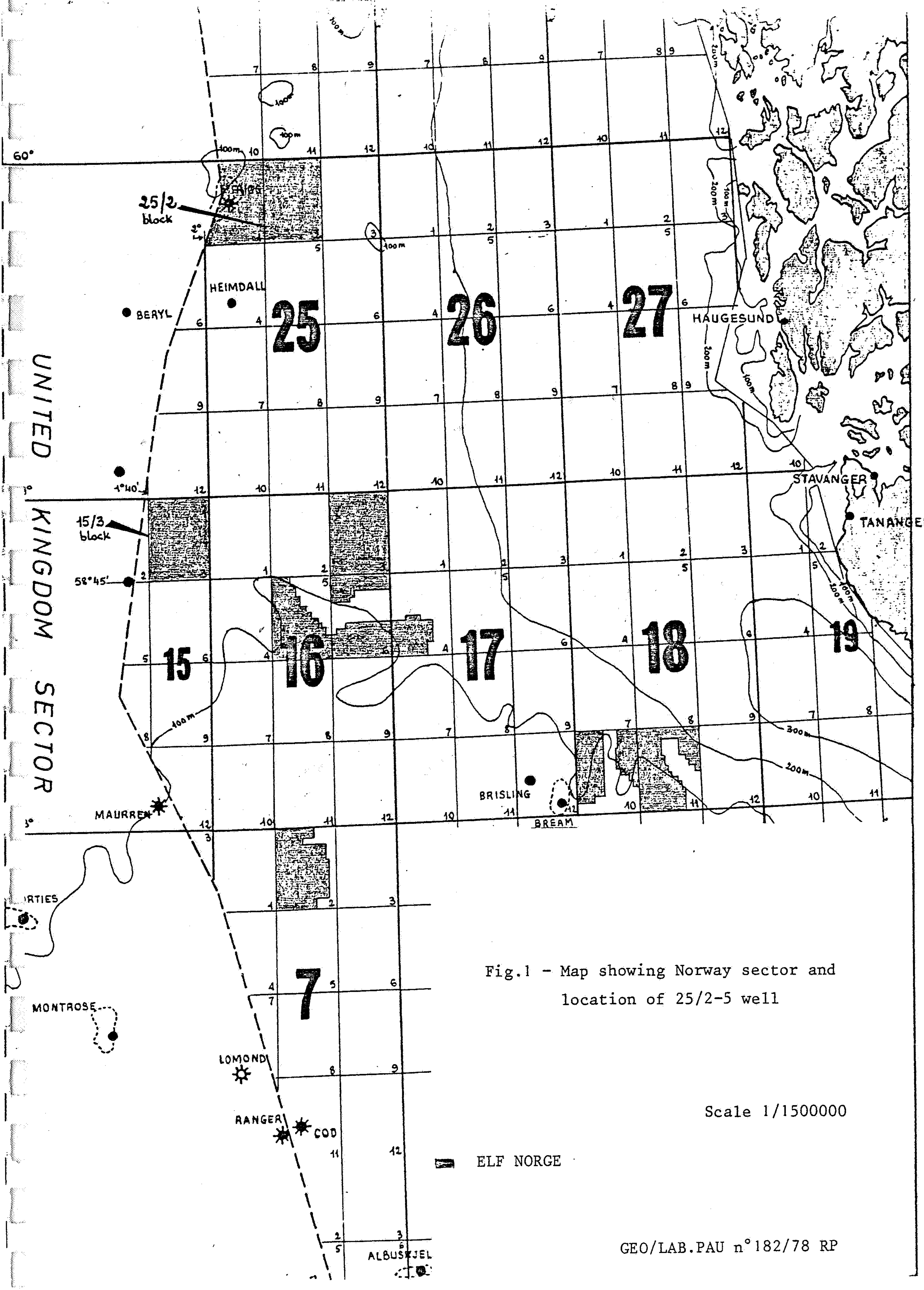


Fig.1 - Map showing Norway sector and location of 25/2-5 well

Scale 1/1500000

GEO/LAB.PAU n°182/78 RP

Figure 2. 25/2-5. Main data and litho-stratigraphical section

GEO/LAB.PAU n°182/78 RP

Coord X: 02° 28' 18"3E Y: 59° 48' 01"4N	Z ground: -117 m; Z RKB: 24 m; 141 m
Line: 582401, 730228	SP: 232, 1109
Depths datum: R.K.B.	
Rig: POLOGLOMAR DRILLER	
Stopped in: TRIAS	

Spudded:	08.03.76
Started drilling:	09.03.76
At T.D.:	30.06.76
Completed:	04.08.76
T.D. Driller:	4000 m
T.D. Logger:	4001,5 m

Well **25/2-5** Country

OPERATOR ELF NORGE A/S — LICENCE 026 — OWNED BY PETRONORD

TARGETS

Jurassic sands.

RESULTS

Oil in Brent sands and Statfjord sands

BRENT SANDS net pay: 40 m, depth: 3336 m

27,50 m porosity: 15-20 % Permeability

12,50 m porosity: 9 15 % Permeability

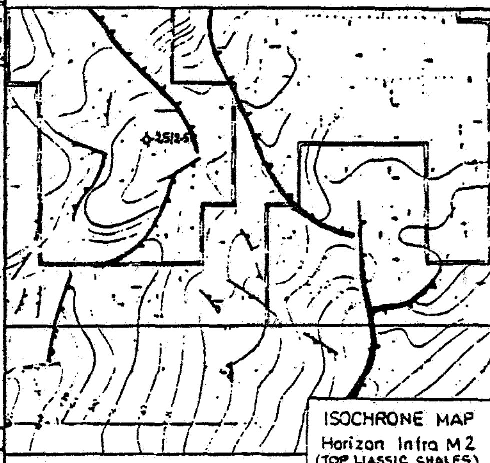
STATFJORD SANDS net pay: 44,5 m, depth: 3652 m,

porosity 5: 15 %

CASINGS		CORES		
30" at	193 m	K1	3339,5-3349,5	4,5%
20" at	699 m	K2	3350 - 3354	100%
13 3/8" at	2860 m	K3	3354 - 3363	97%
9 5/8" at	3300 m	K4	3363 - 3372	100%
7" at	3597 m	K5	3475 - 3485	35.5%
4 1/2" at	3750 m	SWC1	2870 - 2380	29/30
		SWC2	2355 - 2005	30/30
		SWC3	3310 - 2860	16/30
		SWC4	3304 - 2881	14/30
		SWC5	3570,5-3305	15/30
		SWC6	3488 - 3309	16/30
		SWC7	3845 - 3777,5	20/24
		SWC8	3778 - 3741	11/21
		SWC9	3740 - 3592	10/21
		SWC10	3691 - 3600	21/24

SHOWS

- C1 - from 2850
- C2-C3 from 3200
- on cuttings and cores 3302
- on cores 3340 - 3368
- on cores 3479,13-3480,04
- on cuttings btw 3652-3791



LOGS

ISF GRSL	699 - 2873	1		2500 - 3300	2
	2852 - 3232	2		3410 - 3765	3
	3200 - 3312	3		3202 - 3351	4
	3300 - 3405	4	HRT	143 - 2145	1
	3299 - 3493,5	5		1502 - 2600	2
	3300 - 3580,5	6	DLL	3300 - 3577	1
	3577 - 3708	7		3577 - 3994	2
	3577 - 3815	8	FDC/	3300 - 3580,5	1
	3577 - 4001,5	9	CNL	3577 - 4001,5	2
HDT	2000 - 2873	1	GR CLL	3300 - 3705	1
	2852 - 3312	2		3202 - 3351	2
	3300 - 3580	3	BHC/GR	193 - 715	1
	3577 - 4000,5	4	CEV	699 - 2000	1
PROX/ML MLL	2999 - 3492,5	1	SS	150 - 3893	
	3577 - 4001,5	2			
	3577 - 3950	3			
	3707 - 3770	4			

