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VERTICAL PROFILES OF TEMPERATURE, SALINITY AND DENSITY FROM THE--ETC(U)
APR 79 R A KNOX, M J MCPHADEN

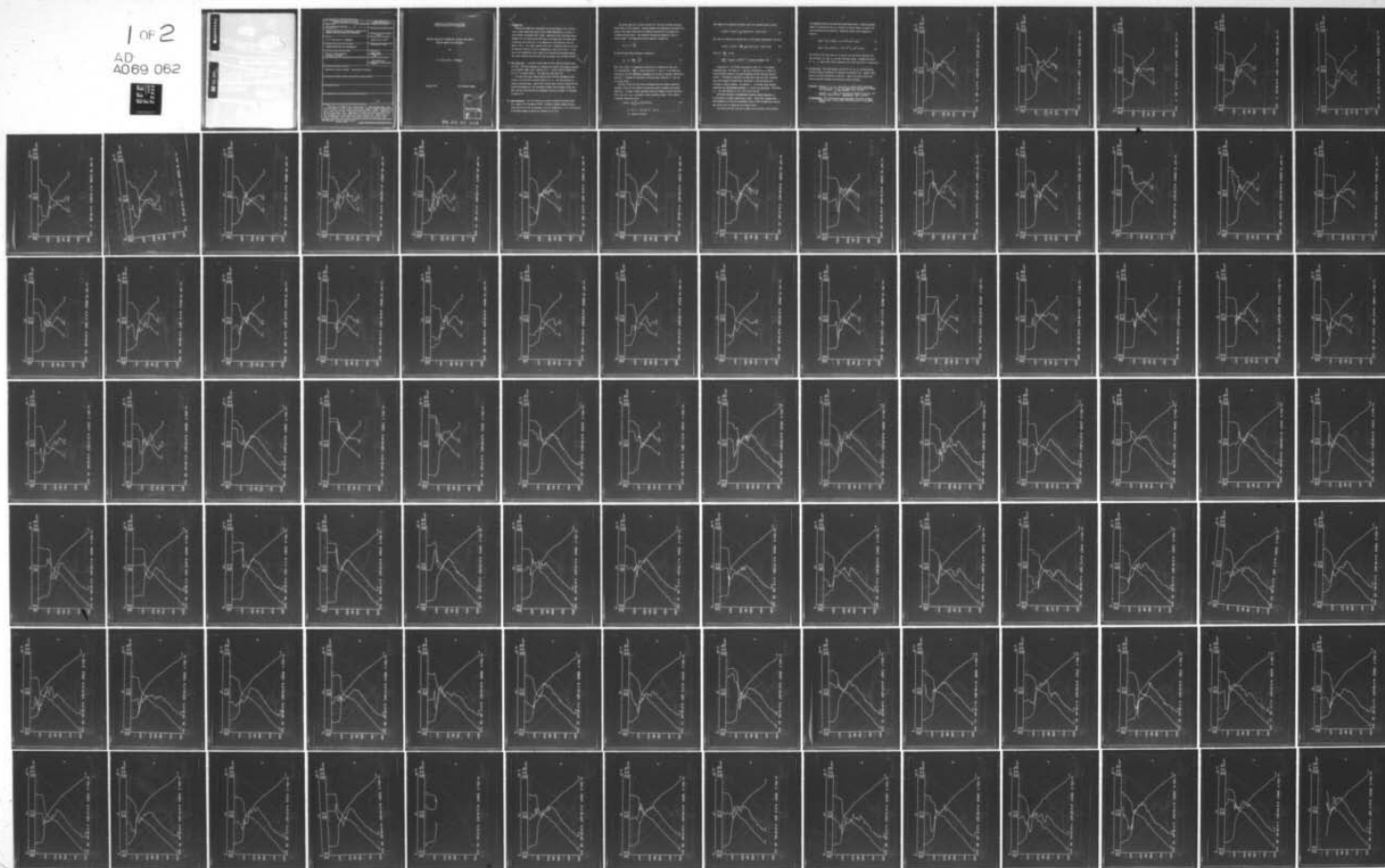
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VERTICAL PROFILES OF TEMPERATURE, SALINITY AND DENSITY
FROM THE NORPAX POLE EXPERIMENT

by

R. A. Knox and M. J. McPhaden

January 1979

SIO Reference Number

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Abstract

I. Introduction

During the NORPAX Pole experiment of January-February 1974, 165 STD casts to 500 m depth were made from R/V THOMAS WASHINGTON in an area of 100 km radius surrounding 35°N, 155°W. Temperature data from these casts, together with ship and aircraft XBT data in the same area, have been used to describe the variability of the temperature field (Barnett, Knox and Weller, 1977). This report presents the final, corrected values of salinity and potential density, as well as temperature, from the STD casts. In the case of the temperature field, there is no significant difference between the values reported here and those used by Barnett, Knox and Weller (1977).

Abstract

II. Data Collection.

A standard Plessey 9006 STD with 1500 db pressure sensor was used. Data were recorded on a Plessey 8114 digital data logger, operated at the fastest sample rate, nominally 0.2 s. Typical lowering speeds were 0.5 m s⁻¹ at greater depths. Only down-cast data were used.

On every third cast, Nansen bottles with reversing thermometers were placed on the STD wire at nominal depths of 0, 20, 100, 300 and 500 m to obtain calibration data. Apart from a few periods of obvious system failure, the STD performed well; the differences between STD and Nansen values were small and were well-defined and repeatable functions of depth, as discussed in section III.

III. Data Processing.

The first step was to remove occasional bad data points via a simple first difference filter. Allowable changes between adjacent scans were set at 5 db for pressure, 0.4°C for temperature, 0.3‰ for salinity. A negligible number of points was rejected in this way.

The second step was to correct the data for "salinity spiking", the well-known effect of time constant mismatch between the temperature and conductivity sensors, the signals from which are combined electronically to produce the recorded salinity signal. The procedure followed was essentially that of Scarlet (1975). The temperature sensor response is modeled as

$$T_R = T_I + \tau \frac{\partial T_I}{\partial t} \quad (1)$$

and the salinity sensor response is modeled as

$$S_R = S_I + \left(\frac{\partial S}{\partial T} \right)_C \tau \frac{\partial T_I}{\partial t} \quad (2)$$

Here $T(t)$ ($S(t)$) is temperature (salinity) as a function of time, and τ is a time constant. $\left(\frac{\partial S}{\partial T} \right)_C$, a given function of T and S , is an empirical relationship for the temperature dependence of salinity at constant conductivity. Subscript I denotes an indicated or recorded value, subscript R the real or in situ value.

Casting (1) and (2) into finite difference form for digital processing requires a choice of the length of record over which to compute the gradient quantities. A greater length suppresses noise but reduces vertical resolution. After some trial runs, we adopted a simple smoothing scheme. First, define a smoothed temperature value:

$$T_I(n\Delta t) = \frac{1}{16} \sum_{k=1}^5 a_k T_I[(n-3+k)\Delta t] \quad (3)$$

$$a_1 = a_5 = 1, \quad a_2 = a_4 = 4, \quad a_3 = 6$$

Δt = sampling interval .

Then compute the temperature gradient using this smoothed series, so that

$$T_R(n\Delta t) = T_I(n\Delta t) + \frac{\tau}{2\Delta t} \{T_I[(n+1)\Delta t] - T_I[(n-1)\Delta t]\}. \quad (4)$$

Note that the smoothing is applied only in the gradient computation. Similarly:

$$S_R(n\Delta t) = S_I(n\Delta t) + \left(\frac{\partial S}{\partial T}\right)_c \frac{\tau}{2\Delta t} \{T_I[(n+1)\Delta t] - T_I[(n-1)\Delta t]\} \quad (5)$$

where for $\left(\frac{\partial S}{\partial T}\right)_c$ we use

$$\left(\frac{\partial S}{\partial T}\right)_c = S_I(n\Delta t) \{-0.033^\circ\text{C}^{-1} + [T_I(n\Delta t)] [0.00045^\circ\text{C}^{-2}]\}. \quad (6)$$

Equations (4) - (6) define the gradient correction or "de-spiking" processing used. The value of τ was set, following Scarlet (1975), by trying different values to see which produced the best resultant density profile. True density inversions are both small scale and rare; therefore those which appear to extend over a few meters in the STD records are artifacts of sensor mismatch. We adjusted τ to minimize these apparent inversions in a few selected profiles; $\tau = 0.35$ s was the result. This value of τ was then applied via (4) - (6) to all profiles.

The third step was a straightforward pressure (depth) averaging in 2.5 db blocks, to reduce random noise further. These block averages were then smoothed by a 1/4:1/2:1/4 weighted 3-point filter to yield the corrected data series prior to comparison with Nansen values.

The fourth and final step was to adjust this de-spiked, block-averaged,

and smoothed series to coincide with Nansen bottle data. Finding no marked change in calibration error as a function of station number, we applied the same corrections to all profiles. These were simple linear functions of pressure

$$T_f(n) = T(n) - 0.020^\circ\text{C} + (4 \times 10^{-5}^\circ\text{C db}^{-1}) (P(n)) \quad (7)$$

$$S_f(n) = S(n) + 0.015\text{‰} + (6 \times 10^{-5} \text{‰ db}^{-1}) (P(n)). \quad (8)$$

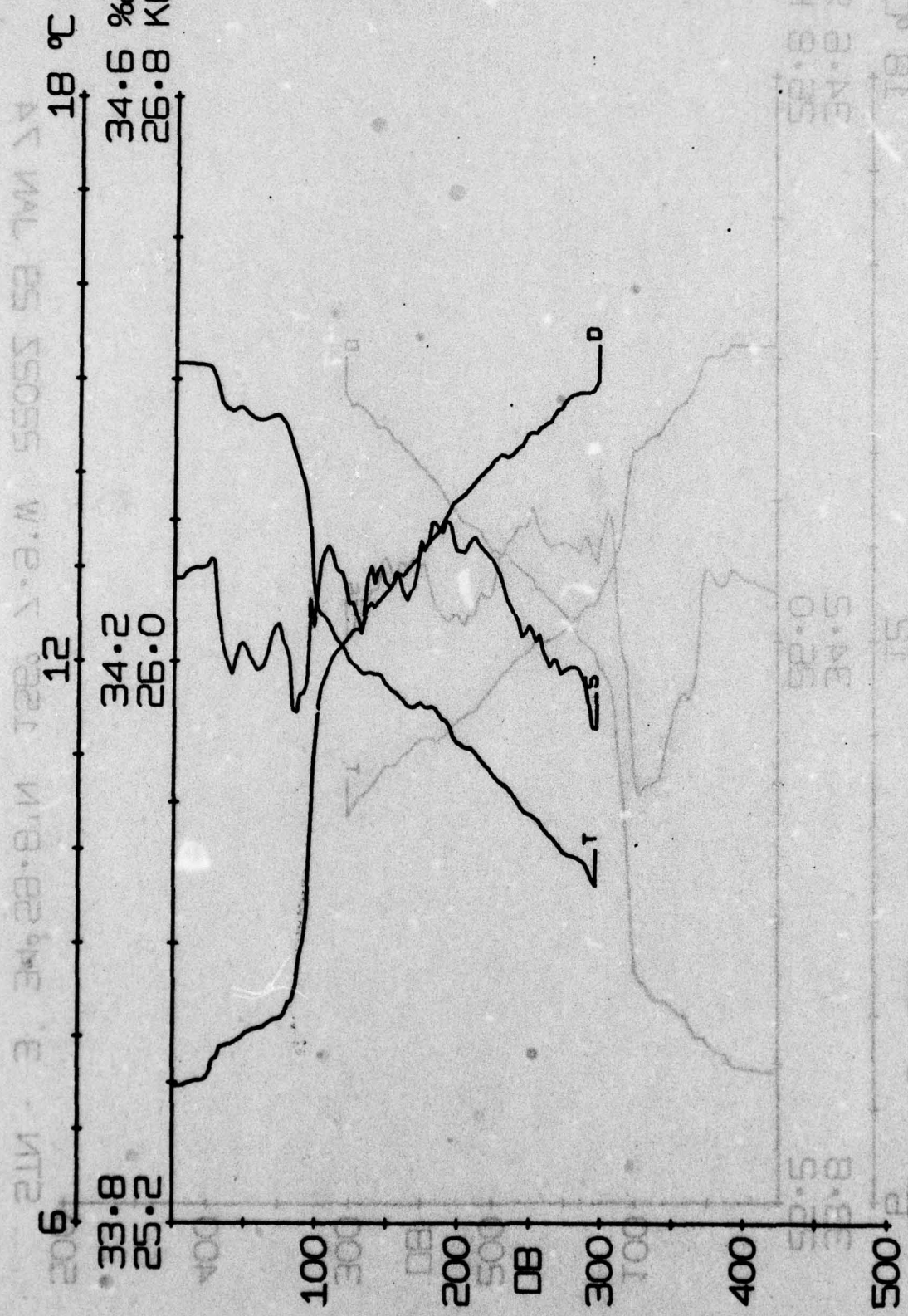
The fields on the right sides of (7) and (8) are the series resulting from step #3 above; T_f and S_f are the final data values. Standard deviations of T_f , S_f about these linear regressions are 0.02°C and 0.01‰ respectively.

IV. Profile Plots. Each page presents one profile of S_f , T_f , and the derived potential density (labeled D) as functions of pressure in db. Station information is given at the margin of the plot. Time is the time at which the lowering started; the down cast typically lasted 15 minutes.

References Barnett, T. P., R. A. Knox and R. A. Weller (1977) Space/time structure of the near surface temperature field during the NORPAX Pole experiment. J. Phys. Oceanogr., 7(4), 572-579.

Scarlet, R. I. (1975) A data processing method for salinity, temperature, depth profiles. Deep-Sea Res., 22(7), 509-515.

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STN 2 35° 1.0'N 155° 55.1'W 2012Z 29 JAN 74

21M 3 34 28.8.M T22 1.8.M 55055 58.7M 14

52.8 KC·M⁻³
34.2 ‰

52.0
34.5

52.5
33.8

18 °C

12

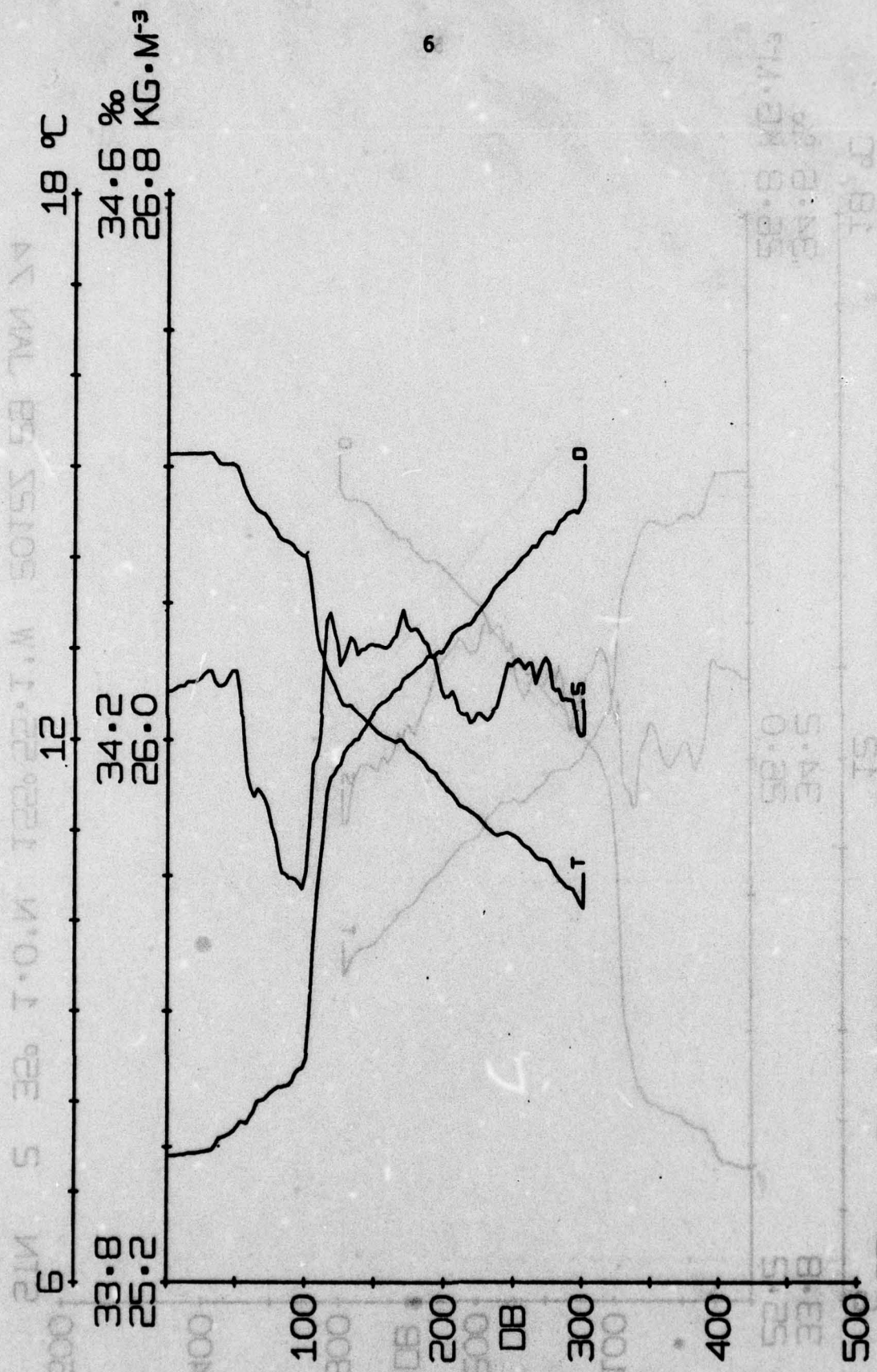
6

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

5



STN 3 34° 59.8' N 156° 7.9' W 2202Z 29 JAN 74

2111 2 32 52 2.4 128 4.0 M 0308Z 30 JAN 74

18 °C

12

33.8	34.2	34.6
25.2	26.0	26.8
		KG·M ⁻³

6
100
200
DB
300
400
500



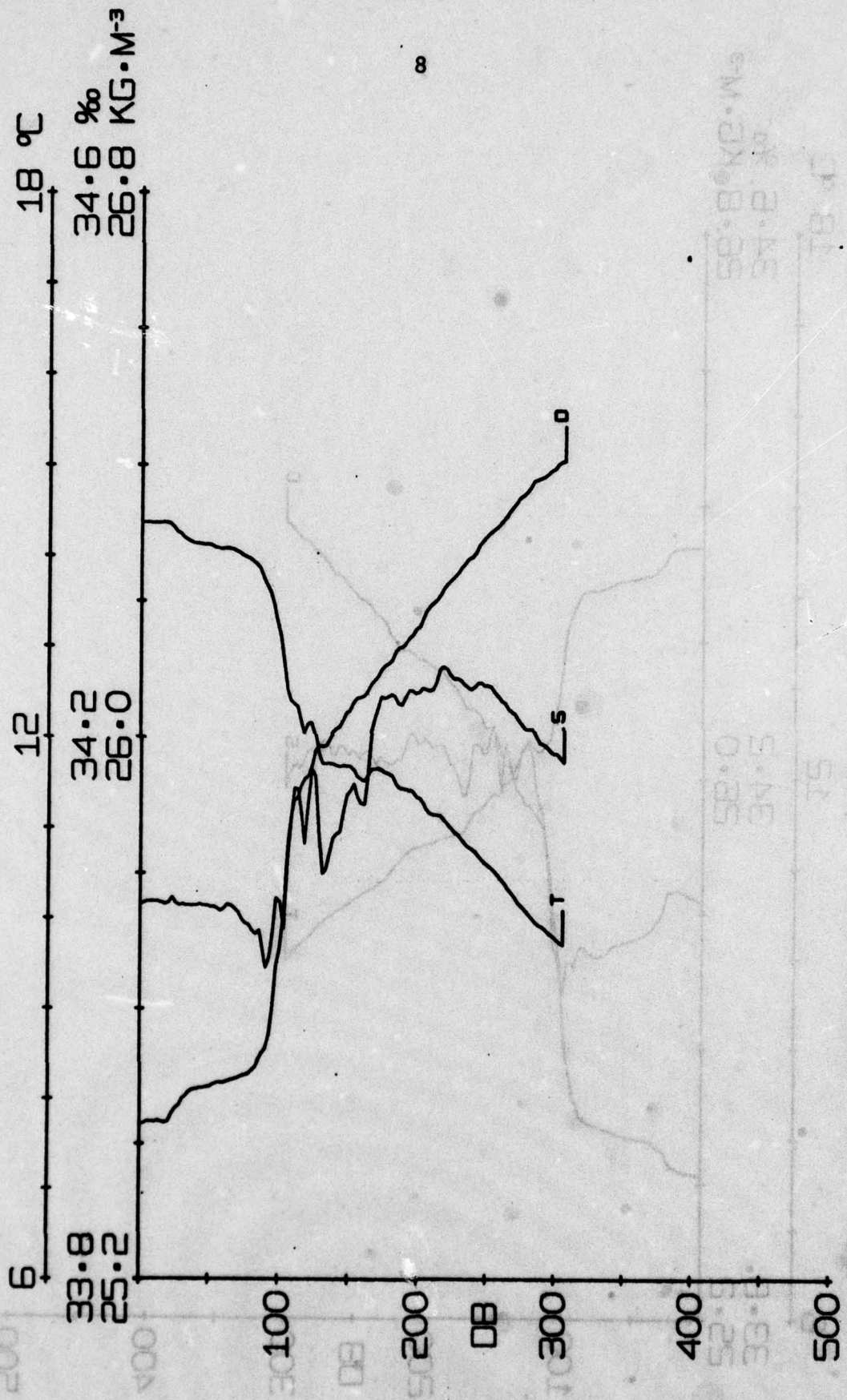
52.0
34.5
18.5

52.0
34.5
18.5

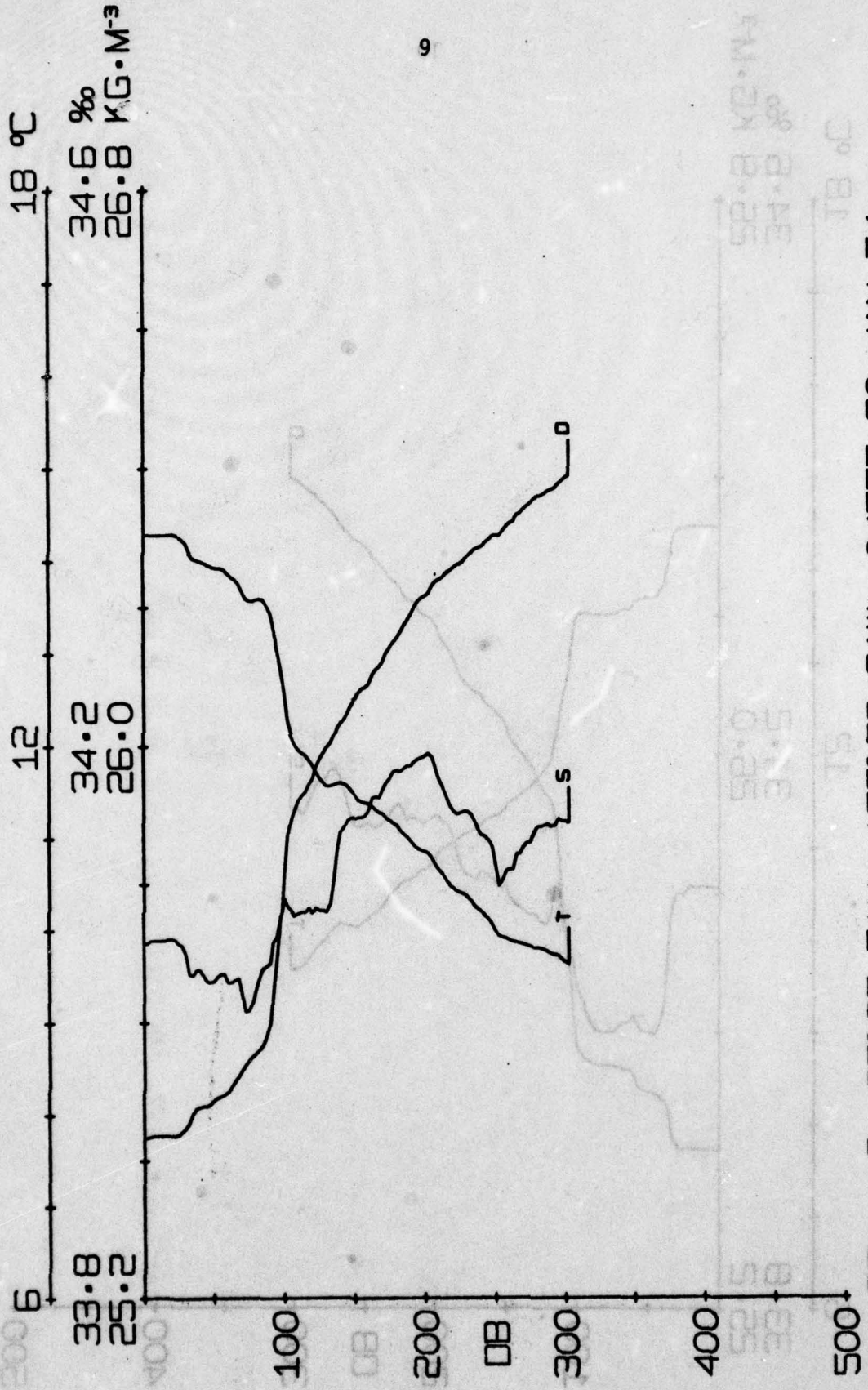
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M⁻³

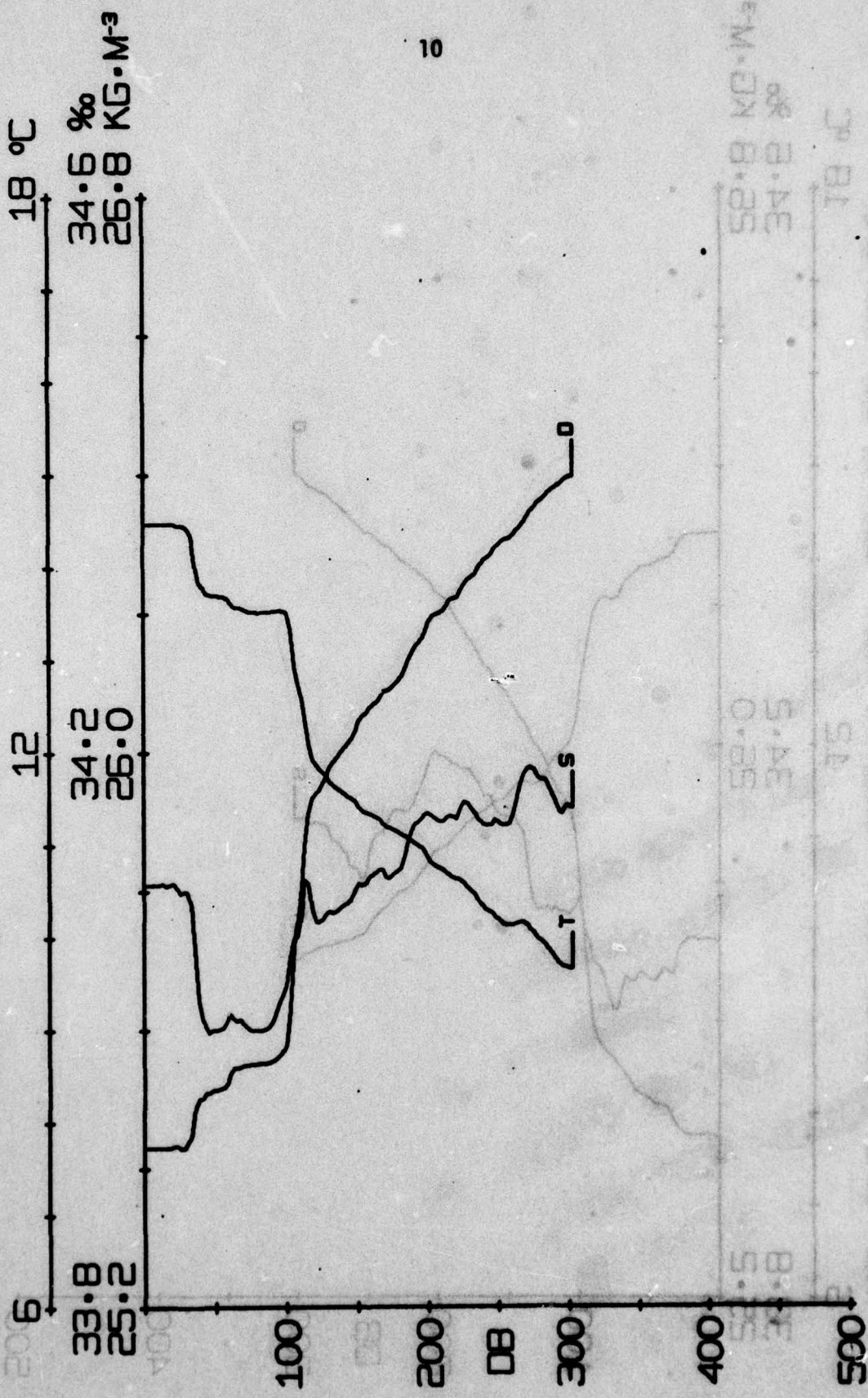
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STN 5 35° 26.9'N 156° 4.0'W 0308Z 30 JAN 74



STN 6 35° 37.7' N 155° 59.2' W 0455Z 30 JAN 74



STN 7 35° 30.4'N 155° 51.1'W 0634Z 30 JAN 74

21M 0 32.3A.1M 122.28.S.M 04225 30 7M Δ

52.8 KG·M⁻³
34.2 ‰
TB 4

52.0
34.5

5.8
34.5

18 °C

34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

39.8
25.2

100

DB

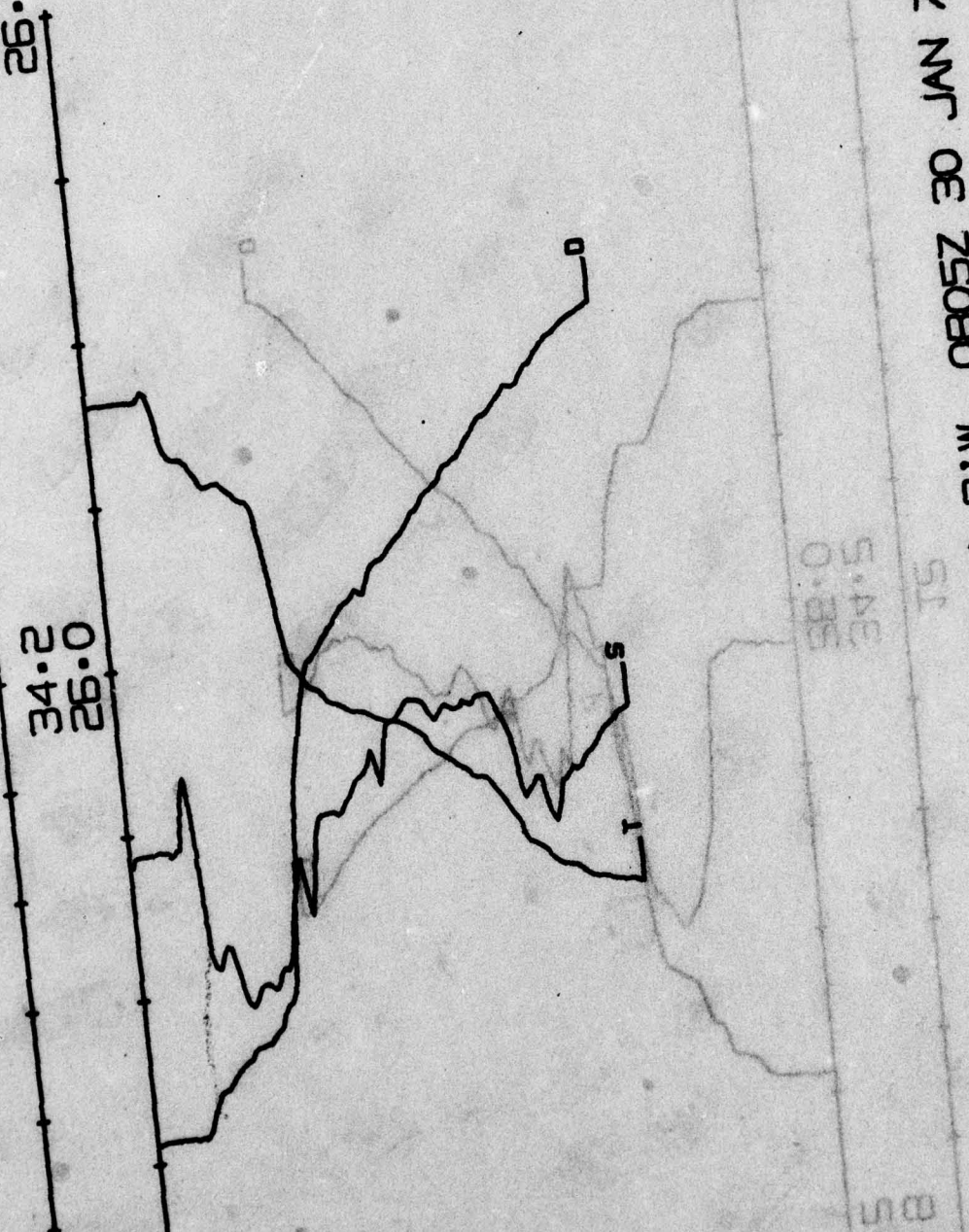
200

DB

300

400

500



59.8 KG·M⁻³
34.2 ‰

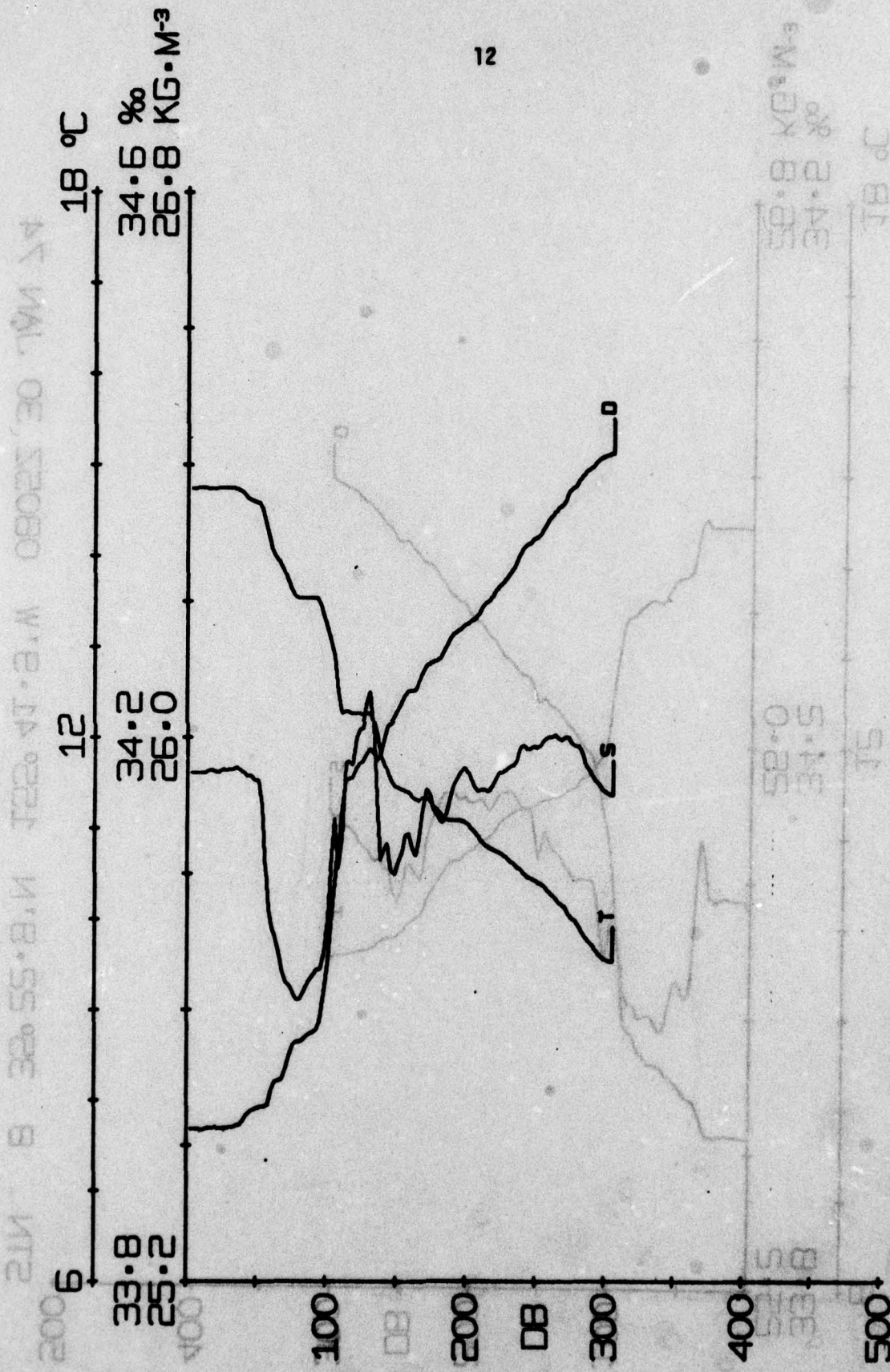
18 °C

39.0
34.5

15

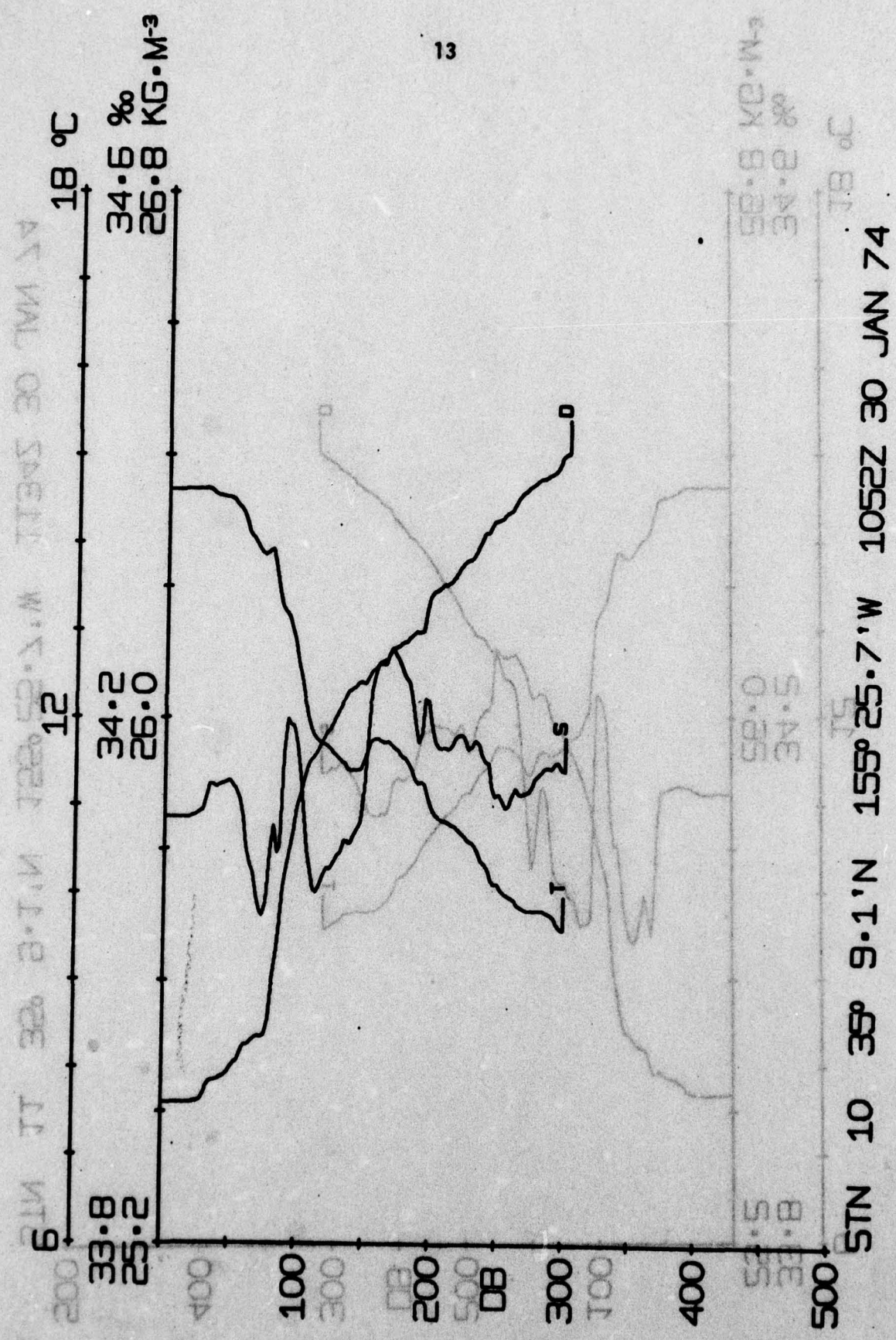
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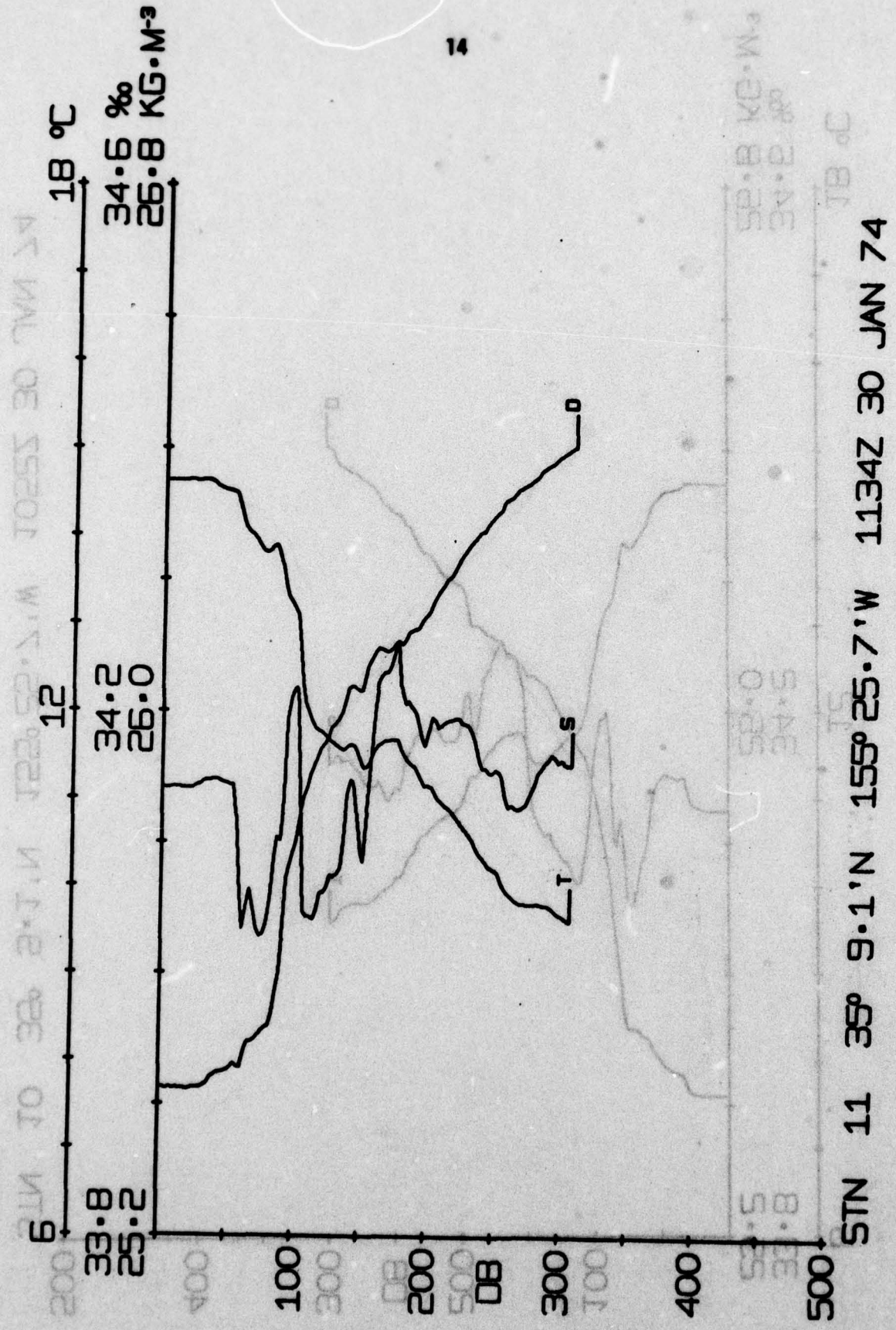
STN



12

STN 9 35° 17.8' N 155° 31.4' W 0928Z 30 JAN 74





52.8 KC·W
34.2 ‰
TB °C

52.0
34.5

53.5
31.8

21M 13 34° 22' N 124° 23' E M 1201Z 30 JAN 74

18 °C
34.6 %
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2

500
400
300
200
100
DB



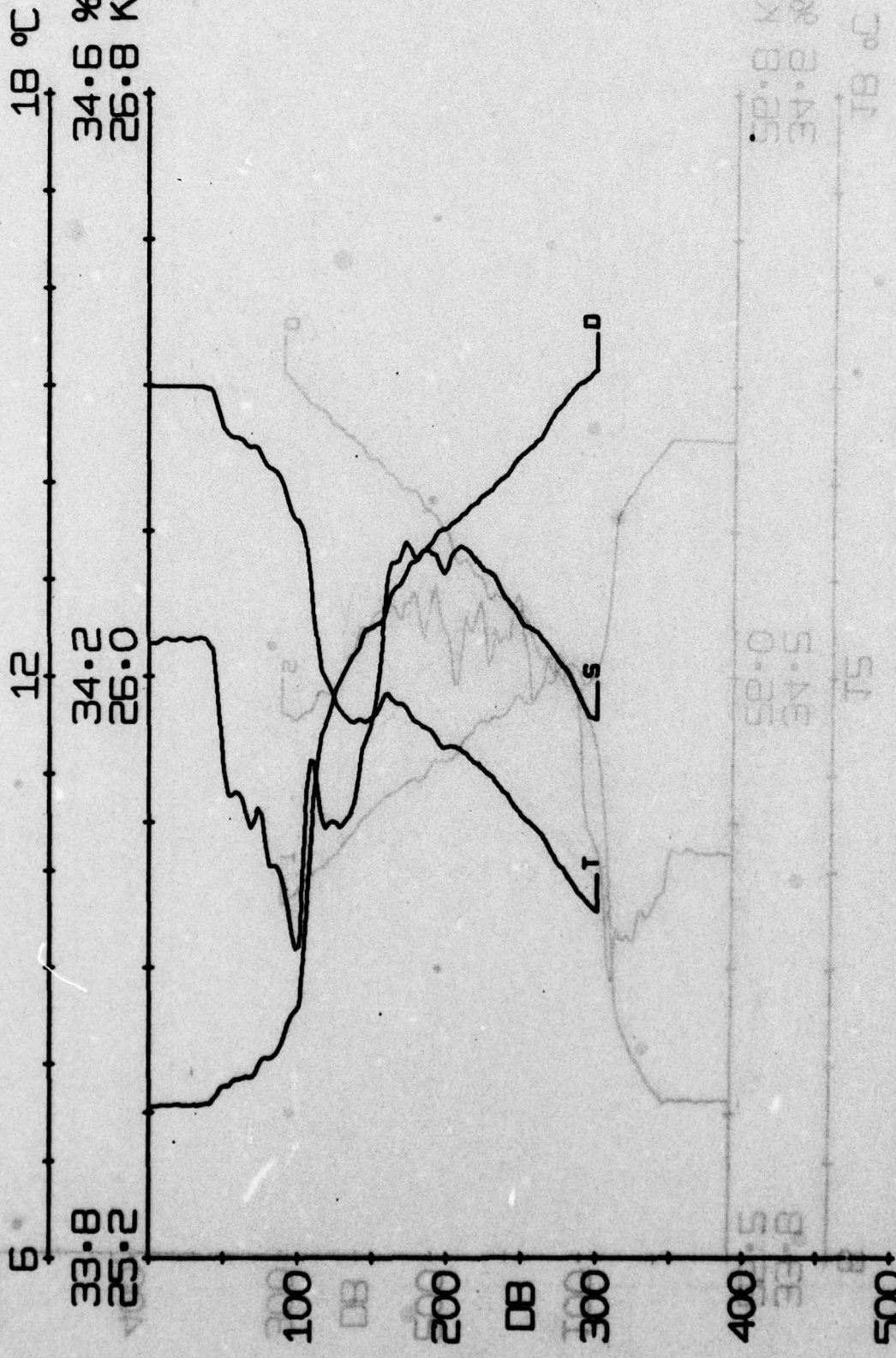
32.8
32.5

52.0
34.5

52.8 KG·M⁻³
34.2 %
18 °C

STN 12 35° 2.0'N 155° 8.2'W 1330Z 30 JAN 74

21M TS 32° 5'0"N 122° 0'5"W T330Σ 30 TMM Δ4



STN 13 34° 55'4"N 154° 59'6"W 1501Z 30 JAN 74

32.8 KG·M⁻³
34.2 ‰

32.0
34.5

33.8
34.2

18 °C

12

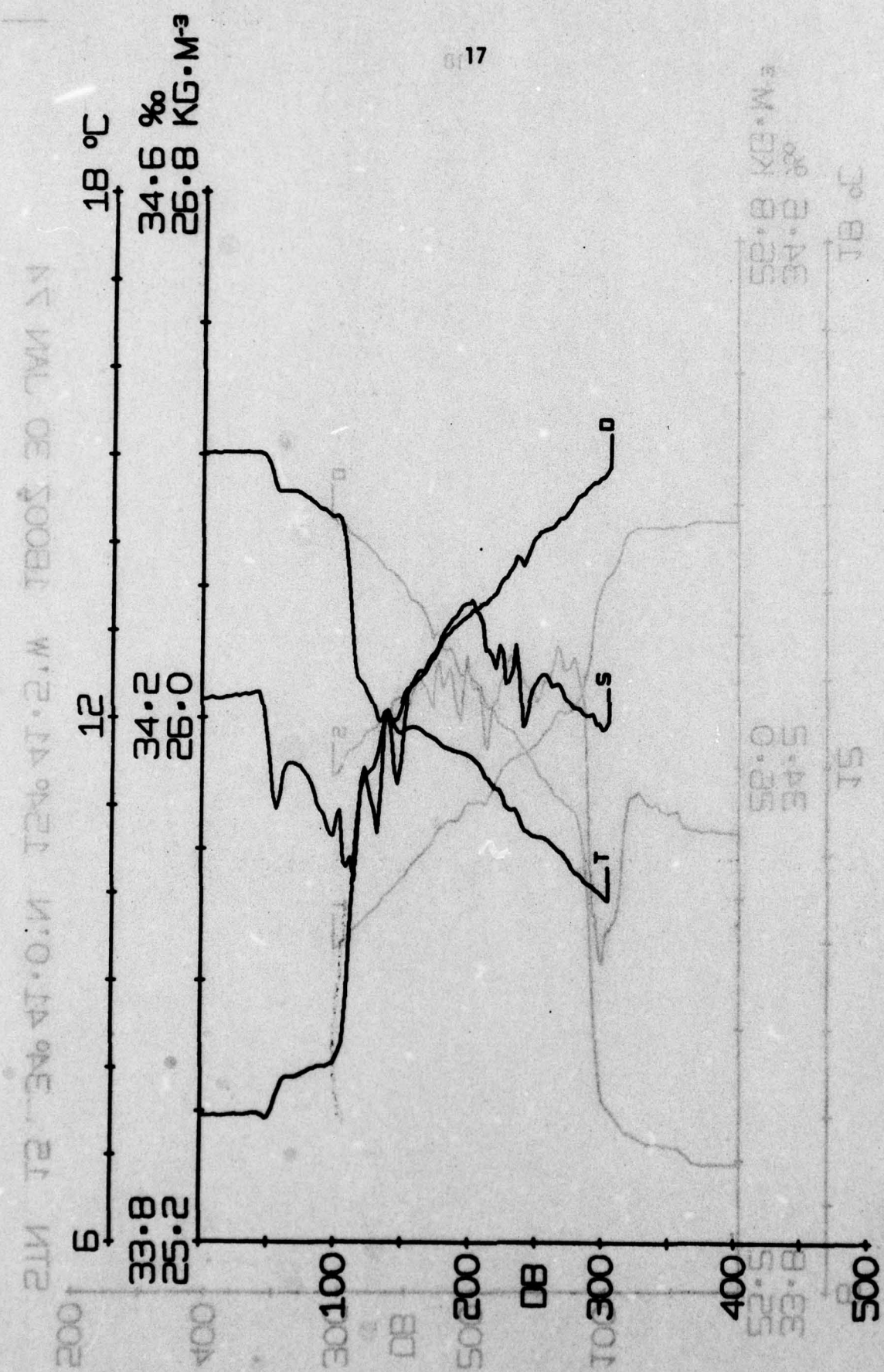
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33.8
25.2

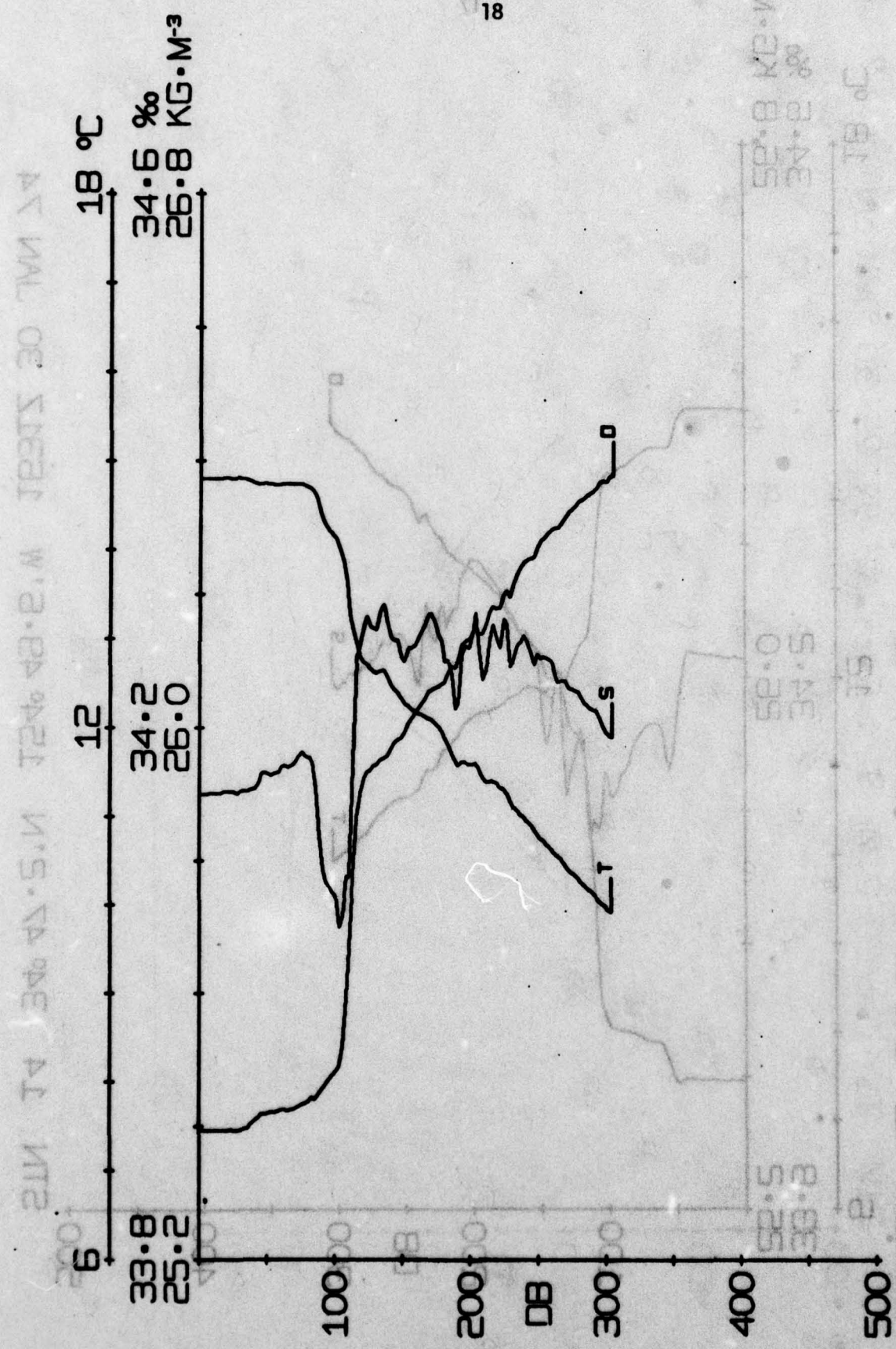
34.2
26.0

34.6 ‰
26.8 KG·M⁻³

100 DB
200 DB
300 DB
400 DB
500 DB



STN 14 34° 47.2' N 154° 49.6' W 1631Z 30 JAN 74

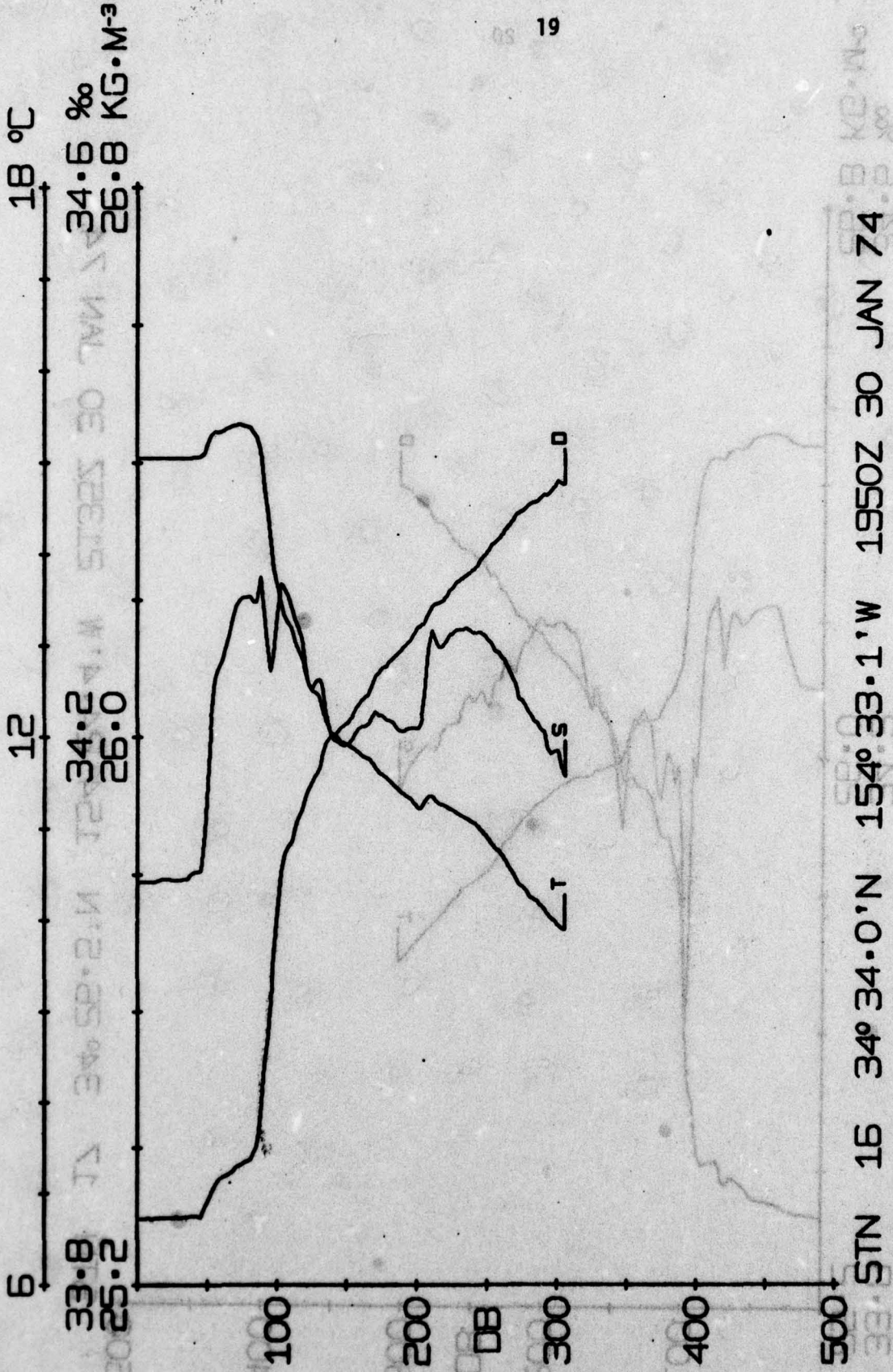


STN 15 34° 41.0'N 154° 41.5'W 1800Z 30 JAN 74

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2 ‰
26.0

6
33.8
25.2

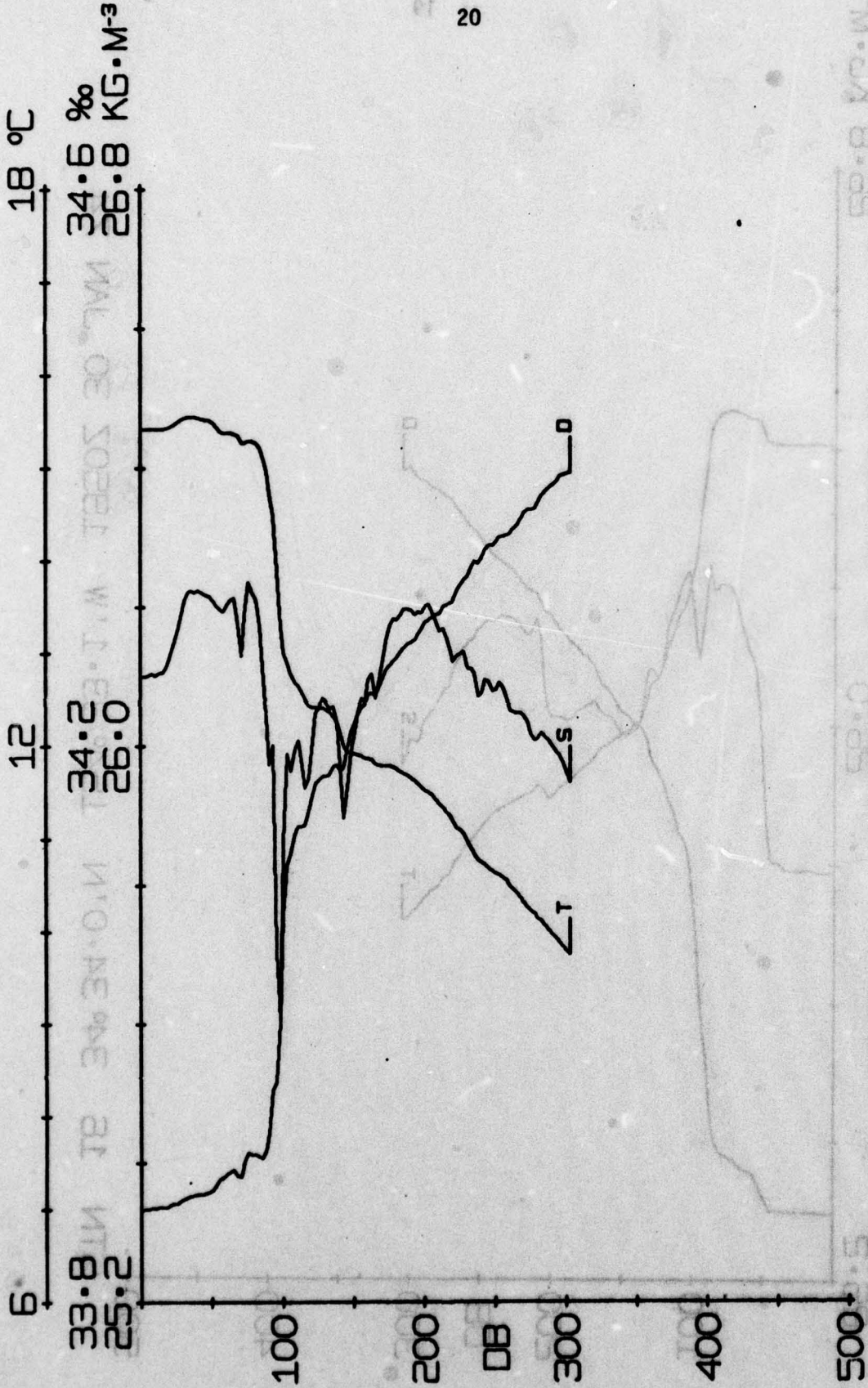


STN 16 34° 34.0' N 154° 33.1' W 1950Z 30 JAN 74

18 °C

12

6



STN 17 34° 26.5' N 154° 24.4' W 2135Z 30 JAN 74

18 °C

12

6

34.2 ‰
26.0 KG·M⁻³

33.8 ‰
25.2 KG·M⁻³

100

200

DB

300

400

500

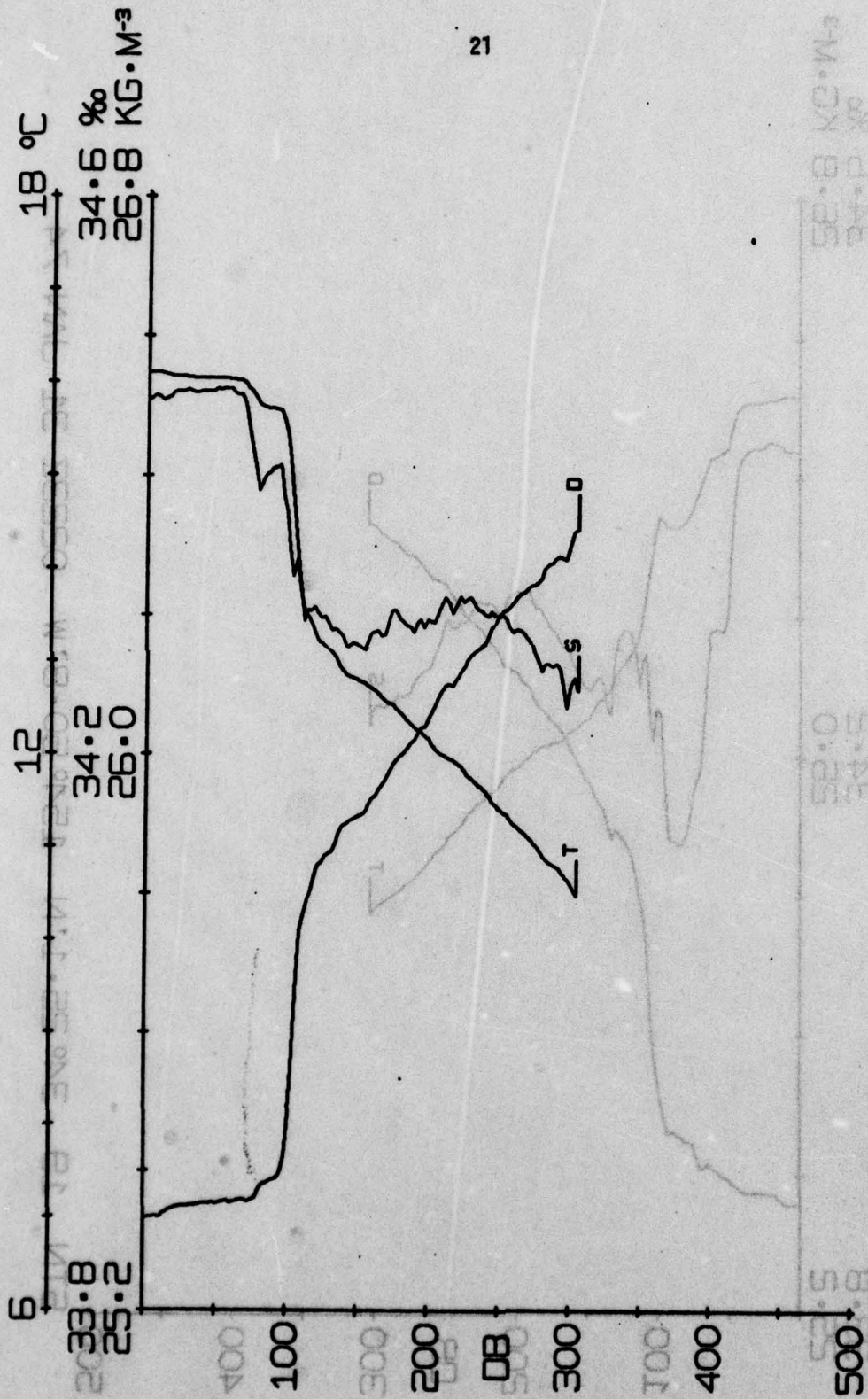
T

S

D

15

18 °C



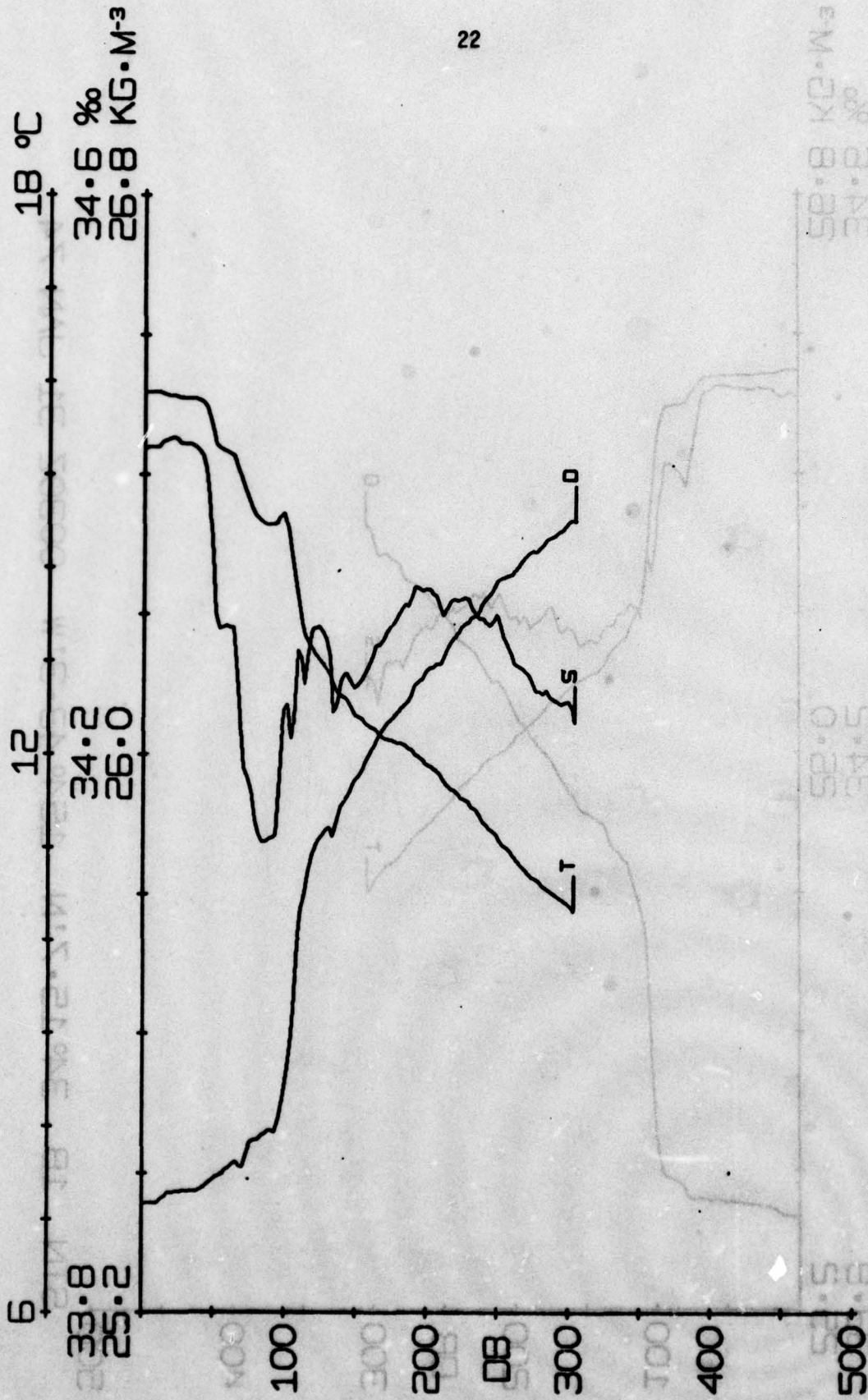
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STN 18 34° 15.7' N 154° 43.3' W 0030Z 31 JAN 74

