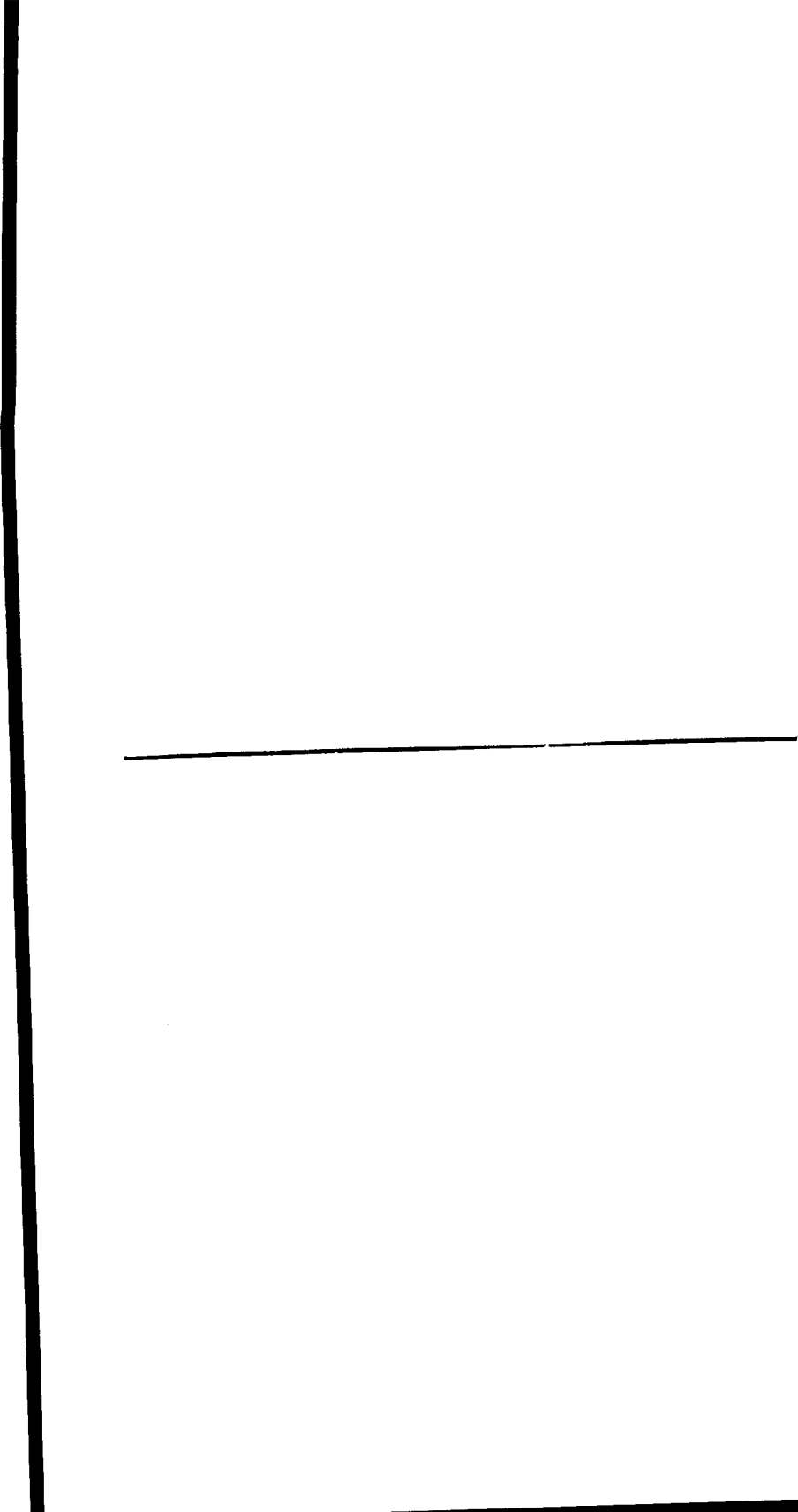


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Radar Systems and
Remote Sensing Laboratory

NASA-CR-200823





**RADAR THICKNESS MEASUREMENTS OVER THE
SOUTHERN PART OF THE GREENLAND ICE SHEET**

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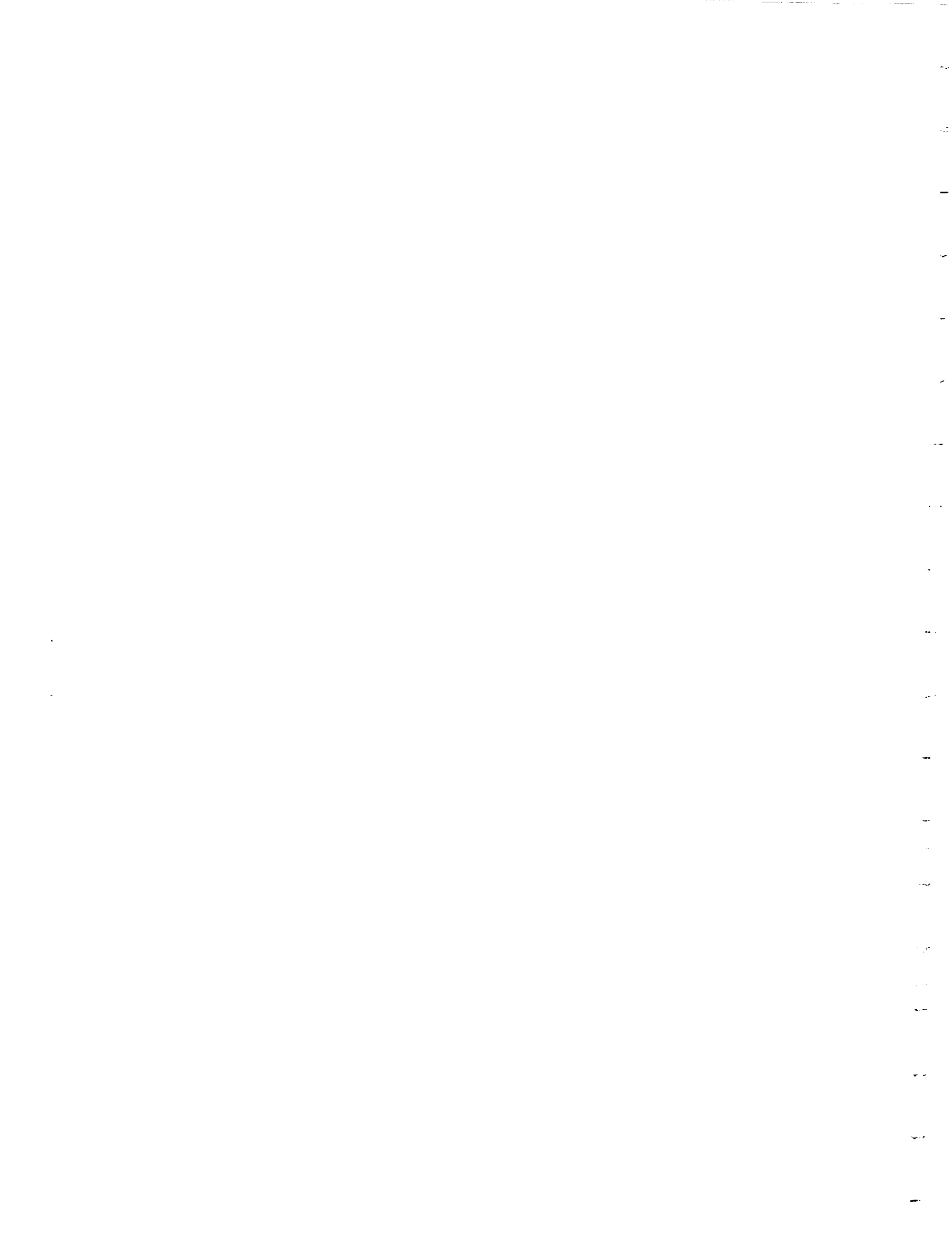


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Abstract—We performed ice thickness measurements over the southern part of the Greenland ice sheet during June and July 1993. We used an airborne coherent radar depth sounder for these measurements. The radar was operated from a NASA P-3 aircraft equipped with GPS receivers. Radar data were collected in conjunction with laser altimeter and microwave altimeter measurements of ice surface elevation. This report provides radio echograms and thickness profiles from data collected during 1993.

1.0 Introduction

In 1991, NASA initiated a research program to test airborne laser and radar altimeters to measure surface elevation of the Greenland ice sheet in conjunction with a surface-based program to validate airborne data and to interpret satellite microwave data sets. Results from these initial airborne laser measurements showed that surface elevations can be determined to an accuracy of about 20 cm [Krabill et al., 1995a, 1995b]. In 1993 the airborne program was expanded to include a radio echo sounder operated by The University of Kansas for determining ice thickness along with laser surface elevations.

We collected ice thickness data along several flights with an airborne coherent radar operating at 150 MHz during 1993 and performed in-flight tests to isolate system problems. The radar data are tagged with the Global Positioning System (GPS) information for accurate location. This report presents results from the 1993 mission.

2.0 Radar System and Experiment Description

We used The University of Kansas radar depth sounder [Raju et al., 1990] for thickness measurements during this experiment. It is a coherent pulse compression radar that operates at a center frequency of 150 MHz. Two complementary Surface Acoustic Wave (SAW) dispersive delay lines are used for pulse expansion and compression. The system uses a high-gain low-noise receiver to amplify and coherently detect the received signal. The detected signals are digitized using two 8-bit A/D converters. The digital signal processor performs coherent and incoherent integrations on the detected signal. The output from the digital signal processor is displayed on a monitor in real time and recorded, along with GPS information, on Bernoulli cartridges for subsequent analysis. The system operation is controlled by a personal computer. Two four-element dipole arrays, one mounted under the left wing and the other under the right wing of the P-3

aircraft, are used for transmission and reception. Table 1 shows important radar system parameters.

Table 1. Radar System Parameters

Description	Characteristic	Units
	Pulse Compression	
	150	MHz
	18.75	MHz
	1.6	μ s
	60	ns
	200	W
	1, 2, 4, 8 (selectable)	KHz
	70	dB
	selectable to 64000	
	selectable to 1024	
	8.5	MHz
	8-bit, 48	dB
	53.3 (18.75 MHz)	μ s
	selectable; accurate to 100 ns	
	4.494	m
	4-element dipole arrays	

Radar data are collected with the aircraft flying at an altitude of about 500 m and a speed of about 100 m/s over the flight lines shown in Figure 1. Since one of the objectives of the experiment is to evaluate radar performance, we made in-flight tests on the system during that time we could not collect data. Also we had to replace a defective amplifier with a gain of 43 dB with a lower-gain (30 dB) amplifier in the field. This reduced radar

sensitivity resulting in a loss of bottom echoes in the percolation zone when ice thickness exceeded about 1.8 km.

3.0 Description of Data

Data are processed in two steps: (1) raw echograms, with their intensity scaled to enhance the visibility of the bottom echoes, are first generated to display measured intensity as a function of time or location and range; and (2) thickness information is derived from these intensity data using adaptive thresholding and smoothing techniques.

The data are arranged according to experiment date. First, a map of the flight line where data were collected is presented. Second, a radio-echogram is given for each 1000 samples in a file. A few vertical black strips in these echograms are from the VHF radio interference signal when pilot was communicating with airbase. The geo-locations, spaced by 100 columns, are printed at the bottom of each echogram. Finally thickness derived from the radar data are presented. The ice thickness is computed by calculating the number of pixels between the top and bottom echoes and multiplying this by 4.494m. In some thickness profiles, the thickness is smoothed using the conventional moving-average method.

References

G. Raju, Xin, W. Xin, and R. K. Moore, "Design, Development, Field Observations, and Preliminary Results of the Coherent Antarctic Radar Depth Sounder (CARDS) of the University of Kansas, U.S.A.," *Journal of Glaciology*, 36(123), pp. 247-254, 1990.

Krabill, W., R. Thomas, C. Martin, R. Swift, and E. Fredrick, "Accuracy of Laser Altimetry over the Greenland Ice Sheet," *Int. J. Rem. Sens.*, 16(7), pp.1211-1222, 1995a.

Krabill, W., R. Thomas, K. Jezek, K. Kuivinen, and S. Manizade, "Greenland Ice Sheet Thickness Changes Measured by Laser Altimetry," *Geophys. Res. Let.*, 22(17), pp.2341-2344, 1995b.

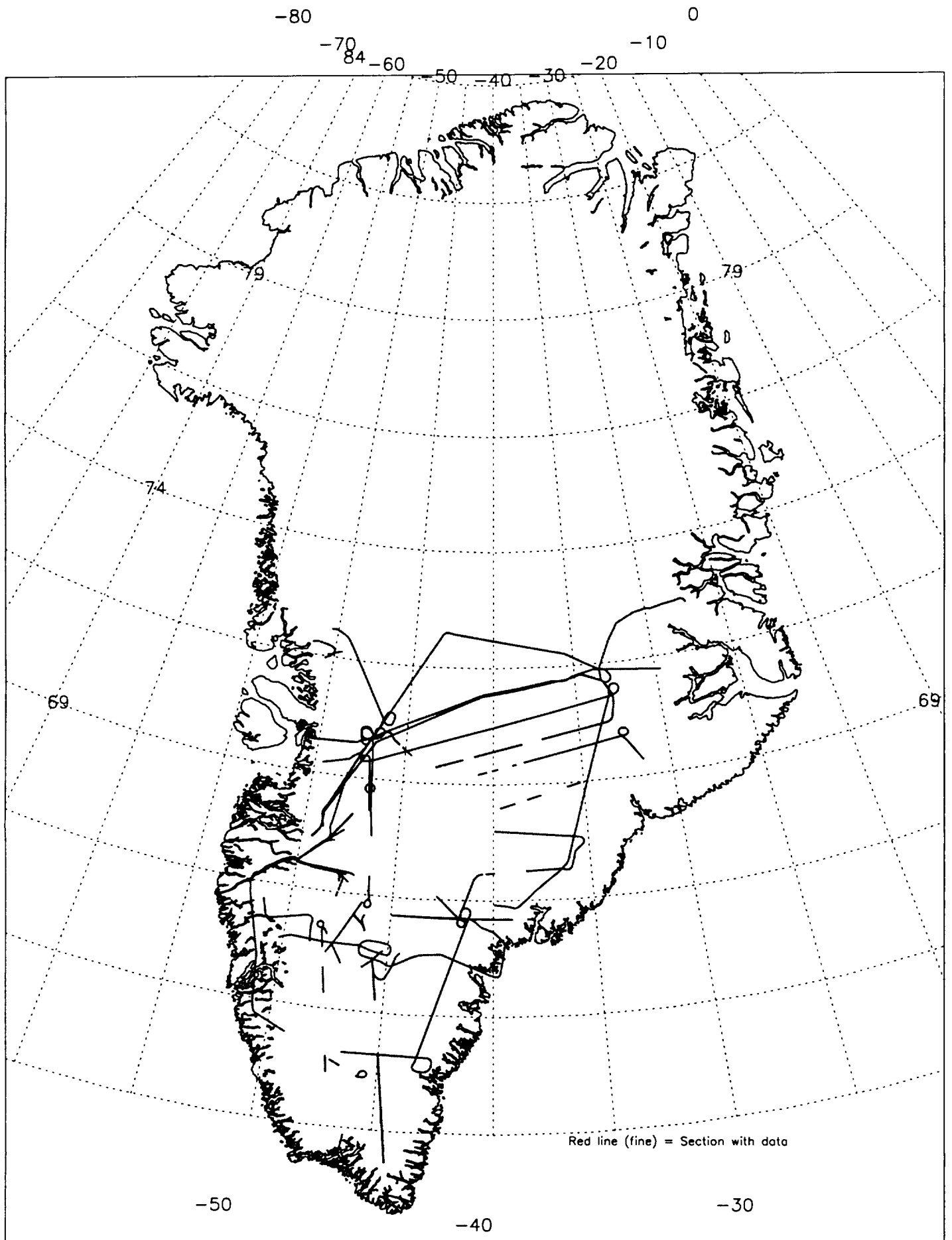
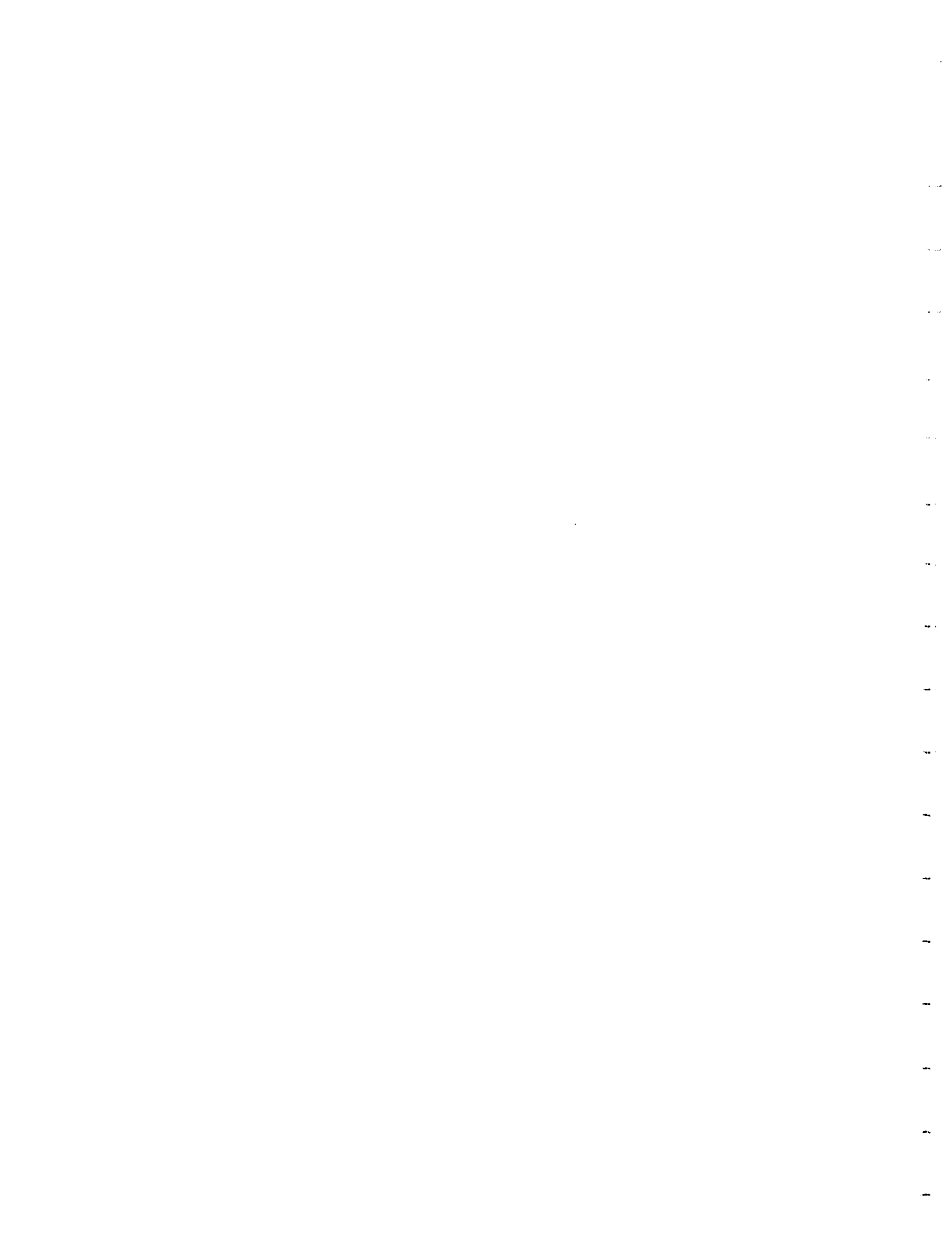


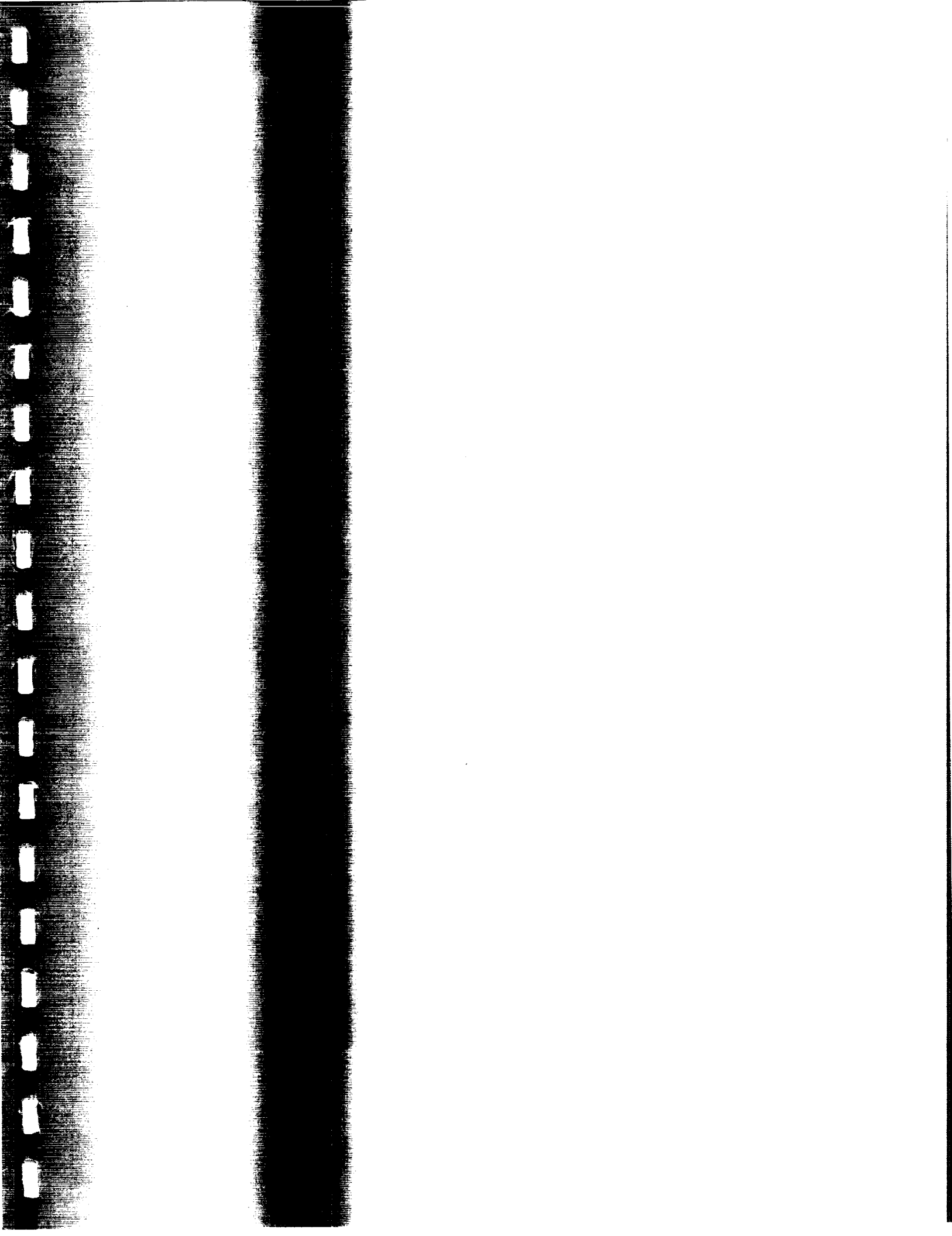
Figure 1: Geo-locations of 1993 Data

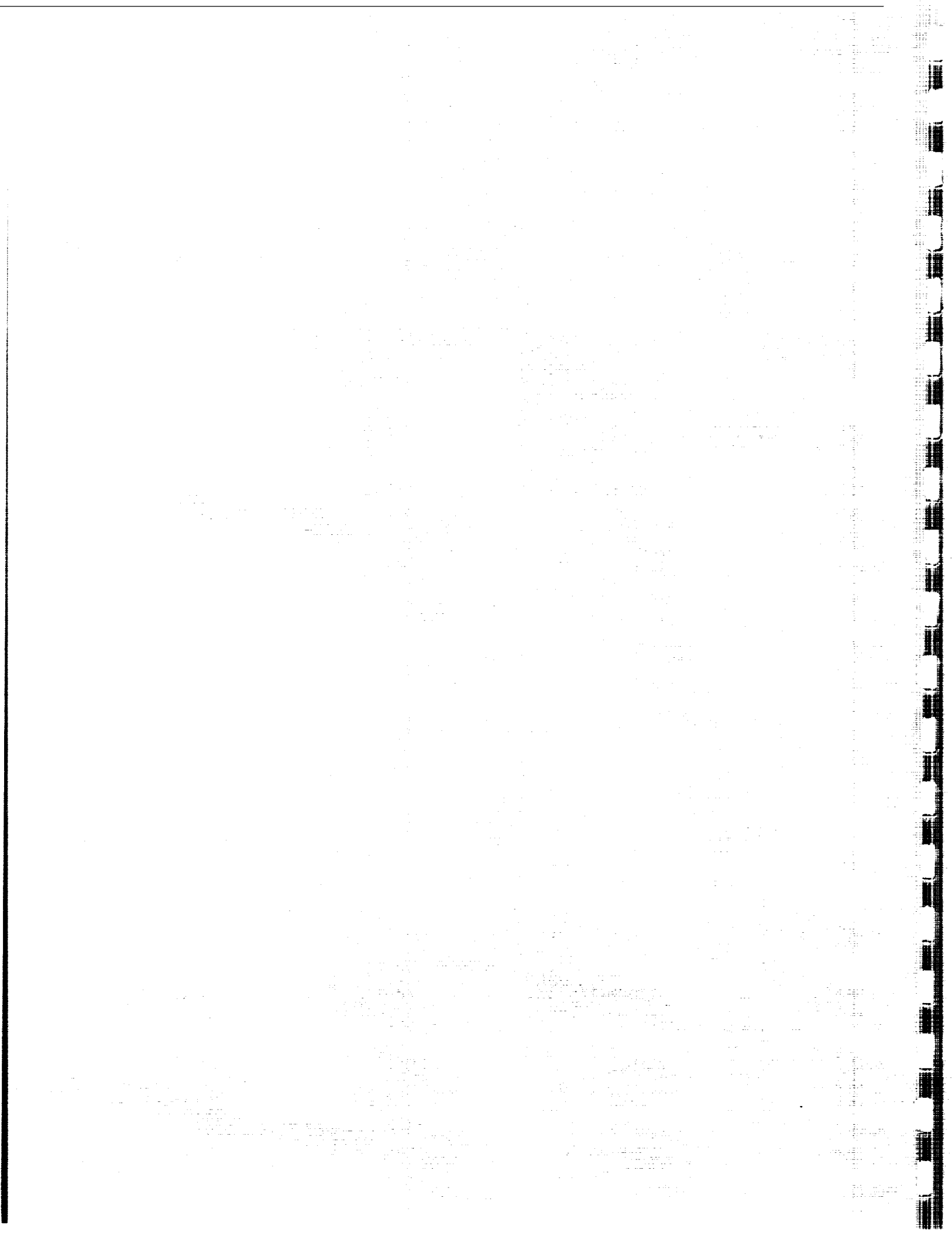
Results

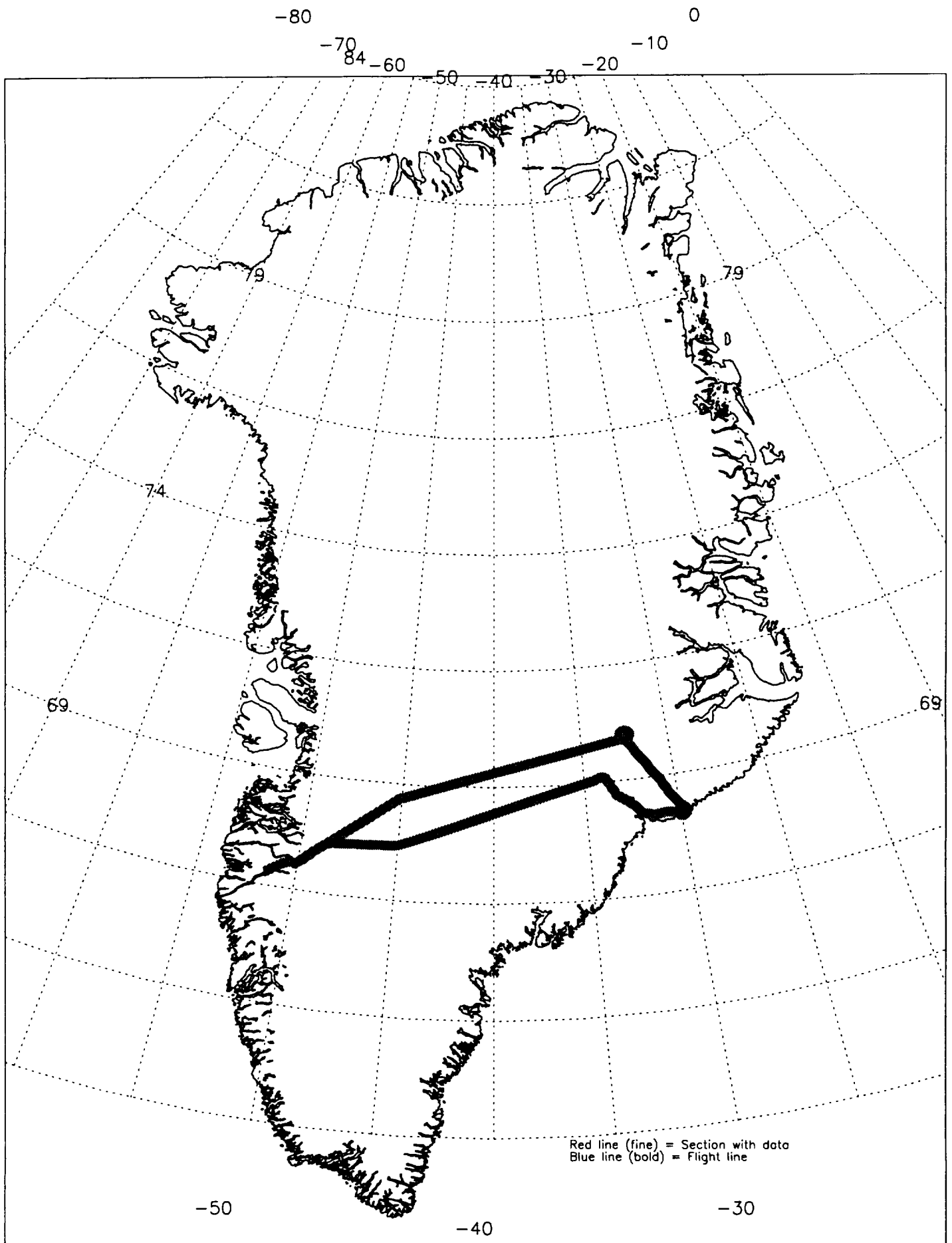
Appendix A

June 23, 1993

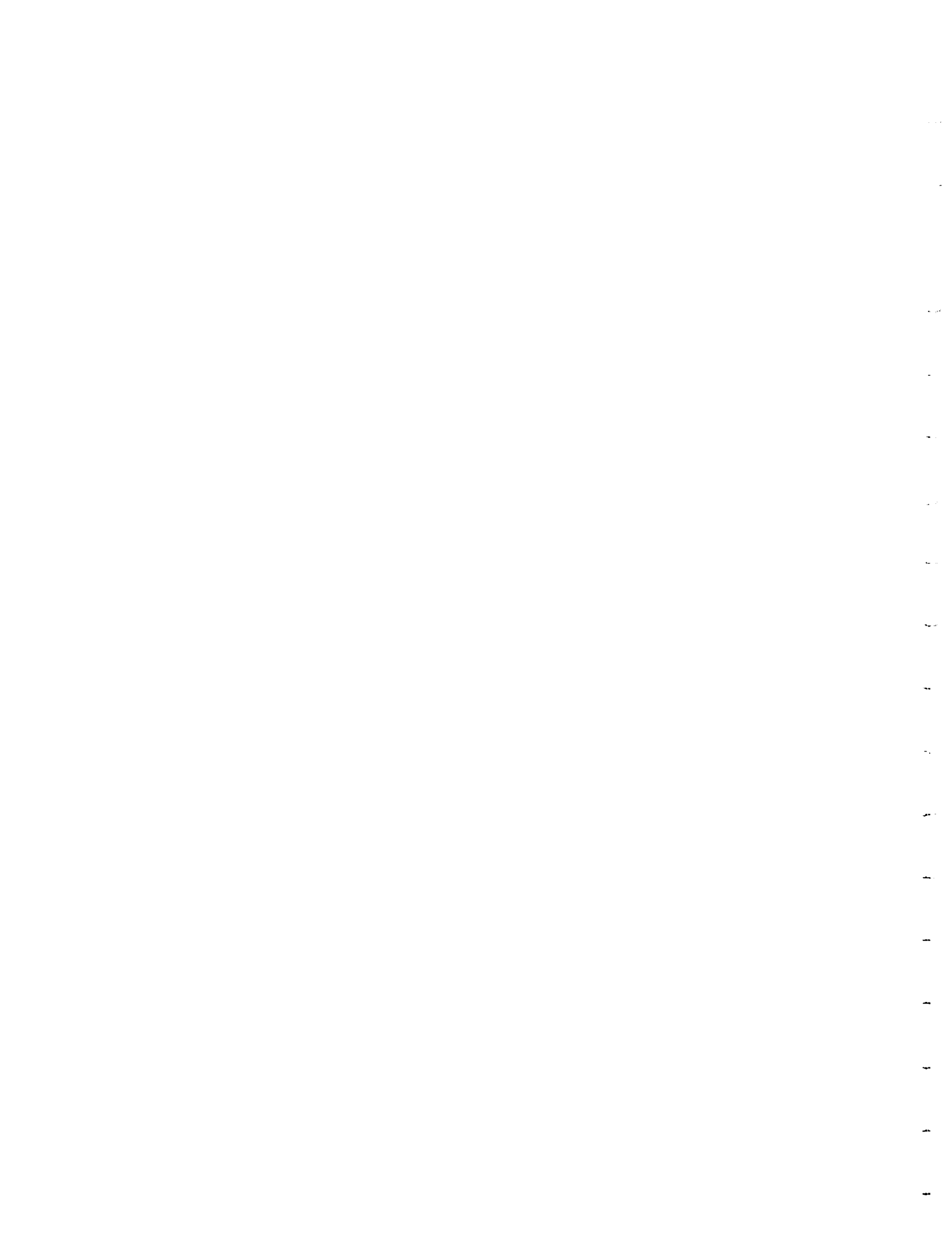




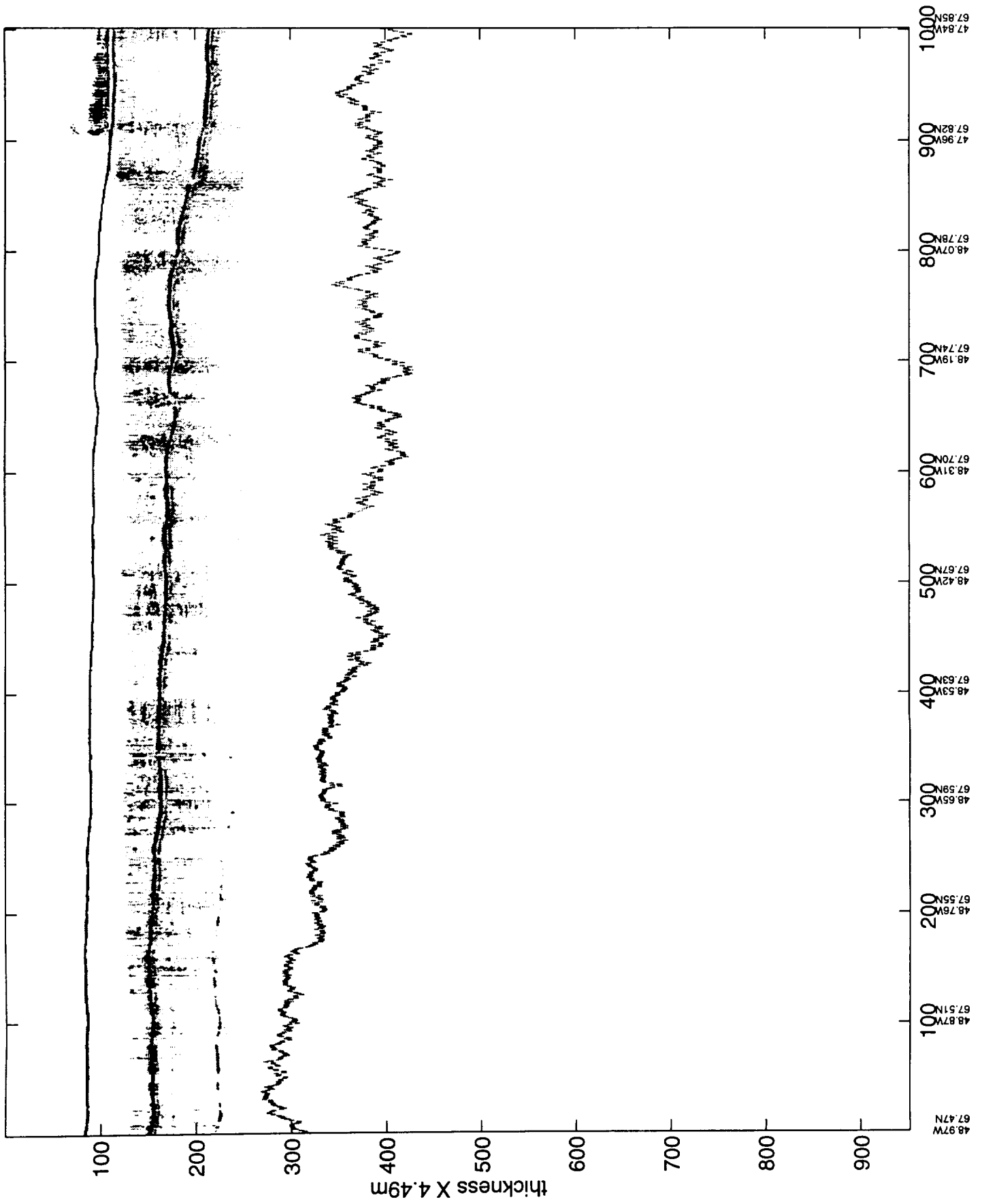




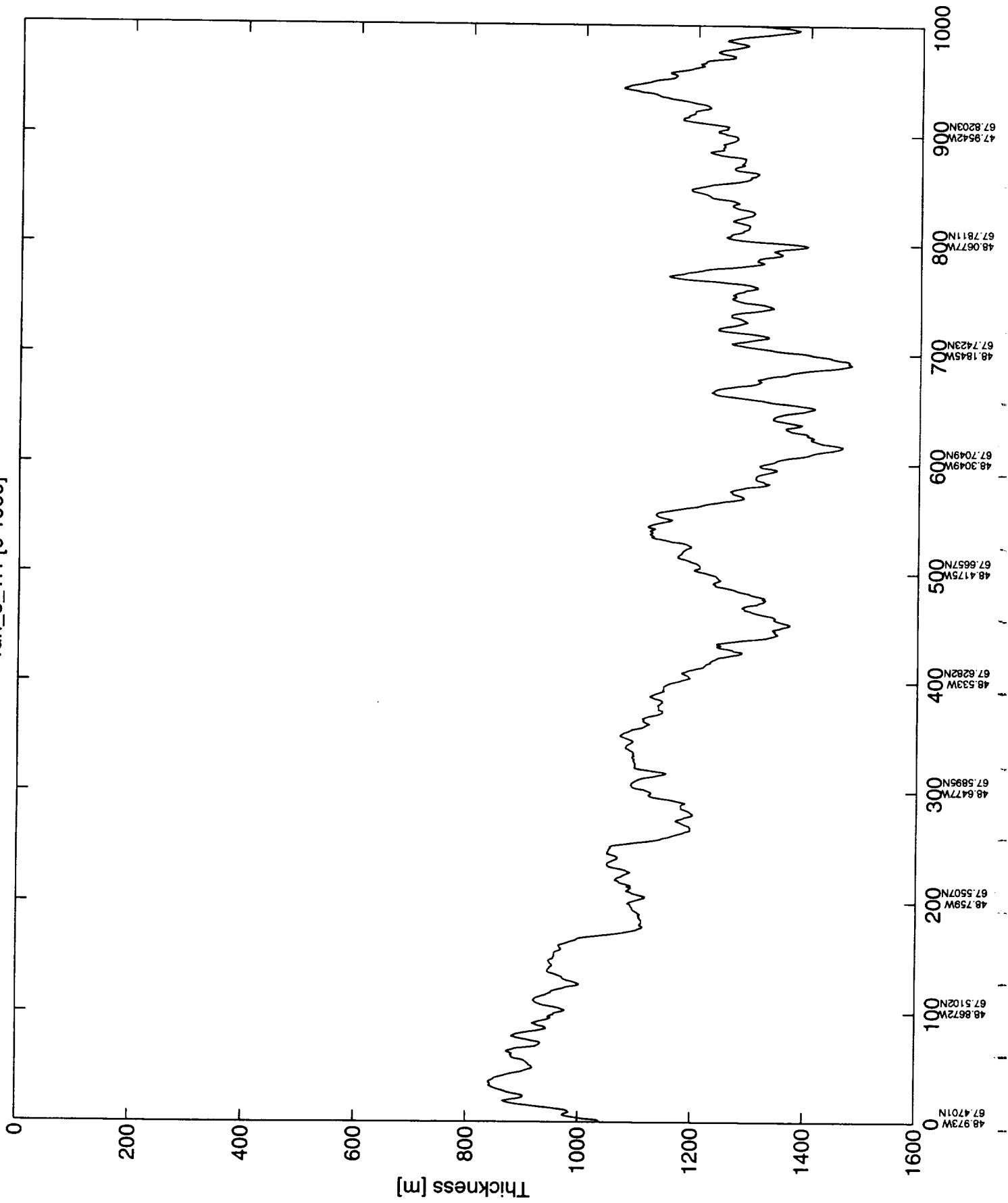
June 23, 1993 (r_6)



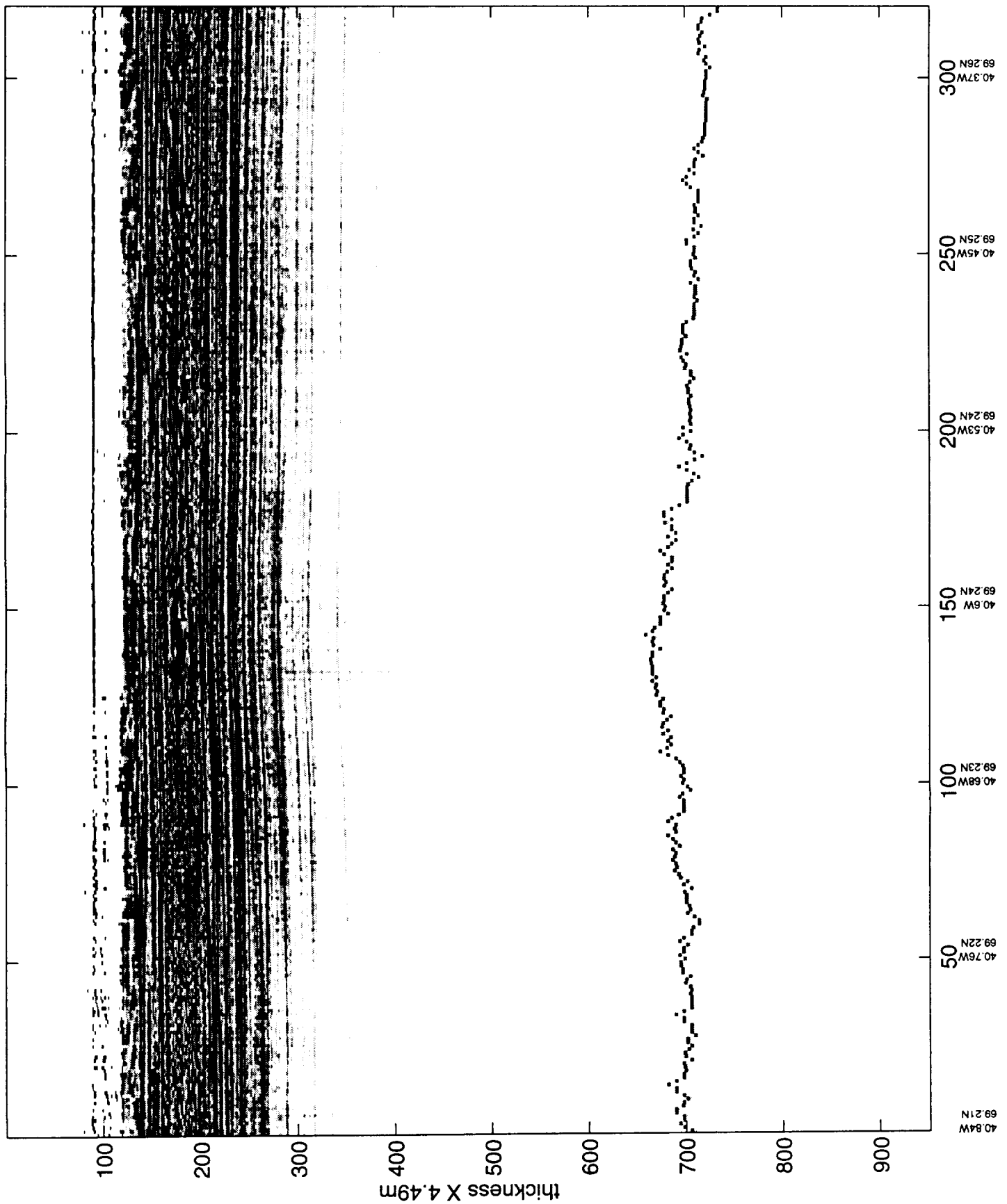
1un_6_1.1 (1) [u-10uu]



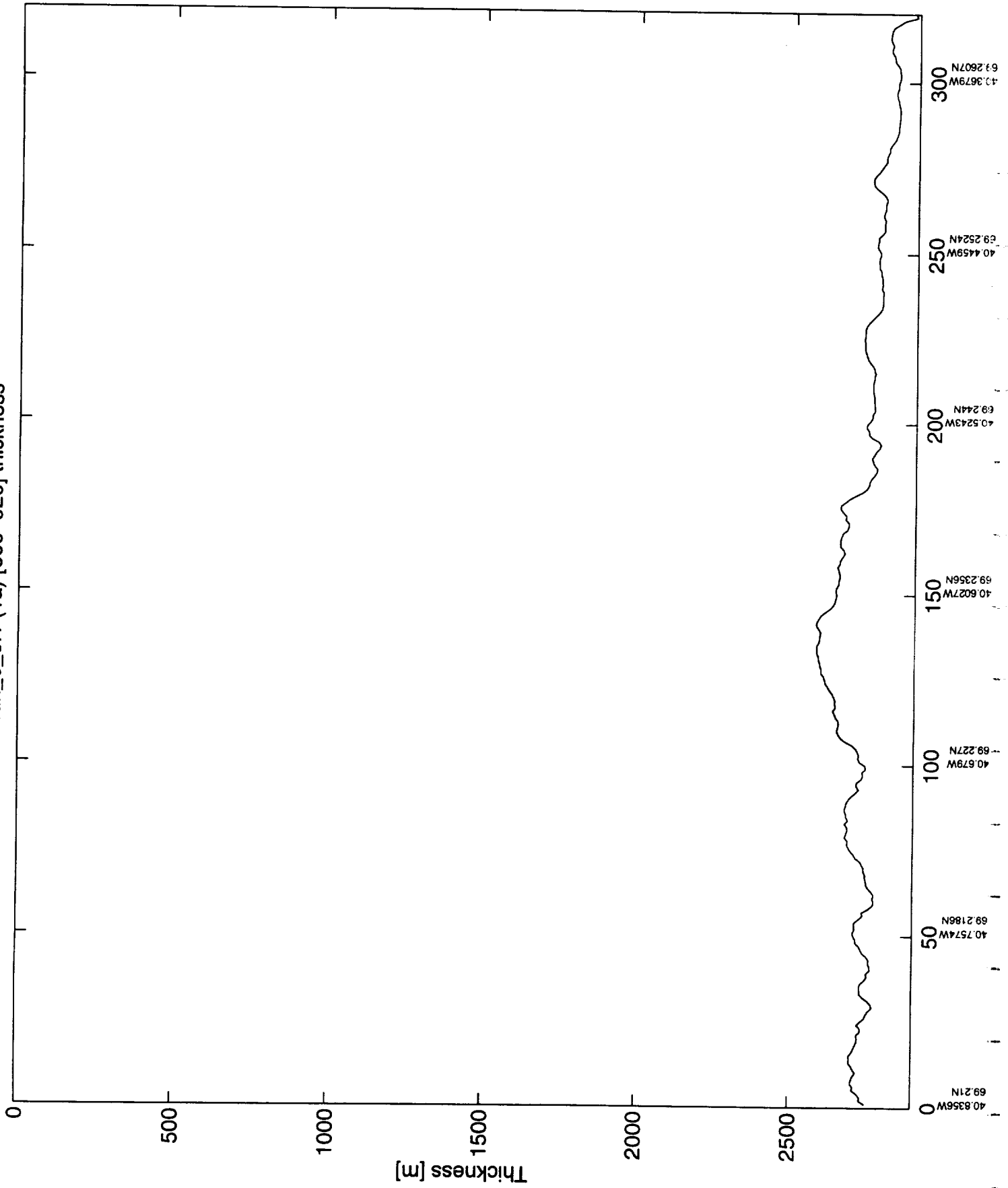
run_6_1.1 [0 1000]



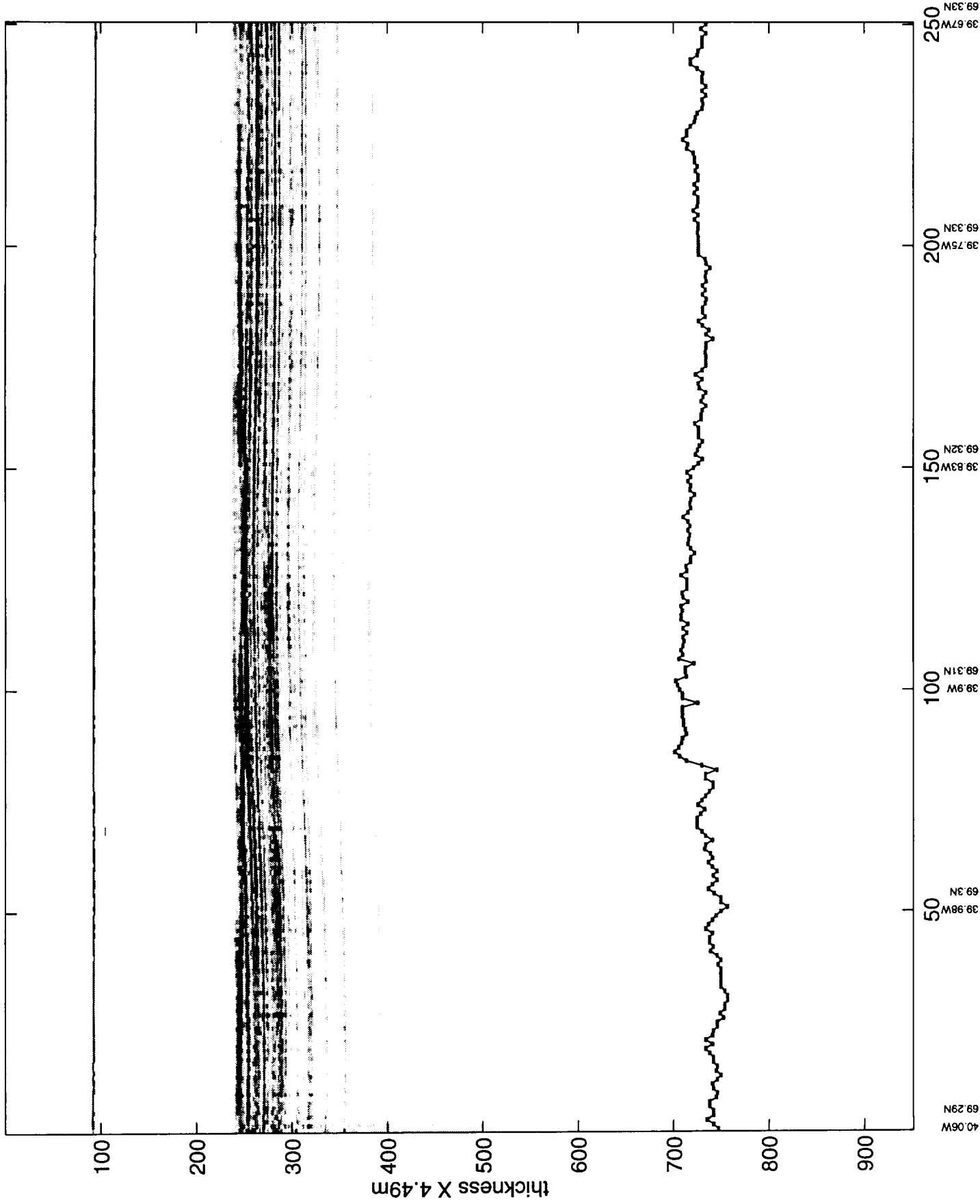
un_0.1 (m, 60d-0z0)



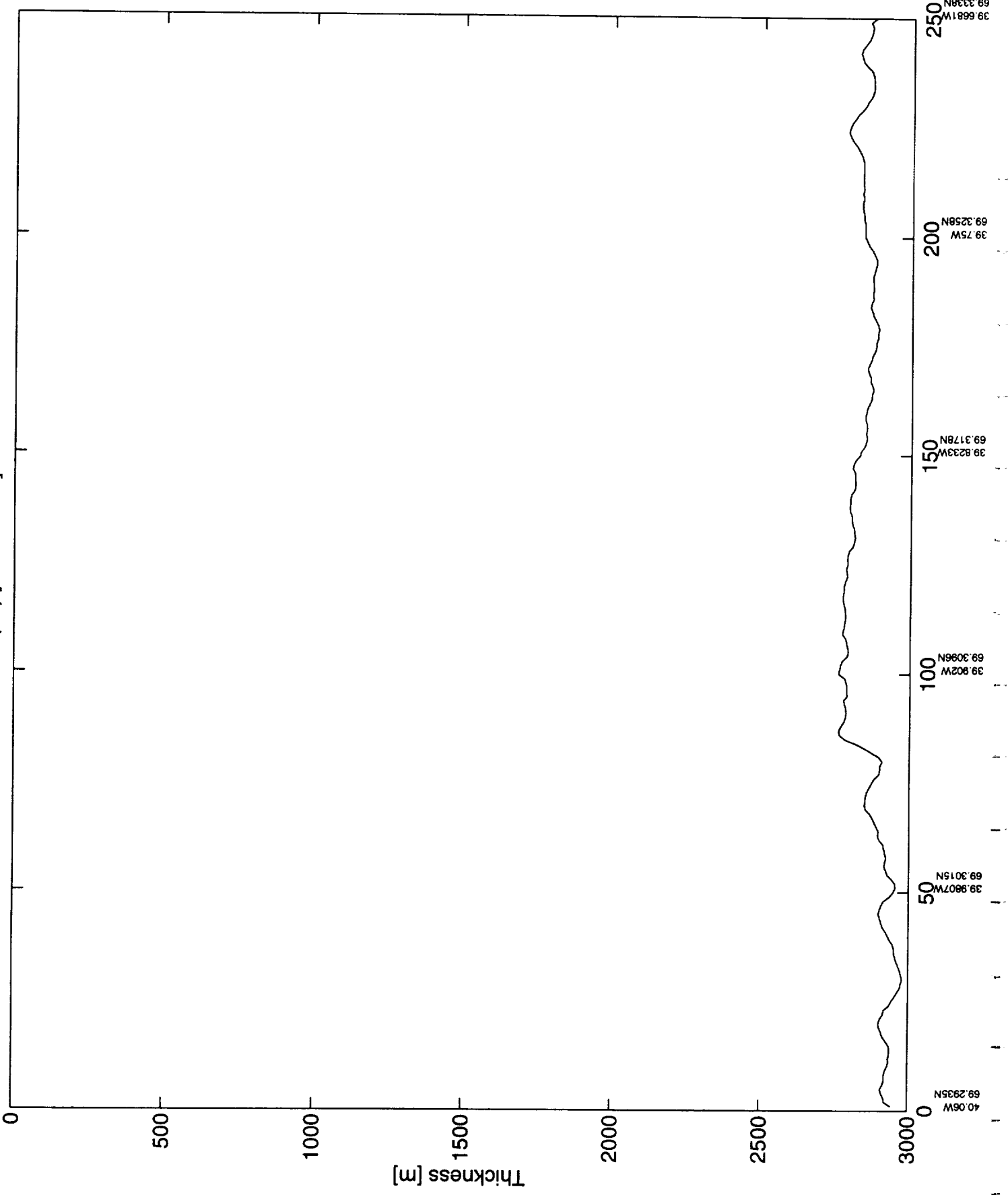
run_6_6.1 (1a) [600-920] thickness



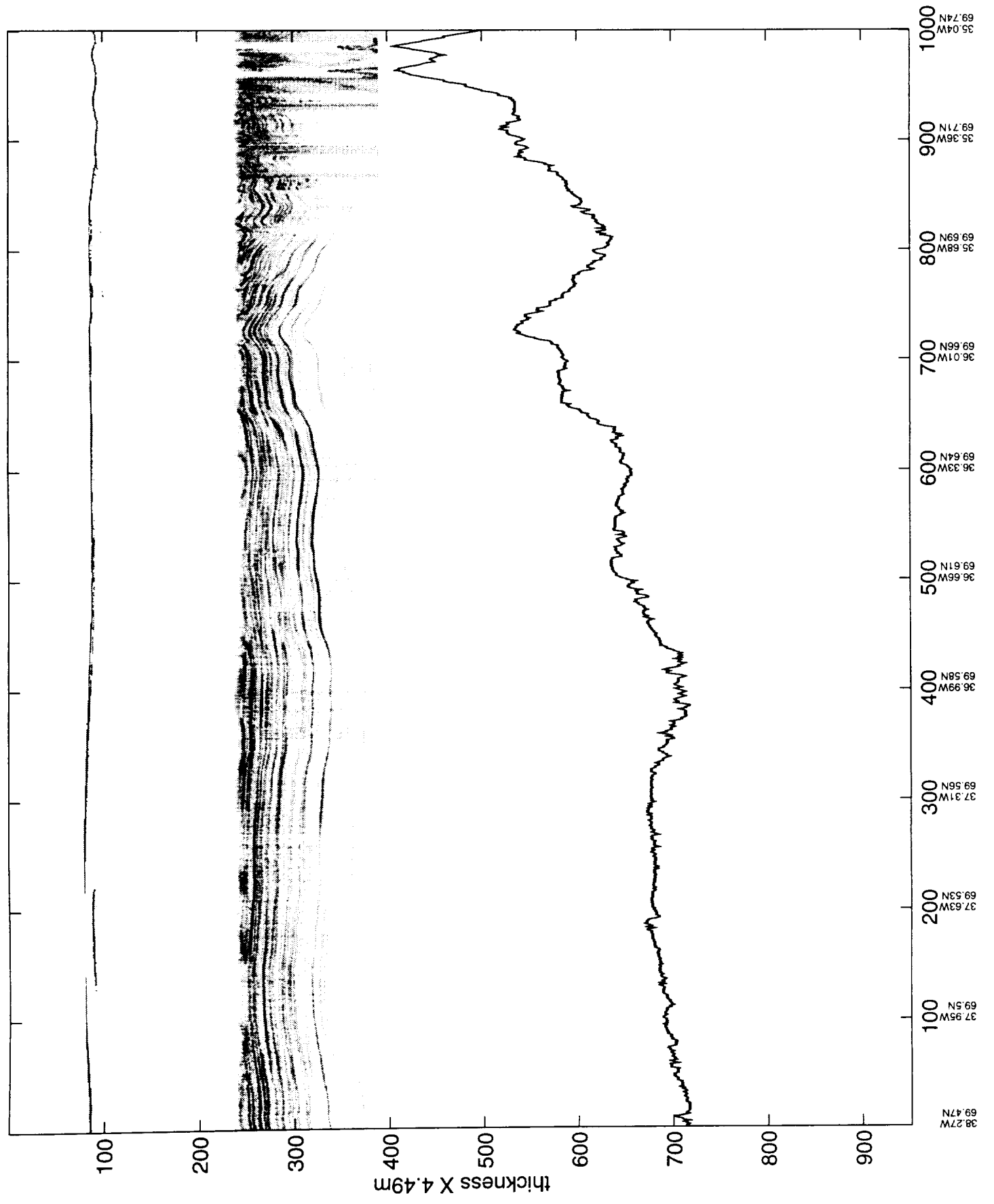
ruh_o_6.1 (<a) [1100-13bu]



run_6_6.1 (2a) [1100-1350] thickness

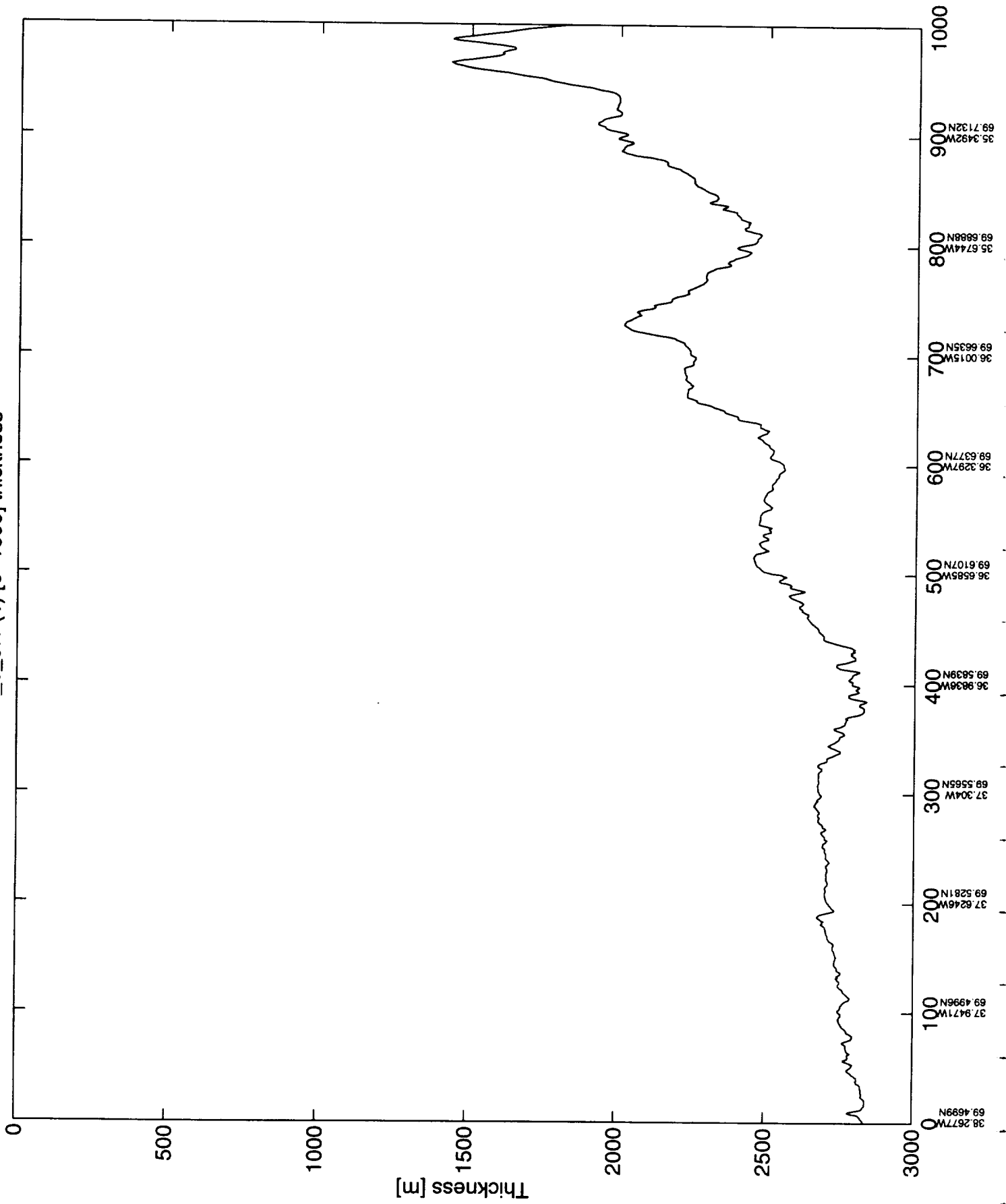


run_o_9.1 (1) [0-1000]

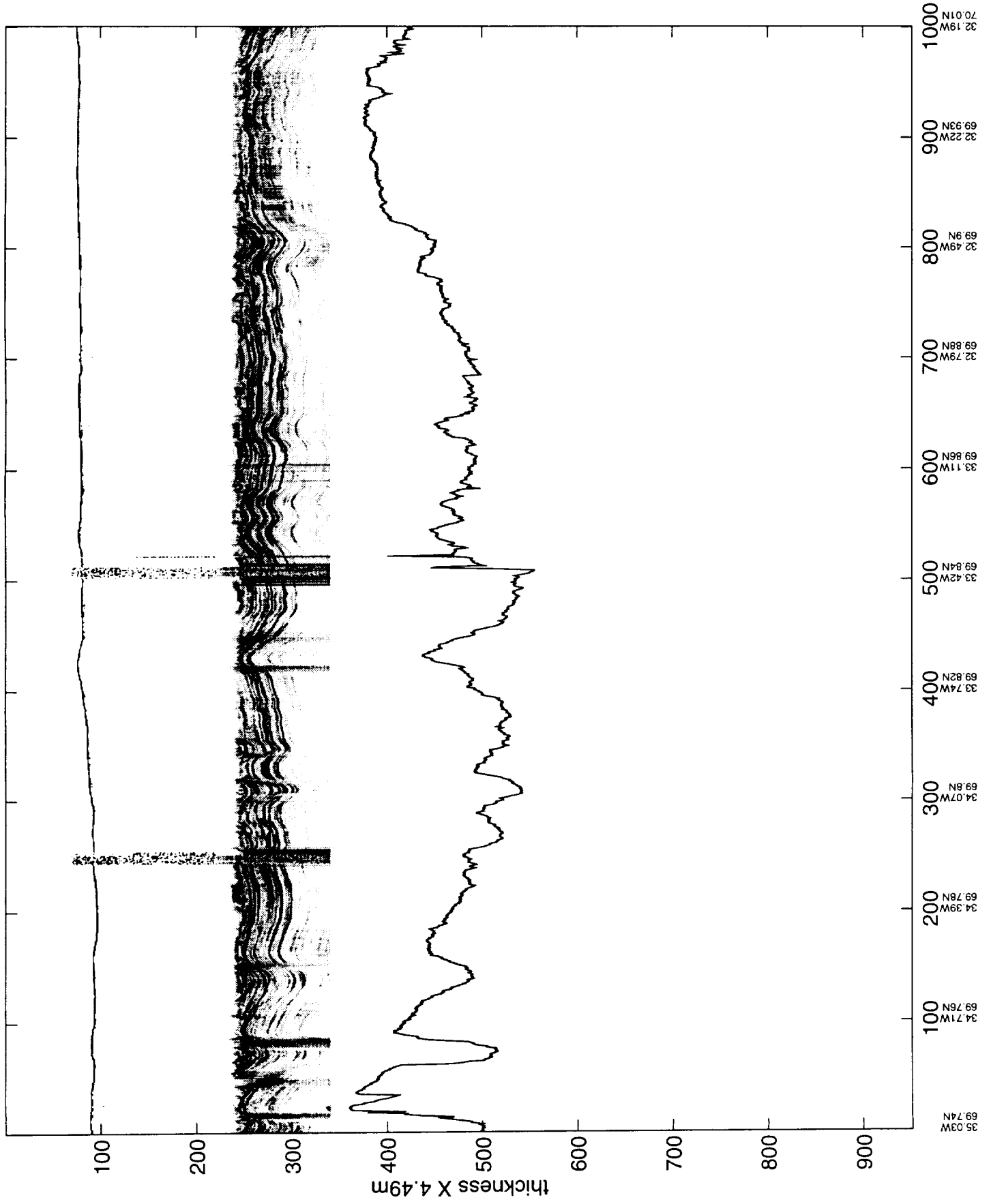


35.04W 69.74N 1000
35.36W 69.71N 900
35.68W 69.69N 800
36.01W 69.66N 700
36.33W 69.64N 600
36.65W 69.61N 500
36.99W 69.58N 400
37.31W 69.56N 300
37.63W 69.53N 200
37.95W 69.5N 100
38.27W 69.47N

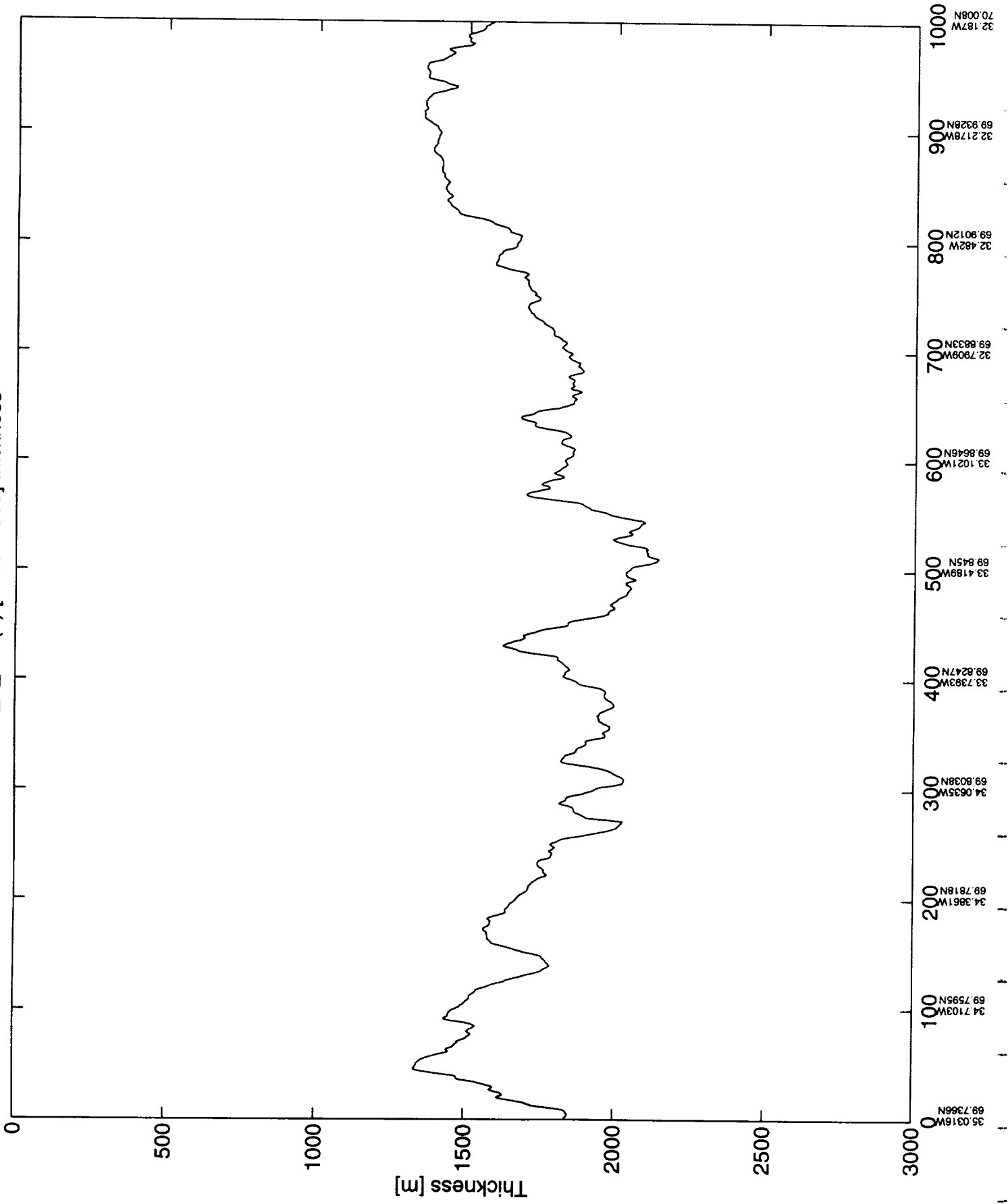
run_6_9.1 (1) [0-1000] thickness



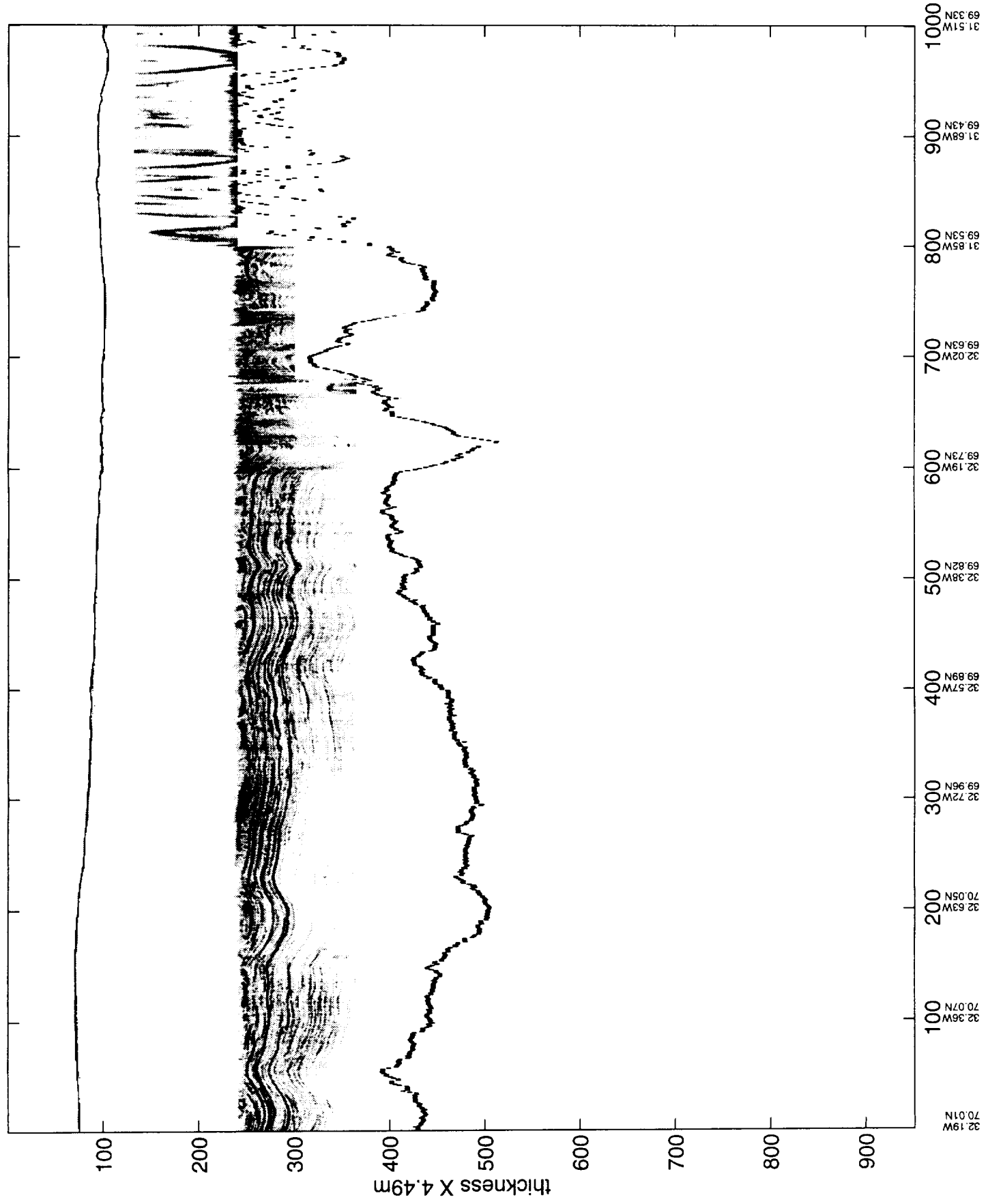
run_0_0.1 (z_11006-z000)



run_6_9.1 (2) [1000-2000] thickness

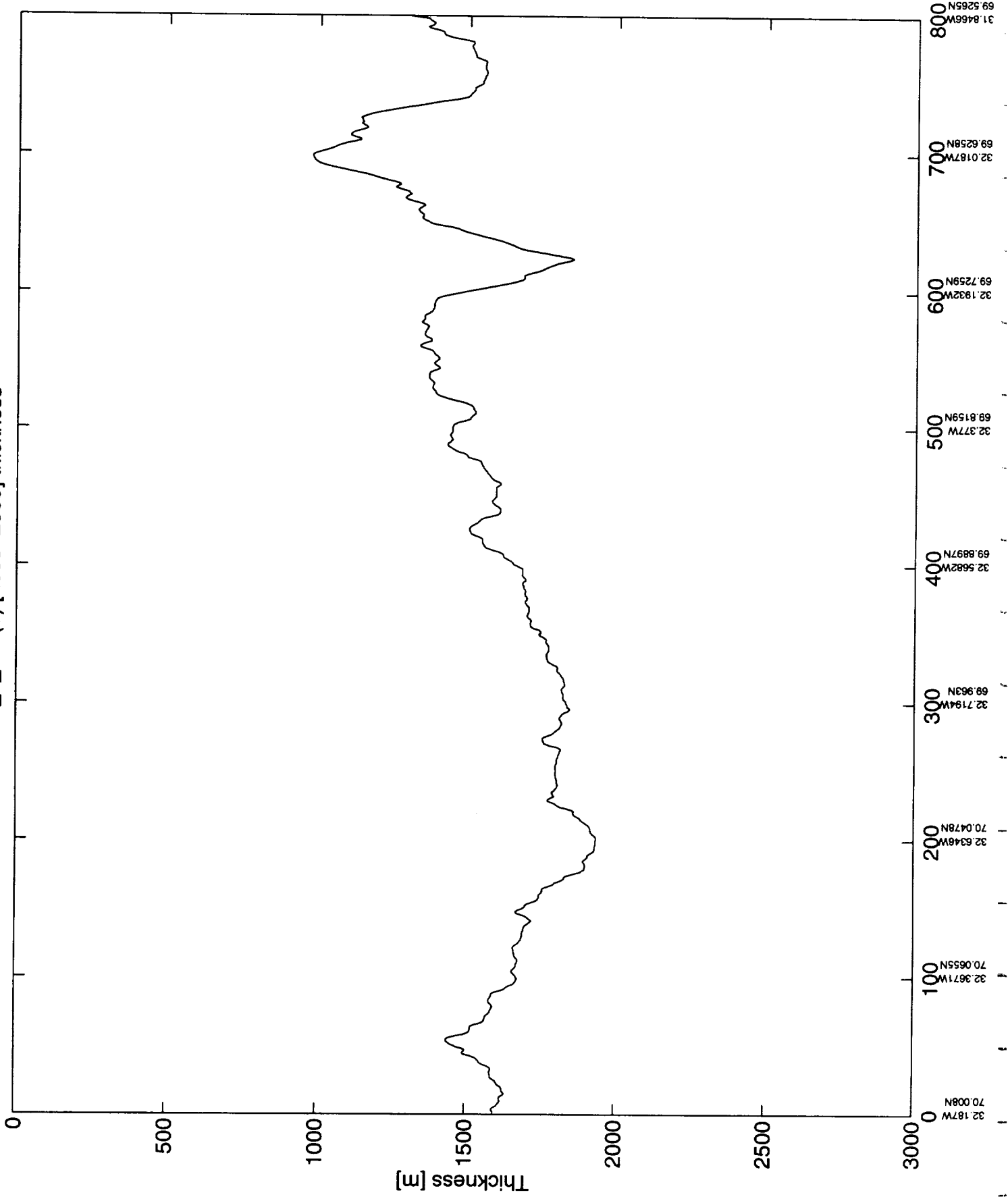


run_o_9.1(5) [2000-3000]

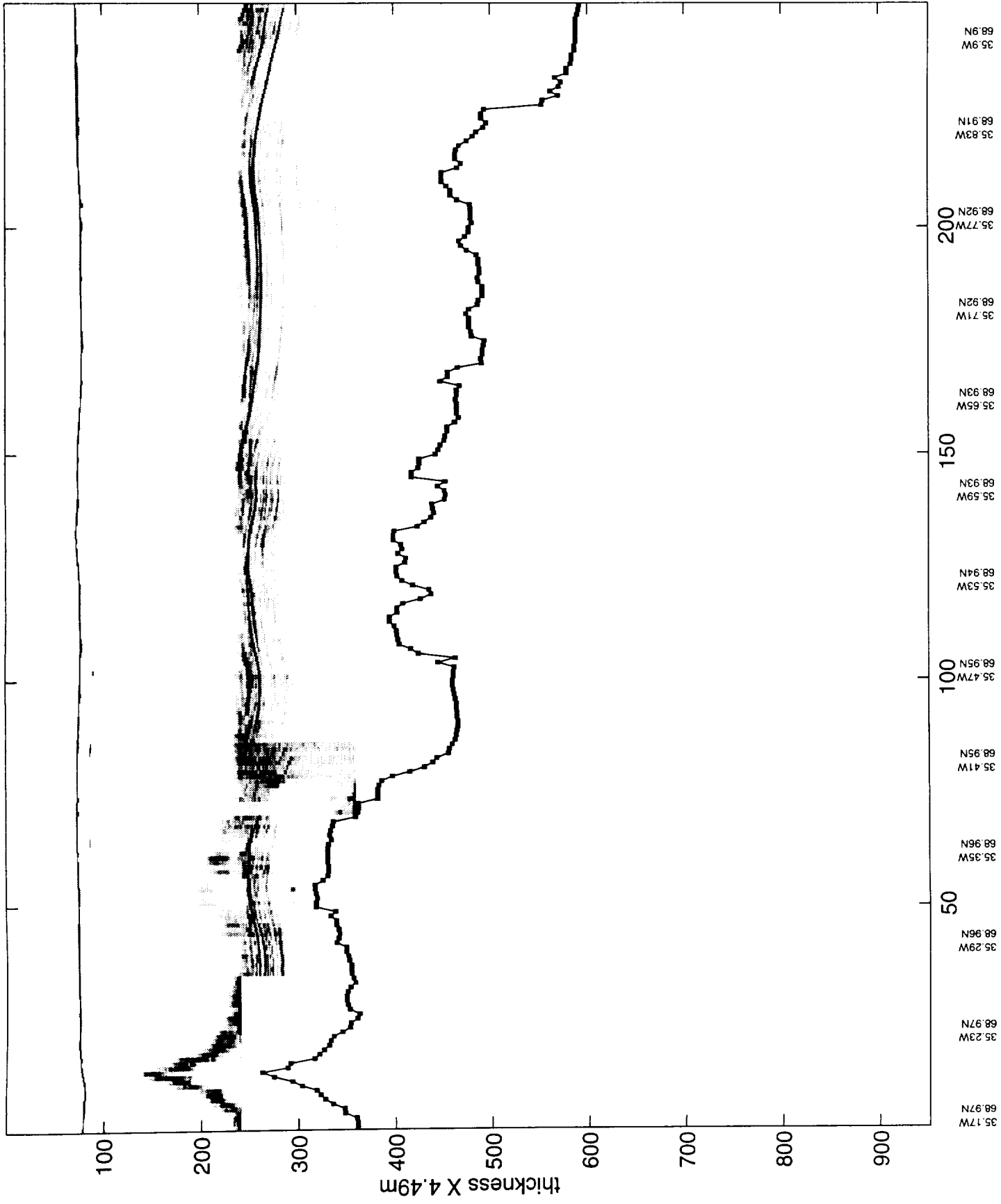


70.01N
32.19W
100 70.07N
32.26W
200 70.05N
32.63W
300 70.96N
32.72W
400 69.89N
32.57W
500 69.82N
32.38W
600 69.73N
32.19W
700 69.63N
32.02W
800 69.53N
31.85W
900 69.43N
31.68W
1000 69.33N
31.51W

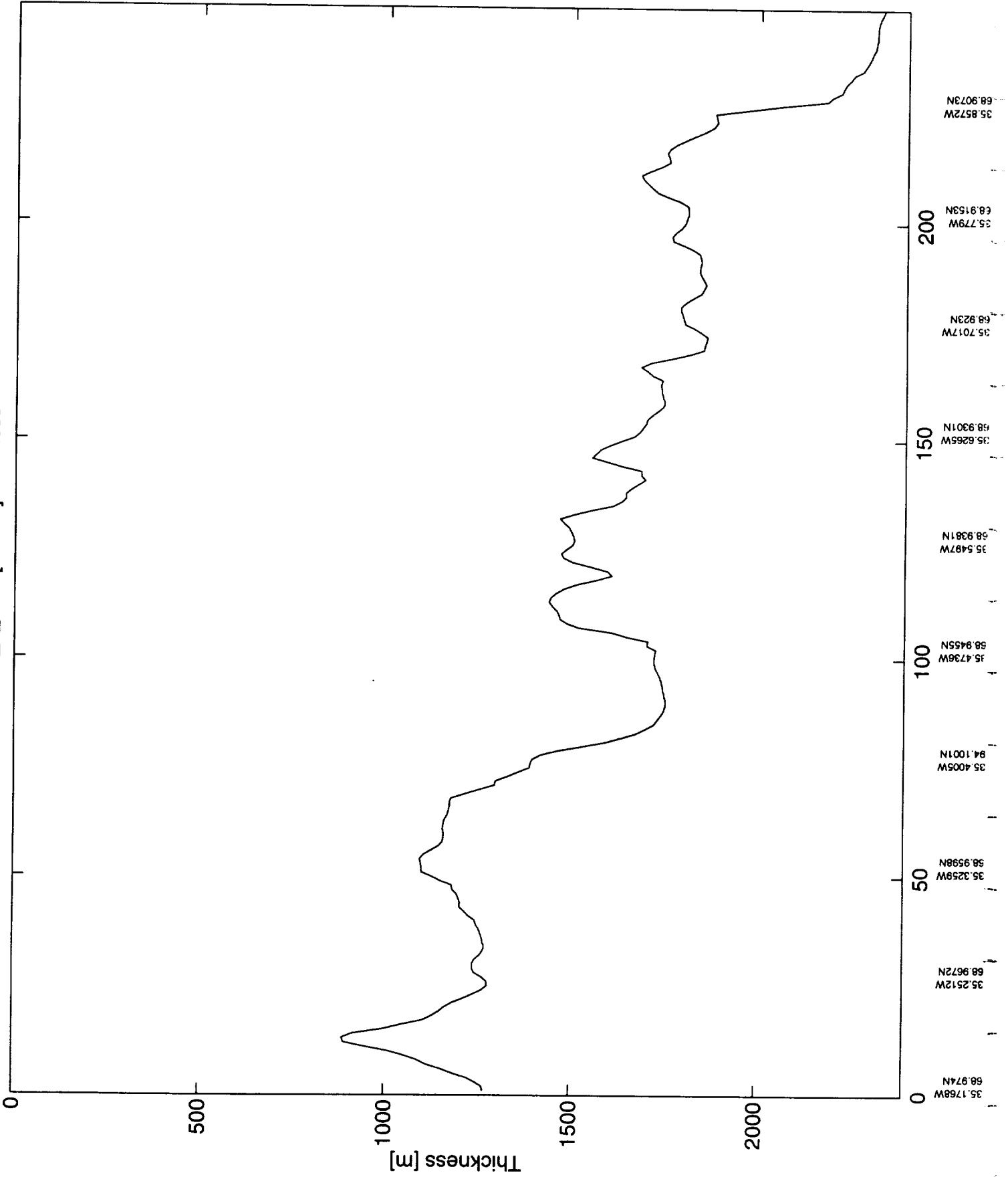
run_6_9.1 (3) [2000-2800] thickness



ru_0_12.1 0-247

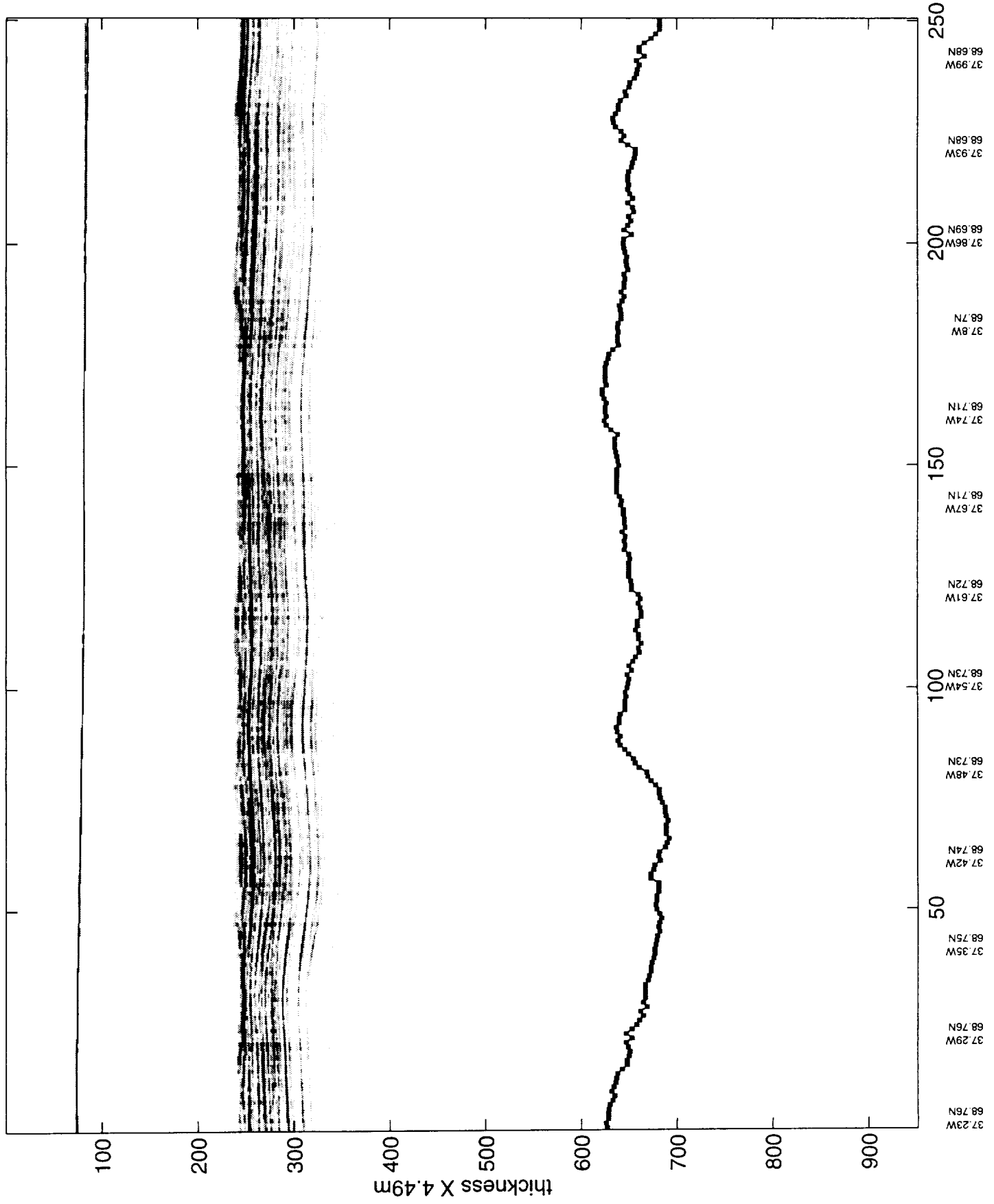


run_6_12.1 [0-249] thickness

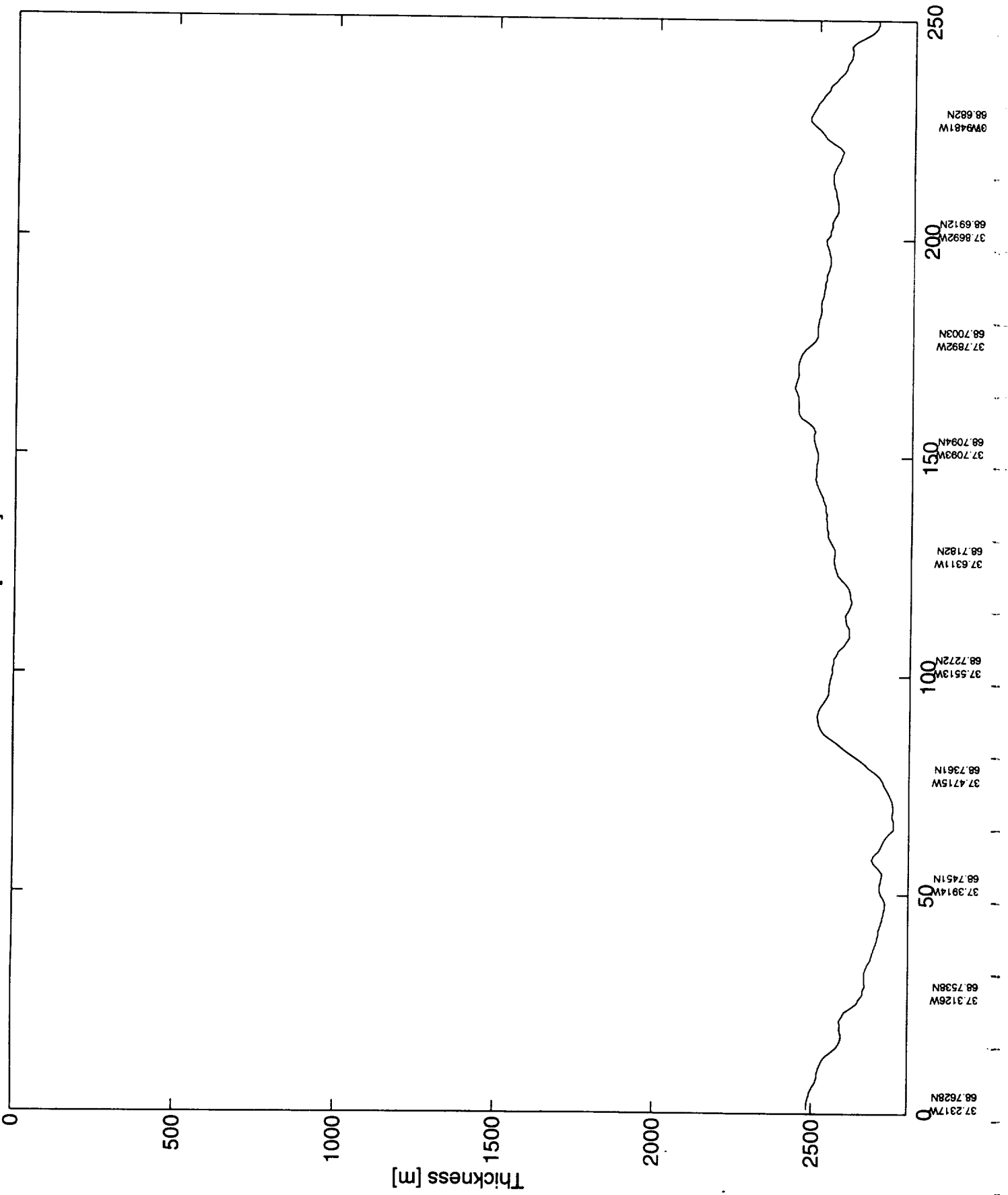


35.1768W 68.974N
35.2512W 68.9672N
35.3259W 68.9598N
35.4005W 68.1001N
35.4736W 68.9455N
35.5487W 68.9381N
35.6265W 68.9301N
35.7017W 68.923N
35.779W 68.9153N
35.8522W 68.9073N

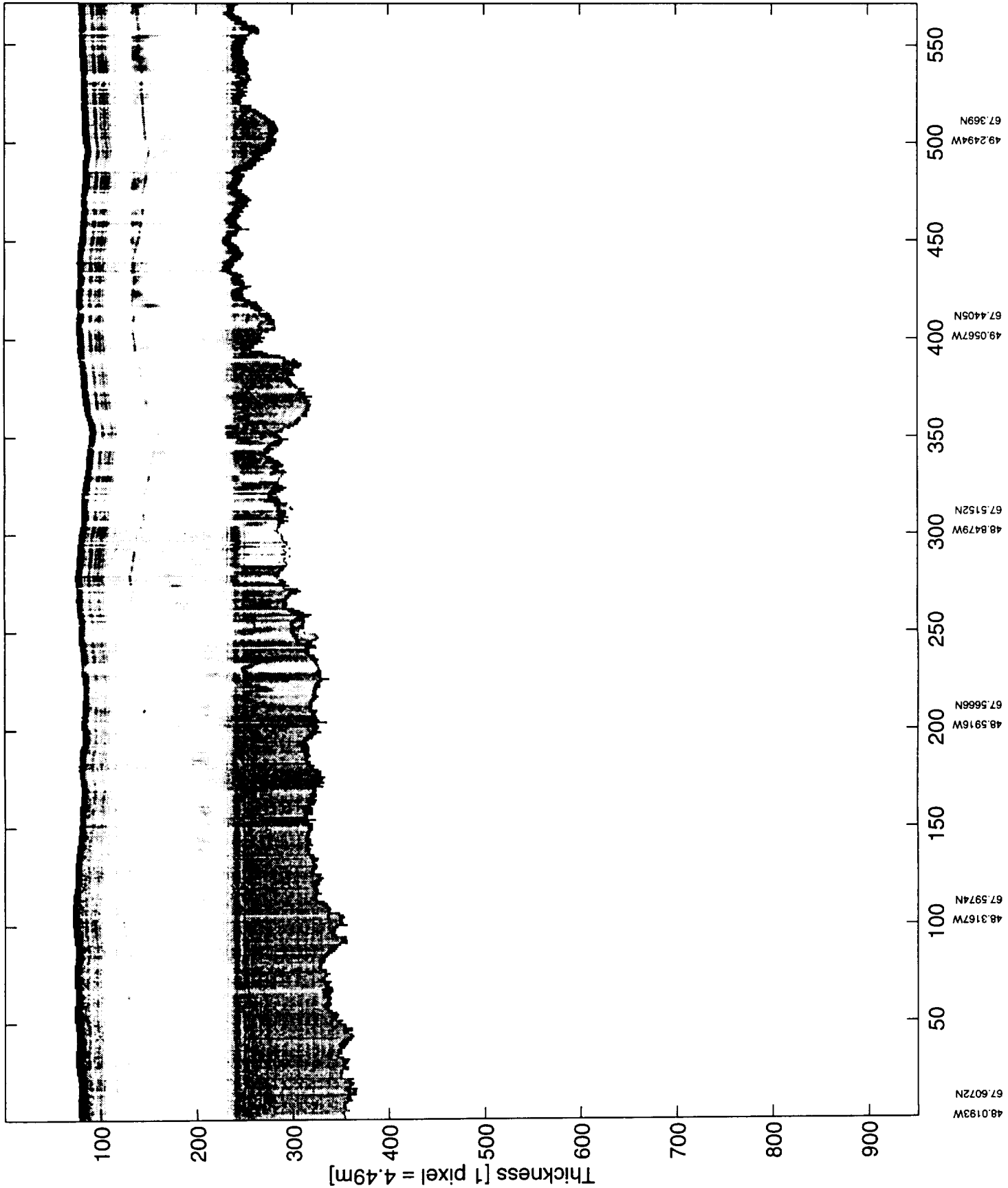
ru1_v_16: 1v-25vj



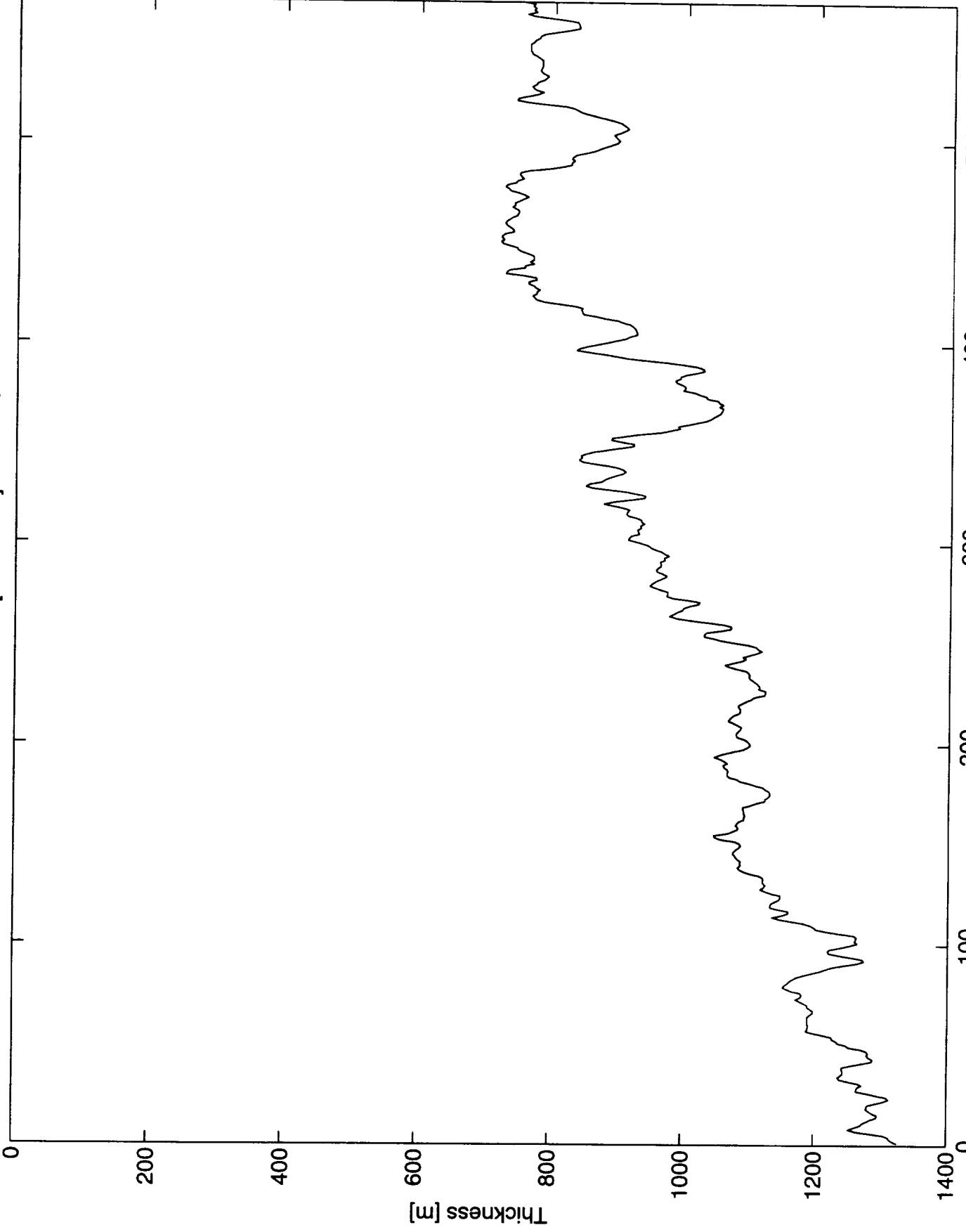
run_6_16.1 [0-250] thickness



run_6_28.1-2[950-1520]



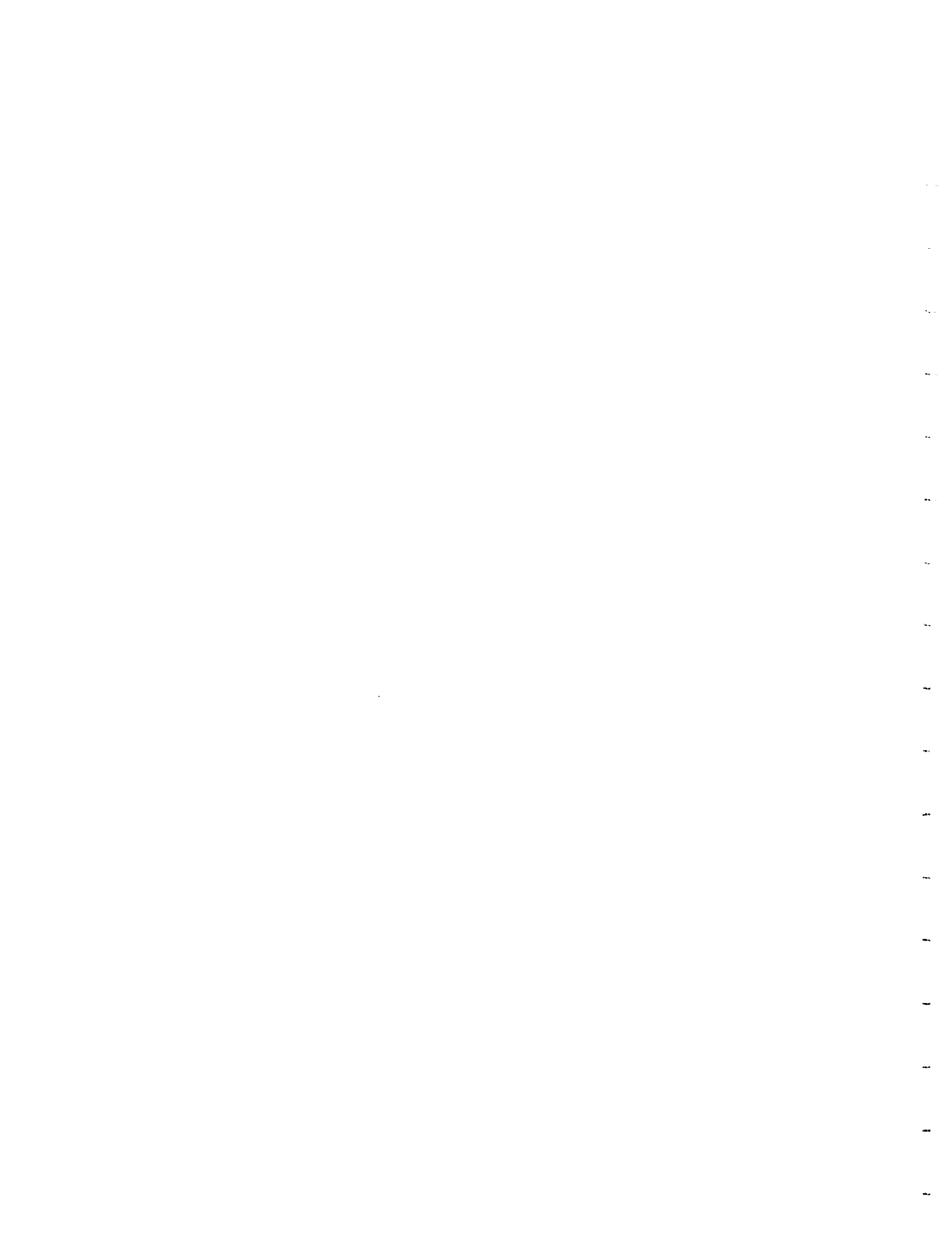
run_6_28.1-2 [950-1520] thickness

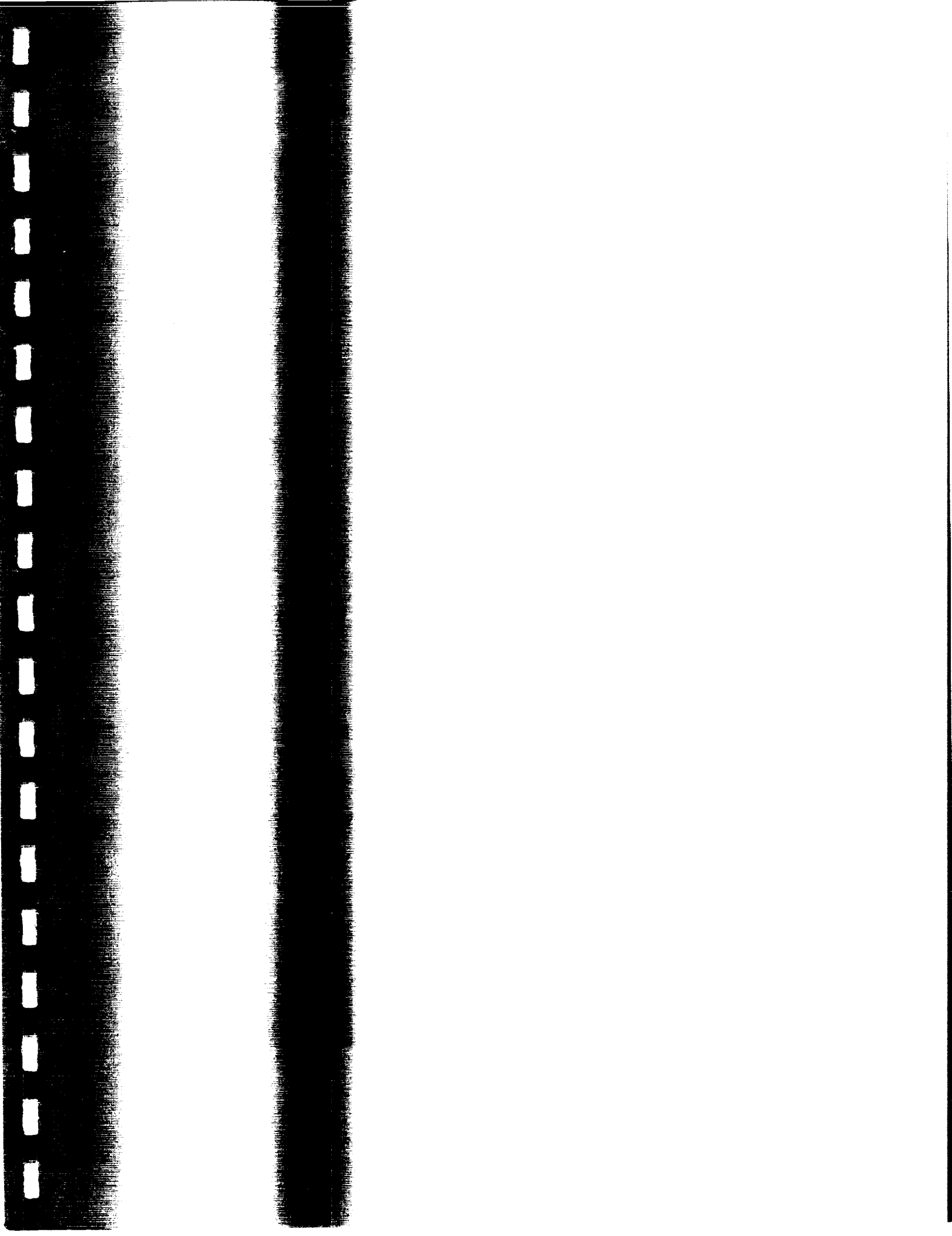


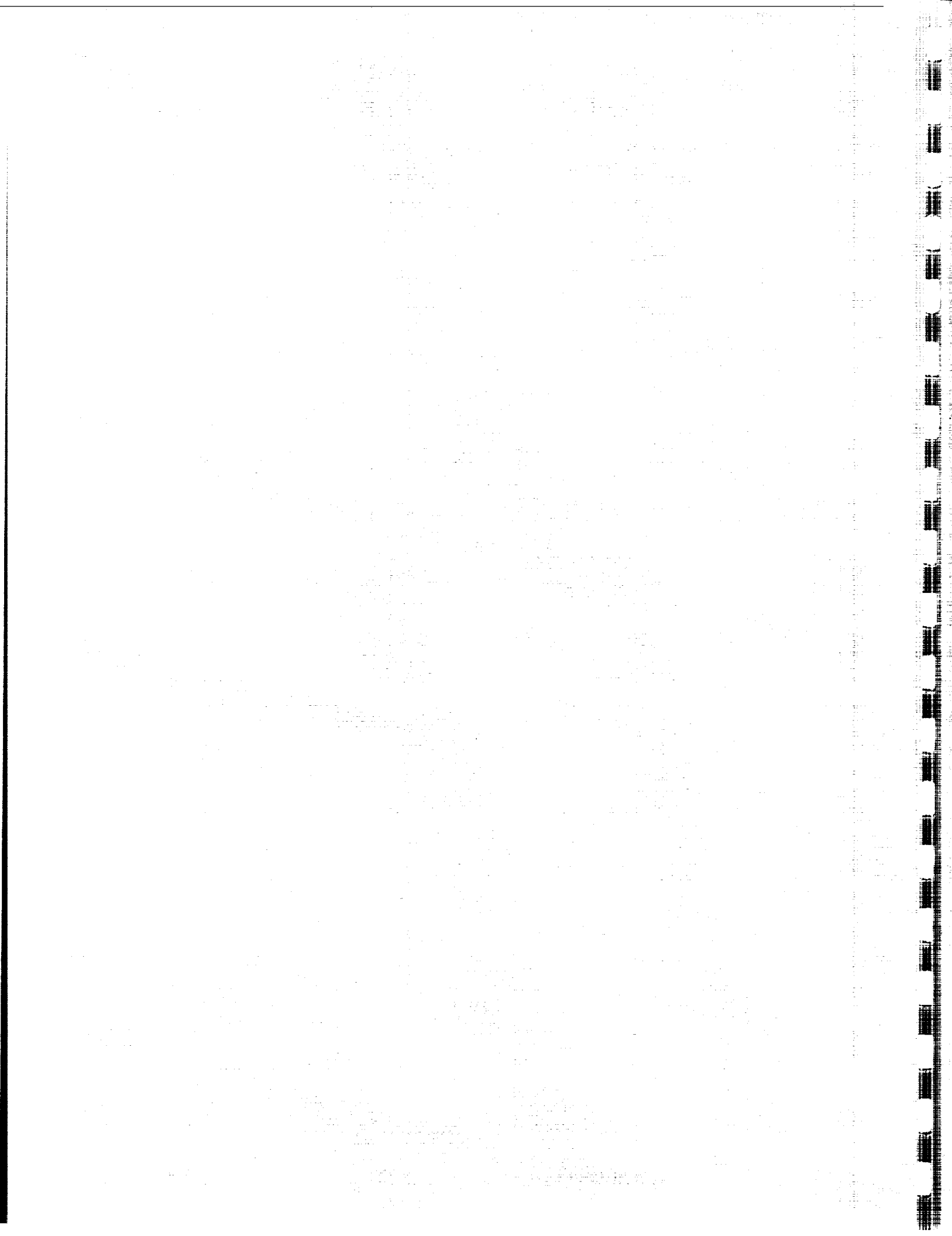
3132N
3072N
48 3167W
57 5974N
5916W
5566N
3479W
5152N
43657W
674405N
3494W
369N

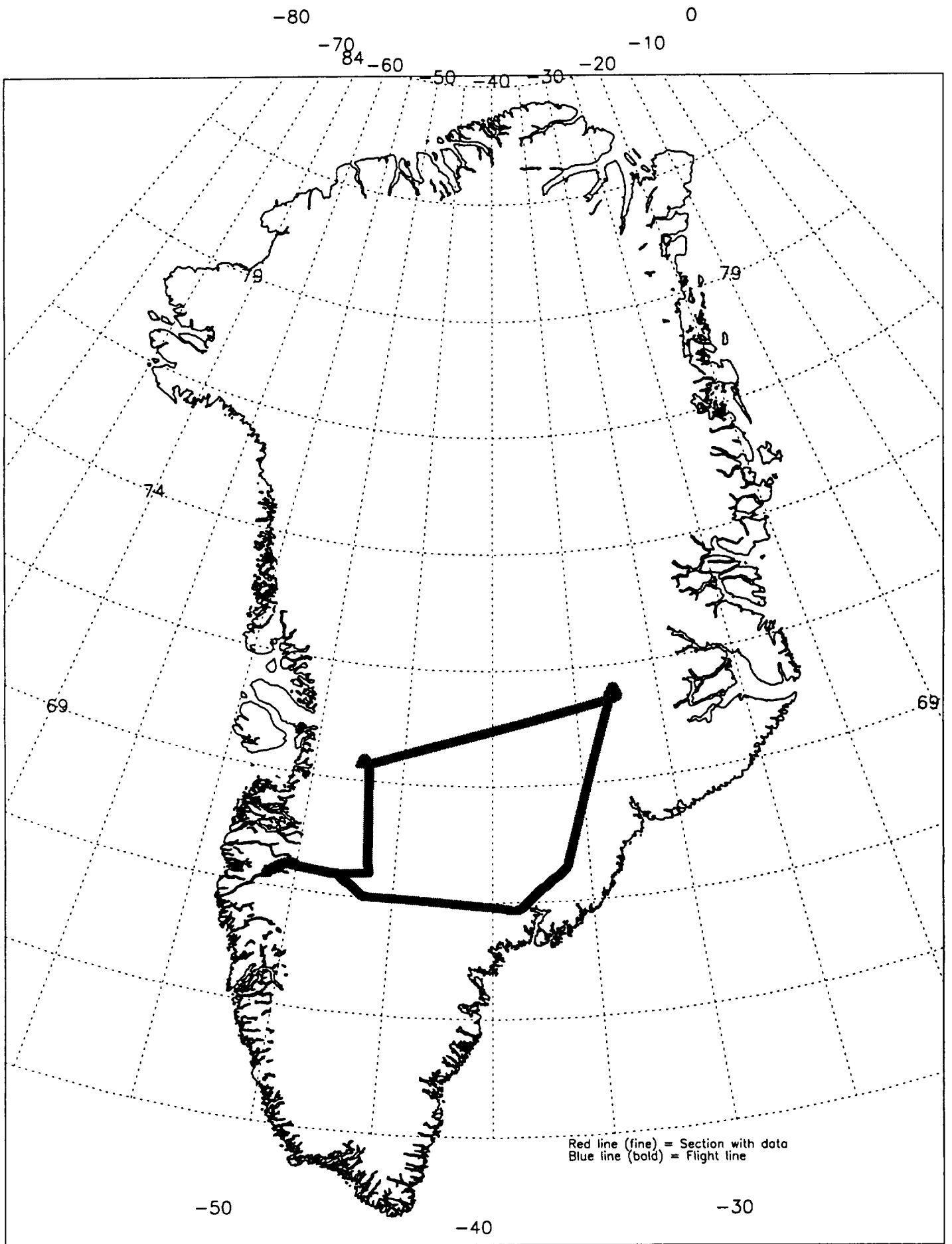
Appendix B

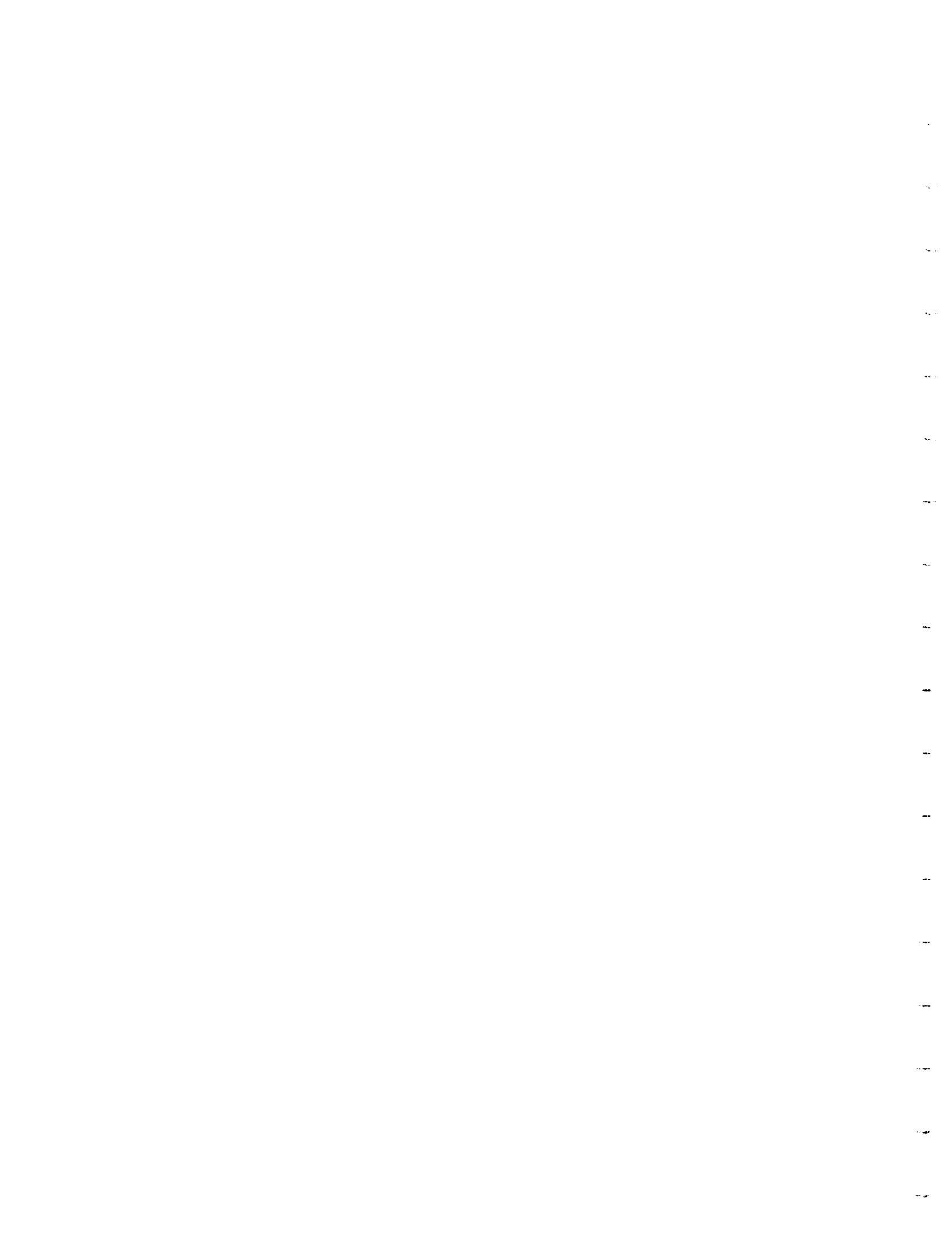
June 24, 1993



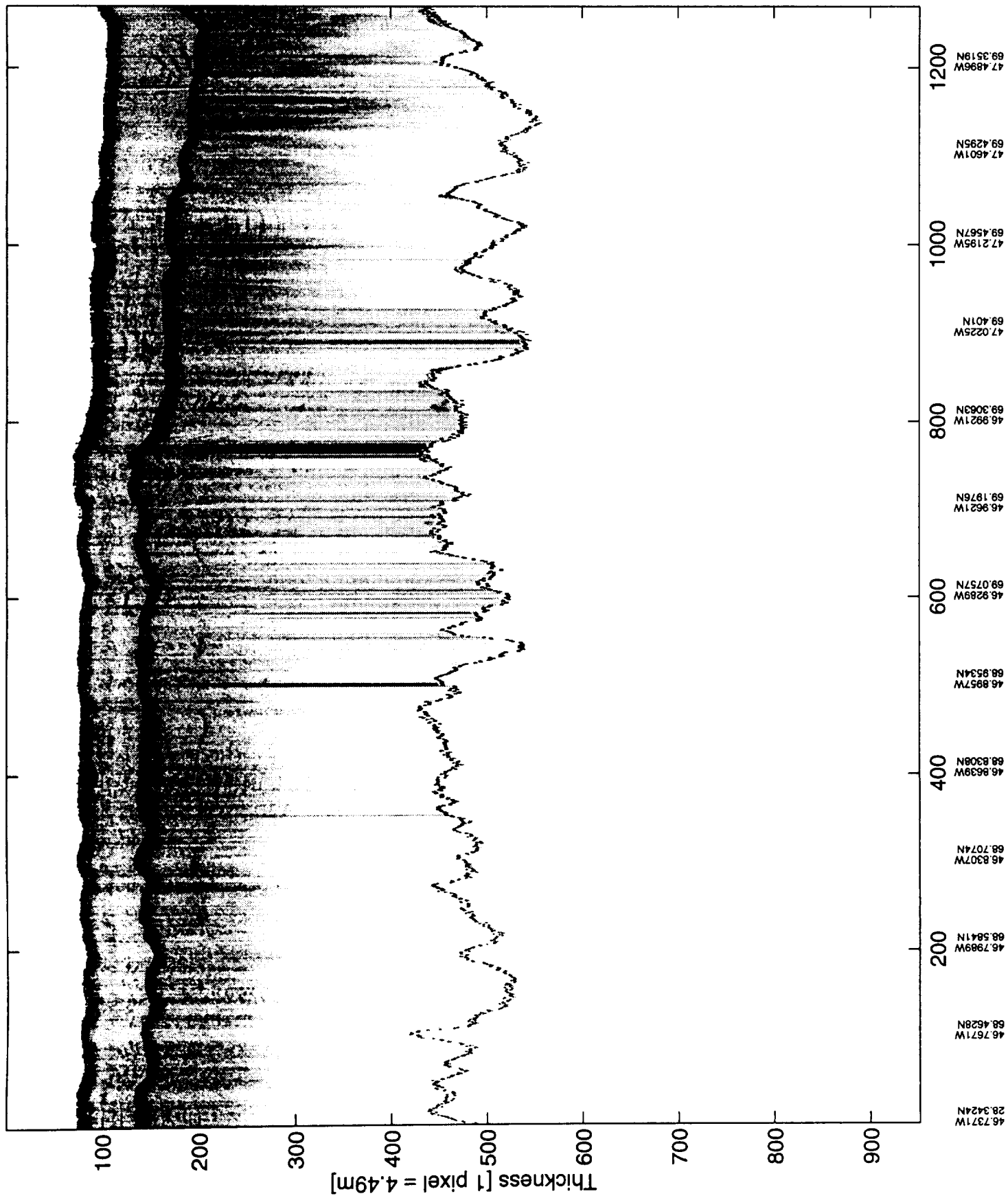




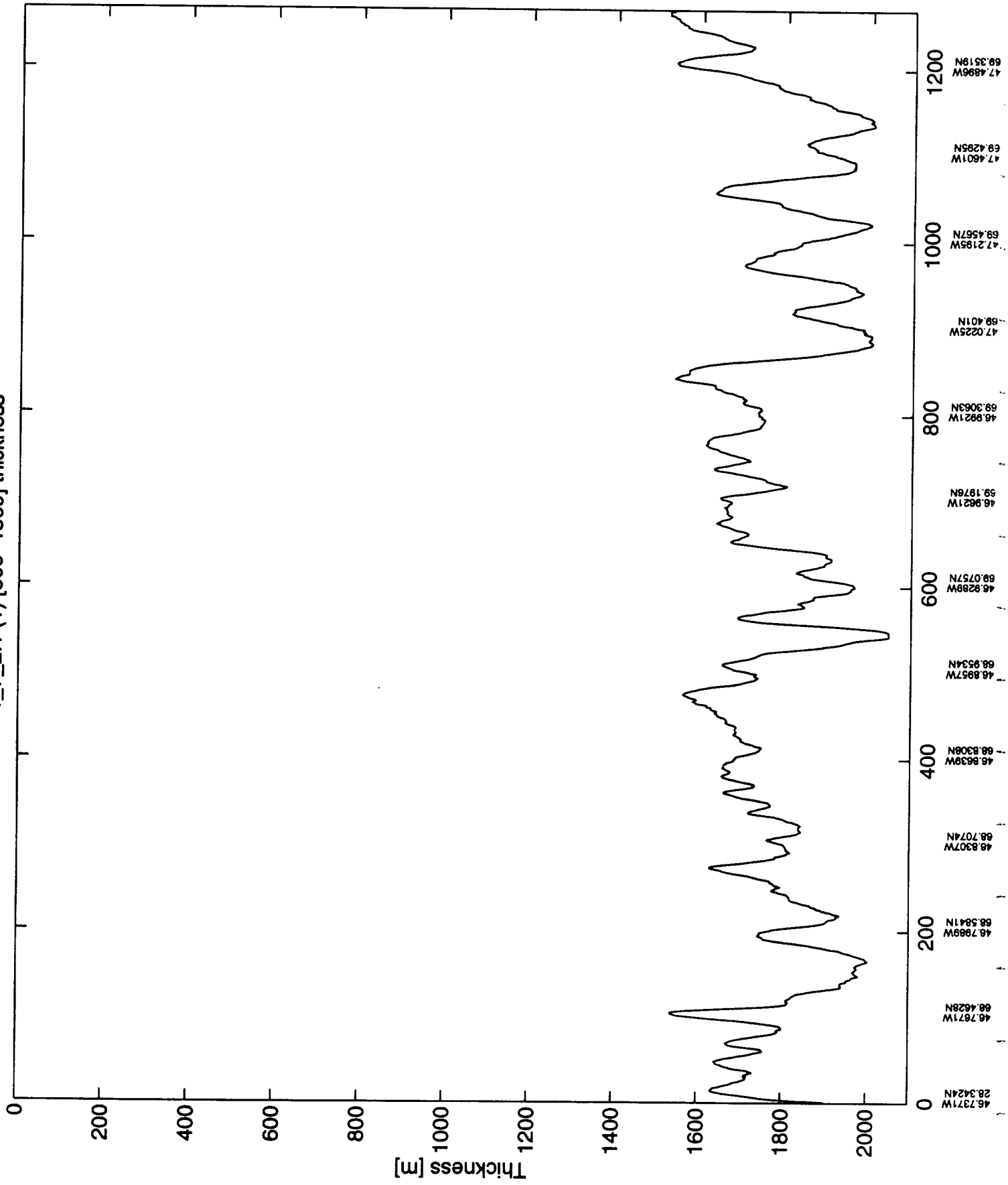




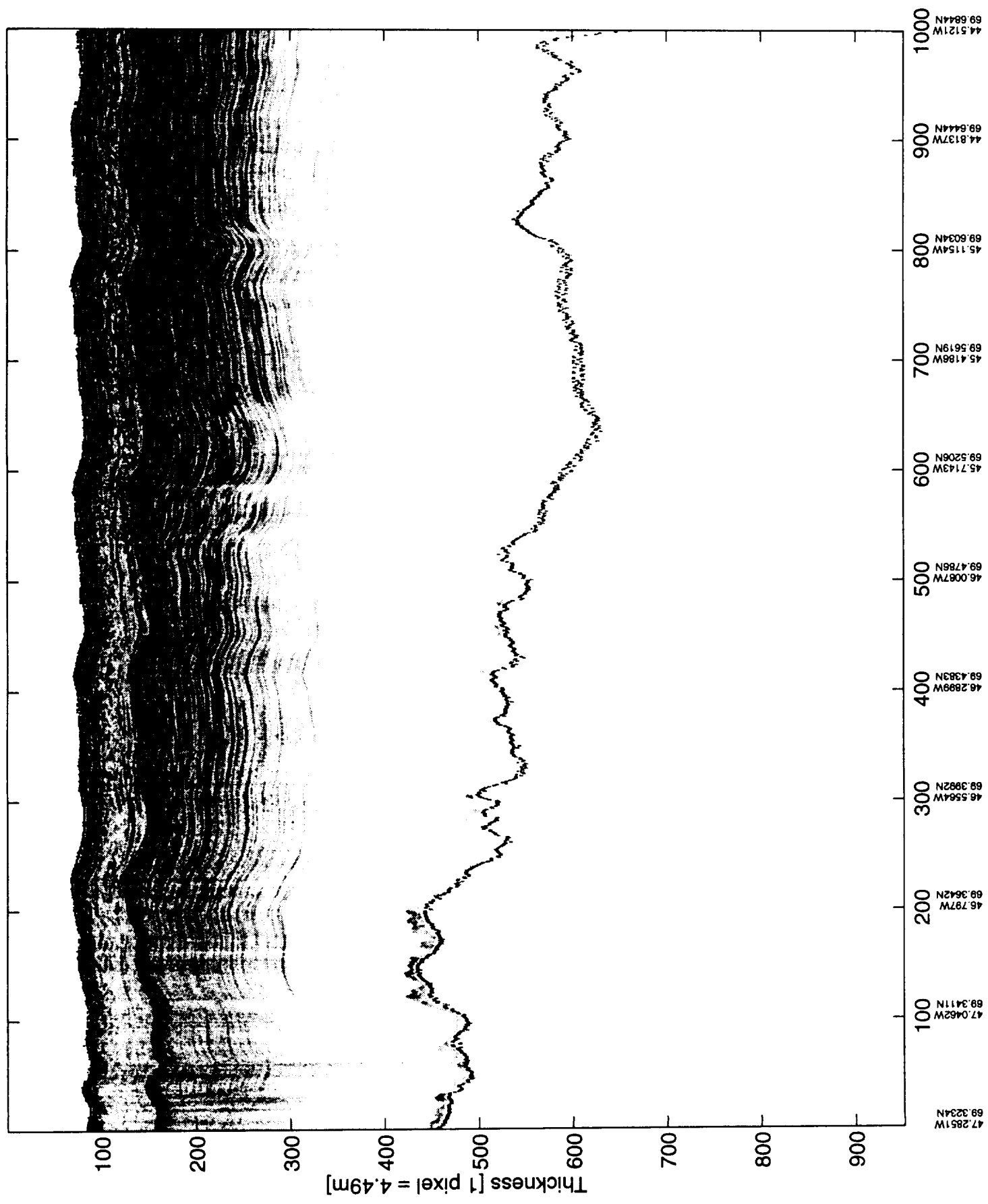
r_7_2.1 (1) [300 1569]



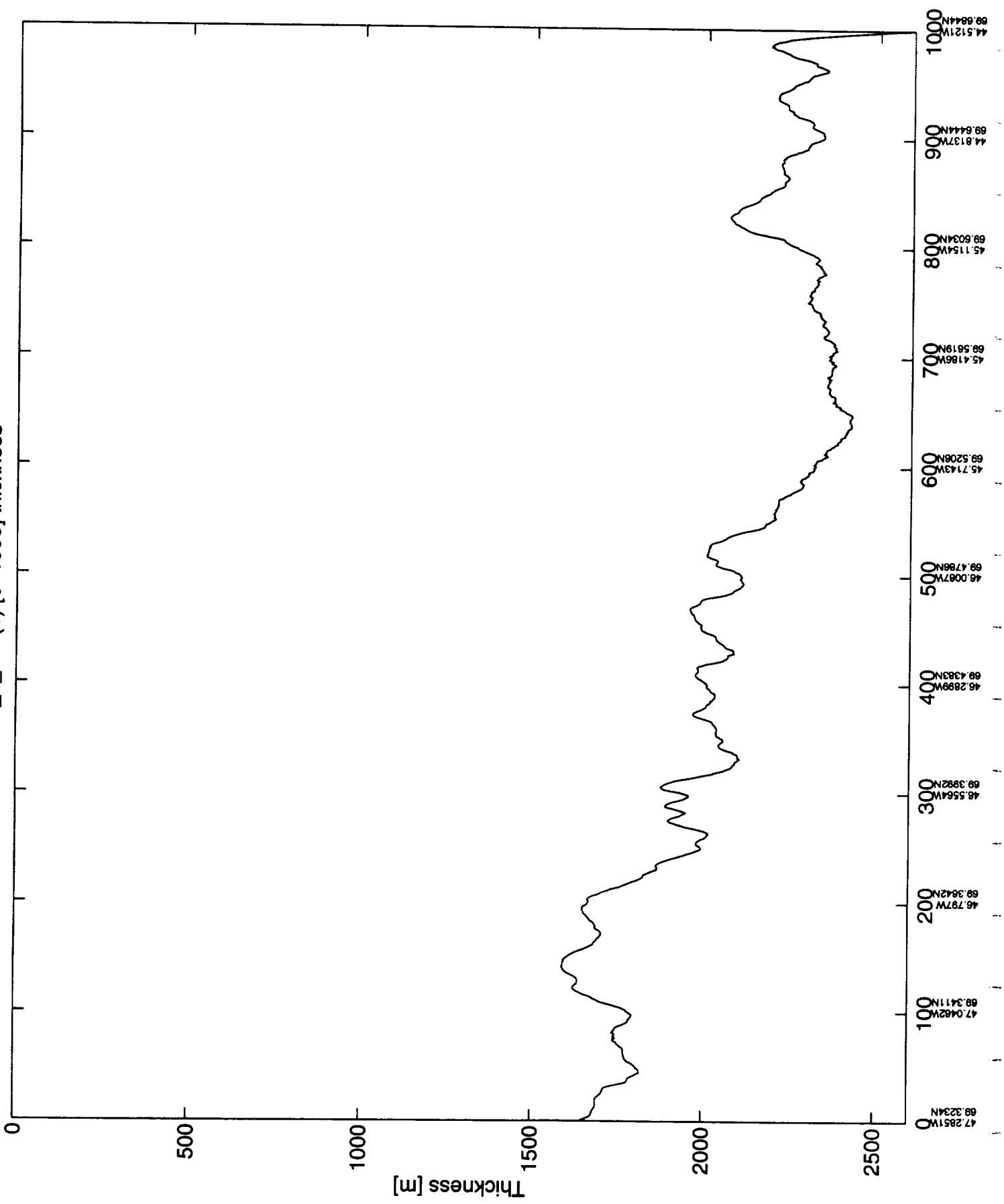
r_7_2.1 (1) [300-1569] thickness

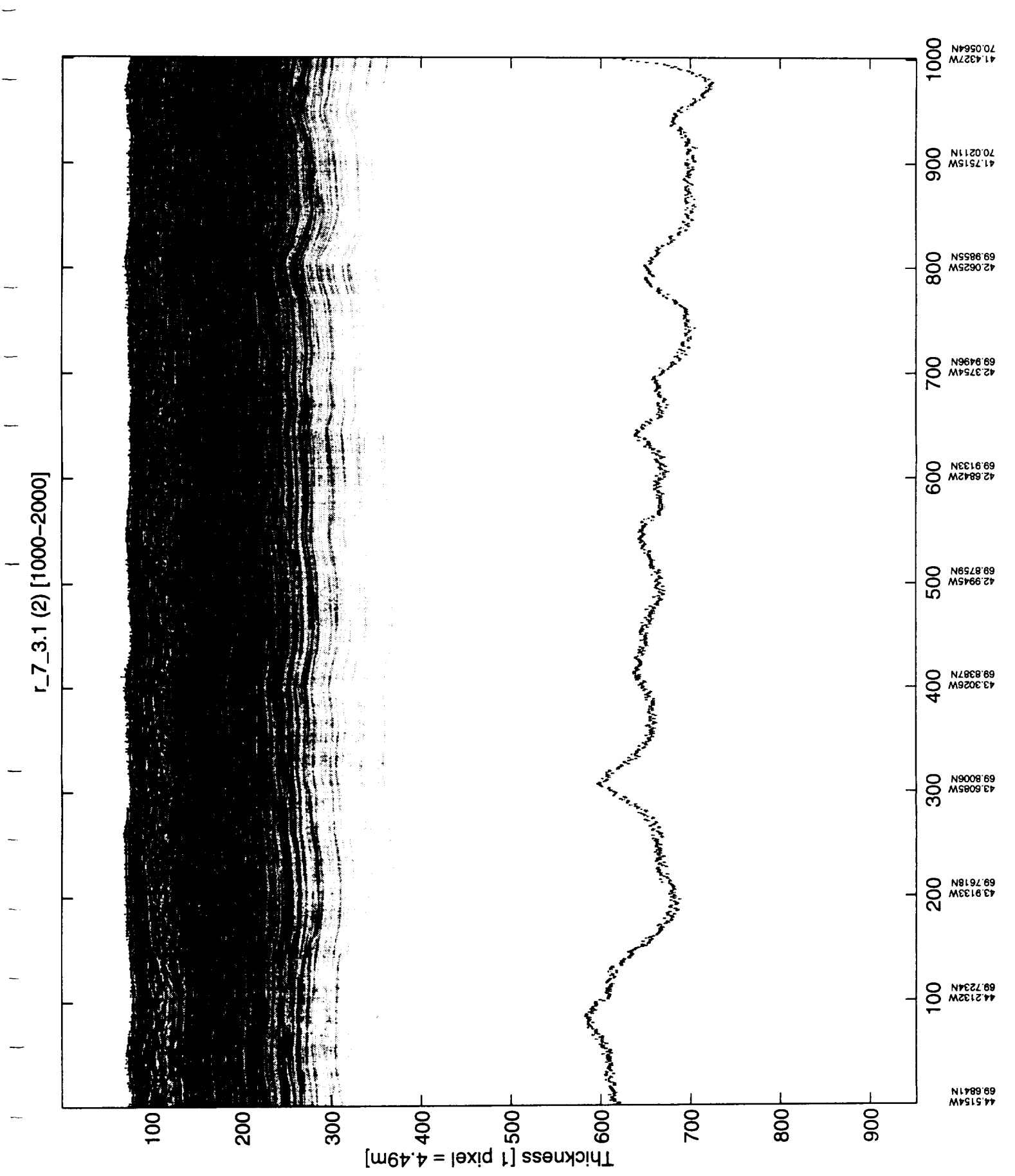


r_7_3.1 (1) [0-1000]



r_7_3.1 (1) [0-1000] thickness





69.6841N
44.5154W

69.7234N
44.2132W

69.7618N
43.9133W

69.8006N
43.6085W

69.8387N
43.3026W

69.8759N
42.9945W

69.9133N
42.6842W

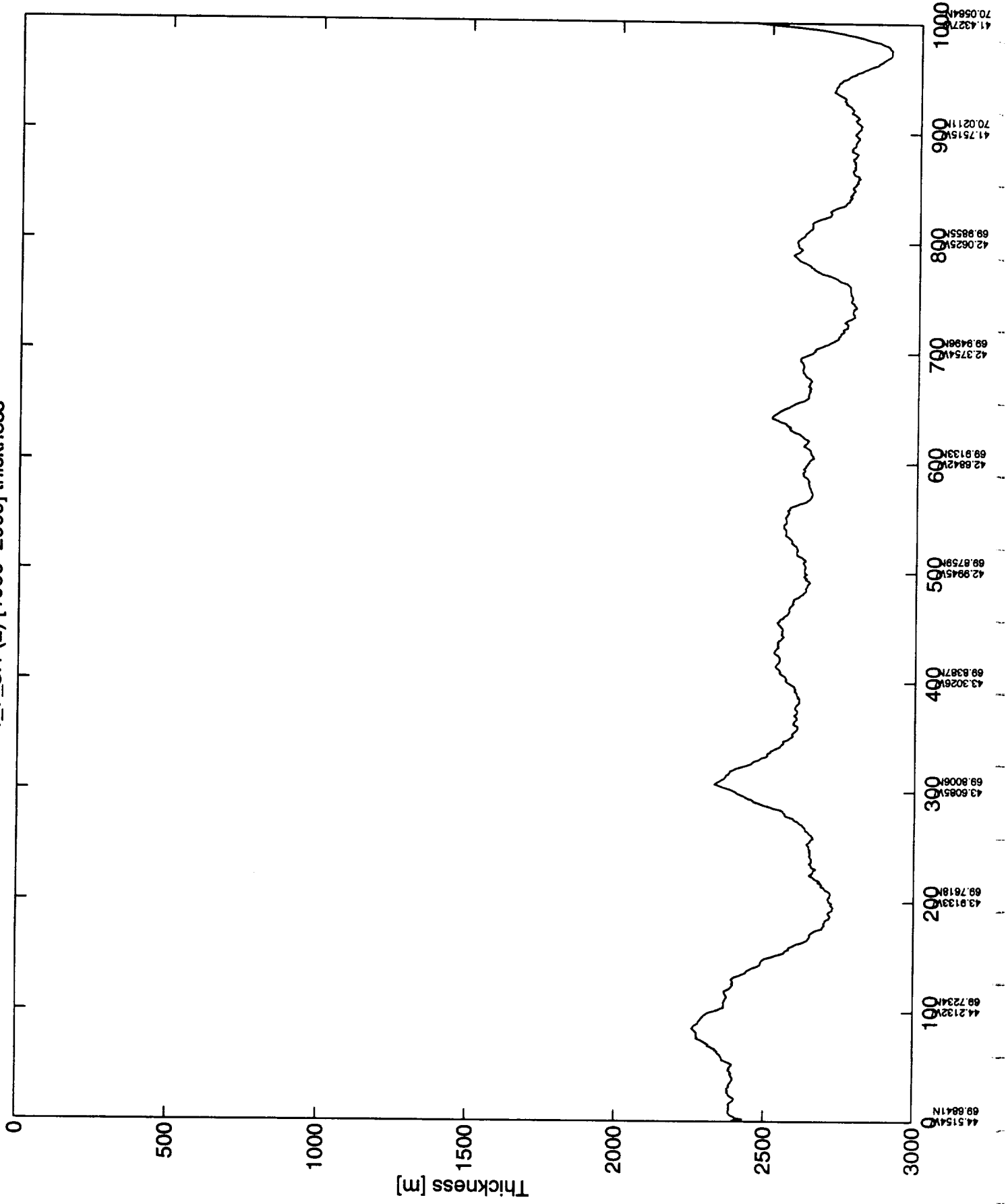
69.9496N
42.3754W

69.9855N
42.0625W

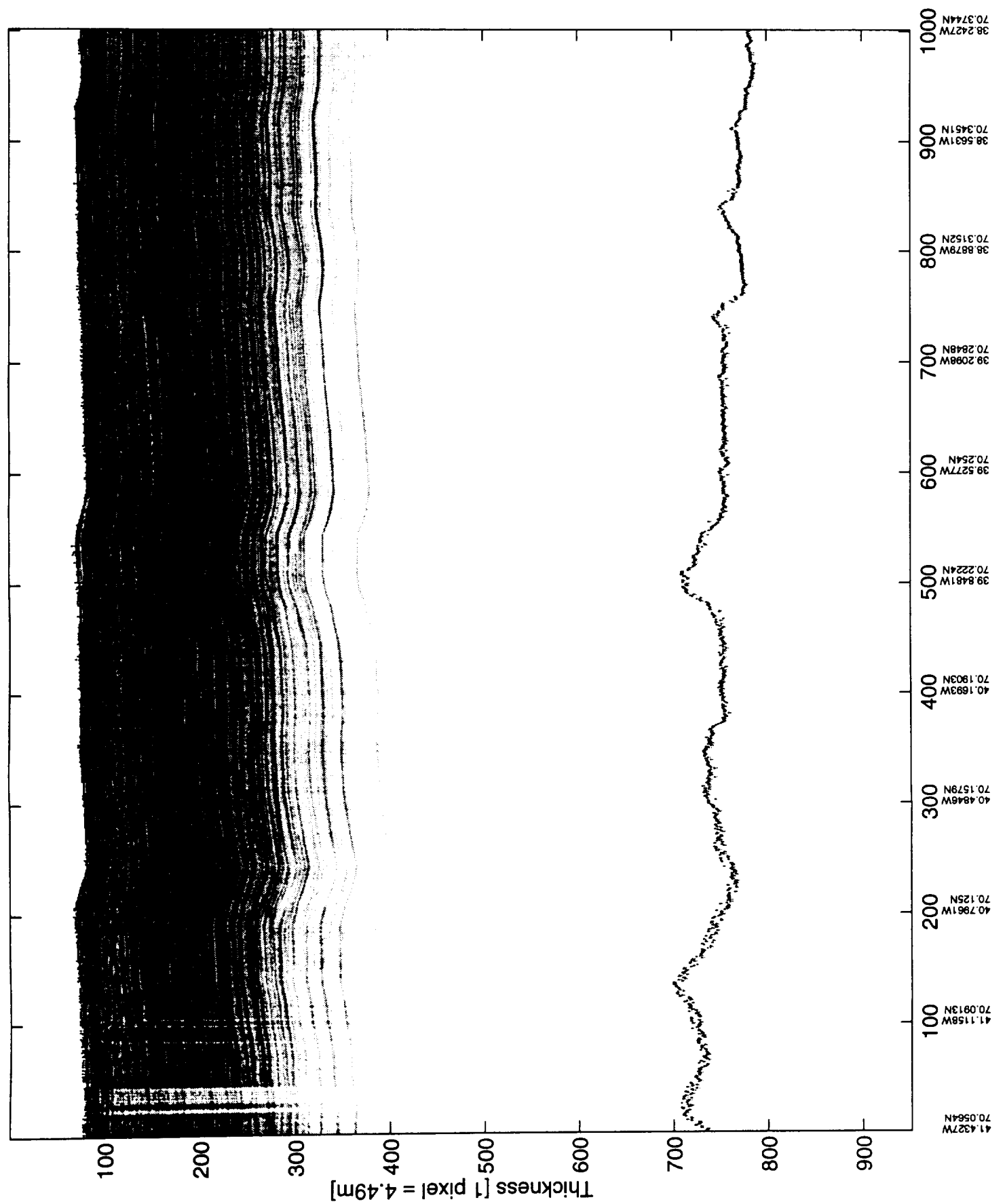
70.0211N
41.7515W

70.0564N
41.4327W

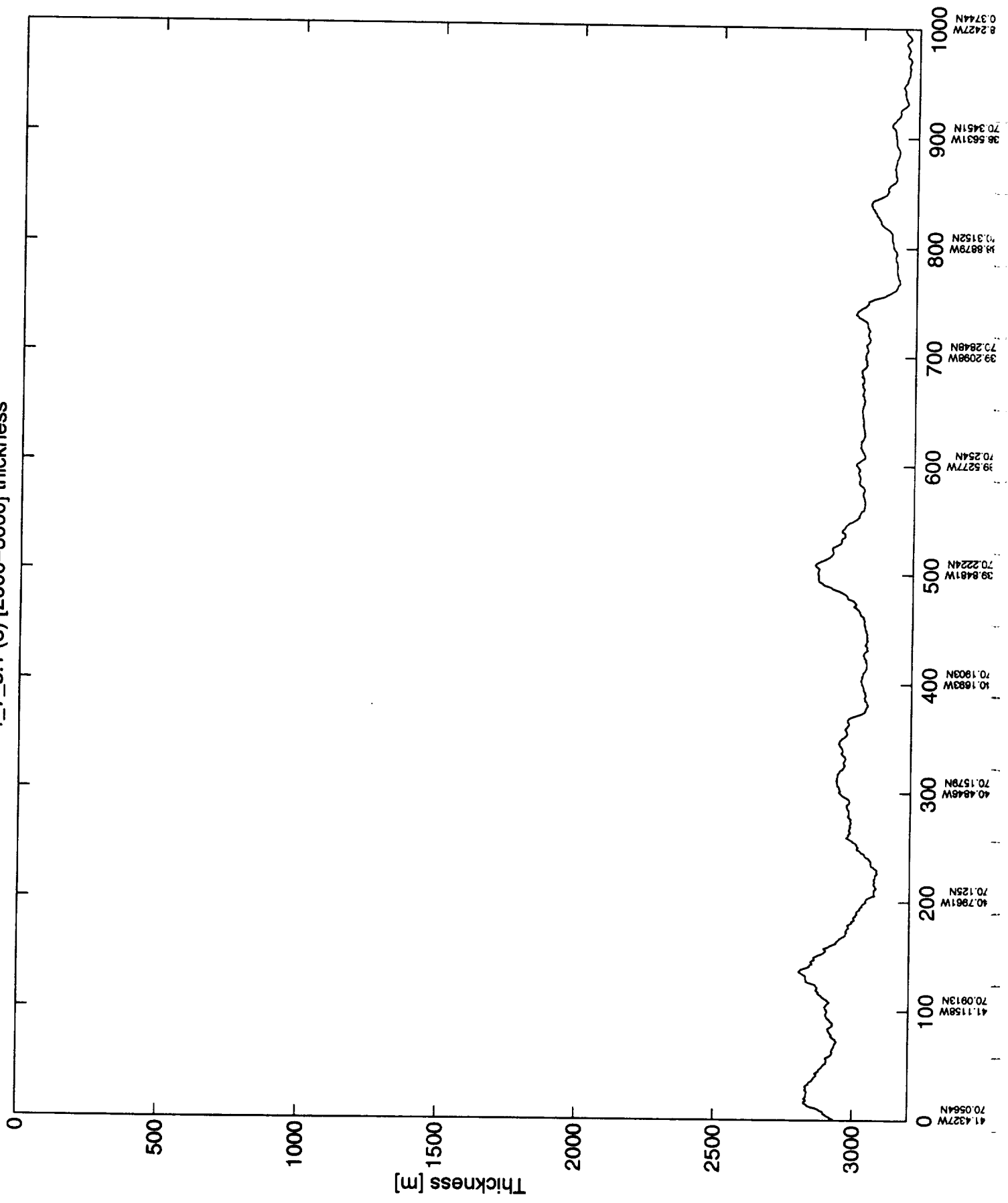
r_7_3.1 (2) [1000-2000] thickness



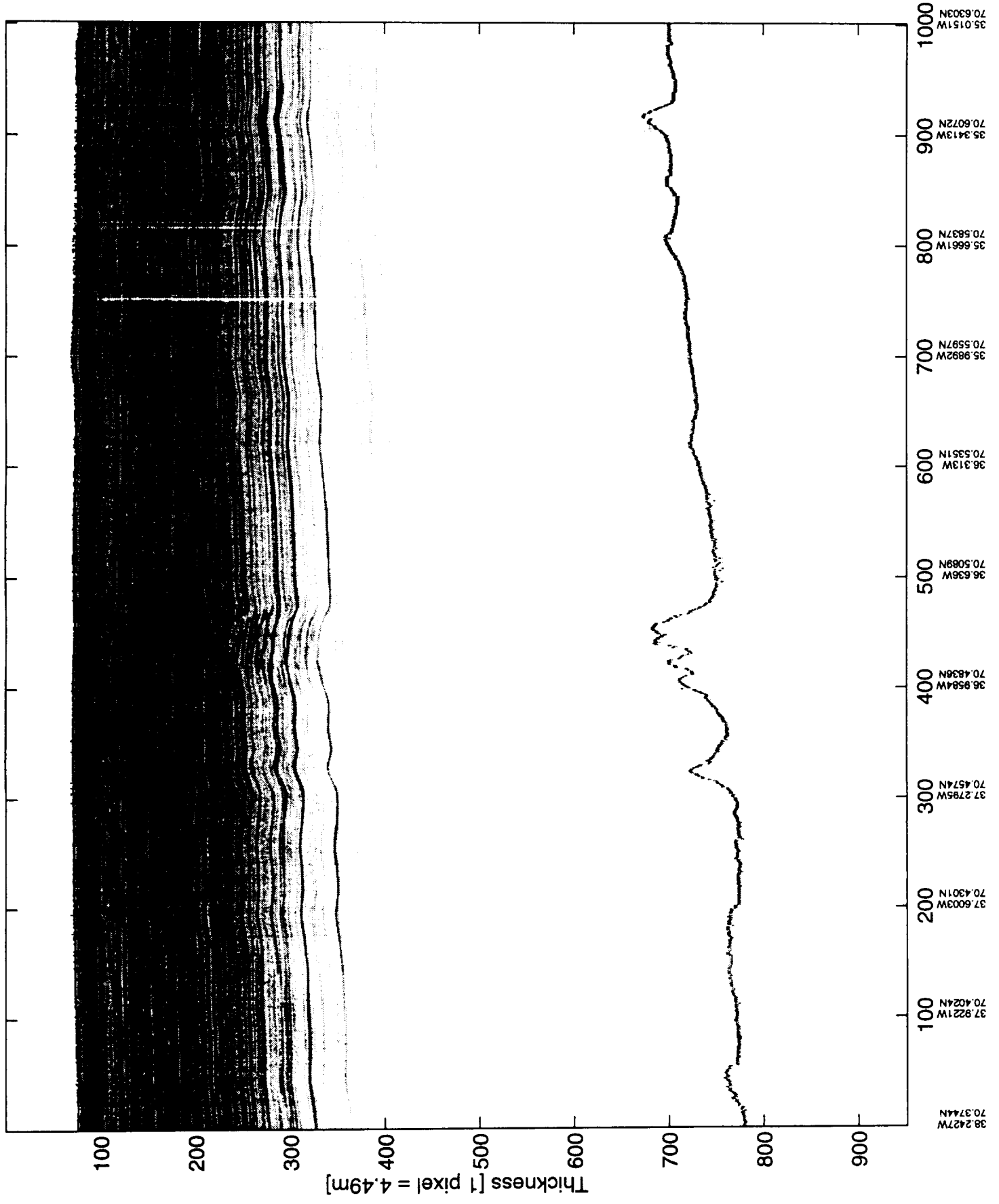
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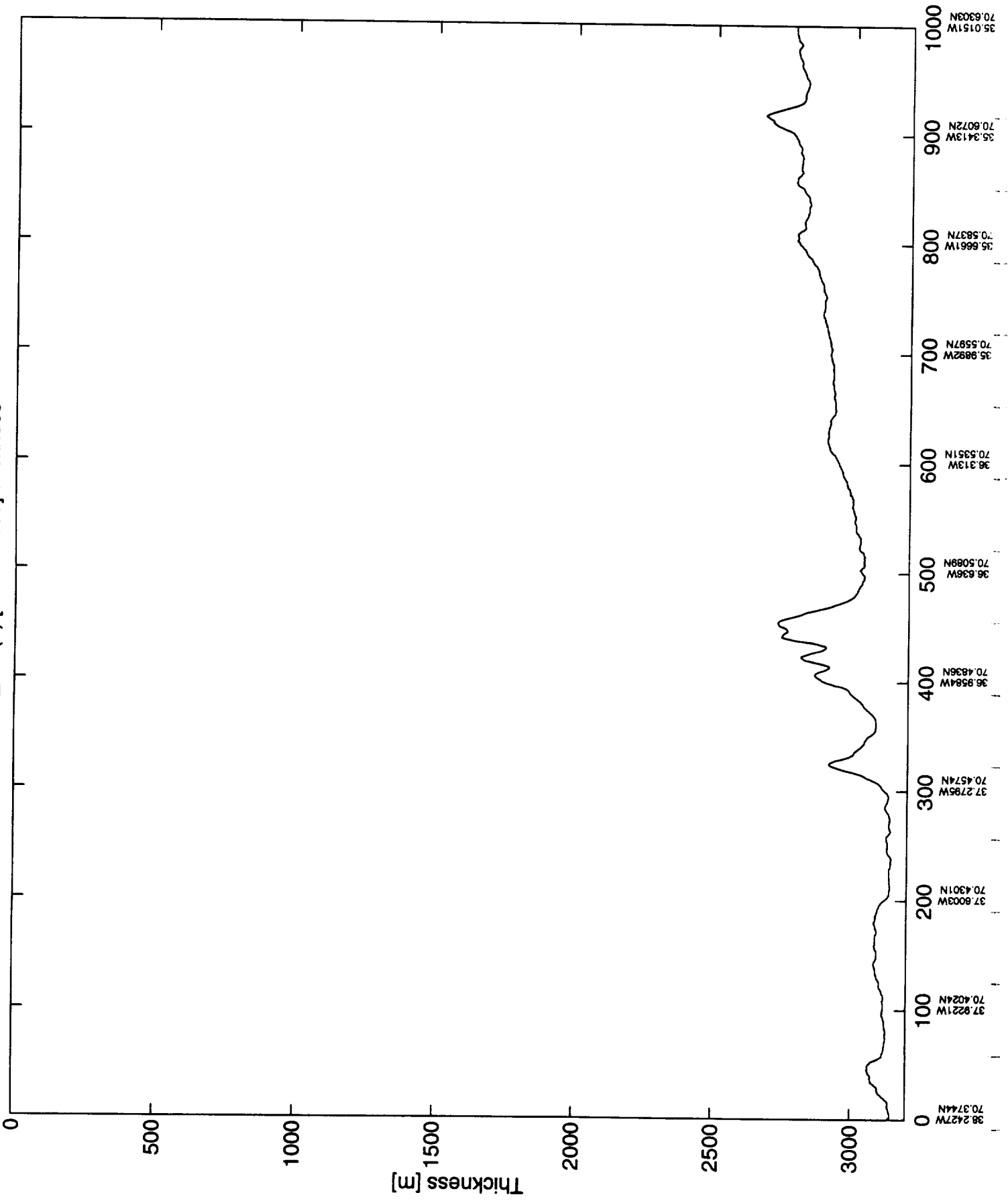
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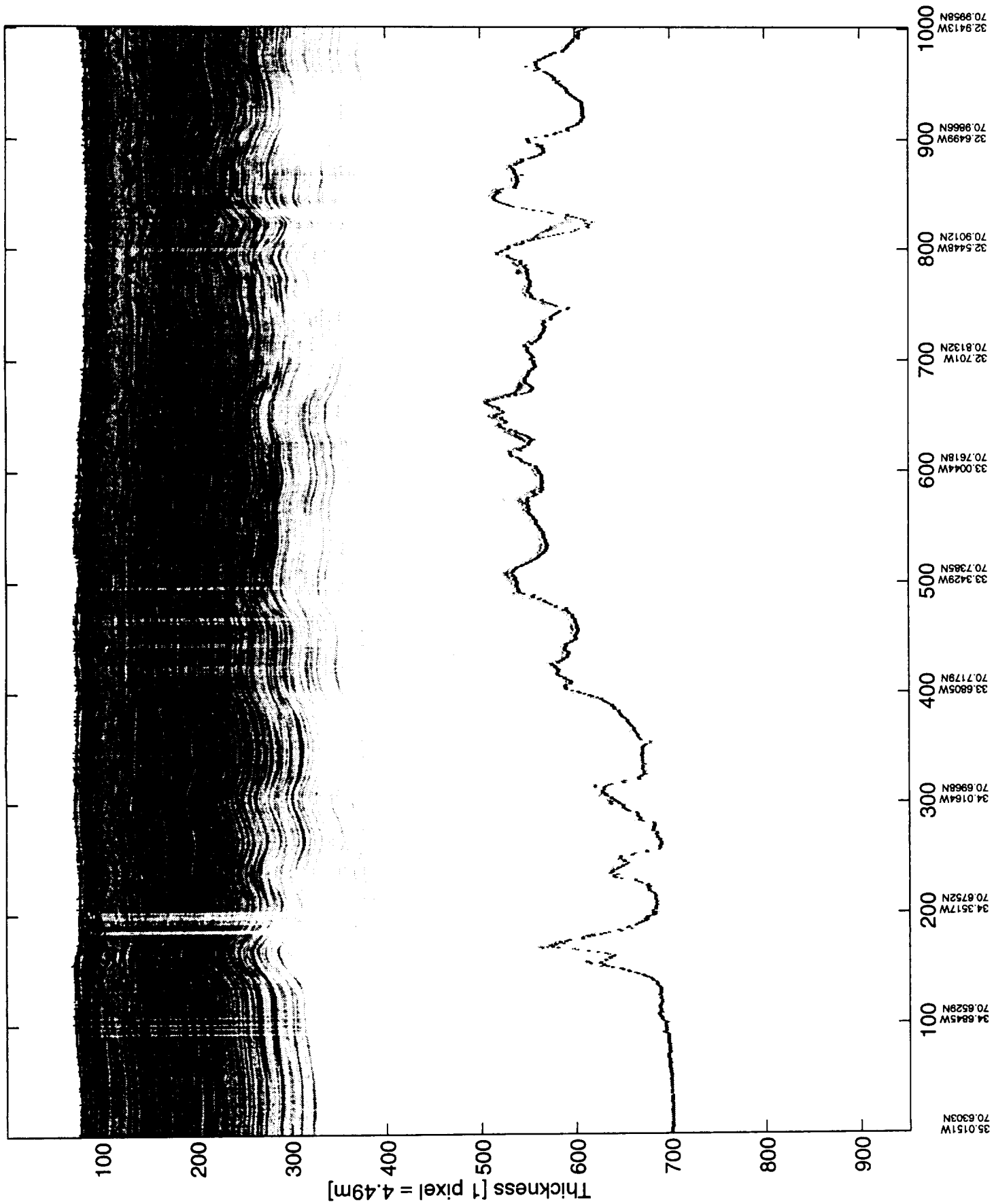
r_7_3.1 (4) [3000-4000]



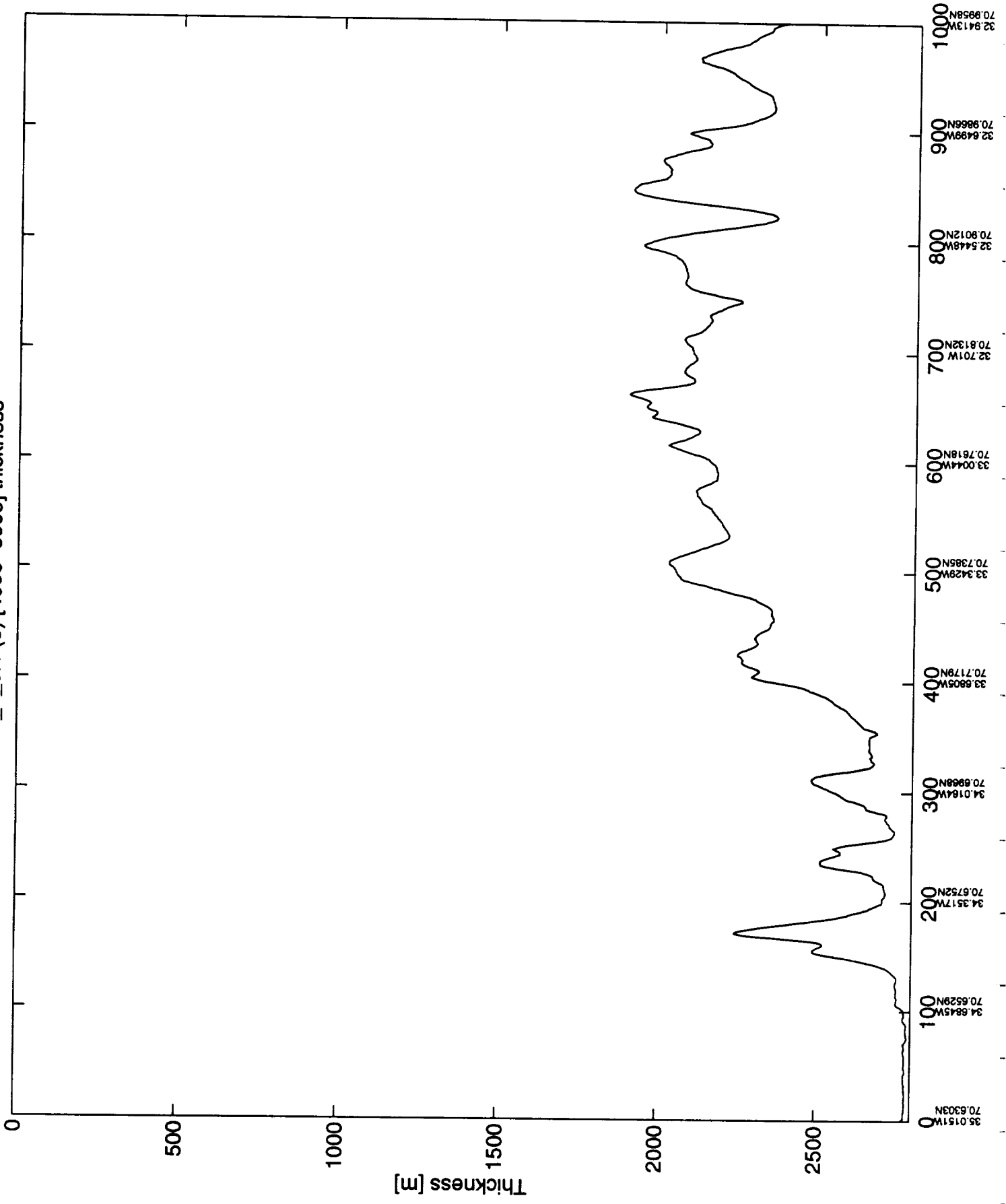
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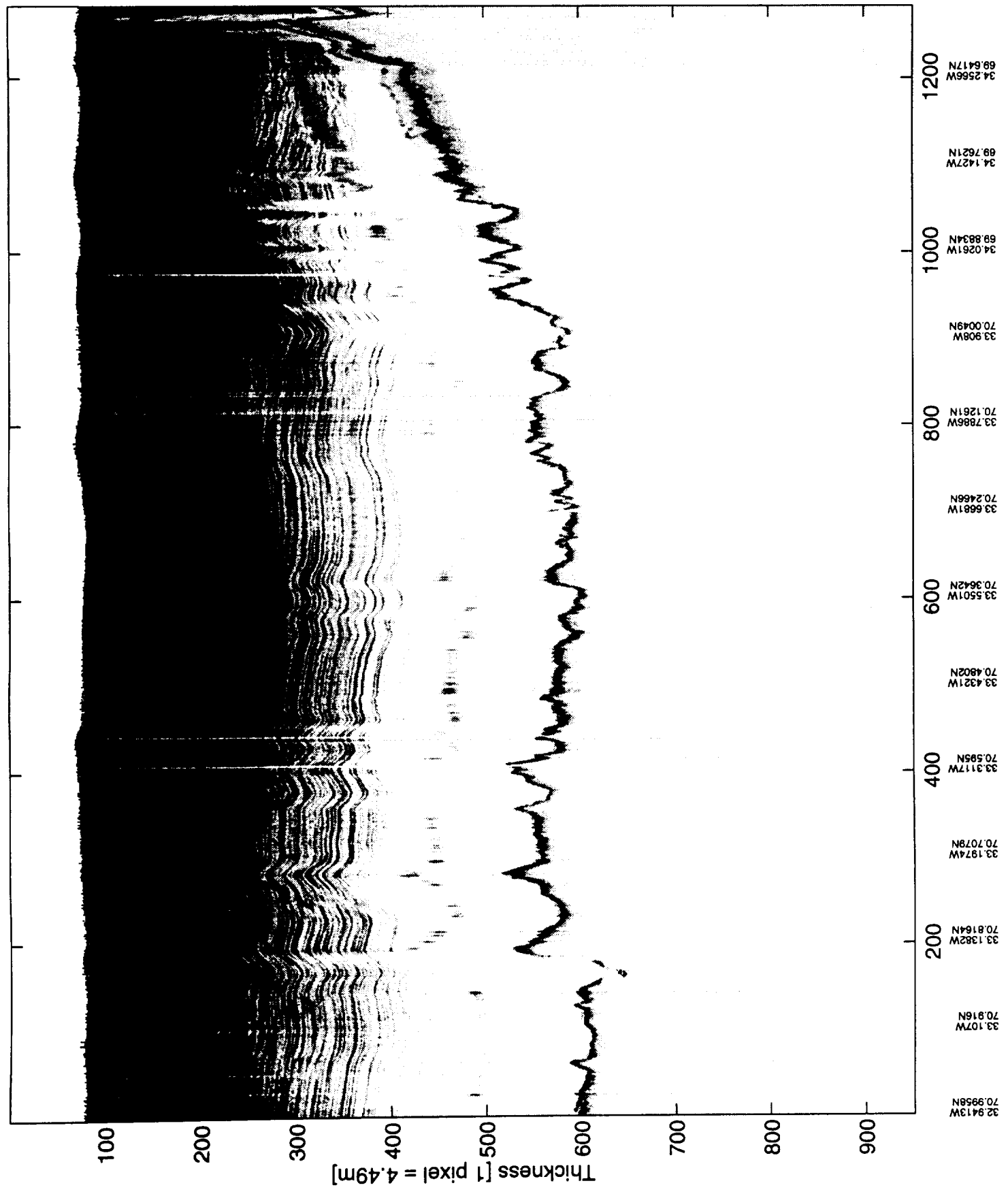
r_7_3.1 (5) [4000-5000]



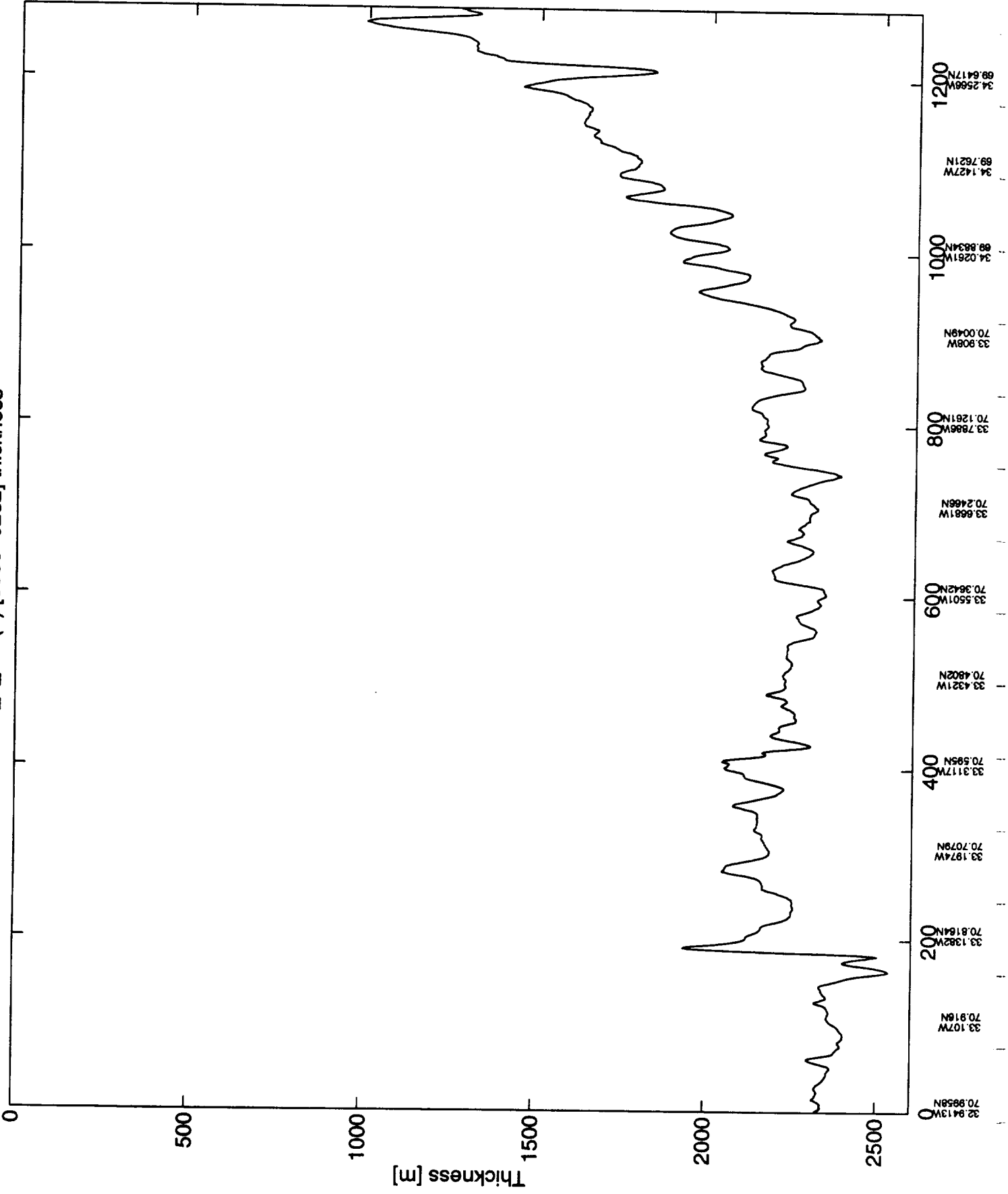
r_7_3.1 (5) [4000-5000] thickness



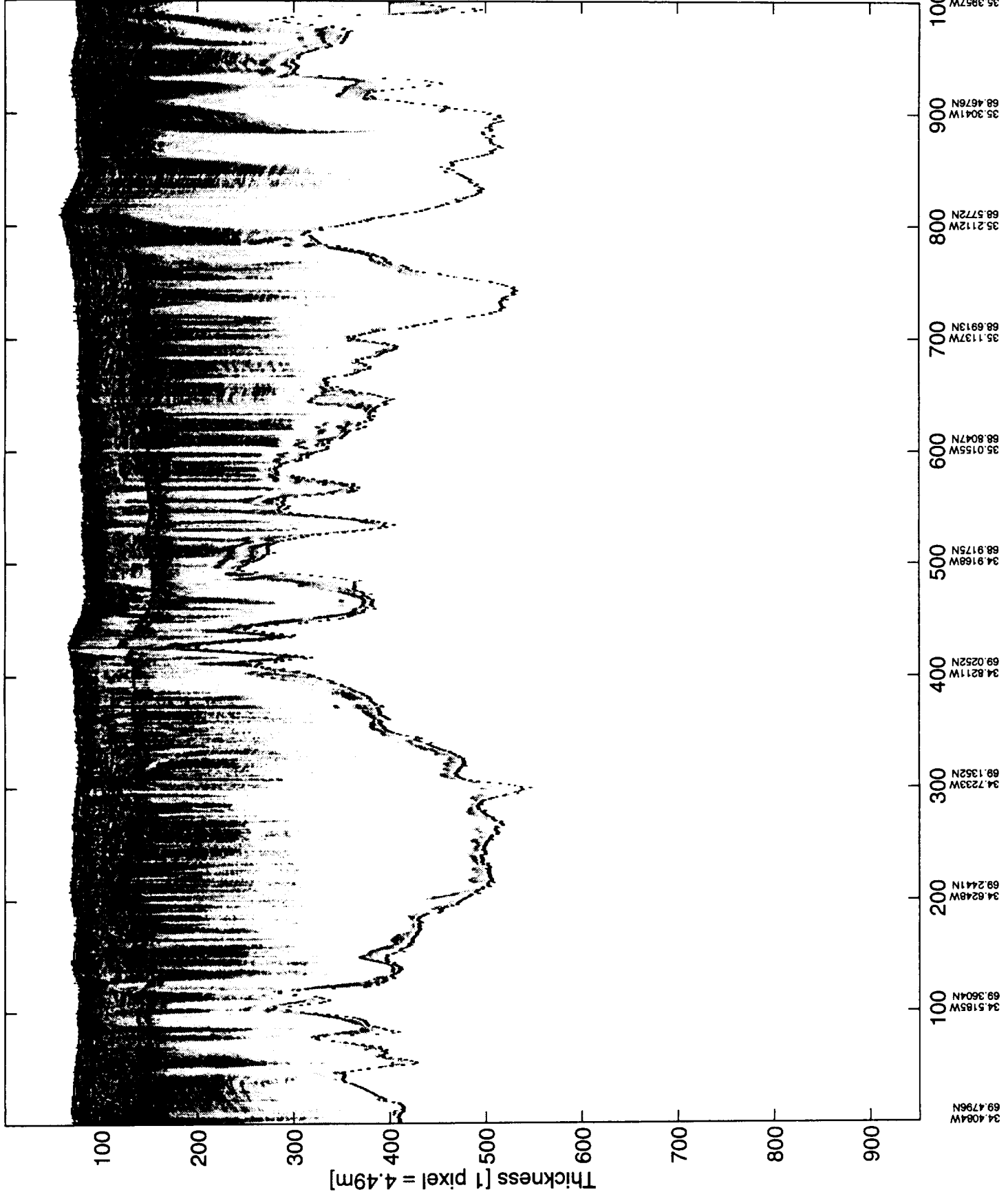
r_7_3.1 (6) [5000-6282]



r_7_3.1 (6) [5000-6282] thickness

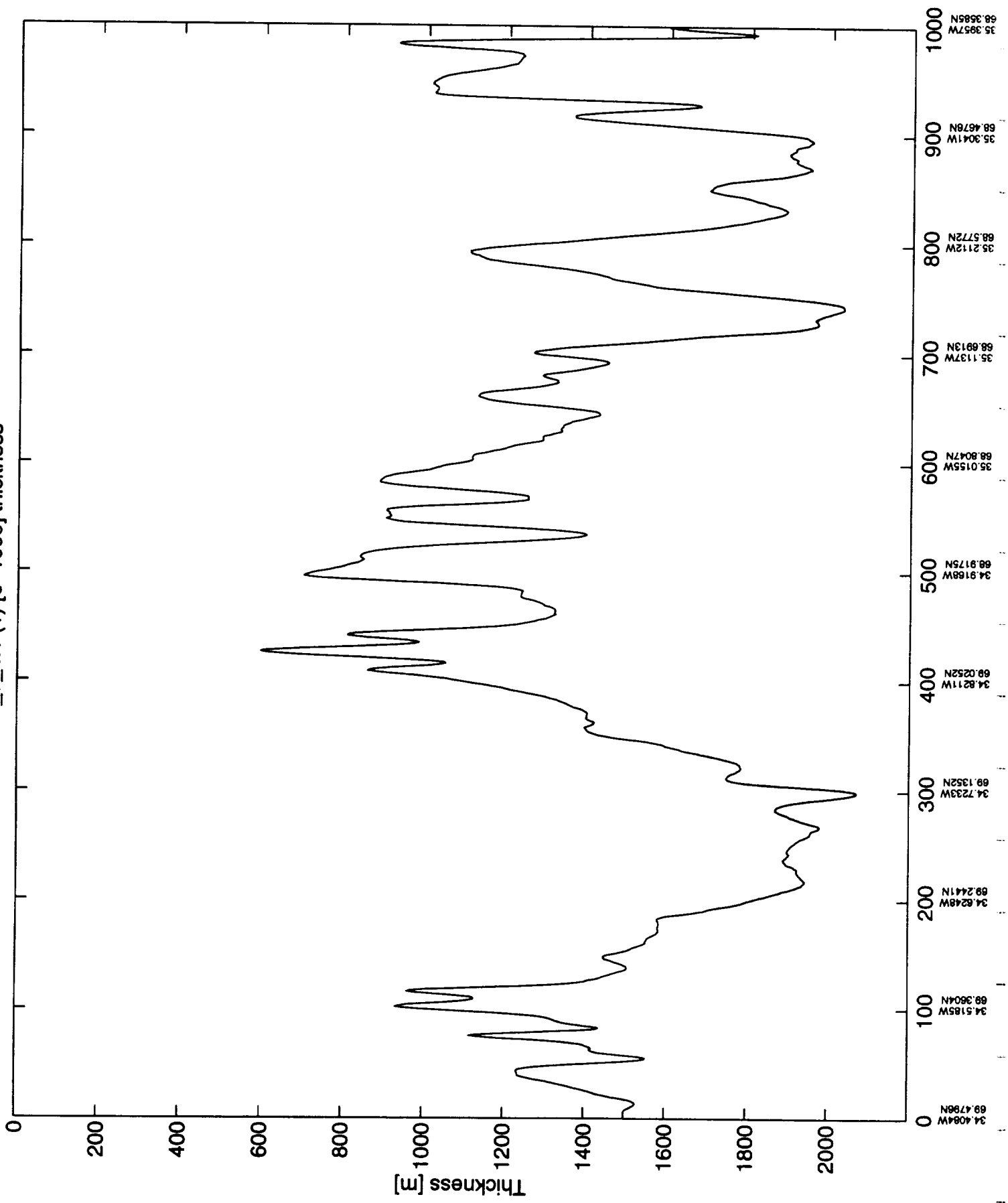


r_7_4.1 (1) [0-1000]