TESTS

FIT1 3382,5	12,2 cu/ft + 4,25 Filt 2l; 5199 psi	FIT10 3492,5	0,5l mud+filtr (S=6,29 l/l); no pressure rec.
FIT2 3357,2	7,5 cu/ft + 1 Filt 2,5l; Flow line plugged	FIT11 3741,5	5l mud+filtr (S=9,8 g/l); 5801 psi
FIT3 3383,5	failure	FIT12 3684,5	9l filtr (S=8,2 g/l); 6300 psi
FIT4 3384	failure	FIT13 3779	2l mud (S=8 g/l); 6000 psi
FIT5 3354	mud 2l; 5144 psi seal failure	FIT14 3682,3	9l filt (S=9,2 g/l); 5700 psi
FIT6 3493	3l mud (S=13 g/l); seal failure	FIT15 3383,8	Tool failure
FIT7 3694	2,5l filtrate (S=10 g/l); 5600 psi	FIT16 3383,8	7,6000cm + 13,4l Mud; No amerada
FIT8 3753	5l filtrate (S=9 g/l); 5500 psi	FIT17 3430,5	1,7 cu/ft filt 6,5l; 5275,5 psi
FIT9 3593,5	1,5l mud+filtrate (S=9,9 g/l); 5200 psi	FIT18 3435	Not significant
		FIT18 3488	2,5l filt (2,59 l/l); 5278,9 psi
		FIT19 3428	0,52 cu.ft filt.19,2 l (4,9 g/l); 5141,6 psi
		FIT19 3405	0,1 cu/ft filt 14,1 (5 g/l)+Mud; 4923 psi N.S.

Checked: Guesdon
Date: 05.10.76

PRODUCTION TEST:

DST n:1 Perfo: 3692-3635 m, 12/M Scallop: 2", VO 10 H.
Initial P: 5479 psi at 3351 m
Flowing P: 4053,4 / 4908,4: 2000
T BHT 230 to 235°F Recovered 7,3l filtrate (salt 7,4g/l)

DST n:2 Perfo: 3692-3595 m; 12/M Scallop 2" 3575-3562, 3582-3552, 3573-3384
Initial P: 5578,2 psi Static P: not significant
ø 3/4" (15"45) SI 24" Head P: 350 psi
P Separator: 170 psi Oil: 333 m³/D
Gas: 87000 to 108.000 m³/D. ø 1"1/2" (17"33)
Head P: 875 psi P Separator 170 psi
Oil: 229 m³/D Gas: 47.730 m³/D.

DST n:3 Perfo: 3350 - 3359 m; 12/M Gun 4" 3359-3362, 3337-3350
Initial P: 5101/5098,6 psi Flowing P 4763,5 psi S 32/64"
Flowing P. 4895,9 psi S24/64 Static P 5129/5138 psi
(at 3329,42 m) ø 32/64"(3") SI = 24 H
Head P: 1595 psi NS Separator P: 210 psi T° 178°C
Gas: 95.399 m³/D Oil: 470,5 m³/D ø 24/64"(7")
Head P: 2030 psi N.S. Separator P. 207 psi T° 123°C
Gas: 52458 m³/D Oil: 275,9 m³/D