33.8
 34.6 ‰
 26.8 KG·M⁻³

33.8
 34.2
 26.0

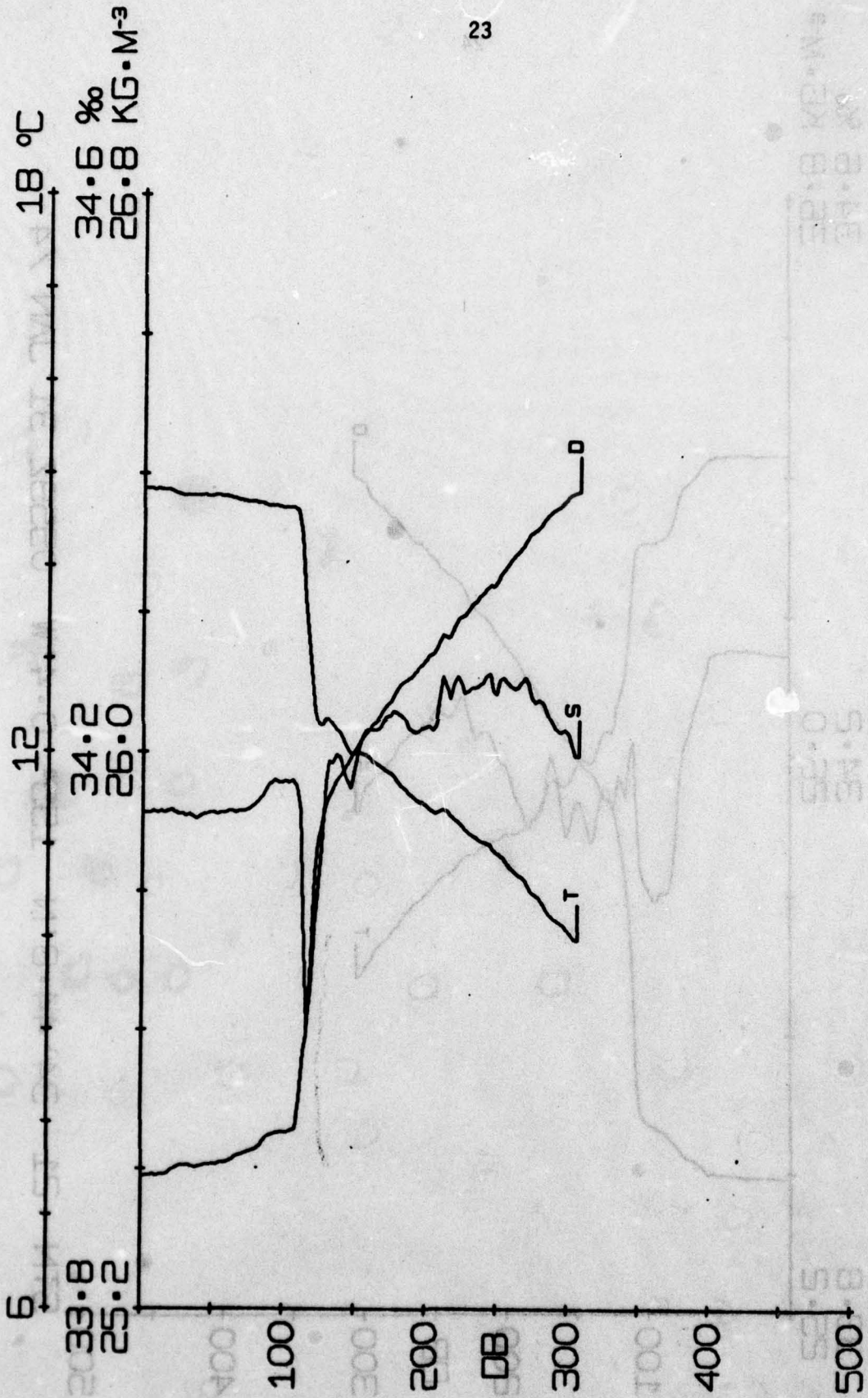
33.8
 34.5
 26.0



STN 19 34° 25.1' N 154° 50.8' W 0223Z 31 JAN 74

52.8 KG·M⁻³
34.2 ‰
18 °C

52.0 KG·M⁻³
34.5 ‰
15 °C

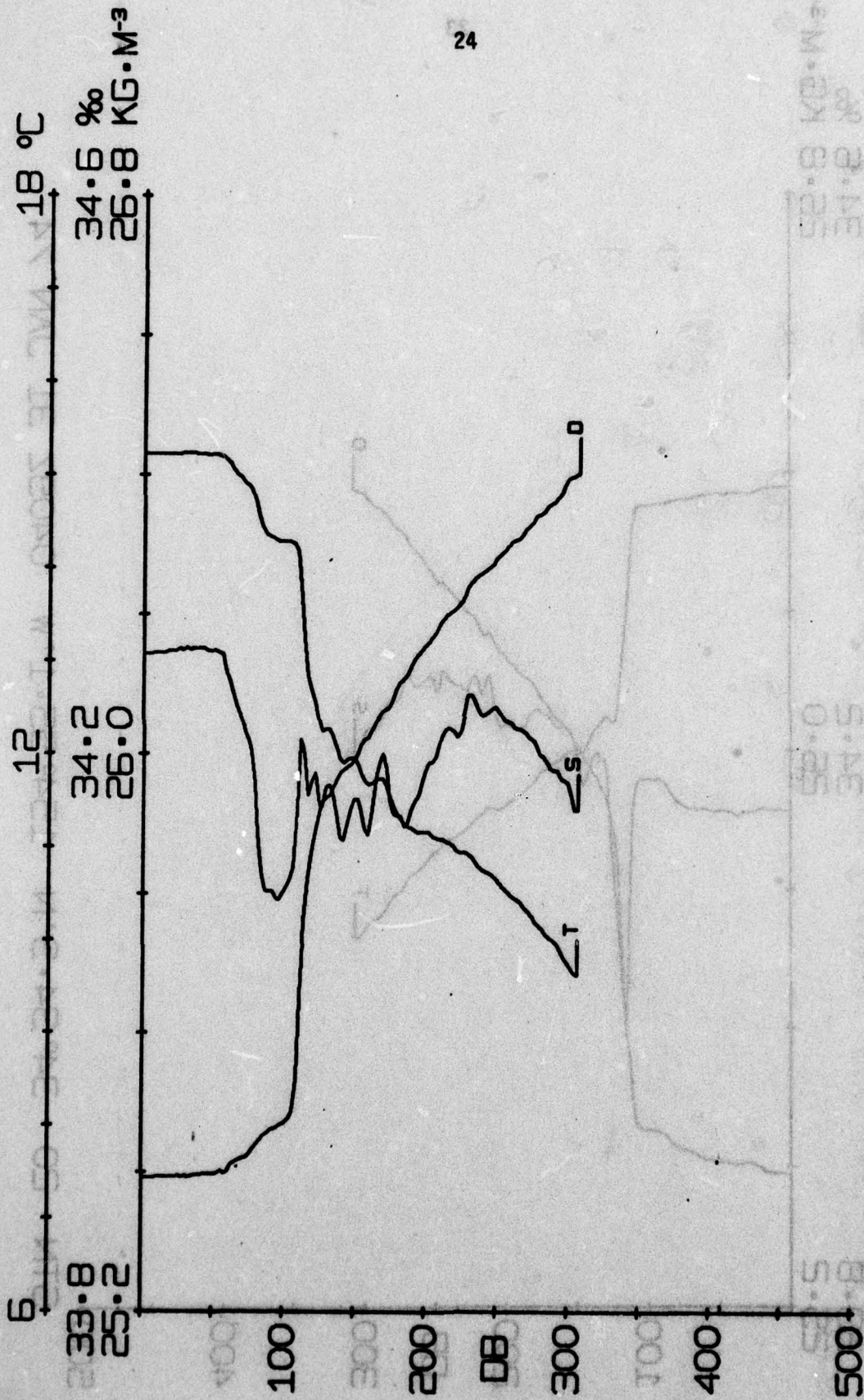


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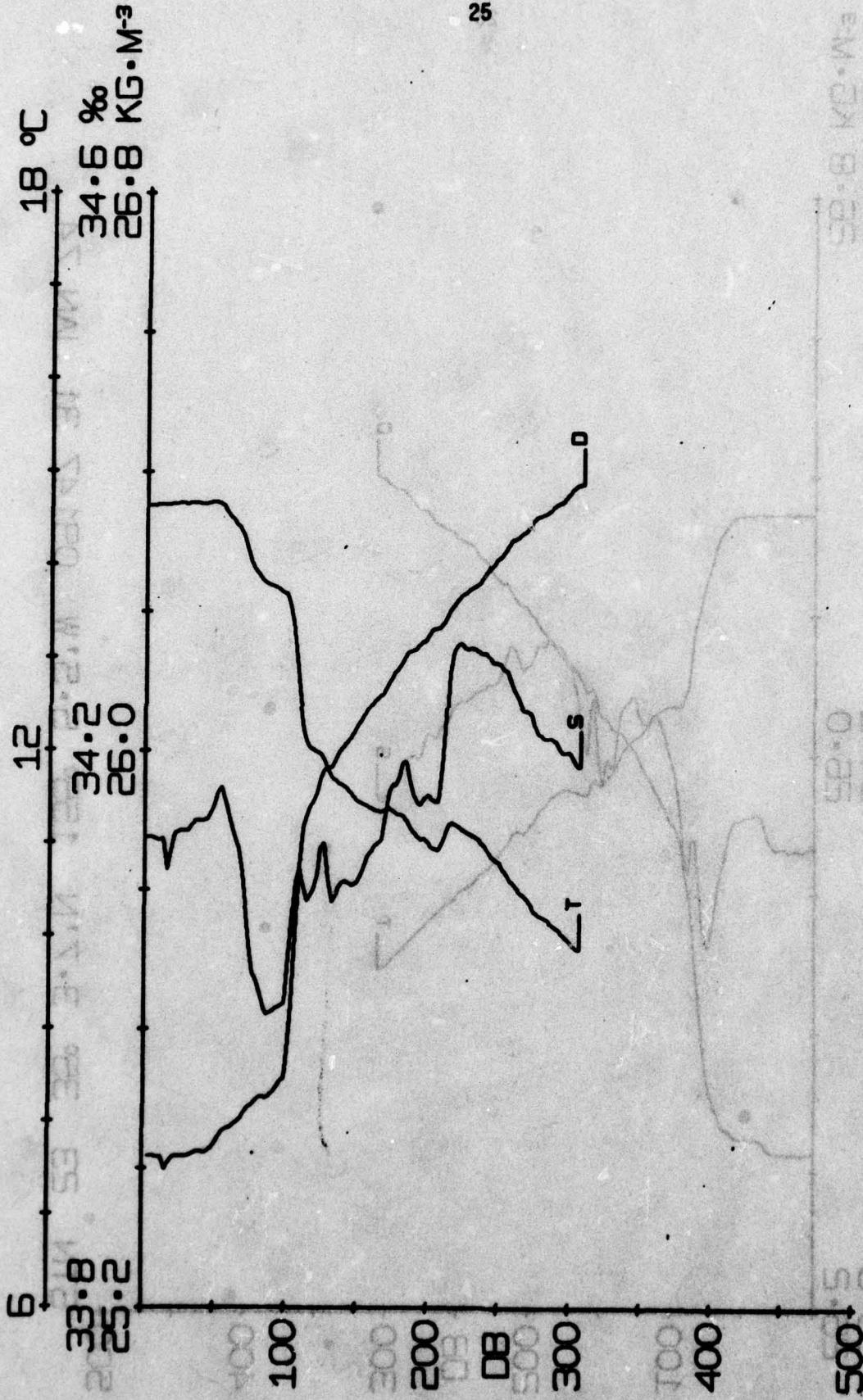
33.8 ‰
34.2 ‰
34.6 ‰

25.2 kg·m⁻³
26.0 kg·m⁻³
26.8 kg·m⁻³

6 °C
12 °C
18 °C



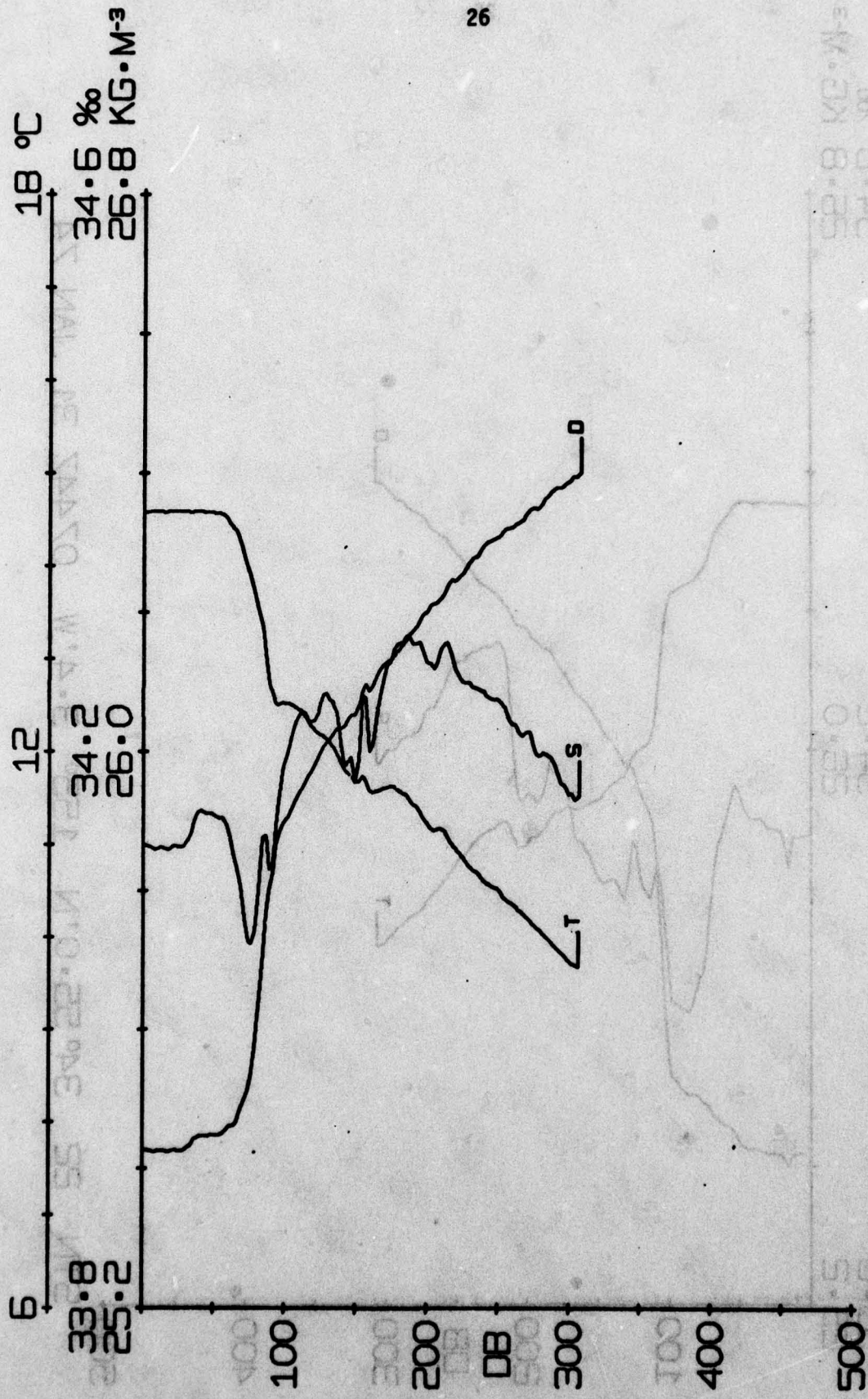
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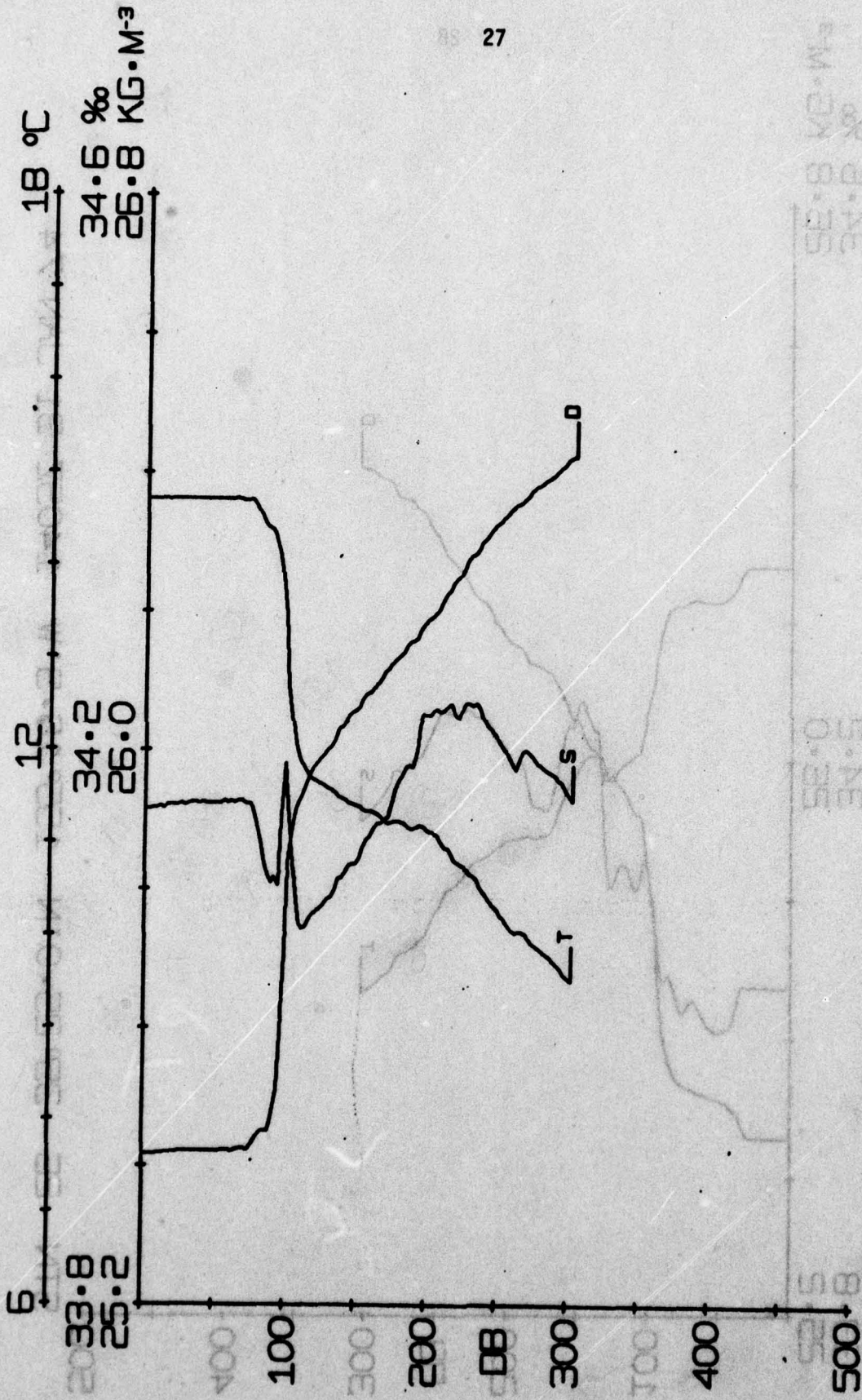
33.8 kg·m⁻³
 34.2 ‰
 26.0

15



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33.8 34.6 34.6
25.2 26.0 26.8
KG·M⁻³



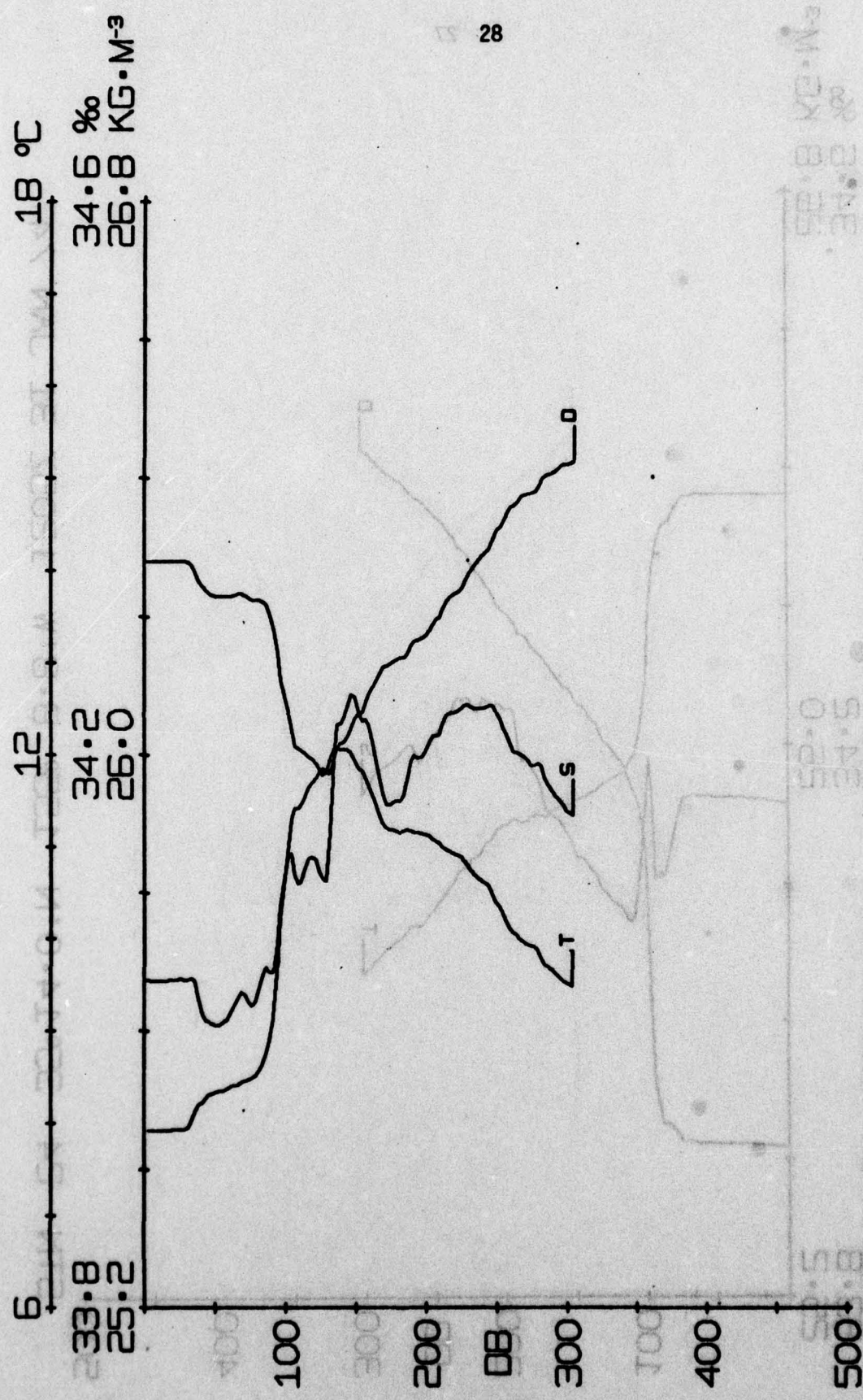
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34.6 ‰
26.8 KG·M⁻³

34.2 ‰
26.0 ‰

33.8 ‰
25.2 ‰

18 °C



STN 26 35° 25.0'N 155° 16.9'W 1405Z 31 JAN 74

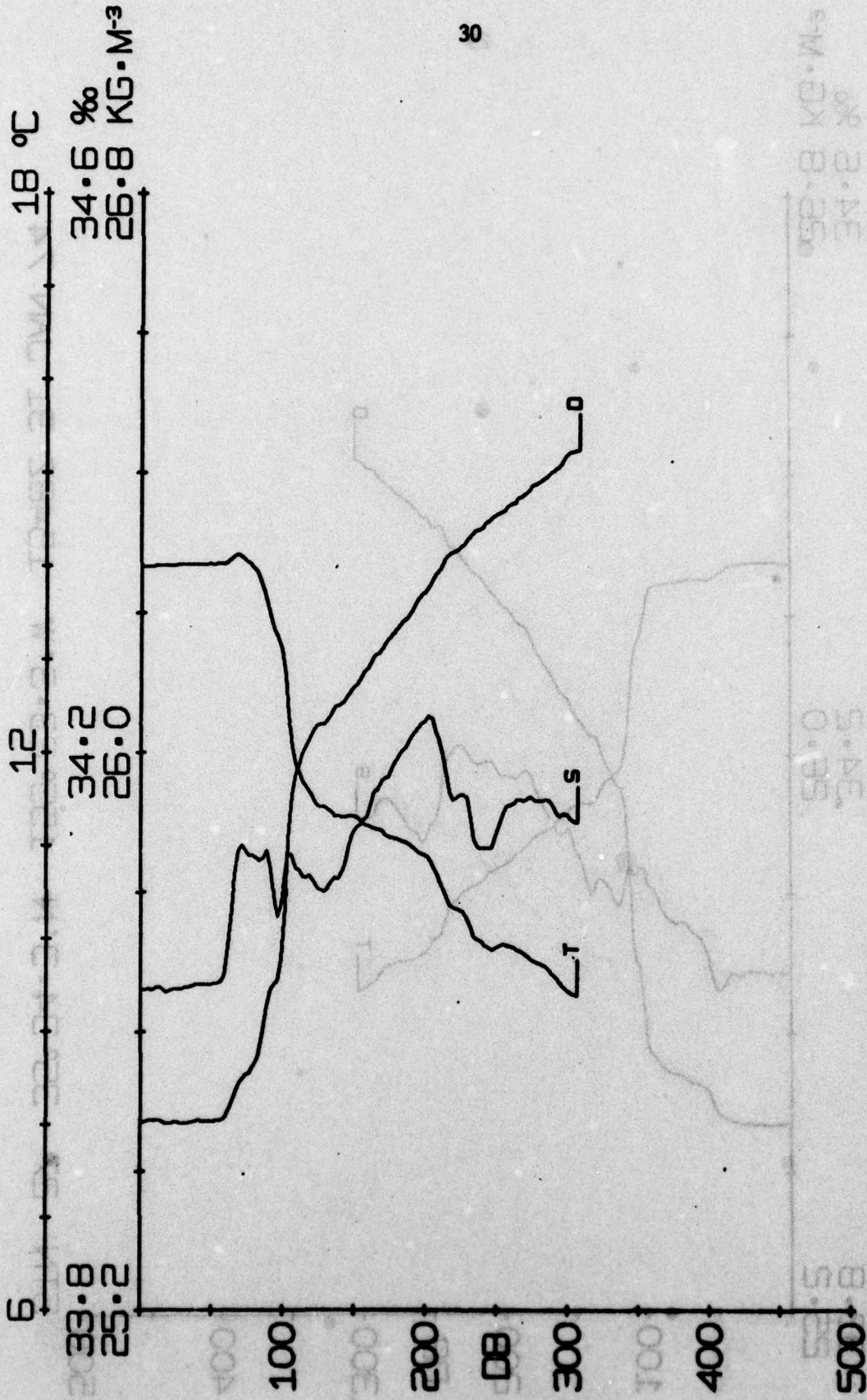


STN 27 35° 34.3'N 155° 23.3'W 1548Z 31 JAN 74

52.8 KG·M⁻³
34.2 ‰
18 °C

52.0
34.5

52.5
34.8

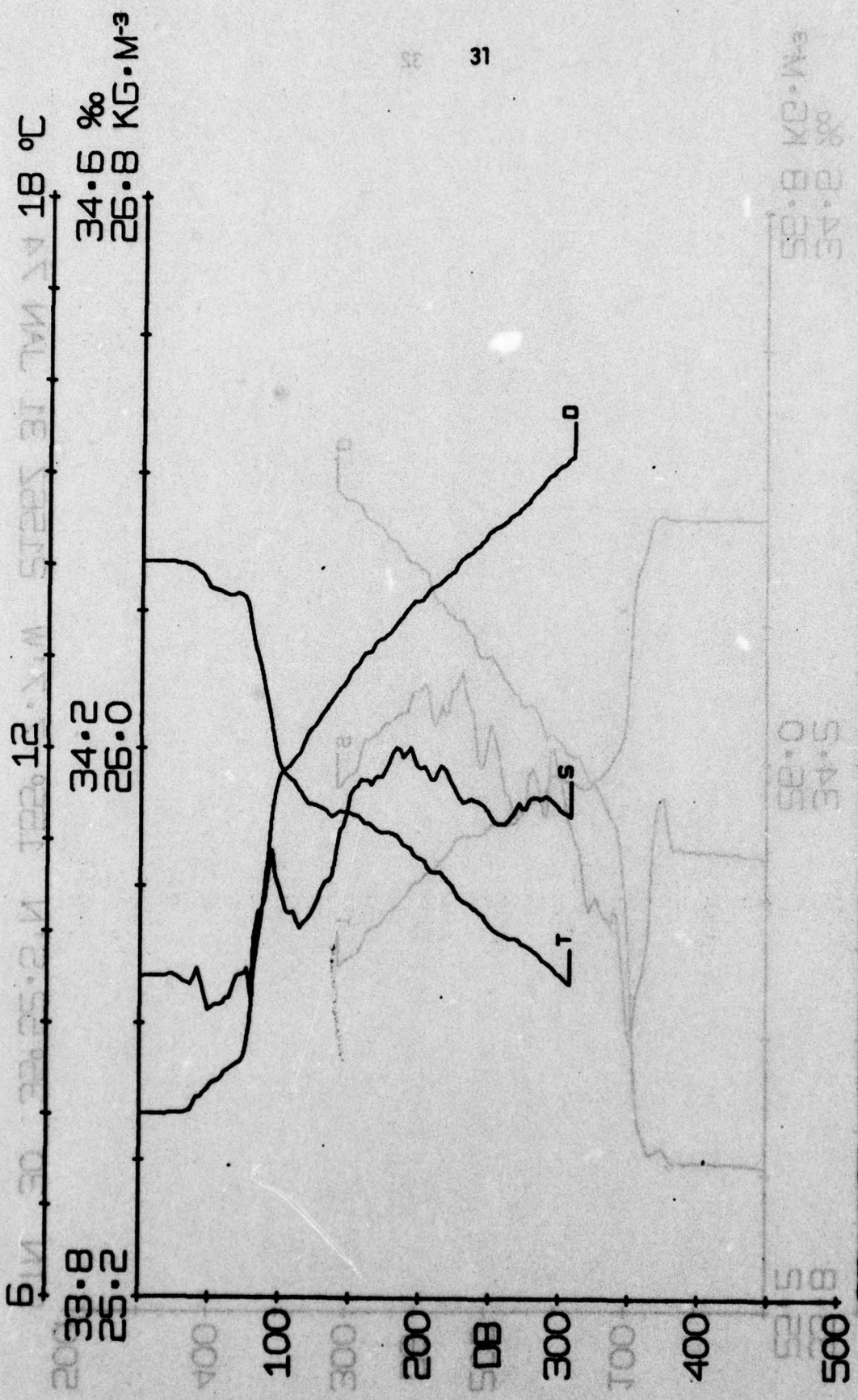


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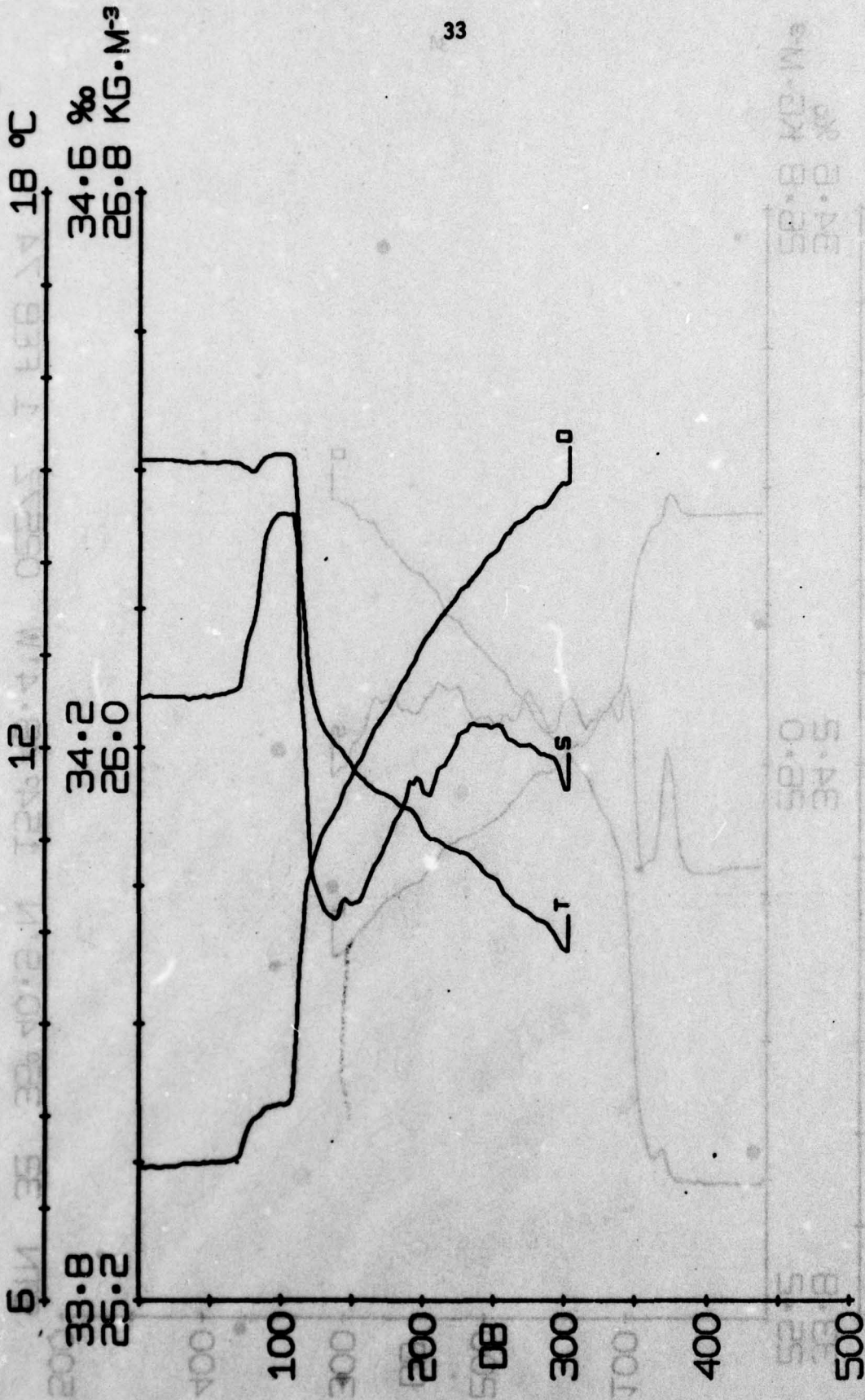
34.2 ‰
26.0

34.2 ‰
26.0

34.2 ‰
26.0







STN 31 35° 52.9'N 154° 43.9'W 0043Z 1 FEB 74

34.6
26.8

34.2
26.0

33.8
25.2

6 21N 3T 32.25.3.N 12 12.13.3.W 00435 T FEB 74

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

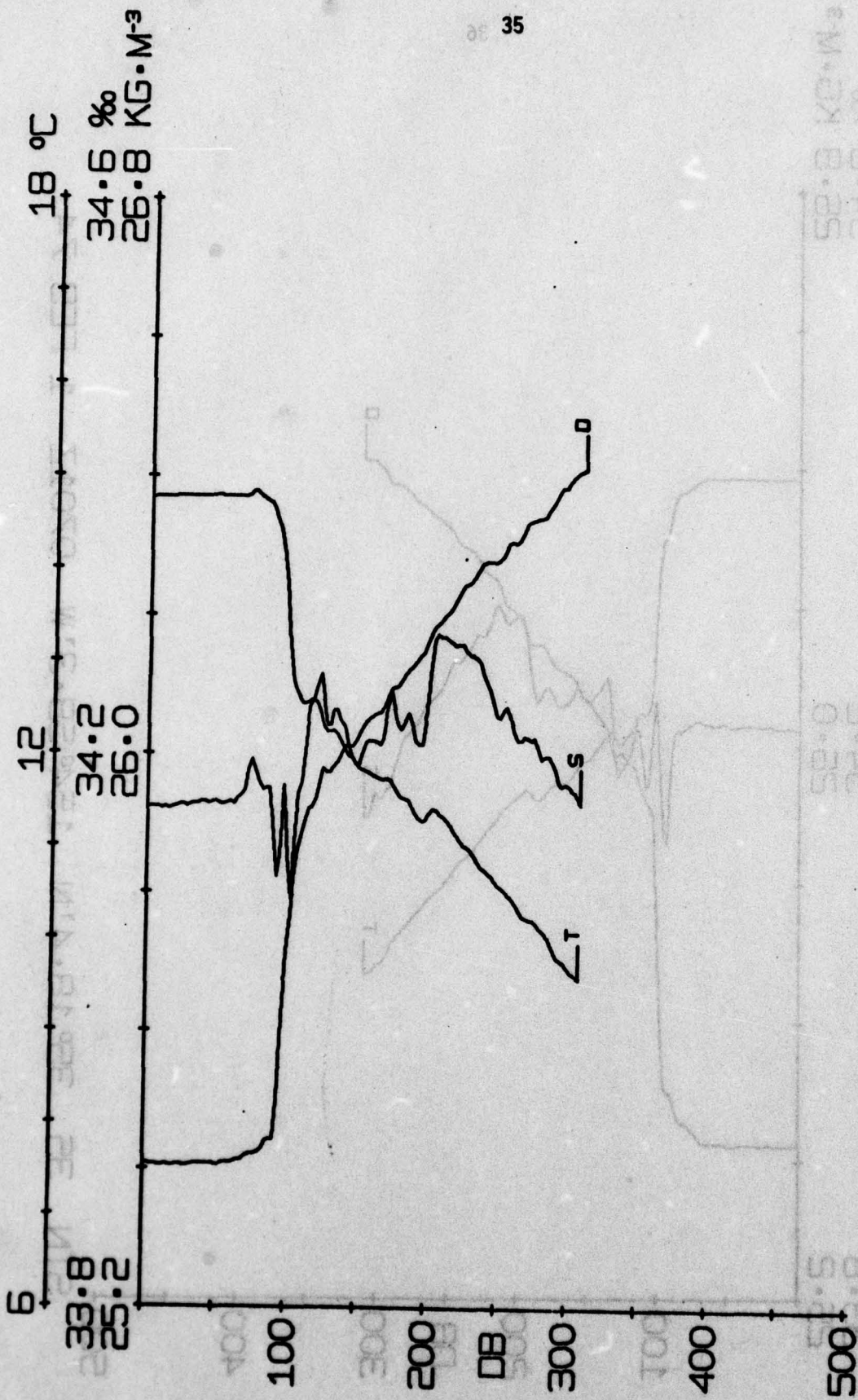


33.8
25.2

34.2
26.0

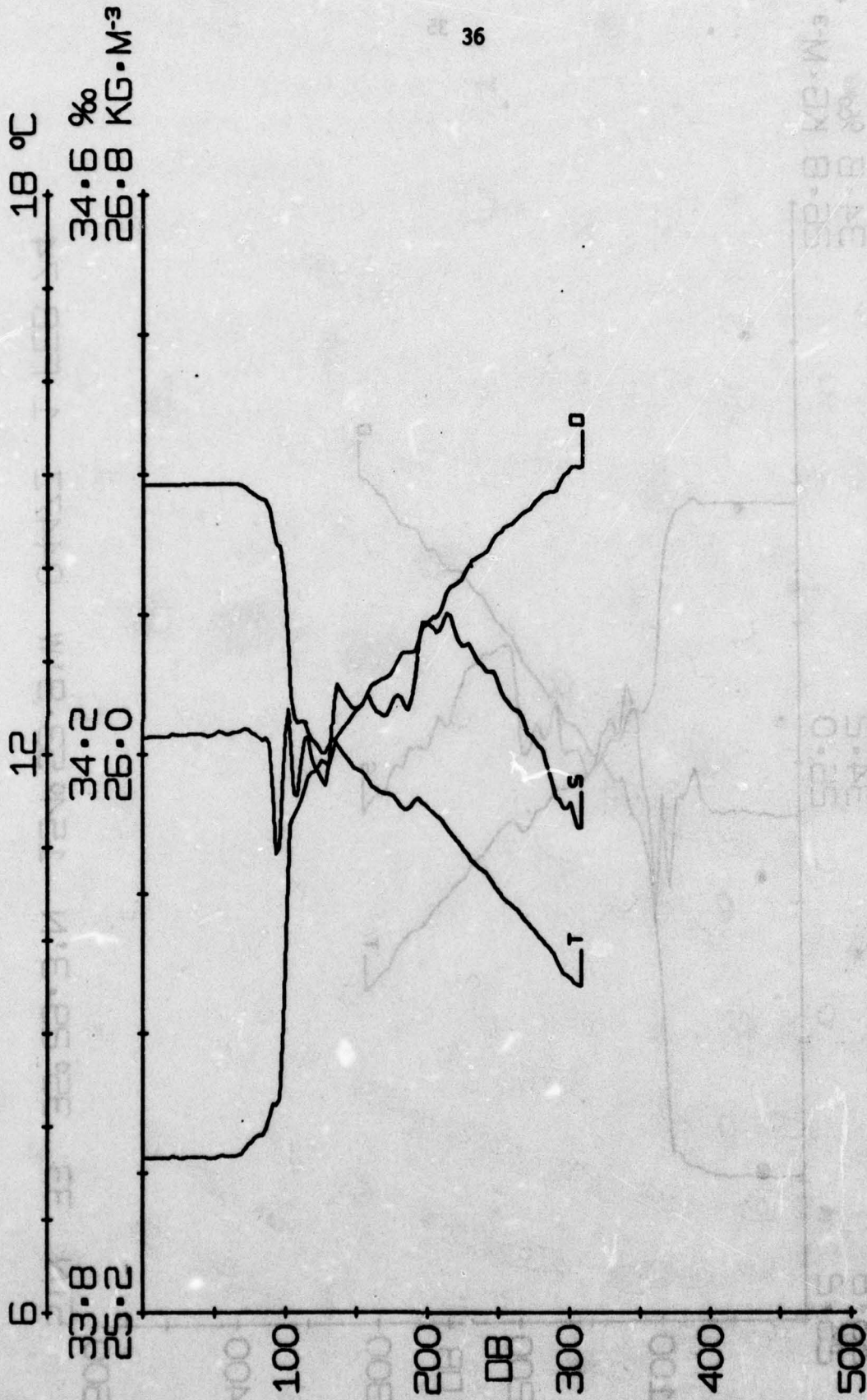
34.6 ‰
26.8 KG·M⁻³

STN 32 35° 40.9'N 154° 48.4'W 0257Z 1 FEB 74

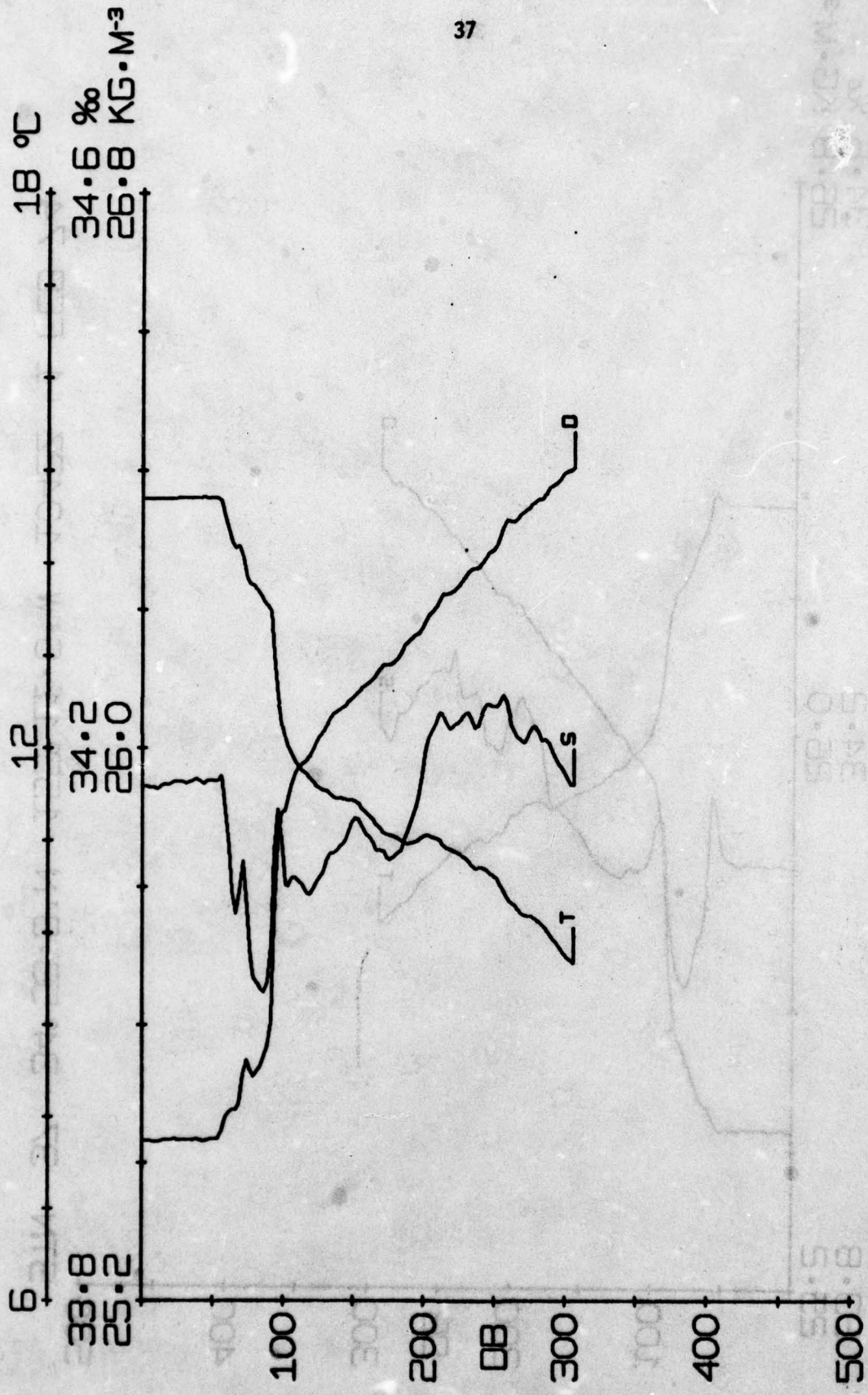


STN 33 35° 29.3'N 154° 53.9'W 0447Z 1 FEB 74

33.8 ‰
34.2 ‰
34.6 ‰
25.2 kg·m⁻³
26.0 kg·m⁻³
26.8 kg·m⁻³



STN 35 35° 18.4'N 154° 58.3'W 0701Z 1 FEB 74



STN 36 35° 7.3'N 155° 6.8'W 0857Z 1 FEB 74

SP: 18 x 10.0 W-3
34.6 ‰
26.8 kg·m⁻³
18 °C

SP: 0
34.2 ‰
26.0 kg·m⁻³
12 °C

SP: 5
33.8 ‰
25.2 kg·m⁻³
6 °C



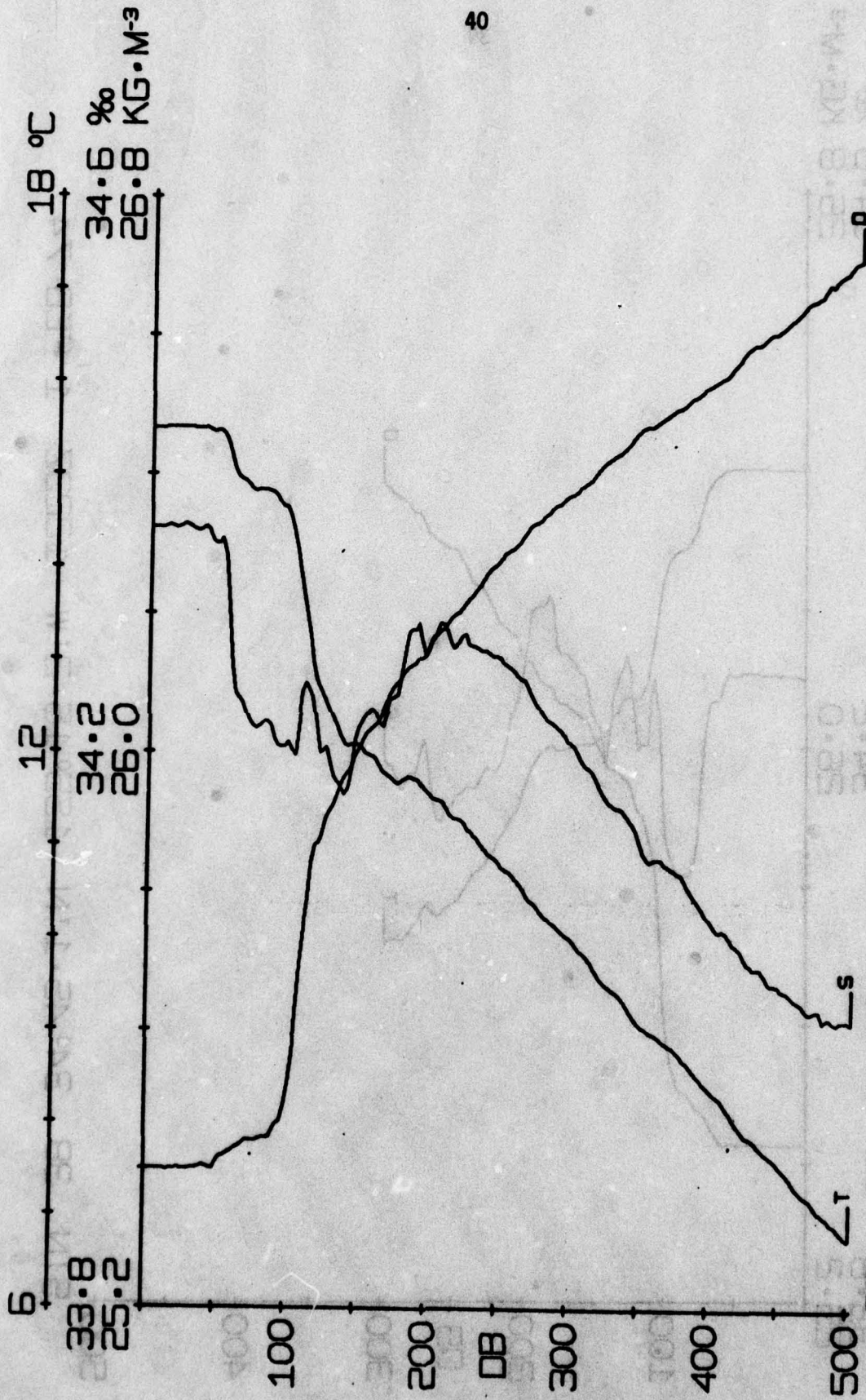
STN 37 34° 56.8' N 155° 11.6' W 1042Z 1 FEB 74

52.5
52.5
34.2
26.0

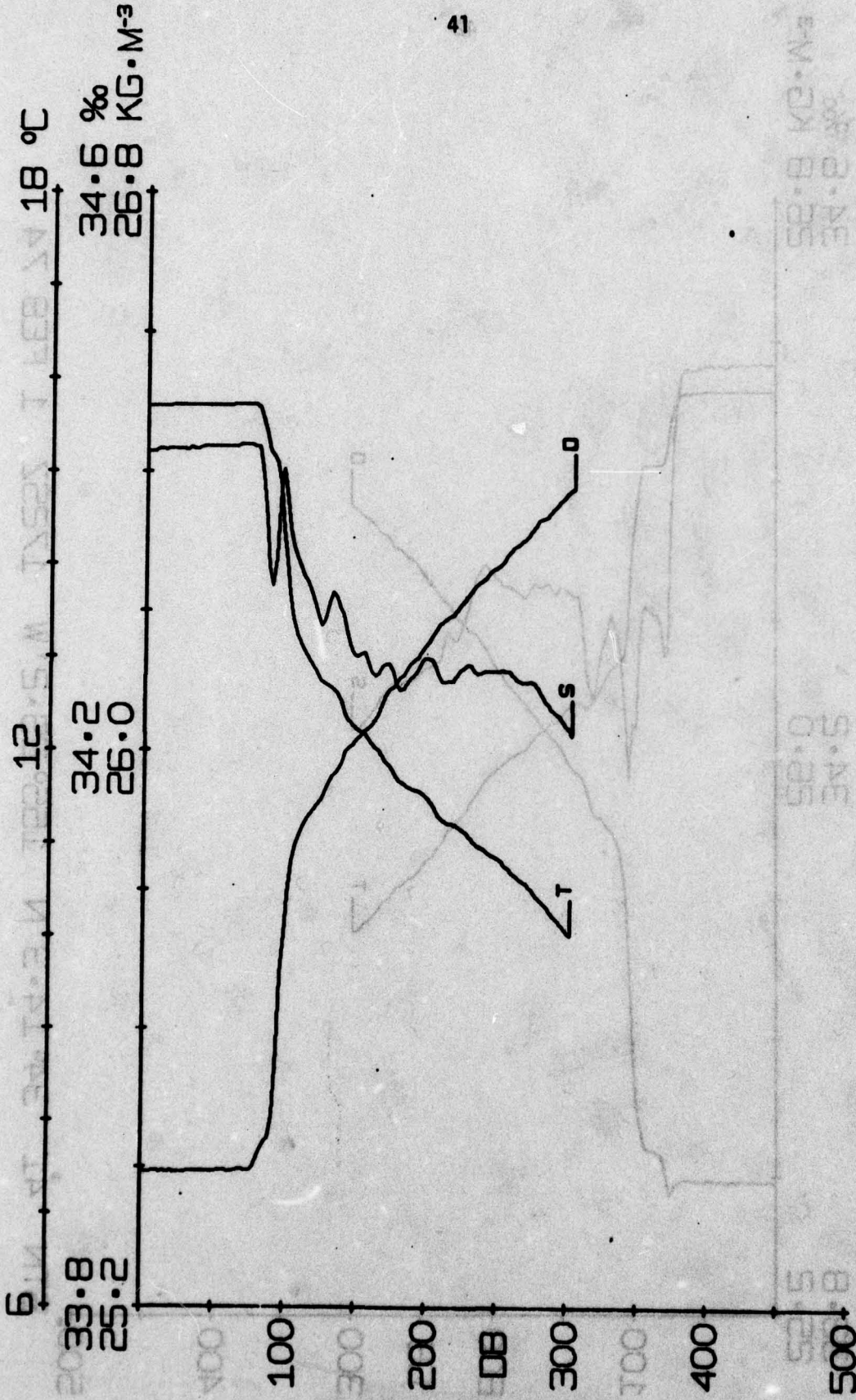


39

STN 38 34° 45.1'N 155° 15.2'W 1223Z 1 FEB 74



STN 39 34° 52.1' N 155° 19.3' W 1358Z 1 FEB 74

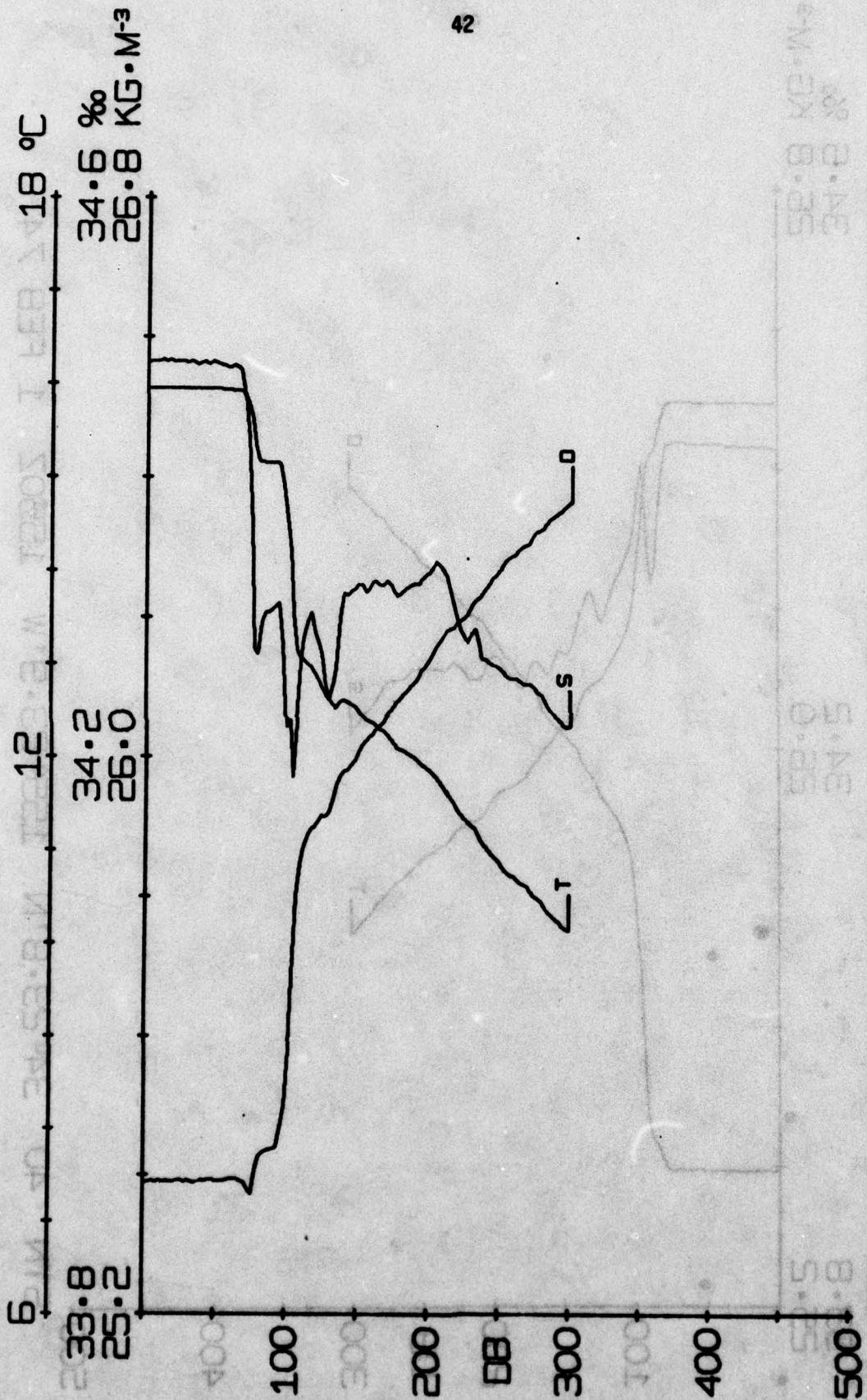


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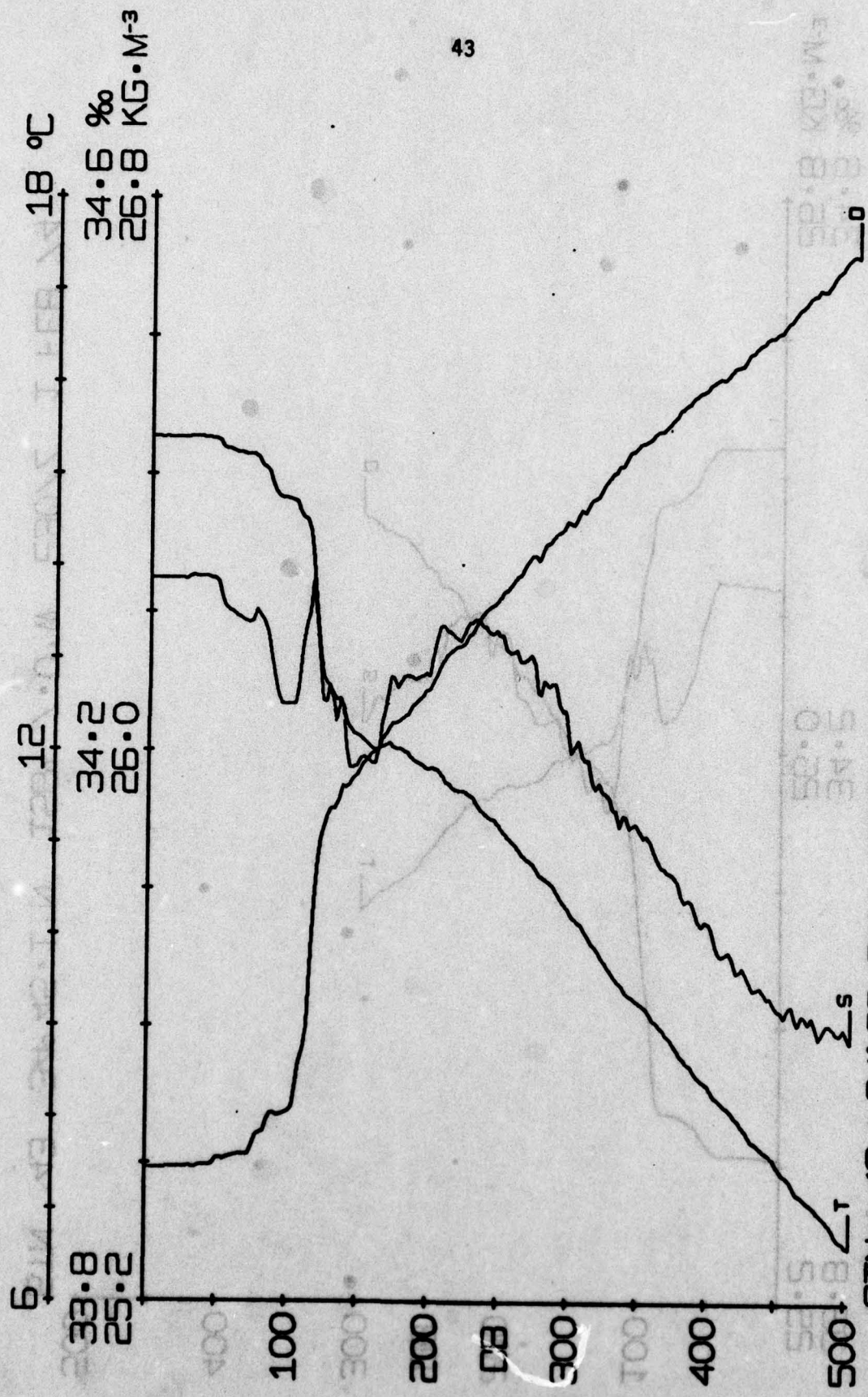
34.6 ‰
26.8 kg·m⁻³

