

Carbon isotope and hydrocarbon characteristic determinations with gas chromatographs mass spectroscopy data of samples from the following four wells:

Atlantic Richfield Itkillik River Unit No. 1 (of core, 7902' - 7911');;

Arco Alaska Inc. KRU West Sak No. 26 (of core, 6873' - 6885');;

Atlantic Richfield Toolik Fed No. 2 (of dry cuttings, 7830' - 7860'); and

Atlantic Richfield Nora Fed No. 1 (of dry cuttings, 12,460' - 12,580').

EXTRACT ISOTOPE DATA

<u>WELL</u>	<u>DEPTH(')</u>	<u>CODE</u>	<u>C ISOTOPE COMPN</u>
ITKILLIK R-1	7902-7911	WF 3640	-27.28
WEST SAK-26	6873-6885	WF 3641	-29.70
TOOLIK FED-2	7830-7860	WF 3642	-30.23
NORA FED-1	12400-12580	WF 3643	-27.66

WF 3640

*** PETROLEUM GEOCHEMISTRY ***

SARA ANALYSIS

SAMPLE NAME : BEAUFORTIAN WF3640
 INSTRUMENT : HPLC_FID
 INJECT TIME : Fri Oct 27, 1989 12:37:26 pm
 METHOD USED : /METHOD/HPLC_FID0.MTH
 SEQUENCE : /DATA/LOOP/SEQUENCE/HP1090_AUTOW.SEO
 RESULT FILE : /RESULT/WF3640_SAP.RES
 REPORT TIME : 2:18 PM FRI., 1 DEC., 1989

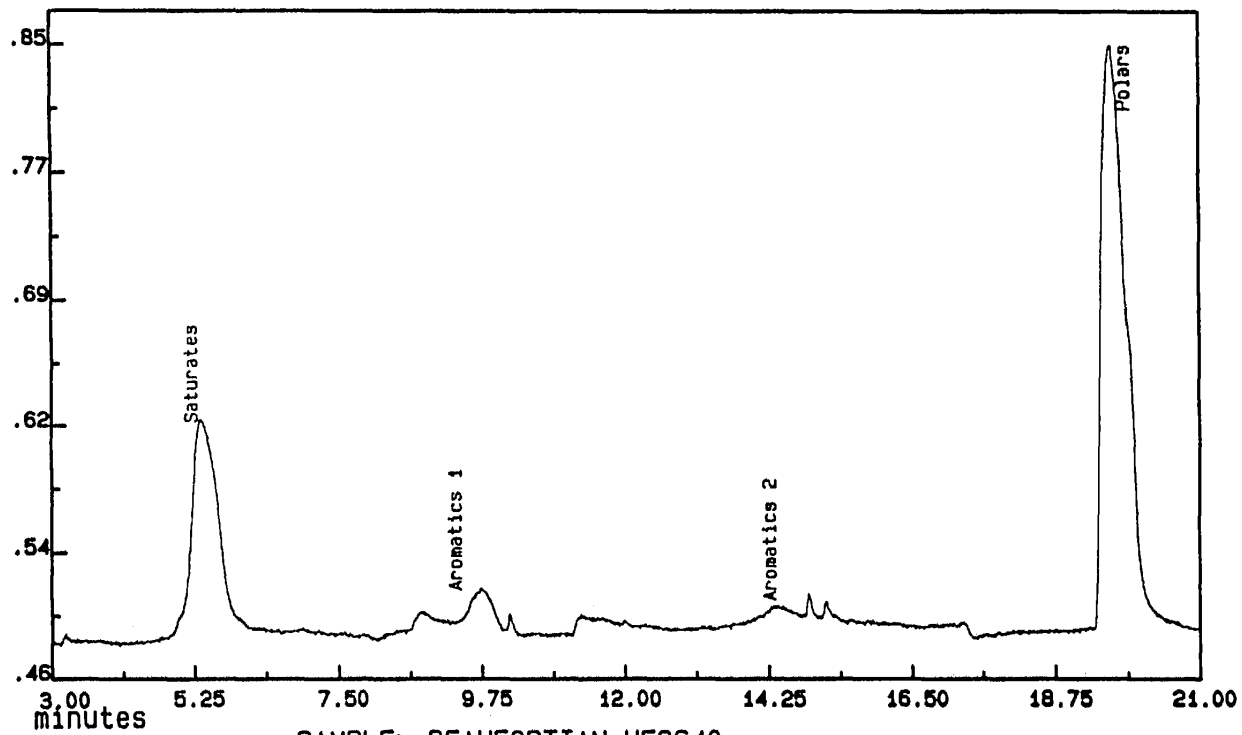
	AREA	TIME	RESPONSE FACTOR
	----	-----	-----
Saturates	4000.	5.29	.1275E-03
Aromatics 1	1530.	9.42	.5470E-04
Aromatics 2	3387.	14.36	.5470E-04
Polars	10356.	19.92	.4160E-04

	AMOUNT (mg)	% RESIDUE
	-----	-----
Saturates	.51	42.2
Aromatics	.27	22.2
Polars	.43	35.6

	% OIL

Saturates	41.9
Aromatics	22.1
Polars	35.4
Asphaltenes	.7

AMPLITUDE/1000
Range Normalized



SAMPLE: BEAUFORTIAN WF3640

ANALYZED: Fri Oct 27, 1989 12:37:26 pm

RESULT: /RESULT/WF3640 SAP.RES METHOD: HPLC FIDO

*** PETROLEUM GEOCHEMISTRY ***
SATURATE GC

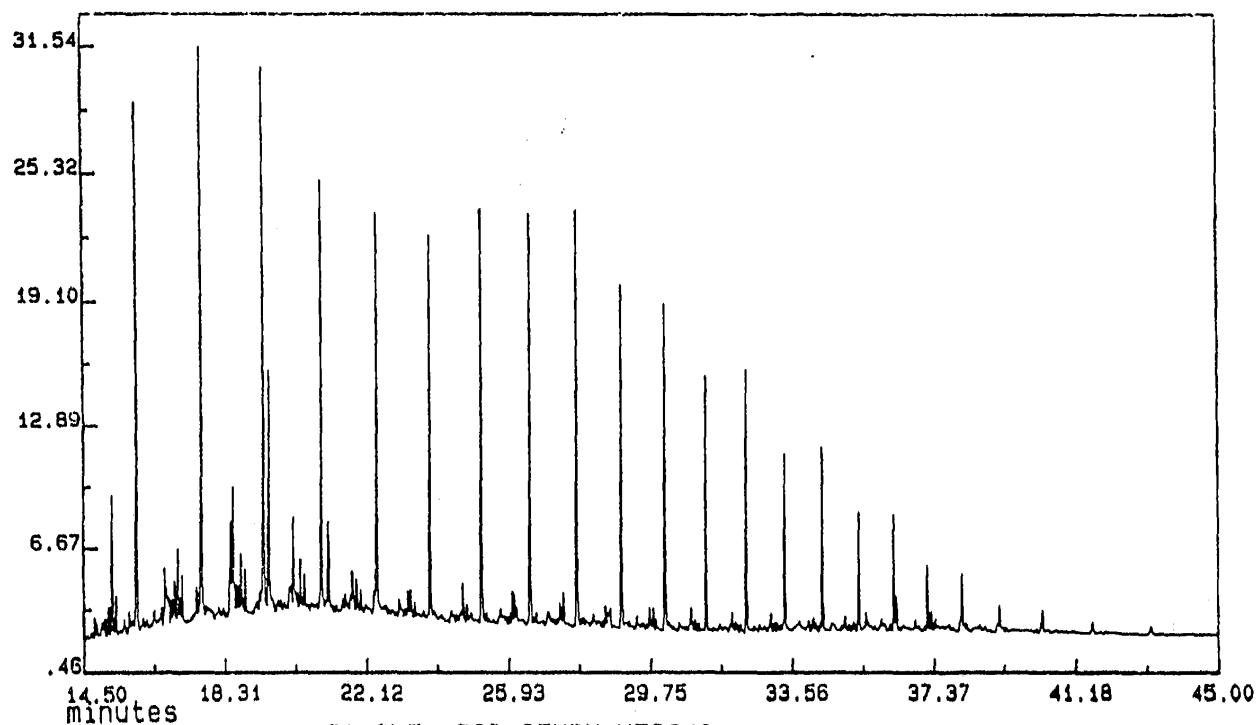
SAMPLE NAME : B&B STUDY WF3640
INSTRUMENT : HP_5890_2
INJECT TIME : Mon Nov 6, 1989 12:13:03 pm
METHOD USED : /METHOD/SAT5890C.MTH
RESULT FILE : /RESULT/WF3640_SAT.RES
REPORT TIME : 5:01 PM MON., 6 NOV., 1989

CPI VALUE : 1.12
PRISTANE / PHYTANE : 2.75 C15/C25 : 1.55
PRISTANE / C17 : .51 C17/Pr : 1.96
PHYTANE / C18 : .25 C18/Ph : 3.95

	AREA	%AREA NALK	TIME	NORM C15
----	-----	-----	-----	-----
N-C10	211.	.0	5.76	.00
N-C11	0.	0.0	0.00	0.00
N-C12	0.	0.0	0.00	0.00
N-C13	1229.	.0	12.07	.00
N-C14	66825.	2.2	14.05	.27
N-C15	245758.	8.3	15.93	1.00
N-C16	272646.	9.2	17.69	1.11
N-C17	288822.	9.7	19.35	1.18
N-C18	211981.	7.1	20.92	.86
N-C19	190552.	6.4	22.41	.78
N-C20	174915.	5.9	23.84	.71
N-C21	191341.	6.4	25.21	.78
N-C22	197587.	6.6	26.53	.80
N-C23	210558.	7.1	27.79	.86
N-C24	162952.	5.5	28.99	.66
N-C25	158947.	5.3	30.15	.65
N-C26	112387.	3.8	31.26	.46
N-C27	120754.	4.1	32.34	.49
N-C28	81388.	2.7	33.37	.33
N-C29	80634.	2.7	34.38	.33
N-C30	51820.	1.7	35.35	.21
N-C31	42940.	1.4	36.29	.17
N-C32	28359.	1.0	37.19	.12
N-C33	35473.	1.2	38.12	.14
N-C34	17062.	.6	39.15	.07
N-C35	17121.	.6	40.30	.07
N-C36	9054.	.3	41.63	.04

	AREA	%AREA ISPR	TIME
----	-----	-----	-----
Farnesane	5854.	2.0	13.63
Acyclic C16	15346.	5.2	15.37
Acyclic C18	72338.	24.5	18.54
Pristane	147720.	50.1	19.50
Phytane	53674.	18.2	21.09