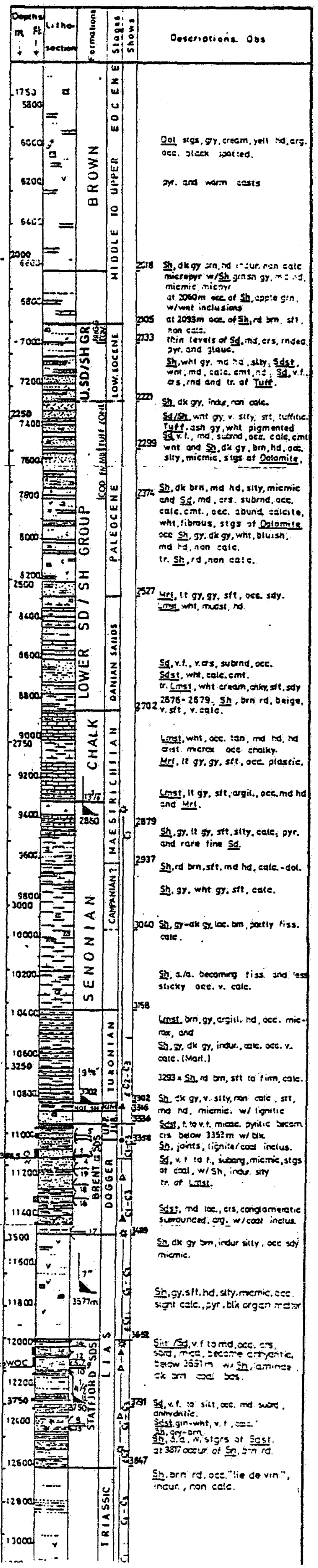


Figure 3. 25/2-5 (Norway) - Reduced gas chromatograms

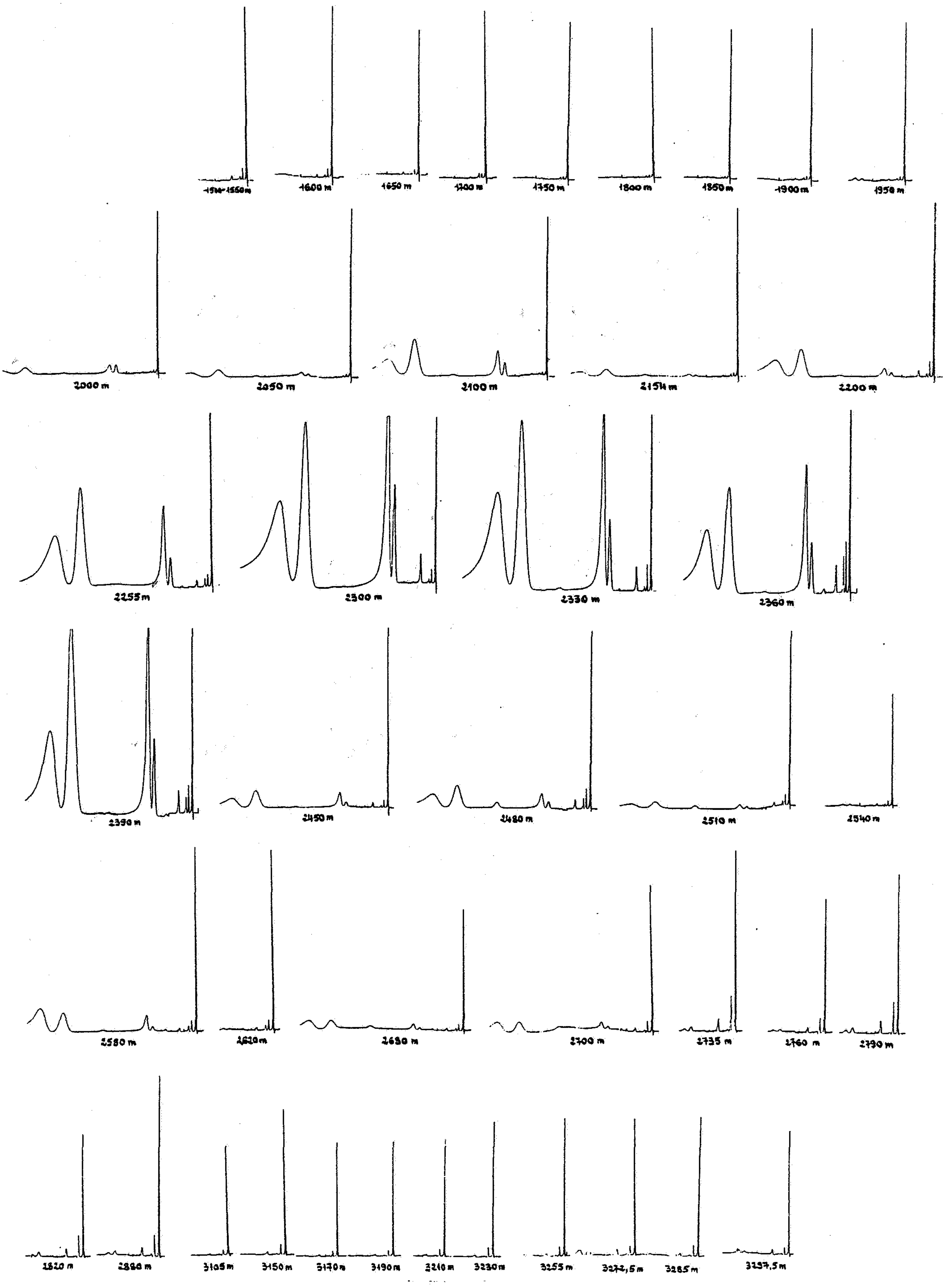
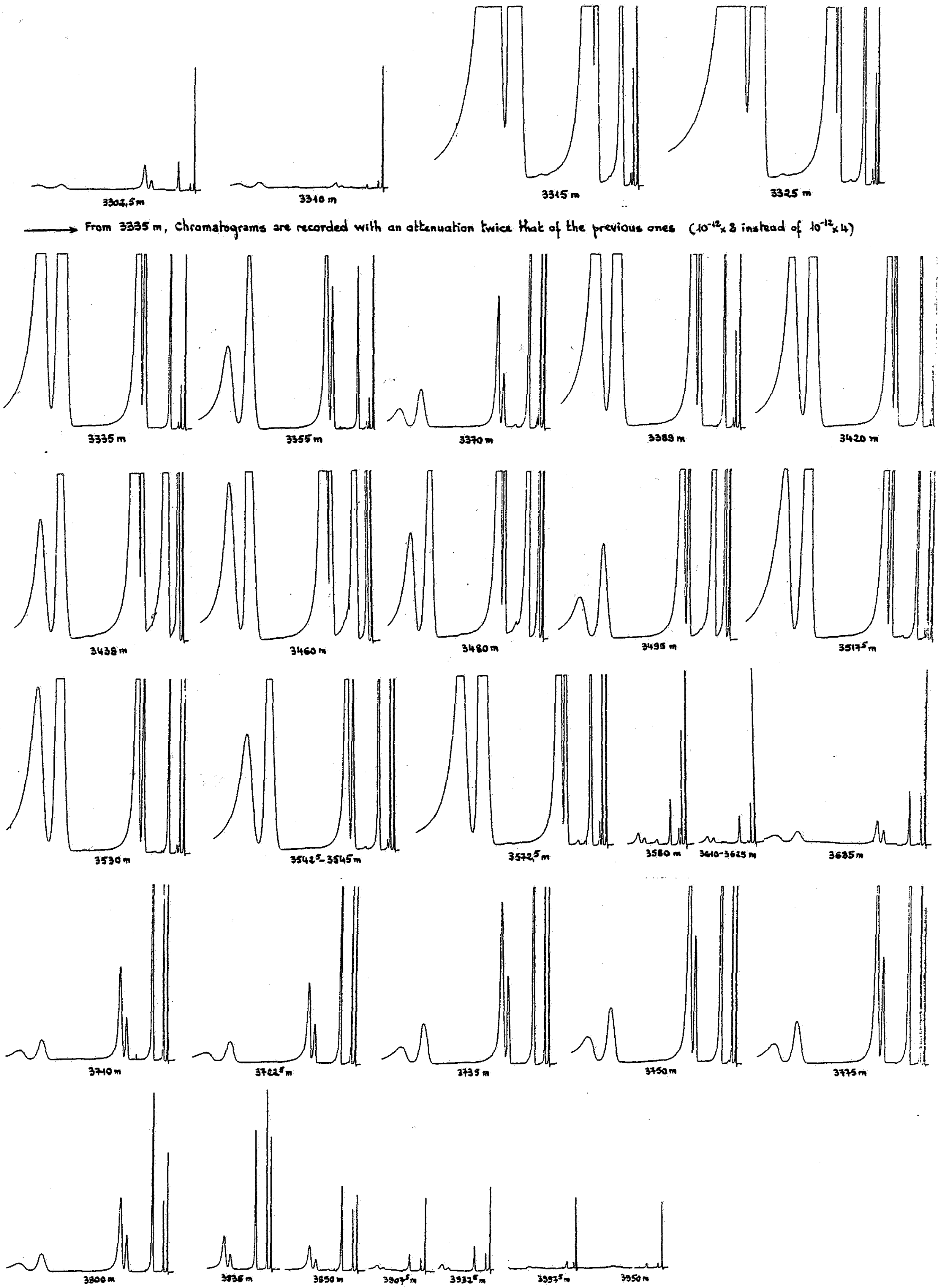