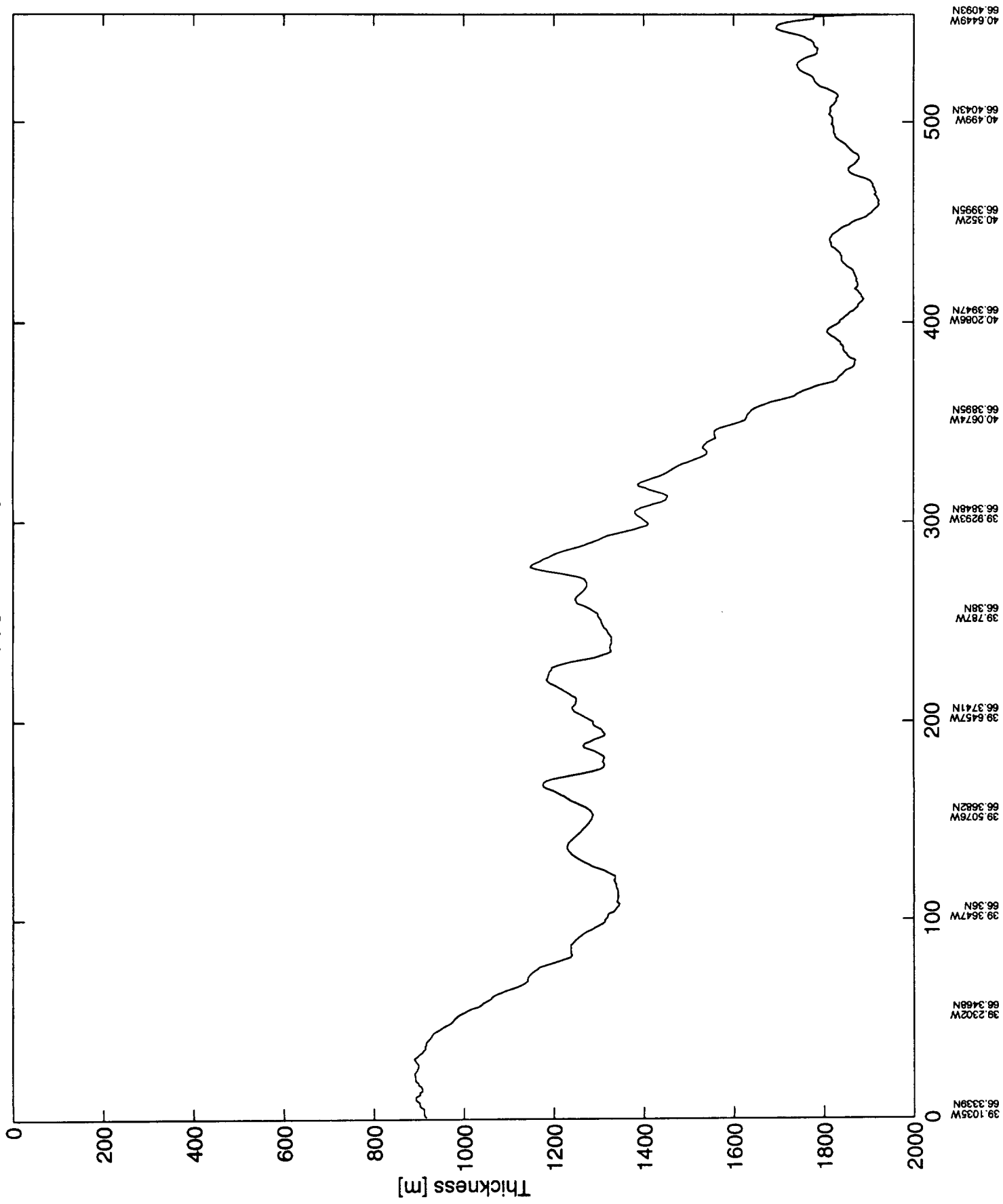


69.4084W
69.4796N
34.5185W
69.3604N
34.6248W
69.2441N
34.7233W
69.1352N
34.8211W
69.0252N
34.9168W
68.9175N
35.0155W
68.8047N
35.1137W
68.6913N
35.2122W
68.5772N
35.3041W
68.4676N
35.3957W
68.3585N

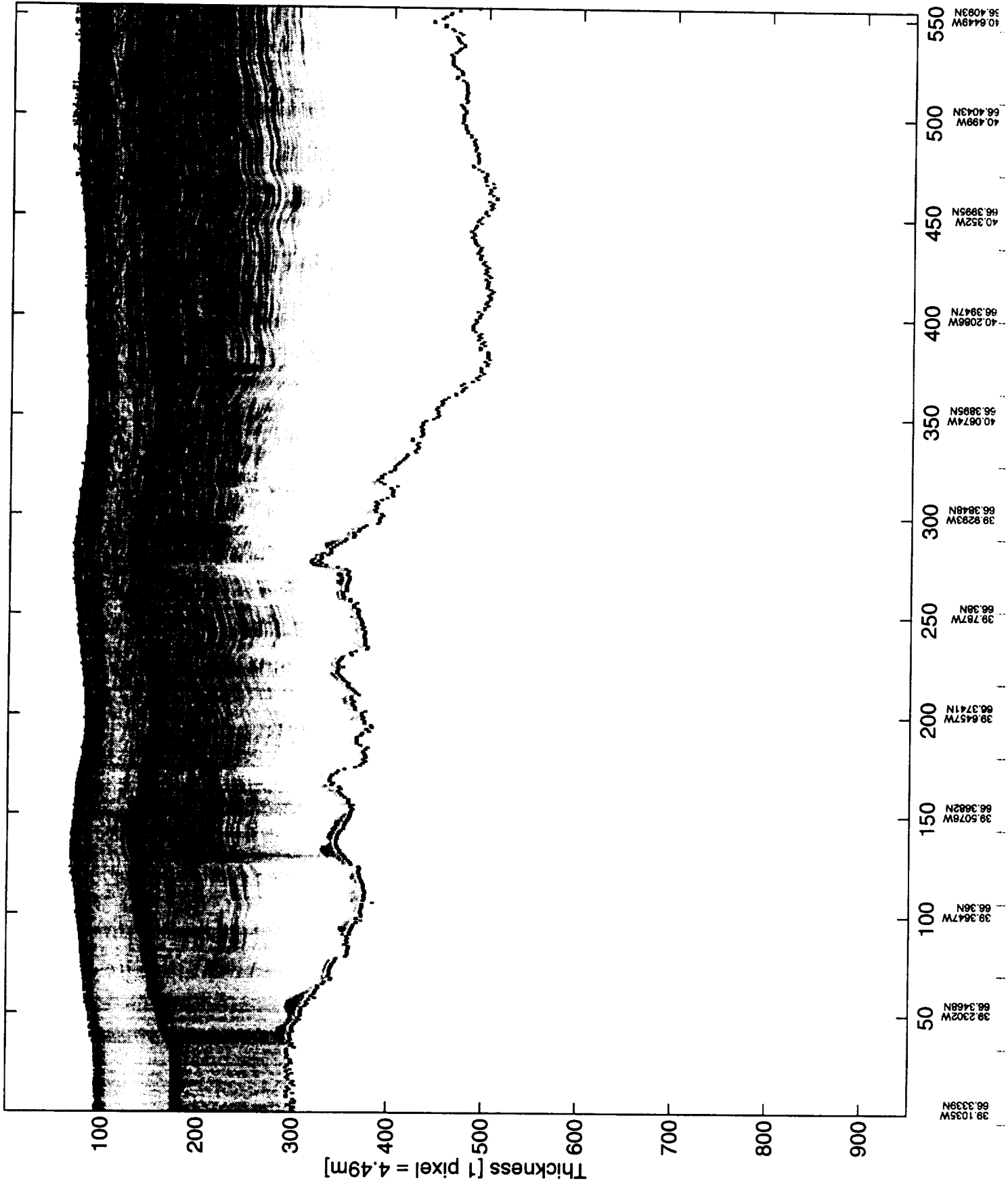
r_7_4.1 (1) [0-1000] thickness



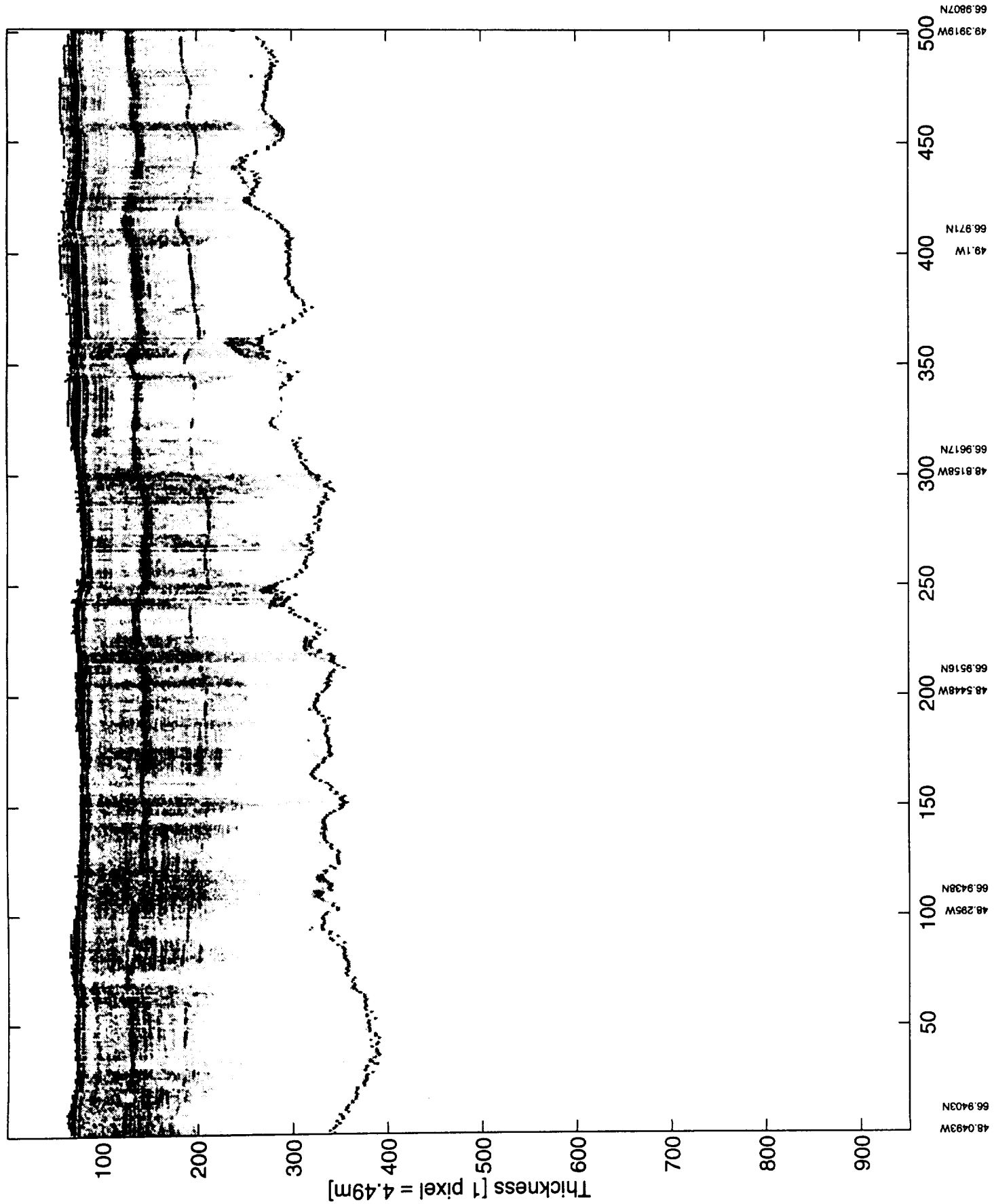
r_7_4.1 (4) [3200-3754] thickness



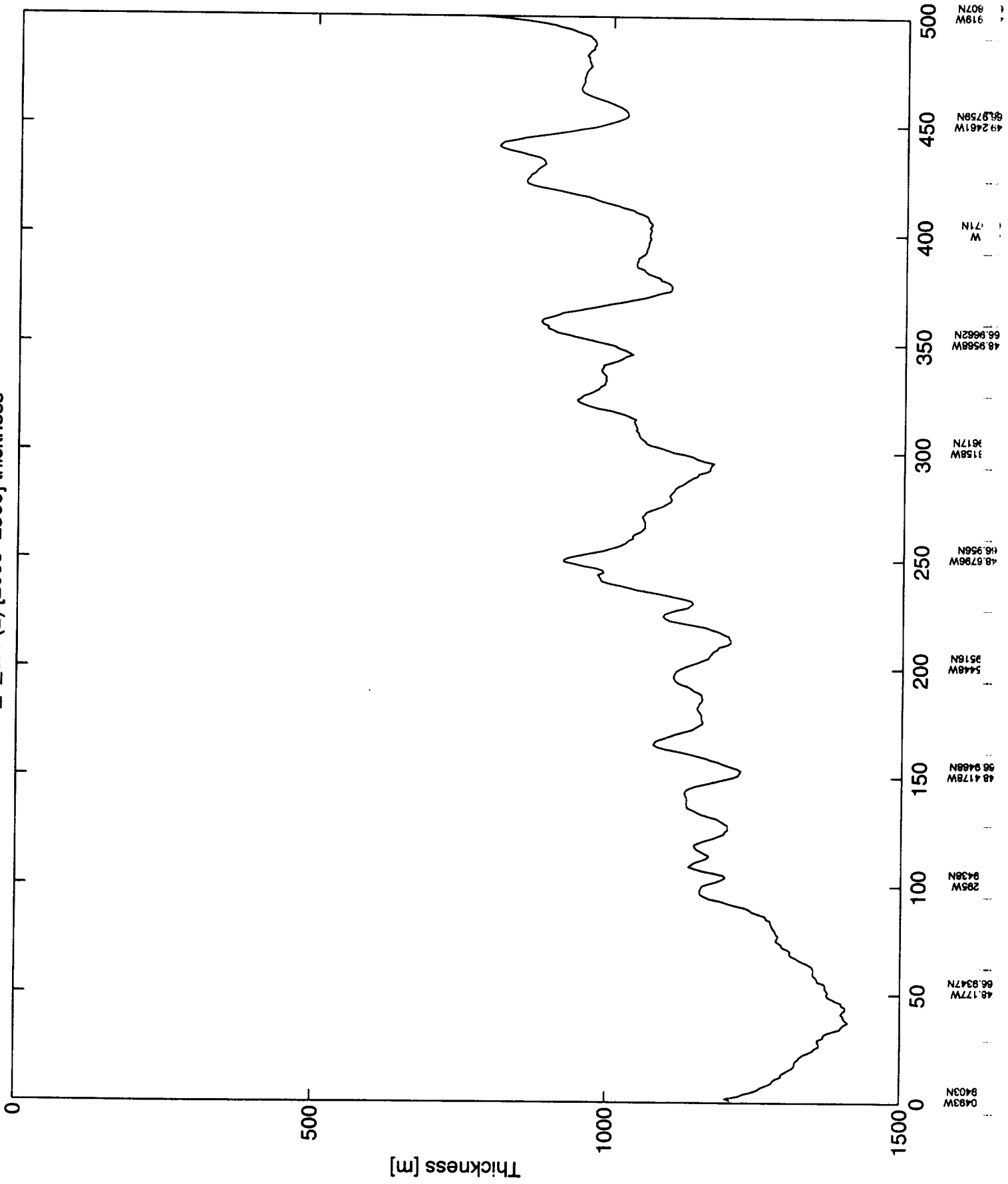
r_7_4.1 (4) [3200-3754]



r_7_8.1 (2) [2000 2500]

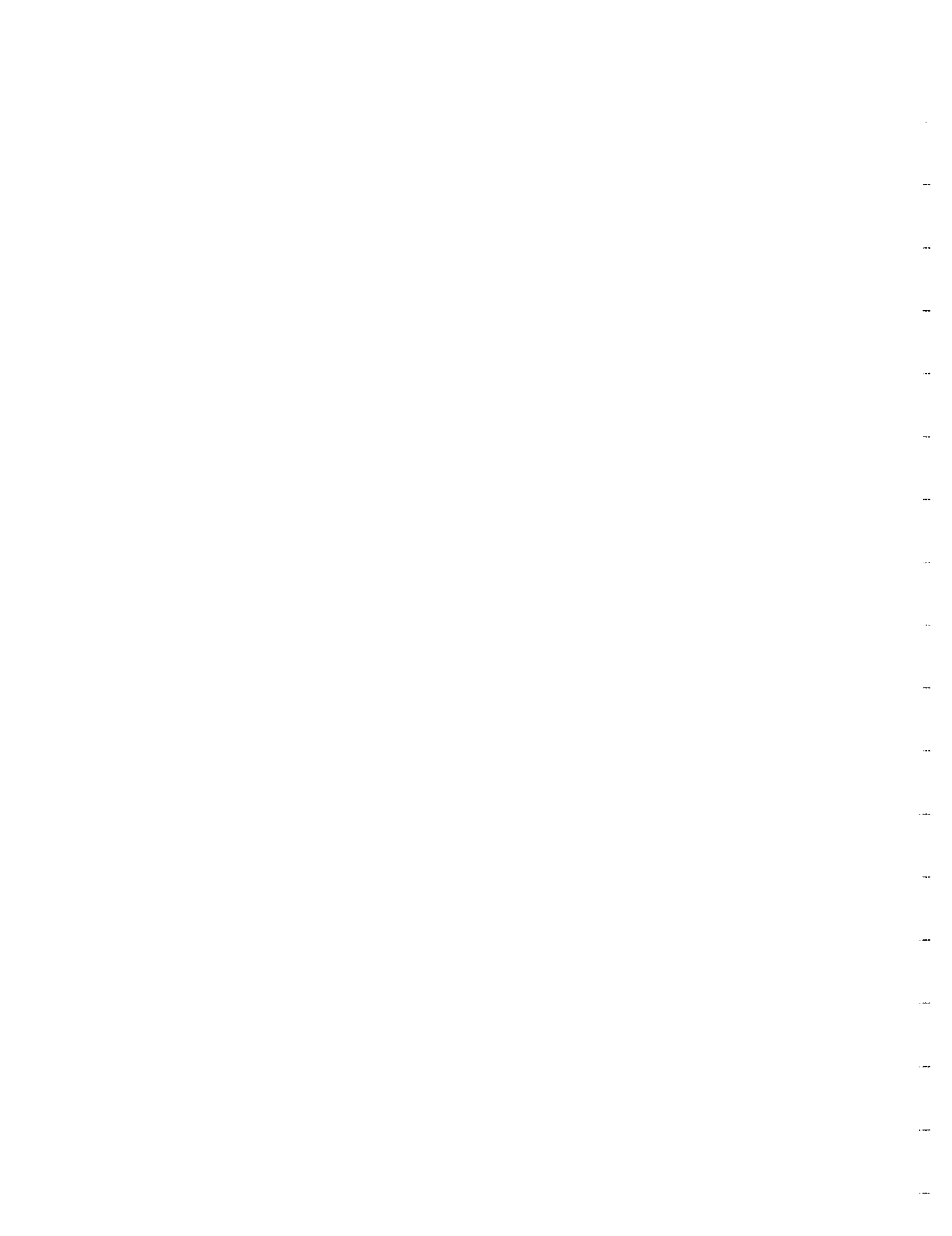


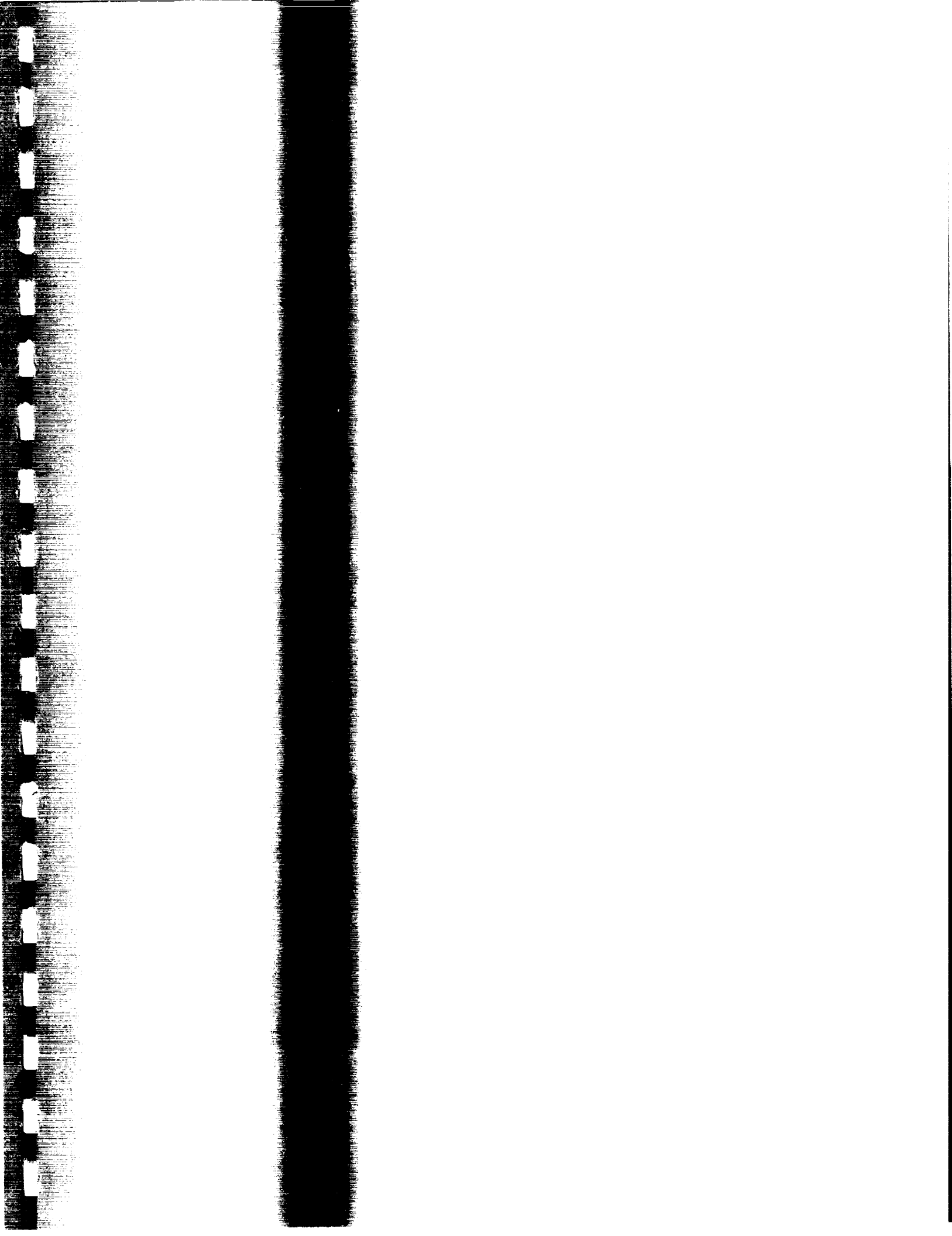
r_7_8.1 (2) [2000-2500] thickness

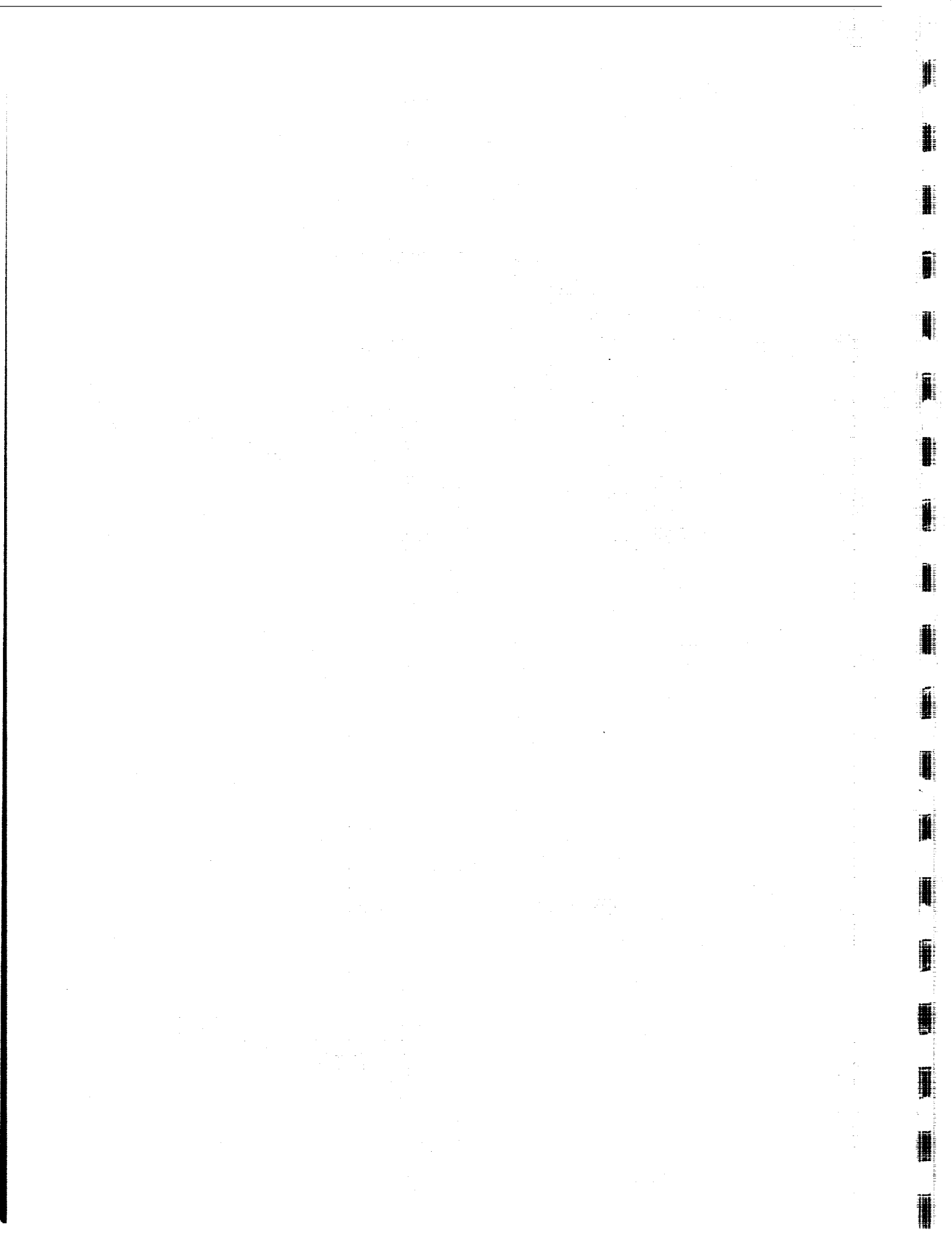


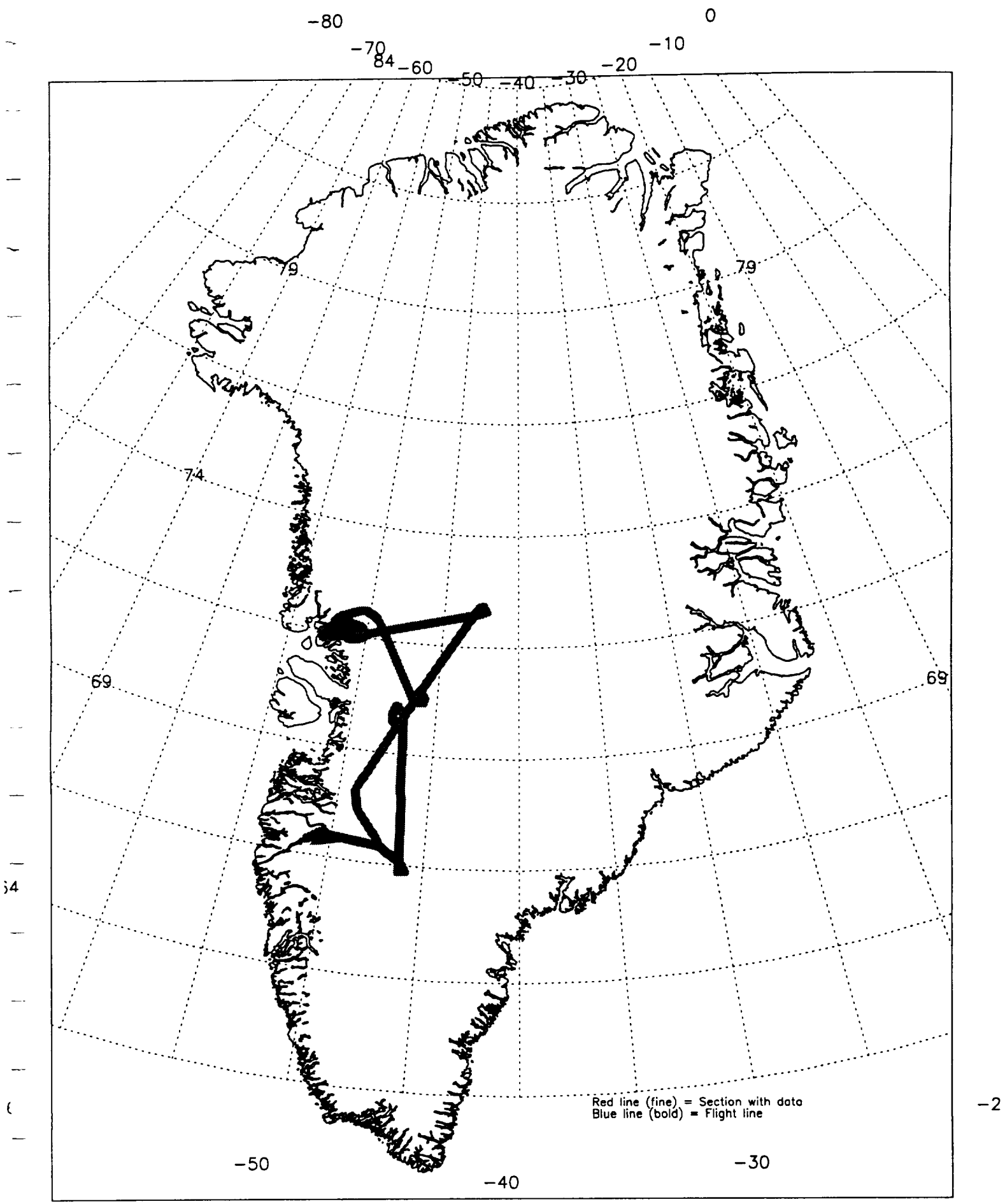
Appendix C

June 27, 1993

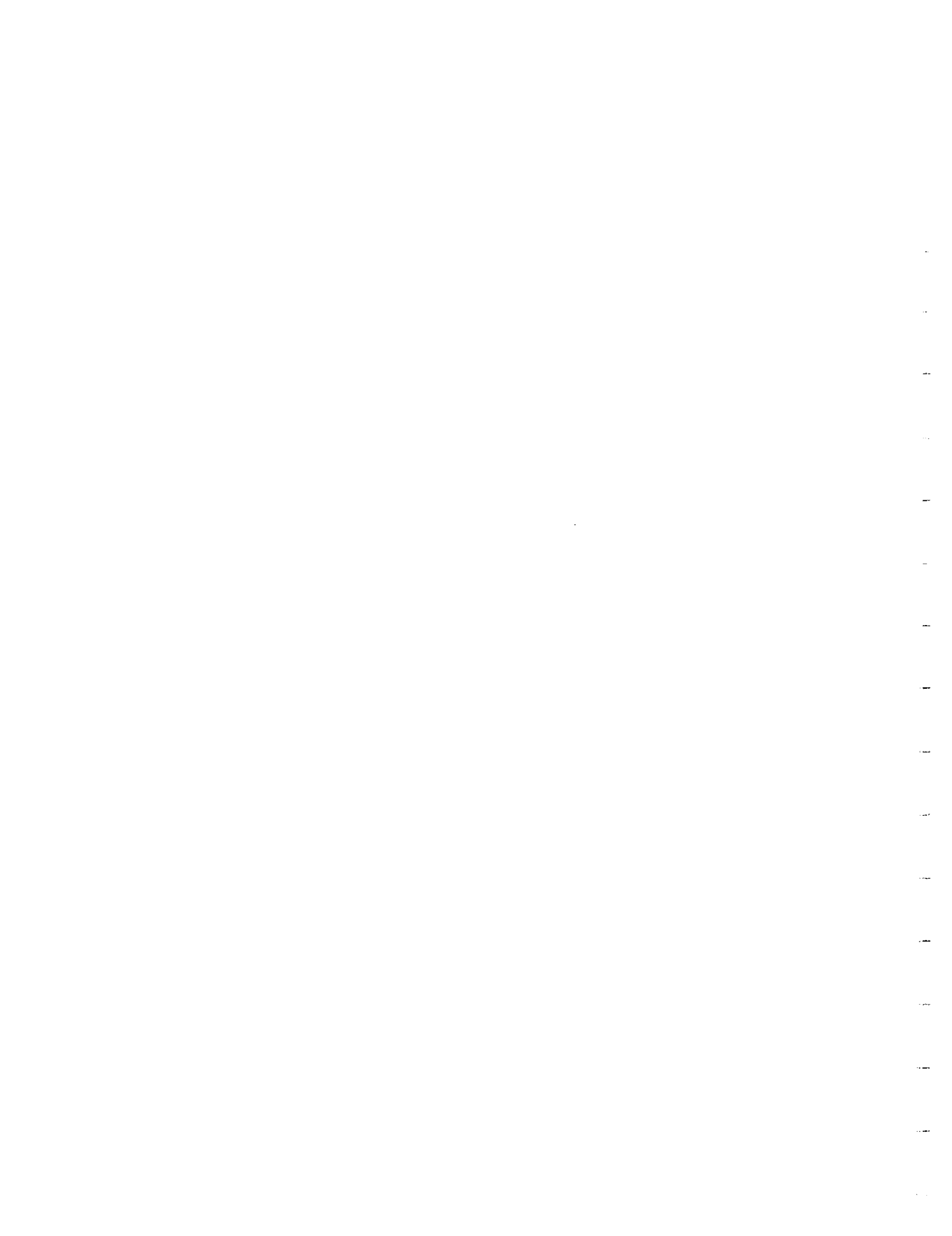


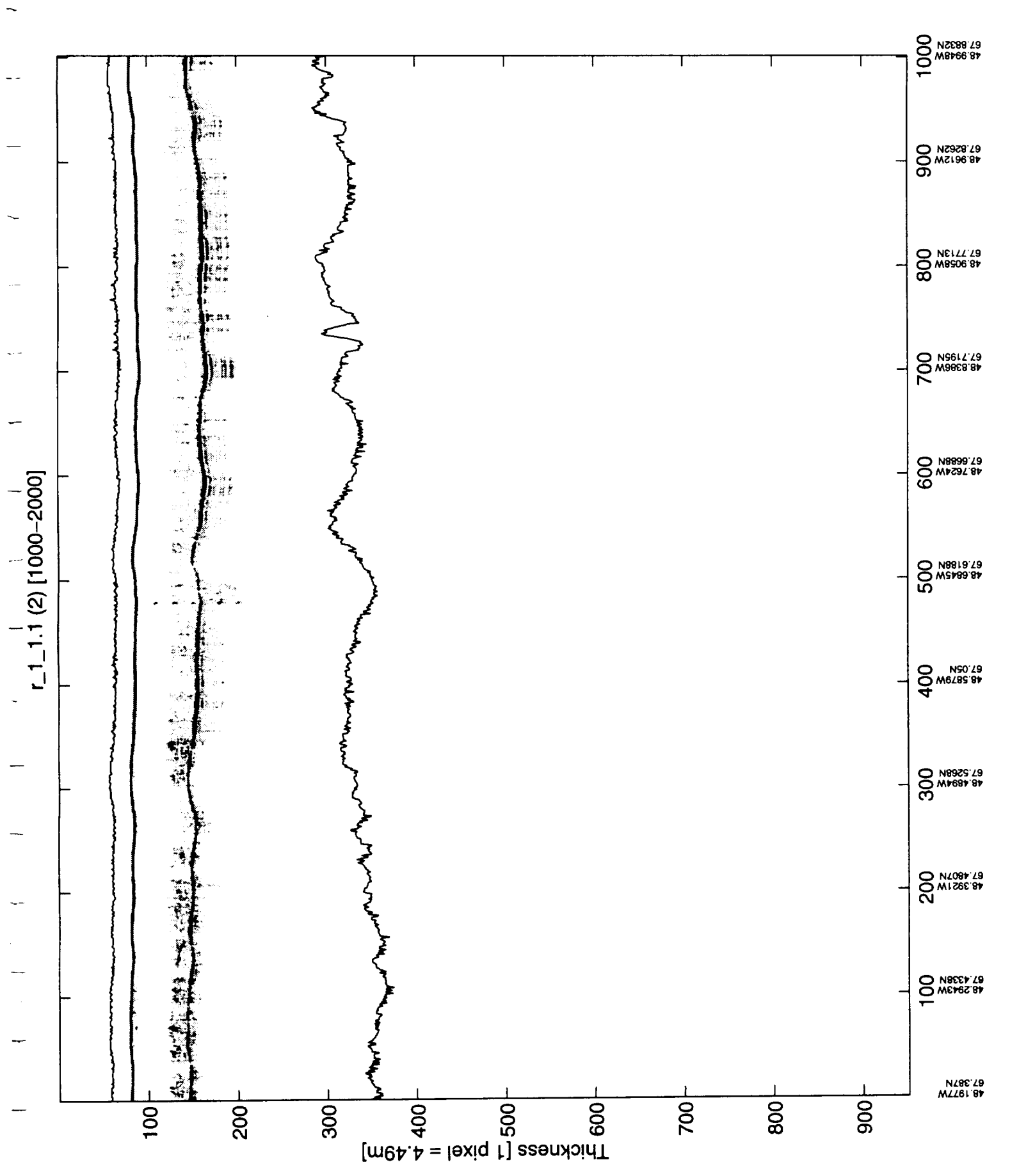




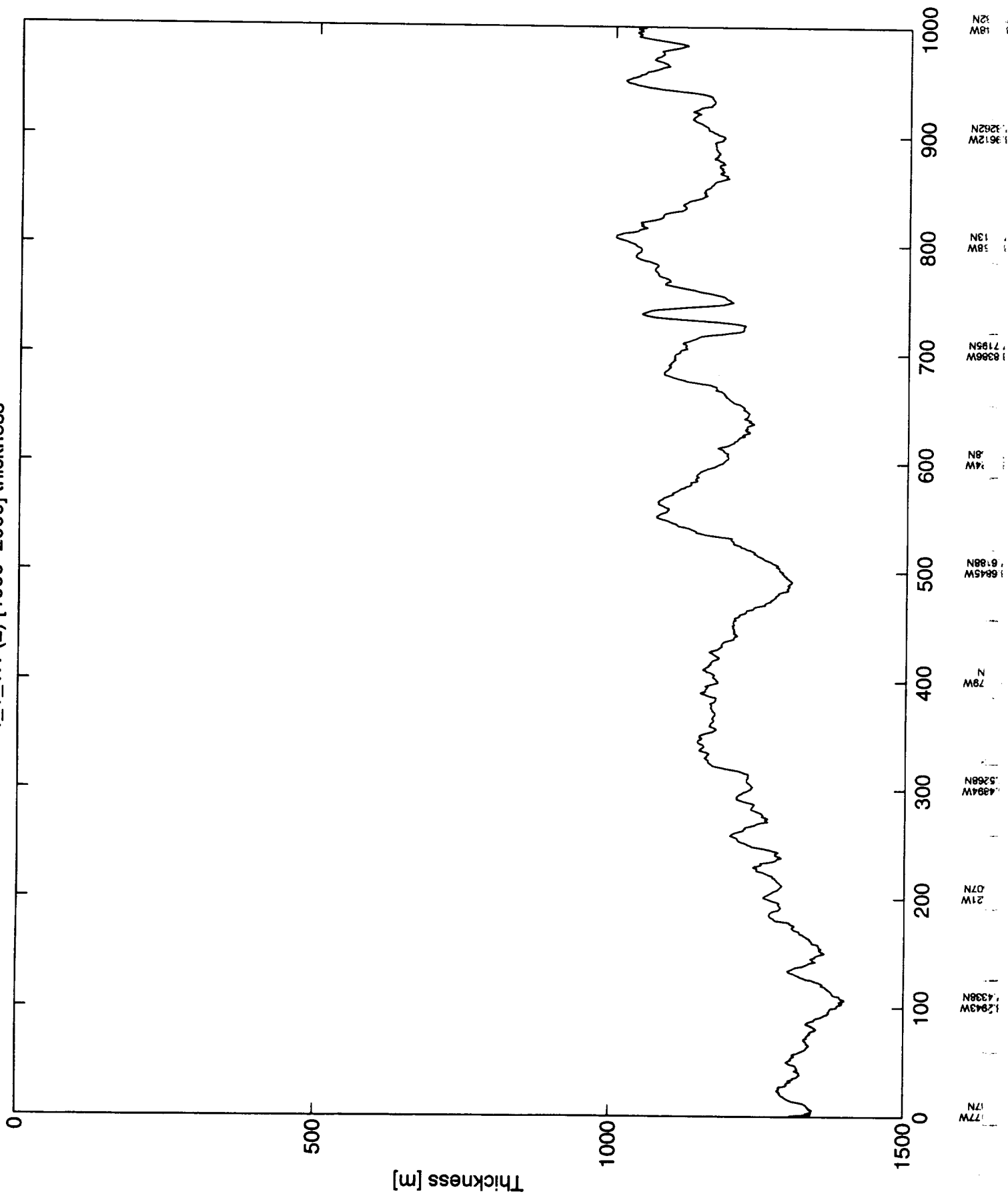


June 27, 1993 (r_1)

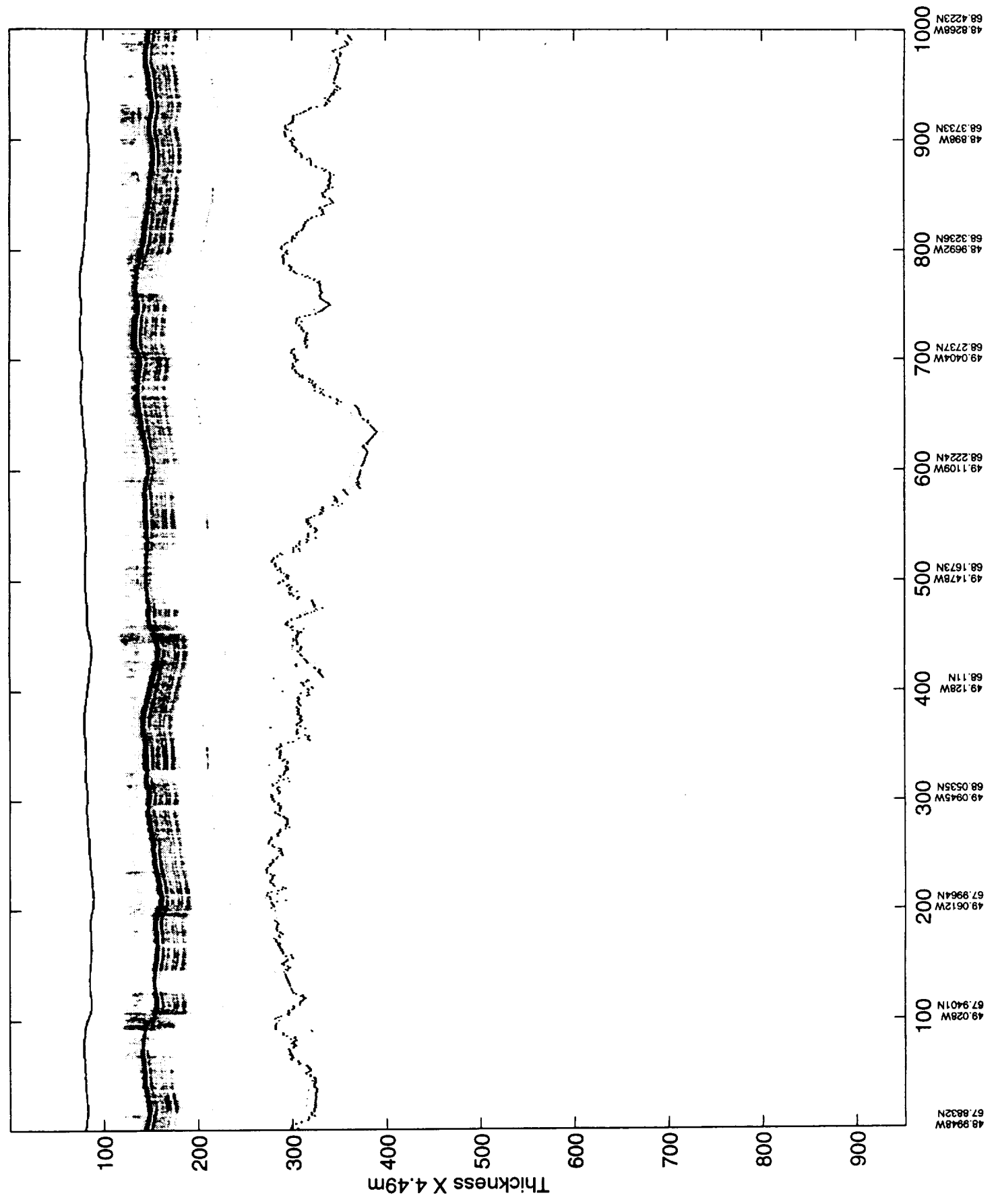




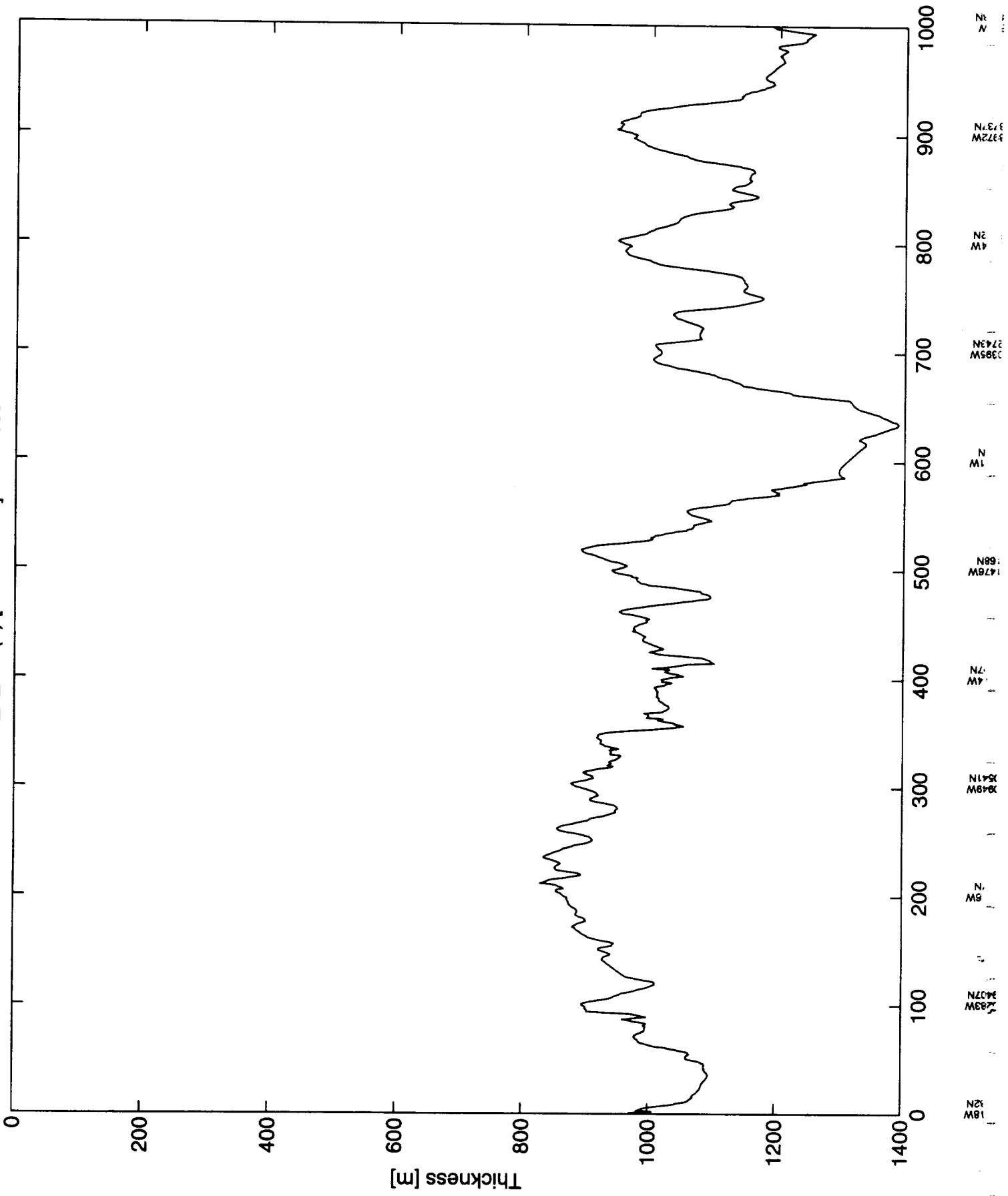
r_1_1.1 (2) [1000-2000] thickness



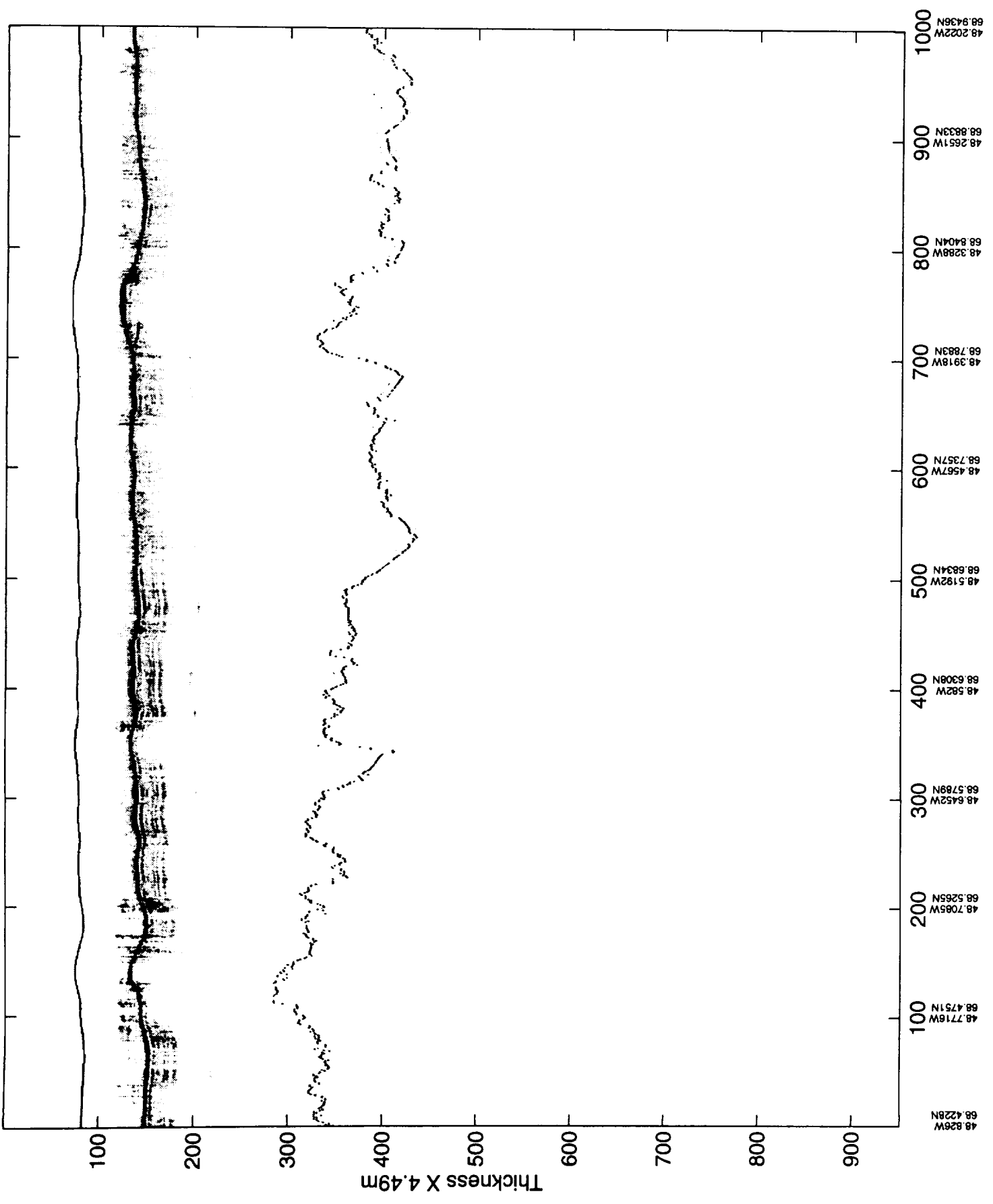
r_1_1.15 [2000-3000]



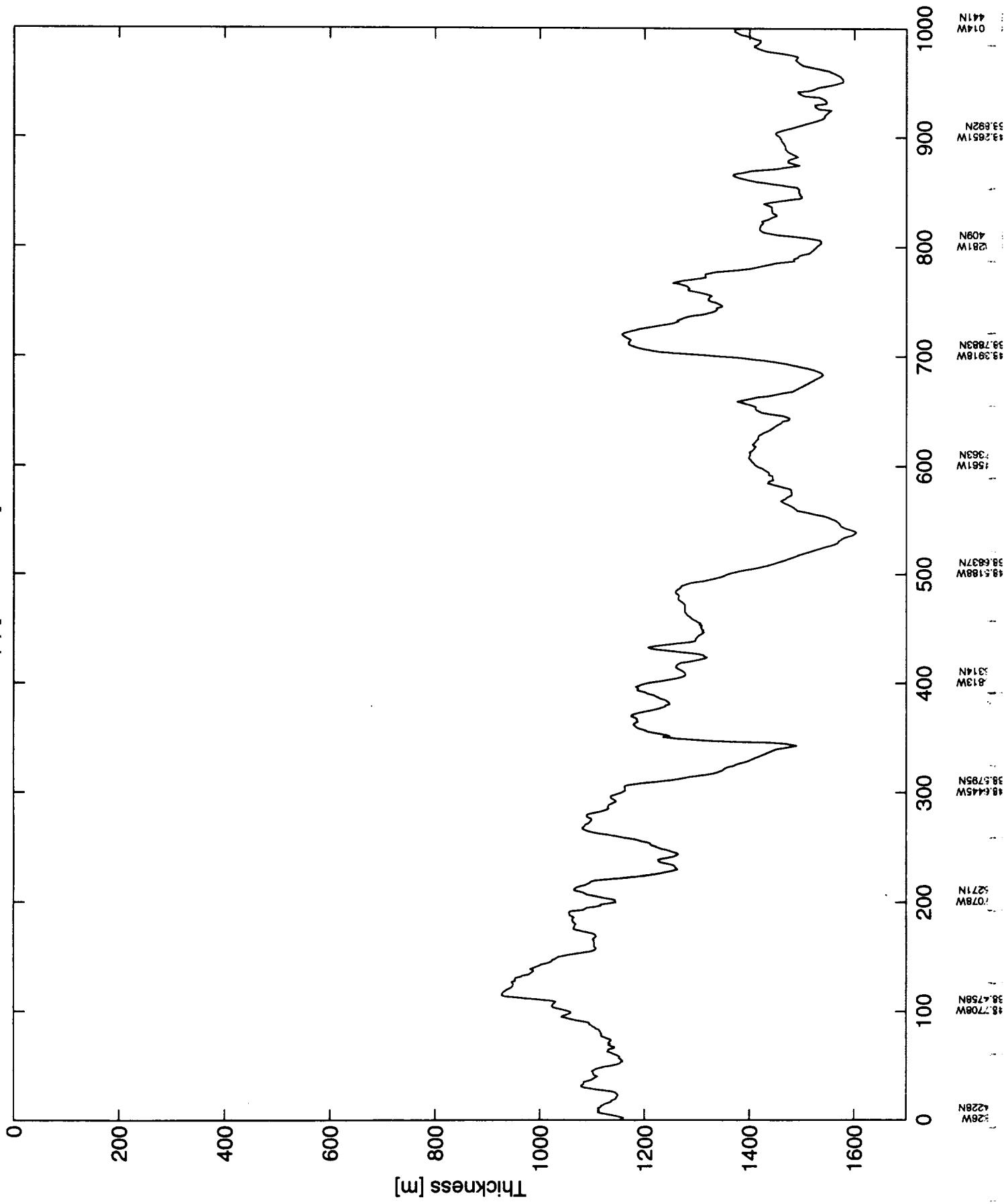
r_1_1.1 (3) [2000-3000] thickness



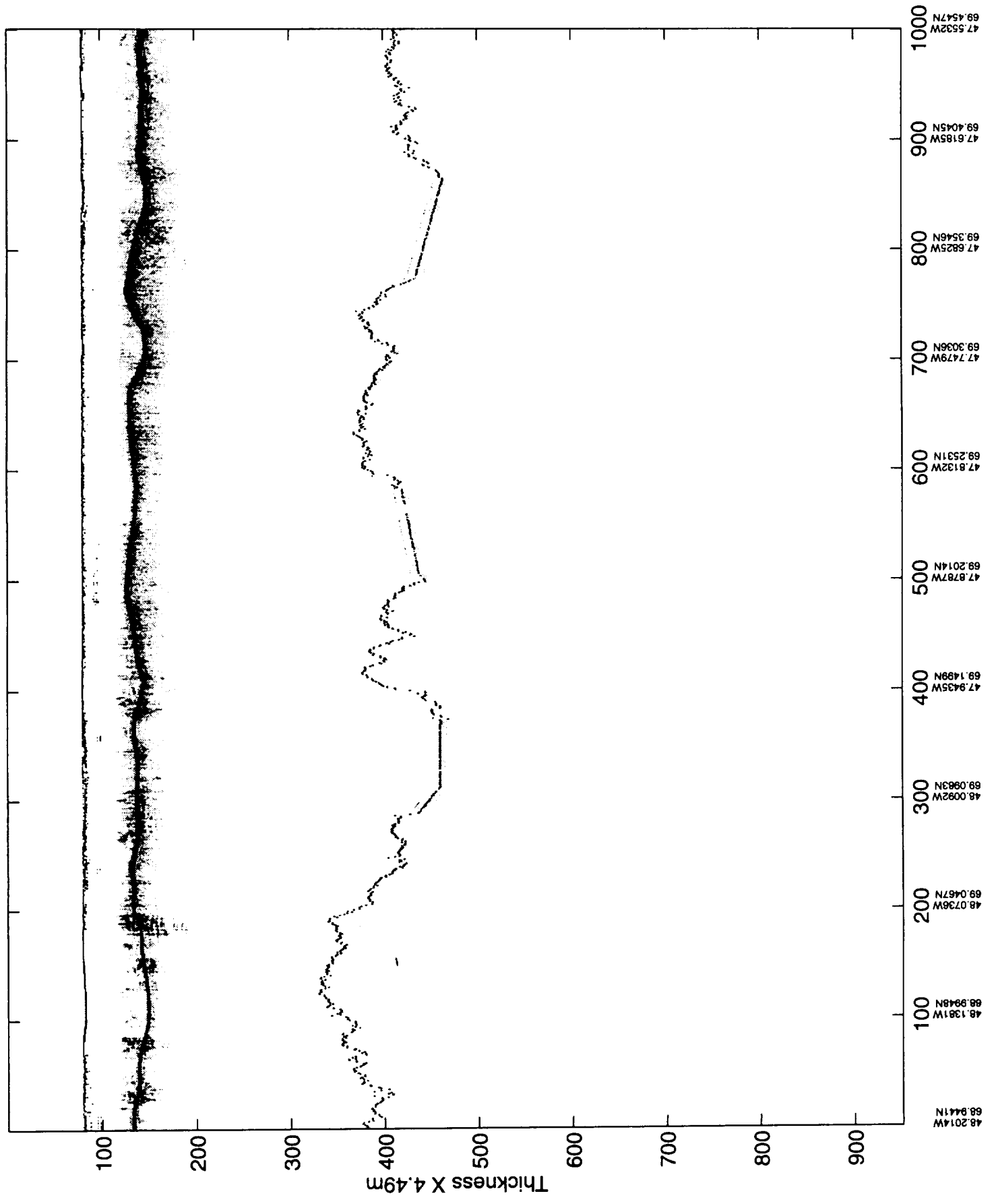
r_1|_1.14 [3000-4000]



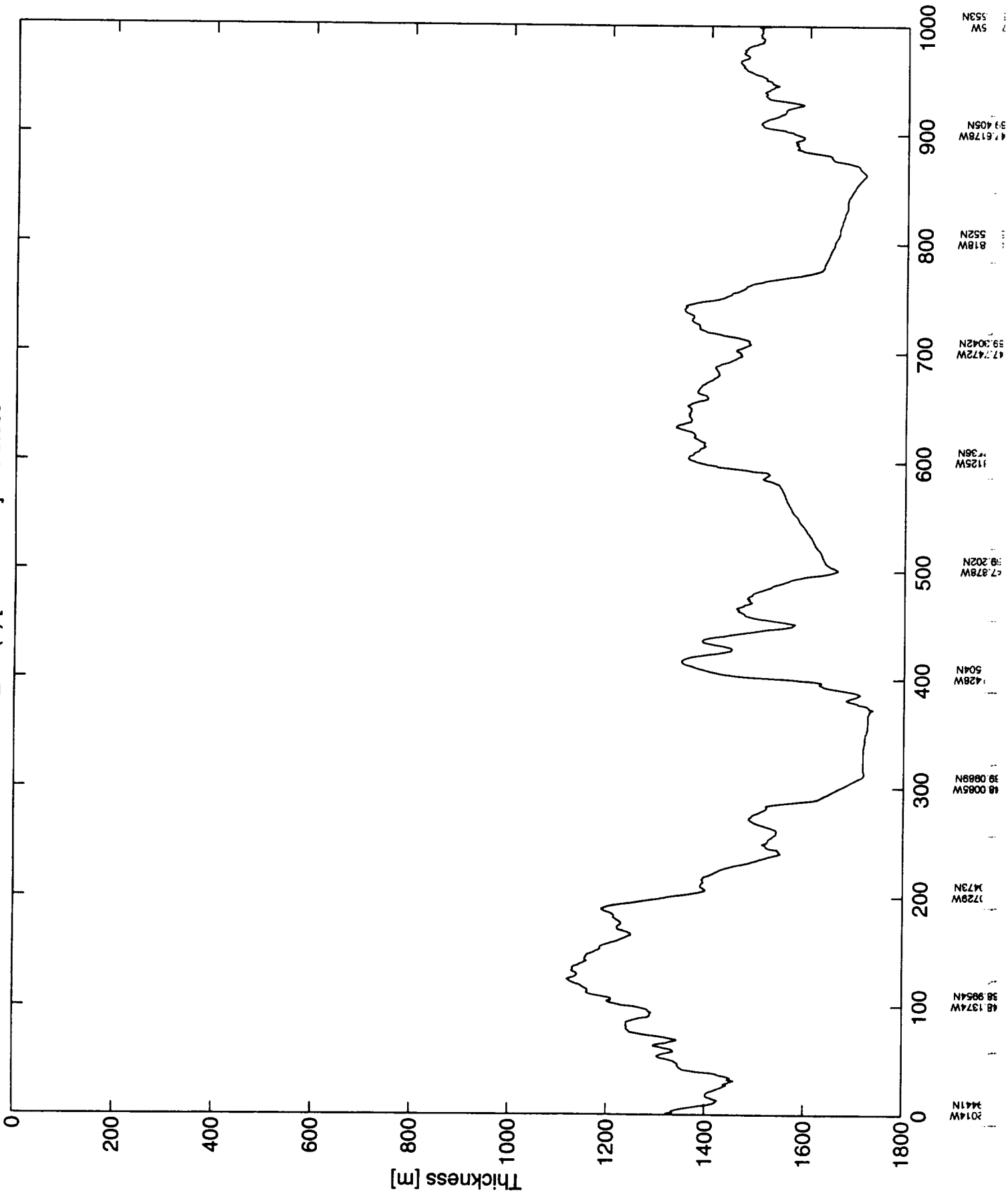
r_1_1.1 (4) [3000-4000] thickness



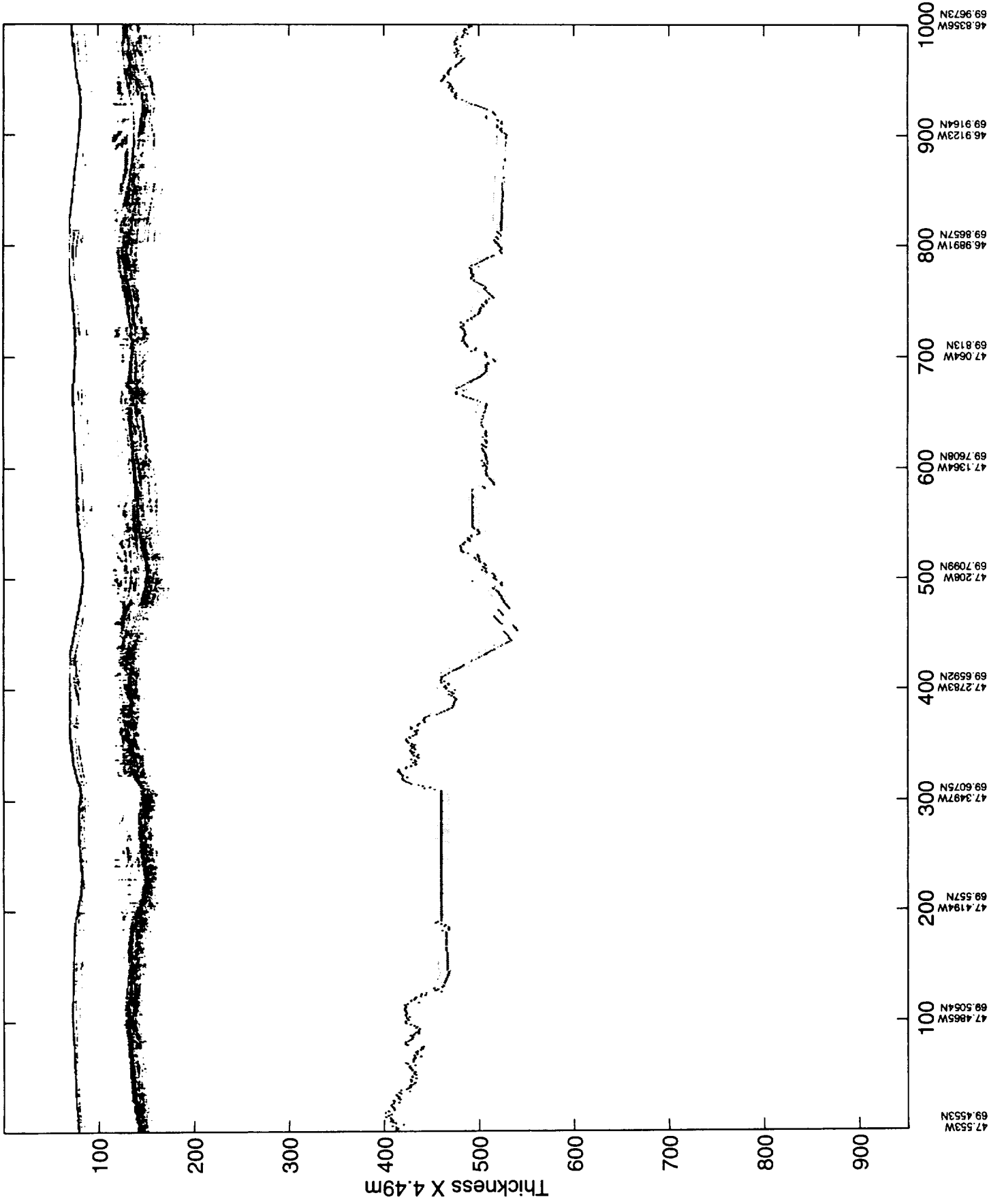
r_1_1.15 [4000-5000]



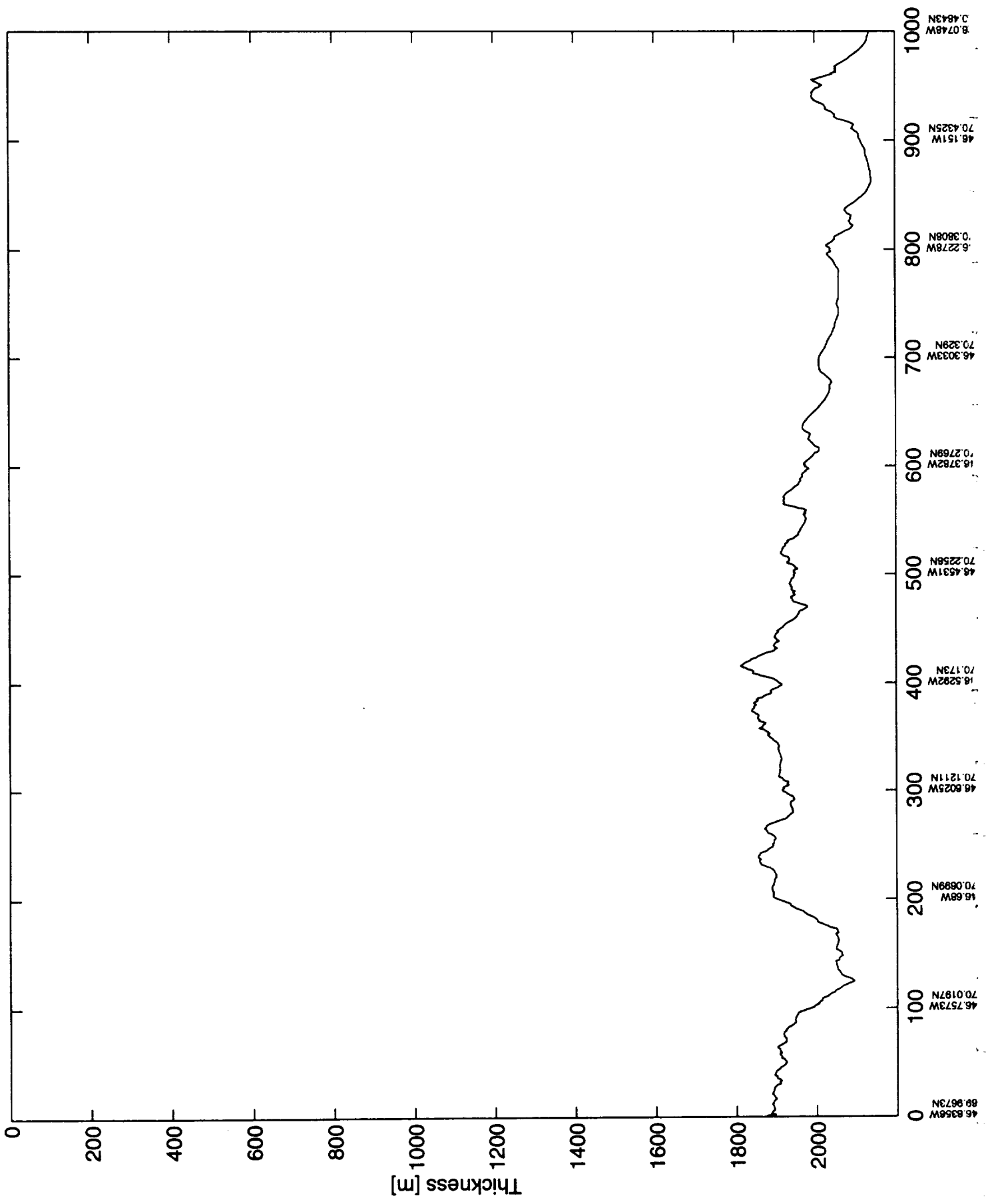
r_1_1.1 (5) [4000-5000] thickness



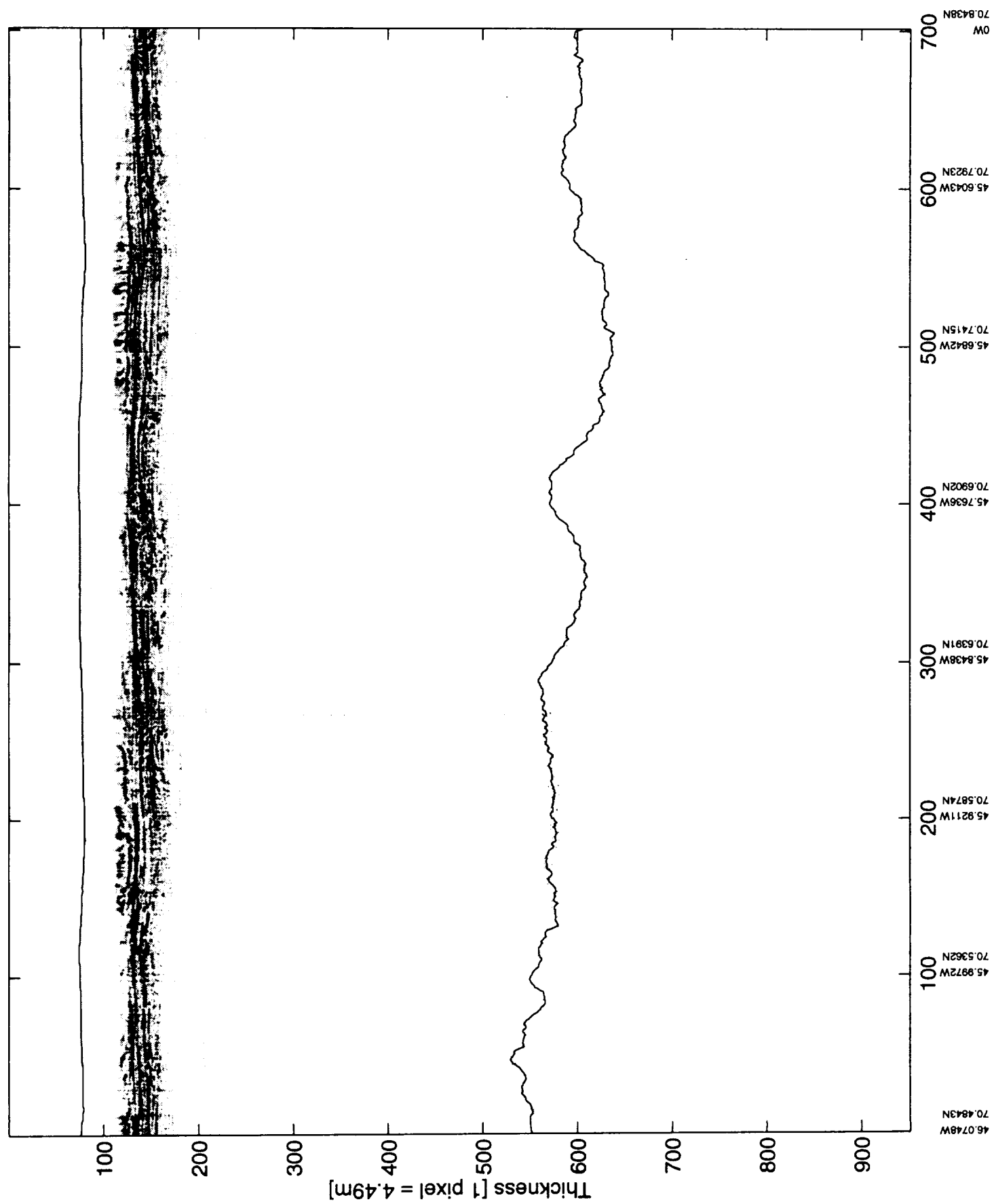
r_1_1.16 [5000-6000]



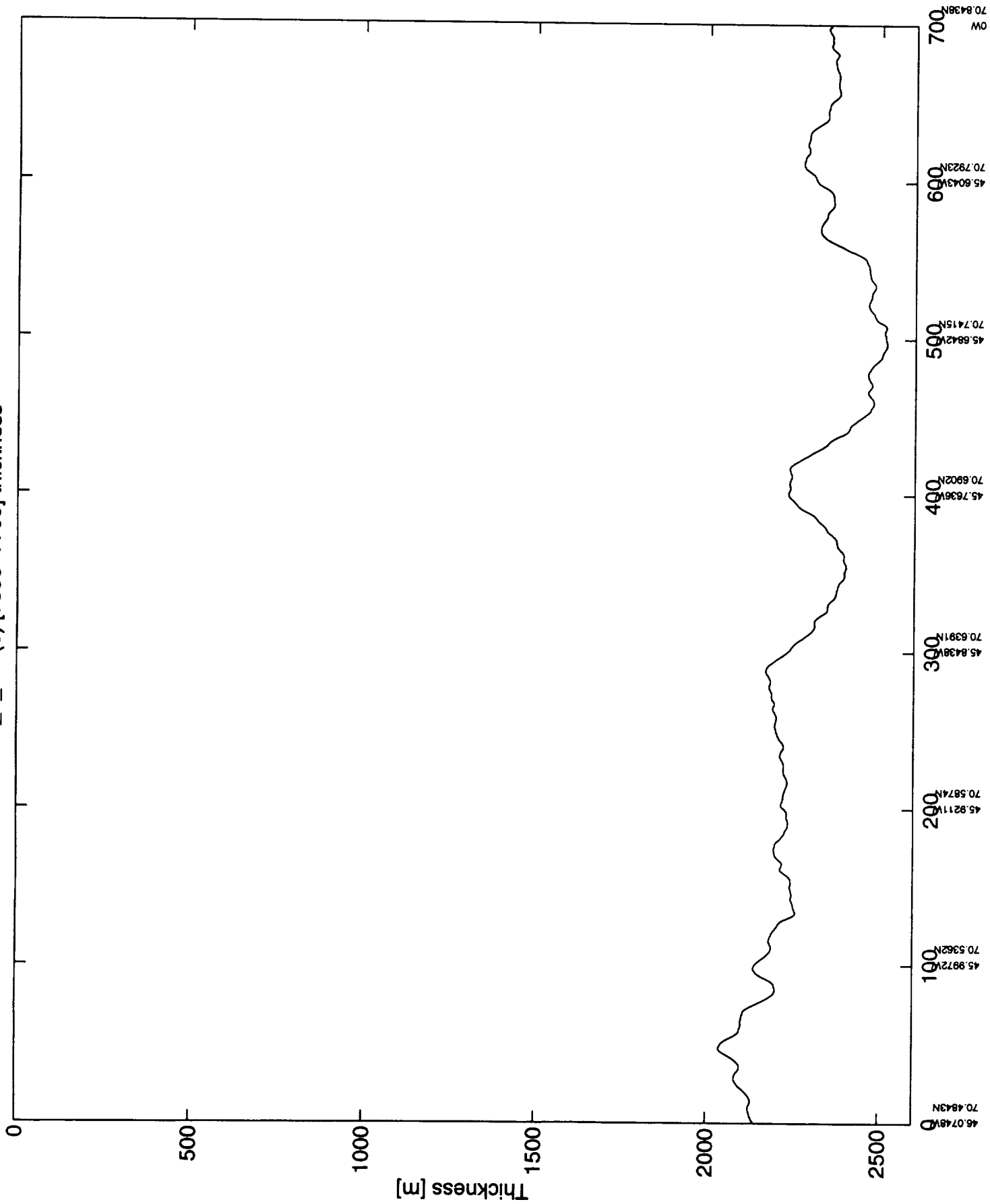
r_1_1.1 (7) [6000-7000] thickness



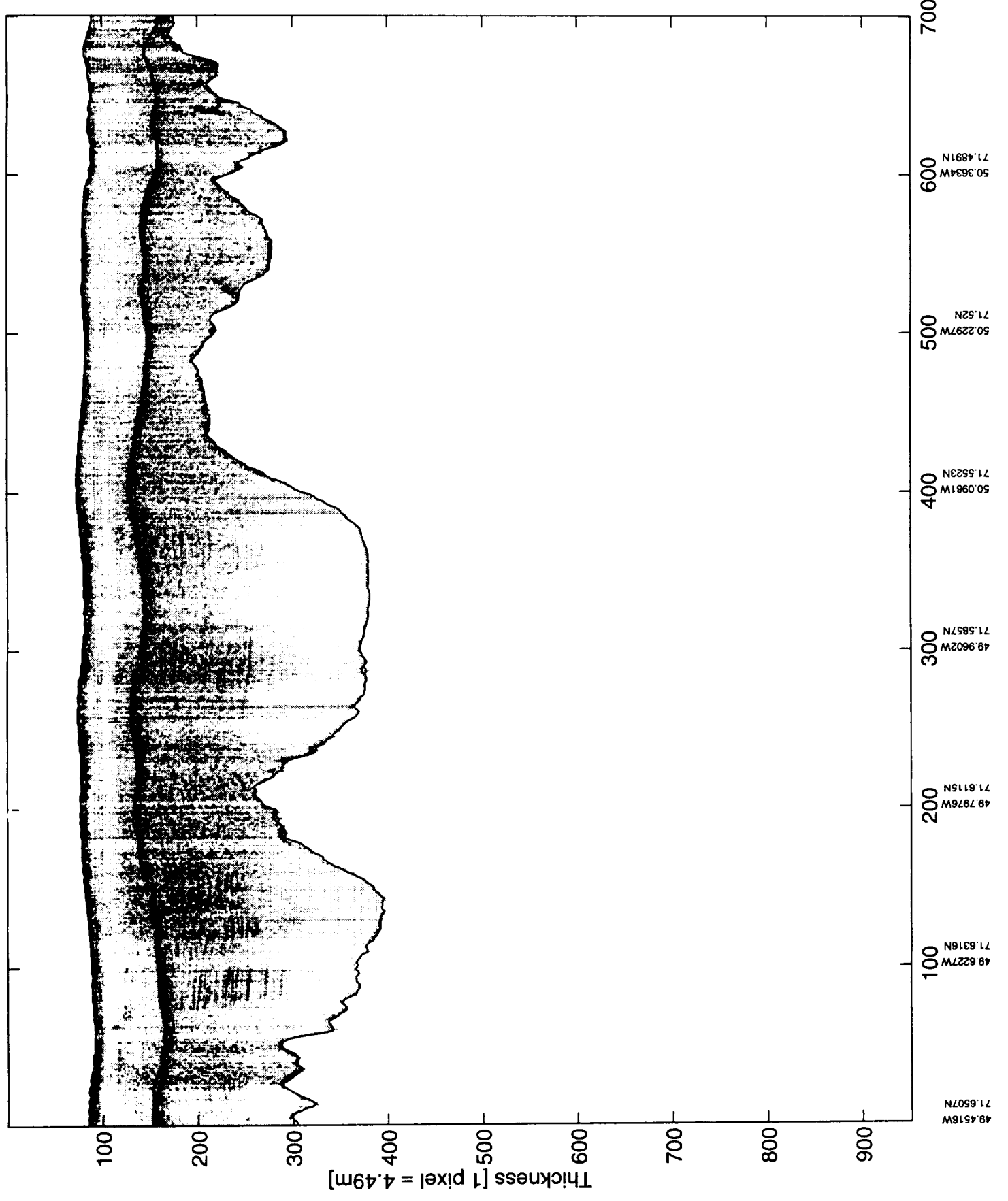
r_1_1.1 (8) [7000-7700]



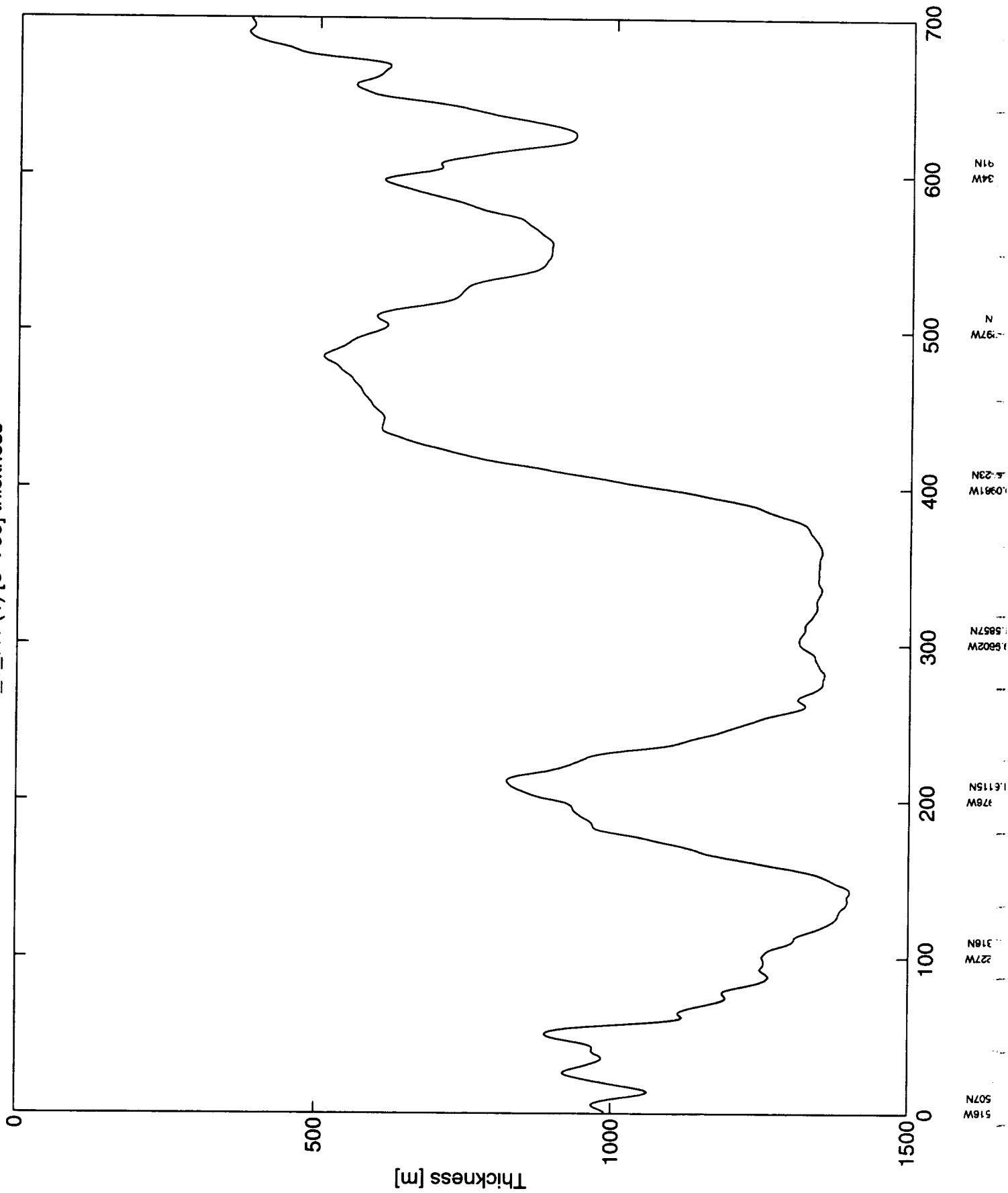
r_1_1.1 (8) [7000-7700] thickness



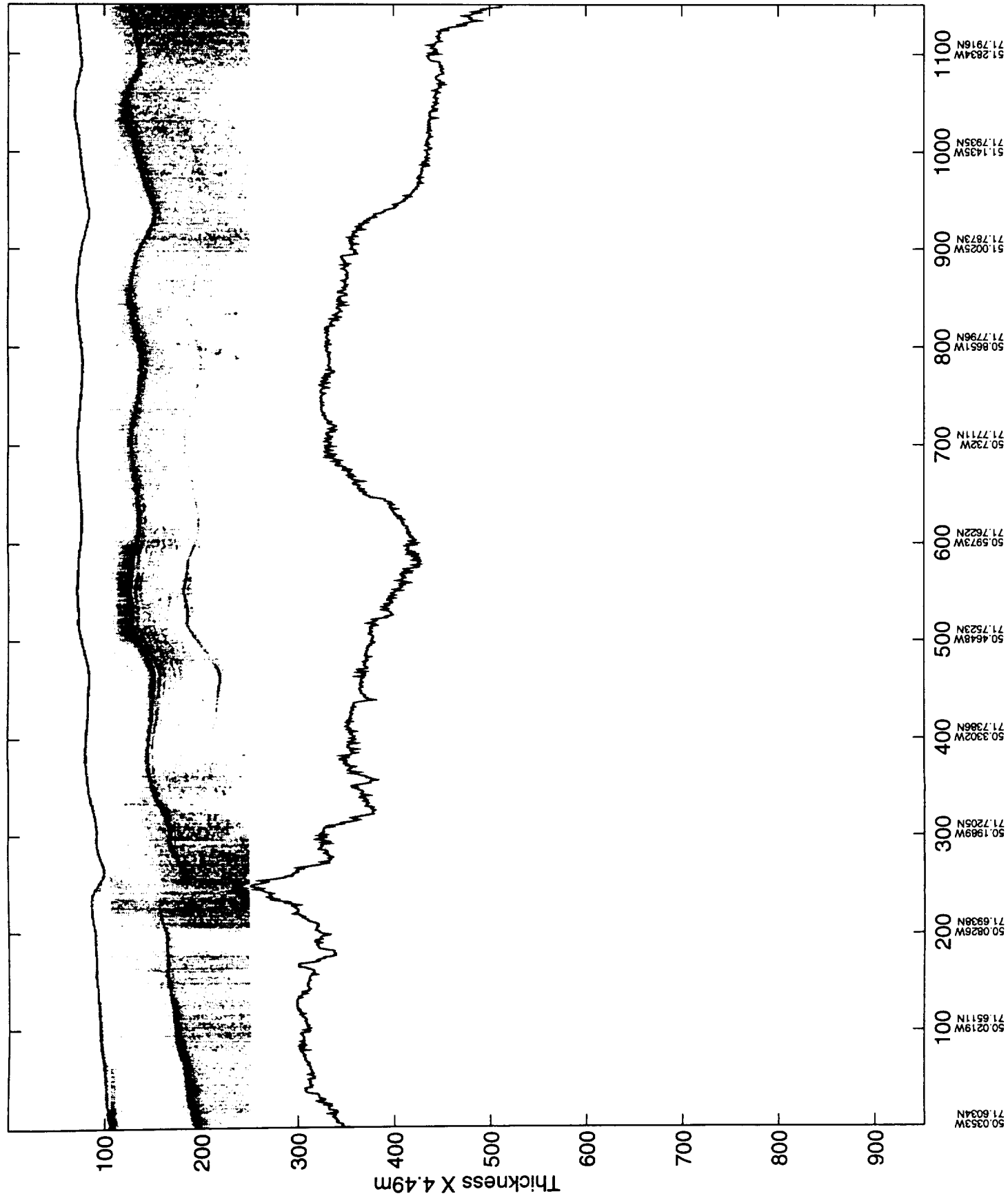
r_1_7.1 (1) [0-700]



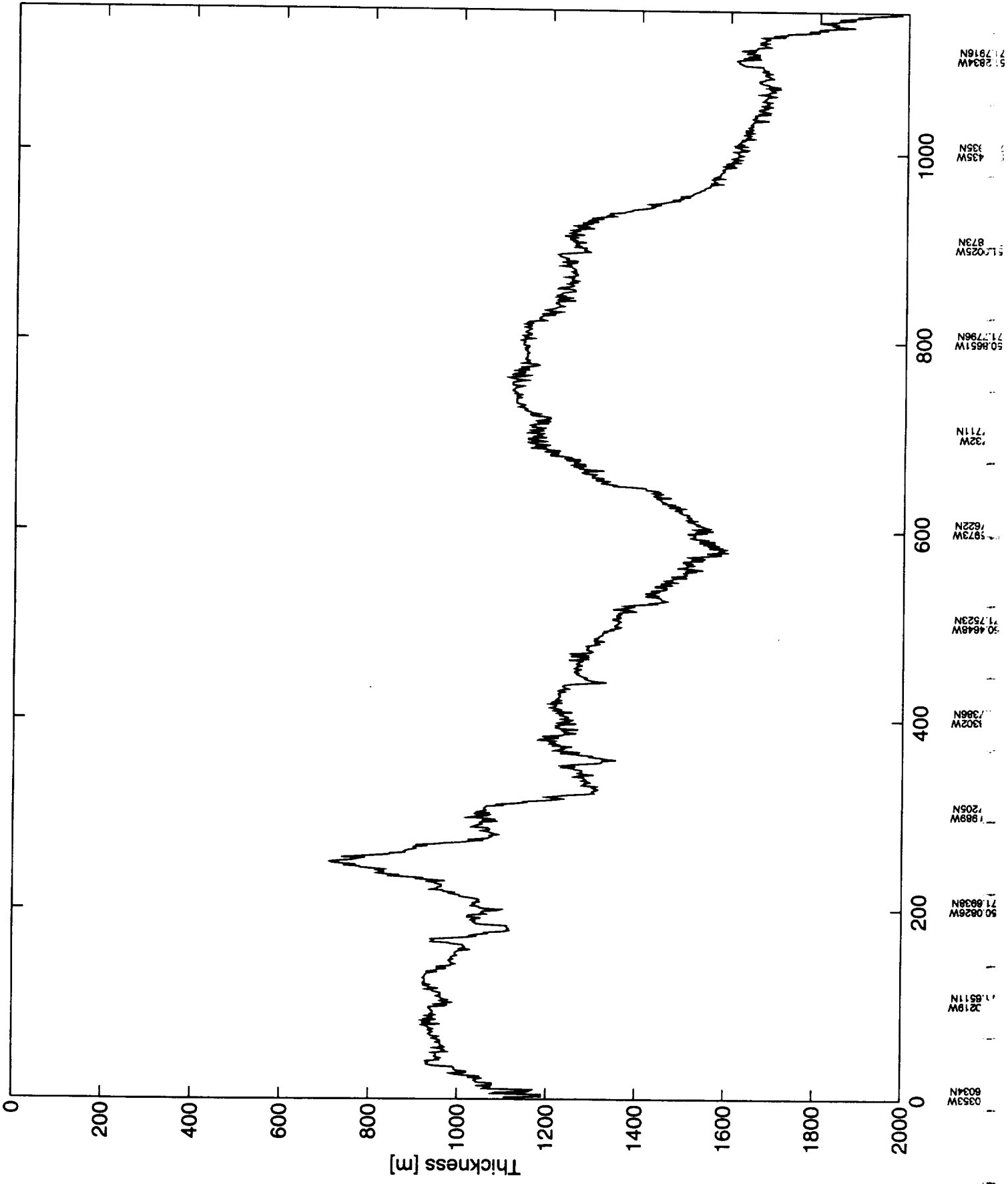
r_1_7.1 (1) [0-700] thickness



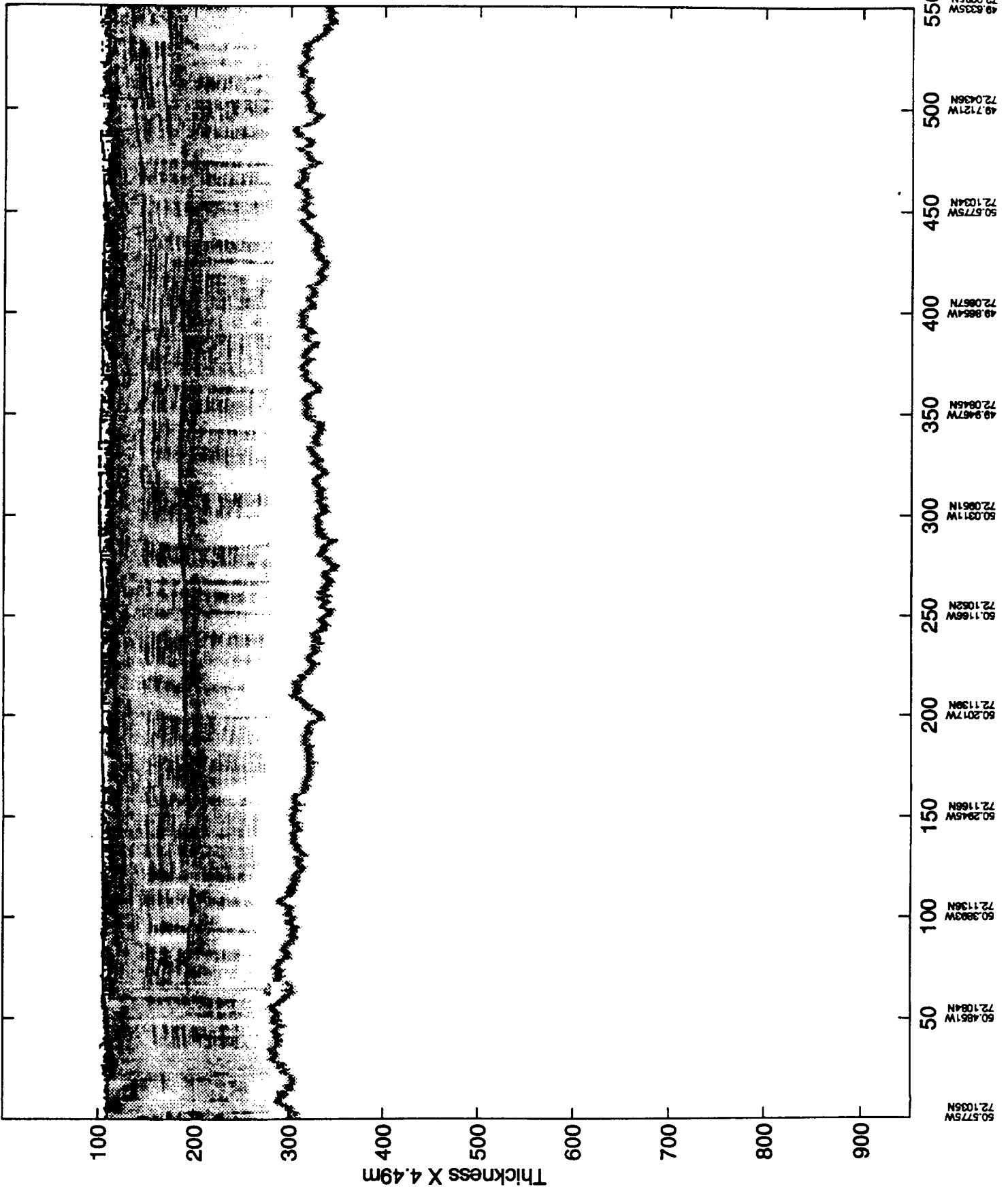
r_1_g.i2a [300-14bu]



r_1_9.12a [300-1450] thickness



r_1_12.1 <1> [450 1000]



50.575W
72.1035N

50.4861W
72.1084N

50.3893W
72.1136N

50.2945W
72.1166N

50.2017W
72.1136N

50.1166W
72.1082N

50.0911W
72.0861N

49.9467W
72.0845N

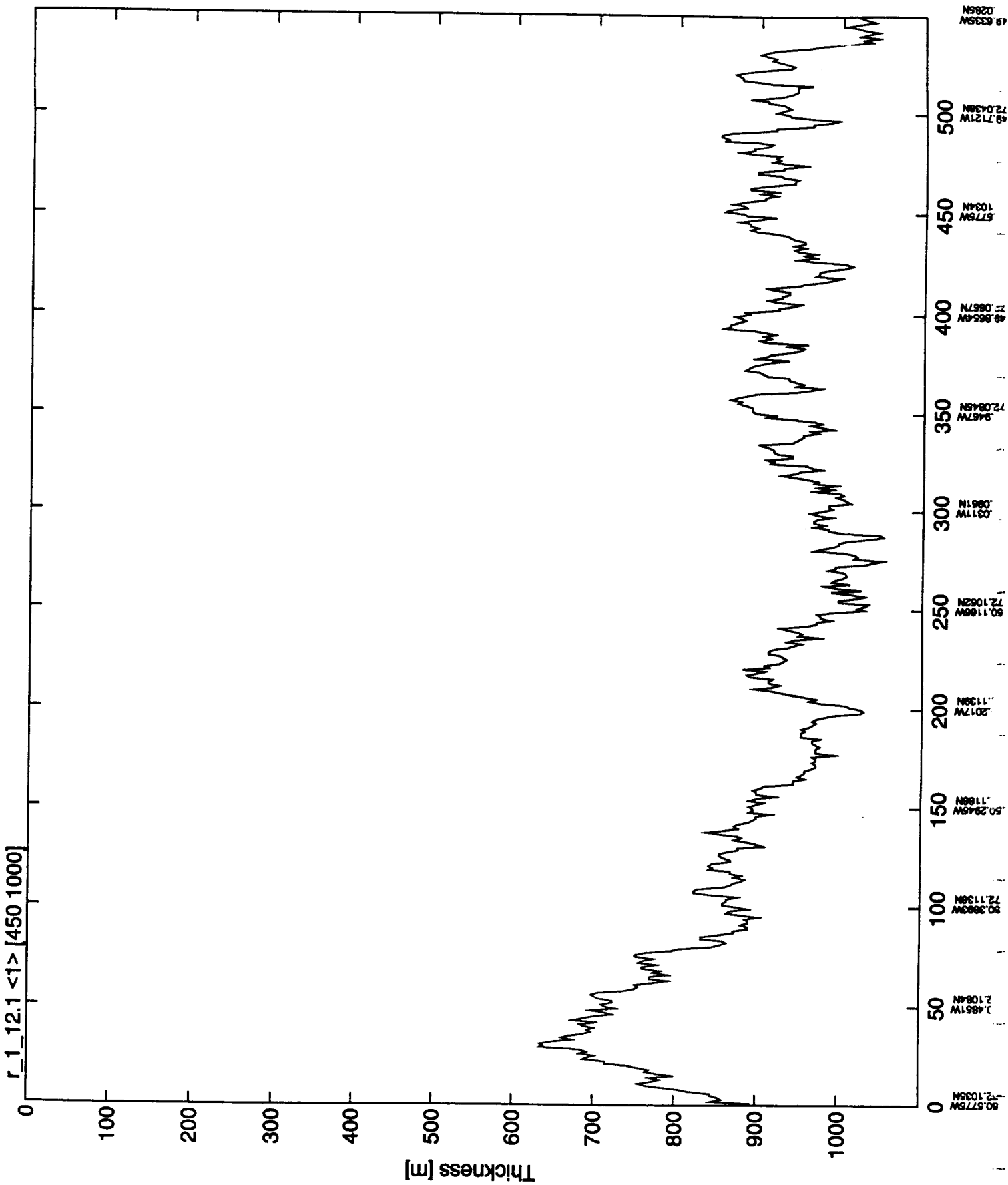
49.8654W
72.0867N

50.575W
72.1034N

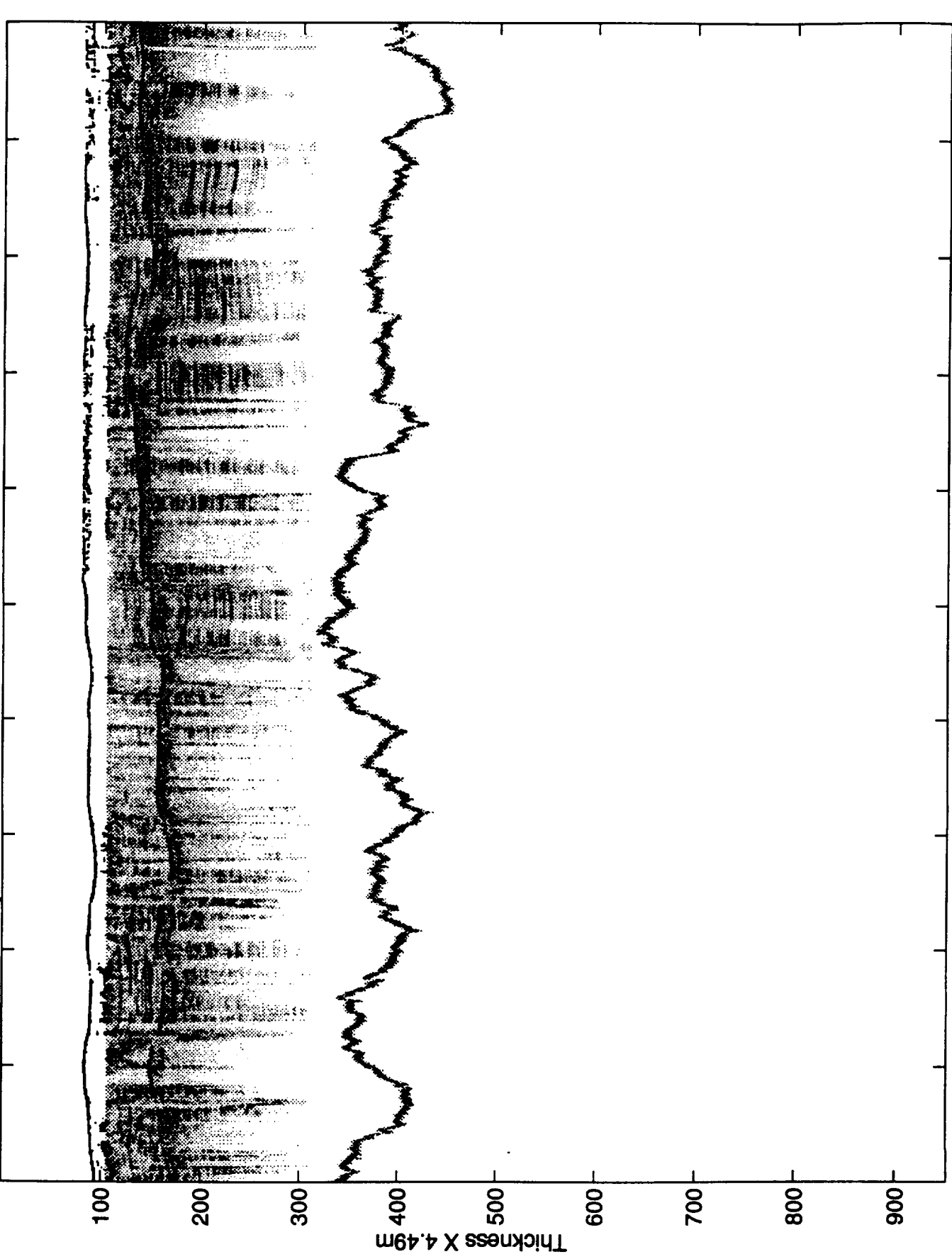
49.7121W
72.0436N

49.8335W
72.0285N

r_1_12.1 <1> [450 1000]

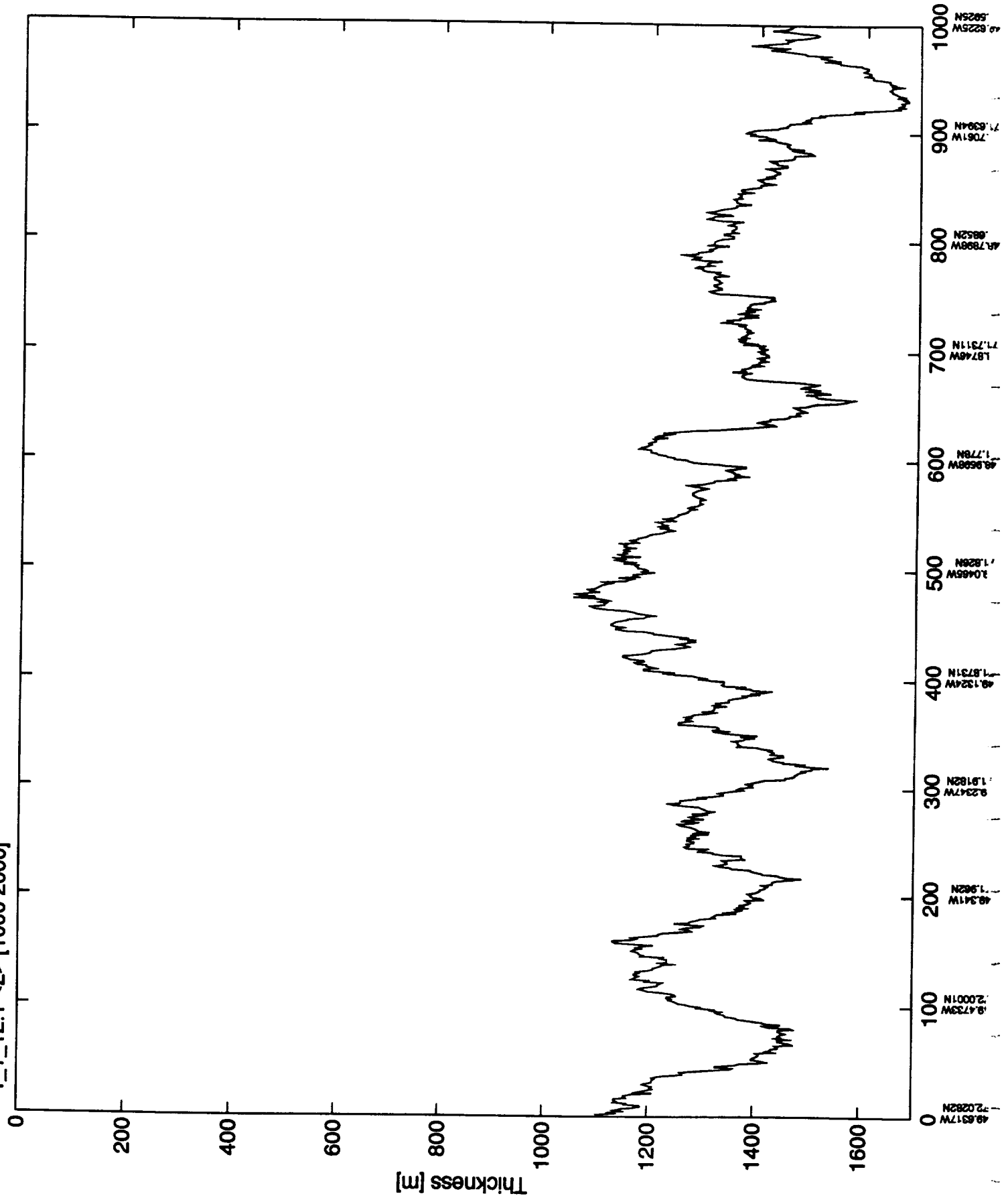


r_1_12.1 <2> [1000 2000]

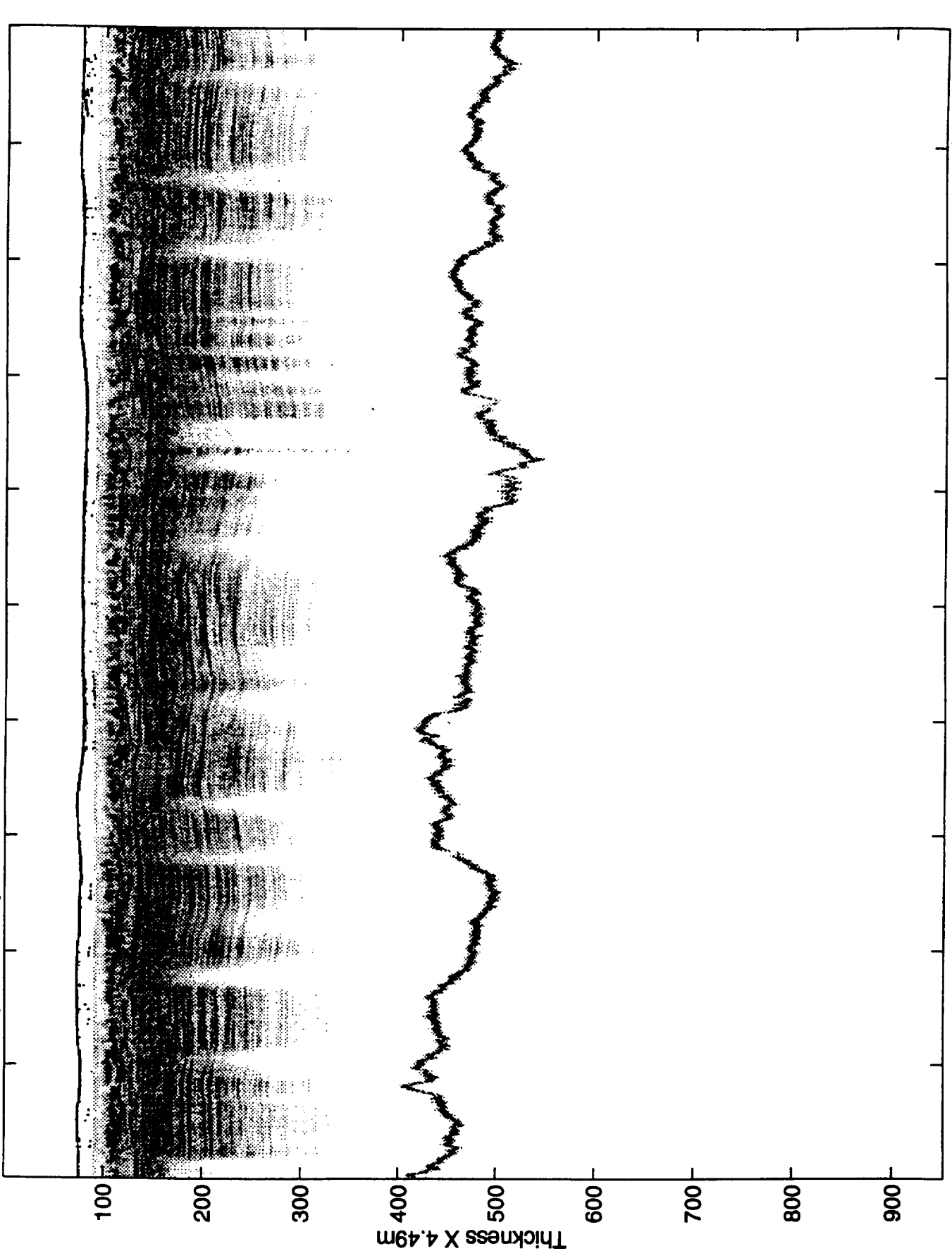


72.0282N 49.6317W
72.0001N 49.4733W
100
71.982N 49.341W
200
71.9182N 49.2347W
300
71.8731N 49.1324W
400
49.0465W 71.826N
500
48.9698W 71.778N
600
48.8746W 71.7311N
700
48.7896W 71.6852N
800
48.7061W 71.6394N
900
48.6225W 71.5925N
1000

$r_{1_12.1} \langle 2 \rangle [1000 \ 2000]$

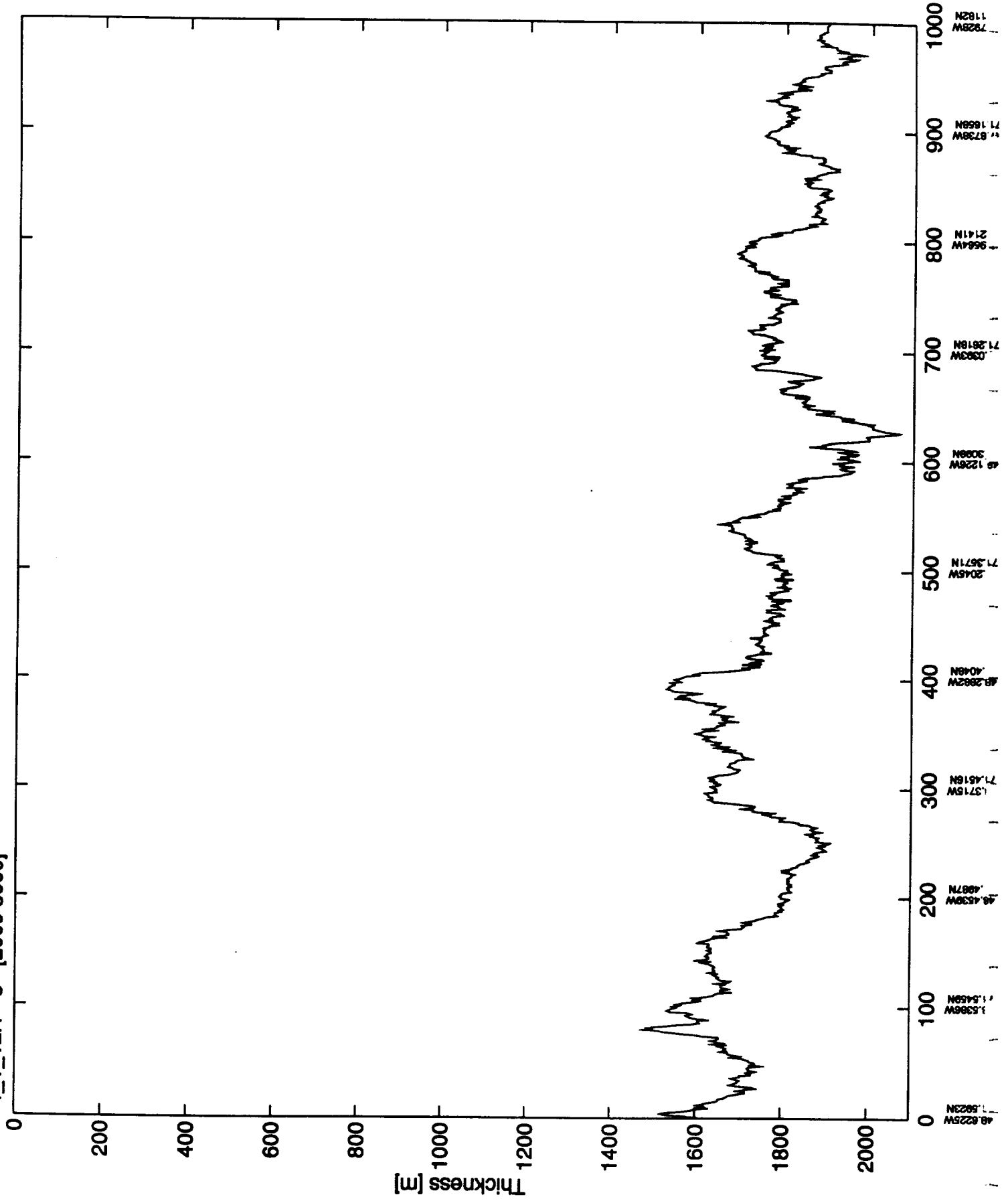


r_1_12.1 <3> [2000 3000]

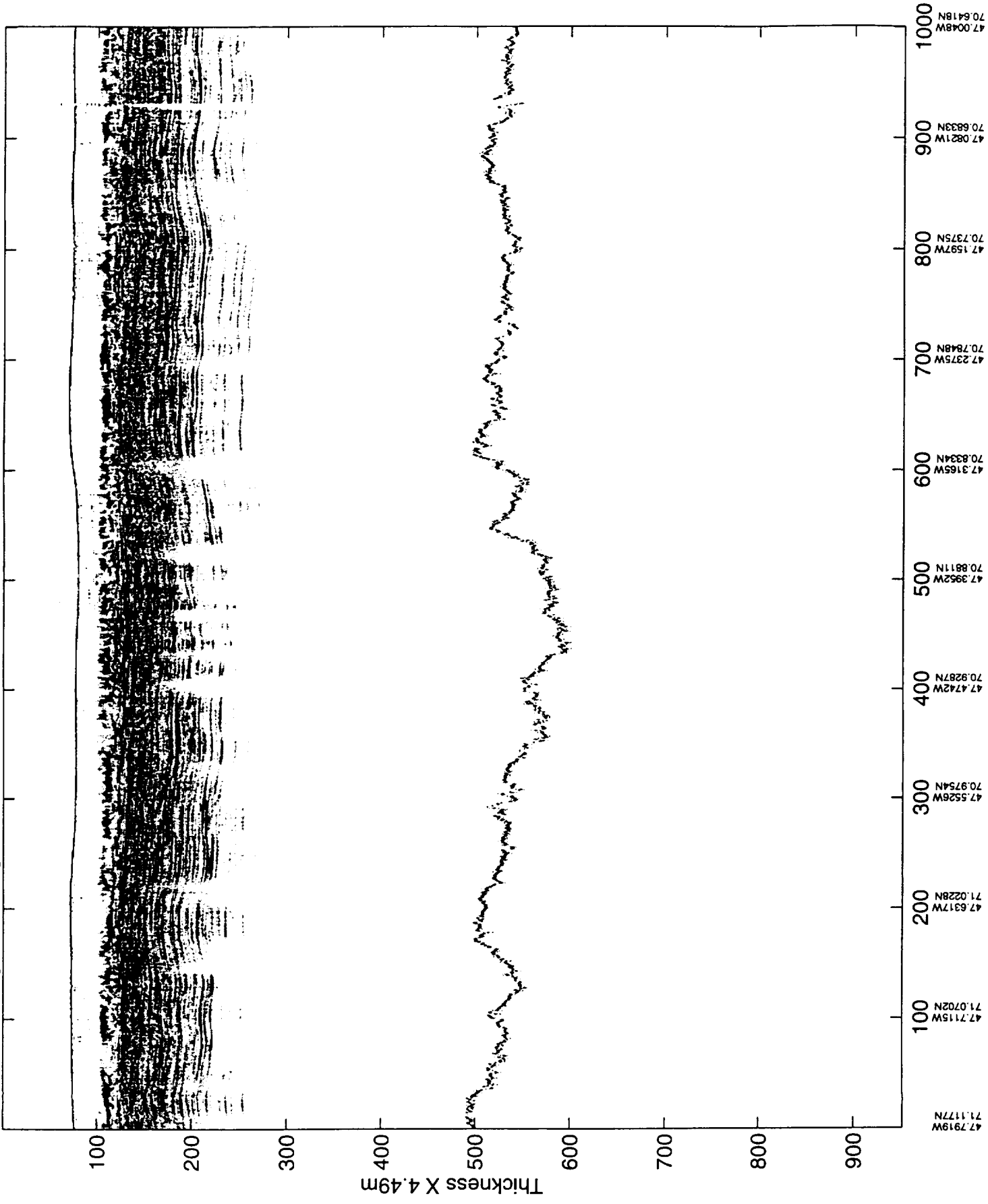


48.6225W 71.5922N
48.5388W 71.5459N
48.4539W 71.4977N
48.3715W 71.4518N
48.2882W 71.4048N
48.2045W 71.3571N
48.1226W 71.3088N
48.0393W 71.2618N
47.9564W 71.2141N
47.8738W 71.1658N
47.7928W 71.1182N

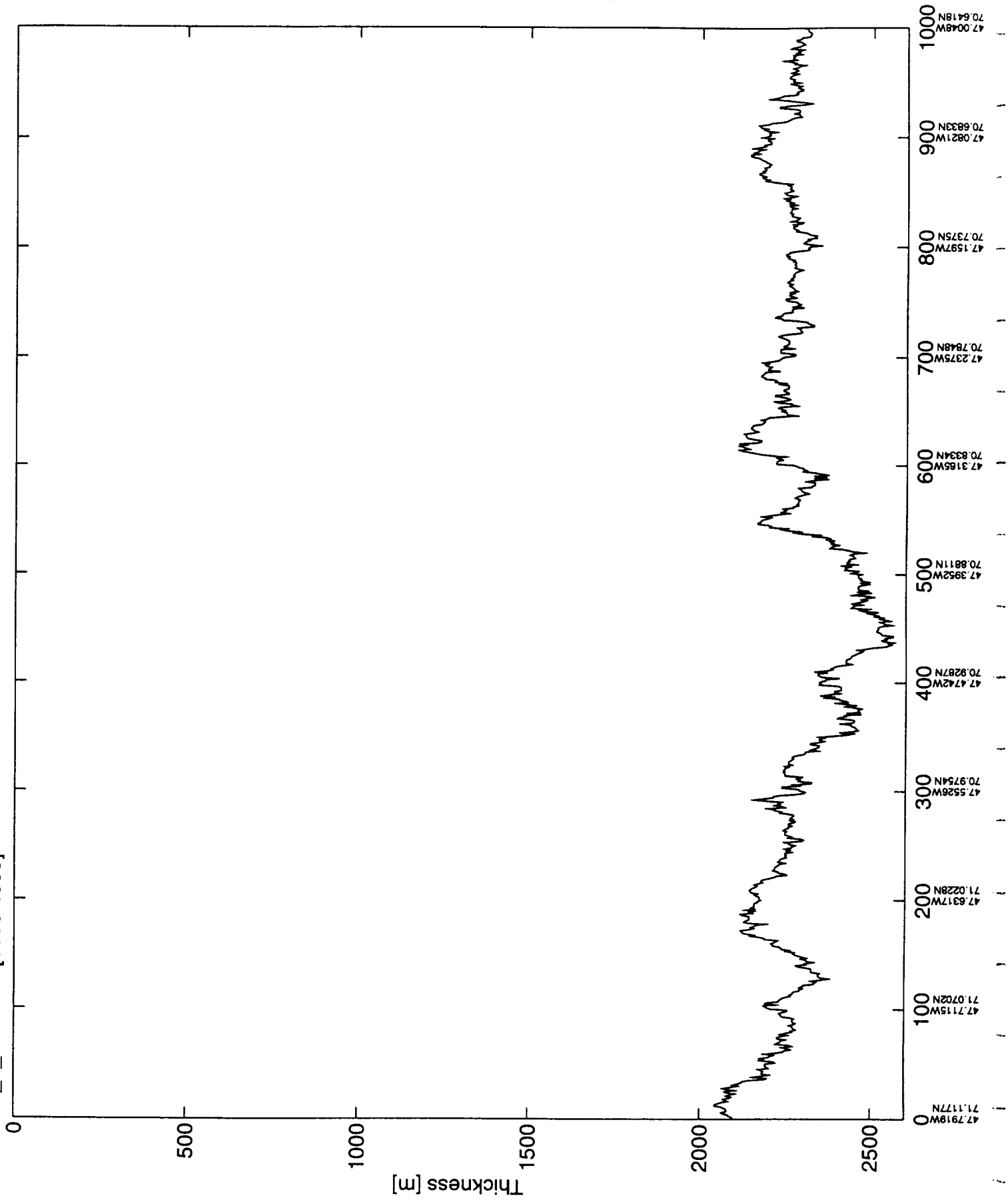
r_1_12.1 <3> [2000 3000]



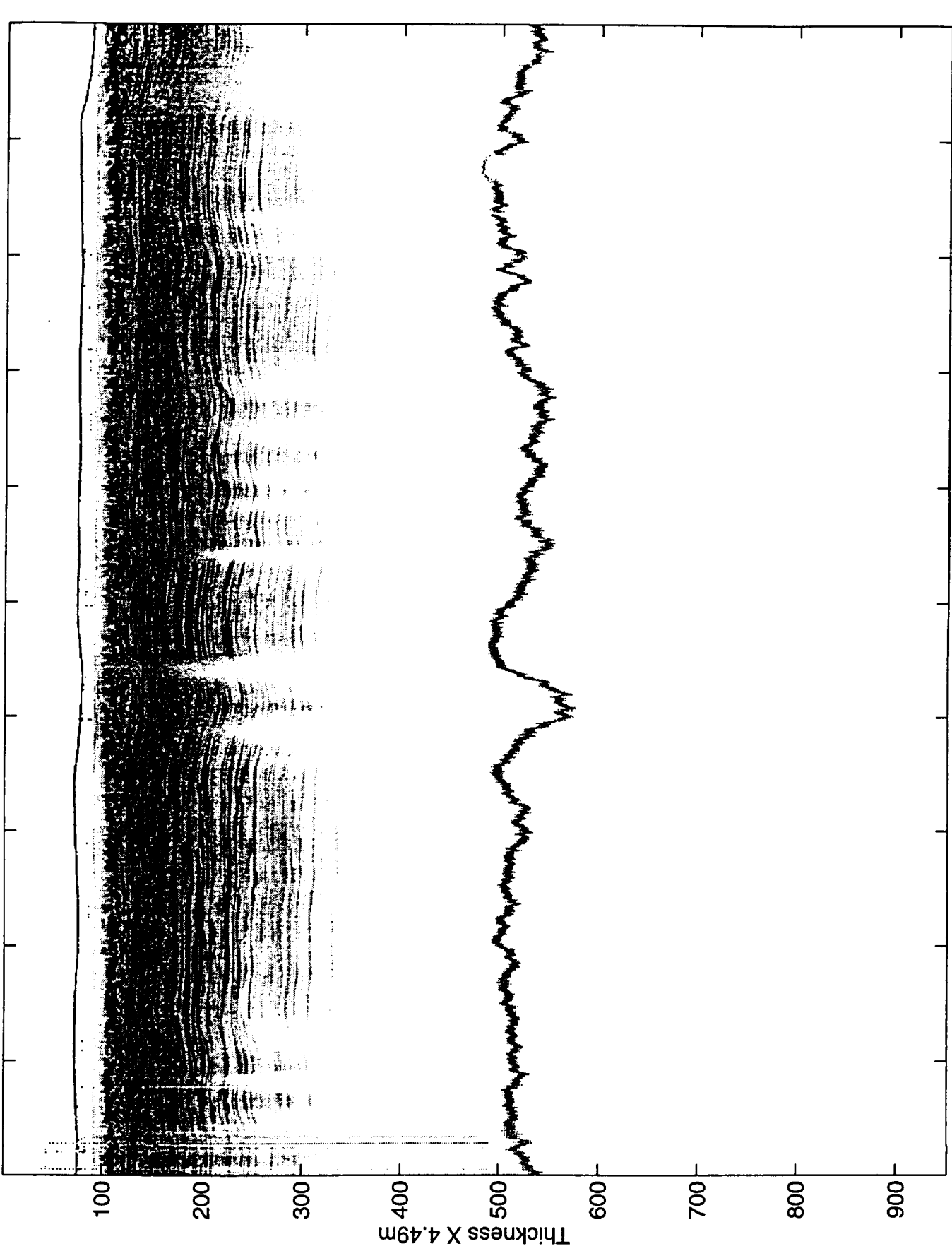
r_1_12.1 <4> [3000 4000]



r_1_12.1 <4> [3000 4000]

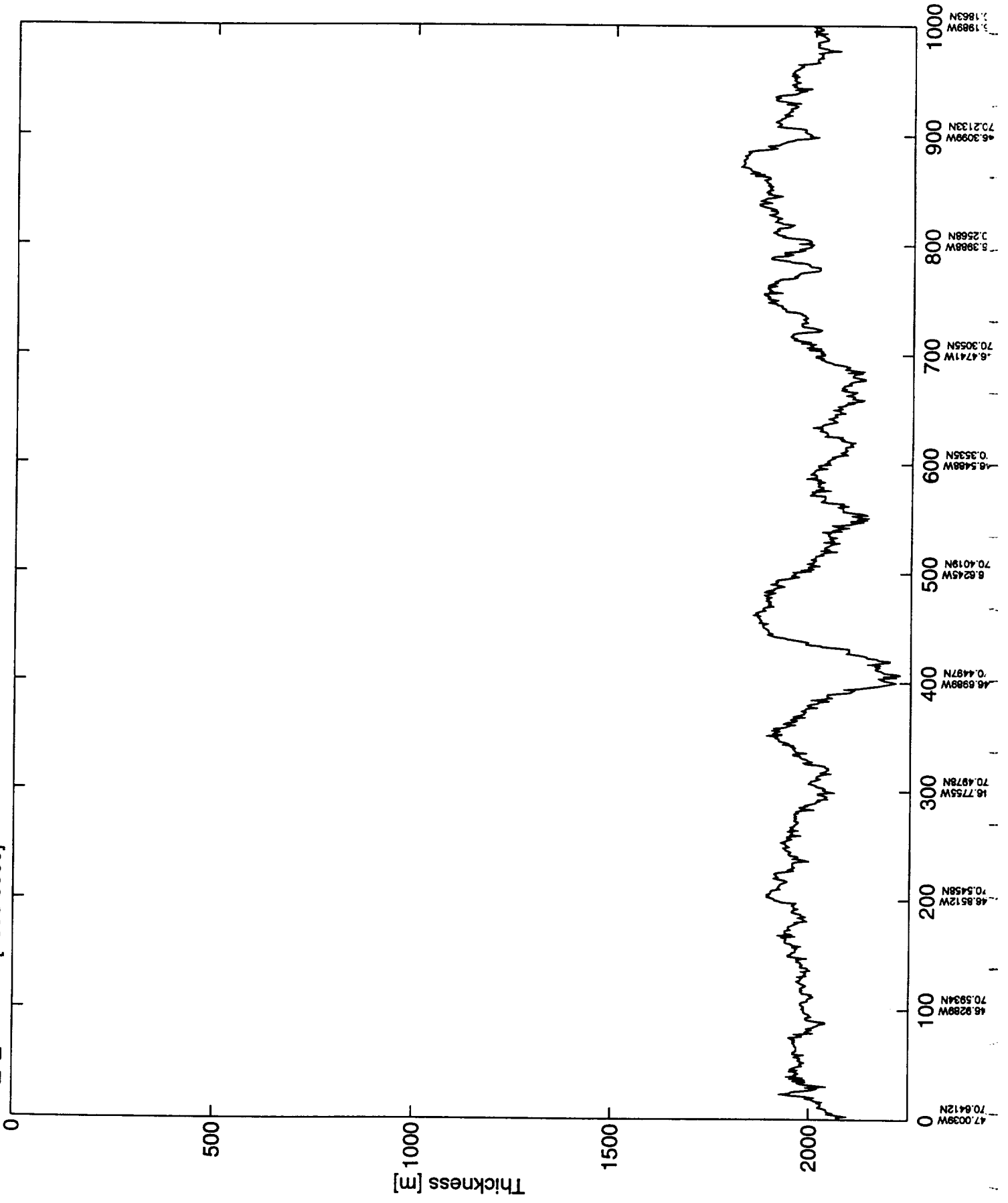


r_1_12.1 <5> [4000 5000]

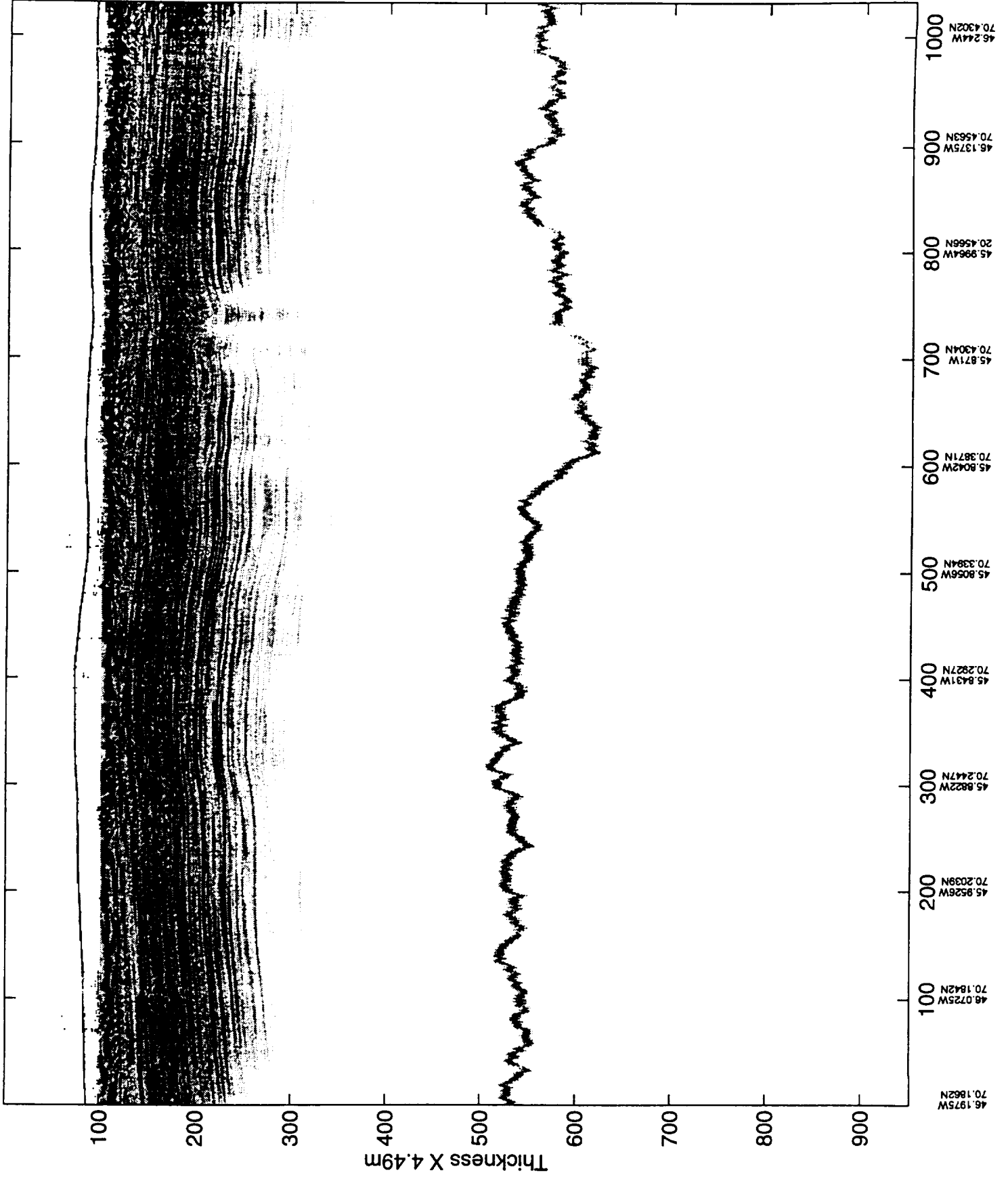


47.0039W
70.6412N
46.9289W
70.5934N
46.8512W
70.5458N
46.7755W
70.4978N
46.6989W
70.4497N
46.6245W
70.4019N
46.5488W
70.3535N
46.4741W
70.3055N
46.3968W
70.2568N
46.3099W
70.2133N
46.1989W
70.1863N

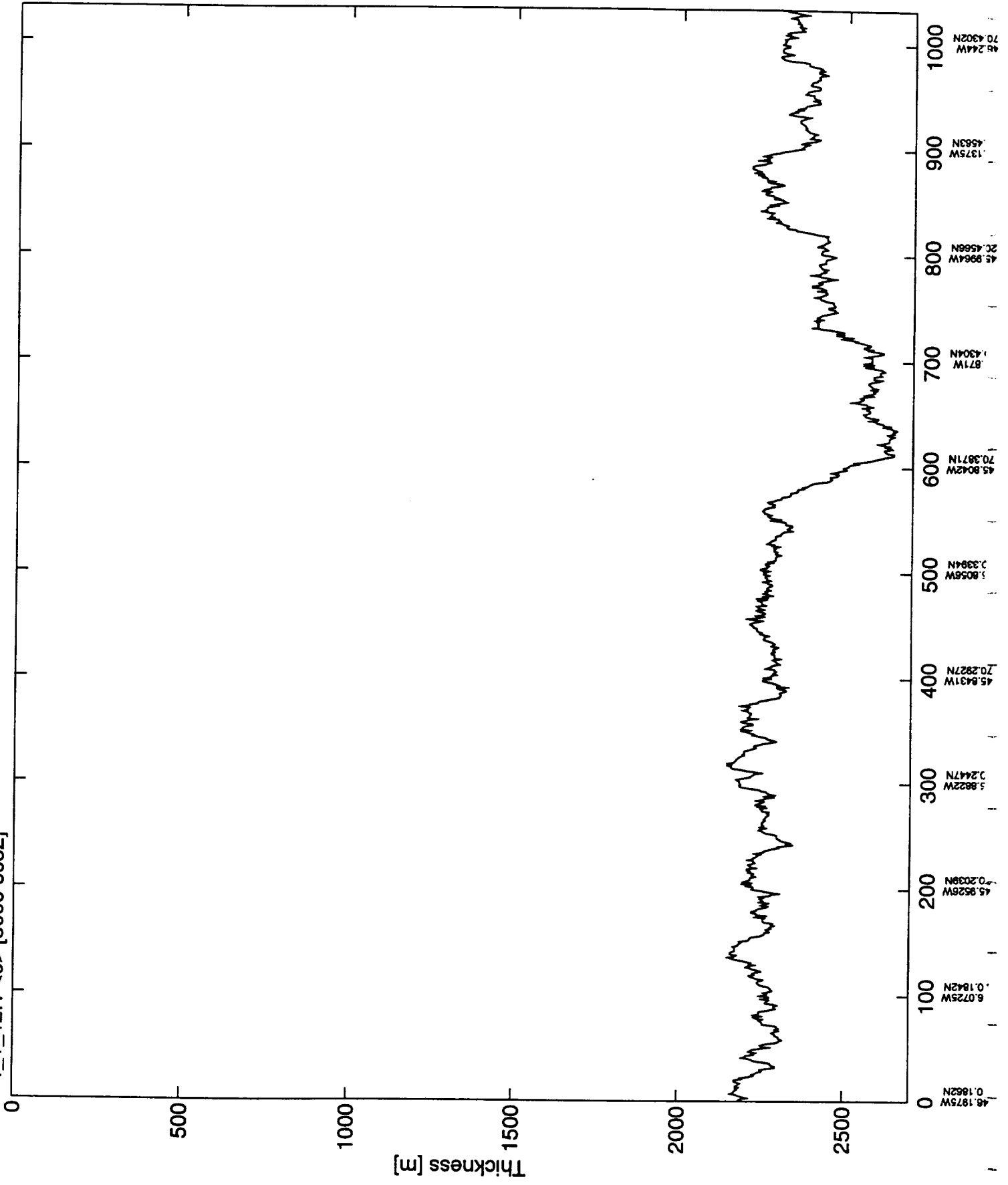
r_1_12.1 <5> [4000 5000]



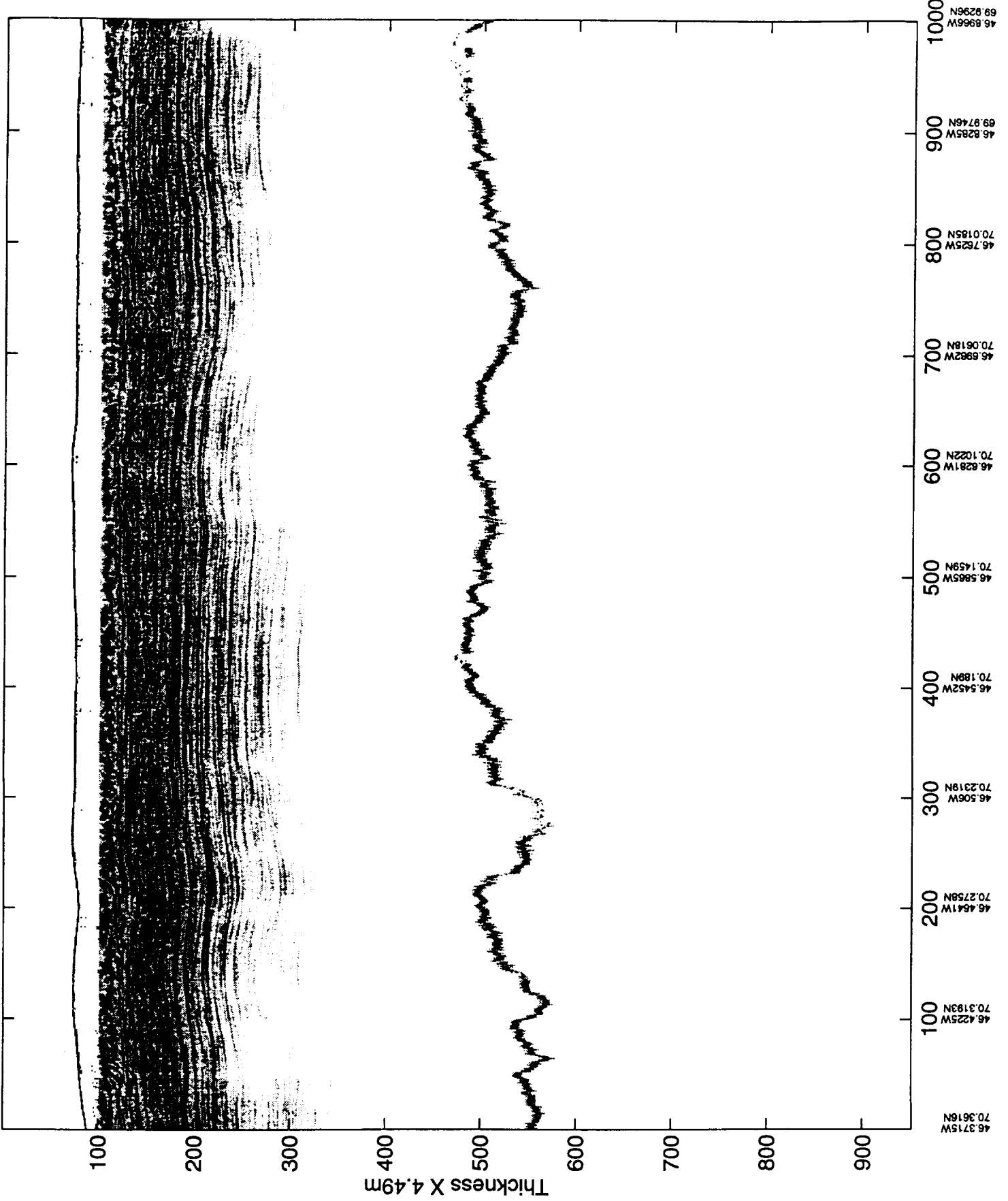
r_1_12.1 <6> [5000 6032]



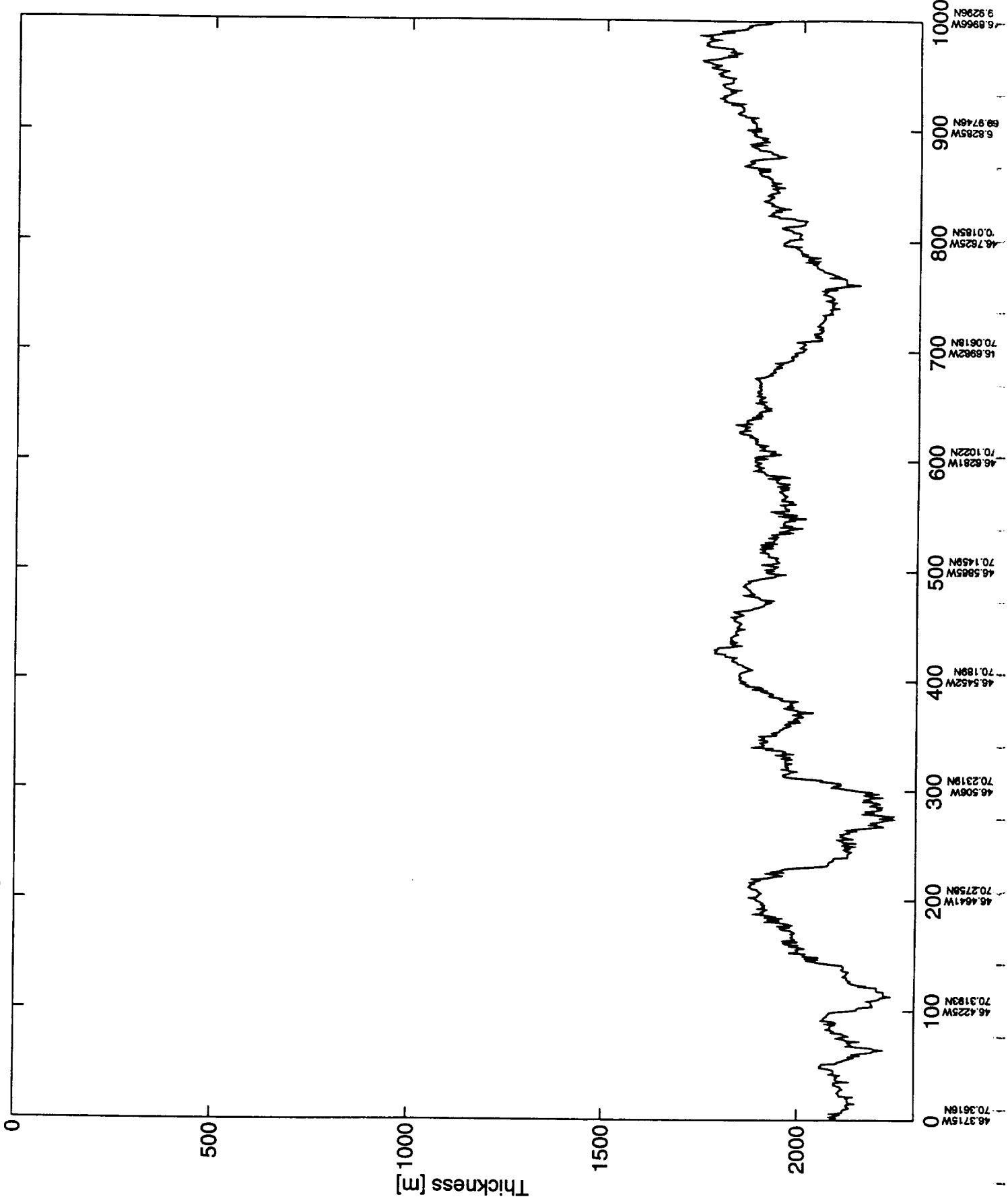
r_1_12.1 <6> [5000 6032]



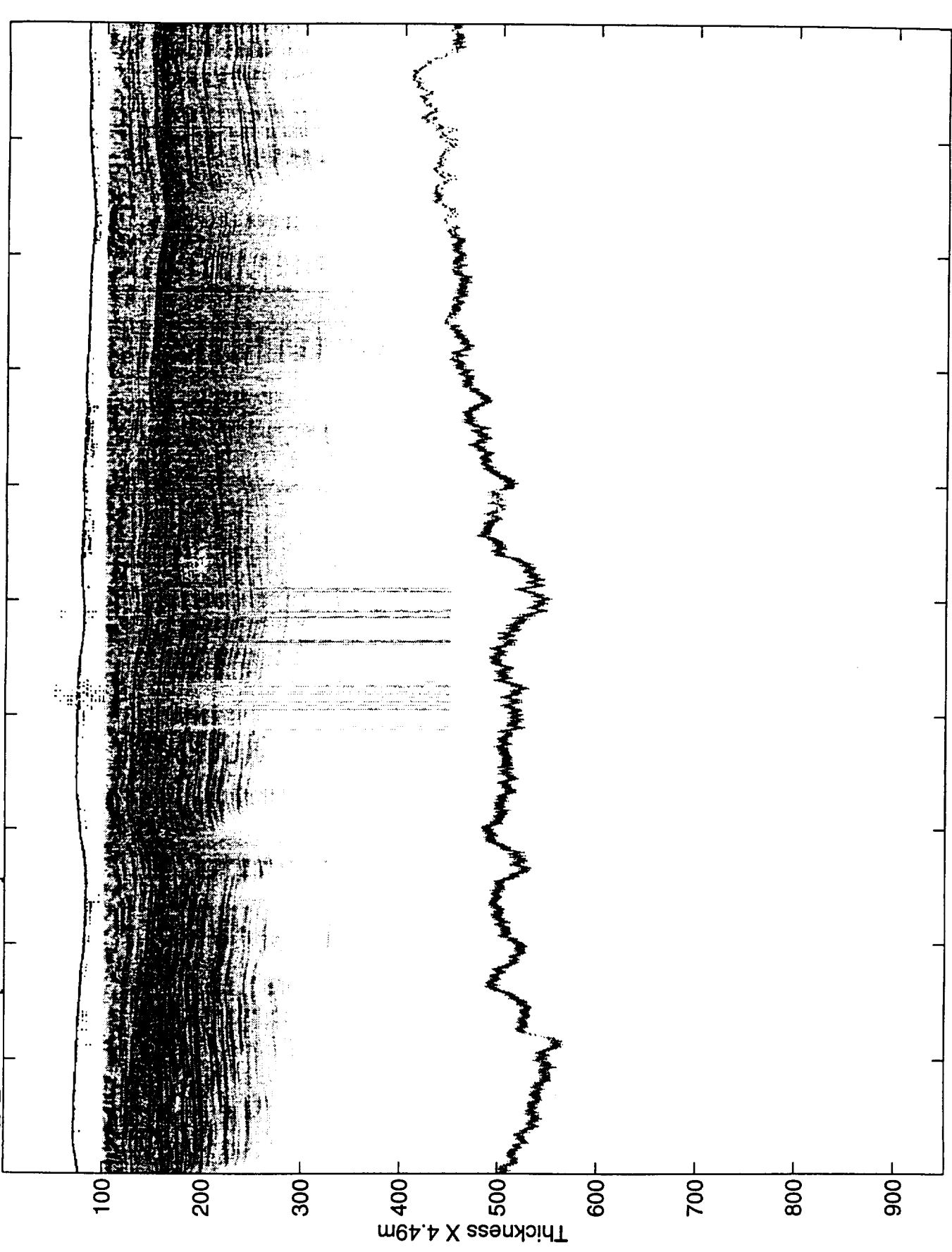
r_1_13.1 <1> [0 1000]



r_1_13.1 <1> [0 1000]

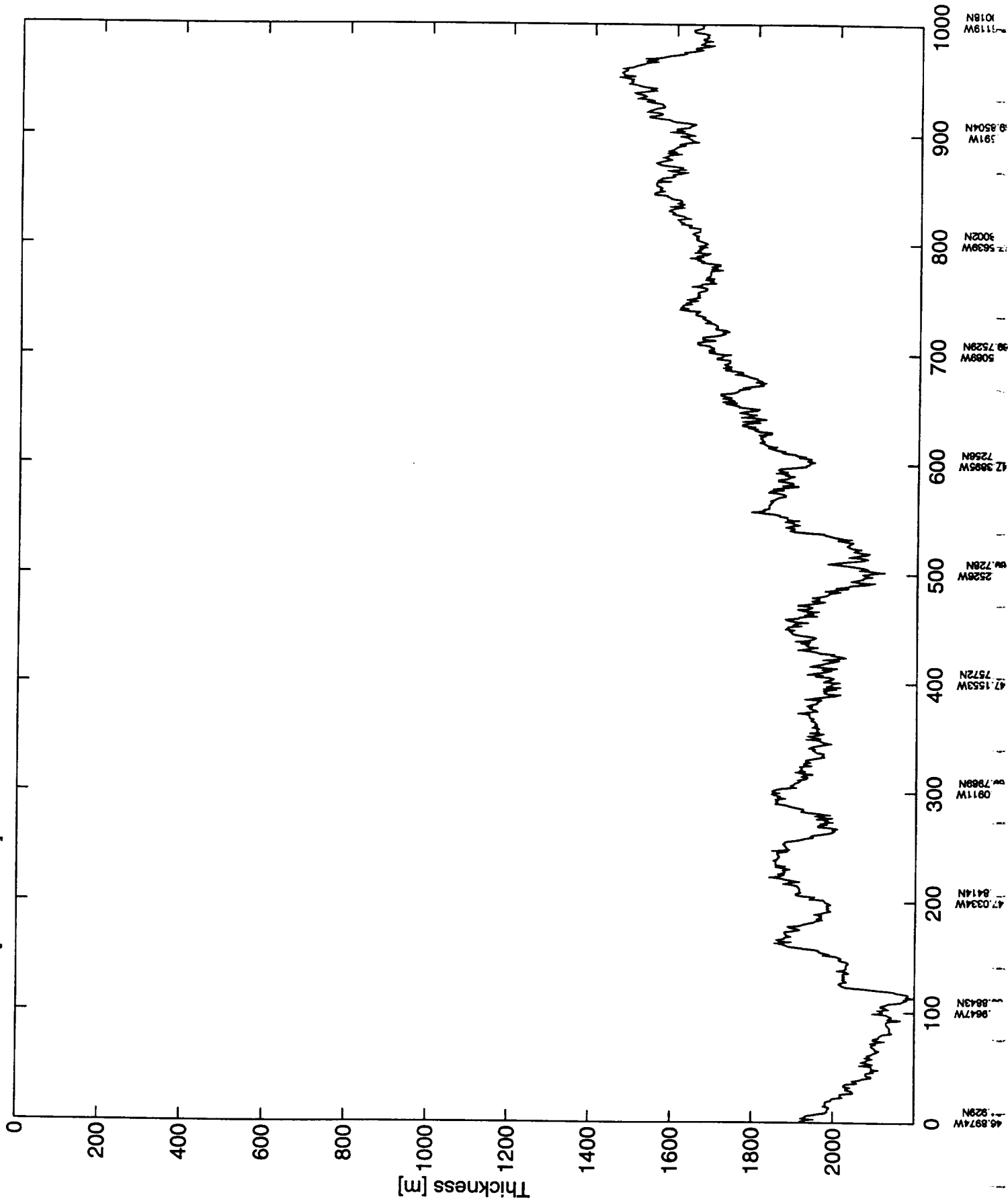


r_1_13.1 <2> [1000 2000]

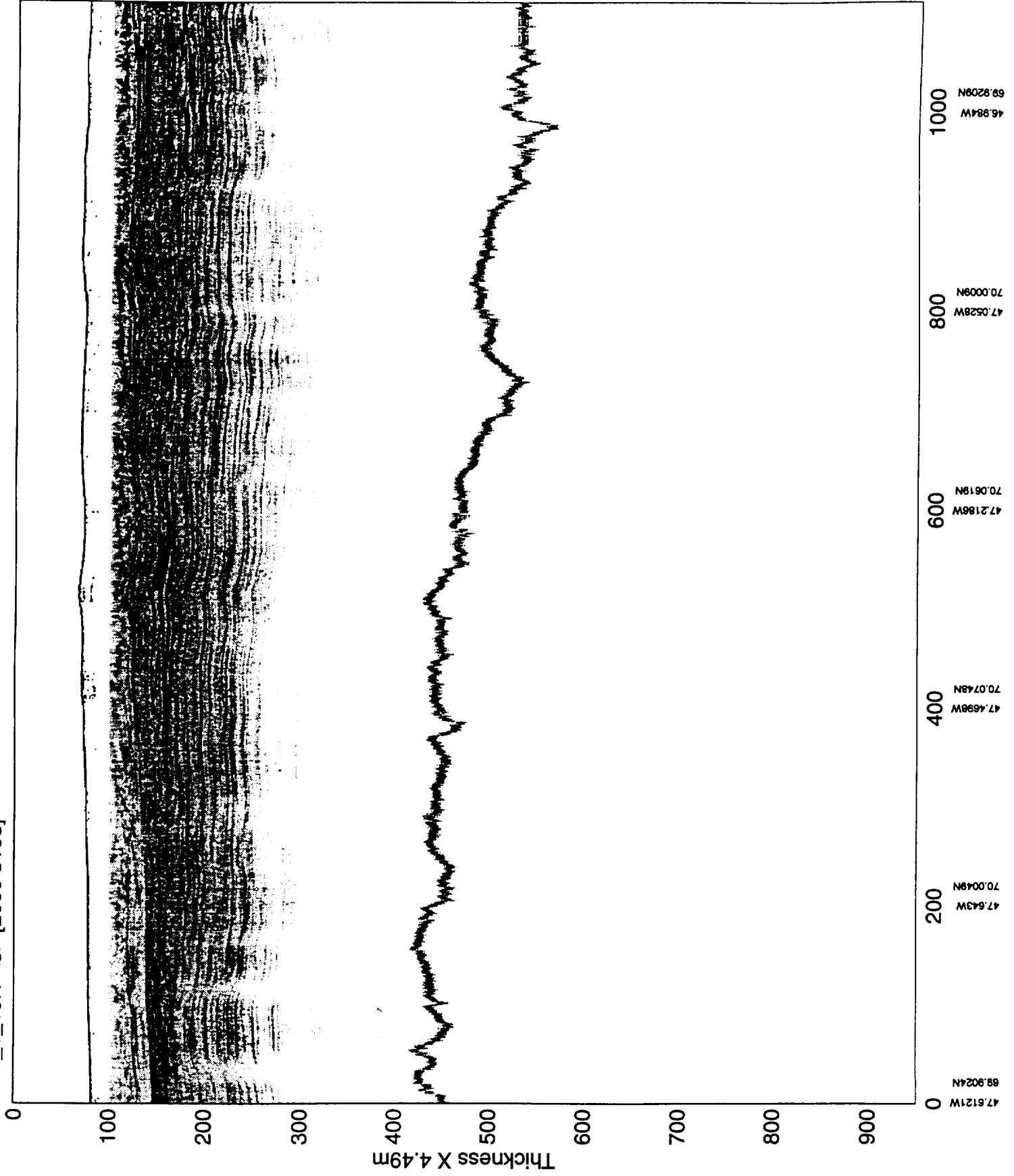


46.8974W 69.829N
46.8647W 69.8643N
47.0344W 69.8414N
47.0811W 69.7969N
47.1553W 69.7572N
47.2526W 69.728N
47.3895W 69.7256N
47.5089W 69.7529N
47.5639W 69.8002N
47.591W 69.8504N
47.6119W 69.9018N

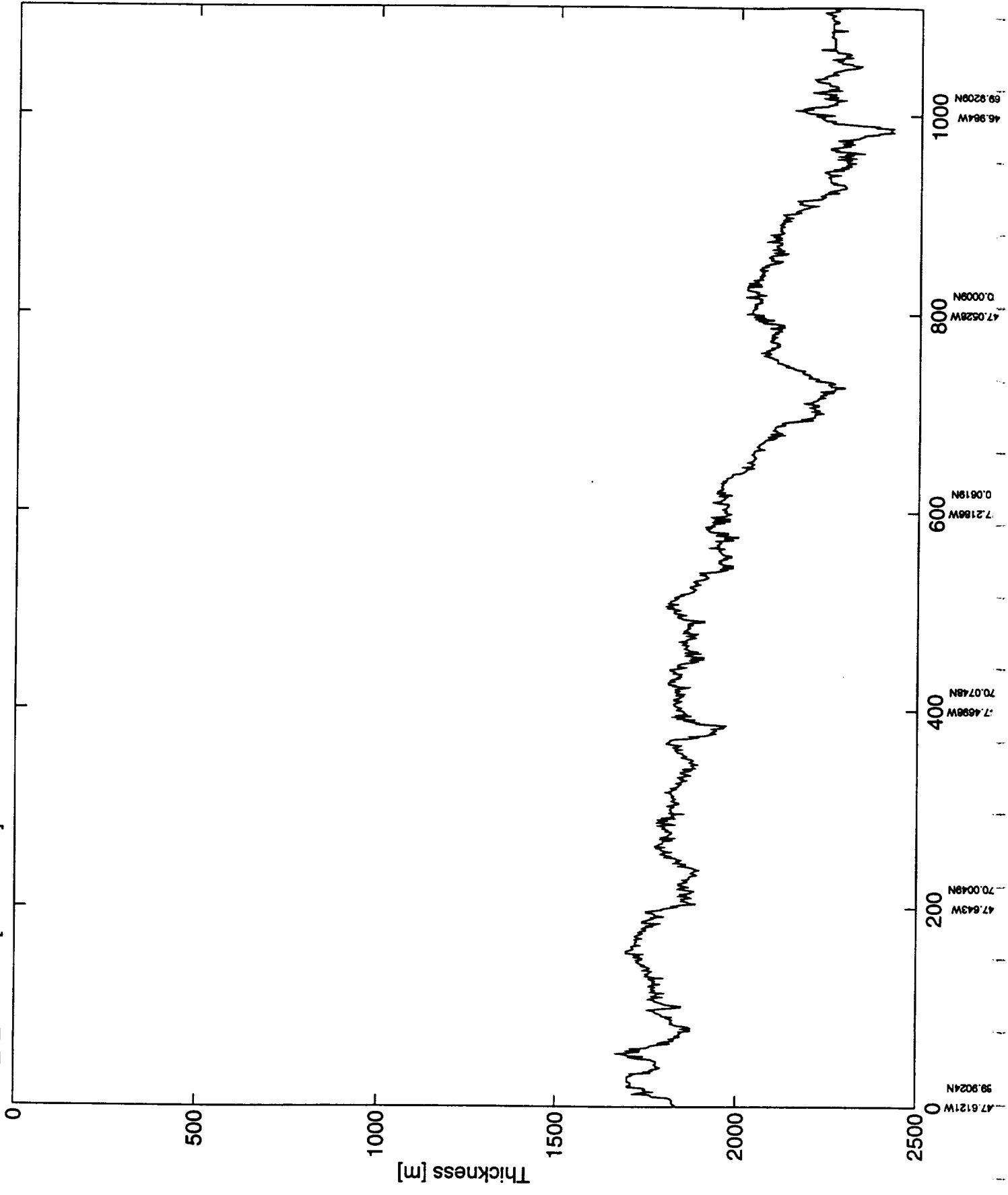
r_1_13.1 <2> [1000 2000]



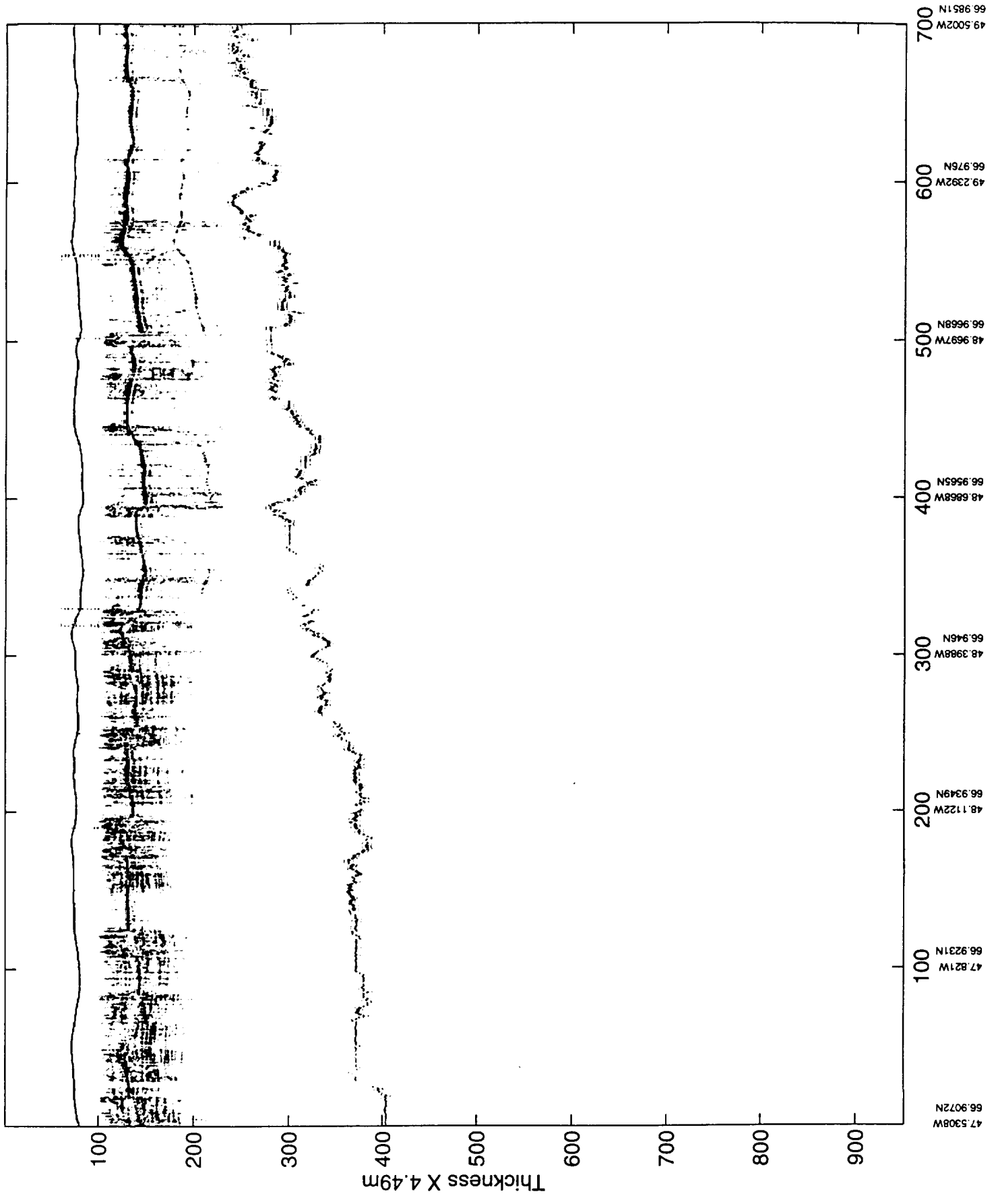
r_1_13.1 <3> [2000 3108]



r_1_13.1 <3> [2000 3108]

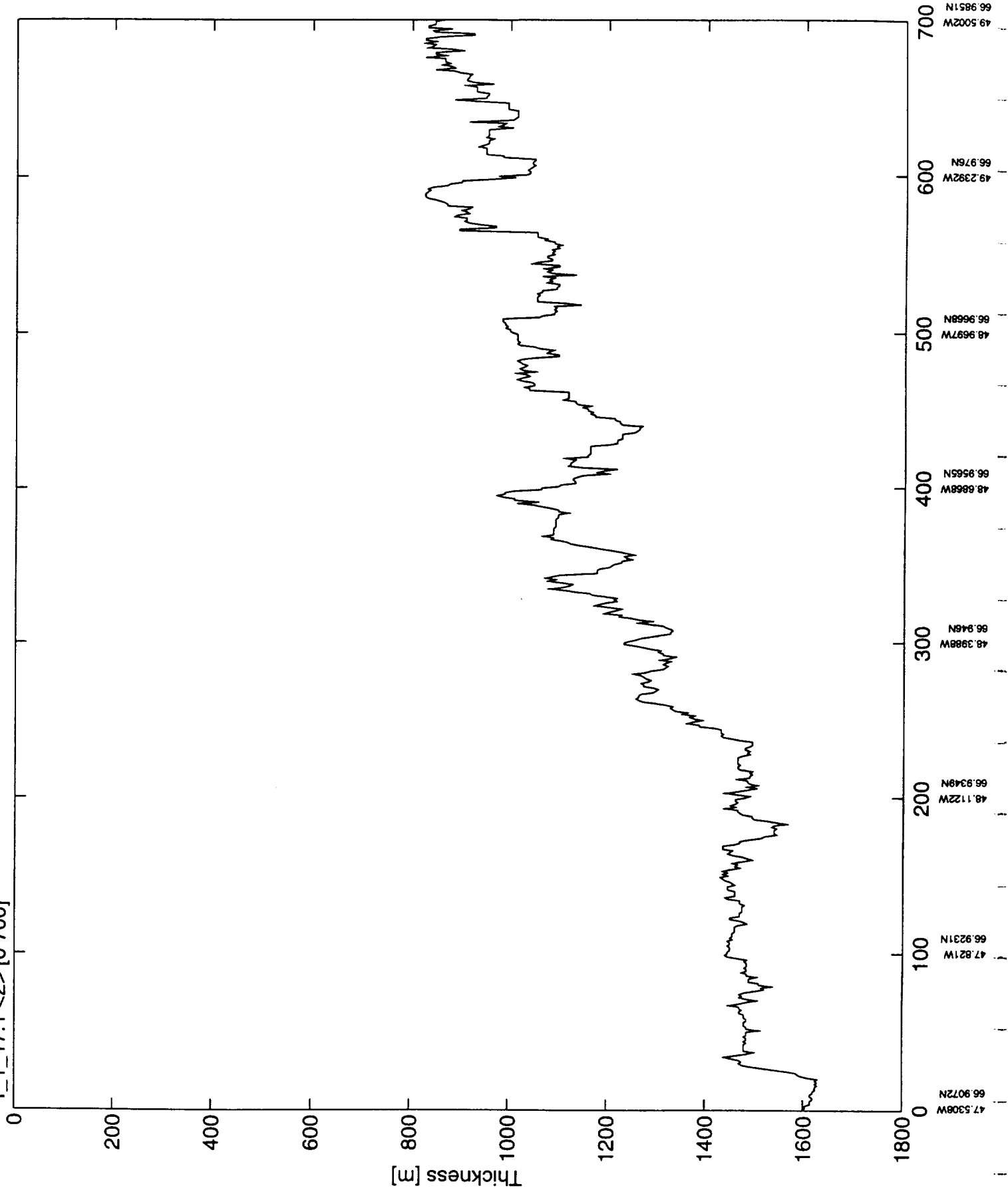


17/10/2000



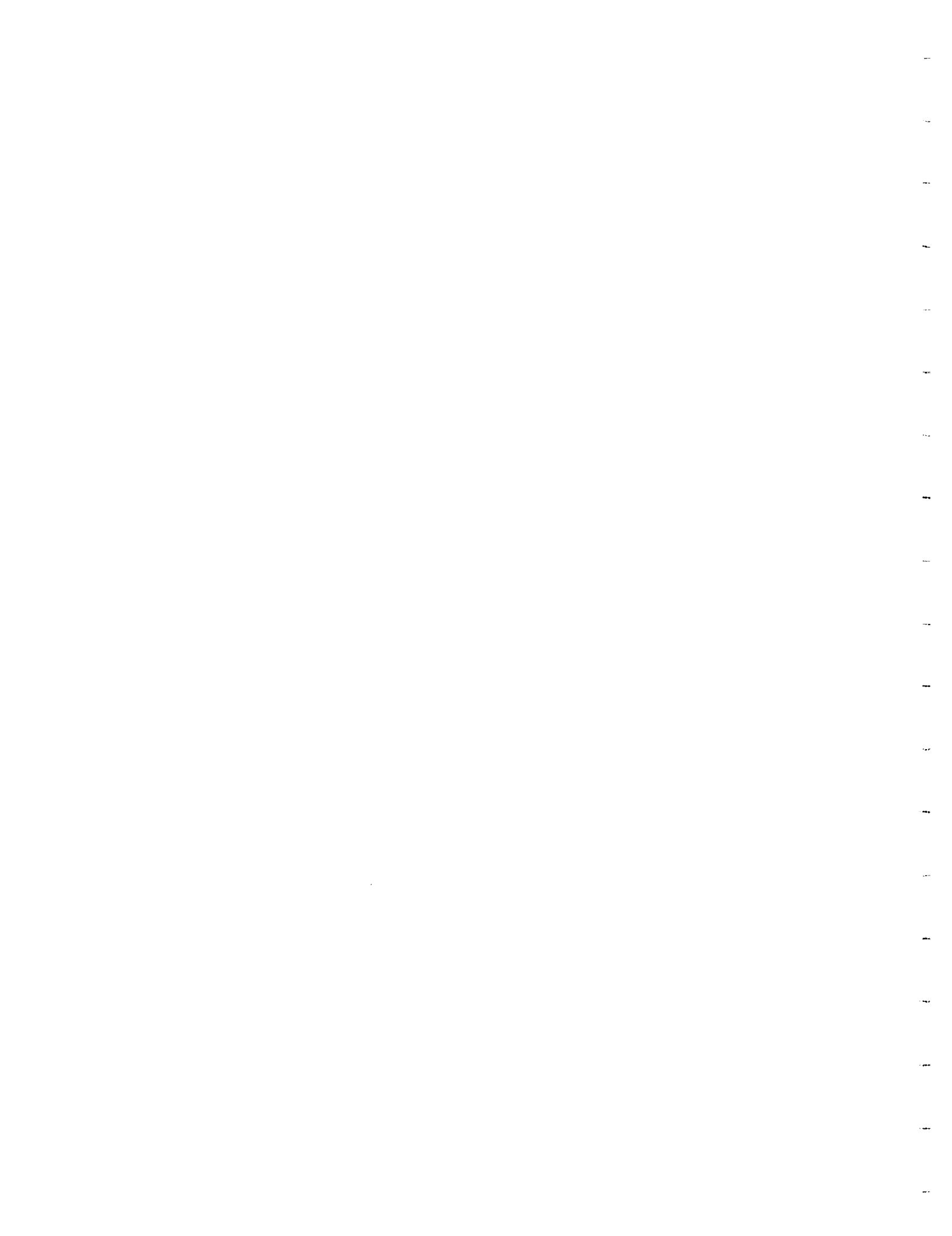
47.5308W 66.9072N
47.821W 66.9231N
48.1122W 66.9349N
48.3988W 66.946N
48.6868W 66.9565N
48.9697W 66.9668N
49.2392W 66.976N
49.5002W 66.9851N

r_1_17.1 <2> [0 700]

