

School of

# OCEANOGRAPHY



OREGON STATE UNIVERSITY

**A COMPENDIUM OF PHYSICAL  
OBSERVATIONS FROM JOINT-1**

Vertical Sections of  
Temperature, Salinity and  
Sigma-t from R/V GILLISS Data  
and  
Low-Pass Filtered Measurements  
of Wind and Currents

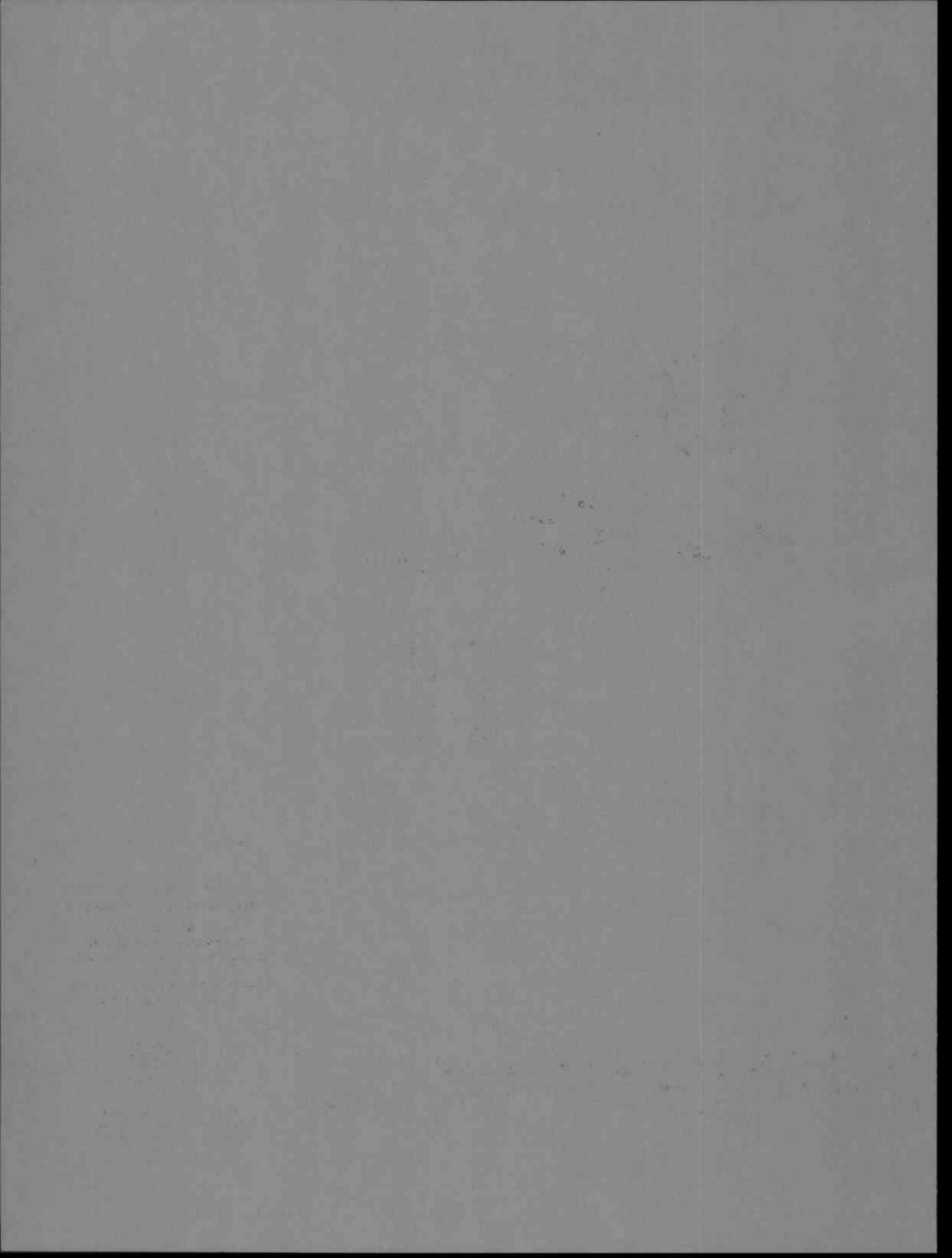
by

E. D. Barton  
R. D. Pillsbury  
R. L. Smith

Reference 75-17  
August 1975

Office for the International  
Decade of Ocean Exploration  
National Science Foundation

IDO 72-06422  
IDO 71-04211



School of Oceanography  
Oregon State University  
Corvallis, OR 97331

A COMPENDIUM OF PHYSICAL OBSERVATIONS FROM JOINT-I

Vertical Sections of Temperature, Salinity  
and Sigma-t from R/V GILLISS Data  
and  
Low-pass Filtered Measurements of Wind  
and Currents

by

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R. D. Pillsbury  
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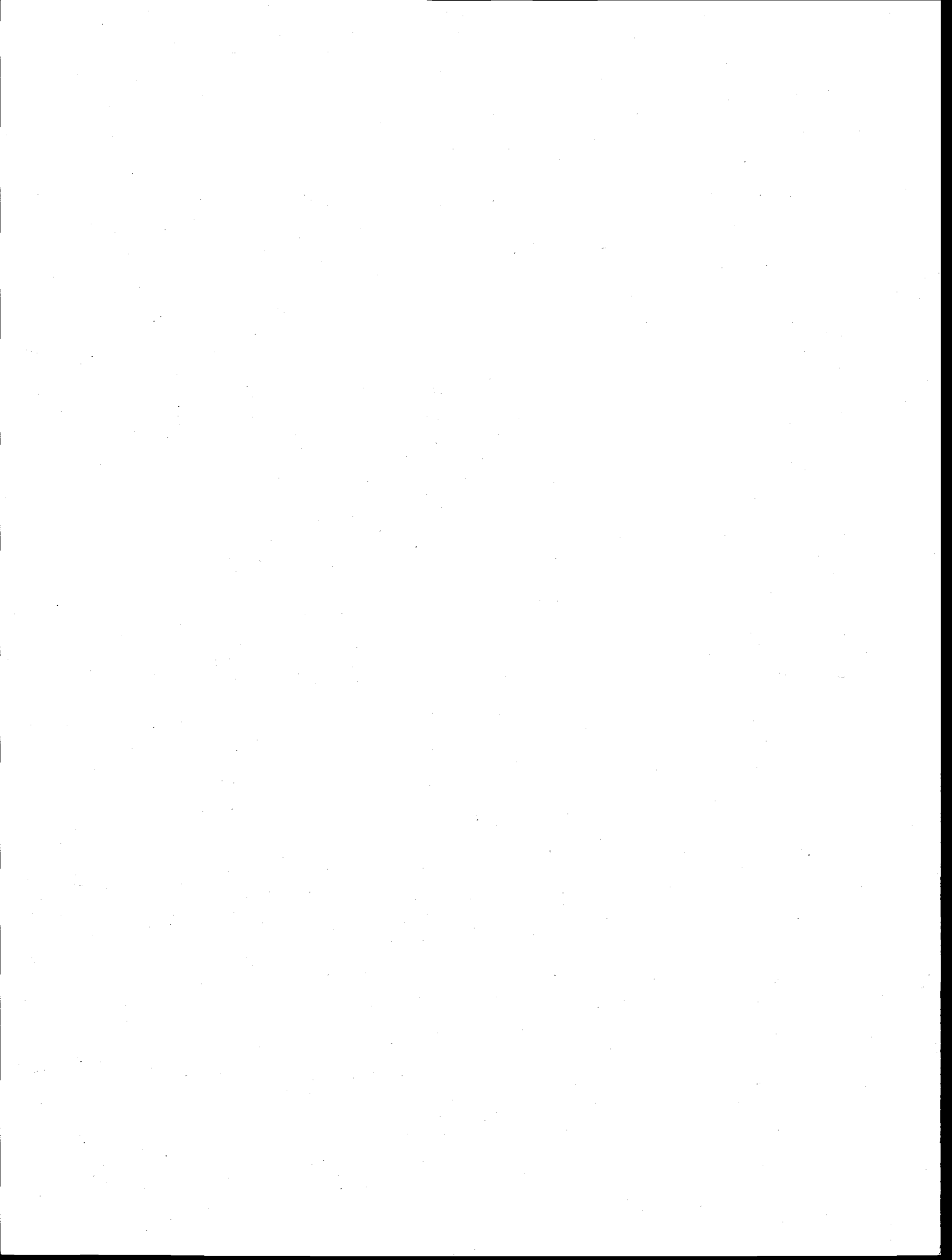


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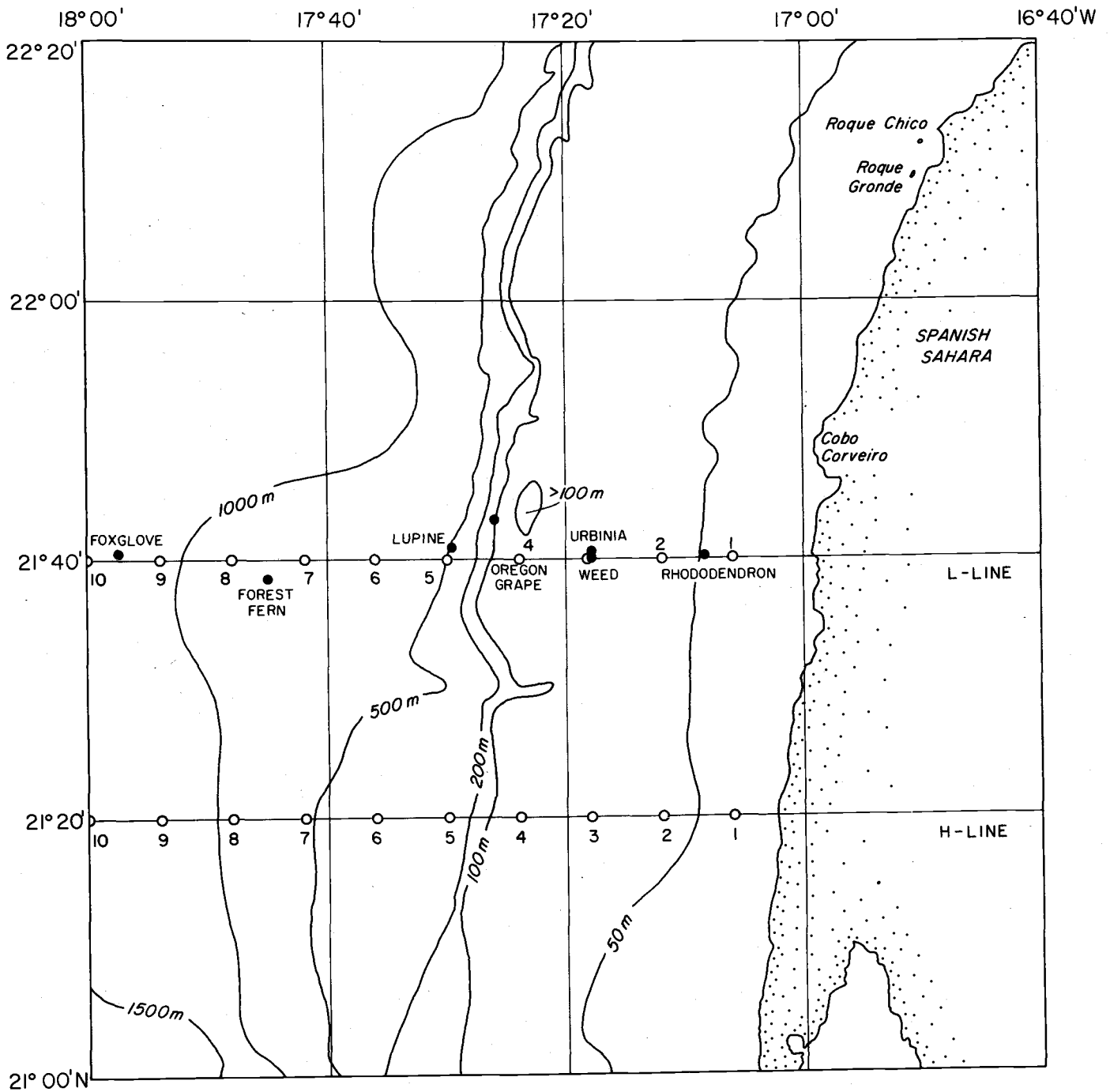


Fig. 1 Standard hydrographic stations and current meter moorings during JOINT-I.

## INTRODUCTION

During February, March and April 1974, the interdisciplinary Coastal Upwelling Ecosystems Analysis experiment known as JOINT-I took place over the continental shelf and slope near Cabo Corveiro in the NW African upwelling region. As part of the field program, Oregon State University made a series of repeated hydrographic surveys from R/V GILLISS along latitudes  $21^{\circ}20'N$  and  $21^{\circ}40'N$  (Fig. 1). The more northerly line was the site of the current meter mooring and meteorological buoy array maintained during the same period by Oregon State University in cooperation with the Deutsches Hydrographisches Institut, Hamburg. This report contains the complete set of contour plots of hydrographic section and anchor station data obtained by OSU. The low-pass filtered time series of current and wind measurements from each OSU mooring are also included.

A summary of the CTD and STD data and the calibration of the probes used during JOINT-I are reported by Barton, Stevenson and Gilbert (1975). From computer listings of the complete data set, vertical sections were contoured by hand. The depth interval between observations was always less than 5 meters and usually about 2 meters. Smooth contours were drawn to pass through the observed or interpolated depth of selected isosurfaces at each station. Numerous large inversions of salinity and temperature created a considerable problem in contouring. Although consistency in interpretation was the aim, there are undoubtedly other equally possible configurations of the isopleths in some cases. The contoured sections are subject to aliasing by internal waves and tides, but it is felt that the distributions have not been greatly distorted by short period fluctuations, at least on the shelf. The 24-hour anchor station in 100 m of

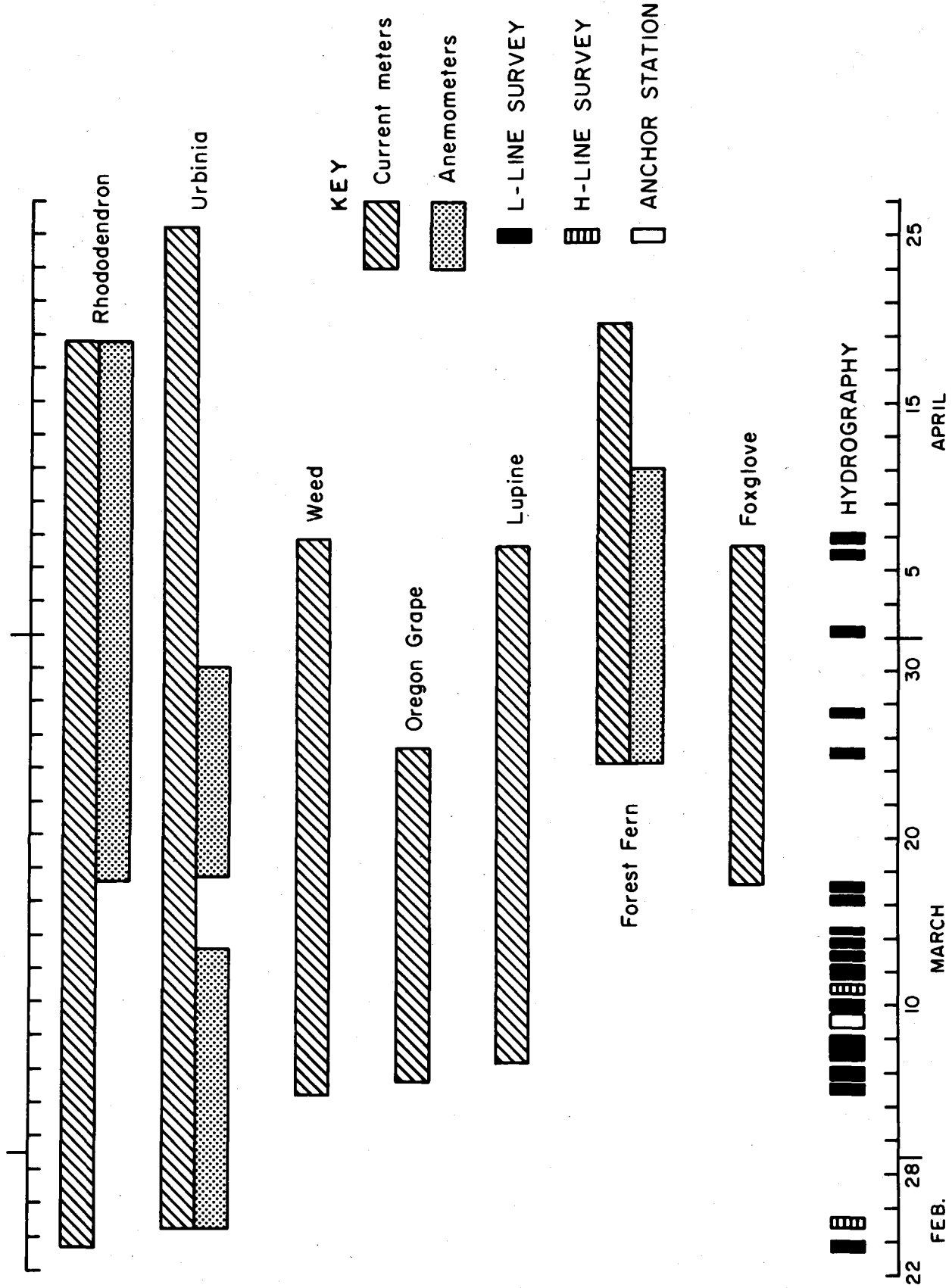


Fig. 2 Operating periods of the various moorings and times of hydrographic surveys during JOINT-I.



water tends to support this supposition (see page 15). A standard bottom profile was used for all sections resulting from repeated occupations of the same line.

In the displayed sections contours are drawn at regular intervals of  $1^{\circ}\text{C}$  in temperature, 0.1 o/oo in salinity, and 0.1 units of sigma-t. Occasionally, extra contours are indicated and labeled. A dashed portion of an otherwise solid contour indicates uncertainty in its positioning. Station numbers are indicated at the top of the sections and distance away from the shoreline is indicated at the bottom.

The position of the OSU current meter array is shown in Fig. 1. The operating periods of the various moorings are illustrated together with the times of the OSU hydrographic surveys in Fig. 2, and in Fig. 3 the vertical arrangement of current meters along  $21^{\circ}40'\text{N}$  is shown. The current meter and anemometer data were recorded at 5 or 10 minute intervals. The resultant time series were filtered to produce hourly series. In this form they are reported by Pillsbury, Bottero, Still and Mittelstaedt (1975). In the present report, the hourly series were further filtered with a symmetrical cosine filter spanning 121 hours with a half power point at 40 hours to suppress diurnal and higher frequency oscillations. Use of the low-pass filter shortens the time series by 2 1/2 days at each end.

Wind observations were recorded at Rhododendron, Urbinia and Forest Fern. A complete record for the whole length of the experiment was not obtained at any one site. For this reason, the two shelf wind series (Rhododendron and Urbinia) were joined at the end of the Urbinia record to provide one continuous series. Comparison of simultaneous measurements

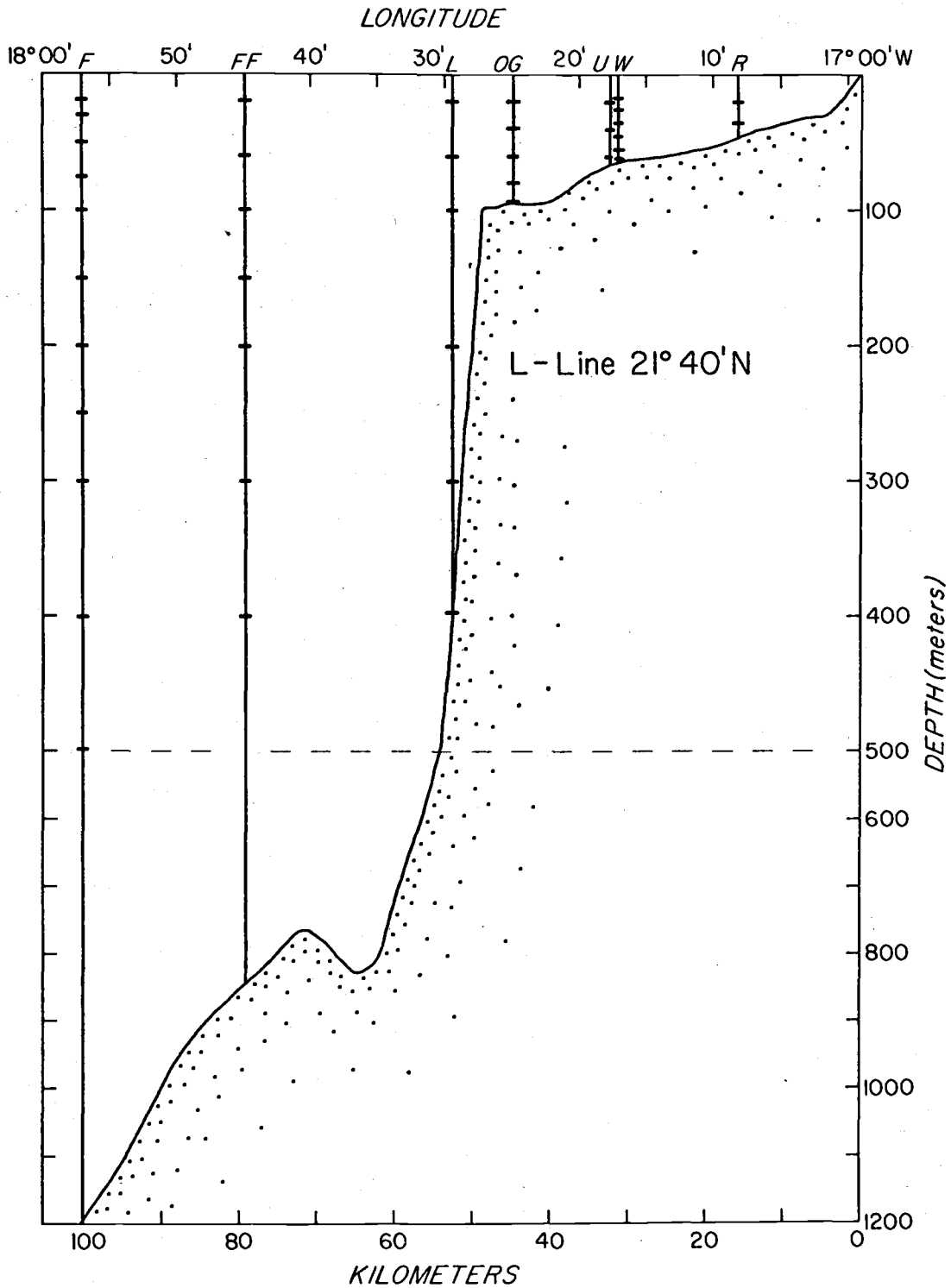


Fig. 3 The vertical distribution of current meters along the mooring line during JOINT-I. Each bar represents a current meter.

over 12 days of overlap between the two records showed no significant differences. A 5-day gap in the joined record existed because of a failure of the direction sensor in the Urbinia anemometer, which was corrected when the instrument was serviced on 17 March. The bad observations were replaced by wind data from the buoy Lisa, deployed by the NOAA Pacific Marine Environmental Laboratory. Lisa was situated within 1 km of Urbinia.

Data from each mooring are presented in order of distance from the coast. Mooring name, position, water depth, length of data series, and depths of the instruments are listed for each mooring. The vector series of low-passed measurements from all the current meters on the mooring are displayed on one page (except for Foxglove) at half day intervals beginning at midday or midnight GMT. The vector wind series is shown at the head of the page for the current record length. The vector series are followed by scalar series plots of the northward ( $v$ ) component and the eastward ( $u$ ) component of the current at all observation depths.

Also included in the report are sections of mean temperature, salinity and sigma-t along  $21^{\circ}40'N$ , based on mean profiles calculated from the repeated occupations of each standard station position, and sections of the mean northward ( $v$ ) and eastward ( $u$ ) components of velocity, based on the overall record mean from each current meter regardless of record length. The mean currents are additionally displayed as depth profiles for each mooring.

## ACKNOWLEDGMENTS

Many people cooperated in the collection and processing of the data set contained in this volume. Mr. W. E. Gilbert processed the hydrographic data and drafted the figures. Mr. J. S. Bottero processed the wind and current meter data. Ms. Karie Tamura typed the manuscript. Dr. Ekki Mittelstaedt supervised the Deutsches Hydrographisches Institut participation in the current meter program. Dr. D. Halpern of the NOAA Pacific Marine Environmental Laboratory, Seattle, kindly provided wind data from buoy Lisa to make it possible to present a continuous time series.

Financial support was given by the International Decade of Ocean Exploration under National Science Foundation Grants IDO 72-06422 and IDO 71-04211.