AMPLITUDE/1000
Range Normalized

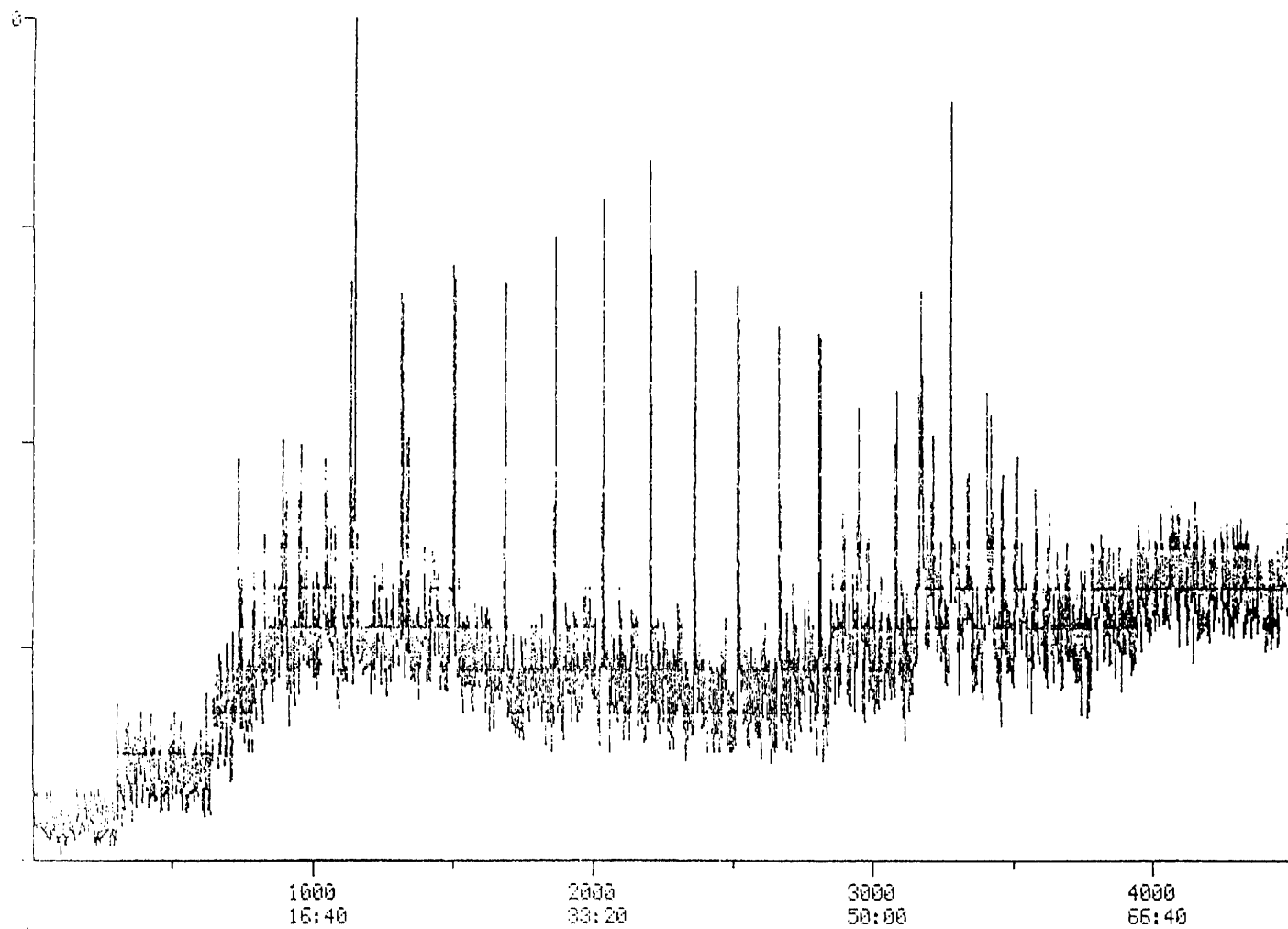


SAMPLE: B&B STUDY WF3640

ANALYZED: Mon Nov 6, 1989 12:13:03 pm

RESULT: /RESULT/WF3640 SAT.RES METHOD: SAT5890C

MIDRIC DATA: WF3640LSAT #1 SCANS 1 TO 4500
10/31/89 16:28:00 CALI: WF3640LSAT #3
SAMPLE: WF3640LSAT
CONDOS.: HP THIN FILM, RES=NORM
RANGE: G 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



MIDMASS CHROMATOGRAMS

10/31/89 16:28:00

SAMPLE: WF3640_SAT

CONDOS.: HP THIN FILM, RES=NORM

RANGE: G 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: WF3640_SAT #1

SCANS 1500 TO 4500

CALI: WF3640_SAT #3

4448.

191.057
± 0.530

462.

217.065
± 0.500

300 2000 2500 3000 3500 4000 4500 SCAN
3:00 33:20 41:40 50:00 58:20 66:40 75:00 TIME

MIDMASS CHROMATOGRAMS

10/31/89 16:28:00

SAMPLE: WF3640_SAT

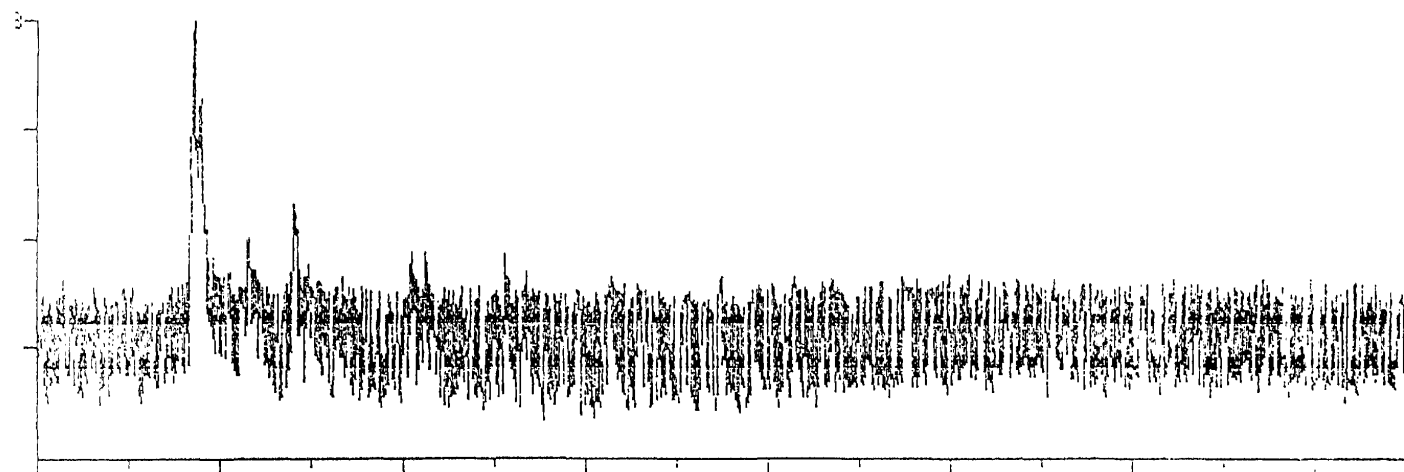
CONDOS.: HP THIN FILM, RES=NORM

RANGE: G 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

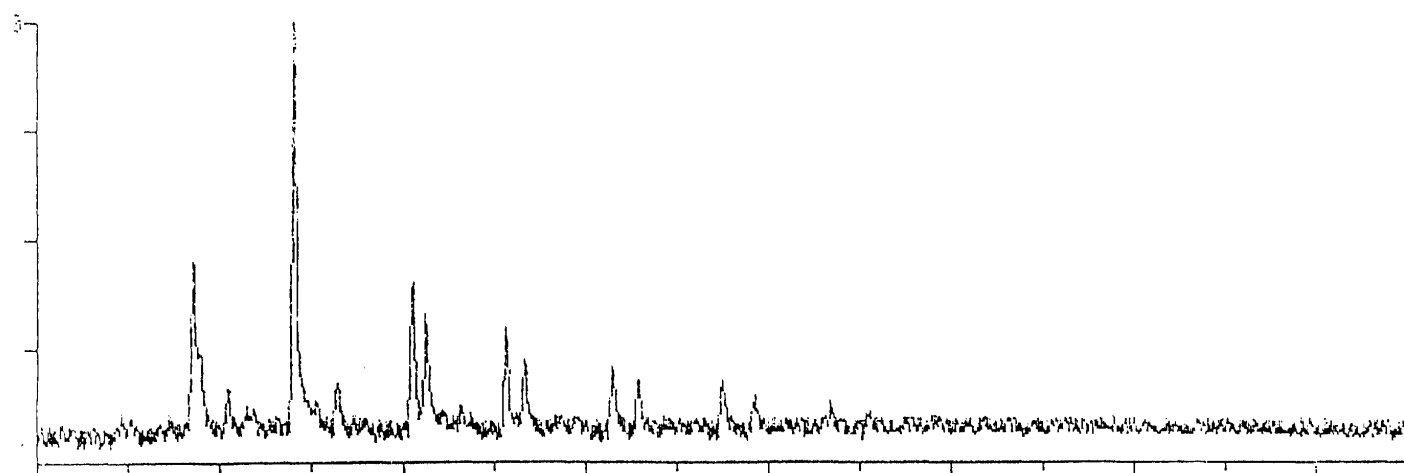
DATA: WF3640_SAT #1

SCANS 3000 TO 4500

CALI: WF3640_SAT #3



879.

177.053
± 0.500

4448.

151.057
± 0.500

SCAN	TIME
3000	50:00
3200	53:20
3400	56:40
3600	60:00
3800	63:20
4000	66:40
4200	70:00
4400	73:20

MIDMASS CHROMATOGRAMS

10/31/85 16:28:00

SAMPLE: WF3640_SAT

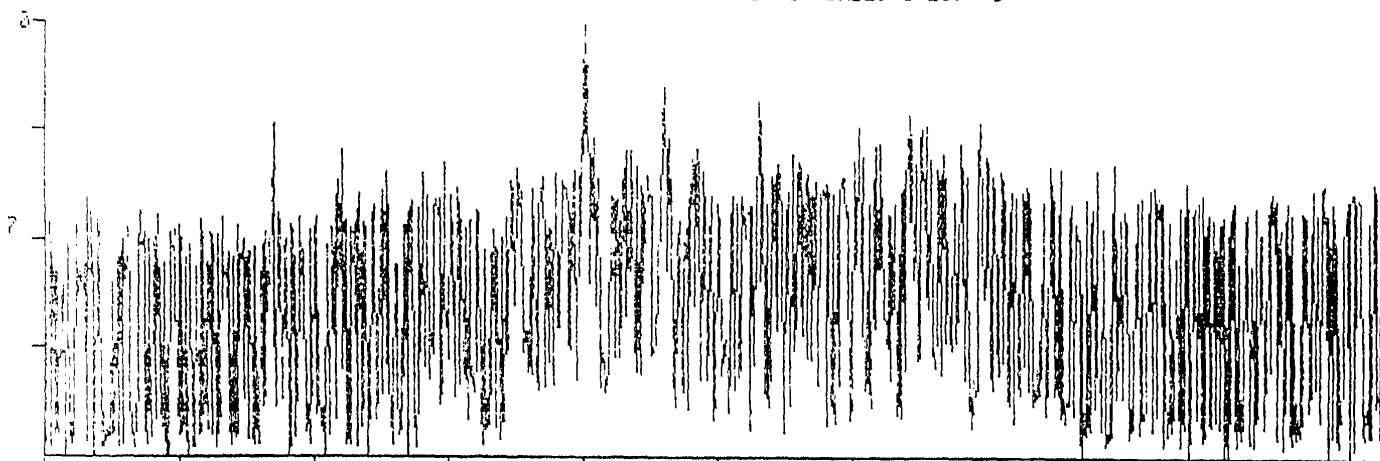
CONDOS.: HP THIN FILM, RES=NORM

RANGE: G 1.4900 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: WF3640_SAT #1

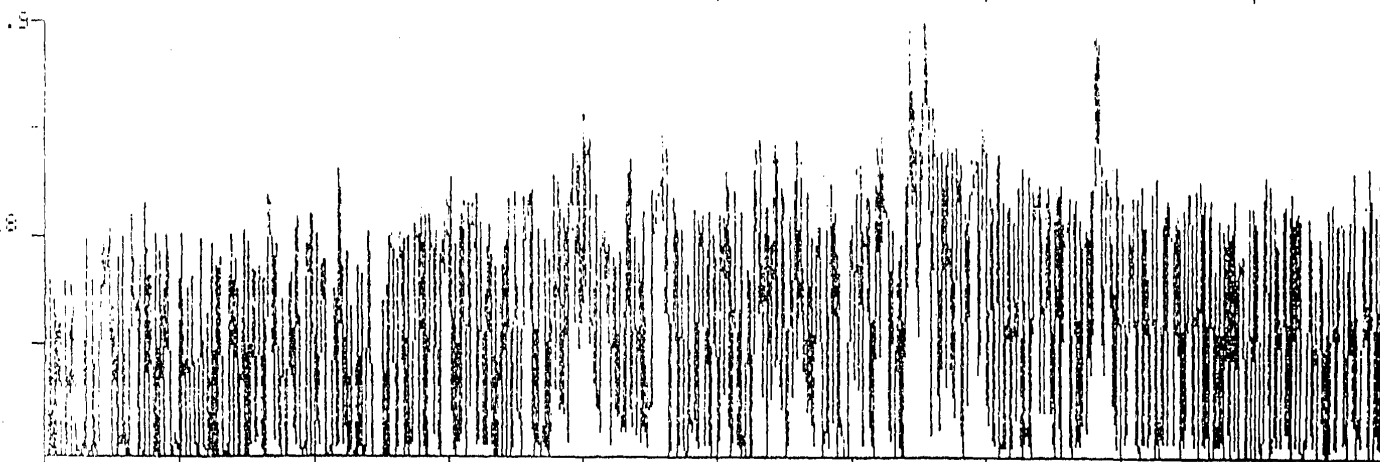
SCANS 2500 TO 3500

CALI: WF3640_SAT #3



462.