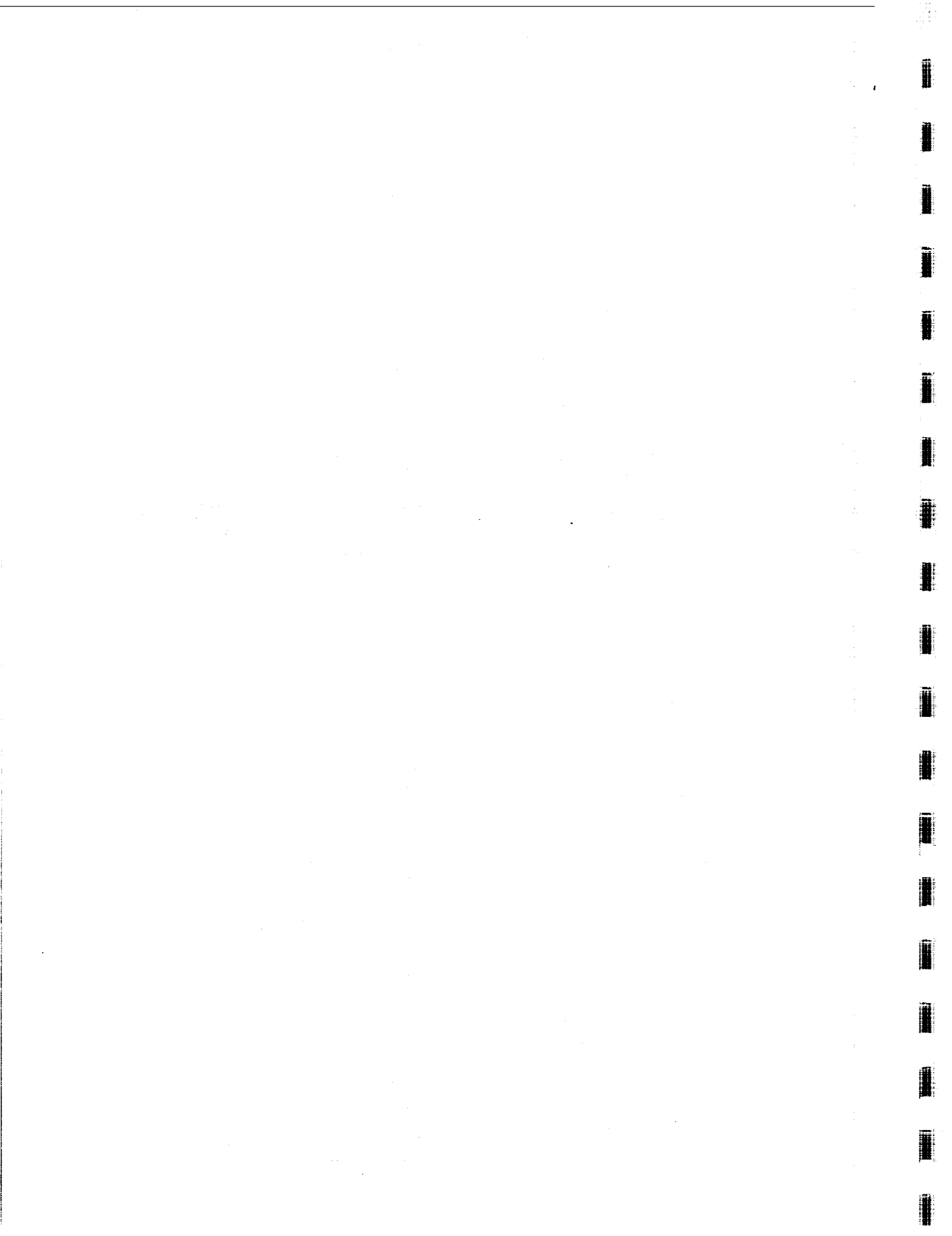


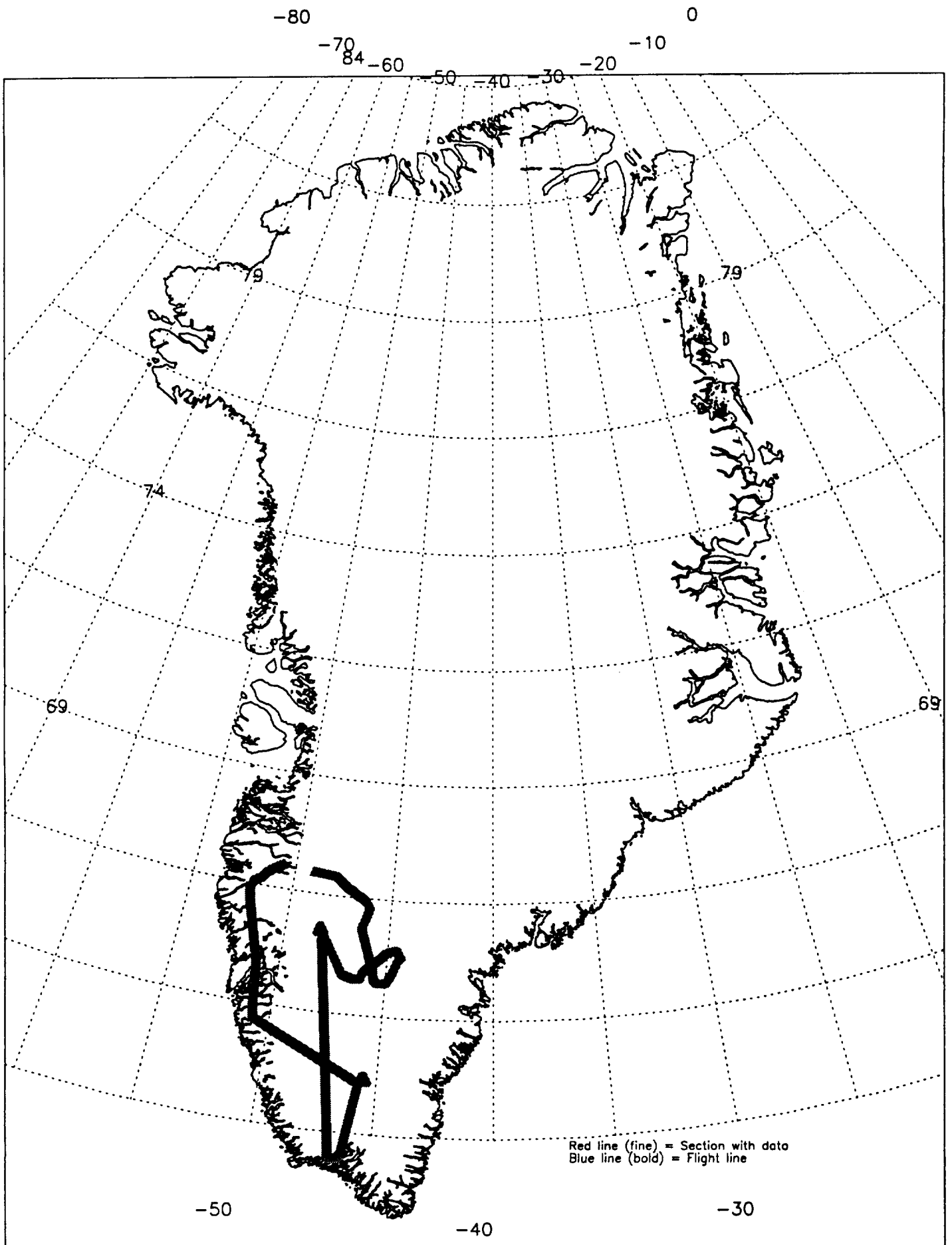
Appendix D

June 28, 1993

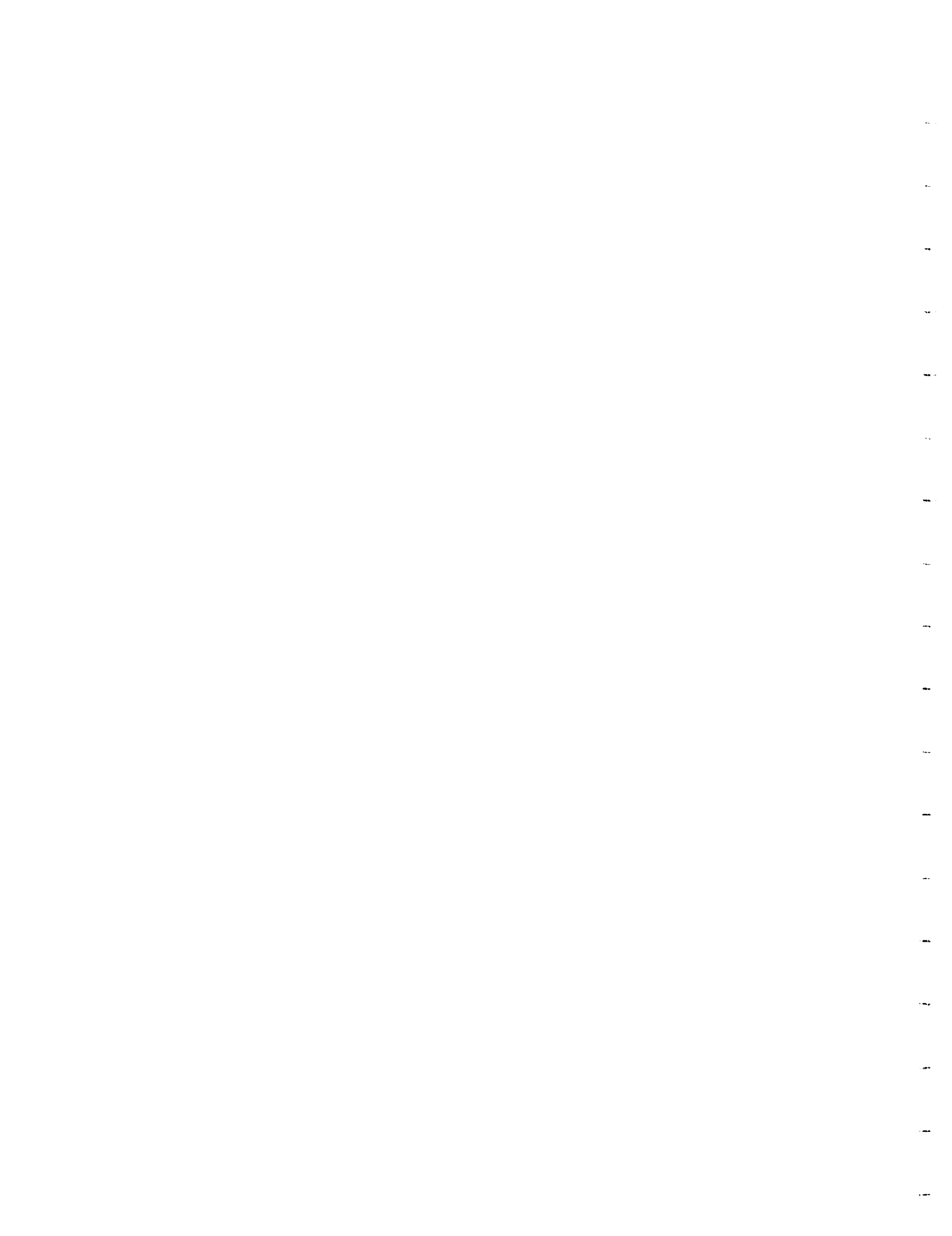




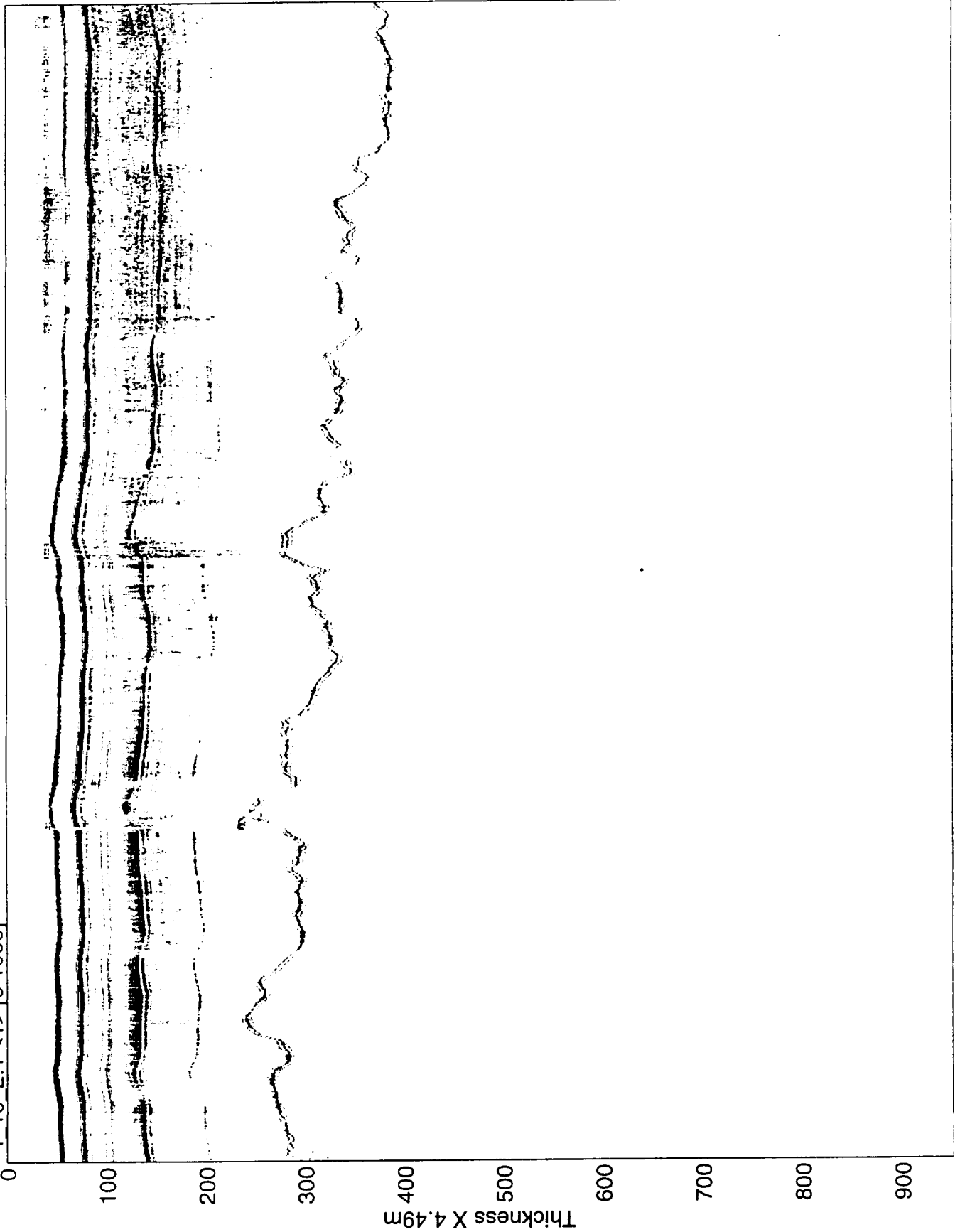




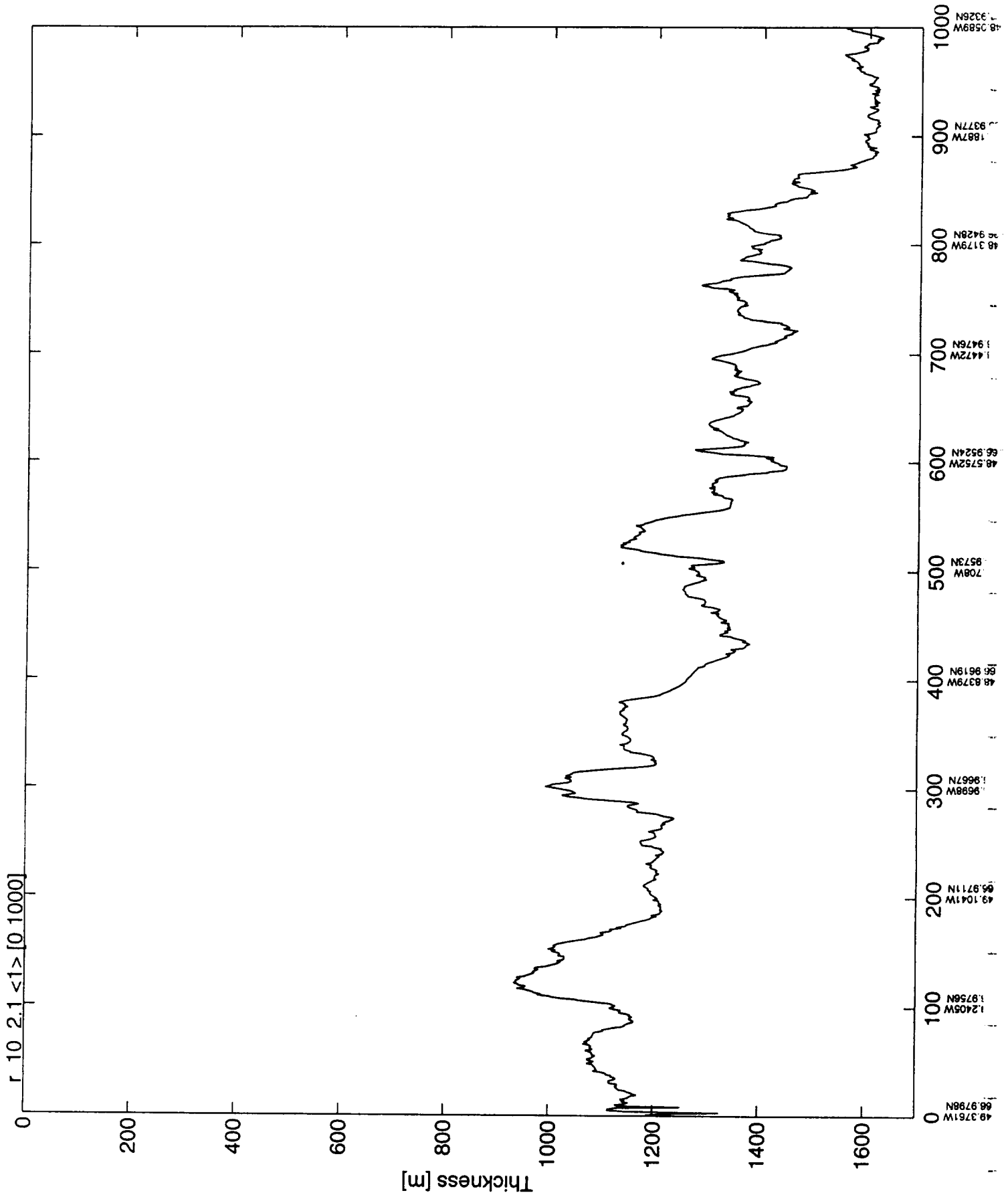
June 28, 1993 (r_10)



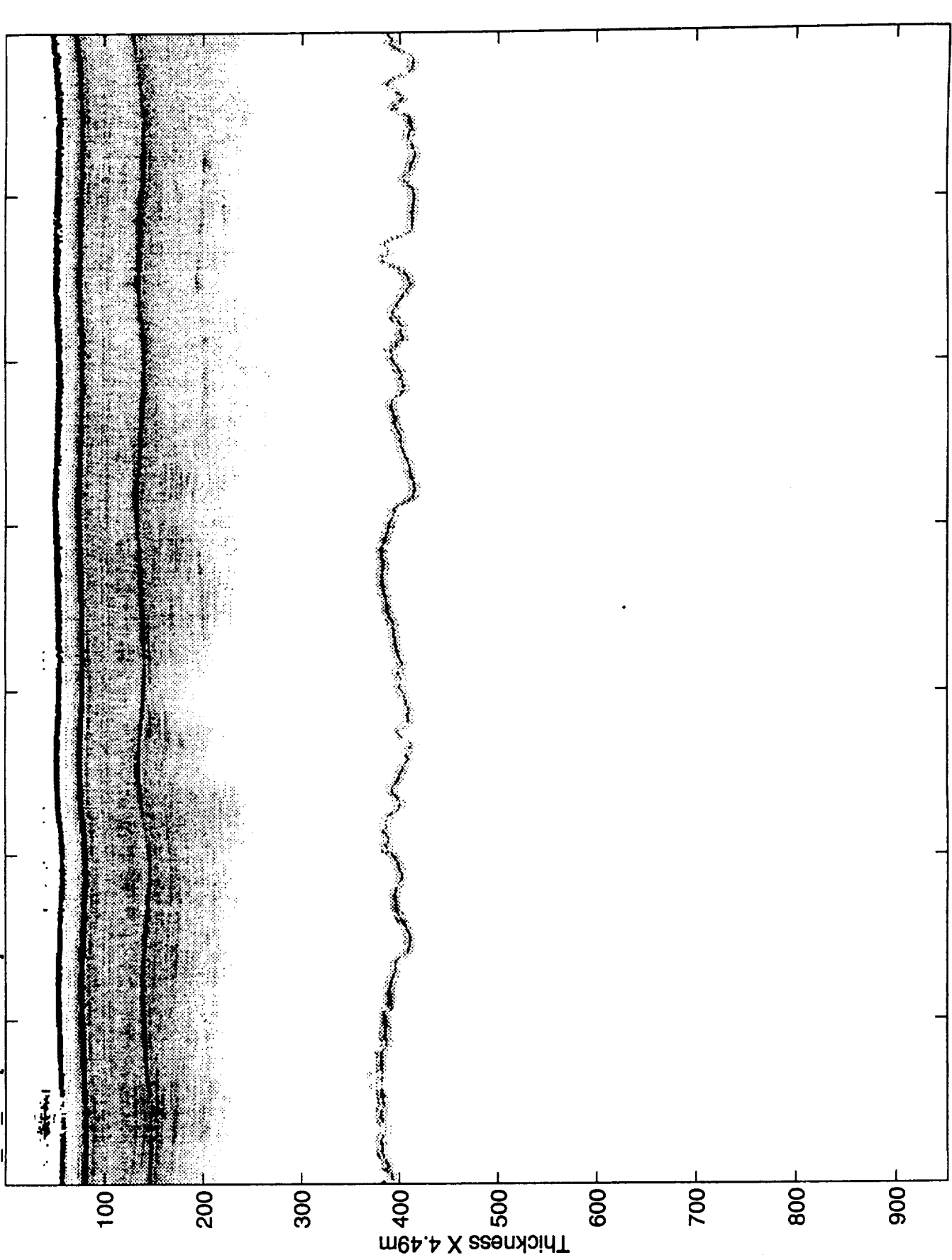
r 10 2.1 <1> [0 1000]



49.3761W
66.9798N
49.2405W
66.9756N
49.1041W
66.9711N
48.9698W
66.9667N
48.8379W
66.9619N
48.708W
66.9573N
48.572W
66.9524N
48.447W
66.9476N
48.3179W
66.9428N
48.1887W
66.9377N
66.9326N
48.0589W

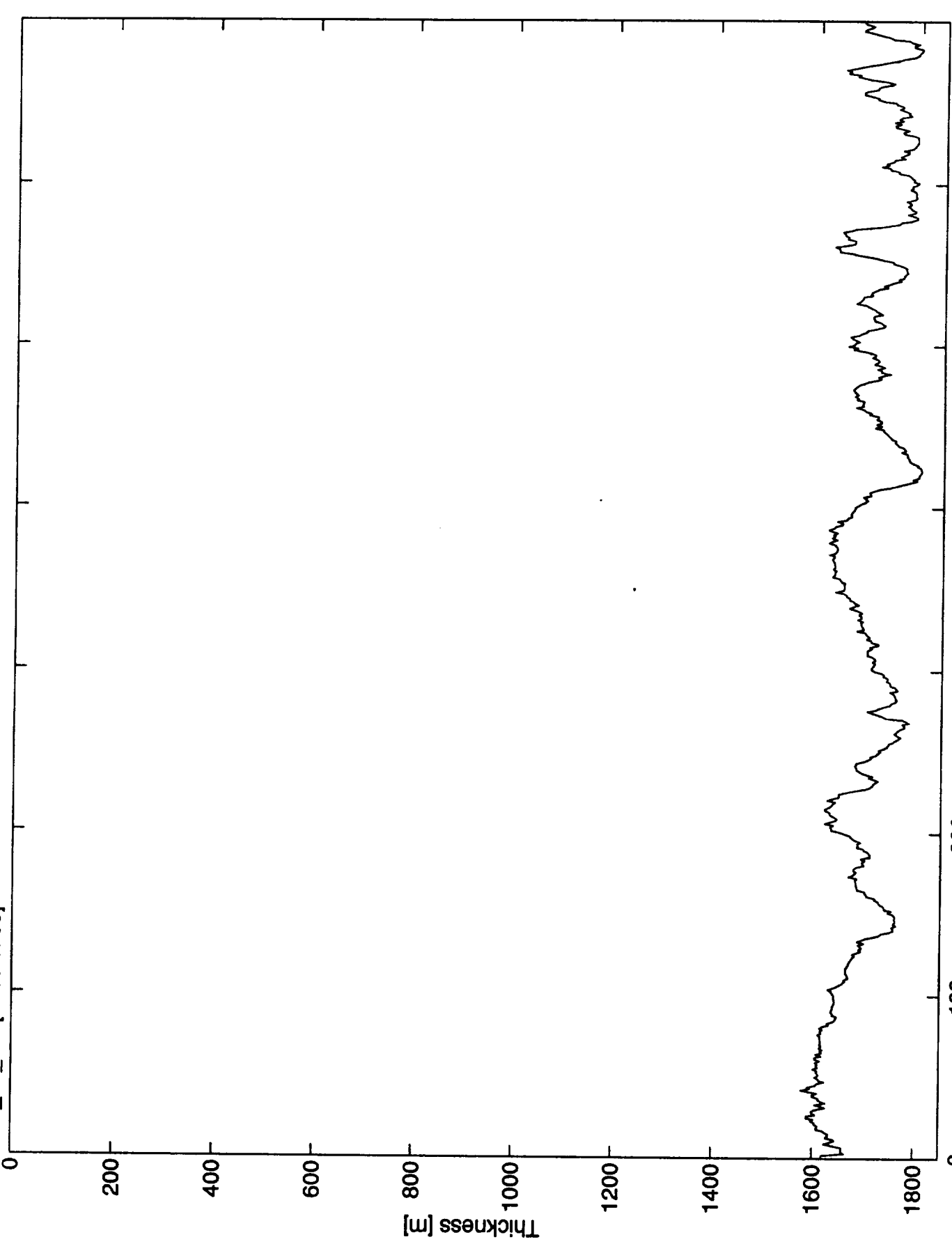


r_10_2:1 [1000 1700]

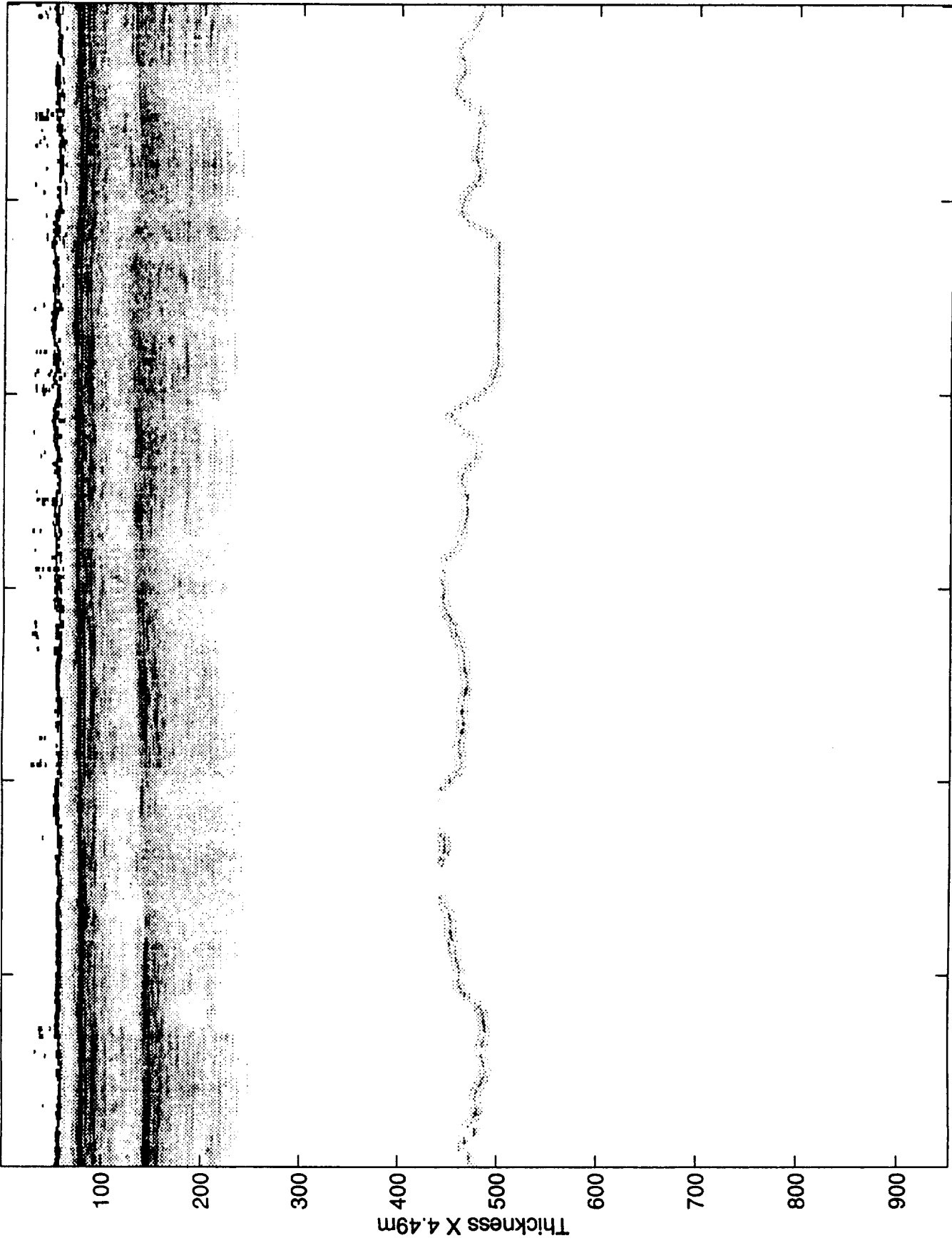


48.05W
66.93N
47.9199W
66.9267N
32.7871W
66.915N
47.672W
66.8668N
47.5696W
66.8517N
47.4689W
66.816N
47.3738W
66.7787N
47.2729W
66.7432N

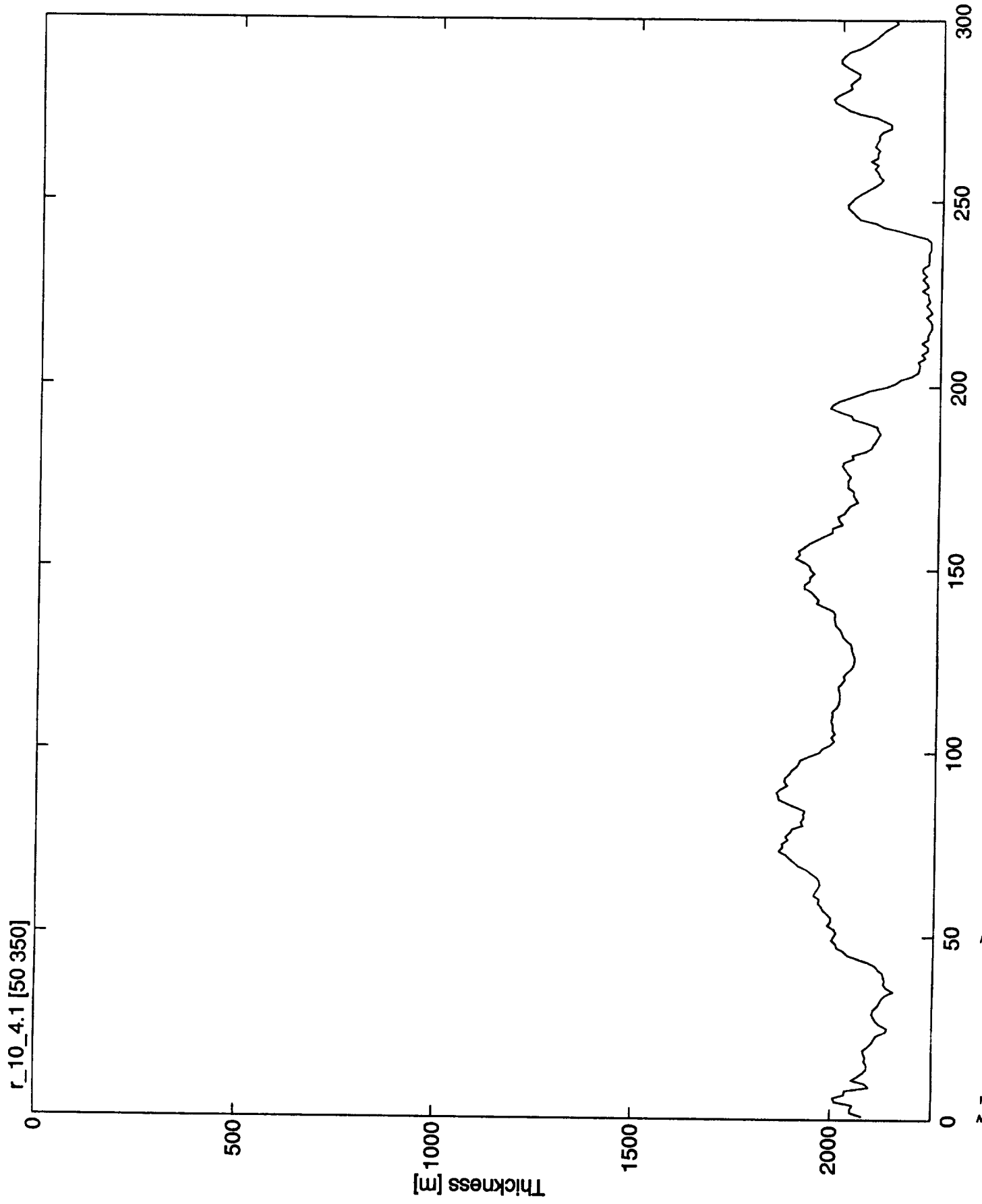
r_10_2.1 [1000 1700]



r_10_4.1 [50 350]

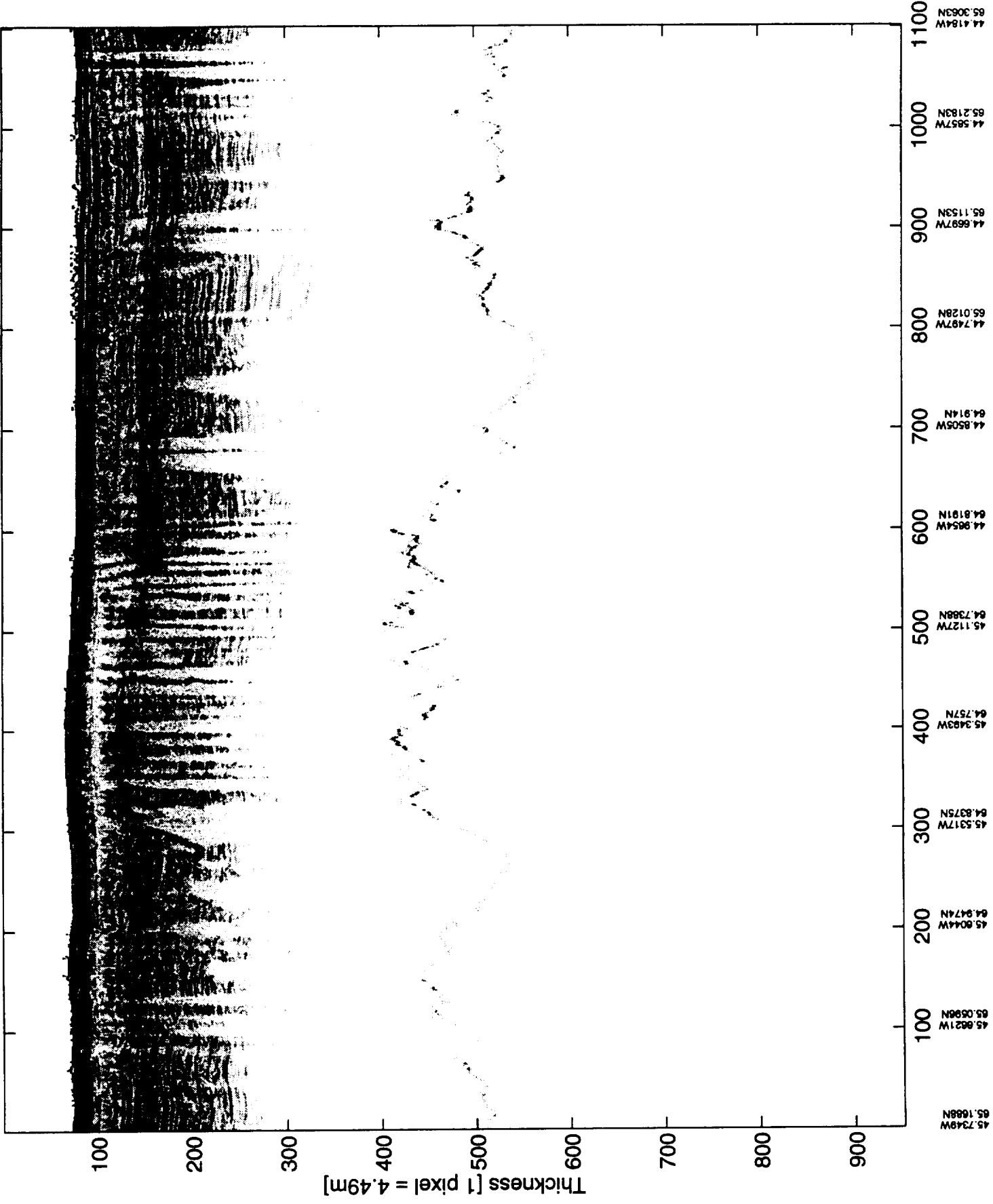


46.2803W 66.0722N
46.3328W 66.0226N
46.3673W 65.9686N
46.335W 55.9141N
46.2981W 55.8608N
5.2567W 5.9073N
5.213W 5.7563N

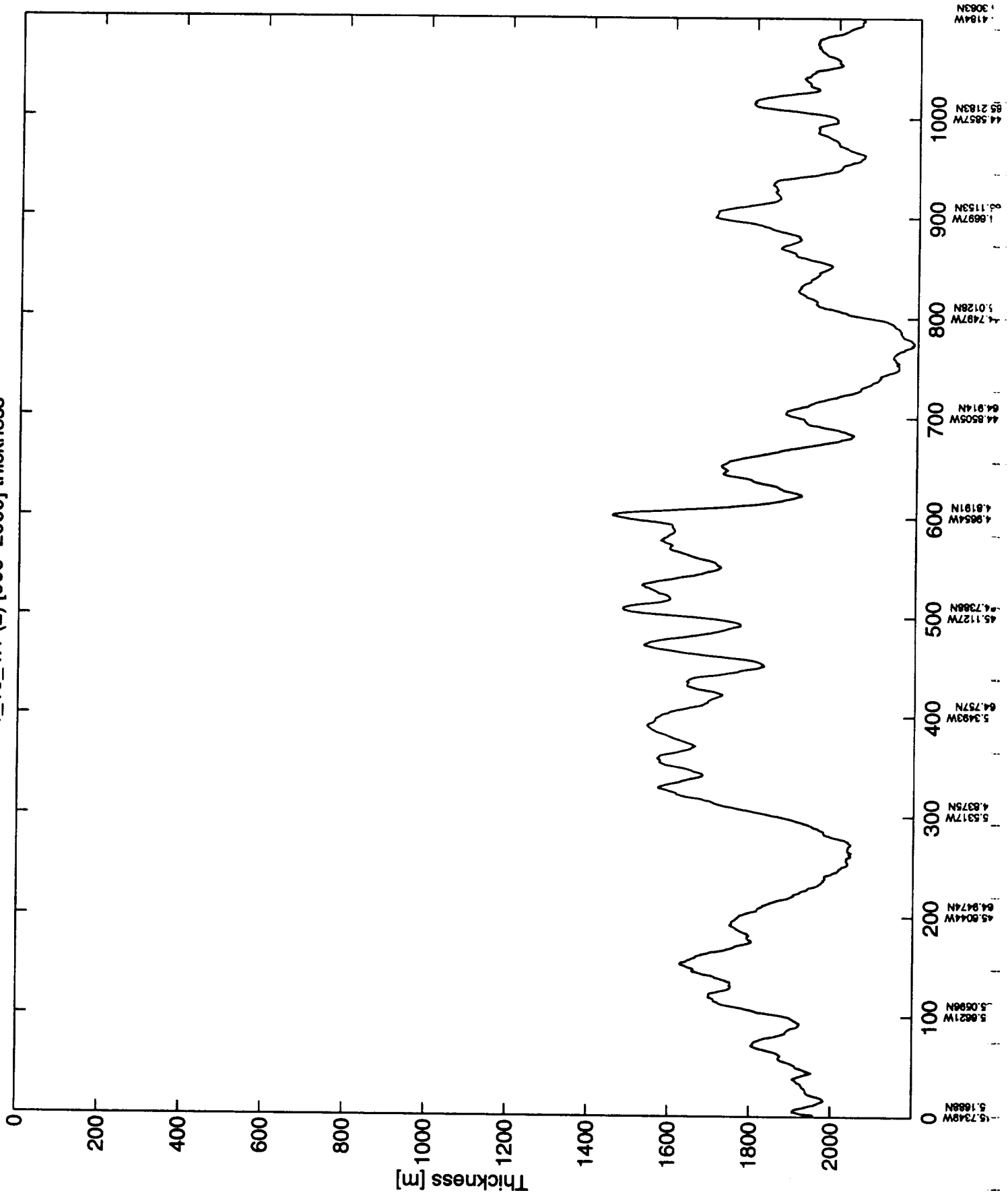


44.293W 66.22N
48.38W 66.0226N
48.3673W 66.16N
48.3141N 66.16N
48.3141N 66.16N
46.281W 66.16N
46.17W 66.16N
46.27W 66.16N
46.27W 66.16N

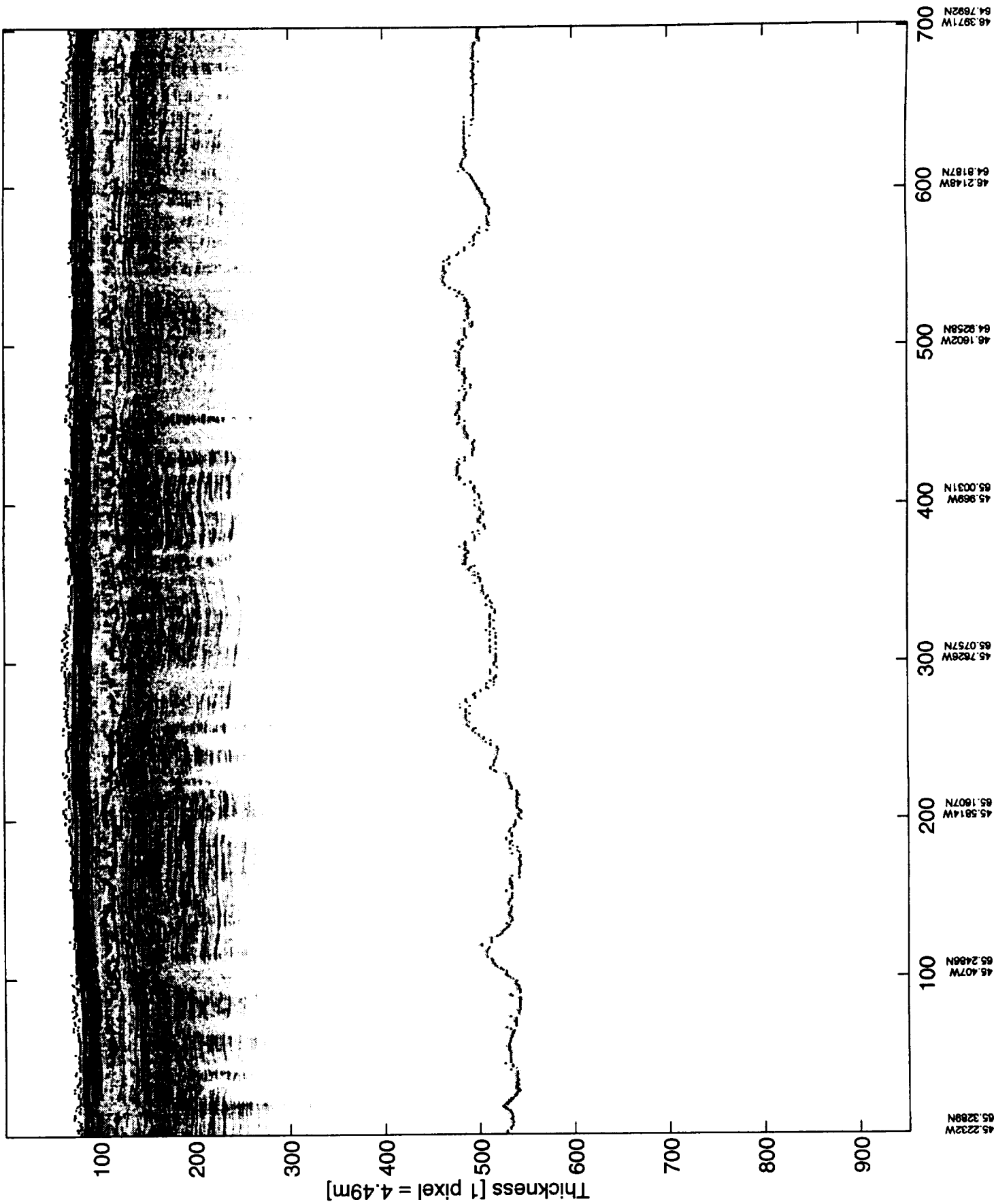
r_10_4.1 (2) [900-2000]



r_10_4.1 (2) [900-2000] thickness

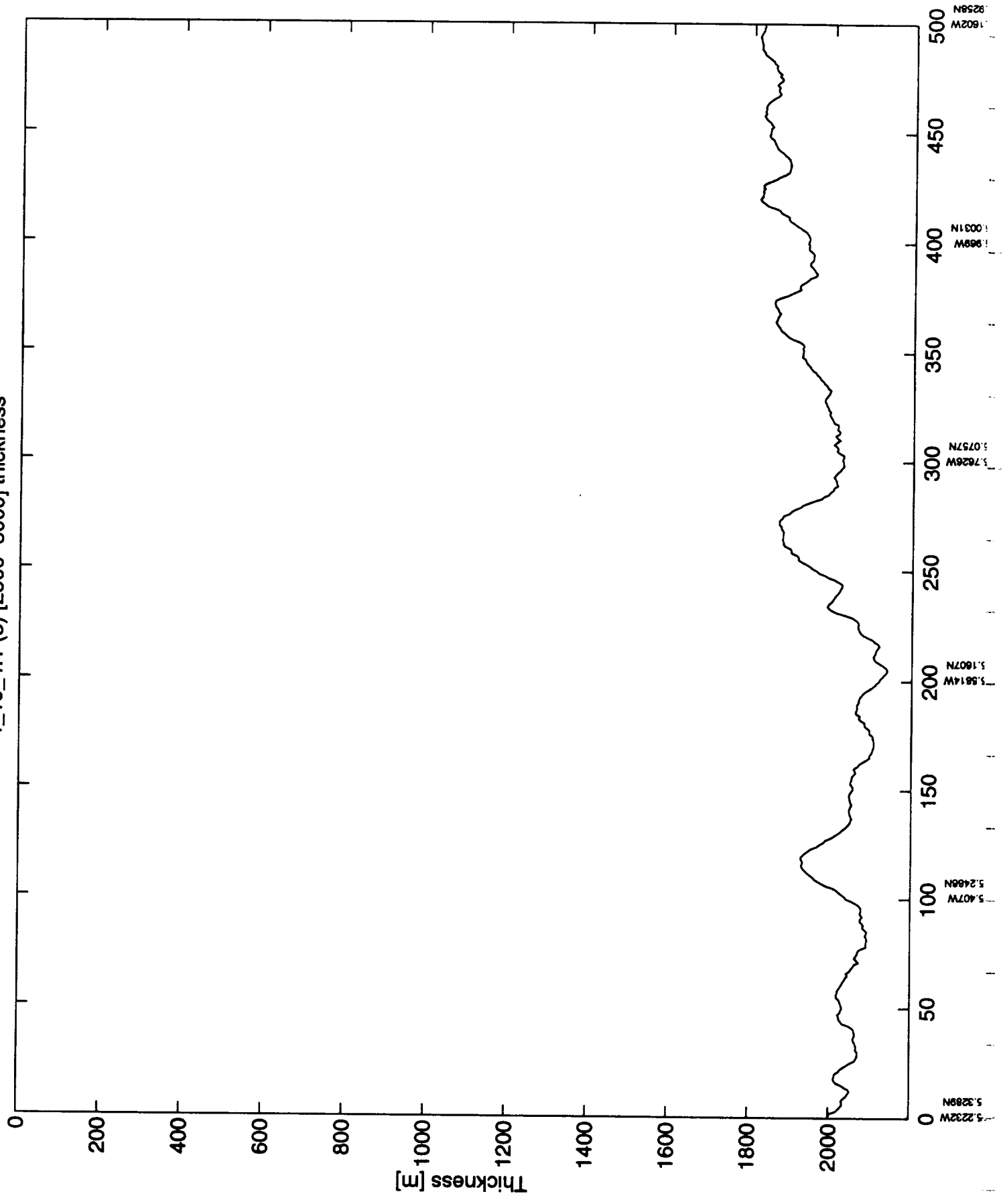


r_10_4.1 (3) [2500-3200]

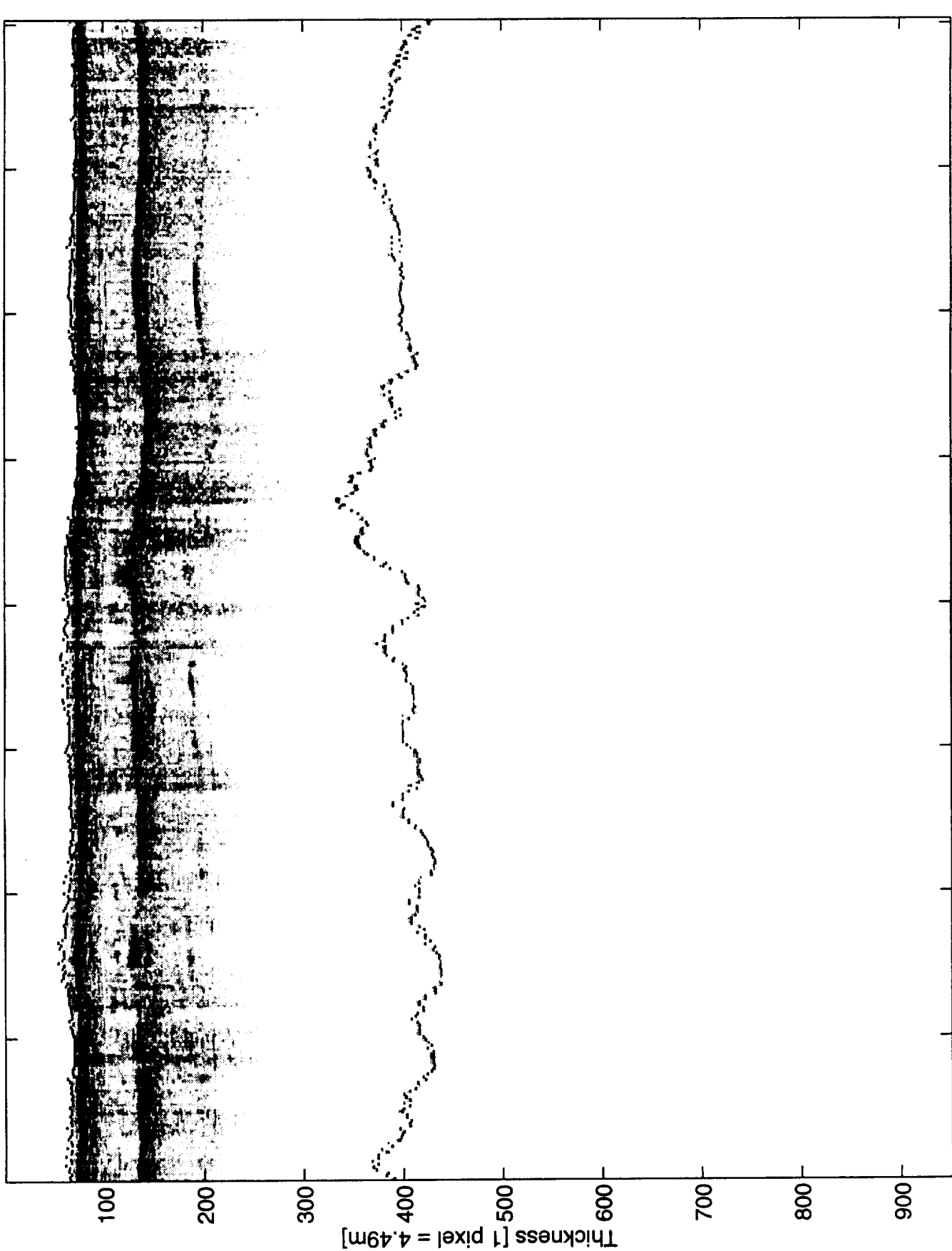


65.2232W
65.407W
65.248N
65.5814W
65.1807N
65.7828W
65.0757N
65.0031N
65.989W
65.1802W
64.9258N
65.2148W
64.8187N
64.3971W
64.7892N

r_10_4.1 (3) [2500-3000] thickness

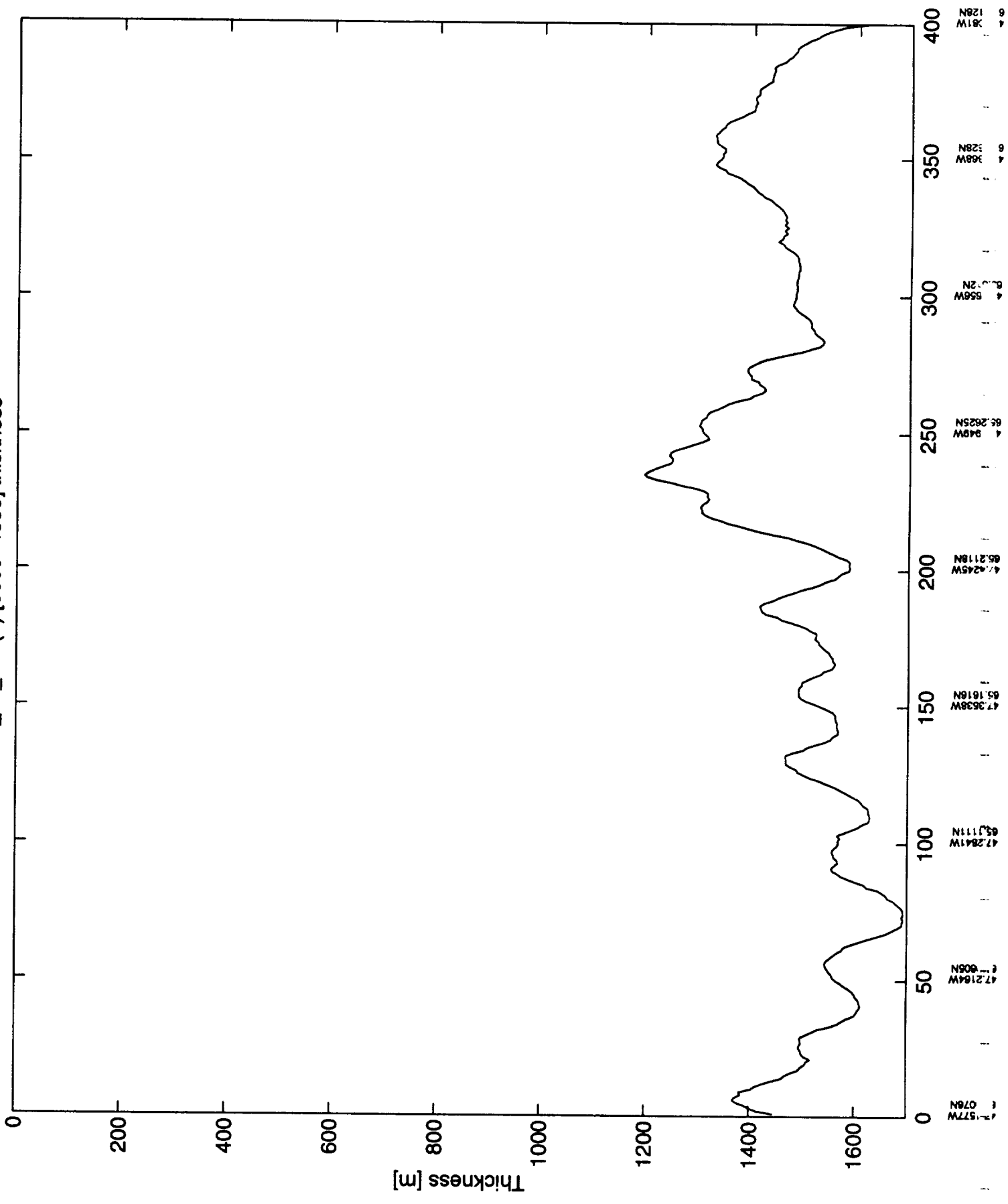


r_10_4.1 (4) [3600-4000]

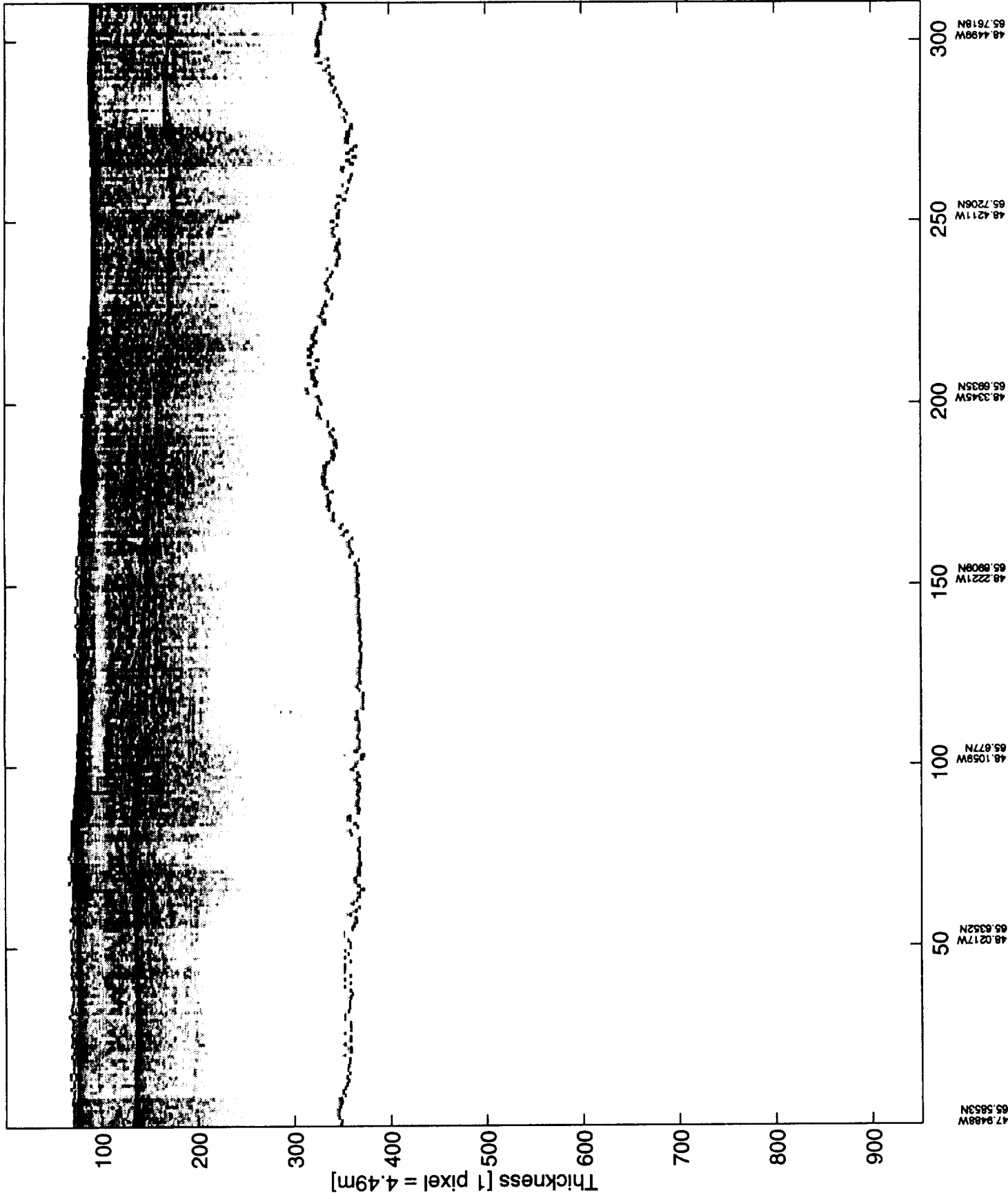


65.0076N
47.1577W
65.1111N
47.2841W
65.2118N
47.4245W
65.312N
47.5656W
65.4128N
47.7081W

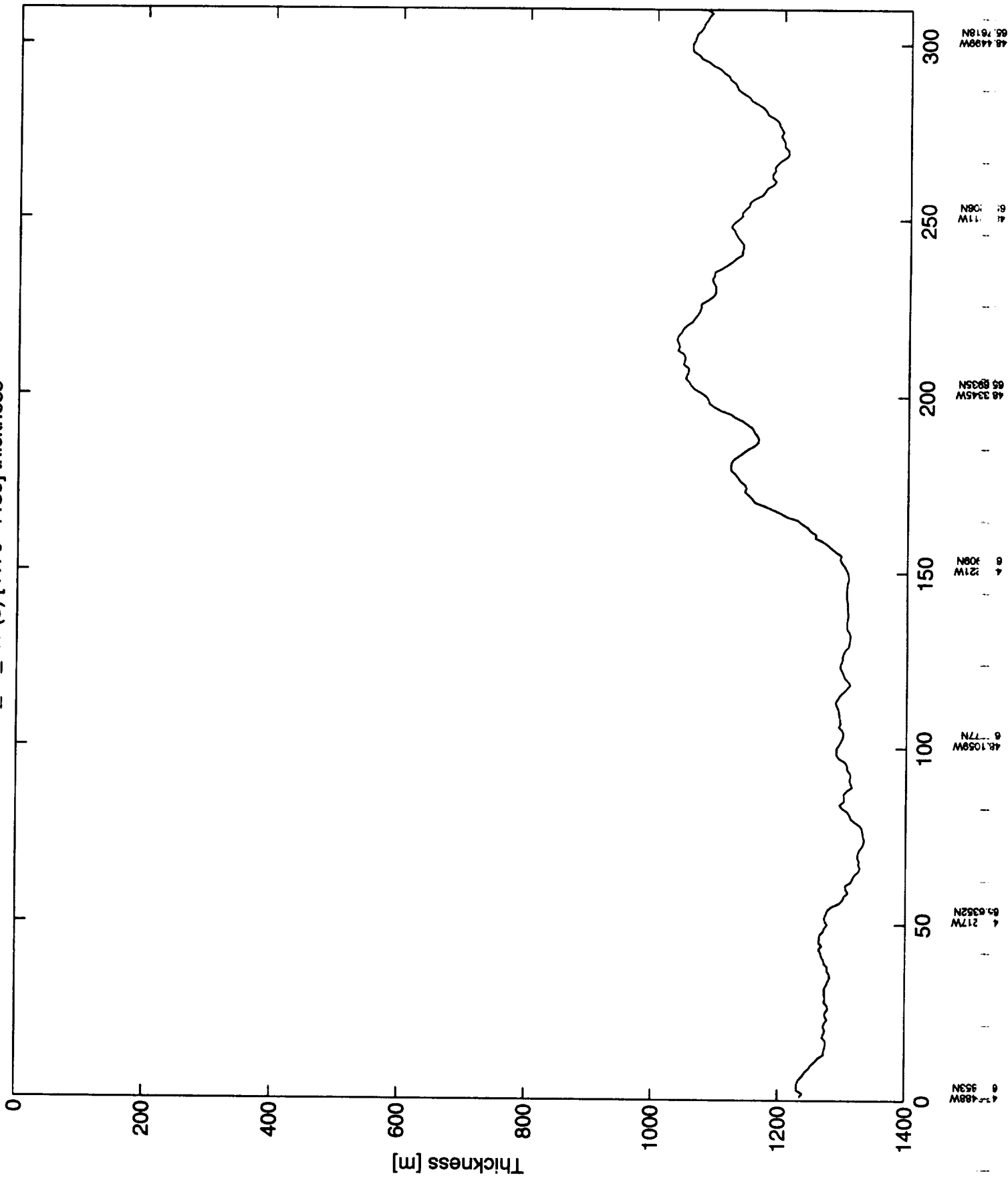
r_10_4.1 (4) [3600-4000] thickness



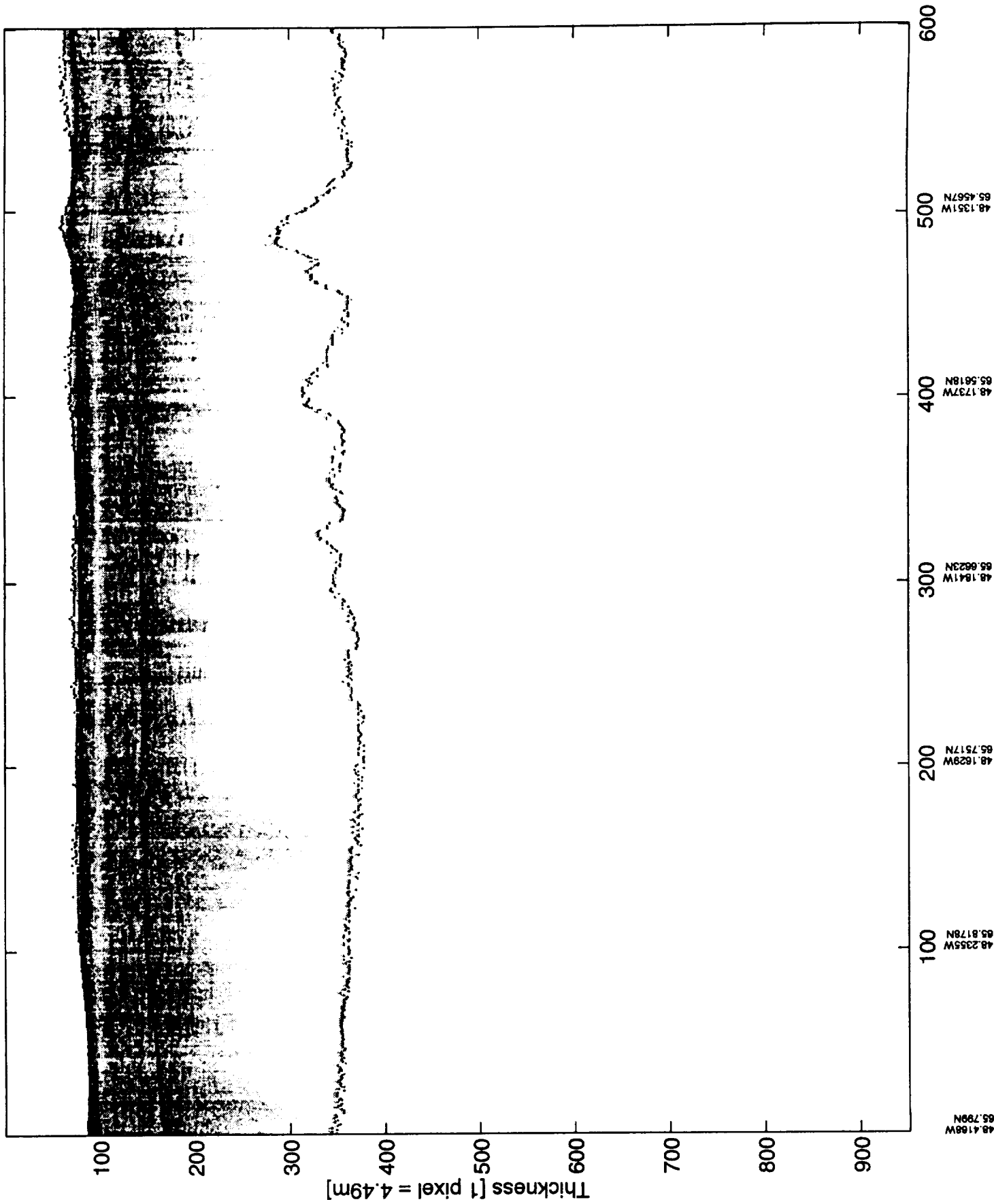
r_10_4.1 (5) [4170-4480]



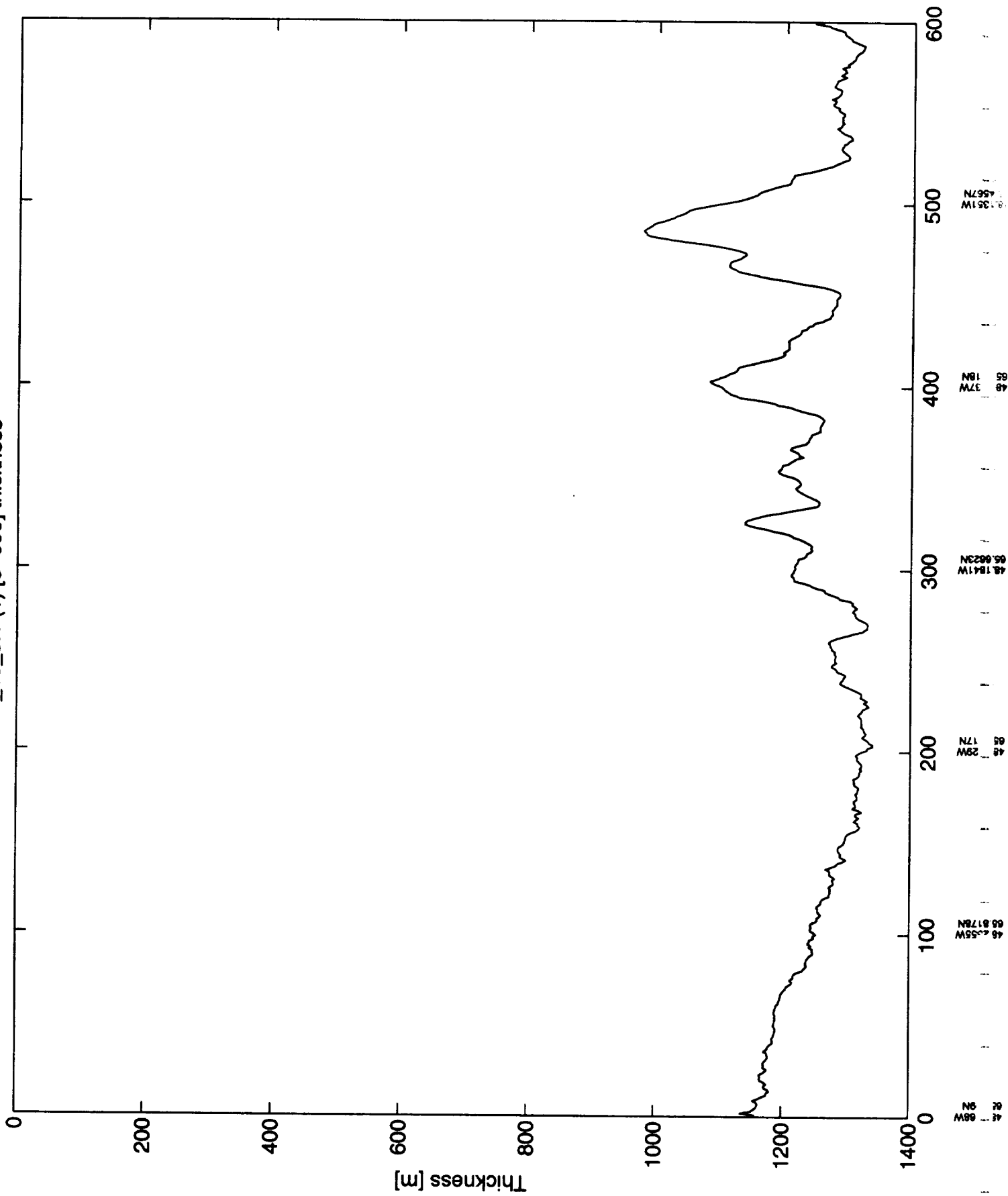
r_10_4.1 (5) [4170-4480] thickness



r_10_5.1 (1) [0-600]



r_10_5.1 (1) [0-600] thickness



42 08W
05 0178N

48 55W
05 0178N

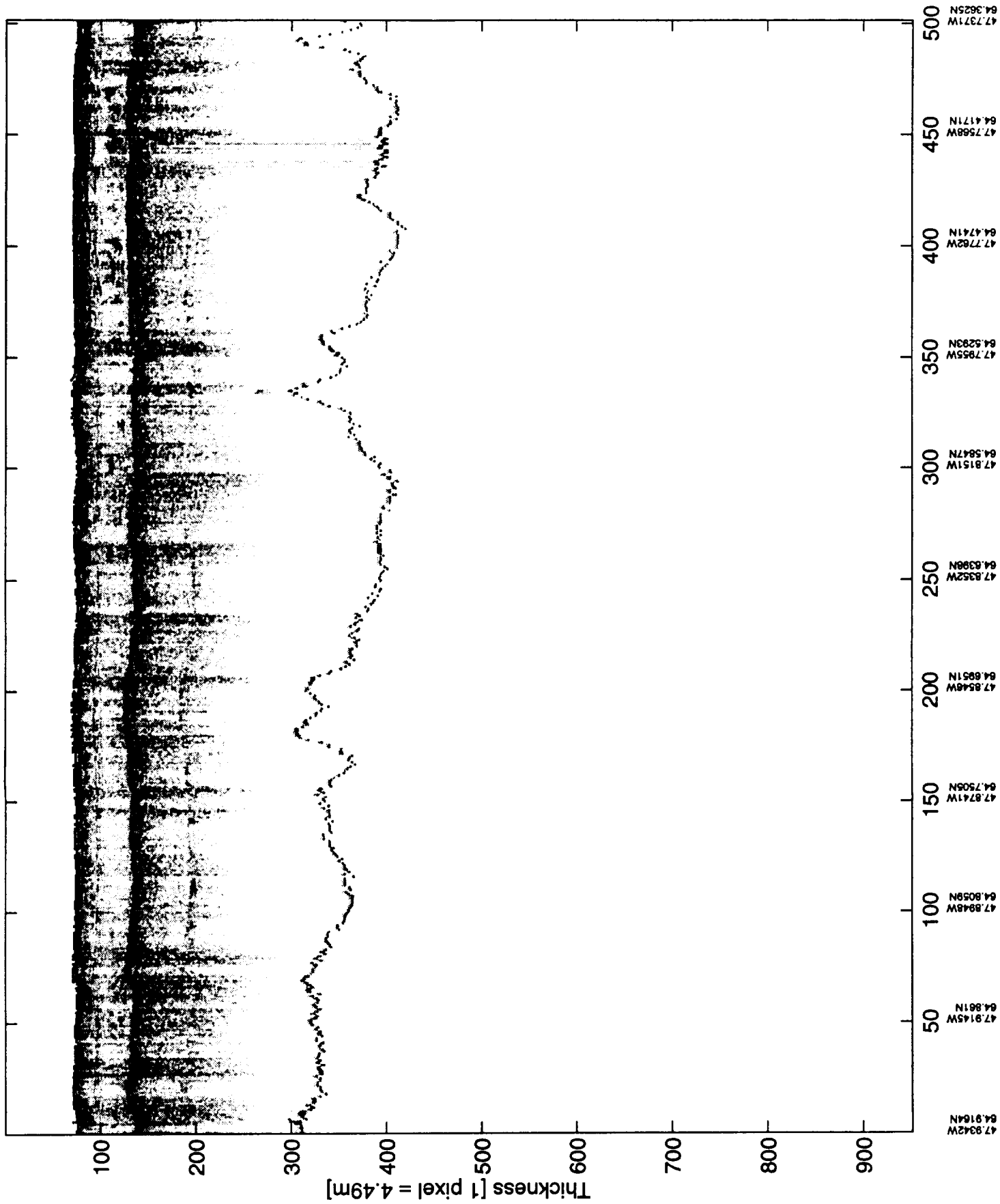
48 29W
05 17N

48 1841W
05 0023N

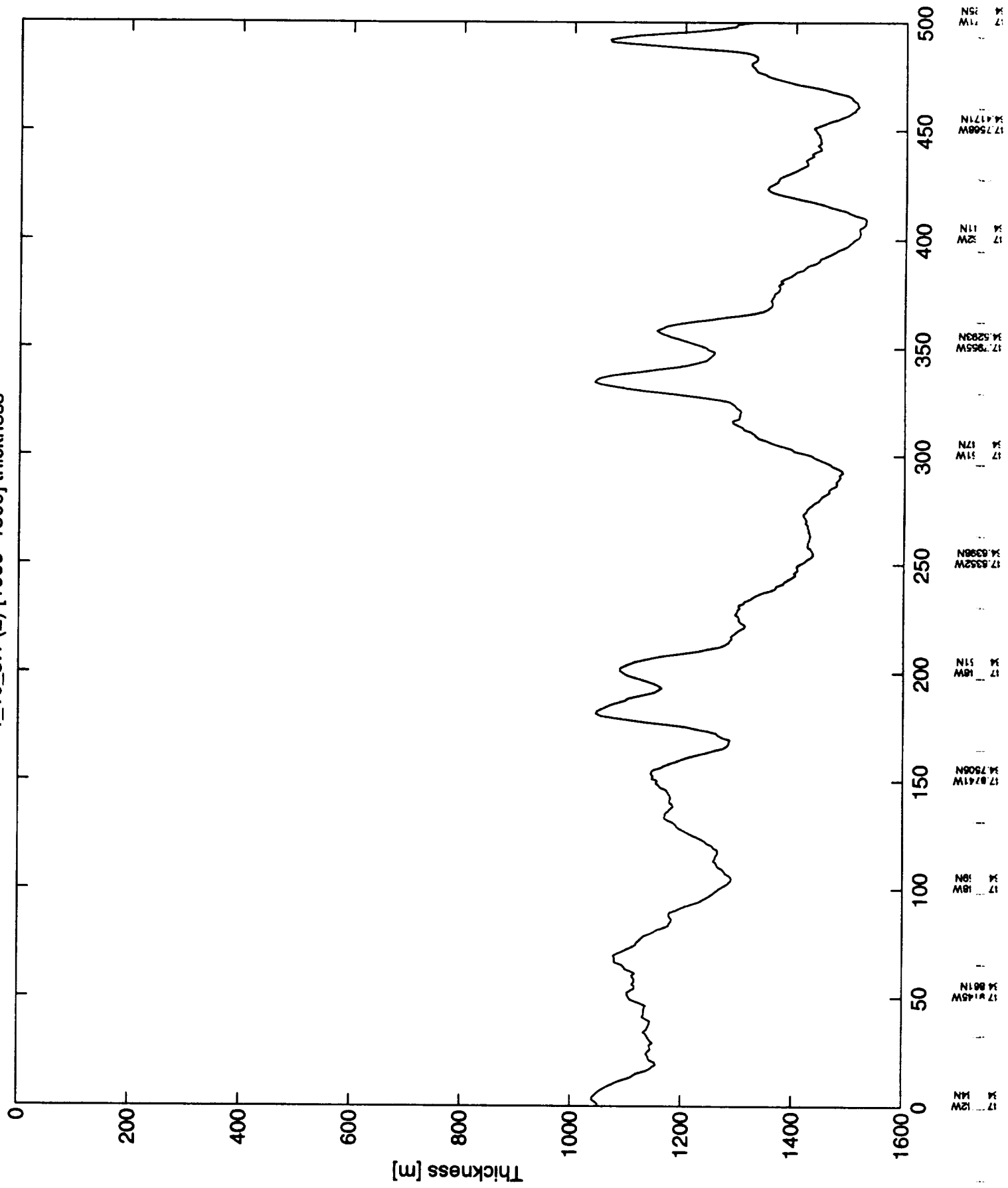
48 37W
05 18N

48 351W
05 457N

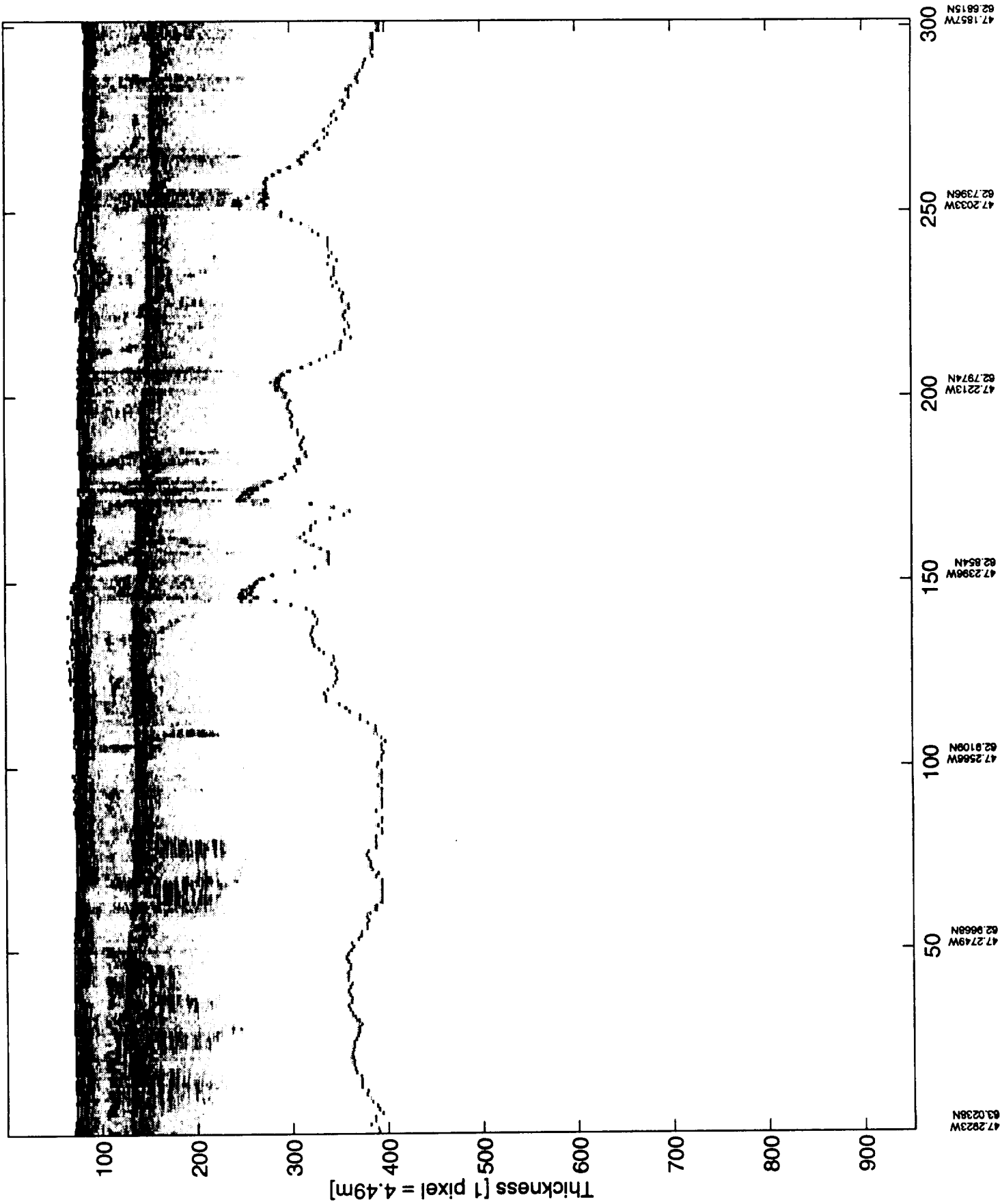
r_10_5.1 (2) [1000 1500]



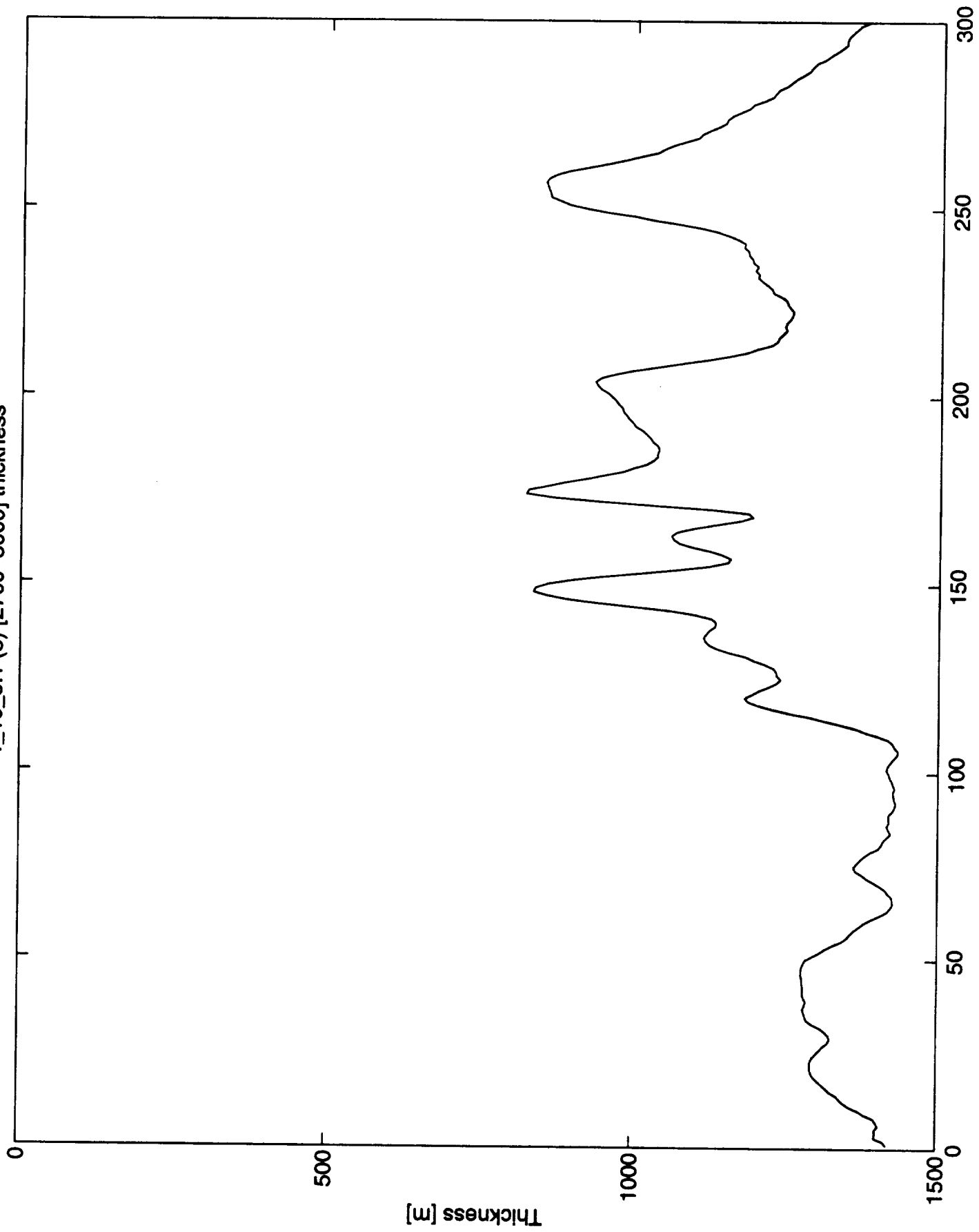
r_10_5.1 (2) [1000-1500] thickness



r_10_5.1 (3) [2700 3000]

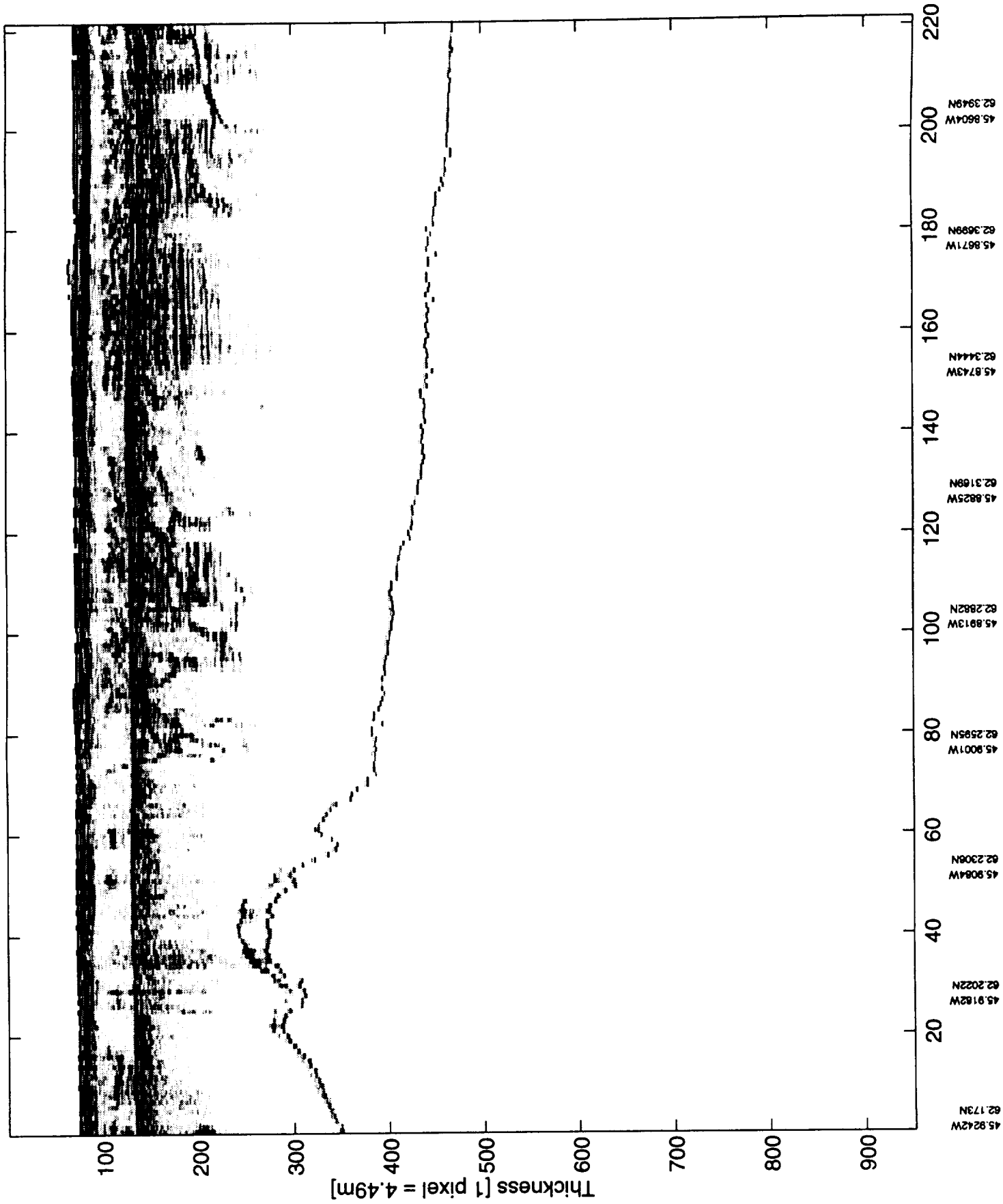


r_10_5.1 (3) [2700-3000] thickness



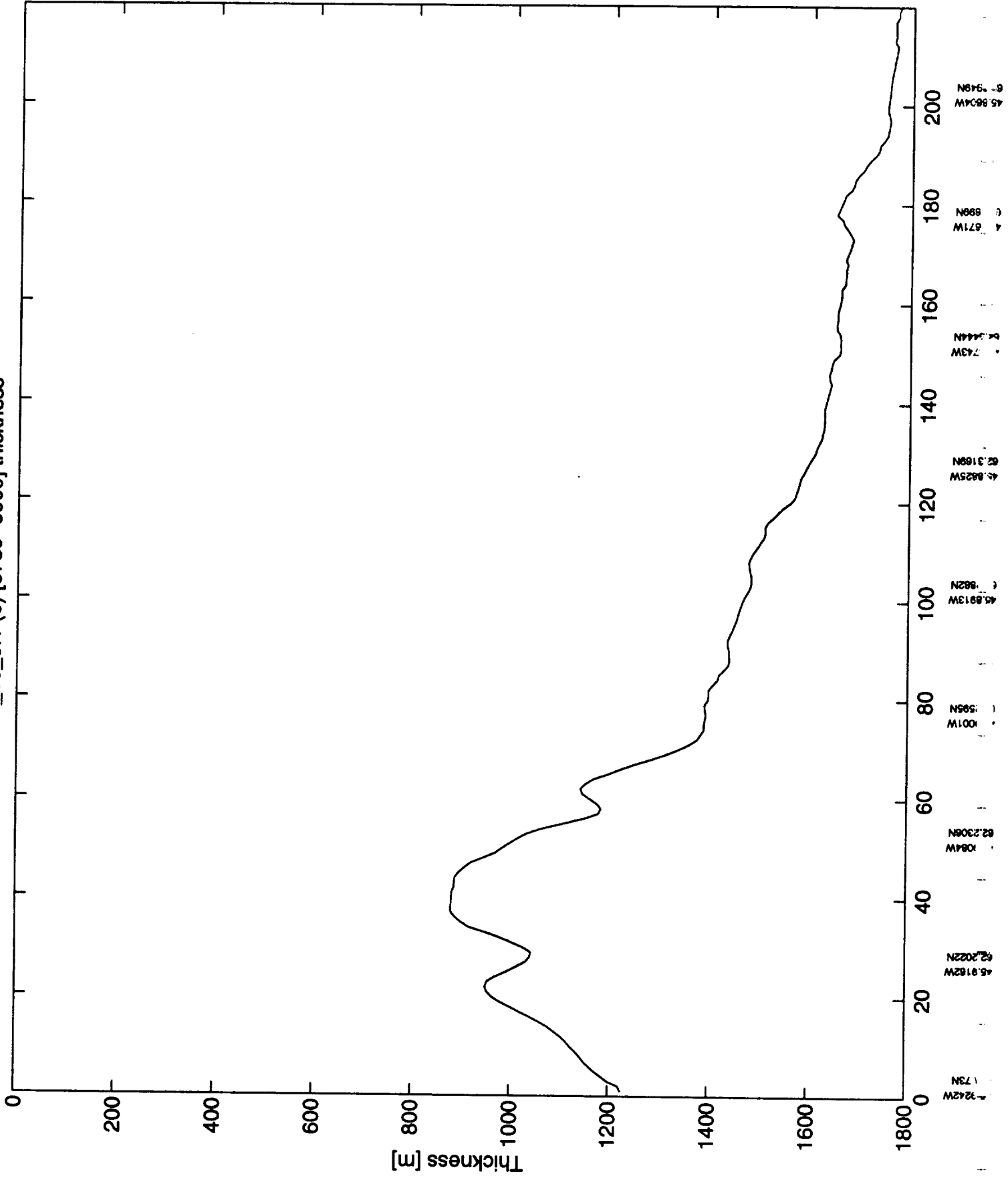
NE 31
MC 12
2033W
1390
NP 3M
1854N
2395W
NE 31
MC 12
1854N
2395W
NE 31
MC 12
1854N
2395W

r_10_5.1 (6) [5780 6000]

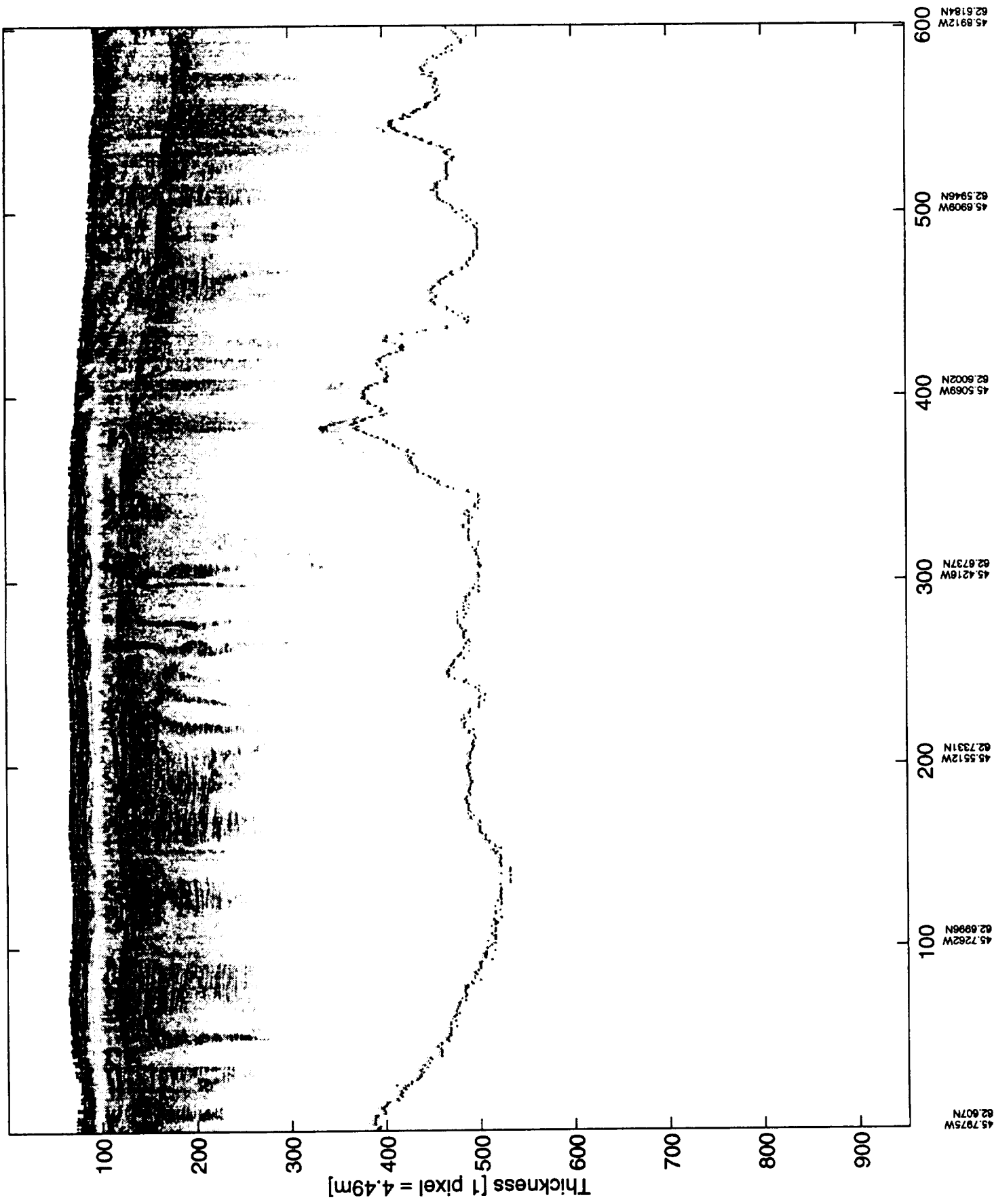


45.9242W
62.173N
45.9182W
62.2022N
45.9084W
62.2308N
45.9001W
62.2585N
45.8913W
62.2882N
45.8825W
62.3189N
45.8743W
62.3444N
45.8671W
62.3689N
45.8604W
62.3949N

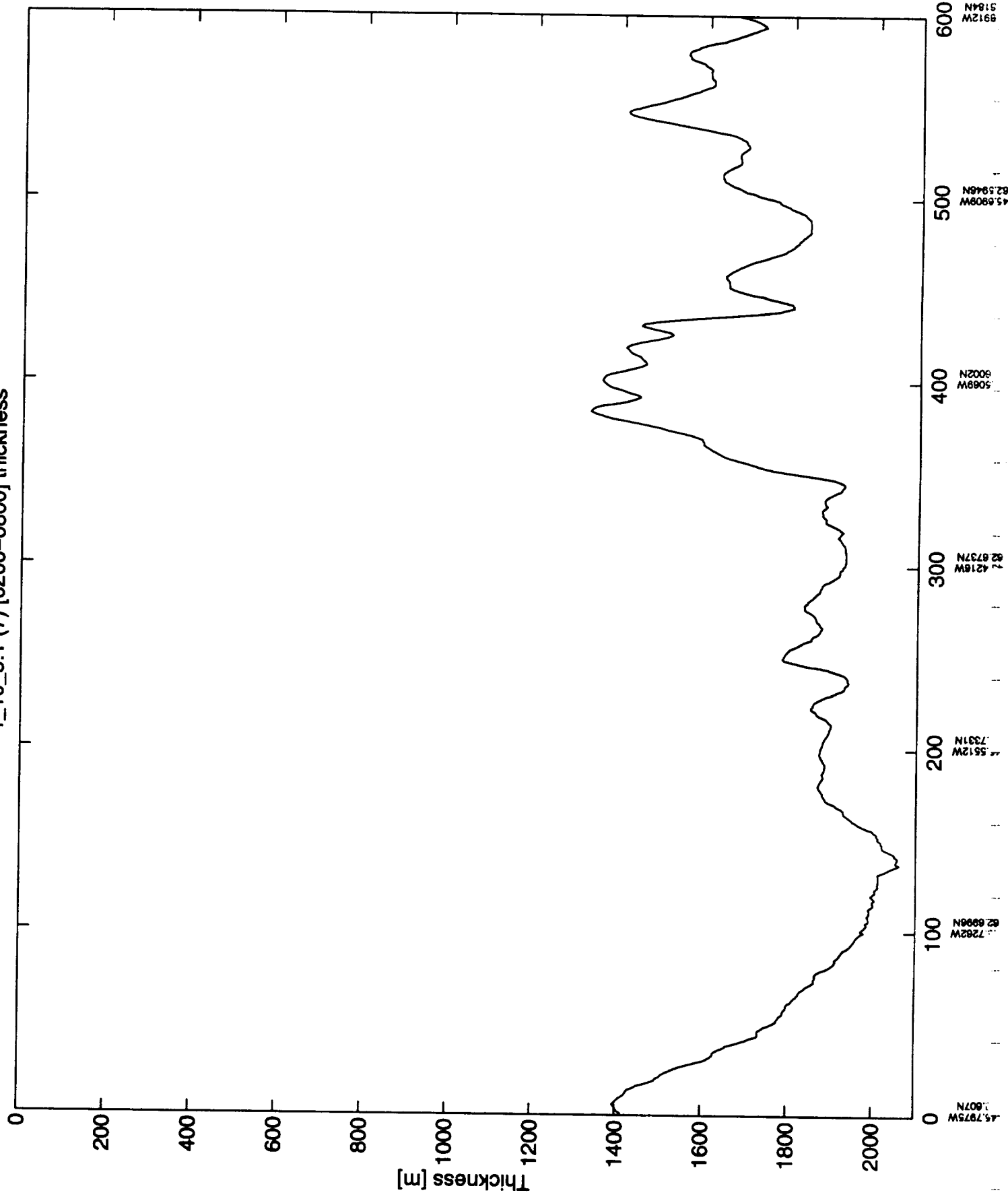
r_10_5.1 (6) [5780-6000] thickness



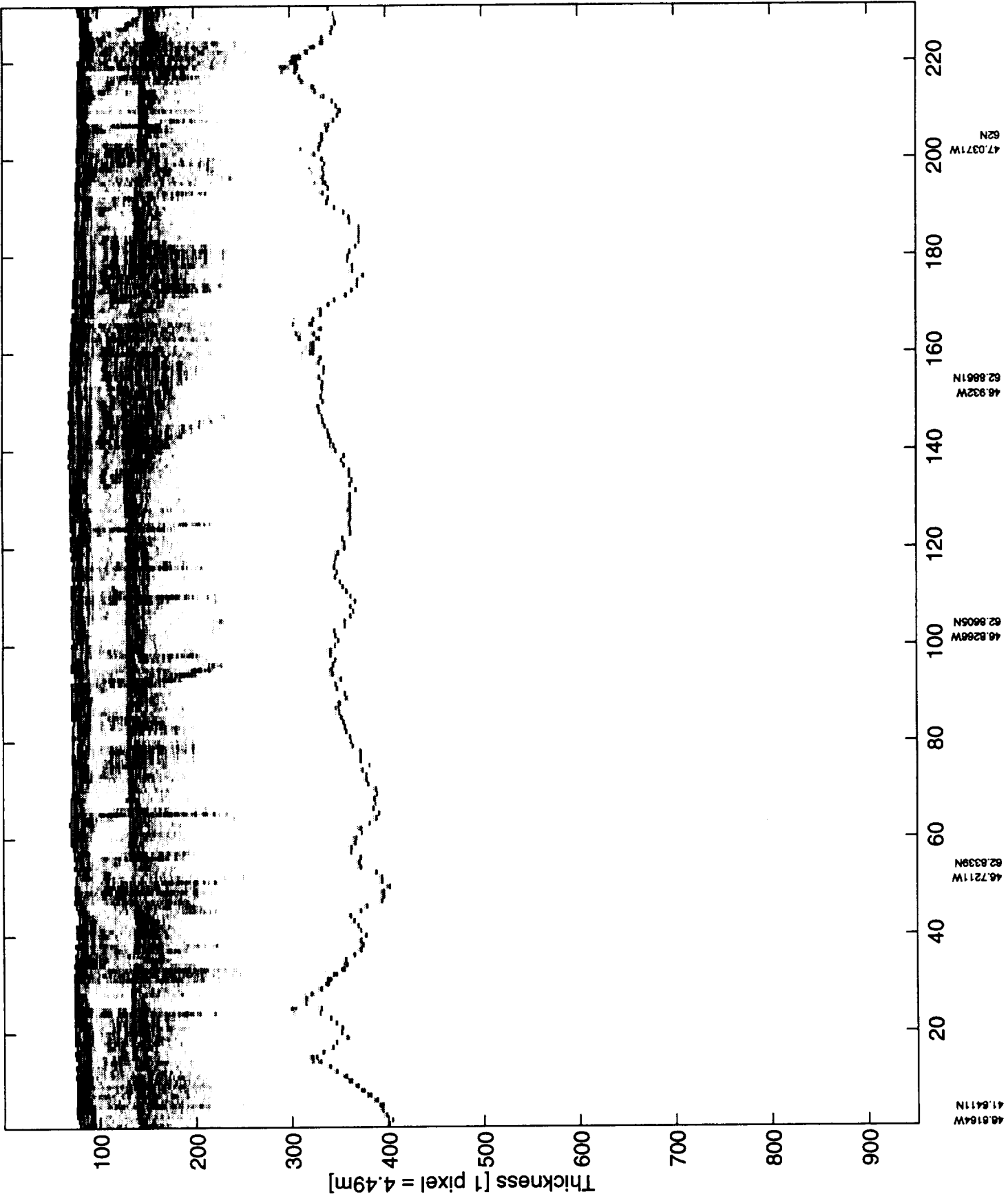
r_10_5.1 (7) [6200 6800]



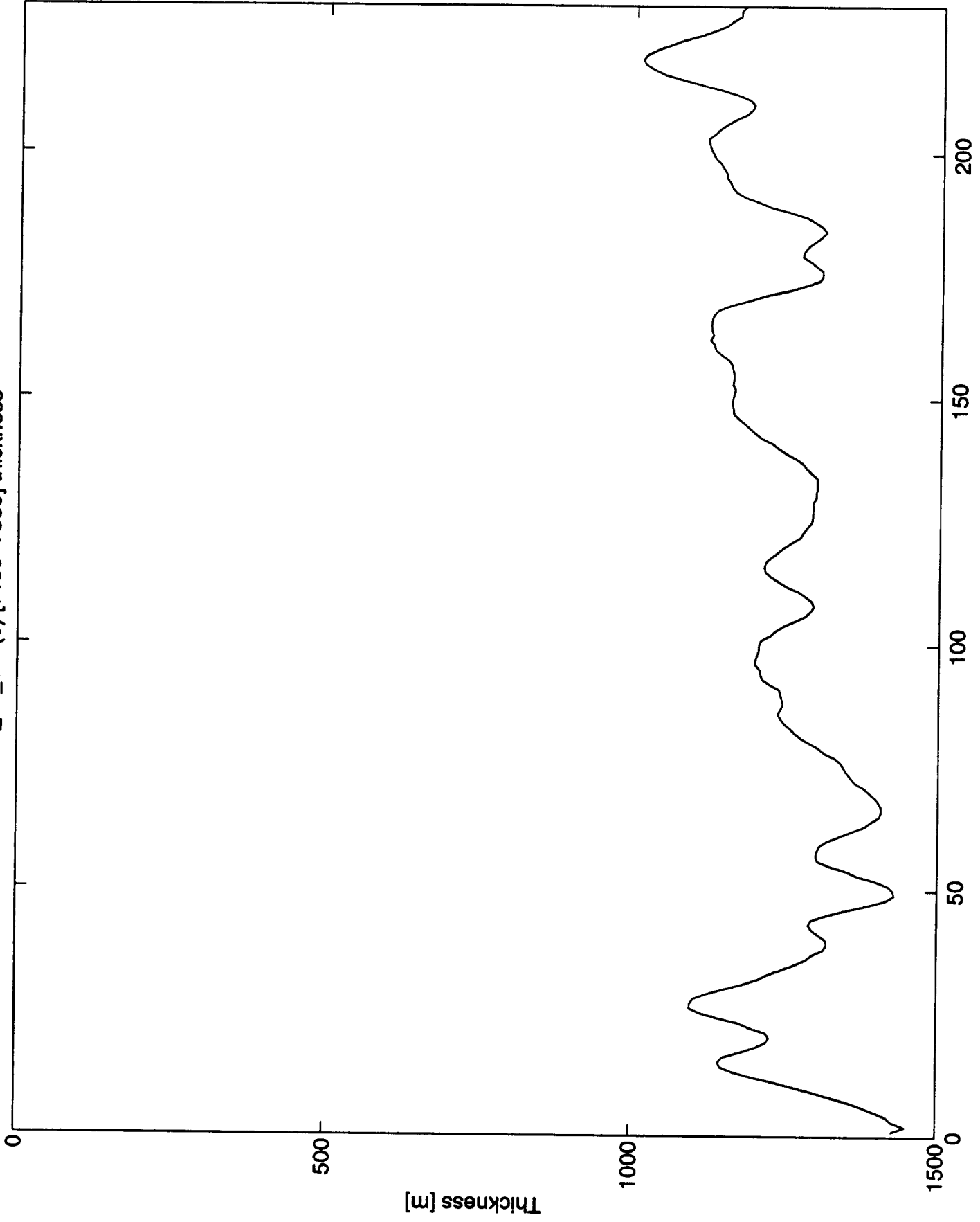
r_10_5.1 (7) [6200-6800] thickness



r_10_5.1 (8) [7150 7380]



r_10_5.1 (8) [7150-7380] thickness

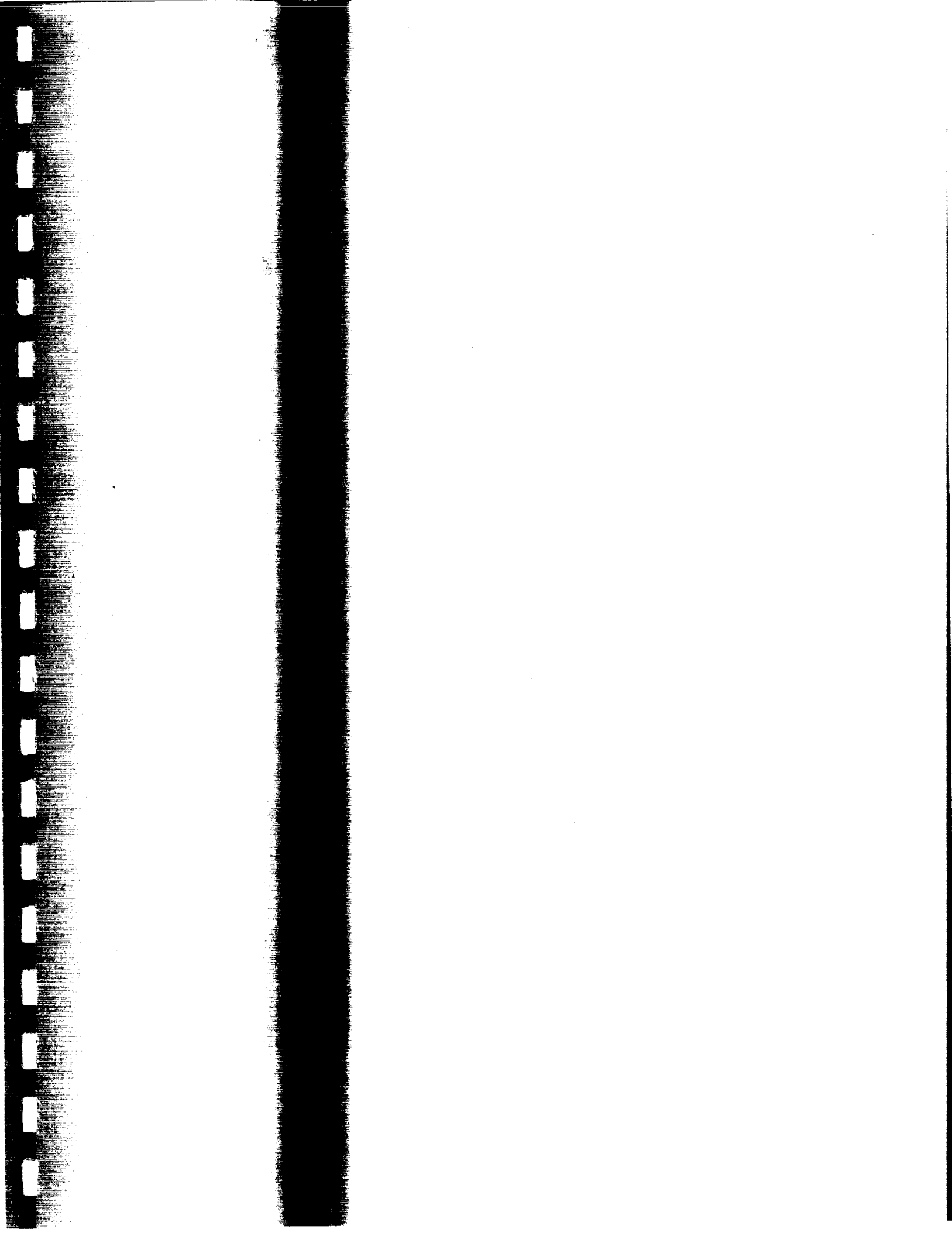


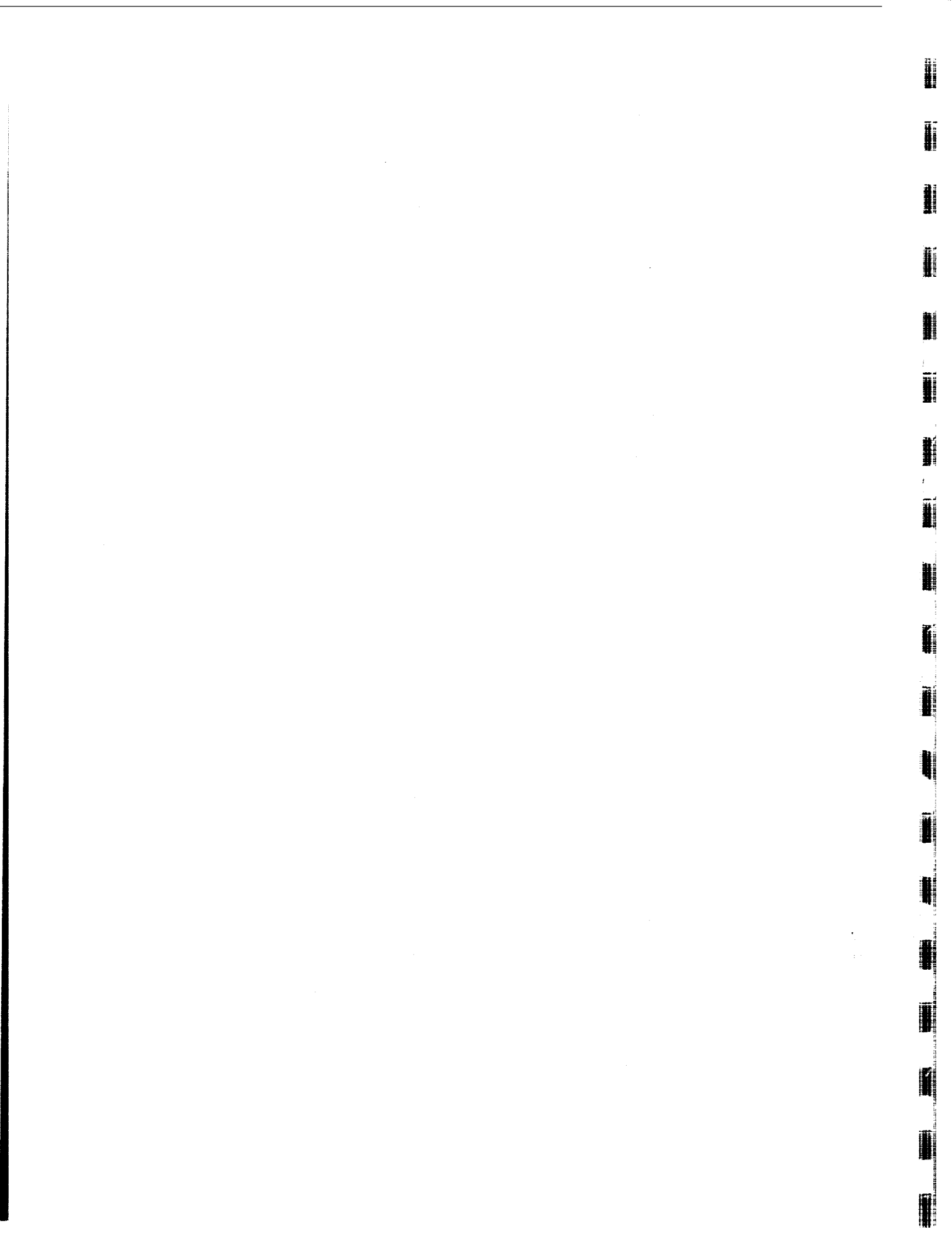
1 11W
2 11N
3 11W
4 11N
5 11W
6 11N
7 11W
8 11N
9 11W
10 11N
11 11W
12 11N
13 11W
14 11N
15 11W
16 11N
17 11W
18 11N
19 11W
20 11N

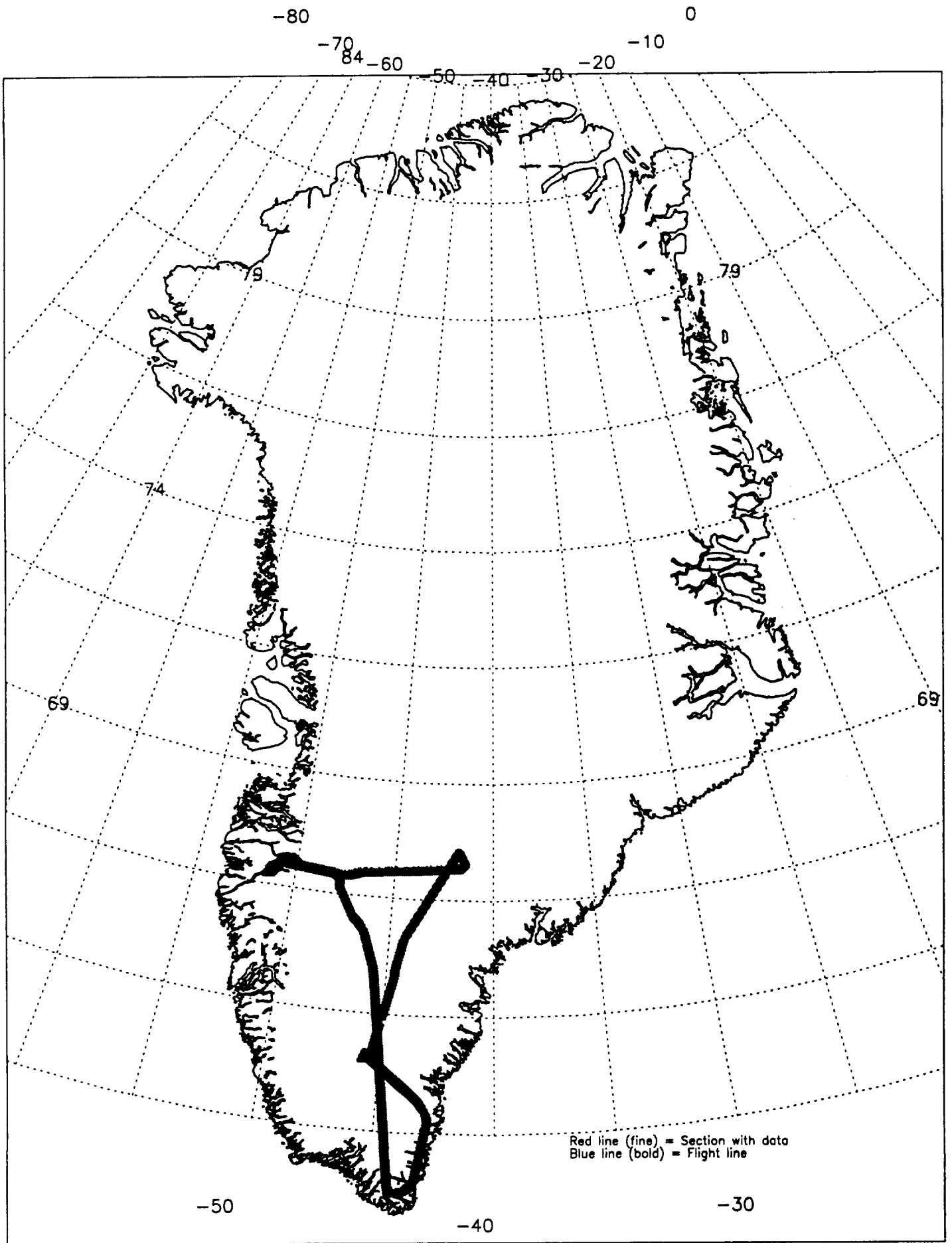
Appendix E

July 1, 1993



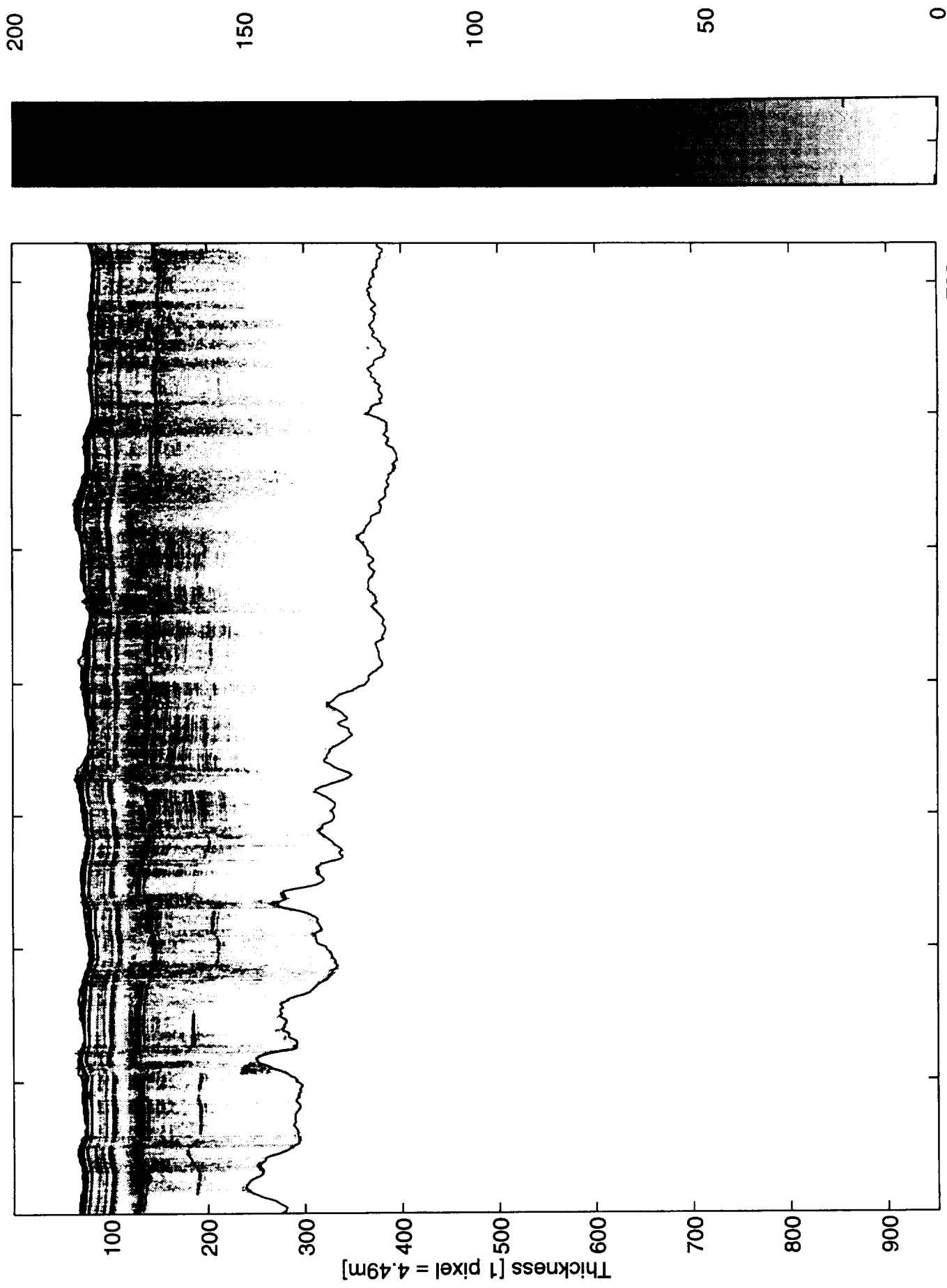




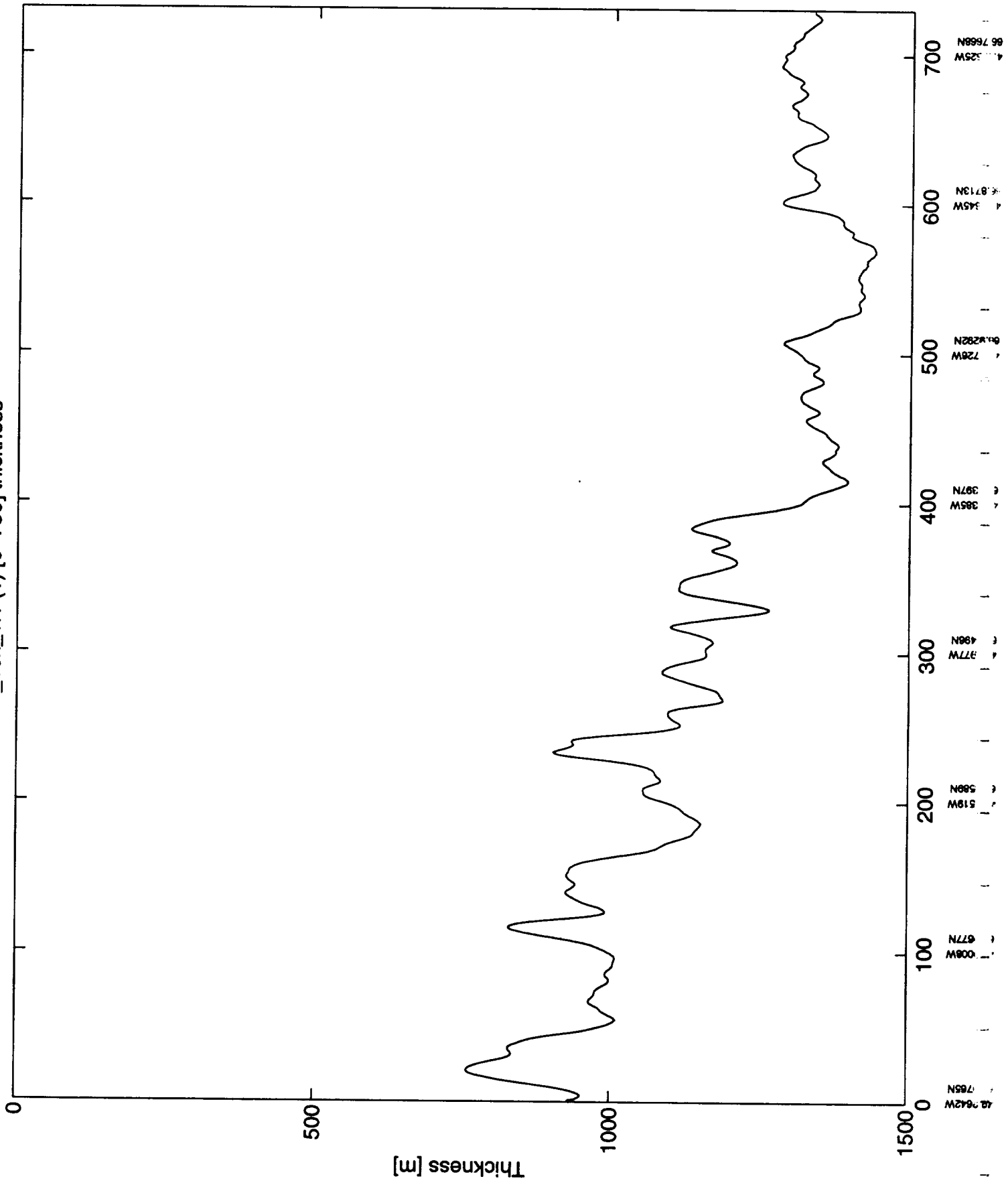




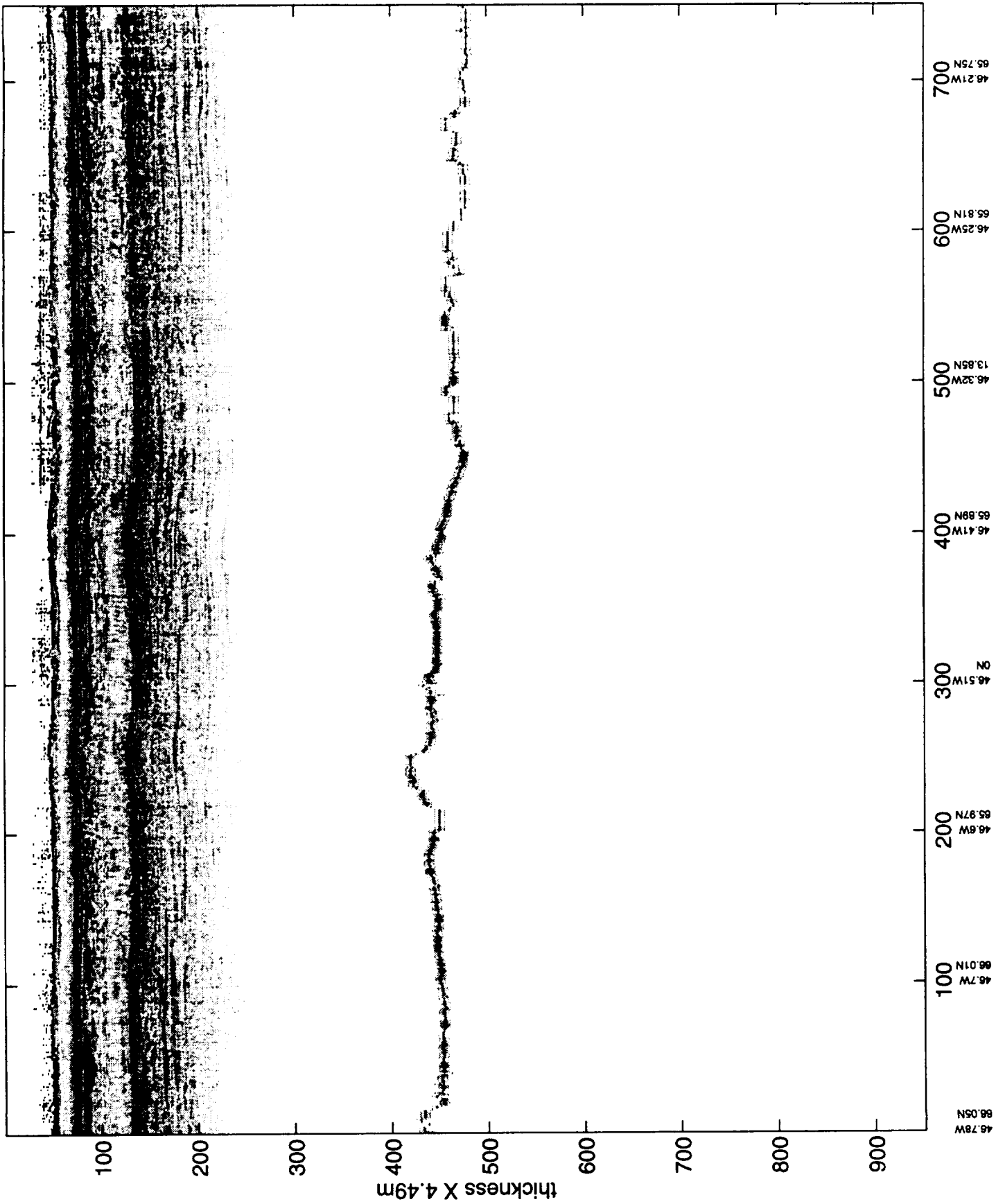
r_10x_1.1 (1) [0-730]

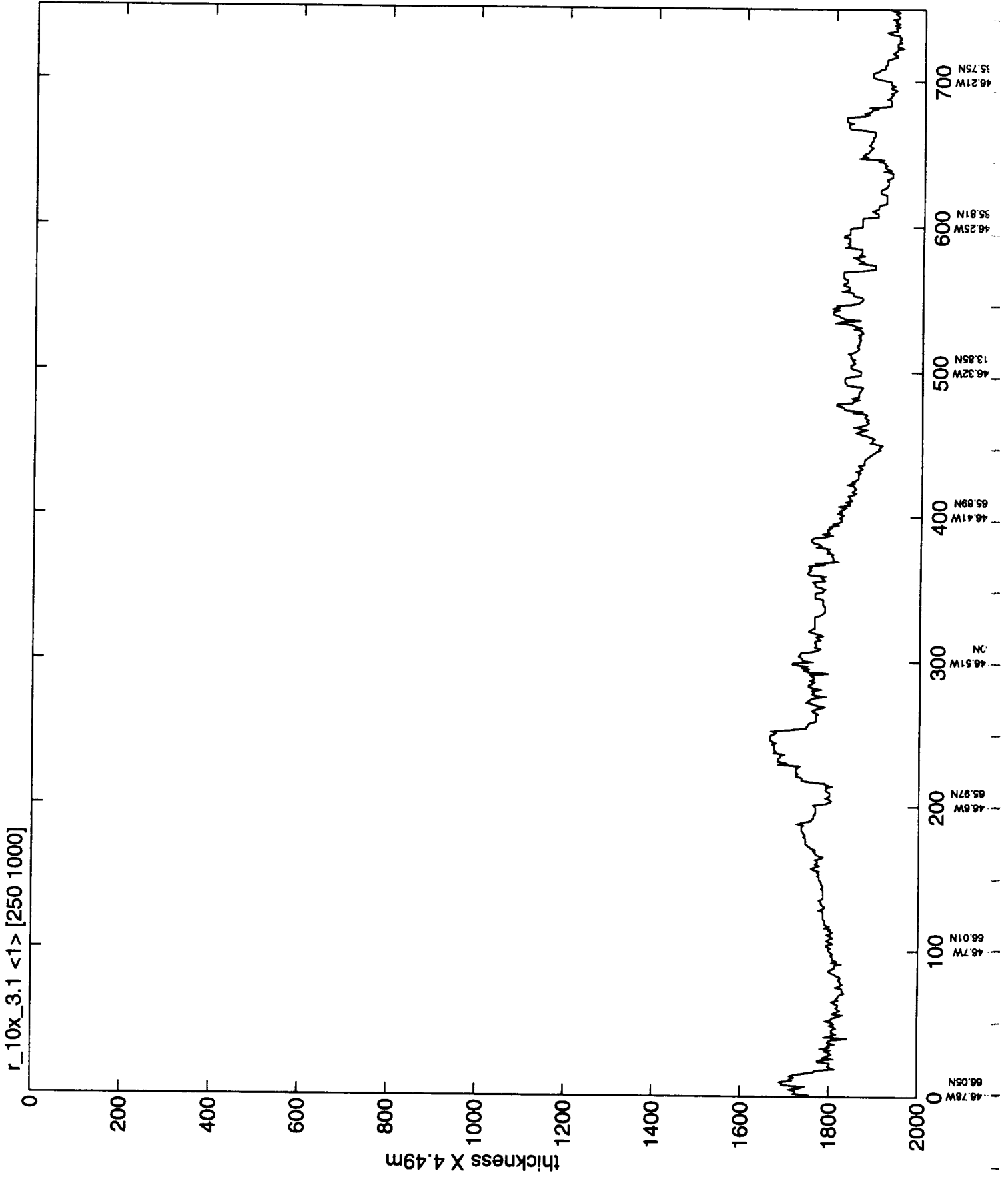


r_10x_1.1 (1) [0-730] thickness

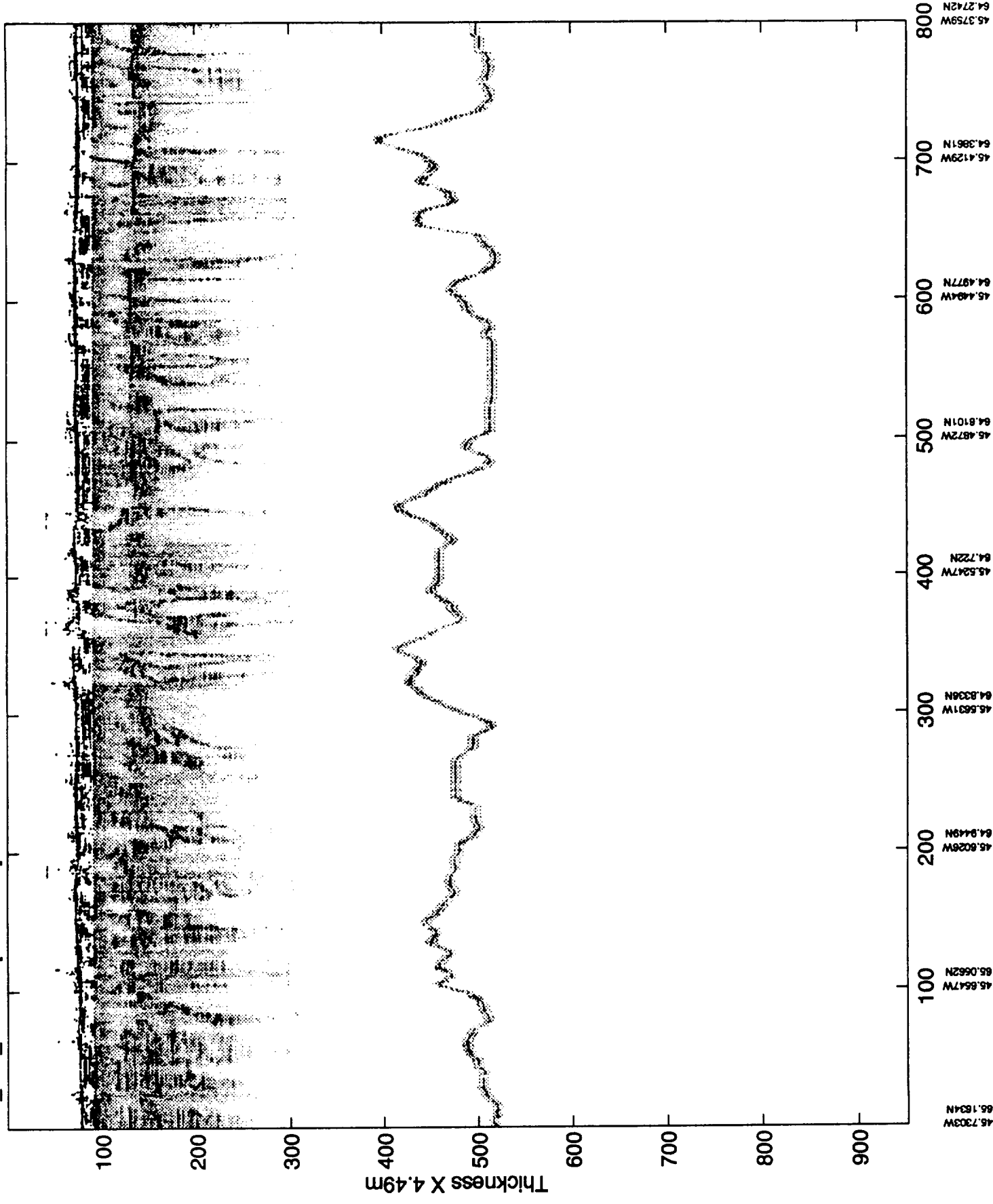


r_10x_3.1 <1> [250 1000]



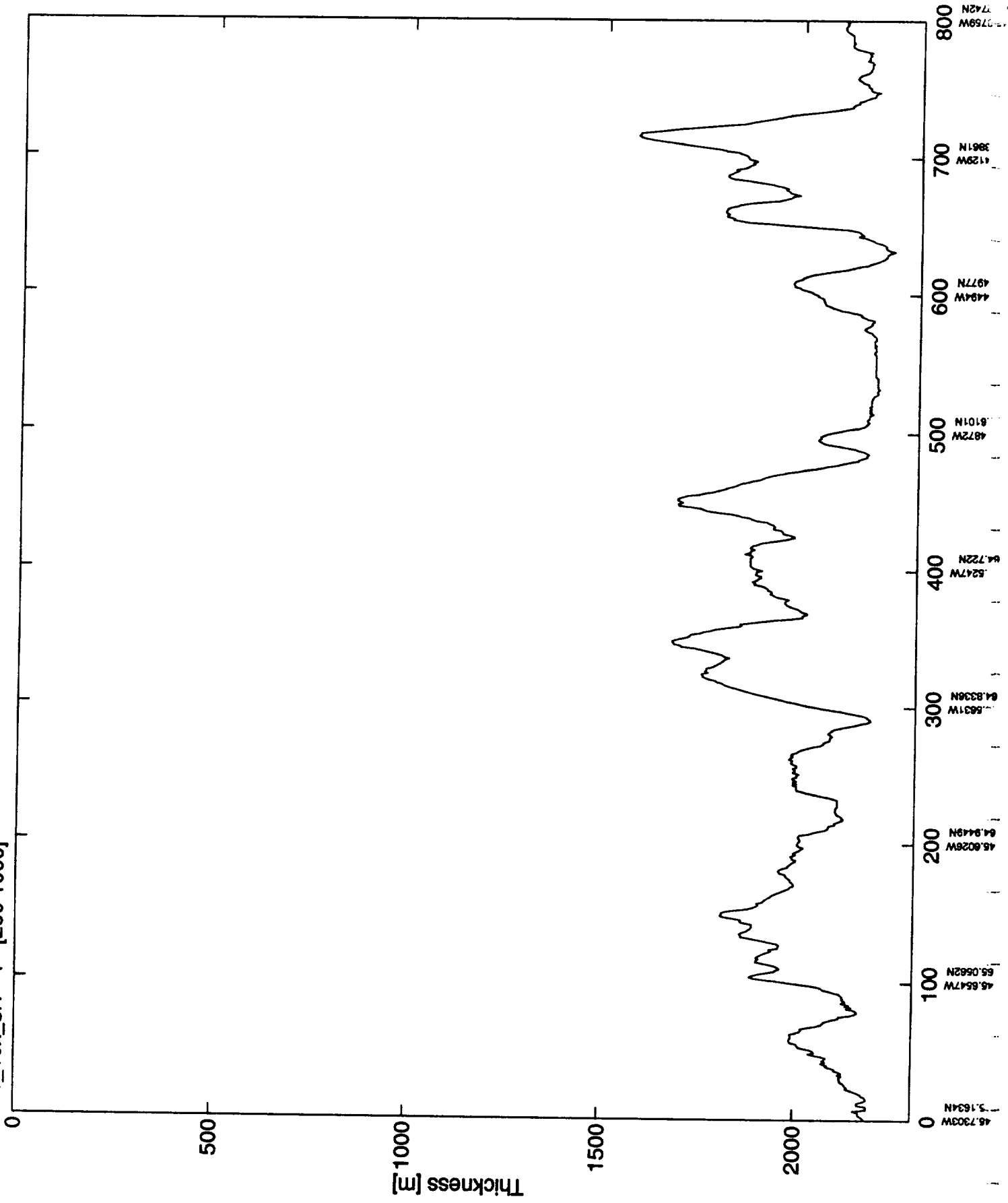


r_10x_5.1 <1> [200 1000]

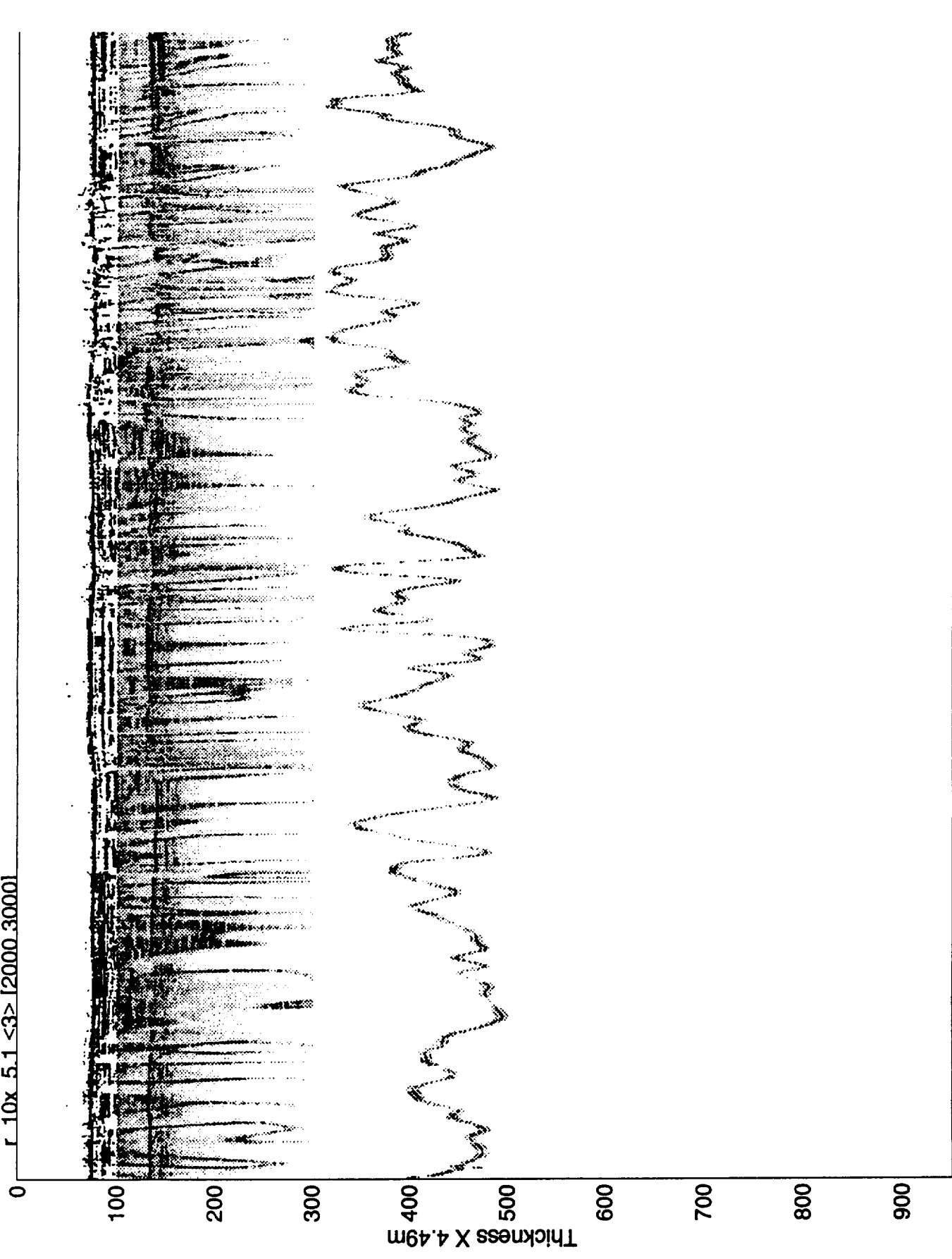


65.7303W
65.1834N
45.6647W
65.0662N
45.6026W
64.9449N
45.5631W
64.8336N
45.5247W
64.722N
45.4827W
64.8101N
45.4844W
64.977N
45.4129W
64.3861N
45.3759W
64.2742N

r_10x_5.1 <1> [200 1000]



r 10x 5.1 <3> [2000.3000]



45.024W 63.1805N
44.9837W 63.0513N
44.9607W 62.9419N
44.8955W 62.7196N
44.8629W 62.6083N
44.8305W 62.4967N
44.7961W 62.3844N
44.7665W 62.2726N
44.7339W 62.1574N
44.7016W 62.0423N

r 10x 5.1 <3> [2000 3000]

0

200

400

600

800

1000

1200

1400

1600

1800

2000

Thickness [m]

0

100

200

300

400

500

600

700

800

900

1000

63.1605N

4.9937W

62.9419N

1.9287W

44.8965N

2.6083N

44.8306W

2.4967N

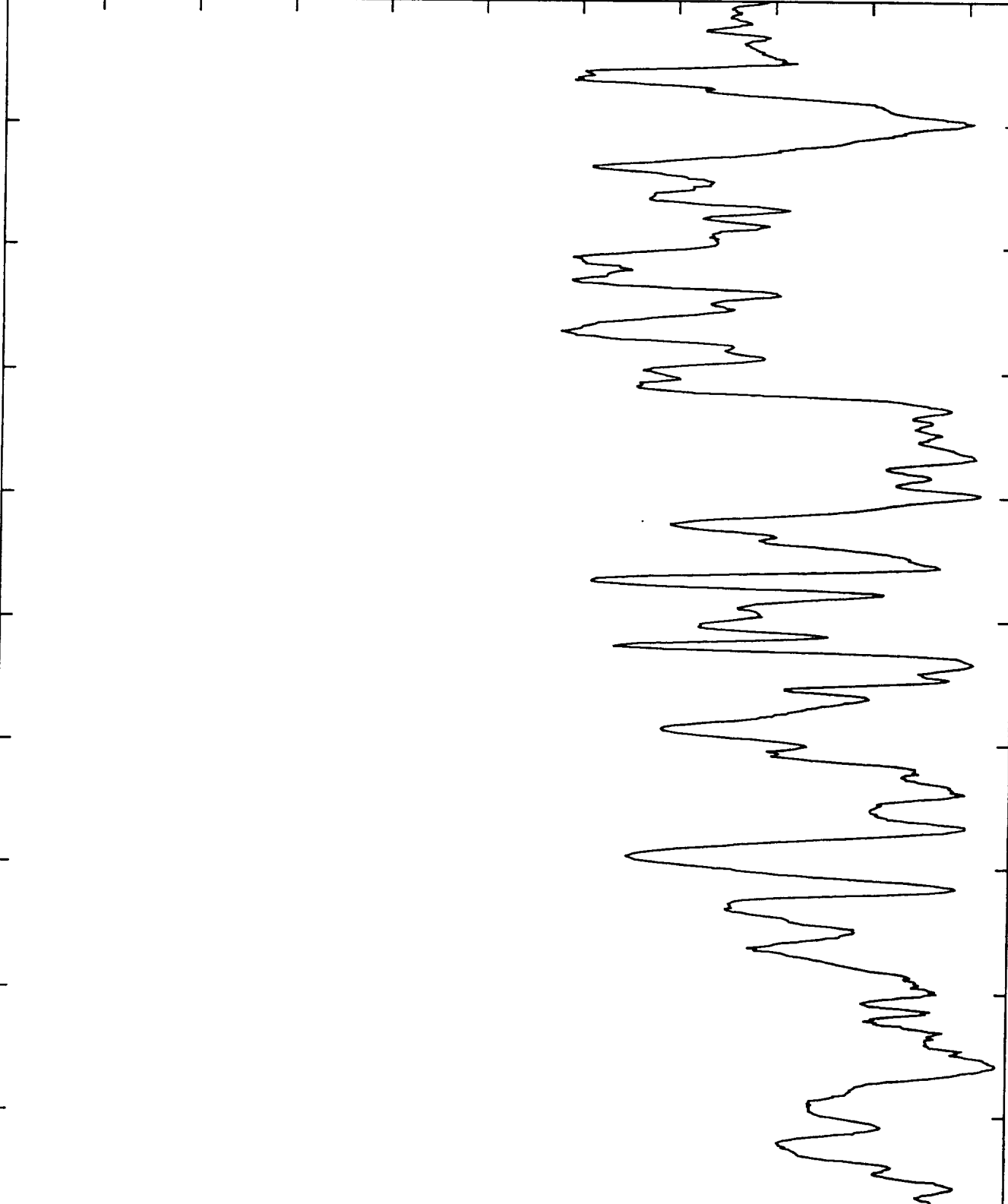
44.7665W

2.2726N

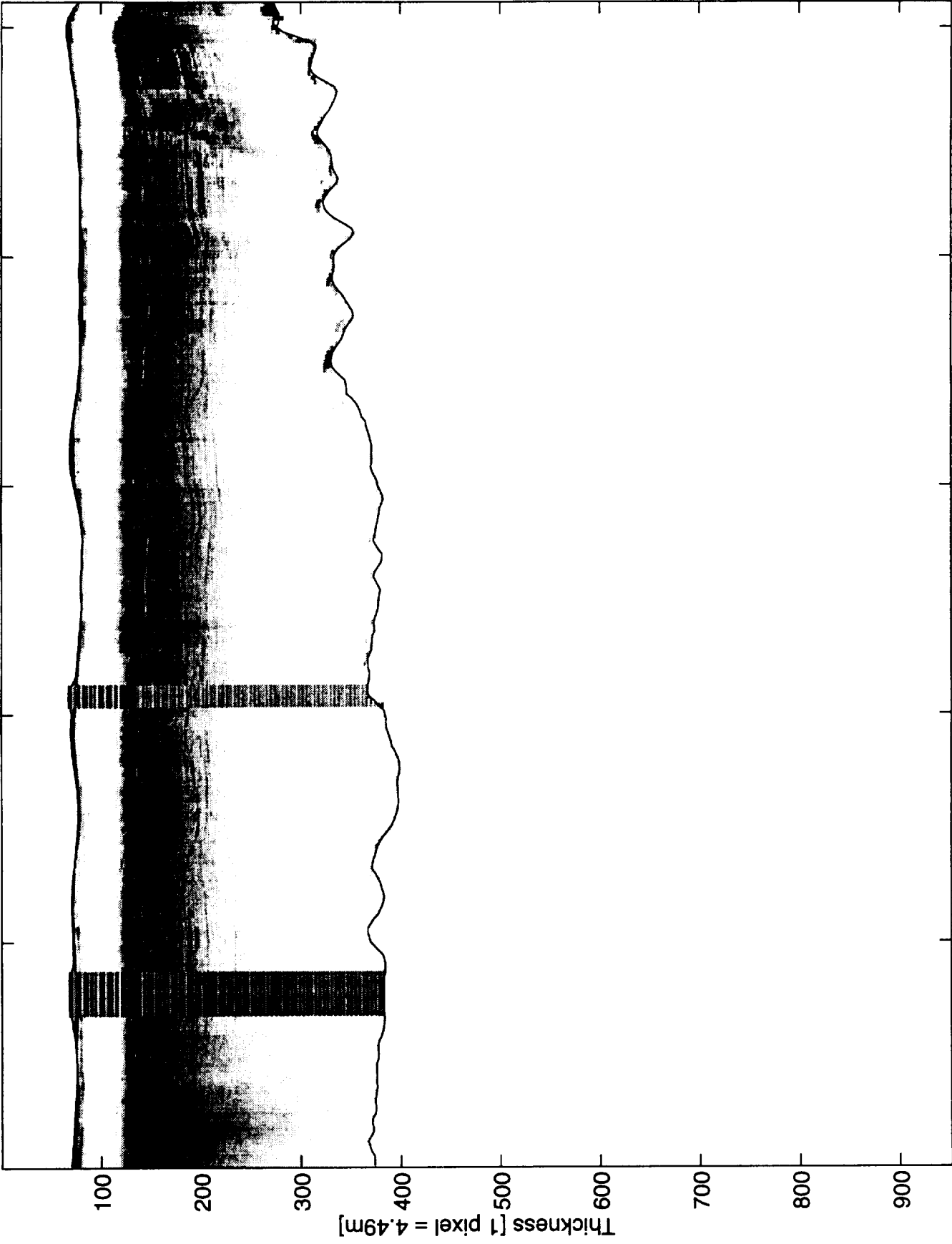
44.7016W

4.1574N

44.7016N



r_10x_11.1 (1) [500-755]



66.9043N

47.8707W

66.9258N

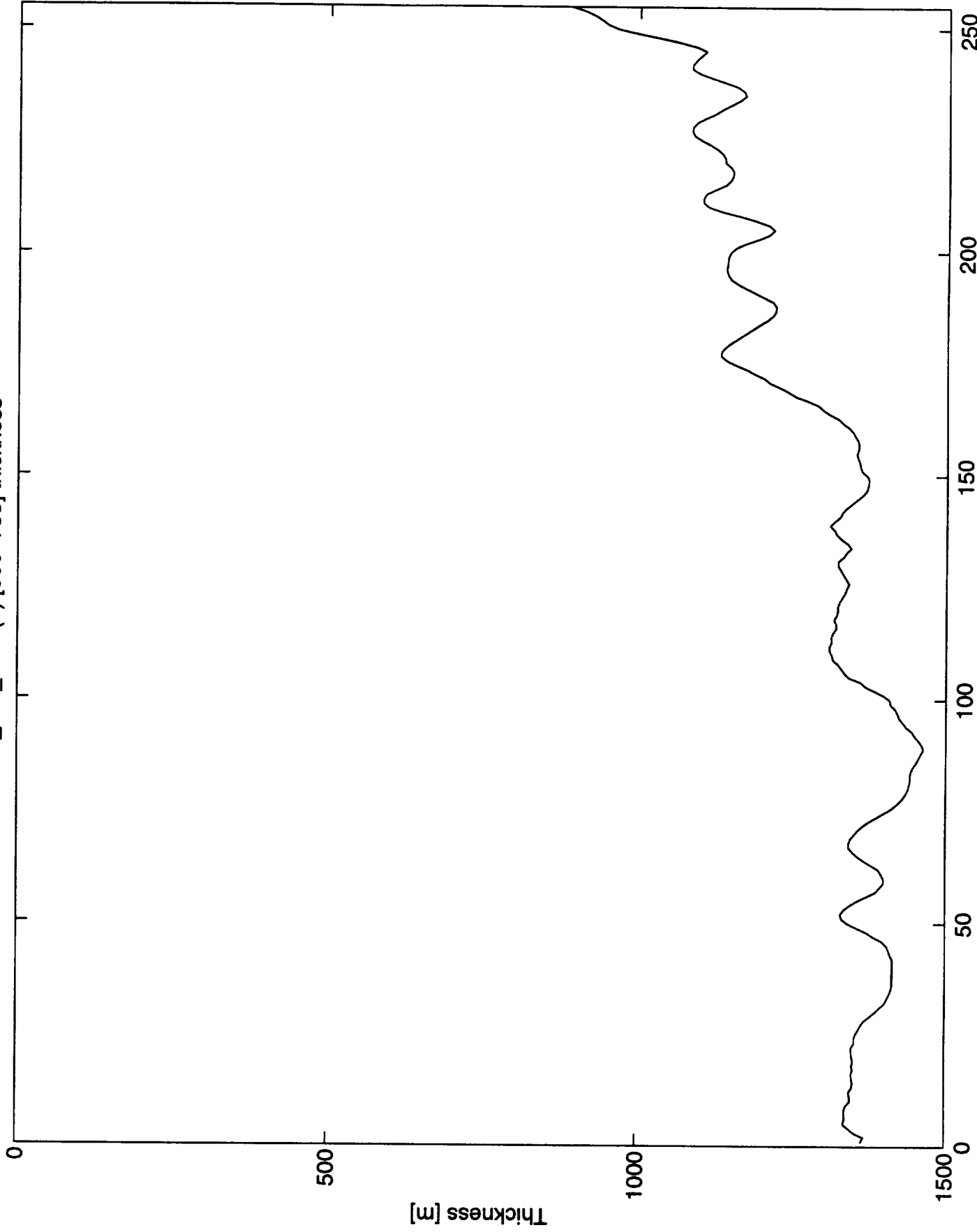
48.1594W

66.9464N

48.6575W

66.9556N

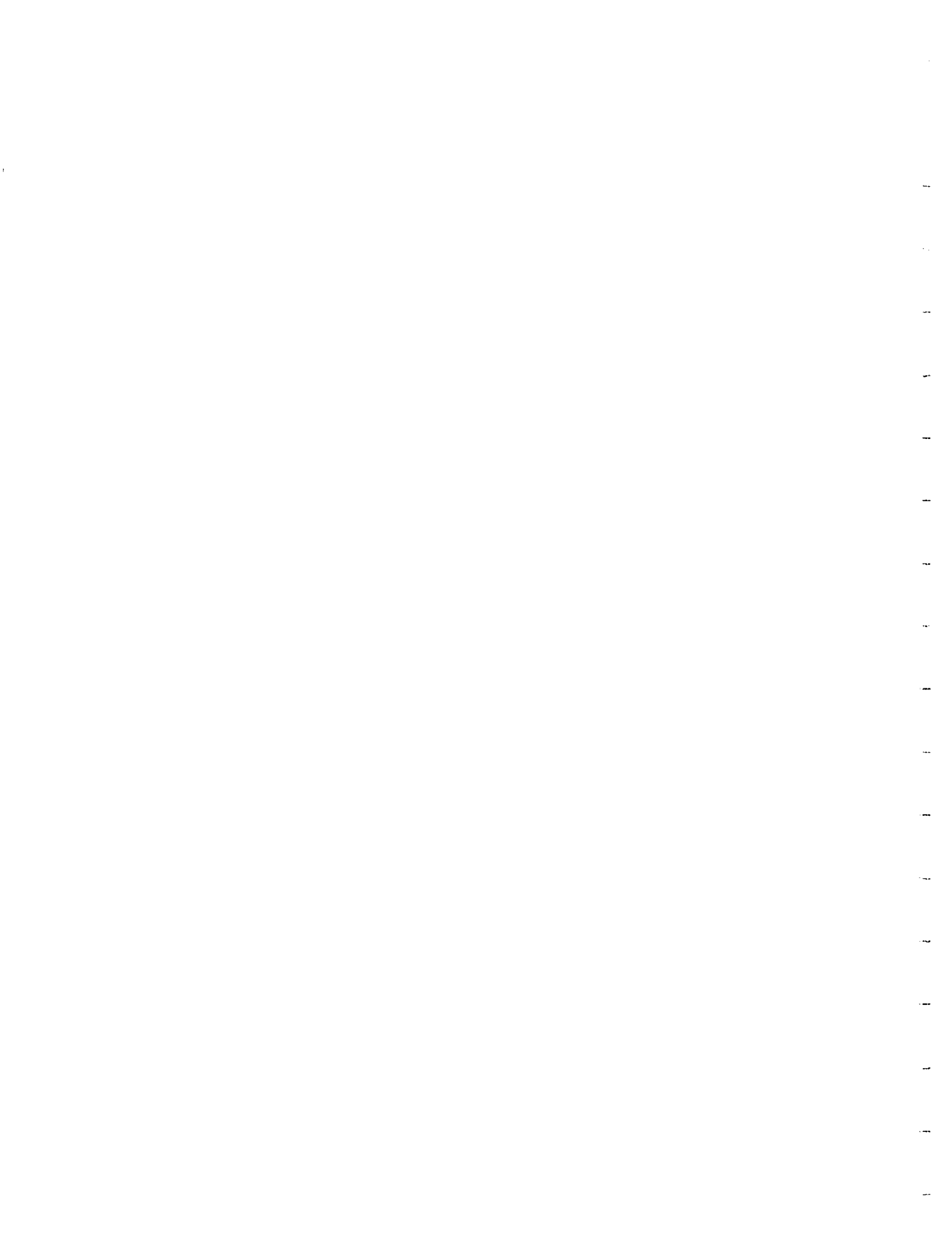
r_10x_11.1 (1) [500-755] thickness

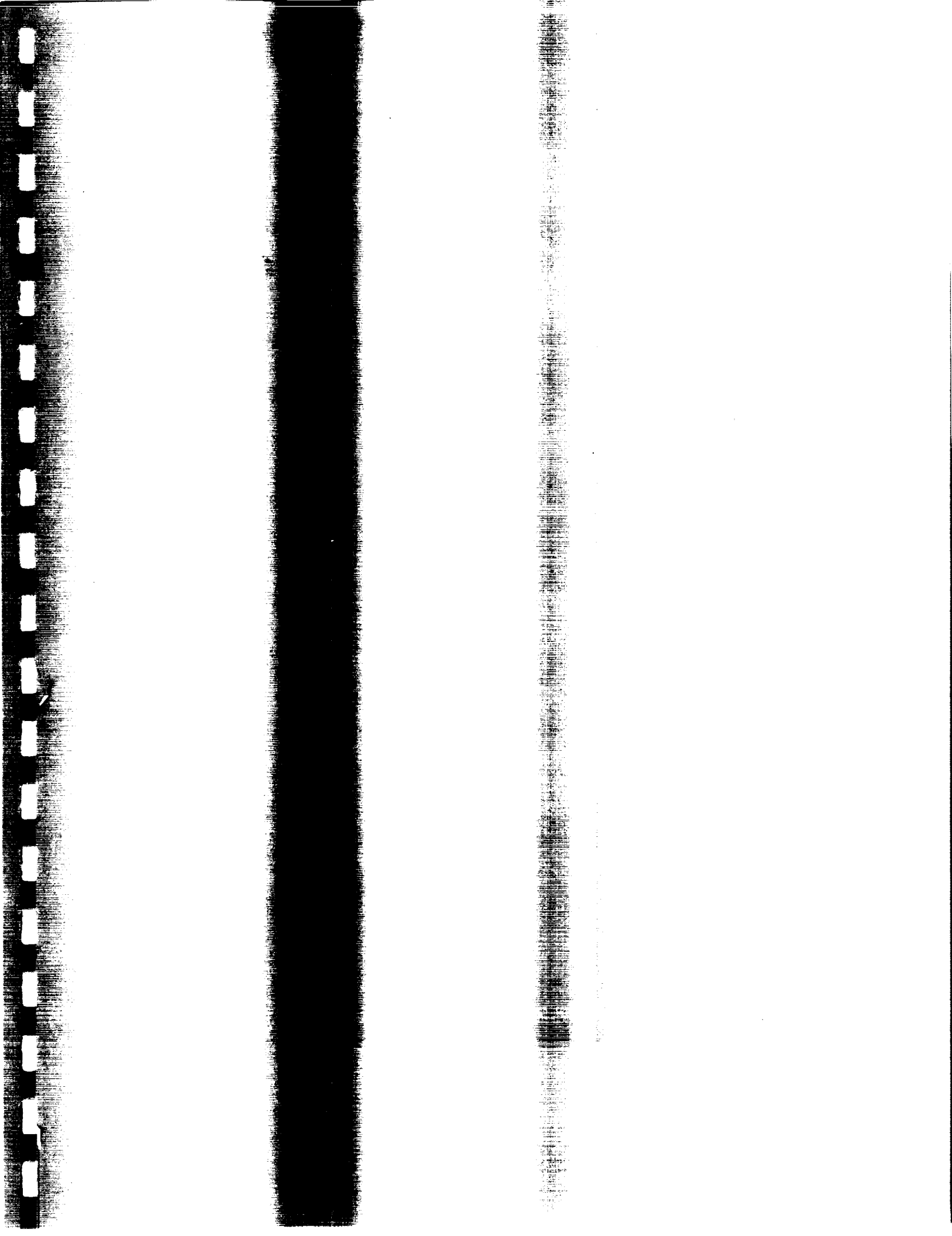


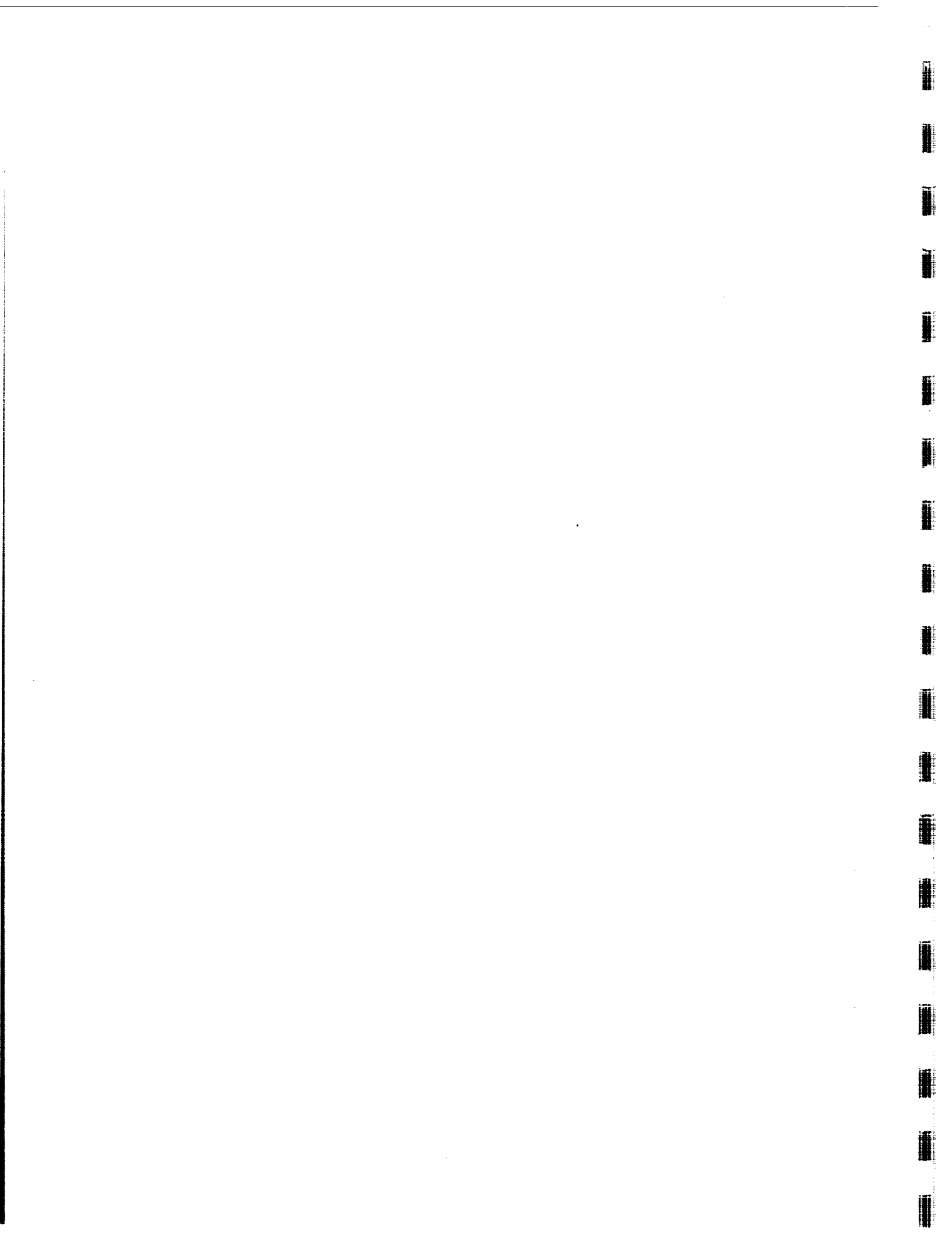
7.73M N 8.33N
7.54M N 8.33N
8.15M N 8.33N
8.15M N 8.33N
8.47M N 8.9N
8.675M N 9.9N

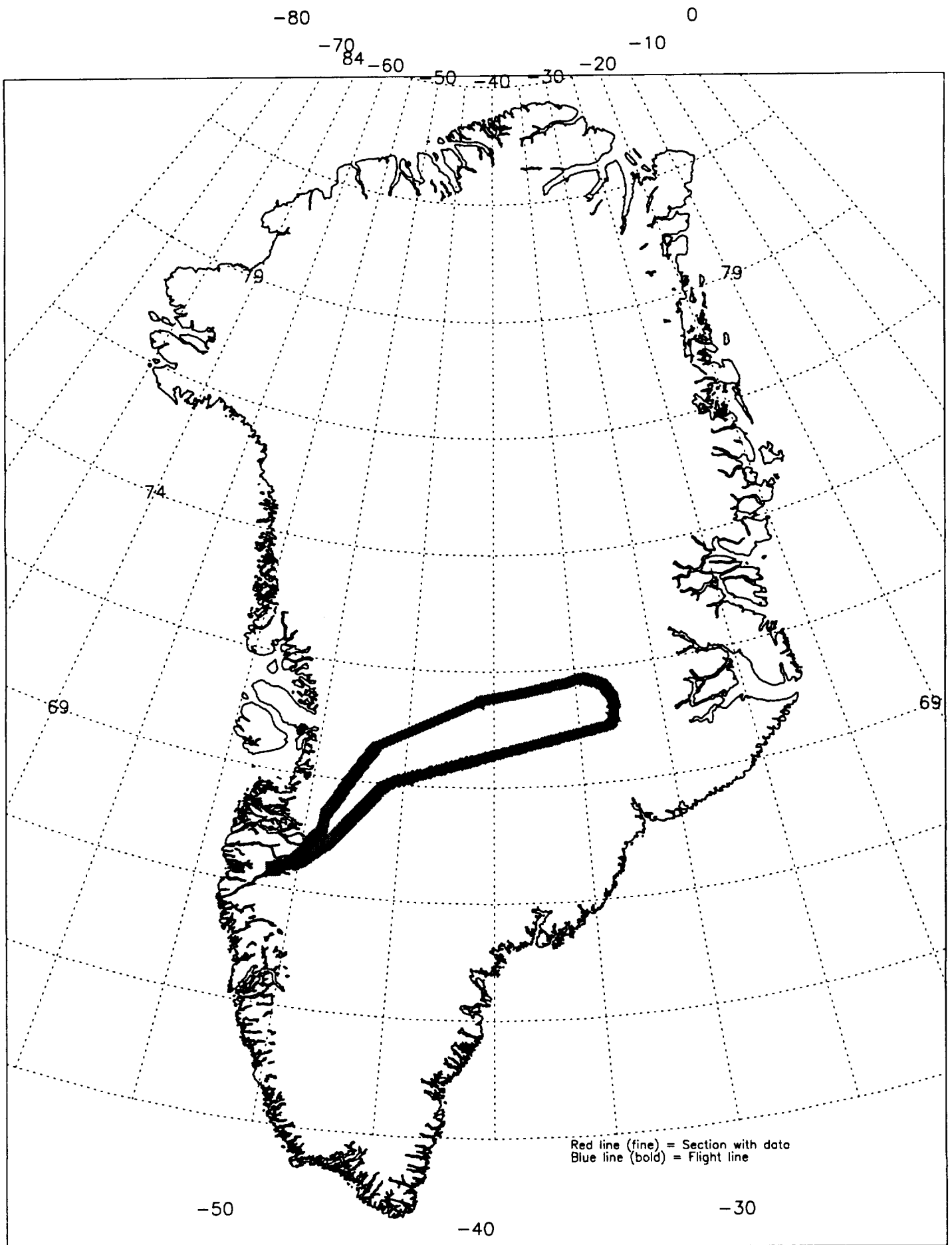
Appendix F

July 2, 1993

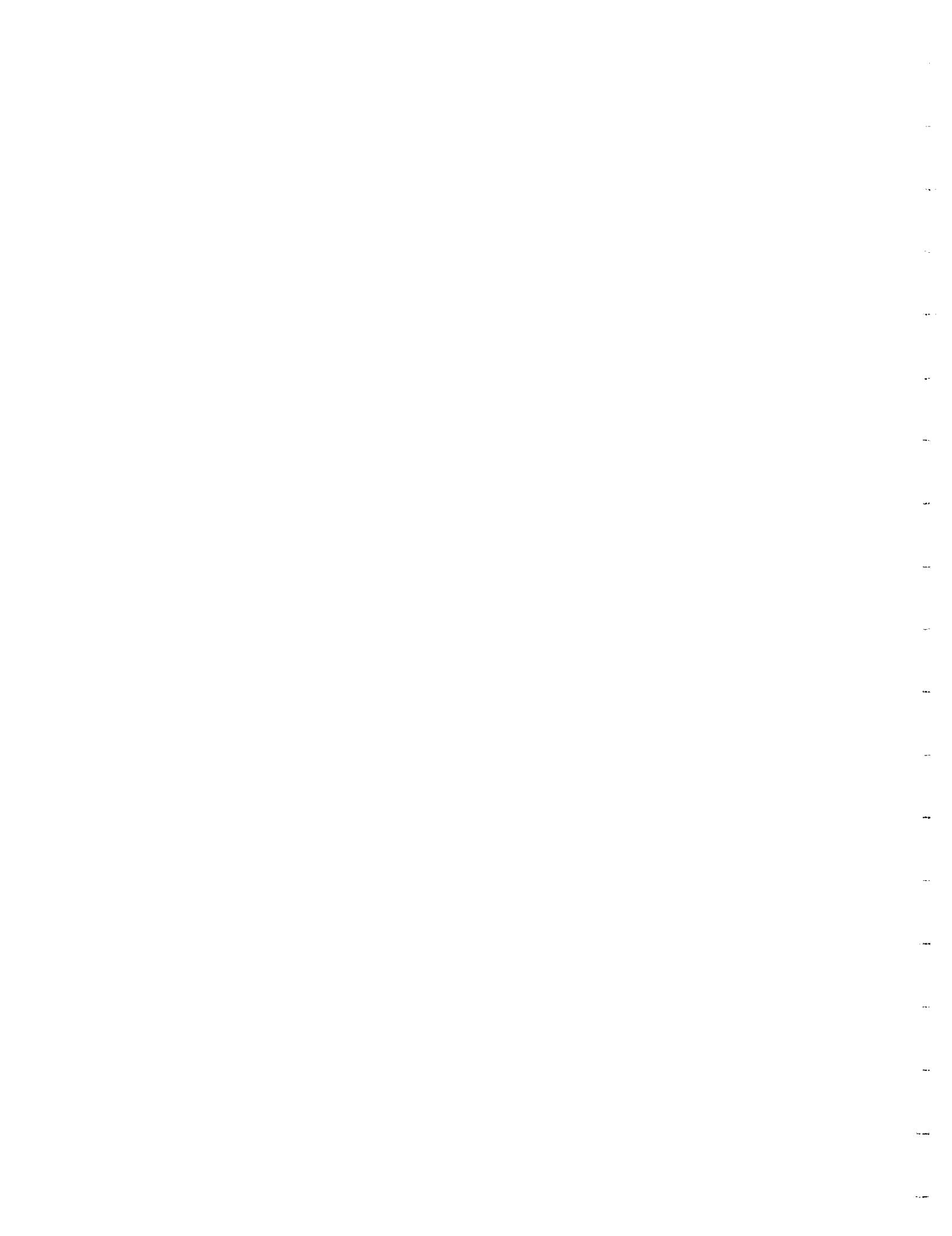




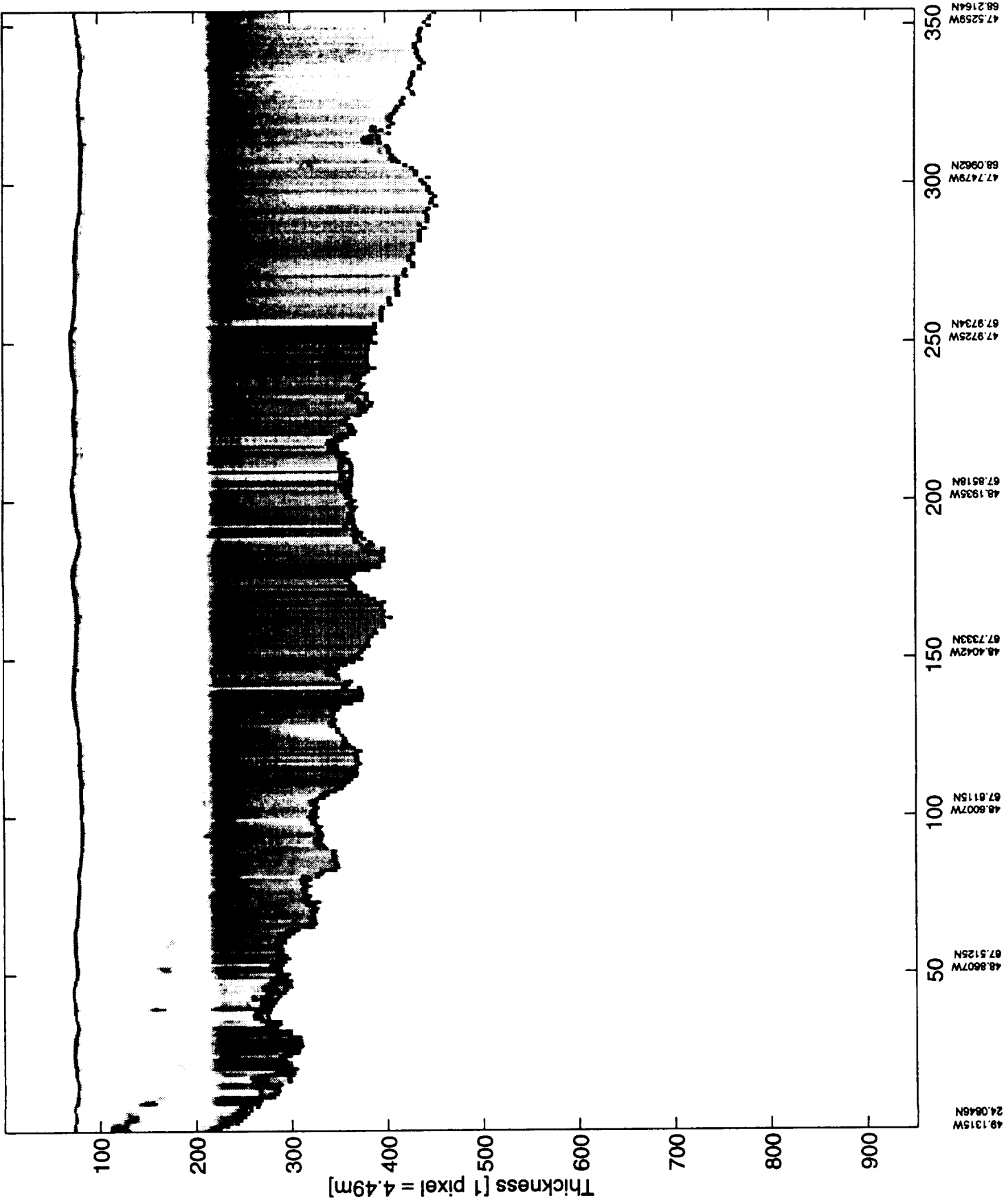




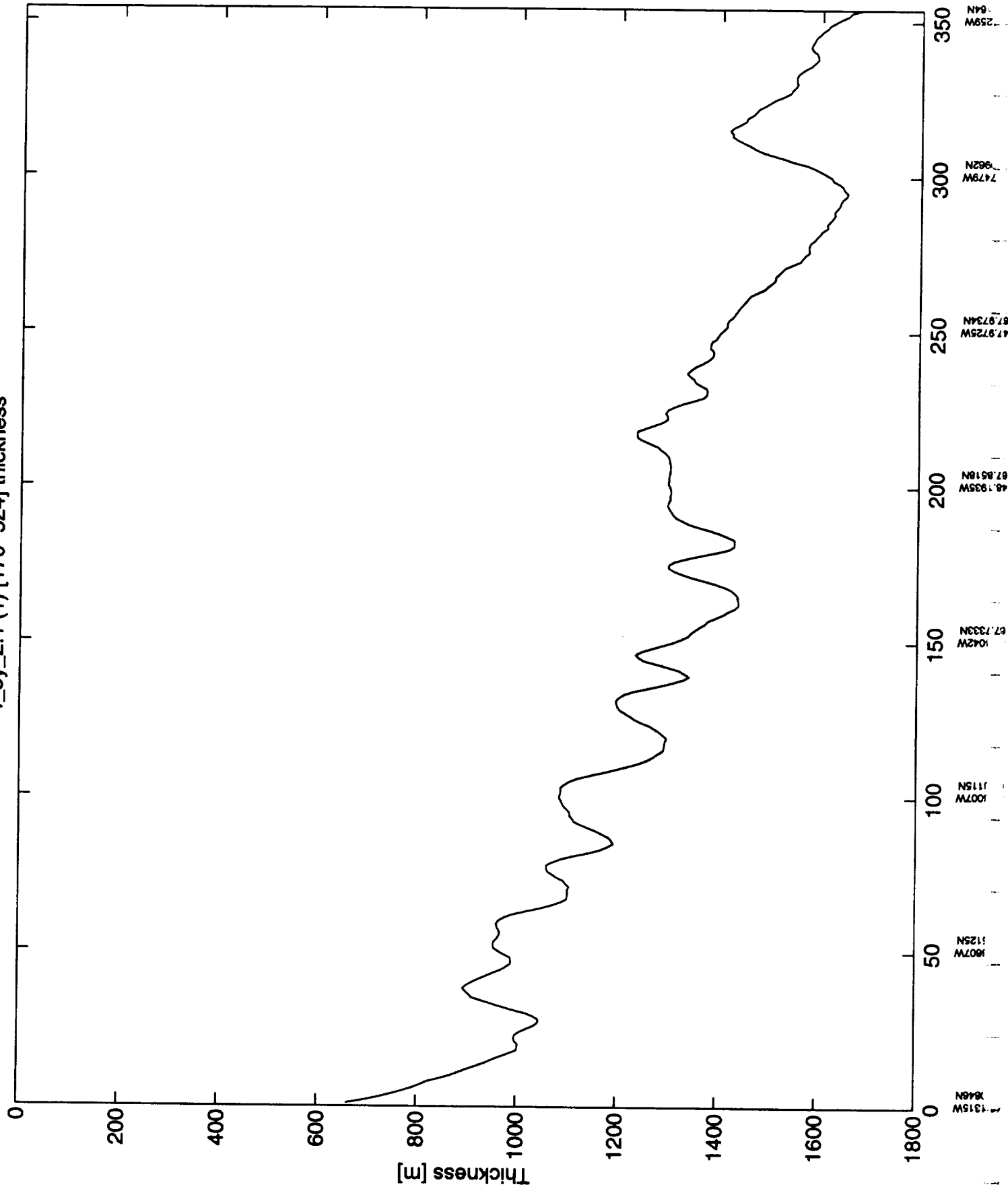
July 2, 1993 (r_5y)



