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THE GULF STREAM DEFLECTION AND MEANDER ENERGETICS
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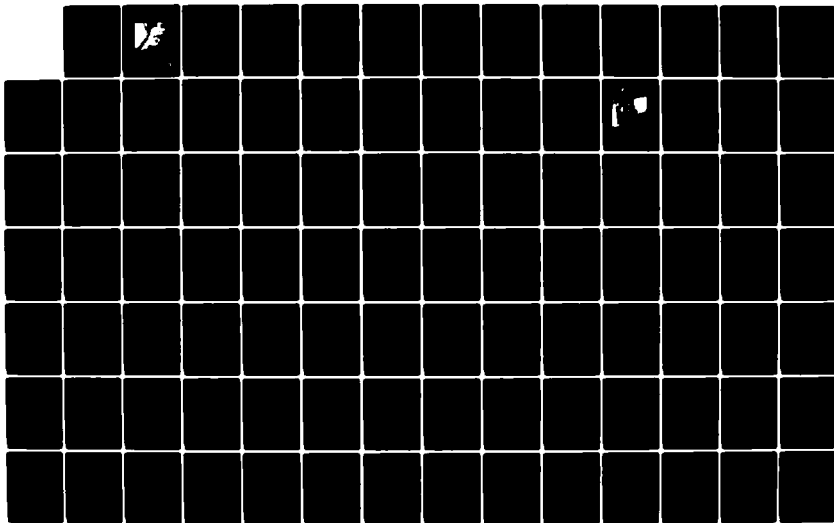
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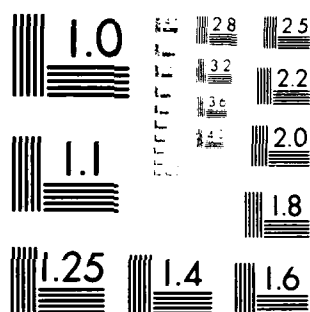
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THE GULF STREAM DEFLECTION AND MEANDER ENERGETICS EXPERIMENT



Current Meter and Bottom Pressure Gauge Data Report
for the September, 1981 to April, 1982 Mooring Period

by
John M. Bane
William K. Dewar

December, 1983
University of North Carolina
at Chapel Hill

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Technical Report No. CMS-83-2

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Data Report for the September, 1981
to April, 1982 Mooring Period



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and
William K. Dewar

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Technical Report No. CMS-83-2

December 1983

Foreword

This is the first in a series of three reports from the Gulf Stream Deflection and Meander Energetics Experiment. The field phase of this study occurred between September 1981 and April 1982, and was comprised of three central components. An array of instrument moorings was in place during the entire field phase. Data from that component are documented here. A detailed hydrographic survey was conducted during September, 1981, and four aircraft surveys utilizing AXBT's were conducted during March 1982. Data from those components will be documented in the second and third reports of this series. The complete set of reports will be:

1. Current Meter and Bottom Pressure Gauge Data Report, September 1981 to April 1982 Mooring Period. University of North Carolina at Chapel Hill Technical Report No. CMS-83-2, December, 1983.
2. Hydrographic Data Report, R/V RESEARCHER Cruise RP-15-RE-81, September 1981. University of North Carolina at Chapel Hill Technical Report No. CMS-84-1.
3. AXBT/PRT Data Report, R/A PROJECT BIRDSEYE Flights, March, 1982. University of North Carolina at Chapel Hill Technical Report No. CMS-84-2.

Contents

	<u>Page</u>
Foreword	iii
List of Tables	vi
List of Figures	vii
Section 1. EXPERIMENT BACKGROUND AND DESCRIPTION	1
1.1 Introduction	1
1.2 Experimental Design	4
1.3 Nomenclature	10
1.4 Mooring Design	11
Section 2. DATA PROCESSING AND DESCRIPTION	13
2.1 Ancillary Data Sources	13
2.2 Brief Description of Aanderaa RCM-4 and WLR-5 Operations ...	17
2.3 Data Transcription	18
2.4 Data Editing	19
2.5 Calibration and Conversion to Engineering Units	21
2.6 Final Processing	44
2.7 Basic Statistics	48
2.8 Percentage Returns	53
2.9 Format of Presentation	55
Section 3. 3 HRLP AND 40 HRLP CURRENT METER DATA	57
Section 4. 3-40 HRBP CURRENT METER DATA	195
Section 5. 40 HRLP MOORING DATA	323
Section 6. 40 HRLP MOORING STICK PLOTS	395
Section 7. BOTTOM PRESSURE DATA	467
Acknowledgements	479
References	481

List of Tables

<u>Table</u>		<u>Page</u>
1	Mooring and Buoy Data	5
2	Aanderaa (Aa) and Calibration-Produced (Cal) Coefficients for the Conversion from Binary Data to Scientific Units	42
3	Basic Current Meter Data Statistics	49
4	Percentage Data Returns	54

List of Figures

Figure		Page
Fig. 1.	The Deflection and Meander Energetics Experiment Study Area. Shown in (a) are the locations of NDBO Meteorological buoys 41001 through 41005. The insert in (a) encloses the study region. A more detailed view of that area is given in (b), which shows bottom topography and the mooring locations. Note the large perturbation in the 400 and 600 m isobaths occurring offshore of Charleston, South Carolina. This feature, known as the Charleston Bump, is thought to have an effect on the mean position of the Gulf Stream. Arrays E and F of this study were deployed in the vicinity of the Bump to measure its effects. Array G was located off Onslow Bay, near the site of the Gulf Stream Meanders Experiment (Brooks and Bane, 1981).	2
Fig. 2.	E, F and G. Both E and F consisted of three moorings placed so as to form a right angle. Mooring #1 was placed on the 300 meter isobath and moorings #2 and 3 on the 400 meter isobath such that 3 was downstream of 2. This configuration allows estimates to be made of the terms in the fluctuation energy equation. Mooring G was located on the 400 m isobath.	7
Fig. 3.	Moorings design. Subsurface floatation, proven successful in earlier experiments (Brooks, et. al, 1981), was used. The current meters were placed at nominal depths of 210 m and 270 m and the mooring line was attached to the anchor through an AMF-Sealink bottom mounted release. Bottom pressure gauges were attached at the base of the mooring on F2 and F3, and additional floatation was provided by glass spheres in 'hard hats'.	12
Fig. 4.	Aanderaa RCM-4 Current Meter. Speed is measured by monitoring the revolutions of the rotor, which is located near the top of the instrument. Directly under the rotor (above the fastening band) are the temperature and conductivity sensors. The compass is located inside the recording unit. The meter is counterbalanced by a vane, which keeps the meter oriented into the current.	15
Fig. 5.	Calibration Curves. Aanderaa-supplied curves were used to convert binary data to engineering units for speed and conductivity. Calibrations were conducted for all the temperature sensors and compasses employed in the experiment and for four of the pressure sensors. All of these curves are presented and, where appropriate, the calibration curves (Cal) are compared to the Aanderaa curves (Aa).	25
Fig. 6.	3 HRLP filter plots. Both physical and spectral representations are given. The quarter power point of this filter is at a frequency of 1 cycle/3 hours, and the resulting time series had an effective sampling interval of 1 hour.	45
Fig. 7.	40 HRLP filter plots. Both physical and spectral representations are given. The quarter power point of this filter is at a frequency of 1 cycle/40 hours, and the resulting time series had an effective sampling interval of 6 hours.	46

Figure	Page
Fig. 8. 40 HRLP filter plots. Both physical and spectral representations are given. The quarter power point of this filter is at 1 cycle/40 hours. The resulting time series had an effective sampling interval of 1 hour.	47
Fig. 9. 3 HRLP and 40 HRLP temperature, salinity and velocity data from E1T for each month.	59
Fig. 10. 3 HRLP and 40 HRLP temperature, salinity and velocity data from E1B for each month.	69
Fig. 11. 3 HRLP and 40 HRLP temperature, salinity and velocity data from E2T for each month.	79
Fig. 12. 3 HRLP and 40 HRLP temperature, salinity and velocity data from E2B for each month.	89
Fig. 13. 3 HRLP and 40 HRLP temperature, salinity and velocity data from E3T for each month.	99
Fig. 14. 3 HRLP and 40 HRLP temperature, salinity and velocity data from E3B for each month.	109
Fig. 15. 3 HRLP and 40 HRLP temperature, salinity and velocity data from F1T for each month.	119
Fig. 16. 3 HRLP and 40 HRLP temperature, salinity and velocity data from F1B for each month.	129
Fig. 17. 3 HRLP and 40 HRLP temperature, salinity and velocity data from F2T for each month.	139
Fig. 18. 3 HRLP and 40 HRLP temperature, salinity and velocity data from F2B for each month.	143
Fig. 19. 3 HRLP and 40 HRLP temperature, salinity and velocity data from F3T for each month.	153
Fig. 20. 3 HRLP and 40 HRLP temperature, salinity and velocity data from F3B for each month.	155
Fig. 21. 3 HRLP and 40 HRLP temperature, salinity and velocity data from GT for each month.	165
Fig. 22. 3 HRLP and 40 HRLP temperature, salinity and velocity data from GTH for each month.	175
Fig. 23. 3 HRLP and 40 HRLP temperature, salinity and velocity data from GB for each month.	185
Fig. 24. 3-40 HRBP temperature, salinity and velocity data from E1T for each month.	197
Fig. 25. 3-40 HRBP temperature, salinity and velocity data from E1B for each month.	207

Figure	Page
Fig. 26. 3-40 HRBP temperature, salinity and velocity data from E2T for each month.	217
Fig. 27. 3-40 HRBP temperature, salinity and velocity data from E2B for each month.	227
Fig. 28. 3-40 HRBP temperature, salinity and velocity data from E3T for each month.	237
Fig. 29. 3-40 HRBP temperature, salinity and velocity data from E3B for each month.	247
Fig. 30. 3-40 HRBP temperature, salinity and velocity data from F1T for each month.	257
Fig. 31. 3-40 HRBP temperature, salinity and velocity data from F1B for each month.	267
Fig. 32. 3-40 HRBP temperature, salinity and velocity data from F2T for each month.	277
Fig. 33. 3-40 HRBP temperature, salinity and velocity data from F2B for each month.	281
Fig. 34. 3-40 HRBP temperature, salinity and velocity data from F3T for each month.	291
Fig. 35. 3-40 HRBP temperature, salinity and velocity data from F3B for each month.	293
Fig. 36. 3-40 HRBP temperature, salinity and velocity data from GT for each month.	303
Fig. 37. 3-40 HRBP temperature, salinity and velocity data from GB for each month.	313
Fig. 38. 40 HRLP sigma-t and velocity data from mooring E1 and 3 HRLP pressure data from E1T for each month.	325
Fig. 39. 40 HRLP sigma-t and velocity data from mooring E2 and 3 HRLP pressure data from E2T for each month.	335
Fig. 40. 40 HRLP sigma-t and velocity data from mooring E3 and 3 HRLP pressure data from E3T for each month.	345
Fig. 41. 40 HRLP sigma-t and velocity data from mooring F1 and 3 HRLP pressure data from F1T for each month.	355
Fig. 42. 40 HRLP sigma-t and velocity data from mooring F2 and 3 HRLP pressure data from F2T for each month.	365
Fig. 43. 40 HRLP sigma-t and velocity data from mooring F3 and 3 HRLP pressure data from F3T for each month.	375
Fig. 44. 40 HRLP sigma-t and velocity data from mooring G and 3 HRLP pressure data from GT*. (*The velocity data is from the hybrid velocity time series, GTH.)	385

Figure	Page
Fig. 45. 40 HRLP vector velocity plots in stick form from mooring E1 for each month.	397
Fig. 46. 40 HRLP vector velocity plots in stick form from mooring E2 for each month.	407
Fig. 47. 40 HRLP vector velocity plots in stick form from mooring E3 for each month.	417
Fig. 48. 40 HRLP vector velocity plots in stick form from mooring F1 for each month.	427
Fig. 49. 40 HRLP vector velocity plots in stick form from mooring F2 for each month.	437
Fig. 50. 40 HRLP vector velocity plots in stick form from mooring F3 for each month.	447
Fig. 51. 40 HRLP vector velocity plots in stick form from mooring G (GTH is plotted).	457
Fig. 52. 3 HRLP and 40 HRLP bottom pressure data from mooring F2 and downstream velocity, V, from F2T for each month.	469

Section 1

Experiment Background and Description

1.1 Introduction

The Gulf Stream Deflection and Meander Energetics Experiment was designed to study time-dependent fluctuations of the Gulf Stream and their relationship to its mean structure. Seven instrument moorings supporting 14 current meters and 2 bottom pressure gauges were deployed from mid-September 1981 to mid-April 1982 along the upper continental slope off North and South Carolina. The study area enclosed a major seafloor topographic feature known as the Charleston Bump (see Fig. 1). This region was chosen for several reasons. First, previous studies to its north and south have indicated that the bump area is a primary location for intense Gulf Stream meander 'amplification' (Hood and Bane, 1983). Second, theory has shown that irregular topography can be a major factor in the stability of a mean flow. Finally, the study in this region complements several earlier studies by completing the geographical picture of the exchanges of energy between the mean Gulf Stream and its eddies. In this technical report we document the procedures used to obtain and process the current meter and pressure data, and present the data in graphical and statistical form.

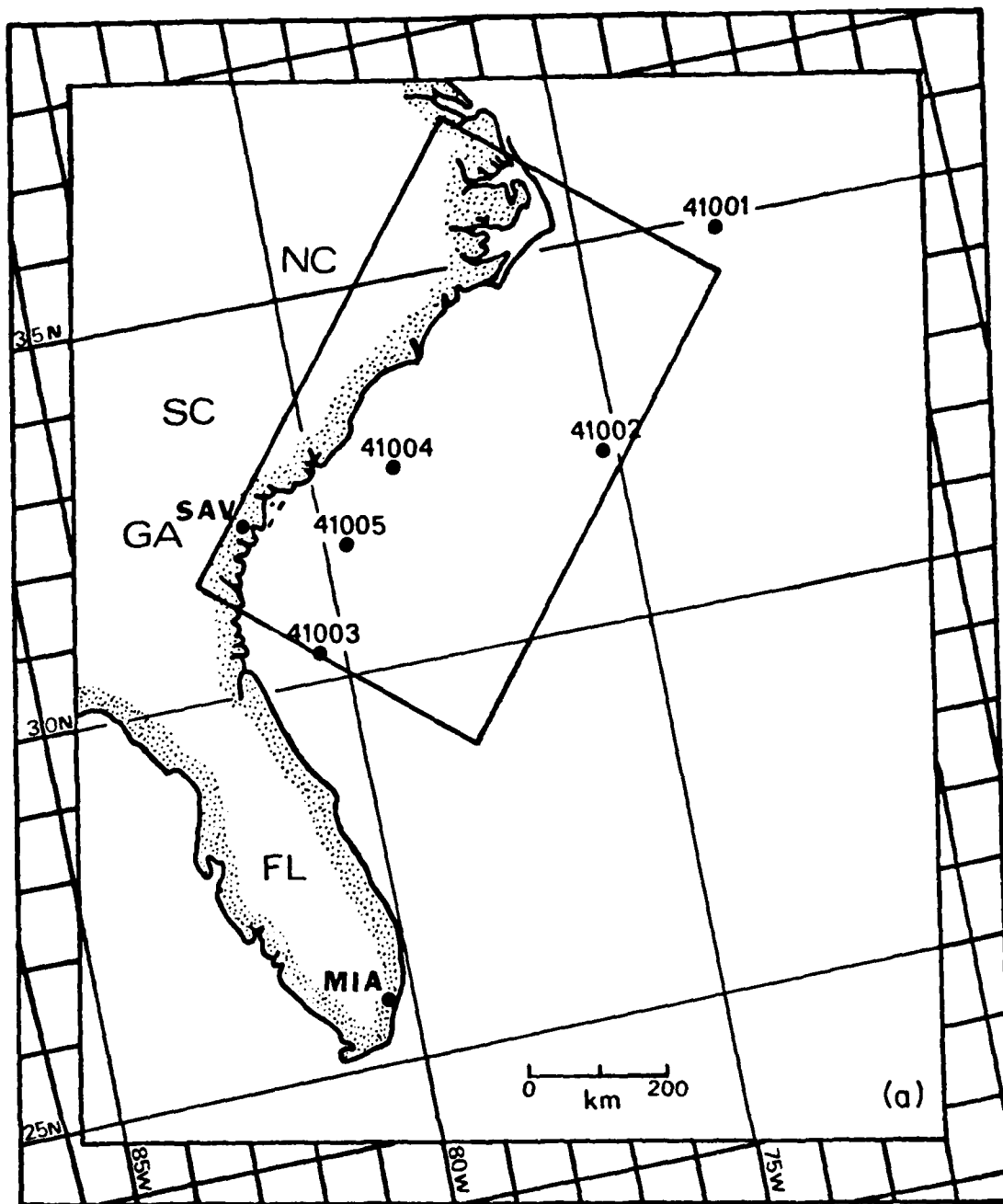


Fig. 1. The Deflection and Meander Energetics Experiment Study Area. Shown in (a) are the locations of NDBO Meteorological buoys 41001 through 41005. The insert in (a) encloses the study region. A more detailed view of that area is given in (b), which shows bottom topography and the mooring locations. Note the large perturbation in the 400 and 600 m isobaths occurring offshore of Charleston, South Carolina. This feature, known as the Charleston Bump, is thought to have an effect on the mean position of the Gulf Stream. Arrays E and F of this study were deployed in the vicinity of the Bump to measure its effects. Array G was located off Onslow Bay, near the site of the Gulf Stream Meanders Experiment (Brooks and Bane, 1981).

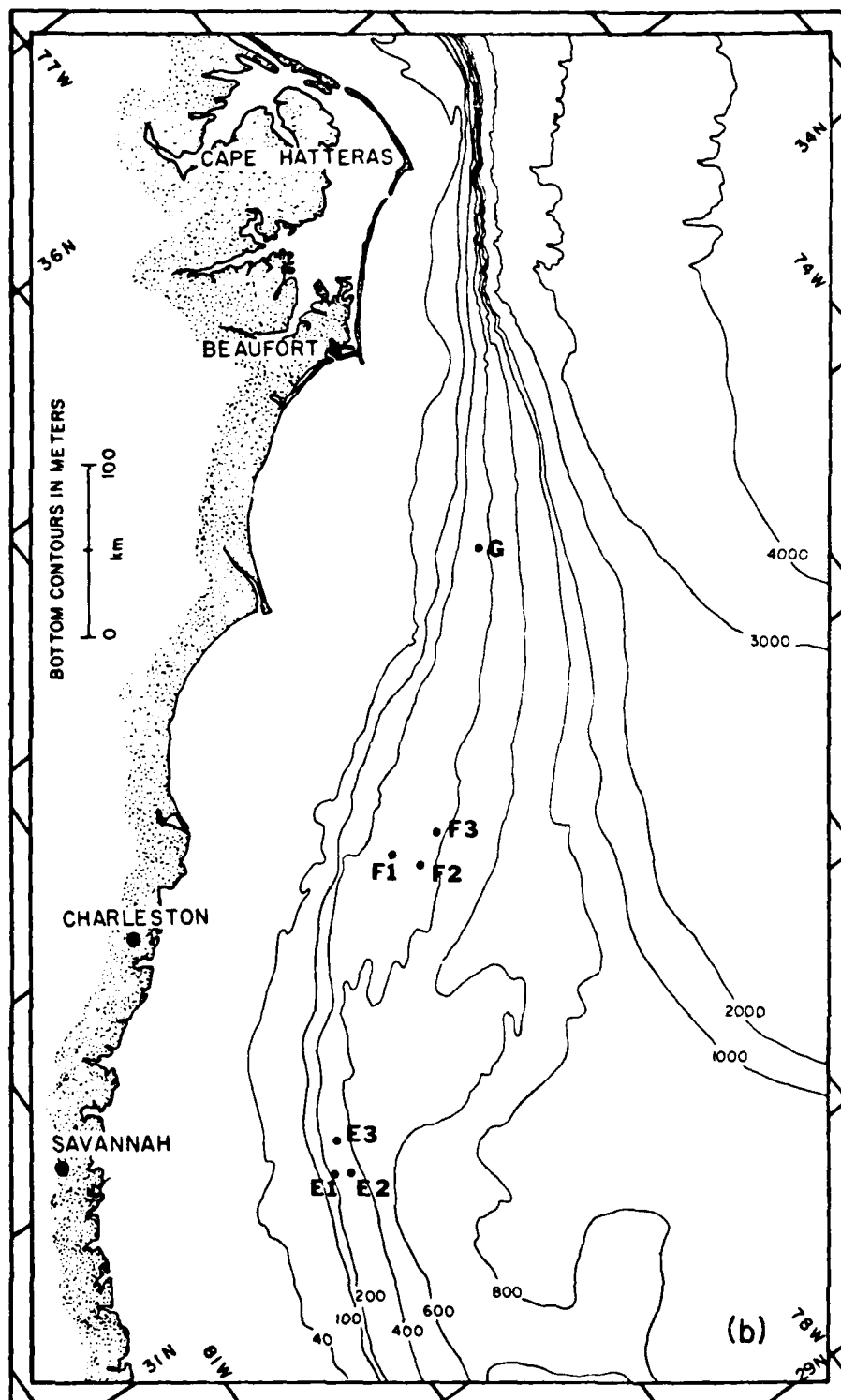


Figure 1. (continued)

1.2 Experimental Design

One of the objectives of this study is to estimate the transfers of energy between the mean Gulf Stream and its time-dependent meanders. Such exchanges are governed by the so-called 'fluctuation energy equation' (Szabo and Weatherly, 1979; Schmitz and Niiler, 1969), and the experiment was designed to provide estimates of the source and sink terms in this equation. Secondary objectives concerned the statistical description of the meanders and the mechanisms by which they are generated. To address these objectives, the instruments were deployed in three arrays, the locations of which are plotted in Fig. 1 and labelled E, F, and G. The latitude and longitude of each mooring are listed in Table I.

Arrays E and F each consisted of three moorings, which were deployed such that each mooring was a vertex of a right triangle. One leg of the right angle was aligned with, and the other across, the local topography (see Fig 2). This orientation was chosen because the mean Gulf Stream in this region is observed to run roughly parallel to the isobaths of the upper continental slope. Each mooring carried two meters mounted at nominal depths of 210 m and 270 m. Therefore, the triangular array design provided several estimates of the spatial gradients in the fluctuation energy equation. Array E was located upstream of the Charleston bump and measured the local energy conversions. Array F was located downstream of the bump and made similar measurements. When combined, the results indicate not only the local variability in the meander field, but also the effect of the bump, and the coherence between individual meander events on either side of the bump.

Mooring G supported two current meters and was located just off of Onslow Bay. The function of this array was to provide a base line data set in a region which has been studied intensively in the past (Brooks and Bane, 1981 and 1983; Bane *et al*, 1981; Hood and Bane, 1983) and to measure coherences between the meander events in this area and those further upstream.

Table I. Mooring and Buoy Data

	Lat	Long	Deployed*	Recovered*	Inst#
Mooring E1	31°14.7	79°40.7	9-19-81 1745	4-25-82 1620	T 5705 B 3424
Mooring E2	31°13.8	79°38.5	9-19-81 1855	4-25-82 1910	T 5707 B 5708
Mooring E3	31°24.0	79°33.7	9-19-81 1250	4-25-82 2205	T 5706 B 3427
Mooring F1	32°25.5	78°15.3	9-18-81 1920	4-22-82 1900	T 3337 B 3423
Mooring F2	32°16.9	78°10.4	9-18-81 1800	4-22-82 2100	T 3425 B 3344
Mooring F3	32°22.3	77°55.7	9-18-81 1600	4-22-82 1745	T 3426 B 3345
Mooring G	33°23.7	76°41.3	9-17-81 0130	4-22-82 0200	T 3332 B 3343

*All times referenced to universal (Zulu) time.

Table 1 (continued) Mooring and Bouy Data

Buoy	Lat	Long	Dates of Operation
41001	34.9°N	72.9°W	1/81 - 6/82
41002	32.3°N	75.3°W	9/81 - 11/81; 1/82 - 8/82
41003	30.3°N	80.4°W	8/81 - 1/82
41004	32.6°N	78.7°W	9/81 - 7/82
41005	31.7°N	79.7°W	9/81 - 1/82

Degrees from True North of Each Array

<u>Array</u>	<u>Offset</u>
E	20°
F	65°
G	37°

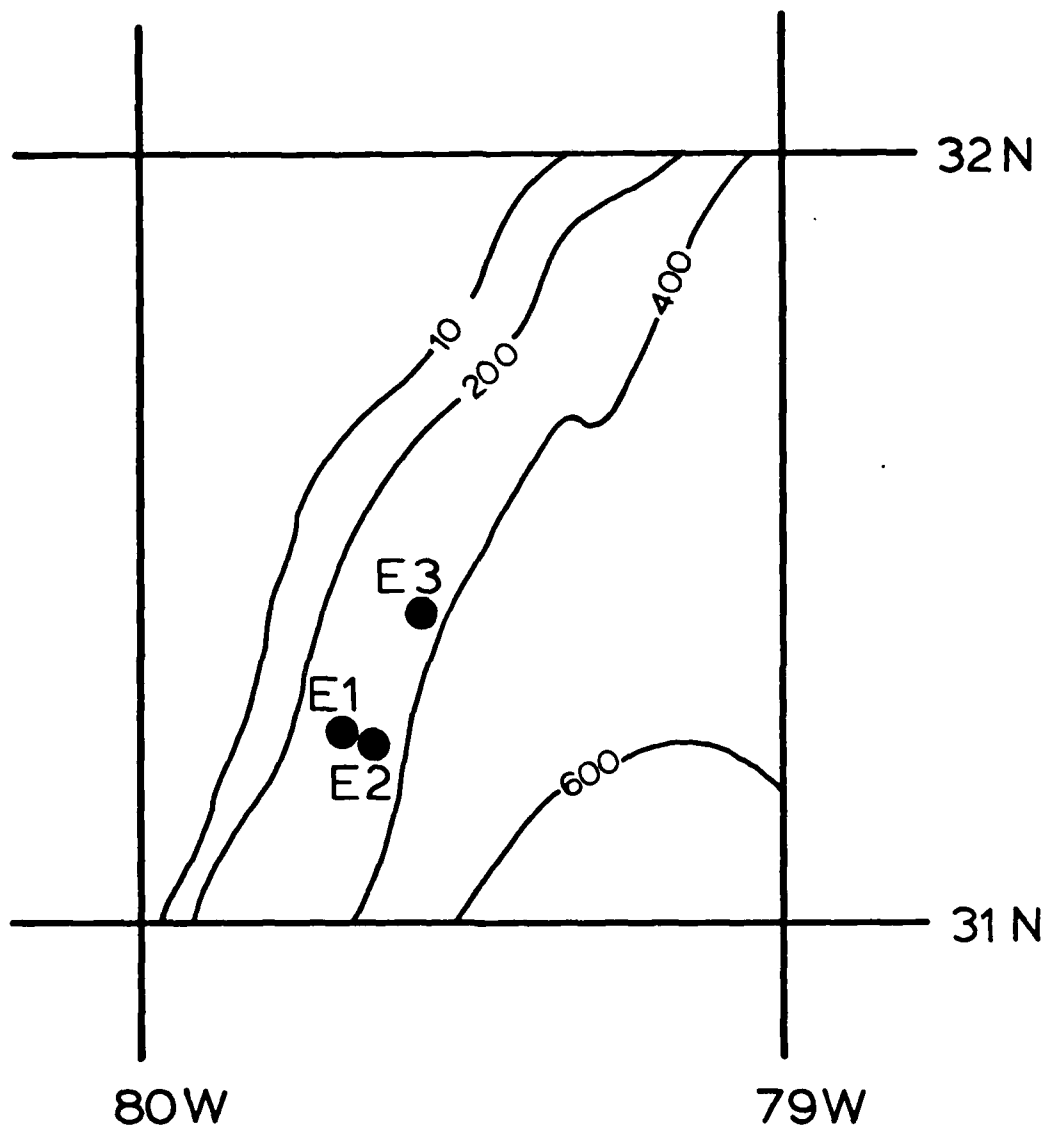


Fig. 2. E, F and G. Both E and F consisted of three moorings placed so as to form a right angle. Mooring #1 was placed on the 300 meter isobath and moorings #2 and 3 on the 400 meter isobath such that 3 was downstream of 2. This configuration allows estimates to be made of the terms in the fluctuation energy equation. Mooring G was located on the 400 m isobath.

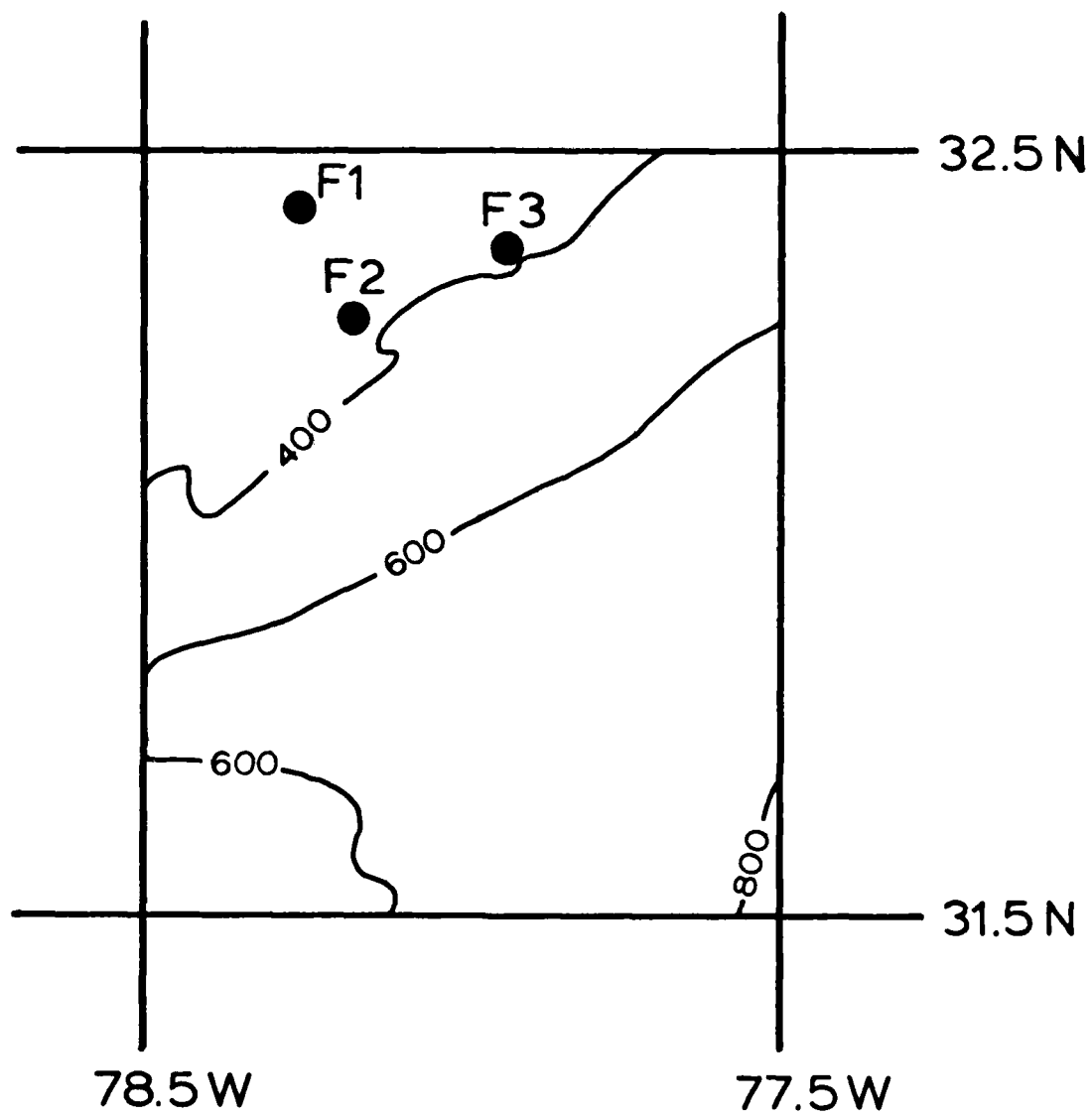


Figure 2. (continued)

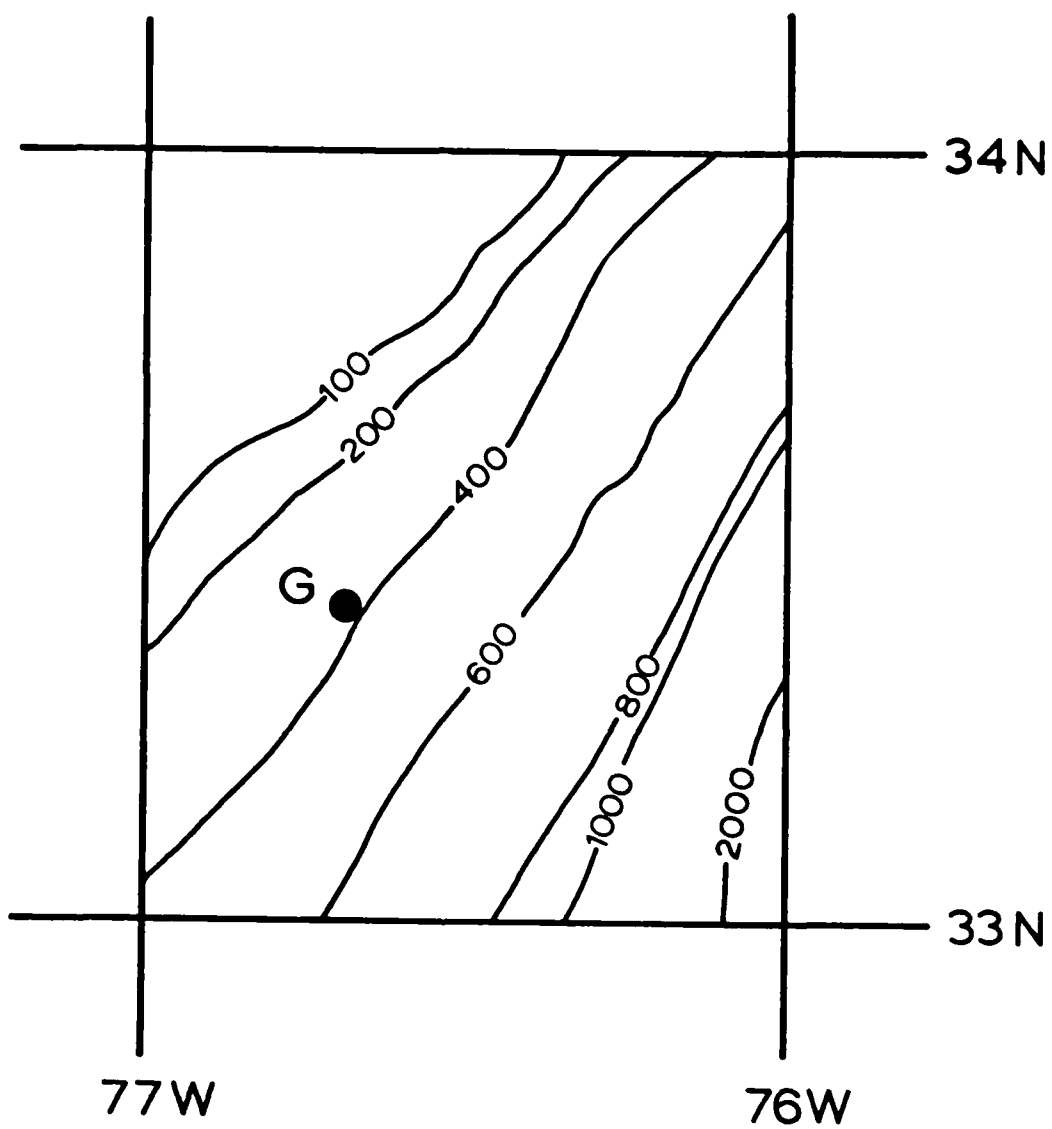


Figure 2. (continued)

1.3 Nomenclature

The three moorings in each of the arrays E and F were numbered 1 through 3 with mooring #2 at the vertex of the right angle. The leg consisting of moorings 1 and 2 extended up the continental slope, while the leg consisting of moorings 2 and 3 extended along an isobath such that 3 was downstream of 2. The moorings in arrays E and F were generally referred to using the letter of the array and their reference number; eg. 'F2' or 'E1'. The current meters were specified by appending the initial 'T' (for Top) if the instrument was used at 210 m, or 'B' (for Bottom) if it was used at 270 m, to the mooring name; eg. 'F2T' or 'GB'. We shall employ this nomenclature.

1.4 Mooring Design

The Gulf Stream, as it flows along the continental margin of the southeastern United States, is characterized by speeds up to 180 cm/sec and lateral excursions of the main jet with amplitudes of 10's of kilometers. The lateral shear in the mean Stream is strong; thus, the current at any one point in the experiment region may drop from 100 to 0 cm/sec in a matter of a few days, only to regain its strength just as rapidly. Such a hostile environment places strong constraints on mooring design, as the strong flows tend to push the moorings over and the rapid changes can cause distortion in the measurements. Prior experiments near this area (Brooks, et al, 1981) successfully employed subsurface taut-line moorings, so that design was retained. A typical mooring from this experiment is shown in Fig. 3.

The primary floatation for each mooring was provided by a 37" diameter Ocean Research Equipment (ORE) steel sphere, capable of a buoyancy greater than 200 kg. The moorings each supported two Aanderaa RCM-4 current meters at nominal depths of 210 m and 270 m. Beneath them, twelve 17" Benthos Glass spheres enclosed in "hard hats" were included to provide secondary floatation. Two railroad wheels anchored each mooring. The attachments of the moorings to the anchors were made through AMF-Sealink bottom mounted releases. Moorings F-2 and F-3 also supported bottom mounted Aanderaa WLR-5 pressure gauges. Other information about the moorings is contained in Table I.

The deployment cruise took place from 14-28 September 1981, and was conducted aboard the NOAA ship R/V Researcher. The recovery cruise was made on the UNC/Duke Oceanographic Consortium Ship R/V Cape Hatteras from 21-26 April, 1982.

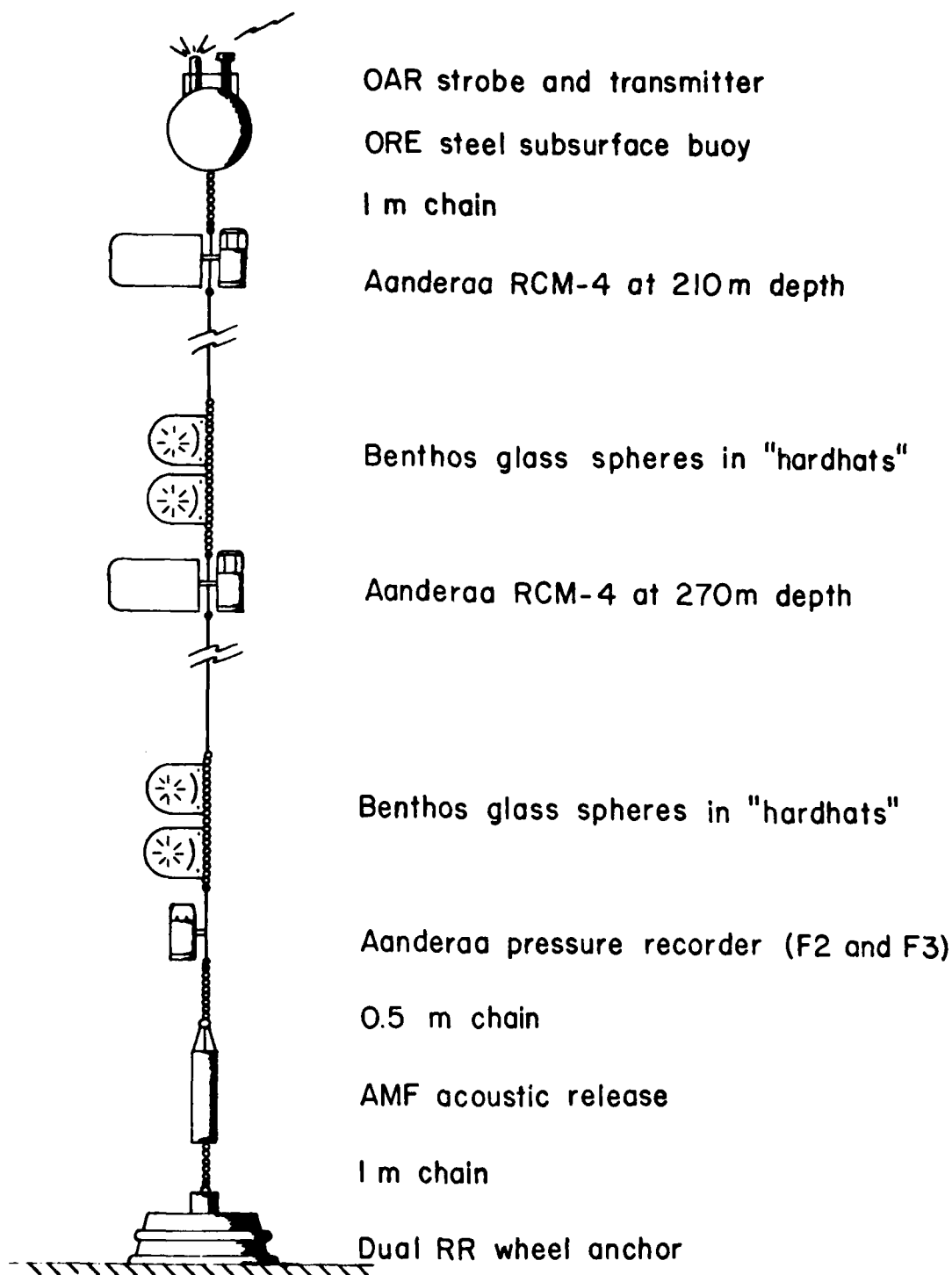


Fig. 3. Mooring design. Subsurface floatation, proven successful in earlier experiments (Brooks, *et al.*, 1981), was used. The current meters were placed at nominal depths of 210 m and 270 m and the mooring line was attached to the anchor through an AMF-Sealink bottom mounted release. Bottom pressure gauges were attached at the base of the mooring on F2 and F3, and additional floatation was provided by glass spheres in 'hard hats'.

Section 2

Data Processing and Description

2.1 Ancillary Data Sources

The Gulf Stream Deflection and Meander Energetics experiment was long term and multi-faceted. In addition to the current meter arrays, a hydrographic survey was conducted on the mooring deployment cruise and four aircraft surveys utilizing AXBT's and a precision radiation thermometer were undertaken. The AXBT surveys provided four independent synoptic snapshots of the upper layer temperature structure. In the present document, we catalog all of the current meter and pressure recorder data. The temperature and hydrographic data will be the subject of a separate technical report.

One of the basic scientific objectives of this study concerned the generating mechanisms of the meanders. To this end, we collected relevant meteorological observations from the National Climatic Center in Asheville, North Carolina. In particular, we studied the records of the meteorological stations at Savannah, Georgia and Miami, Florida and from NBDO meteorological buoys 41001 through 41005. The locations of these buoys are shown in Fig. 1 and their positions are listed in Table 1.

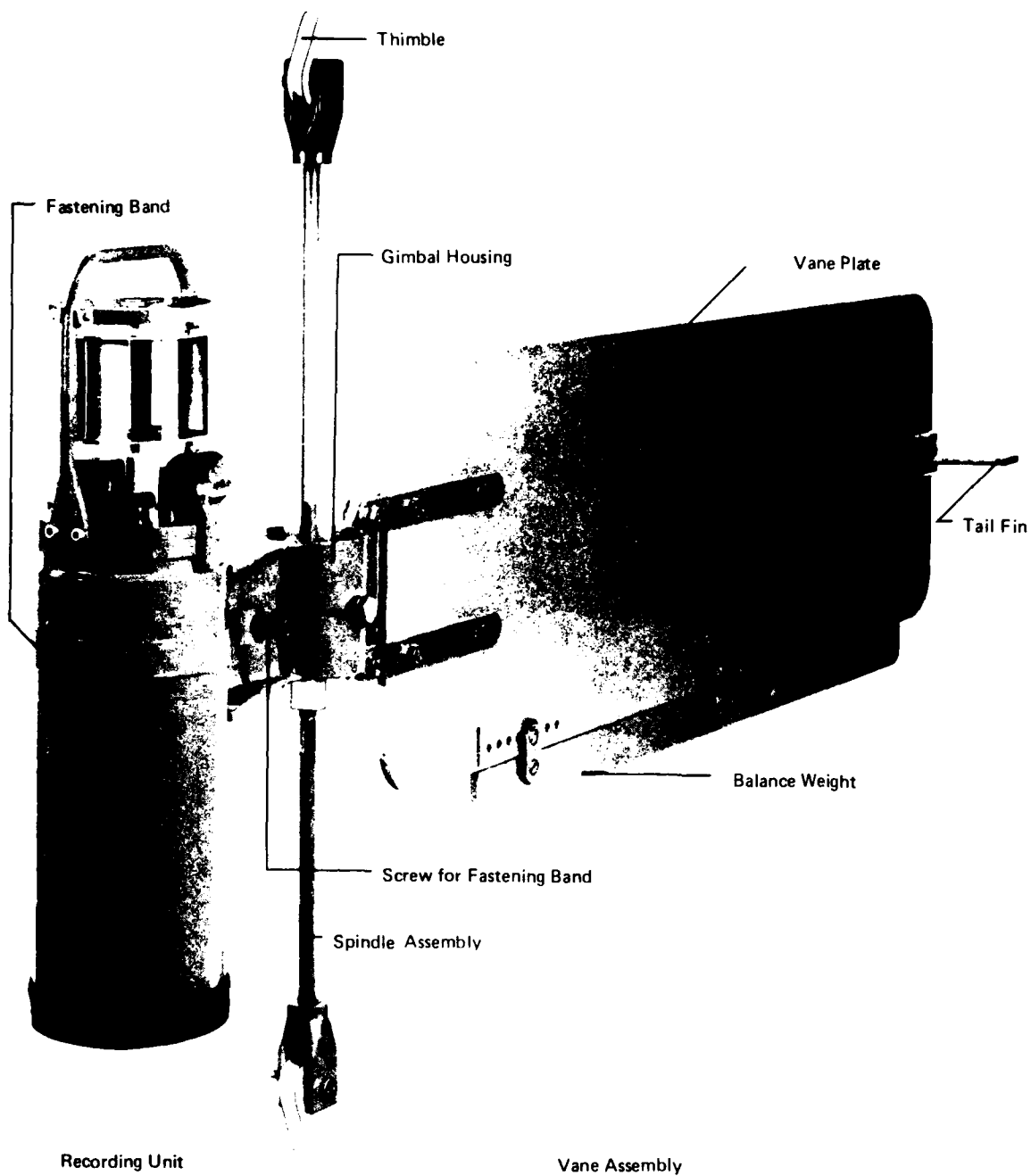


Fig. 4 Aanderaa RCM-4 Current Meter. Speed is measured by monitoring the revolutions of the rotor, which is located near the top of the instrument. Directly under the rotor (above the fastening band) are the temperature and conductivity sensors. The compass is located inside the recording unit. The meter is counterbalanced by a vane which keeps the meter oriented into the current.

2.2 Brief Description of Aanderaa RCM-4 and WLR-5 Operations

Aanderaa current meters (see Fig 4) record horizontal flow speed and direction, pressure, temperature, and conductivity. The last two are combined to infer salinity, and this is combined with temperature to calculate sea water density.

Speed is measured by counting the number of rotations of a rotor in a predetermined time interval. The interval may be set to a variety of values; in this experiment, 30 minutes was used. At the end of the interval, the number of rotations, or 'counts', is recorded on a magnetic reel-to-reel tape. A reading of an internal compass, which is attached to an external vane, is recorded then as well. Temperature and conductivity measurements are made at the end of the sampling interval by sensors located near the rotor. Pressure recordings were written on tape in a similar manner by the WLR-5 gauges, and by each of the "Top" RCM-4's. No pressure recordings were made by the 'Bottom' (270 m) current meters.

2.3 Data Transcription

The counts are written on the tape using a series of variably spaced pulses. If the separation between successive pulses exceeds (is less than) a threshold value, the associated bit is interpreted as a '1' ('0'). One data word consisting of ten bits is written for each observation of each variable every cycle. Neighboring cycles are separated by one ten bit reference word. The conversion to binary data occurs by running the tapes through a reader which interfaces with a mainframe computer. The output of this process consists of values between 0 and 1023 and is stored on a standard 9-track magnetic tape. The data transcription and creation of the 9-T tape was done at the Rosenstiel School of Marine and Atmospheric Science of the University of Miami (Fla.). At the conclusion of the transcription, the 9-T tape contained binary data representing observation number (or time), conductivity, temperature, pressure, speed and direction.

2.4 Data Editing

Inspection of the binary data showed that the data stream was occasionally contaminated. Fluctuations in instrument performance caused randomly spaced gaps in individual variables in the records as well as deletions of entire records. Also, occasional spurious numbers, probably the result of some random instrument malfunction, were recorded. The data was edited at this stage to remove these errors.

The records were ordered to the extent possible using the time data. Missing data from records and missing records were then identified and filled in with null data in order to produce a properly aligned data set.

Prior to interpolating for the missing points, quality control tests were run on the remainder of the data. First, all negative binary data values were identified as null data. Next, large changes between consecutive values of the same data type were identified. These data pairs were assumed to fall into one of three categories: (1) real, sudden changes, (2) spurious instrument malfunctions, or (3), in the case of speed, off scale observations. The third category results in, for example, a data value 1030 being recorded as a 6. The decisions as to which of these categories any one anomolous pair of values belonged were made manually and on a case by case basis, and were to a large extent subjective. We did, however, assume that the first good observation of any variable was not an off-scale observation, and that the most any variable could be off-scale was 1023 units.

Next, the null data were replaced with linearly interpolated data. The beginning and ending points of a bad interval of data were defined to occur where at least two good observations had been made. These good observations were averaged to provide hypothetical beginning and ending values for the missing interval, and the missing points in between were estimated by assuming the transition from beginning to end was linear. Individual good points inside the intervals were left unaltered. If two

good observations were unavailable to delimit one end of a missing interval, say at the beginning or ending of a data set, then a single good observation, if it could be found, was used. Otherwise the bad interval was filled with the averaged value from the available doublet of good data.

This procedure completed the binary data editing. At later stages of the processing, after the data had been converted to engineering units, no further editing was done.

2.5 Calibration and Conversion to Engineering Units

The binary data were converted to engineering units by substituting the data values, N, into polynomial equations whose coefficients had either been determined by empirical fits to laboratory data or were supplied by the instrument manufacturer. The coefficients of the temperature, direction, and pressure polynomials were recomputed prior to their use in the present calculations. The Aanderaa-recommended coefficients were used for the remaining variables. In this section, we document the laboratory techniques involved in the calibration of the sensors and catalog the coefficients for all the instruments.

SPEED

The conversion from N to speed was accomplished with the linear formula

$$\text{Speed (cm/sec)} = 1.5 + 0.0933 N.$$

The values 1.5 and 0.0933 were supplied by Aanderaa.

CONDUCTIVITY

Aanderaa calibration values for conductivity were used for all meters. The coefficients in the linear formula

$$\text{Conductivity (mmho/cm)} = A + BN$$

are listed in Table 2.

DIRECTION

Each RCM-4 compass was calibrated as follows: the instrument was mounted on a non-magnetic bracket located away from known magnetic interference. With the internal digitizing and recording mechanisms set to continuously record, the instrument was turned through 360°, indexing by ten degrees, allowing the compass to stabilize at each position and to record at least six cycles of the direction reading. A cubic equation of the form

$$\text{Direction (magnetic)} = A + BN + CN^2 + DN^3$$

was fitted to the 36 calibration values. The coefficients A through D for each meter are listed in Table 2. The direction values from the cubic equation differed by less than one degree from the measured calibration values. Graphs of the calibration curves and the Aanderaa curves are shown in Fig. 5.

TEMPERATURE

All temperature sensors were calibrated as follows: with all meters sealed and recording at 15 minute intervals, they were immersed in an icewater bath. The ice was allowed to slowly melt, and the water to warm to room temperature ($\sim 25^{\circ}\text{C}$). Stirring was provided throughout the warming period by two small pumps. Four independent Hewlett-Packard quartz-crystal thermometers were placed around the bath for temperature measurement. A continuous record (strip chart) of the temperature measured by one of the quartz sensors was made and used as the calibration standard. Temperature readings around the bath using the other three sensors showed that once the ice had melted, the temperature difference was always less than 0.05°C , insuring that all meters were recording essentially the same temperature. Calibration temperatures at known times of RCM-4 recordings were compared with the corresponding recorded values of N. A number (ca. 15 to 19) of Temperature-N pairs were used to determine the best fit to the cubic equation:

$$\text{Temperature } (^{\circ}\text{C}) = A + BN + CN^2 + DN^3$$

The coefficients A through D are listed for each meter in Table 2, along with the coefficients supplied by Aanderaa. The difference between the temperature values computed from the cubic equation and those directly measured was in all cases less than the stated accuracy of the temperature sensor (0.15°C).

PRESSURE

The pressure transducers on current meters 3425 (F2T), 3426 (F3T), 3337 (FIT) and 3332 (GT) were calibrated using a manual hydraulic pump. Calibration data were

collected in the range 0 to 500 PSIG at intervals of 50 PSIG, covering the approximate depth range of 0 to 350 m. These points were fitted to the cubic equation

$$\text{Pressure (PSIG)} = A + BN + CN^2 + DN^3,$$

the coefficients of which are listed by meter in Table 2, along with the Aanderaa coefficients. The pressure sensors on the remainder of the "Top" current meters were not calibrated prior to deployment; rather, the coefficients supplied by Aanderaa were used.

SALINITY

Salinity values were calculated from the temperature and conductivity data as follows: the conductivity that seawater with a salinity of 35⁰/oo would have at the measured temperature was calculated using the formula

$$\begin{aligned} \text{Cond (T,35)} &= 29.01067 + 0.8677579 T \\ &+ 0.4074545 \times 10^{-2} T^2 - \\ &0.1437152 \times 10^{-4} T^3, \end{aligned}$$

where T is the measured temperature (°C) and Cond is in mmho/cm. This formula is the best-fit cubic equation calculated from information presented by Weyl (1964). The conductivity ratio at the measured temperature was calculated by

$$R_T = \text{Cond (meas)} / \text{Cond (T, 35)},$$

where Cond (meas) is the measured conductivity in mmho/cm. The difference, Δ_{15} , between the conductivity ratio at 15°C and R_T was calculated with the formula (National Institute of Oceanography of Great Britain and Unesco, 1971)

$$\begin{aligned} \Delta_{15} &= 10^{-5} R_T (R_T - 1) (T - 15) [96.7 - 72.0 R_T \\ &+ 37.3 R_T^2 - (0.63 + 0.21 R_T^2) (T - 15)] \end{aligned}$$

The salinity in parts per thousand was then calculated using the formula (ibid.)

$$\begin{aligned} S(0/00) &= -0.08996 + 28.29720 R_{15} + 12.80832 R_{15}^2 \\ &- 10.67869 R_{15}^3 + 5.98624 R_{15}^4 \\ &- 1.32311 R_{15}^5, \end{aligned}$$

where $R_{15} = R_T + \Delta_{15}$.

SIGMA - t

Sigma-t, or equivalently density, was computed from temperature (T) and salinity (S) according to the equation of state:

$$\sigma_t = (a+bT+cS-dT^2-eTS+fS^2+gT^3+hST^2+iS^2T-jS^3) \times 10^{-8}.$$

The coefficients a-j are listed in Table 2.

BOTTOM PRESSURE

The data from the bottom pressure gauges were converted to Newtons/m² using the coefficients supplied by Aanderaa.

$$P(\text{Nts/m}^2) = 6894.311 * (A+BN+CN^2+DN^3)$$

where A-D are listed in Table 2.

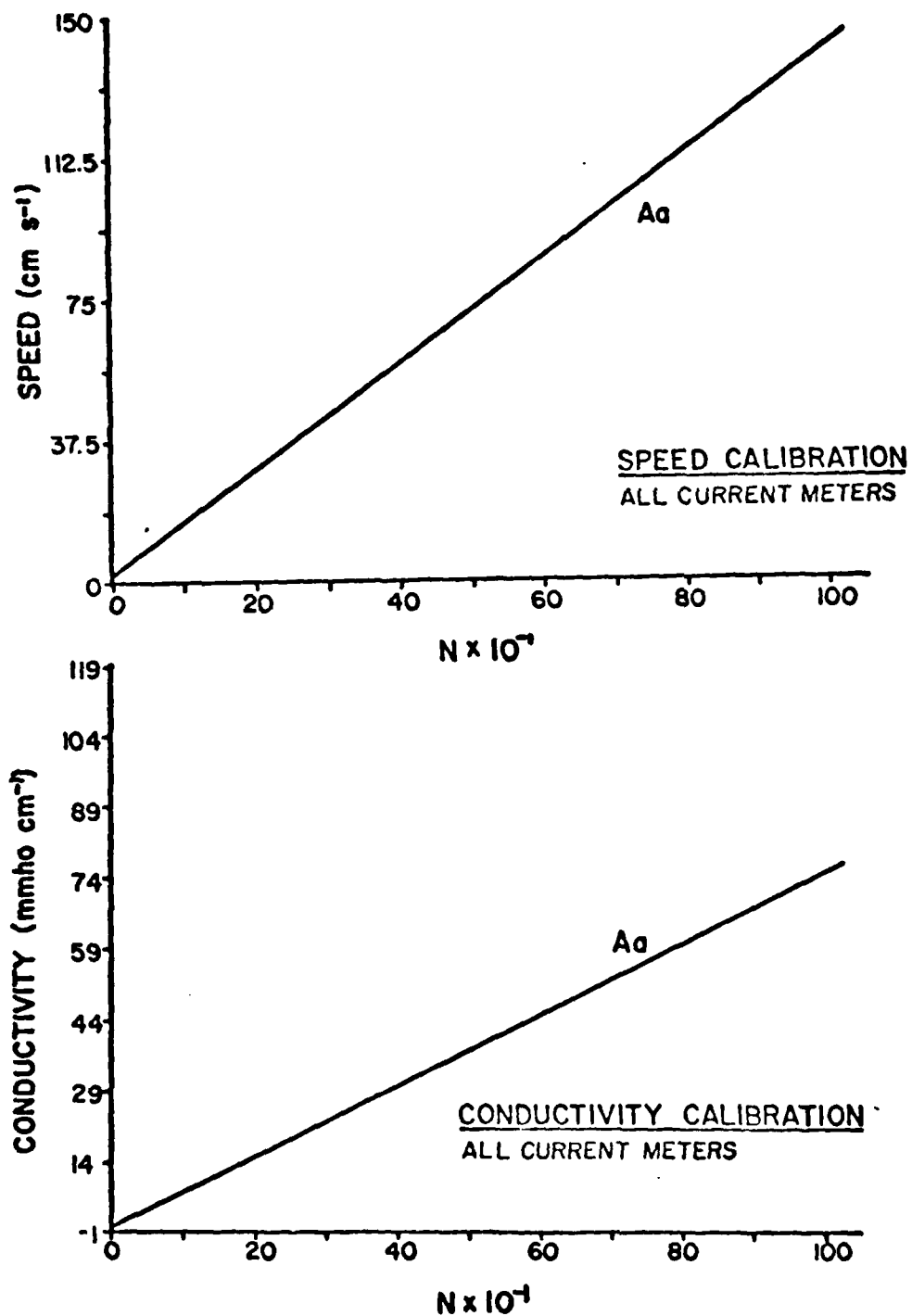


Fig. 5. Calibration Curves. Aanderaa-supplied curves were used to convert binary data to engineering units for speed and conductivity. Calibrations were conducted for all the temperature sensors and compasses employed in the experiment and for four of the pressure sensors. All of these curves are presented and, where appropriate, the calibration curves (Cal) are compared to the Aanderaa curves (Aa).

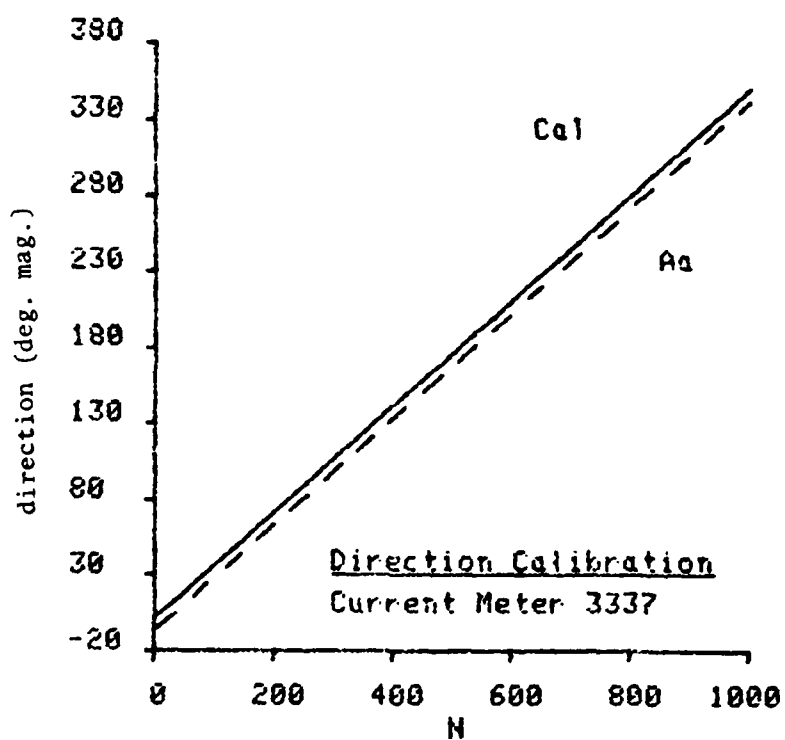
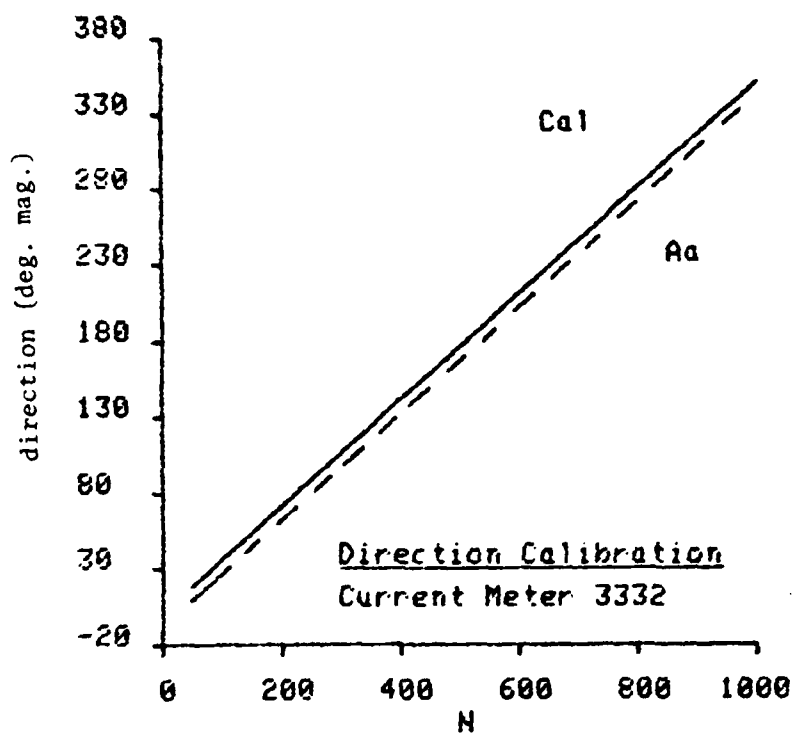


Figure 5. (continued)

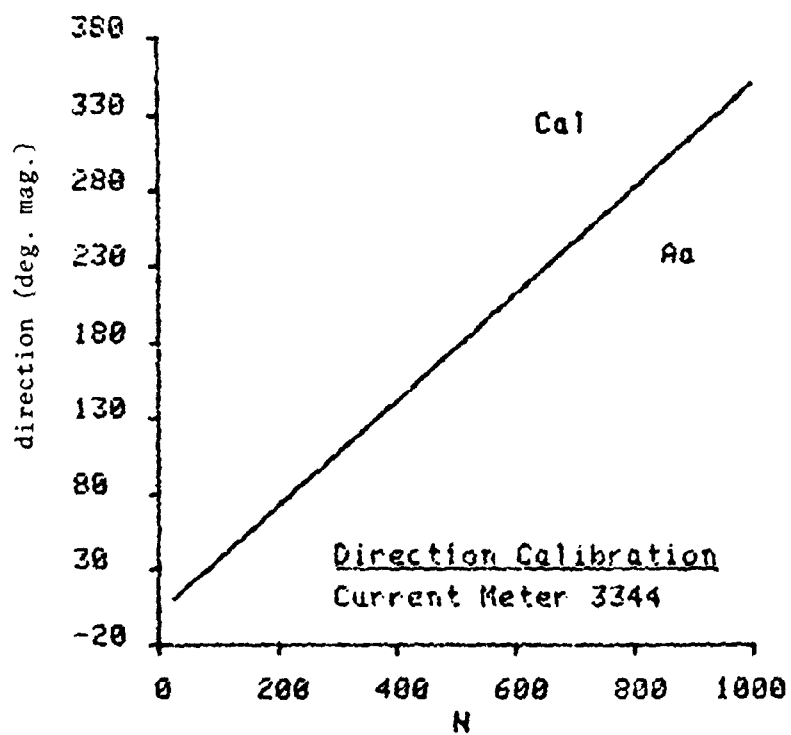
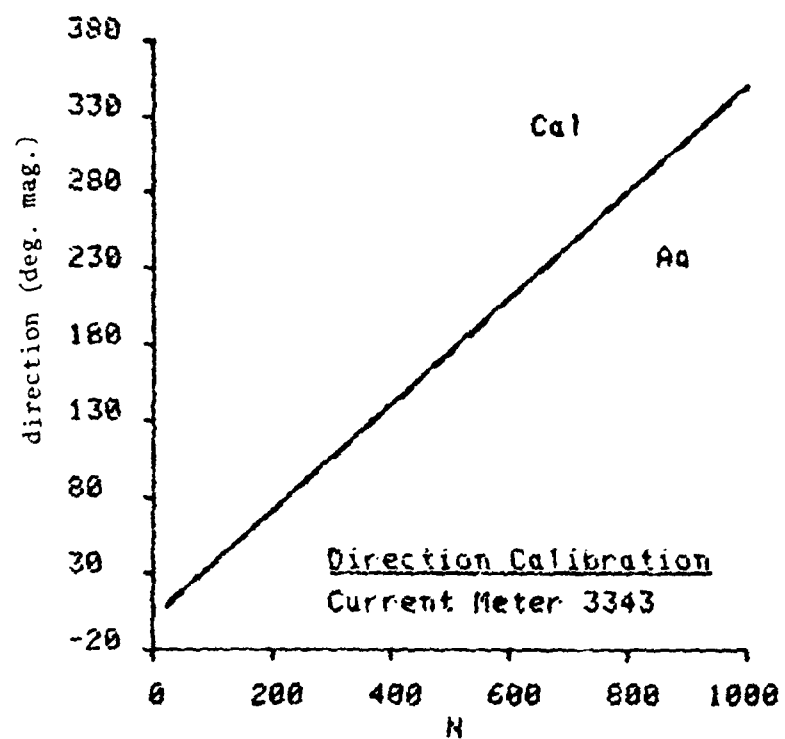


Figure 5. (continued)

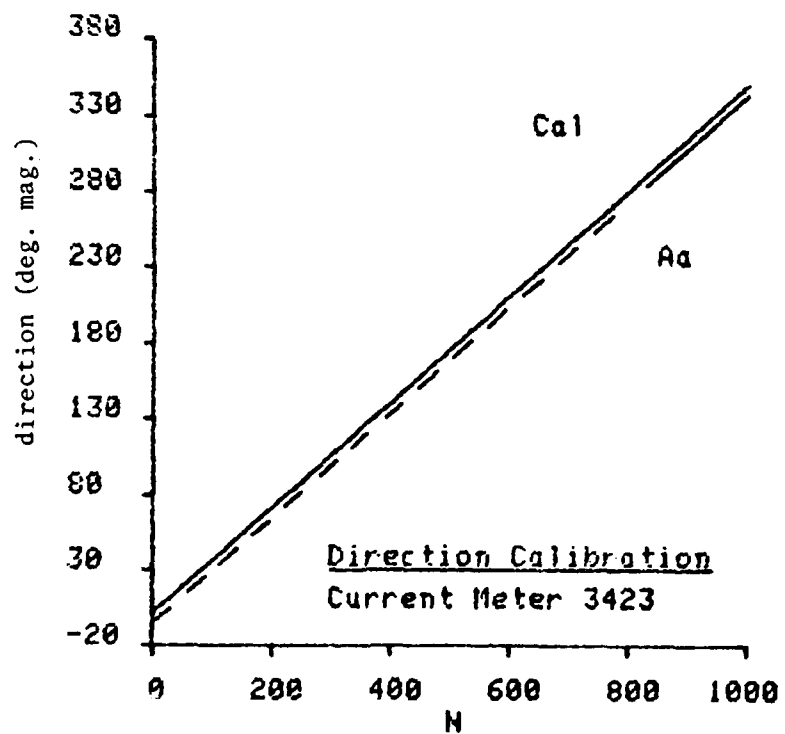
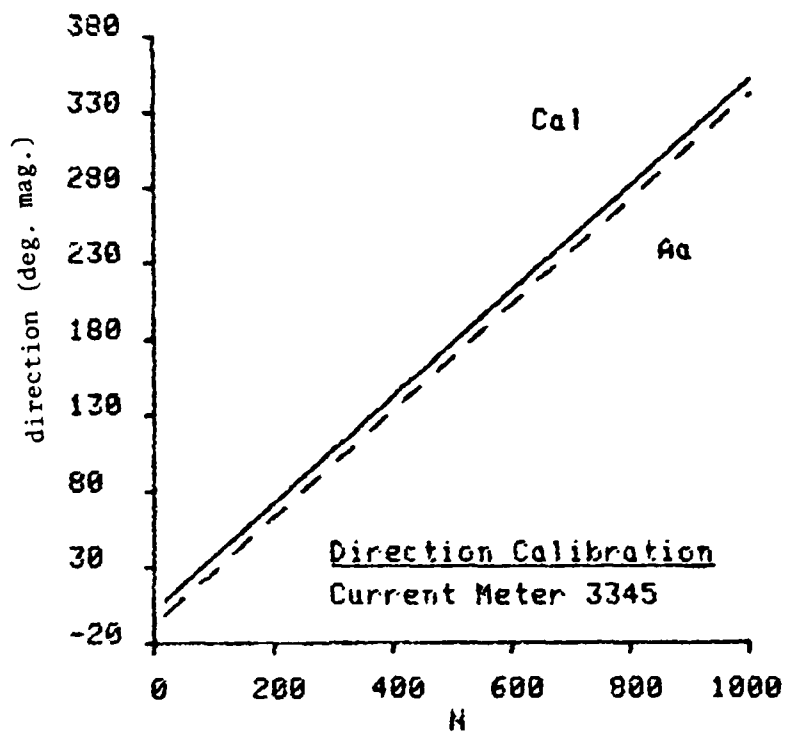


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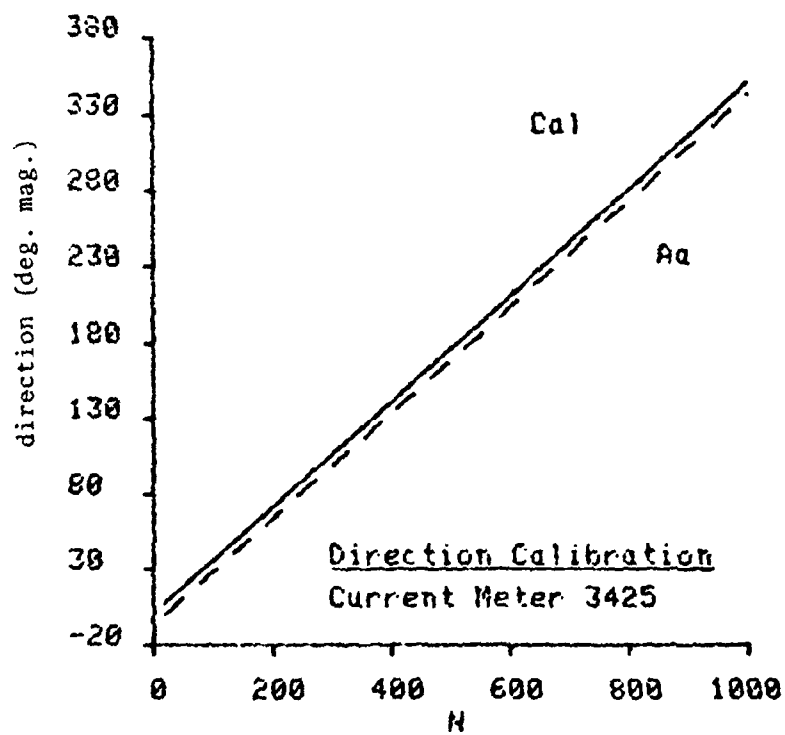
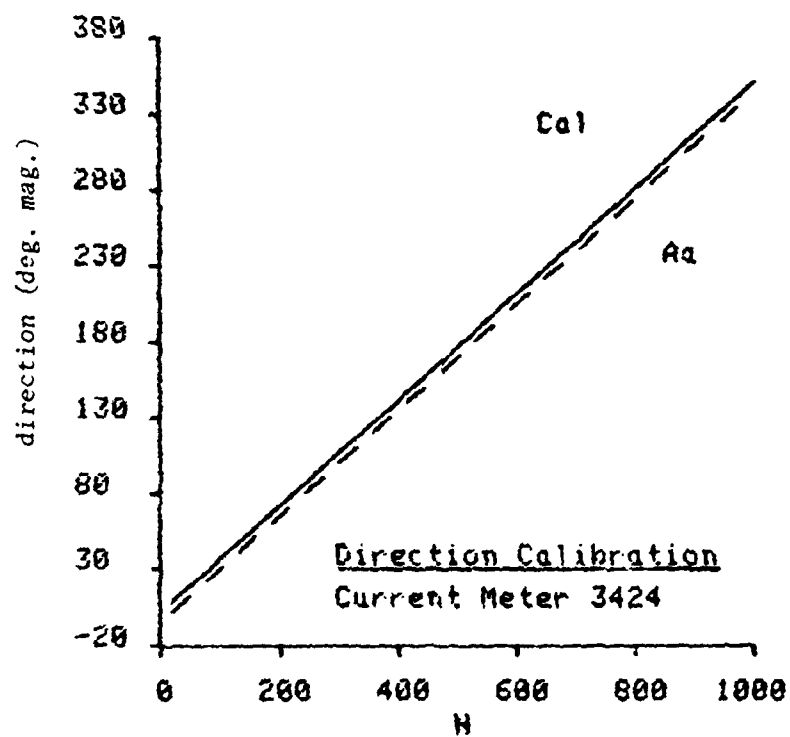


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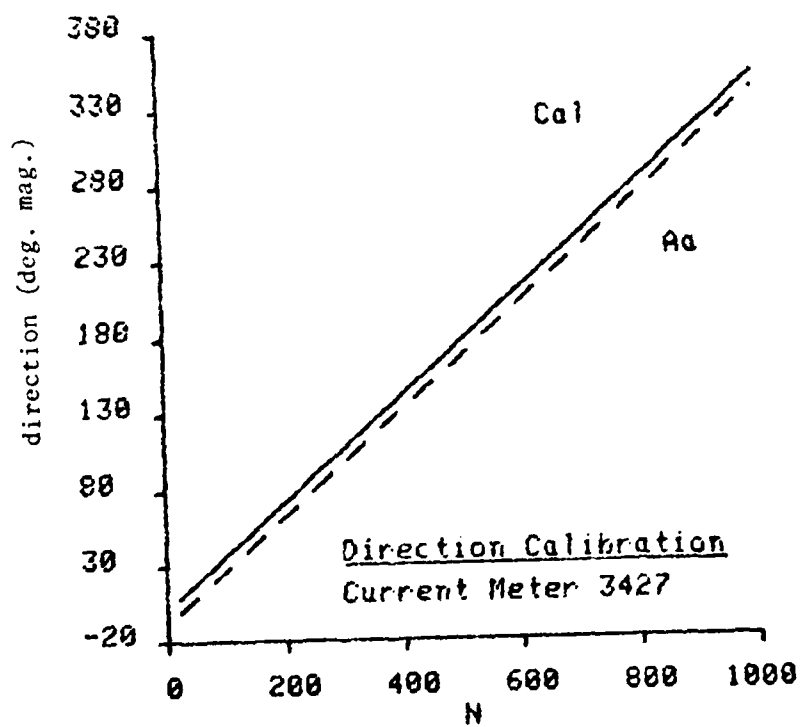
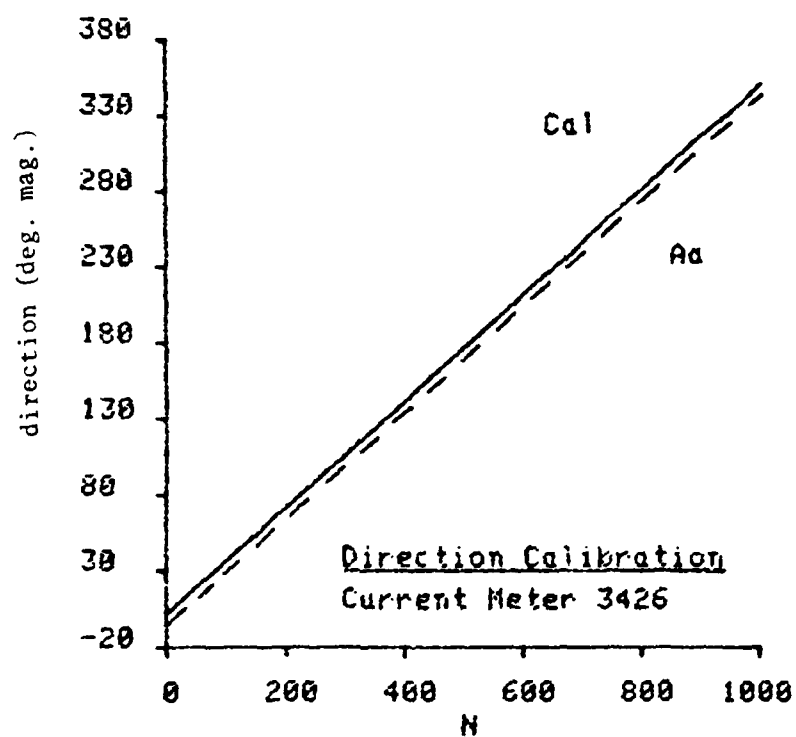


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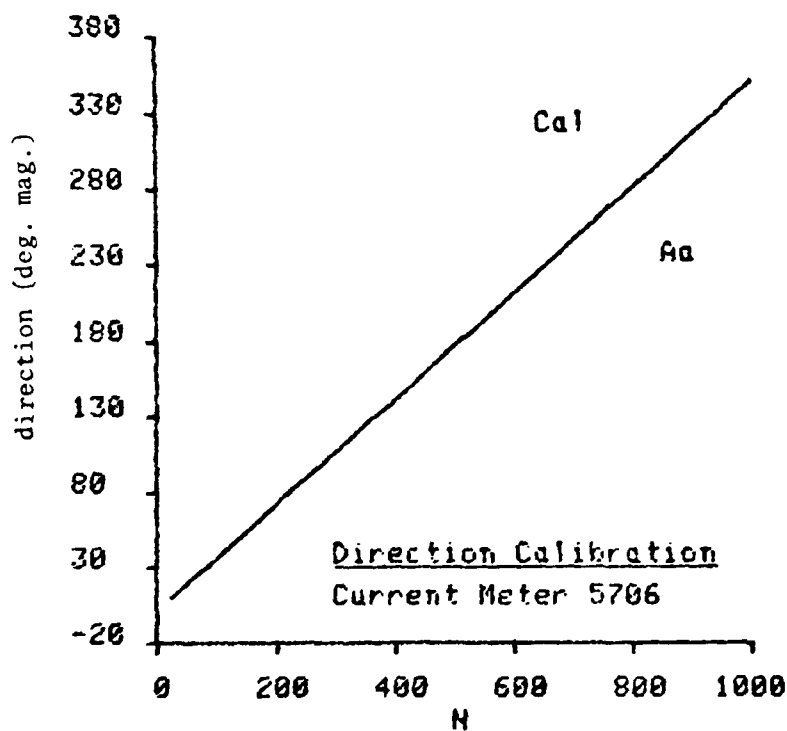
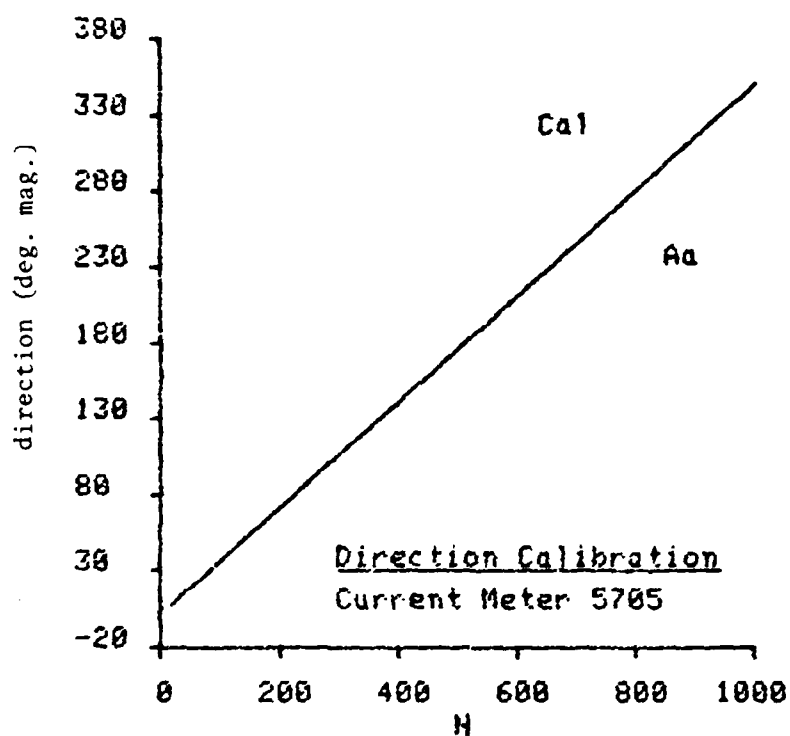


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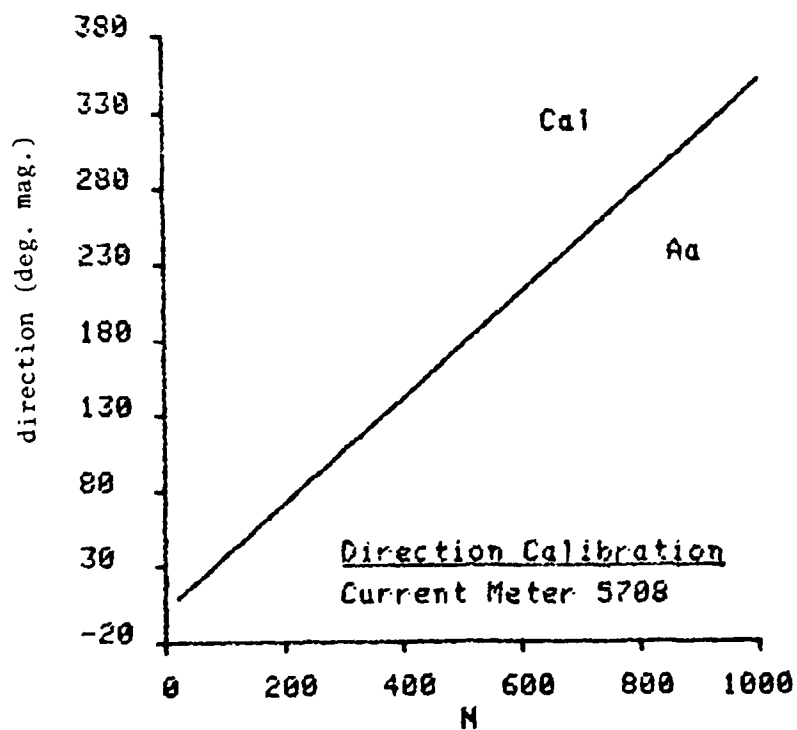
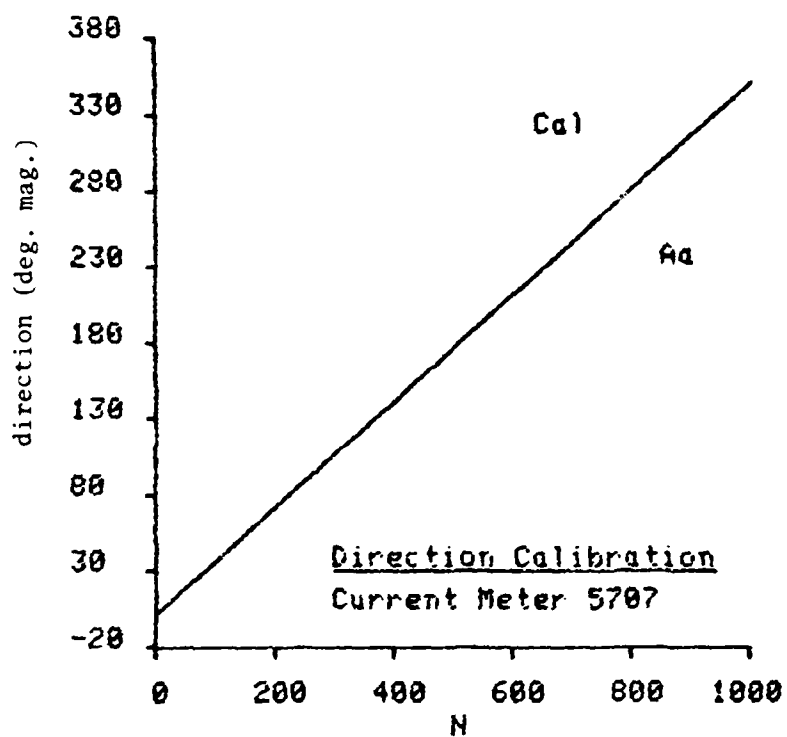


Figure 5. (continued)

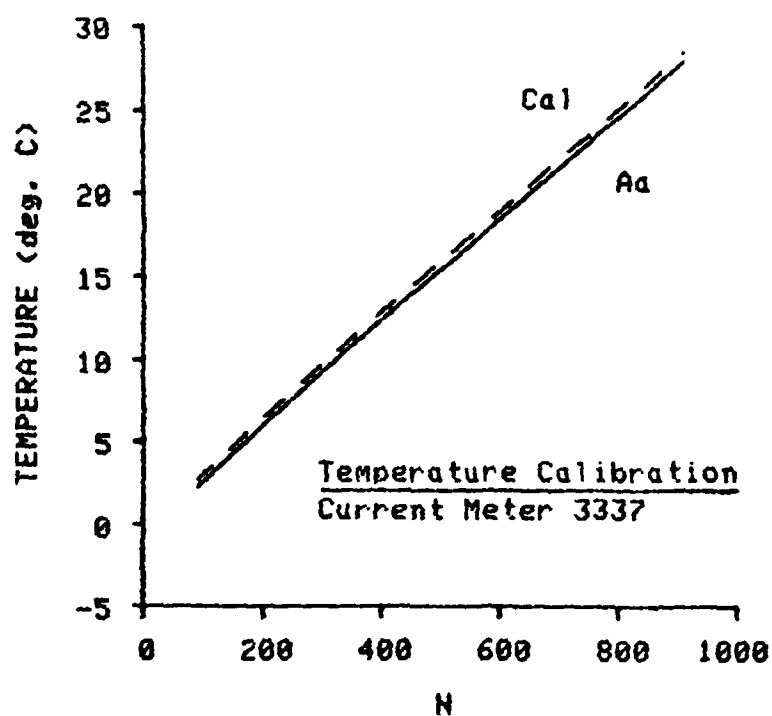
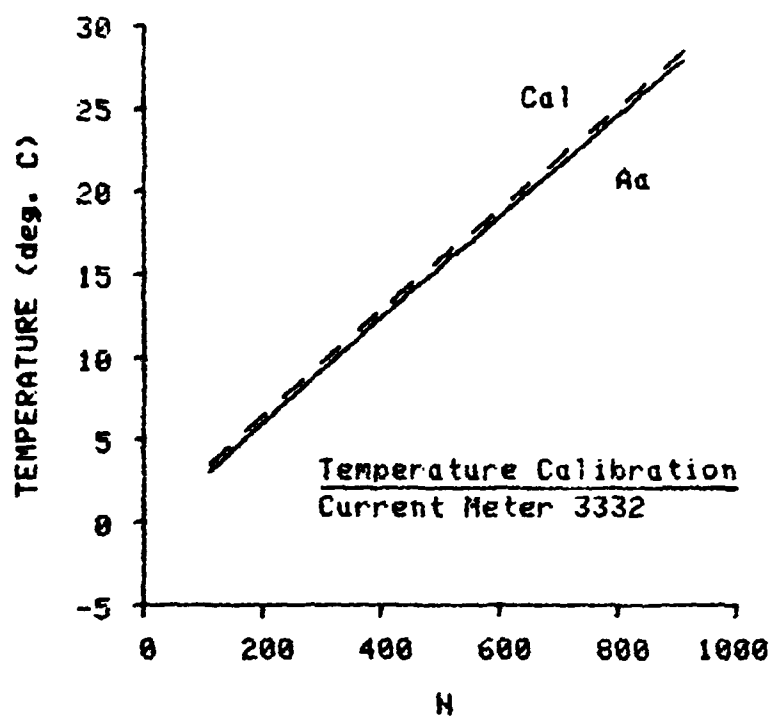


Figure 5. (continued)

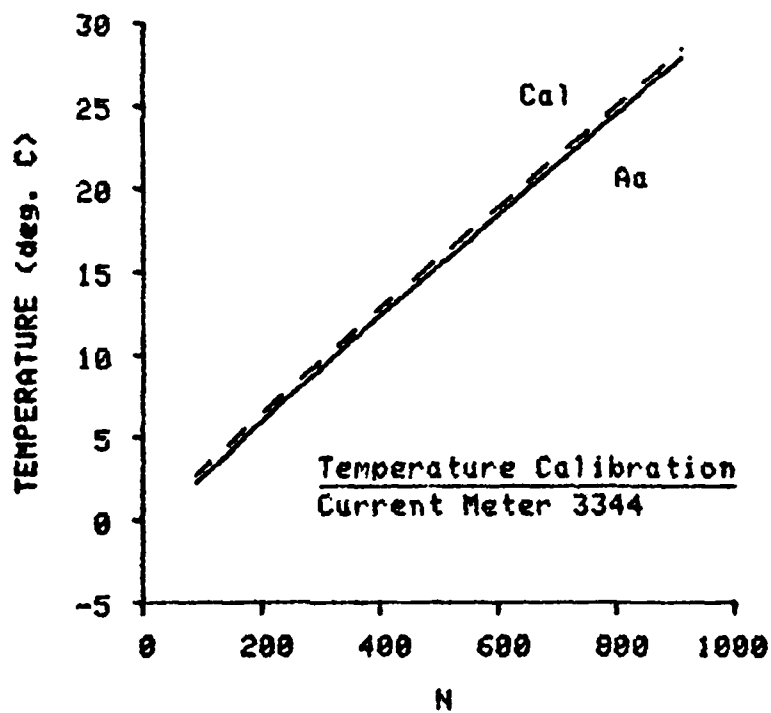
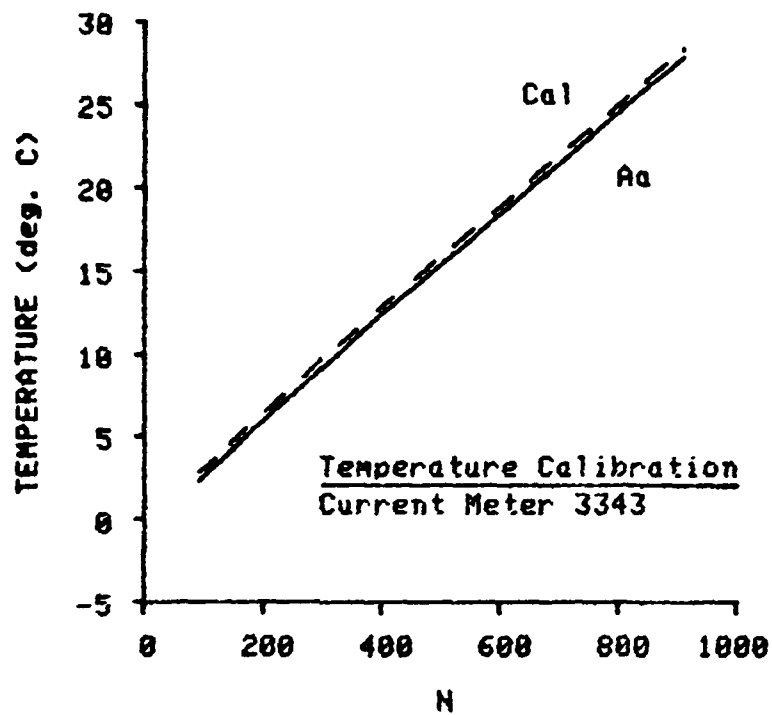


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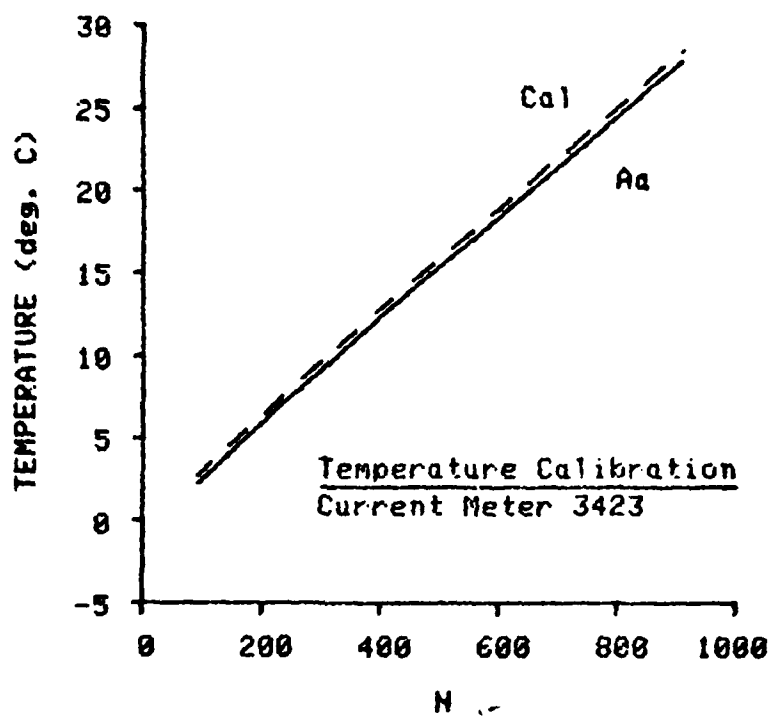
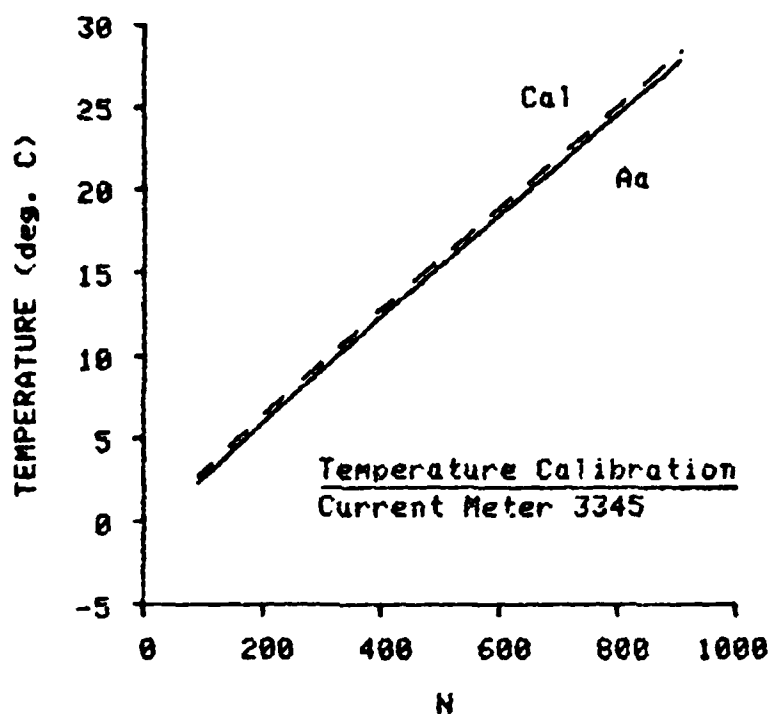


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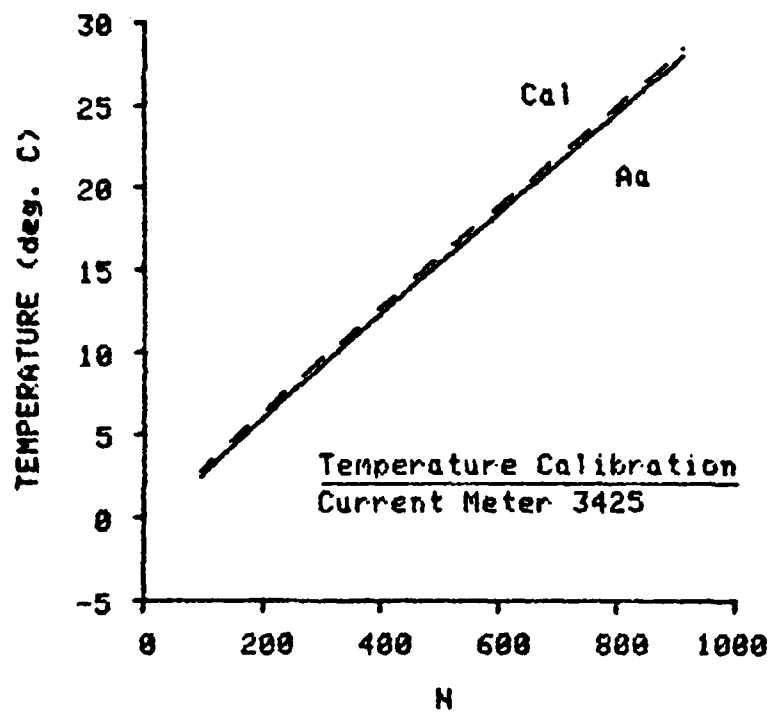
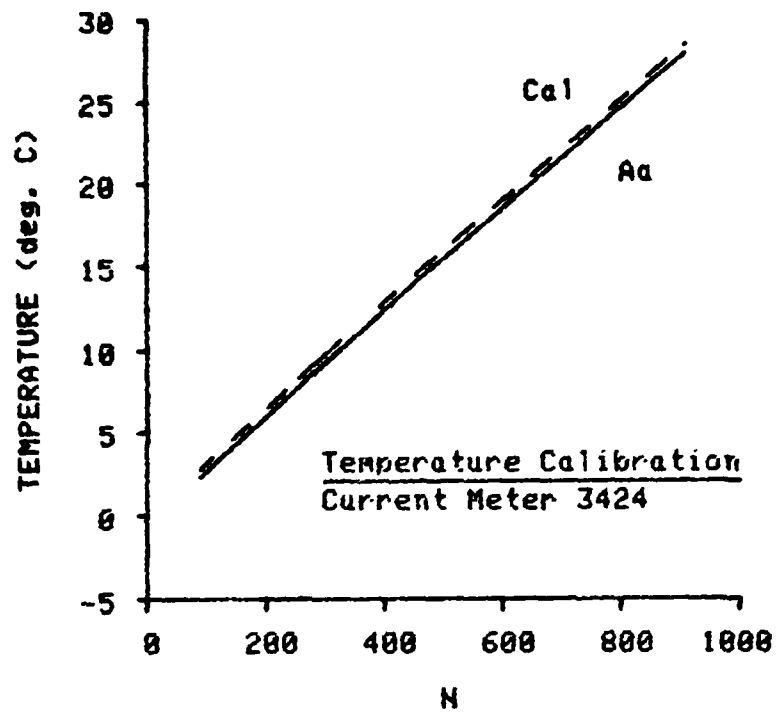


Figure 5. (continued)

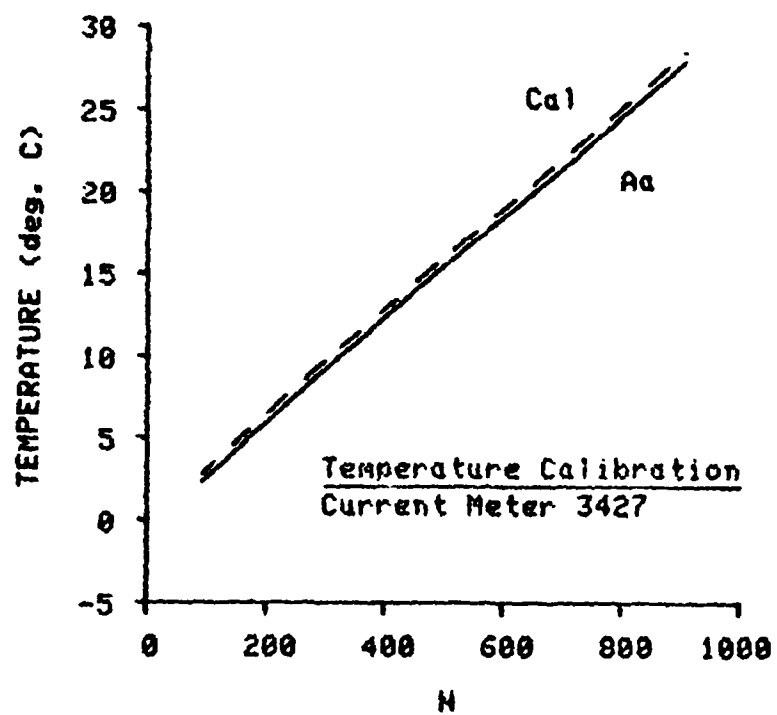
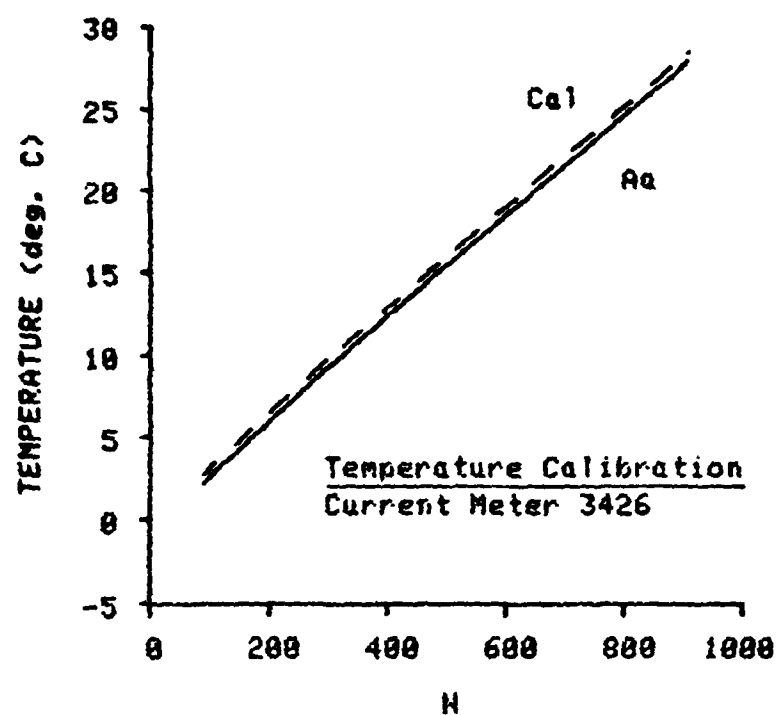


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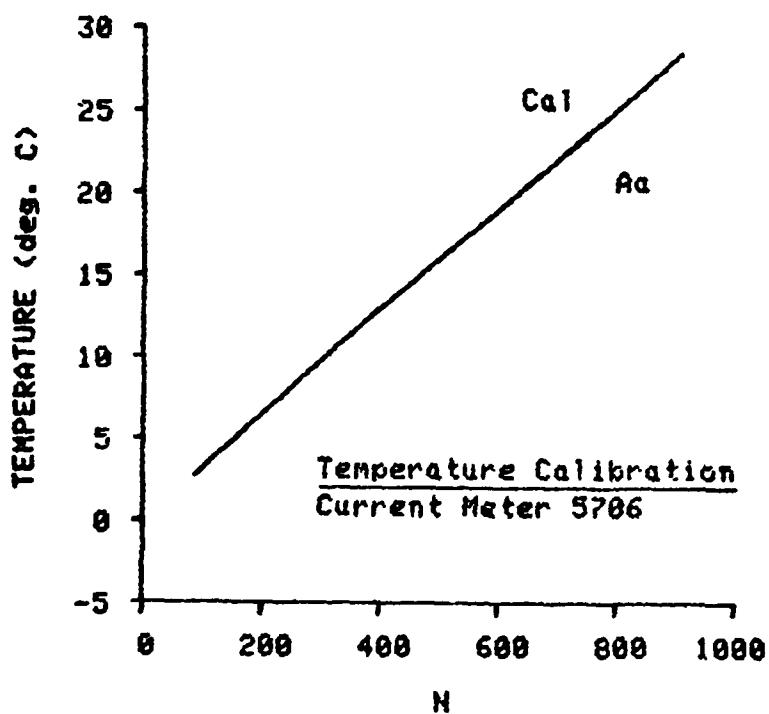
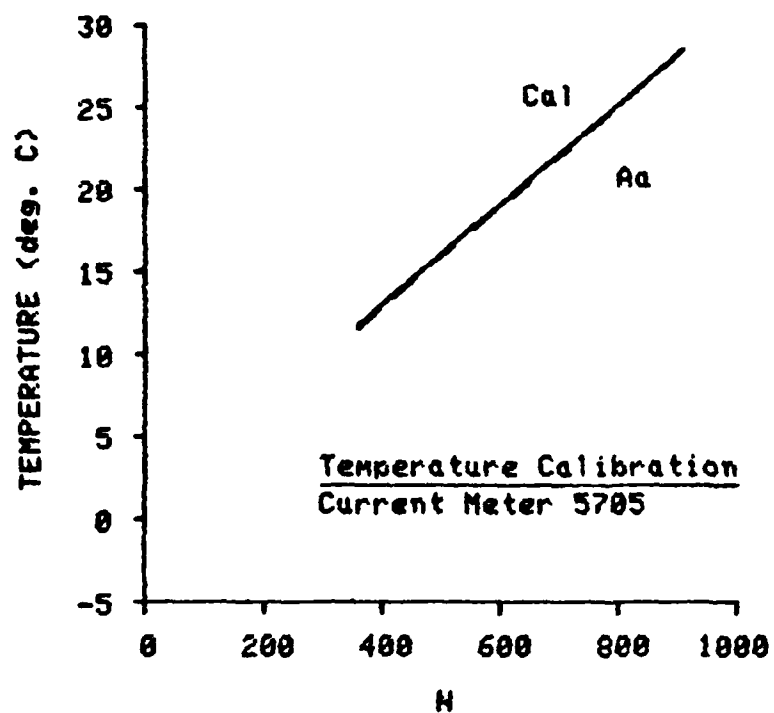


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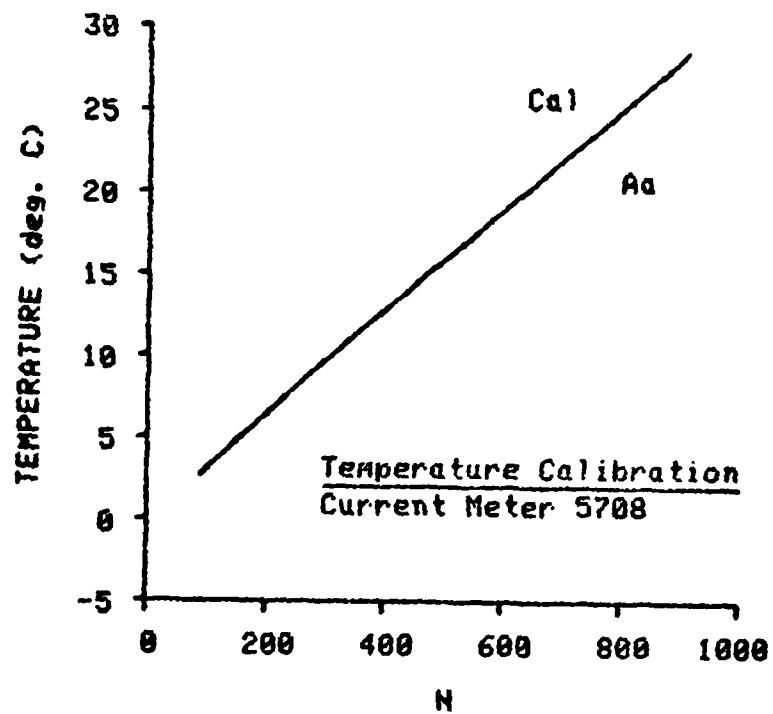
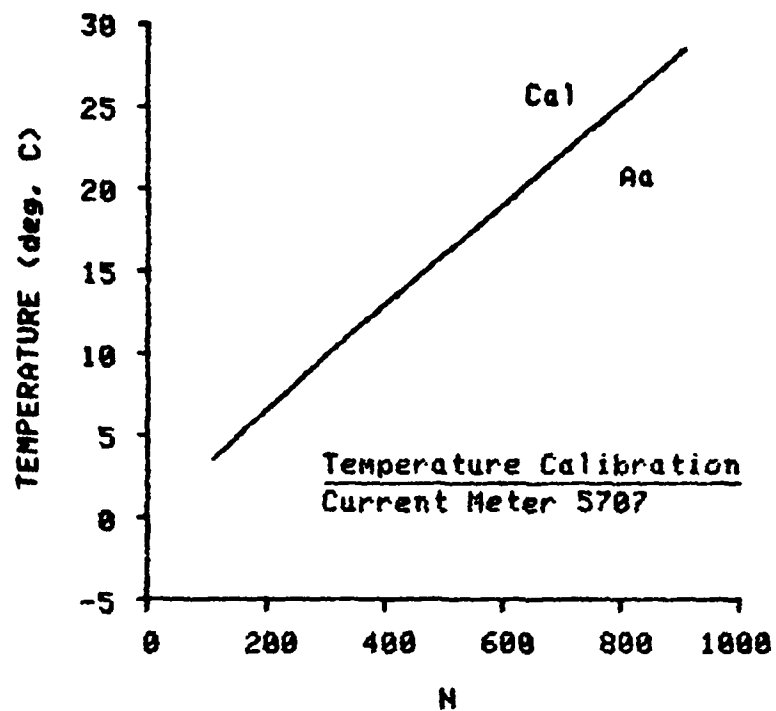


Figure 5. (continued)

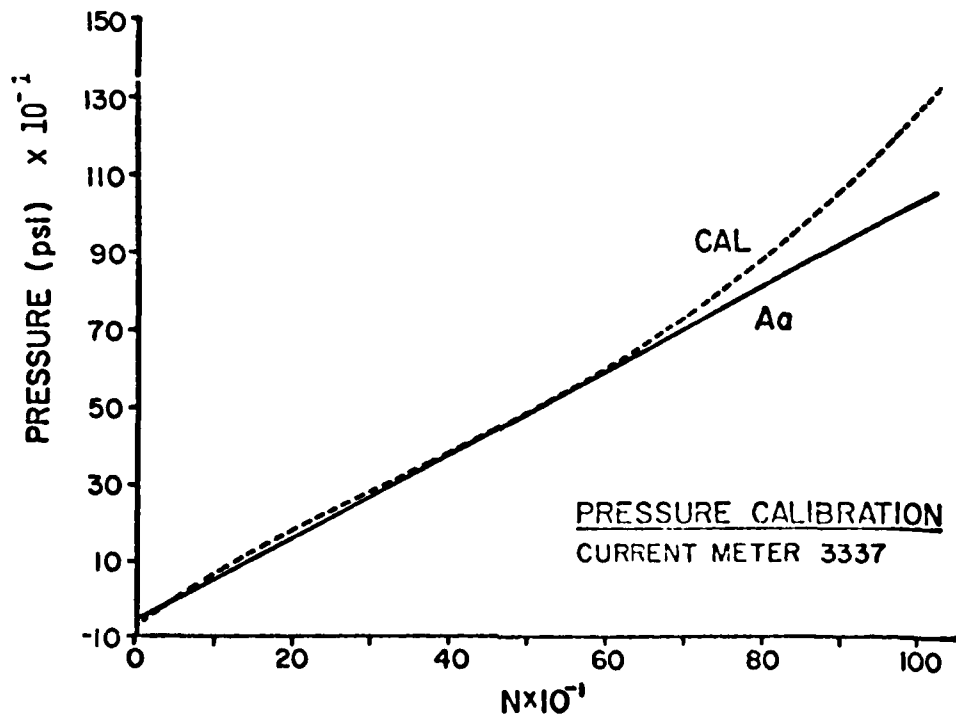
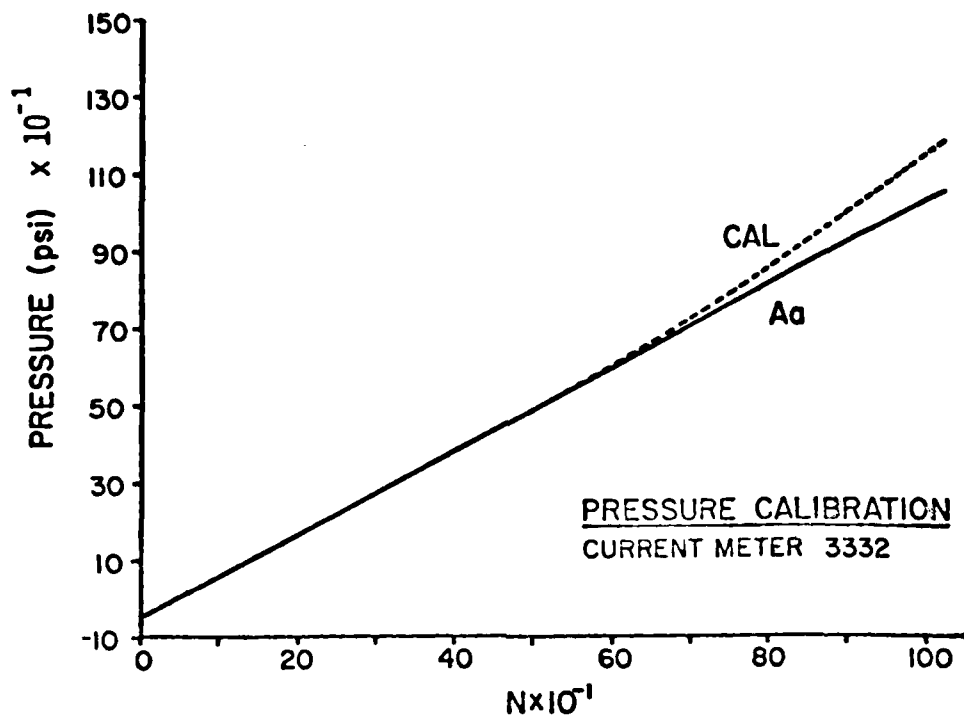


Figure 5. (continued)

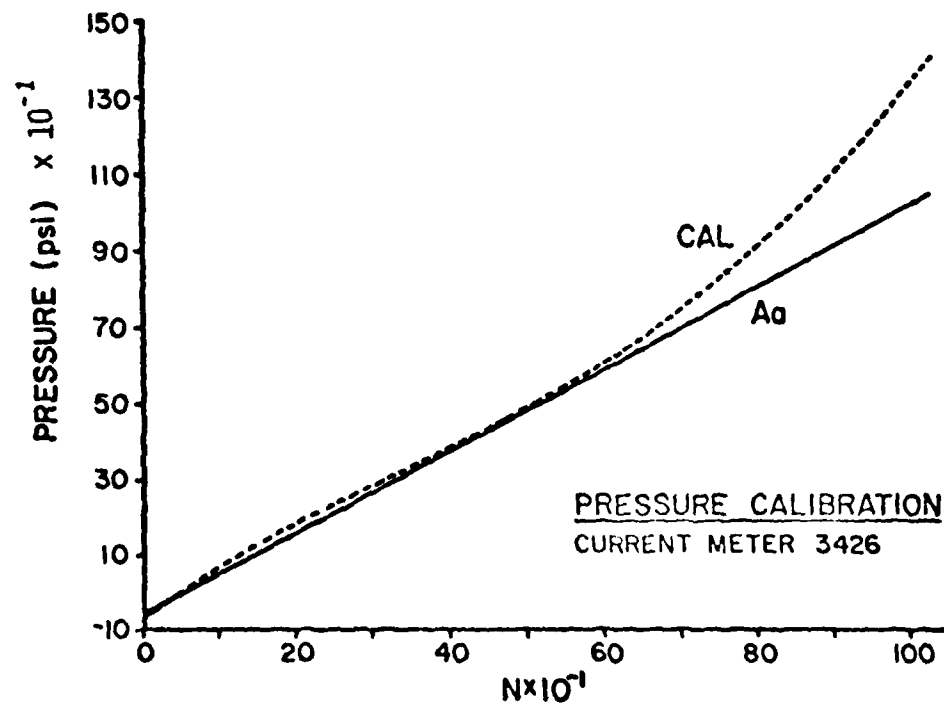
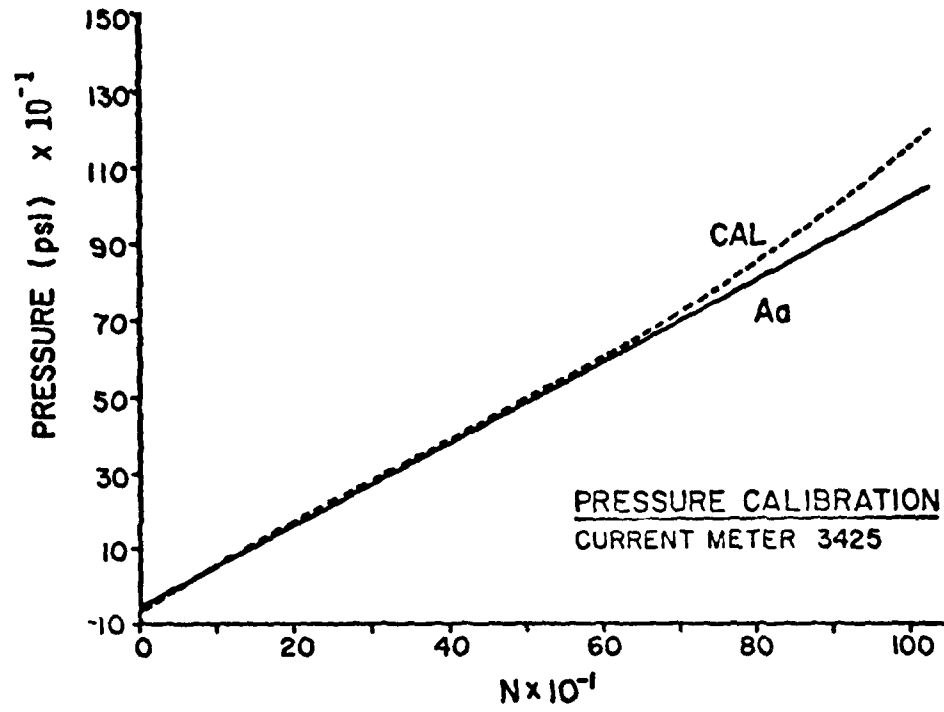


Figure 5. (continued)

Variable Meter No.	Speed (cm sec ⁻¹)		Direction (degrees Mag)		Conductivity (mho cm ⁻¹)		Temperature (°C)		Pressure (kg cm ⁻²) (P.S.I.)	
	Aa	Cal	Aa	Cal	Aa	Cal	Aa	Cal	Aa	Cal
3332 A	1.5		1.5	-7.72	0		-0.885	-0.4407	-4.14547	-5.14979
B	.0933		0.349	0.349	0.07593		0.03587	0.0361	0.0770613	1.1150
C							-0.8389x10 ⁻⁵	-0.8991x10 ⁻⁵		-0.2301x10 ⁻³
D							0.4300x10 ⁻⁸	0.4751x10 ⁻⁸		0.1127x10 ⁻⁶
3337 A	1.5		1.5	-6.76	0.076		-0.8905	-0.4231	-3.74446	-6.74111
B	.0933		0.349	0.349	0.07607		0.03587	0.03586	0.0758434	1.13186
C							-0.8389x10 ⁻⁵	-0.8429x10 ⁻⁵		-0.8440x10 ⁻³
D							0.4300x10 ⁻⁸	0.4445x10 ⁻⁸		0.1120x10 ⁻⁶
3343 A	1.5		1.5	0.21	-0.084		-0.9103	-0.4094		
B	.0933		0.349	0.349	0.07593		0.03587	0.03581		
C							-0.8389x10 ⁻⁵	-0.8120x10 ⁻⁵		
D							0.4300x10 ⁻⁸	0.4303x10 ⁻⁸		
3344 A	1.5		1.5	1.64	-0.084		-0.8905	-0.3816		
B	.0933		0.349	0.349	0.07593		0.03587	0.0359		
C							-0.8389x10 ⁻⁵	-0.8401x10 ⁻⁵		
D							0.4300x10 ⁻⁸	0.4735x10 ⁻⁸		
3345 A	1.5		1.5	-7.77	0.076		-0.8771	-0.4131		
B	.0933		0.349	0.349	0.07497		0.03587	0.03597		
C							-0.8389x10 ⁻⁵	-0.8111x10 ⁻⁵		
D							0.4300x10 ⁻⁸	0.4116x10 ⁻⁸		
3423 A	1.5		1.4	-5.33	0		-0.9111	-0.4405		
B	.0933		0.349	0.349	0.07574		0.03587	0.03574		
C							-0.8389x10 ⁻⁵	-0.8104x10 ⁻⁵		
D							0.4300x10 ⁻⁸	0.4188x10 ⁻⁸		
3424 A	1.5		1.5	-5.96	0		-0.8781	-0.3429		
B	.0933		0.349	0.349	0.07540		0.03587	0.03572		
C							-0.8389x10 ⁻⁵	-0.8219x10 ⁻⁵		
D							0.4300x10 ⁻⁸	0.4259x10 ⁻⁸		
3425 A	1.5		1.5	-6.06	0.07574		-0.8651	-0.4287	-3.91734	-6.74633
B	.0933		0.349	0.349	0.07574		0.03587	0.03617	0.0717081	1.1746
C							-0.8389x10 ⁻⁵	-0.8073x10 ⁻⁵		-0.1164x10 ⁻³
D							0.4300x10 ⁻⁸	0.4415x10 ⁻⁸		0.1036x10 ⁻⁶
3426 A	1.5		1.5	-6.03	0		-0.8827	-0.3740	-4.20412	-7.1725
B	.0933		0.349	0.349	0.07598		0.03587	0.03576	0.0711738	1.3444
C							-0.8389x10 ⁻⁵	-0.8312x10 ⁻⁵		-0.0077x10 ⁻³
D							0.4300x10 ⁻⁸	0.4301x10 ⁻⁸		1.0709x10 ⁻⁶
3427 A	1.5		1.5	-7.94	0.07612		-0.9111	-0.4029		
B	.0933		0.349	0.349	0.07612		0.03587	0.03584		
C							-0.8389x10 ⁻⁵	-0.8114x10 ⁻⁵		
D							0.4300x10 ⁻⁸	0.4145x10 ⁻⁸		

Table 2. Aanderaa and calibrated sensor coefficients for all current meters. These coefficients are used in polynomial equations to convert internally recorded data to engineering units.

Variable Meter No.	Speed (cm sec-1)		Direction (degrees mag)		Conductivity (mho cm-1)		Temperature (°C)		Pressure (kg cm-2) (PSI)	
	Aa	Cal	Aa	Cal	Aa	Cal	Aa	Cal	Aa	Cal
5705 A	1.5		1.5		0		-0.314	-0.5688	-3.4590	No
B	.0933		0.349		0.07599		0.03544	0.03593	0.07609f	Calibration
C							-0.8384×10^{-5}	-0.7912×10^{-5}		Data
D							0.43×10^{-8}	0.4001×10^{-8}		
5706 A	1.5		1.5		0		-0.326	-0.3039	-3.5654	No
B	.0933		0.349		0.07422		0.03583	0.03580	0.076215	Calibration
C							-0.8384×10^{-5}	-0.8593×10^{-5}		Data
D							0.43×10^{-8}	0.4541×10^{-8}		
5707 A	1.5		1.5		0		-0.328	-0.3014	-3.6178	No
B	.0933		0.349		0.07483		0.03546	0.03563	0.076471	Calibration
C							-0.8384×10^{-5}	-0.8486×10^{-5}		Data
D							0.43×10^{-8}	0.4402×10^{-8}		
5708 A	1.5		1.5		0		-0.474	-0.3427		
B	.0933		0.349		0.07456		0.03548	0.03606		
C							-0.8184×10^{-5}	-0.9473×10^{-5}		
D							0.43×10^{-8}	0.4904×10^{-8}		

Table 2. (continued)

2.6 Final Processing

The resulting data sets consisted of time series of calibrated temperature, salinity, pressure, conductivity, speed, and direction. From the last two, we have inferred vector velocities. The local frame of reference for each array, within which the velocities were computed, aligns the y axis with the local topography and the x axis across it. This decomposition has been used in previous studies and succeeds in keeping the mean Gulf Stream velocities largely pointing along the y axis. The orientations of the arrays relative to North are given in Table 1.

To remove contamination and aliasing due to the unresolved high frequencies, we have smoothed all variables with a filter designed to damp energies at frequencies of 1 cycle/2 hr and higher. Physical and spectral space plots of this filter are given in Fig. 6. Note, its quarter power point occurs at 3 hours; thus, the time series produced by its use are called 3 hour low passed (3 HRLP) series. The primary interest of this experiment is in the several-day, lower frequency Gulf Stream fluctuations. To obtain a data set which centered on this activity, the 3 HRLP time series were filtered a second time. The second filter was designed to remove energy at frequencies higher than 1 cycle/12 hours and had a quarter-power point at 1 cycle/40 hrs. This filter is shown in Fig. 7. In addition, the 3 HRLP data for all but the bottom pressure gauges were filtered to remove frequencies lower than 1 cycle/12 hours, thus producing 3 to 40 hour band passed (3-40 HRBP) time series. The filter used in this process is shown in Fig. 8. The final sampling intervals of the 3 HRLP, the 40 HRLP, and 3-40 HRBP time series are 1 hour, 6 hours, and 1 hour, respectively.

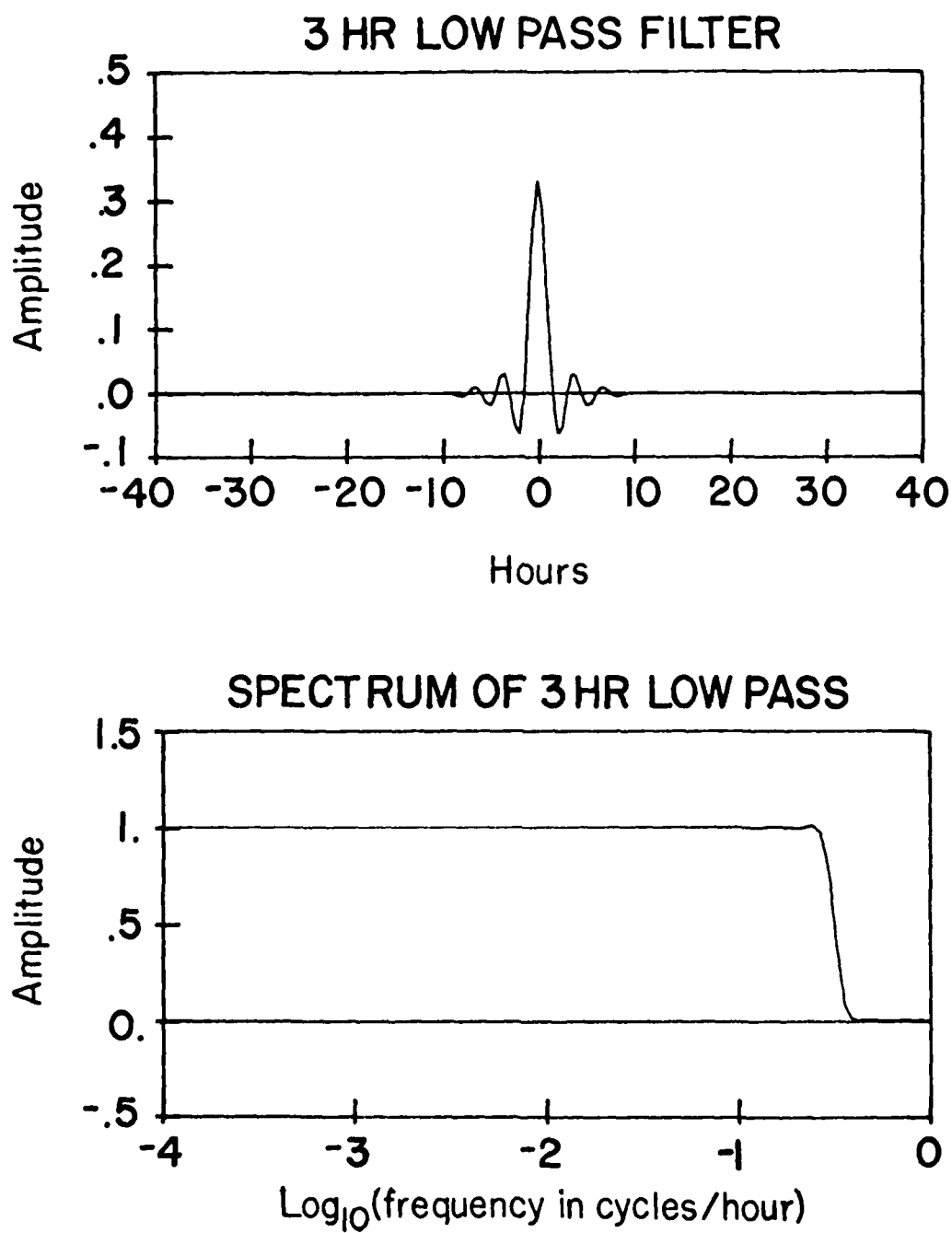


Fig. 6. 3 HRLP filter plots. Both physical and spectral representations are given. The quarter power point of this filter is at a frequency of 1 cycle/3 hours, and the resulting time series had an effective sampling interval of 1 hour.

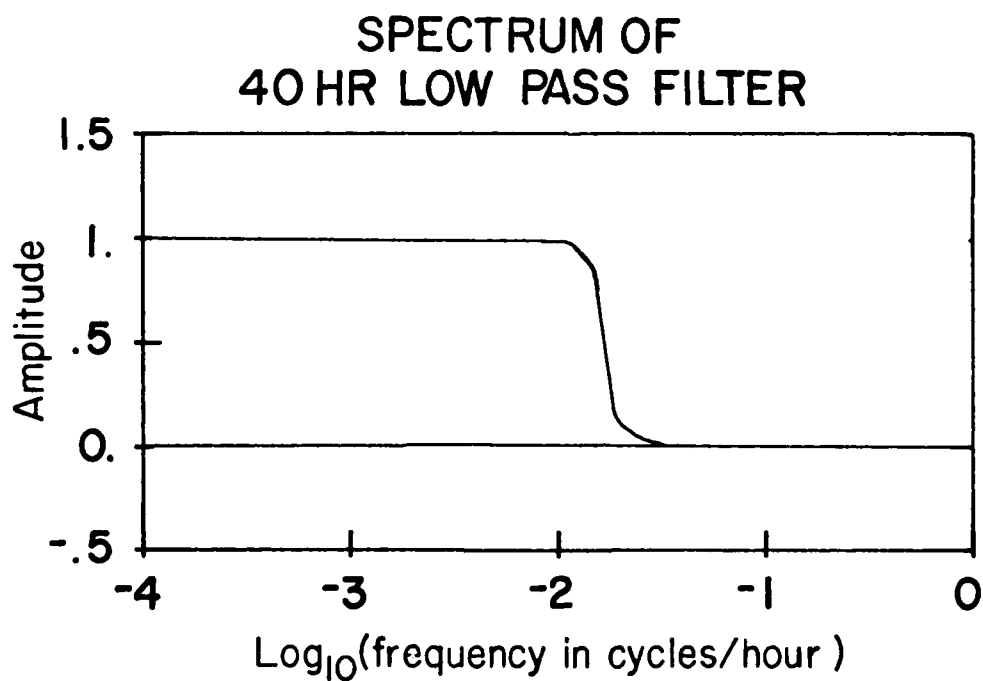
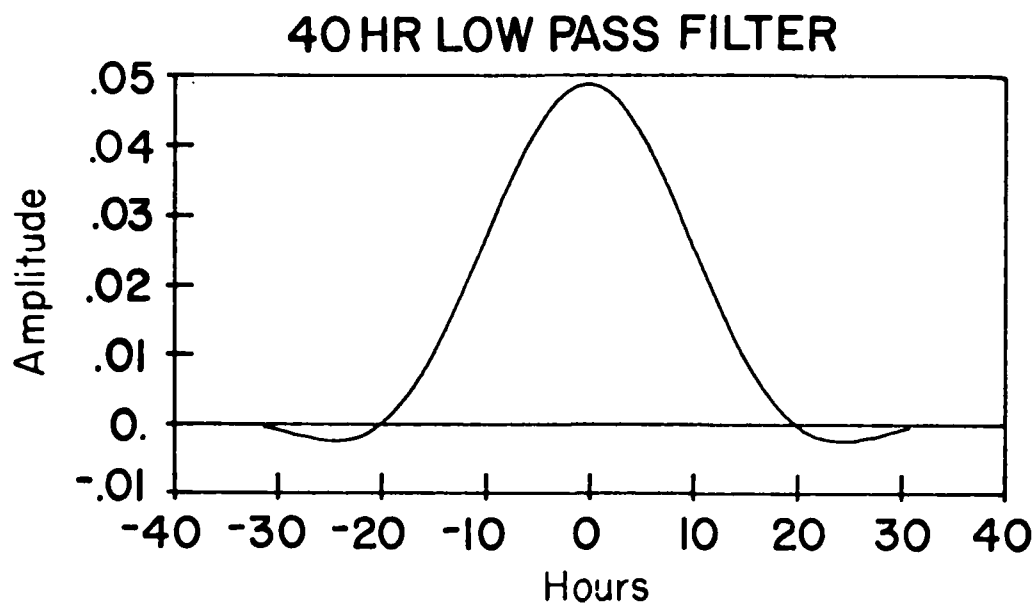


Fig. 7. 40 HRLP filter plots. Both physical and spectral representations are given. The quarter power point of this filter is at a frequency of 1 cycle/40 hours, and the resulting time series had an effective sampling interval of 6 hours.

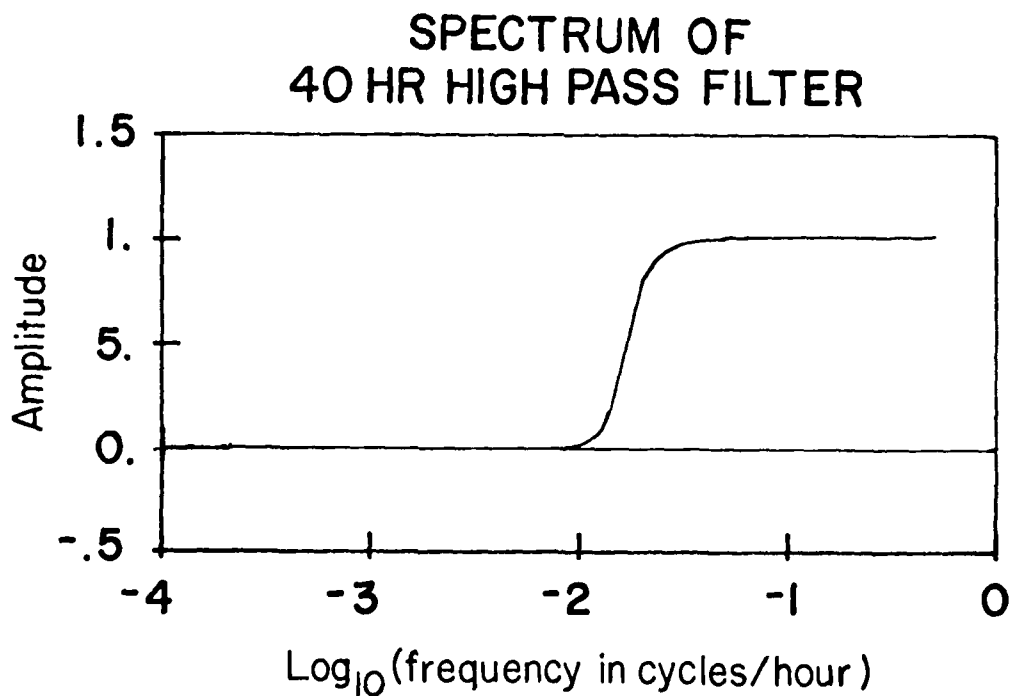
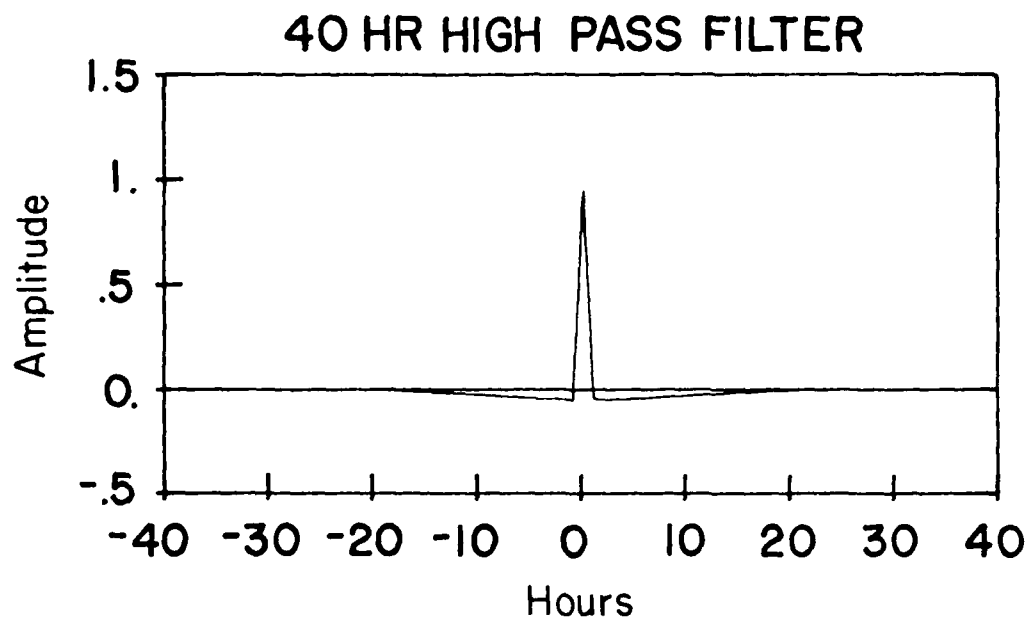


Fig. 8. 40 HRHP filter plots. Both physical and spectral representations are given. The quarter power point of this filter is at 1 cycle/40 hours. The resulting time series had an effective sampling interval of 1 hour.

2.7 Basic Statistics

We have computed the lowest order statistics, i.e. the mean, the maximum and minimum value and the standard deviation for each variable from each current meter. The values of these parameters from both the 3 HRLP and 40 HRLP time series are listed in Table 3.

The filter construction, data convolution, and basic statistical calculations were done using FESTSA, a general purpose time series package (Brooks, 1976).

Table 3. First order statistics for the temperature, salinity, and velocity components from each instrument for both the 3 HRLP and the 40 HRLP data. N is the number of points in the estimate, sd the standard deviation about the mean, and Var the variance about the mean.

3 HRLP

Current Meter	Variable	N	Min	Max	Mean	sd	Var
E1T	T	4970	6.47	18.79	12.92	2.76	7.62
	S	4970	34.83	36.54	35.70	1.04	1.08
	U	4970	-36.91	58.69	8.97	12.79	163.58
	V	4970	-60.41	155.39	42.01	35.81	1282.36
E1B	T	4910	6.88	16.01	10.37	2.29	5.24
	S	4910	35.05	36.47	35.52	1.02	1.04
	U	4910	-33.43	36.09	1.72	9.50	90.25
	V	4910	-54.24	87.82	18.71	20.59	423.95
E2T	T	4994	7.08	17.90	12.90	2.38	5.66
	S	4994	34.65	36.26	35.49	1.03	1.06
	U	4994	-33.84	59.89	8.68	11.63	135.26
	V	4994	-51.01	156.46	58.59	33.33	1110.89
E2B	T	5127	6.80	15.98	10.76	2.0	4.0
	S	5127	32.14	36.03	34.96	1.11	1.23
	U	5127	-20.01	74.31	9.48	12.54	157.25
	V	5127	-39.97	121.27	42.72	20.98	440.16
E3T	T	4905	7.11	17.51	12.73	2.46	6.05
	S	4905	33.43	41.66	35.44	1.06	1.12
	U	4905	-21.72	63.87	10.56	9.01	81.18
	V	4905	-61.29	159.00	56.94	38.16	1456.19
E3B	T	5000	6.85	16.42	10.50	21.22	450.29
	S	5000	35.04	36.67	35.50	1.01	1.02
	U	5000	-15.57	23.19	.22	1.84	3.39
	V	5000	-6.64	128.80	3.22	15.47	239.32
F1T	T	4963	7.41	18.64	11.54	2.30	5.29
	S	4963	34.85	36.60	35.52	1.03	1.06
	U	4963	-54.13	81.00	10.64	20.47	419.02
	V	4963	-54.96	103.75	8.33	25.97	674.44
F1B	T	4979	7.18	17.12	9.96	1.90	3.61
	S	4979	35.02	36.51	35.42	1.0	1.0
	U	4979	-12.63	74.33	2.01	8.49	72.08
	V	4979	-21.33	62.16	18.79	8.33	69.39

Table 3. (continued)

3HRLP

Current Meter	Variable	N	Min	Max	Mean	sd	Var
F2T	T	1142	7.99	28.72	12.38	2.9	8.41
	S	1142	31.50	48.34	35.66	1.23	1.51
	U	1142	—	—	—	—	—
	V	1142	—	—	—	—	—
F2B	T	5095	-.44	31.05	10.90	2.55	6.50
	S	5095	4.69	66.81	35.49	3.49	12.18
	U	5095	-79.19	123.86	8.75	22.38	500.86
	V	5095	-59.02	114.25	12.18	24.64	607.13
F3T	T	137	-1.15	27.33	12.07	4.95	24.50
	S	137	5.04	69.13	37.28	9.36	87.61
	U	137	-98.39	32.51	-11.87	28.14	791.86
	V	137	-49.34	100.32	13.33	37.85	1432.62
F3B	T	4897	13.90	18.45	10.62	2.11	4.45
	S	4897	34.82	36.62	35.38	1.01	1.02
	U	4897	-72.09	106.15	-.24	19.22	369.41
	V	4897	-48.53	105.91	12.57	27.64	763.97
GTH*	T	4960	—	—	—	—	—
	S	4960	—	—	—	—	—
	U	4960	-77.58	146.45	10.12	21.85	477.42
	V	4960	-42.32	141.41	34.74	34.98	1223.60
GB	T	4977	7.97	19.74	12.44	2.62	6.86
	S	4977	33.46	36.68	35.60	1.05	1.10
	U	4977	-23.57	49.24	.70	4.65	21.62
	V	4977	-9.83	107.68	1.64	9.24	85.38

* Direction as measured by GB was combined with speed as measured by GT to compute GTH, a hybrid velocity time series.

Table 3. (continued)

40 HRLP

Current Meter	Variable	N	Min	Max	Mean	sd	Var
E1T	T	818	6.75	17.53	12.90	2.64	6.97
	S	818	35.00	36.38	35.71	.45	.20
	U	818	-14.53	41.14	8.90	9.03	81.54
	V	818	-47.37	129.80	41.55	33.70	1135.69
E1B	T	808	6.98	15.67	10.36	2.21	4.88
	S	808	35.12	36.28	35.53	.40	.16
	U	808	-11.48	15.21	1.73	4.40	19.36
	V	808	-38.99	64.38	18.69	19.00	361.00
F2T	T	822	7.57	17.09	12.89	2.27	5.15
	S	822	34.84	36.18	35.50	.44	.19
	U	822	-12.01	35.21	8.75	7.39	54.61
	V	822	-23.57	143.07	58.63	31.37	984.08
F2B	T	844	7.08	15.13	10.76	1.90	3.61
	S	844	32.96	35.84	34.97	.56	.31
	U	844	-10.12	46.08	9.53	8.85	78.32
	V	844	-23.40	91.11	42.75	18.75	351.56
E3T	T	807	7.57	16.64	12.72	2.36	5.57
	S	807	34.73	36.17	35.45	.46	.21
	U	807	-14.26	29.57	10.52	6.60	43.56
	V	807	-35.57	141.45	56.92	36.99	1368.26
E3B	T	823	7.04	15.19	10.48	2.04	4.16
	S	823	35.10	36.18	35.51	.40	.16
	U	823	-.09	9.20	.19	1.01	1.02
	V	823	-1.36	11.90	28.20	14.16	200.51
F1T	T	817	7.49	18.35	11.51	2.24	5.02
	S	817	35.06	36.56	35.53	.42	.18
	U	817	-39.66	66.47	10.79	18.78	352.69
	V	817	-40.89	93.62	8.25	24.83	616.53
F1B	T	821	7.3	16.74	9.95	1.86	3.46
	S	821	35.13	36.45	35.43	.38	.14
	U	821	-5.59	53.68	2.01	8.22	67.57
	V	821	-5.36	53.53	18.77	8.03	64.48
F2T	T	180	8.75	19.70	12.14	2.46	6.05
	S	180	35.01	38.06	35.59	.58	.34
	U	180	-	-	-	-	-
	V	180	-	-	-	-	-

40 HRLP

Current Meter	Variable	N	Min	Max	Mean	sd	Var
F2B	T	839	6.47	21.22	10.89	2.14	4.58
	S	839	21.94	49.02	35.51	1.75	3.06
	U	839	-46.97	68.75	8.80	19.28	371.72
	V	839	-35.96	68.78	12.14	22.79	519.38
F3T	T	131	11.74	13.42	12.25	.50	.25
	S	131	35.06	37.83	35.60	.68	.46
	U	131	-25.02	17.39	-3.14	12.36	152.77
	V	131	-11.60	76.42	28.99	29.56	873.79
F3B	T	807	7.48	18.20	10.64	2.04	4.16
	S	807	35.04	36.57	35.40	.42	.18
	U	807	-62.35	63.84	~49	17.11	292.75
	V	807	-37.87	79.86	12.42	25.88	669.77
GTH*	T	817	—	—	—	—	—
	S	817	—	—	—	—	—
	U	817	-43.72	75.63	10.25	18.21	331.60
	V	817	-36.20	129.29	35.05	32.64	1065.37
GB	T	819	8.30	19.15	12.47	2.53	6.40
	S	819	34.69	36.60	35.63	.47	.22
	U	819	-11.17	40.89	.71	4.22	17.81
	V	819	-1.26	83.43	1.64	8.60	73.96

* Direction as measured by GB was combined with speed as measured by GT to compute GTH, a hybrid velocity time series.

Table 3. (continued)

2.8 Percentage Returns

In Table 4, we summarize the data returns from each of the instruments. Temperature and salinity were measured at an overall efficiency of 82%. Velocity was obtained at an efficiency of 65.3%. The "best" array was E, in which 100% of the temperature and salinity measurements and 85% of the velocity measurements were successful. In array F, 81% of the temperature and salinity measurements and 52% of the velocity measurements were valid. One current meter from each mooring in F performed successfully for the full 7 months. The top instrument of mooring G measured only speed, while the bottom instrument measured temperature, salinity and direction. Therefore, the return from G was 0% for velocity and 50% for temperature and salinity. Earlier analyses in the region of G, however, have shown that the direction of the low frequency flow is only weakly dependent on depth (Hood and Bane, 1983). Therefore, the direction from GB was combined with the speed of GT to produce a 'hybrid' velocity time series, GTH. This time series was used in the subsequent coherence estimates.

Table 4. Data Returns in Months

	T	S	U	V	PRESSURE
E1T	7	7	7	7	
E1B	7	7	7	7	
E2T	7	7	7	7	
E2B	7	7	7	7	
E3T	7	7	7	7	
E3B	7	7	.5	.5	
F1T	7	7	7	7	
F1B	7	7	.5	.5	
F2T	7	7	0	0	
F2B	6	2	7	7	
F3T	0	0	0	0	
F3B	7	7	7	7	
GT*	0	0	0	0	
GB*	7	7	0	0	
F2BP ⁺					7
F3BP ⁺					0

*GT and GB were combined to produce hybrid velocity data set GTH, which contained 7 months of data.

⁺The letters 'BP' denote bottom pressure gauge.

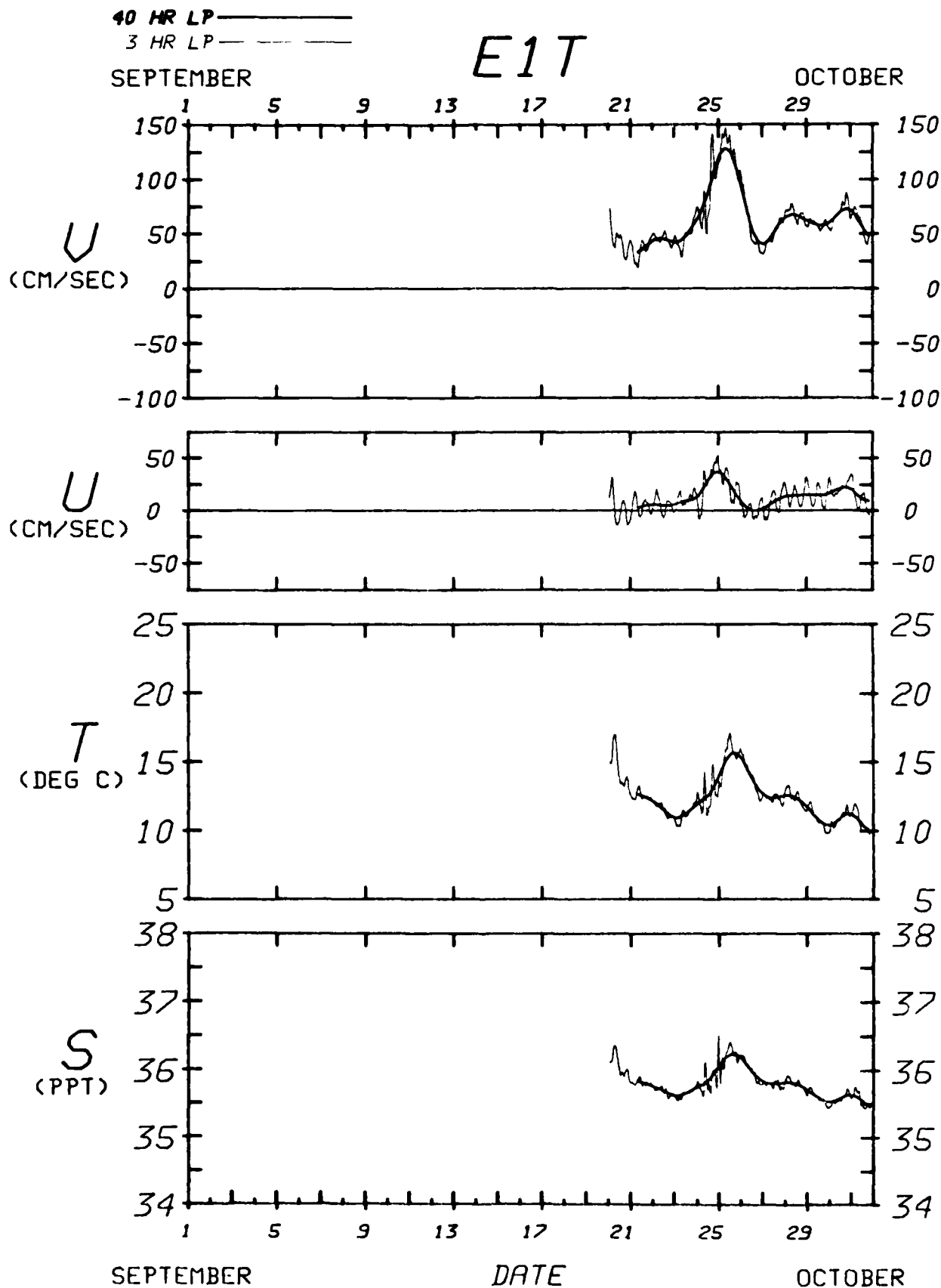
2.9 Format of Presentation

In section 3, the 3 and 40 HRLP data from all instruments are presented together on a monthly basis, with the data from any one instrument being contiguous. In section 4, we show the band-passed time series for the same variables. Again, we plot one month per page. Section 5 contains the 40 HRLP series of U , V , and α_t from each mooring, and Section 6 the stick plots of the velocities from each mooring. In Section 7, we display the 3HRLP and 40HRLP bottom pressure data from mooring F2, along with the downstream velocity, V , from F2.

Section 3

3HRLP and 40HRLP Current Meter Data

The 3 HRLP and 40 HRLP salinity, temperature and velocity data are presented in a monthly format for all current meters. The 3 HRLP data has been superimposed on the 40 HRLP data, and the scaling of all the plots is identical.