Figure 3A. 25/2-5 (Norway) - Reduced gas chromatograms



GEO/LAB.PAU n°182/78 RP

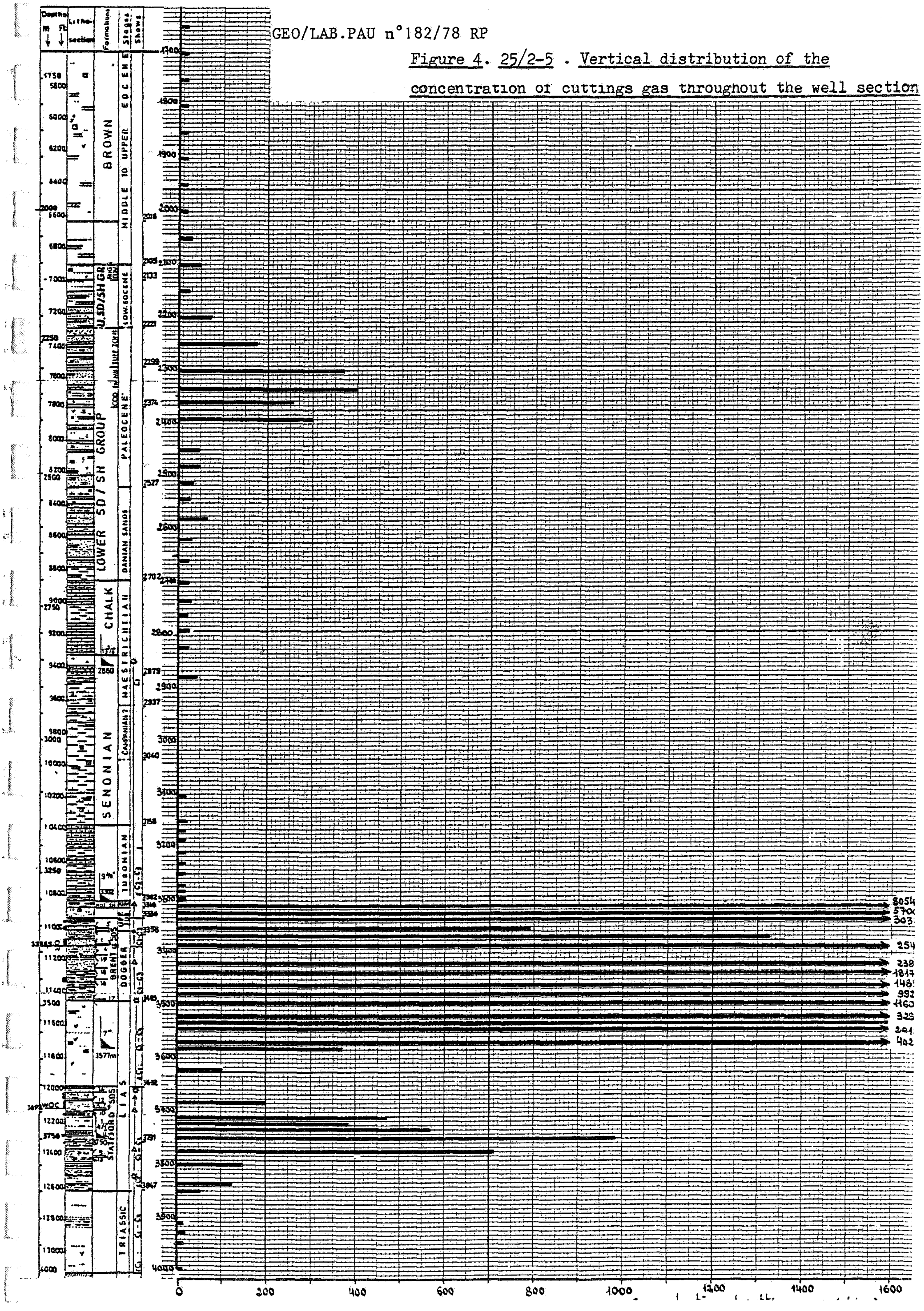


Figure 4. 25/2-5 . Vertical distribution of the concentration of cuttings gas throughout the well section