## REFERENCES

- Barton, D., M. R. Stevenson, and W. E. Gilbert. 1975. CTD/STD measurements off the NW African coast near Cabo Corveiro during JOINT-I. R/V GILLISS Cruise GS7401, February - April 1974. School of Oceanography, Oregon State University, Corvallis, Oregon 97331. Data Report 63. Reference 75-3.
- Pillsbury, R. D., J. S. Bottero, R. E. Still and E. Mittelstaedt. 1975. A compilation of observations from moored current meters. Vol. VIII. Wind, Currents and Temperature off Northwest Africa along 21°40'N during JOINT-I, February - April 1974. School of Oceanography, Oregon State University, Corvallis, Oregon 97331. Data Report 62. Reference 74-20.

## THE OBSERVATIONS

## H-line hydrographic sections (21°20'N):

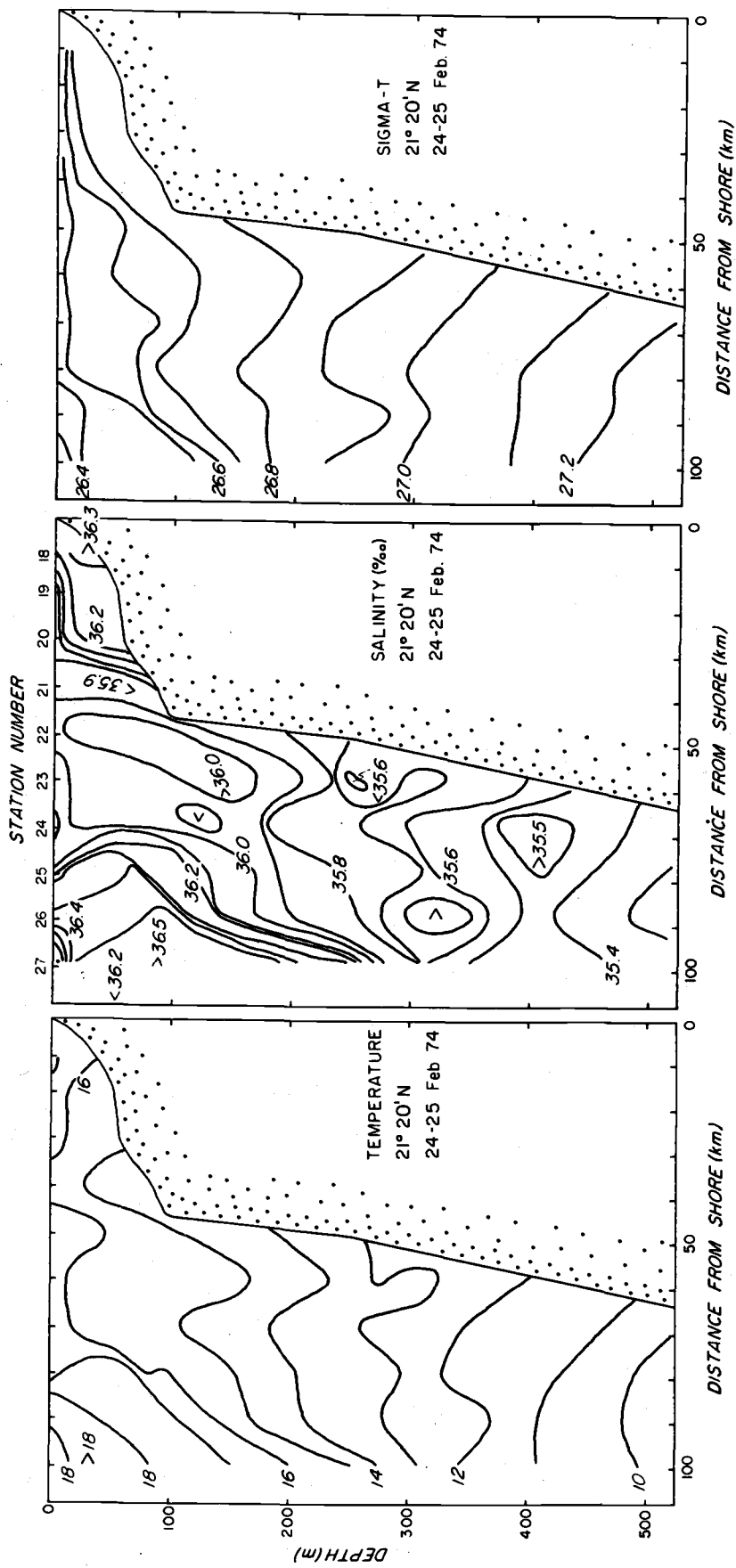
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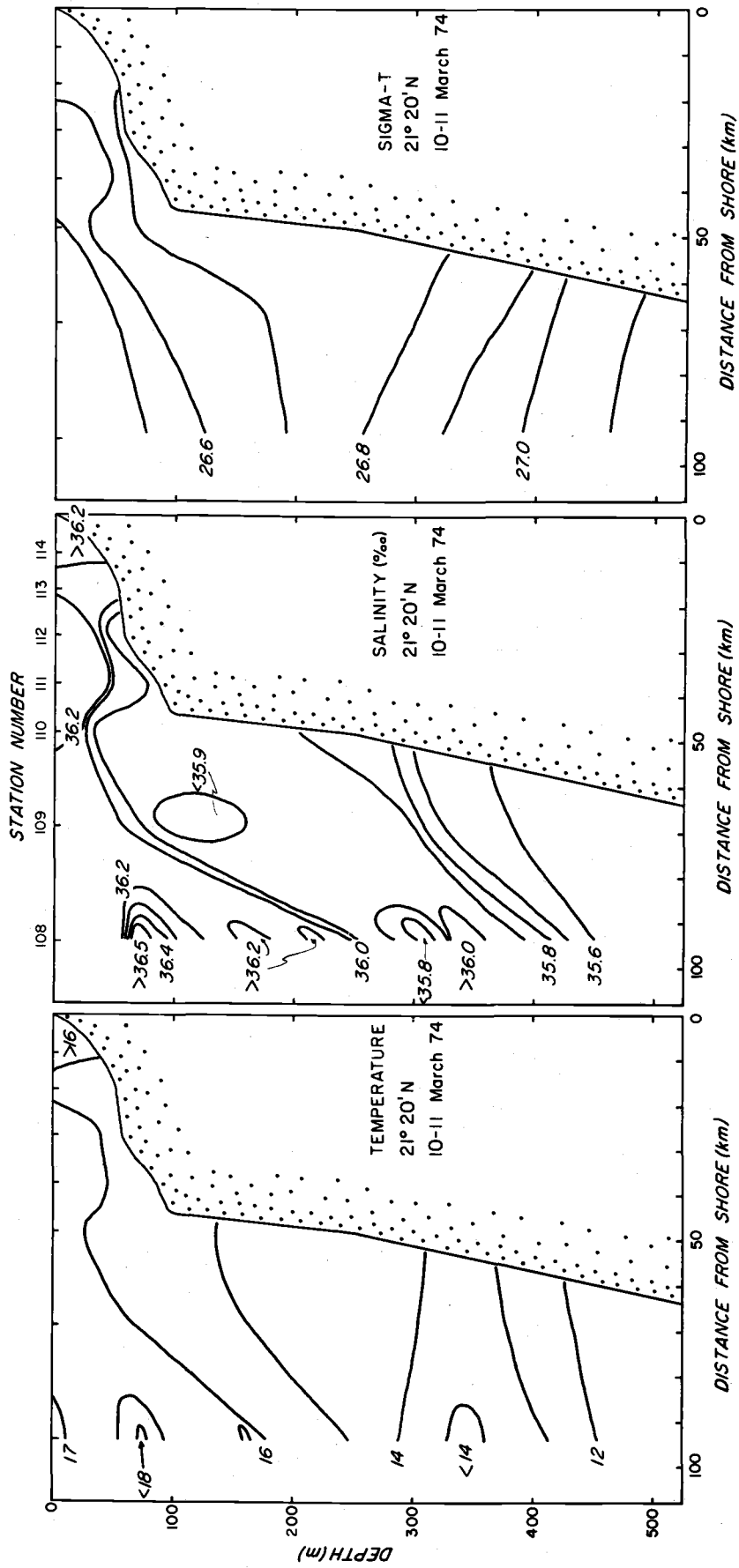
## L-line hydrographic sections (21°40'N):

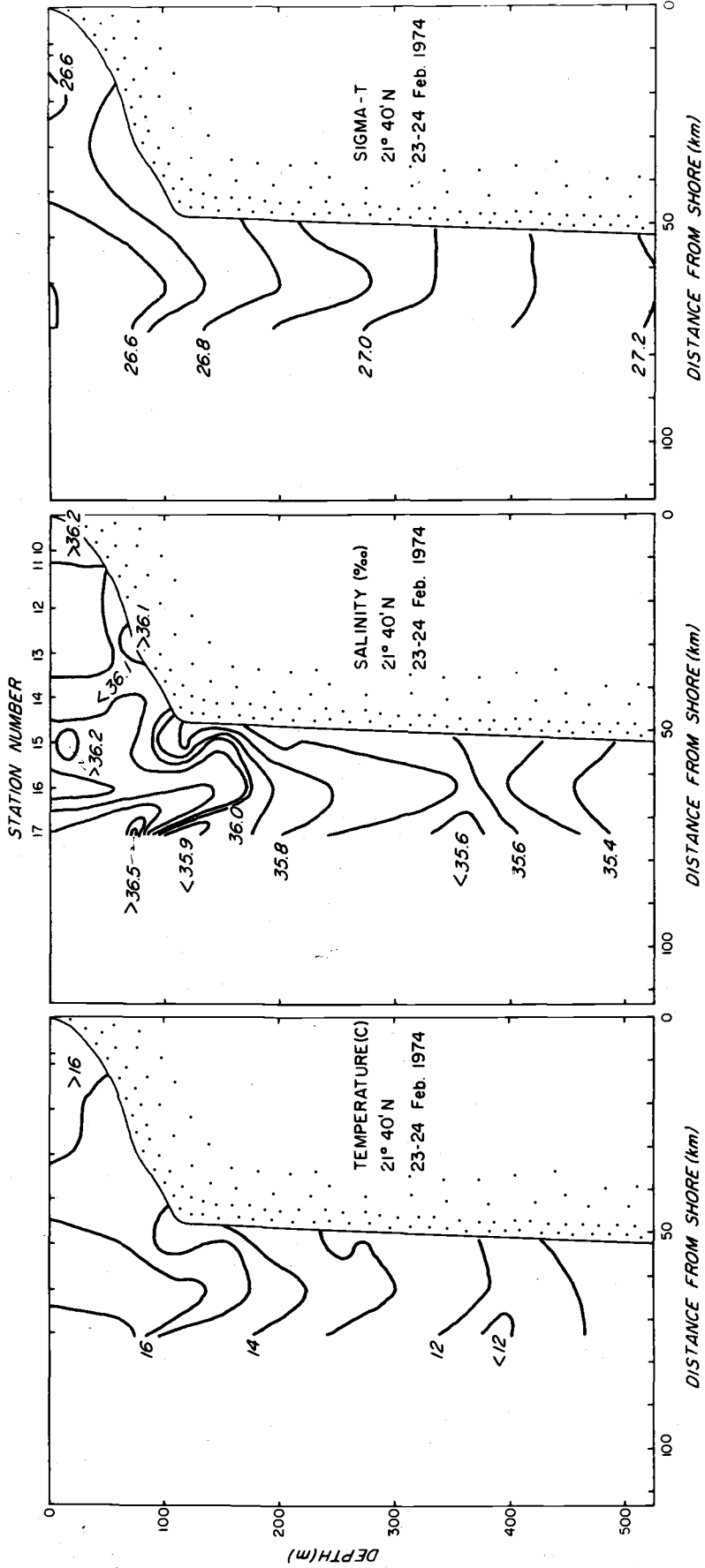
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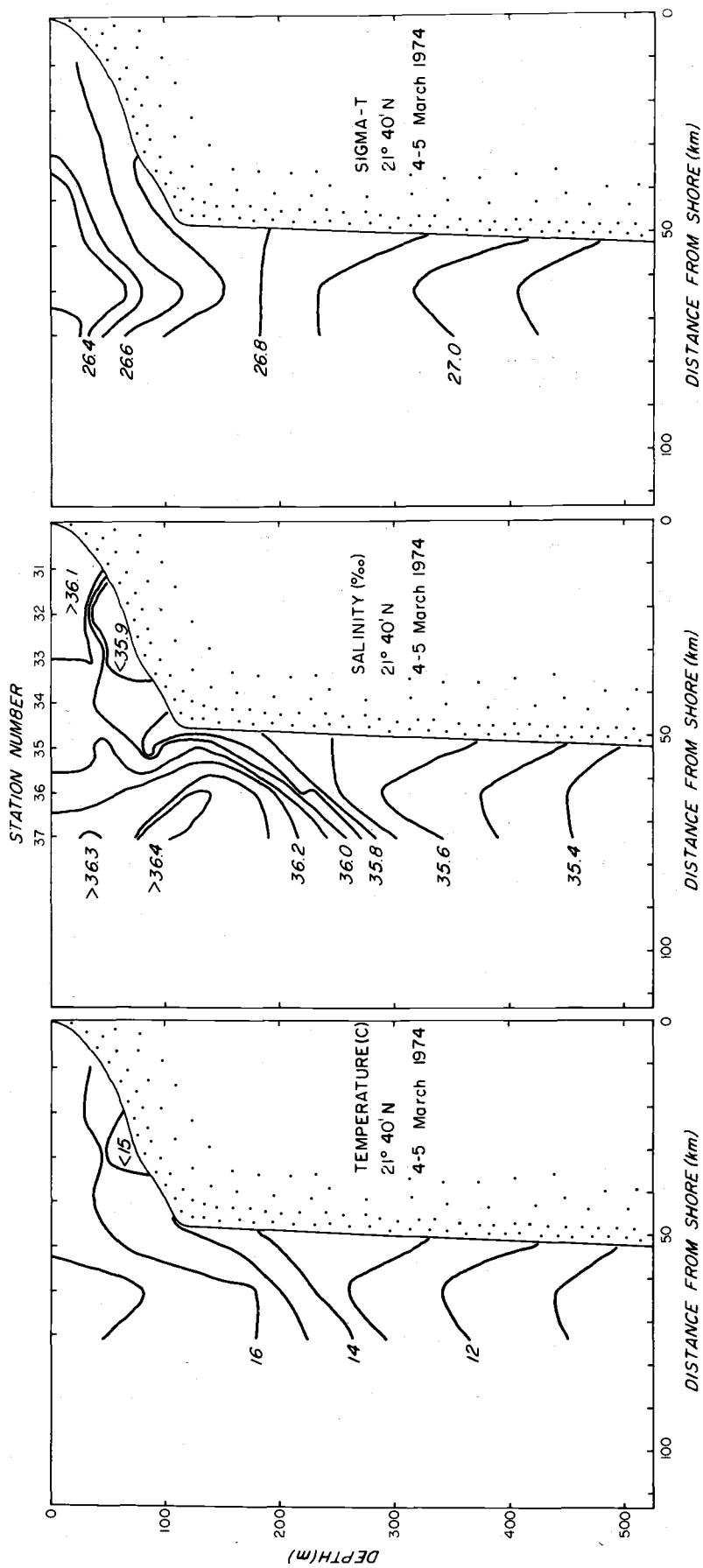
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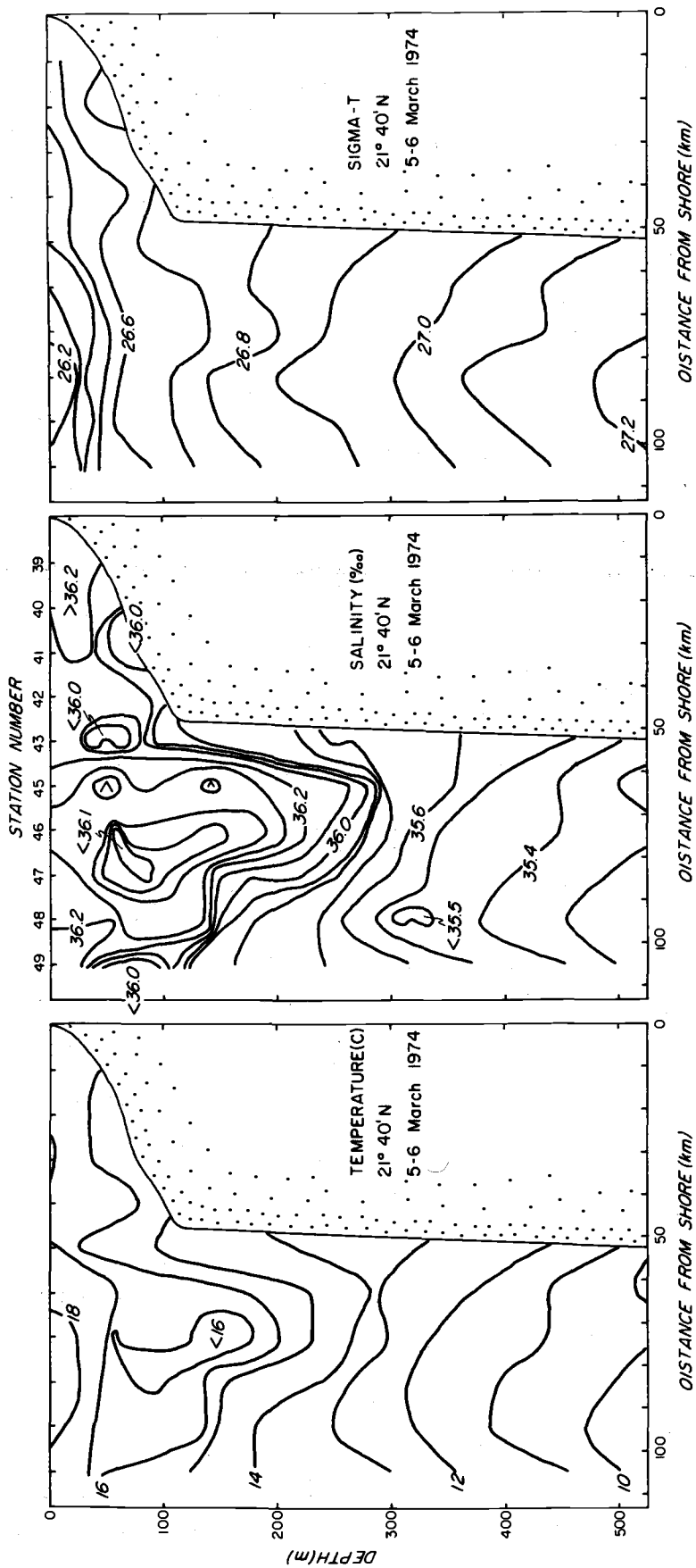