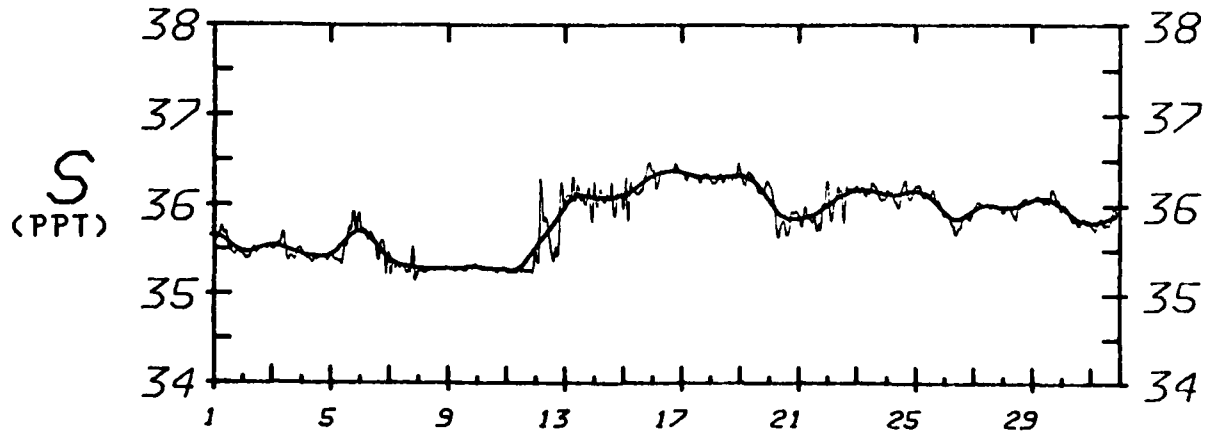
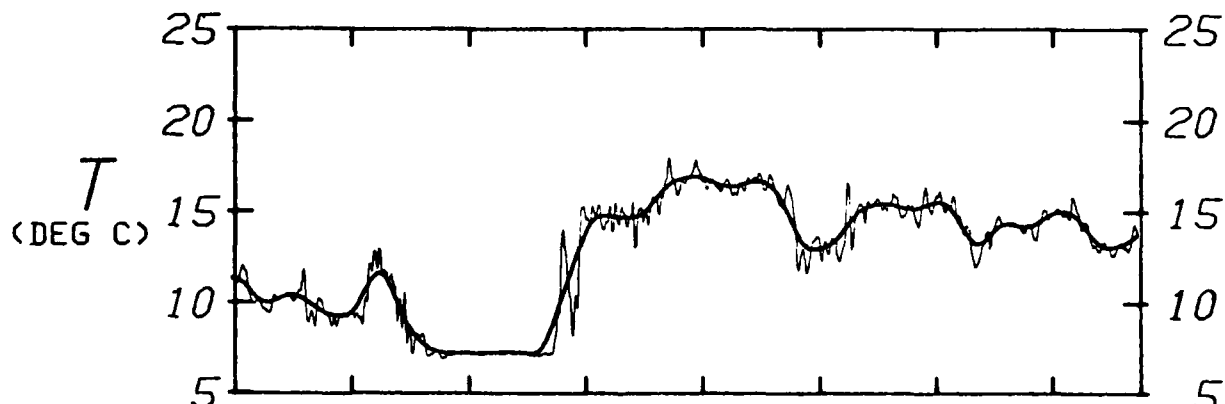
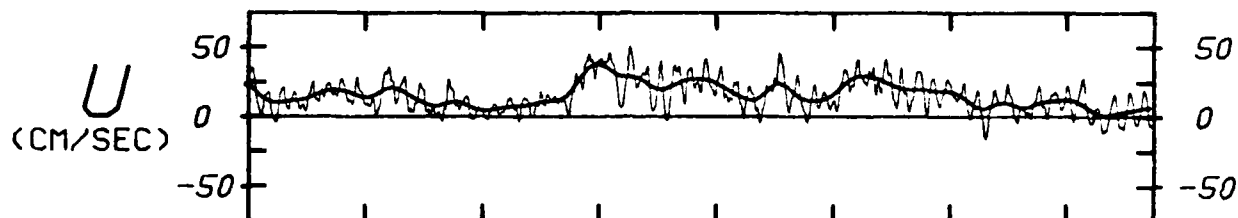
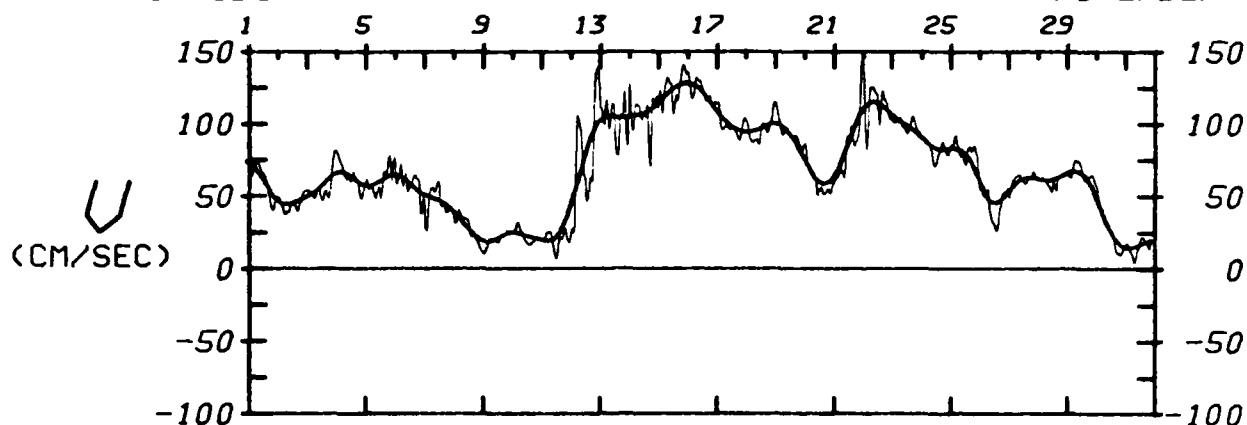


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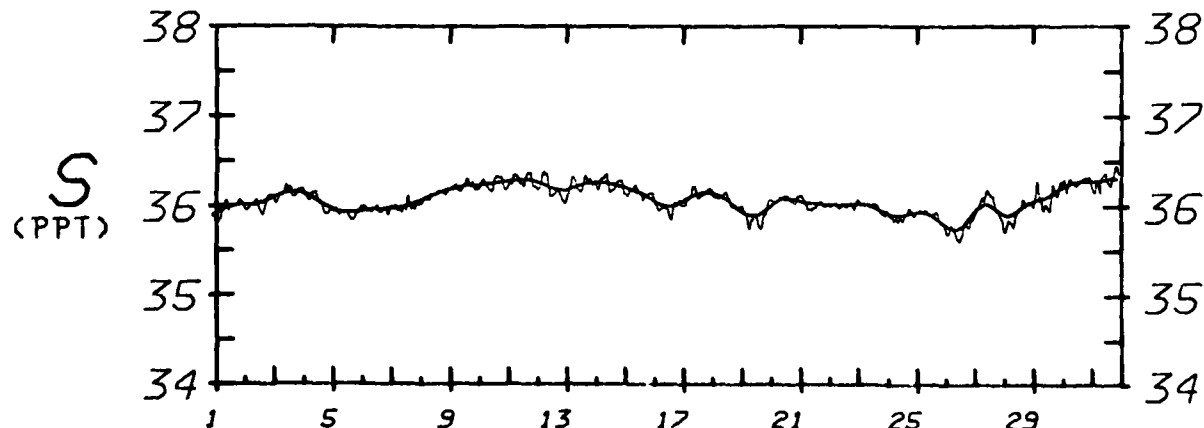
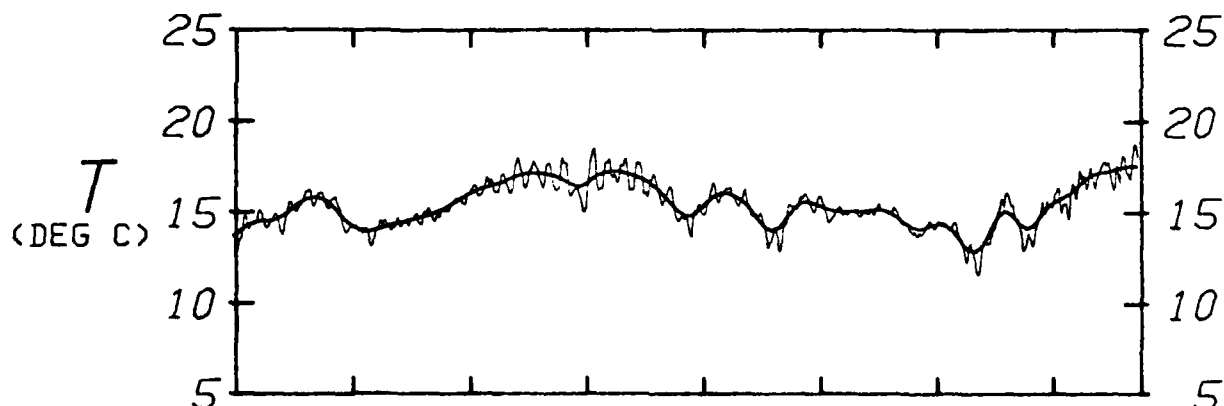
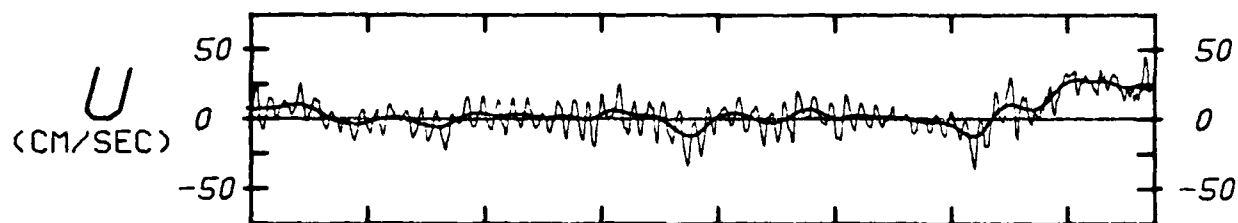
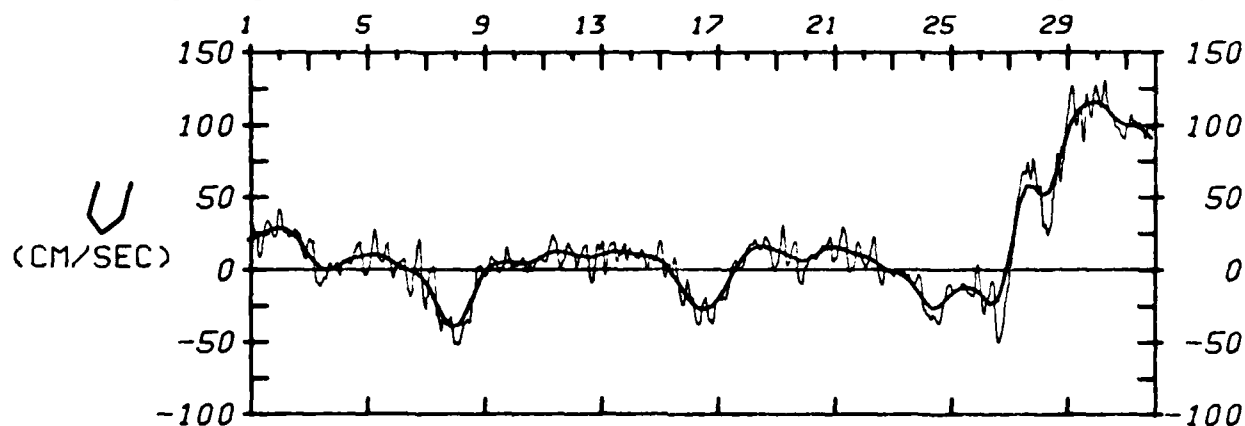
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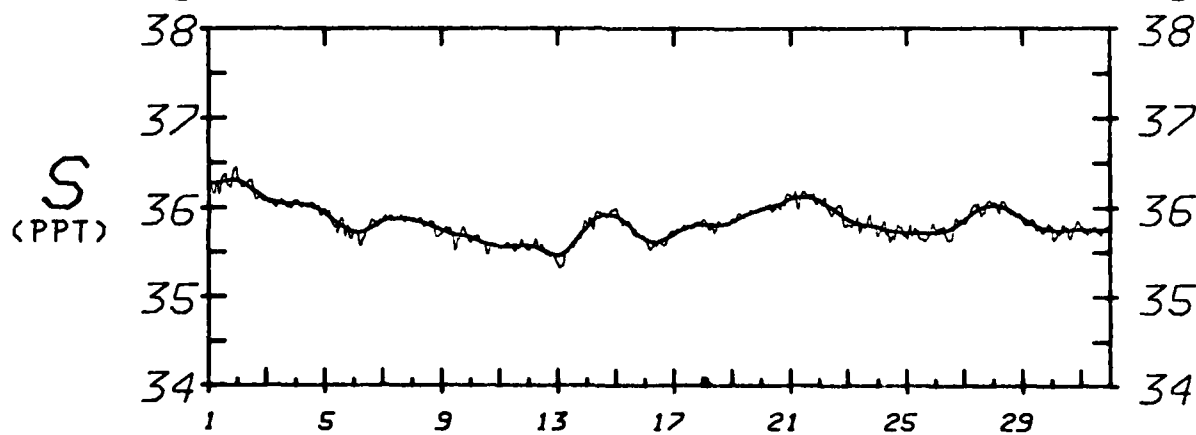
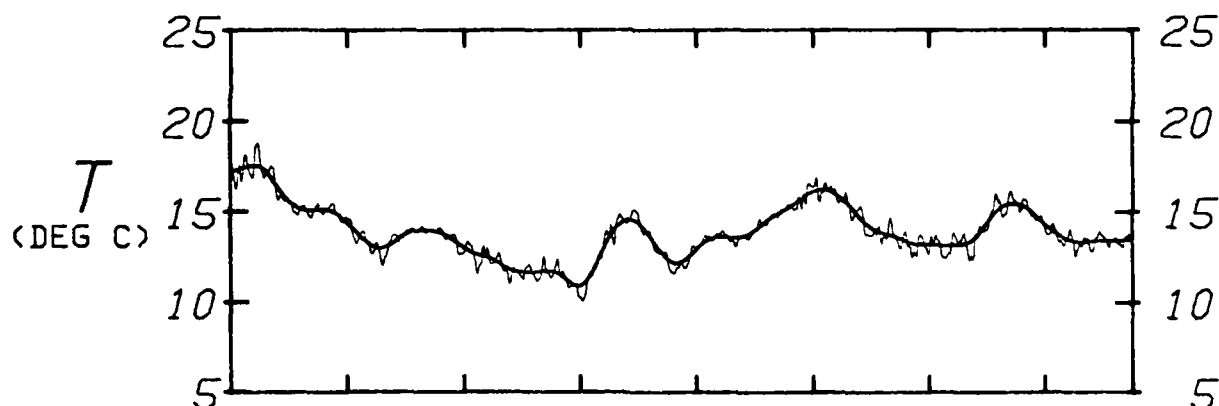
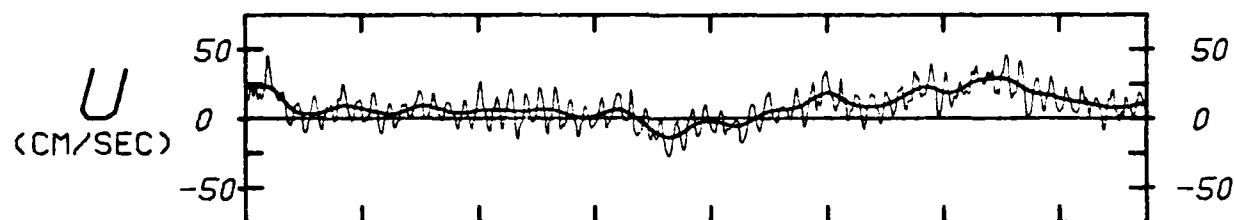
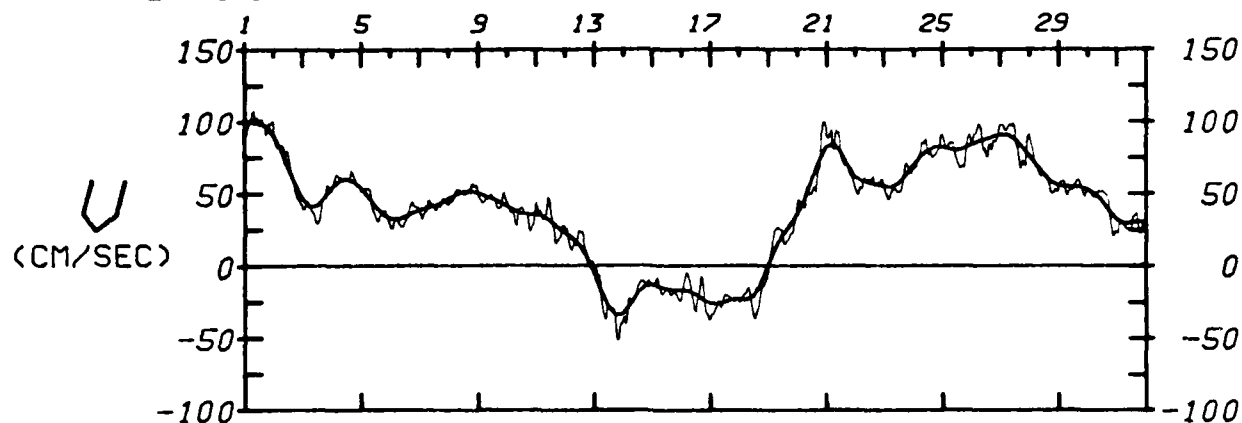
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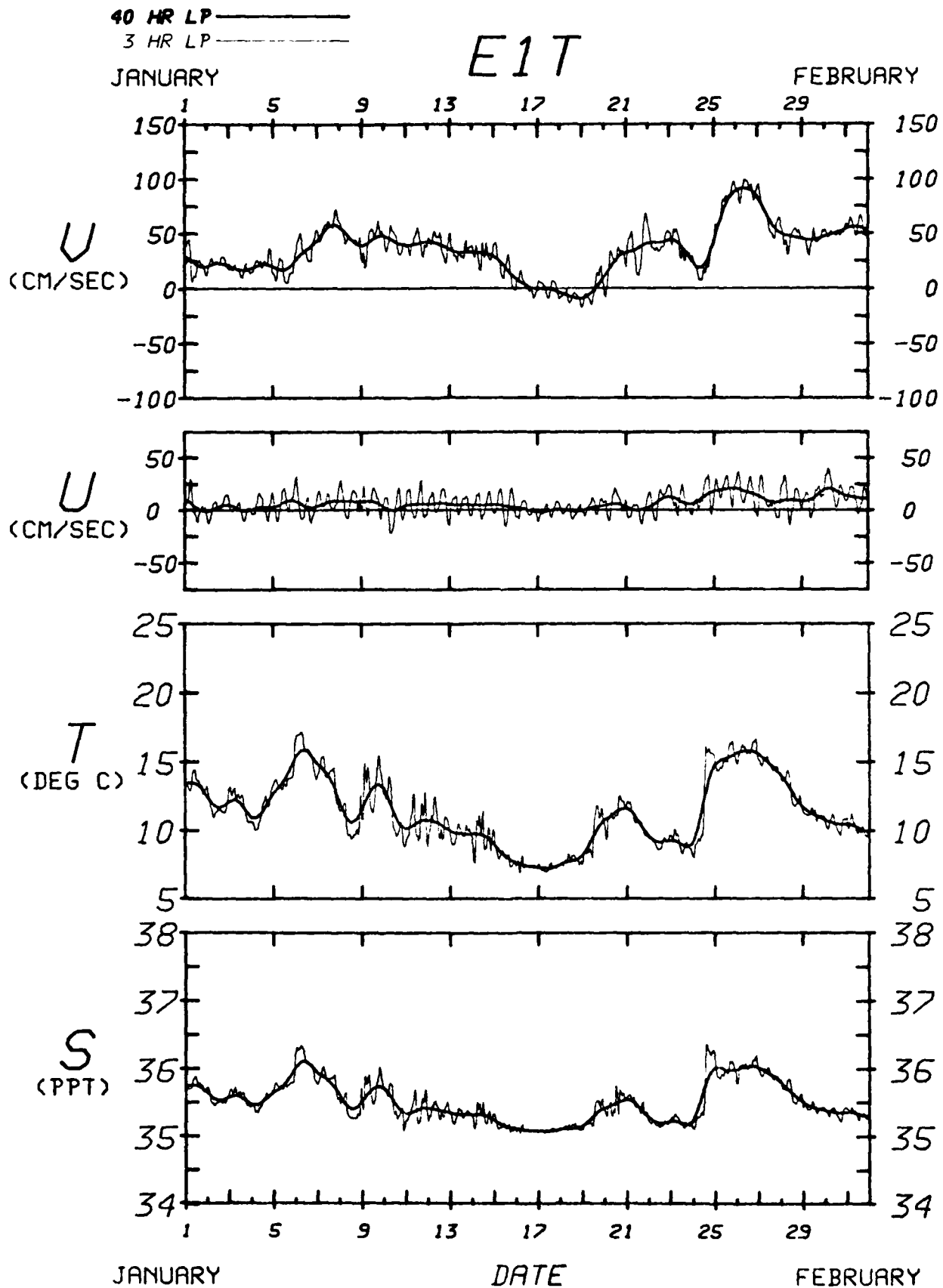
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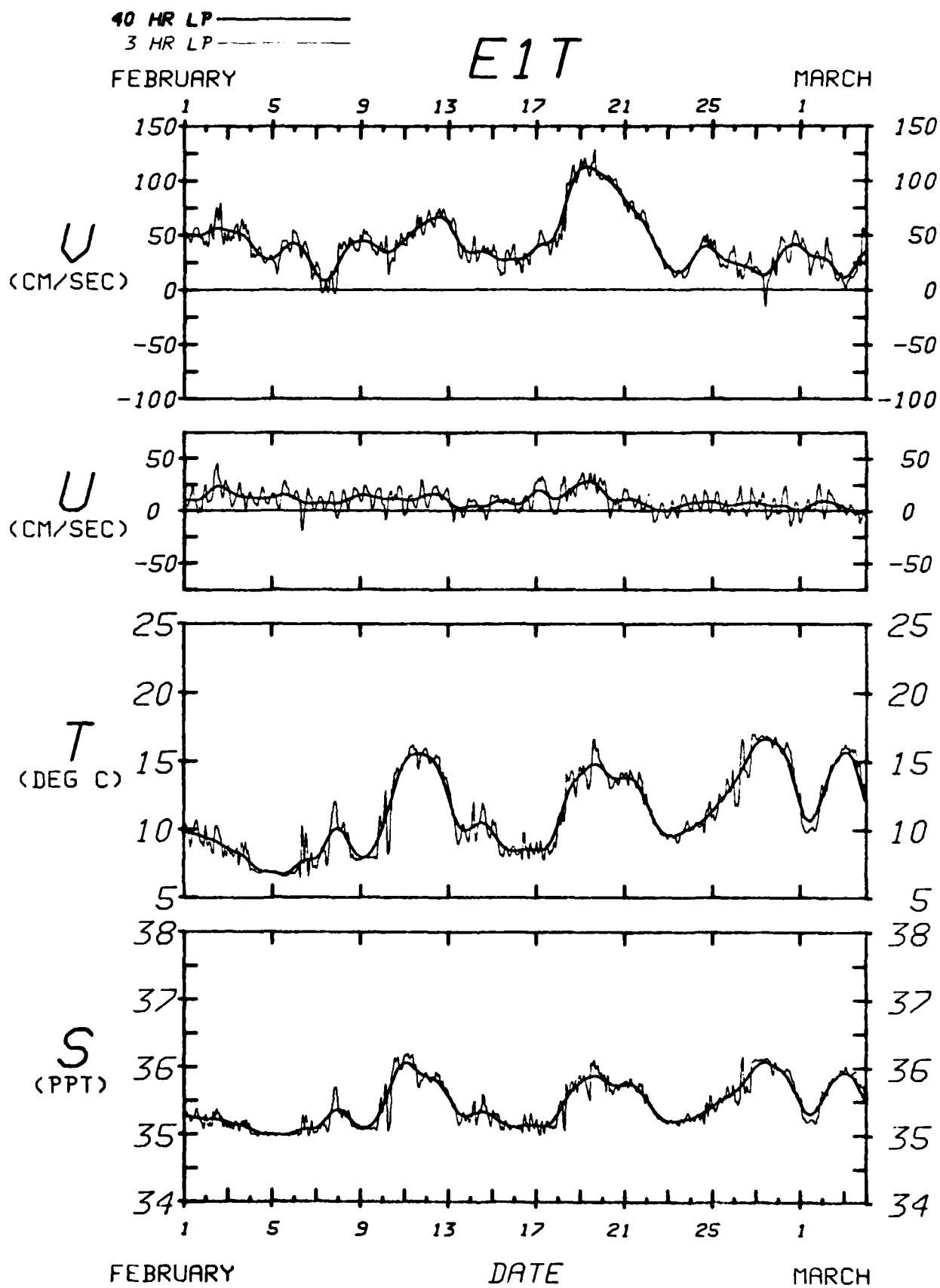


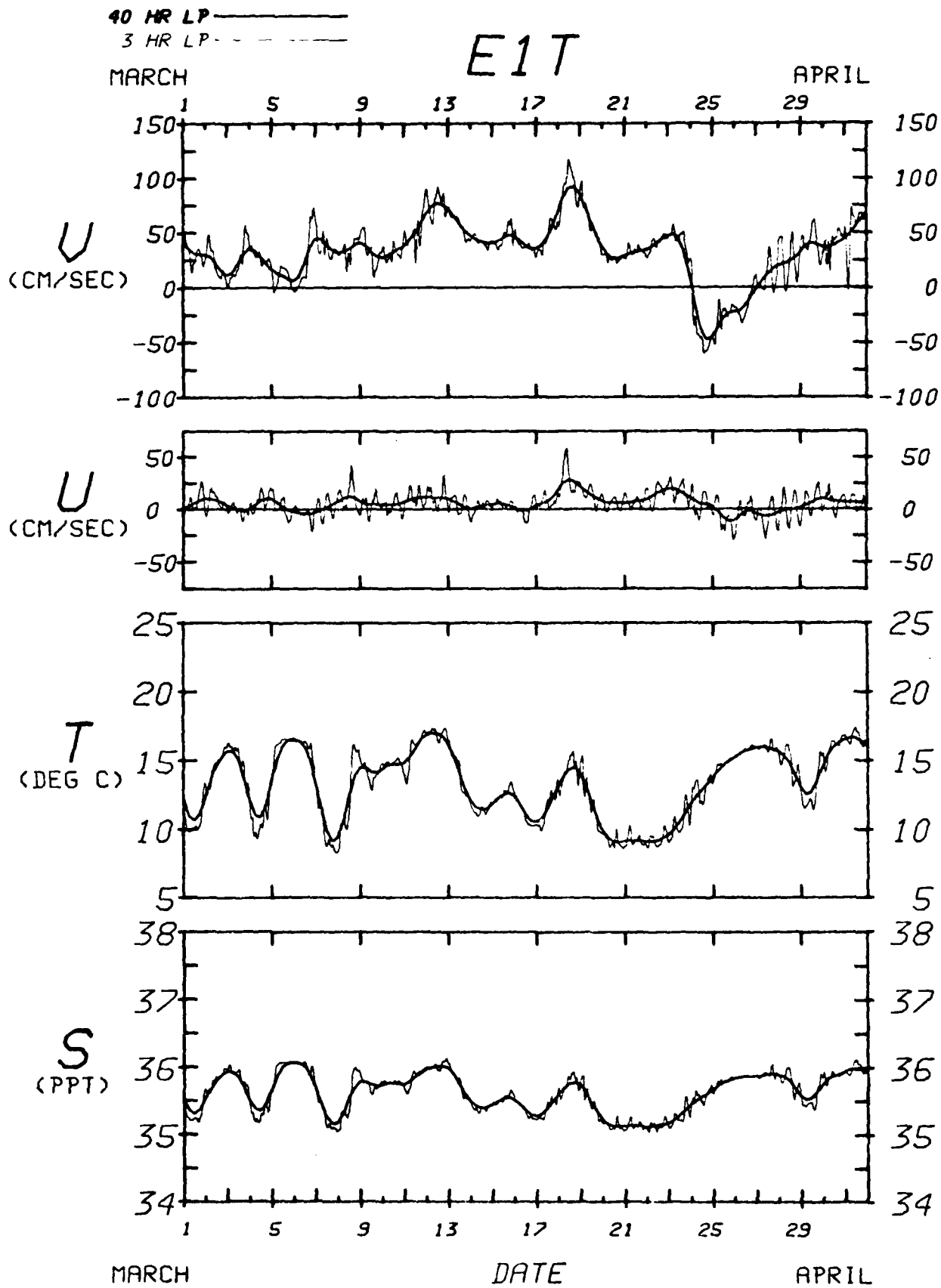
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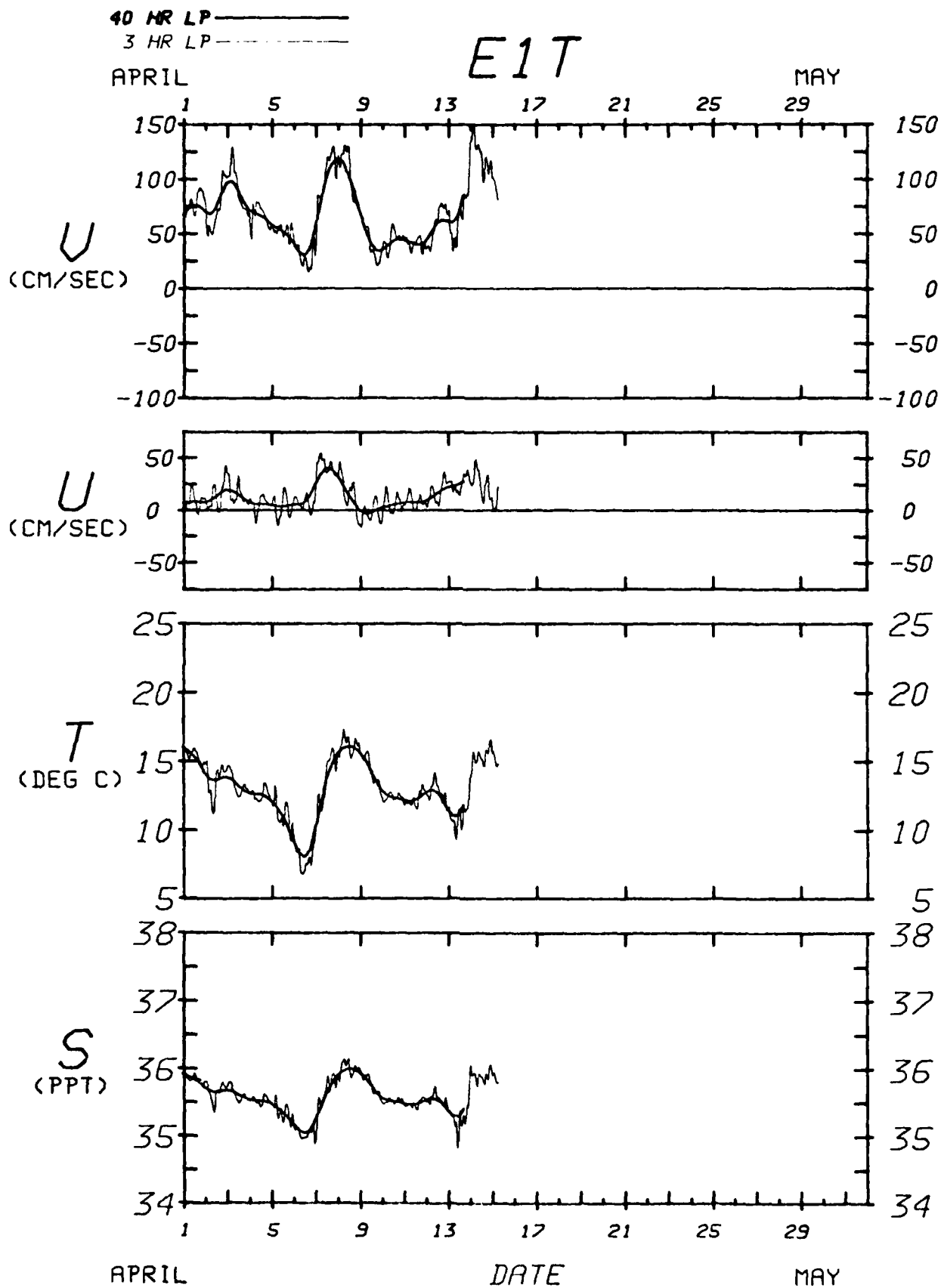
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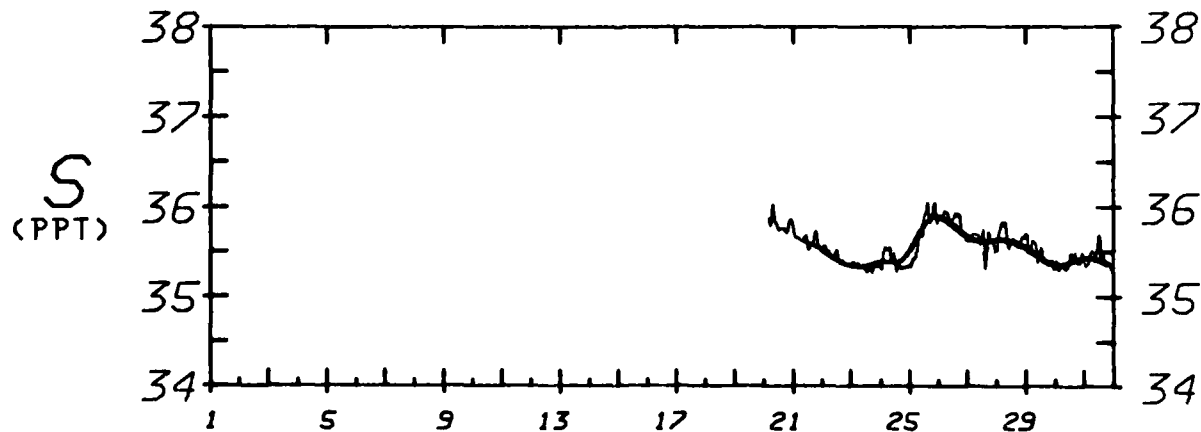
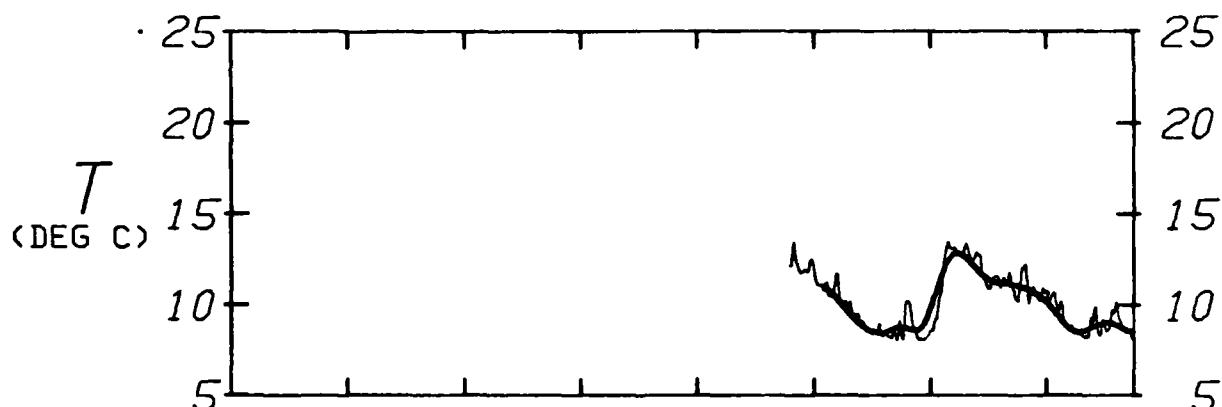
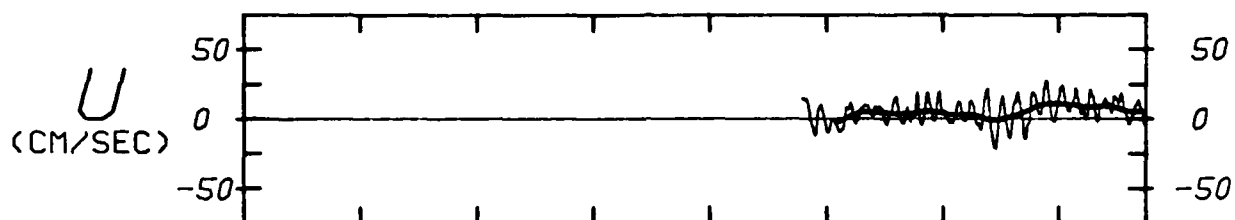
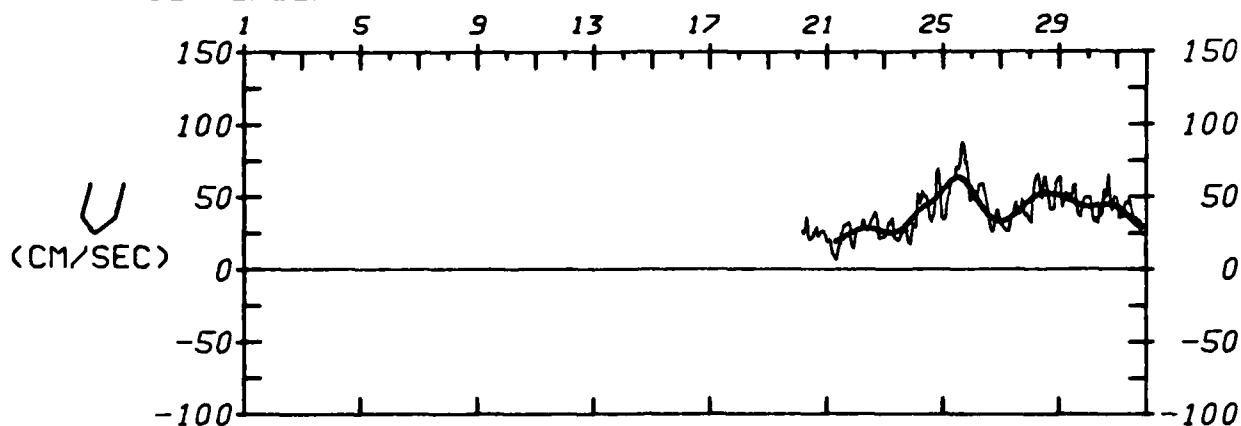


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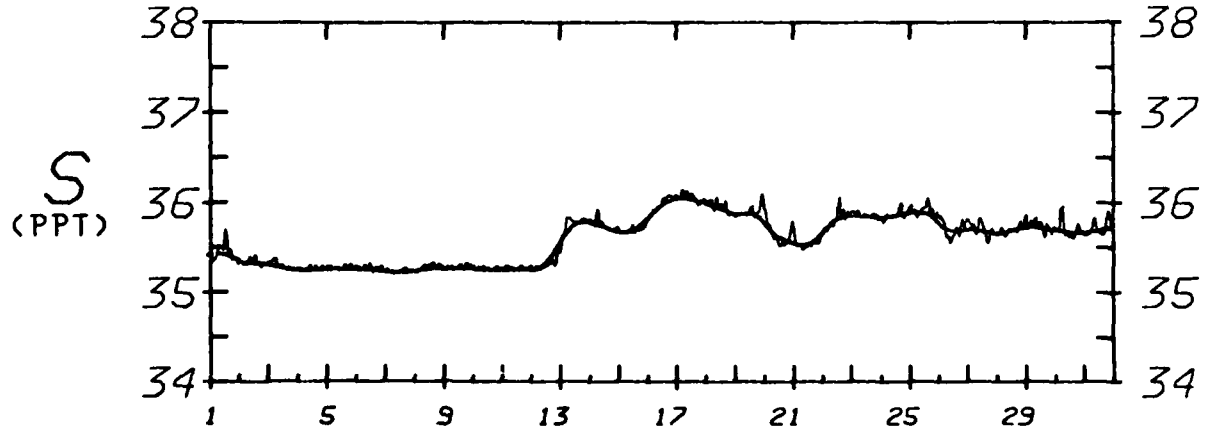
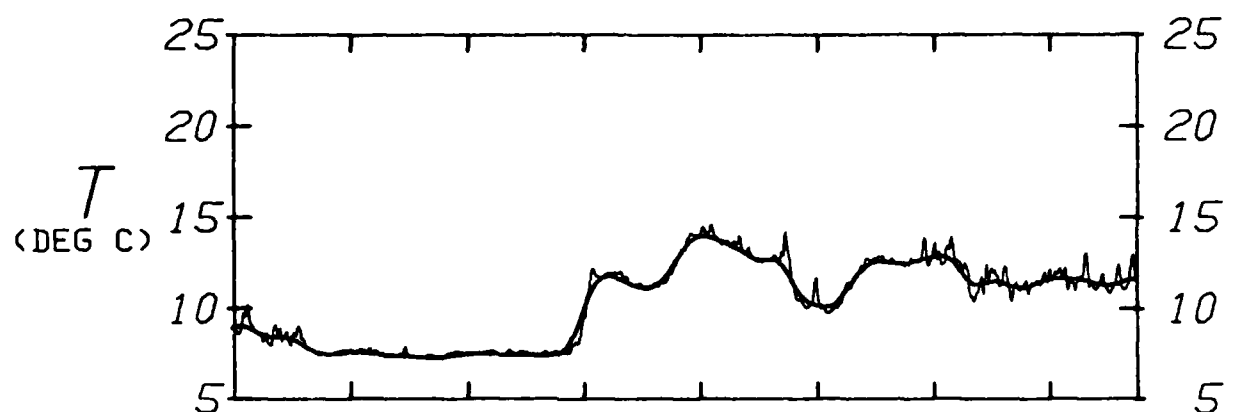
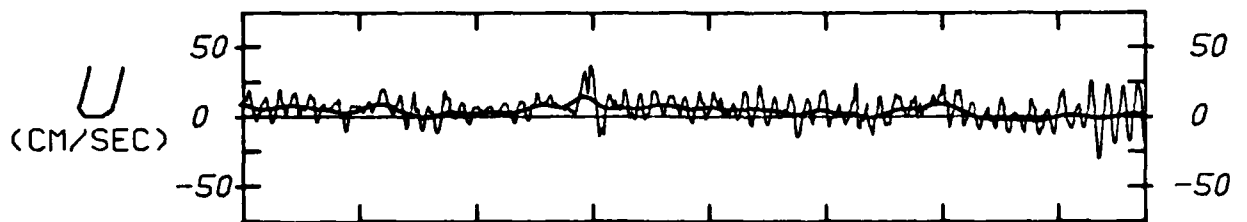
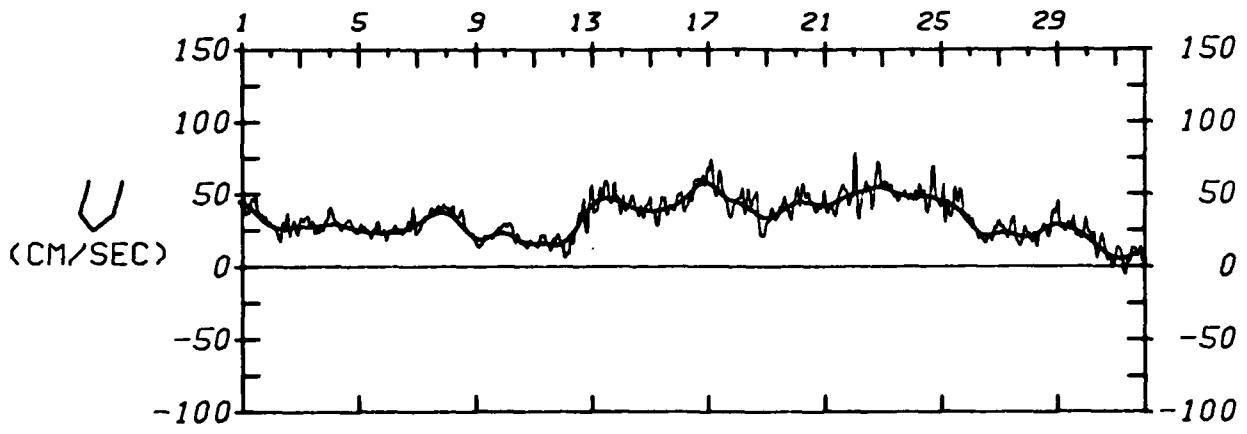
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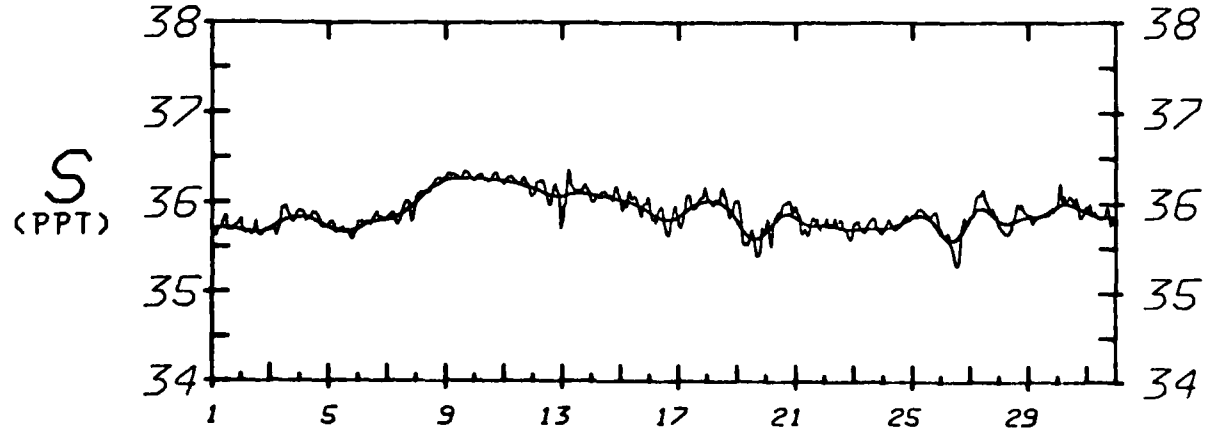
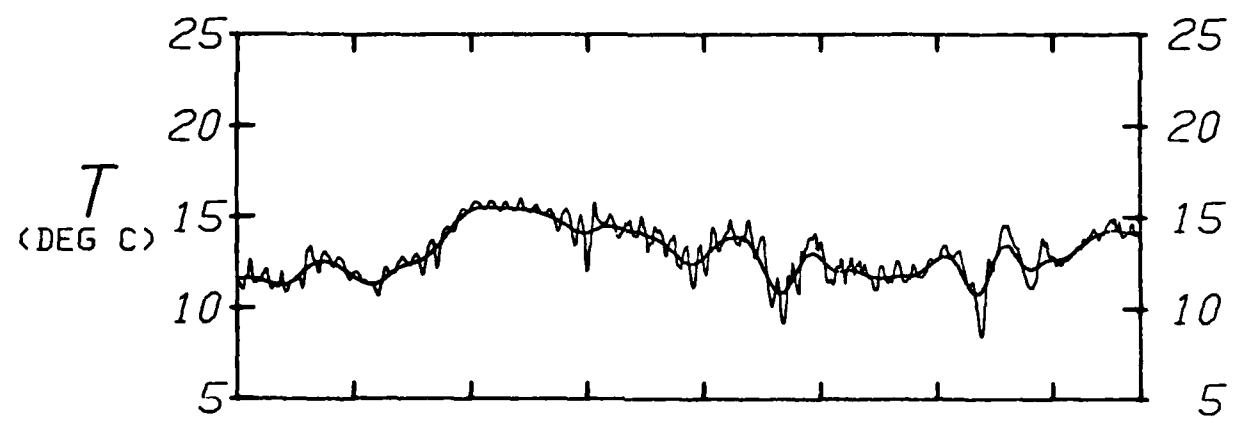
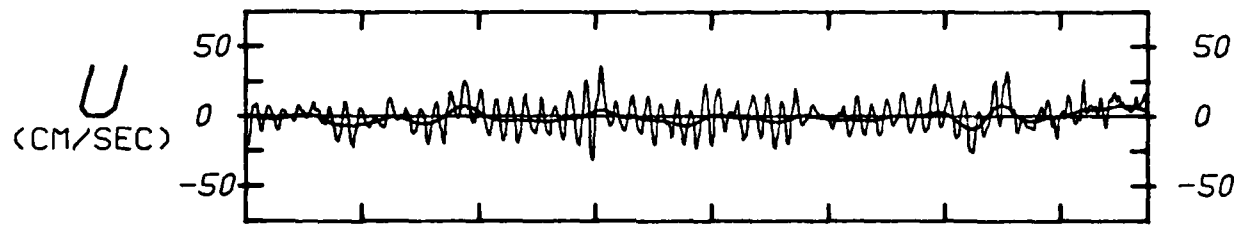
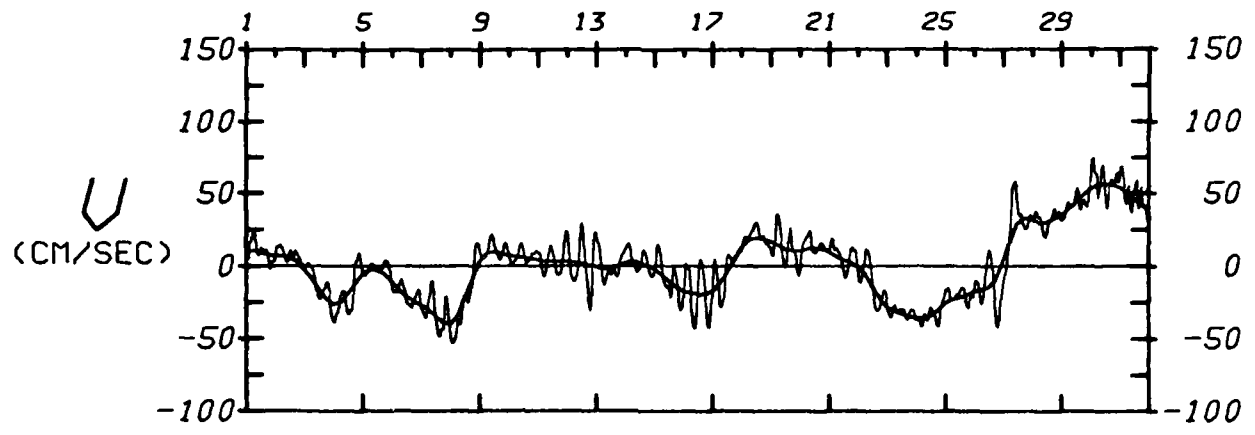
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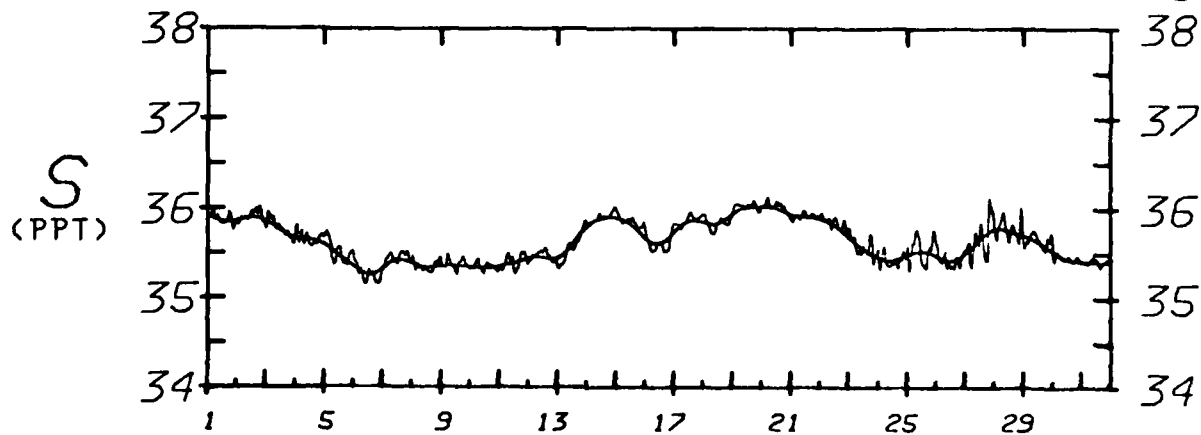
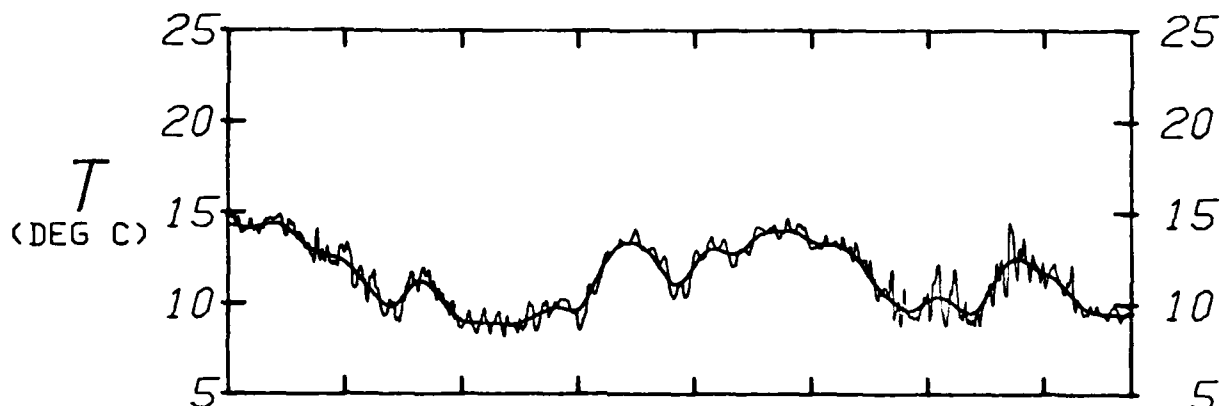
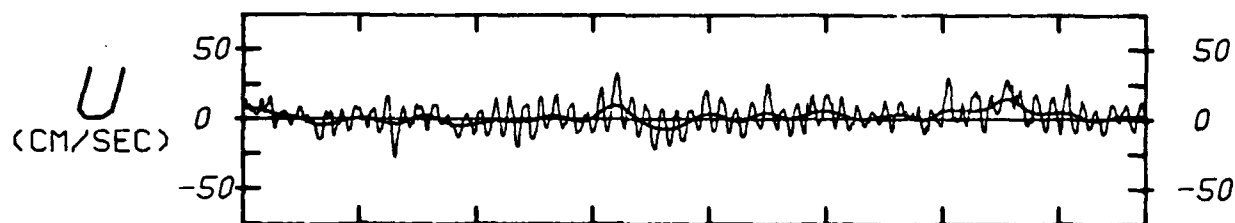
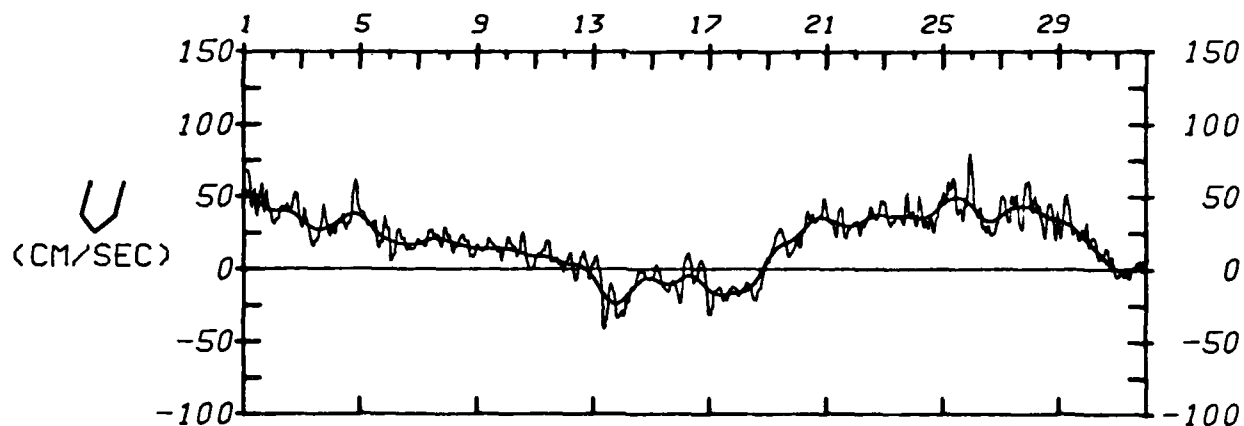
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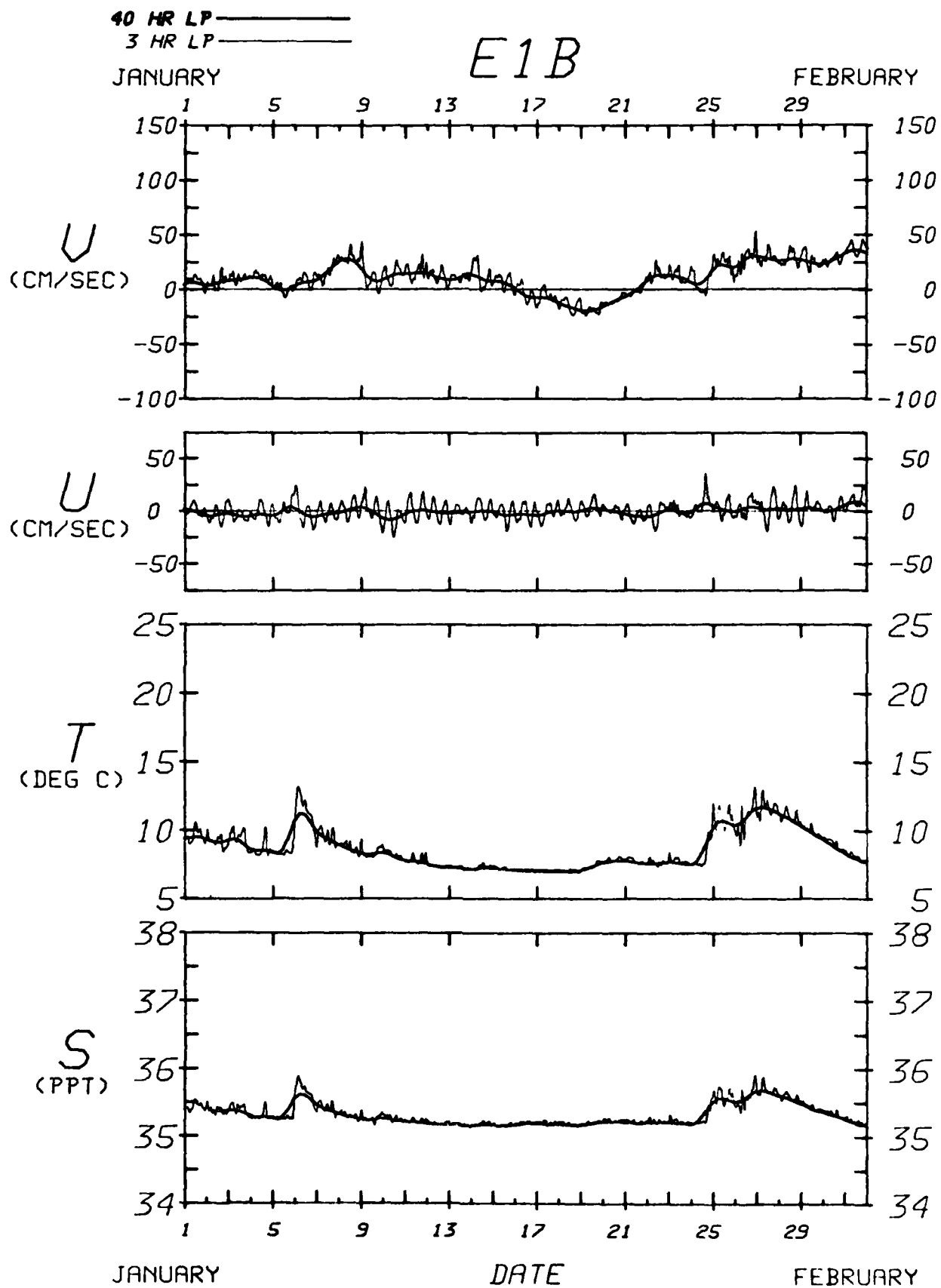
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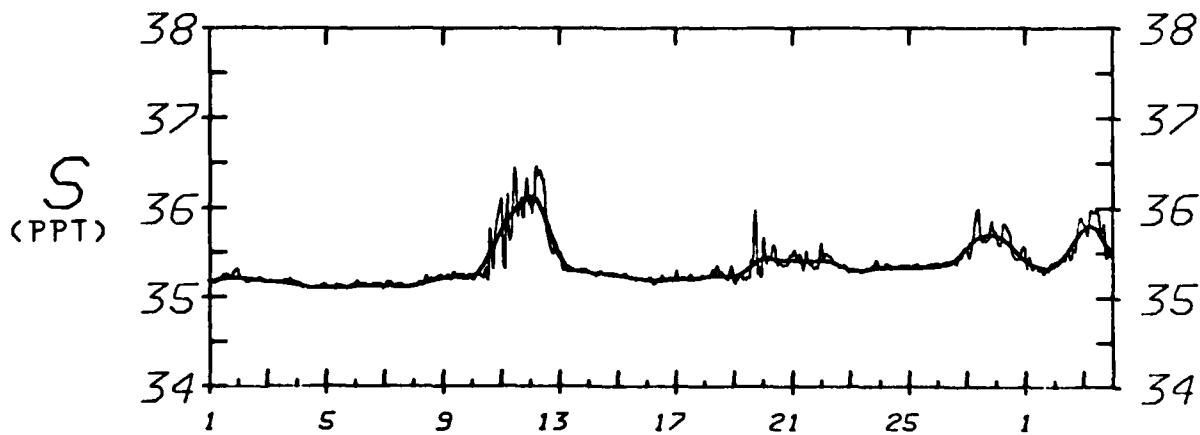
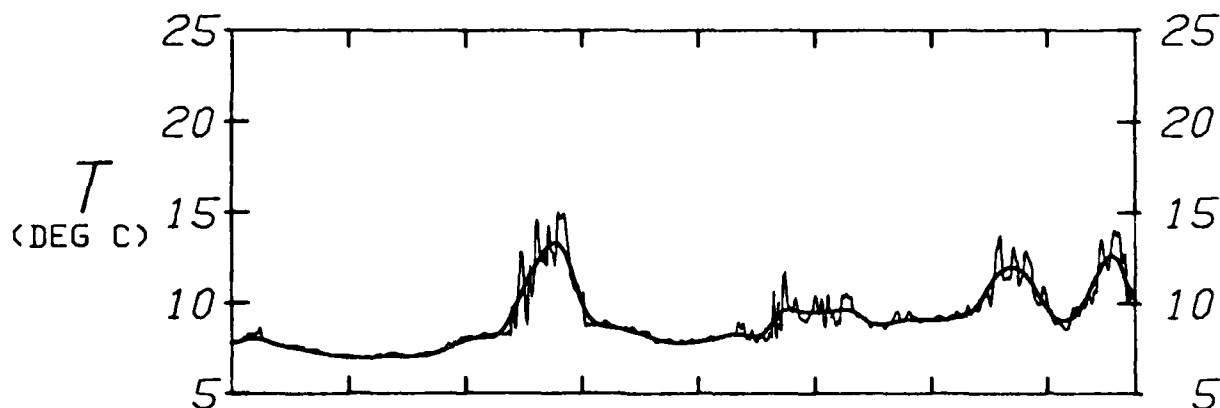
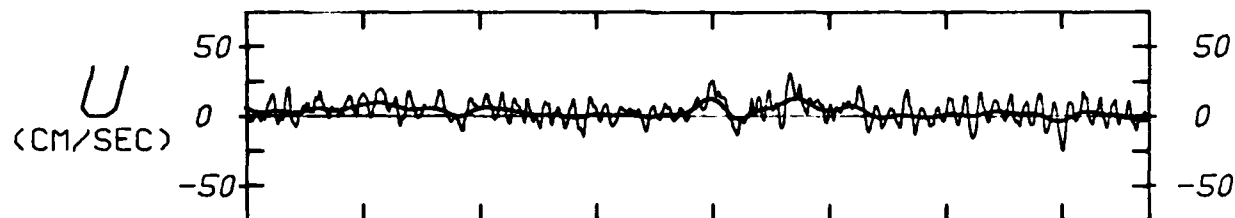
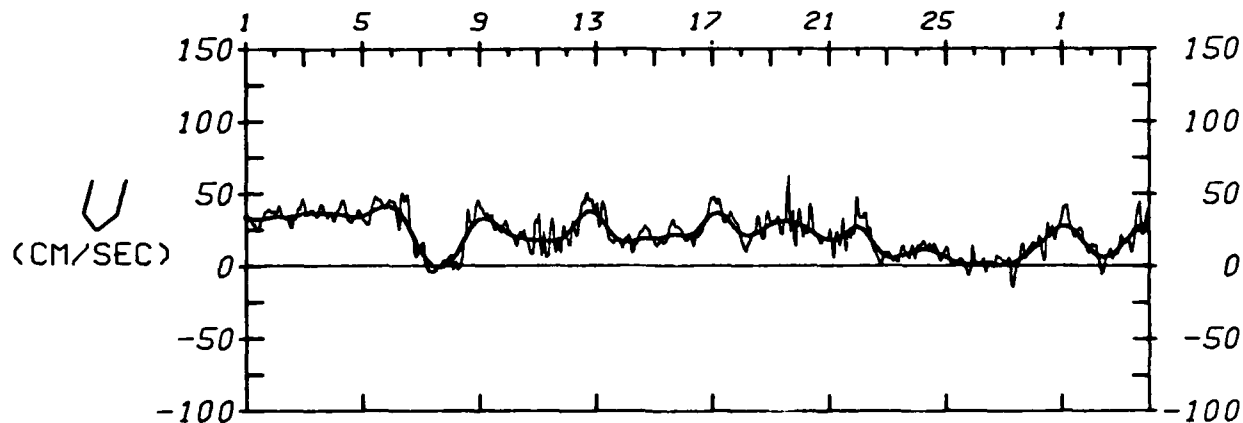


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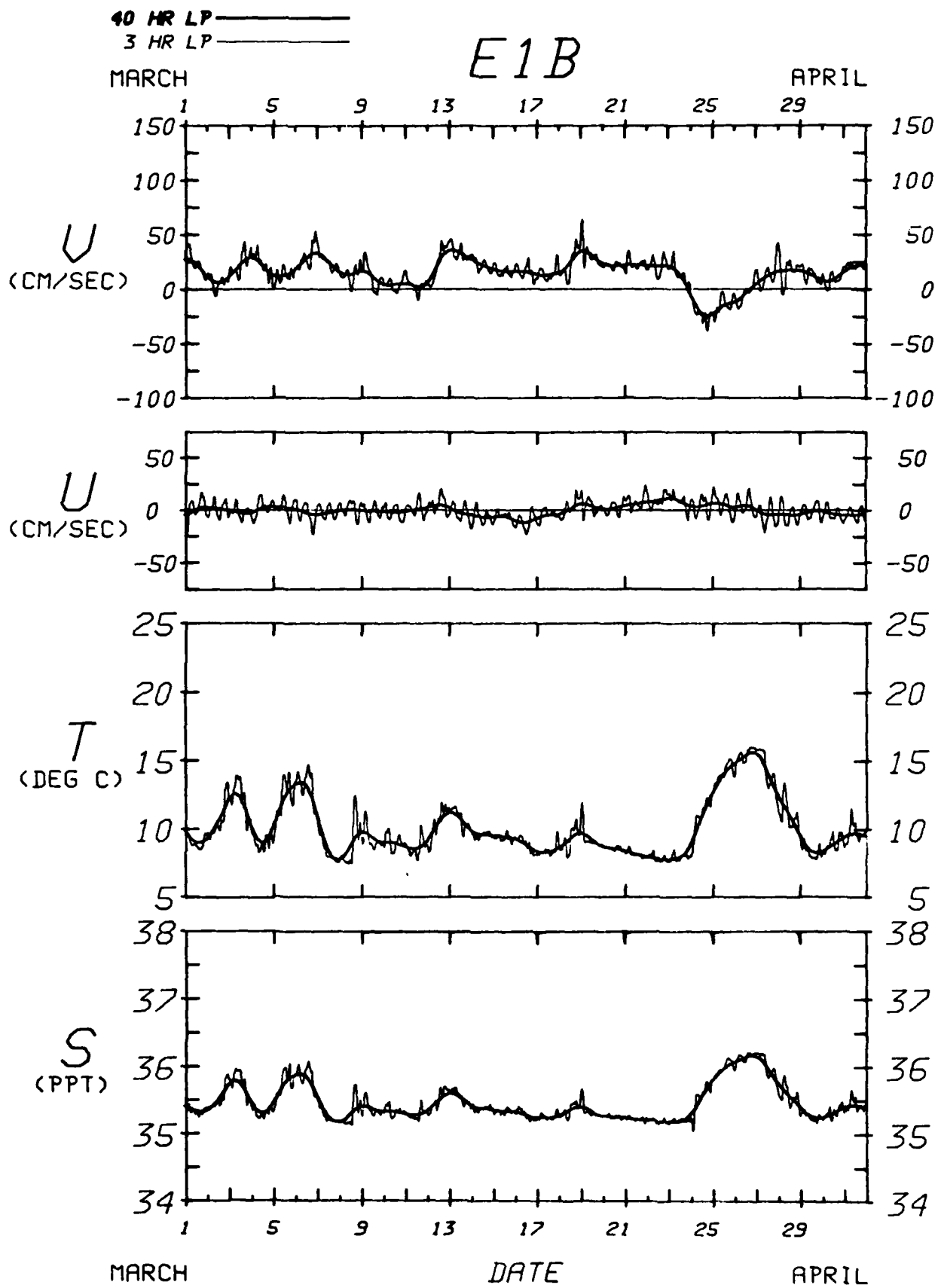
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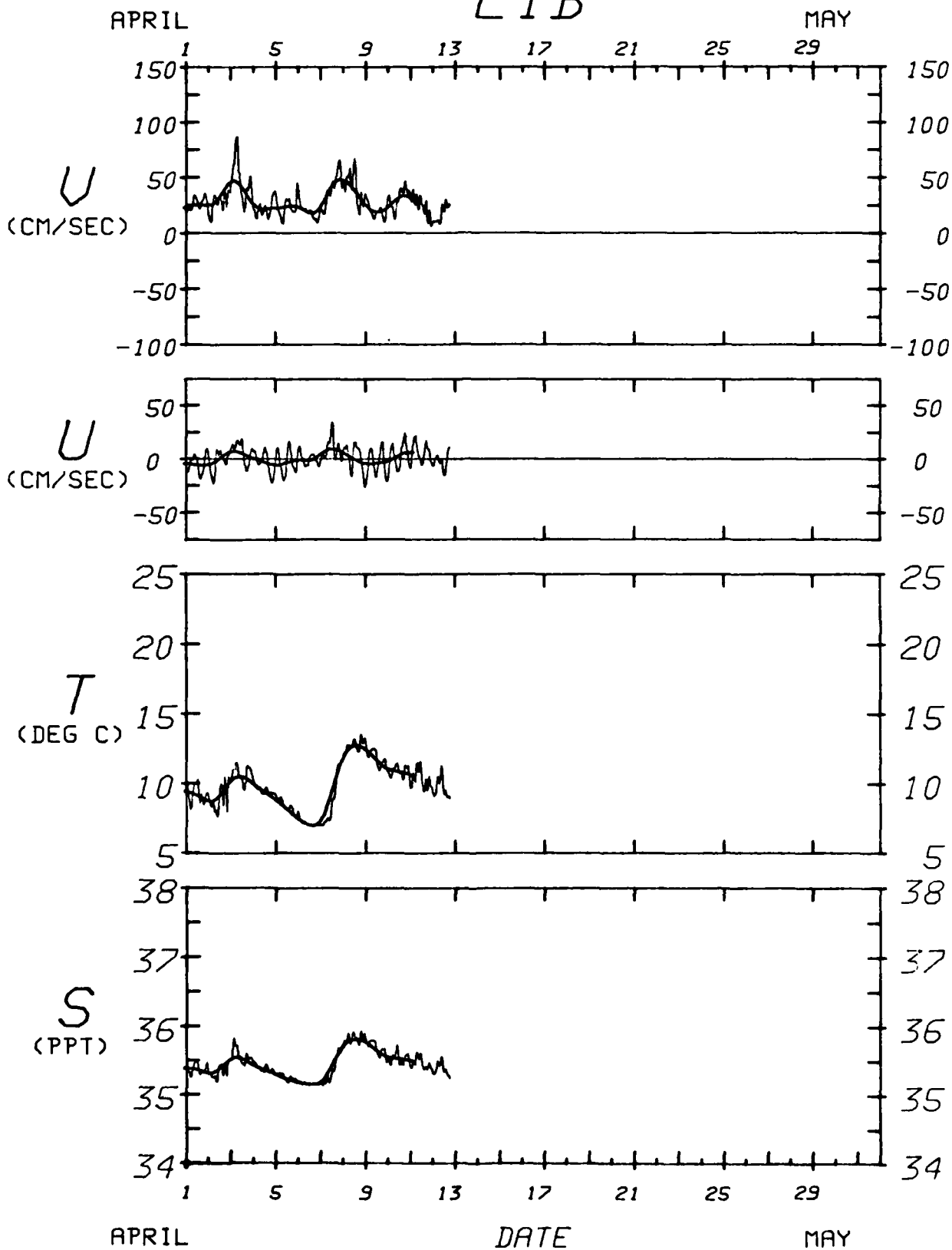
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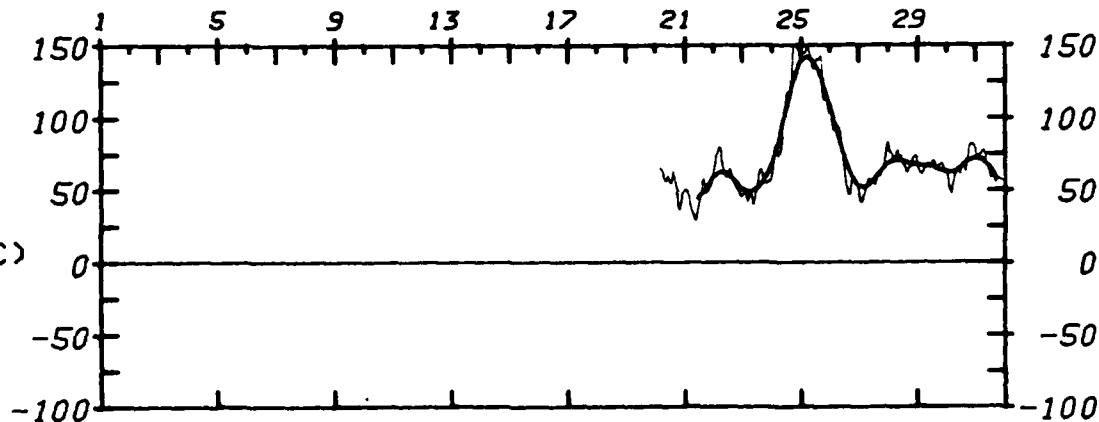
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E2T

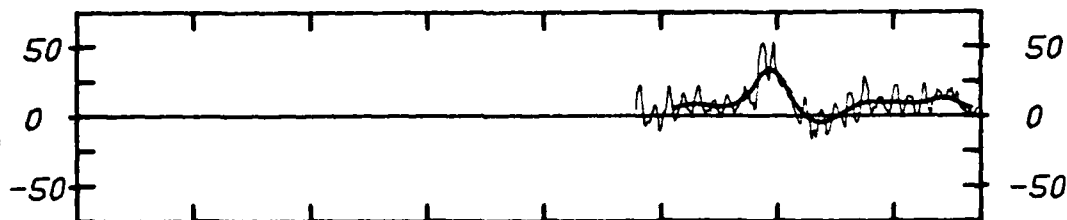
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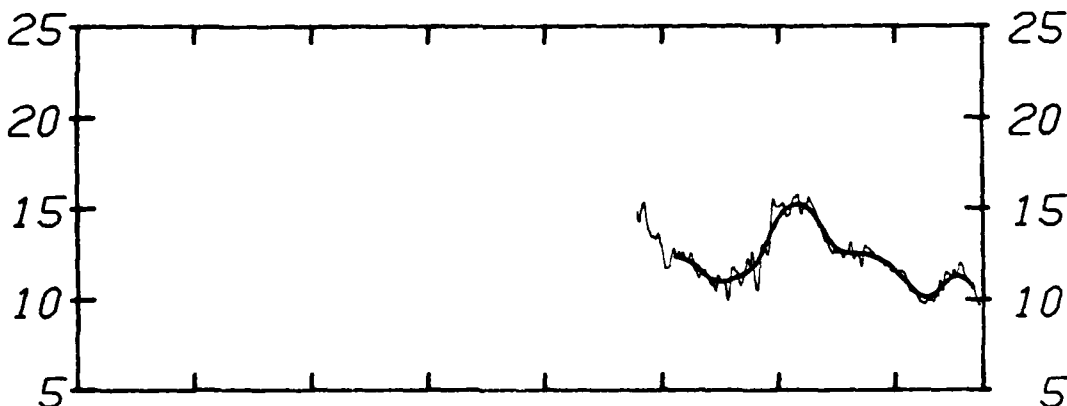
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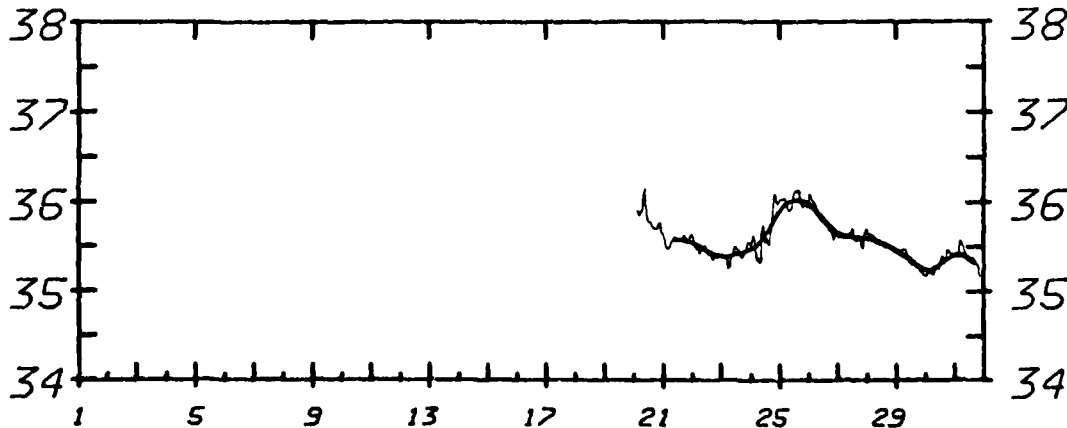
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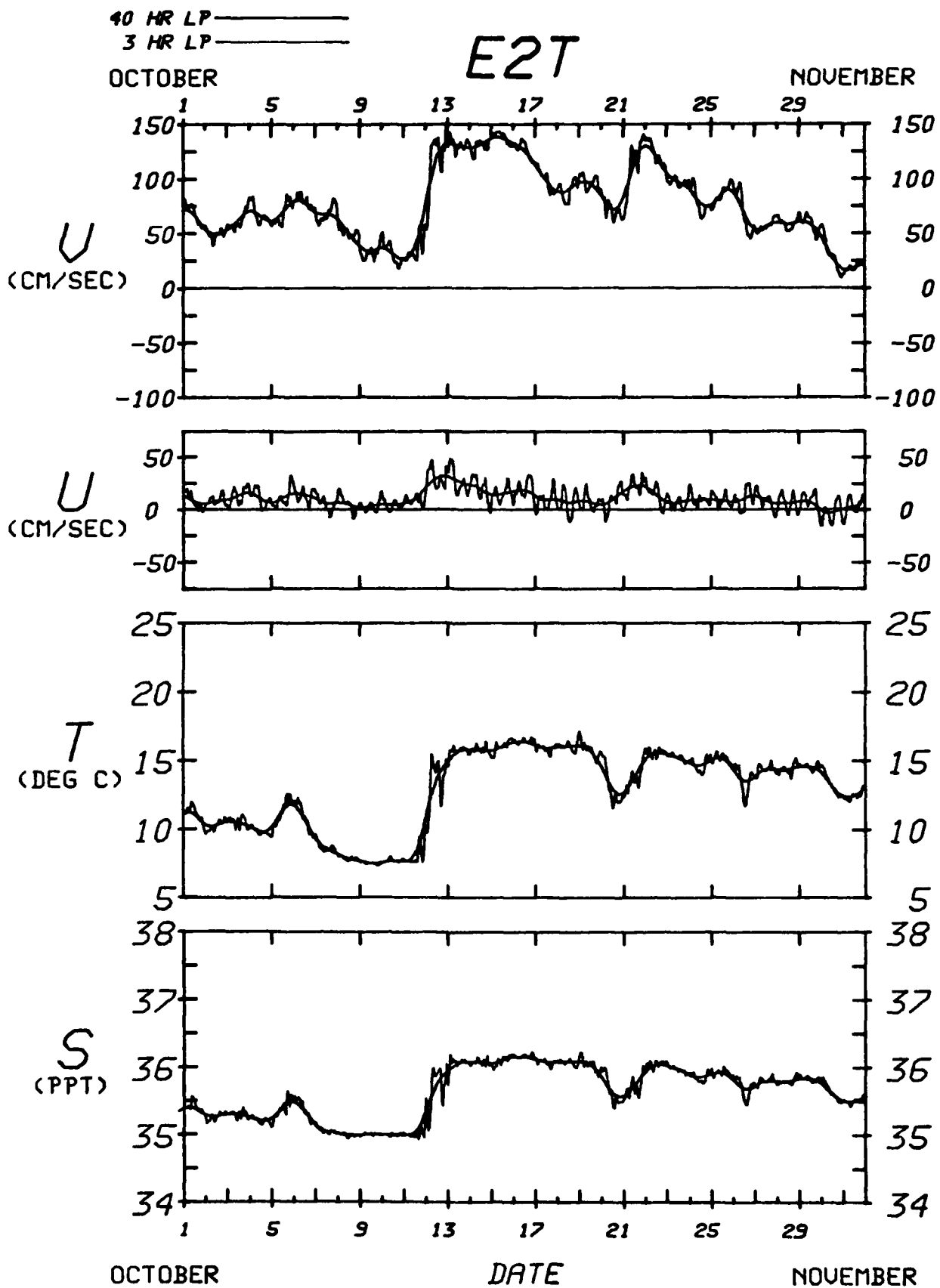
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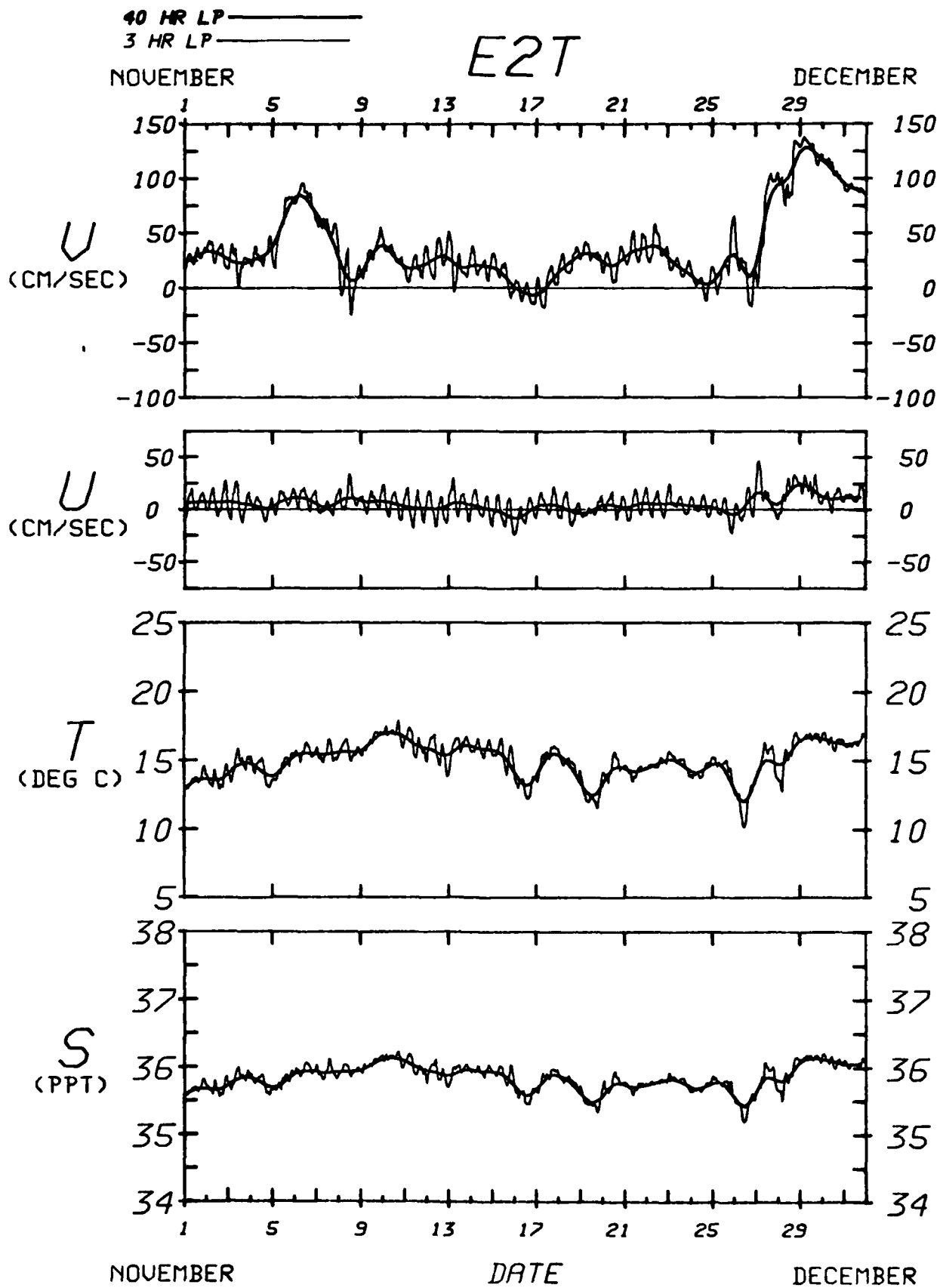


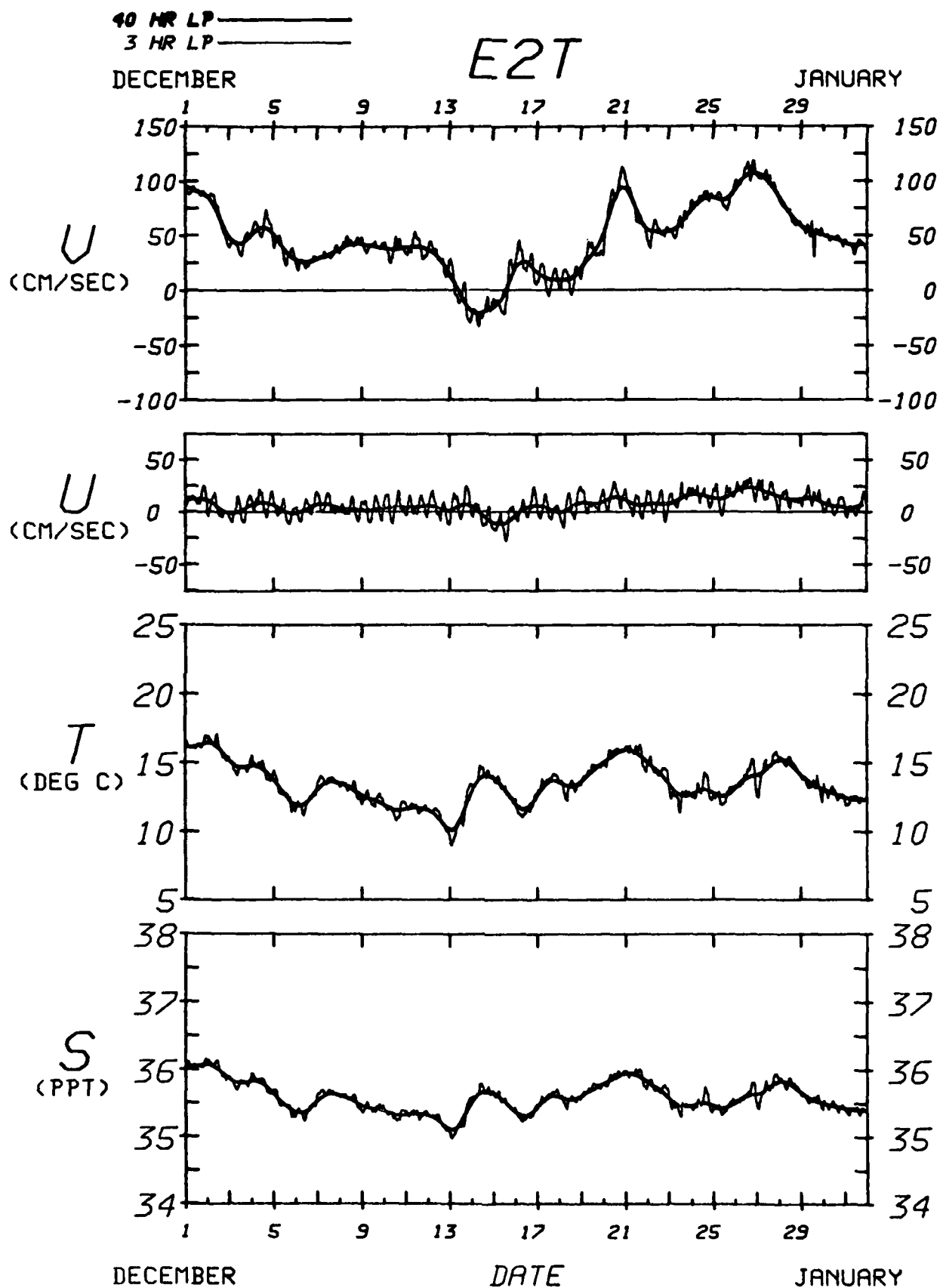
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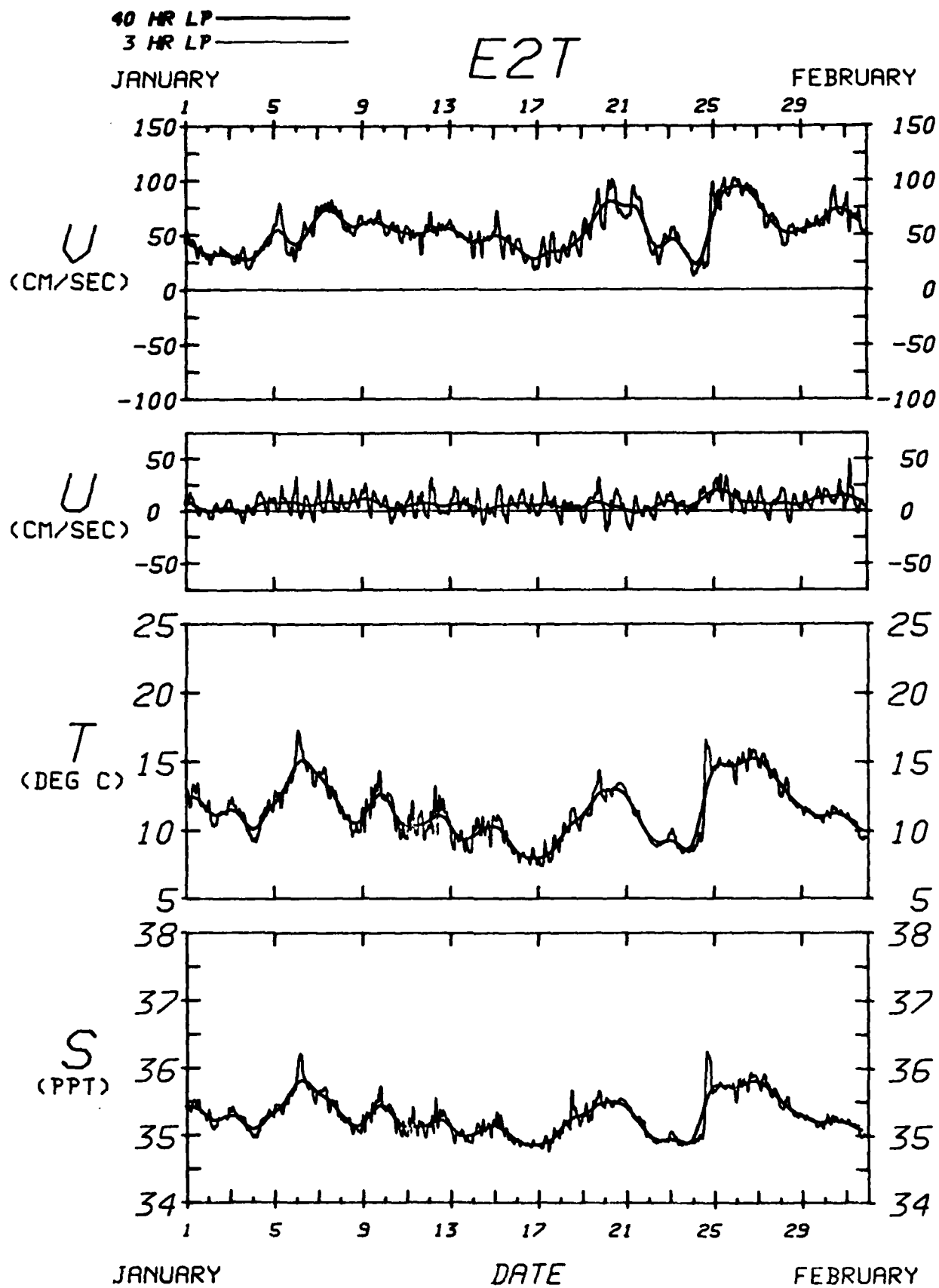
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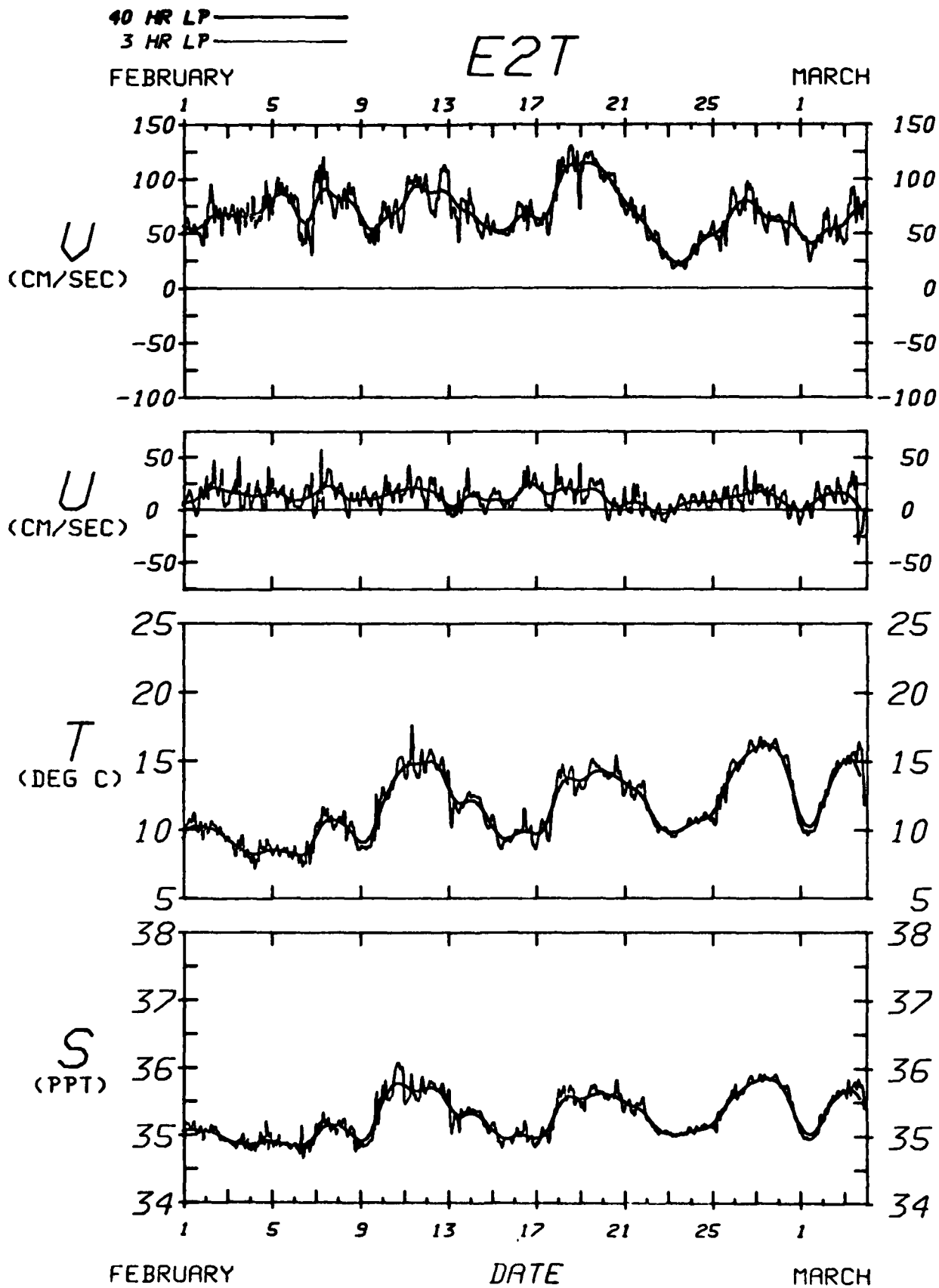
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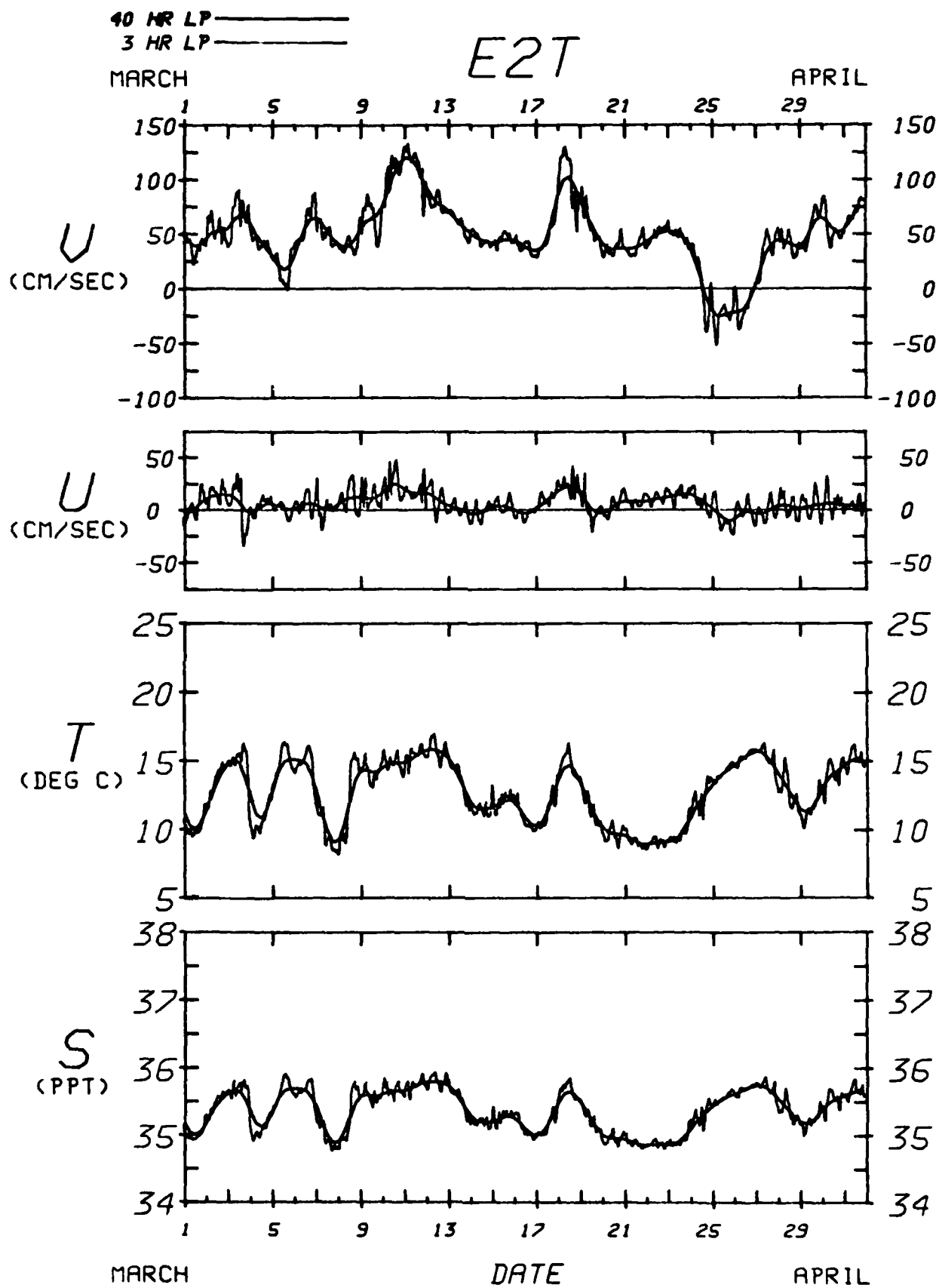


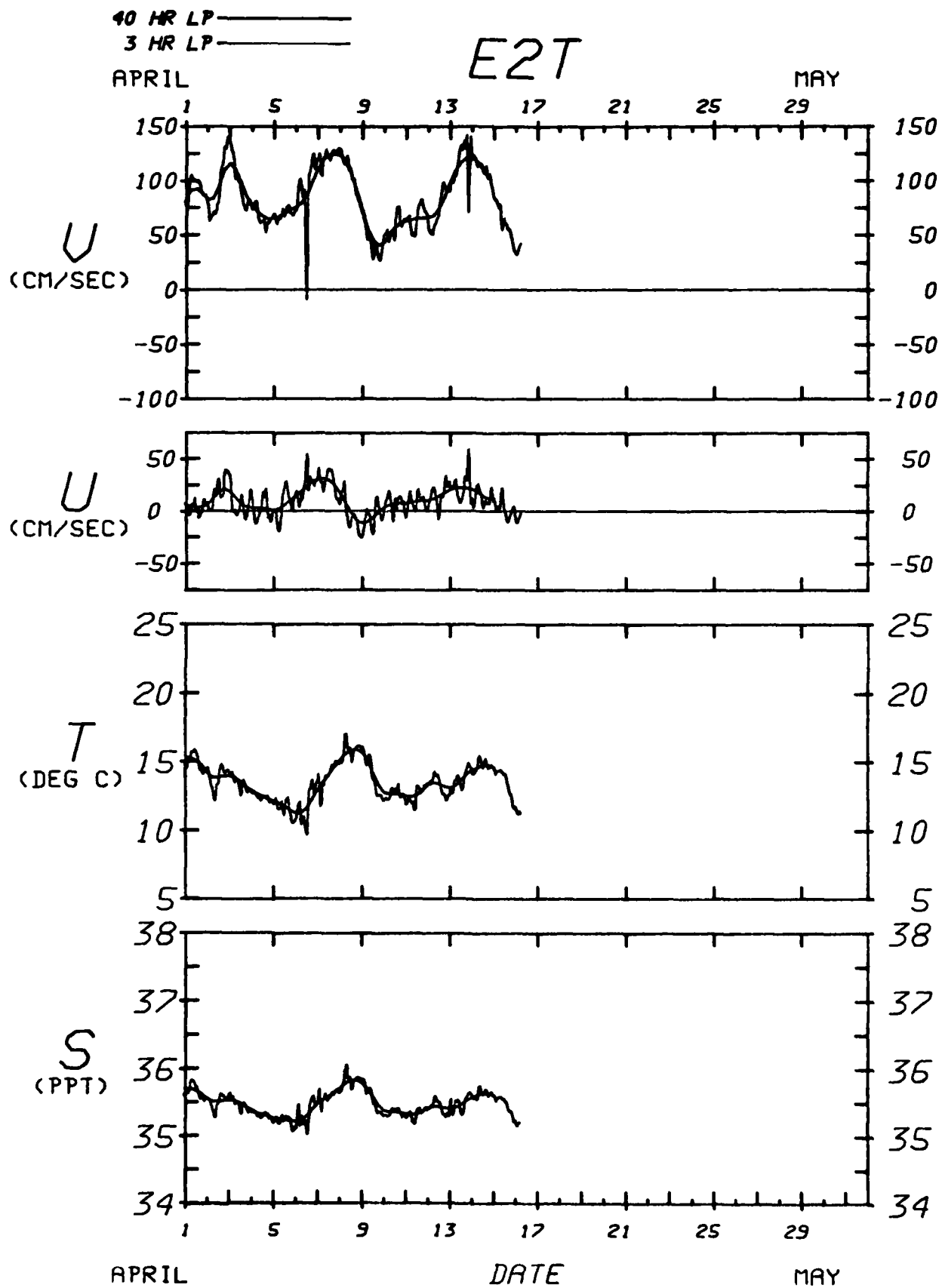












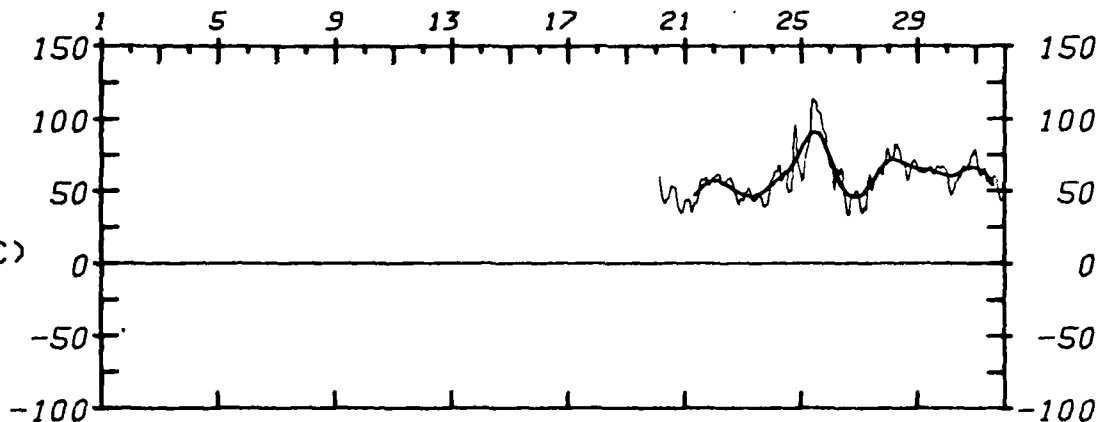
40 HR LP —————
3 HR LP - - - - -

E2B

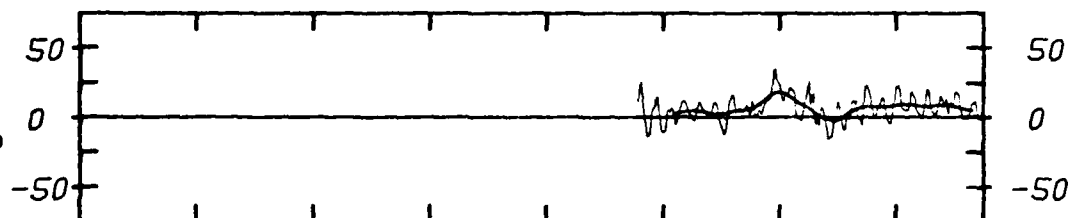
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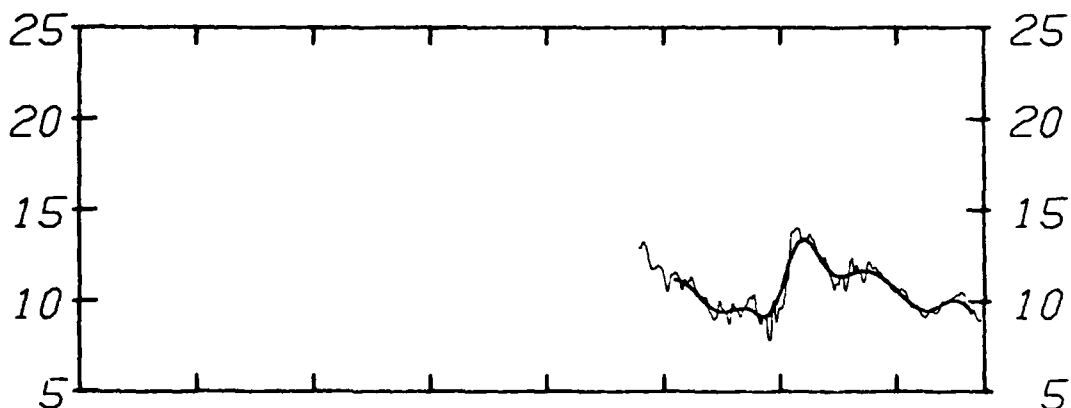
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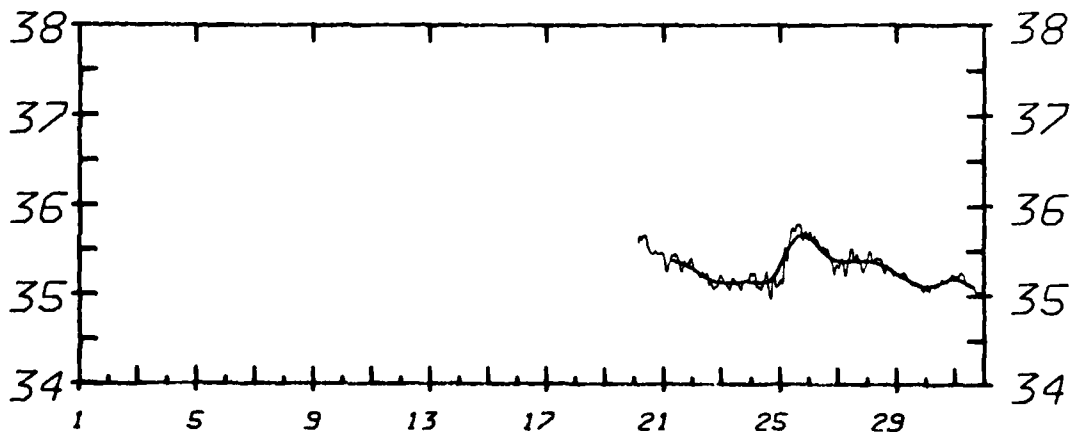
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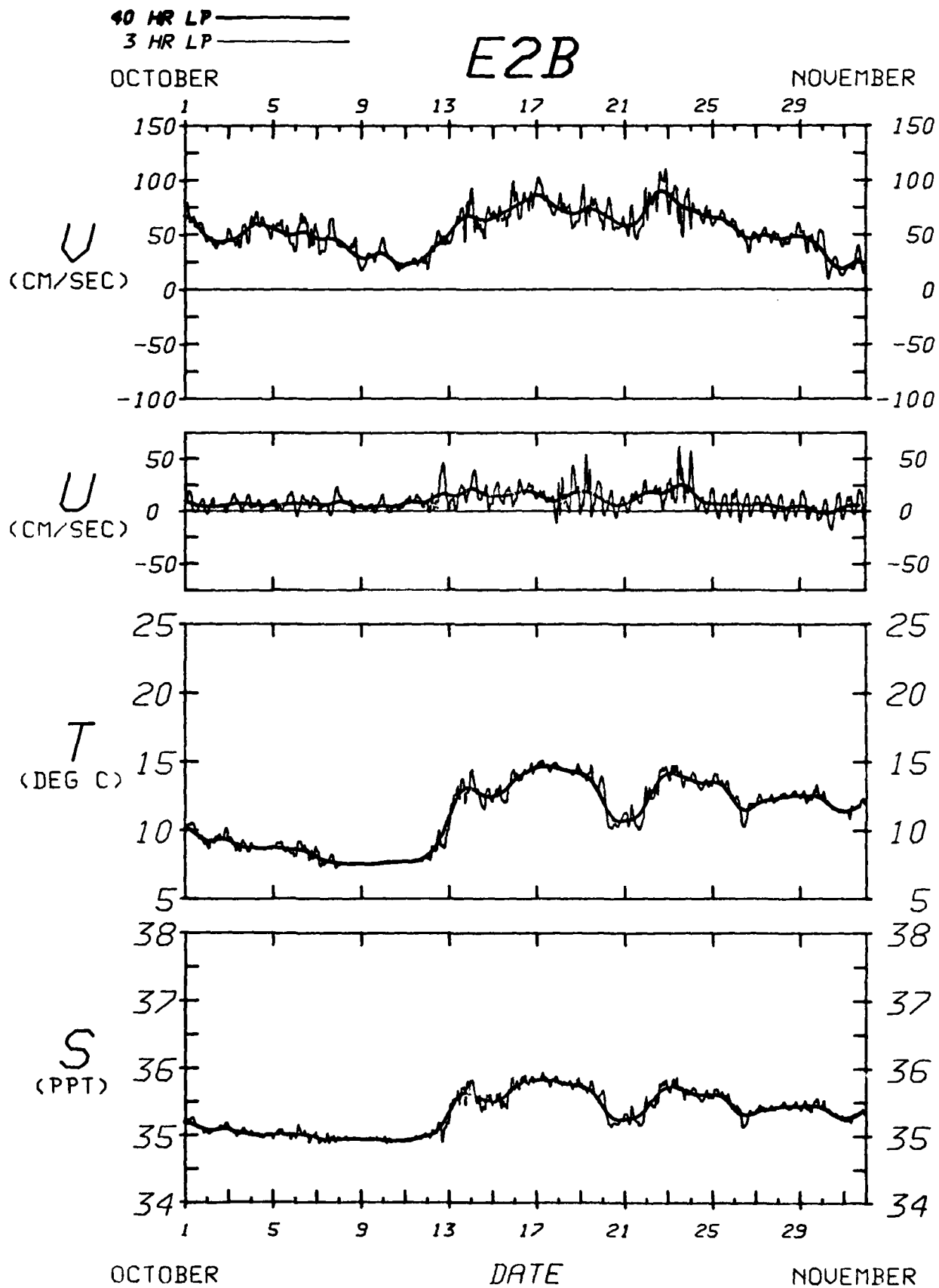
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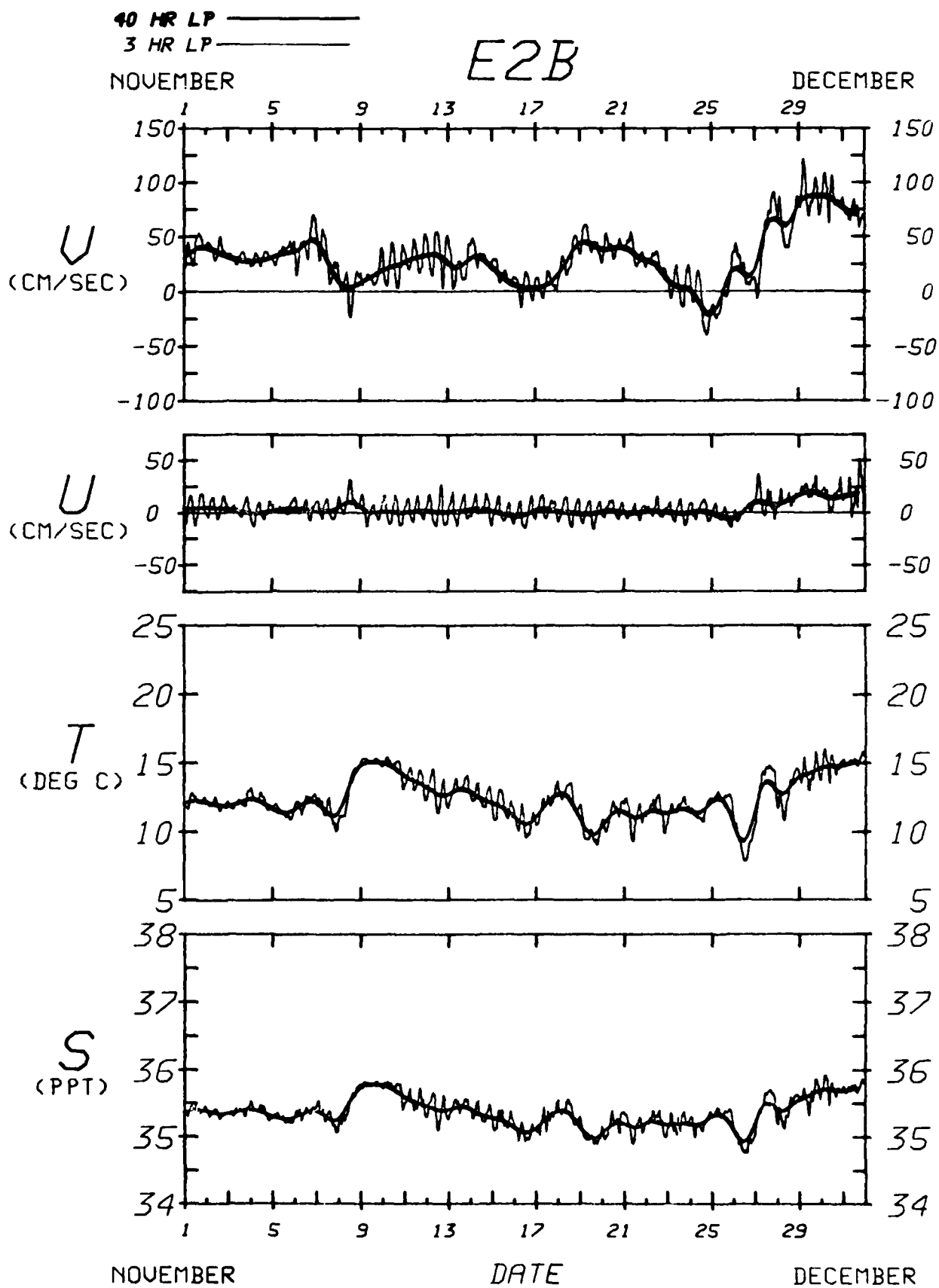


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EXPERIMENT CURRENT METE..(U) NORTH CAROLINA UNIV AT
CHAPEL HILL J M BANE ET AL. DEC 83 CMS-83-2
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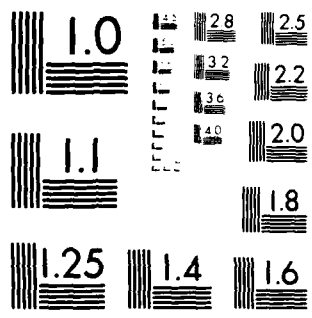
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UNCLASSIFIED NO0014-77-C-0354

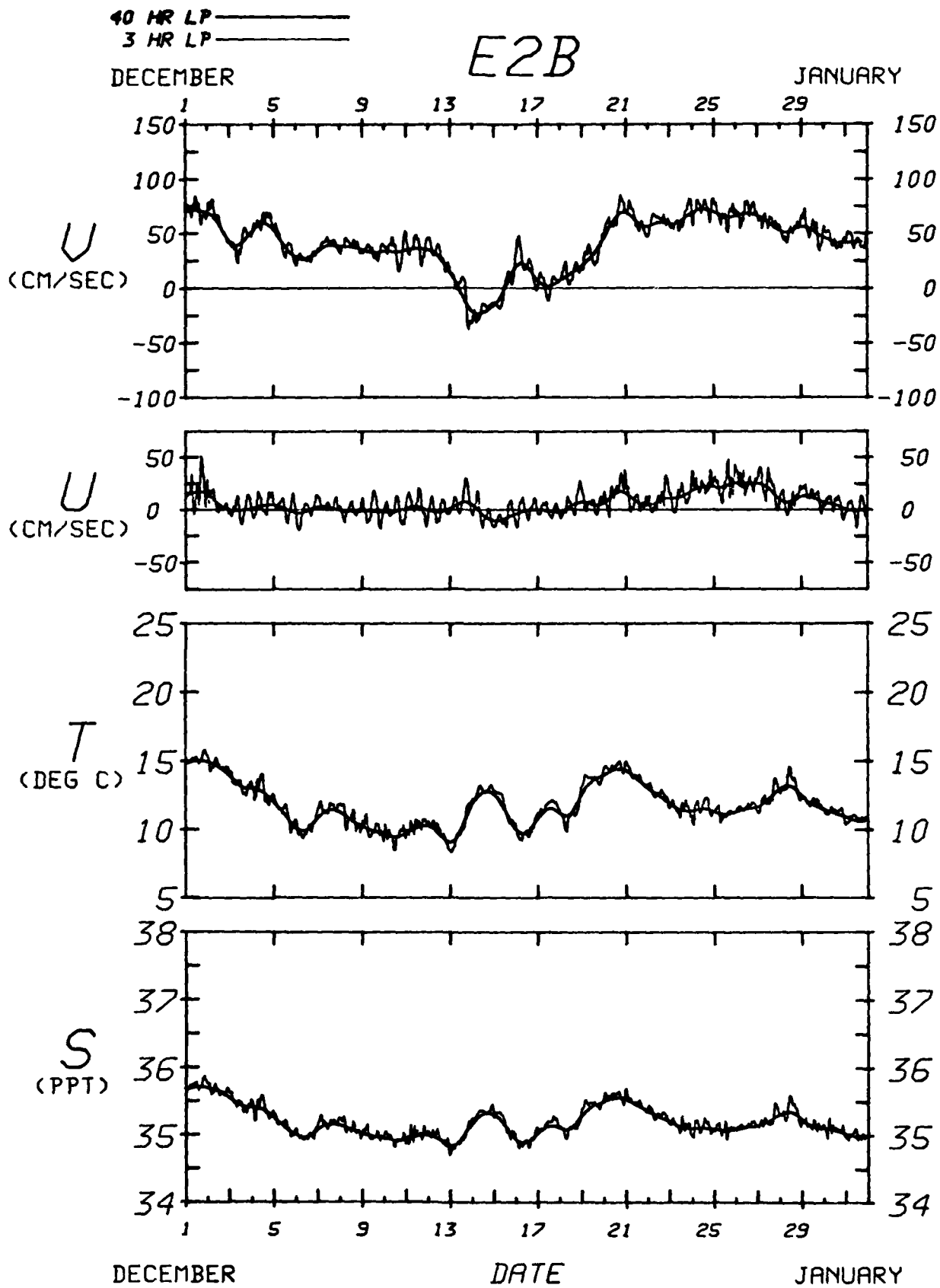
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

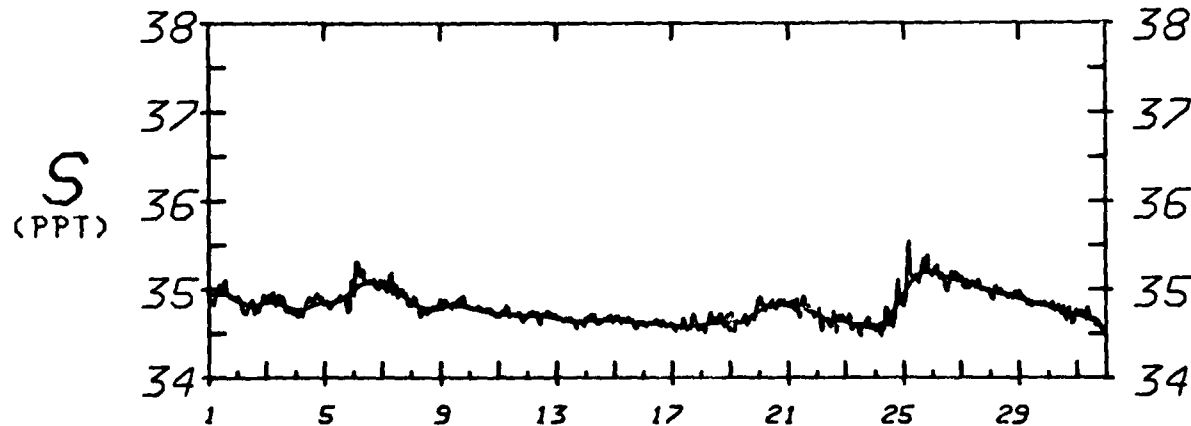
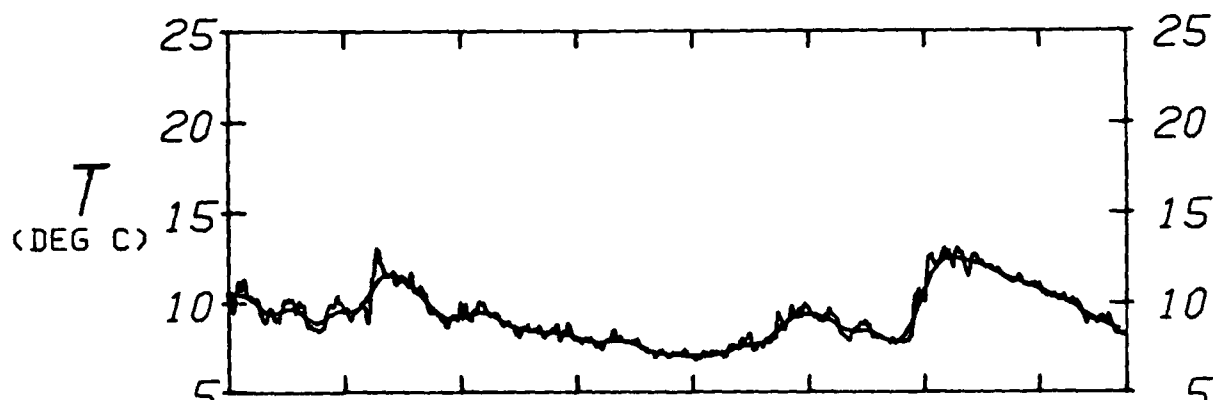
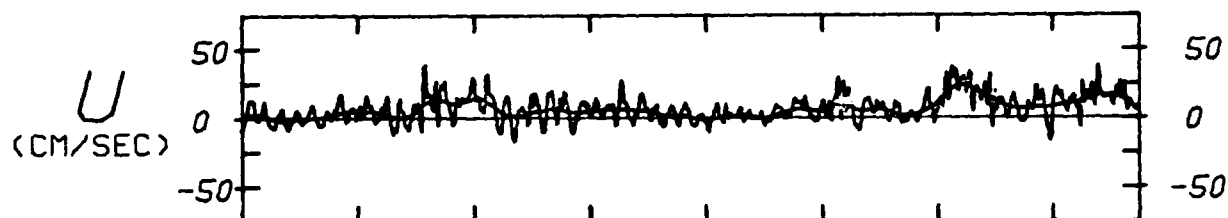
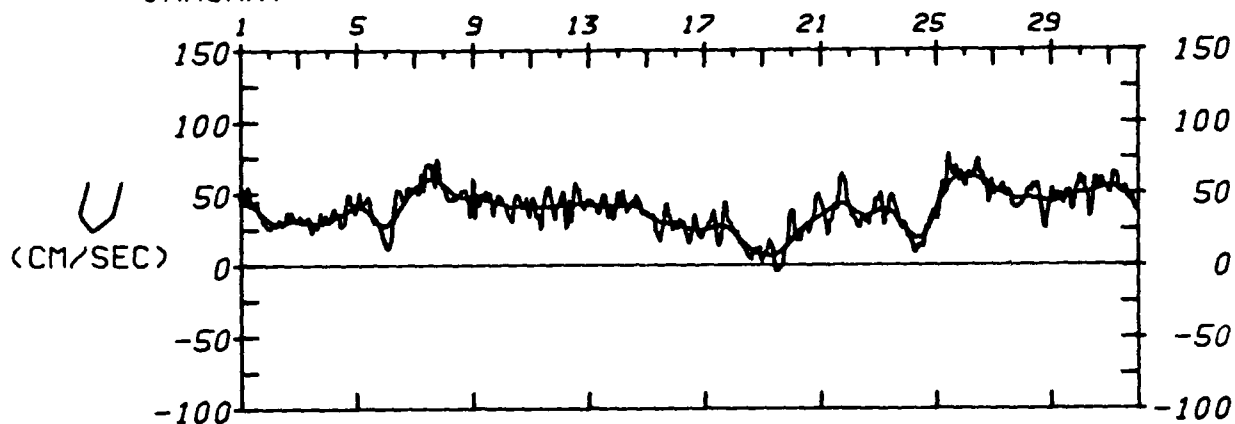


40 HR LP
3 HR LP

E2B

JANUARY

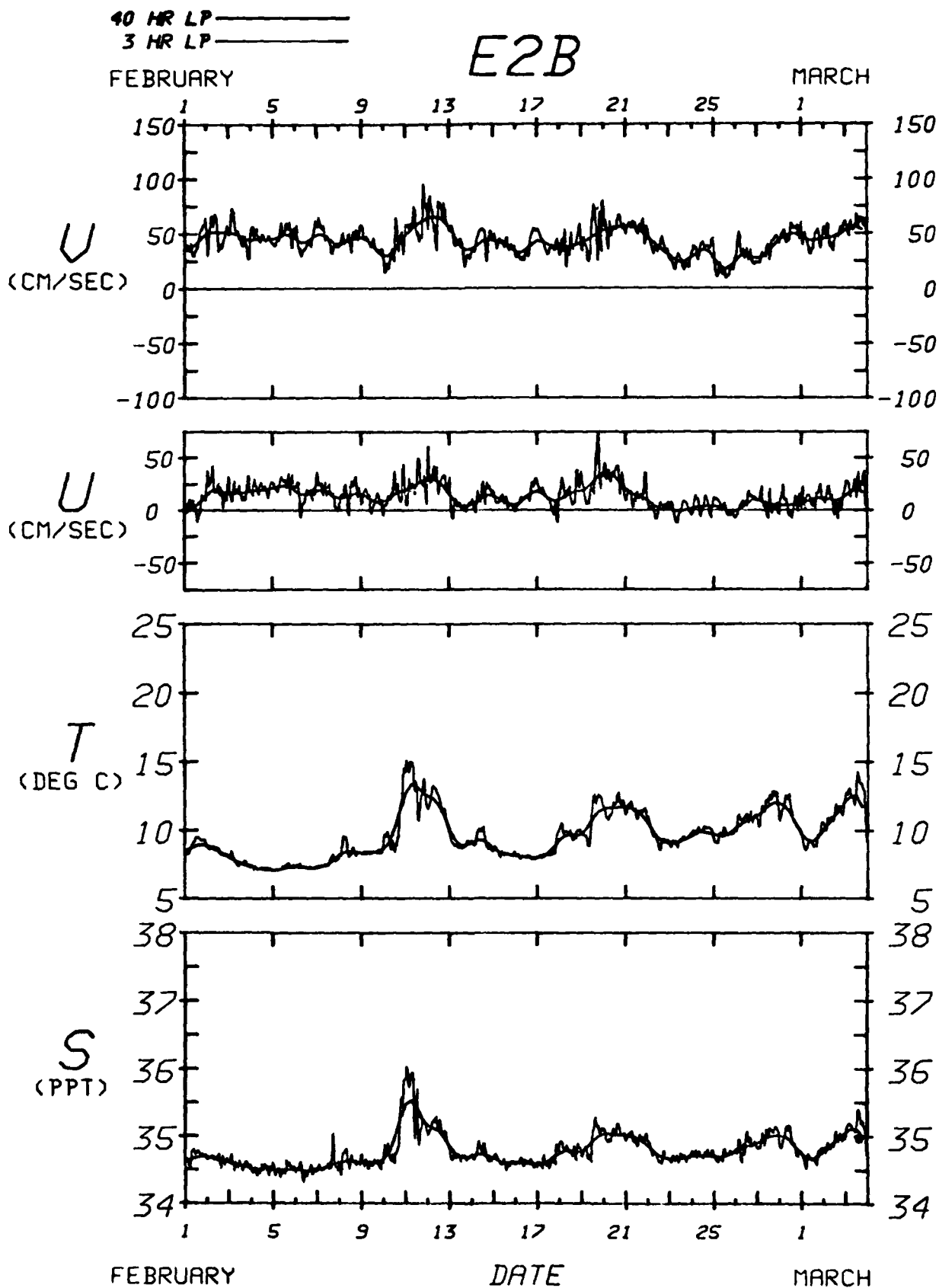
FEBRUARY

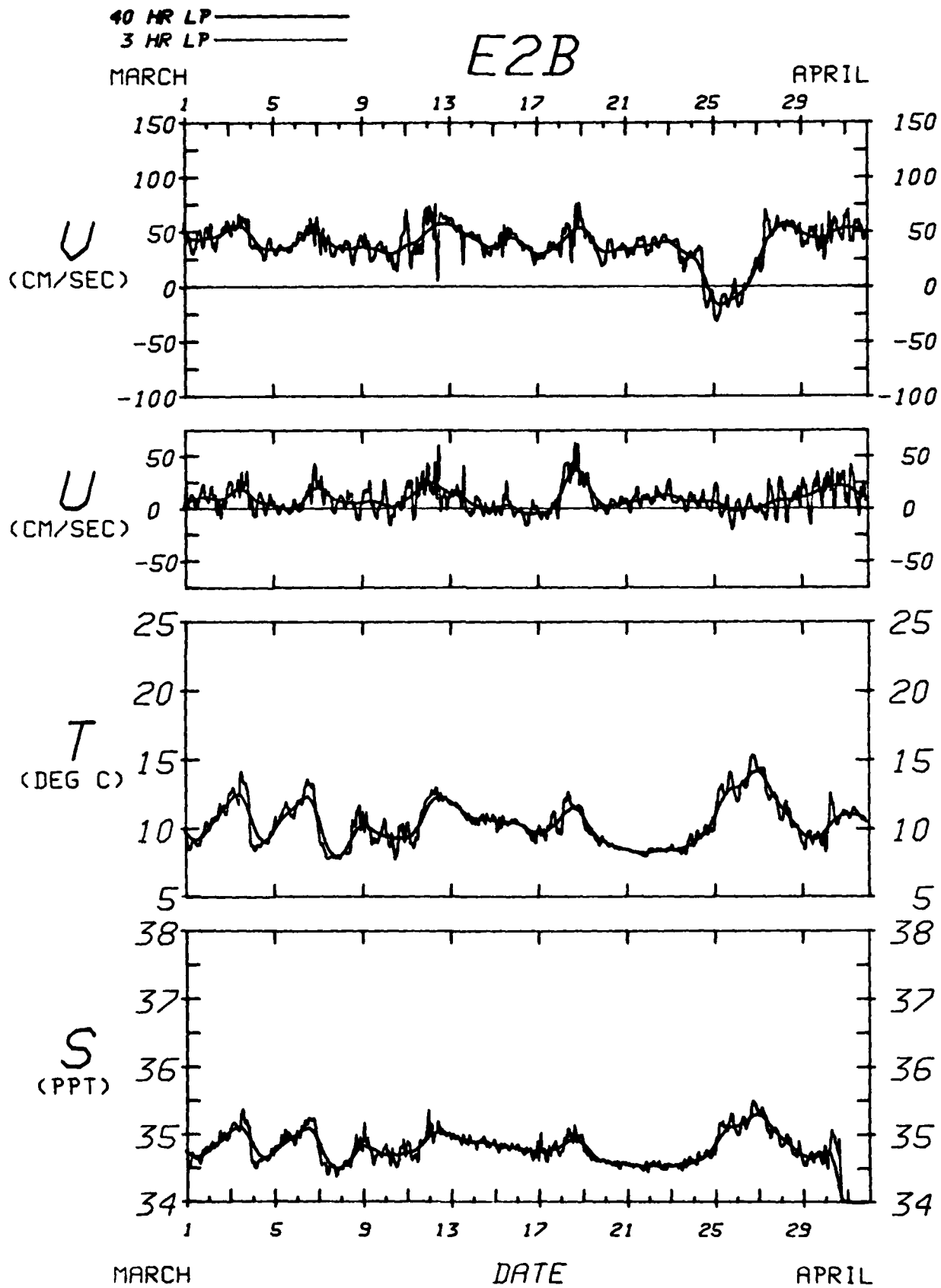


JANUARY

DATE

FEBRUARY



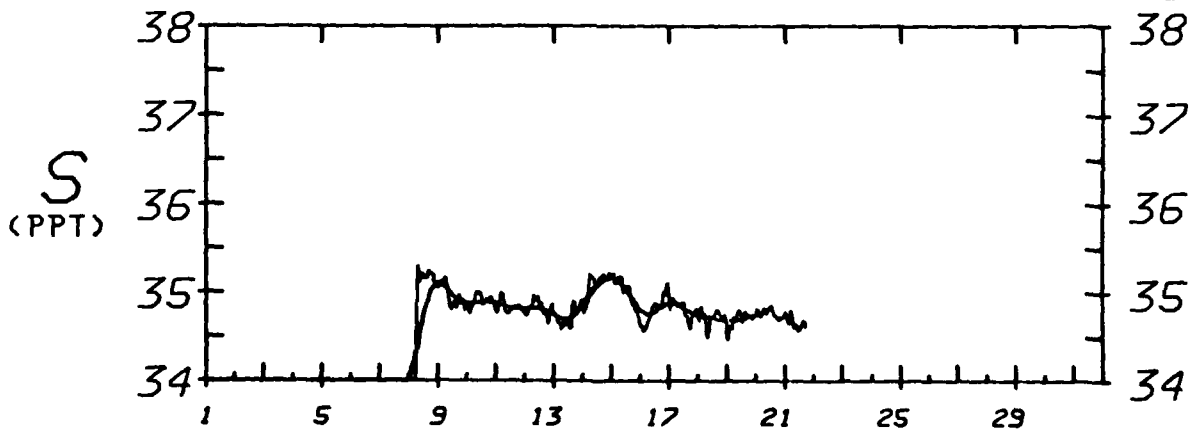
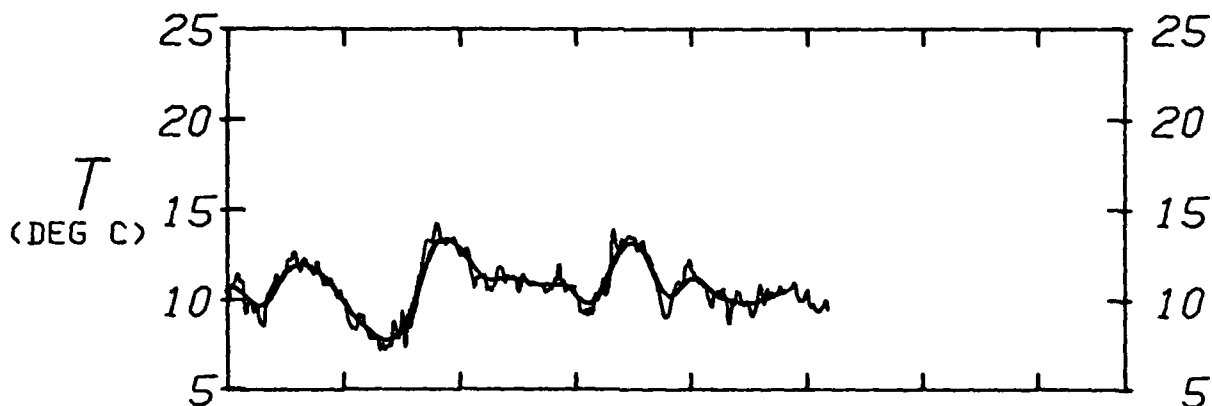
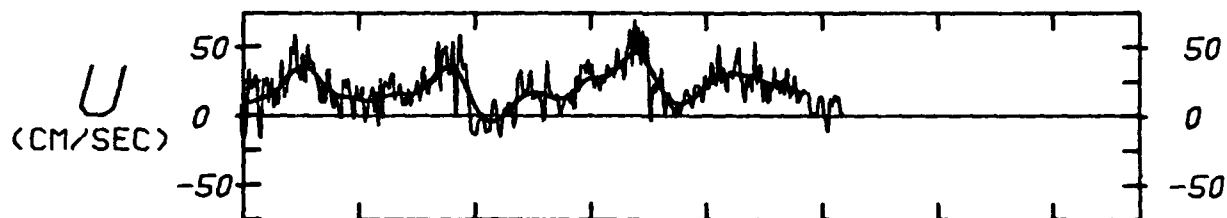
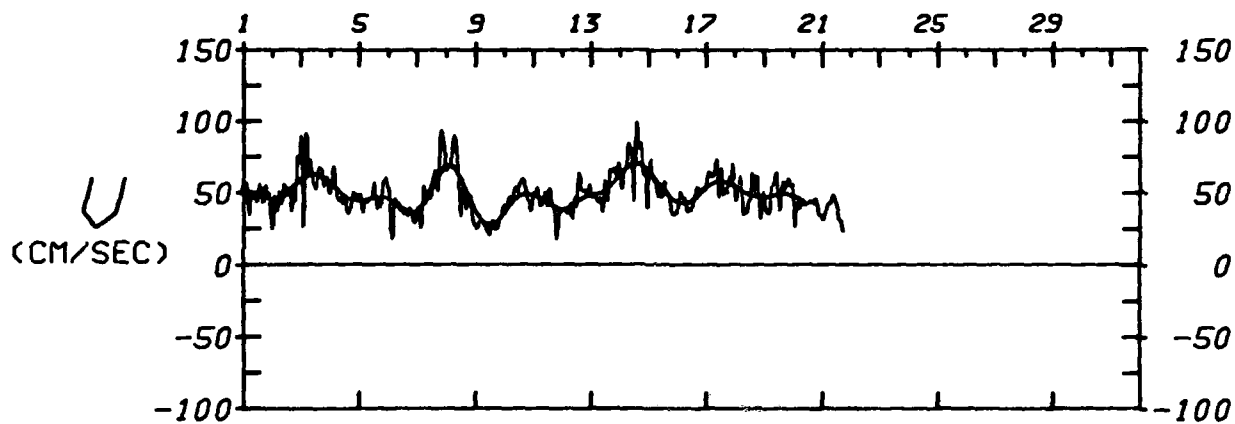


40 HR LP
3 HR LP

E2B

APRIL

MAY



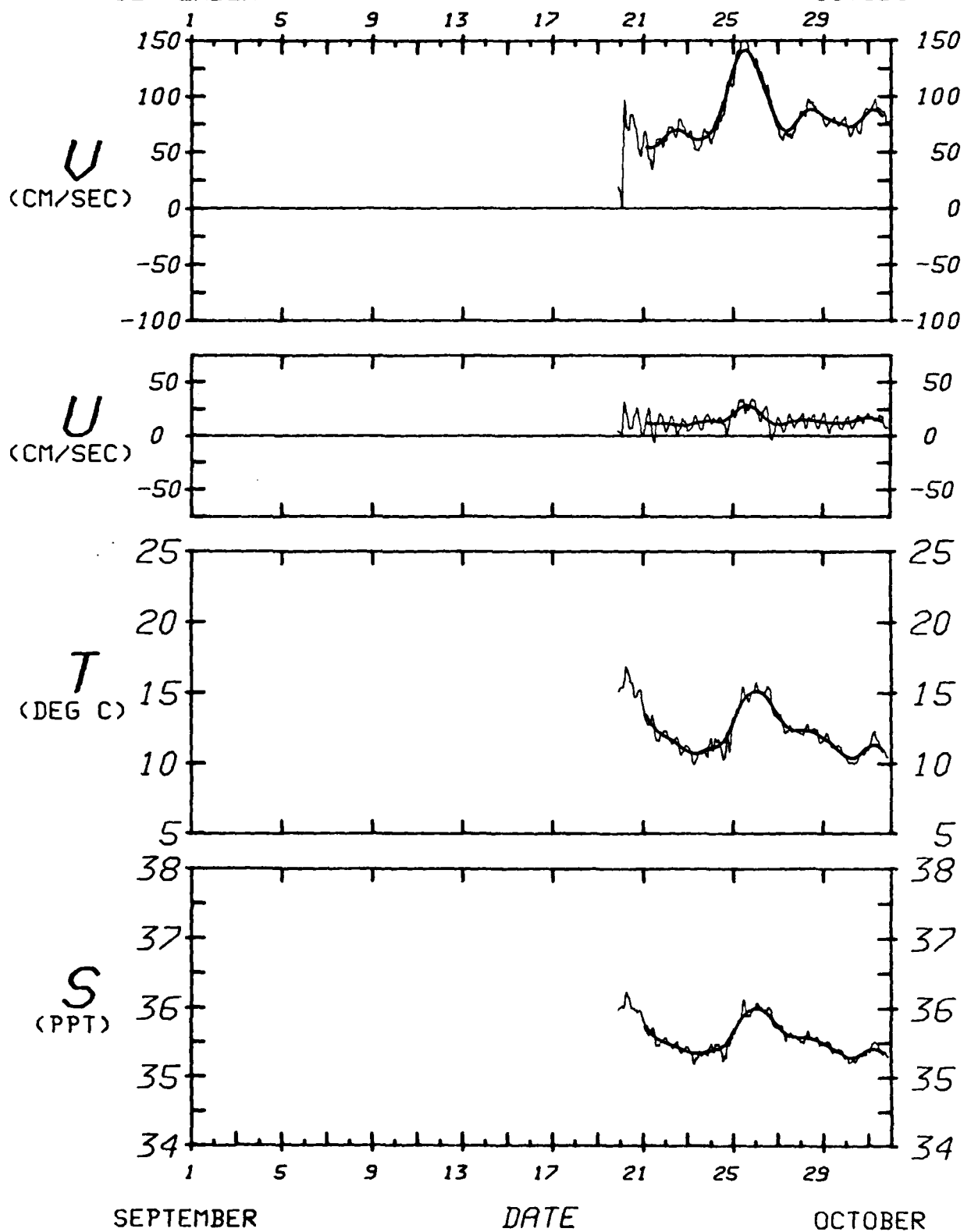
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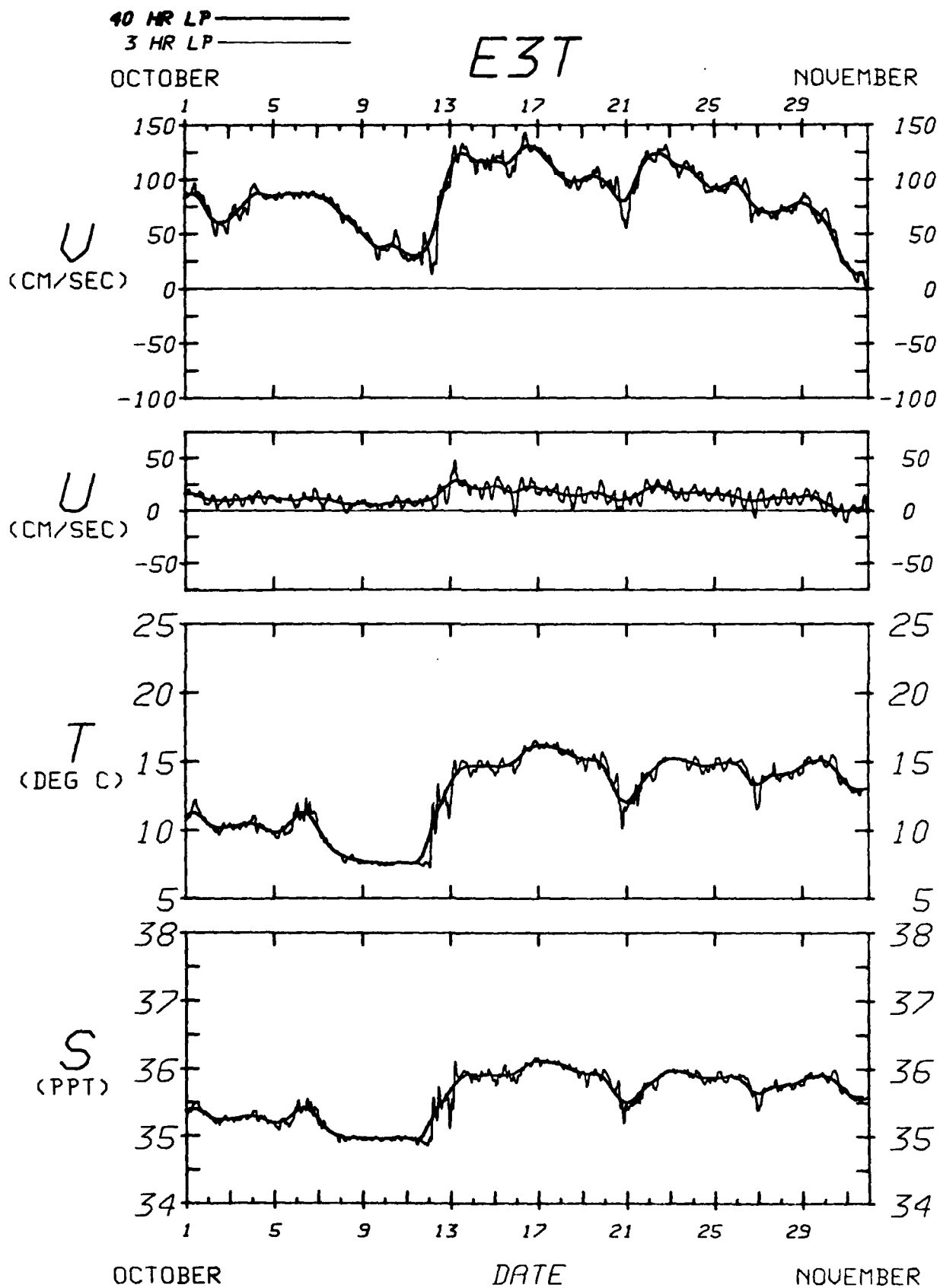
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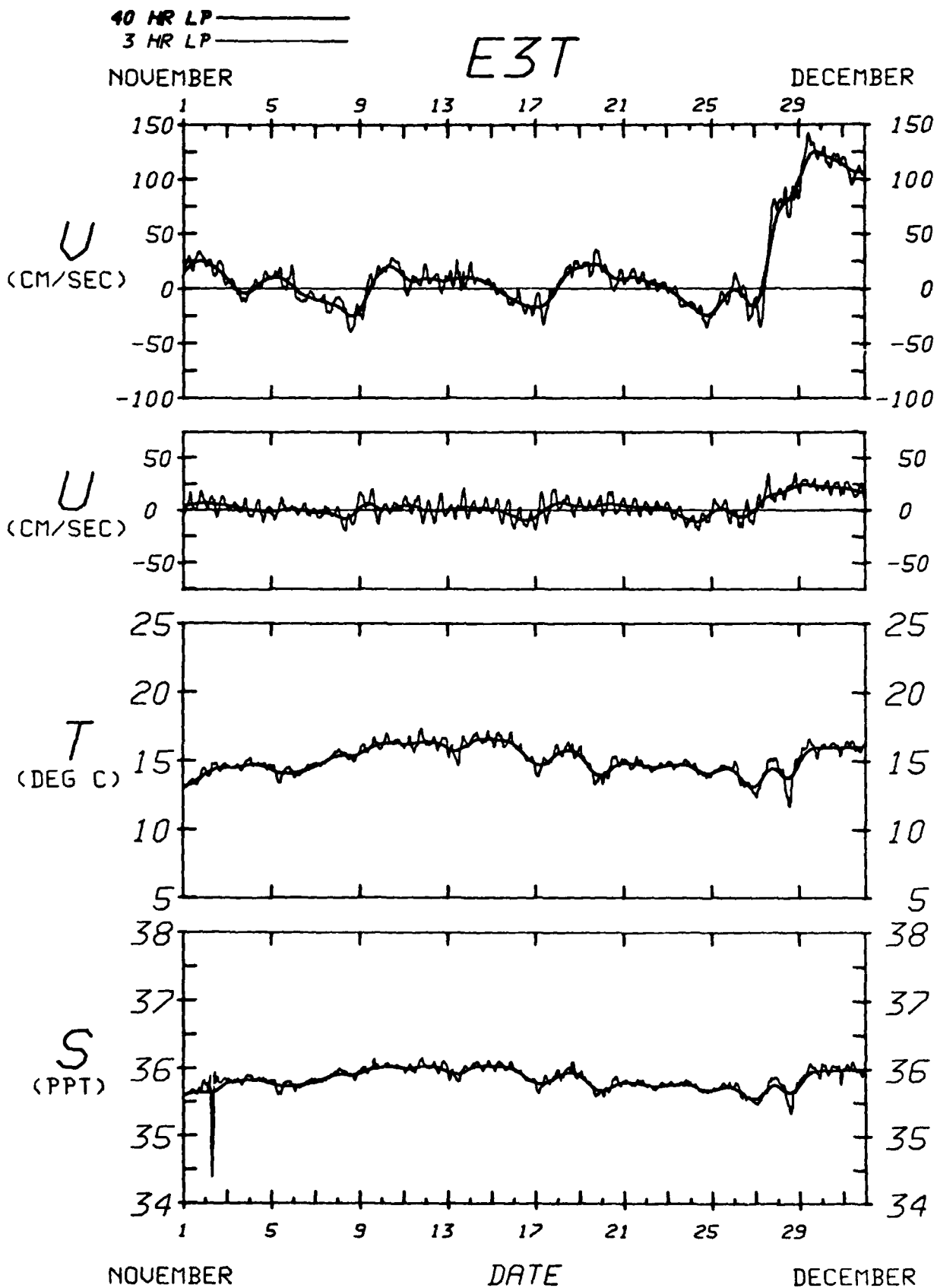
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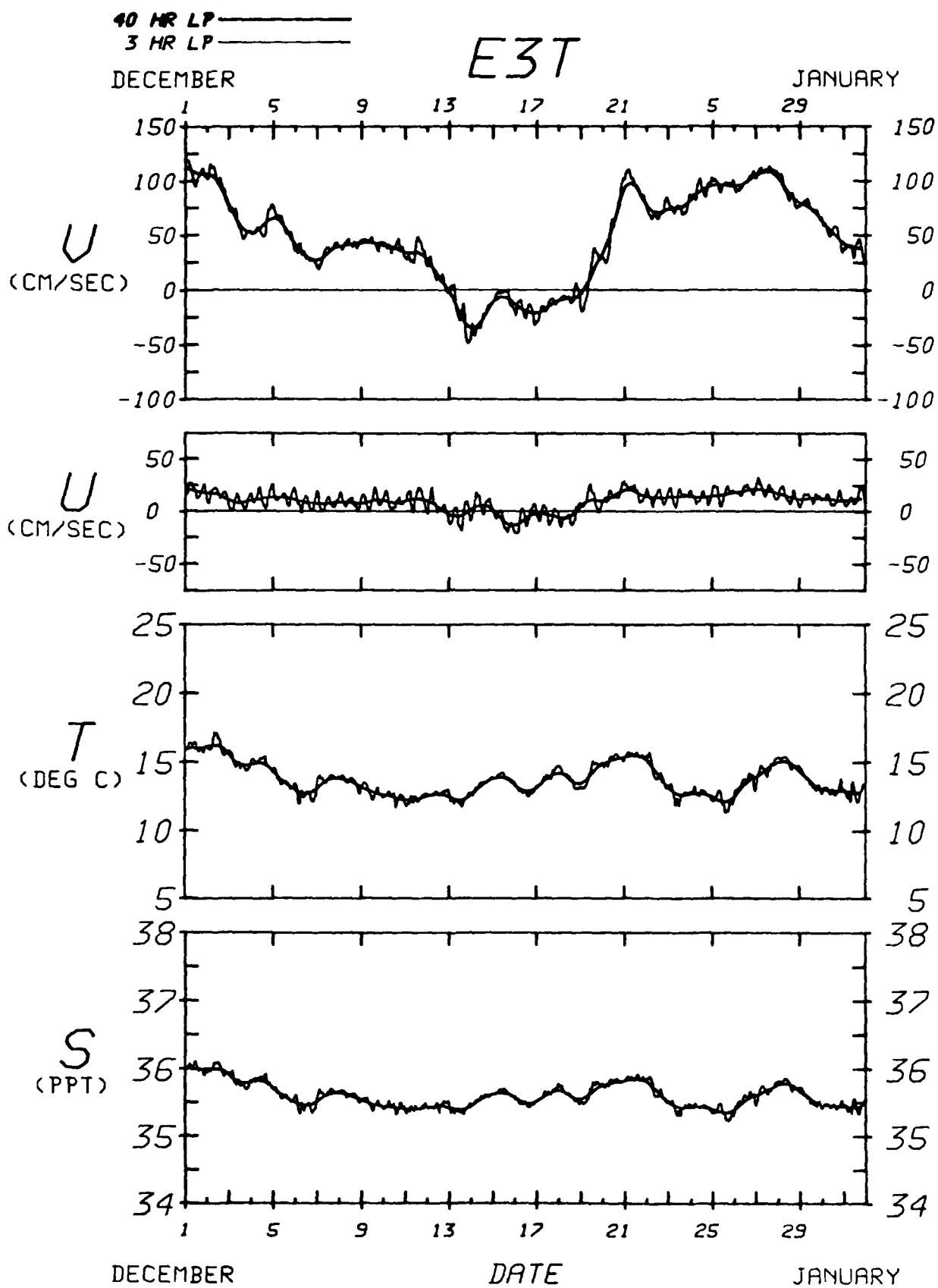
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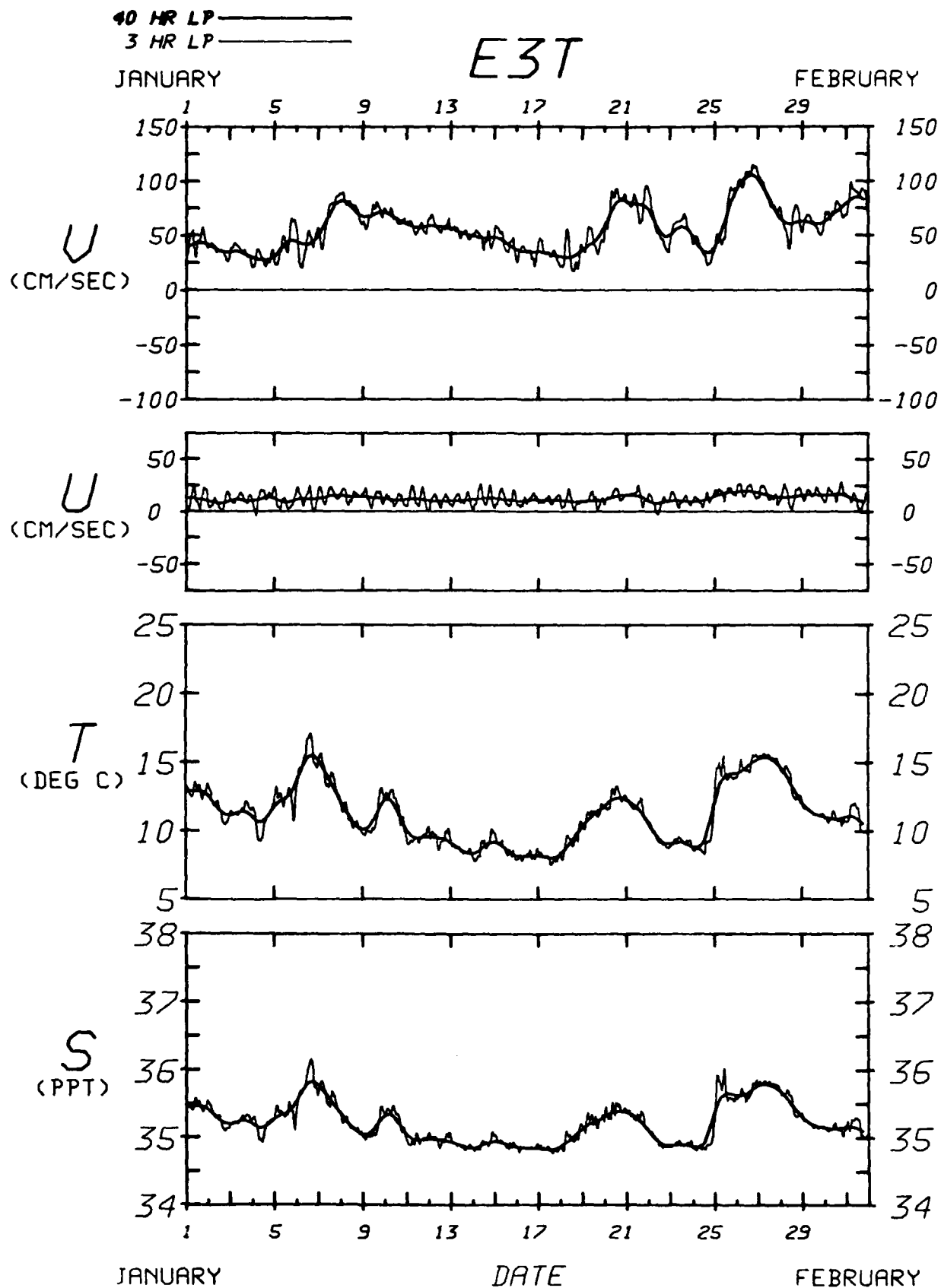
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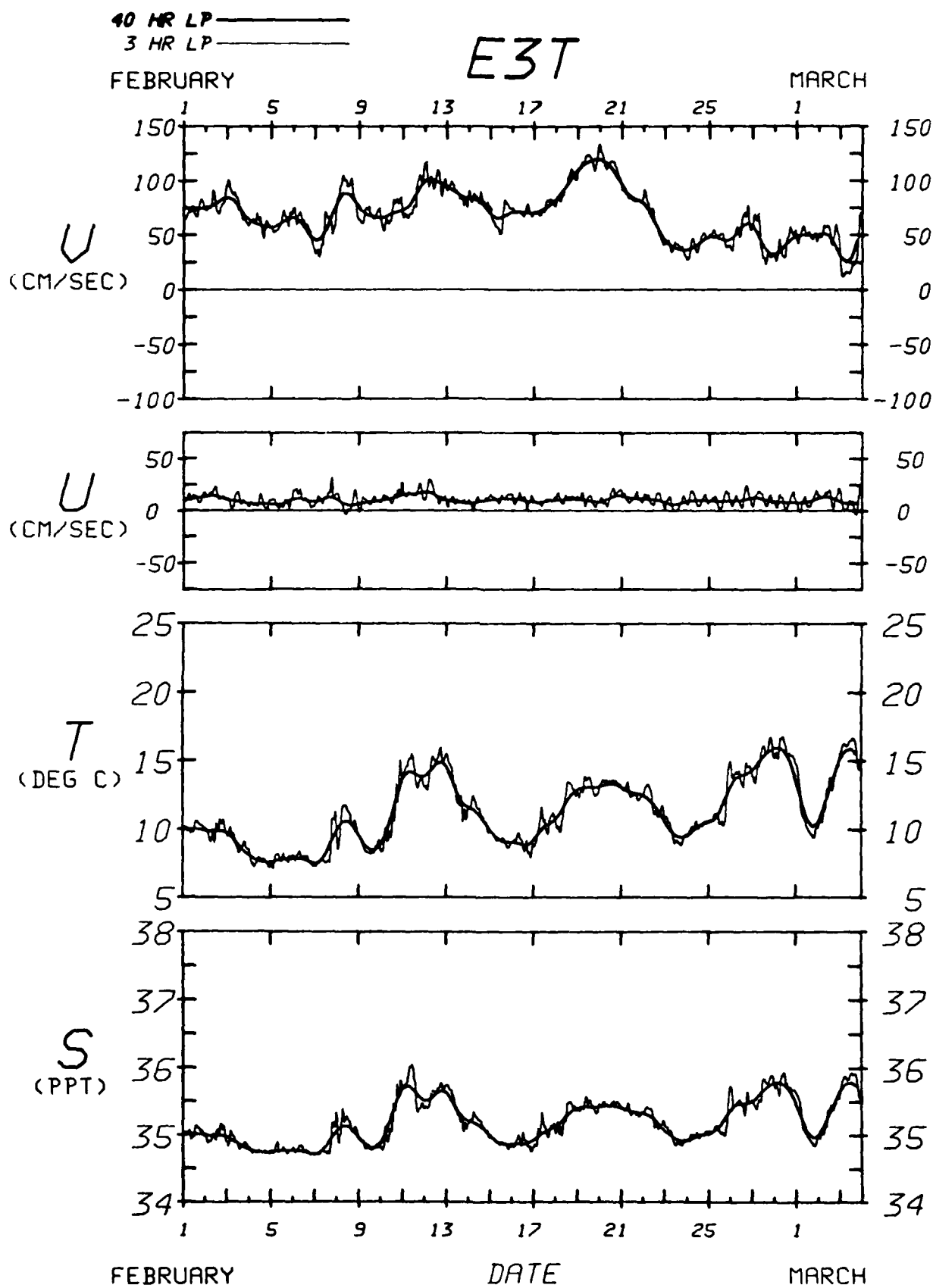


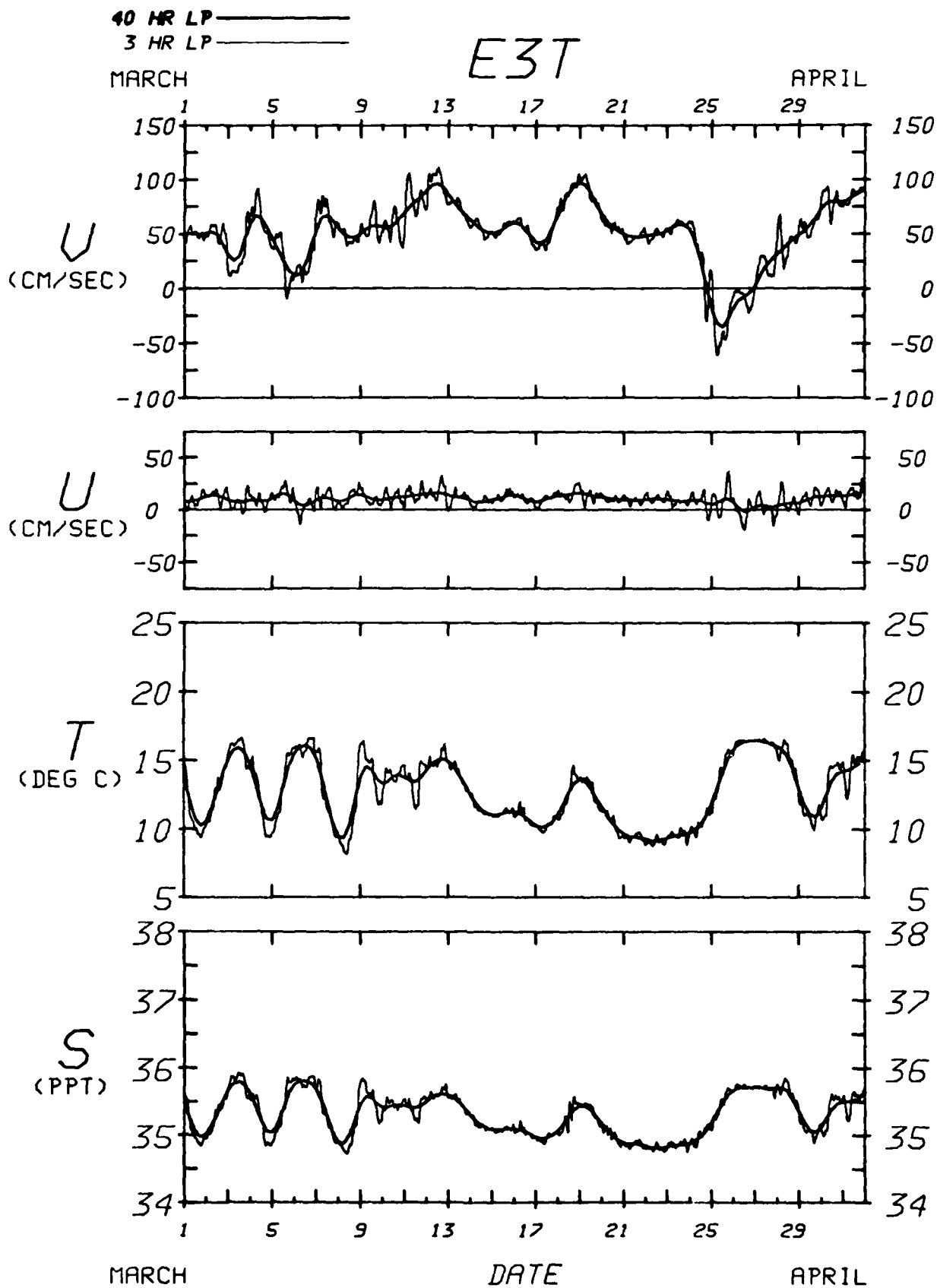


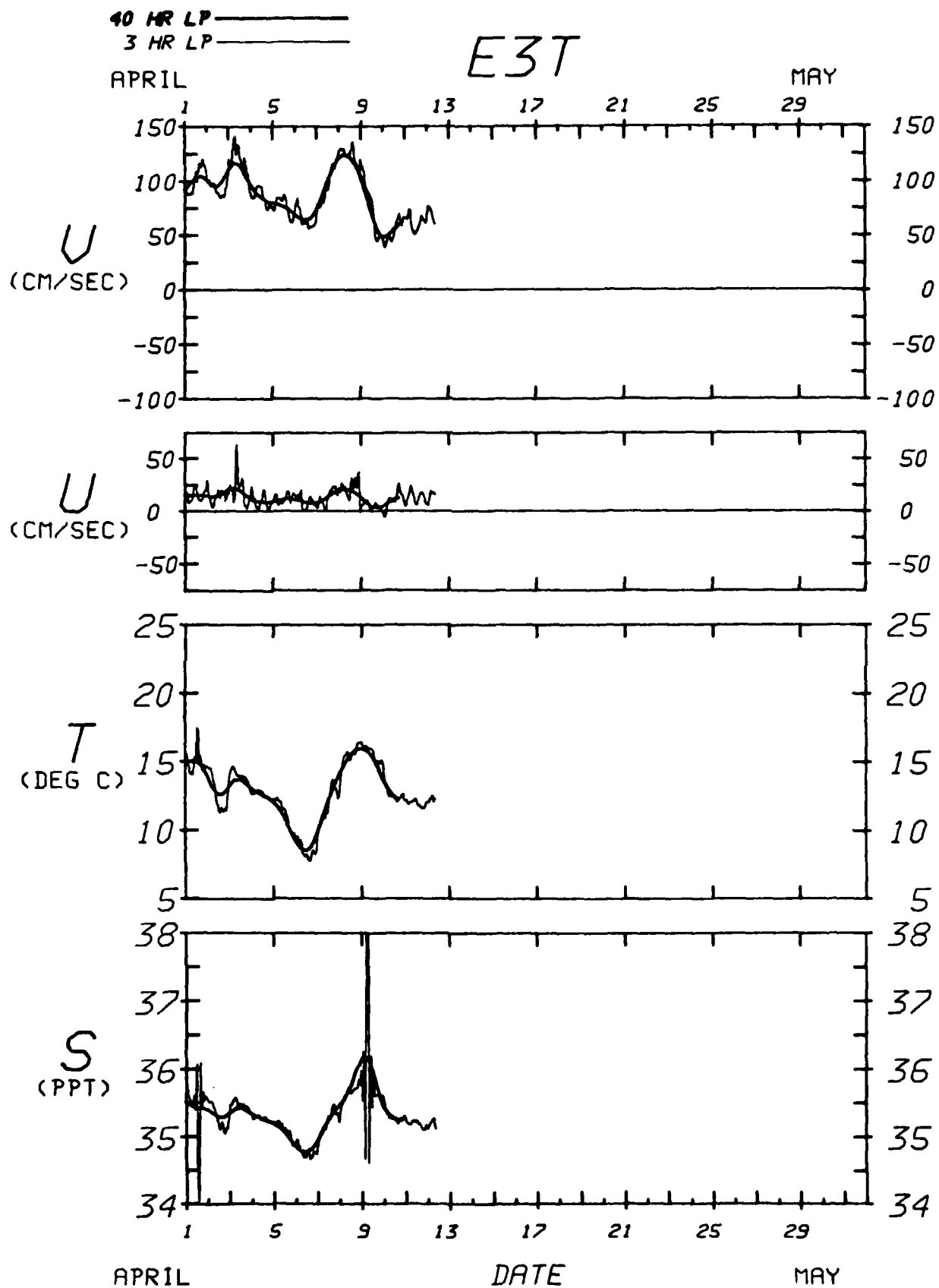


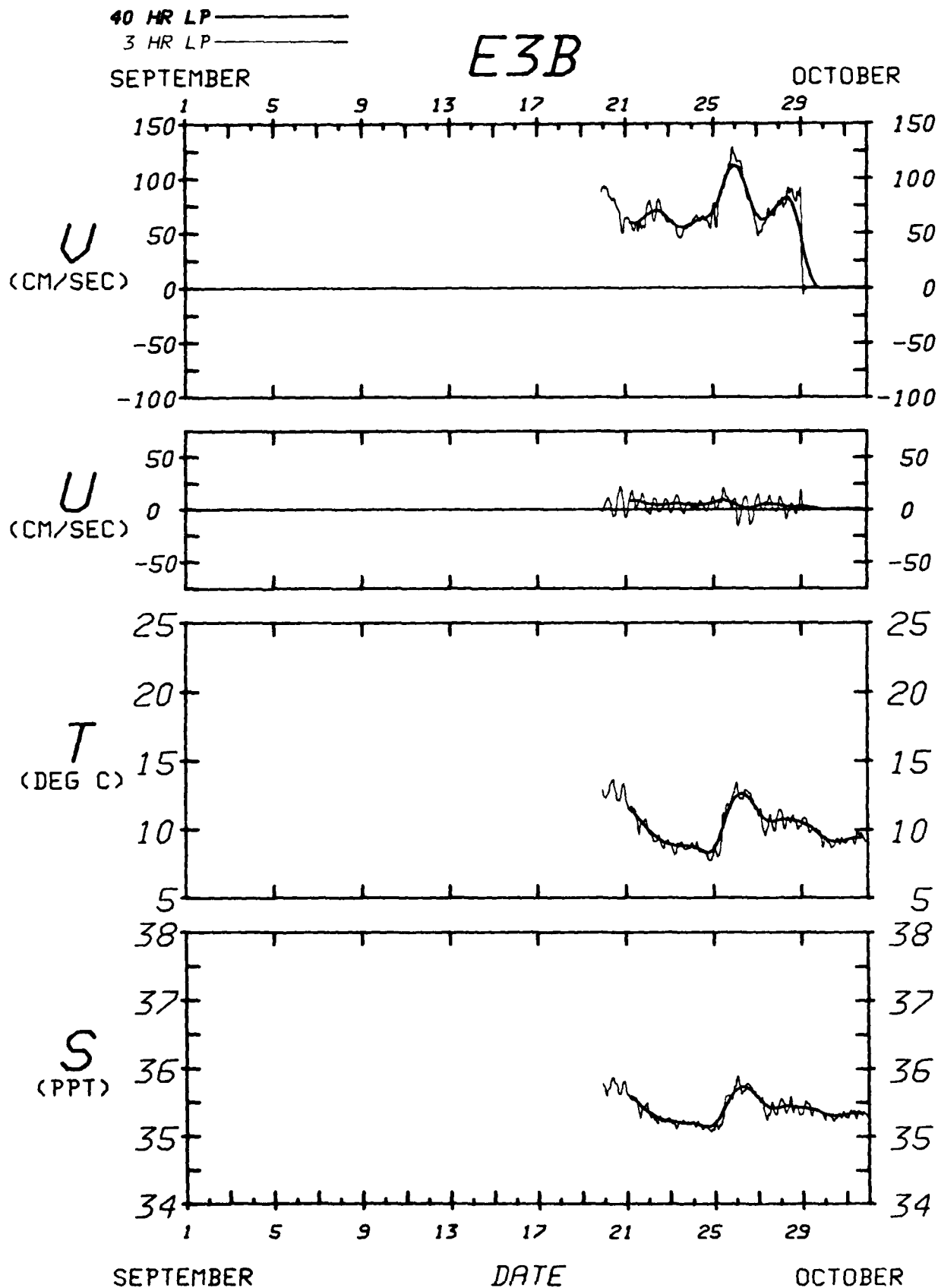


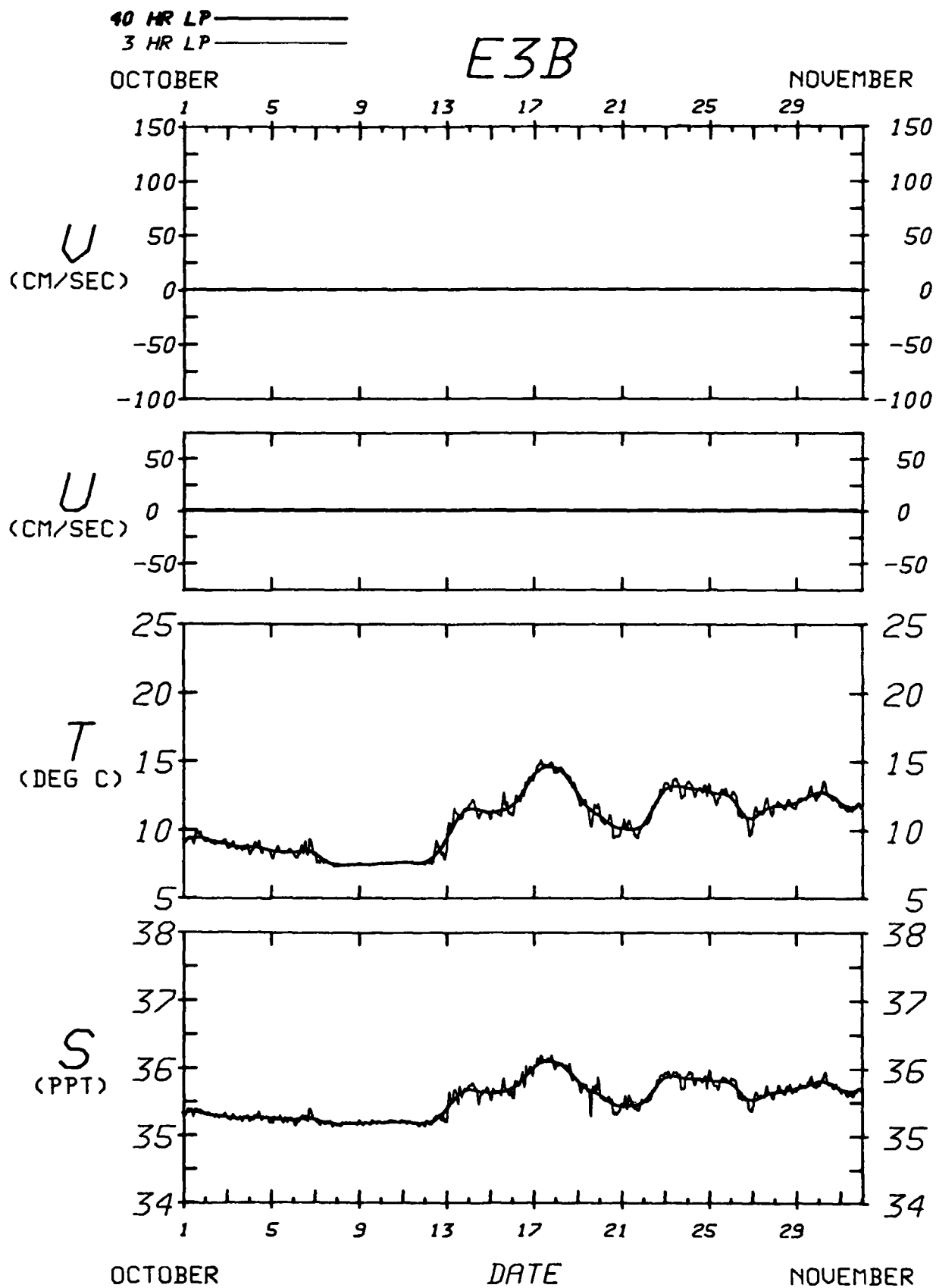












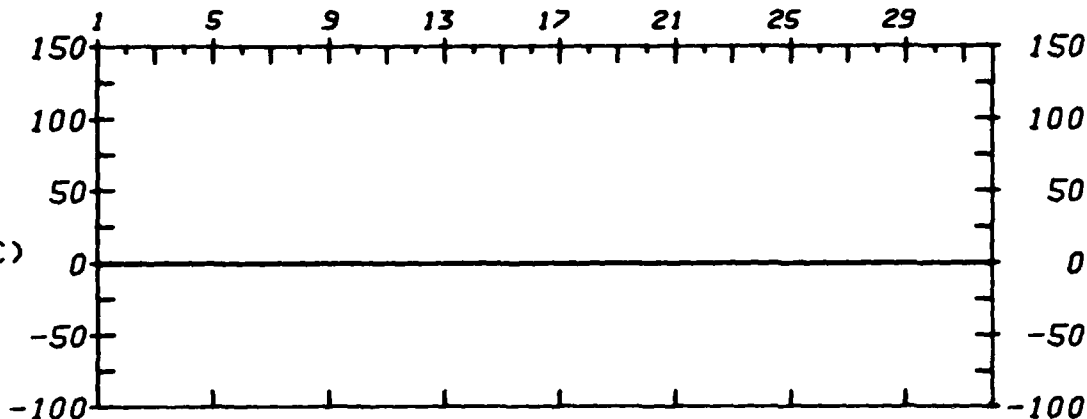
40 HR LP
3 HR LP

E3B

NOVEMBER

DECEMBER

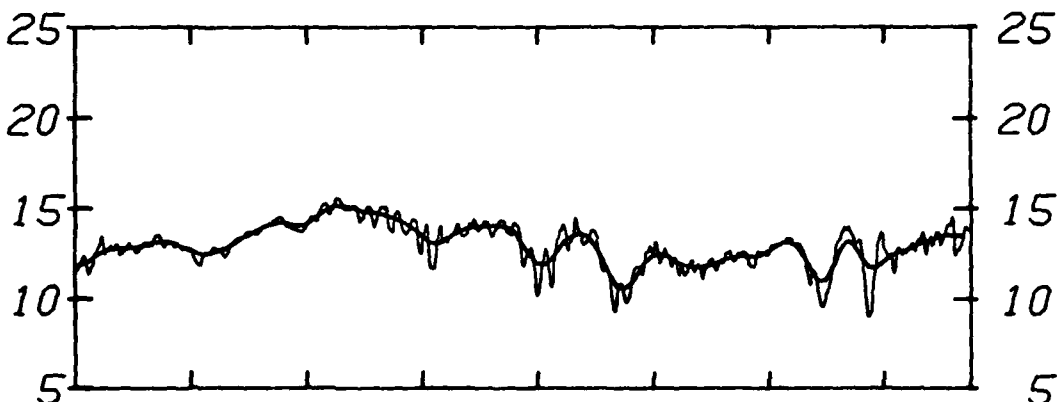
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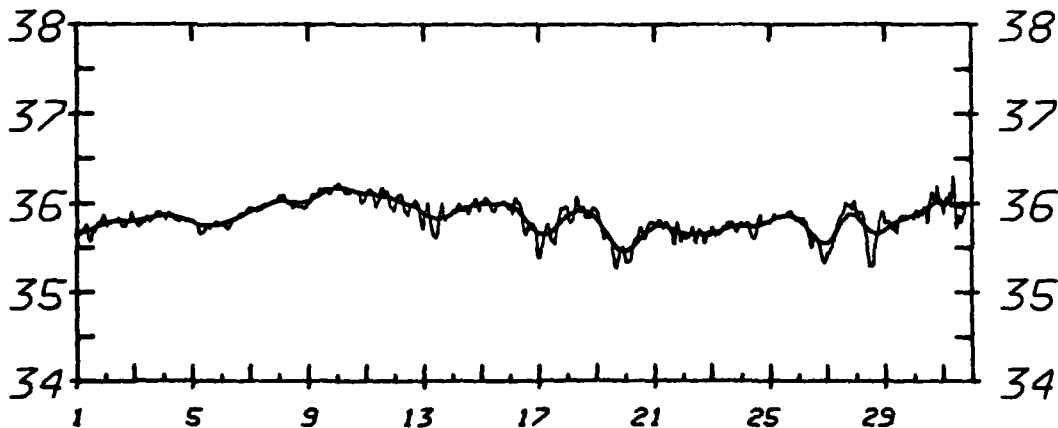
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NOVEMBER