217.065
± 0.500



466.

219.065
± 0.500

2600
43:20

2800
45:40

3000
50:00

3200
53:20

3400
56:40

SCAN
TIME

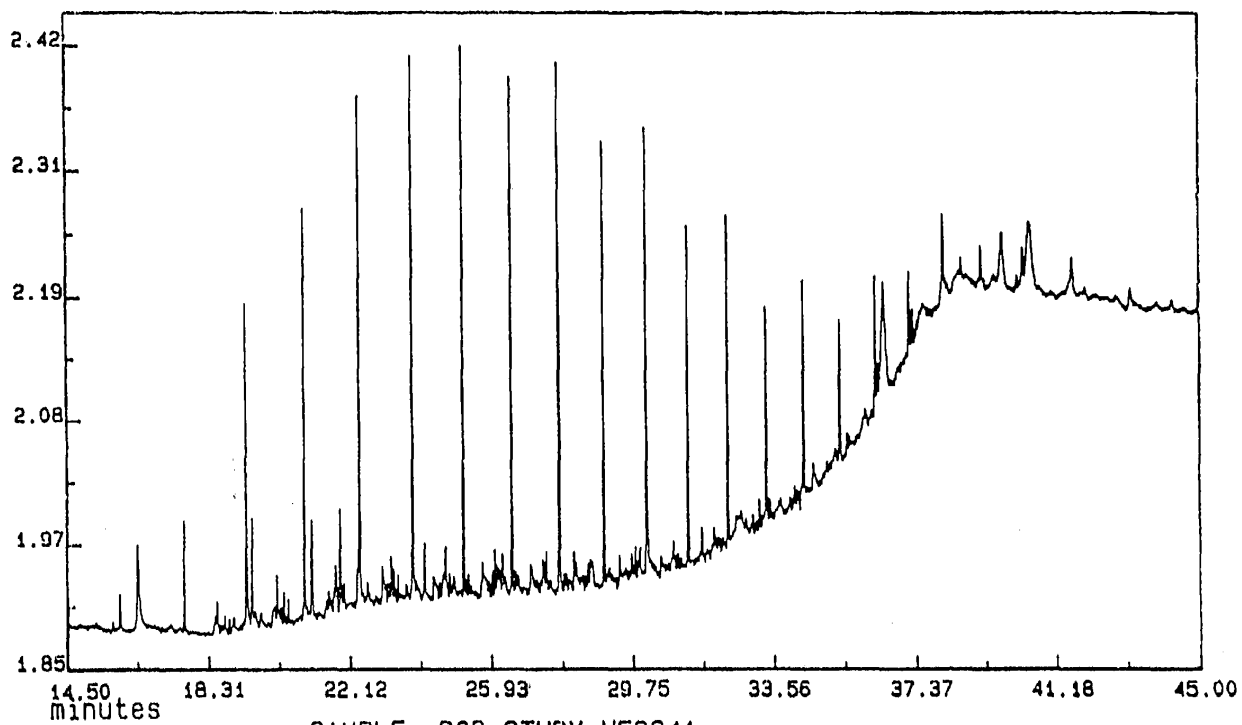
*** PETROLEUM GEOCHEMISTRY ***
SATURATE GC

SAMPLE NAME : B&B STUDY WF3641
INSTRUMENT : HP_5890_2
INJECT TIME : Mon Nov 6, 1989 1:08:35 pm
METHOD USED : /METHOD/SAT5890C.MTH
RESULT FILE : /RESULT/WF3641_SAT.RES
REPORT TIME : 5:26 PM MON., 6 NOV., 1989

CPI VALUE : 1.24
PRISTANE / PHYTANE : 1.16 C15/C25 : .10
PRISTANE / C17 : .45 C17/Pr : 2.24
PHYTANE / C18 : .36 C18/Ph : 2.79

	AREA	%AREA NALK	TIME	NORM C15
	----	-----	-----	-----
N-C10	130.	.2	5.76	.41
N-C11	0.	0.0	0.00	0.00
N-C12	0.	0.0	0.00	0.00
N-C13	0.	0.0	0.00	0.00
N-C14	0.	0.0	0.00	0.00
N-C15	315.	.6	15.90	1.00
N-C16	800.	1.5	17.65	2.54
N-C17	2758.	5.3	19.31	8.75
N-C18	2966.	5.7	20.88	9.41
N-C19	3527.	6.8	22.38	11.19
N-C20	3928.	7.5	23.81	12.46
N-C21	3651.	7.0	25.18	11.58
N-C22	3624.	6.9	26.49	11.49
N-C23	4146.	7.9	27.74	13.15
N-C24	3062.	5.9	28.95	9.71
N-C25	3291.	6.3	30.11	10.44
N-C26	2380.	4.6	31.23	7.55
N-C27	2367.	4.5	32.31	7.51
N-C28	1861.	3.6	33.35	5.90
N-C29	2054.	3.9	34.36	6.51
N-C30	1214.	2.3	35.33	3.85
N-C31	3106.	5.9	36.50	9.85
N-C32	861.	1.6	37.19	2.73
N-C33	1523.	2.9	38.12	4.83
N-C34	465.	.9	39.14	1.47
N-C35	2516.	4.8	40.48	7.98
N-C36	1673.	3.2	41.63	5.31

	AREA	%AREA ISPR	TIME
	----	-----	-----
Farnesane	0.	0.0	0.00
Acyclic C16	0.	0.0	0.00
Acyclic C18	346.	13.1	18.52
Pristane	1232.	46.7	19.47
Phytane	1062.	40.2	21.08

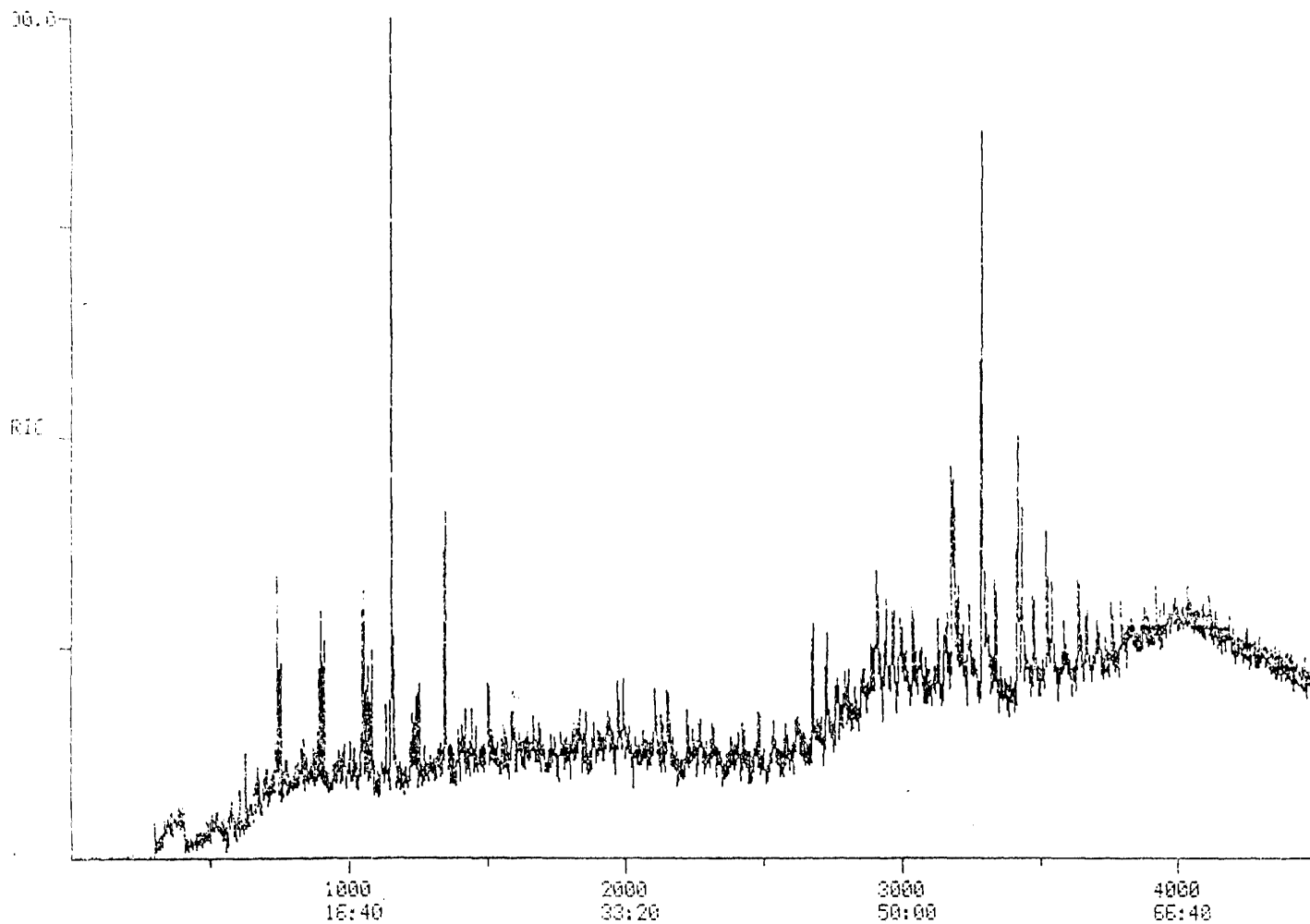
AMPLITUDE/1000
Range Normalized

SAMPLE: B&B STUDY WF3641

ANALYZED: Mon Nov 6, 1989 1:08:35 pm

RESULT: /RESULT/WF3641 SAT.RES METHOD: SAT5890C

MIDRIC DATA: WF3641A_SAT #1 SCANS 1 TO 4500
12/04/89 14:23:00 CALI: WF3641A_SAT #3
SAMPLE: WF3641A_SAT DE-NORM
CONDOS.: HP THIN FILM ,RES=NORM
RANGE: C 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



20512.