34.2 ‰
26.0 kg·m⁻³

33.8
25.2



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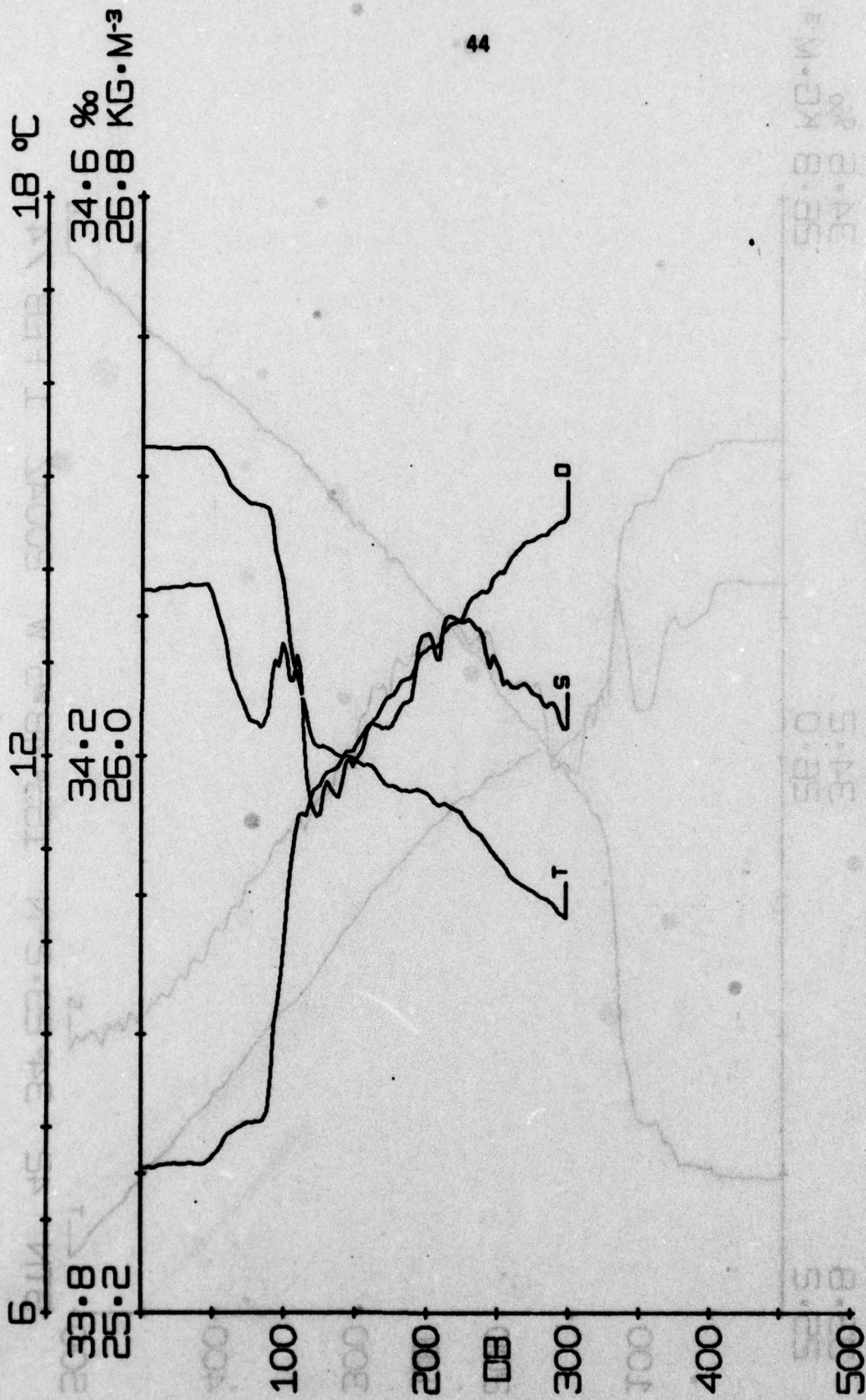


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52.0 KG-M-3
34.5 ‰
33.8 °C

52.0
34.5

52.0
34.5



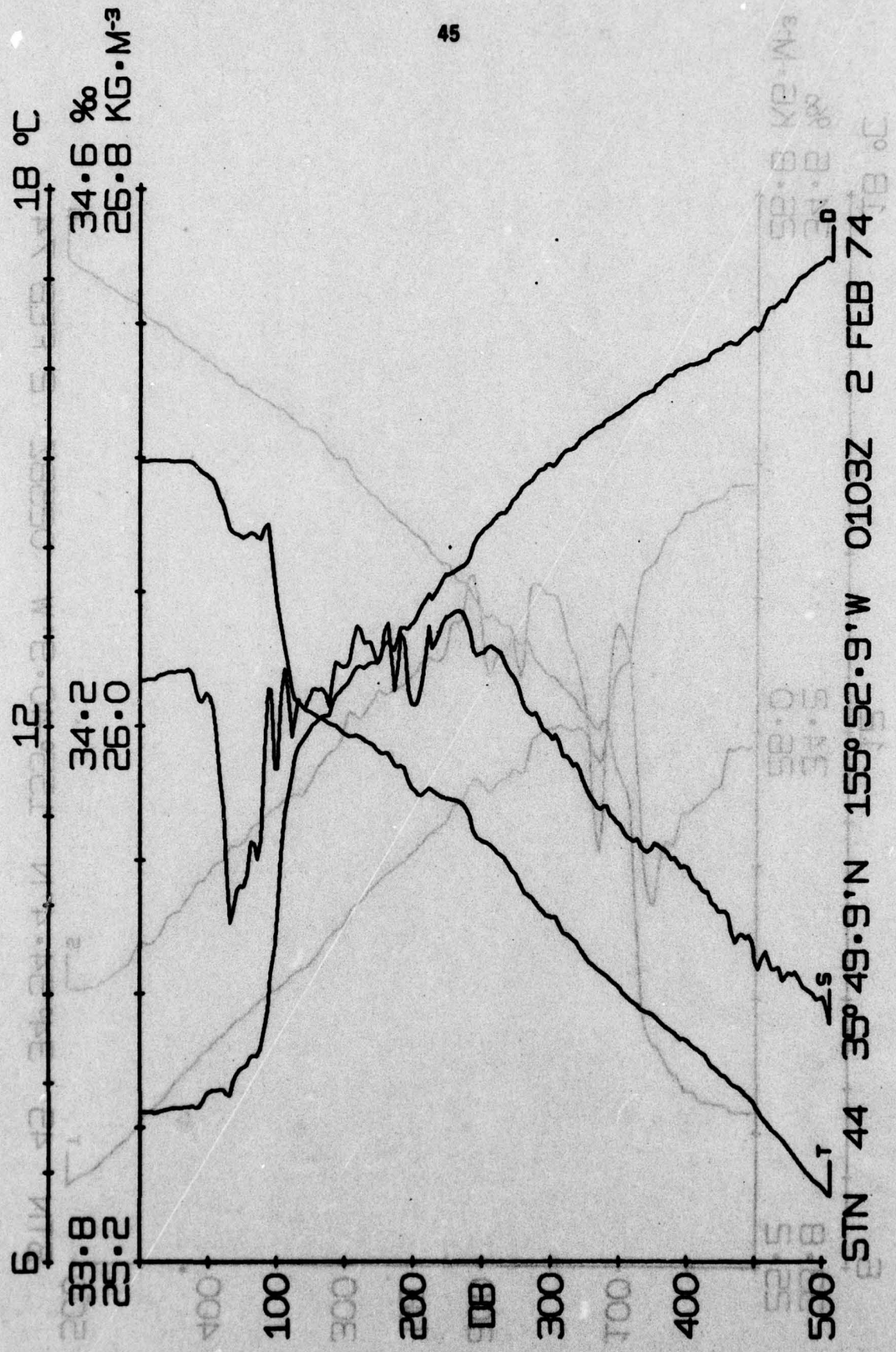
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STN 43 34° 45.1' N 156° 7.0' W 2307Z 1 FEB 74

33.8
34.2
25.2

33.8
34.2
25.2

33.8
34.2
25.2



18 °C

34.6 ‰
26.8 KG·M⁻³

12

34.2 ‰
26.0

6

33.8 ‰
25.2

T

S

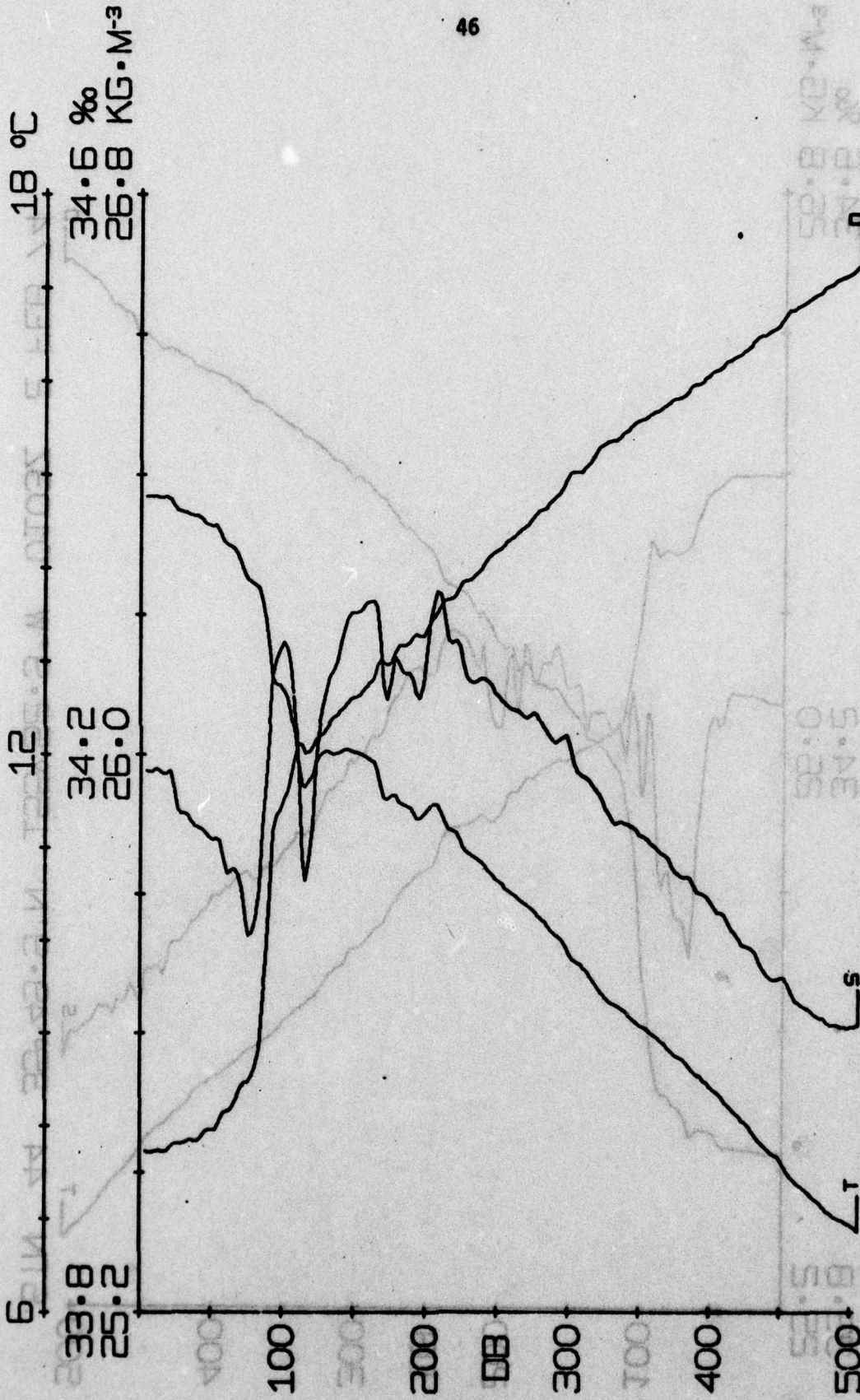
sigma-t

52.5 KG·M⁻³
34.5 ‰
18.0 °C

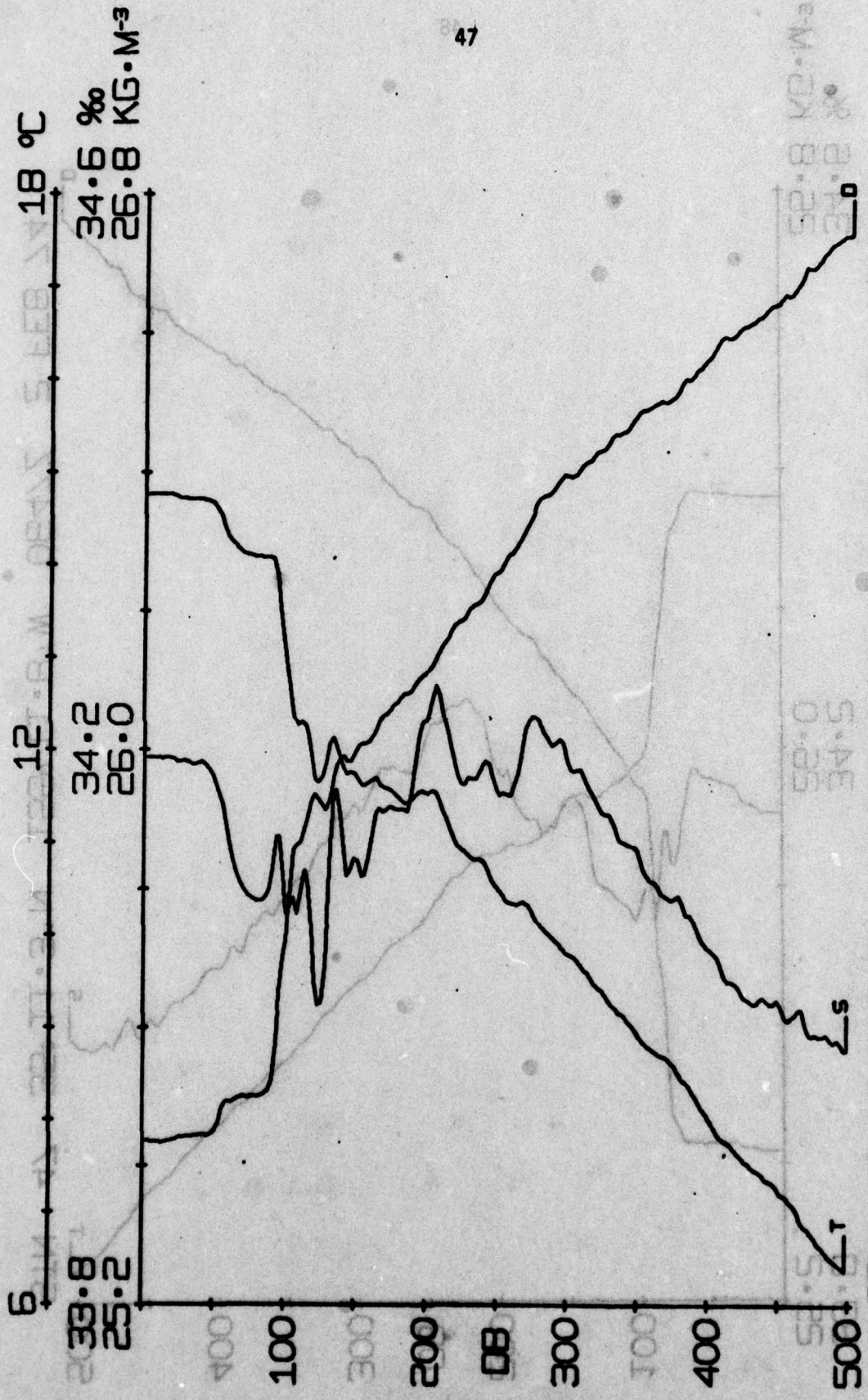
52.5 KG·M⁻³
34.5 ‰
18.0 °C

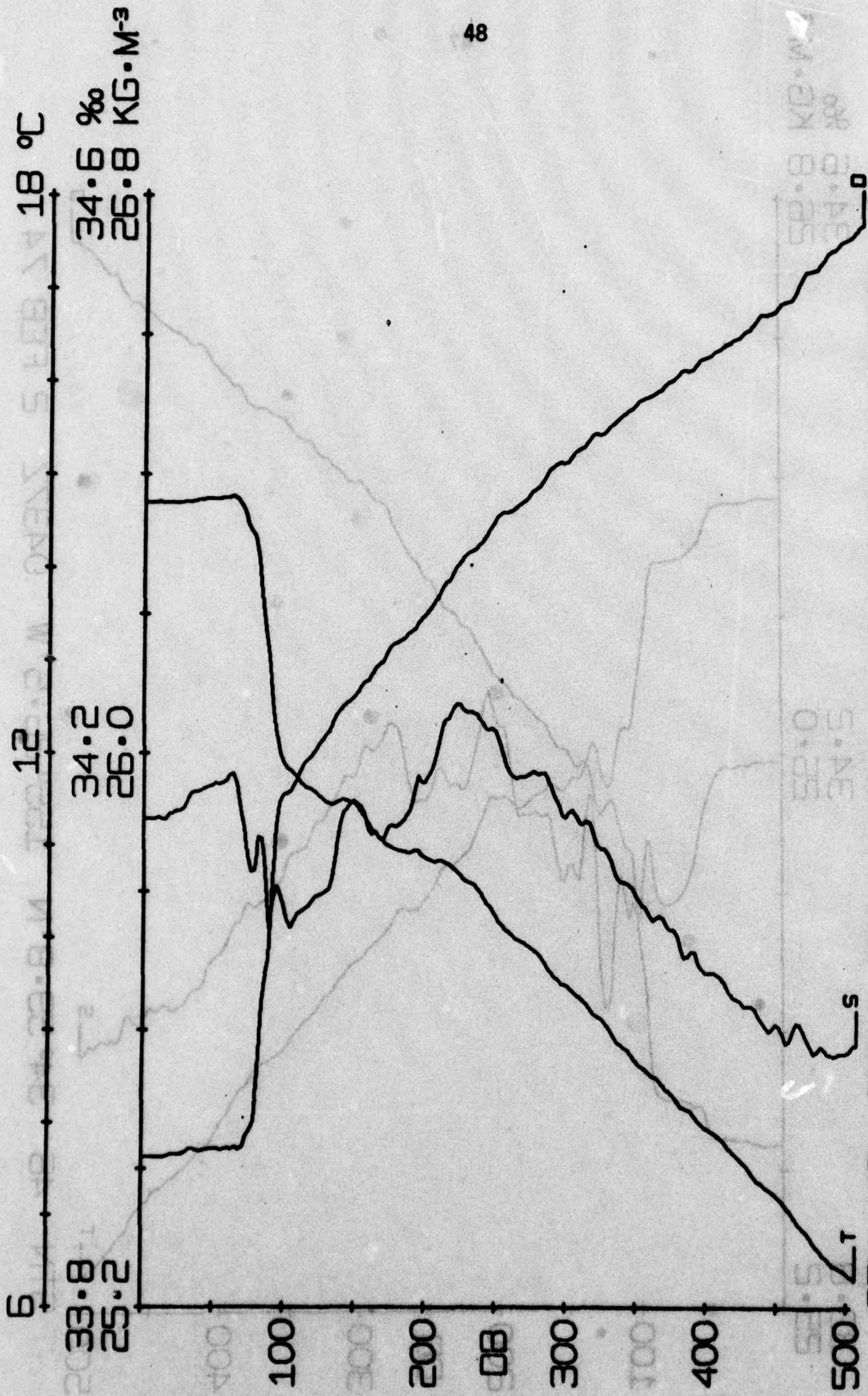
52.5 KG·M⁻³
34.5 ‰
18.0 °C

STN 44 35° 49.9' N 155° 52.9' W 0103Z 2 FEB 74



STN 45 34° 54.4' N 155° 40.9' W 0258Z 2 FEB 74



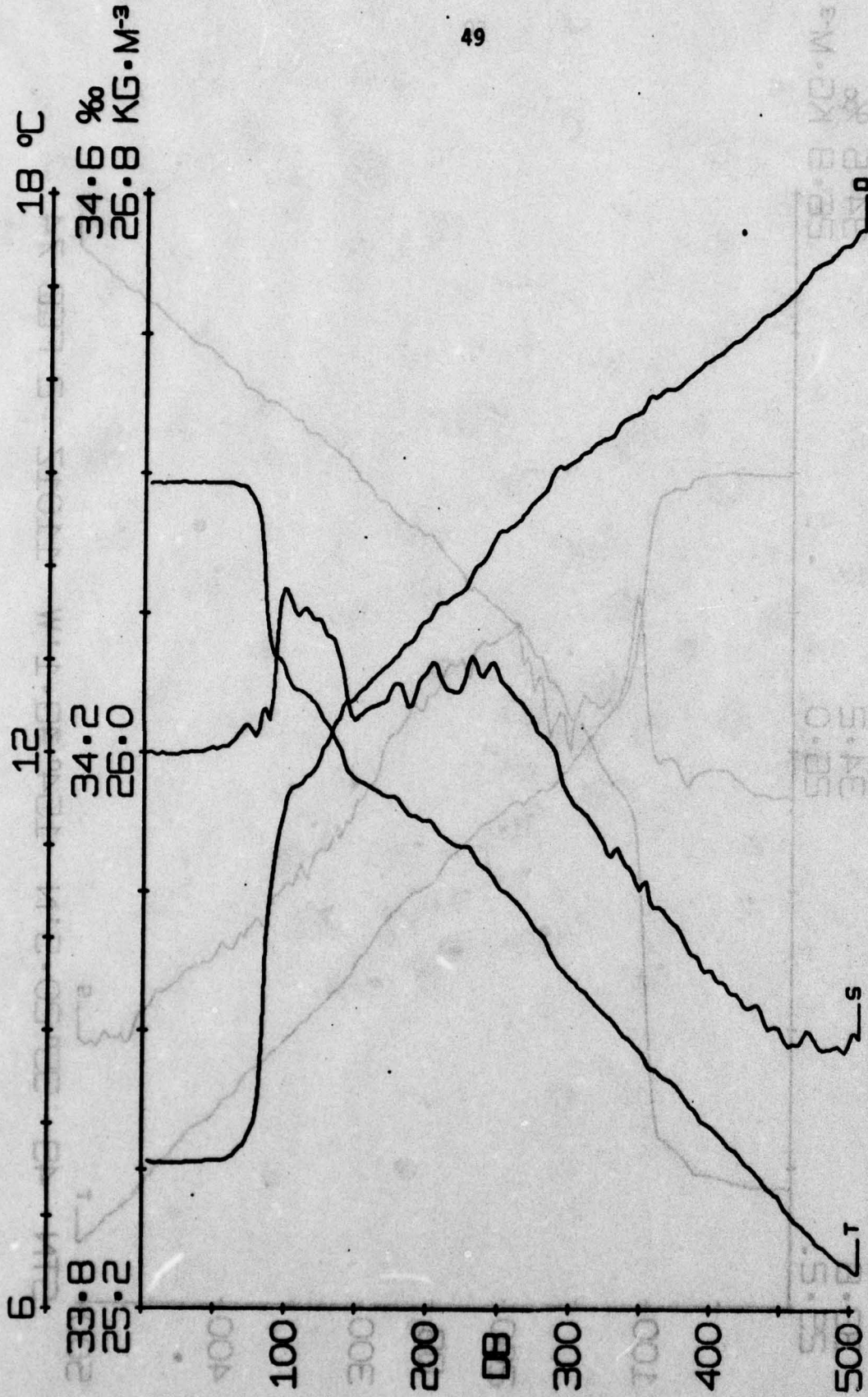


STN 47 35° 11.3'N 155° 11.8'W 0647Z 2 FEB 74 TB °C

58.8 KG·M⁻³
34.2 ‰

58.0 ‰
34.5 ‰

58.5 ‰



58.8 KG·M⁻³

58.0

58.5

58.0

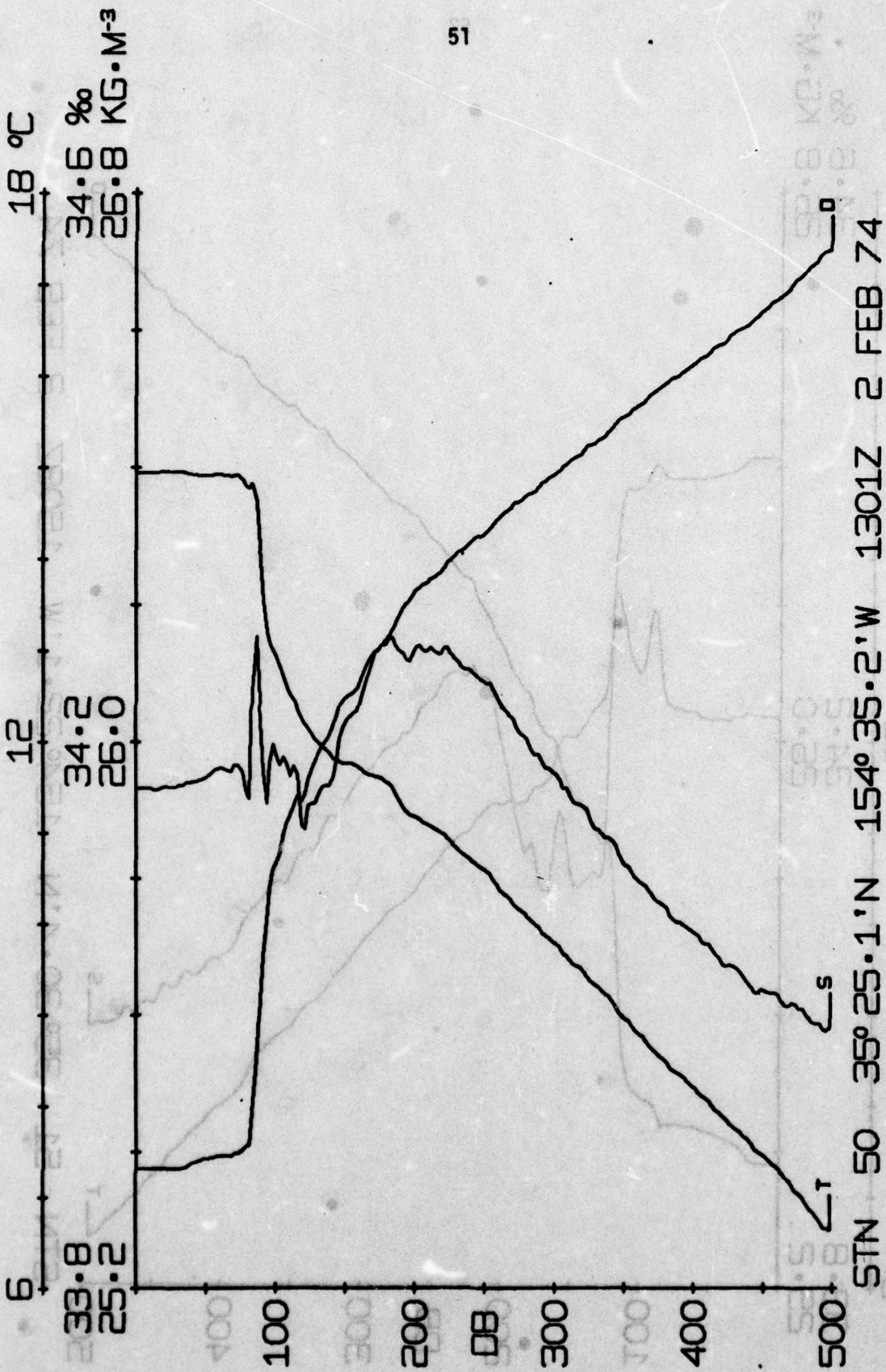
58.5

58.0

58.5



STN 49 35° 20.5' N 154° 48.1' W 1101Z 2 FEB 74



STN 50 35° 25.1'N 154° 35.2'W 1301Z 2 FEB 74

33.8 °C
25.2 ‰
26.8 kg·m⁻³

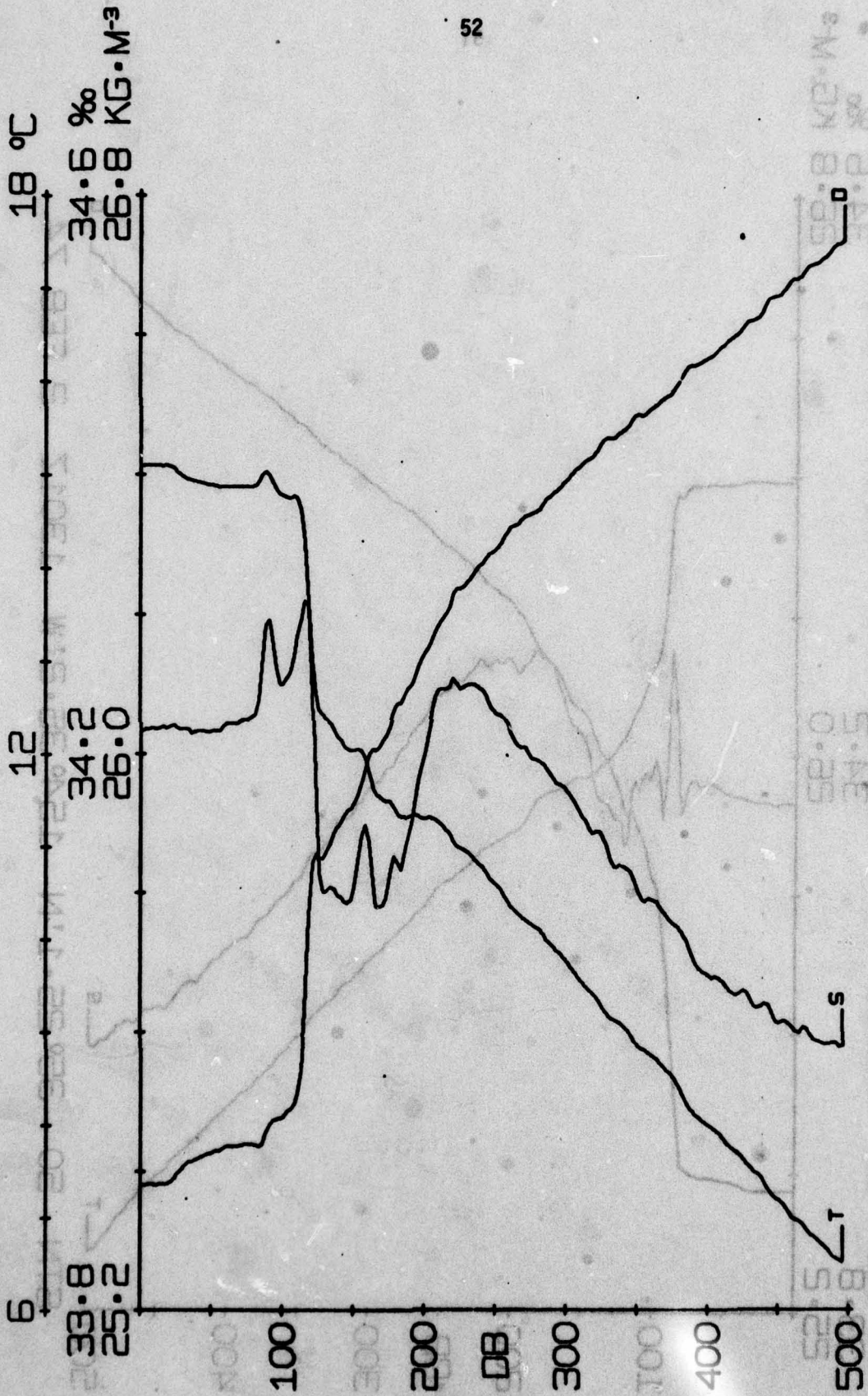
34.2 °C
26.0 ‰
26.8 kg·m⁻³

34.6 °C
26.8 ‰
26.8 kg·m⁻³

T

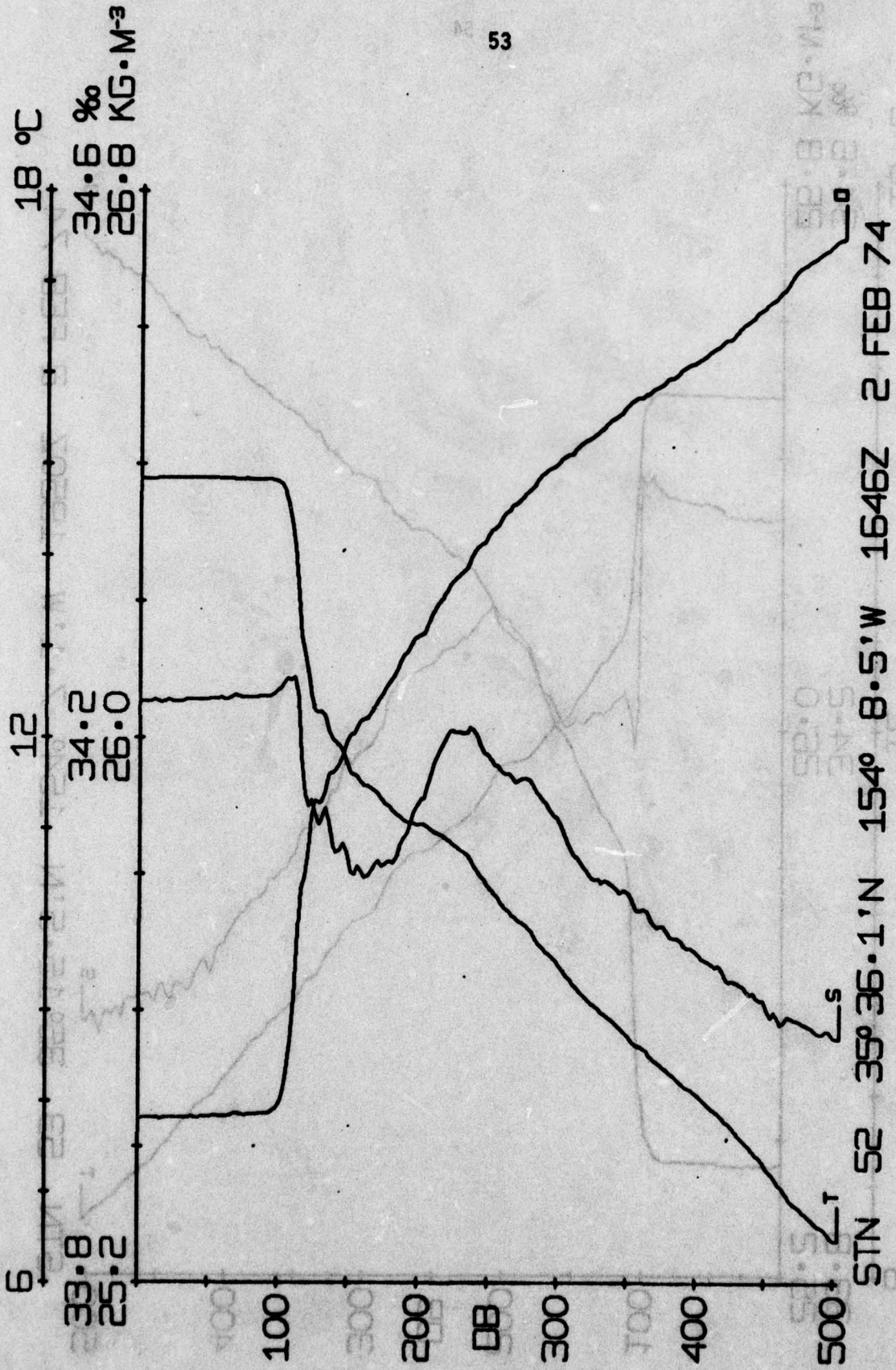
S

σ_t



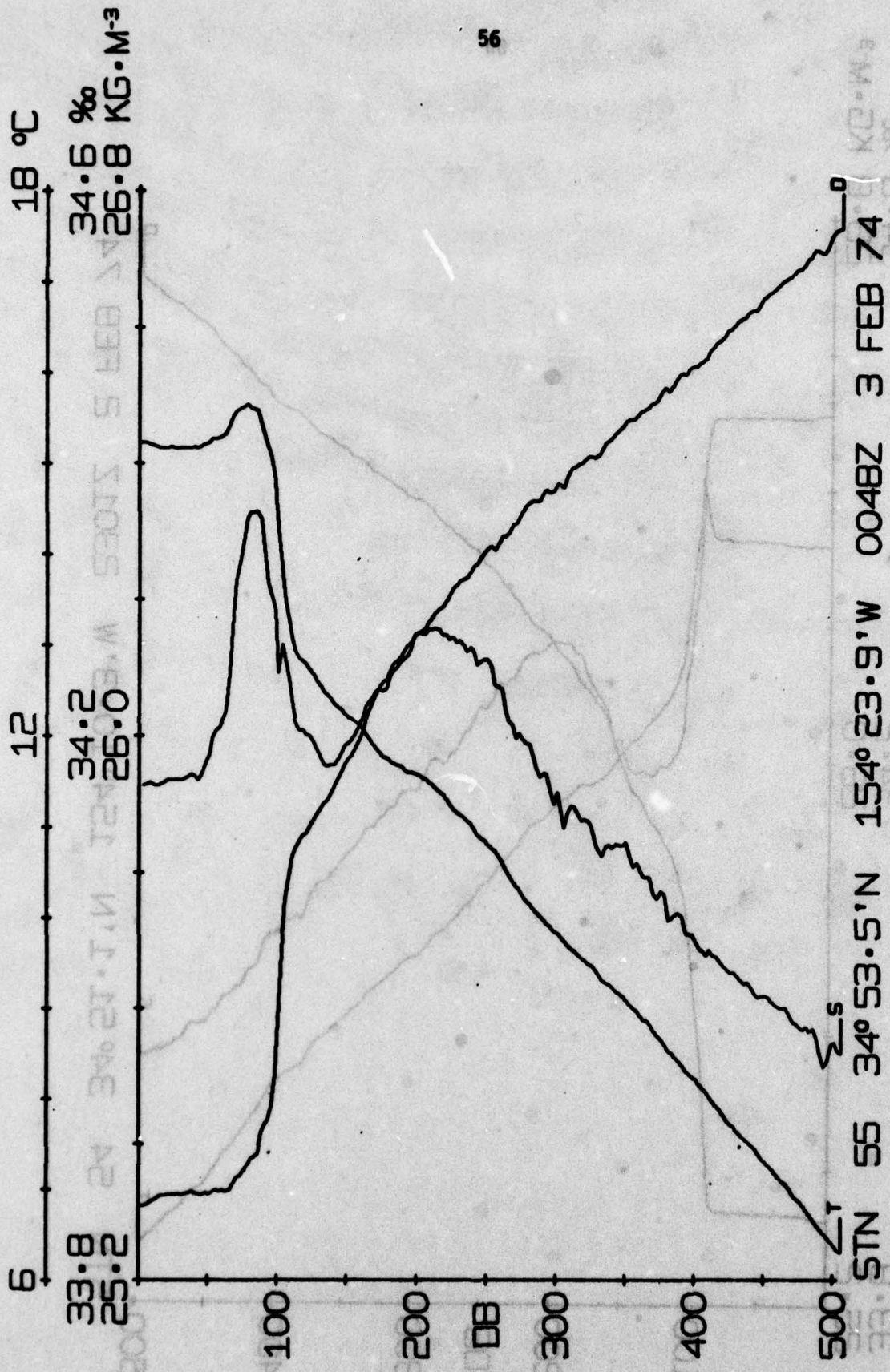
STN 51 35° 30.4'N 154° 22.1'W 1508Z 2 FEB 74

SP:8 KG·M⁻³
SA:8 ‰
TB:8 °C





STN 53 35° 15.5' N 154° 7.1' W 1950Z 2 FEB 74



18 °C

12

6

34.6 ‰
26.8 KG·M⁻³

34.2
26.0

33.8
25.2

100

200

300

400

500

STN 55 34° 53.5'N 154° 23.9'W 0048Z 3 FEB 74

Σs

T

0

18 °C

12

6

34.6 ‰

26.8 KG·M⁻³

34.2
26.0

33.8
25.2

100

200

300

400

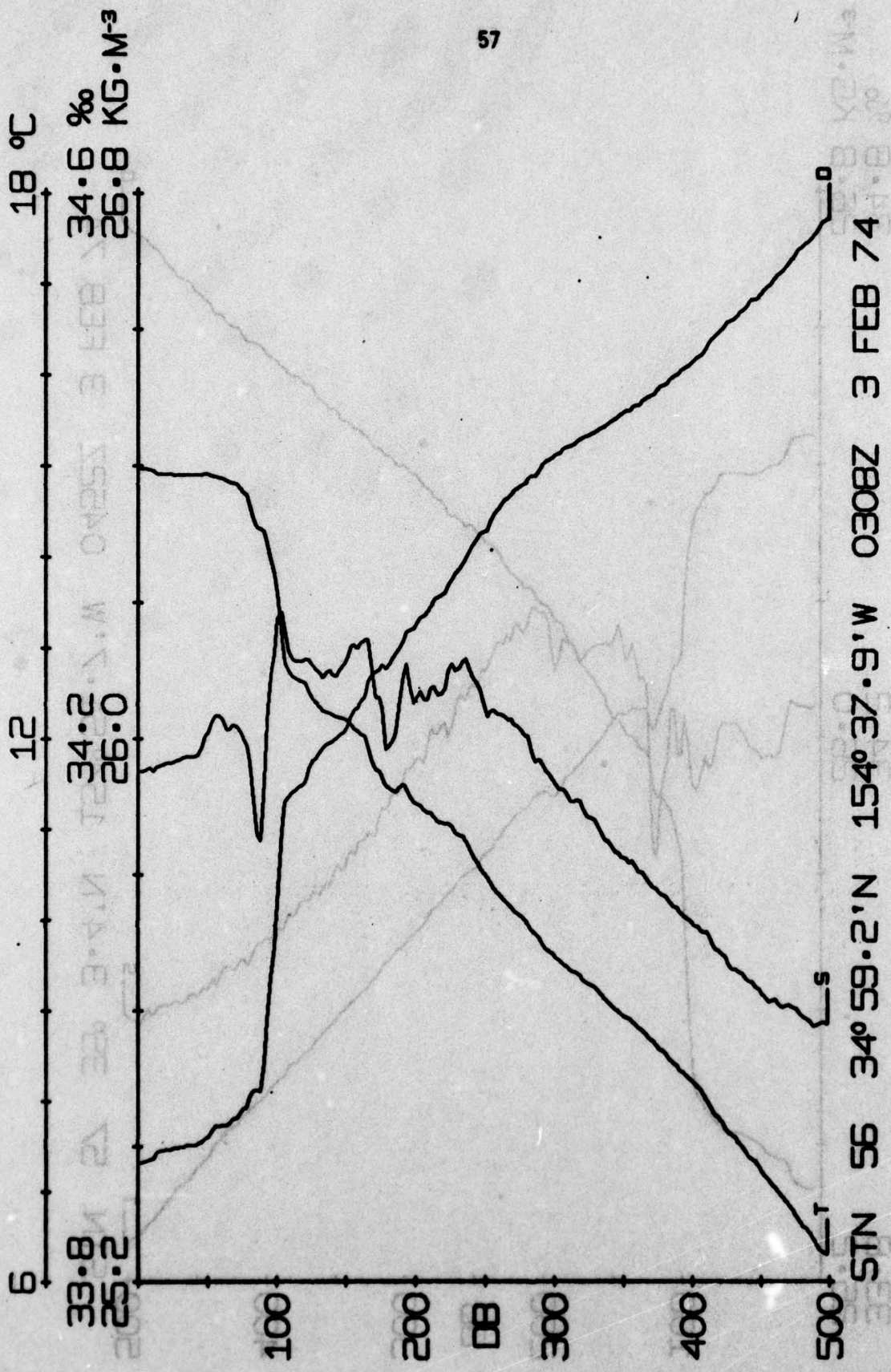
500

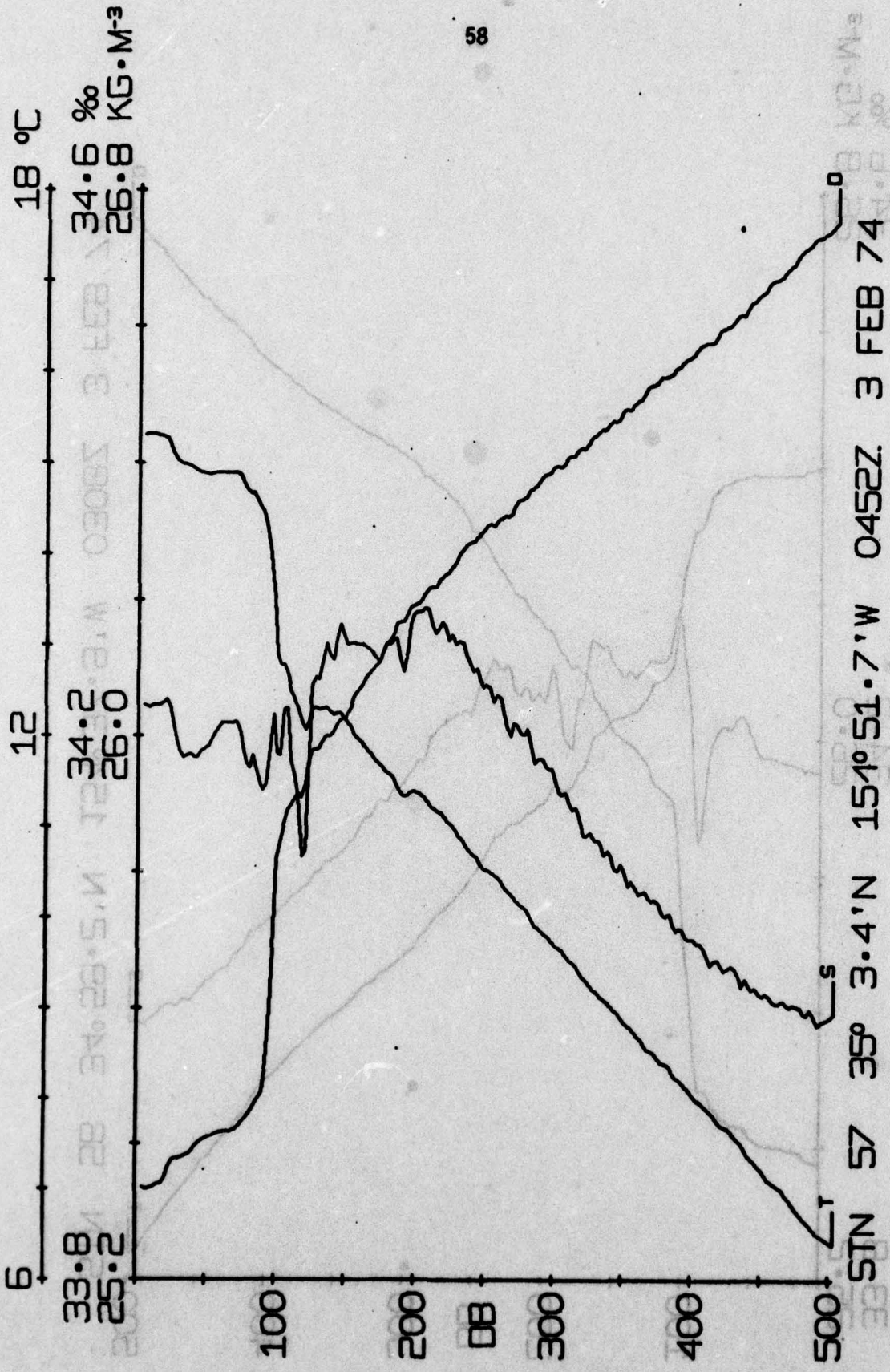
STN 55 34° 53.5'N 154° 23.9'W 0048Z 3 FEB 74

Σs

T

0





18 °C

12

6

33.8
25.2

34.2
26.0

34.6
26.8

33.8
25.2

34.2
26.0

34.6
26.8

34.6
26.8

100

200

DB

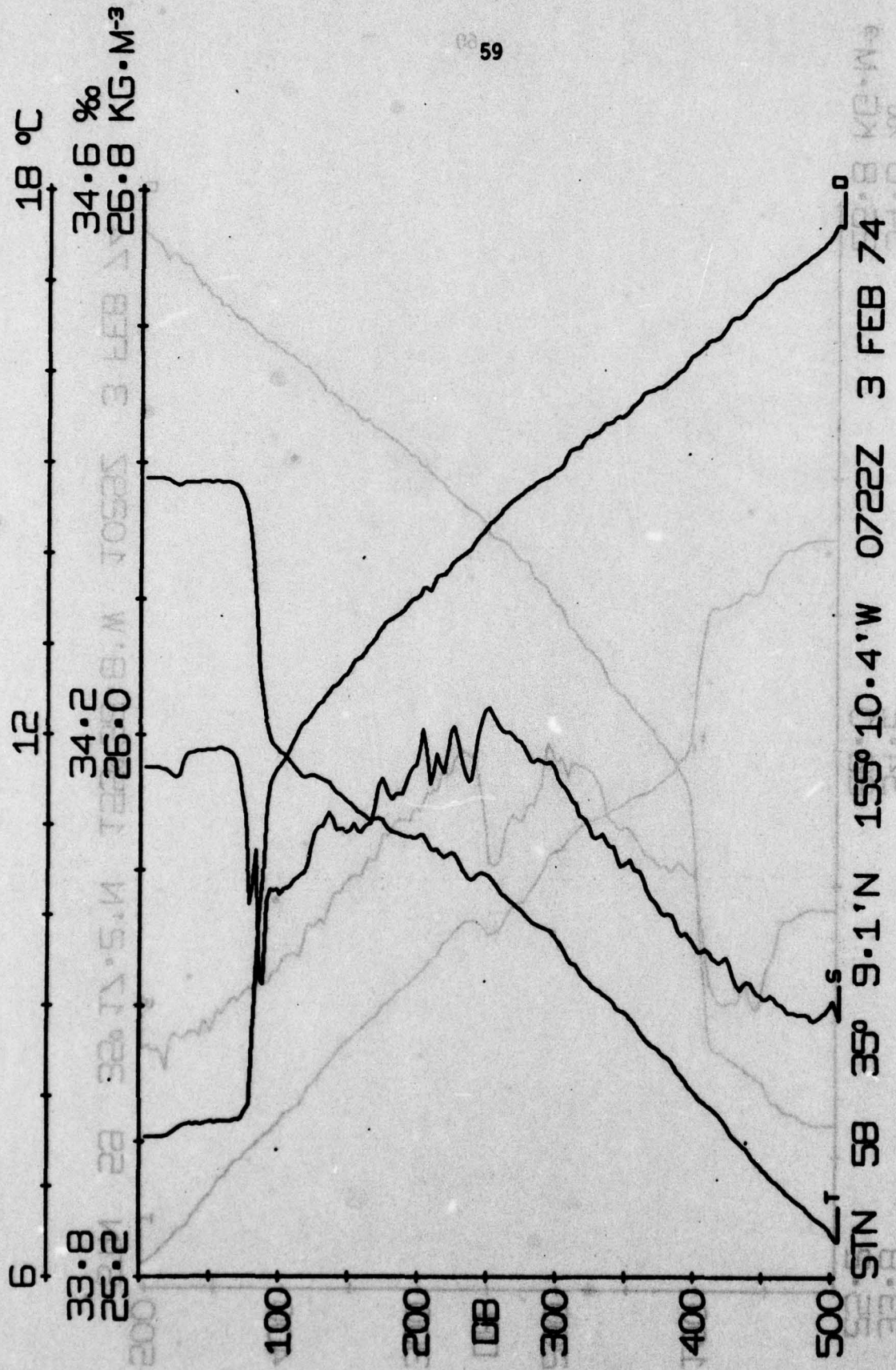
300

400

500

STN 57 35° 3.4'N 151° 51.7'W 0452Z 3 FEB 74

TO C



STN 58 35° 9.1'N 155° 10.4'W 0722Z 3 FEB 74

33.8
25.2
34.2
26.0

15

18 °C

6 12 18 °C

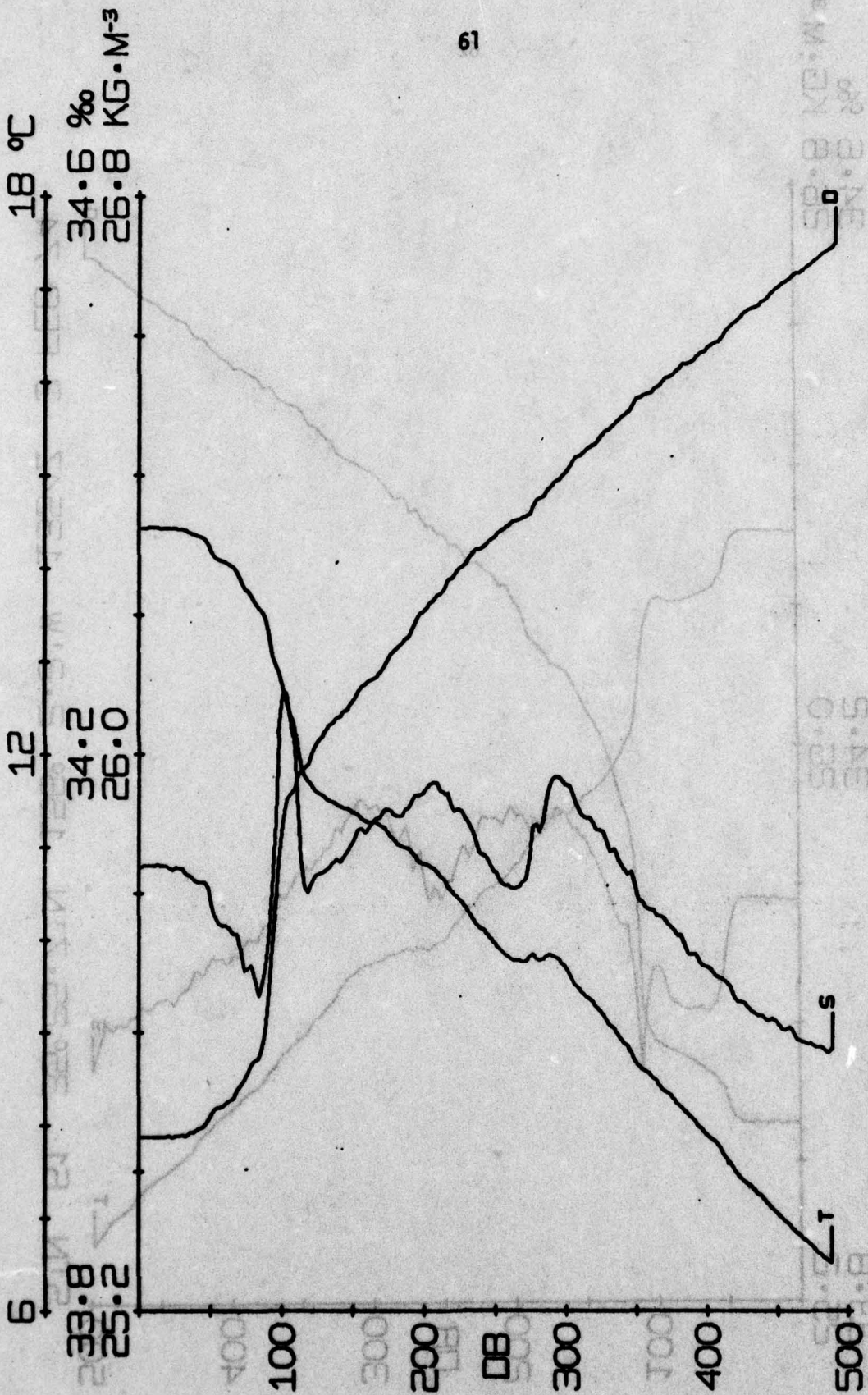
33.8 34.2 34.6 ‰
25.2 26.0 26.8 KG·M⁻³



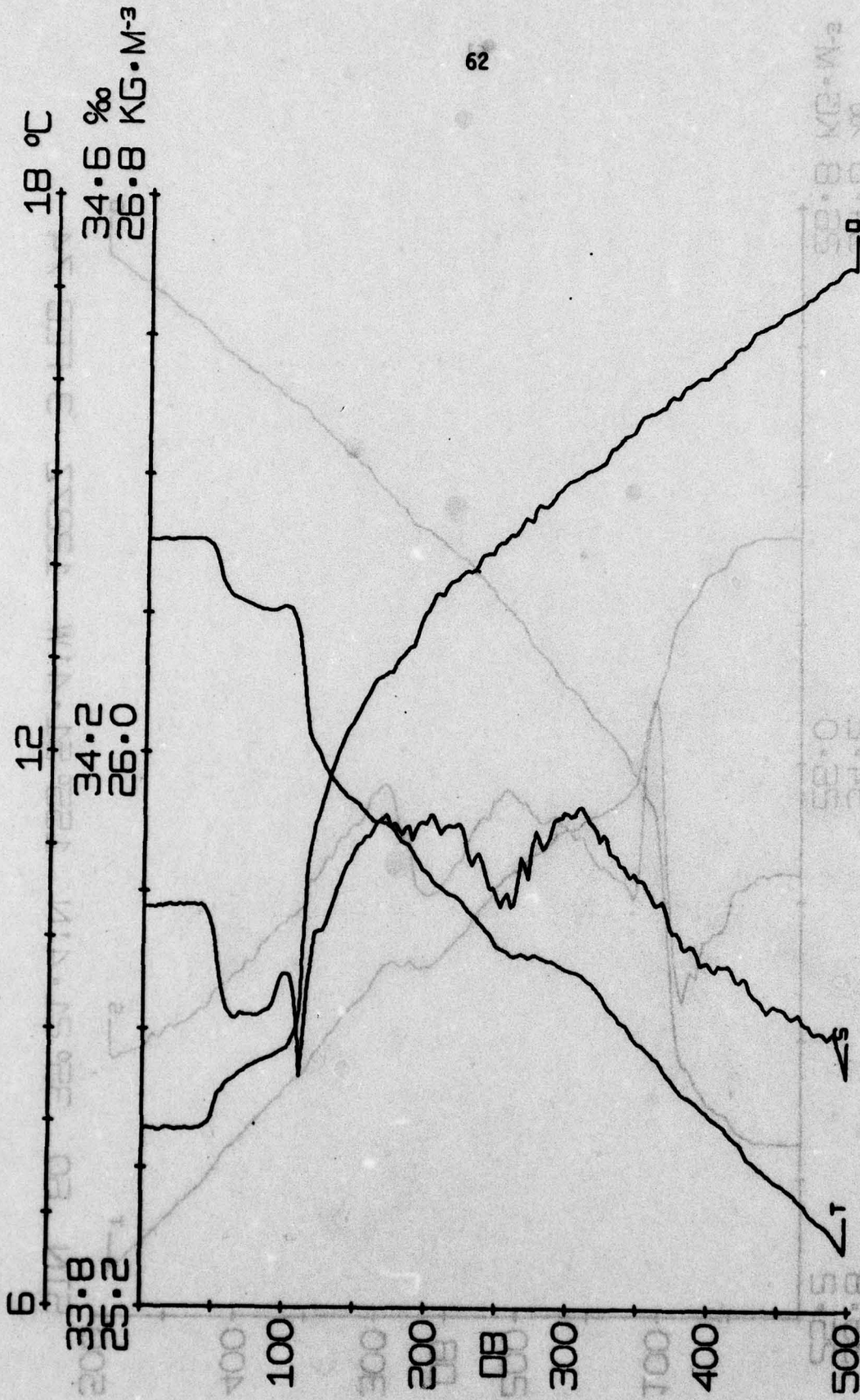
STN 59 35° 17.2' N 155° 38.8' W 1029Z 3 FEB 74