DATE

DECEMBER

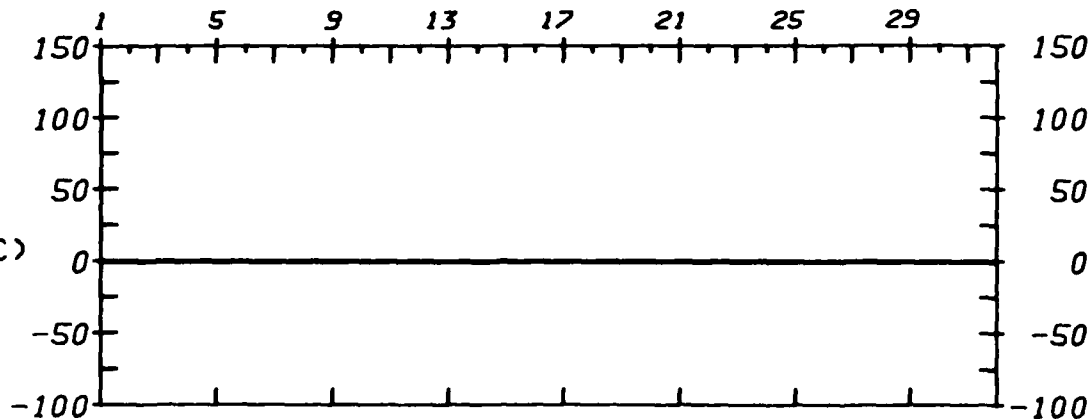
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3 HR LP ———

E3B

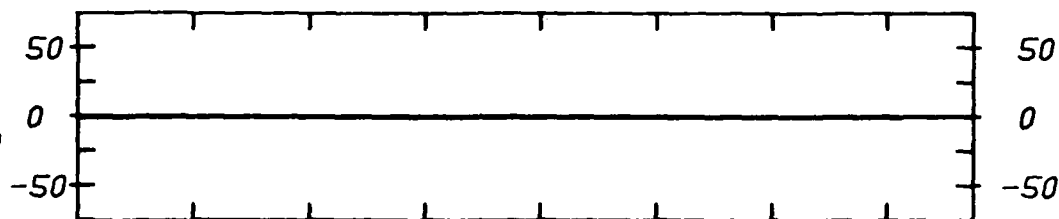
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JANUARY

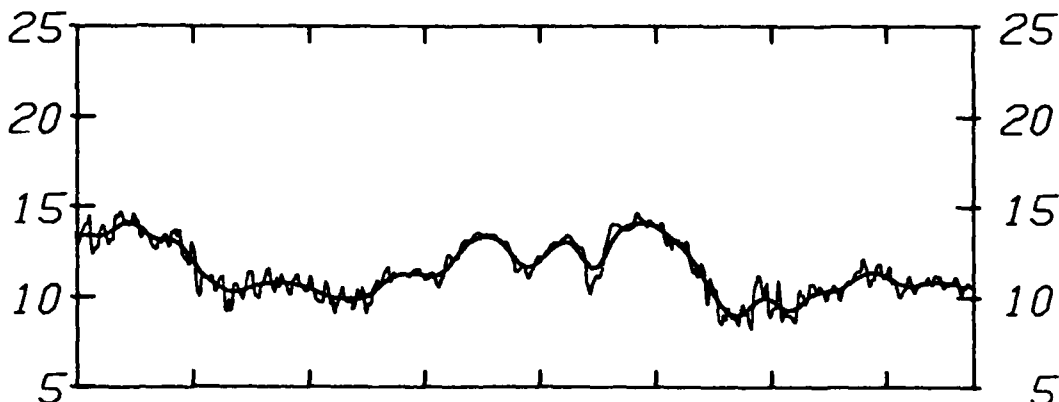
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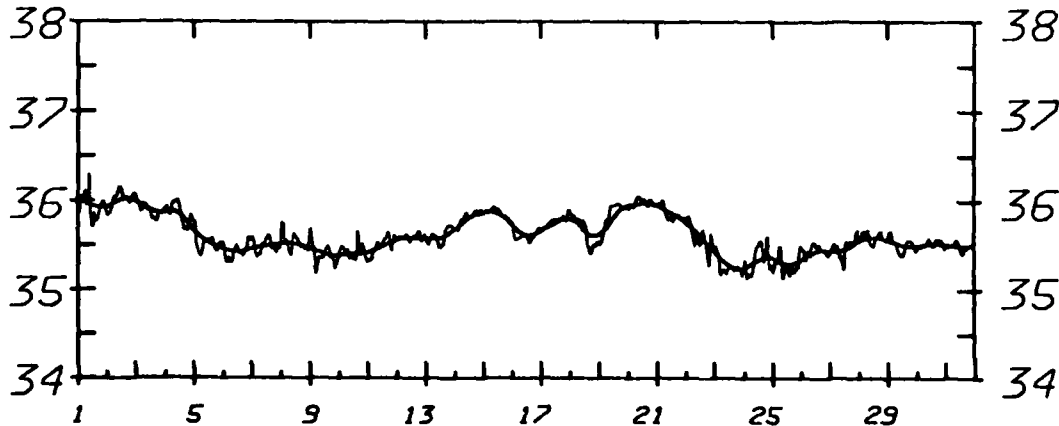
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DECEMBER

DATE

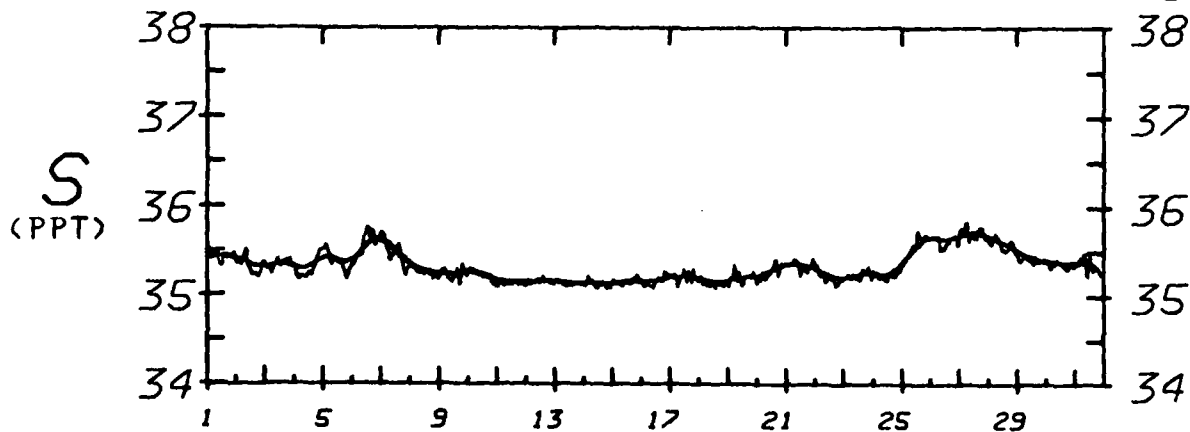
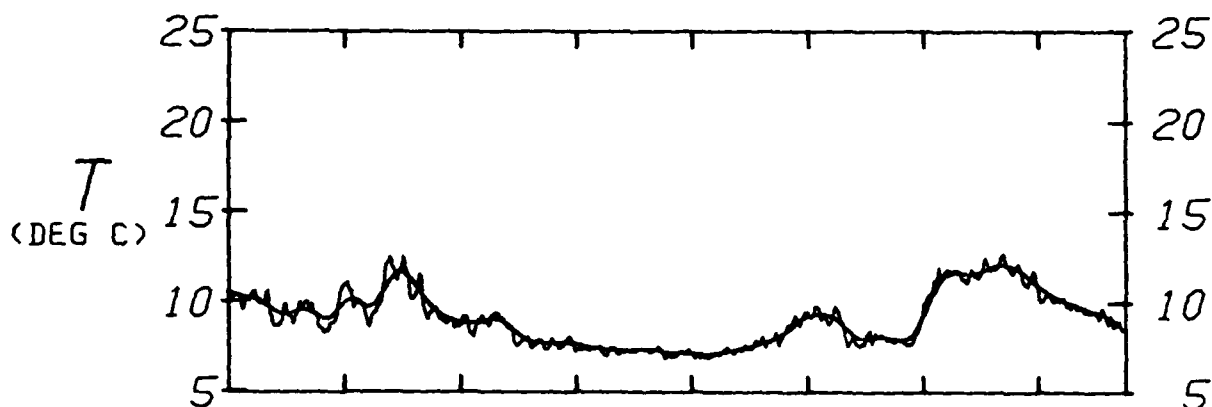
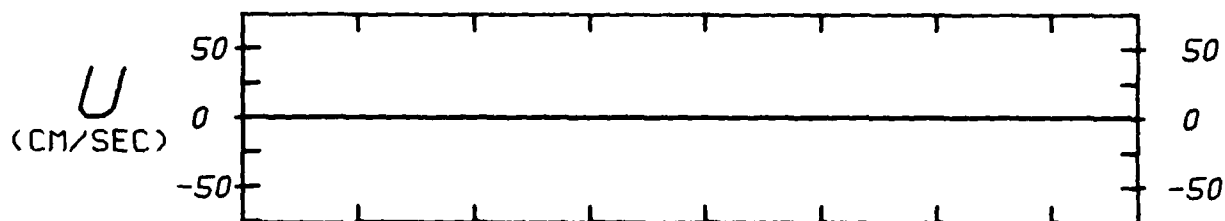
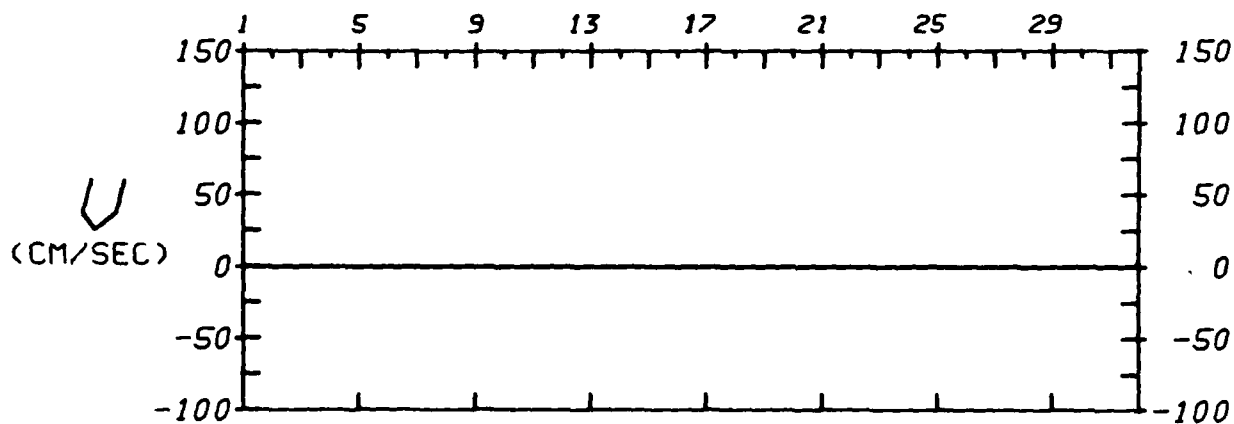
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40 HR LP
3 HR LP

E3B

JANUARY

FEBRUARY



JANUARY

DATE

FEBRUARY

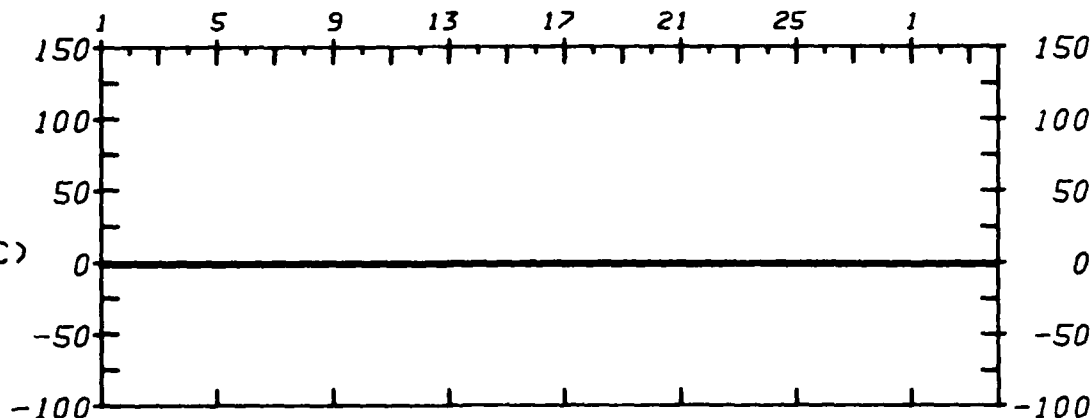
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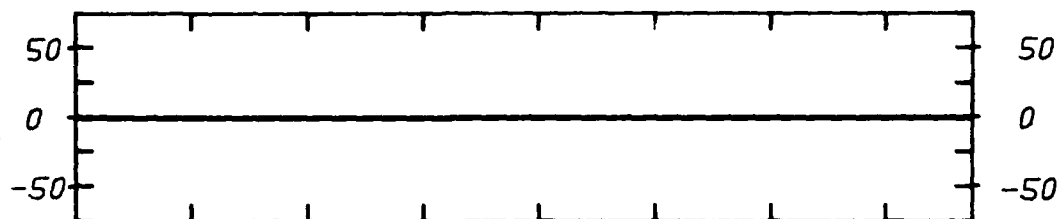
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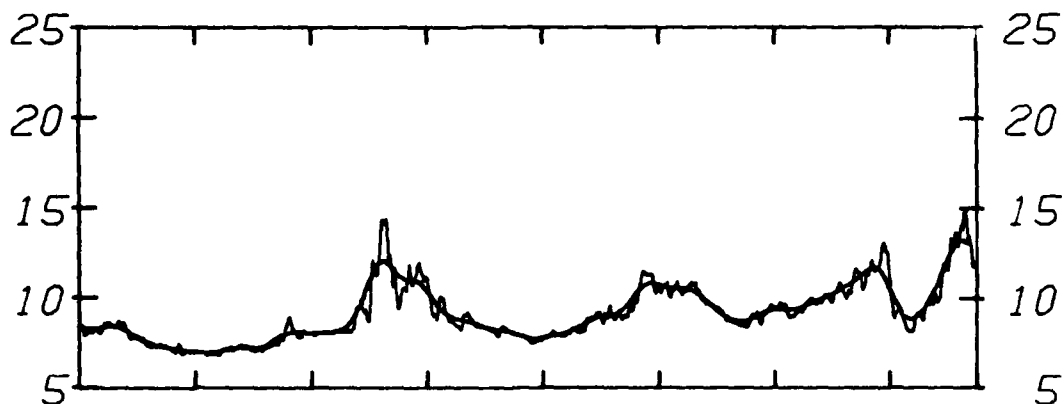
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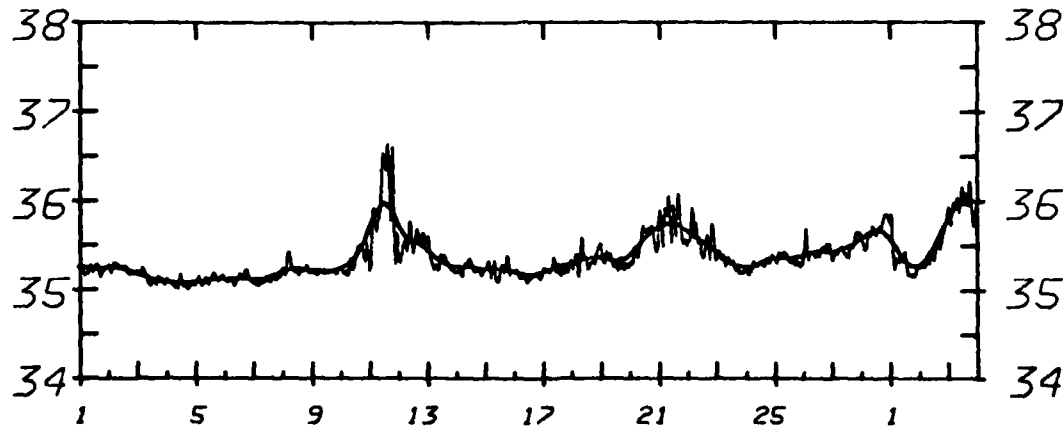
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FEBRUARY

DATE

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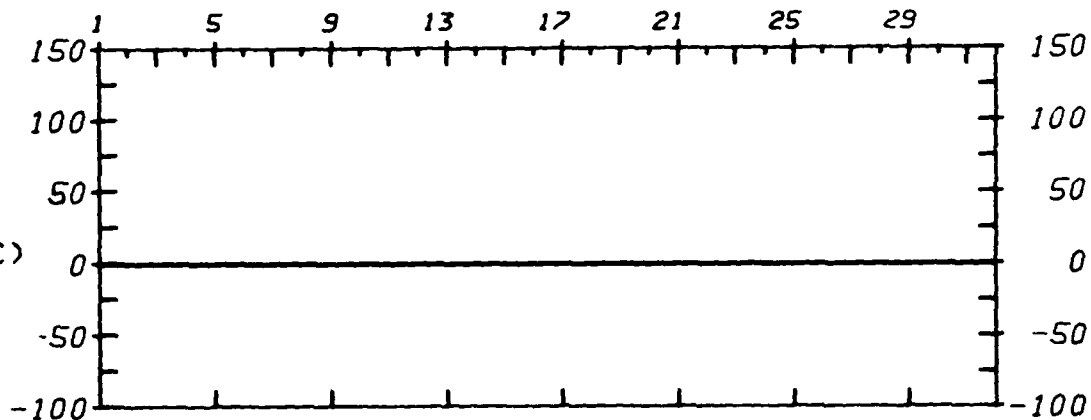
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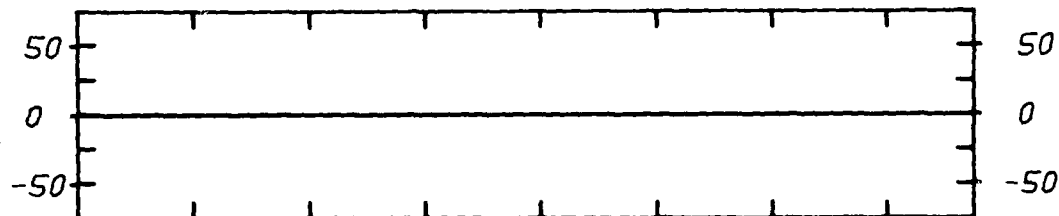
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APRIL

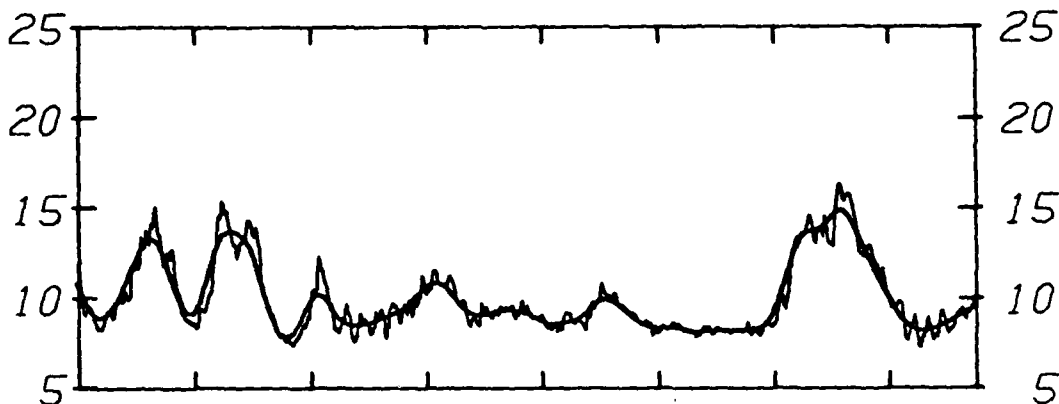
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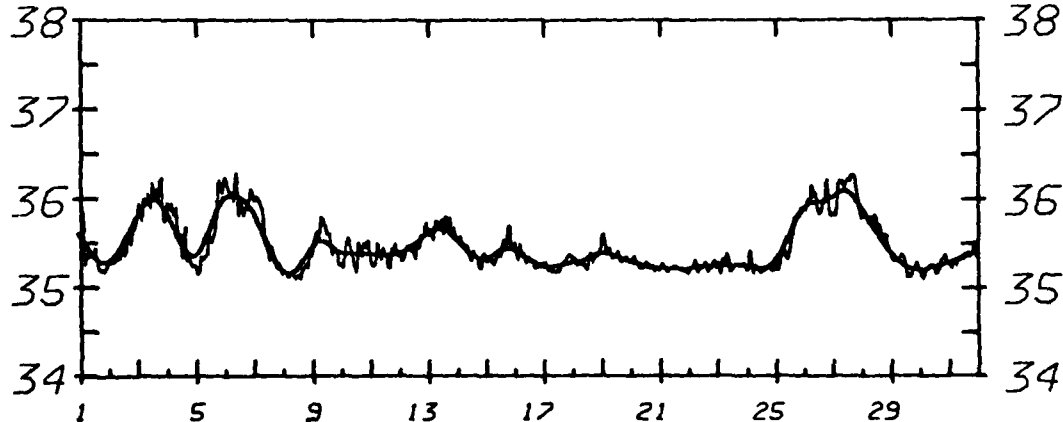
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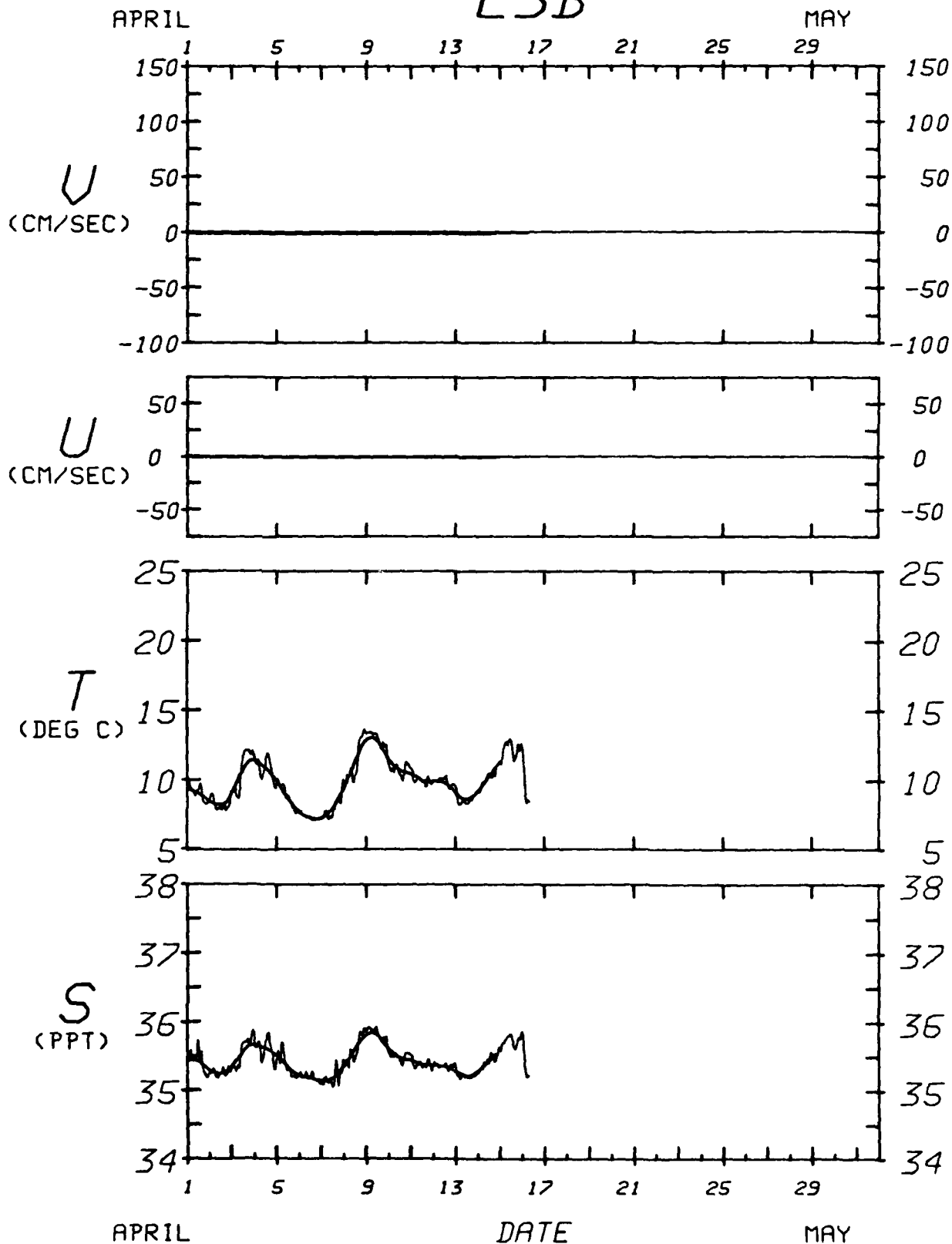
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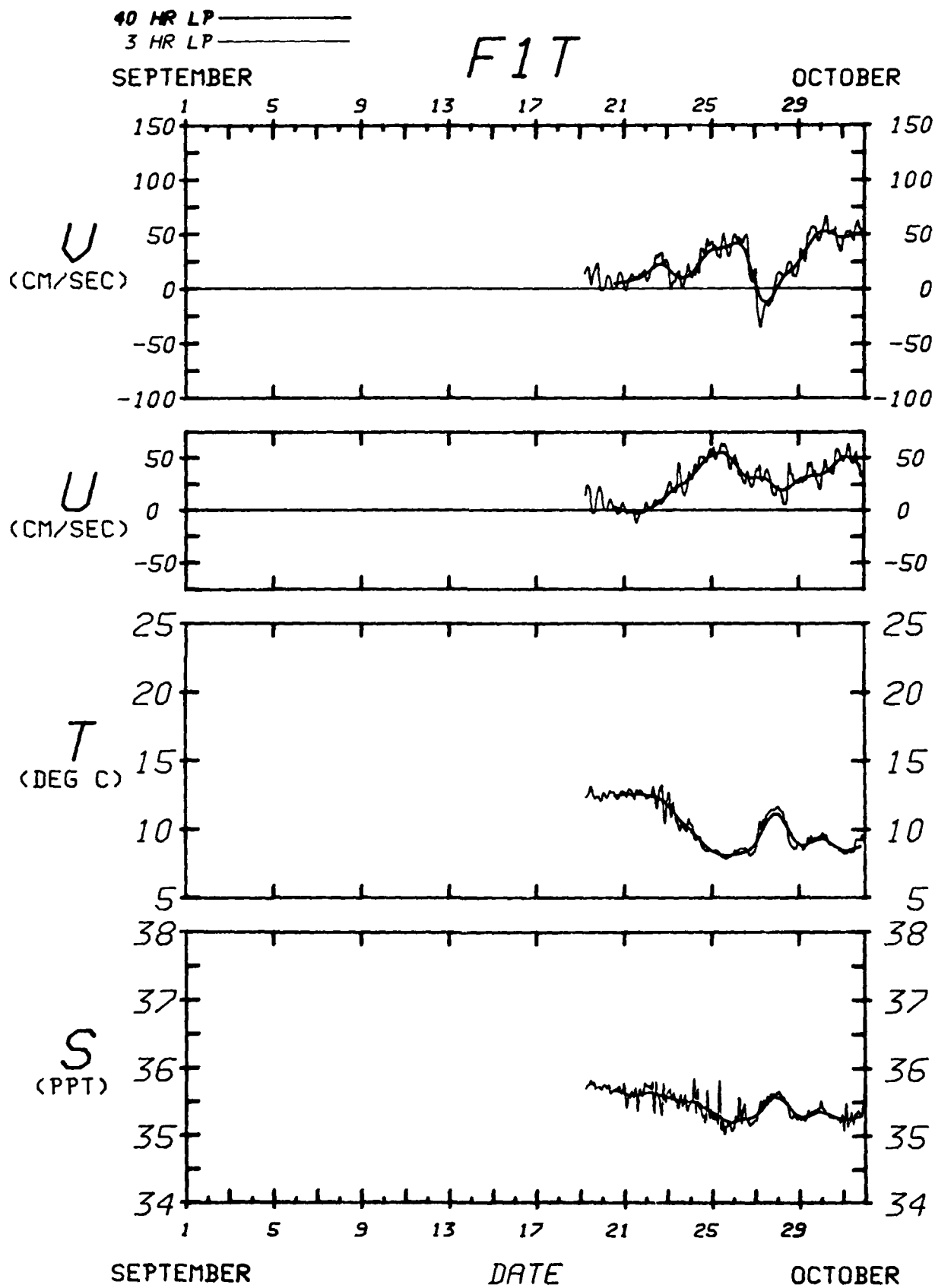
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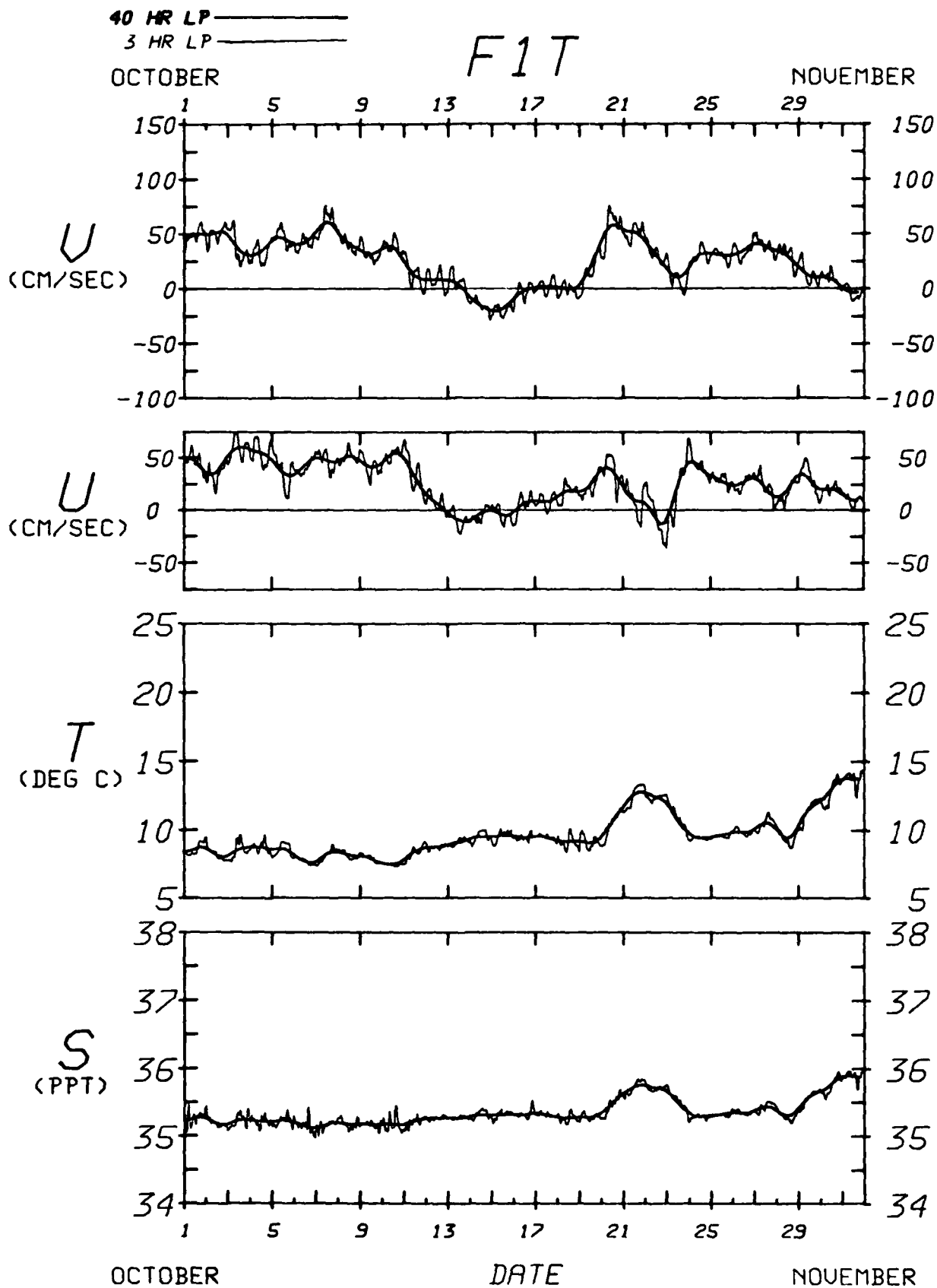
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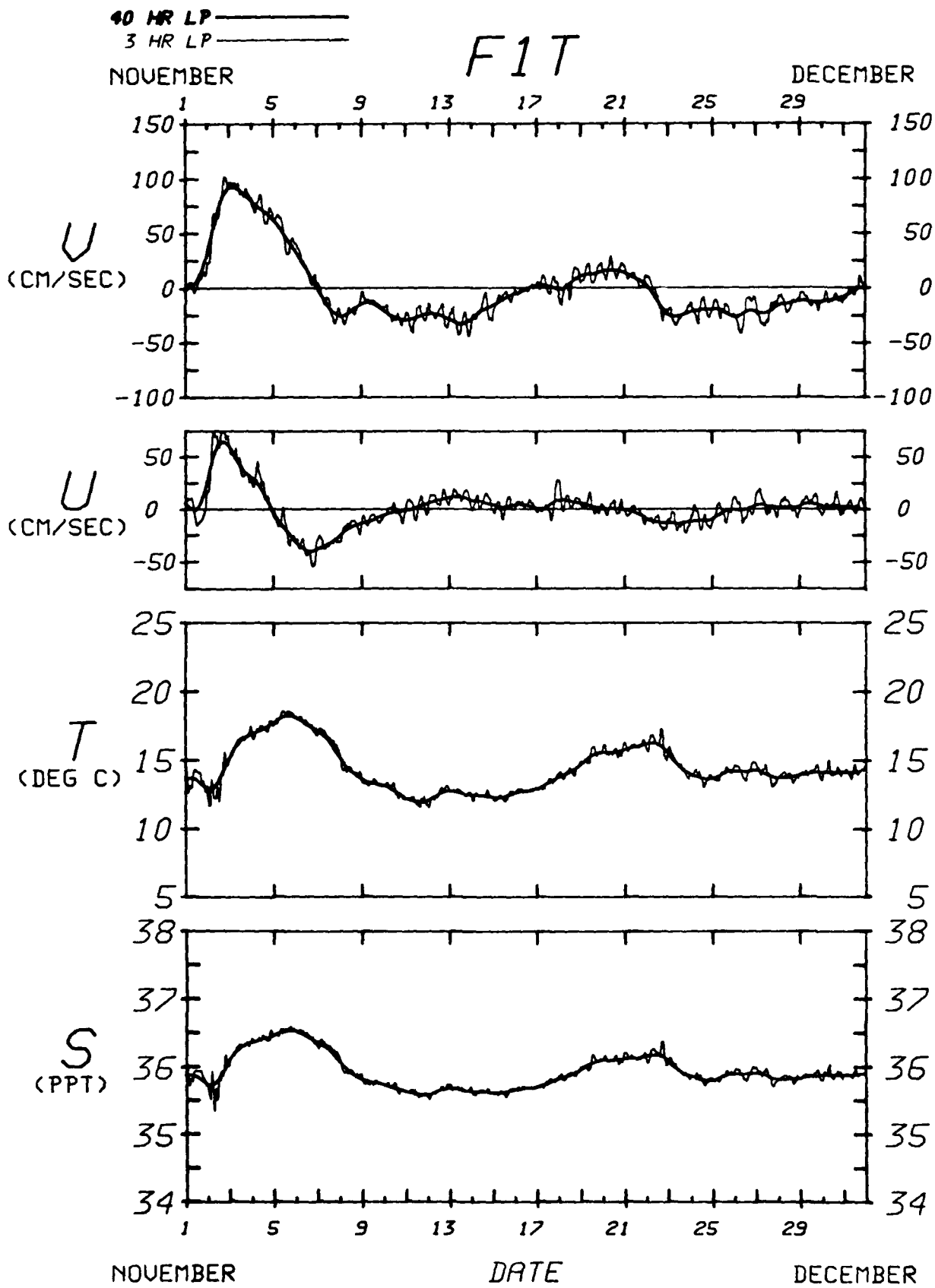
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3 HR LP

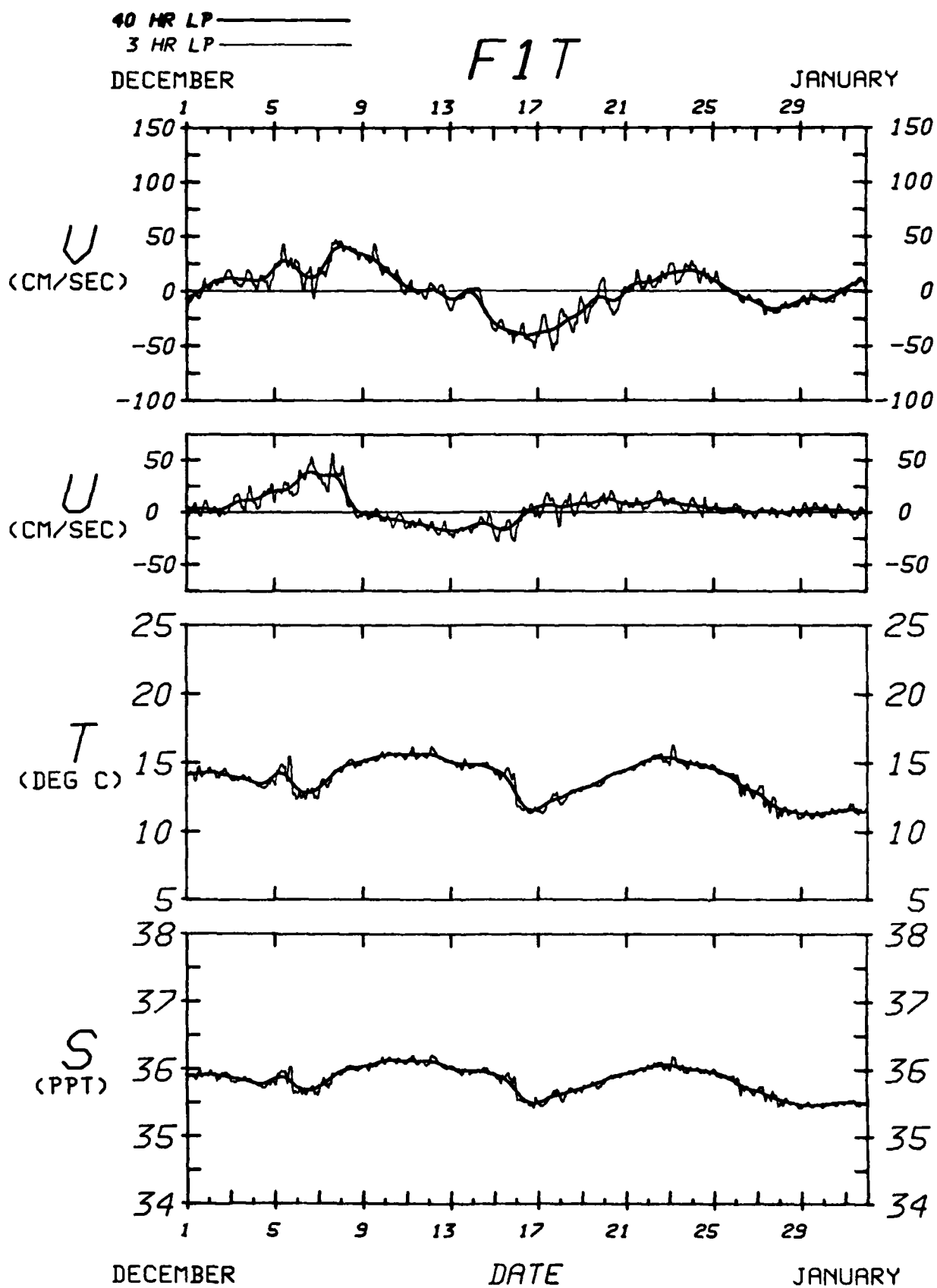
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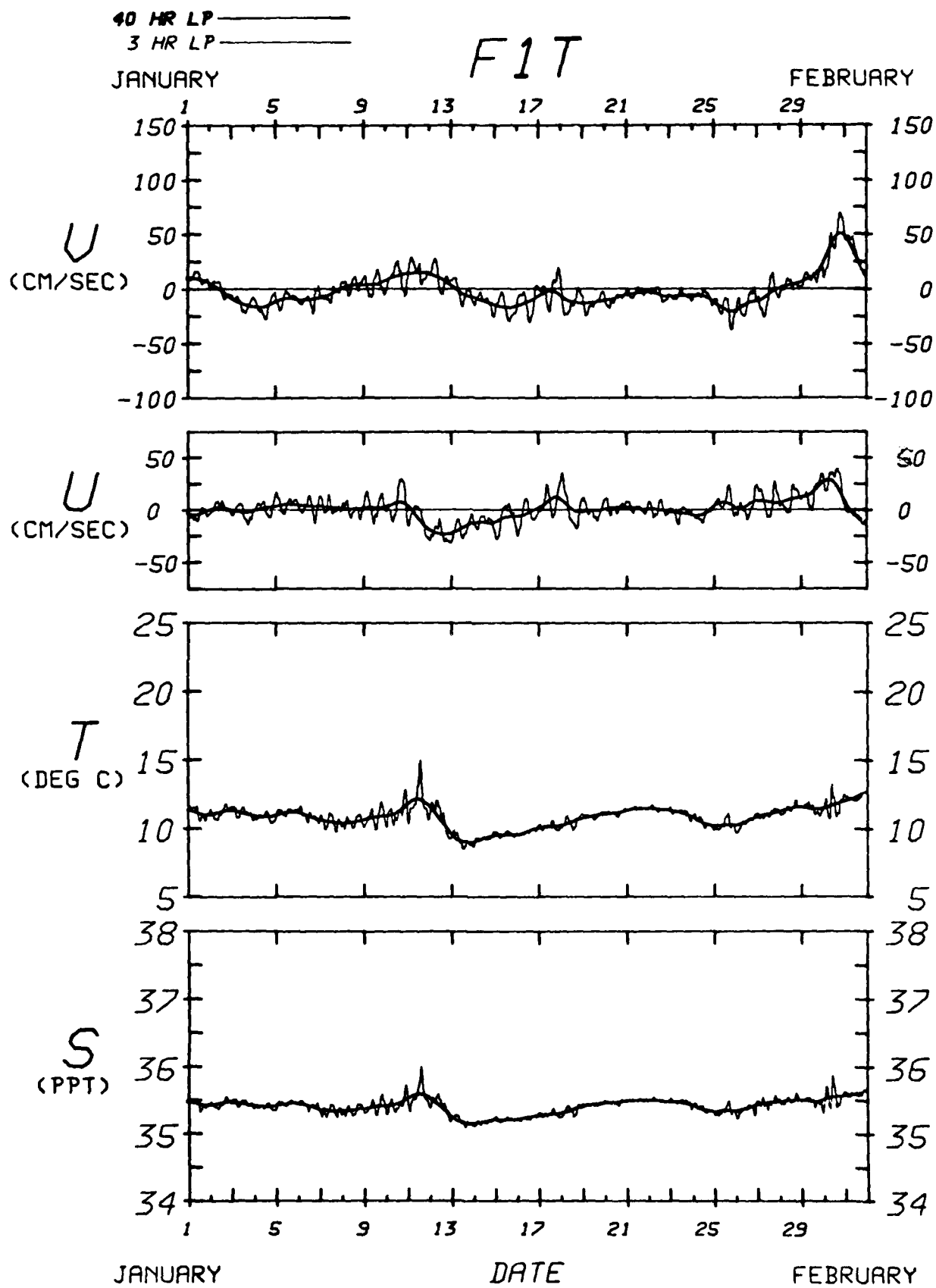


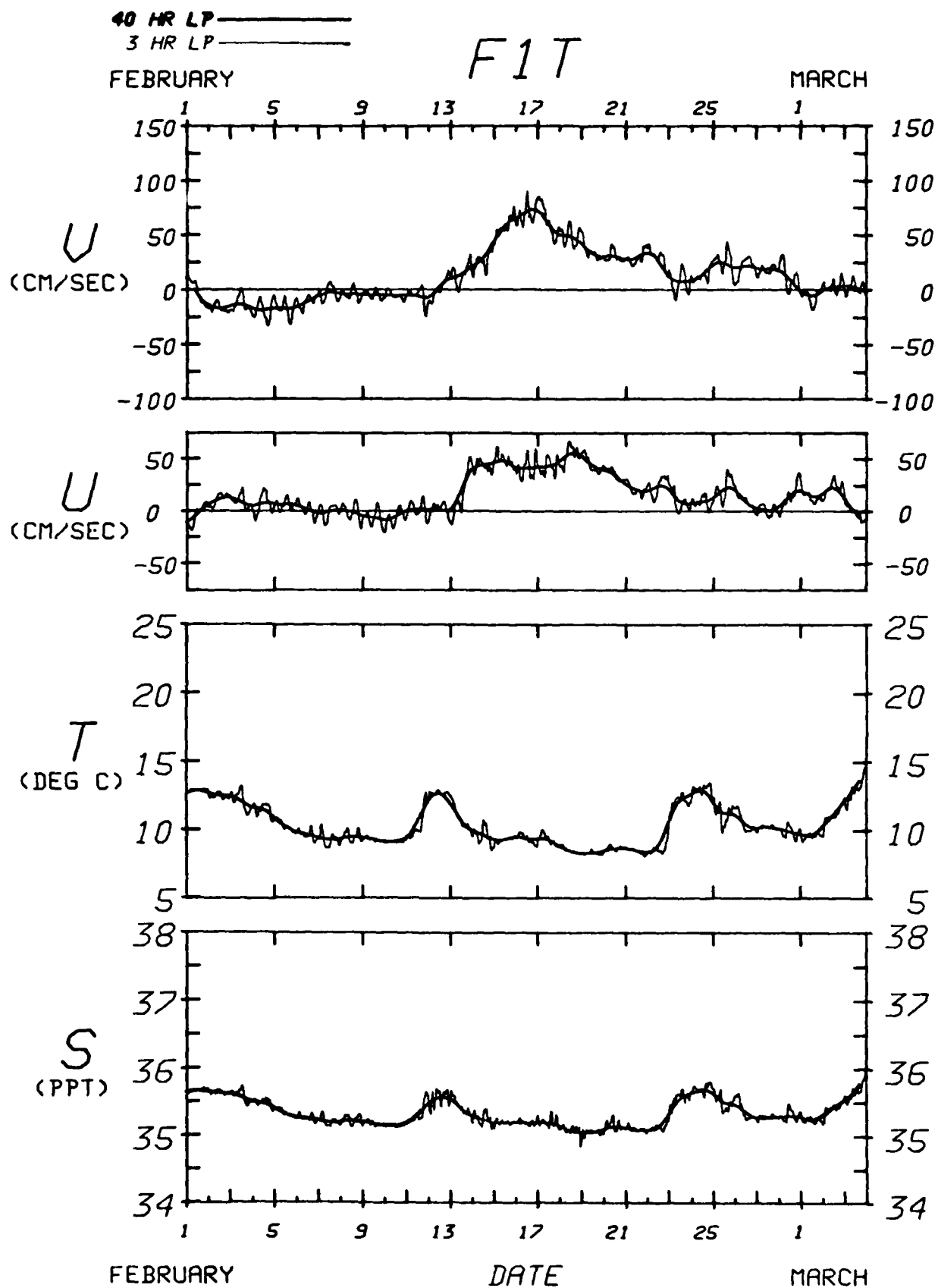


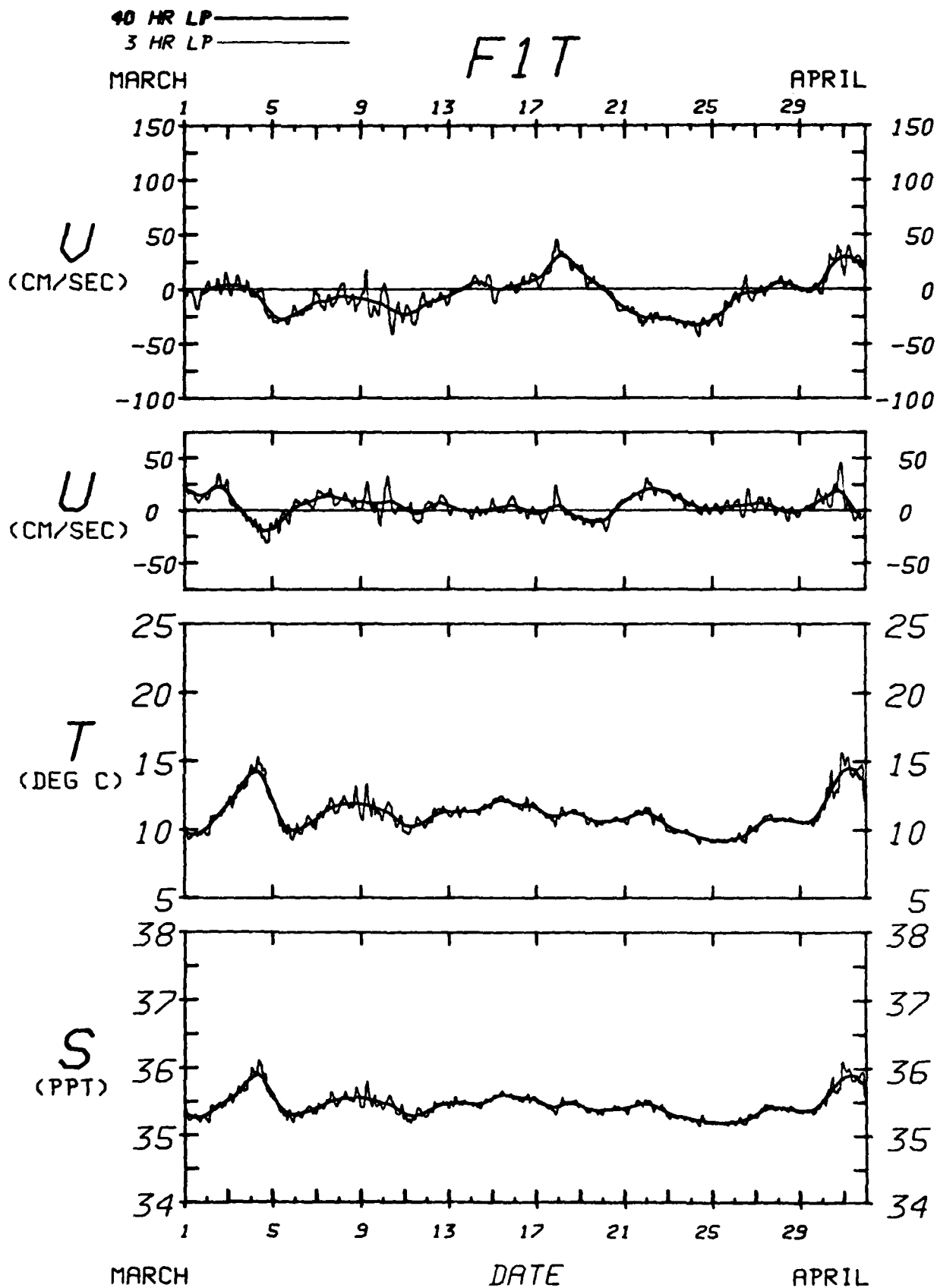






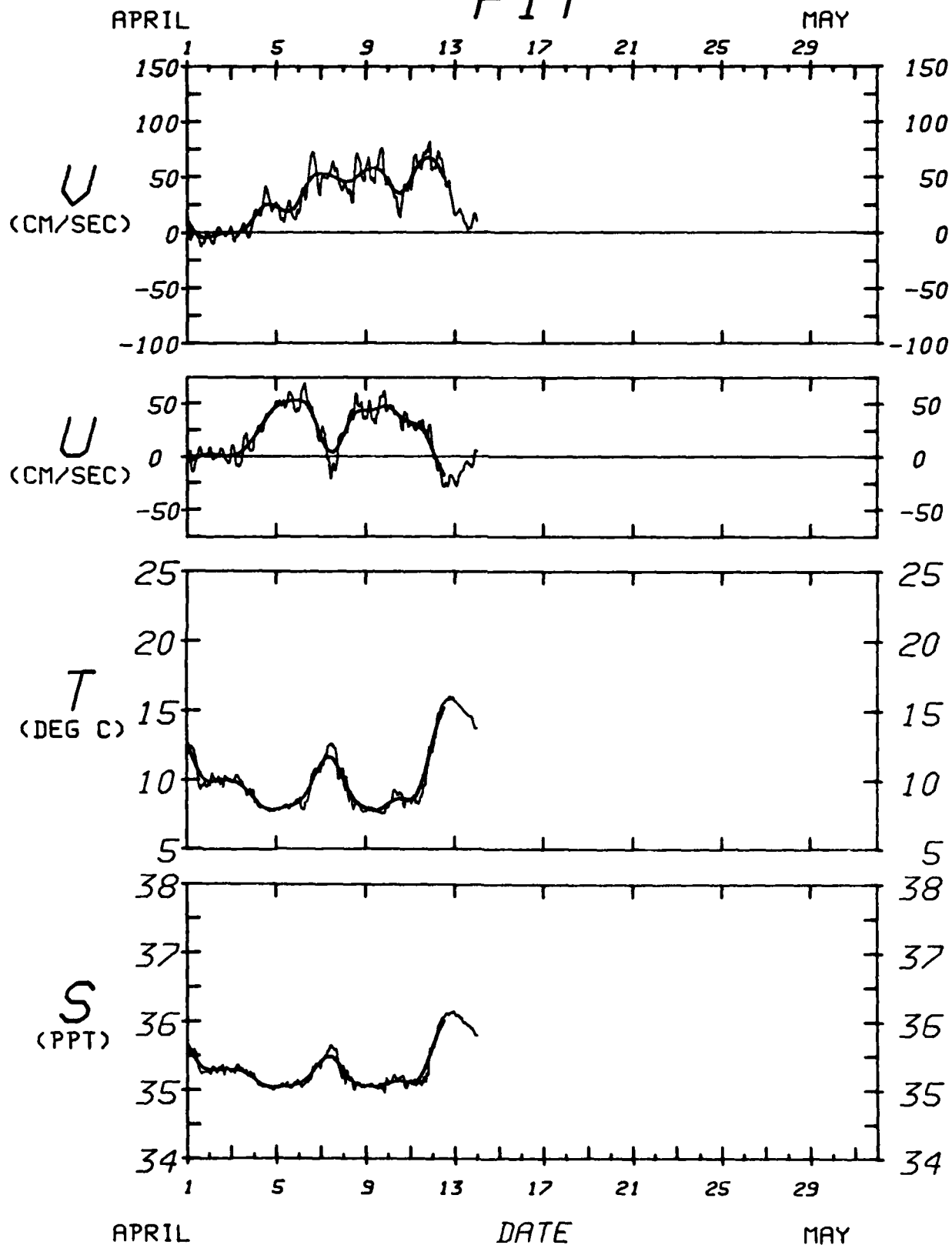


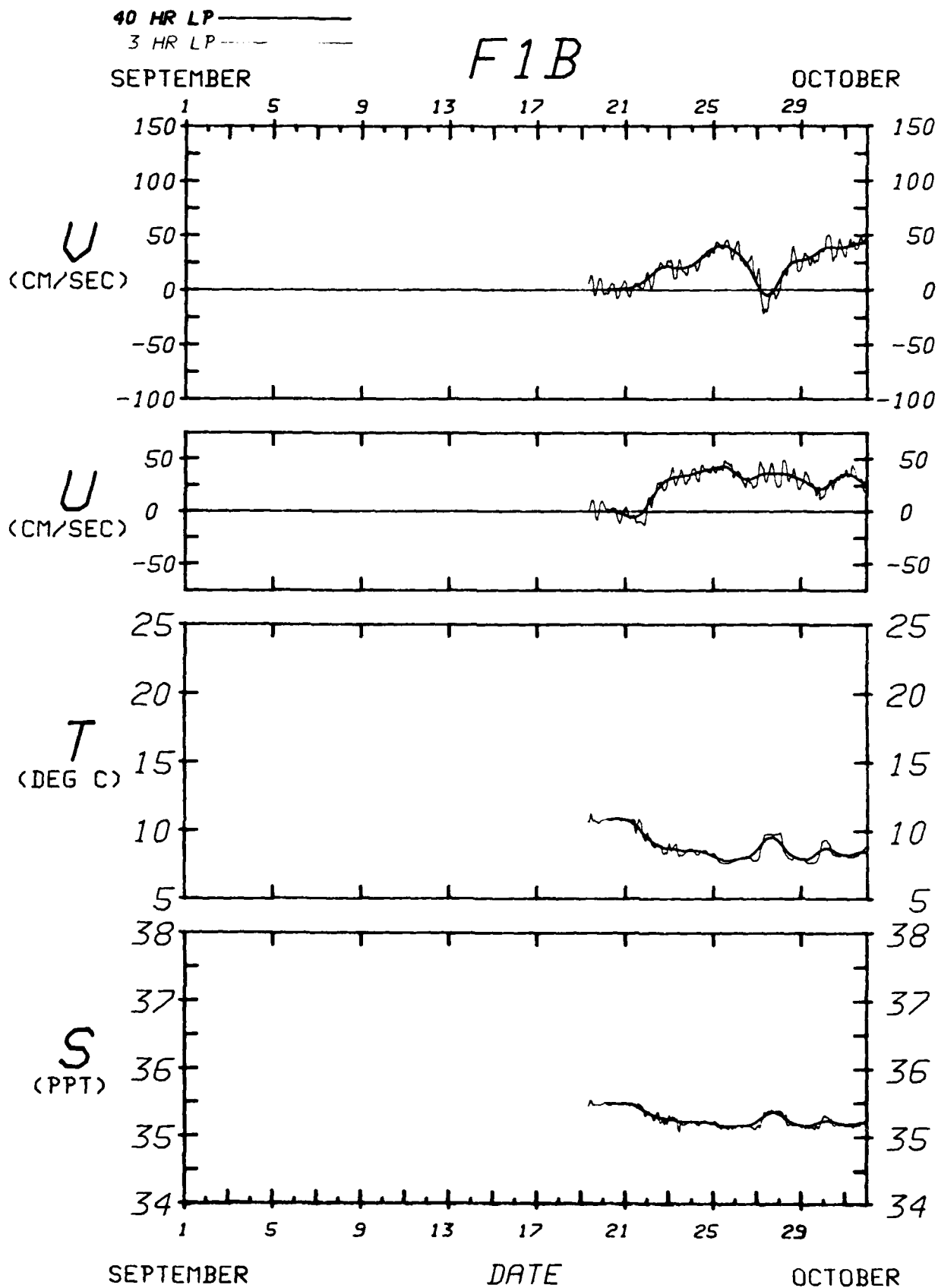


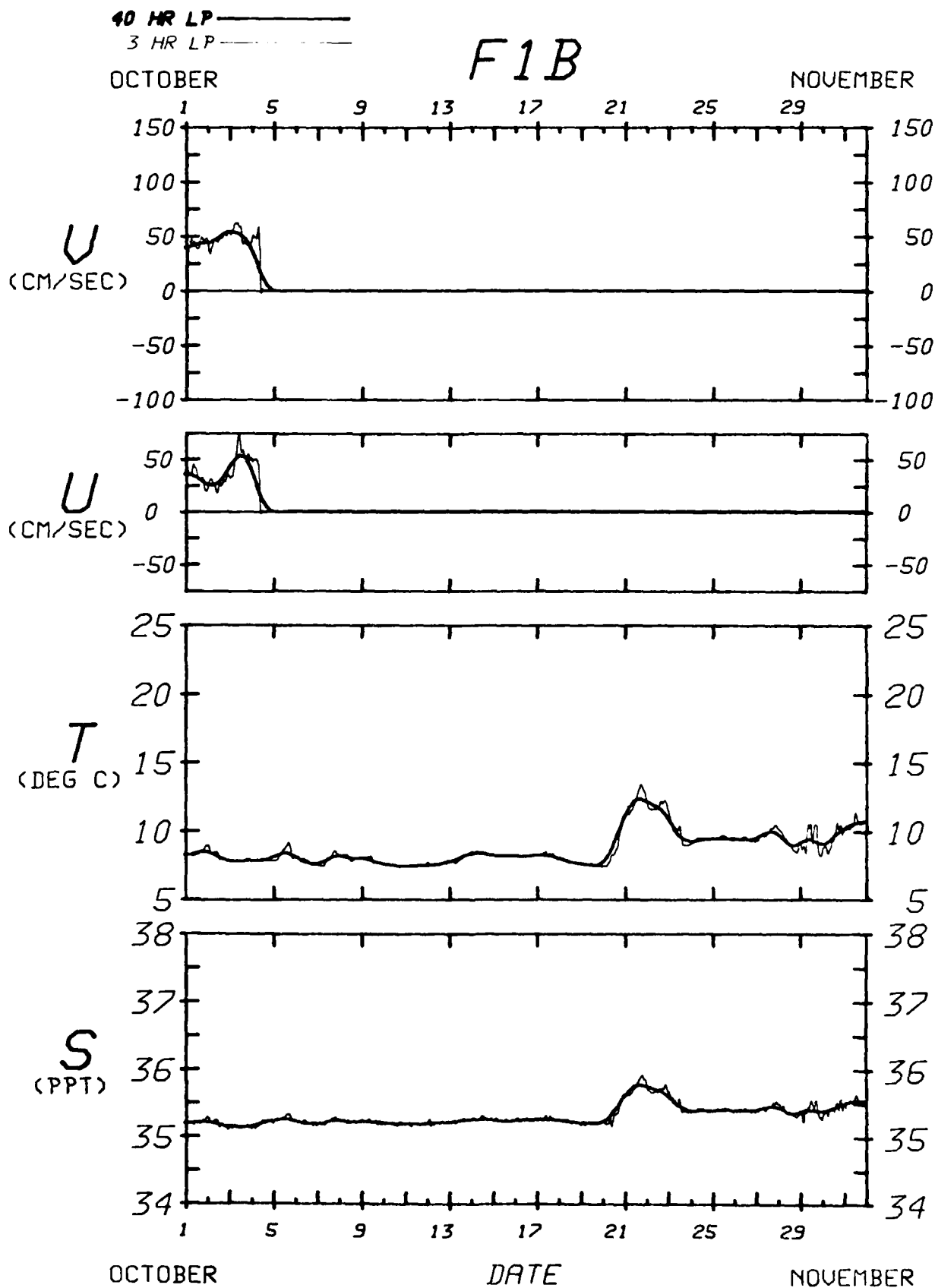


40 HR LP —————
 3 HR LP —————

F1T

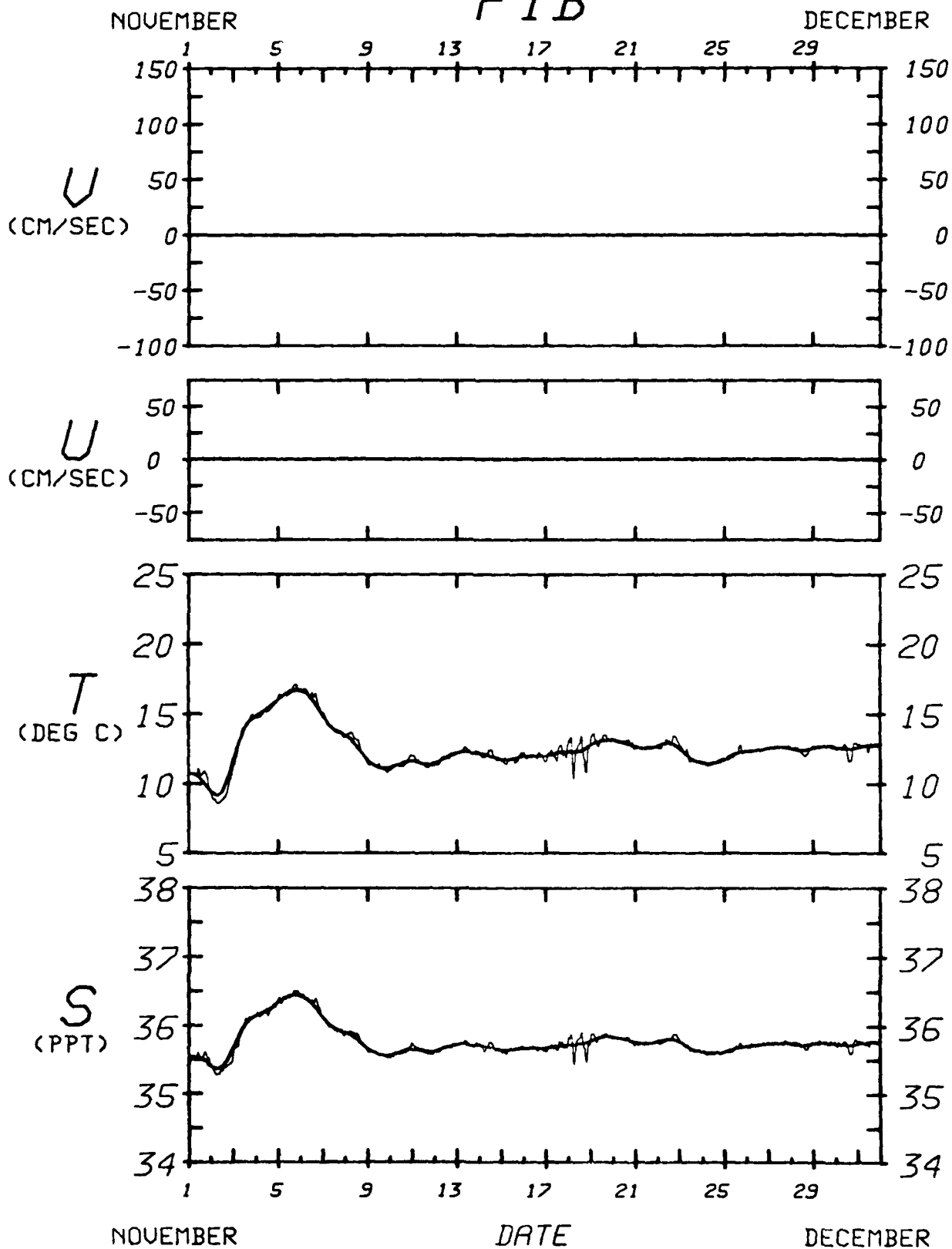






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3 HR LP - - - - -

F1B



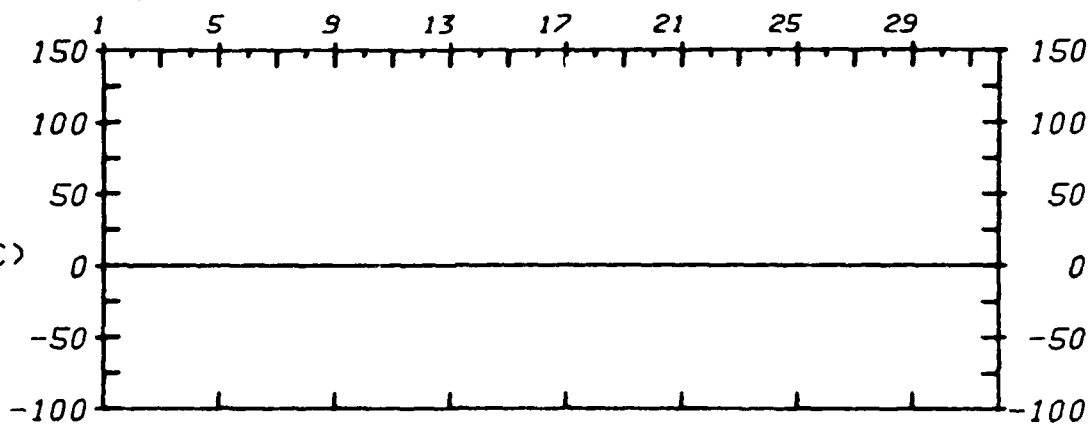
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F1B

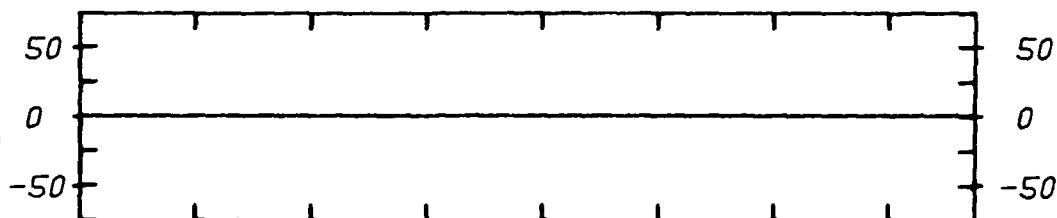
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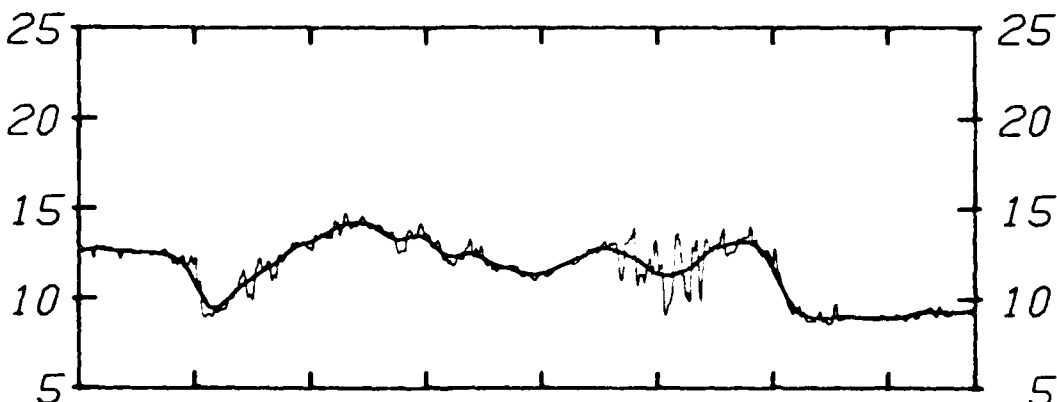
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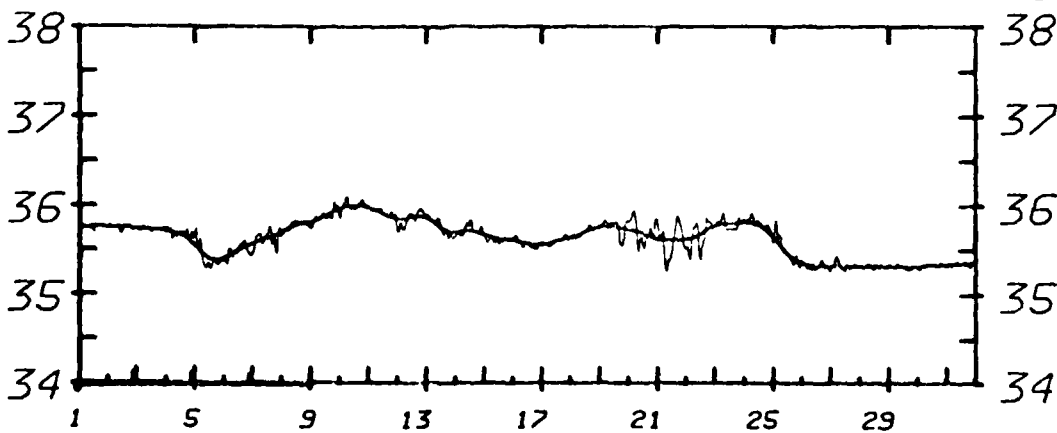
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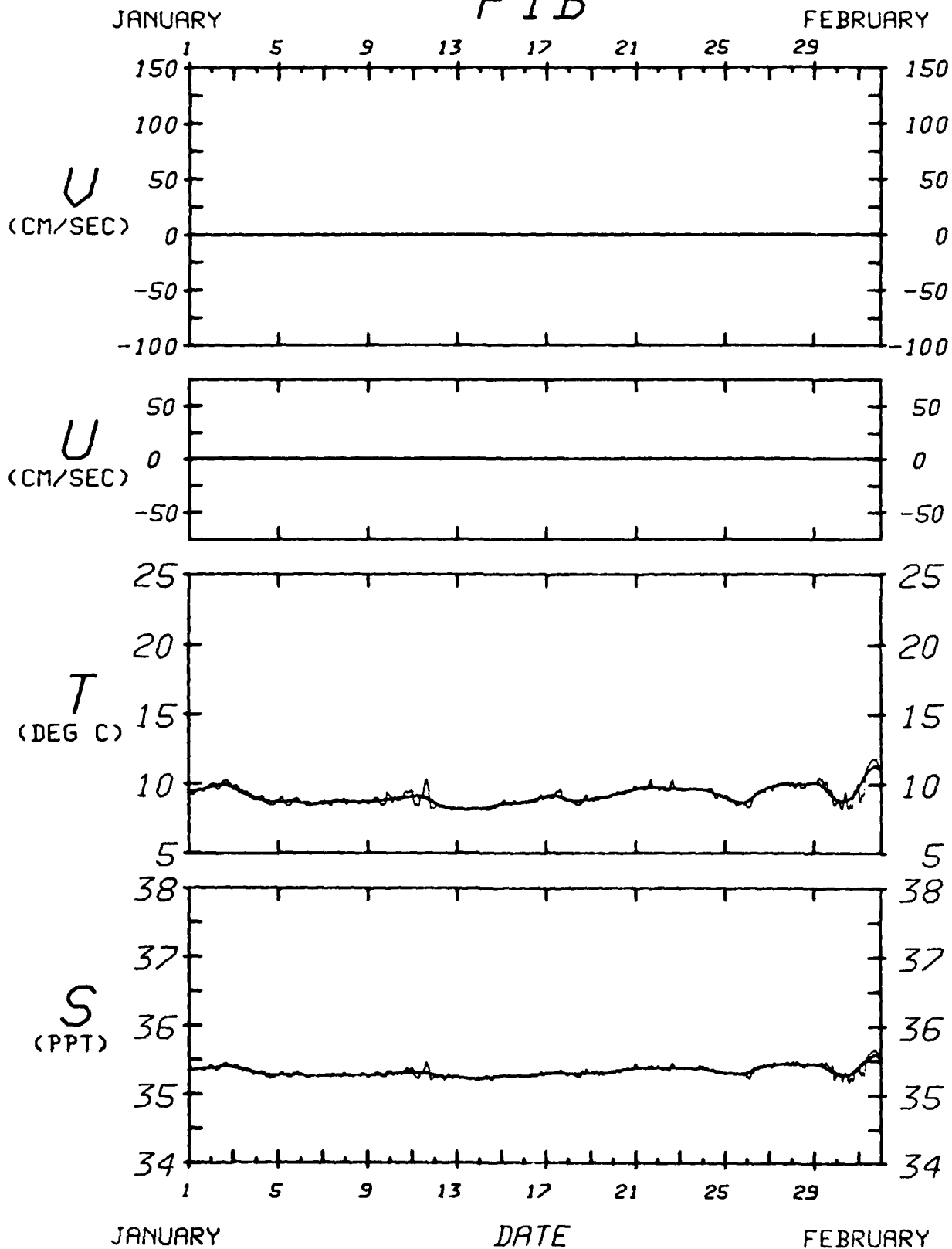
DECEMBER

DATE

JANUARY

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3 HR LP - - - - -

F1B



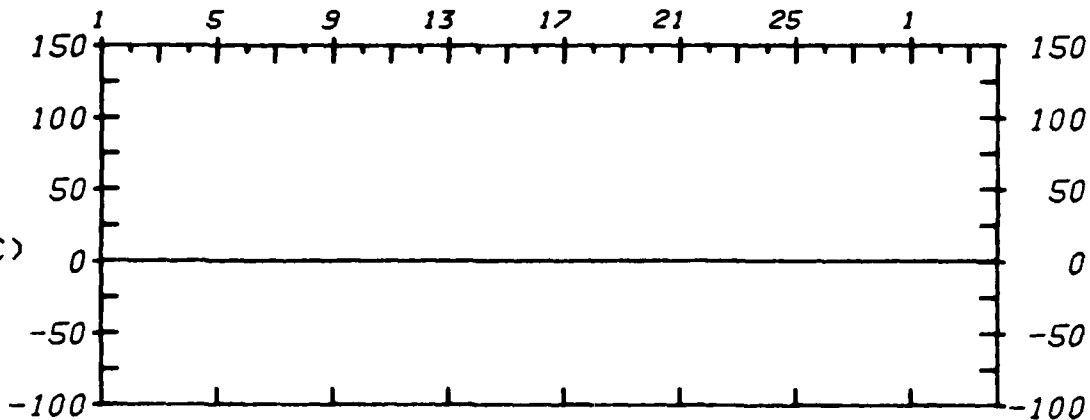
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F1B

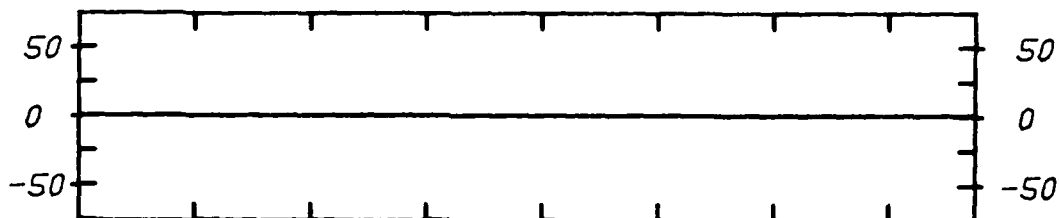
FEBRUARY

MARCH

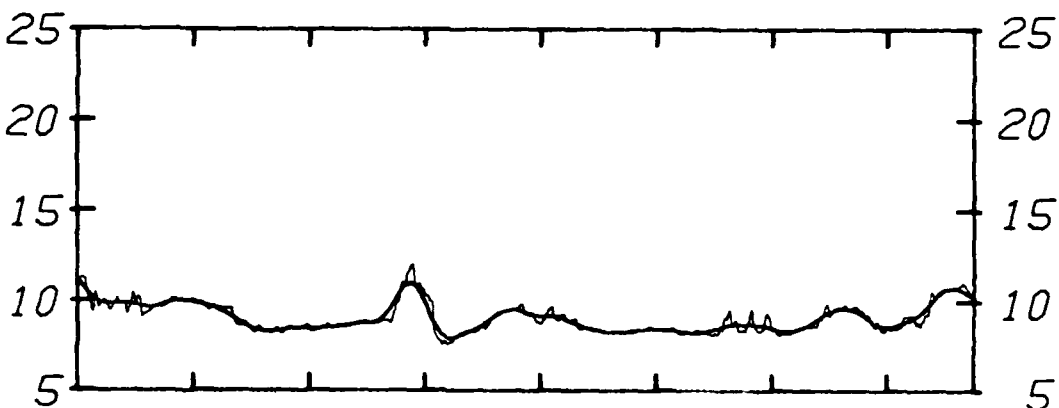
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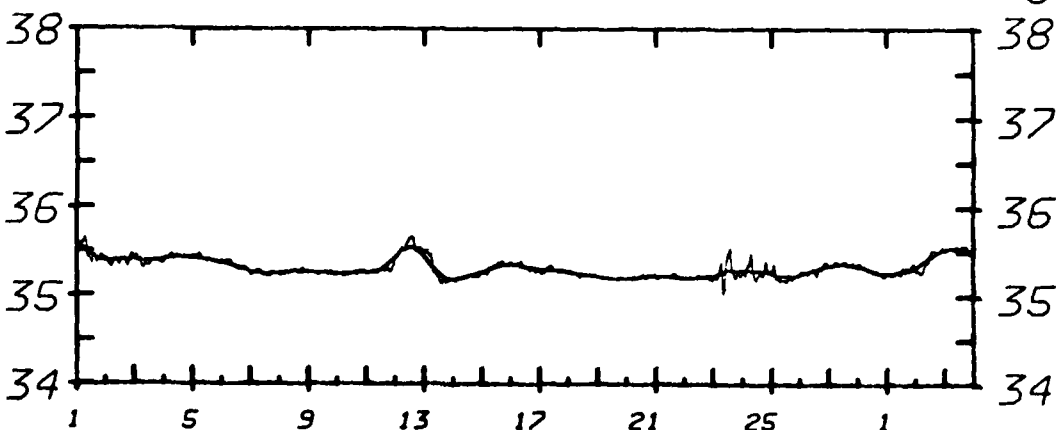
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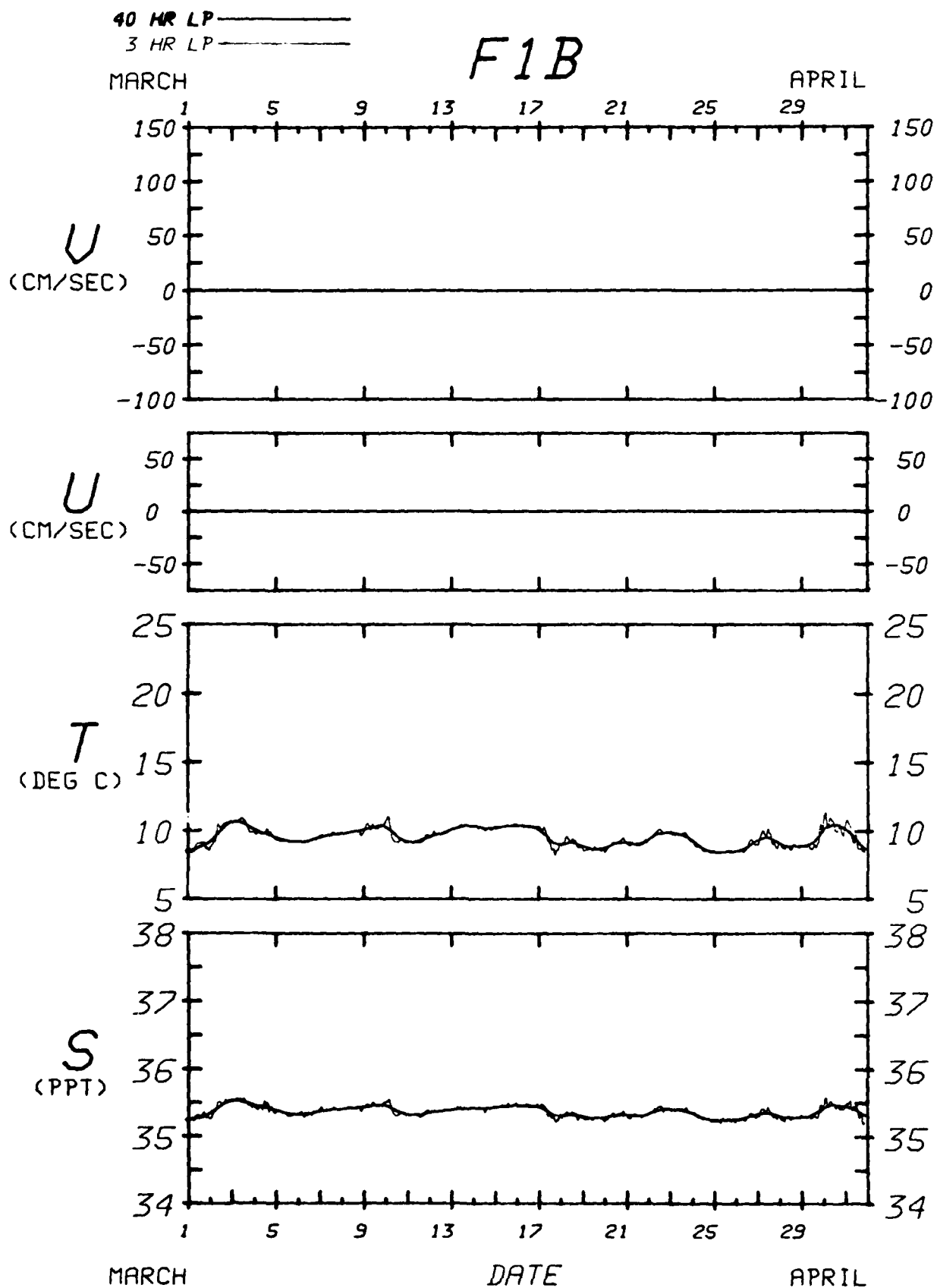
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FEBRUARY

DATE

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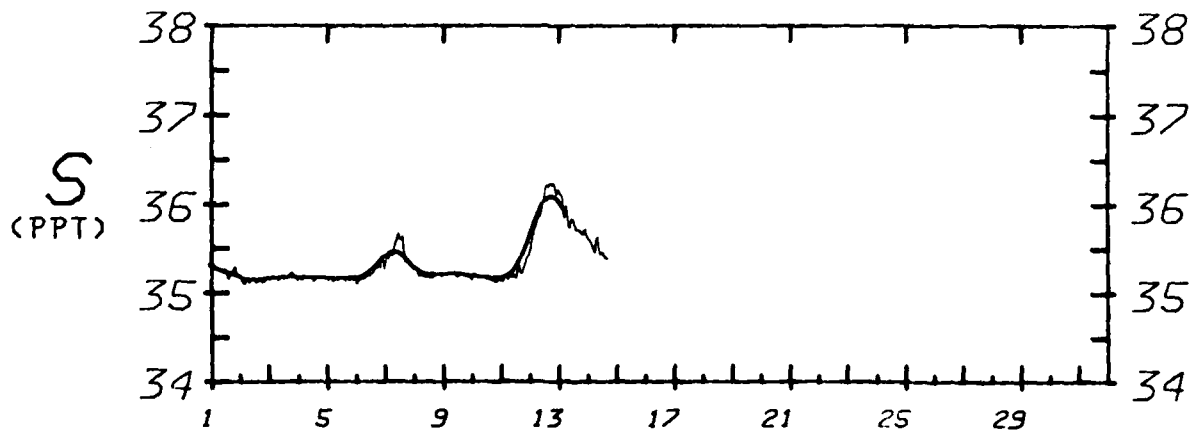
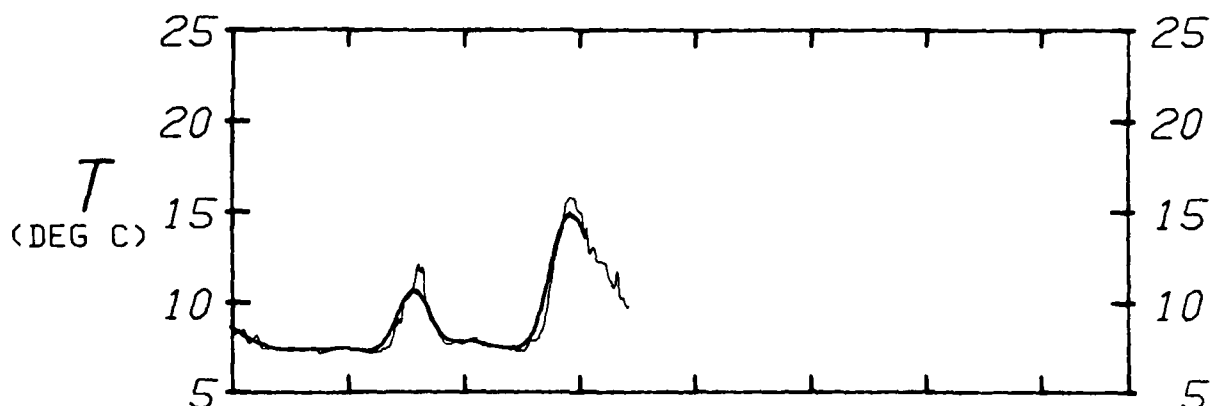
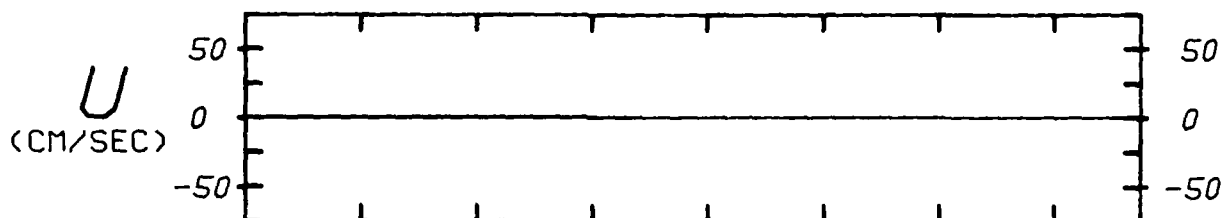
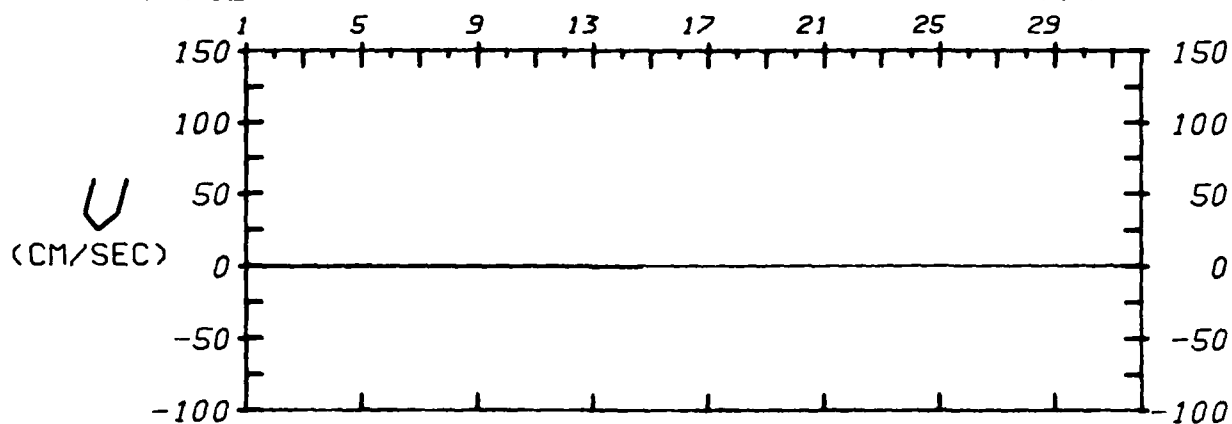


40 HR LP ———
3 HR LP - - - - -

F1B

APRIL

MAY



APRIL

DATE

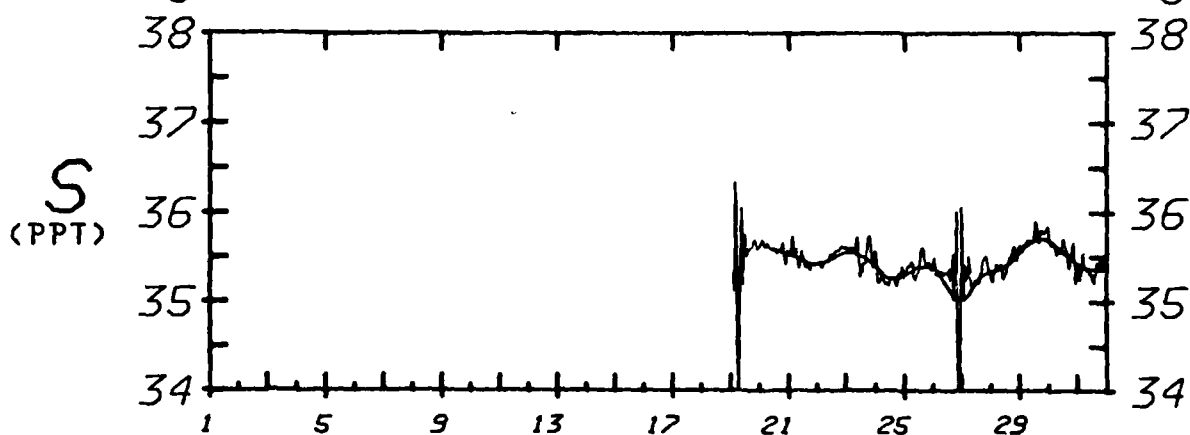
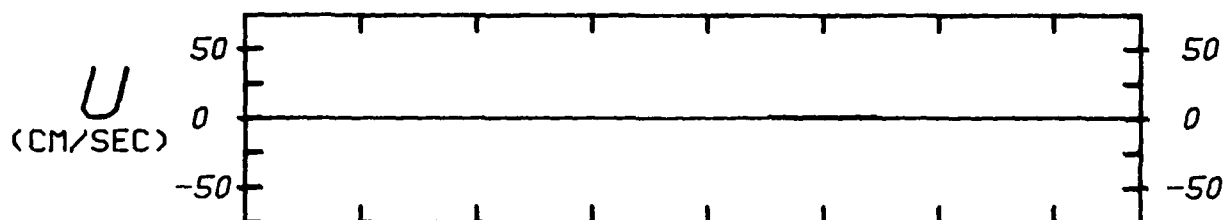
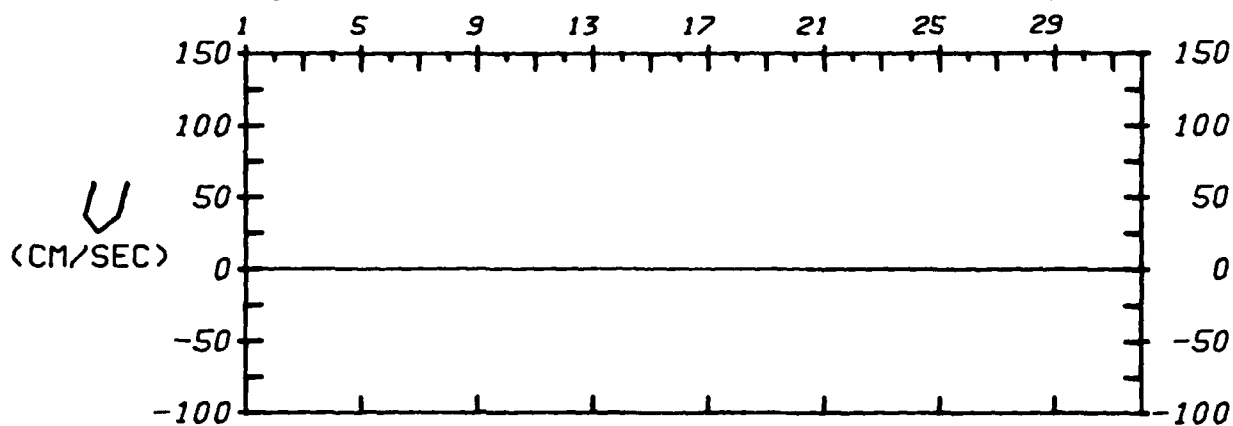
MAY

40 HR LP _____
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F2T

SEPTEMBER

OCTOBER



SEPTEMBER

DATE

OCTOBER

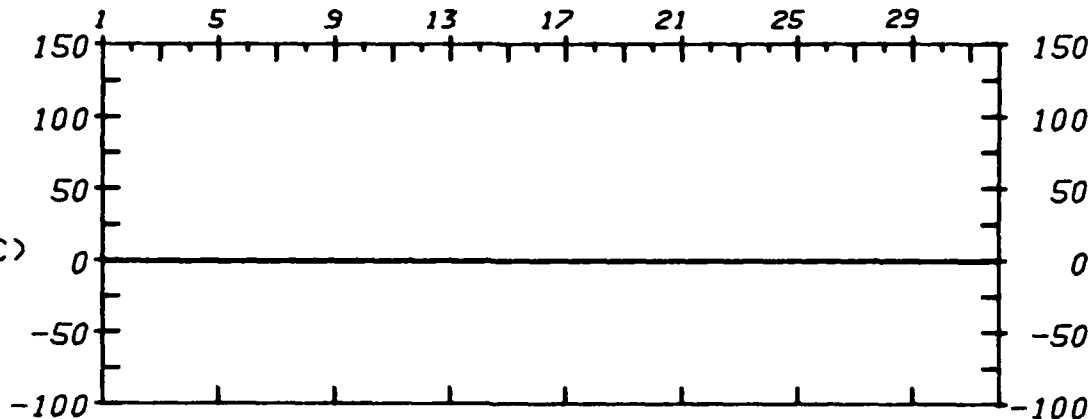
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F2T

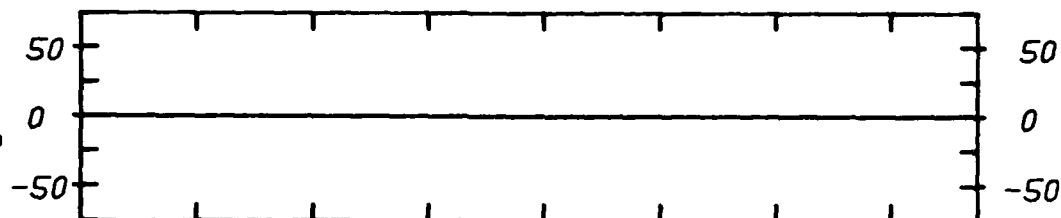
OCTOBER

NOVEMBER

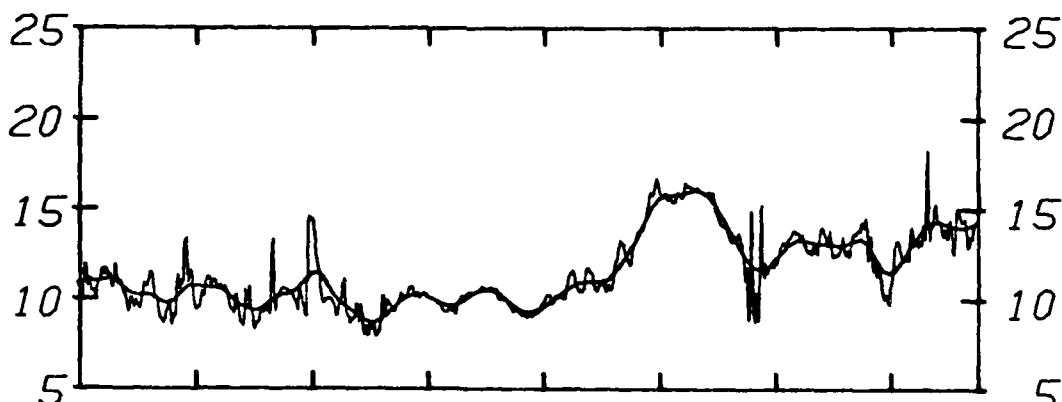
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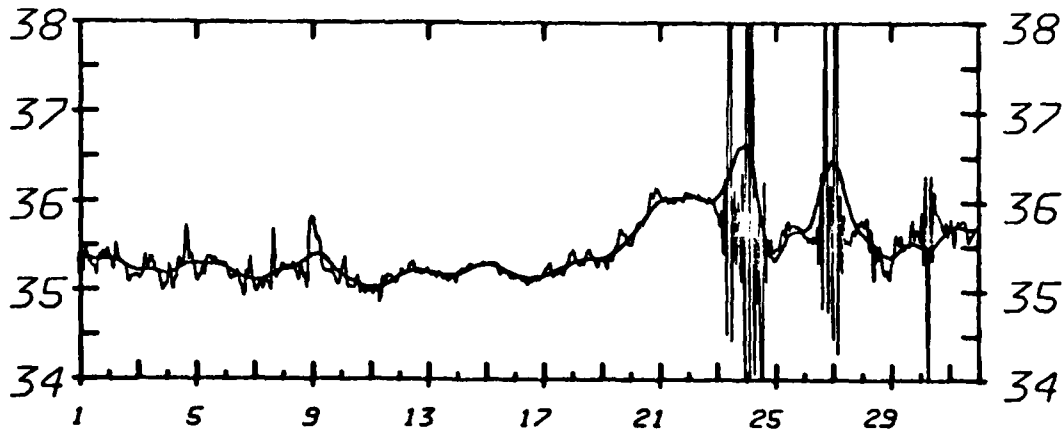
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OCTOBER

DATE

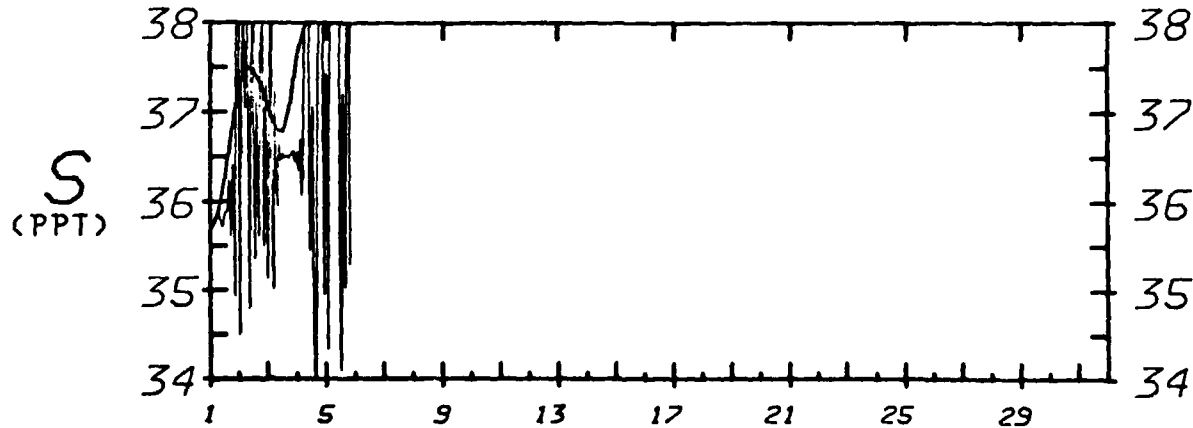
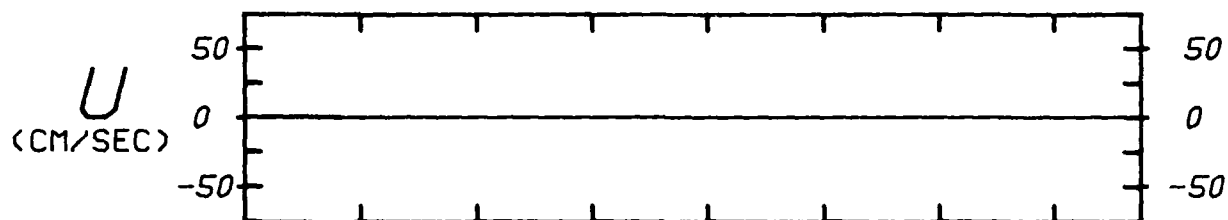
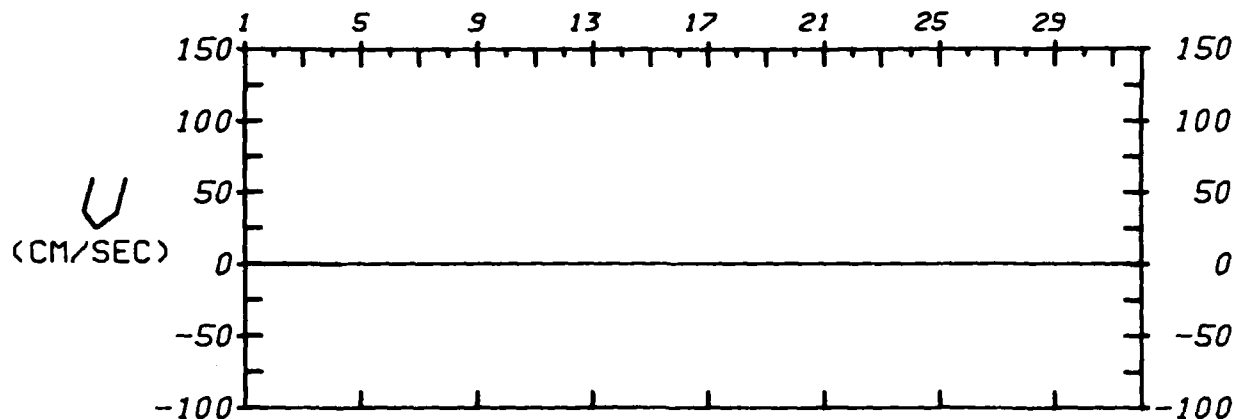
NOVEMBER

40 HR LP ———
3 HR LP ———

F2T

NOVEMBER

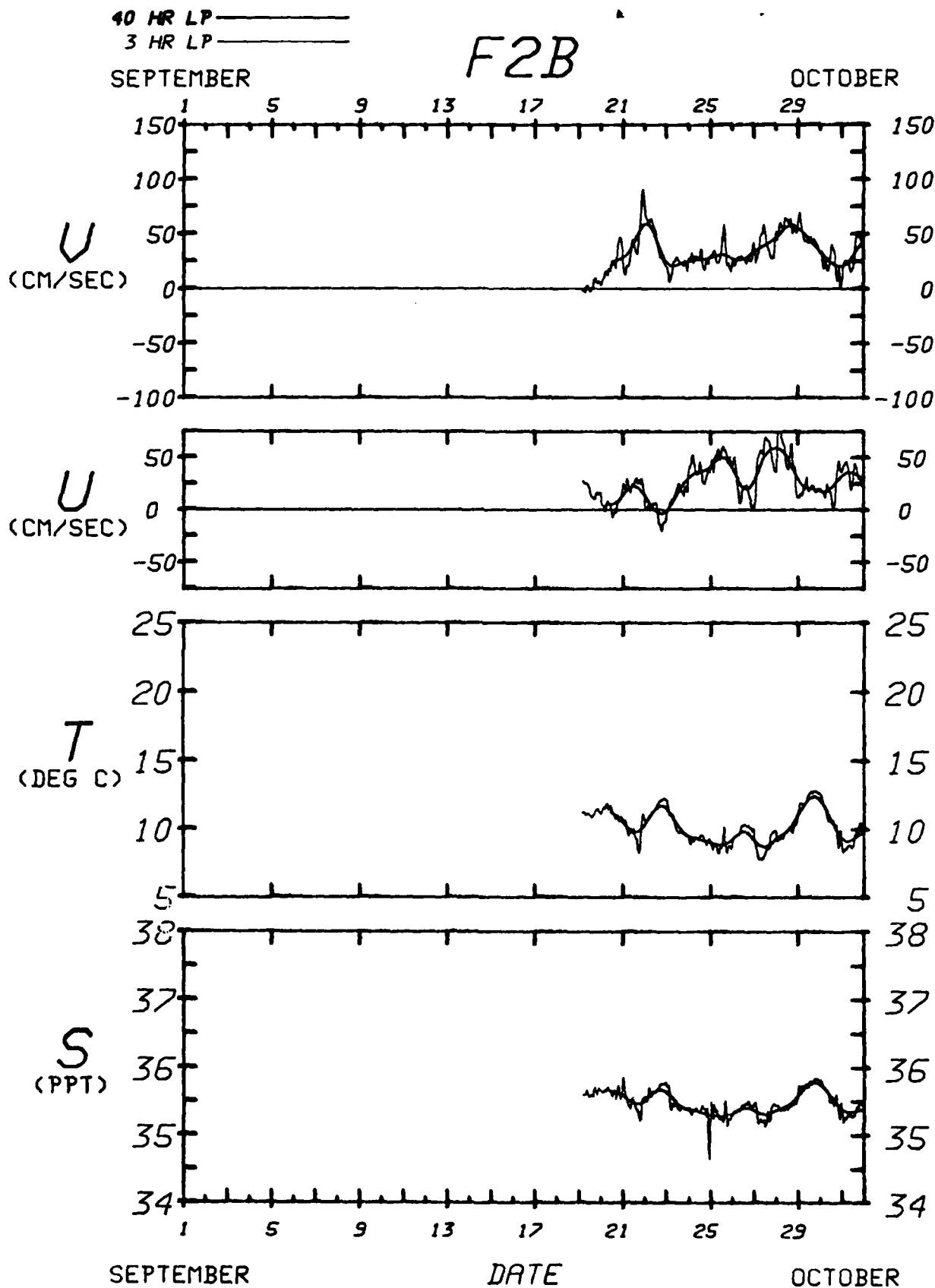
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NOVEMBER

DATE

DECEMBER

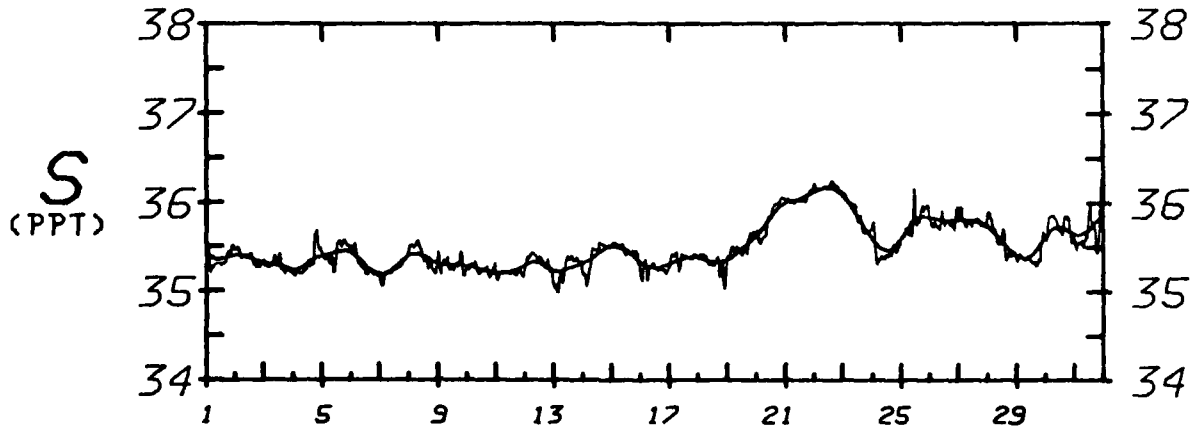
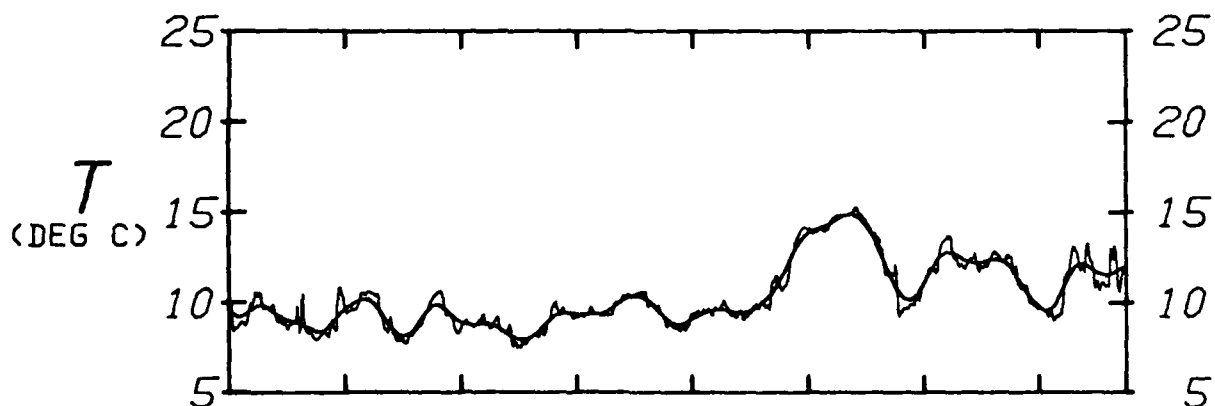
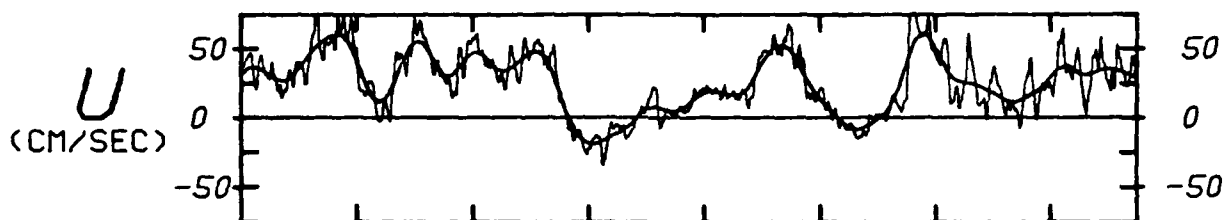
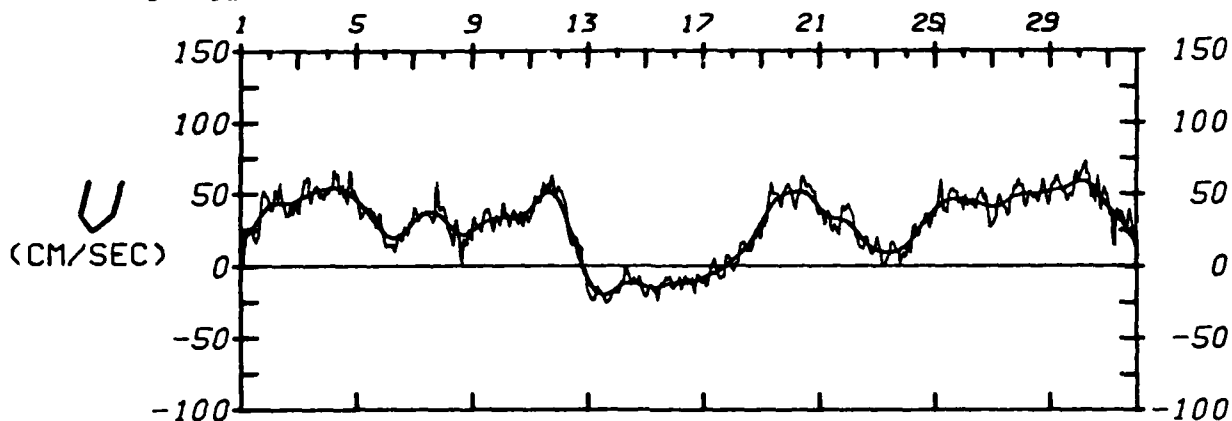


40 HR LP ———
3 HR LP ———

F2B

OCTOBER

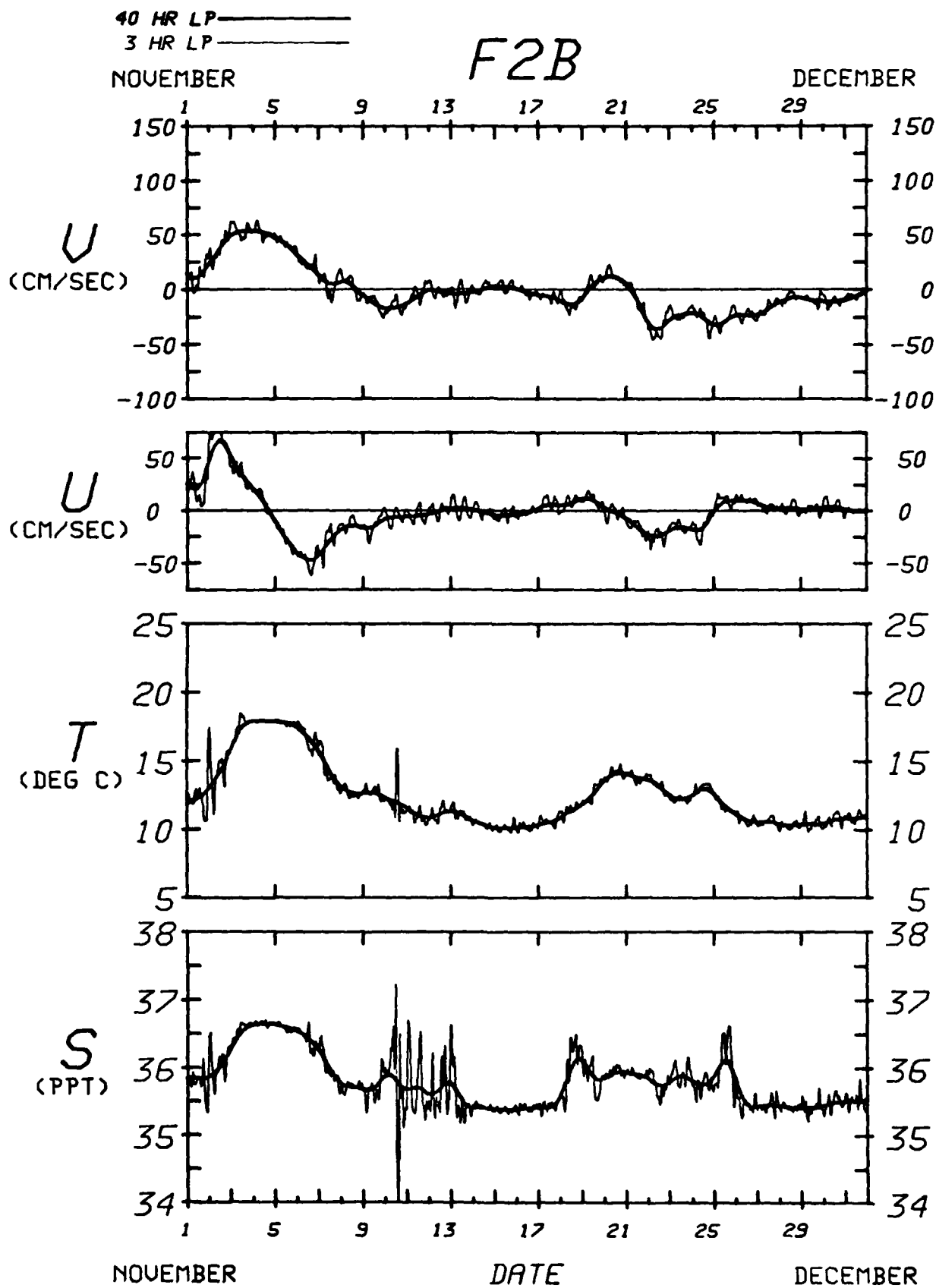
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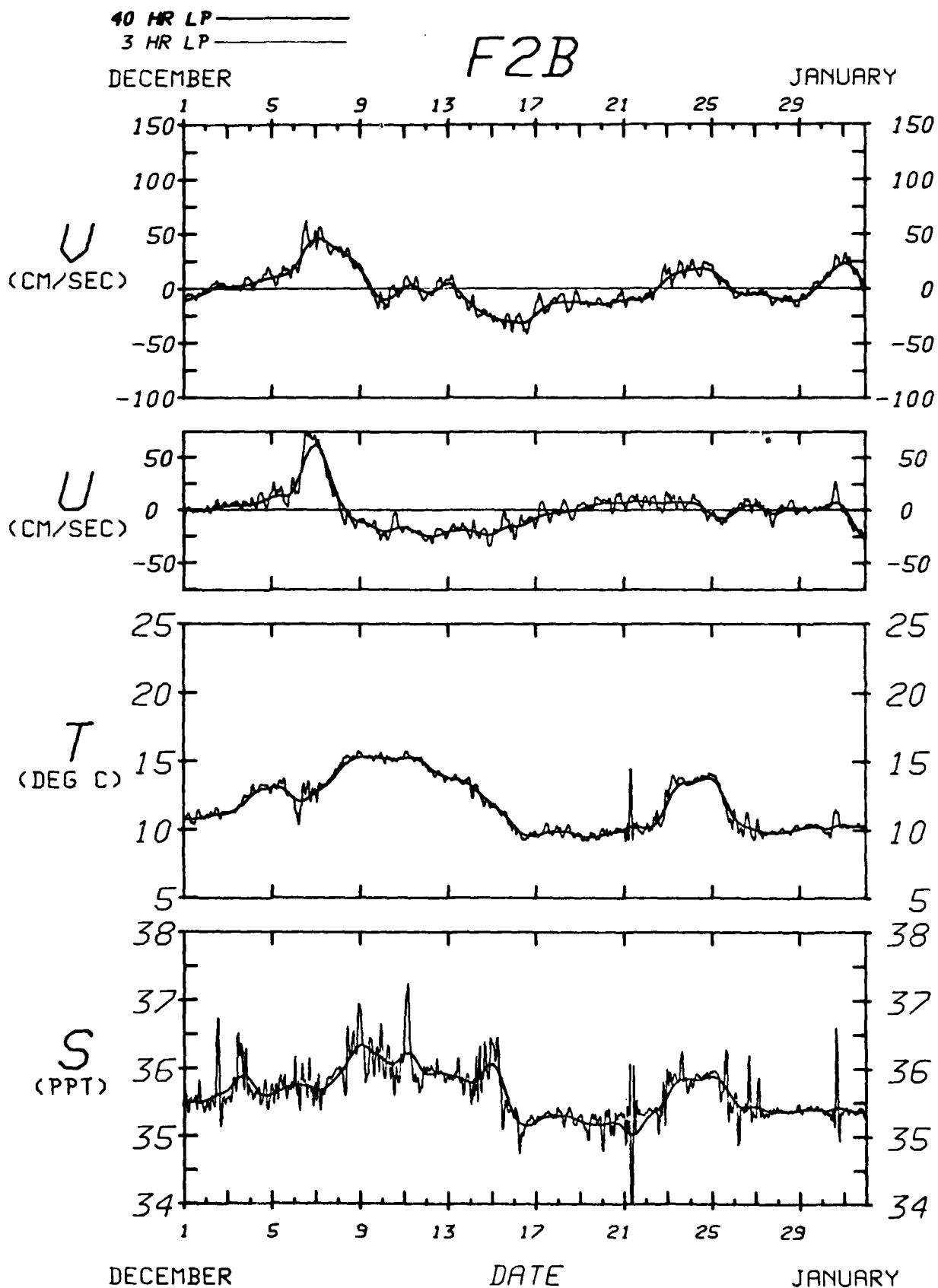


OCTOBER

DATE

NOVEMBER



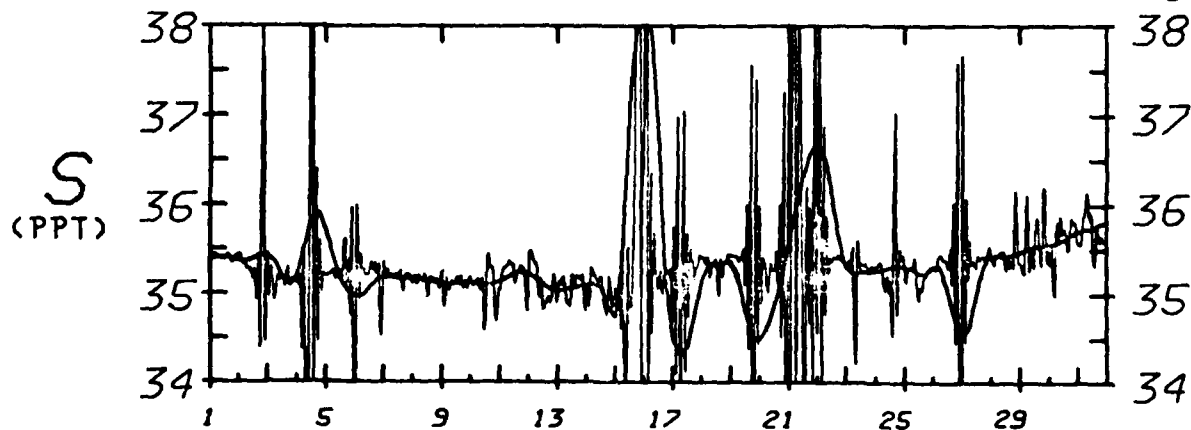
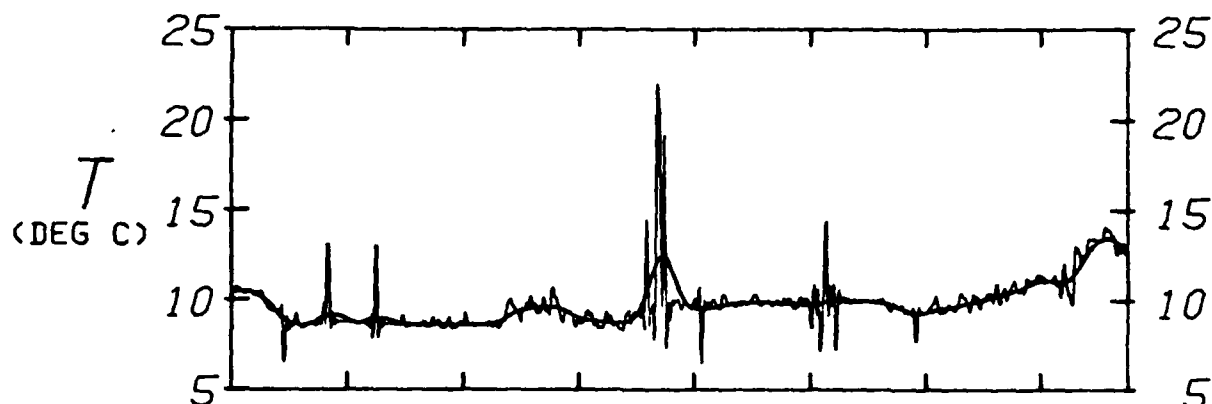
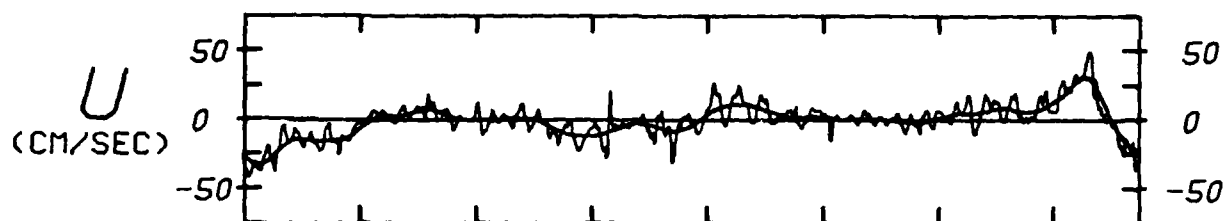
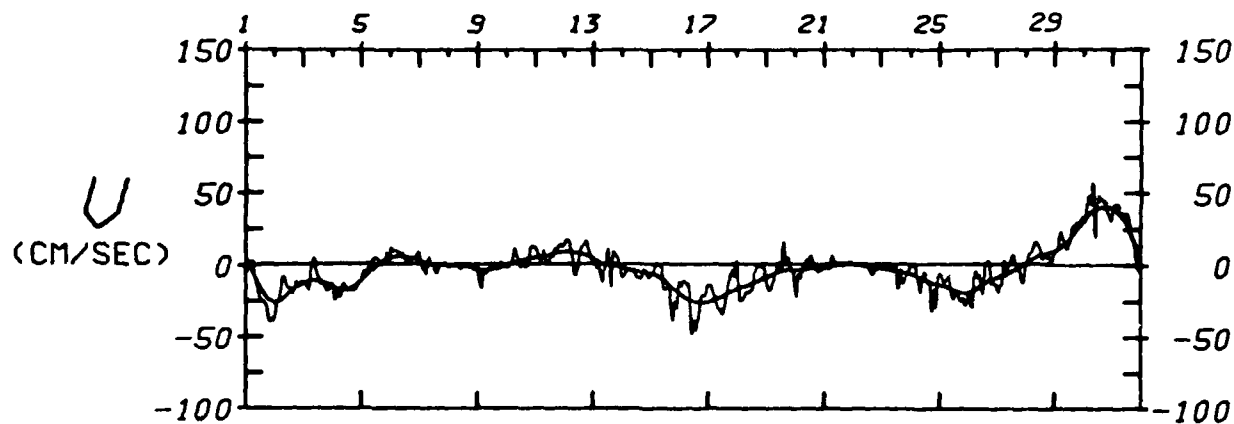


40 HR LP
3 HR LP

F2B

JANUARY

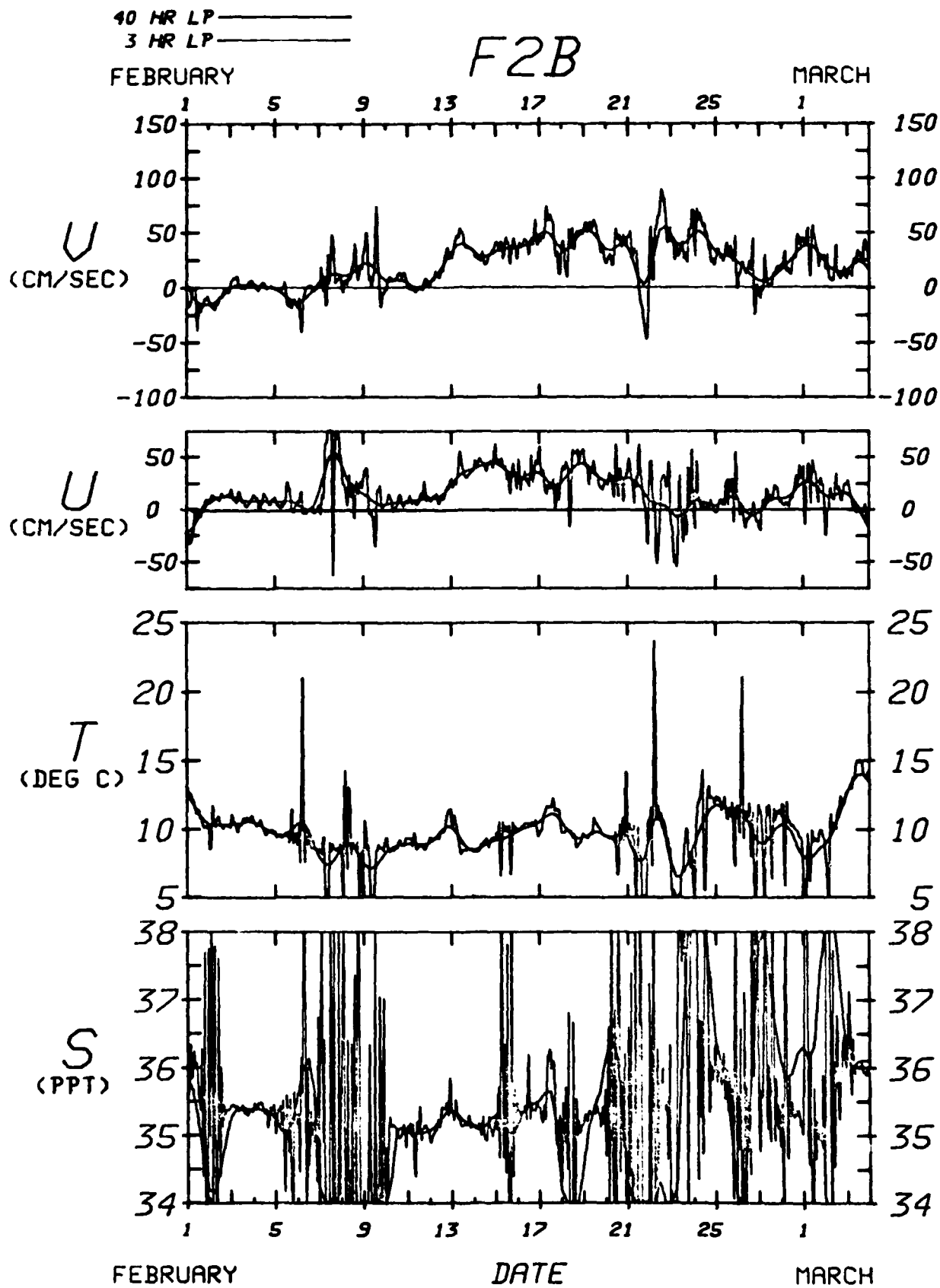
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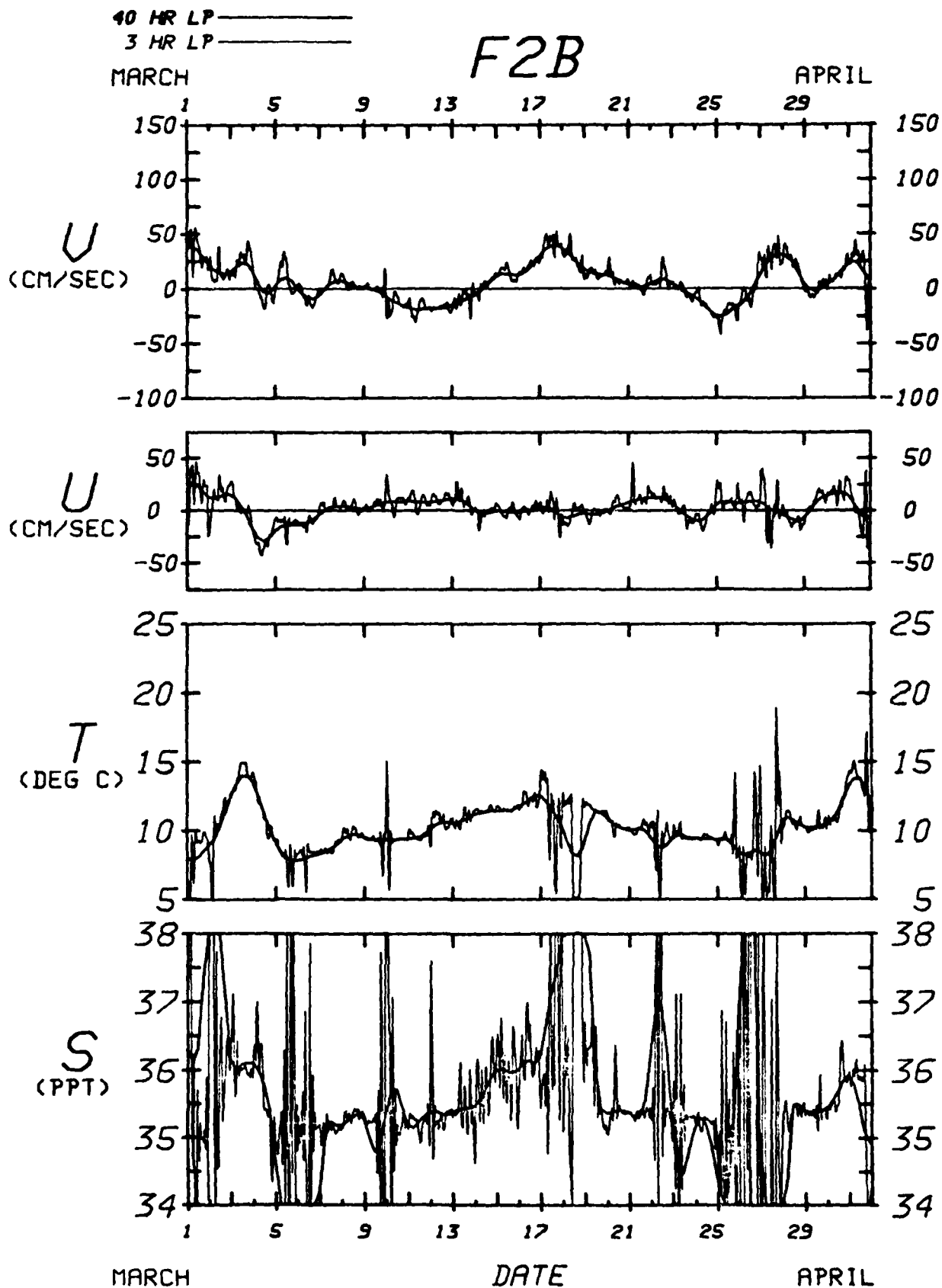


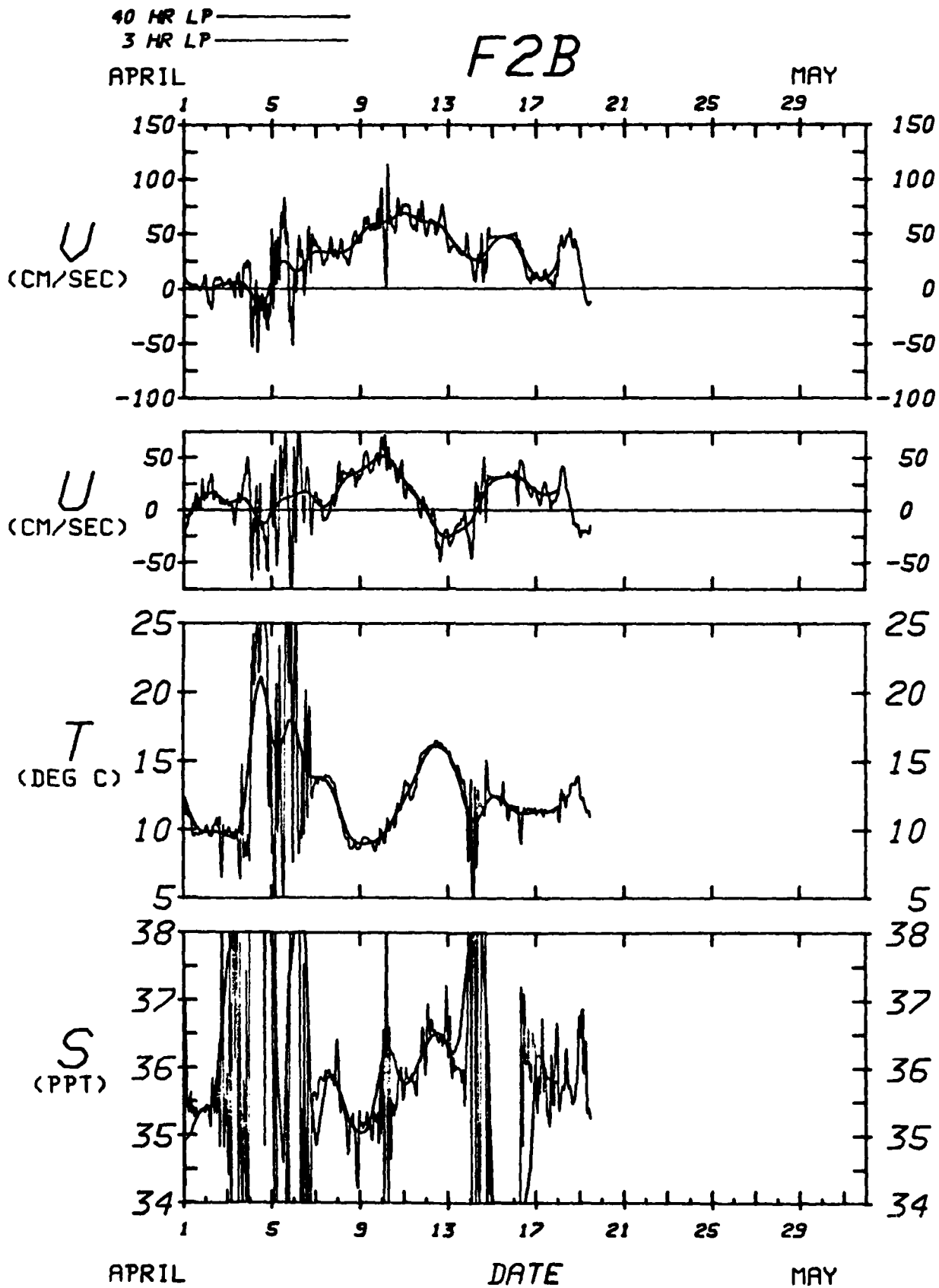
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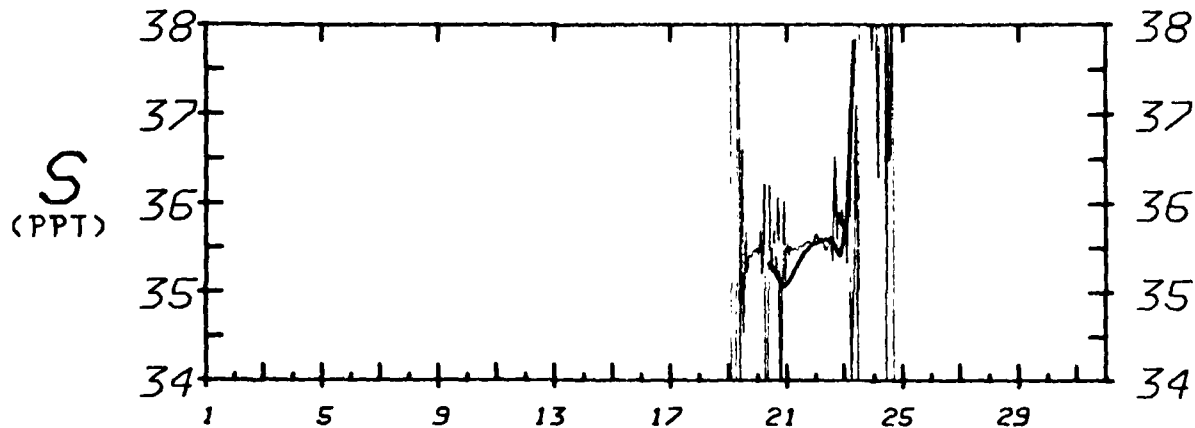
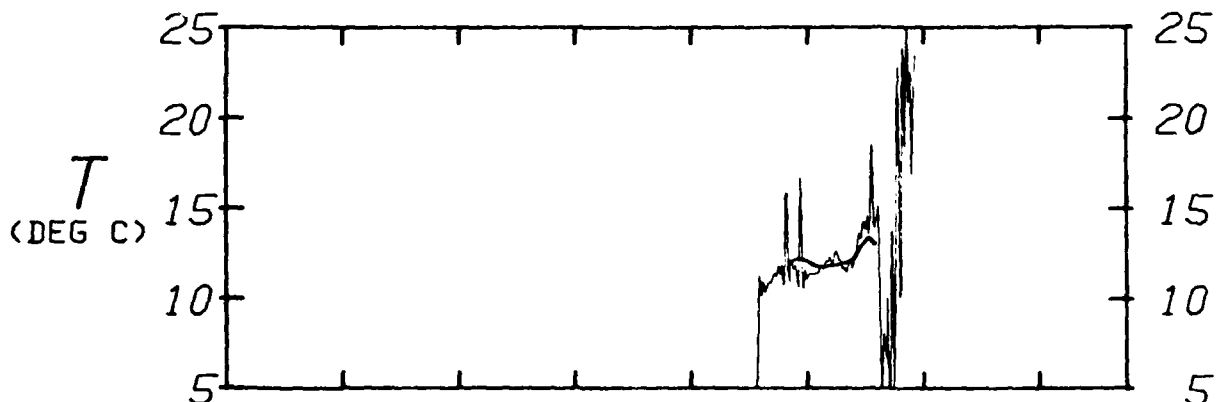
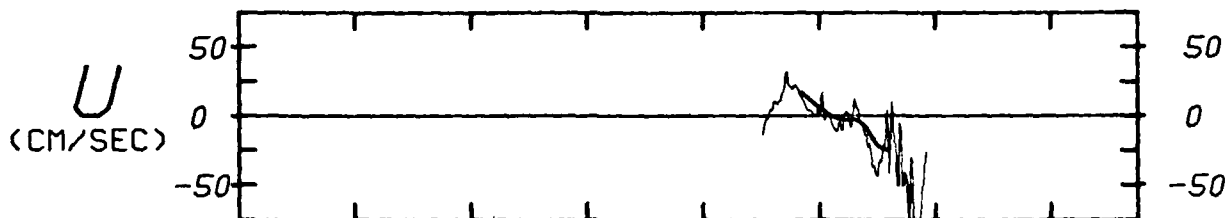
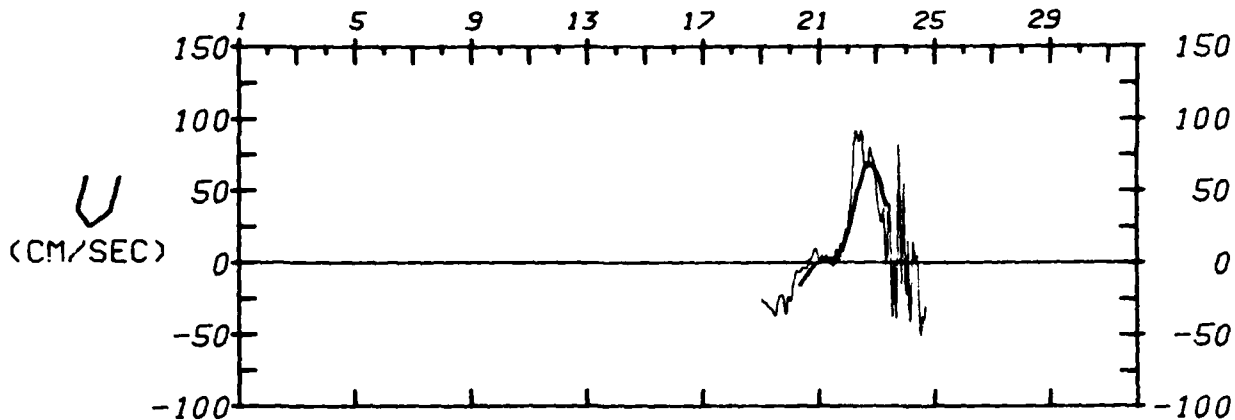


40 HR LP —————
3 HR LP - - - - -

F3T

SEPTEMBER

OCTOBER



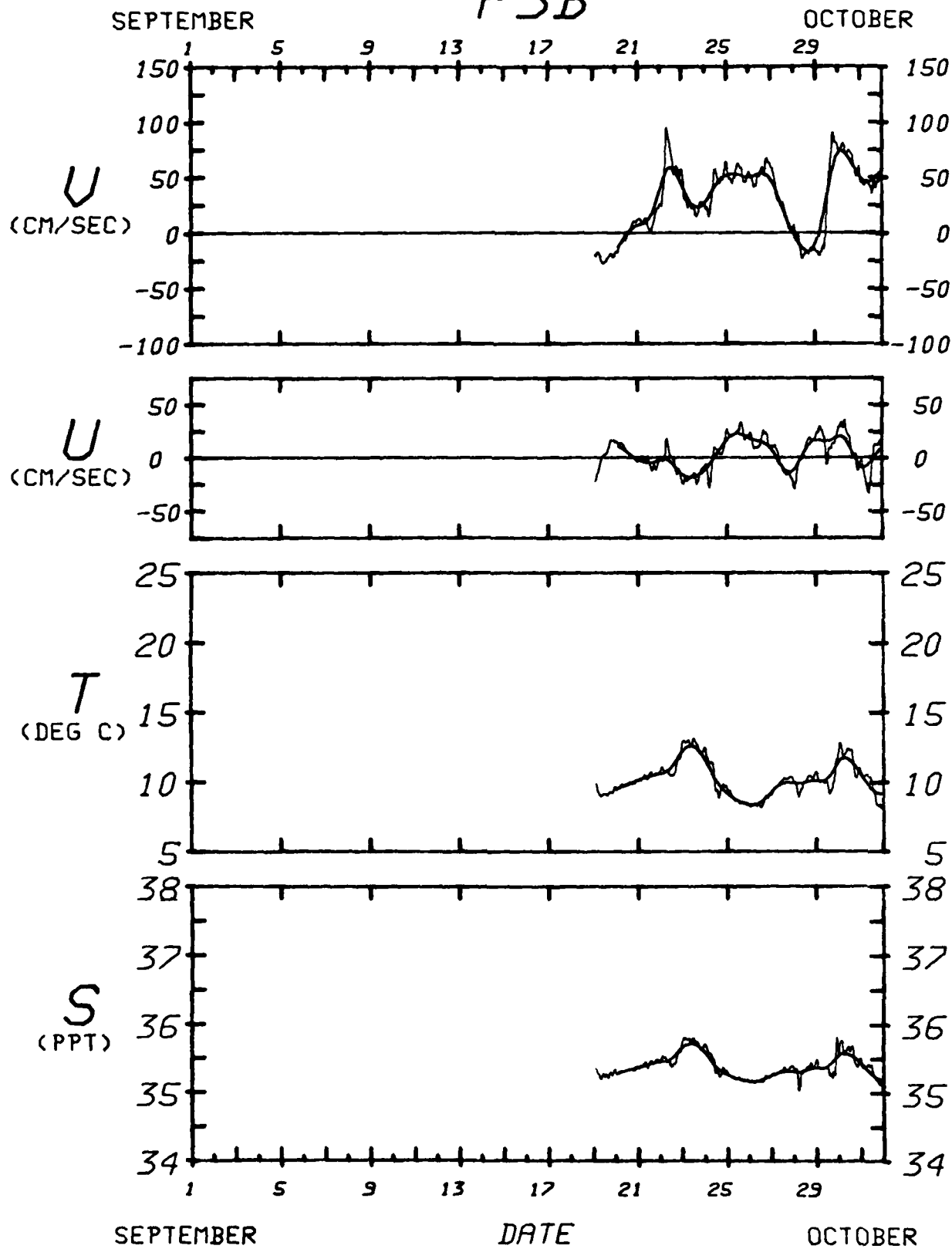
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DATE

OCTOBER

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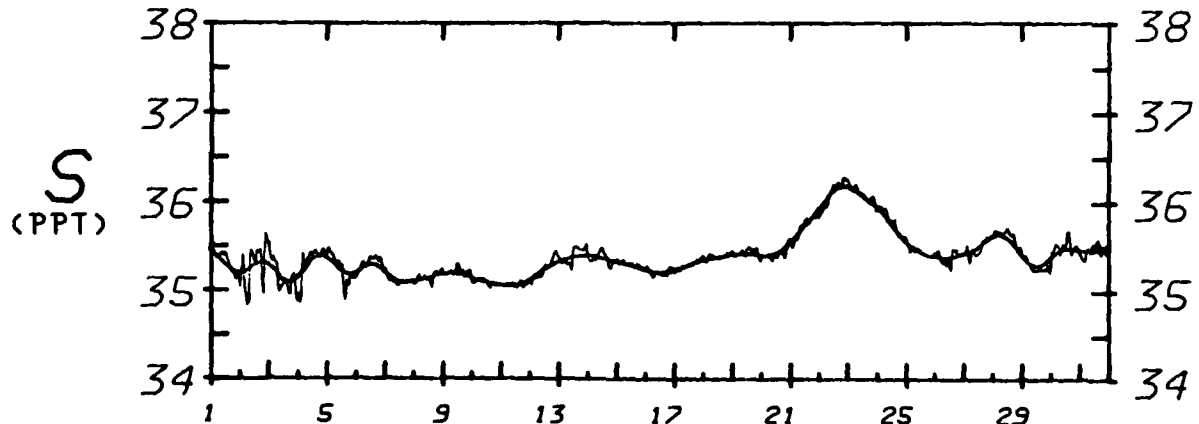
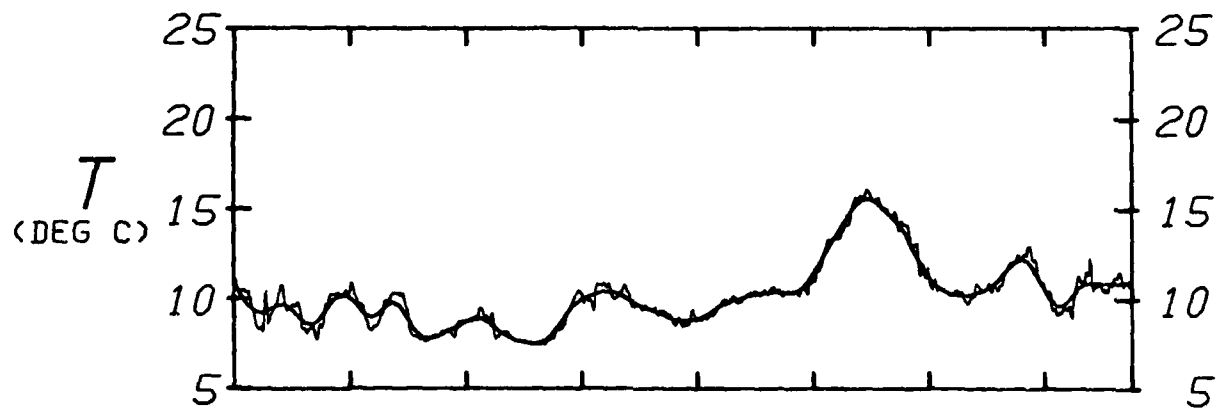
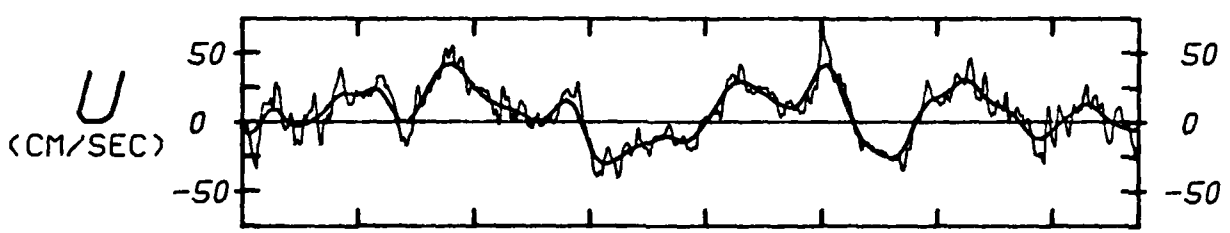
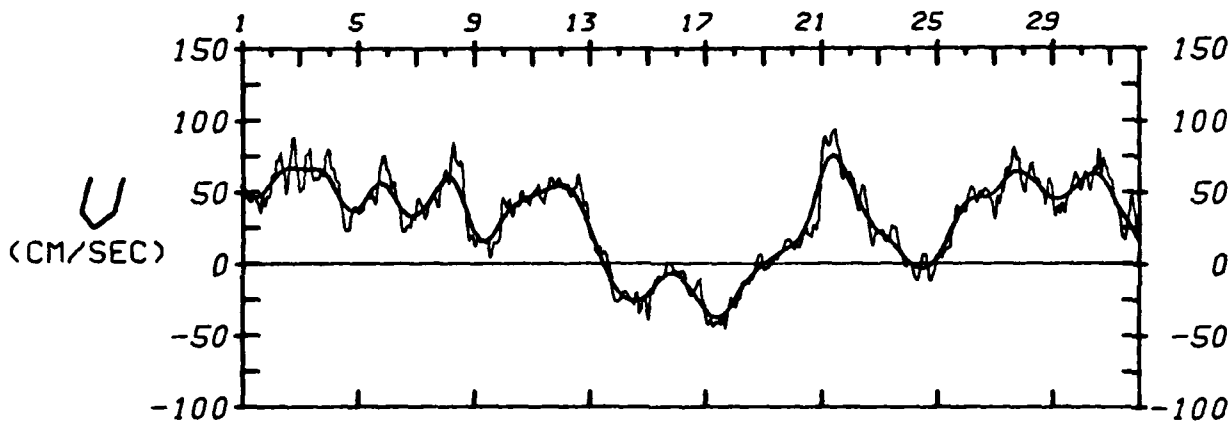


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F3B

OCTOBER

NOVEMBER



OCTOBER

DATE

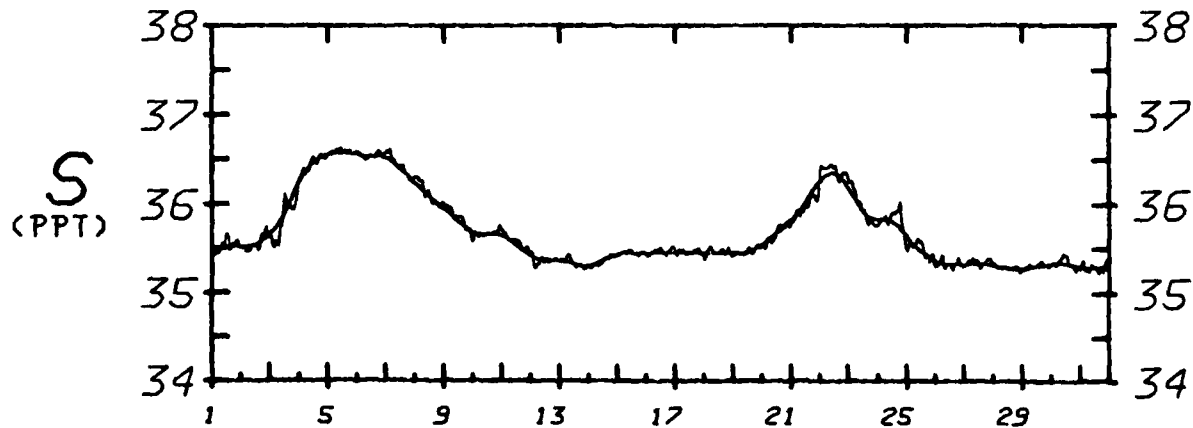
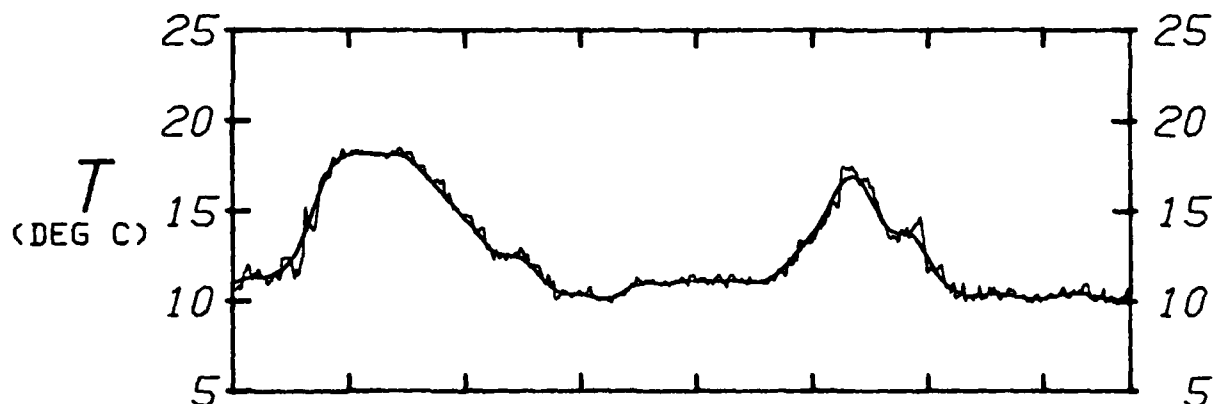
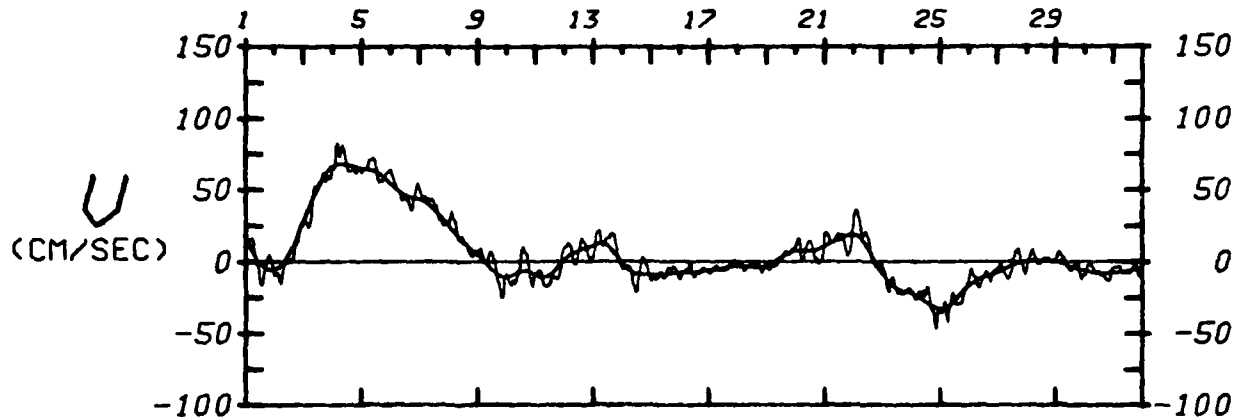
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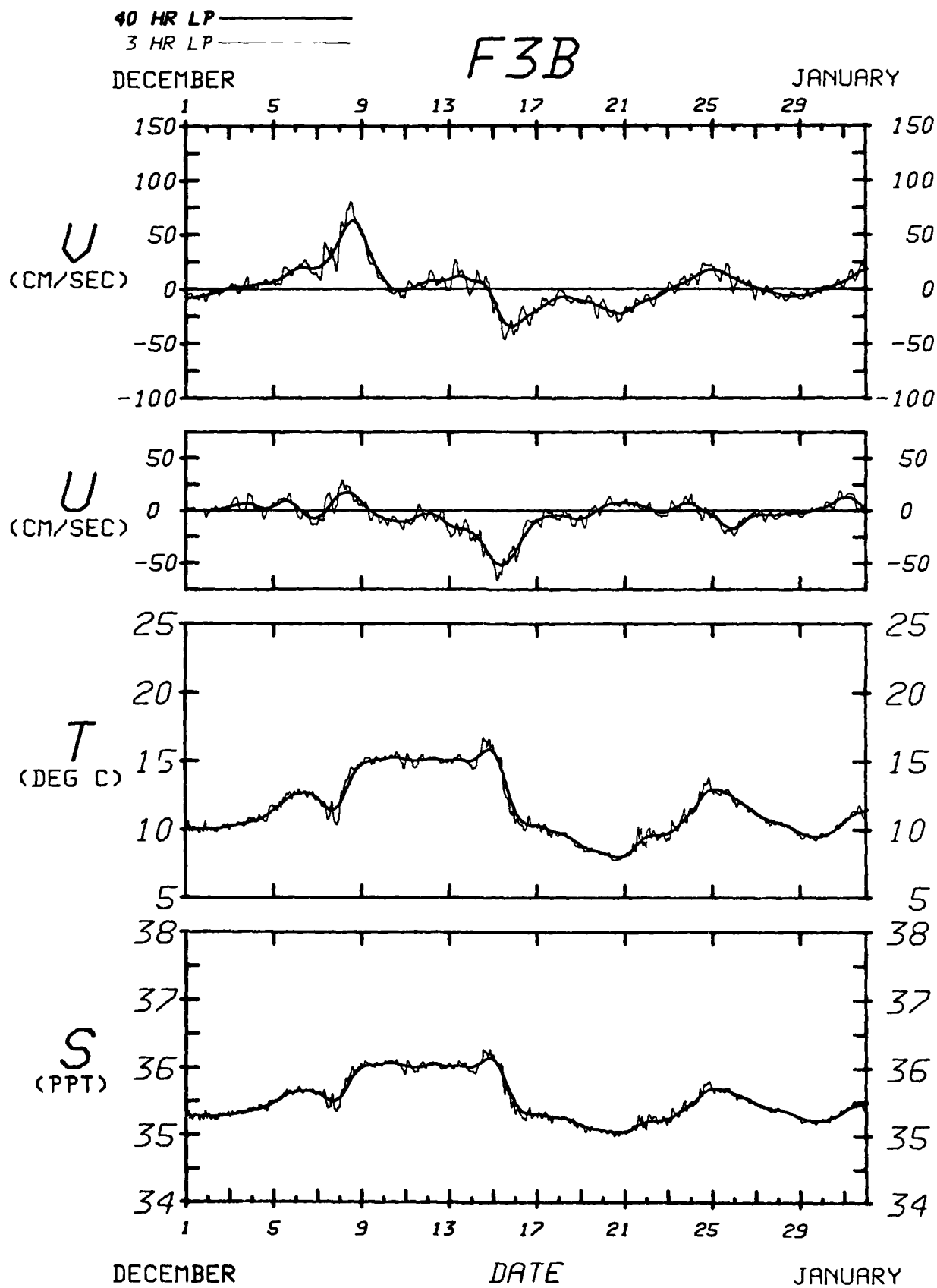
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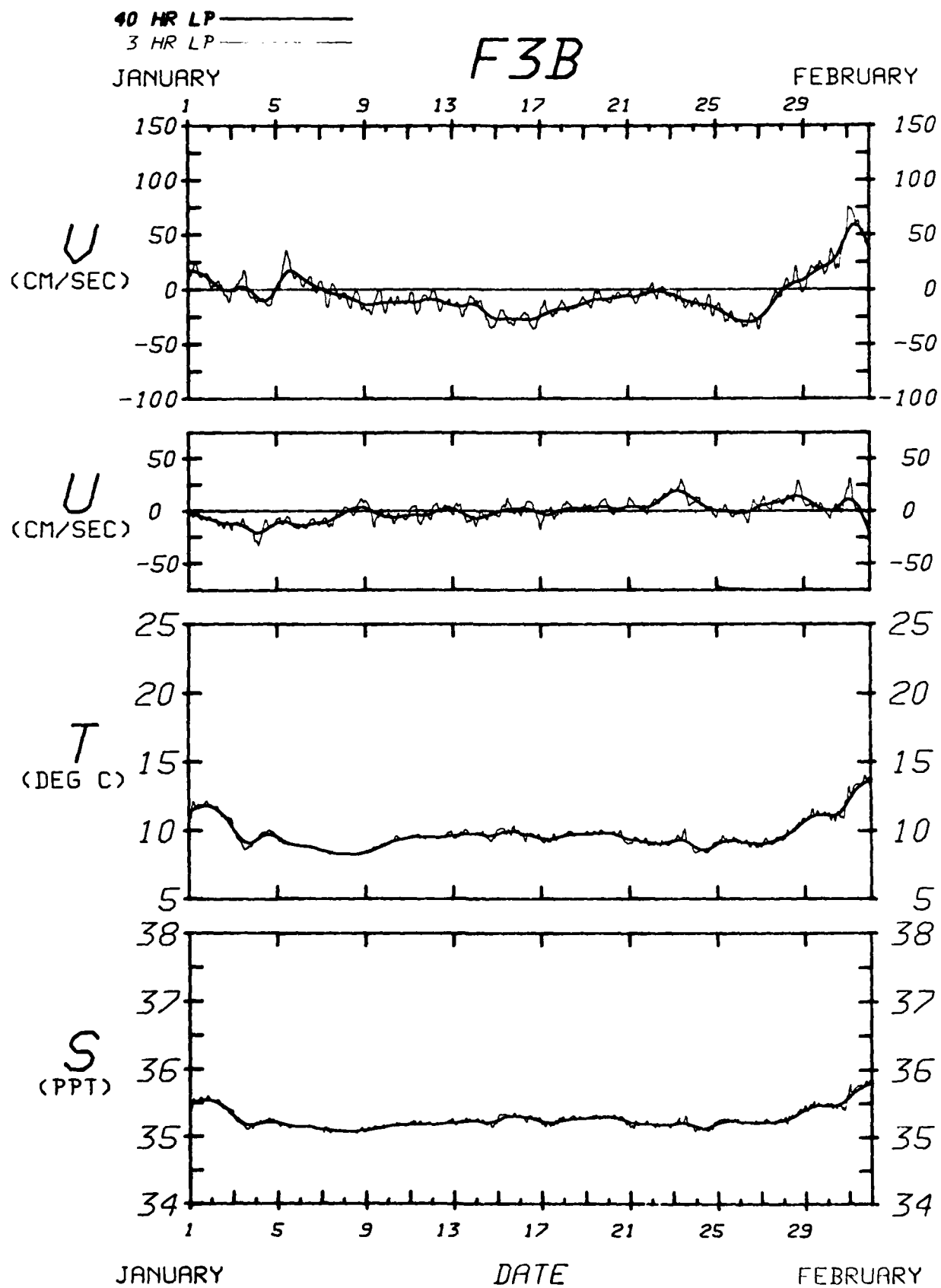