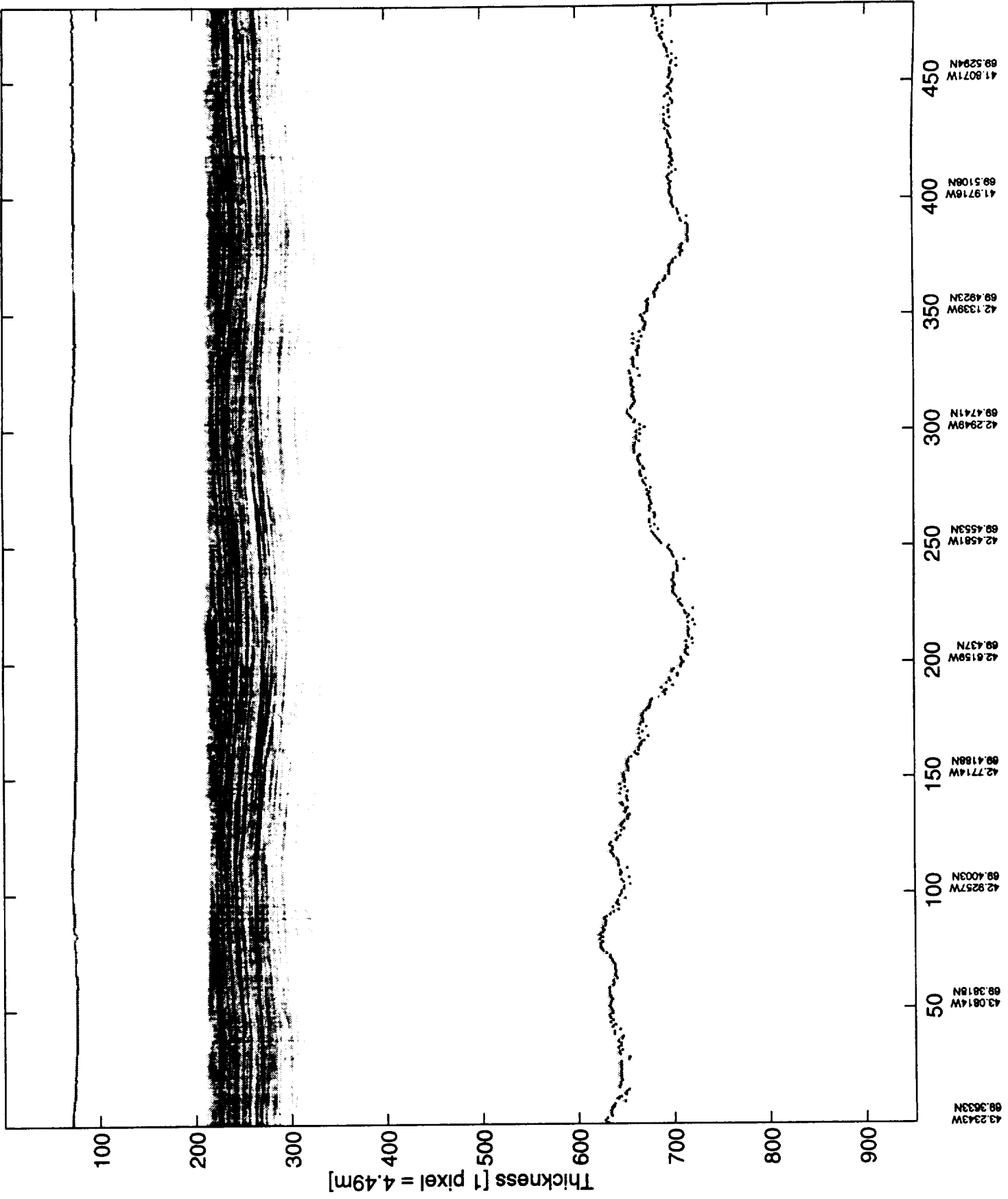
r_5y_2.1 (1) [170-524]



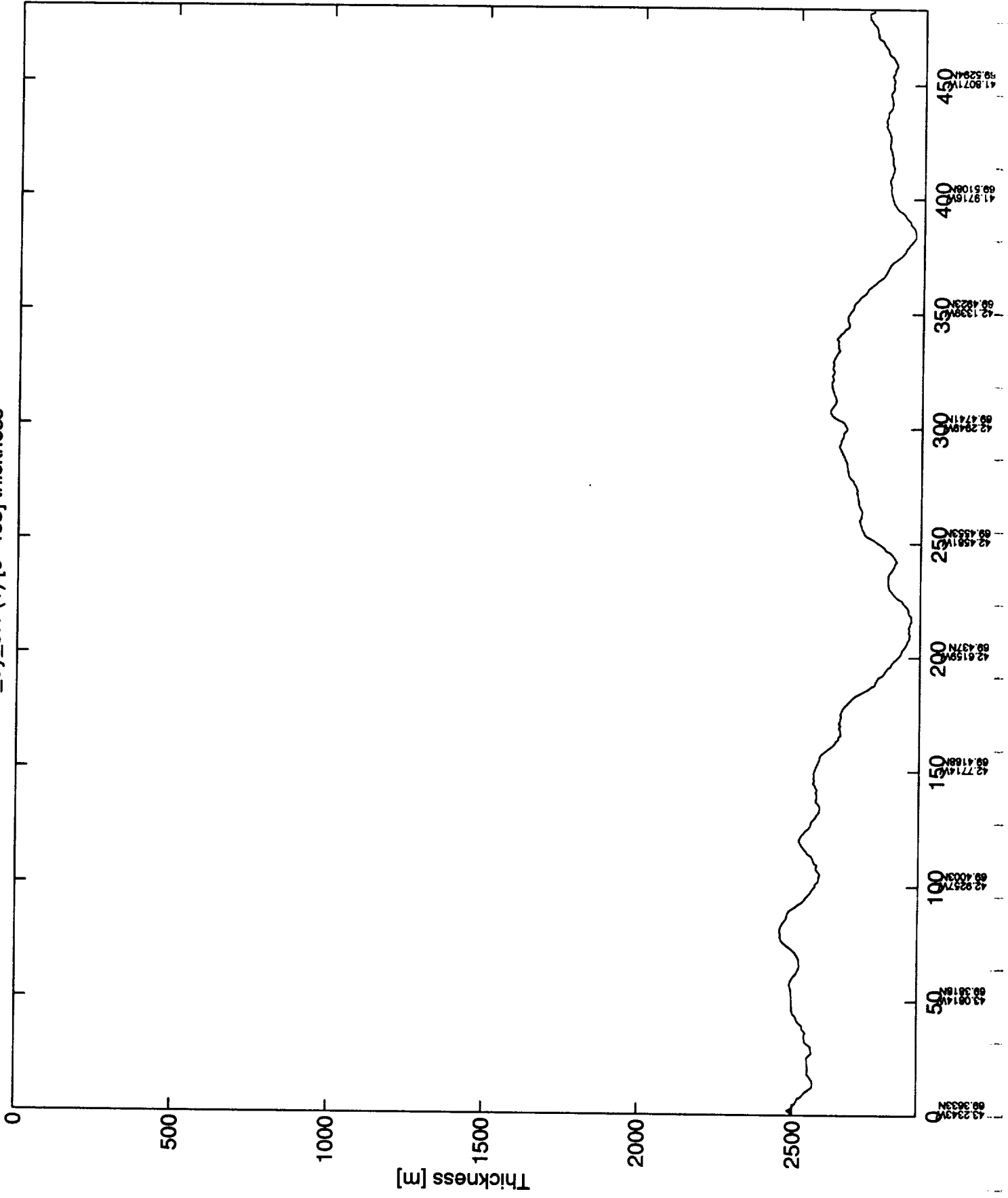
r_5y_2.1 (1) [170-524] thickness



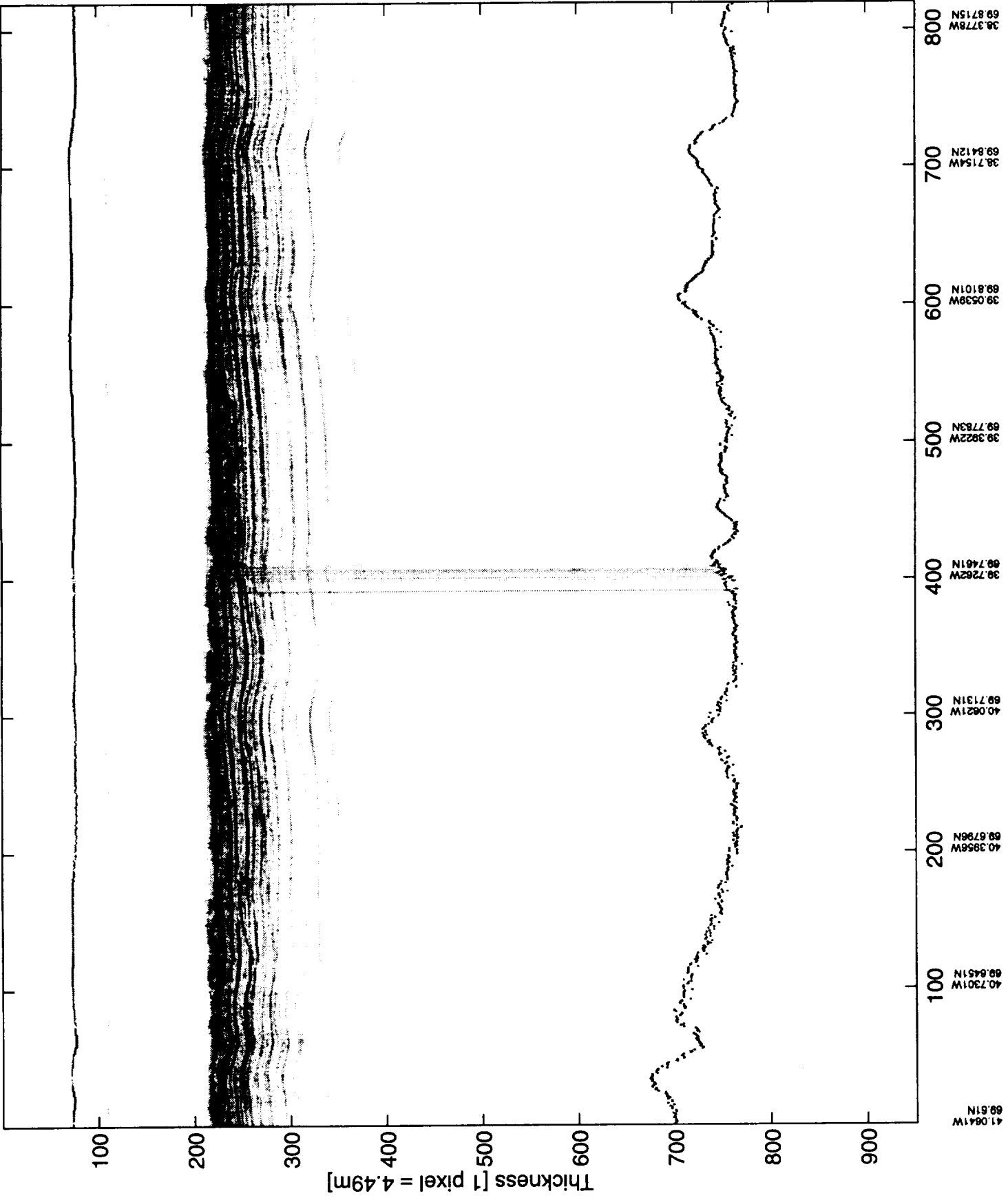
r_5y_9.1 (1) [0-483]



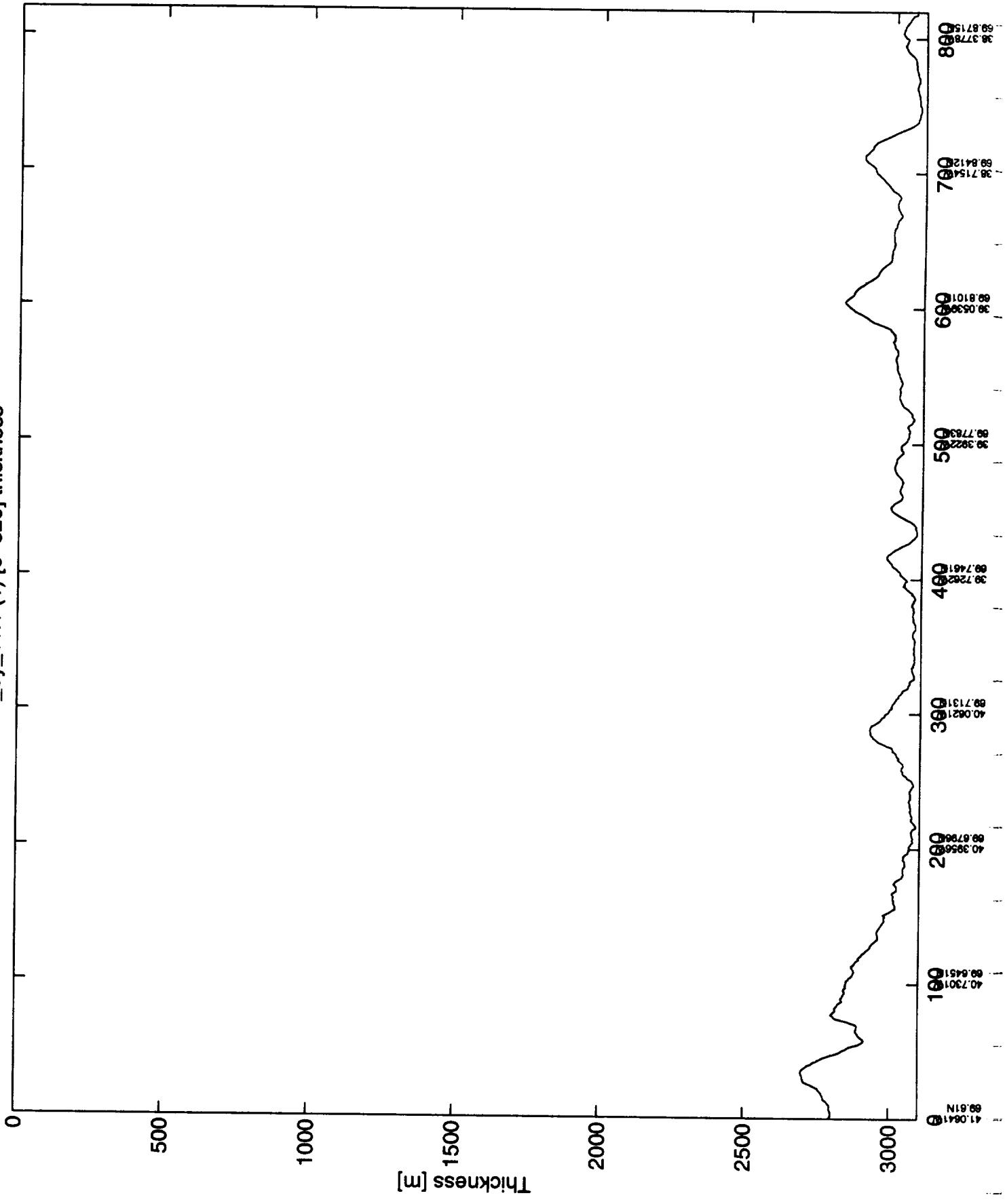
r_5y_9.1 (1) [0-483] thickness



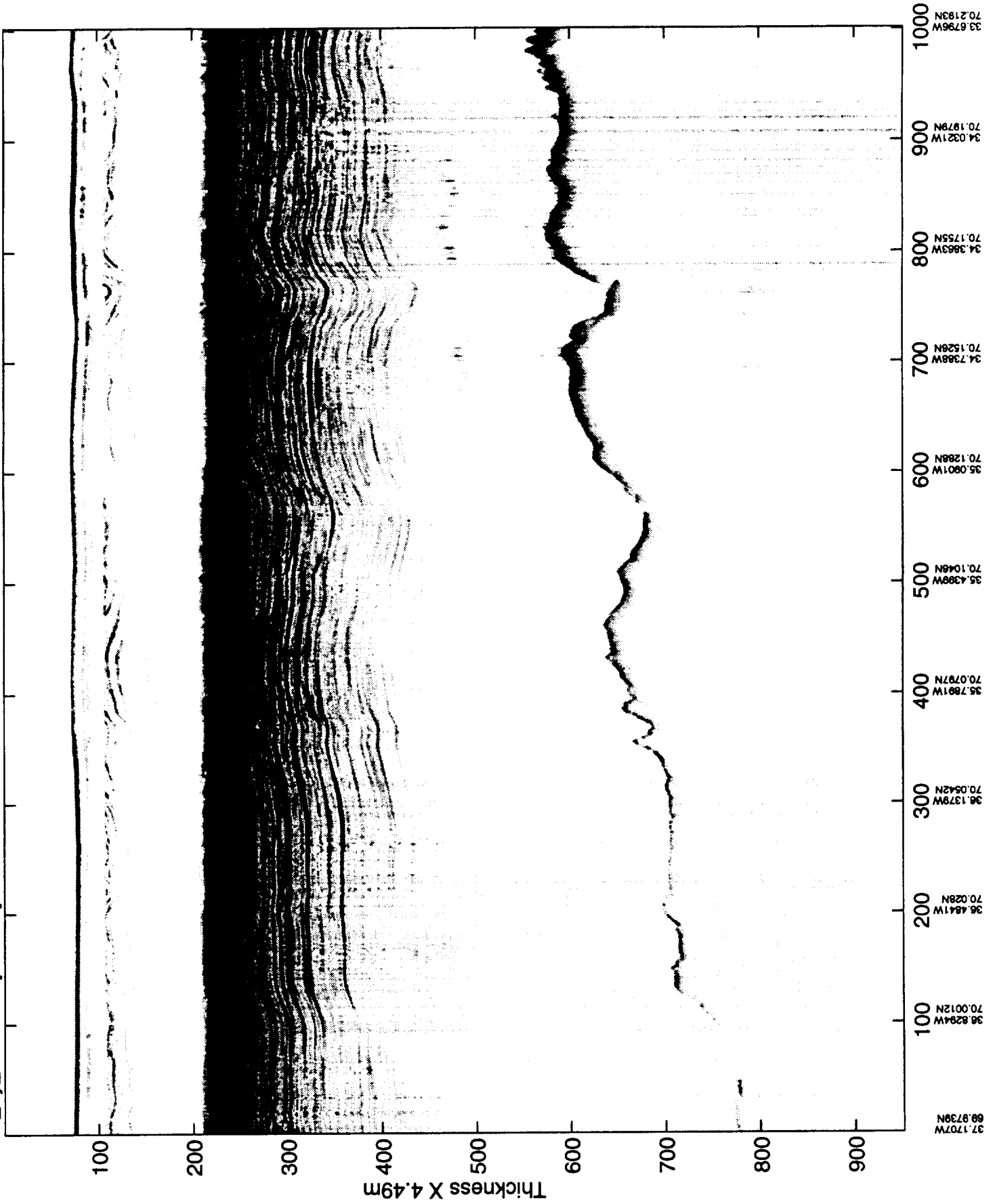
r_5y_11.1 (1) [0-810]



r_5y_11.1 (1) [0-820] thickness

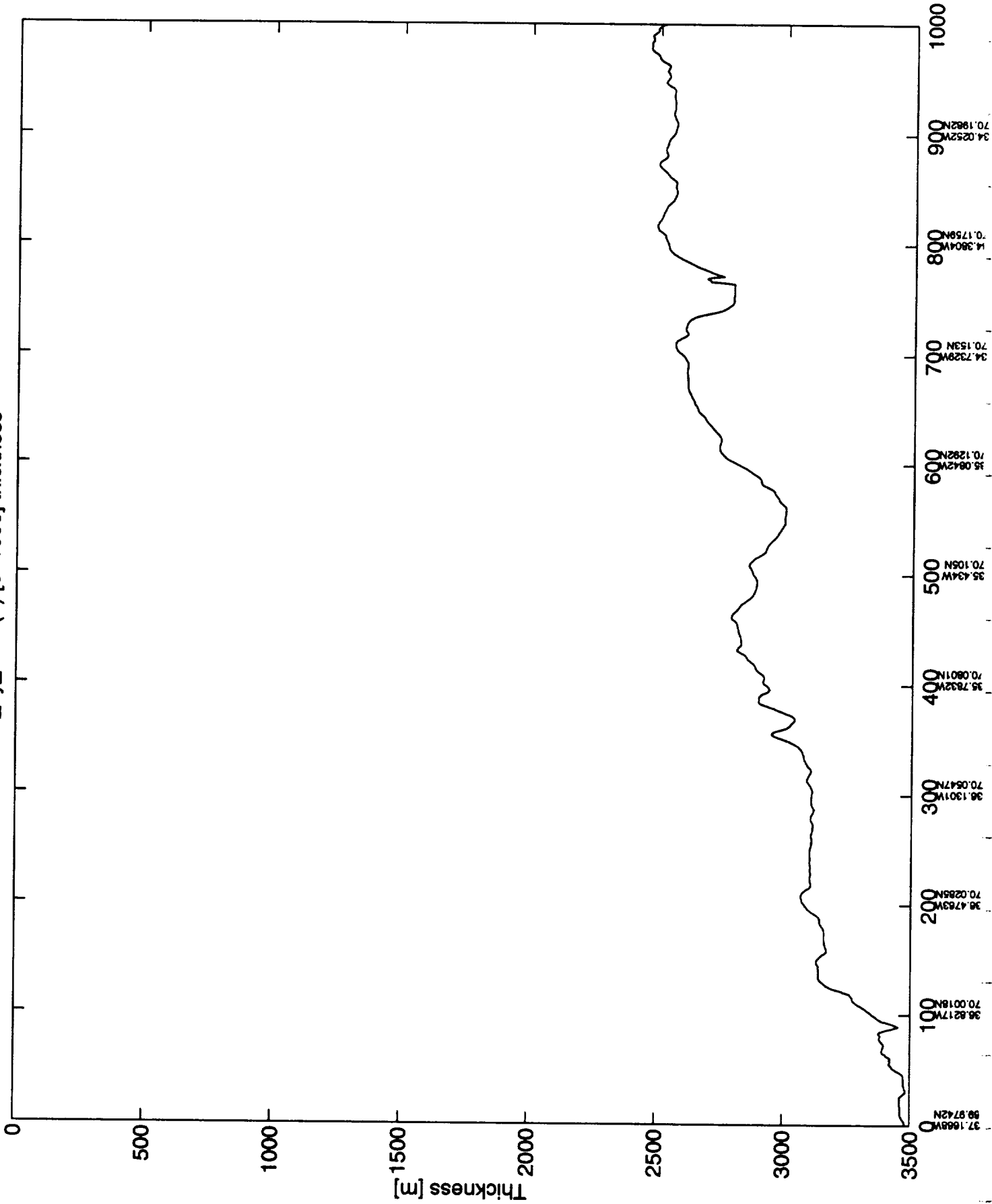


r_5y_12.1 <1> [0 1000]

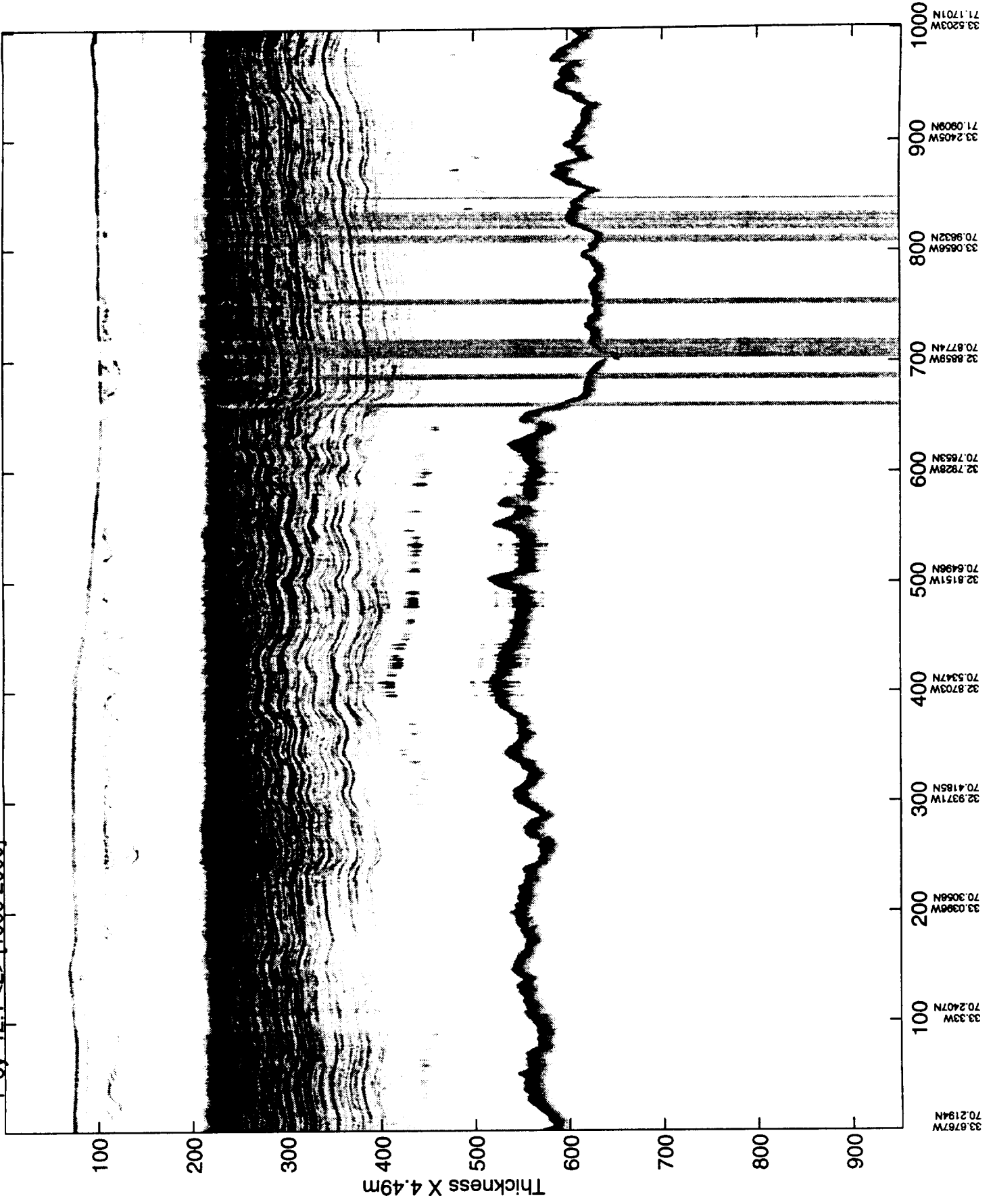


37.1707N
89.8739N

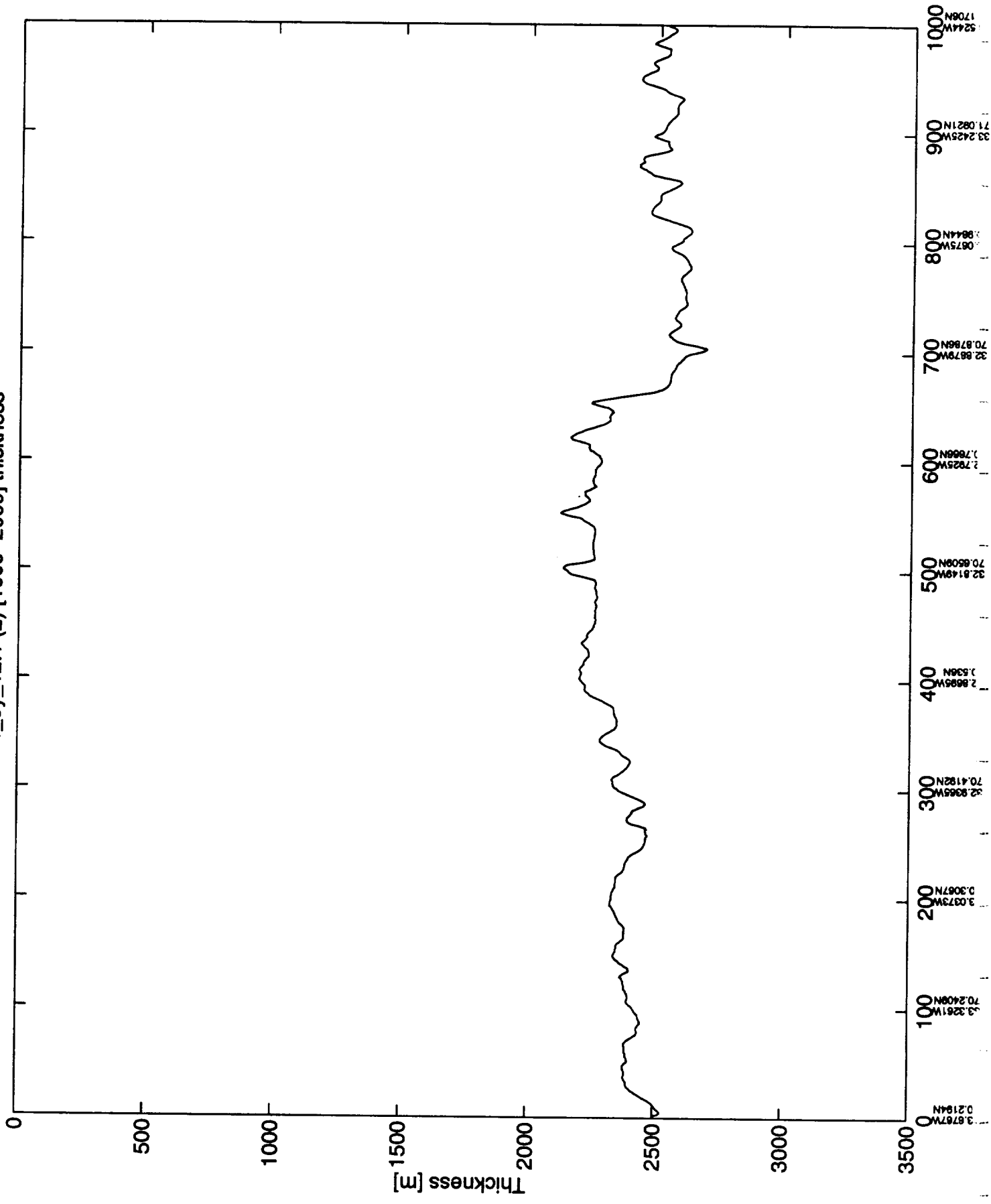
r_5y_12.1 (1) [0-1000] thickness



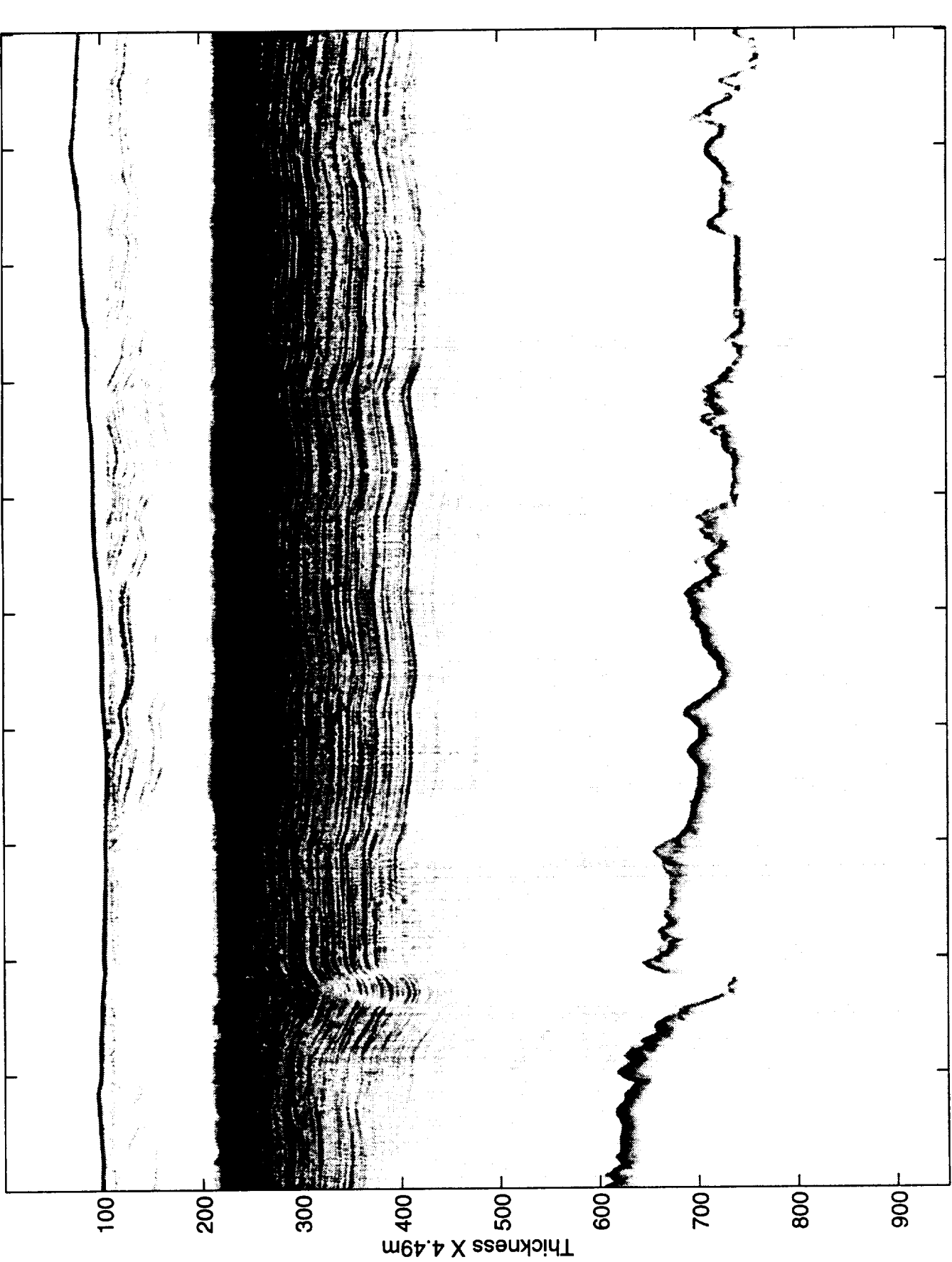
r 5y 12.1 <2> [1000 2000]



r_5y_12.1 (2) [1000-2000] thickness

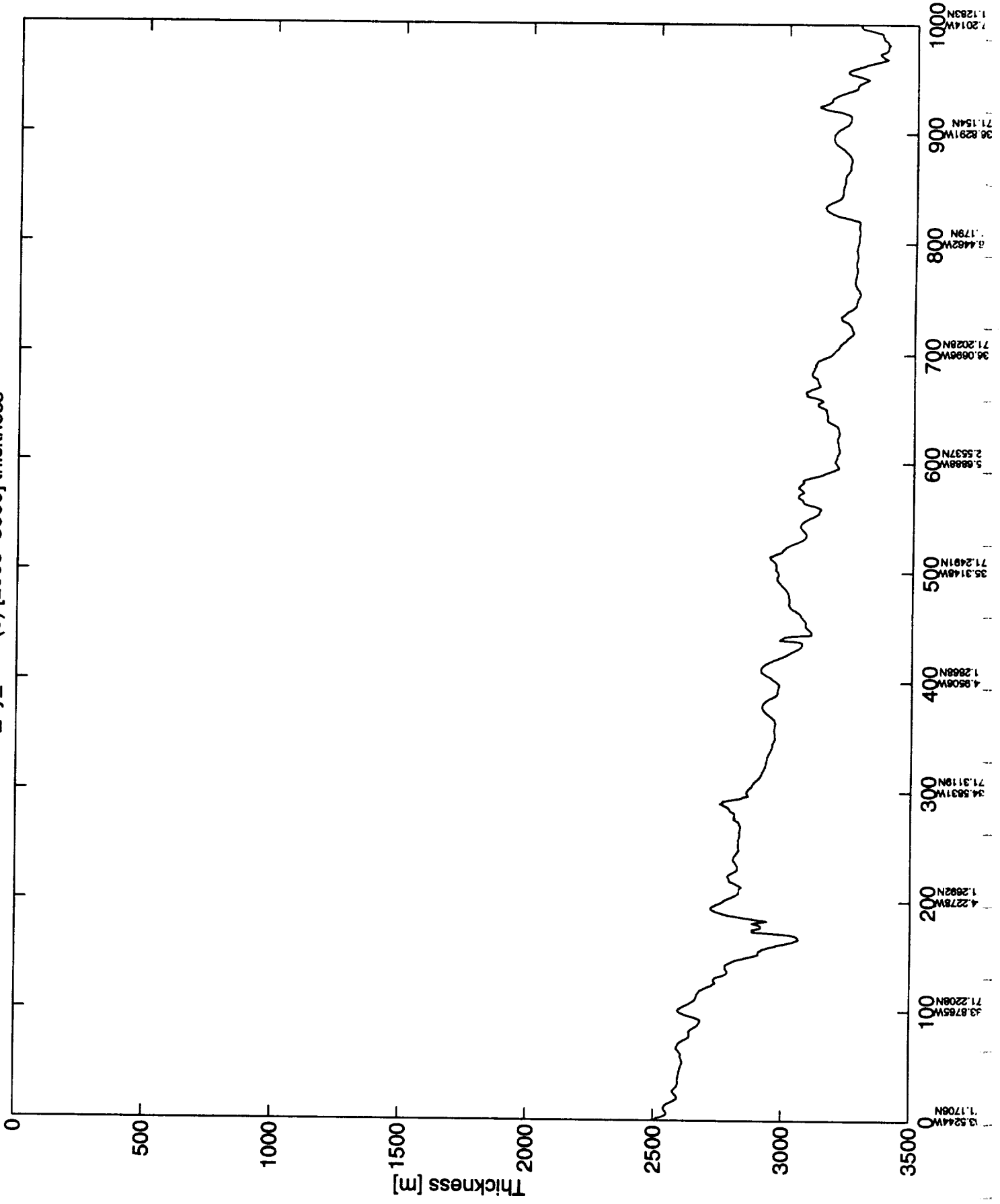


r_5y_12.1 <3> [2000 3000]

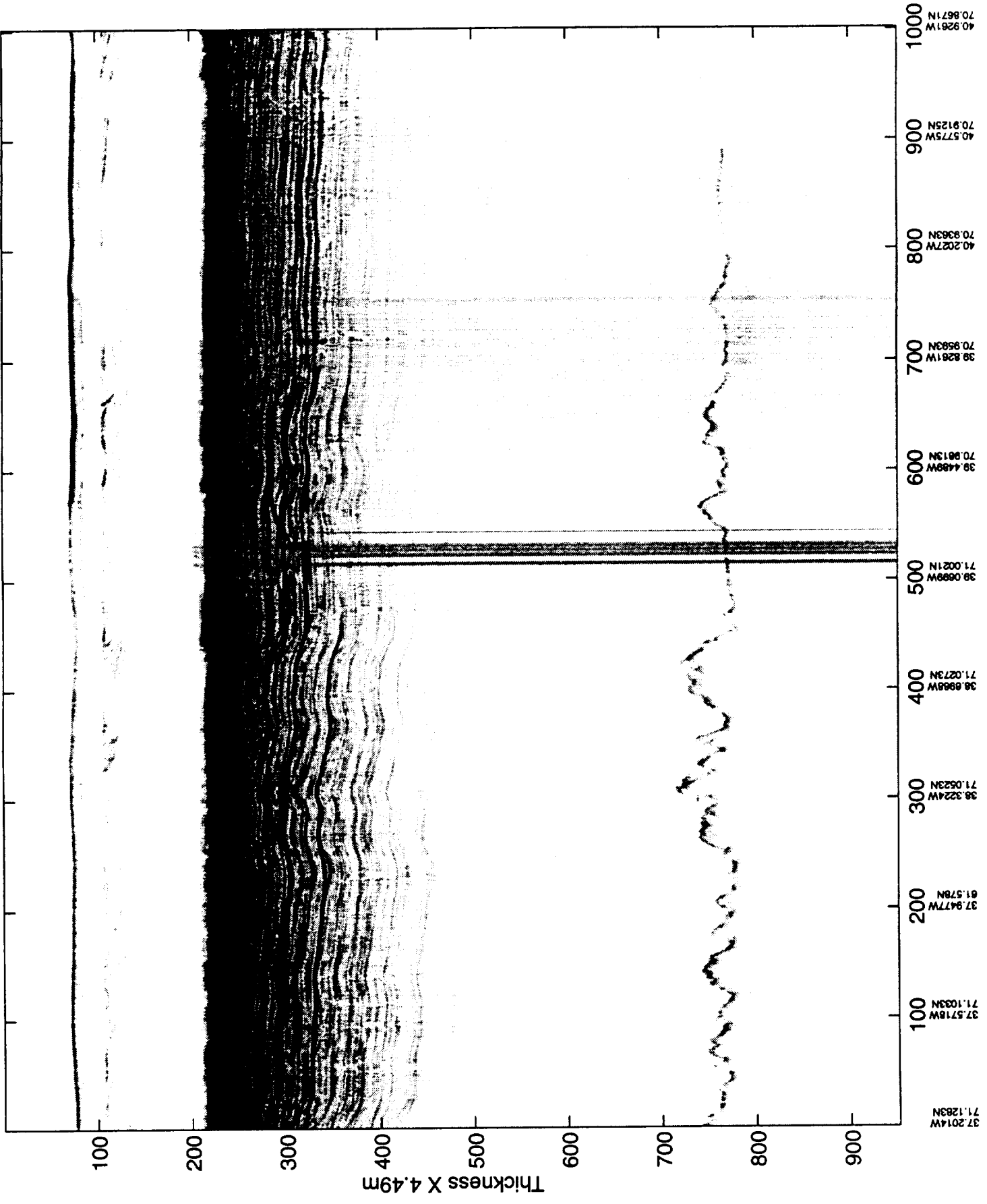


71.1284N
37.1994W
71.1542N
36.8248W
71.1791N
36.4441W
71.203N
36.0654W
71.2208N
35.6845W
71.2485N
35.3108W
71.2872N
34.9468W
71.3118N
34.5789W
71.2686N
34.2239W
71.2202N
33.8728W
71.1706N
33.5244W

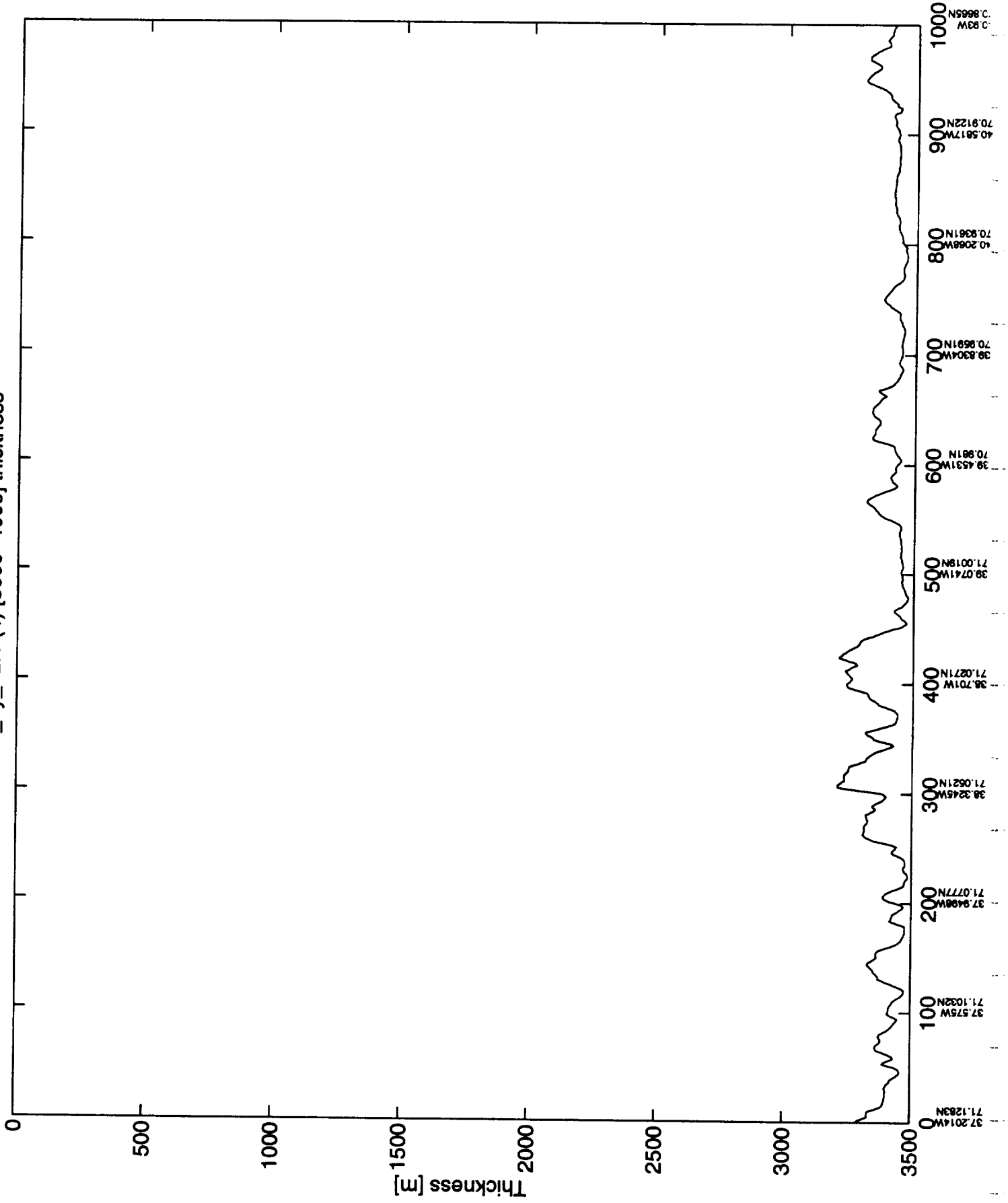
r_5y_12.1 (3) [2000-3000] thickness



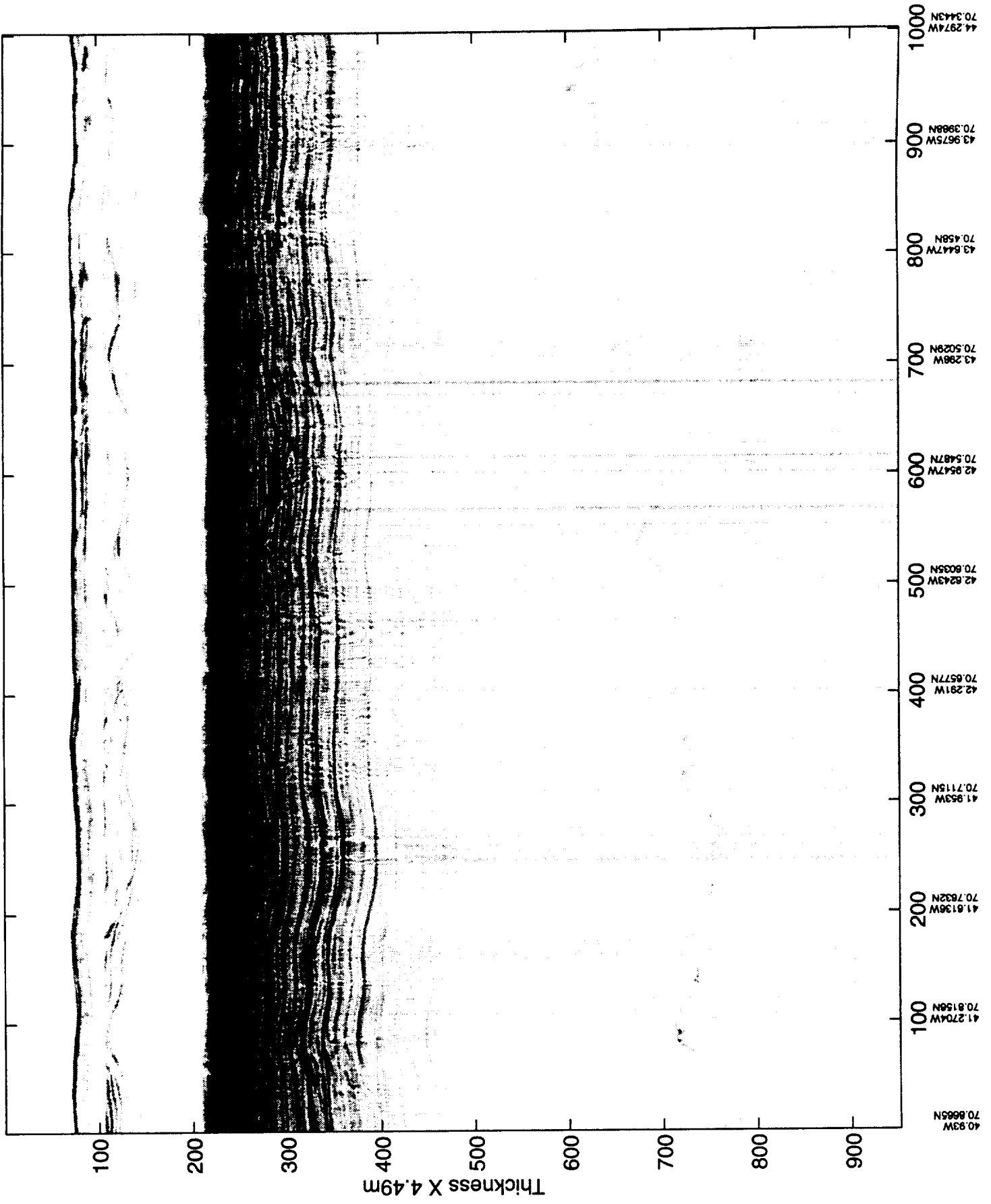
r_5y_12.1 <4> [3000 4000]



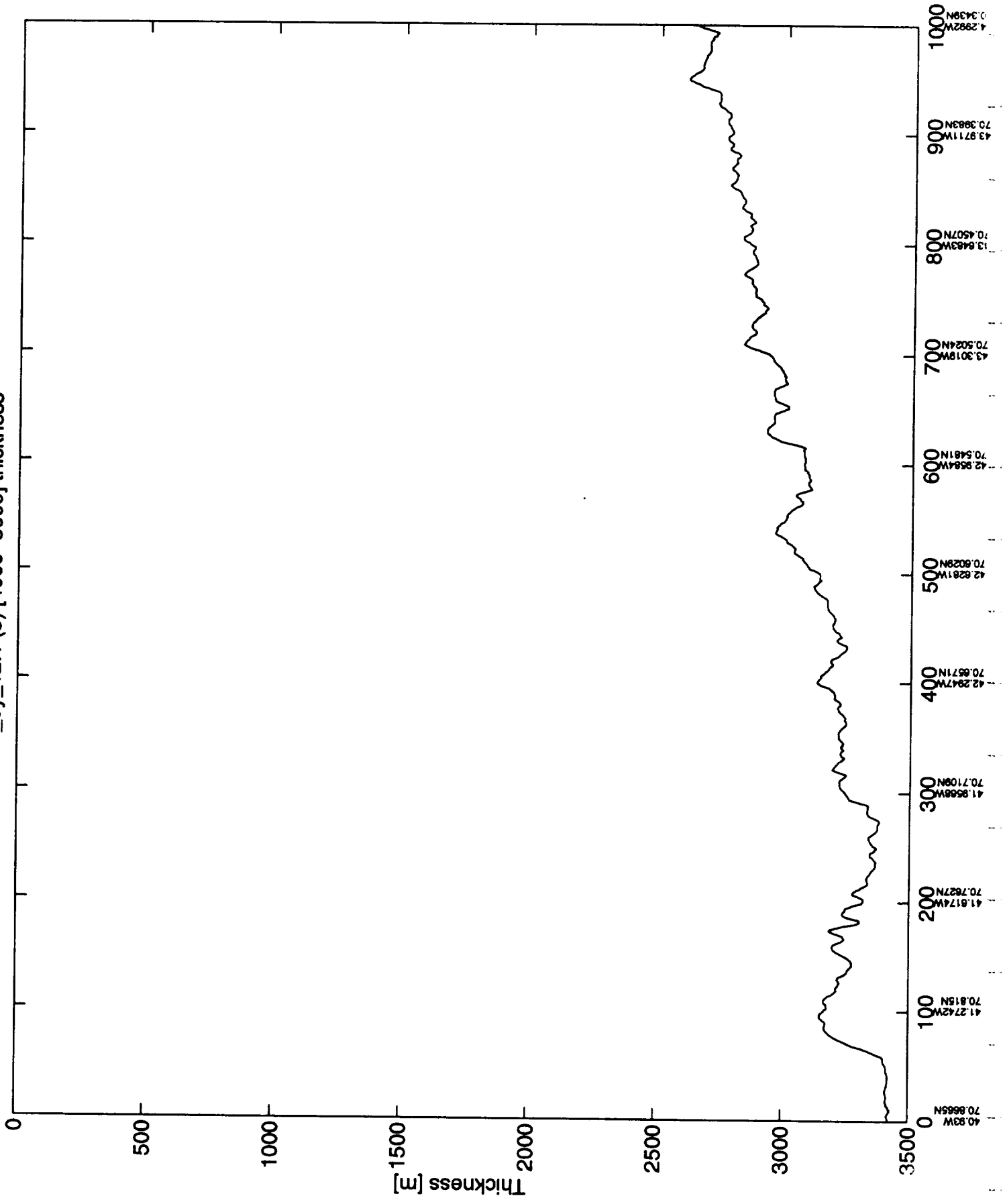
r_5y_12.1 (4) [3000-4000] thickness



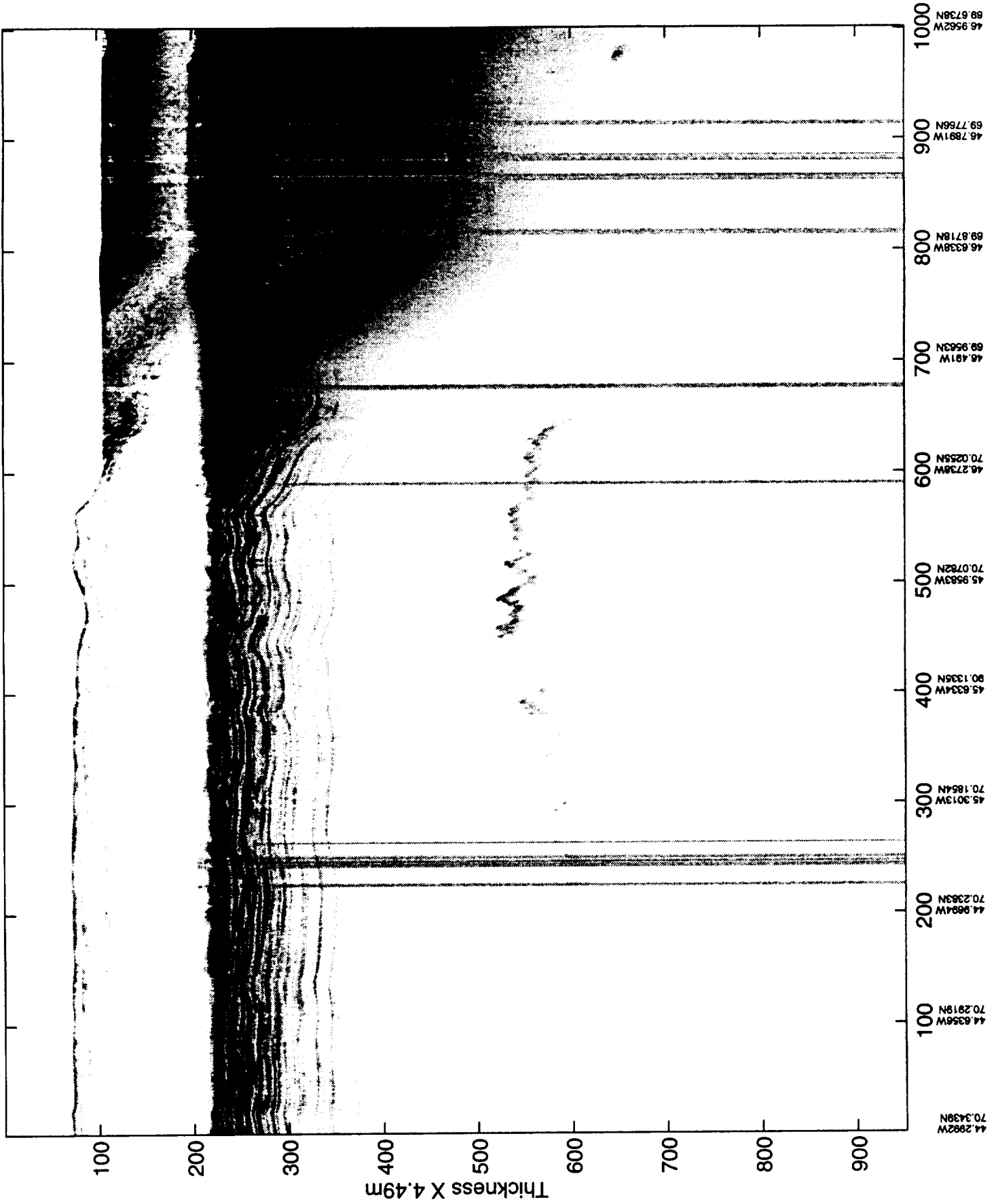
r_5y_12.1 <5> [4000 5000]



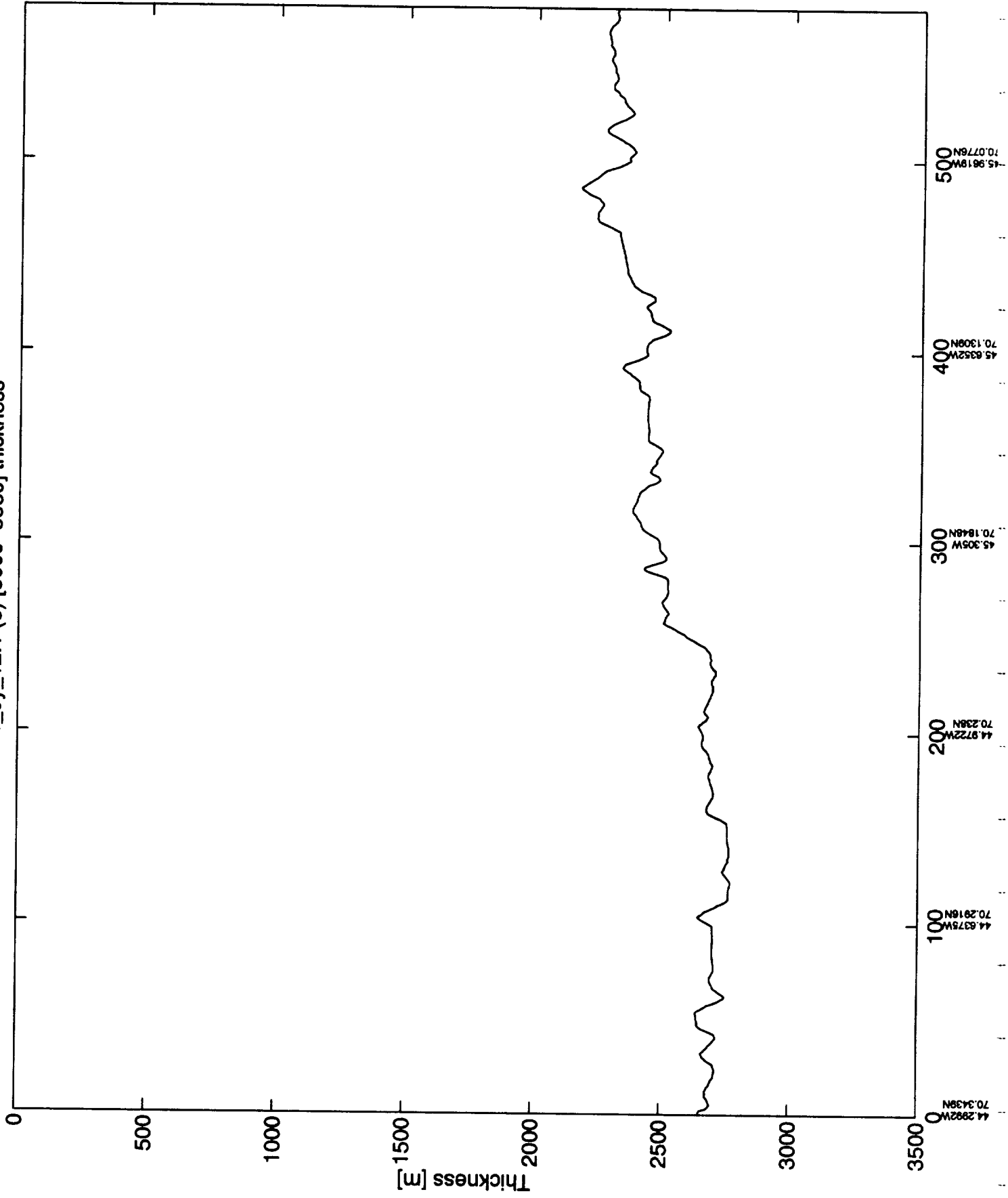
r_5y_12.1 (5) [4000-5000] thickness



r_5y_12.1 <6> [5000 6000]

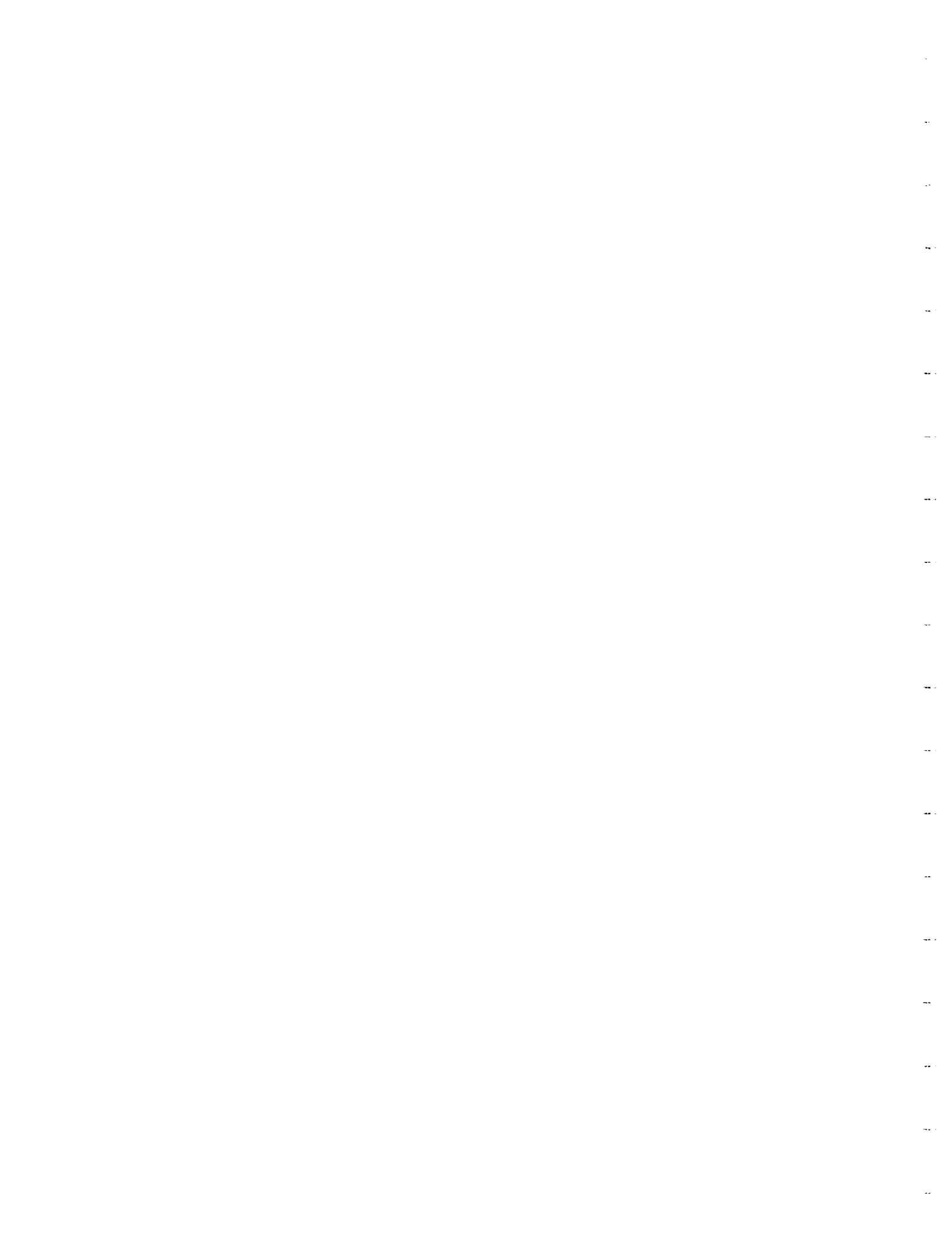


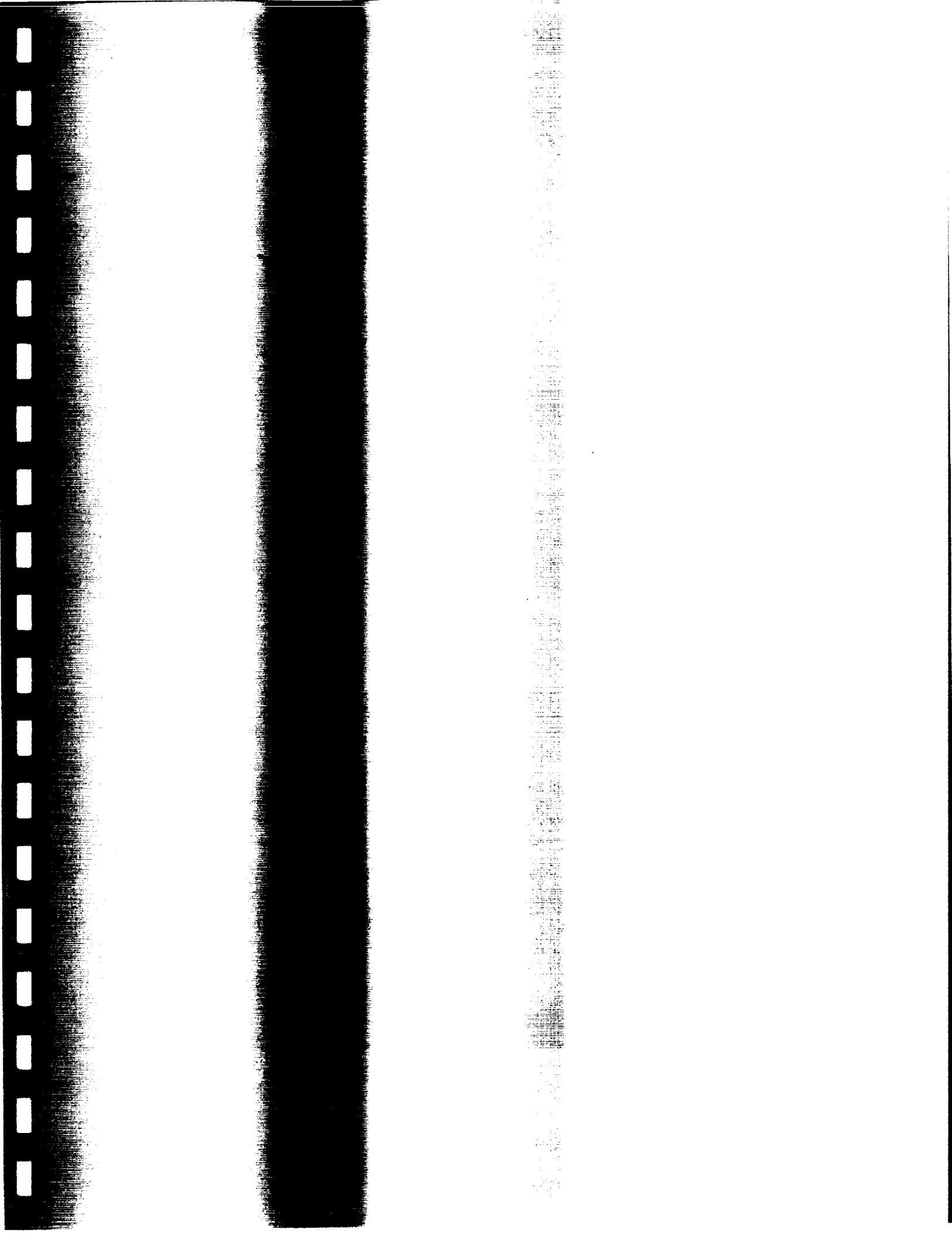
r_5y_12.1 (6) [5000-5580] thickness

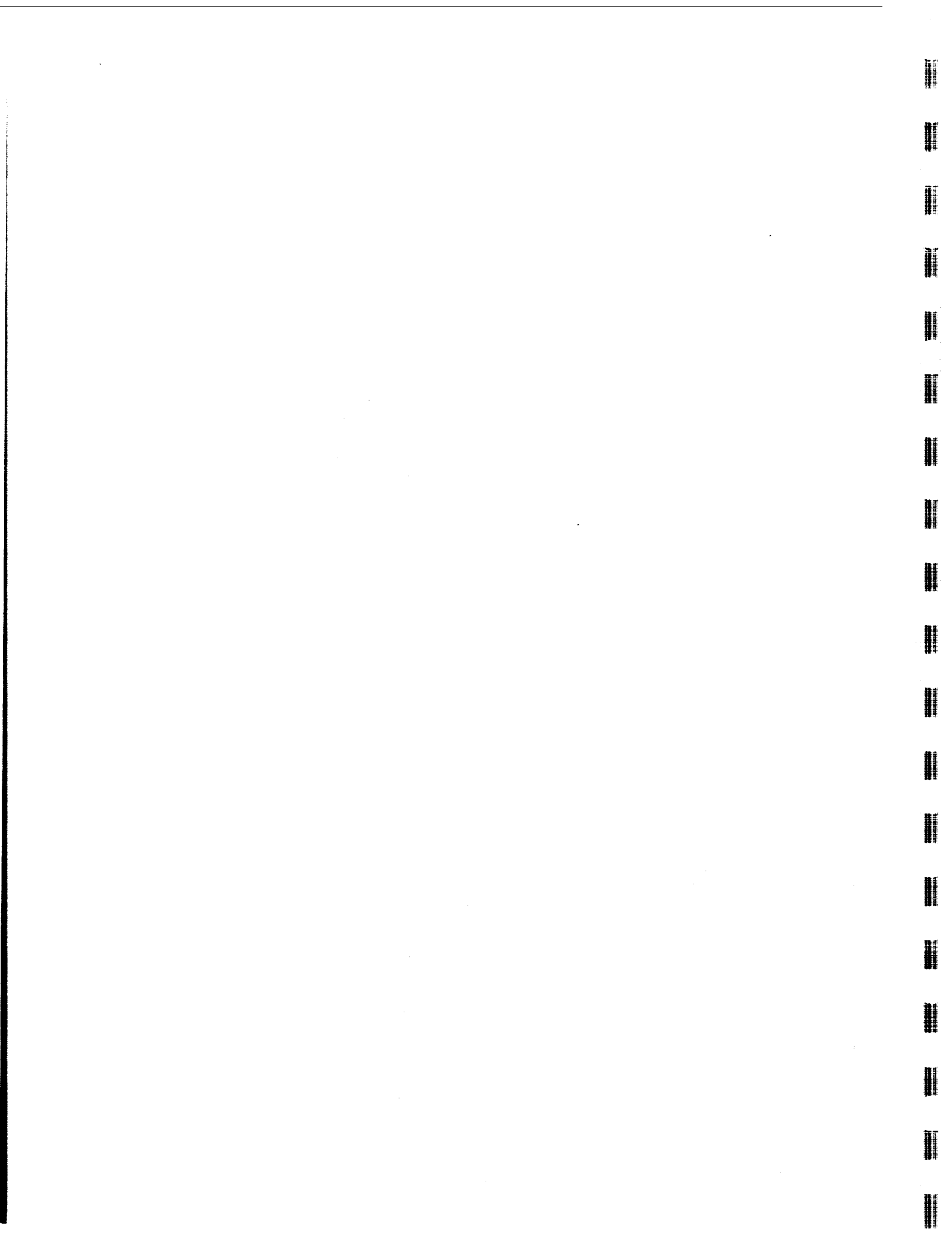


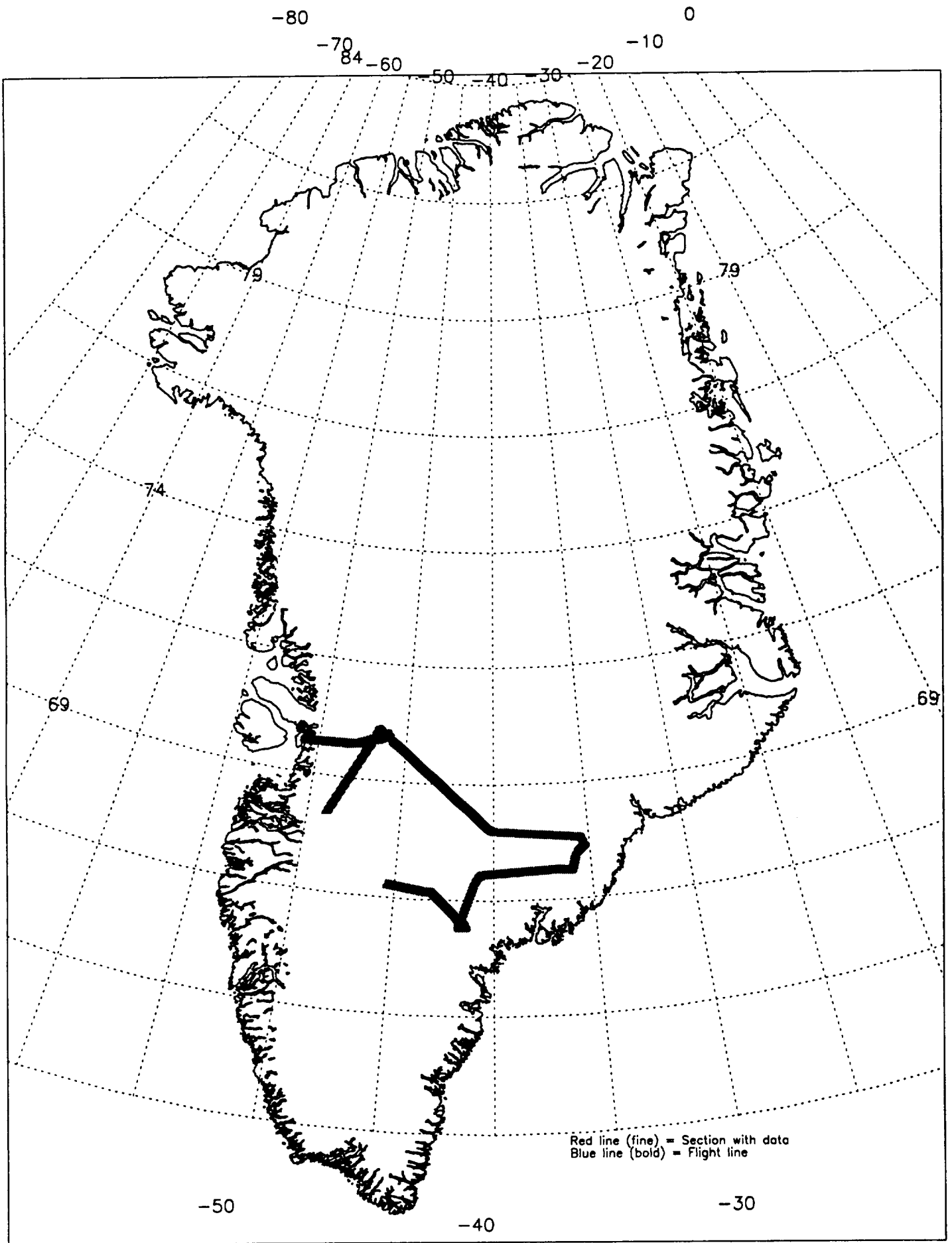
Appendix G

July 3, 1993

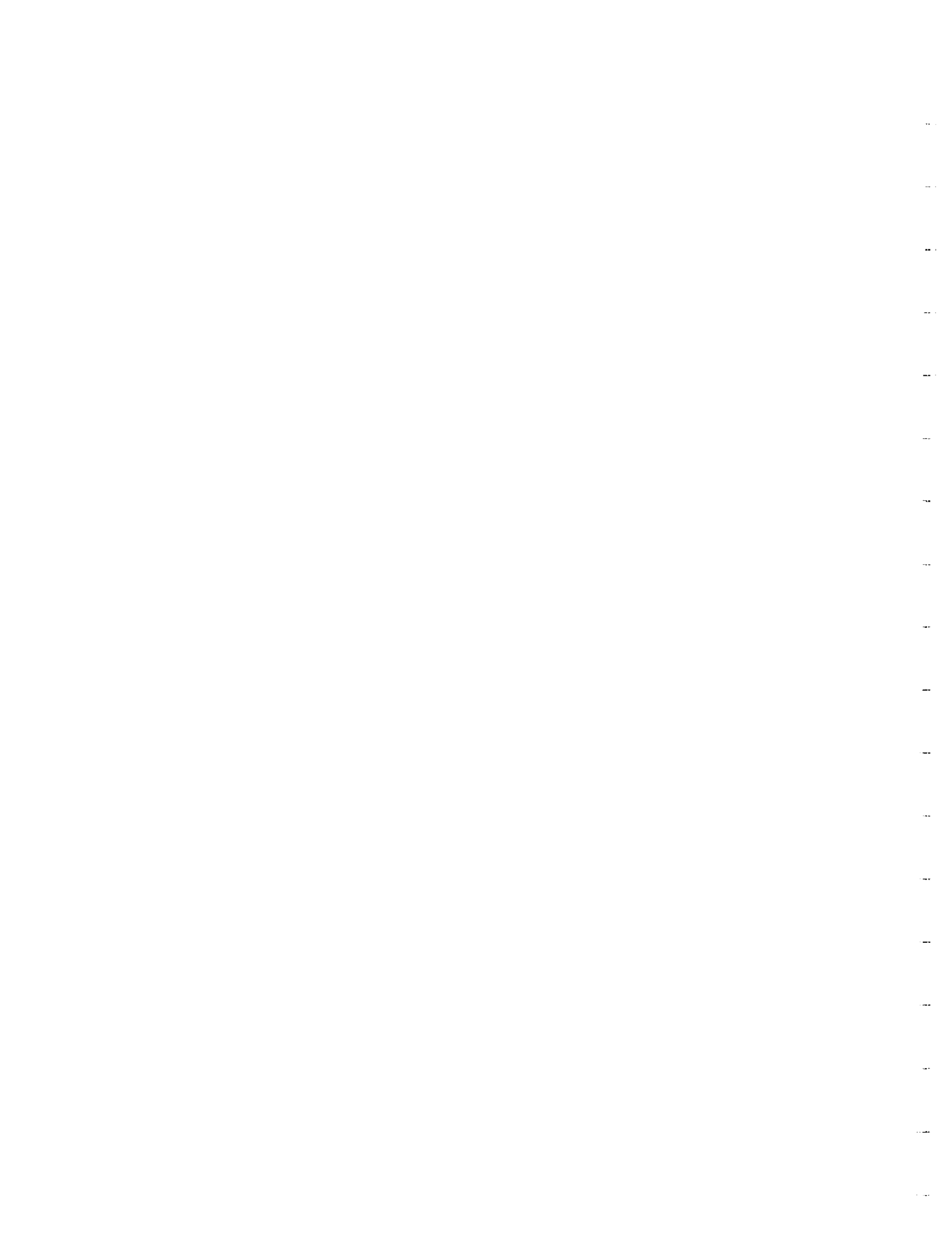




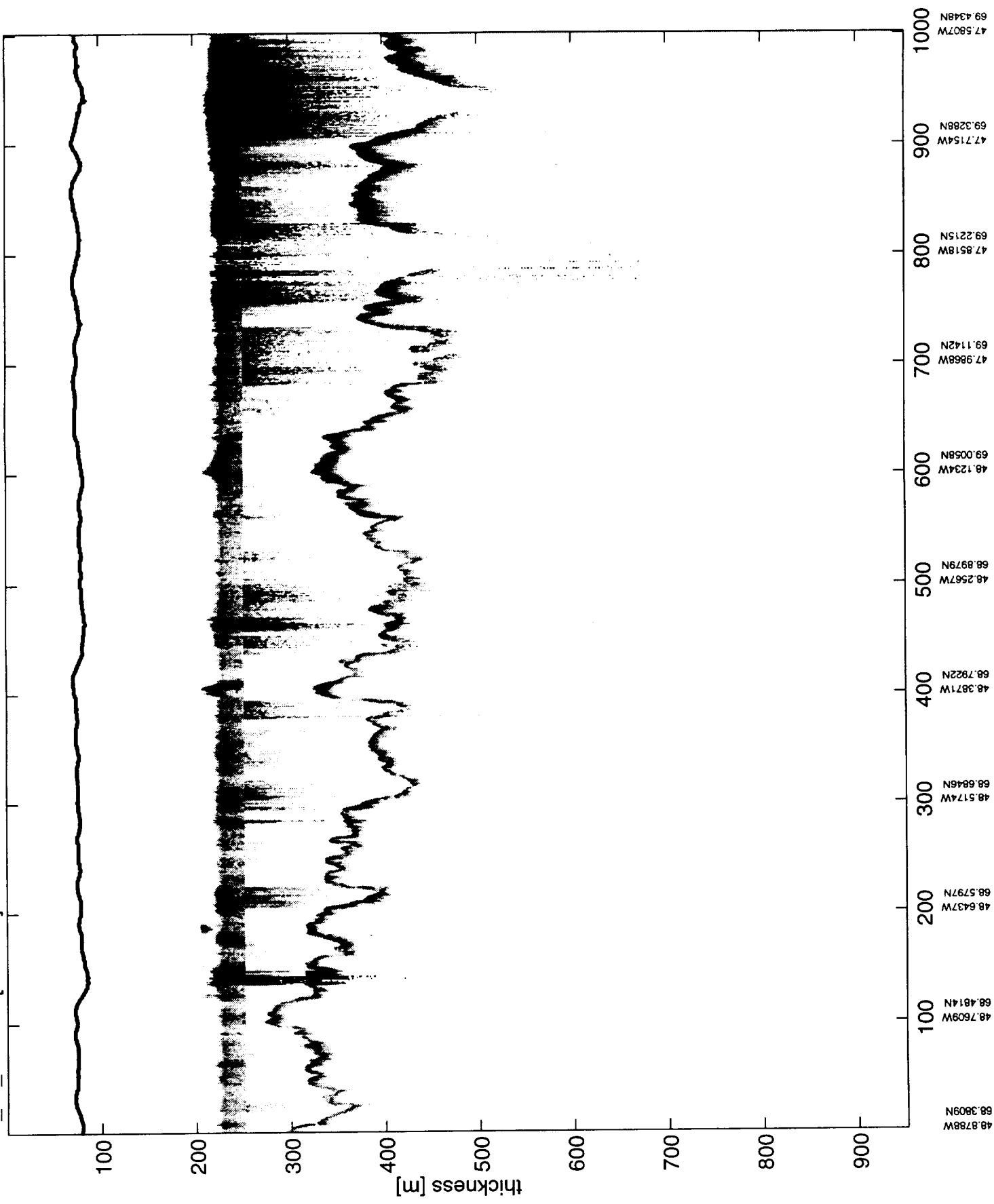




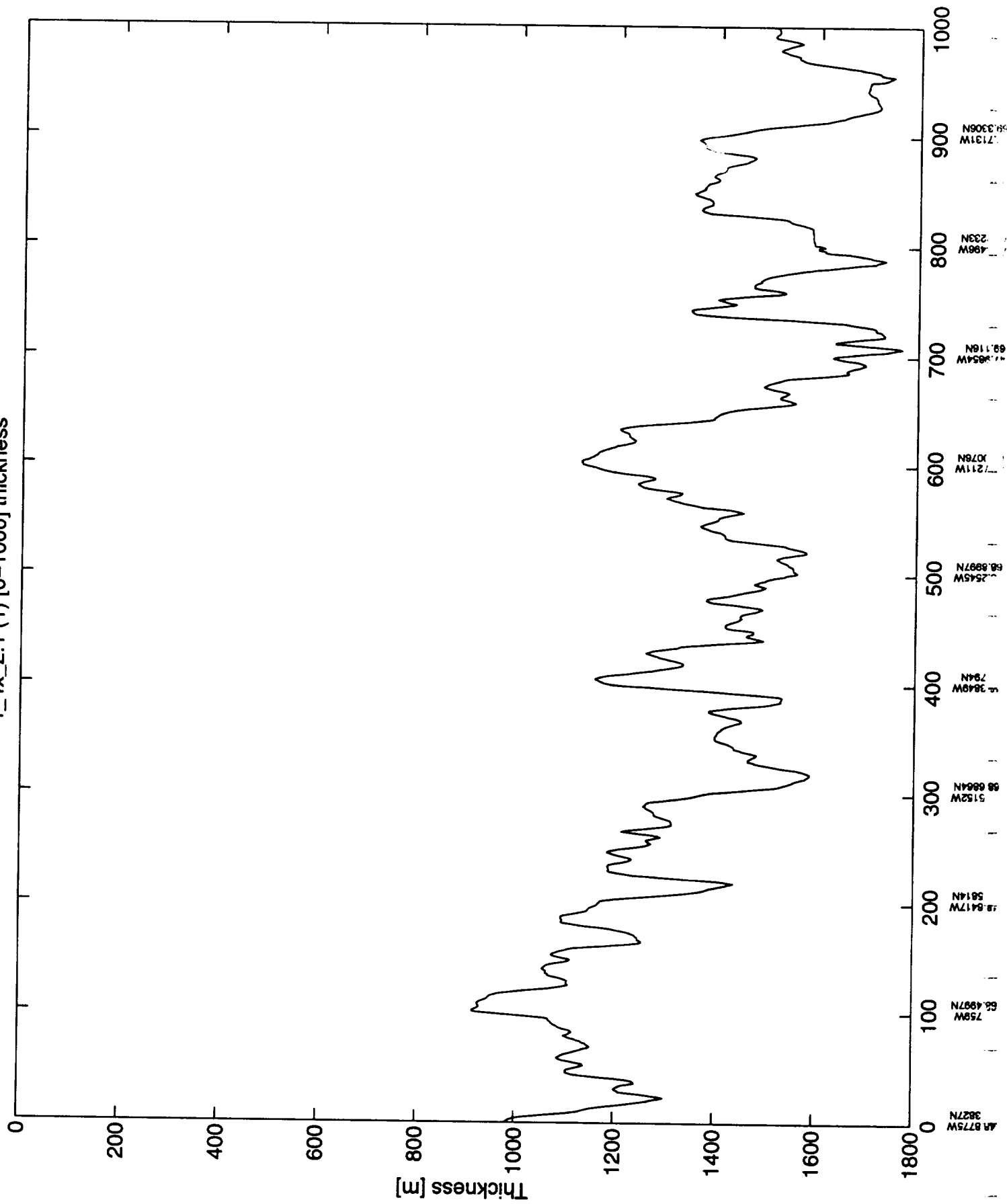
July 3, 1993 (r_4x)



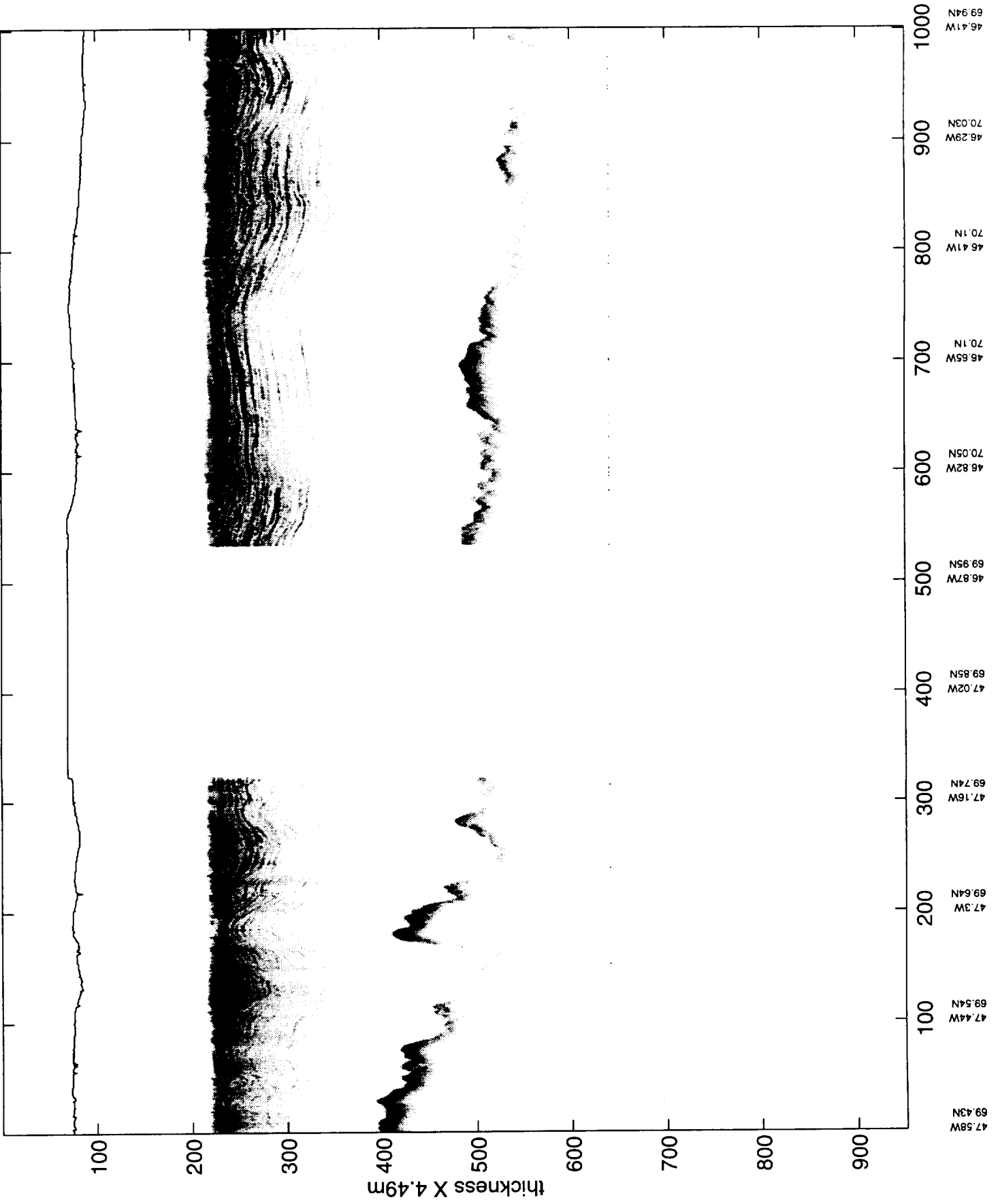
r_4x_2.1 <1> [0-1000]



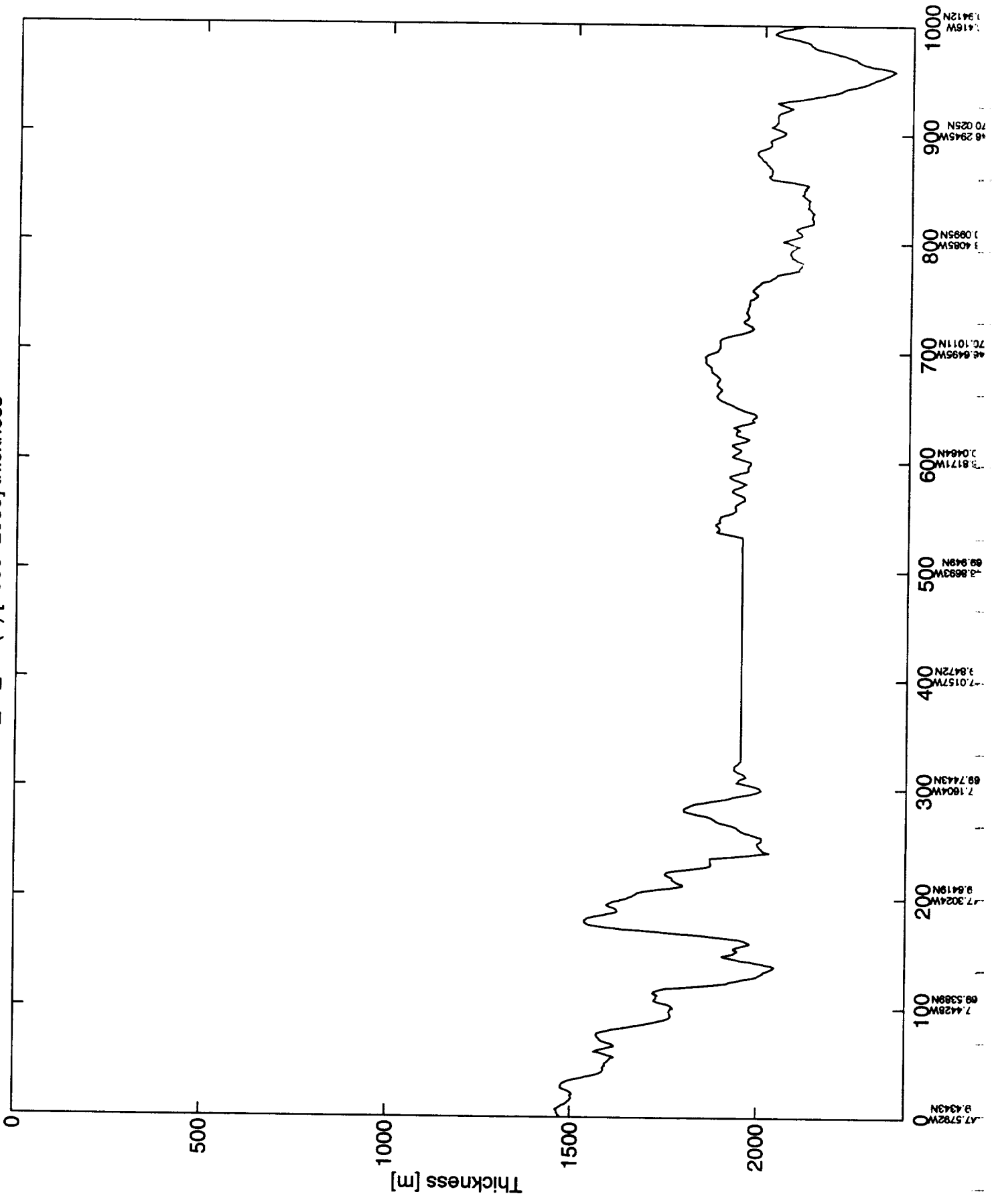
r_4x_2.1 (1) [0-1000] thickness



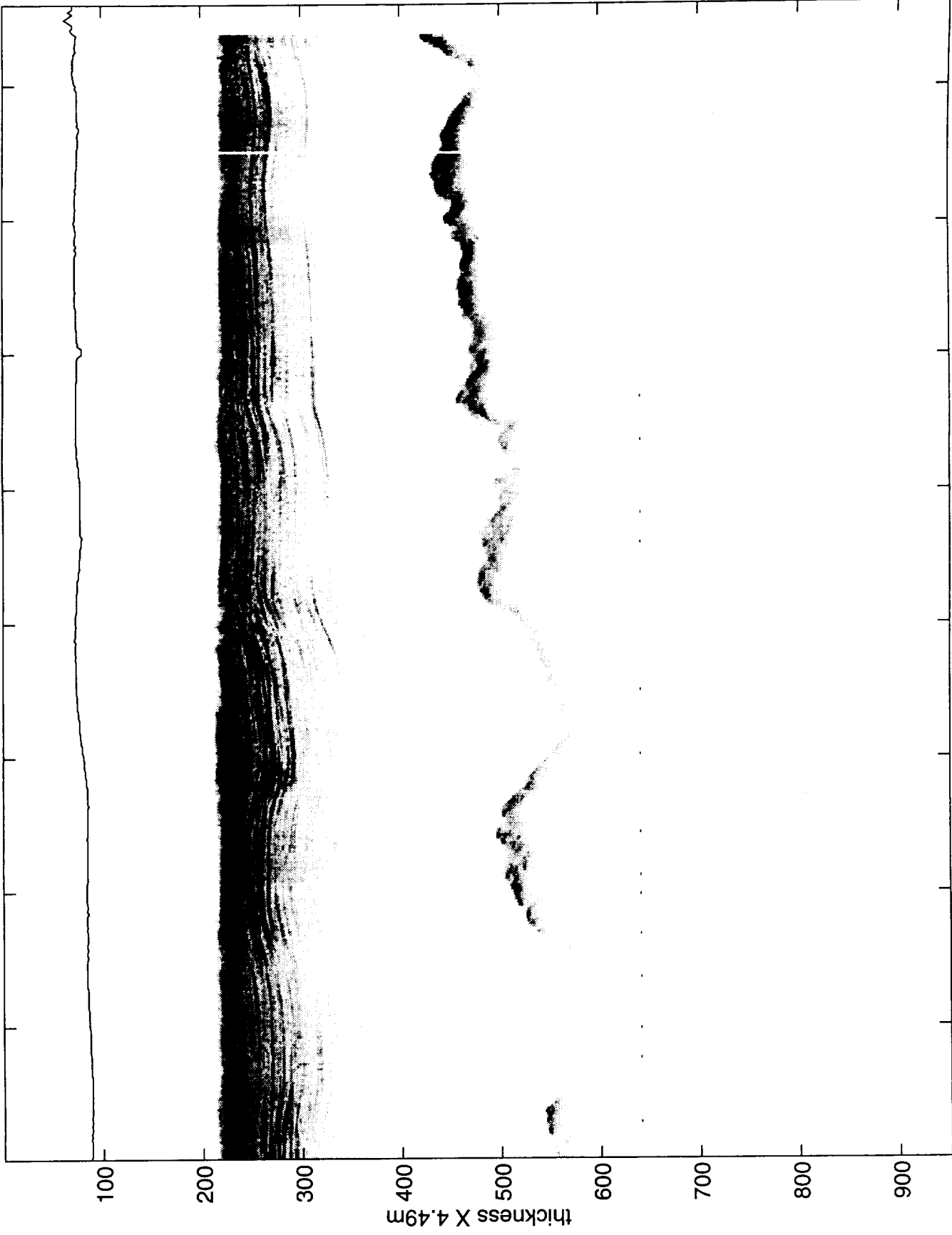
r_4x_2.1 <2> [1000-2000]



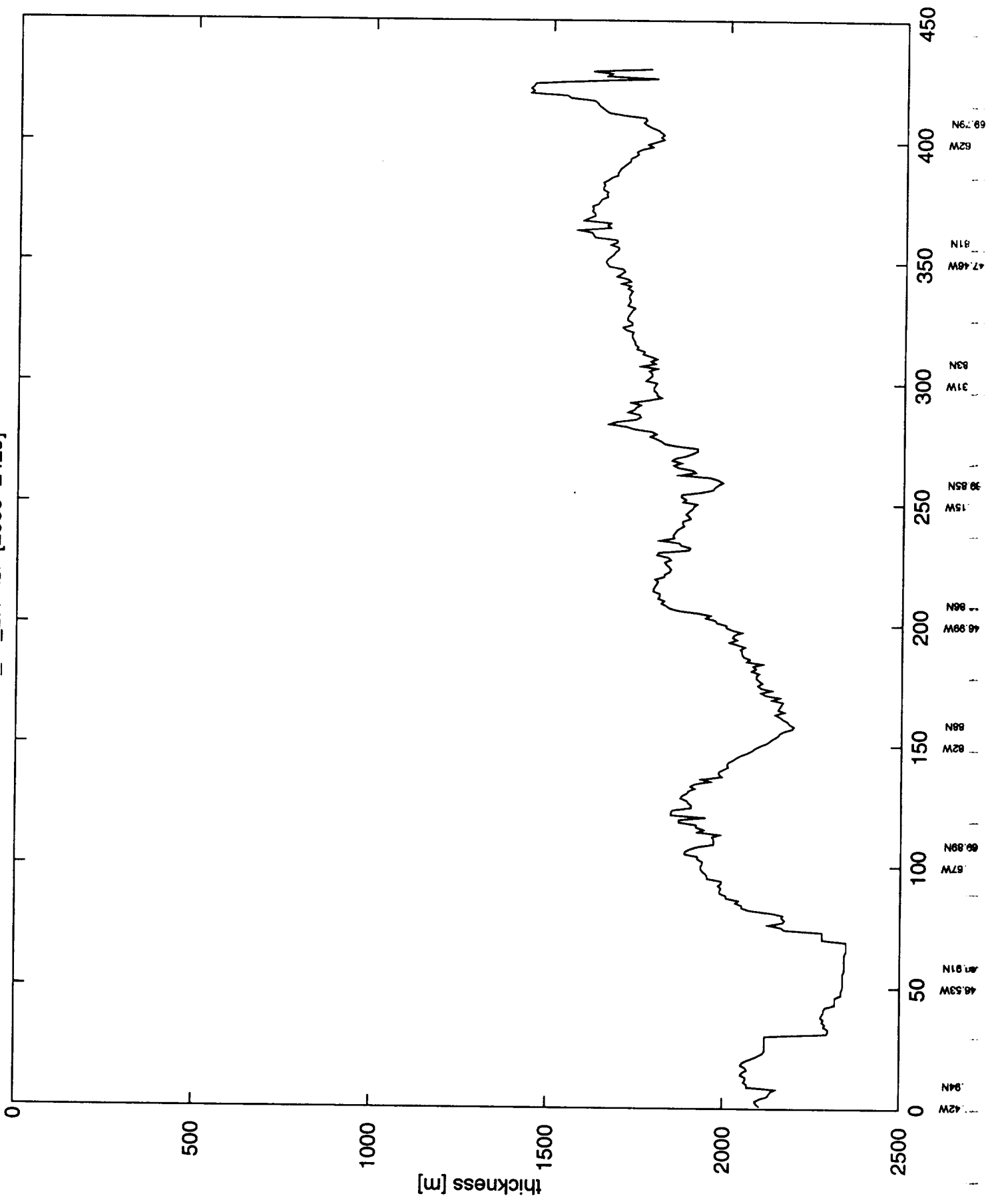
r_4x_2.1 (2) [1000-2000] thickness



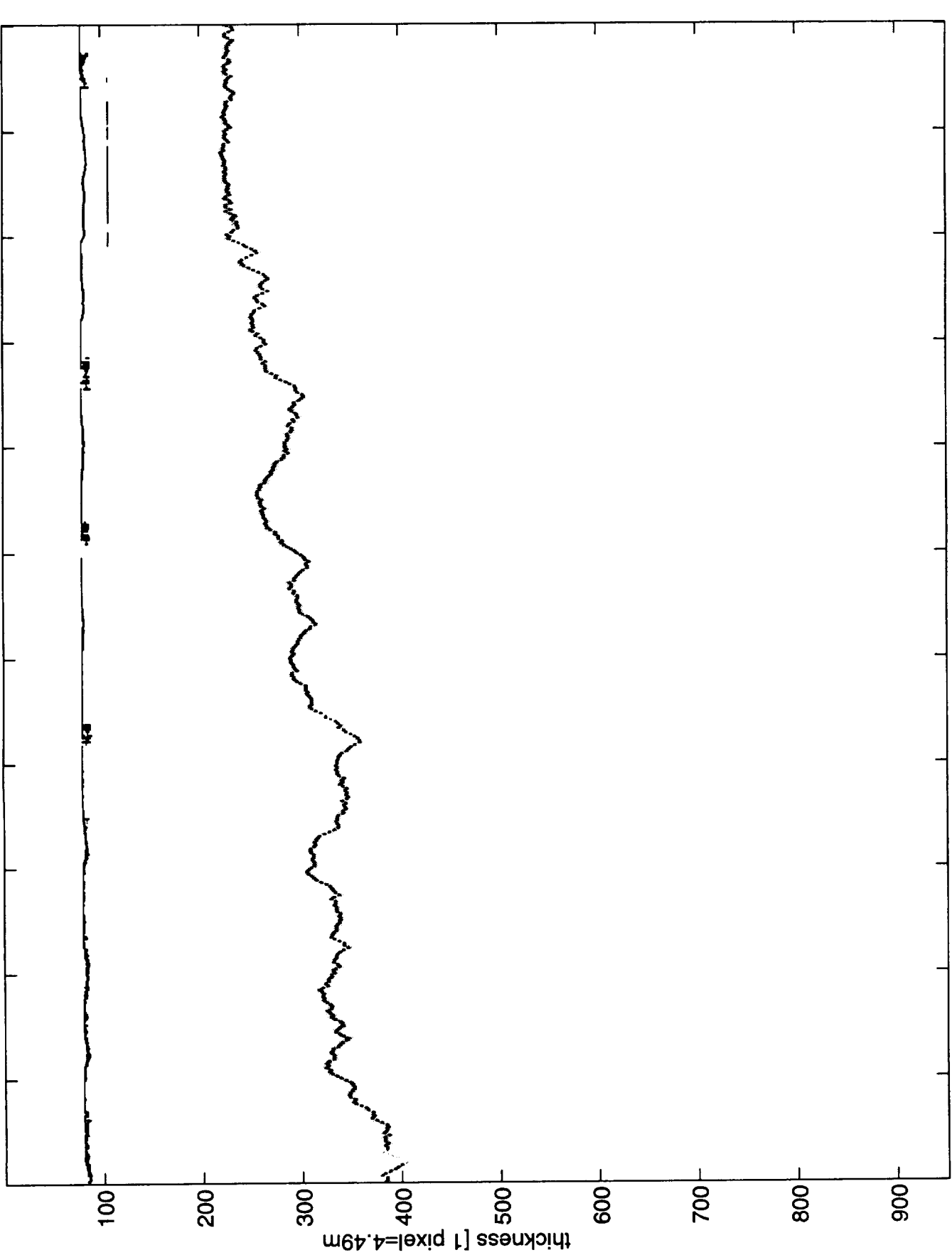
r_4x_2.1 <3> [2000-2430]



r_4x_2.1 <3> [2000-2429]



r_4x_3.1 <1> [0-550]



48.13W

69.75N

48.29W

69.75N

48.46W

69.75N

48.8W

69.74N

48.97W

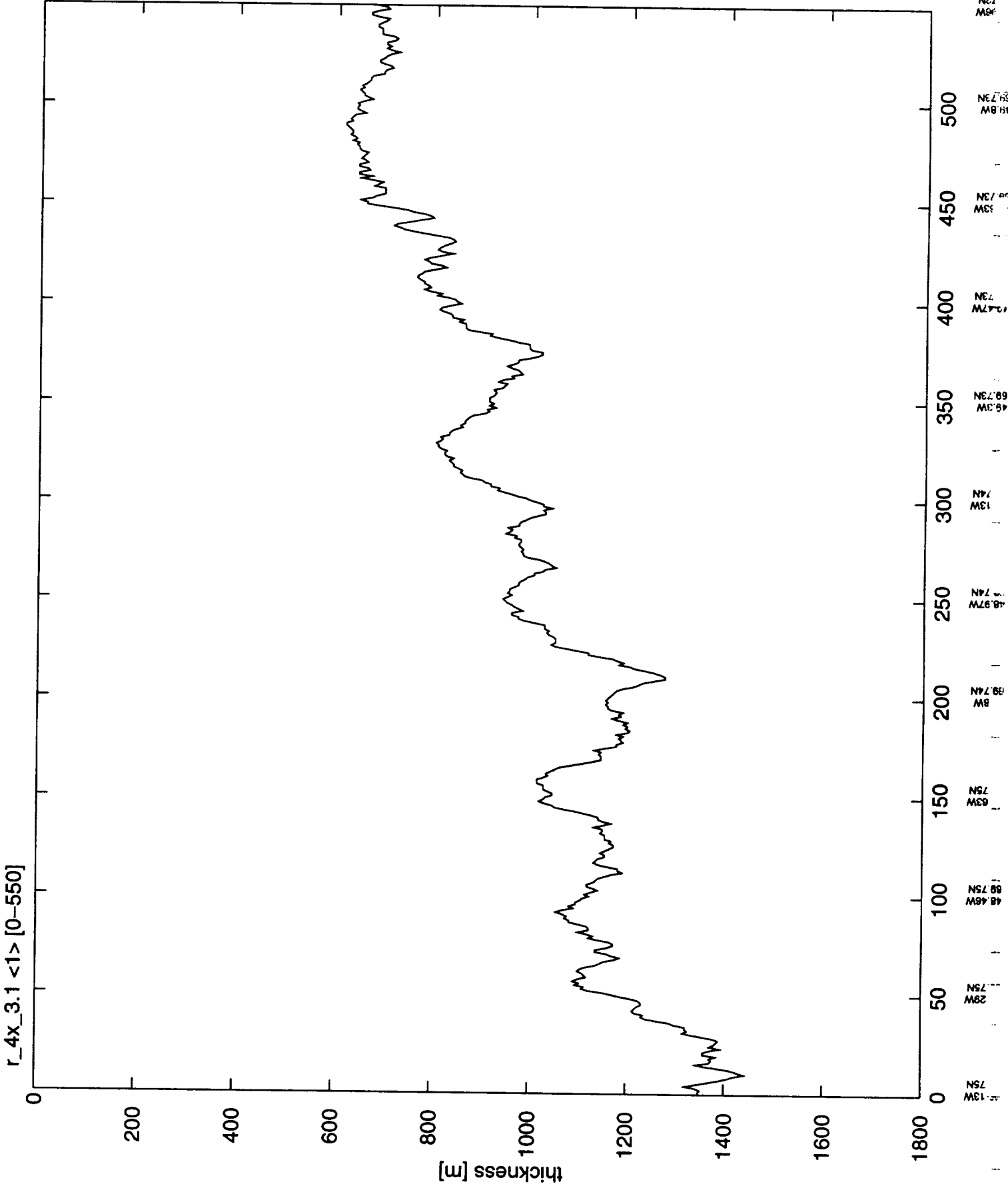
69.74N

48.8W

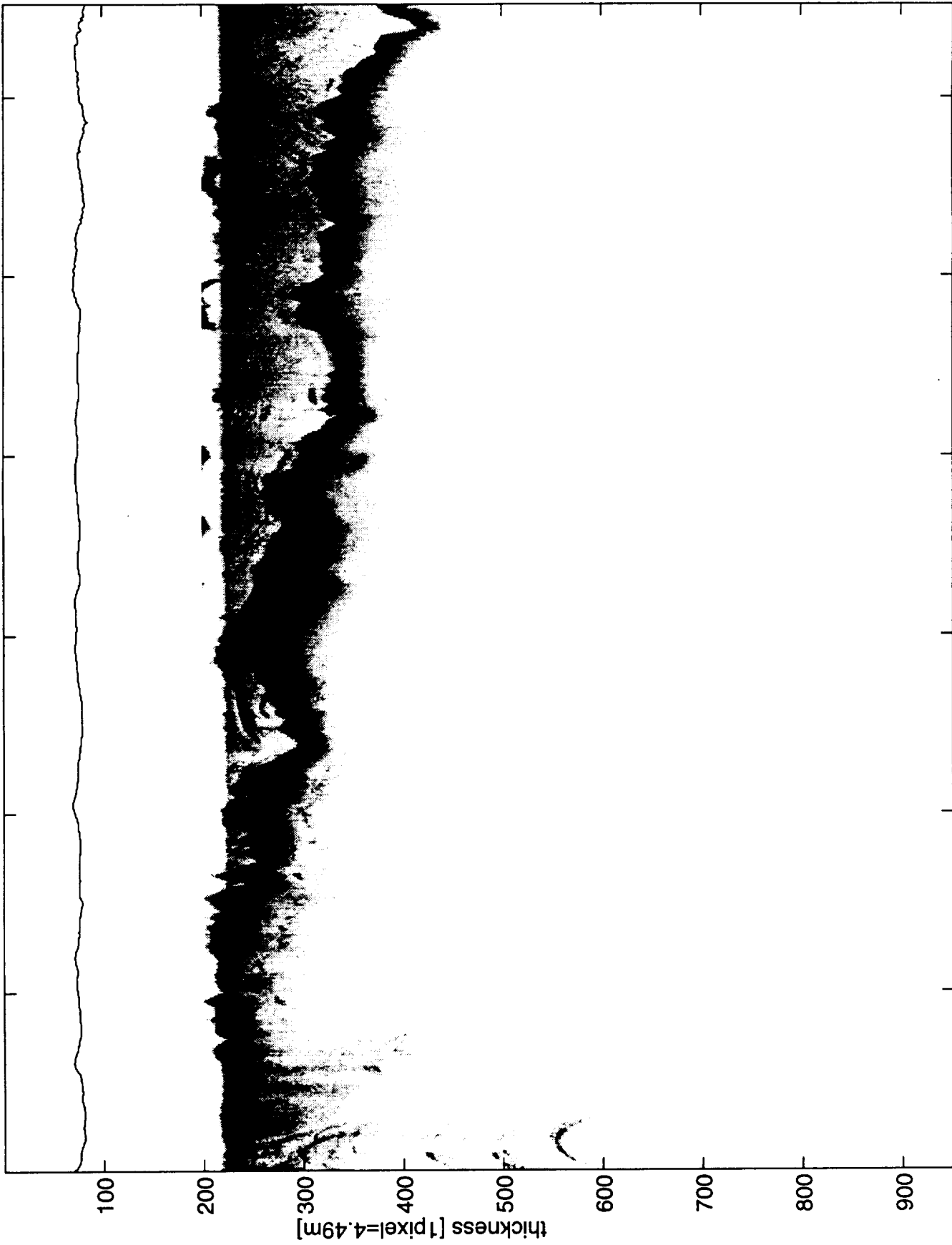
69.73N

49.96W

69.72N

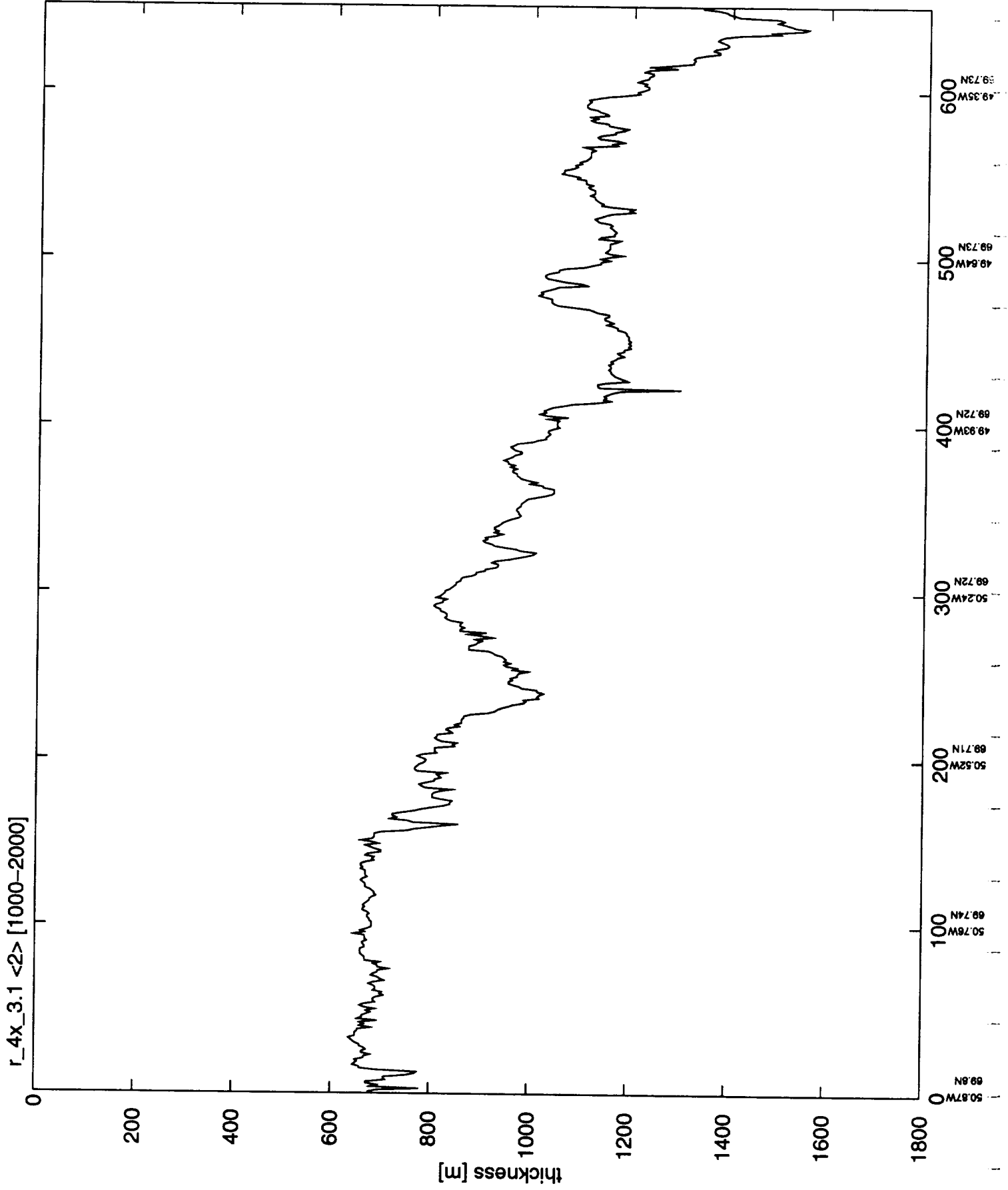


r_4x_3.1 <2> [1350-2000]

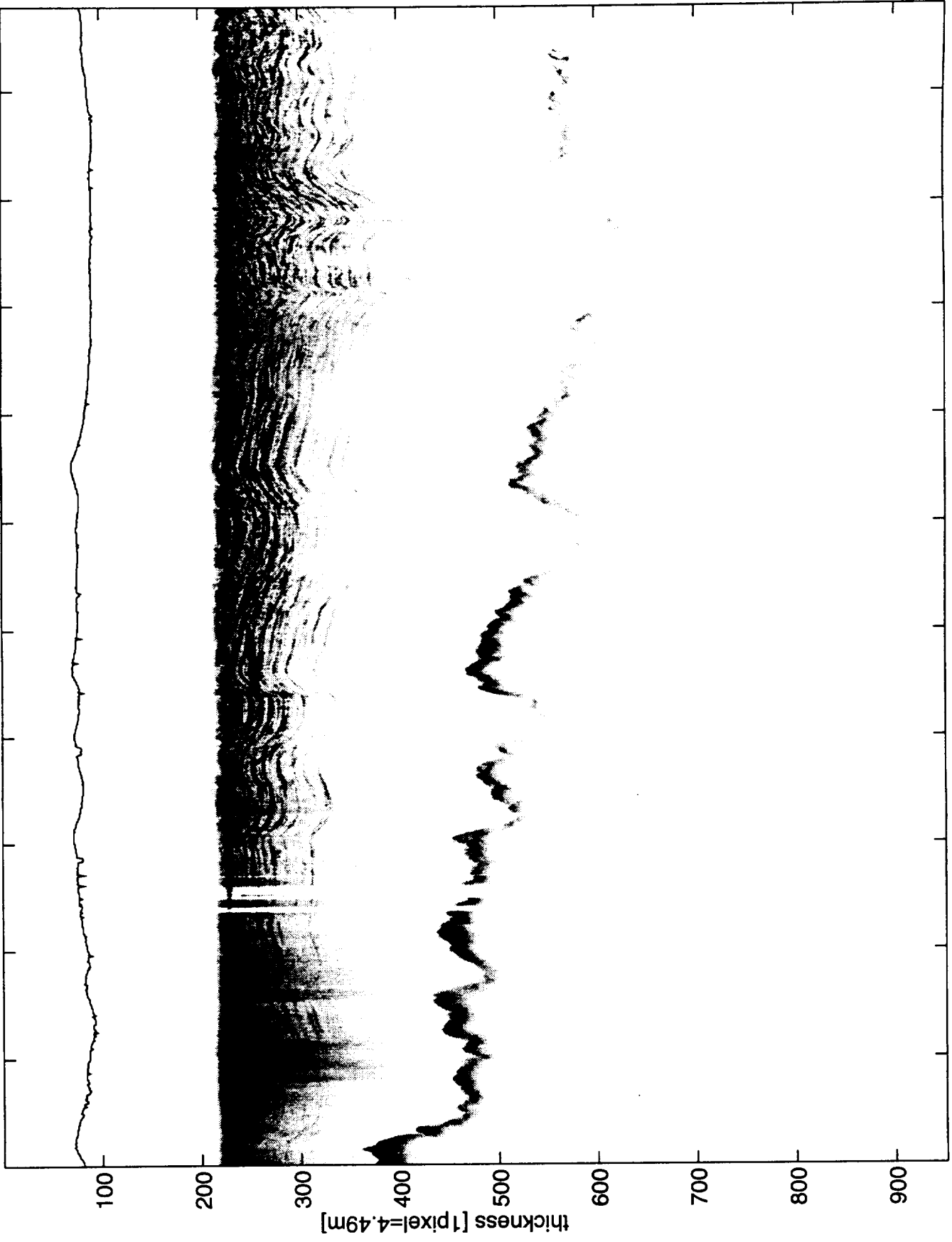


50.8679W 69.8017N
50.7586W 69.738N
50.5226W 69.7149N
50.2425W 69.7189N
49.9269W 69.7235N
49.6354W 69.7291N
49.3514W 69.7343N
49.0506W 69.7389N

r_4x_3.1 <2> [1000-2000]

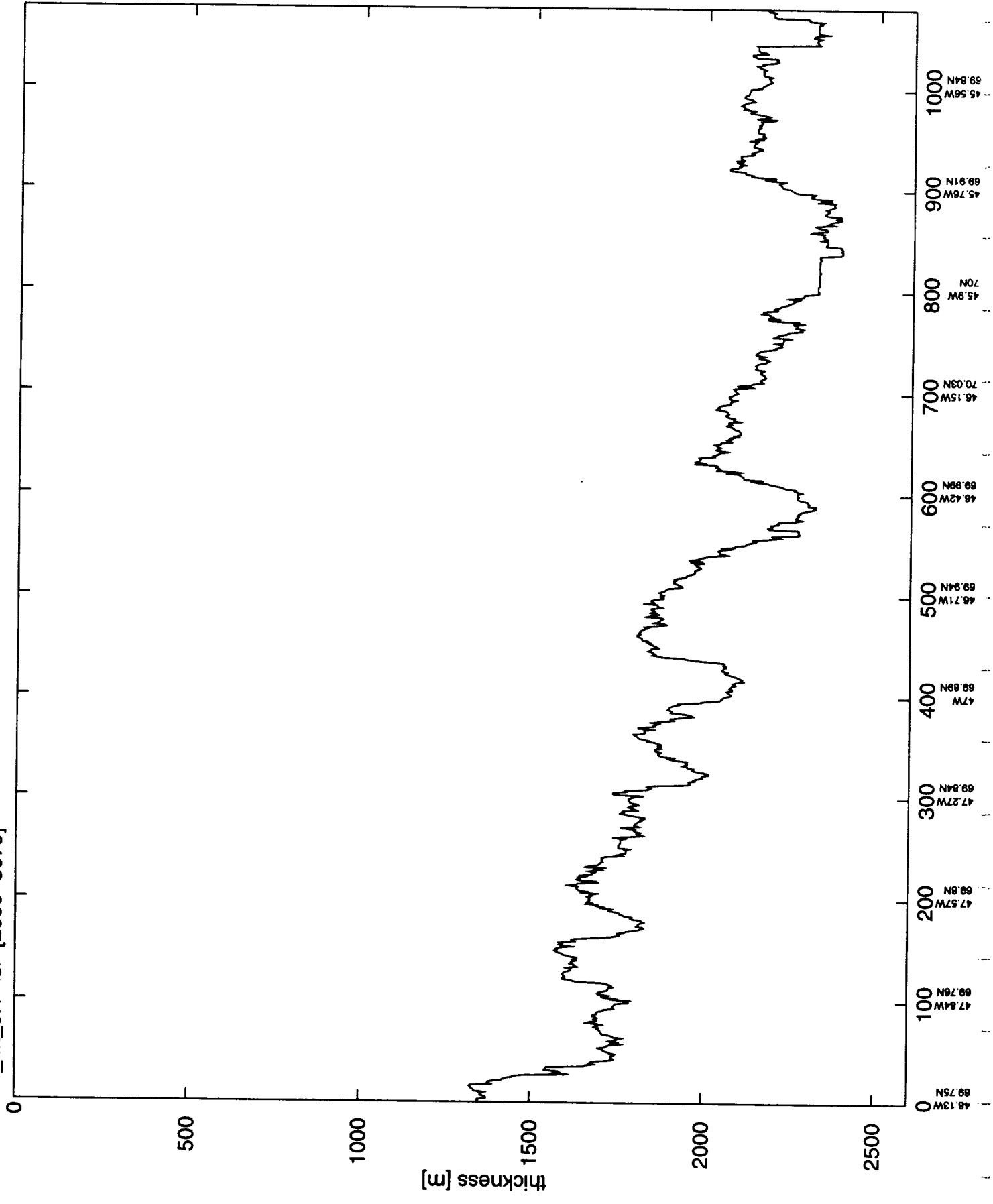


r_4x_3.1 <3> [2000-3079]

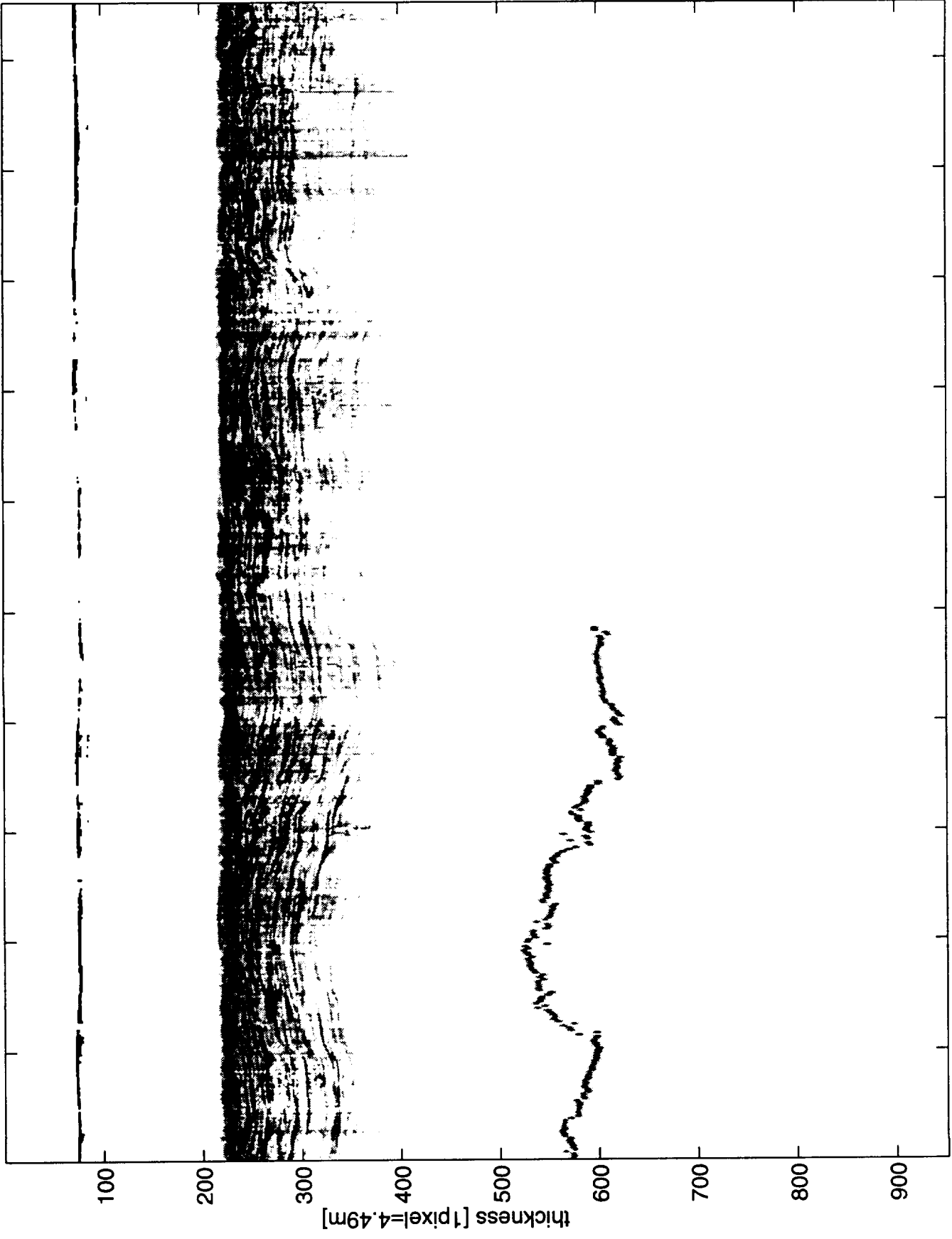


69.75N
47.84W
69.79N
47.57W
69.8N
47.57W
47.27N
69.84N
47.27W
69.89N
47W
69.89N
46.71W
69.94N
46.42W
69.98N
46.15W
70.03N
45.9W
70N
45.9W
69.91N
45.76W
69.84N
45.56W

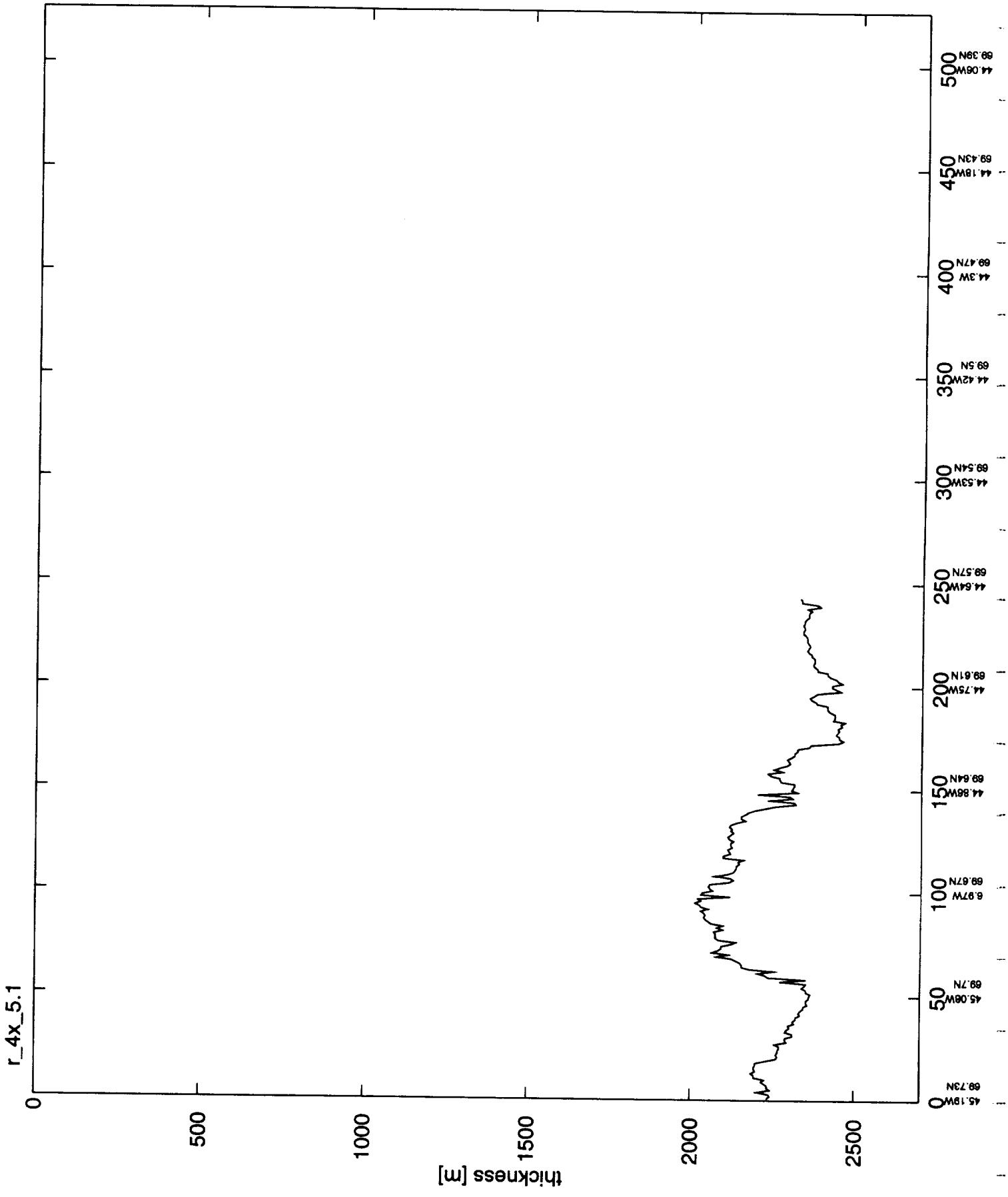
r_4x_3.1 <3> [2000-3079]



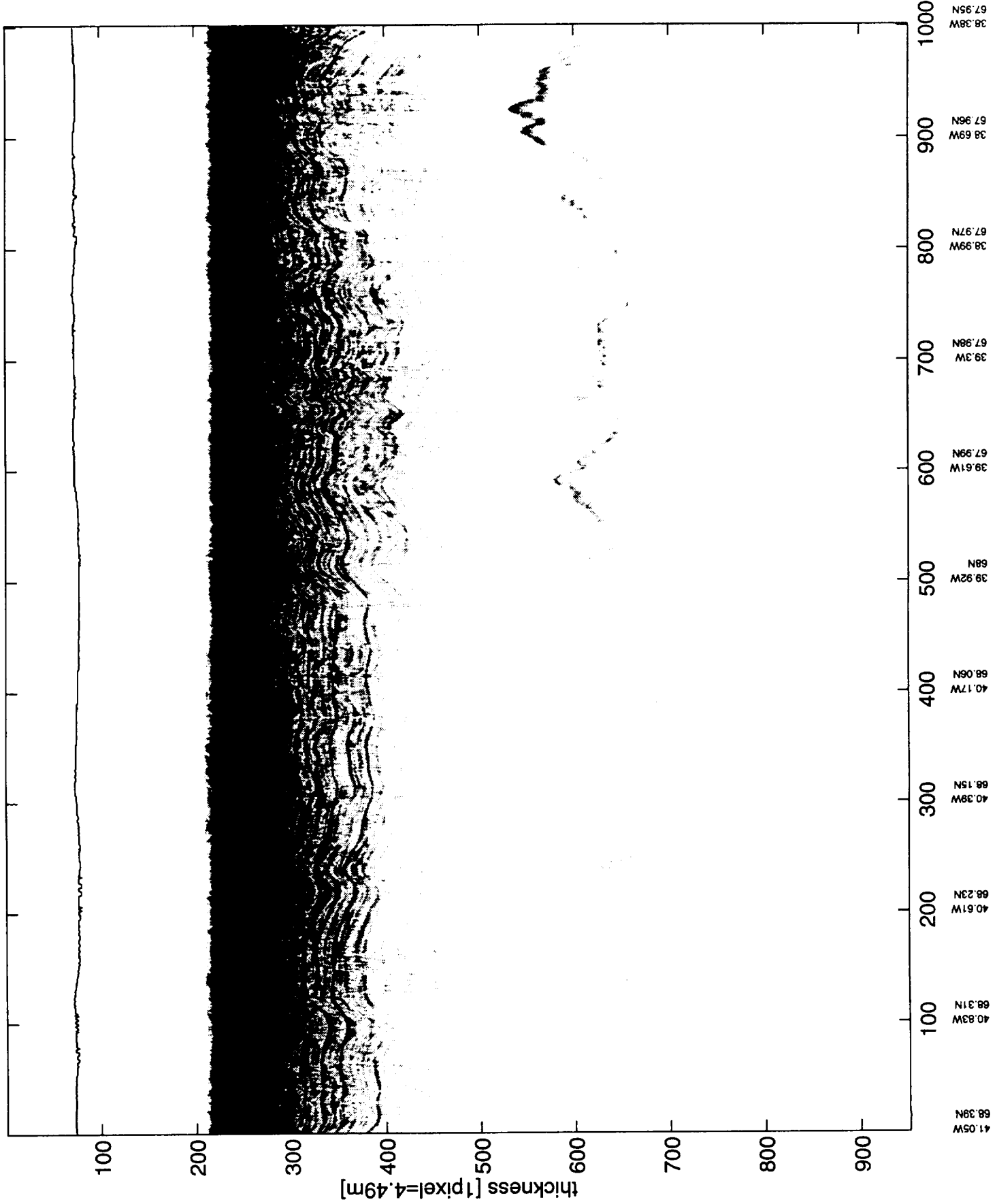
r_4x_5.1



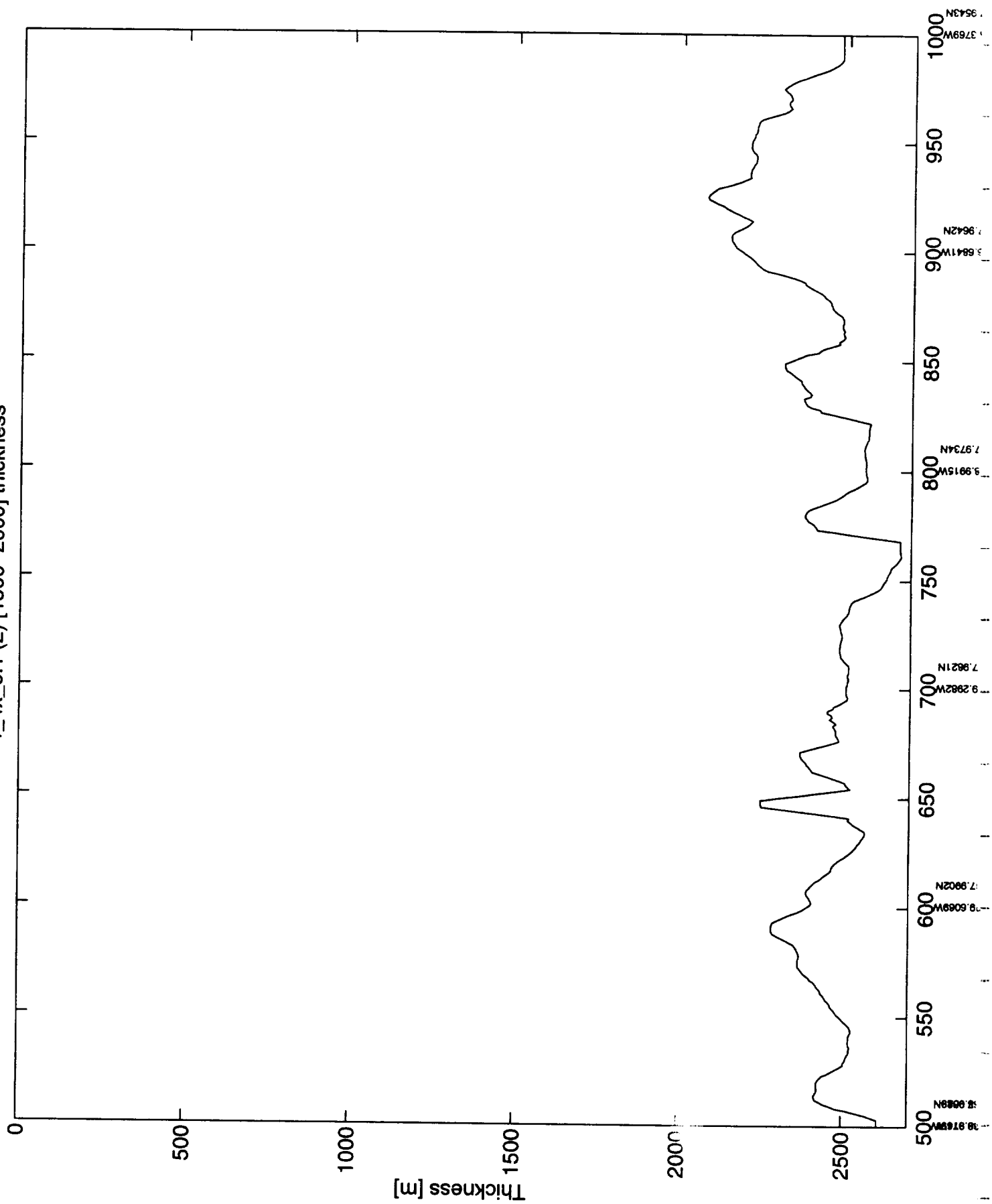
45.19W 69.73N
45.08W 69.7N
44.97W 69.67N
44.86W 69.64N
44.75W 69.61N
44.64W 69.57N
44.53W 69.54N
44.42W 69.5N
44.3W 69.47N
44.18W 69.43N
44.06W 69.39N



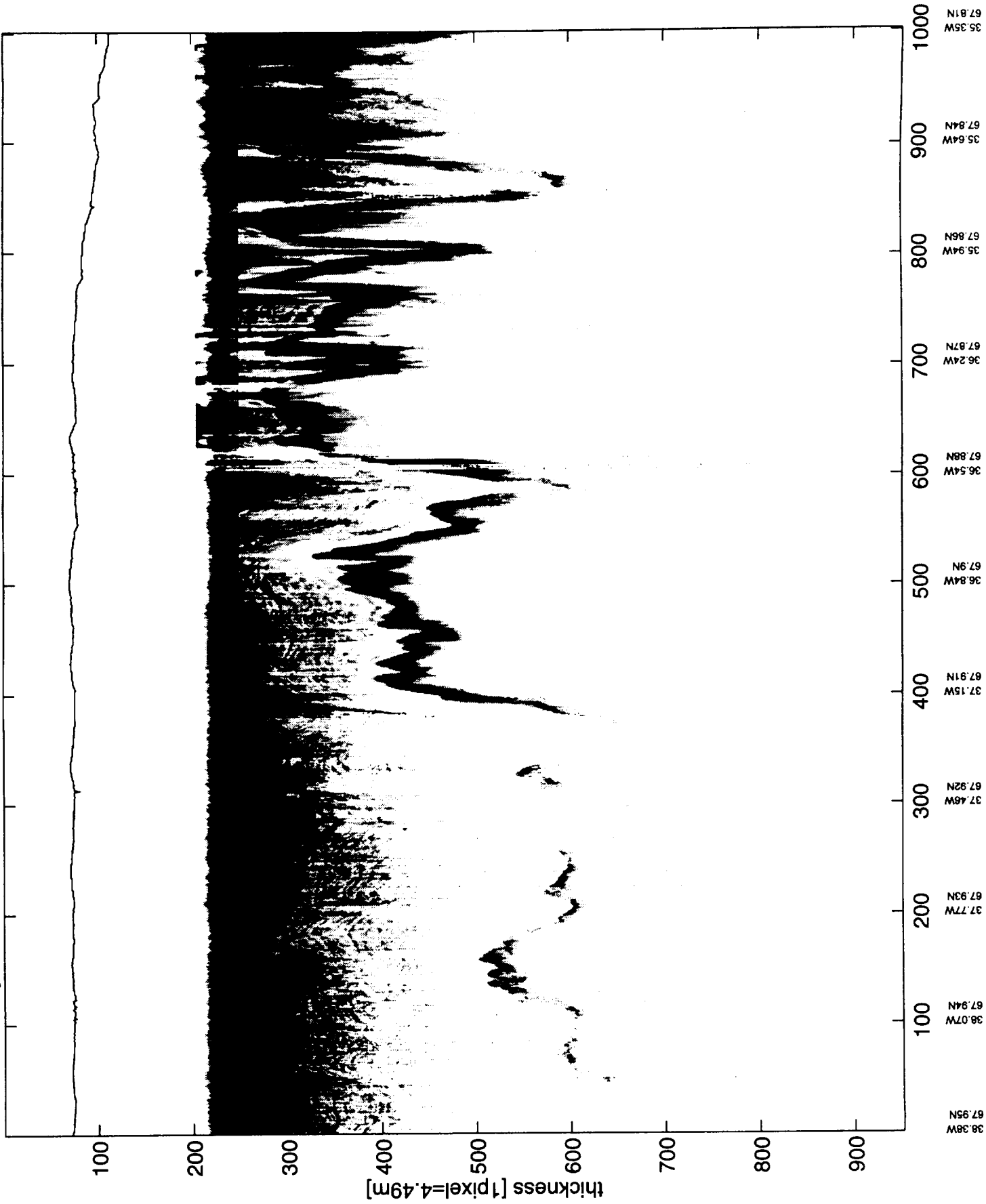
r_4x_6.1 <2> [1000-2000]



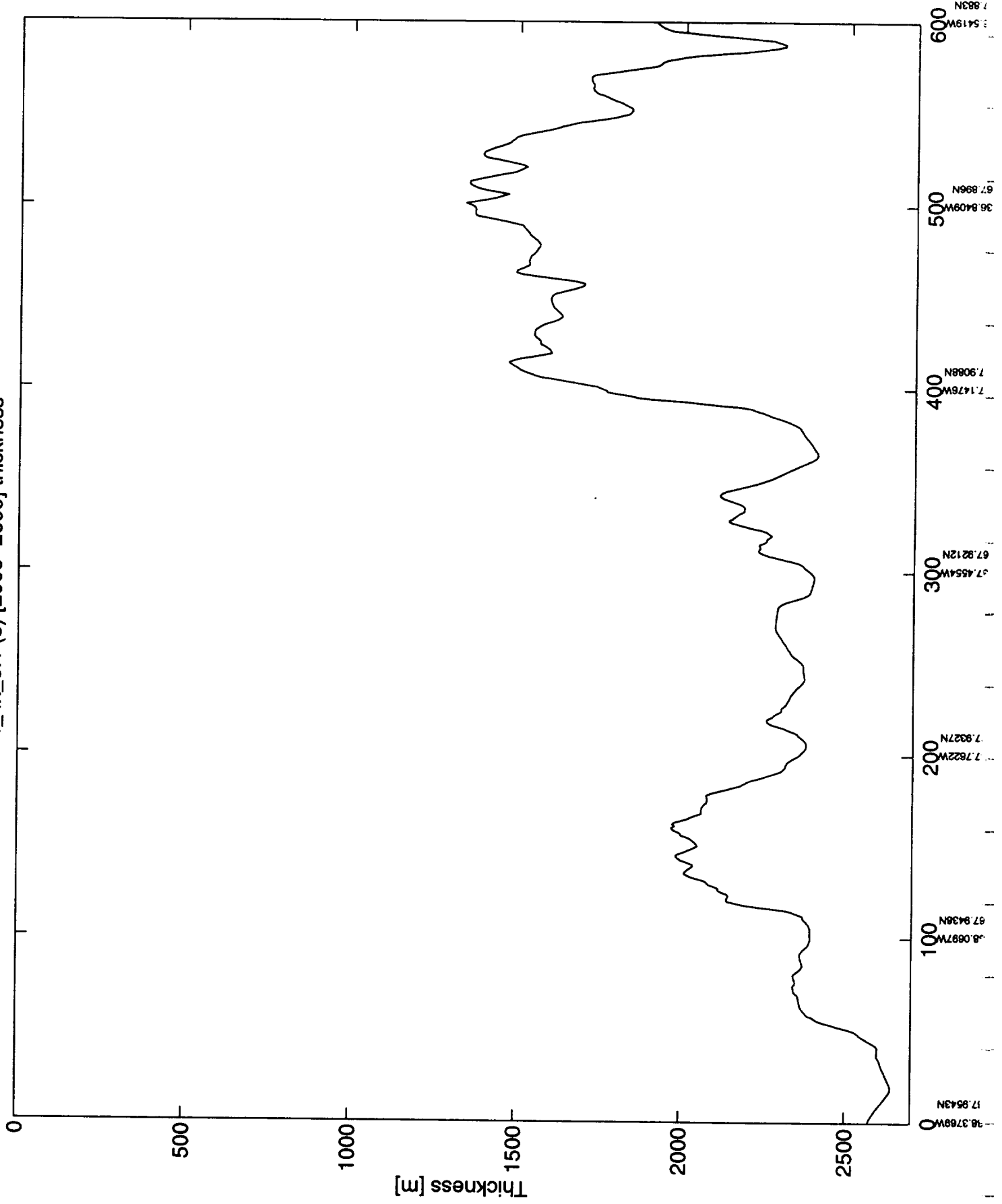
r_4x_6.1 (2) [1500-2000] thickness

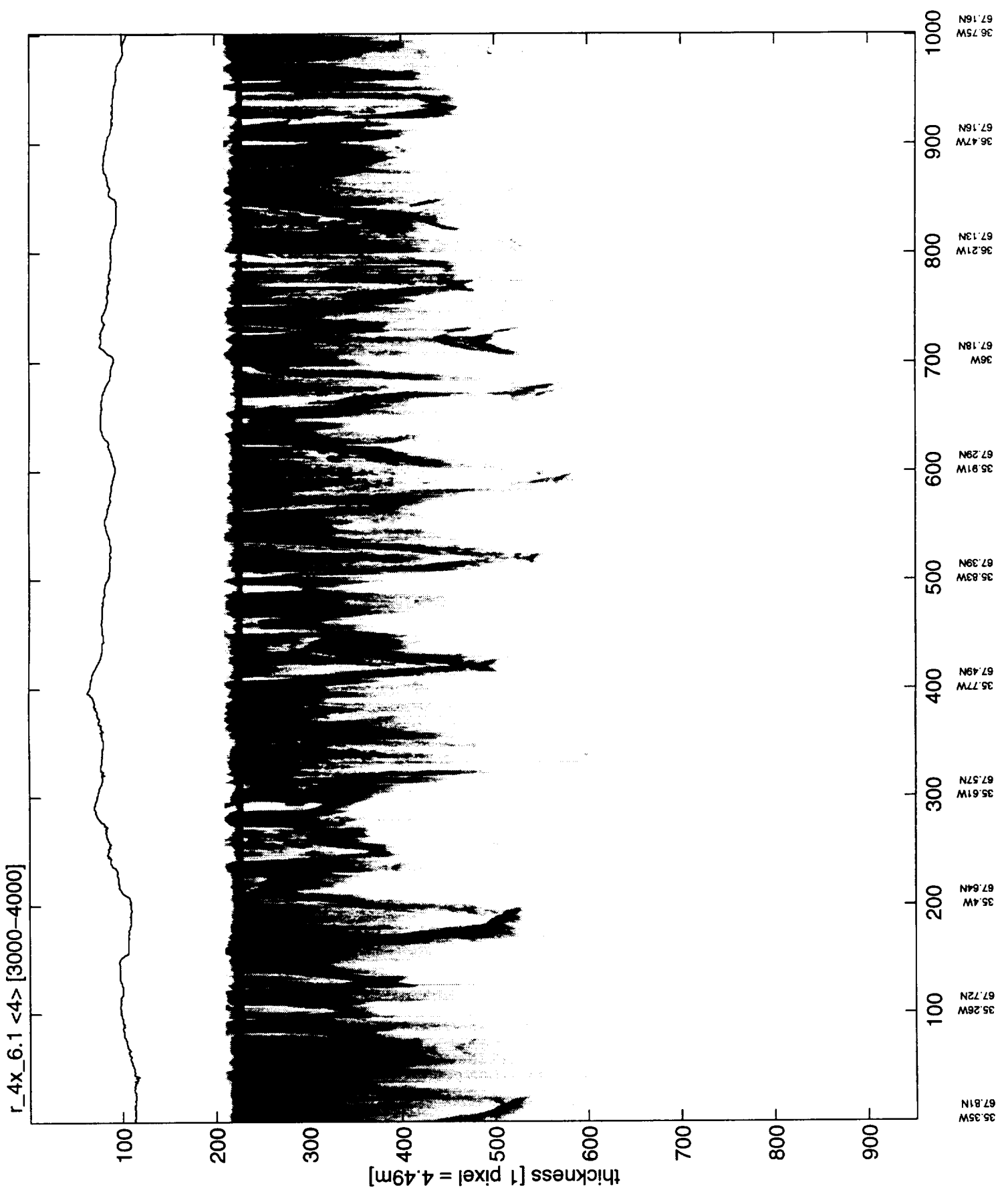


r_4x_6.1 <3> [2000-3000]

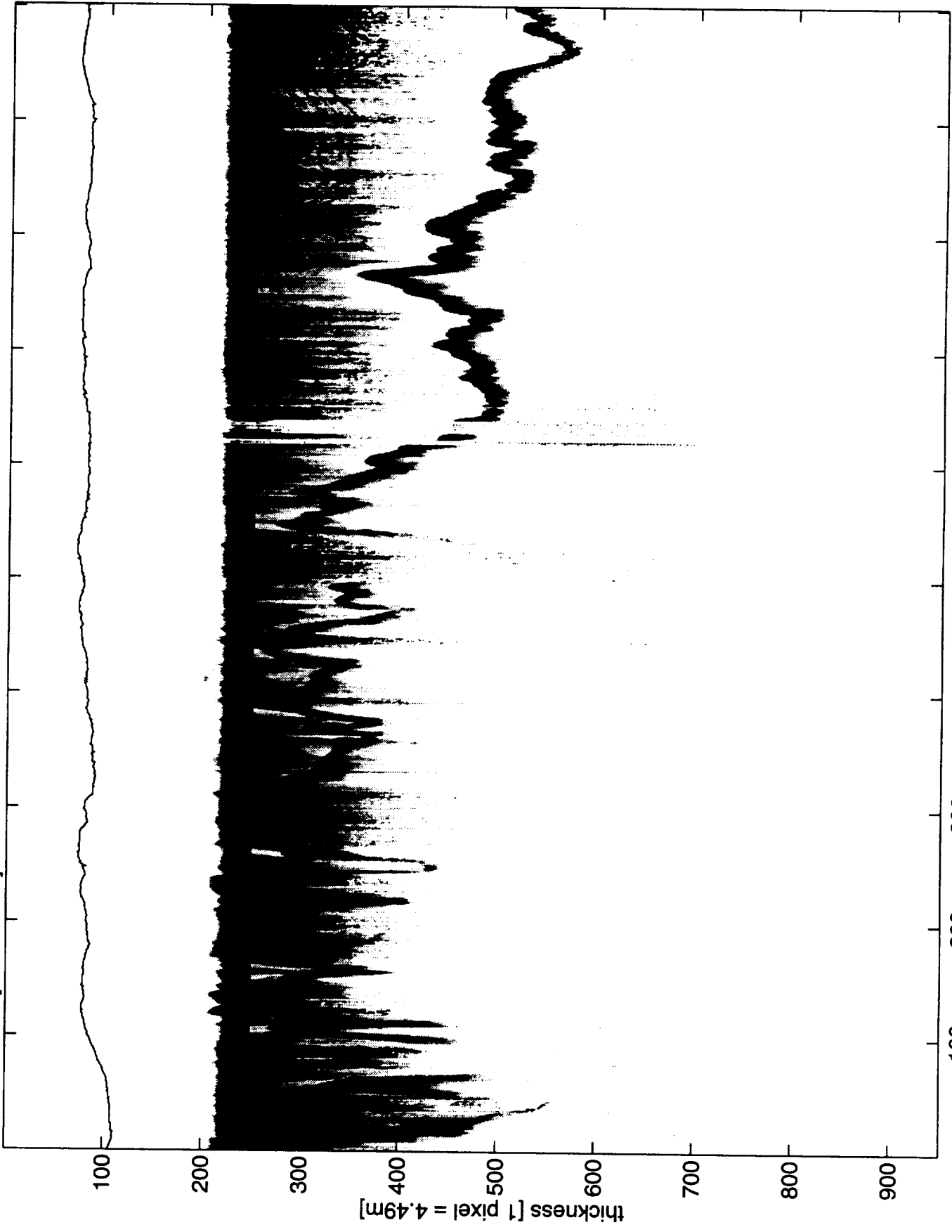


r_4x_6.1 (3) [2000-2600] thickness



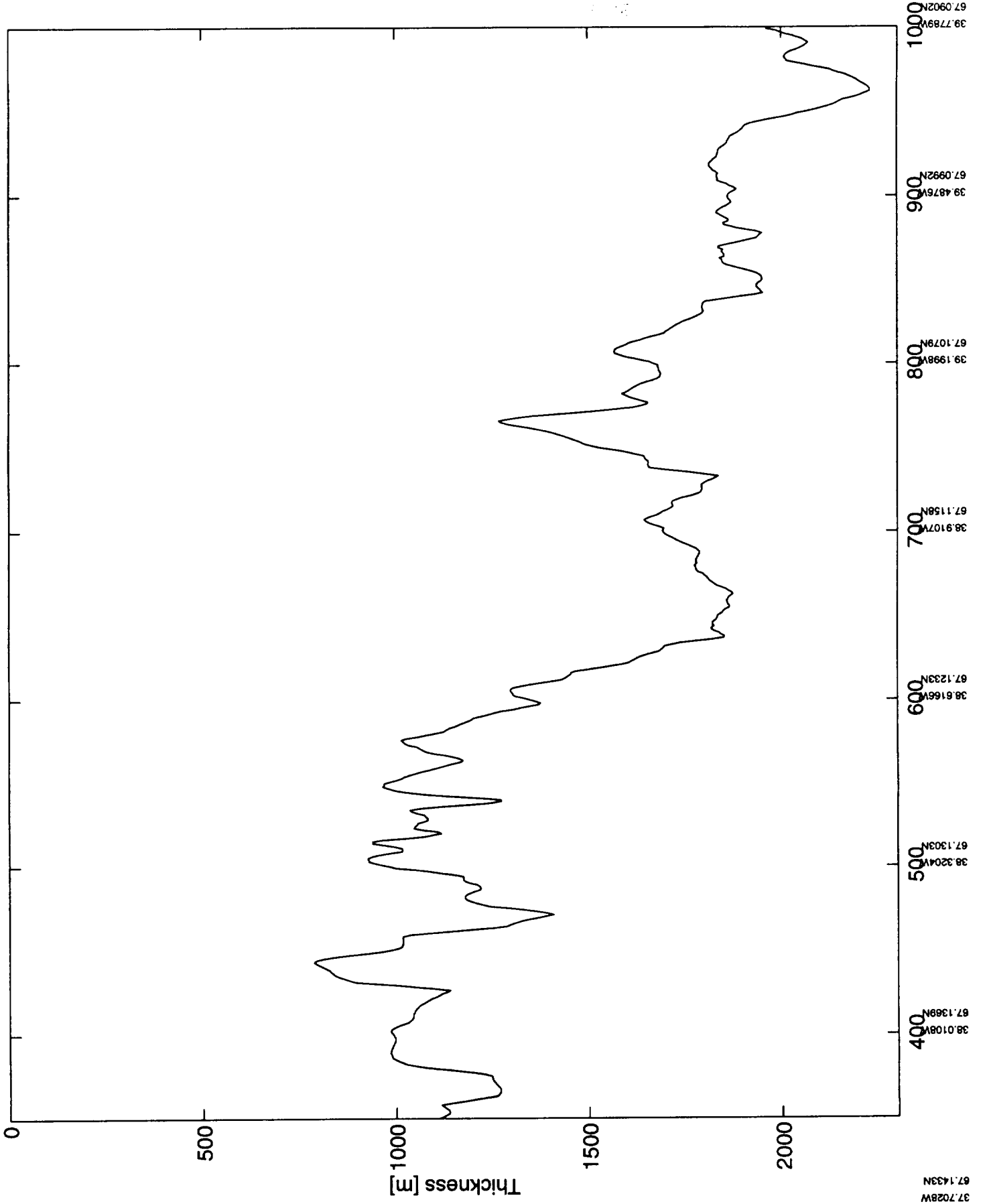


r_4x_6.1 <5> [4000-5000]

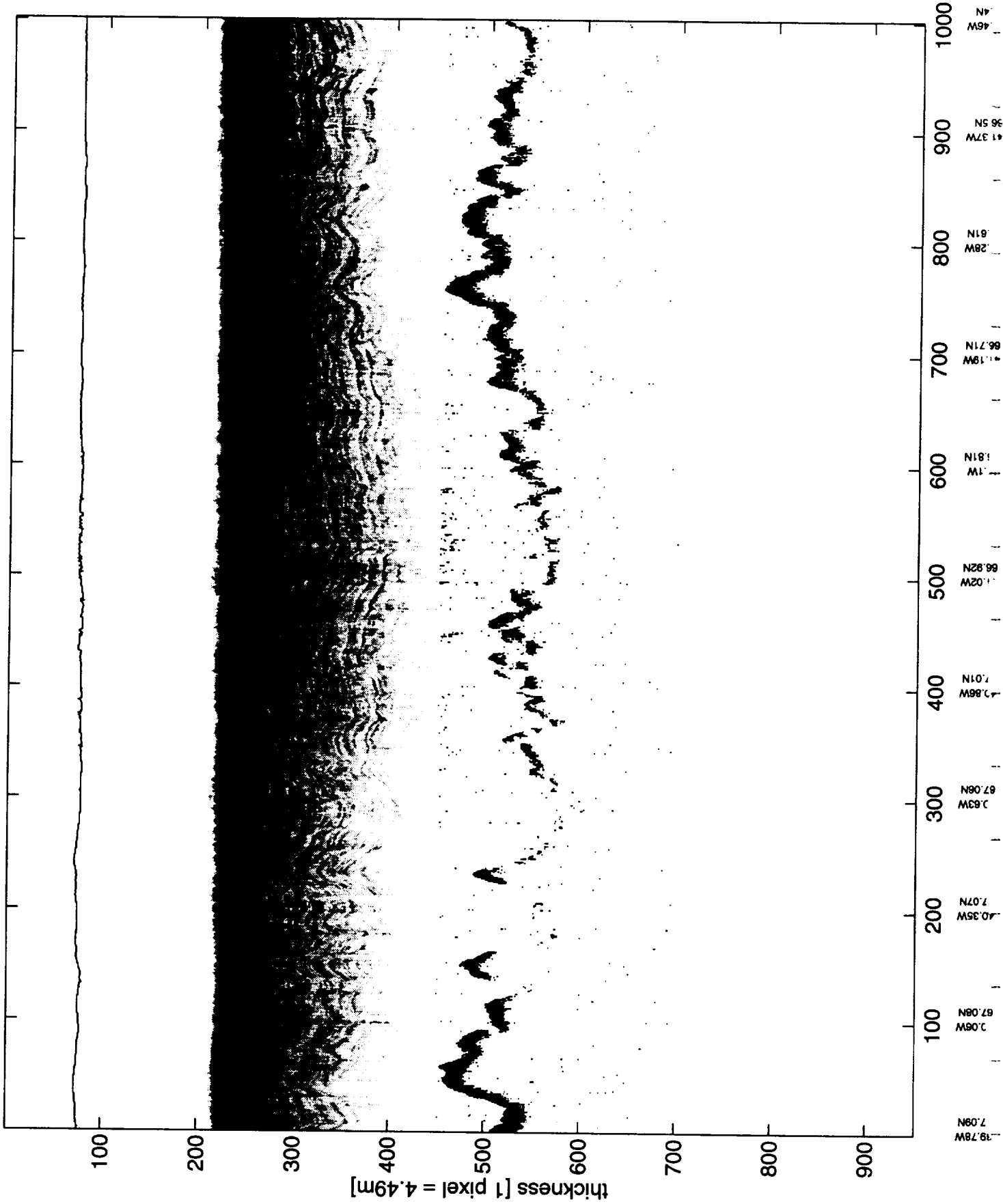


0.678W
0.15N
0.07W
0.15N
0.2739W
0.15N
0.7W
0.14N
0.714N
0.01W
0.14N
0.32W
0.713N
0.62W
0.12N
0.91W
0.912N
0.2W
0.11N
0.948W
0.71N
0.78W
0.9N

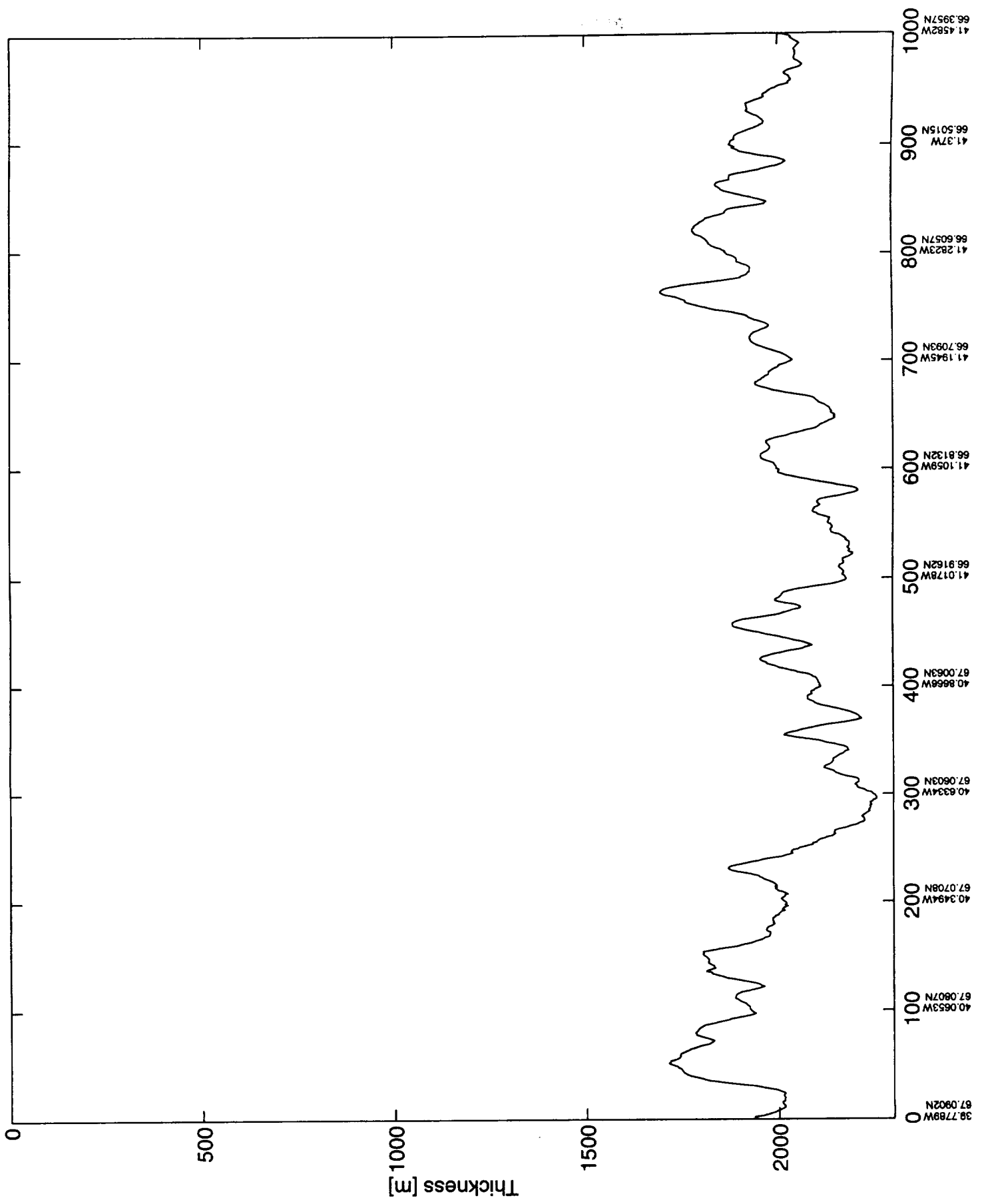
r_4x_6.1 (5) [4350-5000] thickness



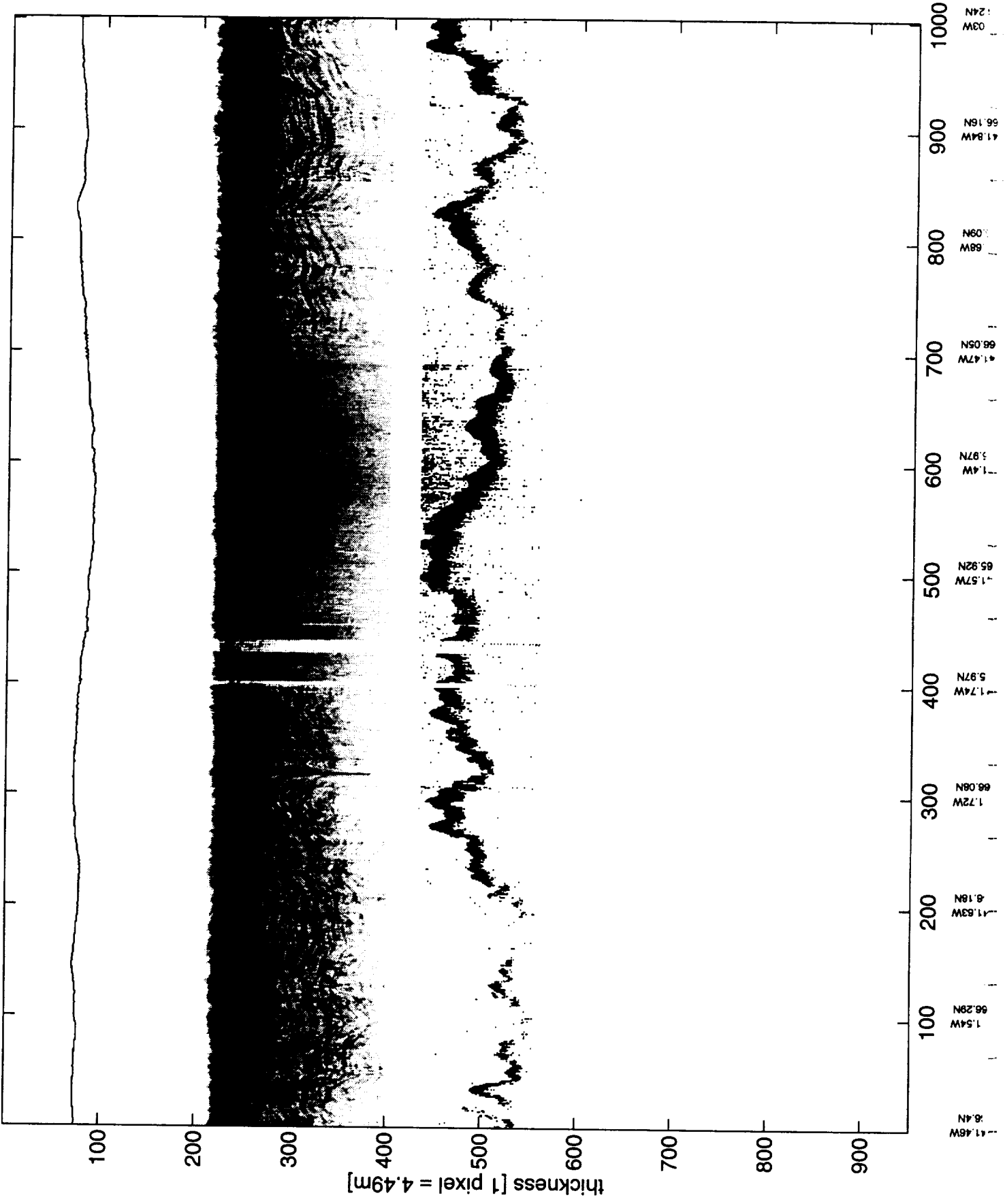
r_4x_6.1 <6> [5000-6000]



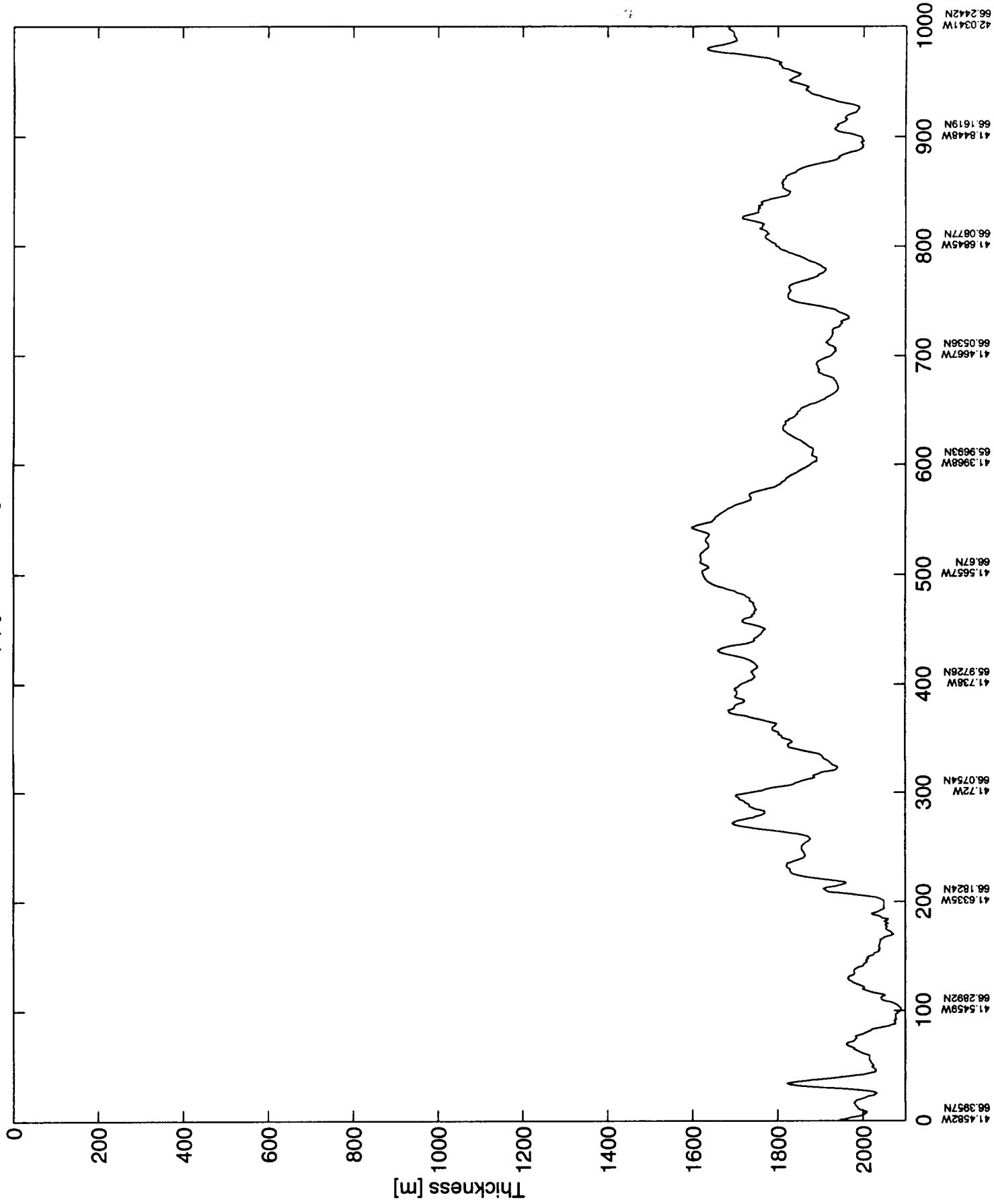
r_4x_6.1 (6) [5000-6000] thickness



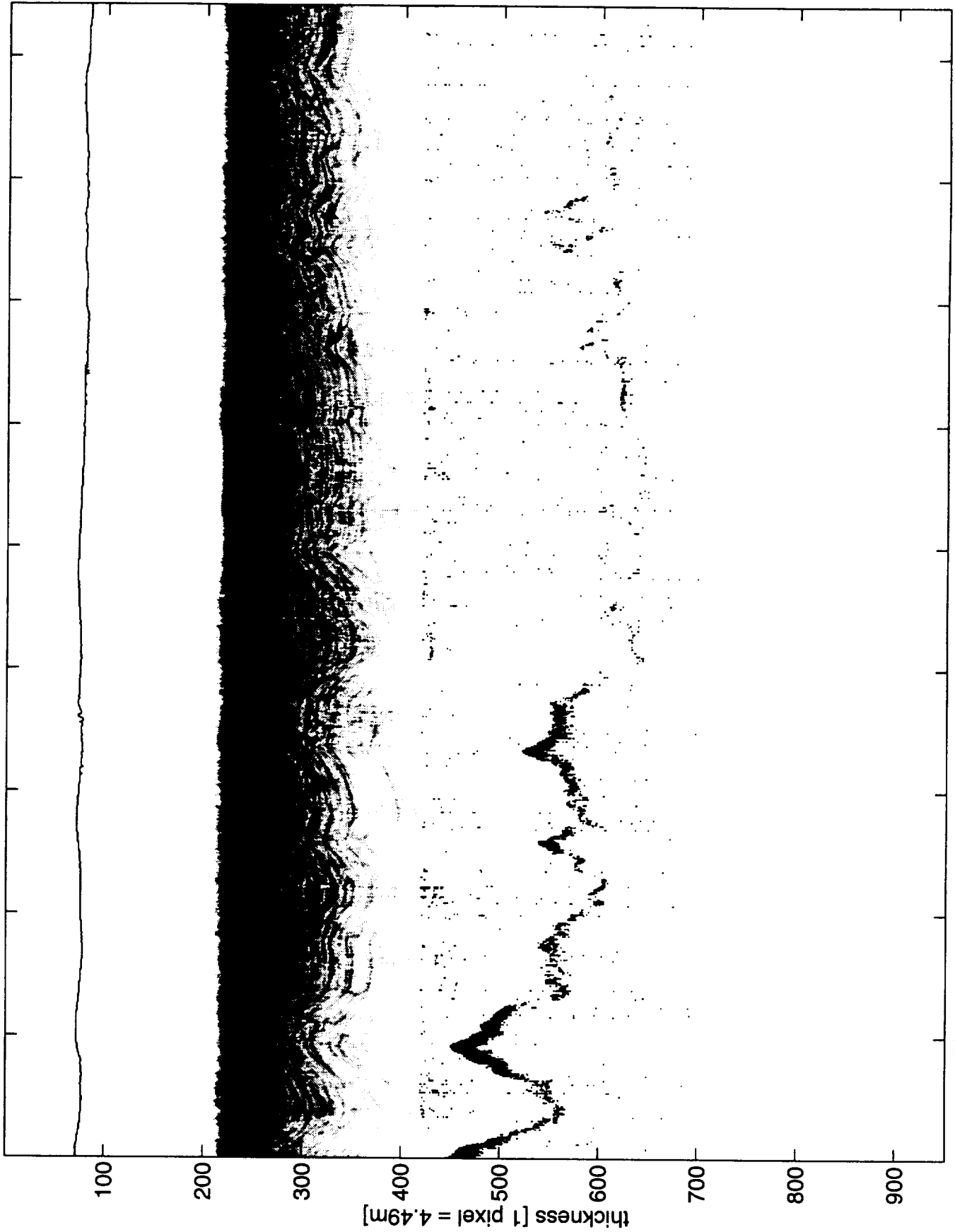
r_4x_6.1 <7> [6000-7000]



r_4x_6.1 (7) [6000-7000] thickness

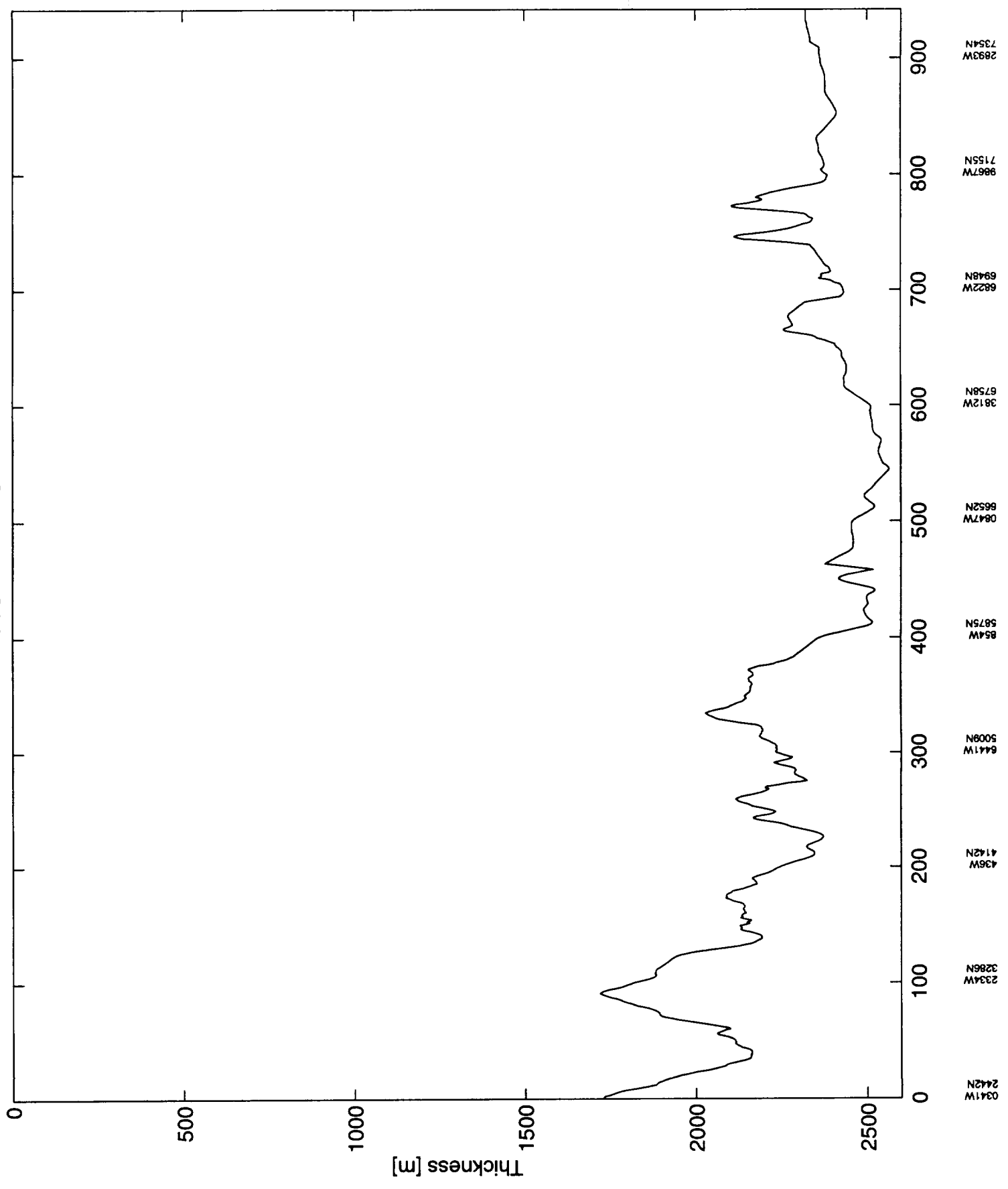


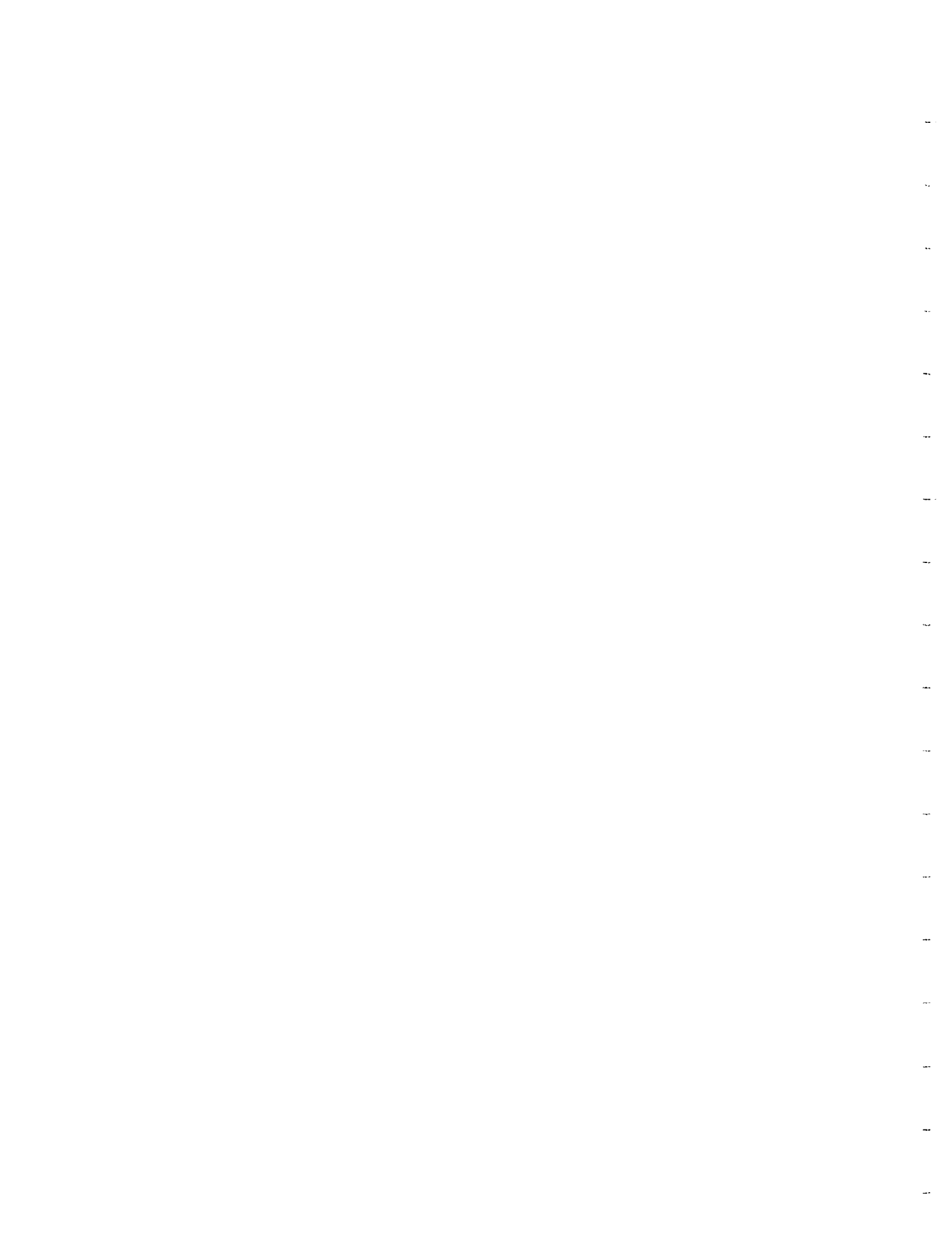
r_4x_6.1 <8> [7000-7942]