33.8 34.2 34.6 ‰

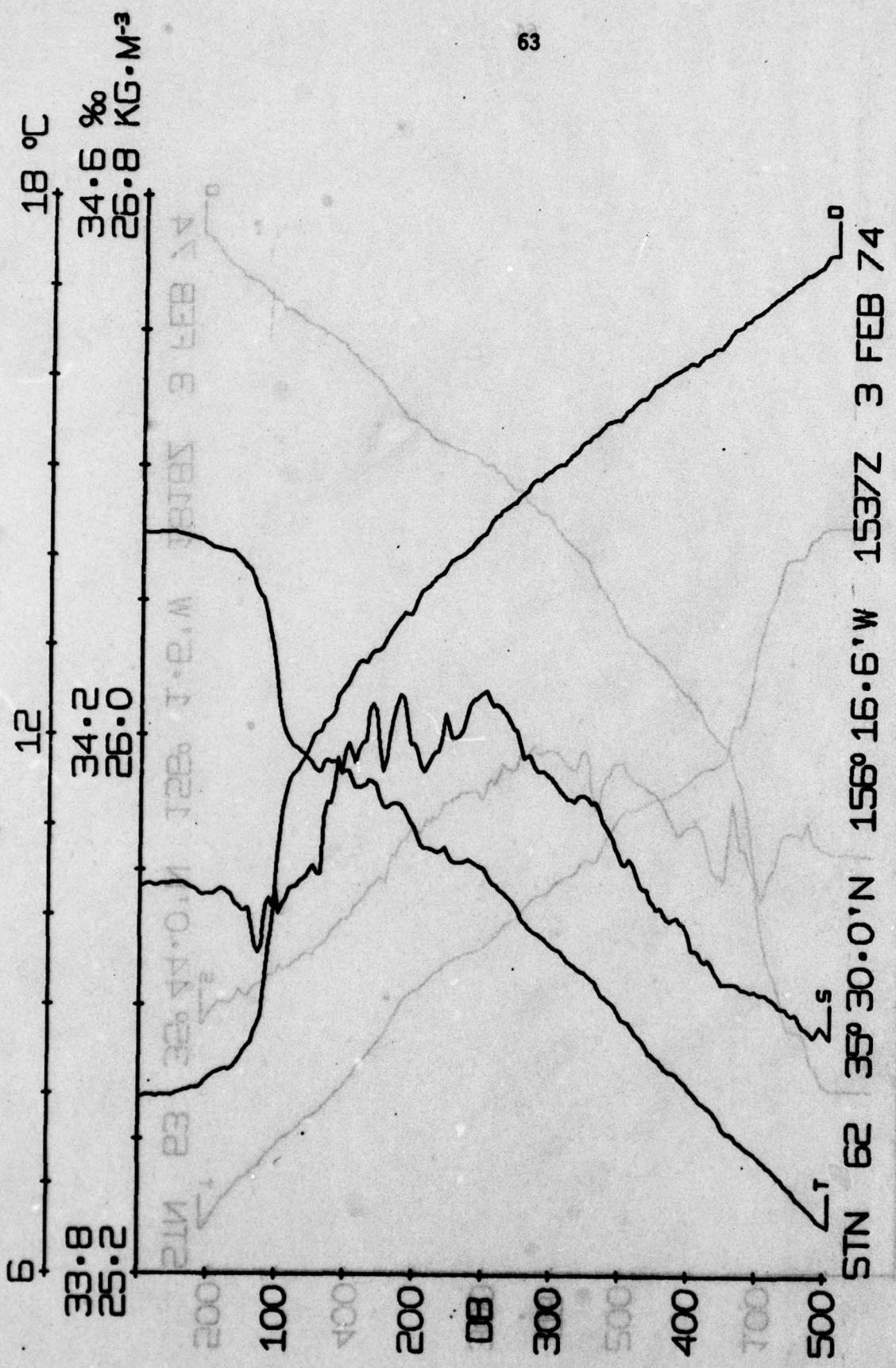
25.2 26.0 26.8 KG·M⁻³



STN 60 35° 21.4' N 155° 51.4' W 1227Z 3 FEB 74



STN 61 35° 25.7'N 156° 2.2'W 1354Z 3 FEB 74



STN 62 35° 30.0'N 156° 16.6'W 1537Z 3 FEB 74
 52.5 34.5 26.8
 52.0 34.2 26.8

52.5 34.5 26.8
 52.0 34.2 26.8

52.5 34.5 26.8
 52.0 34.2 26.8

18 °C

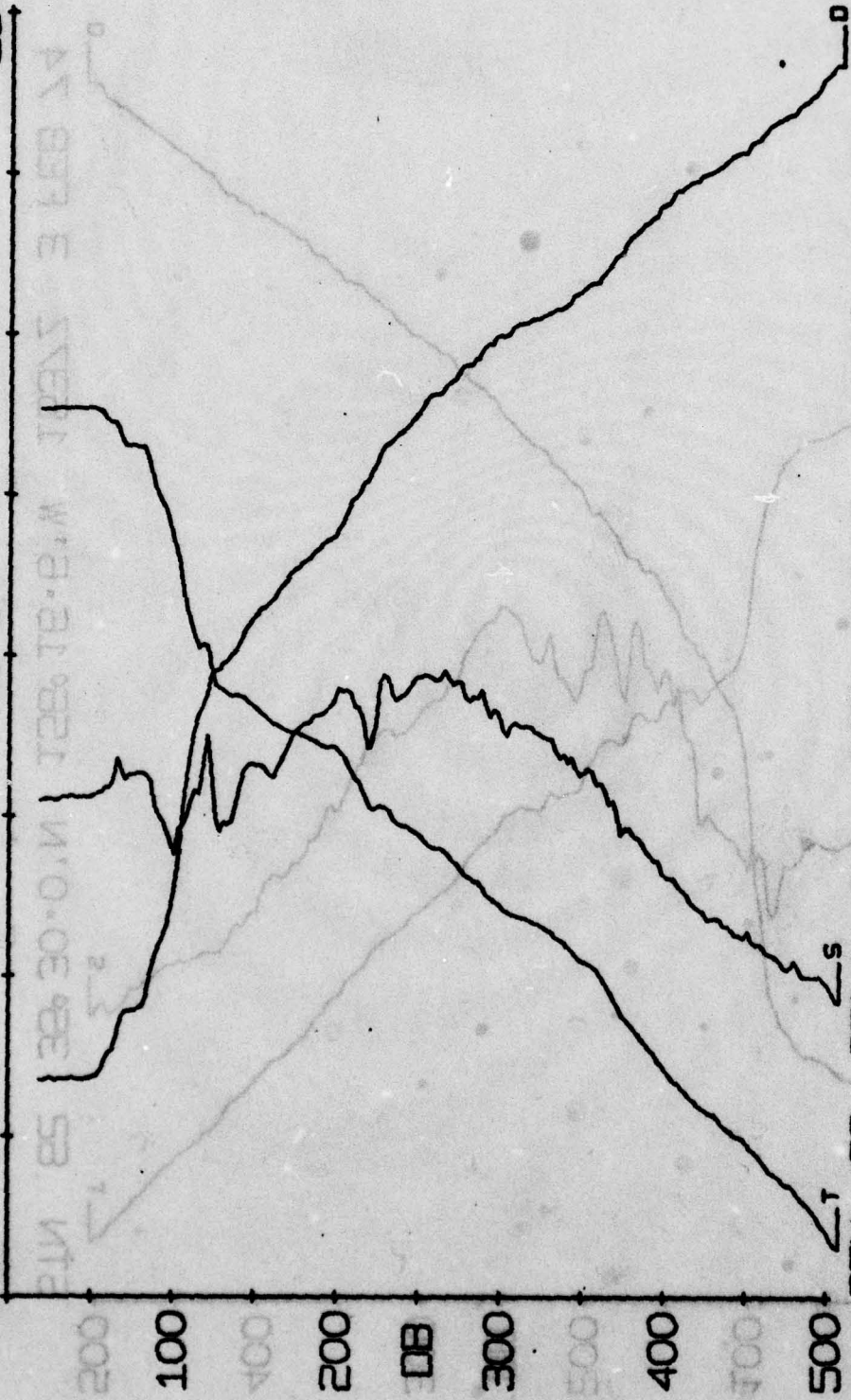
34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

6

33.8
25.2



STN 63 35° 44.0'N 156° 1.6'W 1818Z 3 FEB 74

33.8 KG·M⁻³
34.2 ‰

33.8
34.2

33.8
34.2

18 °C

12

6



STN 64 35° 57.4' N 155° 46.4' W 2045Z 3 FEB 74

52.8 KG·M⁻³
34.2 ‰

52.0
34.5

52.8
33.8

18 °C

15

15

18 °C

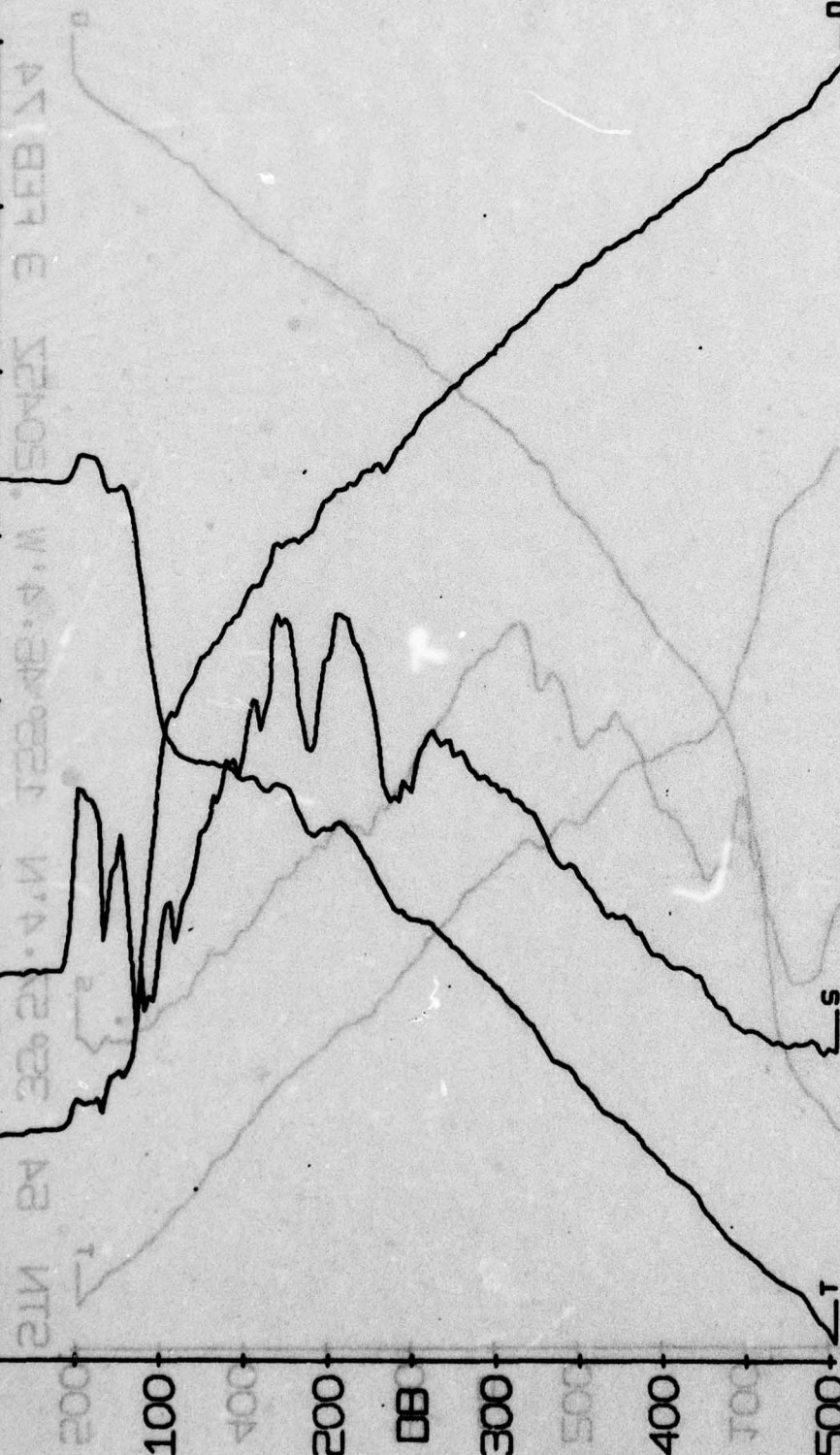
34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

6

33.8
25.2



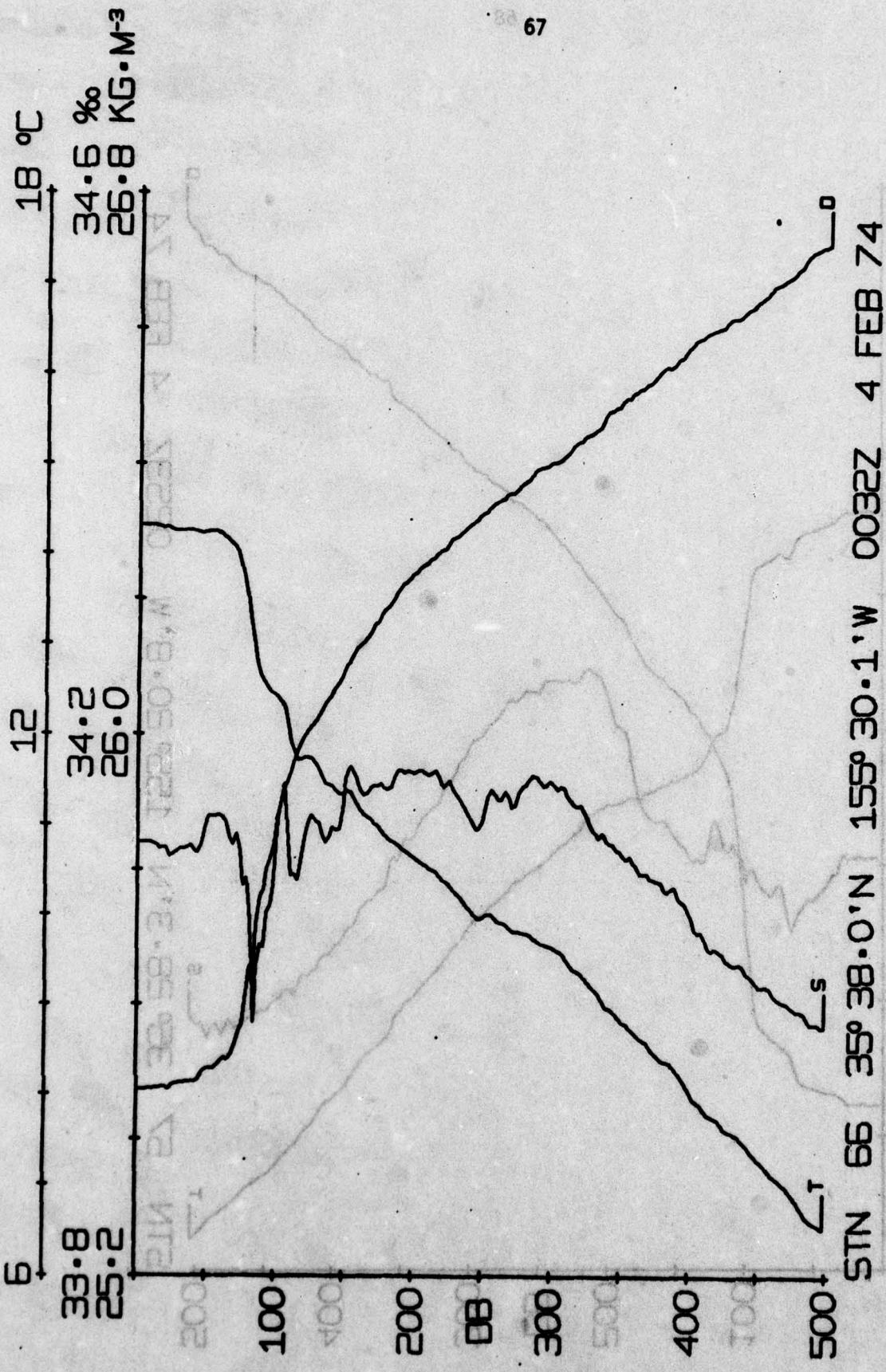
STN 65 35° 46.9'N 155° 37.6'W 2231Z 3 FEB 74

52.5
33.8

52.0
34.5

52.8
34.2

18 °C

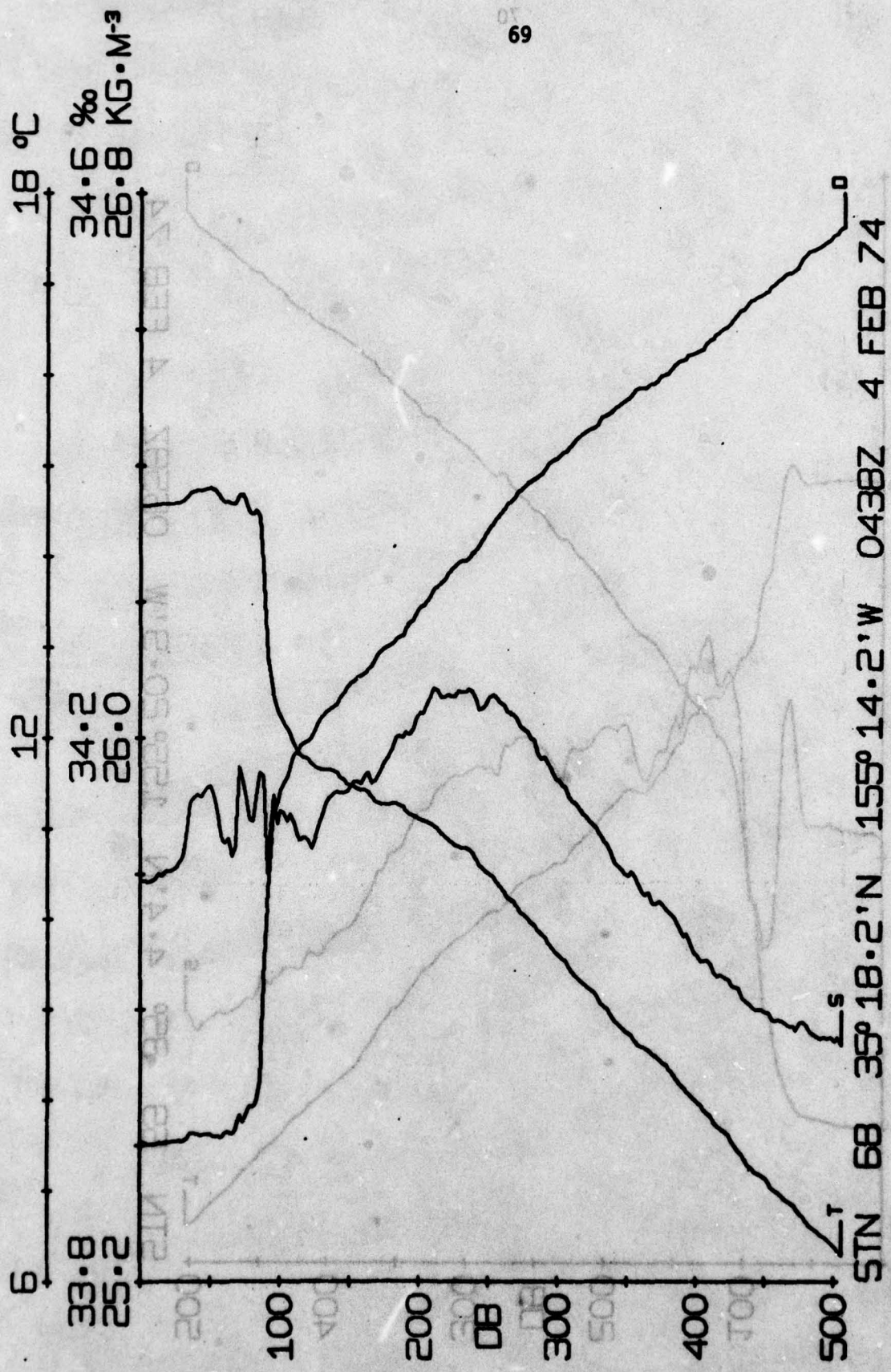


STN 66 35° 38.0'N 155° 30.1'W 0032Z 4 FEB 74

52.5
33.8

52.0
34.5

52.8 KG·M⁻³
34.8 ‰
18.0°C



STN 68 35° 18.2' N
 155° 14.2' W
 0438Z 4 FEB 74

34.6 ‰
 26.8 KG·M⁻³

33.8
 25.2

18 °C

12

6

500

400

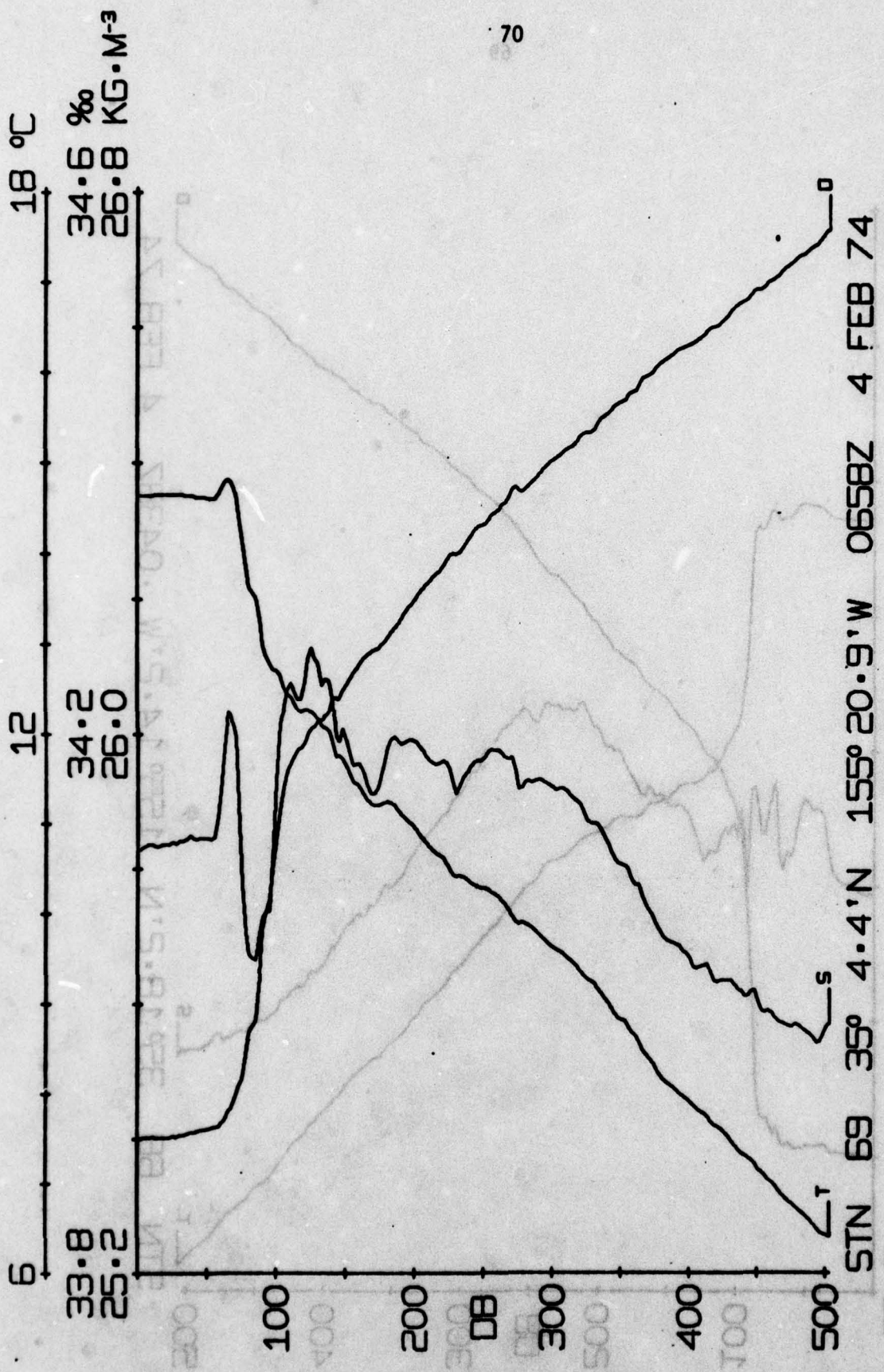
300

200

100

DB

18 °C



52.5
33.8

52.8
34.2

52.8
34.2

75

78 °C

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 70 34° 55.4' N 155° 13.1' W 0838Z 4 FEB 74

52.5
33.8

52.0
34.5

52.8 KG·M⁻³
34.2 ‰

6

12

18 °C



STN 71 34° 46.3'N 155° 5.0'W 1017Z 4 FEB 74

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2

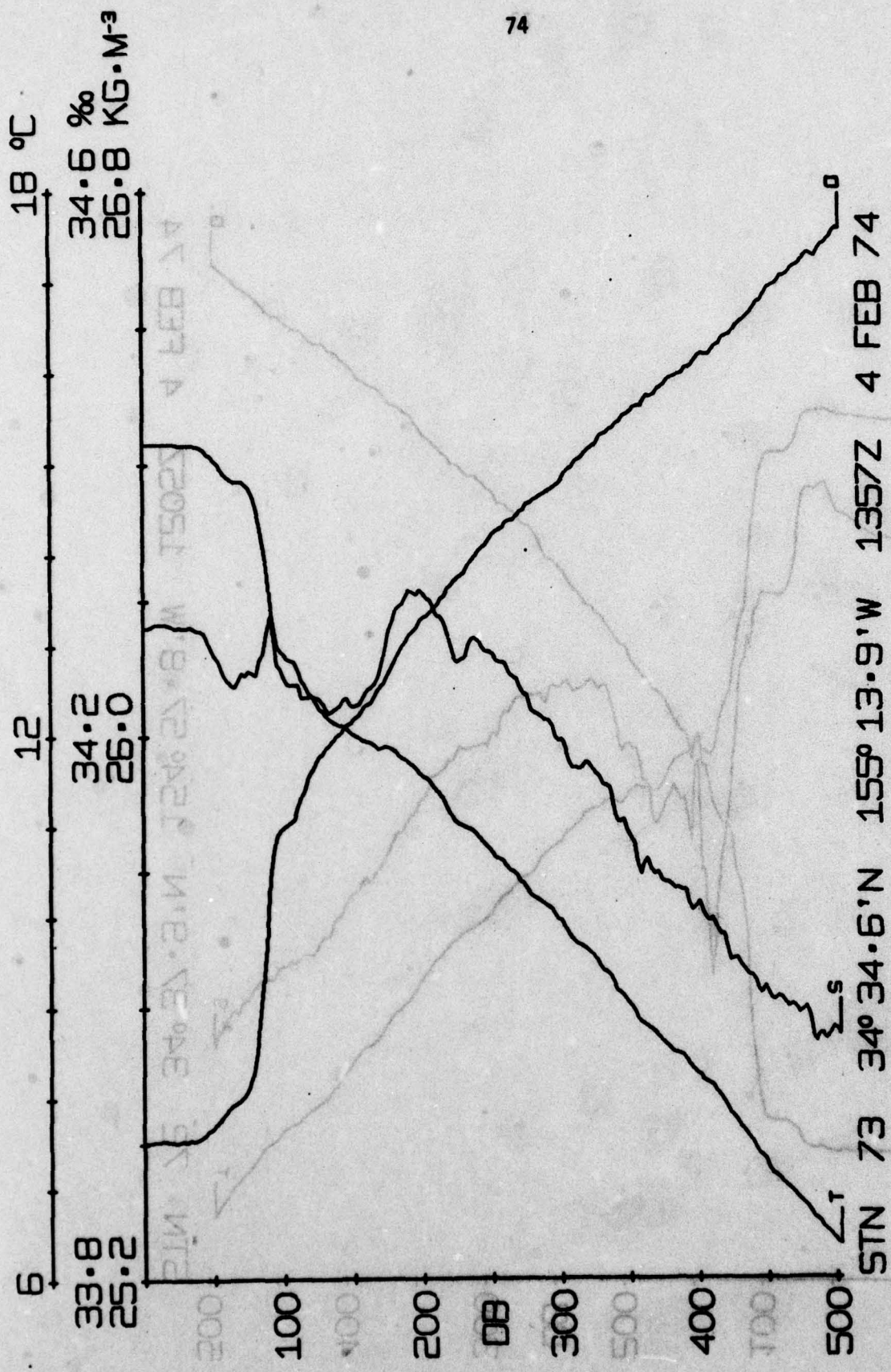
52.5
33.8

52.0
34.5

52.8
34.8

51

5



STN 73 34° 34.6' N 155° 13.9' W 1357Z 4 FEB 74

STN 74 34° 34.6' N 155° 13.9' W 1357Z 4 FEB 74

33.8 34.2 34.6
25.2 26.0 26.8

18 °C

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2

STN 74 34° 31.7' N 155° 30.1' W 1600Z 4 FEB 74

52.5
33.8

52.0
34.5

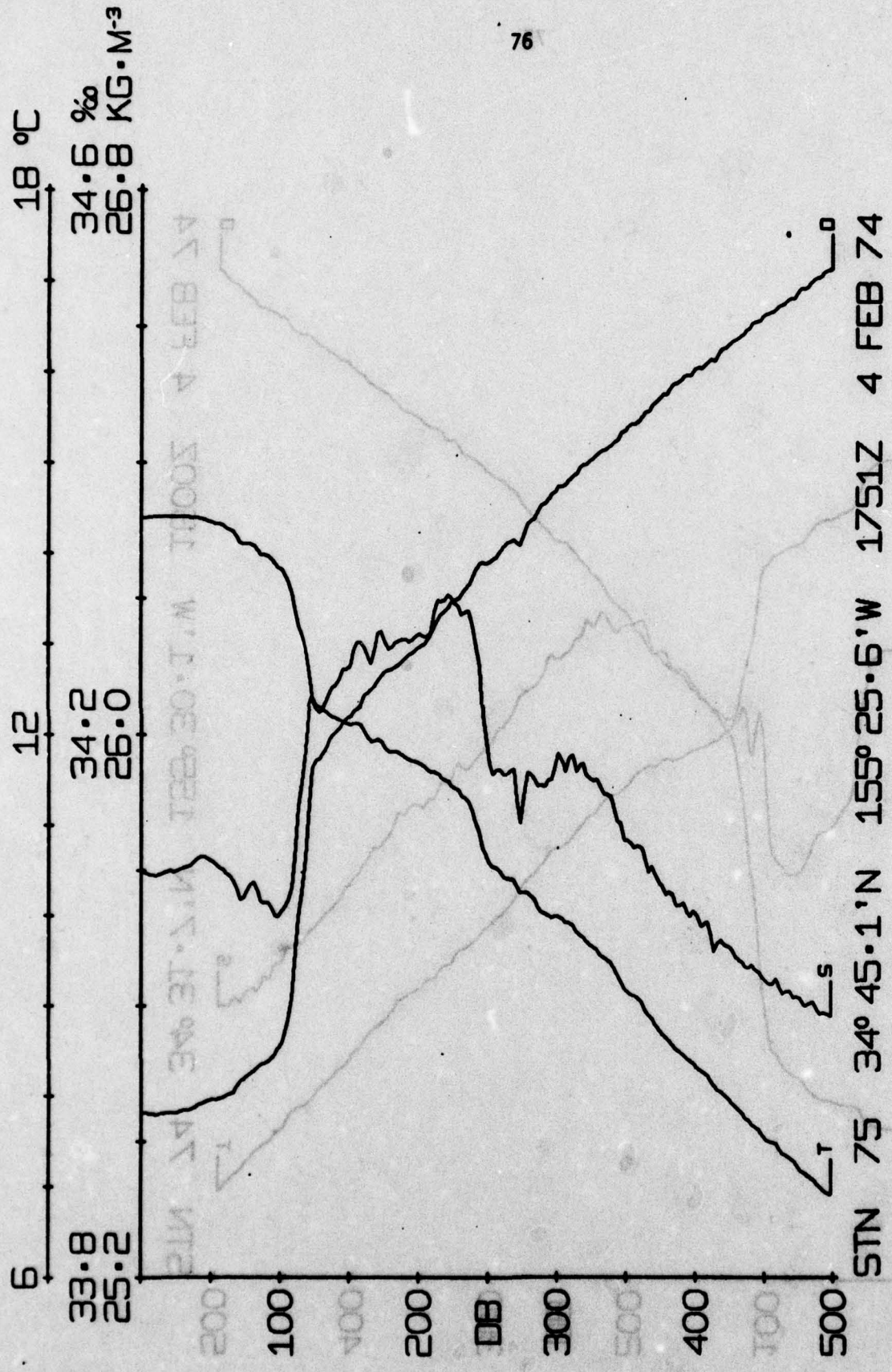
52.8 KG·M⁻³
34.2 ‰

18 °C

75

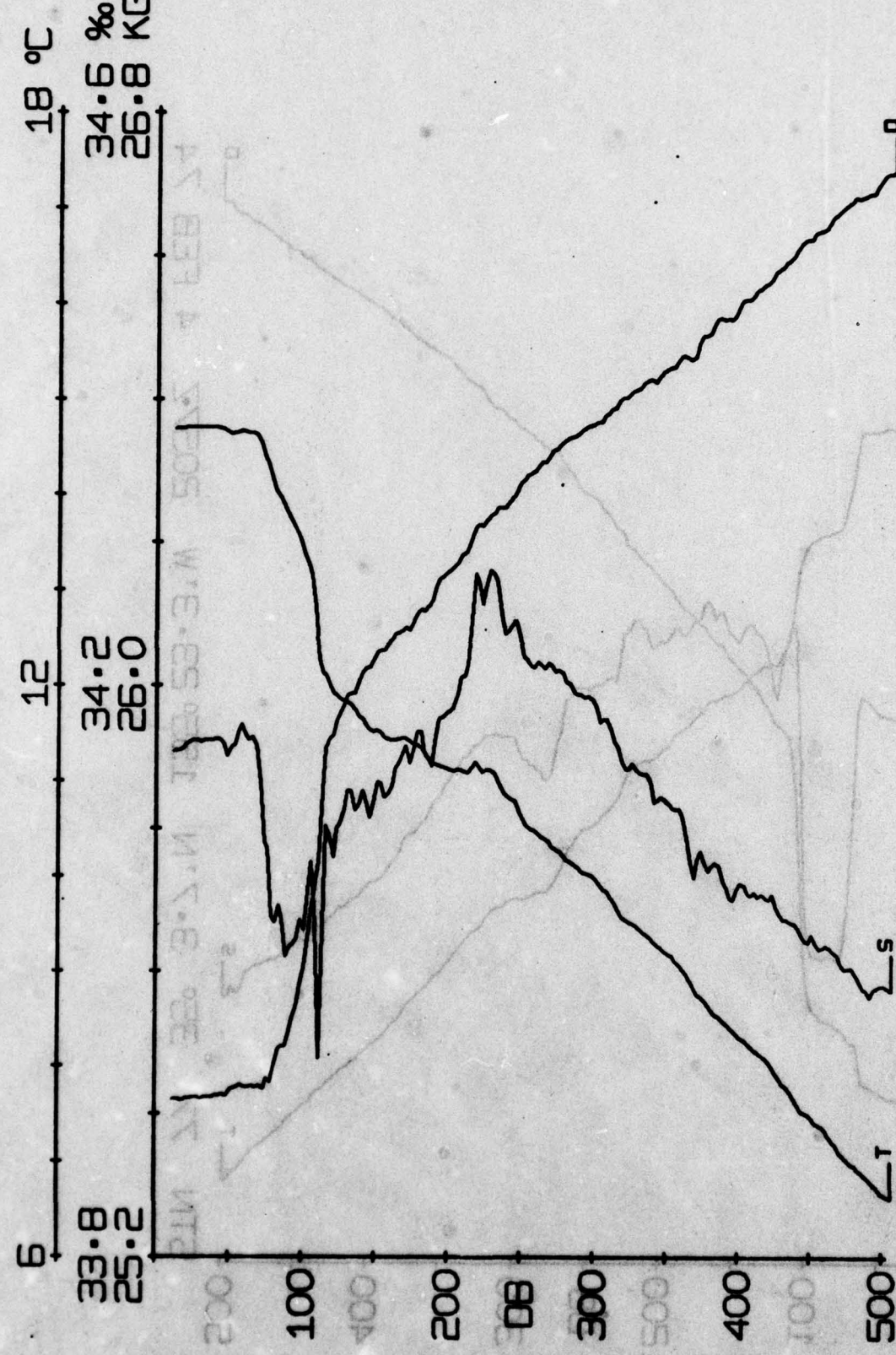
2





52.5
 33.8
 26.0
 52.8
 34.8
 26.8

15
 18 °C



18 °C

34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

6

33.8
25.2

STN 76 34° 55.1' N 155° 23.8' W 1921Z 4 FEB 74

52.5
33.8

52.0
34.5

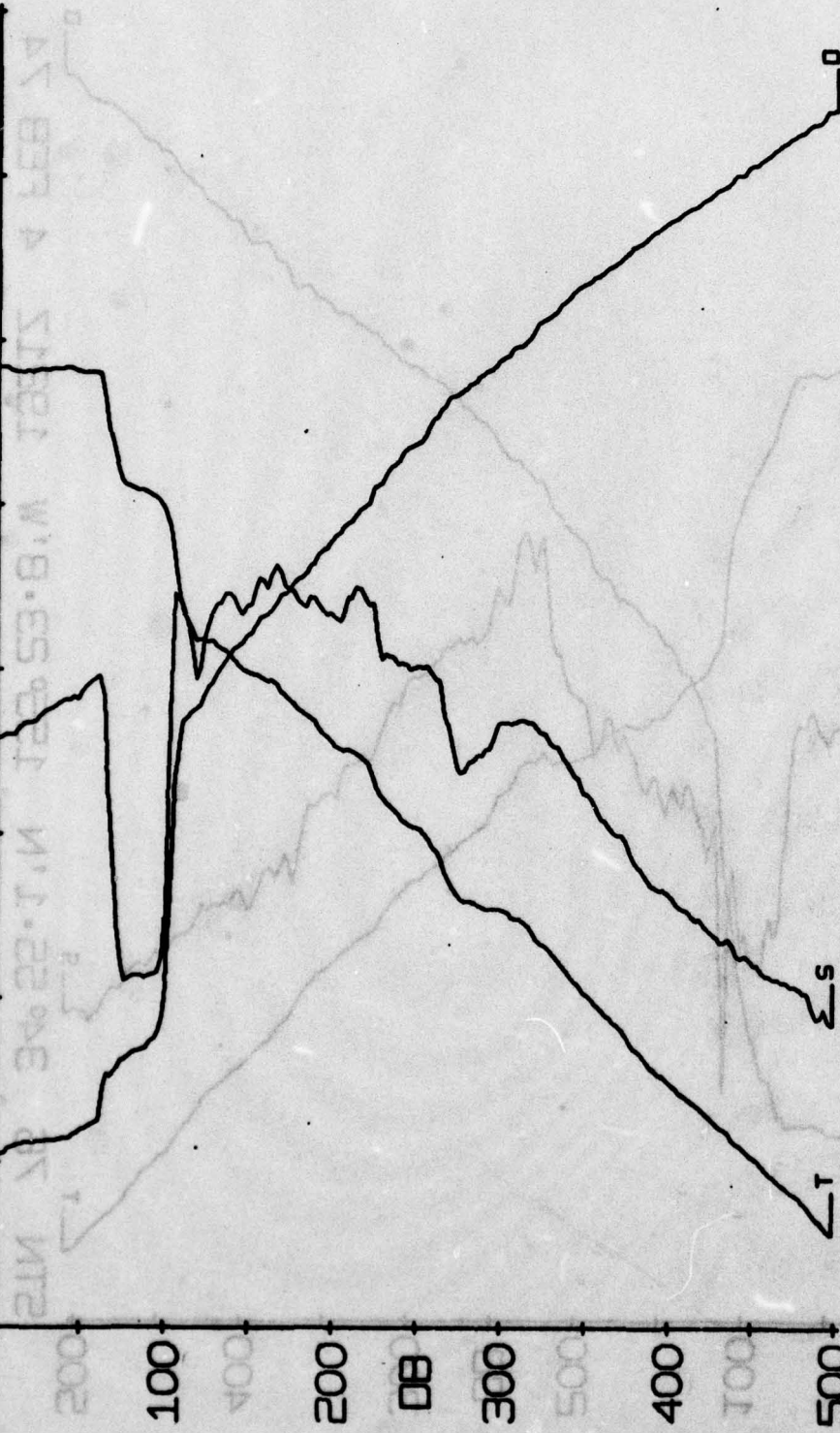
18 °C

15

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 77 35° 3.7'N 155° 23.3'W 2057Z 4 FEB 74

33.8 KG·M⁻³
34.2 ‰
26.0

33.8
34.2

33.8
34.2



18 °C

34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

6

33.8
25.2

100

200

300

400

500

DB

500

STN 78 35° 15.4' N 155° 25.0' W 2359Z 4 FEB 74

52.5
33.8

52.0
34.5

52.8
34.8

2

15

13.0



STN 80 35° 38.2'N 155° 17.3'W 0405Z 5 FEB 74

52.5 8.55
 52.8 34.5
 34.6 ‰
 26.8 KG-M-3

52.0 8.45
 34.5 ‰
 26.0

18 °C

15

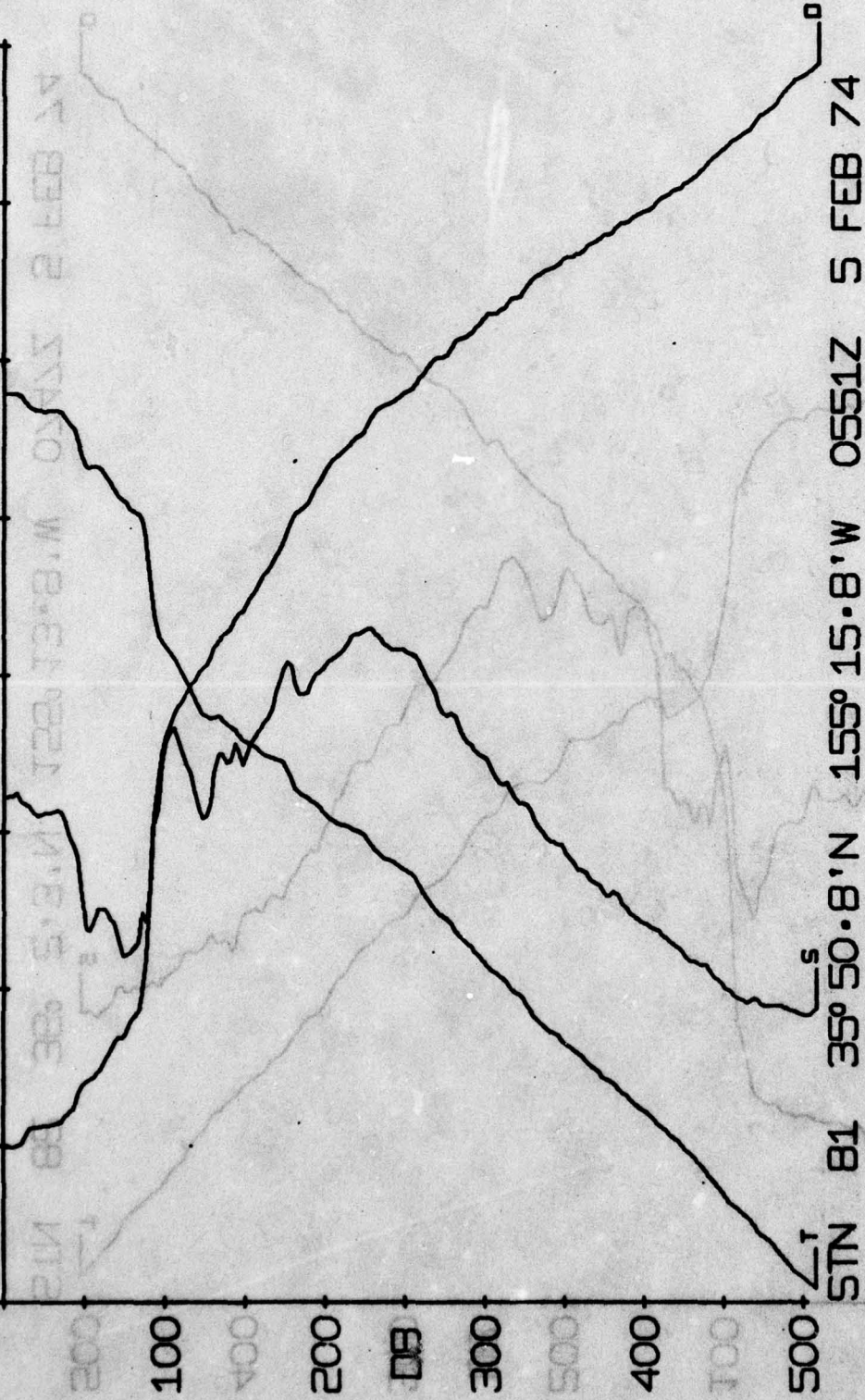
18 °C

81

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

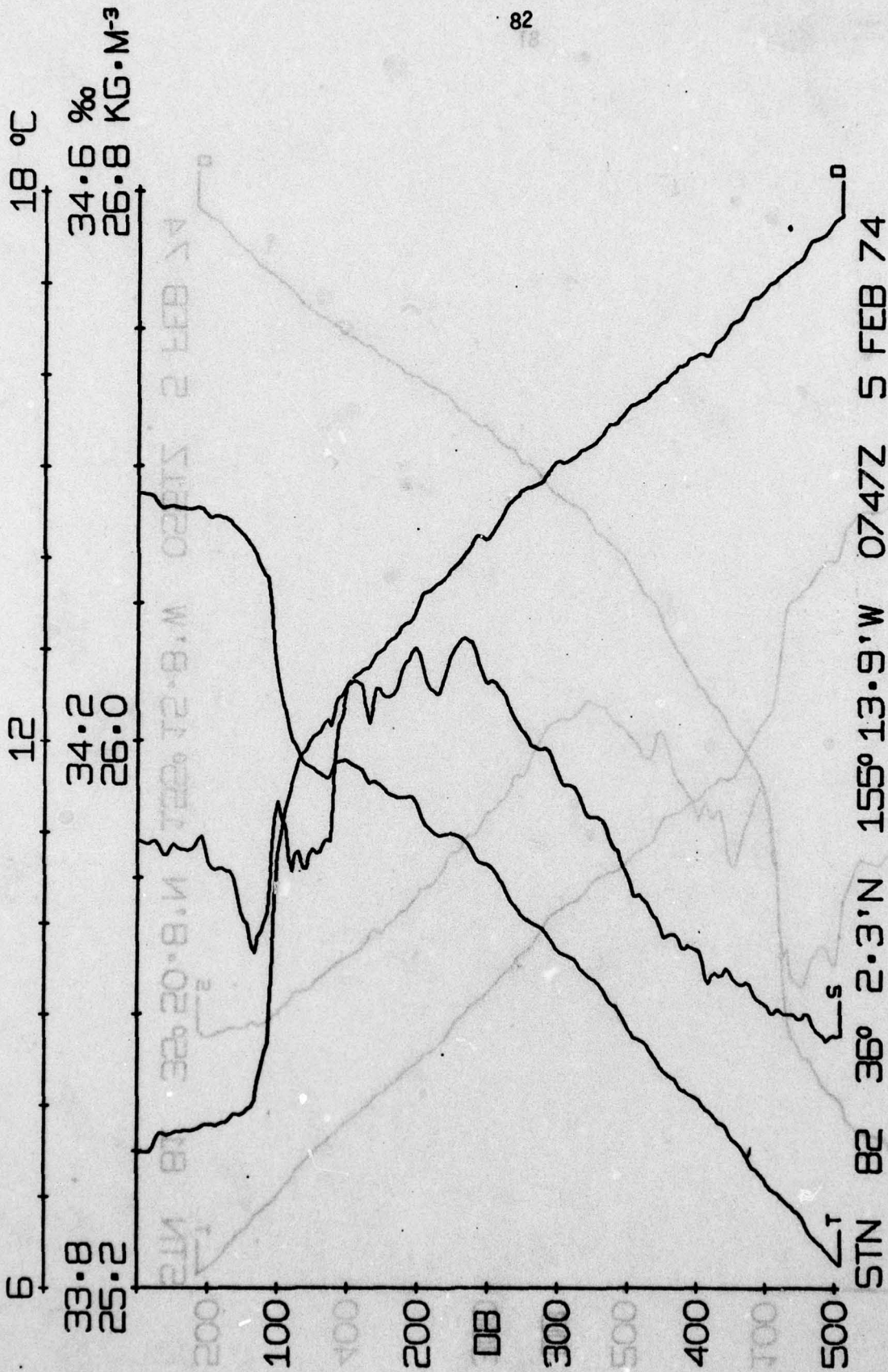
6
33.8
25.2



52.5
33.8
26.0

18 °C
34.6 ‰
26.8 KG·M⁻³

6
33.8
25.2



STN 82 36° 2.3'N 155° 13.9'W 0747Z 5 FEB 74

33.8 25.2

34.2 26.0

34.6 26.8

18 °C

12

6

33.8 25.2

34.2 26.0

34.6 26.8

18 °C

18 °C
34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

6

33.8
25.2



STN 83 35° 53.2' N 154° 54.1' W 1031Z 5 FEB 74

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6

2 FEB 74

1300

1200

1100

1000

900

800

200

100

400

200

DB

300

500

400

300

200

100

500

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

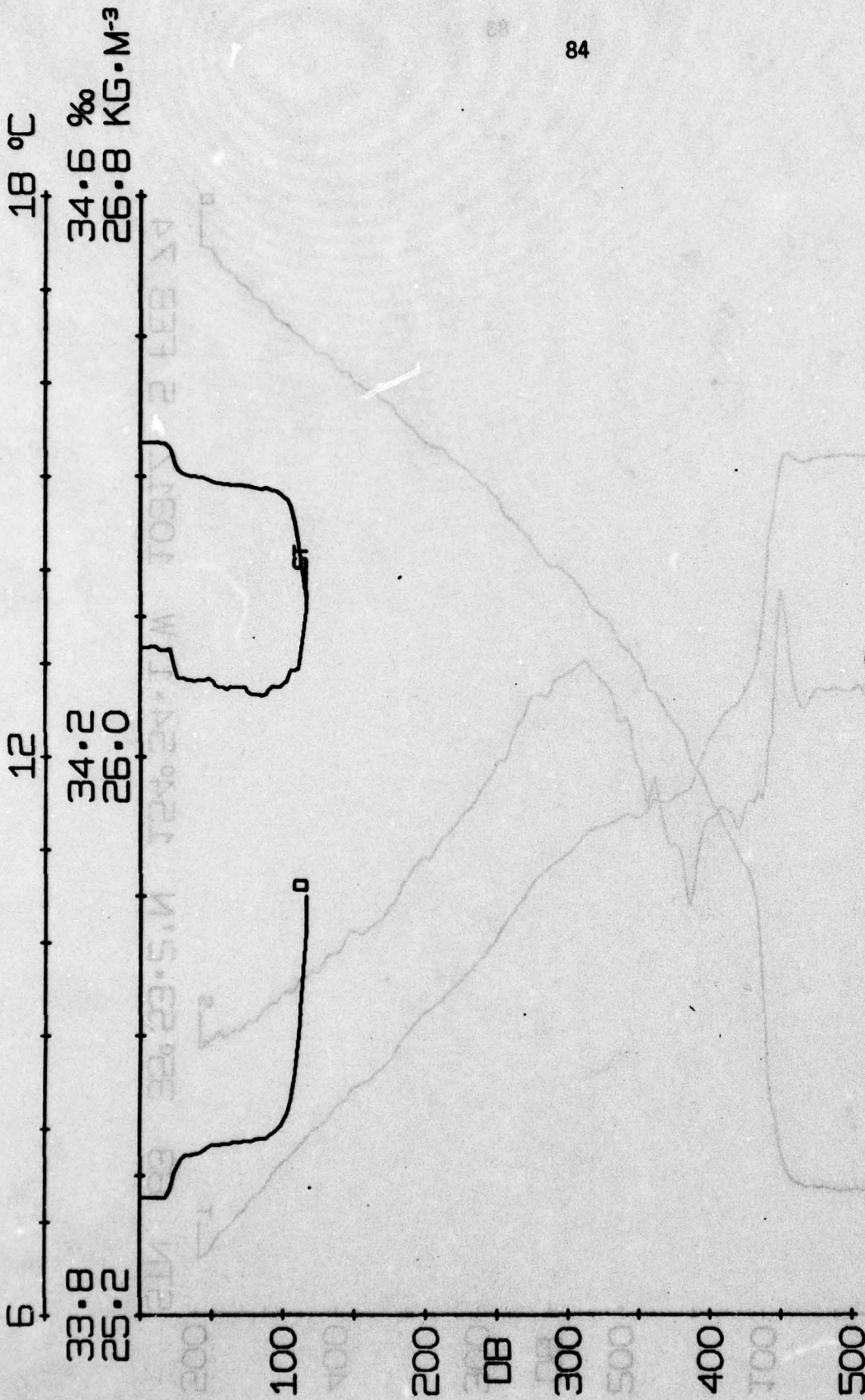
18 °C

12

6

2 FEB 74

</



STN 84 35° 43.6'N 154° 37.0'W 1306Z 5 FEB 74

52.5
33.8
52.8
34.2
52.8
34.2

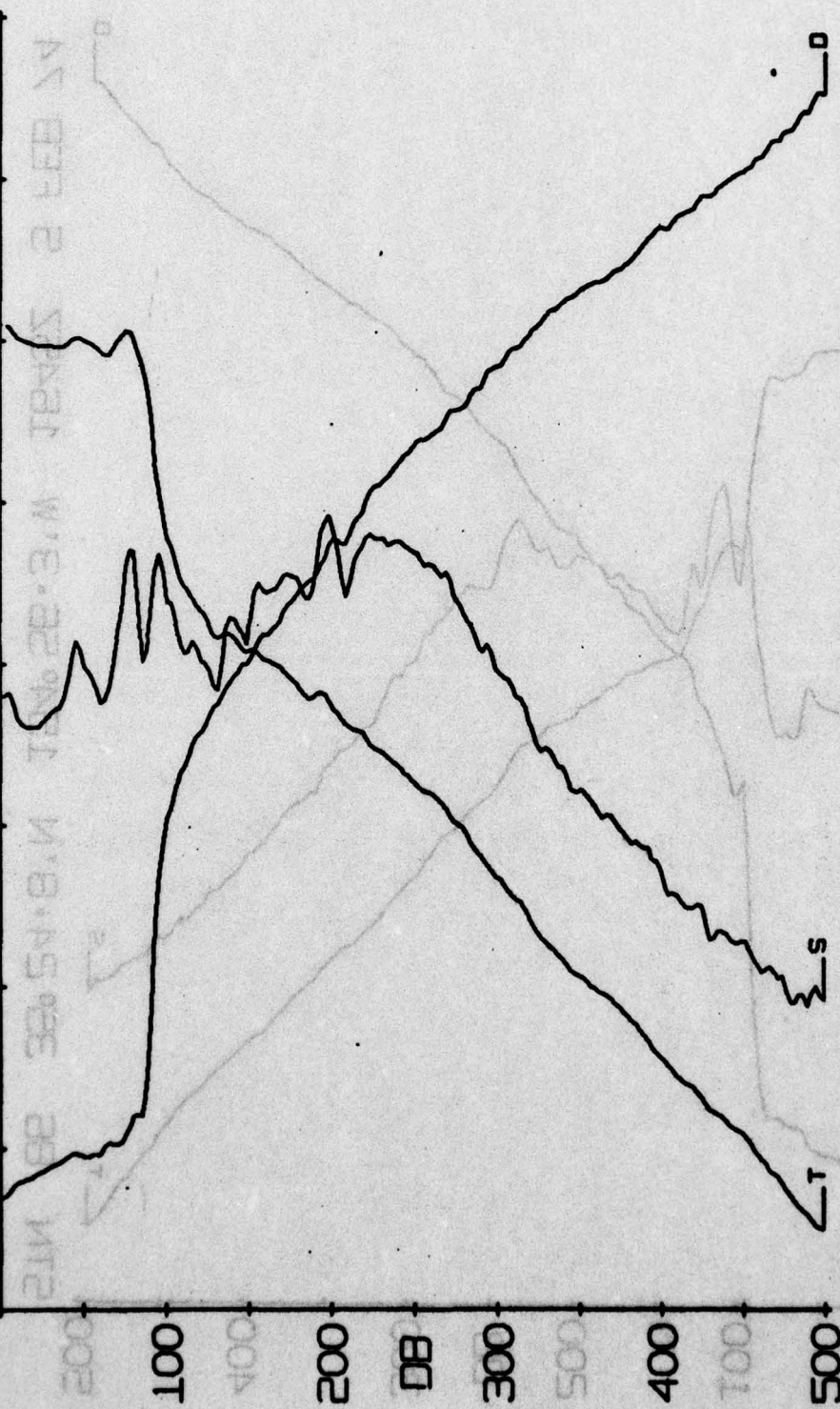
18 °C

15

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



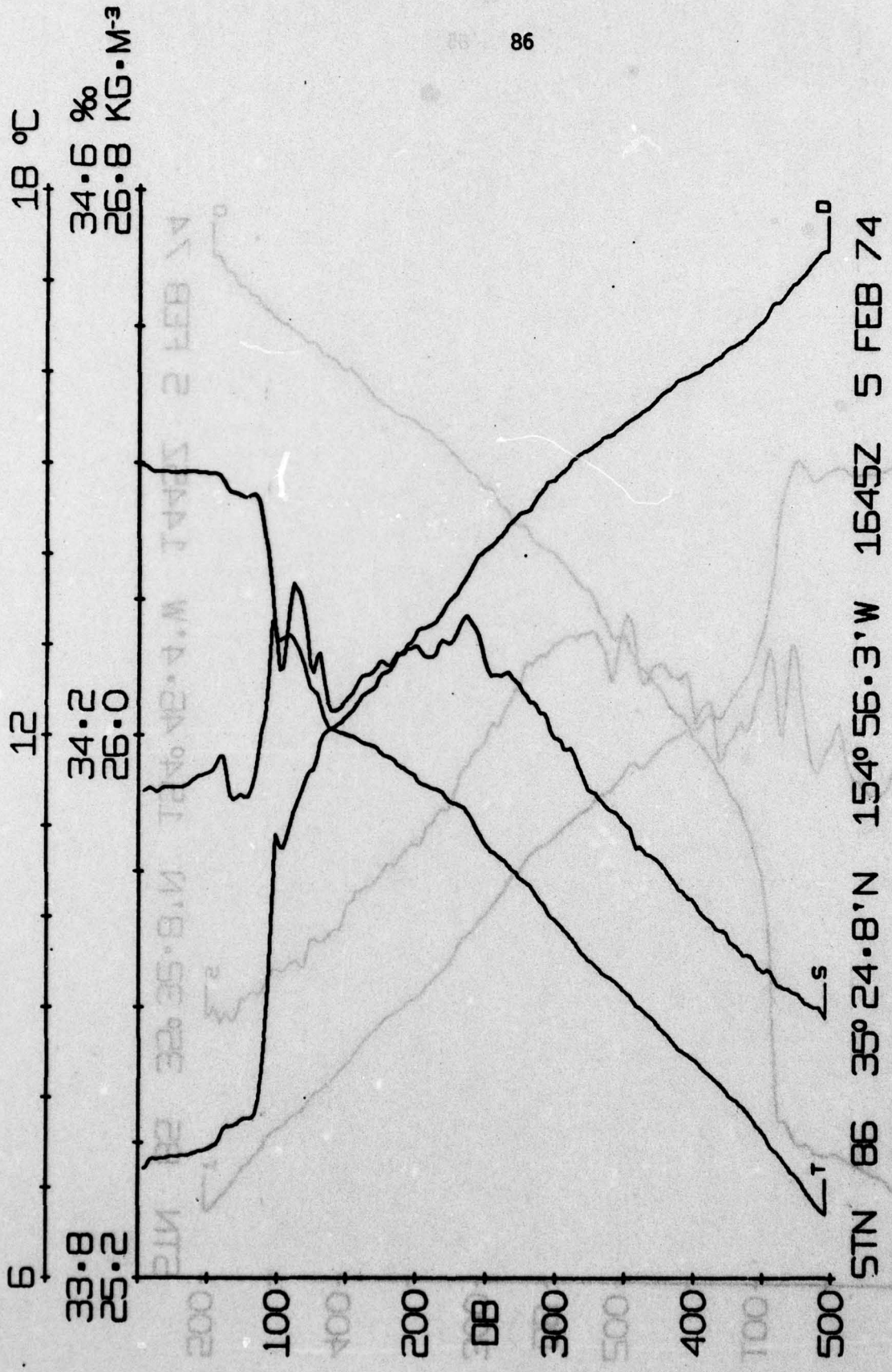
STN 85 35° 32.8' N 154° 46.4' W 1445Z 5 FEB 74