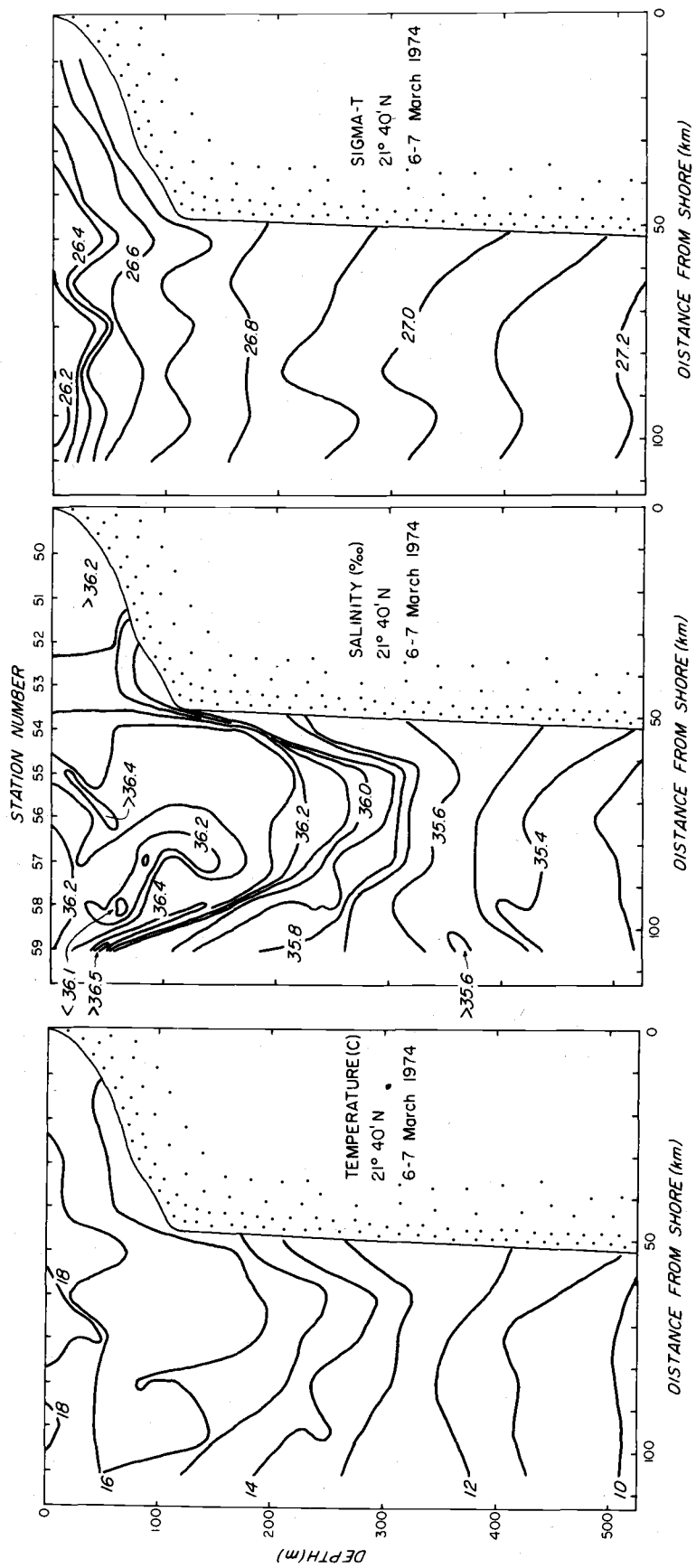


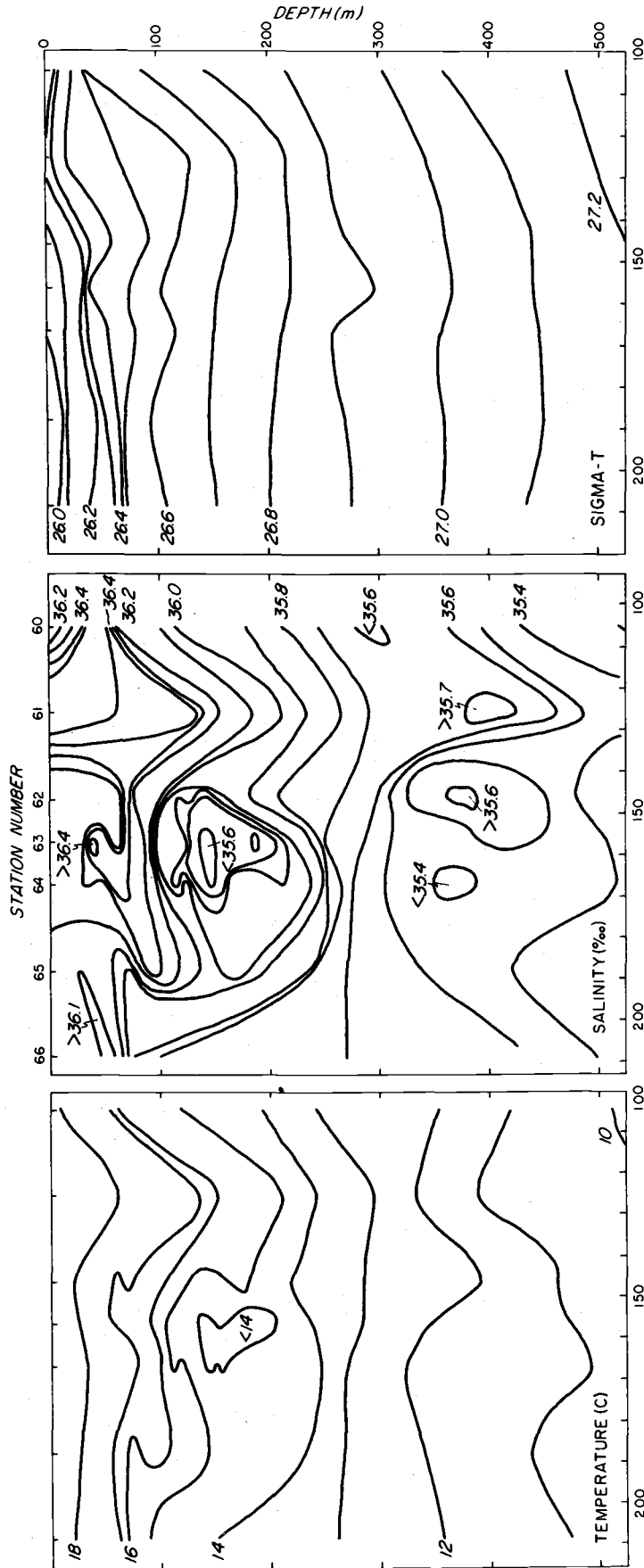




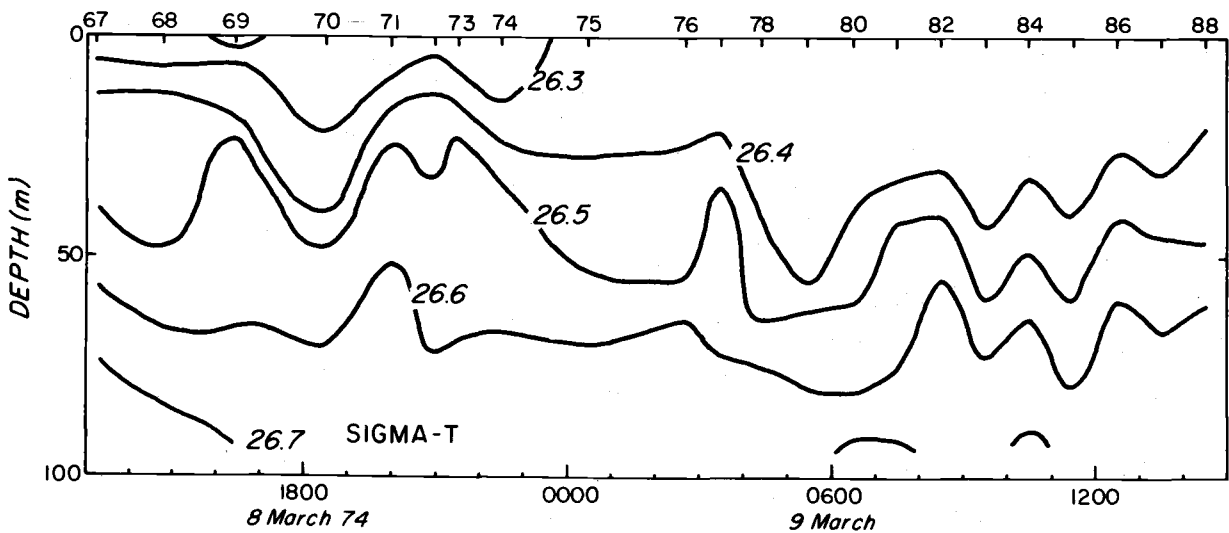
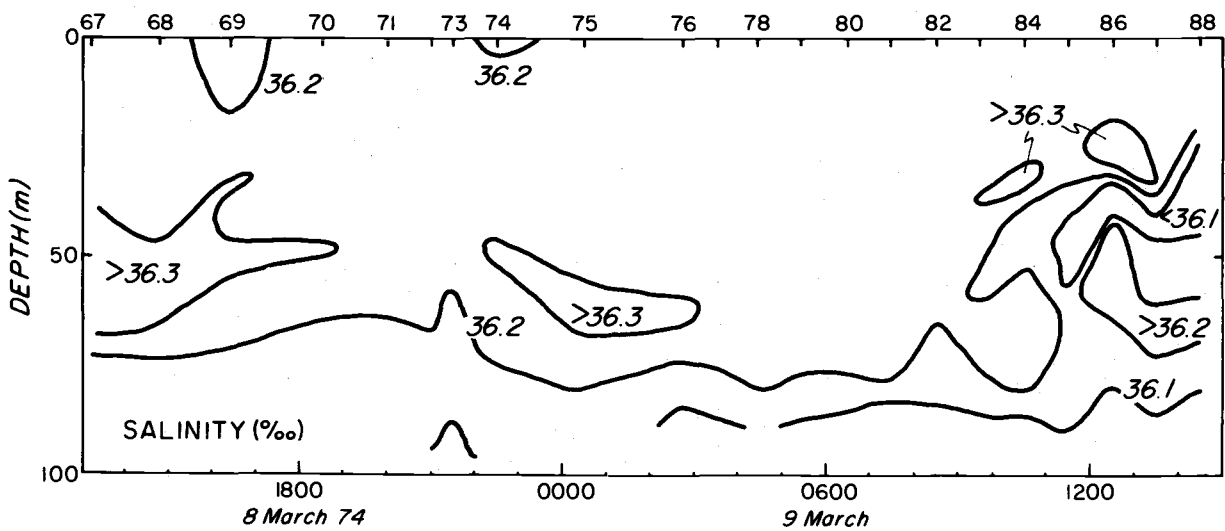
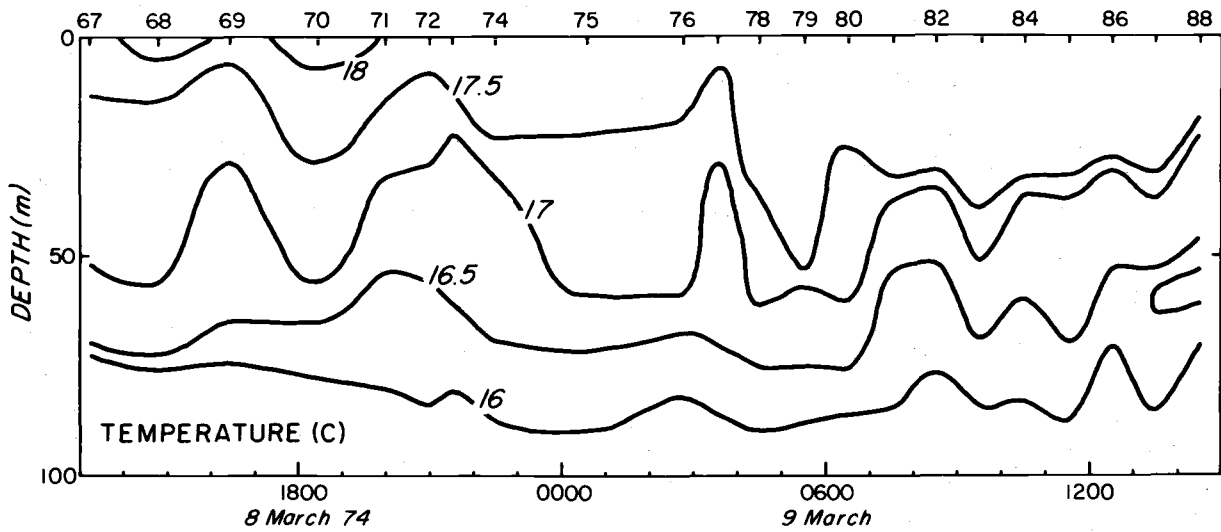




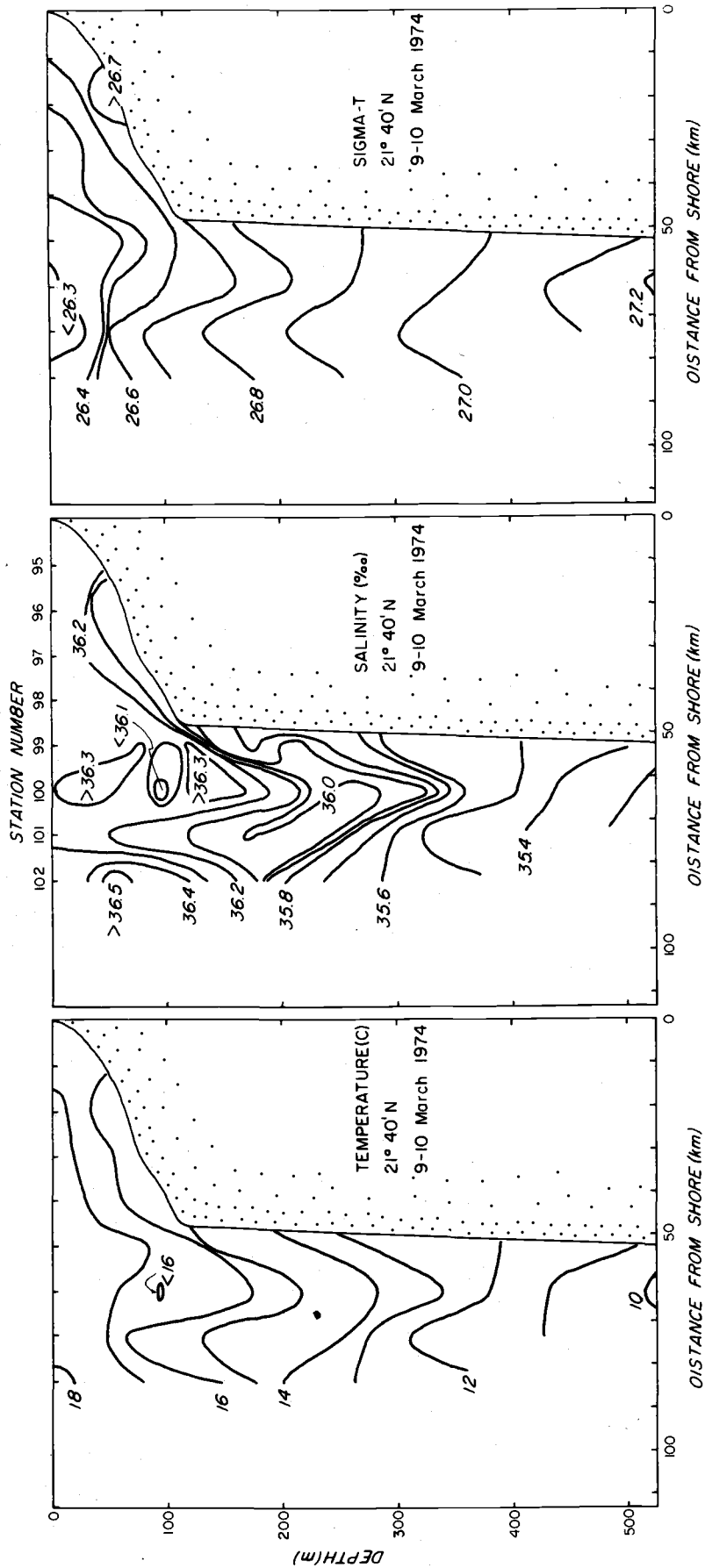


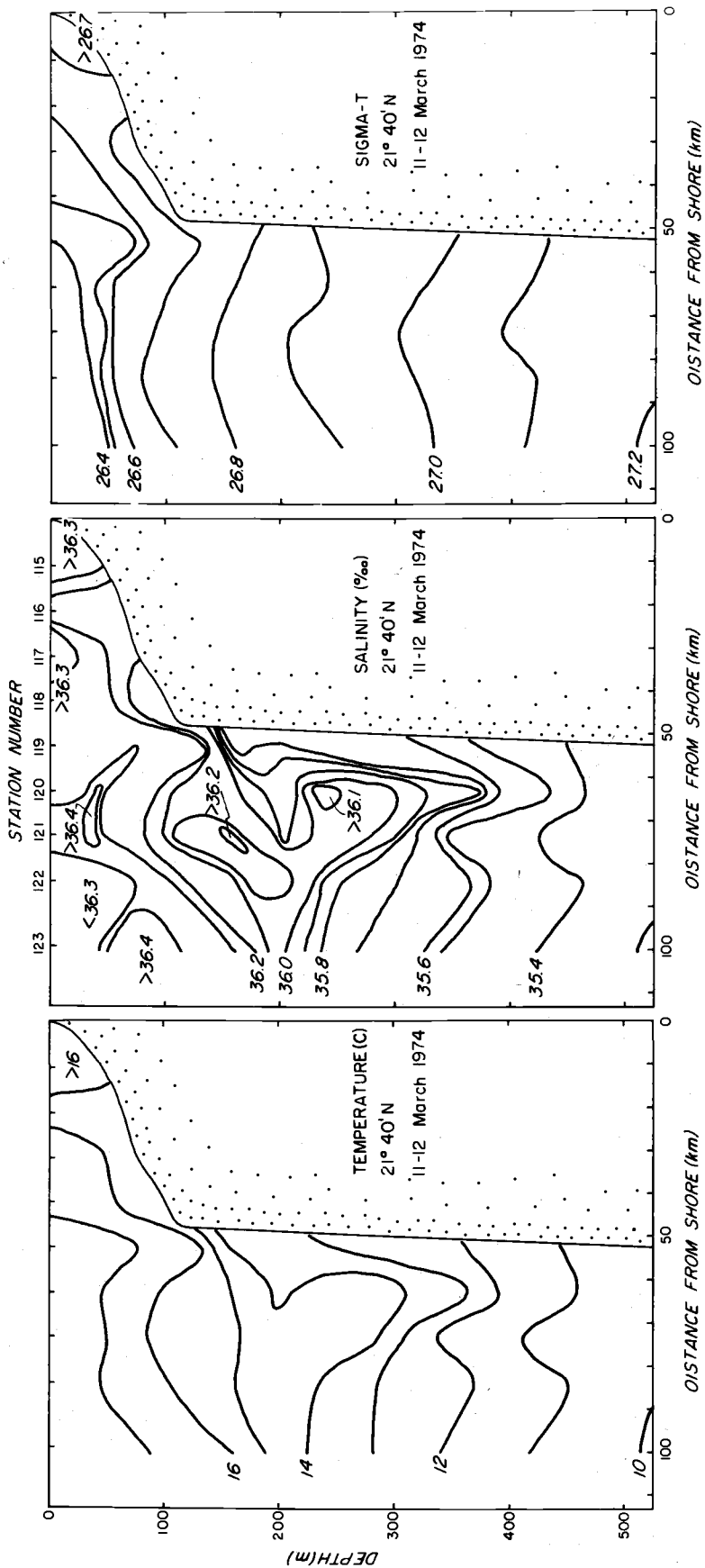


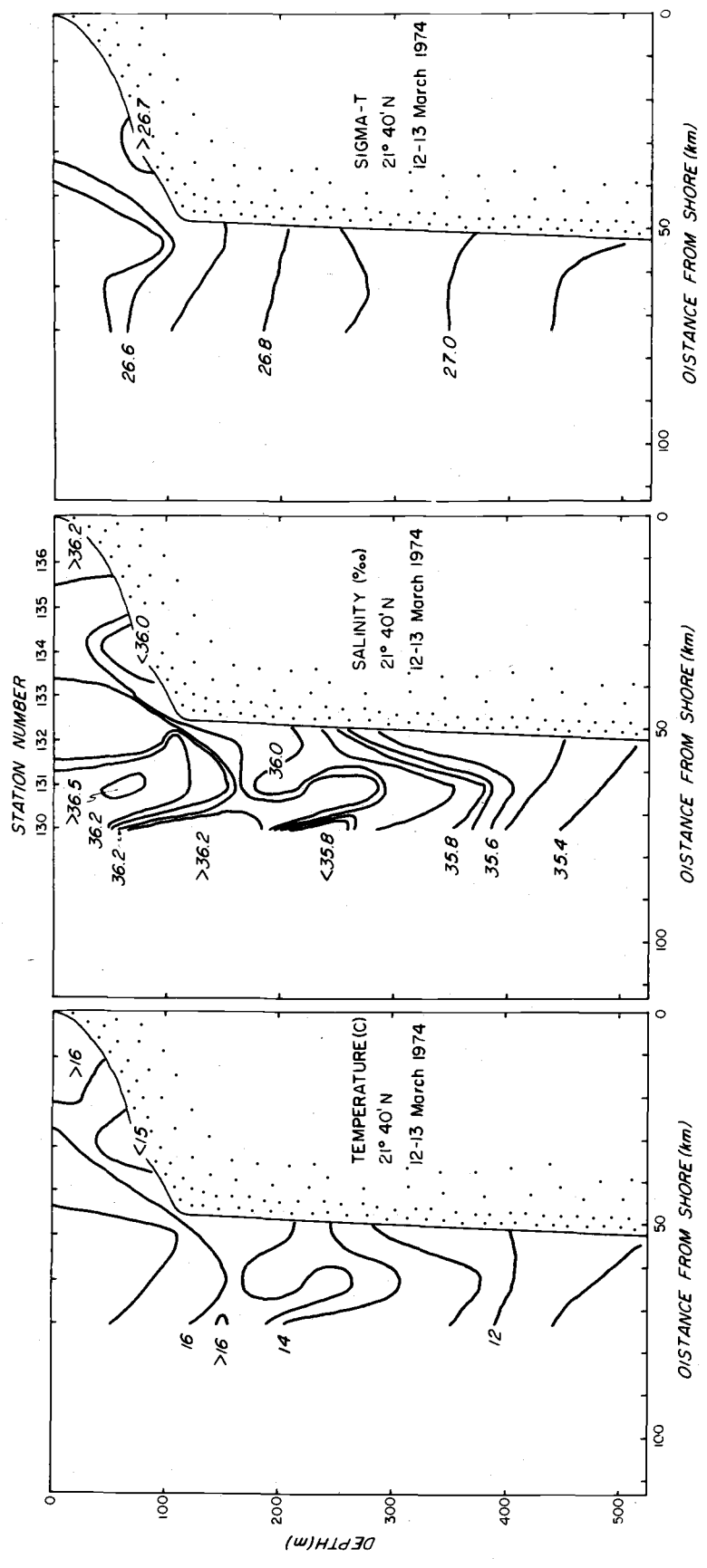
Extended L-line 7-8 March 1974



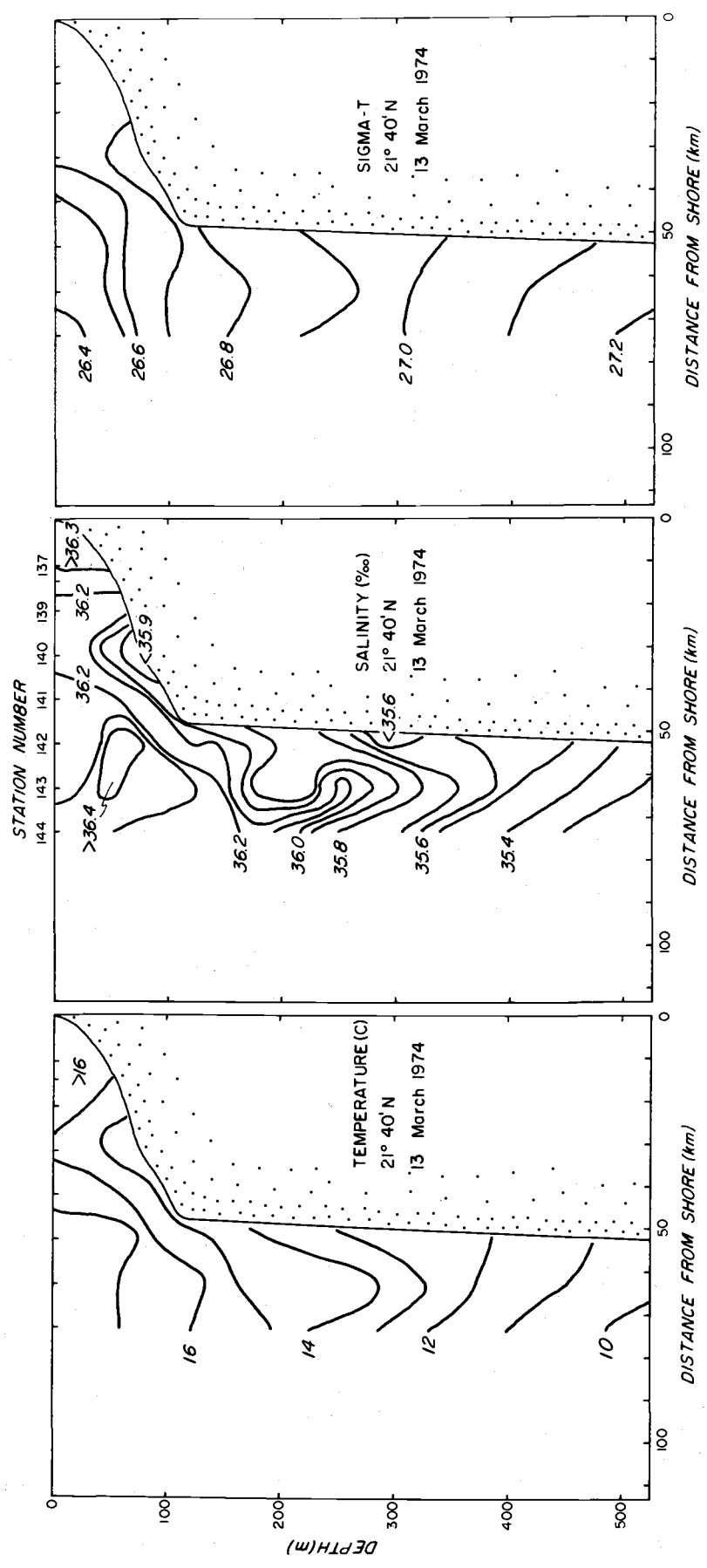
Oregon Grape Anchor Station (21° 43.7' N, 17° 25.1' W)