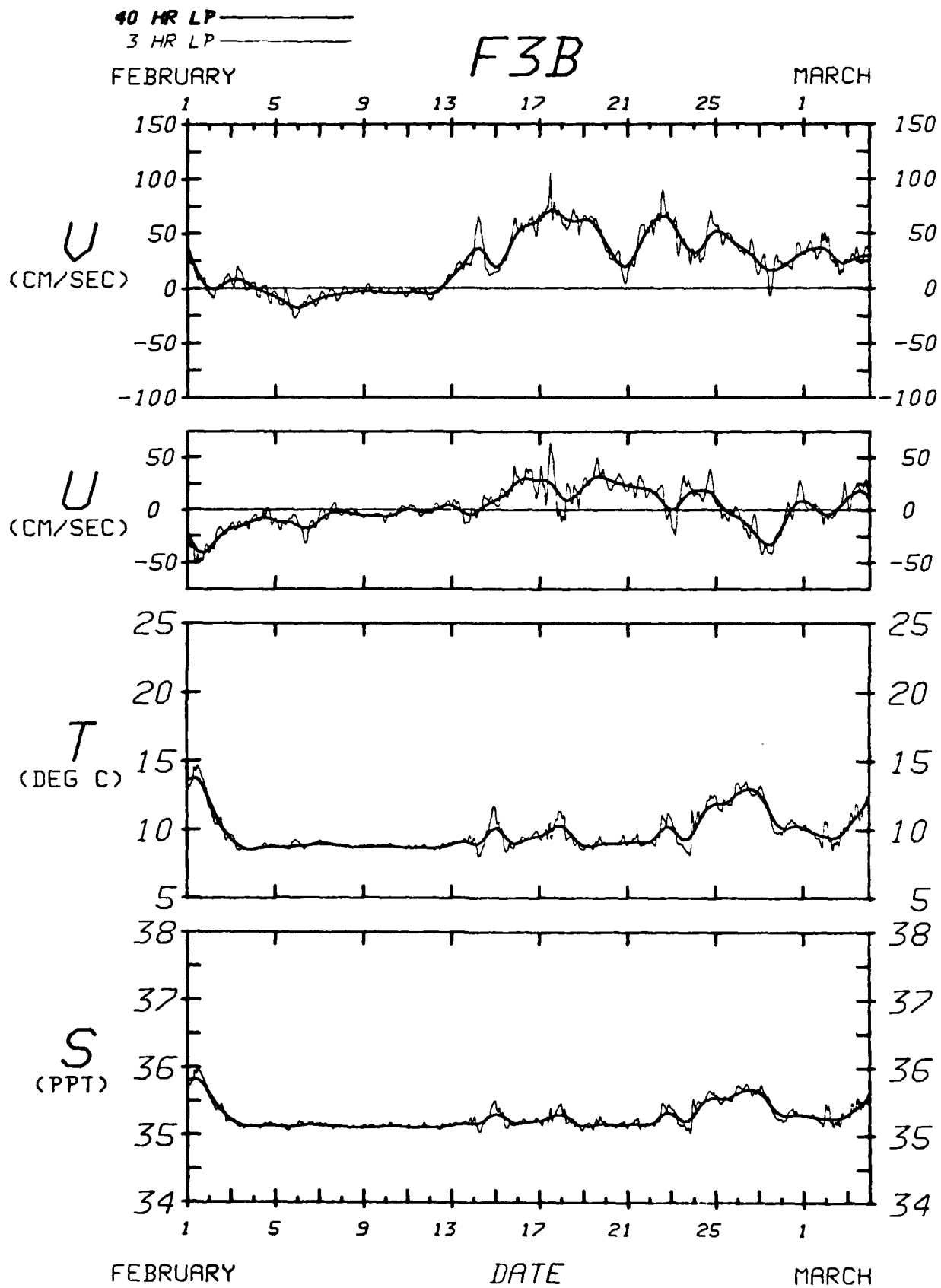
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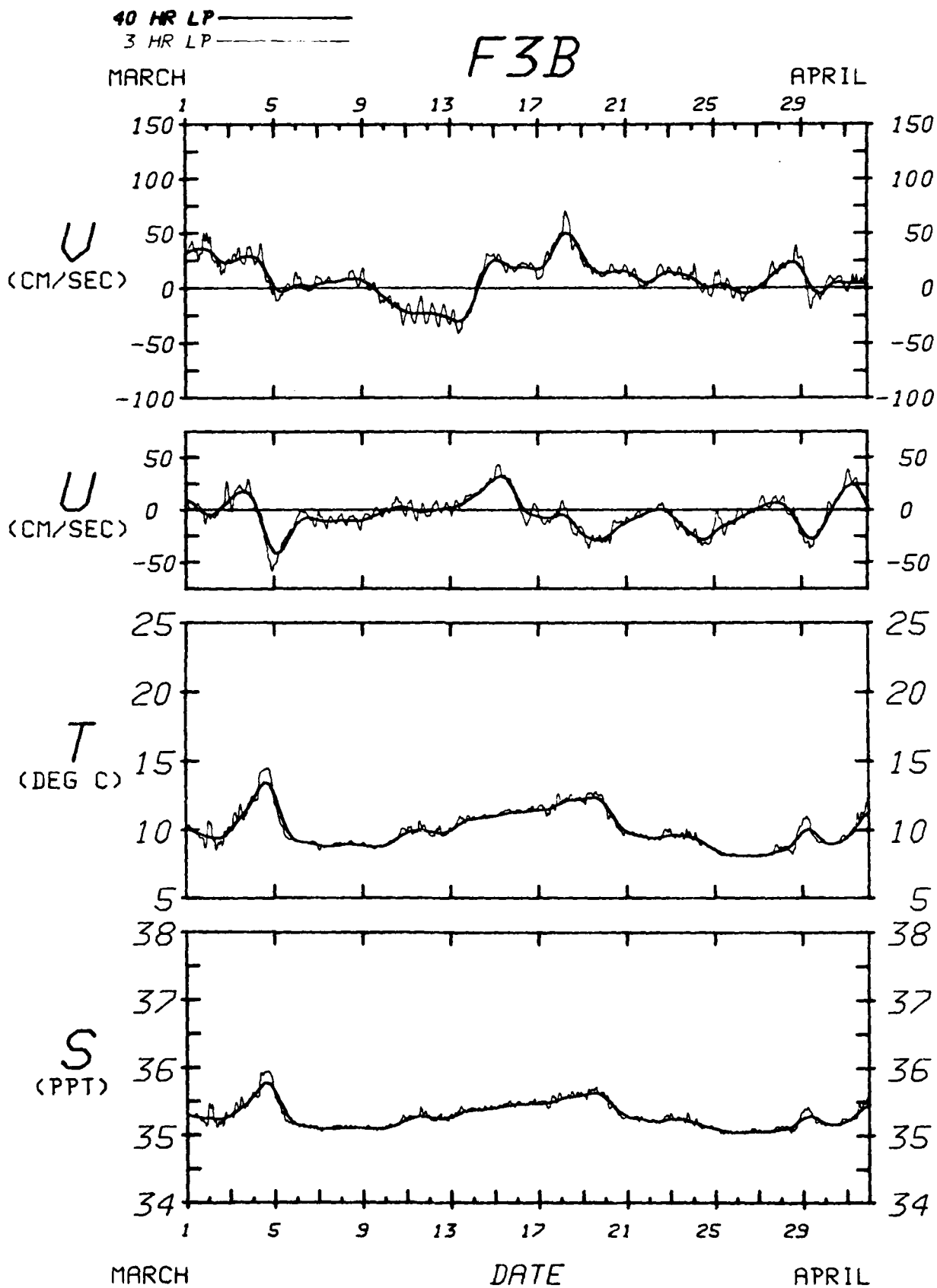
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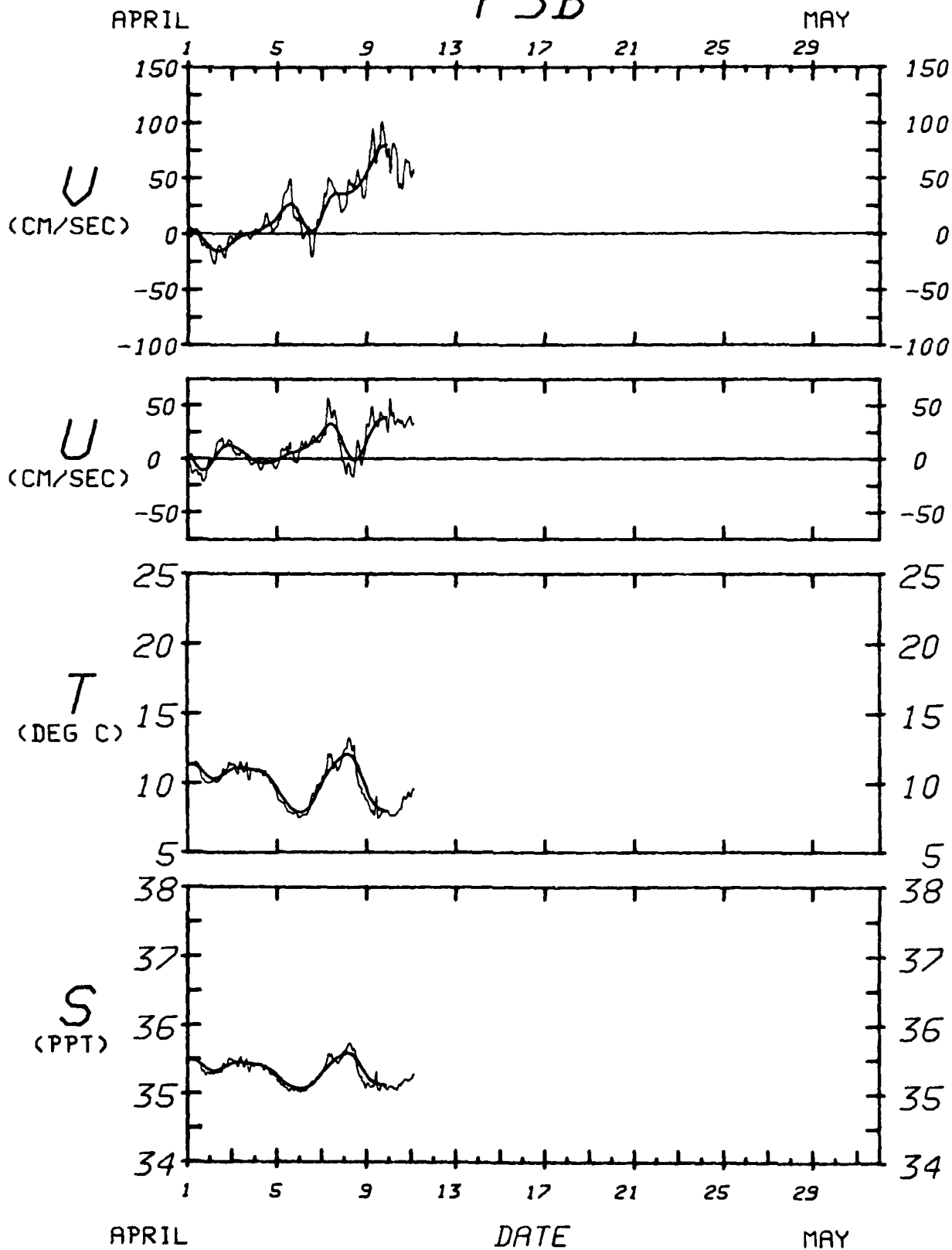




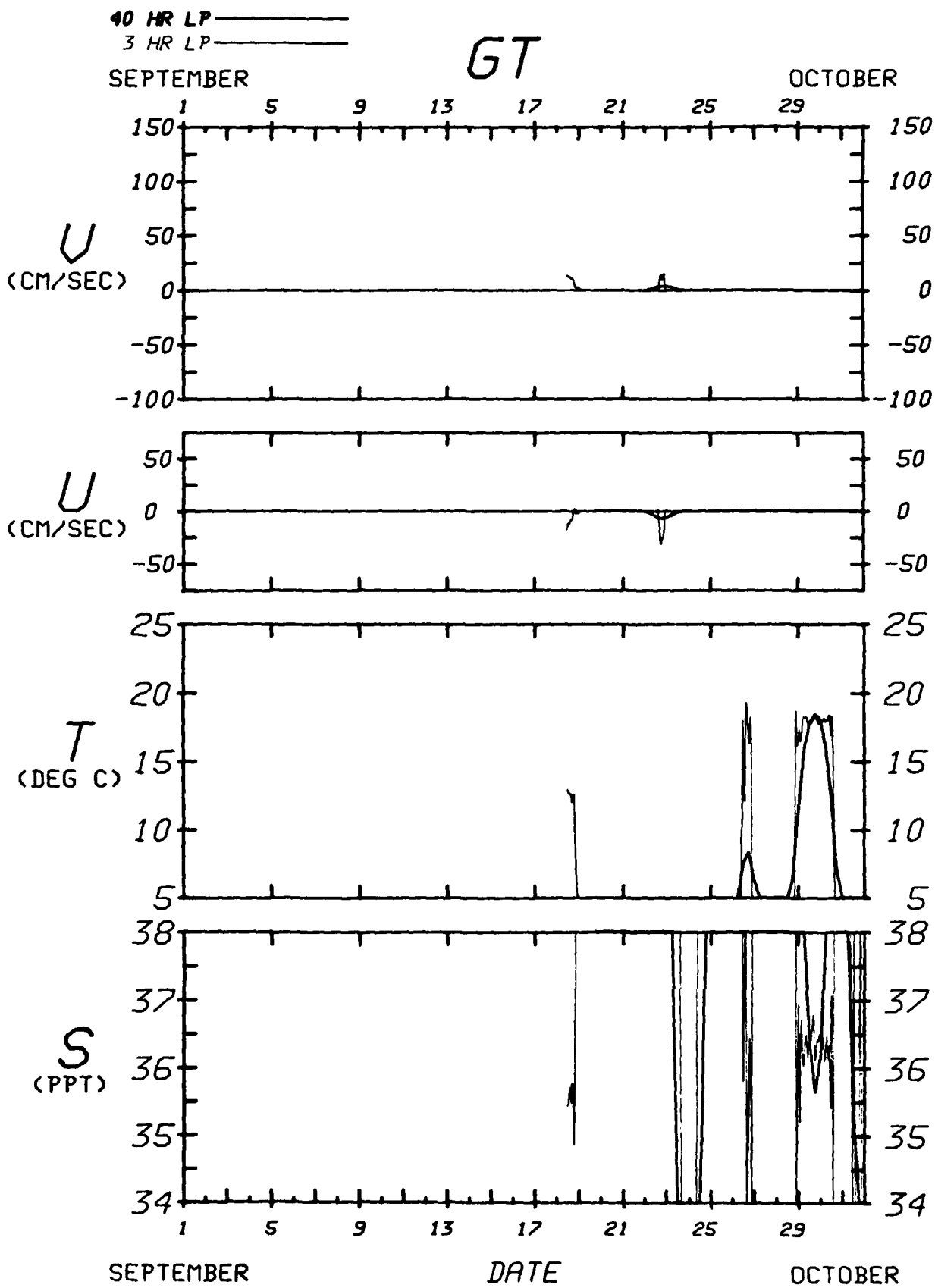


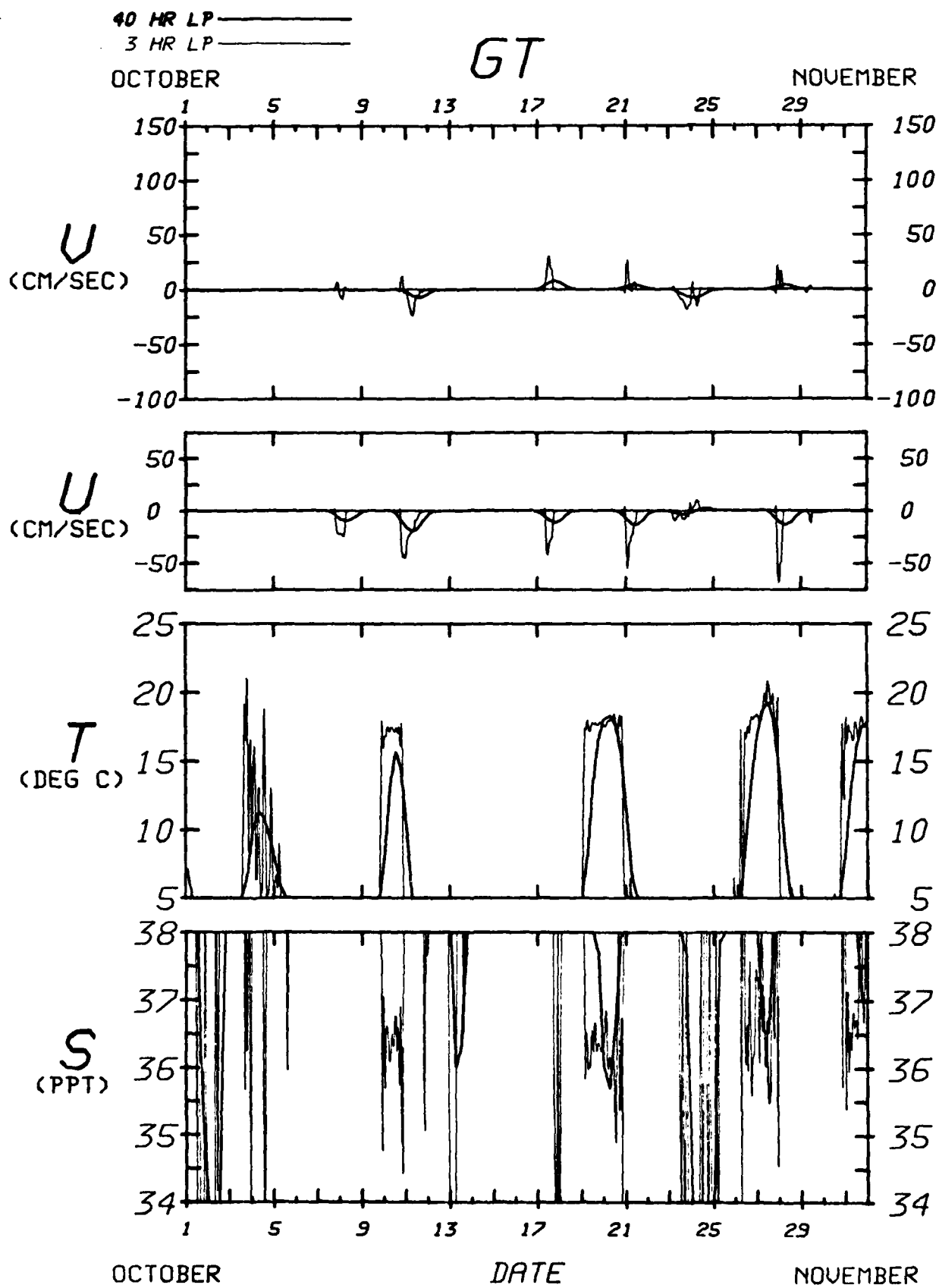
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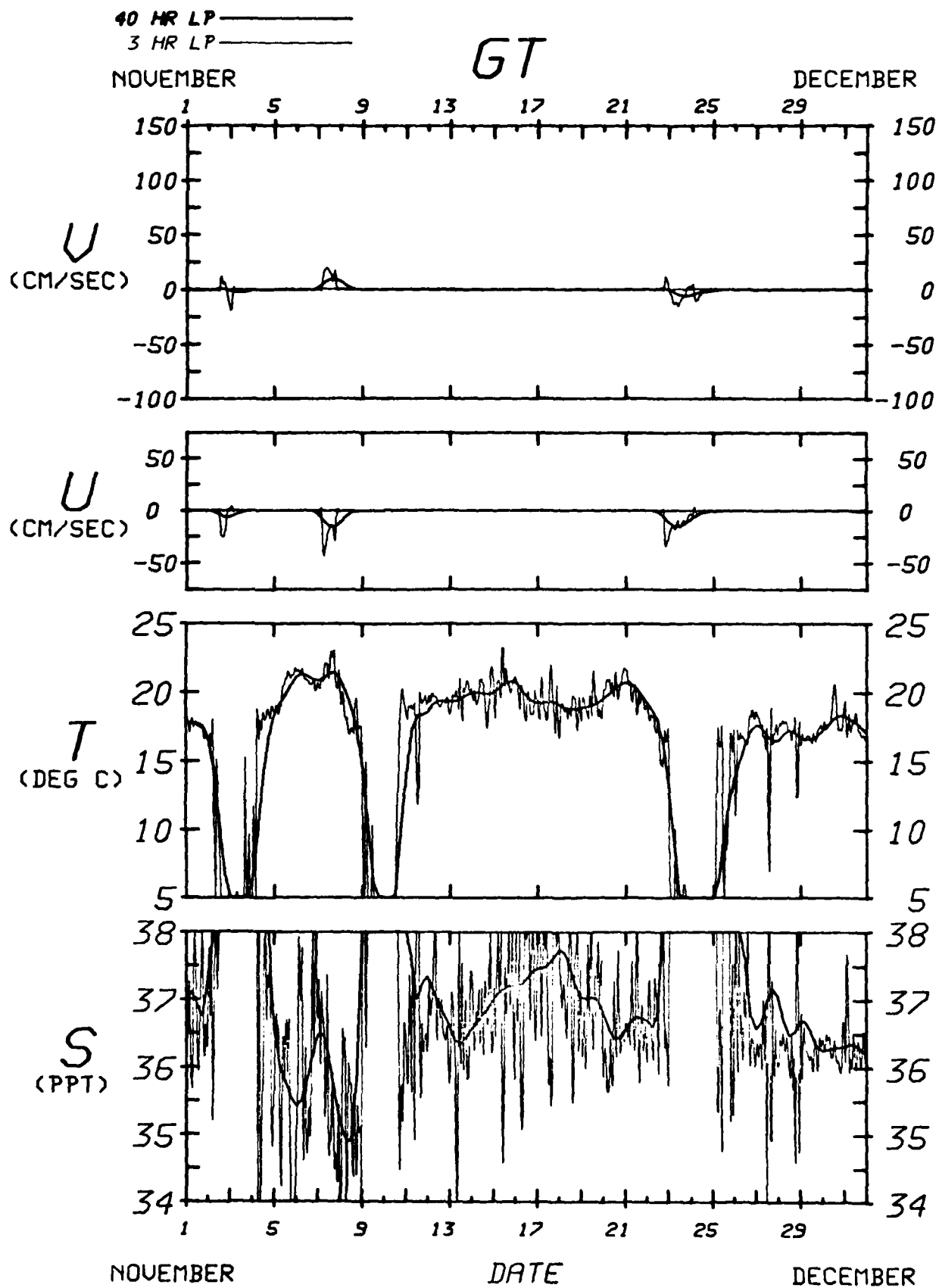
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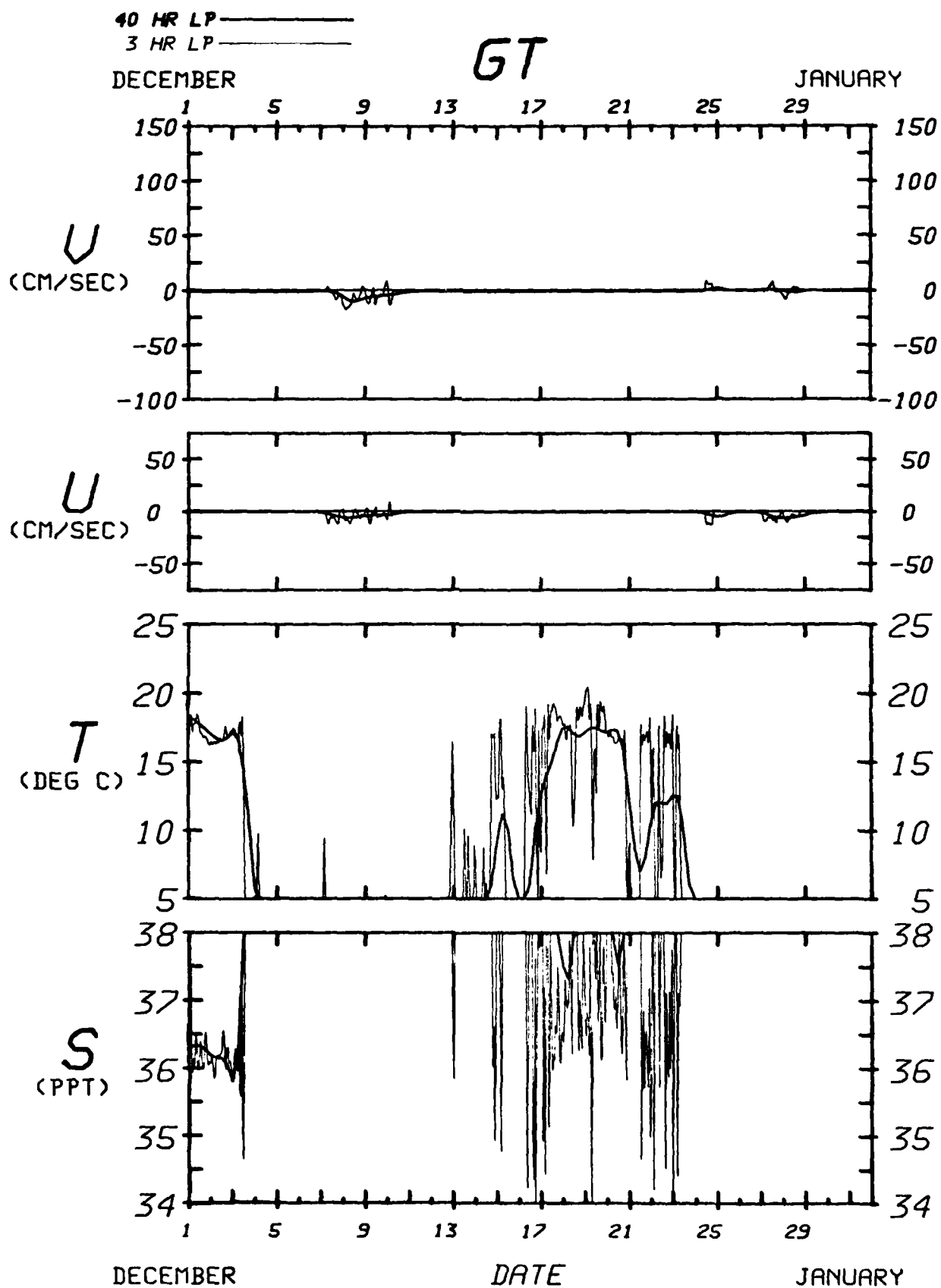


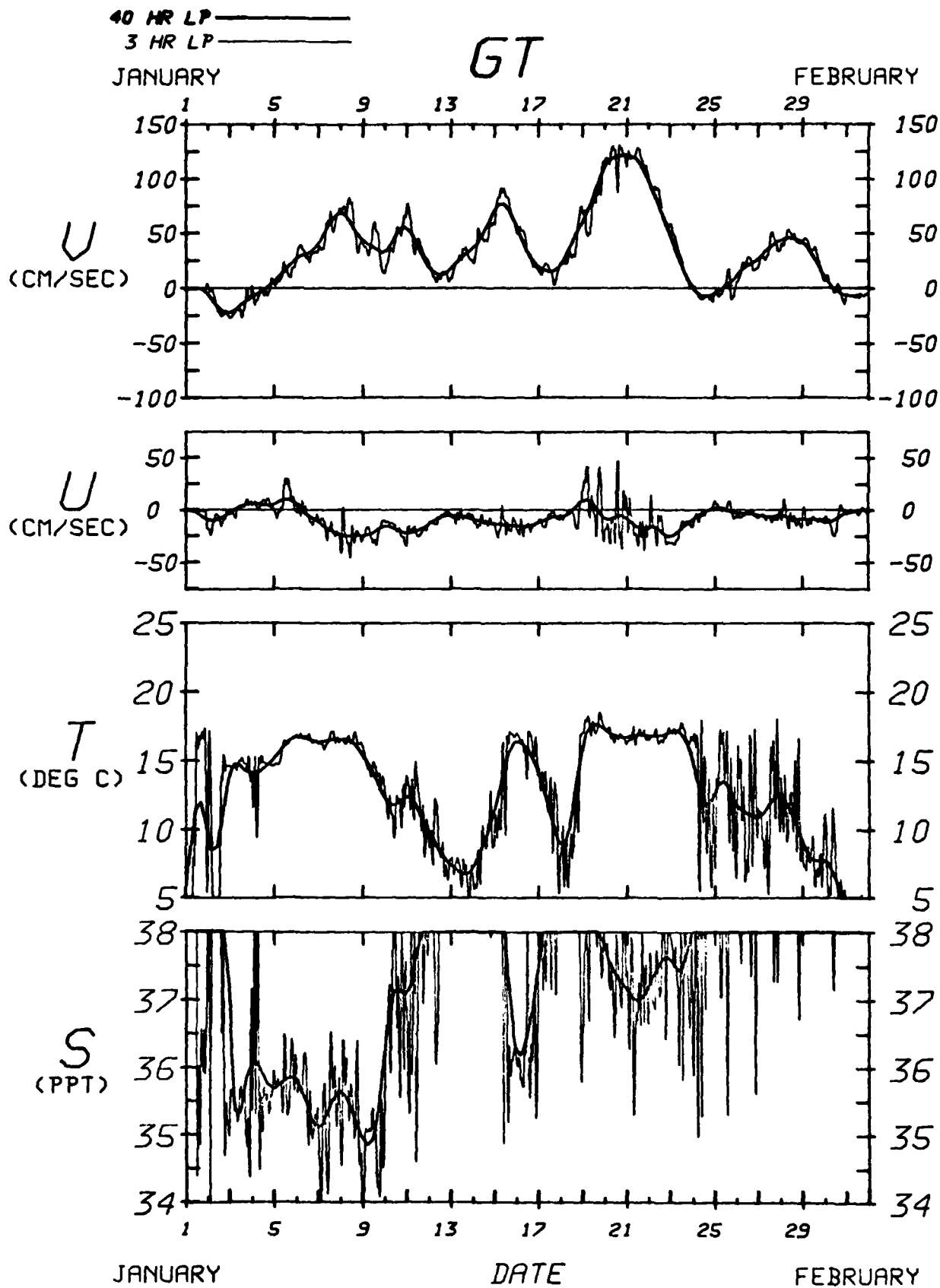
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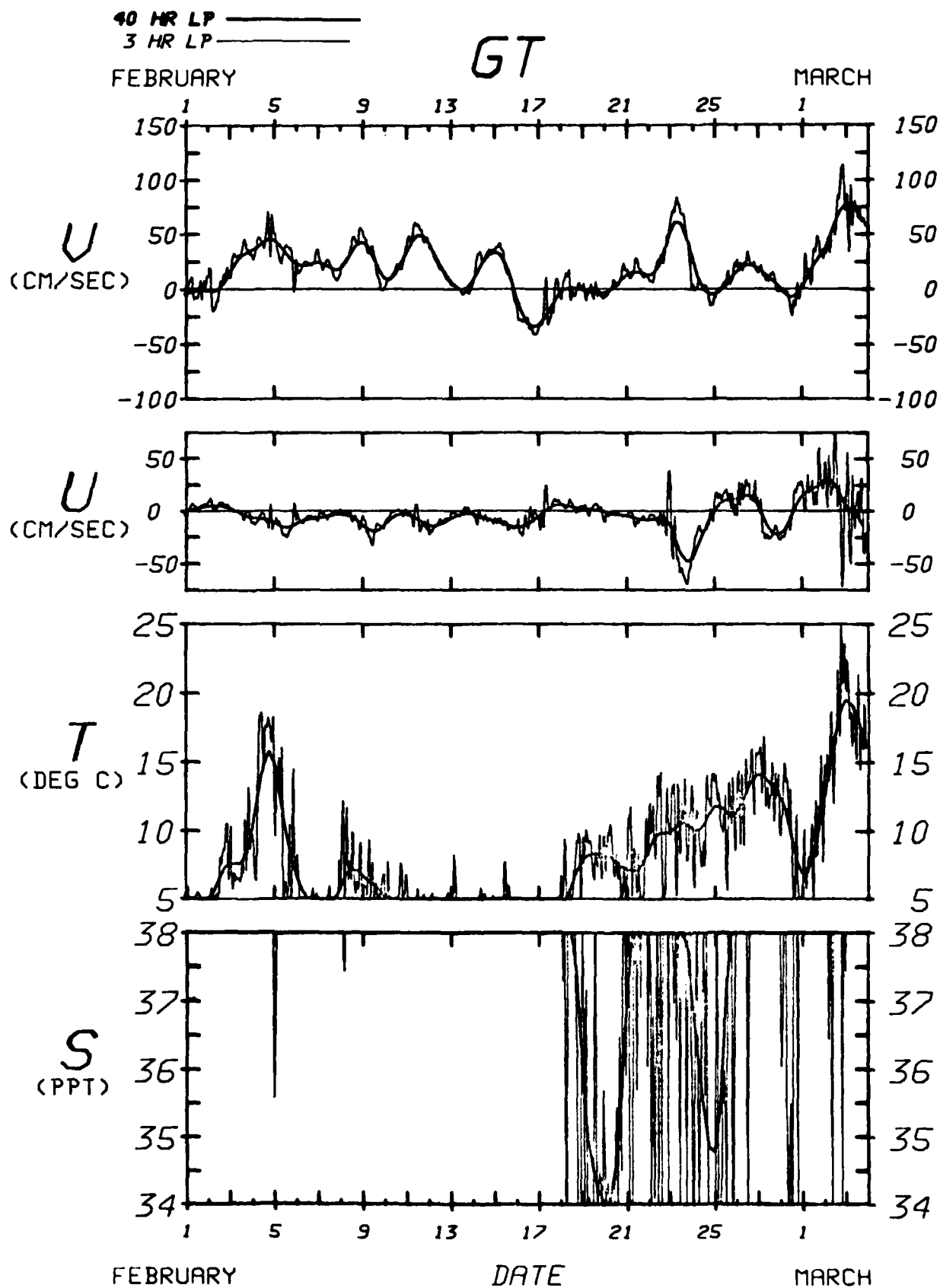


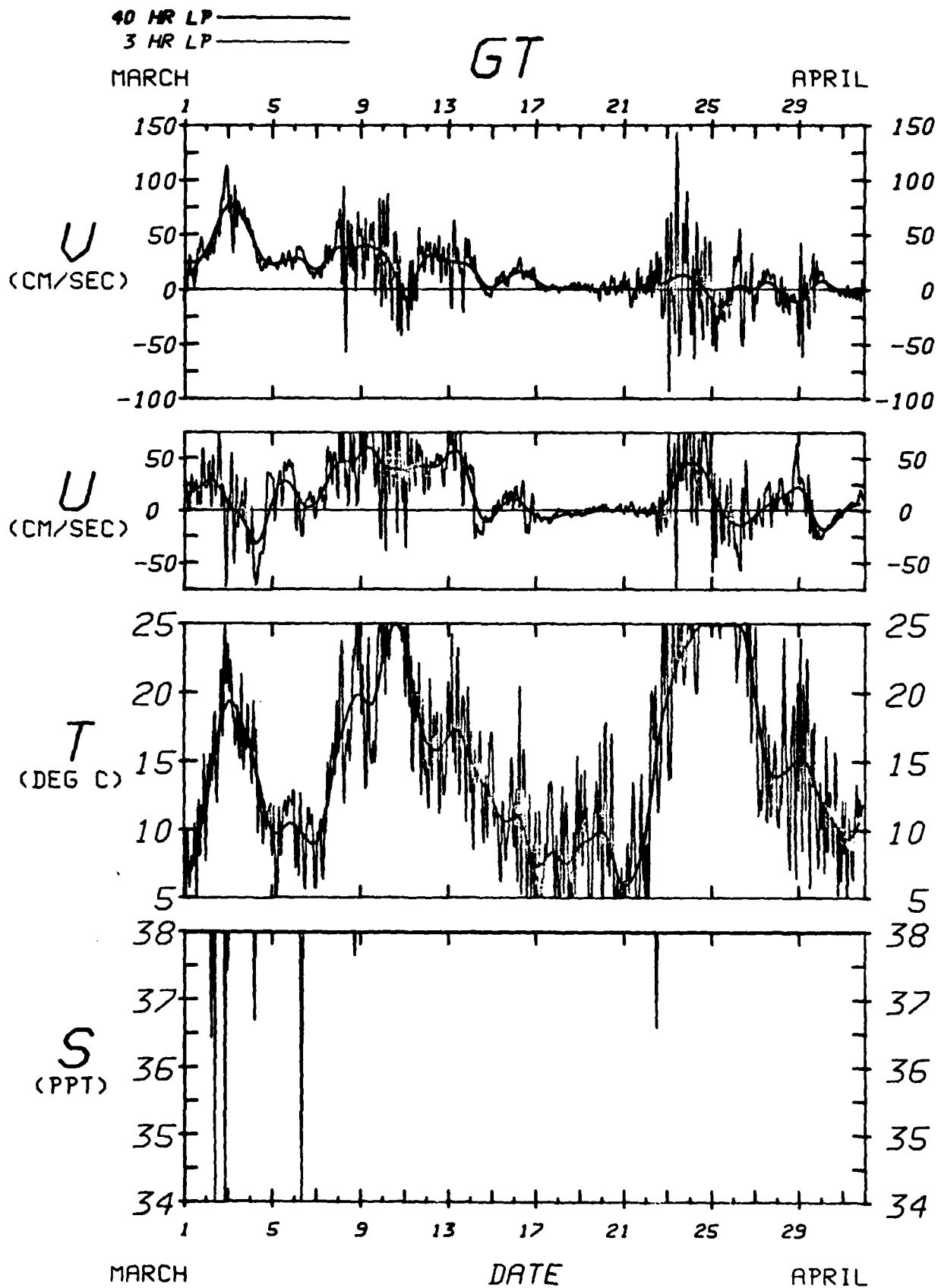










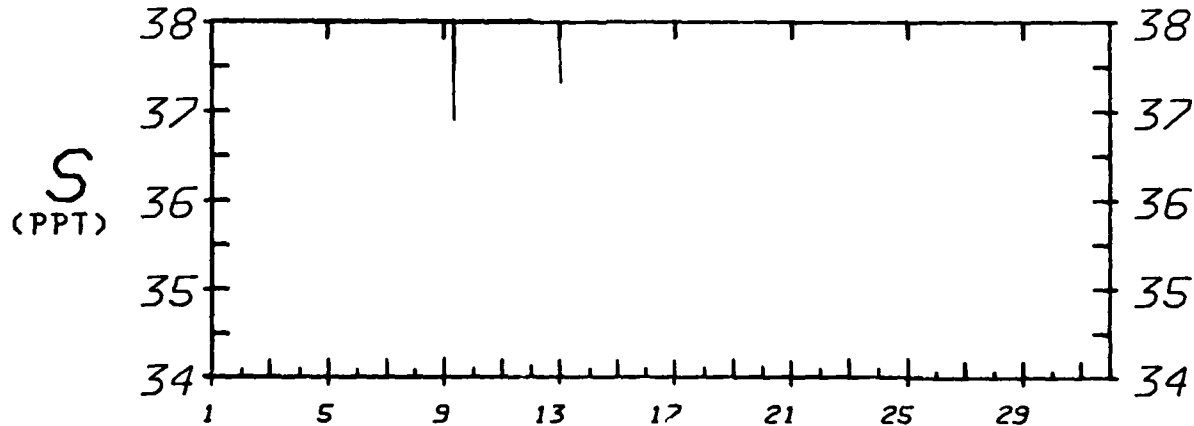
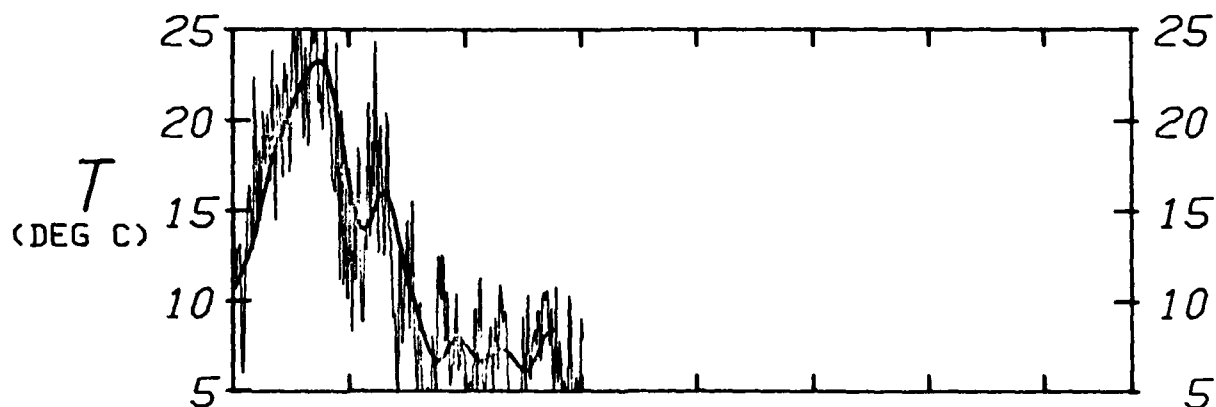
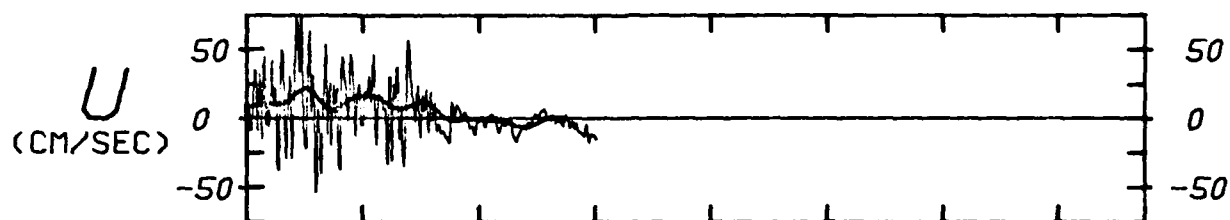
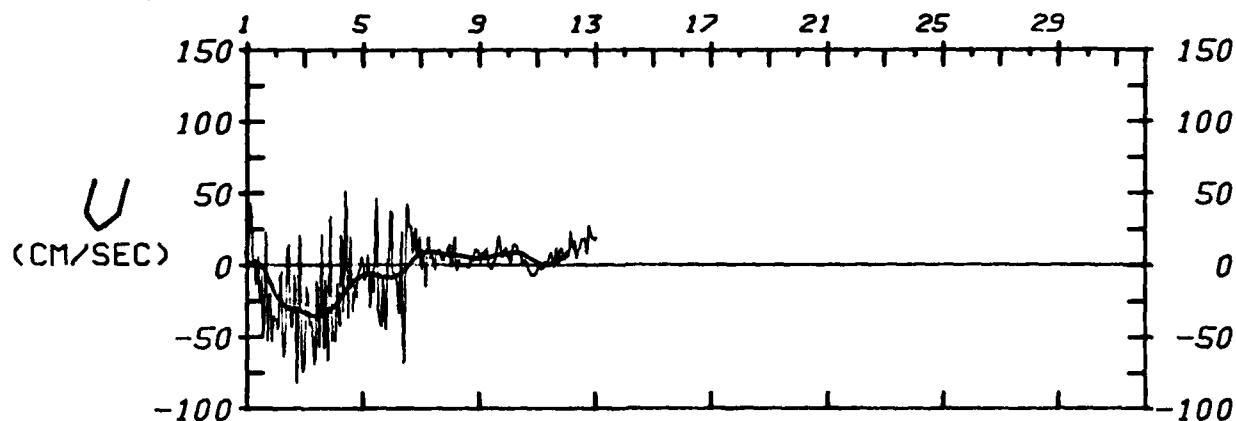


40 HR LP
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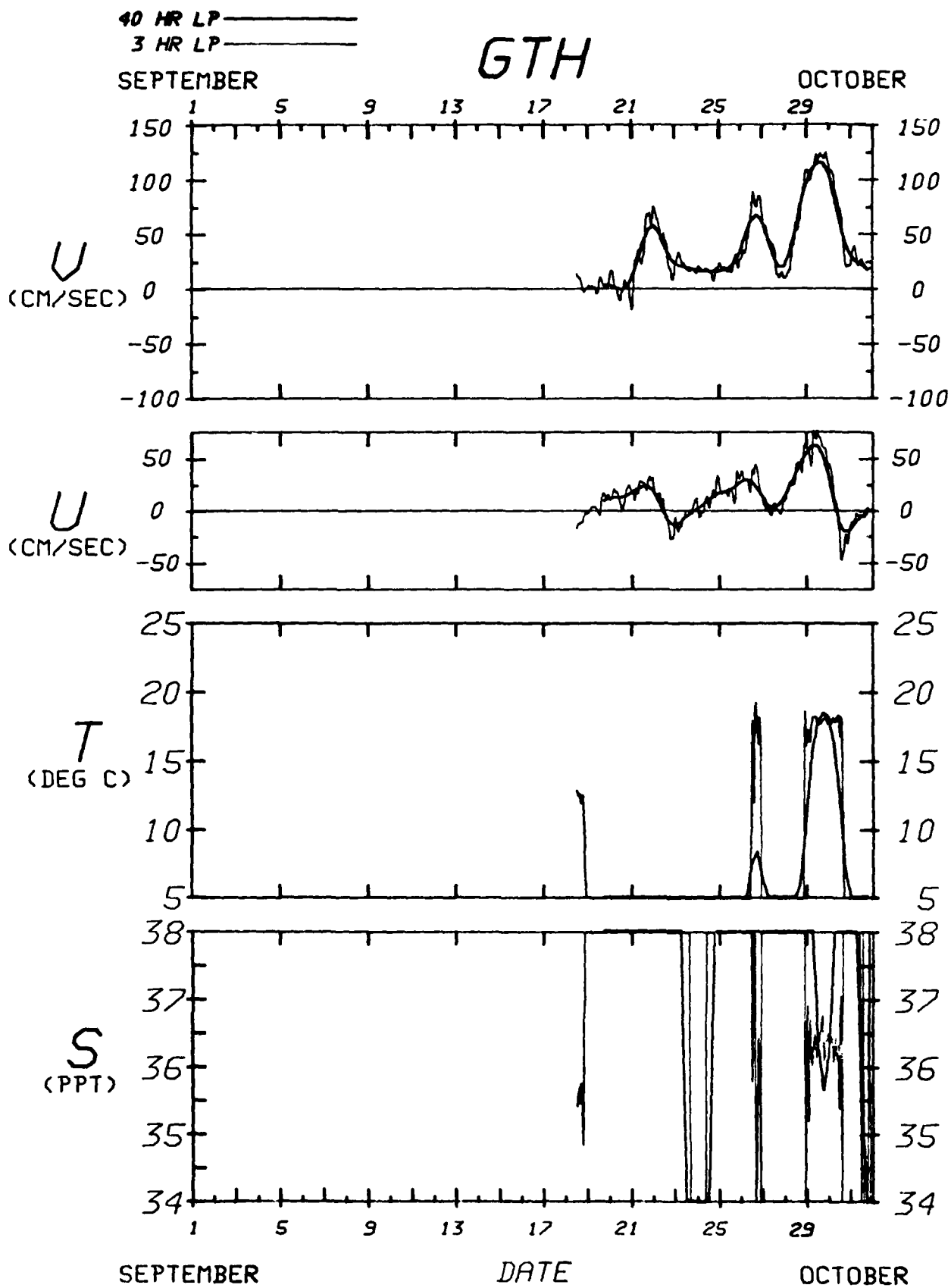


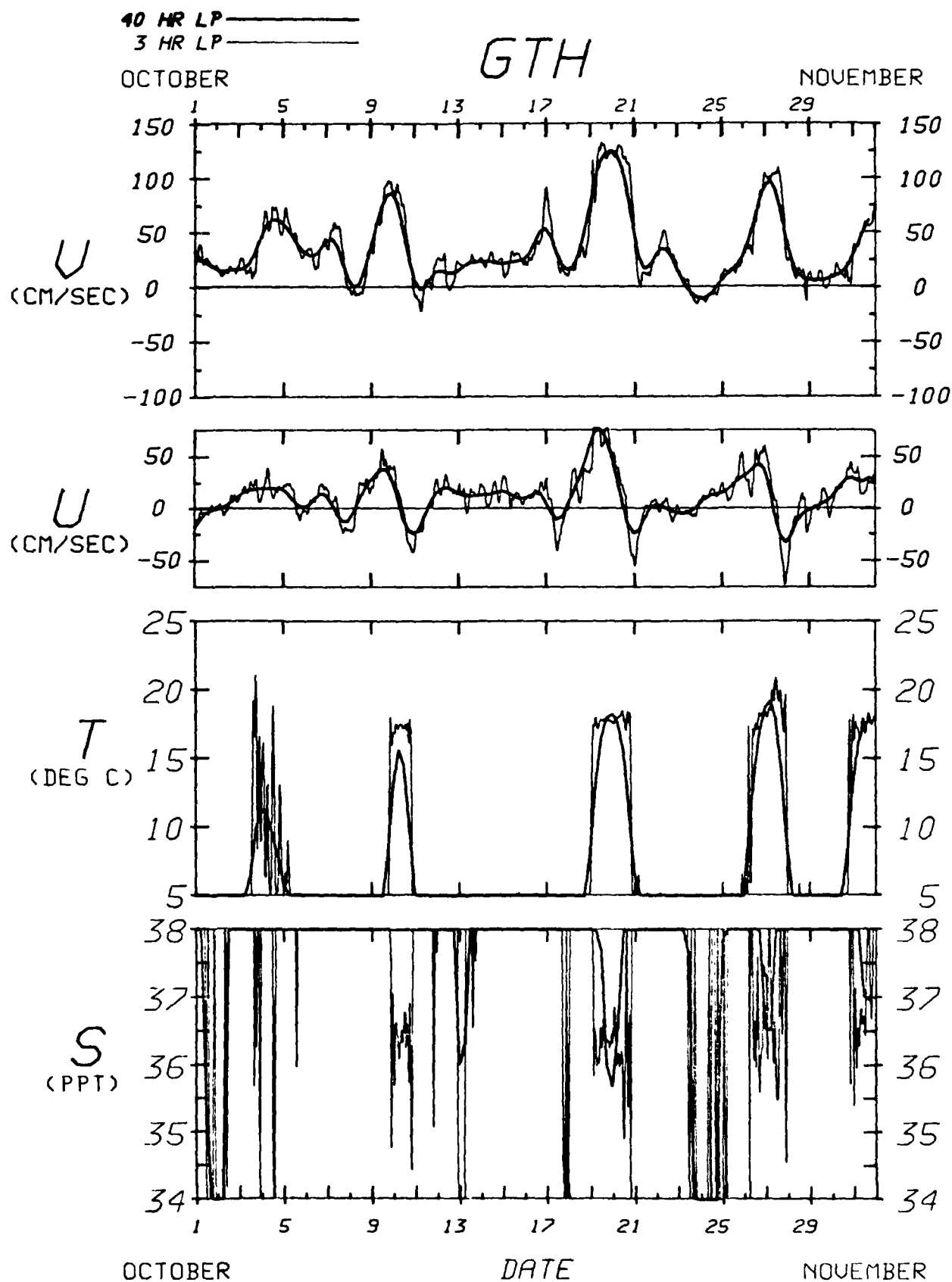
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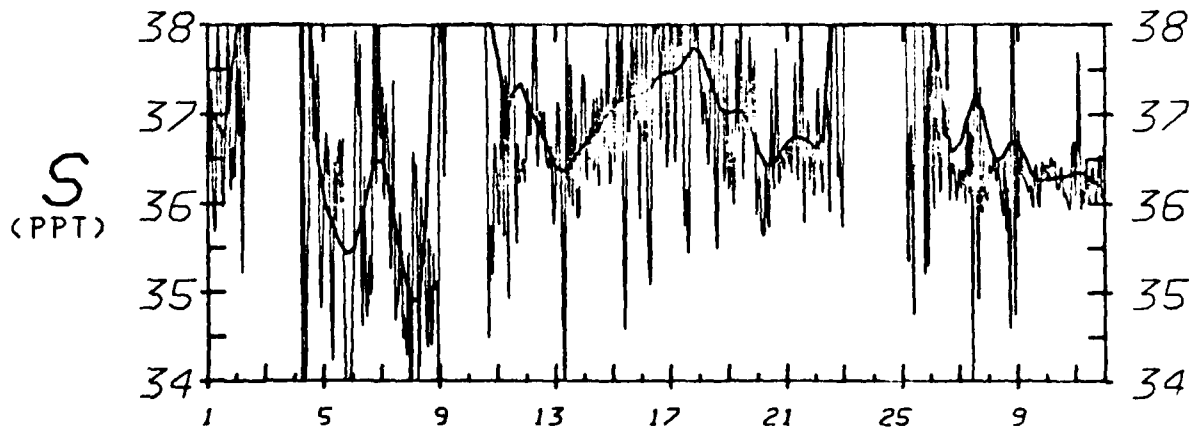
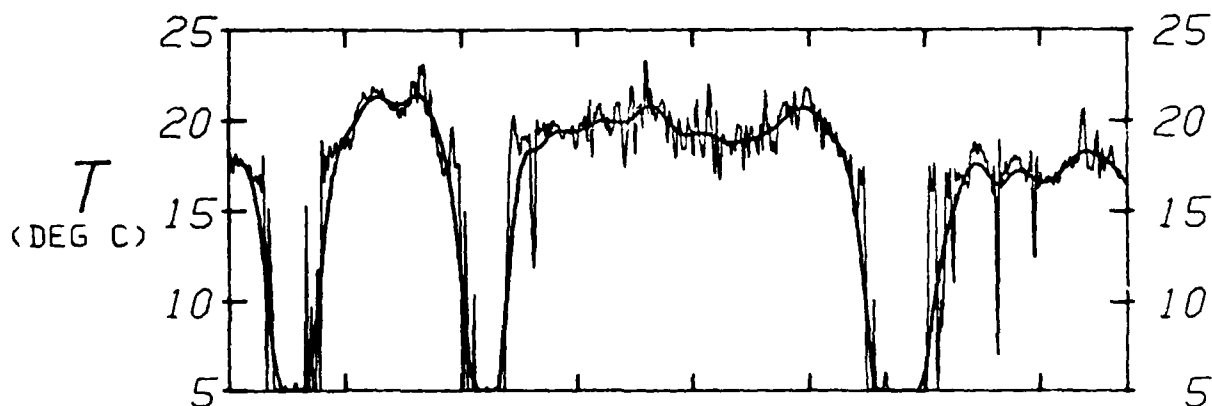
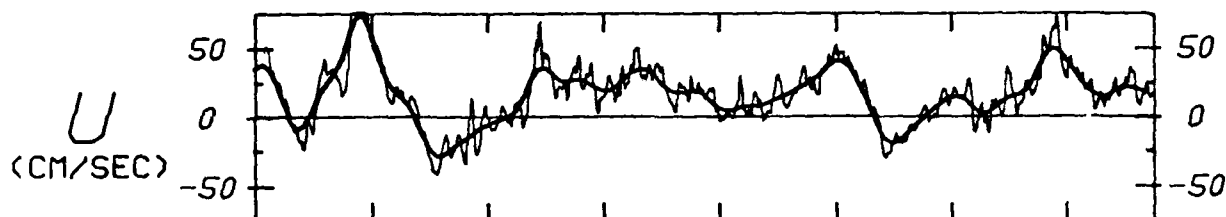
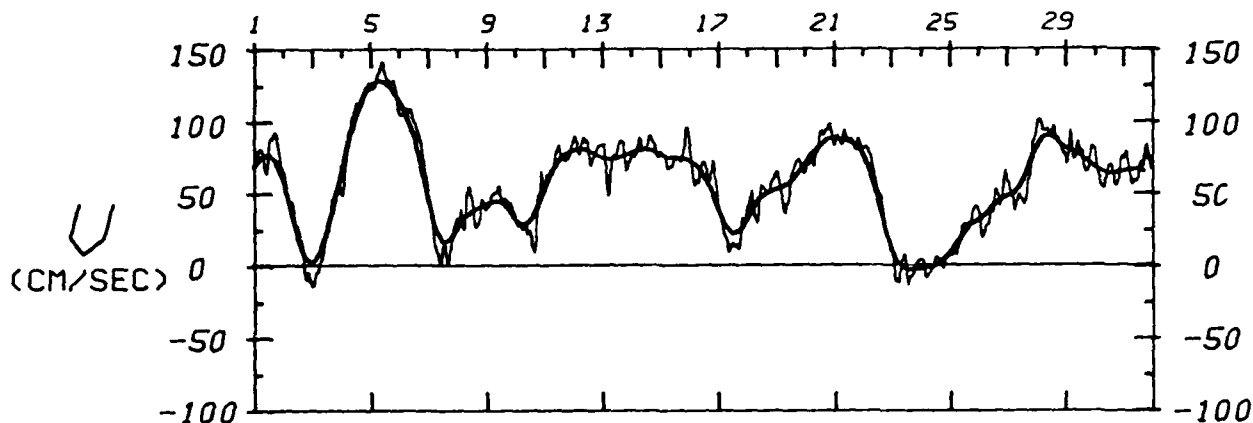


40 HR LP
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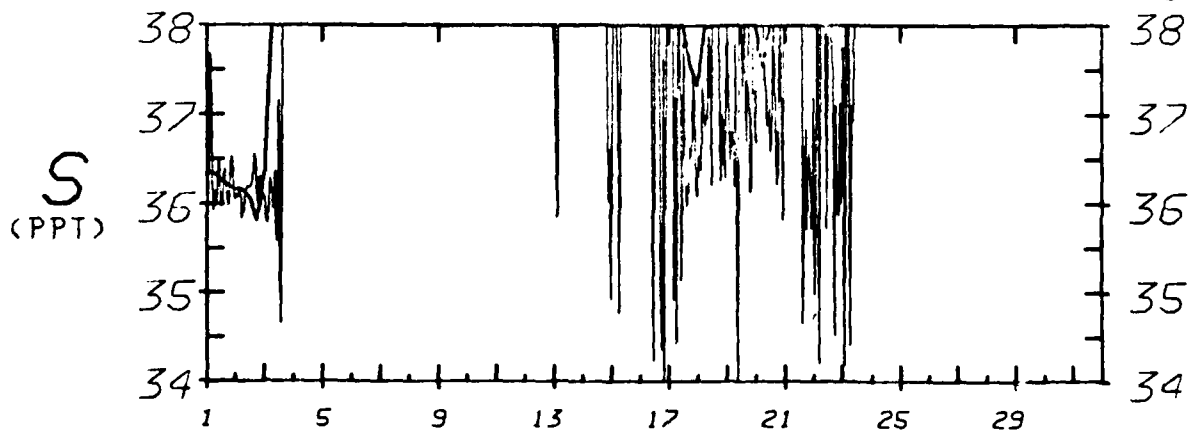
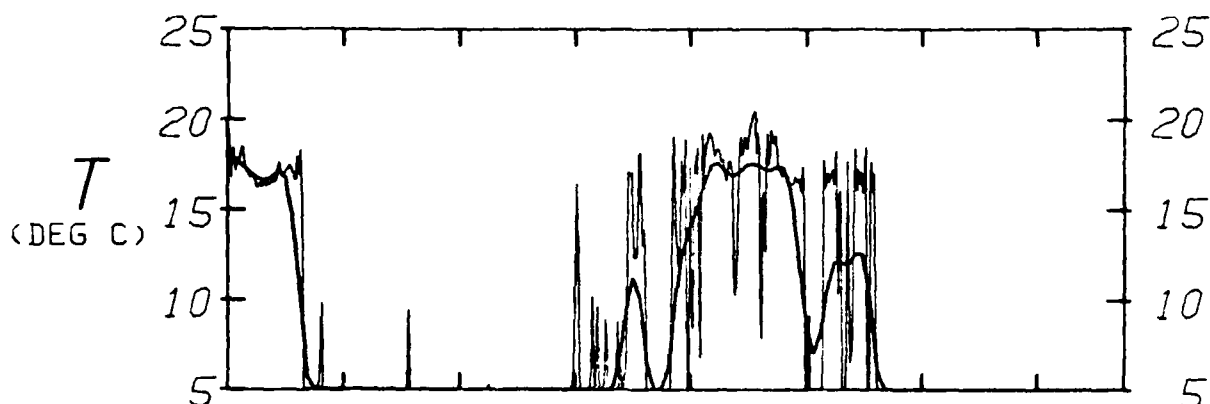
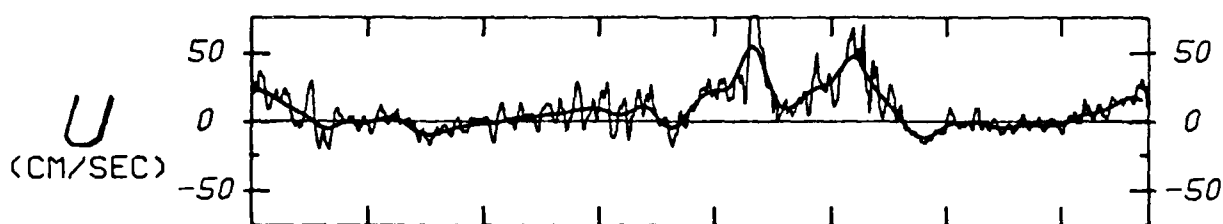
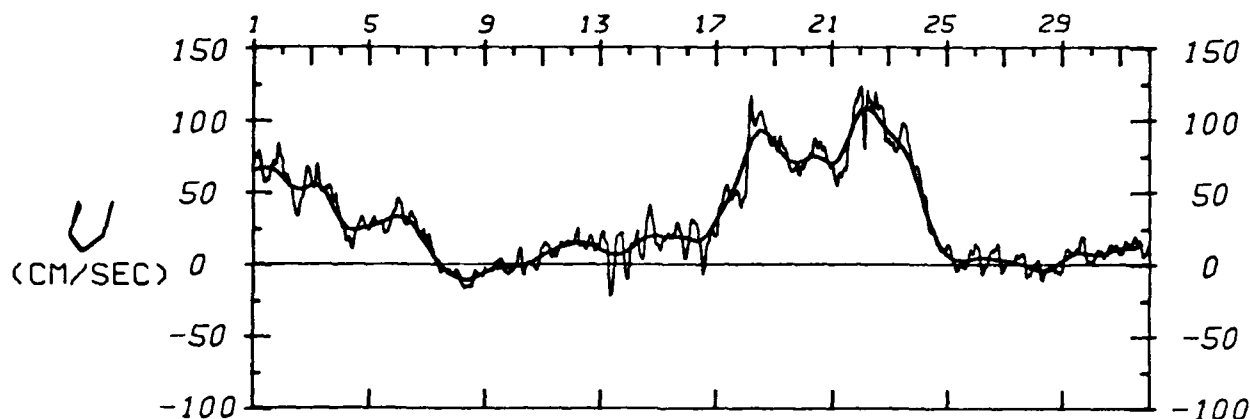
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40 HR LP
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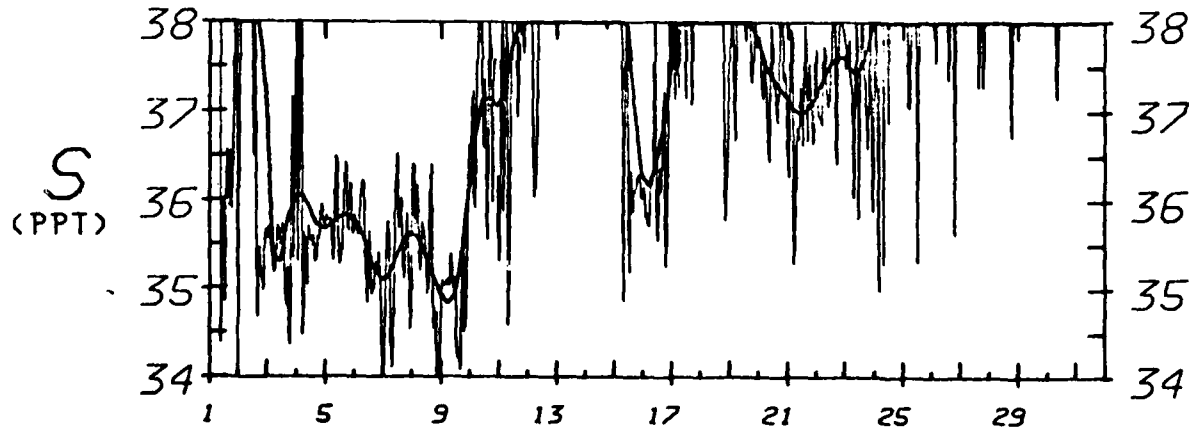
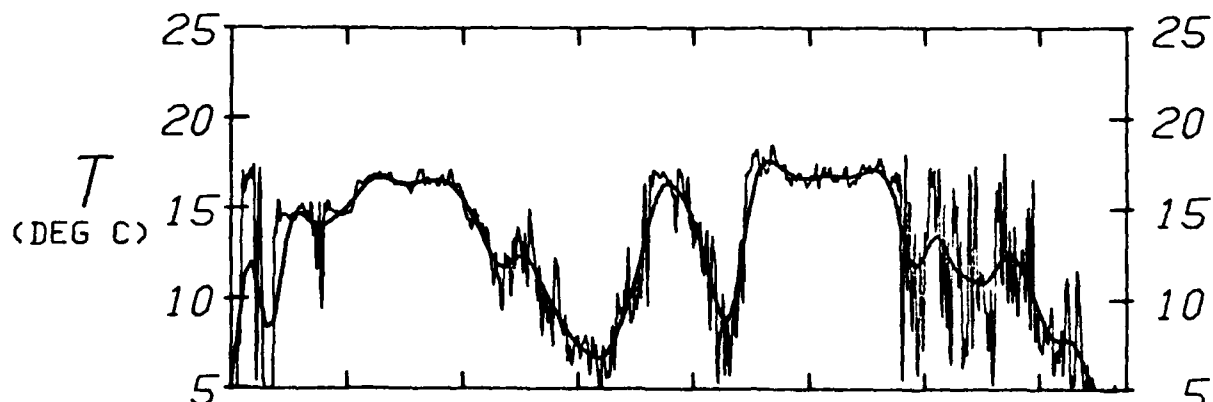
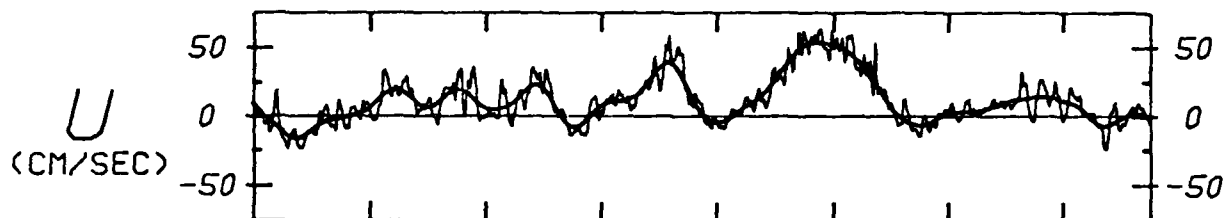
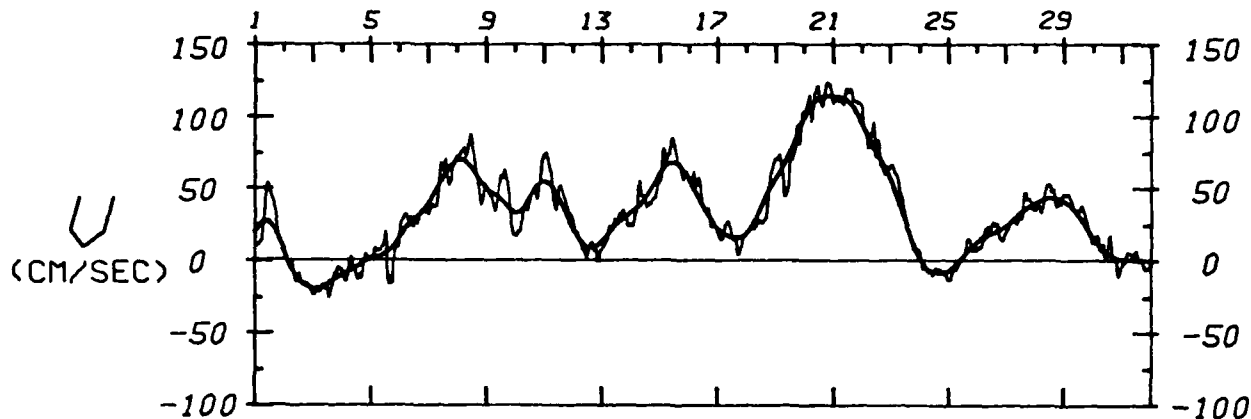
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40 HR LP
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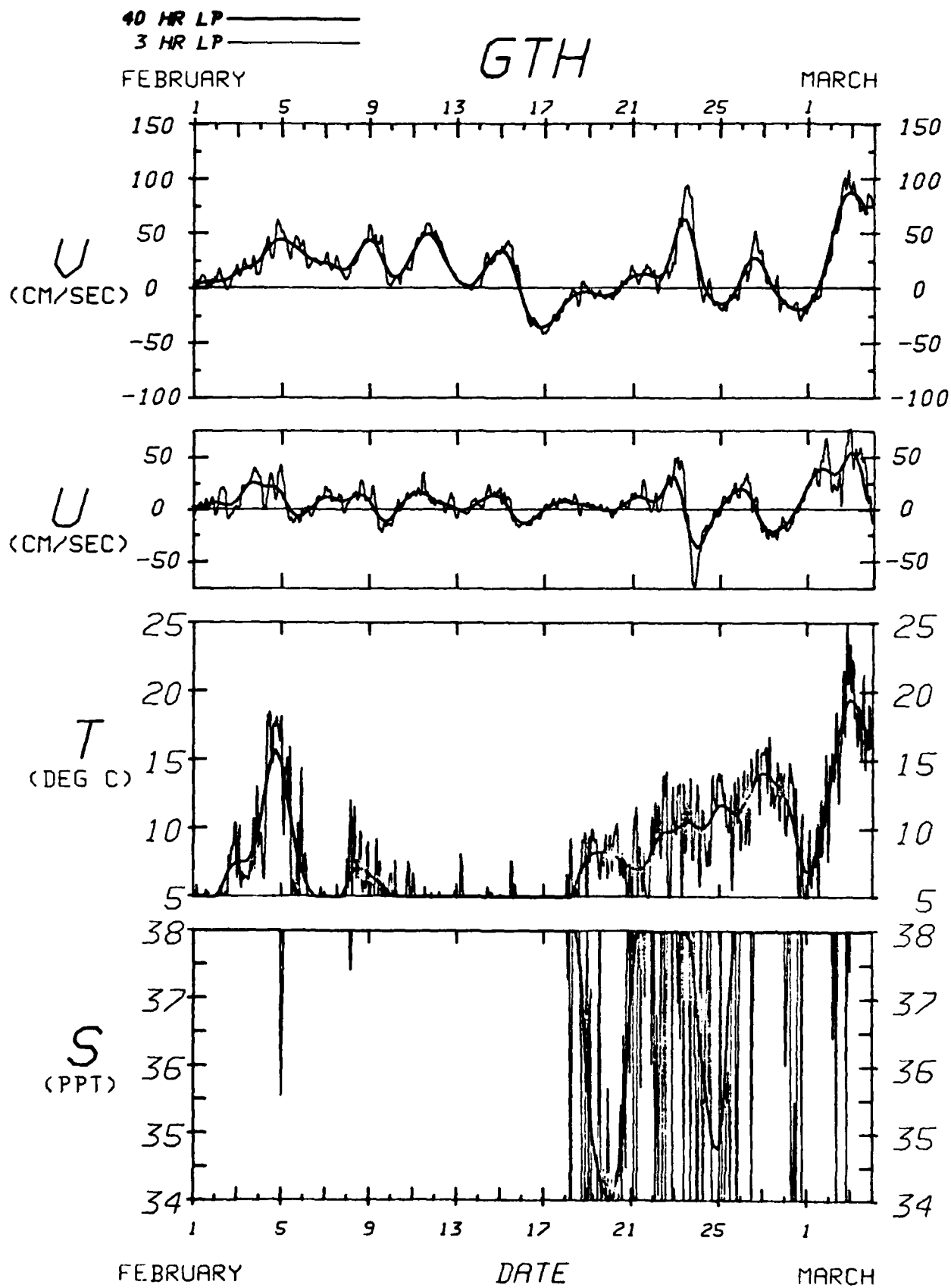
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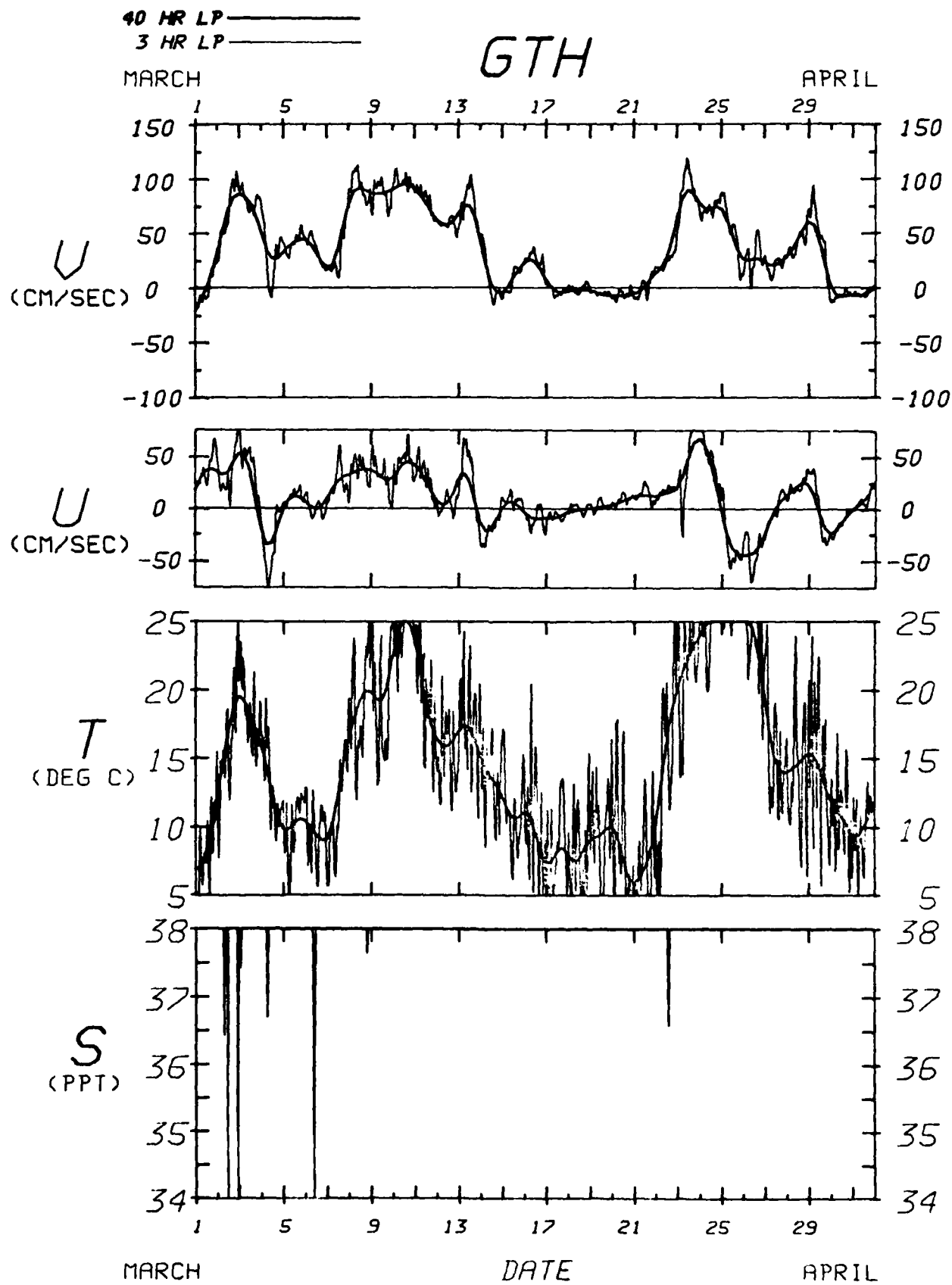


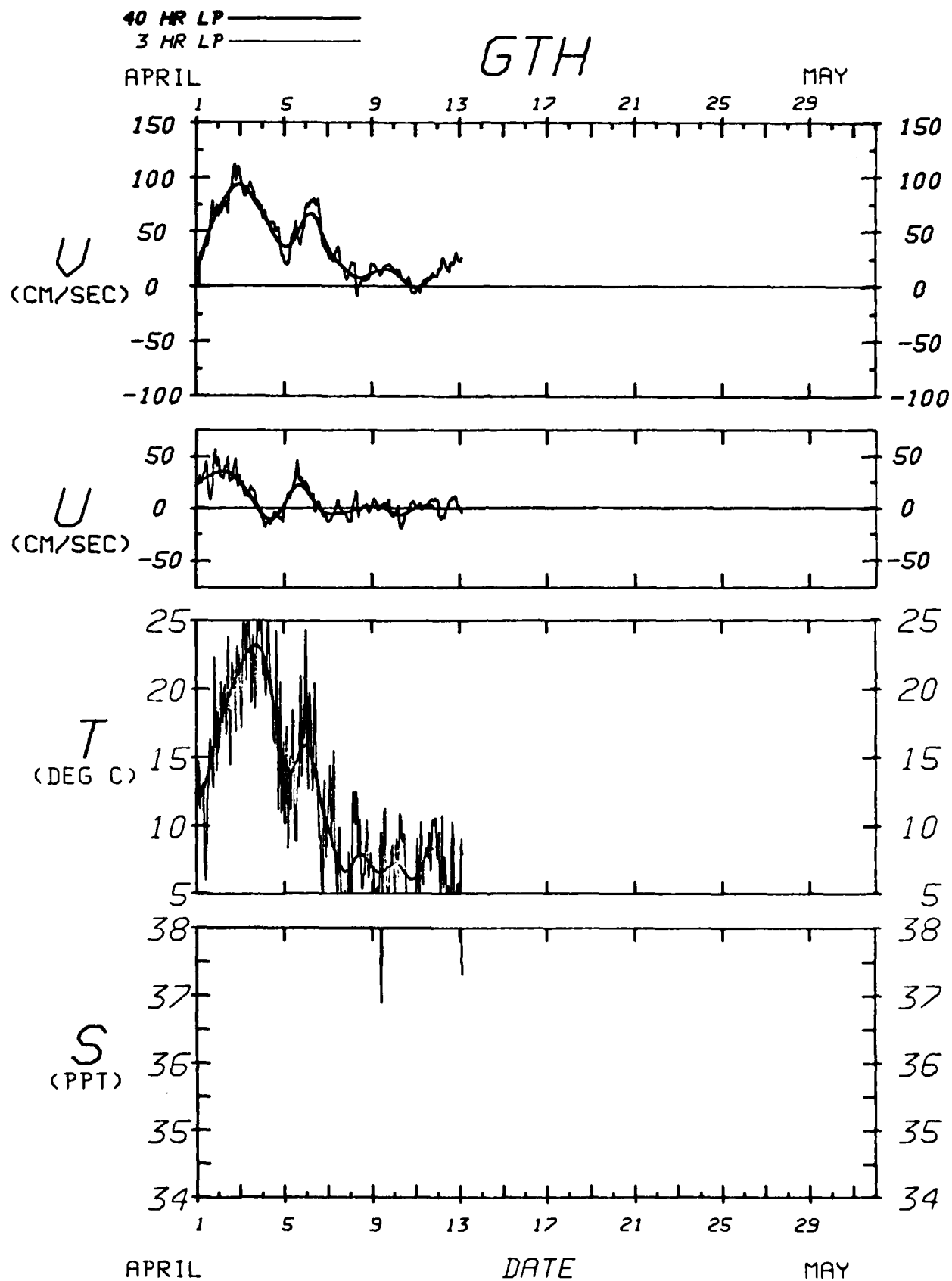
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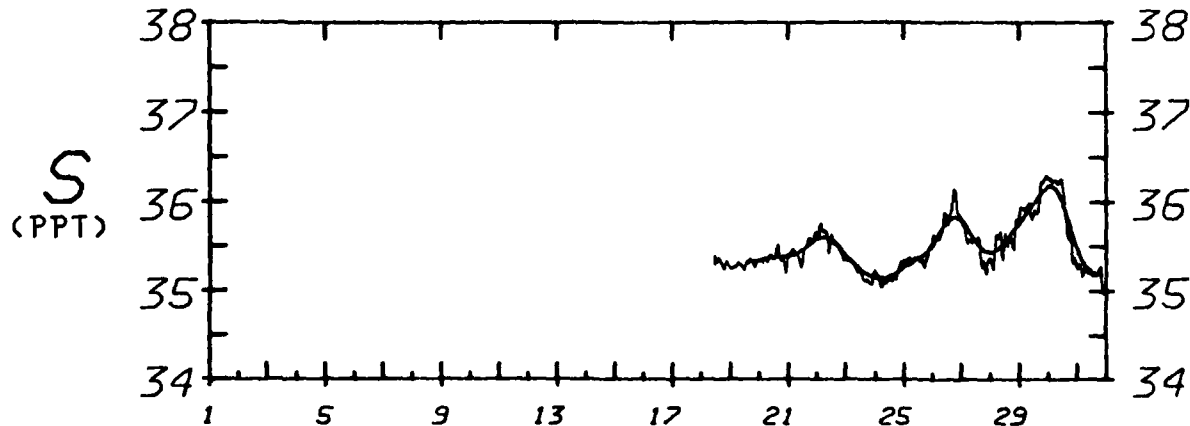
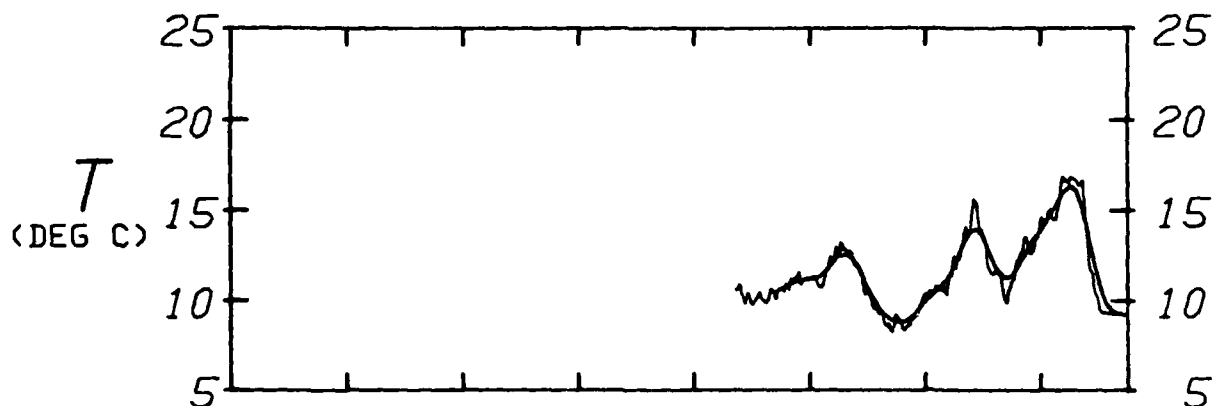
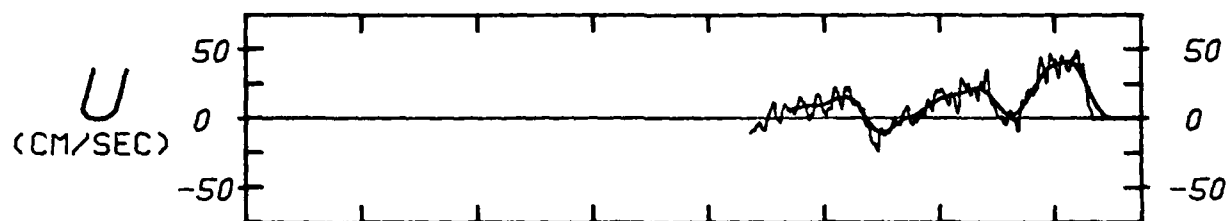
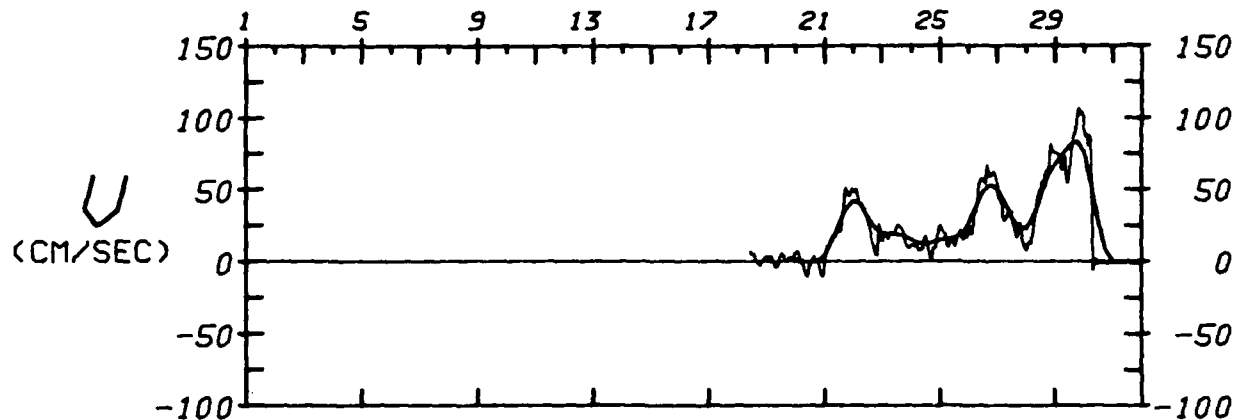
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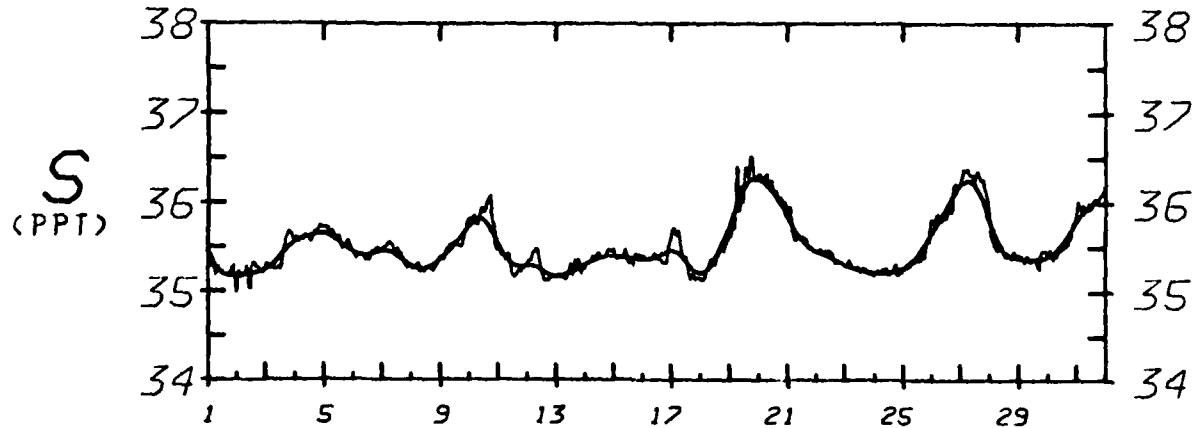
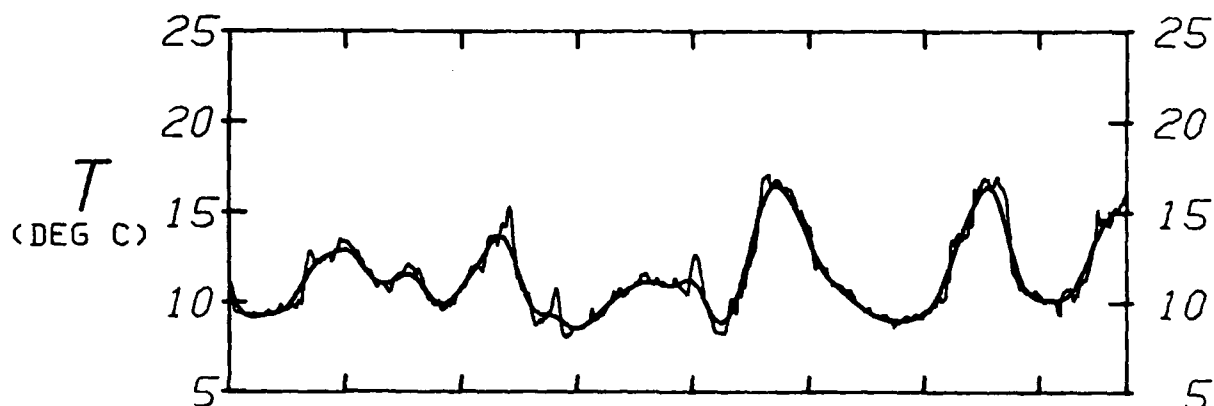
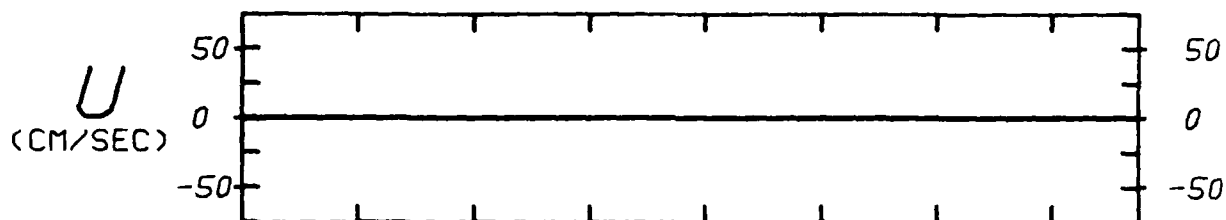
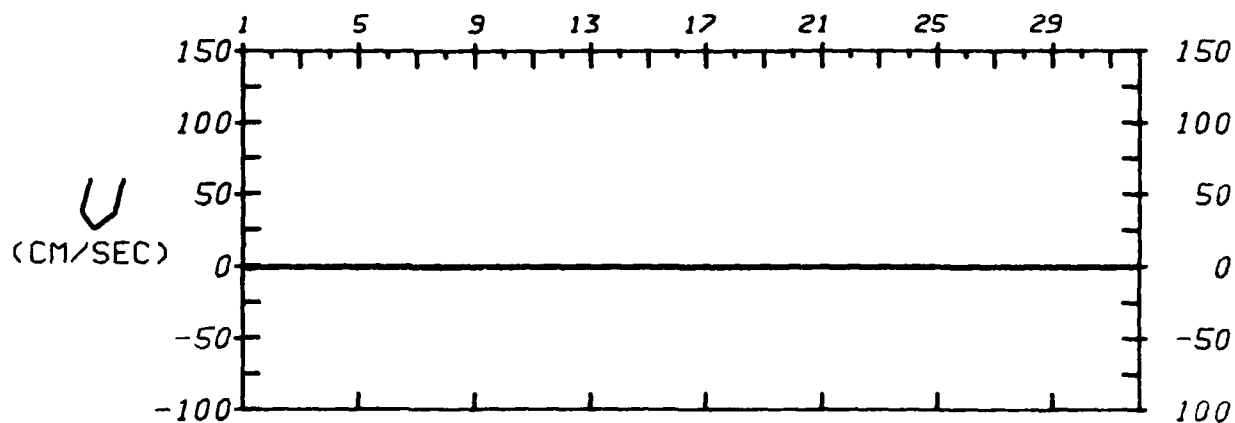
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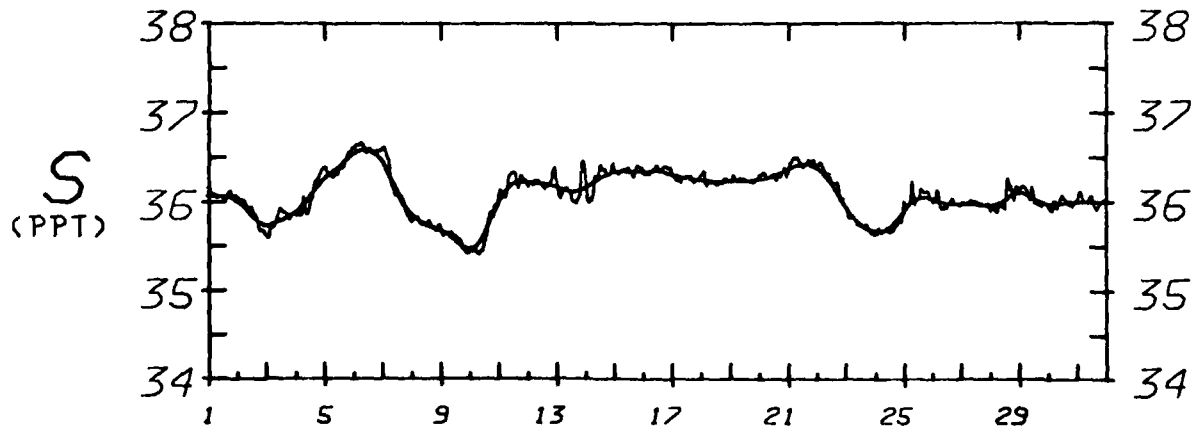
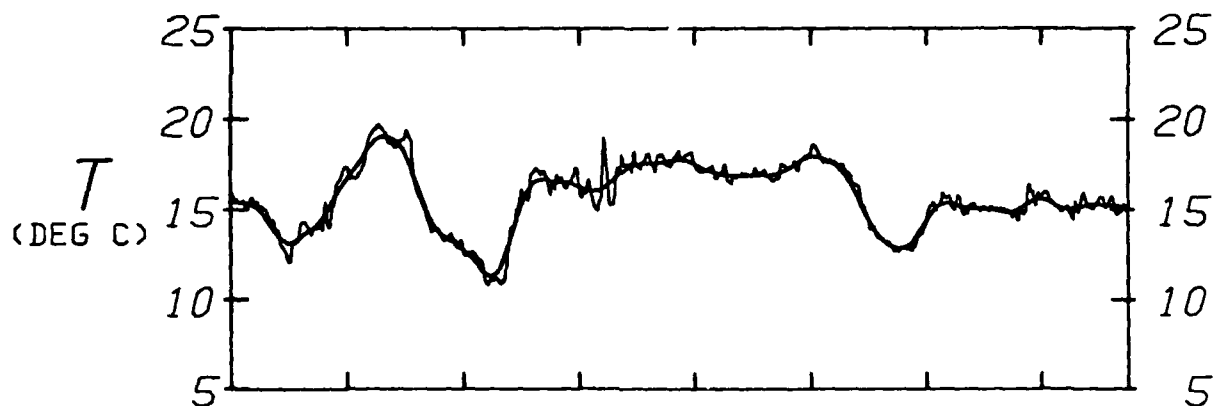
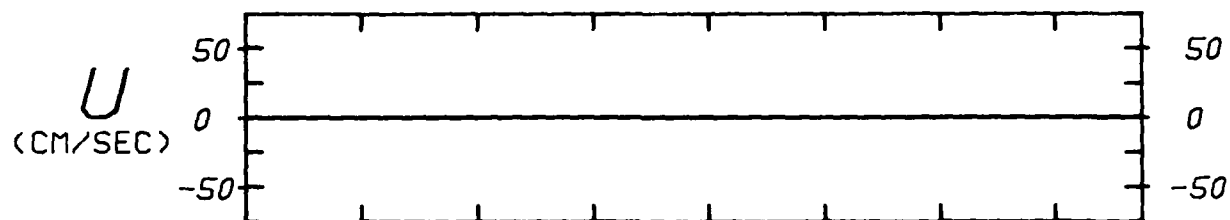
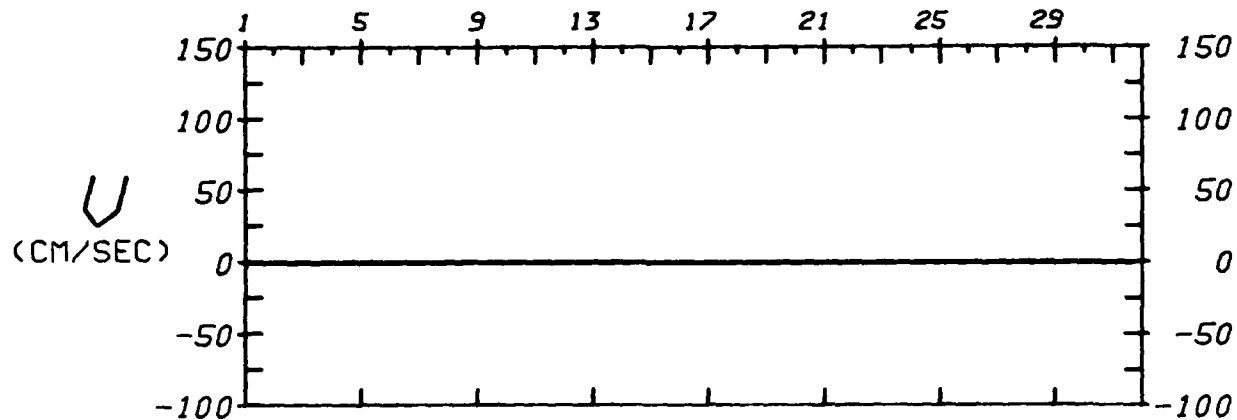
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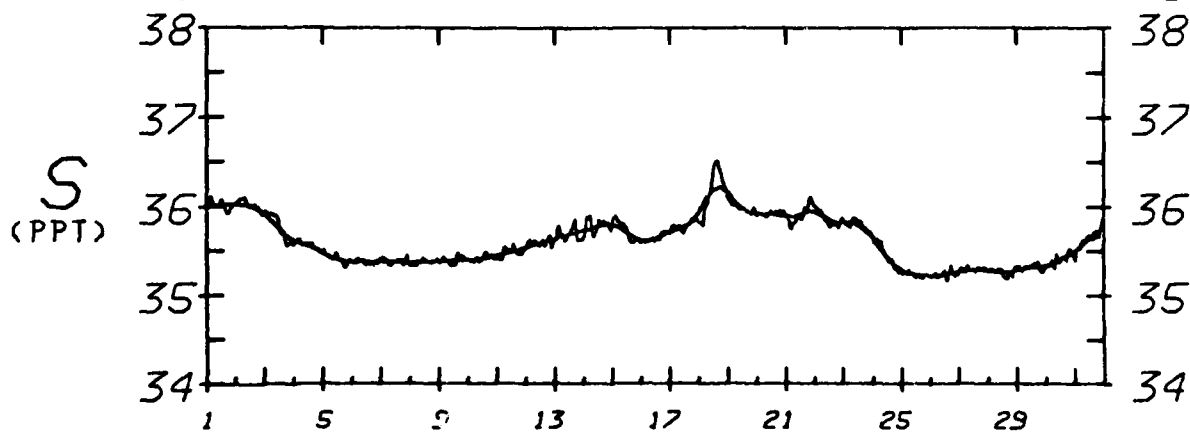
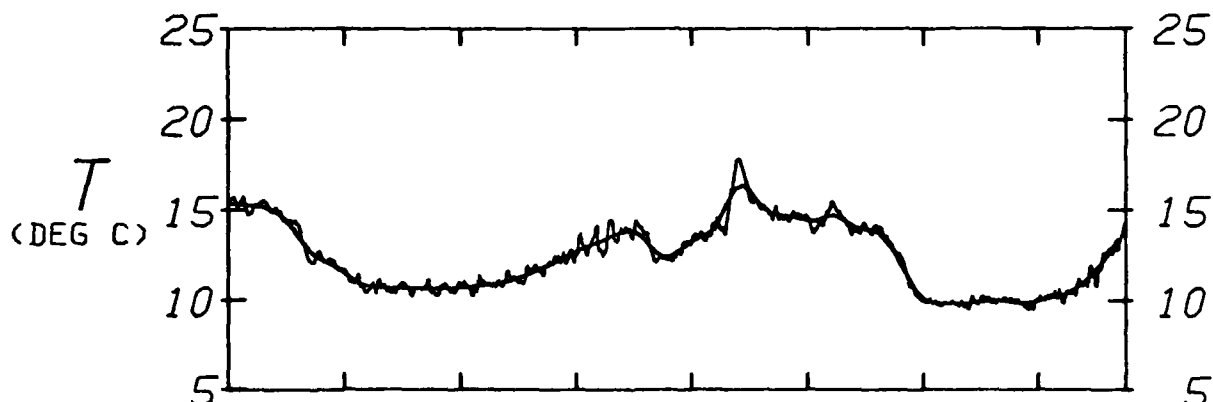
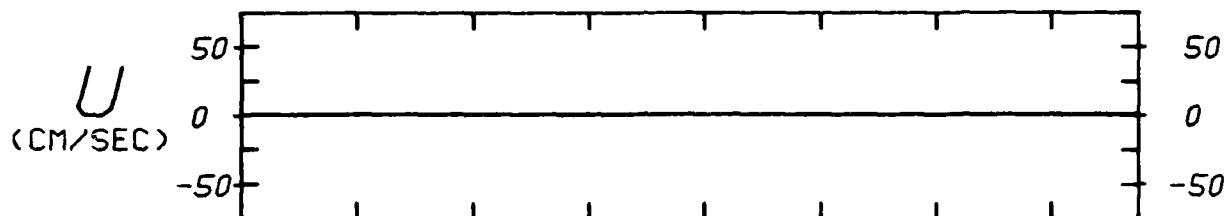
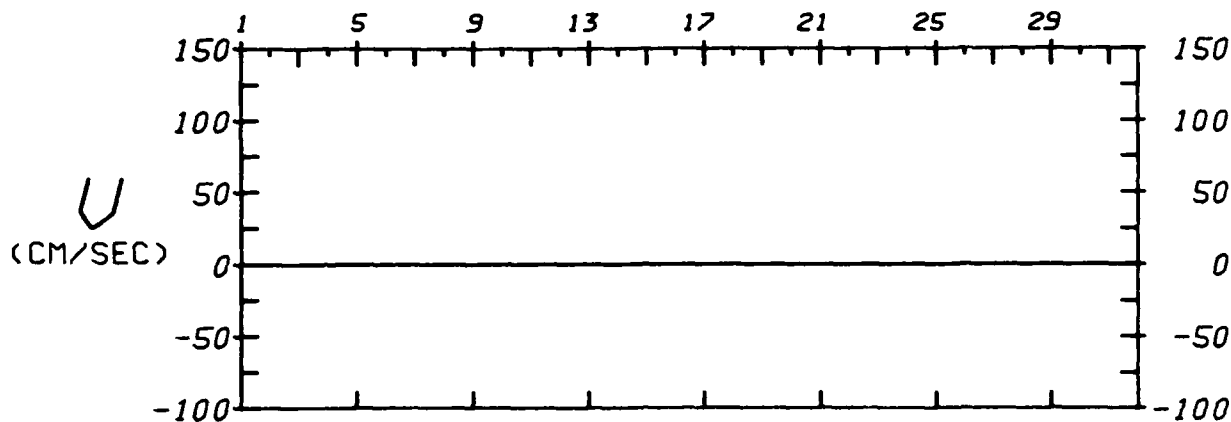
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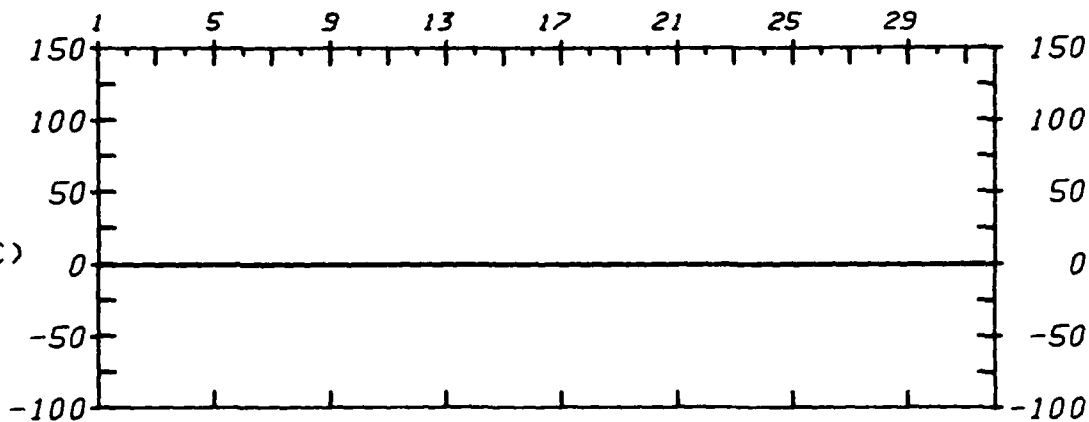
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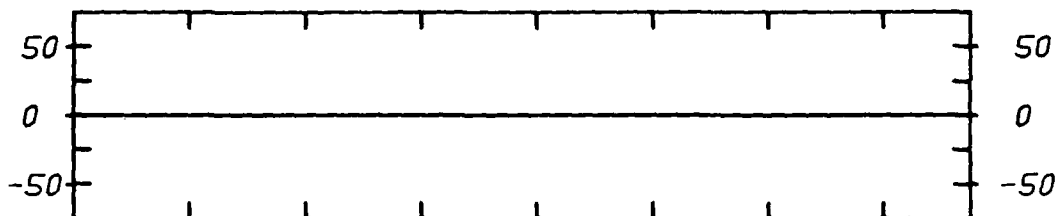
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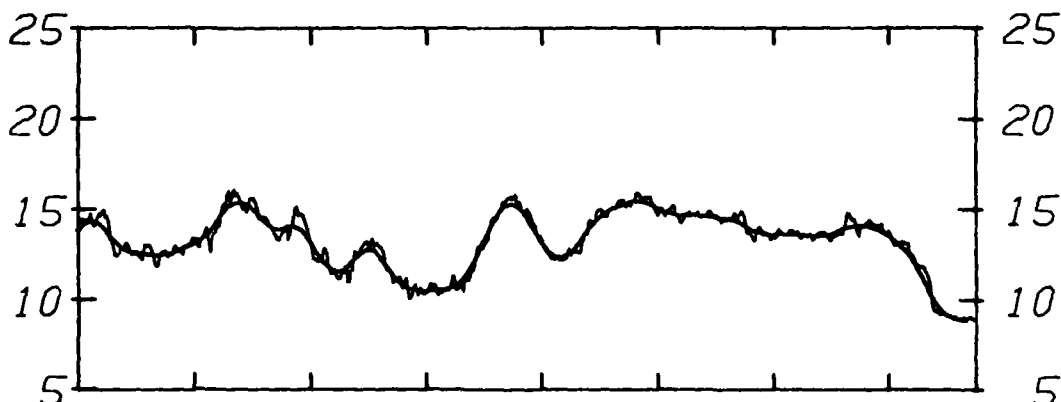
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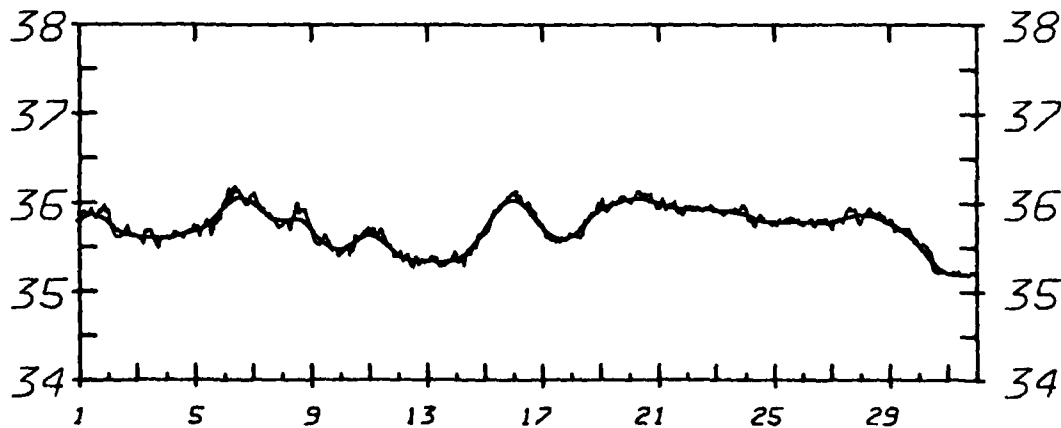
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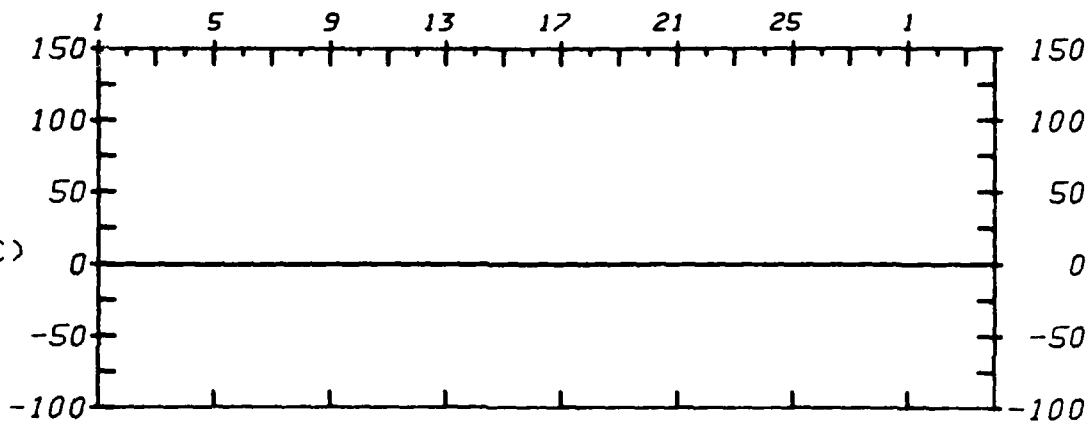
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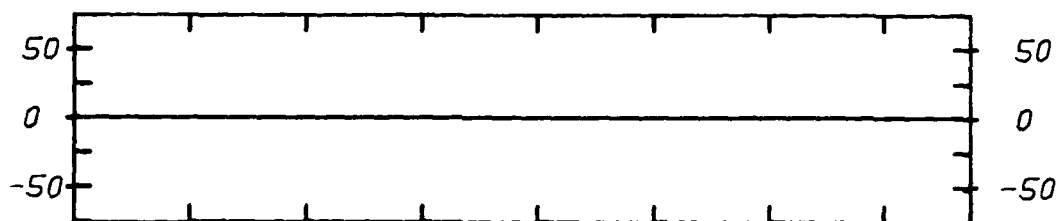
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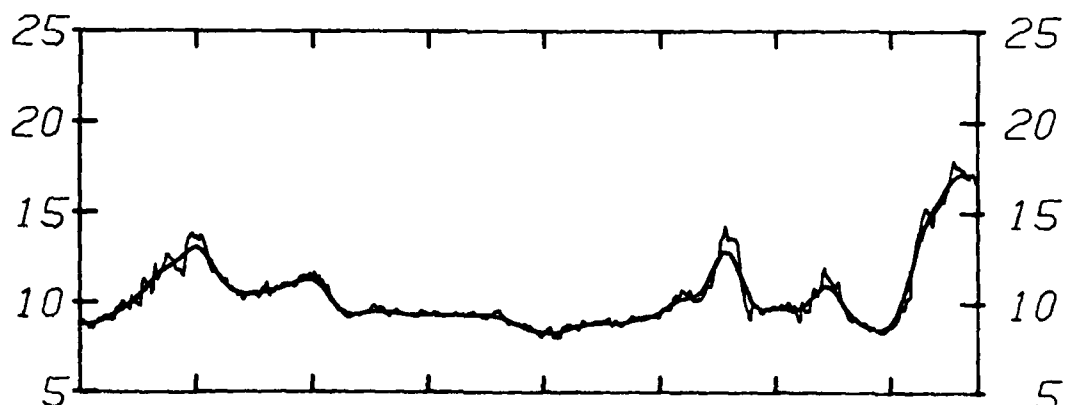
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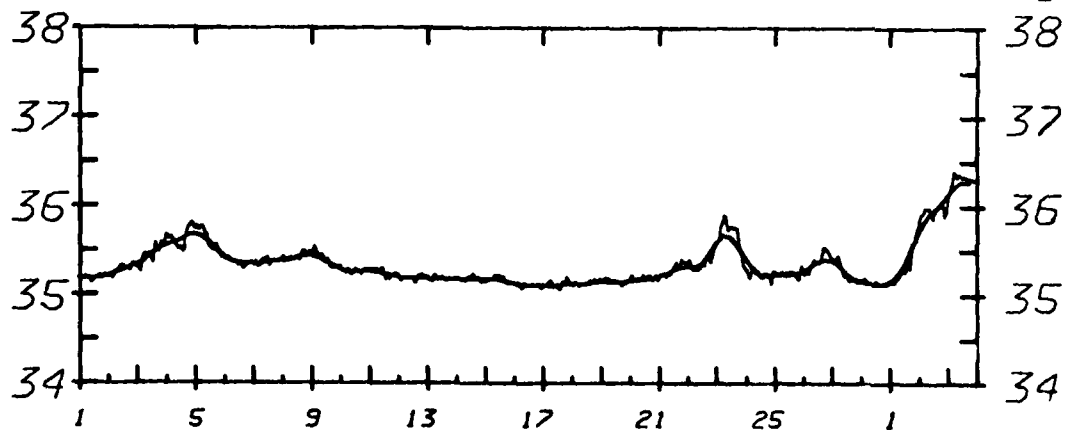
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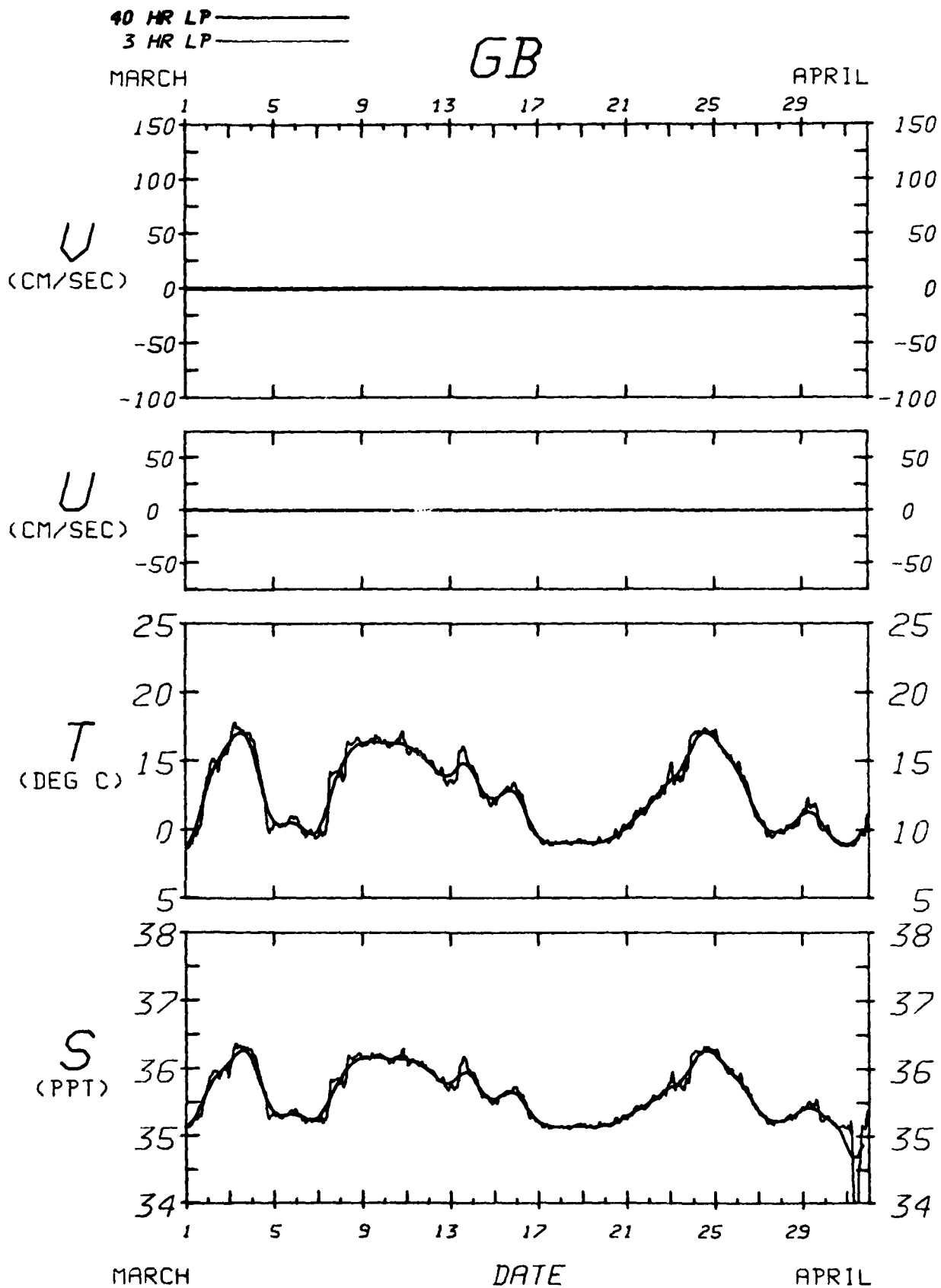
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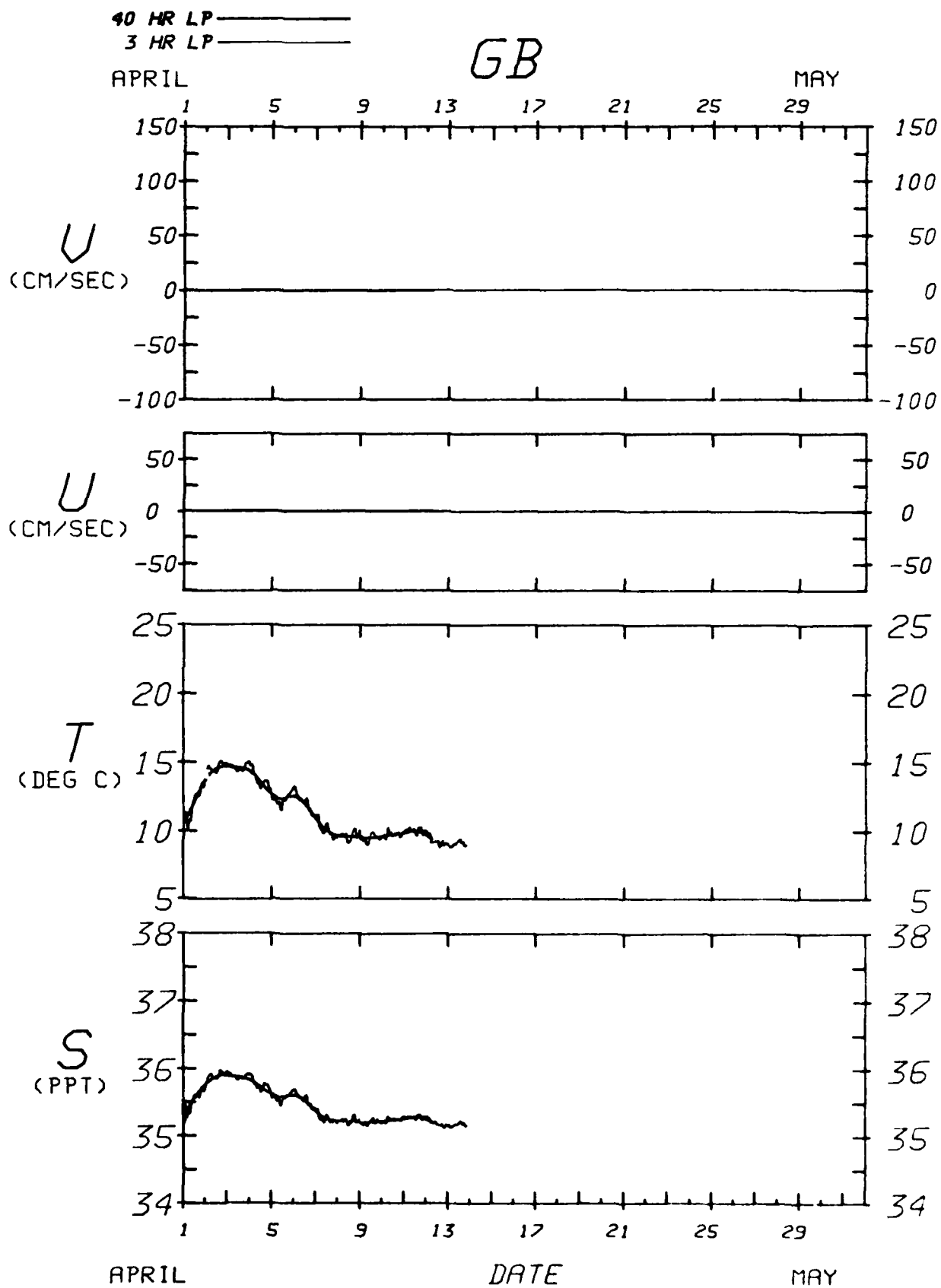


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MARCH





AD-A144 977

THE GULF STREAM DEFLECTION AND MEANDER ENERGETICS
EXPERIMENT CURRENT METE. (U) NORTH CAROLINA UNIV AT
CHAPEL HILL J M BANE ET AL. DEC 83 CMS-83-2

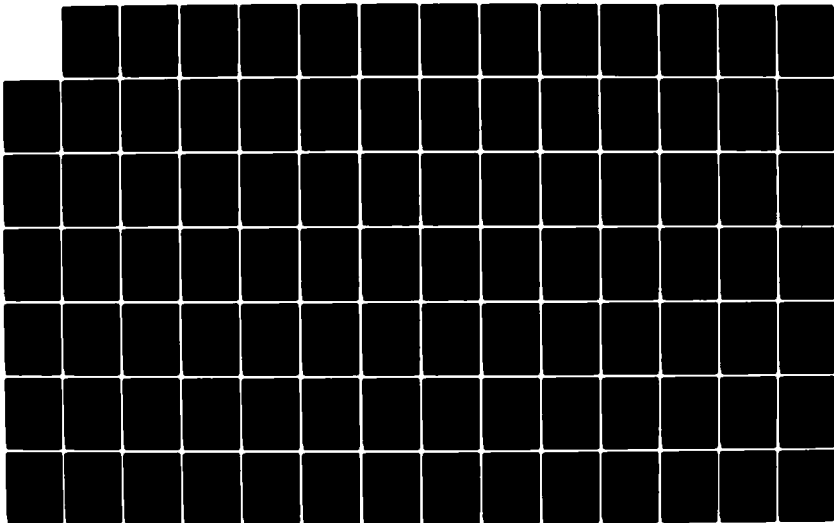
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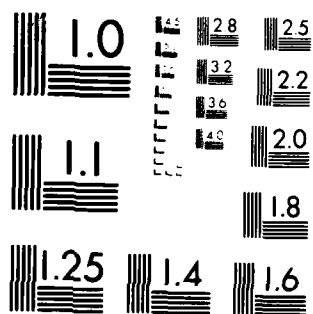
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

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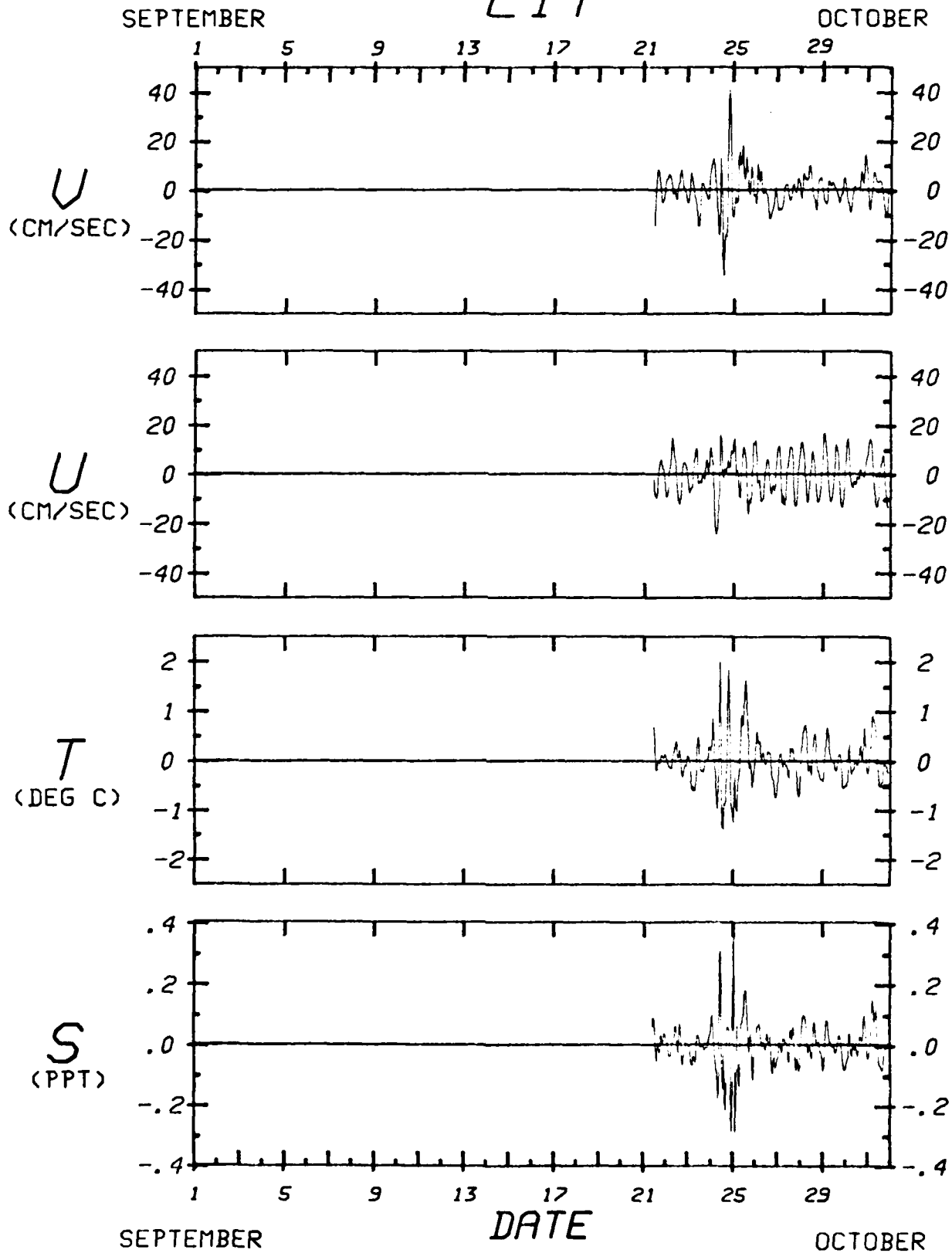
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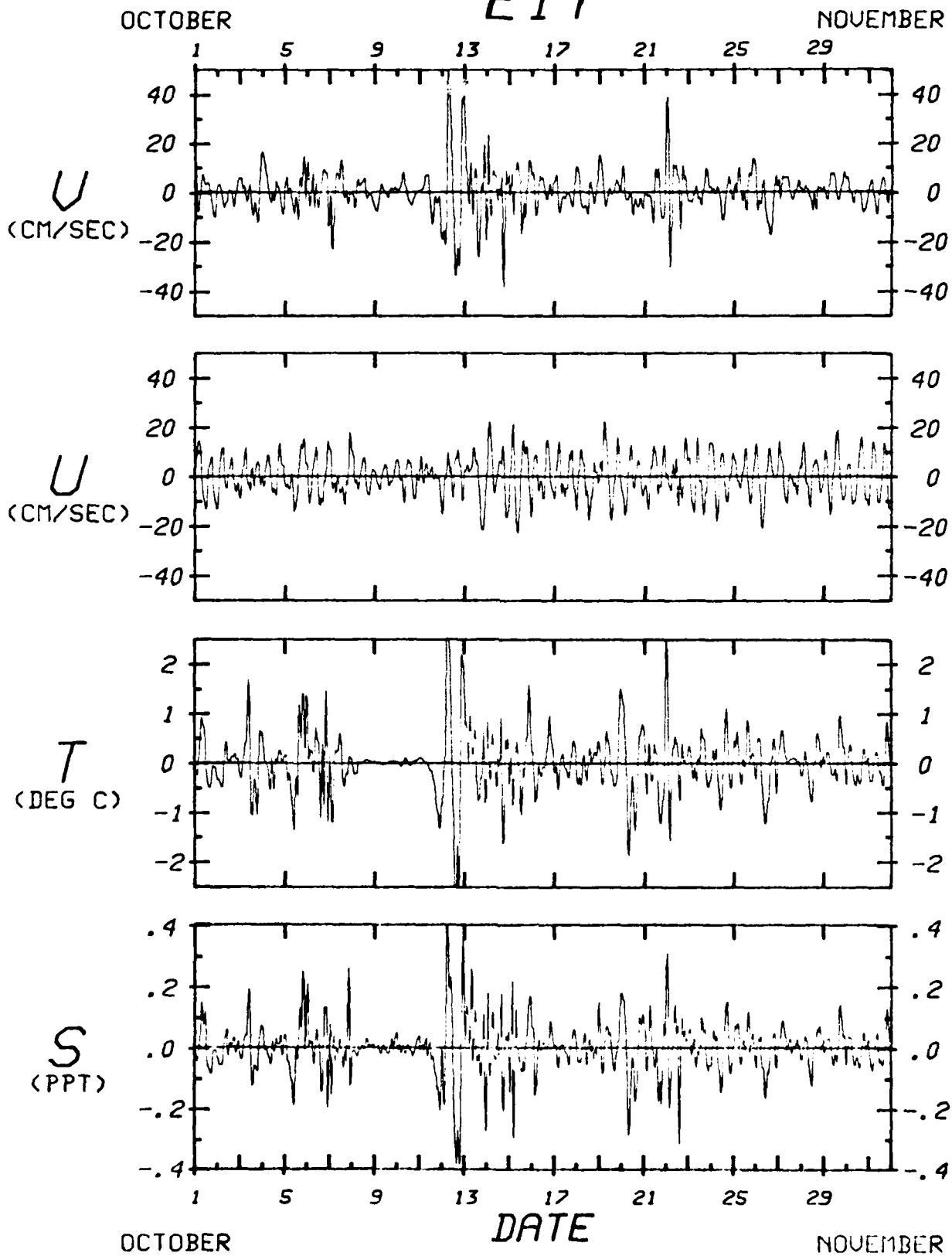
3-40HRBP Current Meter Data

The band-passed time series (variance in the band from 1 cycle/3 hrs to 1 cycle/40 hrs) of salinity, temperature and velocity are presented for all current meters in a monthly format. Note, this filtering removes the mean value from the series. The scaling in all plots is identical.

3-40 BP

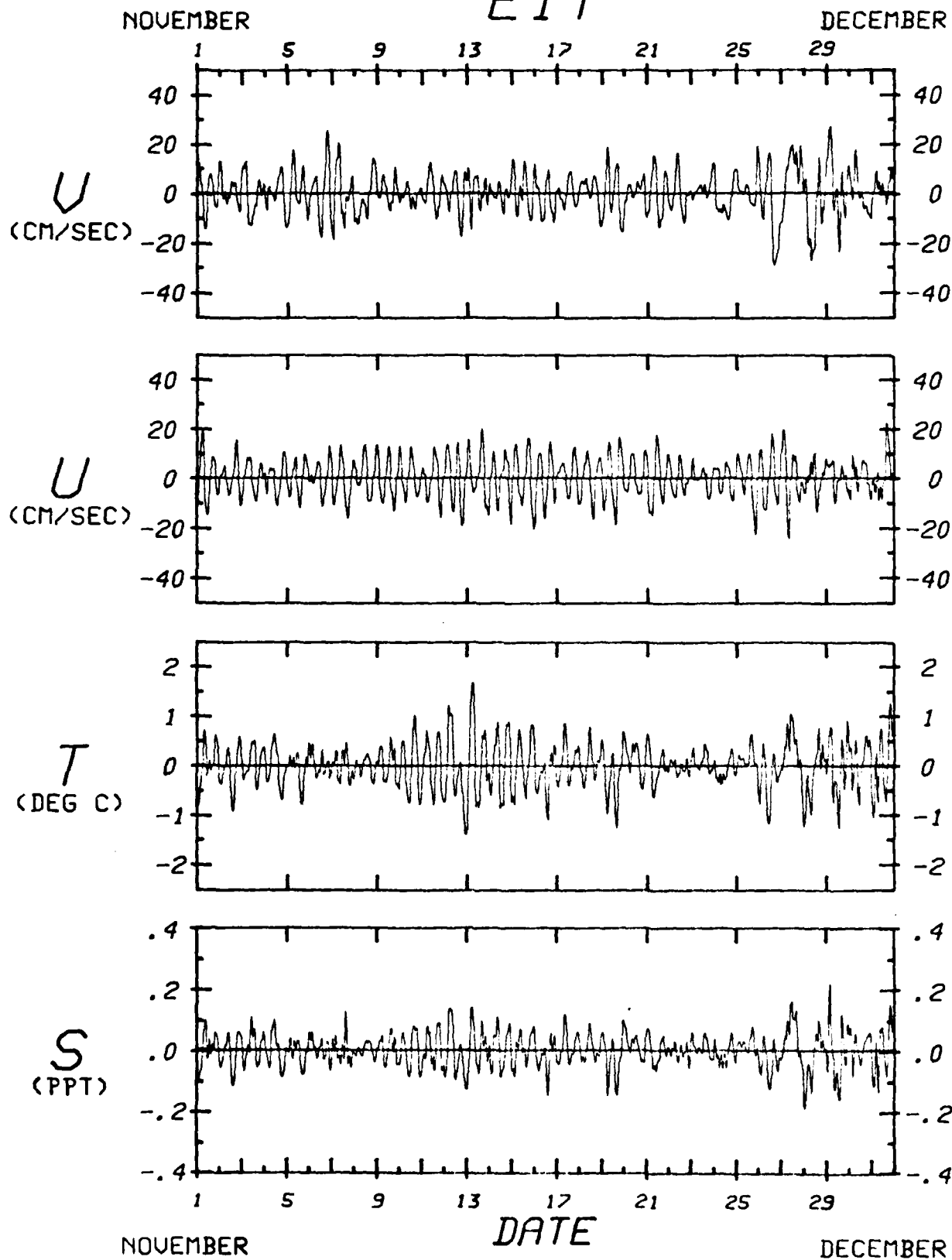
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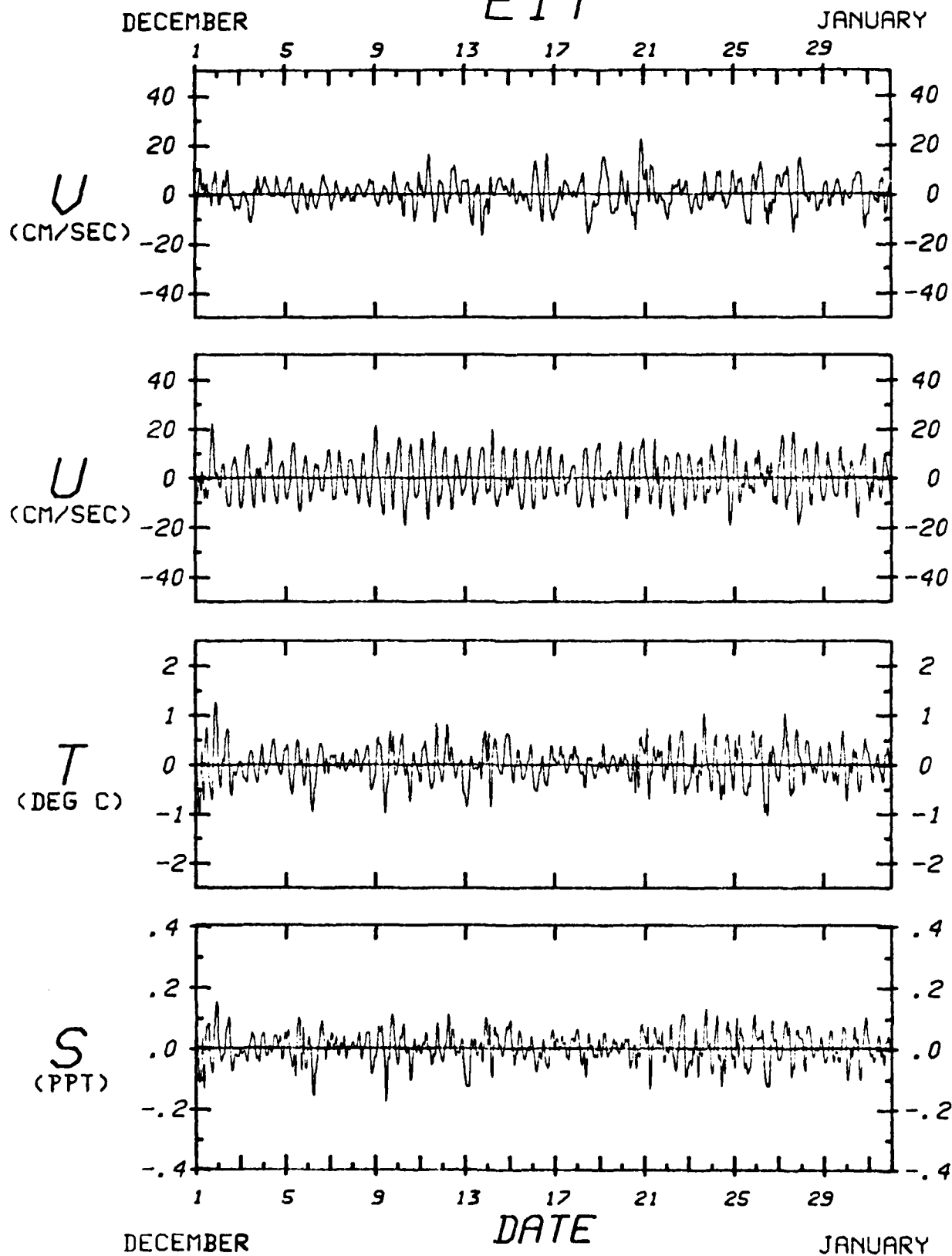
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3-40 BP

E1T

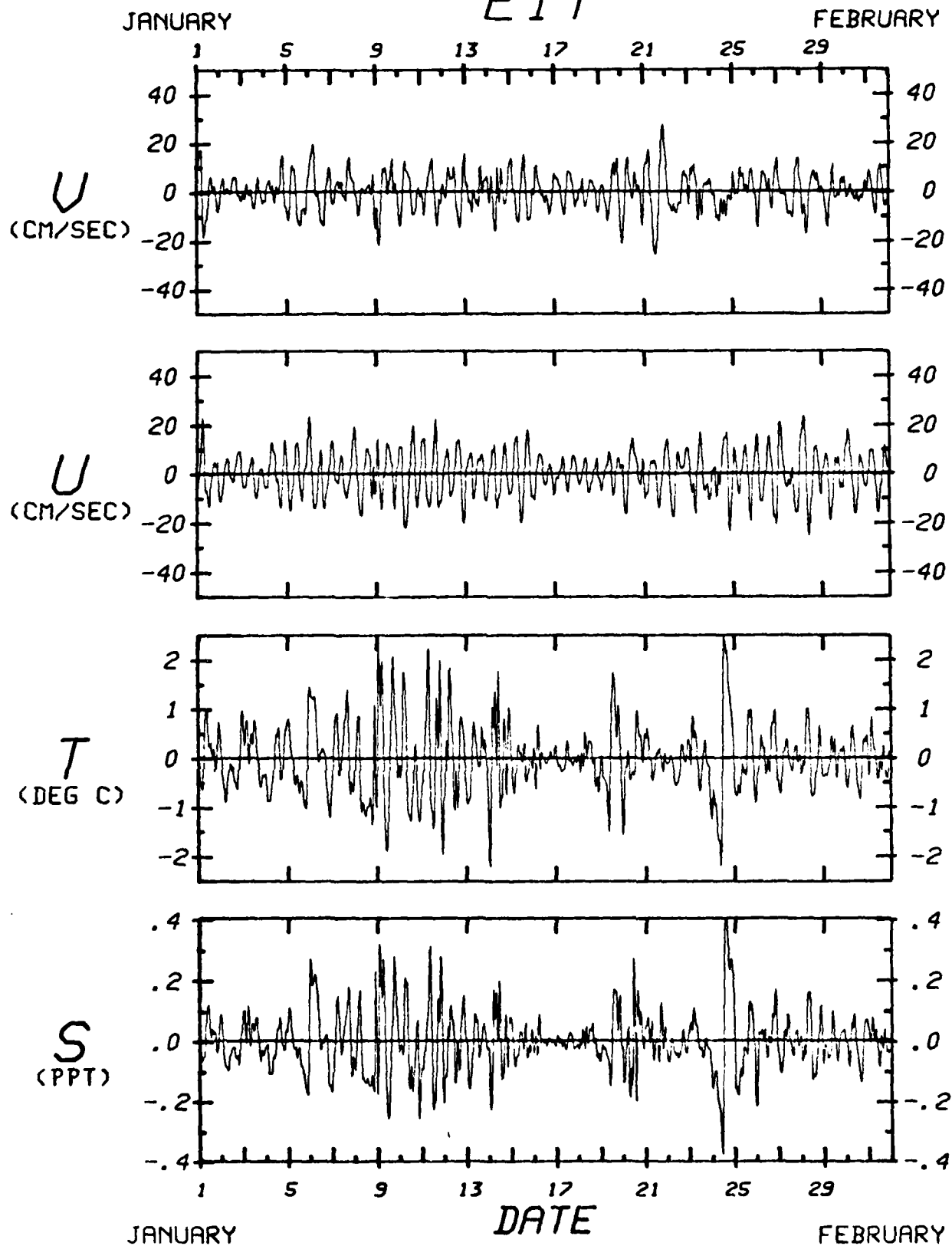


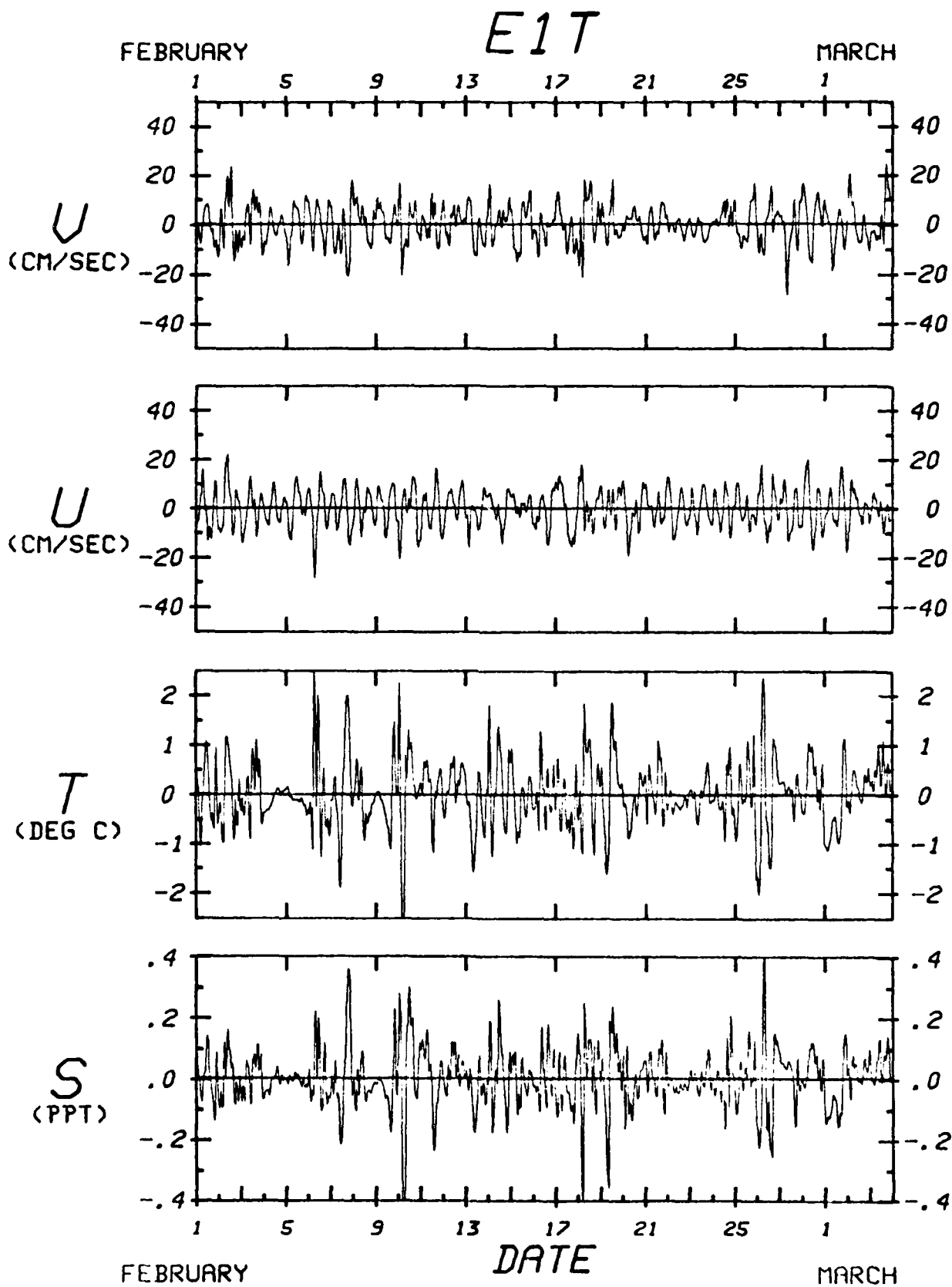
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3-40 BP

E1T



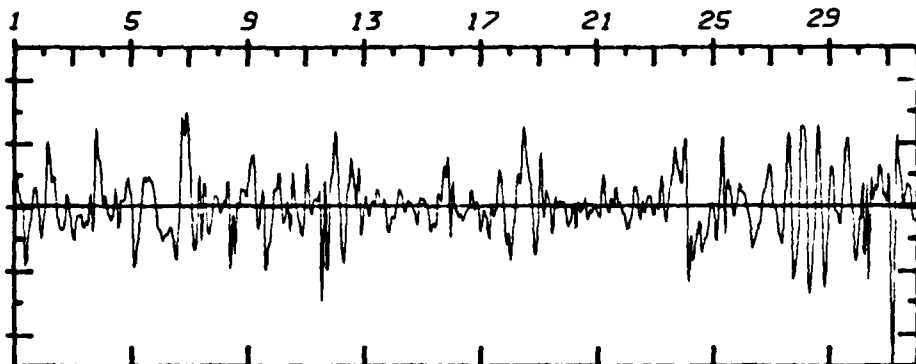


3-40 BP

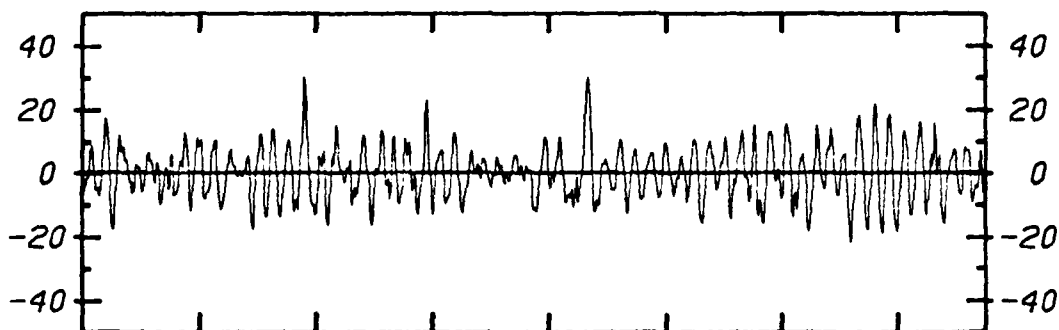
E1T

MARCH

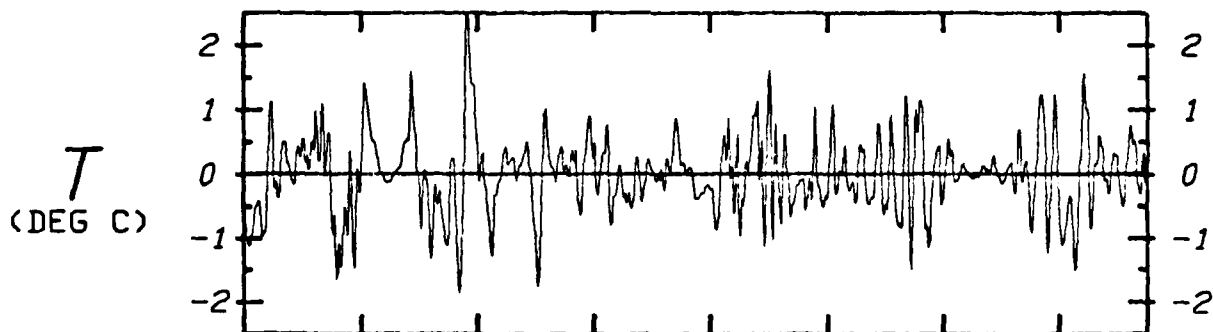
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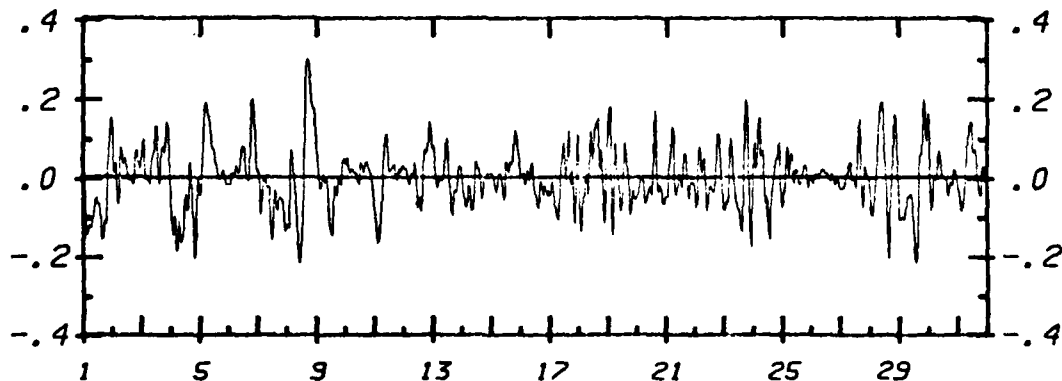
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(DEG C)



S
(PPT)

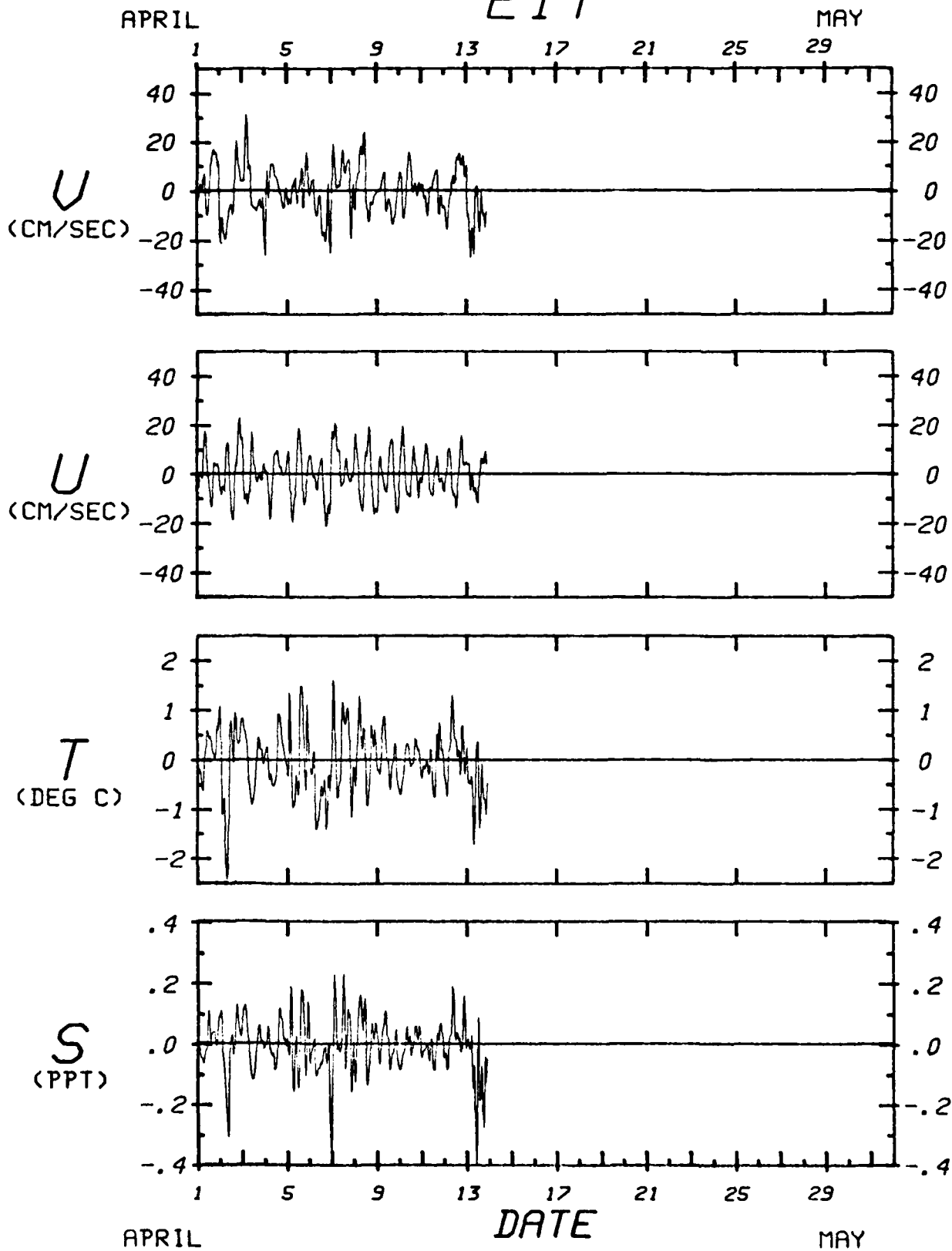
MARCH

DATE

APRIL

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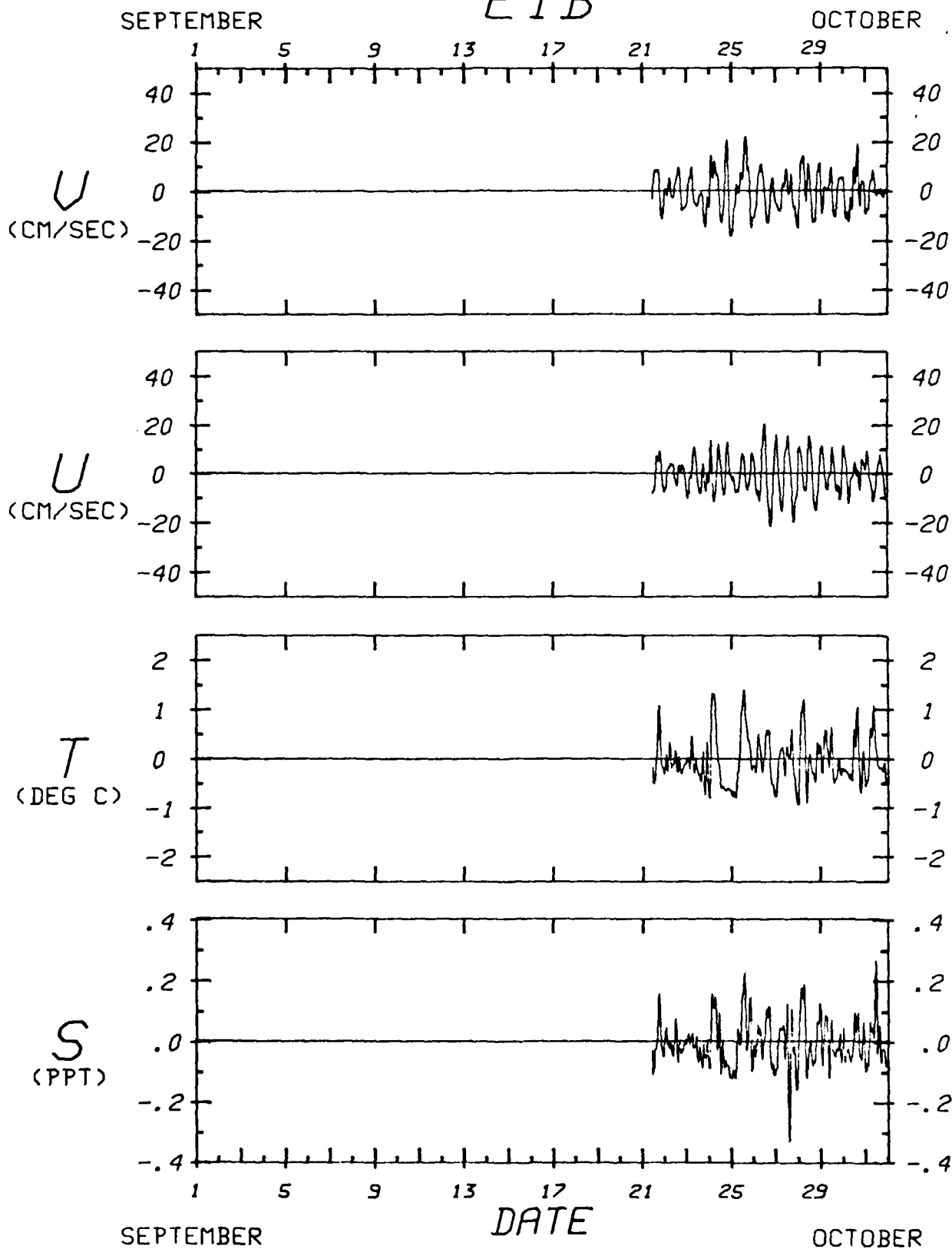
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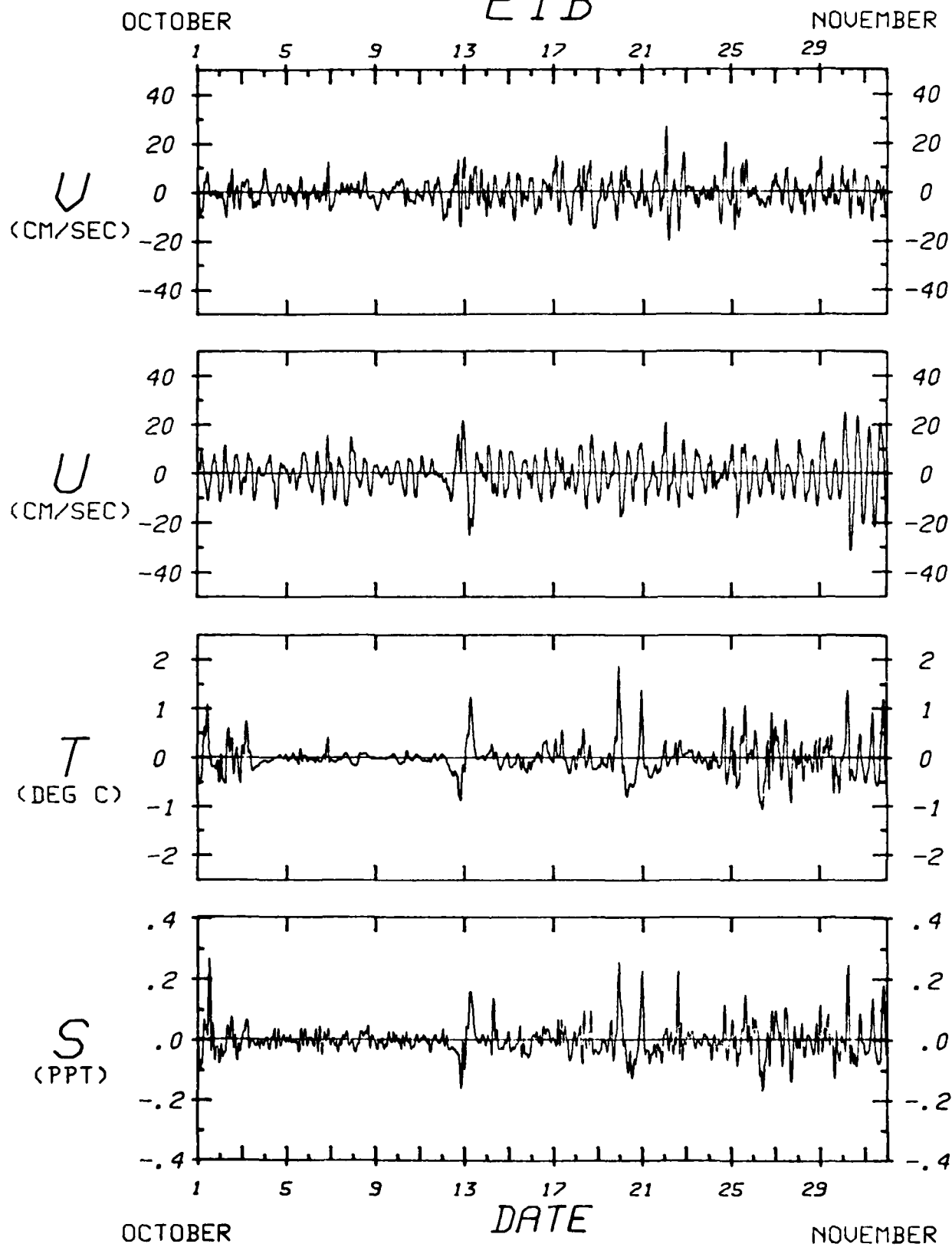
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E1B