52.5
33.8
25.2

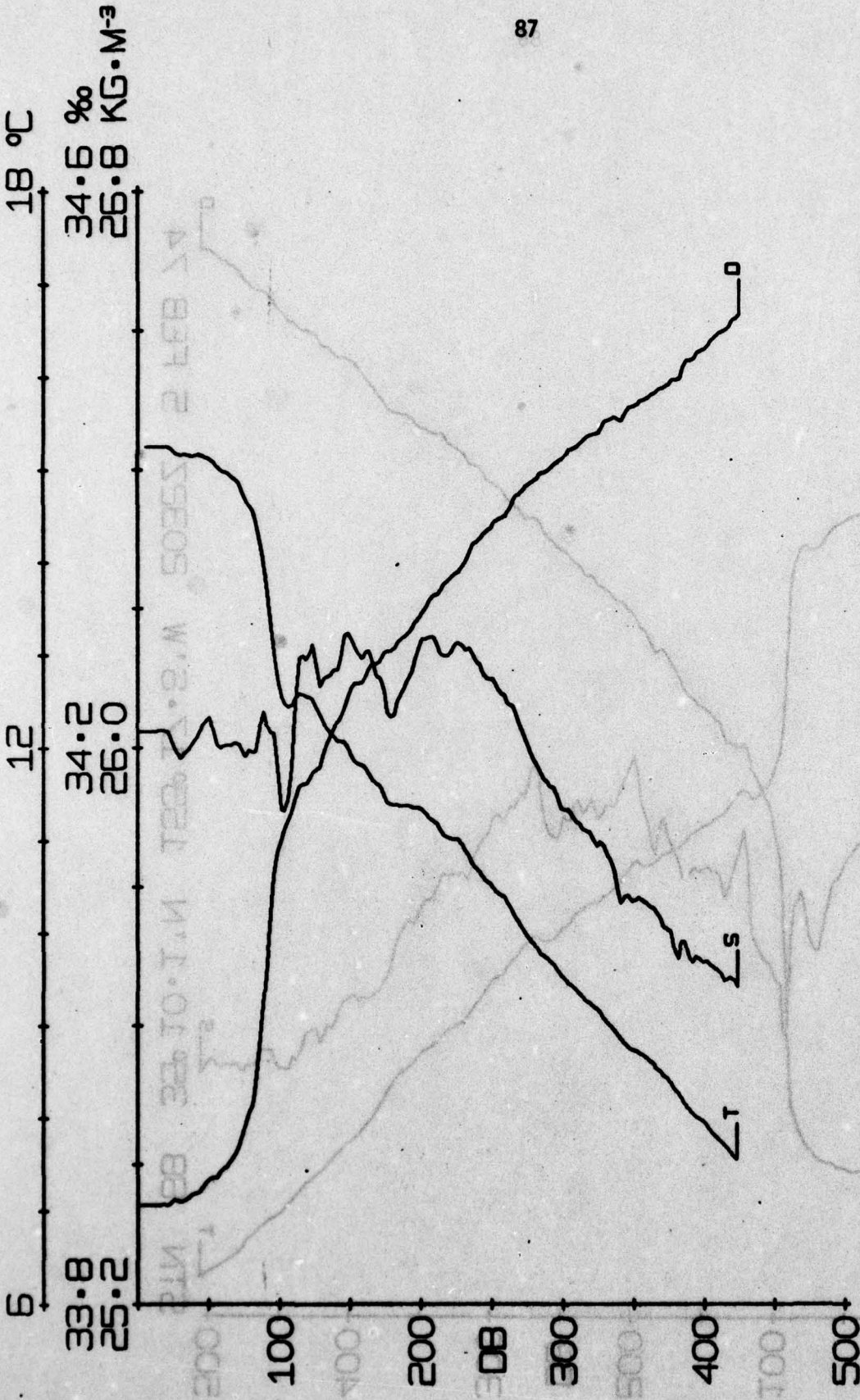
52.0
34.5
26.0

52.0
34.5
26.0

52.0
34.5
26.0



52.5
 33.8
 26.8
 34.2
 34.5
 26.8
 18 °C



STN 87 35° 16.6'N 155° 5.5'W 1849Z 5 FEB 74

33.8
25.2

18 °C

12

34.2
26.0

6

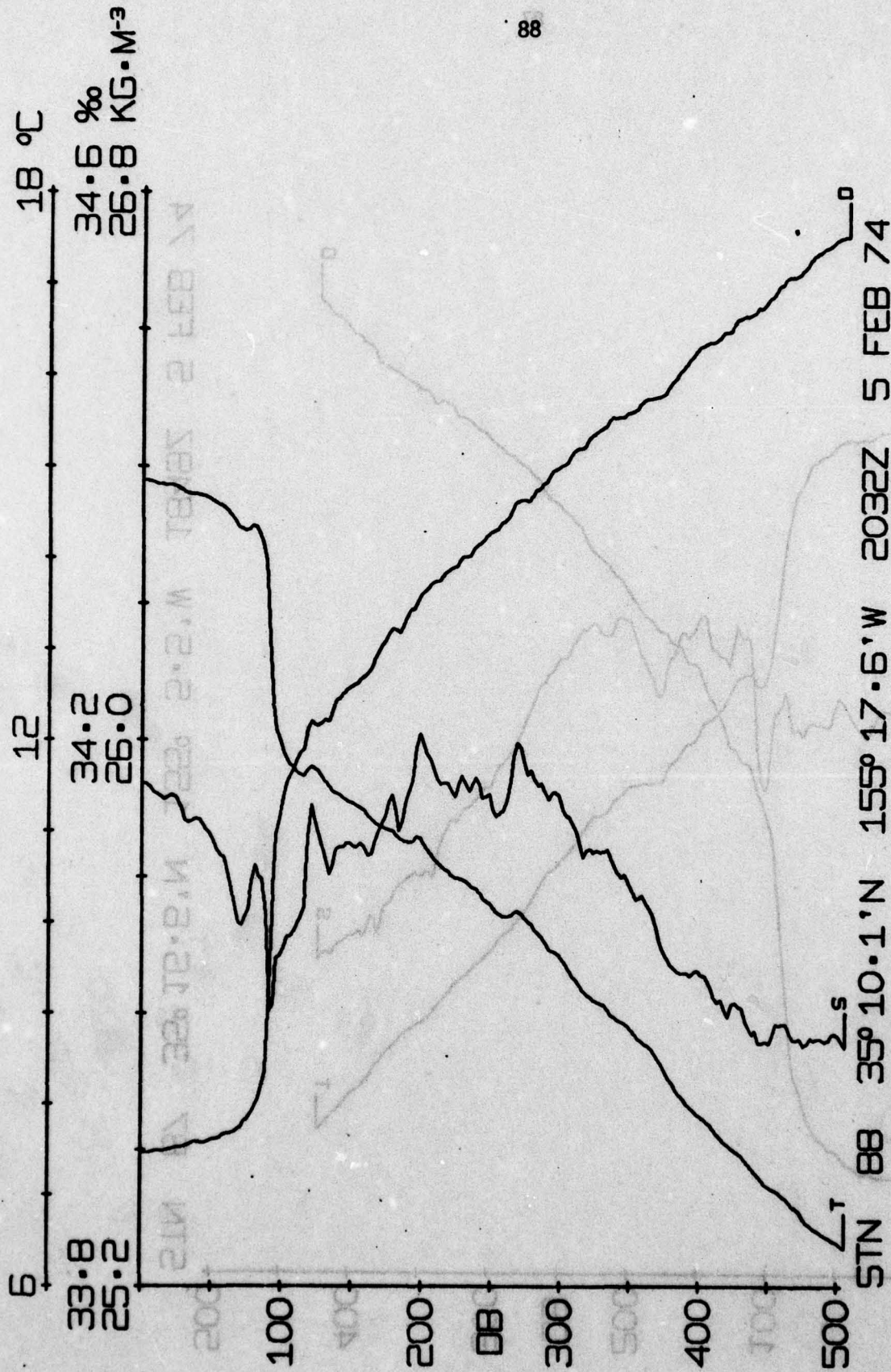
52.5
33.8

52.0
34.5

52.8 kg·m⁻³
34.2 ‰

18 °C

15



52.5 33.8
 52.8 34.6
 52.8 34.6
 75

18 °C

34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

6

33.8
25.2



STN 89 35° 3.2' N 155° 26.0' W 2249Z 5 FEB 74

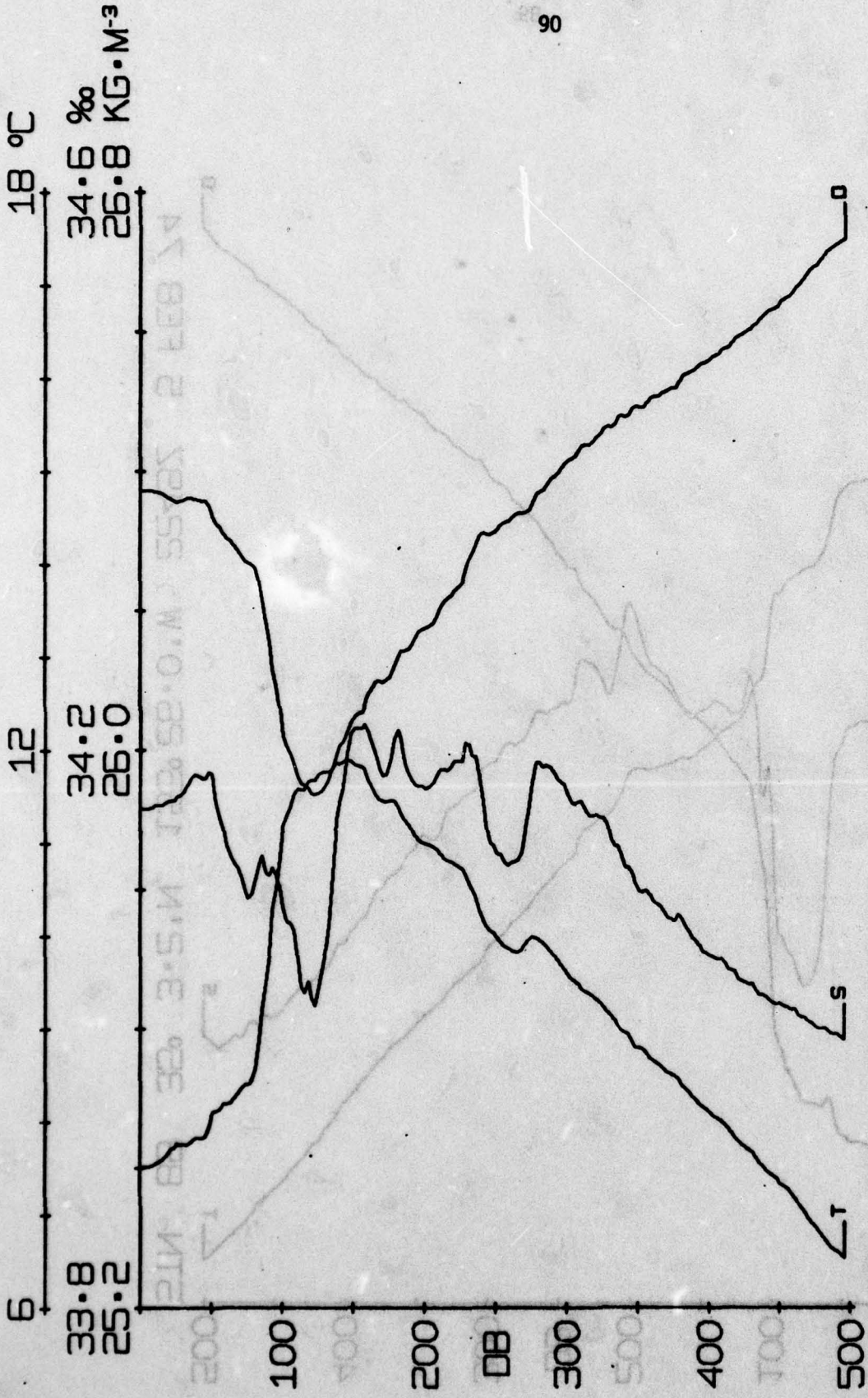
89

33.8
25.2

34.2
26.0

34.6
26.8

18 °C



STN 90 34° 54.8' N 155° 35.5' W 0036Z 6 FEB 74

52.5
33.8
52.8 KG·M⁻³
34.2 ‰
26.0

50.0
34.5
51.5

TB dC

18 °C

34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

6

33.8
25.2



STN 91 34° 46.1' N 155° 45.1' W 0225Z 6 FEB 74

33.8
25.2

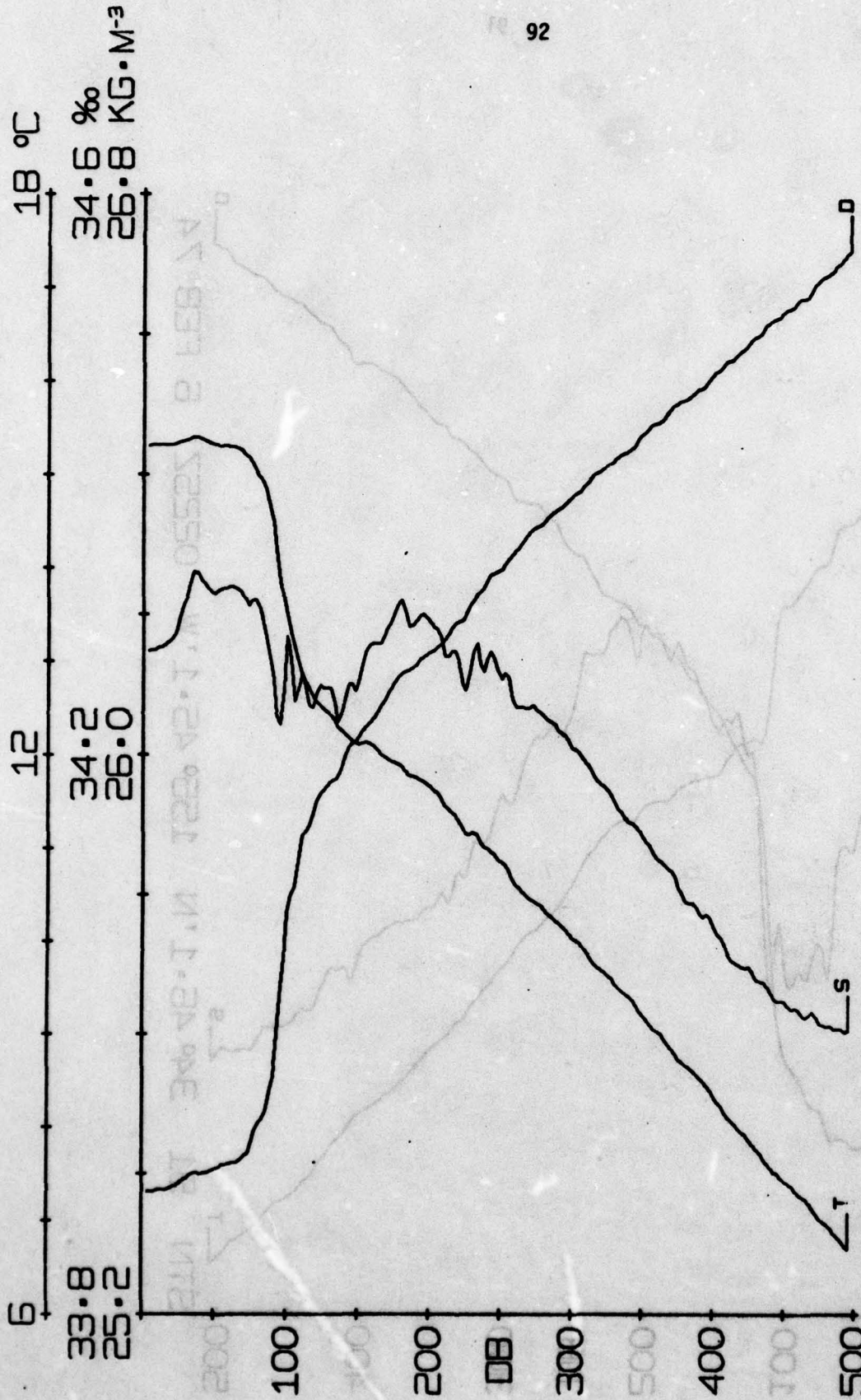
34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6



STN 92 34° 38.5' N 155° 53.9' W 0428Z 6 FEB 74

52.5 33.8 26.0
 52.8 34.2 26.0
 18 °C

18 °C

12

6

34.6 ‰
26.8 KG·M⁻³

34.2
26.0

STN 93 34° 31.6' N 156° 2.9' W 0618Z 6 FEB 74

52.5
33.8

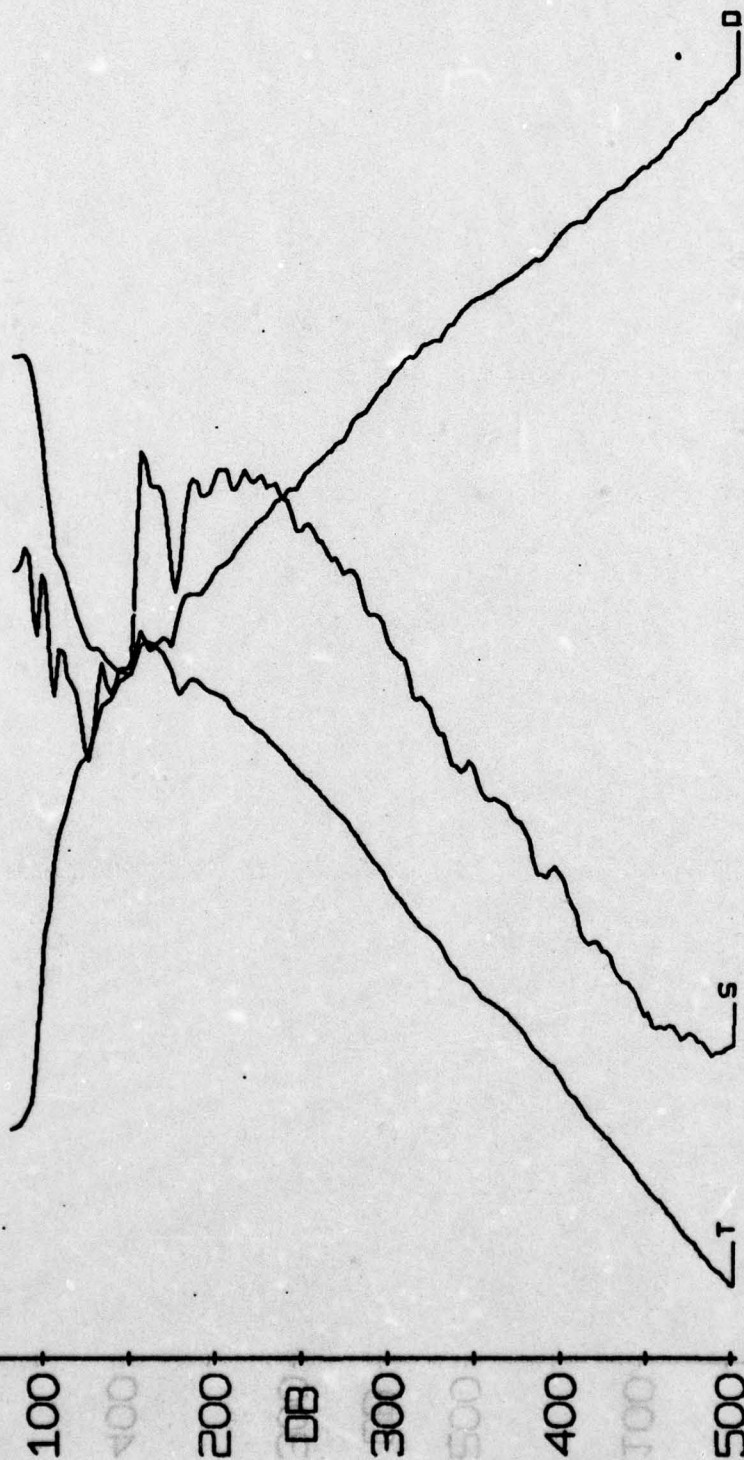
52.8 KG·M⁻³
34.2 ‰

211 24 34 53 2.4 128.75 4.1 M 080BS 2 FEB 74

200 100 400 200 DB 300 500 400 100 500

52.5
33.8

18 °C



STN 93 34° 31.6' N 156° 2.9' W 0618Z 6 FEB 74

52.5
33.8

52.8 KG·M⁻³
34.2 ‰

211 24 34 53 2.4 128.75 4.1 M 080BS 2 FEB 74

200 100 400 200 DB 300 500 400 100 500

52.5
33.8

18 °C

AD-A069 062

SCRIPPS INSTITUTION OF OCEANOGRAPHY LA JOLLA CALIF
VERTICAL PROFILES OF TEMPERATURE, SALINITY AND DENSITY FROM THE--ETC(U)
APR 79 R A KNOX, M J MCPHADEN

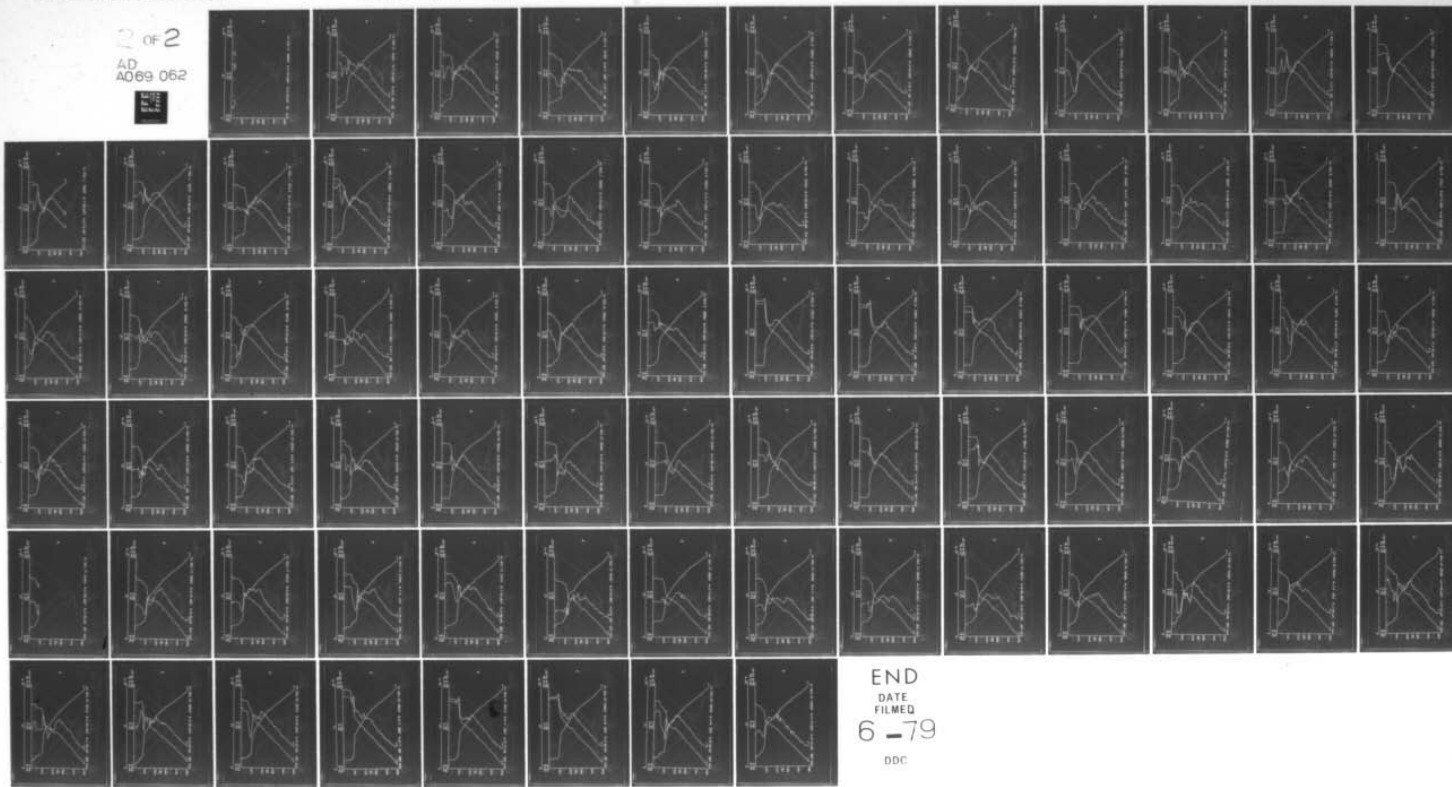
F/G 8/10

UNCLASSIFIED

SIO-REF-79-6

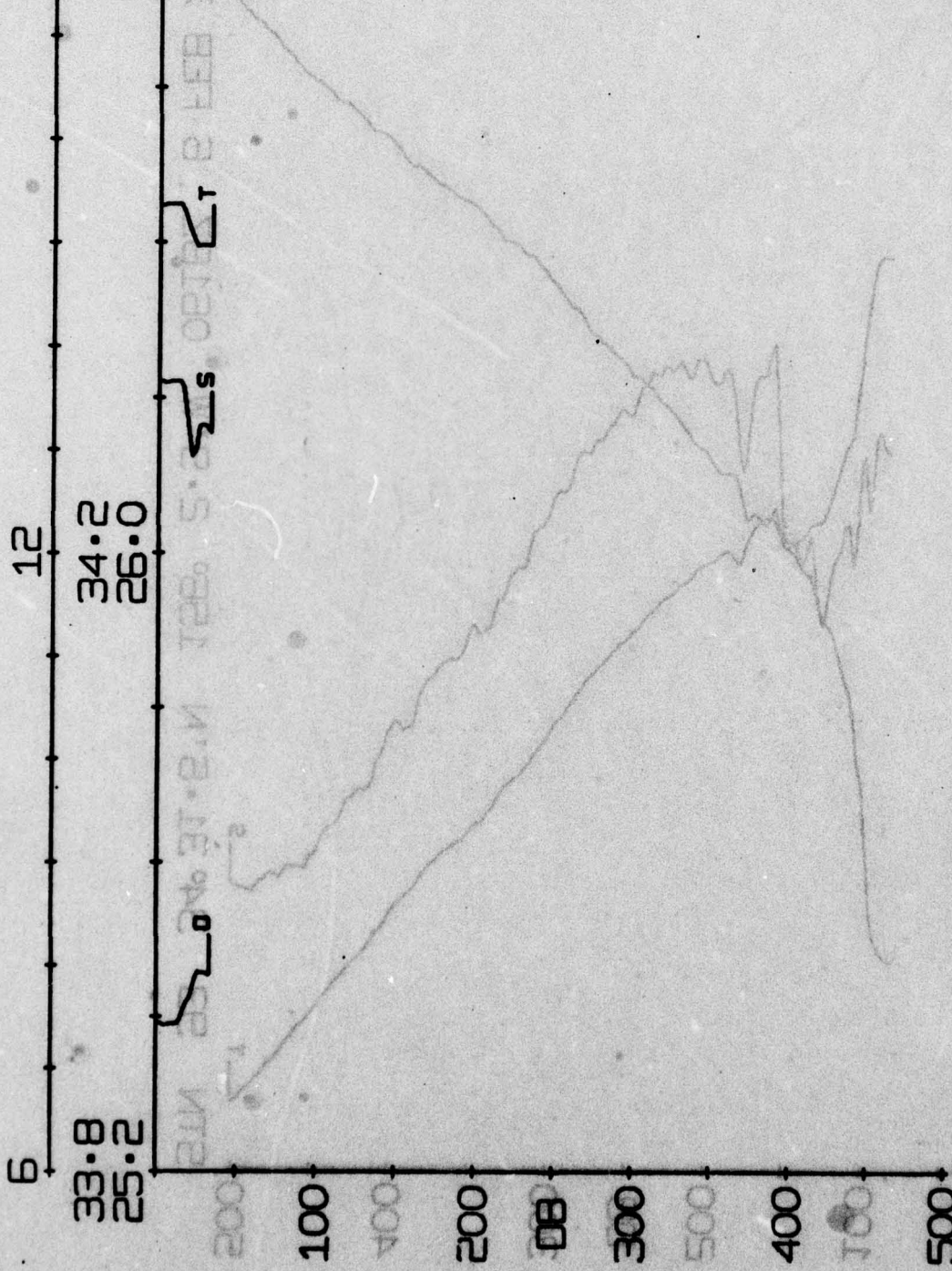
NL

2 of 2
AD
A069 062



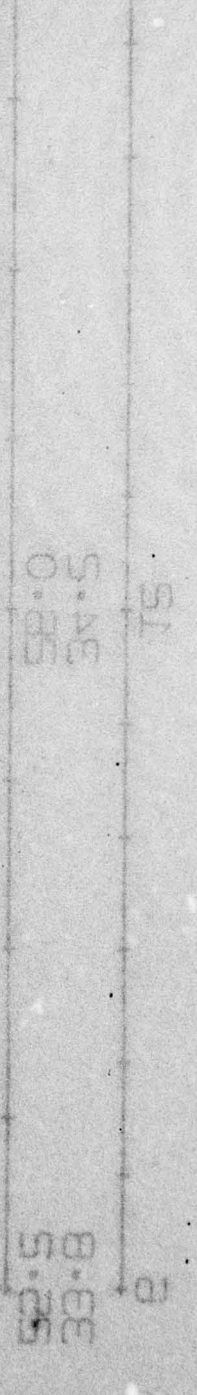
END
DATE
FILMED
6 -79
DDC

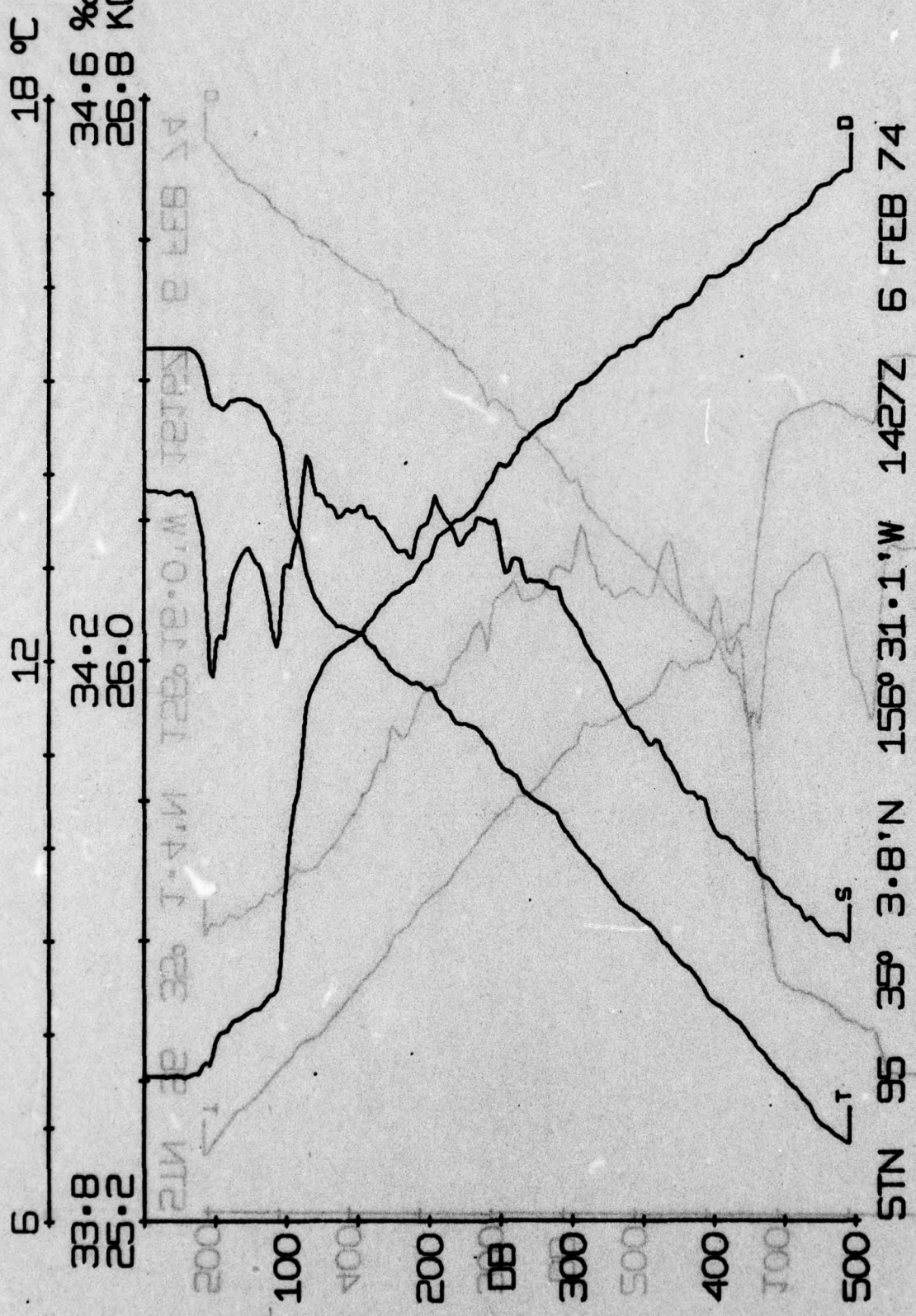
6 12 18 °C
33.8 34.6 ‰
25.2 26.8 KG·M⁻³



STN 94 34° 23.5' N 156° 12.4' W 0808Z 6 FEB 74

52.5 58.0
33.8 34.5
25.2 26.8



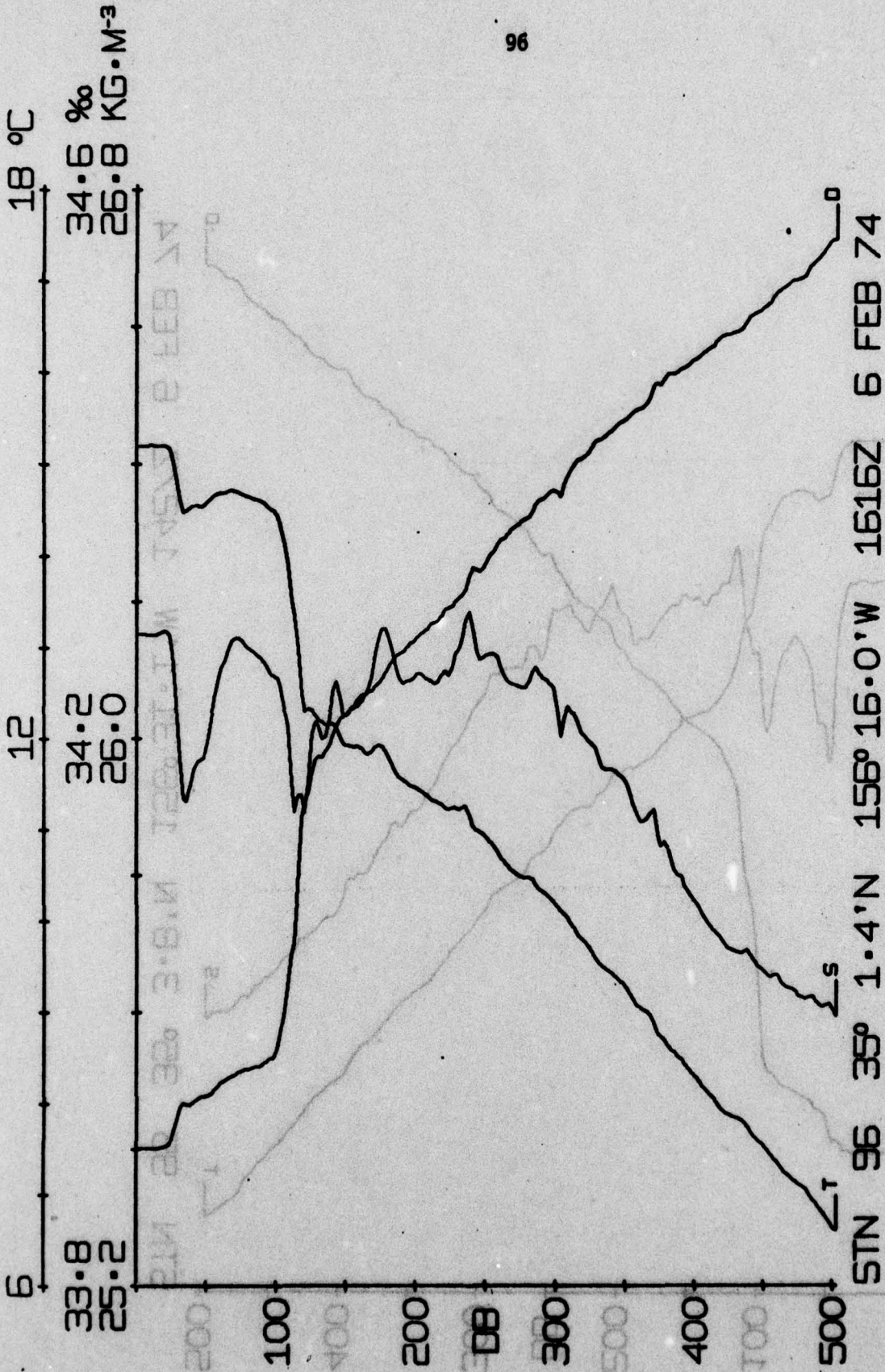


STN 95 35° 3.8' N 156° 31.1' W 1427Z 6 FEB 74

33.8 34.2 34.6

25.2 26.0 26.8

KG·M⁻³



52.5
33.8

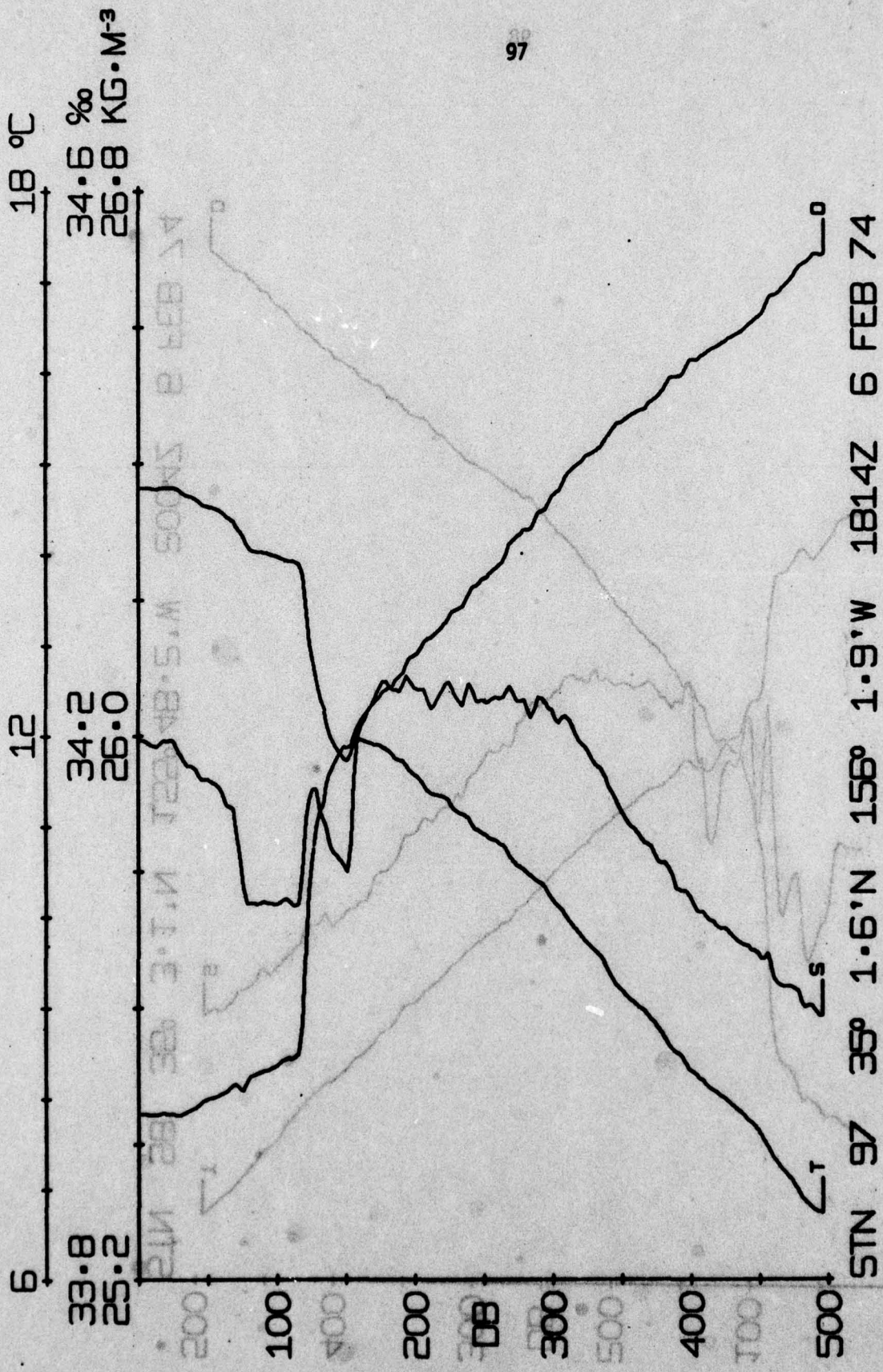
52.0
34.5

52.8 KG·M⁻³
34.2 ‰

18 °C

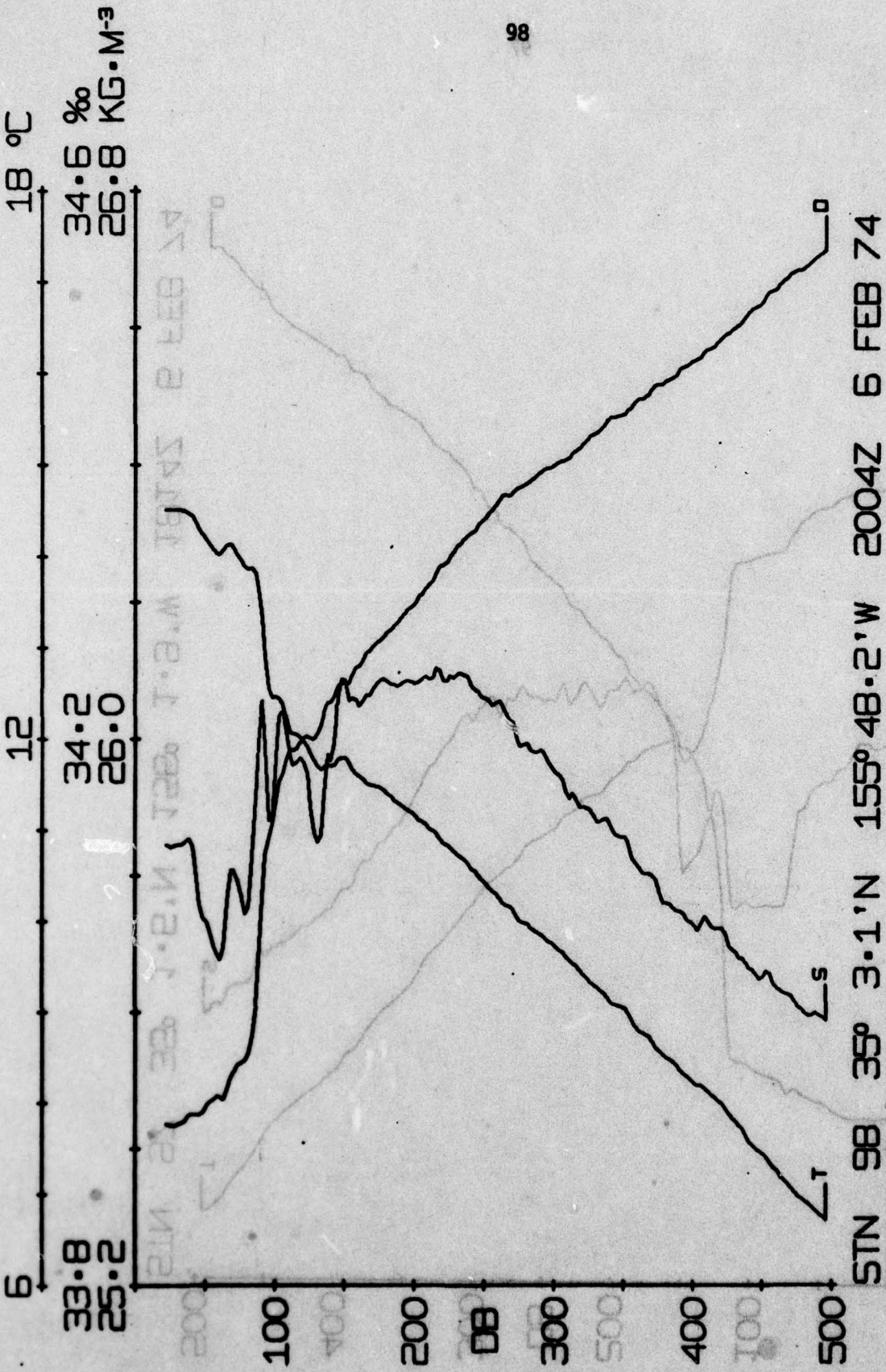
15

0



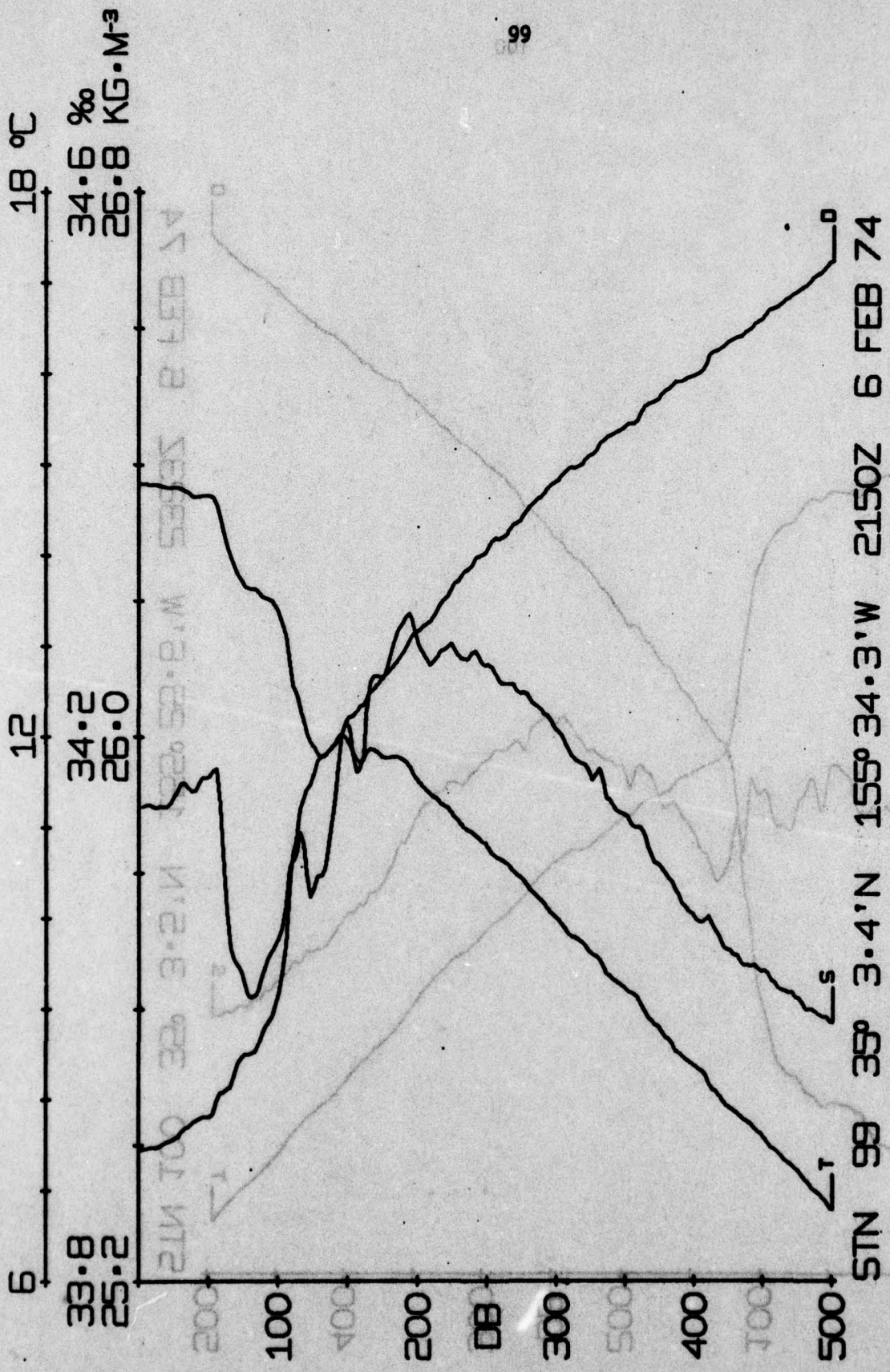
STN 97 35° 1.6'N 156° 1.9'W 1814Z 6 FEB 74

52.5 33.8 26.0
 52.8 34.5 26.8
 KG·M⁻³ ‰



98

52.5
 33.8
 52.0
 34.5
 52.8 KG·M⁻³
 34.8 ‰
 26.8
 15



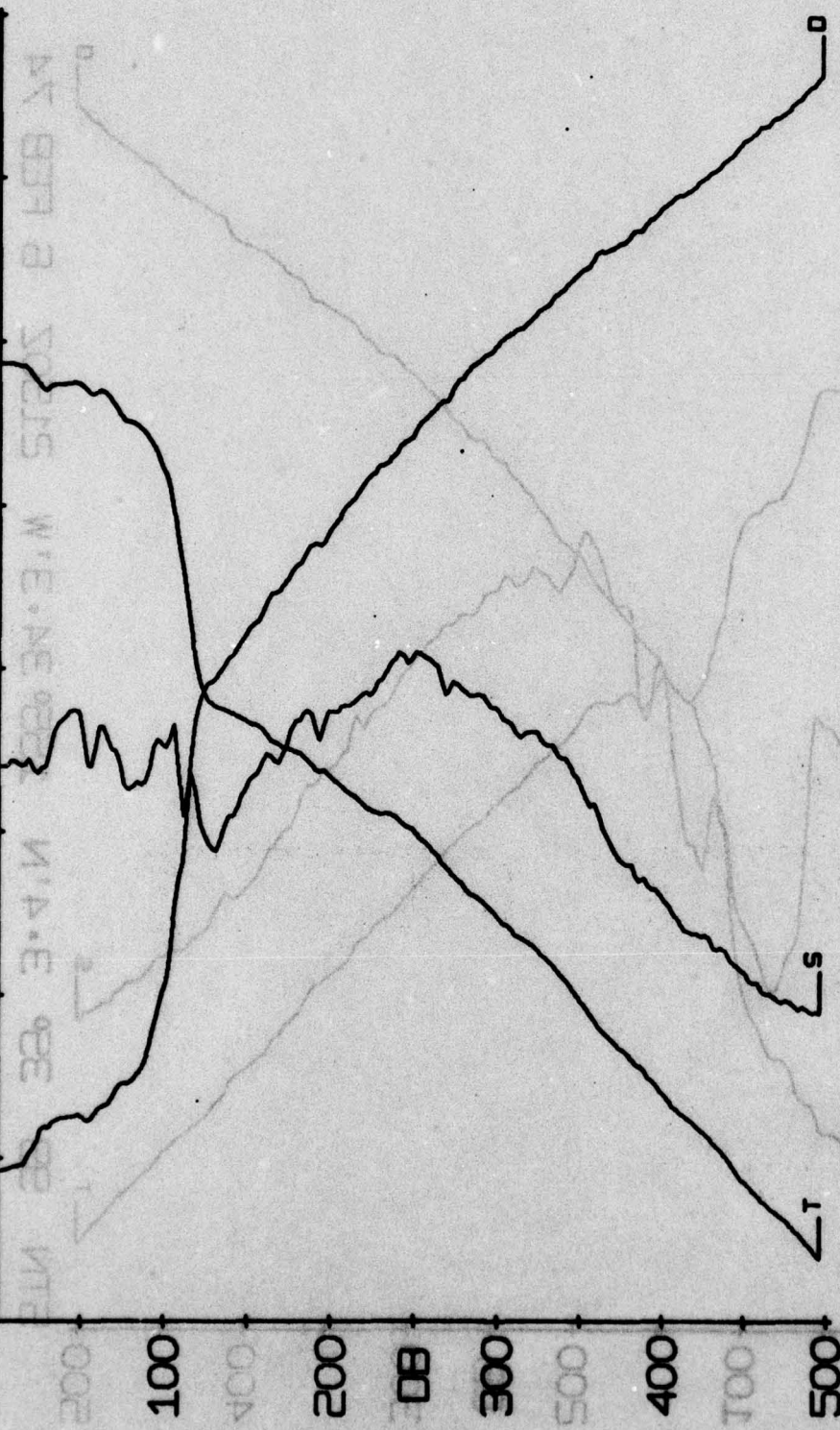
52.5
 33.8
 52.0
 34.5
 52.8
 34.8
 52.8
 34.8
 52.8
 34.8

18 °C
34.6 ‰
26.8 KG·M⁻³

100

12
34.2
26.0

6
33.8
25.2



STN 100 35° 3.5'N 155° 25.6'W 2323Z 6 FEB 74

52.5
33.8
52.8 KG·M⁻³
34.2 ‰

18 °C

12

6

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 101 35° 4.3'N 155° 11.0'W 0231Z 7 FEB 74

52.5
33.8
26.0

52.0
34.5
26.5

52.5
33.8
26.0

18 °C

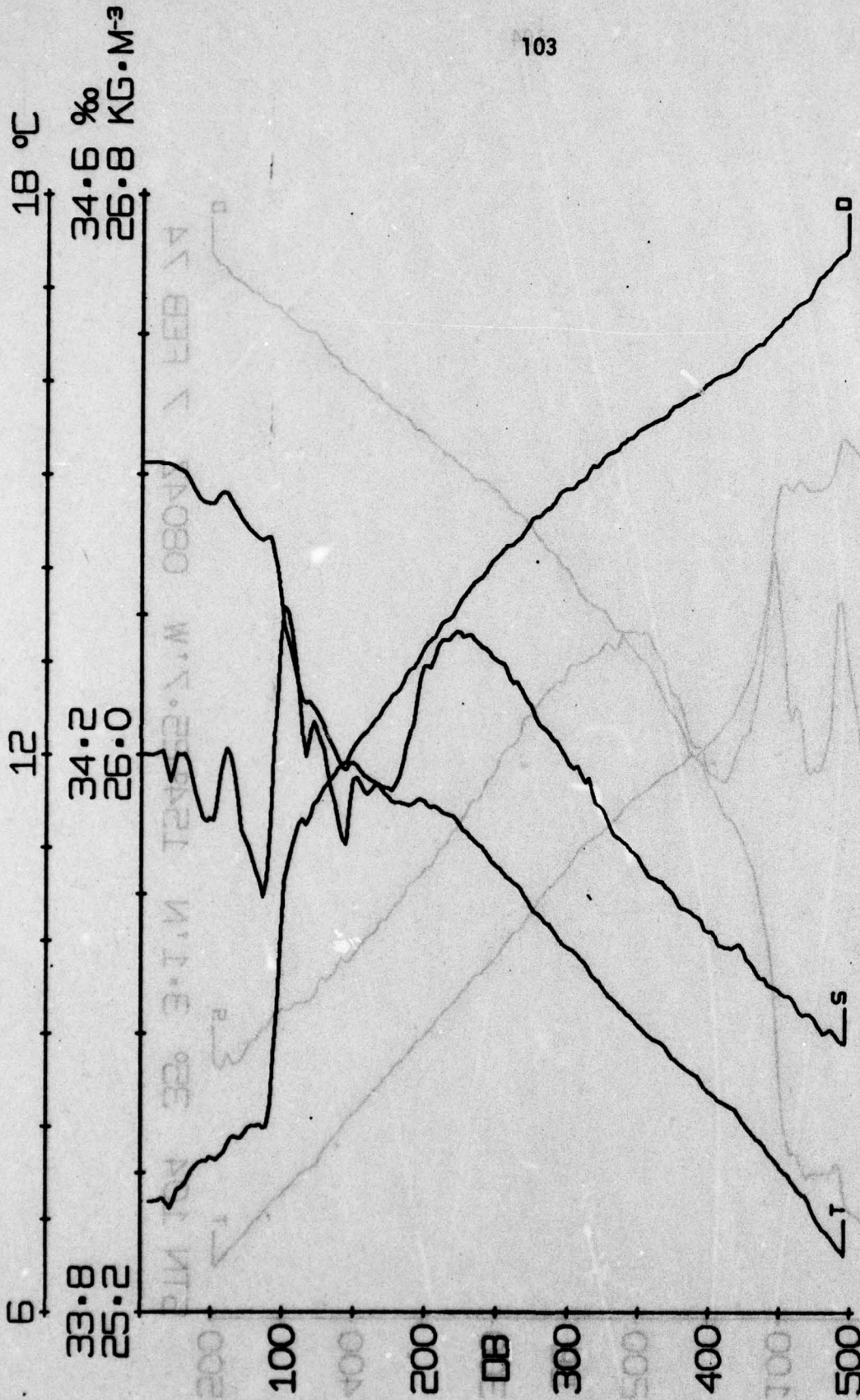
15

2



STN 102 35° 6.4'N 154° 52.9'W 0411Z 7 FEB 74

52.8 KG·M⁻³
 34.2 ‰
 26.8 °C

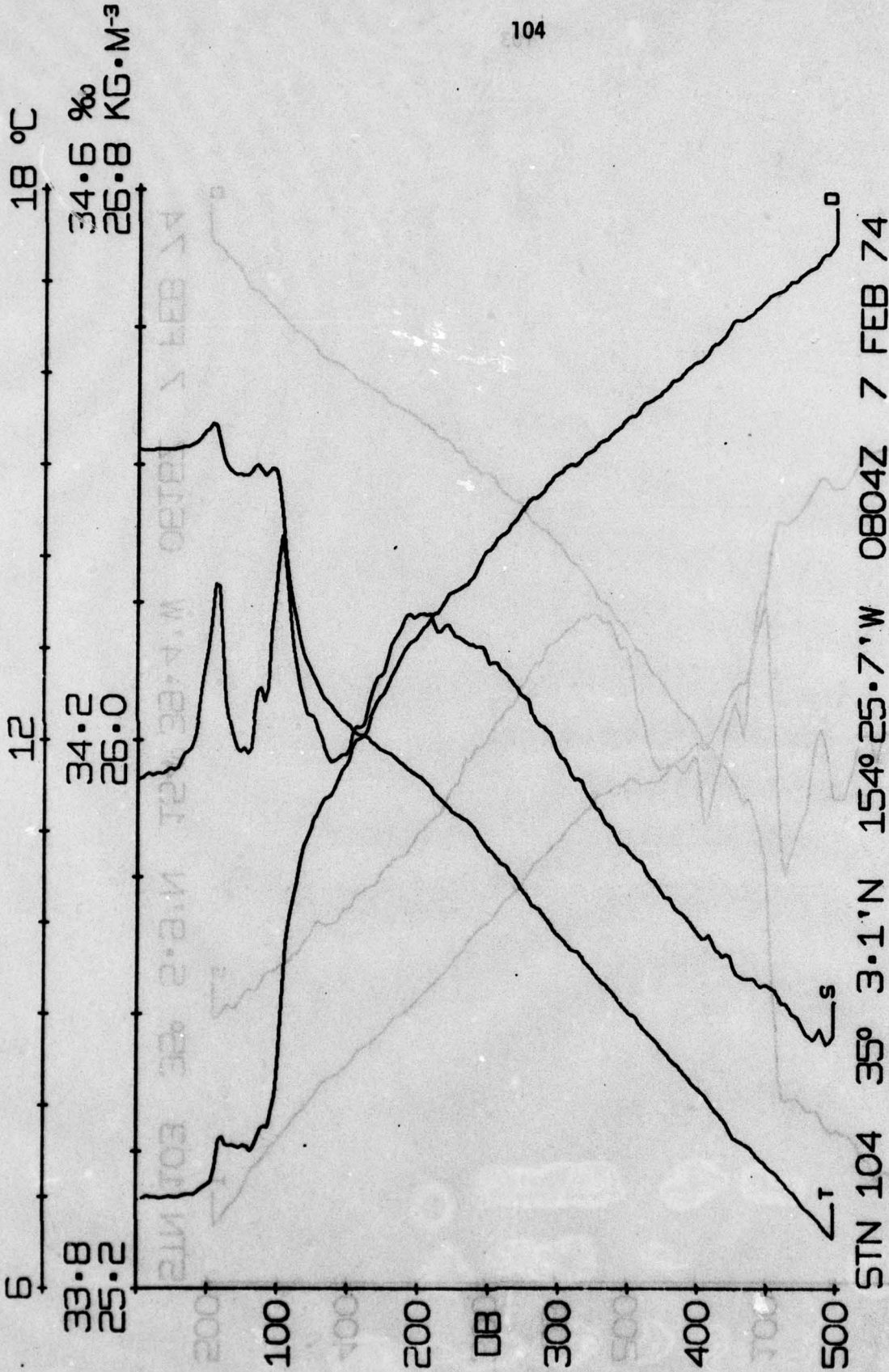


STN 103 35° 5.9'N 154° 39.4'W 0616Z 7 FEB 74

52.8 KG·M⁻³
34.8 ‰
TB °C

52.0
34.5

52.5
33.8



58.8 KG·M⁻³
34.6 ‰
T8 °C

58.0
34.5
T5

58.5
34.8

18 °C

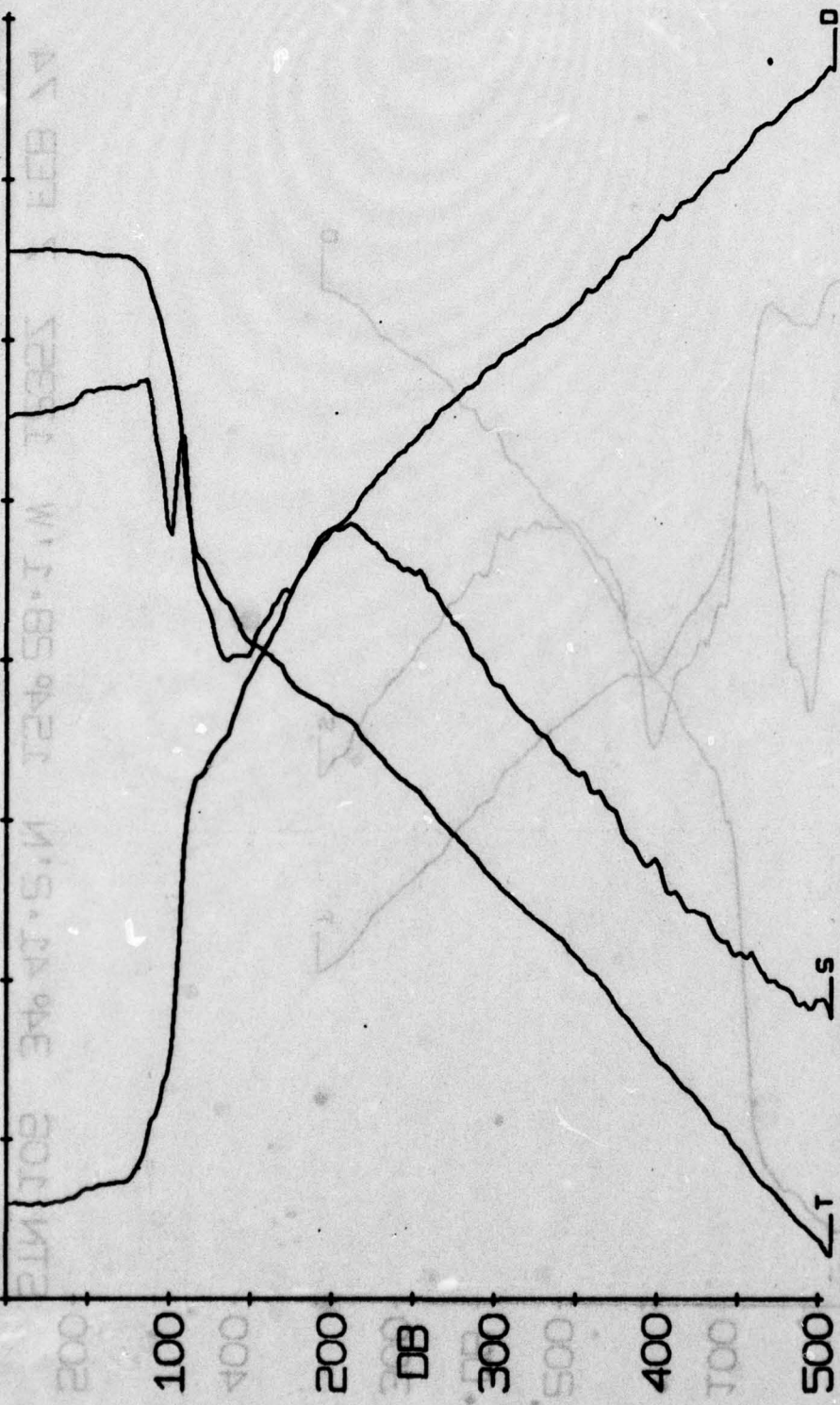
34.6 ‰
26.8 KG·M⁻³

12

34.2 ‰
26.0

6

33.8 ‰
25.2



105

STN 105 35° 2.5'N 154° 18.2'W 0918Z 7 FEB 74

52.5 ‰
33.8

52.0 ‰
34.5

52.5 ‰
33.8

18 °C

12

6

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 106 34° 41.2'N 154° 28.1'W 1235Z 7 FEB 74

33.8
25.2

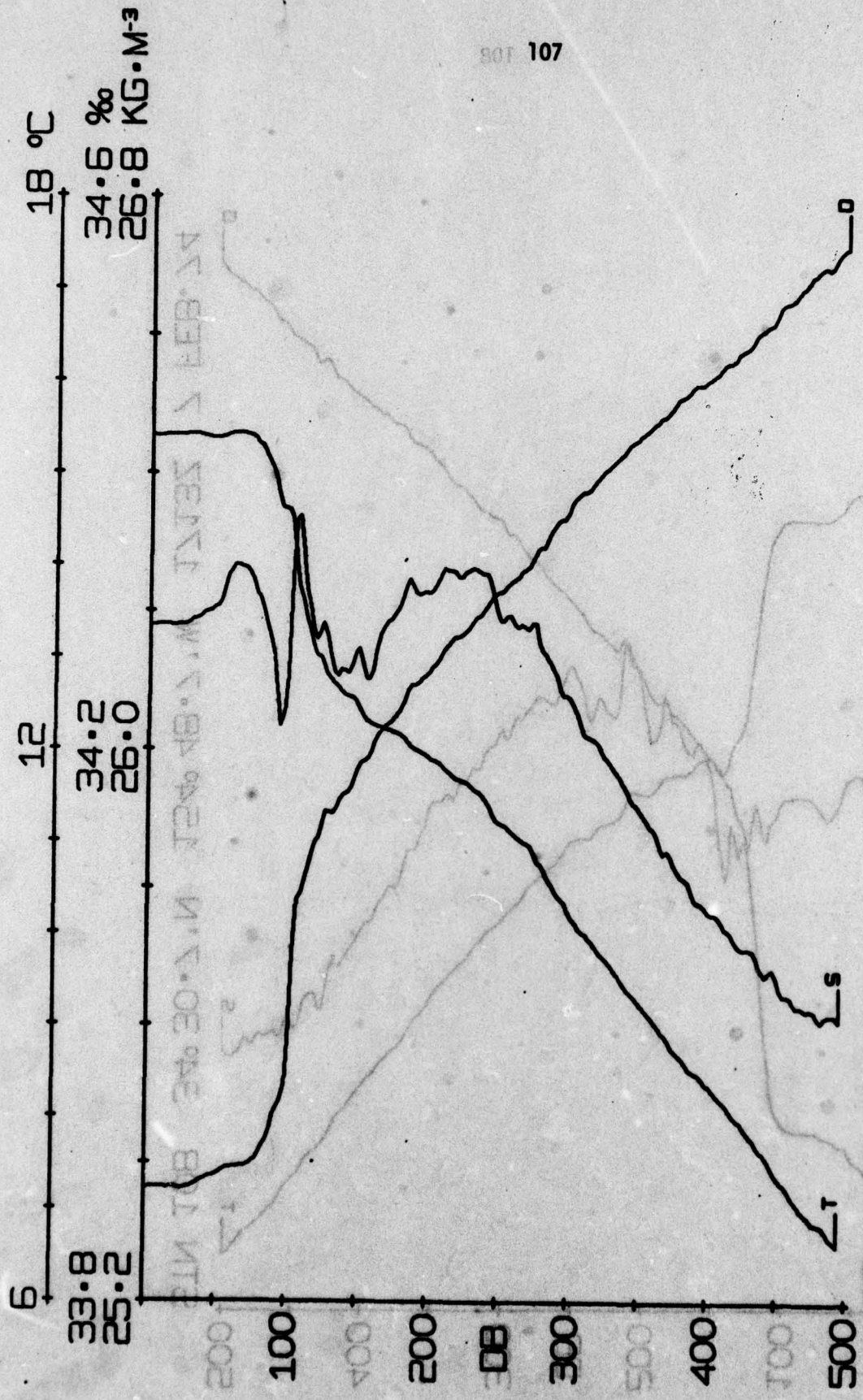
34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6