Figure 5. 25/2-5.

Variation of the composition of cuttings gas throughout the well section

GEO/LAB.PAU n°182/78 RP

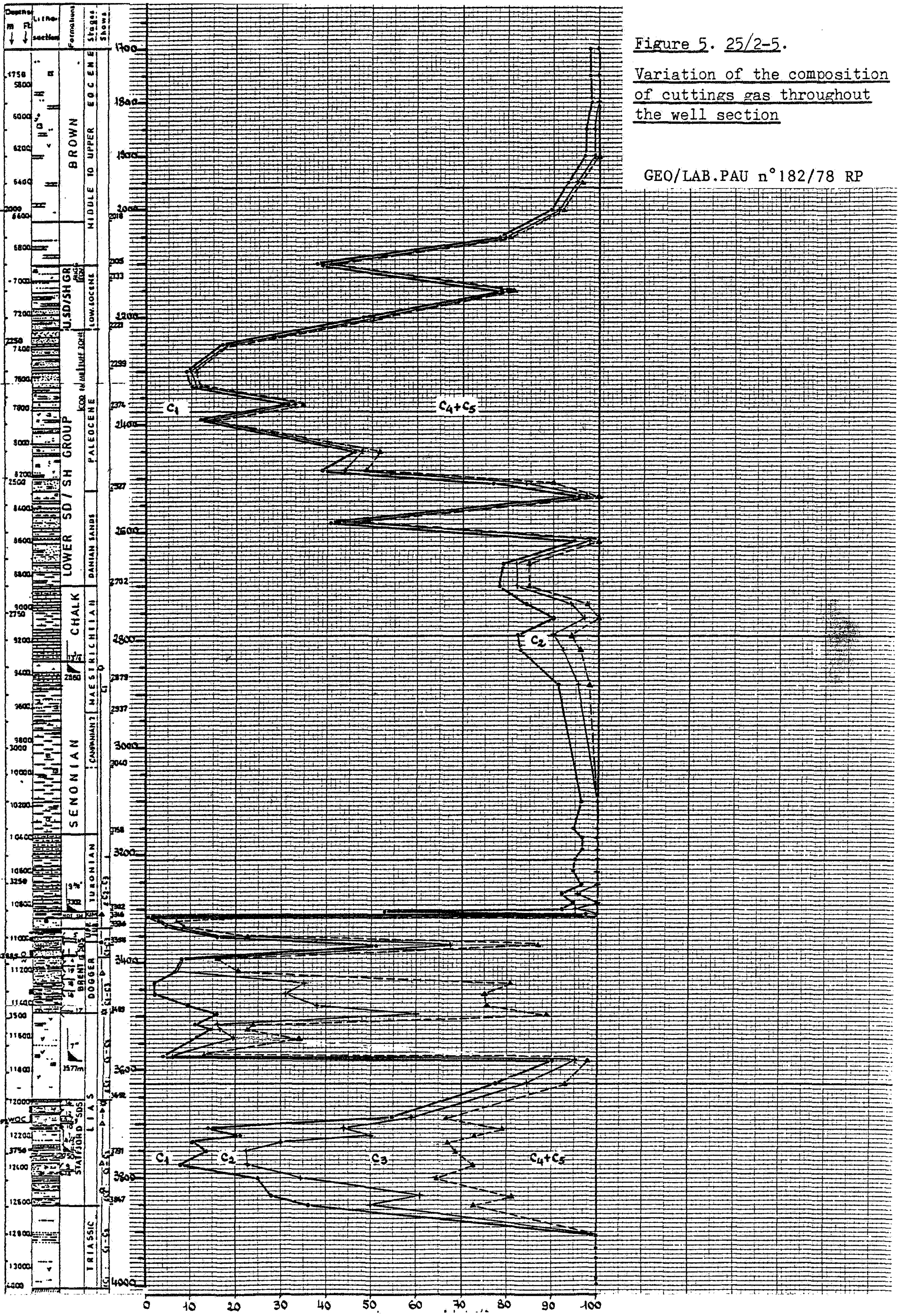
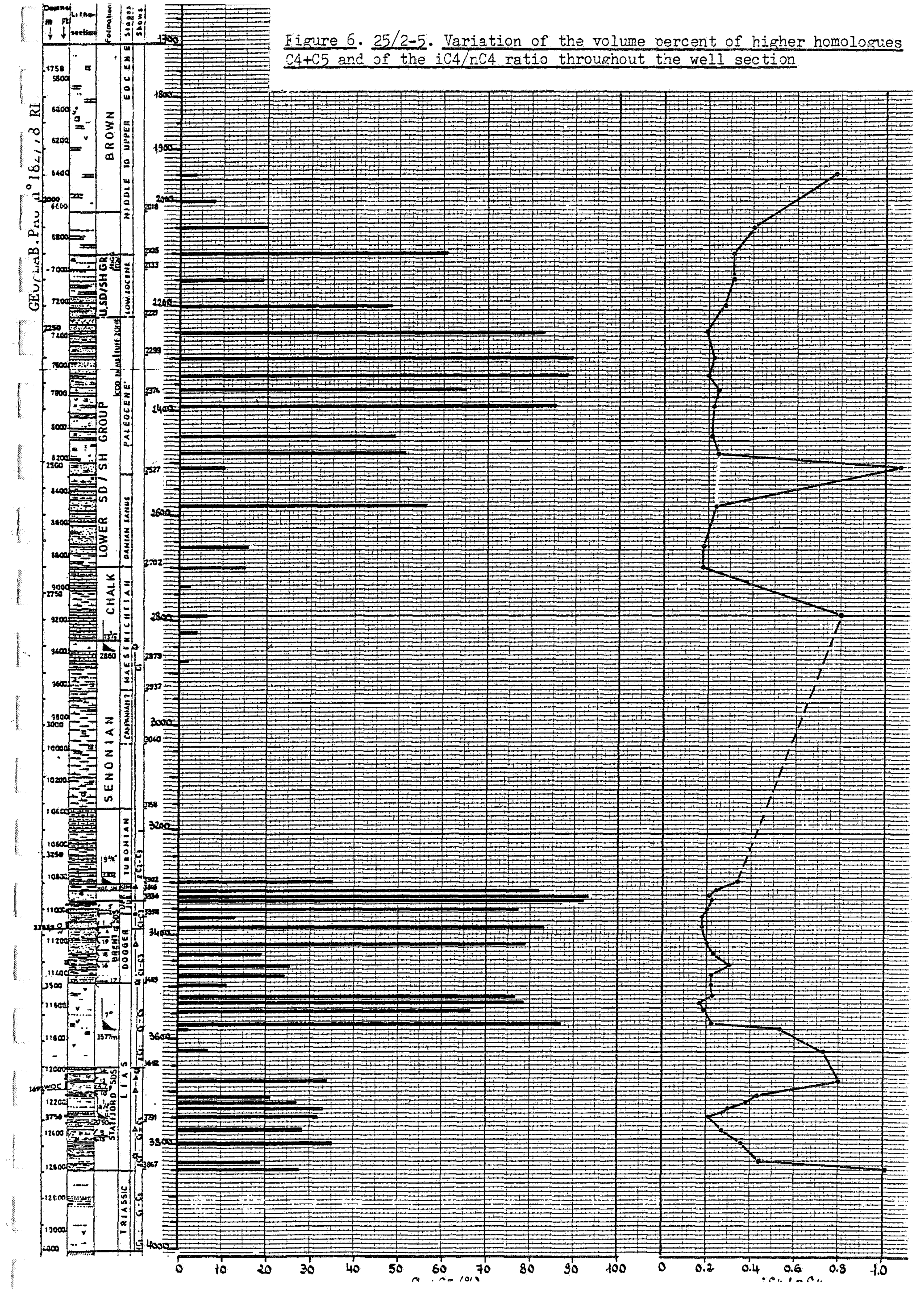