MIDMASS CHROMATOGRAMS

12/04/89 14:23:00

SAMPLE: WF3641A_SAT DE-NORM

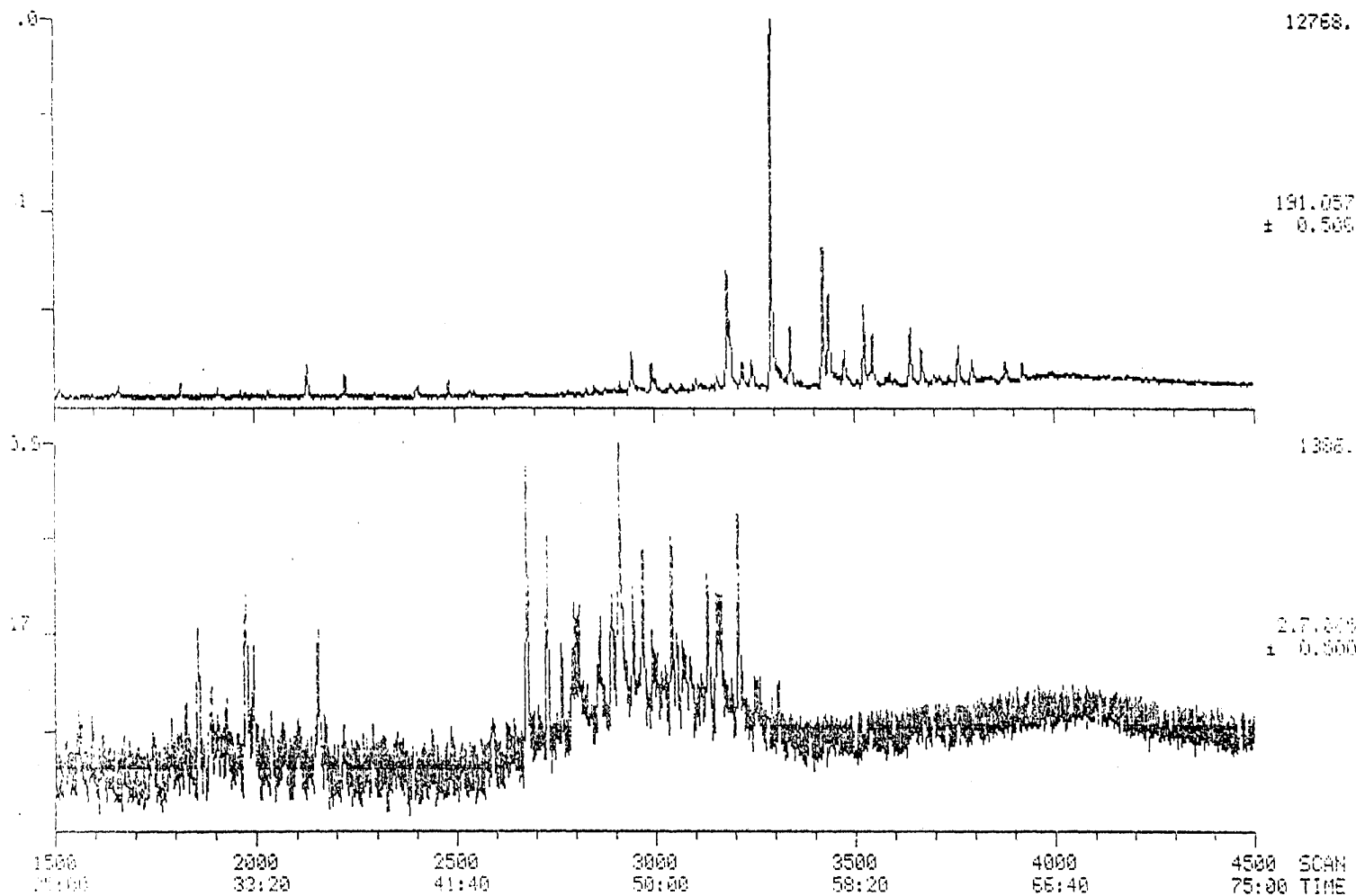
CONDOS.: HP THIN FILM ,RES=NORM

RANGE: G 1,4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

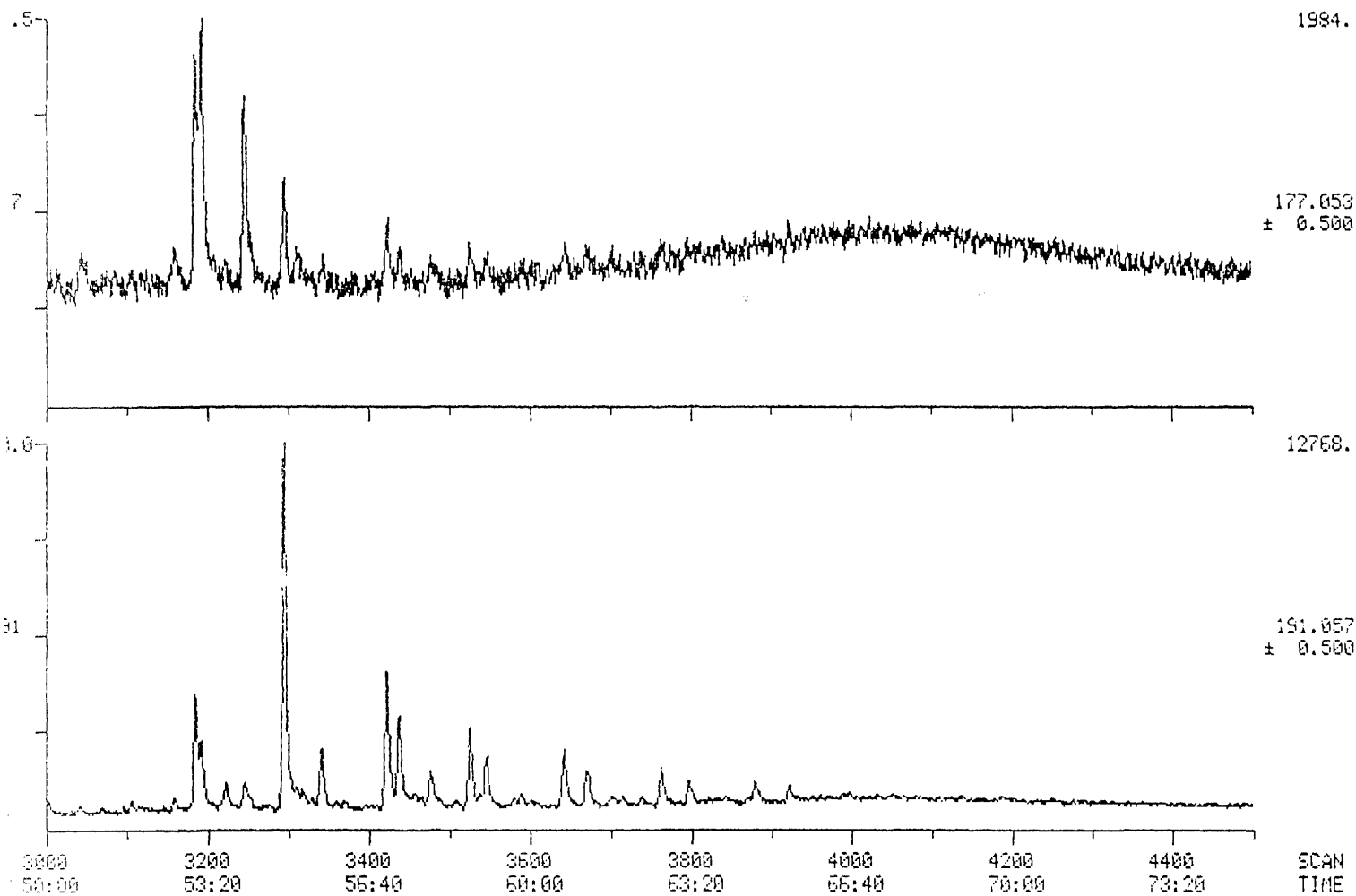
DATA: WF3641A_SAT #1

SCANS 1500 TO 4500

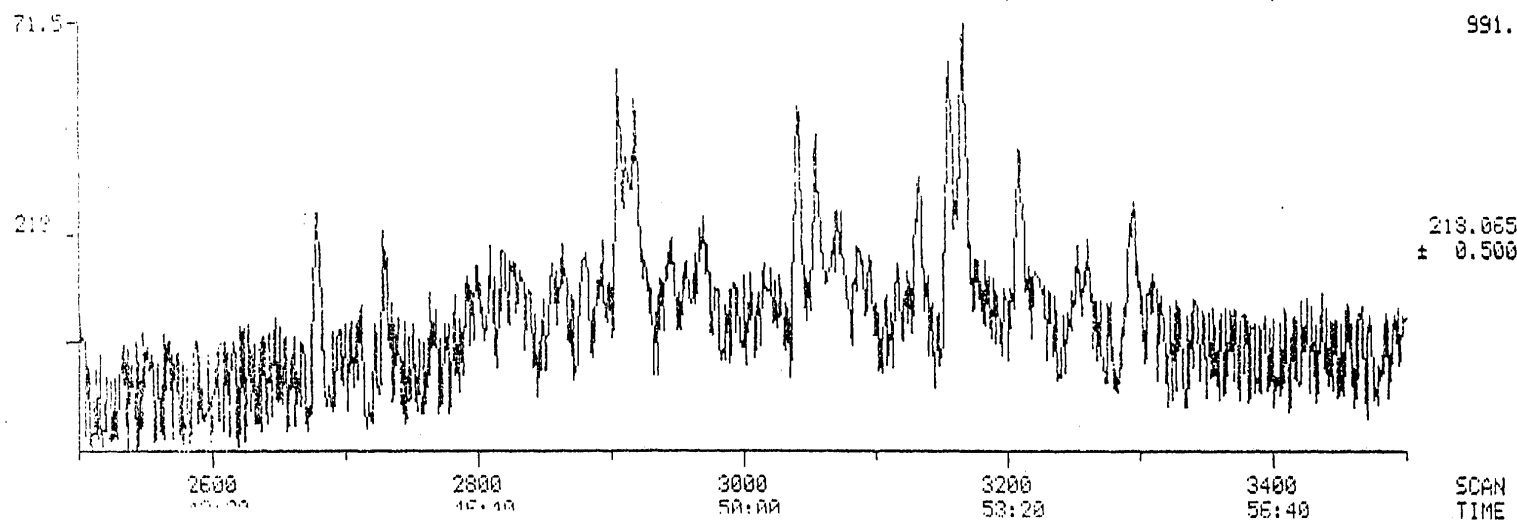
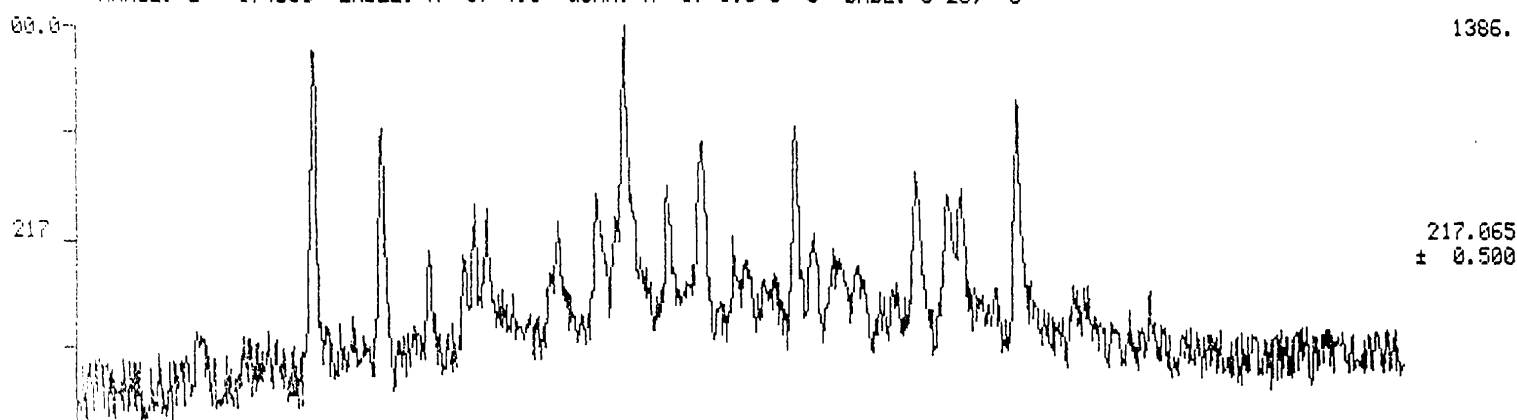
CALI: WF3641A_SAT #3