6.24N
4.23W
66.33N
2.43W
6.41N
42.64W
6.5N
2.85W
66.58N
4.08W
6.66N
3.68W
3.68N
3.72N
43.98W
66.74N
1.29W

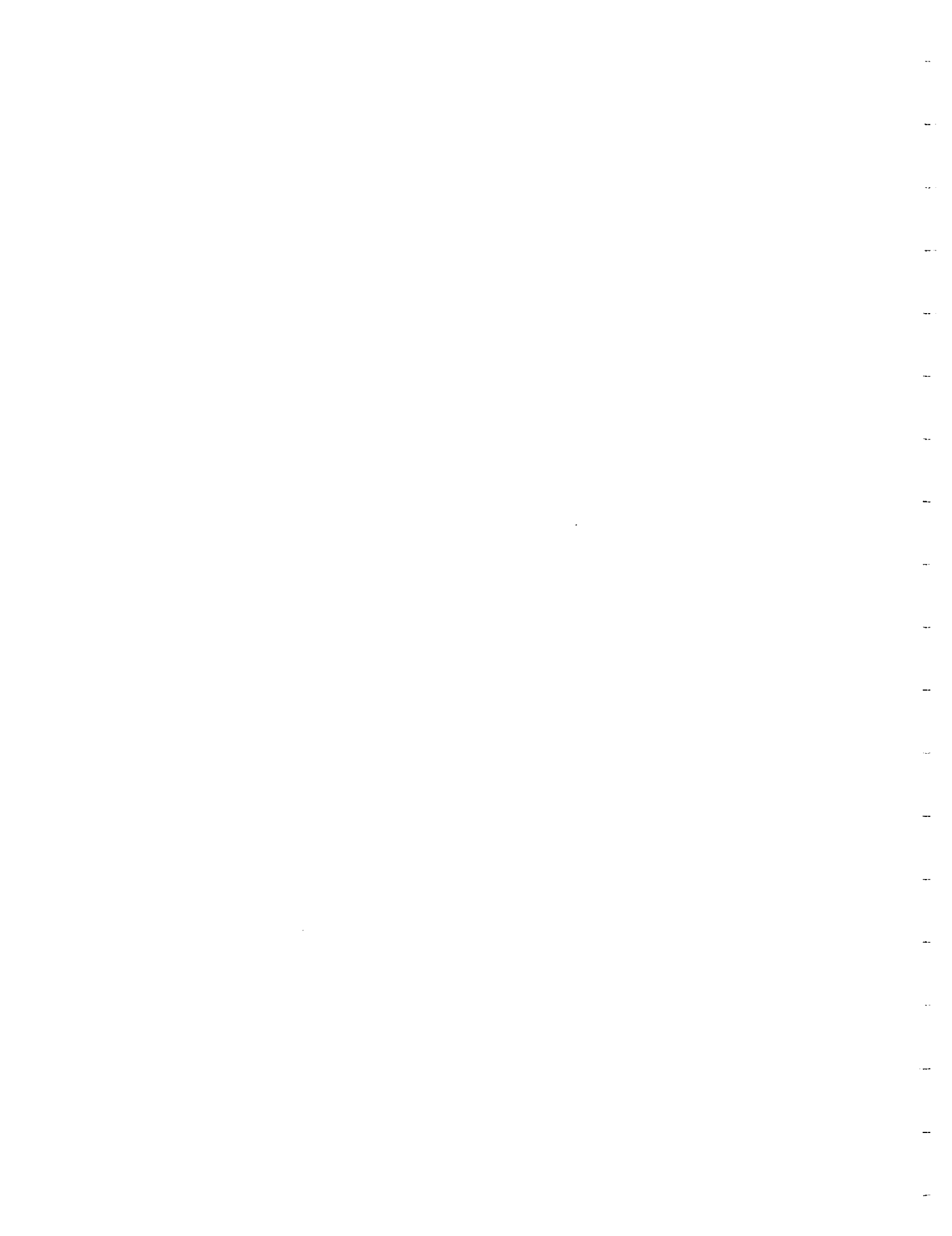
r_4x_6.1 (8) [7000-7942] thickness

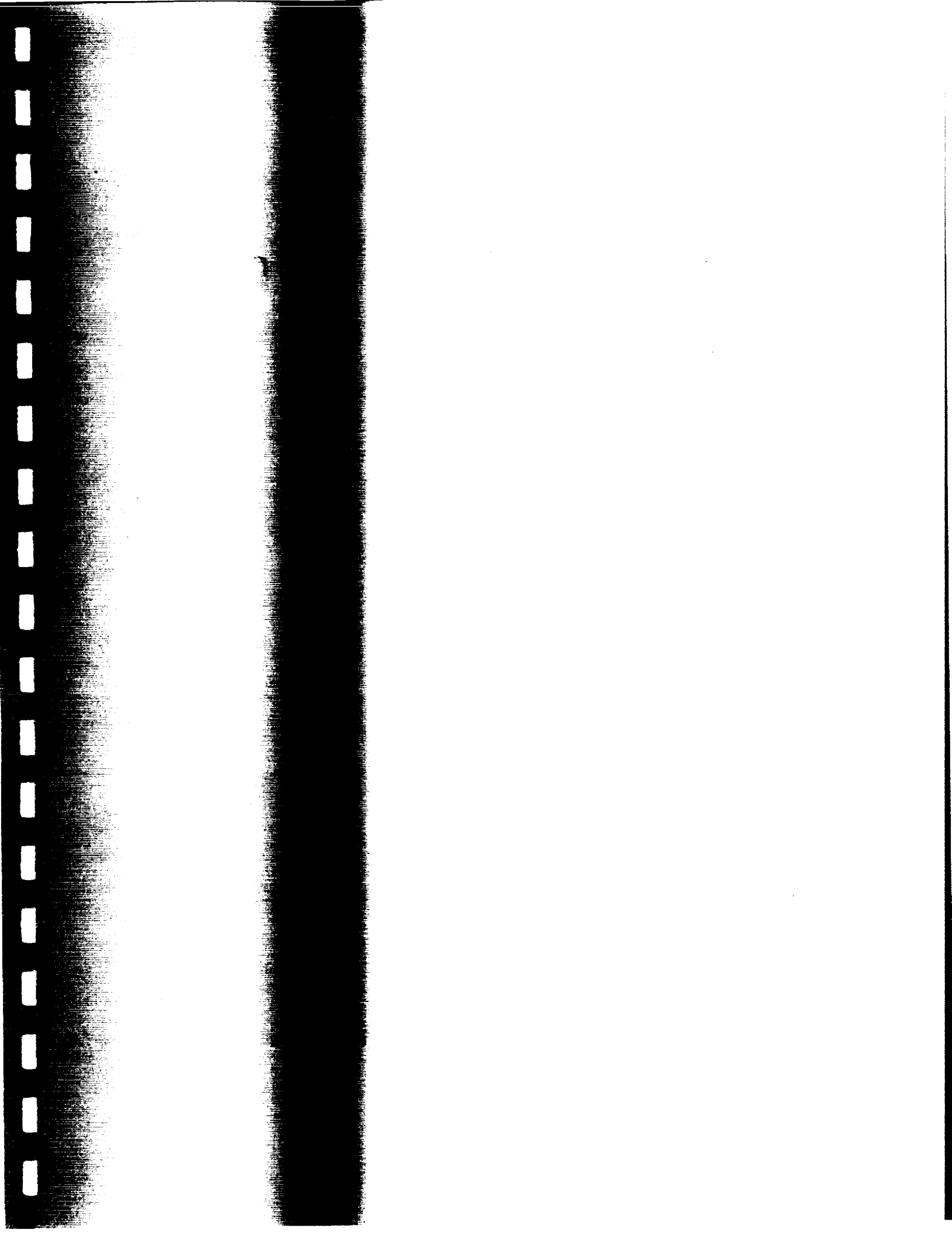


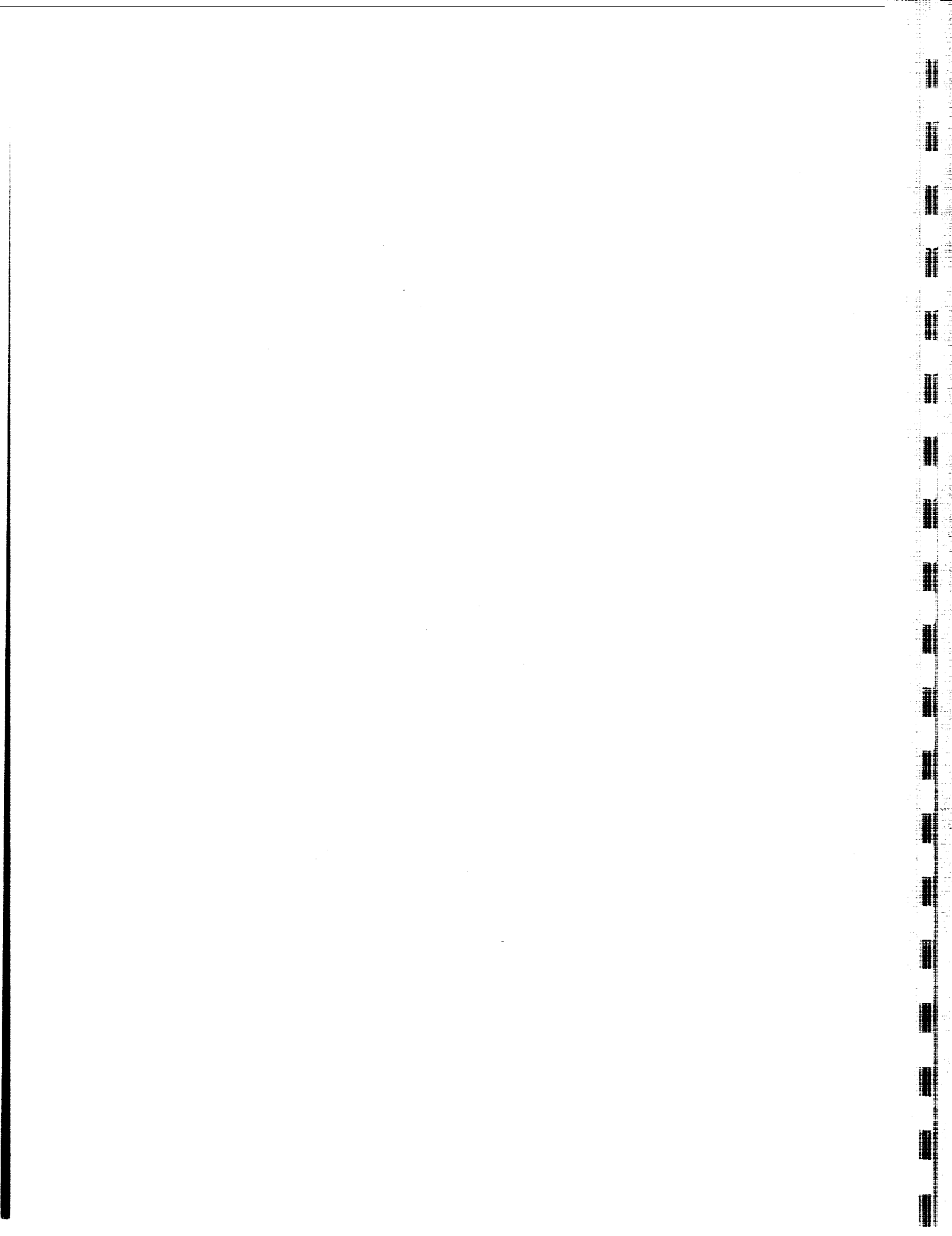


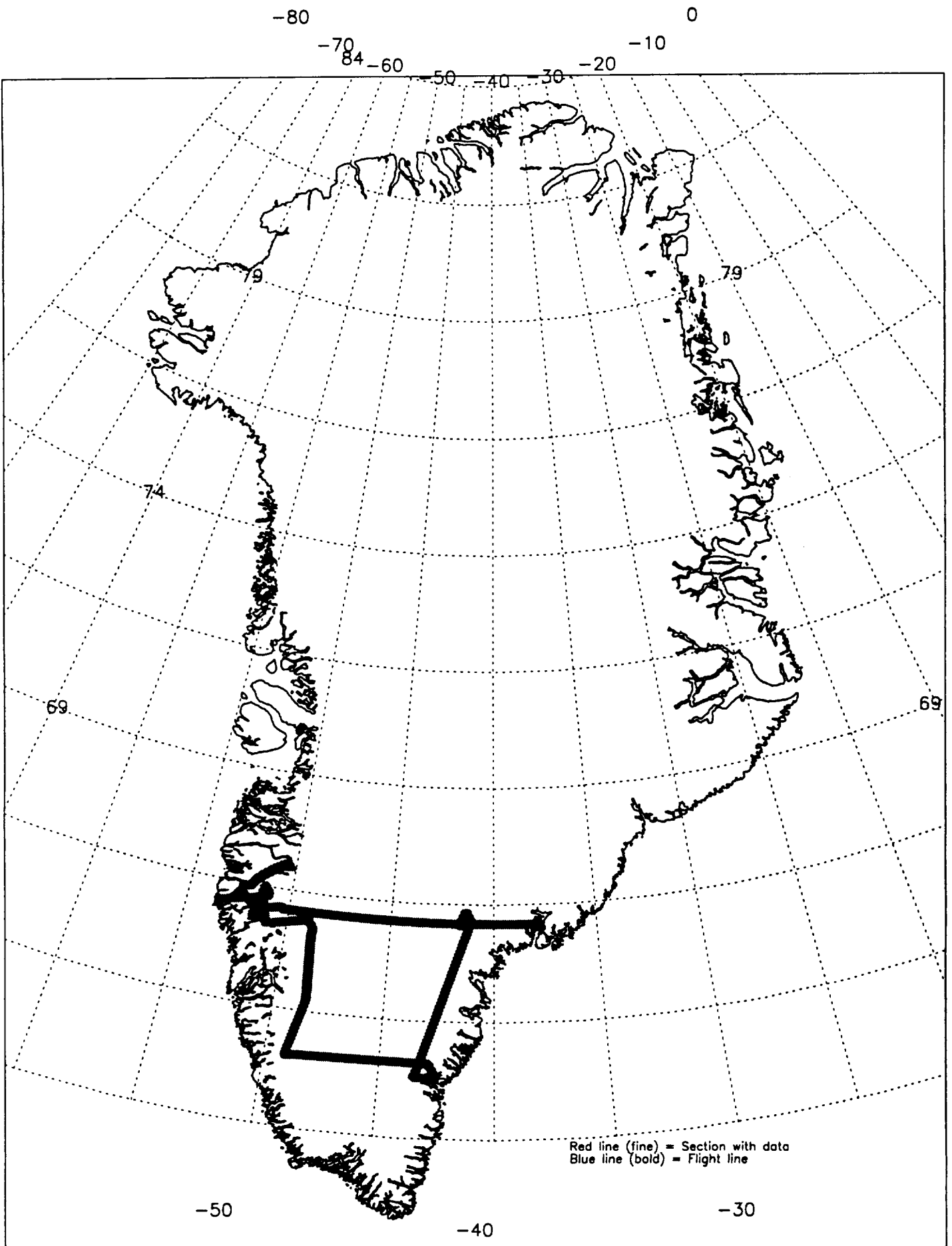
Appendix H

July 7, 1993

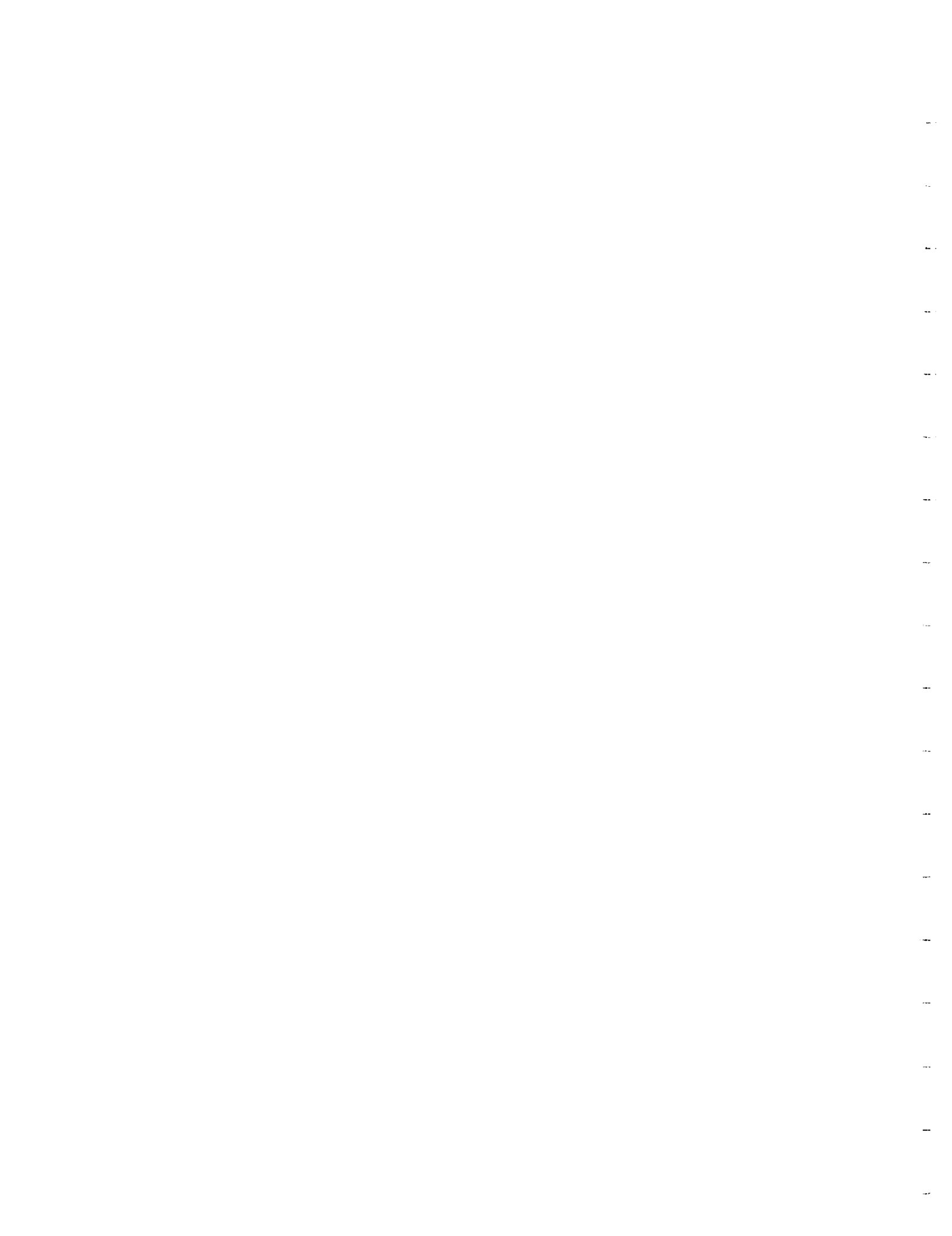




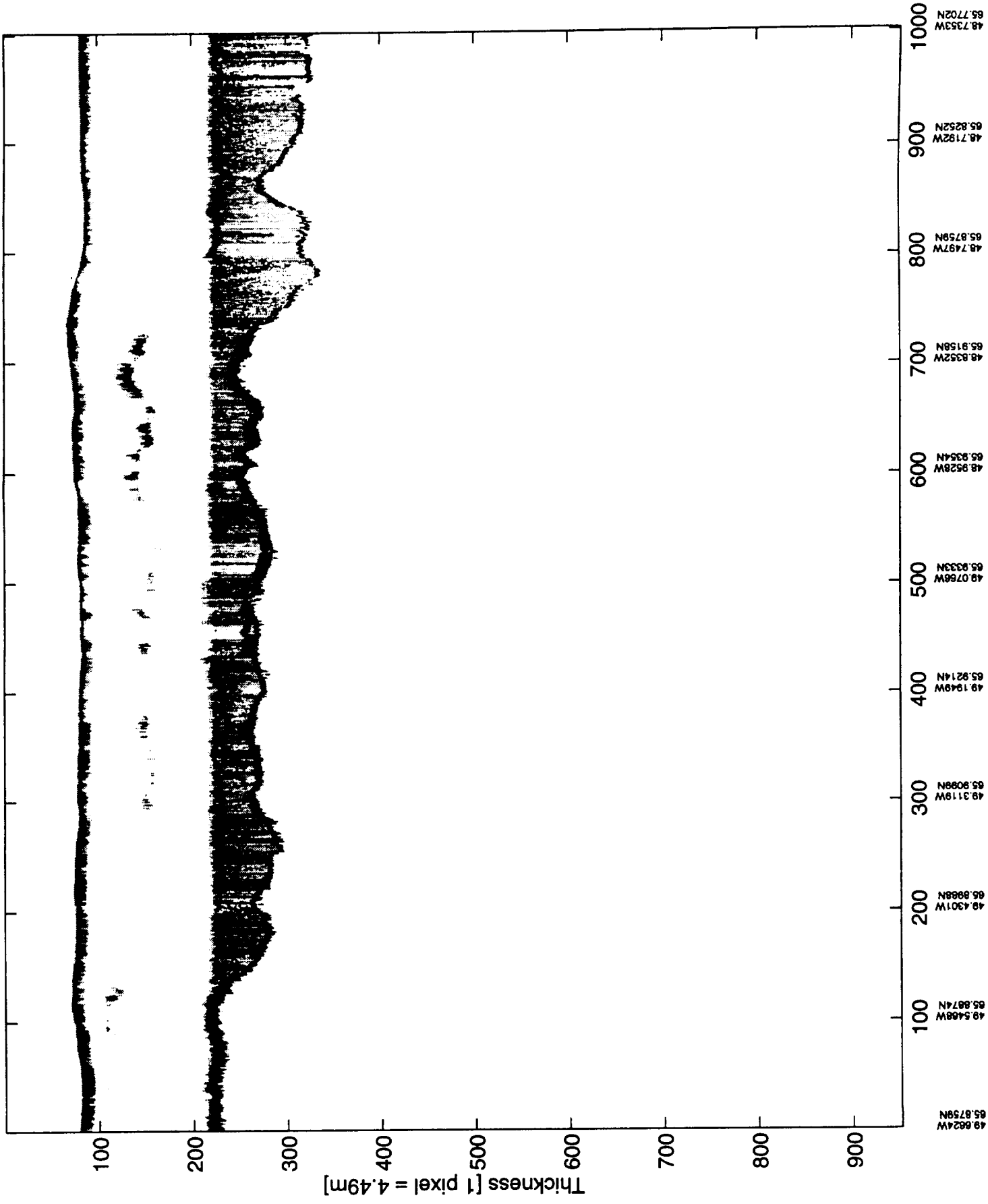




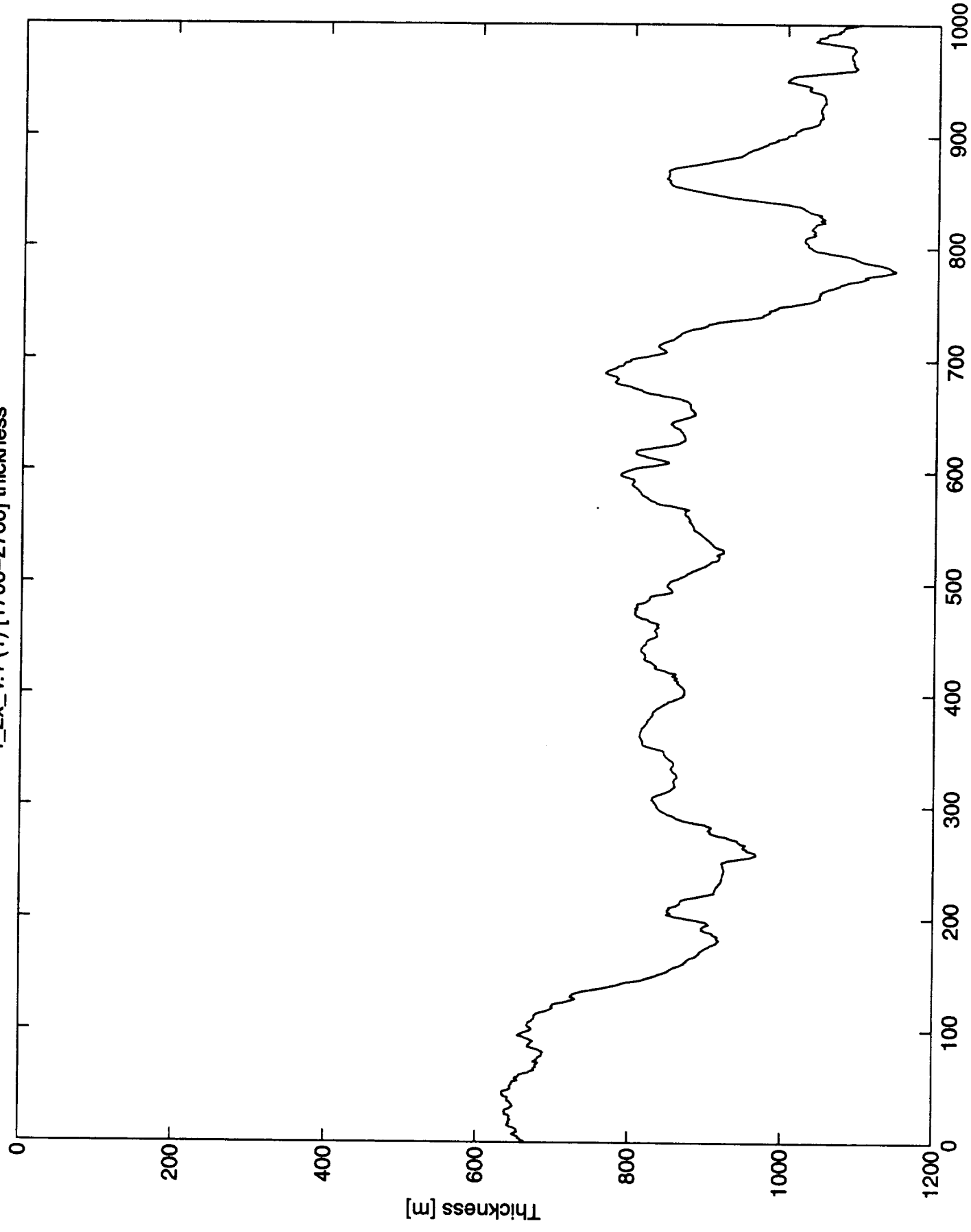
July 7, 1993 (r_2x)



r_2x_4.1 (1) [1700 2700]

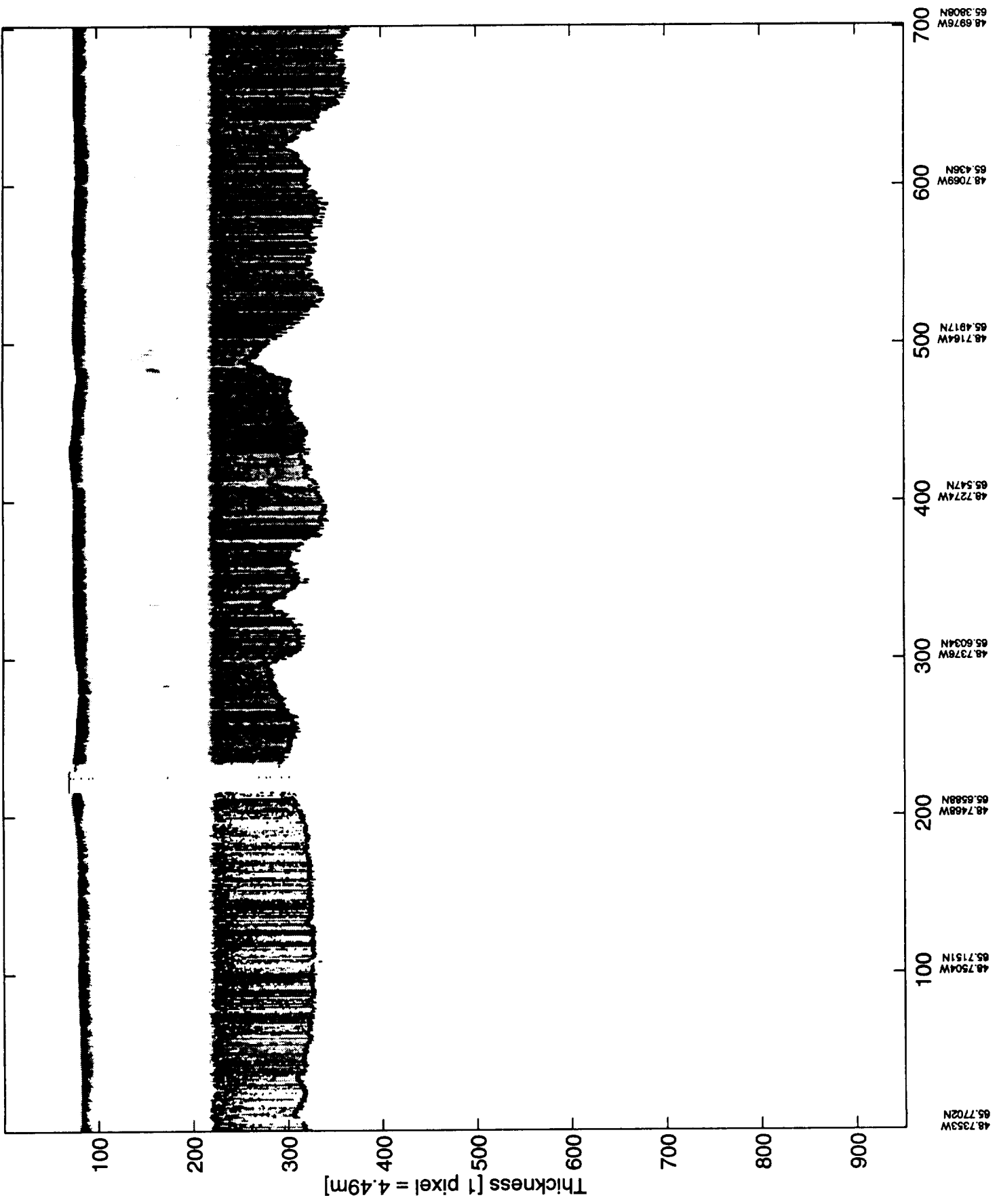


r_2x_4.1 (1) [1700-2700] thickness

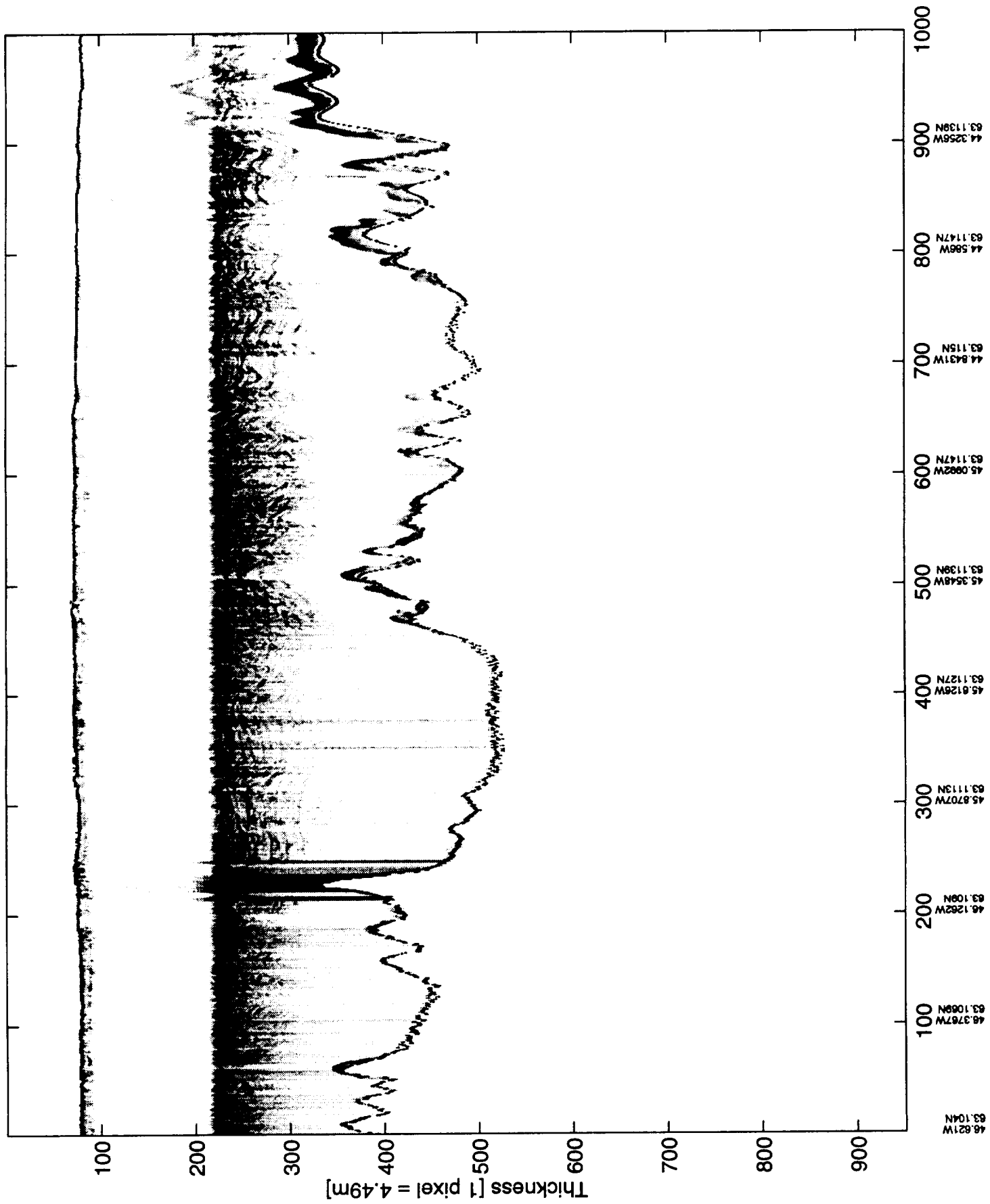


8.49
7.44
4.87
8.74
3.44
1.11
0.98
2.1
7.64
3.33
3.5
3.52
1.58
4.5
7.5
1.92
2.52
3.5

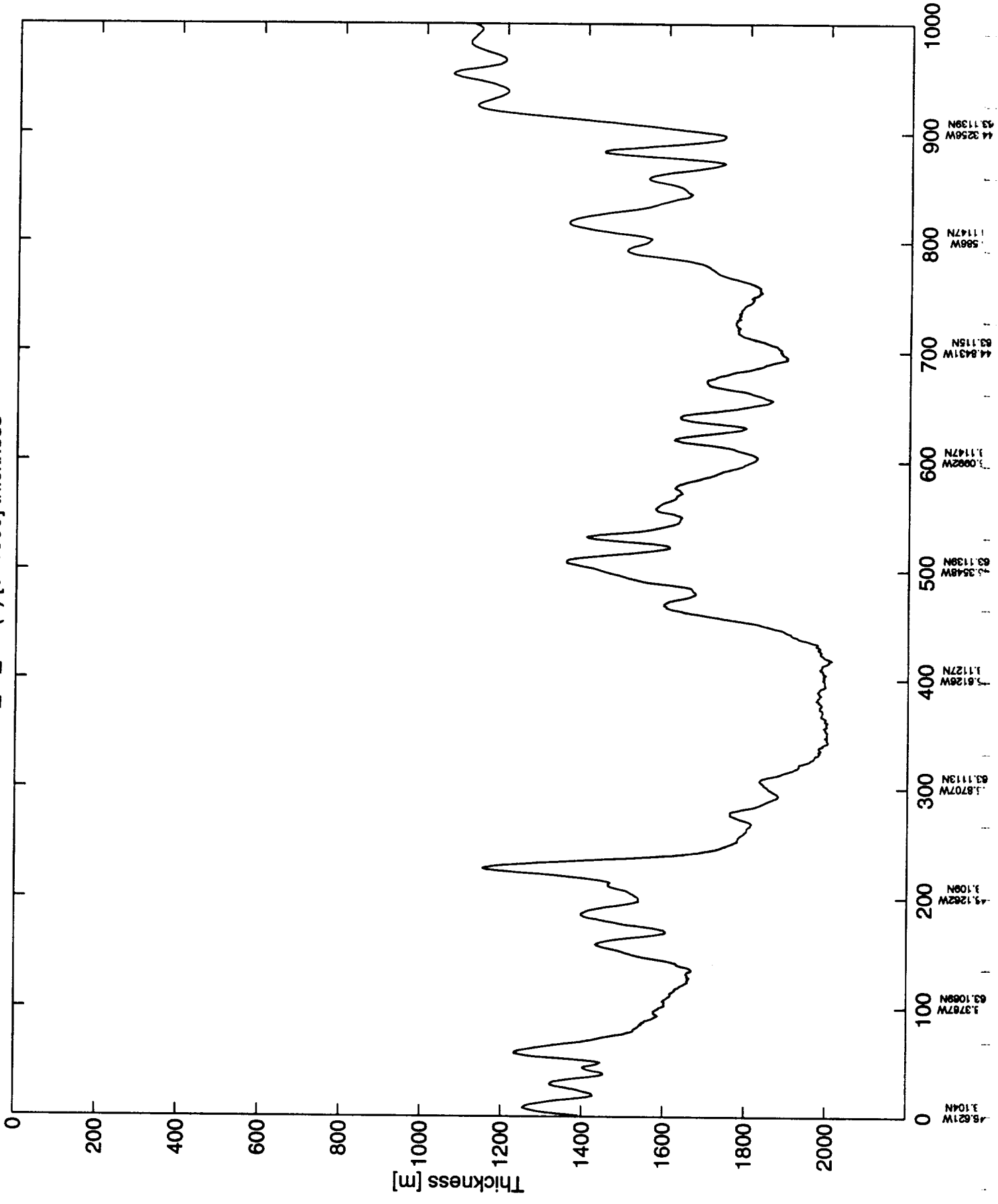
r_2x_4.1 (2) [2700 3400]



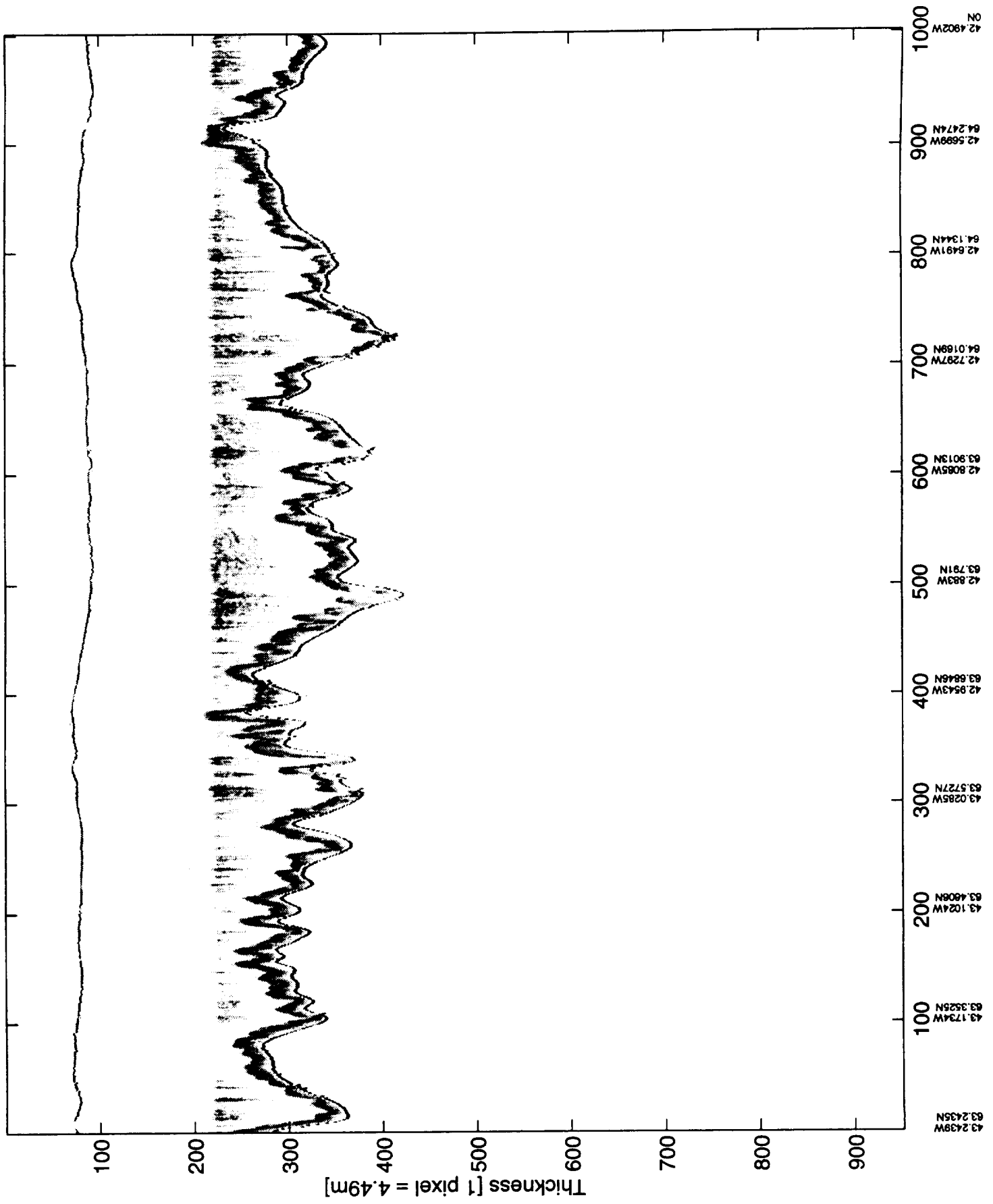
r_2x_6.1 (1) [0-1000]



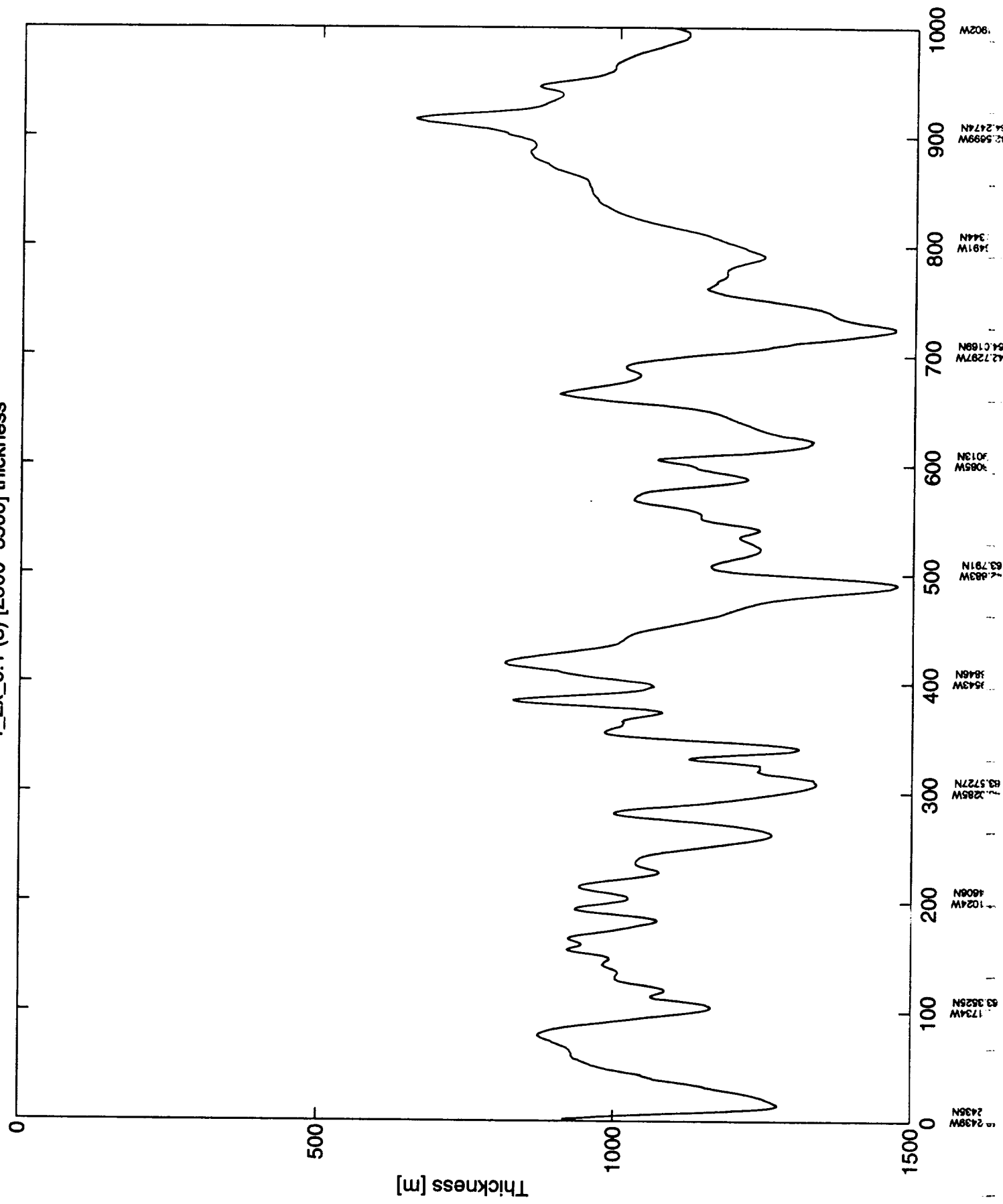
r_2x_6.1 (1) [0-1000] thickness



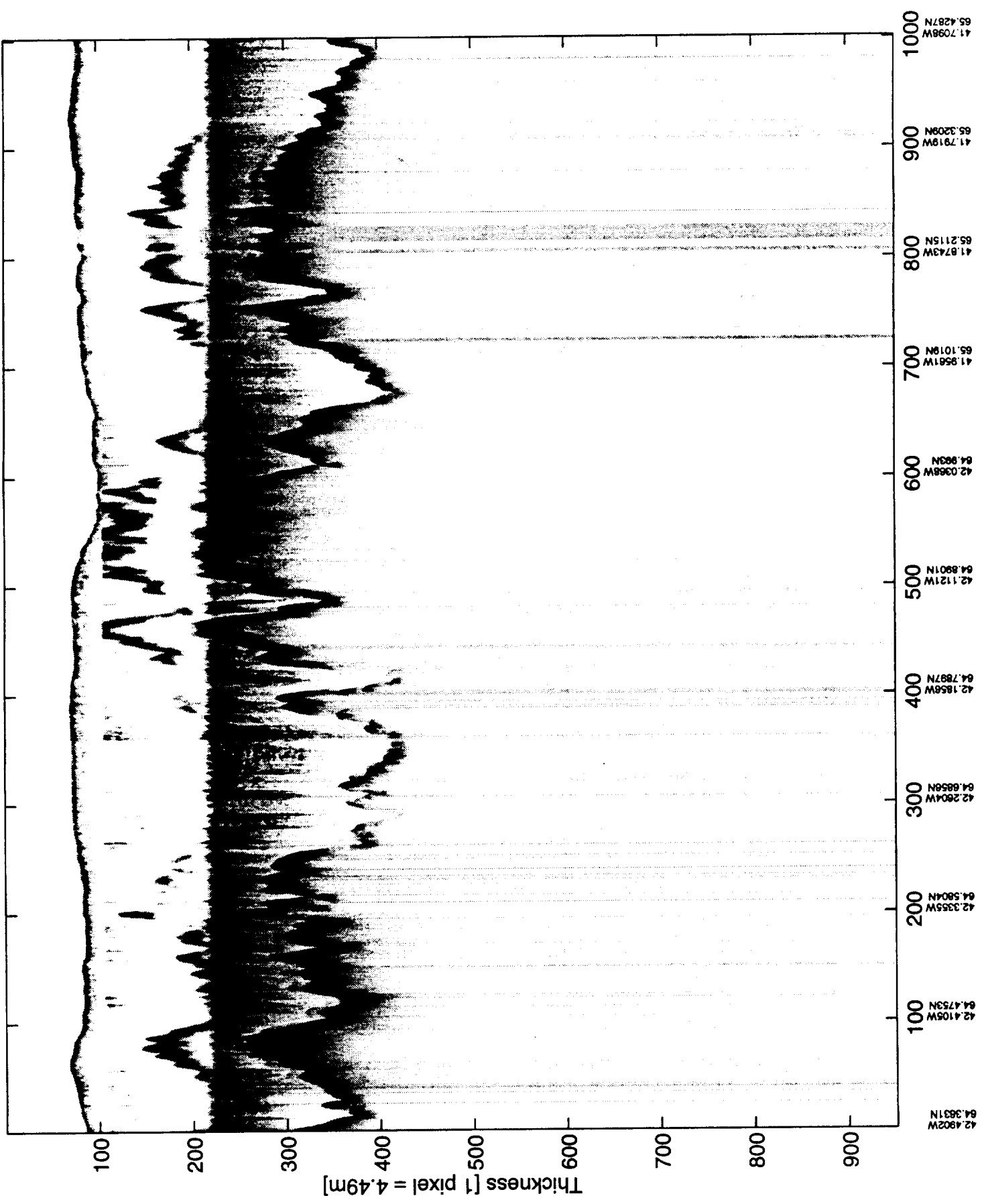
r_2x_6.1 (3) [2500 3500]



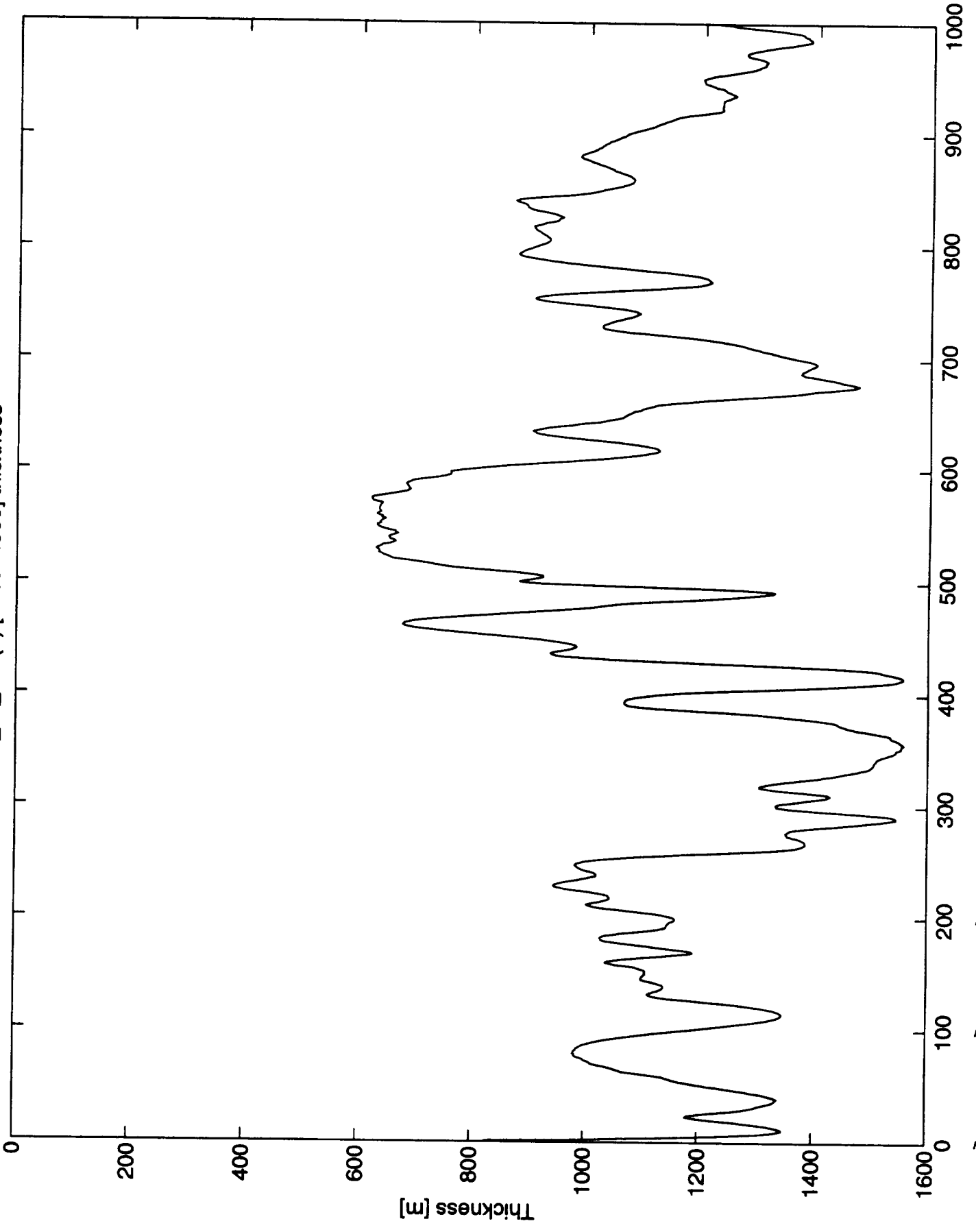
r_2x_6.1 (3) [2500-3500] thickness



r_2x_6.1 (4) [3500 4500]

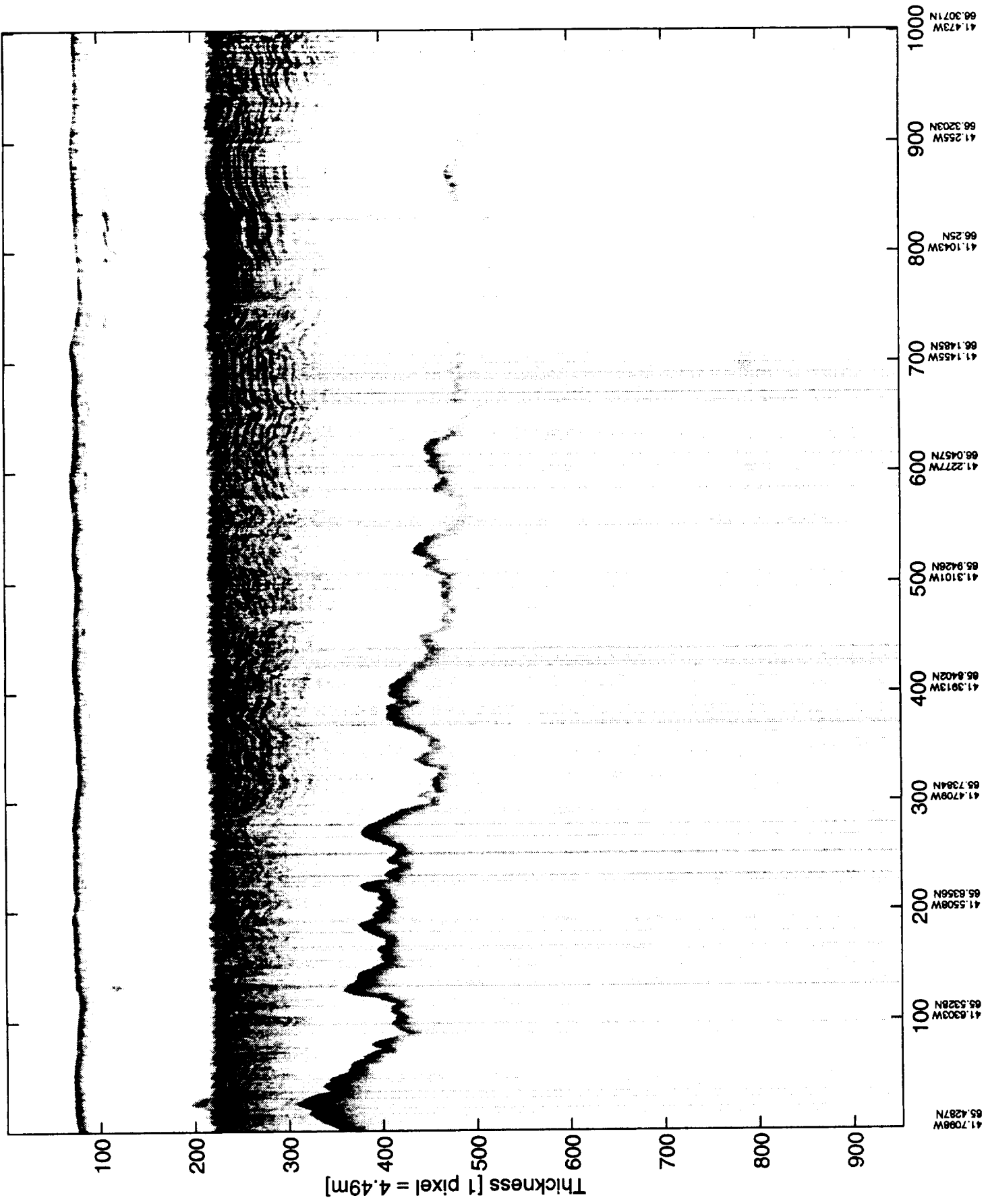


r_2x_6.1 (4) [3500-4500] thickness

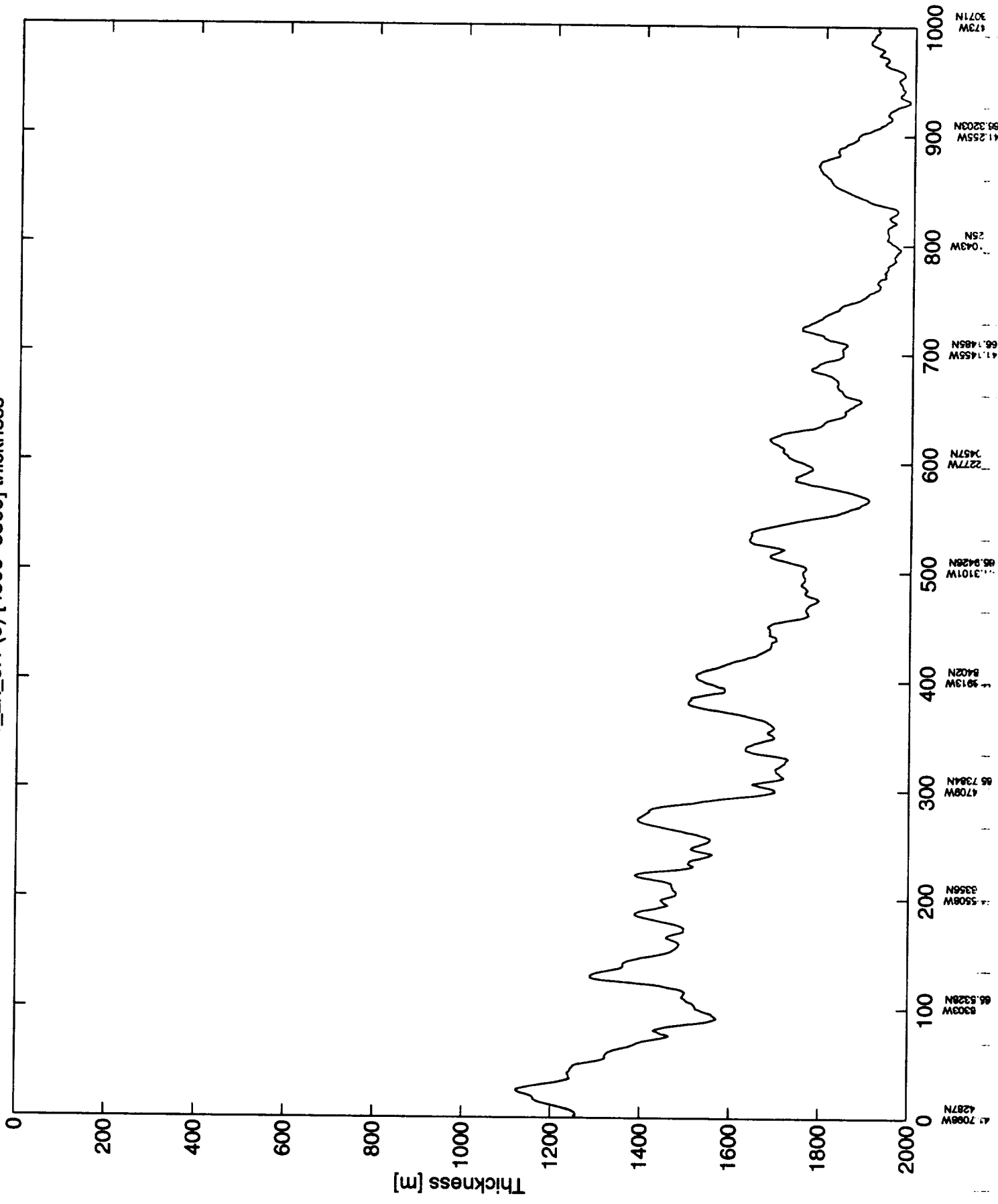


42 02W 04 11N
42 05W 04 4753N
42 08W 04 44N
42 10W 04 0856N
42 12W 04 07N
42 14W 04 0901N
42 16W 04 08N
41 581W 05 1319N
41 561W 05 1319N
41 541W 05 1319N
41 521W 05 1319N
41 501W 05 1319N

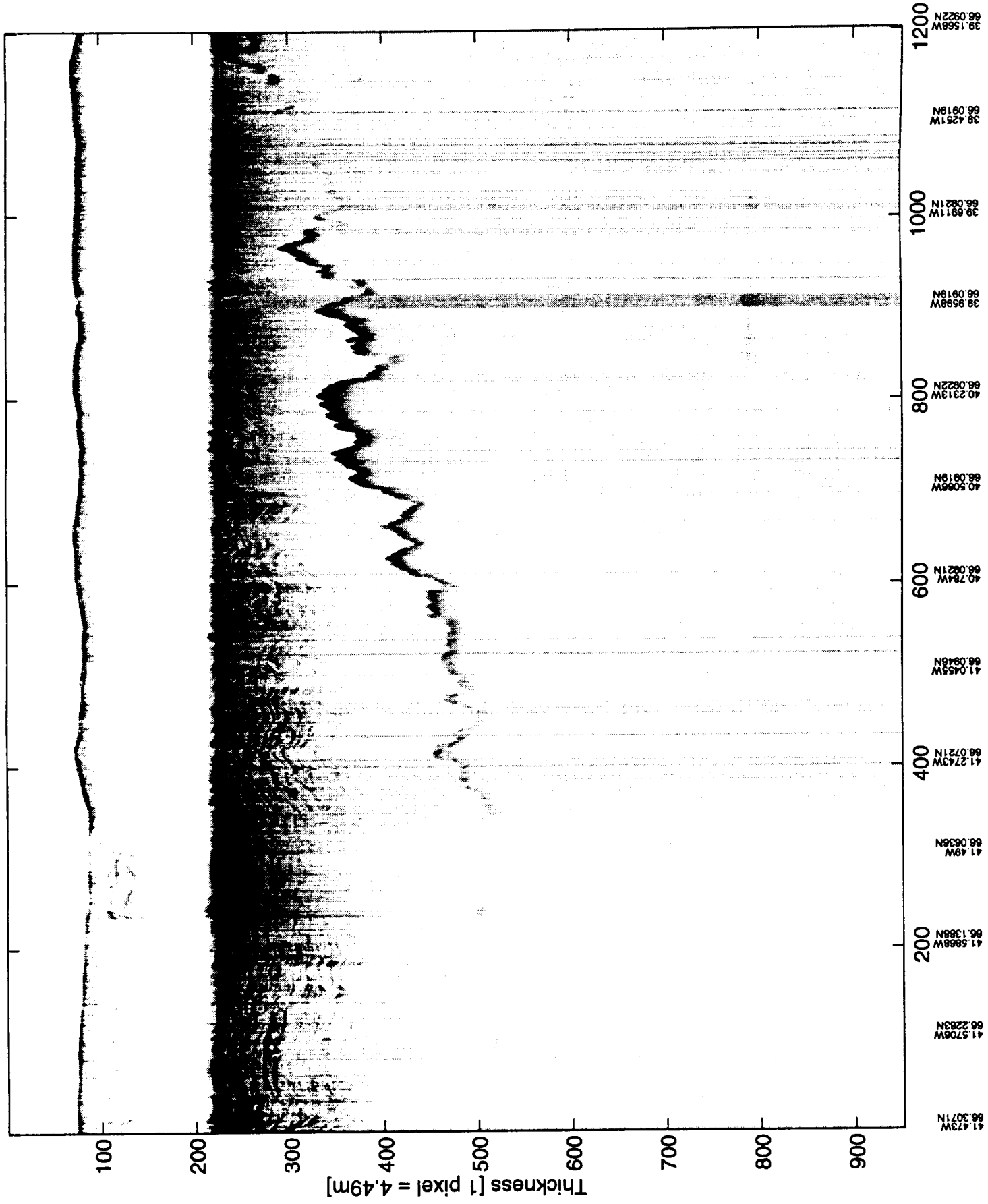
r_2x_6.1 (5) [4500 5500]



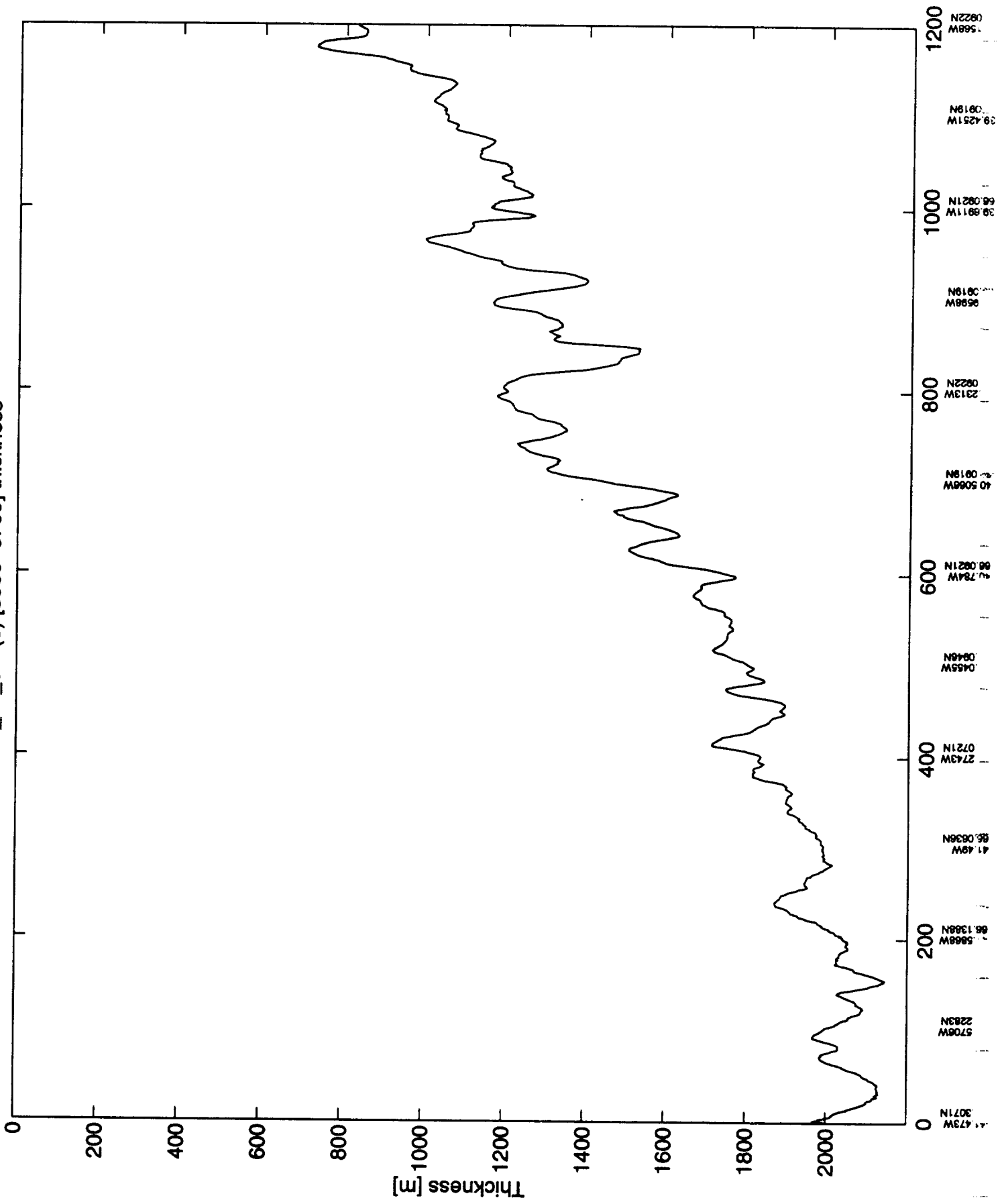
r_2x_6.1 (5) [4500-5500] thickness



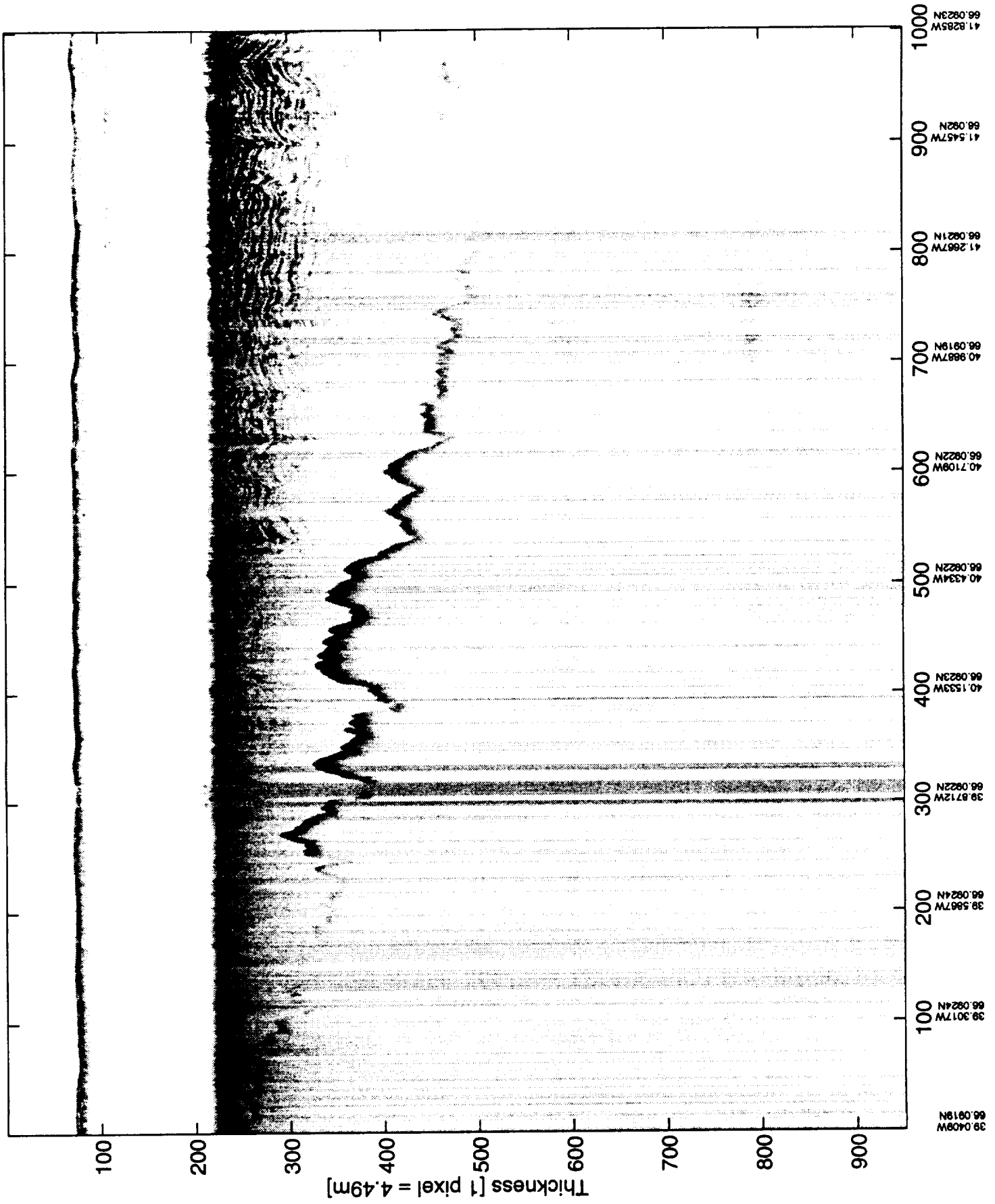
r_2x_6.1 (6) [5500 6700]



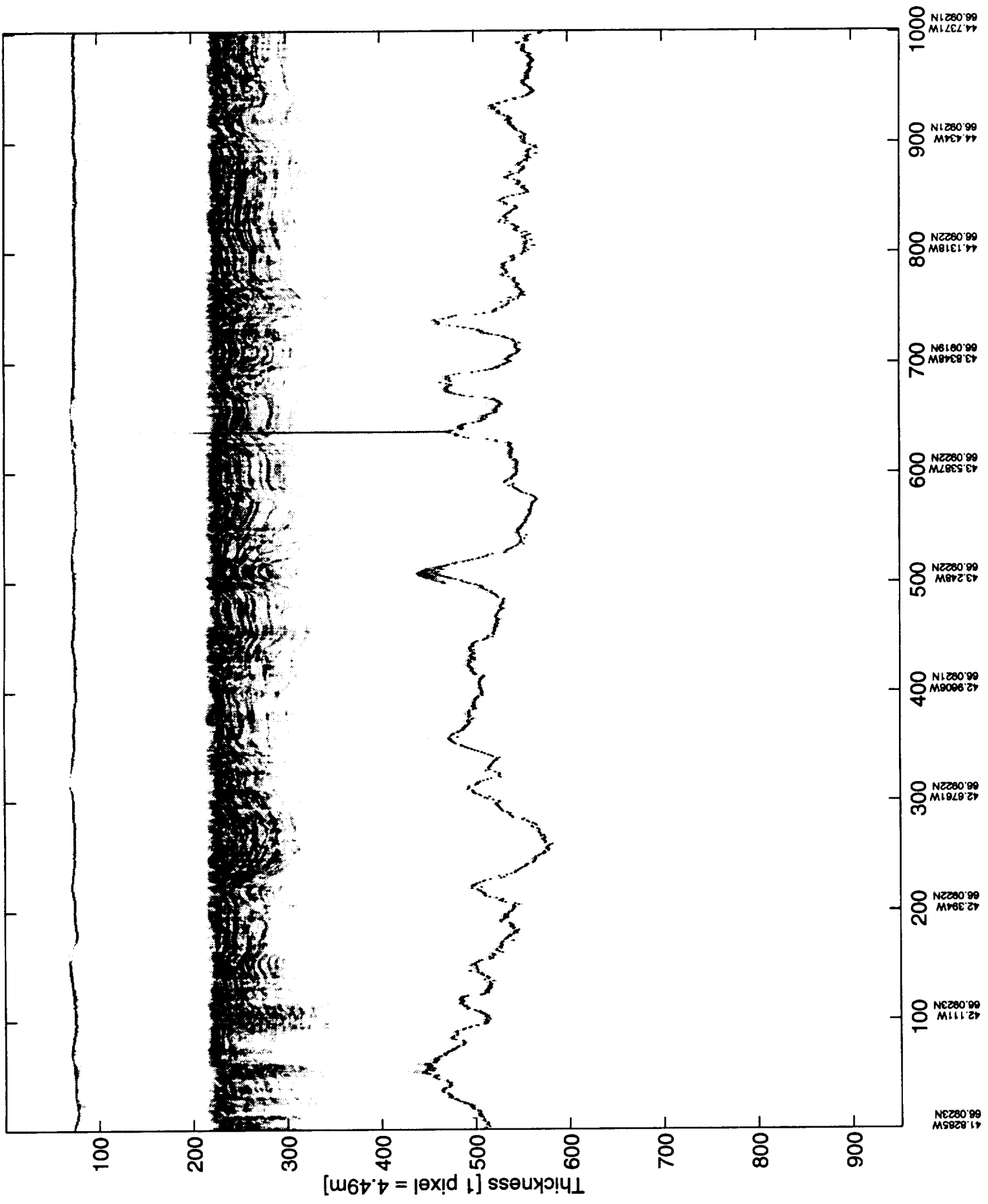
r_2x_6.1 (6) [5500-6700] thickness



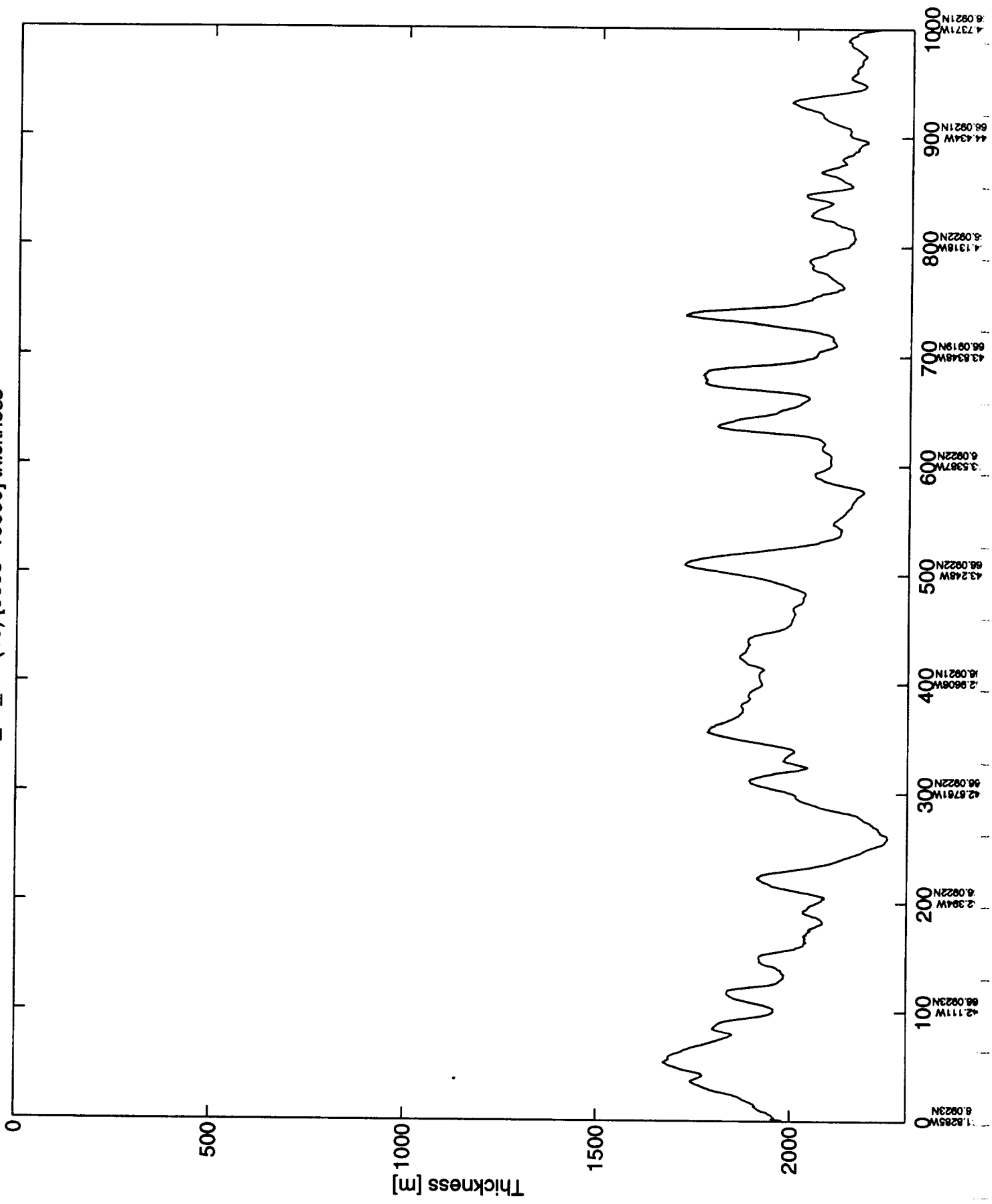
r_2x_6.1 (9) [8000 9000]



r_2x_6.1 (10) [9000 10000]

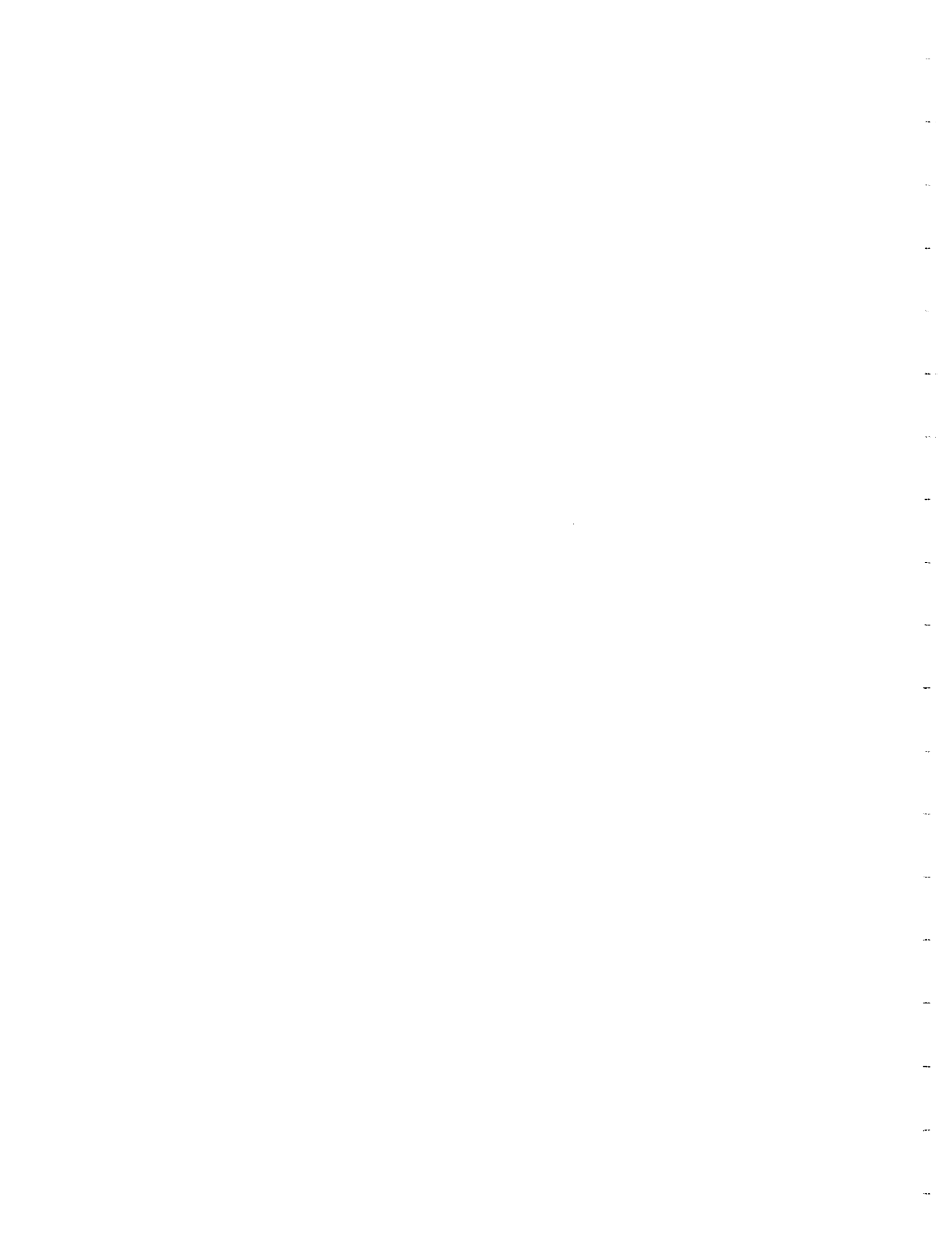


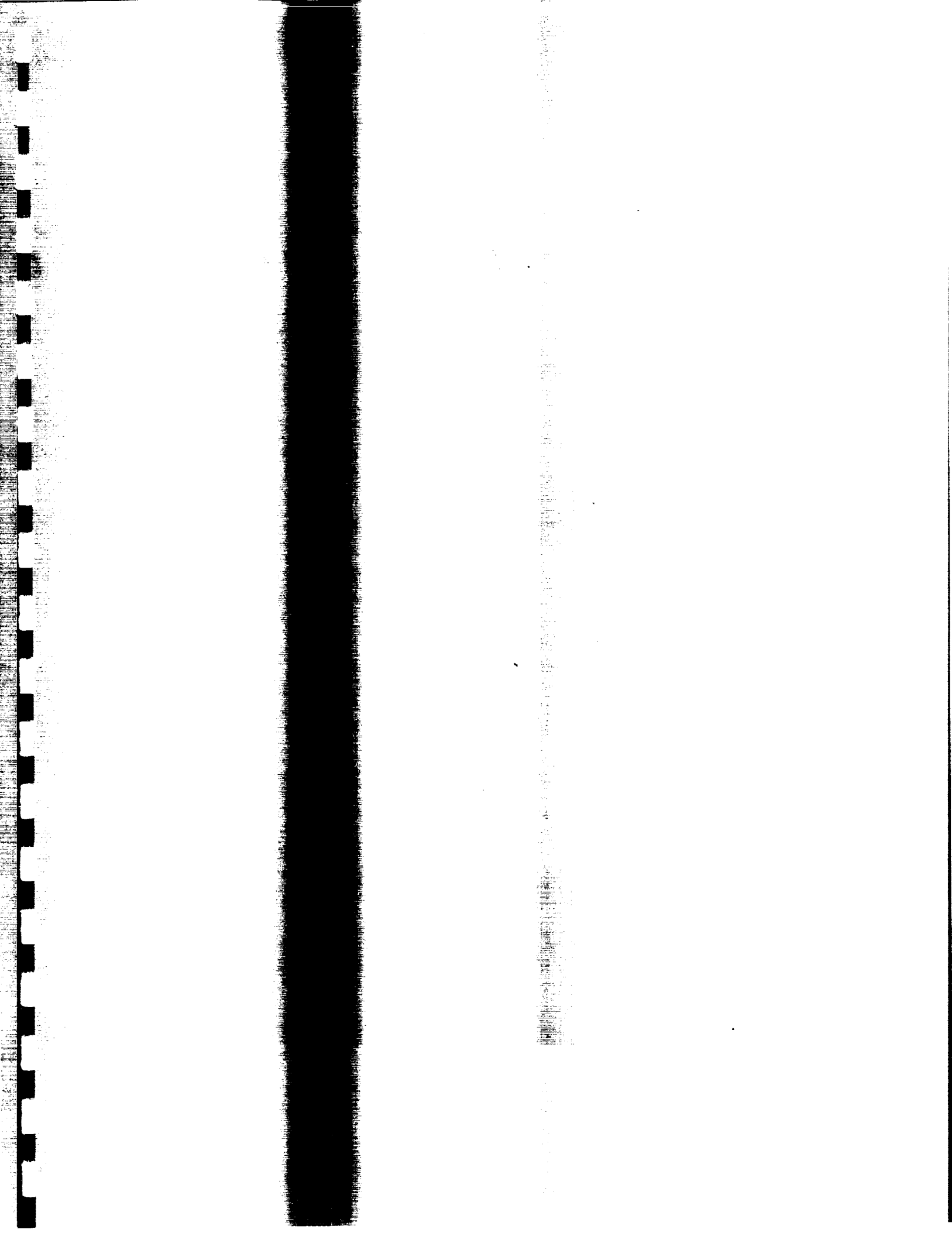
r_2x_6.1 (10) [9000-10000] thickness

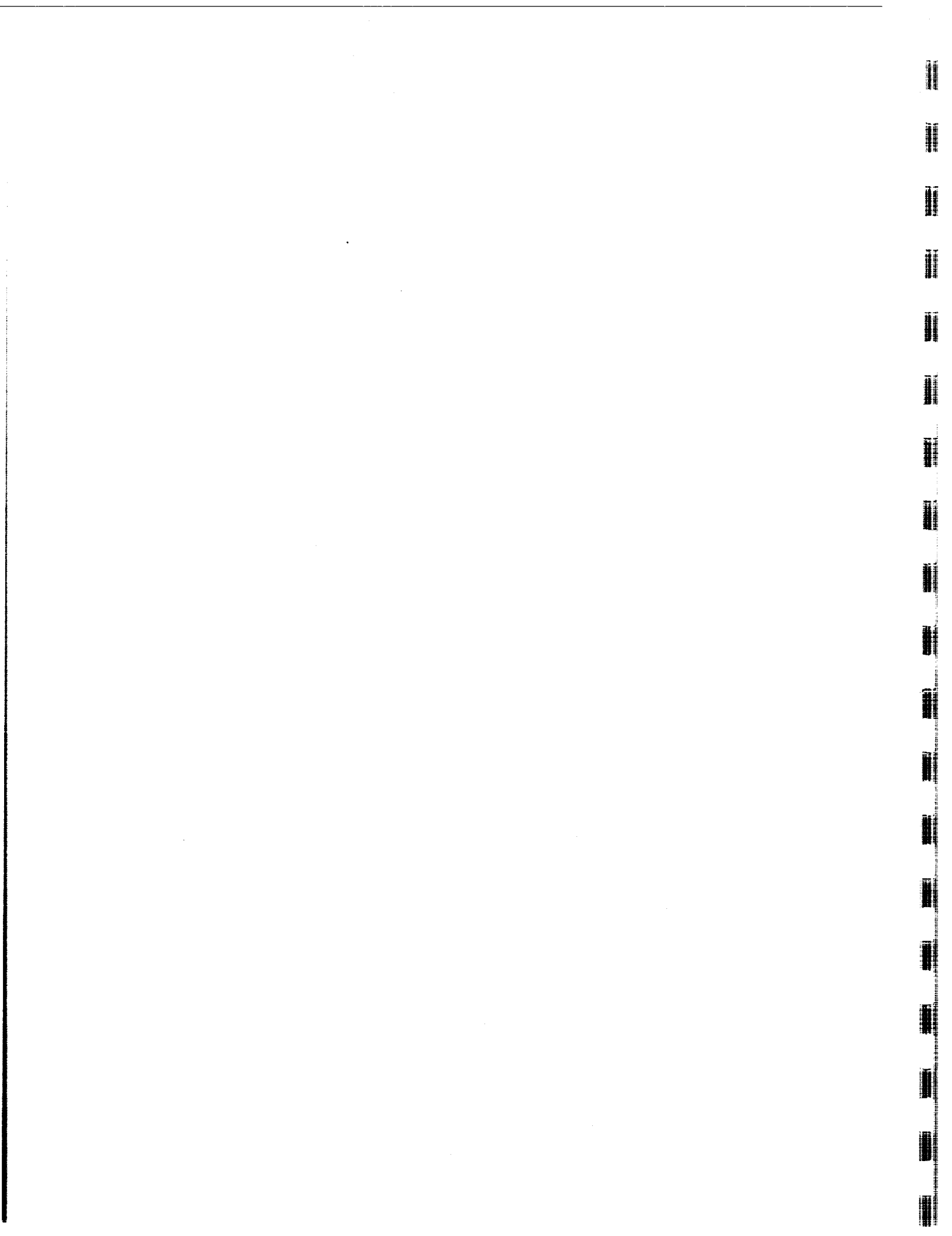


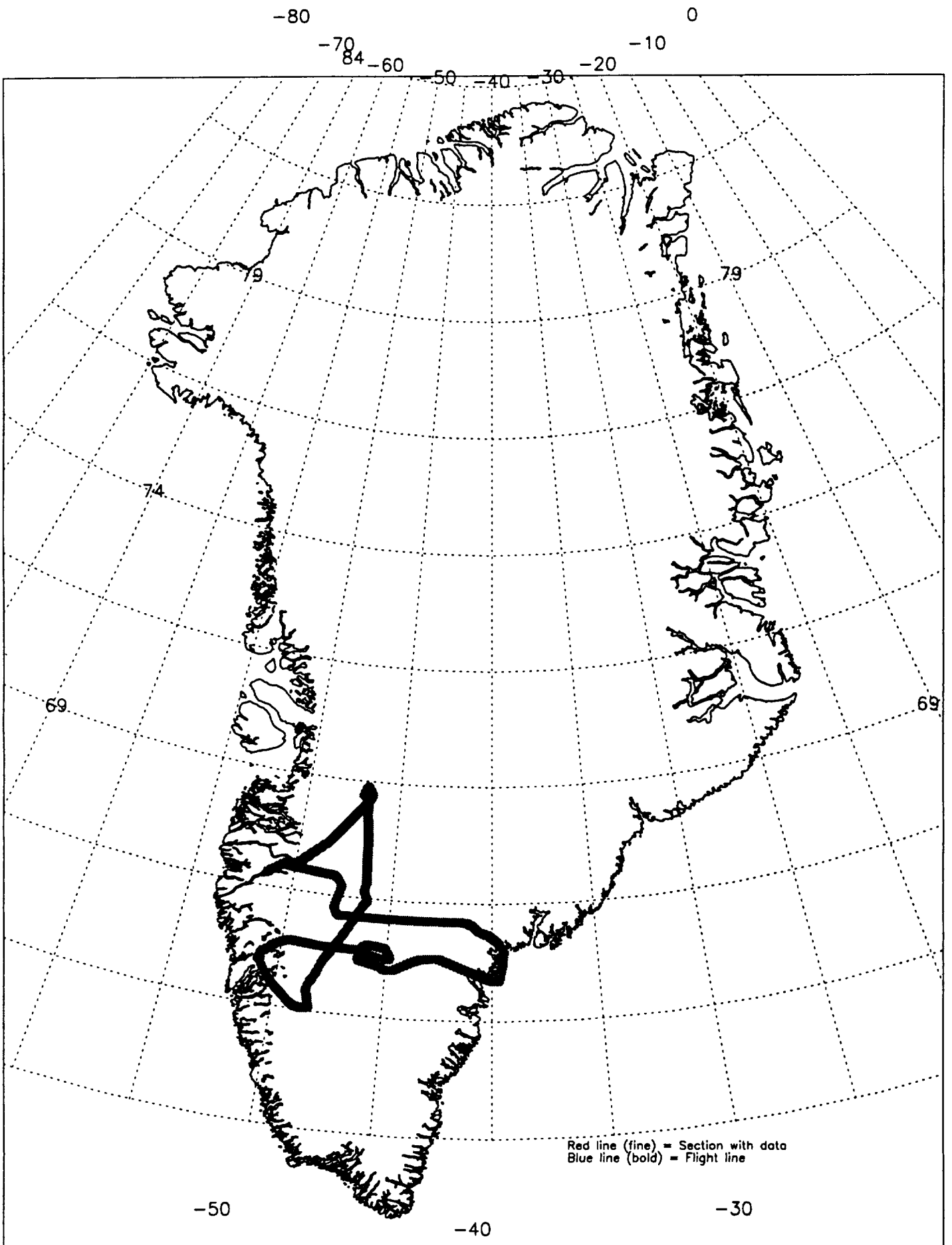
Appendix I

July 8, 1993

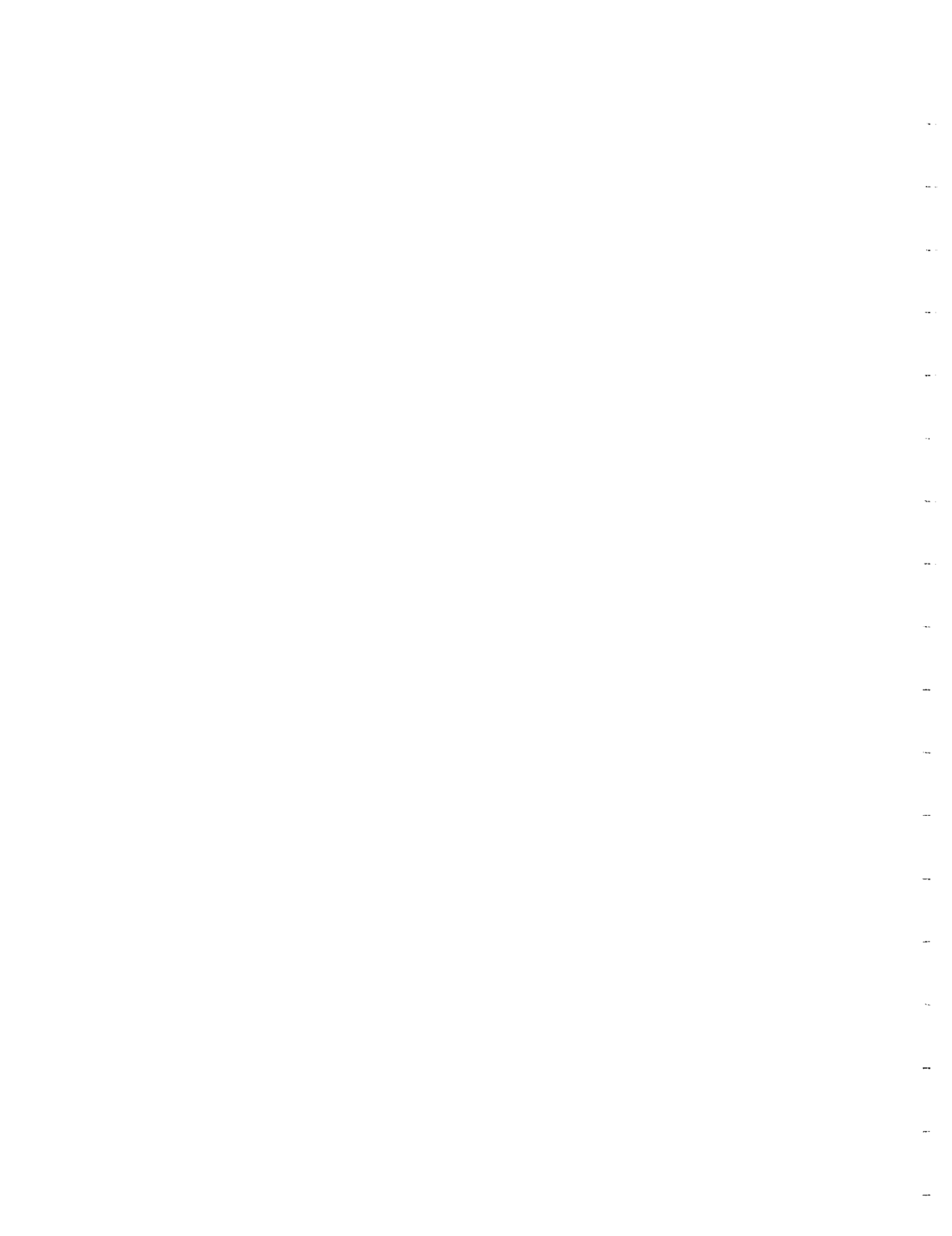






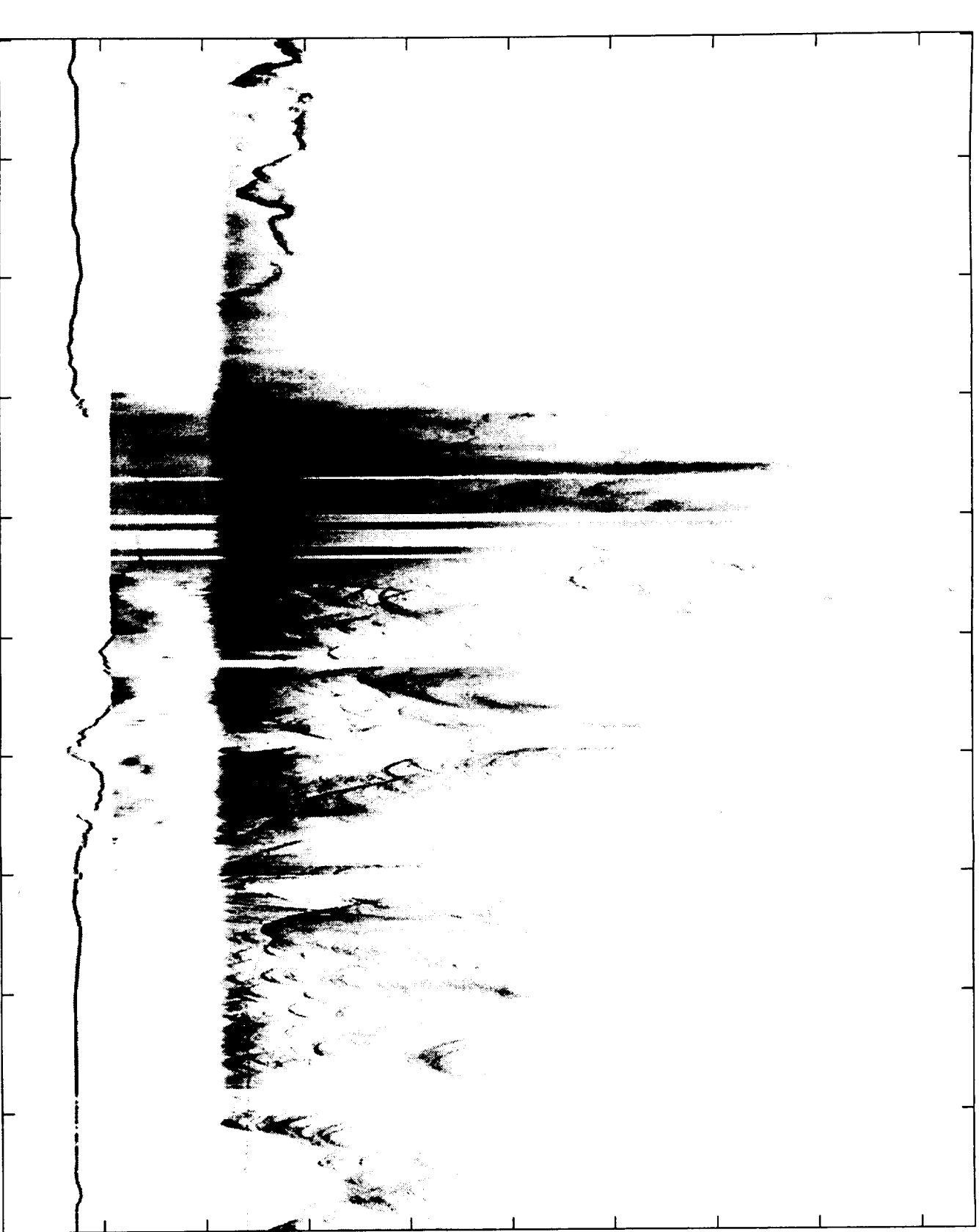


July 8, 1993 (r_9x)



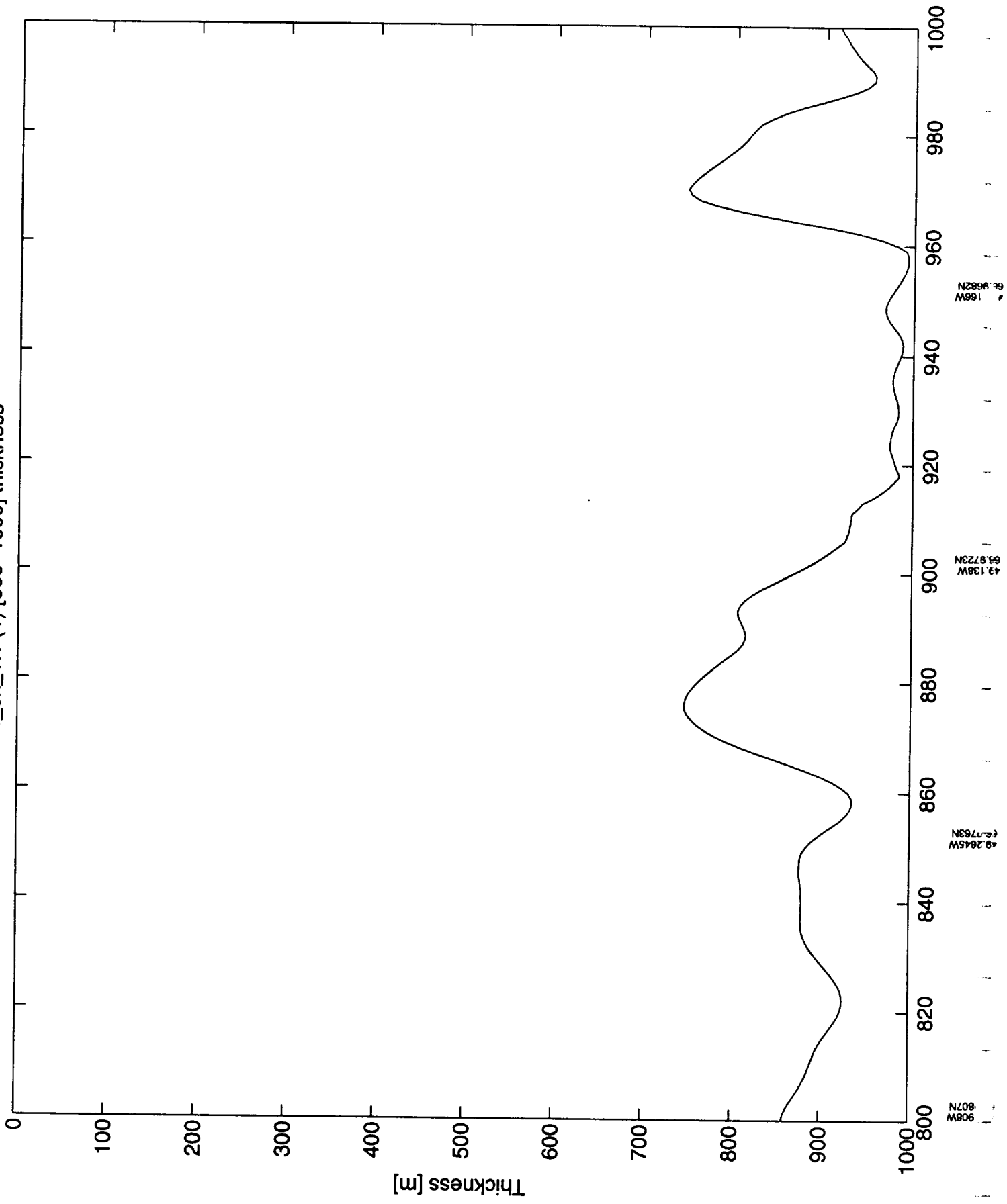
r_9x_1.1 <1> [0-1000]

thickness [1 pixel = 4.49m]

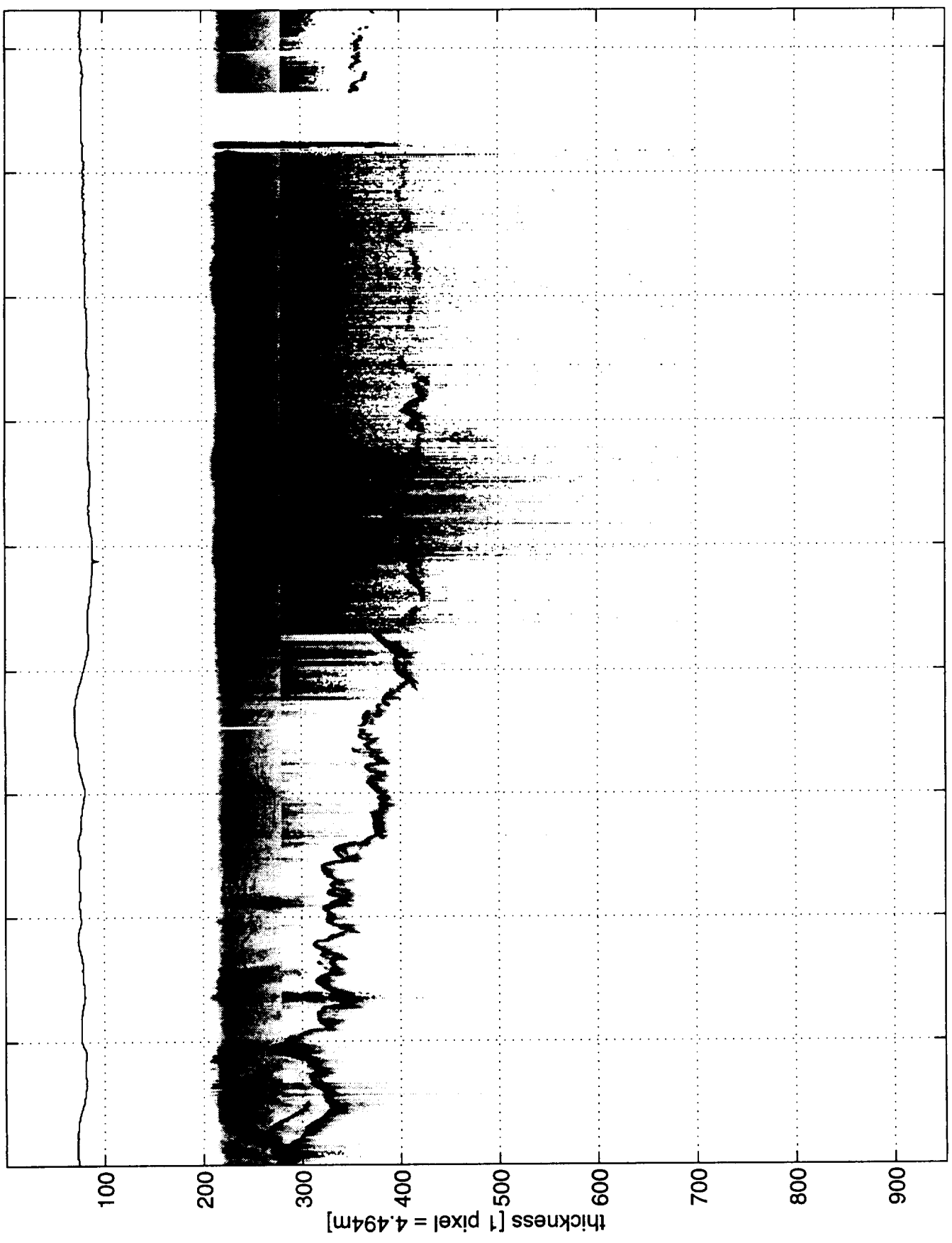


66.857N
51.2855W
66.9156N
50.8655W
66.9716N
50.6746W
67.02N
50.4397W
67.0305N
50.1885W
67.0136N
49.9338W
66.9973N
49.664W
66.9888N
49.3965W
66.9808N
49.1435W
66.9725N
48.9008W
66.9643N

r_9x_1.1 (1) [800-1000] thickness

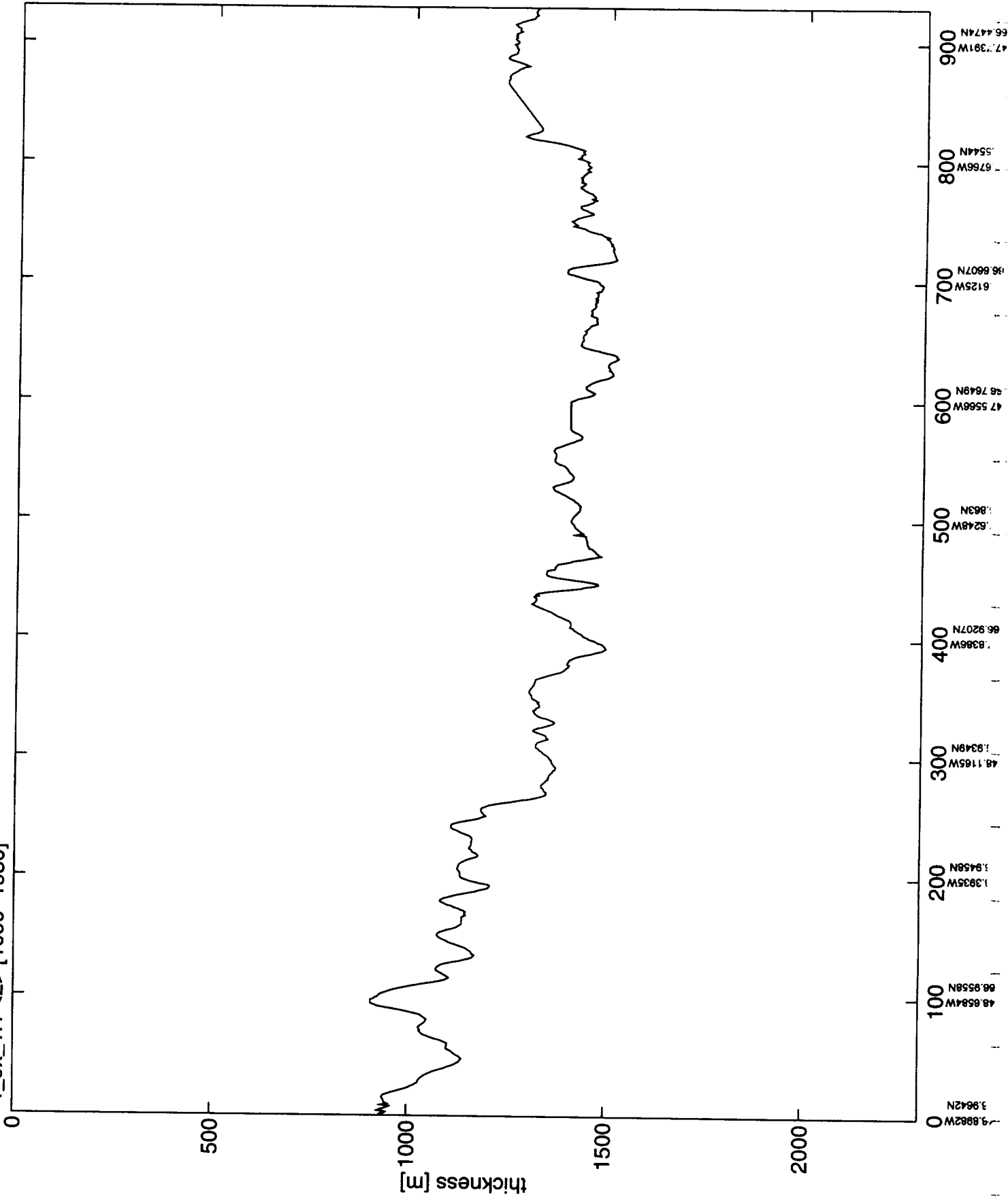


r_9x_1.1 <2> [1000-1930]

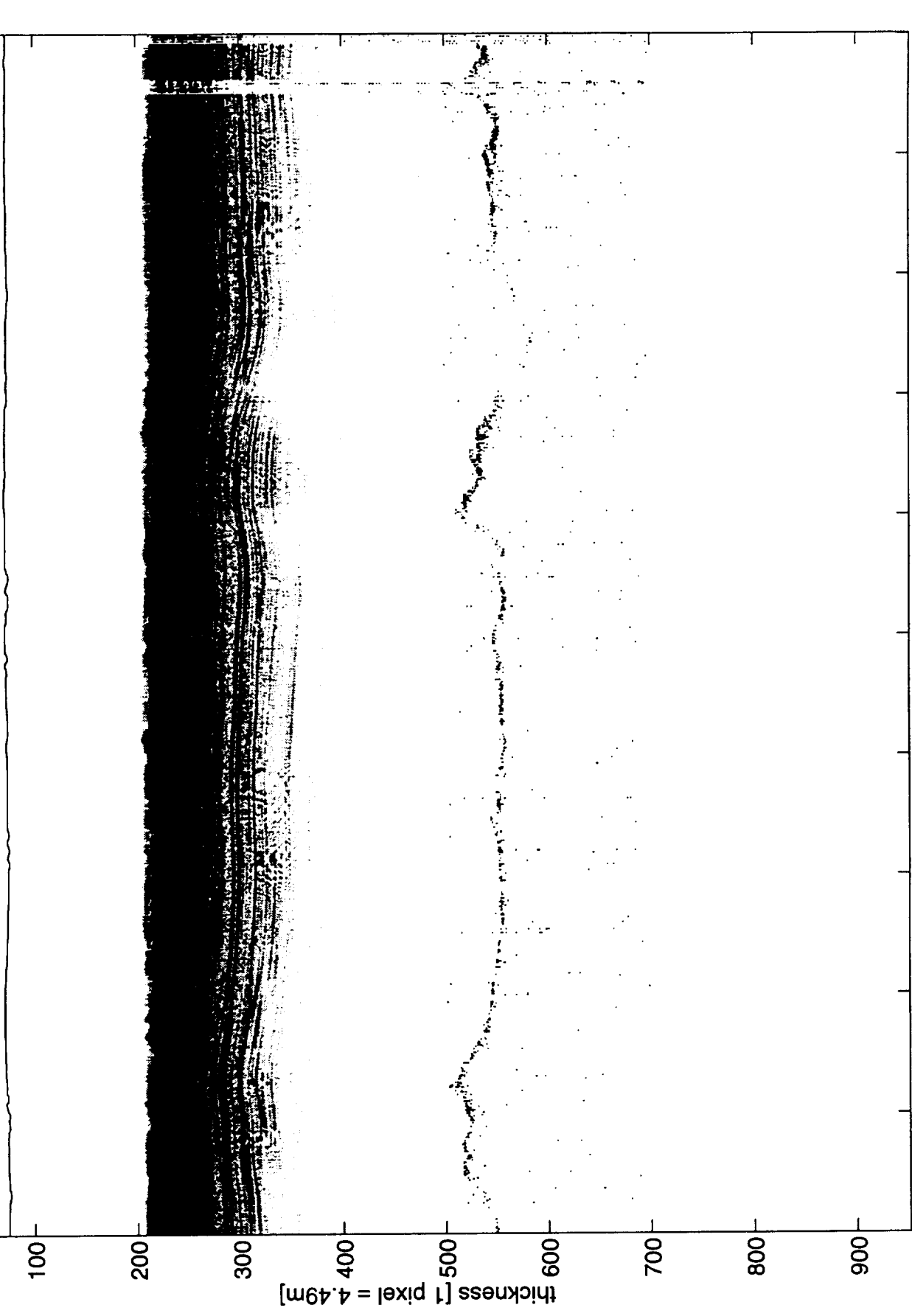


48.8982W 66.9642N
48.8584W 66.9558N
48.3935W 66.9458N
48.1165W 66.9349N
47.8386W 66.9207N
47.6248W 66.863N
47.5666W 66.7649N
47.6125W 66.6607N
47.6766W 66.5544N
47.7391W 66.4474N

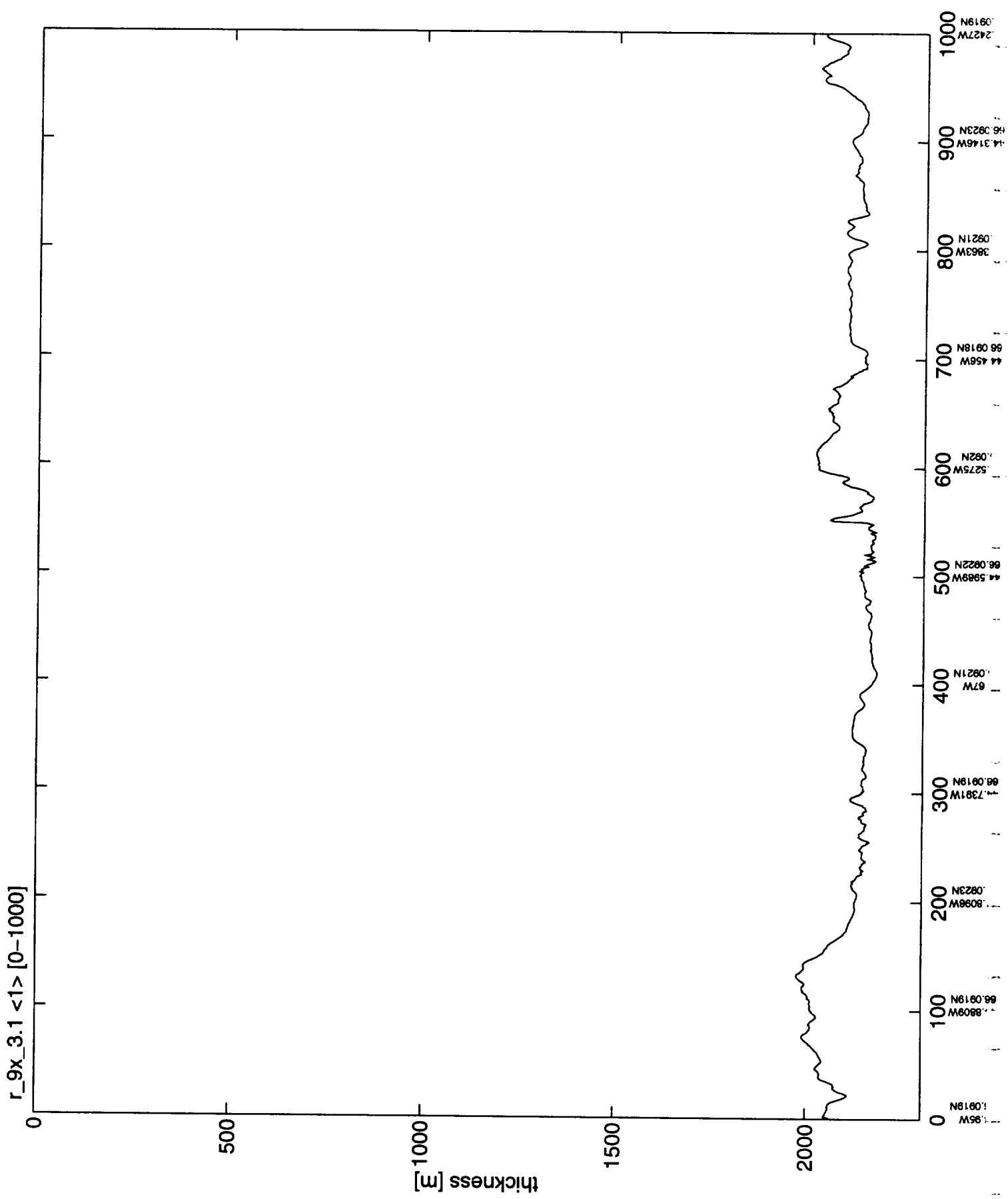
r_9x_1.1 <2> [1000-1930]



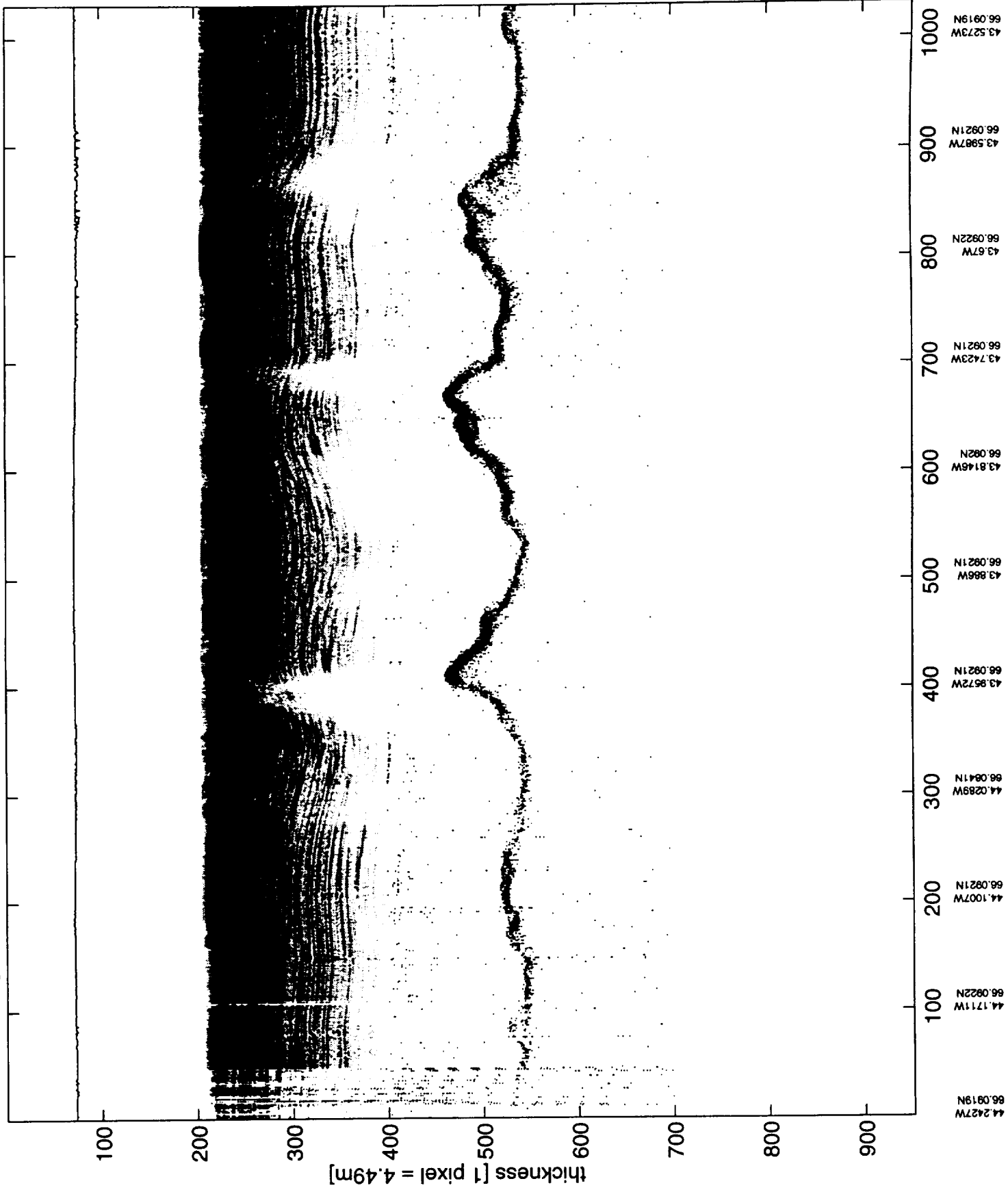
r_9x_3.1 <1> [0-1000]



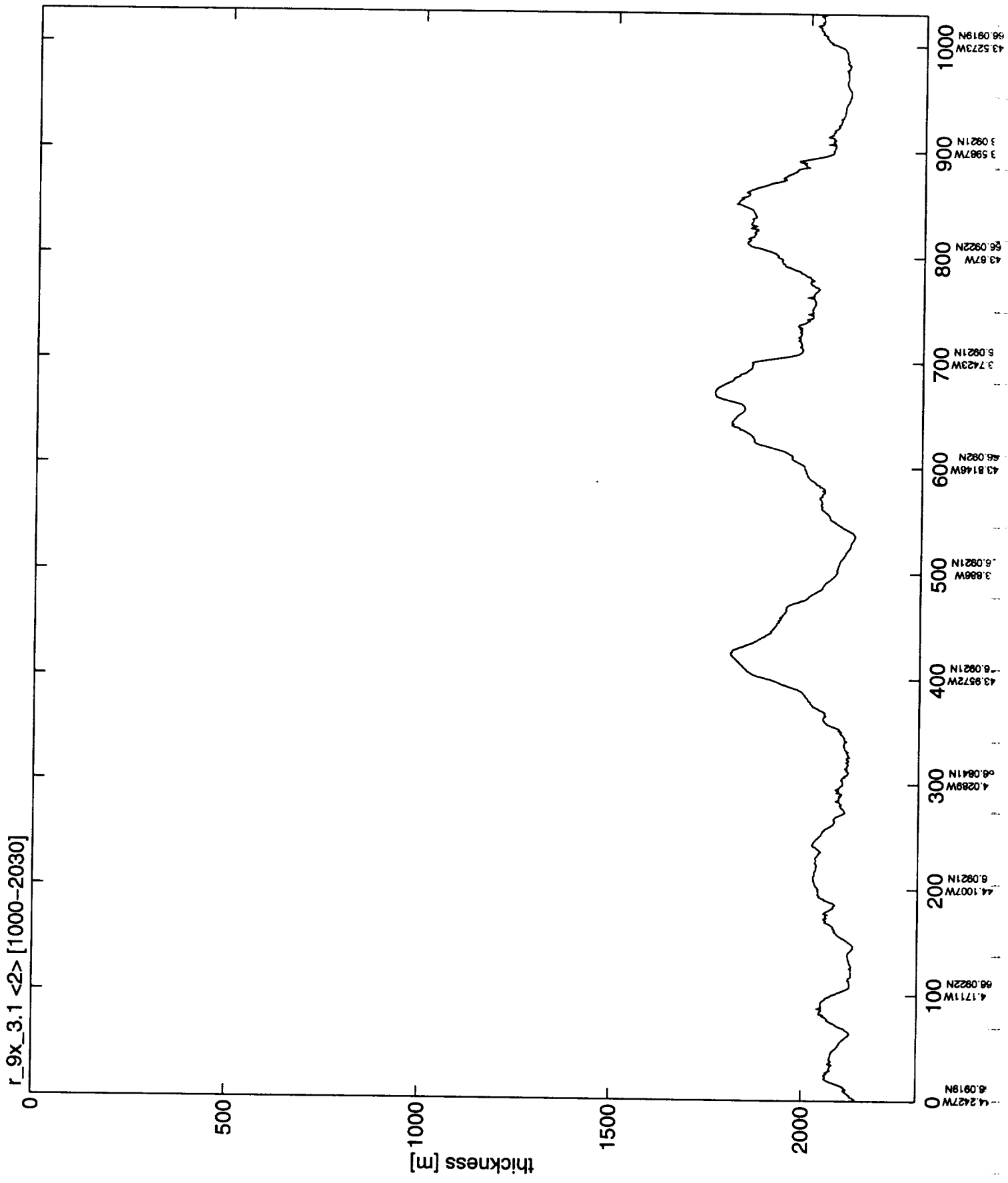
44.85W 66.0919N
44.8809W 66.0919N
44.8098W 66.0923N
44.7391W 66.0919N
44.67W 66.0921N
44.5989W 66.0922N
44.5275W 66.092N
44.456W 66.0918N
44.3863W 66.0921N
44.3146W 66.0923N
44.2427W 66.0919N



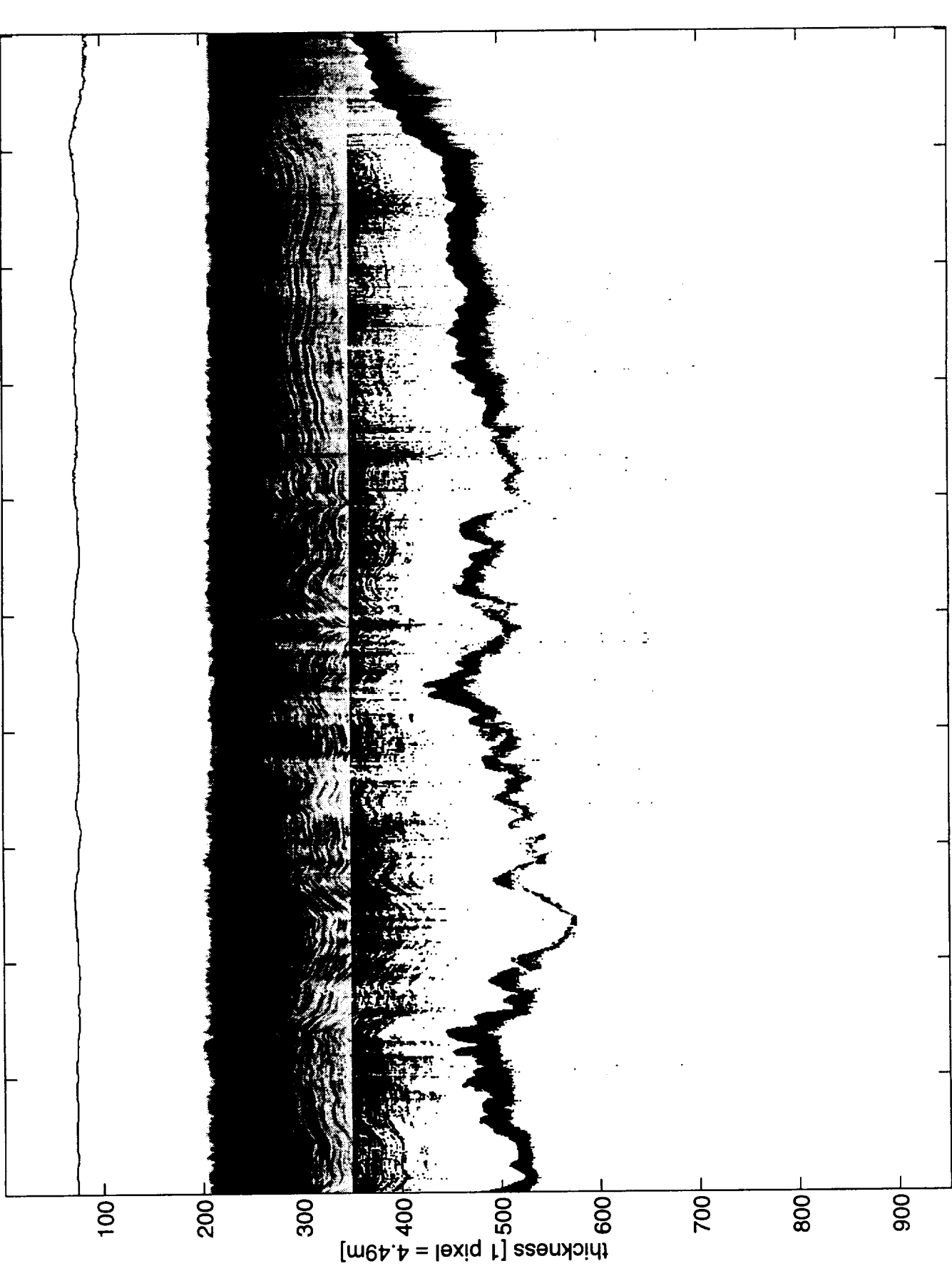
r_9x_3.1 <2> [1000-2030]



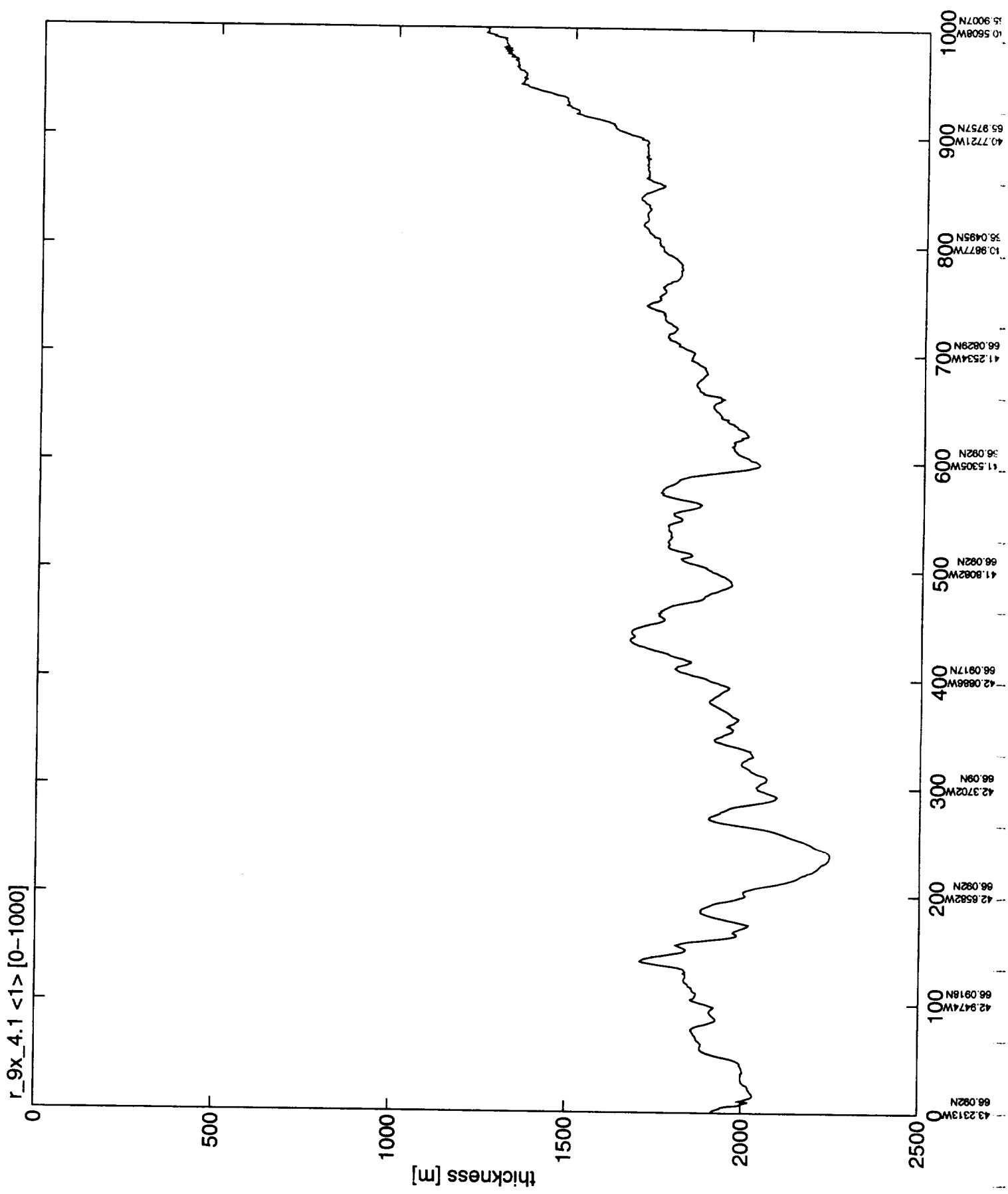
r_9x_3.1 <2> [1000-2030]



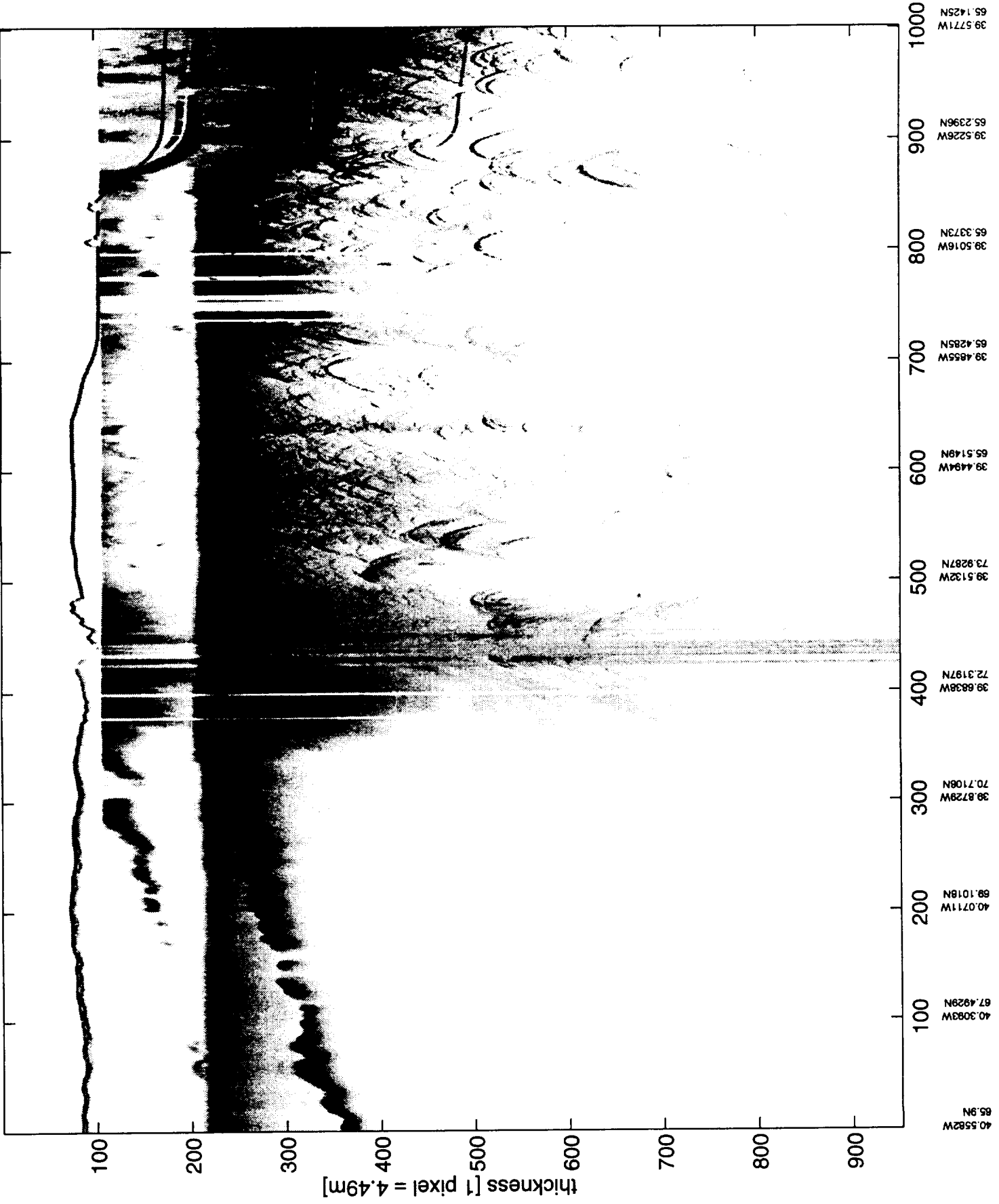
r_9x_4.1 <1> [0-1000]



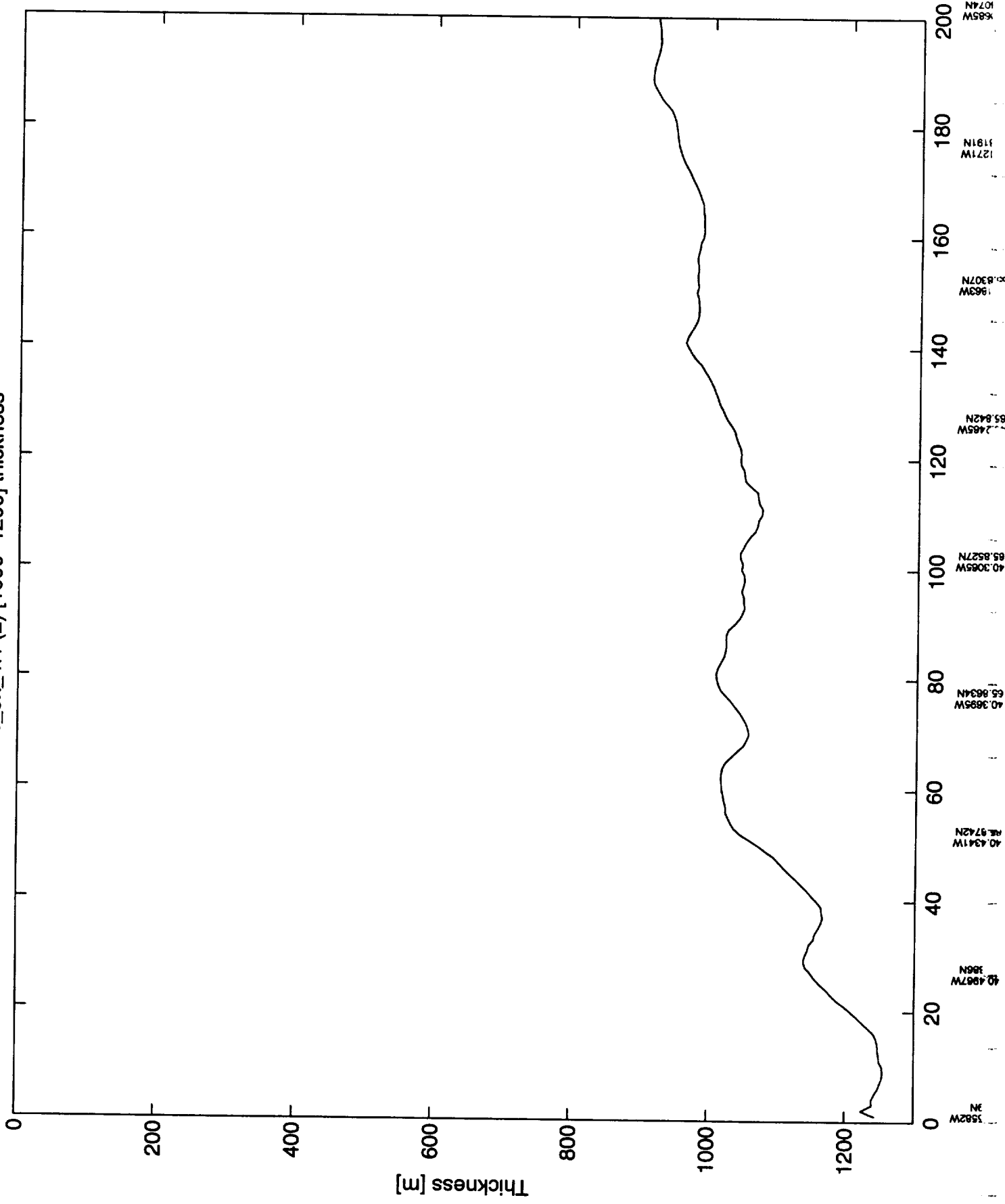
43.2313W 66.082N
42.9474W 66.0918N
42.6582W 66.082N
42.3702W 66.08N
42.0886W 66.0817N
41.8082W 66.082N
41.5305W 66.082N
41.2534W 66.0829N
40.9877W 66.0495N
40.7721W 65.9757N
40.5680W 65.9007N



r_9x_4.1 <2> [1000-2000]



r_9x_4.1 (2) [1000-1200] thickness

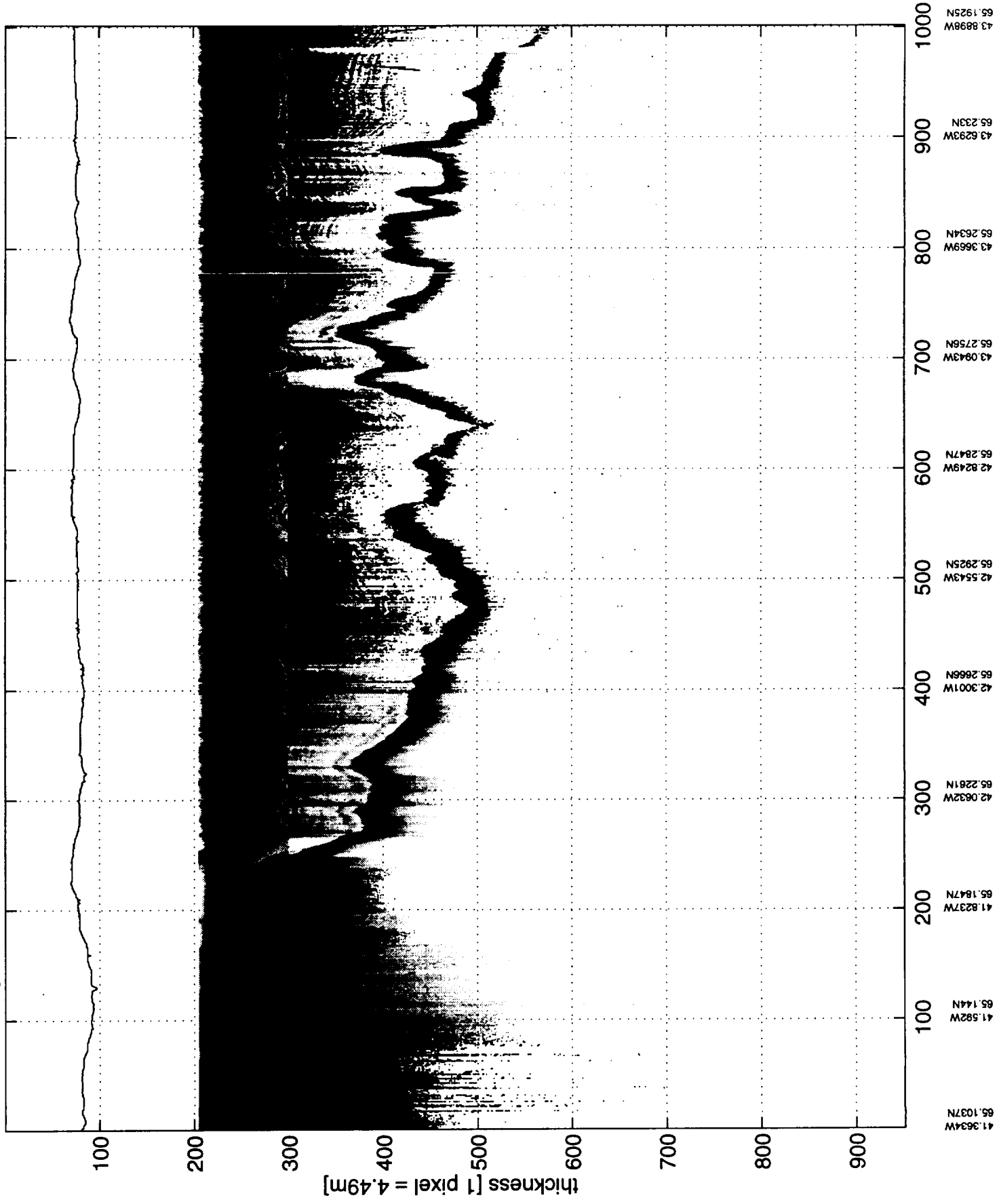


r_9x_4.1 <3> [2000-3000]



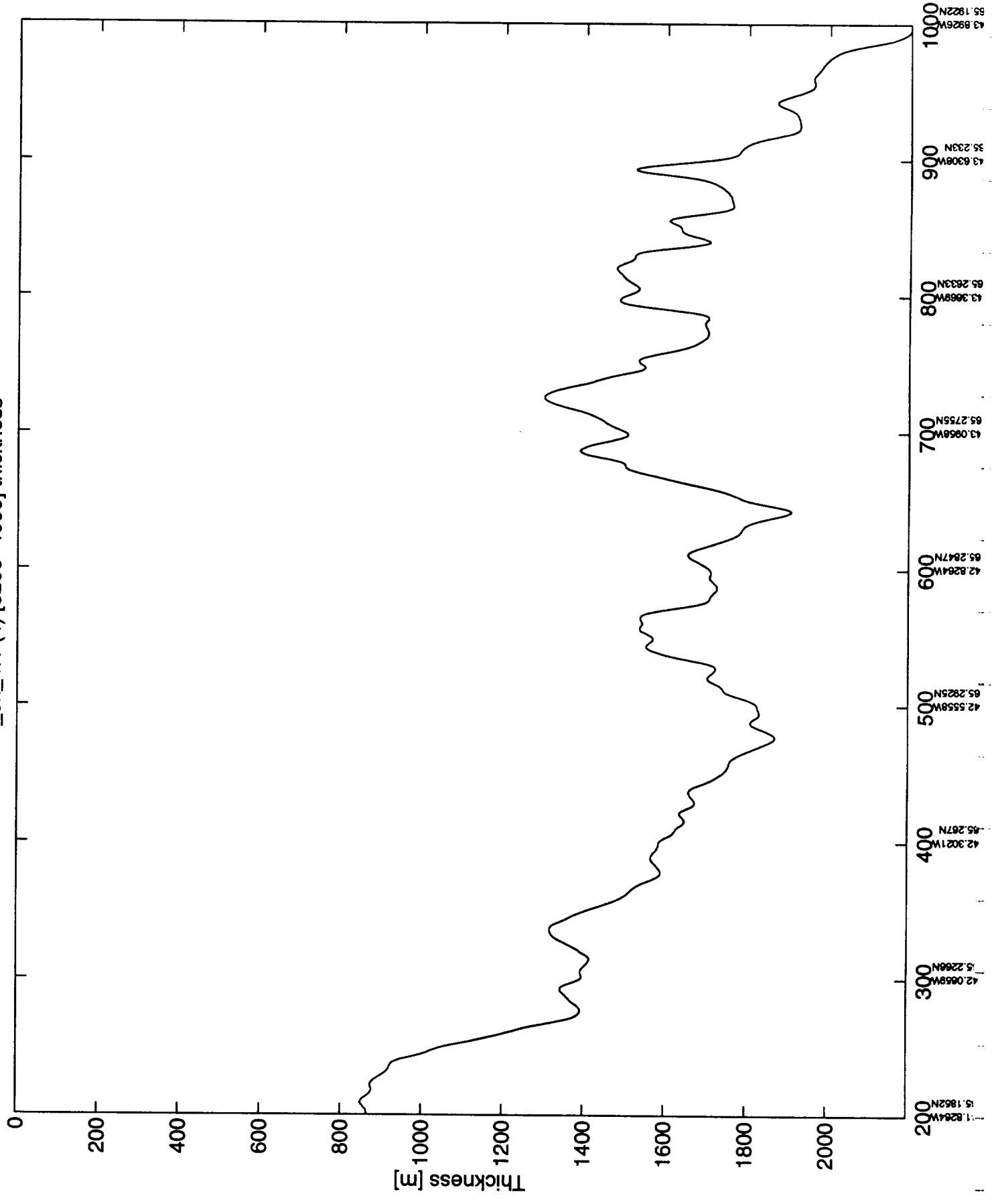
39.577W 65.1414N
39.818W 65.0516N
39.658W 64.9626N
39.735W 64.8659N
39.662W 64.8539N
40.1981W 64.8891N
40.4058W 64.9291N
40.6432W 64.9733N
40.8879W 65.0179N
41.1252W 65.0611N
41.3607W 65.1032N

r_9x_4.1 <4> [3000-4000]



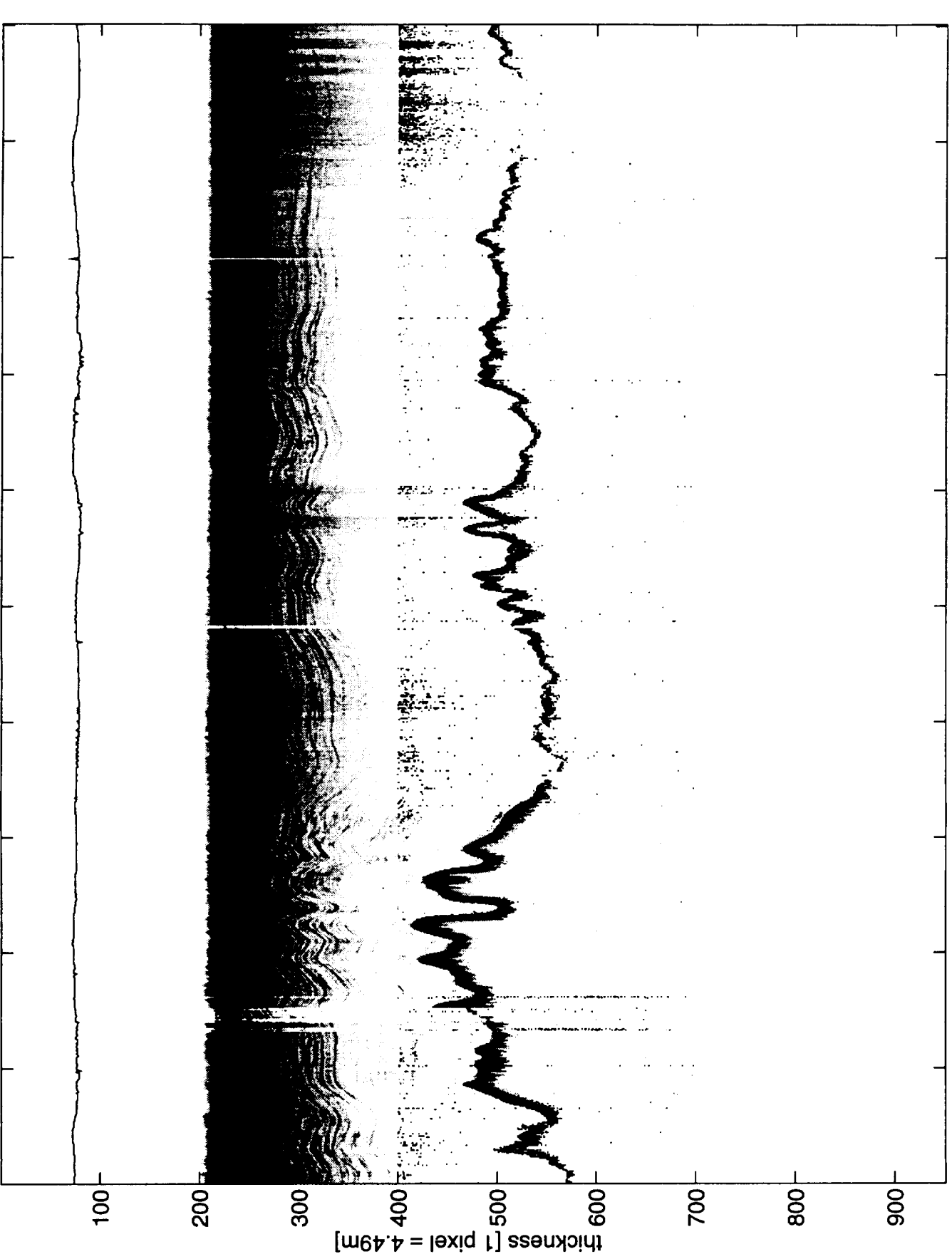
41.3634W 65.1037N
41.582W 65.144N
41.8237W 65.1847N
42.0632W 65.2281N
42.3001W 65.2666N
42.5543W 65.2925N
42.8249W 65.2847N
43.0843W 65.2756N
43.3669W 65.2634N
43.6293W 65.233N
43.8898W 65.1925N

r_9x_4.1 (4) [3200-4000] thickness



1.5945W 5.1445N

r_9x_4.1 <5> [4000-5000]



43.8926W

65.1348N

44.3786W

44.6223W

64.9878N

45.1486W

65.0334N

45.403W

65.0785N

45.6734W

65.107N

45.9542W

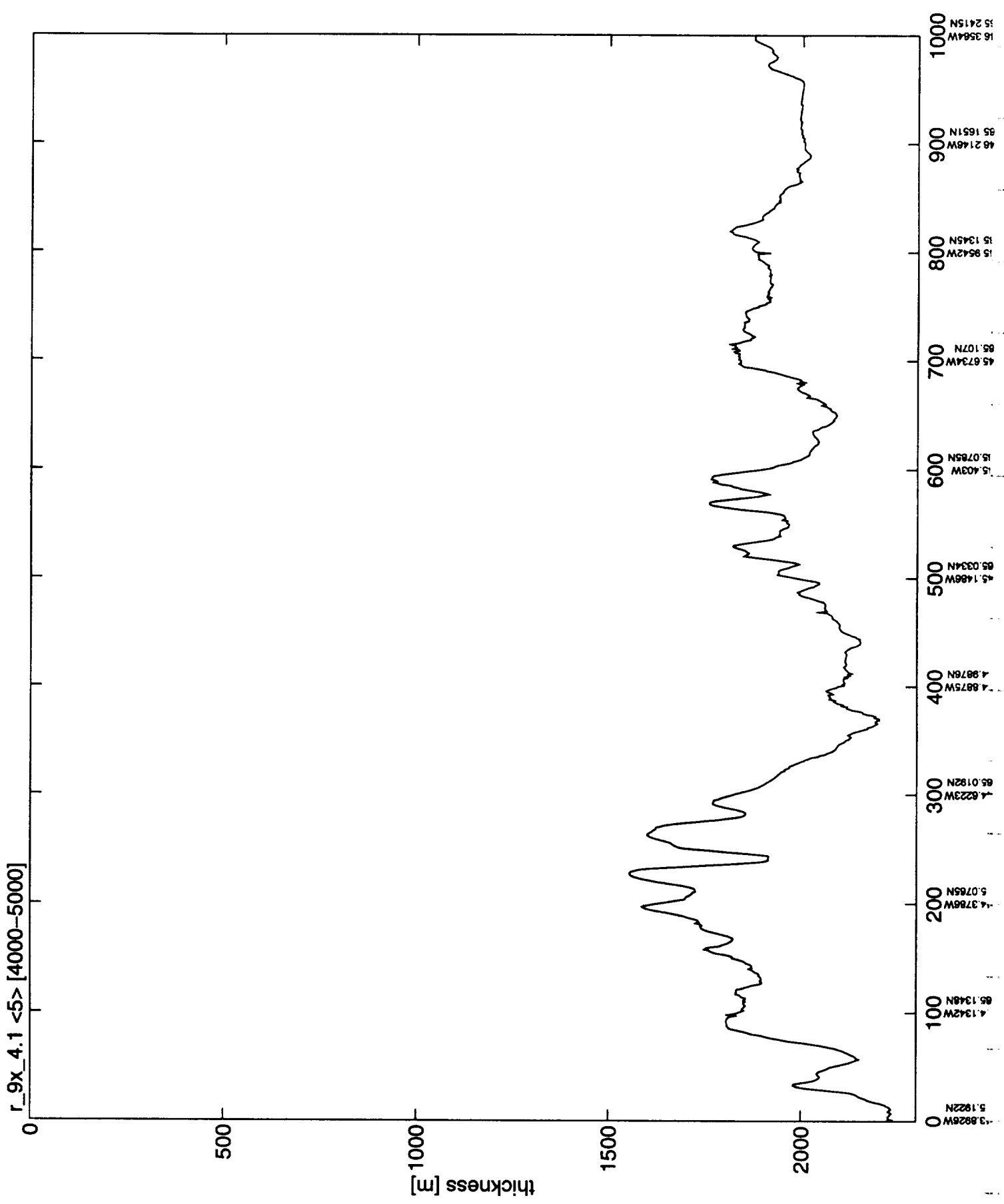
65.1345N

46.2146W

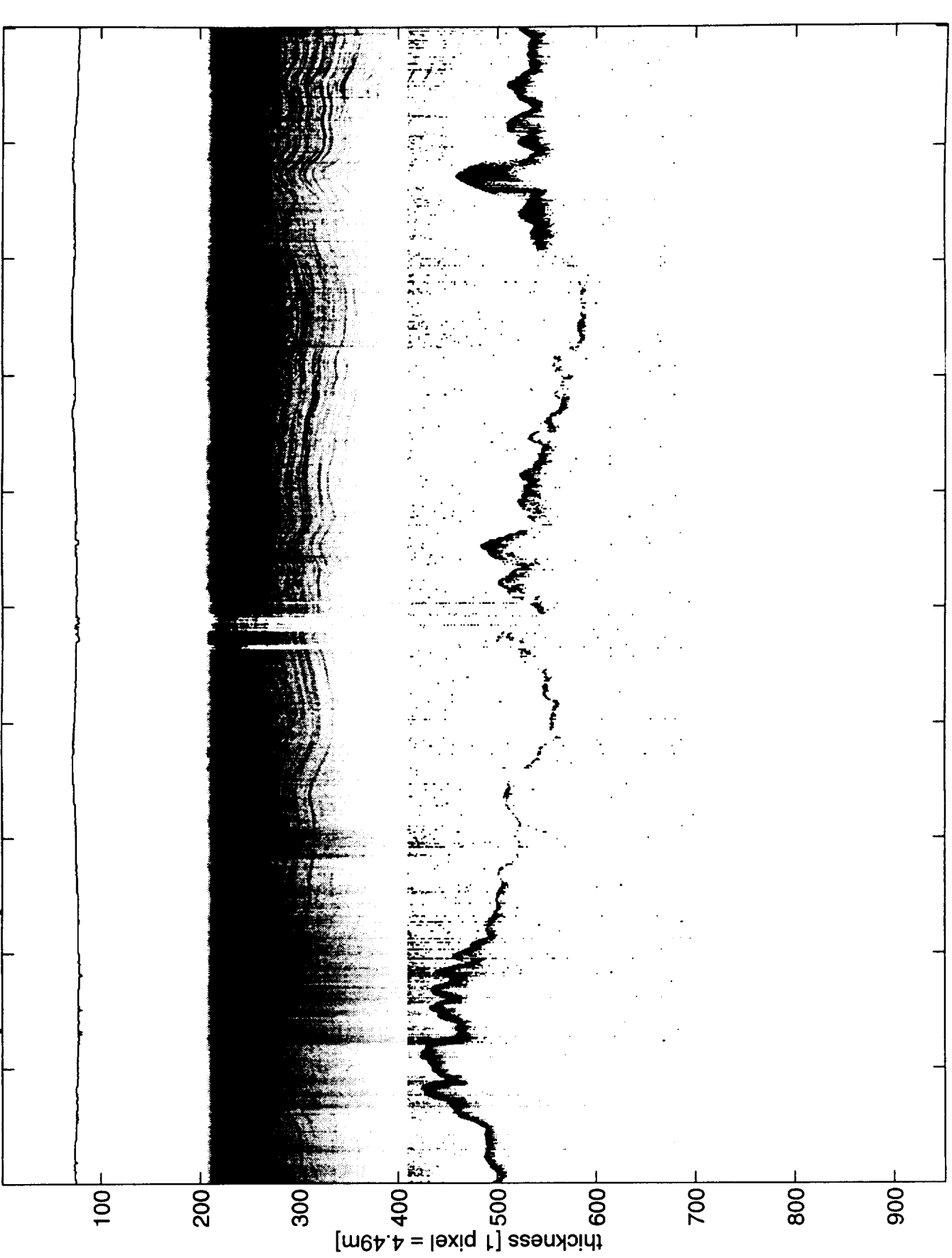
65.1651N

46.3564W

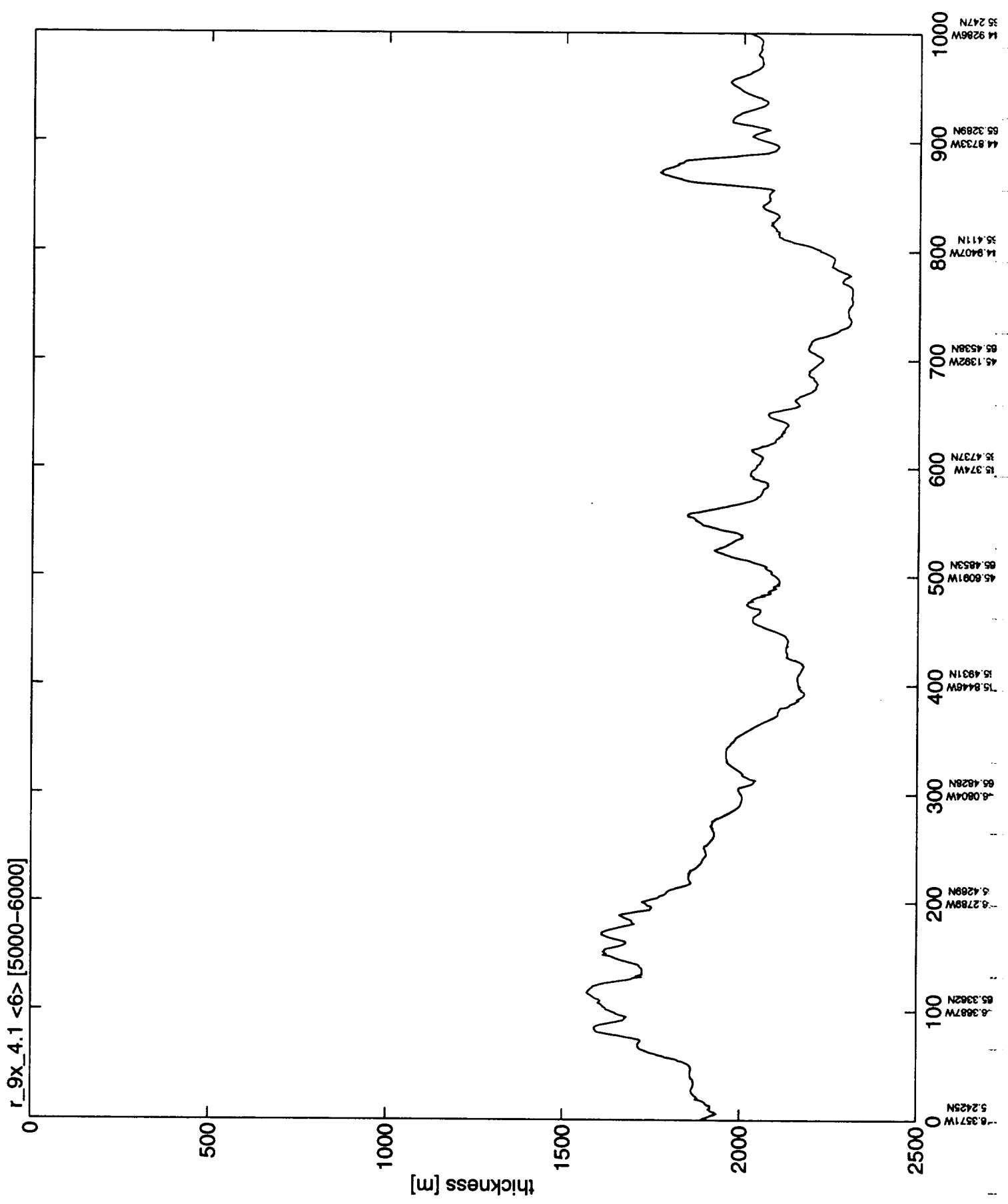
65.2415N



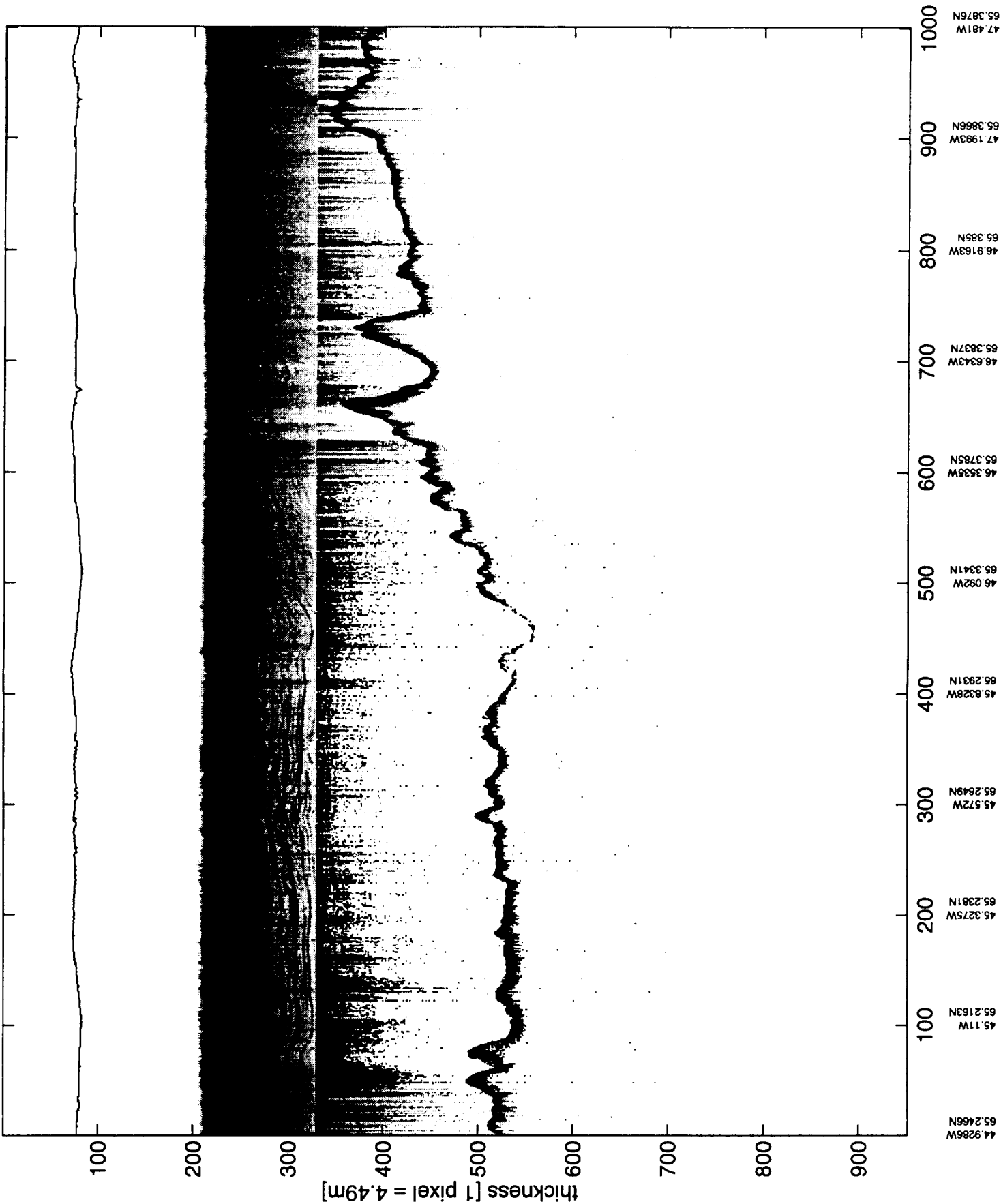
r_9x_4.1 <6> [5000-6000]

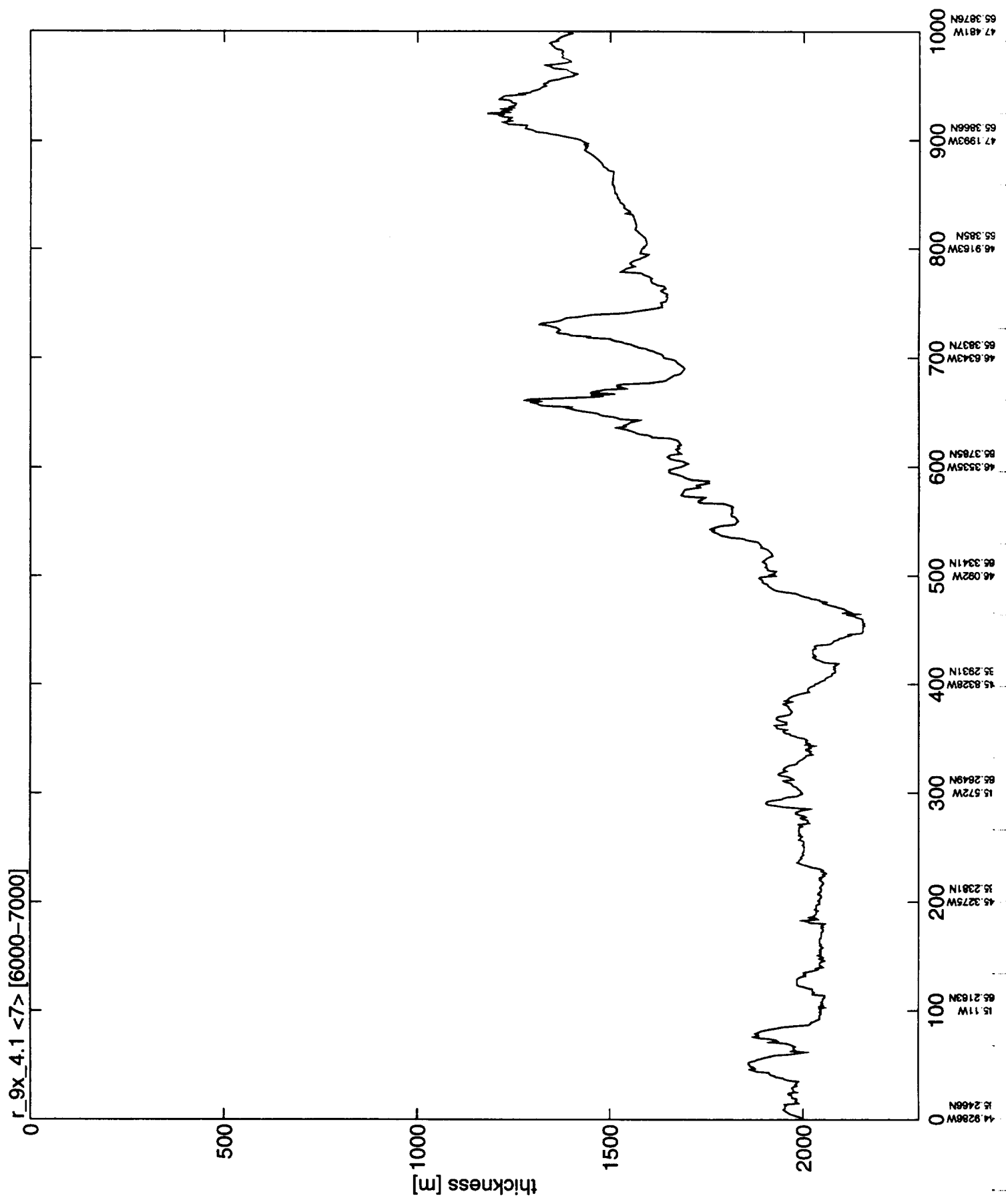


65.2425N
46.3571W
65.362N
46.3687W
46.2789W
65.4269N
46.0804W
65.4828N
46.8446W
65.4931N
46.6091W
65.4853N
46.374W
65.4737N
45.1392W
65.4538N
44.9407W
65.411N
44.8733W
65.3289N
44.9286W
65.247N



r_9x_4.1 <7> [6000-7000]





r_9x_4.1 <8> [7000-8000]

100

200

300

400

500

600

700

800

900

thickness [1 pixel = 4.49m]