Figure 6. 25/2-5. Variation of the volume percent of higher homologues C4+C5 and of the iC4/nC4 ratio throughout the well section



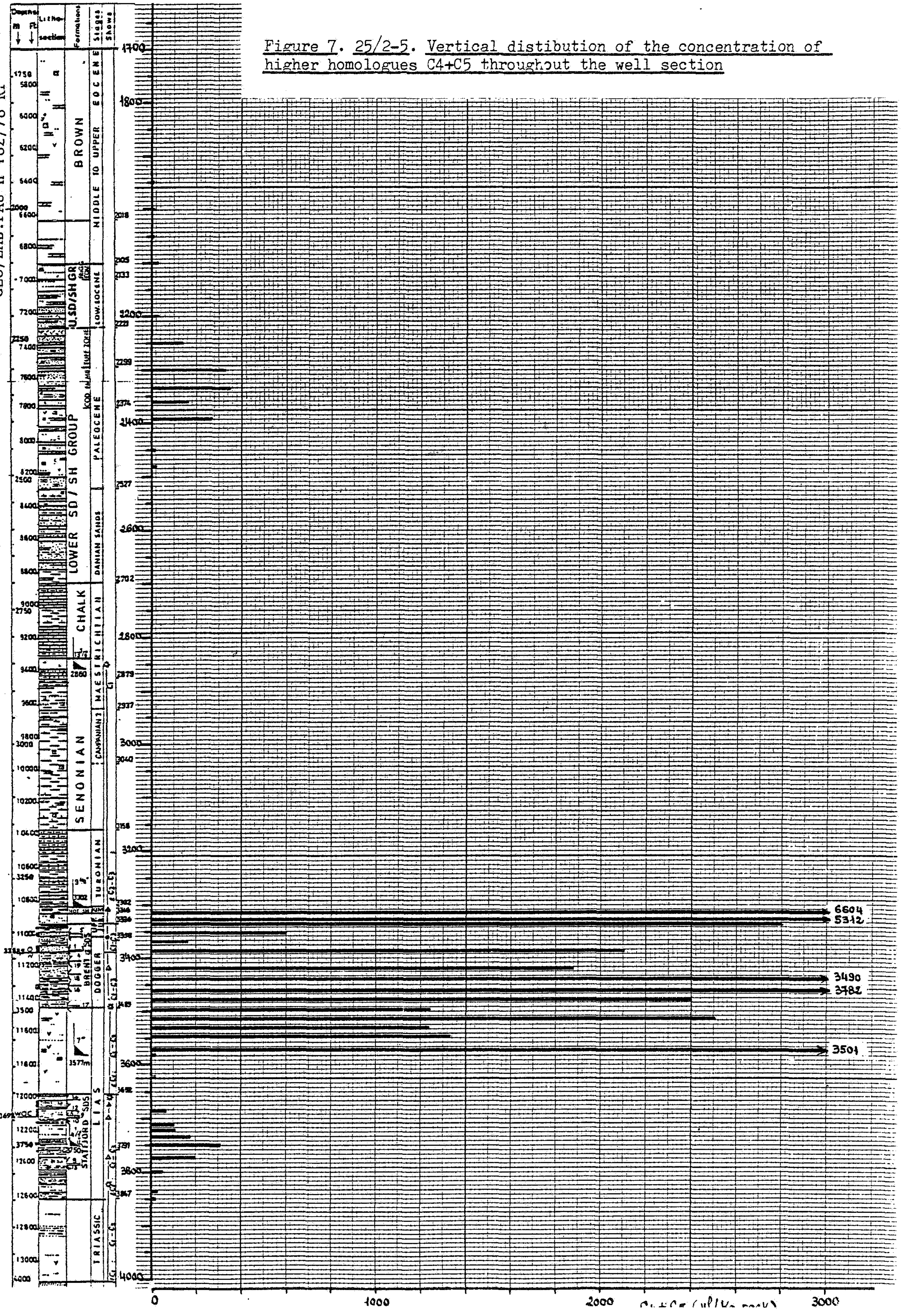
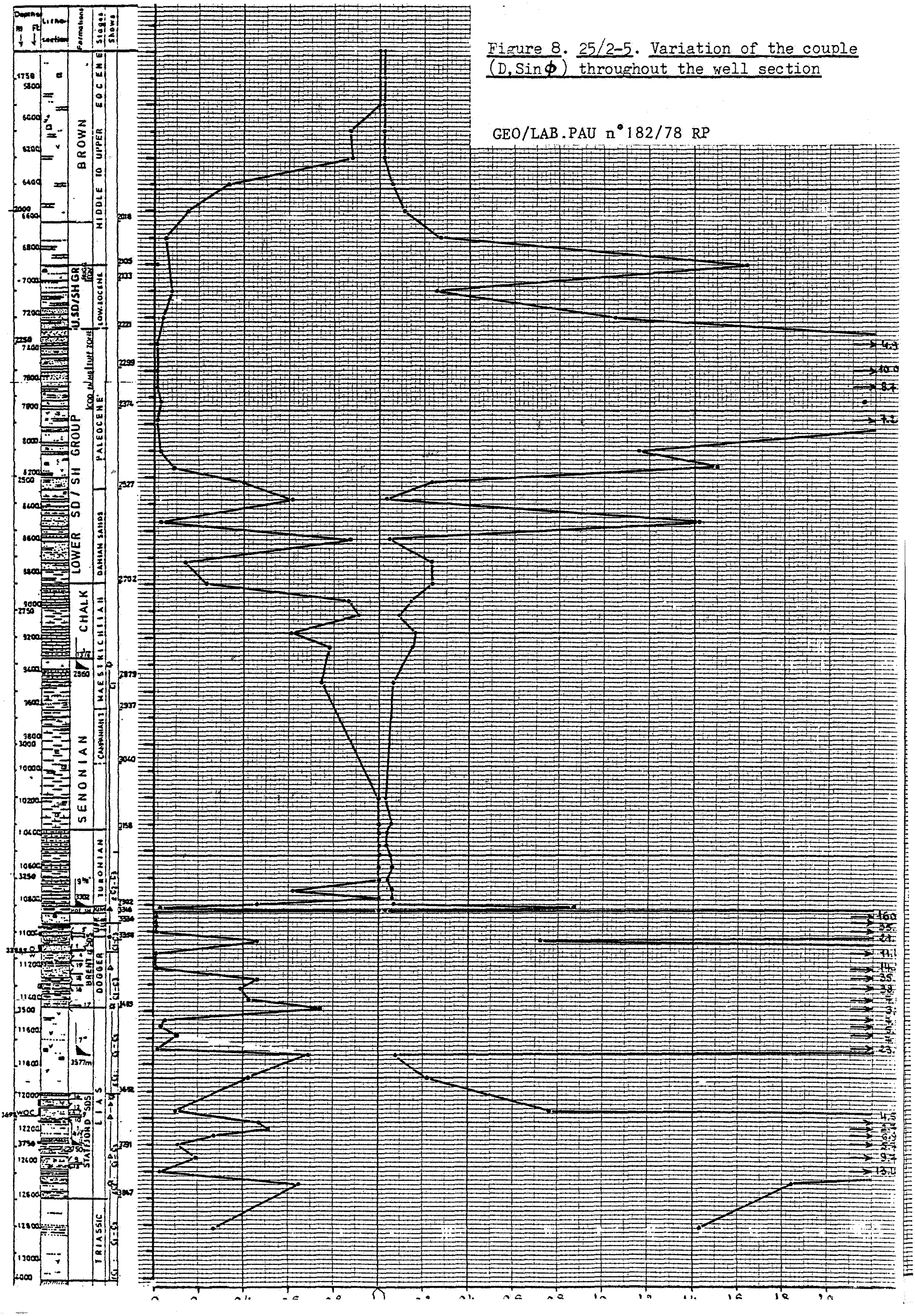