3-40 BP

E1B

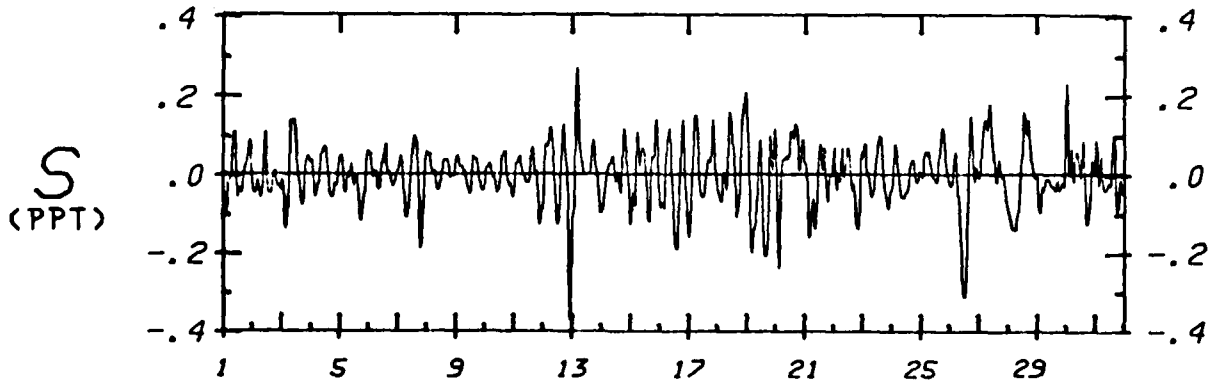
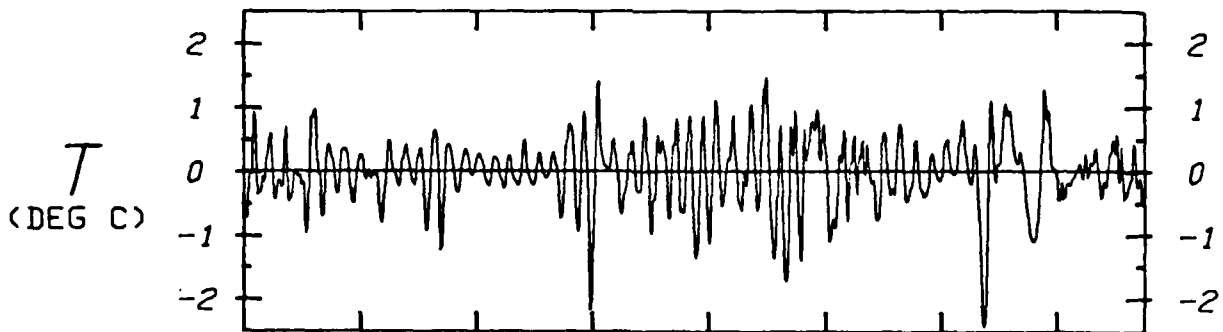
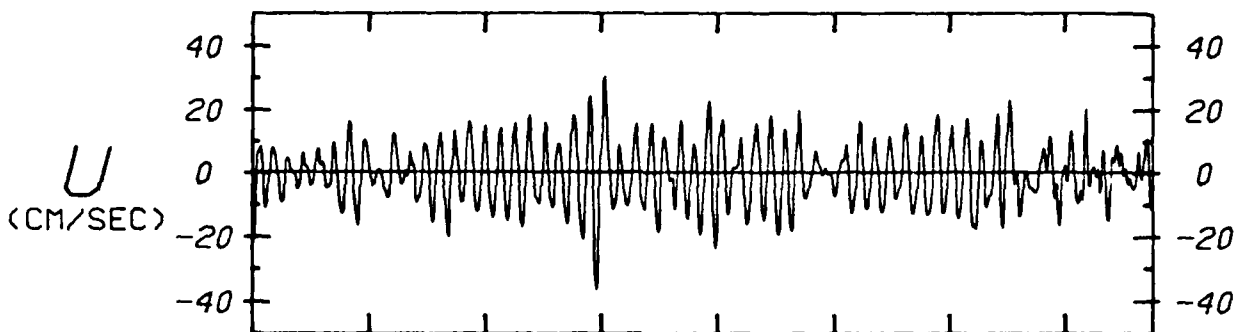
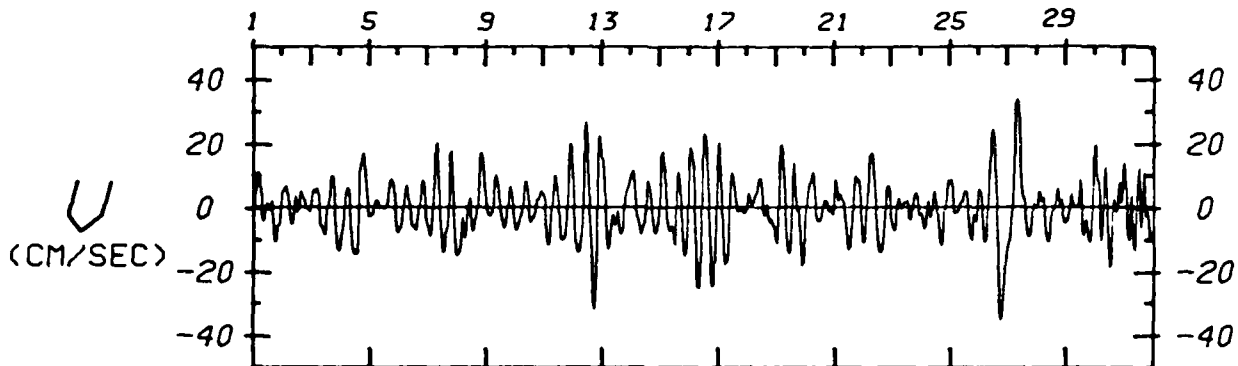


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E1B

NOVEMBER

DECEMBER



NOVEMBER

DATE

DECEMBER

3-40 BP

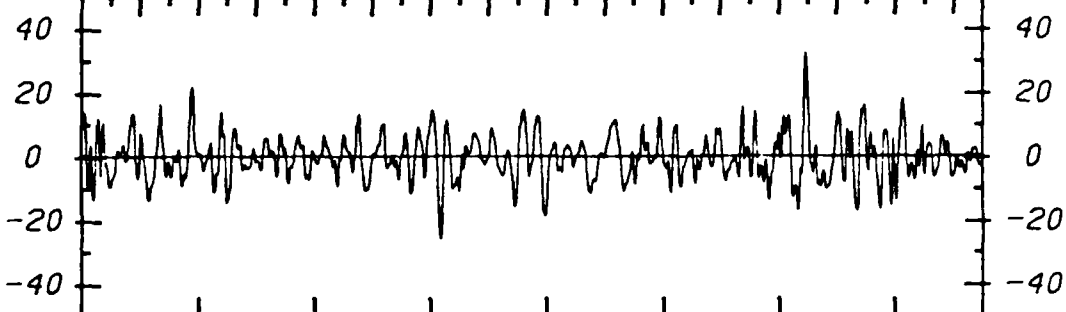
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DECEMBER

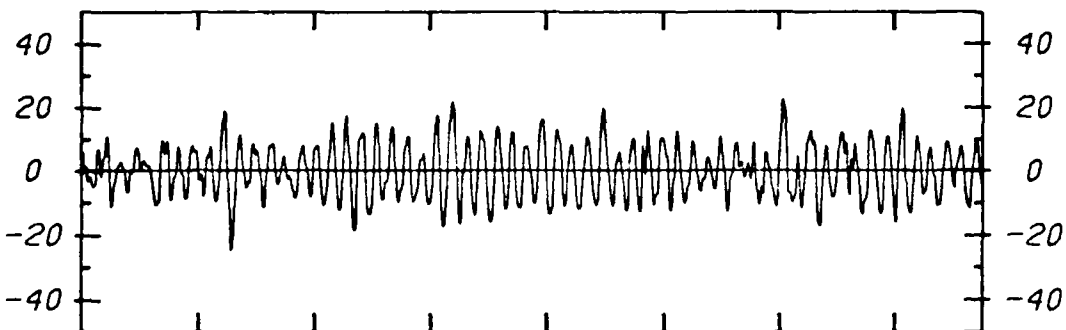
JANUARY

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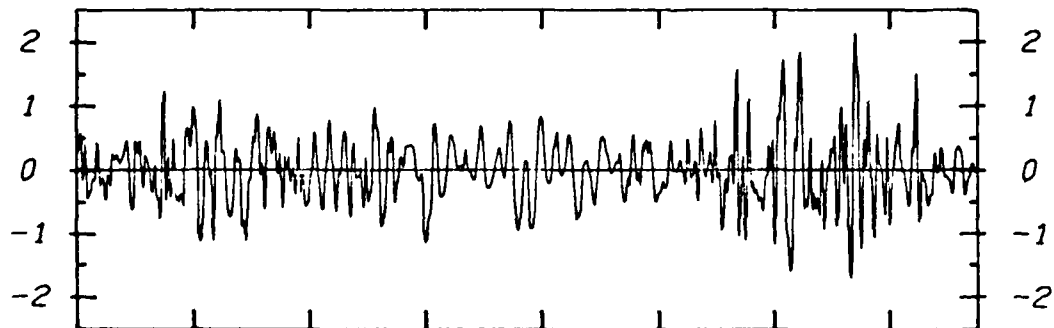
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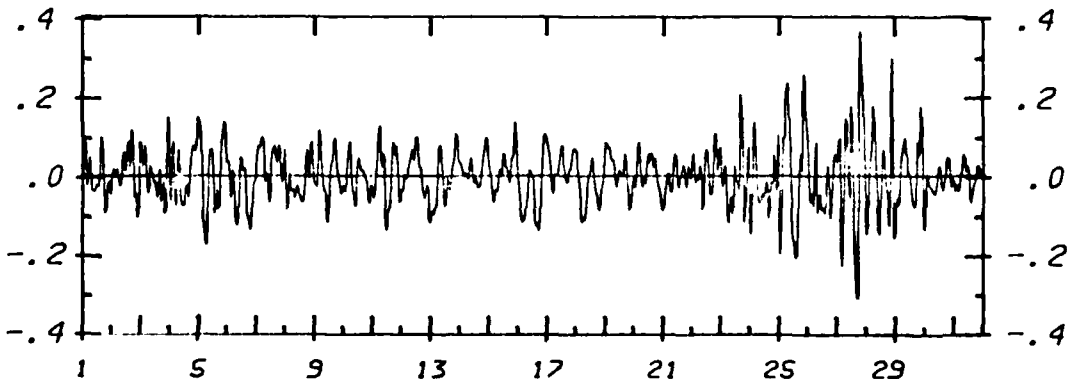
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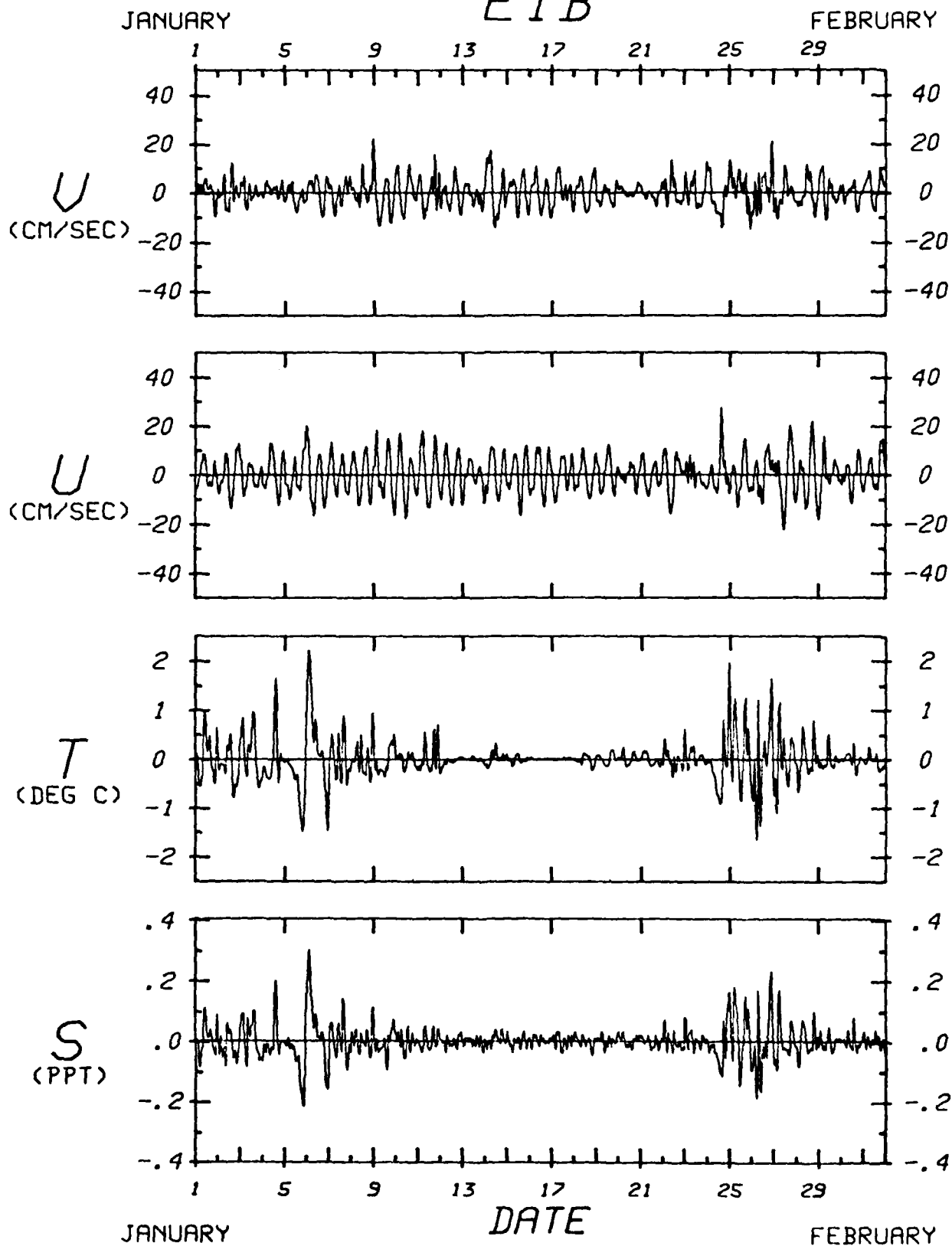
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DATE

JANUARY

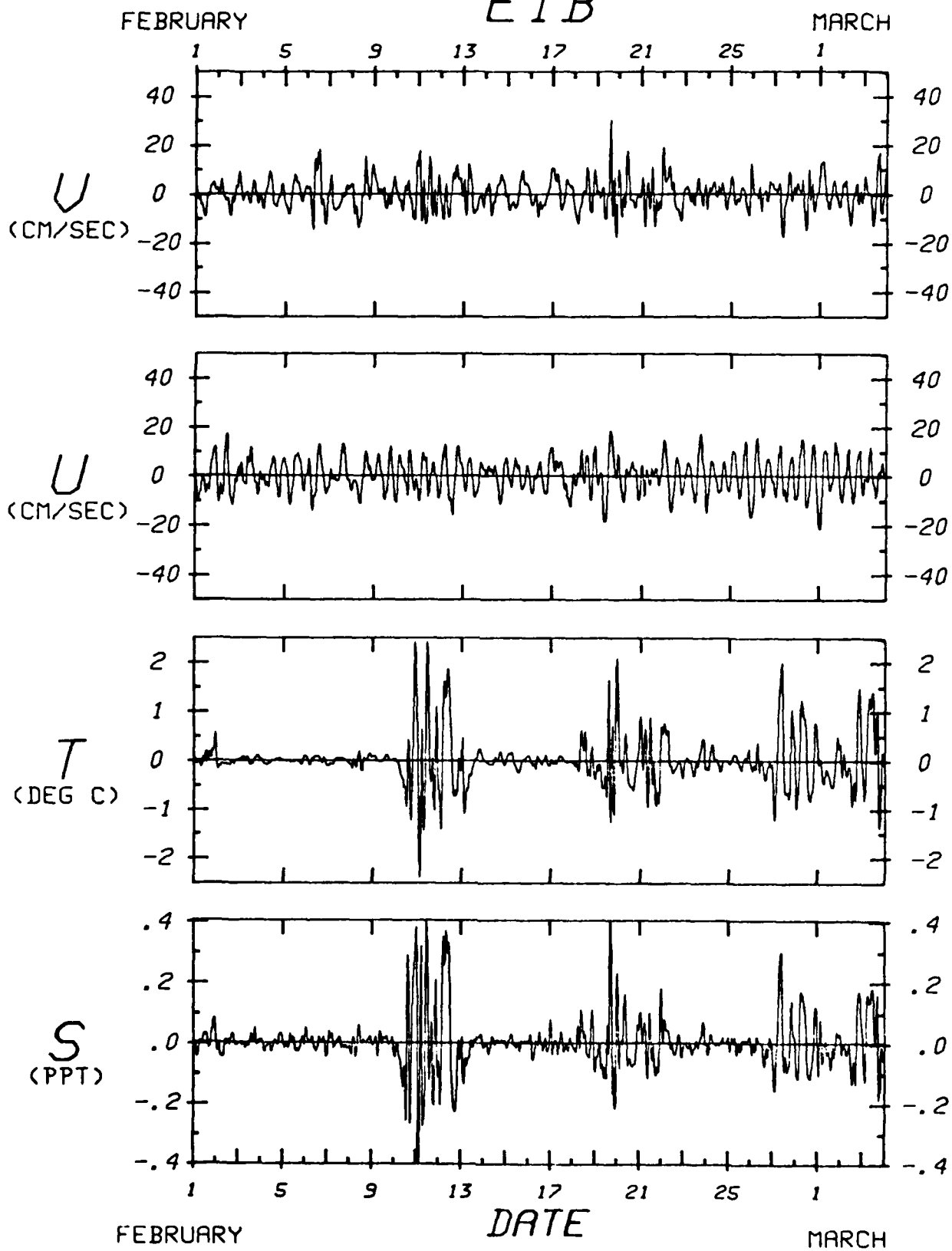
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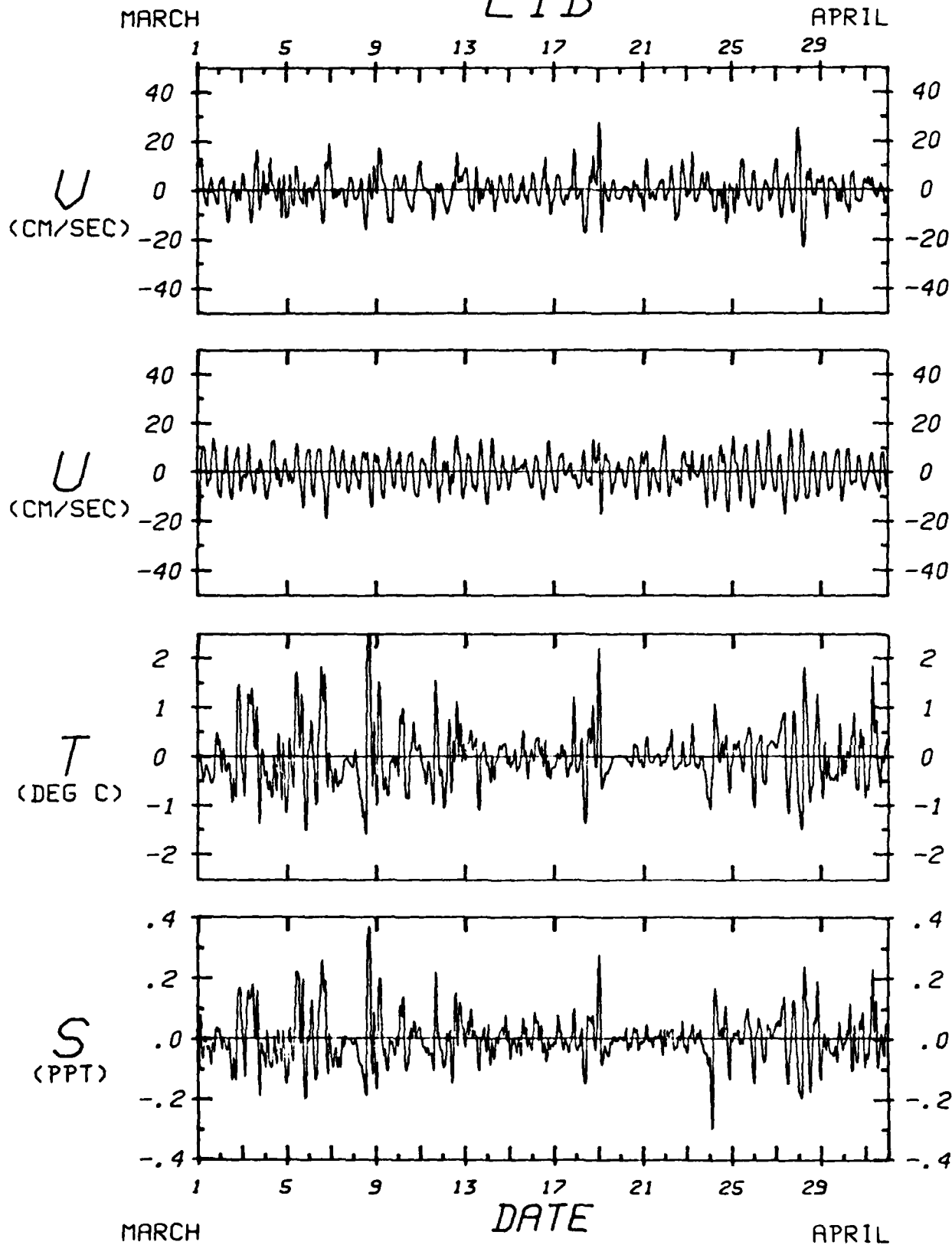
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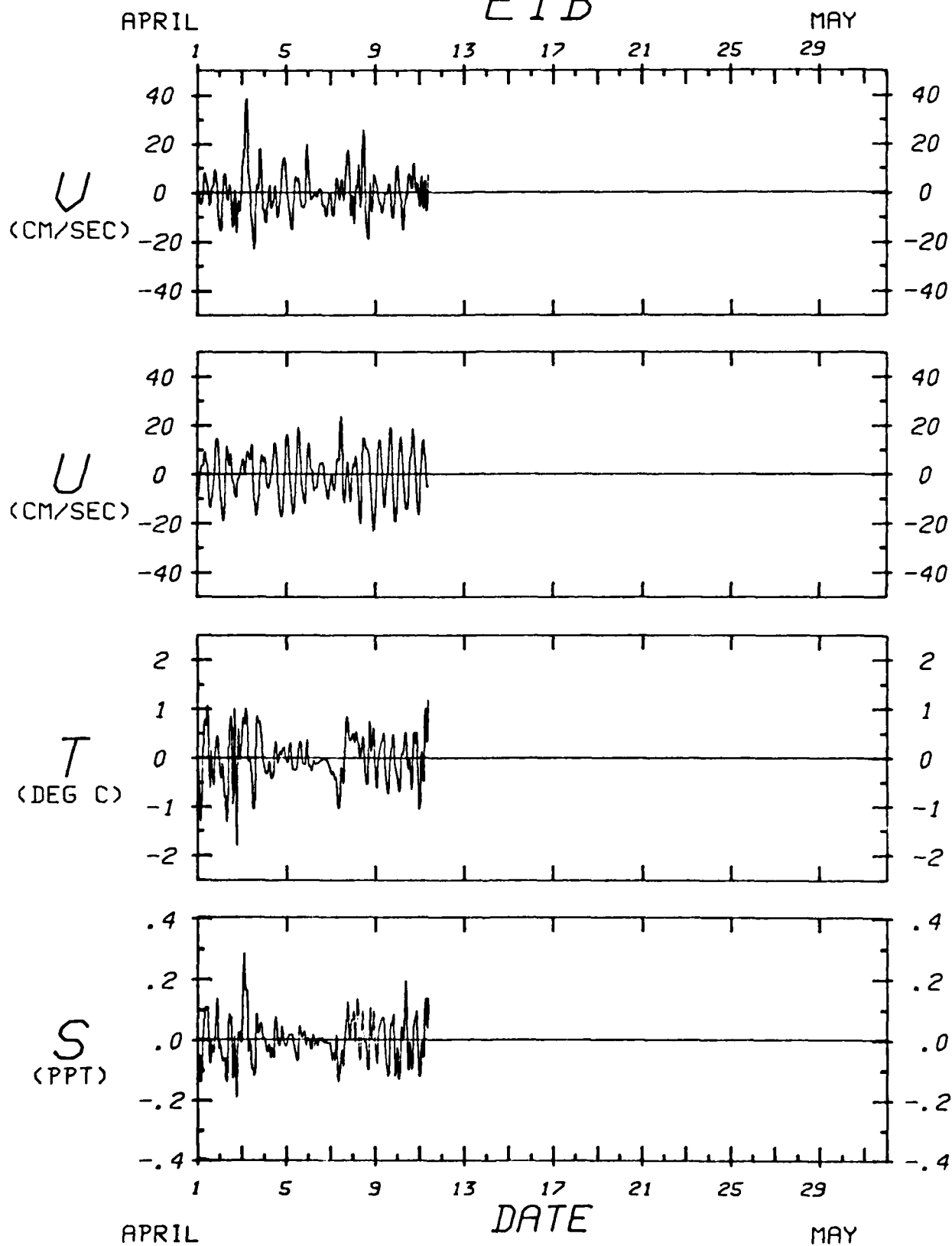


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E1B



E1B



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3-40 BP

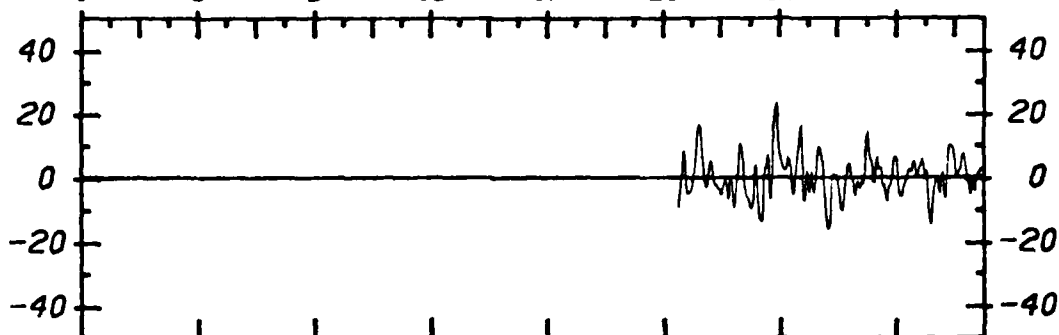
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SEPTEMBER

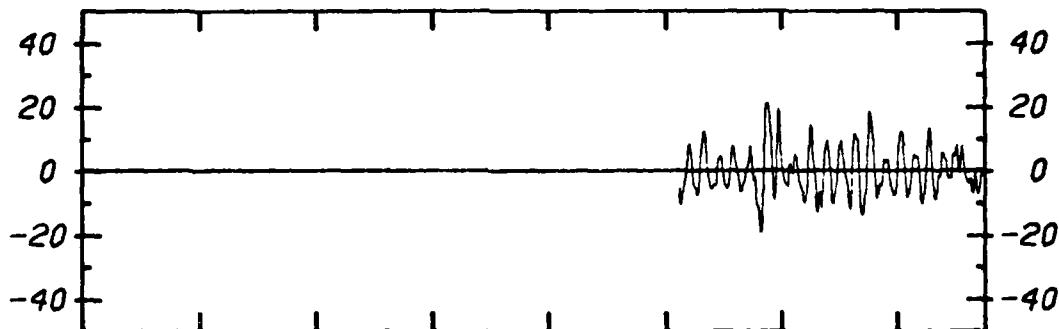
OCTOBER

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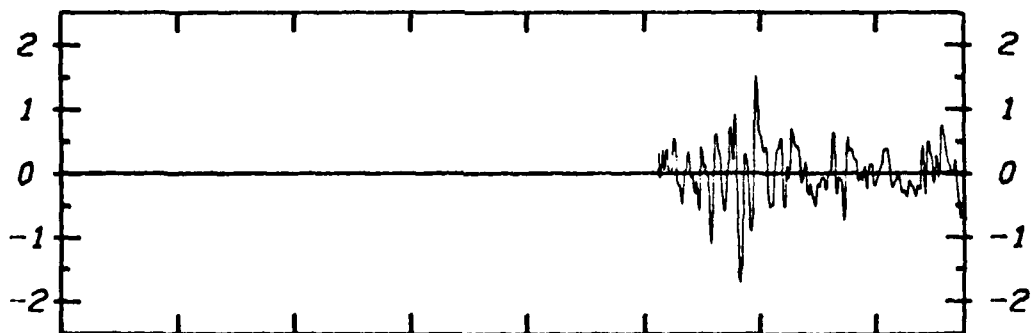
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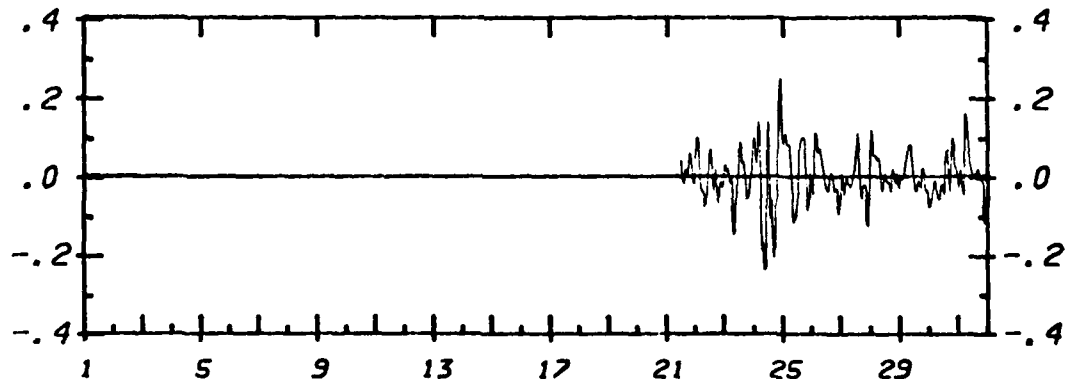
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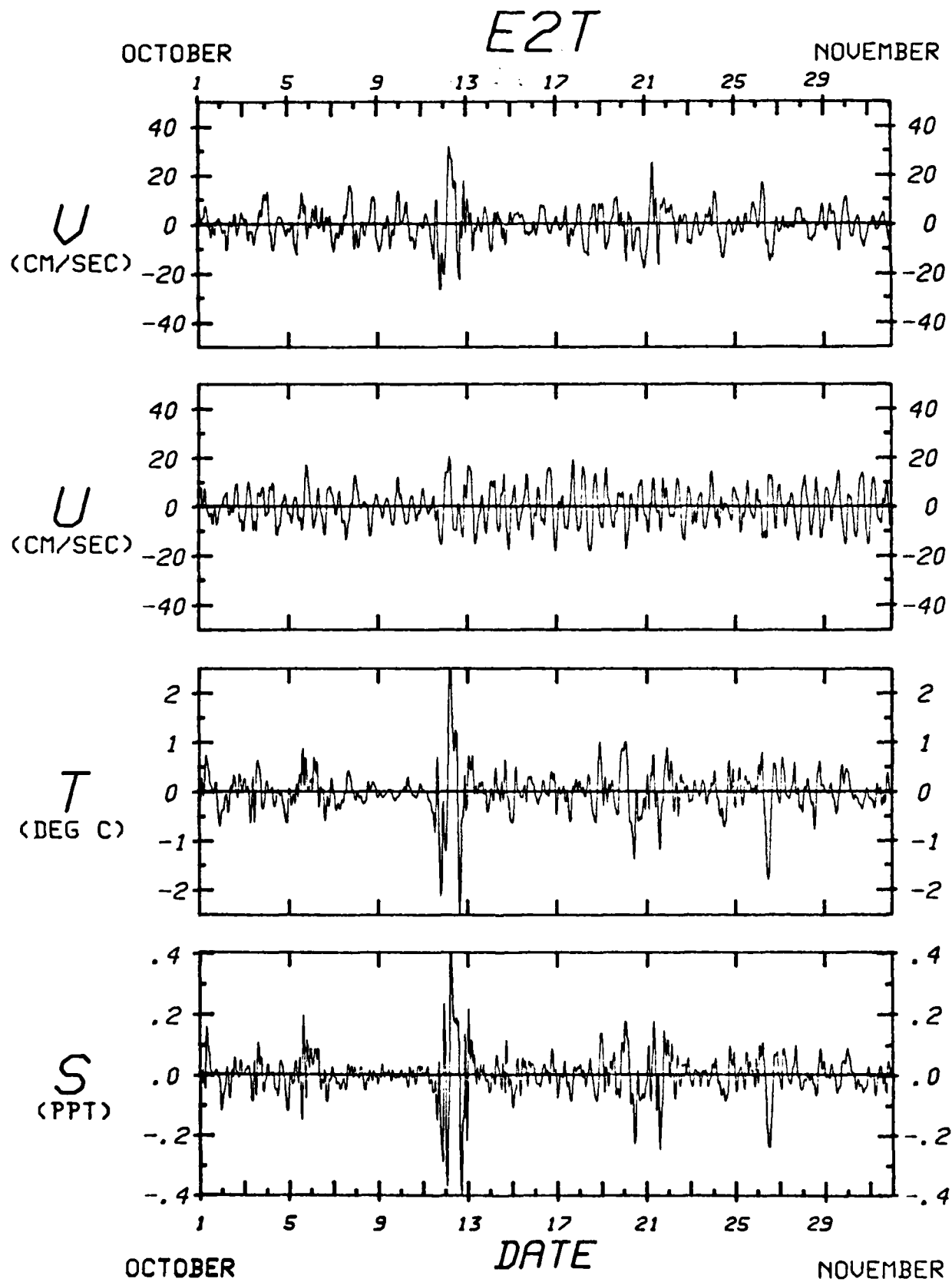


SEPTEMBER

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OCTOBER

3-40 BP

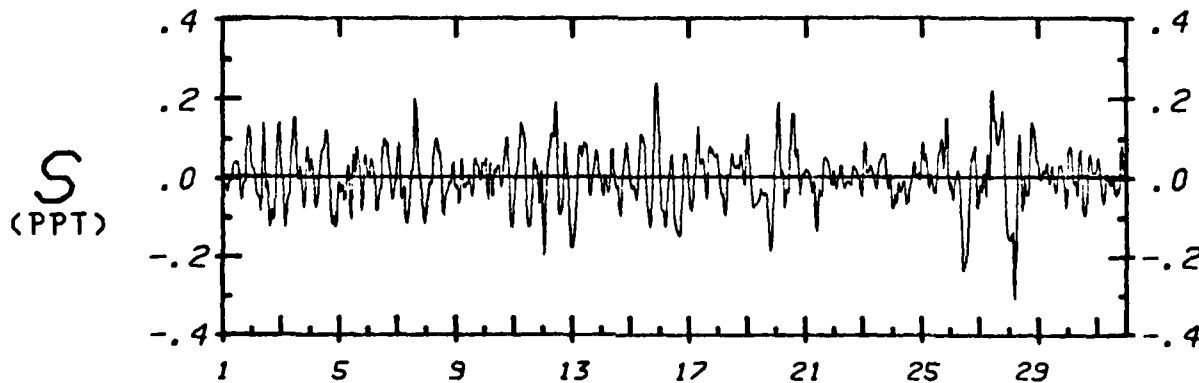
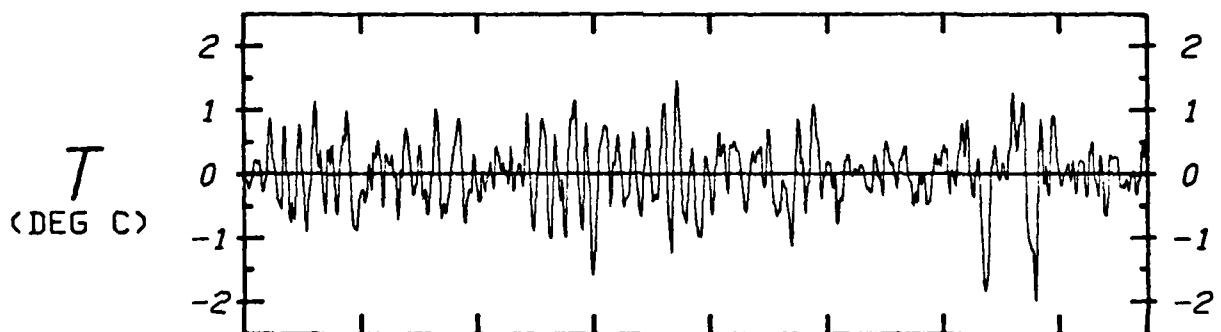
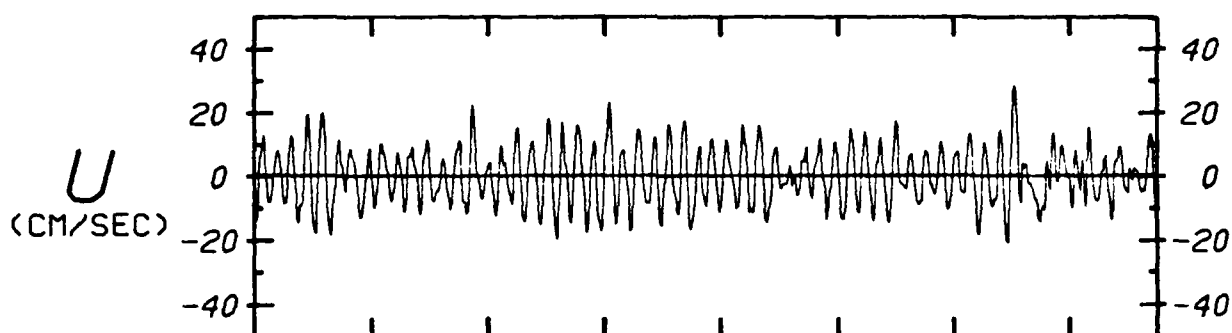
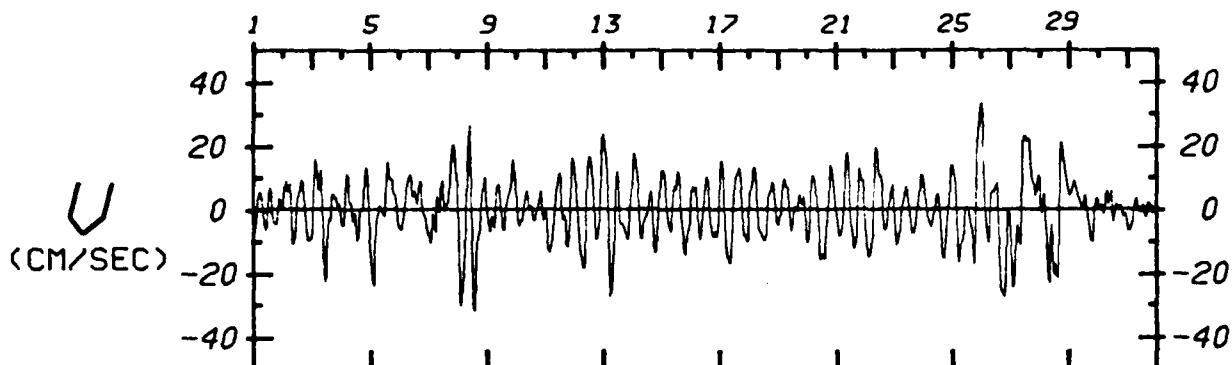


3-40 BP

E2T

NOVEMBER

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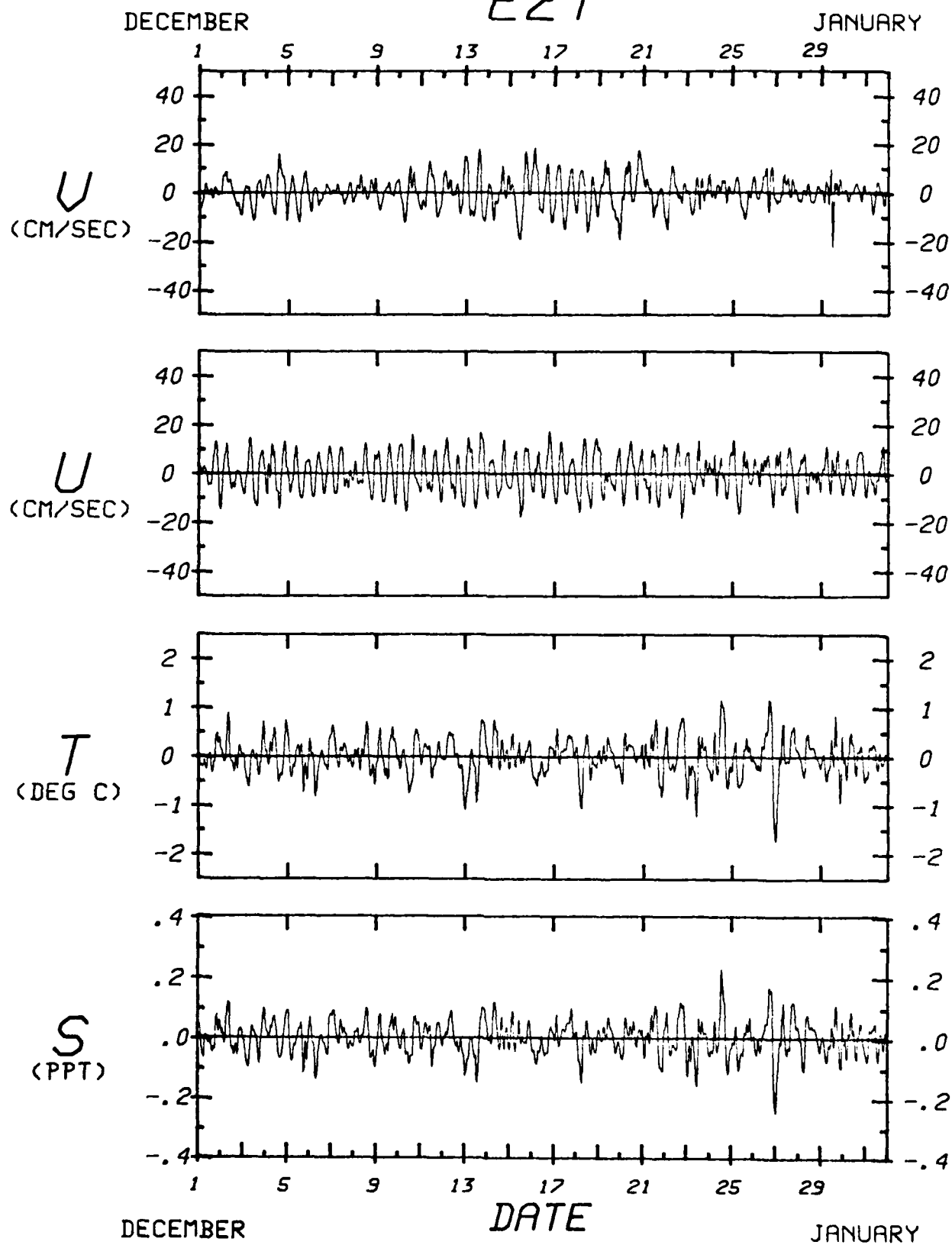


NOVEMBER

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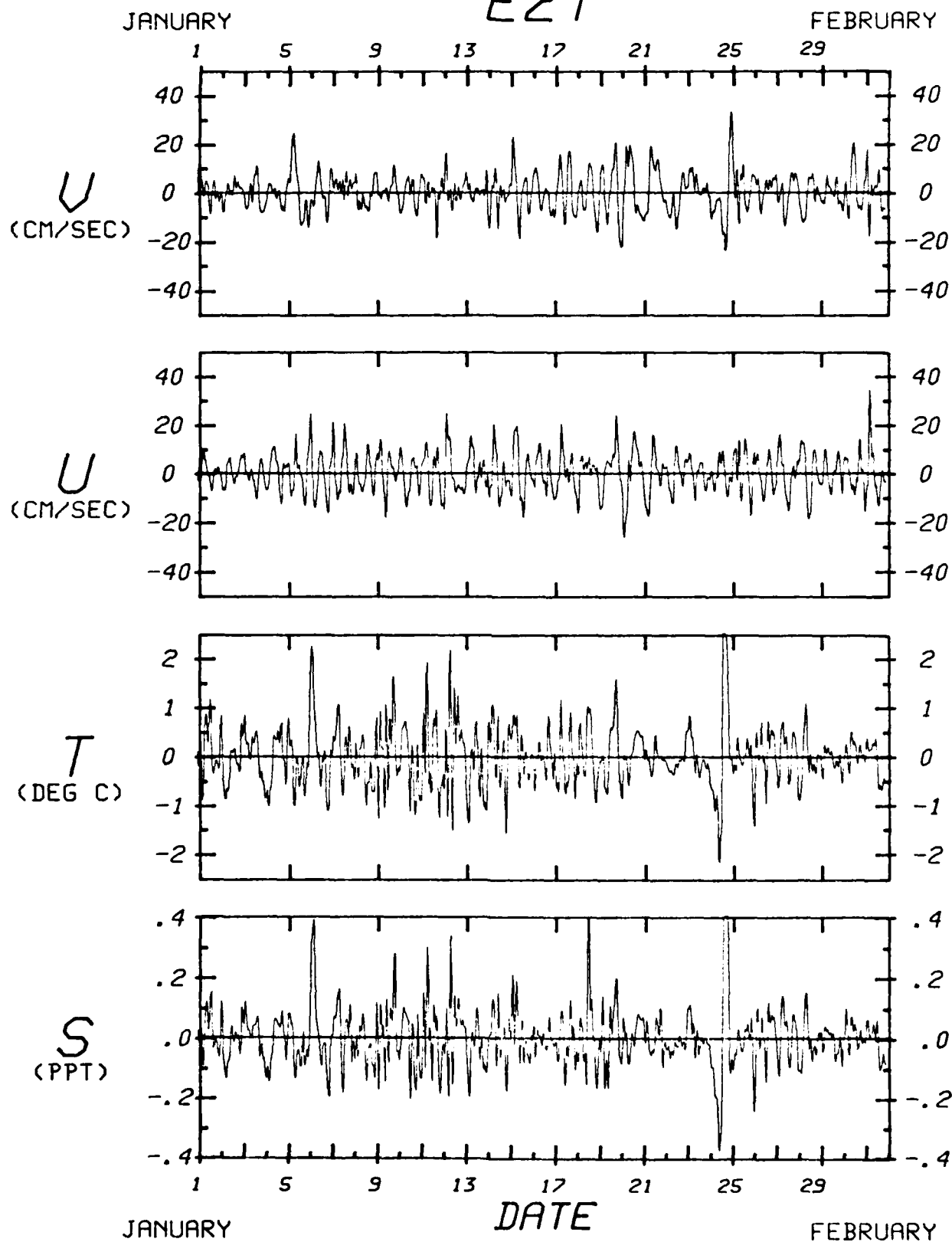
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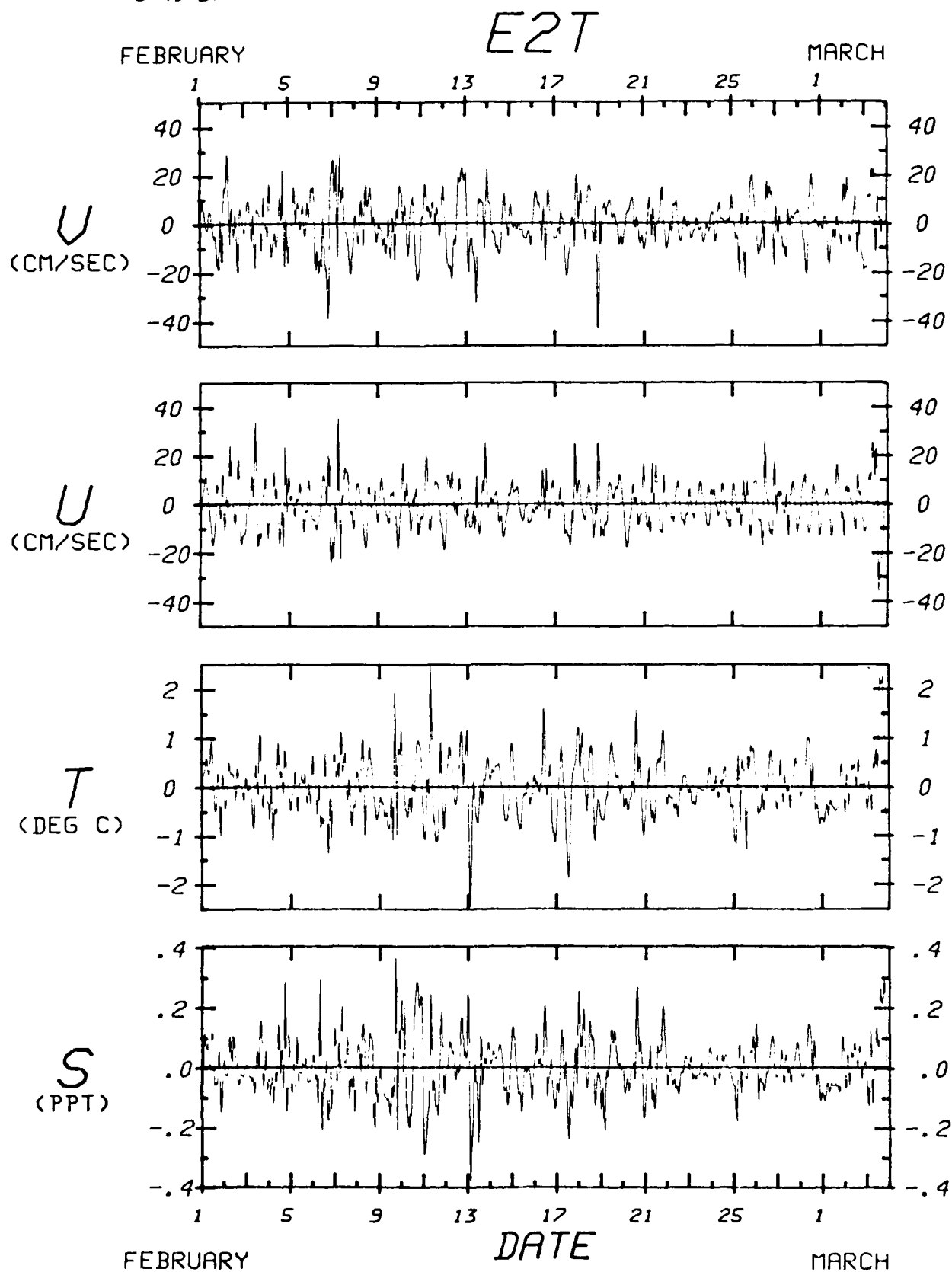
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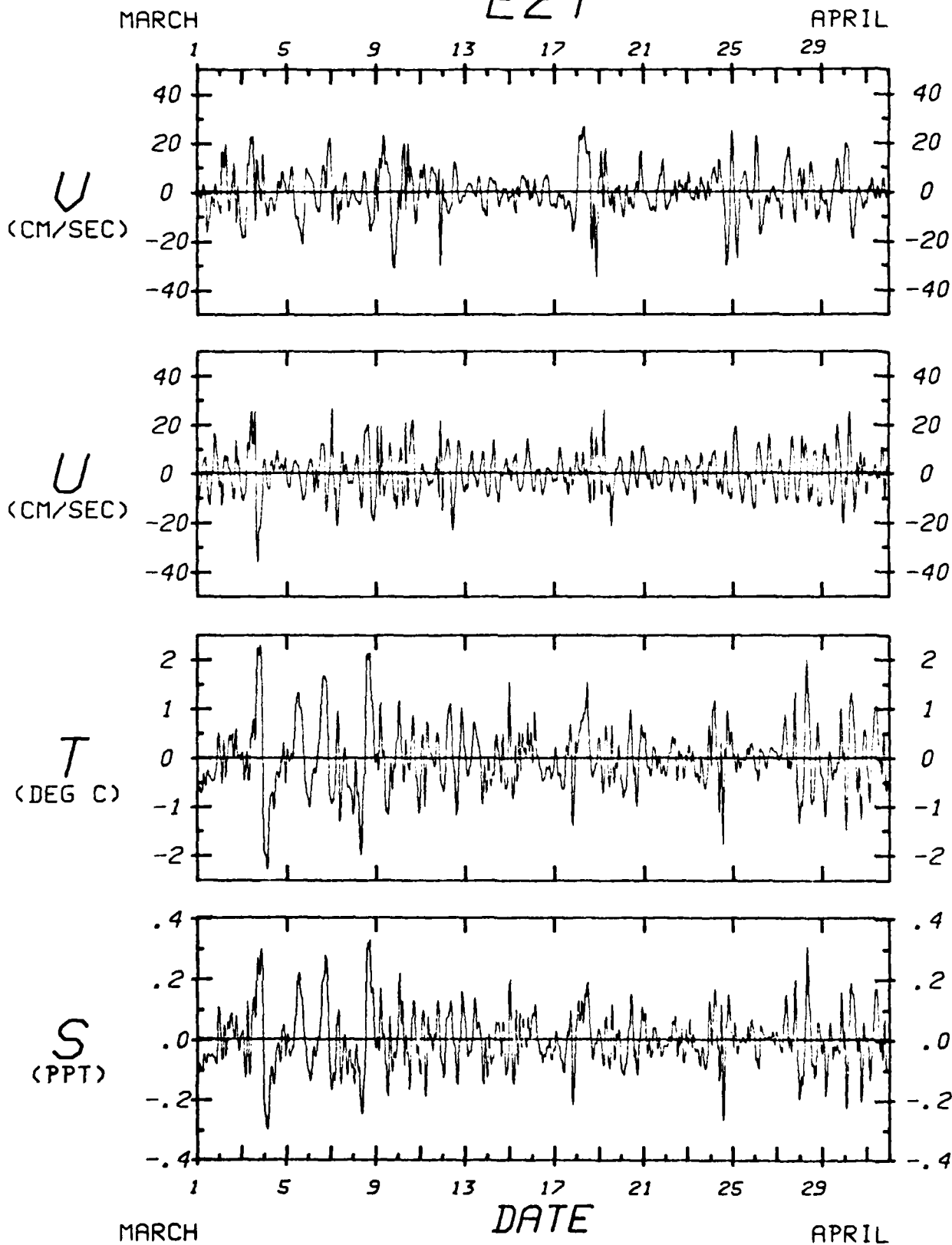
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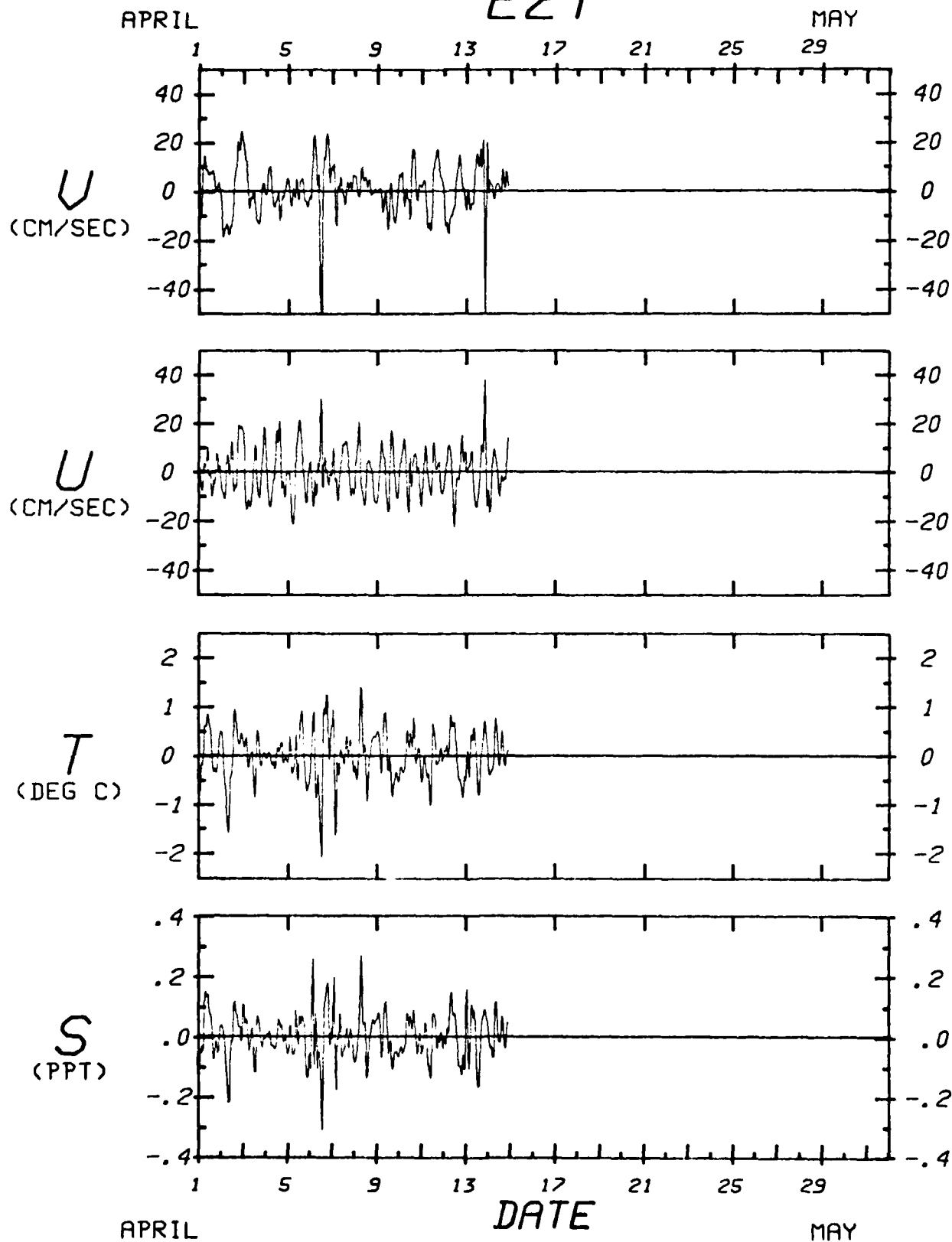
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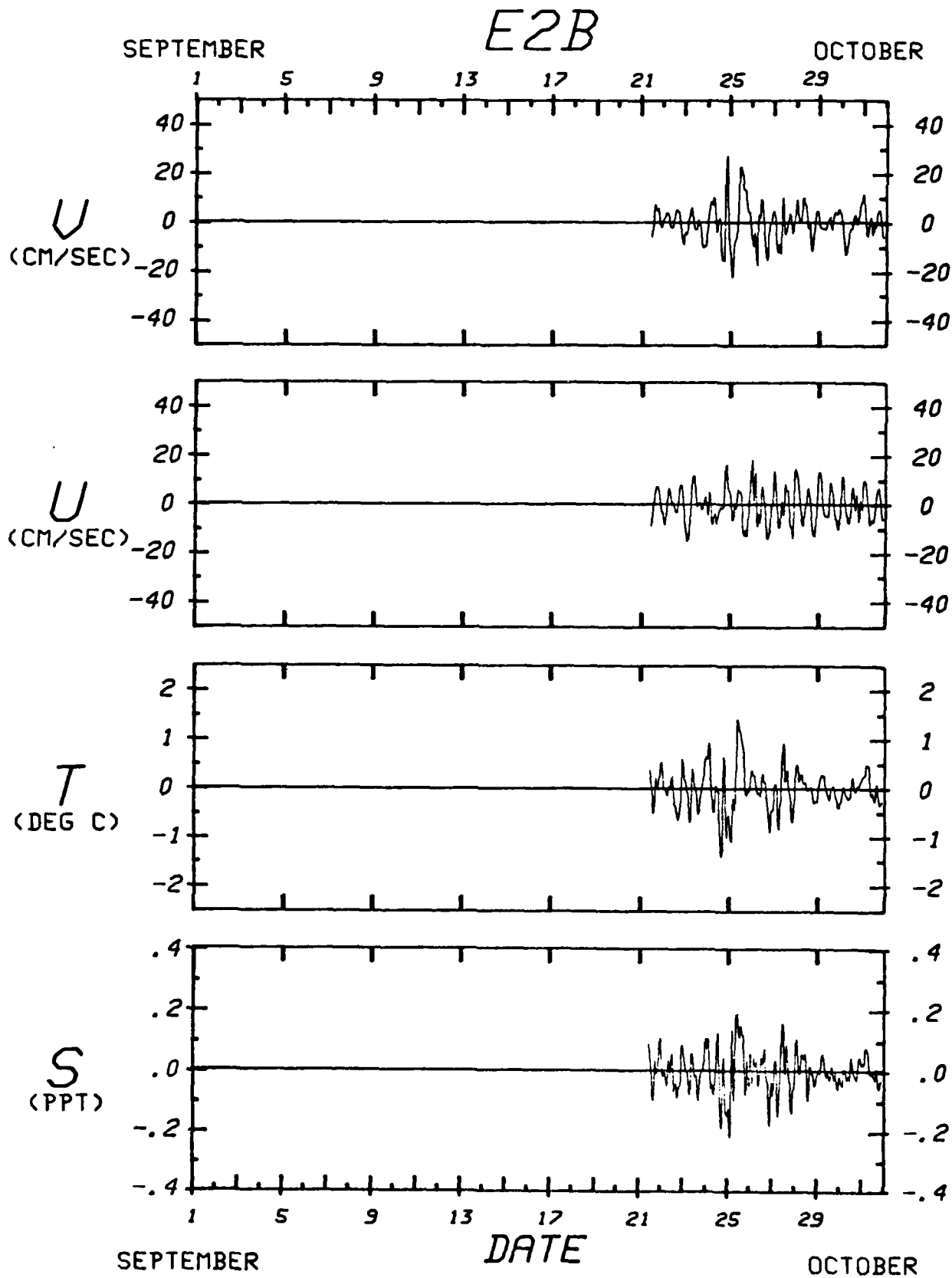
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3-40 BP



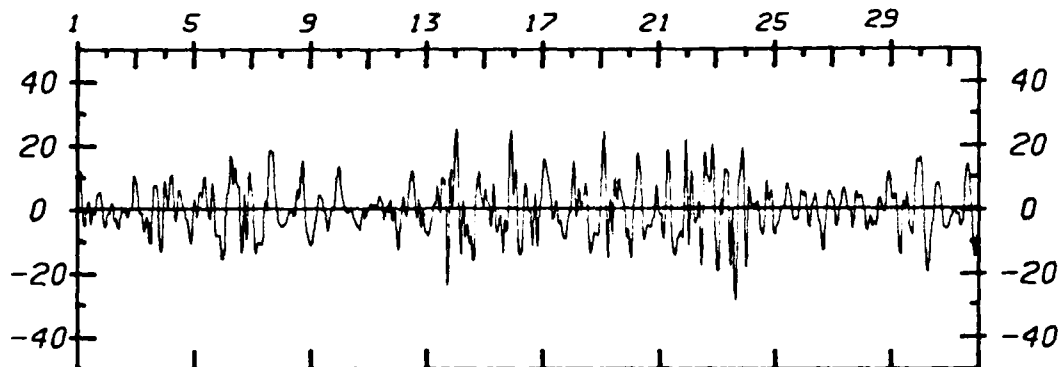
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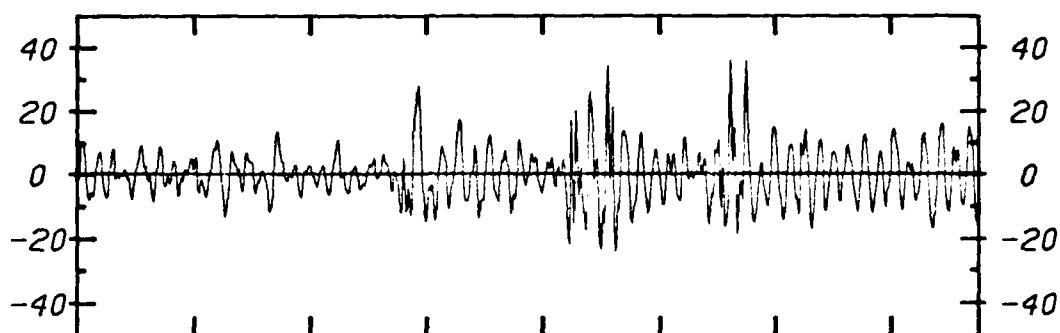
OCTOBER

NOVEMBER

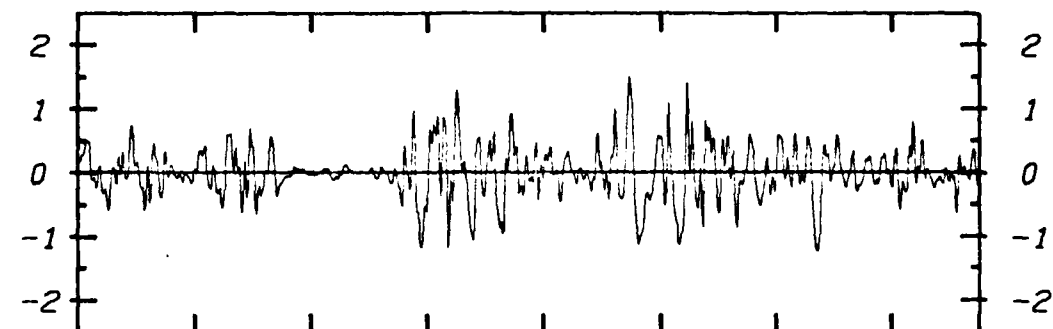
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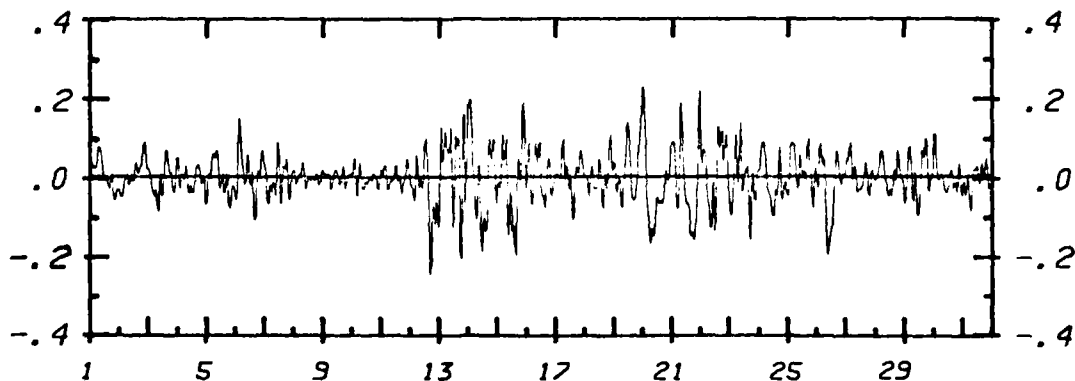
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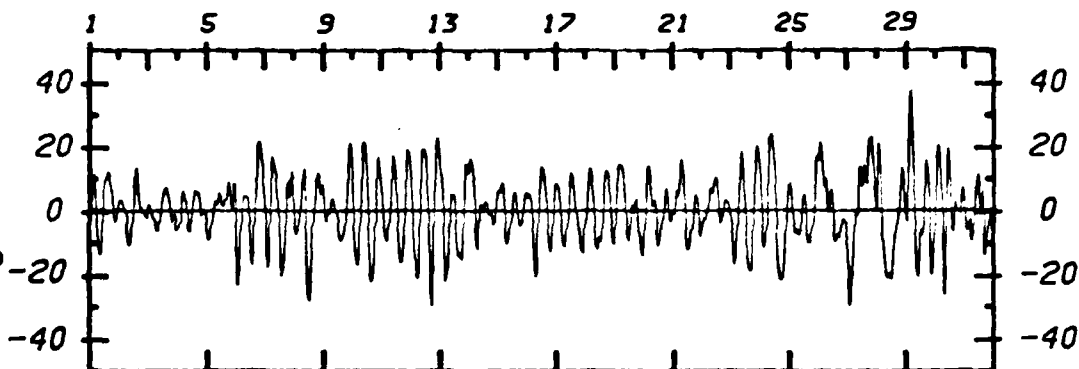
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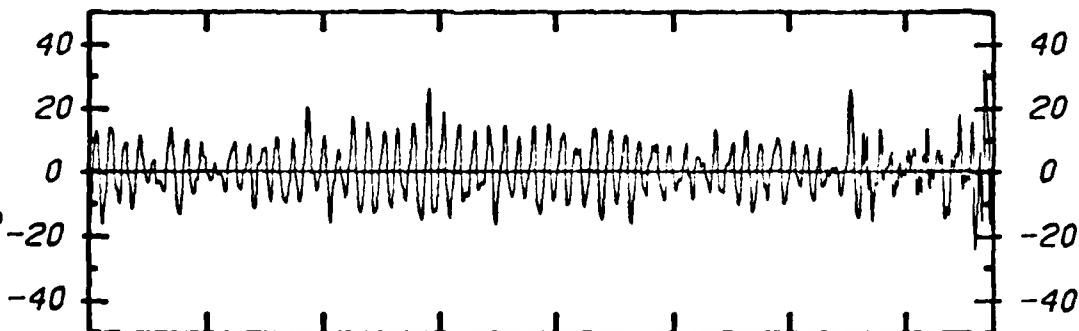
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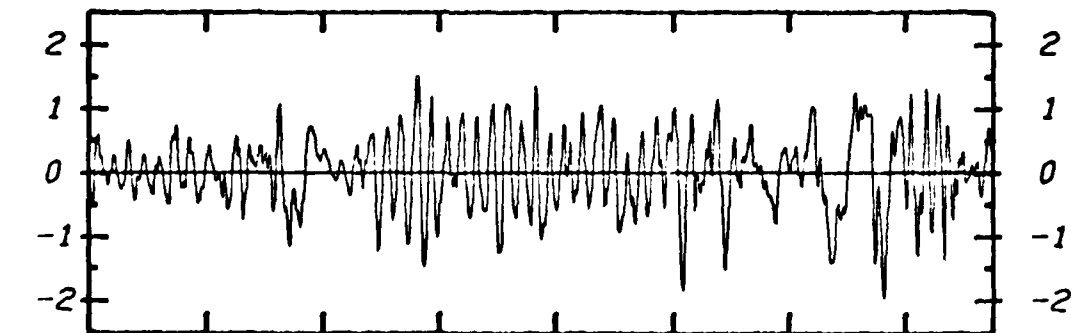
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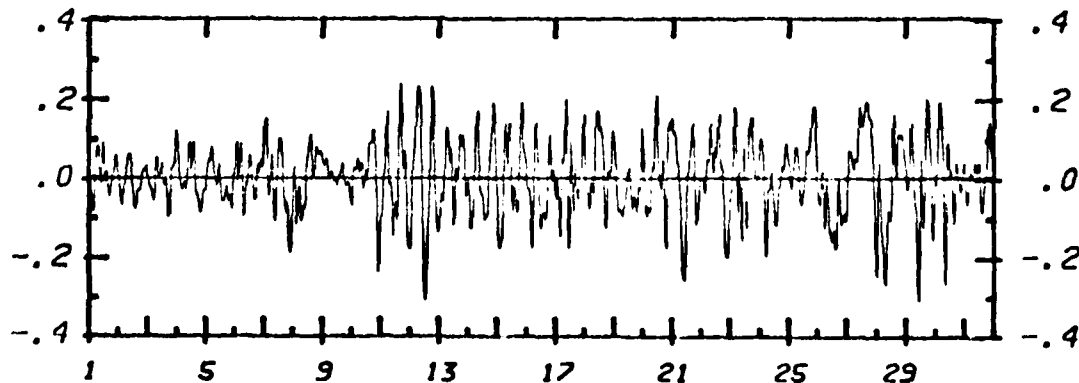
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NOVEMBER

DATE

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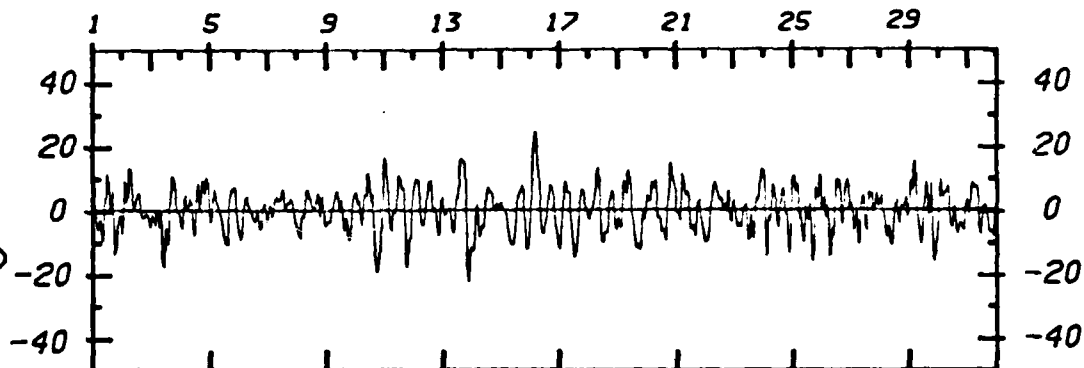
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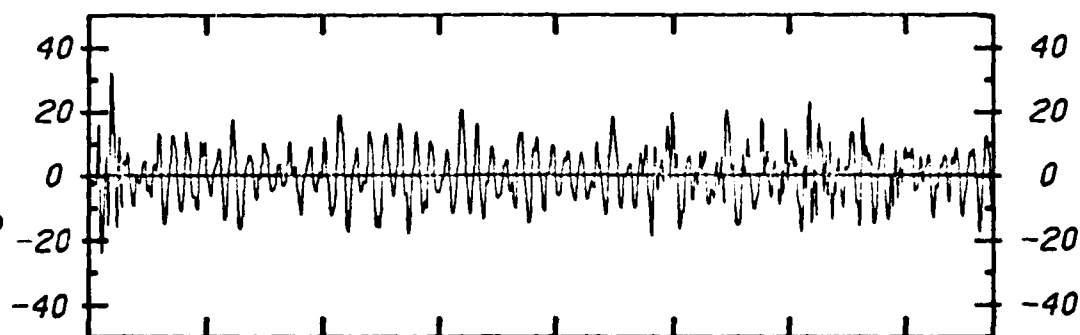
DECEMBER

JANUARY

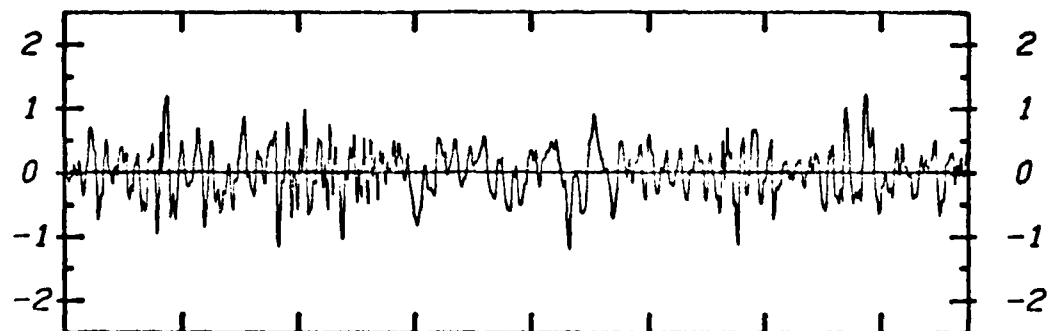
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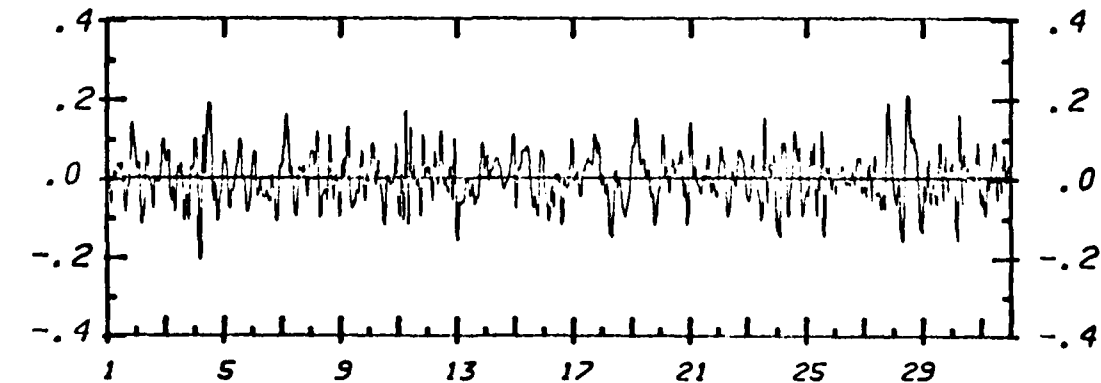
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DECEMBER

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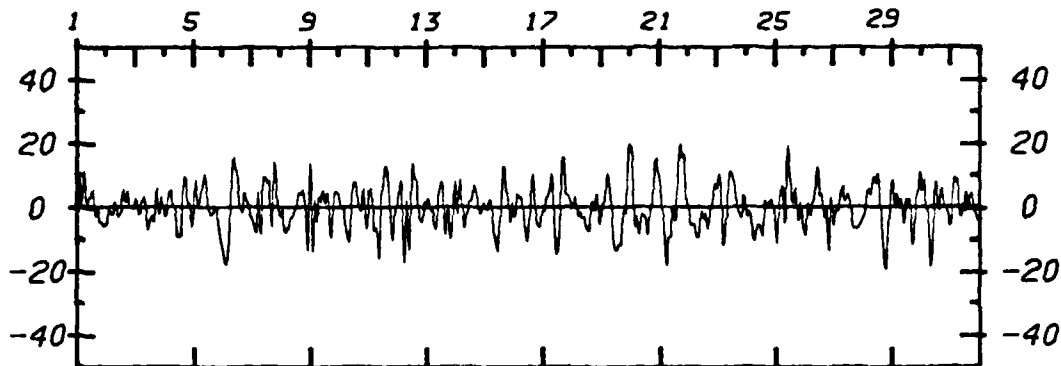
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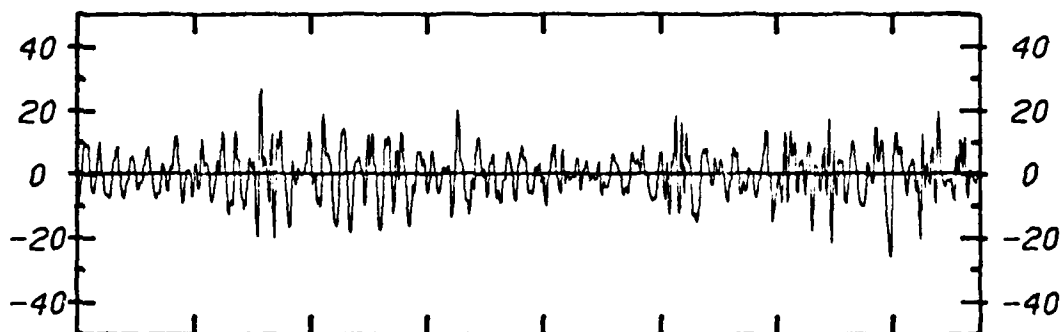
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FEBRUARY

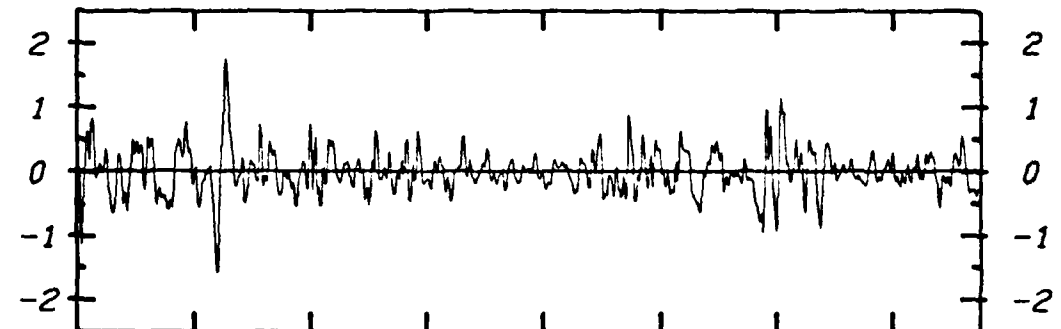
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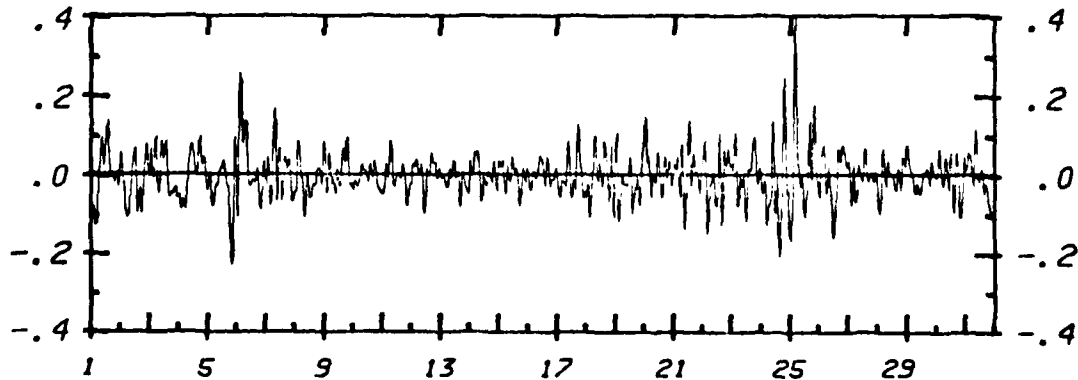
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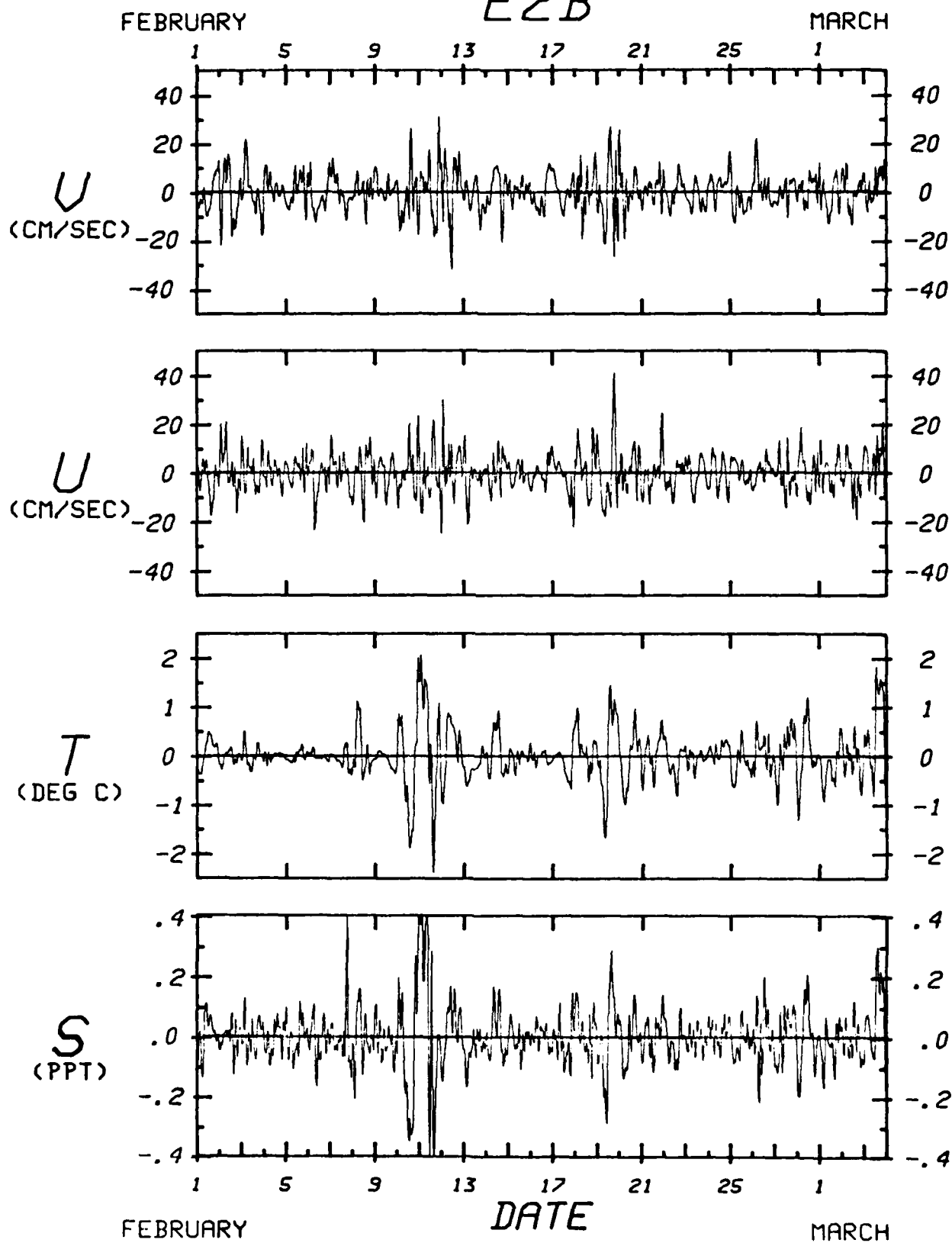


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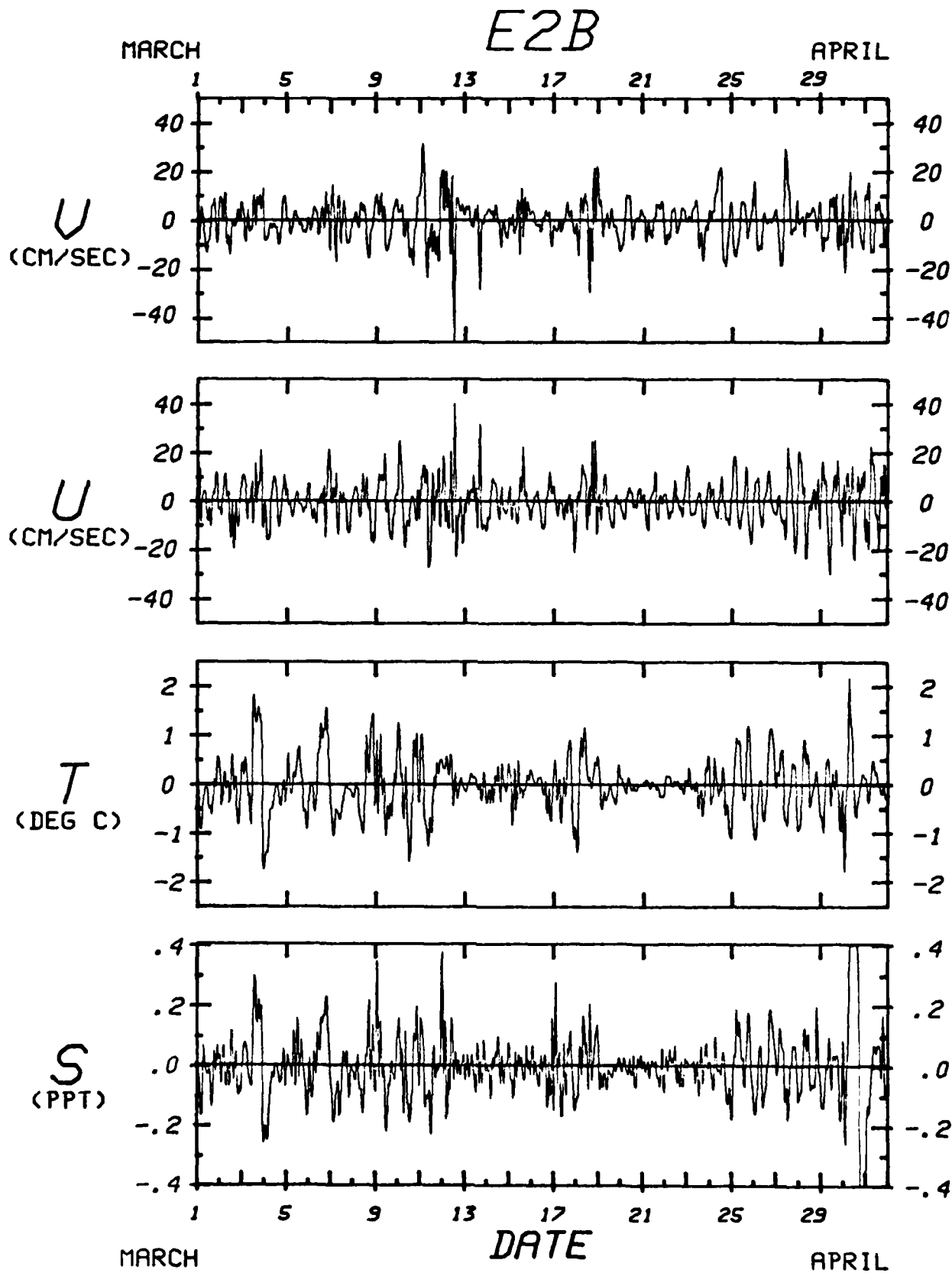
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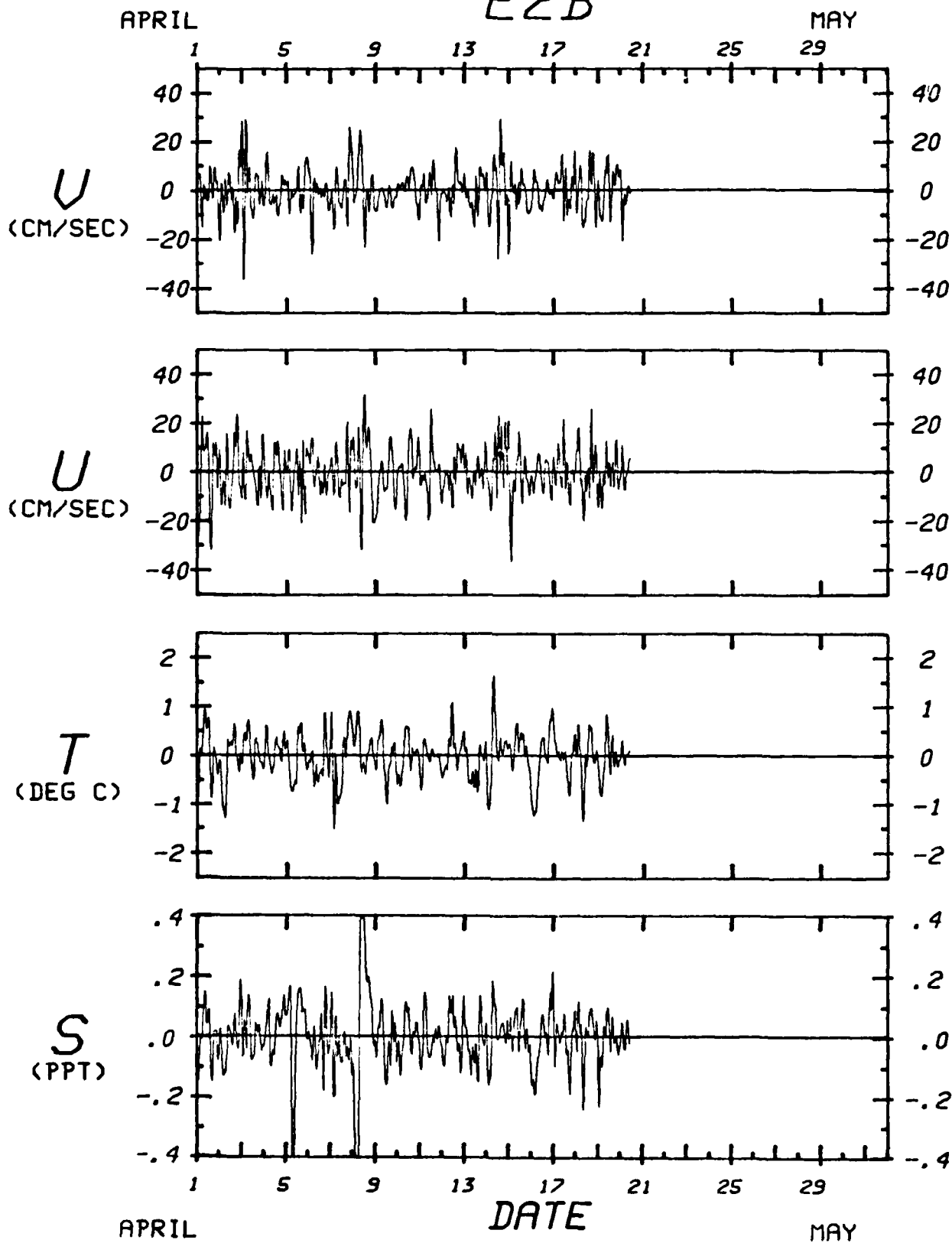


3-40 BP



3-40 BP

E2B



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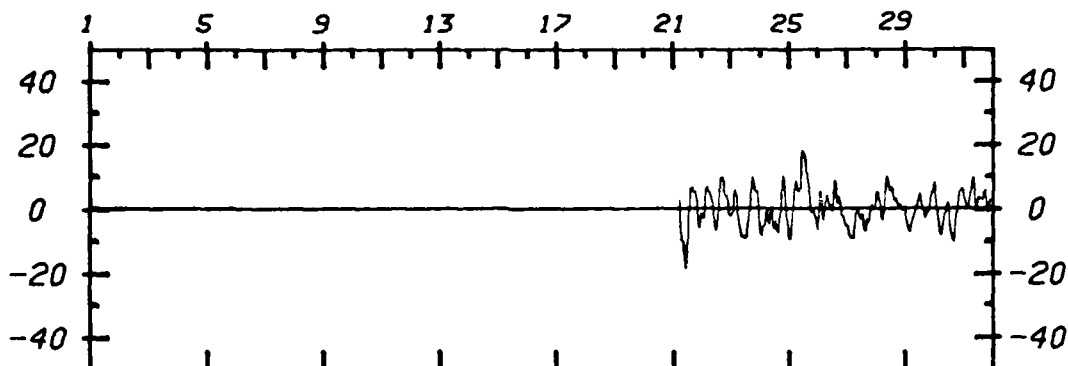
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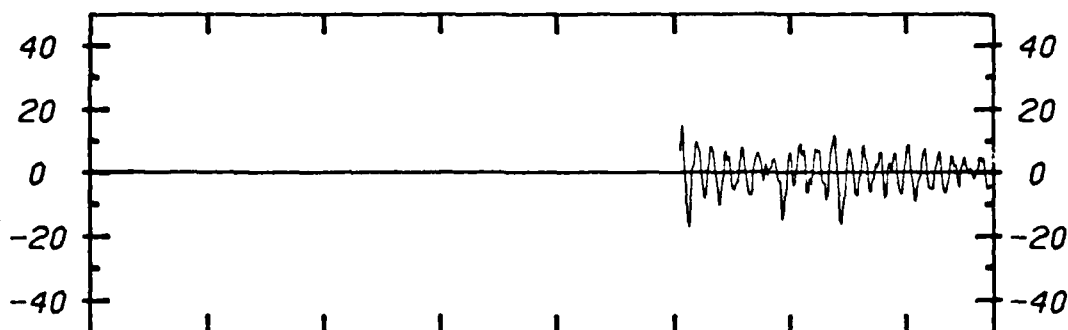
SEPTEMBER

OCTOBER

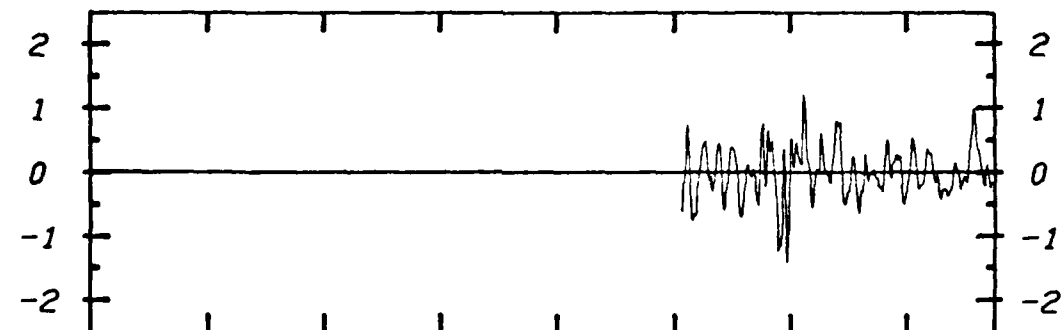
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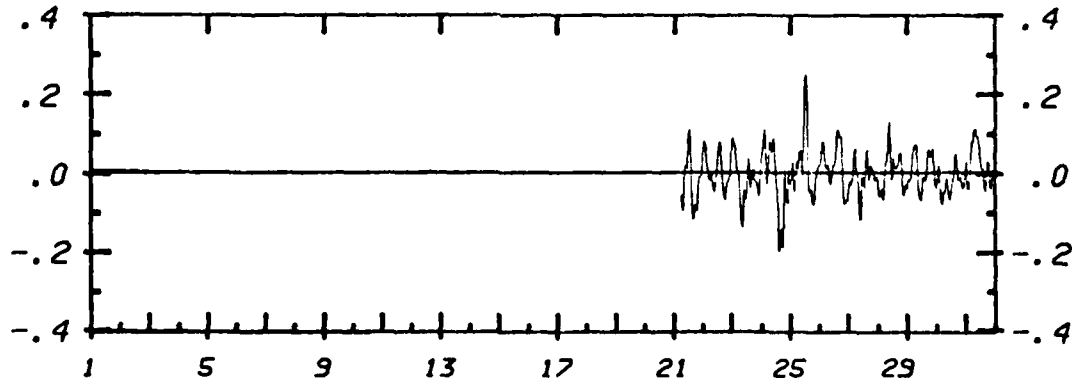
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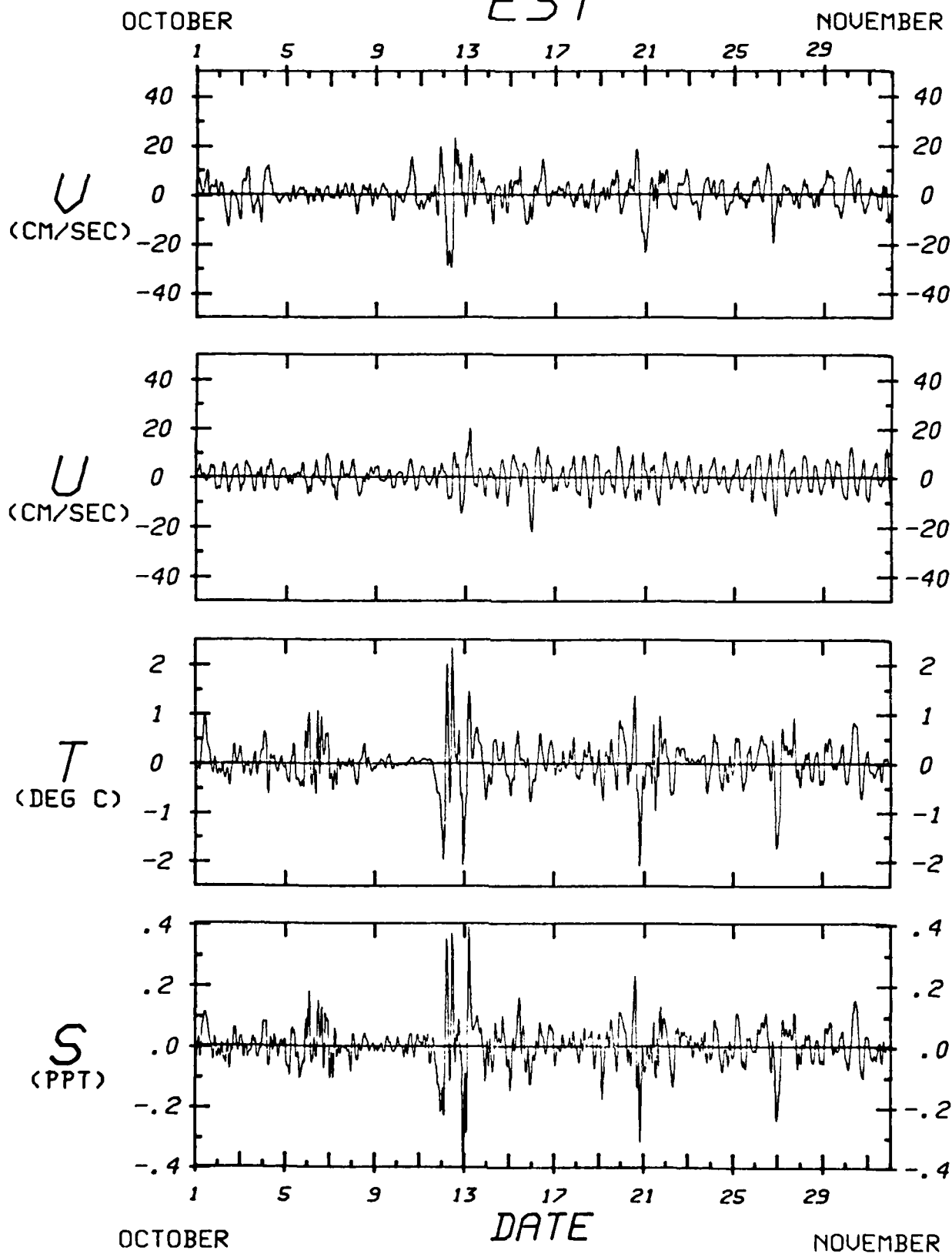
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DATE

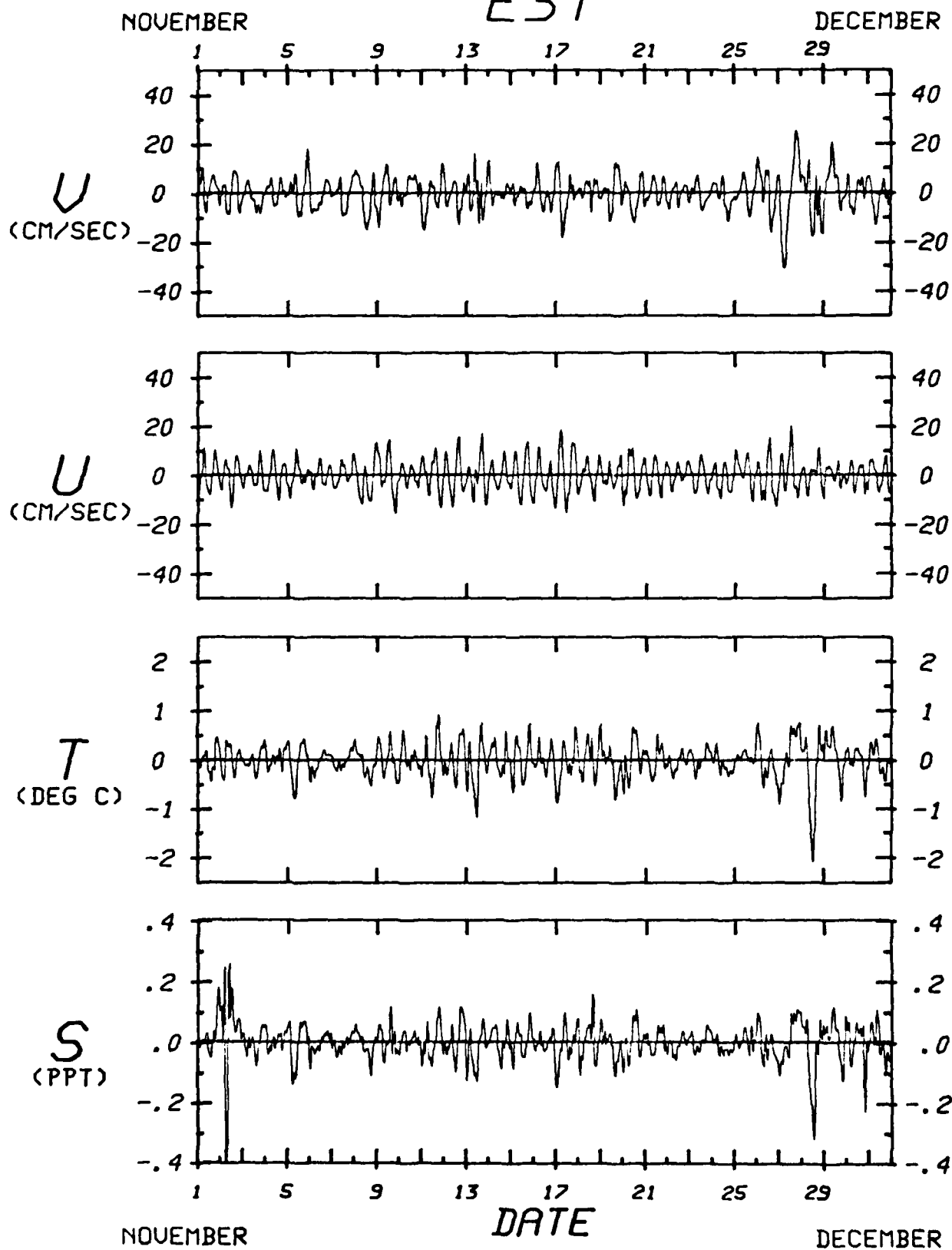
OCTOBER

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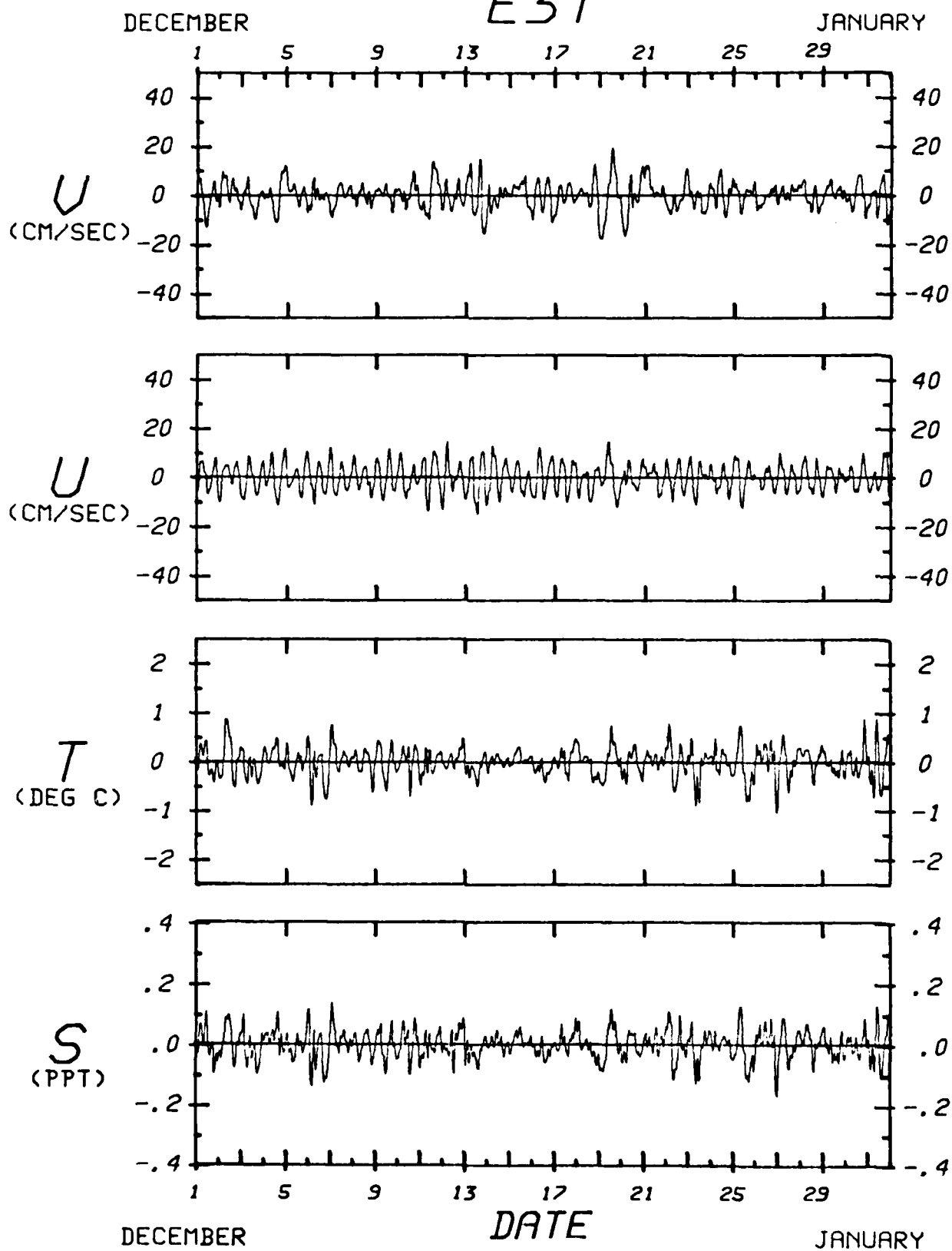


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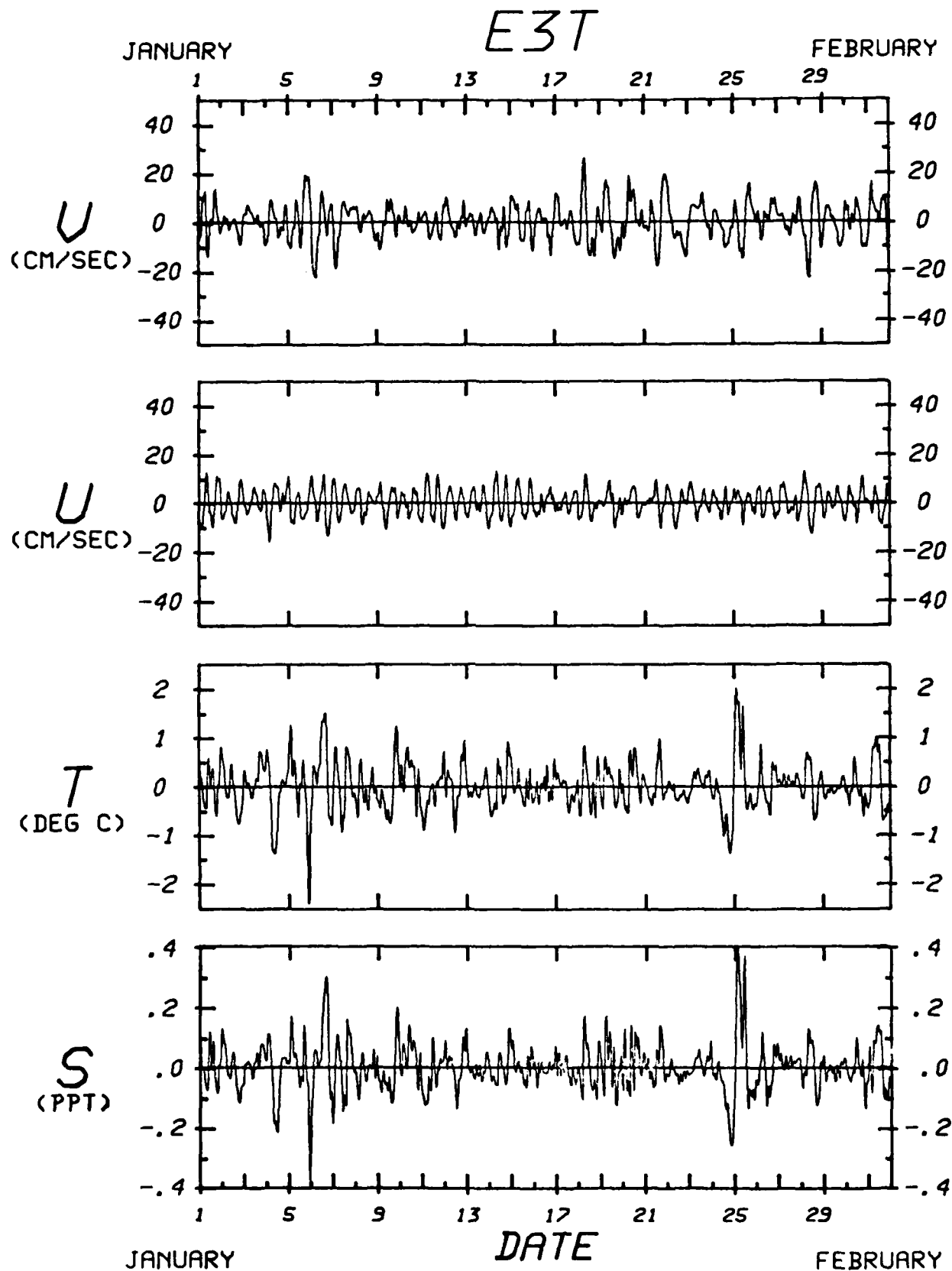


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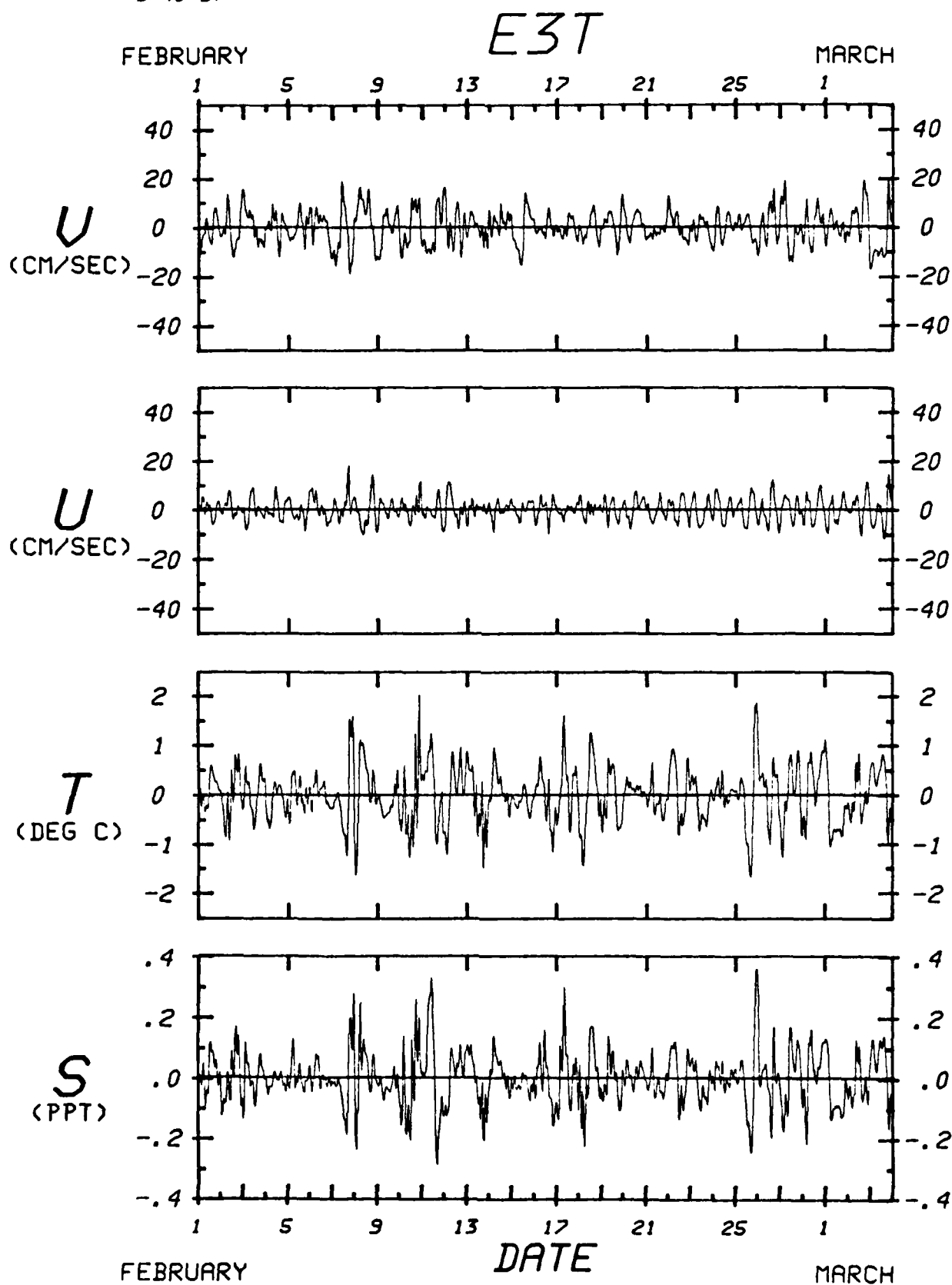
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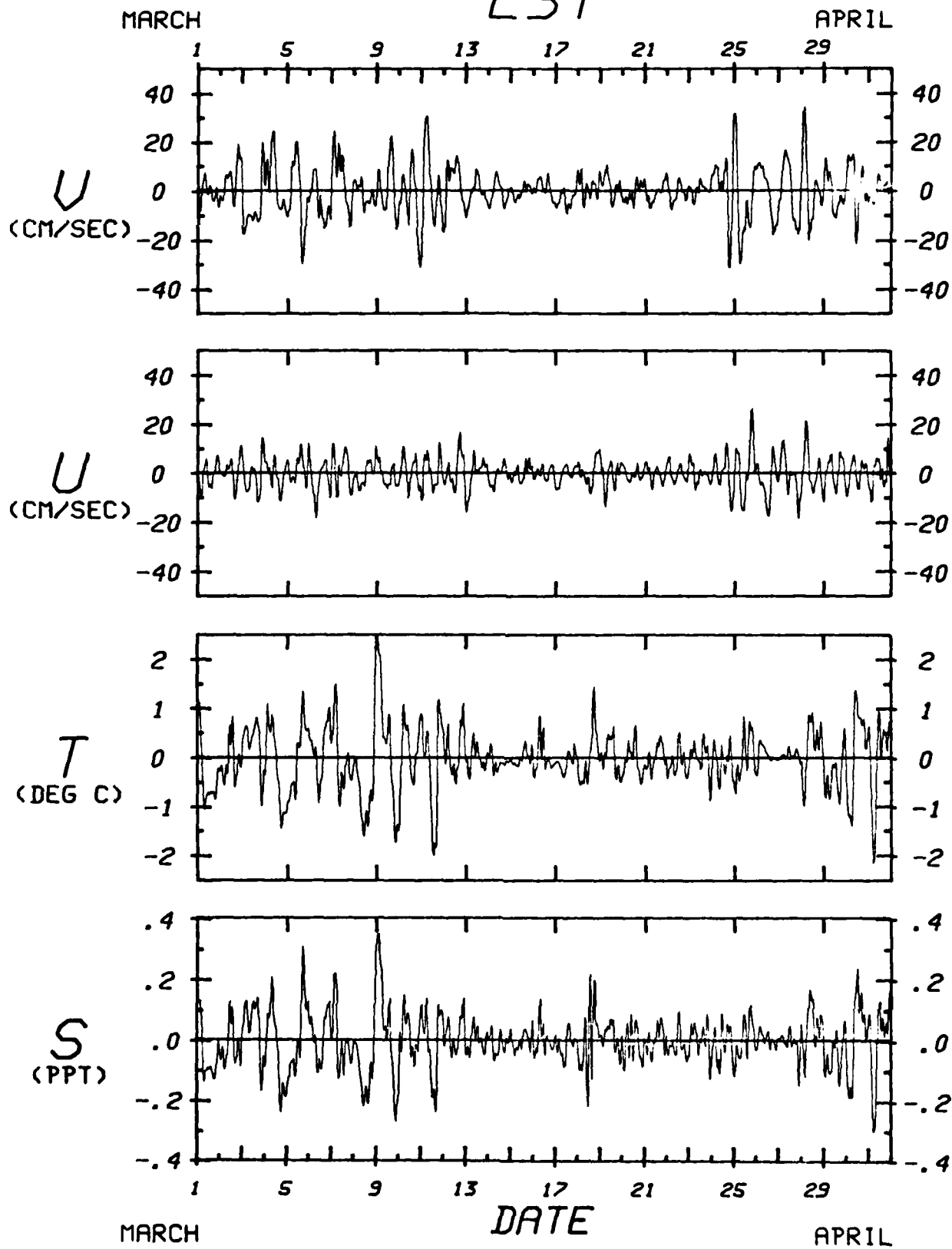


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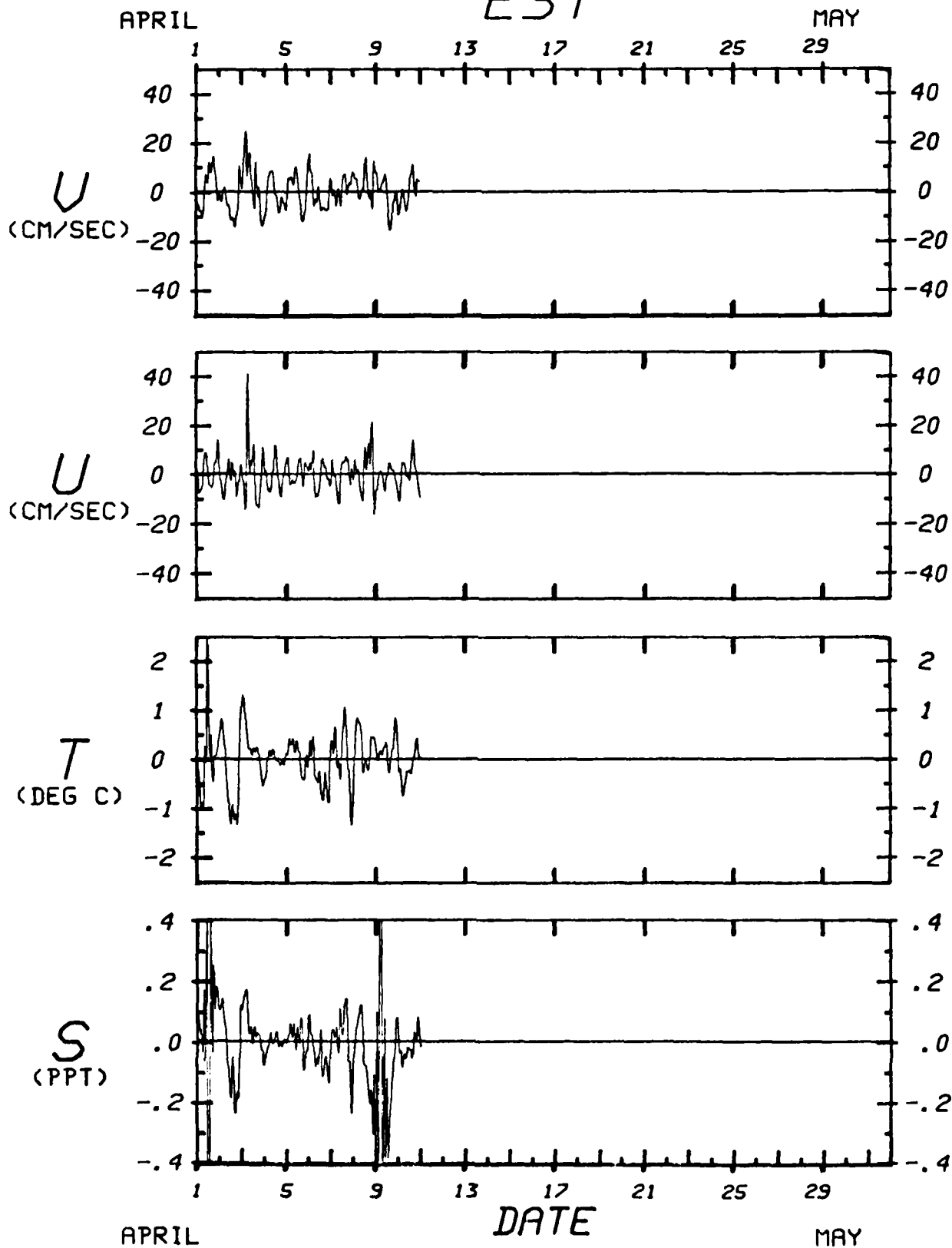
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E3T



3-40 BP

E3T



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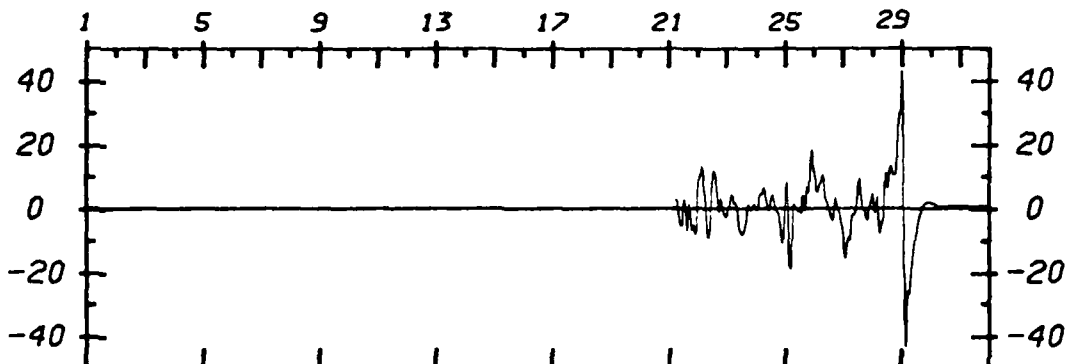
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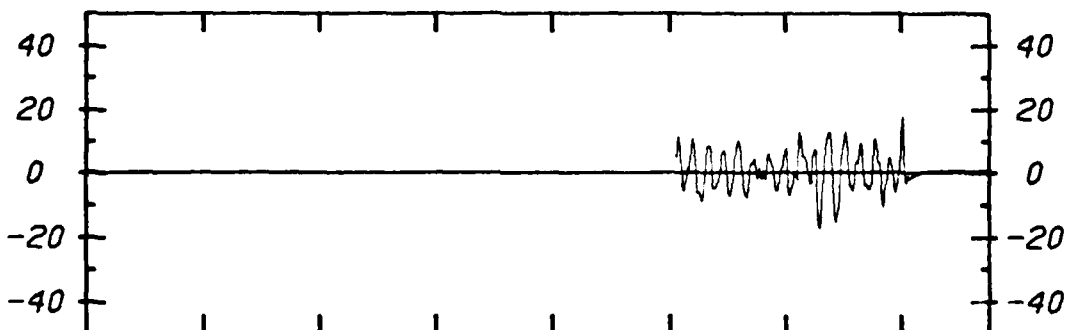
SEPTEMBER

OCTOBER

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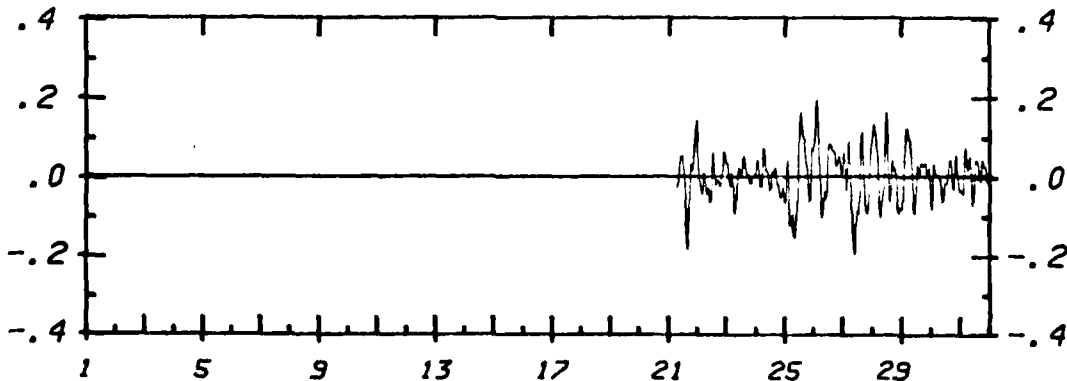
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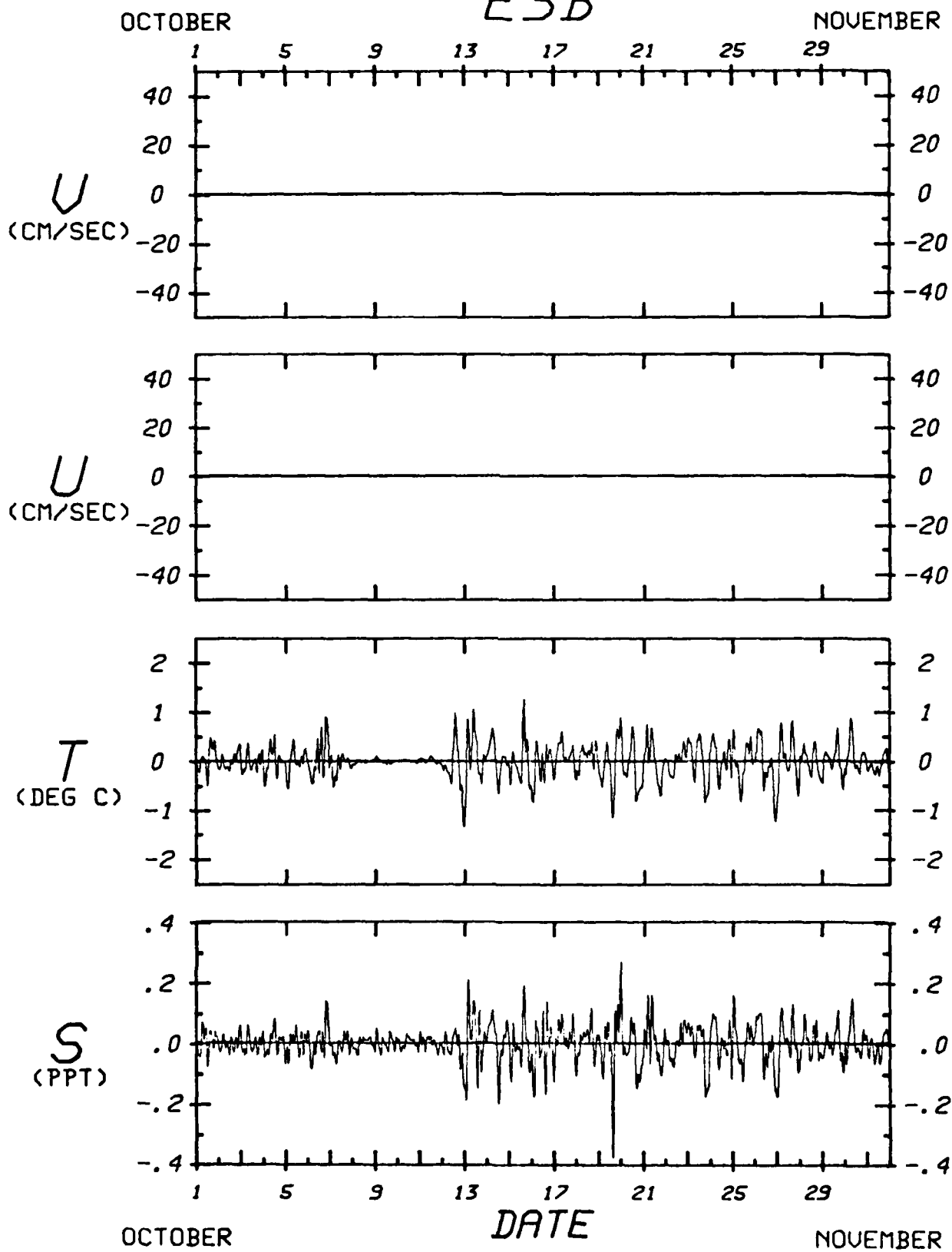
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DATE

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3-40 BP

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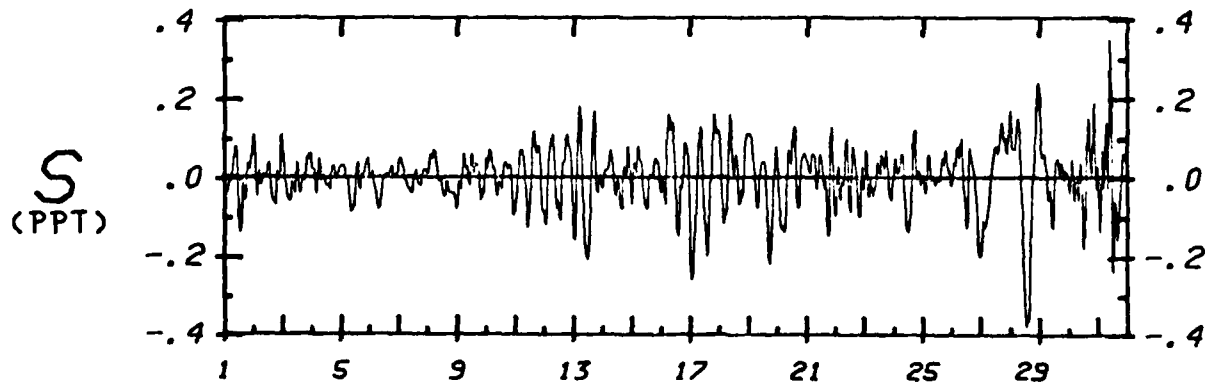
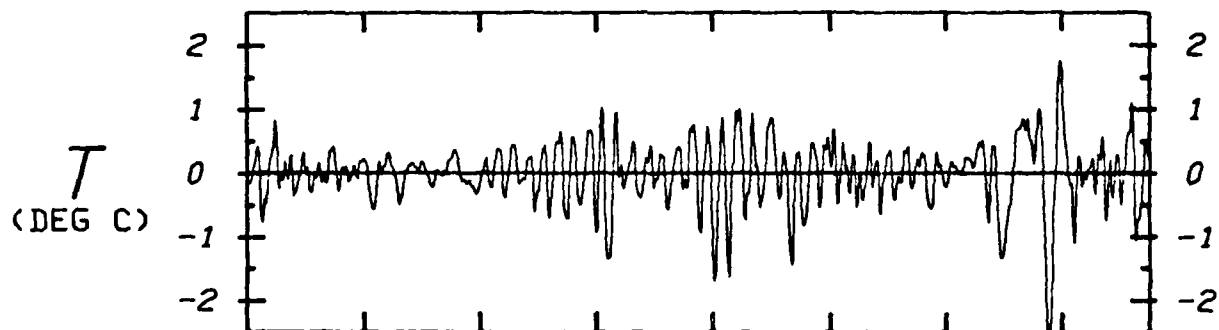
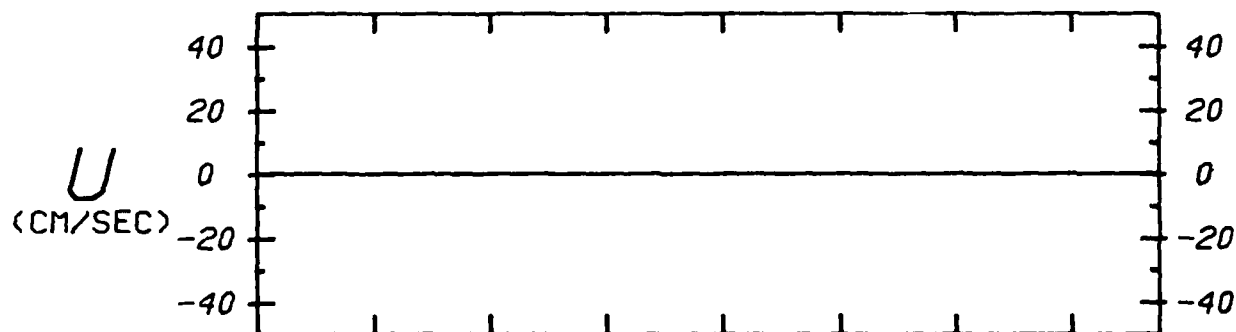
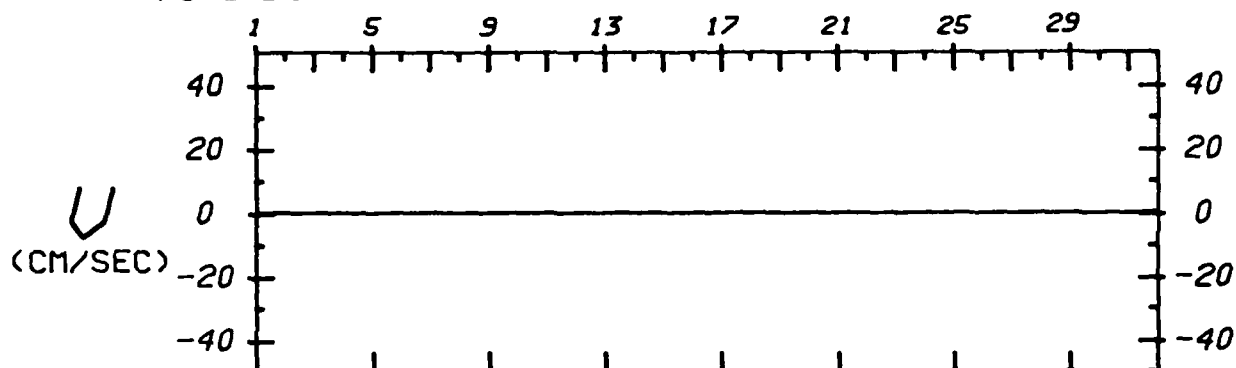


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E3B

NOVEMBER

DECEMBER



NOVEMBER

DATE

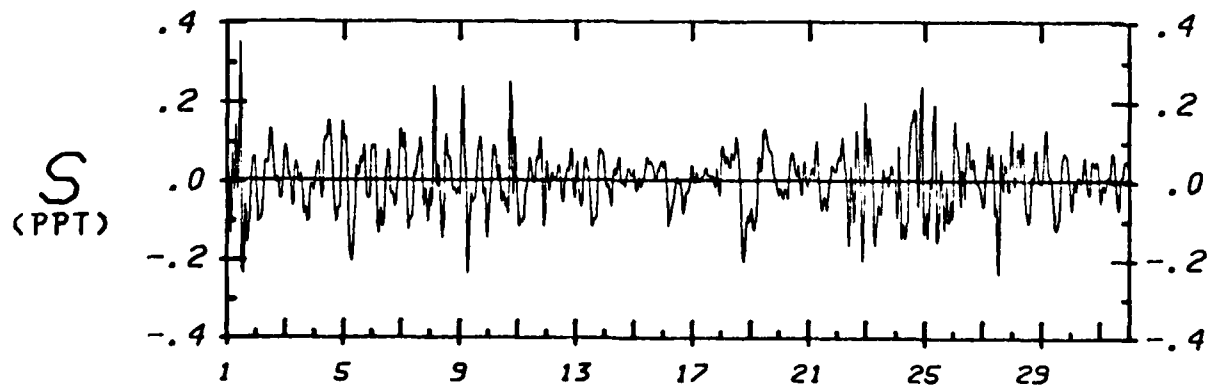
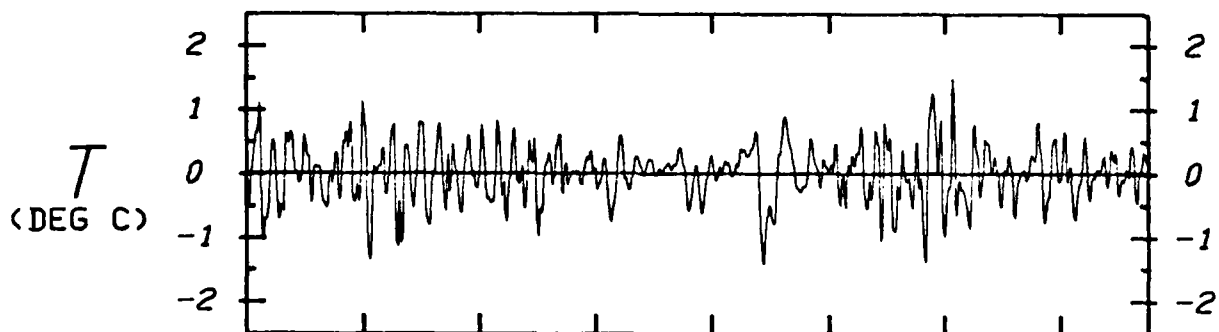
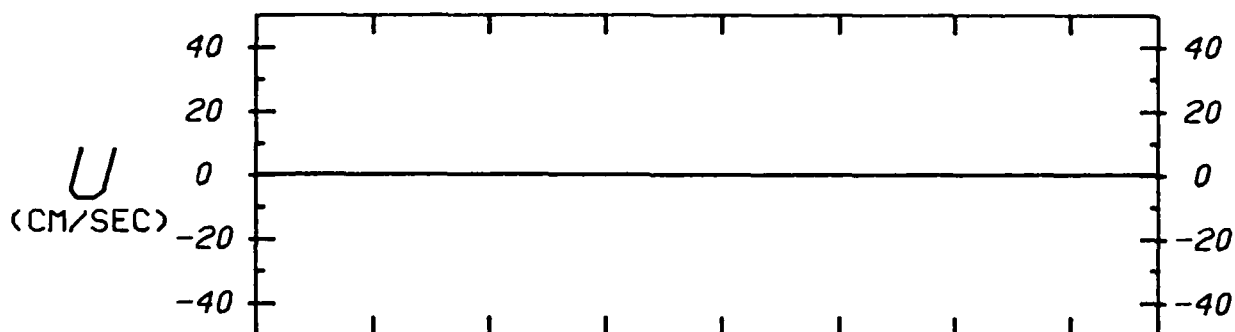
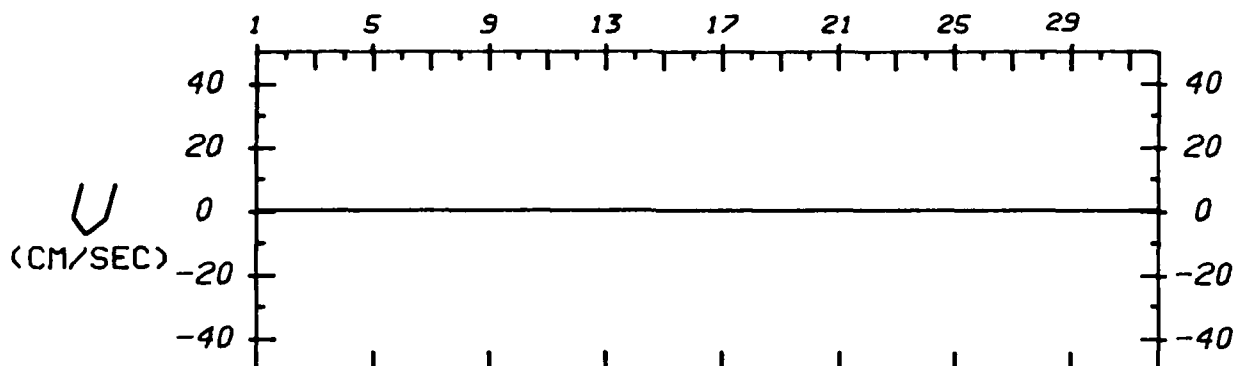
DECEMBER

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DECEMBER

JANUARY



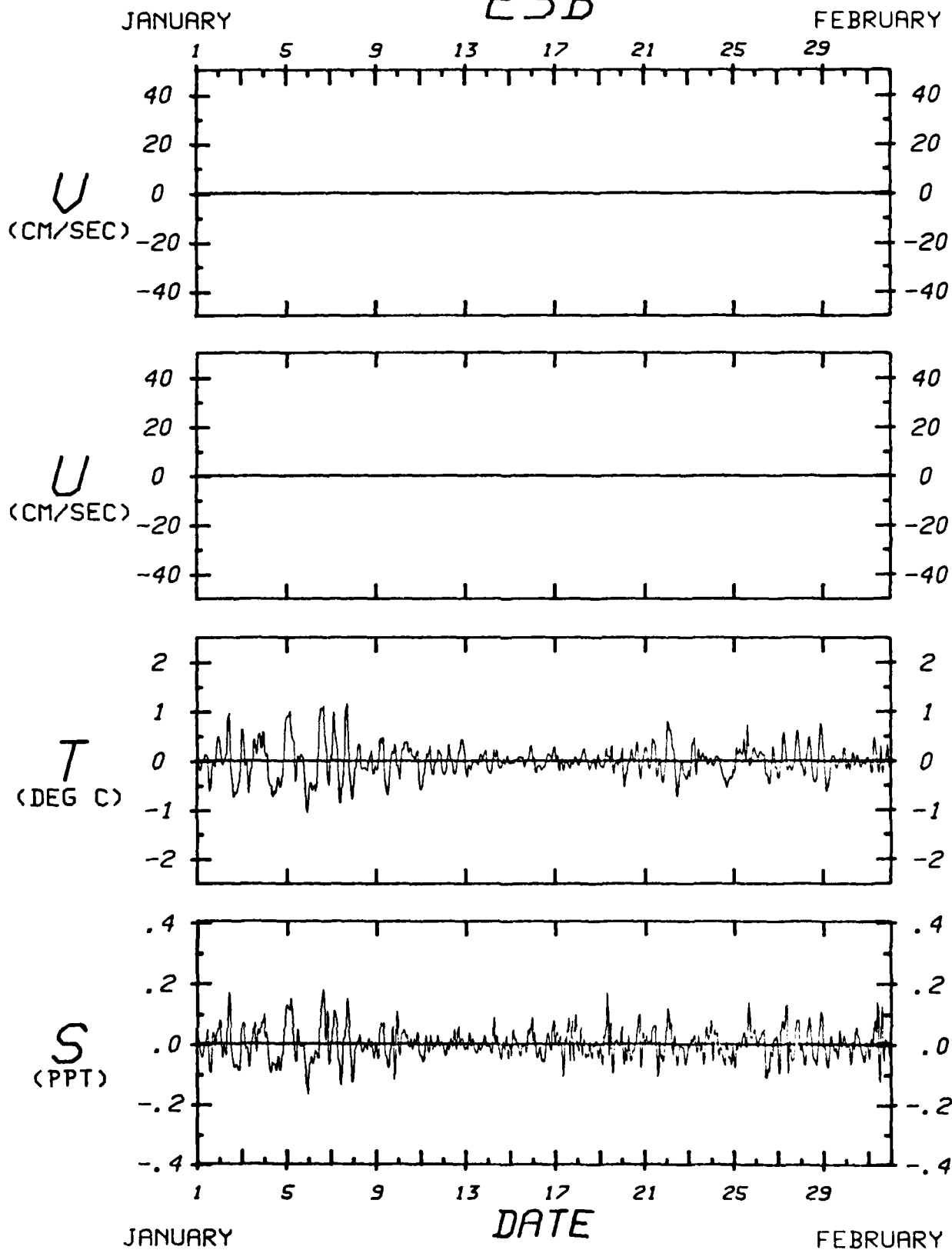
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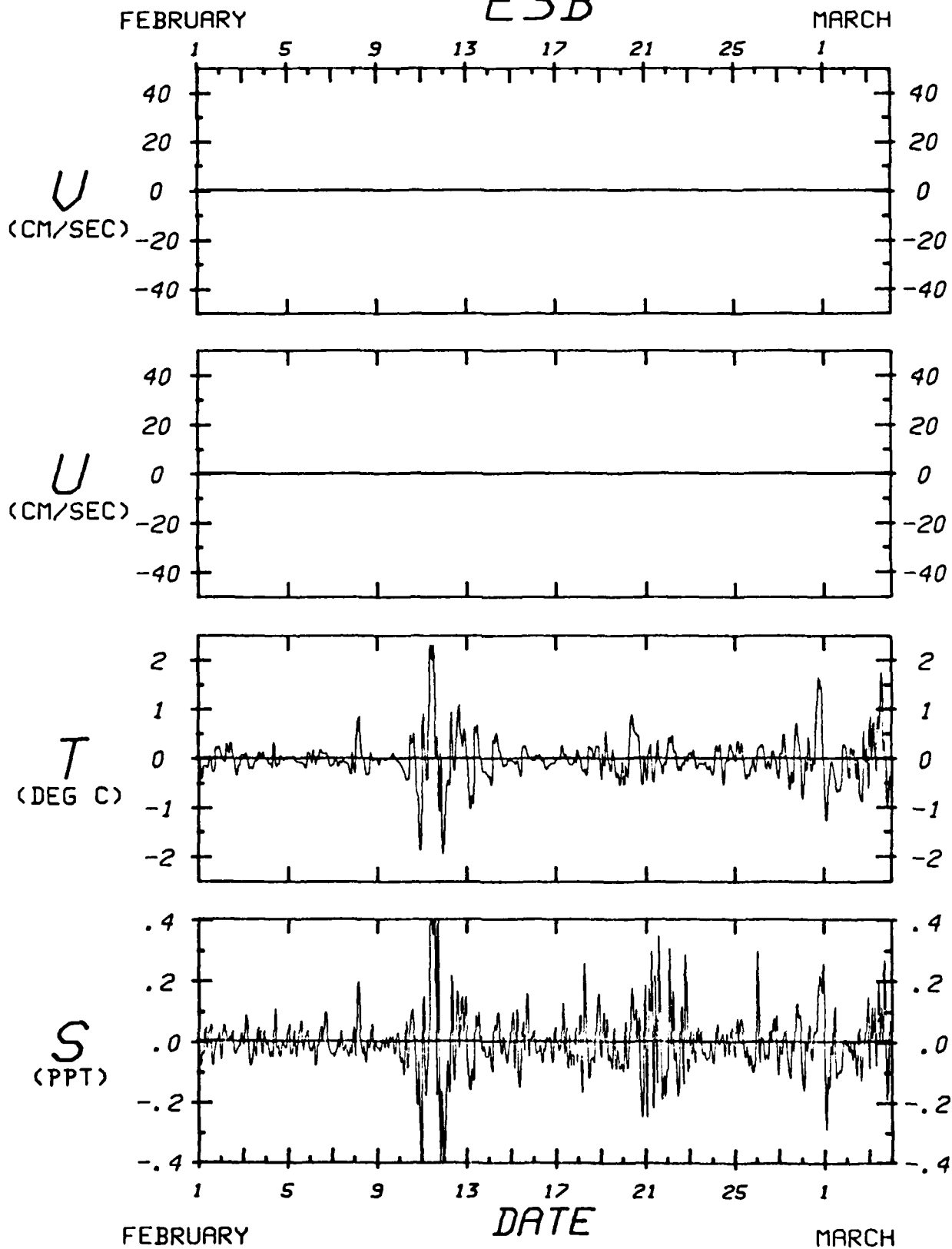
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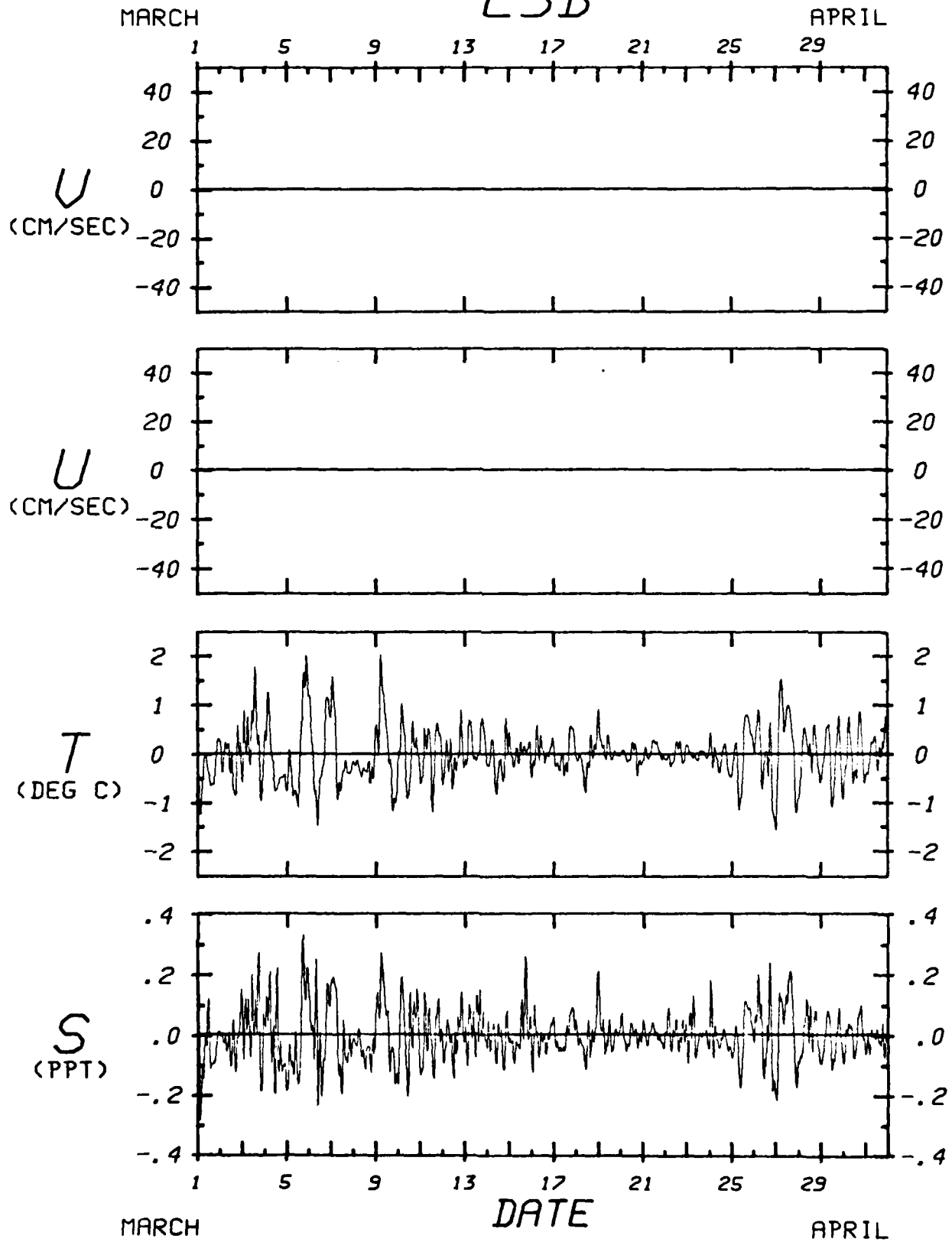
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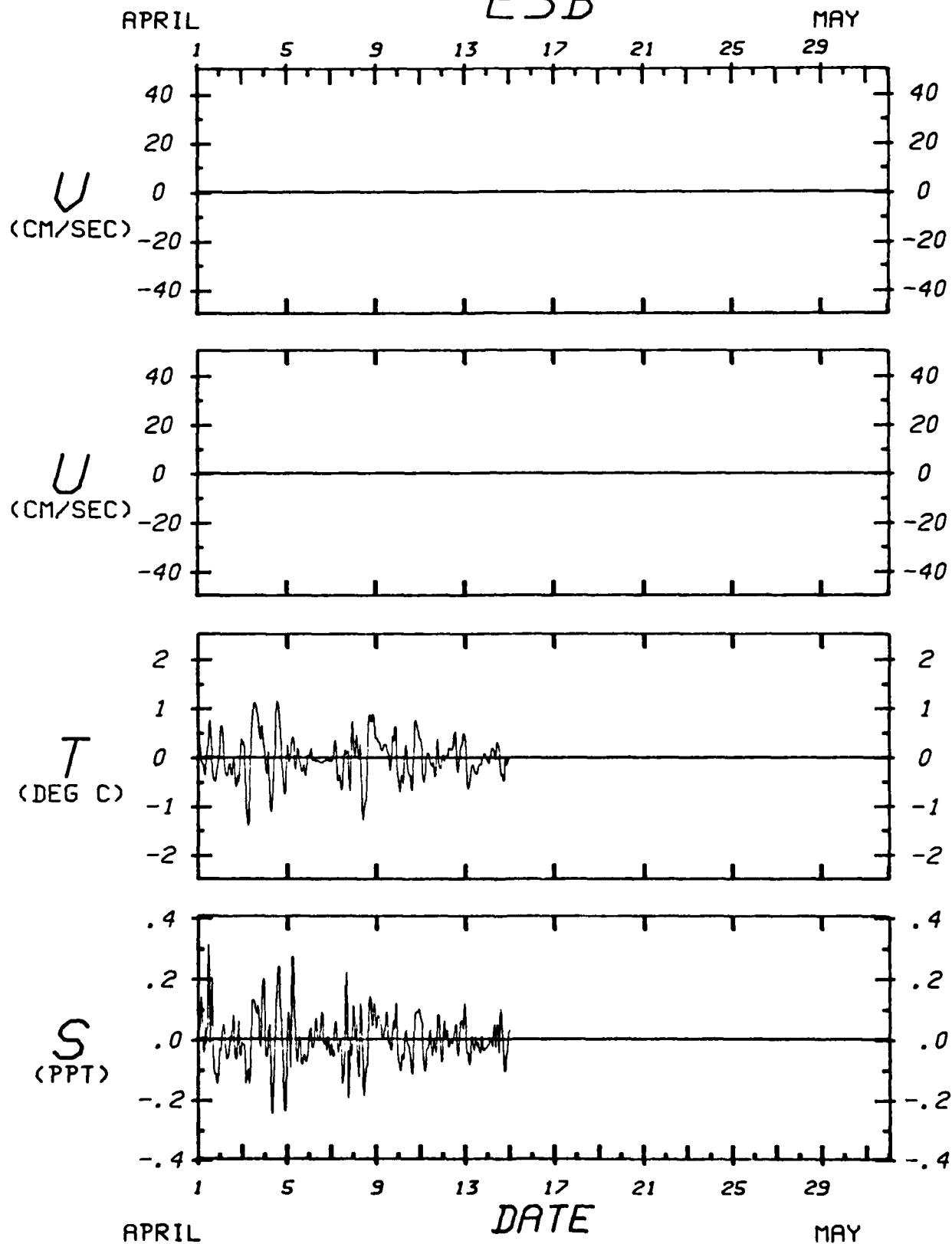
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3-40 BP

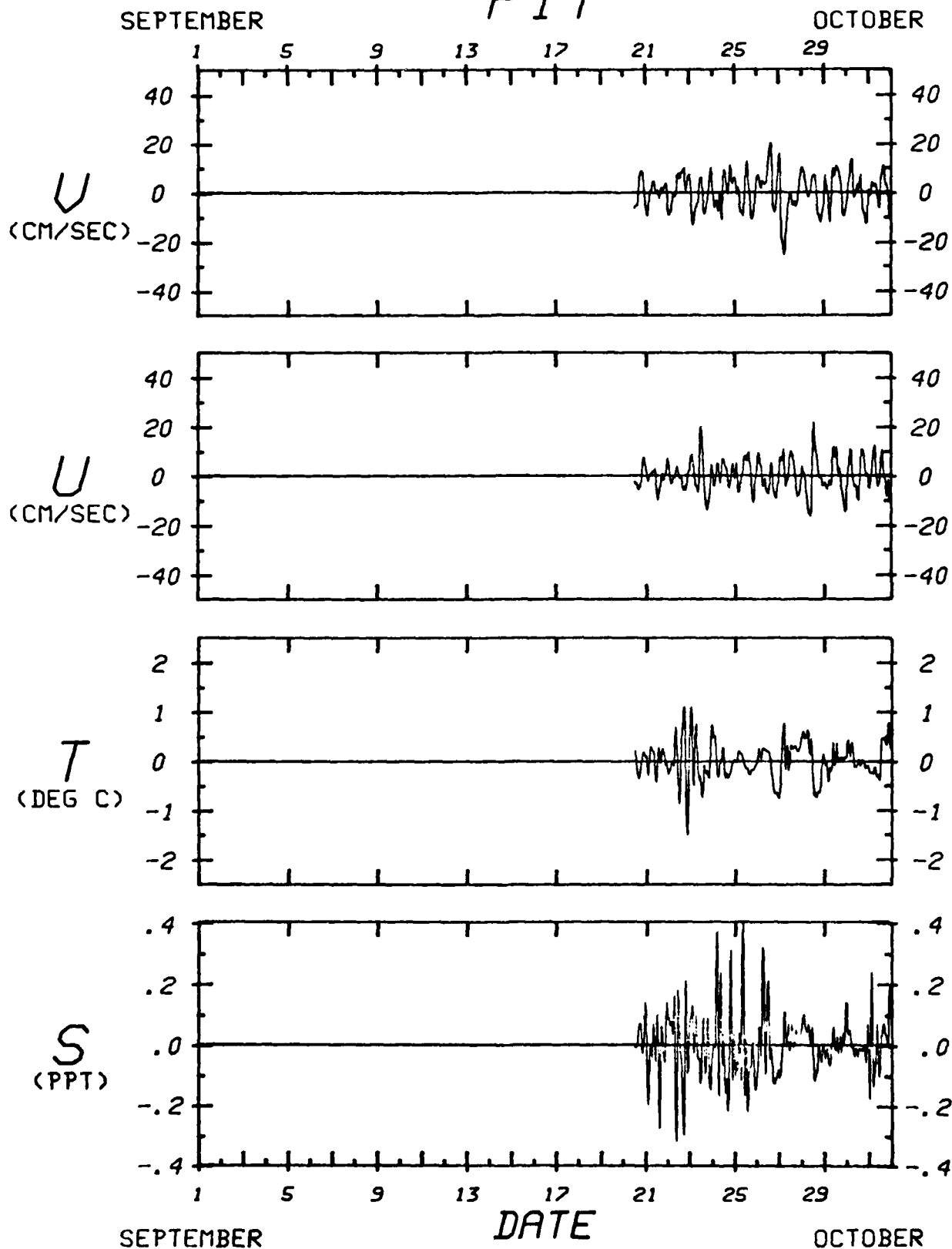
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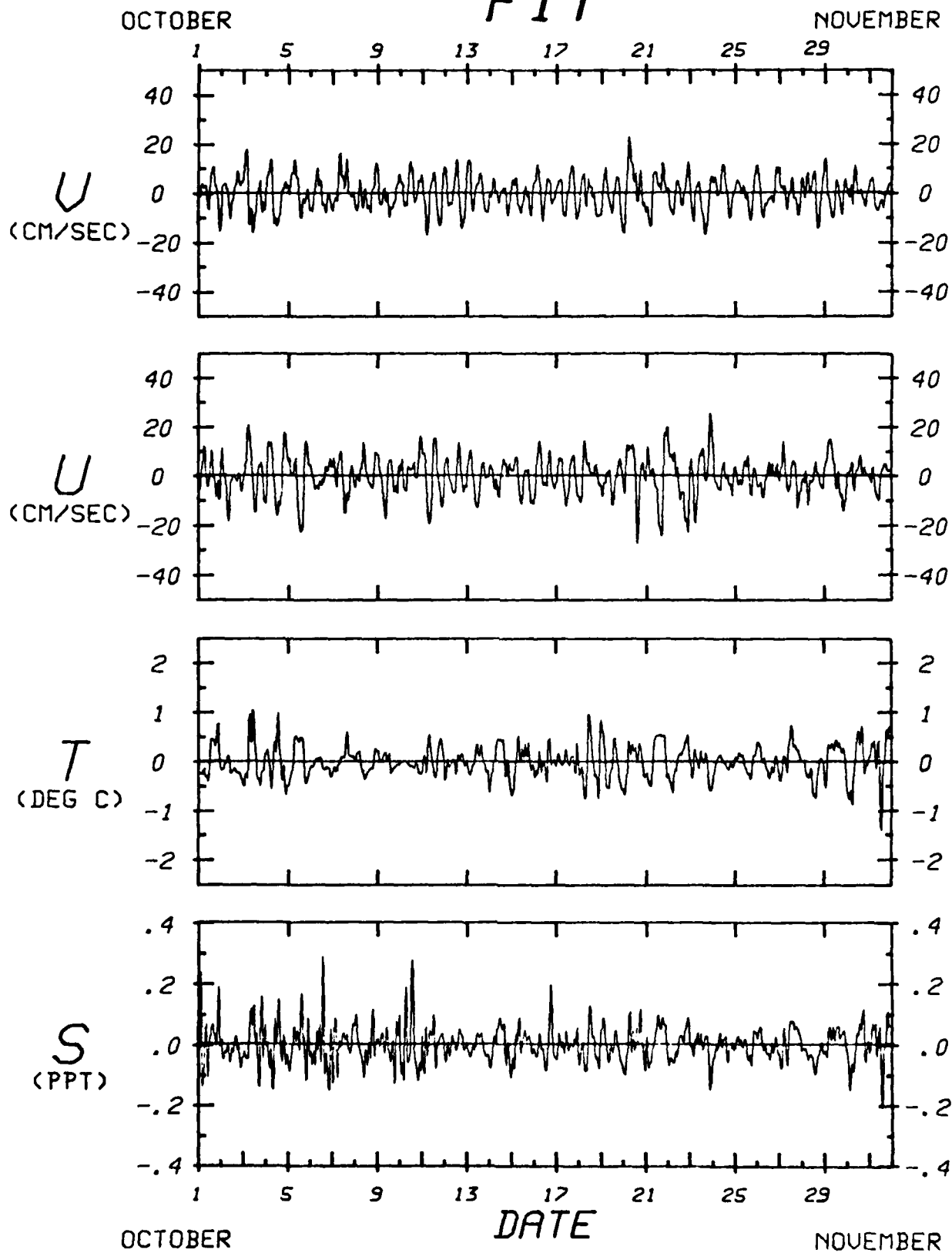
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F1T