100

200

300

400

500

600

700

800

900

1000

47.4841W
65.3877N

47.7602W
65.3885N

48.0387W
65.3898N

48.3192W
65.397N

48.5971W
65.4063N

48.8678W
65.414N

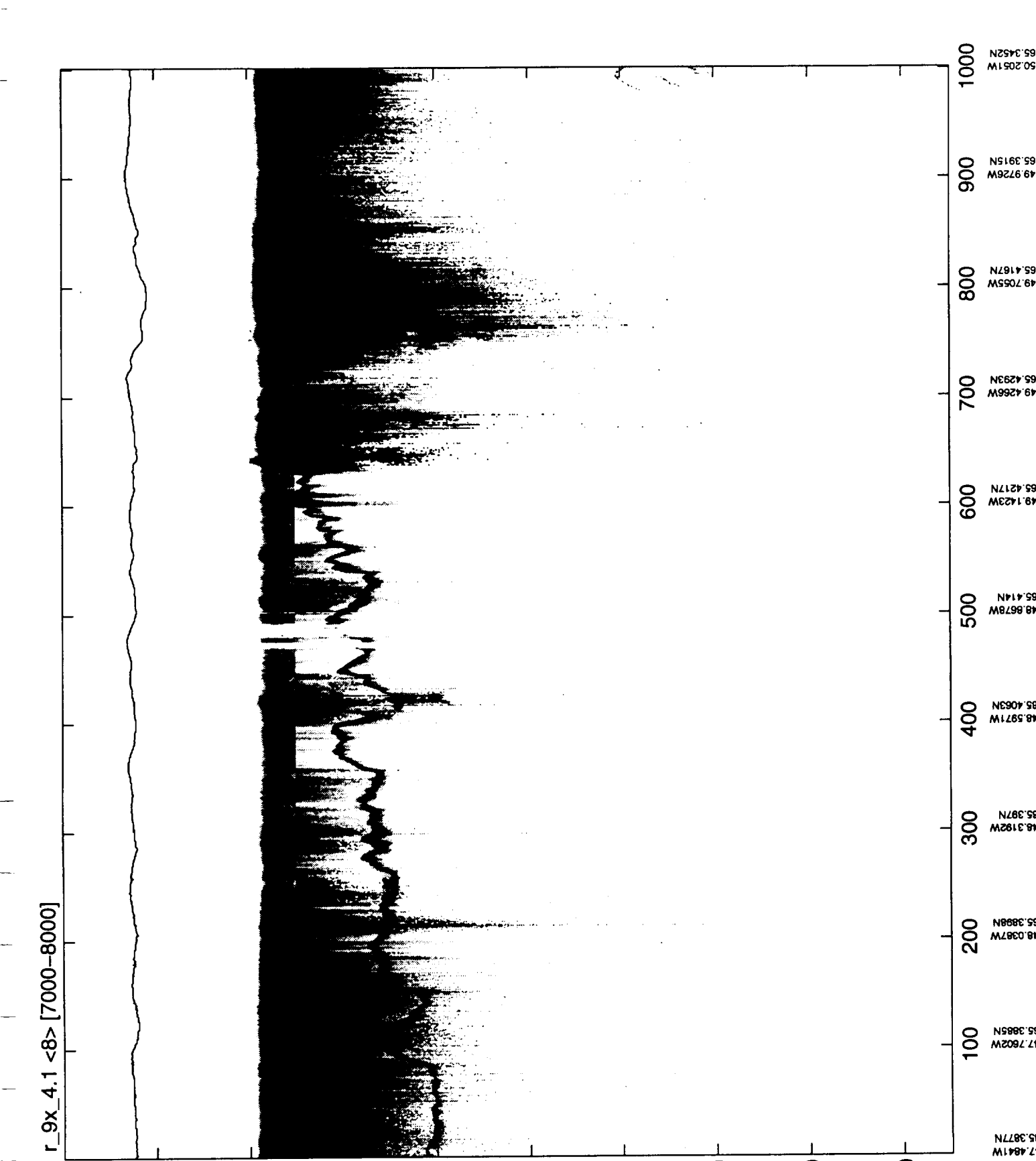
49.1423W
65.4217N

49.4266W
65.4293N

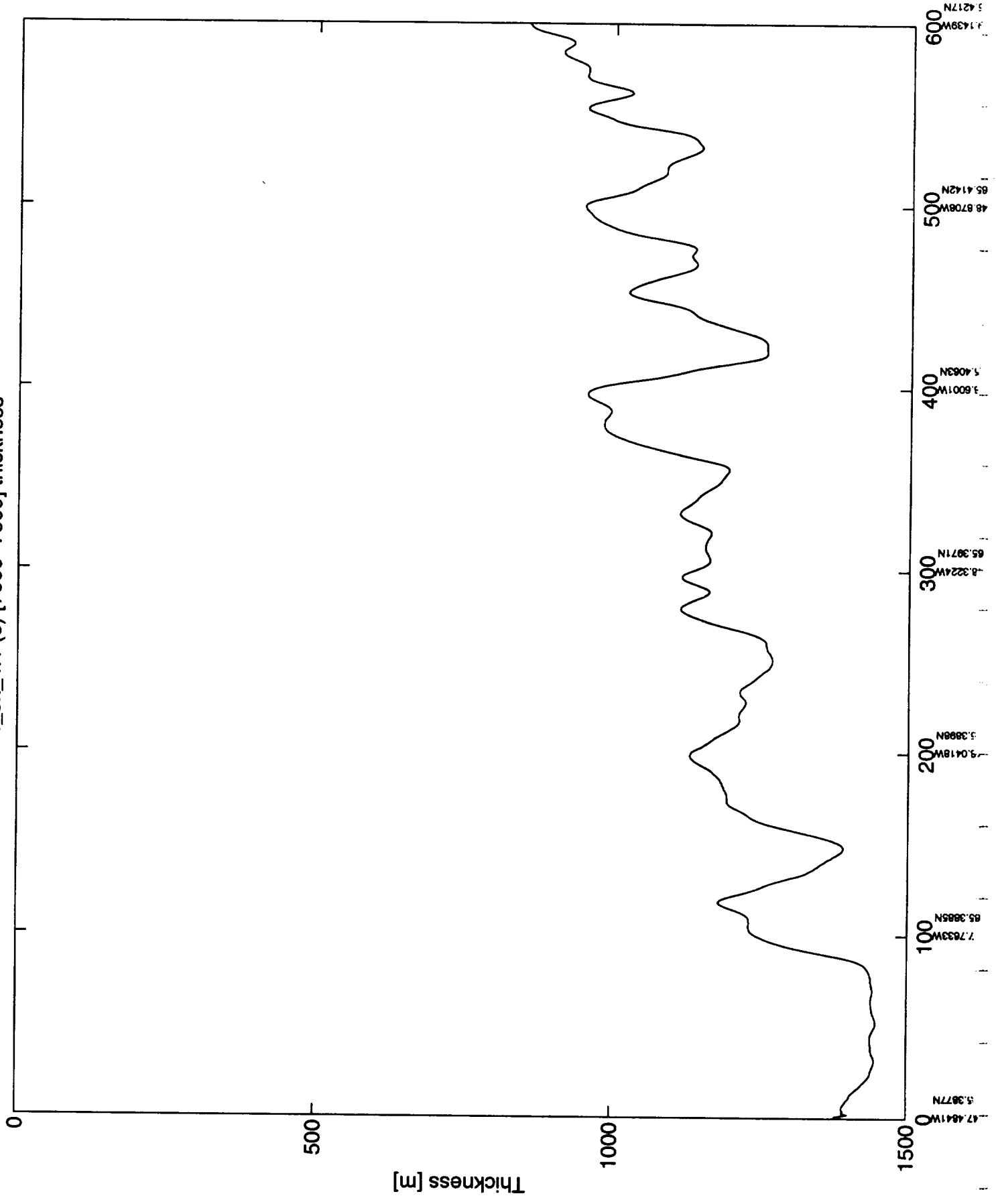
49.7055W
65.437N

49.9726W
65.3915N

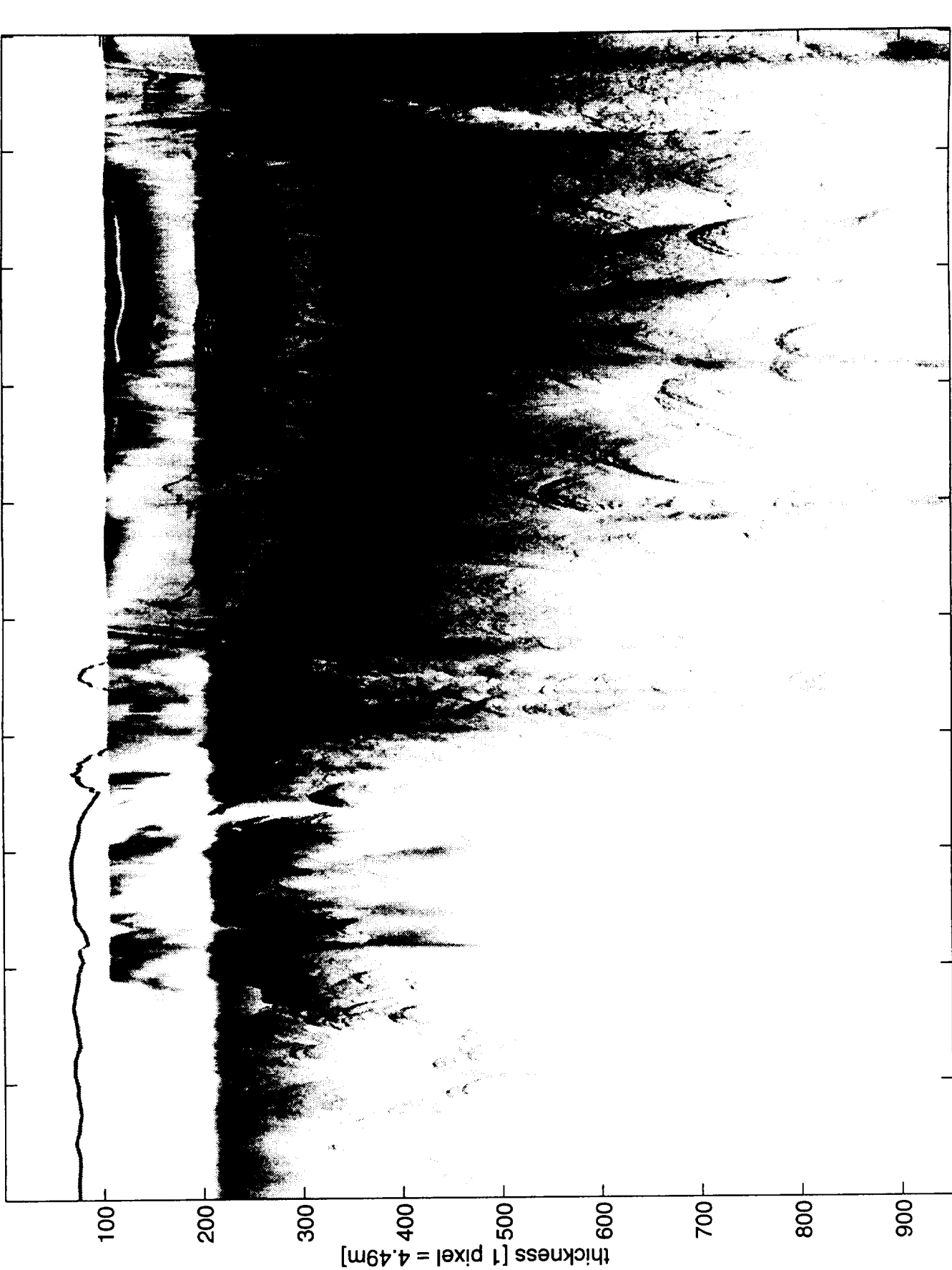
50.2051W
65.3452N



r_9x_4.1 (8) [7000-7600] thickness



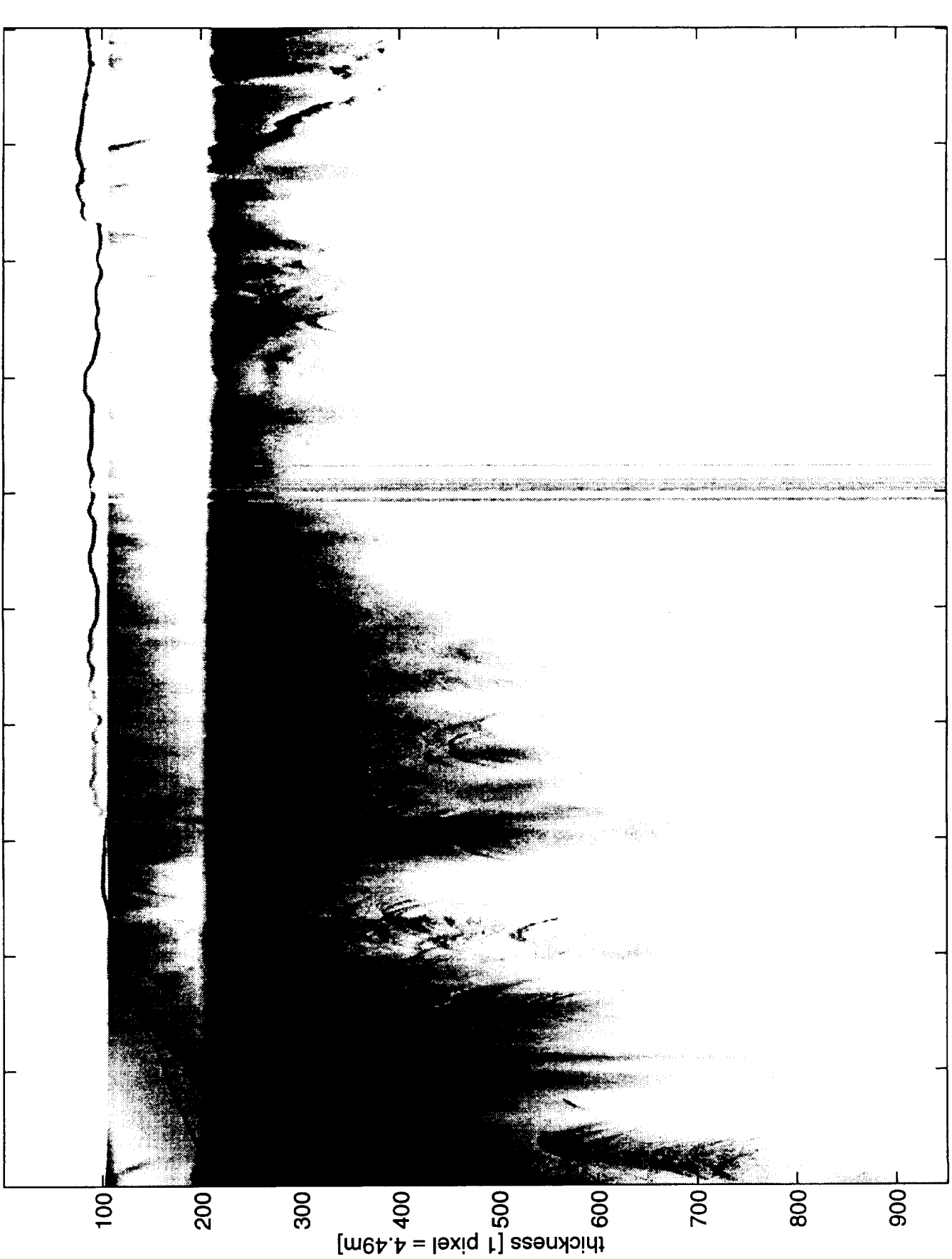
r_9x_4.1 <9> [8000-9000]



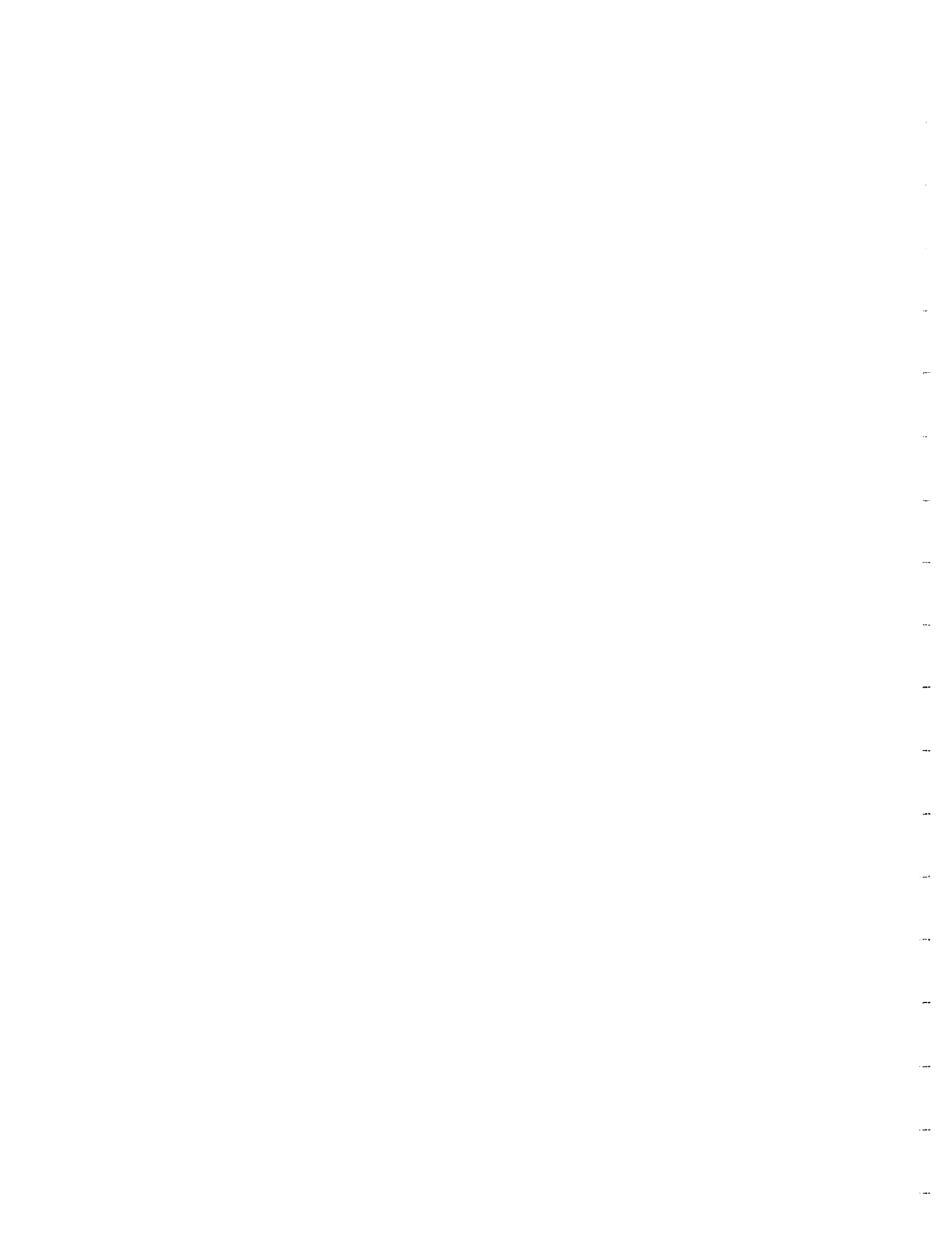
50.207W 65.345N
50.435W 65.2891N
50.6347W 65.2168N
50.813W 65.1404N
51.0166W 65.0768N
50.9791W 64.9871N
50.8238W 64.9089N
50.6989W 64.8188N
50.5609W 64.7309N
50.4057W 64.6452N
50.2467W 64.5585N



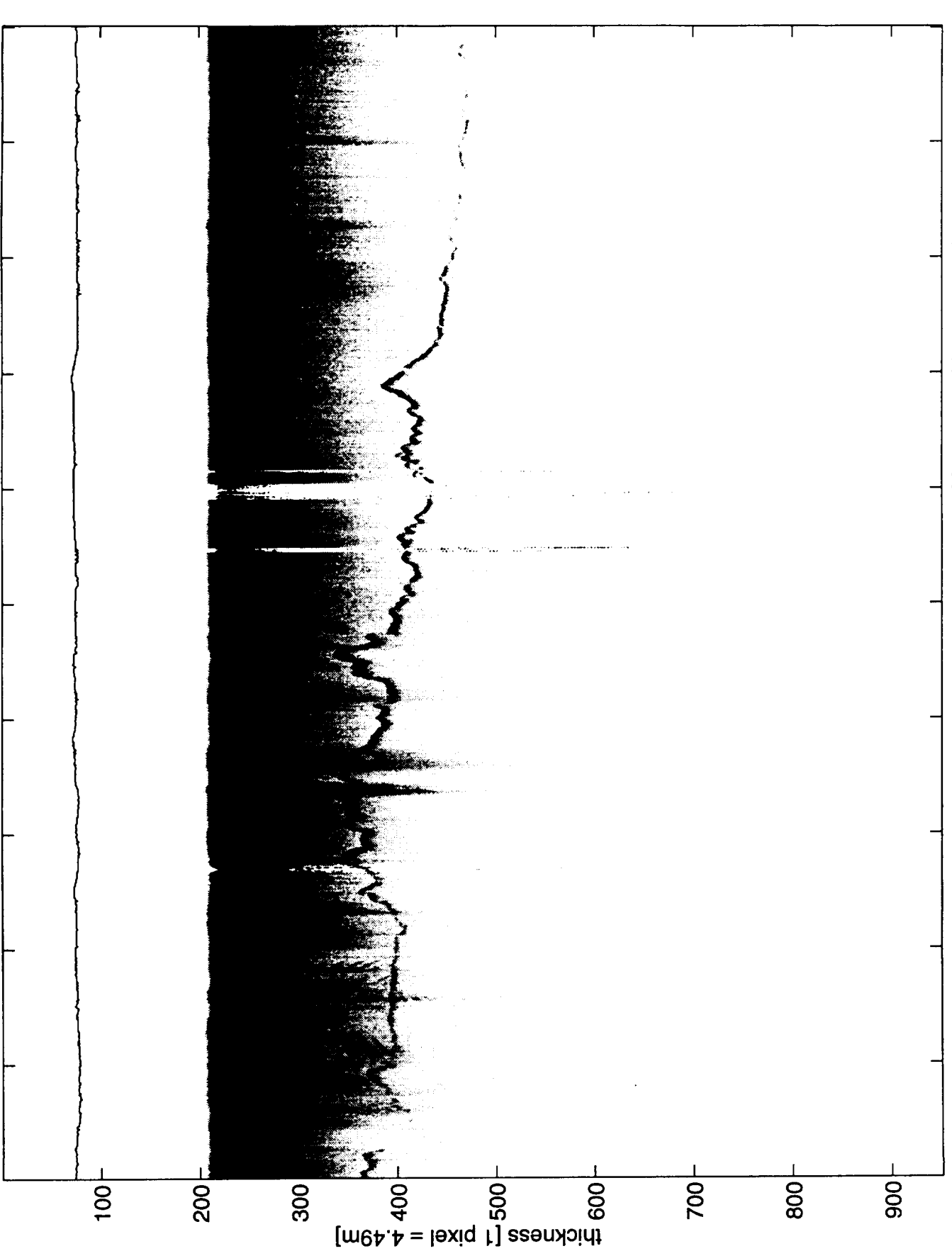
r_9x_4.1 <10> [9000-10000]



50.2449W
64.5575N
50.0801W
64.4731N
48.8857W
64.398N
49.6846W
64.3298N
49.5274W
64.2543N
49.3547W
64.1808N
49.1824W
64.118N
48.9714W
64.054N
48.757W
64.0379N
48.5388W
64.0307N
48.4083W
64.1091N

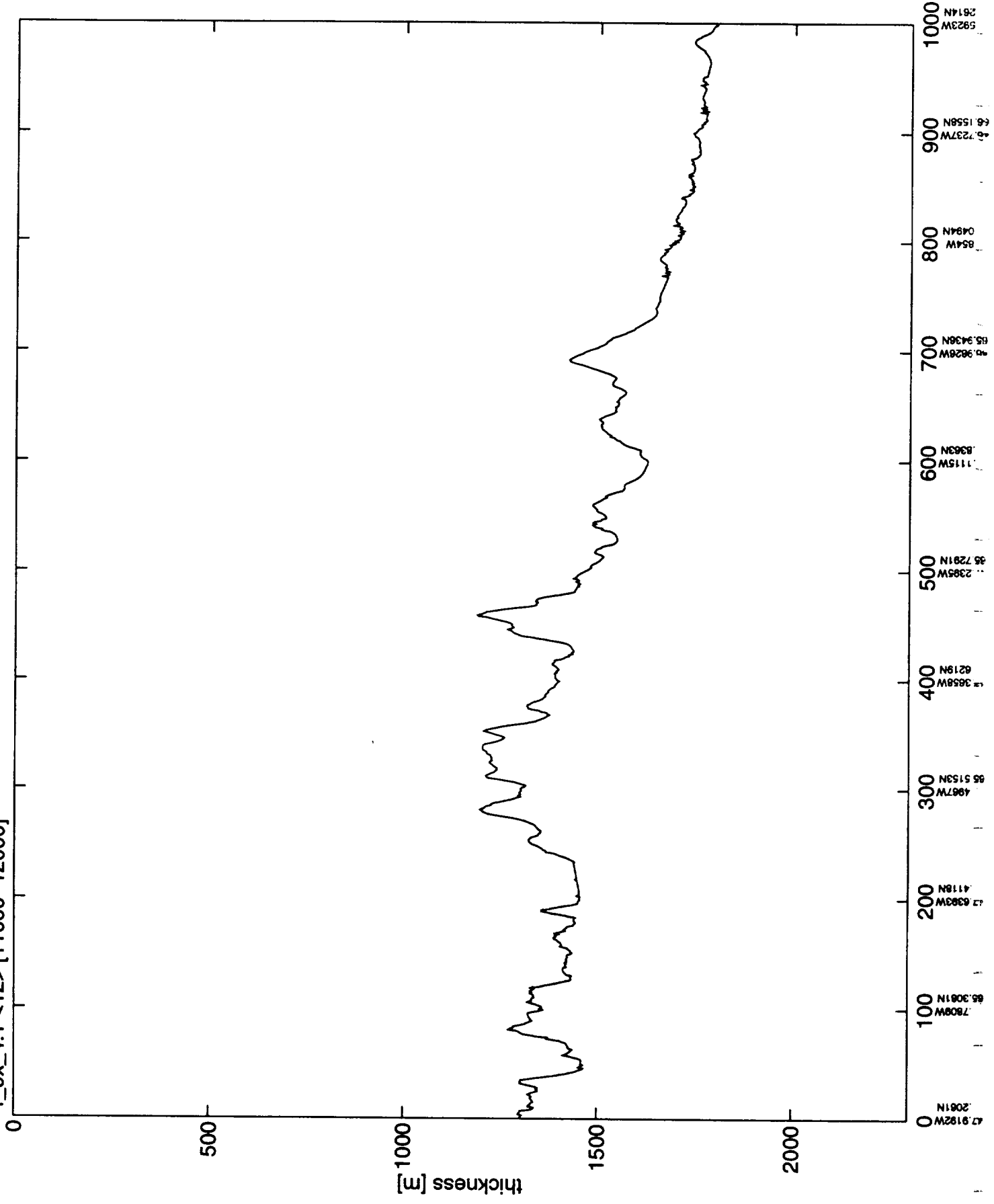


r_9x_4.1 <12> [11000-12000]

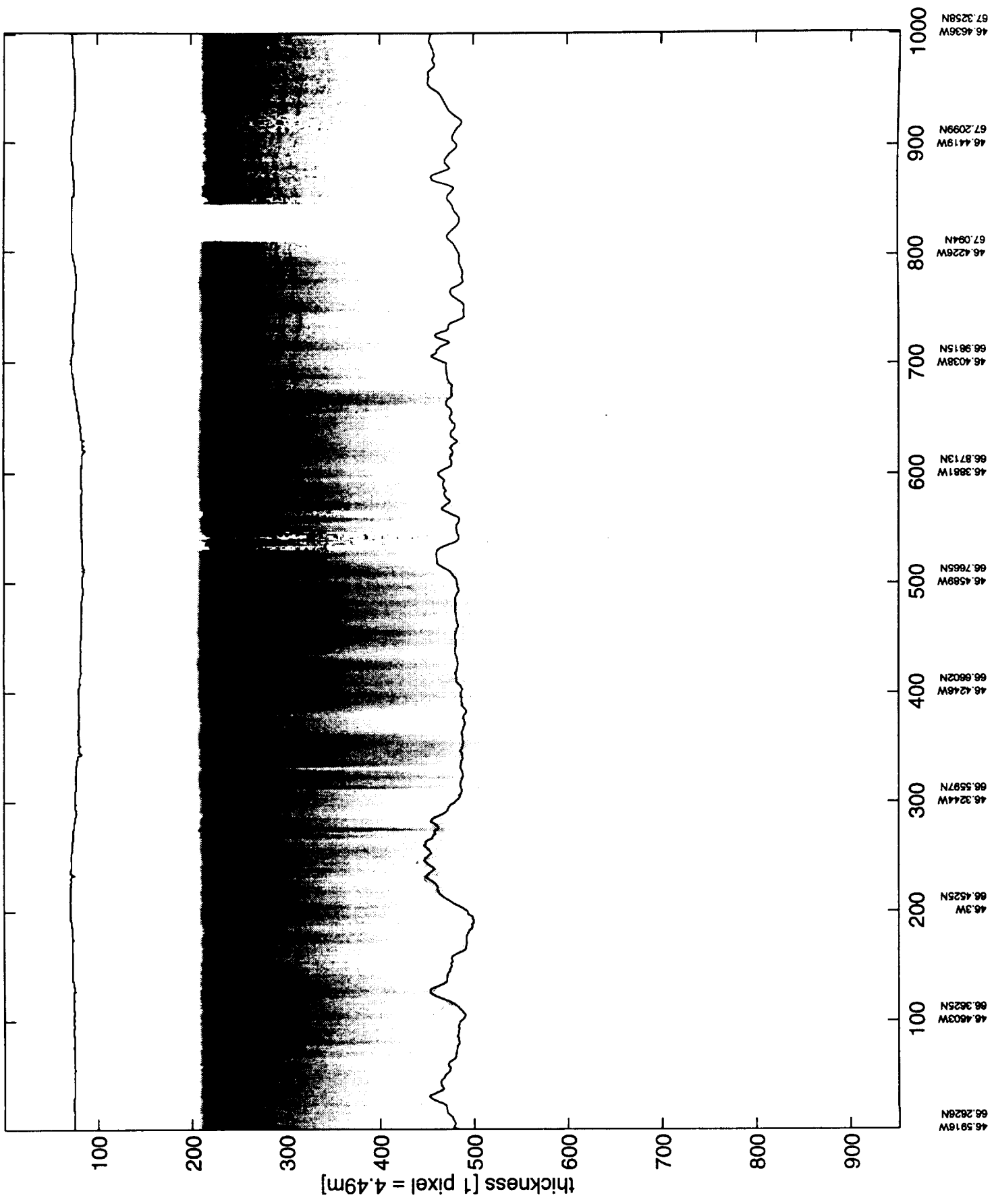


65.2061N
47.9192W
65.3081N
47.7809W
65.4118N
47.6393W
65.5153N
47.4967W
65.6219N
47.3558W
65.7291N
47.2395W
65.8363N
47.115W
65.9436N
46.9826W
66.0494N
46.854W
66.1558N
46.7237W
66.2614N
46.5923W

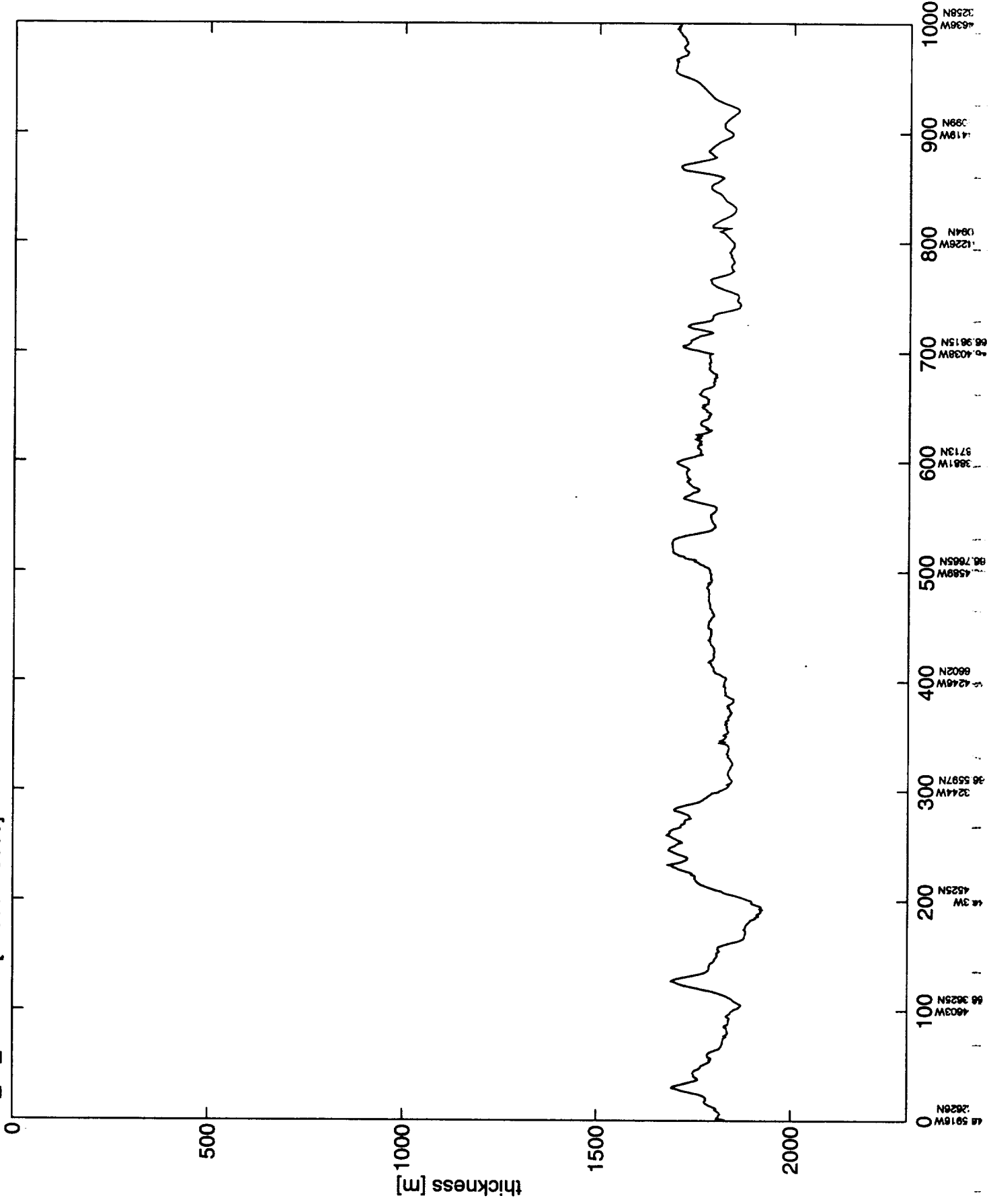
r_9x_4.1 <12> [11000-12000]



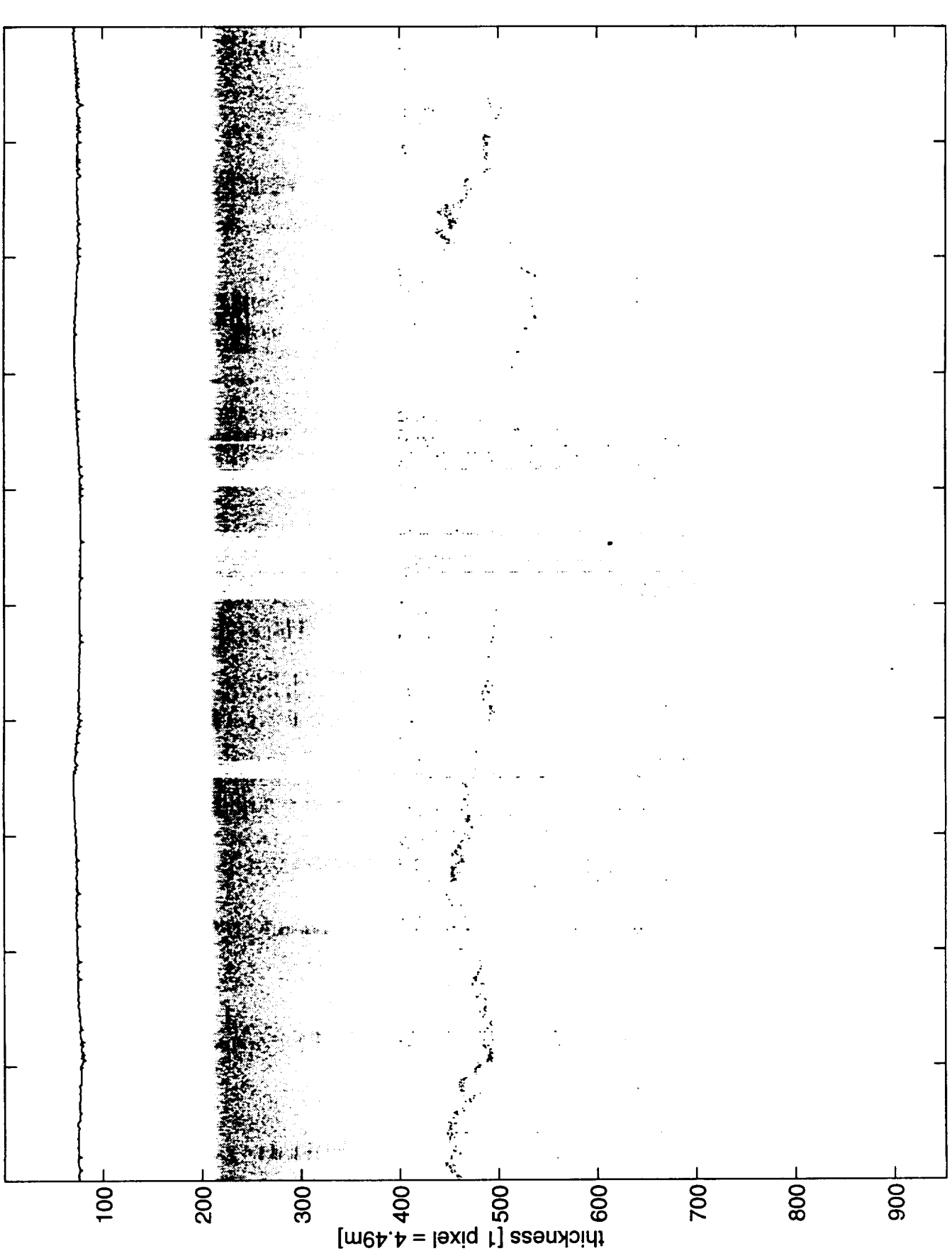
r_9x_4.1 <13> [12000-13000]



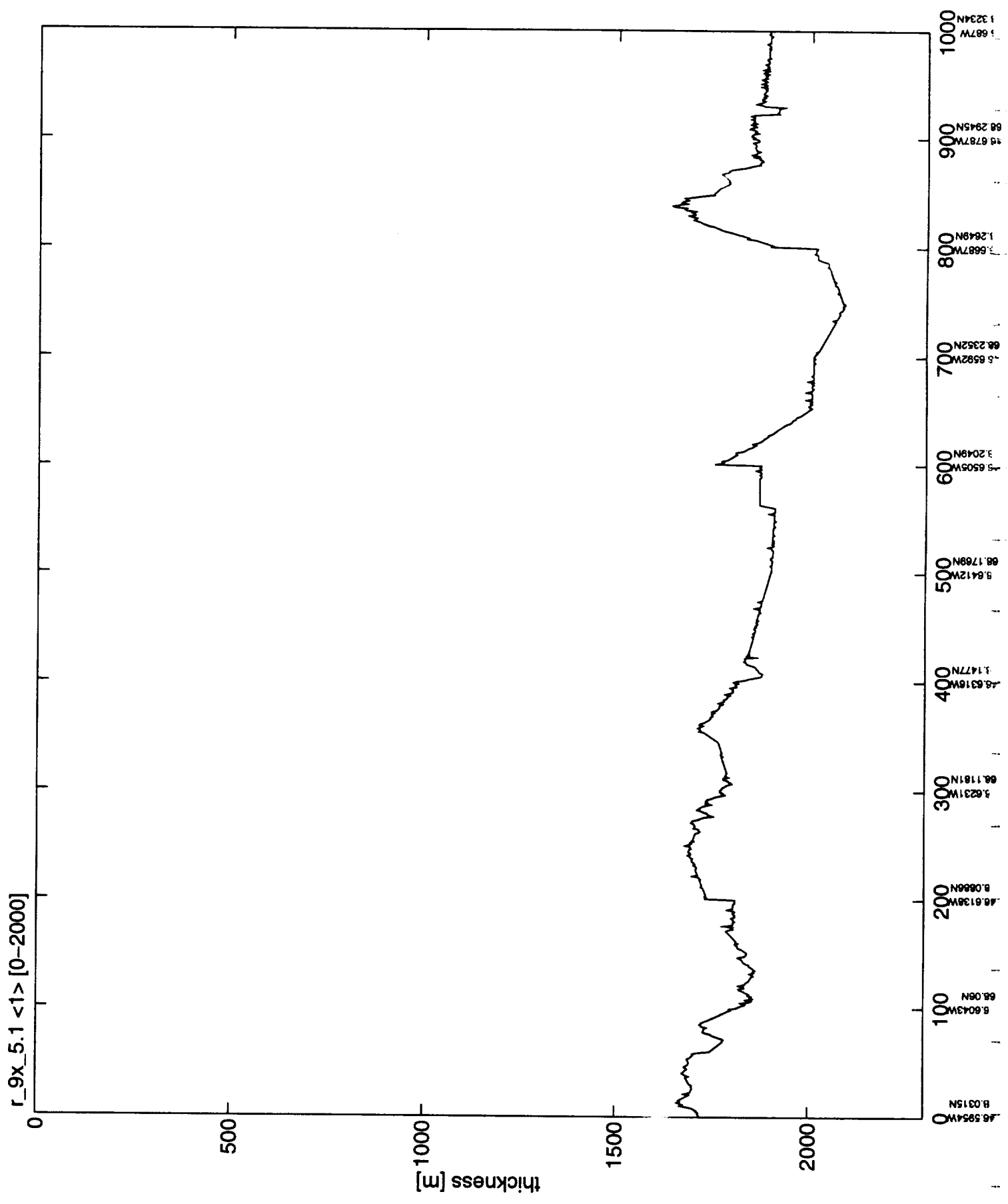
r_9x_4.1 <13> [12000-13000]



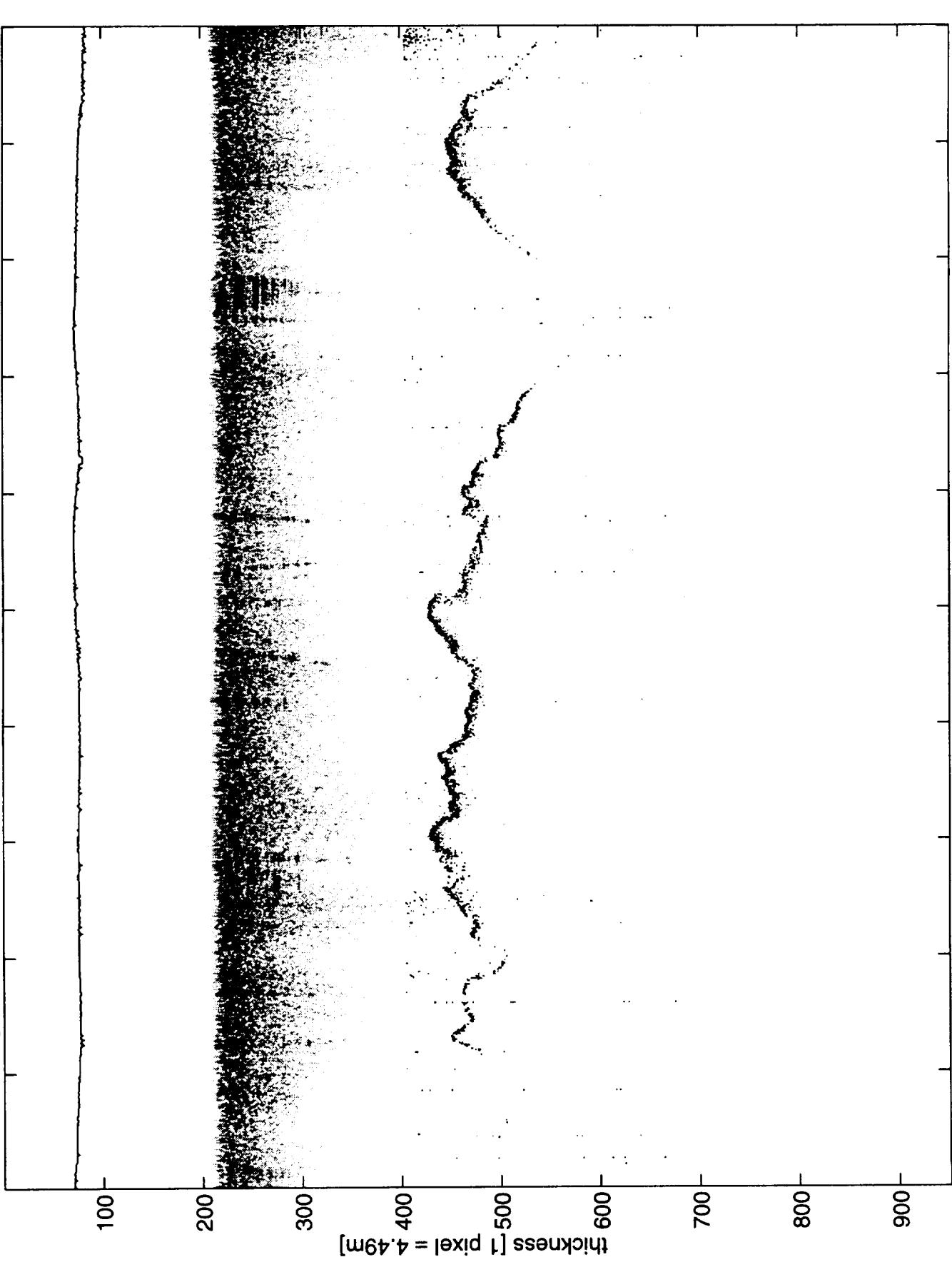
r_9x_5.1 <1> [0-2000]



46.5954W 68.0315N
46.6043W 68.06N
46.6136W 68.086N
46.6231W 68.1161N
46.6316W 68.1477N
46.6412W 68.1769N
46.6505W 68.2049N
46.6592W 68.2352N
46.6687W 68.2649N
46.6787W 68.2945N
46.687W 68.3234N

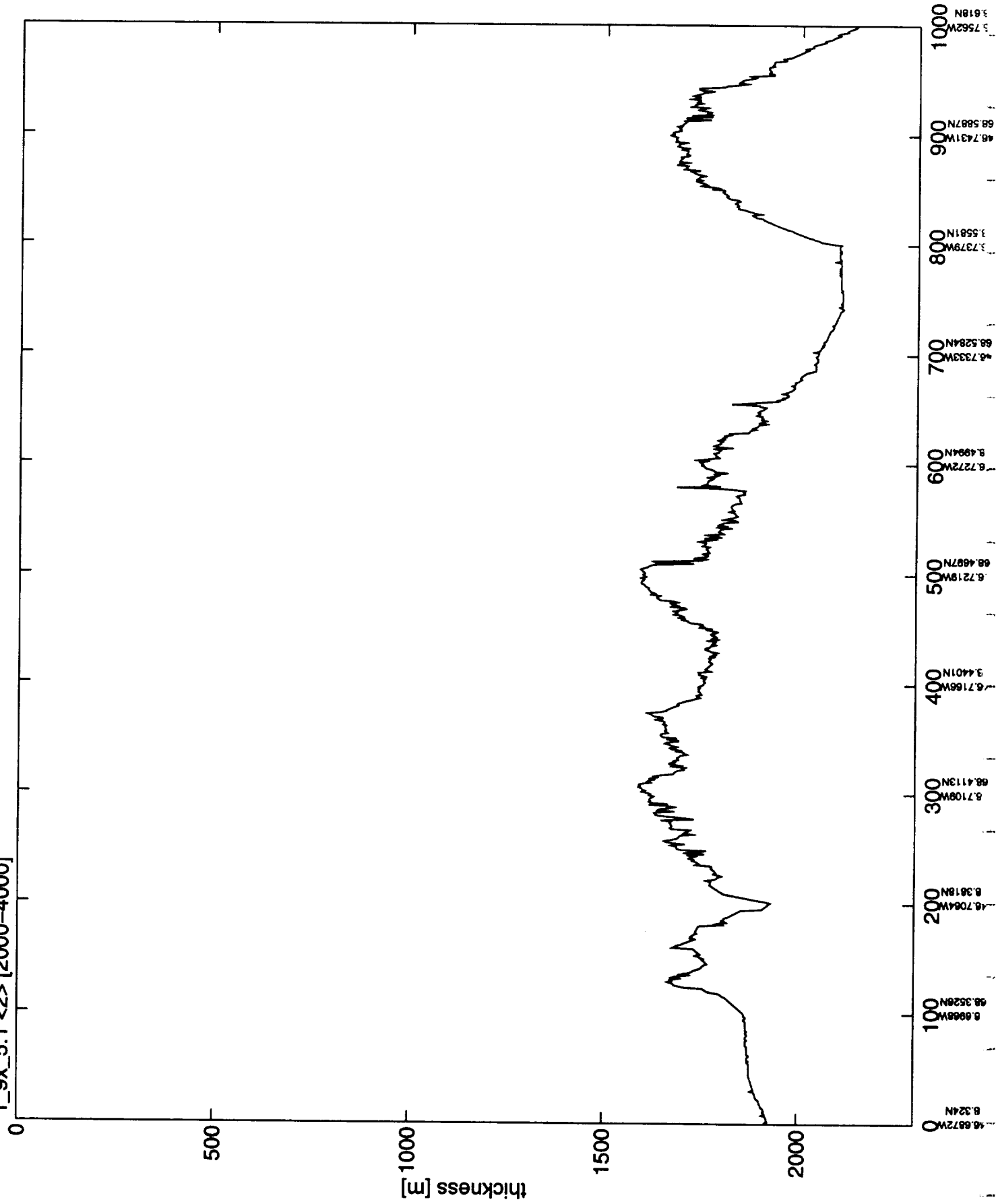


r_9x_5.1 <2> [2000-4000]

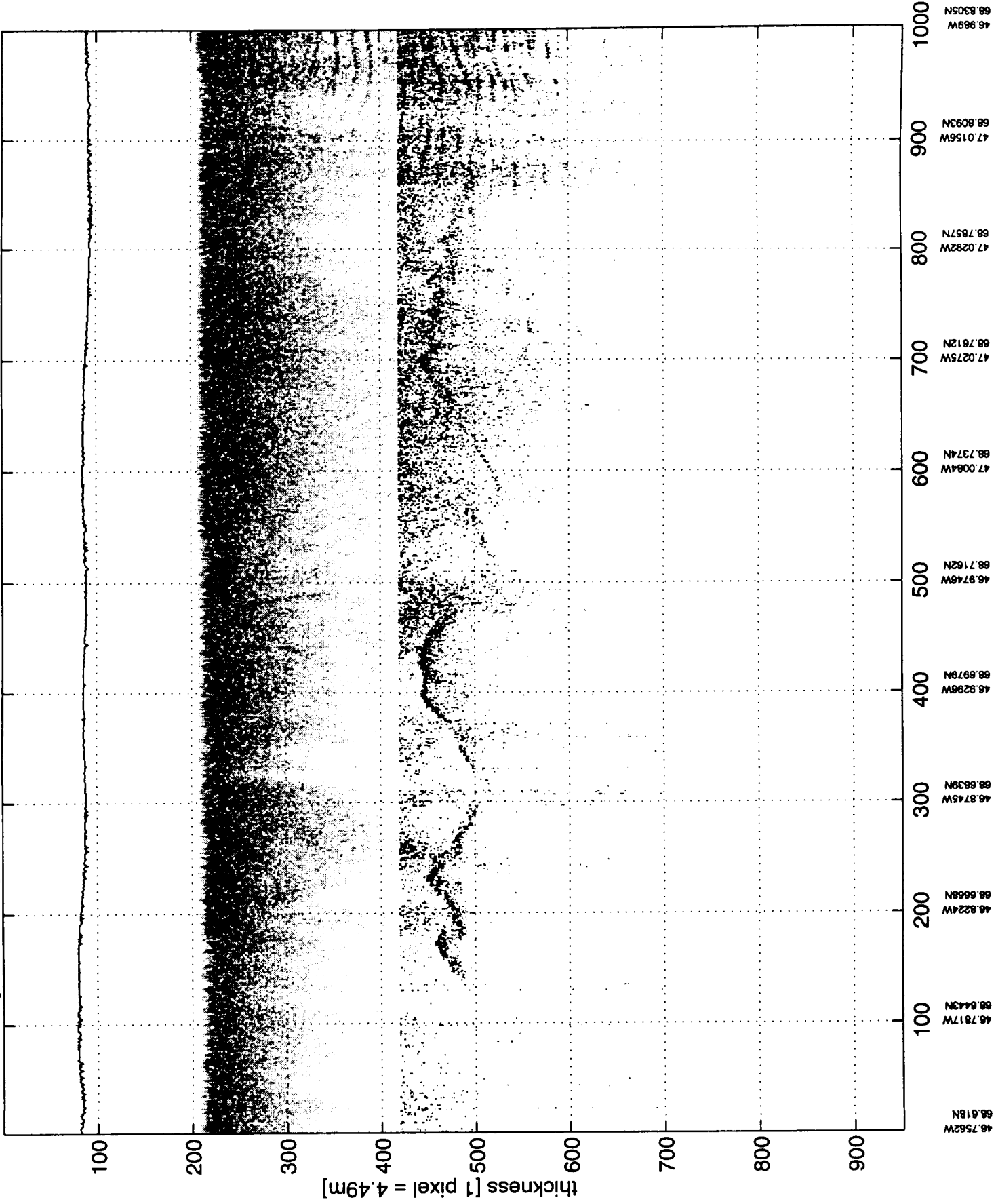


46.6872W
68.324N
46.6968W
68.3528N
46.7064W
68.3818N
46.7109W
68.413N
46.7166W
68.4401N
46.7219W
68.4687N
46.7272W
68.4984N
46.7333W
68.5284N
46.7379W
68.5581N
46.7431W
68.5887N
46.7562W
68.618N

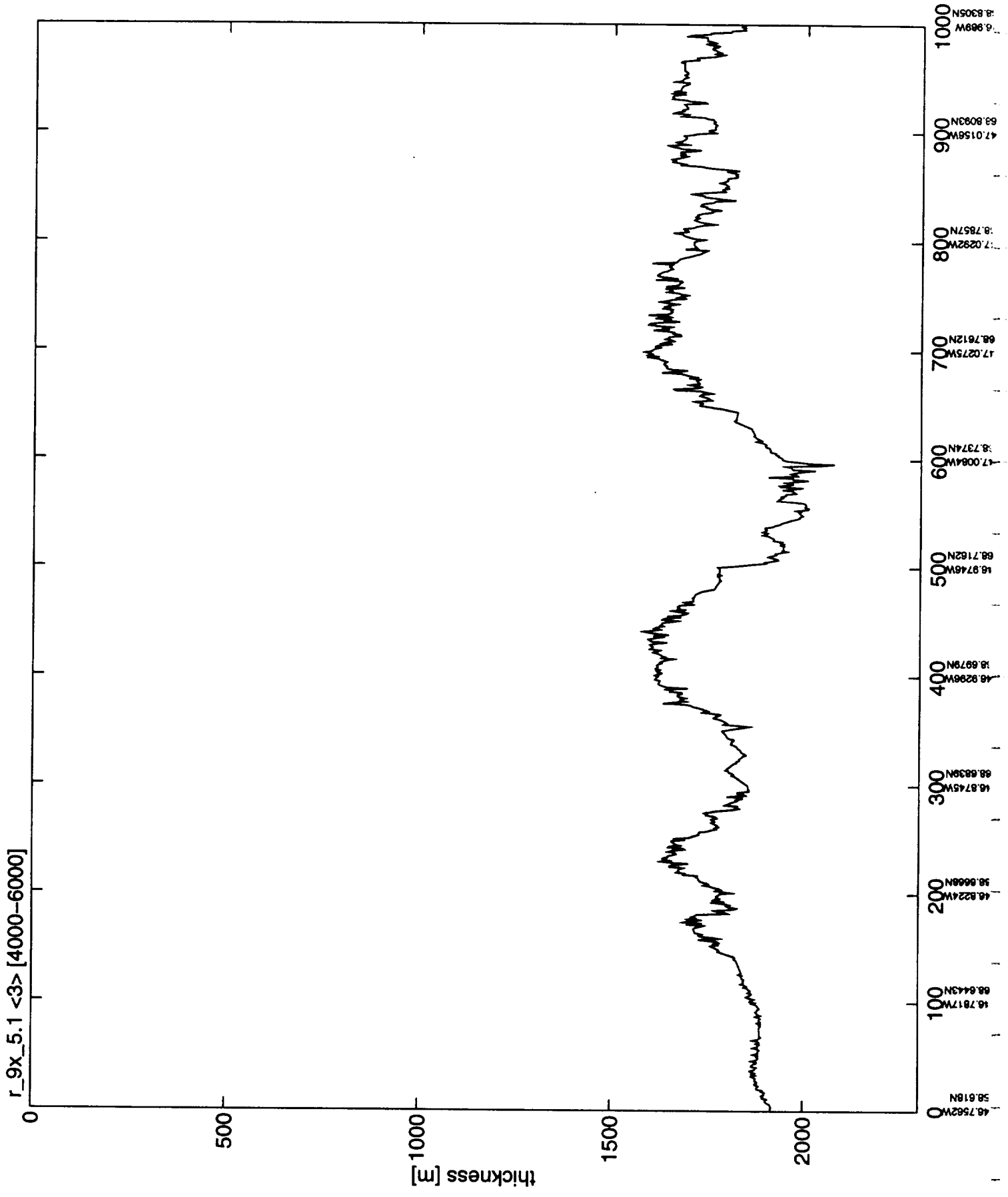
r_9x_5.1 <2> [2000-4000]



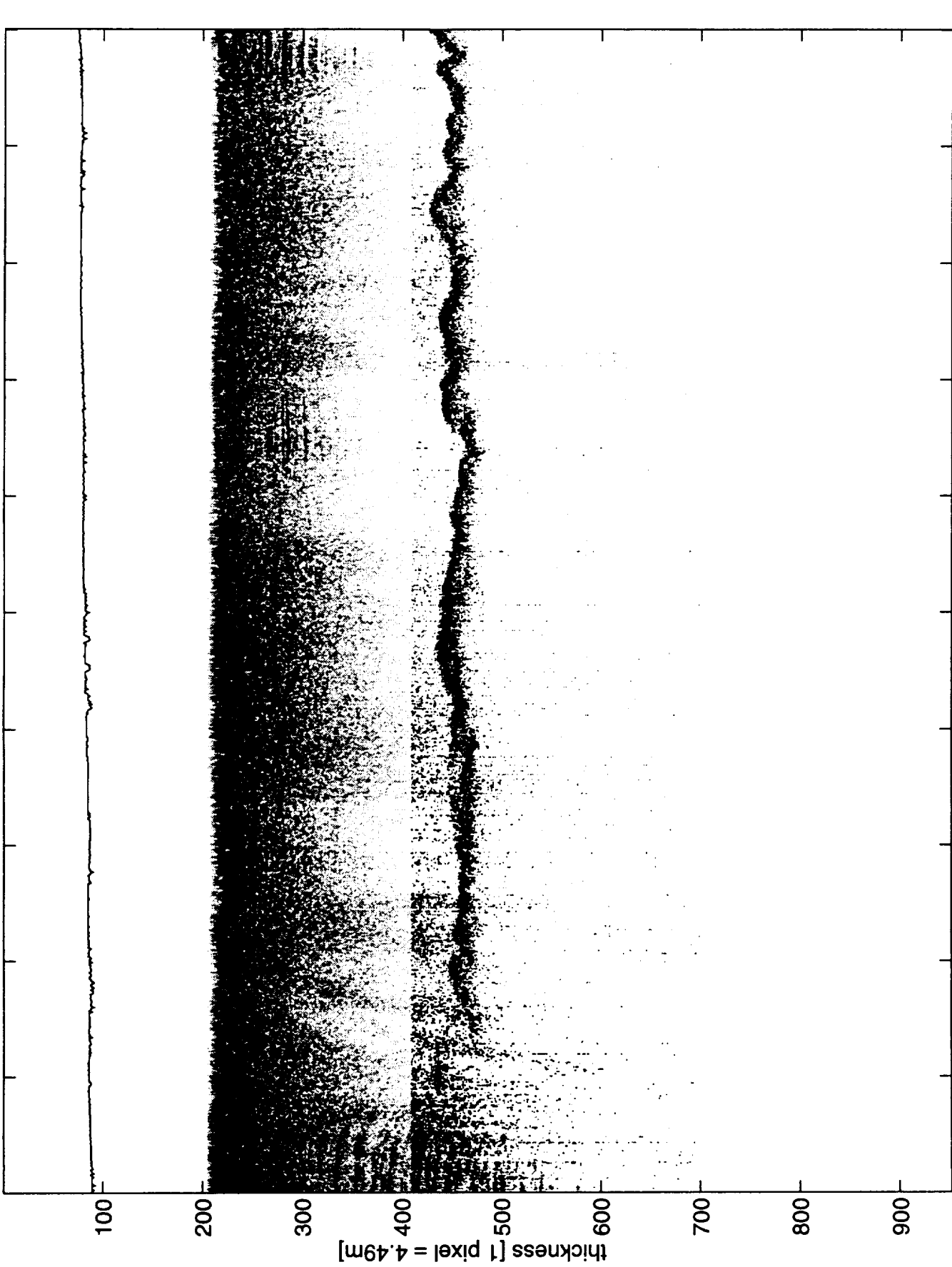
r_9x_5.1 <3> [4000-6000]



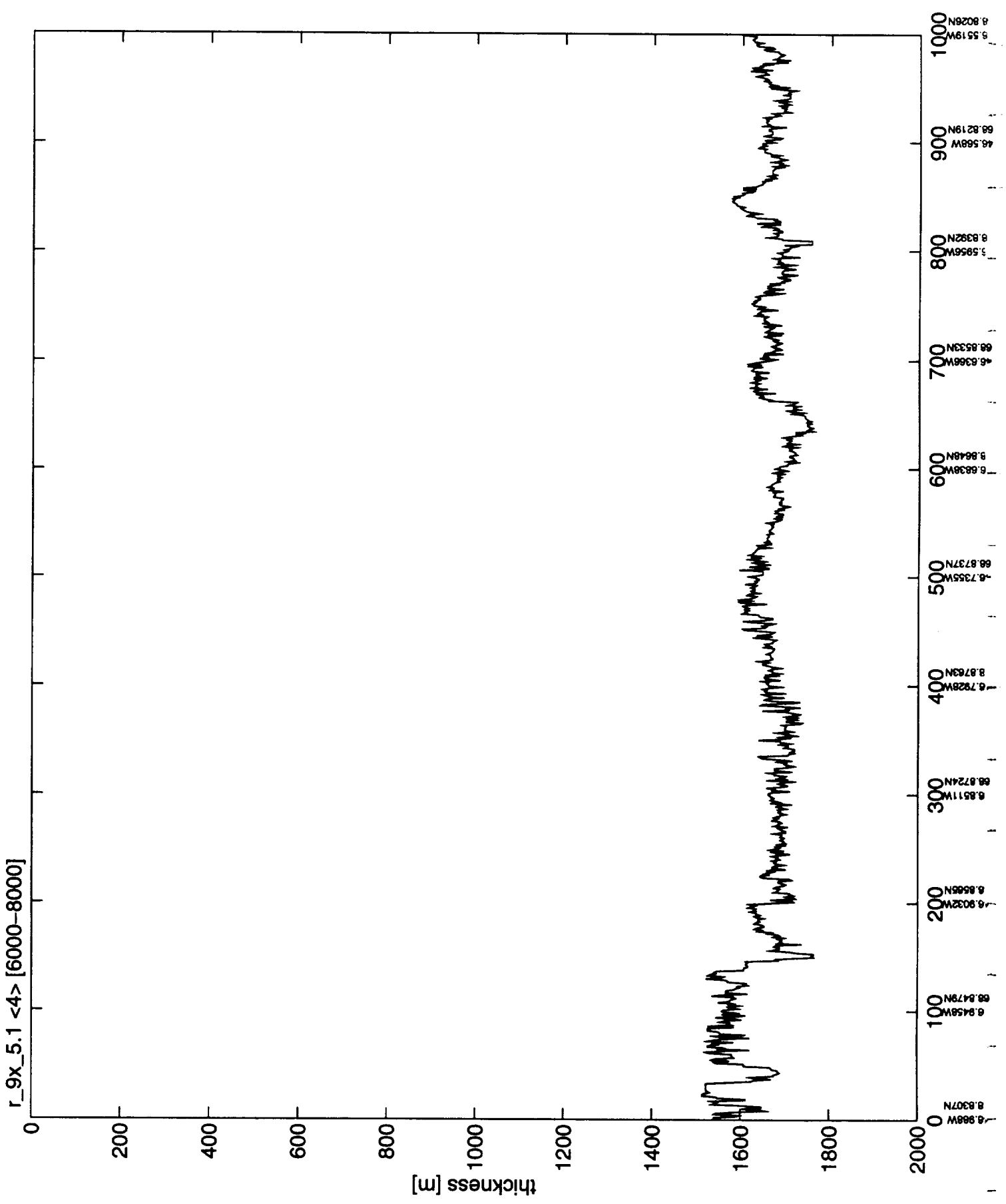
r_9x_5.1 <3> [4000-6000]



r_9x_5.1 <4> [6000-8000]

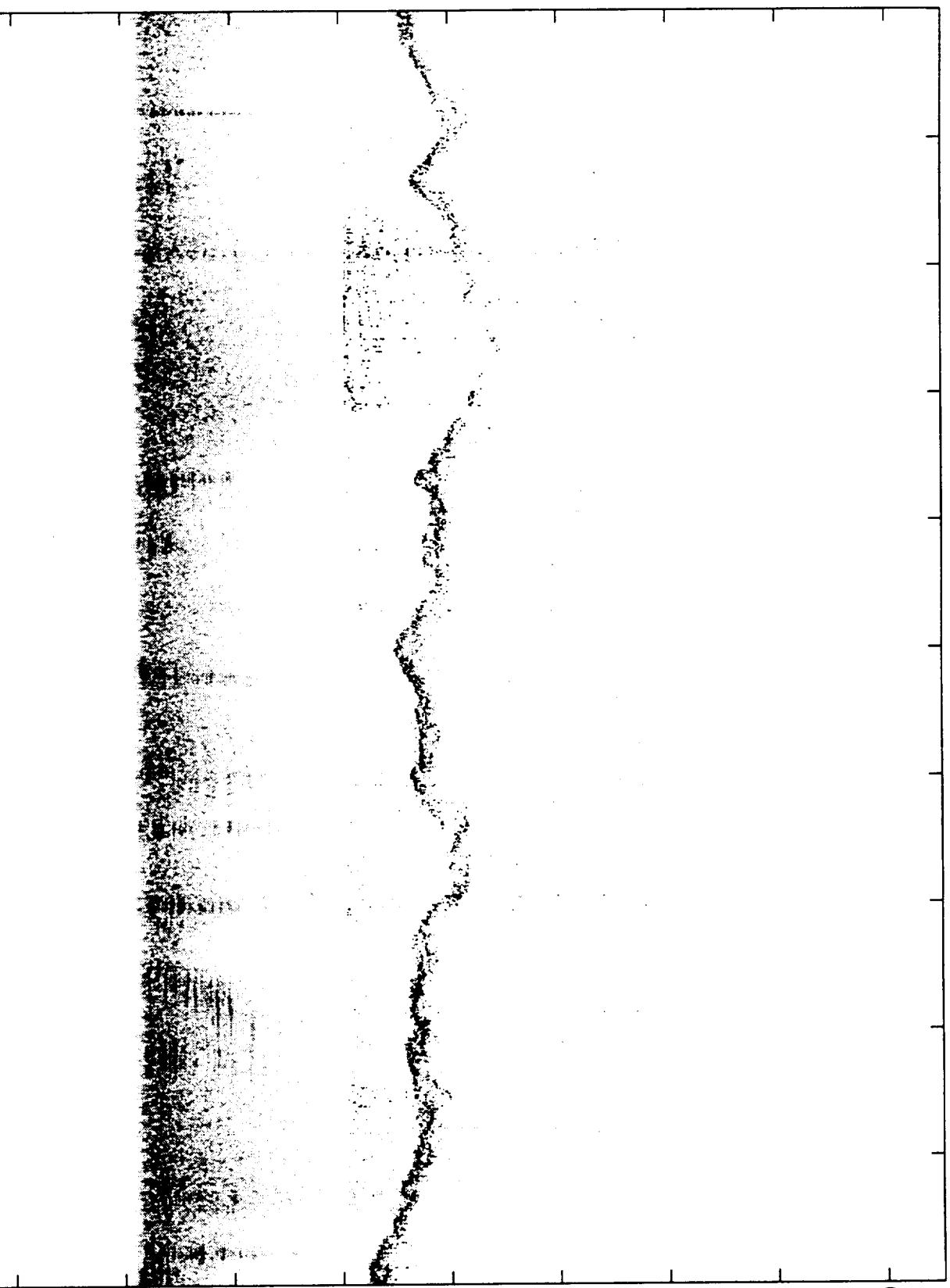


46.988W 68.8307N
46.9458W 68.8479N
46.9032W 68.8585N
46.8511W 68.8724N
46.7928W 68.8793N
46.7355W 68.8737N
46.6838W 68.8648N
46.6365W 68.8533N
46.5956W 68.8392N
46.568W 68.8219N
46.5519W 68.8026N



r_9x_5.1 <5> [8000-10000]

thickness [1 pixel = 4.9m]



46.5519W

68.8026N

46.5427W

68.7817N

46.5474W

68.7611N

46.5609W

68.7409N

46.5754W

68.7204N

46.5898W

68.6993N

46.6059W

68.6779N

46.6296W

68.6561N

46.6666W

68.6354N

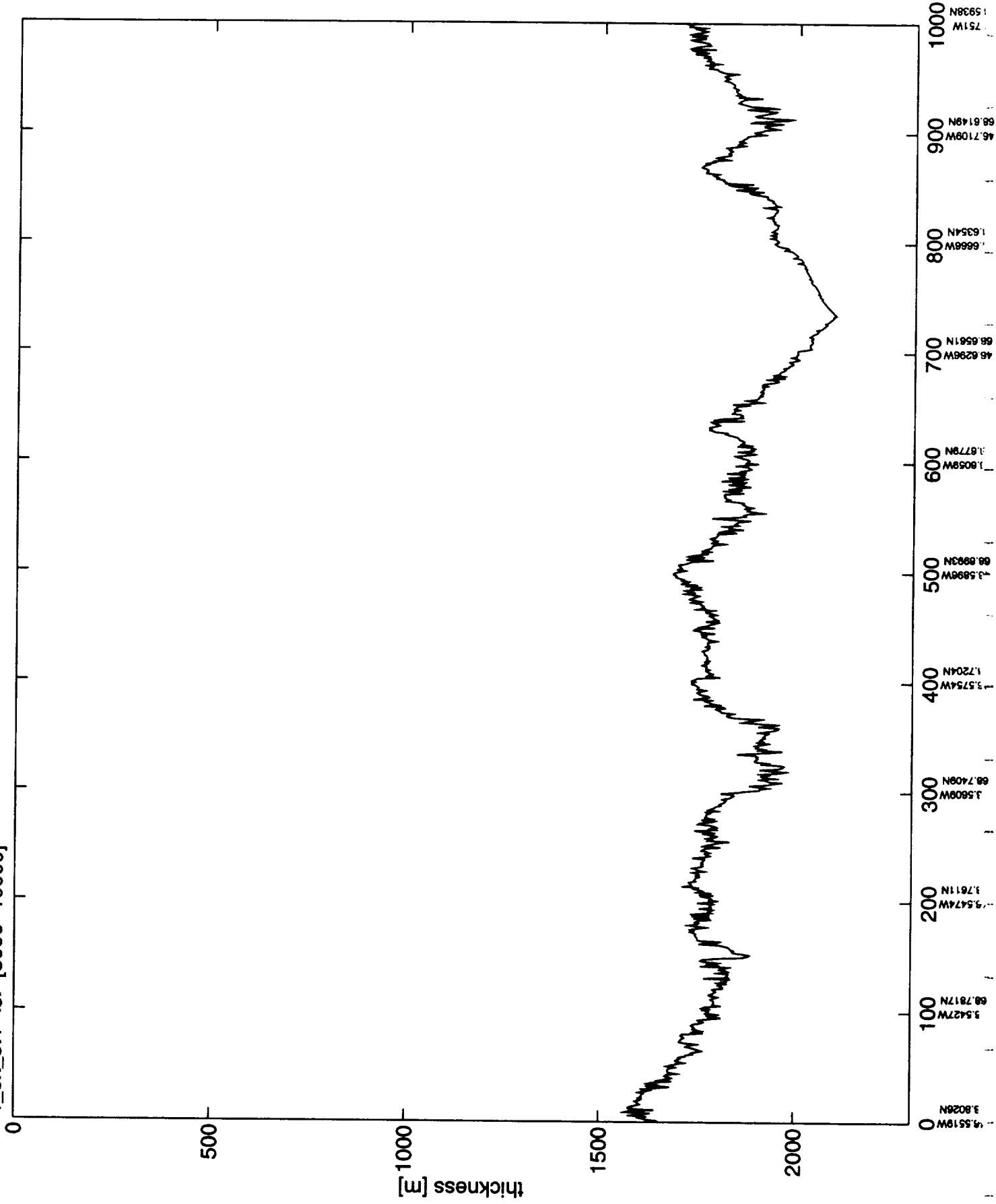
46.7109W

68.6149N

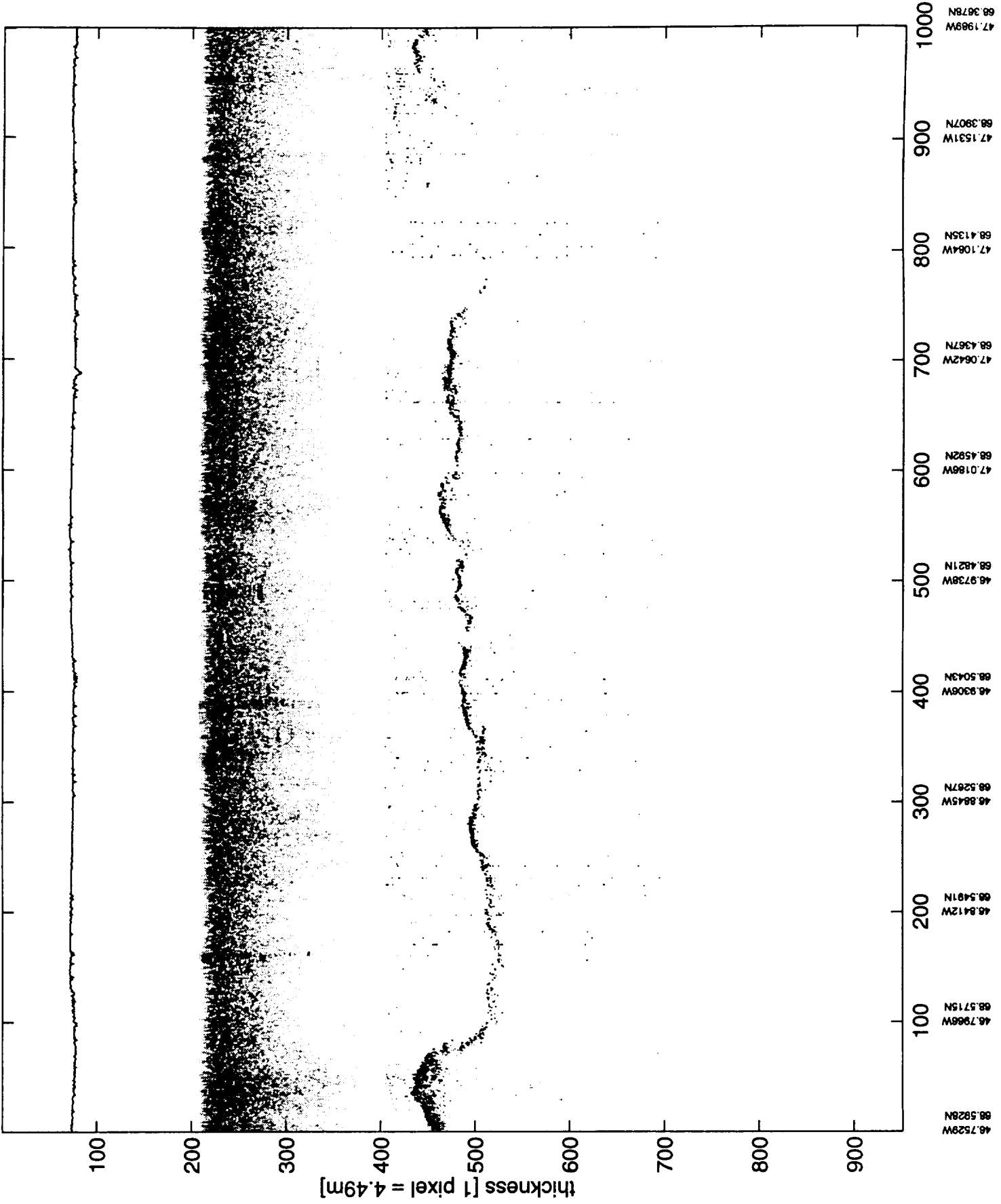
46.7511W

68.5938N

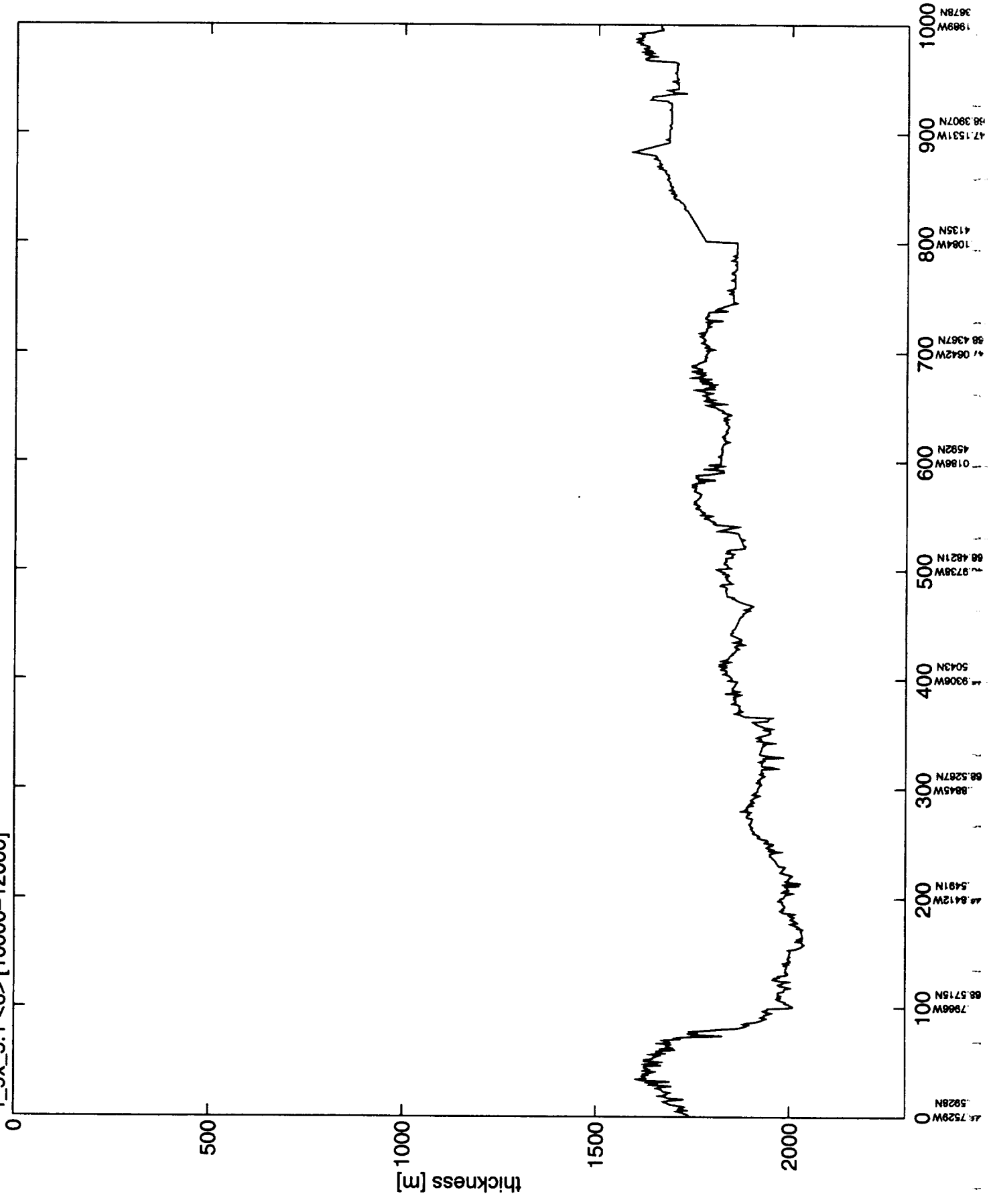
r_9x_5.1 <5> [8000-10000]



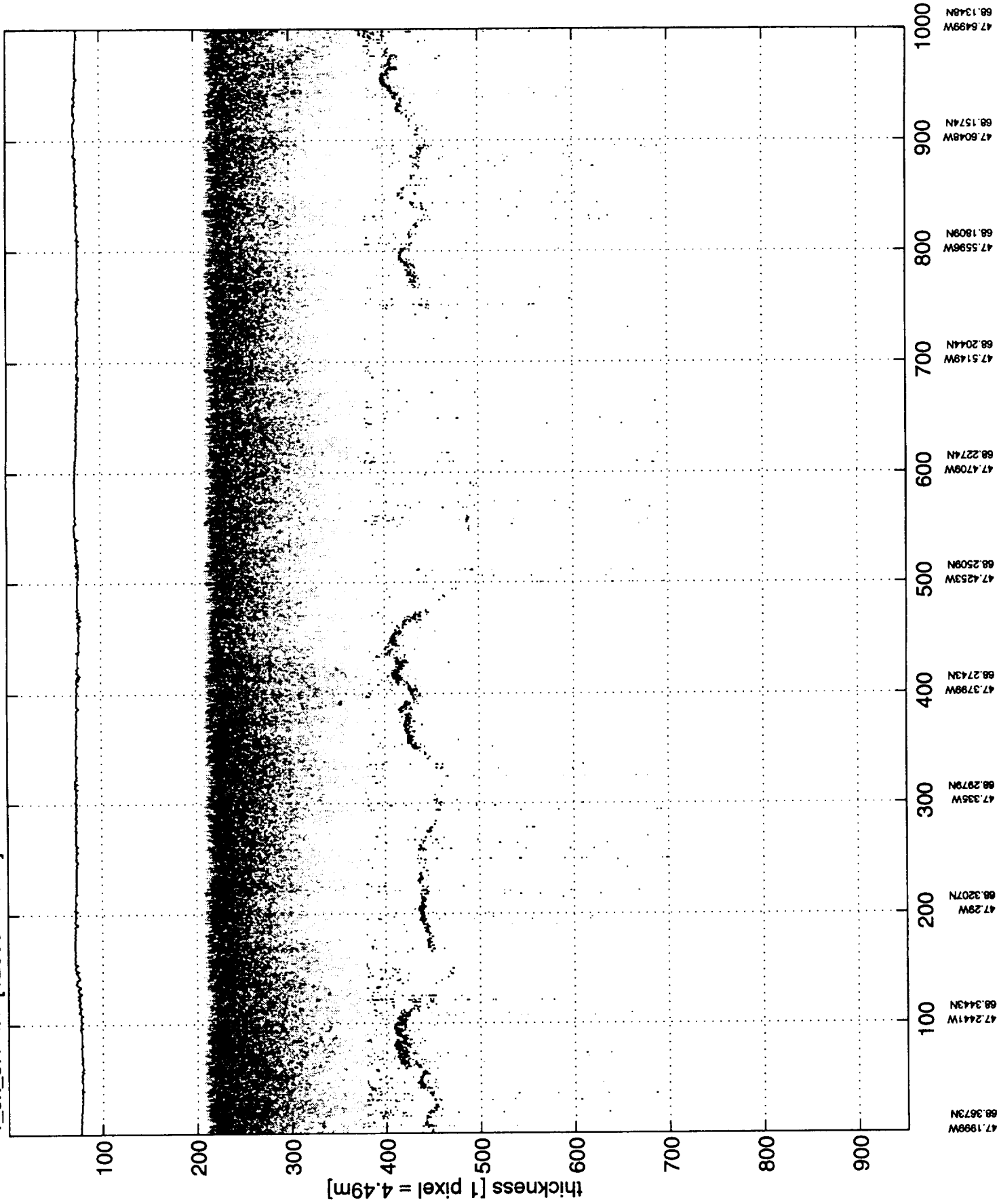
r_9x_5.1 <6> [10000-12000]

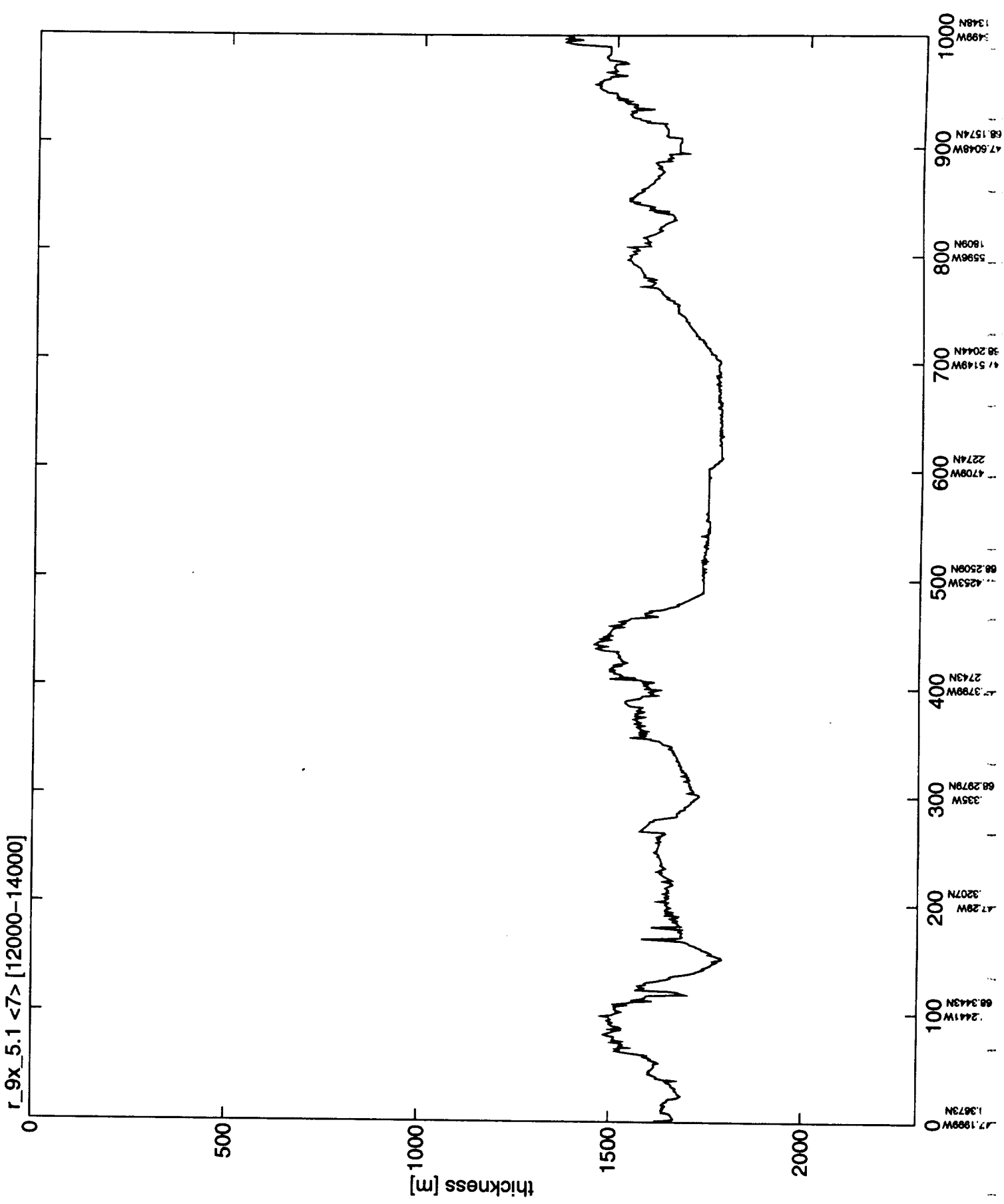


r_9x_5.1 <6> [10000-12000]

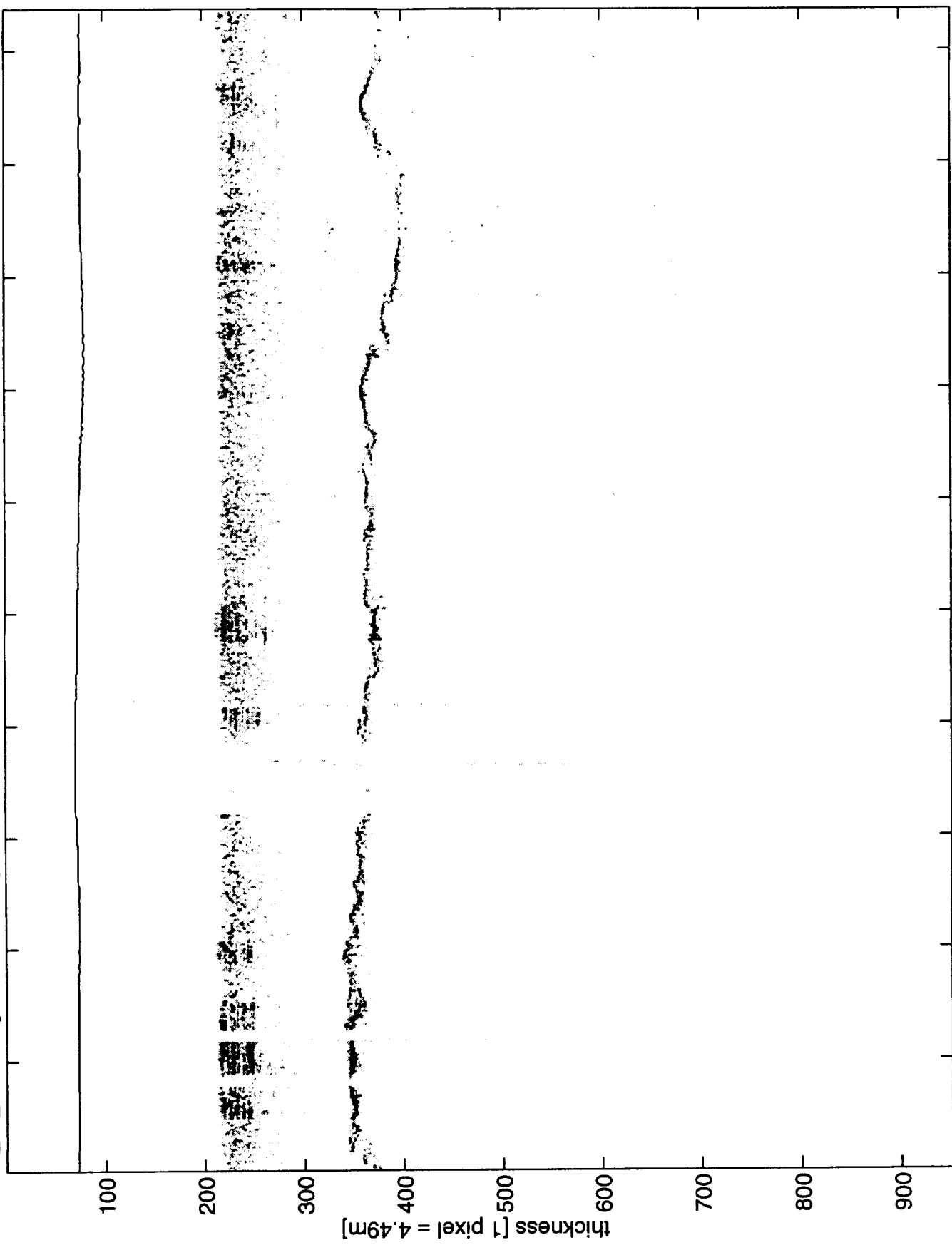


r_9x_5.1 <7> [12000-14000]



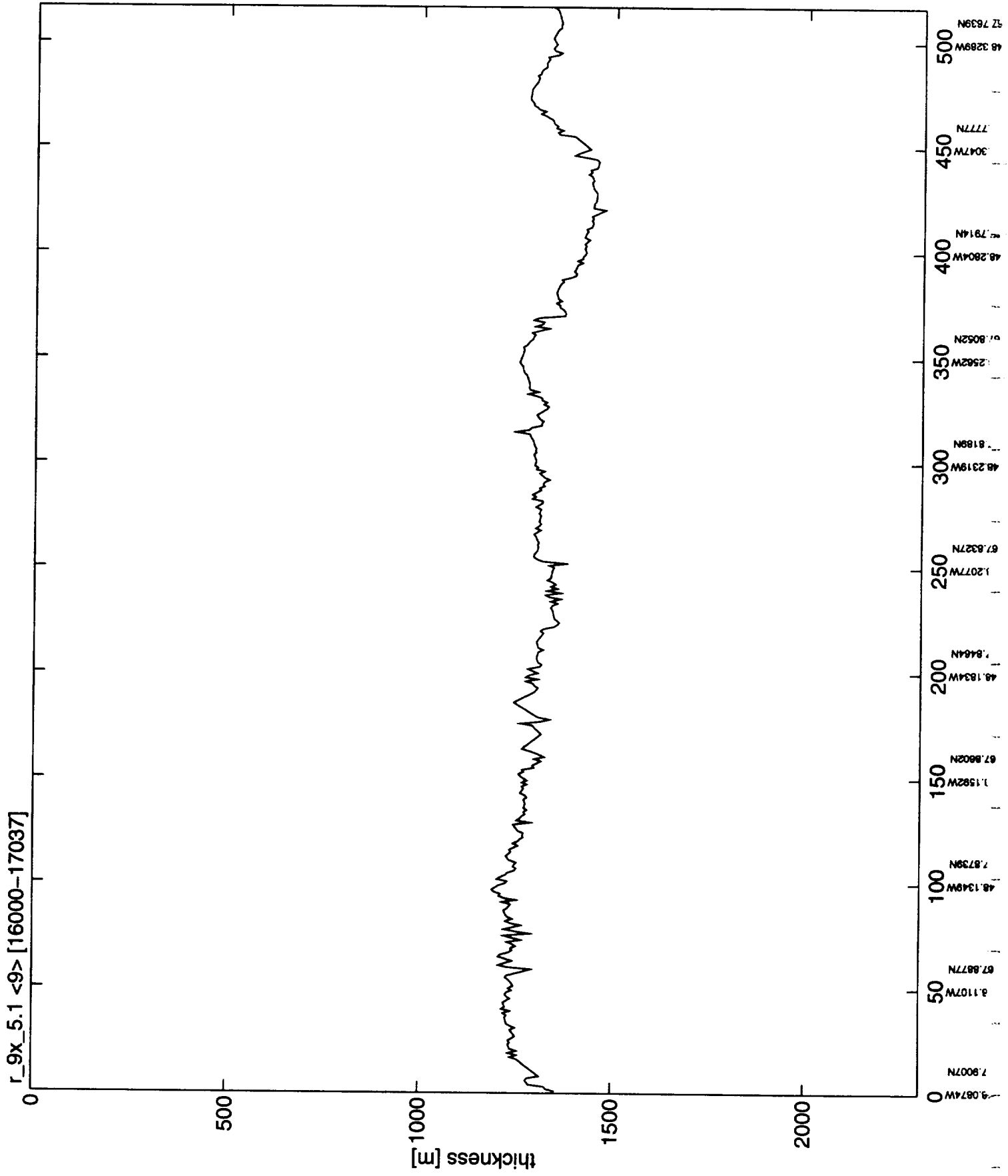


r_9x_5.1 <9> [16000-17037]



48.0874W 67.9007N
48.1107W 67.8877N
48.1349W 67.8739N
48.1592W 67.8602N
48.1834W 67.8464N
48.2077W 67.8327N
48.2319W 67.8189N
48.2562W 67.8052N
48.2804W 67.7914N
48.3047W 67.7777N
48.3289W 67.7639N

r_9x_5.1 <9> [16000-17037]



r_9x_6.1 <1> [0-2000]

100

200

300

400

500

600

700

800

900

thickness [1 pixel = 4.49m]

100

200

300

400

500

600

700

800

900

48.4558W
67.7008N

48.6364W
67.6118N

48.6373W
67.6108N

48.5949W
67.634N

48.6377W
67.6102N

48.6776W
67.5872N

48.5949W
67.634N

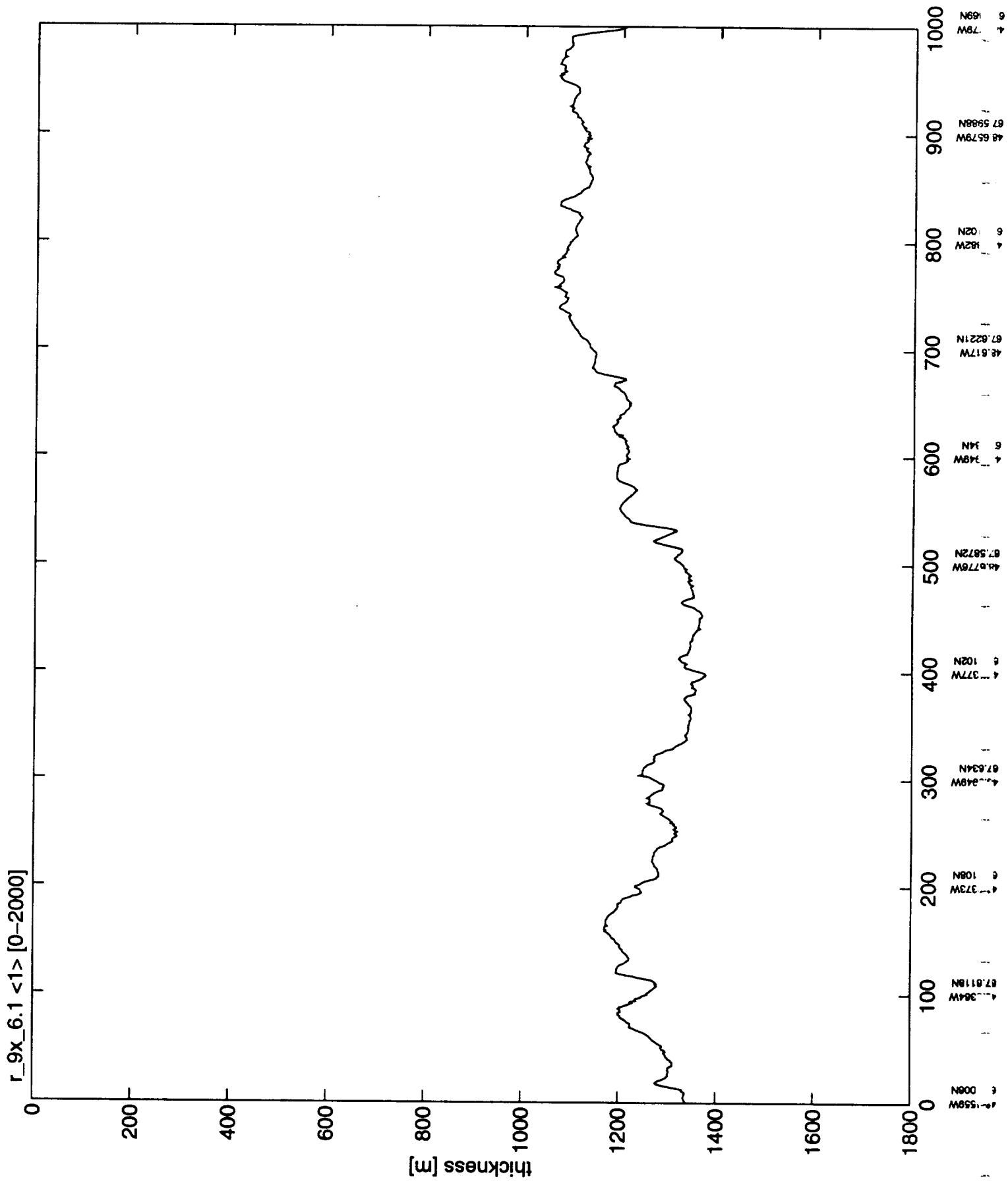
48.617W
67.6221N

48.6382W
67.6102N

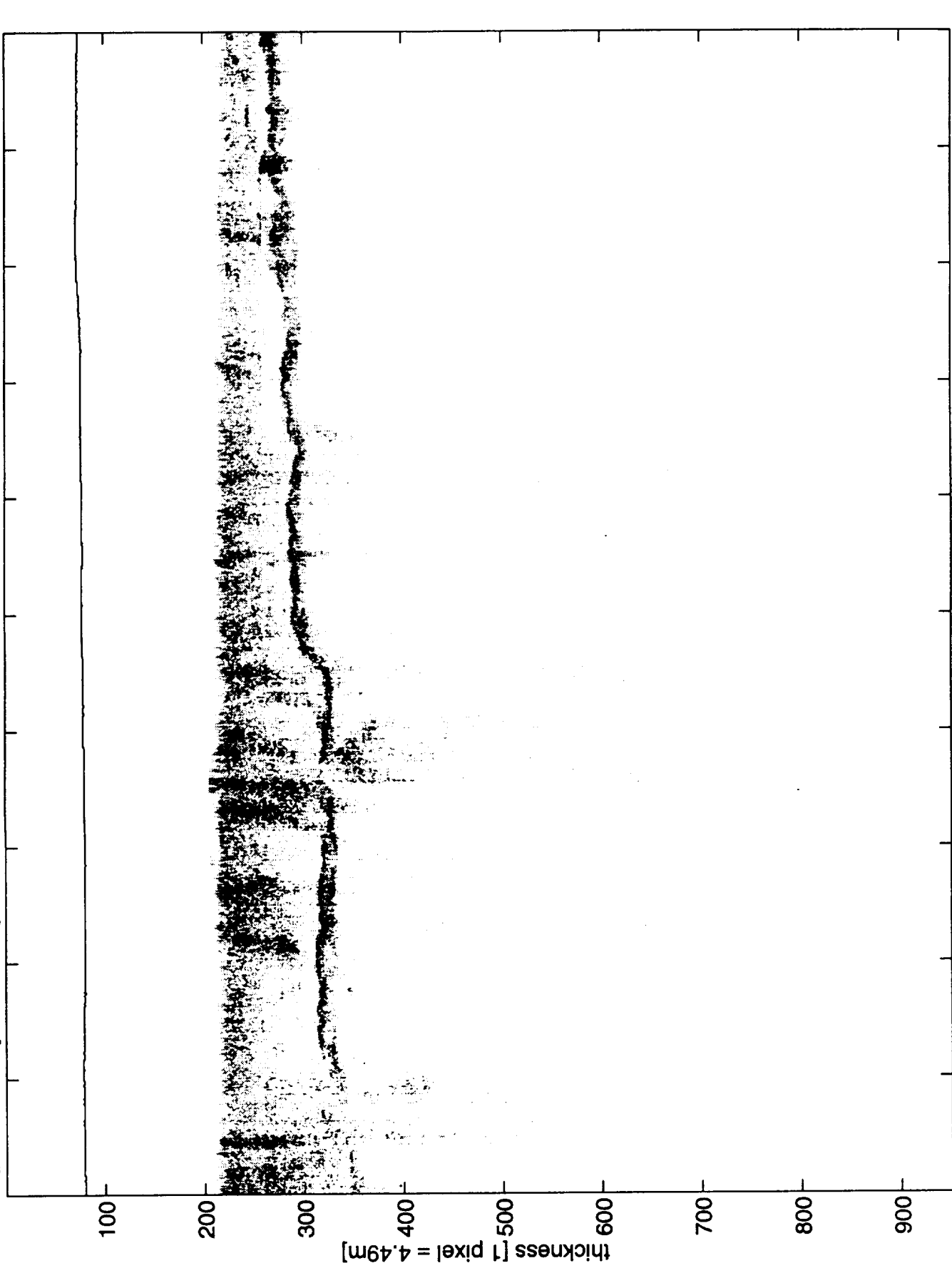
48.6579W
67.5988N

48.679W
67.5869N

r_9x_6.1 <1> [0-2000]

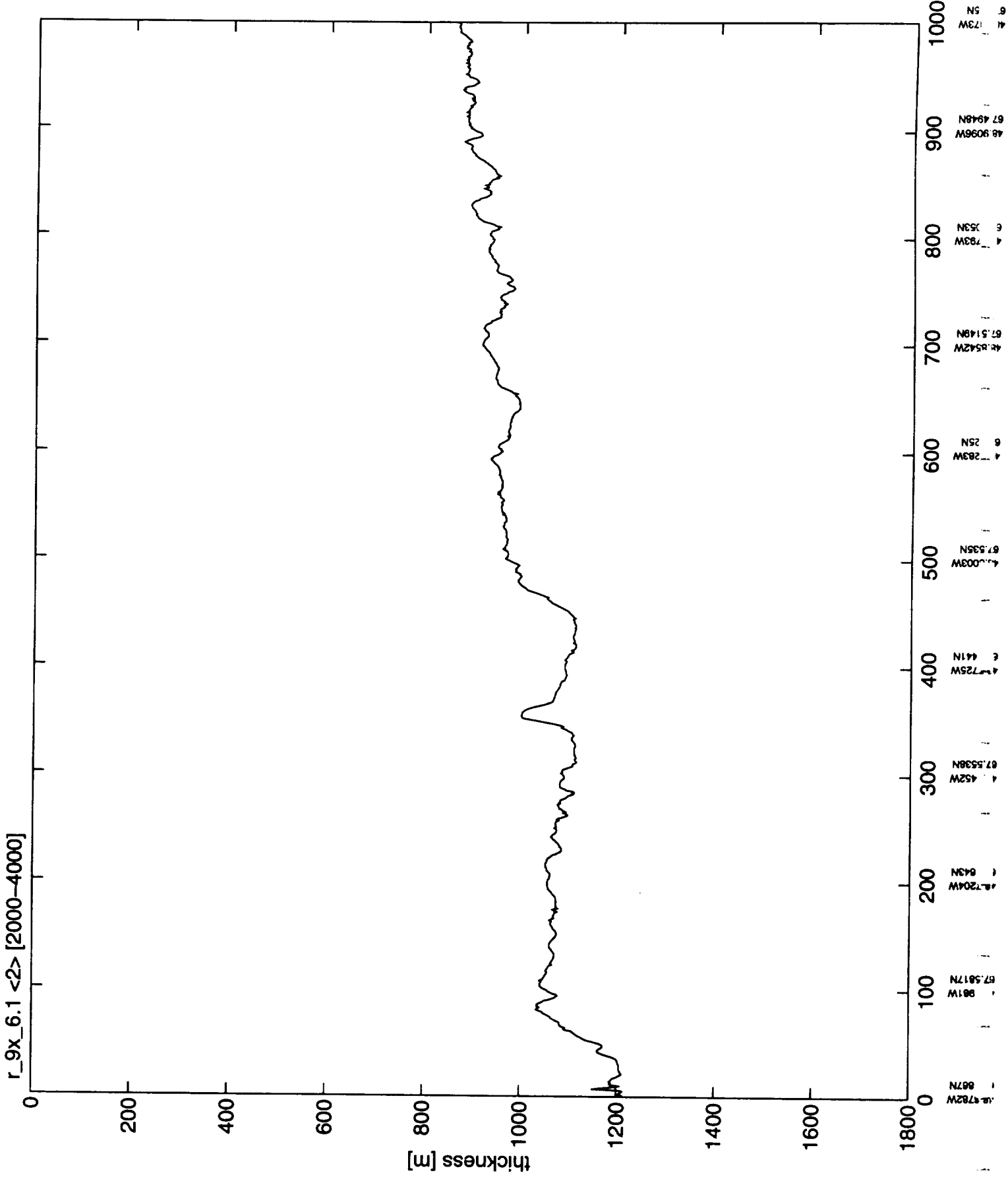


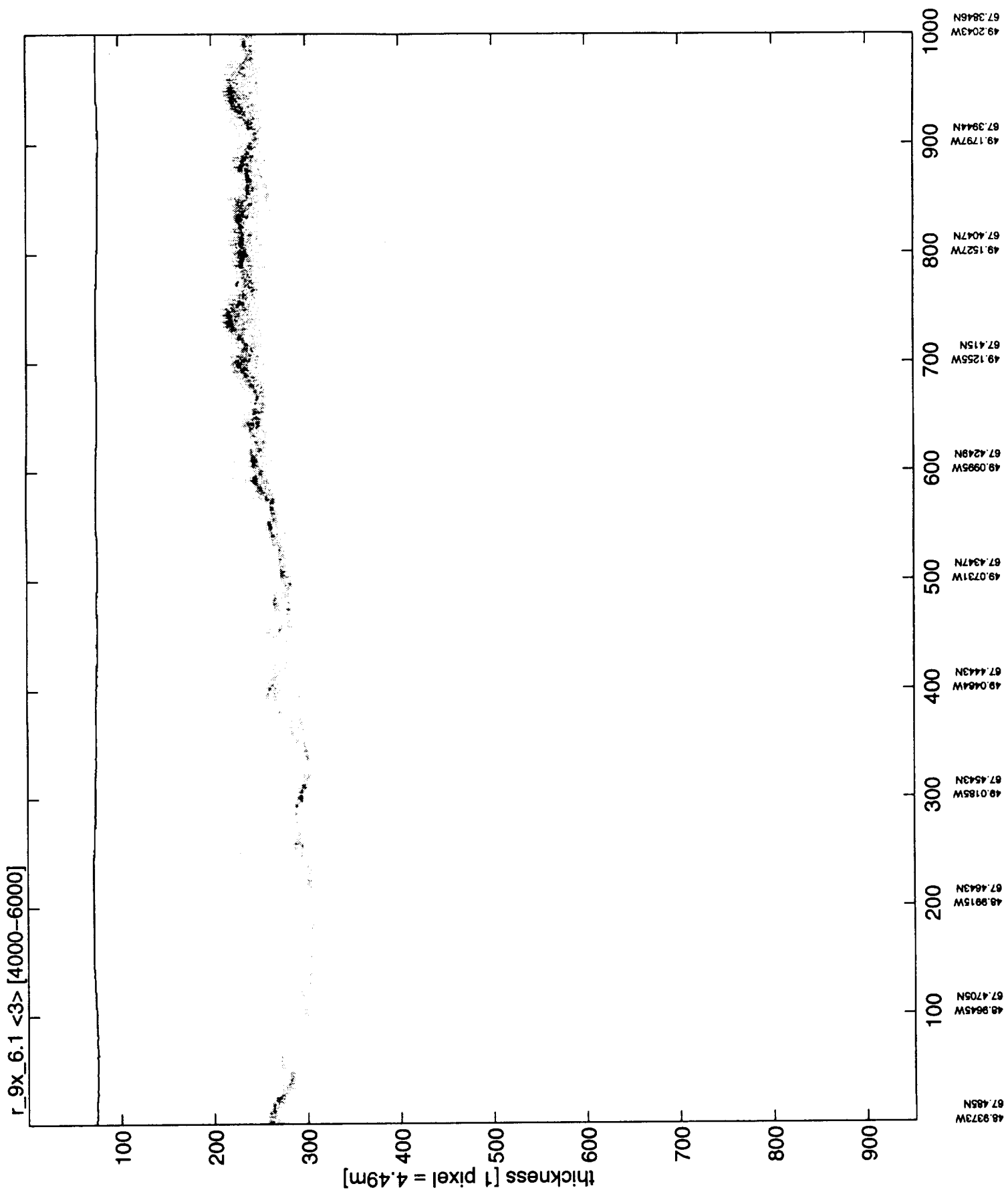
r_9x_6.1 <2> [2000-4000]



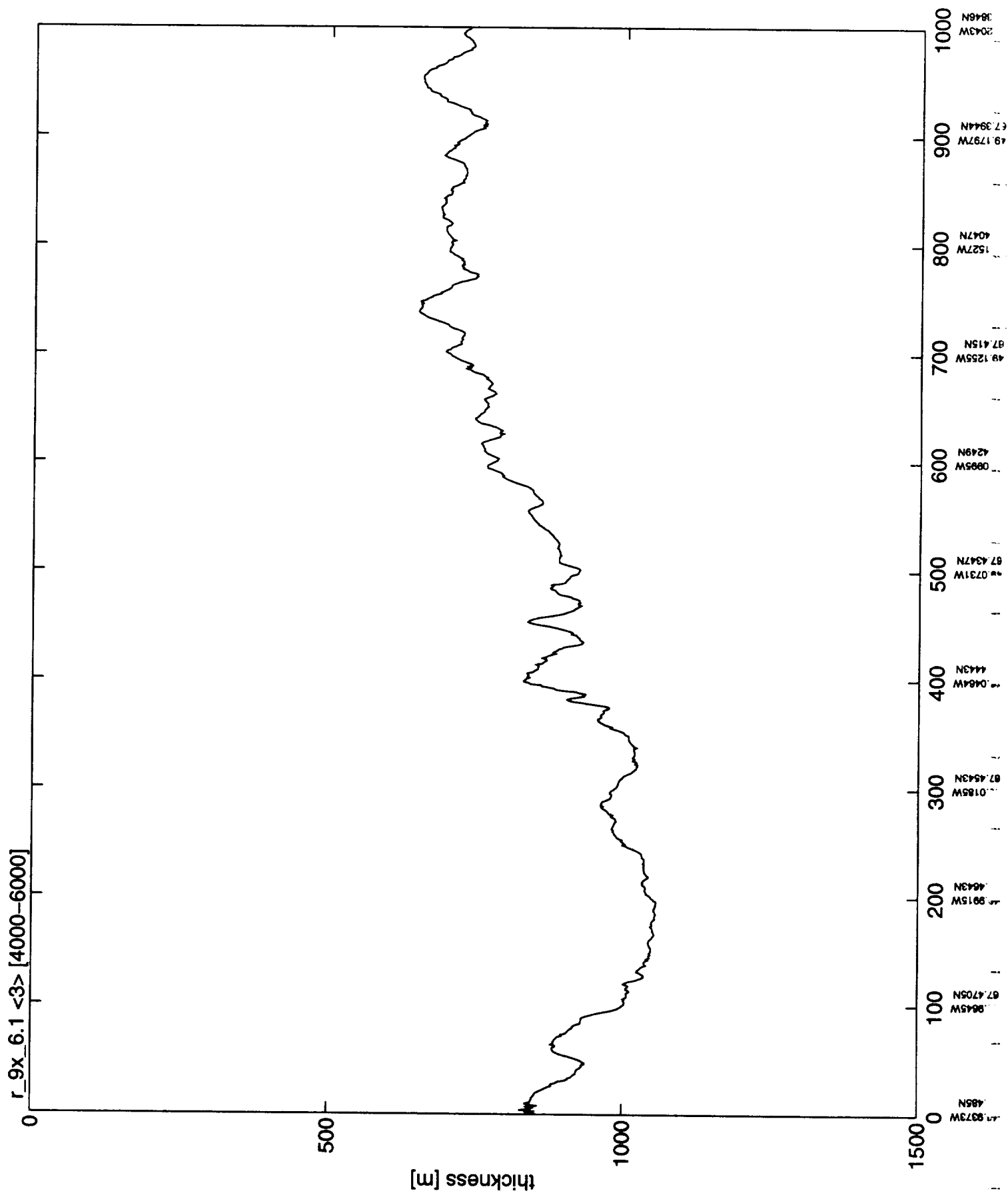
48.6752W 67.587N
48.6981W 67.5817N
48.7204W 67.5643N
48.7452W 67.5538N
48.7725W 67.5441N
48.8003W 67.535N
48.8263W 67.525N
48.8542W 67.5149N
48.8793W 67.5053N
48.9096W 67.4948N
48.9373W 67.485N

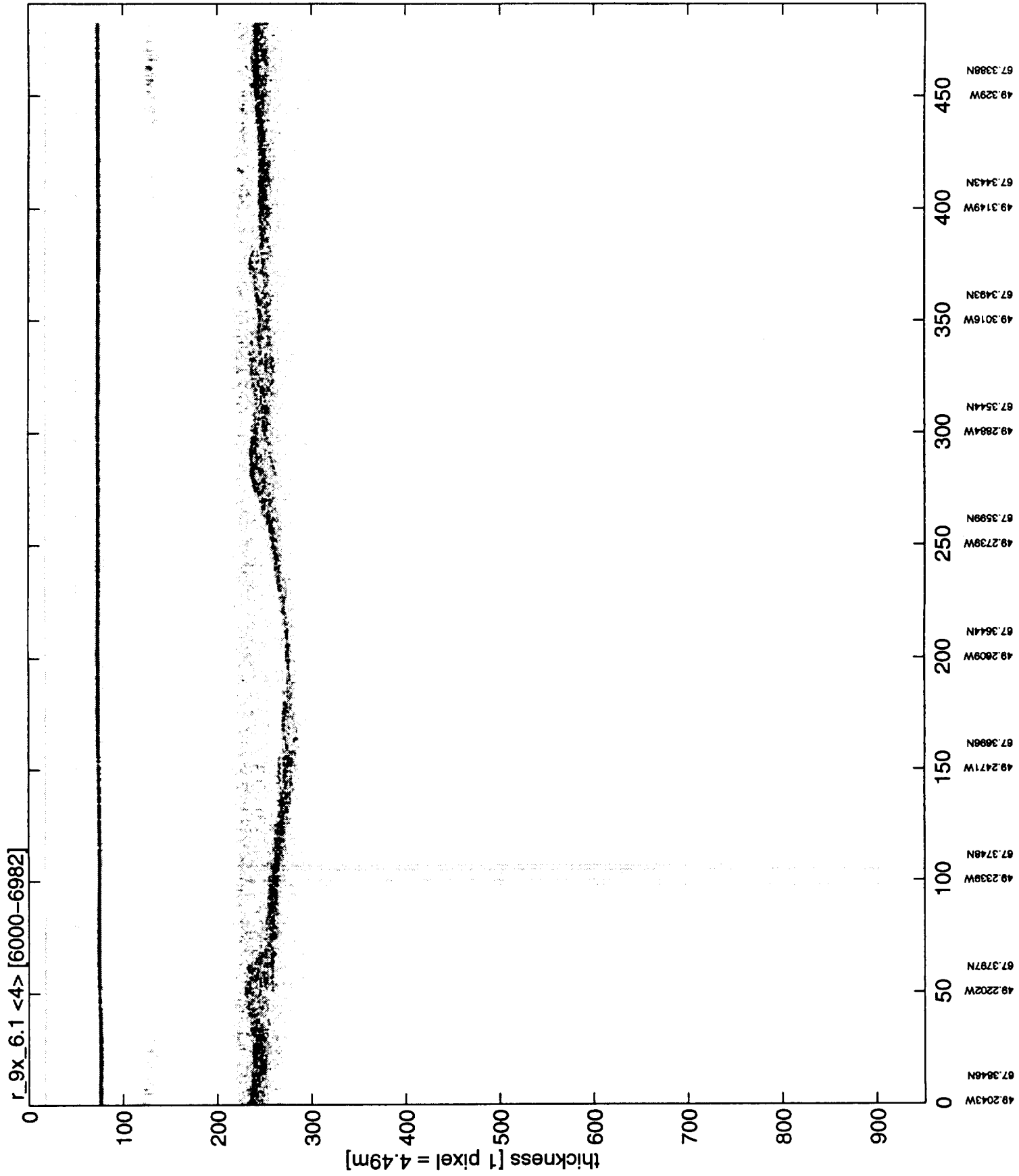
r_9x_6.1 <2> [2000-4000]

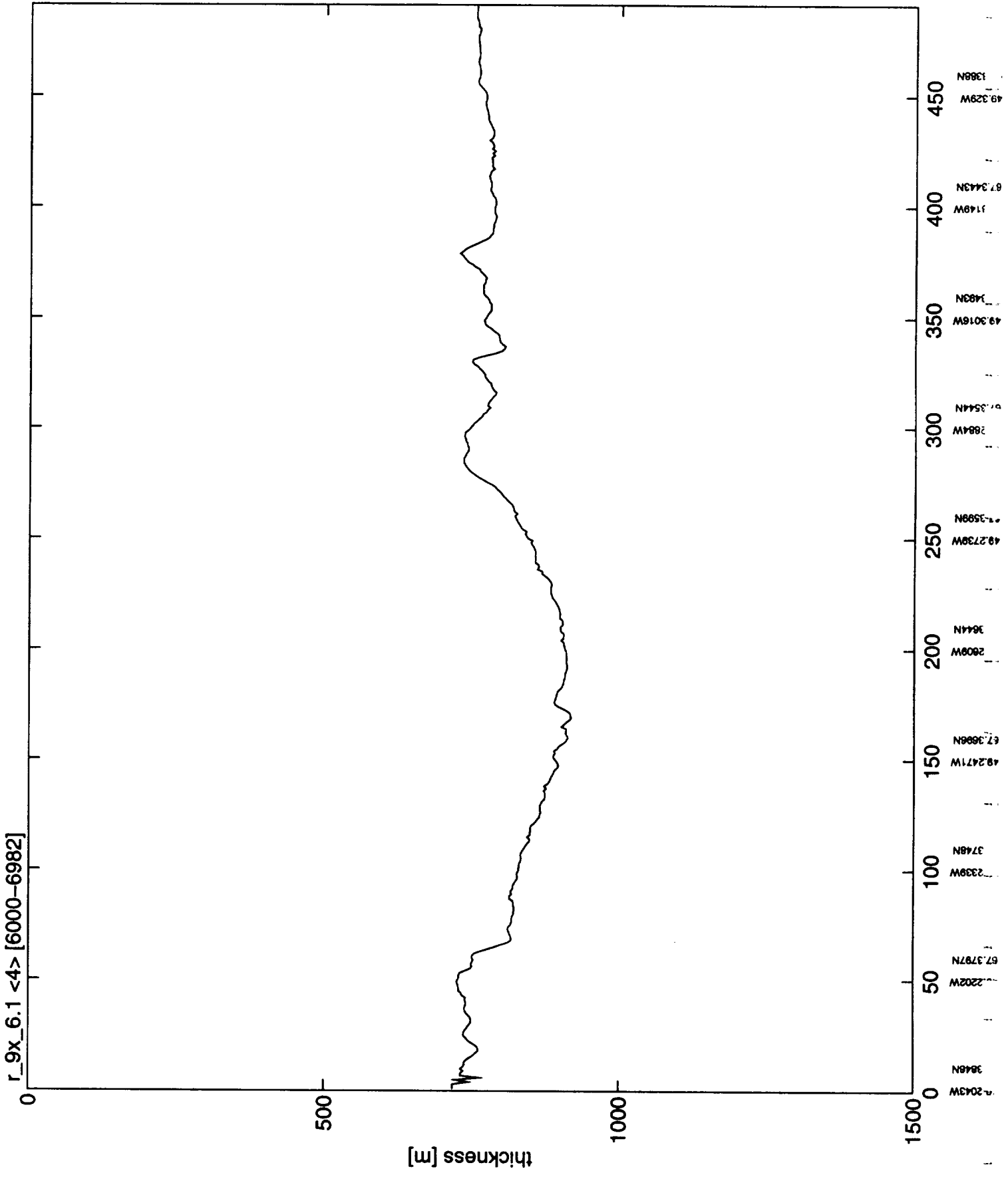




r_9x_6.1 <3> [4000-6000]

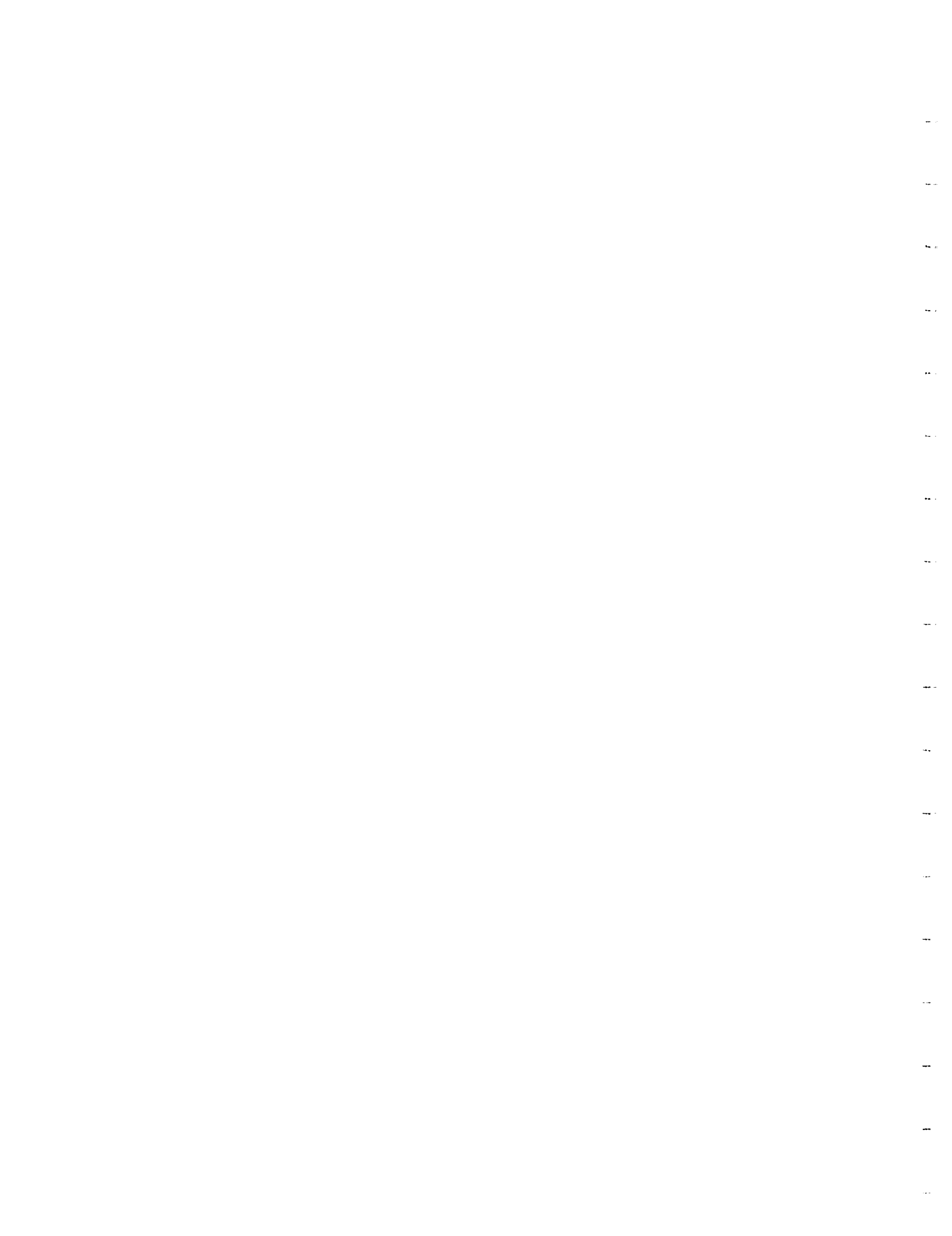


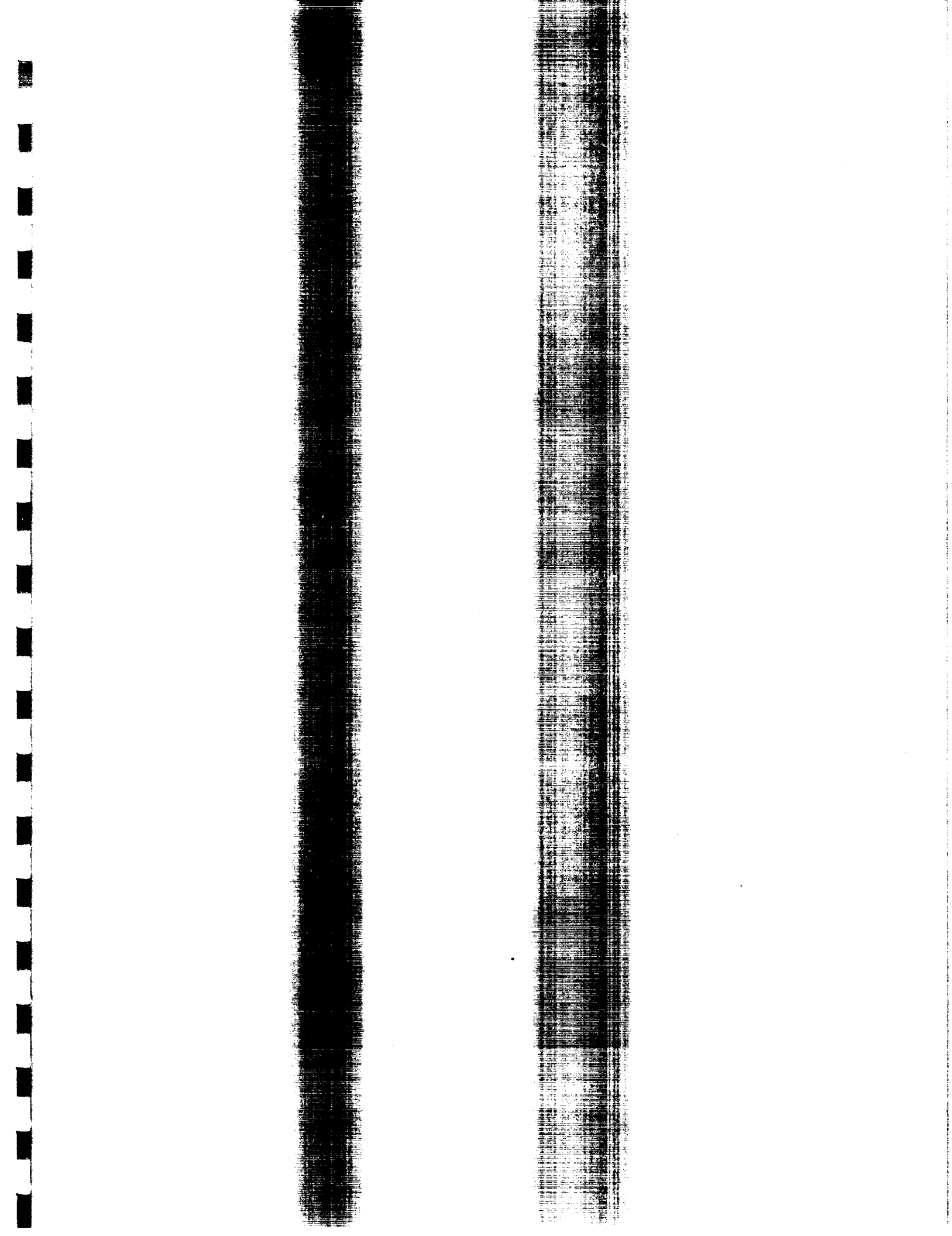


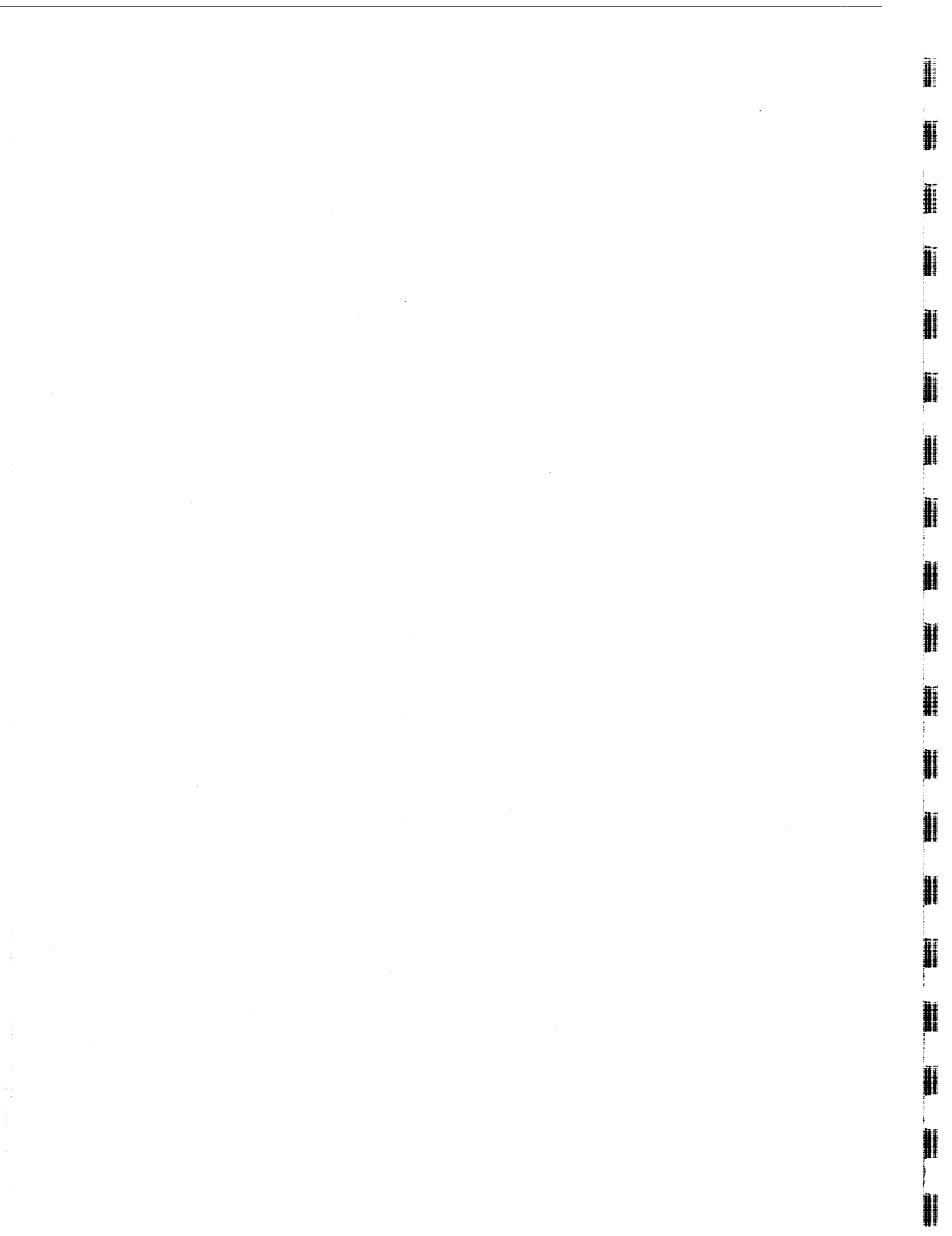


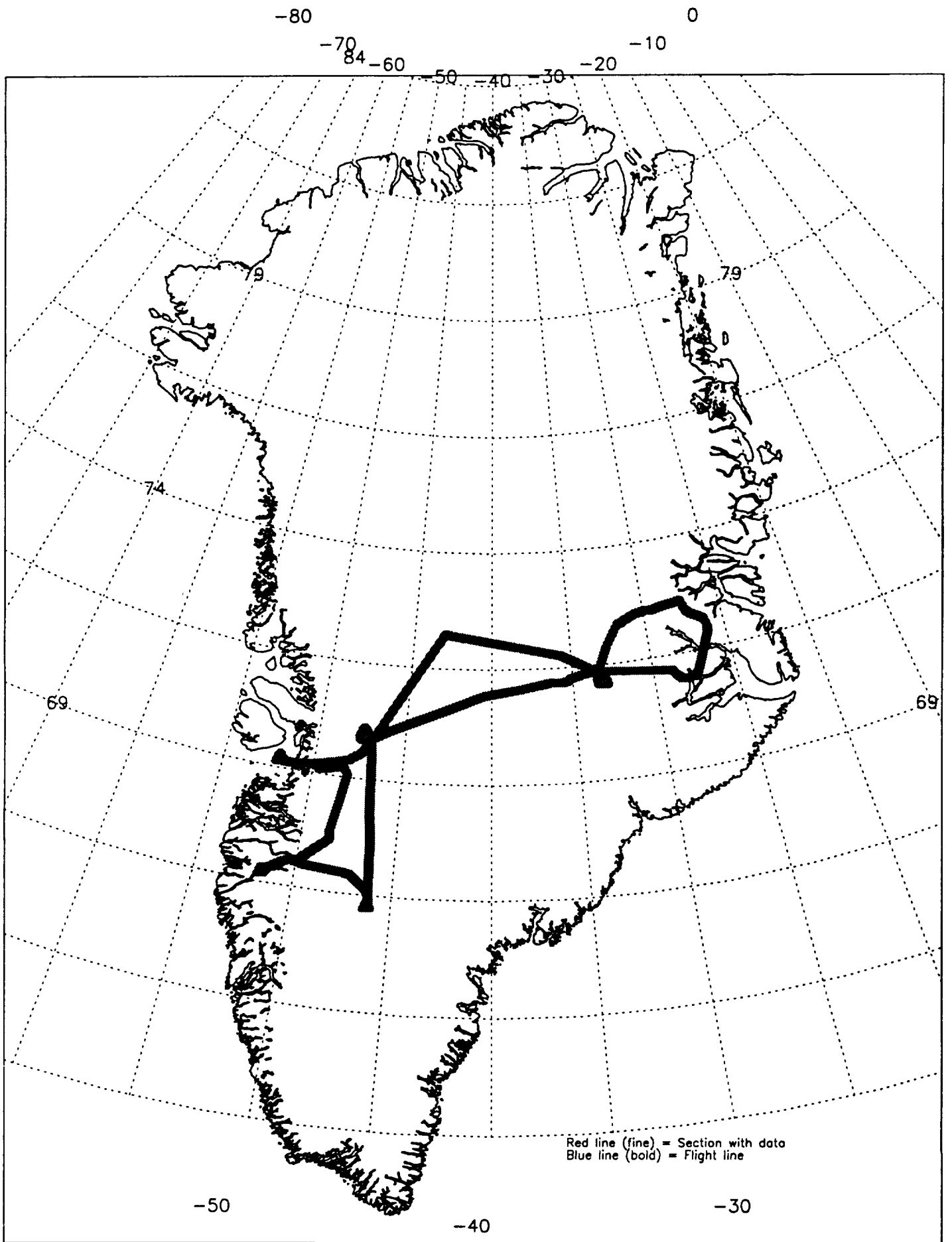
Appendix J

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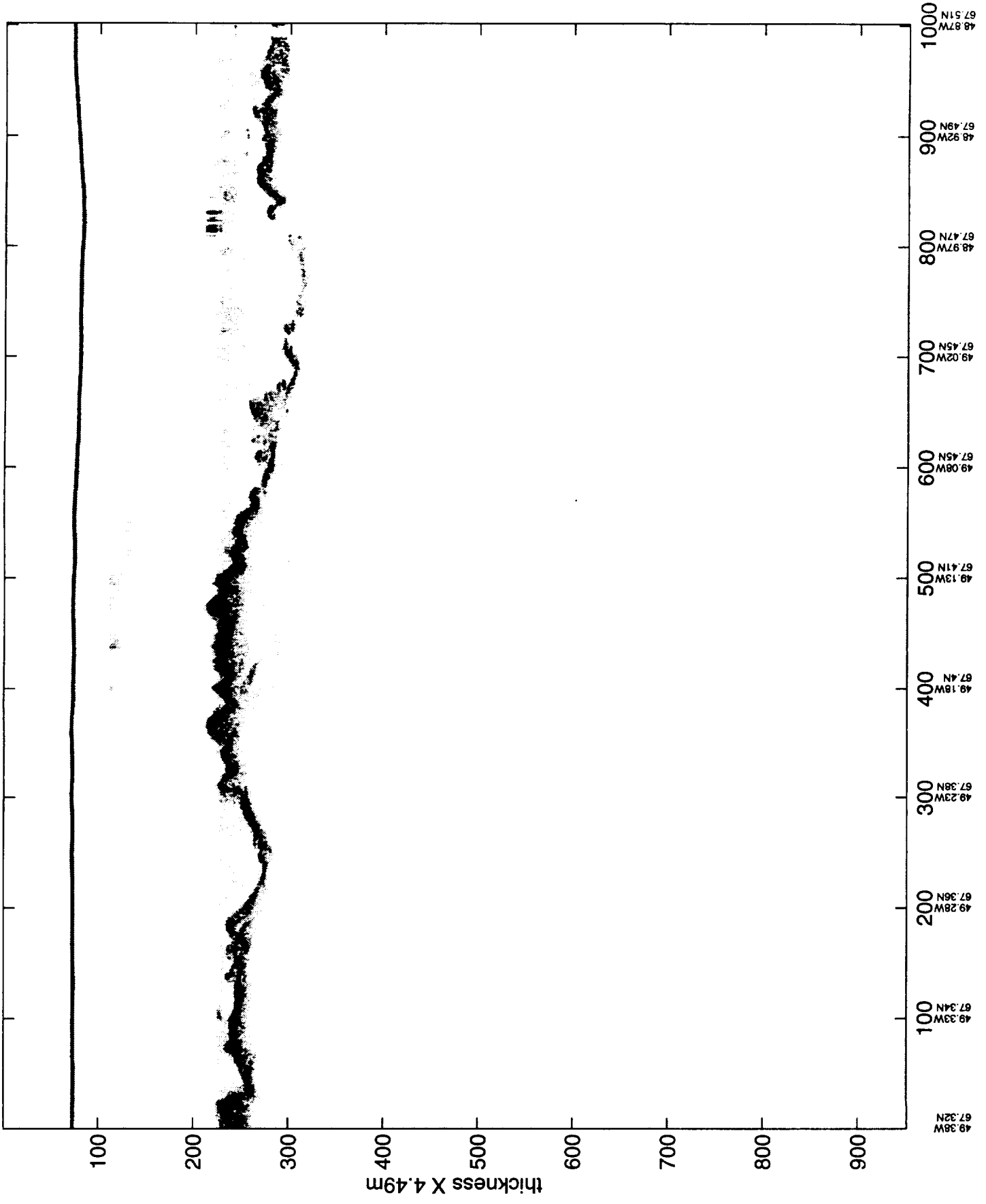








r_5|_2.13 [2000-3000]



48.38W
67.32N

48.33W
67.34N

48.28W
67.36N

48.23W
67.38N

48.18W
67.4N

48.13W
67.41N

48.08W
67.45N

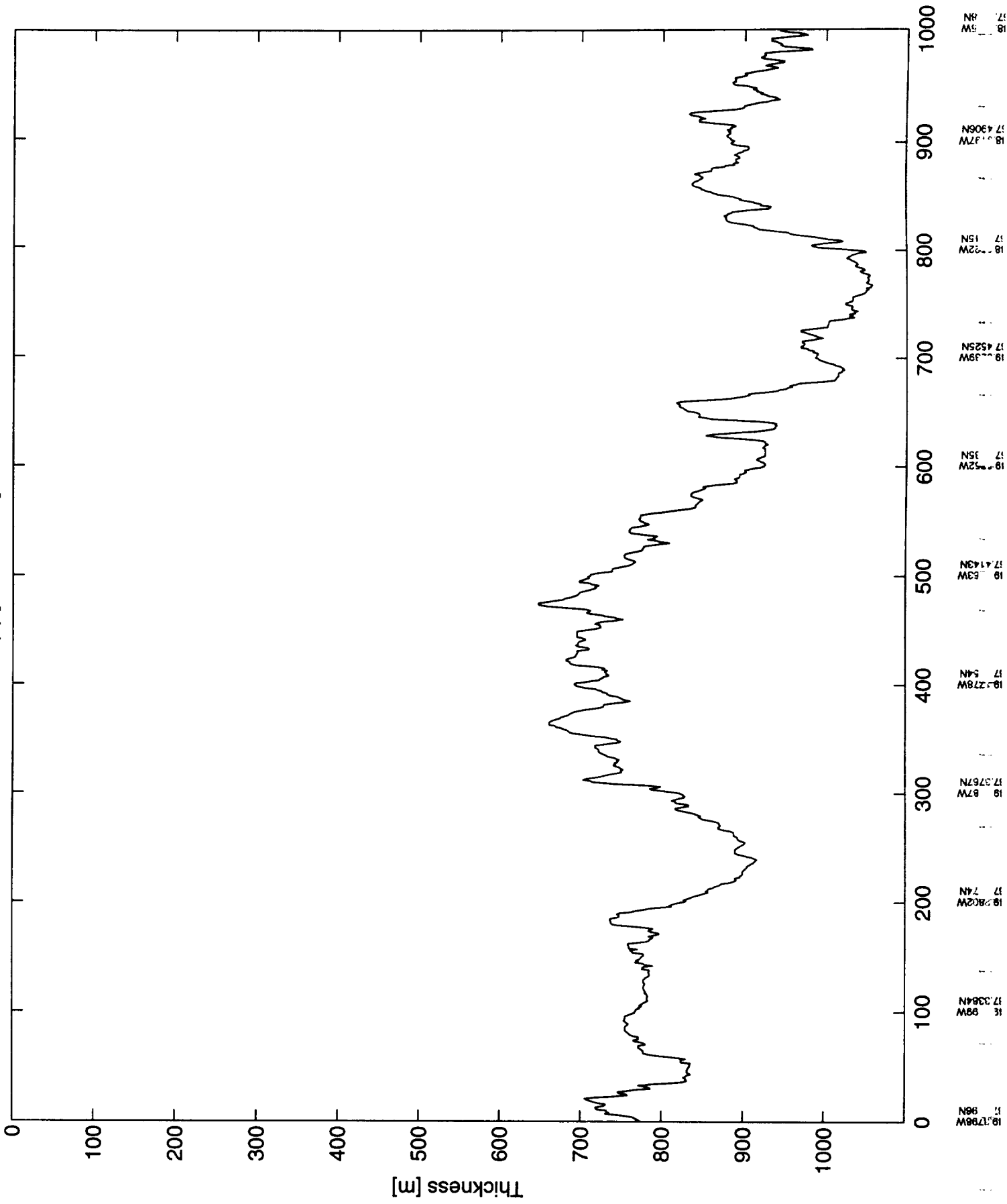
49.02W
67.45N

48.97W
67.47N

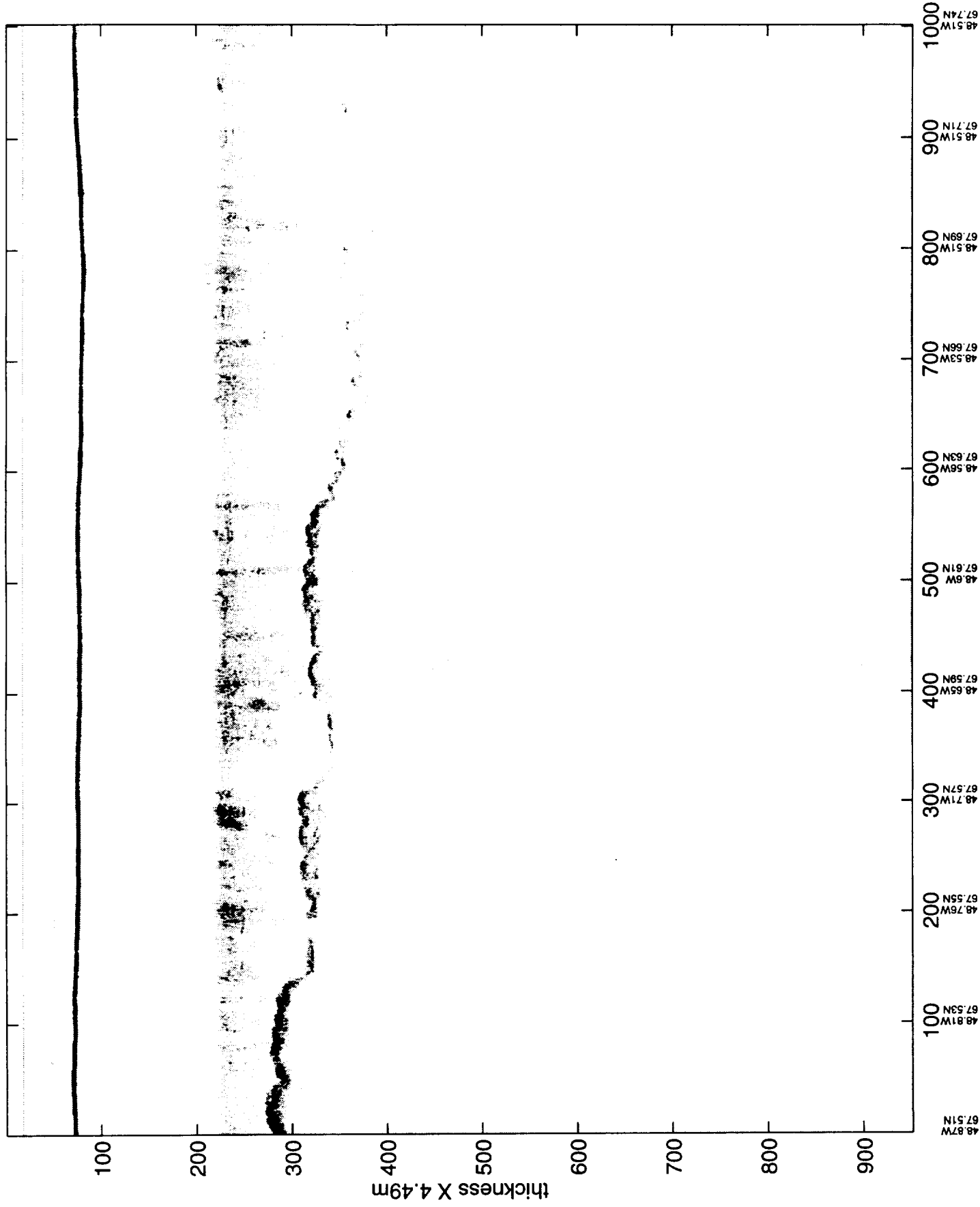
48.92W
67.49N

48.87W
67.51N

run_5l_2.1 (3) [2000-3000] thickness

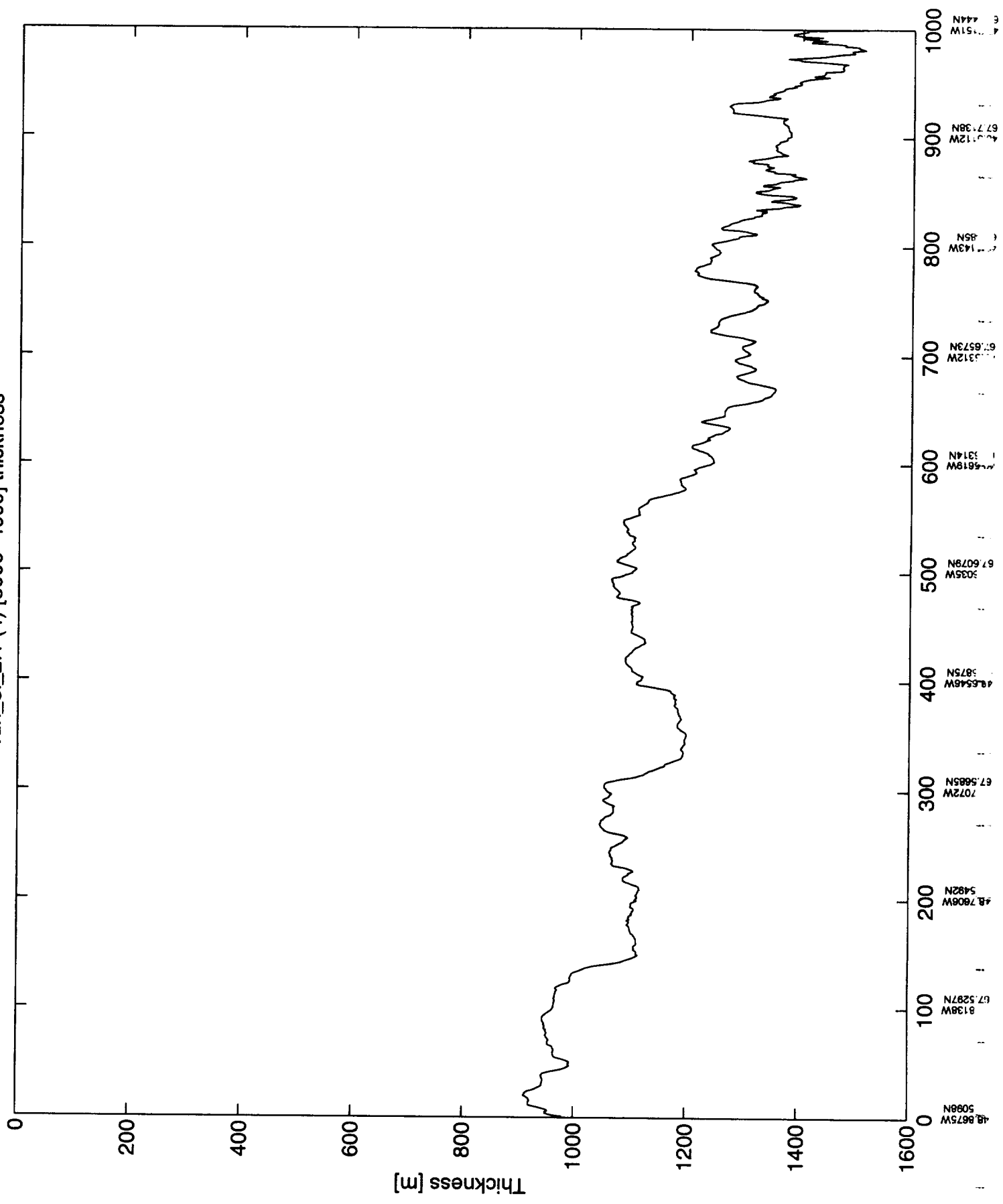


r_5l_2.14 [3000-4000]

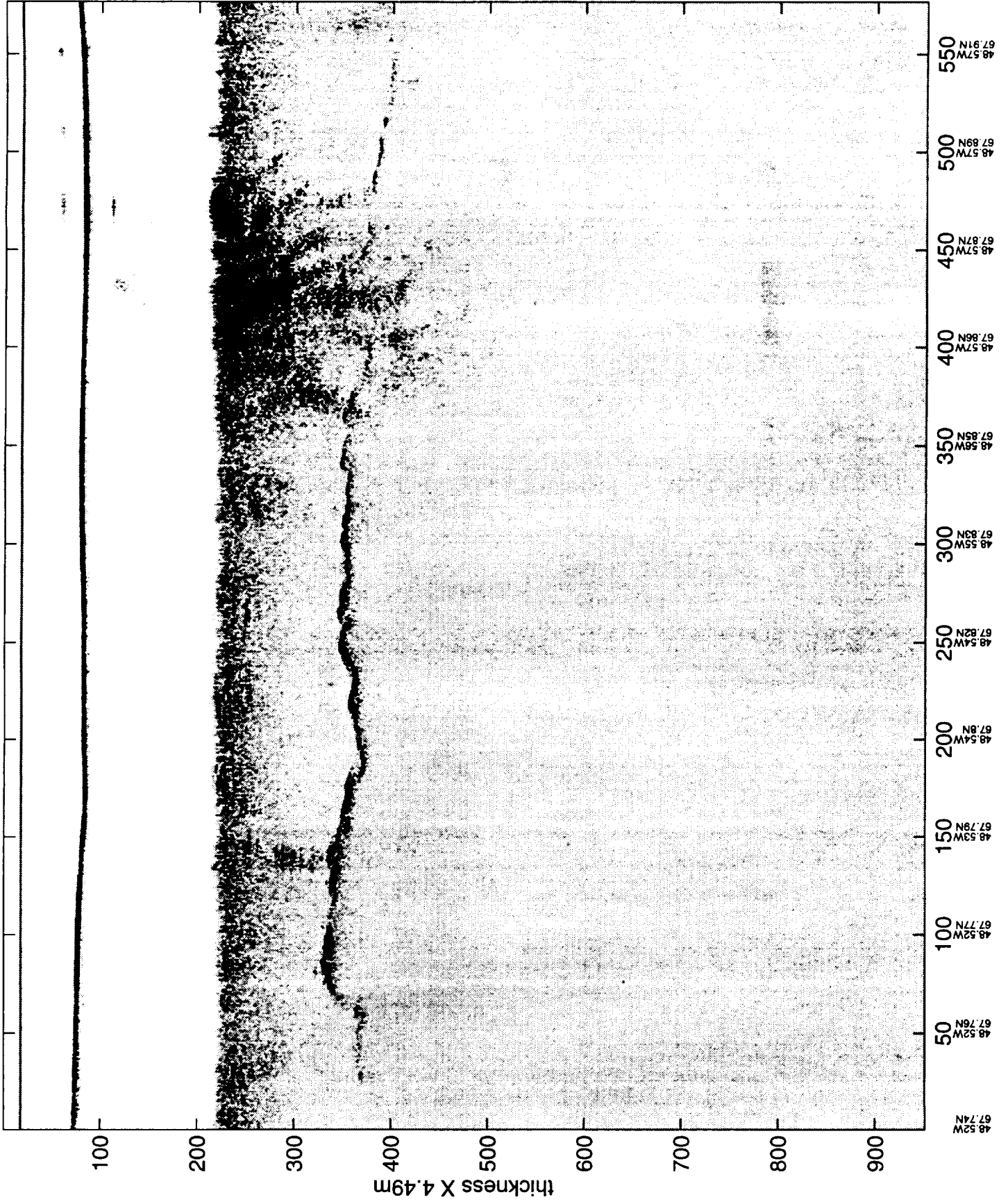


48.87W 67.51N
48.81W 67.53N
48.76W 67.55N
48.71W 67.57N
48.65W 67.59N
48.6W 67.61N
48.56W 67.63N
48.53W 67.65N
48.51W 67.69N
48.51W 67.71N
48.51W 67.74N

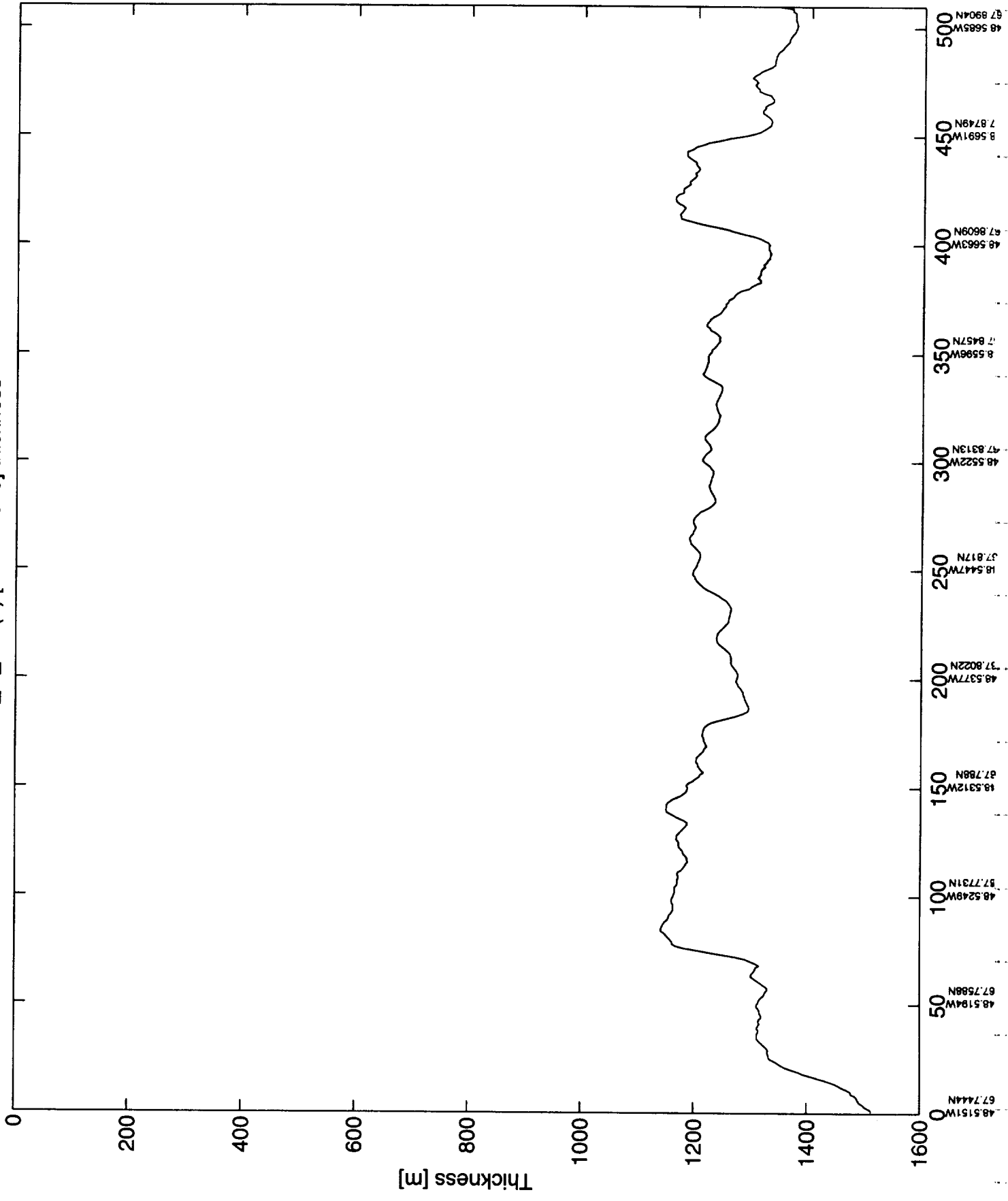
run_5l_2.1 (4) [3000-4000] thickness



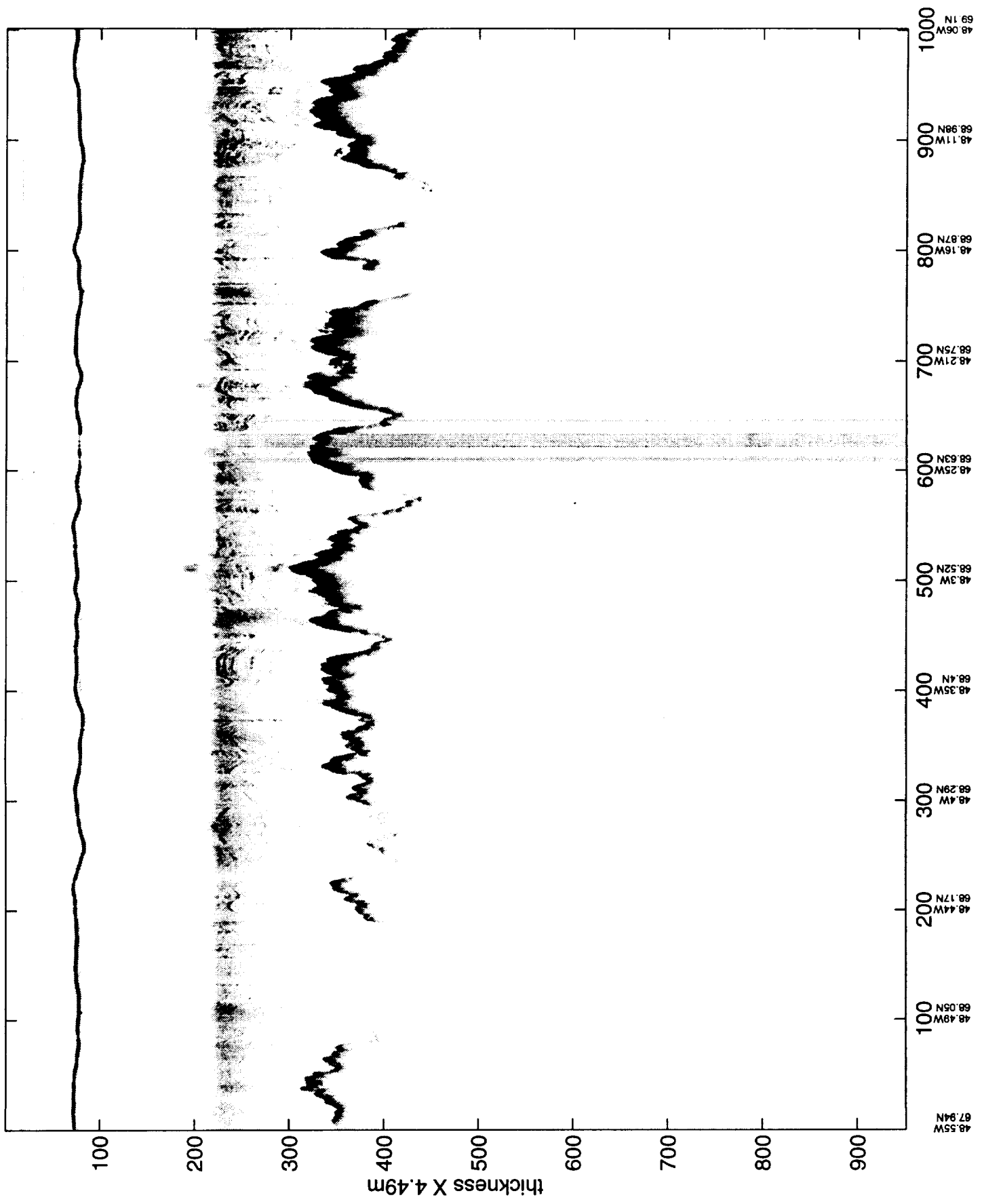
r_5l_2.15 [4000-4576]



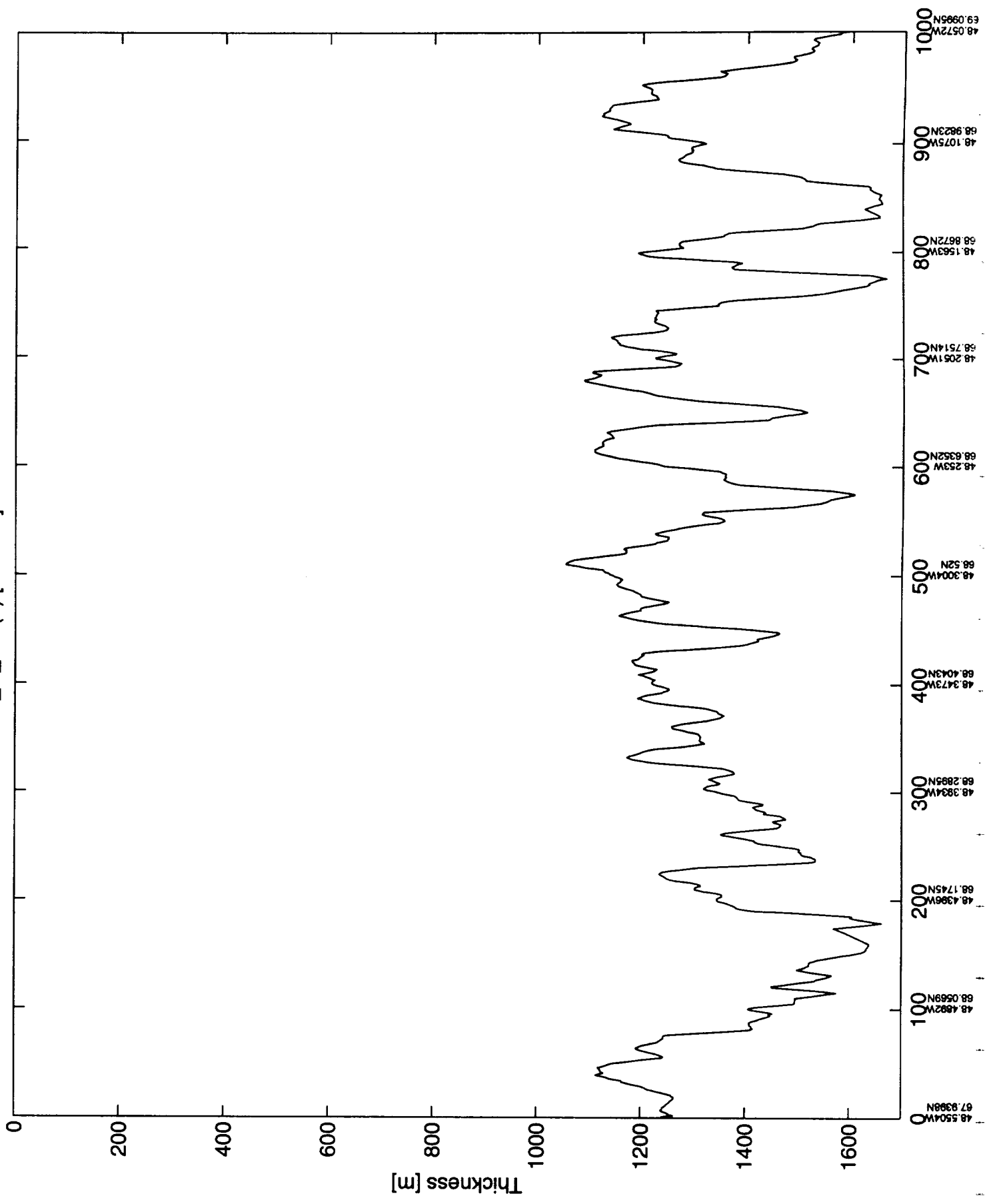
run_5l_2.1 (5) [4000-4510] thickness



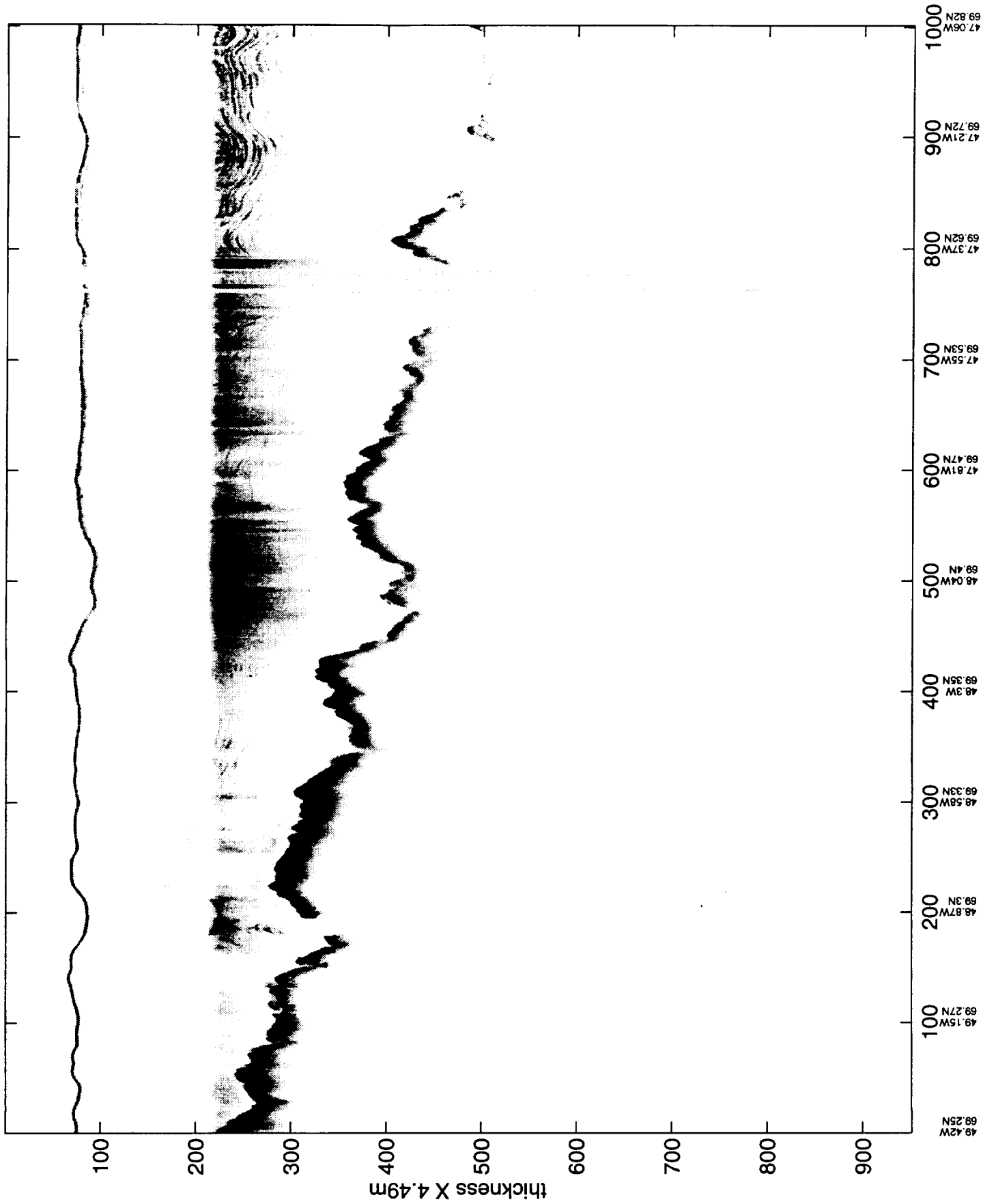
r_5[3.11 [0-1000]



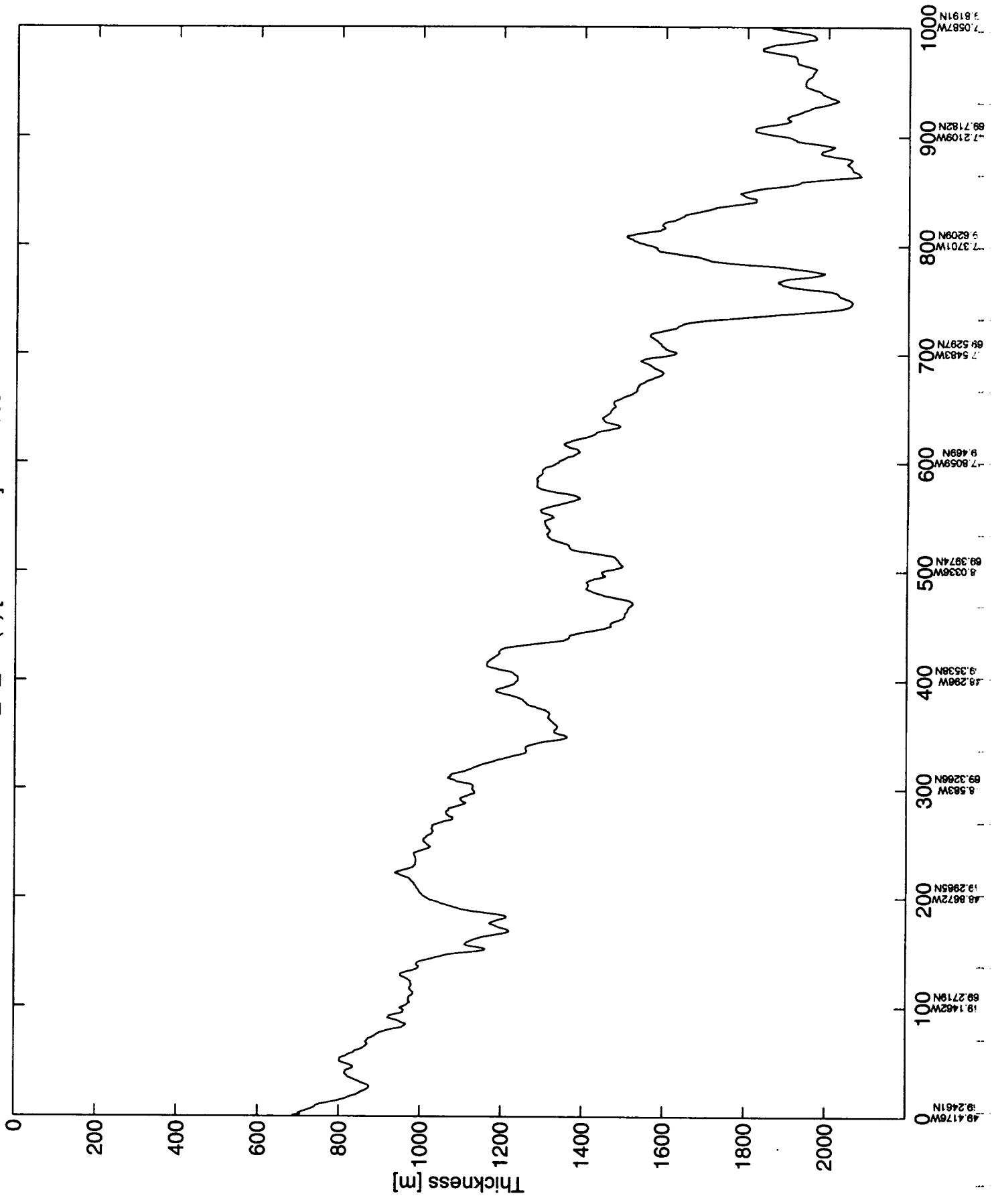
run_5l_3.1 (1) [0-1000] thickness

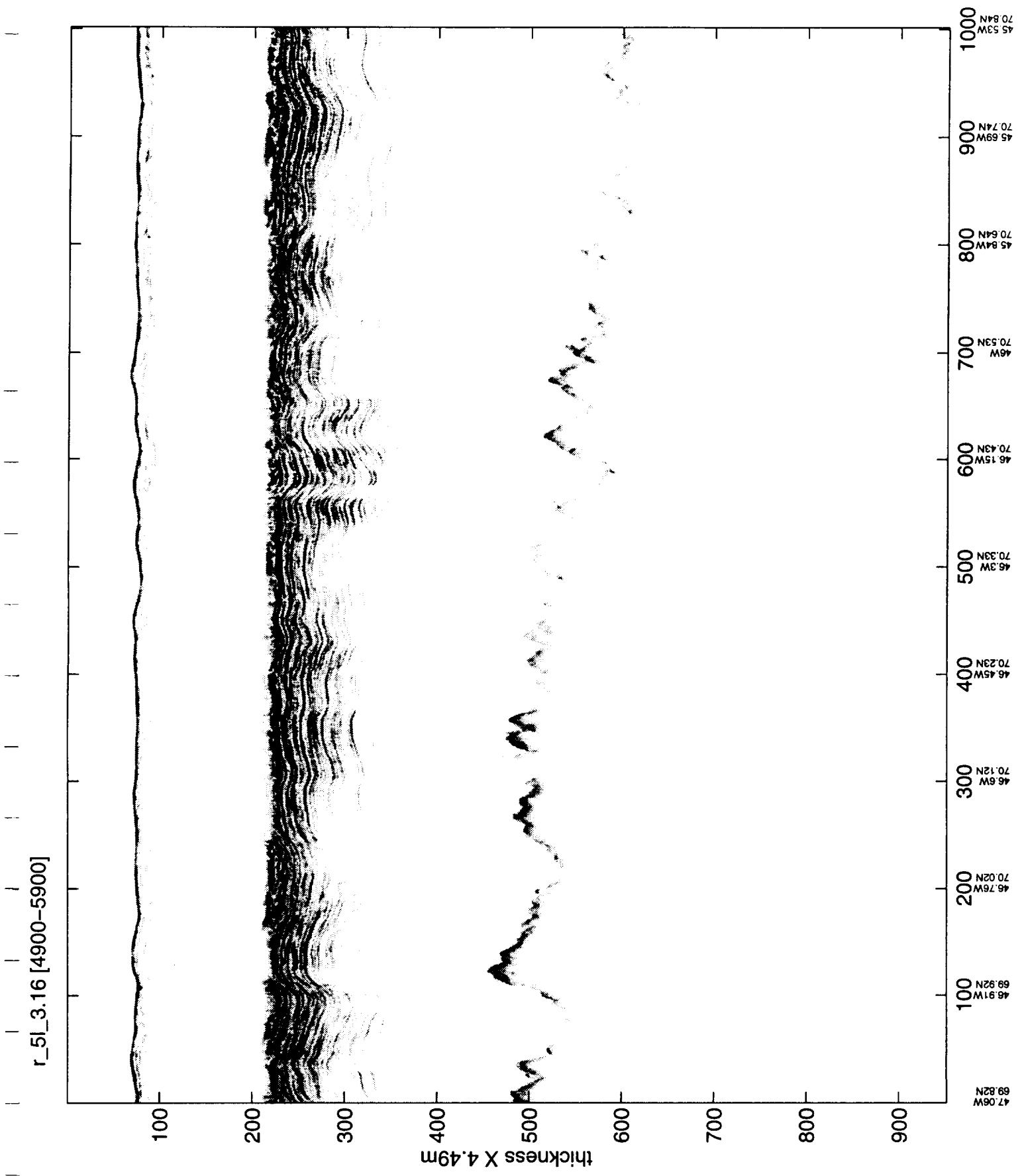


r_5l_3.15 [3900-4900]



run_5l_3.1 (5) [3900-4900] thickness

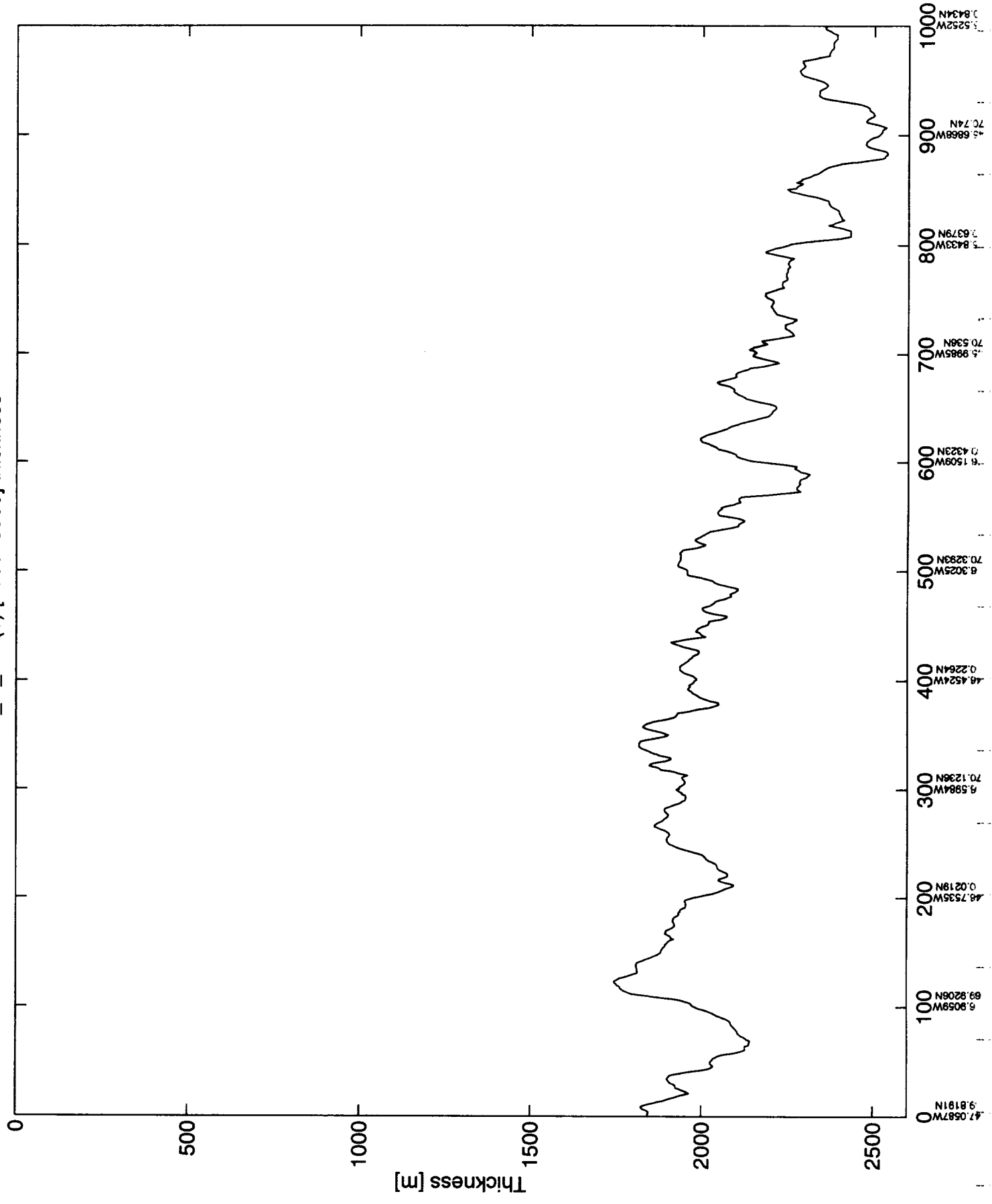




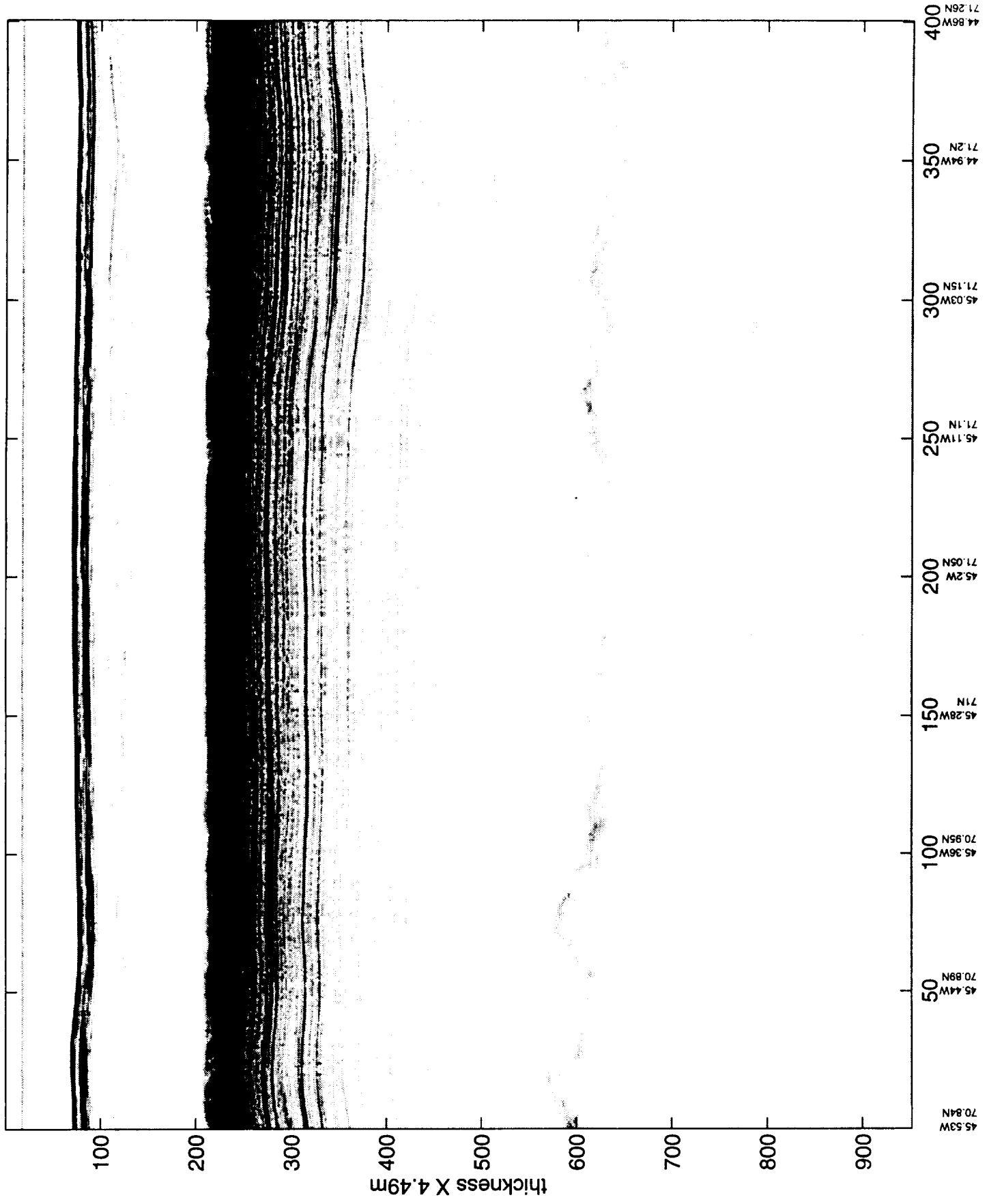
r_5l_3.16 [4900-5900]

thickness X 4.49m

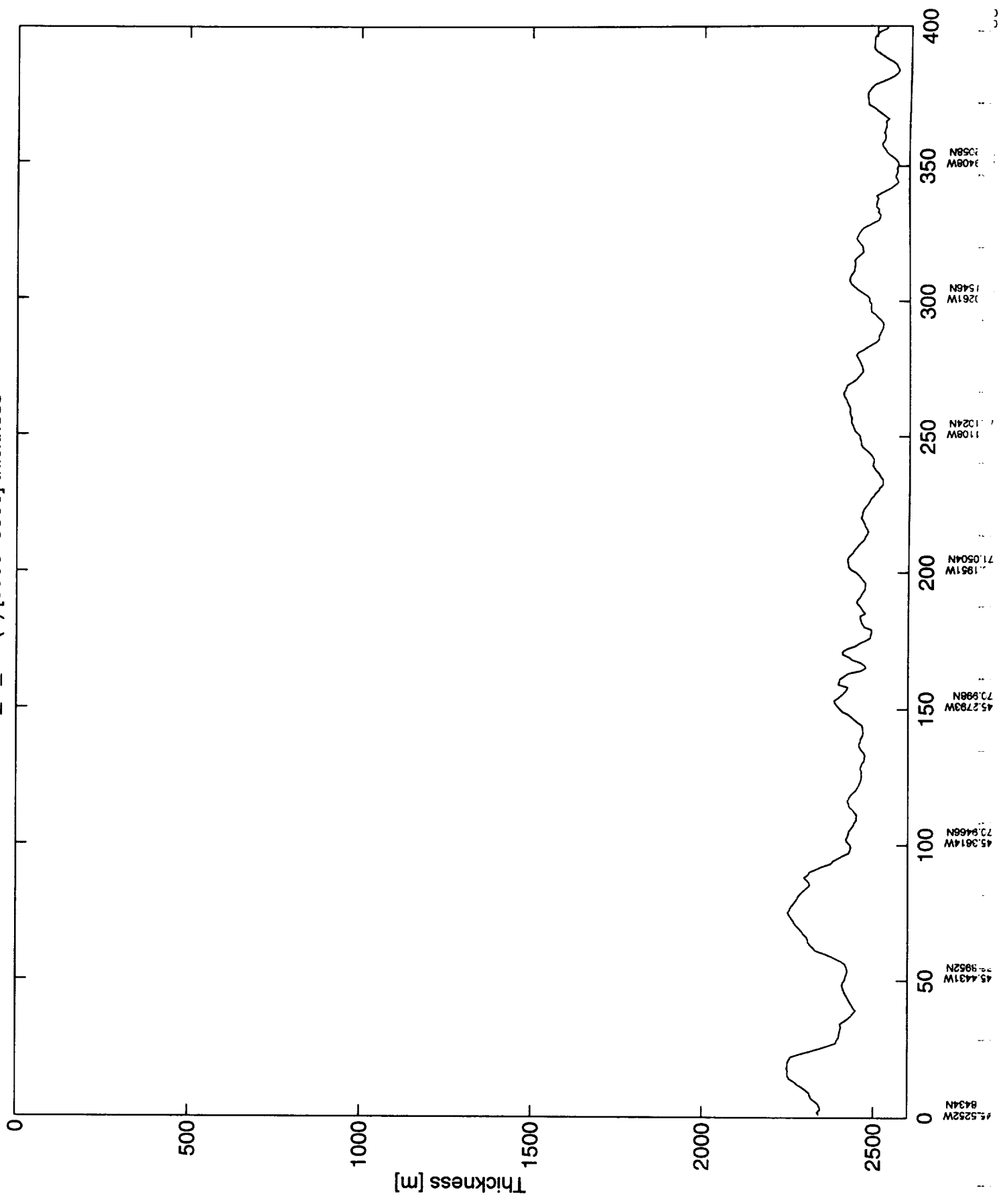
run_5[3.1 (6) [4900-5900] thickness



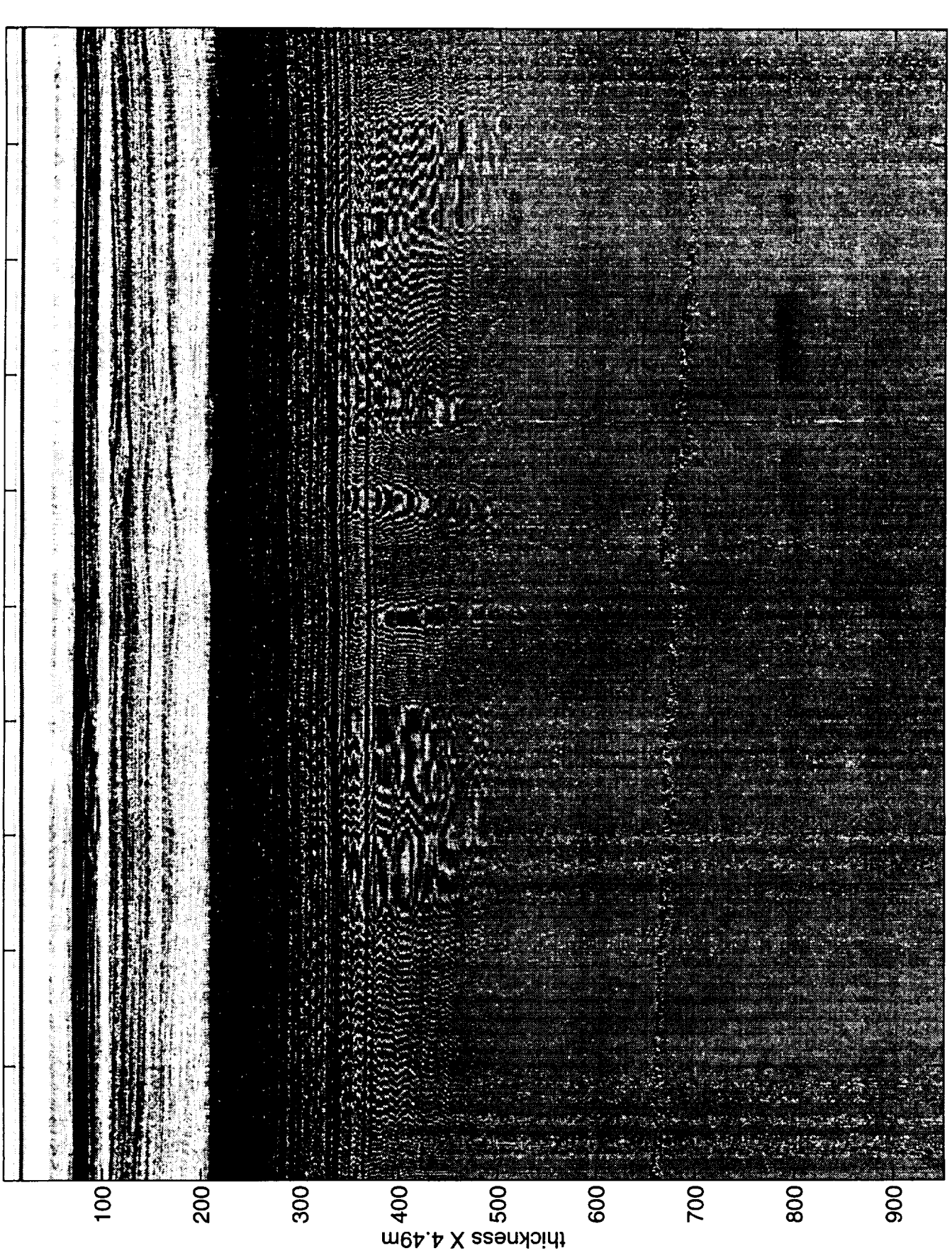
r_5|_3.17 [5900-6300]