Figure 7. 25/2-5. Vertical distibution of the concentration of higher homologues C4+C5 throughout the well section

Figure 8. 25/2-5. Variation of the couple (D, Sin ϕ) throughout the well section

GEO/LAB.PAU n° 182/78 RP



GEO/LAB.PAU n°182/78 RP

TABLE I. 25/2-5 . Main data from cuttings gas

Depth (m)	METHANE (%)	ETHANE (%)	ETHYLENE (%)	PROPANE (%)	I-BUTANE (%)	N-BUTANE (%)	I-PENTANE (%)	N-PENTANE (%)	ΣC_1-C_5 (µl/kg)	Depth (m)	C_4+C_5 (%)	IR (% rock)	TOC (% rock)	OG/TOC (µl/g)
1500-1550	92.79	3.69	1.62	1.89	0.0 B	0.0 B	0.0 B	0.0 B	28.89	1550	0	84.9	1.07	3
1600	93.40	3.37	1.46	1.76	0.0 B	0.0 B	0.0 B	0.0 B	22.59	1600	0	84.1	0.80	3
1650	94.01	2.96	0.97	2.07	0.0 B	0.0 B	0.0 B	0.0 B	16.71	1650	0	84.3	0.58	3
1700	94.50	2.06	3.44	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	17.77	1700	0	76.7	0.52	3
1750	96.61	1.88	1.52	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	16.45	1750	0	81.8	0.57	3
1800	96.98	1.50	1.52	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	16.56	1800	0	83.9	0.65	3
1850	95.84	1.78	1.36	1.02	0.0 B	0.0 B	0.0 B	0.0 B	15.64	1850	0	85.9	0.57	3
1900	95.47	2.06	1.37	1.11	0.0 B	0.0 B	0.0 B	0.0 B	16.86	1900	0	85.6	0.53	3
1950	92.24	1.74	1.09	1.00	1.69	2.22	0.0 B	0.0 B	19.45	1950	3.9	86.5	0.47	4
2000	88.44	1.41	0.83	1.04	8.28	0.0 B	0.0 B	0.0 B	19.31	2000	8.3	87.7	0.39	5
2050	77.41	1.11	0.73	0.55	2.06	5.15	12.99	0.0 B	29.65	2050	20.2	89.8	0.49	6
2100	37.42	0.64	0.75	0.43	5.15	16.83	38.79	0.0 B	50.99	2100	60.8	90.5	0.48	11
2154	77.81	1.50	1.06	0.83	0.93	2.97	14.90	0.0 B	25.16	2154	18.9	89.5	0.43	6
2200	47.48	2.20	0.63	1.31	1.03	3.74	19.99	23.62	71.99	2200	48.4	87.0	0.47	15
2255	16.77	0.22	0.42	0.22	3.09	16.35	28.65	34.28	174.57	2255	82.4	83.6	0.55	32
2300	9.04	0.36	0.14	1.09	5.01	22.66	23.57	38.14	371.71	2300	89.4	88.0	0.71	52
2330	10.26	0.62	0.13	0.81	3.14	15.78	26.10	43.15	400.23	2330	88.2	84.1	0.86	47
2360	30.76	1.73	1.36	1.30	3.60	15.23	20.27	25.75	255.76	2360	64.8	85.5	0.55	47
2390	12.03	0.80	0.54	0.96	4.56	20.88	30.79	29.27	303.45	2390	85.5	86.5	0.85	36
2450	45.44	1.58	0.58	3.47	1.75	8.23	19.46	19.49	44.83	2450	48.9	89.4	0.63	7
2480	37.68	4.98	1.43	4.52	1.69	7.11	20.99	21.59	44.71	2480	51.4	—	—	-
2510	76.71	*7.13	0.0 B	6.06	5.21	4.89	0.0 B	0.0 B	33.18	2510	10.1	86.8	0.52	6
2540	94.26	1.99	1.21	2.55	0.0 B	0.0 B	0.0 B	0.0 B	23.34	2540	0	83.9	0.34	3
2580	40.43	1.56	0.68	0.97	1.24	5.49	12.64	35.98	66.49	2580	56.3	92.3	0.36	18
2620	92.90	3.54	1.58	1.98	0.0 B	0.0 B	0.0 B	0.0 B	28.38	2620	0	87.3	0.44	6
2660	78.30	2.62	1.08	2.42	2.37	13.22	0.0 B	0.0 B	24.00	2660	15.6	85.1	0.54	4
2700	77.10	4.10	1.17	2.42	2.32	12.90	0.0 B	0.0 B	25.11	2700	15.2	77.6	0.51	5
2735	83.09	9.97	1.03	3.65	2.26	0.0 B	0.0 B	0.0 B	30.83	2735	2.3	41.0	0.08	38
2760	89.75	6.97	0.0 B	3.27	0.0 B	0.0 B	0.0 B	0.0 B	19.66	2760	0	58.0	0.28	7
2790	81.83	7.91	0.0 B	3.88	2.84	3.55	0.0 B	0.0 B	34.43	2790	6.4	14.0	0.10	34
2820	82.53	9.63	0.0 B	3.93	3.90	0.0 B	0.0 B	0.0 B	23.08	2820	3.9	14.9	0.14	16
2880	91.15	4.31	0.62	2.12	1.80	0.0 B	0.0 B	0.0 B	44.74	2880	1.8	47.4	0.22	20
3105	96.69	3.31	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	12.93	3105	0	80.0	0.23	6
3150	94.36	5.64	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	18.46	3150	0	82.7	0.24	8
3170	96.58	3.42	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	14.01	3170	0	77.8	0.68	2
3190	96.67	3.33	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	13.63	3190	0	82.7	0.28	5
3210	95.12	4.88	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	12.93	3210	0	82.3	0.32	4
3230	94.46	5.54	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	17.91	3230	0	84.6	0.25	7
3255	96.30	3.70	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	18.13	3255	0	82.8	0.24	8
3272,5	91.92	3.54	0.0 B	4.53	0.0 B	0.0 B	0.0 B	0.0 B	19.75	3272	0	82.3	0.29	7
3285	94.42	5.58	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	19.36	3285	0	81.5	0.24	8
3297,5	91.97	2.74	0.0 B	5.29	0.0 B	0.0 B	0.0 B	0.0 B	16.21	3297	0	79.9	0.29	6
3302,5	52.64	1.35	0.0 B	10.71	8.72	26.57	0.0 B	0.0 B	30.65	3302	36.3	82.4	0.23	13
3310	97.46	2.54	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	22.48	3310	0	84.2	0.28	8
3315	0.62	0.16	0.01	17.21	7.76	32.80	20.68	20.75	8054.54	3315	82.0	64.9	2.42	333
3325	2.75	0.23	0.02	3.83	5.55	26.62	30.52	30.48	5699.69	3325	93.2	83.7	3.86	148
3335	4.38	0.26	0.0 B	3.41	6.36	28.66	32.10	24.83	3034.74	3335	92.0	85.4	3.30	92
3355	15.71	0.67	0.0 B	6.39	5.90	29.88	23.23	18.21	788.25	3355	77.2	90.2	2.65	30
3370	50.77	16.79	0.15	19.16	0.67	3.80	2.63	6.03	1326.04	3370	13.1	87.6	3.26	41
3389	8.01	0.79	0.07	8.19	5.82	32.57	24.39	20.16	2549.06	3389	82.5	92.3	3.34	76
3420	6.52	0.64	0.07	13.99	5.60	28.19	22.14	22.85	2386.78	3420	78.9	88.8	3.34	72
3438	2.03	33.13	0.0 B	45.63	3.12	13.70	1.52	0.88	18176.38	3438	19.2	90.4	23.03	79
3460	1.90	28.87	0.0 B	43.89	4.11	13.68	3.96	3.60	14892.54	3460	25.4	92.6	30.60	49
3480	9.60	28.56	0.30	37.41	2.94	13.57	3.96	3.67	9925.86	3480	24.1	90.4	9.10	109
3495	16.19	43.95	0.0 B	29.14	1.56	7.03	1.30	0.84	11604.44	3495	10.7	92.2	14.90	98
3517	11.02	4.63	0.0 B	7.56	5.17	22.96	23.76	24.60	3288.39	3517	76.5	92.4	2.68	122
3530	14.28	2.08	0.0 B	5.35	3.97	23.91	31.19	19.23	1506.88	3530	78.3	92.1	3.67	43
3542.5-3545.5	11.38	8.27	0.0 B	14.10	4.22	22.28	18.39	21.40	2012.61	3545	66.3	91.1	4.01	50
3572	3.96	2.05	0.0 B	6.96	7.26	33.52	22.13	24.13	4024.56	3572	87.0	91.9	3.77	107
3580	90.05	4.86	0.0 B	2.68	0.83	1.58	0.0 B	0.0 B	369.02	3580	2.4	64.3	2.55	15
3625	77.44	7.19	0.0 B	8.53	2.87	3.96	0.0 B	0.0 B	101.47	3625	6.8	72.7	1.19	9
3685	54.76	3.48	0.0 B	7.52	4.36	5.48	3.27	20.63	193.99	3685	33.7	86.6	1.98	10
3710	14.14	29.77	0.0 B	35.10	3.14	7.34	1.73	8.79	472.17	3710	21.0	80.2	3.51	13
3722,5	21.12	29.24	0.0 B	22.73	3.78	9.89	3.11	10.13	386.34	3722	26.9	77.2	2.63	15
3735	10.48	19.39	0.0 B	37.29	5.52	18.27	4.03	5.02	566.33	3735	32.8	90.3	4.03	14
3750	13.73	8.70	0.0 B	46.16	4.48	21.75	3.79	1.39	986.99	3750	31.4	90.1	5.40	18
3770-3775	8.14	14.56	0.0 B	49.49	4.12	15.56	5.77	2.35	707.79	3775	27.8	90.4	5.67	13
3800	24.8	9.6	0.0	30.5	6.8	18.5	4.6	5.5	146.0	3800	35.2	91.5	1.52	10
3835	27.85	33.45	0.0	19.65	5.73	13.13	0.0 B	0.0 B	125.39	3835	18.9	91.9	0.85	15
3850	36.23	13.80	0.0	22.46	13.85	13.66	0.0 B	0.0 B	53.47	3850	27.5	91.3	1.00	5
3907,5	100.00	0.0 B	0.0	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	15.78	3907	0	91.0	0.27	6
3932,5	100.00	0.0 B	0.0	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	18.35	3932	0	90.7	0.24	8
3950	100.00	0.0 B	0.0	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	15.68	3950	0	90.9	0.17	9
3997,5	100.00	0.0 B	0.0	0.0 B	0.0 B	0.0 B	0.0 B	0.0 B	15.92	3997	0	89.3	0.16	10