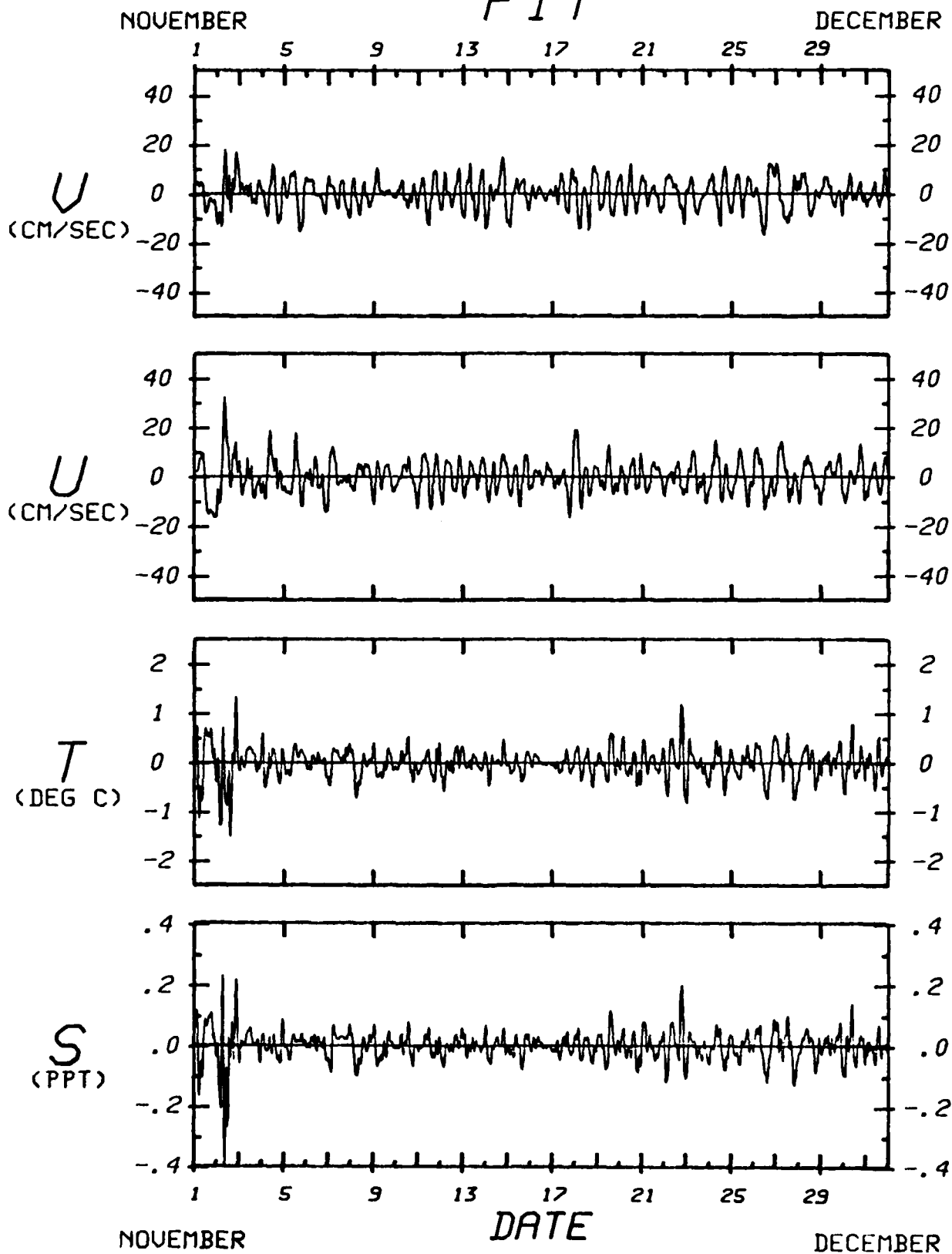
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F1T



3-40 BP

F1T

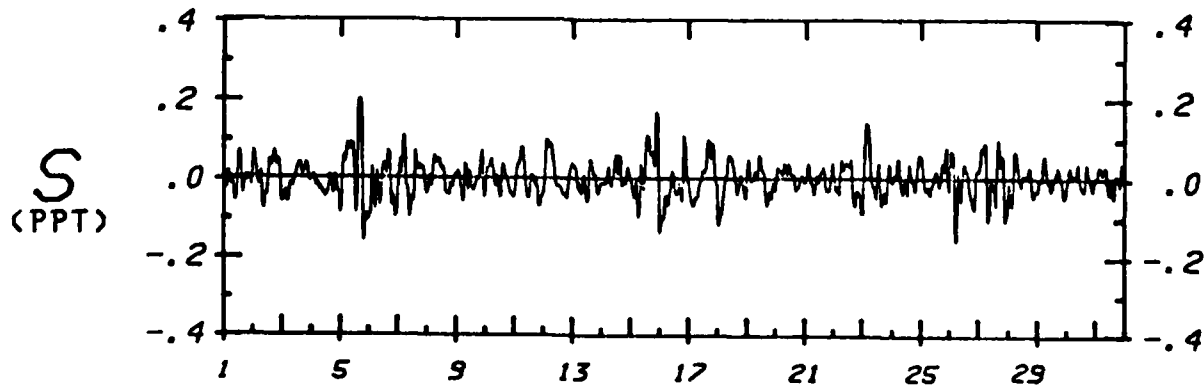
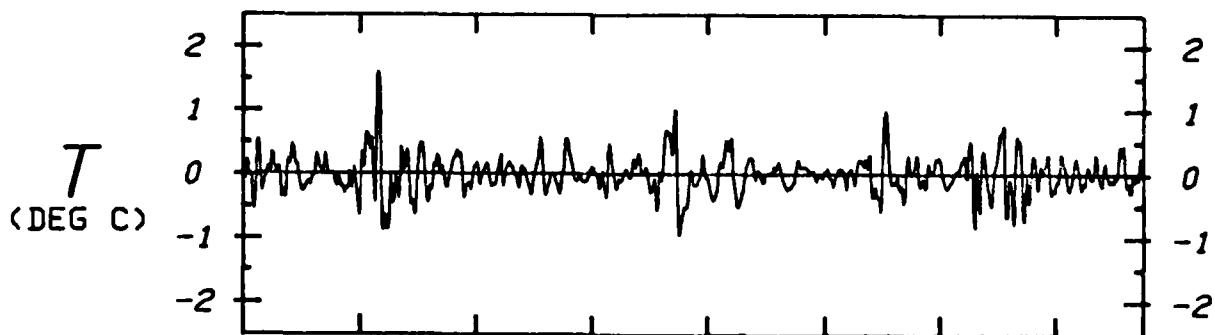
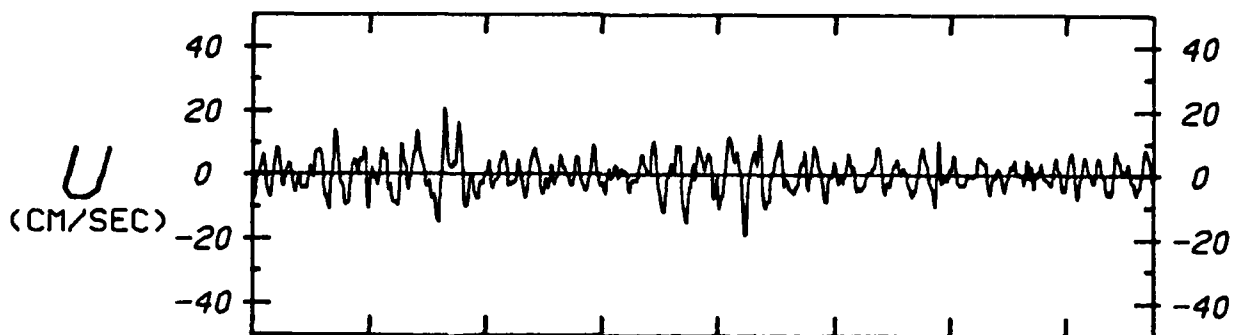
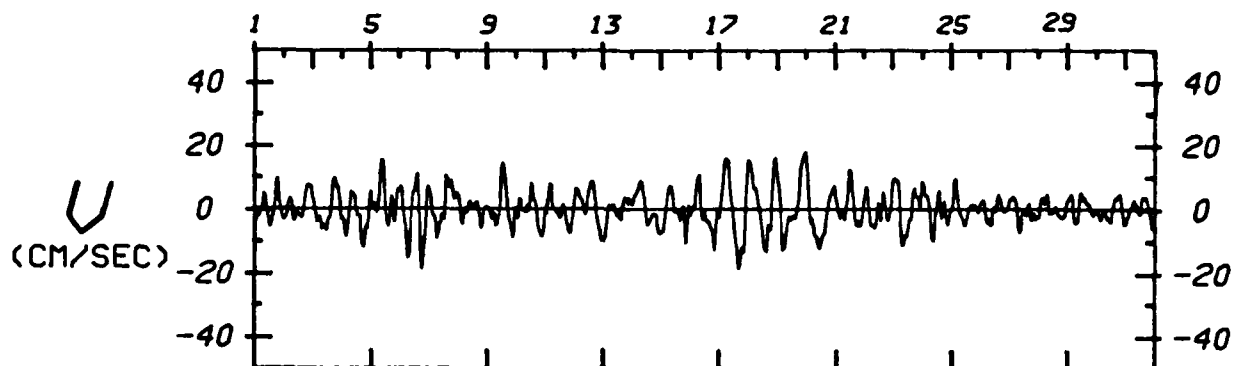


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F1T

DECEMBER

JANUARY



DECEMBER

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JANUARY

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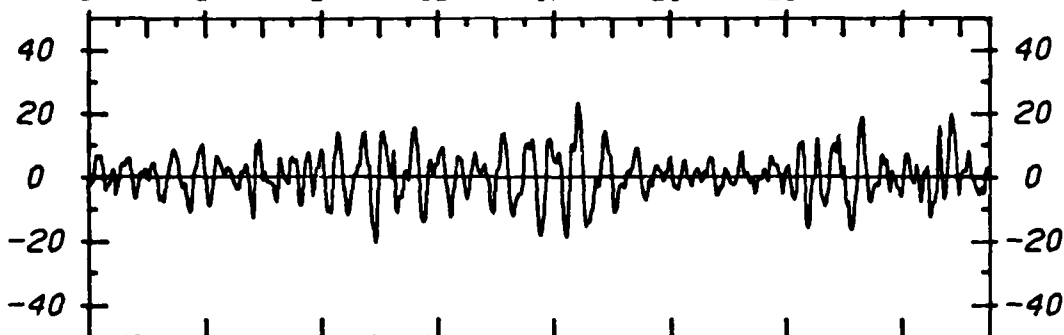
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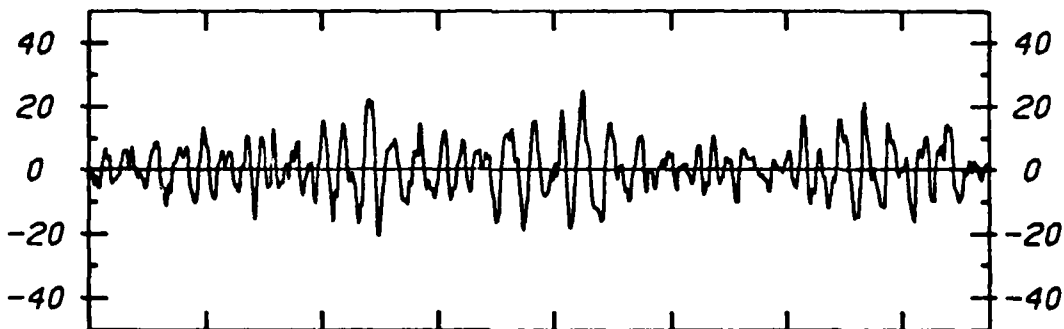
FEBRUARY

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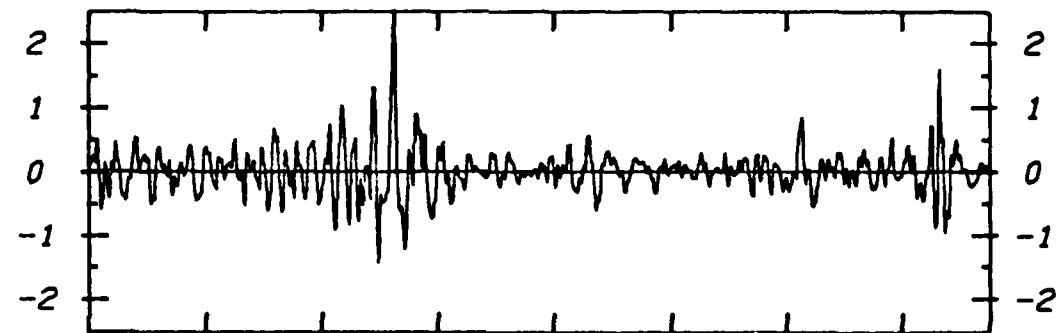
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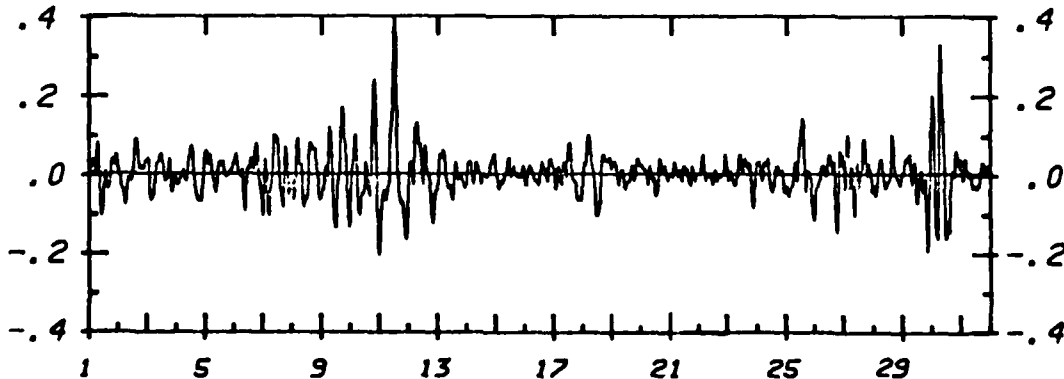
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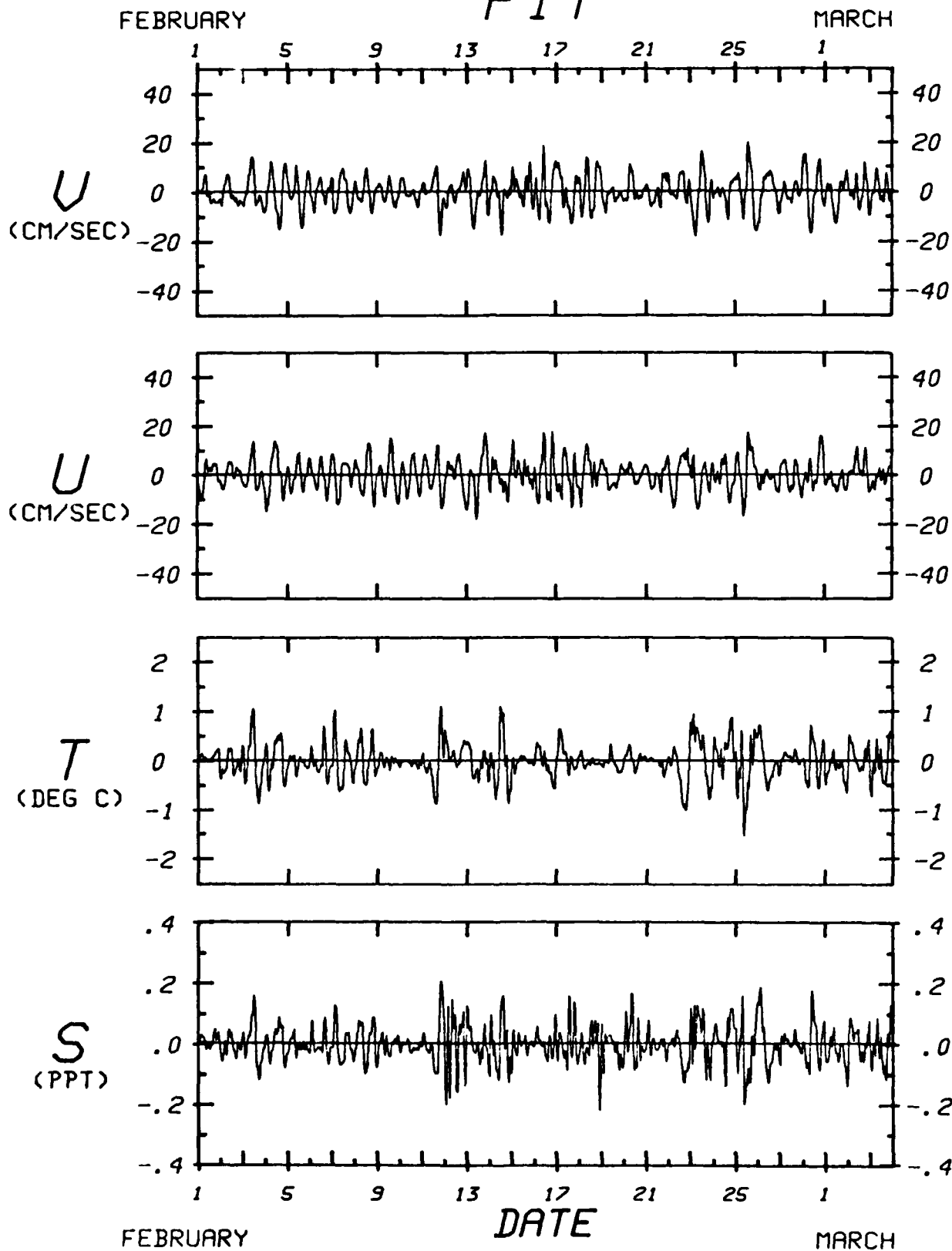
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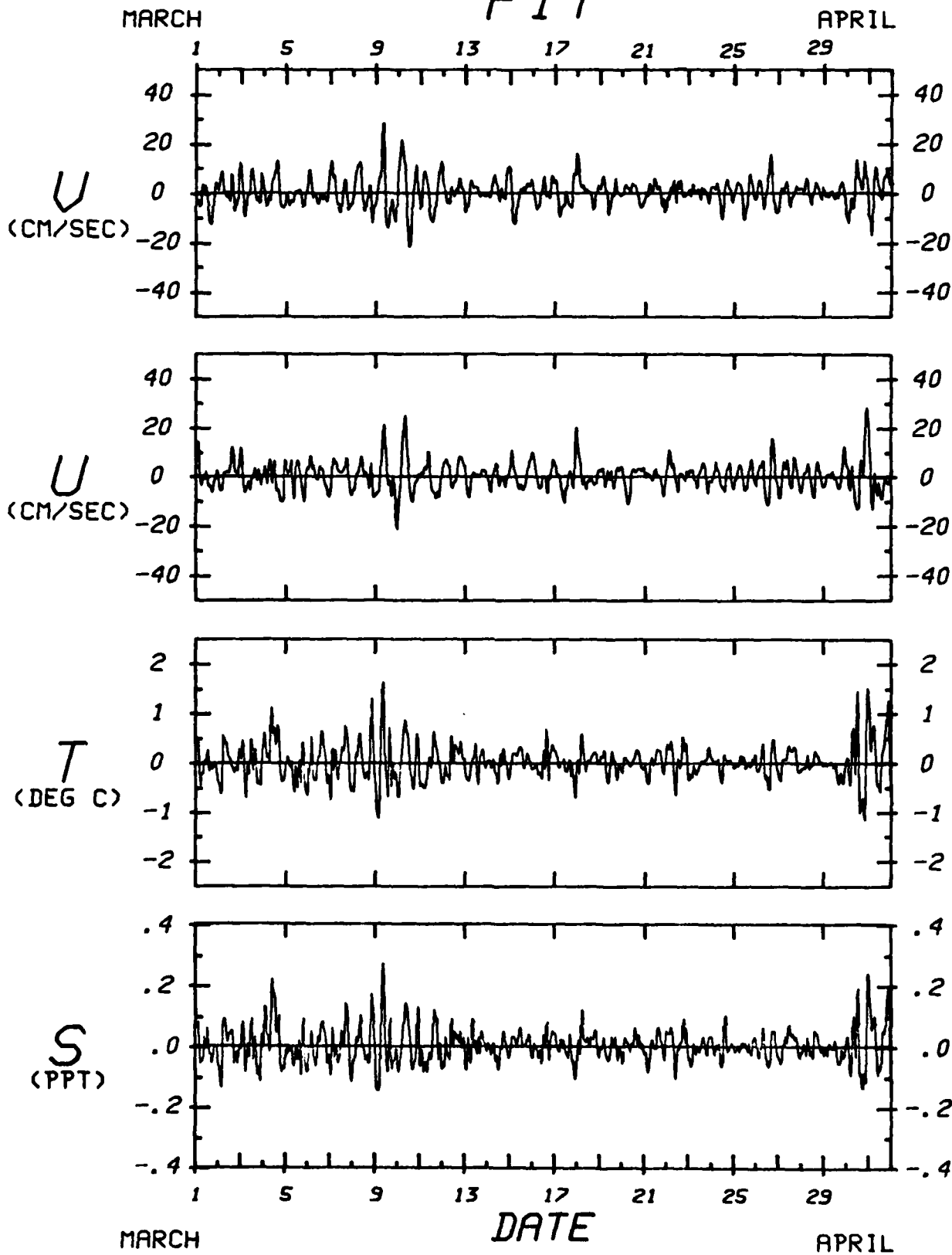
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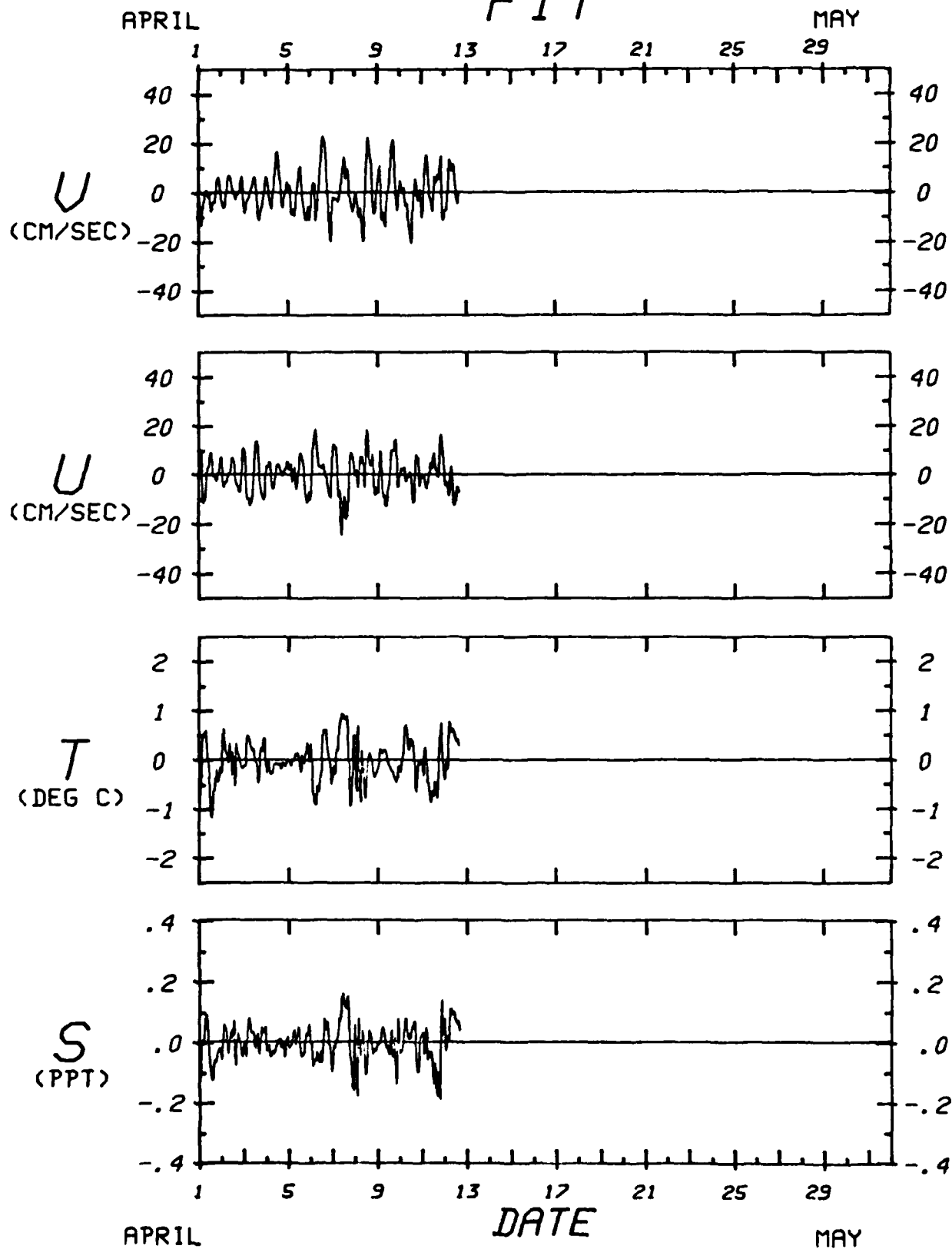
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3-40 BP

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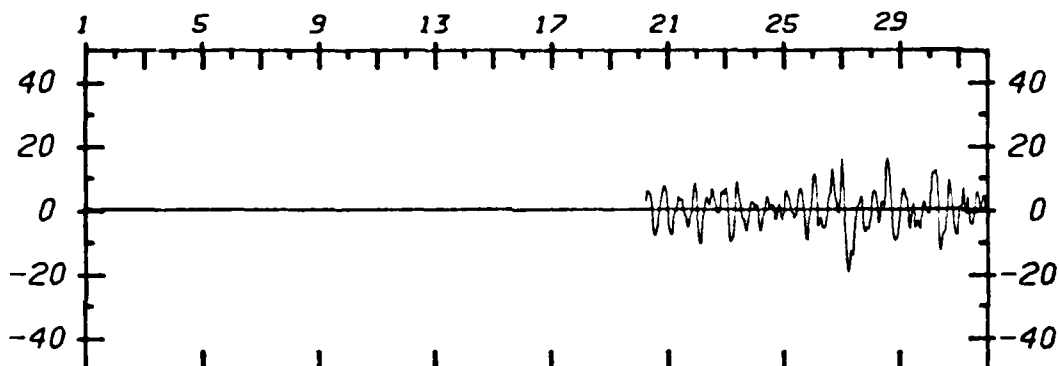
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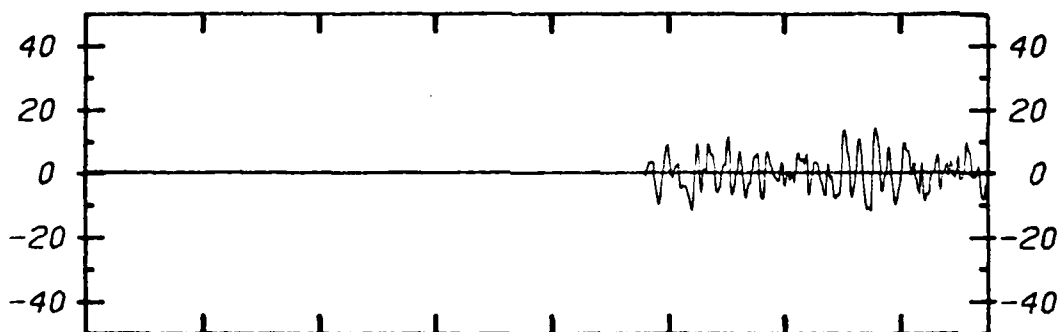
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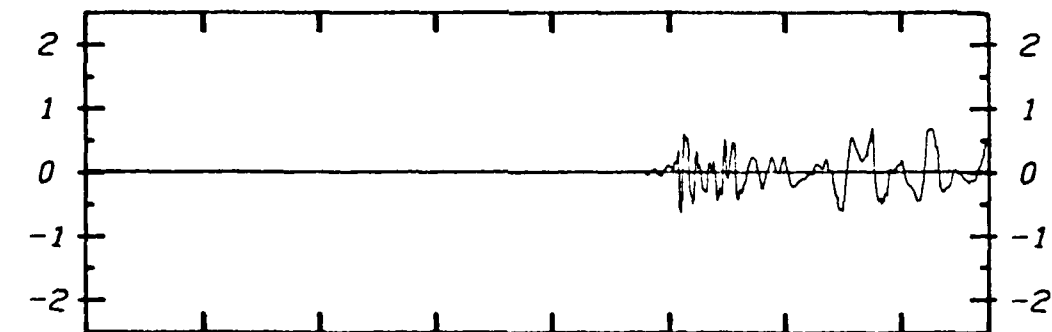
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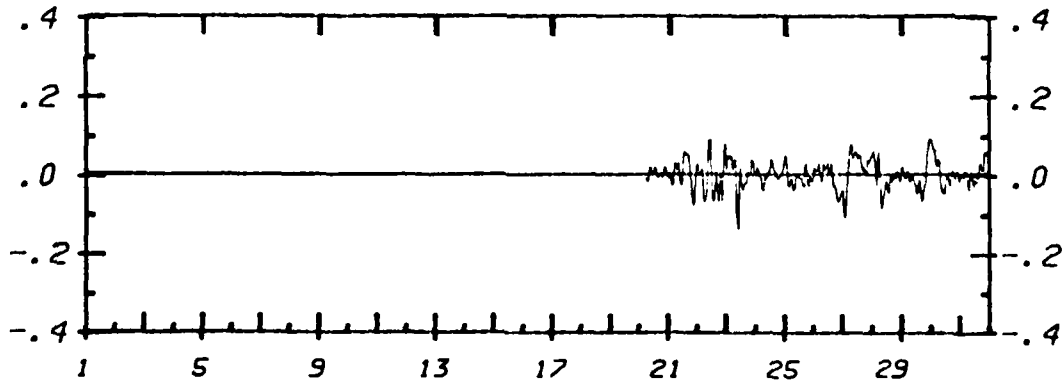
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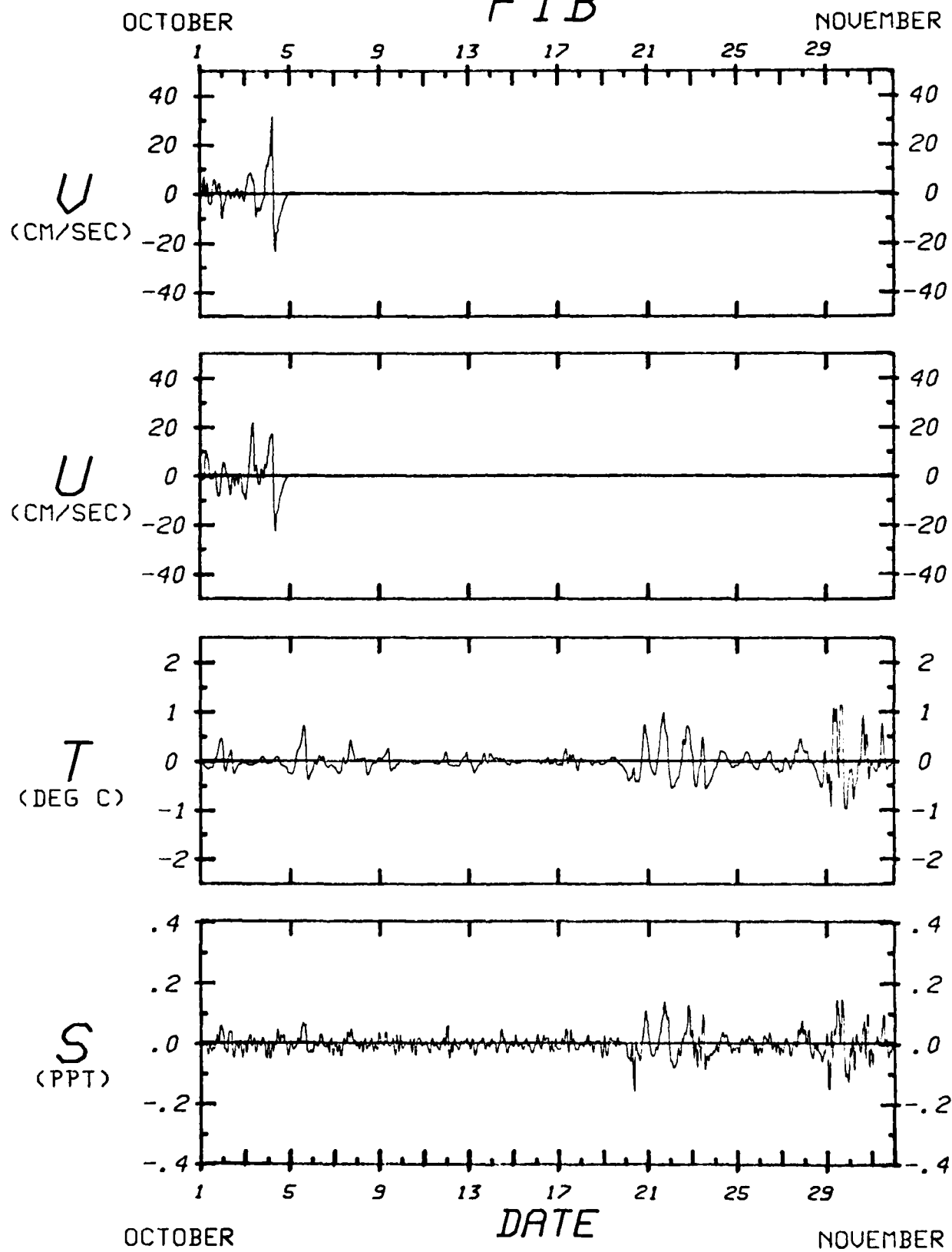


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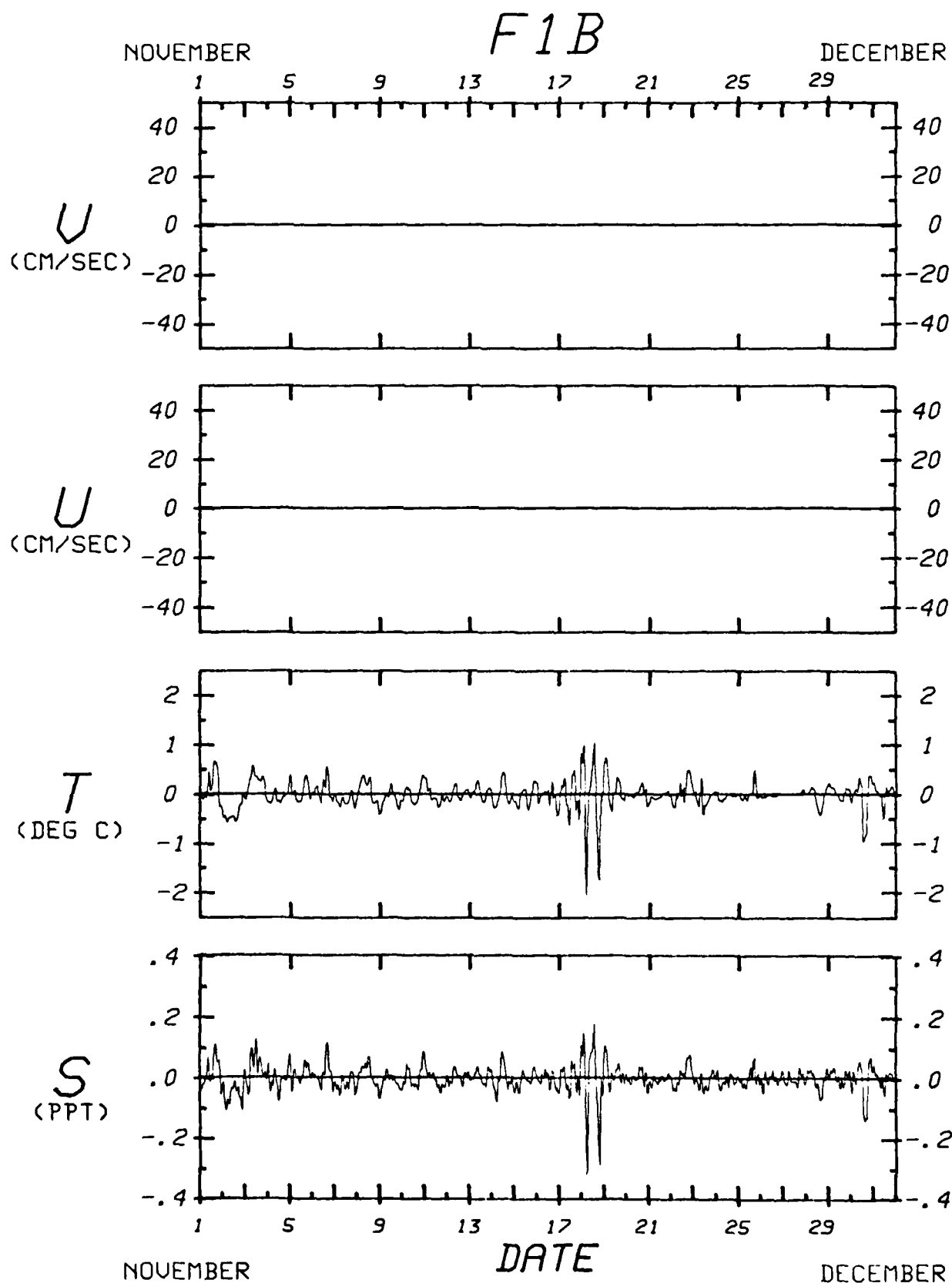
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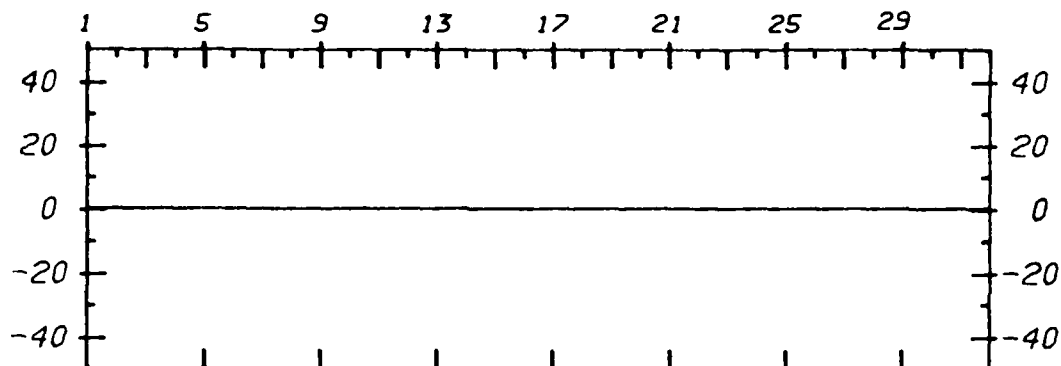
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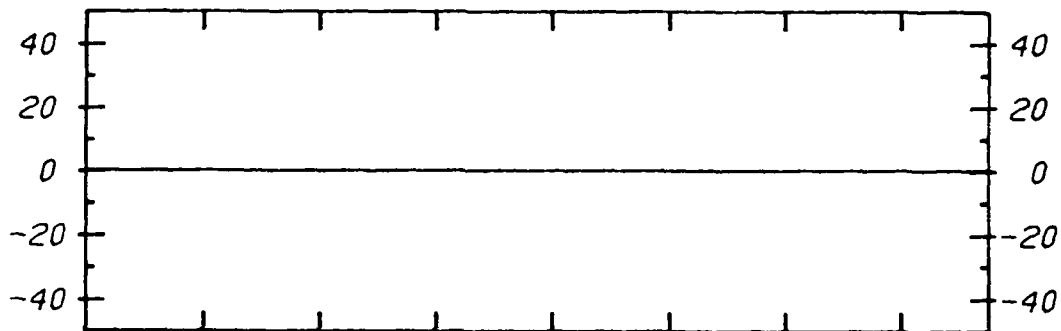
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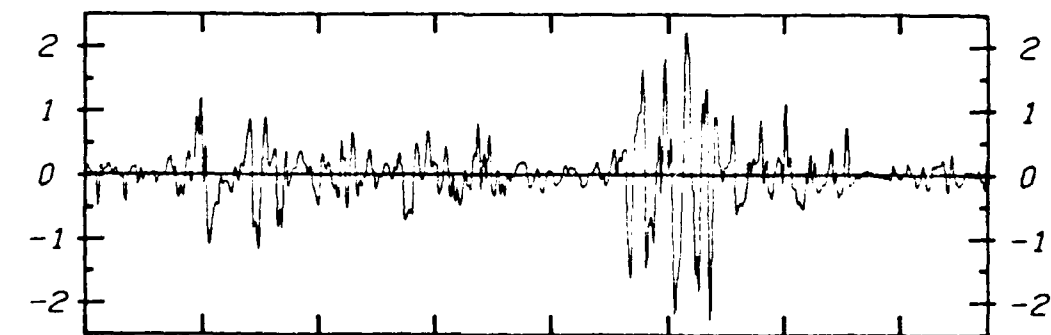
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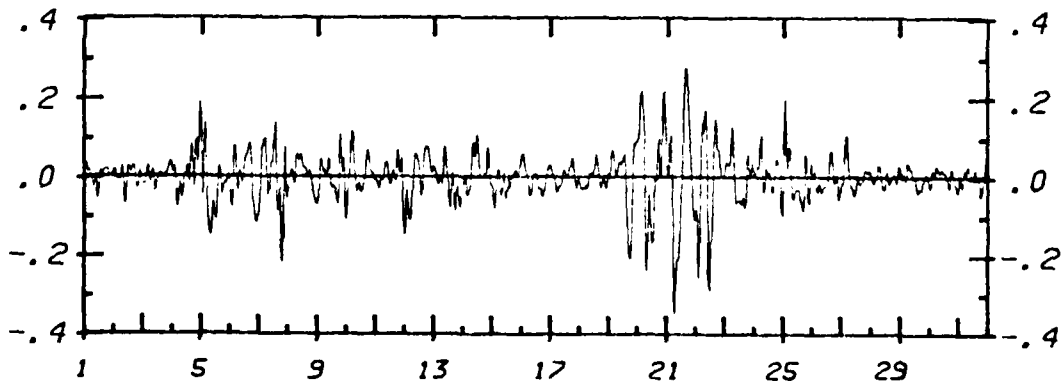
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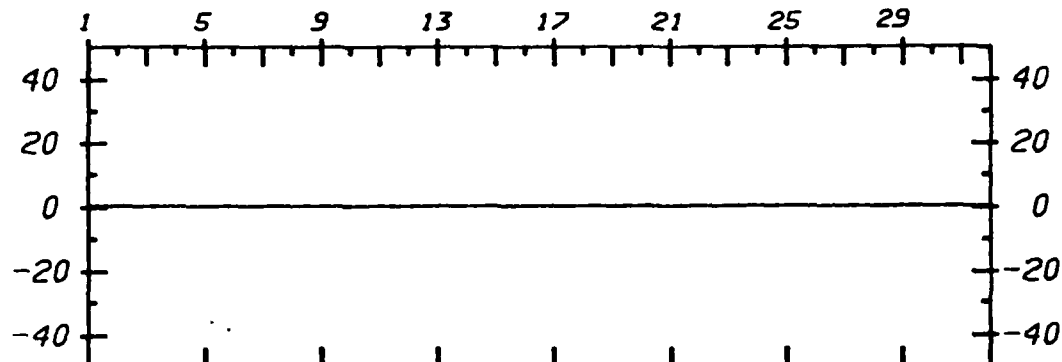
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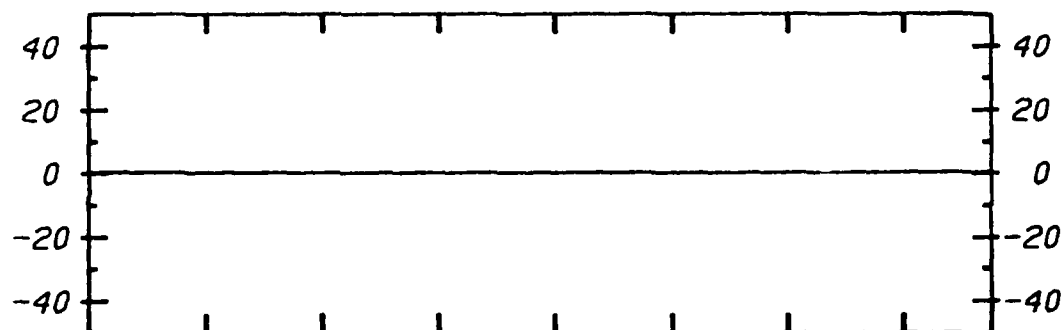
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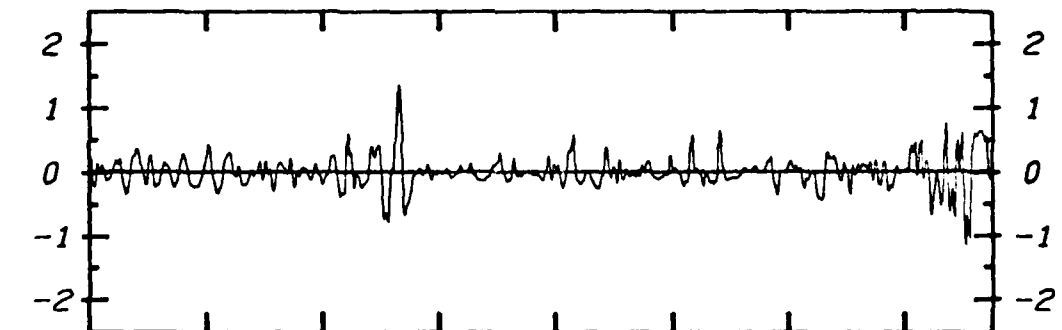
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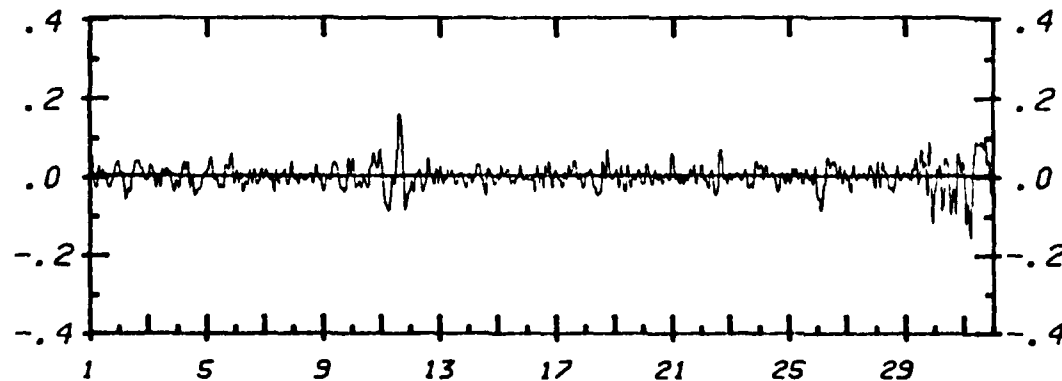
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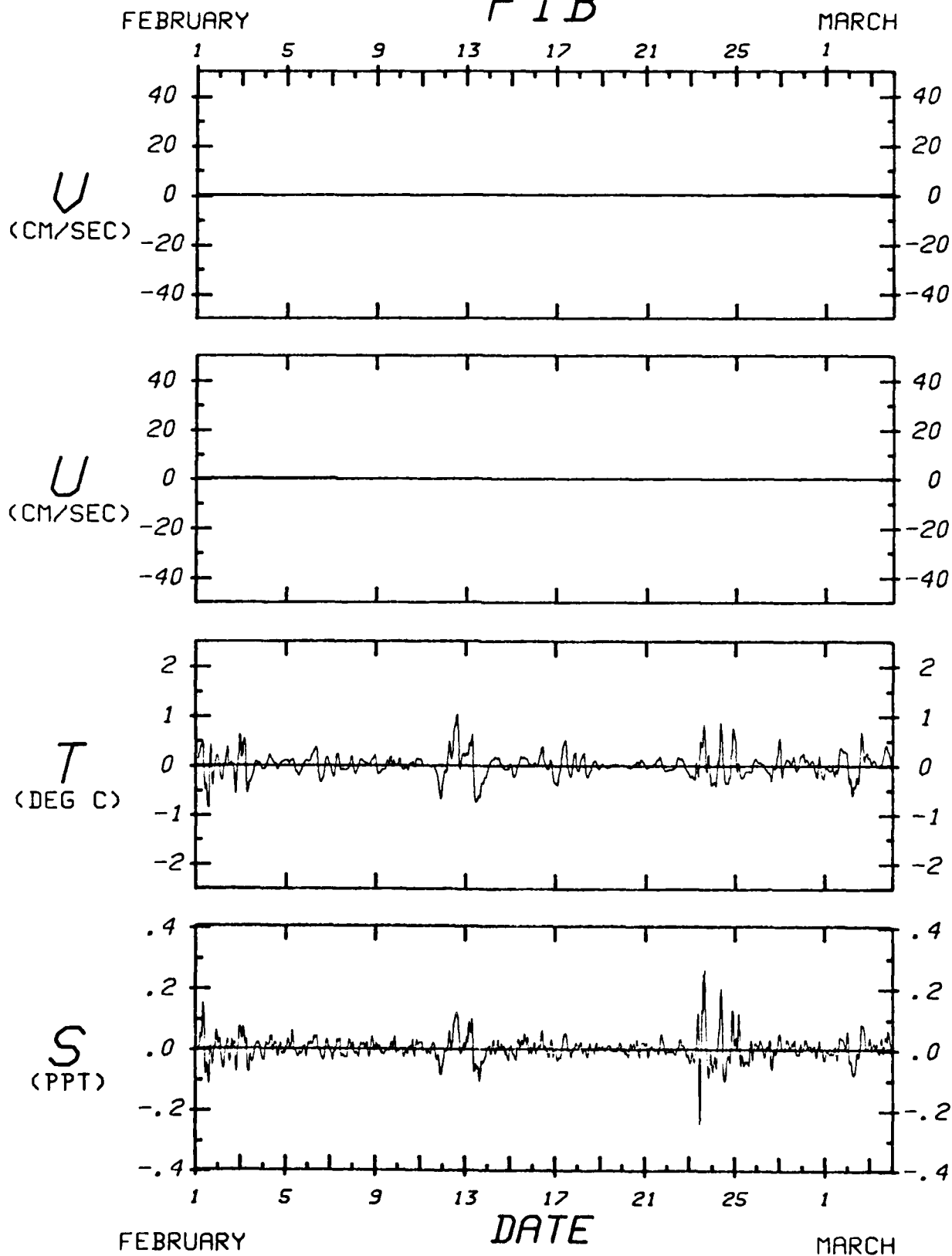
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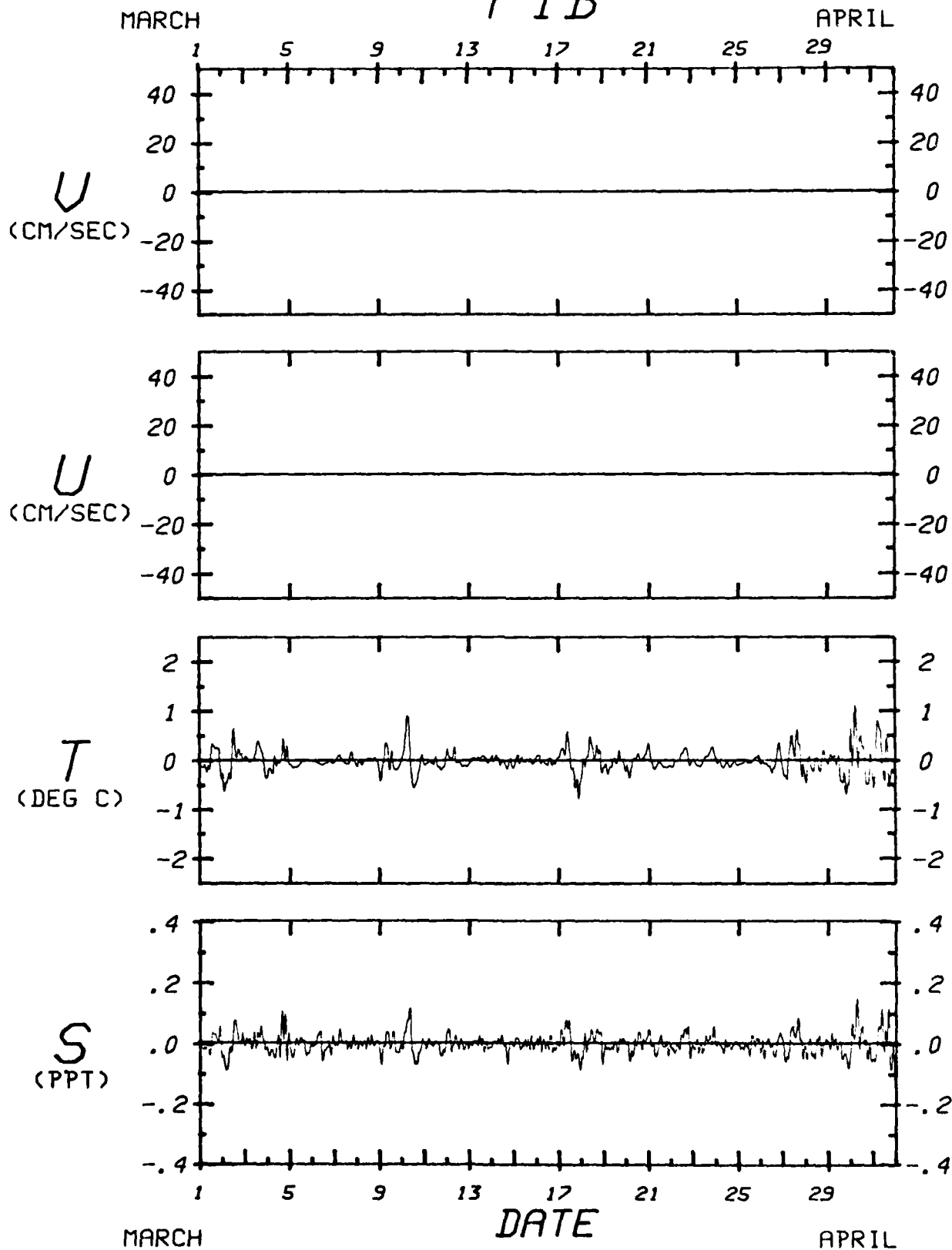
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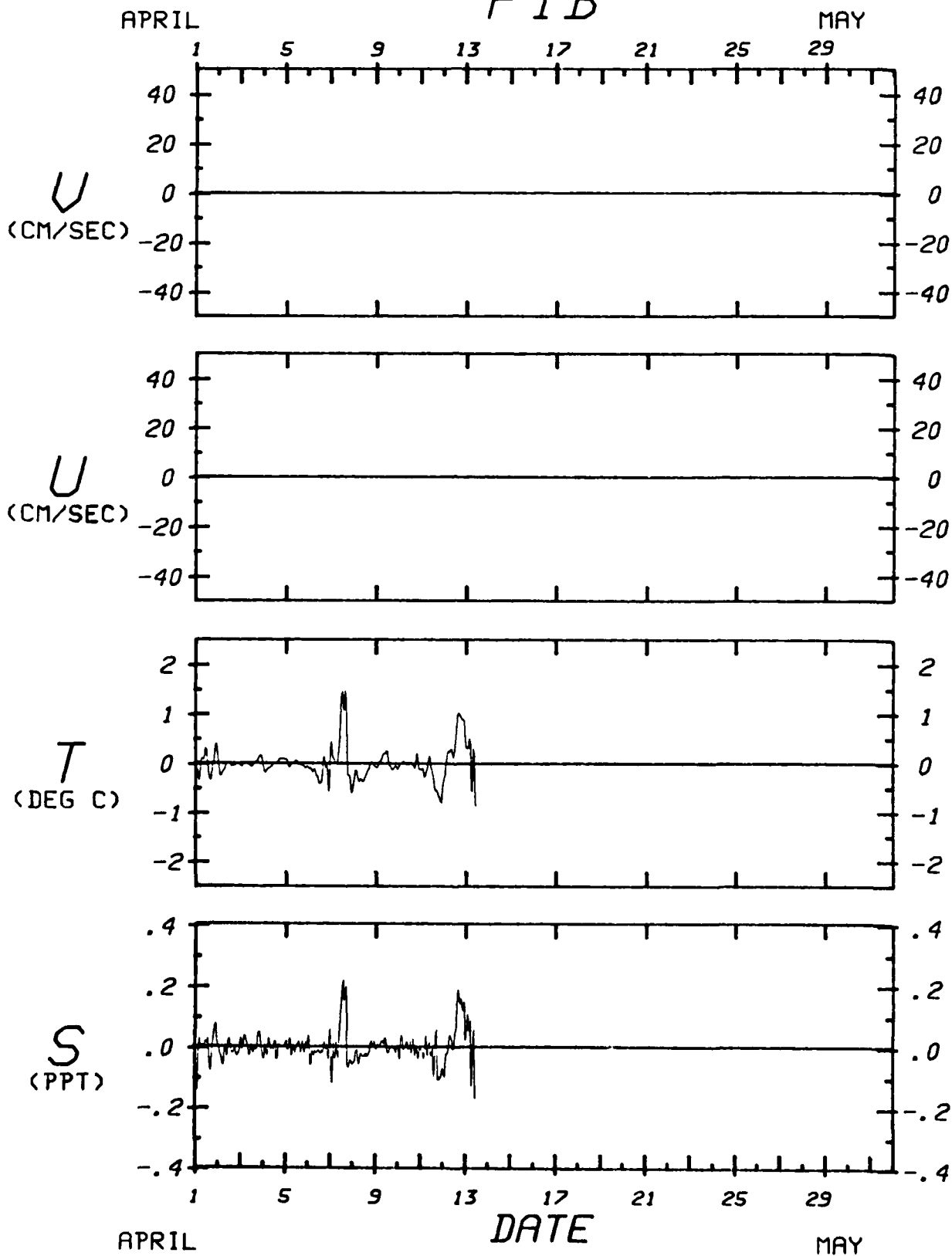
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3-40 BP

F1B



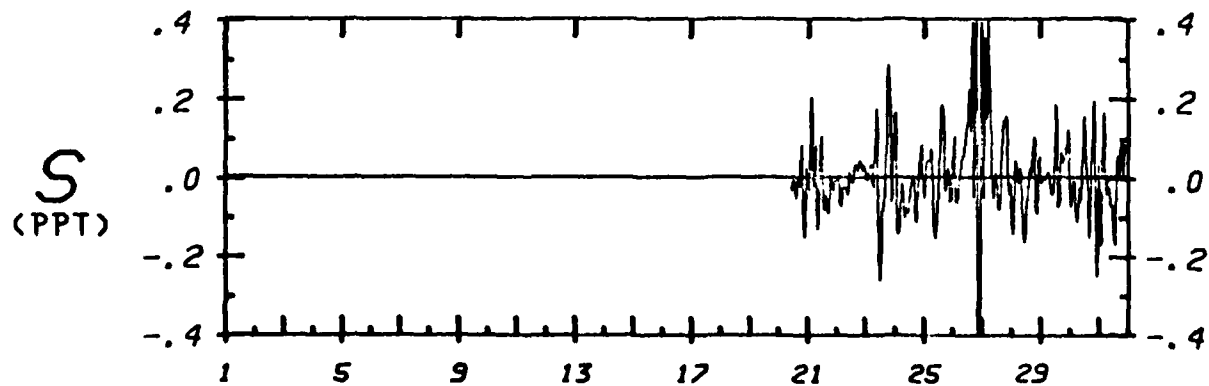
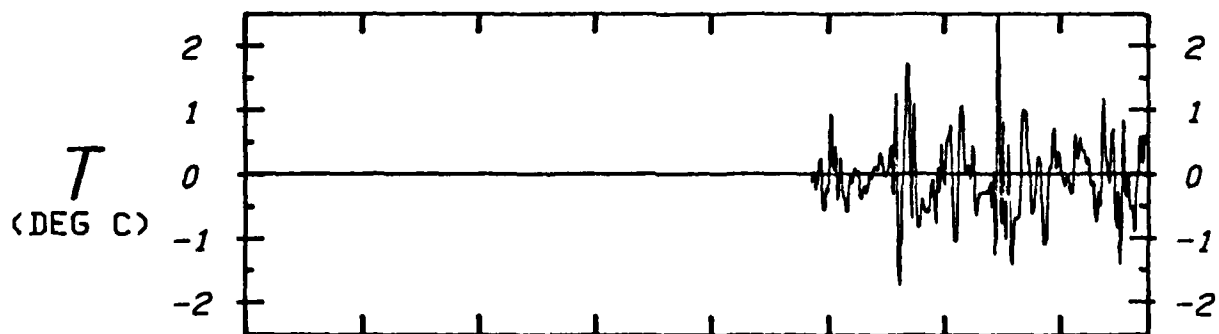
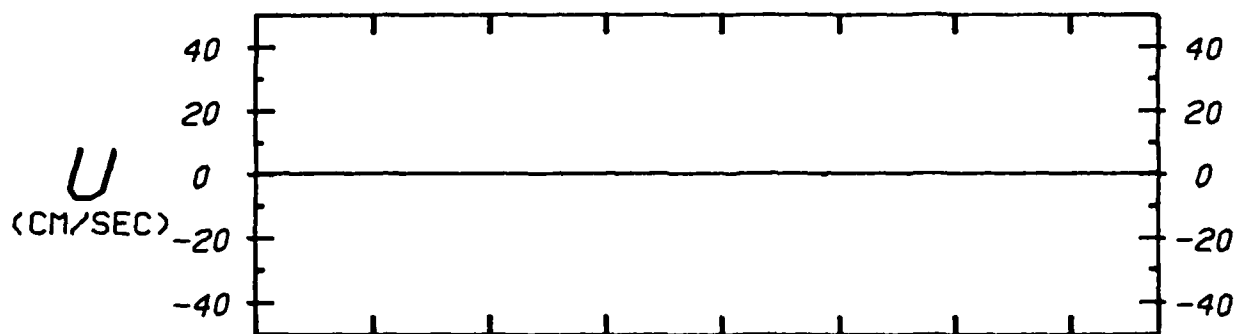
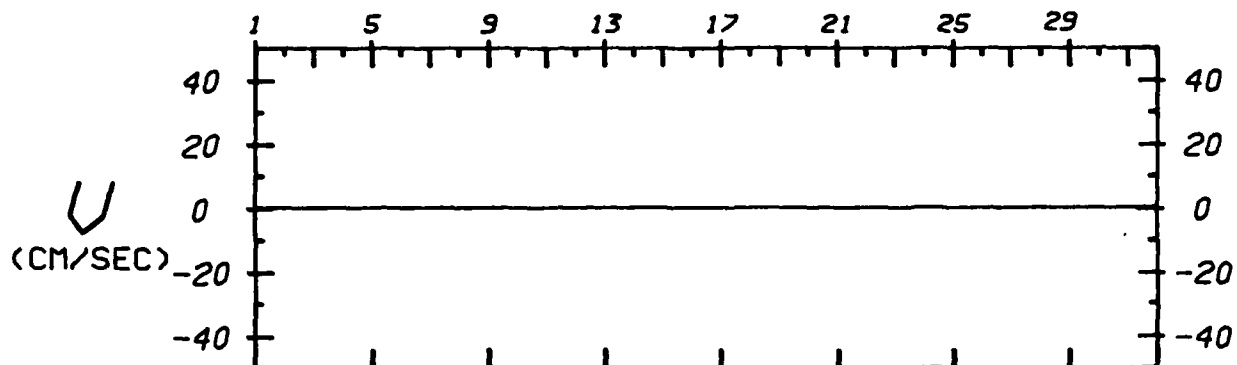
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SEPTEMBER

OCTOBER



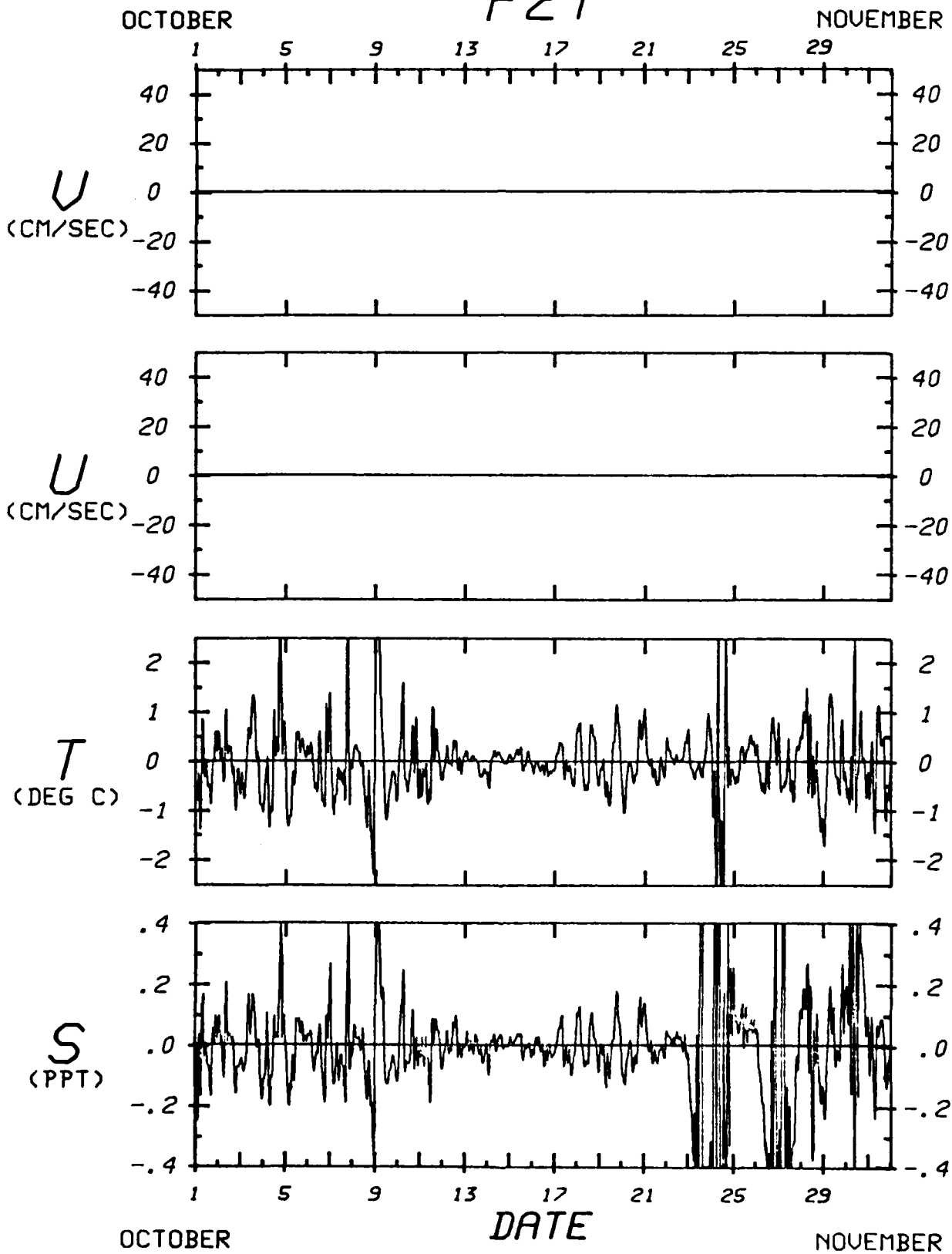
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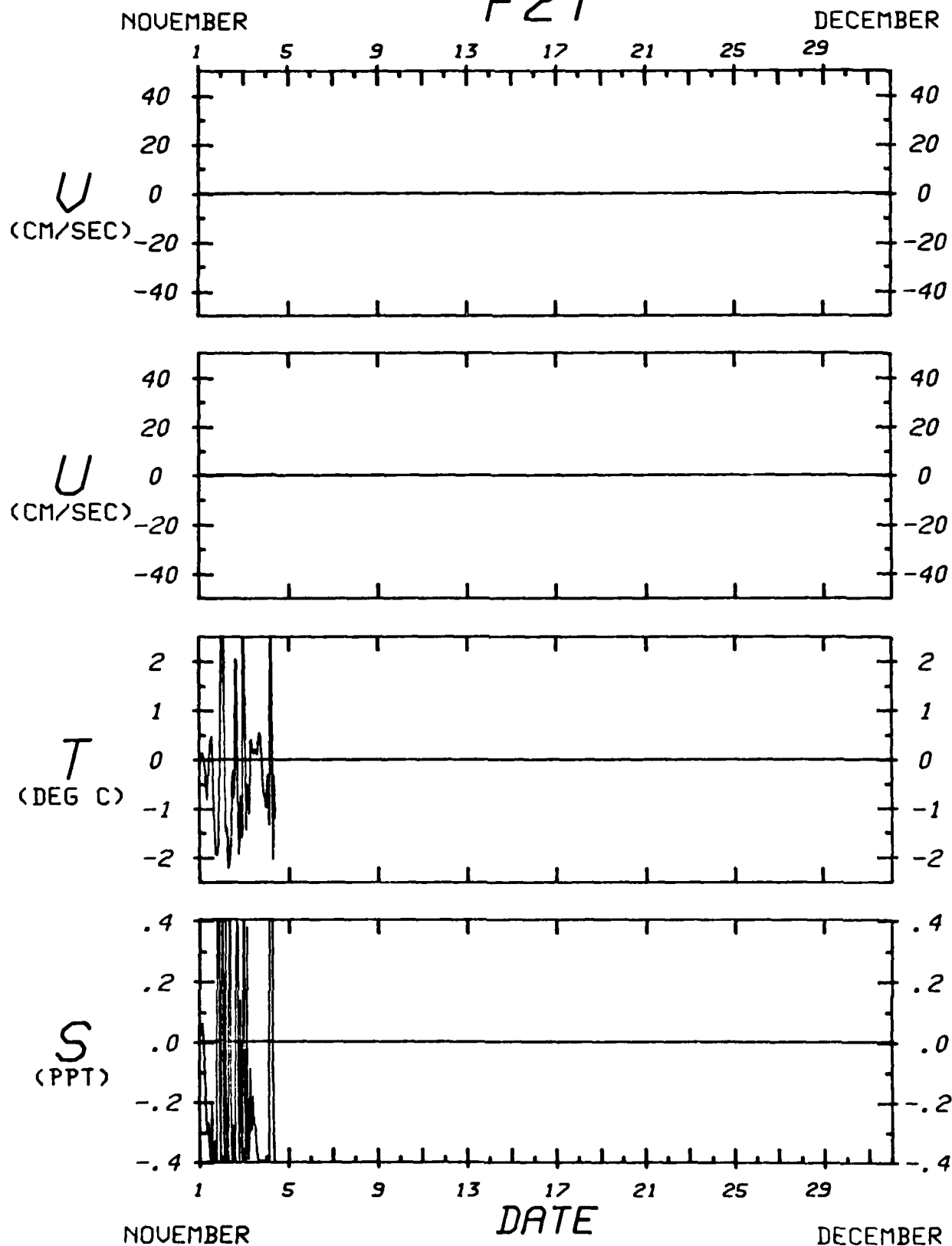
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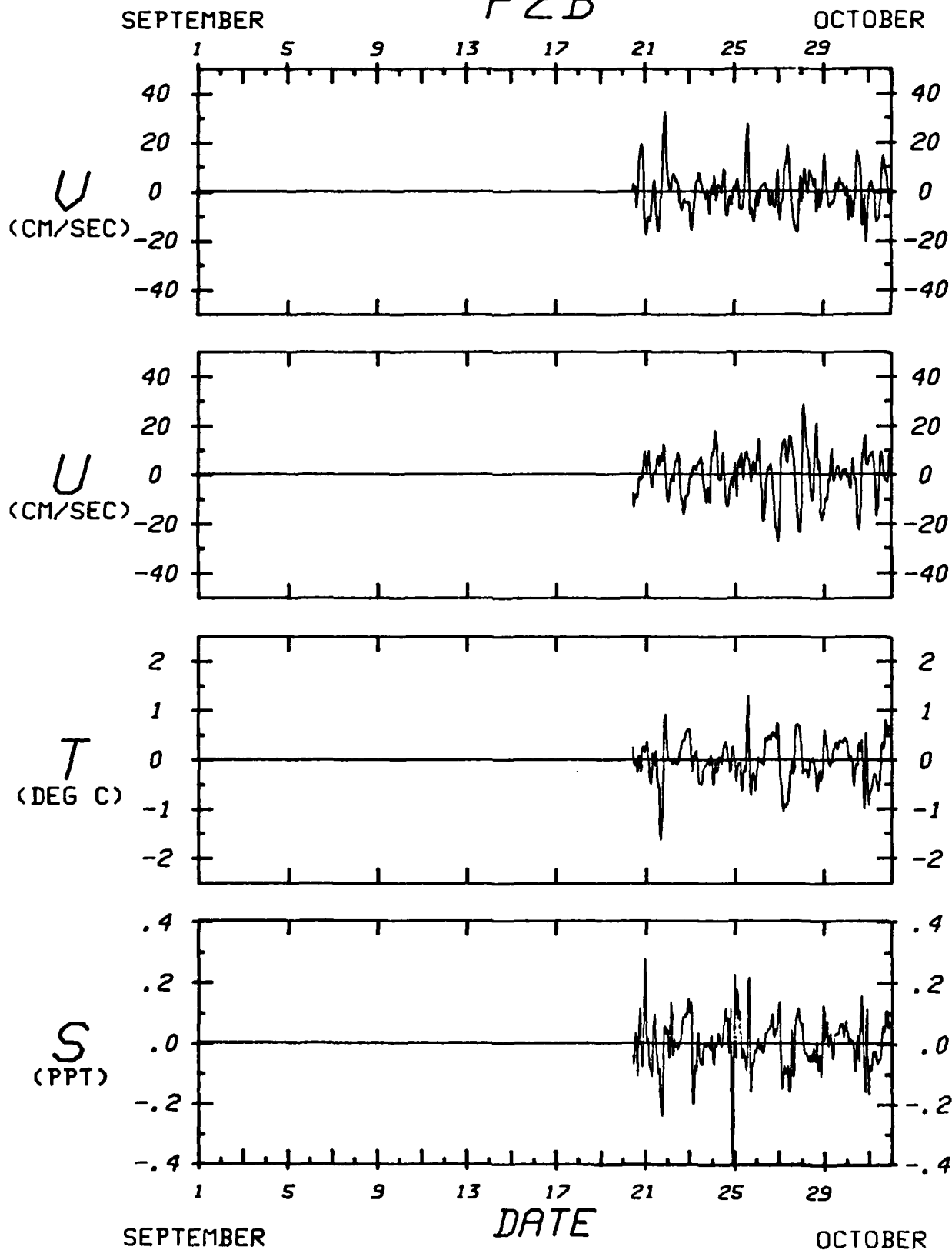
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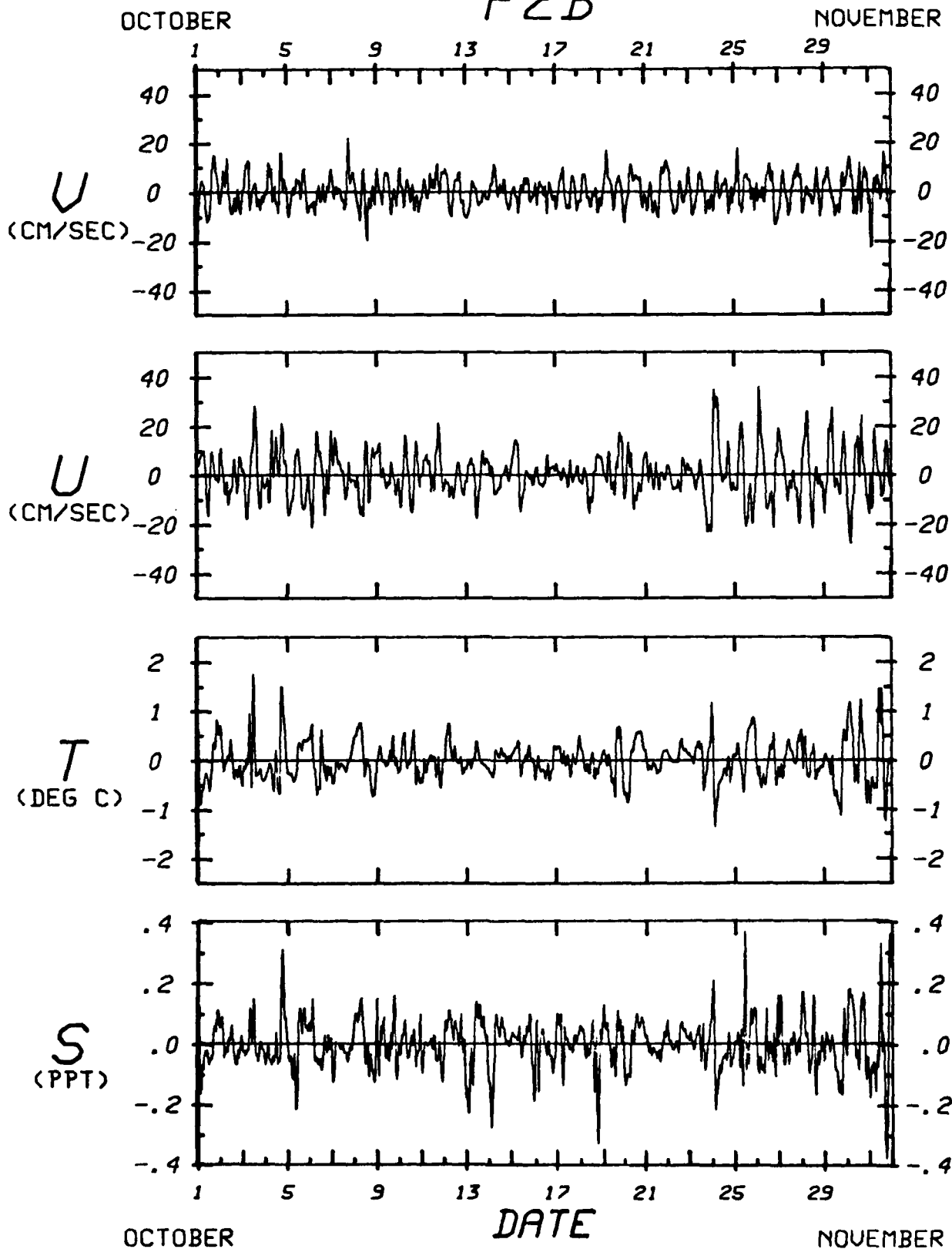
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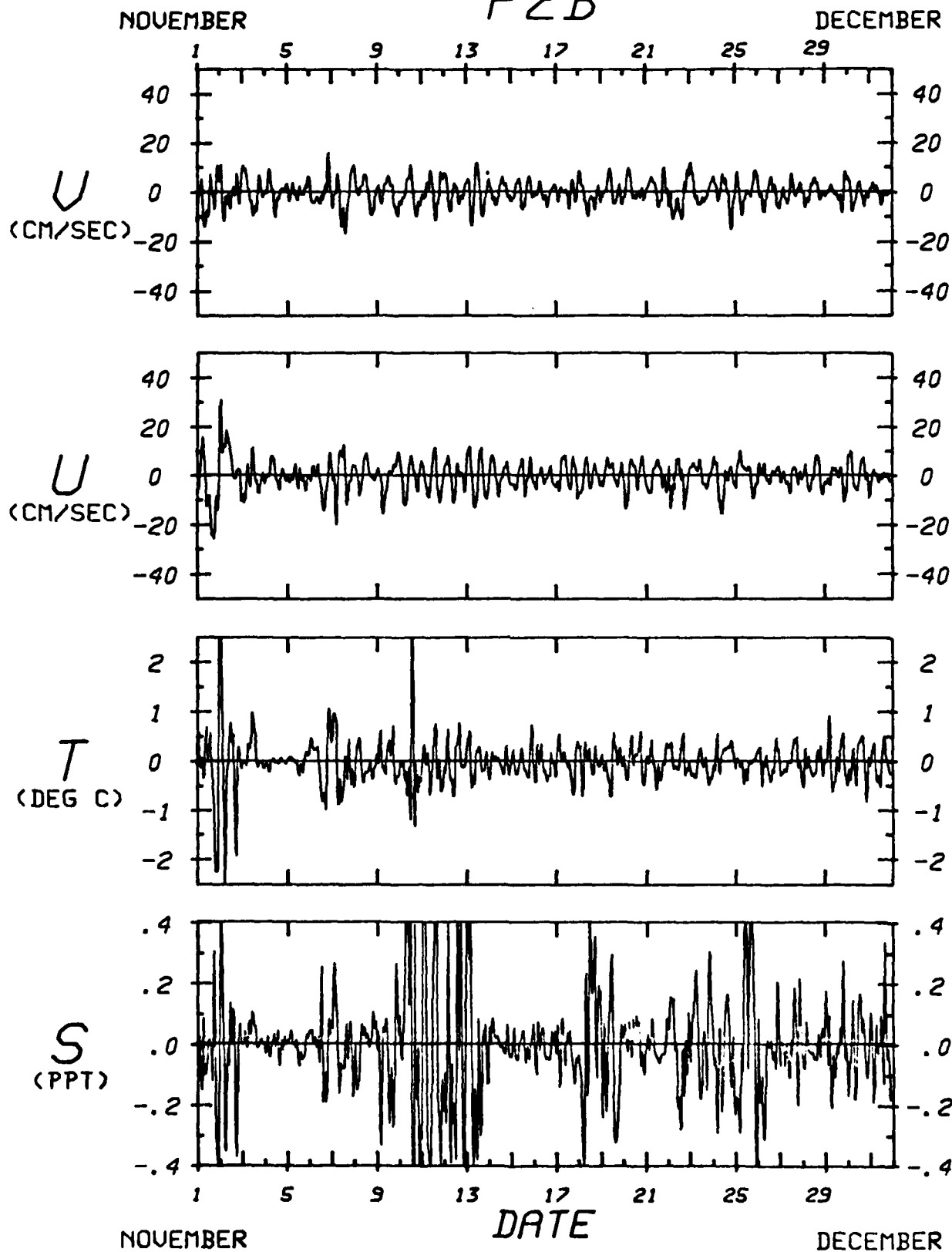
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3-40 BP

F2B



3-40 BP

F2B

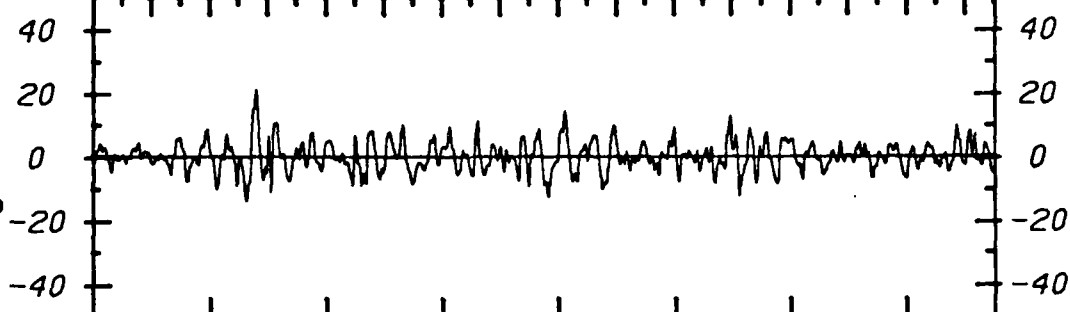
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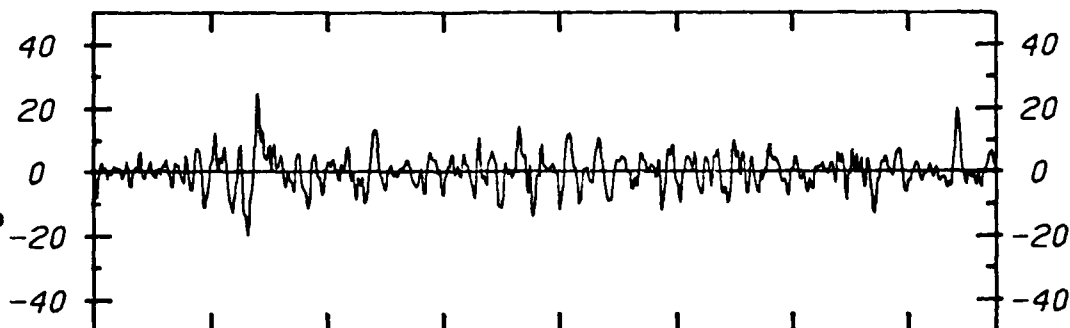
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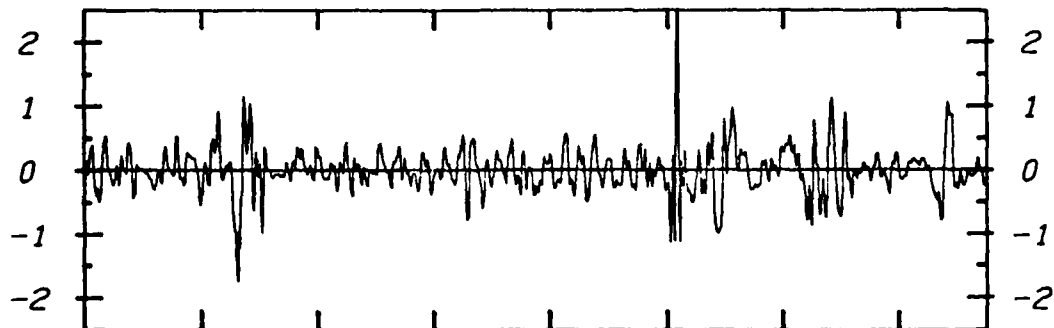
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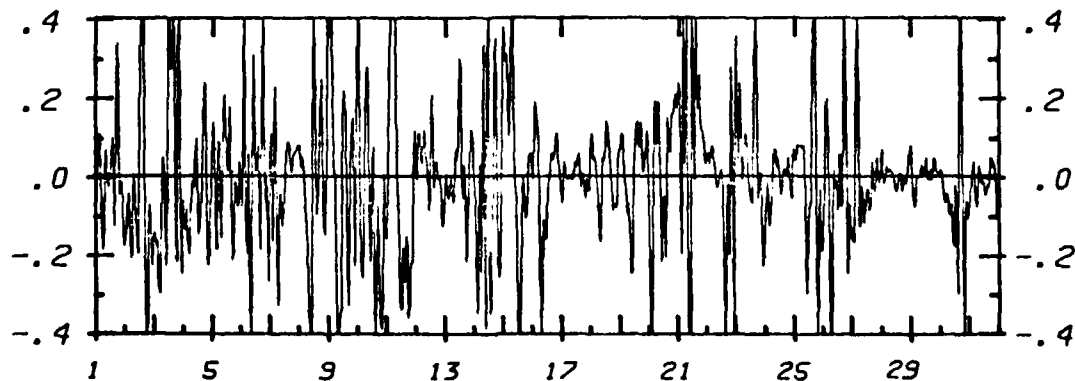
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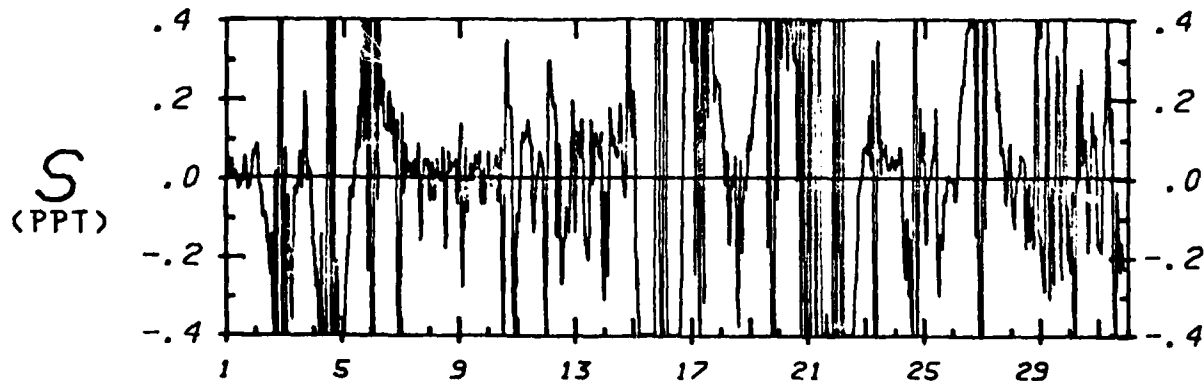
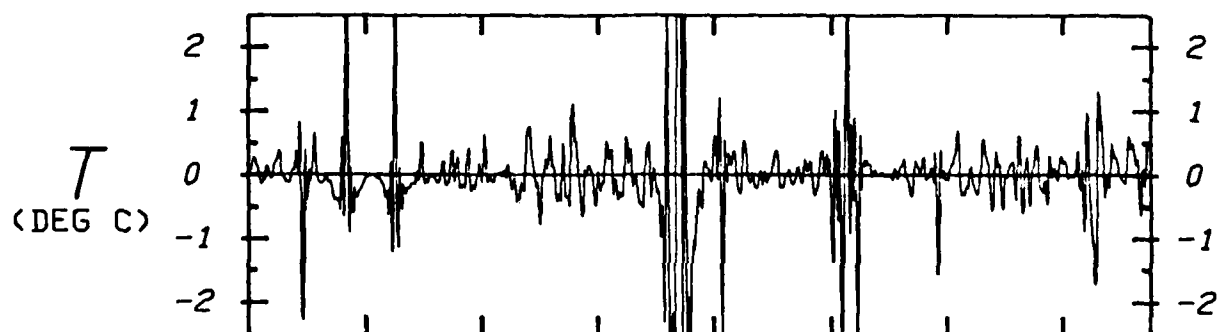
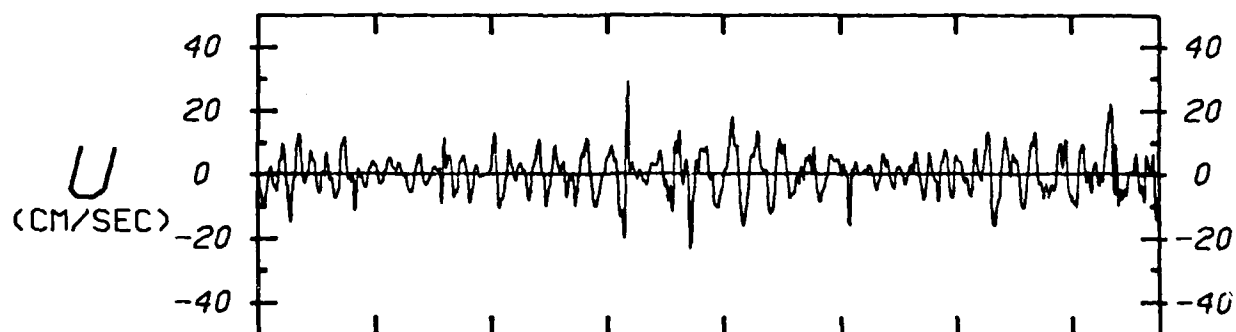
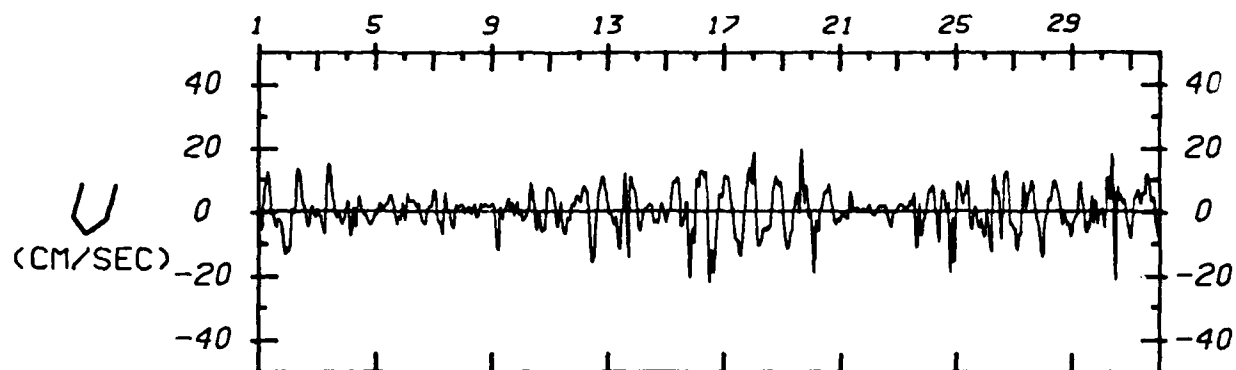
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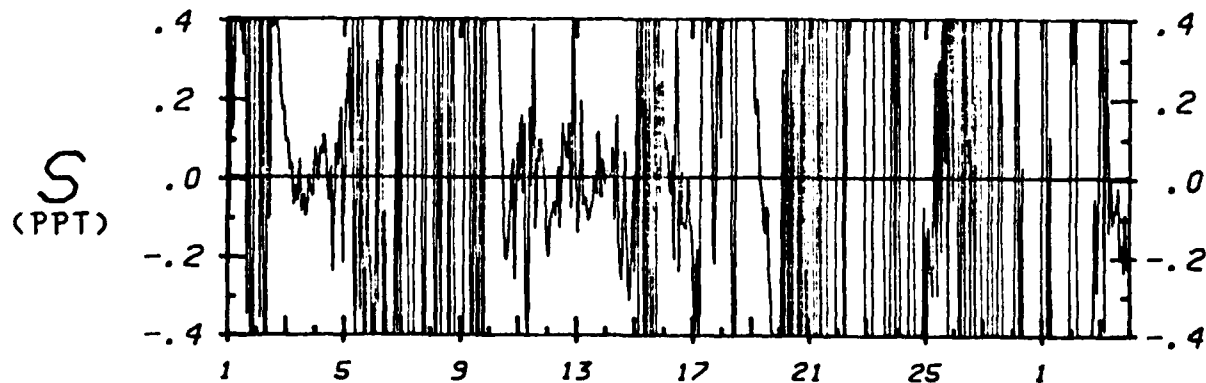
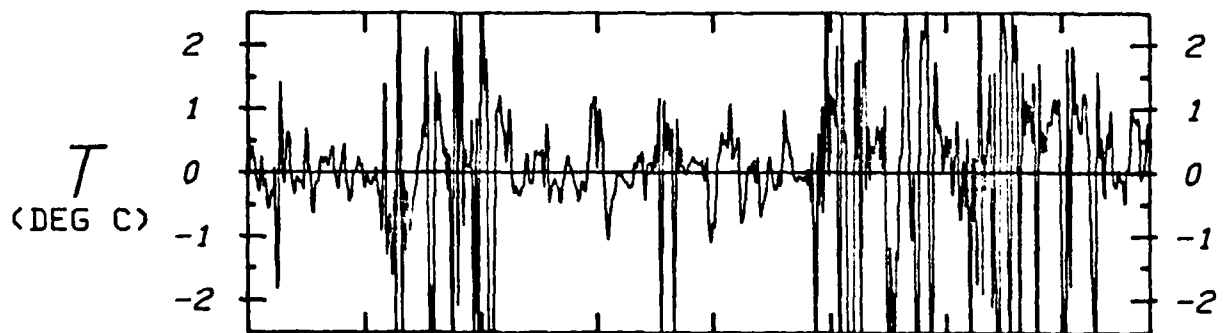
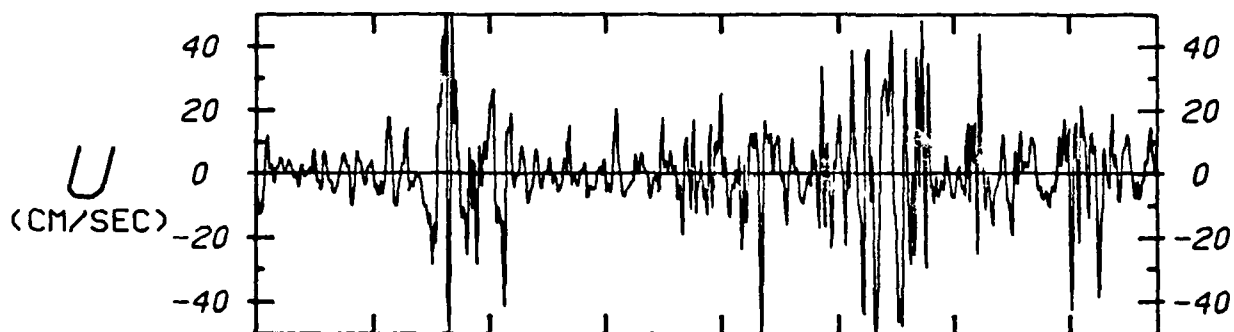
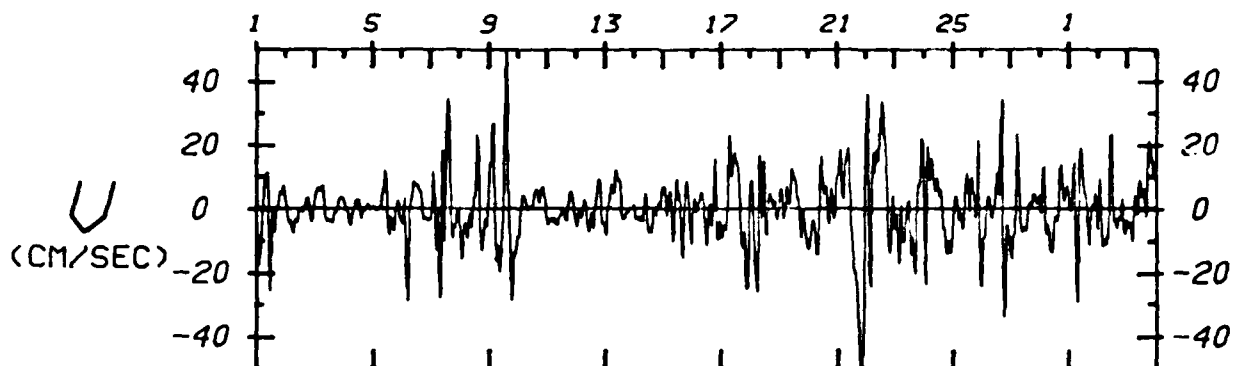
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FEBRUARY

MARCH



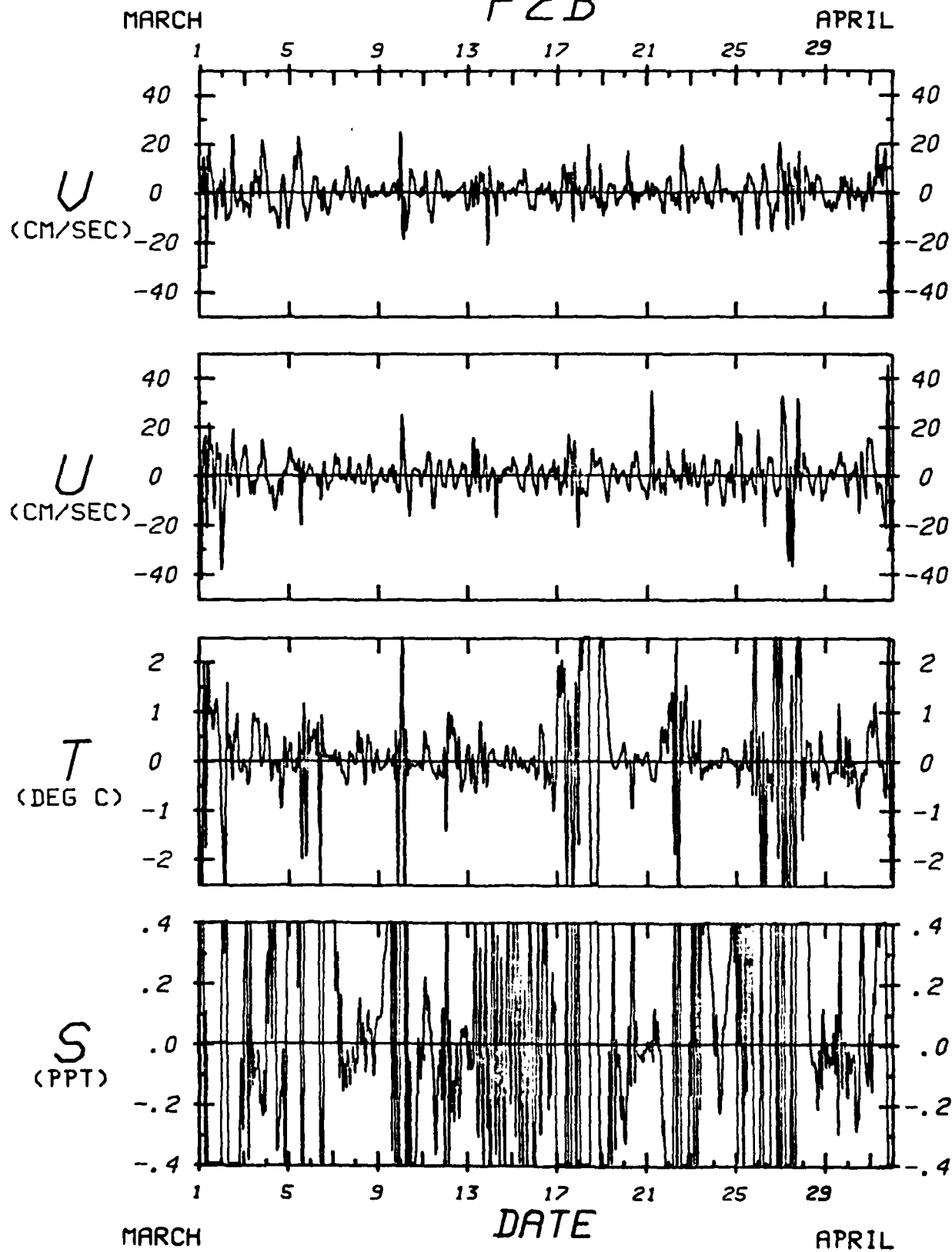
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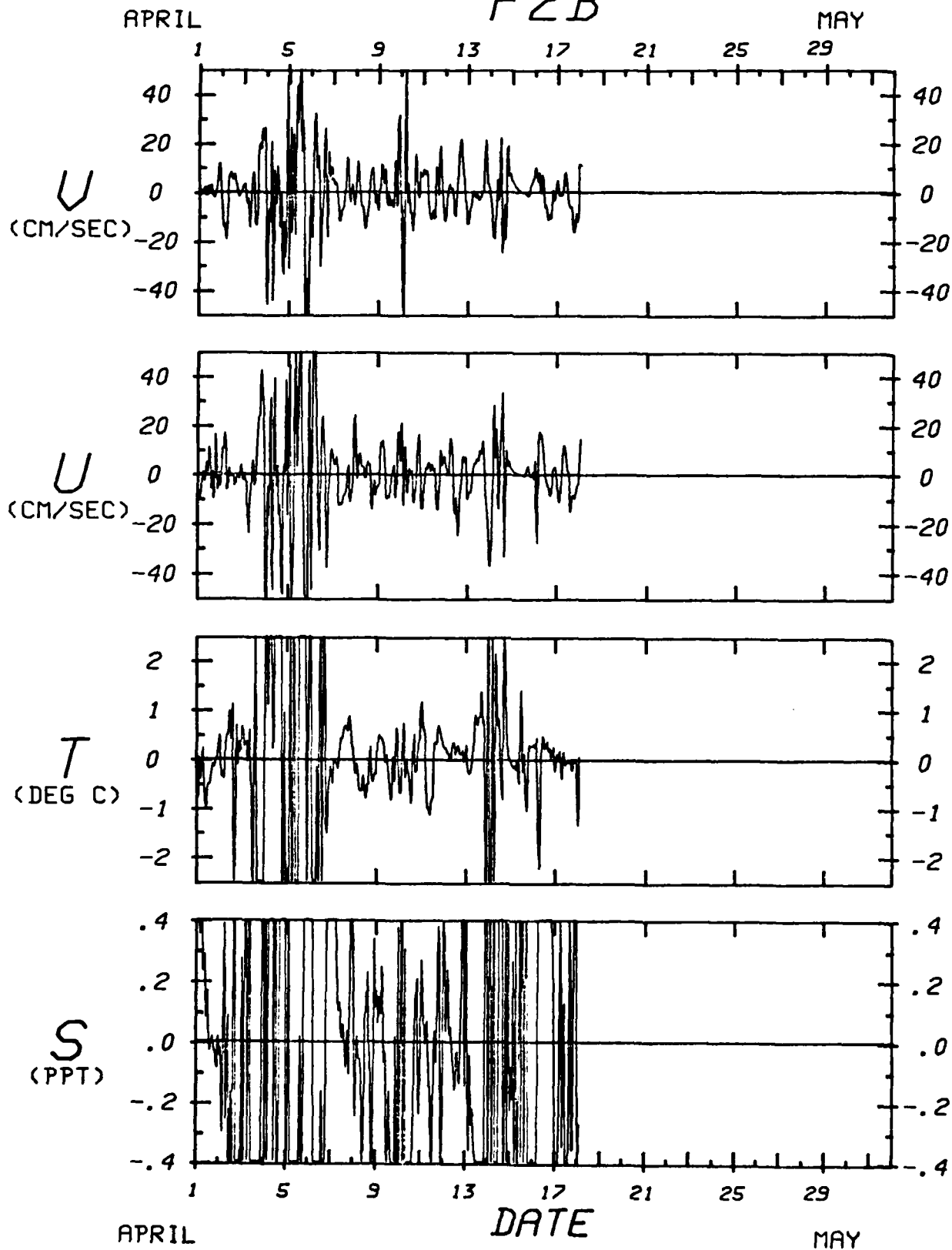
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3-40 BP

F2B



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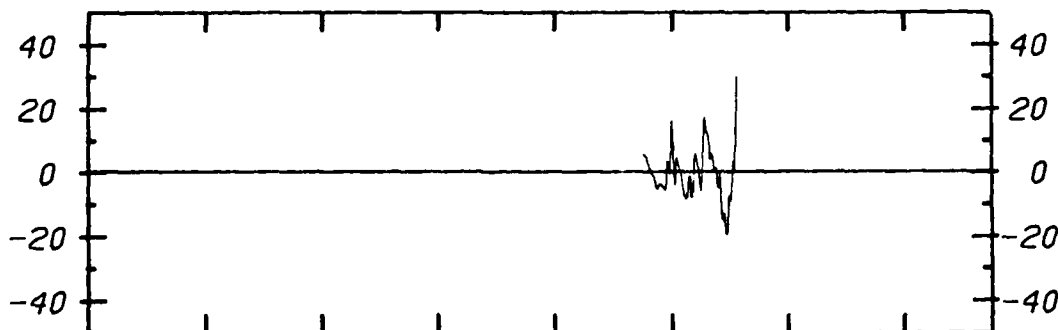
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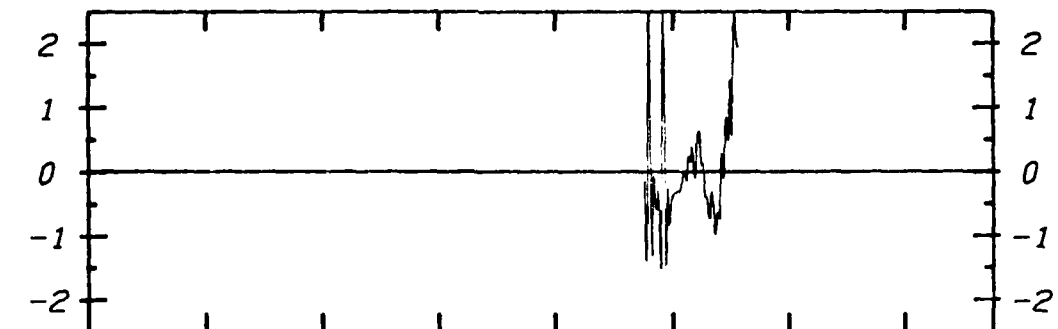
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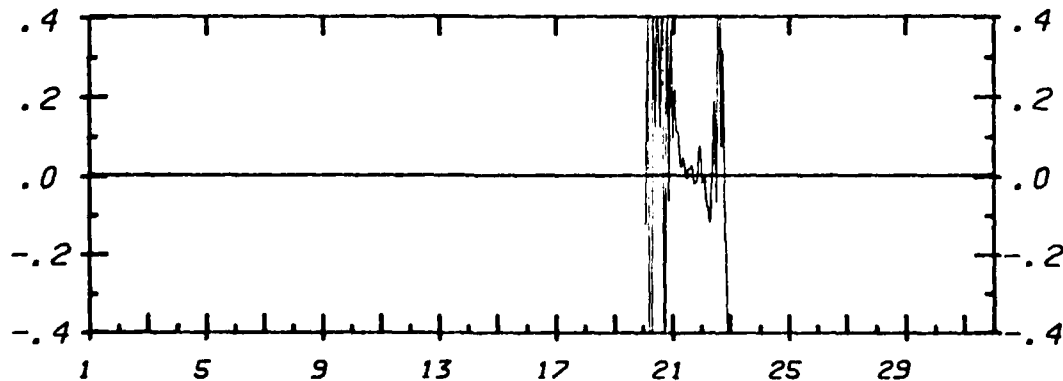
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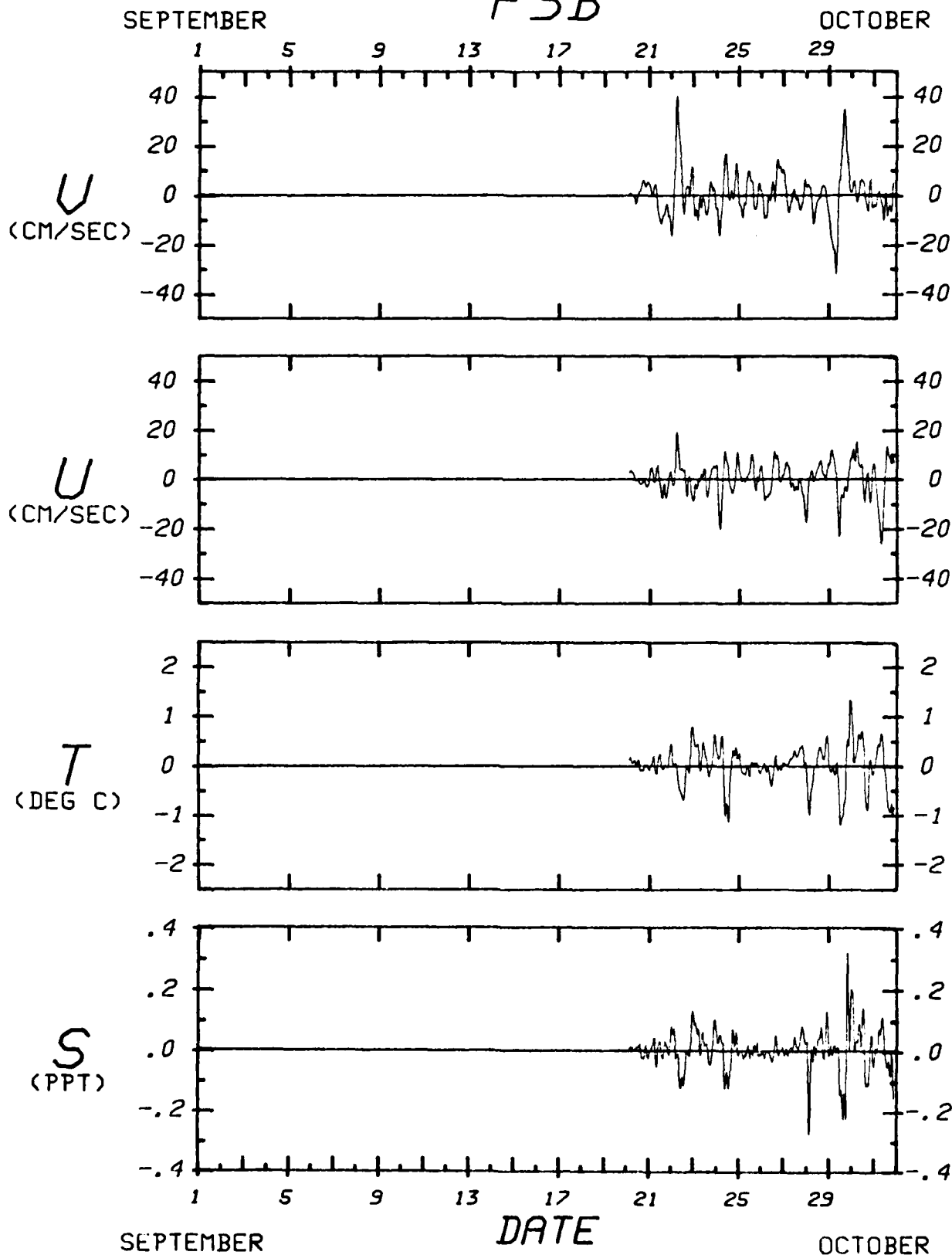
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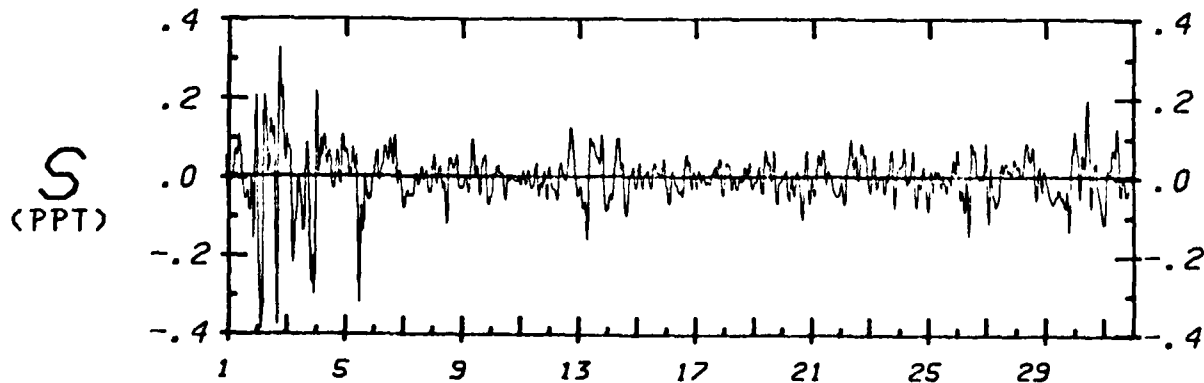
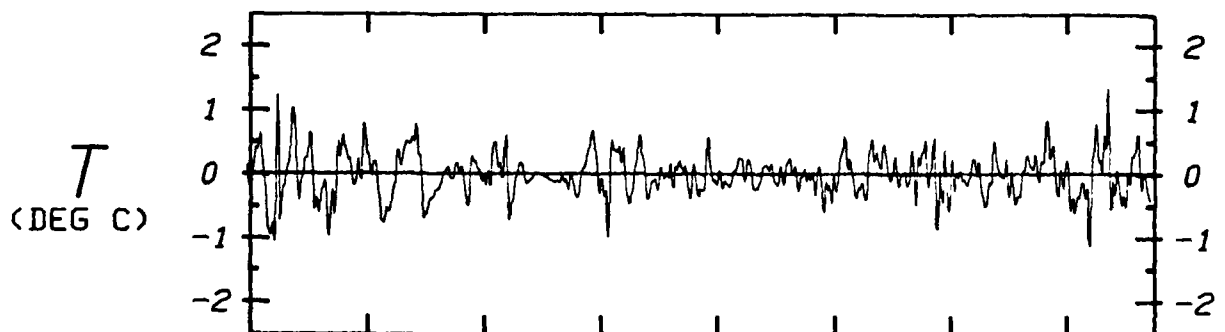
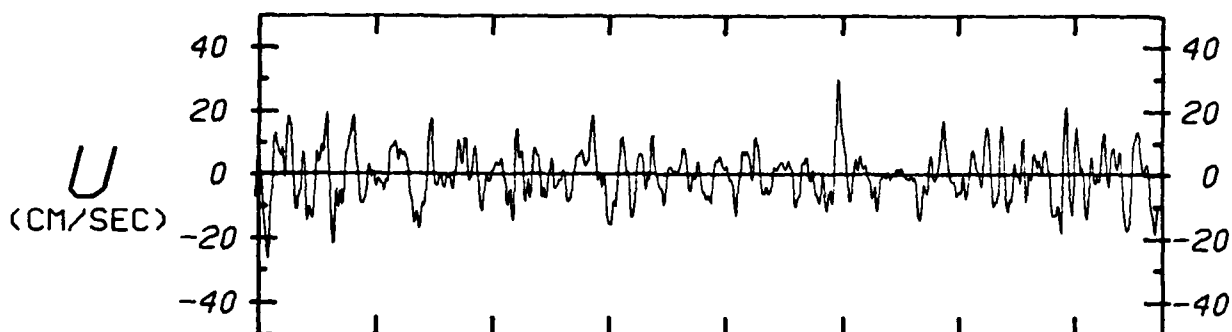
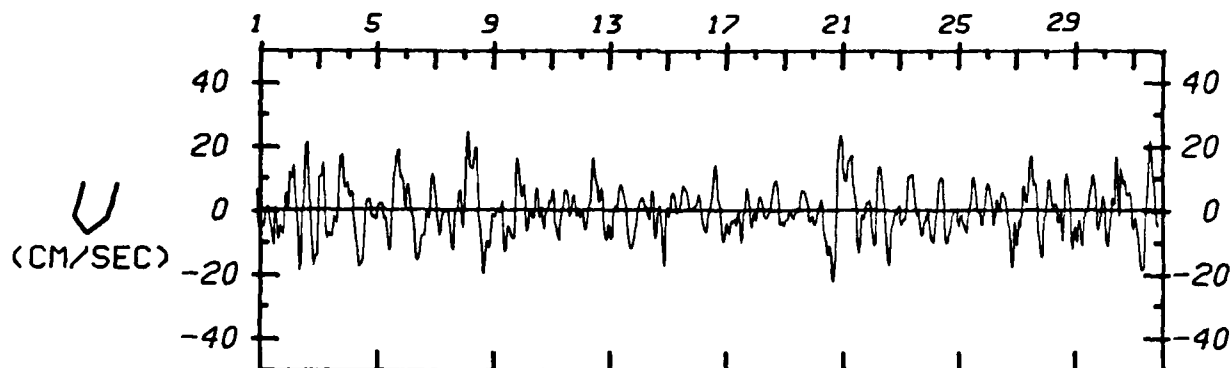


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OCTOBER

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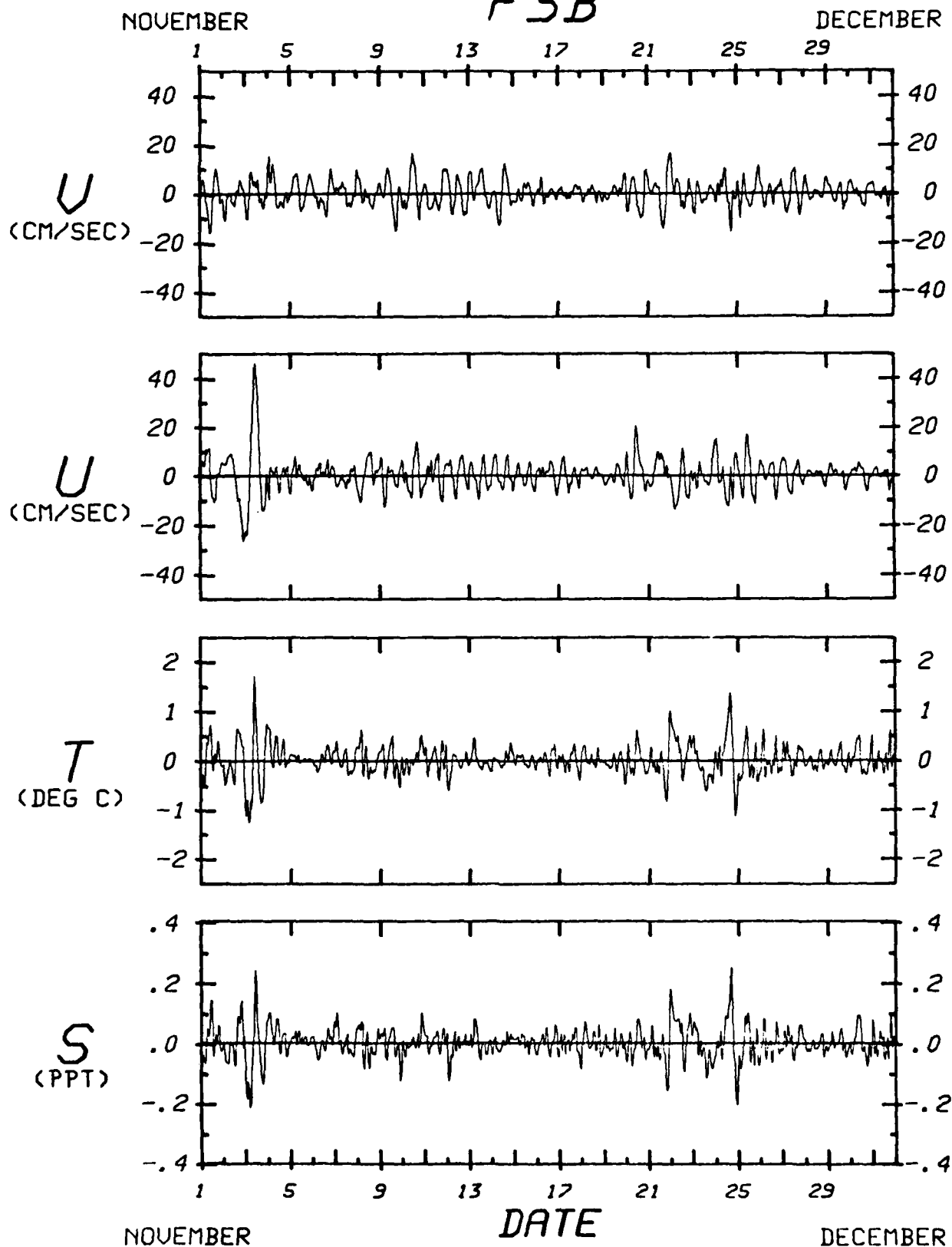
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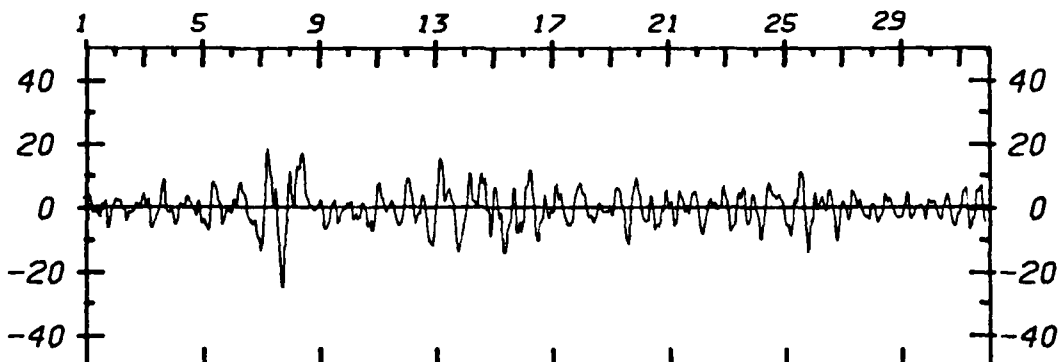
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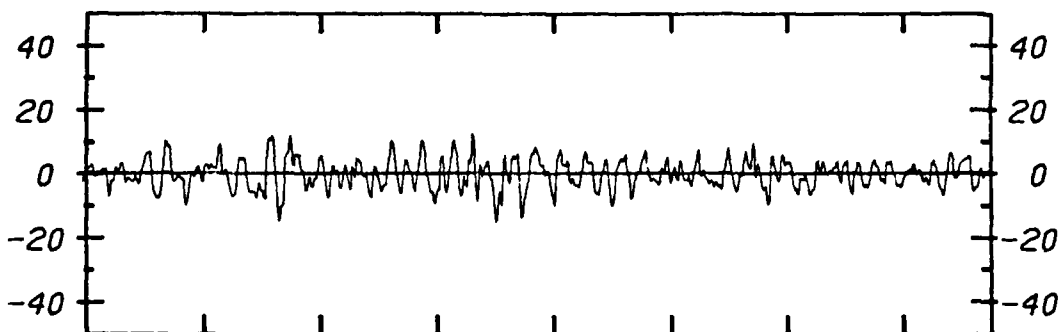
DECEMBER

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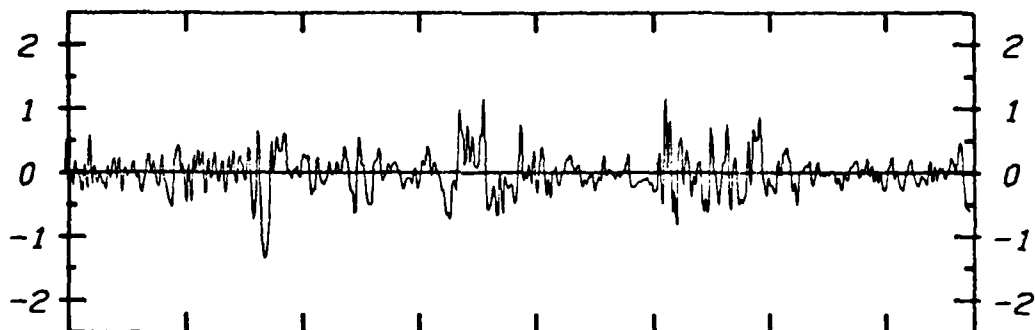
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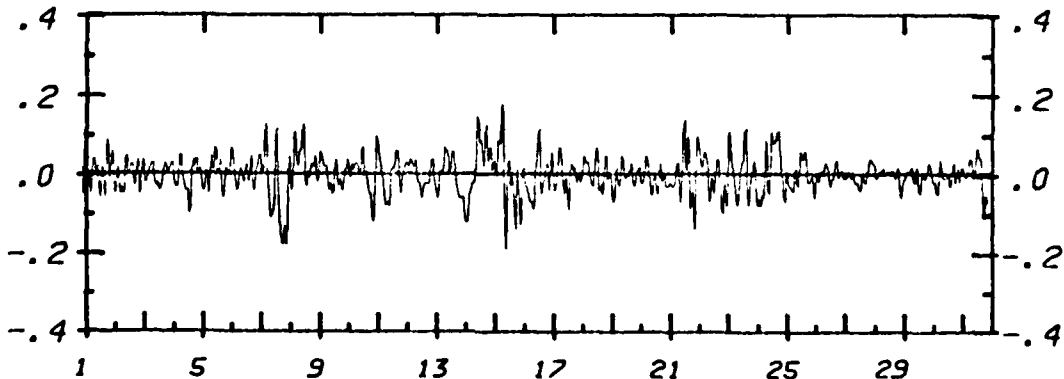
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DECEMBER

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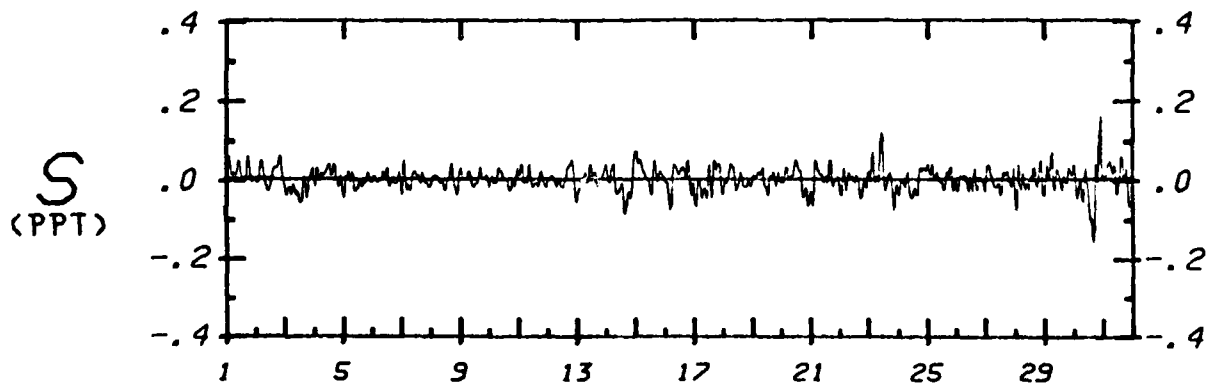
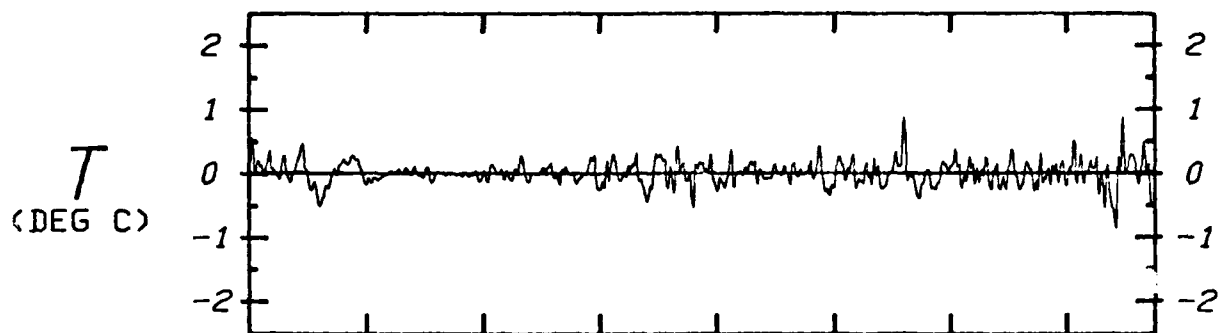
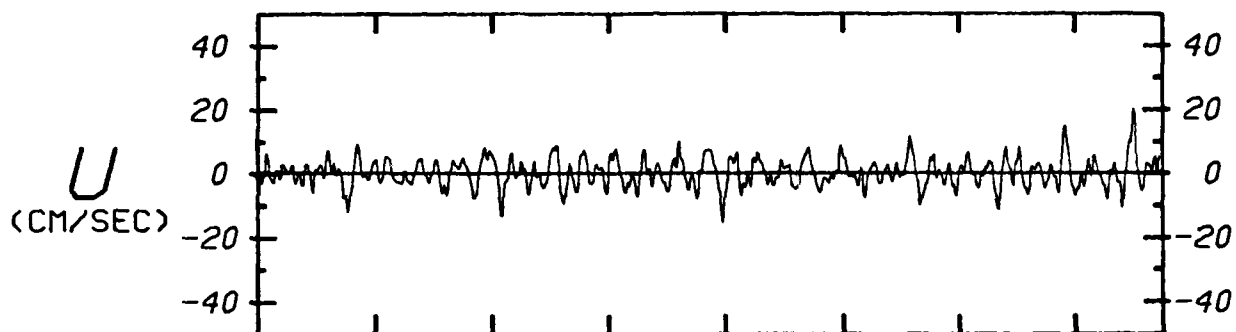
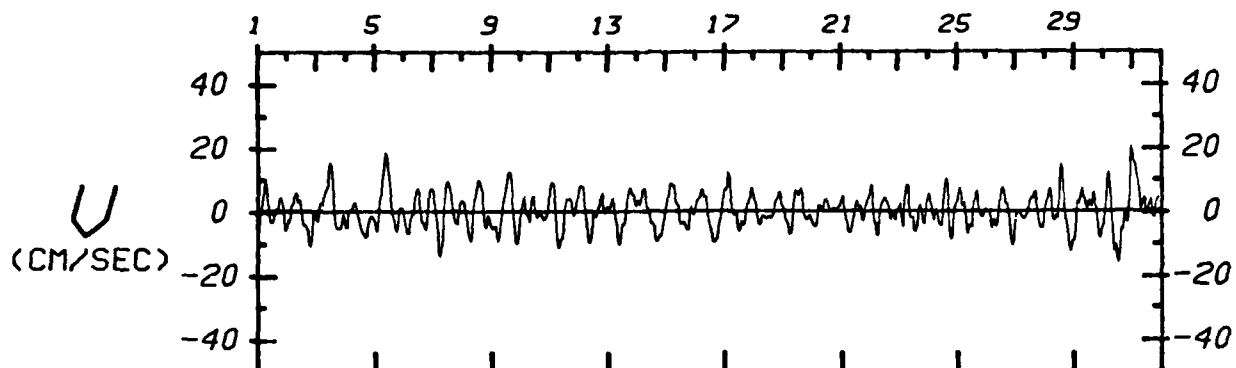
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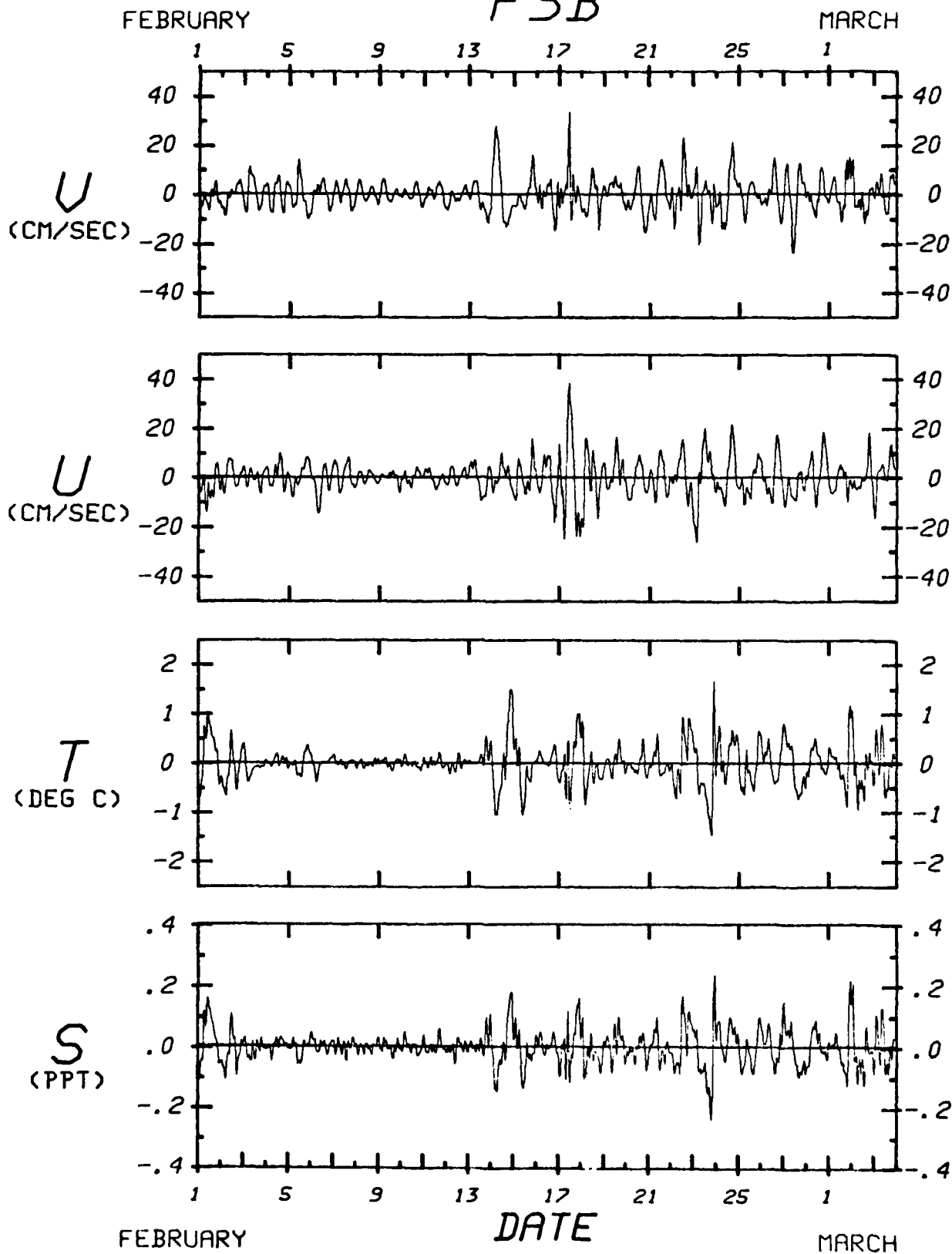
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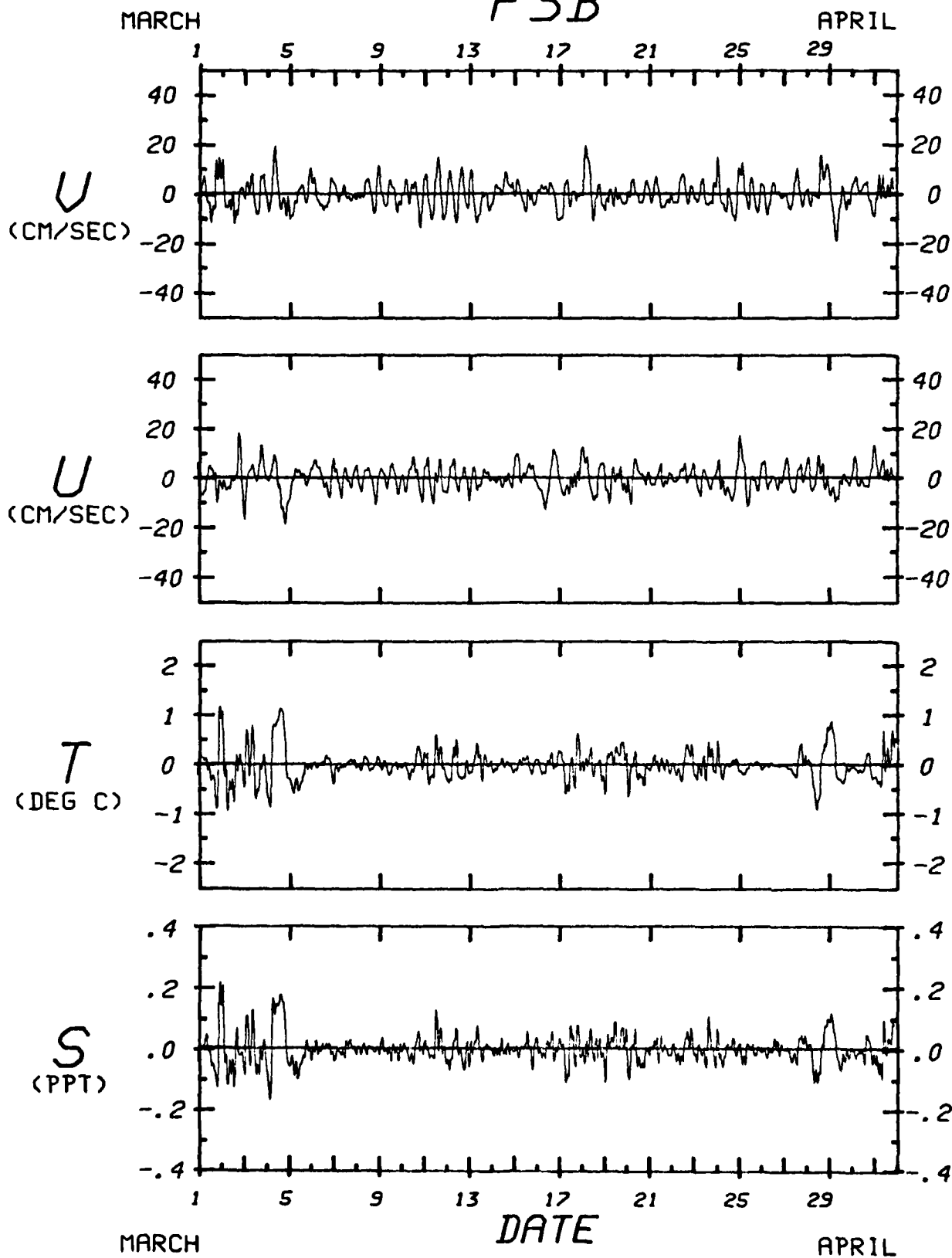
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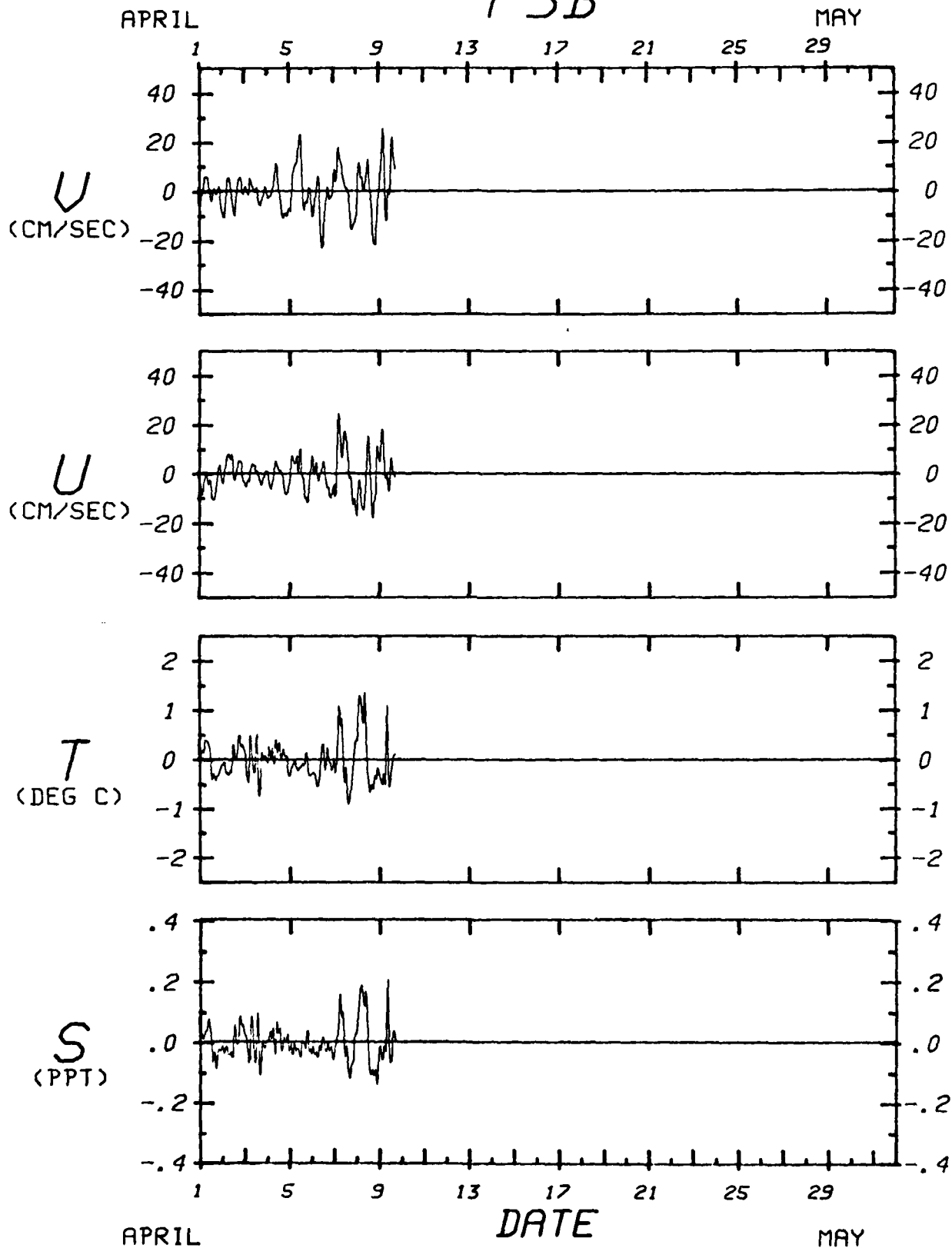
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THE GULF STREAM DEFLECTION AND MEANDER ENERGETICS
EXPERIMENT CURRENT METE. (U) NORTH CAROLINA UNIV AT
CHAPEL HILL J M BANE ET AL. DEC 83 CMS-83-2

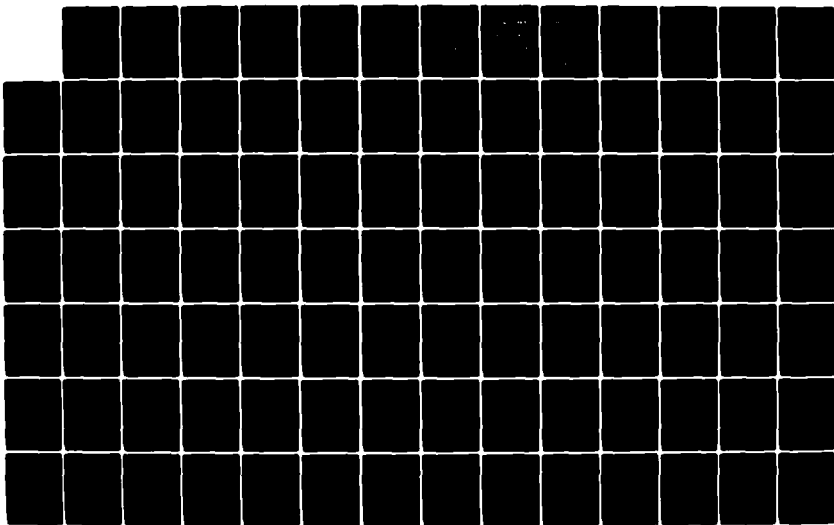
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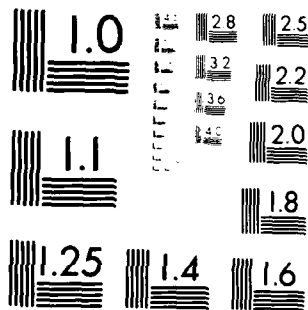
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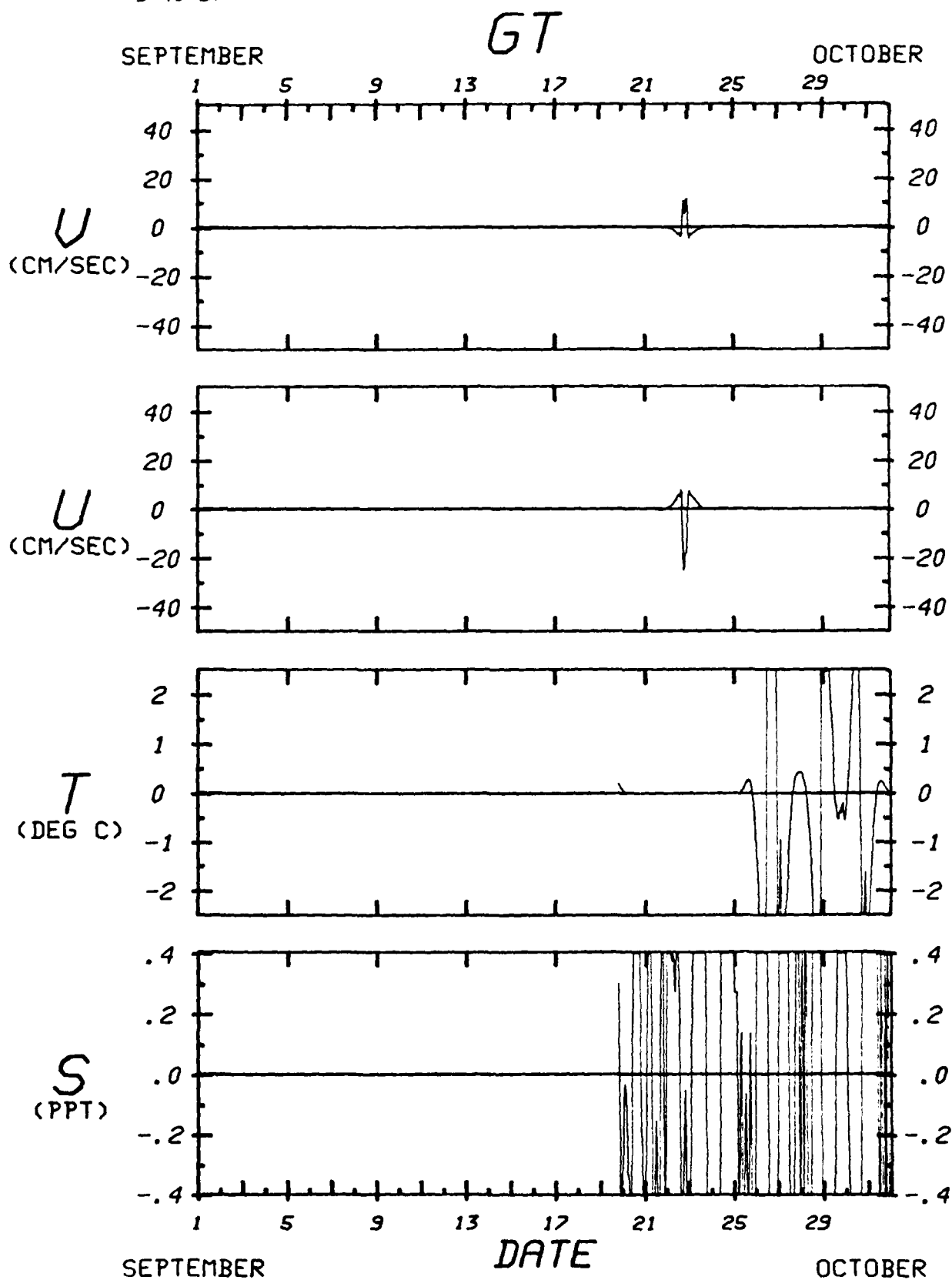
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

3-40 BP



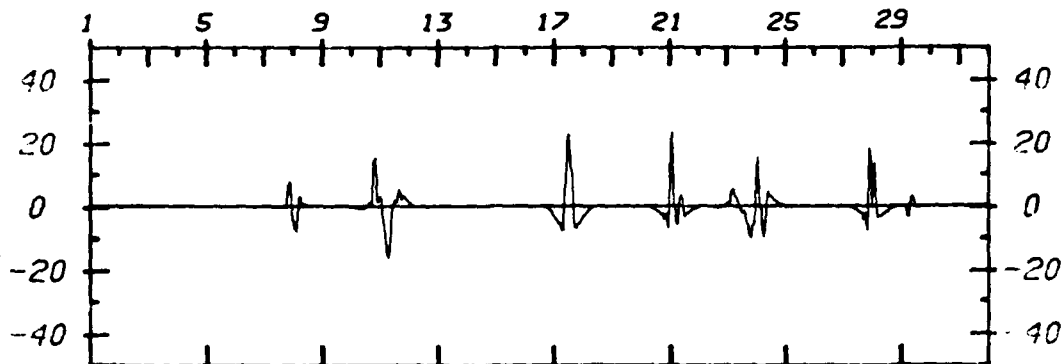
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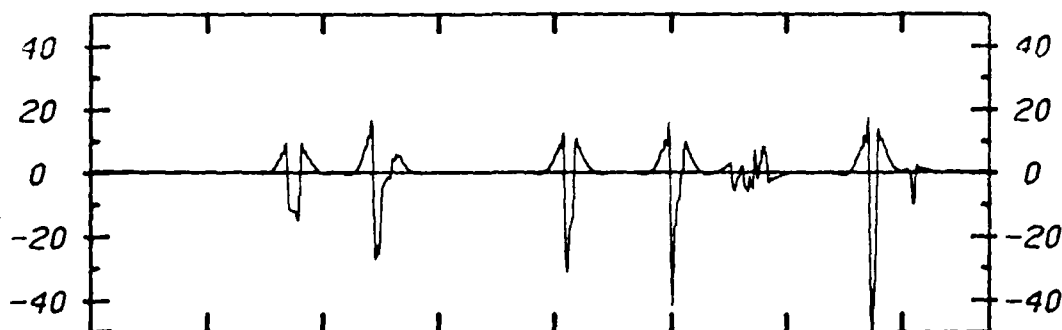
OCTOBER

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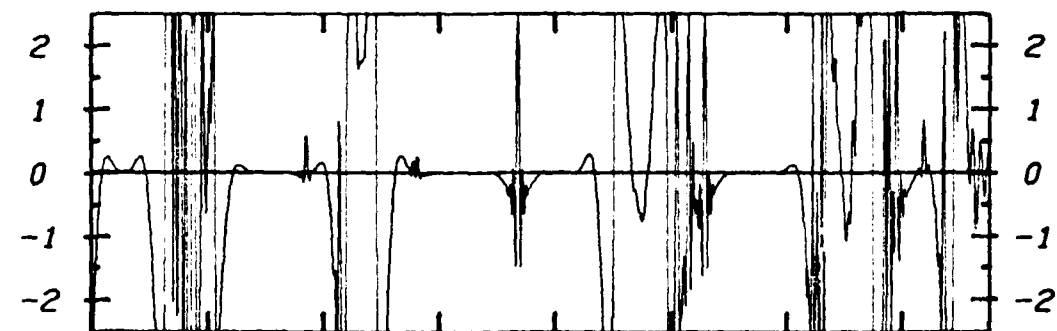
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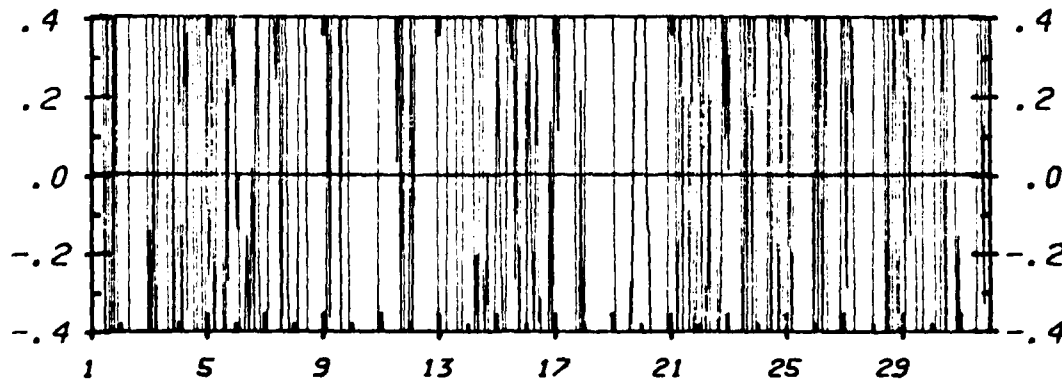
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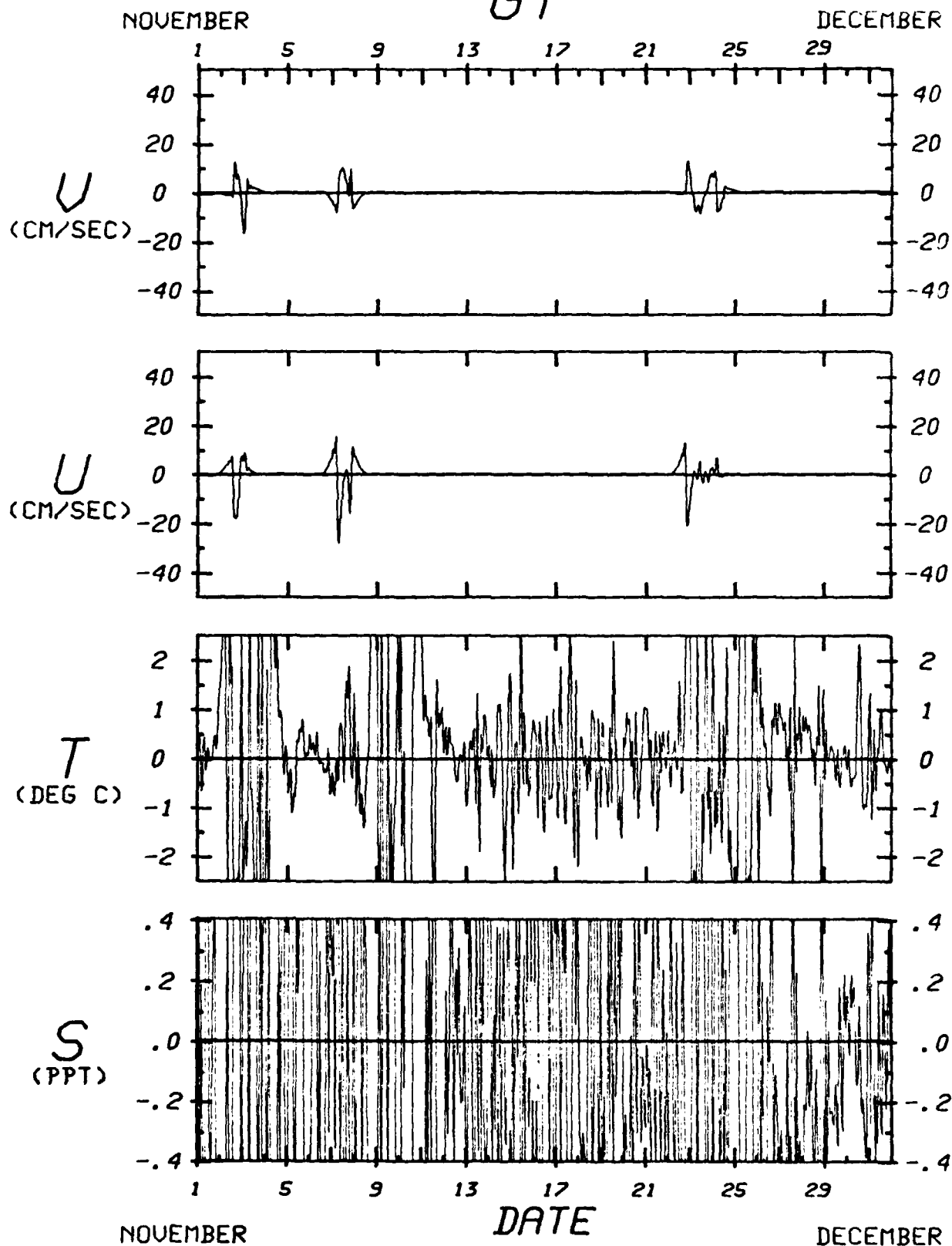
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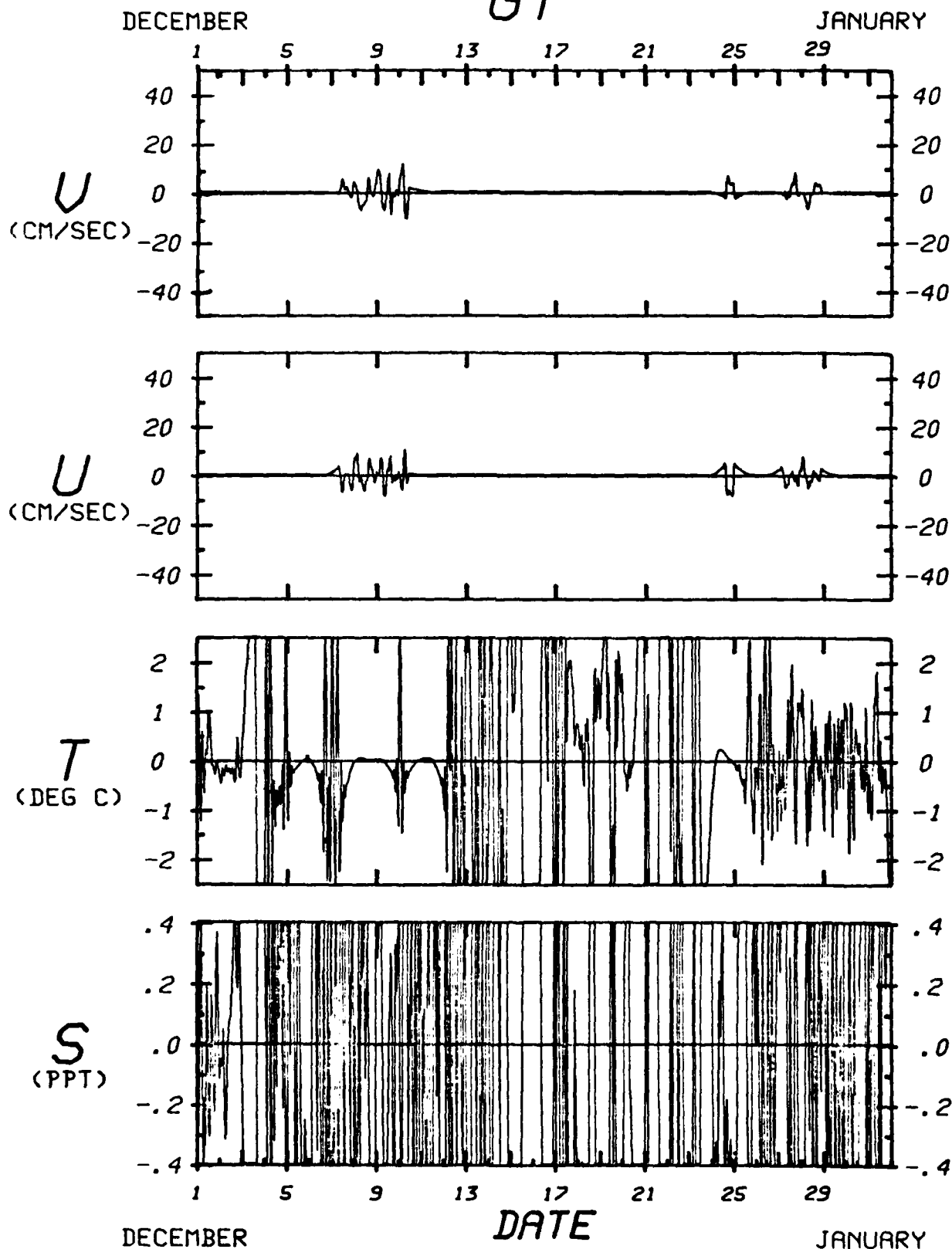
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3-40 BP

GT



3-40 BP

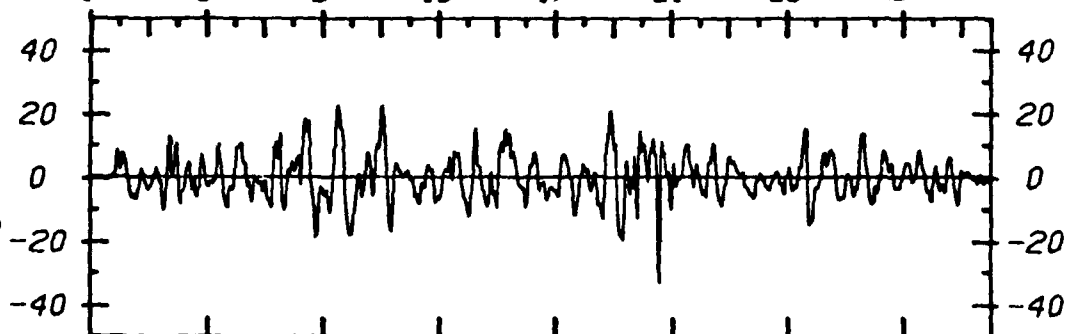
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JANUARY

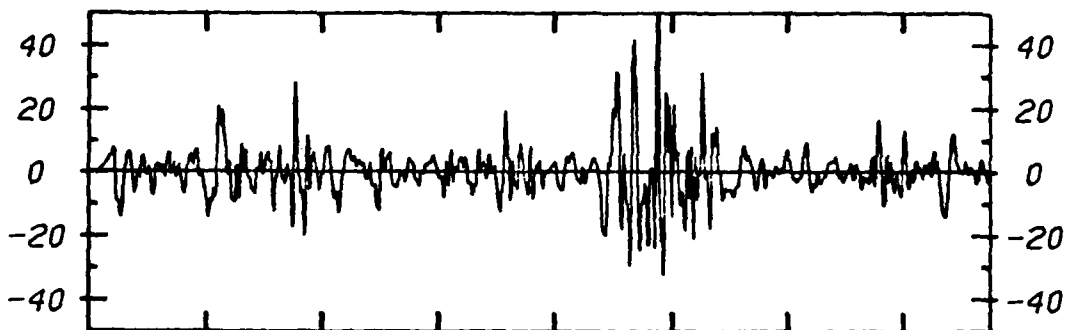
FEBRUARY

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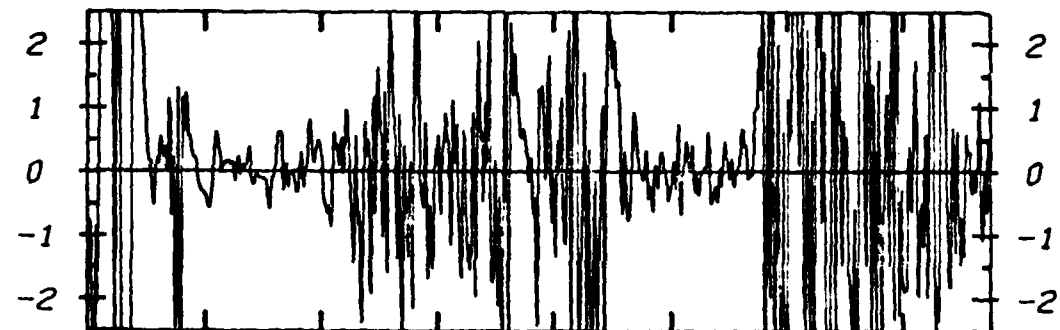
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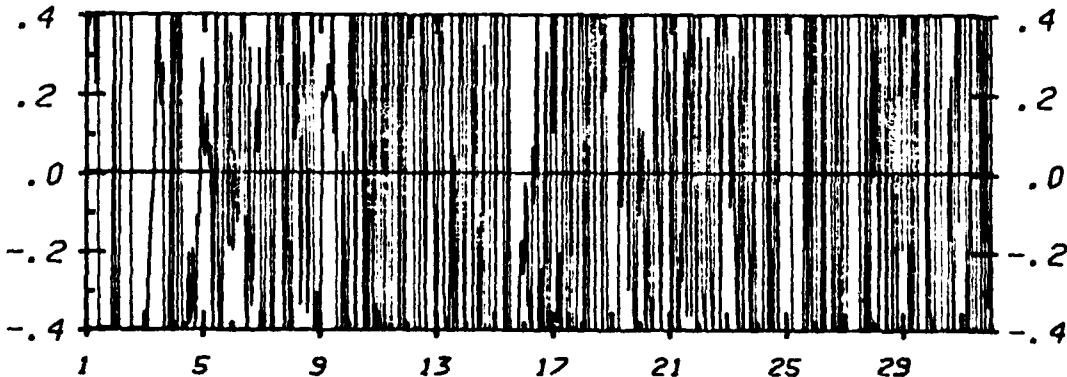
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(PPT)