MIDMASS CHROMATOGRAMS DATA: WF3641A_SAT #1 SCANS 3000 TO 4500
 12/04/89 14:23:00 CALI: WF3641A_SAT #3
 SAMPLE: WF3641A_SAT DE-NORM
 COND.: HP THIN FILM ,RES=NORM
 RANGE: G 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



MIDMASS CHROMATOGRAMS DATA: WF3641A_SAT #1 SCANS 2500 TO 3500
 12/04/89 14:23:00 CALI: WF3641A_SAT #3
 SAMPLE: WF3641A_SAT DE-NORM
 CONDS.: HP THIN FILM ,RES=NORM
 RANGE: G 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



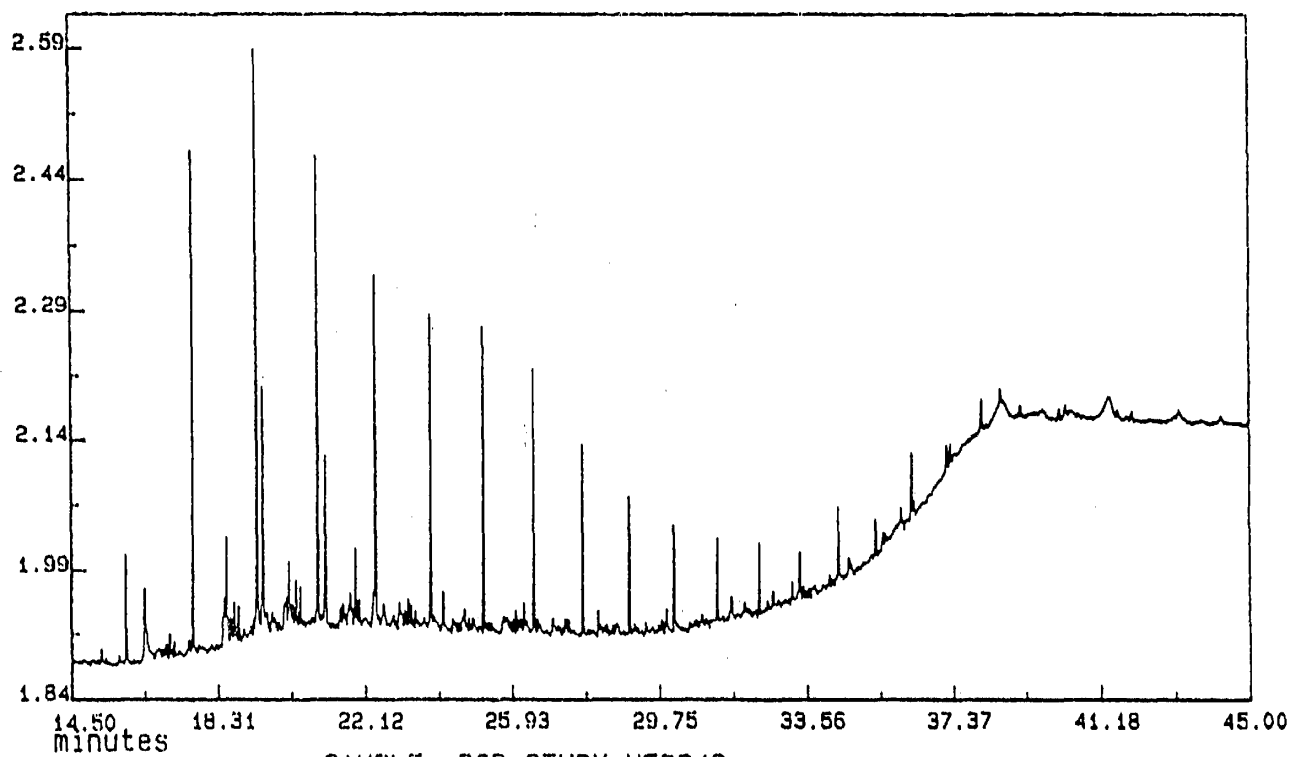
*** PETROLEUM GEOCHEMISTRY ***
SATURATE GC

SAMPLE NAME : B&B STUDY WF3642
INSTRUMENT : HP_5890_2
INJECT TIME : Mon Nov 6, 1989 2:04:06 pm
METHOD USED : /METHOD/SAT5890C.MTH
RESULT FILE : /RESULT/WF3642_SAT.RES
REPORT TIME : 5:28 PM MON., 6 NOV., 1989

CPI VALUE : 1.05
PRISTANE / PHYTANE : 1.42 C15/C25 : .88
PRISTANE / C17 : .54 C17/Pr : 1.84
PHYTANE / C18 : .54 C18/Ph : 1.85

	AREA	%AREA NALK	TIME	NORM C15
----	-----	-----	-----	-----
N-C10	0.	0.0	0.00	0.00
N-C11	102.	.3	7.69	.10
N-C12	110.	.3	9.98	.11
N-C13	0.	0.0	0.00	0.00
N-C14	161.	.4	14.05	.16
N-C15	982.	2.5	15.90	1.00
N-C16	4173.	10.6	17.65	4.25
N-C17	6320.	16.1	19.31	6.44
N-C18	4482.	11.4	20.88	4.56
N-C19	3739.	9.5	22.38	3.81
N-C20	2974.	7.6	23.81	3.03
N-C21	2709.	6.9	25.18	2.76
N-C22	2386.	6.1	26.49	2.43
N-C23	1779.	4.5	27.74	1.81
N-C24	1244.	3.2	28.95	1.27
N-C25	1112.	2.8	30.11	1.13
N-C26	877.	2.2	31.23	.89
N-C27	698.	1.8	32.31	.71
N-C28	558.	1.4	33.35	.57
N-C29	854.	2.2	34.36	.87
N-C30	356.	.9	35.33	.36
N-C31	539.	1.4	36.28	.55
N-C32	1006.	2.6	37.19	1.02
N-C33	737.	1.9	38.12	.75
N-C34	739.	1.9	39.15	.75
N-C35	441.	1.1	40.43	.45
N-C36	149.	.4	41.99	.15

	AREA	%AREA ISPR	TIME
----	-----	-----	-----
Farnesane	0.	0.0	0.00
Acyclic C16	145.	1.8	15.25
Acyclic C18	2282.	27.5	18.52
Pristane	3443.	41.6	19.46
Phytane	2416.	29.2	21.08

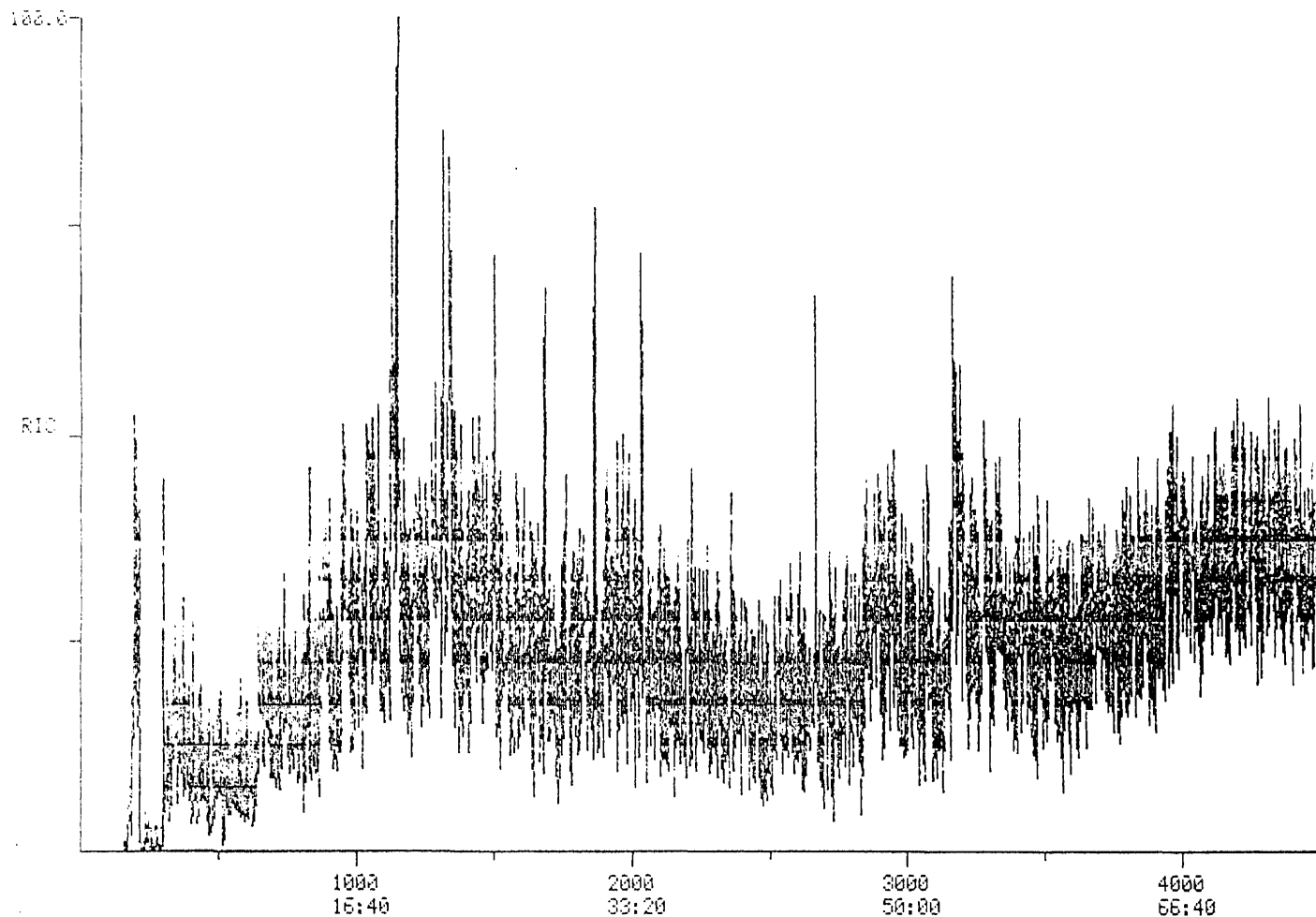


SAMPLE: B&B STUDY WF3642

ANALYZED: Mon Nov 6, 1989 2:04:06 pm

RESULT: /RESULT/WF3642 SAT.RES METHOD: SAT5890C

MIDRIC DATA: WF3642_SAT #1 SCANS 1 TO 4500
11/01/89 17:09:00 CALI: WF3642_SAT #3
SAMPLE: WF3642_SAT
CONDS.: HP THIN FILM, RES=NORM
RANGE: G 1.4990 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3



1764.