TABLE II. 25/2-5. Ratios deduced from cuttings gas analysis

Depth (m)	C_1/C_{2+} R1	C_2/C_1 R2	C_2/C_3 R3	C_3/C_4 R4	C_4/C_5 R5	iC_4/nC_4 R6	C_{3+}/C_1 R7	D R8	Sinϕ R9	C_1/C_2 R10	C_1/C_3 R11	C_1/C_4 R12	C_1/C_5 R13	Depth (m)
1550	16.608	0.040	1.949	********	********	********	0.020	0.045	0.890	25.132	48.971	********	********	1550
1600	18.188	0.036	1.915	********	********	********	0.019	0.041	0.886	27.684	53.020	********	********	1600
1650	18.695	0.031	1.427	********	********	********	0.022	0.038	0.819	31.796	45.372	********	********	1650
1700	45.764	0.022	********	********	********	********	0.0	0.022	1.000	45.764	********	********	********	1700
1750	51.515	0.019	********	********	********	********	0.0	0.019	1.000	51.515	********	********	********	1750
1800	64.779	0.015	********	********	********	********	0.0	0.015	1.000	64.779	********	********	********	1800
1850	34.213	0.019	1.741	********	********	********	0.011	0.021	0.867	53.859	93.794	********	********	1850
1900	30.193	0.022	1.860	********	********	********	0.012	0.024	0.881	46.422	86.368	********	********	1900
1950	13.849	0.019	1.735	0.256	********	0.763	0.053	0.057	0.334	52.965	91.873	23.562	********	1950
2000	8.243	0.016	1.353	0.126	********	********	0.105	0.107	0.150	62.737	84.875	10.684	********	2000
2050	3.541	0.014	2.001	0.077	0.555	0.400	0.268	0.268	0.053	69.827	139.750	10.740	5.959	2050
2100	0.605	0.017	1.511	0.019	0.567	0.306	1.635	1.635	0.011	58.057	87.739	1.703	0.965	2100
2154	3.683	0.019	1.808	0.213	0.262	0.312	0.252	0.253	0.076	51.927	93.860	19.954	5.222	2154
2200	0.915	0.046	1.681	0.275	0.109	0.274	1.046	1.047	0.044	21.542	36.217	9.970	1.389	2200
2255	0.203	0.013	0.997	0.011	0.309	0.189	4.925	4.925	0.003	76.024	75.825	0.862	0.267	2255
2300	0.099	0.040	0.328	0.039	0.448	0.221	10.013	10.013	0.004	25.316	8.304	0.327	0.146	2300
2330	0.115	0.061	0.770	0.043	0.273	0.199	8.669	8.670	0.007	16.498	12.698	0.543	0.148	2330
2360	0.453	0.056	1.334	0.069	0.409	0.237	2.150	2.151	0.026	17.796	23.735	1.634	0.668	2360
2390	0.138	0.066	0.832	0.038	0.424	0.219	7.190	7.190	0.009	15.095	12.566	0.473	0.200	2390
2450	0.842	0.035	0.454	0.348	0.256	0.212	1.153	1.154	0.030	28.785	13.077	4.552	1.166	2450
2480	0.619	0.132	1.102	0.514	0.206	0.238	1.484	1.490	0.089	7.561	8.330	4.285	0.885	2480
2510	3.293	0.093	1.177	0.601	********	1.065	0.211	0.230	0.404	10.752	12.650	7.600	********	2510
2540	20.783	0.021	0.780	********	********	********	0.027	0.034	0.615	47.435	36.989	********	********	2540
2580	0.687	0.039	1.613	0.144	0.136	0.227	1.418	1.418	0.027	25.837	41.675	6.008	0.815	2580
2620	16.835	0.038	1.786	********	********	********	0.021	0.044	0.873	26.260	46.904	********	********	2620
2660	3.795	0.033	1.085	0.155	********	0.179	0.230	0.232	0.144	29.875	32.407	5.021	********	2660
2700	3.548	0.053	1.695	0.159	********	0.180	0.229	0.235	0.226	18.827	31.918	5.066	********	2700
2735	5.232	0.120	2.735	1.613	********	********	0.071	0.140	0.860	8.331	22.784	36.750	********	2735
2760	8.759	0.078	2.131	********	********	********	0.036	0.086	0.905	12.871	27.421	********	********	2760
2790	4.504	0.097	2.040	0.607	********	0.799	0.125	0.158	0.610	10.351	21.115	12.807	********	2790
2820	4.725	0.117	2.452	1.006	********	********	0.095	0.150	0.776	8.566	21.007	21.137	********	2820
2880	11.076	0.047	2.029	1.180	********	********	0.043	0.064	0.740	21.158	42.941	50.681	********	2880
3105	29.241	0.034	********	********	********	********	0.0	0.034	1.000	29.241	********	********	********	3105
3150	16.740	0.060	********	********	********	********	0.0	0.060	1.000	16.740	********	********	********	3150
3170	28.201	0.035	********	********	********	********	0.0	0.035	1.000	28.201	********	********	********	3170
3190	29.057	0.034	********	********	********	********	0.0	0.034	1.000	29.057	********	********	********	3190
3210	19.494	0.051	********	********	********	********	0.0	0.051	1.000	19.494	********	********	********	3210
3230	17.055	0.059	********	********	********	********	0.0	0.059	1.000	17.055	********	********	********	3230
3255	26.001	0.038	********	********	********	********	0.0	0.038	1.000	26.001	********	********	********	3255
3272	11.383	0.039	0.782	********	********	********	0.049	0.063	0.616	25.945	20.281	********	********	3272
3285	16.912	0.059	********	********	********	********	0.0	0.059	1.000	16.912	********	********	********	3285
3297	11.458	0.030	0.517	********	********	********	0.058	0.065	0.459	33.623	17.382	********	********	3297
3302	1.112	0.026	0.126	0.304	********	0.328	0.874	0.874	0.029	38.851	4.913	1.492	********	3302
3310	38.406	0.026	********	********	********	********	0.0	0.026	1.000	38.406	********	********	********	3310
3315	0.006	0.262	0.009	0.424	0.979	0.237	160.660	160.660	0.002	3.819	0.036	0.015	0.015	3315
3325	0.028	0.084	0.061	0.119	0.527	0.208	35.225	35.225	0.002	11.866	0.719	0.086	0.045	3325
3335	0.046	0.059	0.075	0.097	0.615	0.222	21.796	21.796	0.003	17.089	1.282	0.125	0.077	3335
3355	0.186	0.042	0.104	0.179	0.863	0.197	5.322	5.322	0.008	23.629	2.458	0.439	0.379	3355
3370	1.034	0.331	0.876	4.287	0.517	0.178	0.636	0.717	0.461	3.023	2.650	11.359	5.867	3370
3389	0.087	0.098	0.096	0.213	0.862	0.179	11.372	11.372	0.009	10.208	0.979	0.209	0.180	3389
3420	0.070	0.098	0.046	0.414	0.751	0.199	14.232	14.232	0.007	10.224	0.466	0.193	0.145	3420
3438	0.021	16.342	0.726	2.714	7.015	0.228	31.979	35.913	0.455	0.061	0.044	0.121	0.846	3438
3460	0.019	15.224	0.658	2.468	2.352	0.300	36.509	39.556	0.385	0.066	0.043	0.107	0.251	3460
3480	0.107	2.974	0.763	2.266	2.166	0.217	6.408	7.064	0.421	0.336	0.257	0.582	1.260	3480
3495	0.193	2.715	1.508	3.395	4.003	0.222	2.463	3.666	0.741	0.368	0.555	1.886	7.550	3495
3517	0.124	0.420	0.612	0.269	0.582	0.225	7.624	7.636	0.055	2.383	1.458	0.392	0.228	3517
3530	0.167	0.146	0.389	0.192	0.553	0.166	5.856	5.858	0.025	6.860	2.672	0.512	0.283	3530
3545	0.128	0.723	0.583	0.532	0.666	0.190	7.068	7.105	0.102	1.384	0.807	0.429	0.286	3545
3572	0.041	0.516	0.294	0.171	0.882	0.216	23.721	23.726	0.022	1.938	0.570	0.097	0.086	3572
3580	9.049	0.054	1.817	1.112	********	0.528	0.056	0.078	0.691	18.511	33.628	37.388	********	3580
3625	3.433	0.093	0.843	1.250	********	0.725	0.198	0.219	0.424	10.767	9.074	11.339	********	3625
3685	1.210	0.073	0.530	0.764	0.412	0.797	0.753	0.757	0.096	13.750	7.286	5.565	2.291	3685
3710	0.165	2.105	0.848	3.349	0.997	0.428	3.966	4.490	0.469	0.475	0.403	1.350	1.345	3710
3722	0.268	1.384	1.286	1.662	1.033	0.382	2.350	2.727	0.508	0.722	0.929	1.545	1.596	3722
3735	0.117	1.850	0.520	1.560	2.628	0.302	6.690	6.941	0.267	0.541	0.281	0.441	1.158	3735
3750	0.159	0.633	0.188	1.759	5.065	0.206	5.649	5.685	0.111	1.579	0.297	0.523	2.651	3750
3775	0.089	1.789	0.294	2.514	2.424	0.265	9.497	9.664	0.185	0.559	0.164	0.413	1.002	3775
3800	0.073	0.388	0.315	0.119	5.698	0.363	13.398	13.403	0.029	2.578	0.812	0.097	0.551	3800
3835	0.386	1.201	1.685	1.053	********	0.436	1.390	1.837	0.654	0.833	1.403	1.477	********	3835
3850	0.568	0.381	0.614	0.816	********	1.014	1.379	1.431	0.266	2.625	1.613	1.317	********	3850
3907	********	********	********	********	********	********	********	********	********	********	********	********	********	3907
3932	********	********	********	********	********	********	********	********	********	********	********	********	********	3932
3950	********	********	********	********	********	********	********	********	********	********	********	********	********	3950
3997	********	********	********	********	********	********	********	********	********	********	********	********	********	3997