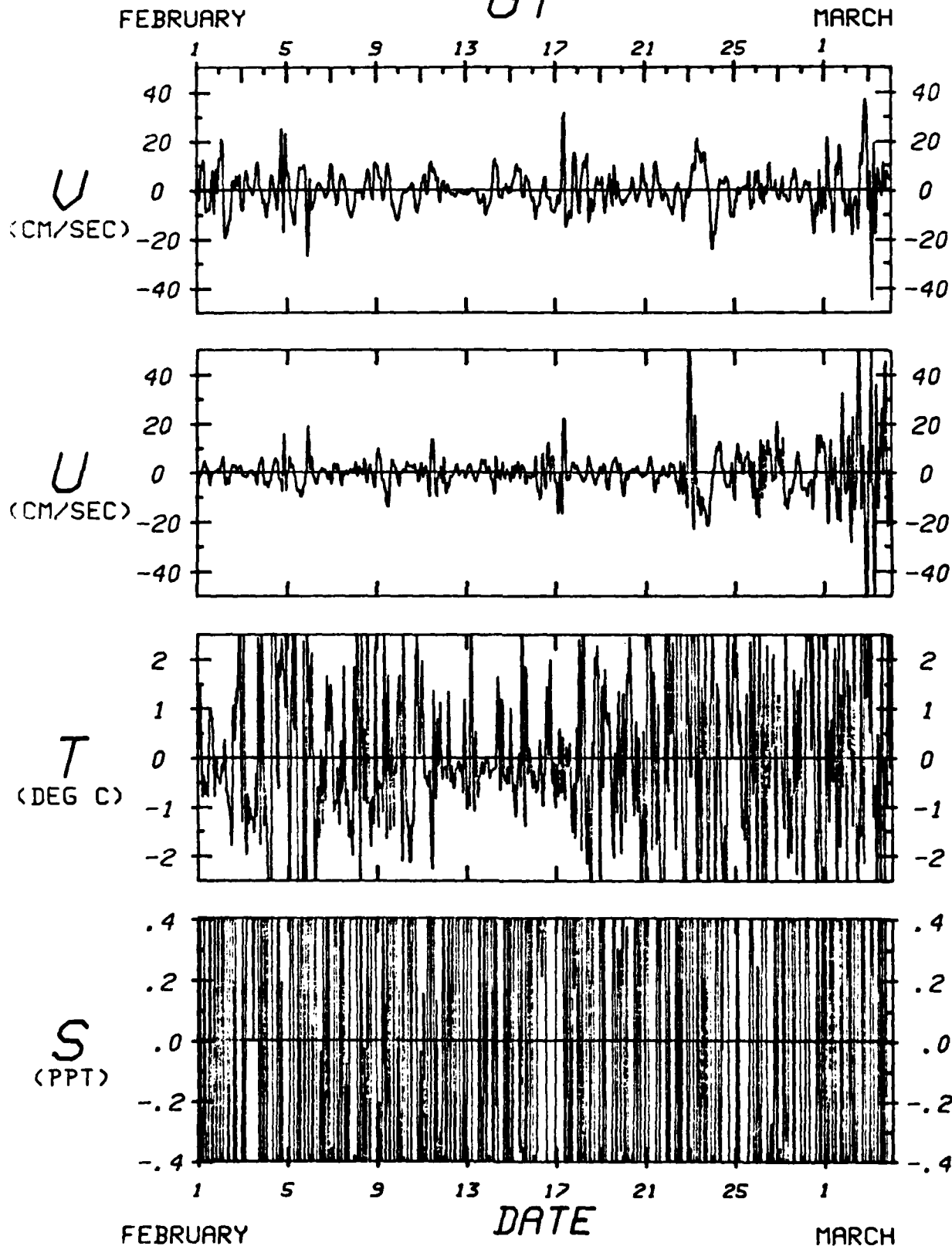
JANUARY

DATE

FEBRUARY

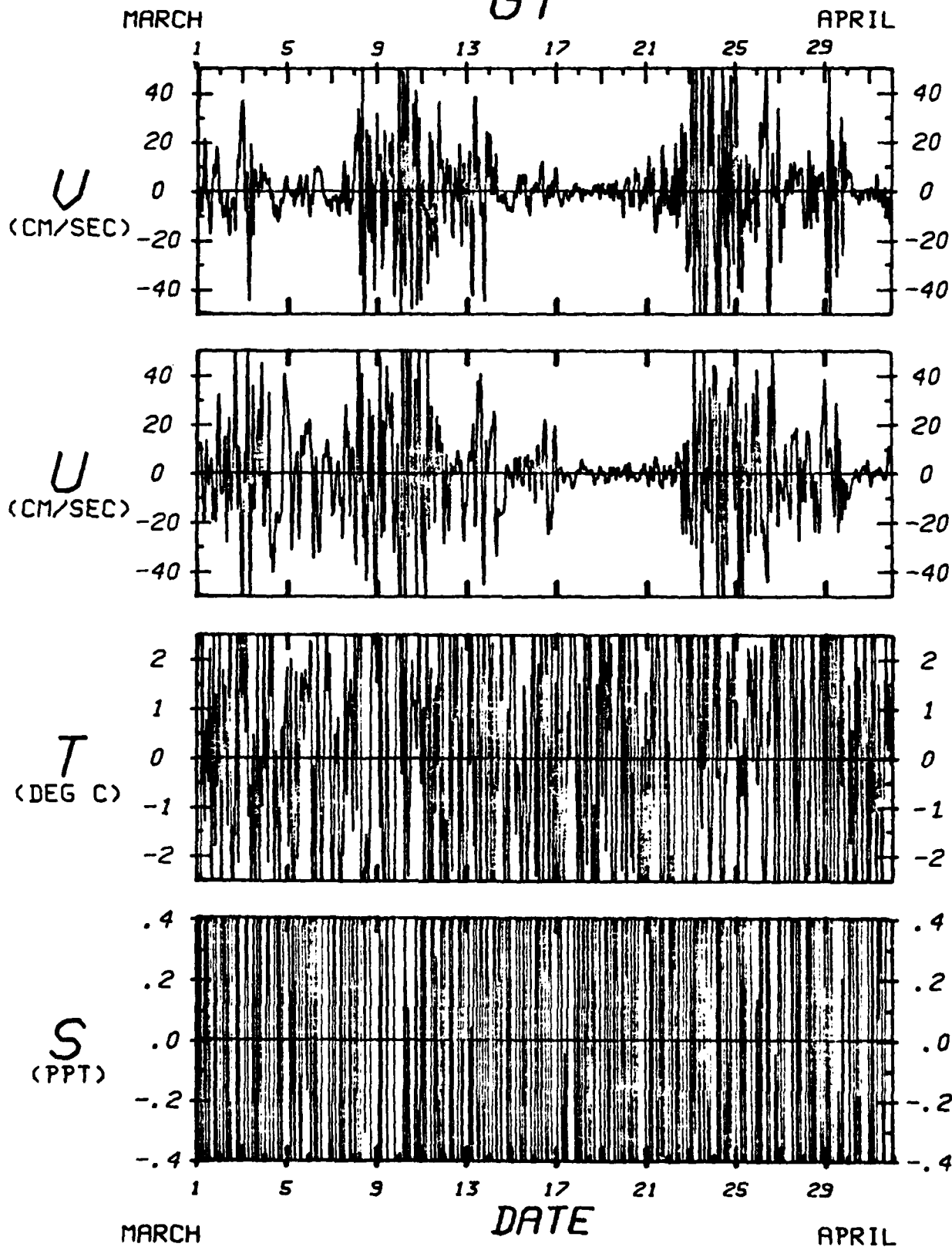
3-40 BP

GT



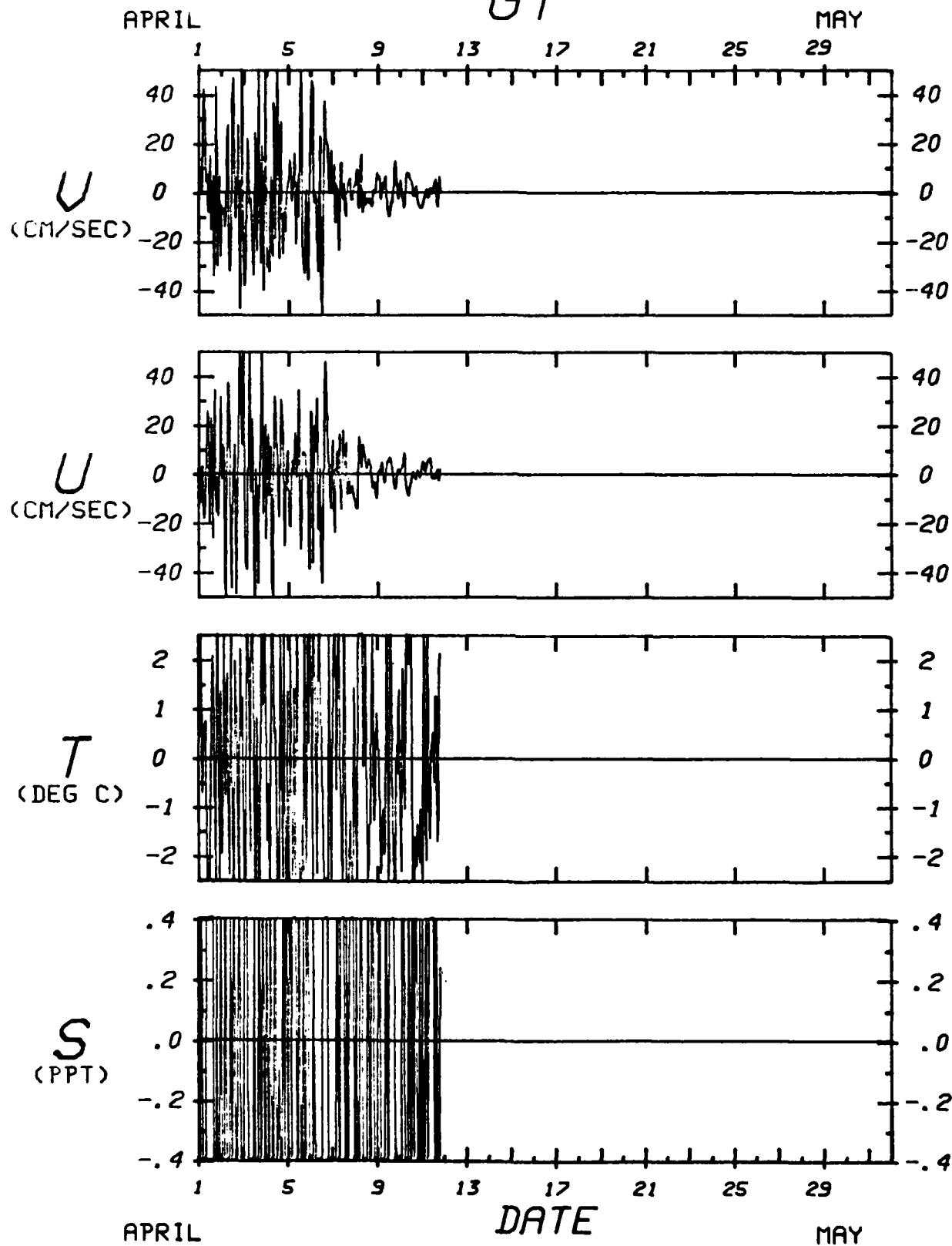
3-40 BP

GT



S-40 BP

GT



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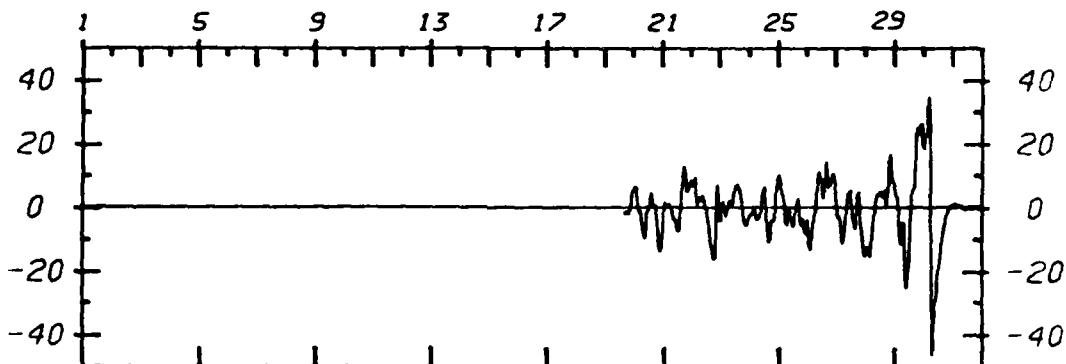
3-40 BP

GB

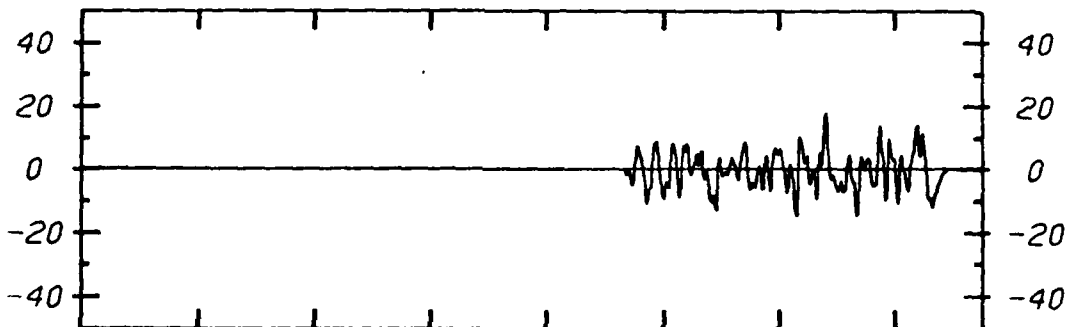
SEPTEMBER

OCTOBER

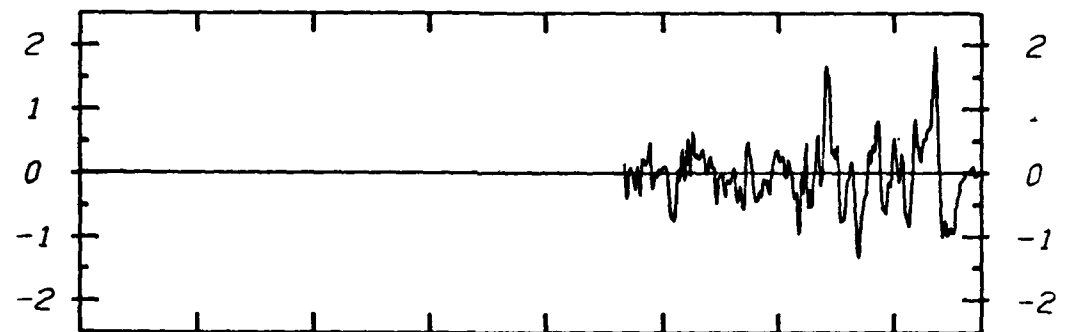
U
(CM/SEC)



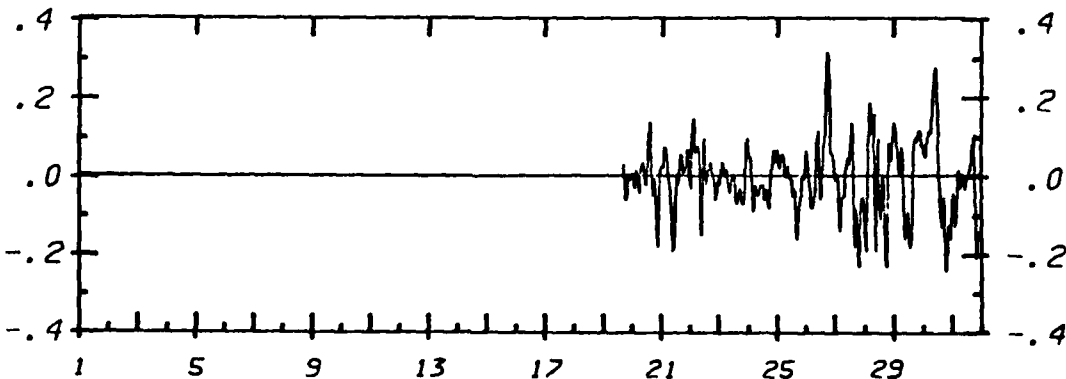
U
(CM/SEC)



T
(DEG C)



S
(PPT)



SEPTEMBER

DATE

OCTOBER

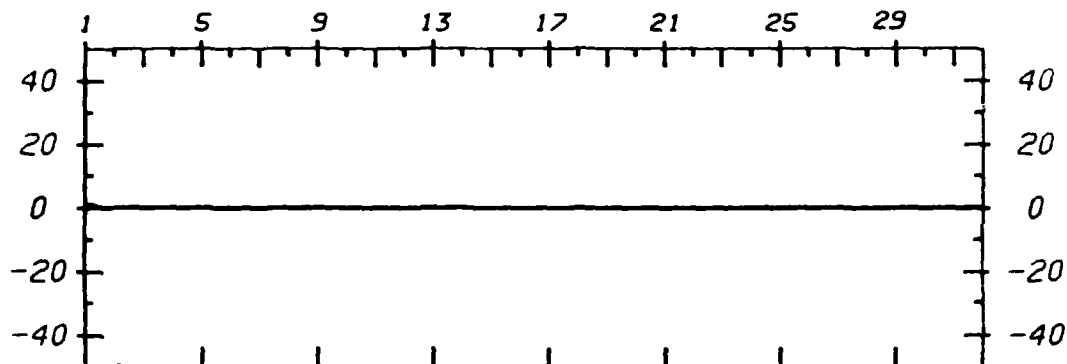
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GB

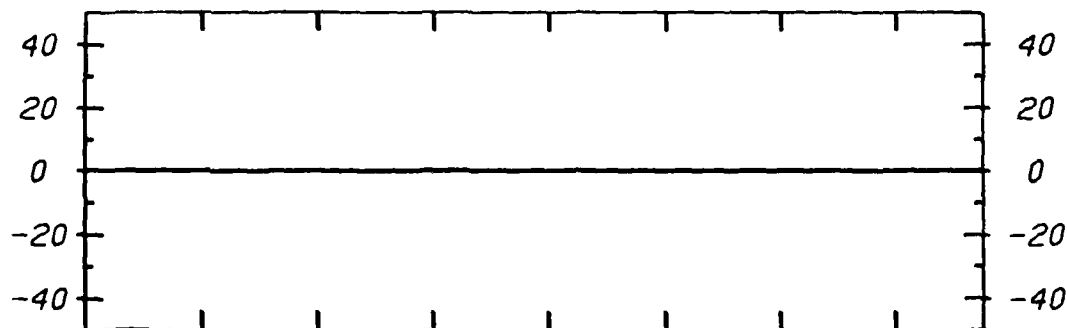
OCTOBER

NOVEMBER

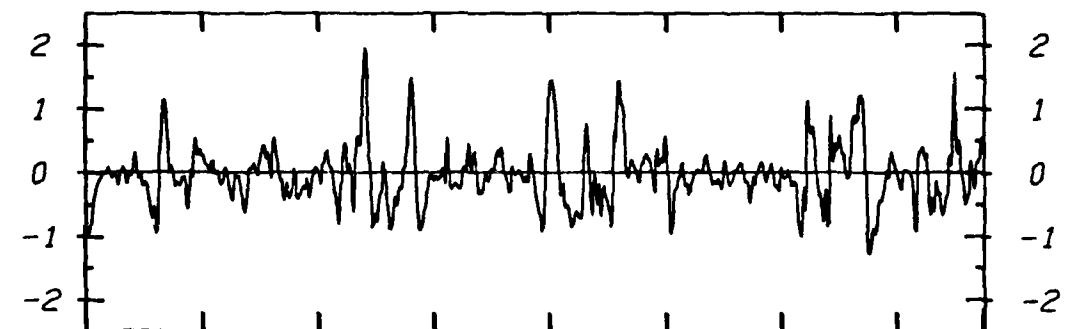
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(CM/SEC)



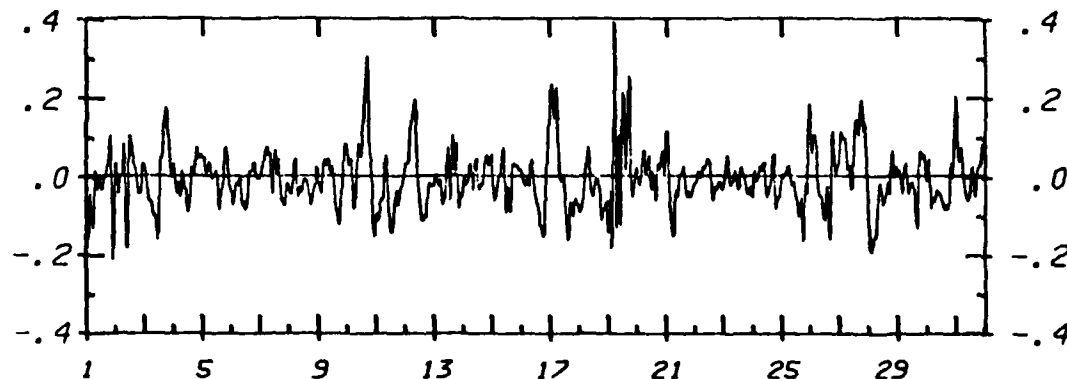
U
(CM/SEC)



T
(DEG C)



S
(PPT)



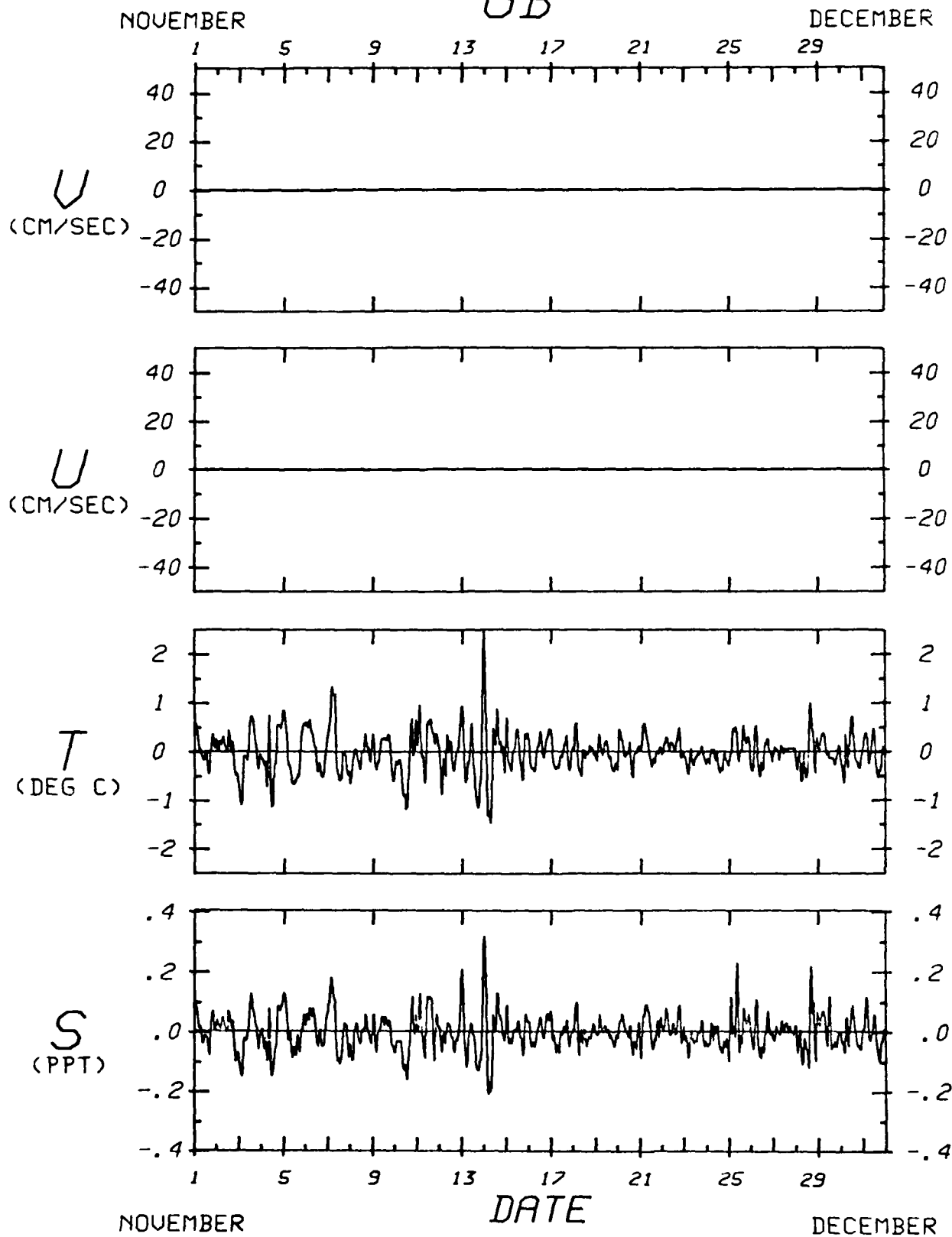
OCTOBER

DATE

NOVEMBER

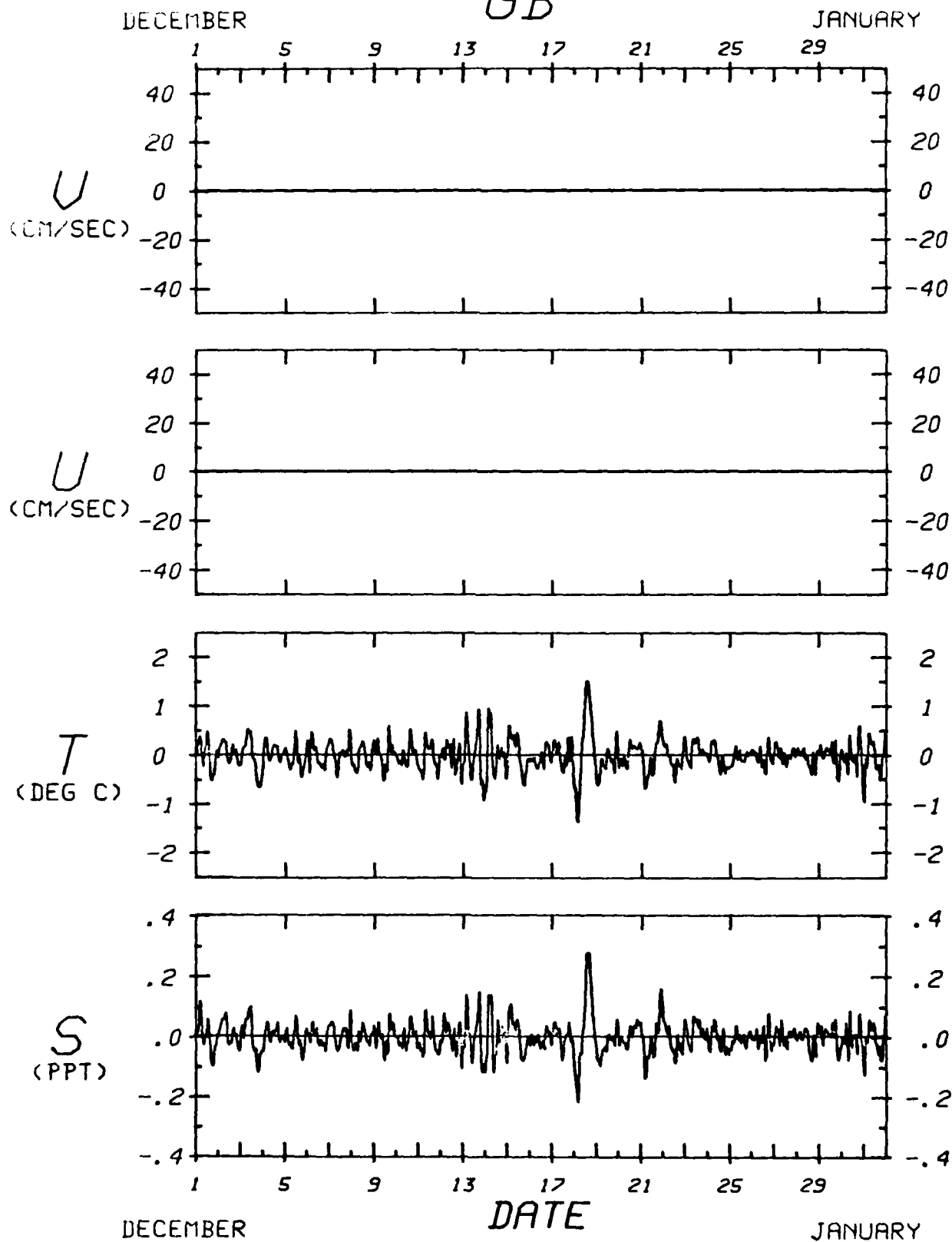
3-40 BP

GB



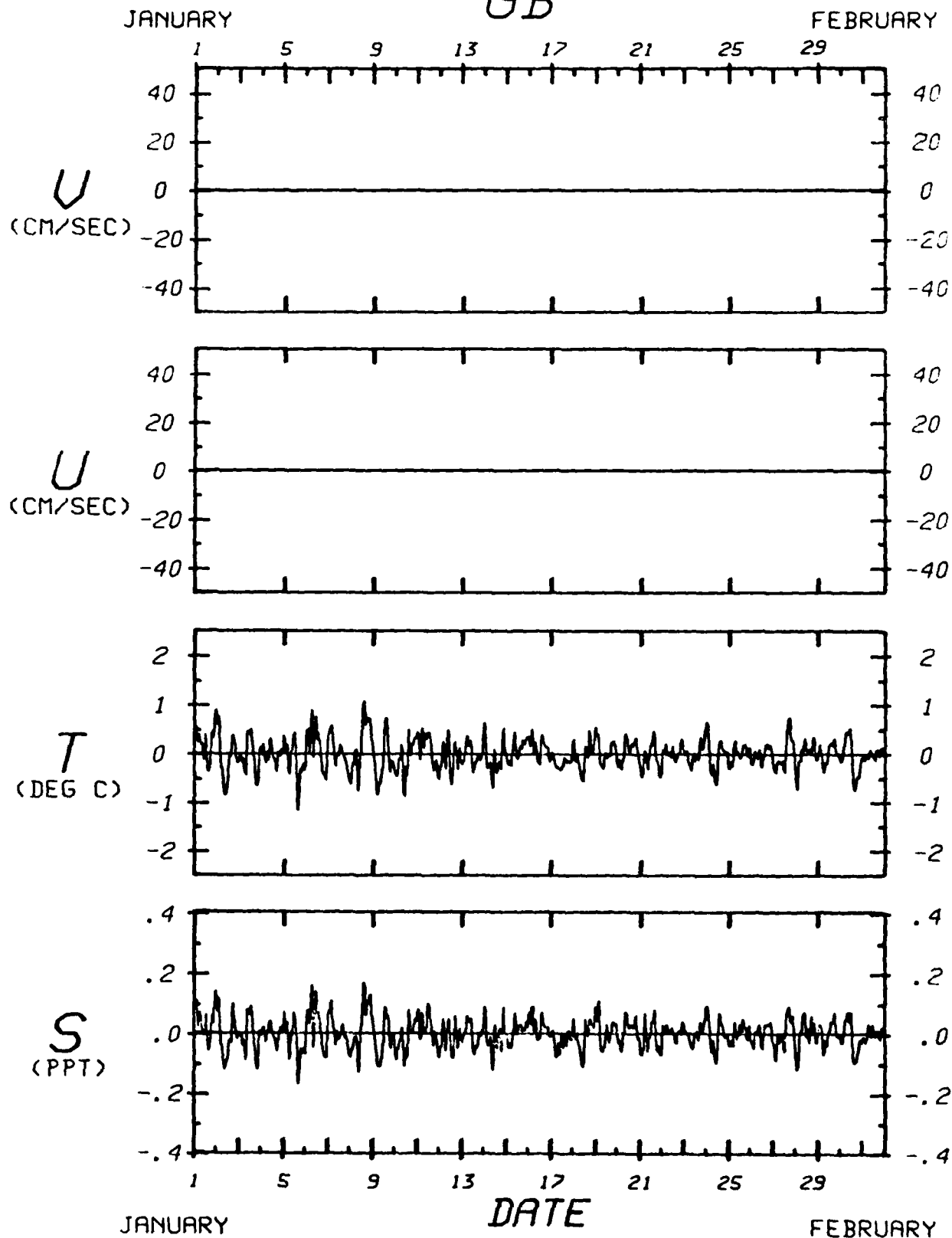
3-40 BP

GB

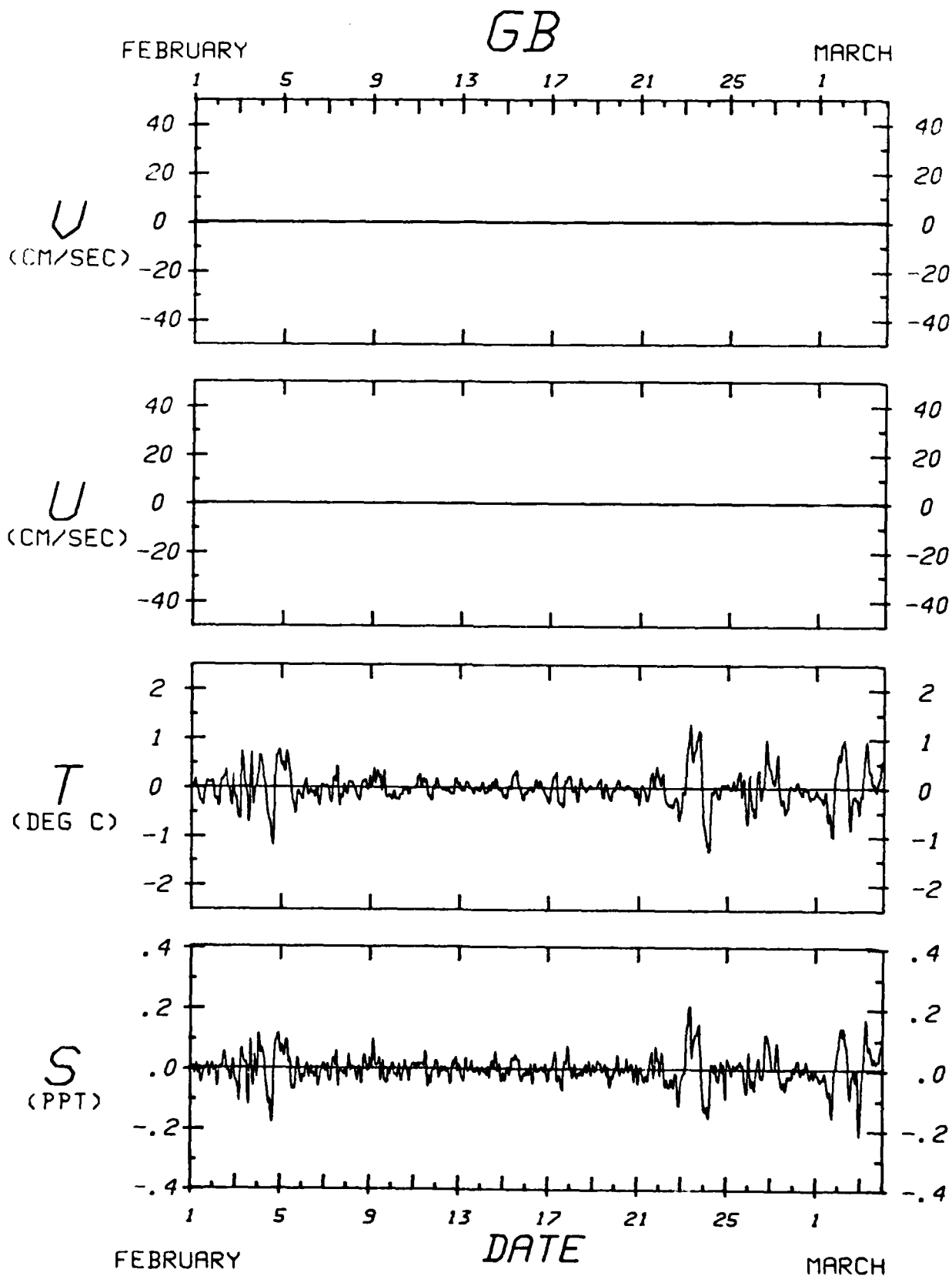


3-40 BP

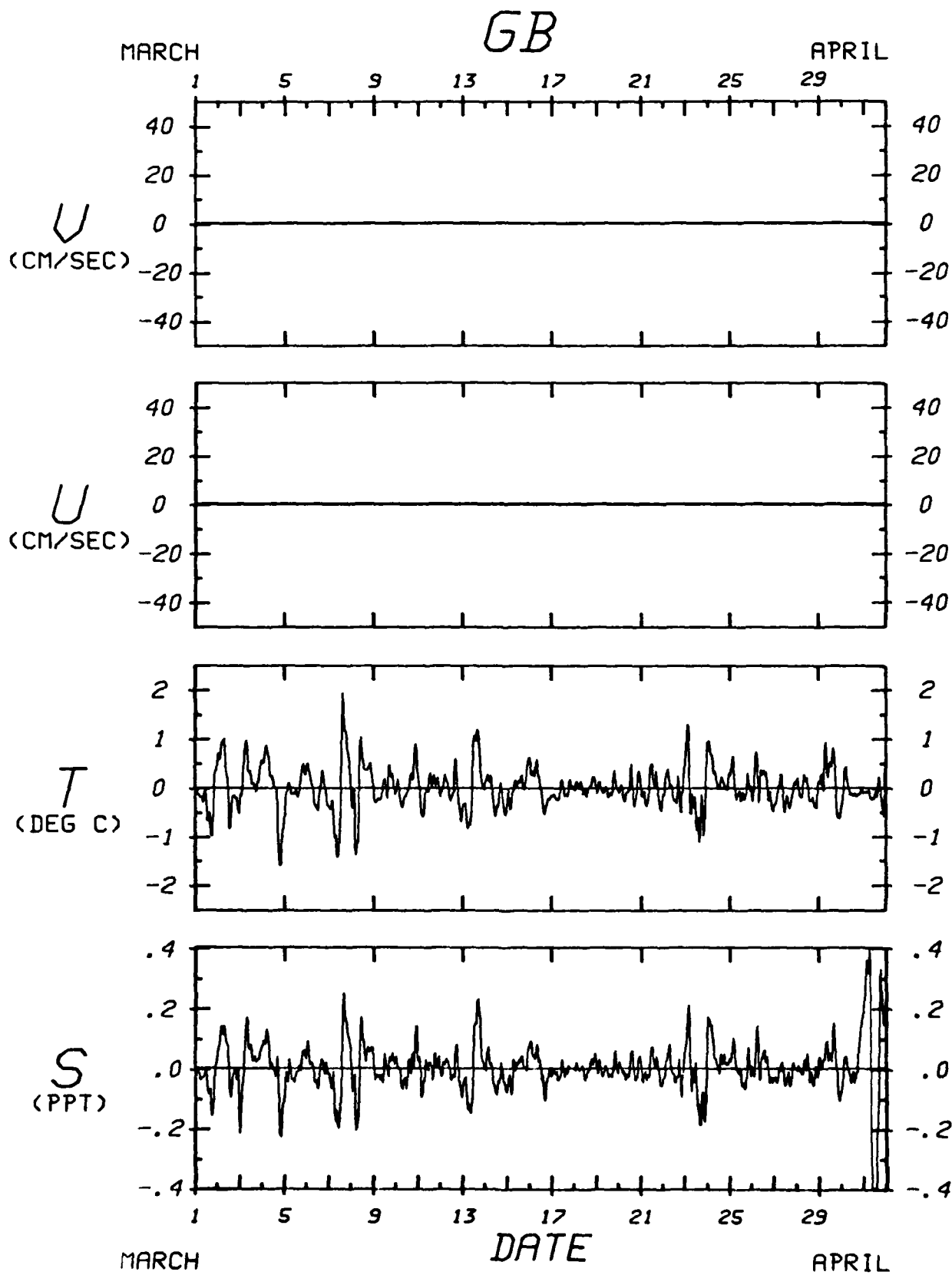
GB



3-40 BP

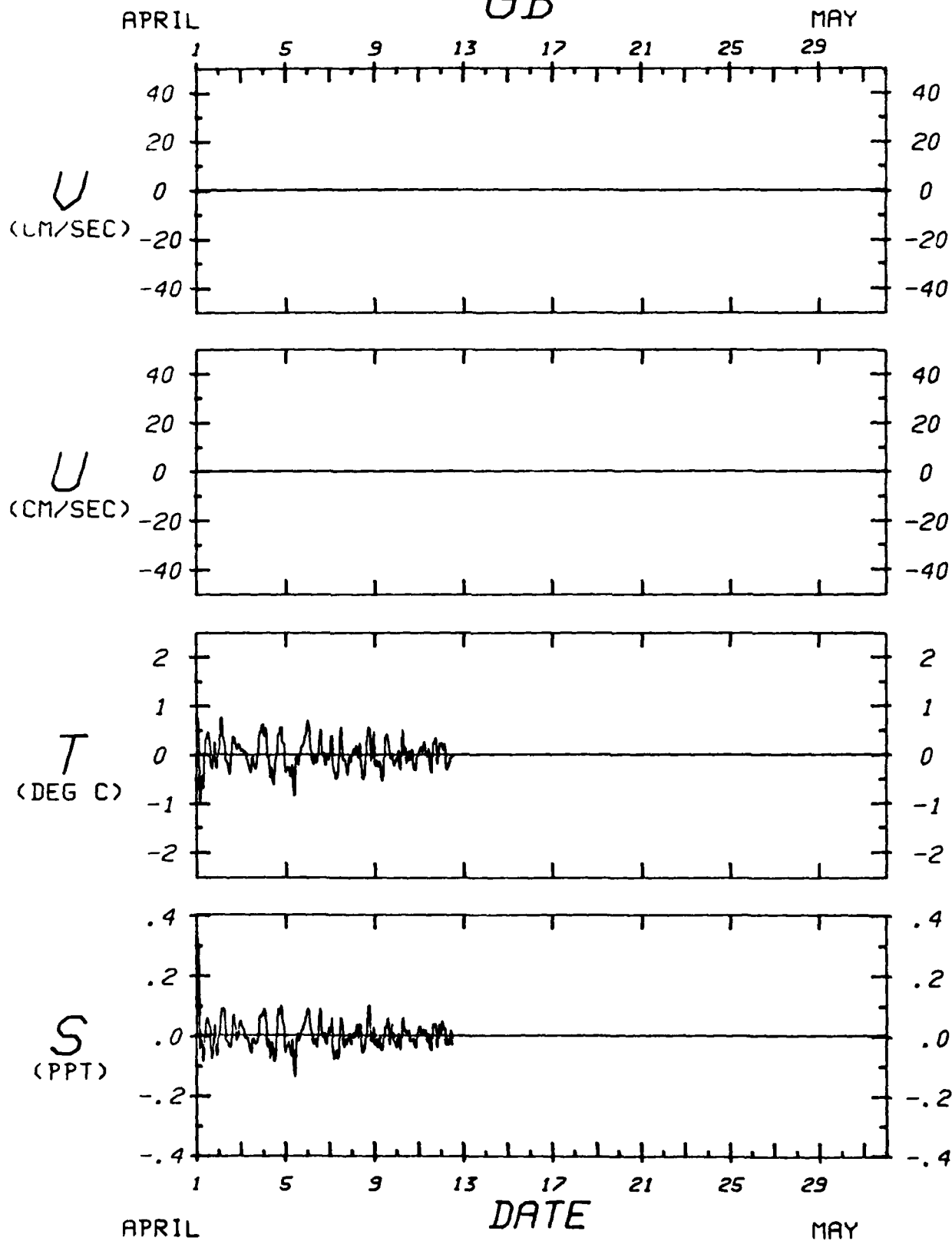


3-40 BP



3-40 BP

GB



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Section 5

40HRLP Mooring Data

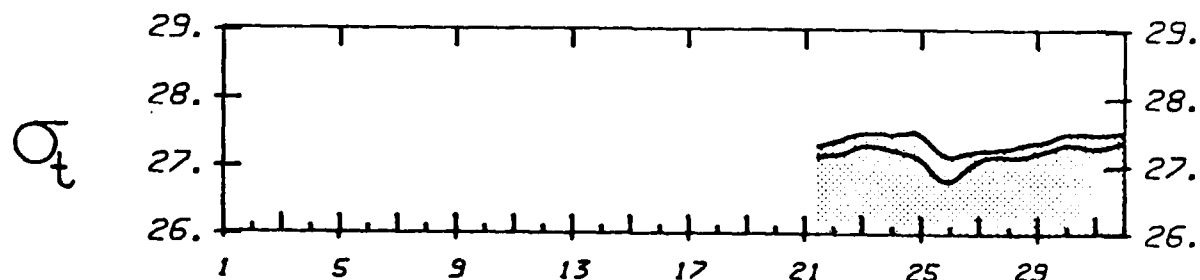
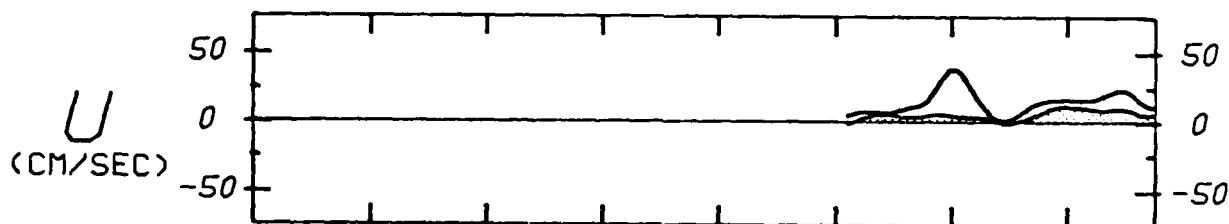
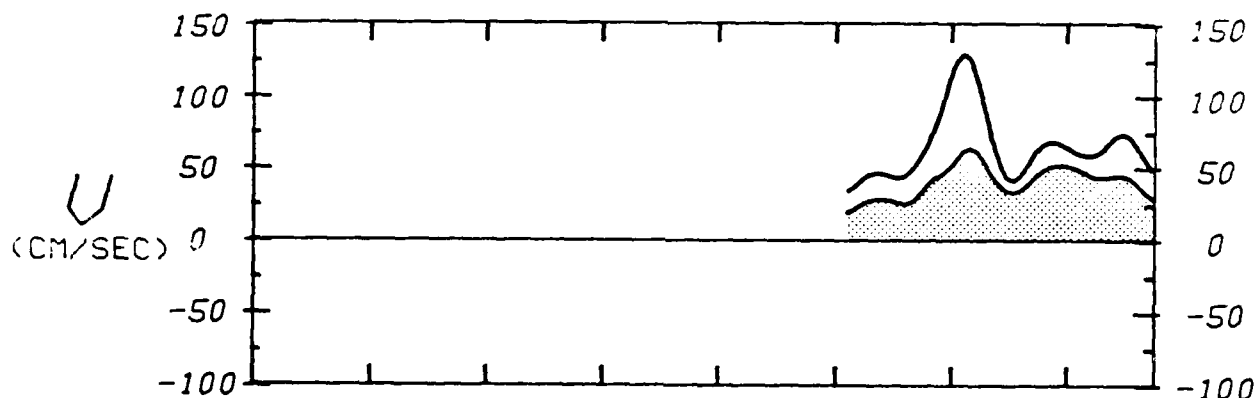
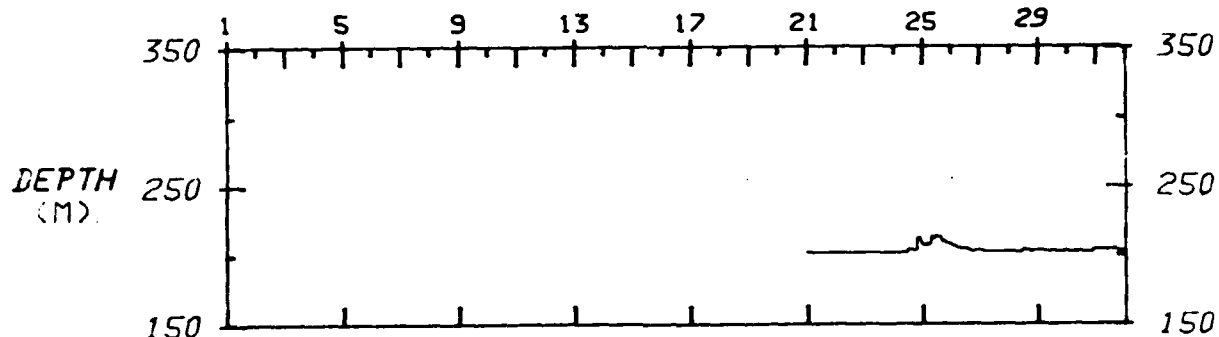
The 40 HRLP density (σ_t) and velocity data from each mooring are presented in a monthly format along with the pressure data from the mooring 'Top' current meter. The data from the 'Top' and 'Bottom' instrument are superimposed, with the 'Bottom' data indicated by stippling. The same scaling has been used on all plots, although different ranges for σ_t were employed for some meters. Conductivity was computed from the internally recorded data using coefficients supplied by Aanderaa. The conductivity sensor on E2B was, however, apparently biased, and when the measurements were converted to salinity consistently returned values which were .5⁰/oo too low. The σ_t values presented for E2B are thus too high, which accounts for the occasional reversal in density at E2. The error appears to be systematic however, so fluctuation of σ_t about its mean should be well represented.

E1T
E1B

40 HRLP DATA FROM MOORING: E1

SEPTEMBER

OCTOBER



SEPTEMBER

DATE

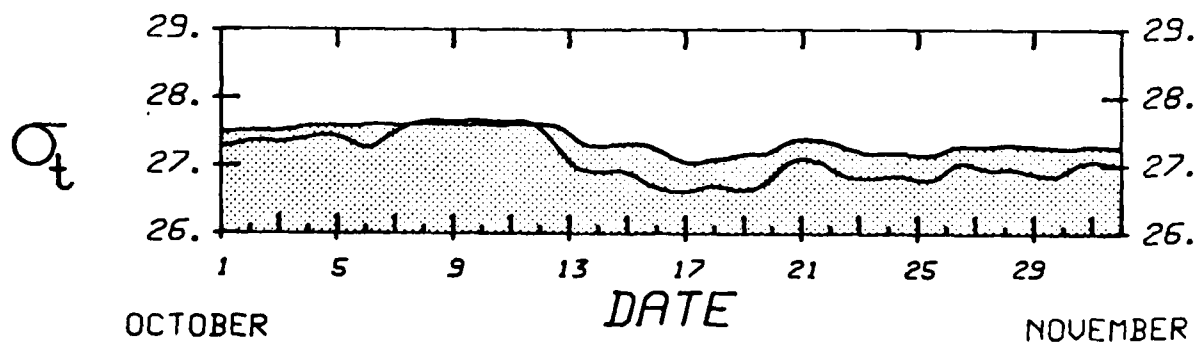
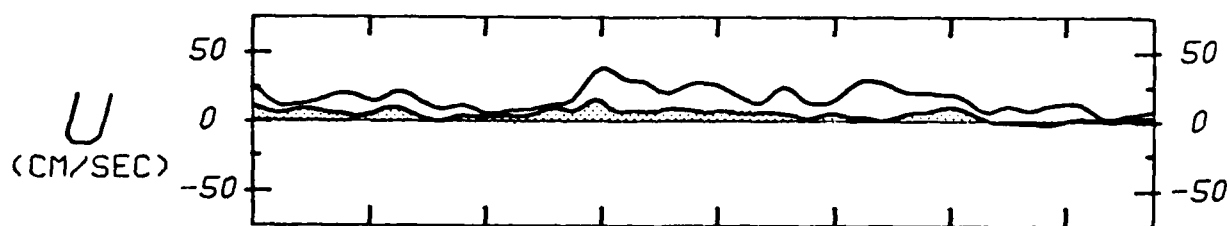
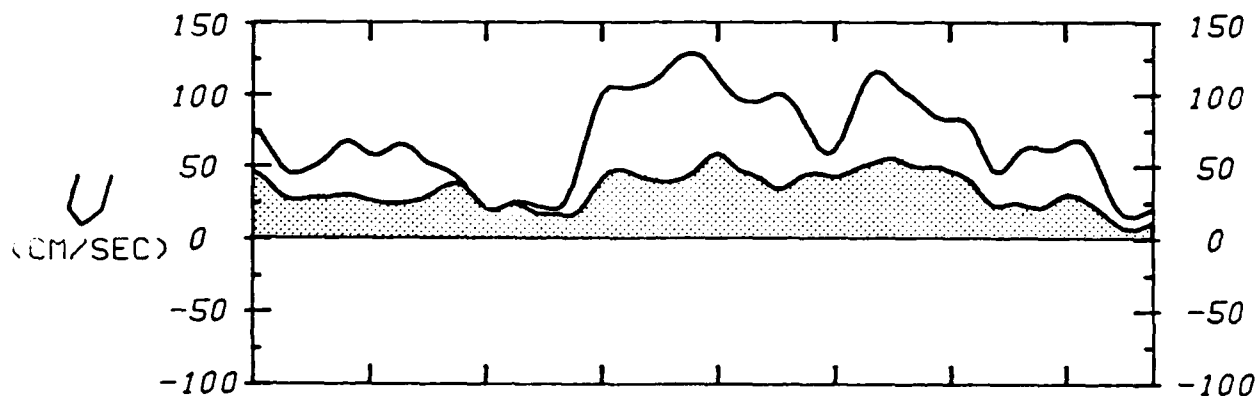
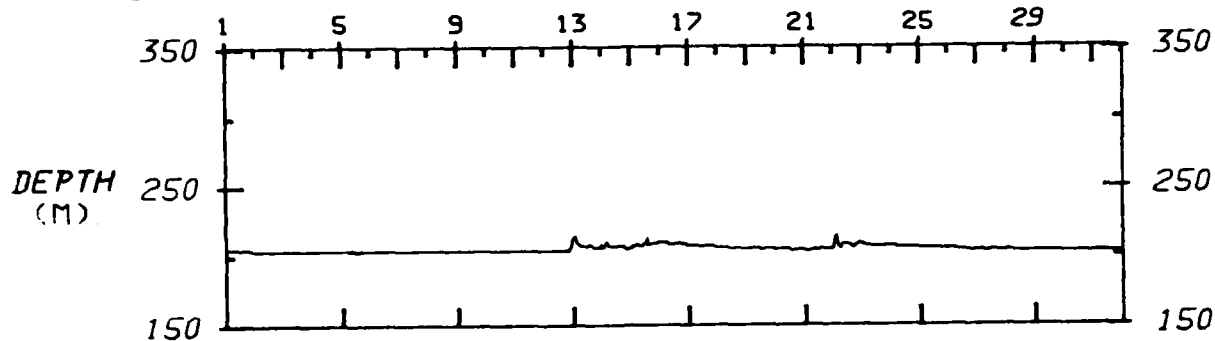
OCTOBER

E1T
E1B

40 HRLP DATA FROM MOORING: E1

OCTOBER

NOVEMBER

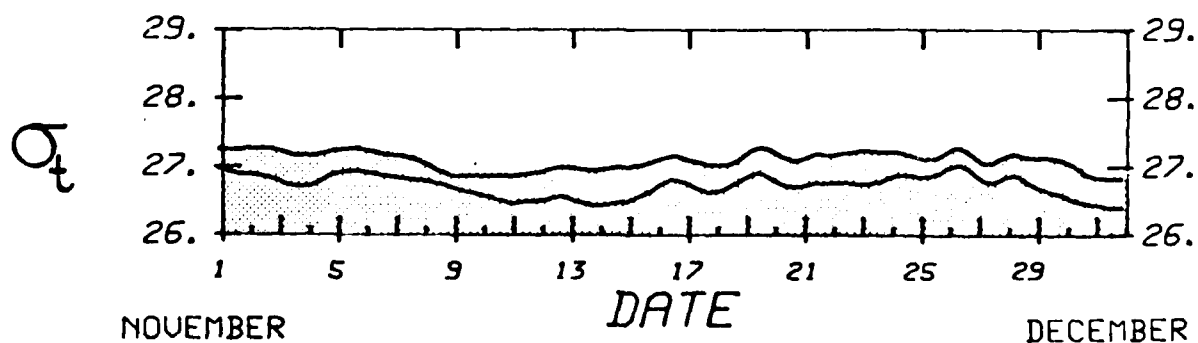
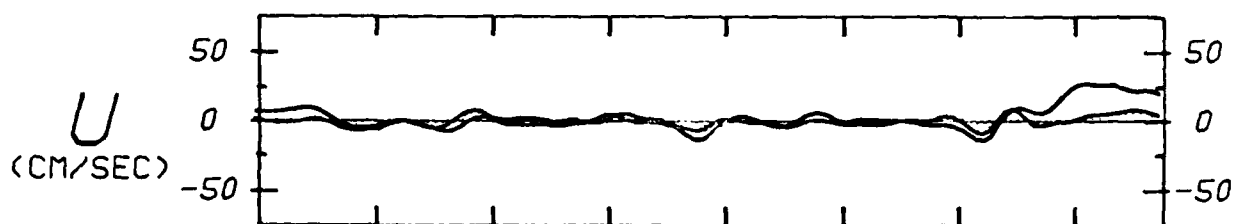
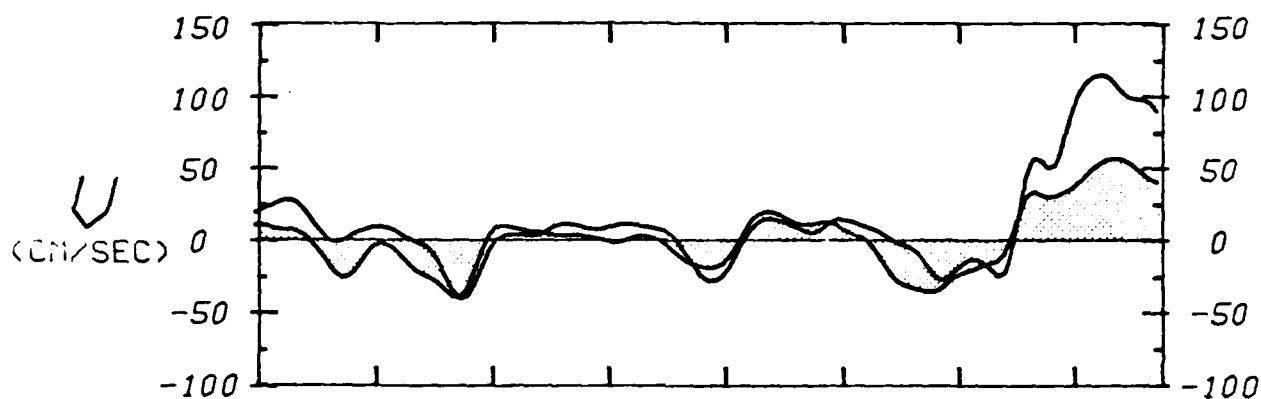
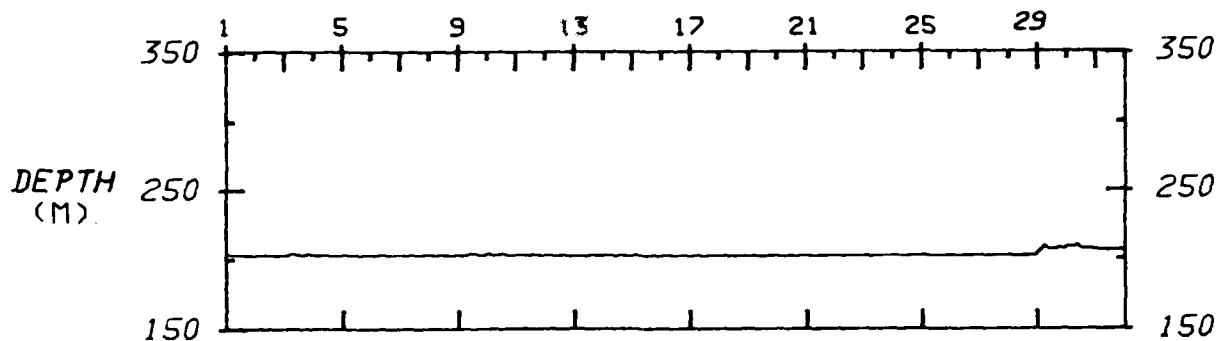


E1T
E1B

40 HRLP DATA FROM MOORING: E1

NOVEMBER

DECEMBER



NOVEMBER

DATE

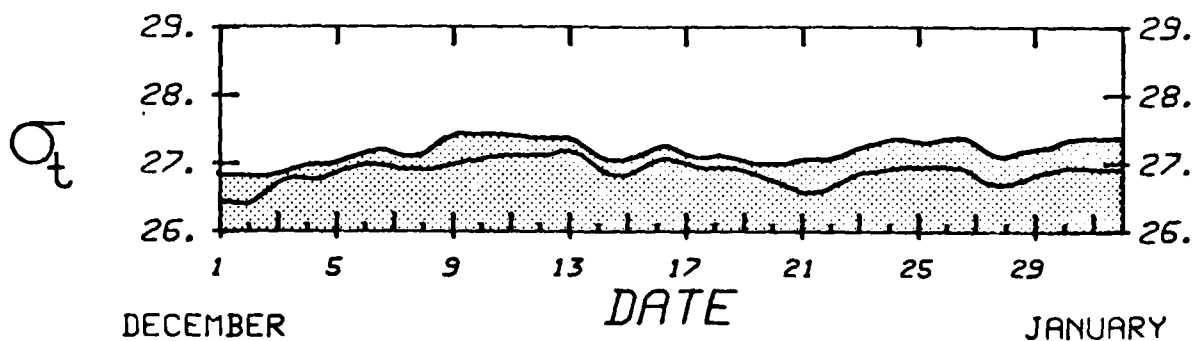
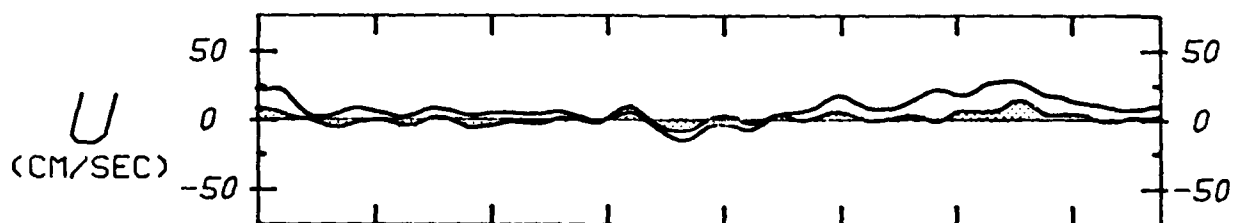
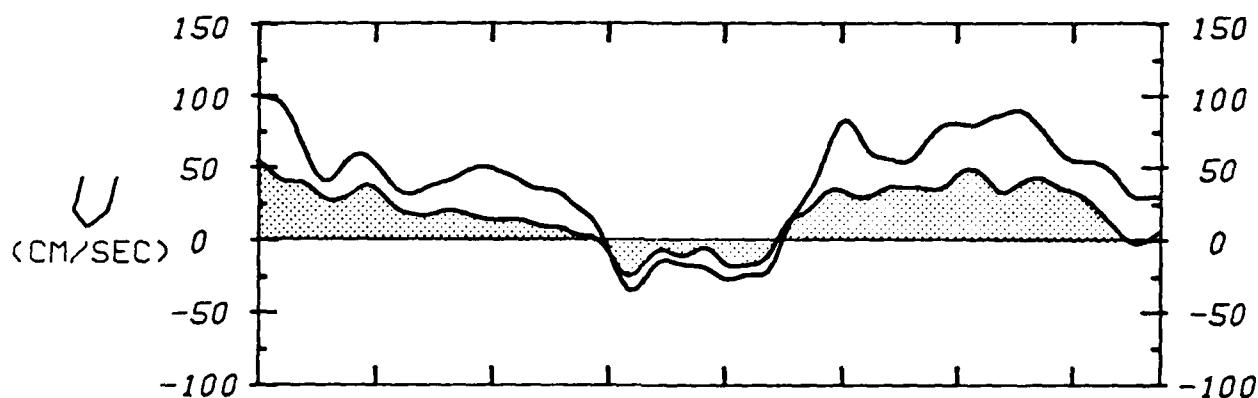
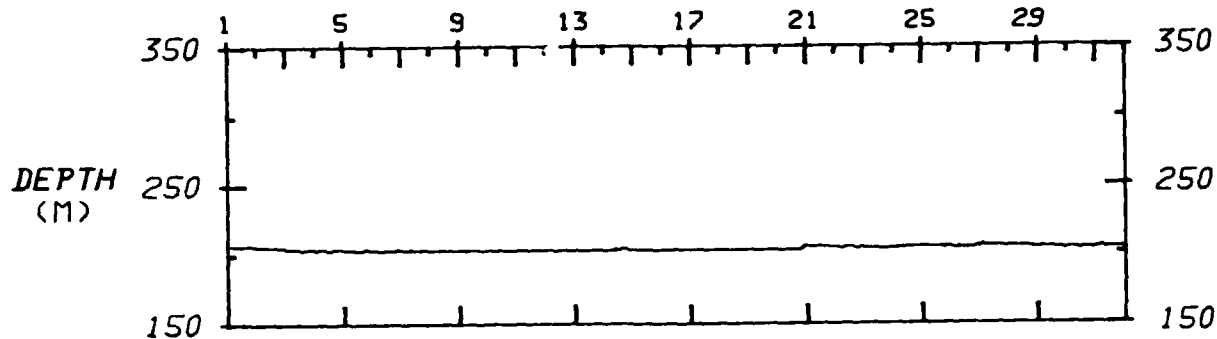
DECEMBER

E1T
E1B

40 HRLP DATA FROM MOORING: E1

DECEMBER

JANUARY

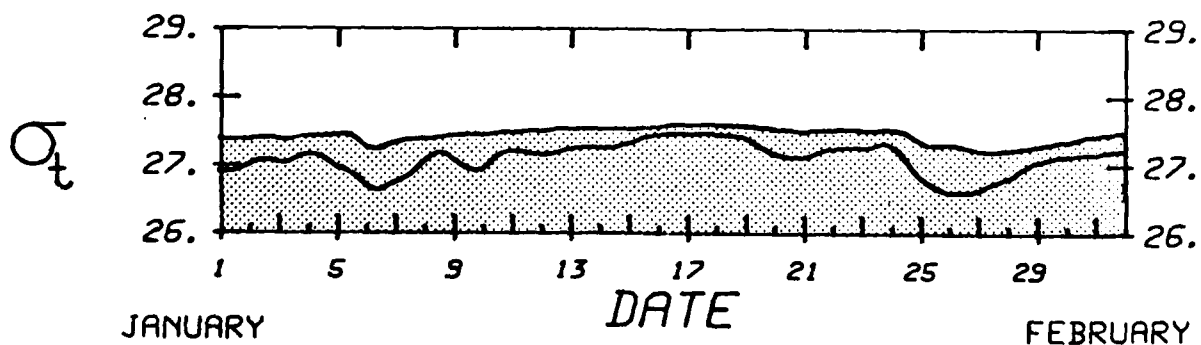
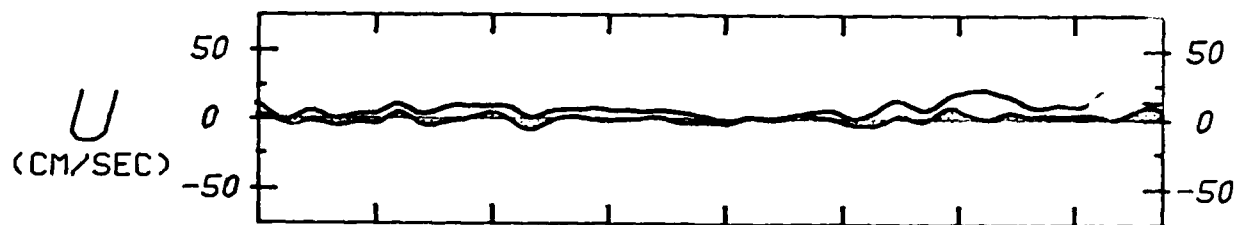
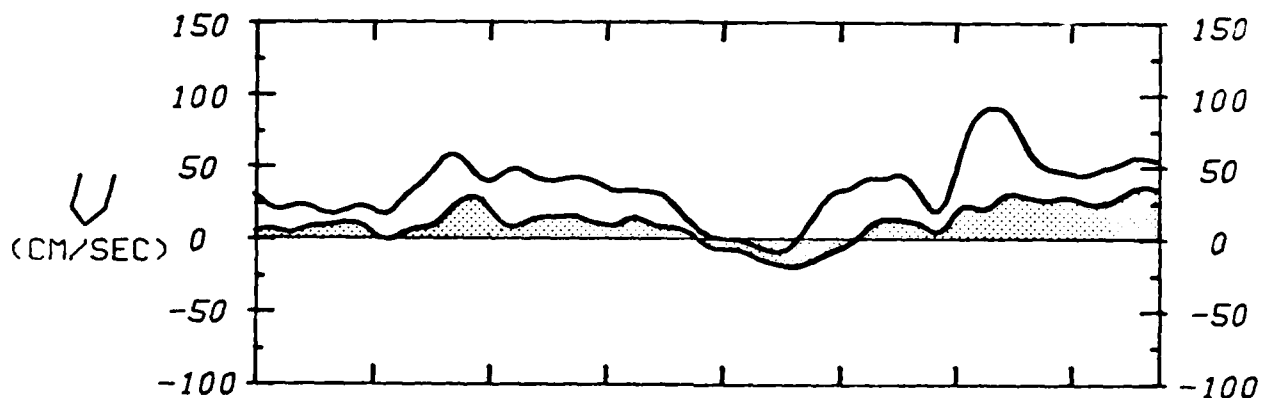
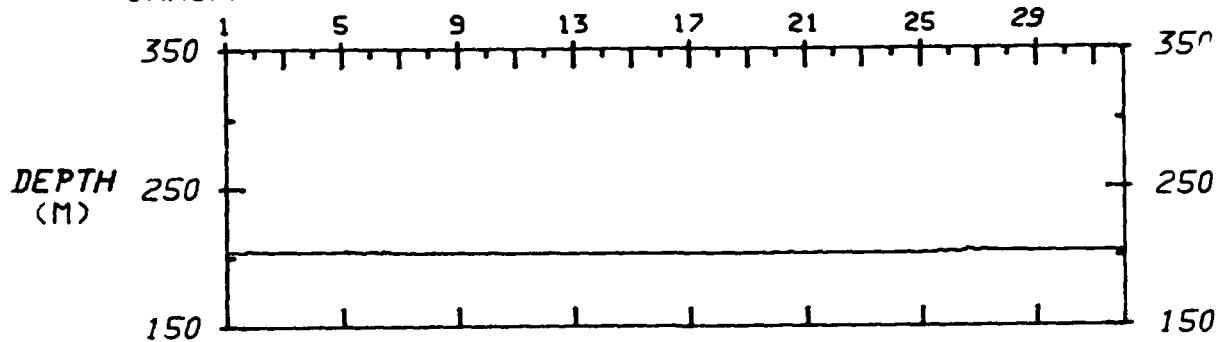


E1T
E1B

40 HRLP DATA FROM MOORING: E1

JANUARY

FEBRUARY

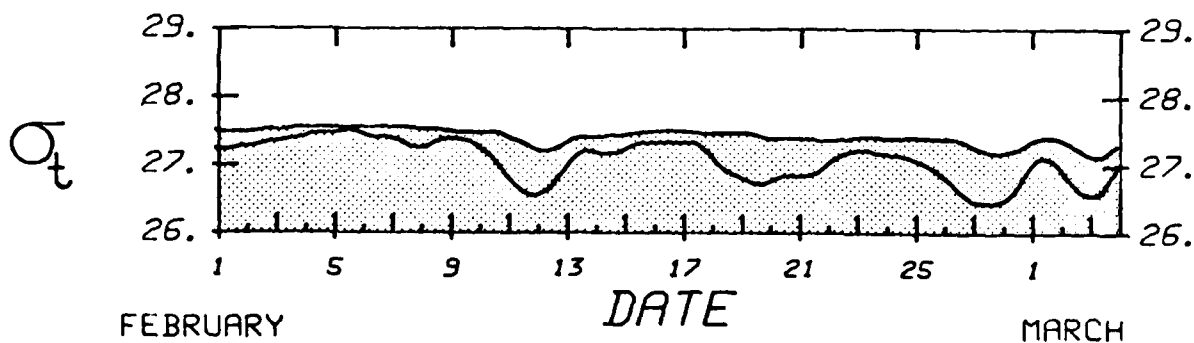
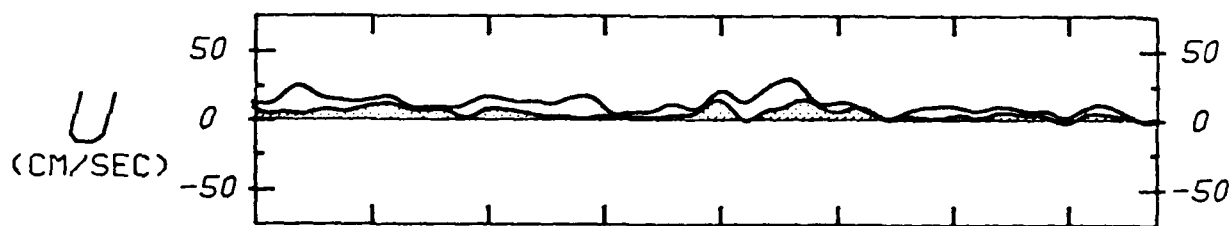
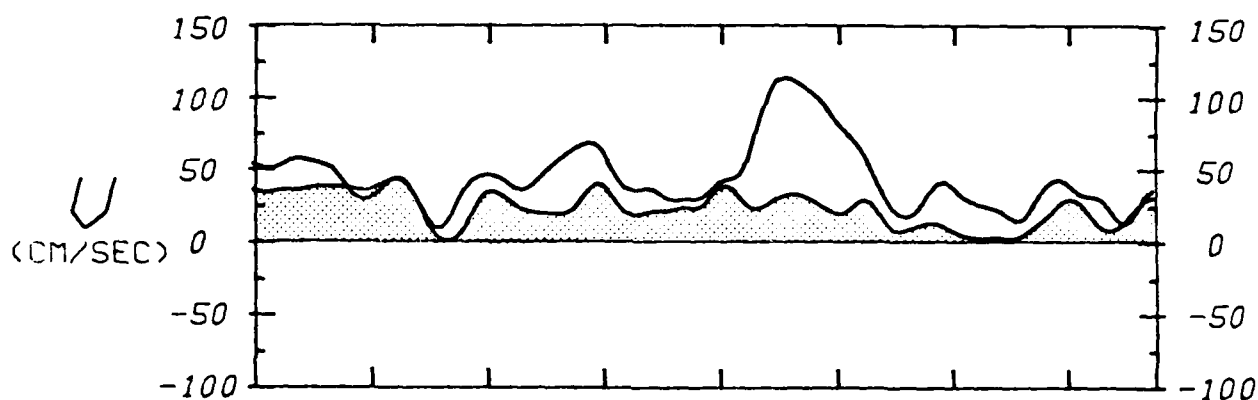
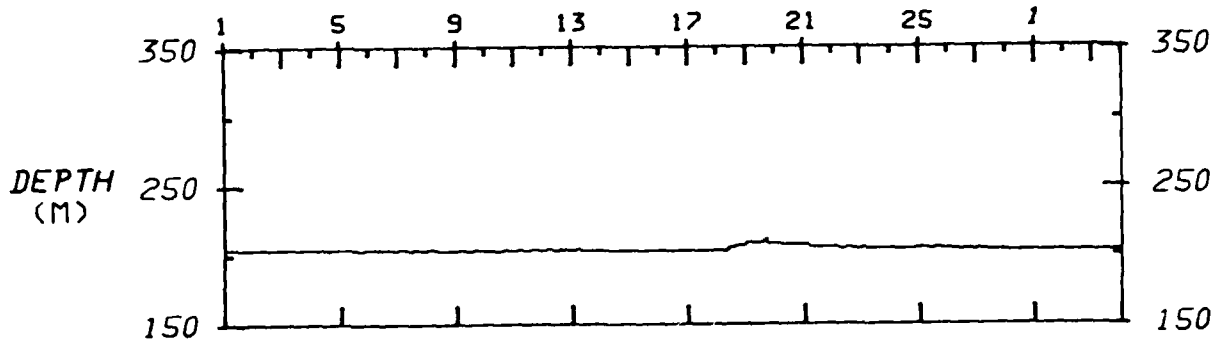


E1T ———
E1B ·····

40 HRLP DATA FROM MOORING: E1

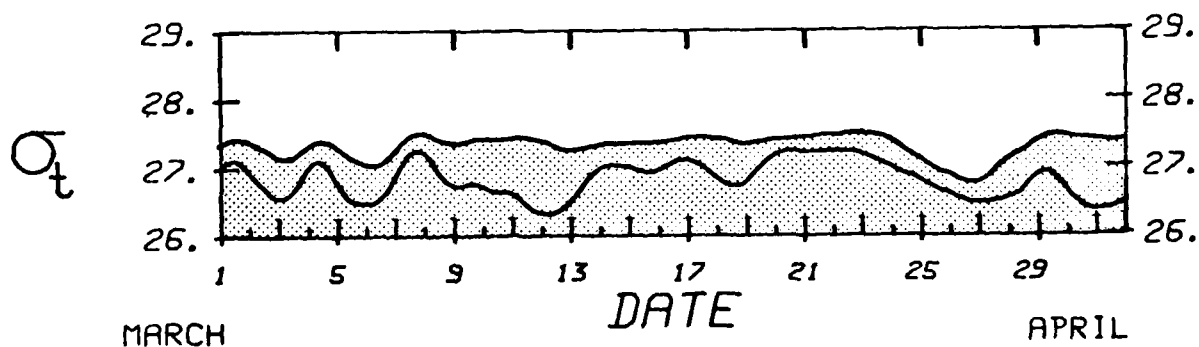
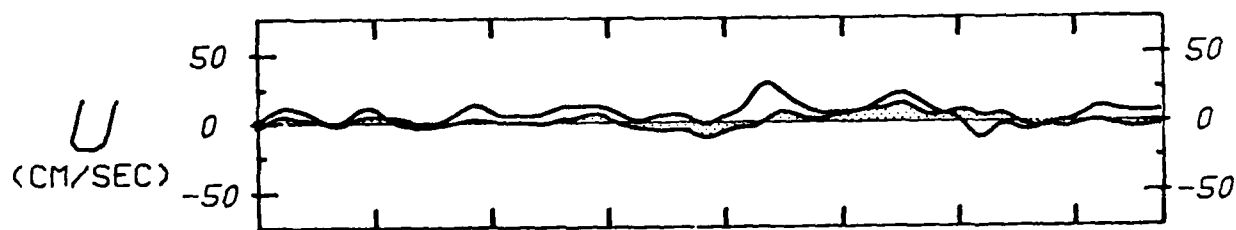
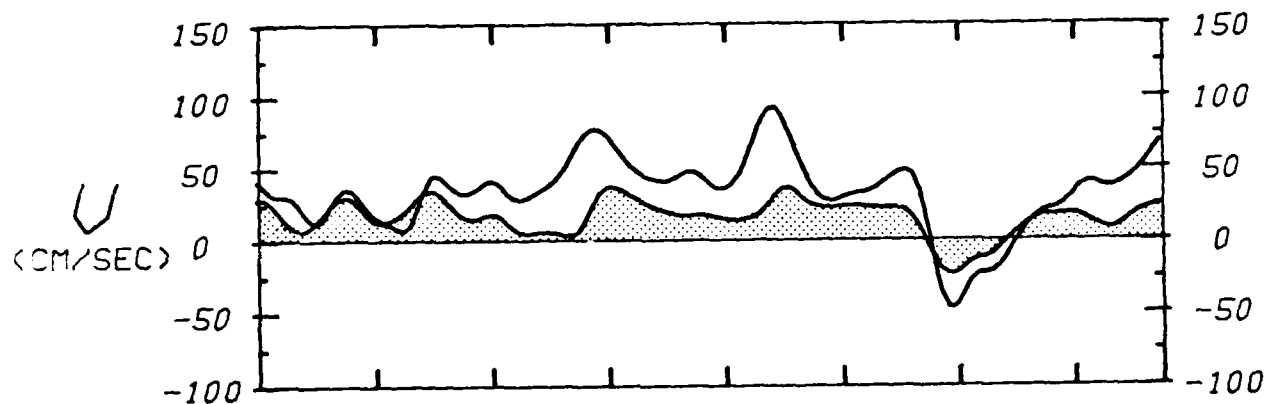
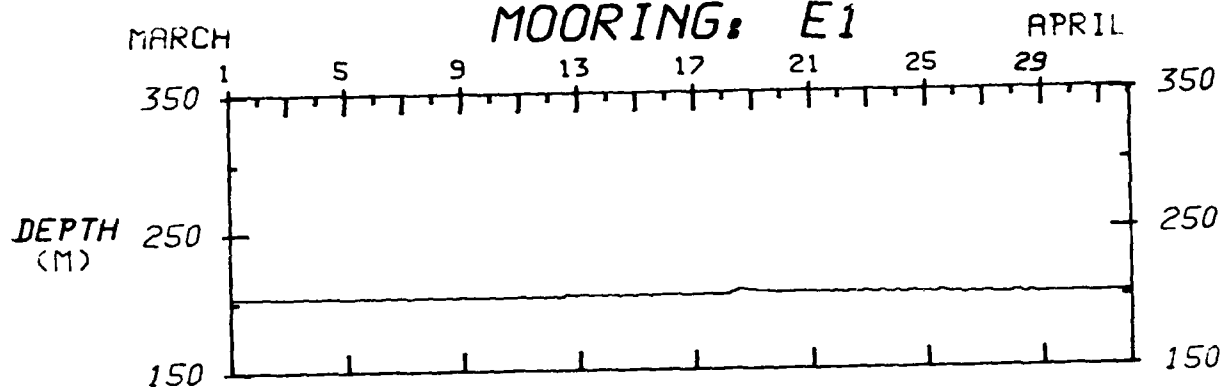
FEBRUARY

MARCH



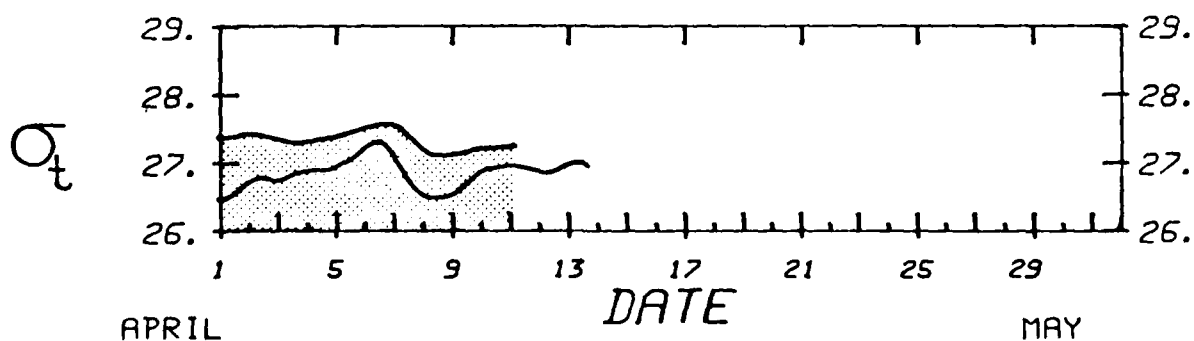
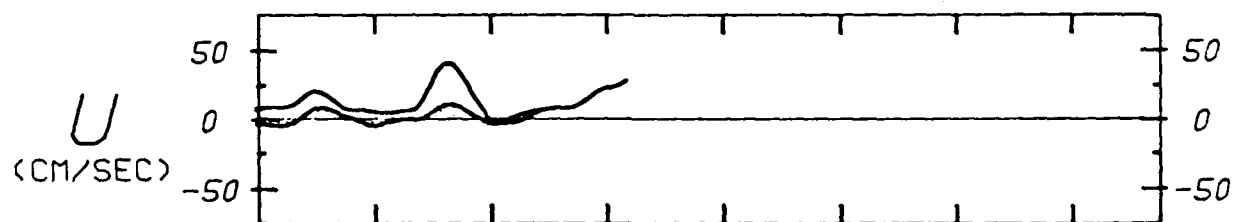
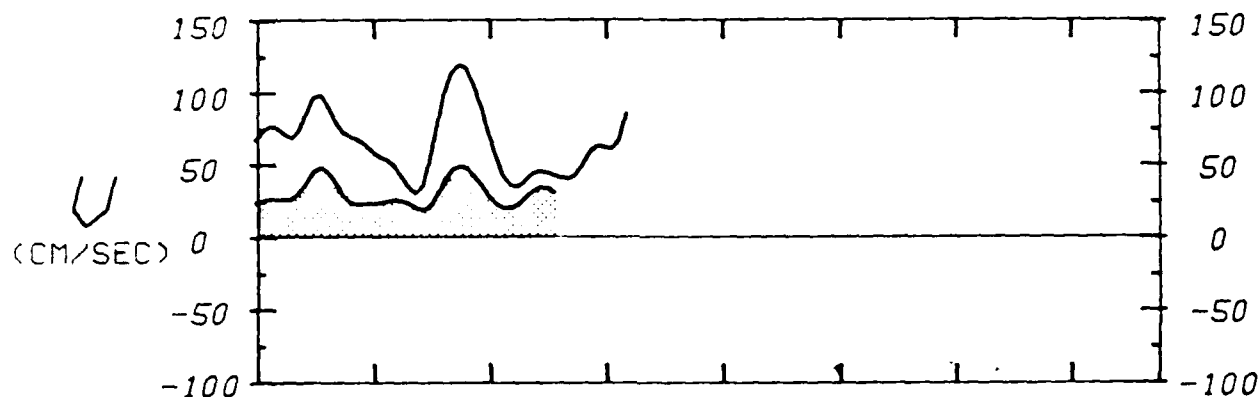
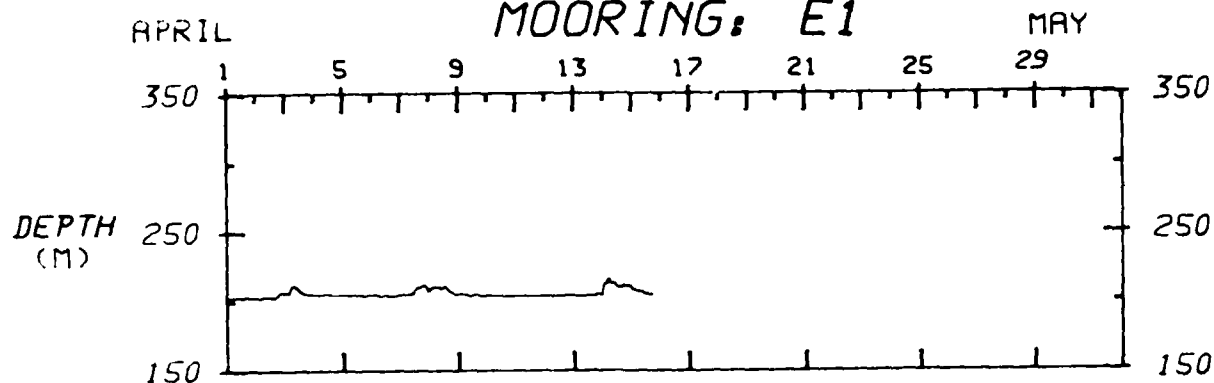
E1T
E1B

40 HRLP DATA FROM MOORING: E1



E1T
E1B

40 HRLP DATA FROM MOORING: E1



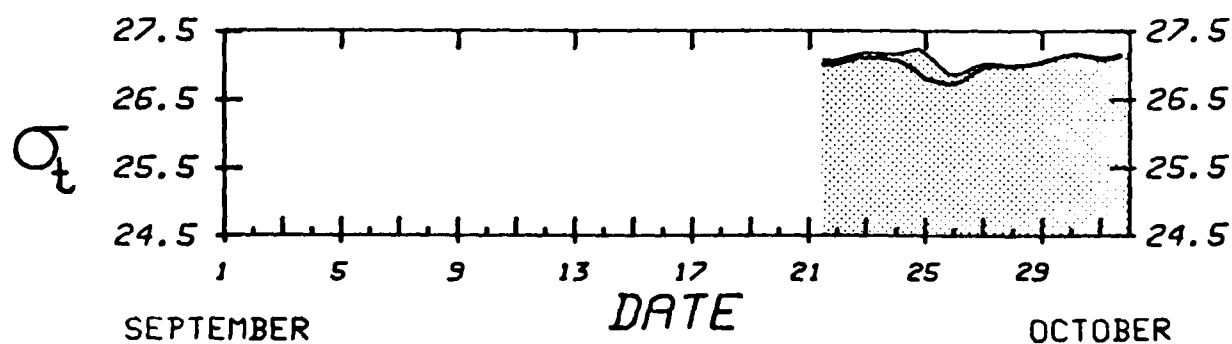
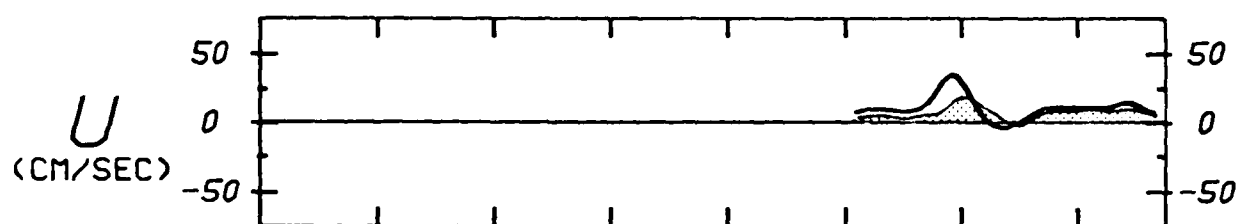
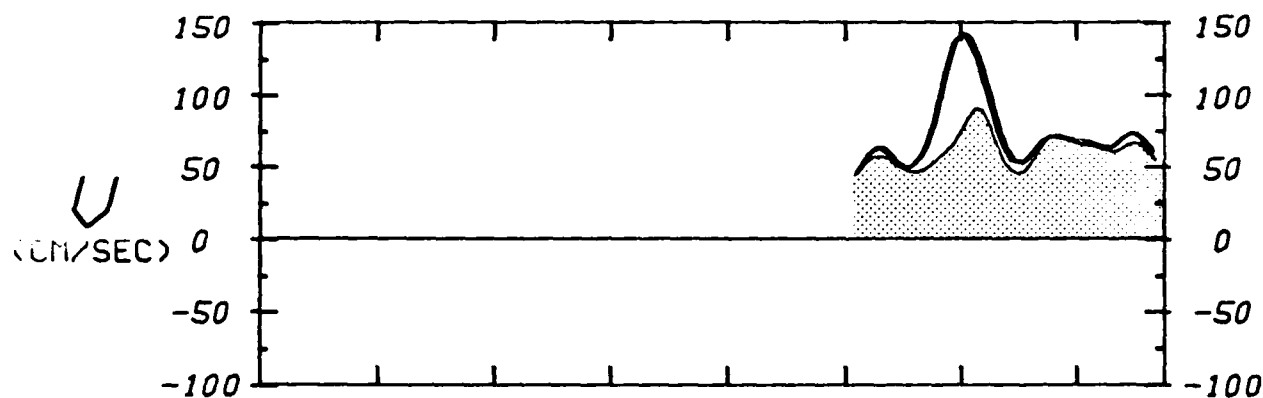
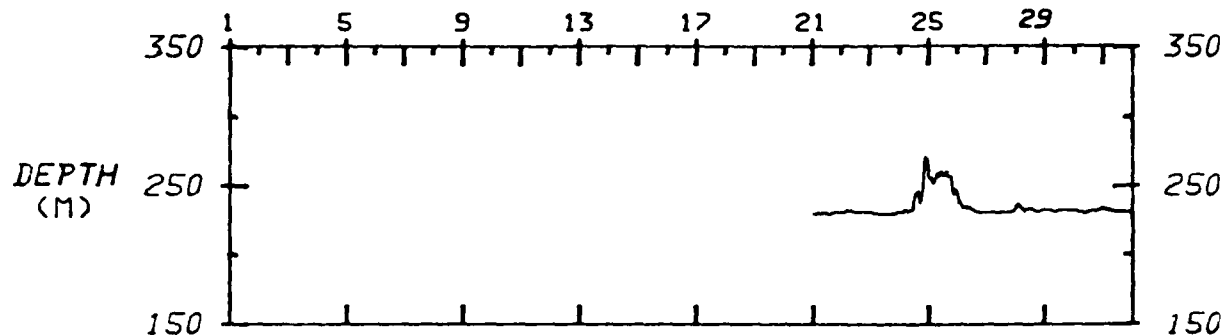
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E2T
E2B

40 HRLP DATA FROM MOORING, E2

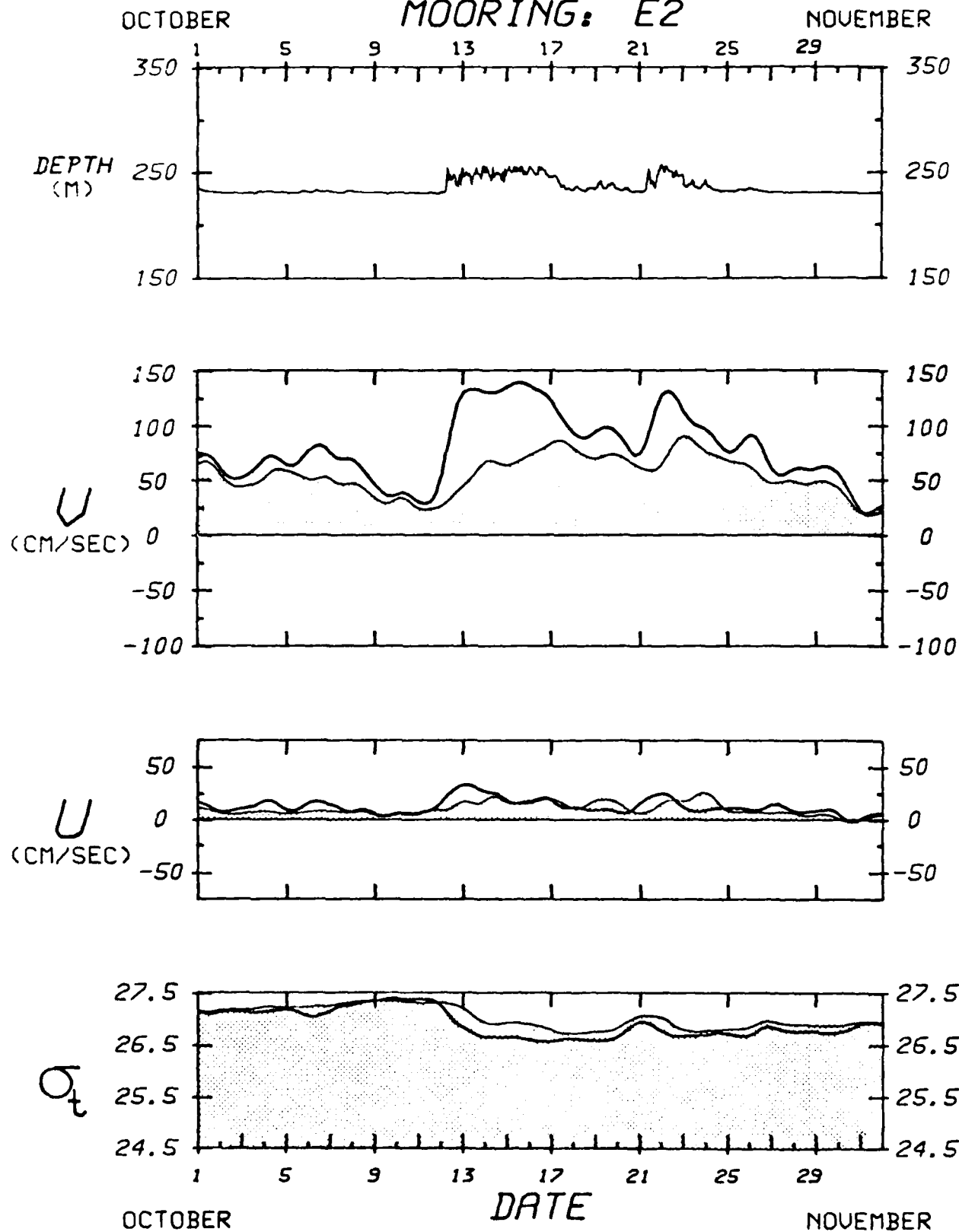
SEPTEMBER

OCTOBER



E2T
E2B

40 HRLP DATA FROM MOORING: E2

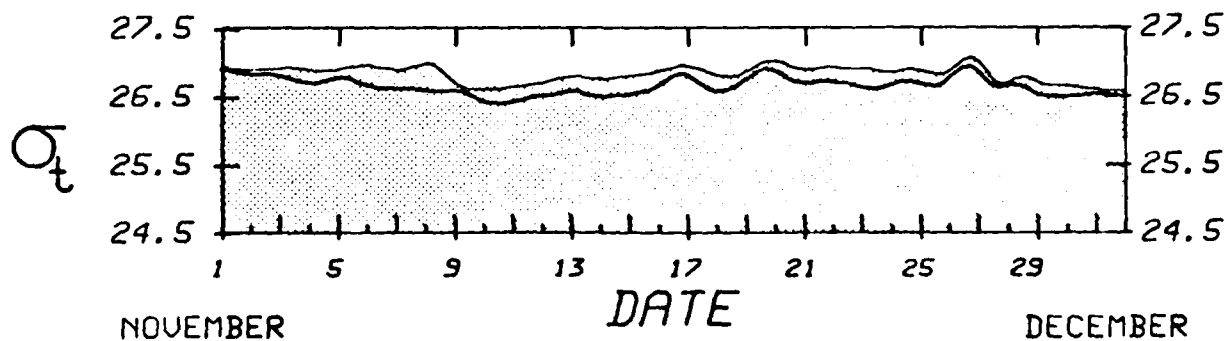
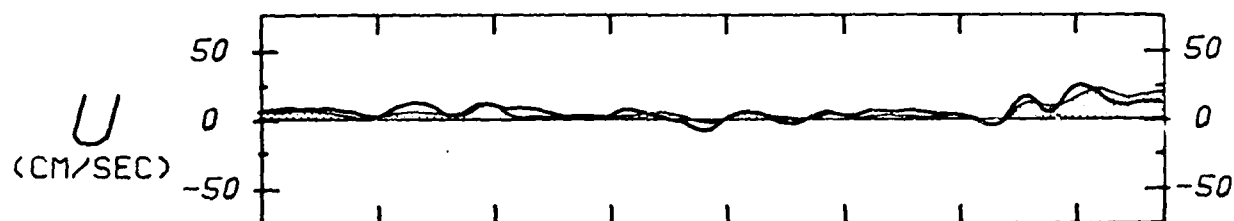
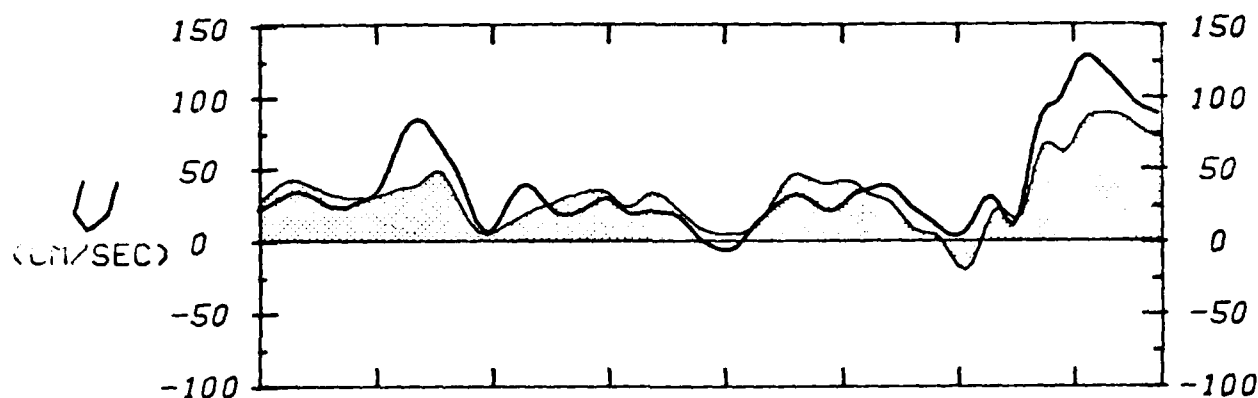
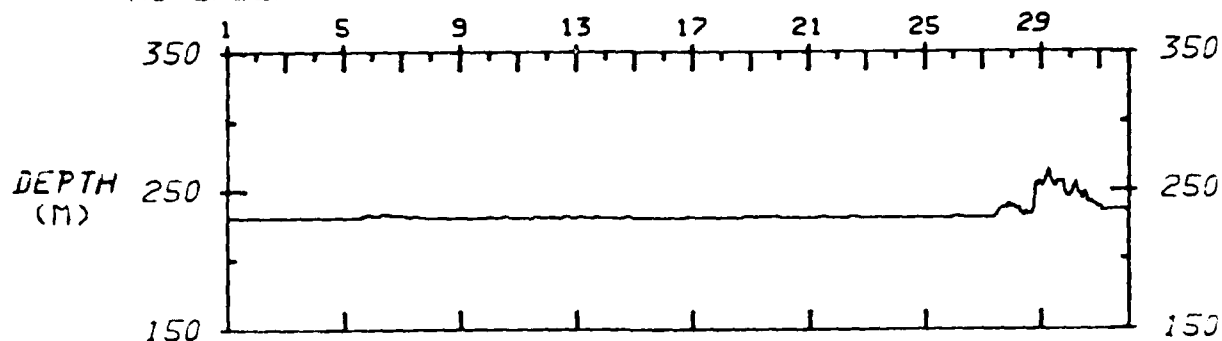


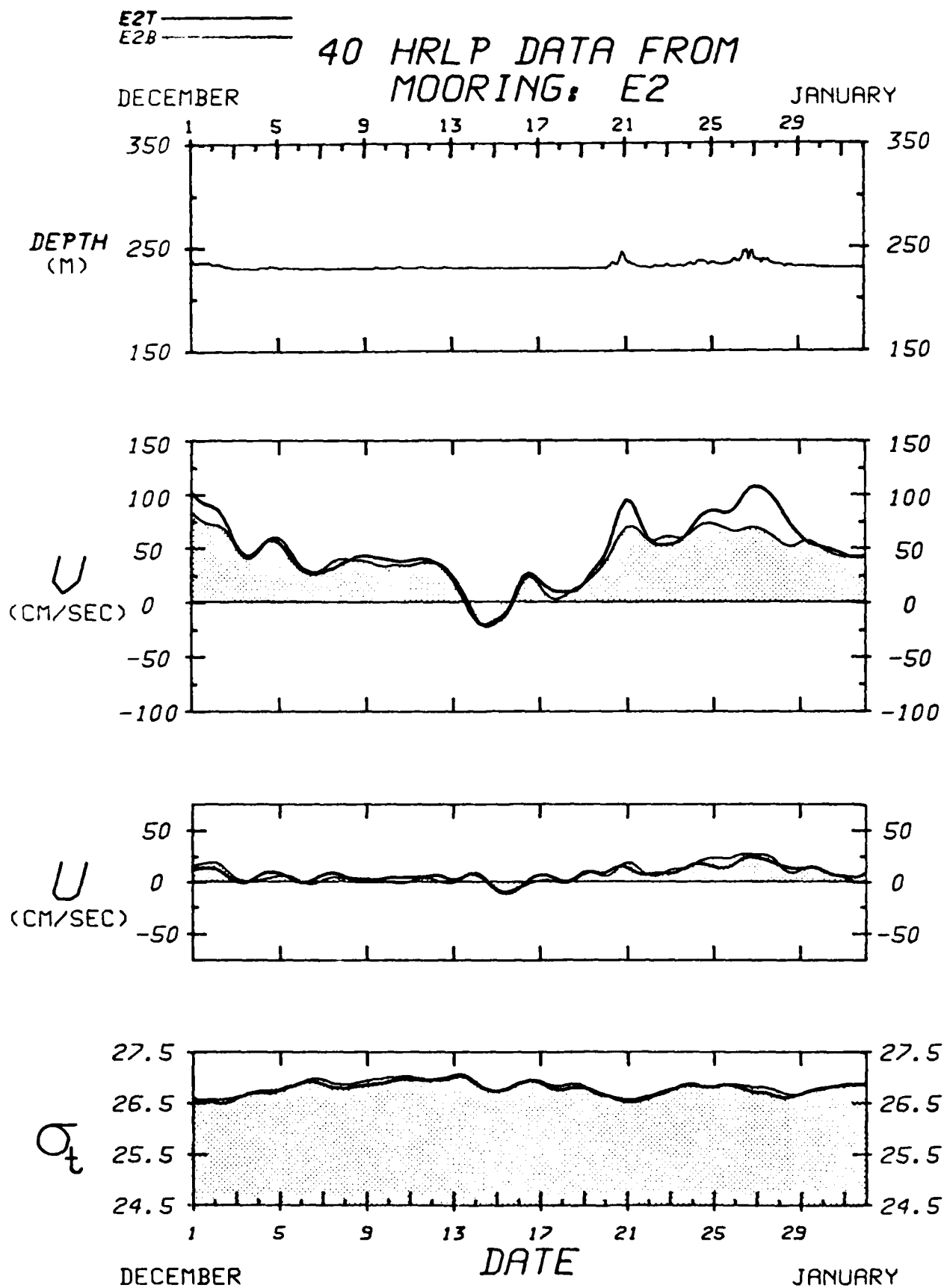
E2T
E2B

40 HRLP DATA FROM MOORING: E2

NOVEMBER

DECEMBER





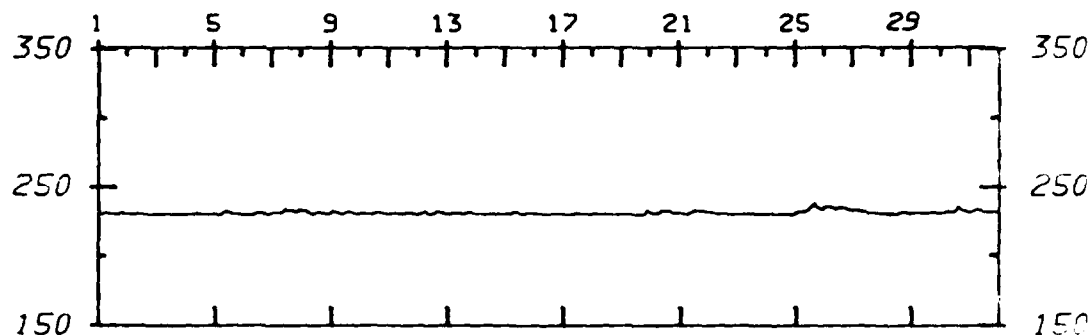
E2T -----
E2B -----

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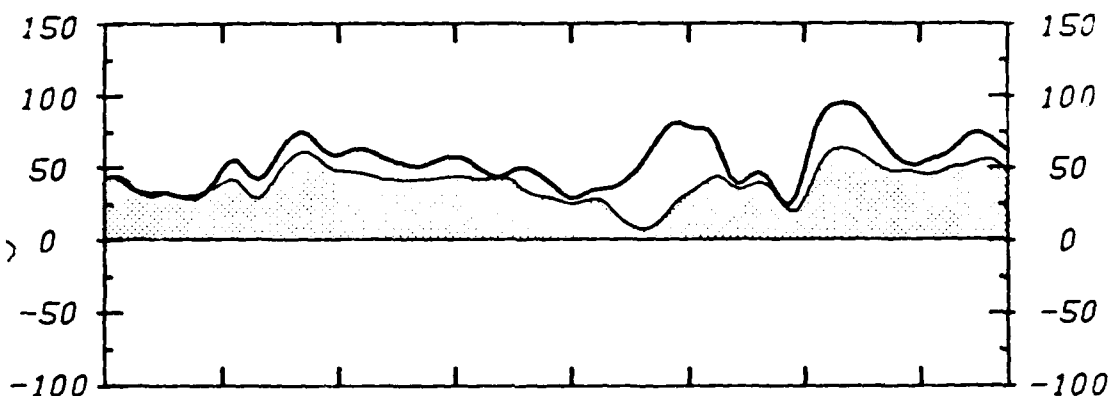
JANUARY

FEBRUARY

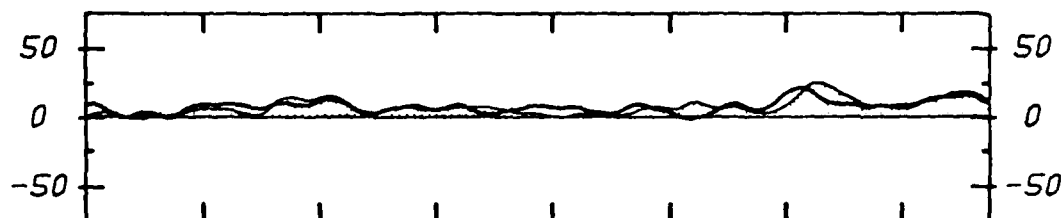
DEPTH
(M)



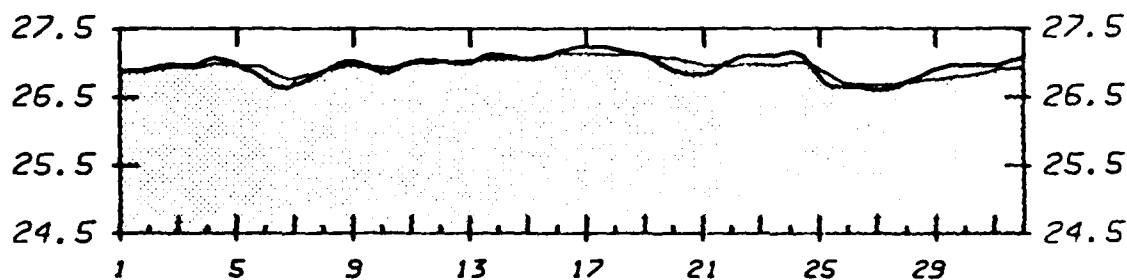
U
(CM/SEC)



U
(CM/SEC)



σ_t



JANUARY

DATE

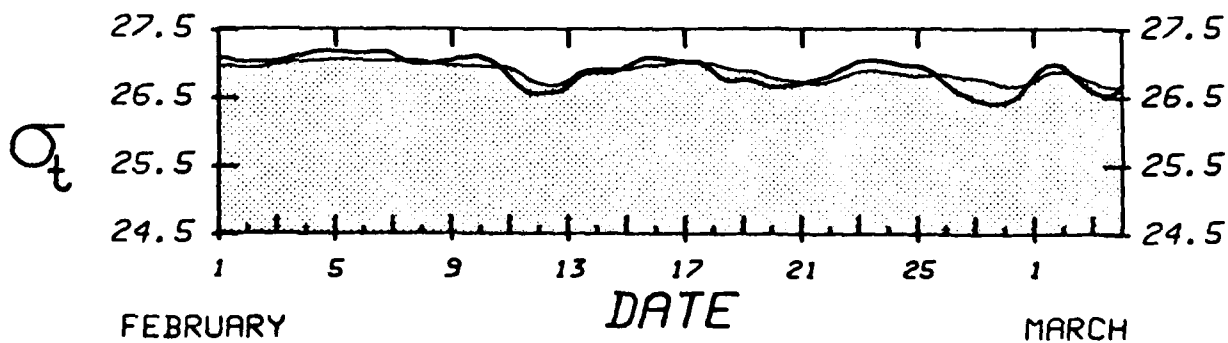
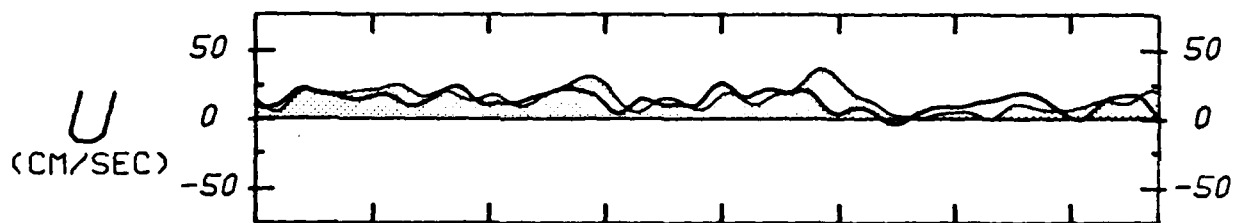
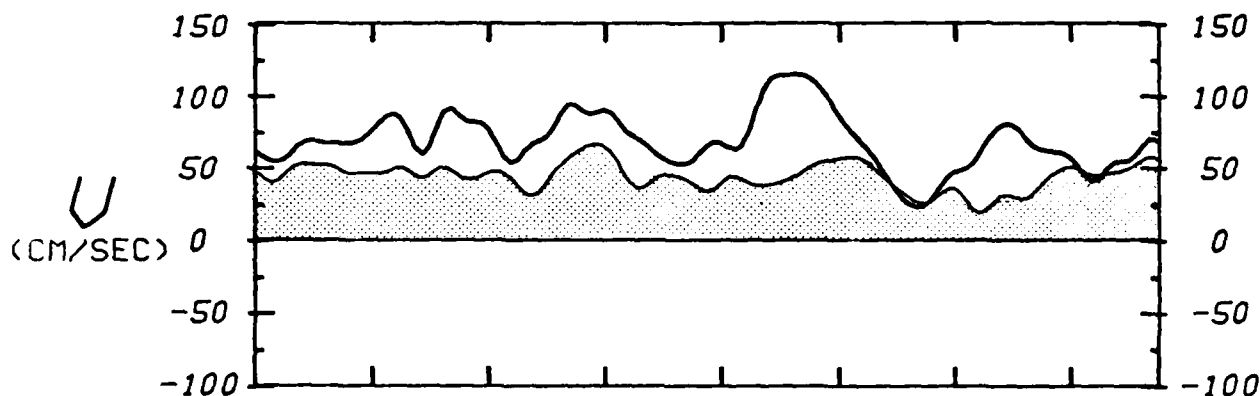
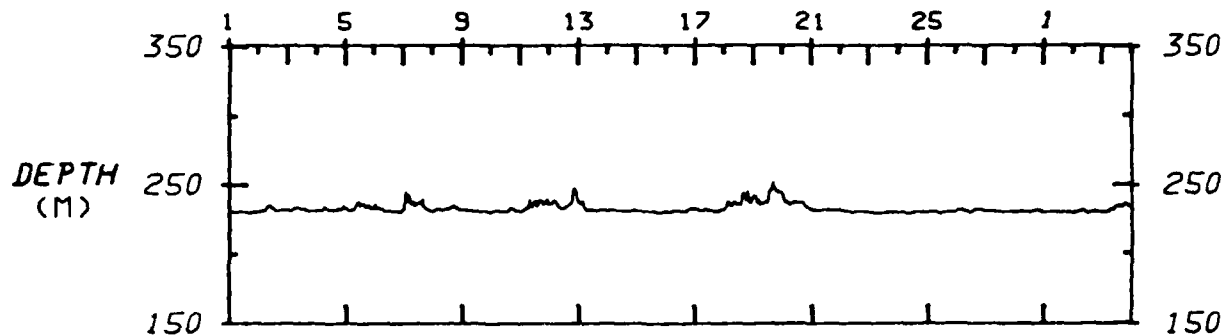
FEBRUARY

E2T
E2B

40 HRLP DATA FROM MOORING: E2

FEBRUARY

MARCH



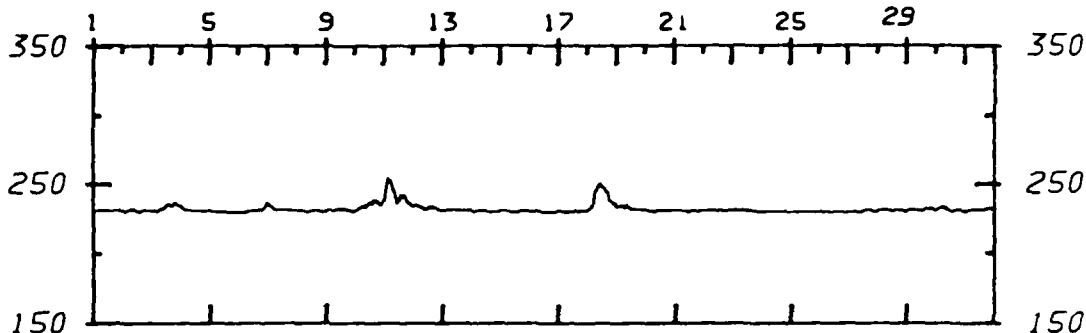
E2T ———
E2B - - -

40 HRLP DATA FROM MOORING: E2

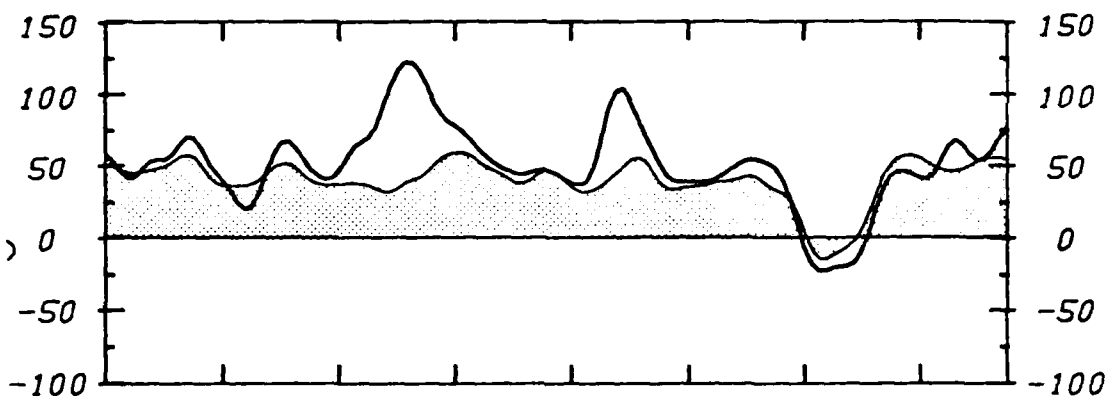
MARCH

APRIL

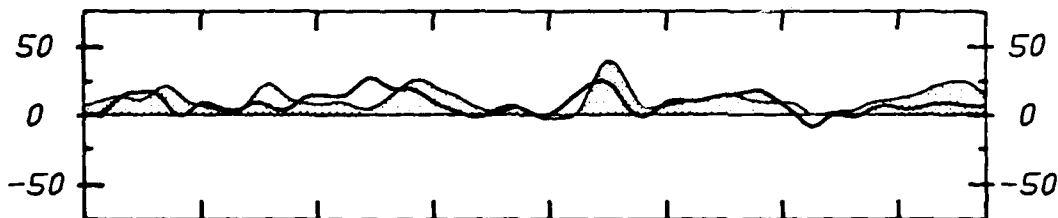
DEPTH
(M)



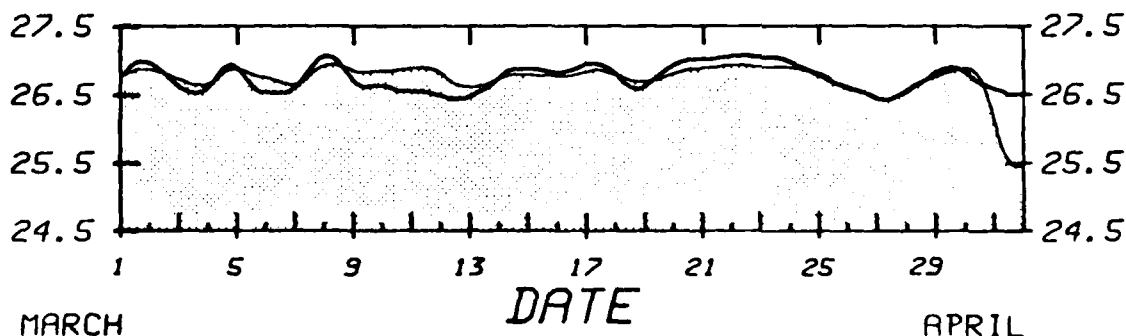
U
(CM/SEC)



U
(CM/SEC)



Q_t

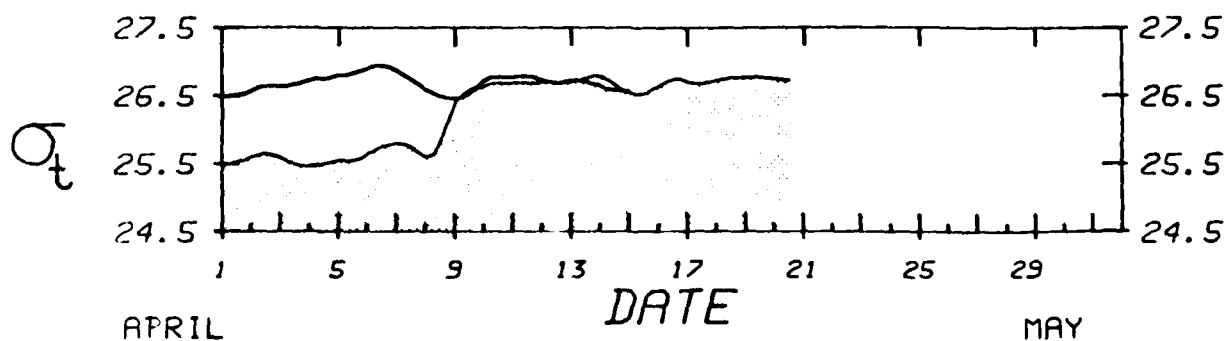
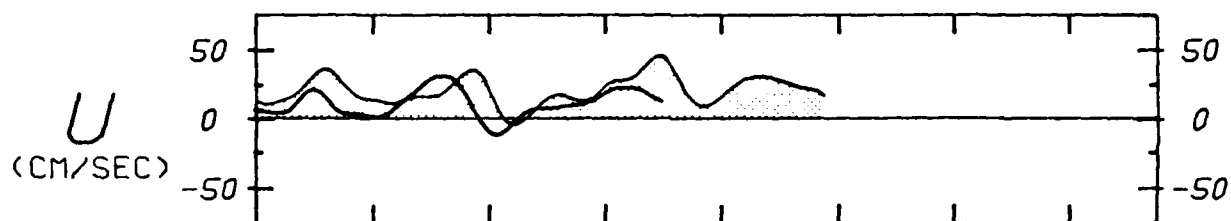
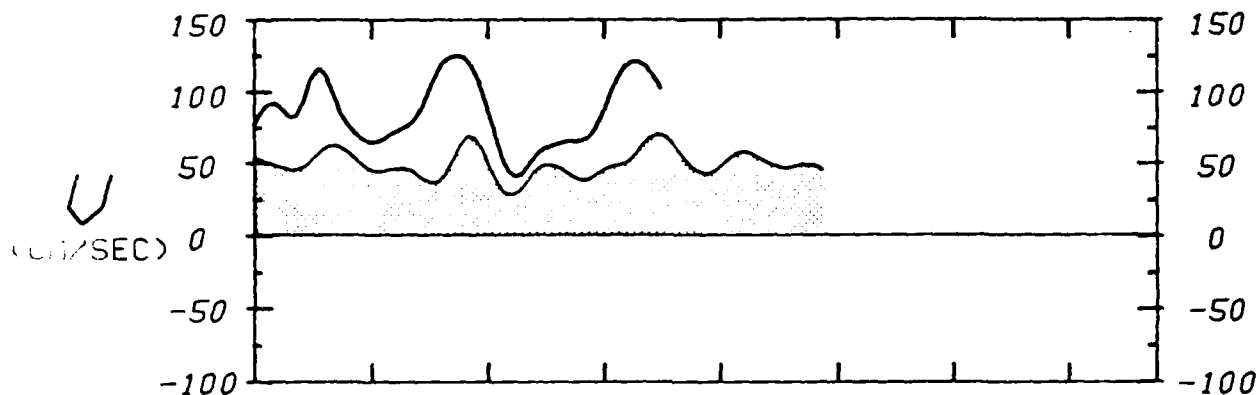
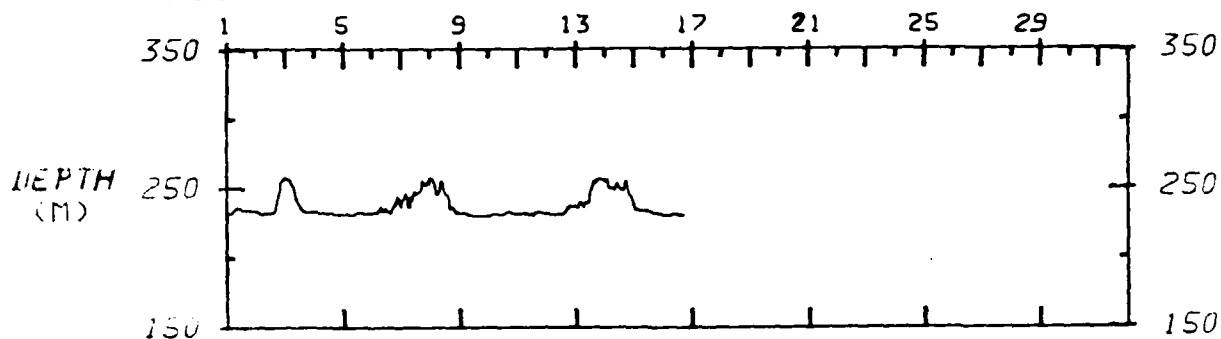


E2T
E2S

40 HRLP DATA FROM MOORING: E2

APRIL

MAY



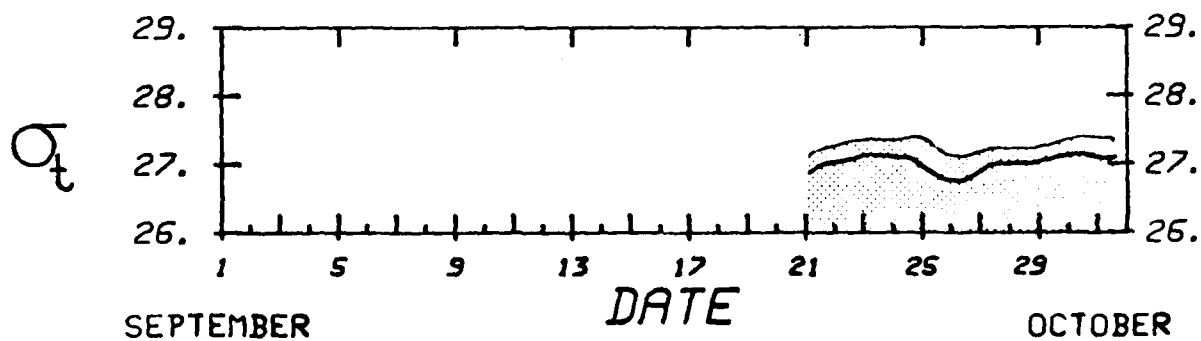
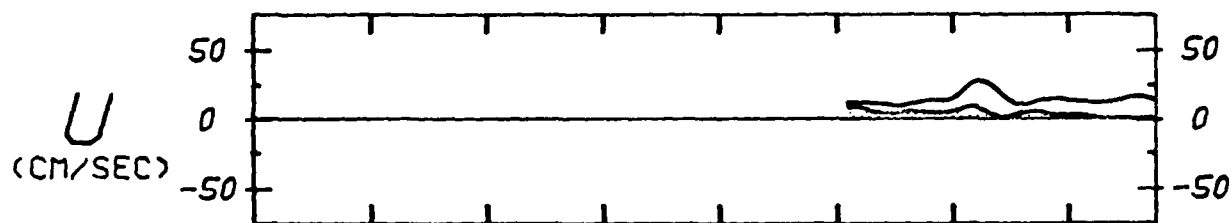
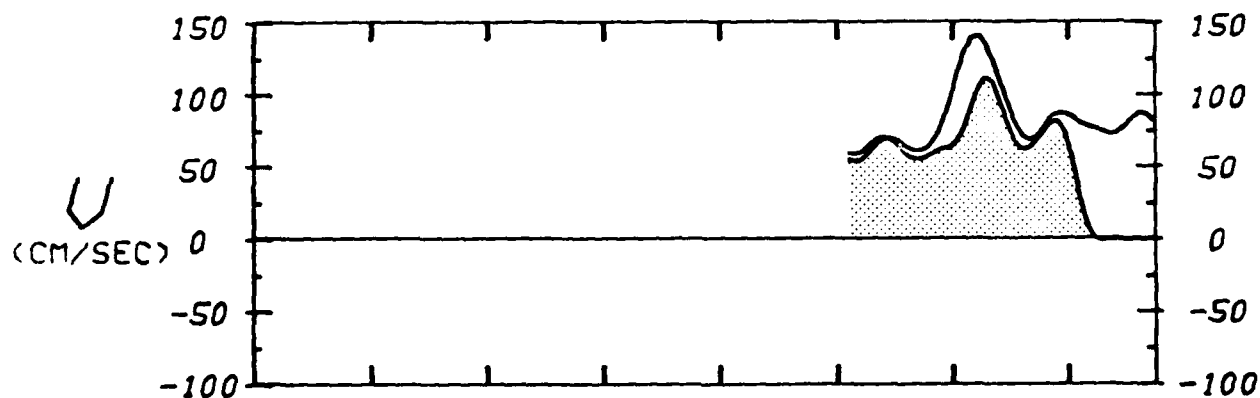
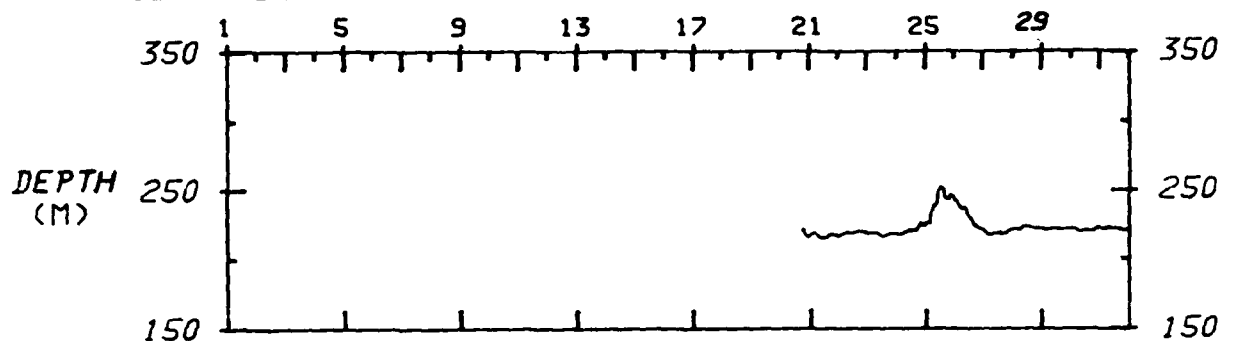
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E3T
E3B

40 HRLP DATA FROM MOORING, E3

SEPTEMBER

OCTOBER

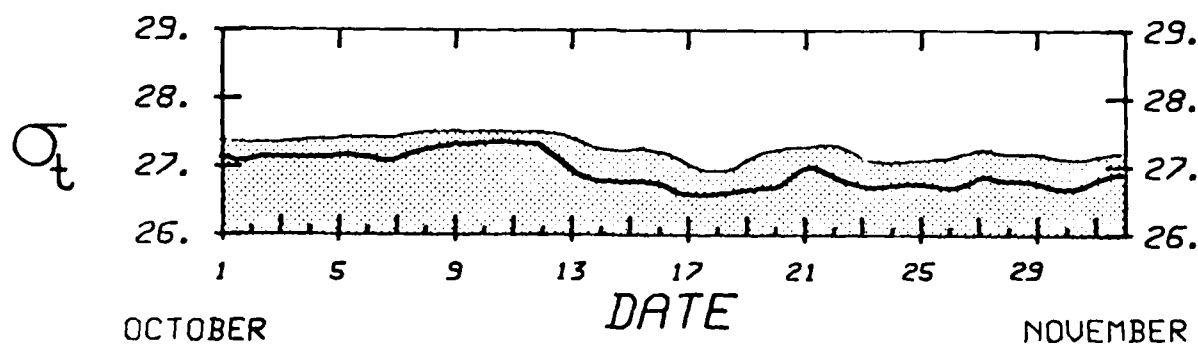
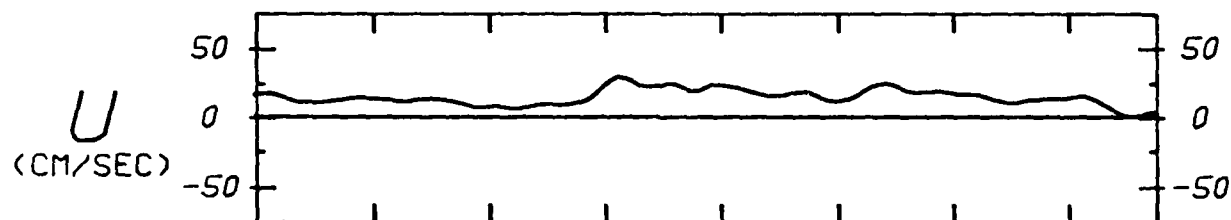
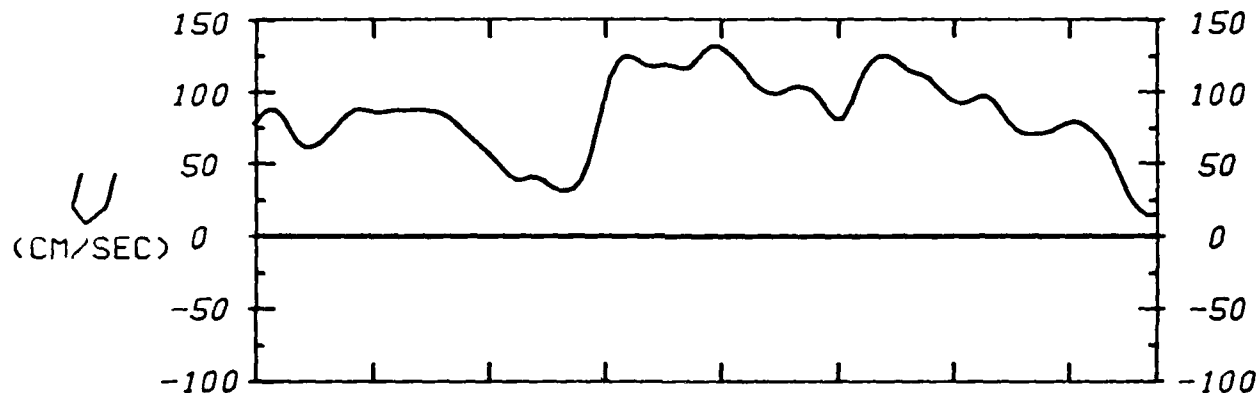
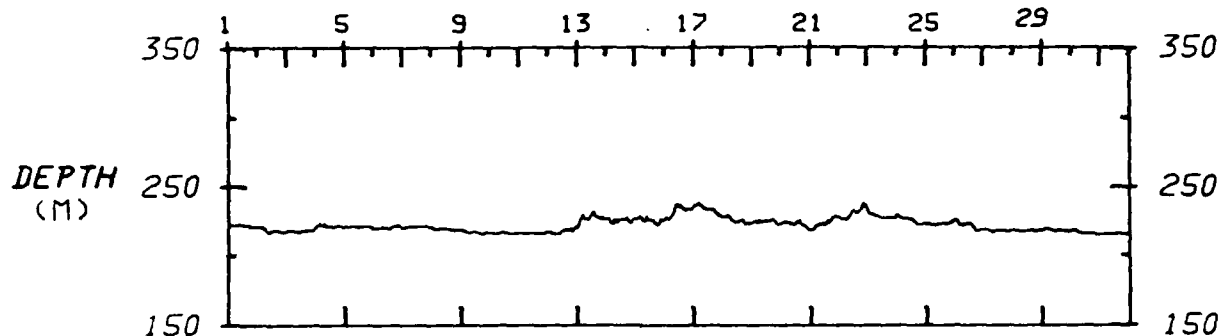


E3T
E3B

40 HRLP DATA FROM MOORING: E3

OCTOBER

NOVEMBER

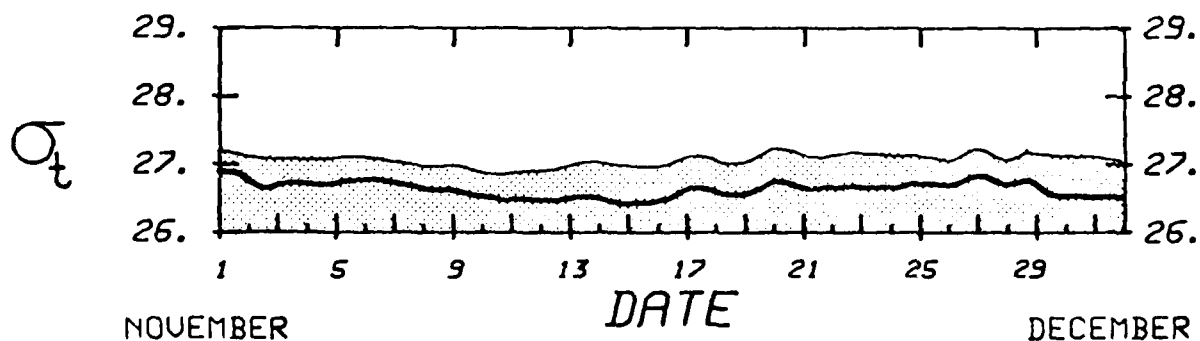
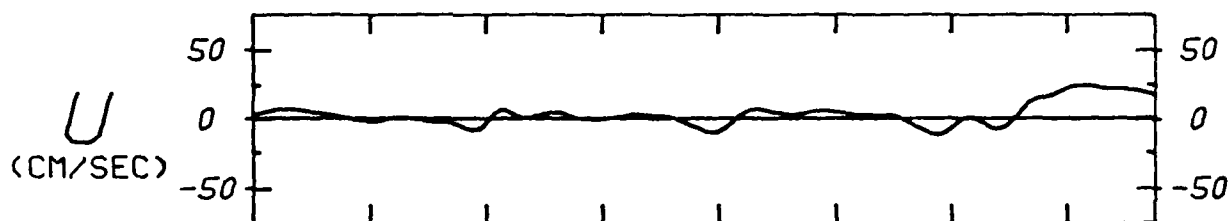
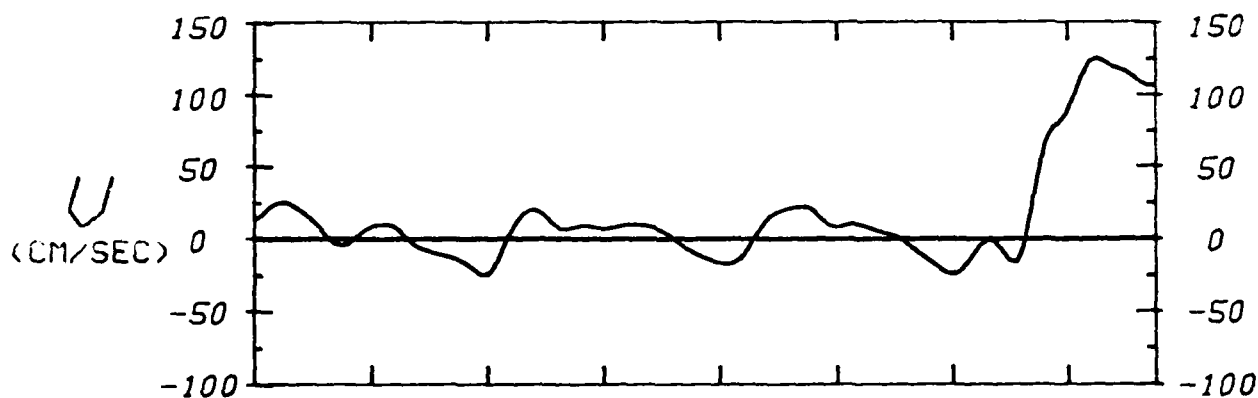
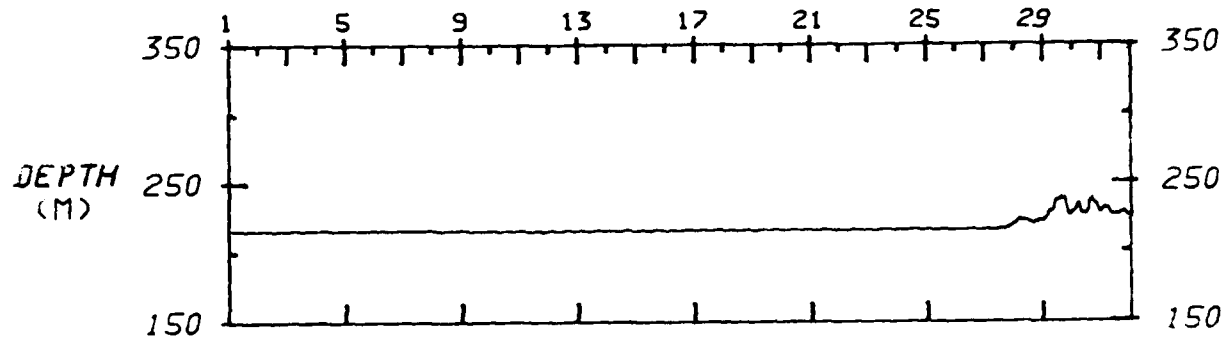


537
E3B

40 HRLP DATA FROM MOORING: E3

NOVEMBER

DECEMBER

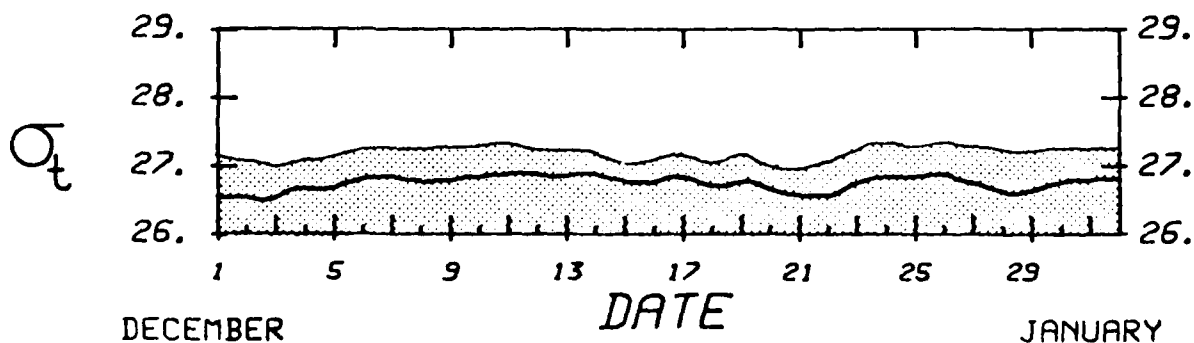
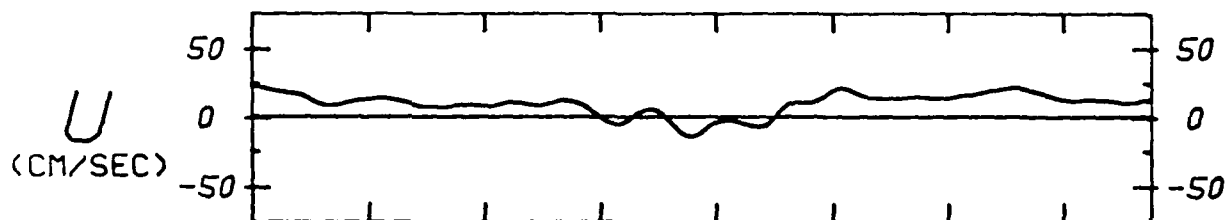
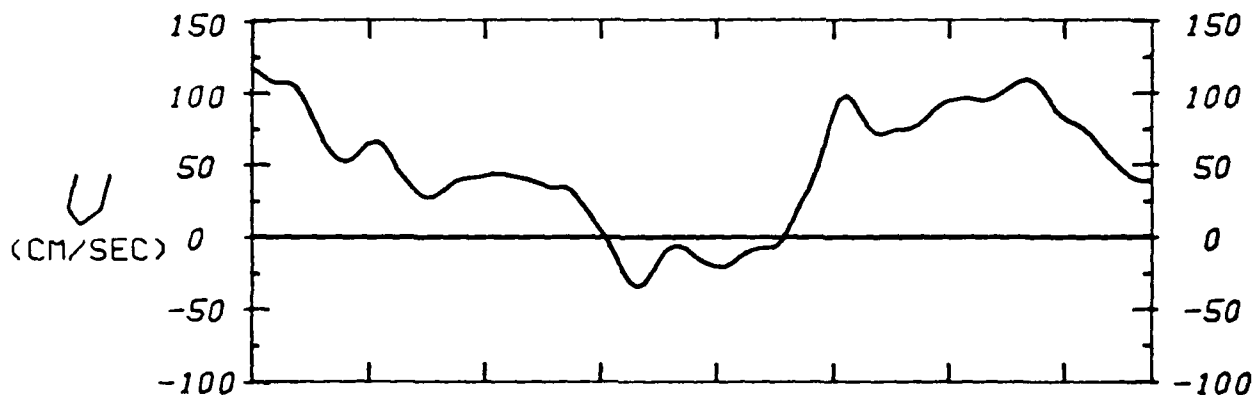
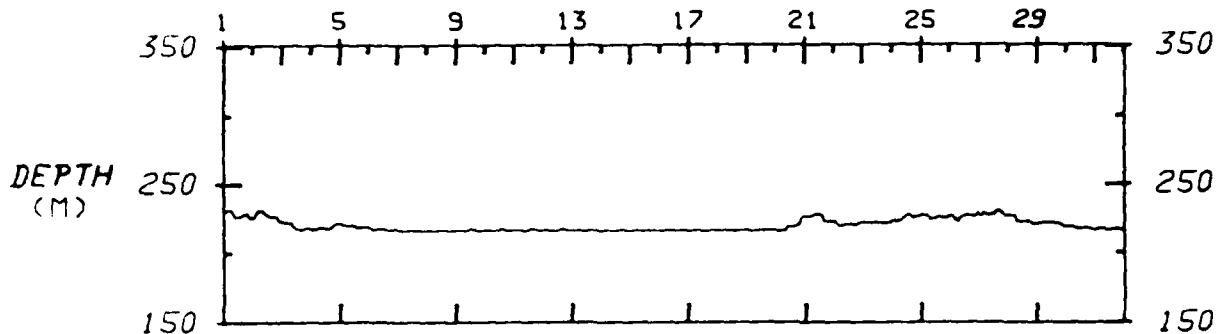


E3T
E3B

40 HRLP DATA FROM MOORING: E3

DECEMBER

JANUARY

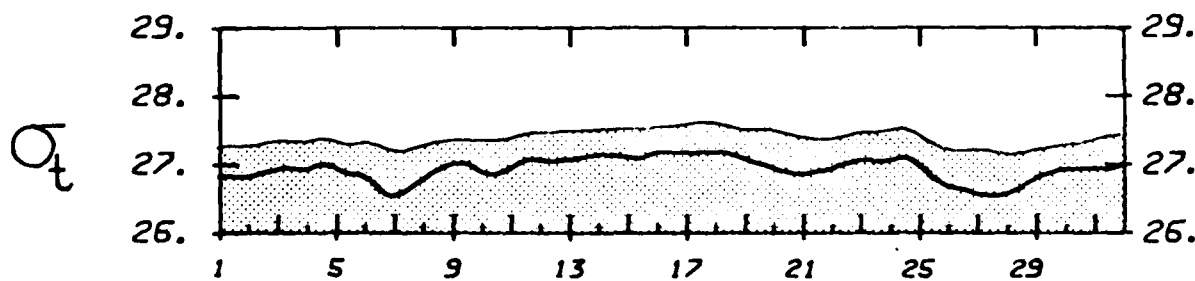
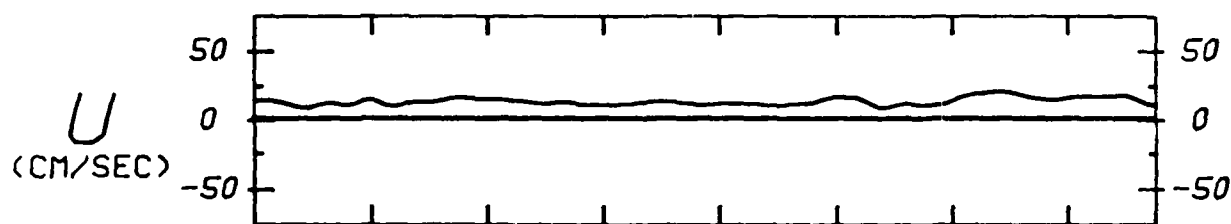
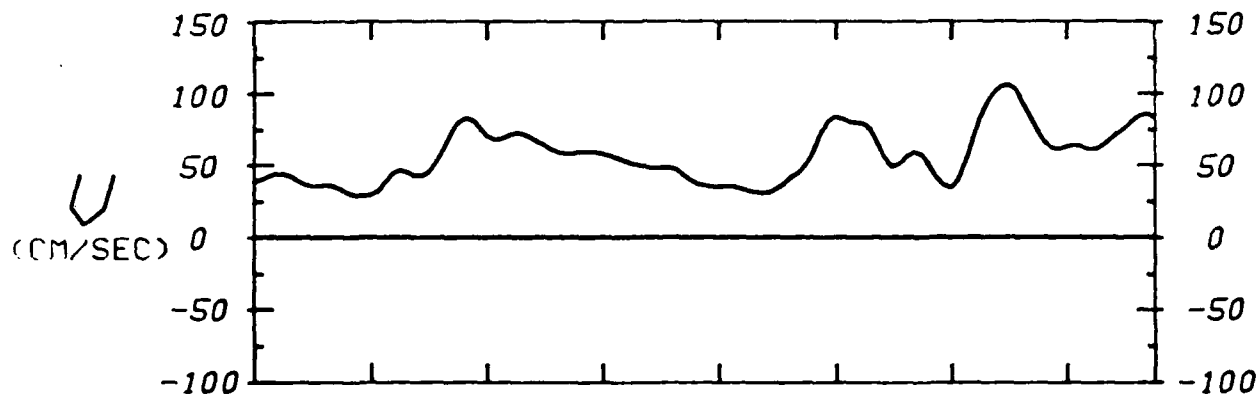
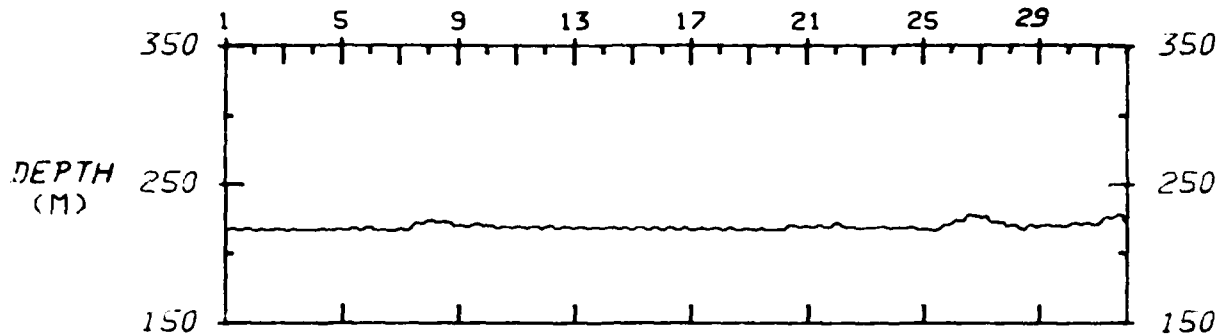


E3T
E3B

40 HRLP DATA FROM MOORING E3

JANUARY

FEBRUARY



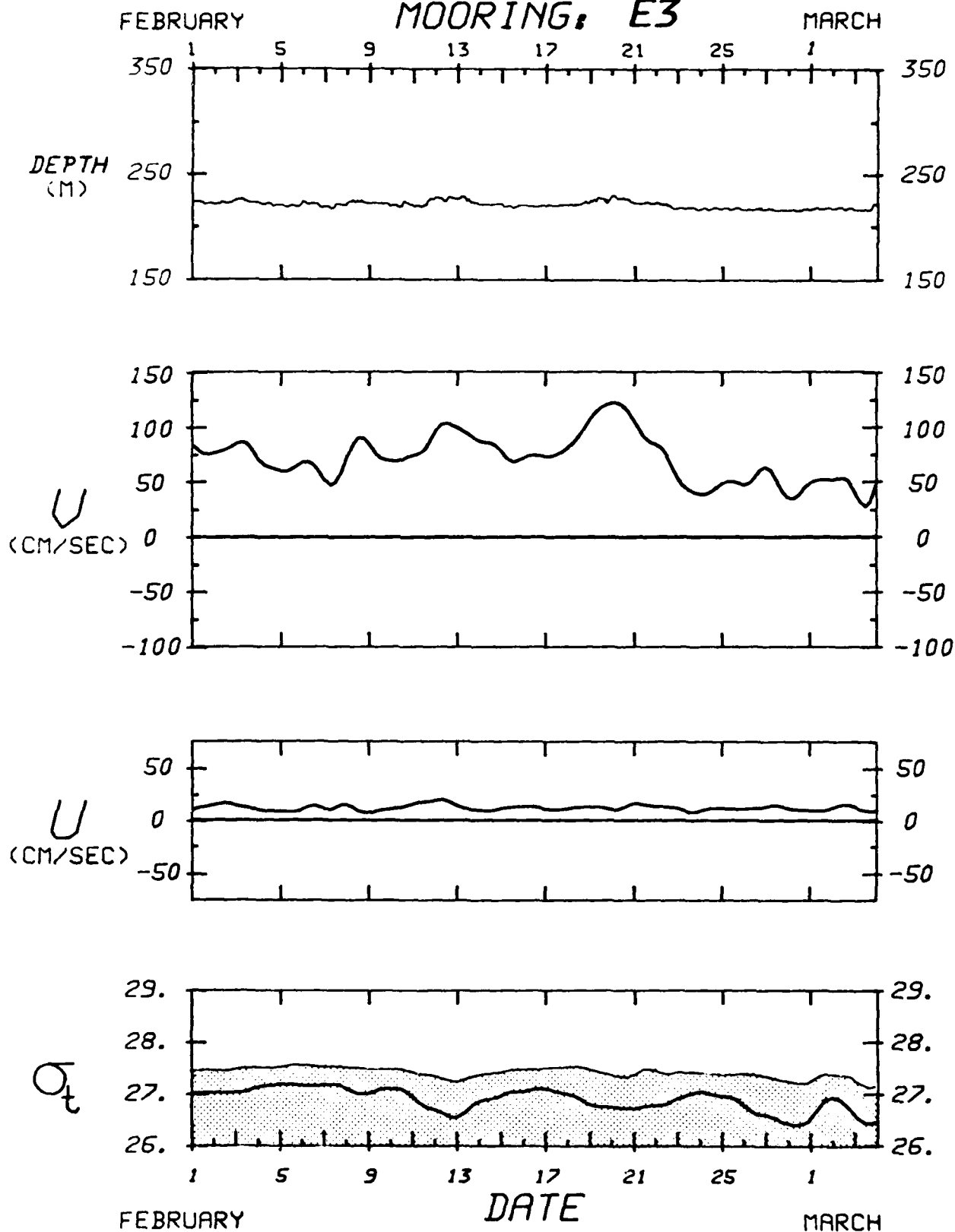
JANUARY

DATE

FEBRUARY

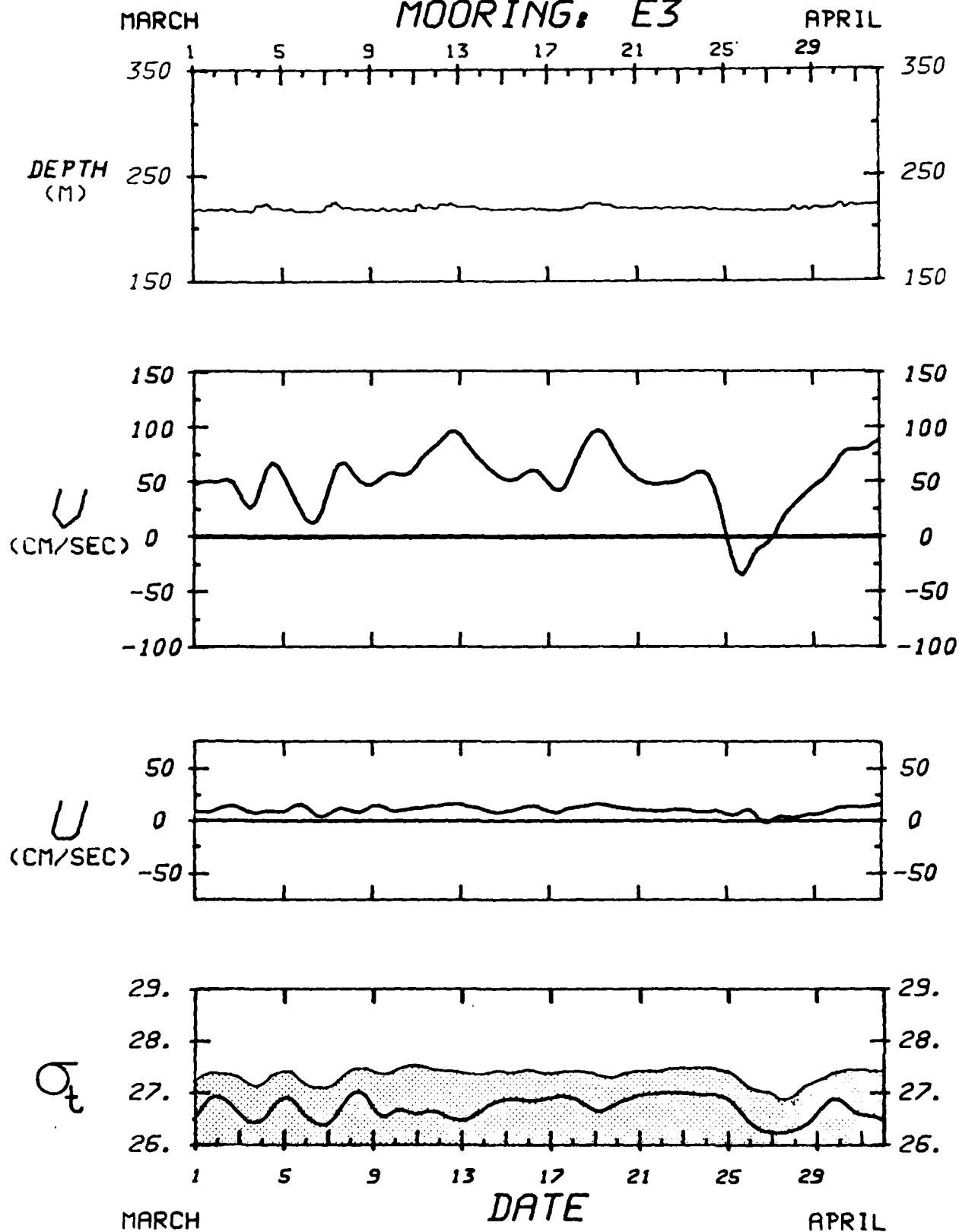
E3T ———
E3B ———

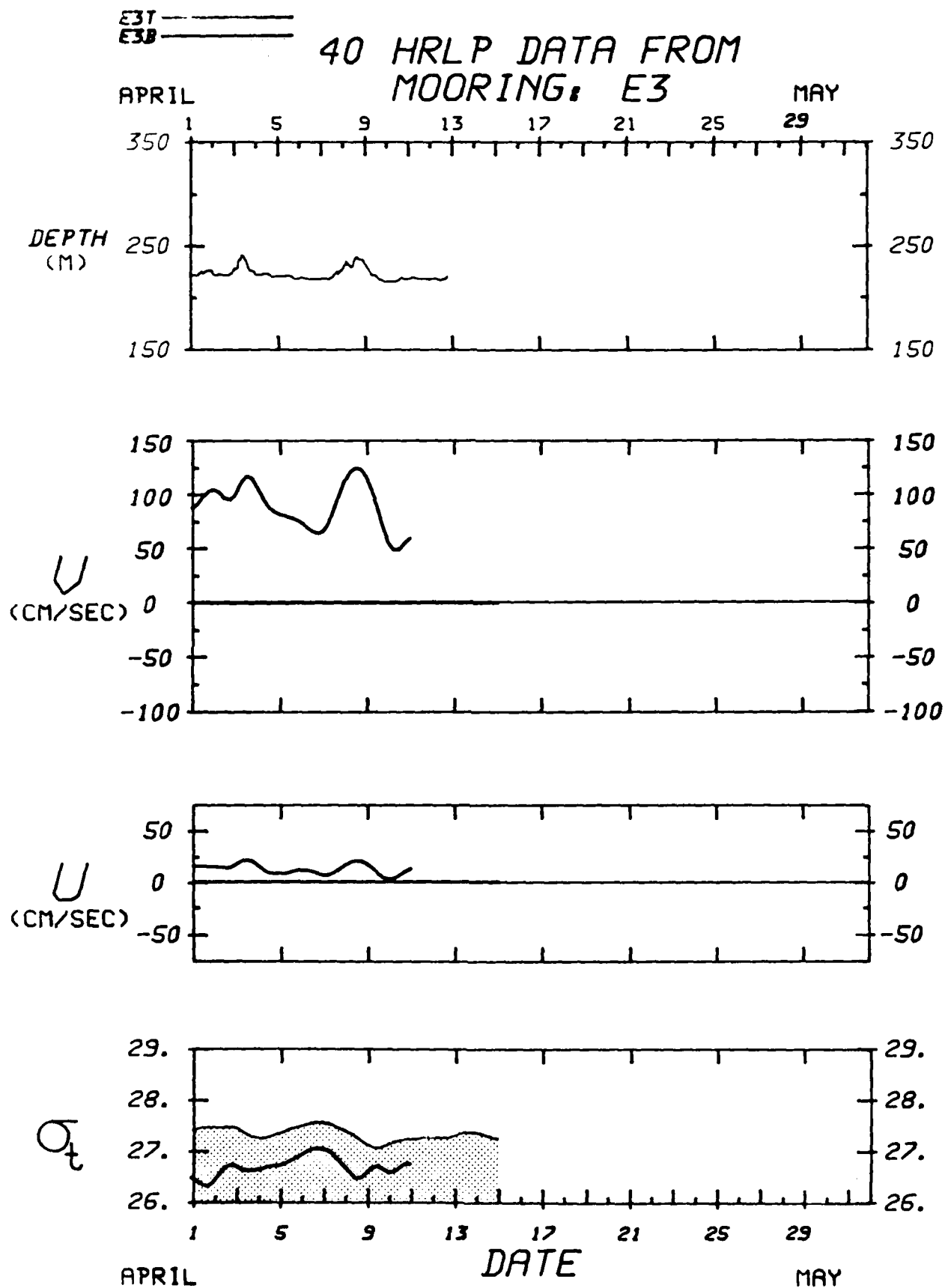
40 HRLP DATA FROM MOORING: E3



E3T
E3B

40 HRLP DATA FROM MOORING: E3



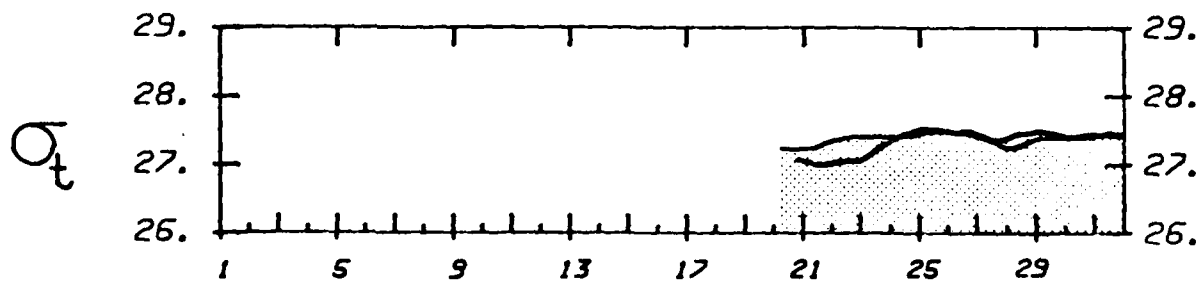
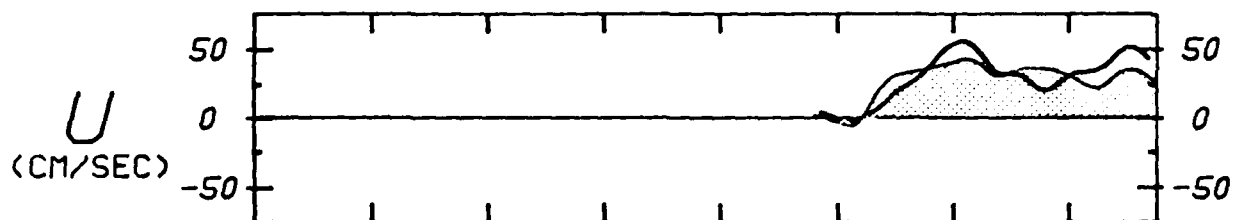
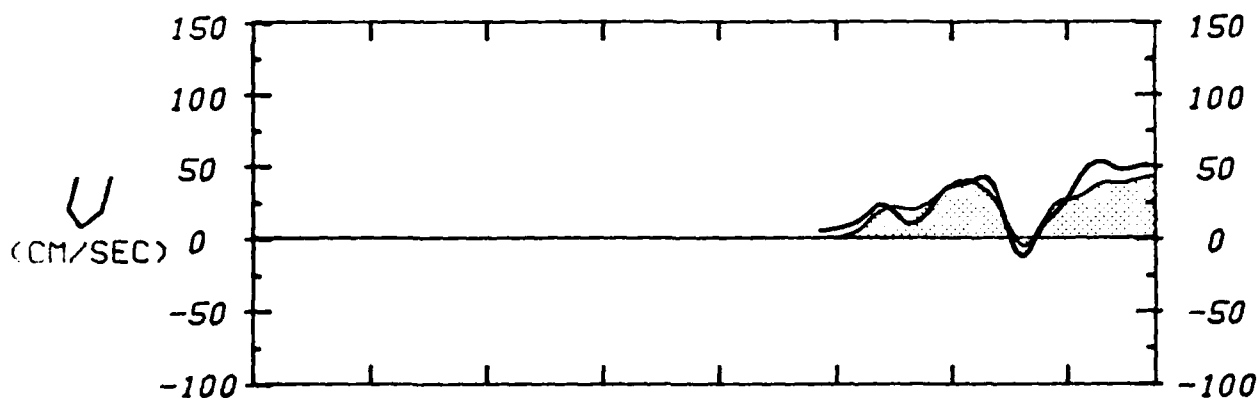
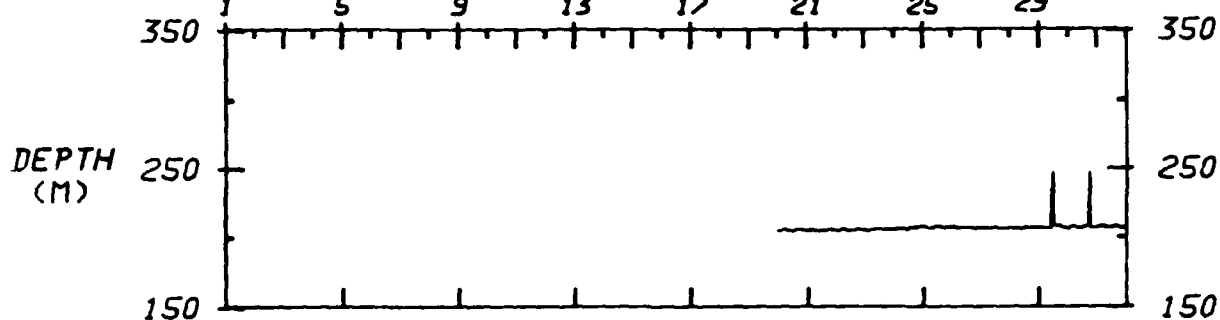