MIDMASS CHROMATOGRAMS

11/01/89 17:09:00

SAMPLE: WF3642_SAT

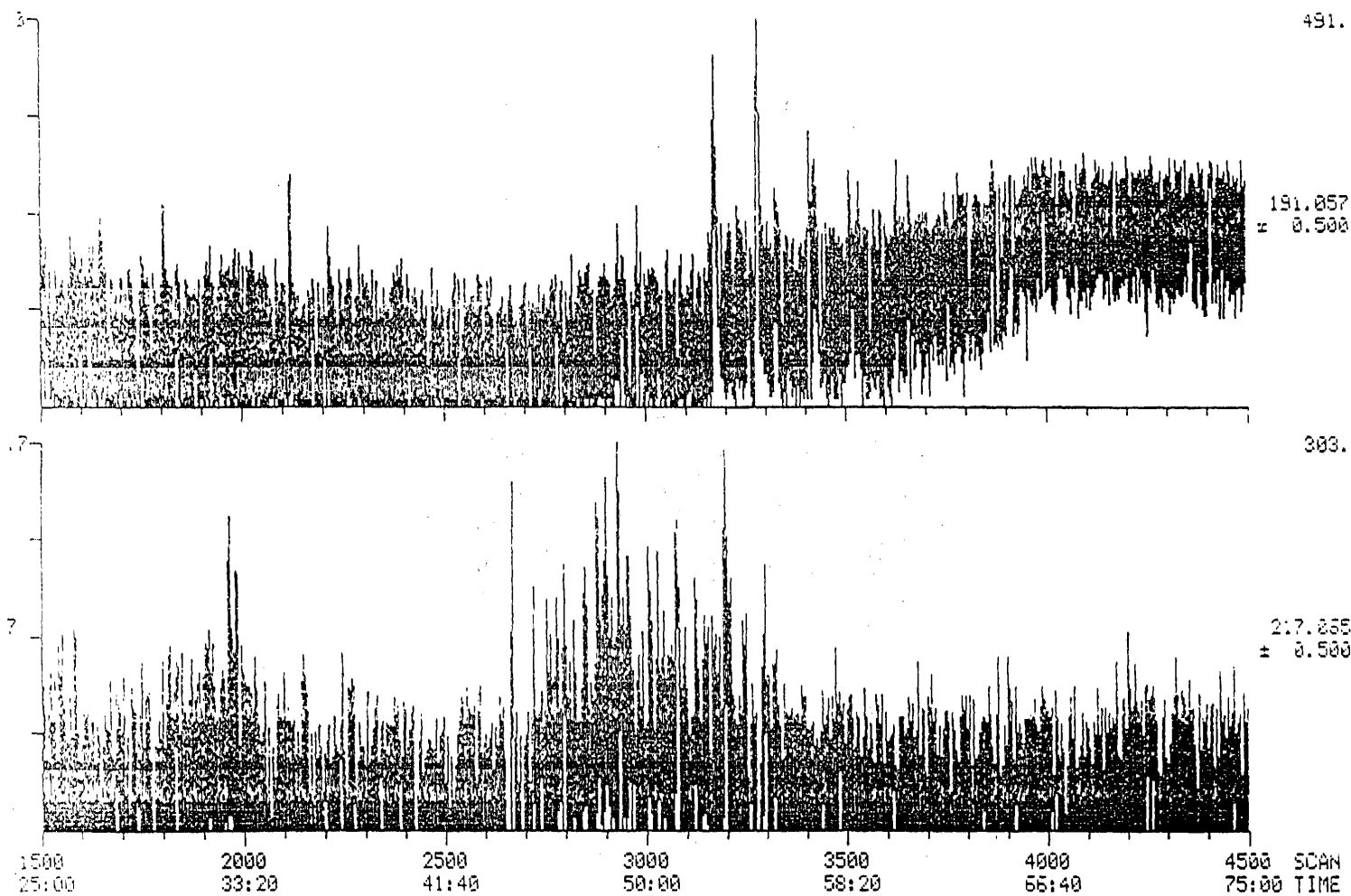
CONDOS.: HP THIN FILM, RES=NORM

RANGE: G 1.4990 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: WF3642_SAT #1

CALI: WF3642_SAT #3

SCANS 1500 TO 4500



MIDMASS CHROMATOGRAMS

11/01/89 17:09:00

SAMPLE: WF3642_SAT

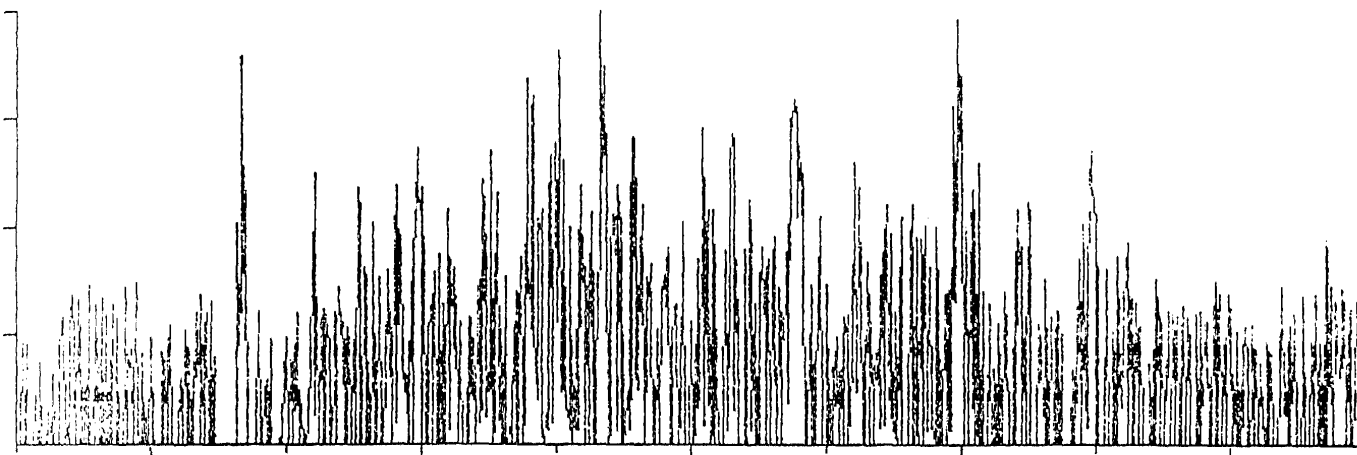
CONDS.: HP THIN FILM, RES=NORM

RANGE: G 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: WF3642_SAT #1

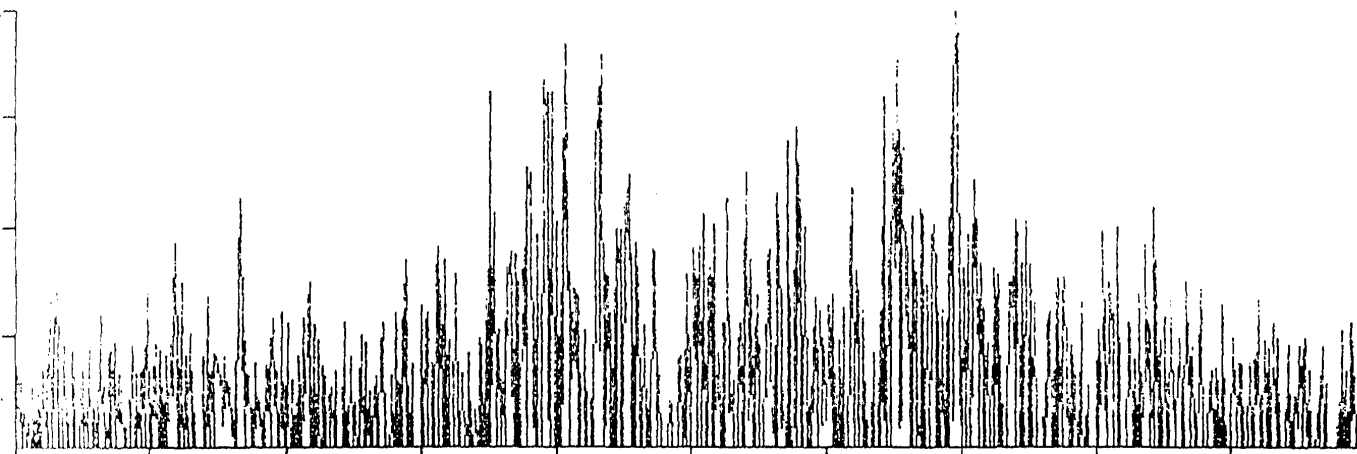
CALI: WF3642_SAT #3

SCANS 2500 TO 3500



333.

217.065
± 0.500



229.

218.065
± 0.500

3000

2000

2000

3000

3400

SCAN

MIDMASS CHROMATOGRAMS

11/01/89 17:09:00

SAMPLE: WF3642.SAT

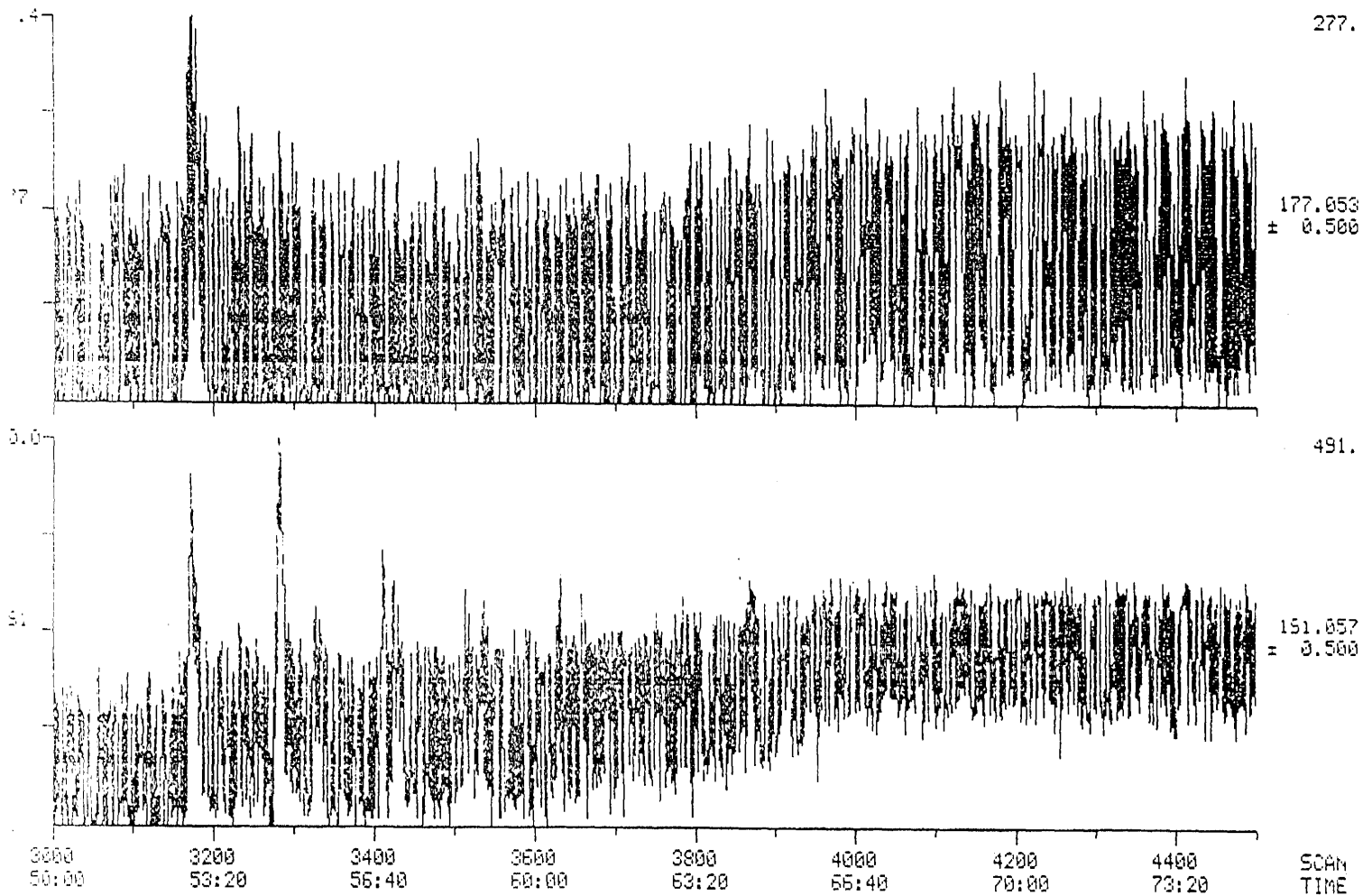
CONDOS.: HP THIN FILM, RES=NORM

RANGE: G 1.4900 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: WF3642.SAT #1