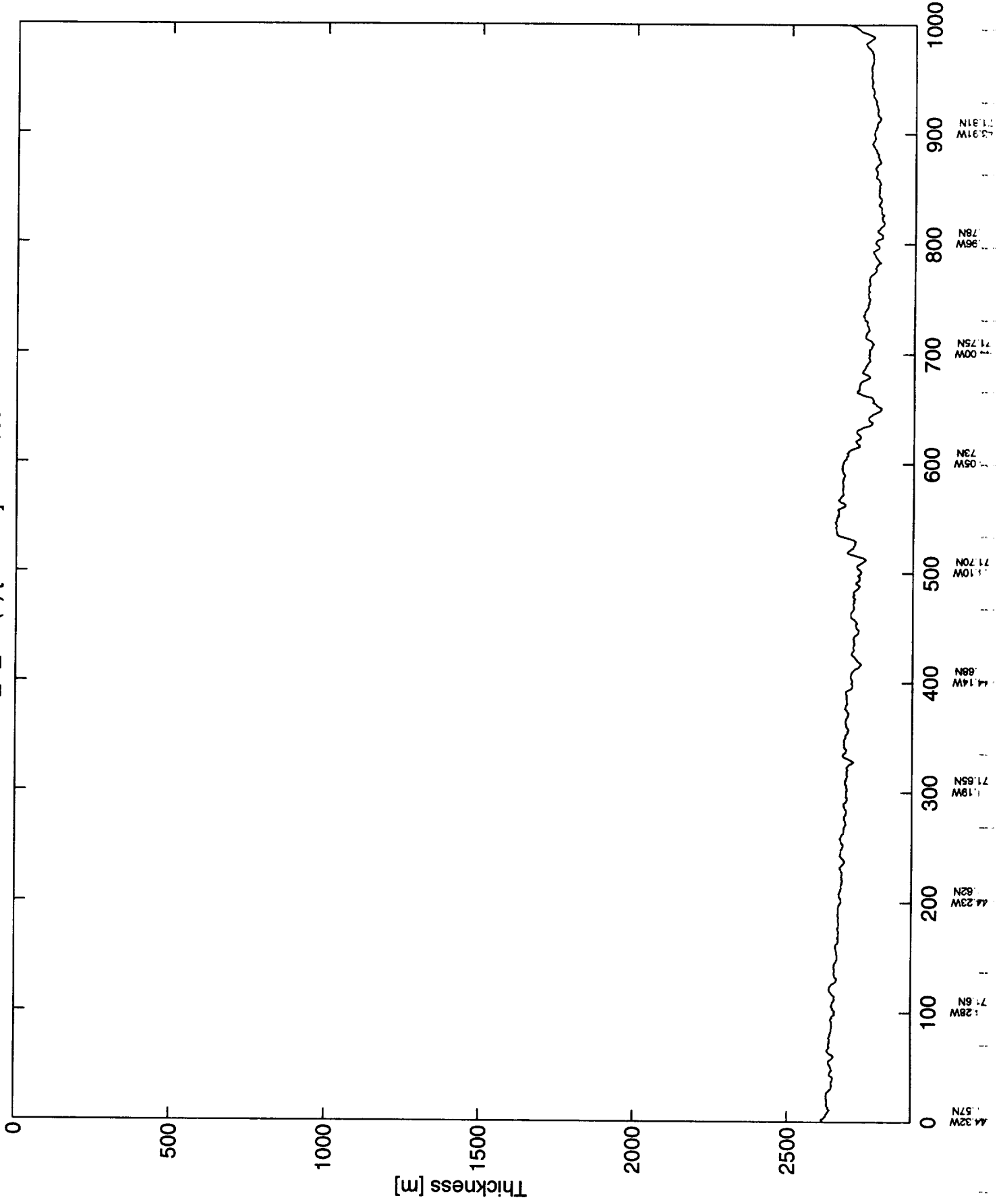
run_5l_3.1 (7) [5900-6300] thickness

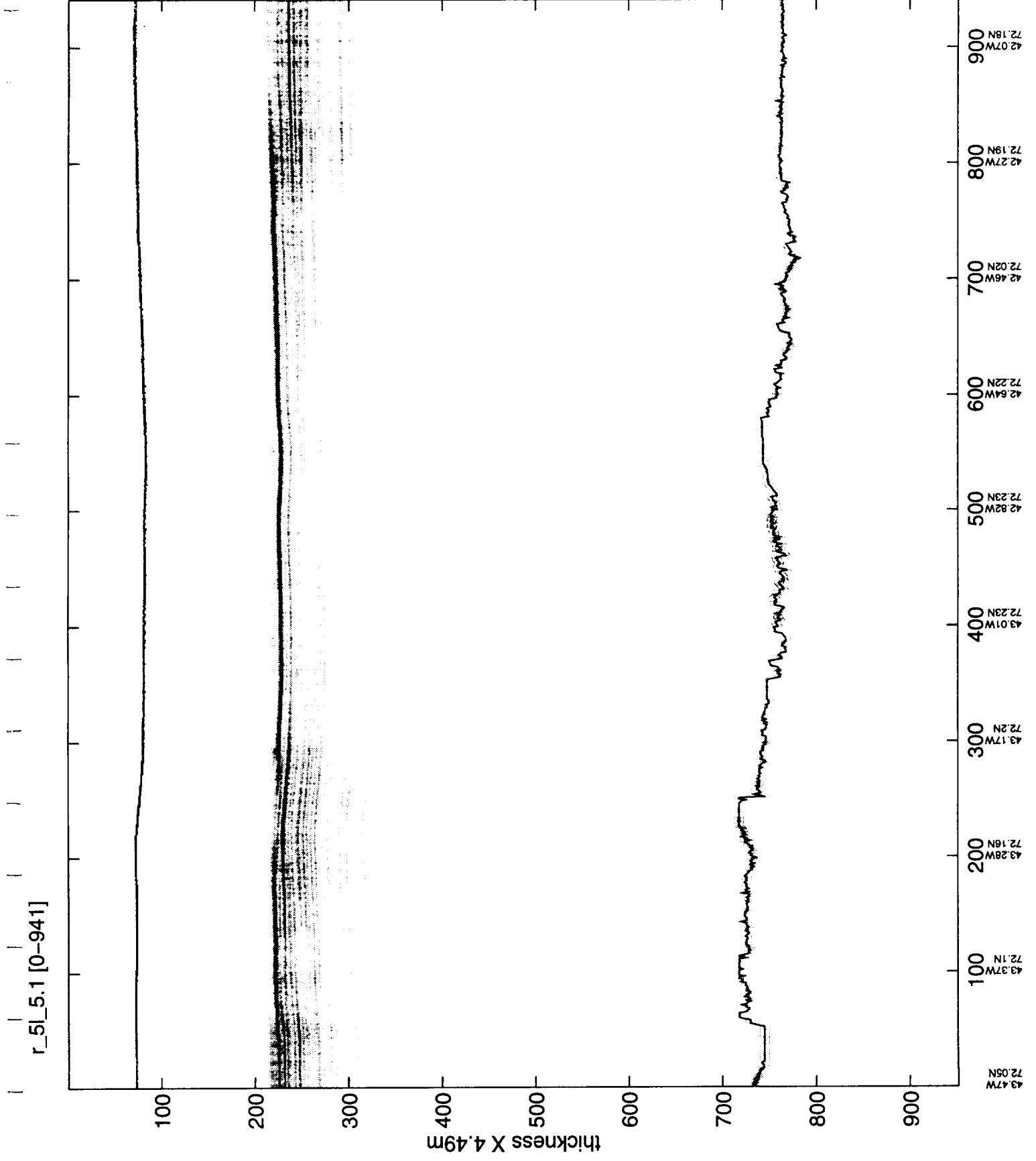


r_5l_4.11 [0-1000]



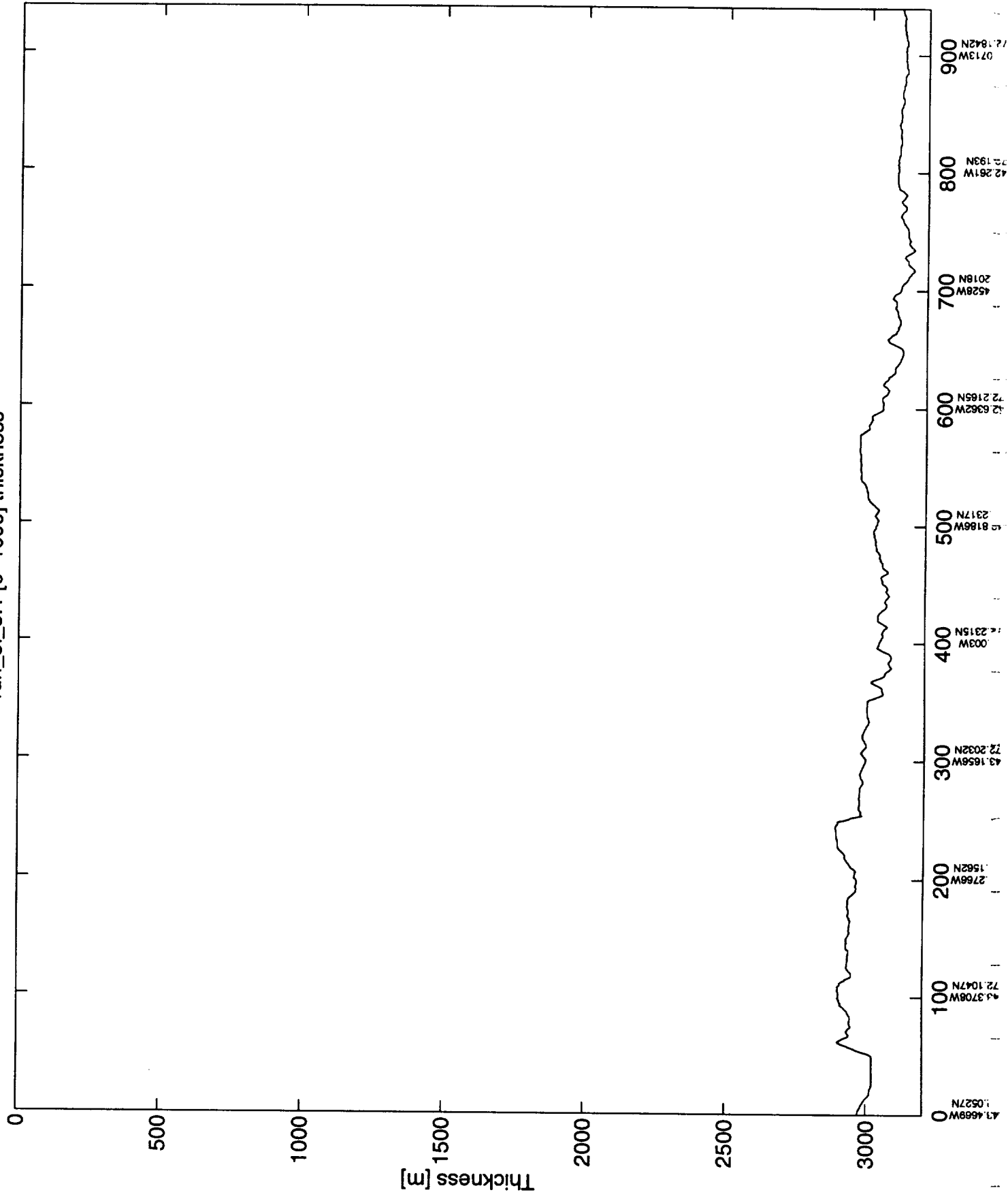
run_5l_4.1 (1) [0-1000] thickness



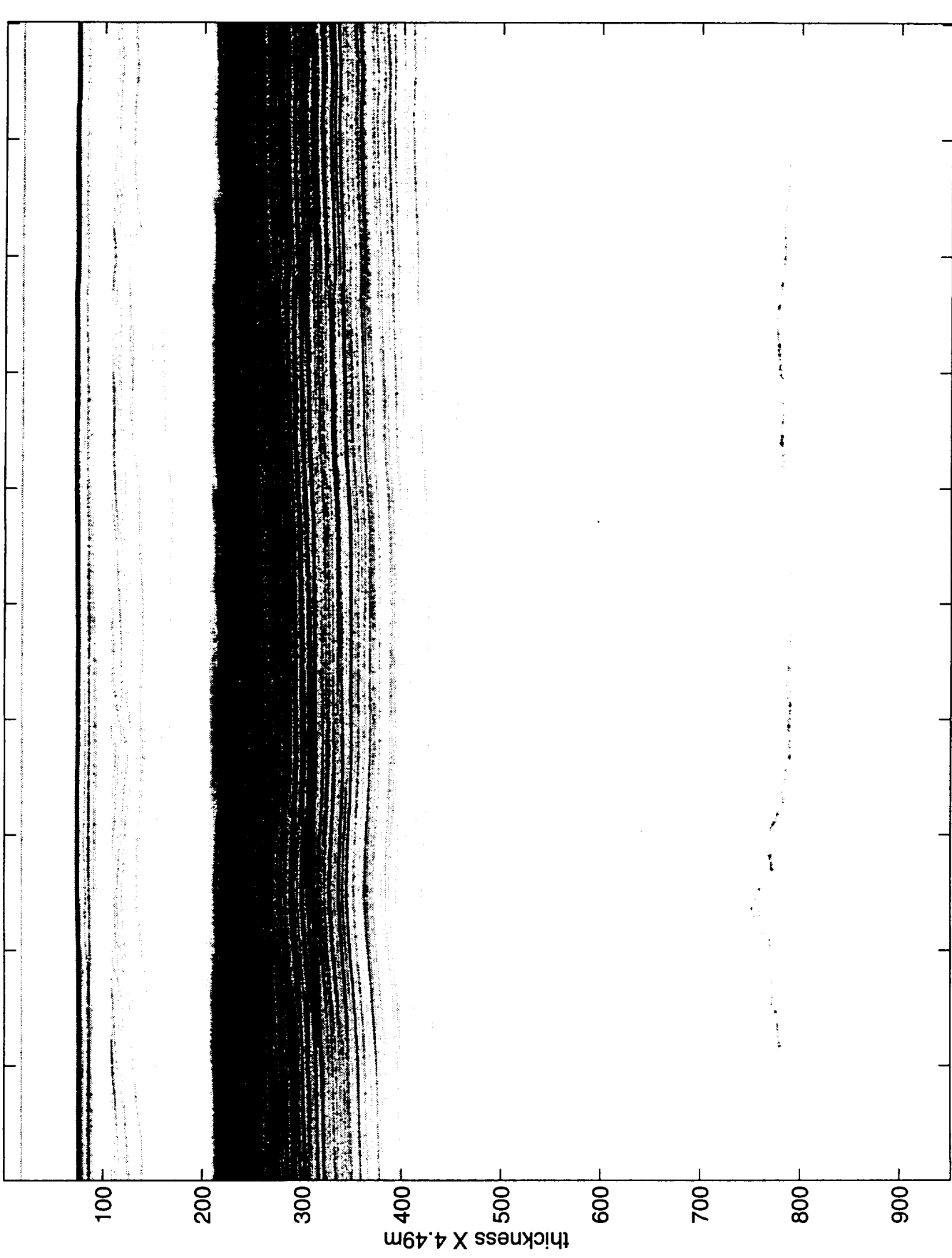


43.47W
72.05N
43.37W
72.11N
43.28W
72.16N
43.17W
72.21N
43.01W
72.23N
42.82W
72.23N
42.64W
72.22N
42.46W
72.02N
42.27W
72.19N
42.07W
72.18N

run_5l_5.1 [0-1000] thickness

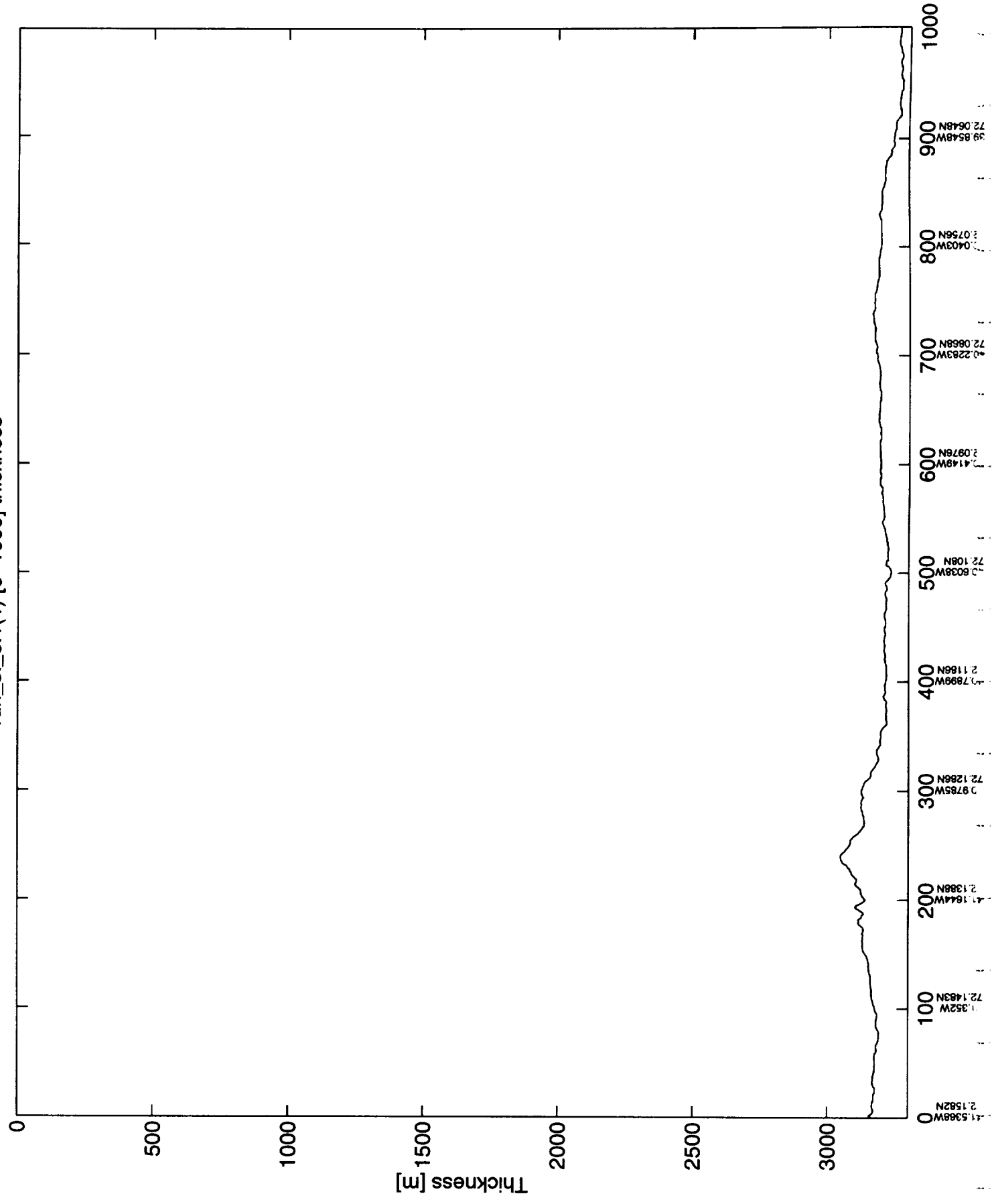


r_5l_6.11 [0-1000]

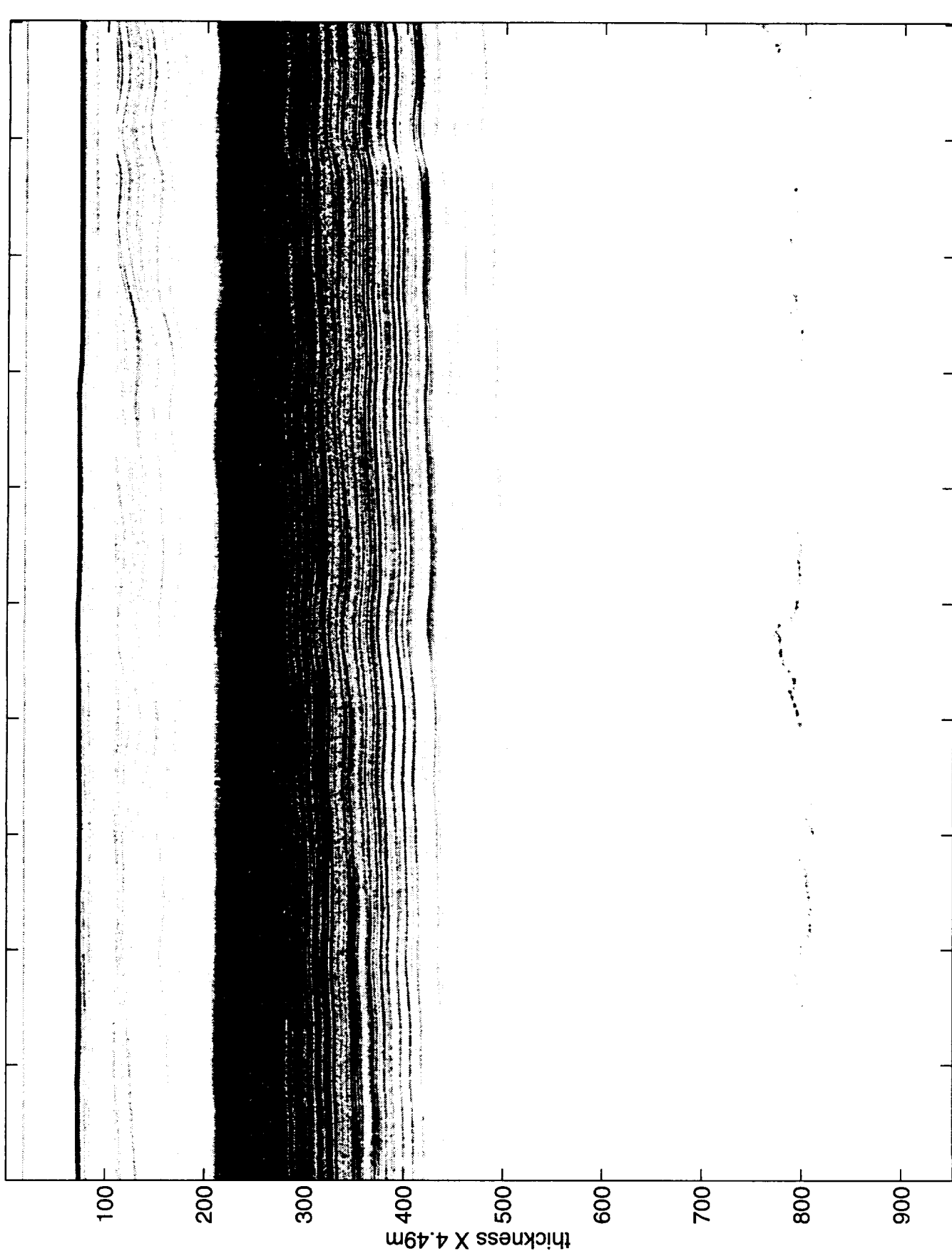


41.54W
72.16N
41.55W
72.15N
200 41.17W
72.14N
300 40.98W
2.975N
400 40.79W
72.12N
500 40.61W
72.11N
600 40.42W
72.1N
700 40.23W
72.09N
800 40.04W
72.08N
900 39.86W
72.07N
1000 39.67W
72.05N

run_5L_6.1(1) [0-1000] thickness

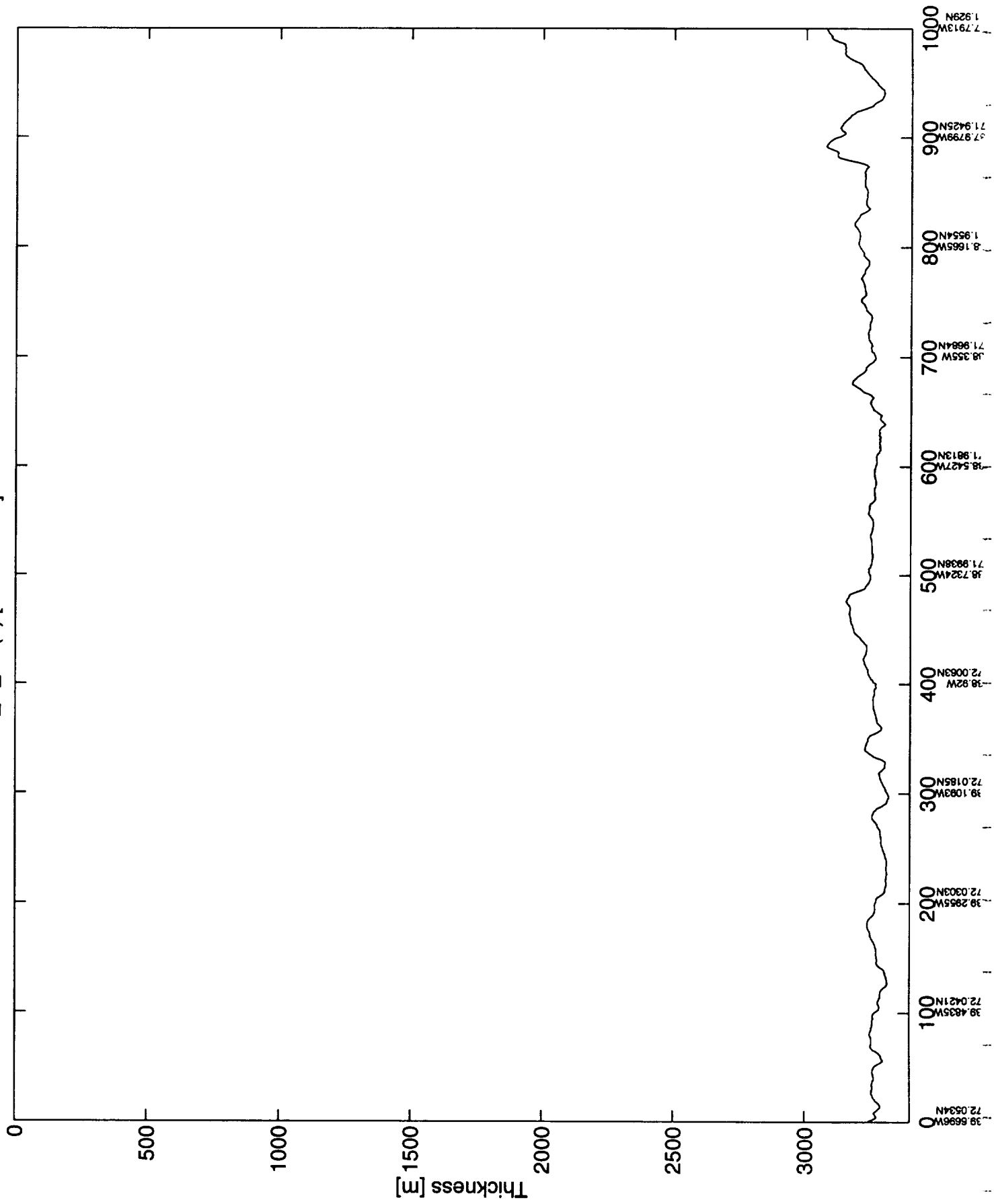


r_5l_6.12 [1000-2000]

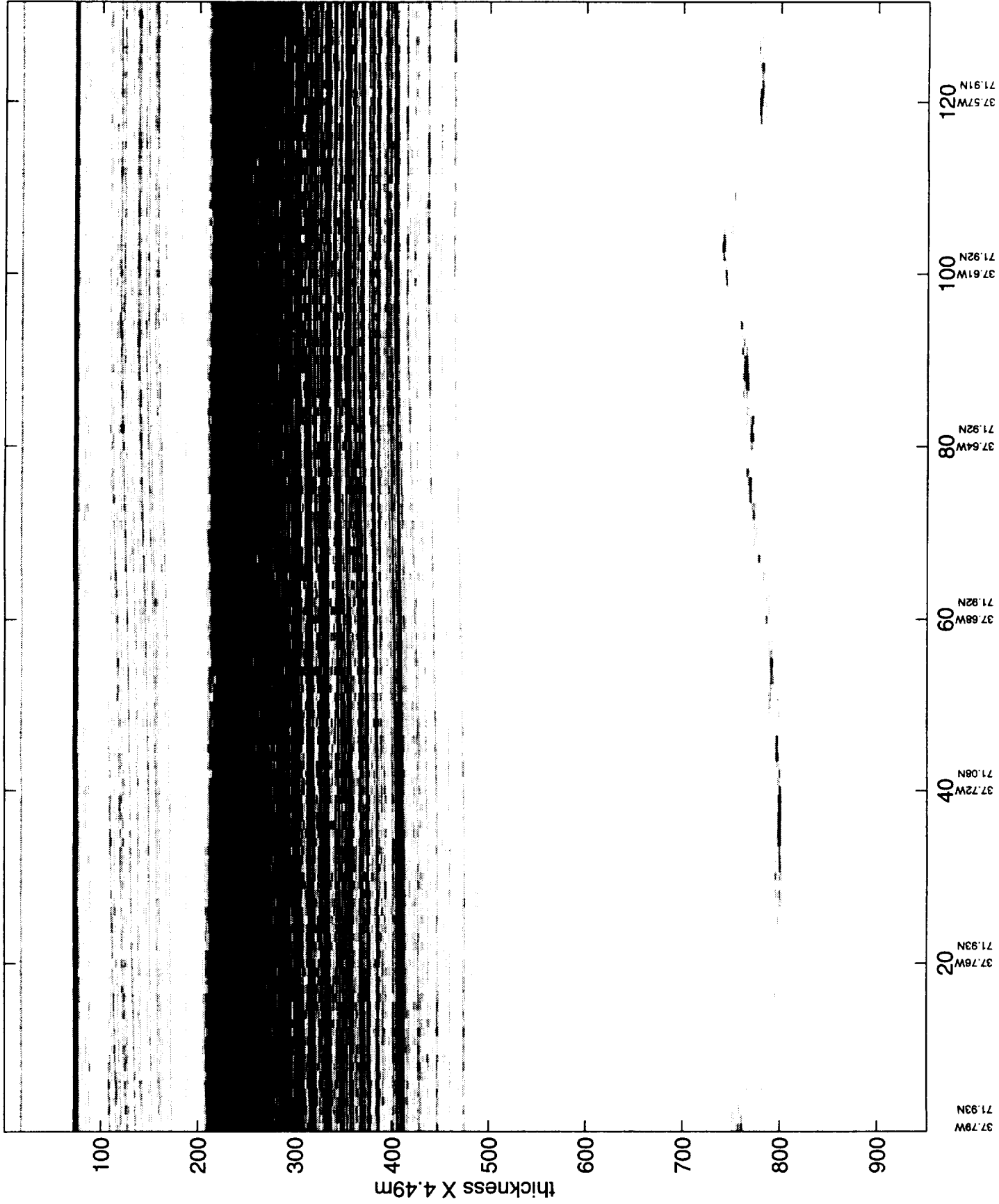


37.93N
37.98W
71.94N
38.17W
71.96N
38.36W
71.97N
38.54W
71.98N
38.73W
71.99N
39.01N
72.01N
39.22W
72.02N
39.11W
72.02N
39.3W
72.03N
39.49W
72.04N
39.67W
72.05N

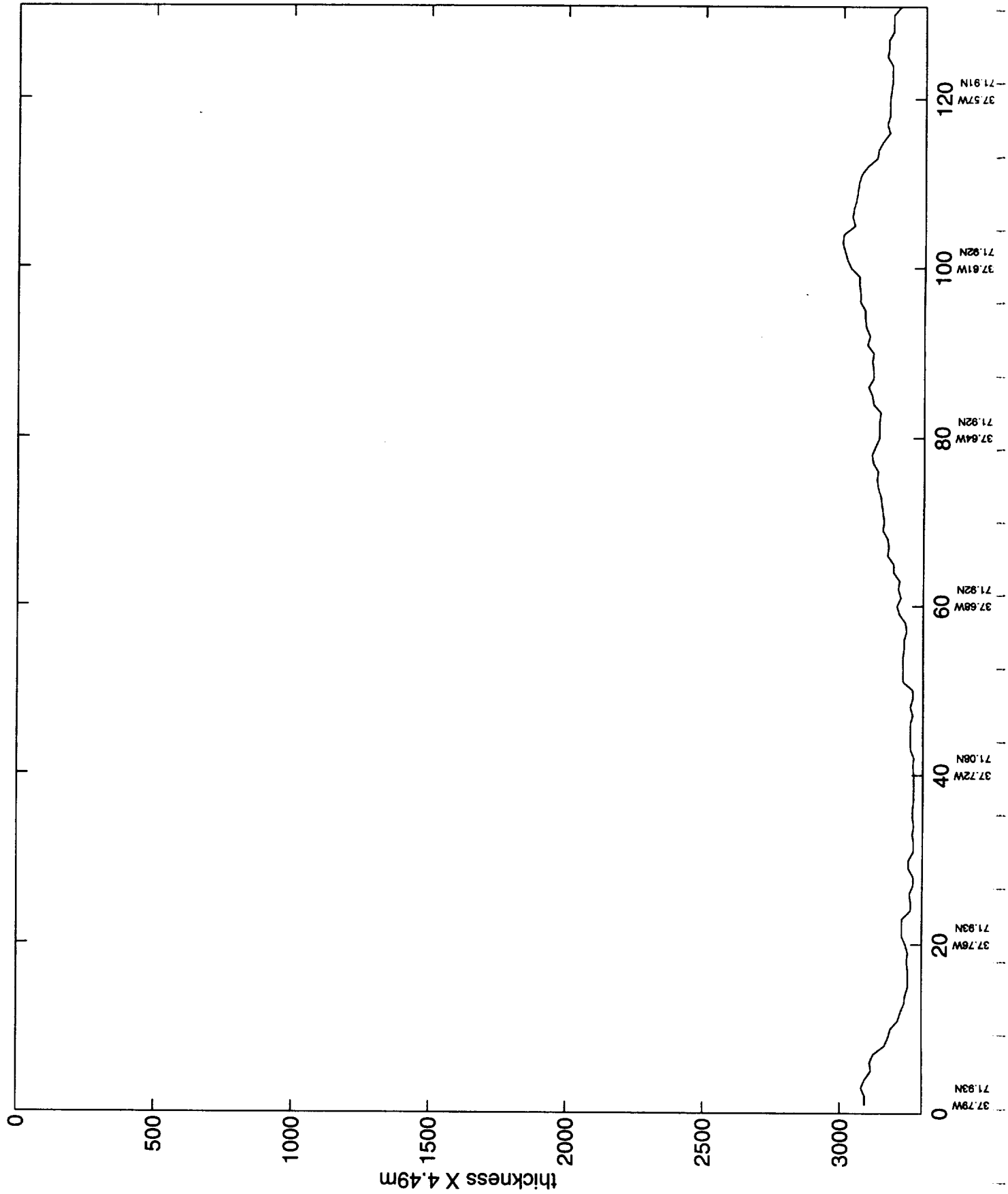
run_5l_6.1(2) [1000-2000] thickness



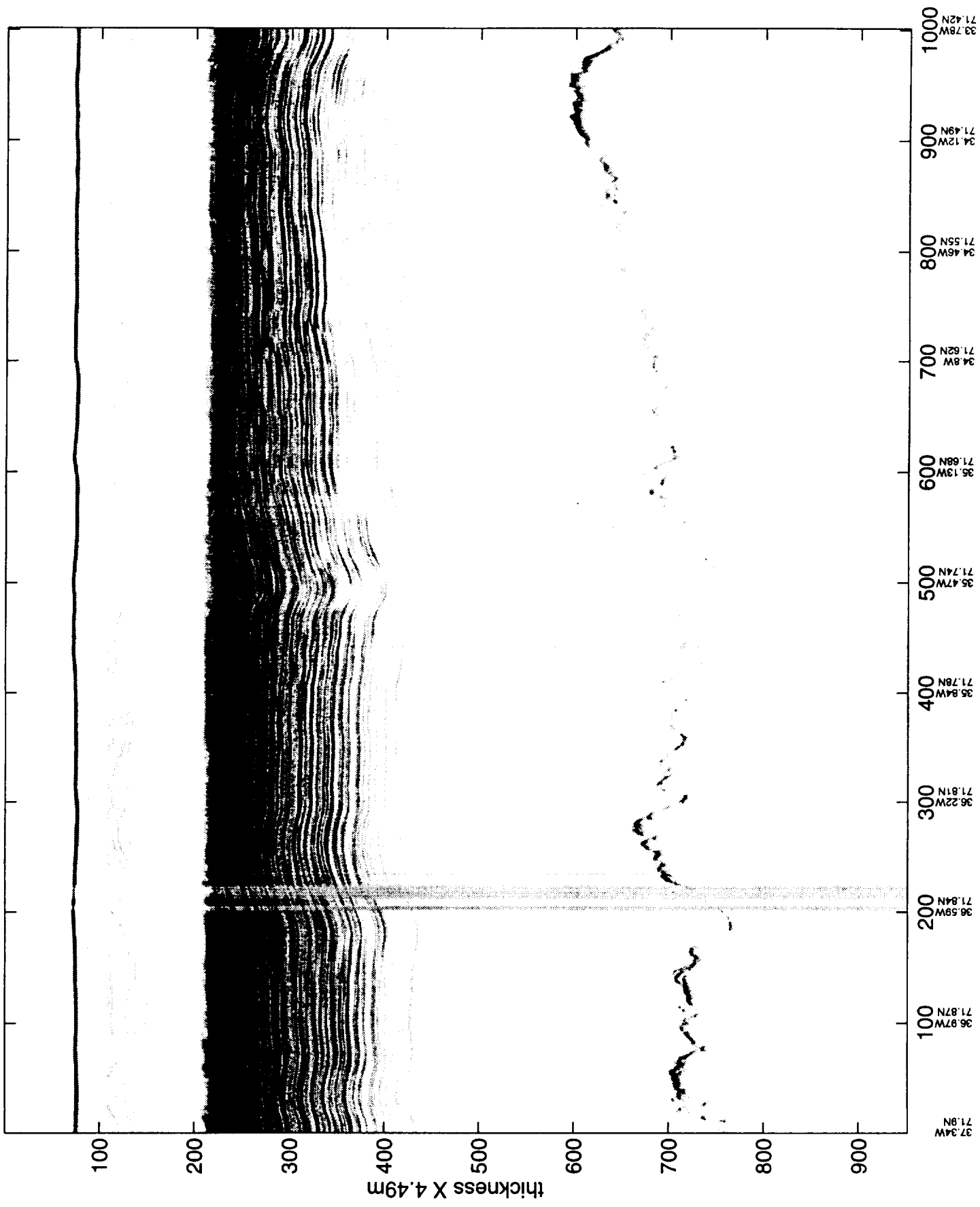
r_5l_6.13 [2000-2131]



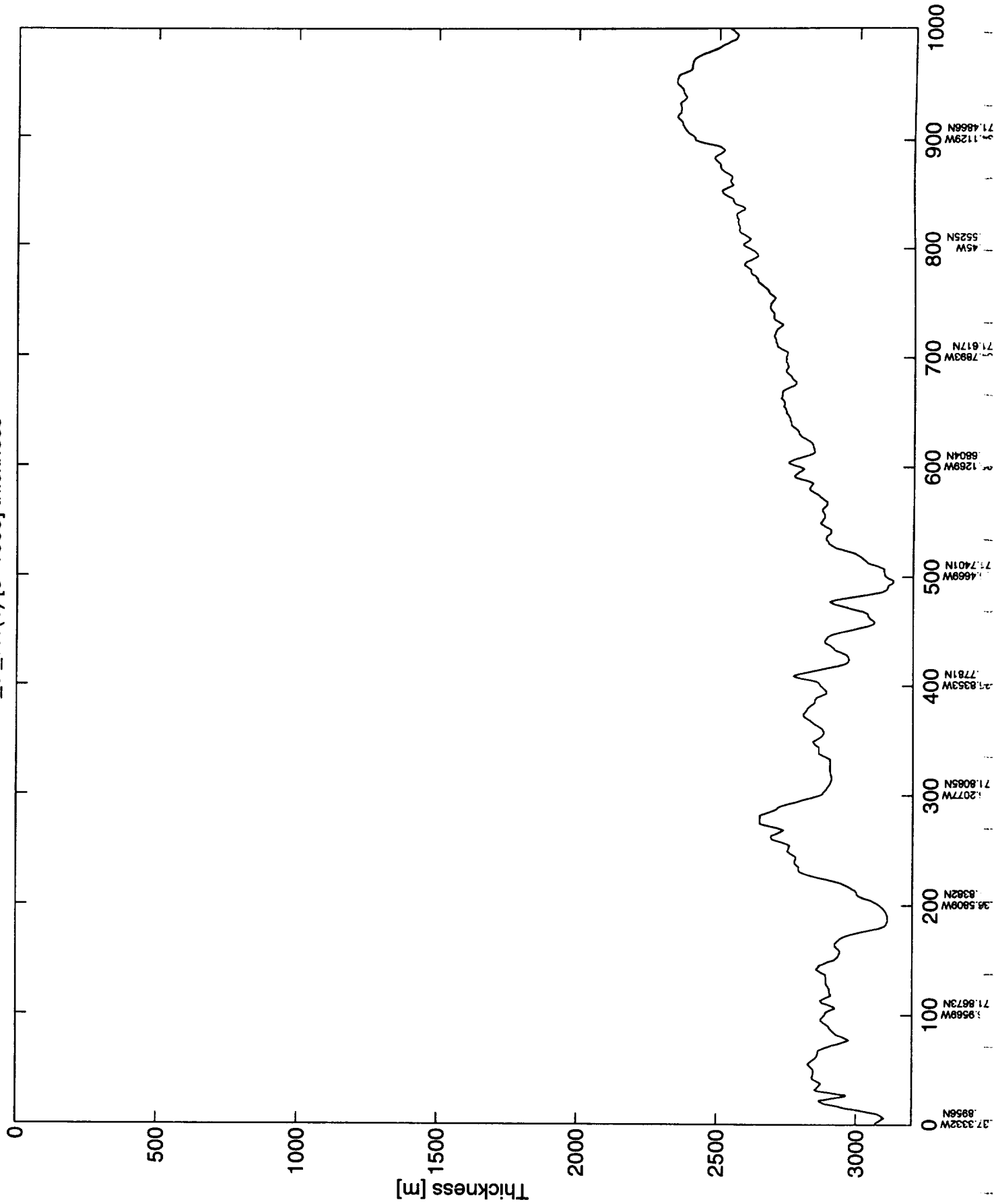
r_5l_6.13 [2000-2131] thickness



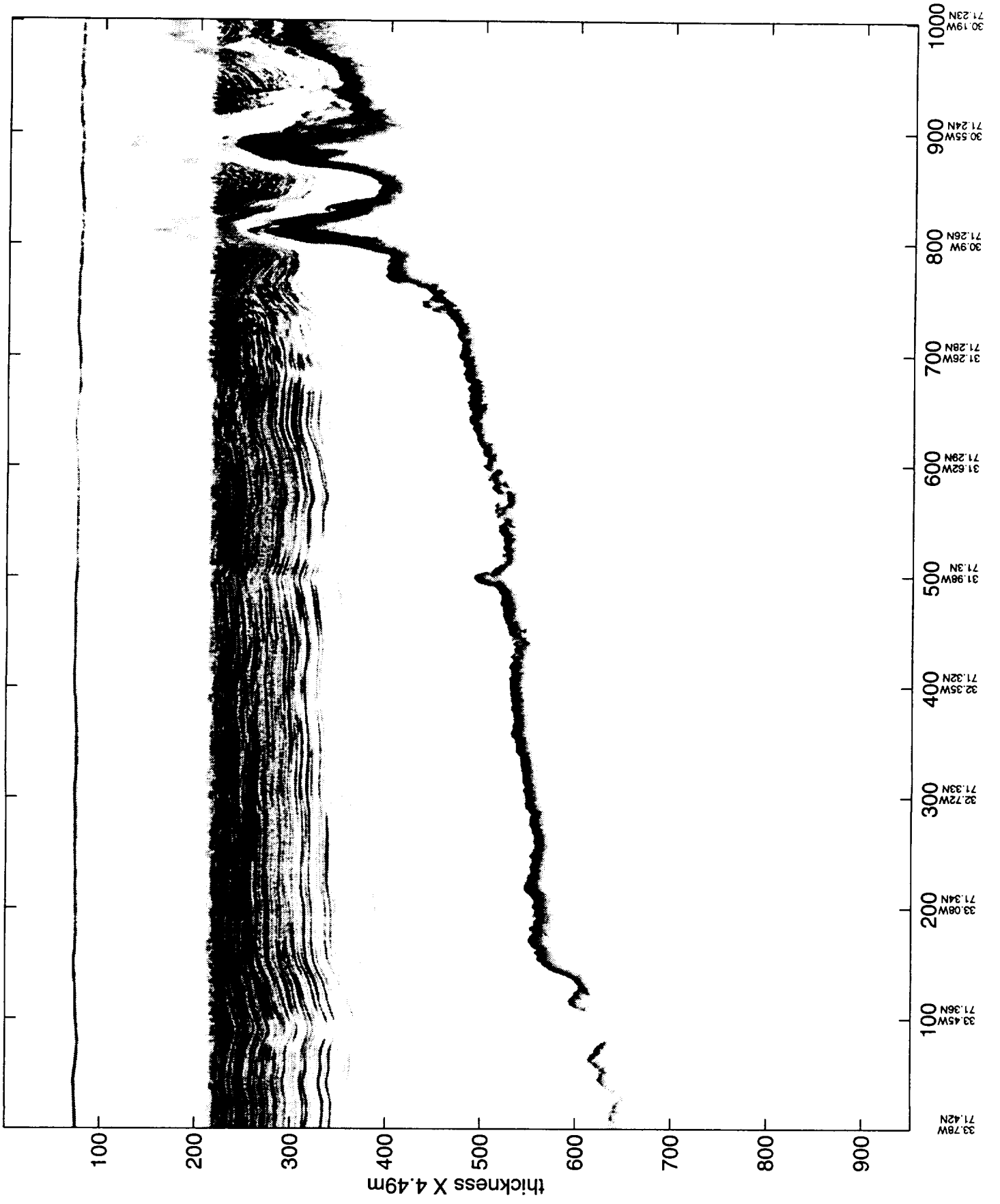
r_5L7.11 [0-1000]



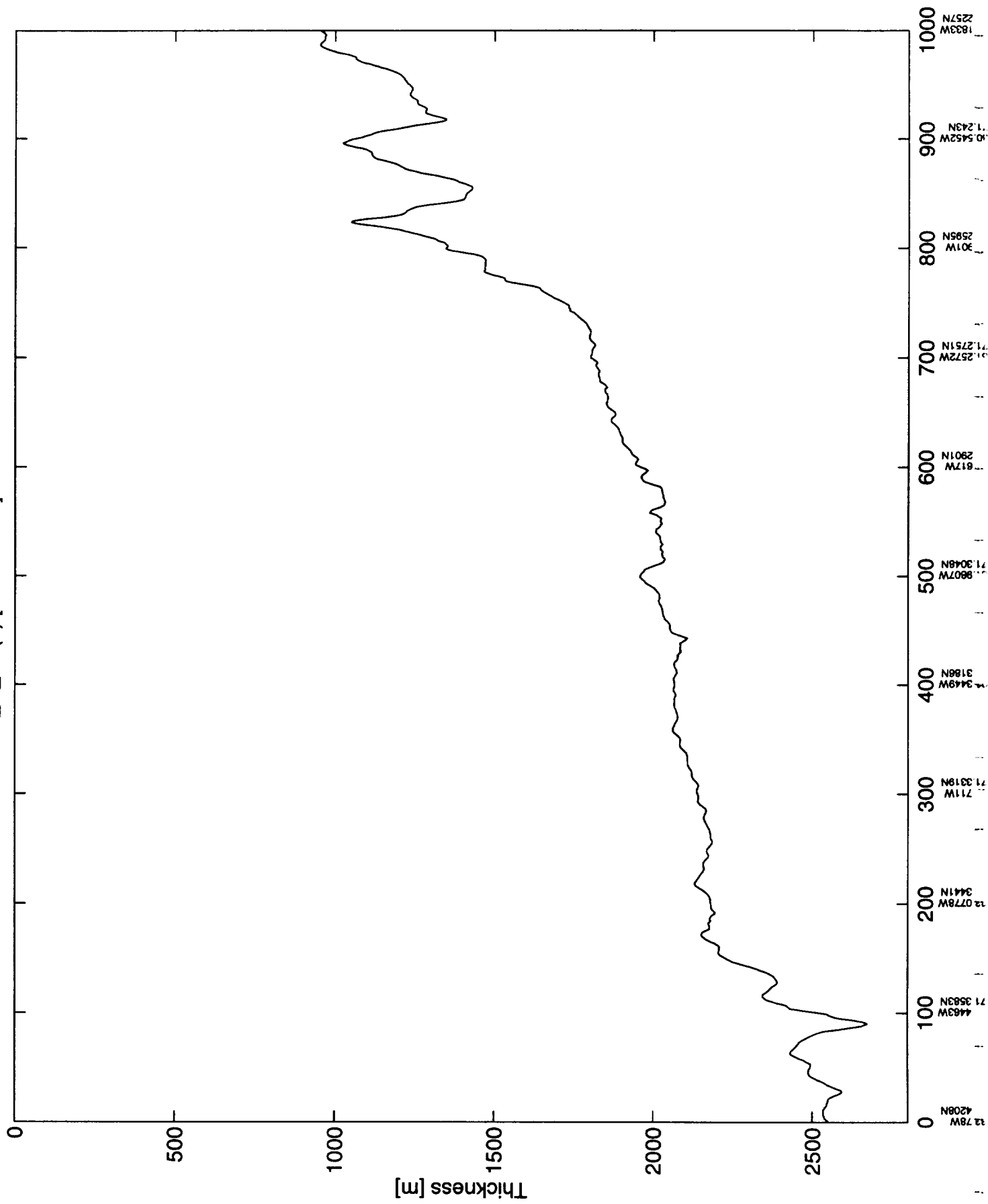
run_5L_7.1(1) [0-1000] thickness

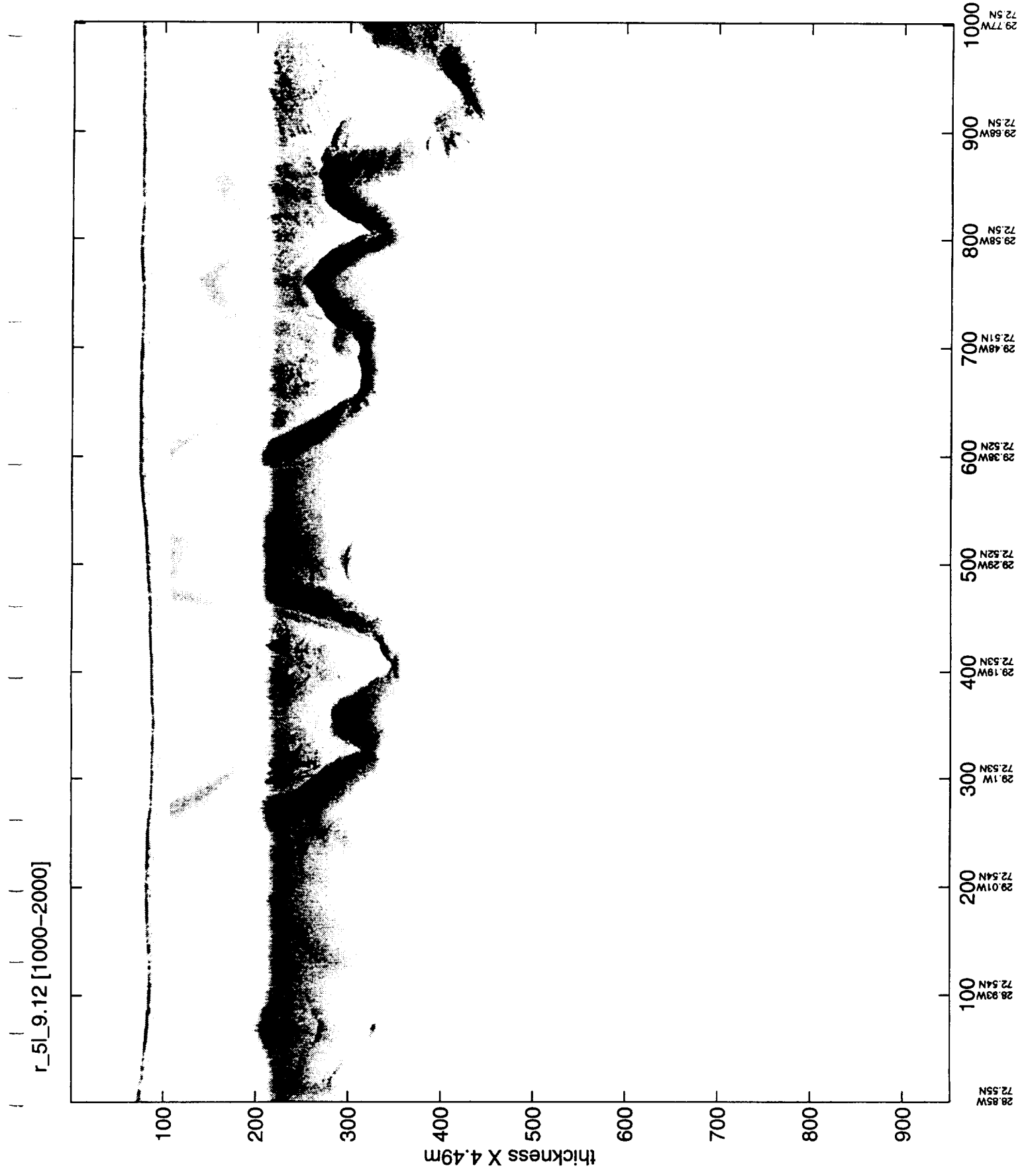


r_5l_7.12 [1000-2000]



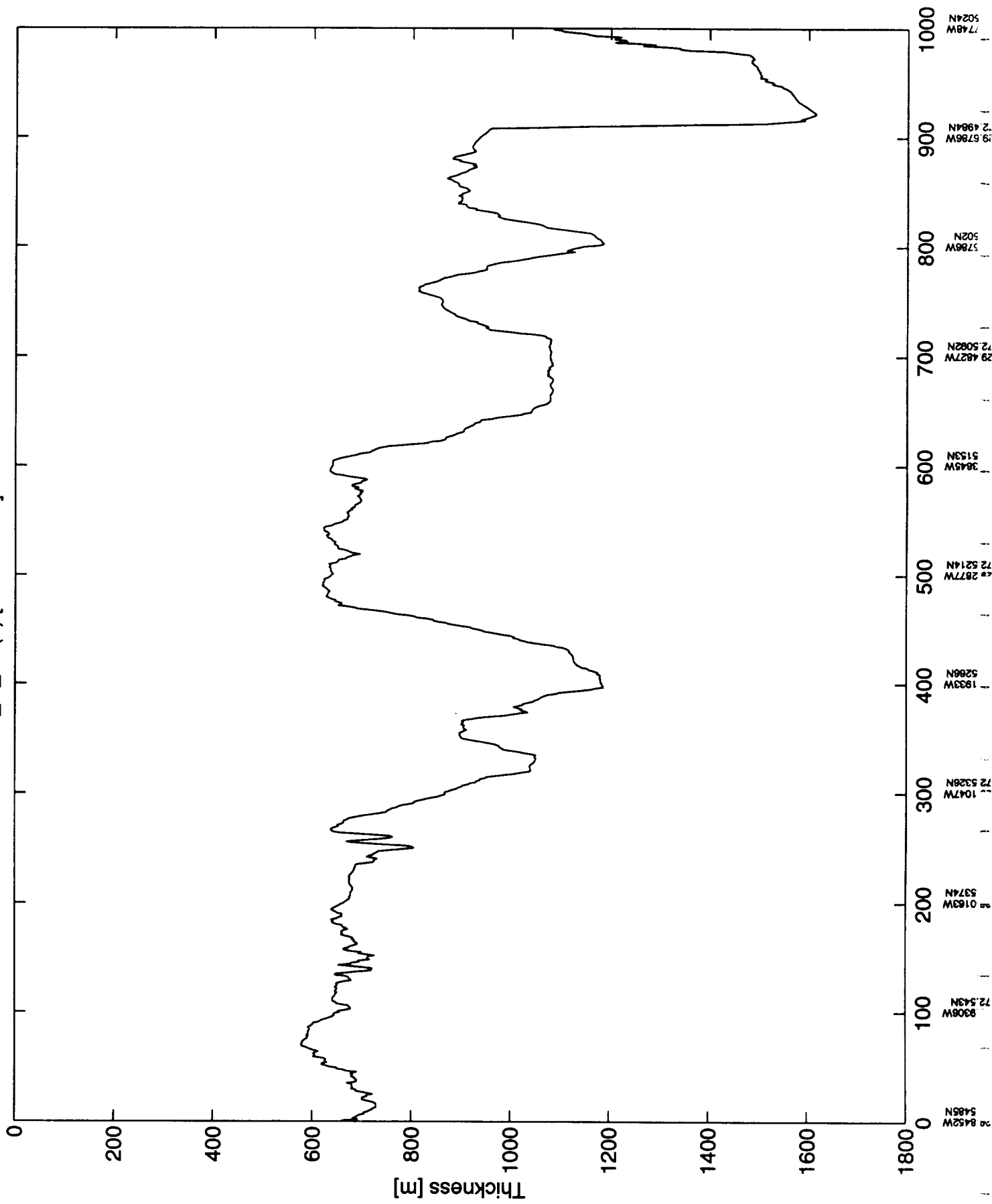
run_5l_7.1(2) [1000-2000] thickness



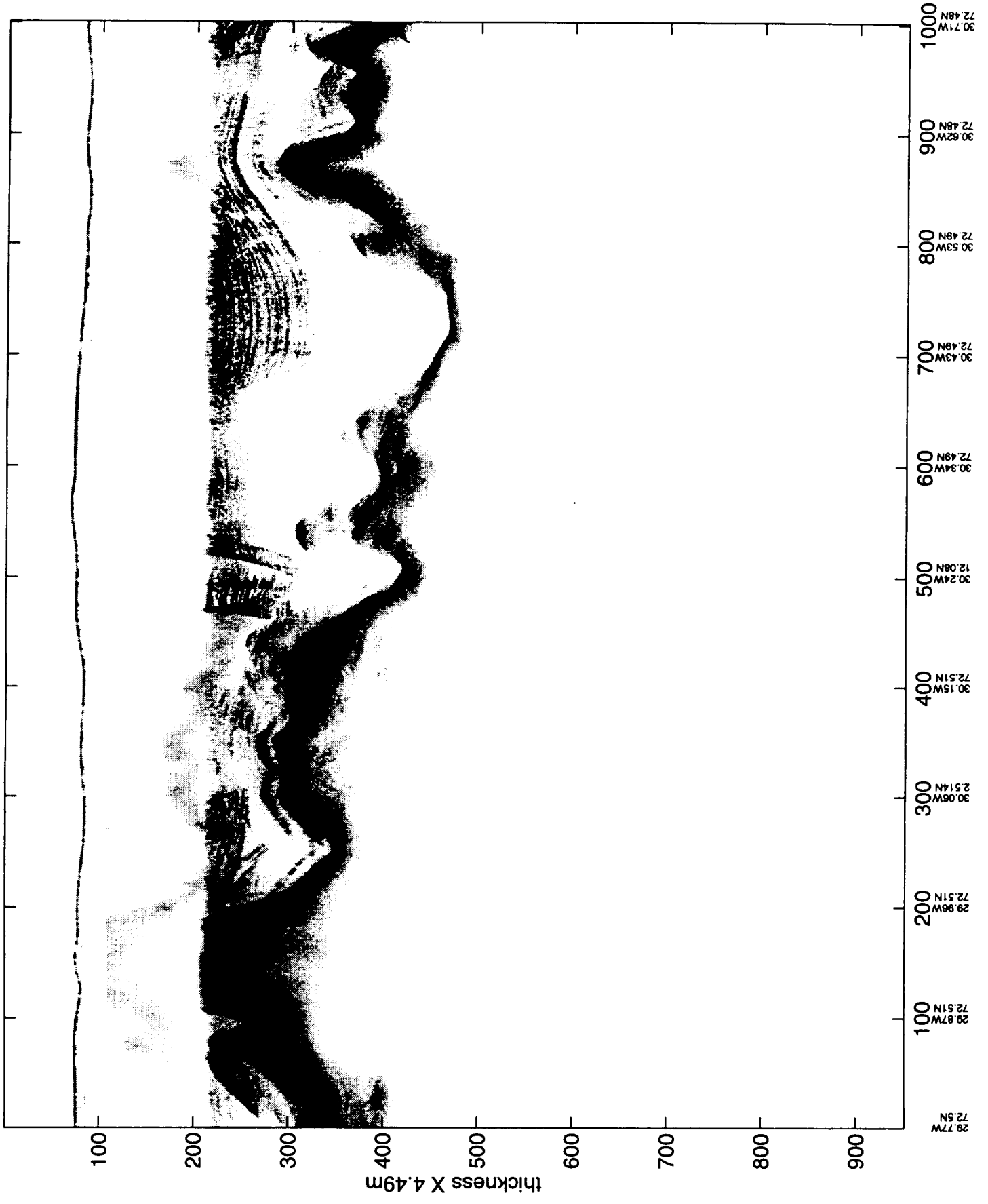


r_5|_9.12 [1000-2000]

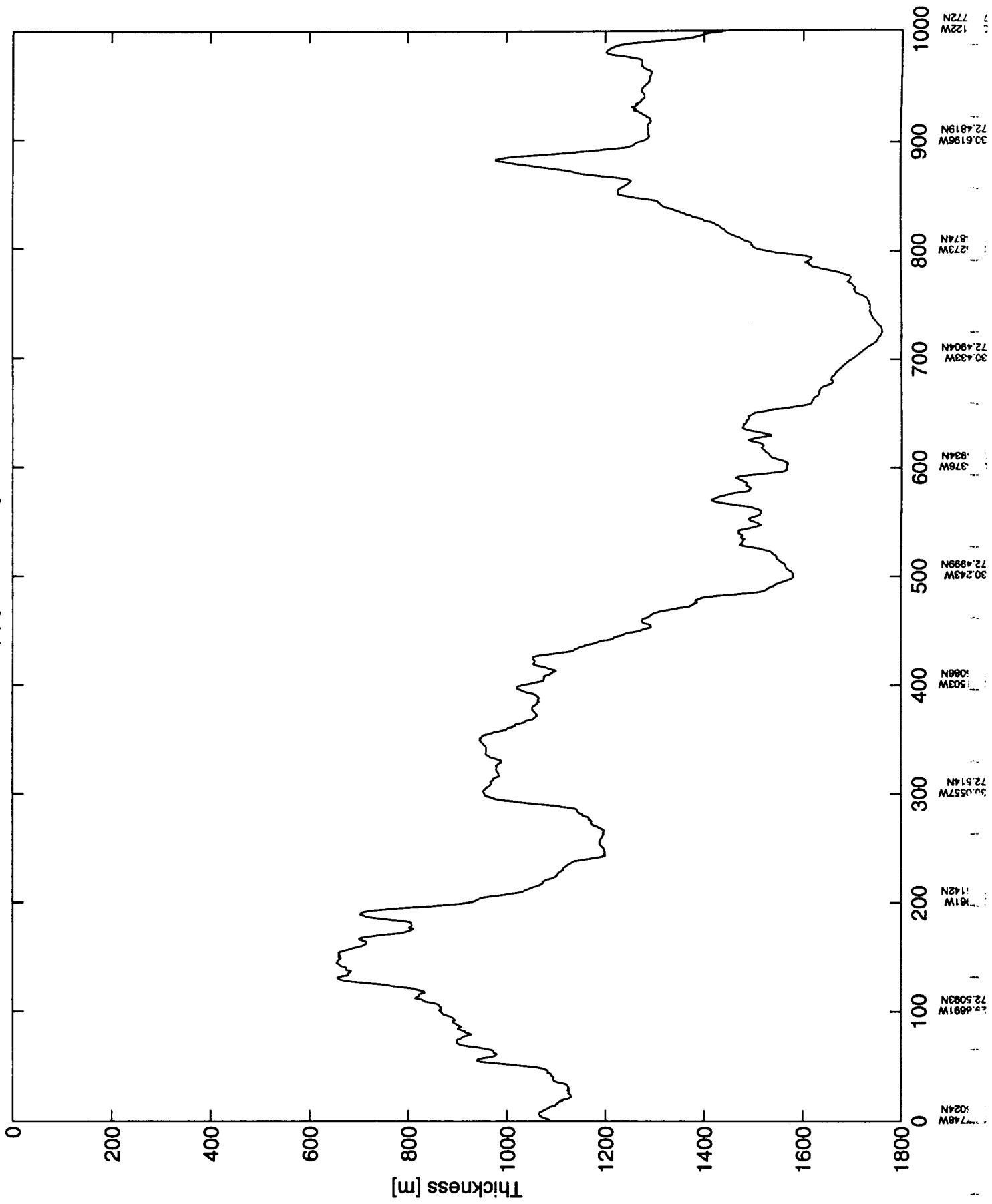
run_5l_9.1(2) [1000-2000] thickness



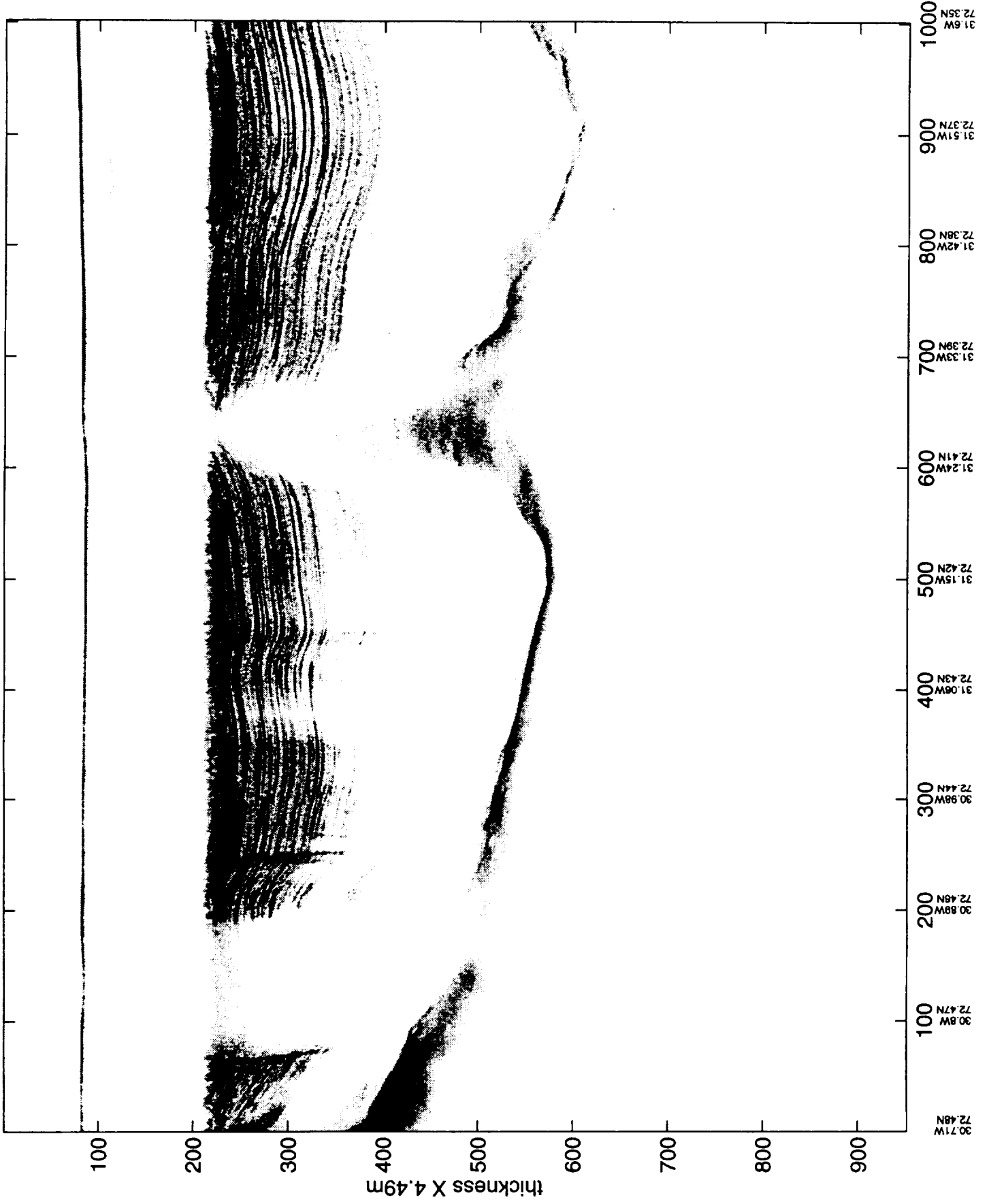
r_5l_9.13 [2000-3000]



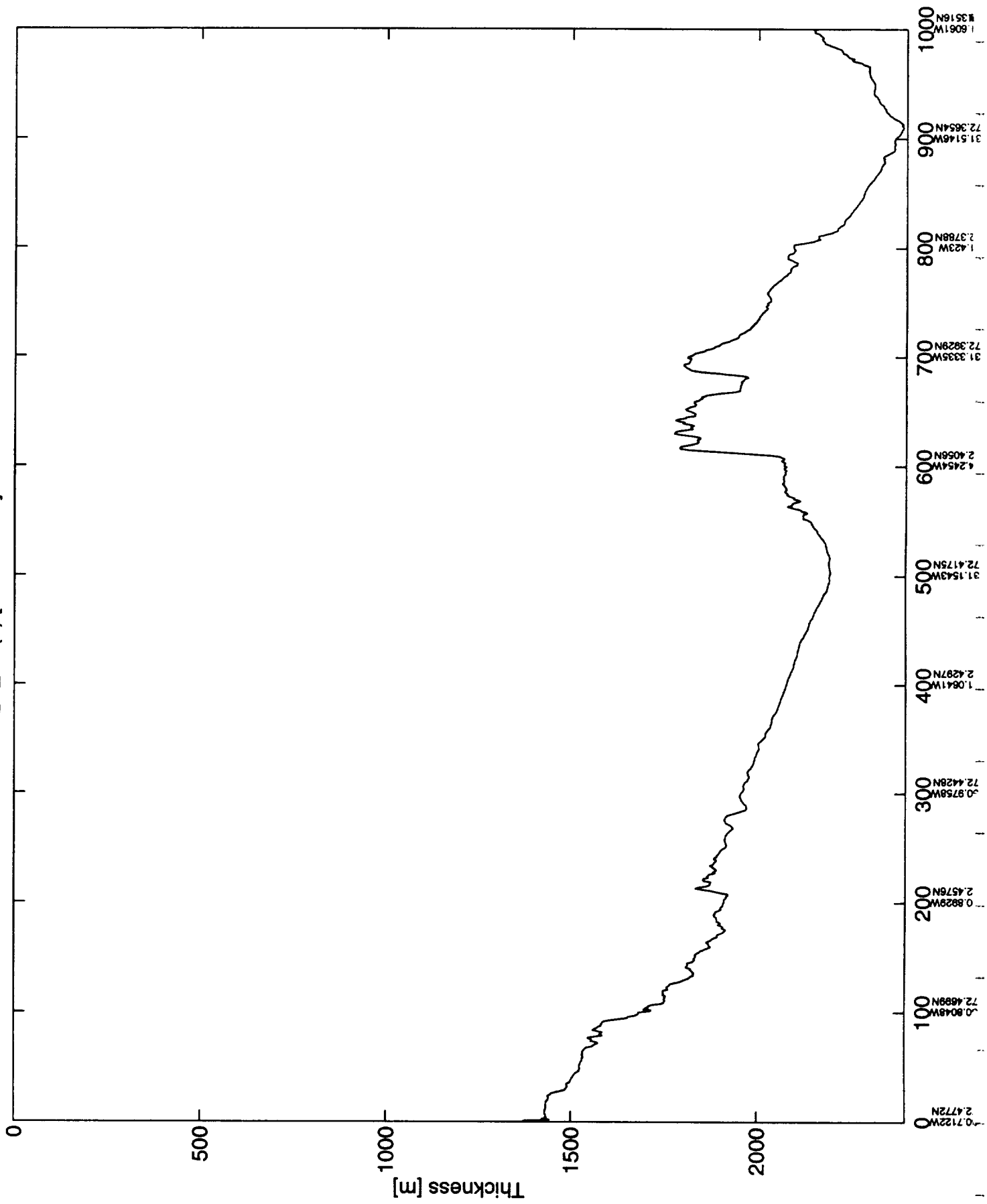
run_5l_9.1(3) [2000-3000] thickness



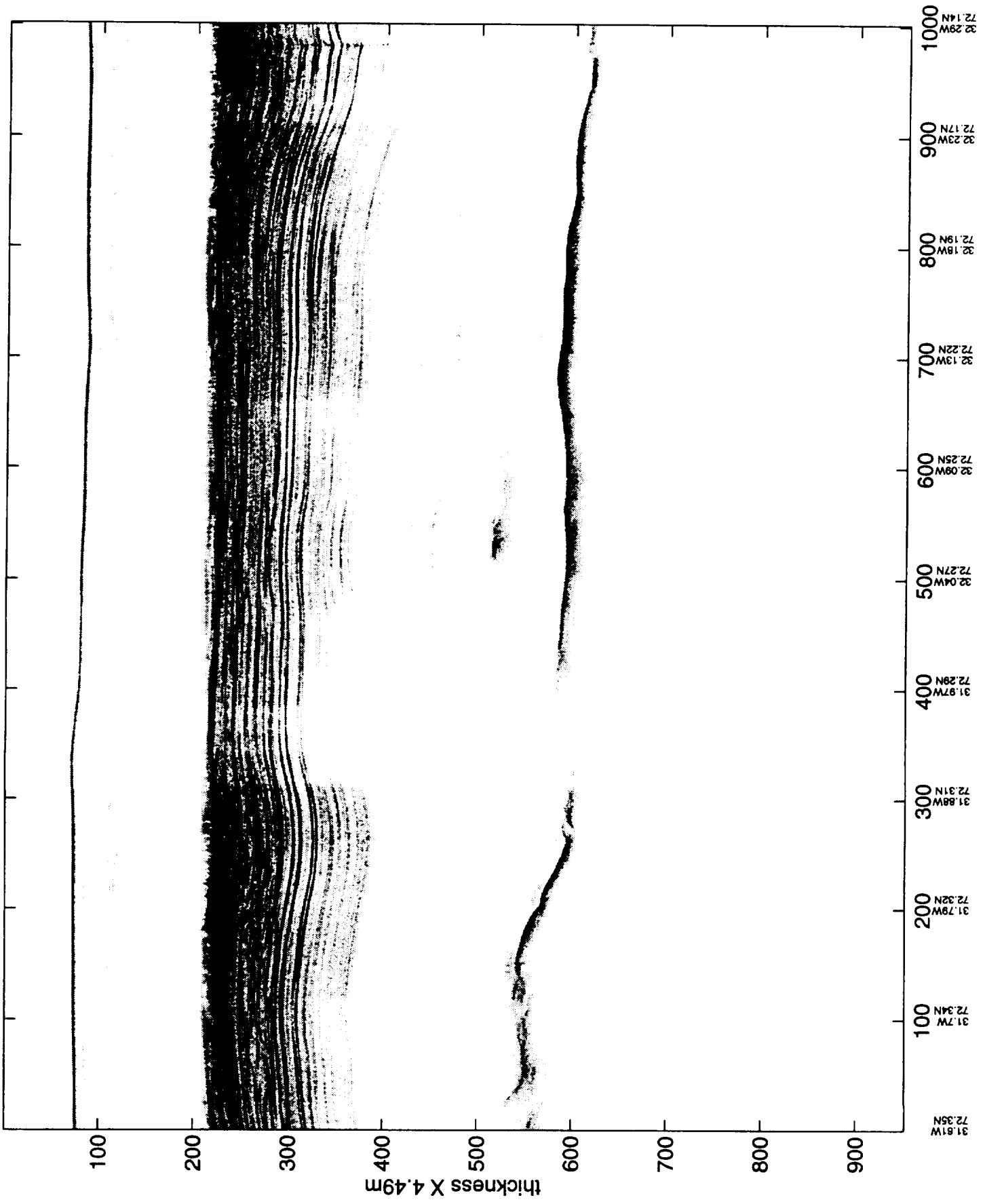
r_5l_9.14 [3000-4000]



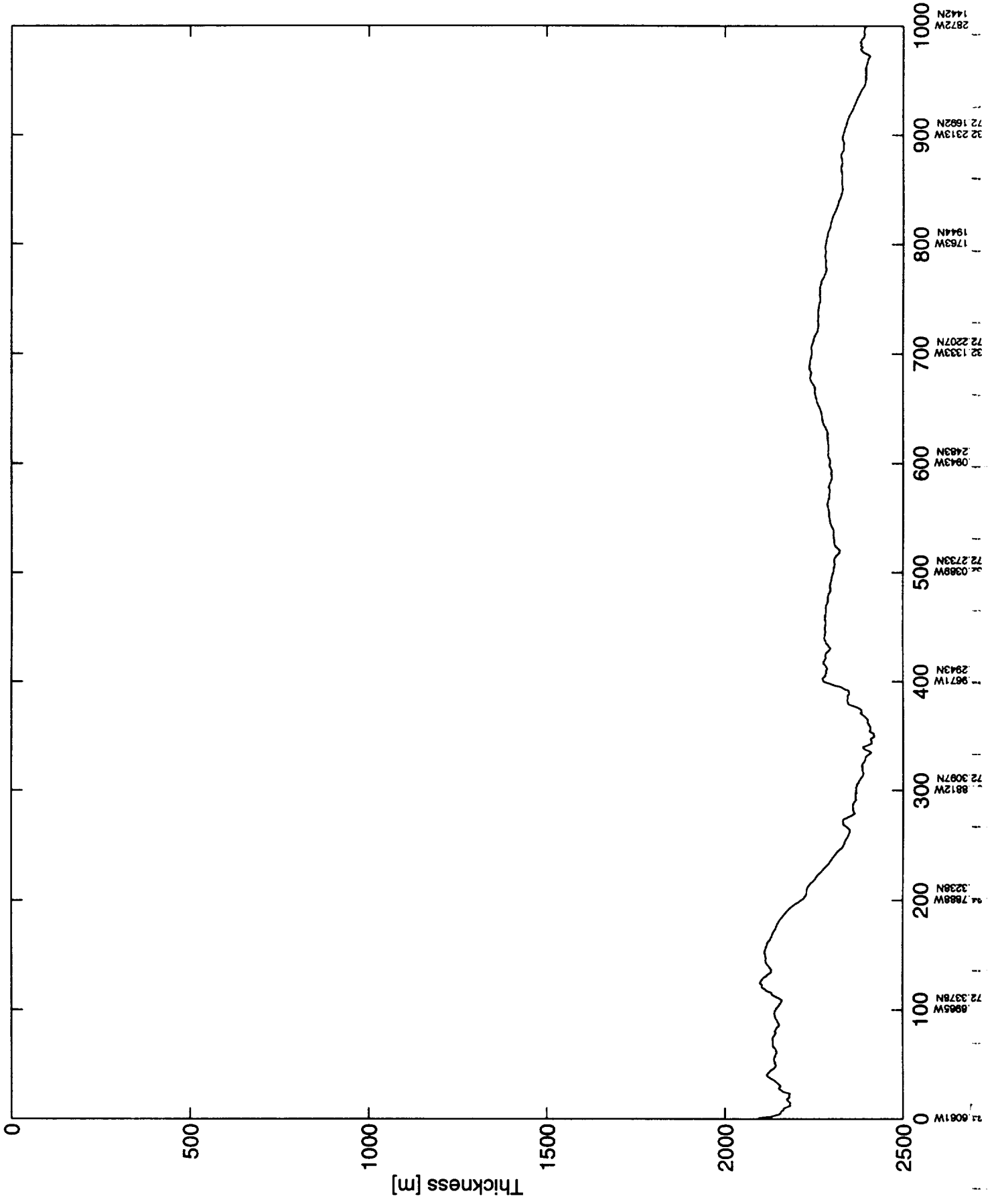
run_5L_9.1(4) [3000-4000] thickness



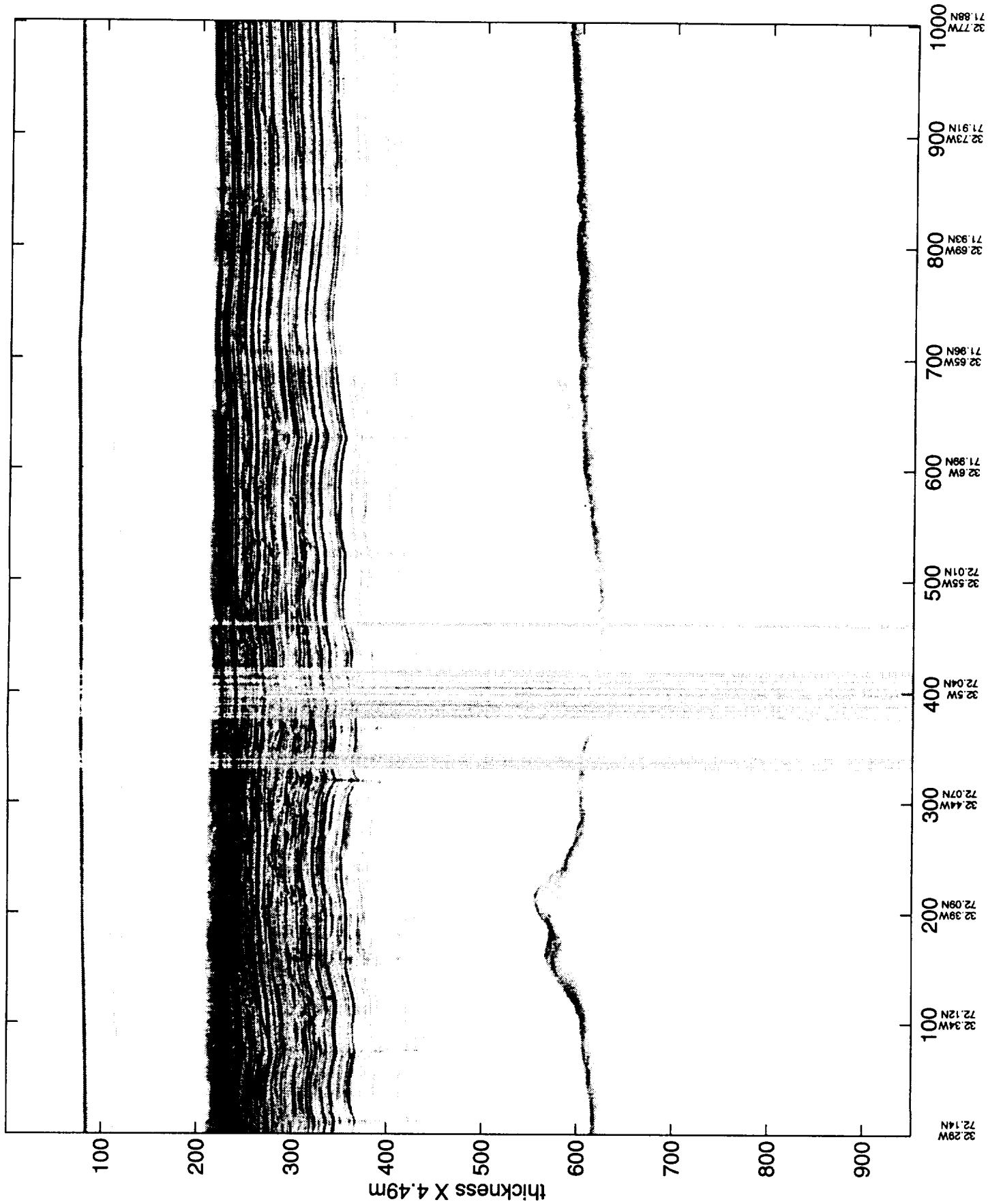
r_5l_9.15 [4000-5000]



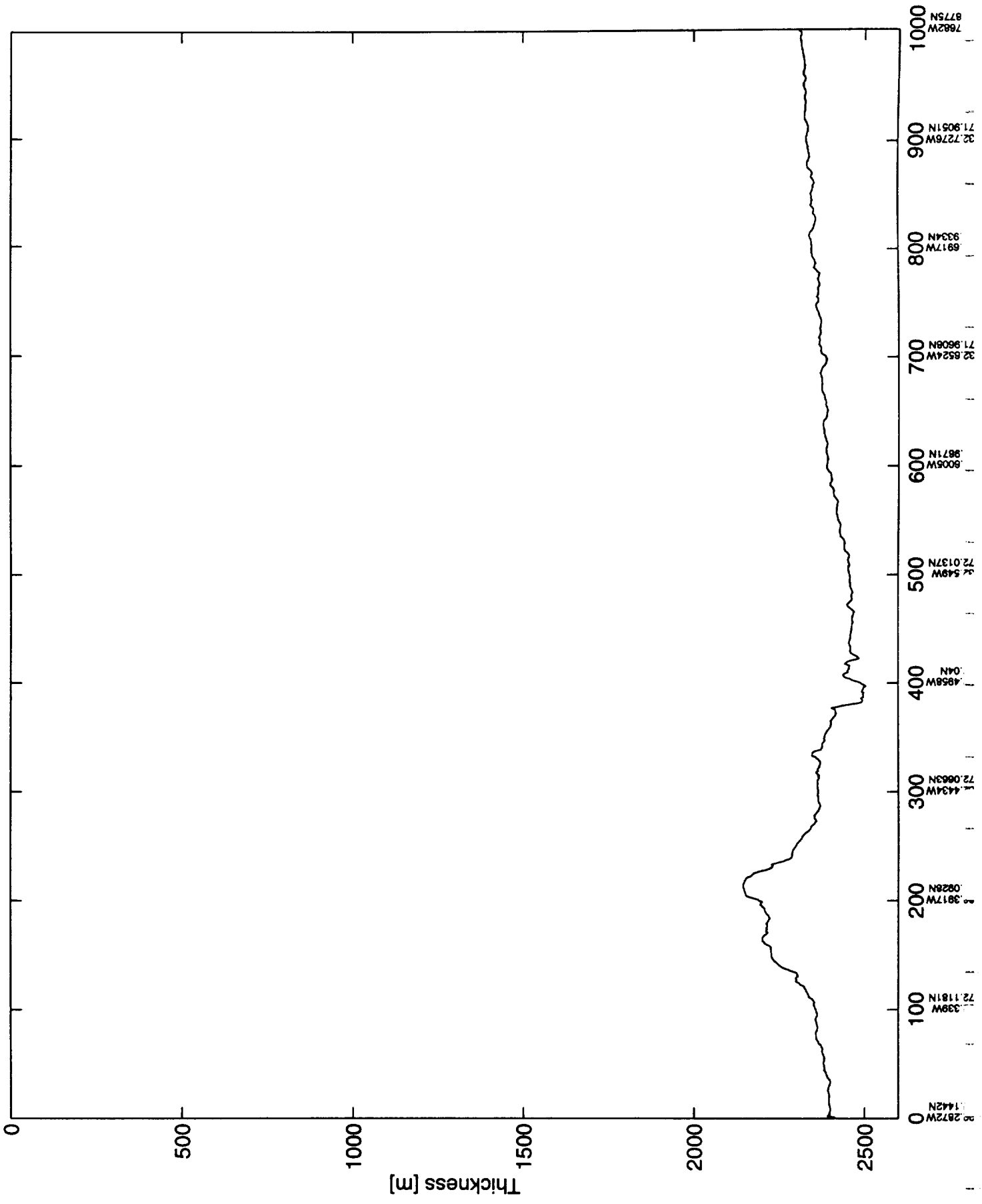
run_5|_9.1 (5) [4000-5000] thickness



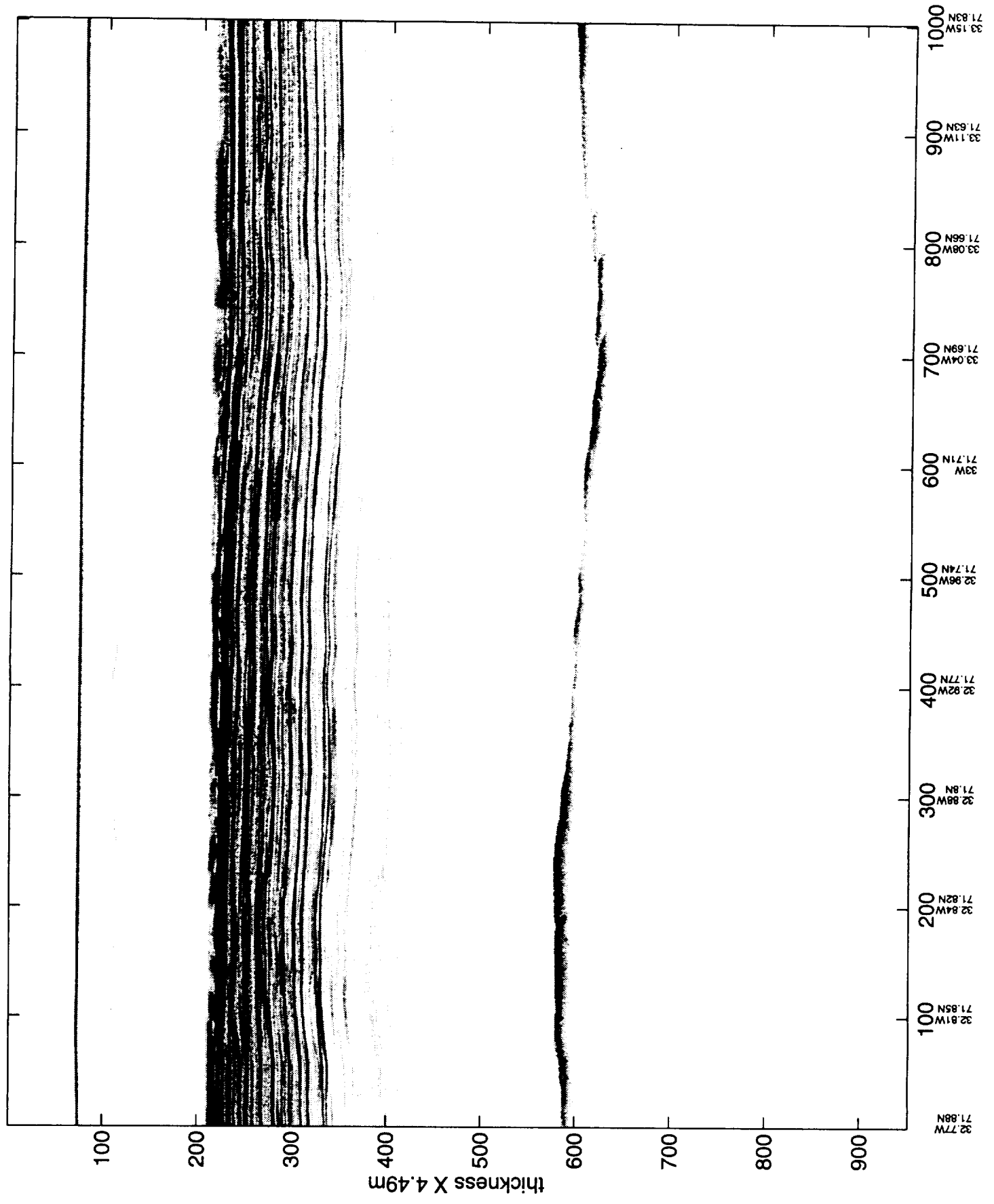
r_5l_9.16 [5000-6000]



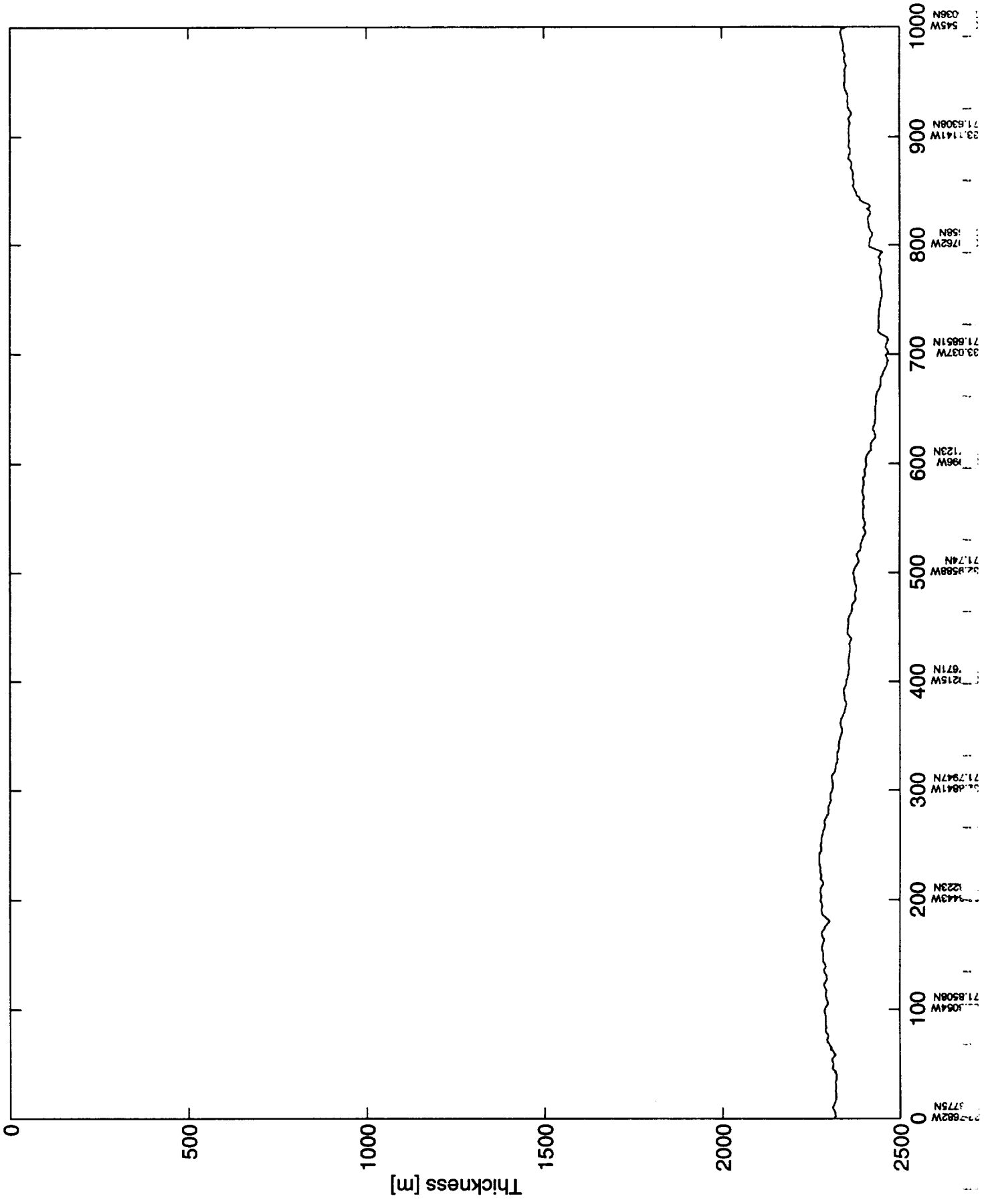
run_5l_9.1 (6) [5000-6000] thickness



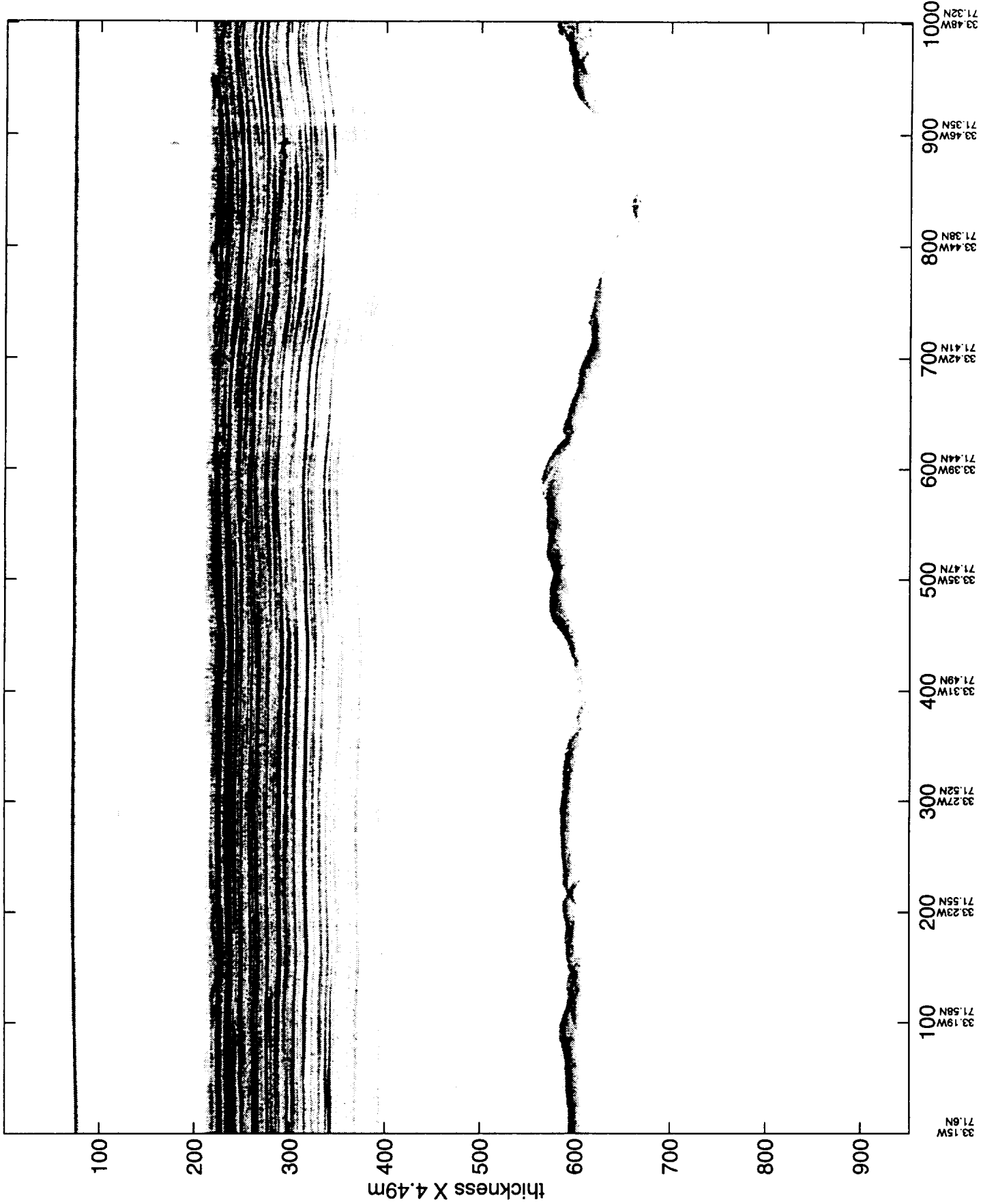
r_5l_9.17 [6000-7000]



run_5l_9.1 (7) [6000-7000] thickness

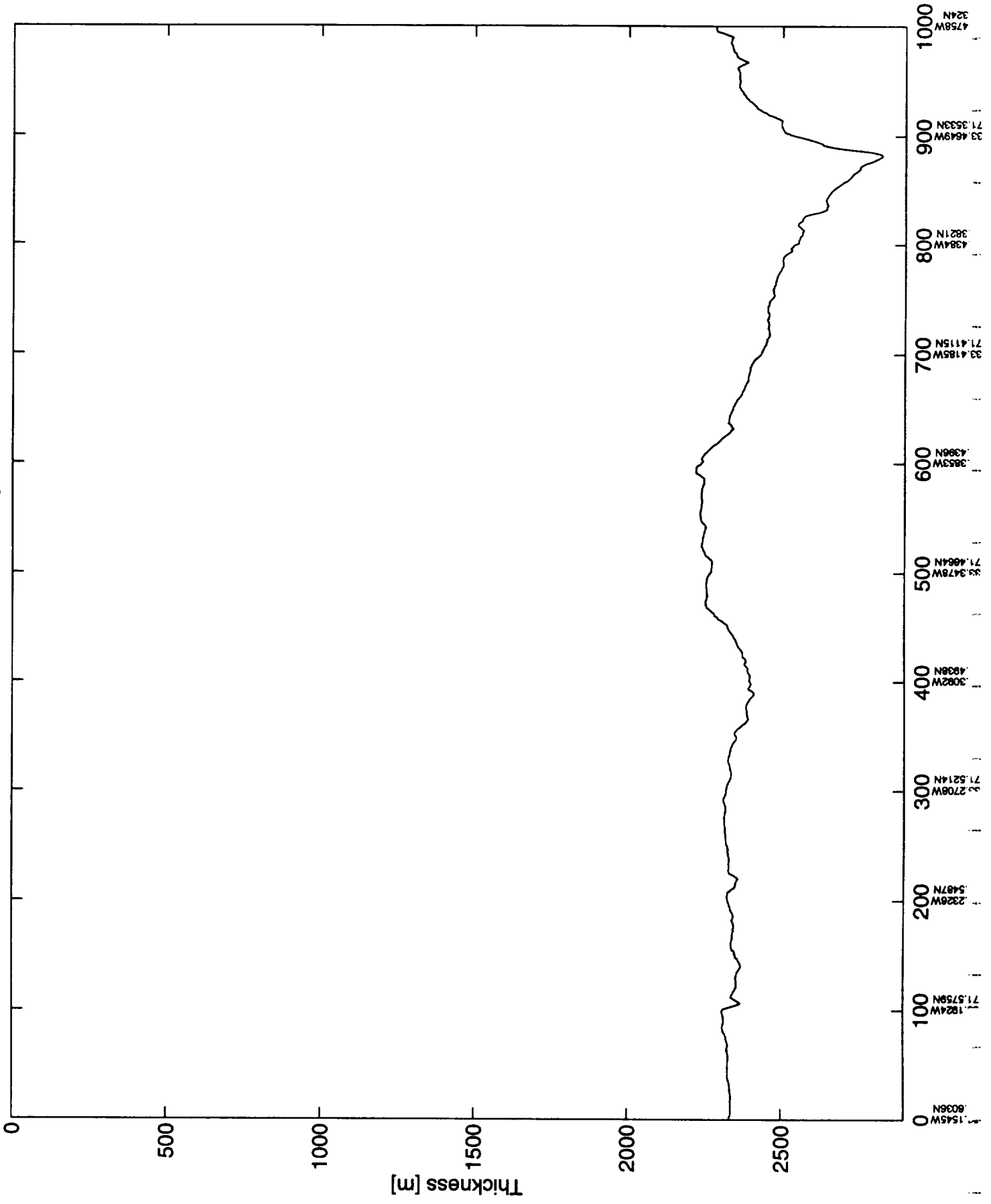


r_5l_9.18 [7000-8000]

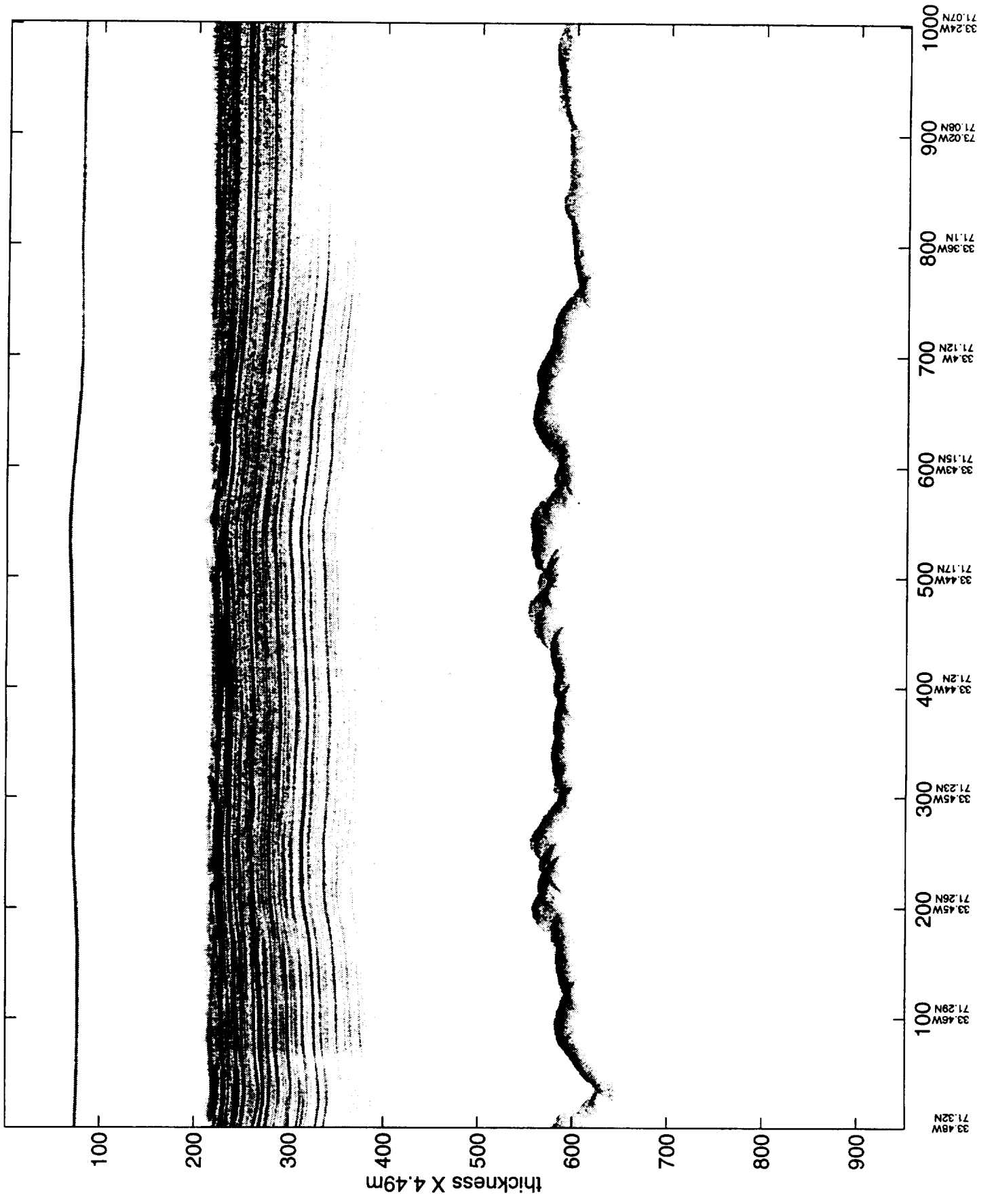


33.15W 71.6N
33.19W 71.58N
33.23W 71.55N
33.27W 71.52N
33.31W 71.49N
33.35W 71.47N
33.39W 71.44N
33.42W 71.41N
33.44W 71.38N
33.46W 71.35N
33.48W 71.32N

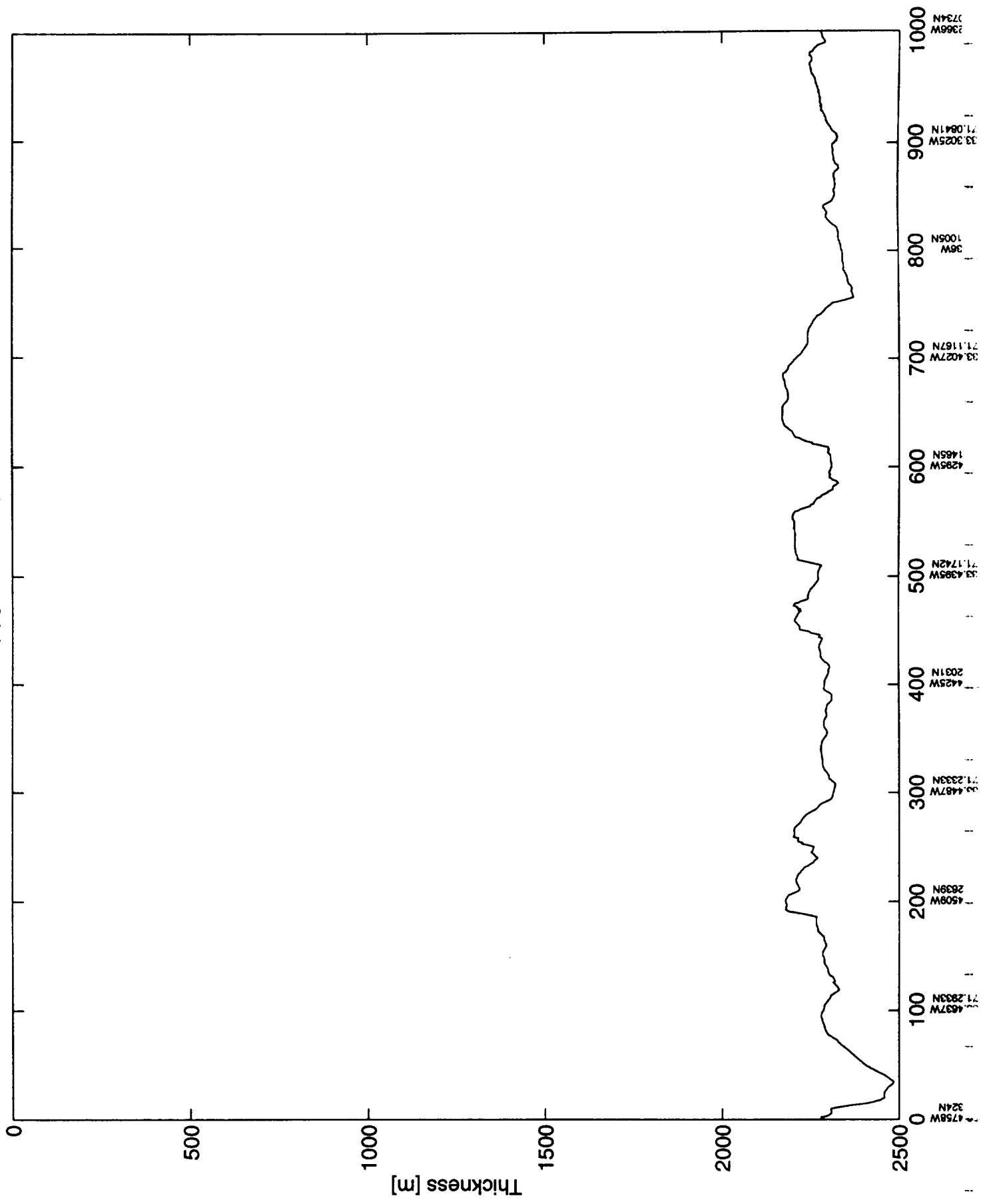
run_5l_9.1 (8) [7000-8000] thickness



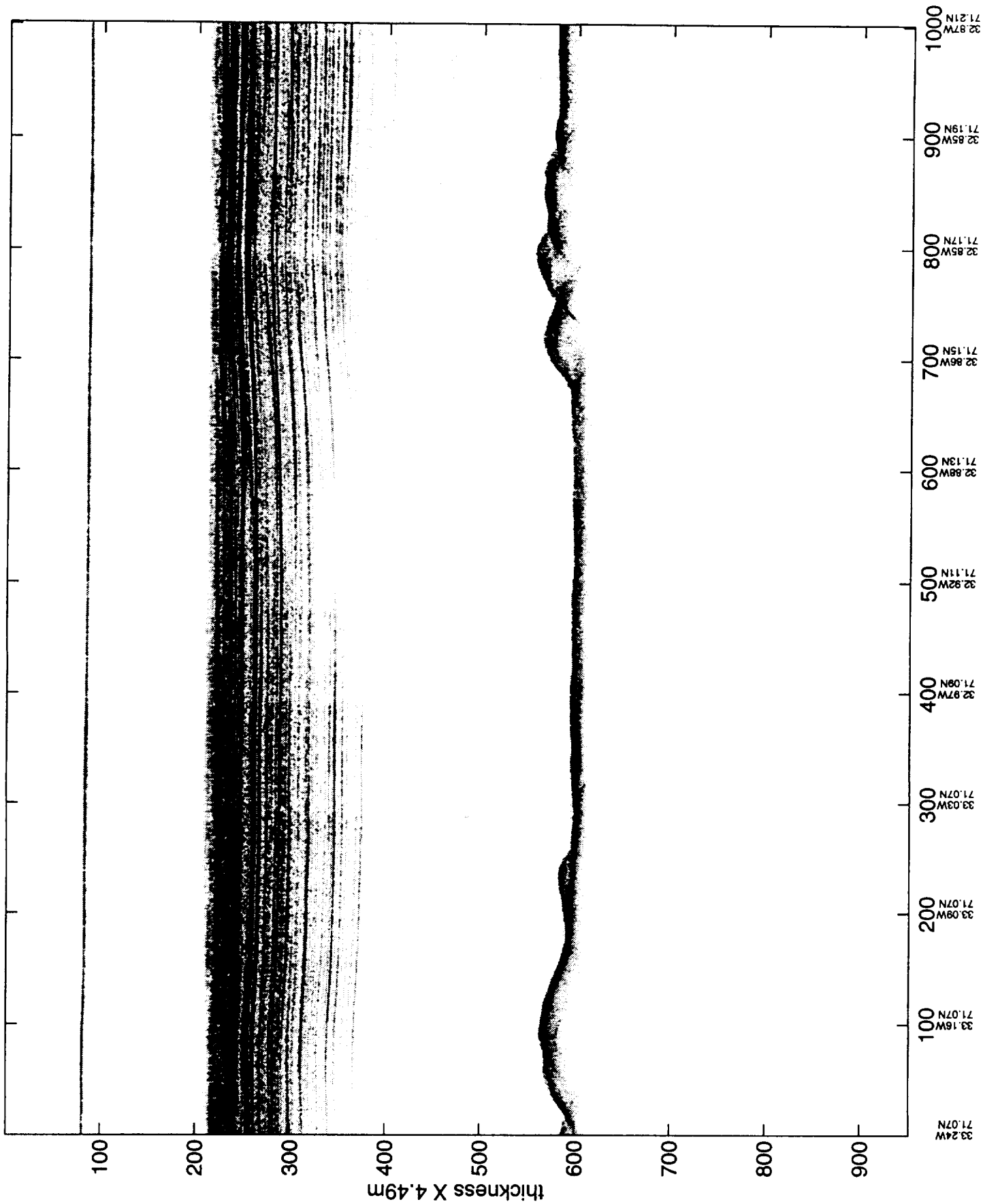
r_5l_9.19 [8000-9000]



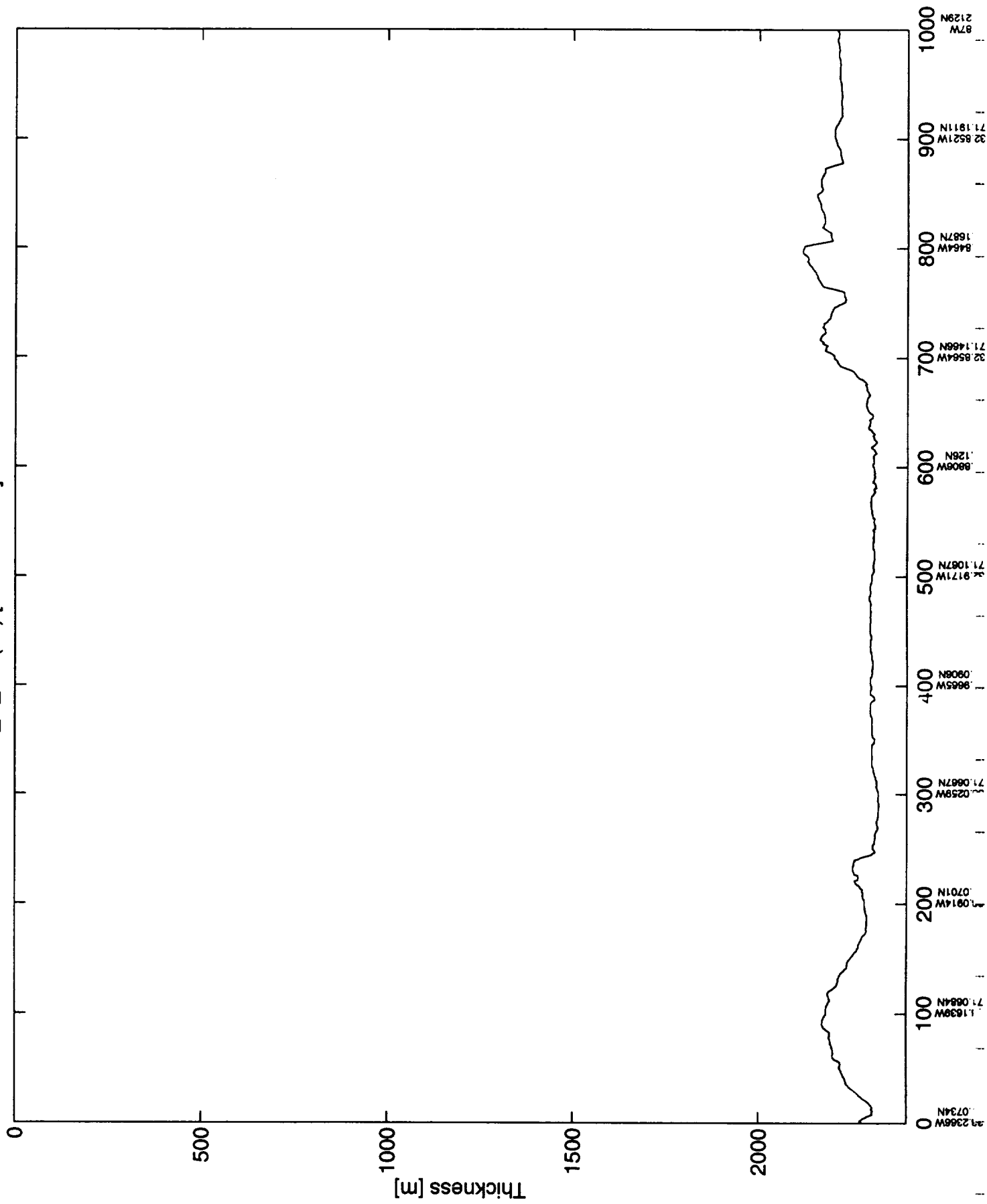
run_5l_9.1 (9) [8000-9000] thickness



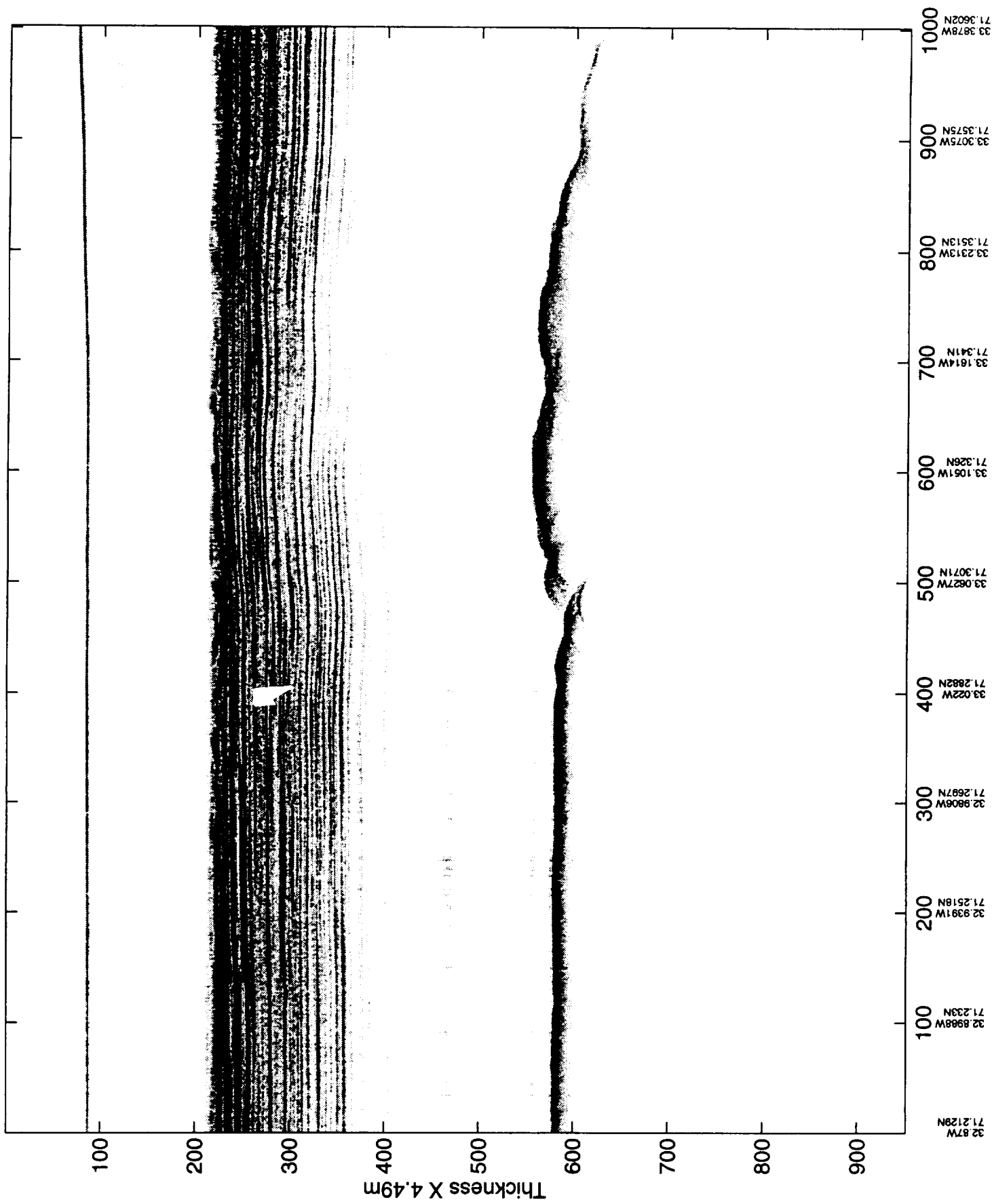
r_5|_9.110 [9000-10000]



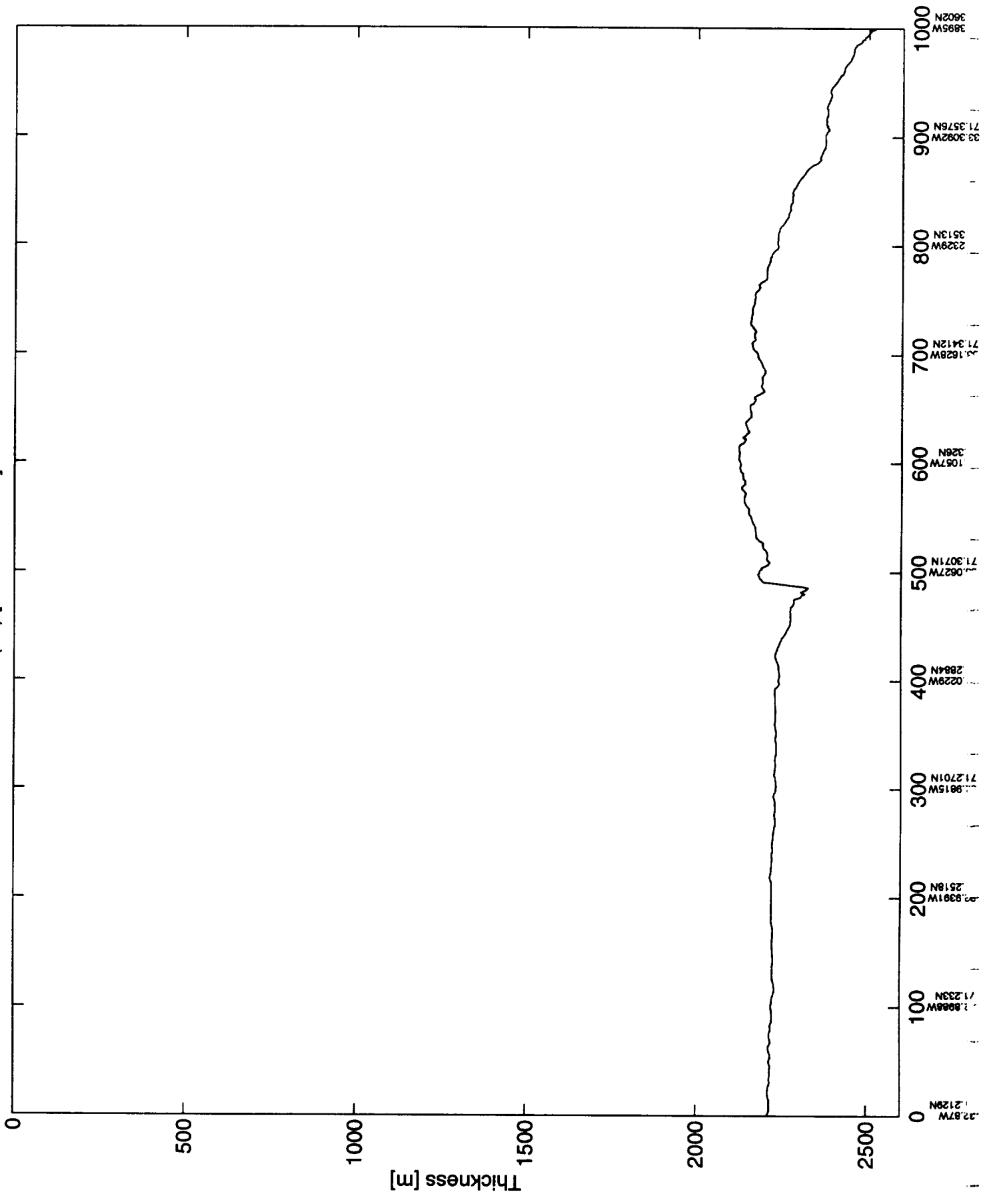
run_5l_9.1 (10) [9000-10000] thickness



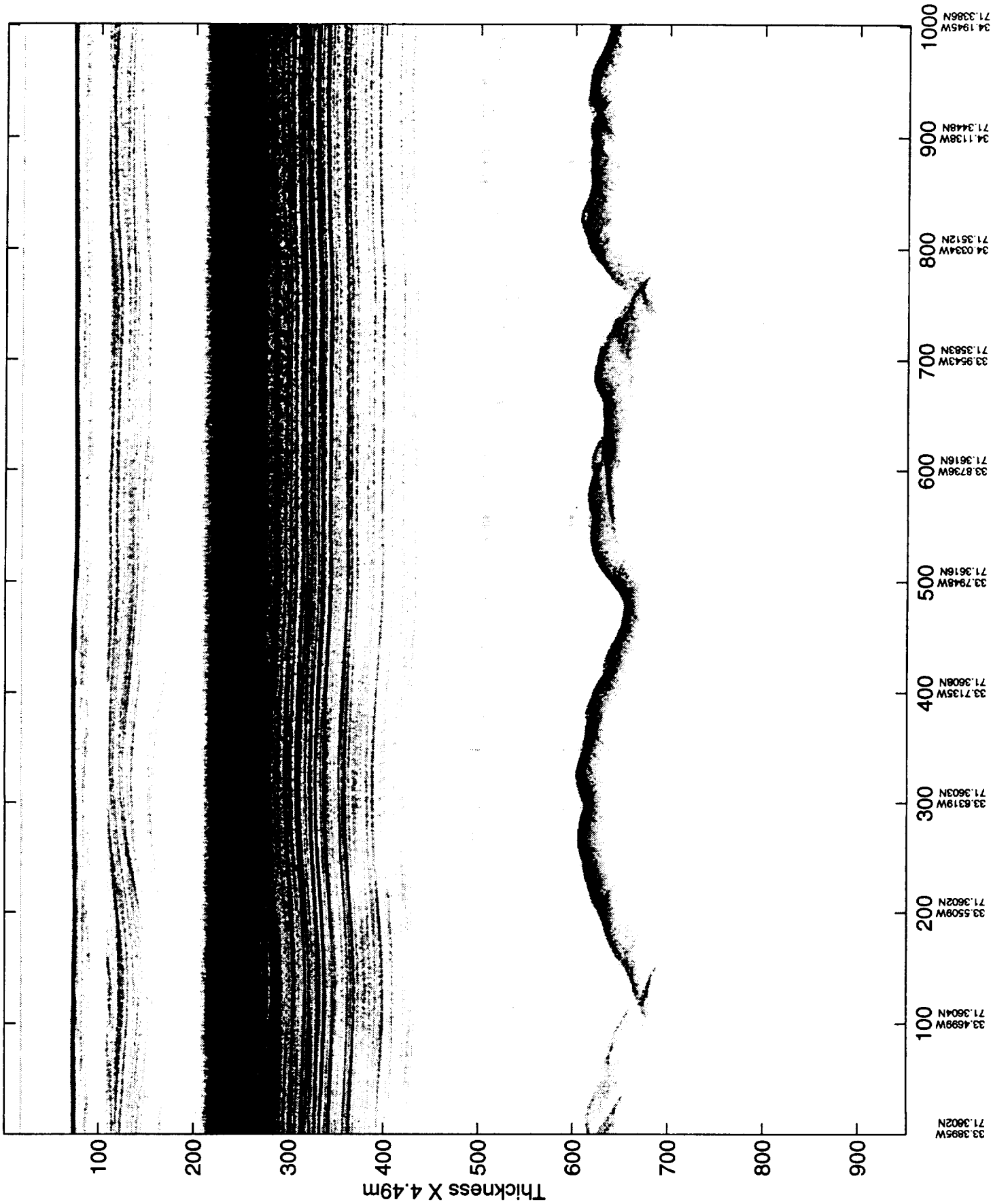
r_5l_9.111 [10000-11000]



run_5l_9.1 (11) [10000-11000] thickness

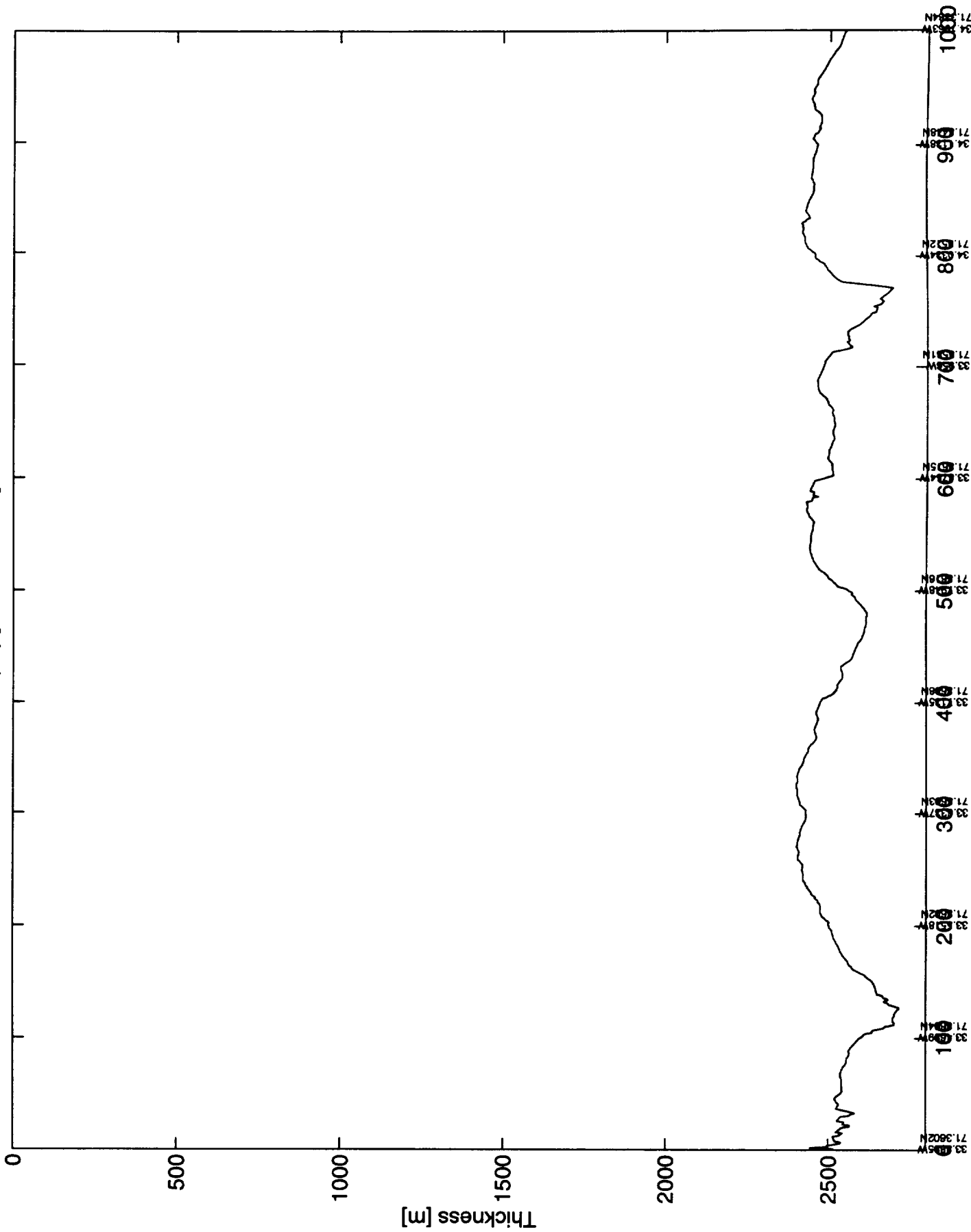


r_5l_9.112 [11000-12000]

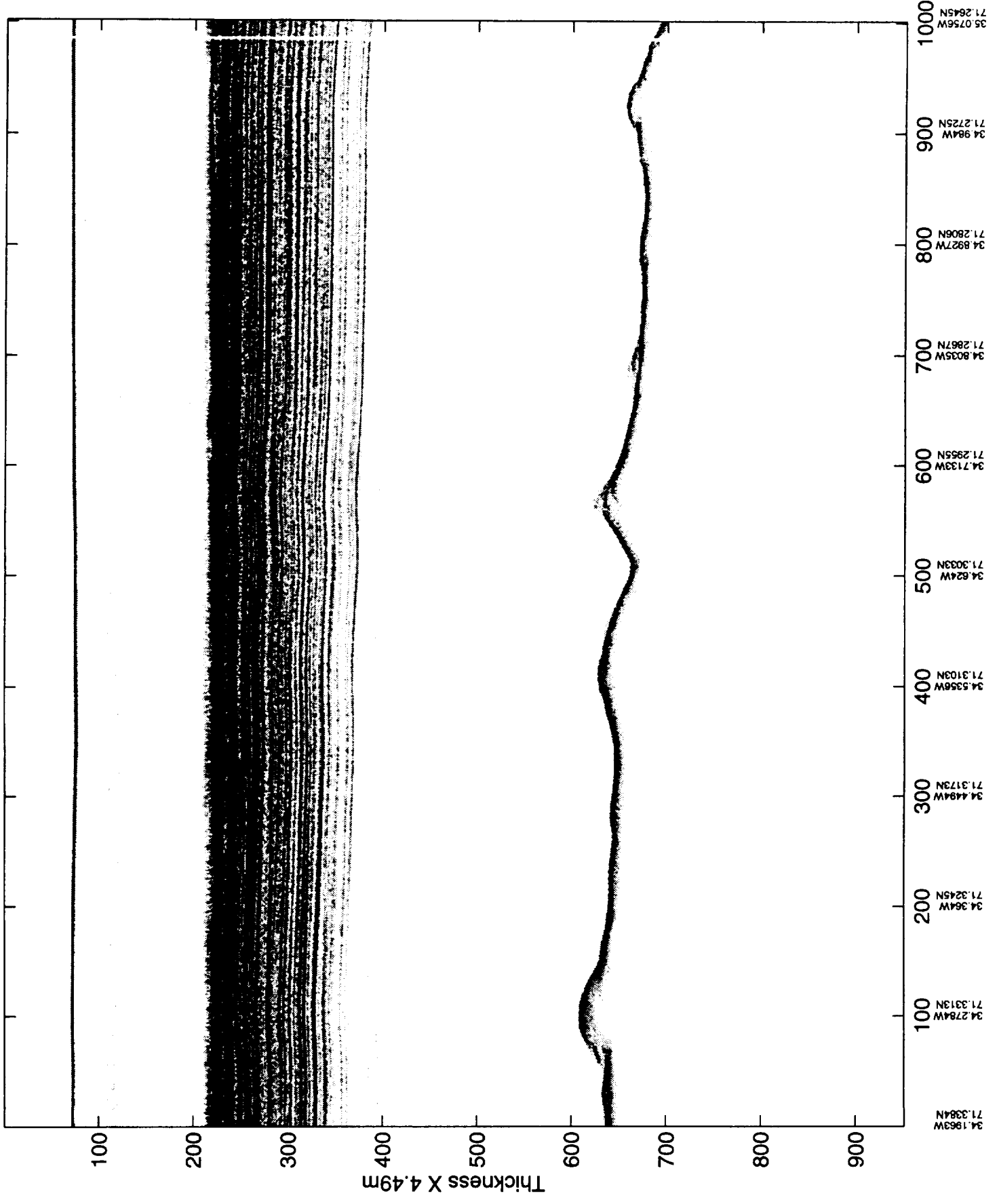


33.3895W 71.3002N
33.4899W 71.3044N
33.5509W 71.3022N
33.6319W 71.3033N
33.7135W 71.3080N
33.7948W 71.3616N
33.8736W 71.3616N
33.9543W 71.3583N
34.0344W 71.3612N
34.1138W 71.3448N
34.1945W 71.3386N

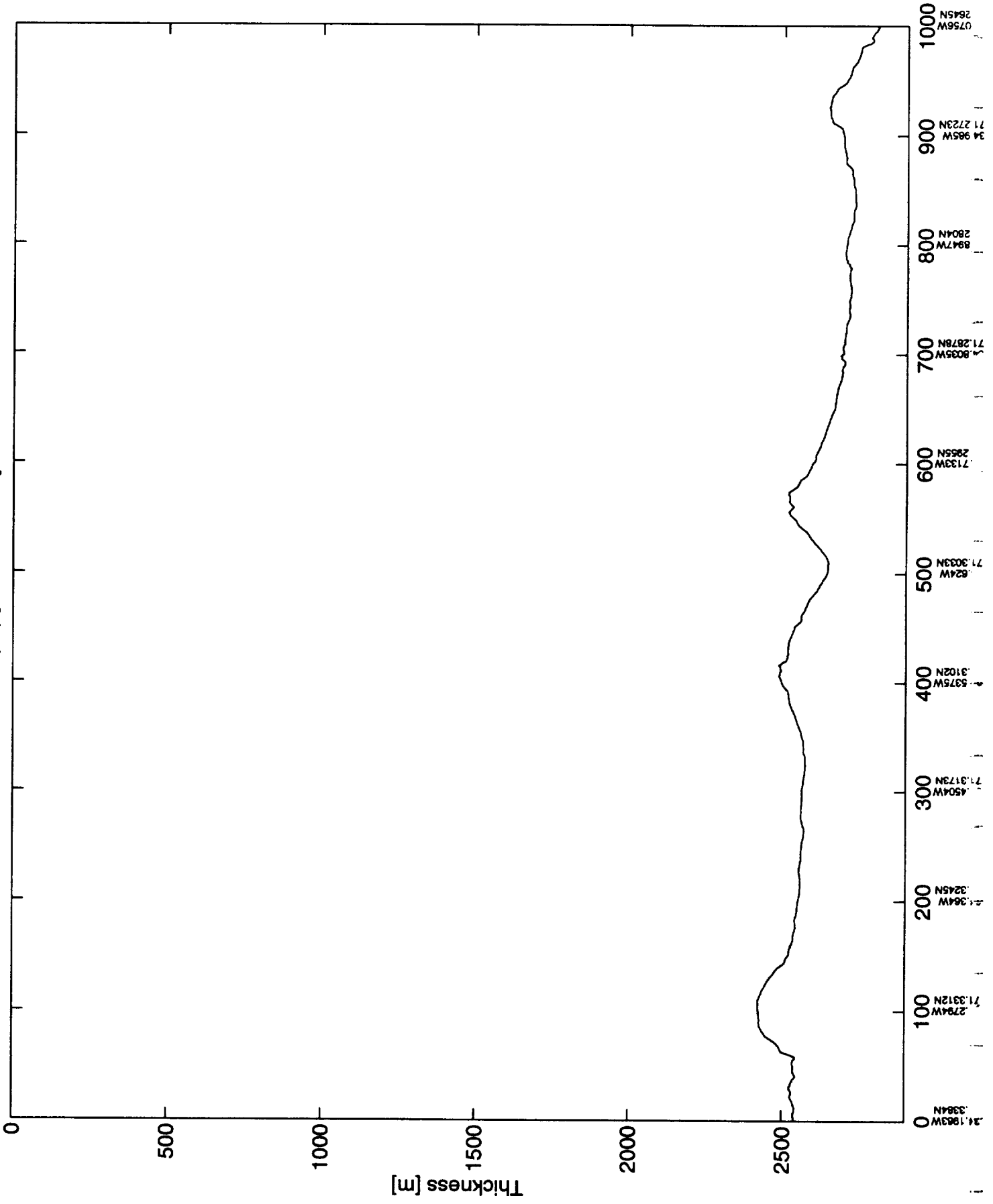
run_5l_9.1 (12) [11000-12000] thickness



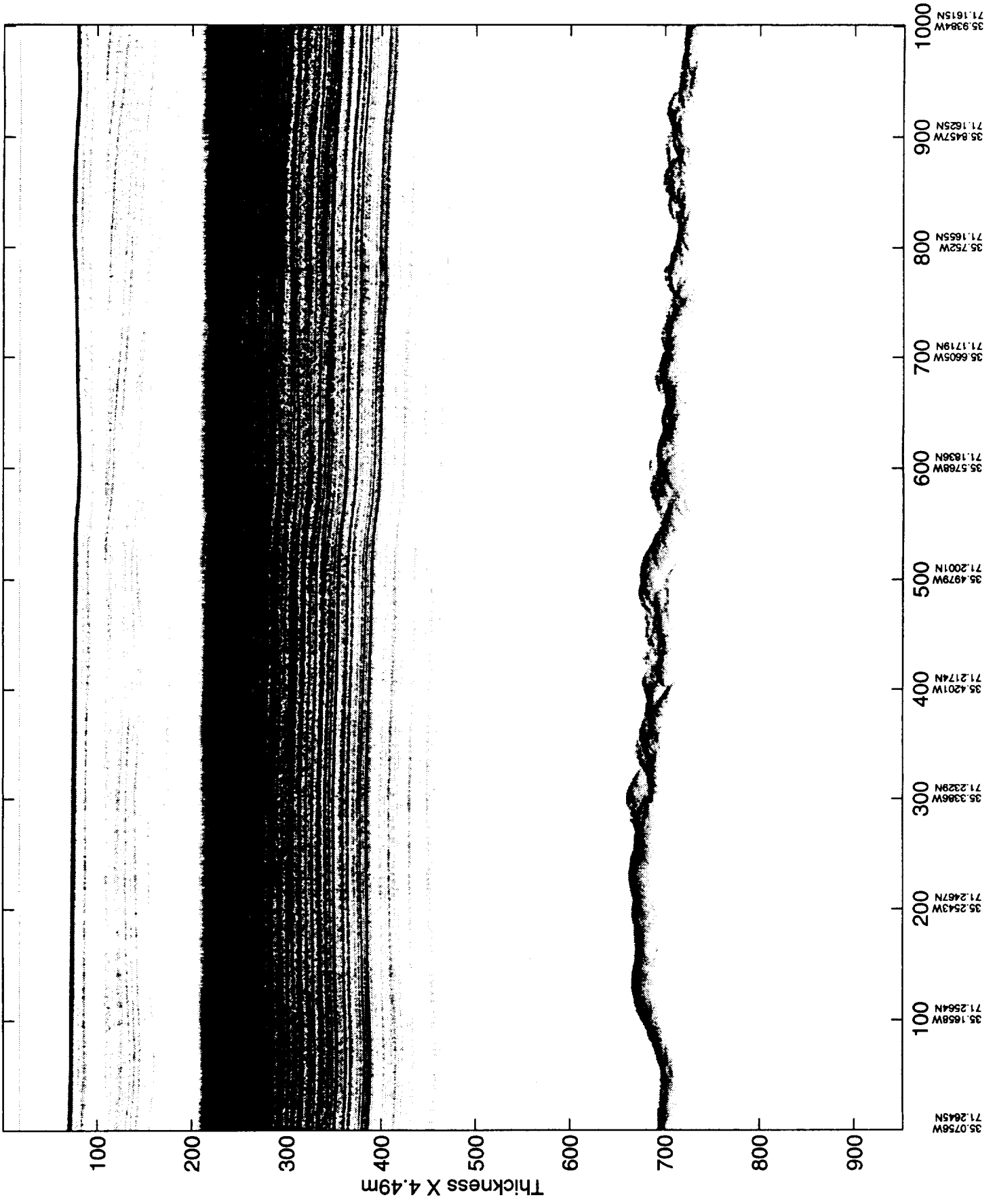
r_5l_9.113 [12000-13000]



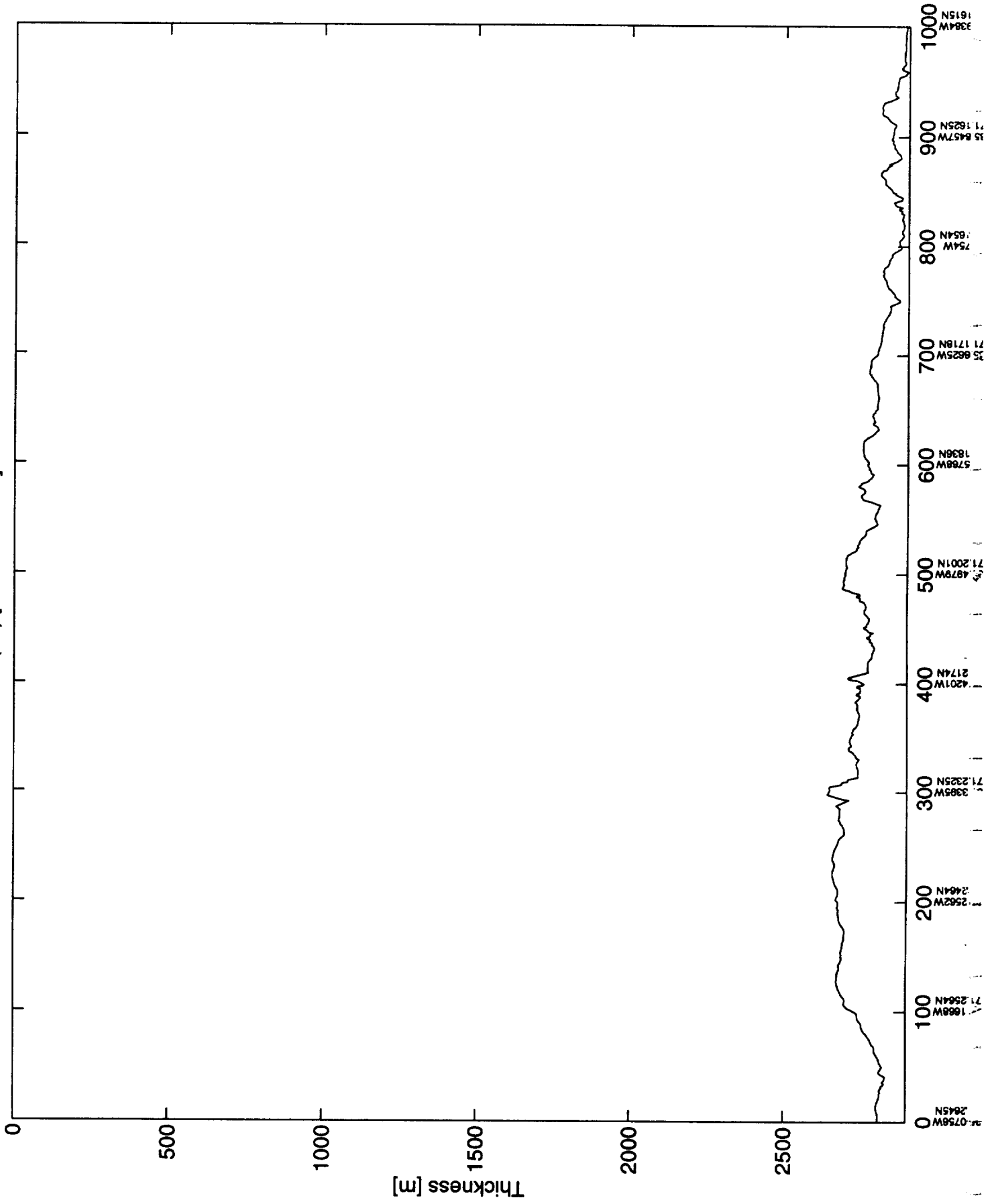
run_5l_9.1 (13) [12000-13000] thickness



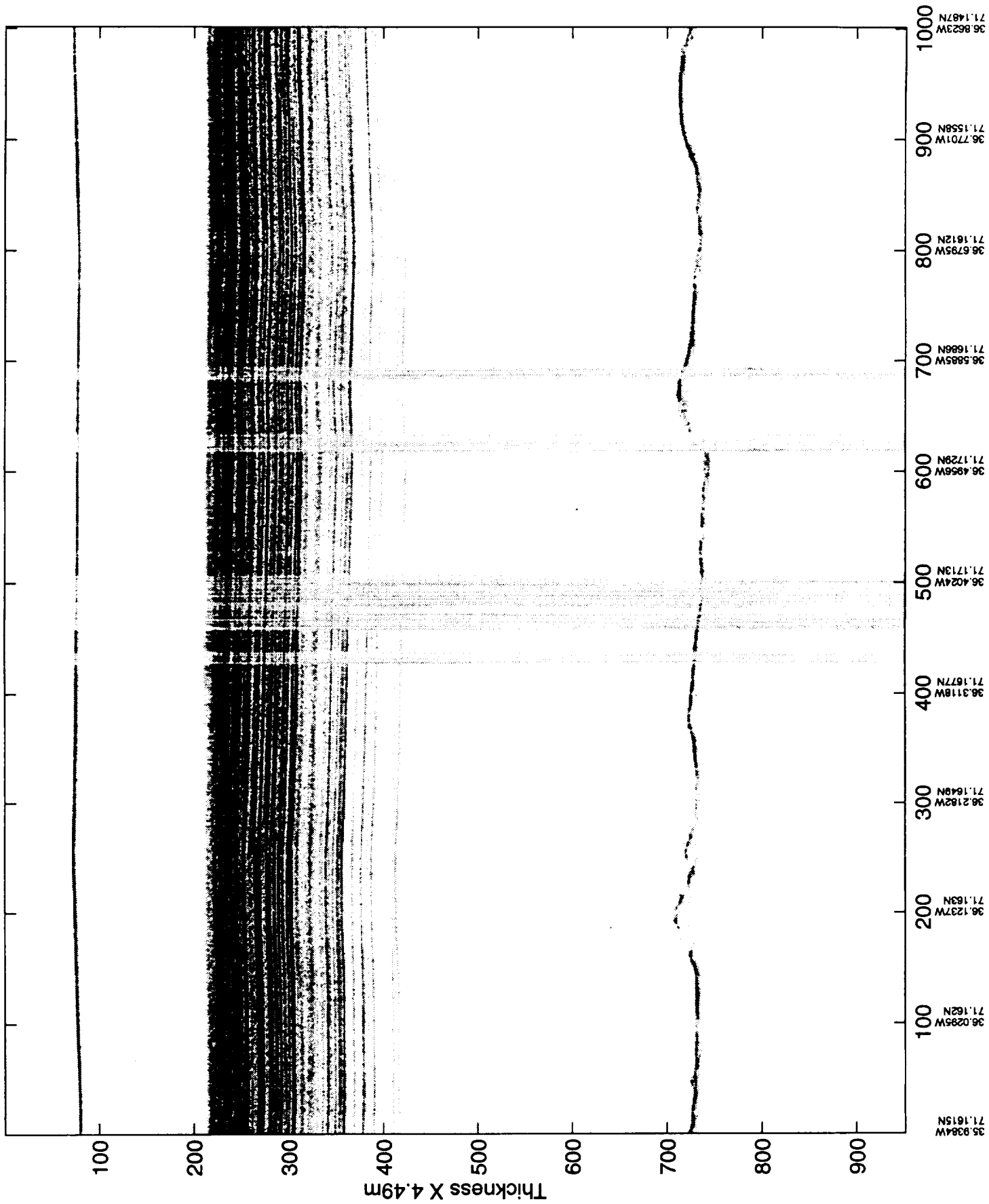
r_5l_9.114 [13000-14000]



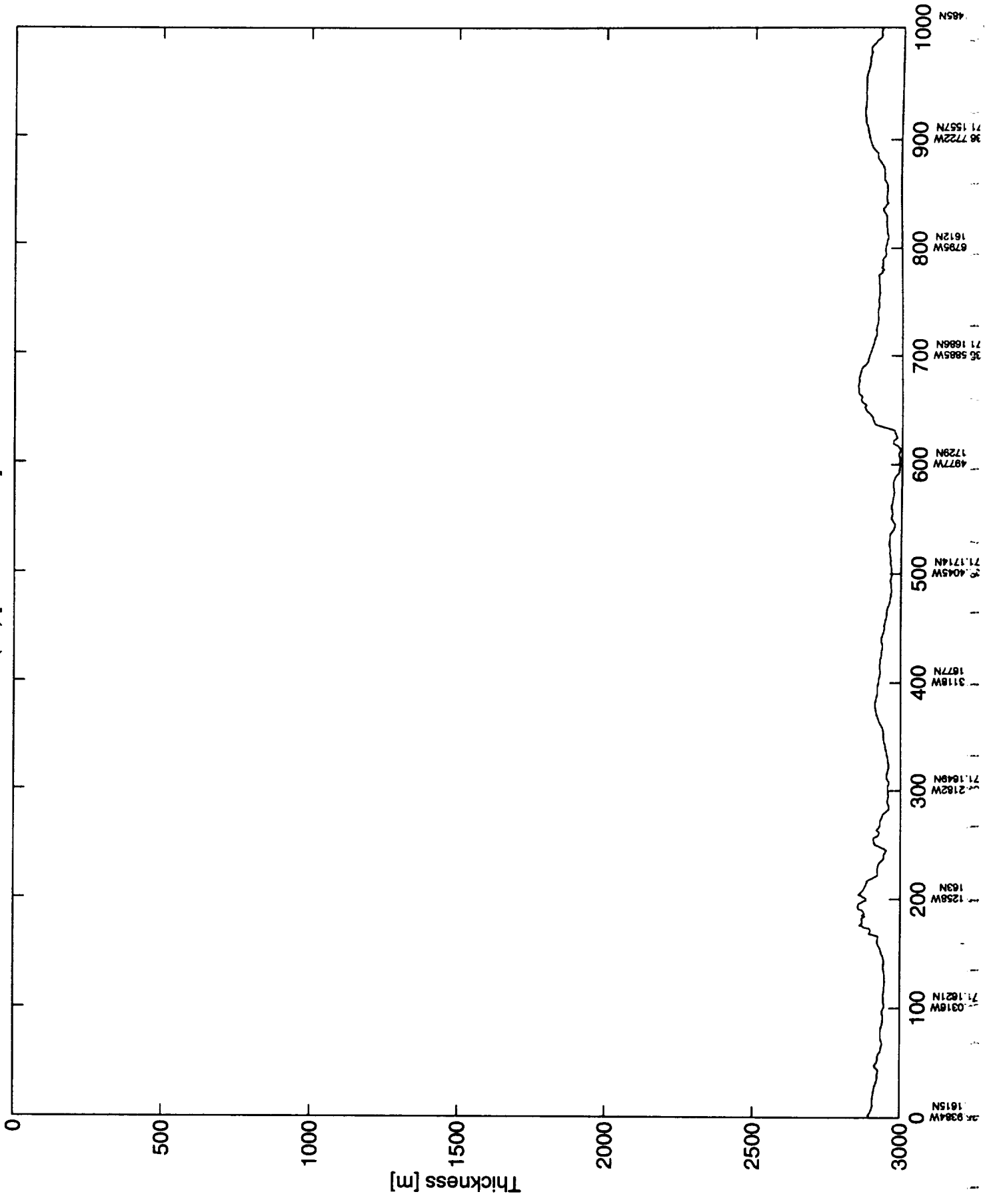
run_5l_9.1 (14) [13000-14000] thickness



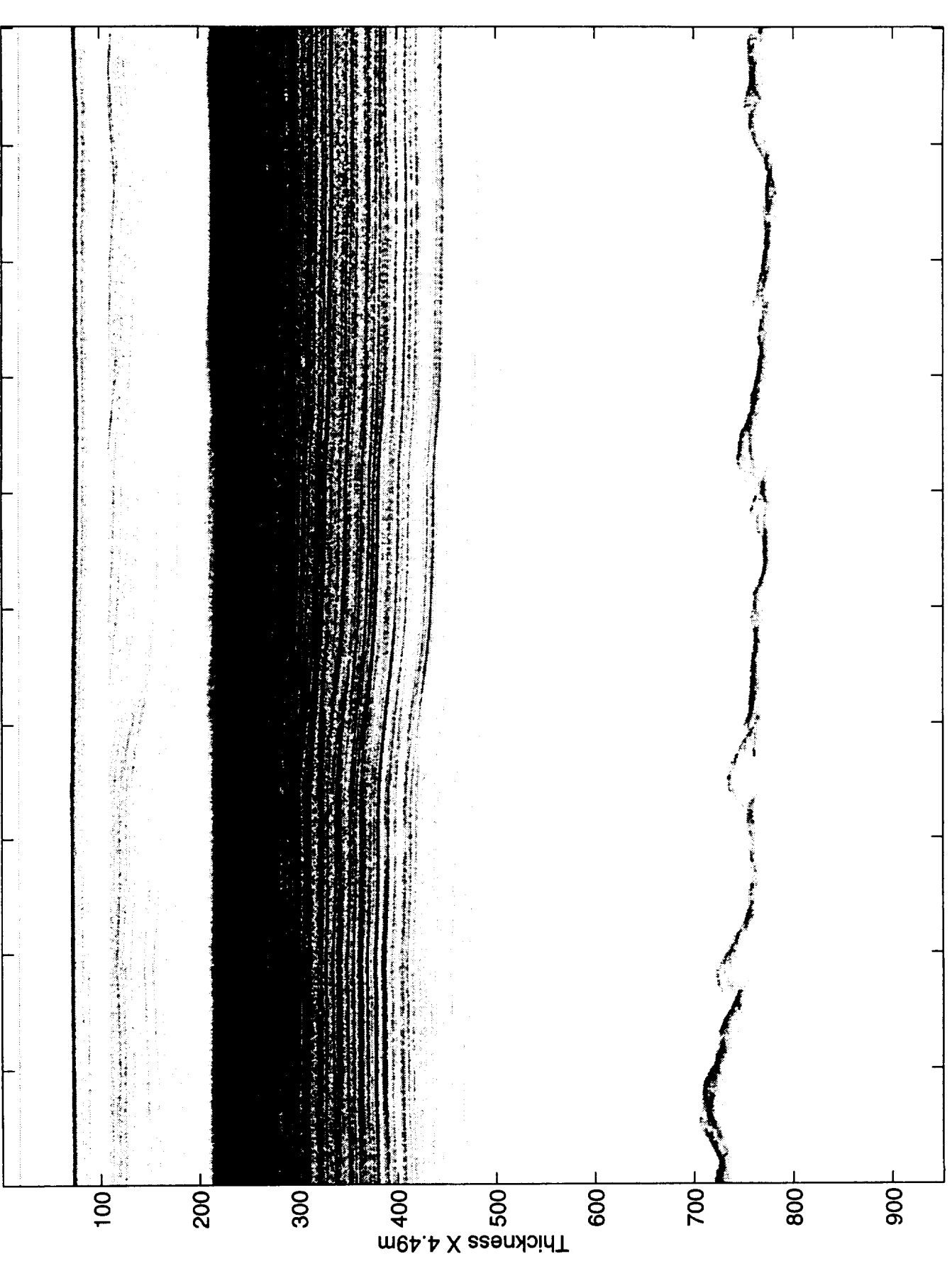
r_5l_9.115 [14000-15000]



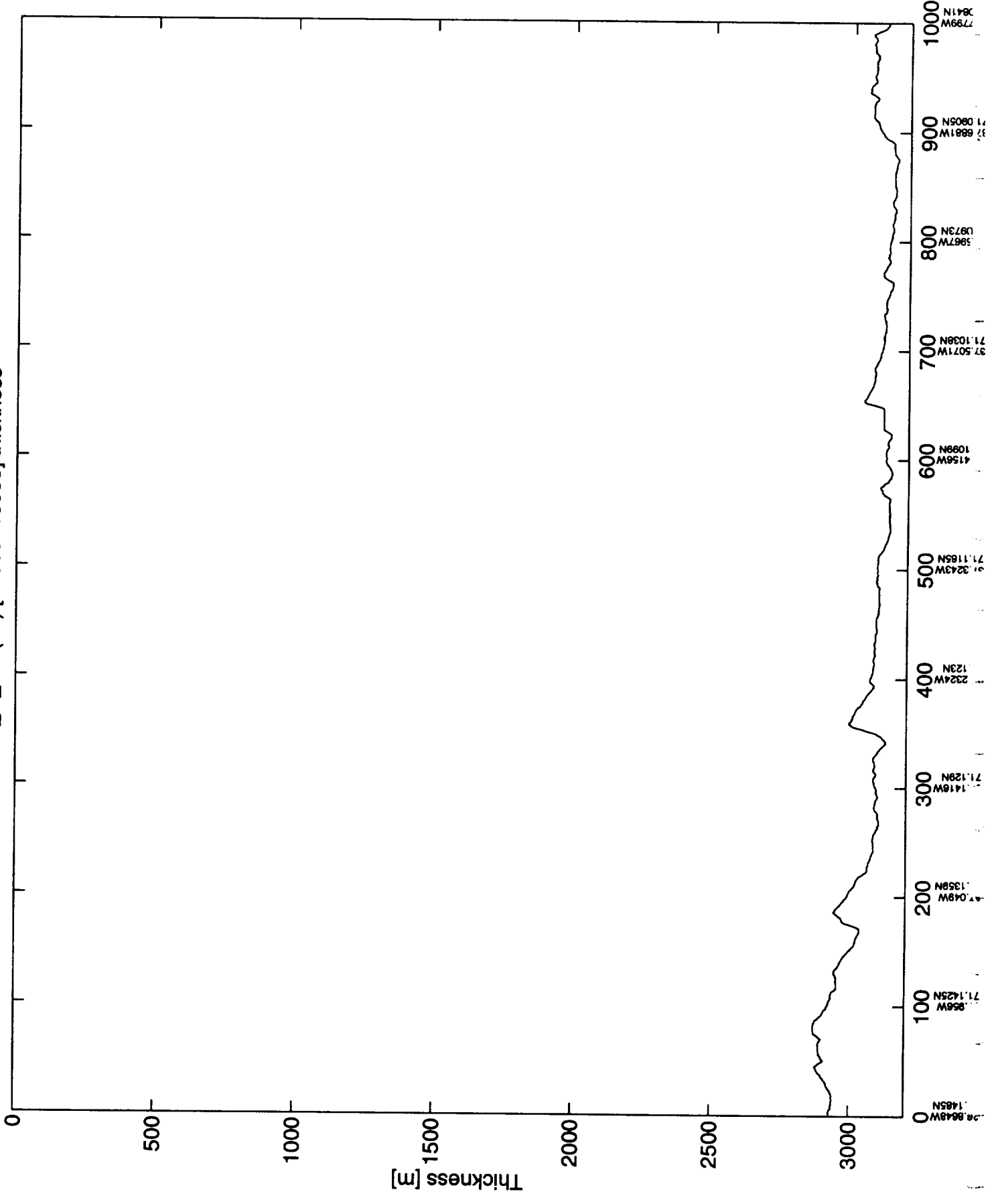
run_5l_9.1 (15) [14000-15000] thickness



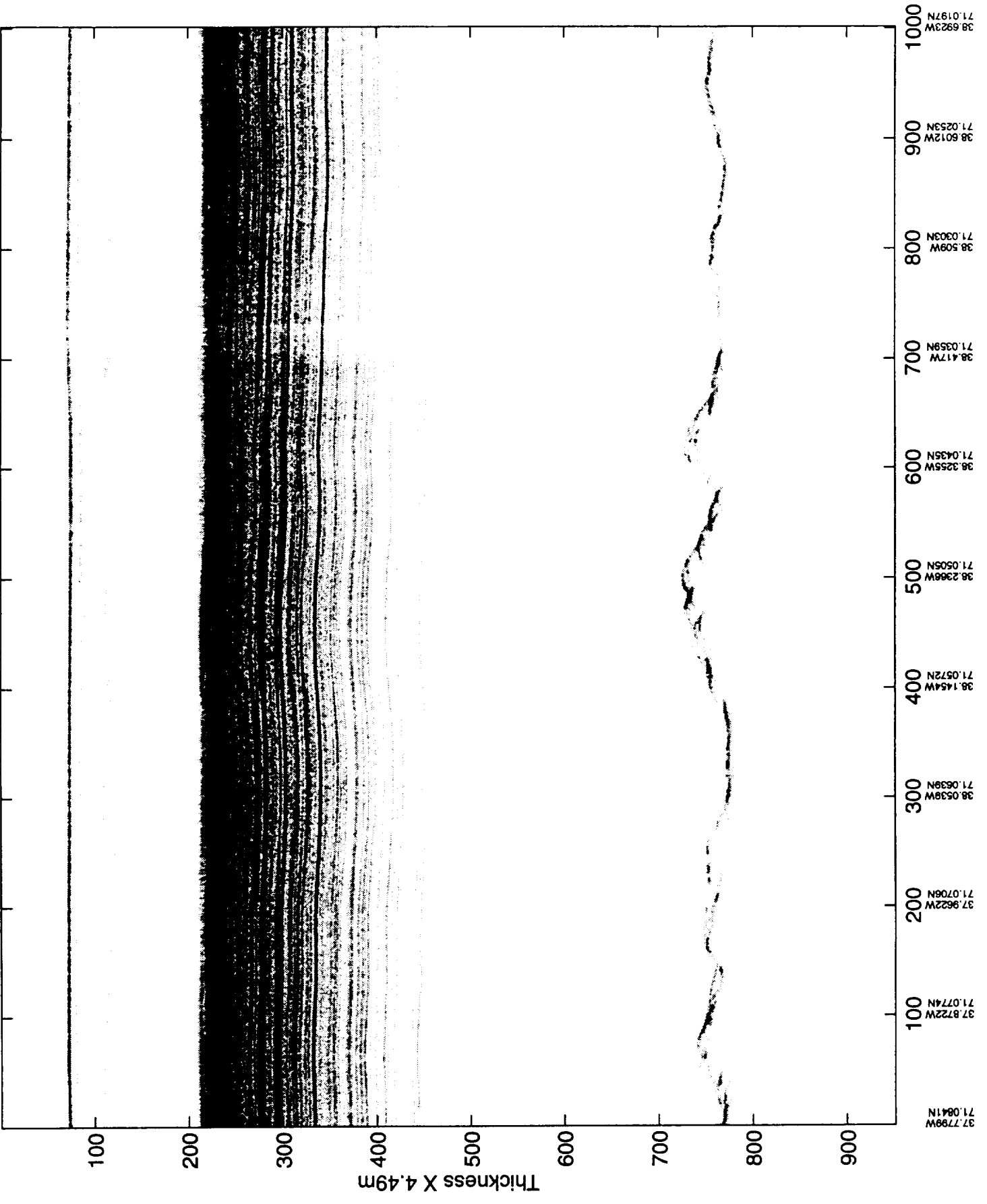
r_5l_9.116 [15000-16000]



run_5l_9.1 (16) [15000-16000] thickness

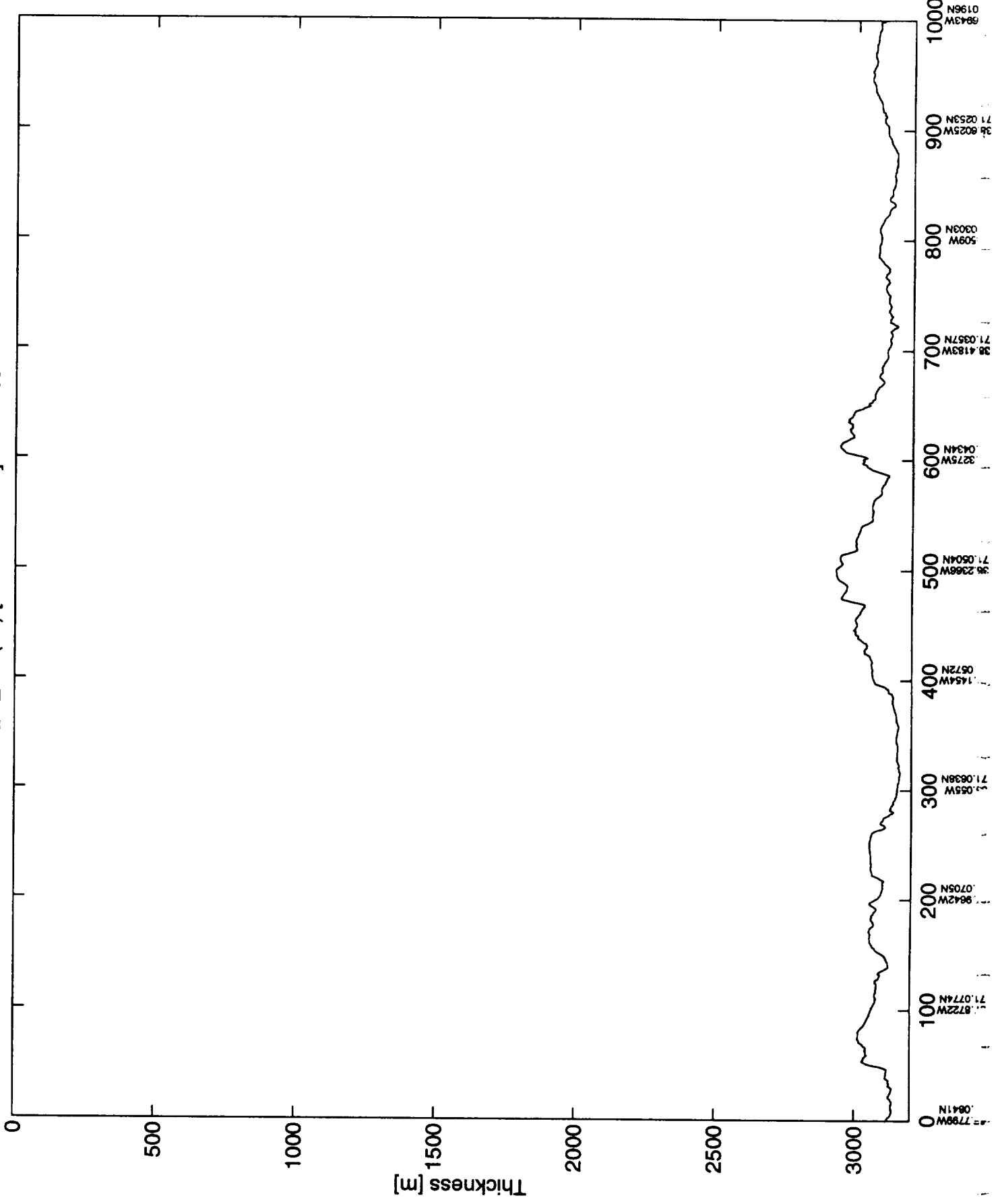


r_5l_9.117 [16000-17000]