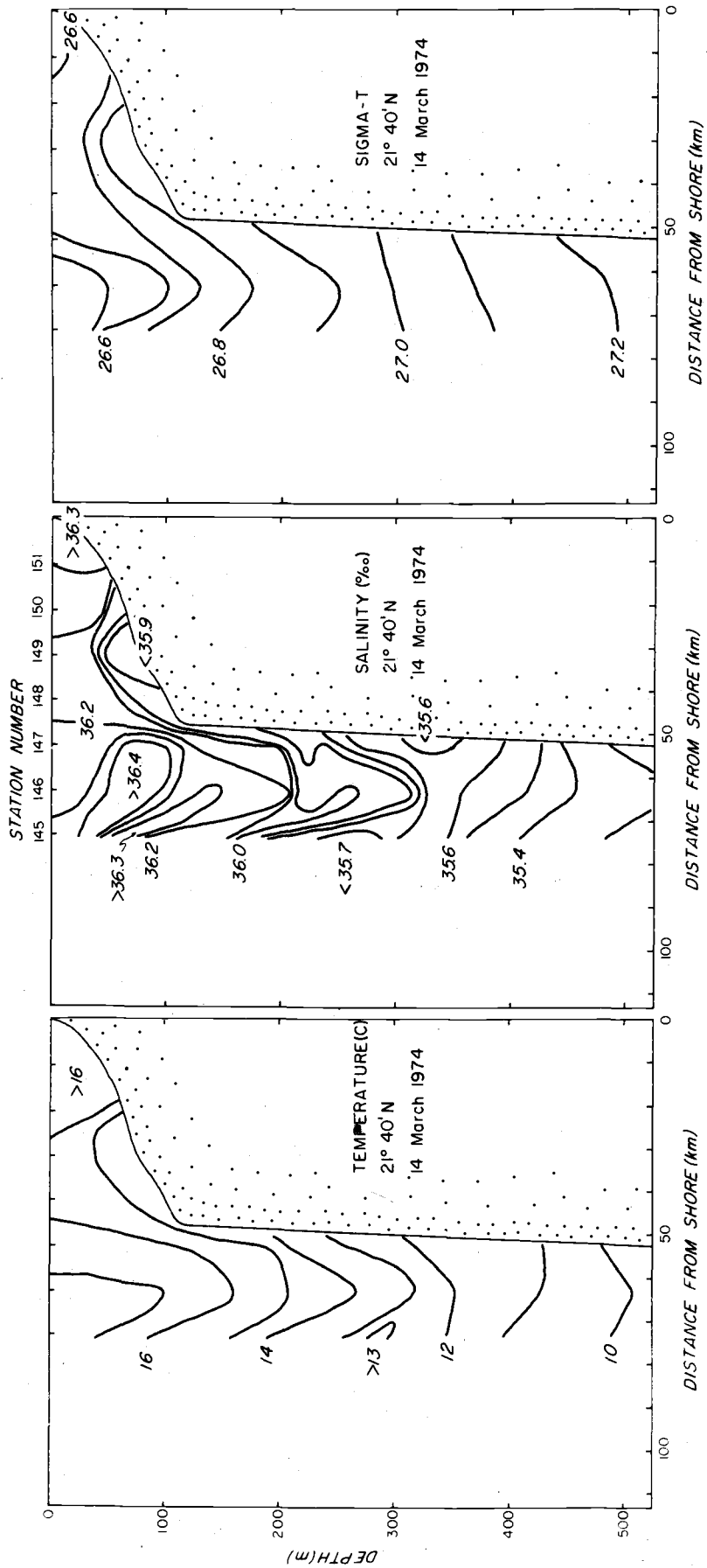


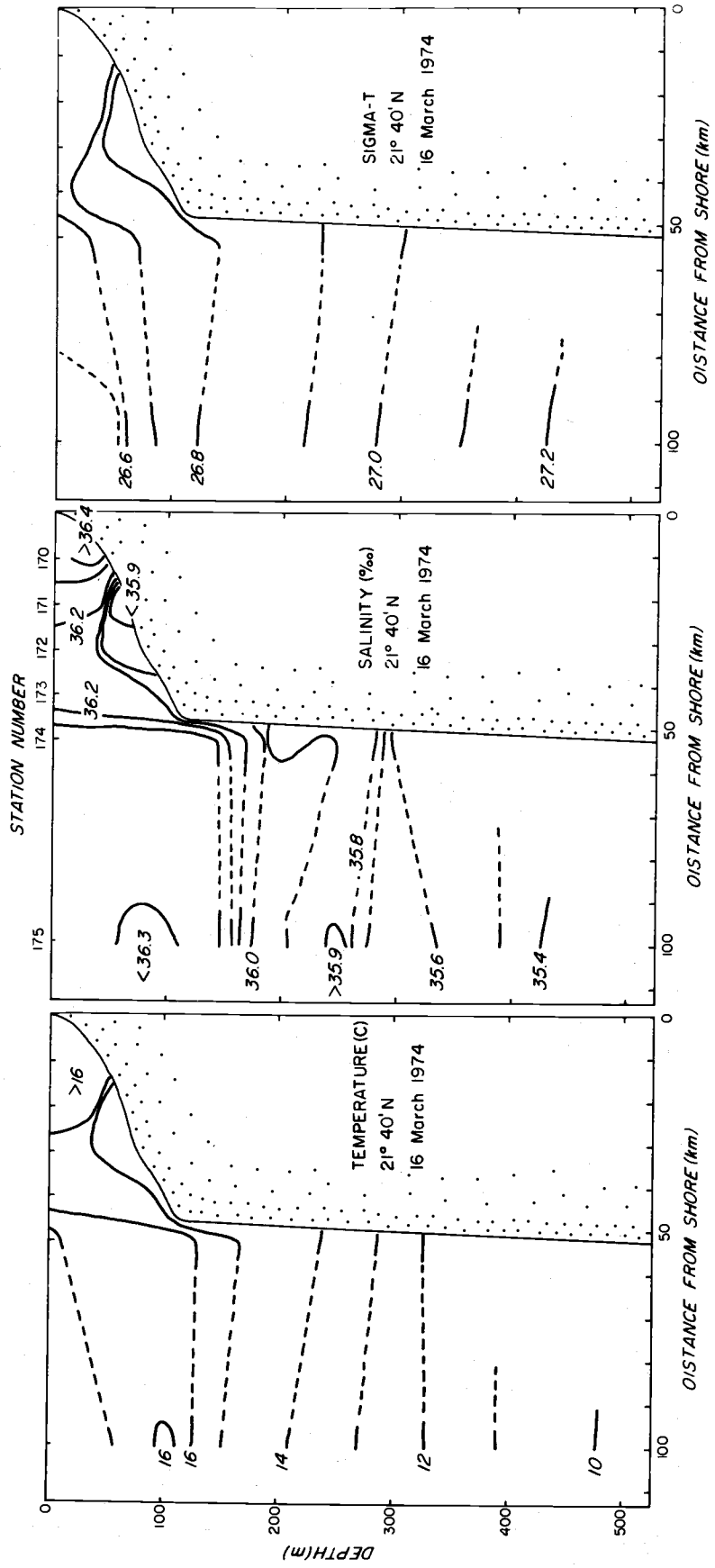


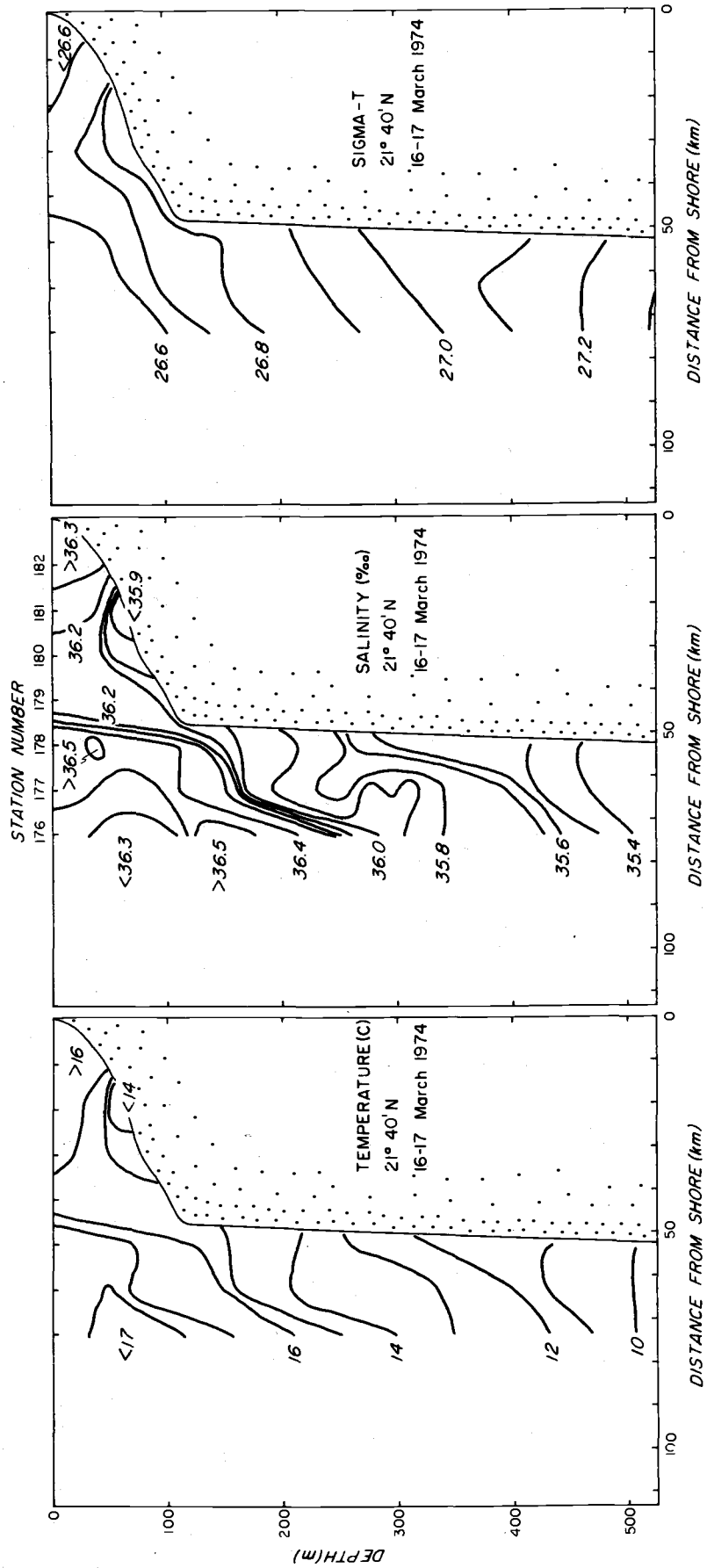


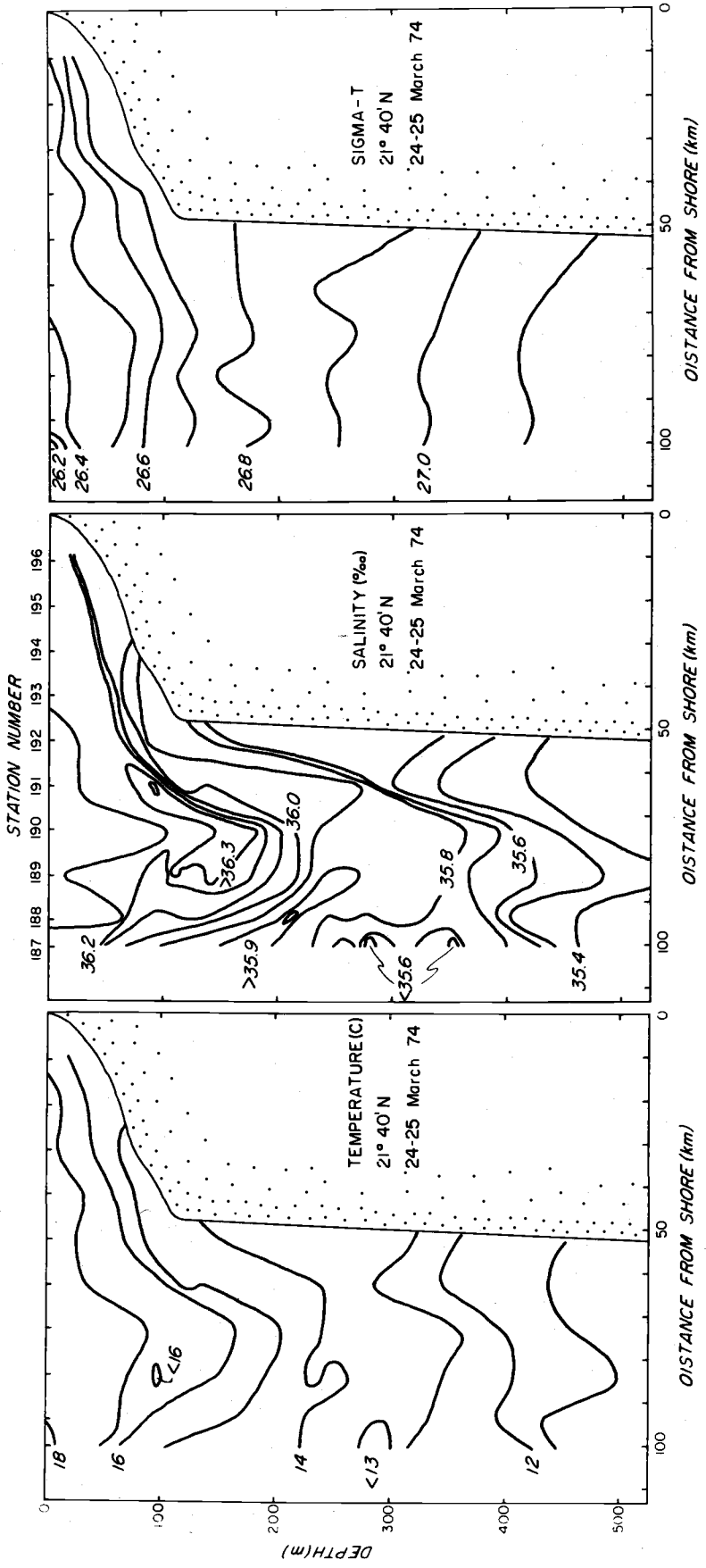


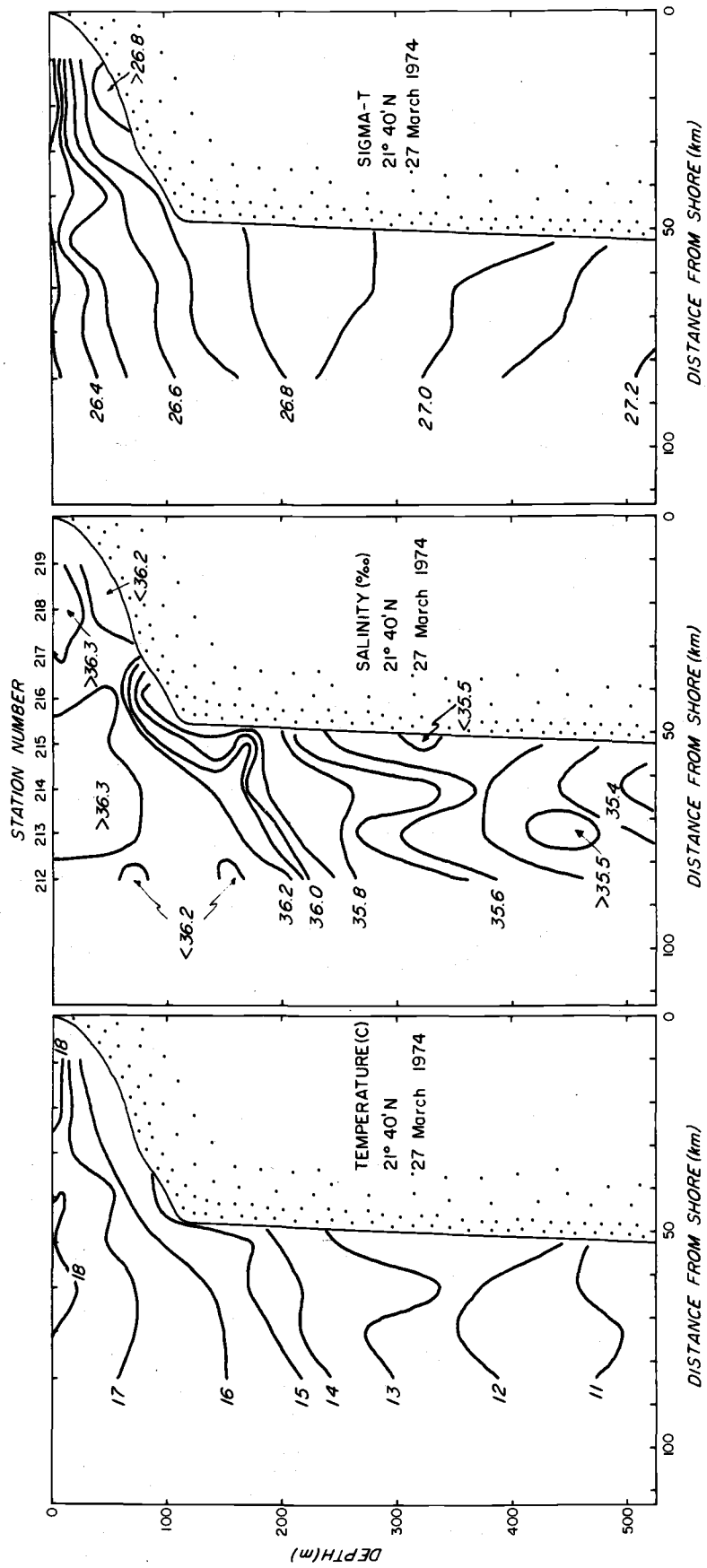


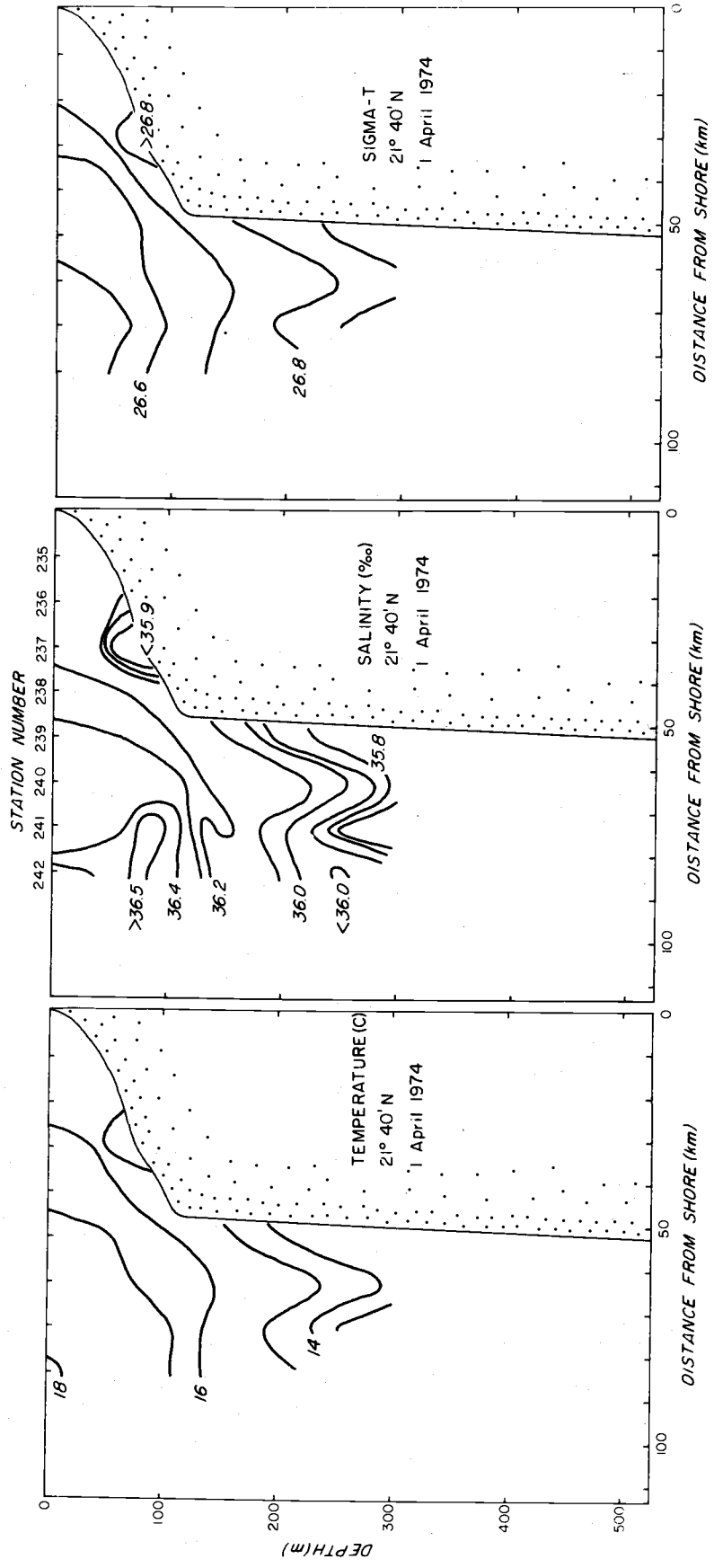


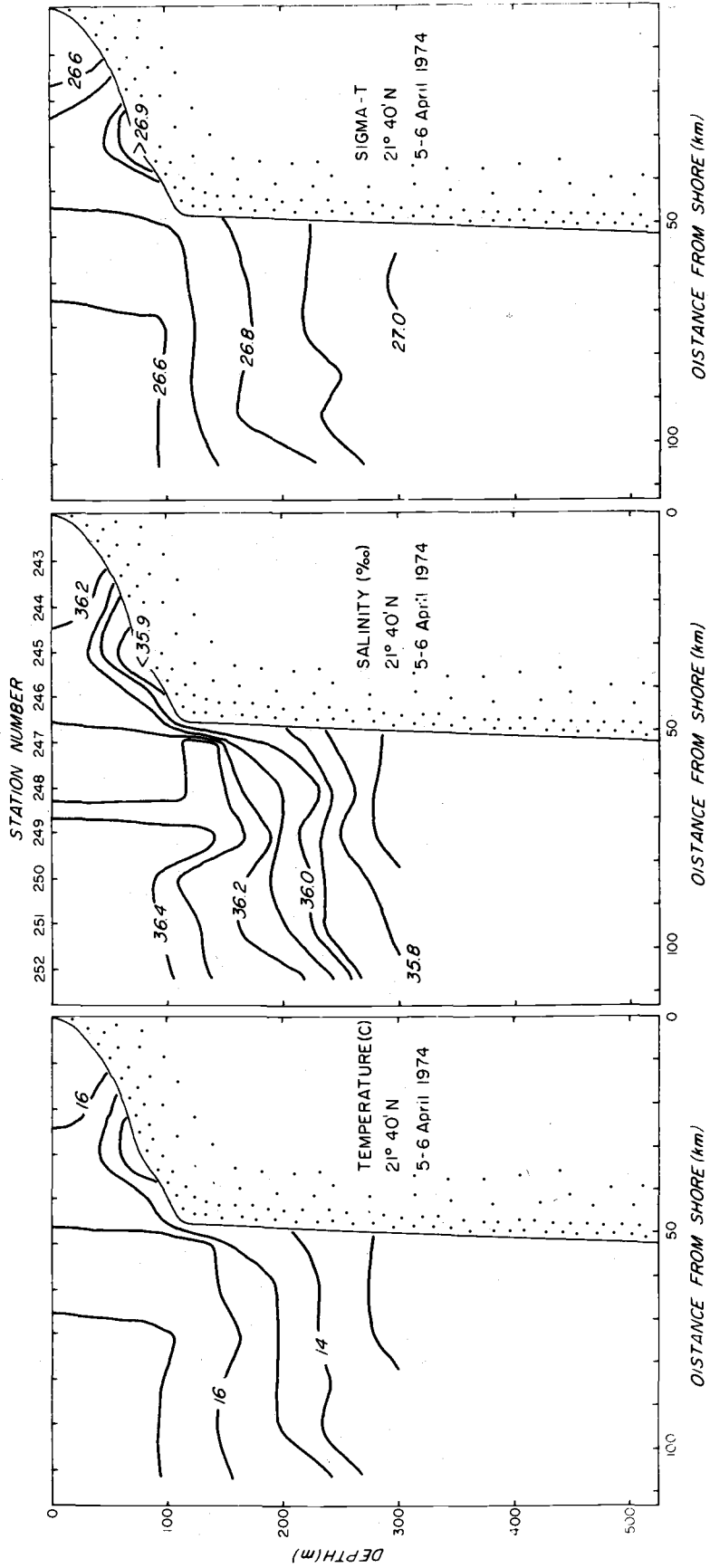




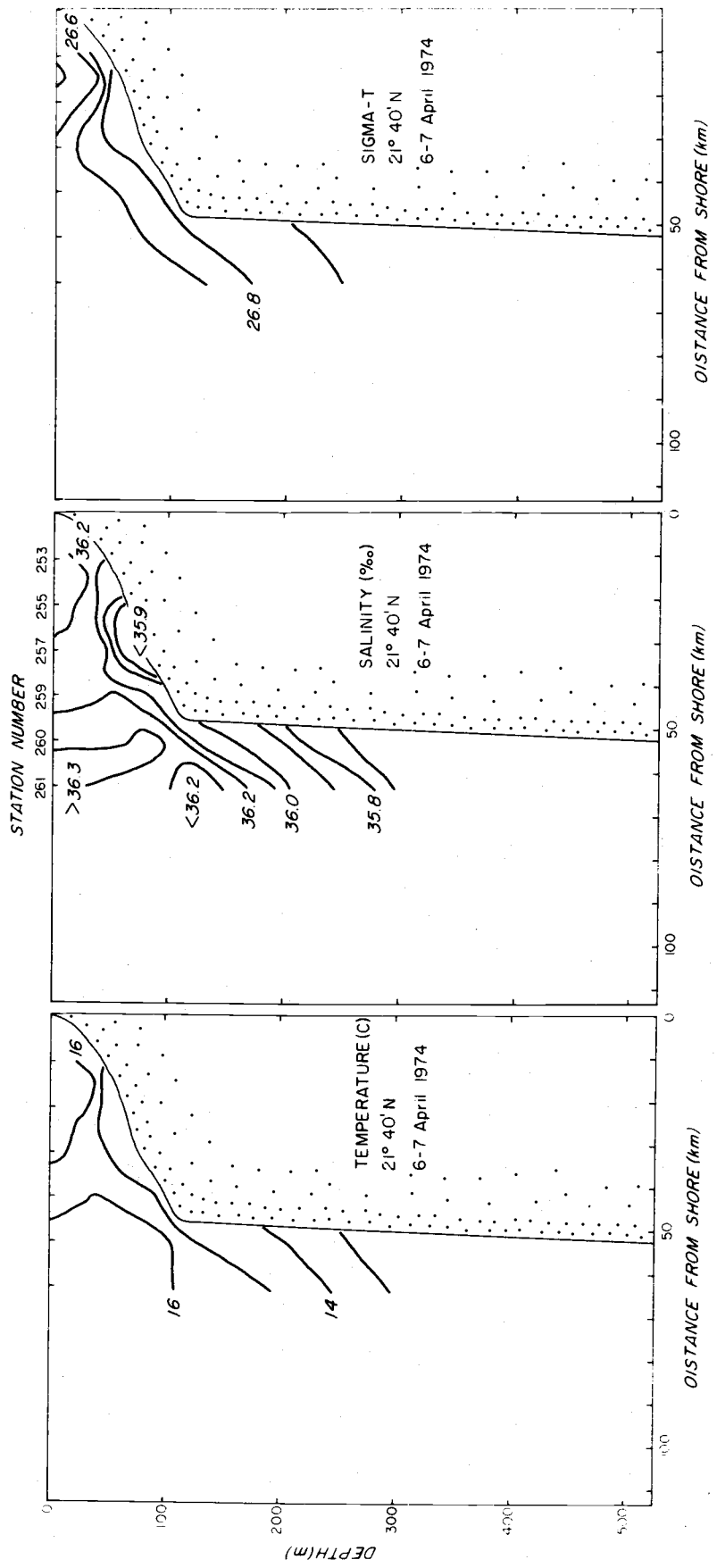


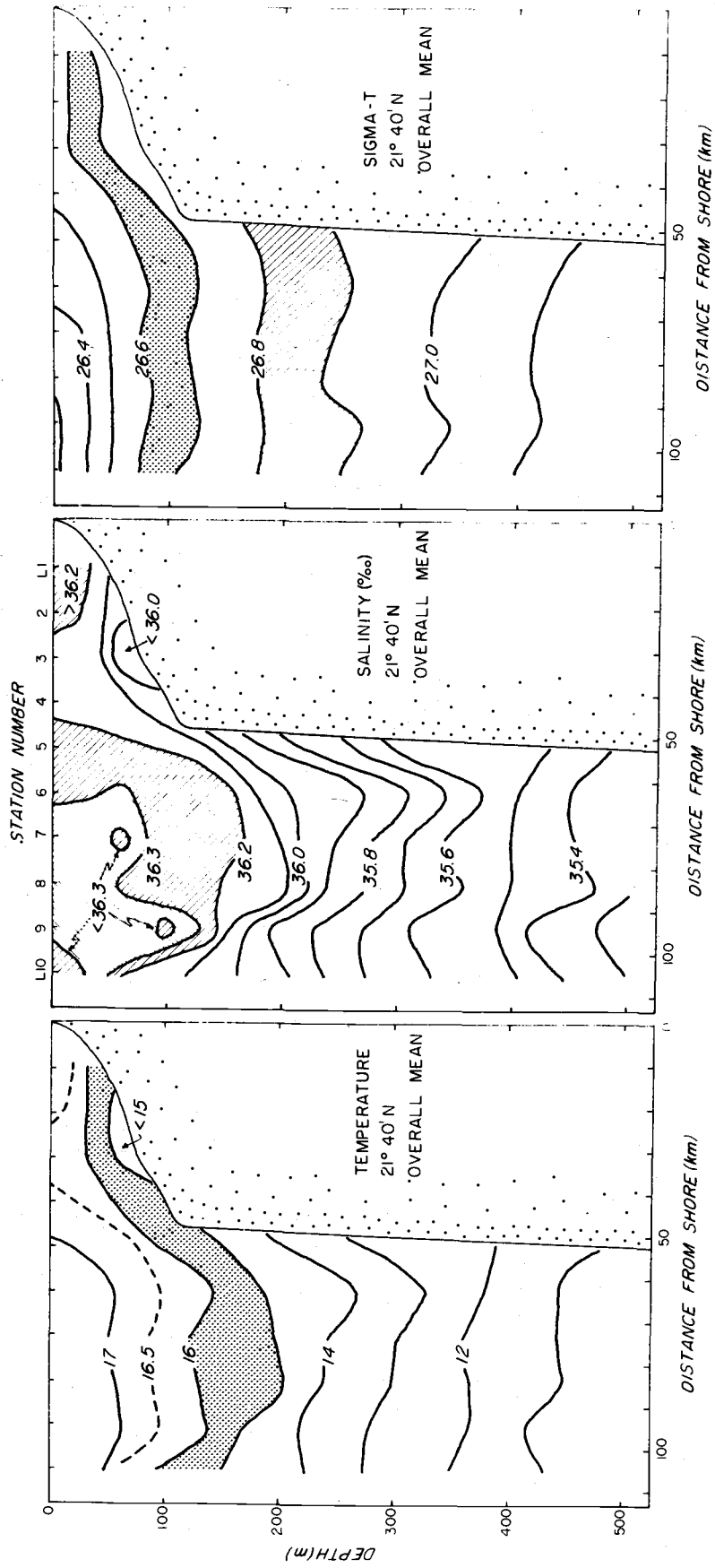


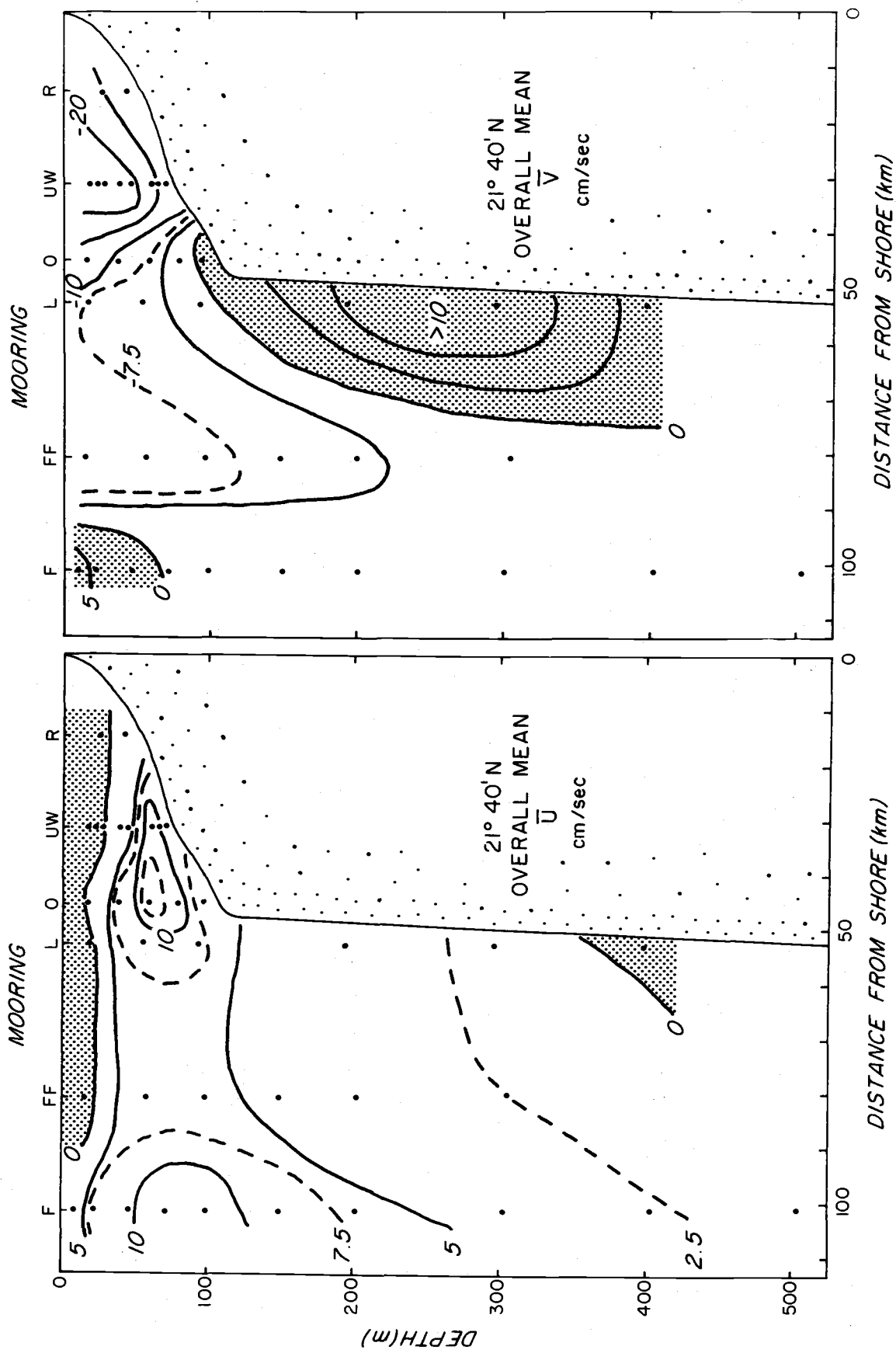


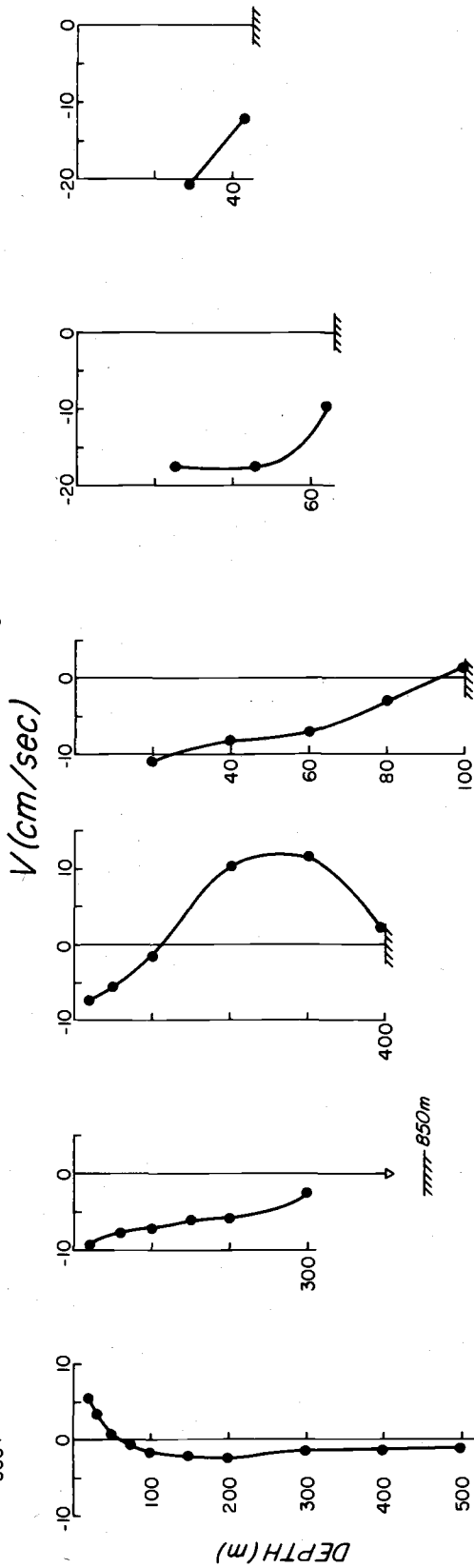
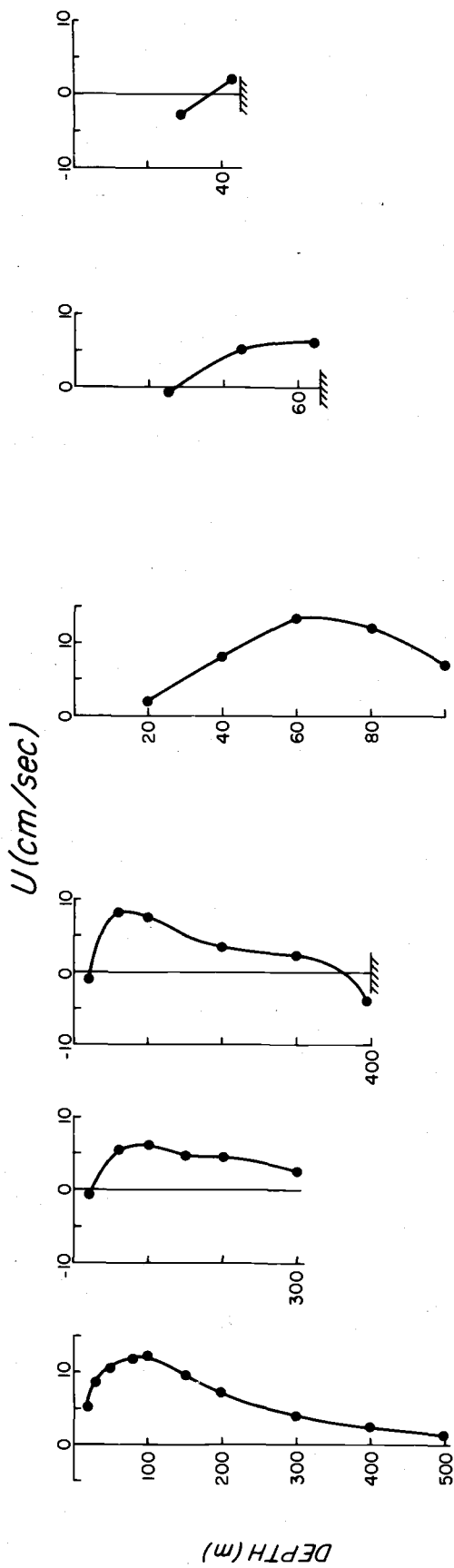






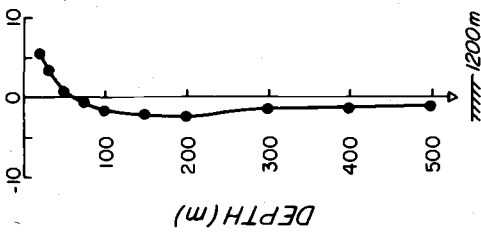
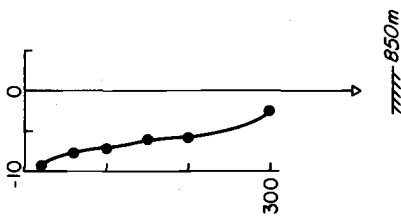
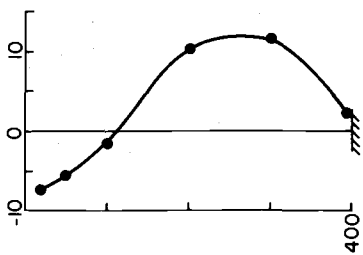
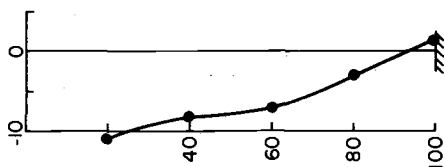
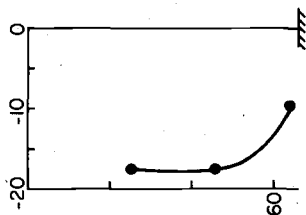
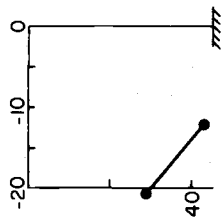
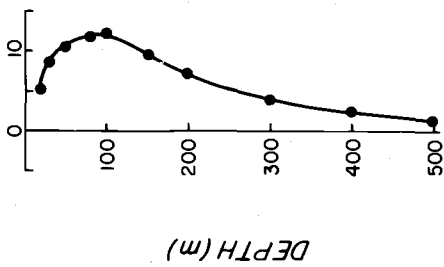
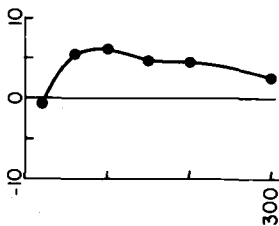
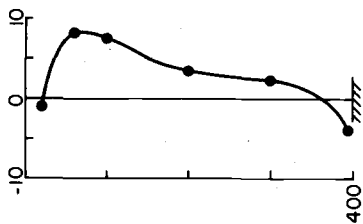
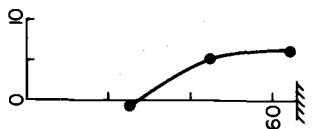
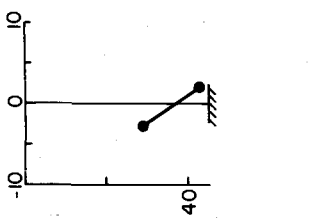






*U (cm/sec)*

*V (cm/sec)*



RHODODENDRON  
23 Feb - 18 Apr

URBINIA  
24 Feb - 25 Apr

OREGON GRAPE  
5-25 Mar

LUPINE  
6 Mar - 6 Apr

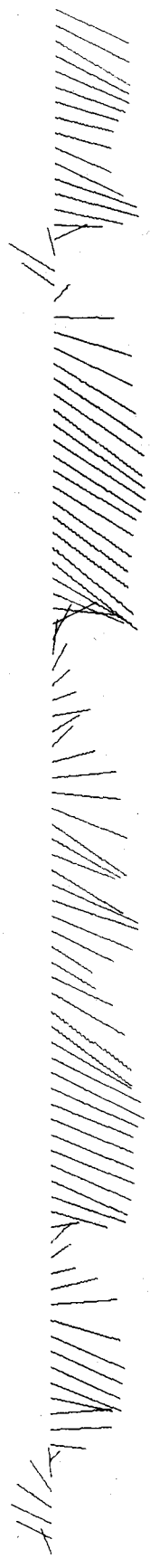
FOREST FERN  
24 Mar - 19 Apr

FOXGLOVE  
17 Mar - 5 Apr