SCANS 3000 TO 4500

CALI: WF3642.SAT #3



SARA ANALYSIS

SAMPLE NAME : BEAUFORTIAN WF3643
 INSTRUMENT : HPLC FID
 INJECT TIME : Fri Oct 27, 1989 2:45:11 pm
 METHOD USED : /METHOD/HPLC_FID0.MTH
 SEQUENCE : /DATA/LOOP/SEQUENCE/HP1090 AUTOW.SEQ
 RESULT FILE : /RESULT/WF3643_SAP.RES
 REPORT TIME : 3:10 PM FRI., 27 OCT., 1989

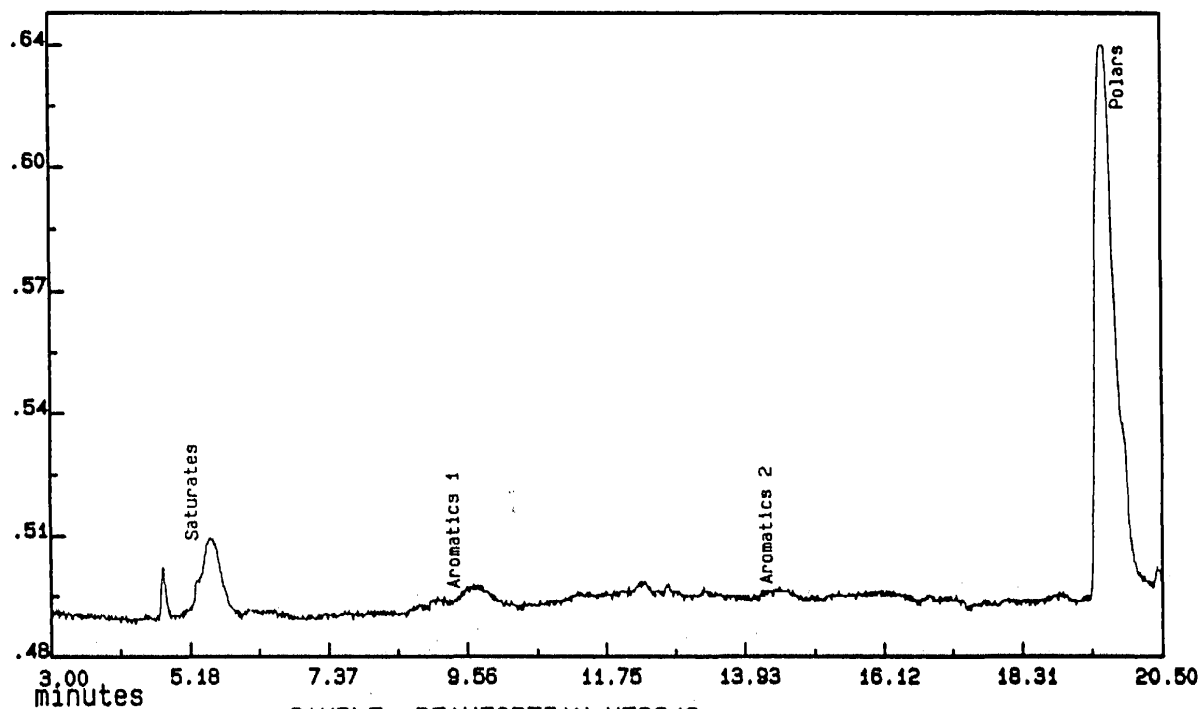
	AREA	TIME	RESPONSE FACTOR
	----	-----	-----
Saturates	584.	5.29	.1275E-03
Aromatics 1	315.	9.42	.5470E-04
Aromatics 2	1015.	14.36	.5470E-04
Polars	3199.	19.92	.4160E-04

	AMOUNT (mg)	% RESIDUE
	-----	-----
Saturates	.07	26.6
Aromatics	.07	26.0
Polars	.13	47.5

	% OIL

Saturates	26.6
Aromatics	26.0
Polars	47.5
Asphaltenes	0.0

AMPLITUDE/1000
Range Normalized



SAMPLE: BEAUFORTIAN WF3643

ANALYZED: Fri Oct 27, 1989 2:45:11 pm

RESULT: /RESULT/WF3643 SAP.RES METHOD: HPLC FIDO

*** PETROLEUM GEOCHEMISTRY ***
SATURATE GC

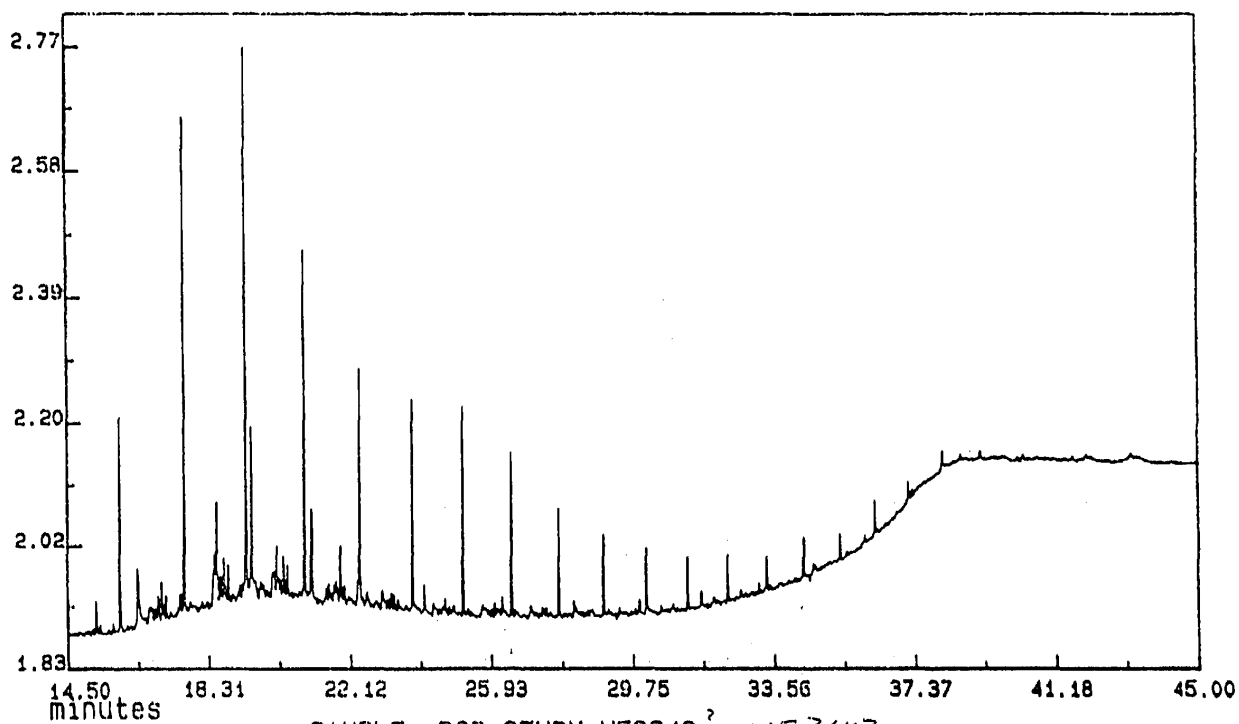
SAMPLE NAME : B&B STUDY WF3642- WF3643 JMR
INSTRUMENT : HP_5890_2
INJECT TIME : Mon Nov 6, 1989 2:59:40 pm
METHOD USED : /METHOD/SAT5890C.MTH
RESULT FILE : /RESULT/WF3643_SAT.RES
REPORT TIME : 5:30 PM MON., 6 NOV., 1989

CPI VALUE : 1.03

PRISTANE / PHYTANE : 2.11 C15/C25 : 2.75
PRISTANE / C17 : .54 C17/Pr : 1.84
PHYTANE / C18 : .41 C18/Ph : 2.46

	AREA	%AREA NALK	TIME	NORM C15
----	-----	-----	-----	-----
N-C10	0.	0.0	0.00	0.00
N-C11	0.	0.0	0.00	0.00
N-C12	0.	0.0	0.00	0.00
N-C13	0.	0.0	0.00	0.00
N-C14	205.	.5	14.05	.08
N-C15	2469.	6.5	15.90	1.00
N-C16	5297.	13.9	17.65	2.15
N-C17	7064.	18.5	19.31	2.86
N-C18	4475.	11.7	20.88	1.81
N-C19	3177.	8.3	22.38	1.29
N-C20	2617.	6.8	23.81	1.06
N-C21	2319.	6.1	25.18	.94
N-C22	1979.	5.2	26.49	.80
N-C23	1307.	3.4	27.75	.53
N-C24	1005.	2.6	28.95	.41
N-C25	896.	2.3	30.12	.36
N-C26	673.	1.8	31.23	.27
N-C27	605.	1.6	32.31	.24
N-C28	559.	1.5	33.36	.23
N-C29	901.	2.4	34.36	.36
N-C30	423.	1.1	35.33	.17
N-C31	383.	1.0	36.28	.16
N-C32	468.	1.2	37.19	.19
N-C33	356.	.9	38.12	.14
N-C34	685.	1.8	39.15	.28
N-C35	179.	.5	40.30	.07
N-C36	200.	.5	42.00	.08

	AREA	%AREA ISPR	TIME
----	-----	-----	-----
Farnesane	0.	0.0	0.00
Acyclic C16	160.	2.1	15.37
Acyclic C18	1964.	25.3	18.53
Pristane	3833.	49.3	19.47
Phytane	1818.	23.4	21.08