STN 107 34° 23.0'N 154° 38.3'W 1513Z 7 FEB 74

801 107

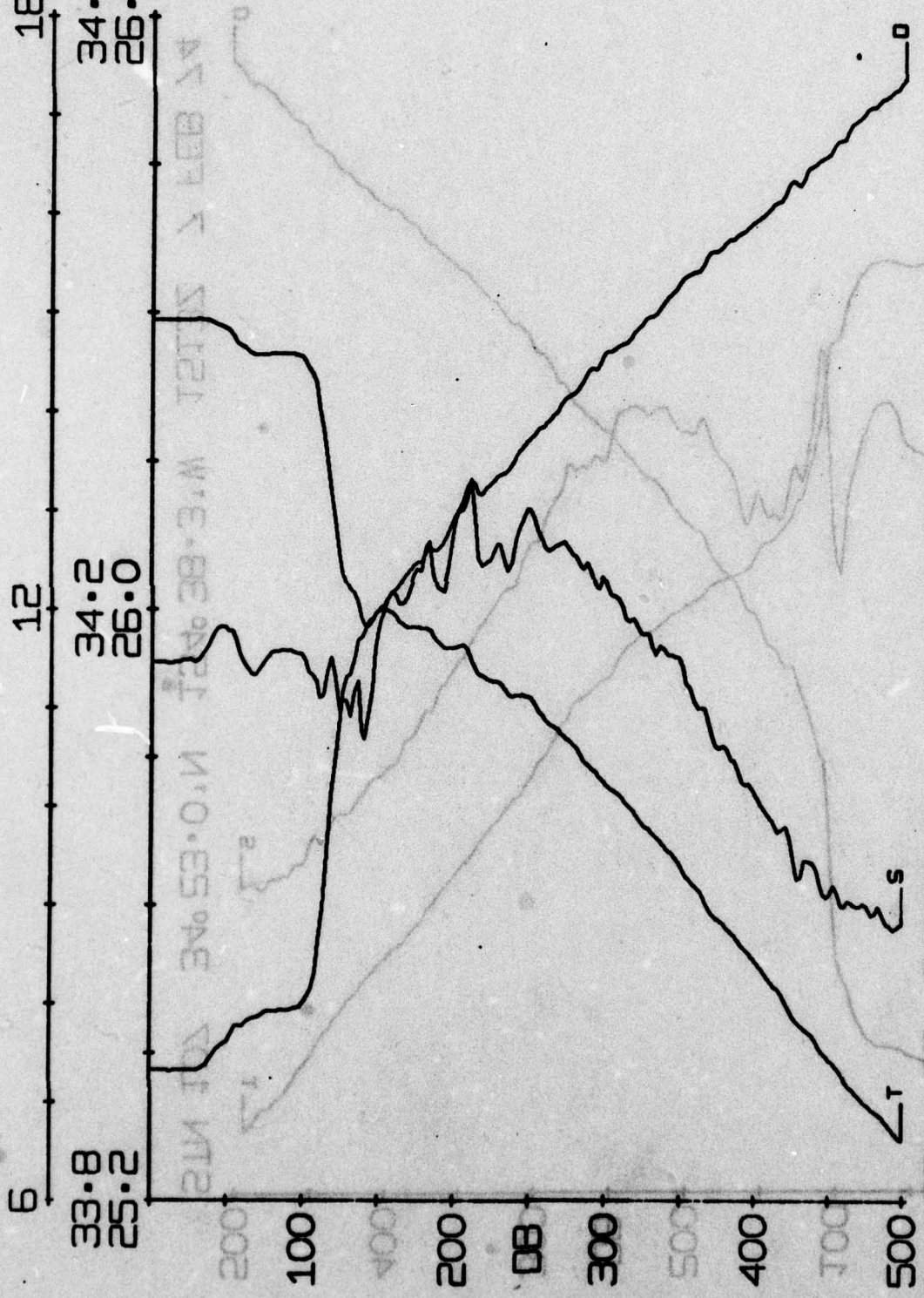
52.5
 33.8
 26.0
 34.5
 26.8 kg·m⁻³

52.5
 34.5
 26.0

18 °C

6 12 18 °C

33.8 34.6 ‰
25.2 26.8 KG·M⁻³



STN 108 34° 30.7' N 154° 48.7' W 1713Z 7 FEB 74

33.8 34.6 ‰
25.2 26.8 KG·M⁻³

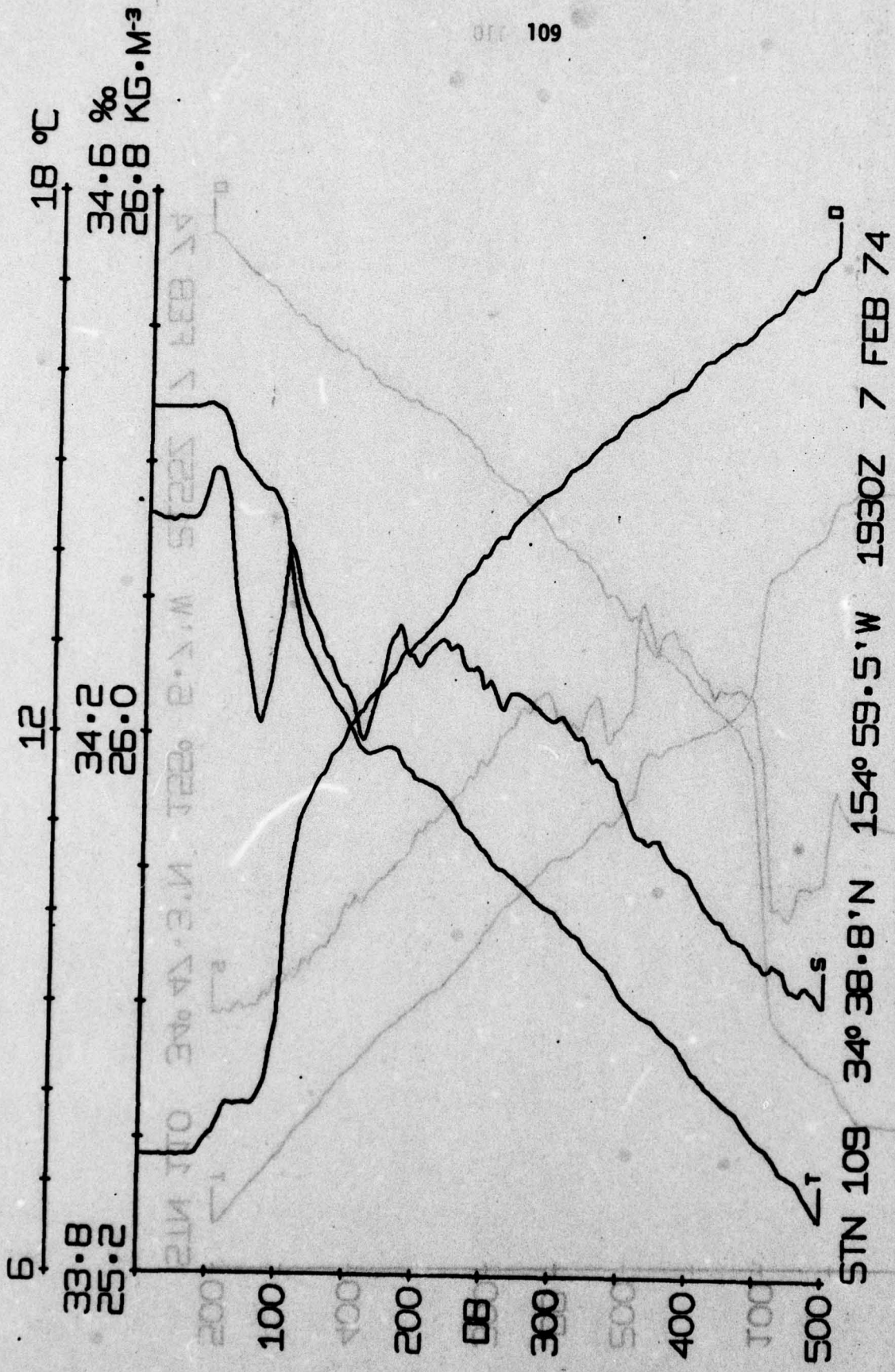
34.5 34.5 ‰

33.8 33.8 ‰

18 °C

15

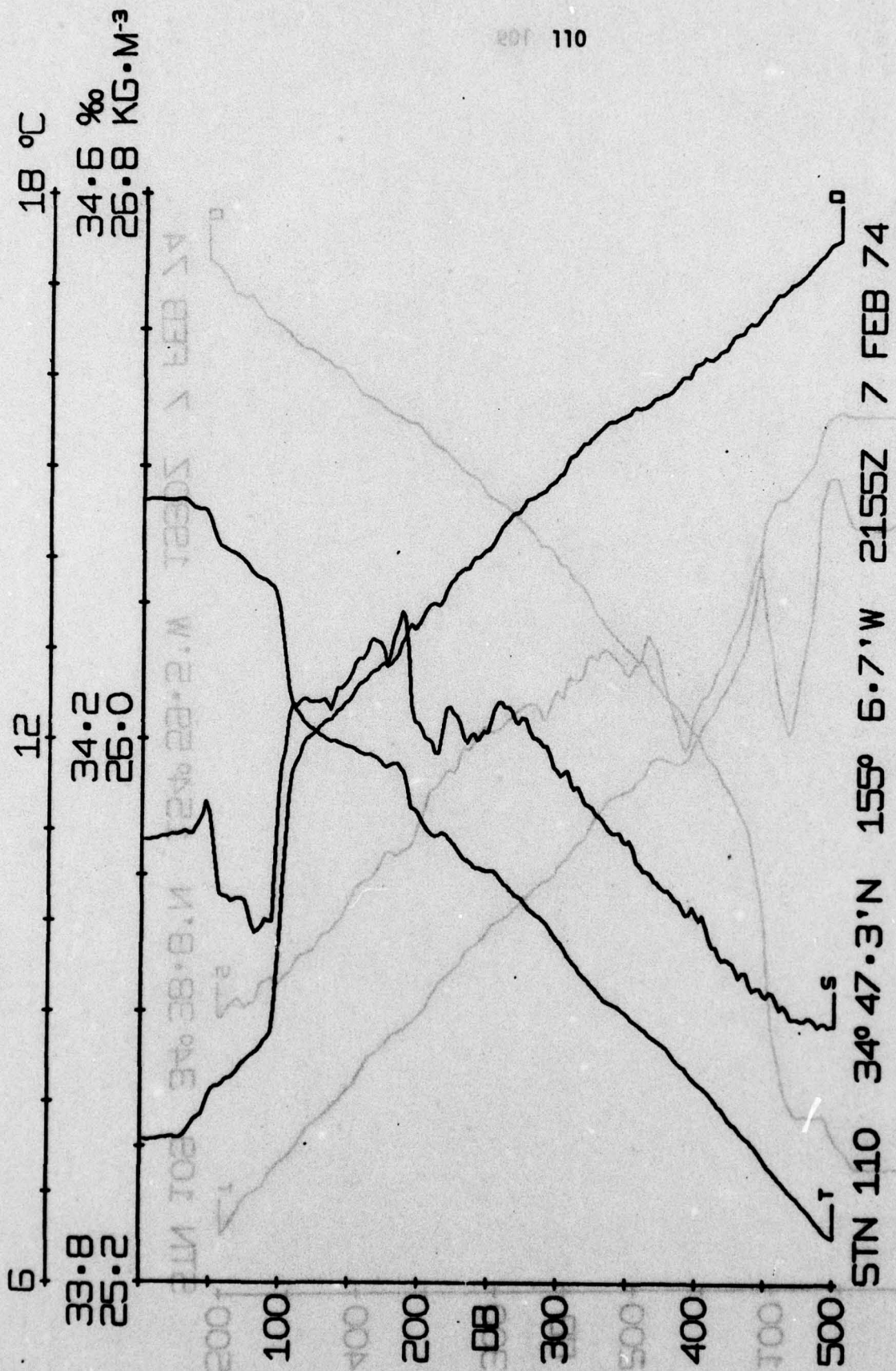
2



STN 109 34° 38.8' N 154° 59.5' W 1930Z 7 FEB 74

33.8
25.2

34.6
26.8



52.5
33.8

52.0
34.5

52.8
34.8

18 °C

12

6

33.8
25.2

34.2
26.0

34.6
26.8

52.5
33.8

52.0
34.5

52.8
34.8

18 °C

12

6

33.8
25.2

34.2
26.0

34.6
26.8

6

12

18 °C

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³



STN 111 34° 57.1' N 155° 15.1' W 2345Z 7 FEB 74

52.5
33.8

52.0
34.5

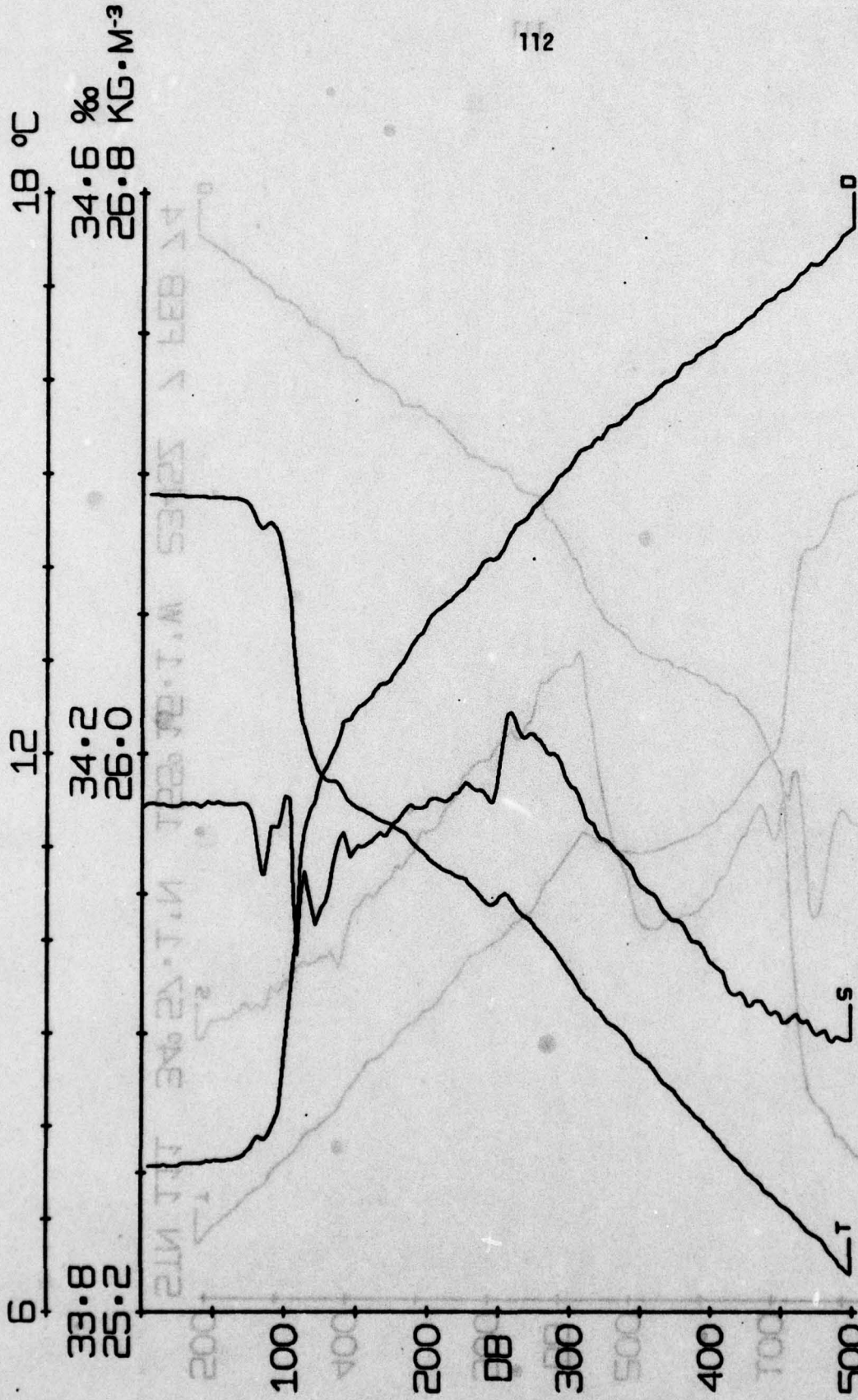
52.8 KG·M⁻³
34.2 ‰

2

15

18 °C

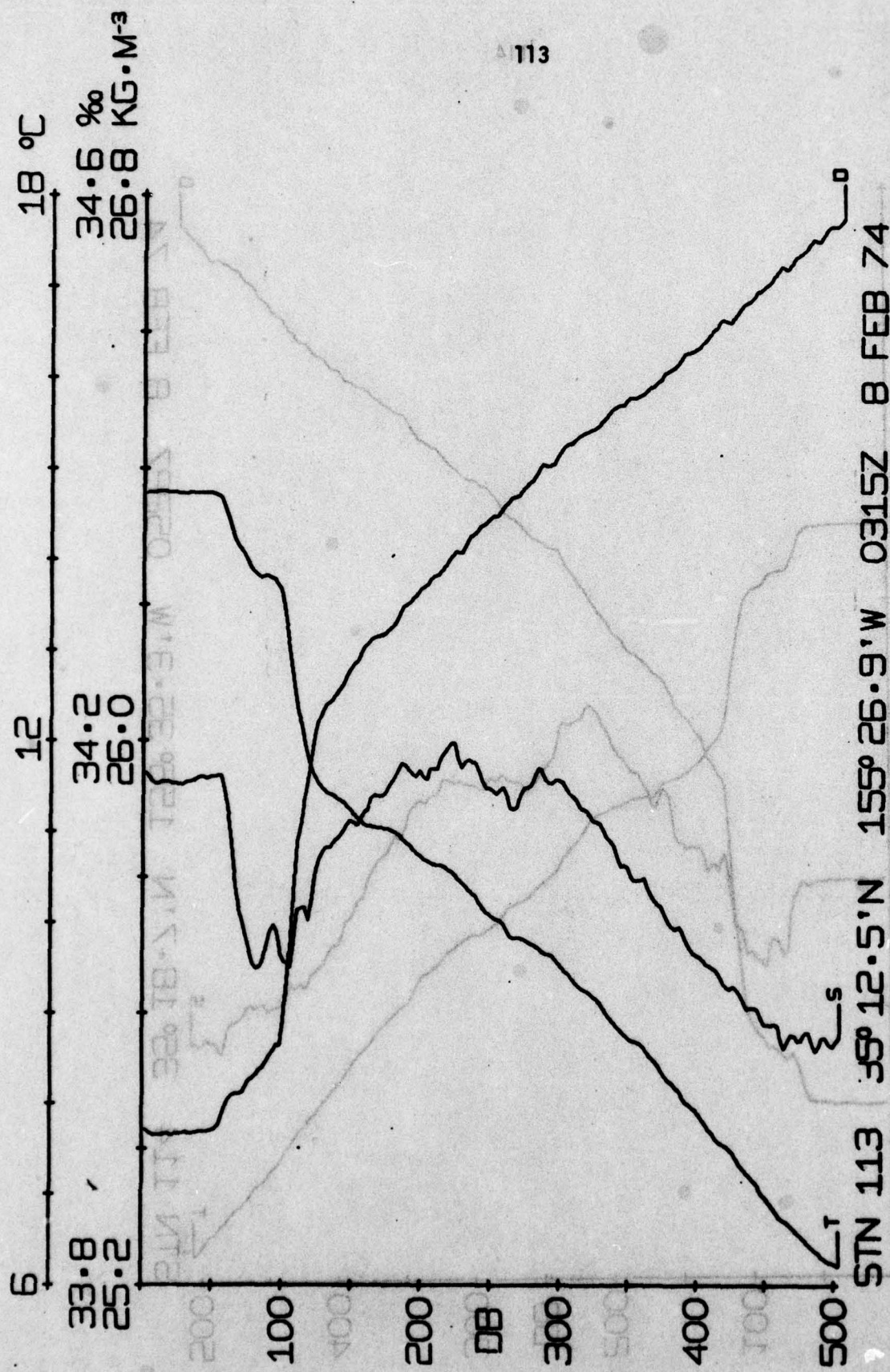
111



STN 112 35° 4.9'N 155° 17.0'W 0129Z 8 FEB 74

52.5
33.8
52.0
34.5
52.8 KG·M⁻³
34.2 ‰
TB °C

113



34.6 ‰
26.8 KG·M⁻³
18.0 °C

34.2 ‰
26.0 KG·M⁻³
12.5 °C

33.8 ‰
25.2 KG·M⁻³
6.0 °C

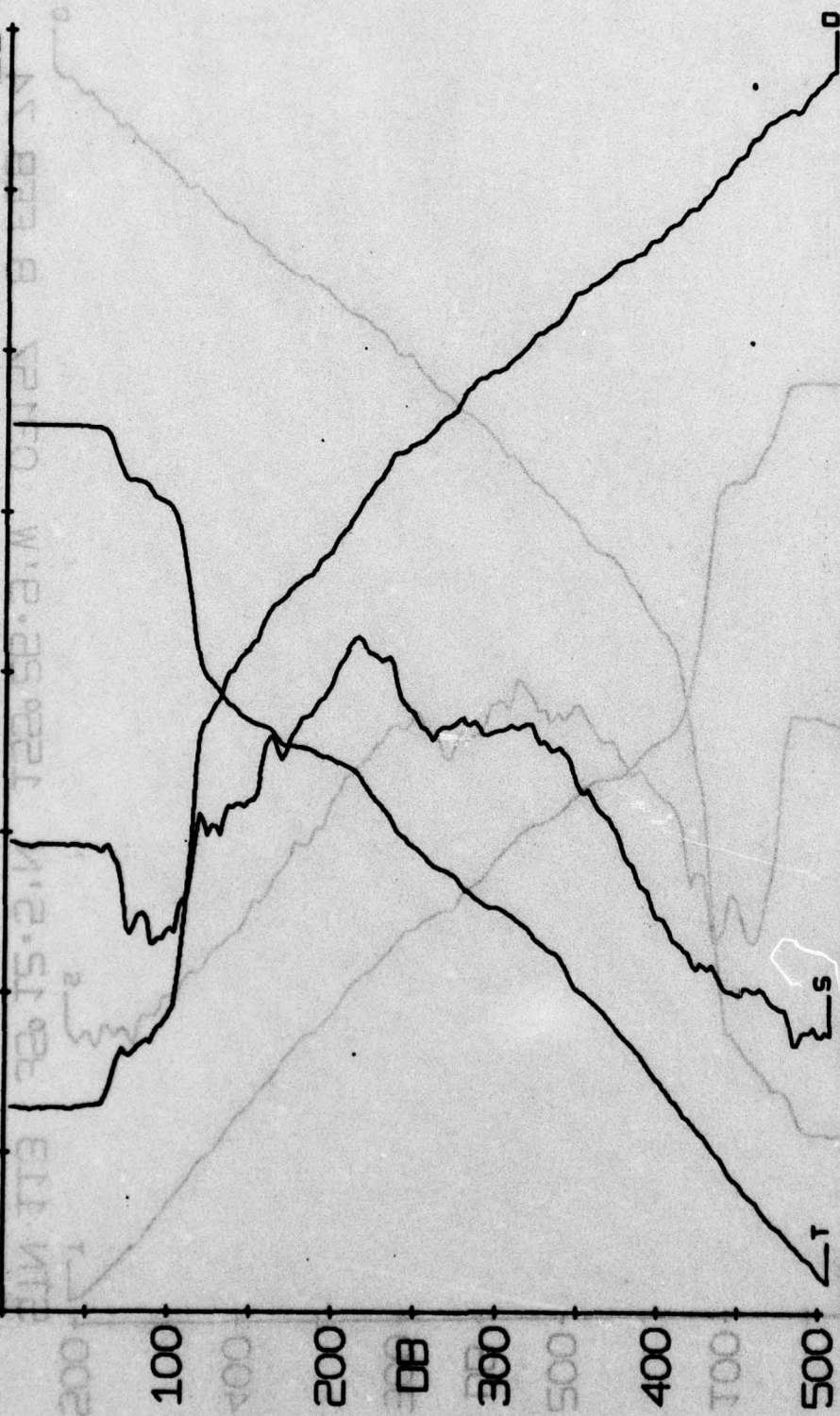
STN 113
35° 12.5' N
155° 26.9' W
0315Z
8 FEB 74

114

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 114 35° 18.7' N 155° 35.3' W 0522Z 8 FEB 74

33.8 KG·M⁻³
34.2 ‰

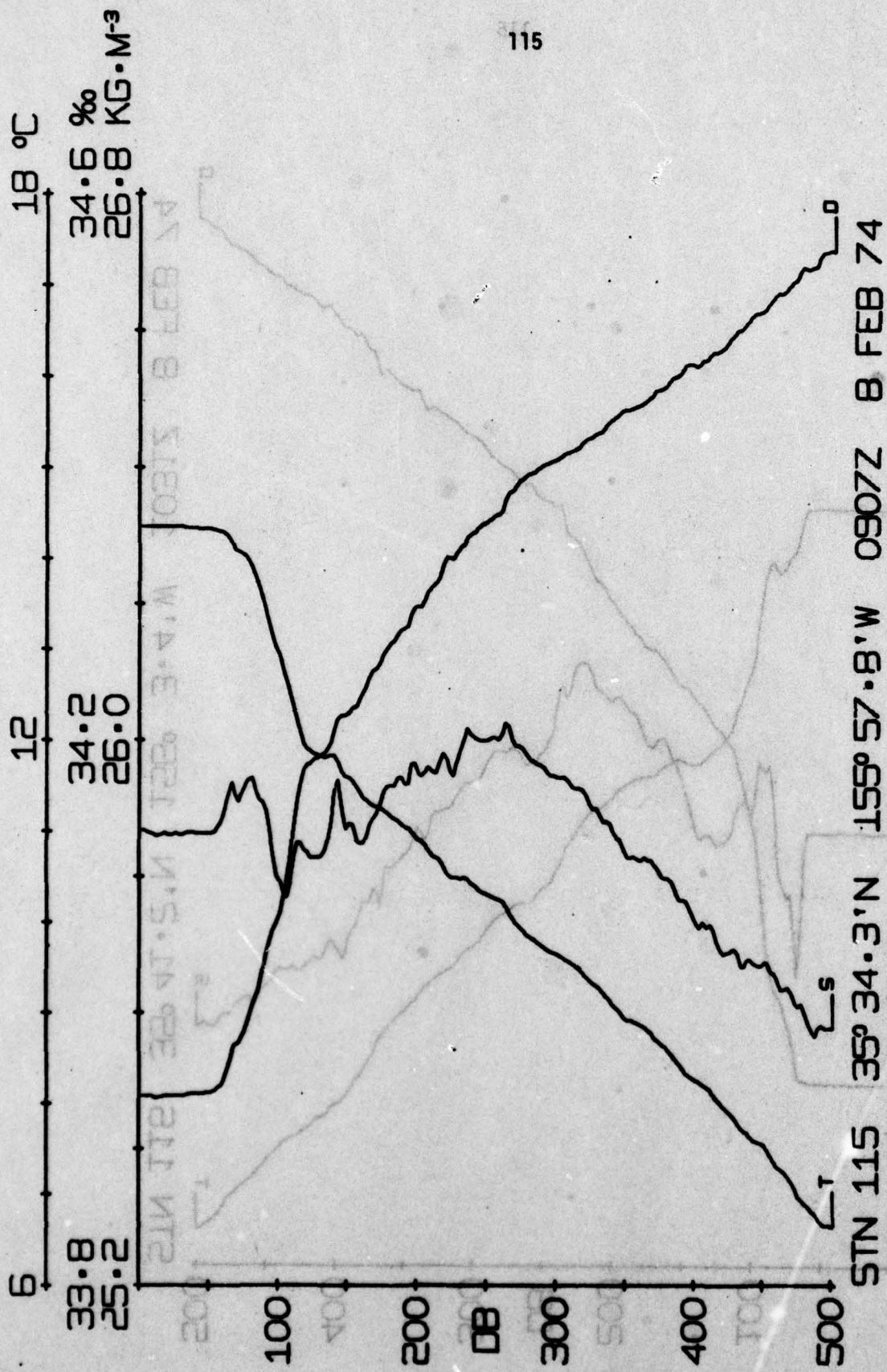
12
34.2
26.0

6
33.8
25.2

18 °C

12

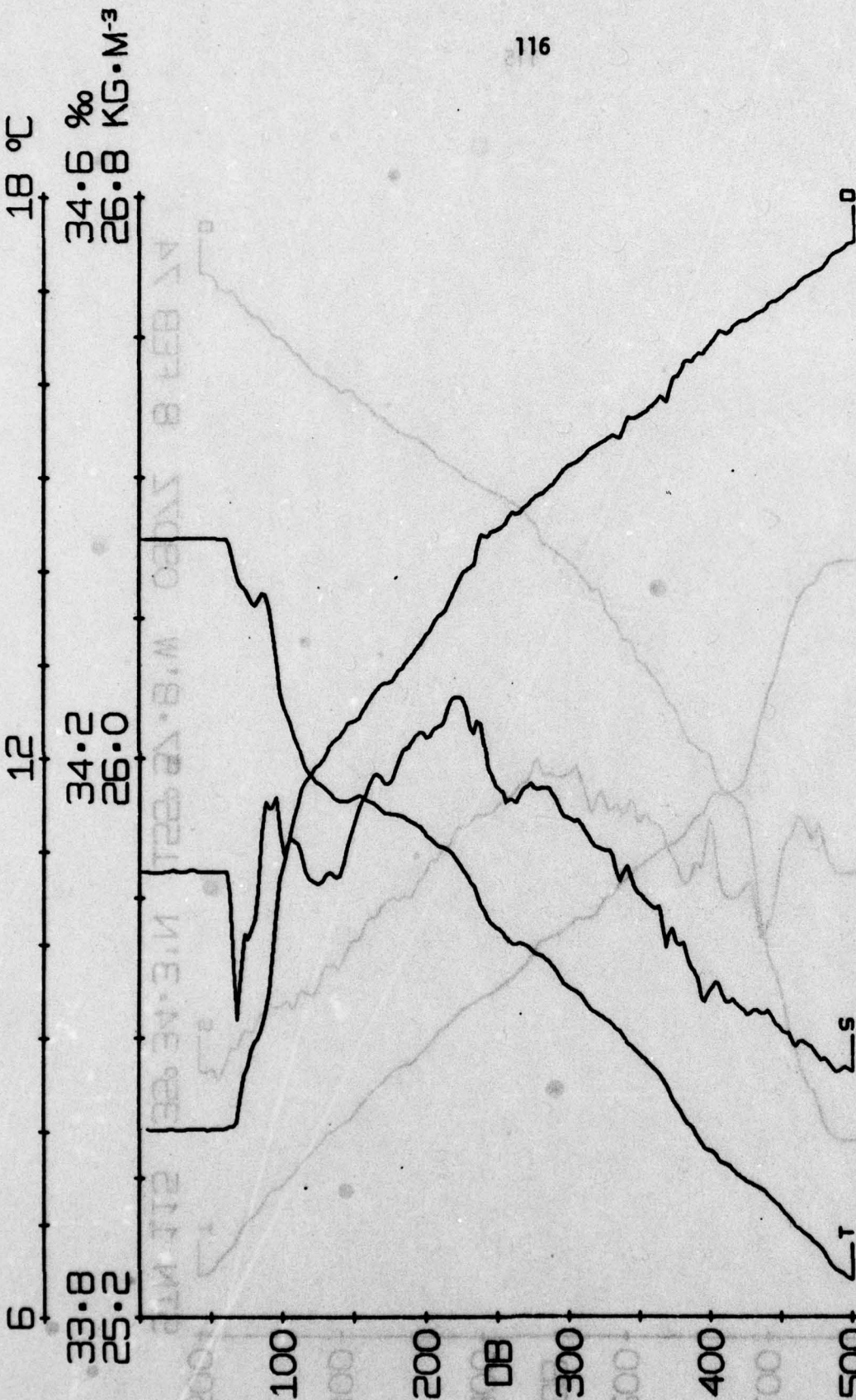
6



52.5
33.8
26.0

52.0
34.2
26.8

52.0
34.2
26.8



STN 116 35° 41.2' N 156° 3.4' W 1031Z 8 FEB 74

33.8
25.2

12
34.2
26.0

18 °C
34.6 ‰
26.8 KG·M⁻³

52.5
33.8
26.8

52.0
34.5

18 °C

18 °C

34.6 ‰
26.8 KG·M⁻³

12

34.2 ‰
26.0

6

33.8 ‰
25.2

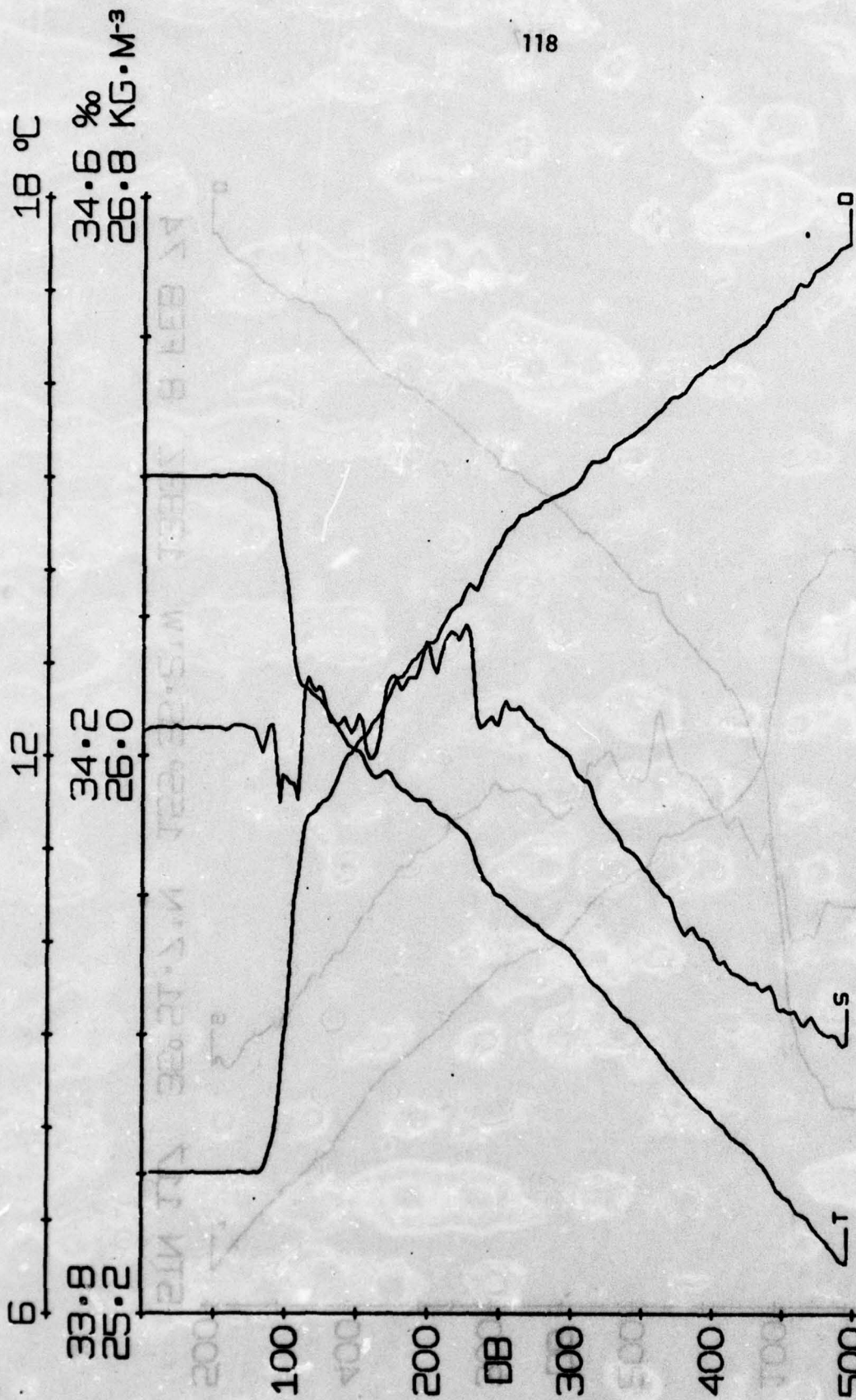


STN 117 35° 51.7' N 155° 36.2' W 1333Z 8 FEB 74

32.5 ‰
33.8 ‰

25.0 ‰
26.5 ‰

15

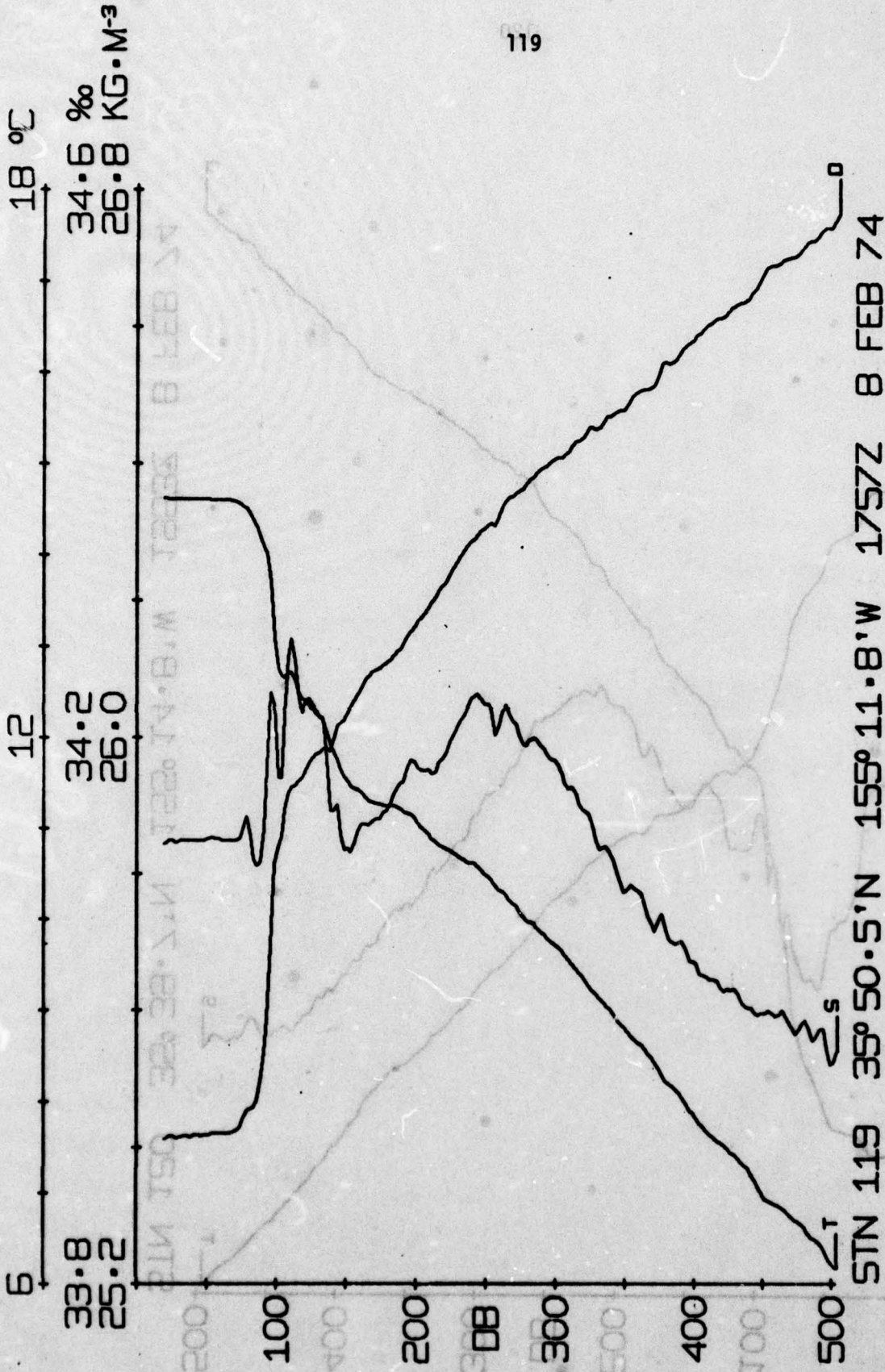


STN 118 36° 1.0'N 155° 13.6'W 1608Z 8 FEB 74

33.8 °C
34.2 ‰
25.2 σ-t
26.8 σ-θ

33.8 °C
34.2 ‰
26.0 σ-t
26.8 σ-θ

33.8 °C
34.2 ‰
25.2 σ-t
26.8 σ-θ



52.8 KG·M⁻³
34.8 ‰
18 °C

52.0
34.5

52.5
33.8

120

18 °C

34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

6

33.8
25.2



STN 120 35° 39.7' N 155° 14.8' W 1953Z 8 FEB 74

33.8
25.2

34.2
26.0

34.6
26.8

18 °C

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 121 35° 26.2' N 155° 16.6' W 2353Z 8 FEB 74

52.5
33.8

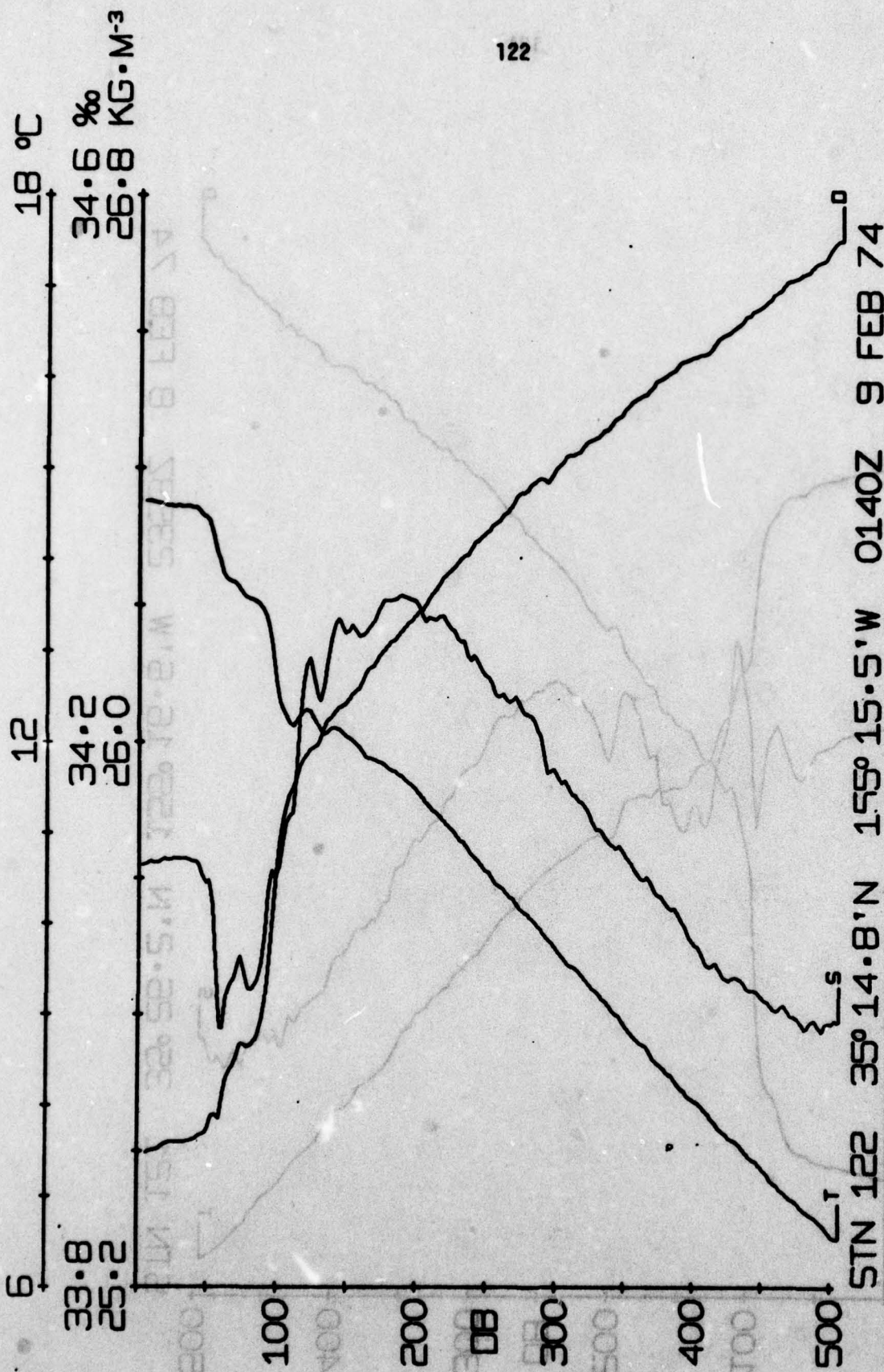
52.0
34.5

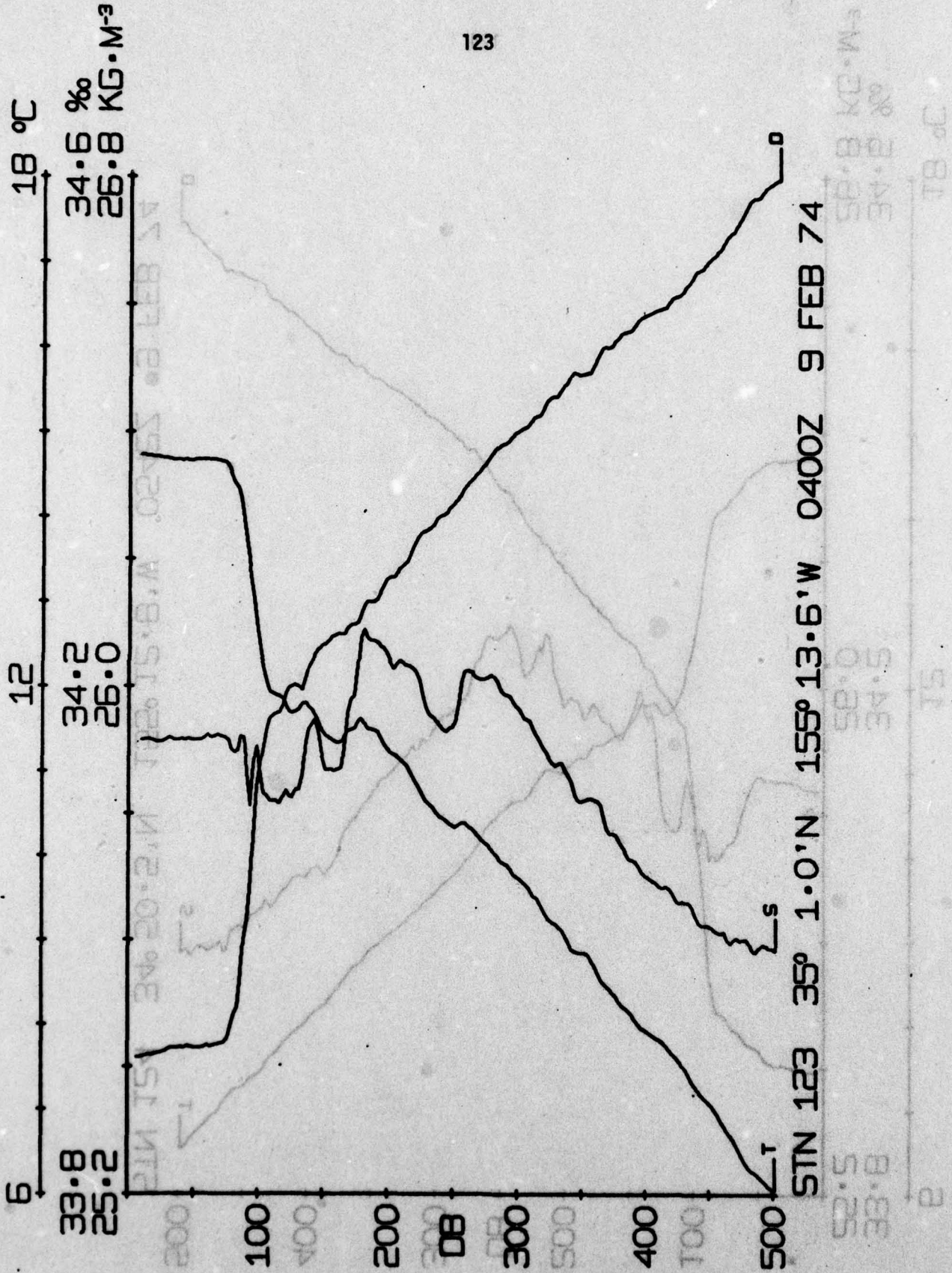
52.8 KG·M⁻³
34.8 ‰

2

75

18 °C





18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 124 34° 50.5' N 155° 12.8' W 0542Z 9 FEB 74

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

15

6

125

18 °C

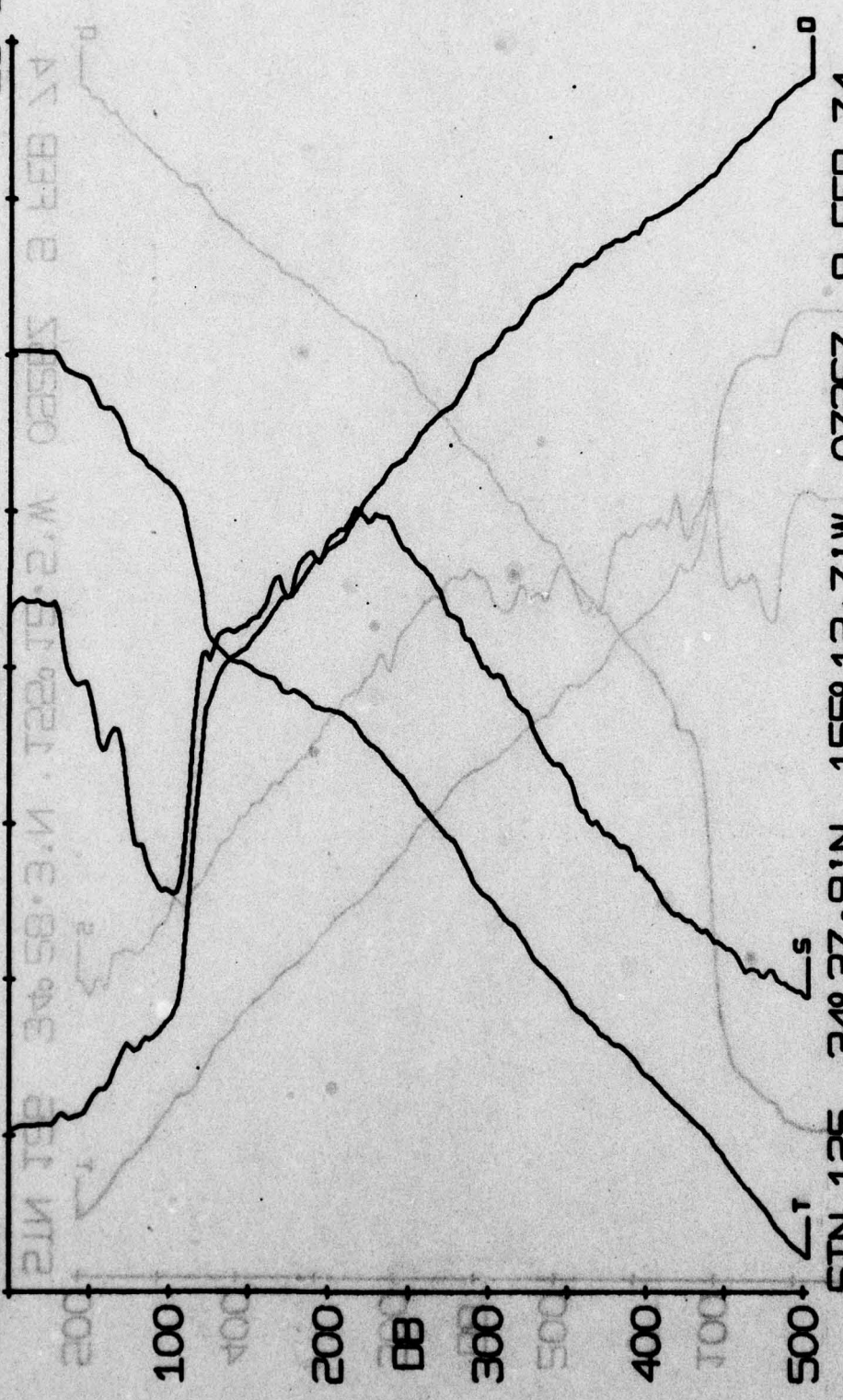
34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

6

33.8
25.2



STN 125 34° 37.9'N 155° 12.7'W 0726Z 9 FEB 74

52.5
33.8
26.0

52.0
34.5
26.0

52.5
33.8
26.0

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2 ‰
26.0

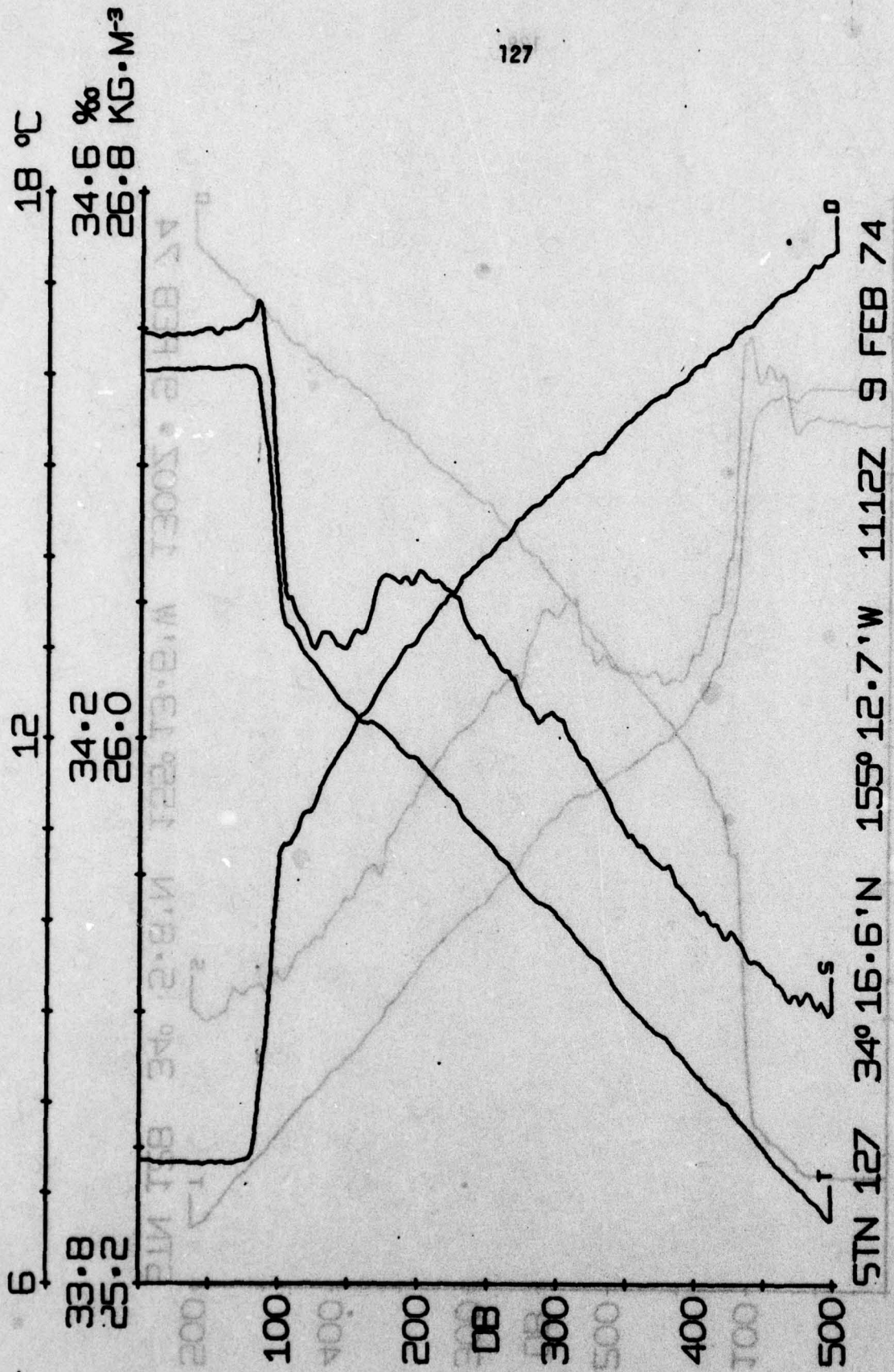
6
33.8 ‰
25.2



33.5 ‰
33.8 ‰
26.0

15
34.5 ‰
26.0

15
34.5 ‰
26.0



18 °C

34.6 ‰
26.8 KG·M⁻³

12

34.2
26.0

6

33.8
25.2

STN 127 34° 16.6' N 122° 13.2' W 1300Z 9 FEB 74

STN 127 34° 16.6' N 155° 12.7' W 1112Z 9 FEB 74

33.8 KG·M⁻³
34.2 ‰

52.0
5.46

52.5
33.8

18 °C

15

6

18 °C

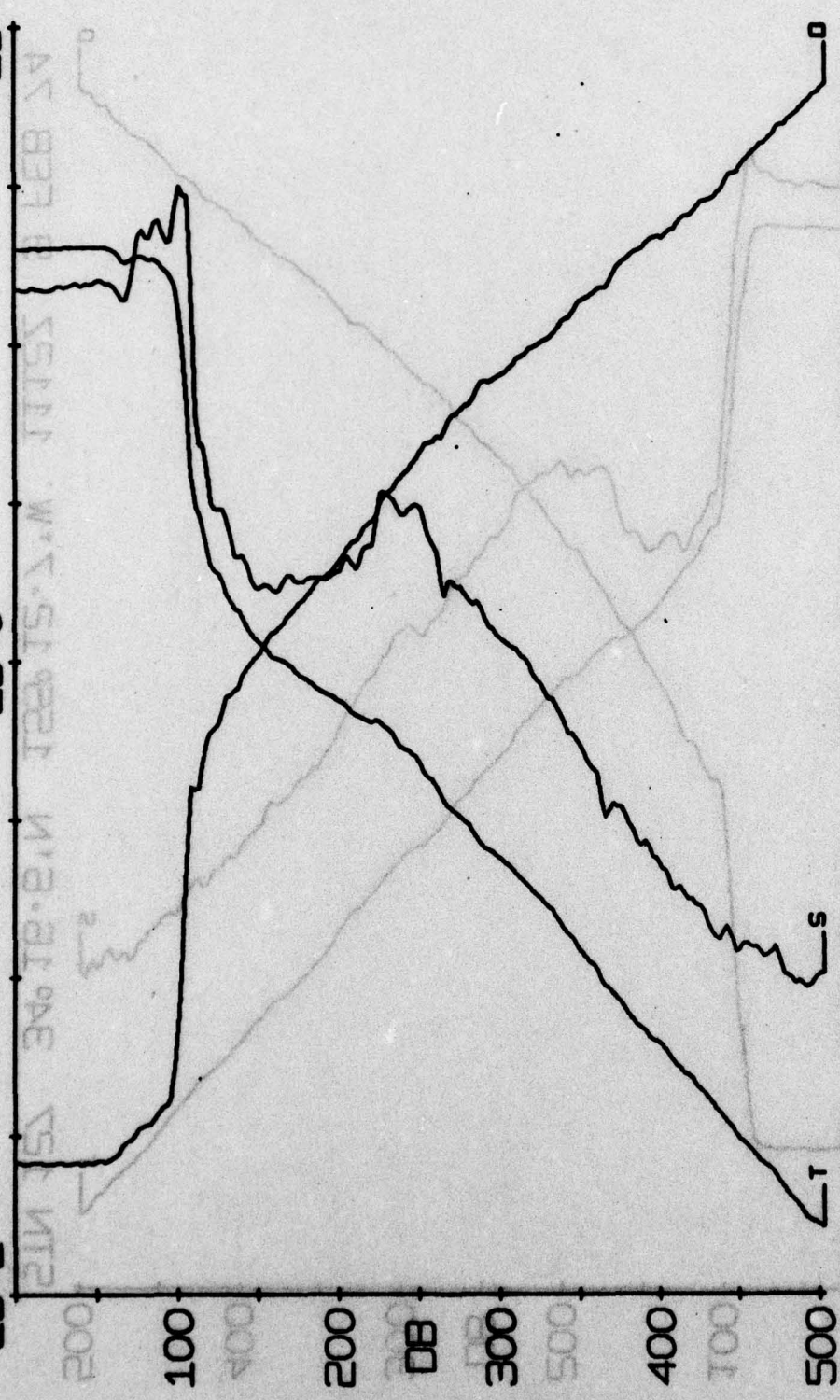
34.6 ‰
26.8 KG·M⁻³

12

34.2 ‰
26.0

6

33.8 ‰
25.2



STN 128 34° 5.8'N 155° 13.6'W 1300Z 9 FEB 74

33.8 ‰
25.2

34.2 ‰
26.0

34.6 ‰
26.8

18 °C

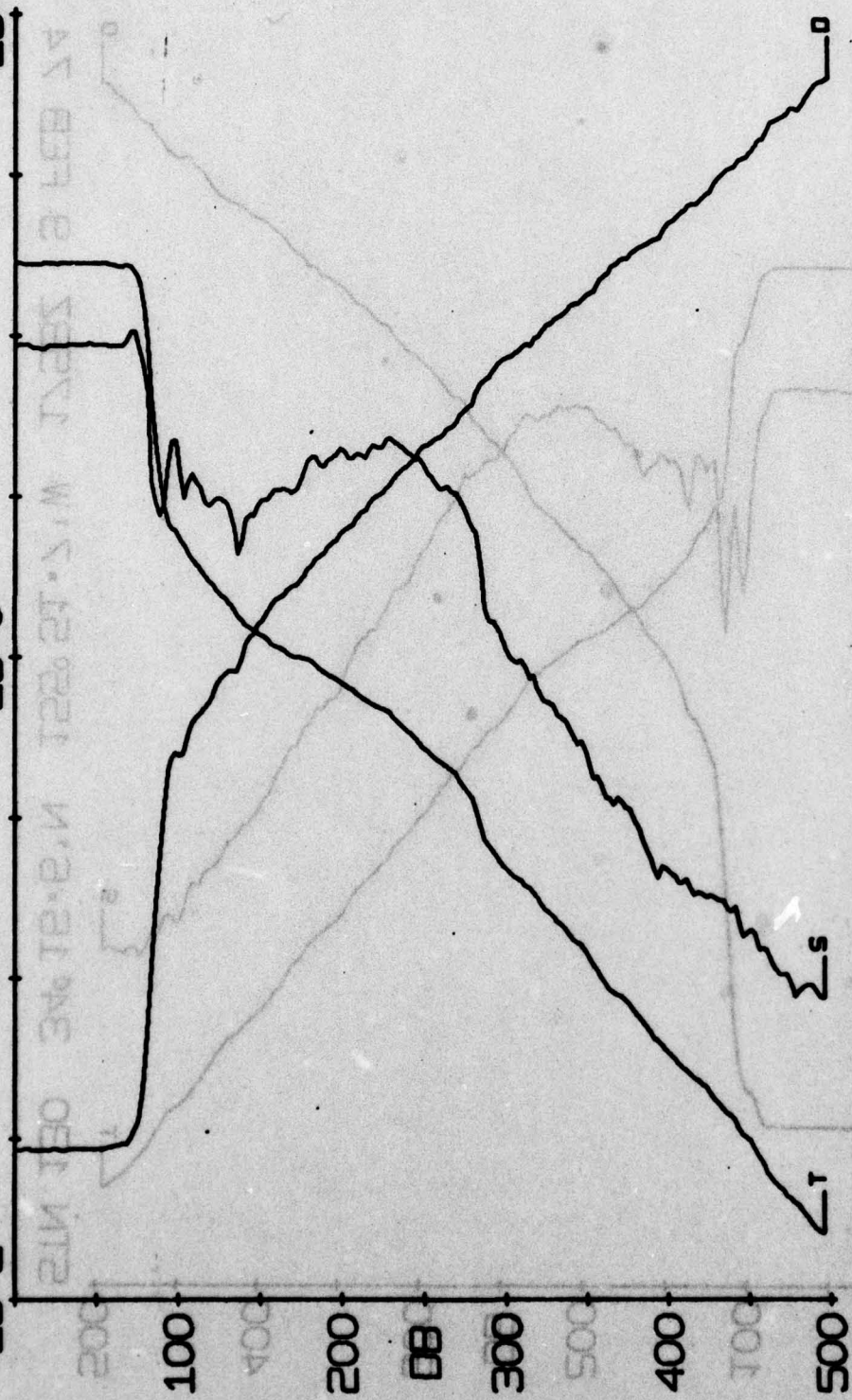
12

6

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 129 34° 10.6' N 155° 34.9' W 1541Z 9 FEB 74

33.8
25.2
34.2
26.0

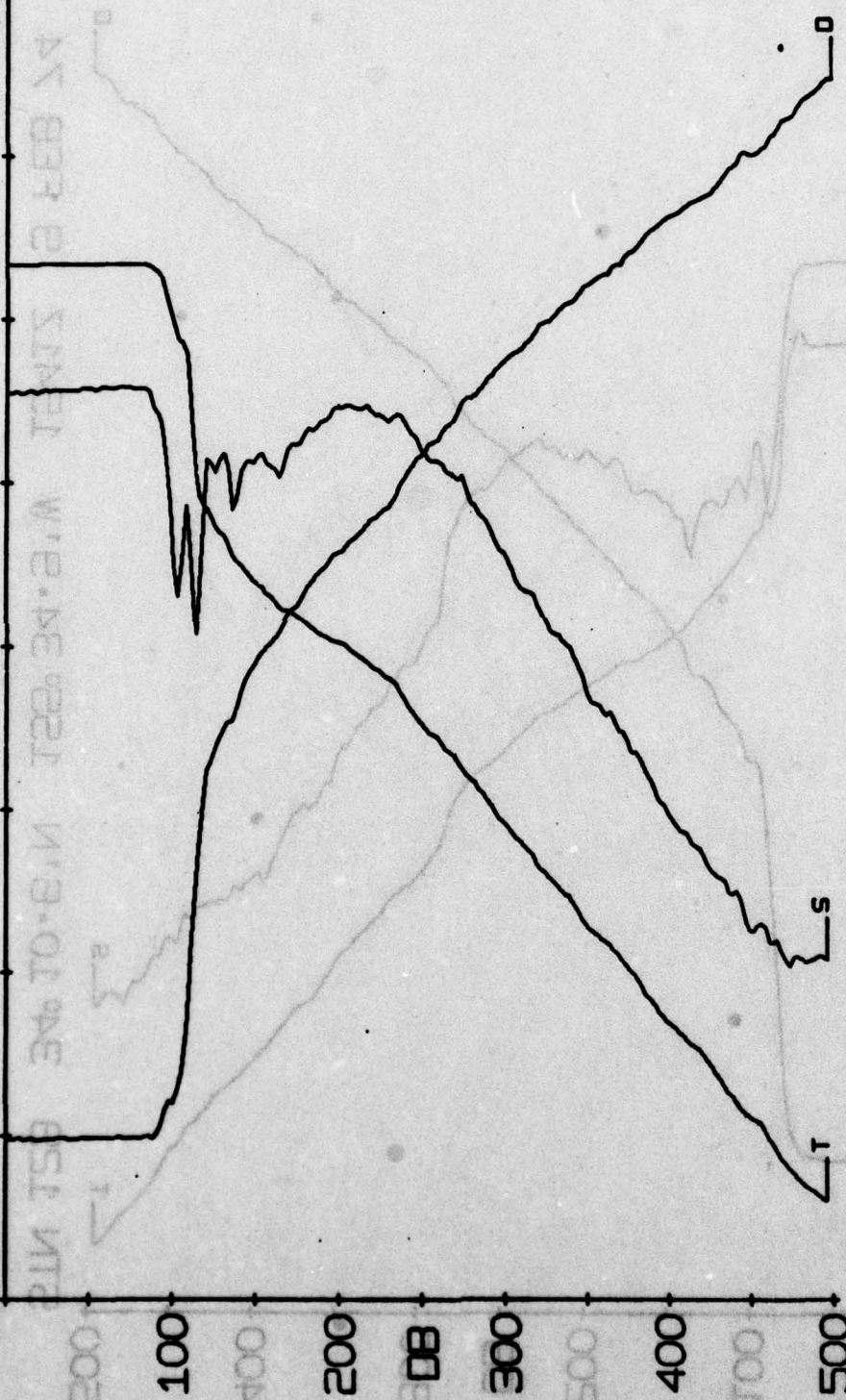
33.8
25.2
34.2
26.0

33.8
25.2
34.2
26.0

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 130 34° 16.6' N 155° 51.7' W 1758Z 9 FEB 74