JOINT - 1 MEAN CURRENTS 1974

FOREST FERN

10 m/s



26  
FEB

1  
MAR

1  
APR

DAYS. TICKS ARE AT 0000 HRS

URBINIA/LISA/RHODODENDRON

## RHODODENDRON I and II

## RHODODENDRON I

Position: 21°40.2'N, 17°08.3'W

Water Depth: 42 m

Data Interval: 2052 GMT 23 February to 0152 GMT 17 March 1974

Instrument Depths: 0 m, 20 m, 35 m

## RHODODENDRON II

Position: 21°39.2'N, 17°08.8'W

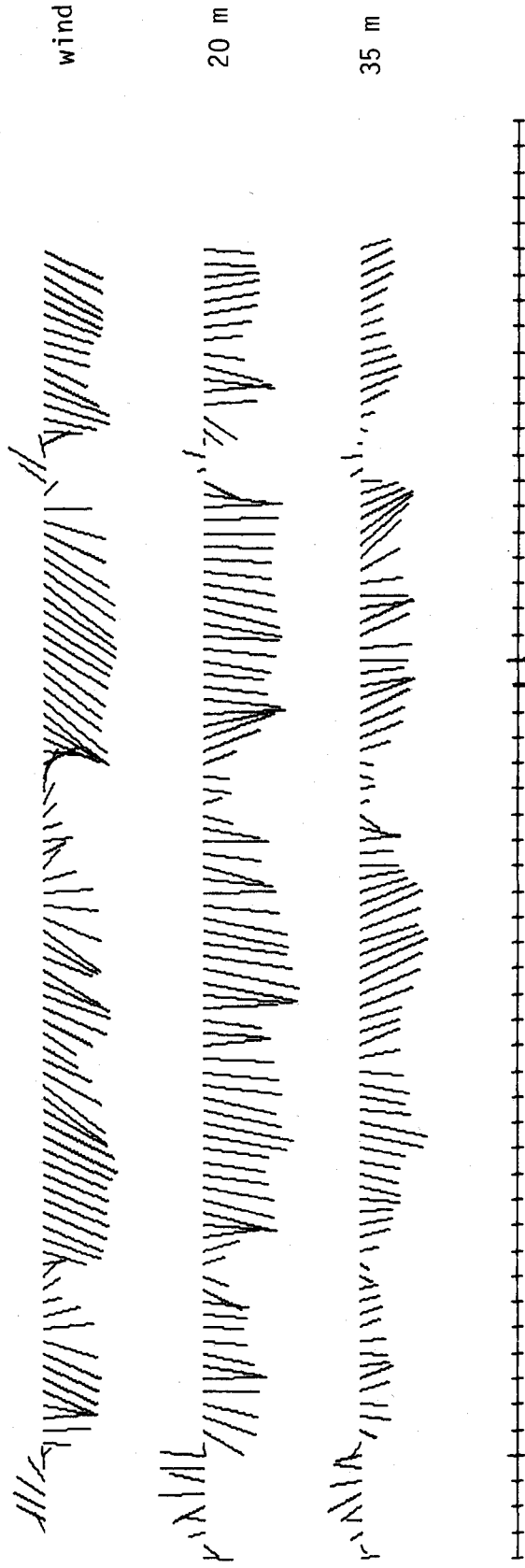
Water Depth: 45 m

Data Interval: 1826 GMT 17 March to 0826 GMT 18 April 1974

Instrument Depths: 0 m, 20 m, 35 m

Comment: Current meter records from the two moorings were joined to form continuous series before low-pass filtering. See text for explanation of the wind series.

RHODODENDRON

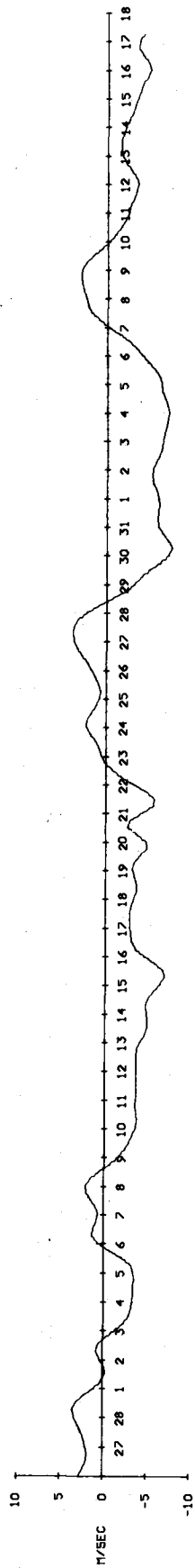


25 Feb. 74

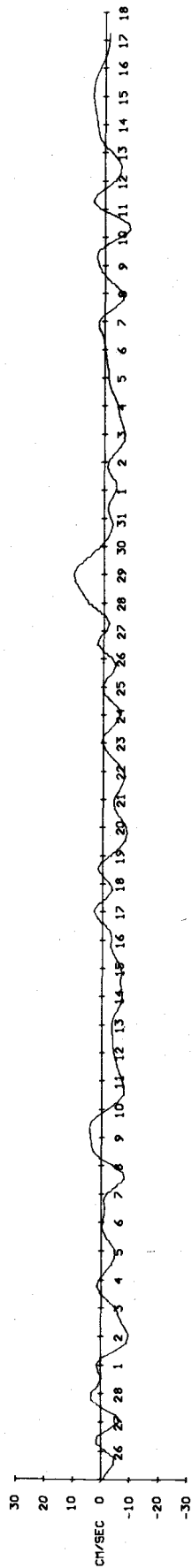
1 April

Scale: 25 m s<sup>-1</sup> to 1 inch (wind)  
75 cm s<sup>-1</sup> to 1 inch (current)  
7 days per inch

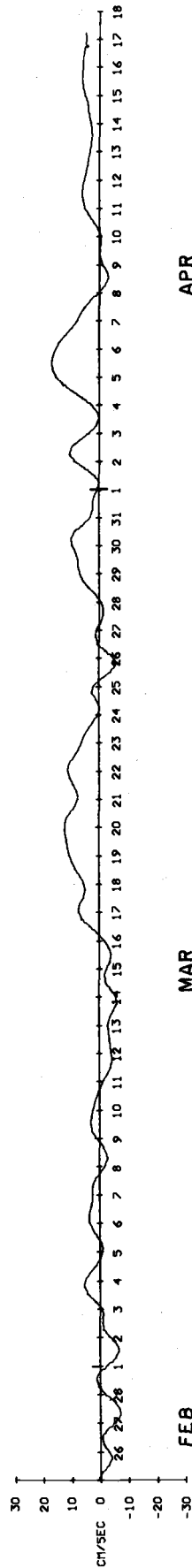
North is directed vertically upwards with respect to the time axis.



LLP U, URBINIA/LISA/RHODODENDRON WIND

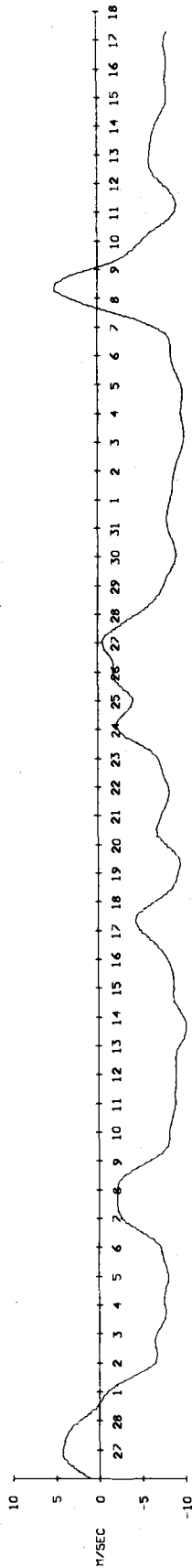


LLP U AT 20 METERS, RHODODENDRON

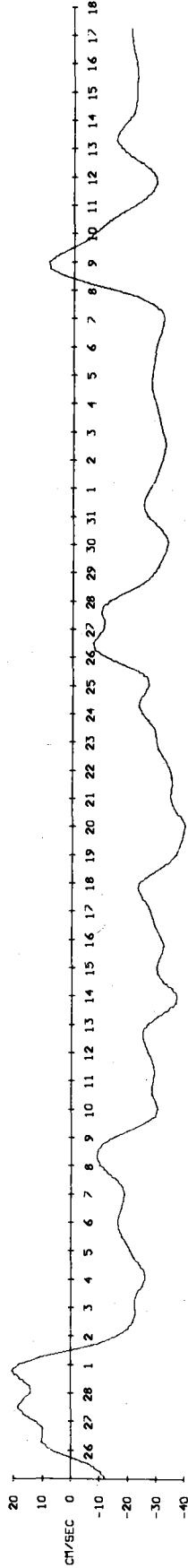


LLP U AT 35 METERS, RHODODENDRON.