AMPLITUDE/1000
Range NormalizedSAMPLE: B&B STUDY ~~WF3642~~ [?] WF 3643 JR

ANALYZED: Mon Nov 6, 1989 2:59:40 pm

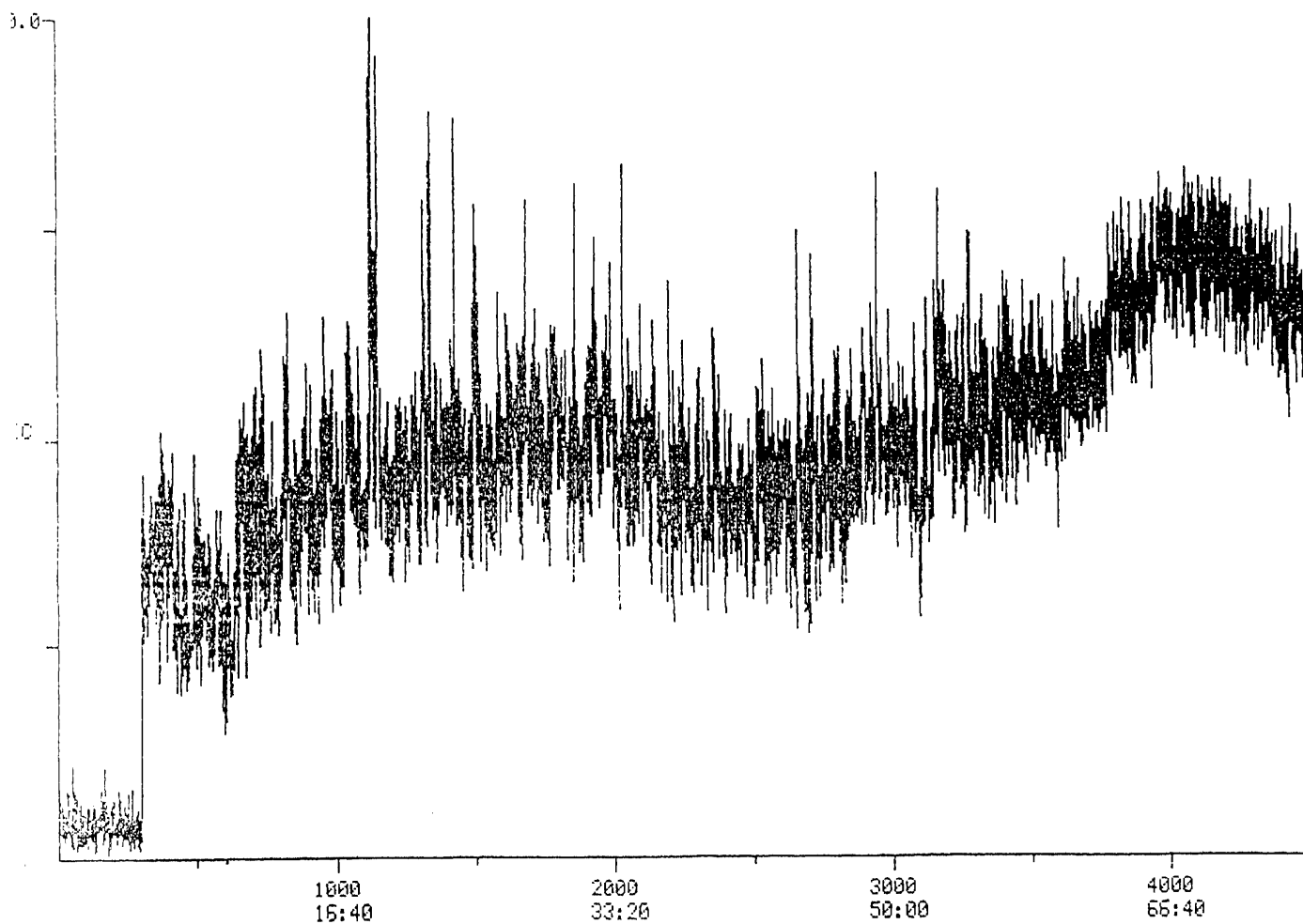
RESULT: /RESULT/WF3643 SAT.RES METHOD: SAT5890C

MIDRIC
11/13/89 14:18:00
SAMPLE: WF3643_SAT
CONDS.: HP THIN FILM, RES=NORM
RANGE: G 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: WF3643_SAT #1
CALI: WF3643_SAT #3

SCANS 1 TO 4500

3700.



MIDMASS CHROMATOGRAMS

11/13/89 14:18:00

SAMPLE: WF3643_SAT

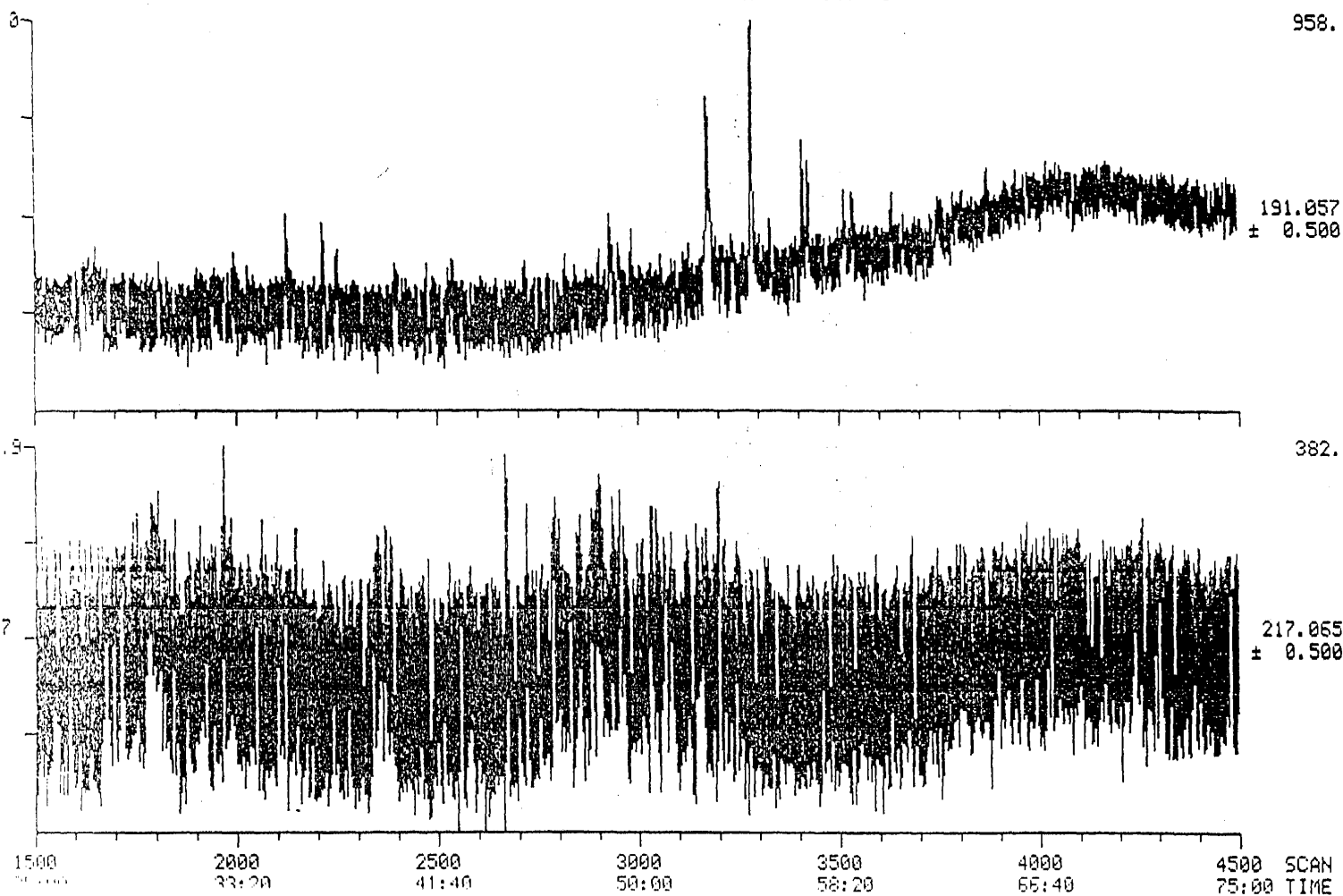
CONDOS.: HP THIN FILM, RES=NORM

RANGE: G 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: WF3643_SAT #1

CALI: WF3643_SAT #3

SCANS 1500 TO 4500



MIDMASS CHROMATOGRAMS

11/13/89 14:18:00

SAMPLE: WF3643_SAT

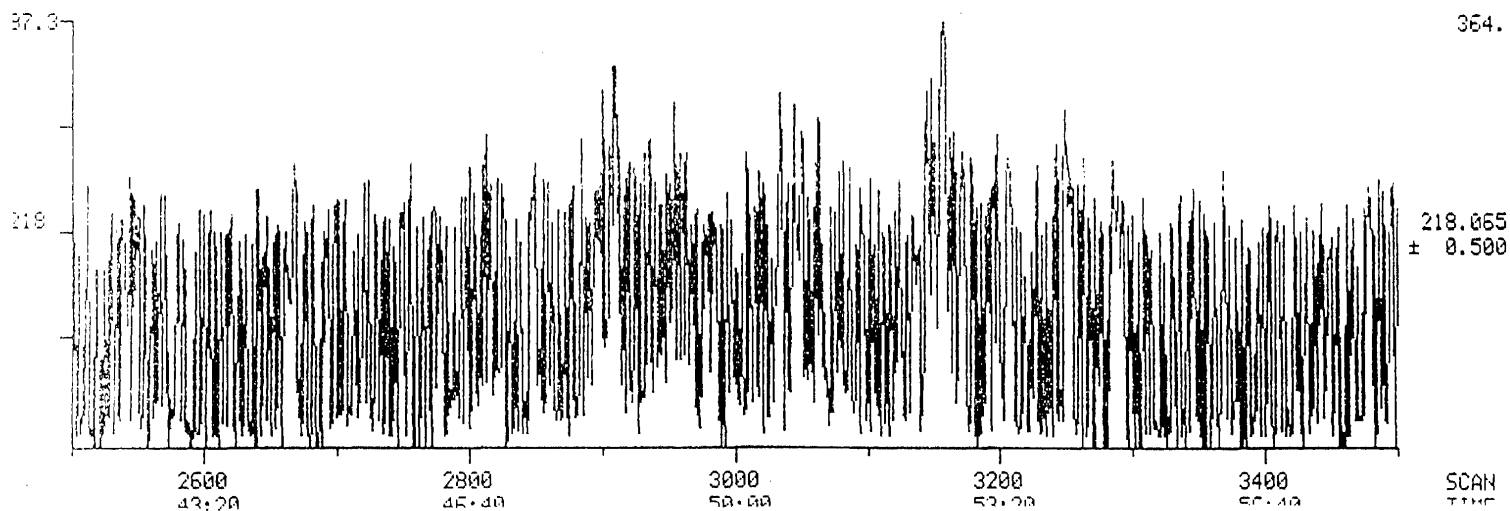
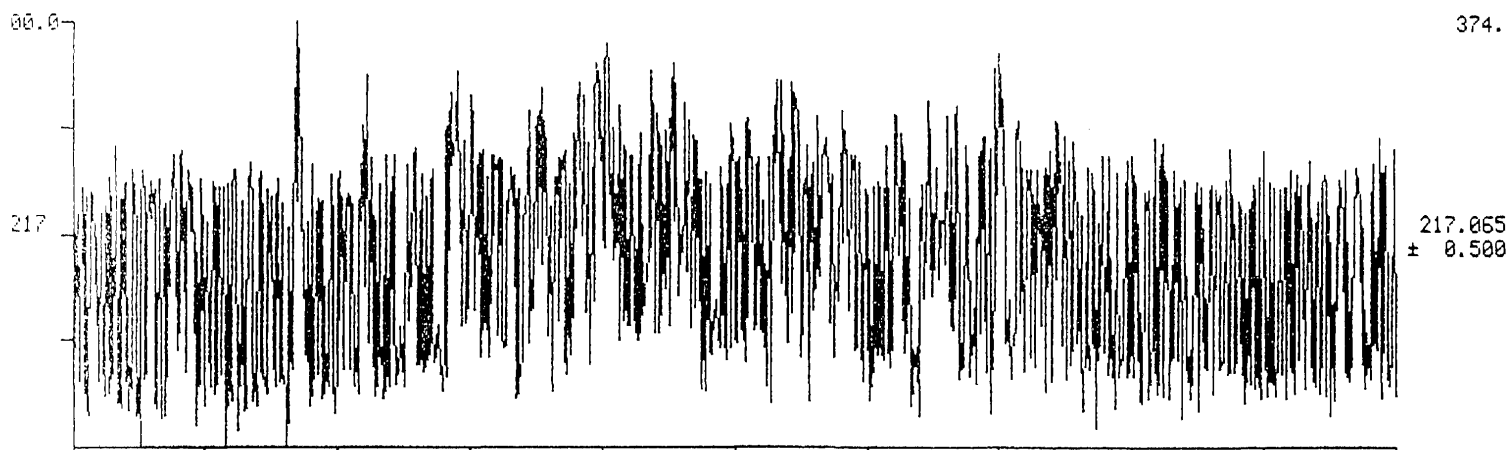
CONDOS.: HP THIN FILM, RES=NORM

RANGE: G 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: WF3643_SAT #1

SCANS 2500 TO 3500

CALI: WF3643_SAT #3



MIDMASS CHROMATOGRAMS

11/13/89 14:18:00

SAMPLE: WF3643.SAT

CONDOS.: HP THIN FILM, RES=NORM

RANGE: G 1.4980 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: WF3643.SAT #1

CALI: WF3643.SAT #3

SCANS 3000 TO 4500