33.8
34.5
25.2

12
34.2
26.0

18 °C
34.6 ‰
26.8 KG·M⁻³

18 °C

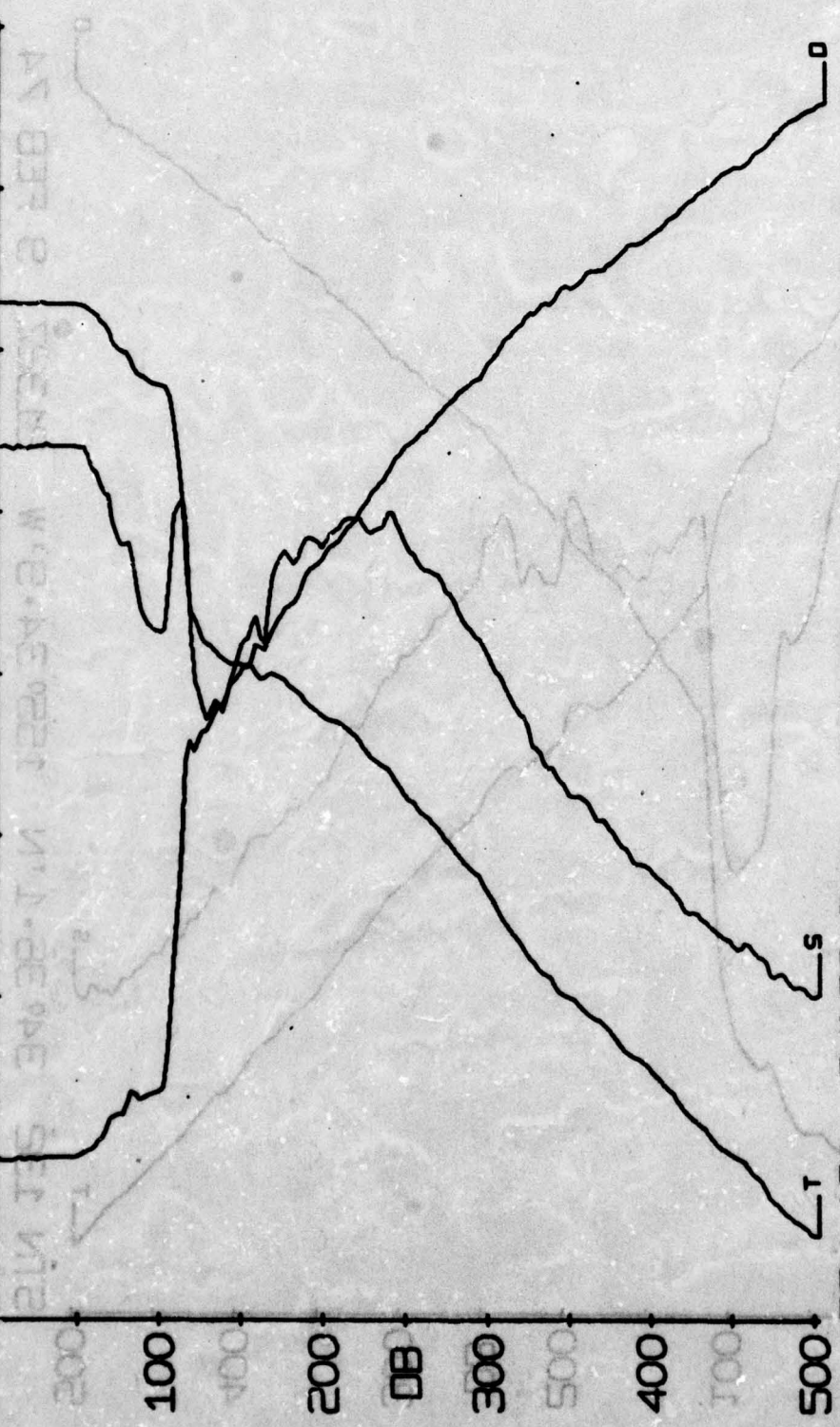
34.6 ‰
26.8 KG·M⁻³

12

34.2 ‰
26.0

6

33.8 ‰
25.2



STN 131 34° 26.6' N 155° 43.1' W 1941Z 9 FEB 74

33.8 ‰
25.2

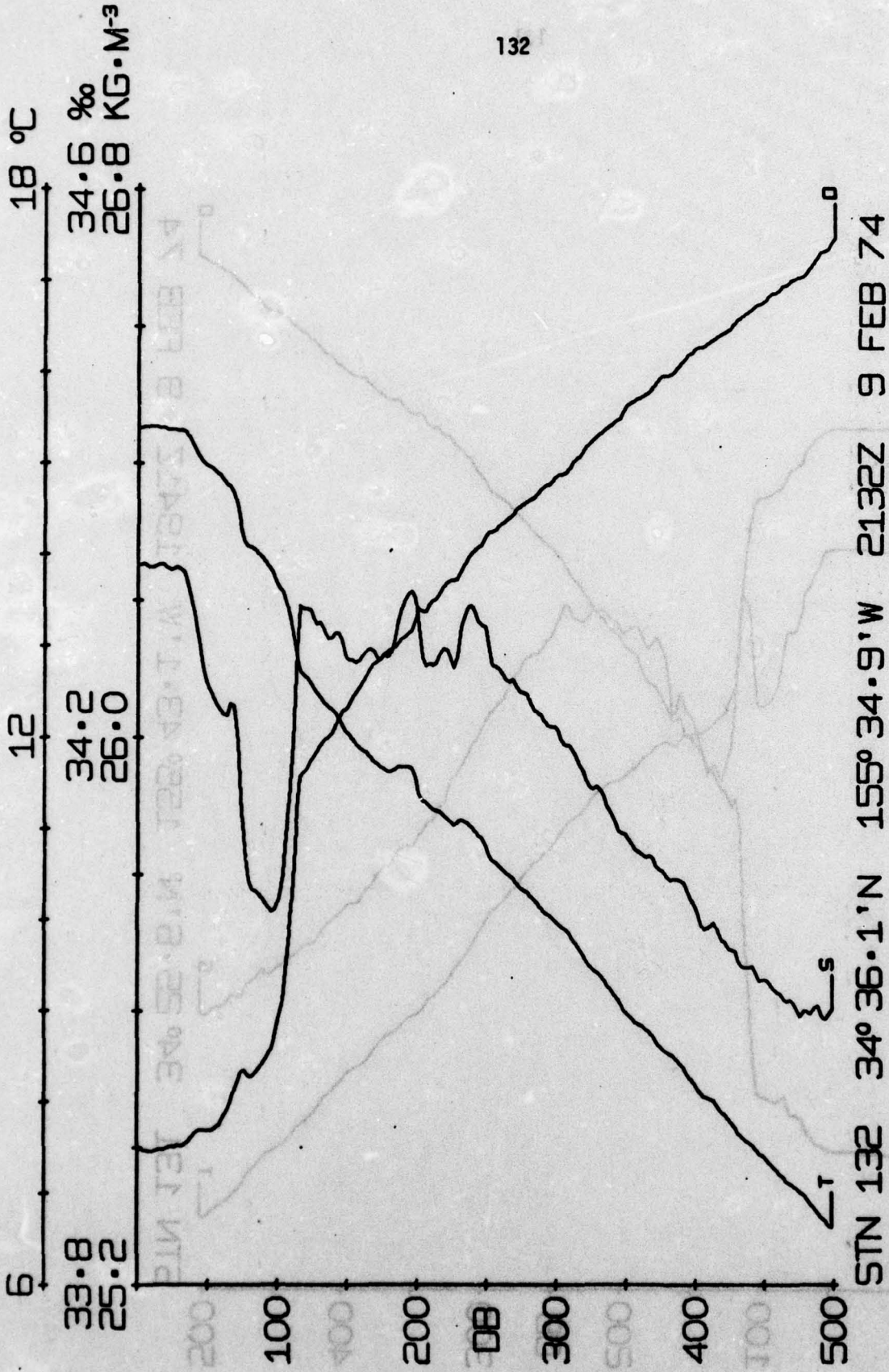
34.2 ‰
26.0

34.6 ‰
26.8

18 °C

12

6



52.5
33.8

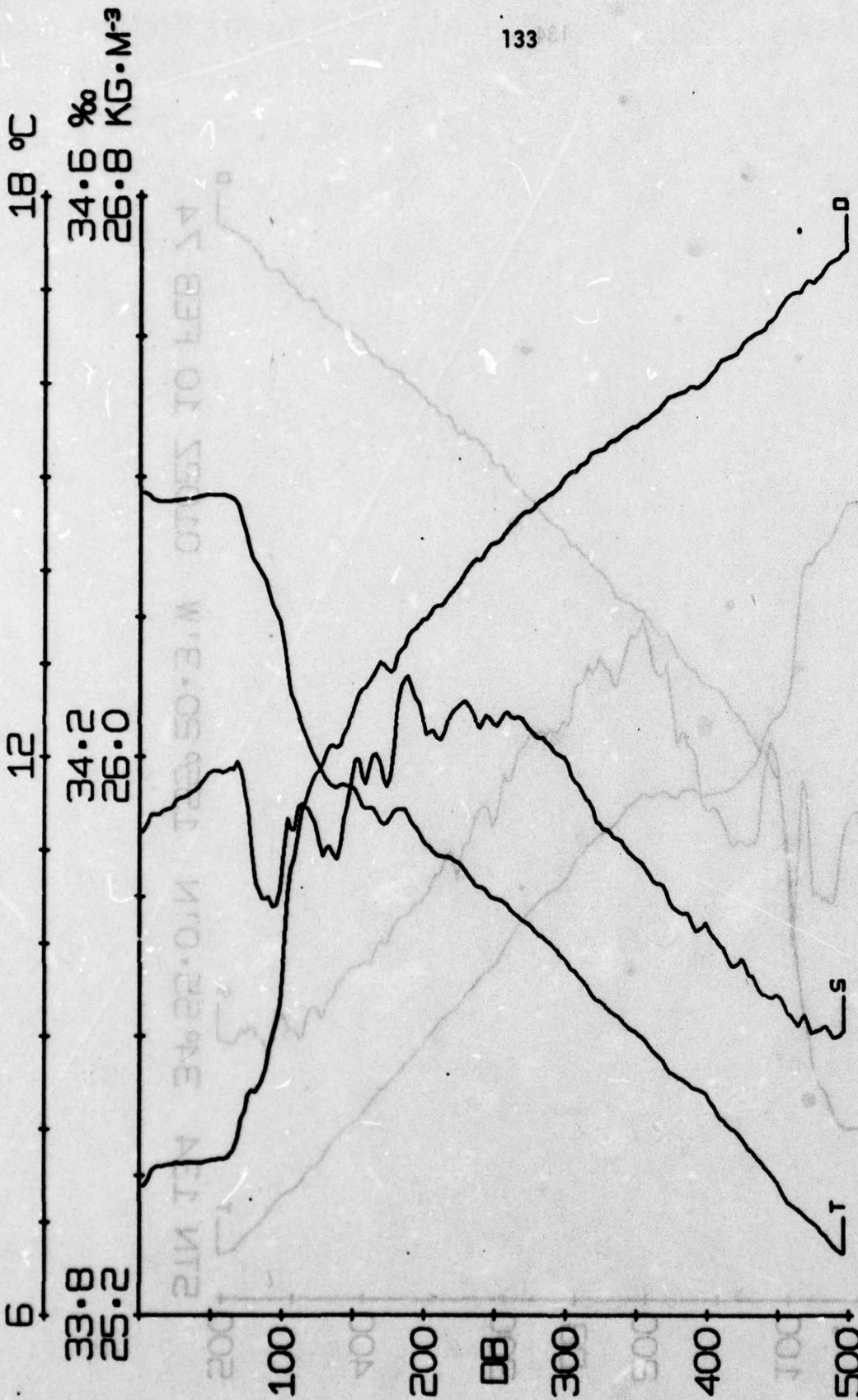
52.0
34.5

52.5
33.8

18.0

15

0



STN 133 34° 45.1'N 155° 28.0'W 2323Z 9 FEB 74

58.8 KG·M⁻³
34.8 ‰

58.0
34.5

52.5
33.8

18 °C

15

6

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 134 34° 55.0' N 155° 20.3' W 0102Z 10 FEB 74

52.8 MC·W·M⁻³
34.2 ‰

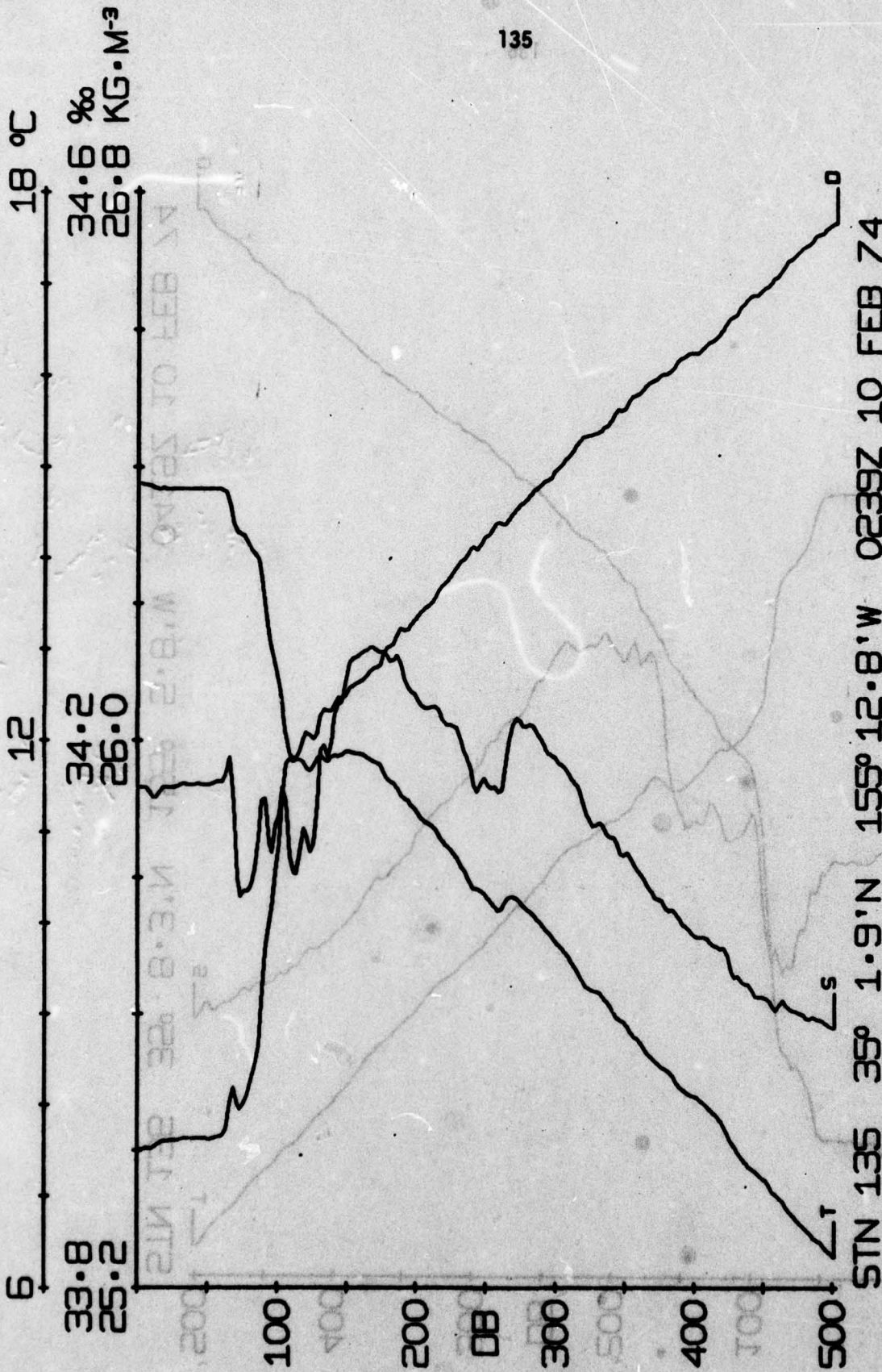
52.0
34.2

52.5
33.8

70 RB

51

2



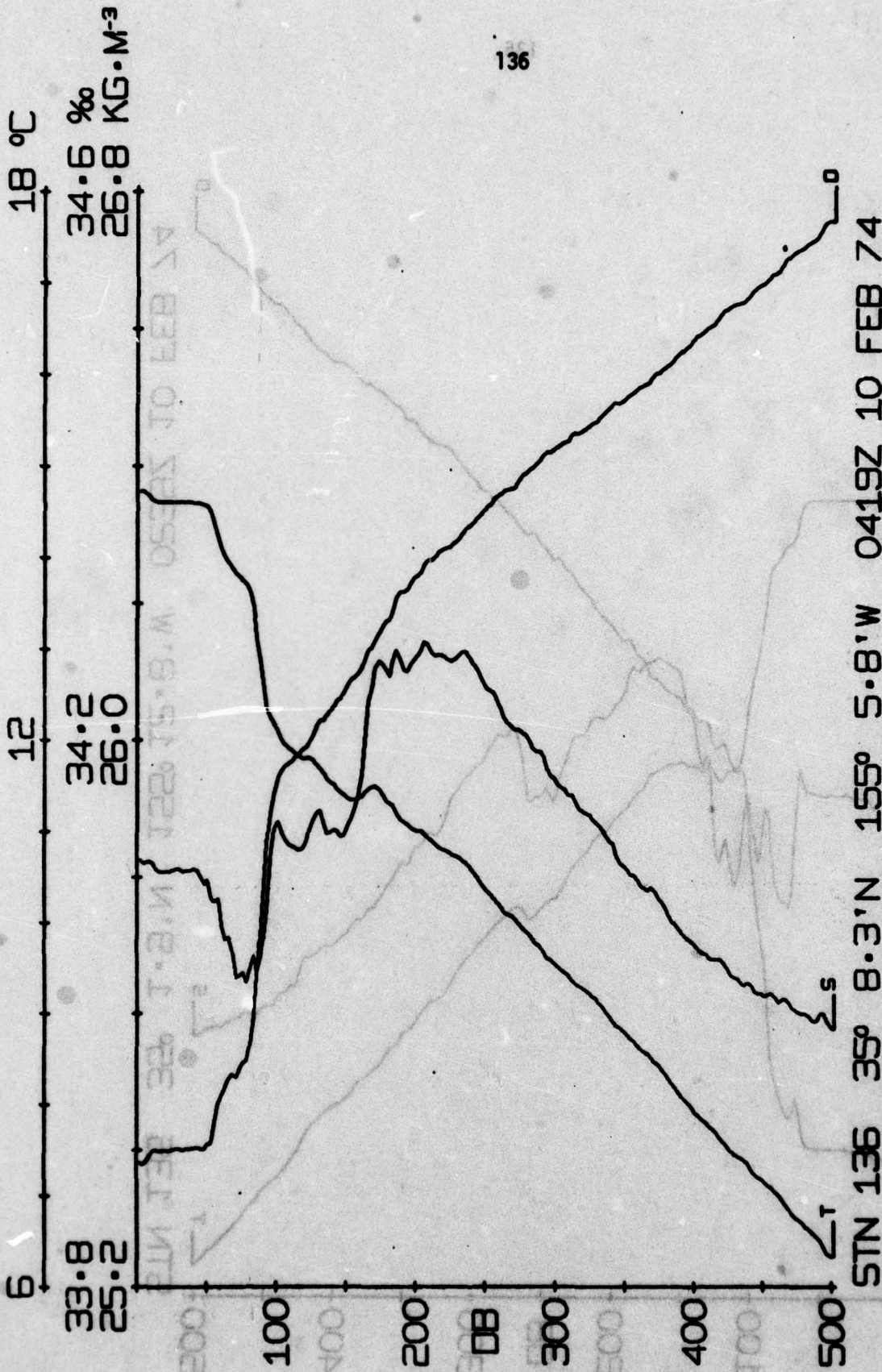
52.5
33.8
59.0
34.5
75

52.5
33.8
59.0
34.5
75

52.5
33.8
59.0
34.5
75

52.5
33.8
59.0
34.5
75

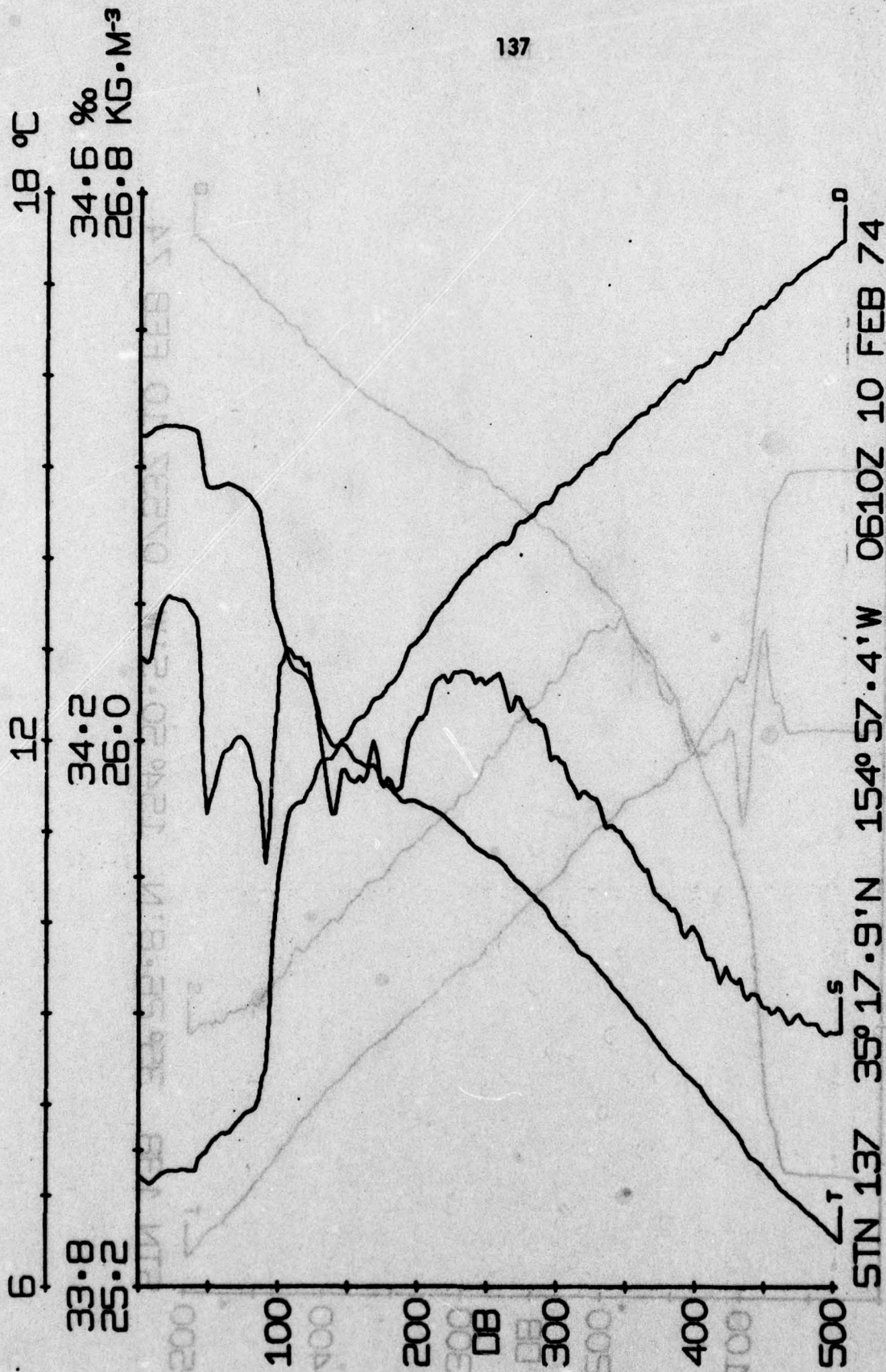
52.5
33.8
59.0
34.5
75



STN 136 35° 8.3'N 155° 5.8'W 0419Z 10 FEB 74
 52.5 8.8E
 34.2 34.2‰
 26.0 26.0

5.48
 0.25

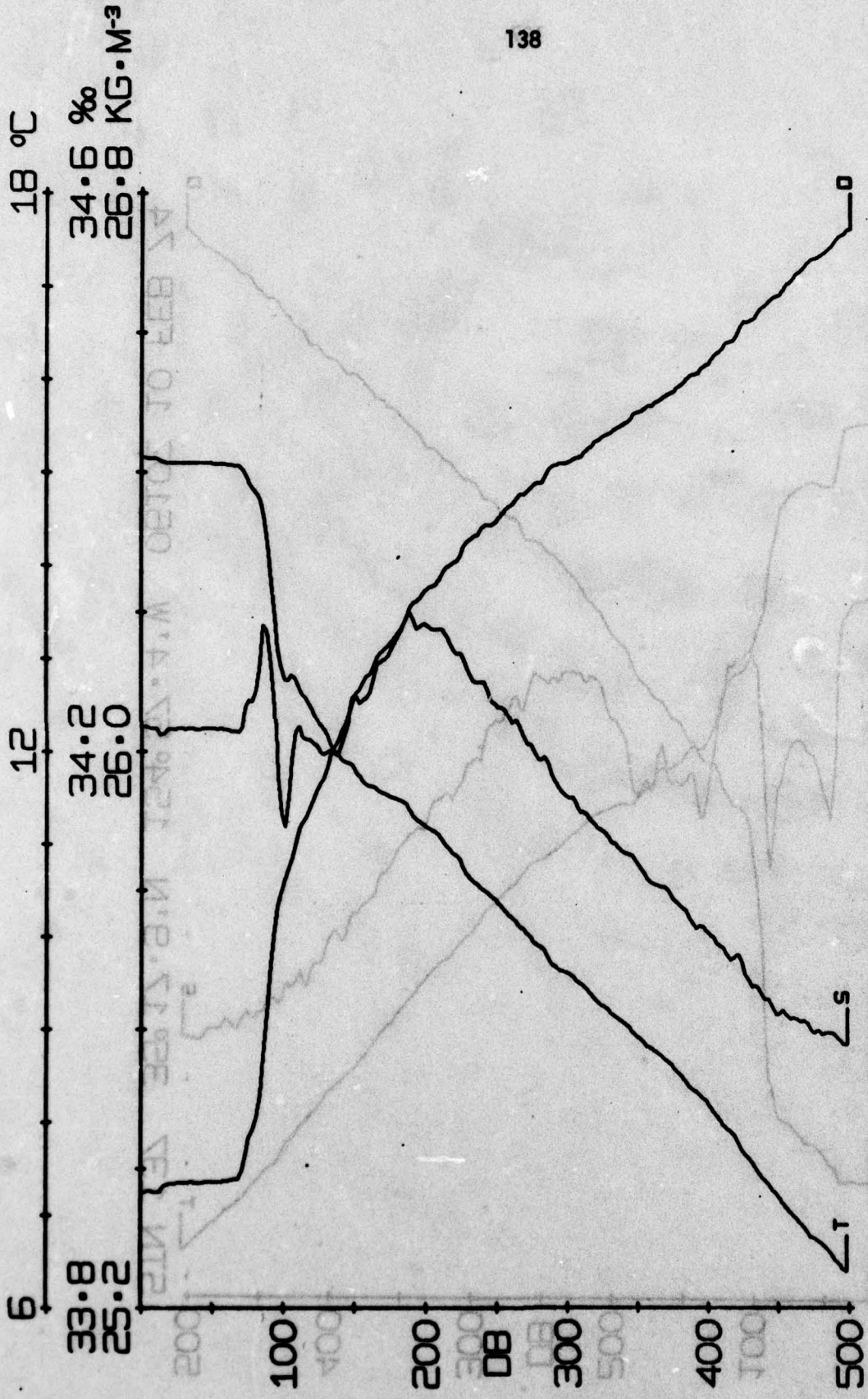
15.0



52.5 52.0 52.0 KG·M⁻³
33.8 34.5 34.5 ‰
18 °C

52.5 52.0 52.0 KG·M⁻³
33.8 34.5 34.5 ‰
18 °C

52.5 52.0 52.0 KG·M⁻³
33.8 34.5 34.5 ‰
18 °C



STN 138 35° 26.8' N 154° 50.5' W 0753Z 10 FEB 74

52.5
33.8
52.8
34.2

52.0
34.3

52.8
34.2

52.0
34.3

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



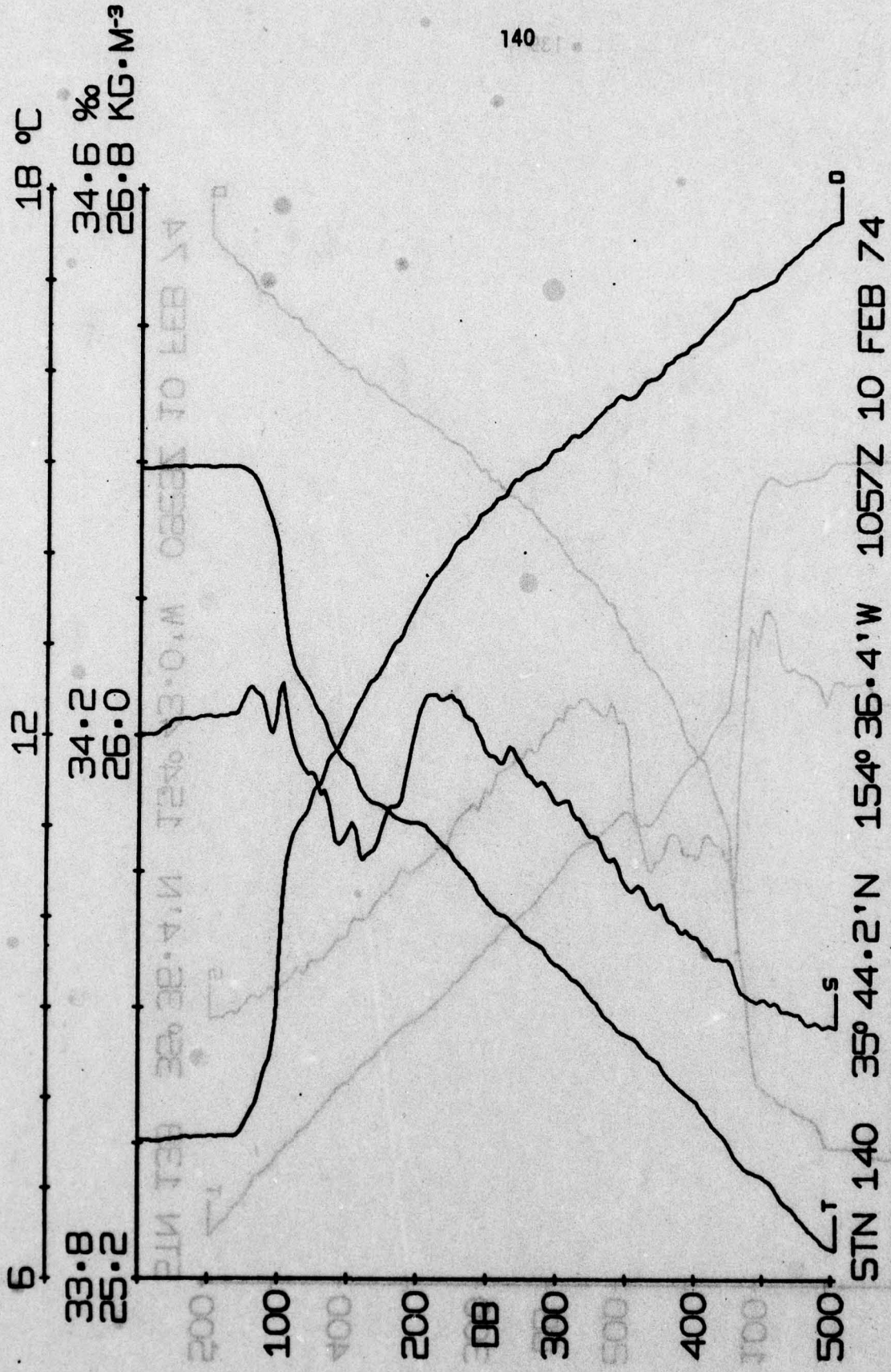
STN 139 35° 36.4'N 154° 43.0'W 0929Z 10 FEB 74

52.5
33.8

34.0
34.5

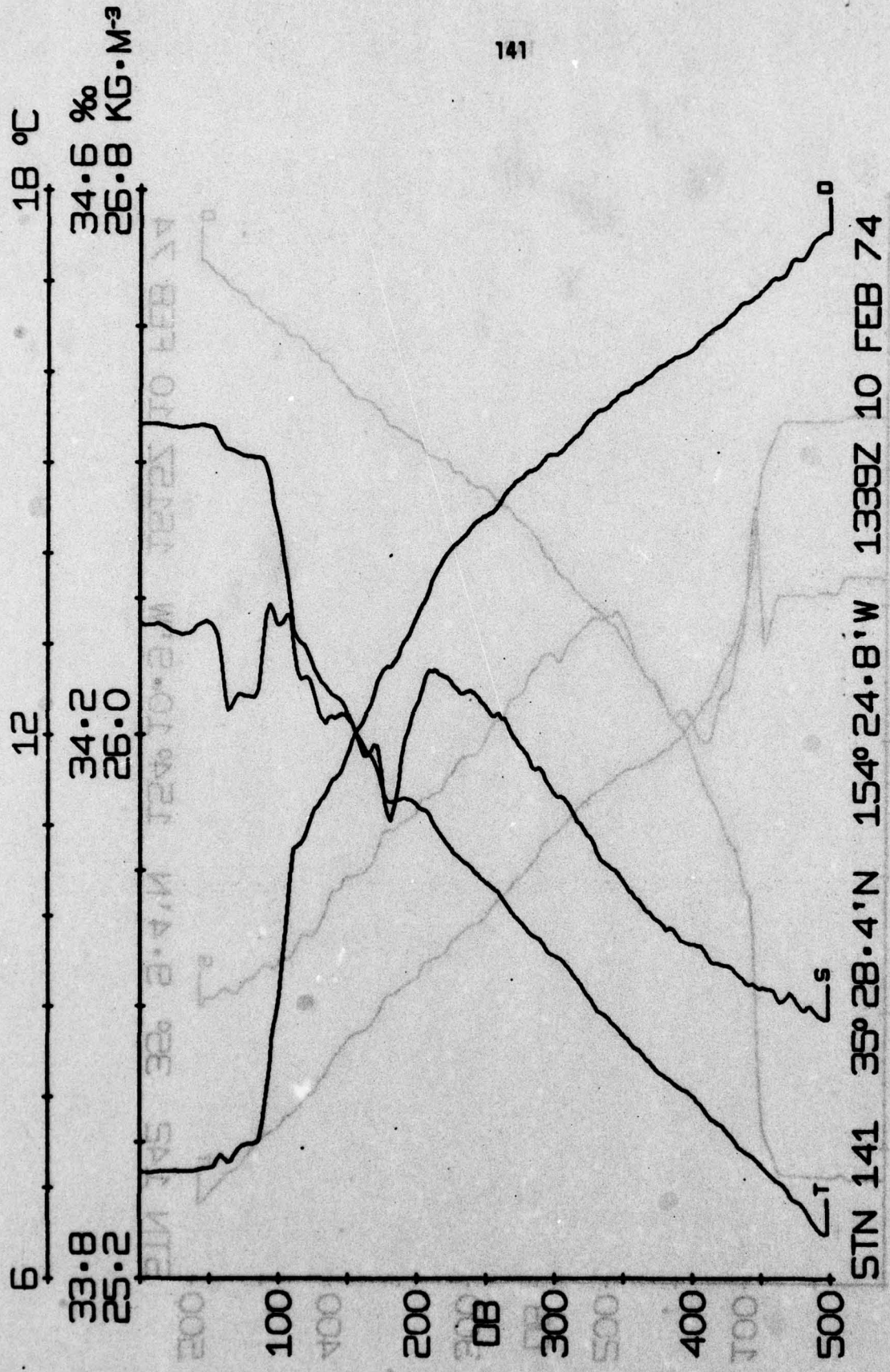
52.8 KG·M⁻³
34.6 ‰

15
18 °C



140

52.5
 33.8
 26.0
 34.5
 26.0
 34.2
 26.0
 34.6
 26.8



33.8 34.2 34.6 35.0
 25.2 26.0 26.8 27.5

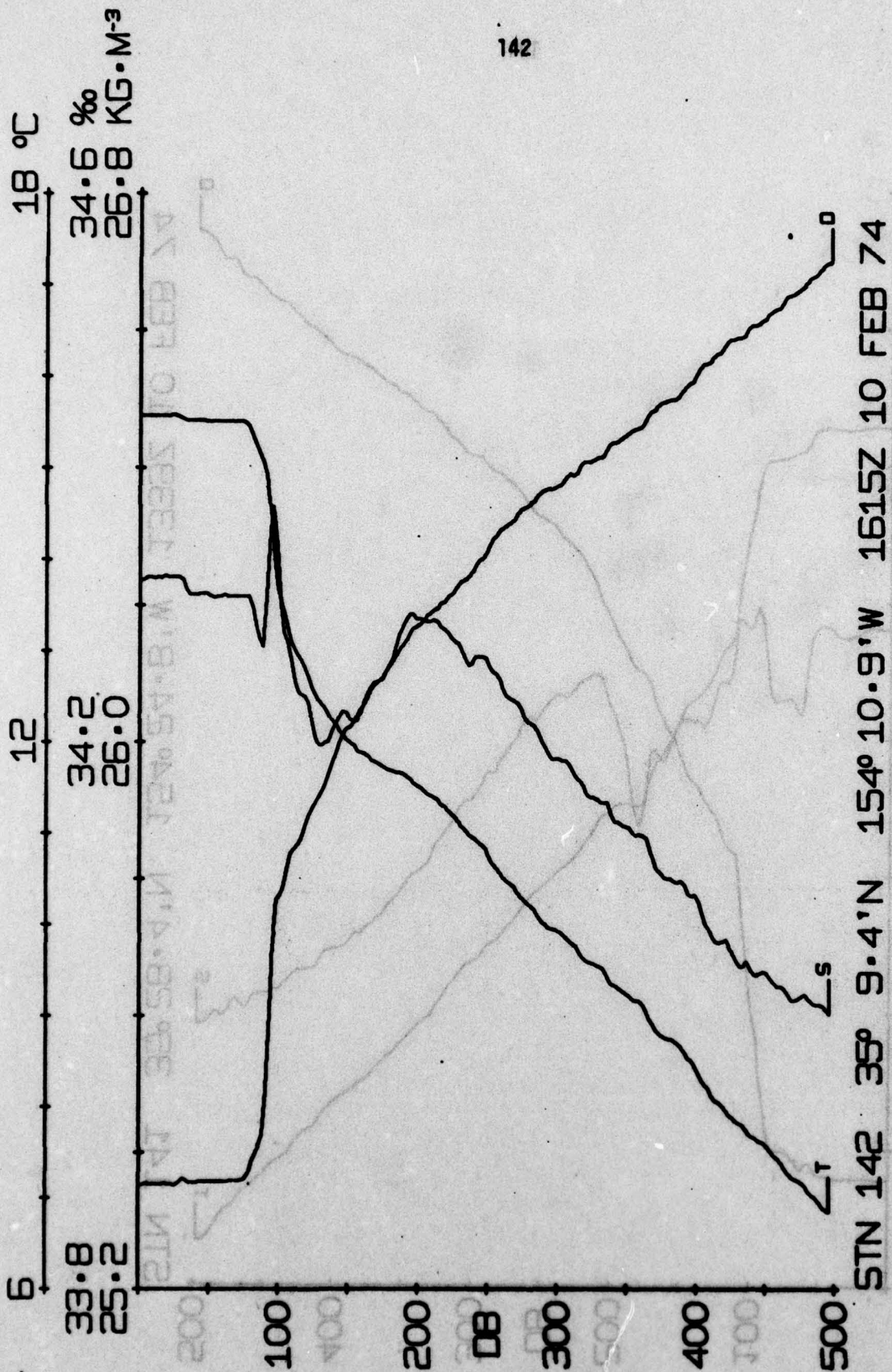
52.5 52.8 53.0 53.5

33.8 34.2 34.6 35.0

52.5 52.8 53.0 53.5

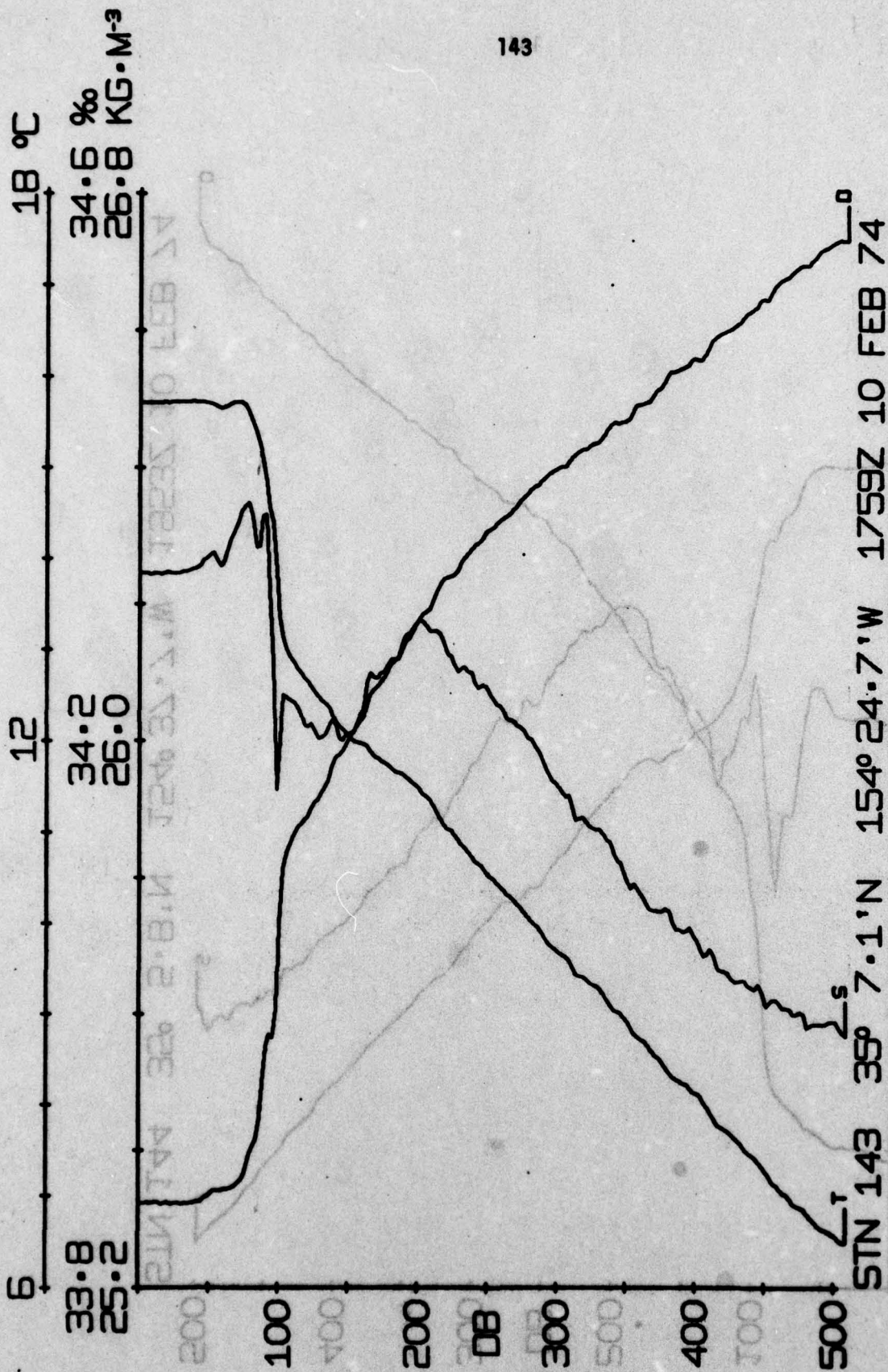
33.8 34.2 34.6 35.0

52.5 52.8 53.0 53.5



STN 142 35° 9.4'N 154° 10.9'W 1615Z 10 FEB 74

33.8
 25.2
 34.2
 26.0
 34.6 ‰
 26.8 KG·M⁻³
 18 °C
 6
 100
 200
 300
 400
 500
 DB
 T
 S
 50.5
 33.8
 50.0
 34.5
 50.8 KG·M⁻³
 34.2 ‰
 18 °C
 15



52.8 KG-M³
34.8 ‰
18 °C

52.0
34.5

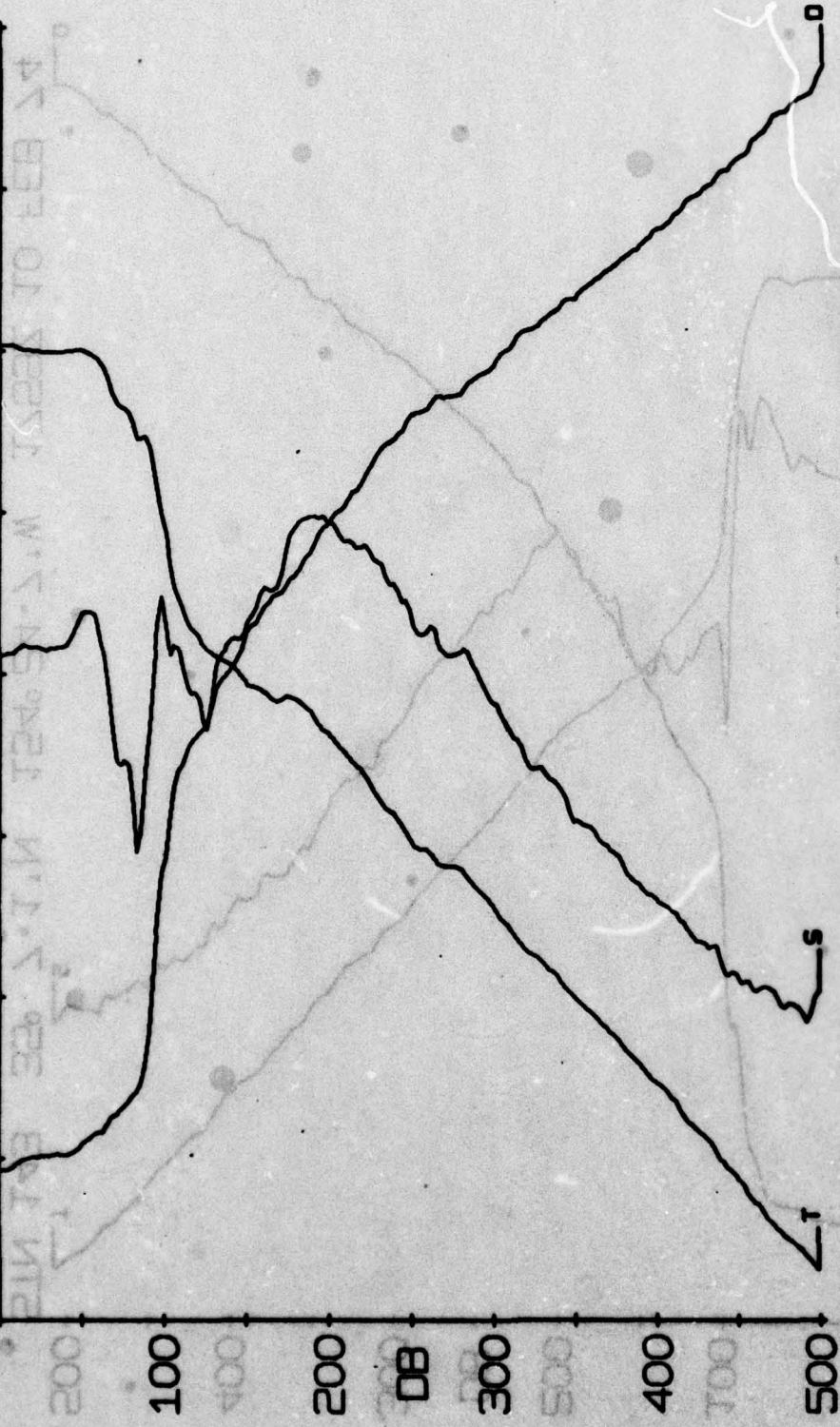
52.5
33.8

144

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 144 36° 5.8'N 154° 37.7'W 1953Z 10 FEB 74

33.5
33.8

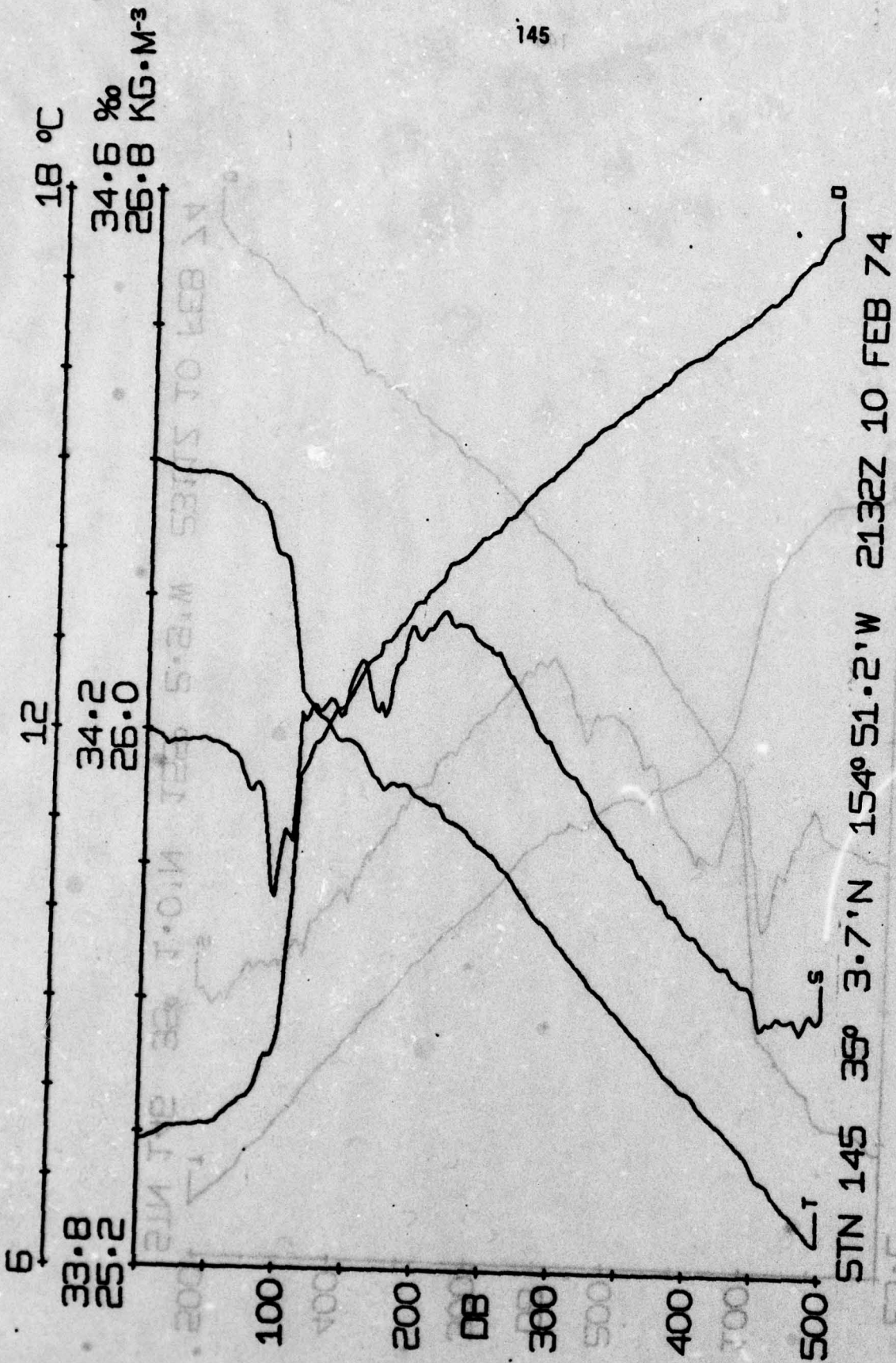
34.0
34.5

35.0
34.8

18 °C

15

6



STN 145 35° 3.7'N 154° 51.2'W 2132Z 10 FEB 74

52.5 33.8 26.0 34.6 26.8

51 18 °C

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2

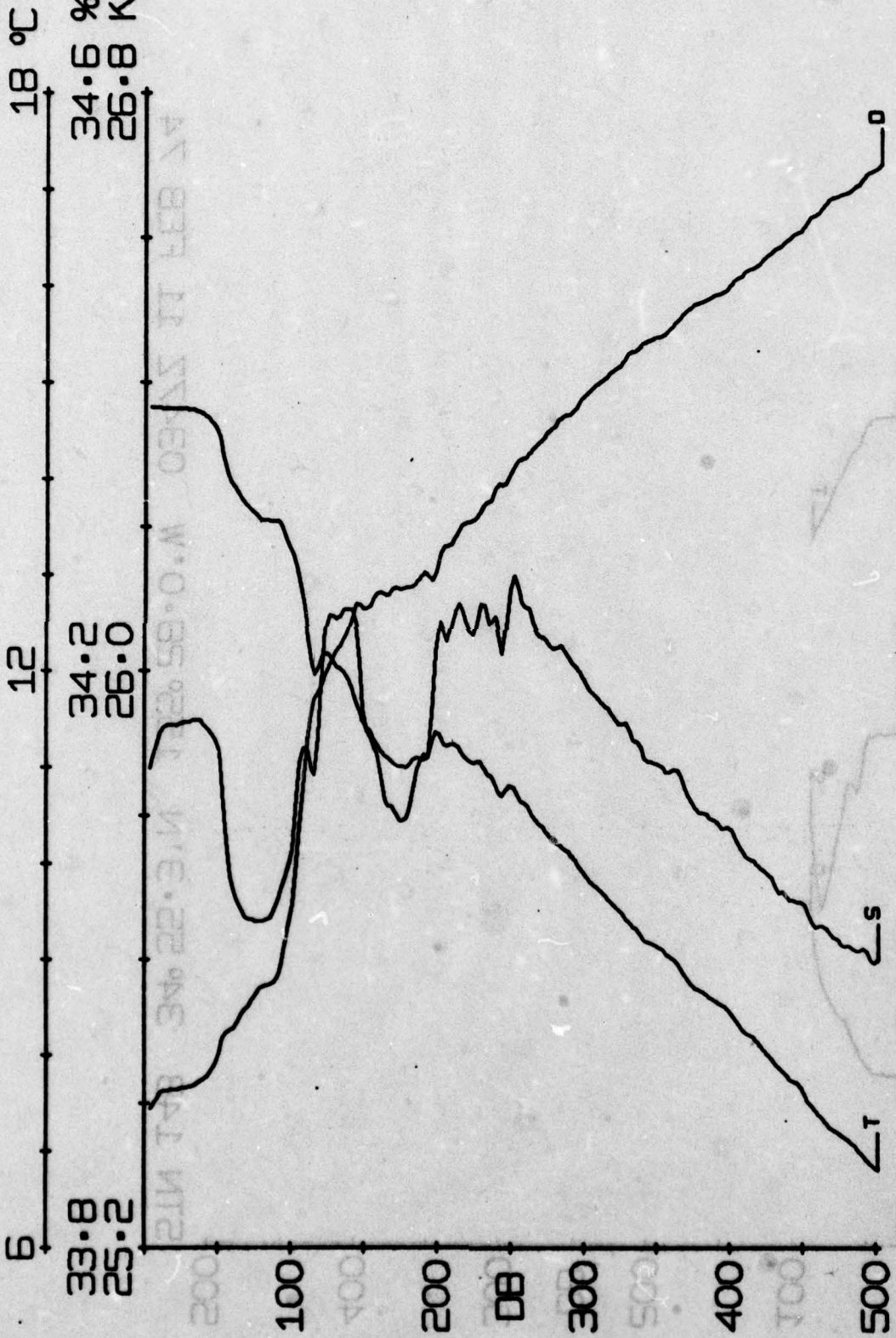


STN 146 35° 1.0'N 155° 2.9'W 2311Z 10 FEB 74

33.8
25.2

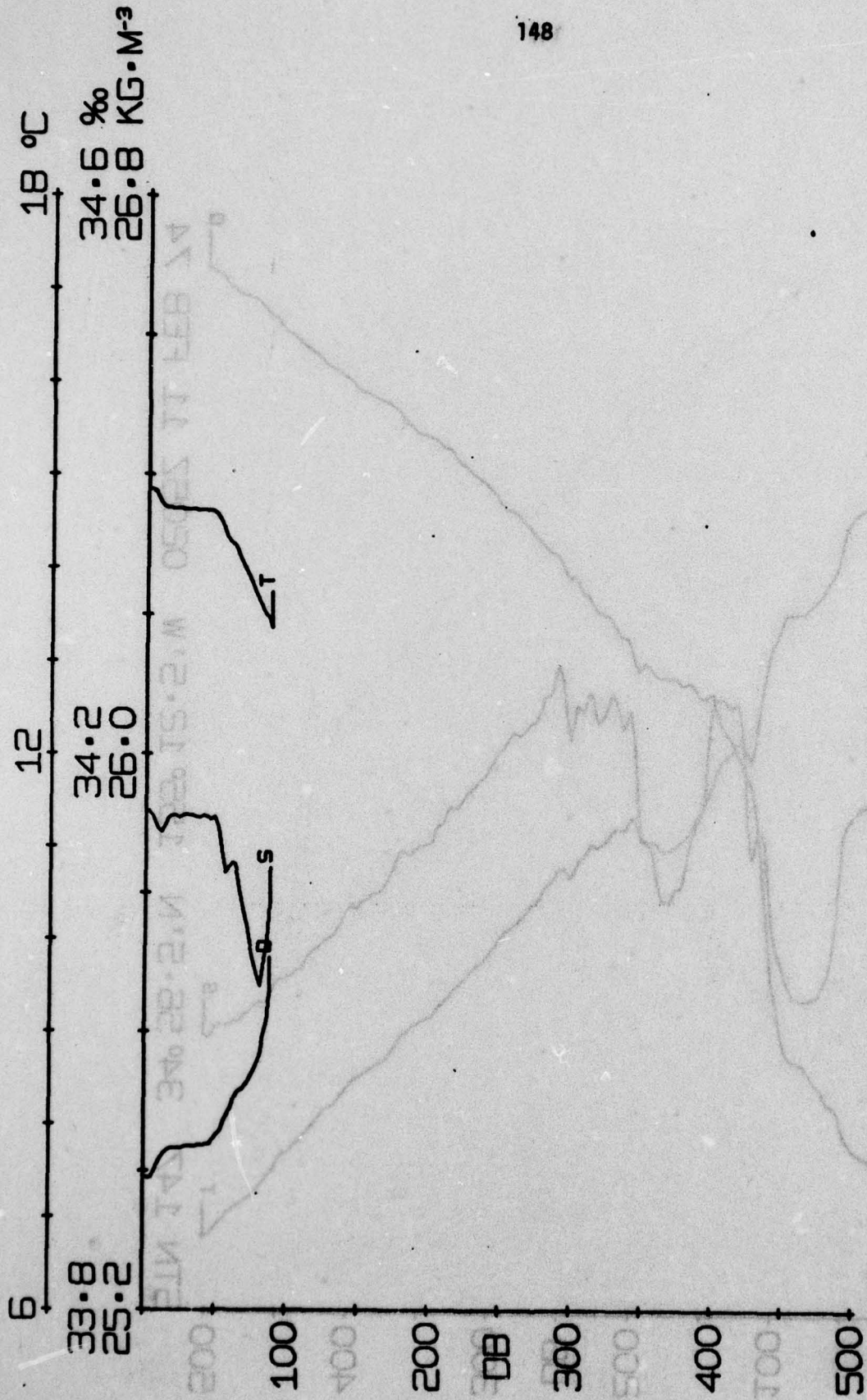
34.2
26.0

34.6 ‰
26.8 KG·M⁻³



STN 147 34° 56.5' N 155° 12.5' W 0205Z 11 FEB 74

52.5
 33.8
 52.0
 34.5
 52.8
 34.8
 18.0°C



STN 148 34° 55.3' N 155° 28.0' W 0347Z 11 FEB 74

33.8
34.2

34.2
34.6

34.6 ‰
26.8 KG·M⁻³

6

12

18 °C

STN 148 34° 55.3' N 155° 28.0' W 0347Z 11 FEB 74

500

400

300

200

100

DB

500

400

300

200

100

52.5
33.8

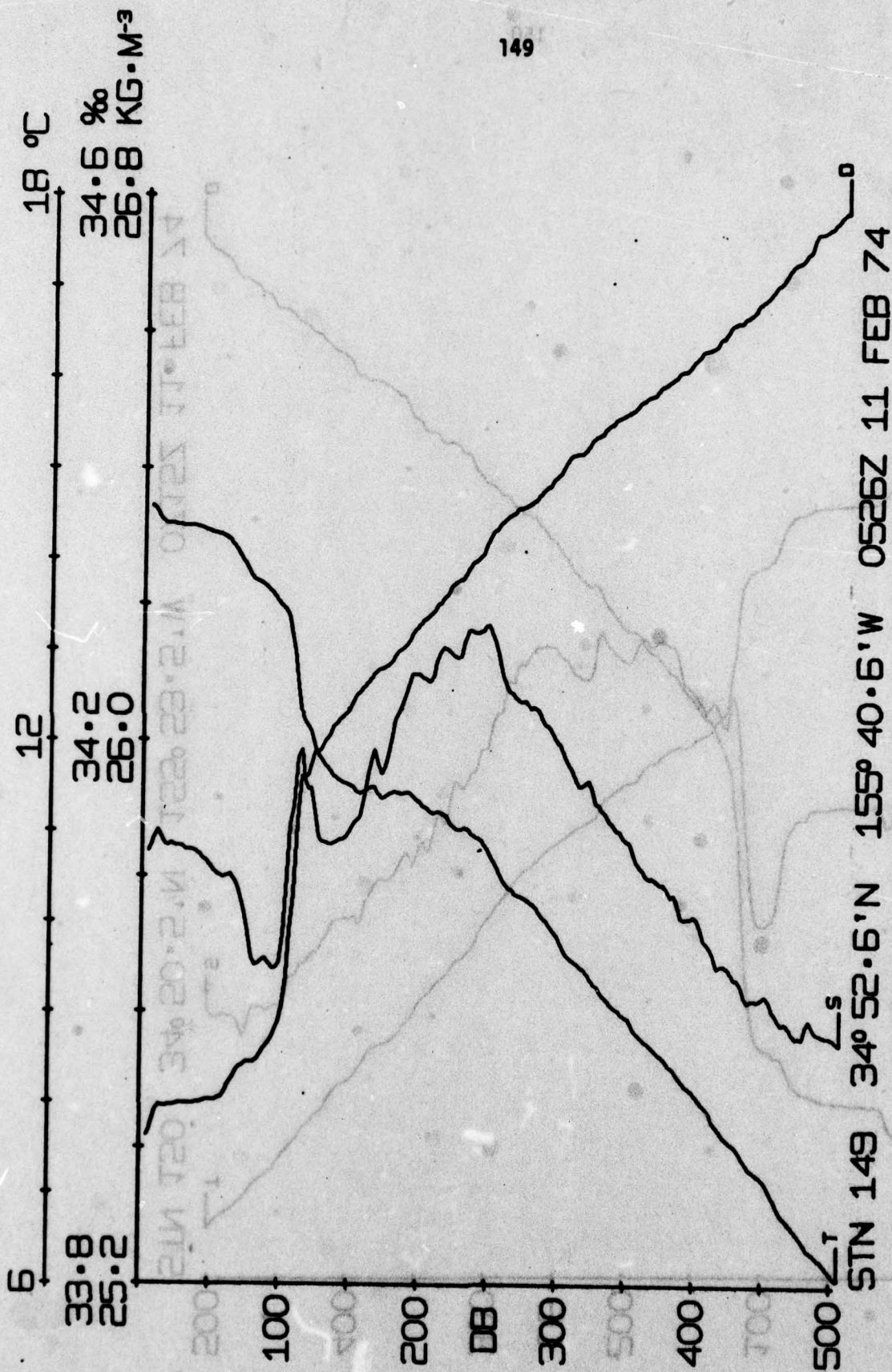
52.0
34.5

52.8 KG·M⁻³
34.6 ‰

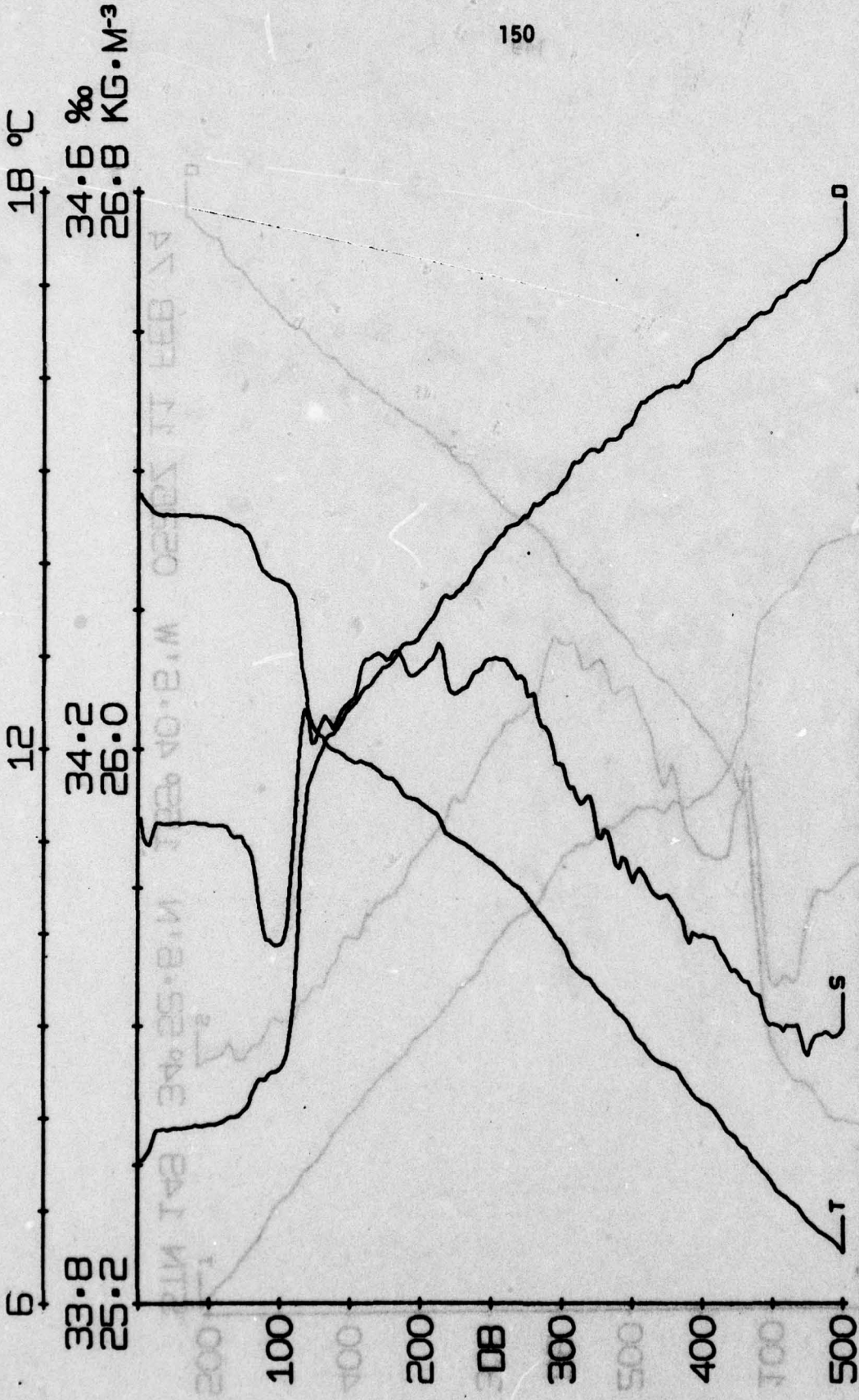
2

15

18 °C



52.5
33.8
52.0
34.5
52.8
34.8
26.8



STN 150 34° 50.5'N 155° 53.5'W 0715Z 11 FEB 74

33.8 °C
 34.2 ‰
 26.0 kg·m⁻³

34.6 °C
 26.8 kg·m⁻³

0600
 1800

18 °C

34.6 ‰
26.8 KG·M⁻³

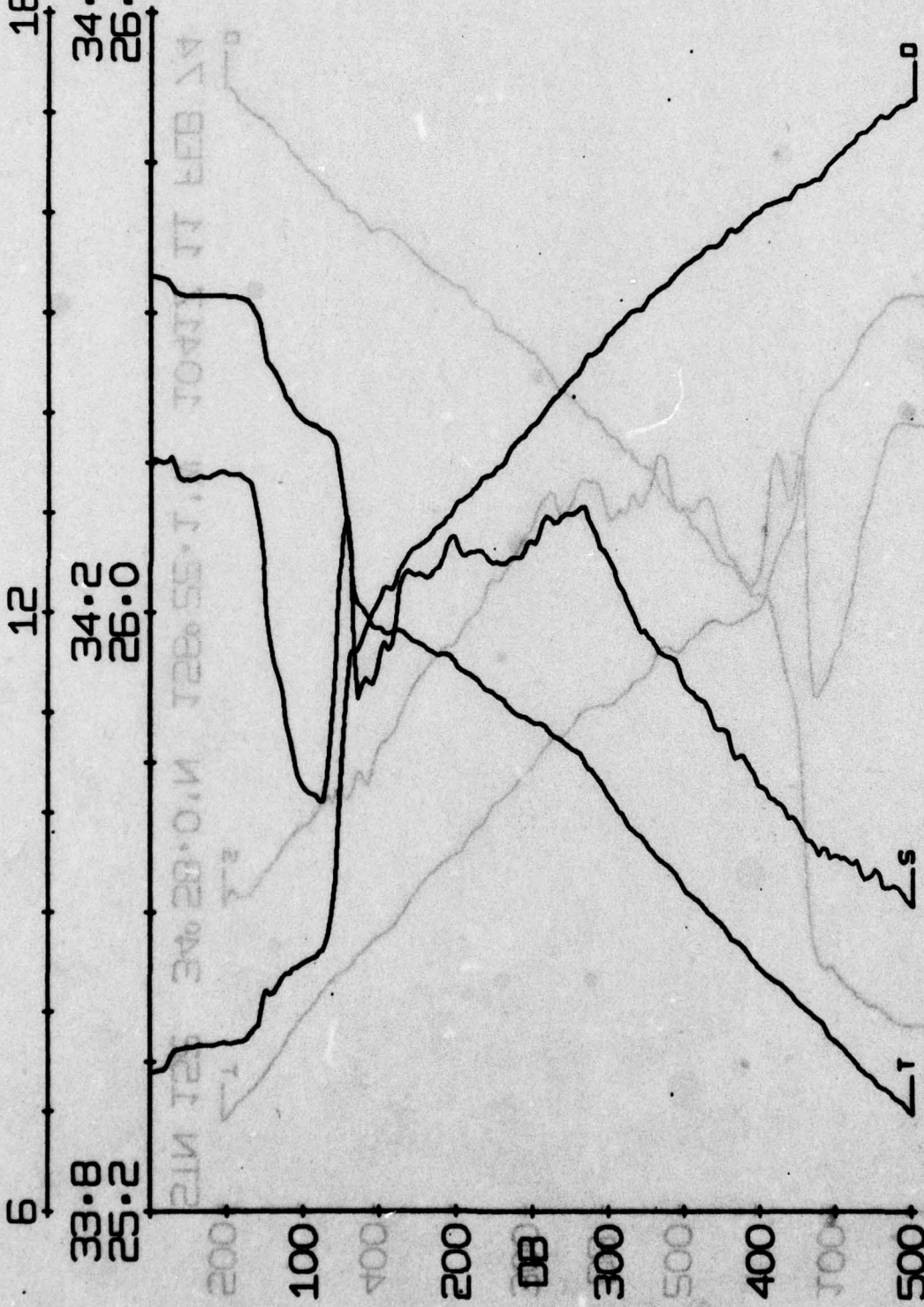
12

34.2 ‰
26.0

6

33.8 ‰
25.2

STN 151 34° 29' 0.1" N 128° 55' J. 10471 JT FEB 74



STN 151 34° 49' 3" N 157° 6' 1" W 0847Z 11 FEB 74

33.5 ‰
25.8

34.0 ‰
24.5

34.5 ‰
25

18 °C

12

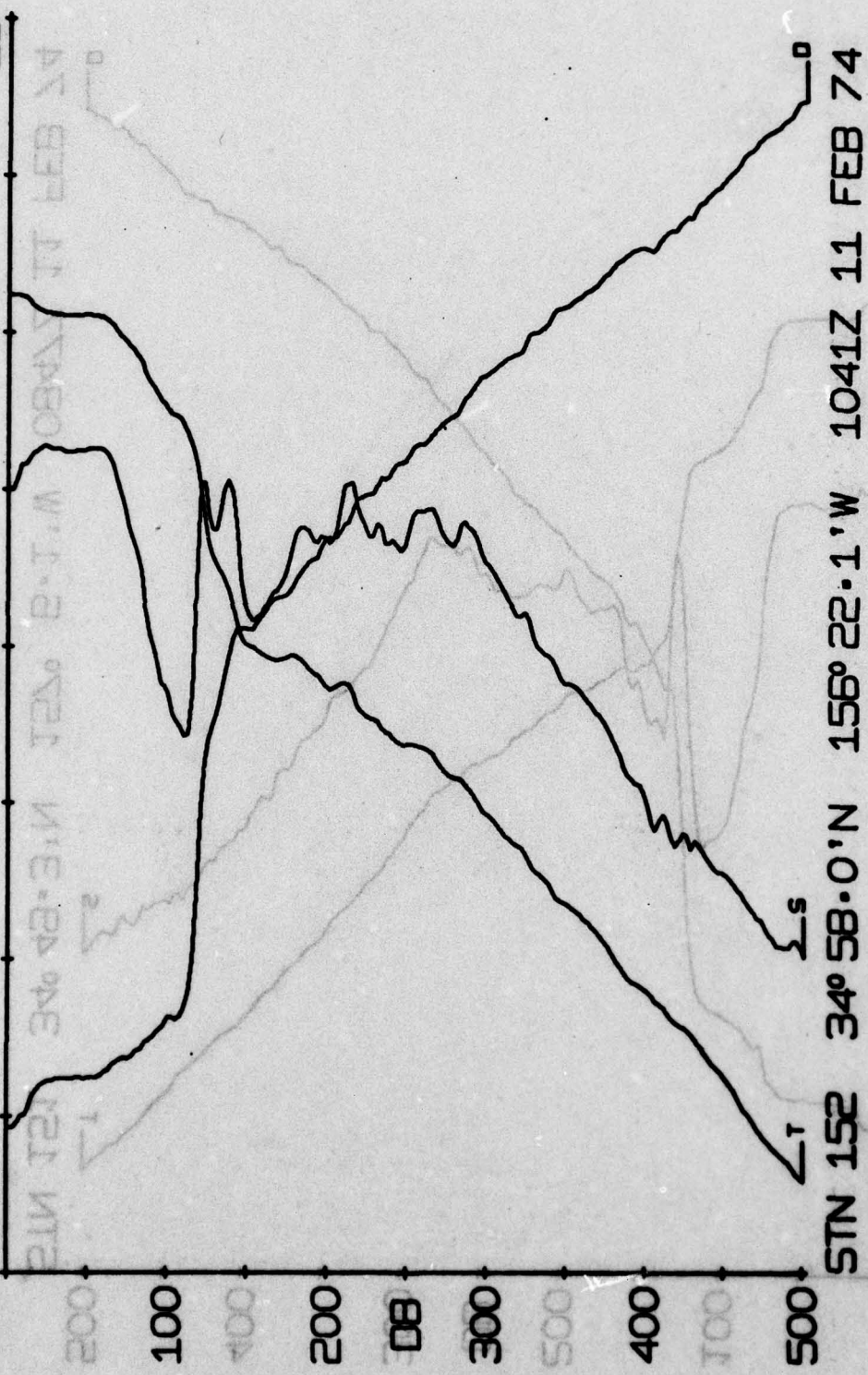
6

34.5 ‰
25

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 152 34° 58.0' N 156° 22.1' W 1041Z 11 FEB 74