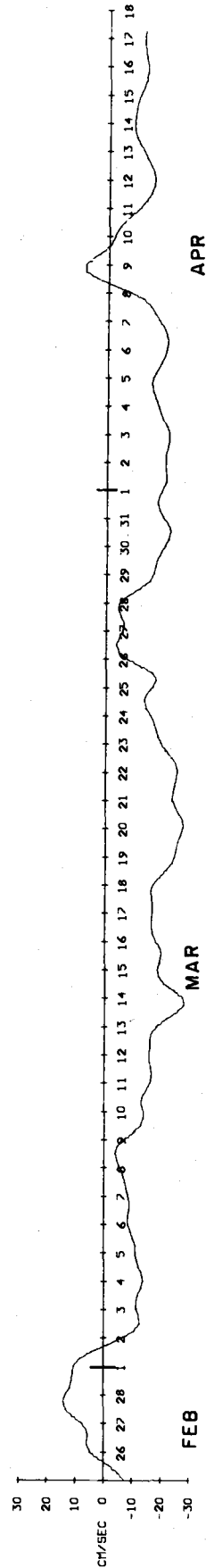




LLP V, URBINIA/LISA/RHODODENDRON WIND



LLP V AT 20 METERS, RHODODENDRON



LLP V AT 35 METERS, RHODODENDRON

## URBINIA I and II

## URBINIA I

Position: 21°40.6'N, 17°17.8'W

Water Depth: 67 m

Data Interval: 1903 GMT 24 February to 0603 17 March 1974

Instrument Depths: 0 m, 20 m, 40 m, 60 m

## URBINIA II

Position: 21°40.0'N, 17°17.8'W

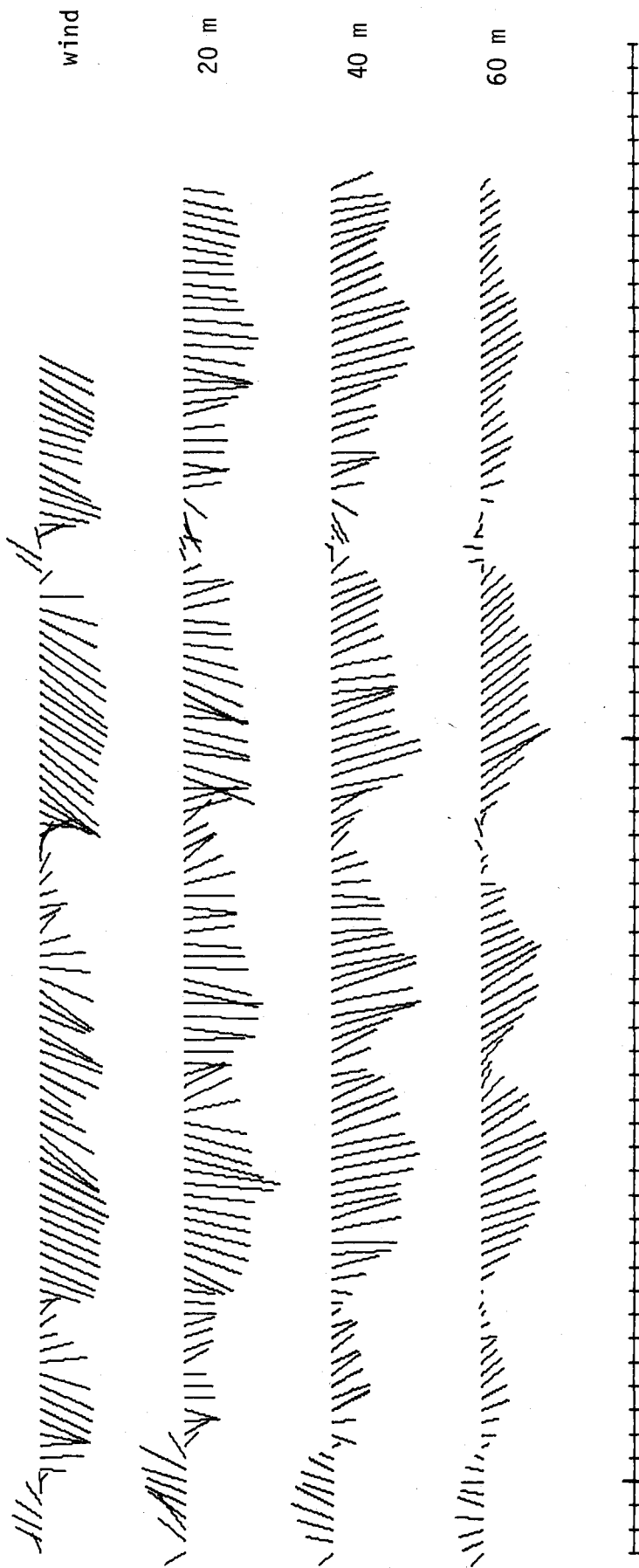
Water Depth: 67 m

Data Interval: 0008 GMT 18 March to 0708 GMT 25 April 1974

Instrument Depths: 0 m, 20 m, 40 m, 60 m

Comment: Current meter records from the two moorings were joined to form continuous series before low-pass filtering.

URBINIA

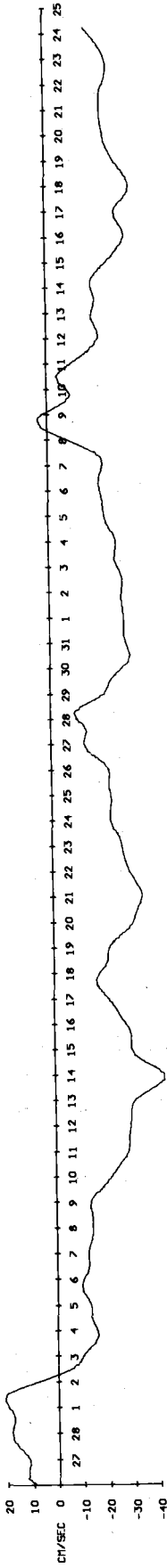


26 Feb. 74

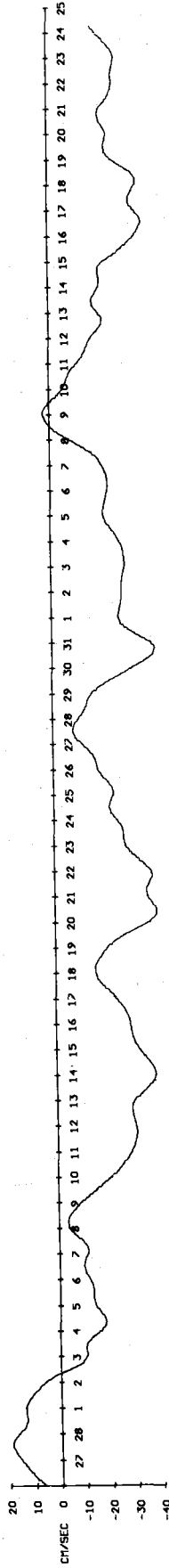
1 April

Scale: 25 m s<sup>-1</sup> to 1 inch (wind)  
75 cm s<sup>-1</sup> to 1 inch (current)  
7 days per inch

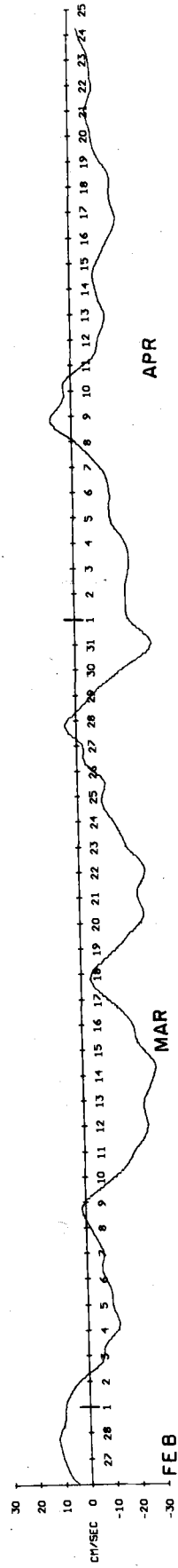
North is directed vertically upwards with respect to the time axis.



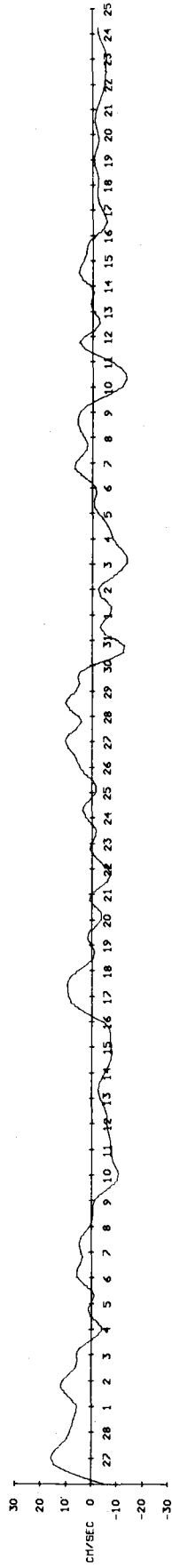
LLP V AT 20 METERS, URBINIA



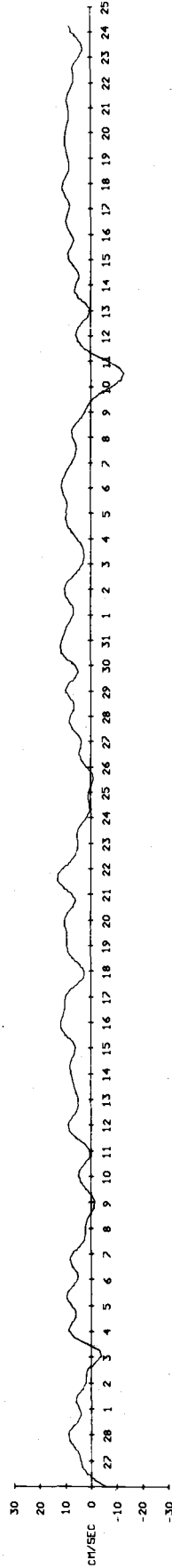
LLP V AT 40 METERS, URBINIA



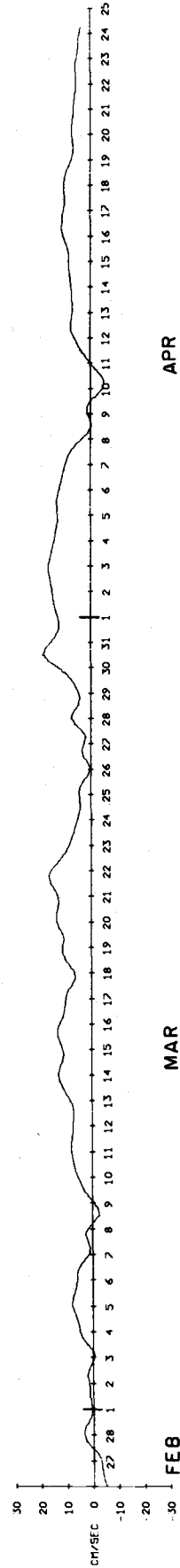
LLP V AT 60 METERS. URBINIA



LLP U AT 20 METERS, URBINIA



LLP U AT 40 METERS, URBINIA



LLP U AT 60 METERS, URBINIA

## WEED

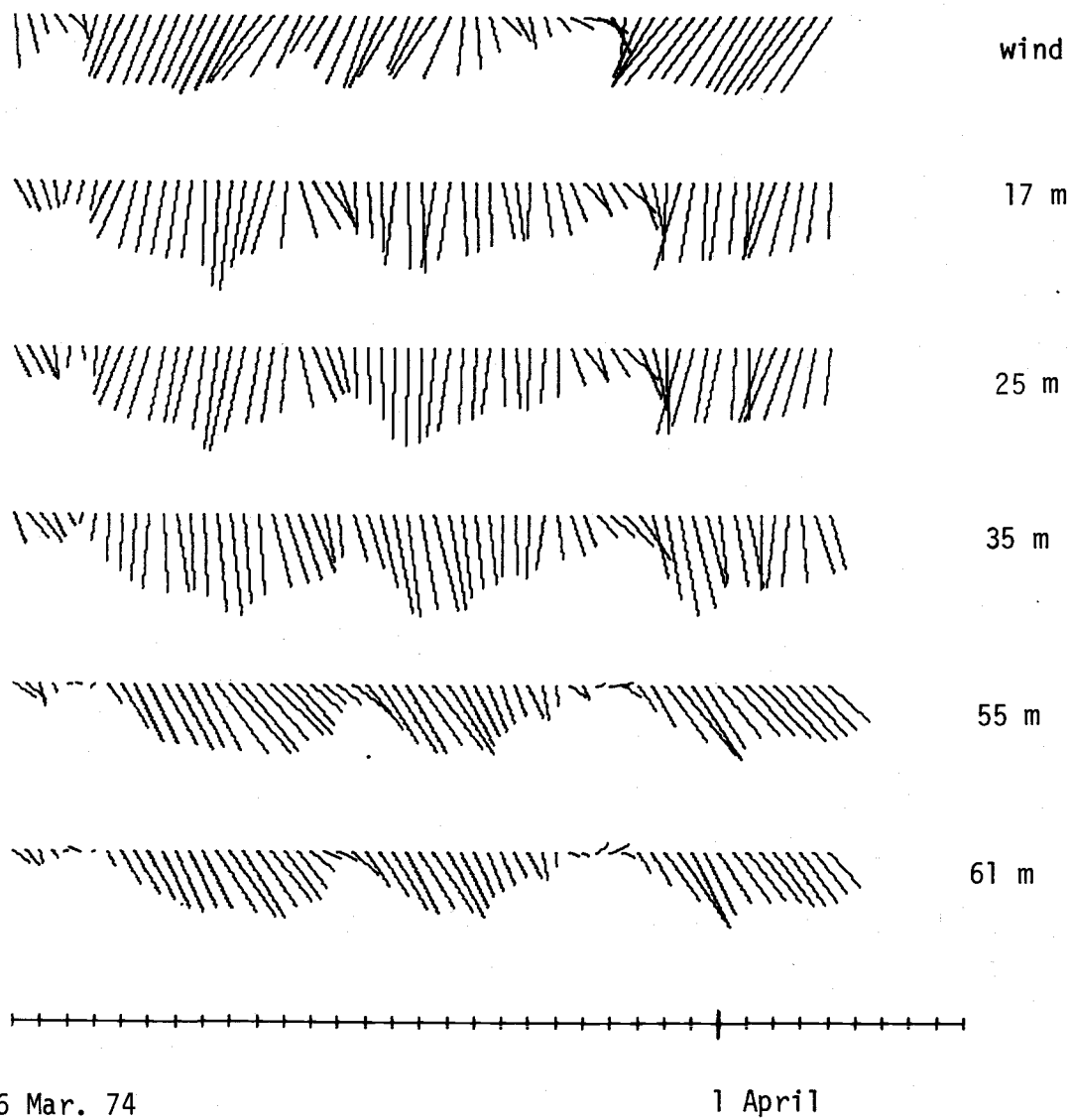
Position: 21°39.5'N, 17°17.5'W

Water Depth: 67 m

Data Interval: 2052 GMT 4 March to 1052 GMT 6 April 1974

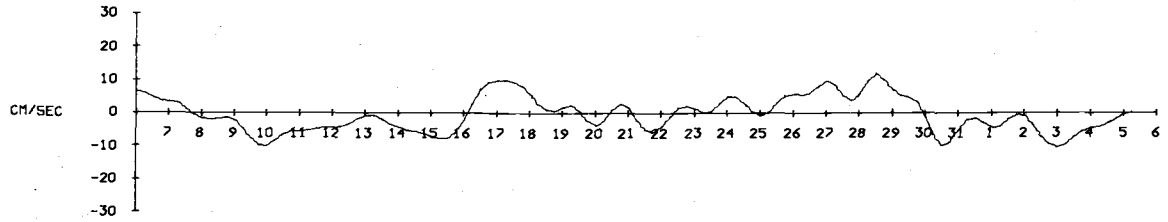
Instrument Depths: 17 m, 25 m, 35 m, 55 m, 61 m

WEED

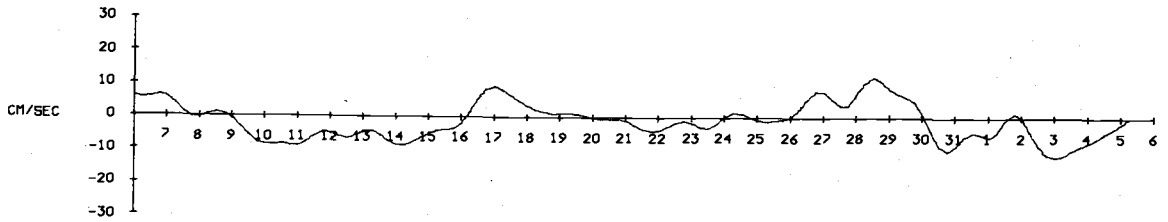


Scale: 25 m s<sup>-1</sup> to 1 inch (wind)  
 75 cm s<sup>-1</sup> to 1 inch (current)  
 7 days per inch

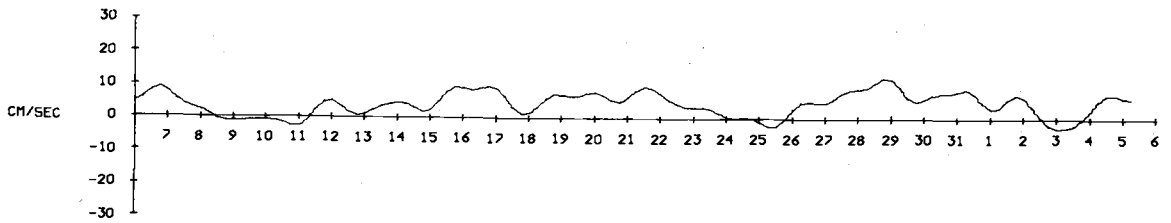
North is directed vertically upwards with respect to the time axis.



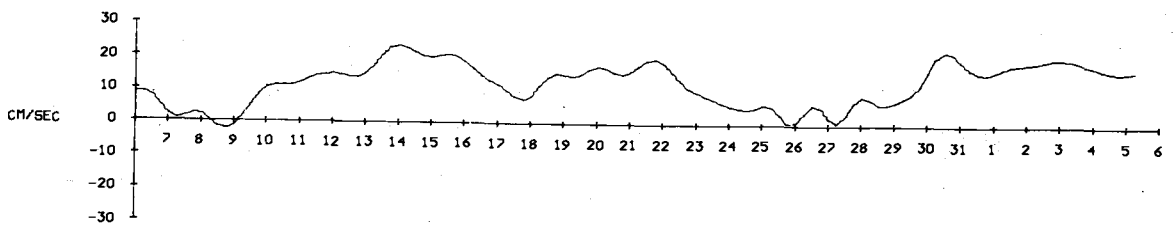
LLP U AT 17 METERS, WEED



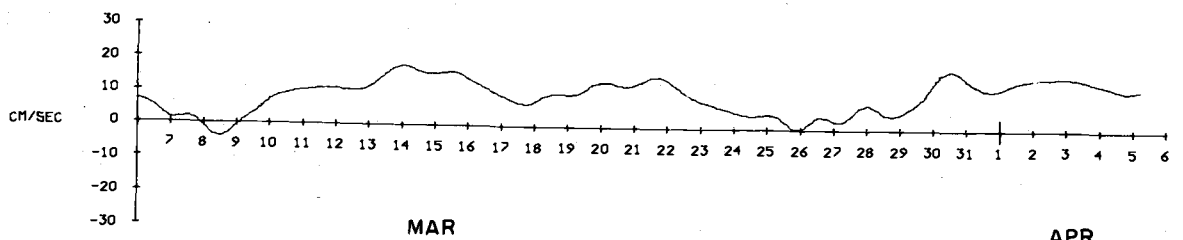
LLP U AT 25 METERS, WEED



LLP U AT 35 METERS, WEED



LLP U AT 55 METERS, WEED

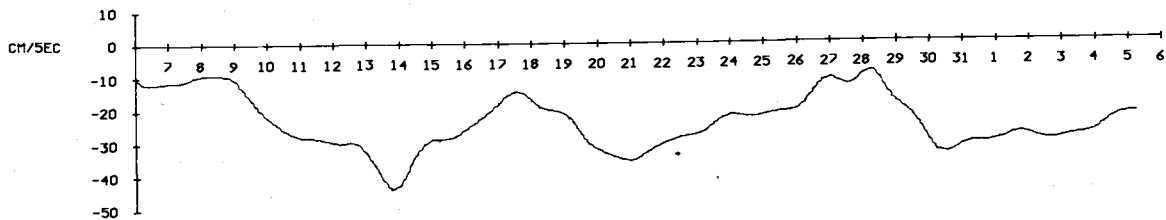


LLP U AT 61 METERS, WEED

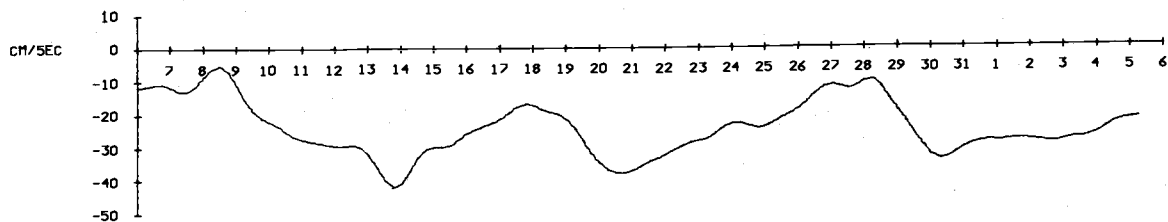
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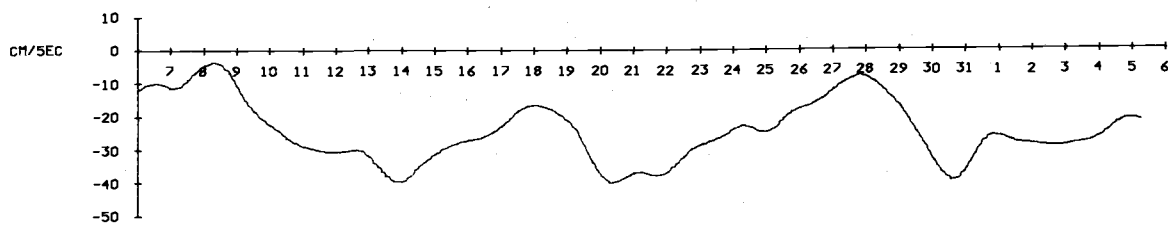




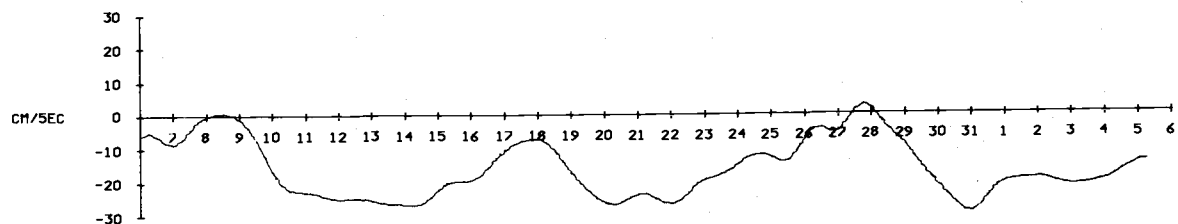
LLP V AT 17 METERS, WEED



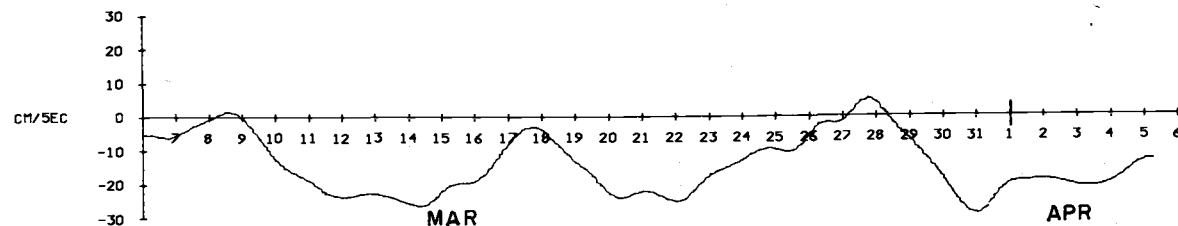
LLP V AT 25 METERS, WEED



LLP V AT 35 METERS, WEED



LLP V AT 55 METERS, WEED



LLP V AT 61 METERS, WEED

## OREGON GRAPE

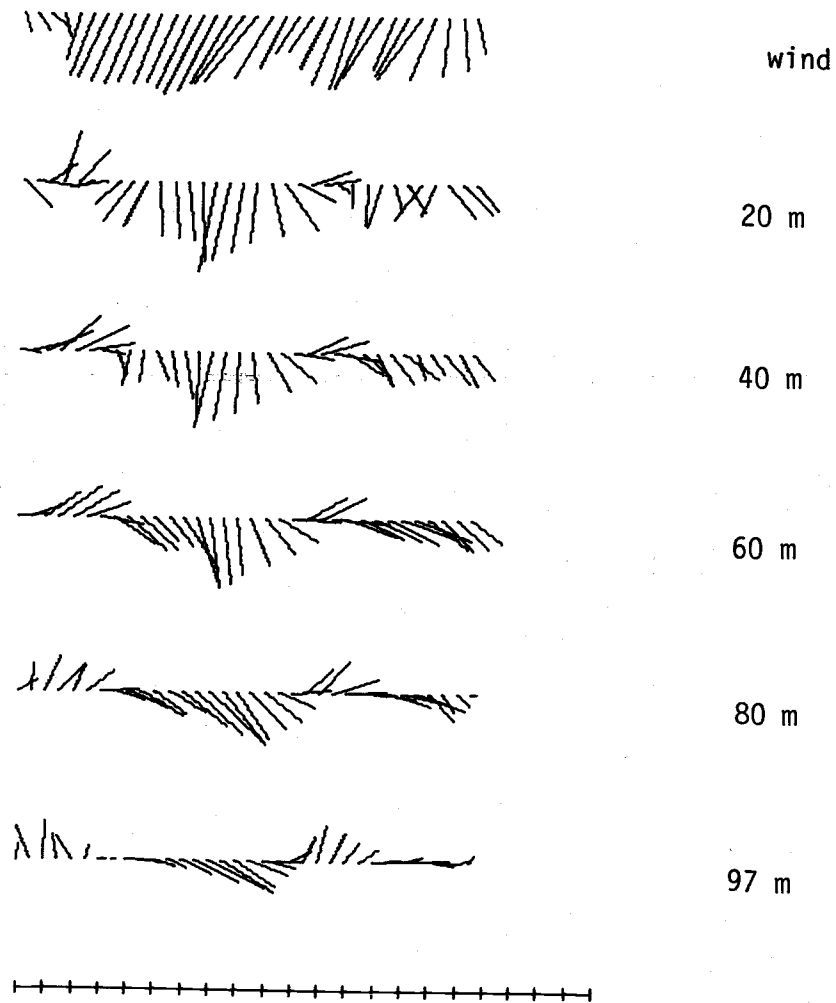
Position: 21°44.2'N, 17°24.8'W

Water Depth: 104 m

Data Interval: 1710 GMT 5 March to 0110 GMT 25 March 1974

Instrument Depths: 20 m, 40 m, 60 m, 80 m, 97 m

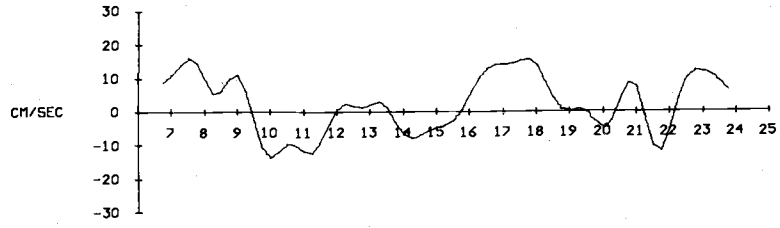
## OREGON GRAPE



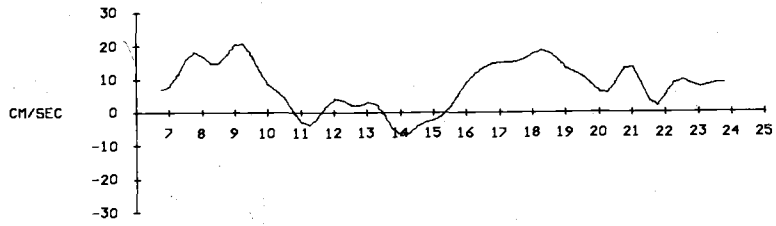
6 Mar. 74

Scale: 25 m s<sup>-1</sup> to 1 inch (wind)  
 75 cm s<sup>-1</sup> to 1 inch (current)  
 7 days per inch

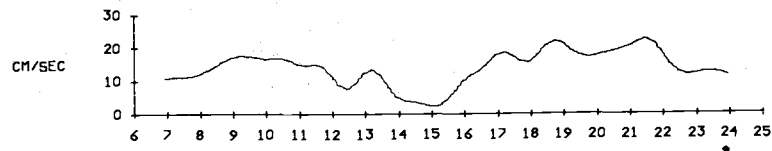
North is directed vertically upwards with respect to the time axis.