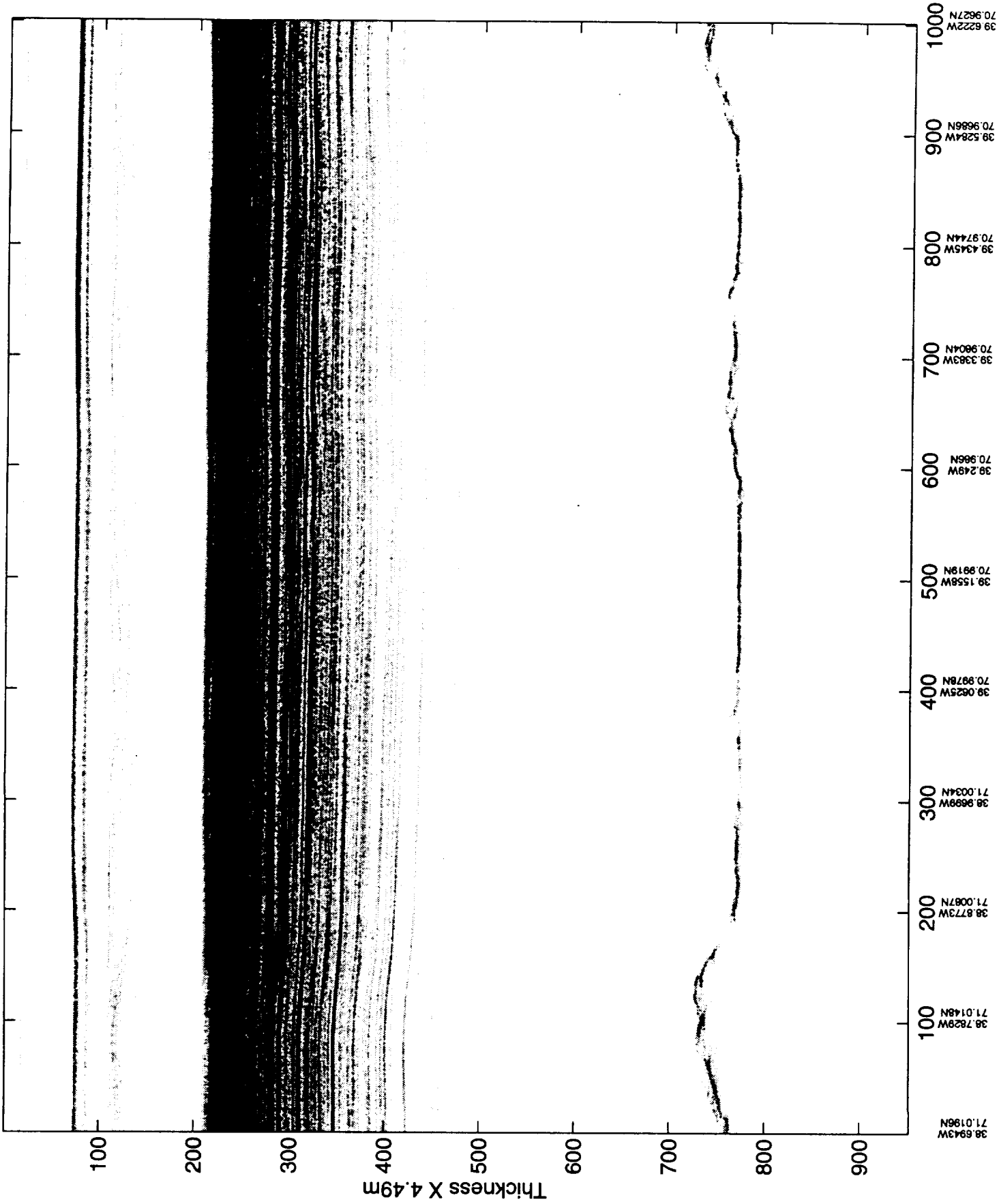


71.0841N
37.779W
100 71.074N
37.872W
200 71.076N
37.962W
300 71.053N
38.053W
400 71.057N
38.154W
500 71.050N
38.236W
600 71.043N
38.325W
700 71.035N
38.417W
800 71.030N
38.509W
900 71.025N
38.601W
1000 71.019N
38.692W

run_5l_9.1 (17) [16000-17000] thickness

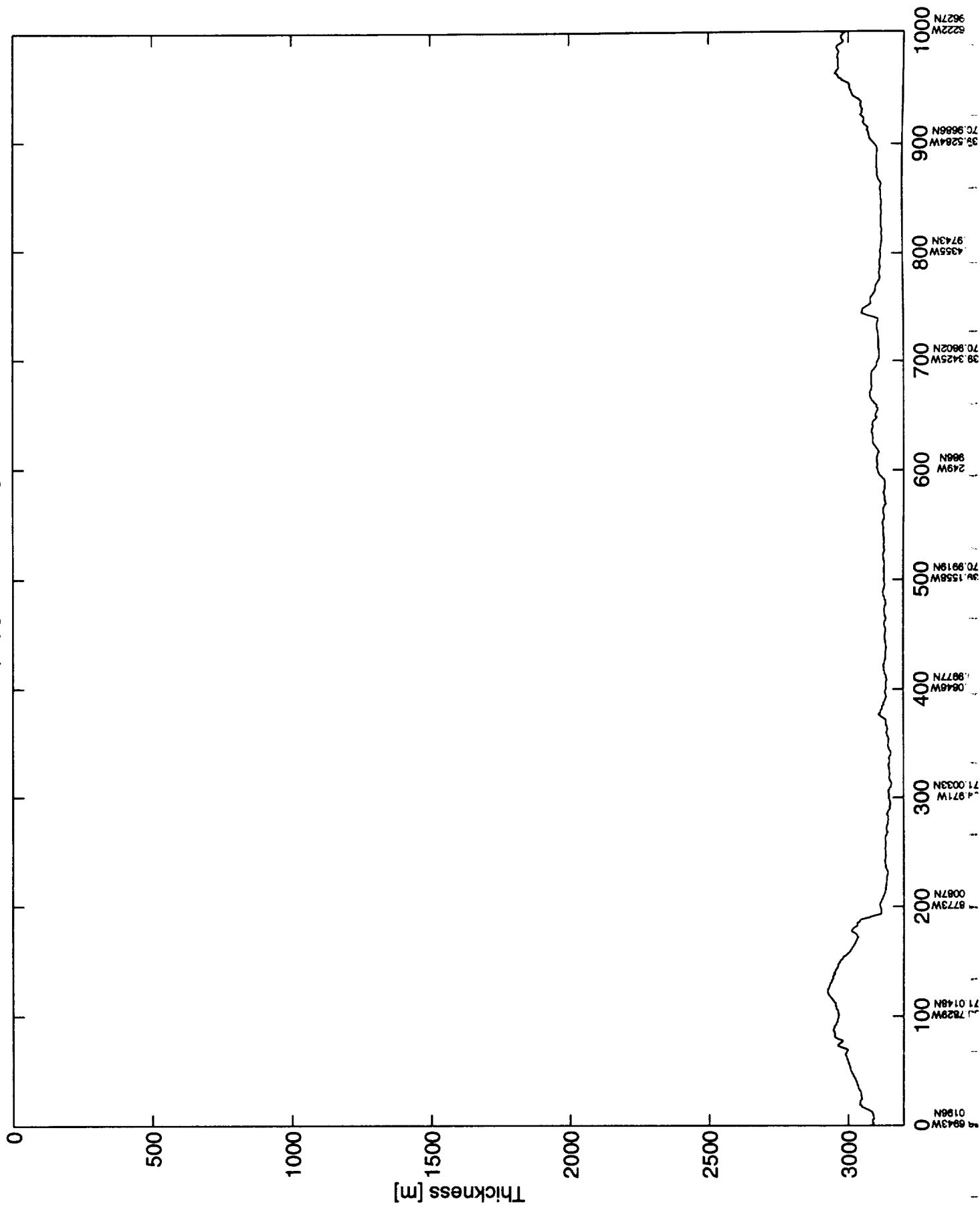


r_5l_9.118 [17000-18000]

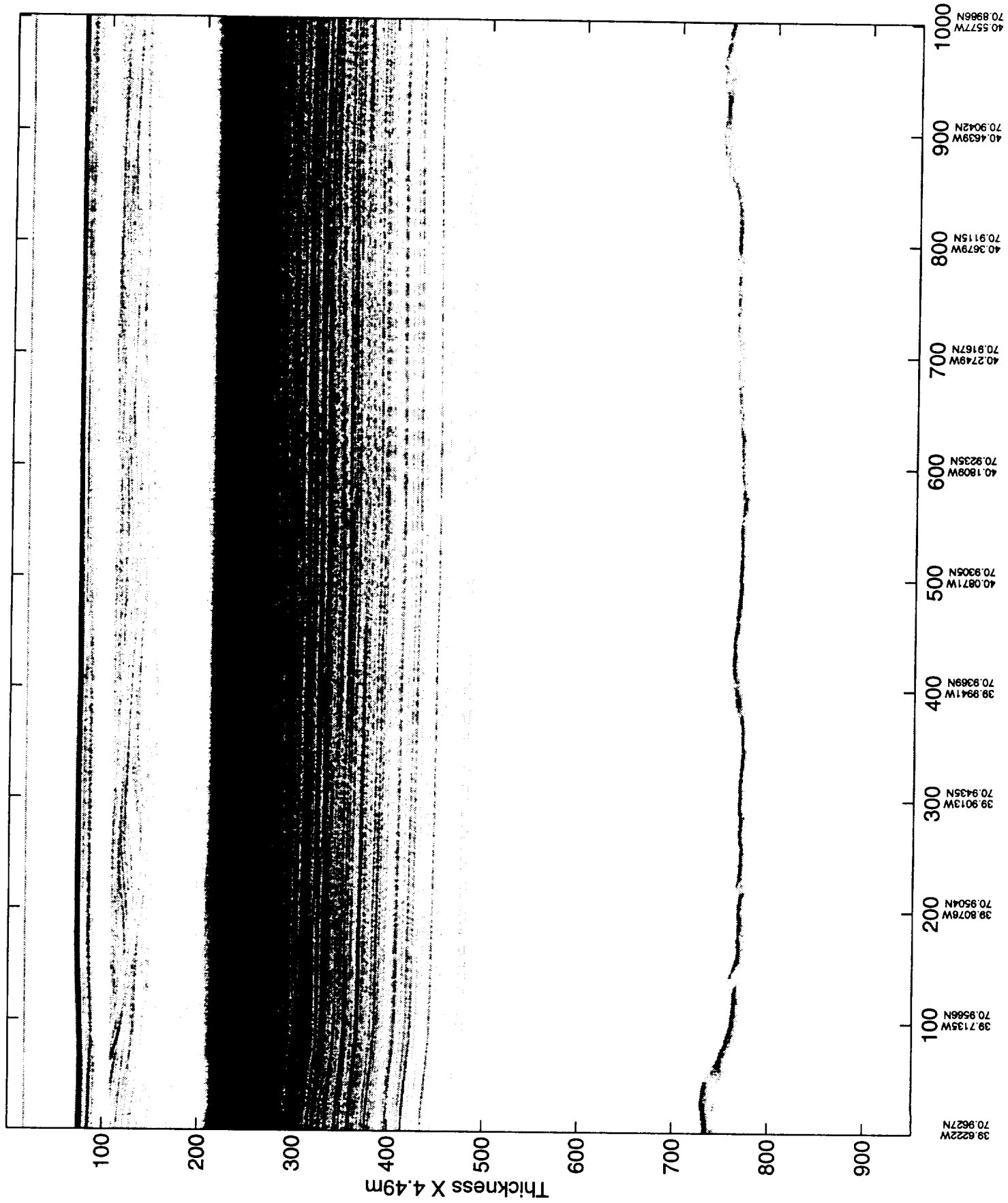


38.6943W 71.0196N
38.7829W 71.0148N
38.8773W 71.0087N
38.9699W 71.0034N
38.0625W 70.9978N
38.1558W 70.9919N
38.249W 70.986N
38.3383W 70.9804N
38.4345W 70.9744N
38.5284W 70.9686N
38.6222W 70.9627N

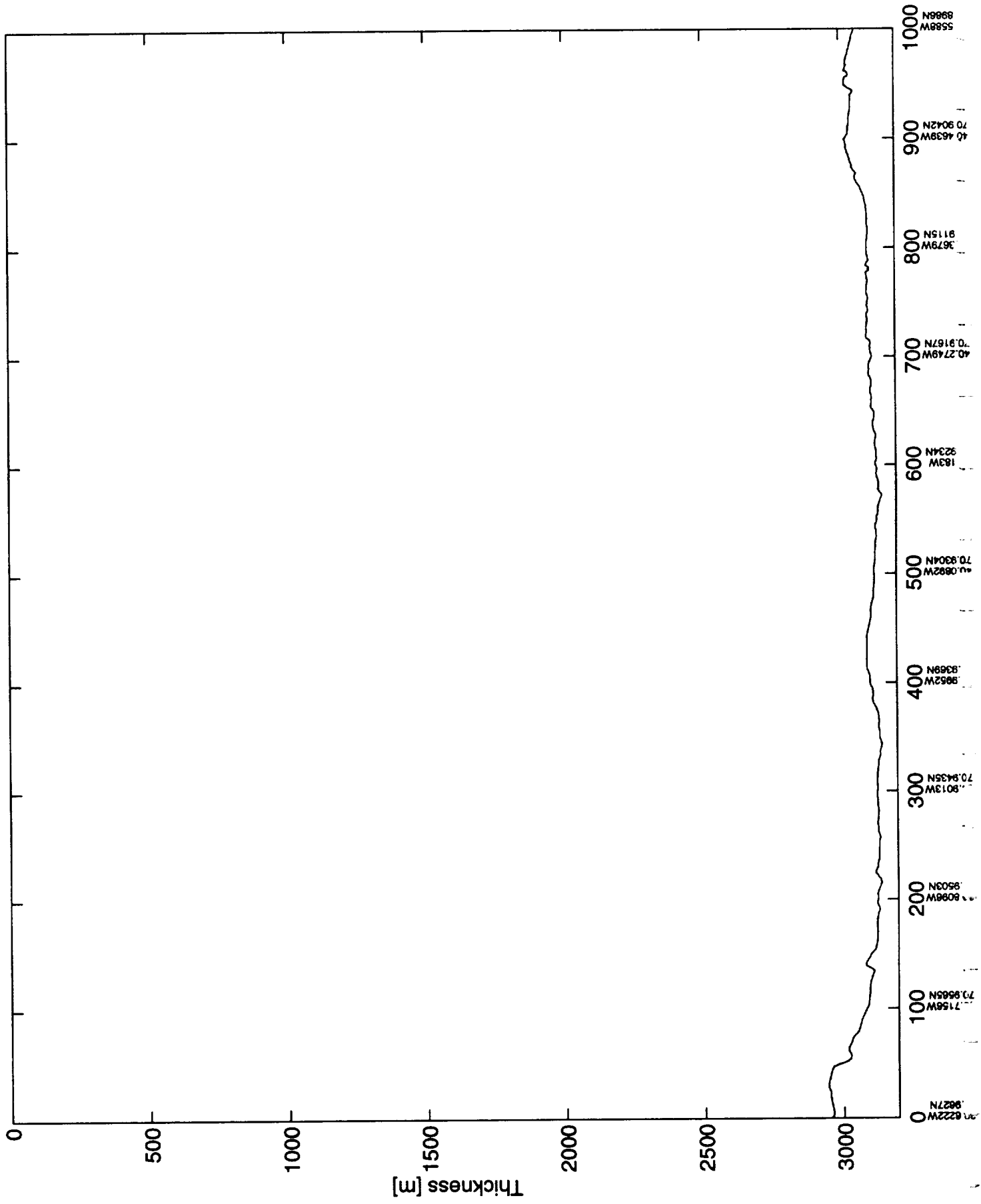
run_5l_9.1 (18) [17000-18000] thickness



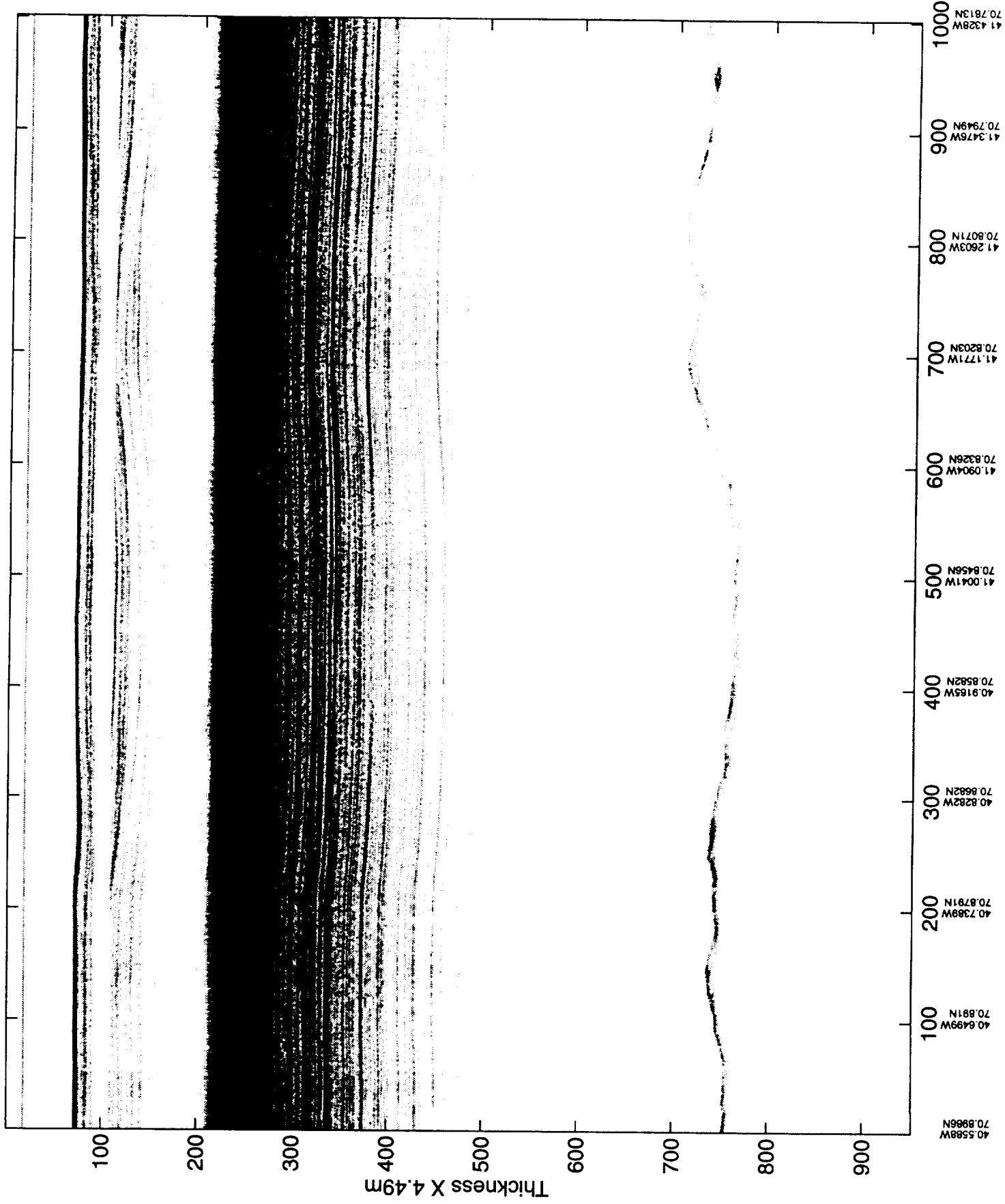
r_5[9.119 [18000-19000]]



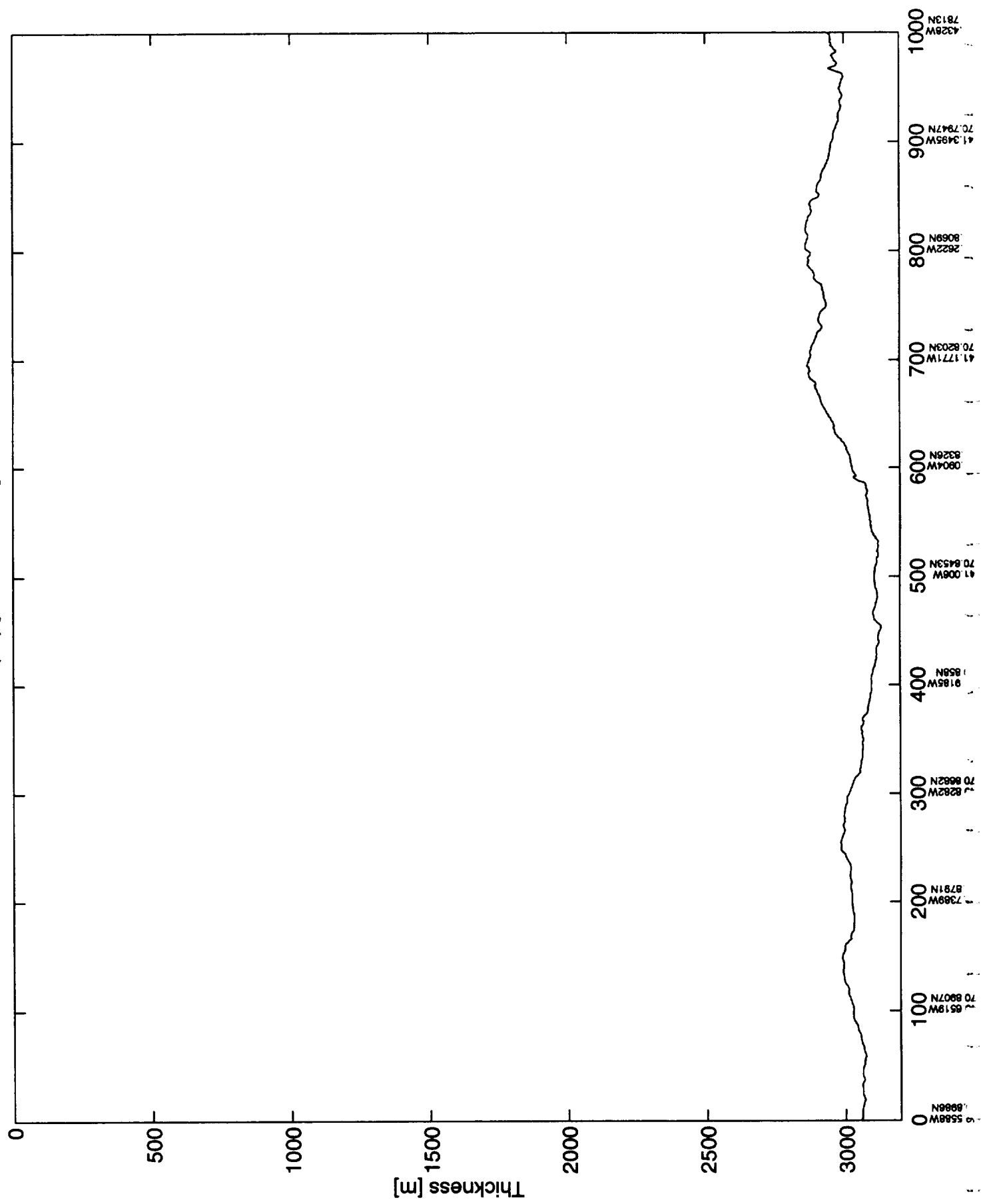
run_5l_9.1 (19) [18000-19000] thickness



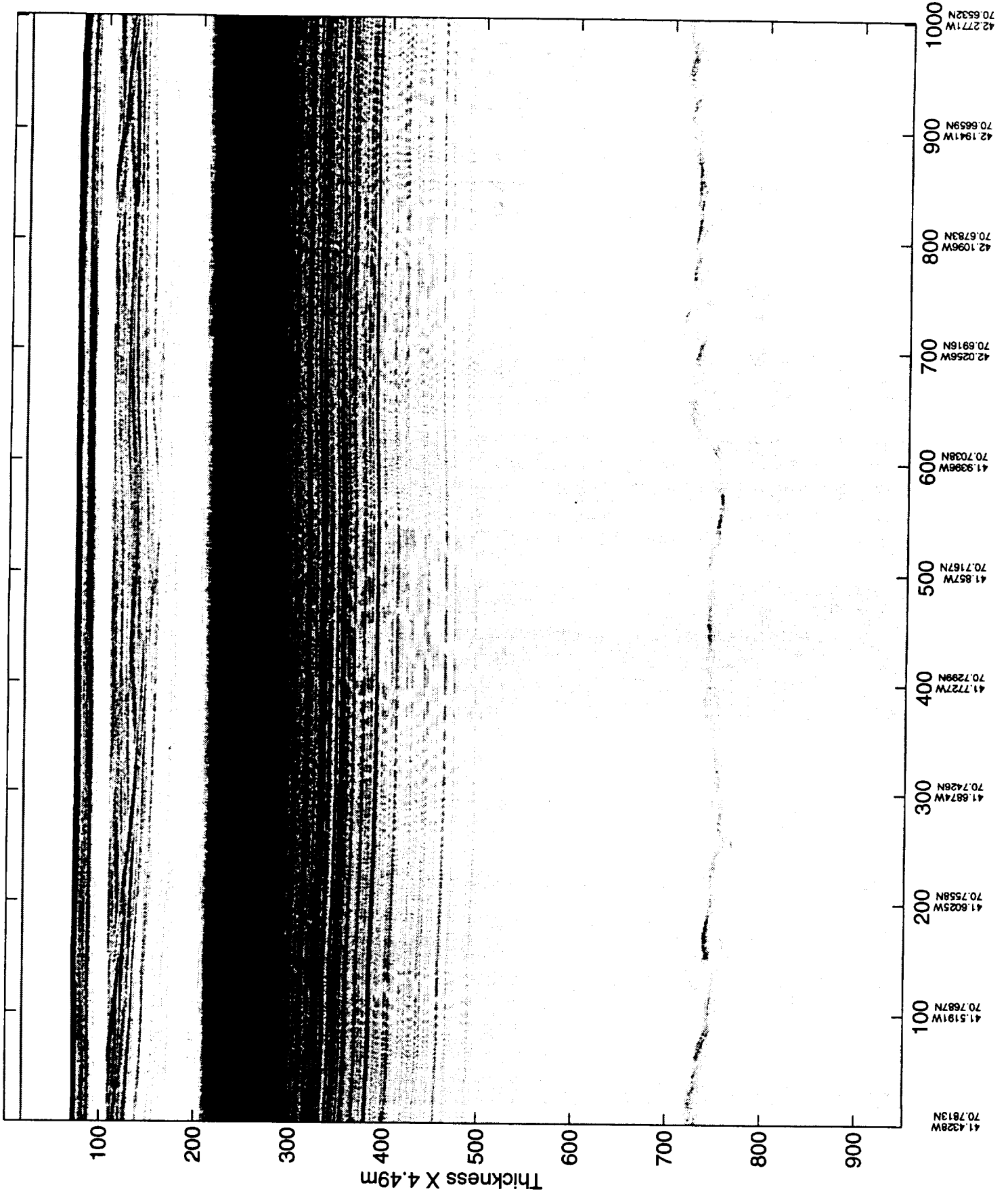
r_5l_9.120 [19000-20000]



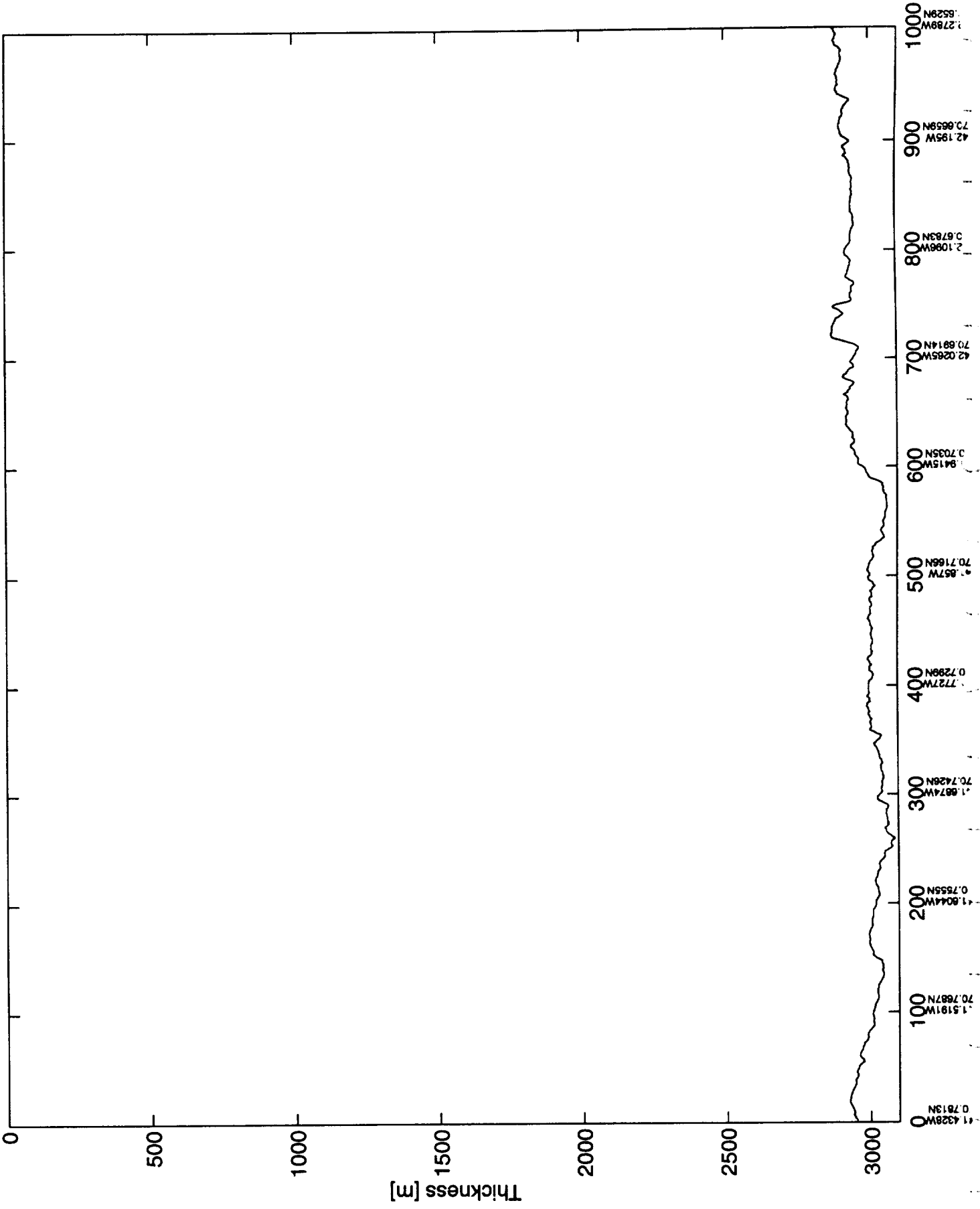
run_5l_9.1 (20) [19000-20000] thickness



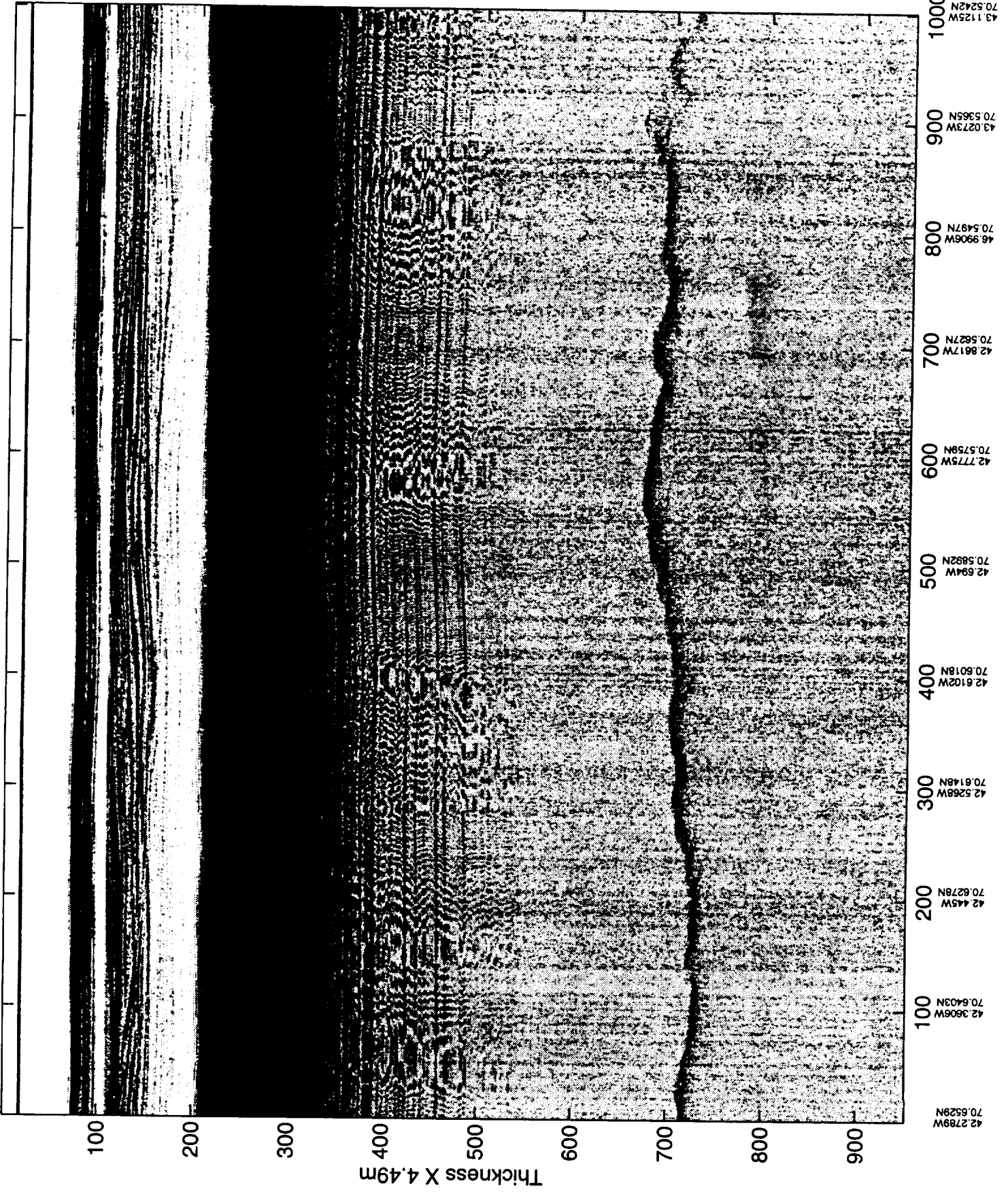
r_5l_9.121 [20000-21000]



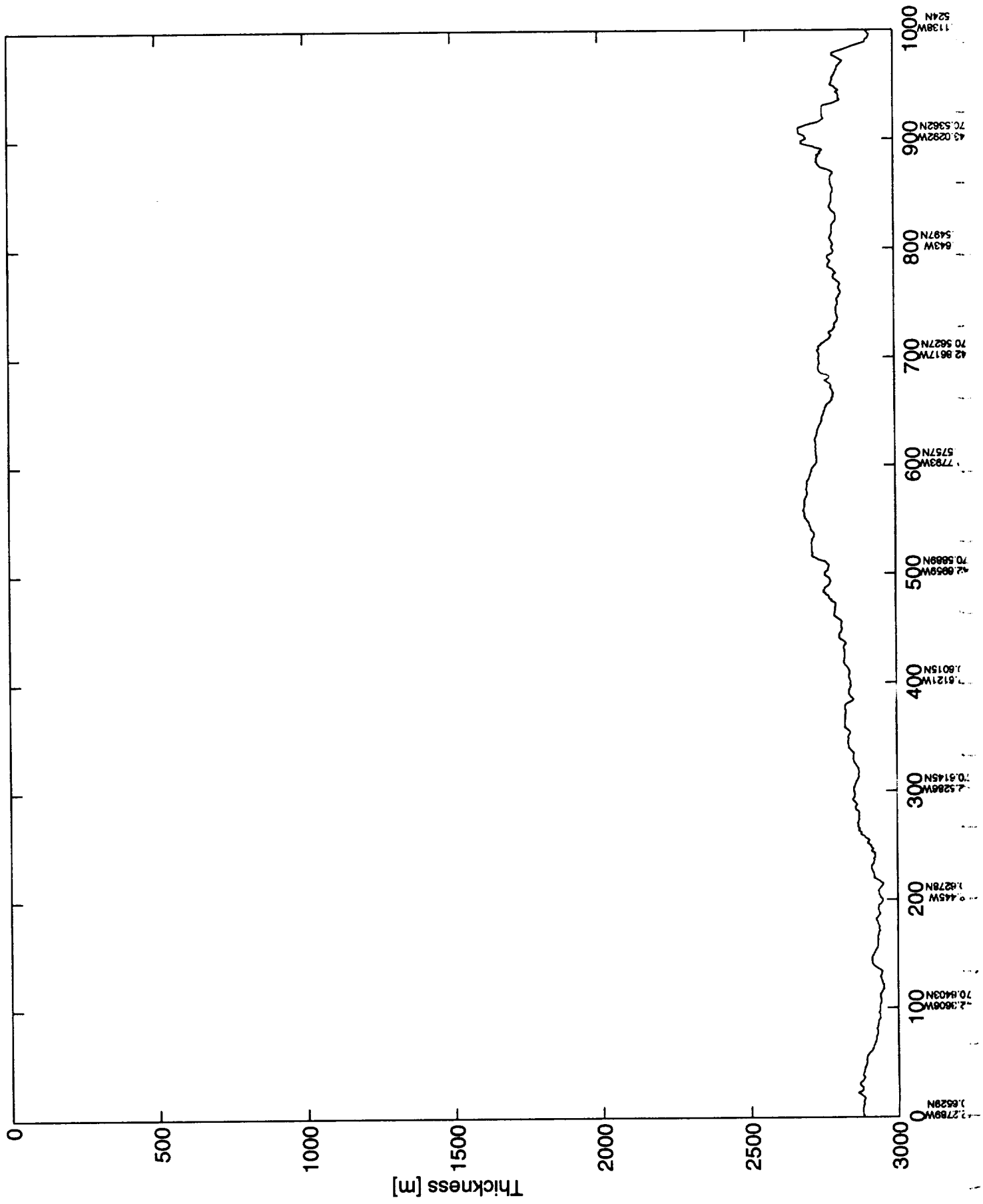
run_5l_9.1 (21) [20000-21000] thickness



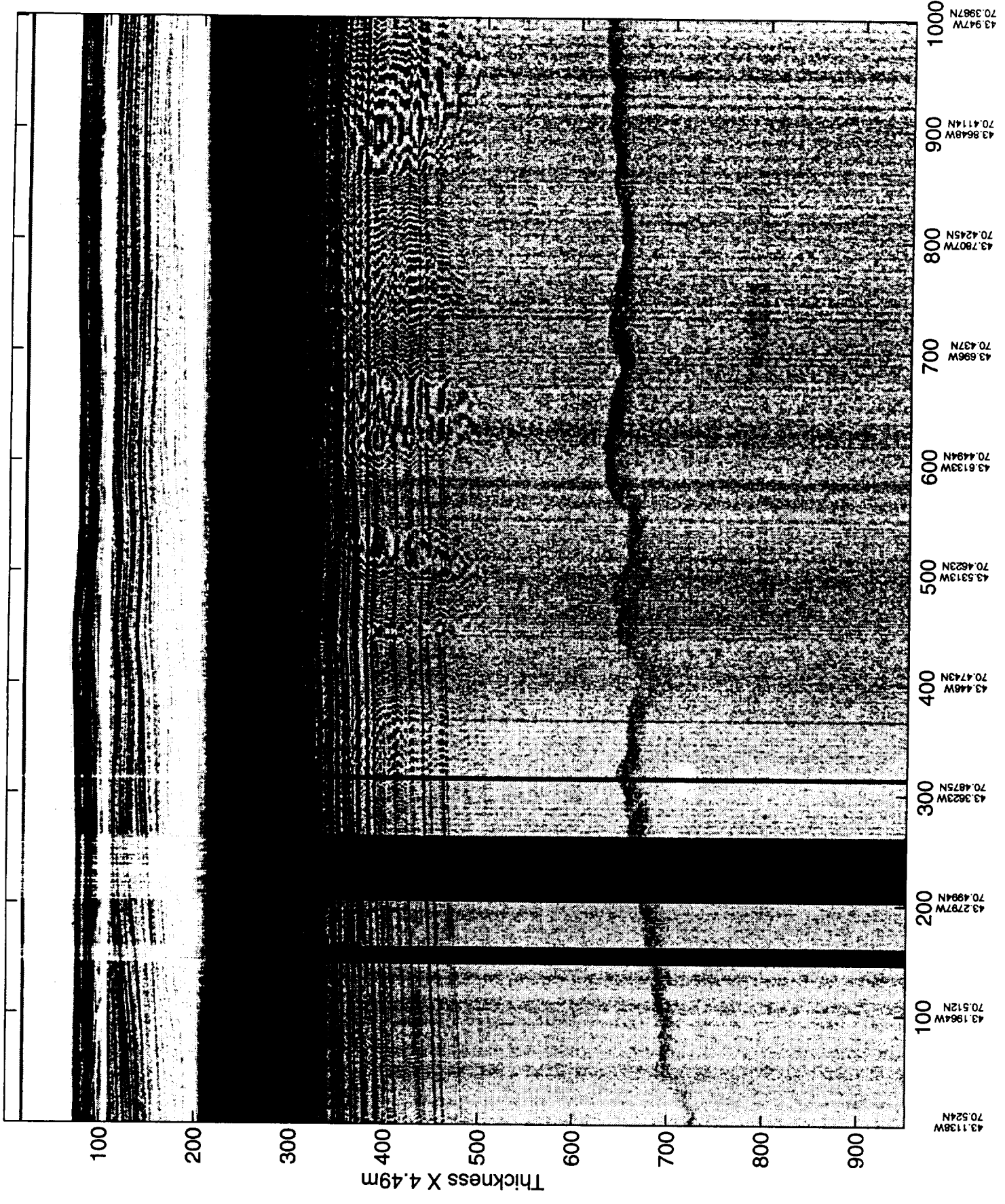
r_5l_9.122 [21000-22000]



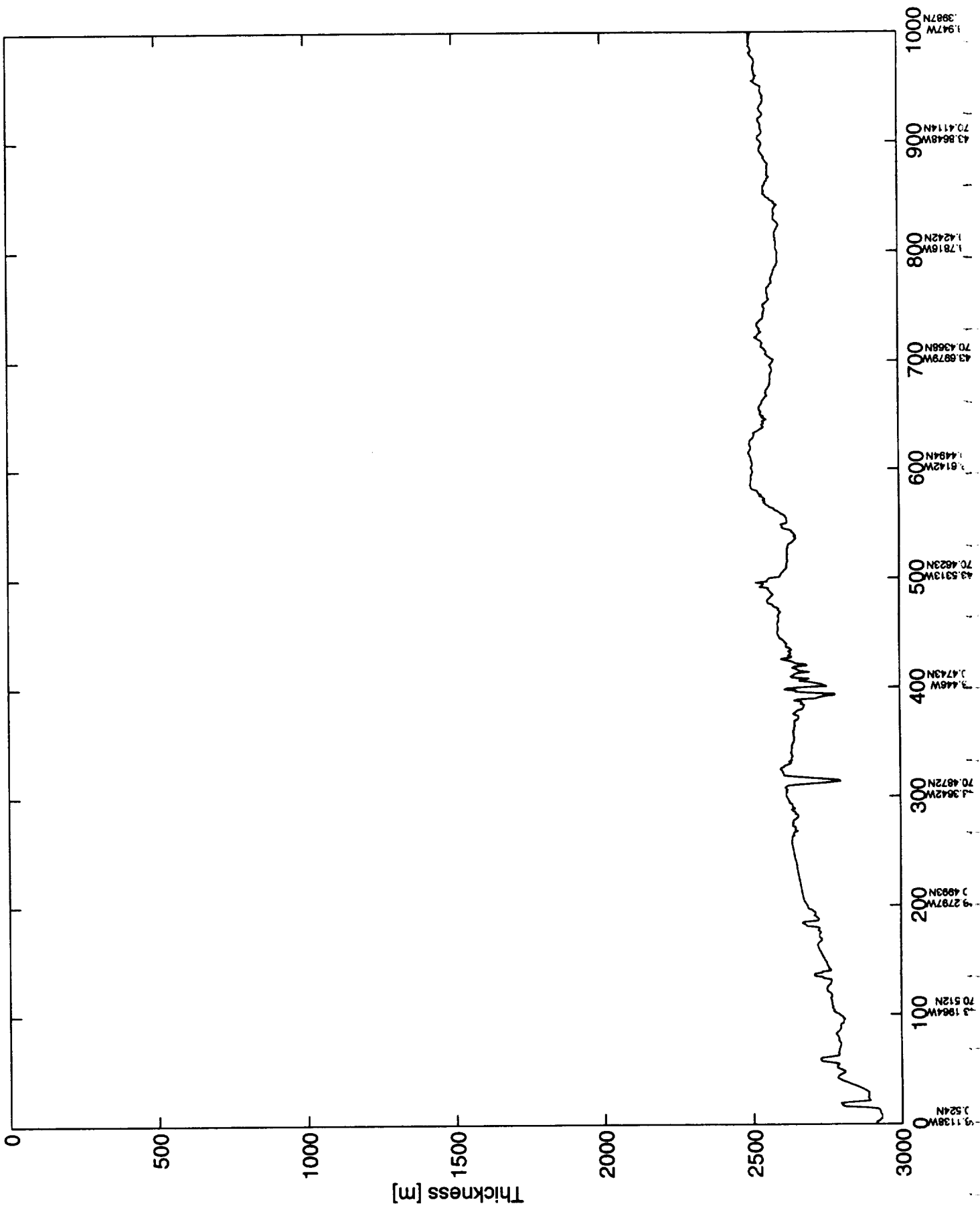
run_5l_9.1 (22) [21000-22000] thickness



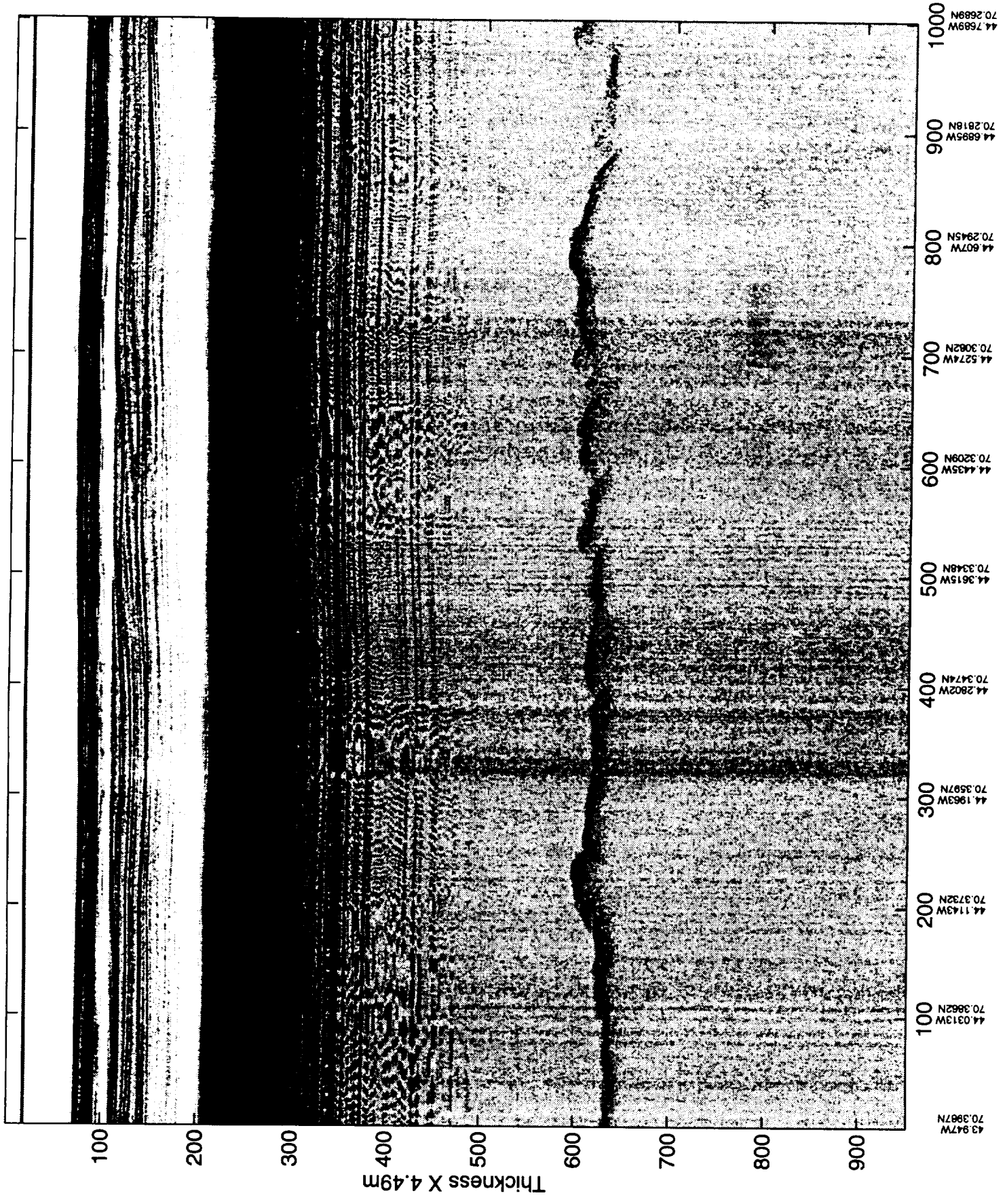
r_5l_9.123 [22000-23000]



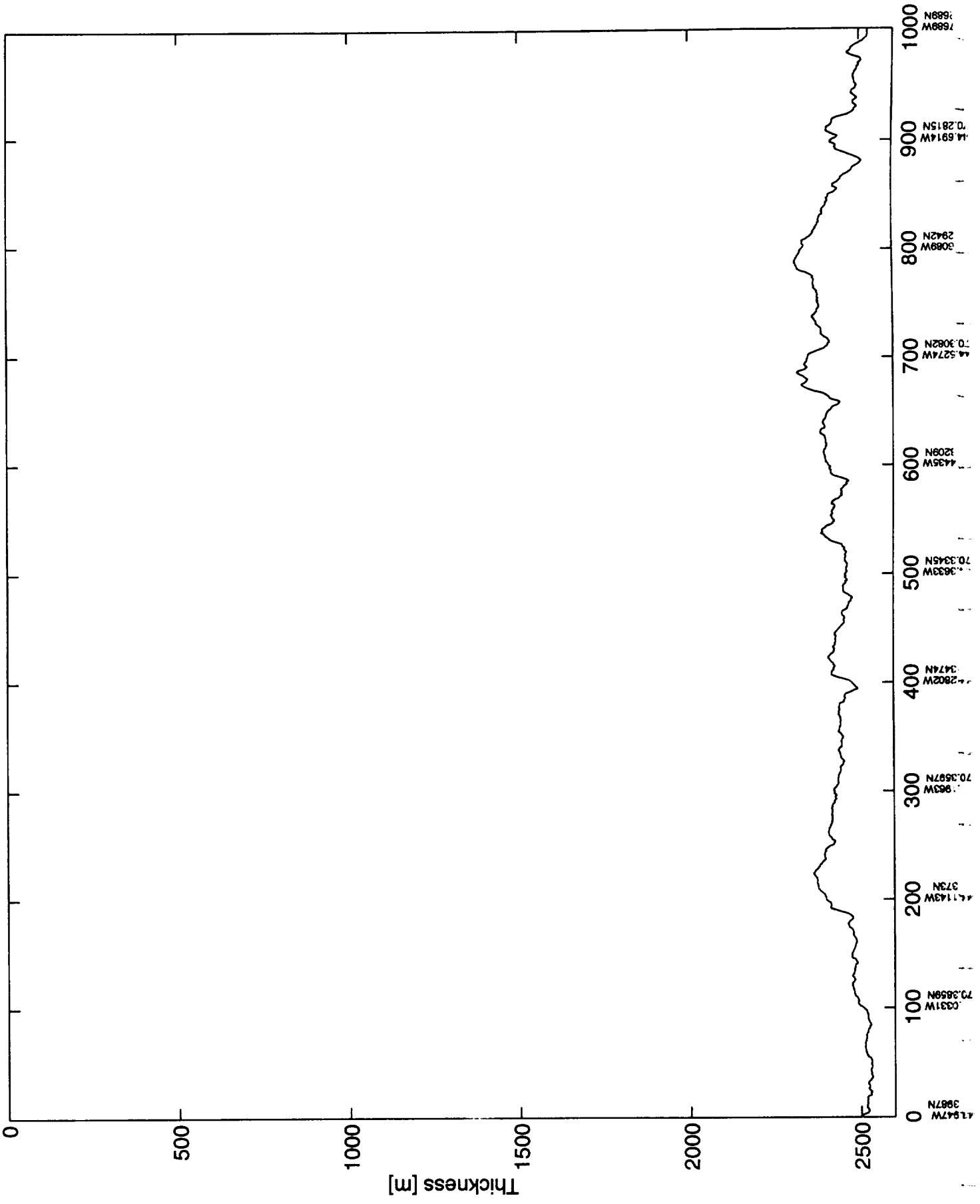
run_5l_9.1 (23) [22000-23000] thickness



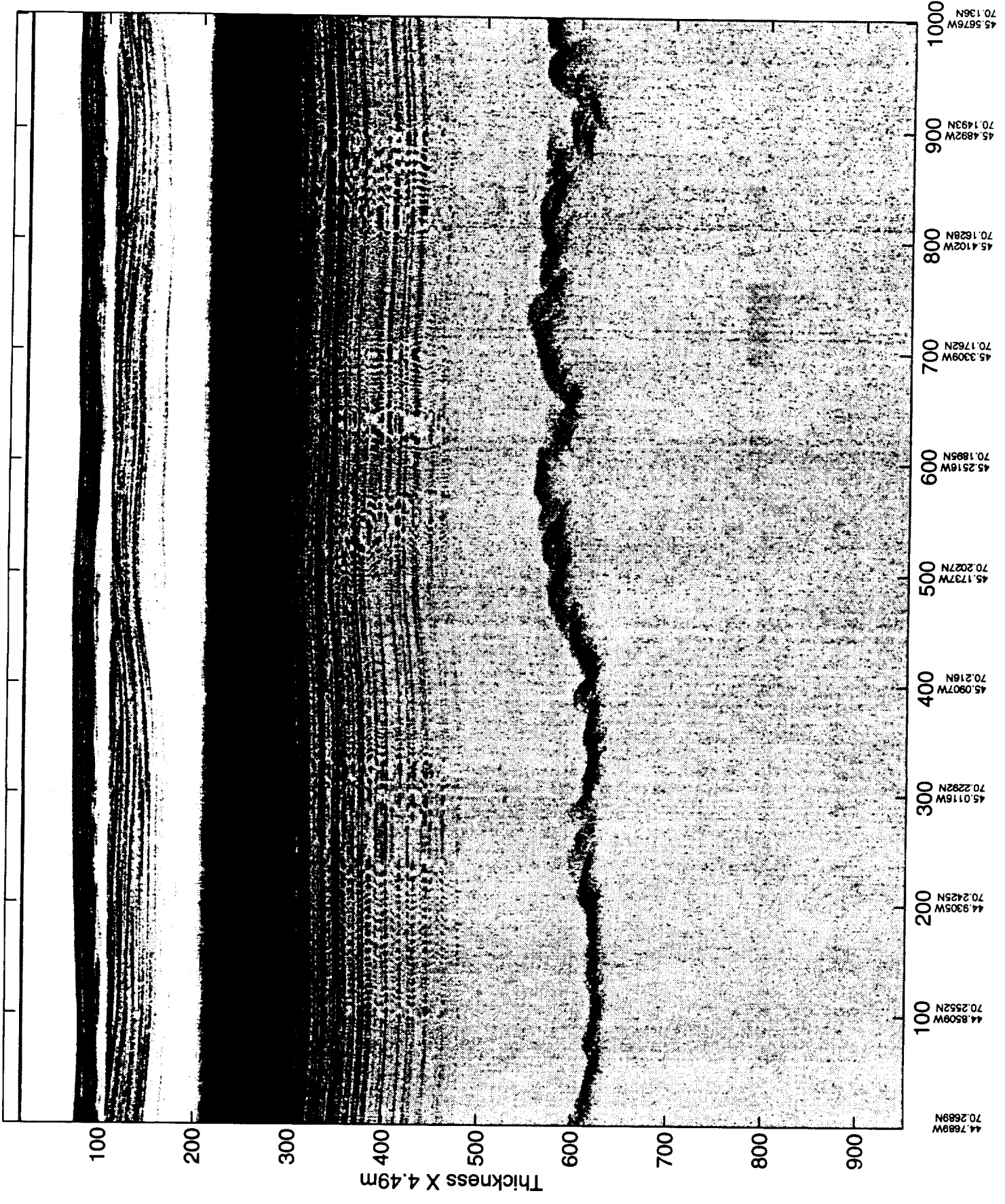
r_5l_9.124 [23000-24000]



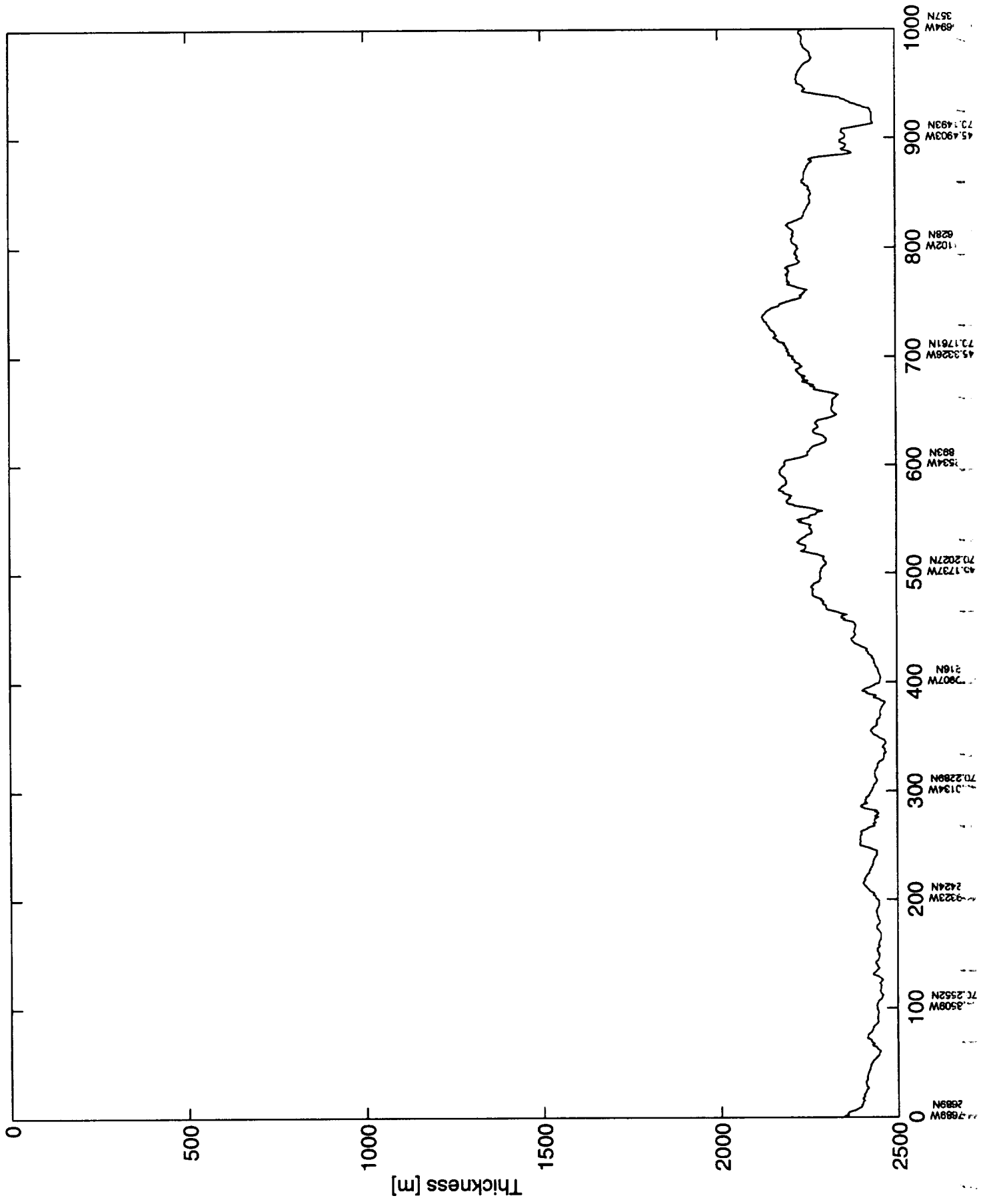
run_5l_9.1 (24) [23000-24000] thickness



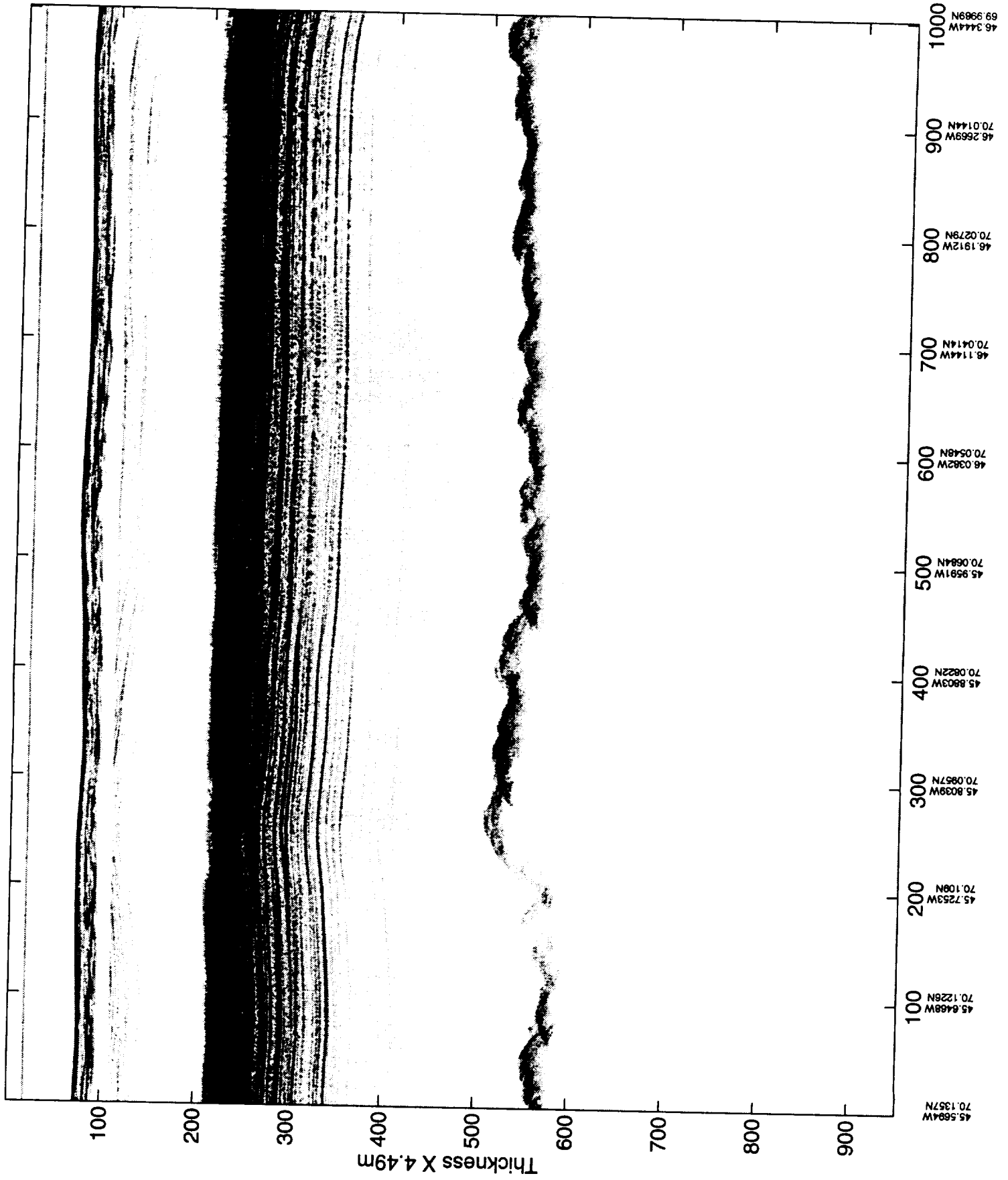
r_5|_9.125 [24000-25000]



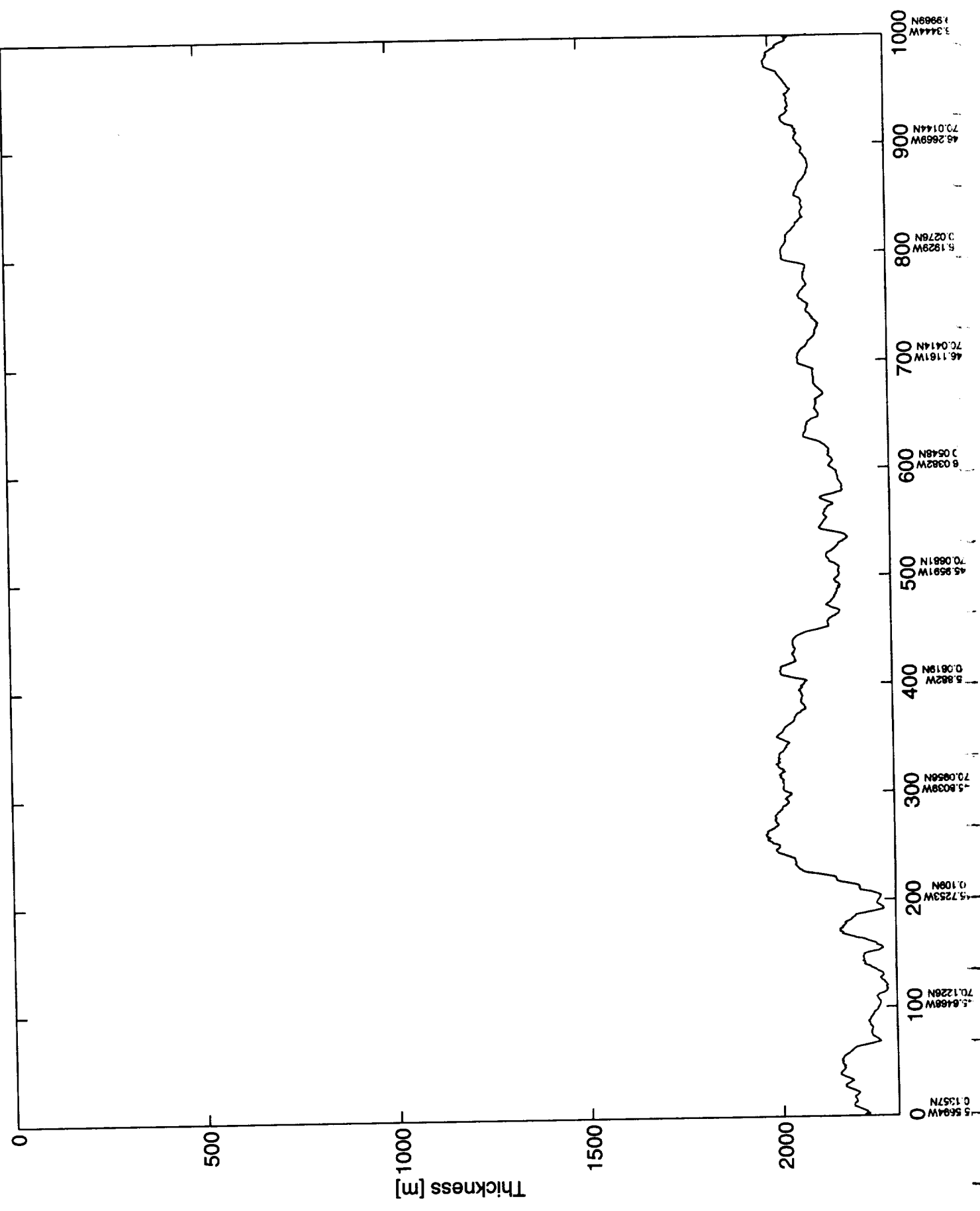
run_5l_9.1 (25) [24000-25000] thickness



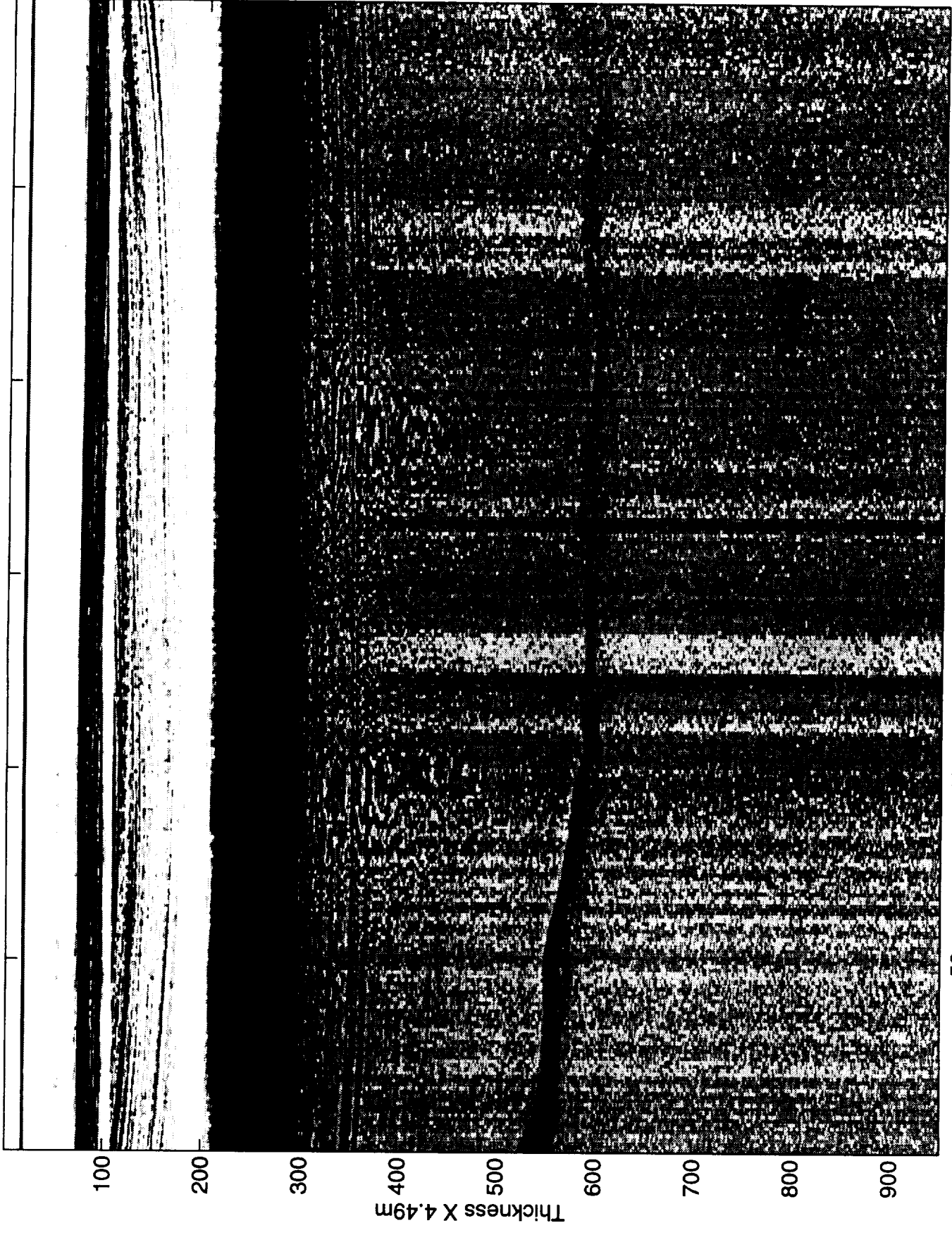
r_5l_9.126 [25000-26000]



run_5l_9.1 (26) [25000-26000] thickness



r_5l_9.127 [26000-26298]



100

200

300

400

500

600

700

800

900

Thickness X 4.9m

50

100

150

200

250

48.344W
69.998N

46.380W
69.913N

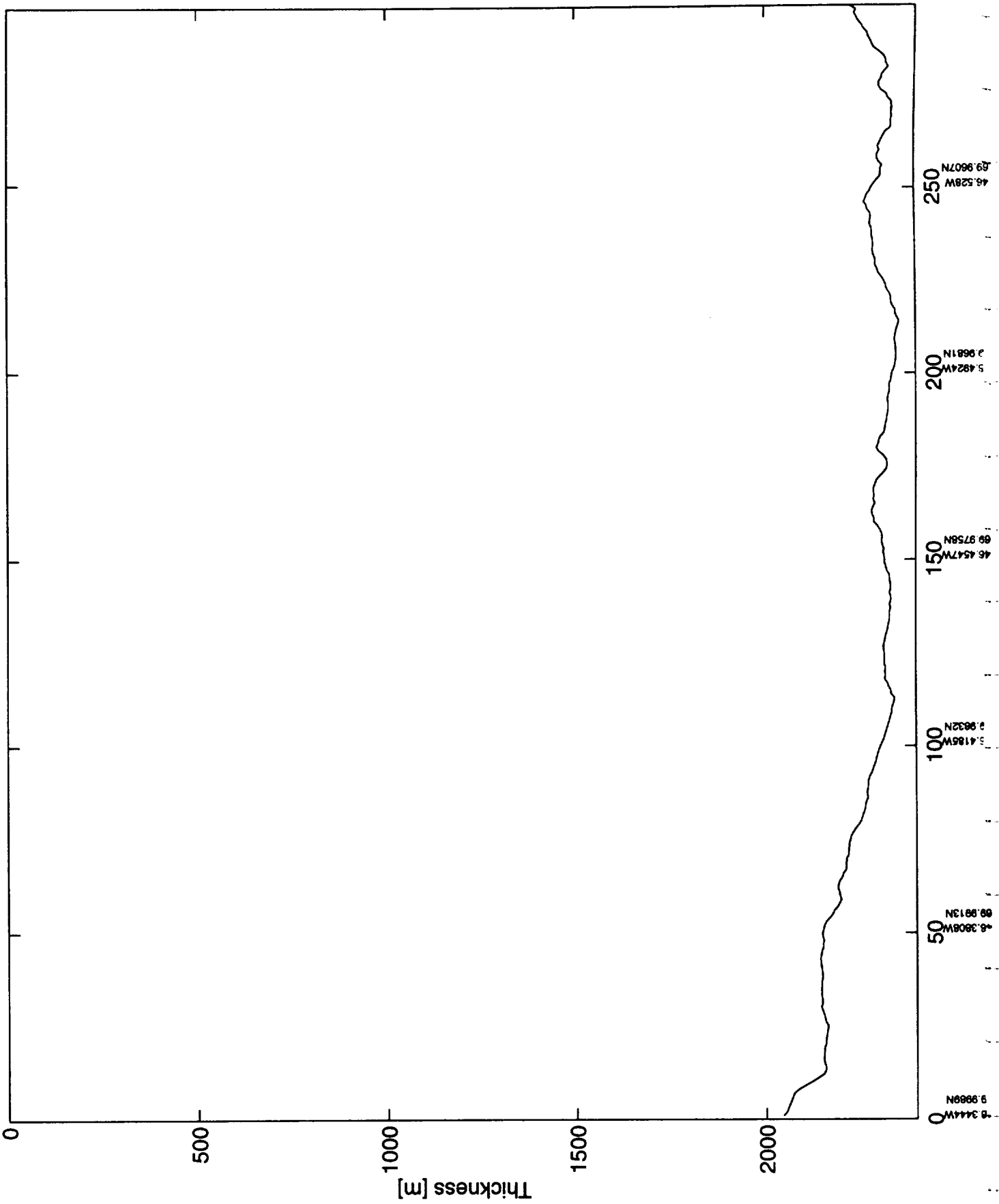
46.416W
69.934N

46.454W
69.975N

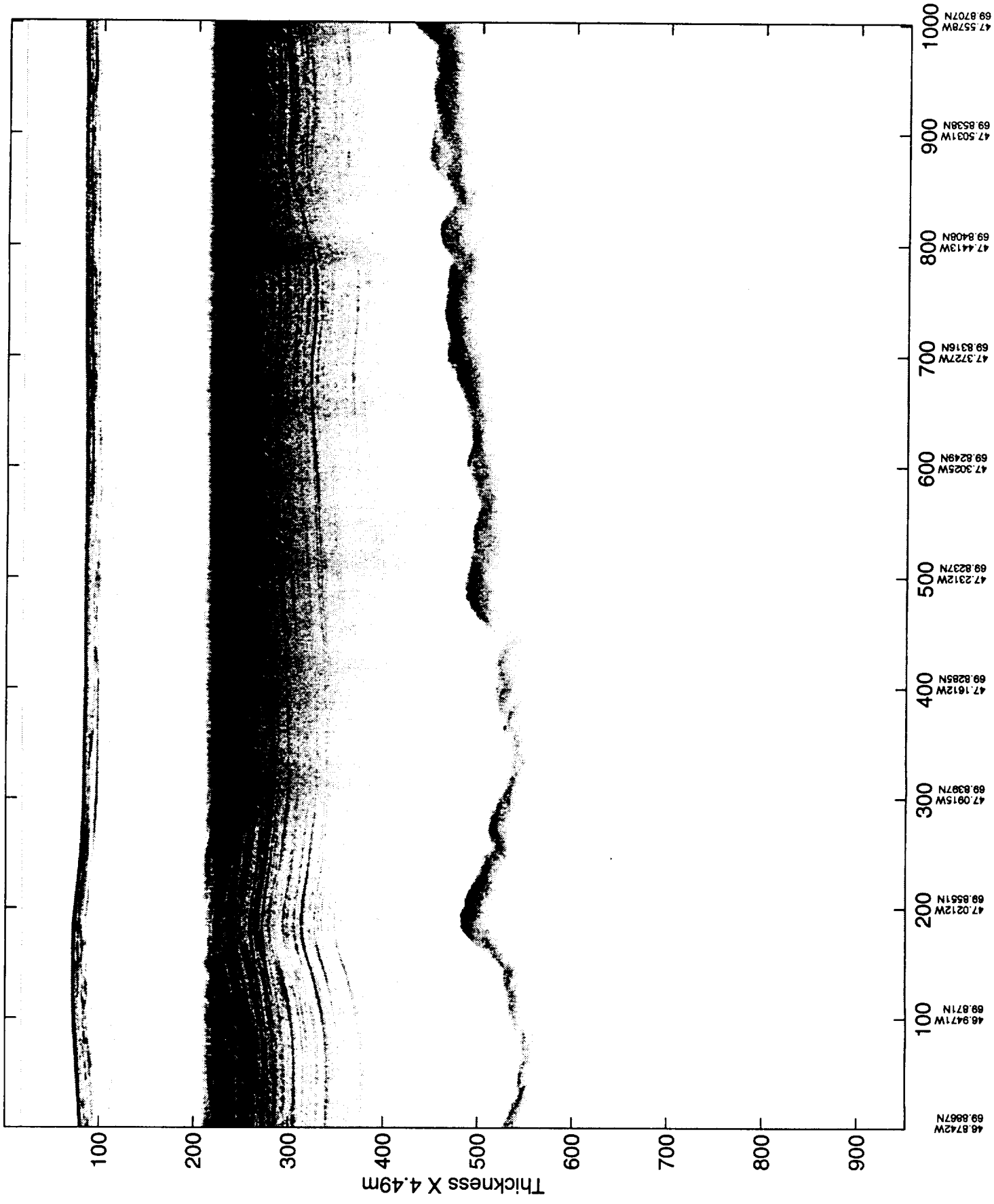
46.490W
69.985N

46.528W
69.990N

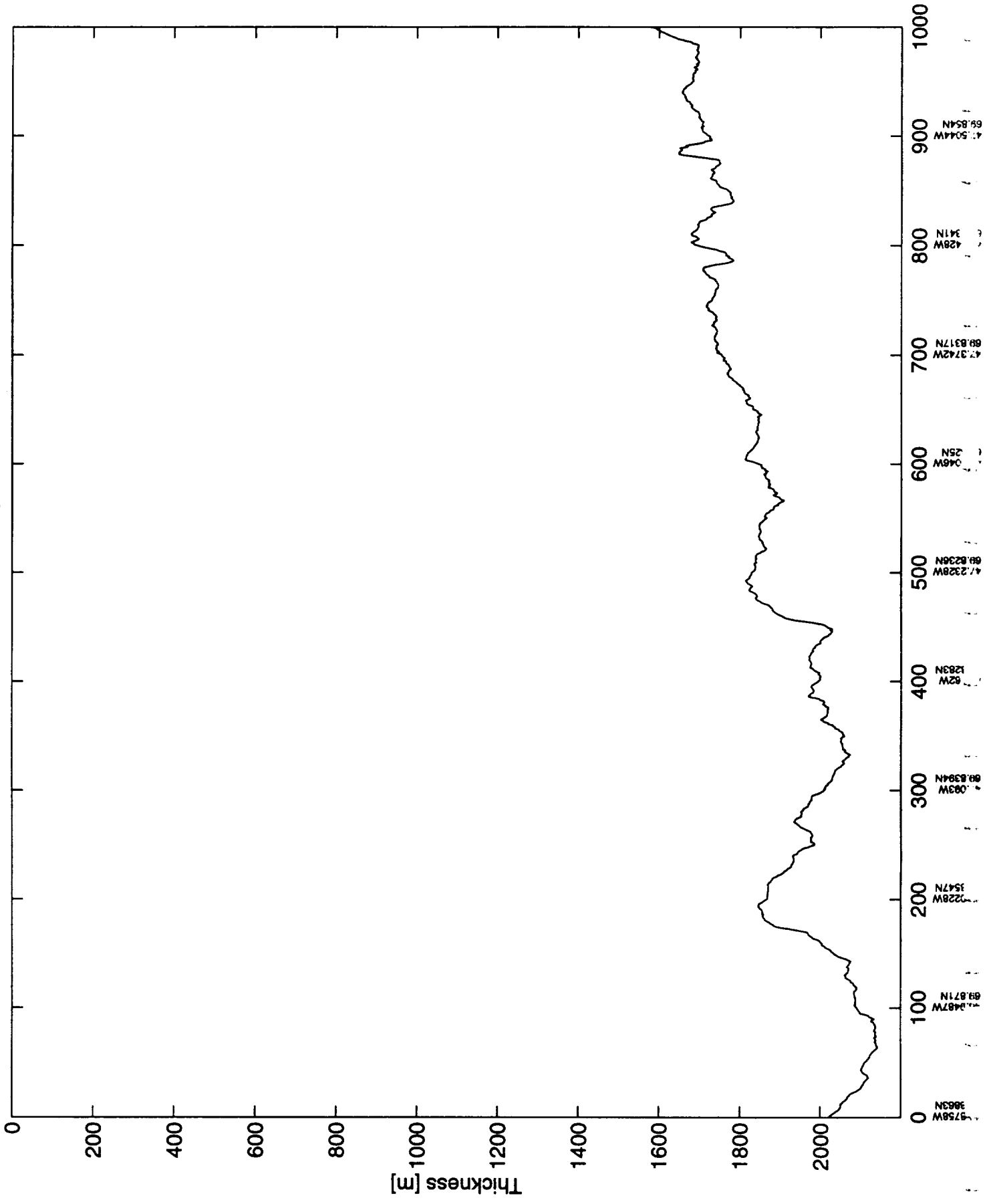
run_5l_9.1 (27) [26000-26298] thickness



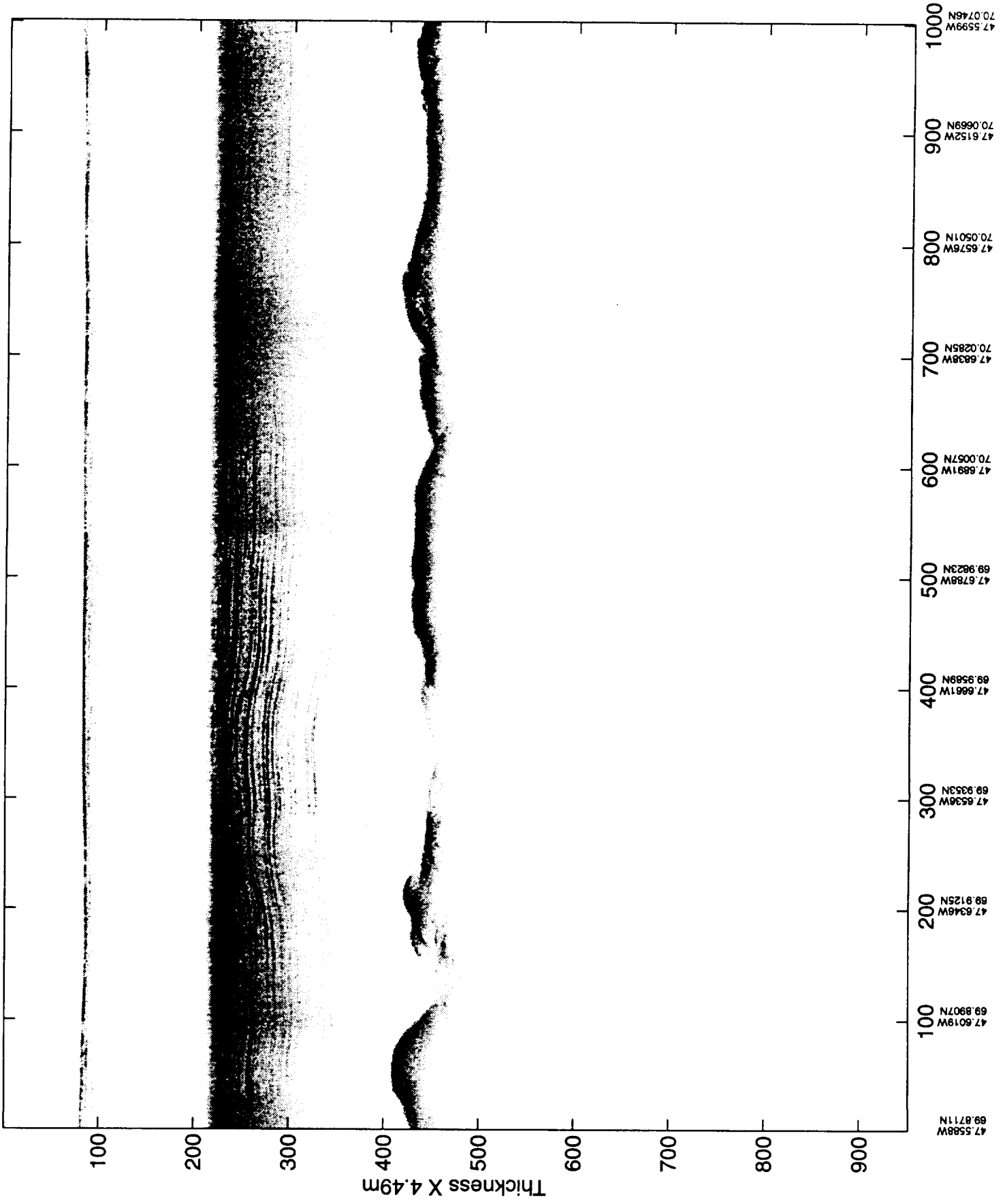
r_5l_10.11 [0-1000]



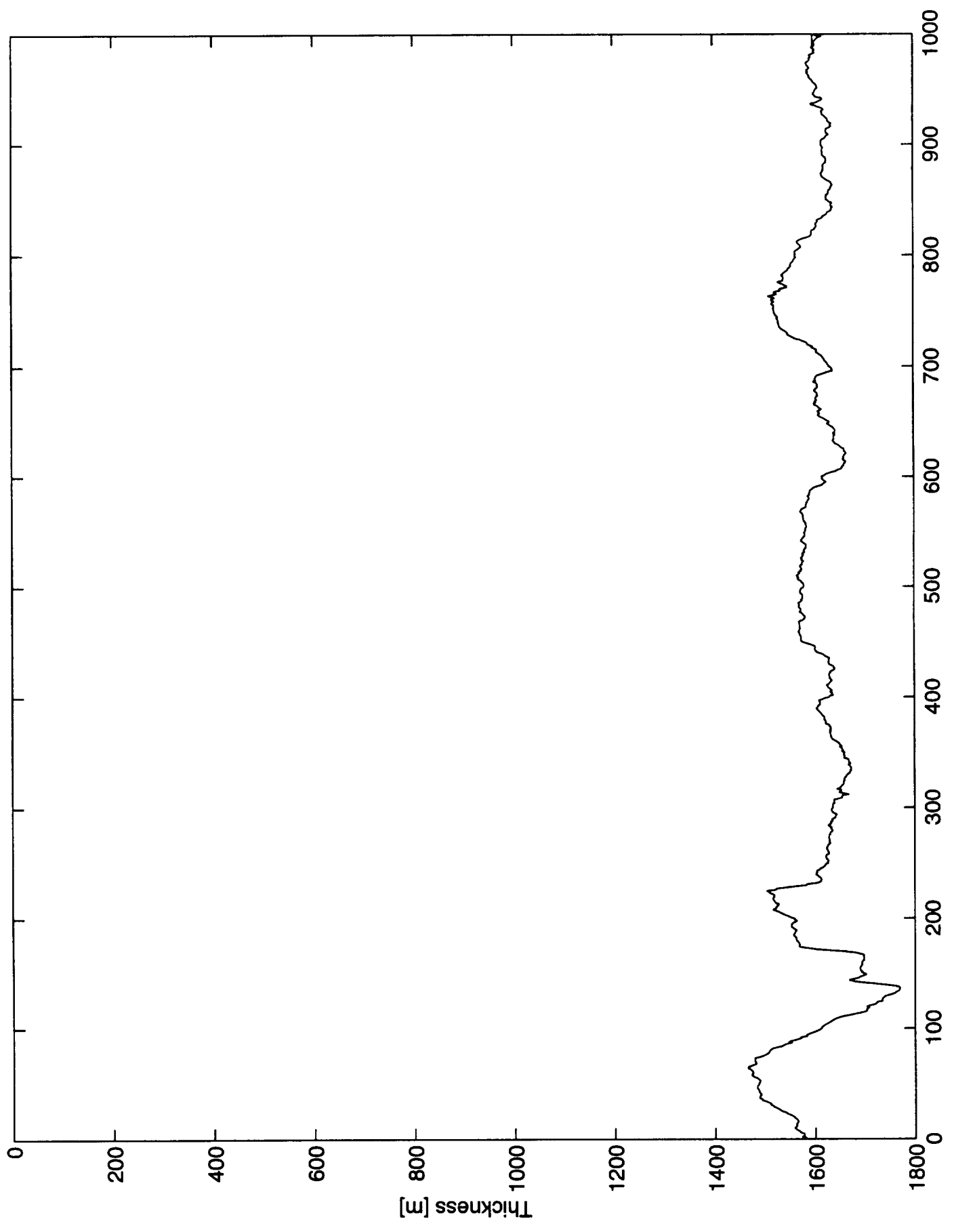
run_5l_10.1 (1) [0-1000] thickness



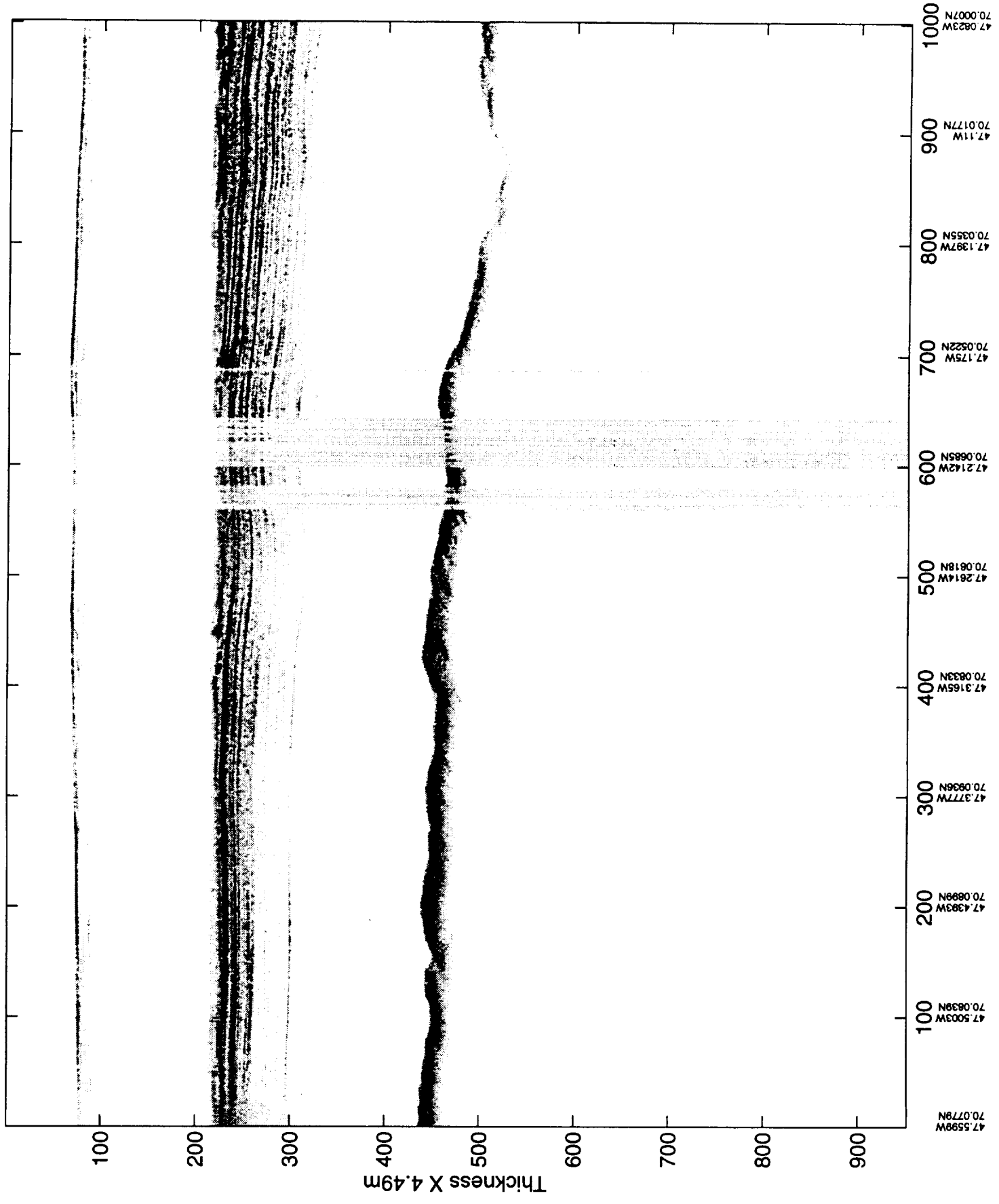
r_5l_10.12 [1000-2000]



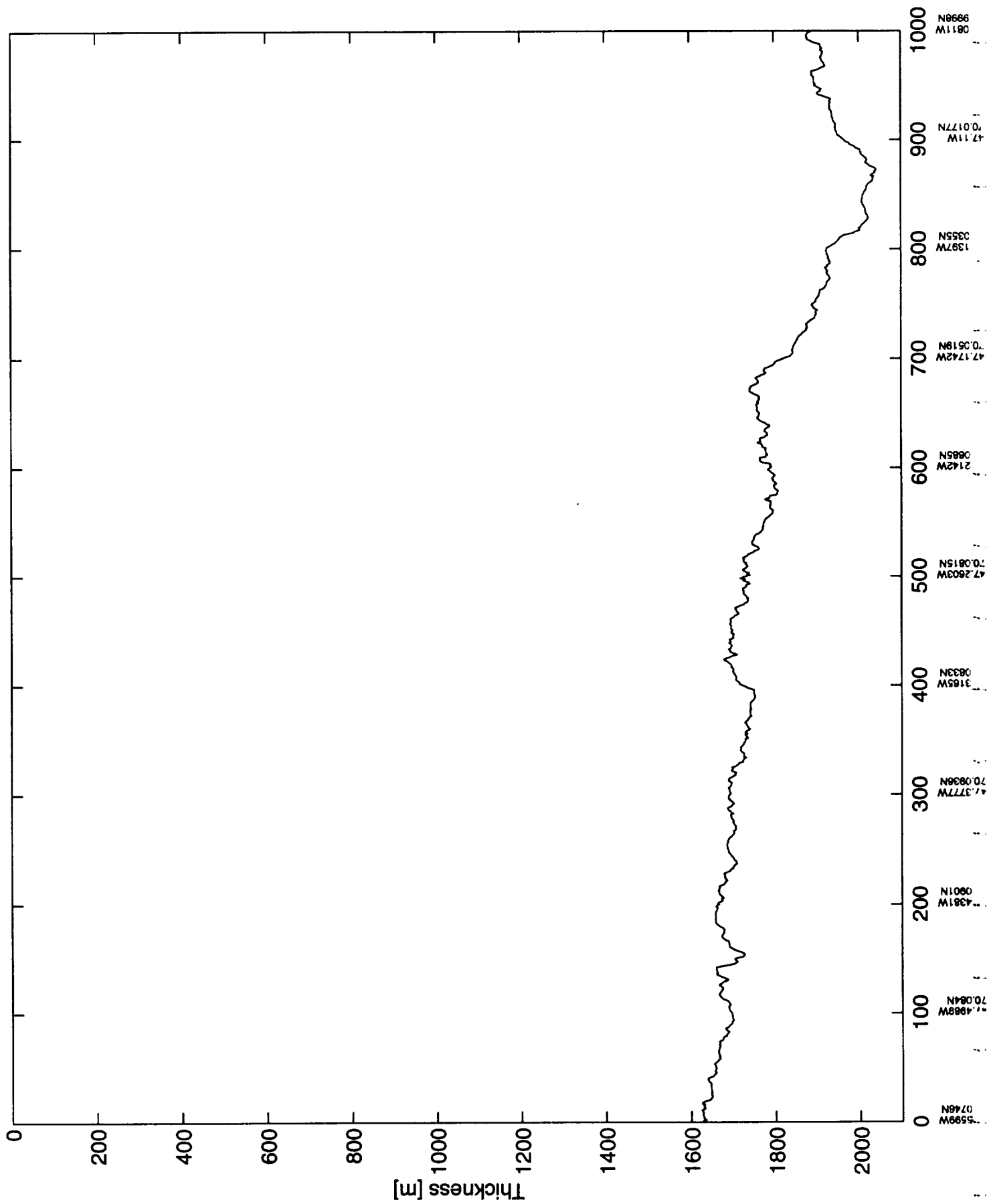
run_5l_10.1 (2) [1000-2000] thickness



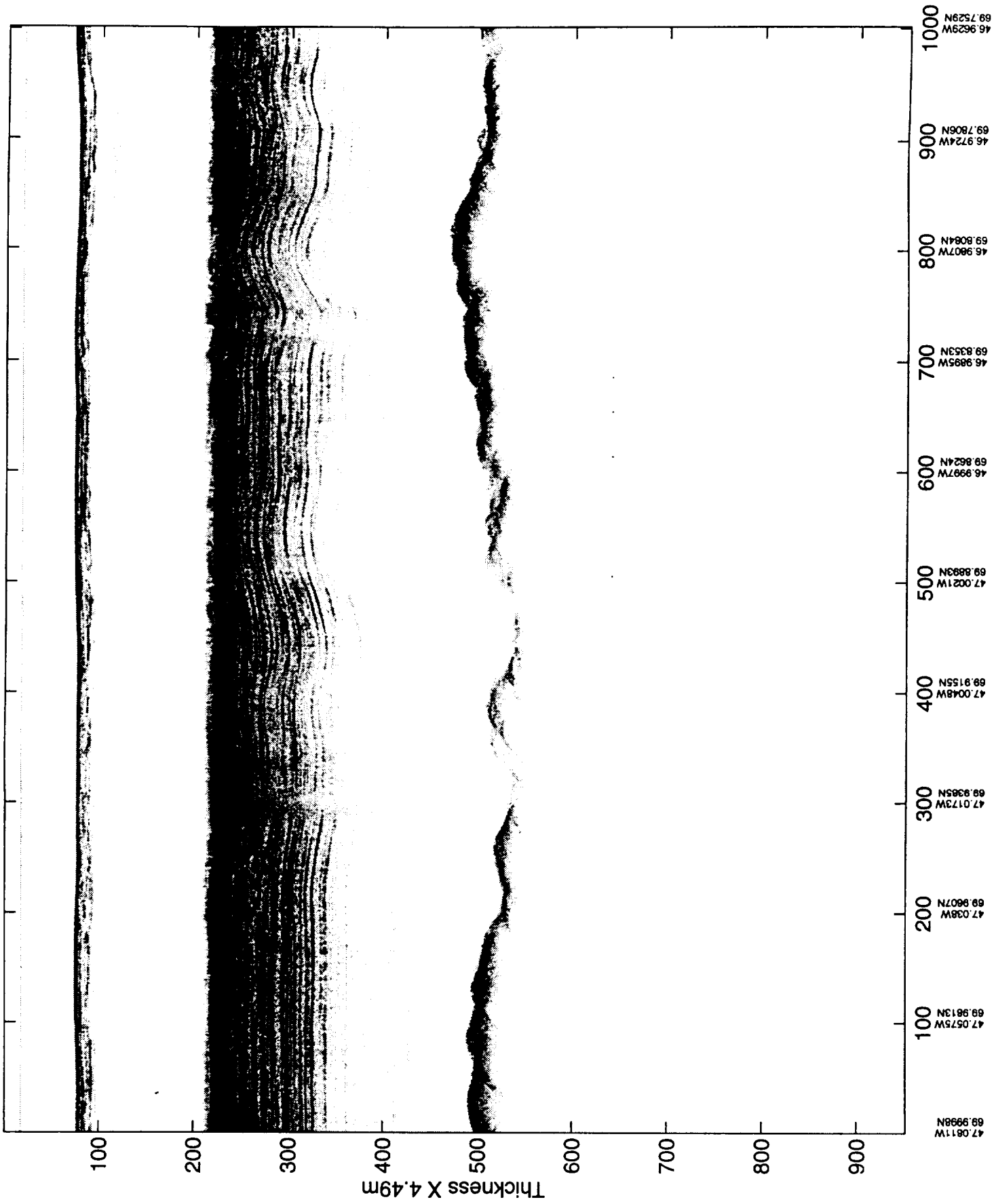
r_5l_10.13 [2000-3000]



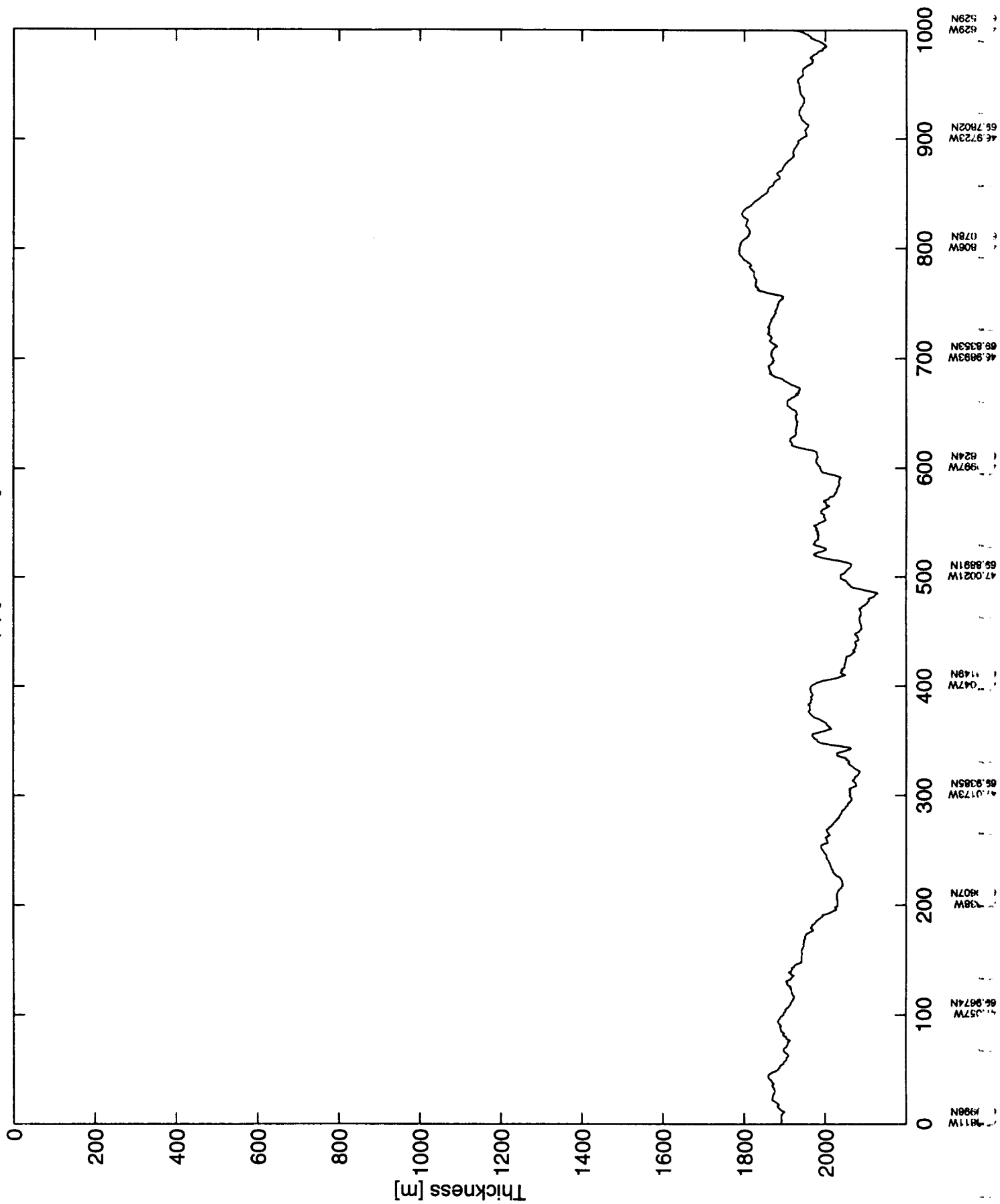
run_5l_10.1 (3) [2000-3000] thickness



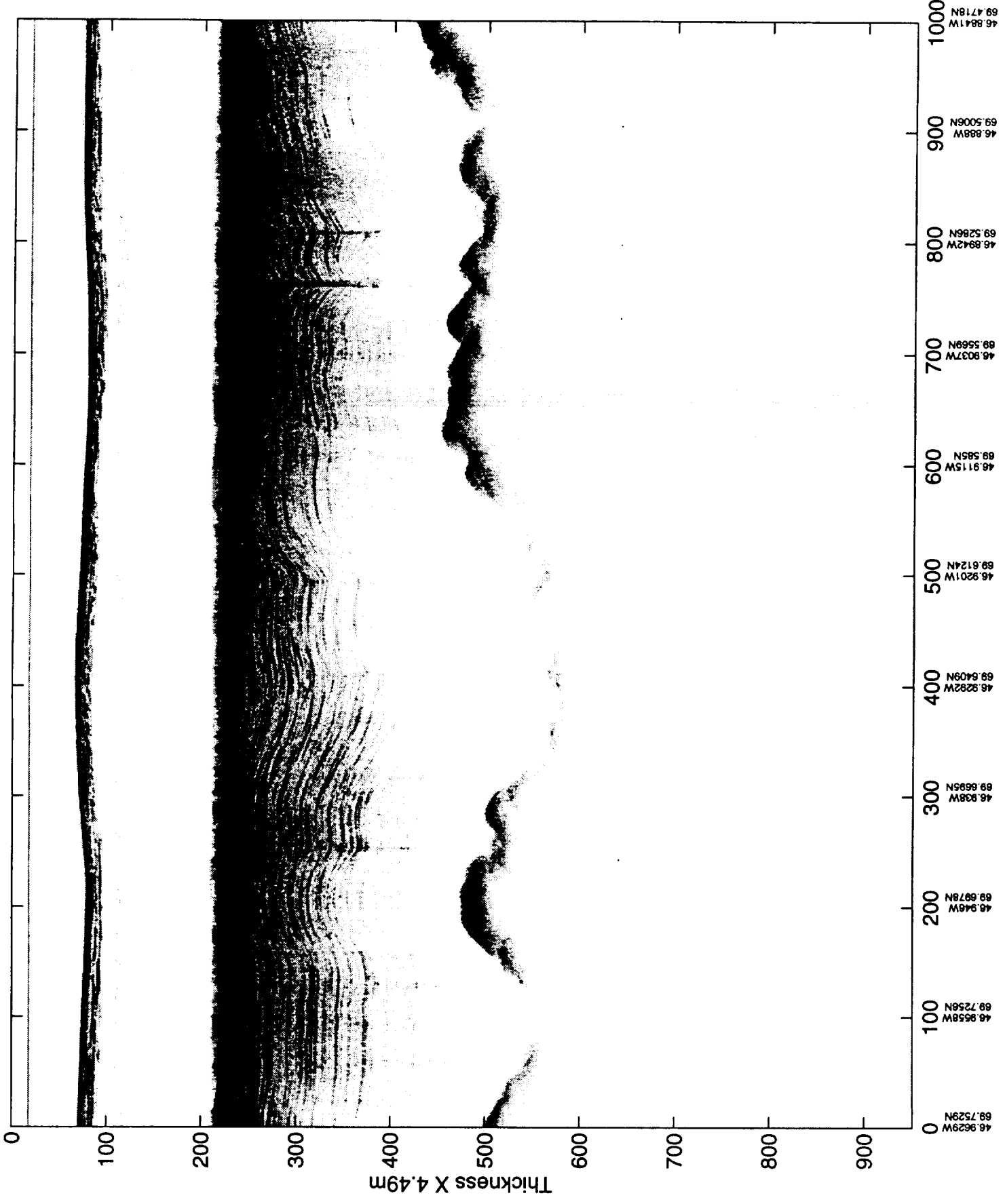
r_5l_10.14 [3000-4000]



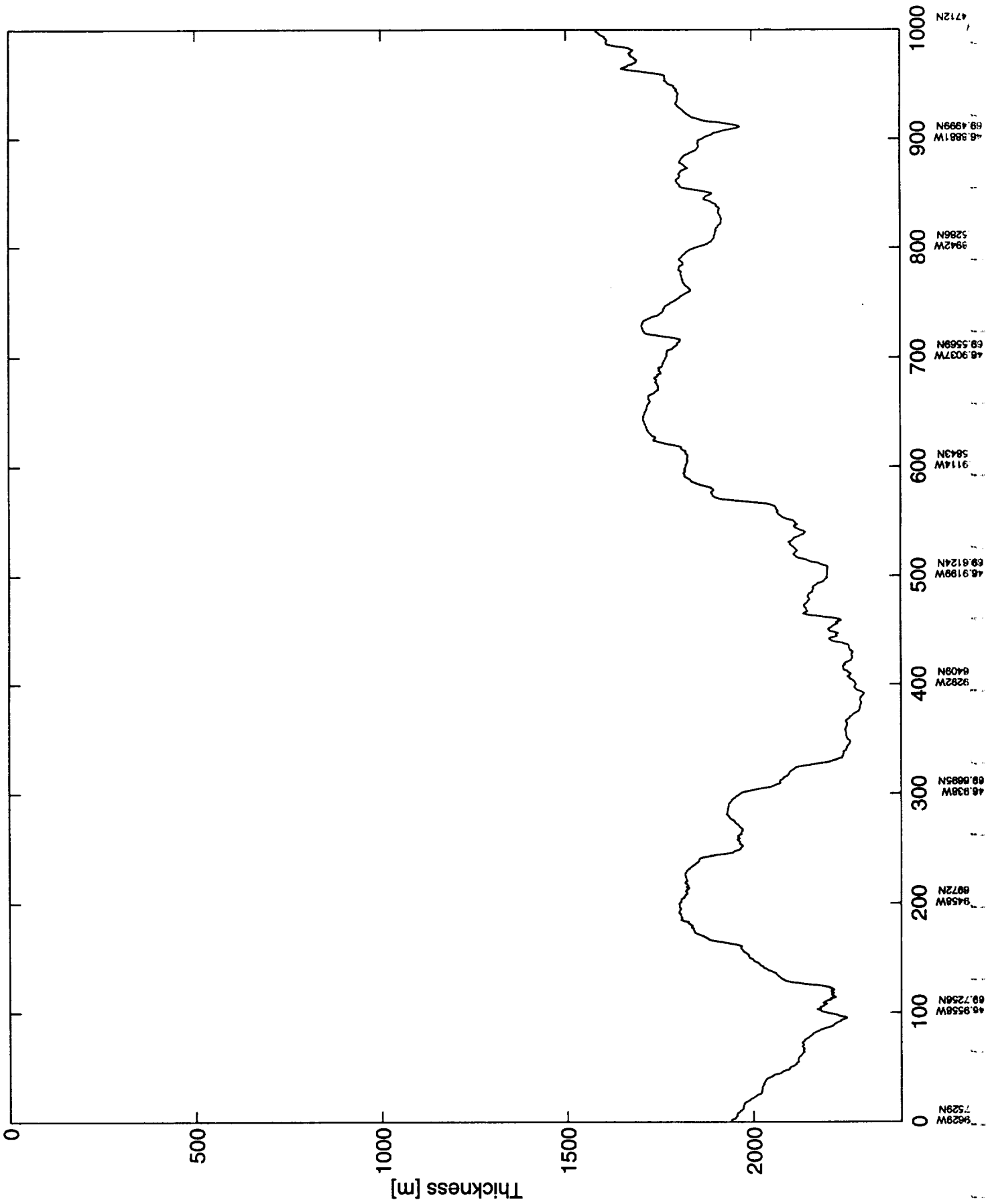
run_5l_10.1 (4) [3000-4000] thickness



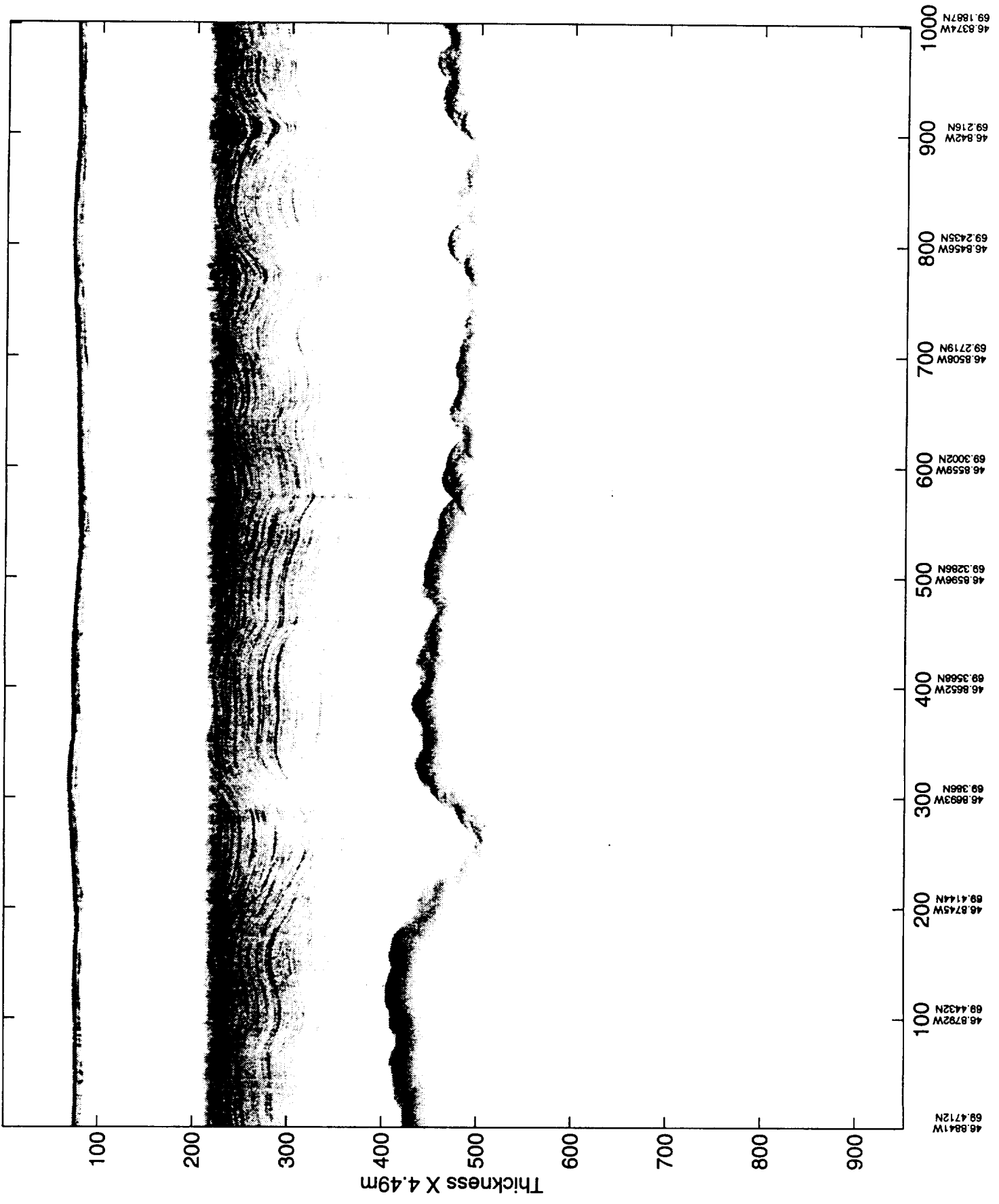
r_5l_10.15 [4000-5000]



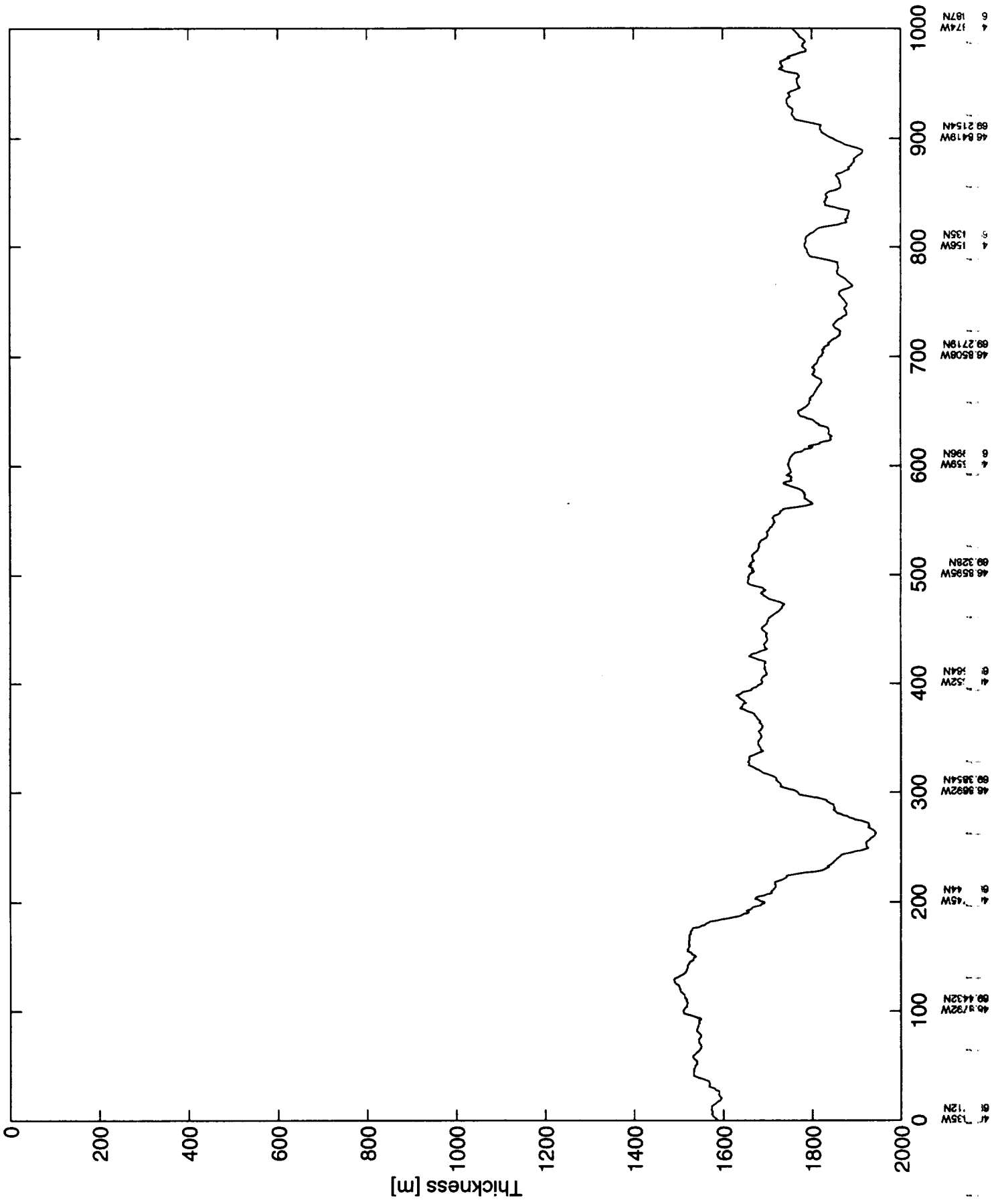
run_5l_10.1 (5) [4000-5000] thickness



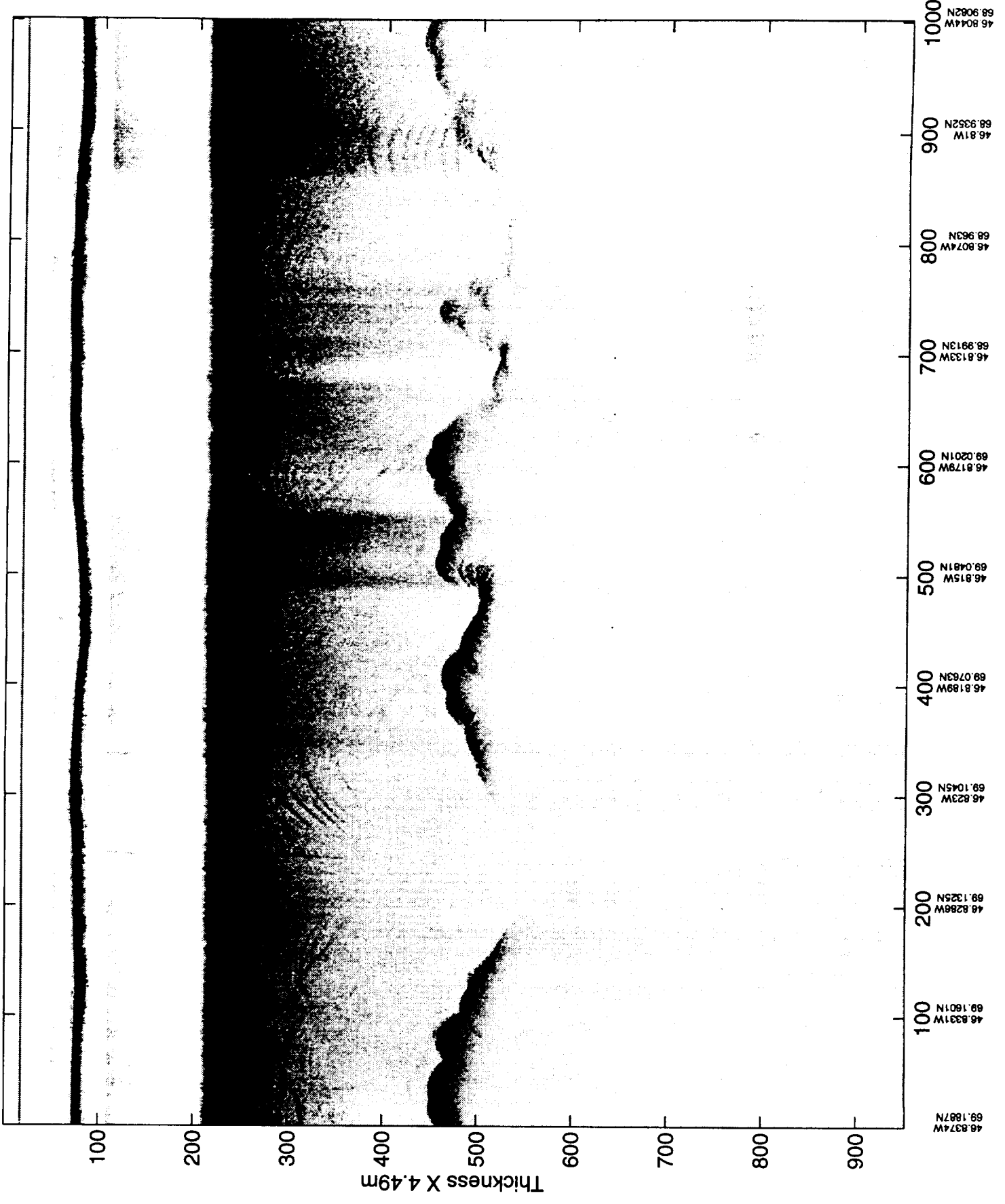
r_5L_10.16 [5000-6000]



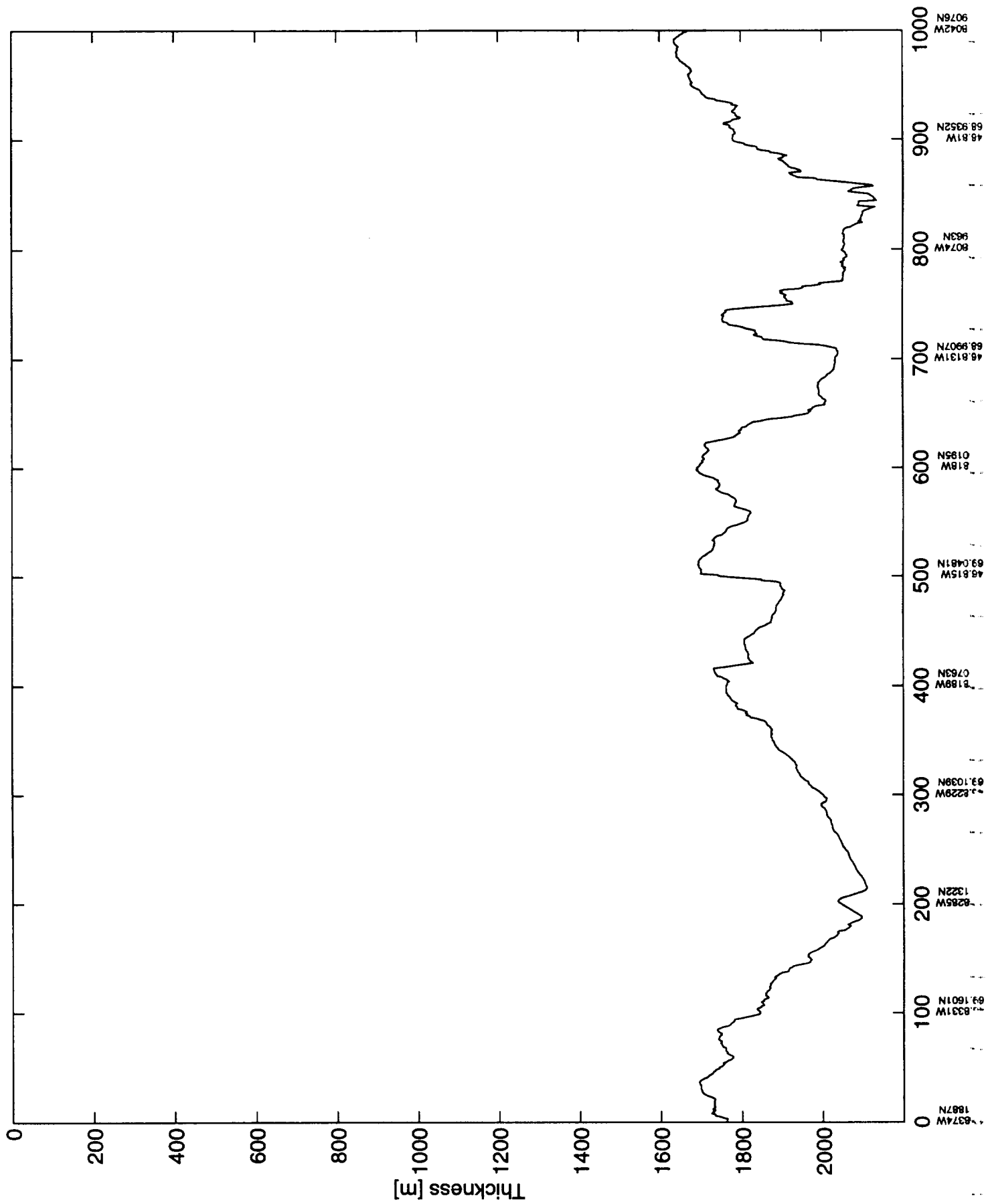
run_5l_10.1 (6) [5000-6000] thickness



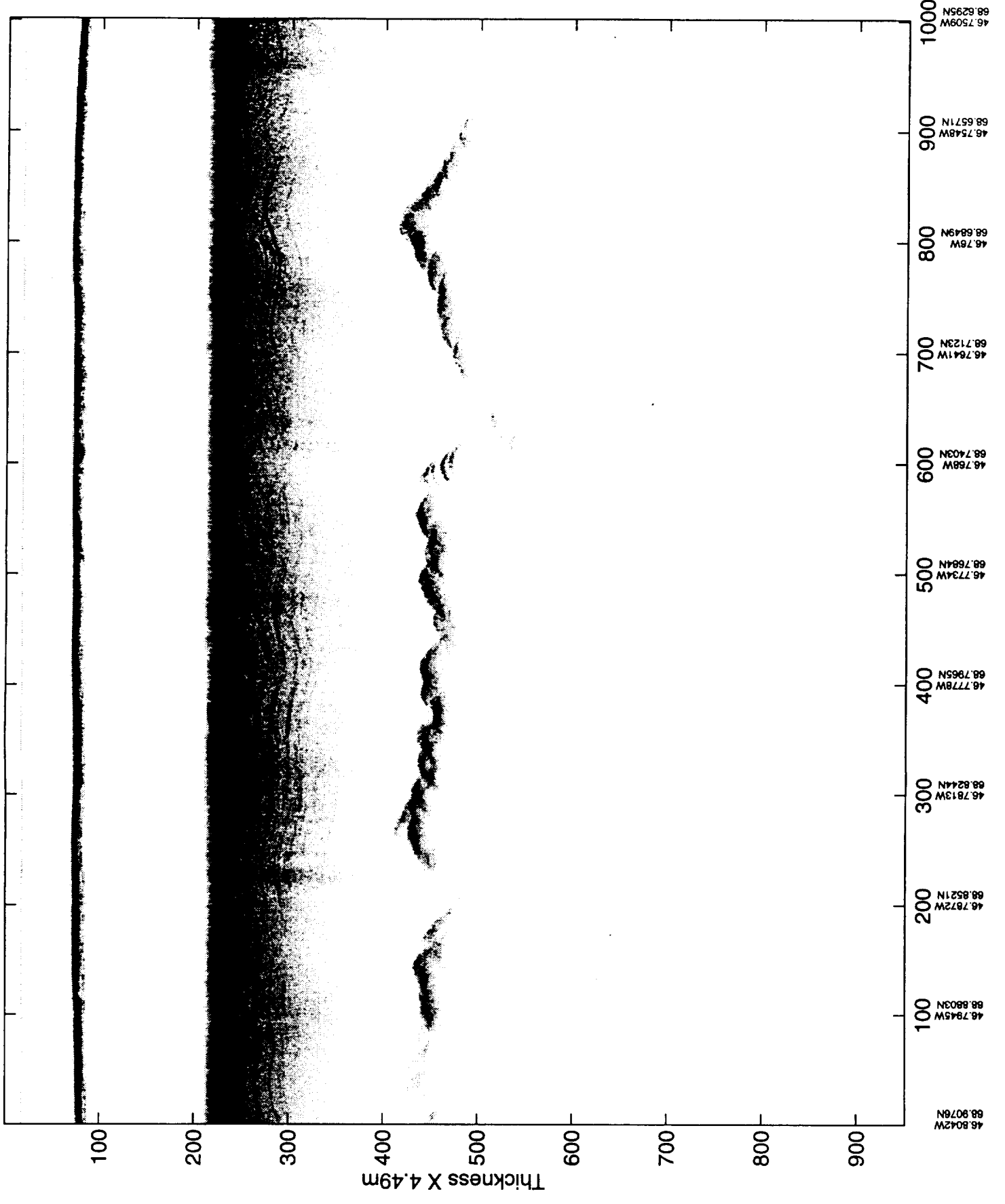
r_5l_10.17 [6000-7000]



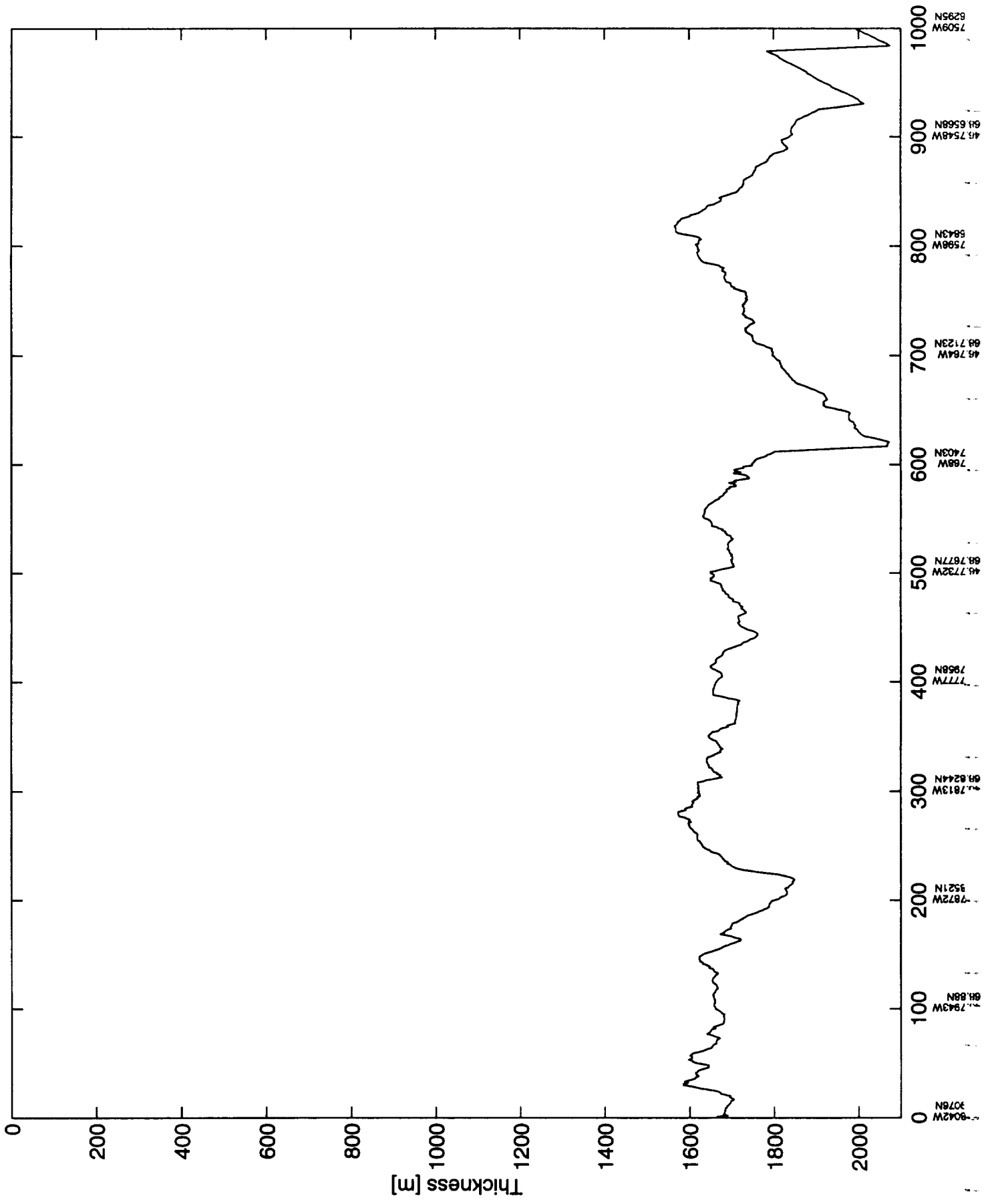
run_5l_10.1 (7) [6000-7000] thickness



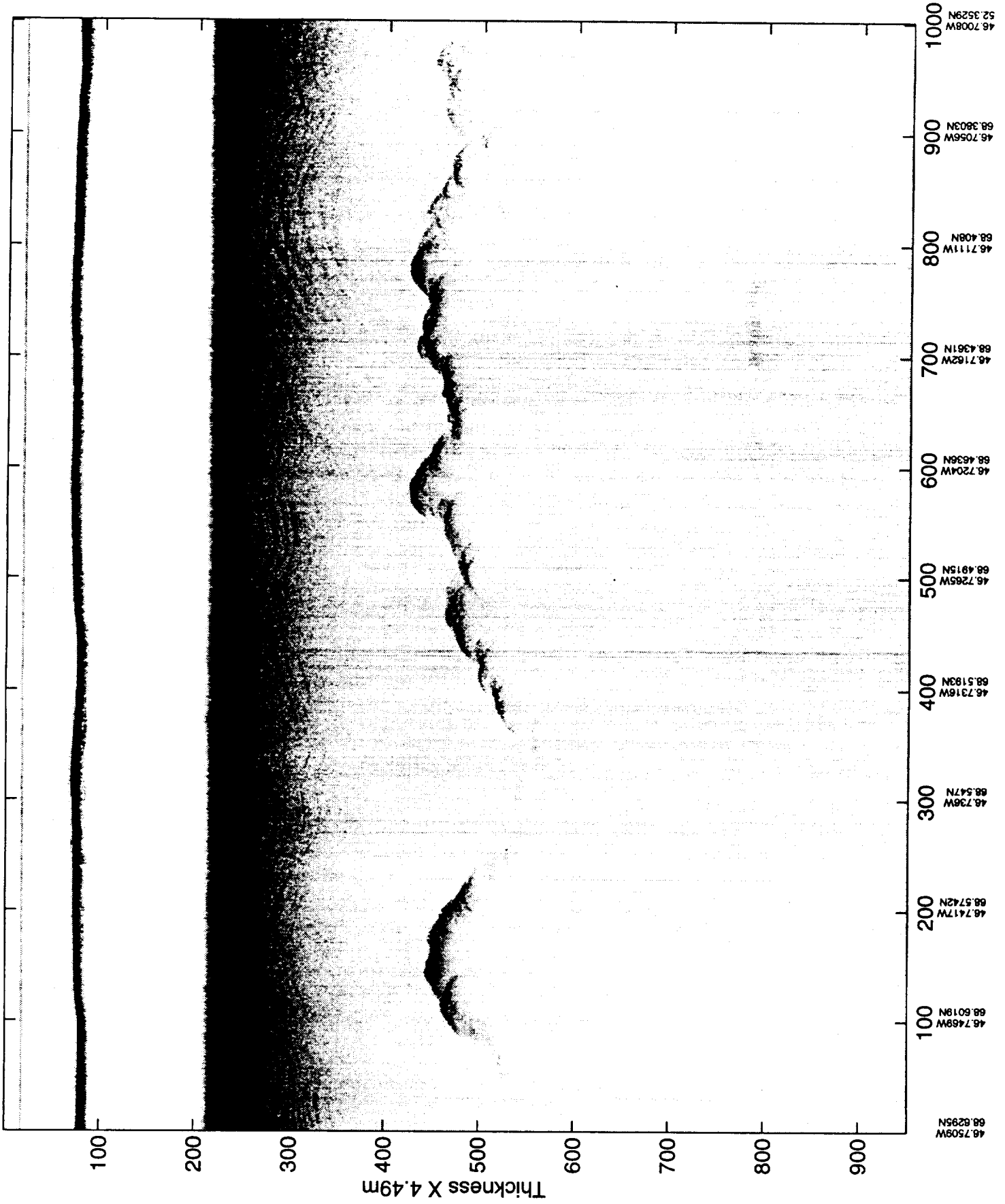
r_5]_10.18 [7000-8000]



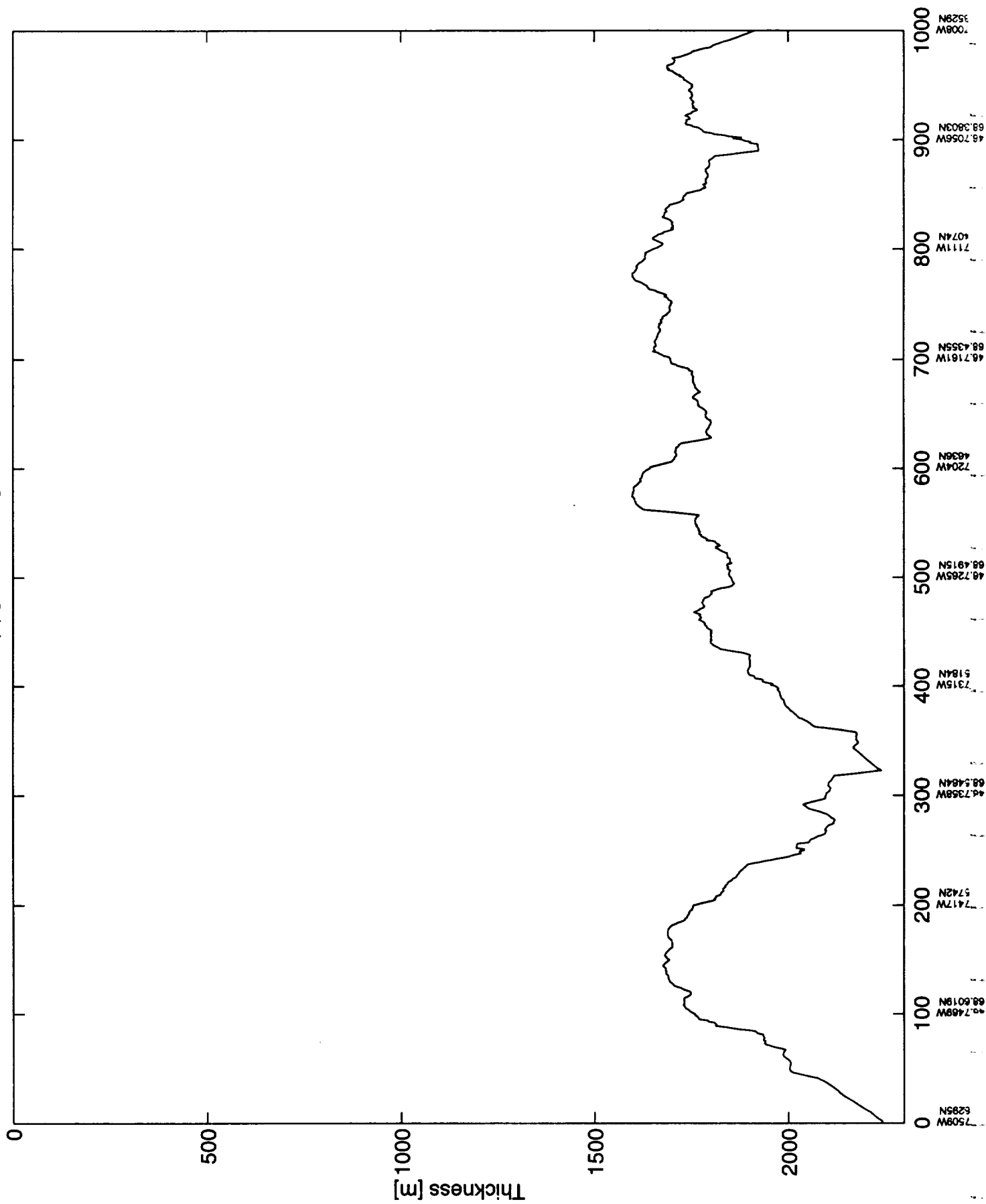
run_5l_10.1 (6) [7000-8000] thickness



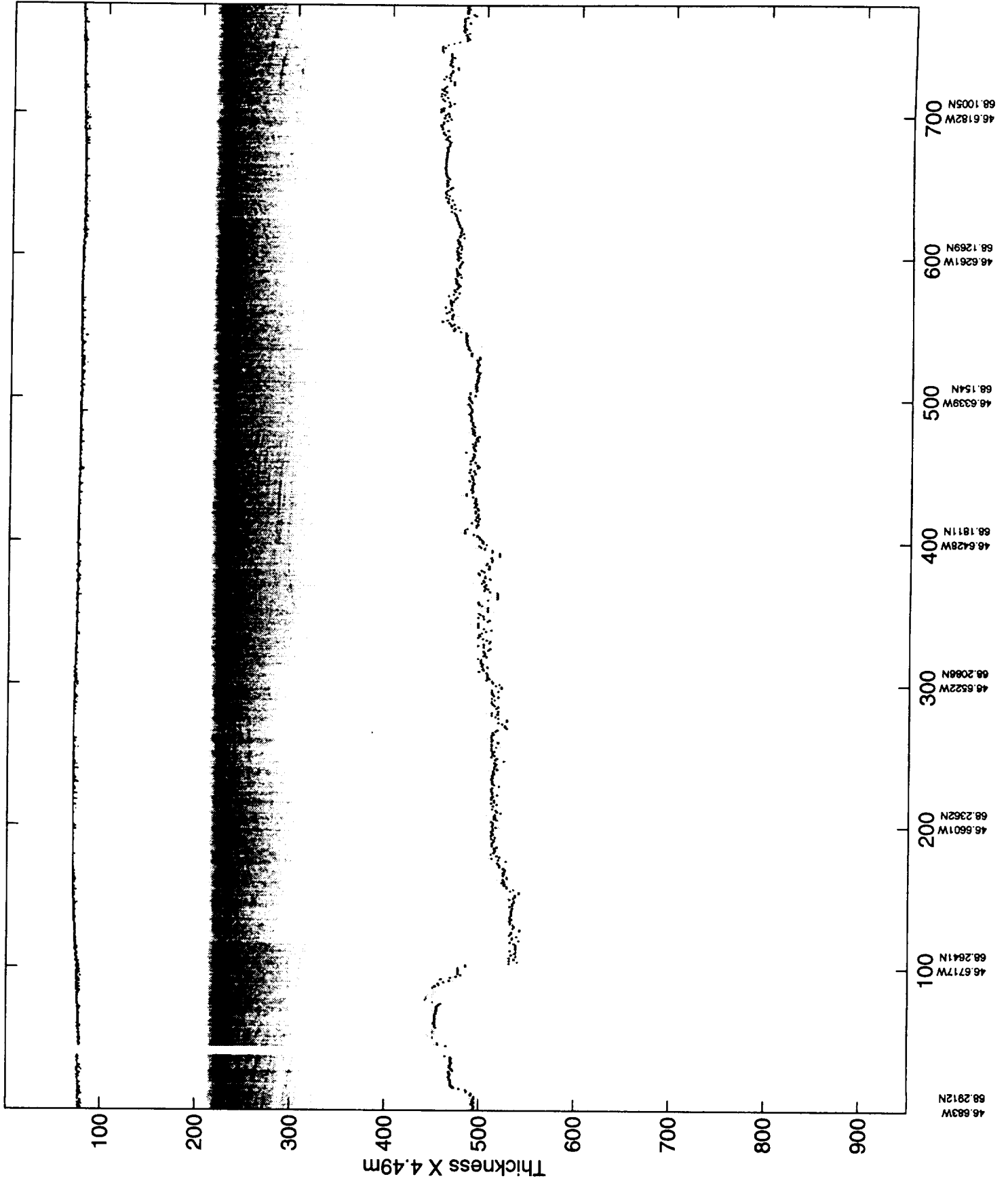
r_5l_10.19 [8000-9000]



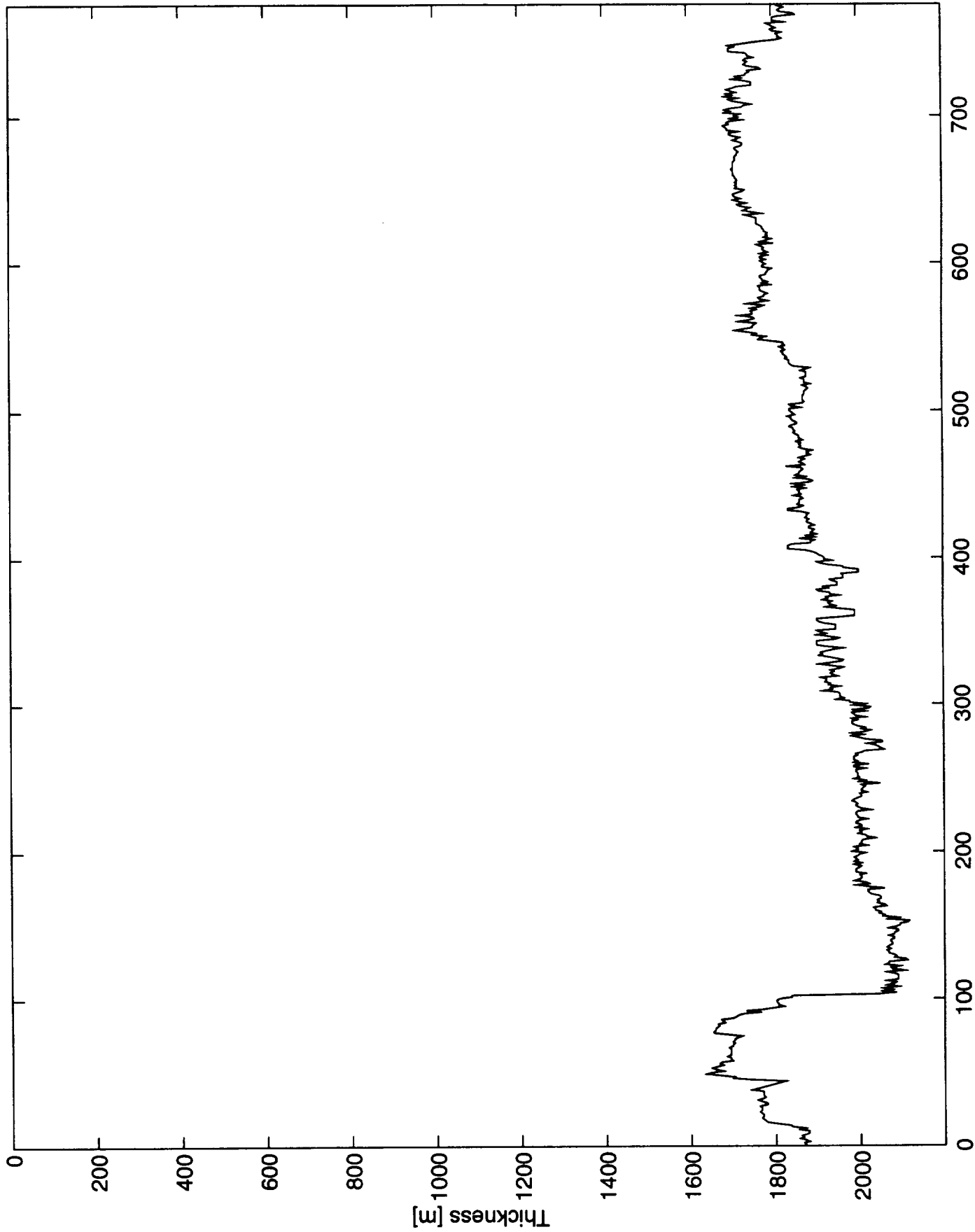
run_5l_10.1 (7) [8000-9000] thickness



r_5[10.110a [9225--10000]

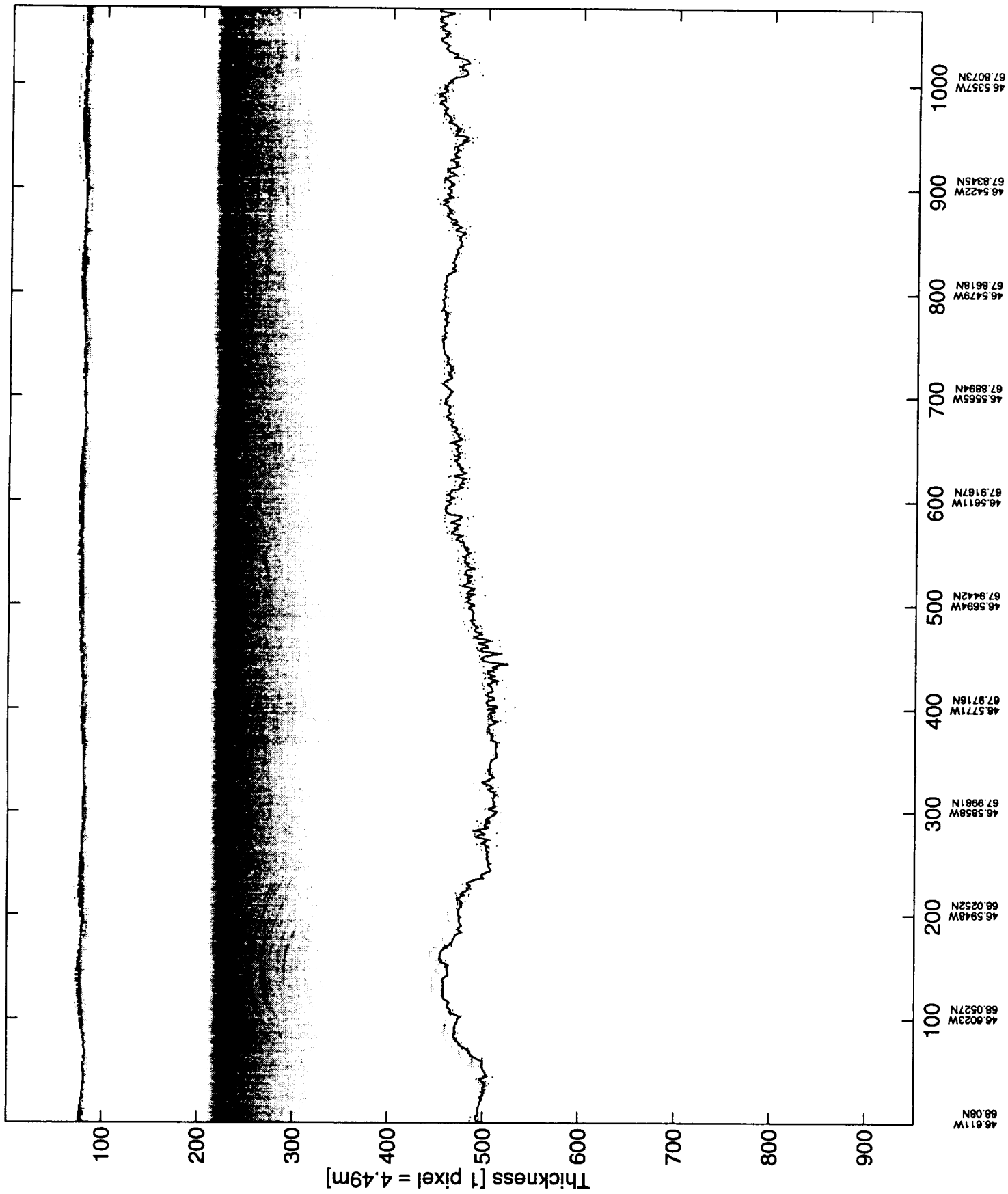


r_5l_10.110a [9225-10000] thickness

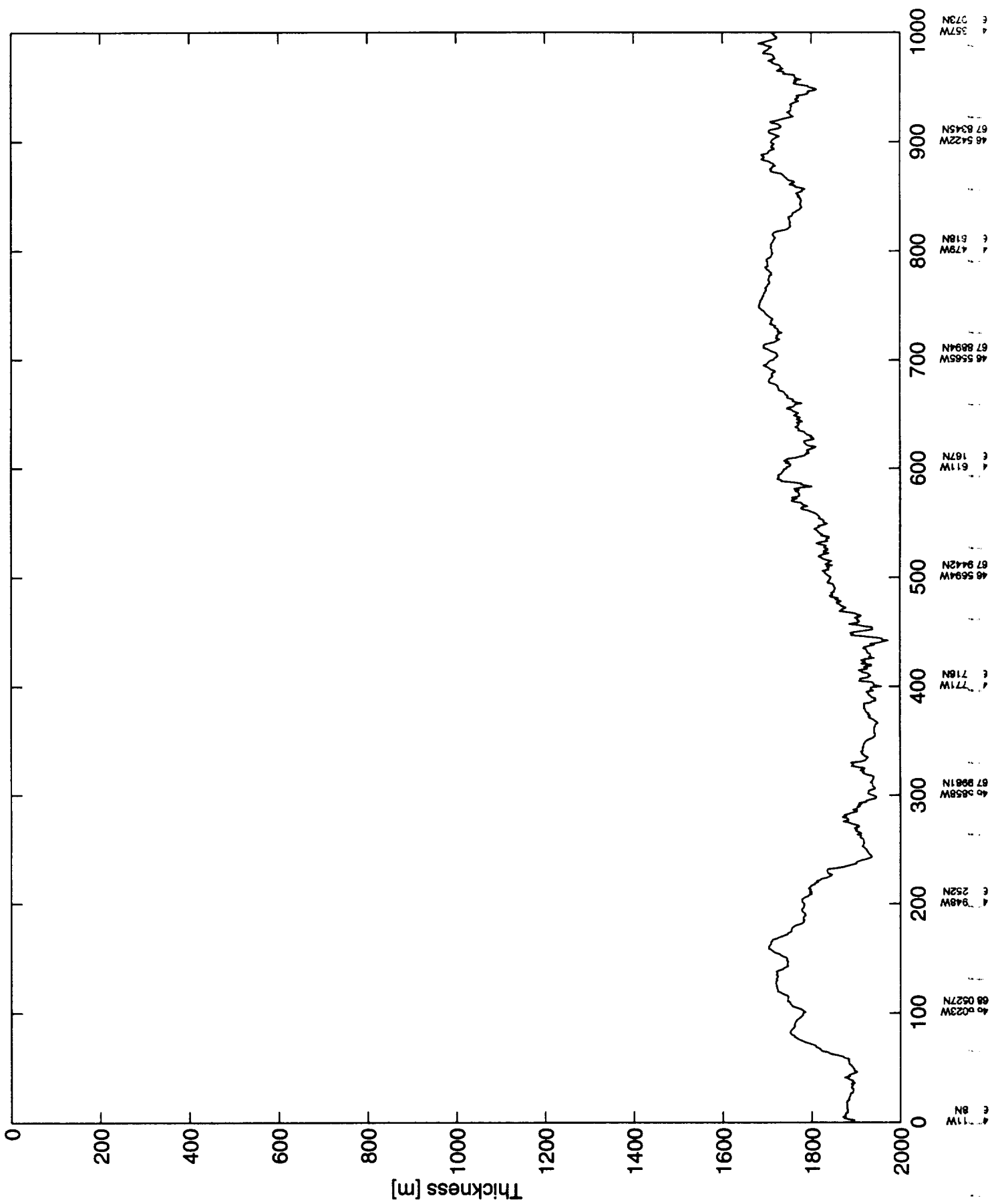


46 3W 68 12N
46 417W 68 41N
46 501W 68 62N
46 522W 68 86N
46 542W 68 111N
46 539W 68 54N
46 5261W 68 126N
46 3182W 68 105N

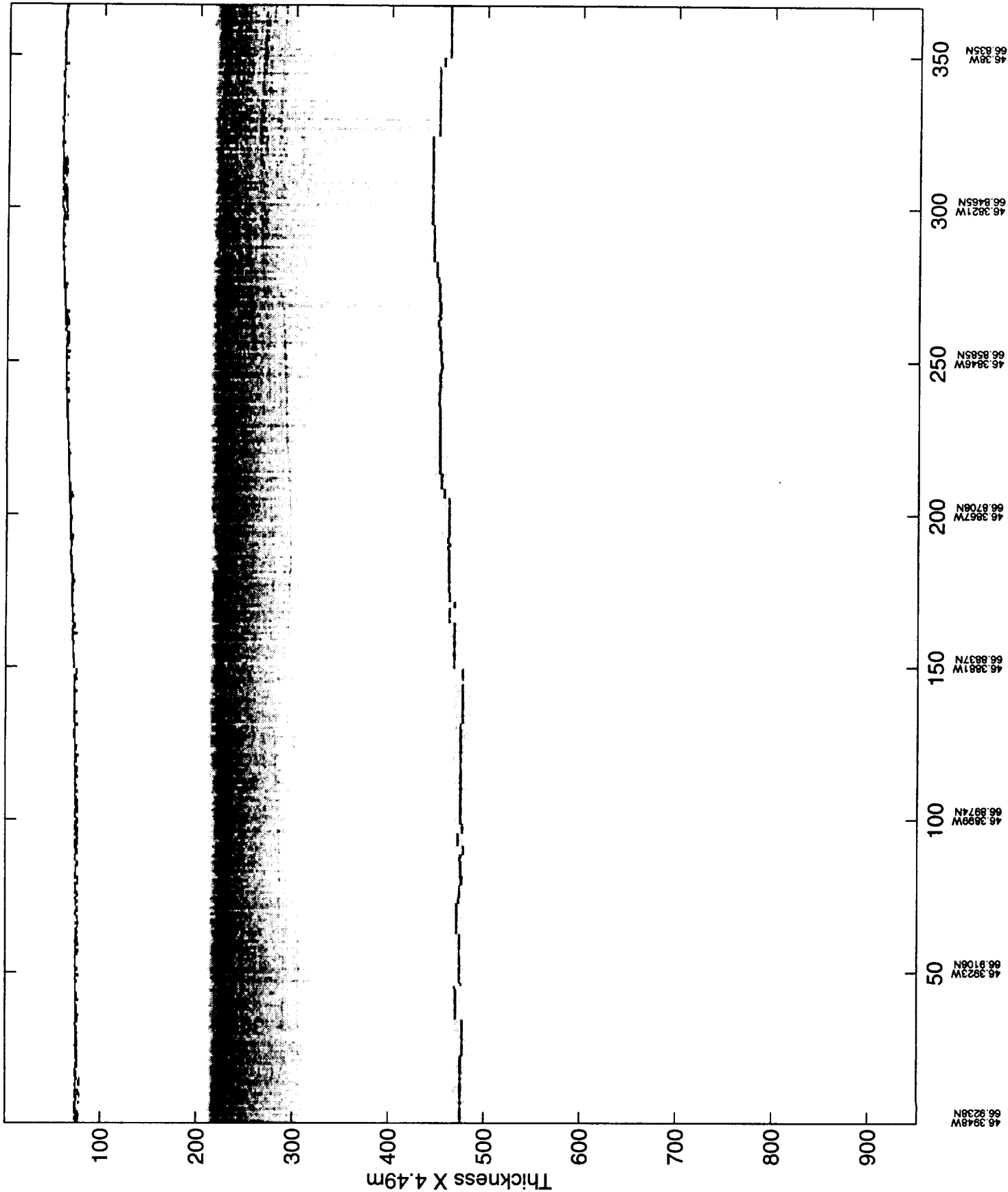
run_5l_10.1 (11) [10000-11073]



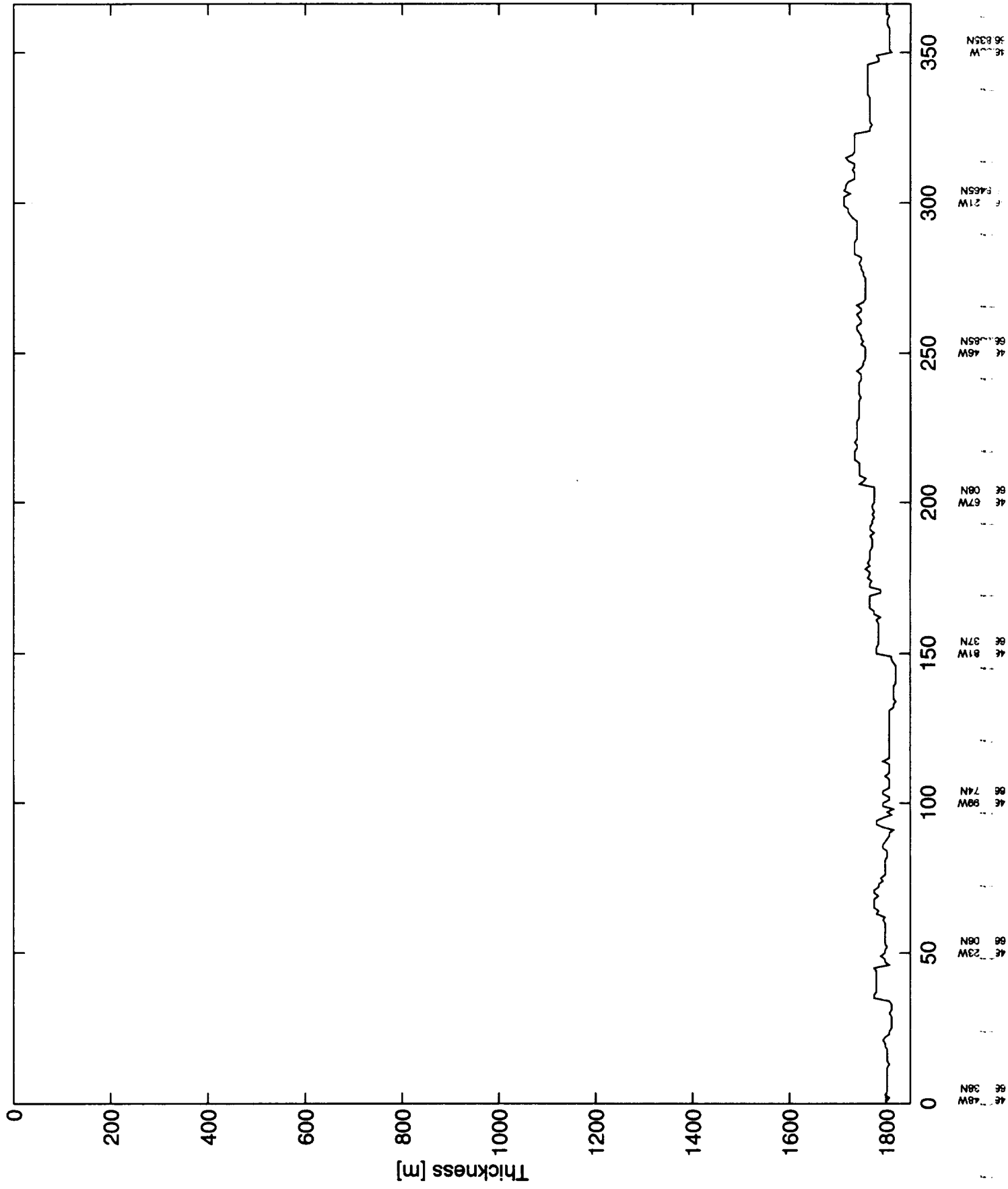
run_5L_10.1 (11) [10000-11073] thickness



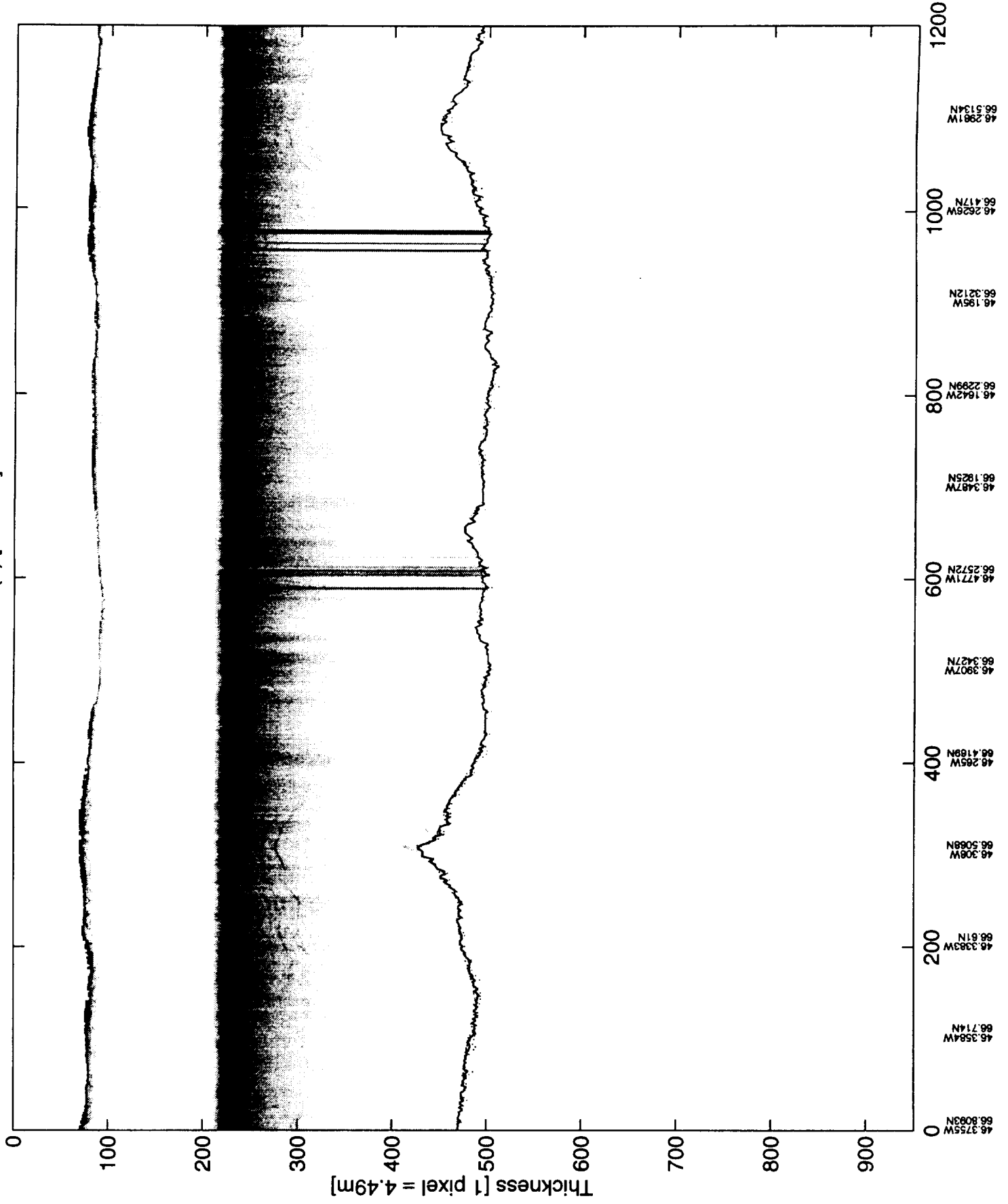
r_5l_13.1 [0-366]



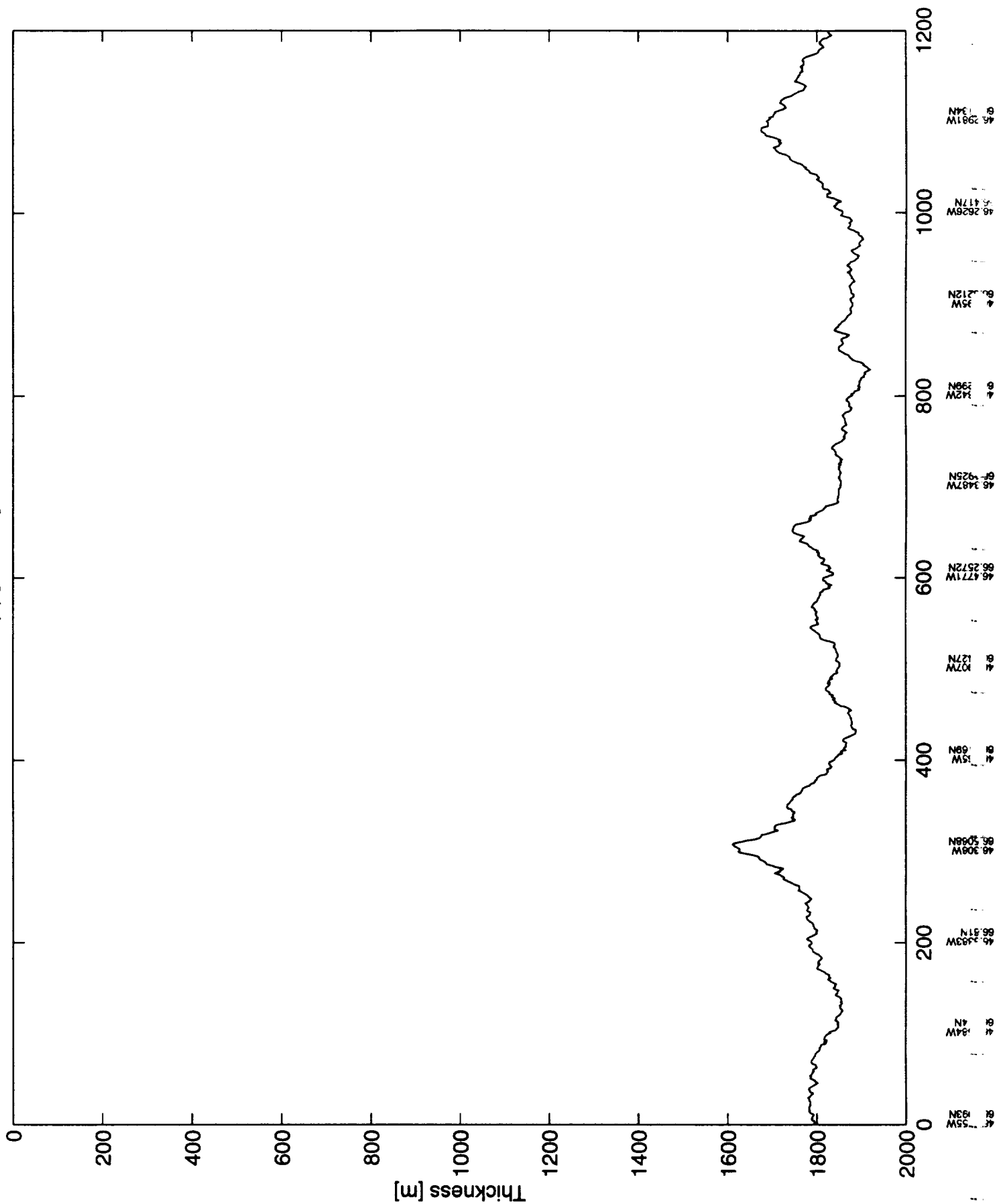
r_5l_13.1 [0-366] thickness



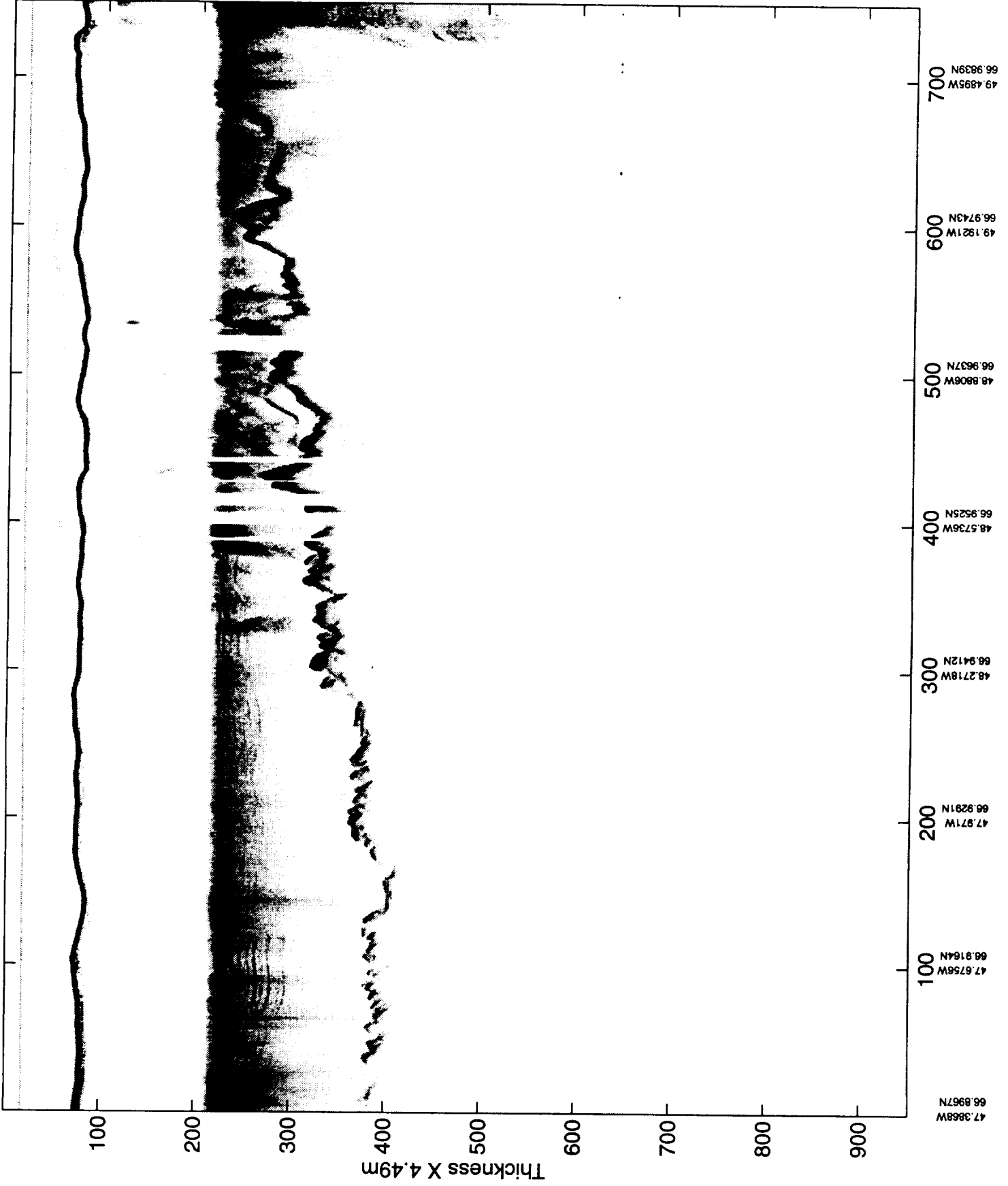
r_5l_14.1 (1) [0-1200]



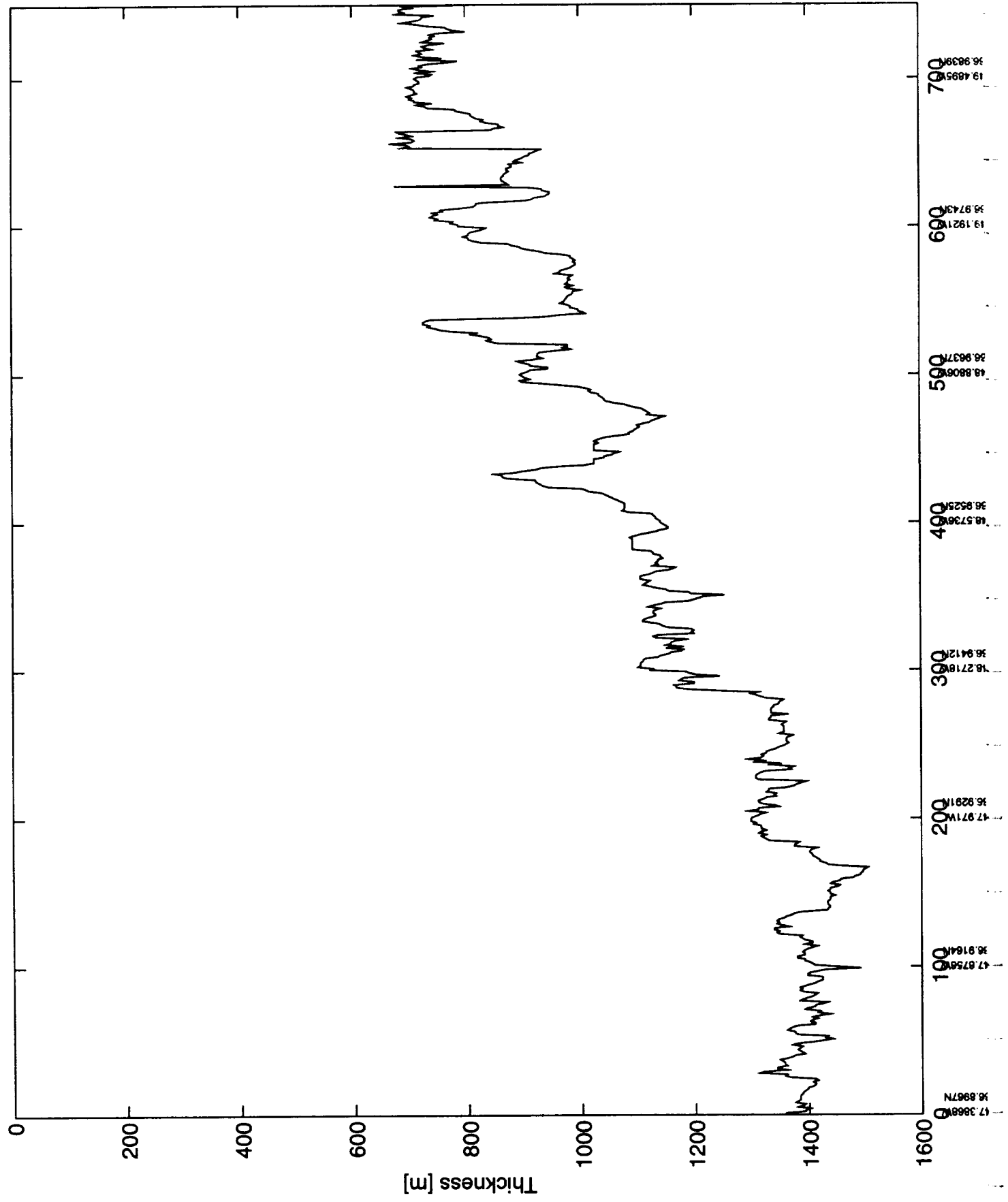
run_5l_14.1 (1) [0-1200] thickness



r_5l_14.12a [1600-2350]



r_5l_14.12a [1600-2350] thickness



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