52.5
33.8

52.0
34.5

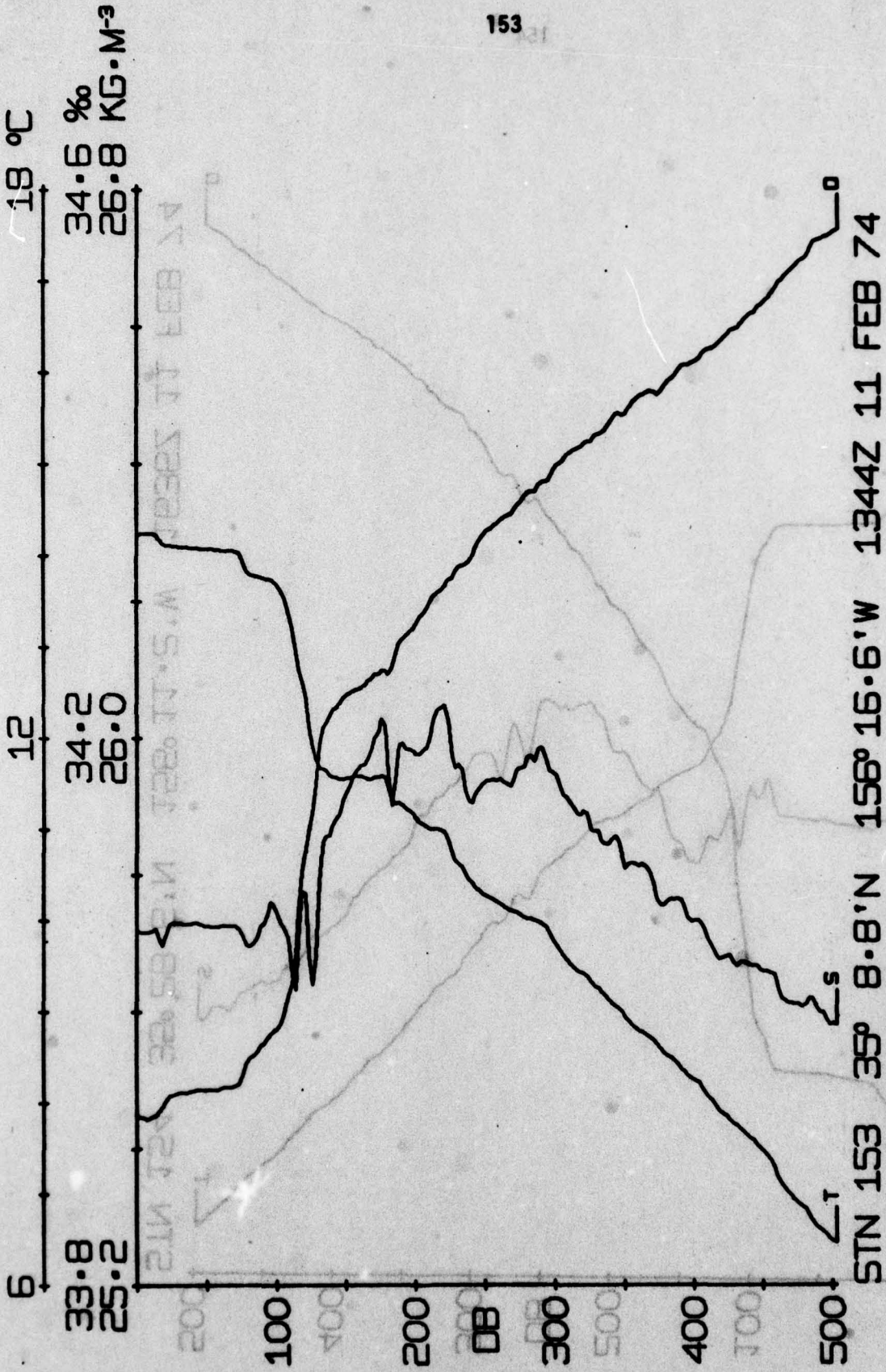
52.8 KG·M⁻³
34.2 ‰

18 °C

12

6

153



STN 153 35° 8.8'N 156° 16.6'W 1344Z 11 FEB 74

52.5 33.8

52.0 34.2

18 °C

12

6

500

400

300

200

100

0

DB

DB

300

500

400

300

200

100

0

18 °C

34.6 ‰

26.8 kg·m⁻³

34.2 ‰

26.0

33.8

25.2

52.0

34.2

52.5

33.8

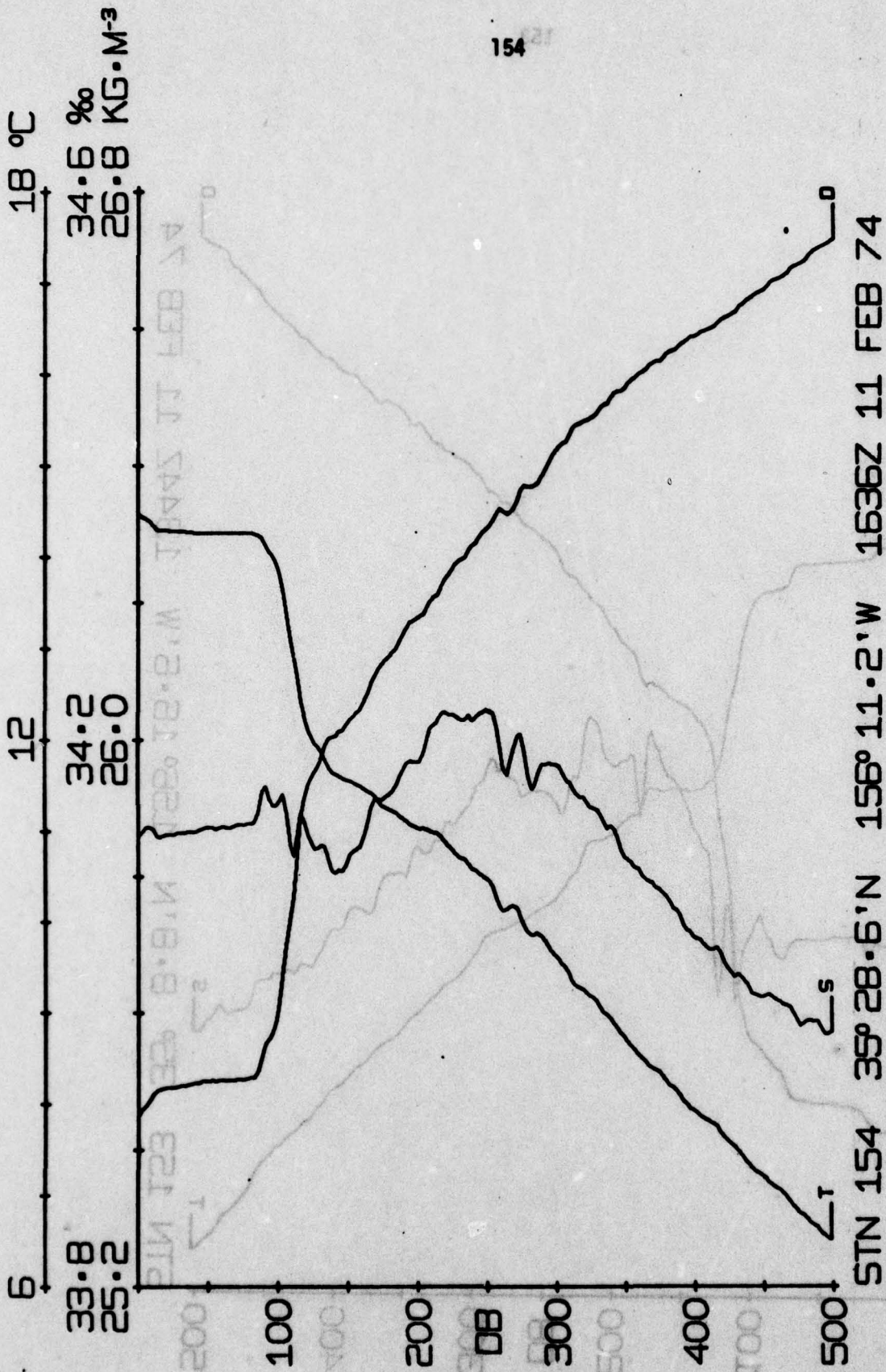
156° 16.6' W

1344Z 11 FEB 74

STN 153

35° 8.8' N

153



18 °C

12

6

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³

STN 154 35° 28.6' N 156° 11.2' W 1636Z 11 FEB 74

52.5
33.8

52.0
34.5

52.8 KG·M⁻³
34.2 ‰

18 °C

T

S

σ_t

0

15

18 °C

18 °C

34.6 ‰

26.8 KG·M⁻³

12

34.2

26.0

6

33.8

25.2



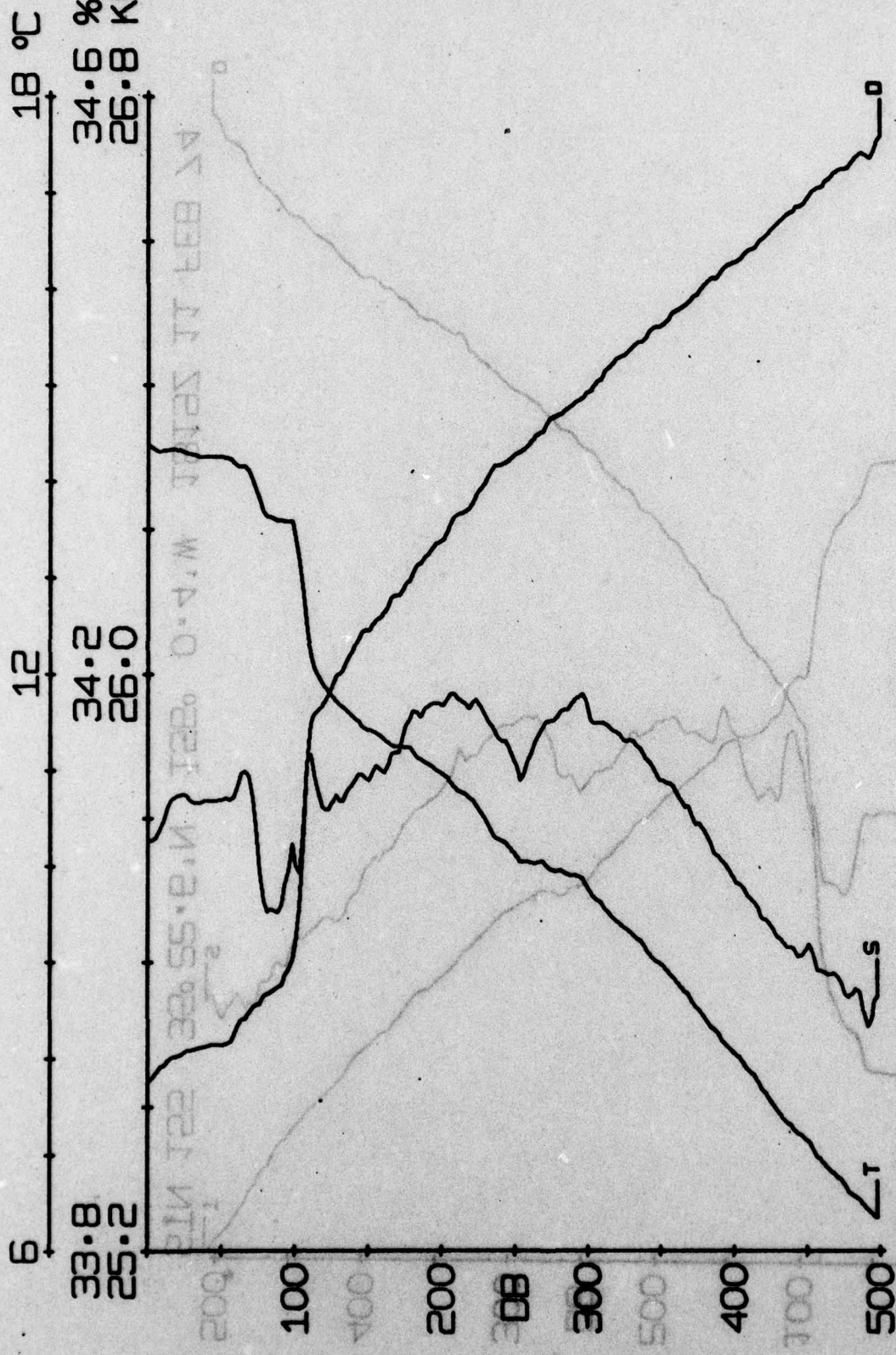
STN 155 35° 22.6' N 156° 0.4' W 1819Z 11 FEB 74

52.5
33.8

52.0
34.5

18 °C

15



STN 156 35° 16.6' N 155° 58.0' W 2008Z 11 FEB 74

33.8
25.2

34.2
26.0

52.5
33.8

52.0
34.5

52.8
34.2

18 °C

12

6

STN 156 35° 16.6' N 155° 58.0' W 2008Z 11 FEB 74

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2

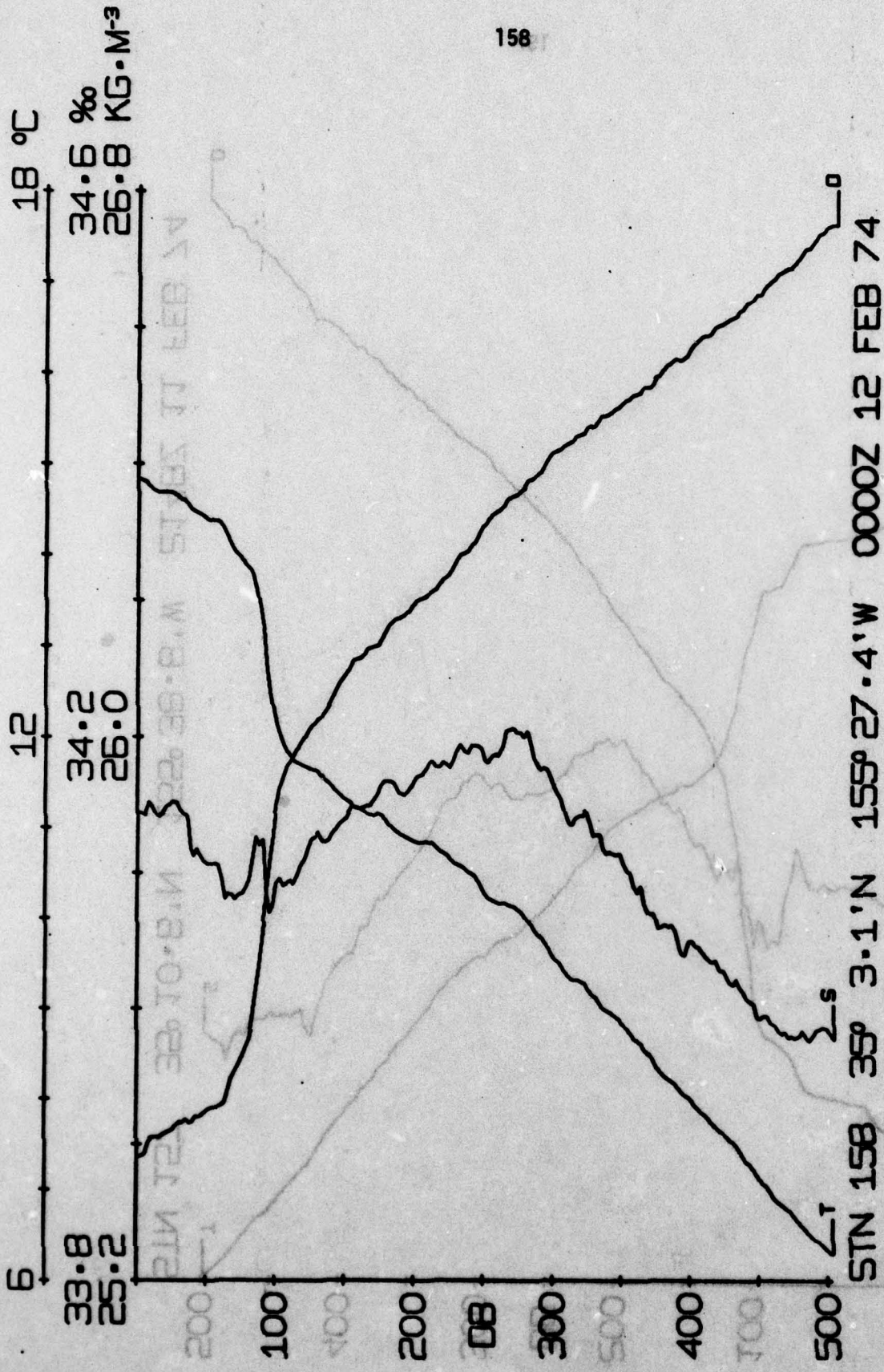


STN 157 35° 10.6' N 155° 38.8' W 2148Z 11 FEB 74

52.5
33.8
25.2

18 °C
34.6 ‰
26.8 KG·M⁻³

15

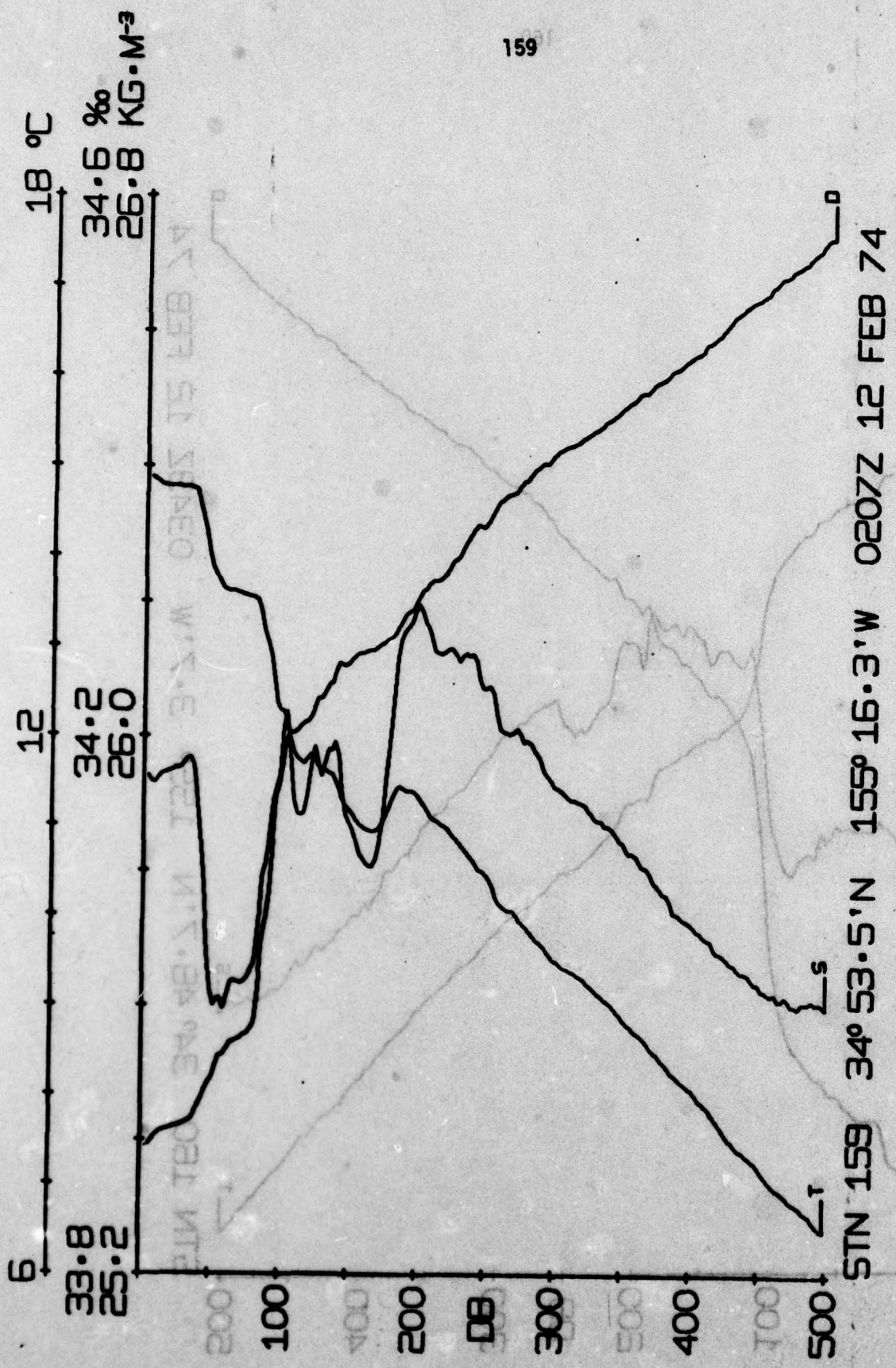


STN 158 35° 3.1'N 155° 27.4'W 0000Z 12 FEB 74

52.5 33.8 18.0

52.0 34.5 15

52.8 34.2 18.0



52.5
33.8
58.0
34.5
58.8
34.8
18.0°C

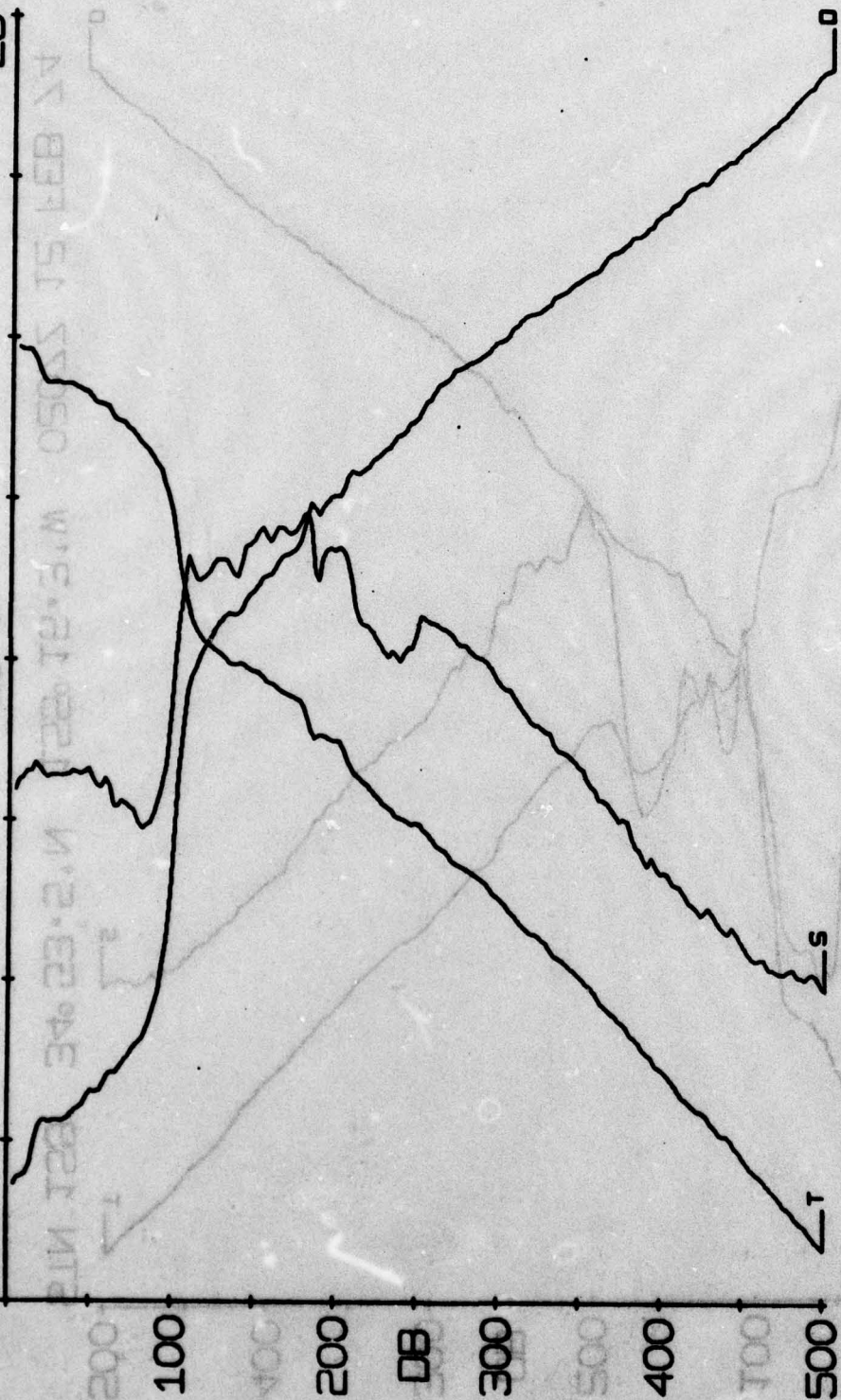
58.0
34.5
15

52.5
33.8
58.0
34.5
15

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 160 34° 48.7' N 155° 3.7' W 0343Z 12 FEB 74

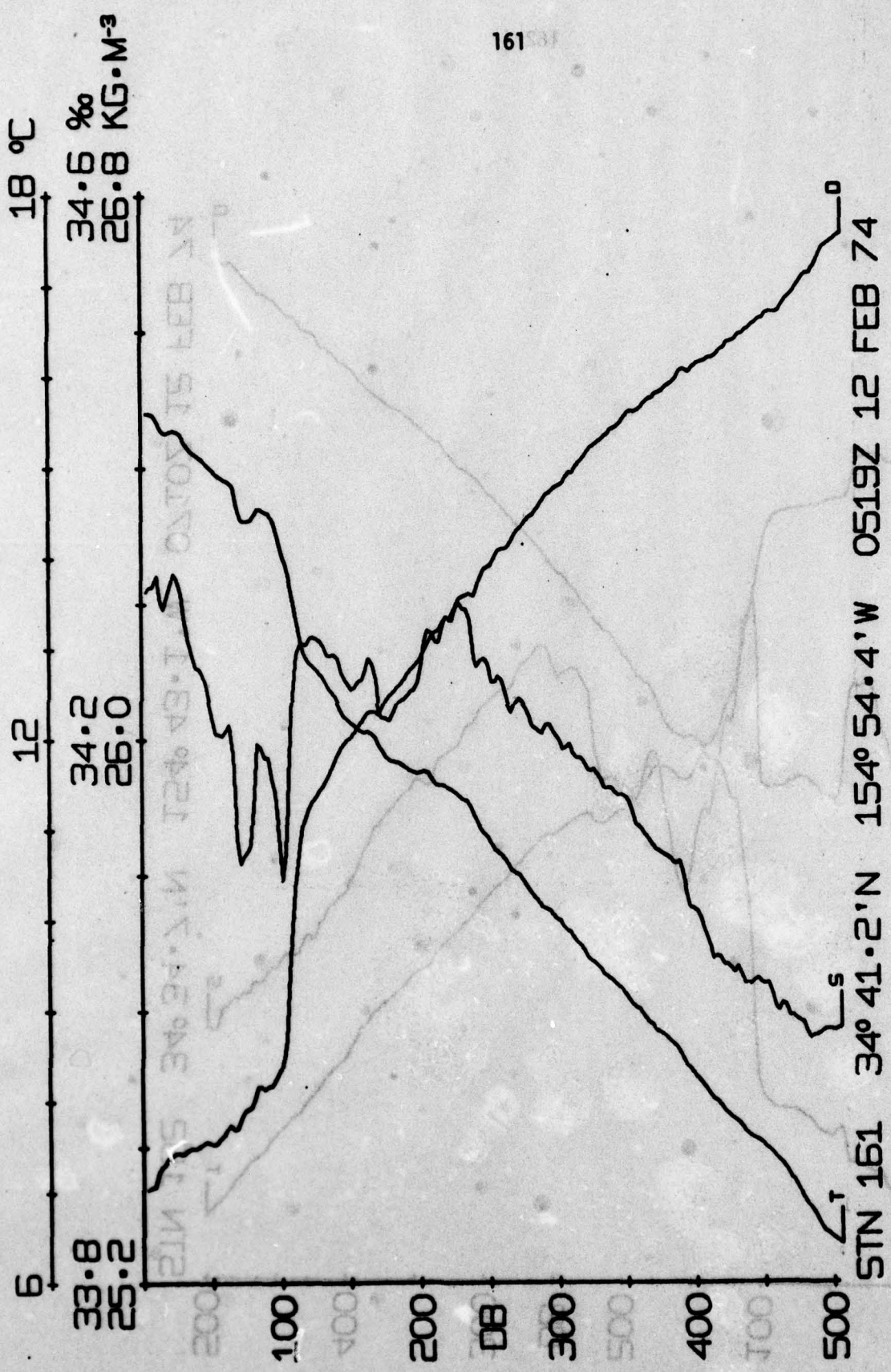
52.8 KG·M⁻³
34.2 ‰

52.0
34.5

52.5
33.8

TB °C

15



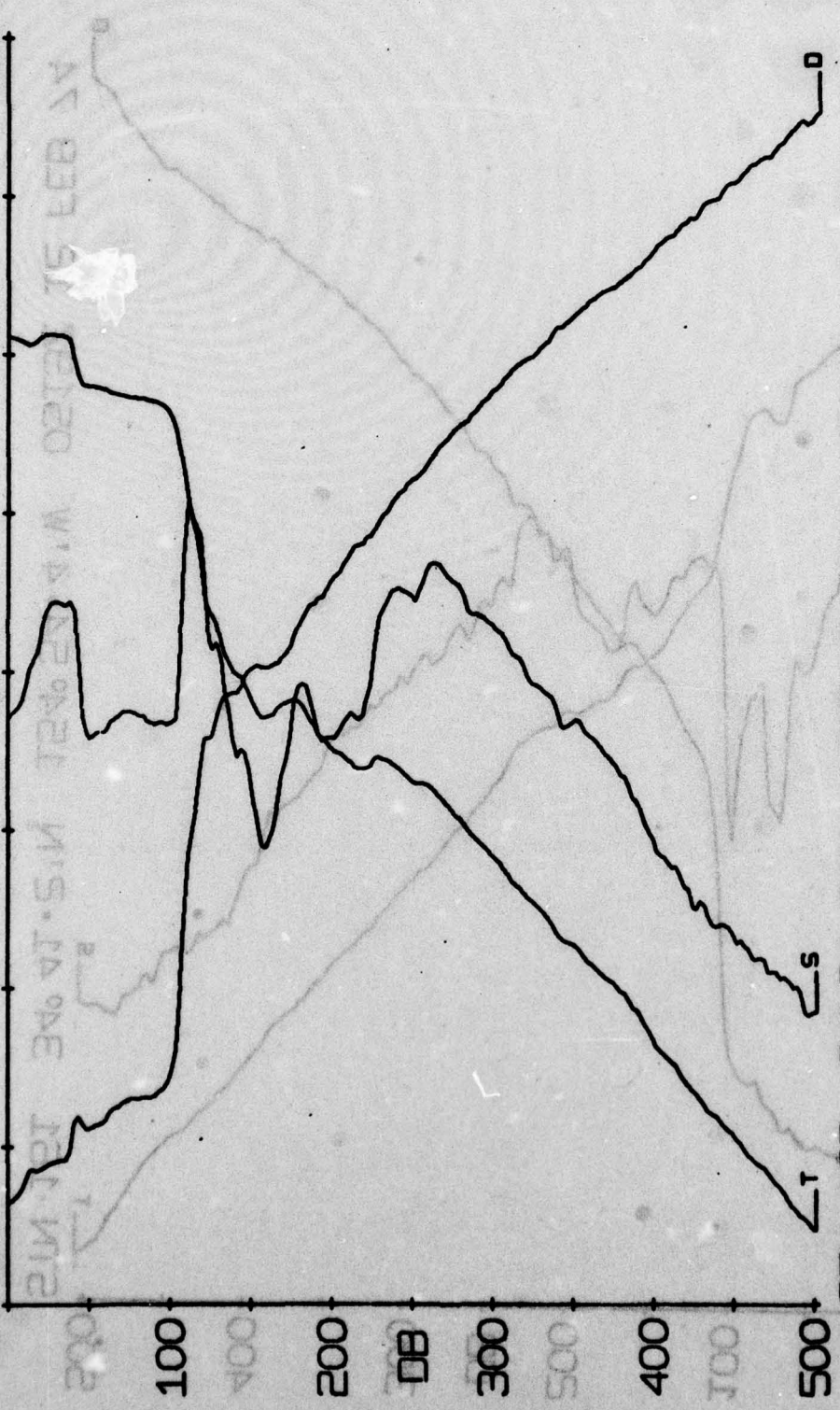
161

52.5
 33.8
 52.0
 34.5
 52.8
 34.8
 52.8
 34.8
 52.8
 34.8

18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2

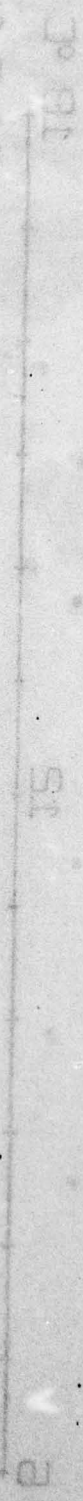


STN 162 34° 34.7' N 154° 43.1' W 0710Z 12 FEB 74

33.8
25.2

34.2
26.0

34.6 ‰
26.8 KG·M⁻³



18 °C
34.6 ‰
26.8 KG·M⁻³

12
34.2
26.0

6
33.8
25.2



STN 163 34° 20.9'N 154° 22.5'W 1018Z 12 FEB 74

33.8
25.2

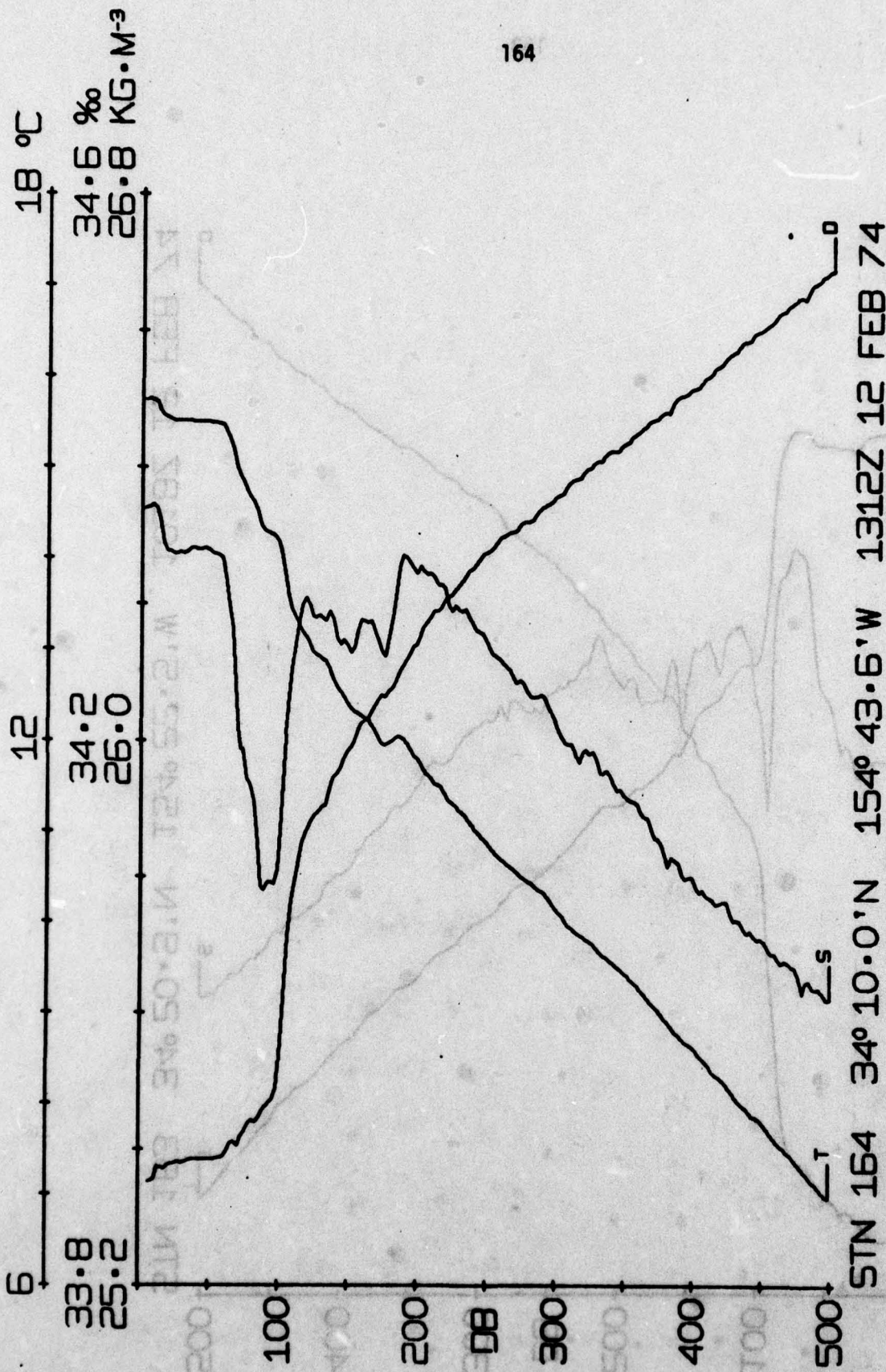
34.2
26.0

33.8
25.2

18 °C

12

6



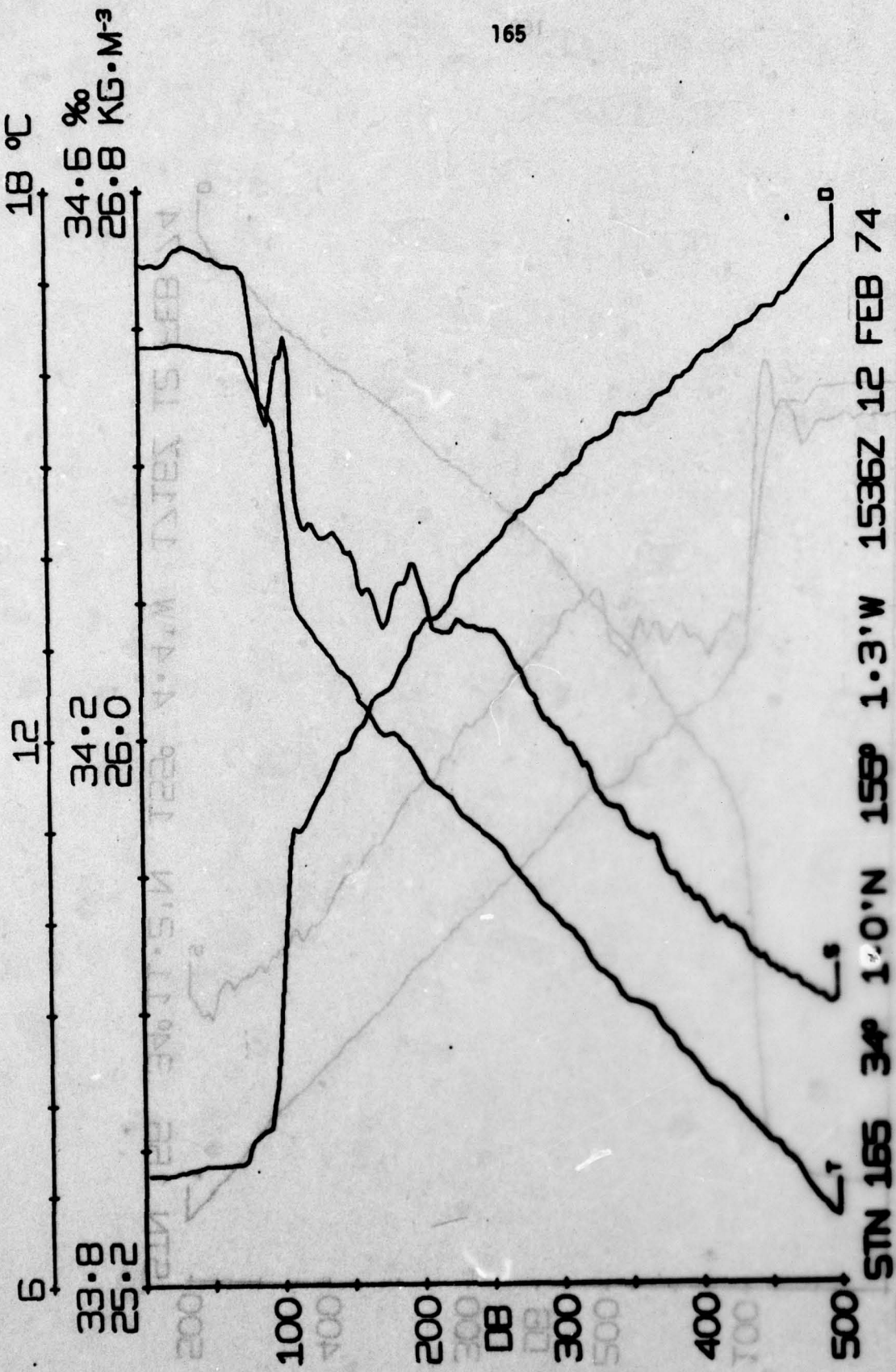
52.5
33.8
52.0
34.5
52.8 KG·M⁻³
34.2 ‰

52.0
34.5

18 °C

15

e



STN 165 34 14' 0" N 156 1' 3" W 1536Z 12 FEB 74

18 °C
34.6 ‰
26.8 KG·M⁻³

18 °C

12

34.2
26.0

6

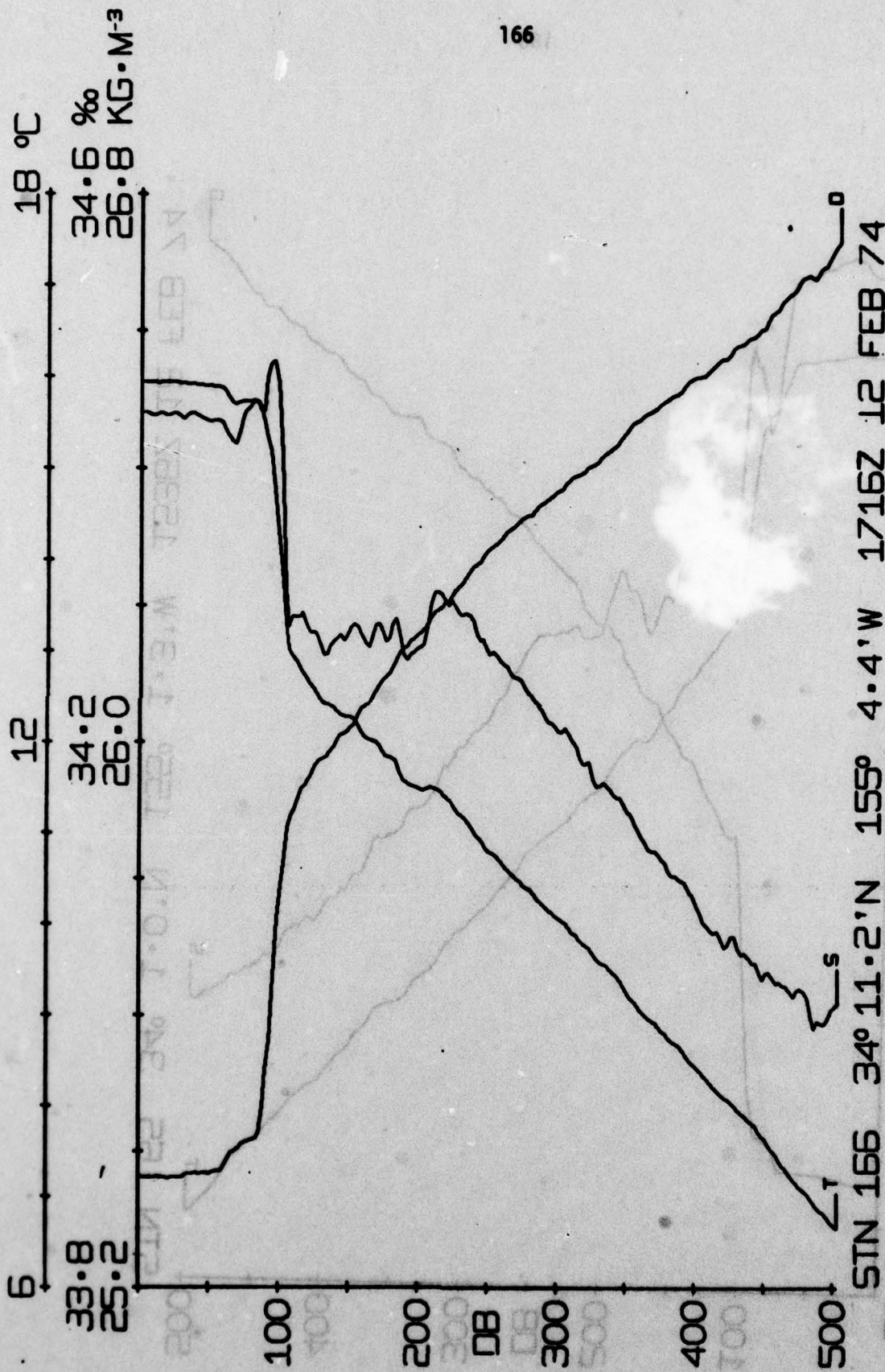
33.8
25.2

500
400
300
200
100
0
DB
DB
500
400
300
200
100
0

34.6 ‰
26.8 ‰
18 °C

34.2 ‰
26.0 ‰
18 °C

33.8 ‰
25.2 ‰
18 °C



52.5
33.8
52.0
34.2
26.8

52.5
34.2
26.0

ST

18 °C

18 °C

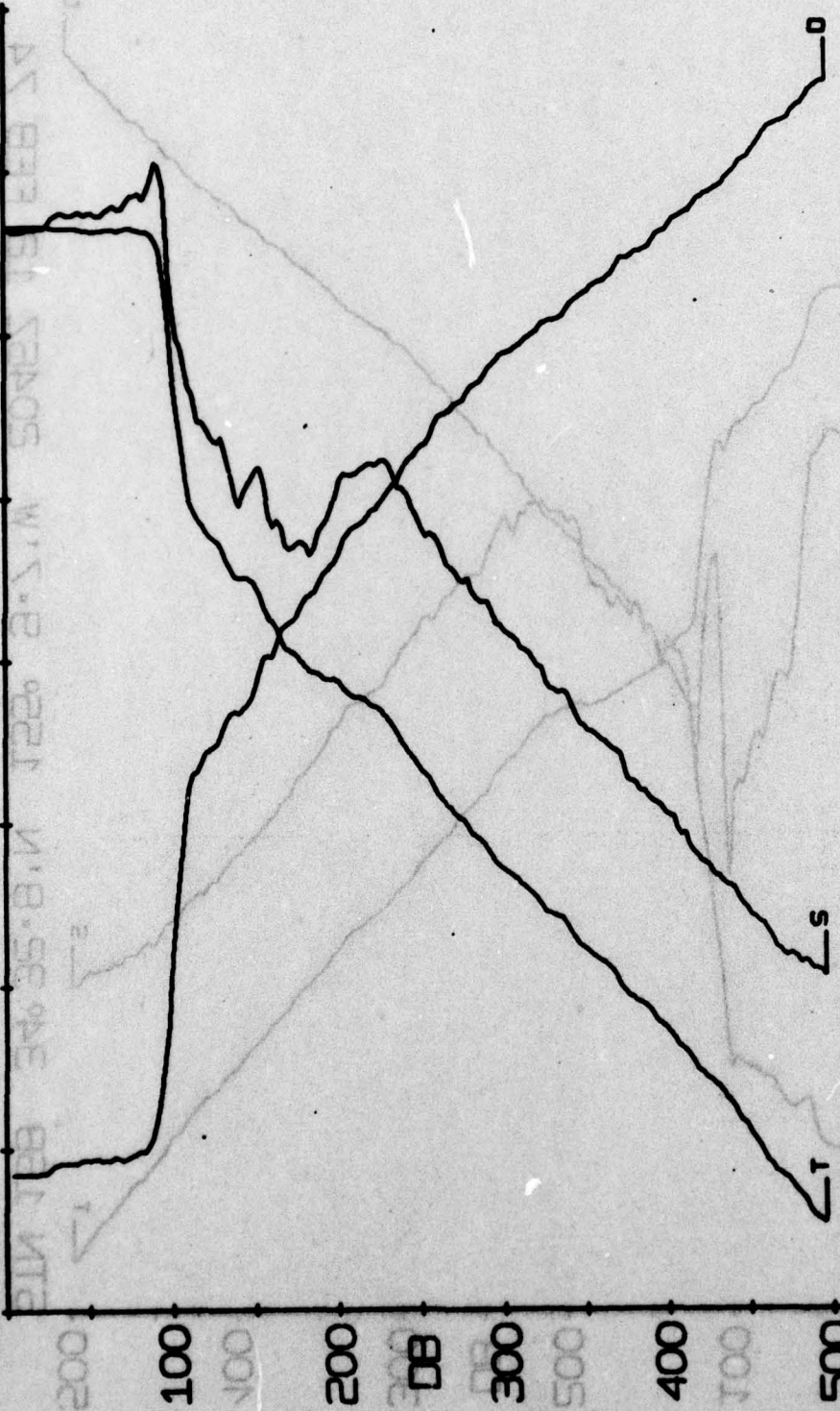
34.6 ‰
26.8 KG·M⁻³

12

34.2 ‰
26.0

6

33.8 ‰
25.2



STN 167 34° 22.0'N 155° 8.0'W 1906Z 12 FEB 74

33.8 ‰
25.2

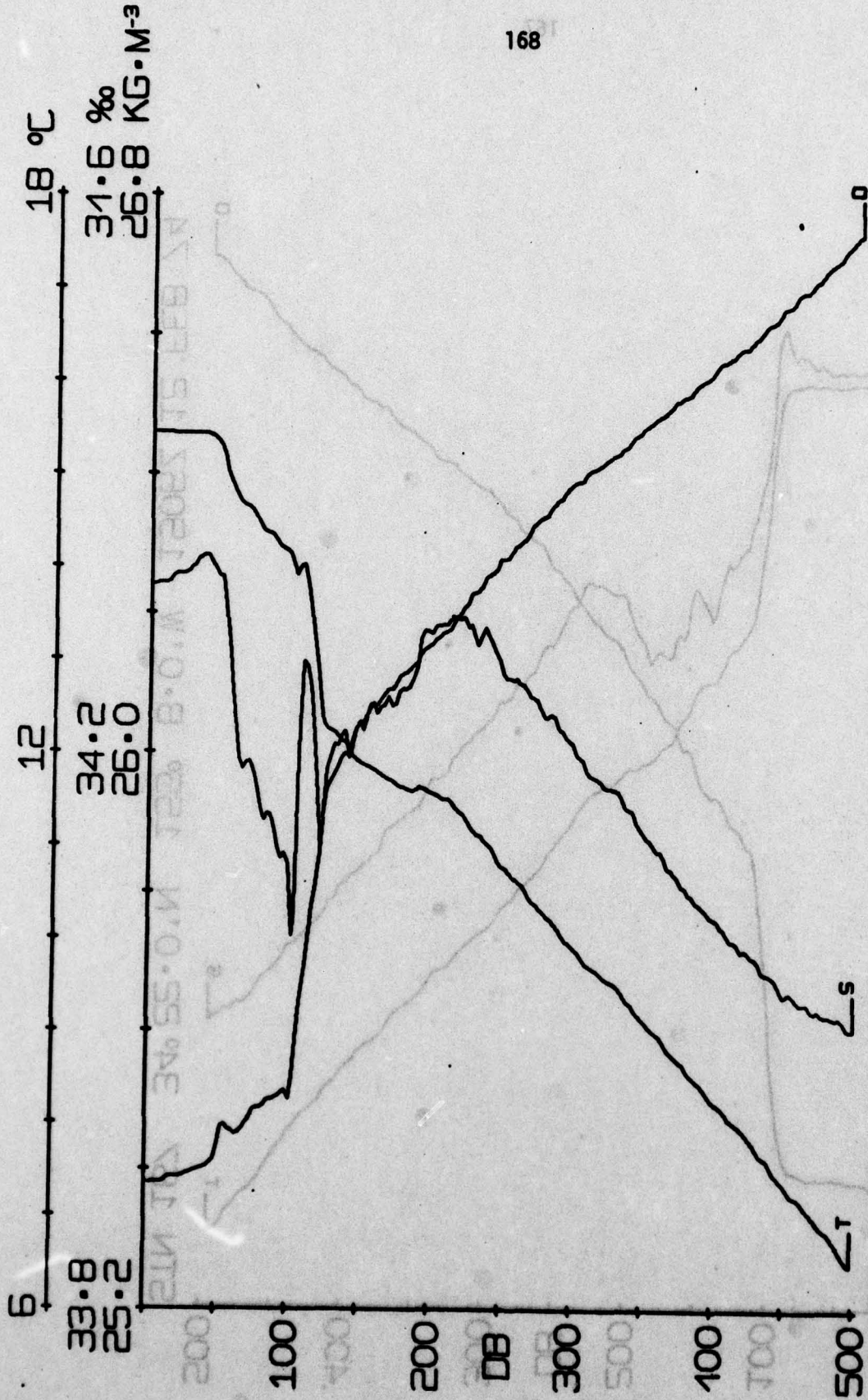
34.2 ‰
26.0

34.6 ‰
26.8 KG·M⁻³

18 °C

12

6



STN 168 34° 32.8'N 155° 9.7'W 2046Z 12 FEB 74

33.8
25.2

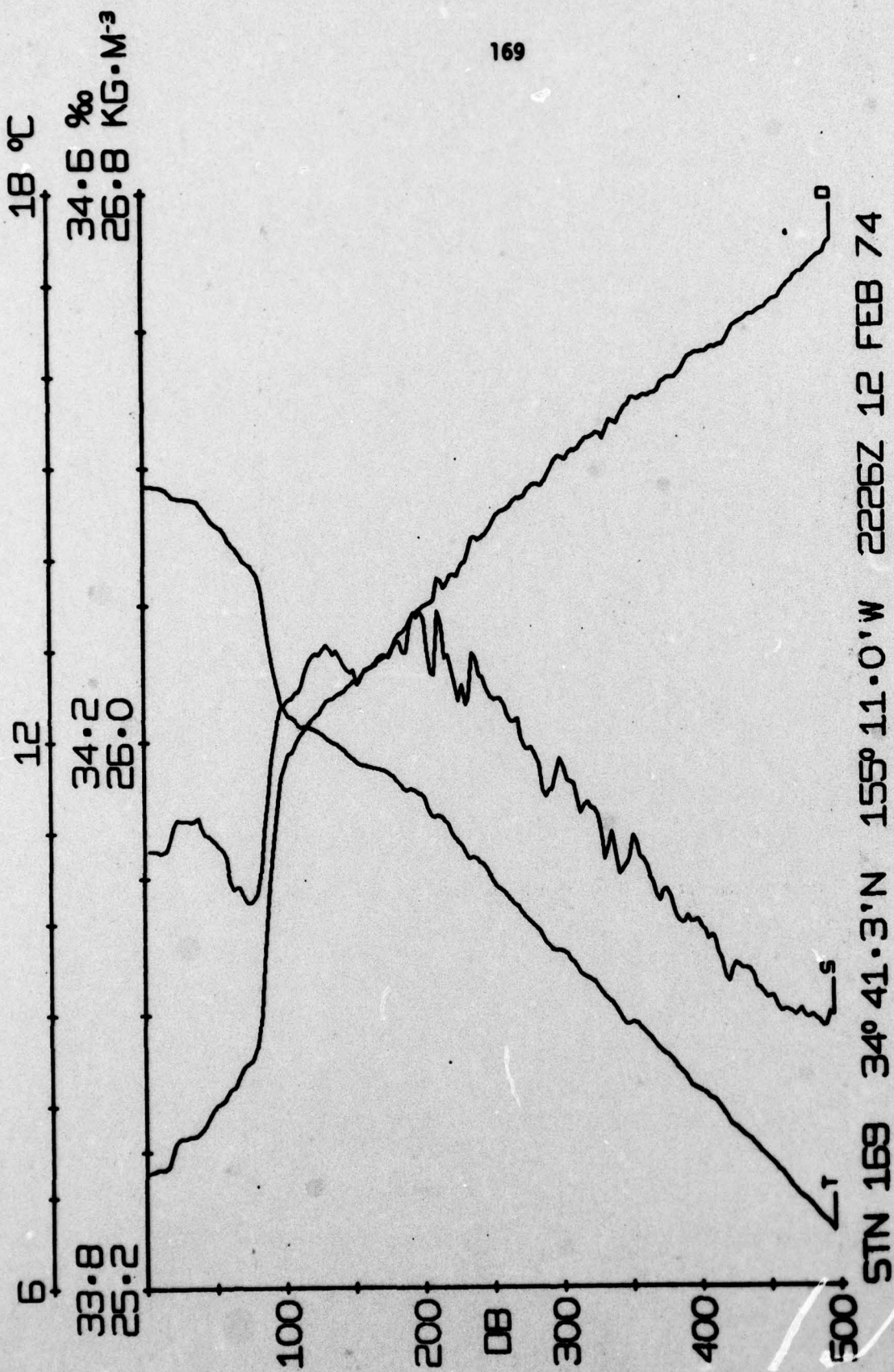
31.6 ‰
26.8 KG·M⁻³

52.5
33.8

52.8 ‰
34.5

18 °C

15



STN 169 34° 41.3' N 155° 11.0' W 2226Z 12 FEB 74