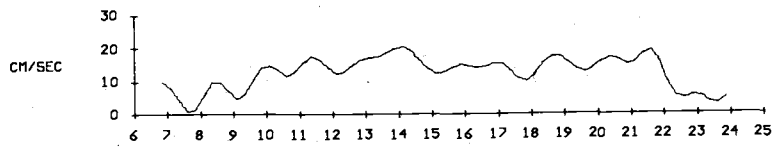
LLP U AT 20 M, OREGON GRAPE



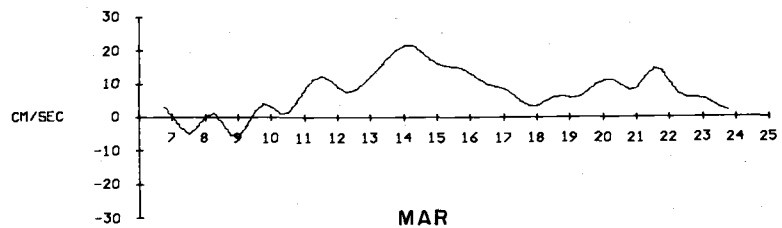
LLP U AT 40 M, OREGON GRAPE



LLP U AT 60 M, OREGON GRAPE

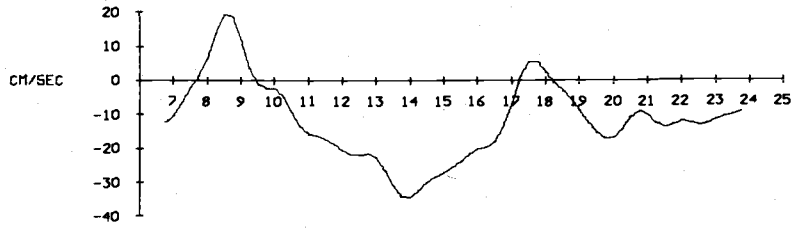


LLP U AT 80 M, OREGON GRAPE

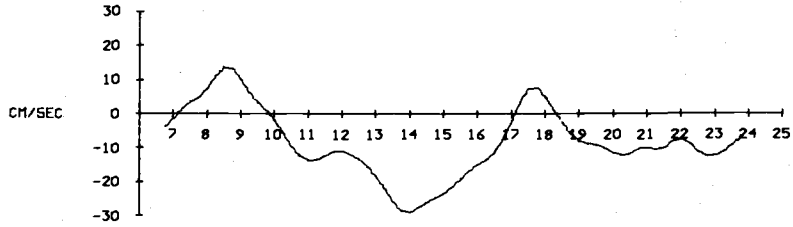


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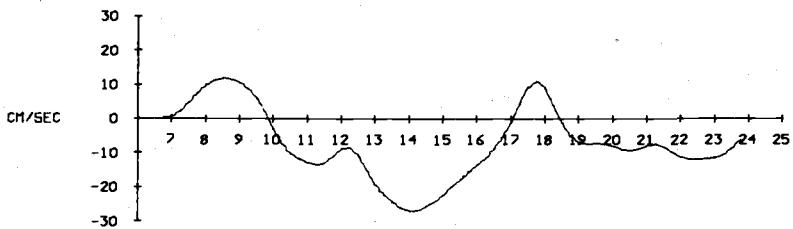
LLP U AT 97 M, OREGON GRAPE



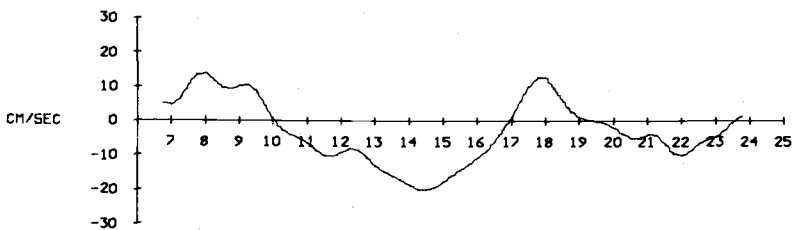
LLP V AT 20 M, OREGON GRAPE



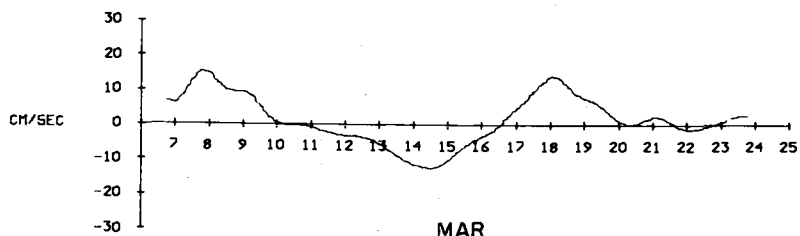
LLP V AT 40 M, OREGON GRAPE



LLP V AT 60 M, OREGON GRAPE



LLP V AT 80 M, OREGON GRAPE



LLP V AT 97 M, OREGON GRAPE

## LUPINE

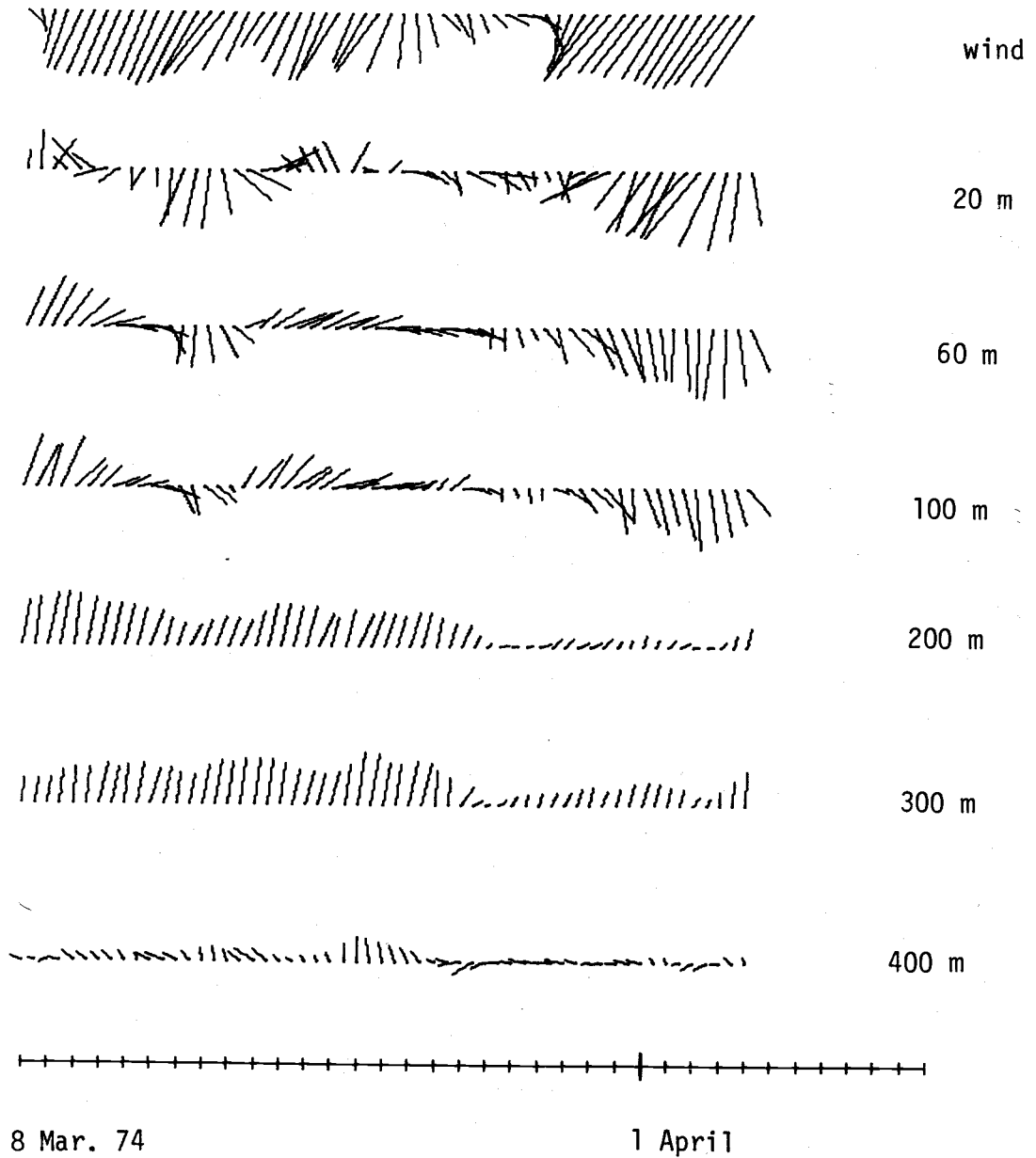
Position: 21°40.9'N, 17°29.7'W

Water Depth: 400 m

Data Interval: 1857 GMT 6 March to 0757 GMT 6 April 1974

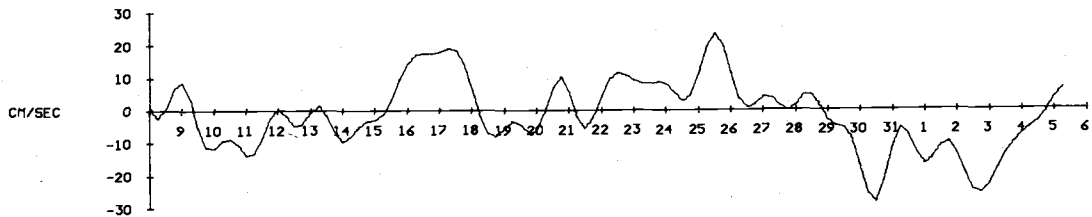
Instrument Depths: 20 m, 60 m, 100 m, 200 m, 300 m, 400 m

LUPINE

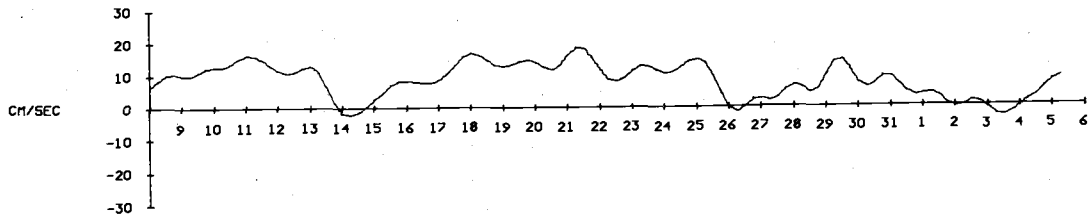


Scale: 25 m s<sup>-1</sup> to 1 inch (wind)  
 75 cm s<sup>-1</sup> to 1 inch (current)  
 7 days per inch

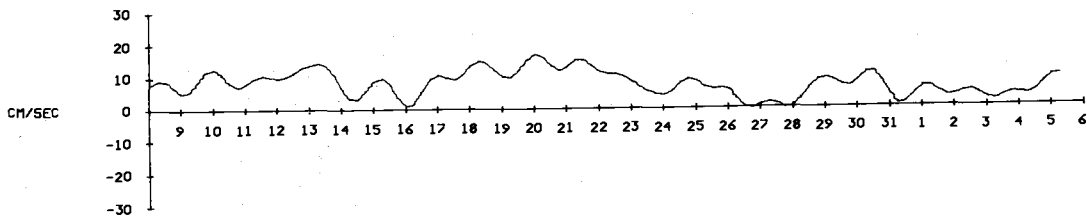
North is directed vertically upwards with respect  
 to the time axis.



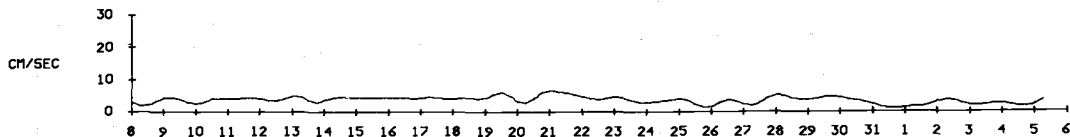
LLP U AT 20 METERS, LUPINE



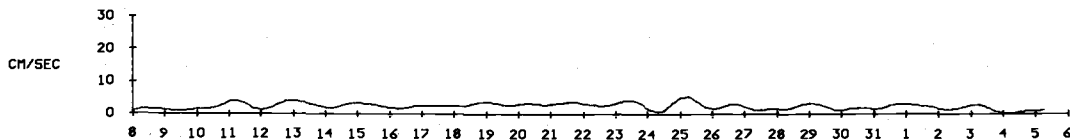
LLP U AT 60 METERS, LUPINE



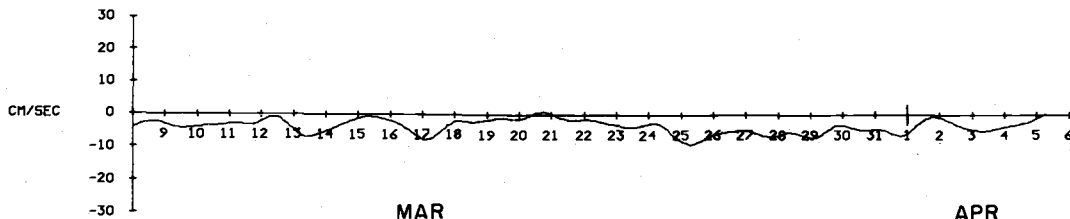
LLP U AT 100 METERS, LUPINE



LLP U AT 200 METERS, LUPINE



LLP U AT 300 METERS, LUPINE

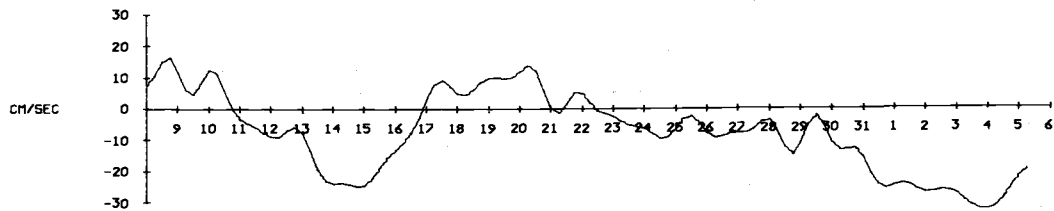


LLP U AT 400 METERS, LUPINE

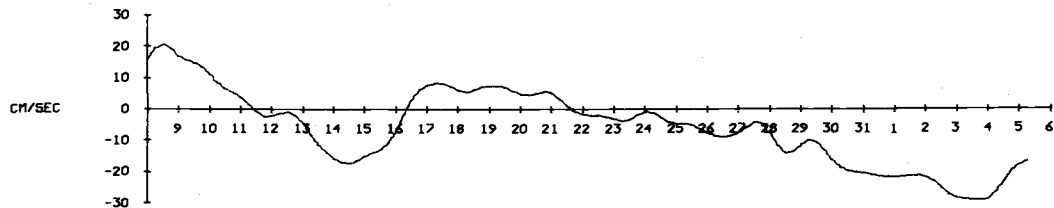
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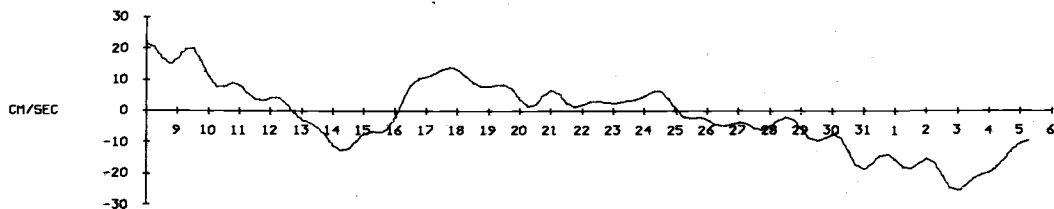




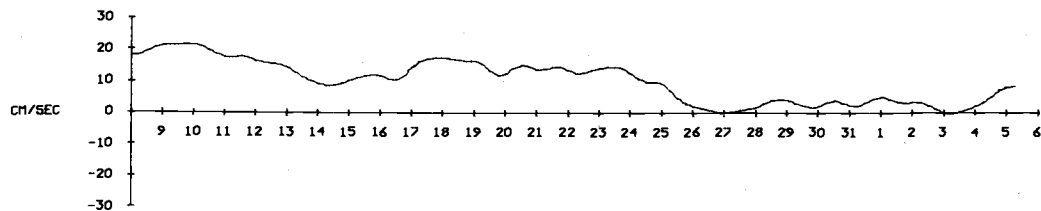
LLP V AT 20 METERS, LUPINE



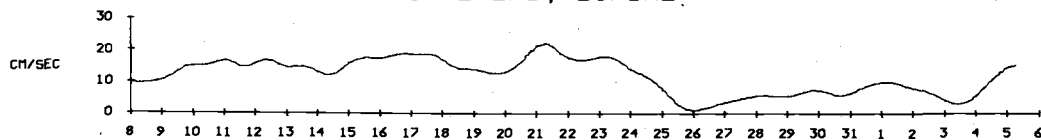
LLP V AT 60 METERS, LUPINE



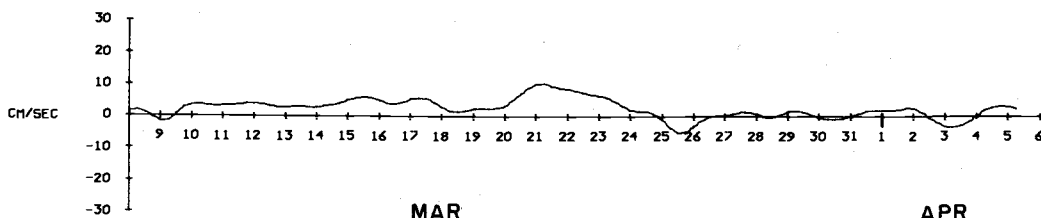
LLP V AT 100 METERS, LUPINE.



LLP V AT 200 METERS, LUPINE.



LLP V AT 300 METERS, LUPINE



LLP V AT 400 METERS, LUPINE

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## FOREST FERN

Position: 21°36.3'N, 17°46.0'W

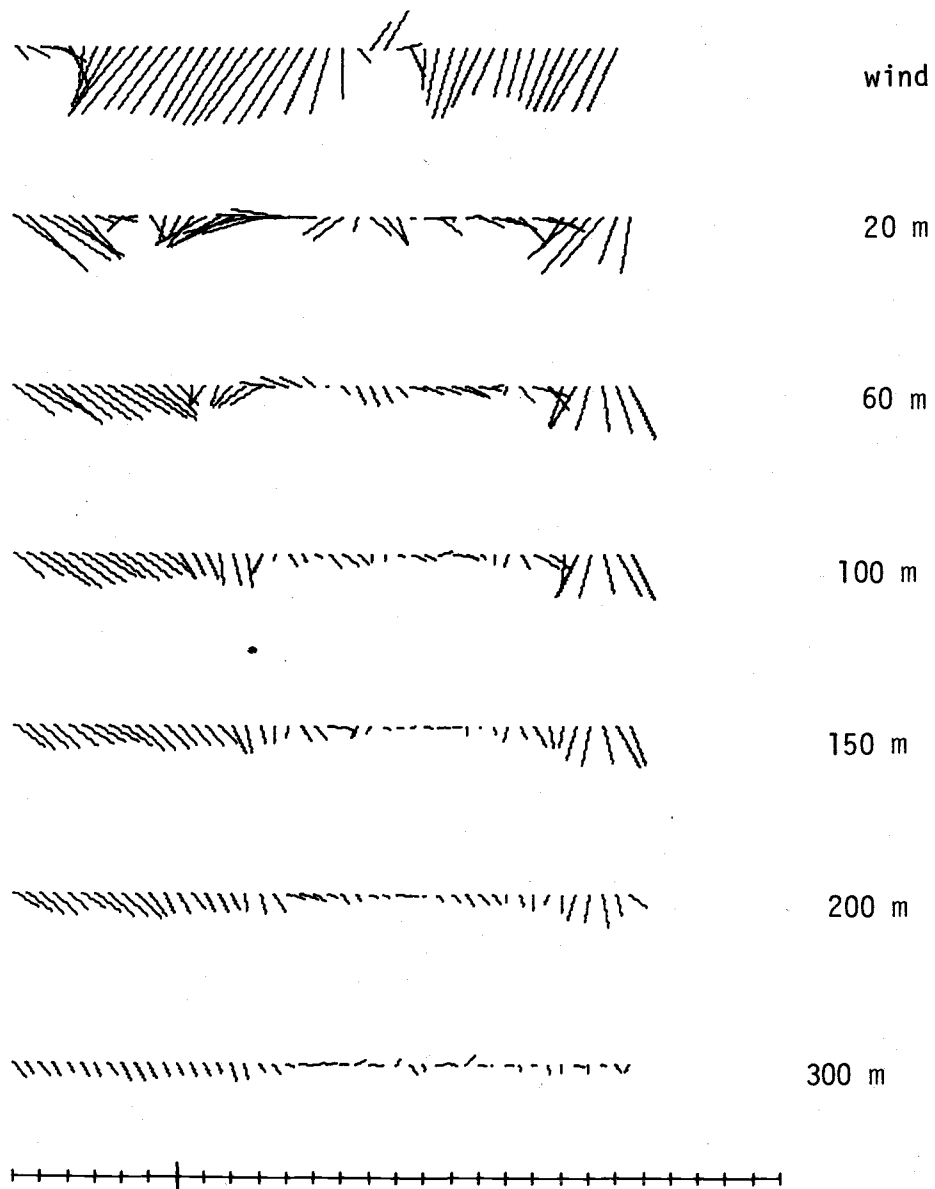
Water Depth: 788 m

Data Interval: 2132 GMT 24 March to 0832 GMT 19 April 1974

Instrument Depths: 0 m, 20 m, 60 m, 100 m, 150 m, 200 m, 300 m

Comment: The Urbinia/Lisa/Rhododendron wind vector series is shown opposite. The wind series measured at Forest Fern is shown on page 31.

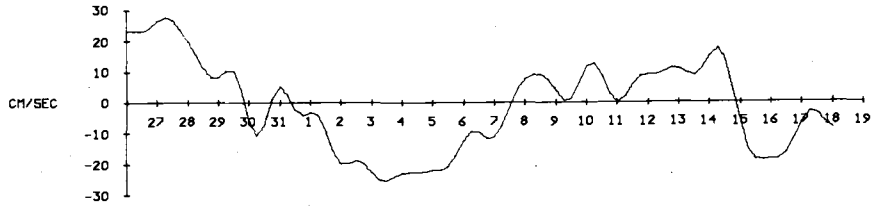
## FOREST FERN



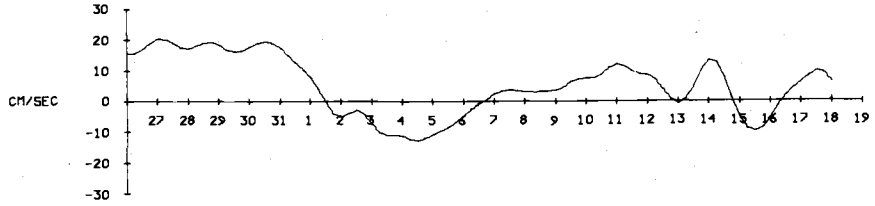
26 Mar.      1 April

Scale: 25 m s<sup>-1</sup> to 1 inch (wind)  
 75 cm s<sup>-1</sup> to 1 inch (current)  
 7 days per inch

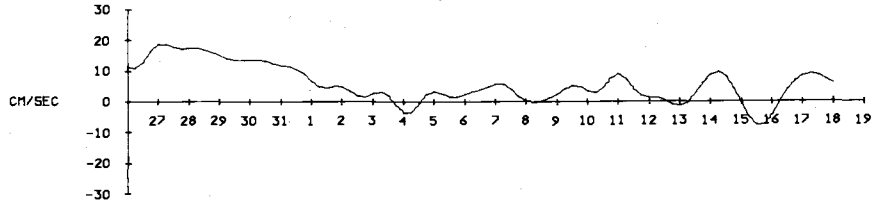
North is directed vertically upwards with respect  
 to the time axis.



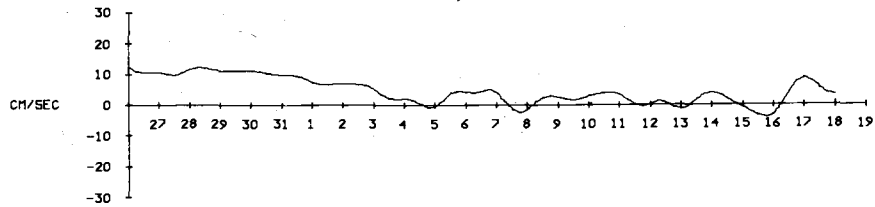
LLP U AT 20 M, FOREST FERN



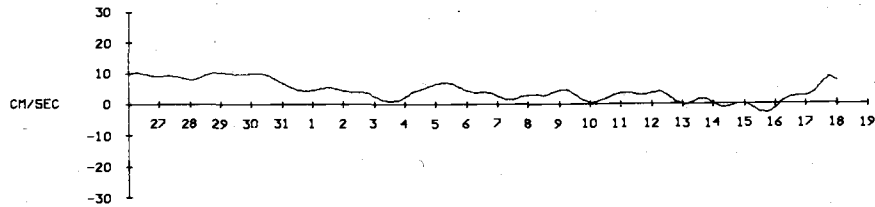
LLP U AT 60 M, FOREST FERN



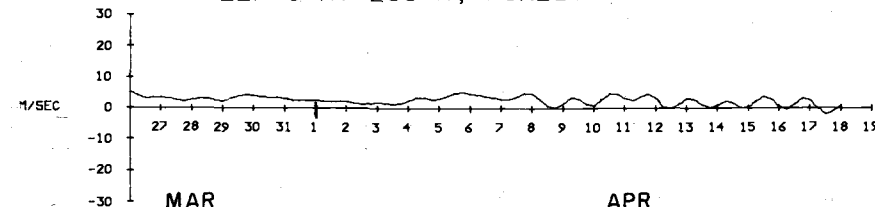
LLP U AT 100 M, FOREST FERN



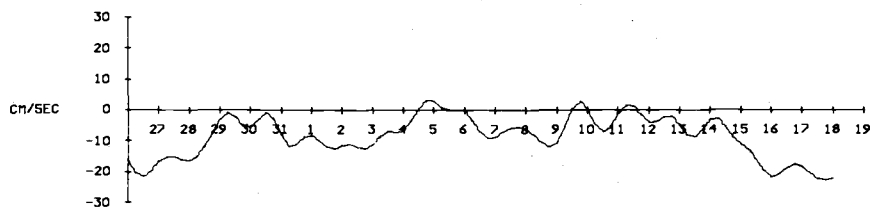
LLP U AT 150 M, FOREST FERN



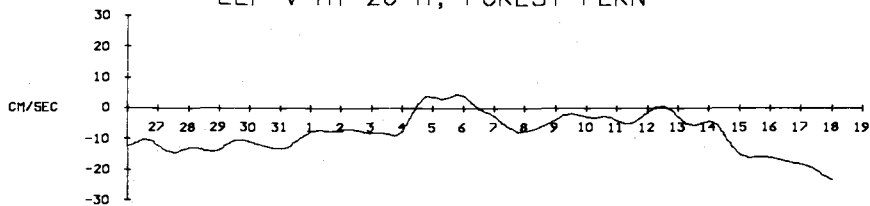
LLP U AT 200 M, FOREST FERN



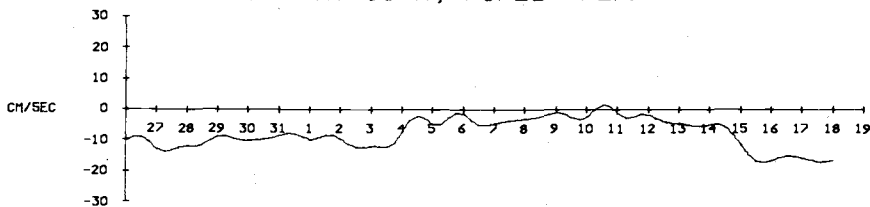
LLP U AT 300 M, FOREST FERN



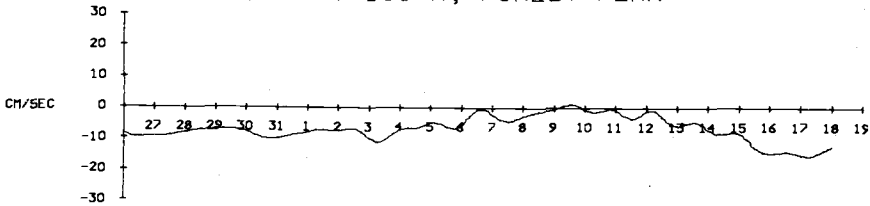
LLP V AT 20 M, FOREST FERN



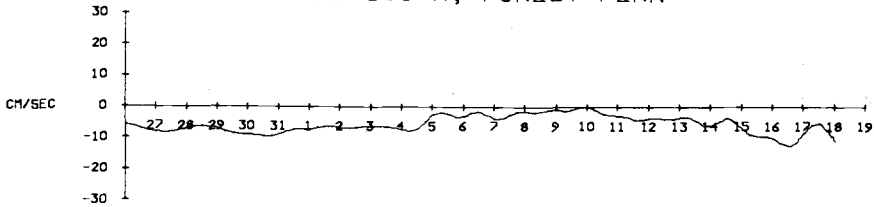
LLP V AT 60 M, FOREST FERN



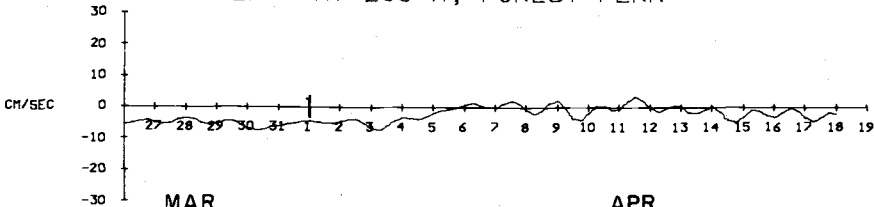
LLP V AT 100 M, FOREST FERN



LLP V AT 150 M, FOREST FERN



LLP V AT 200 M, FOREST FERN



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LLP V AT 300 M, FOREST FERN

## FOXGLOVE

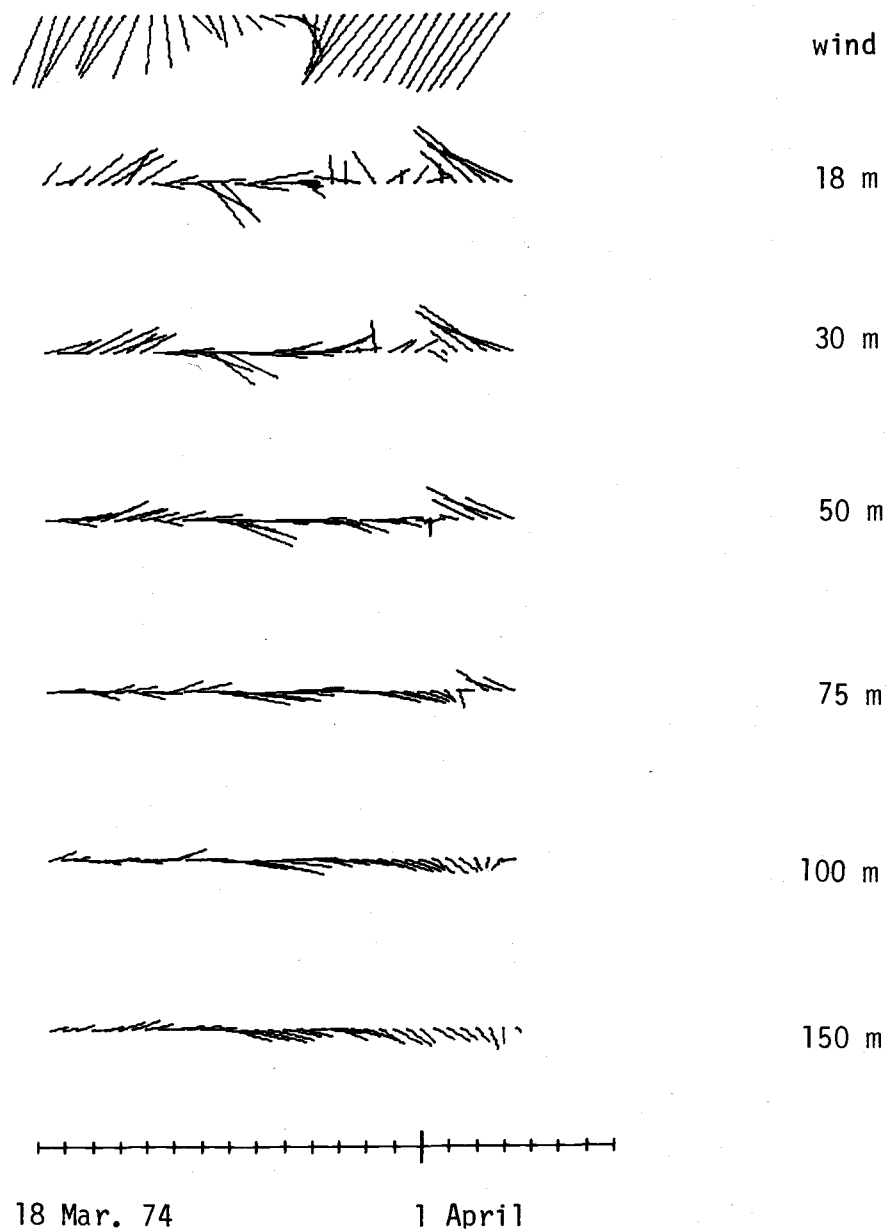
Position: 21°40.5'N, 17°57.2'W

Water Depth: 1200 m

Data Interval: 0721 GMT 17 March to 0121 GMT 6 April 1974

Instrument Depths: 18 m, 30 m, 50 m, 75 m, 100 m, 150 m,  
200 m, 300 m, 400 m, 500 m

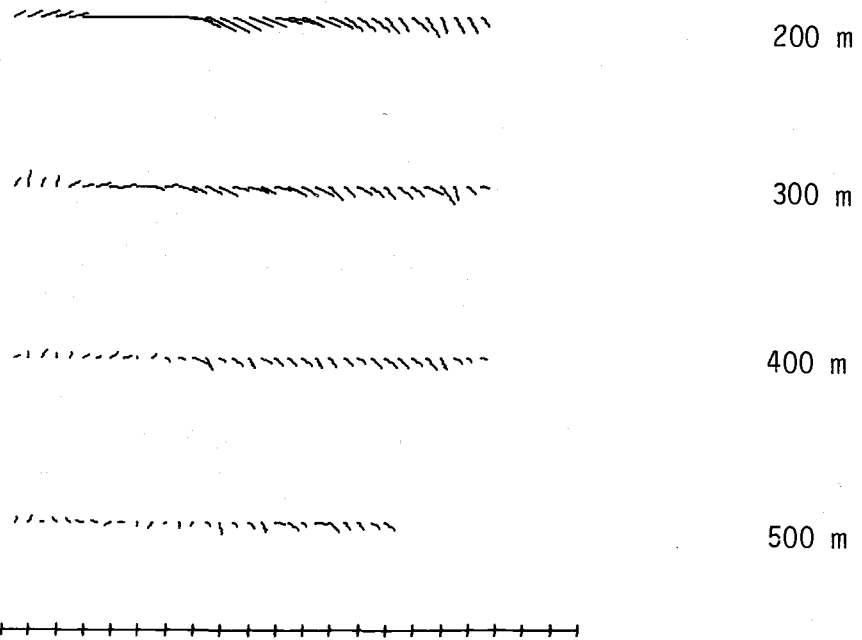
## FOXGLOVE



Scale: 25 m s<sup>-1</sup> to 1 inch (wind)  
 75 cm s<sup>-1</sup> to 1 inch (current)  
 7 days per inch

North is directed vertically upwards with respect  
 to the time axis.

## FOXGLOVE



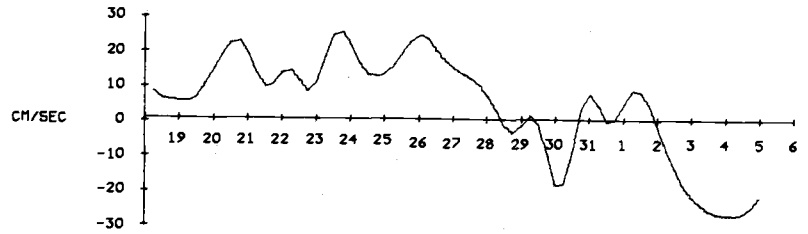
18 Mar. 74

Scale: 25 m s<sup>-1</sup> to 1 inch (wind)  
75 cm s<sup>-1</sup> to 1 inch (current)  
7 days per inch

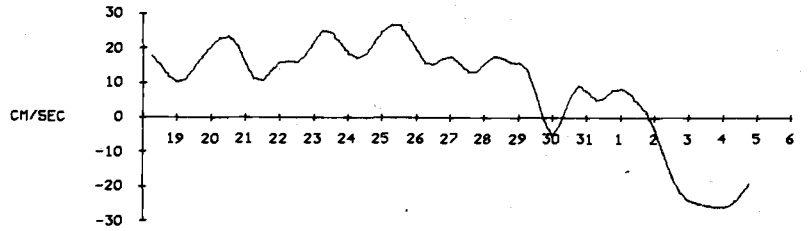
North is directed vertically upwards with respect  
to the time axis.



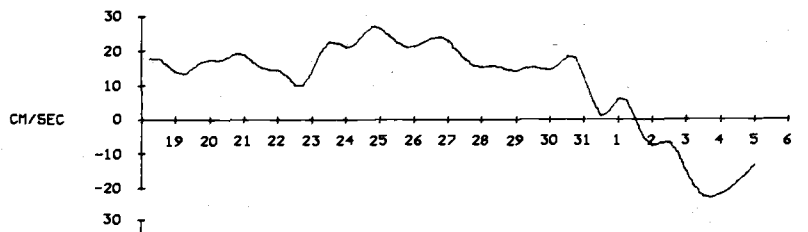
LLP U AT 18 M, FOXGLOVE



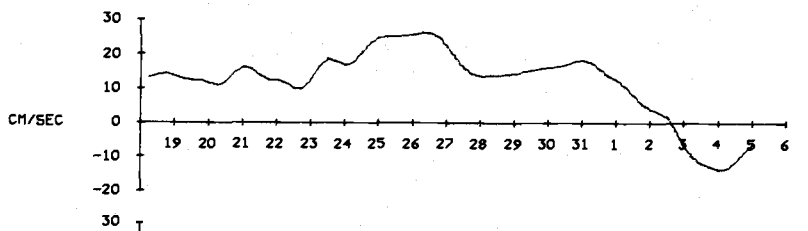
LLP U AT 30 M, FOXGLOVE



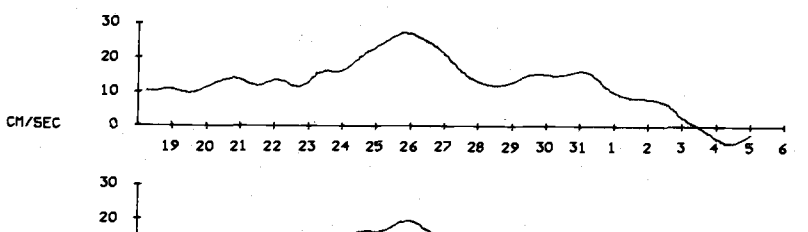
LLP U AT 50 M, FOXGLOVE



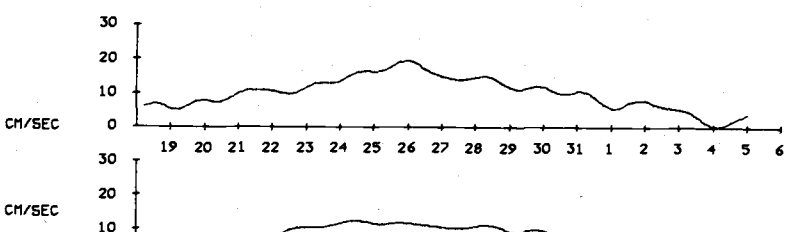
LLP U AT 75 M, FOXGLOVE



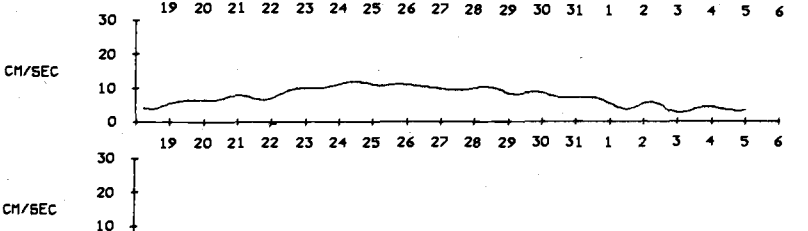
LLP U AT 100 M, FOXGLOVE



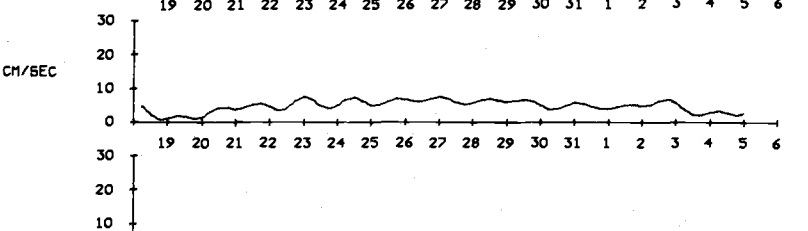
LLP U AT 150 M, FOXGLOVE



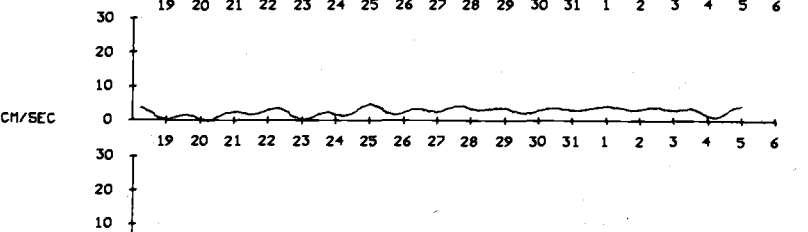
LLP U AT 200 M, FOXGLOVE



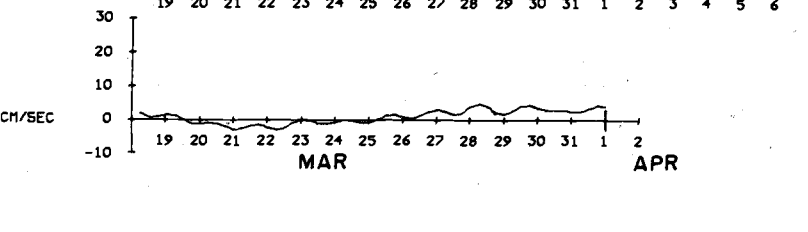
LLP U AT 300 M, FOXGLOVE



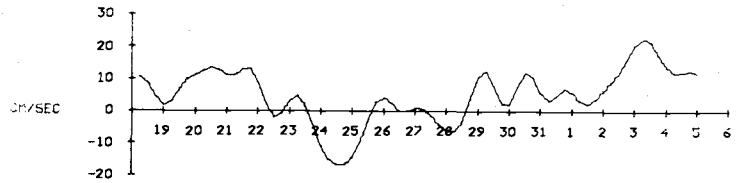
LLP U AT 400 M, FOXGLOVE



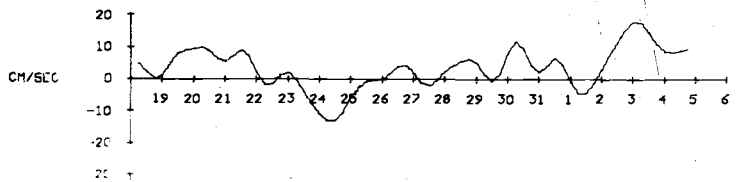
LLP U AT 500 M, FOXGLOVE



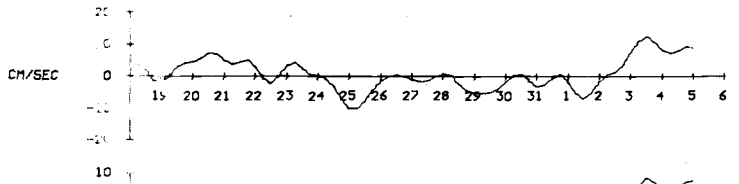
LLP V AT 18 M, FOXGLOVE



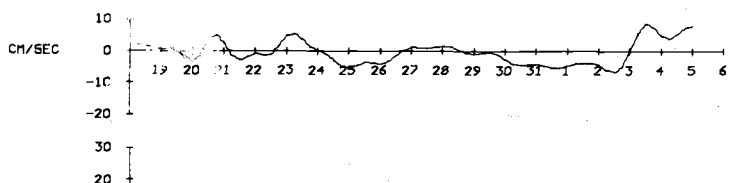
LLP V AT 30 M, FOXGLOVE



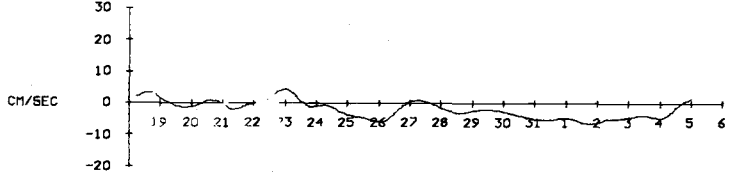
LLP V AT 50 M, FOXGLOVE



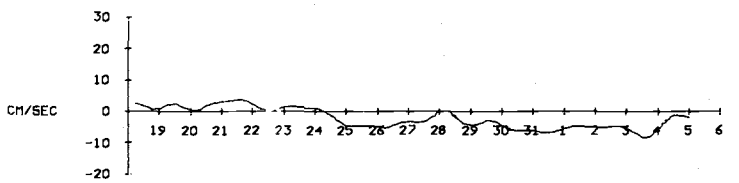
LLP V AT 75 M, FOXGLOVE



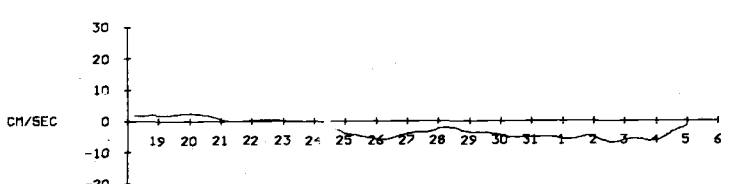
LLP V AT 100 M, FOXGLOVE



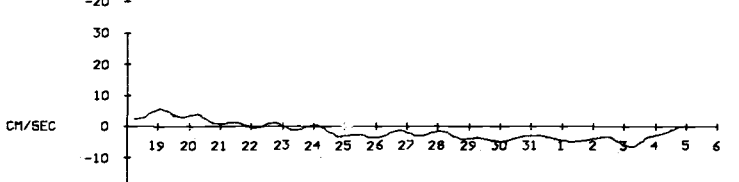
LLP V AT 150 M, FOXGLOVE



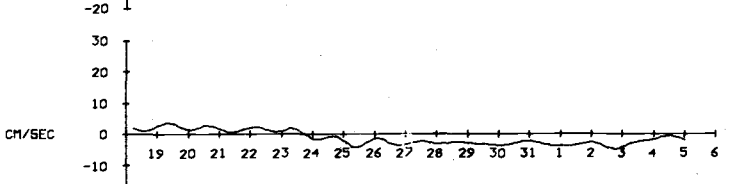
LLP V AT 200 M, FOXGLOVE



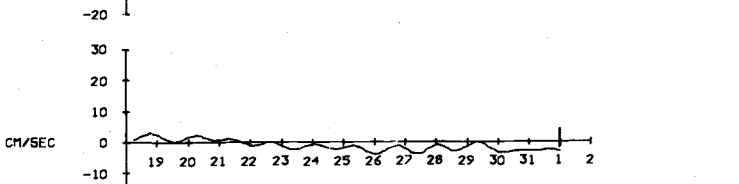
LLP V AT 300 M, FOXGLOVE



LLP V AT 400 M, FOXGLOVE



LLP V AT 500 M, FOXGLOVE



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