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F1T _____
 F1B _____

40 HRLP DATA FROM MOORING: F1

SEPTEMBER 1 5 9 13 17 21 25 29 OCTOBER



SEPTEMBER

DATE

OCTOBER

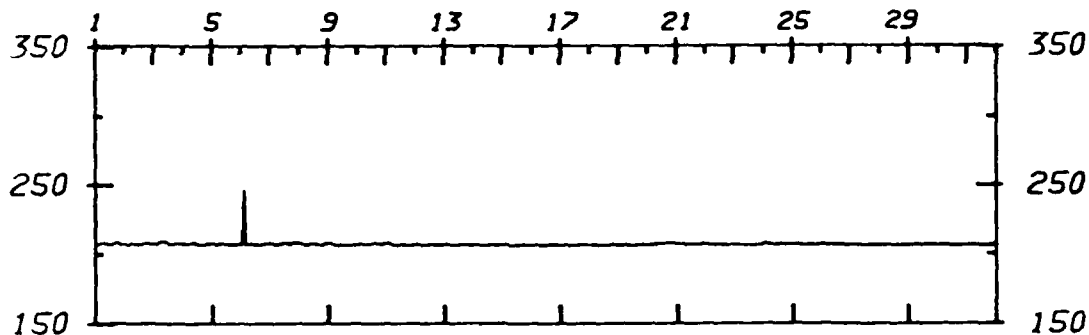
F1T ———
F1B ———

40 HRLP DATA FROM MOORING: F1

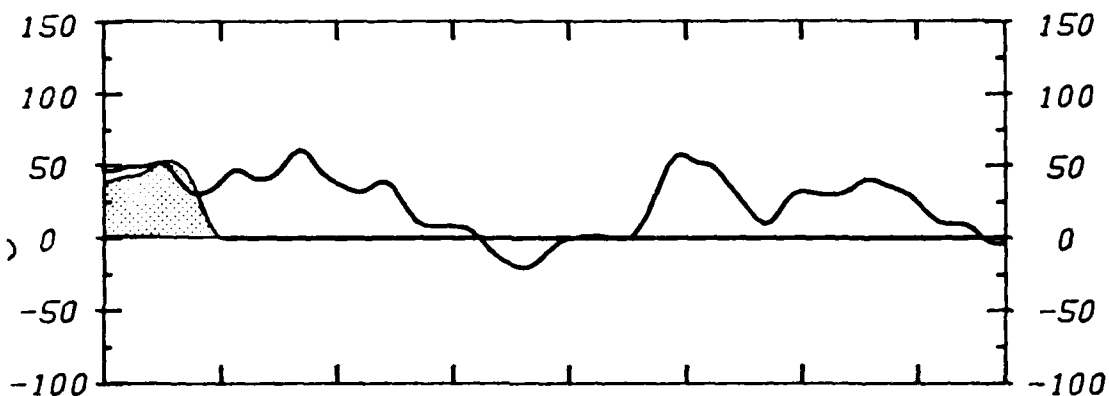
OCTOBER

NOVEMBER

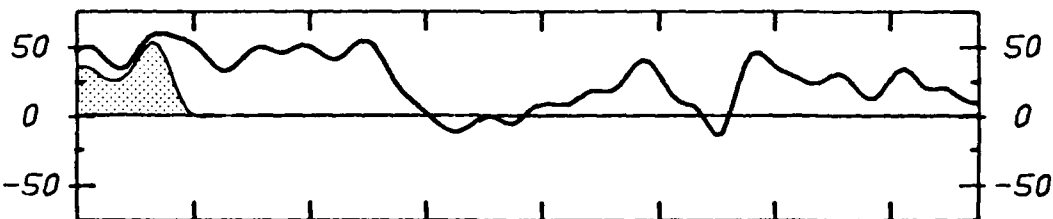
DEPTH
(M)



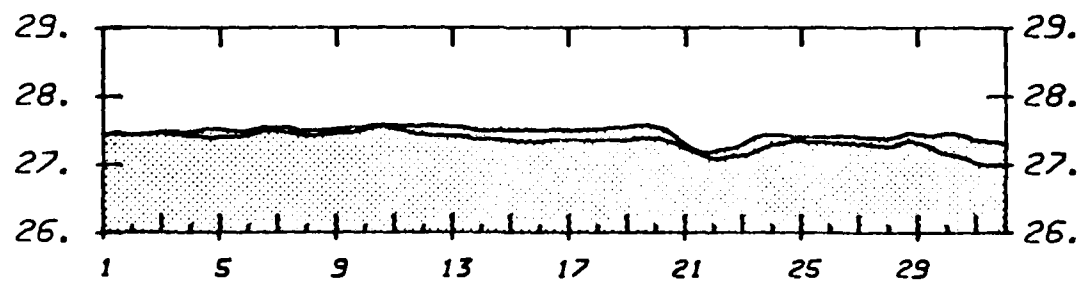
U
(CM/SEC)



U
(CM/SEC)



σ_t



OCTOBER

DATE

NOVEMBER

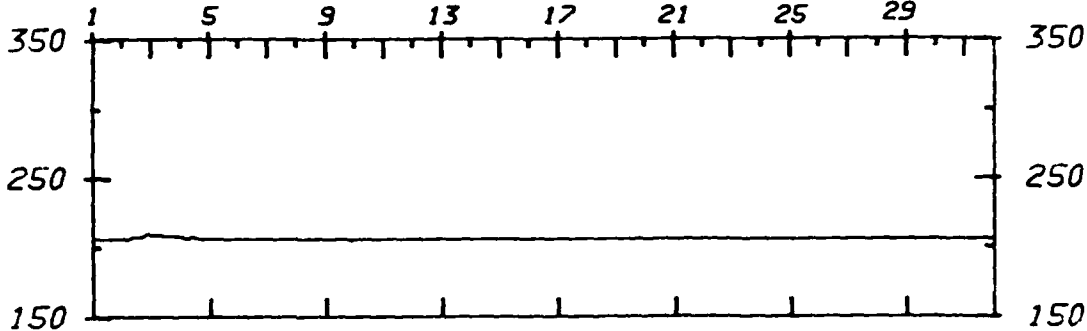
F1T ———
F1B ———

40 HRLP DATA FROM MOORING: F1

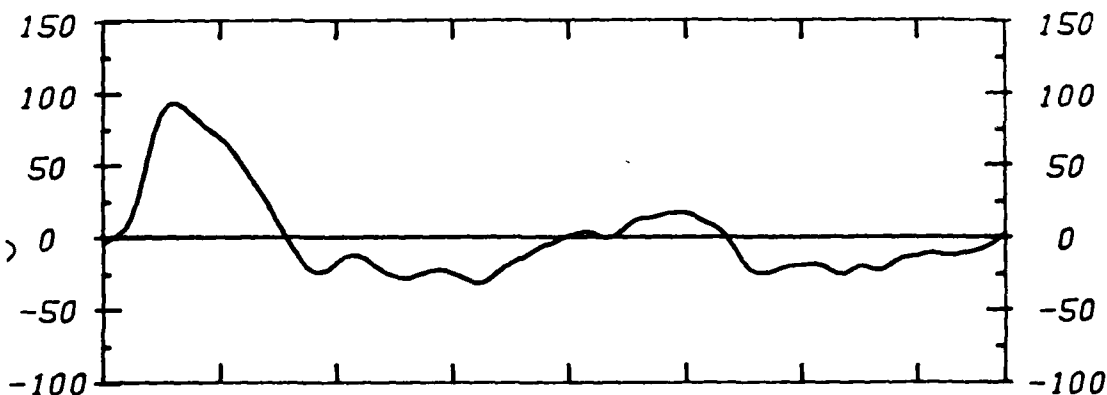
NOVEMBER

DECEMBER

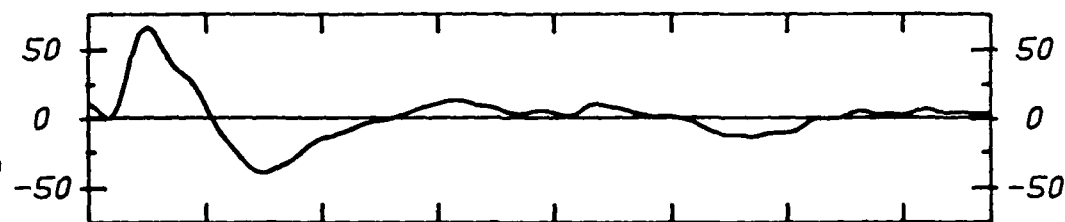
DEPTH
(M)



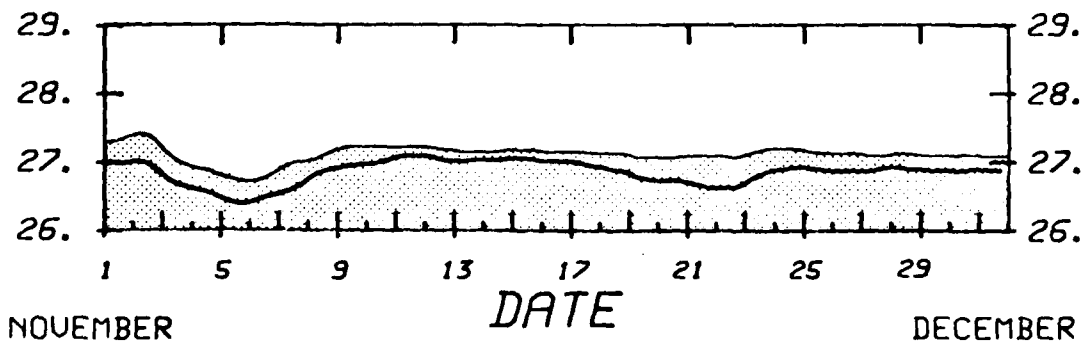
U
(CM/SEC)



U
(CM/SEC)

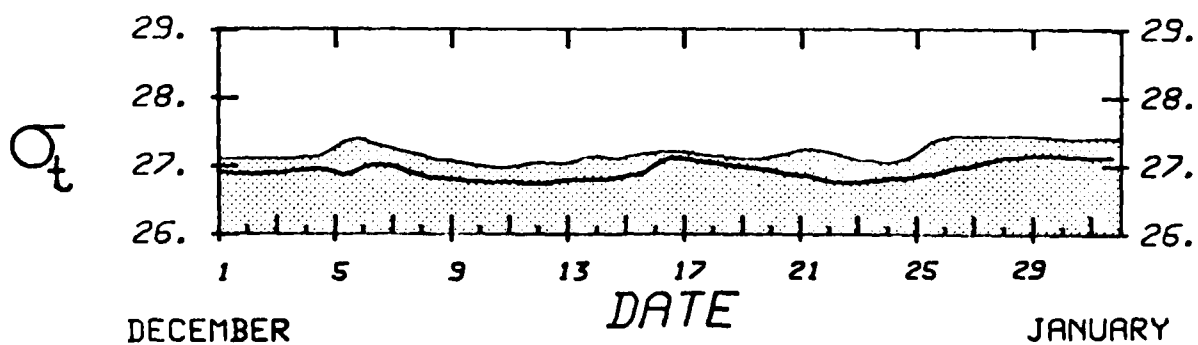
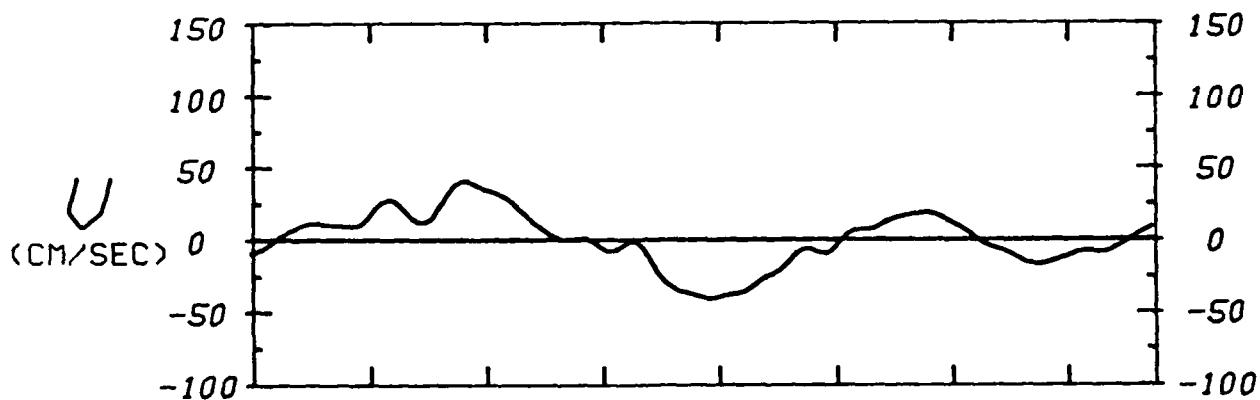
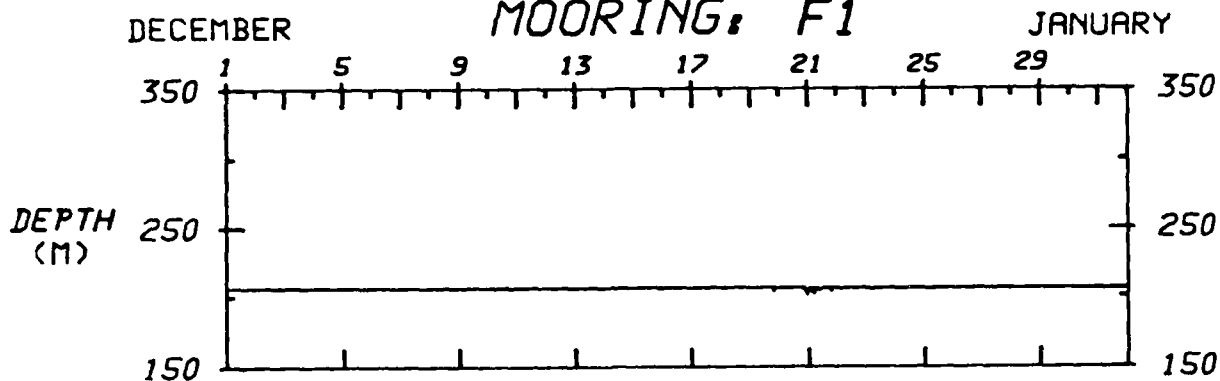


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F1T —————
 F1B —————

40 HRLP DATA FROM MOORING: F1

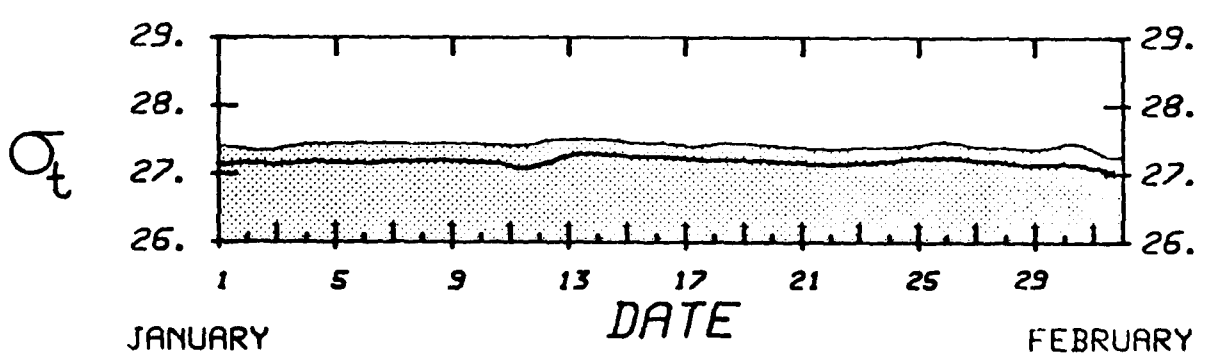
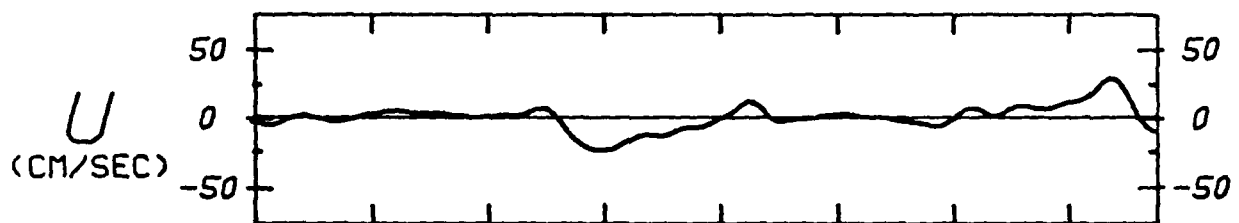
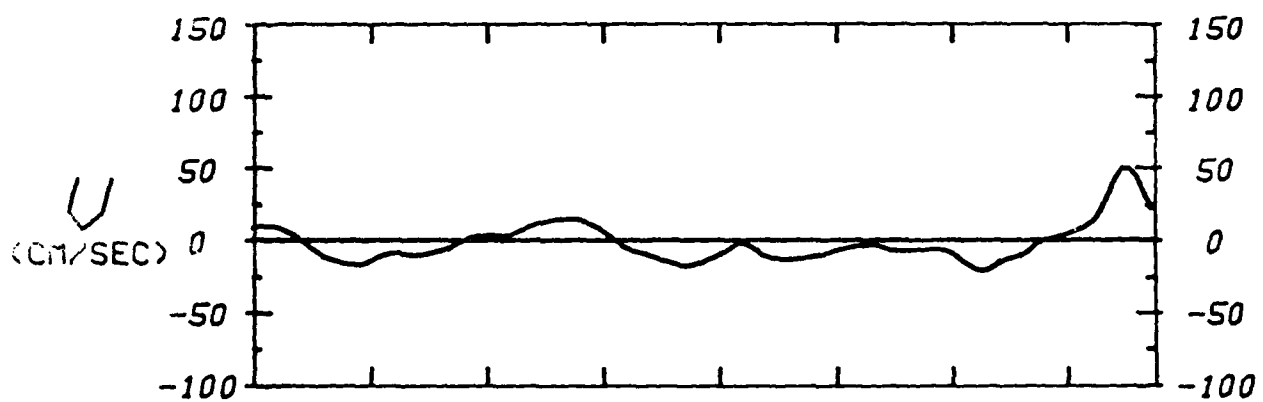
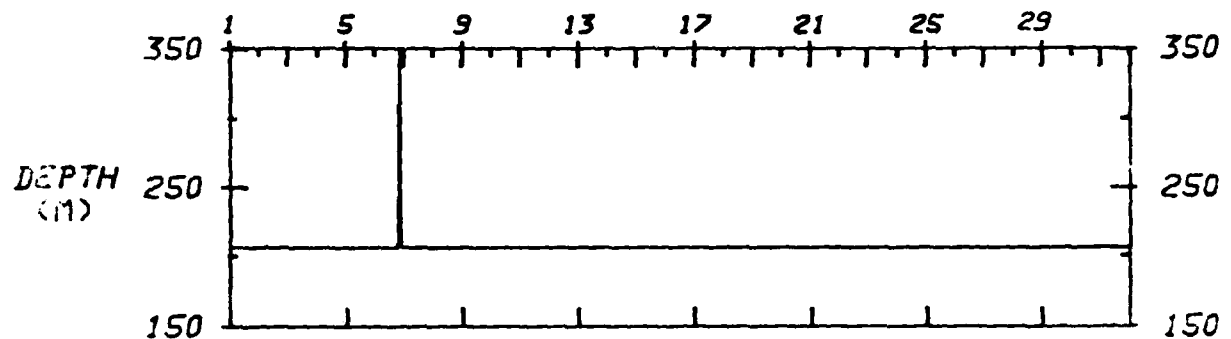


SIT
F1B

40 HRLP DATA FROM MOORING: F1

JANUARY

FEBRUARY

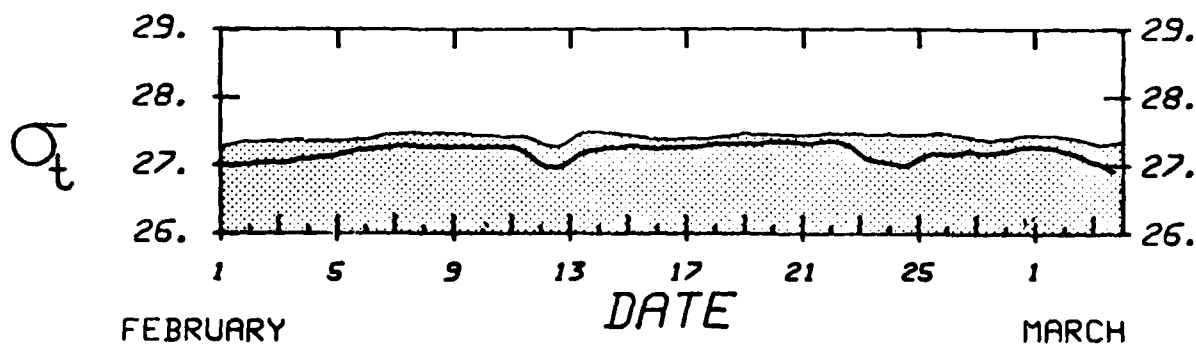
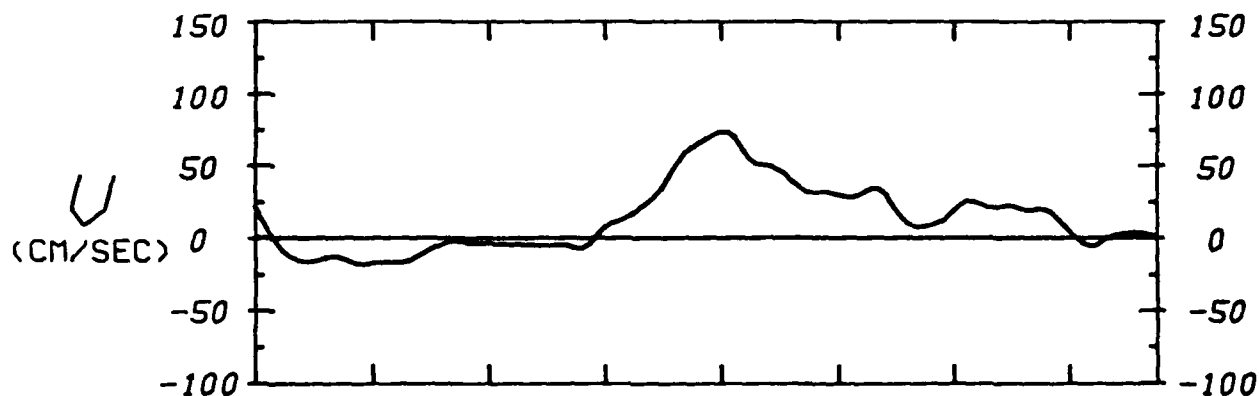
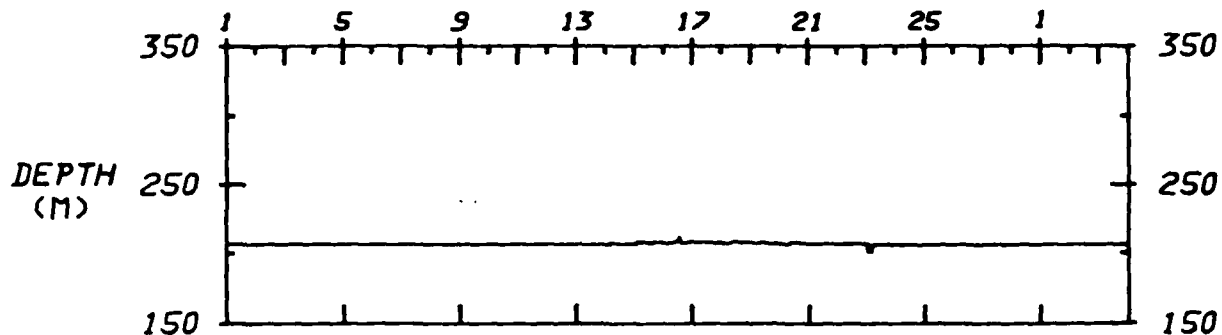


F1T ———
F1B ———

40 HRLP DATA FROM MOORING: F1

FEBRUARY

MARCH

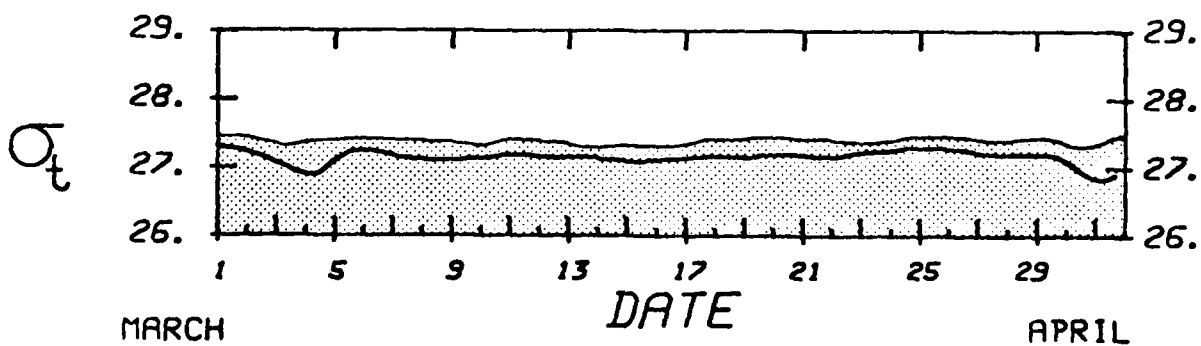
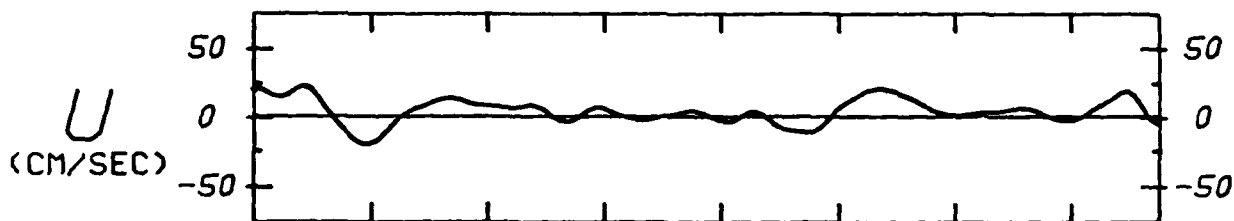
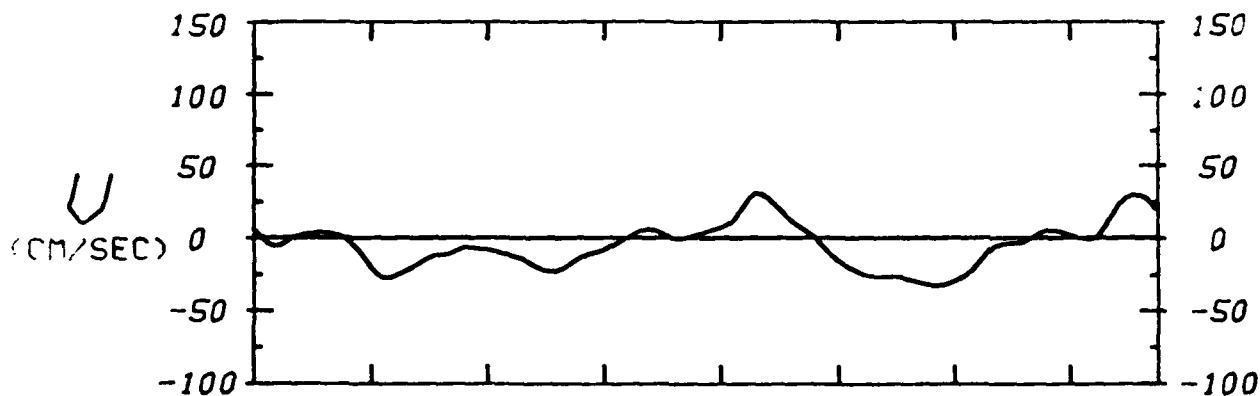
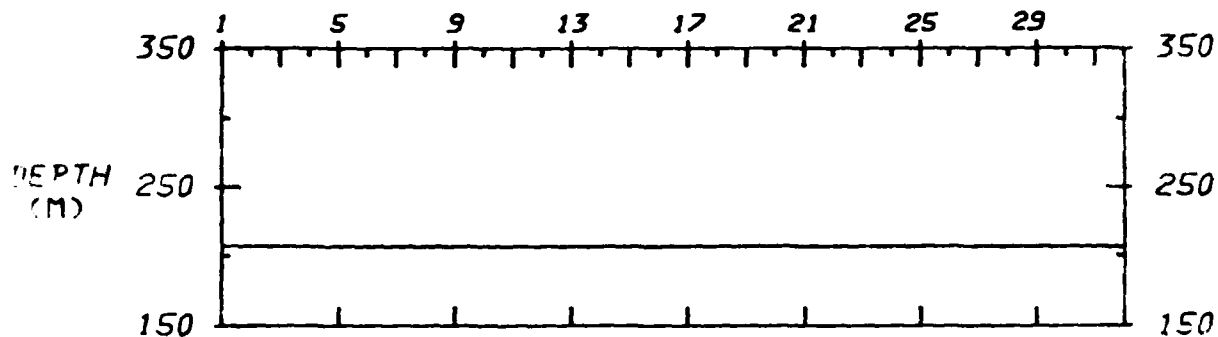


F1T
F1B

40 HRLP DATA FROM MOORING: F1

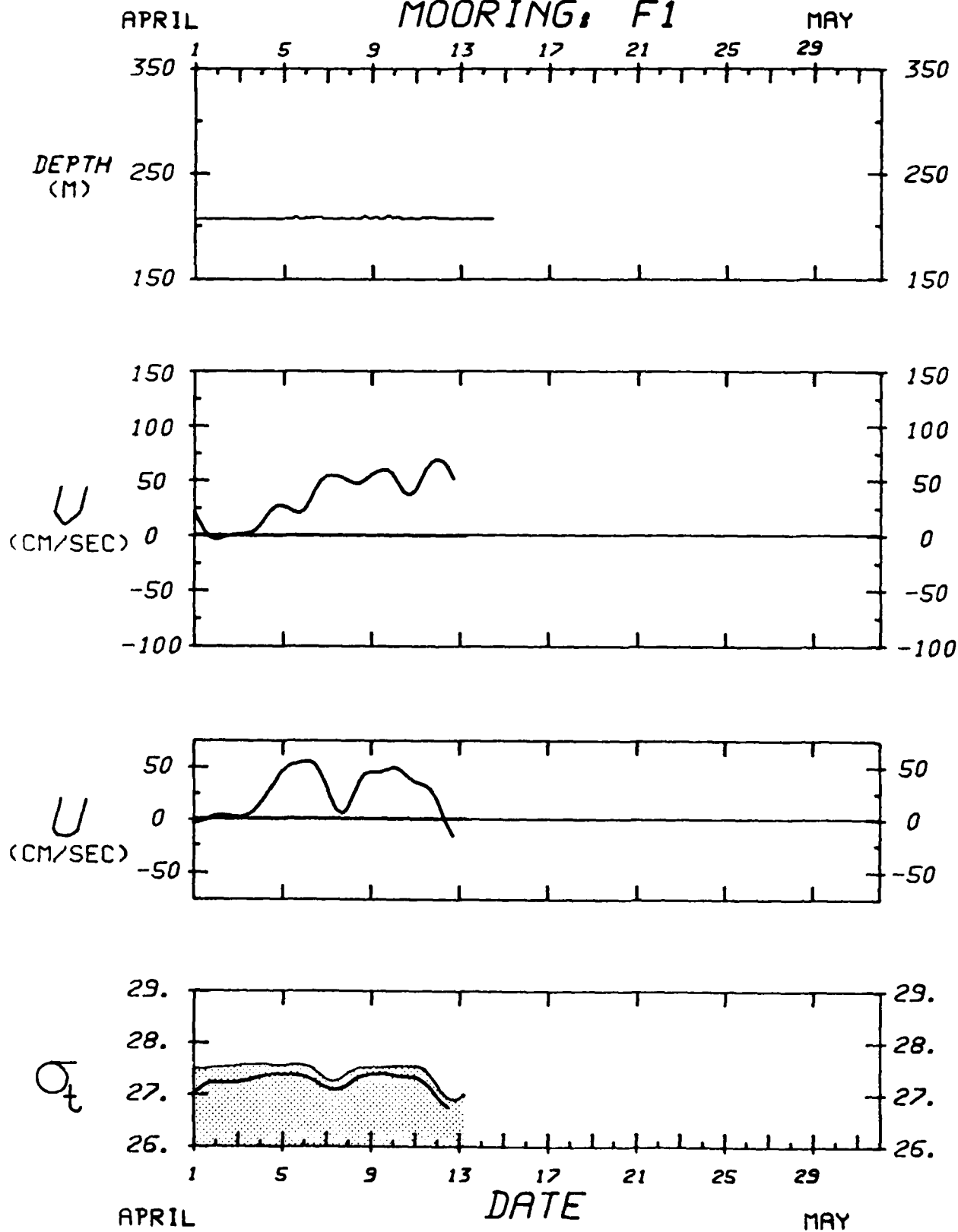
MARCH

APRIL



F1T ———
F1B ■■■■

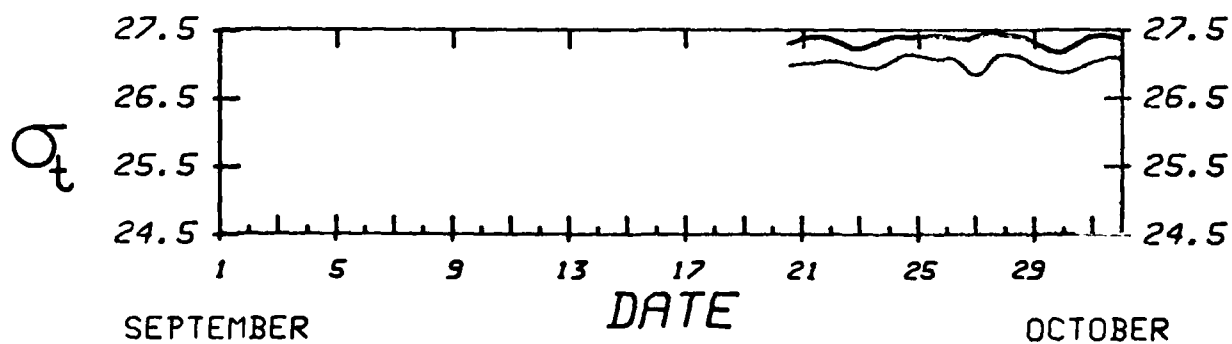
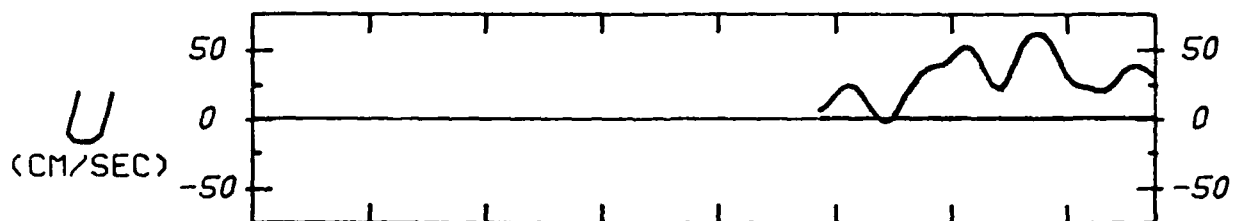
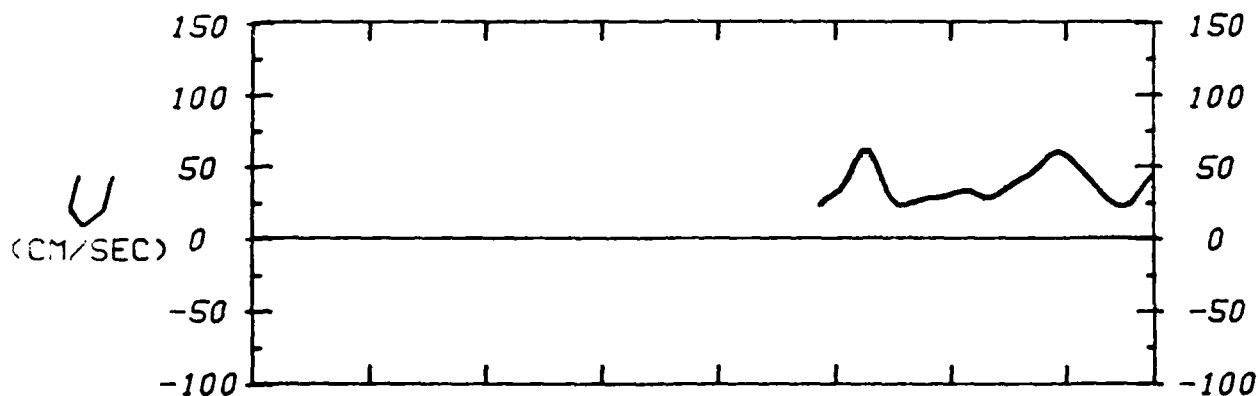
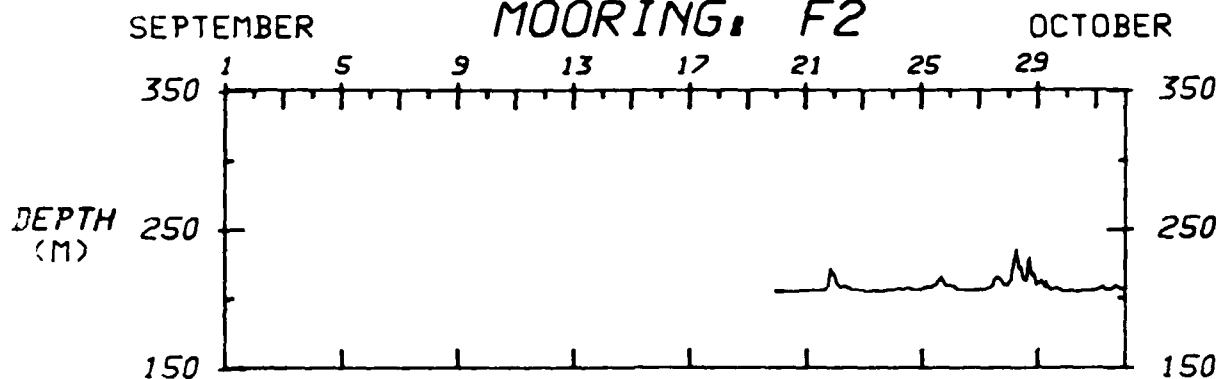
40 HRLP DATA FROM MOORING: F1

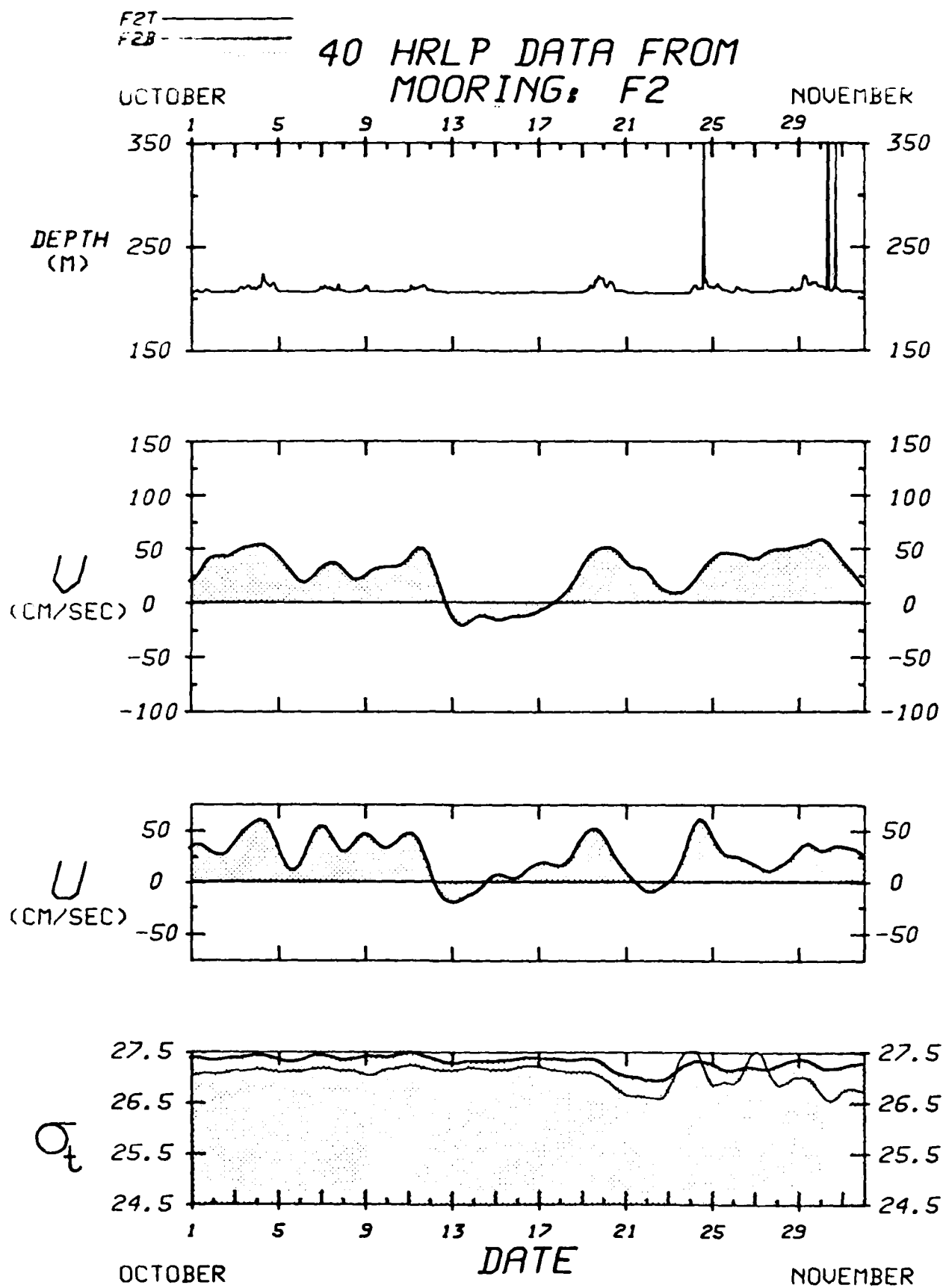


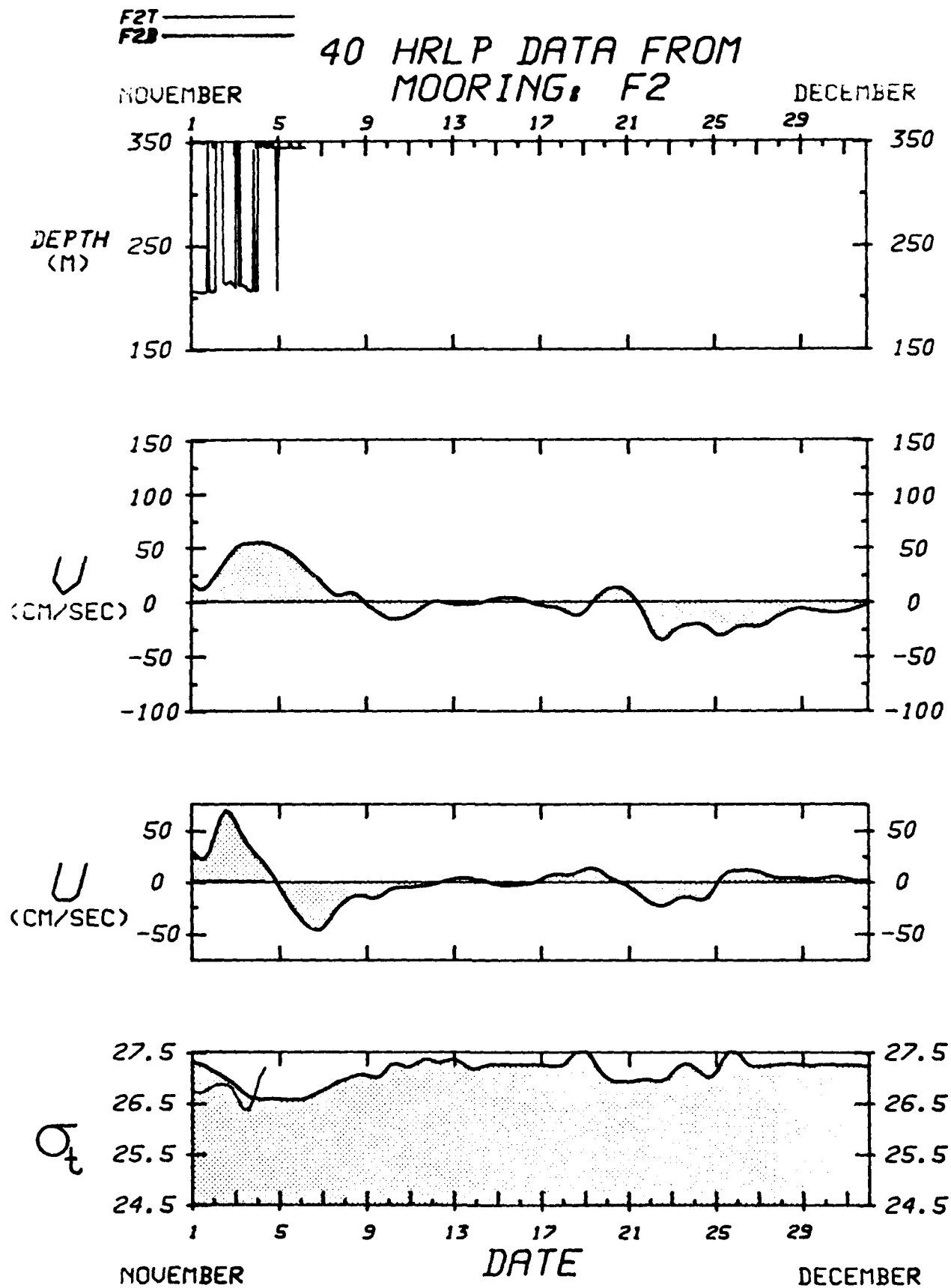
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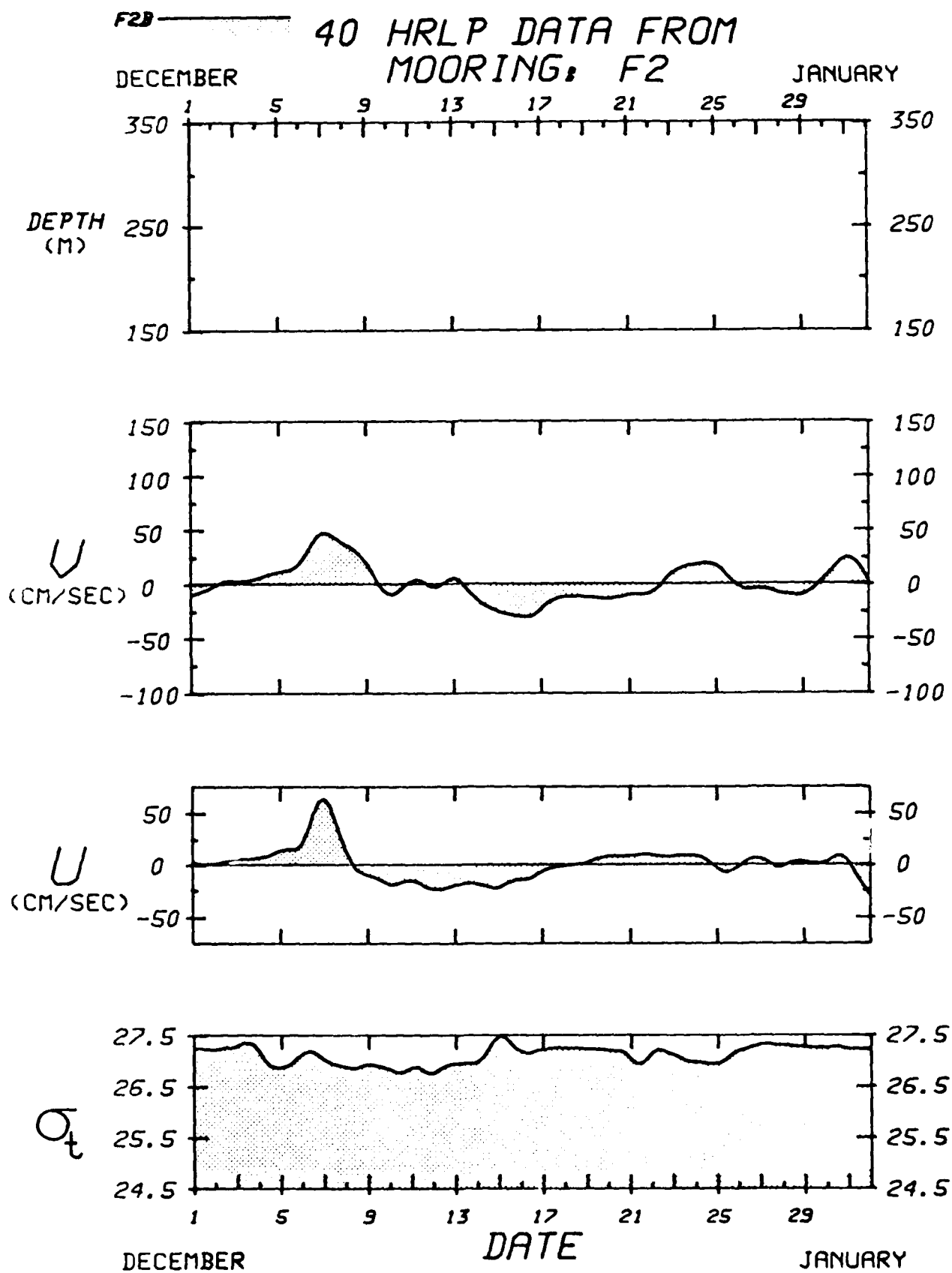
F2T
F2B

40 HRLP DATA FROM MOORING: F2







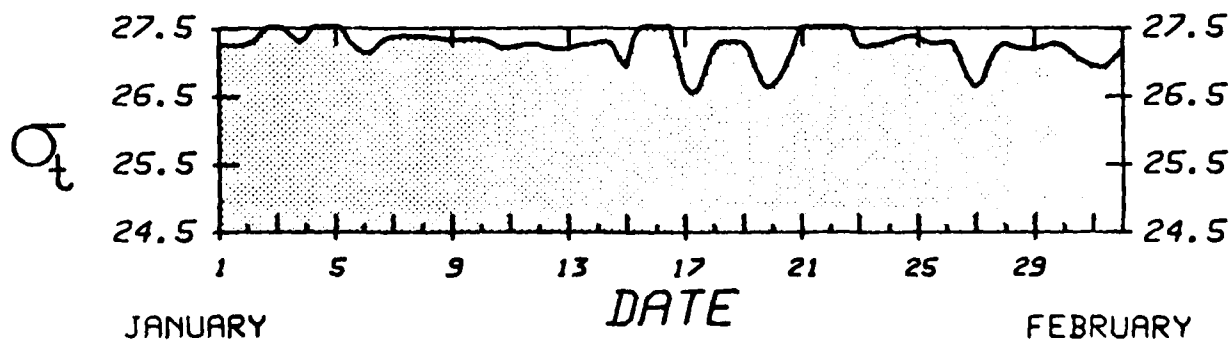
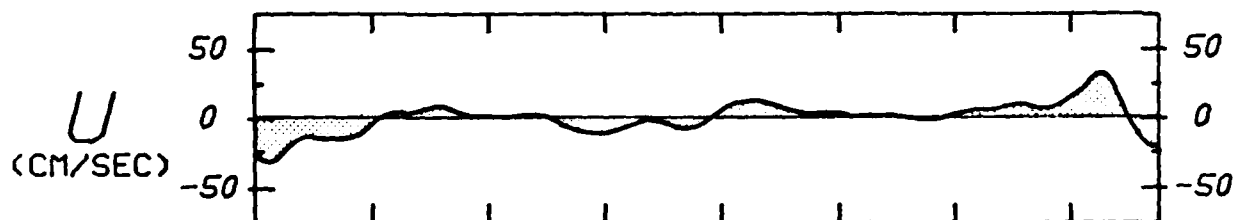
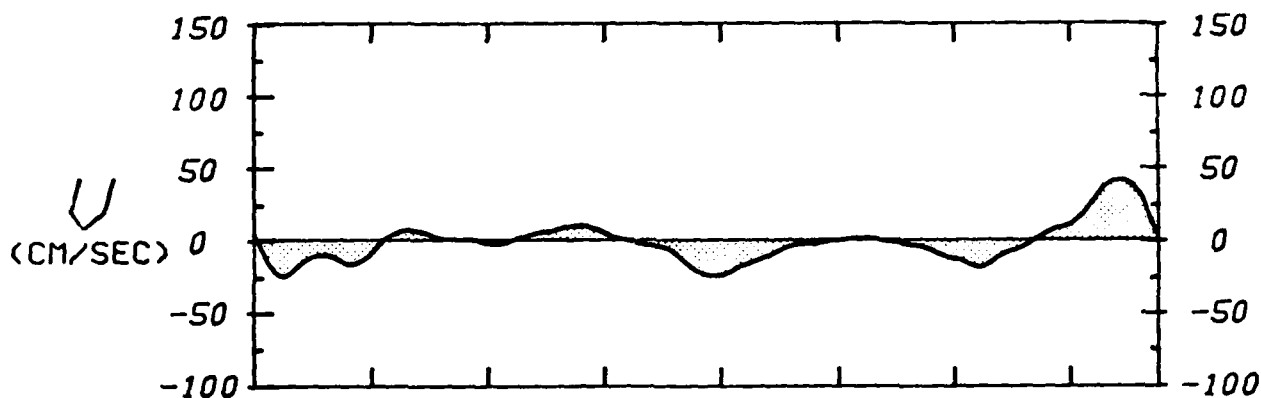
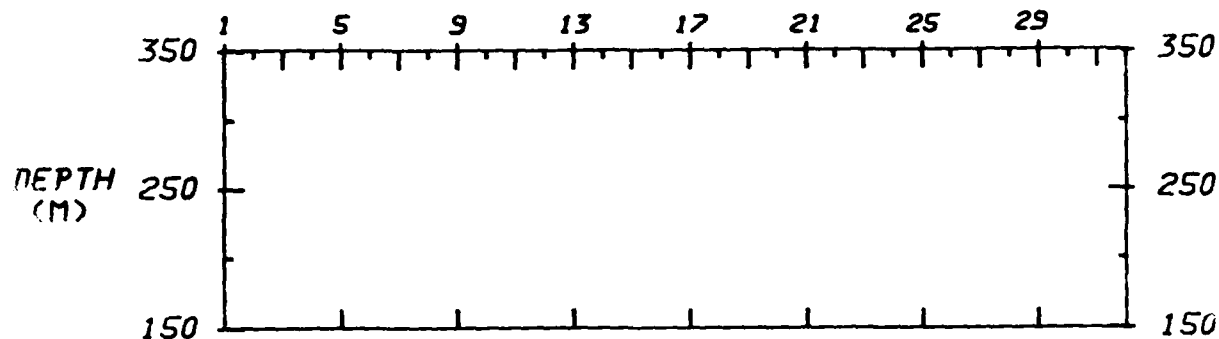


F2B

40 HRLP DATA FROM MOORING: F2

JANUARY

FEBRUARY

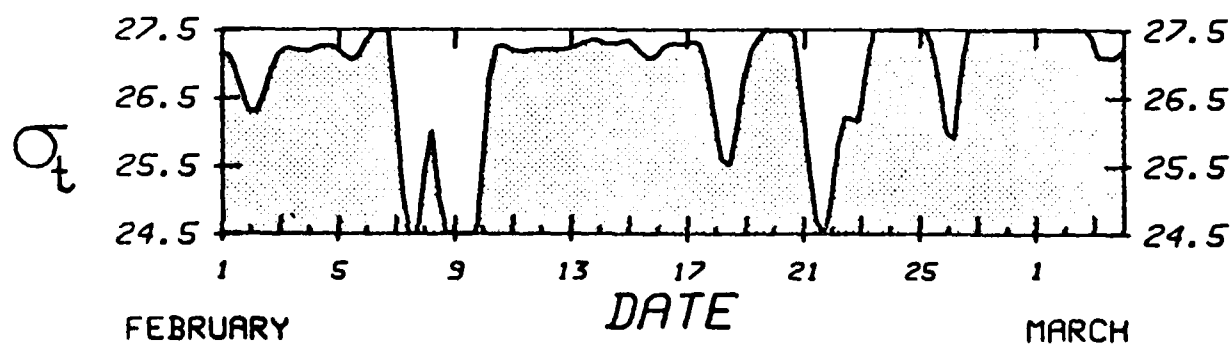
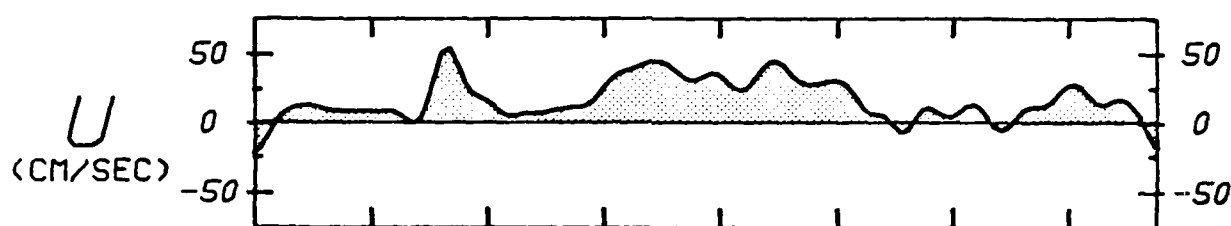
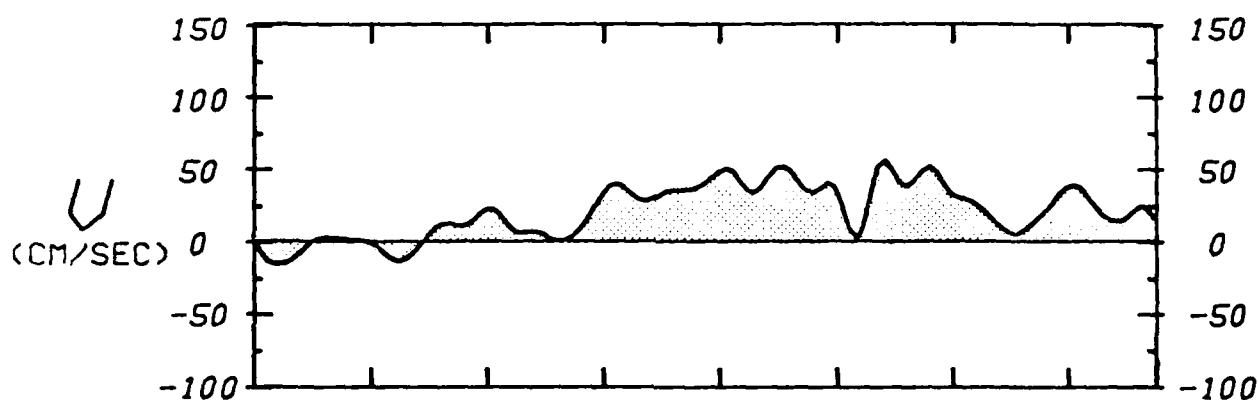
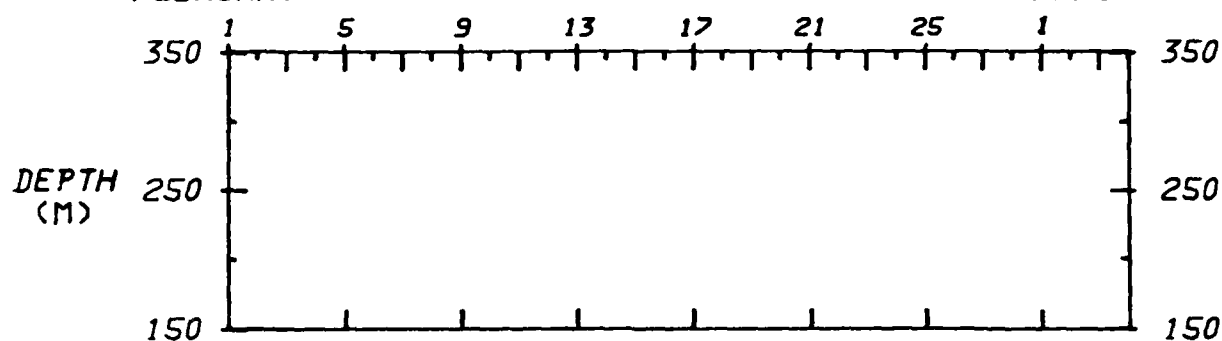


F2B

40 HRLP DATA FROM MOORING: F2

FEBRUARY

MARCH

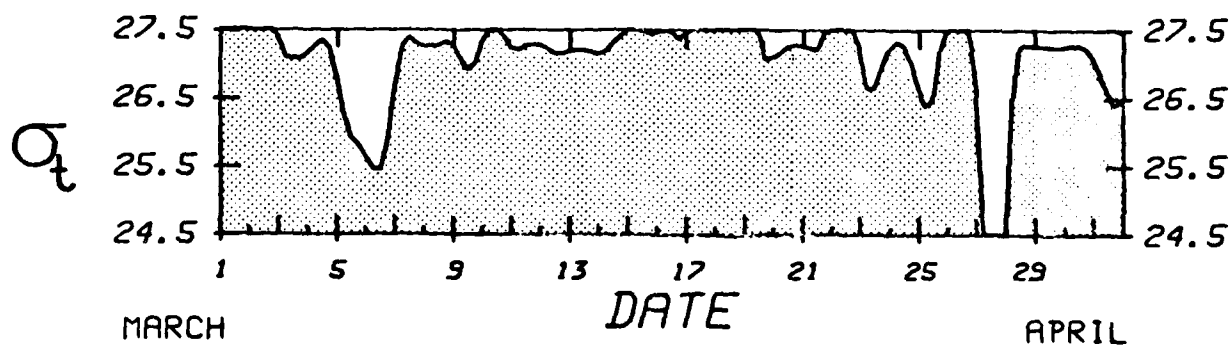
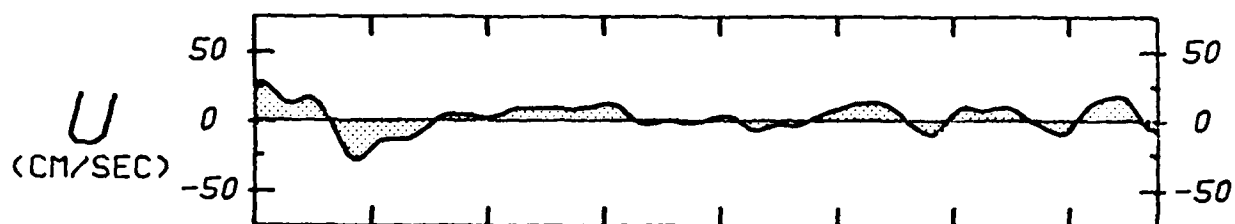
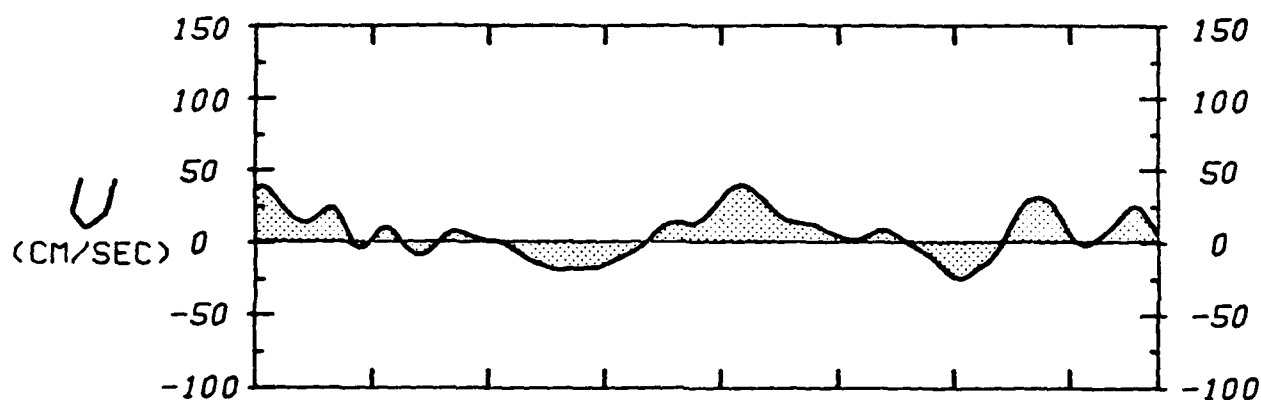
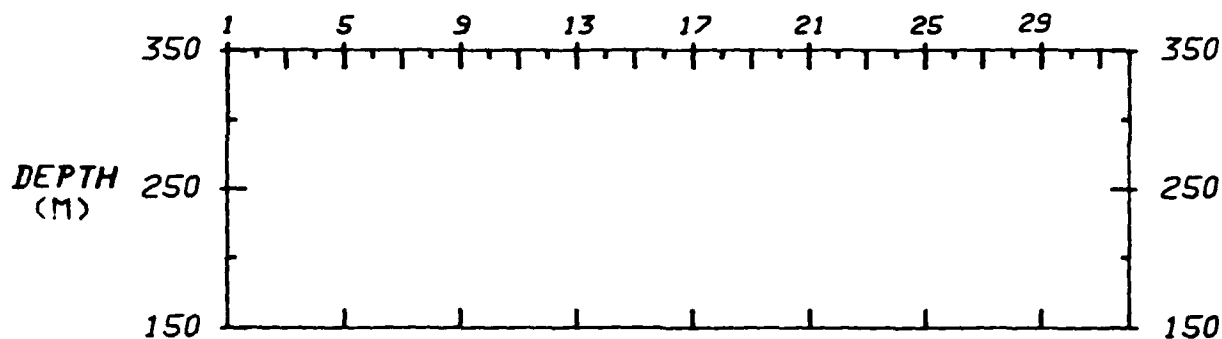


F2B

40 HRLP DATA FROM MOORING: F2

MARCH

APRIL

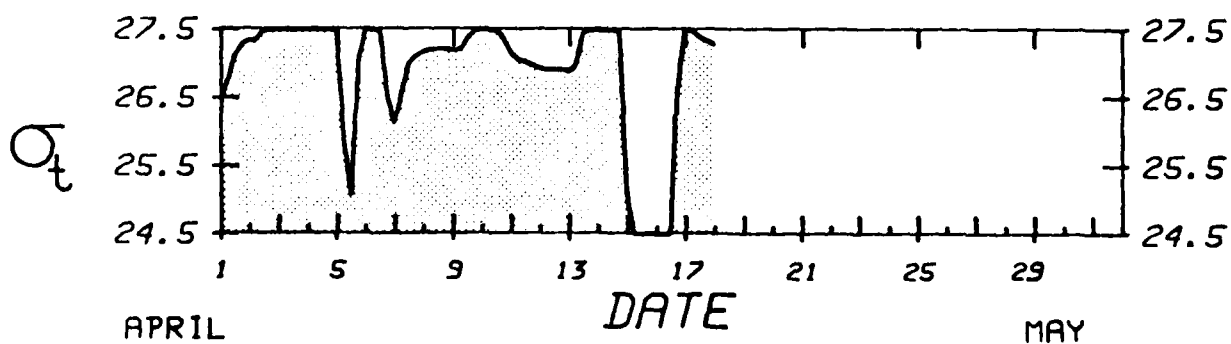
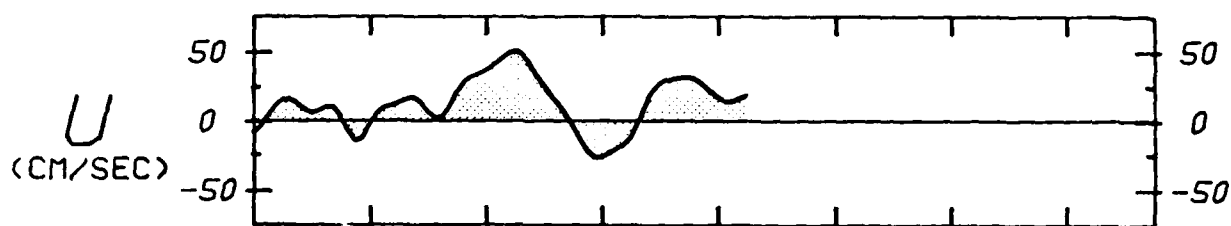
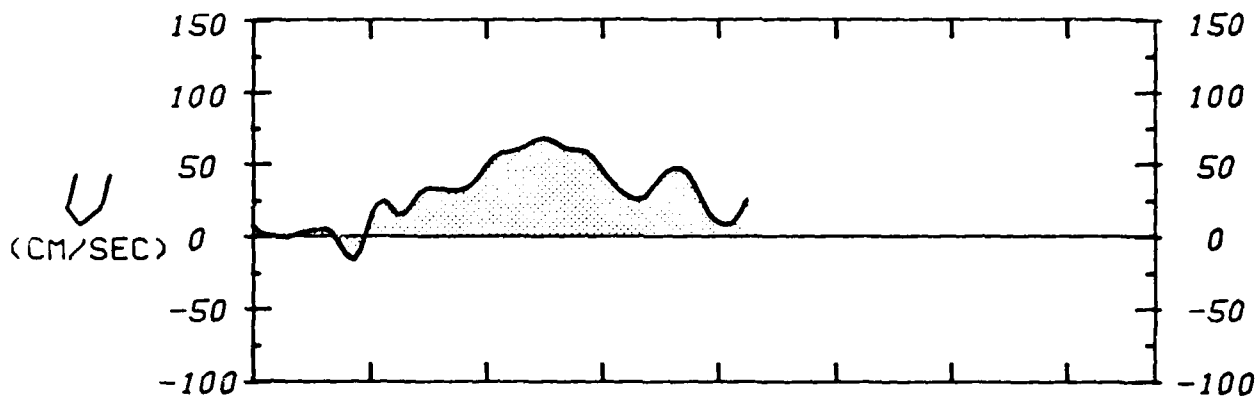
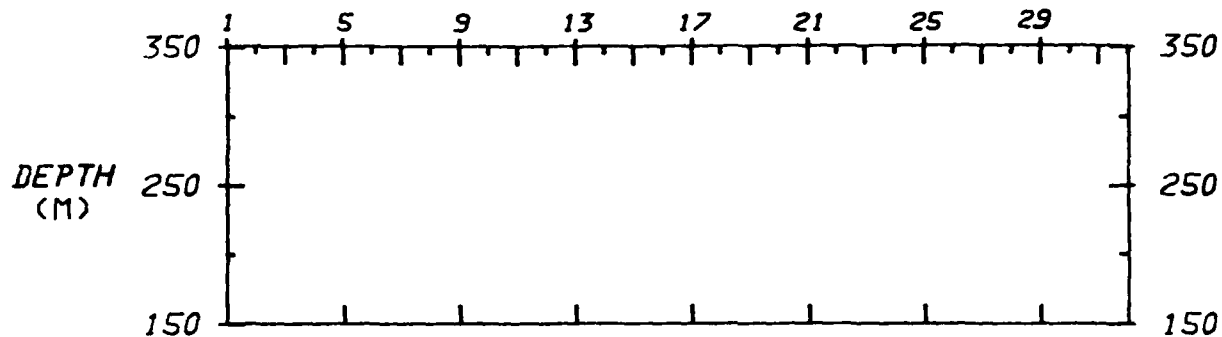


F2B

40 HRLP DATA FROM MOORING: F2

APRIL

MAY

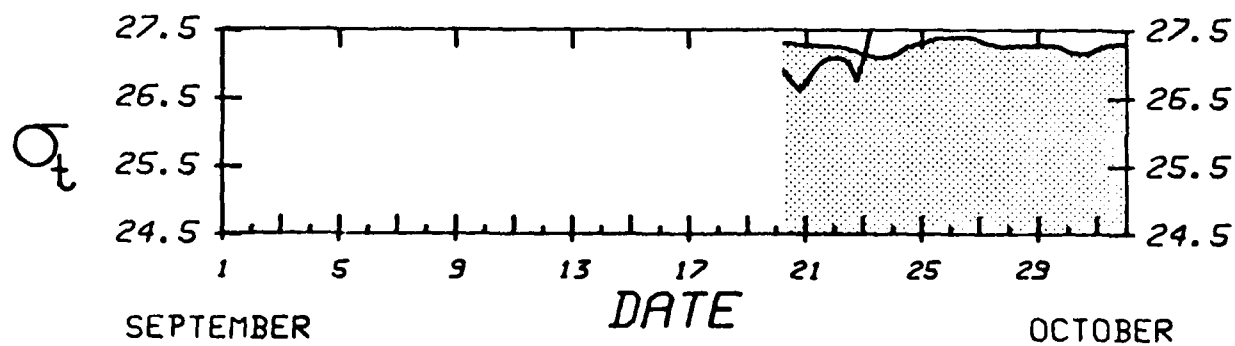
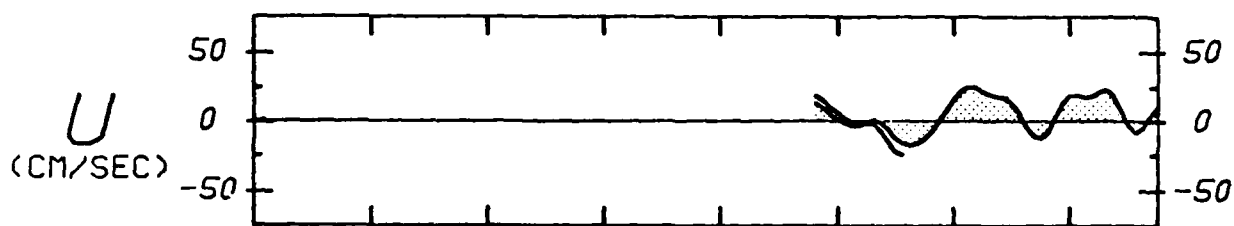
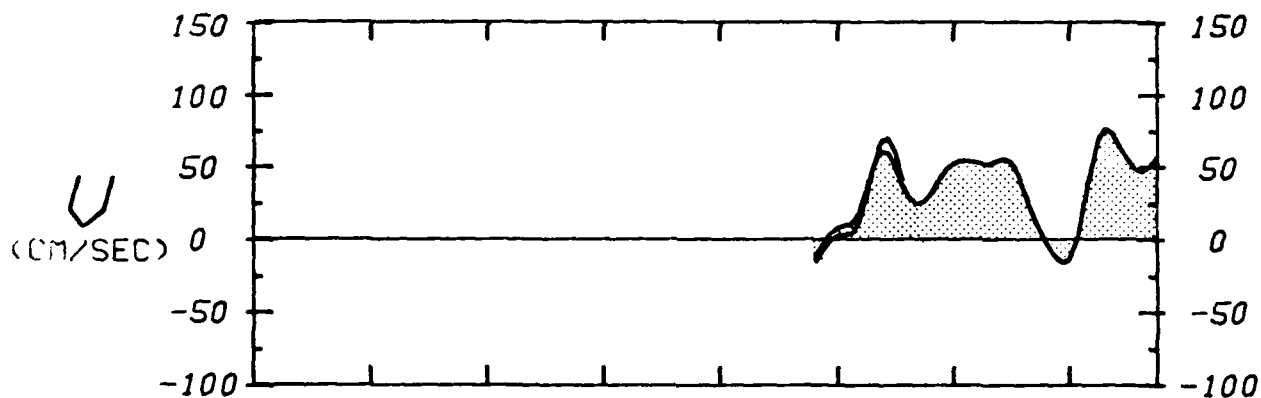
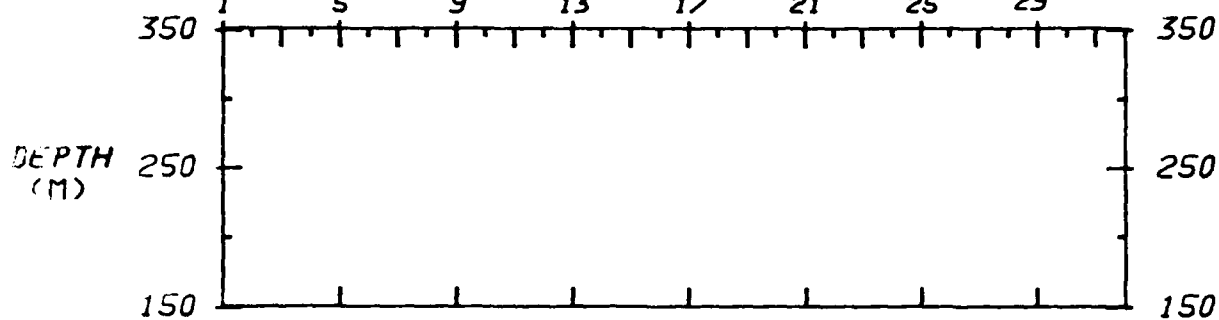


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F3T _____
 F3B _____

40 HRLP DATA FROM MOORING: F3

SEPTEMBER 1 5 9 13 17 21 25 29 OCTOBER

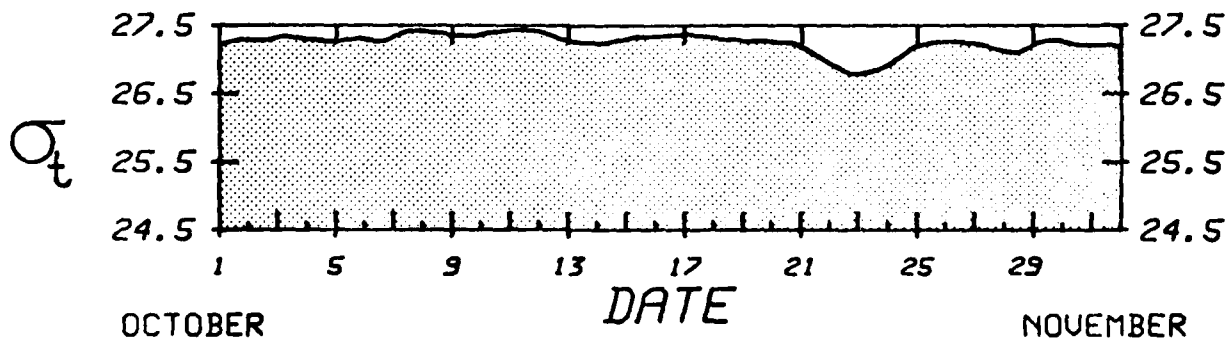
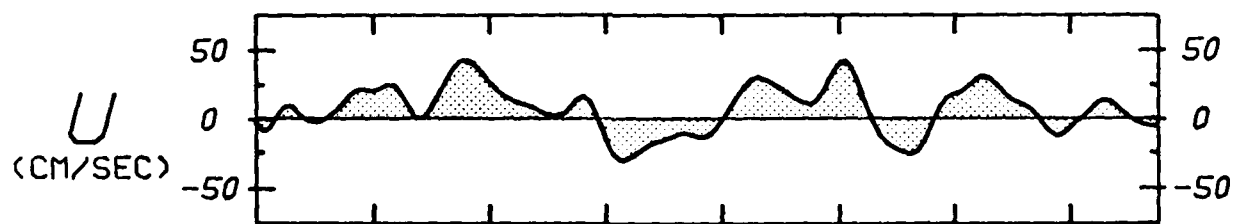
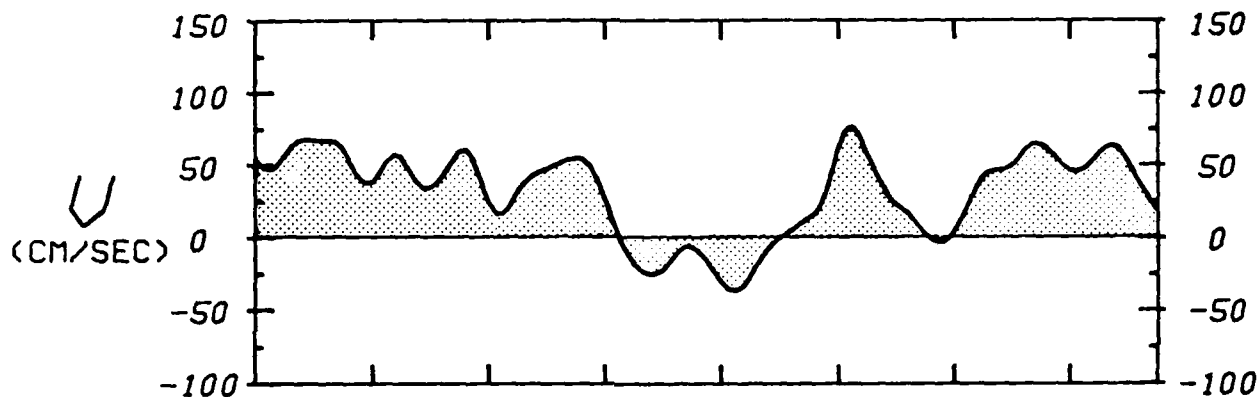
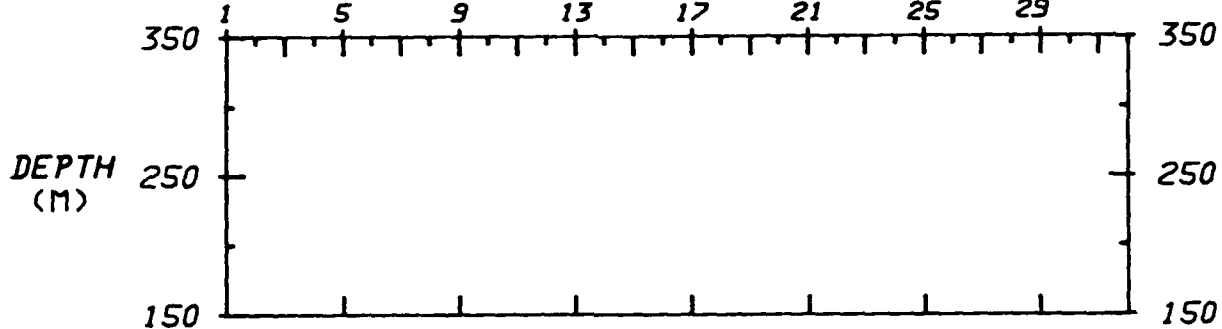


F38

40 HRLP DATA FROM MOORING: F3

OCTOBER

NOVEMBER



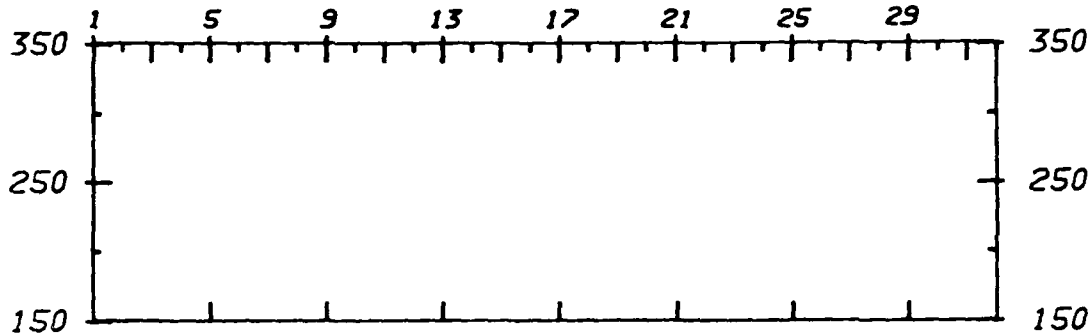
F3B

40 HRLP DATA FROM MOORING: F3

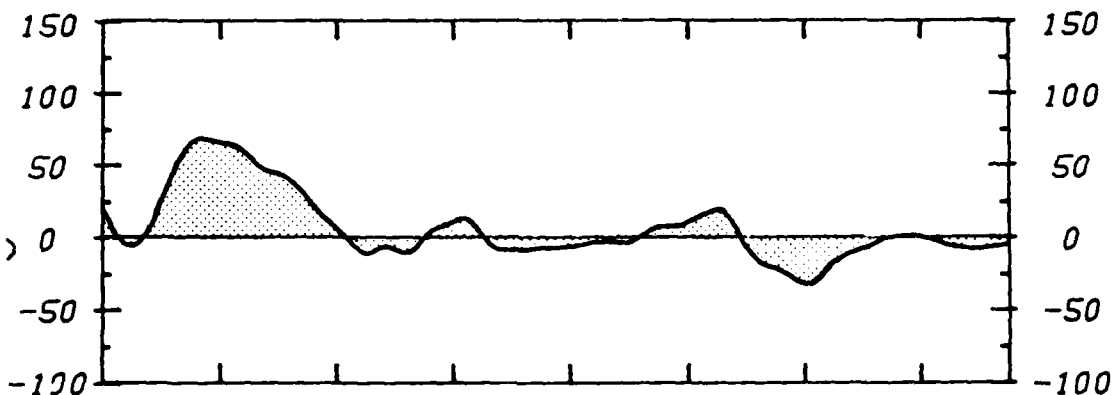
NOVEMBER

DECEMBER

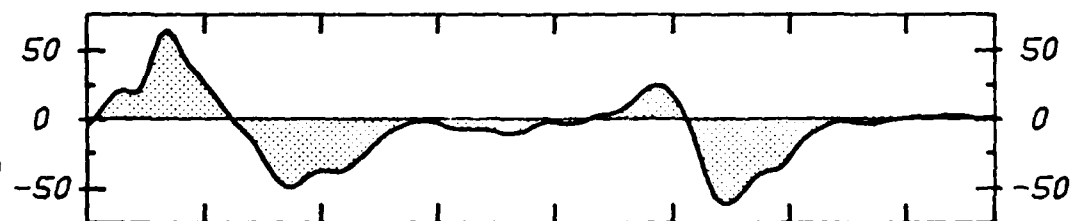
DEPTH
(M)



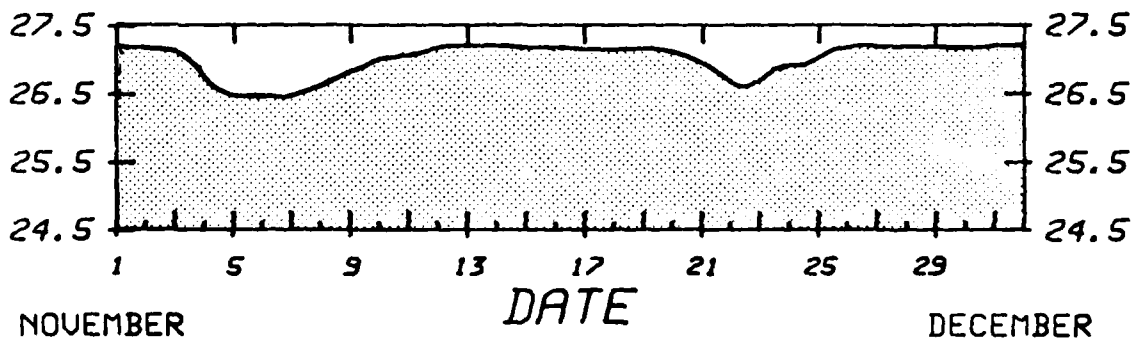
U
(CM/SEC)



U
(CM/SEC)



σ_t

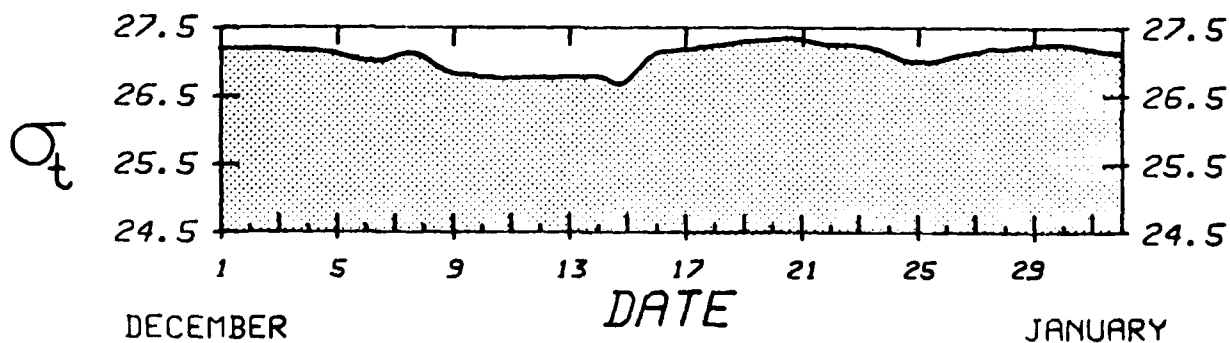
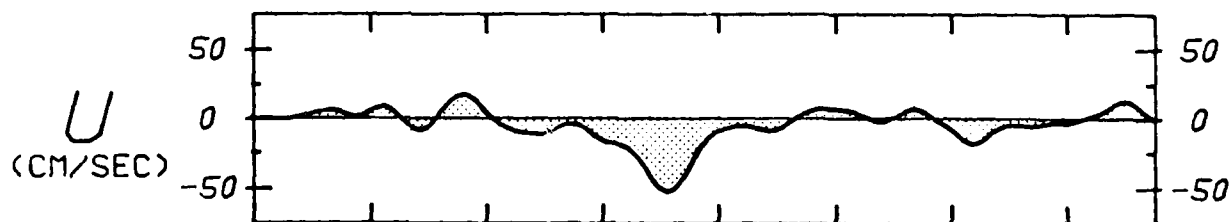
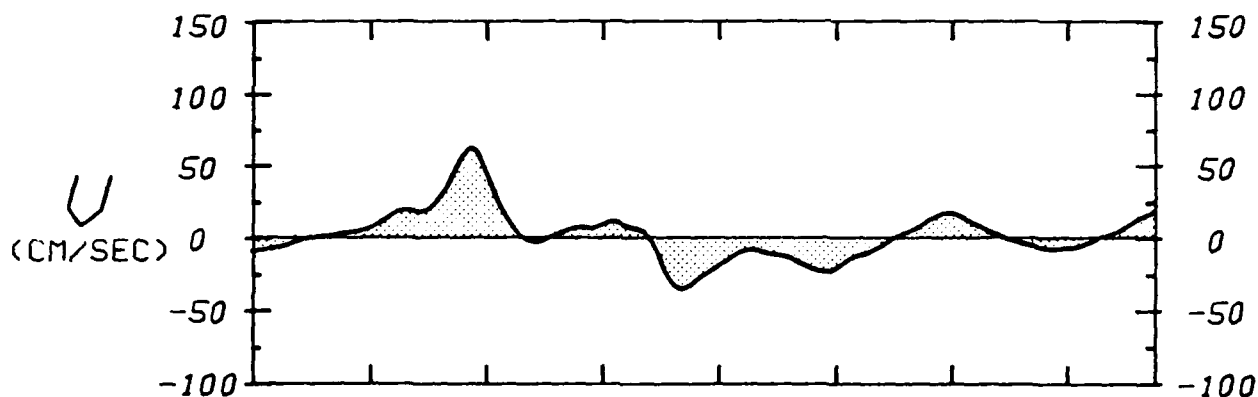
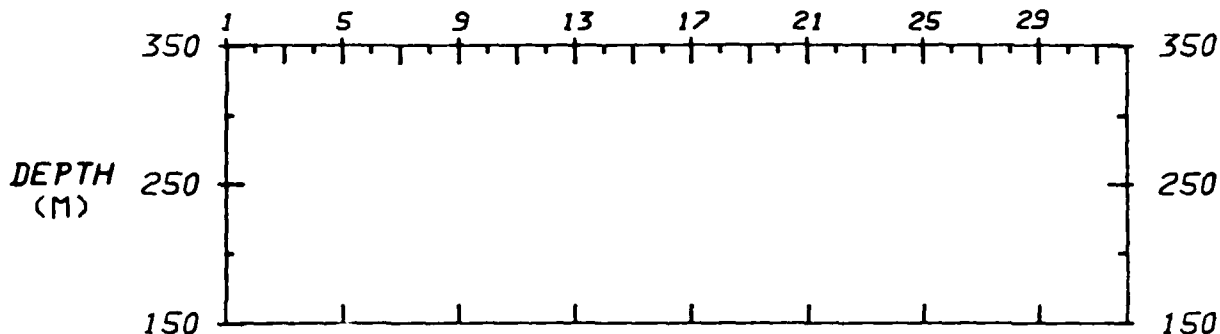


F3B

40 HRLP DATA FROM MOORING: F3

DECEMBER

JANUARY

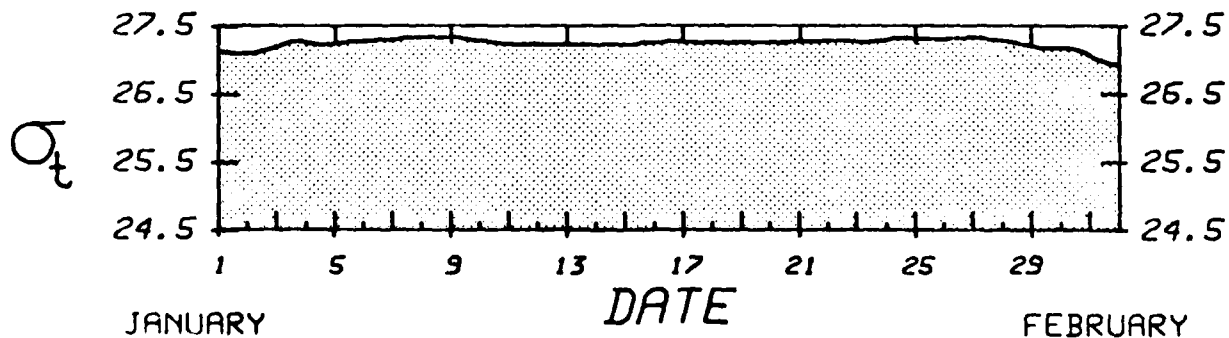
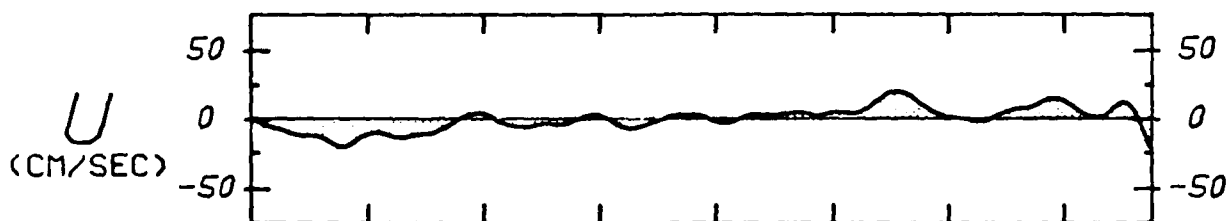
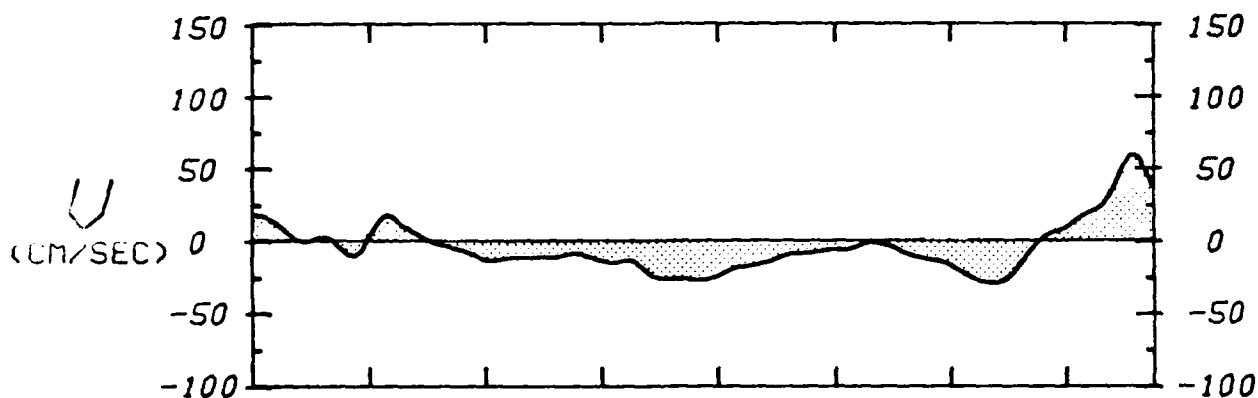
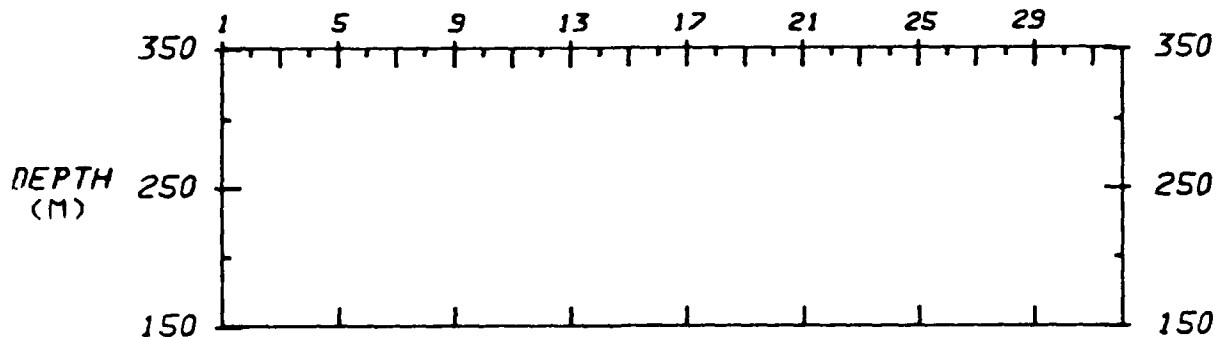


F3B —————→

40 HRLP DATA FROM MOORING: F3

JANUARY

FEBRUARY

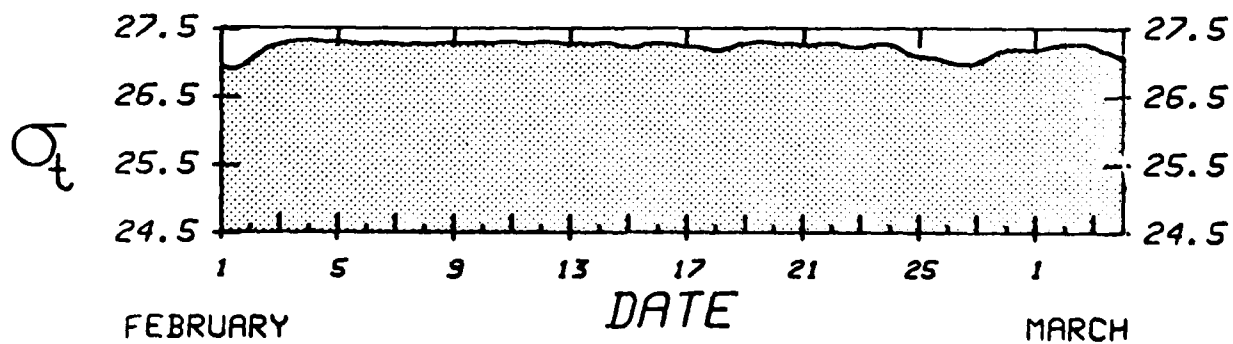
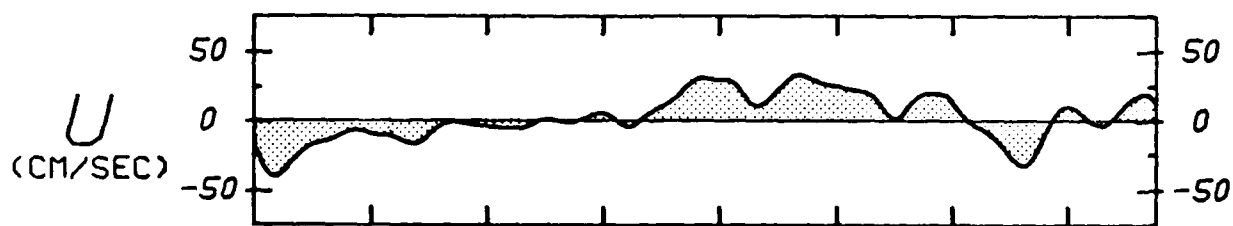
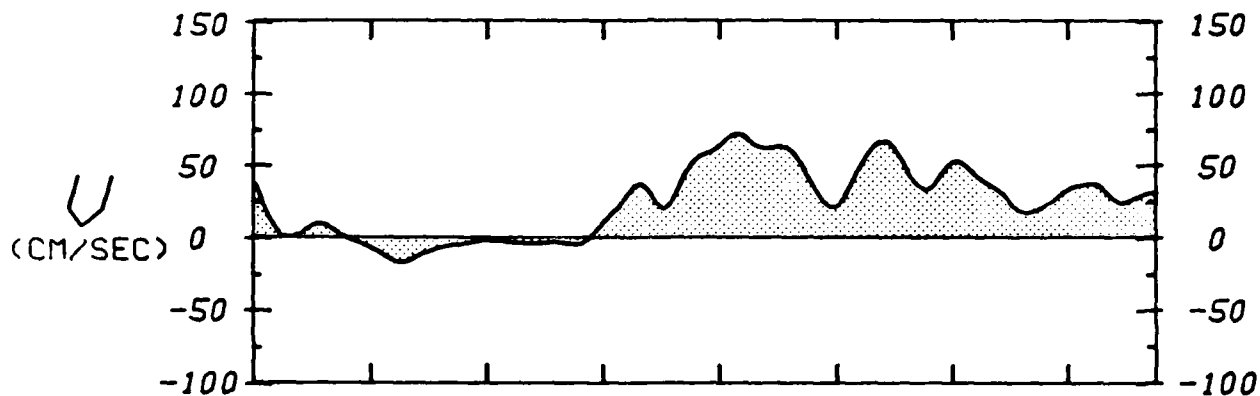
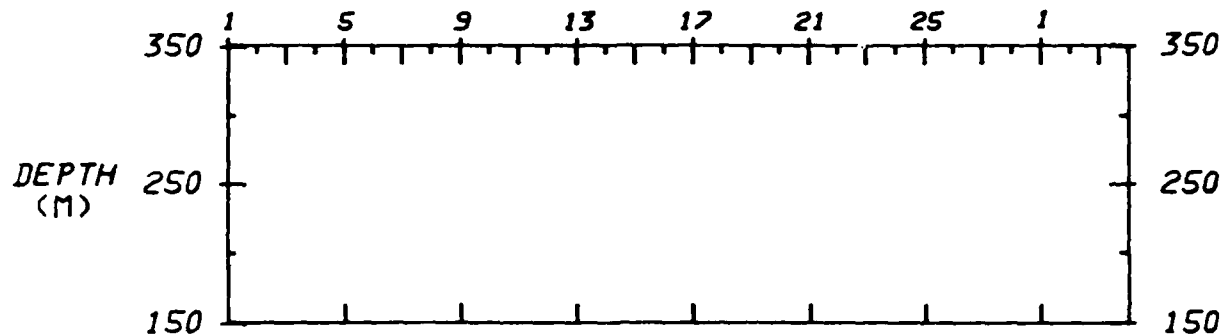


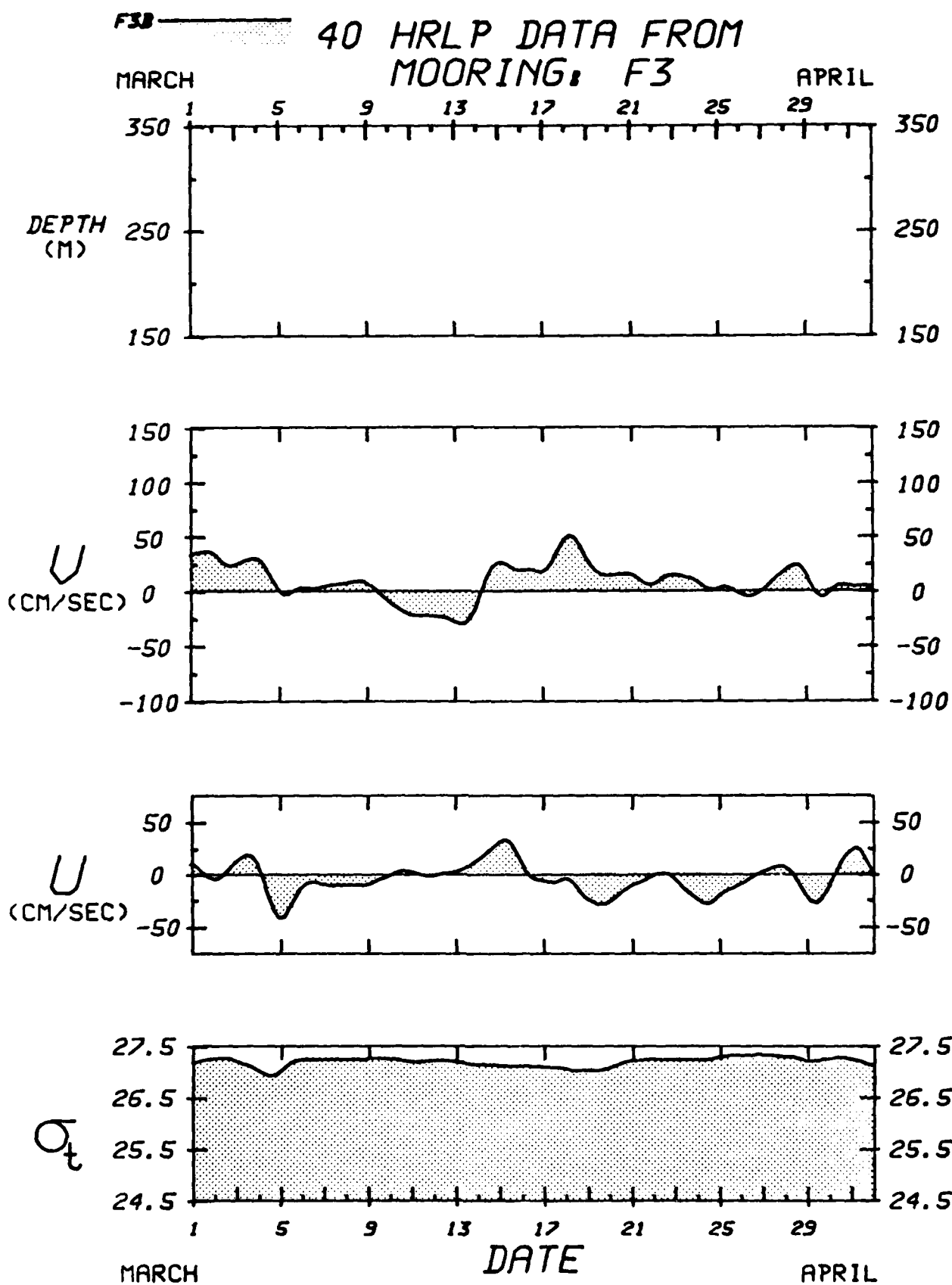
F3B

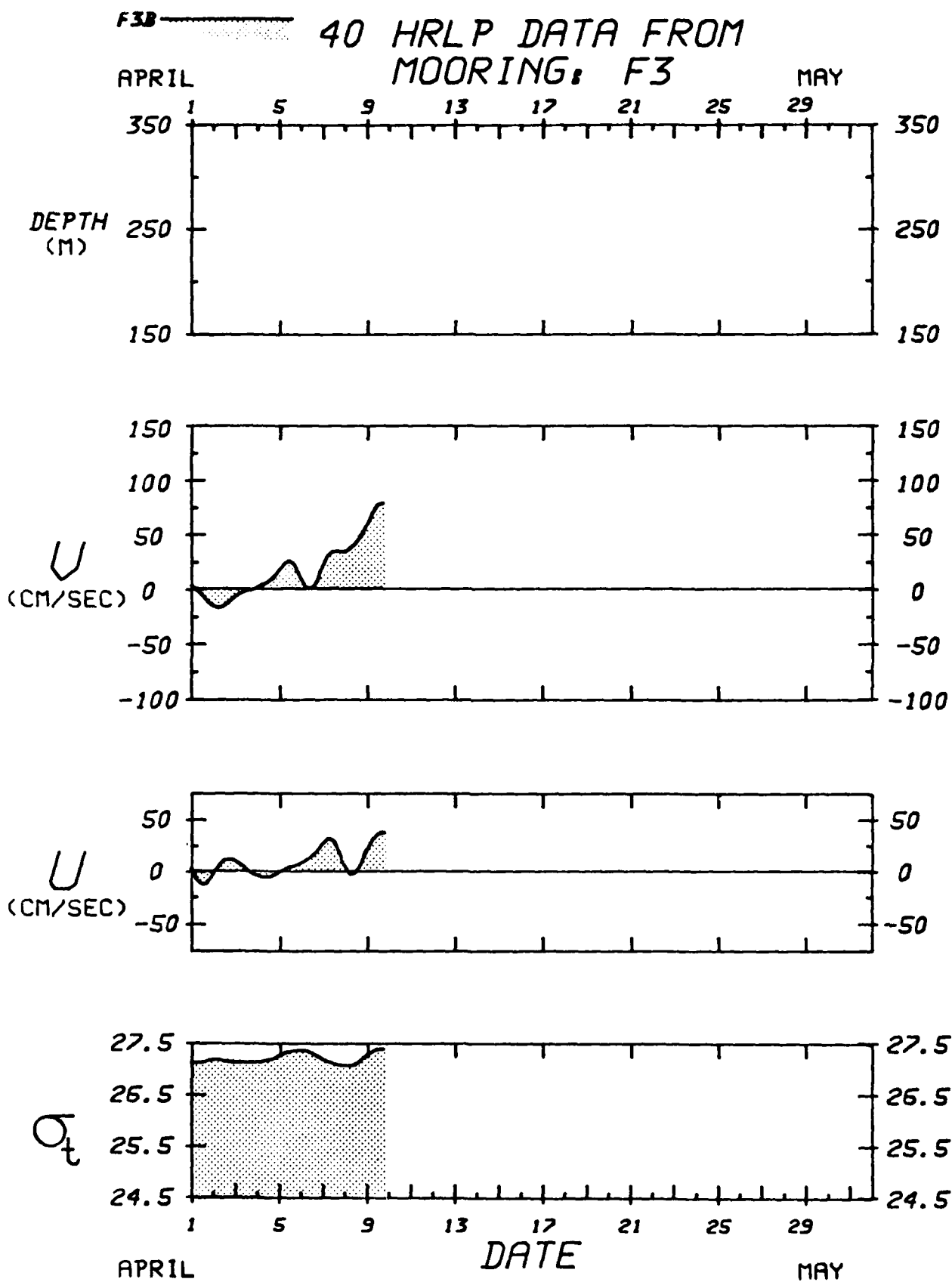
40 HRLP DATA FROM MOORING: F3

FEBRUARY

MARCH







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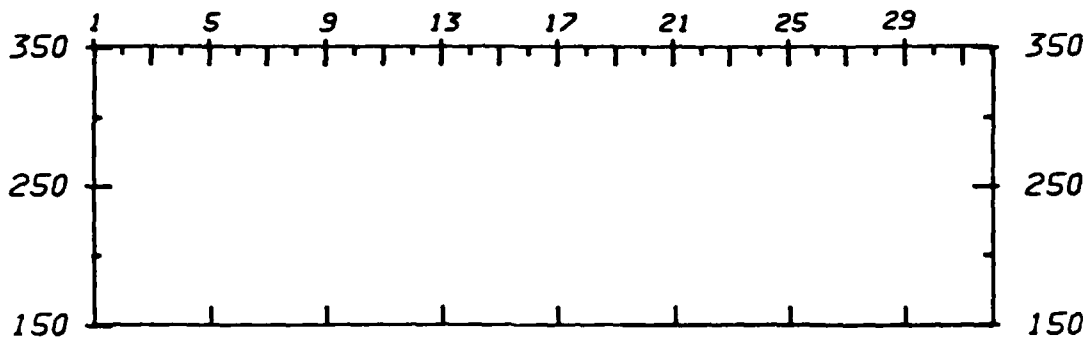
GT _____
GB _____

40 HRLP DATA FROM MOORING: G

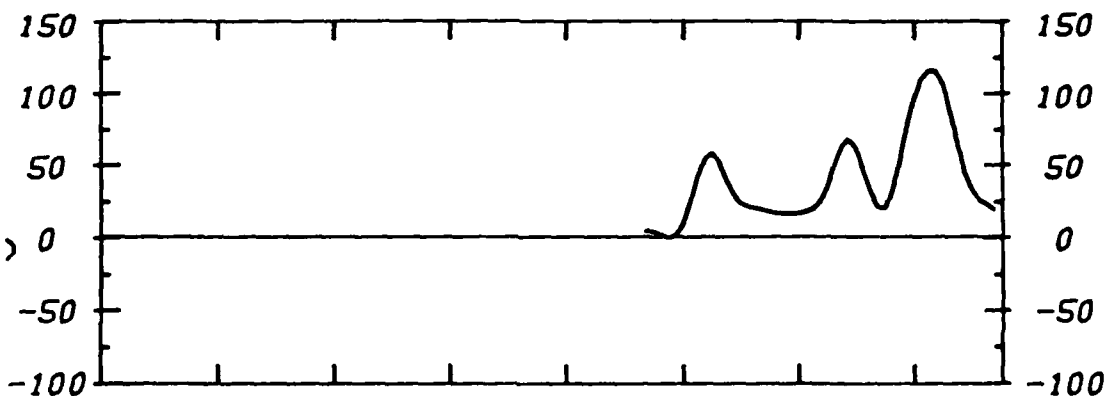
SEPTEMBER

OCTOBER

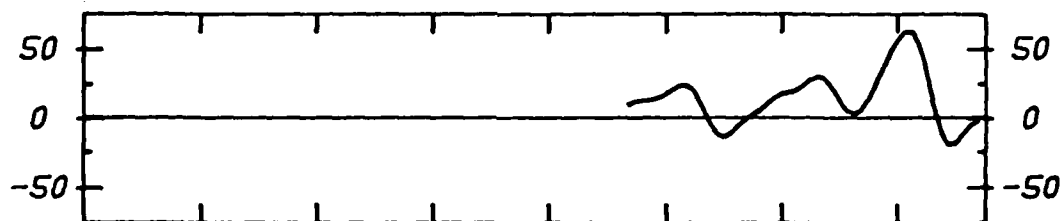
DEPTH
(M)



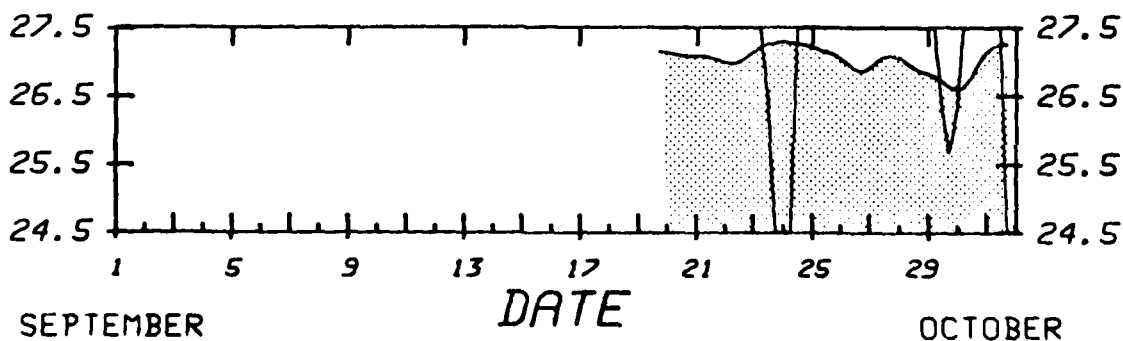
U
(CM/SEC)



U
(CM/SEC)



σ_t

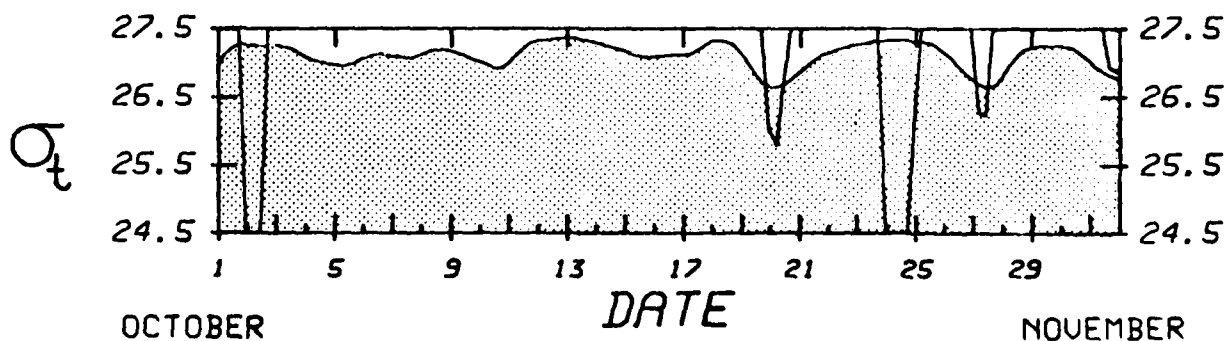
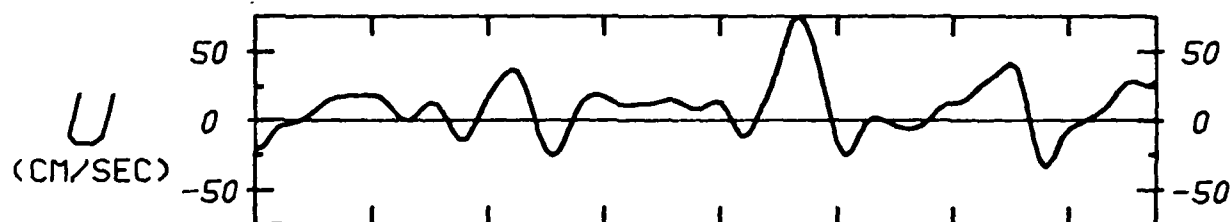
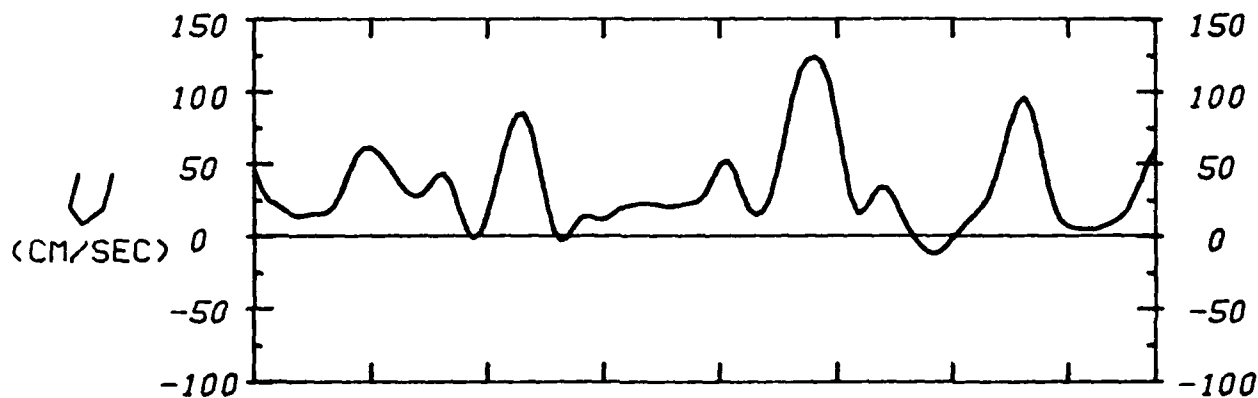
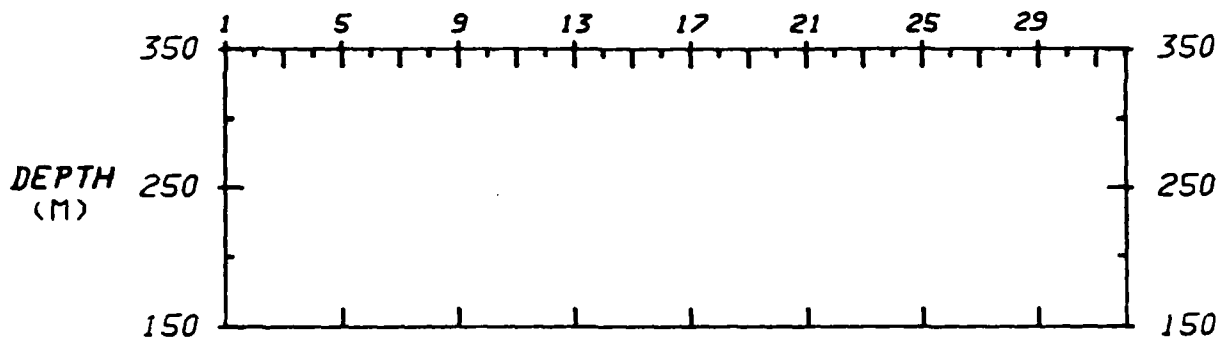


GT
GB

40 HRLP DATA FROM MOORING: G

OCTOBER

NOVEMBER



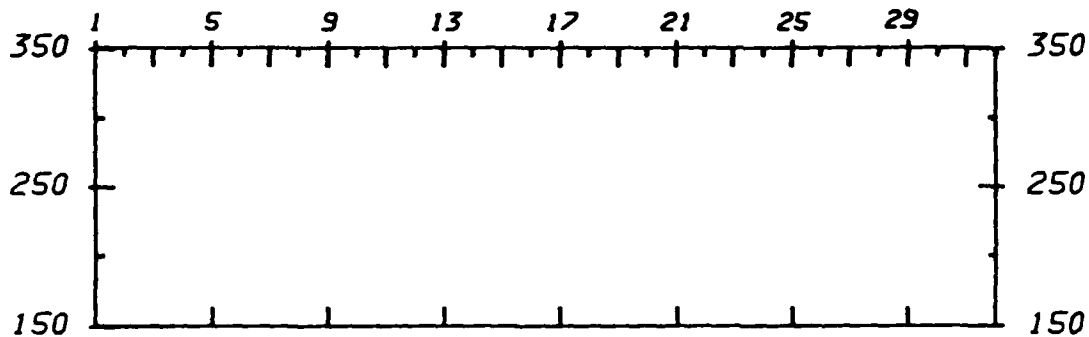
GT
GB

40 HRLP DATA FROM MOORING: 6

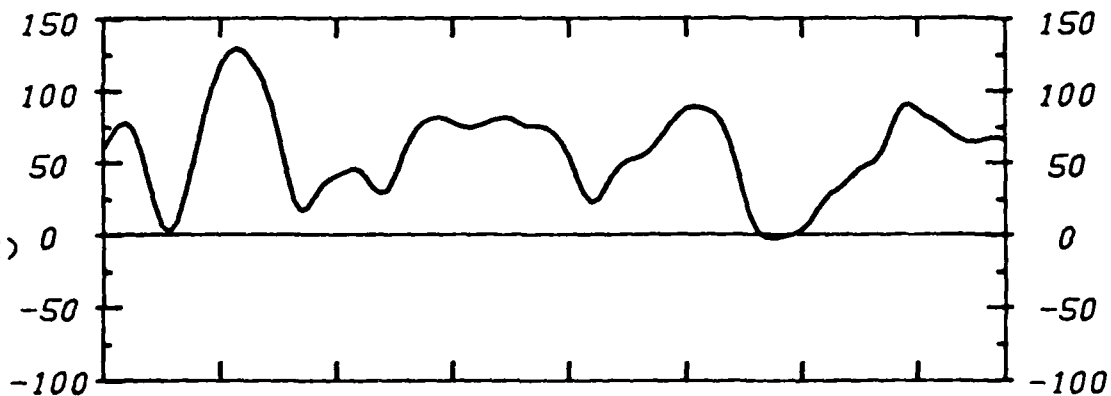
NOVEMBER

DECEMBER

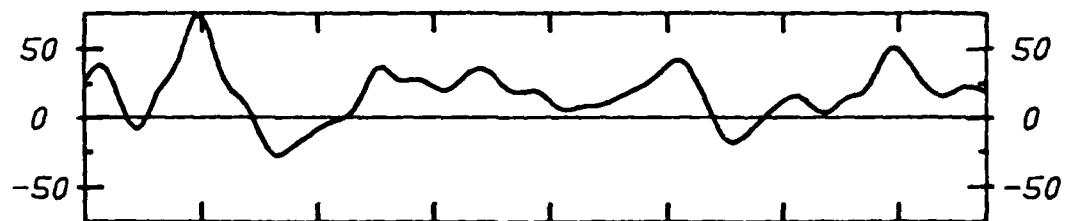
DEPTH
(M)



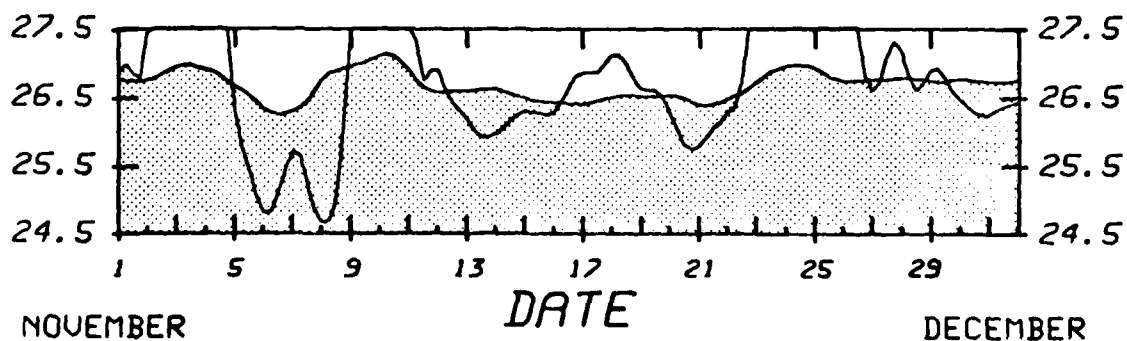
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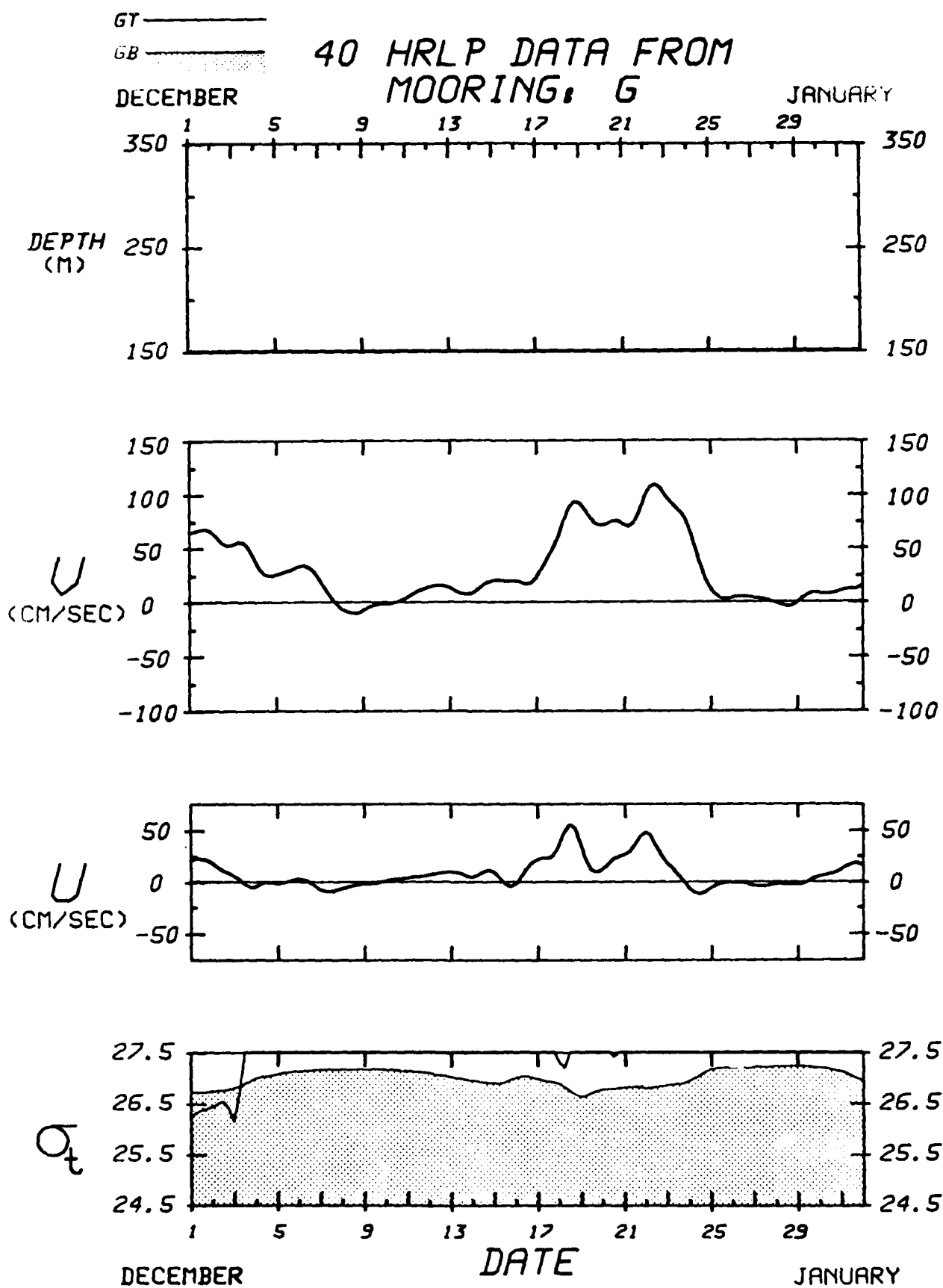


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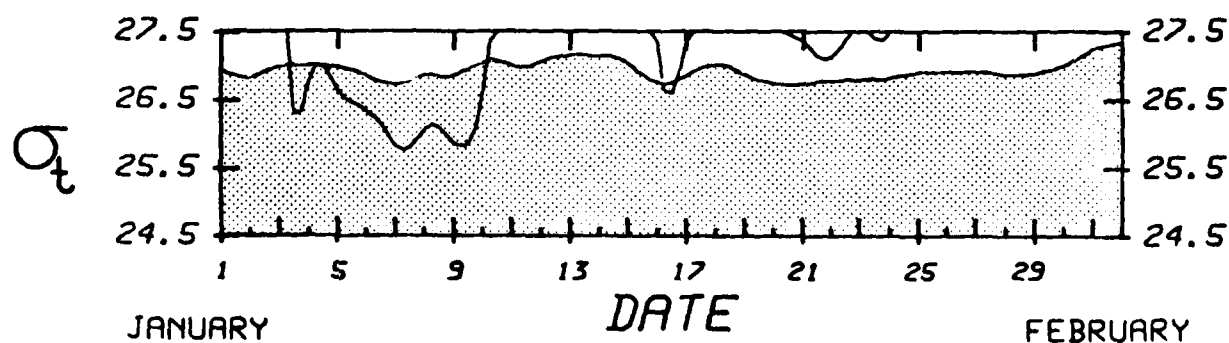
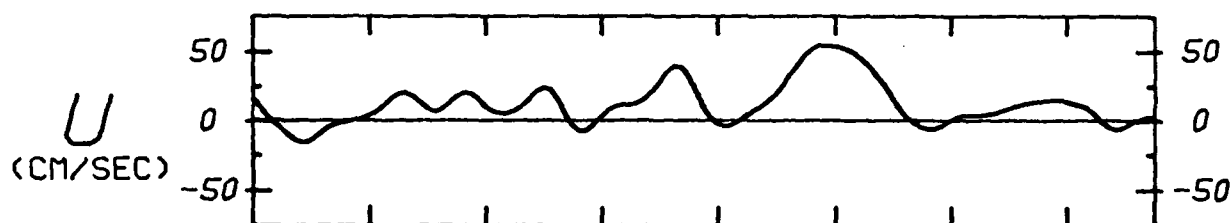
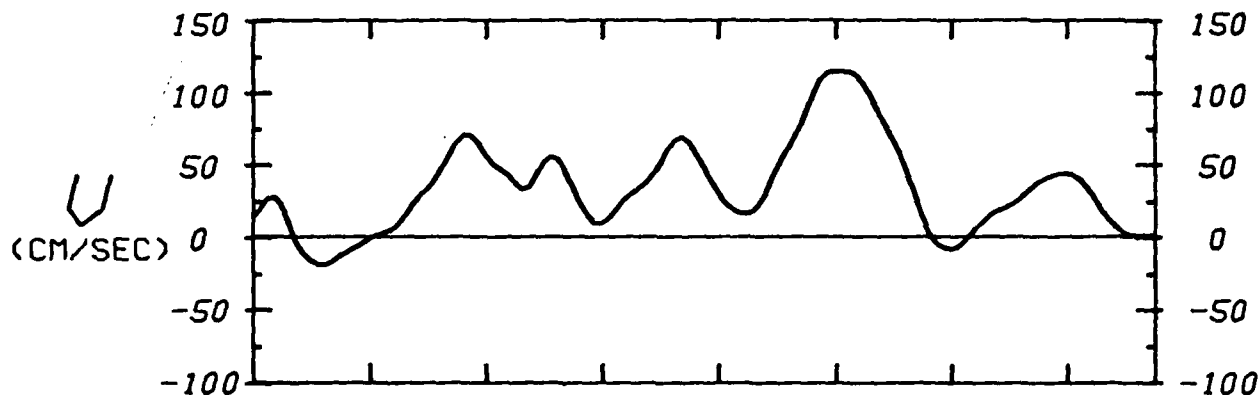
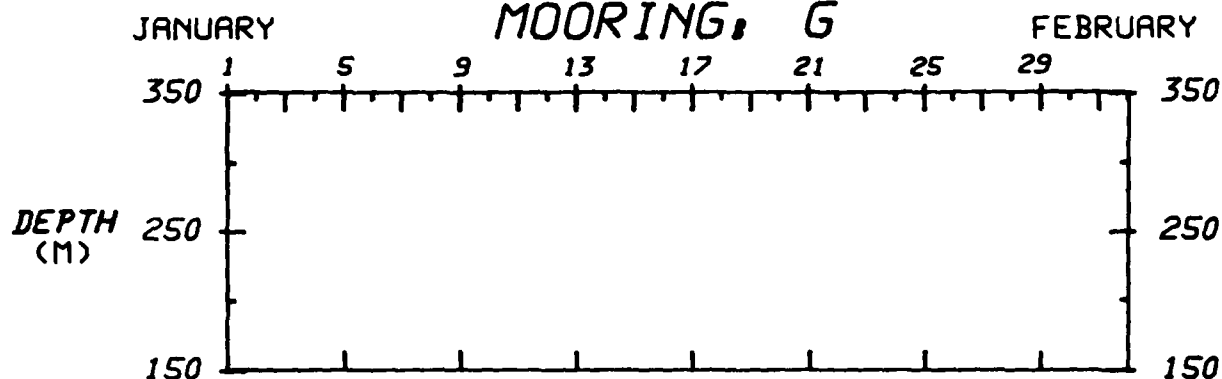
σ_t





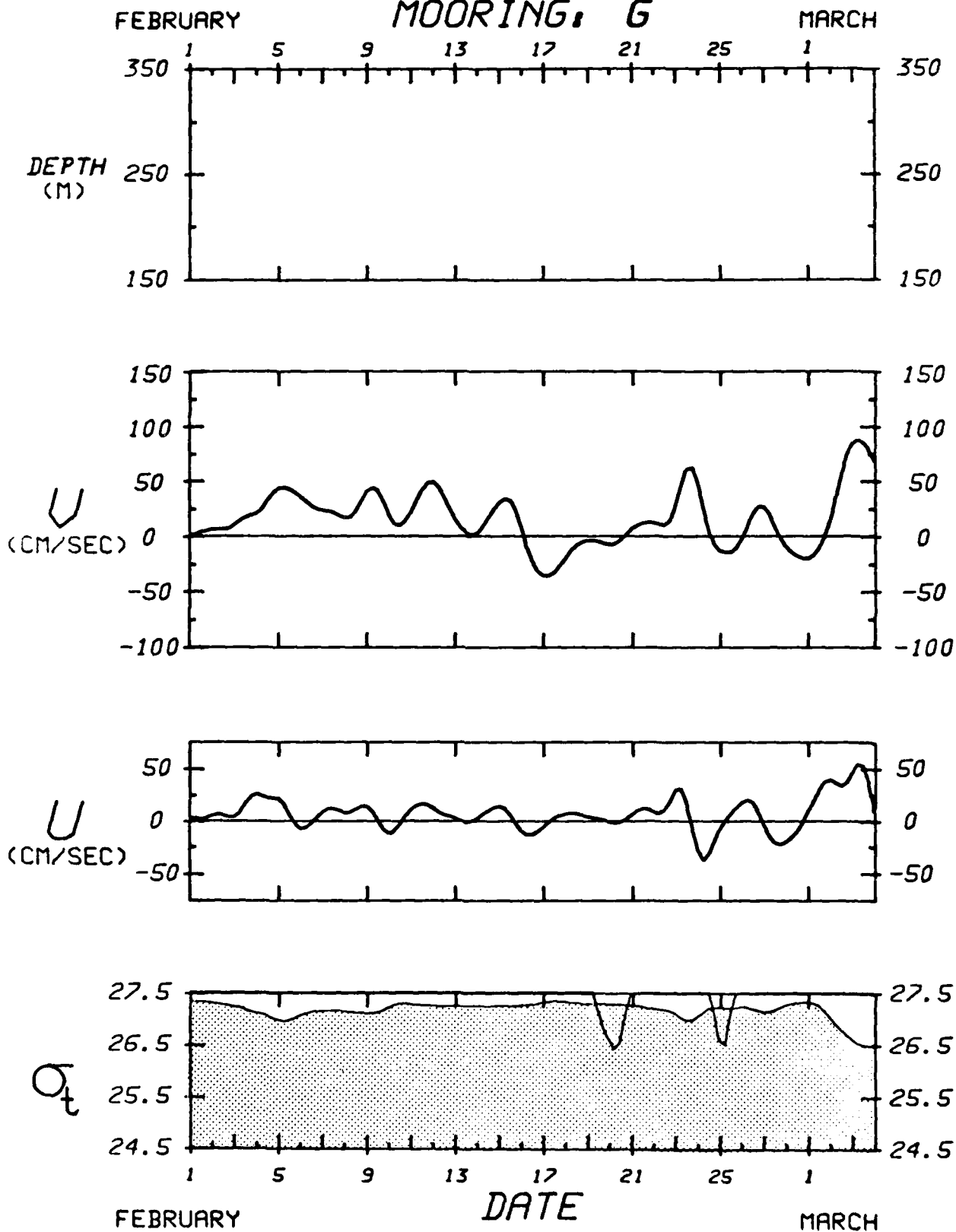
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GB ———

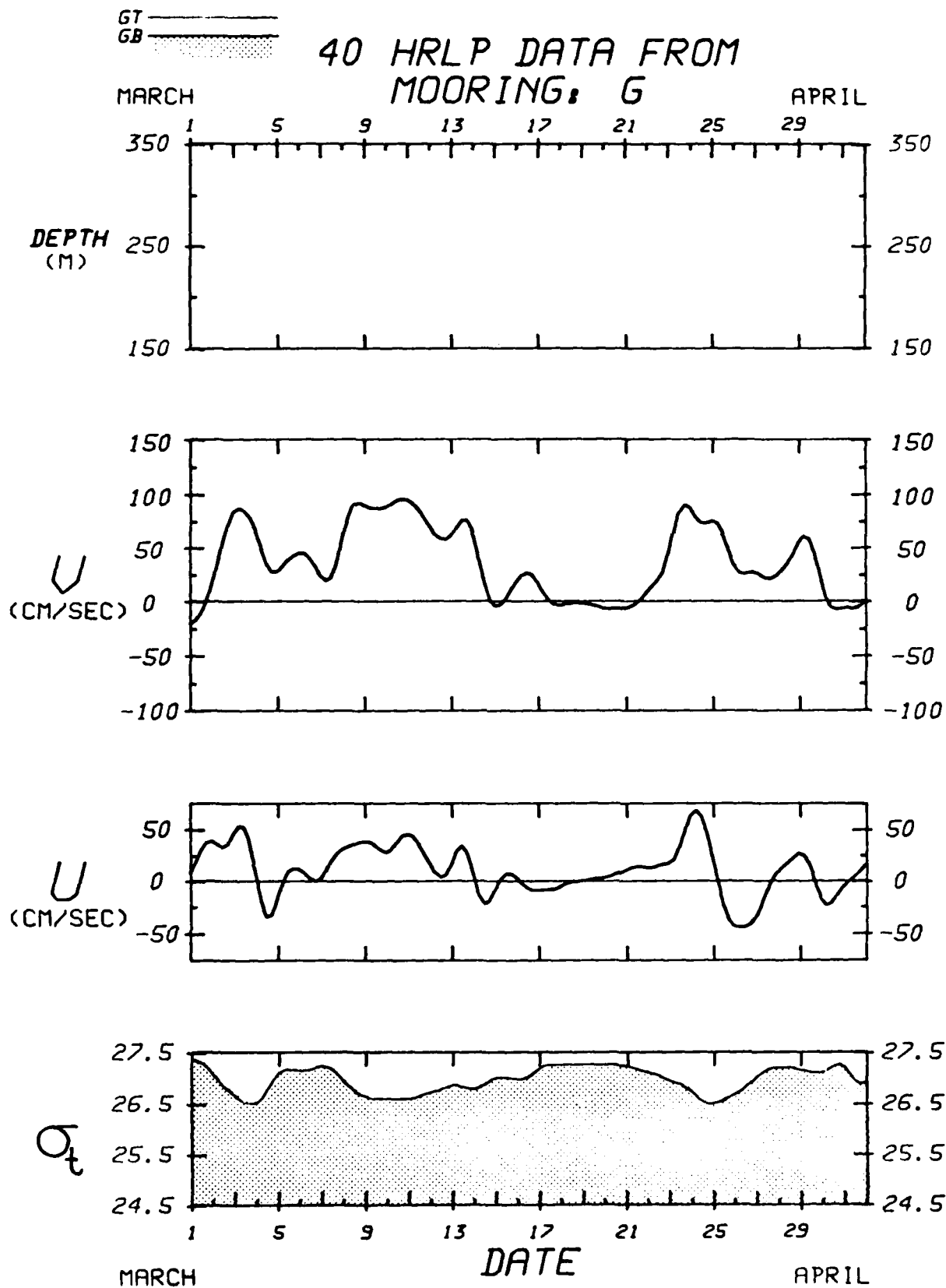
40 HRLP DATA FROM MOORING, G



GT _____
GB _____

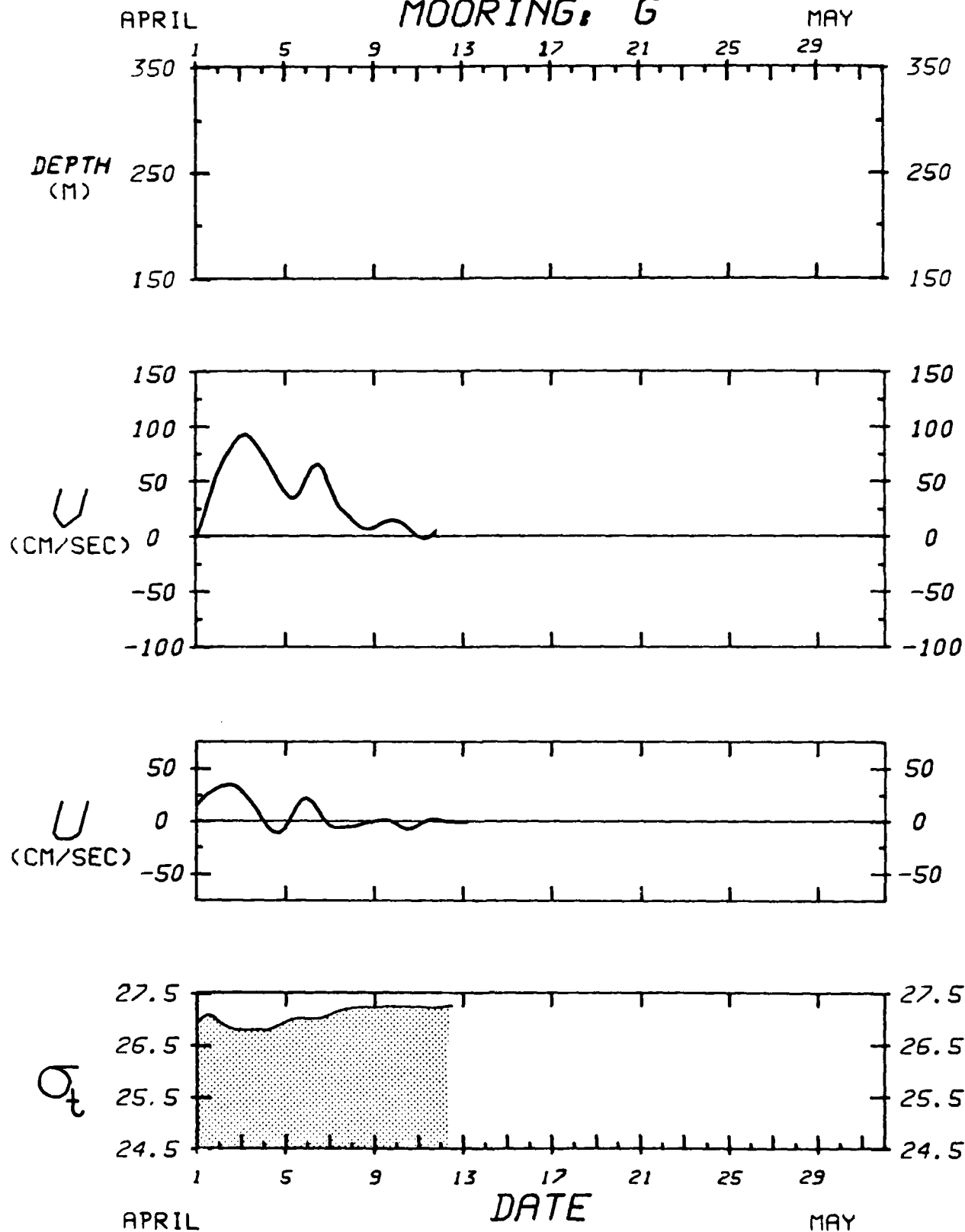
40 HRLP DATA FROM MOORING: G





ST
GB

40 HRLP DATA FROM MOORING: G



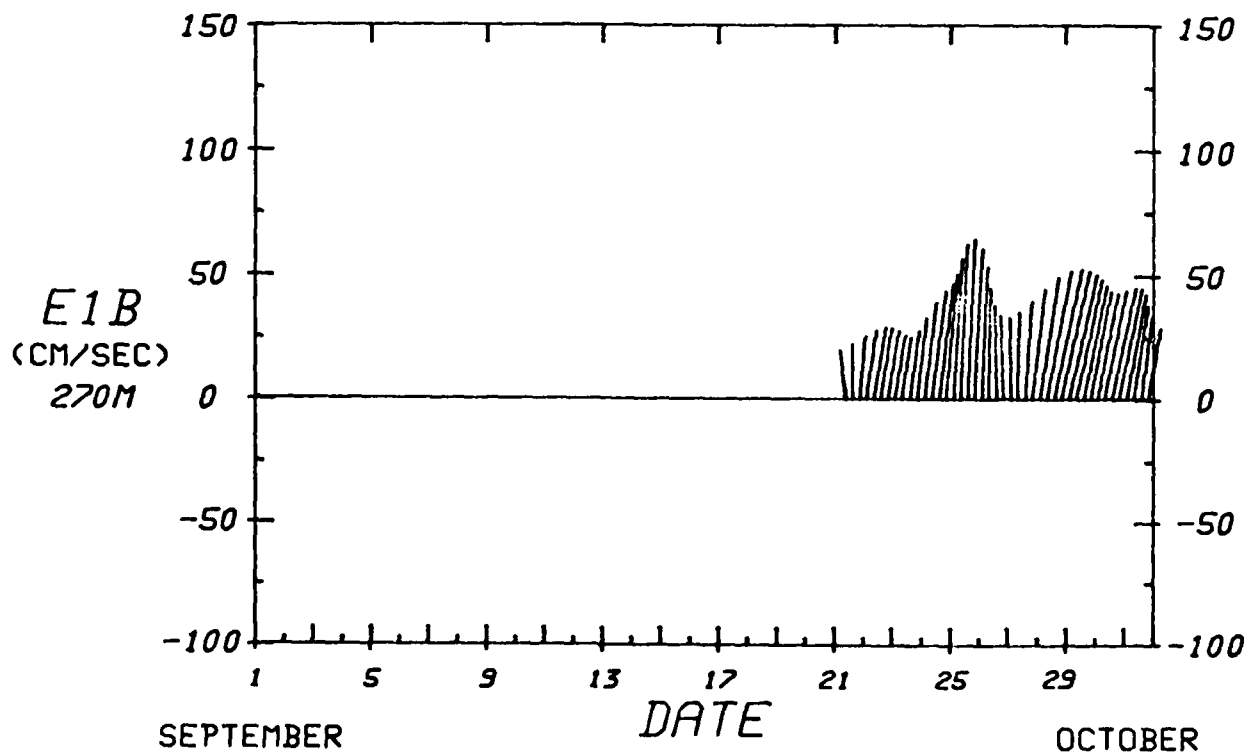
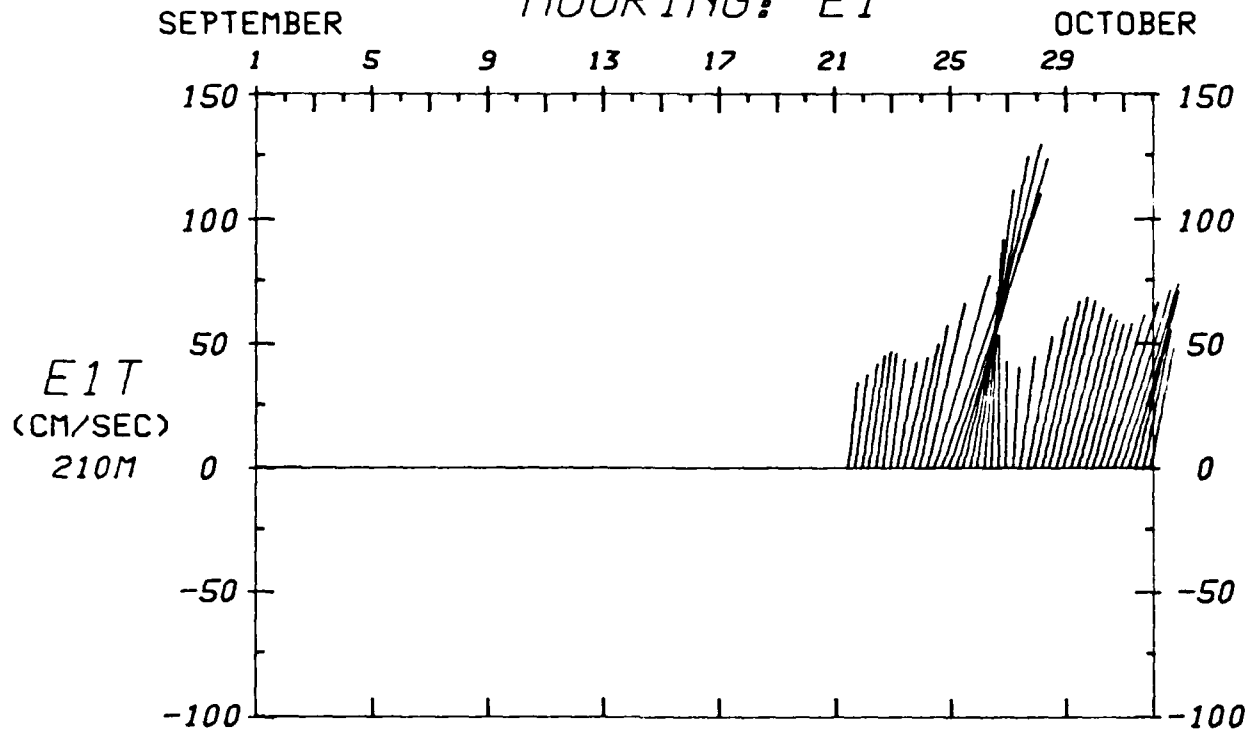
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Section 6

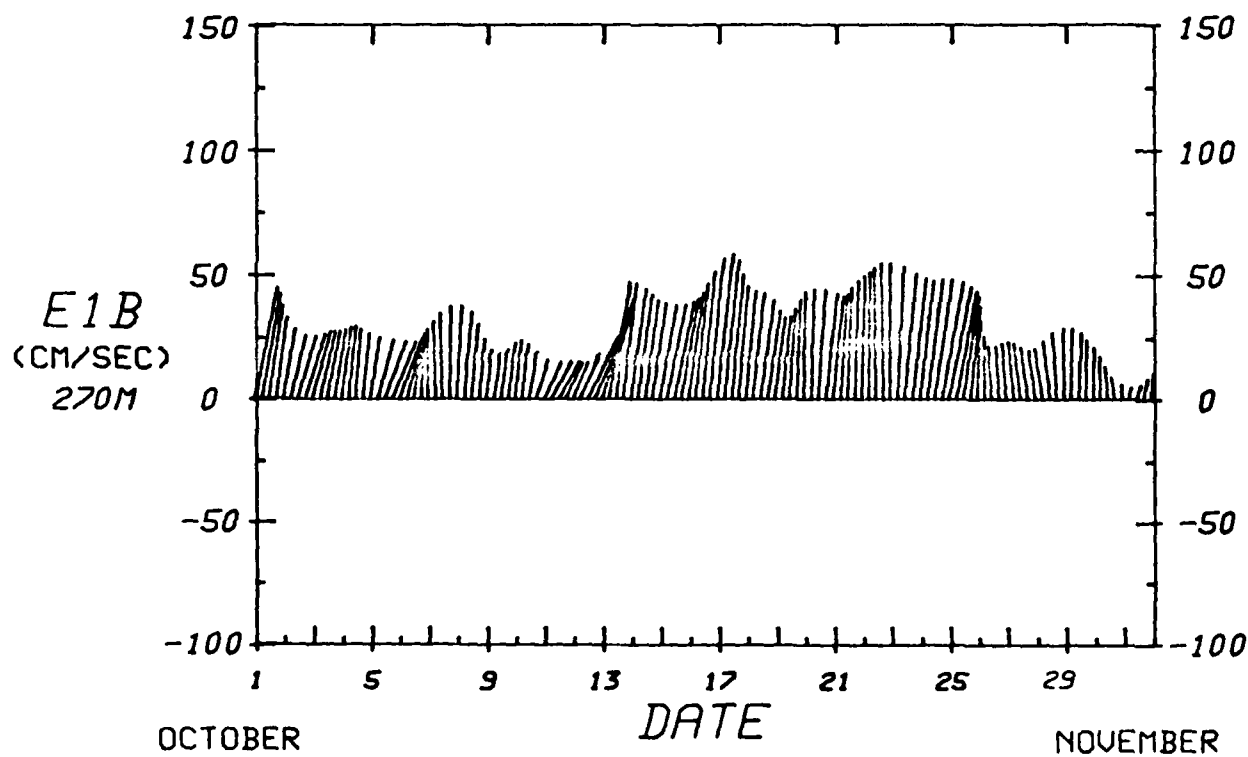
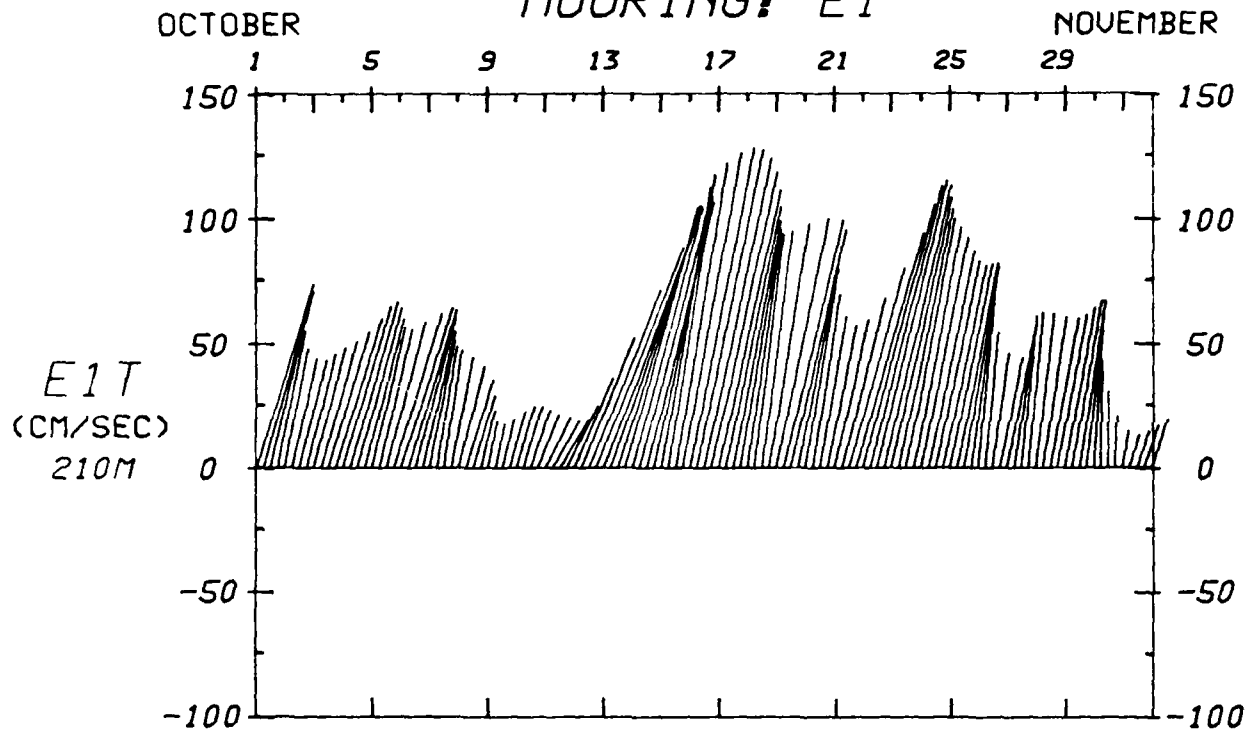
40HRLP Mooring Stick Plots

The 40 HRLP velocity data from each mooring are presented in a monthly format. Speed and direction are indicated in the well-known stick plot manner, and the scaling is the same for all plots.

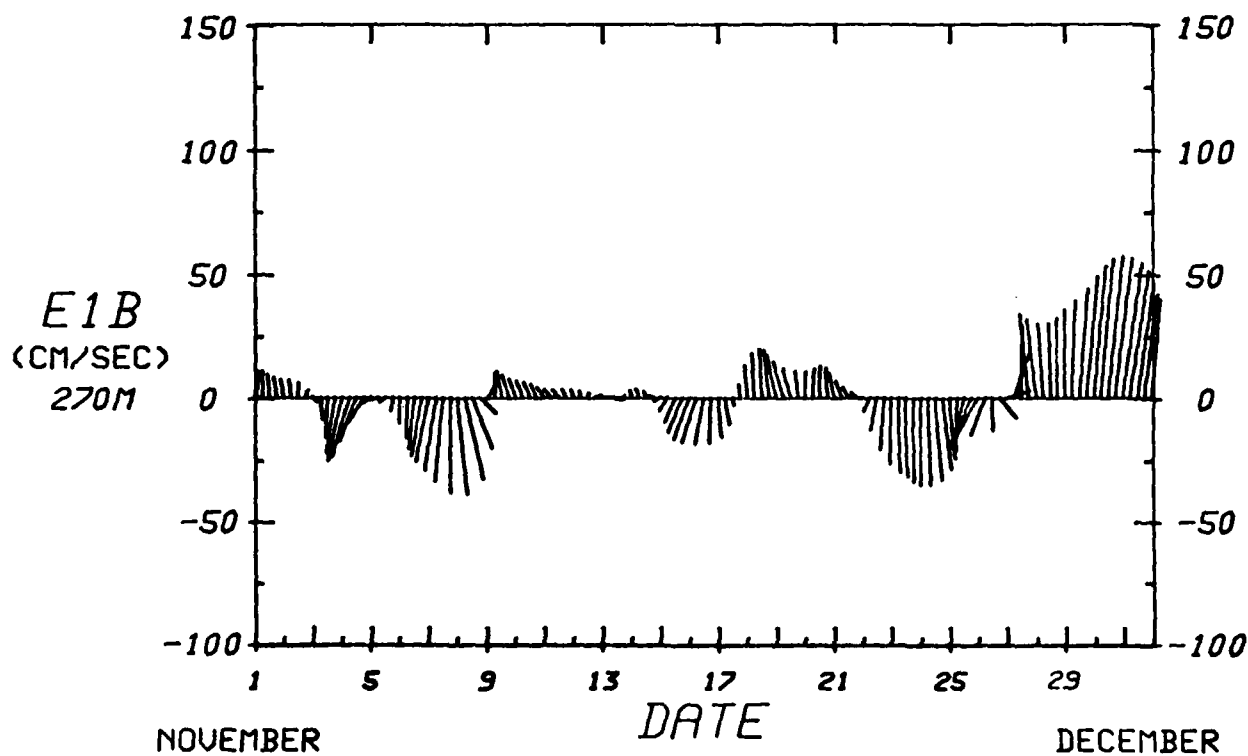
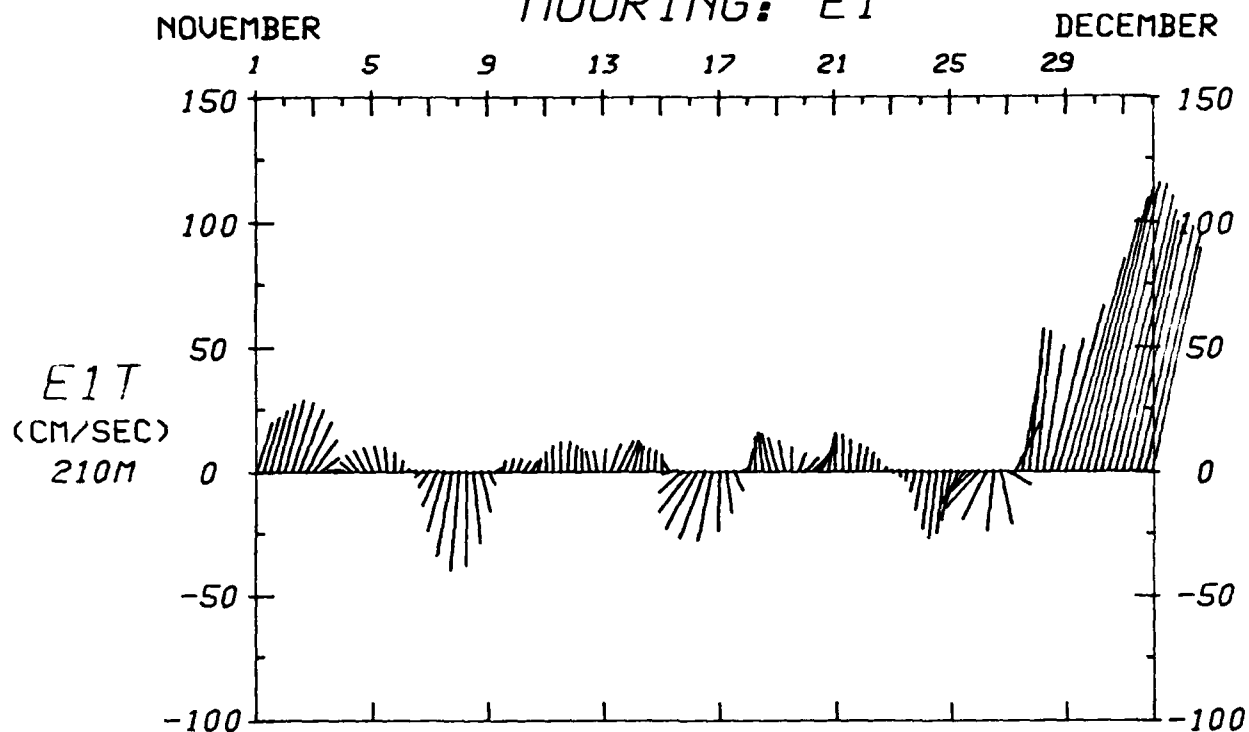
40HRLP VECTOR VELOCITY MOORING: E1



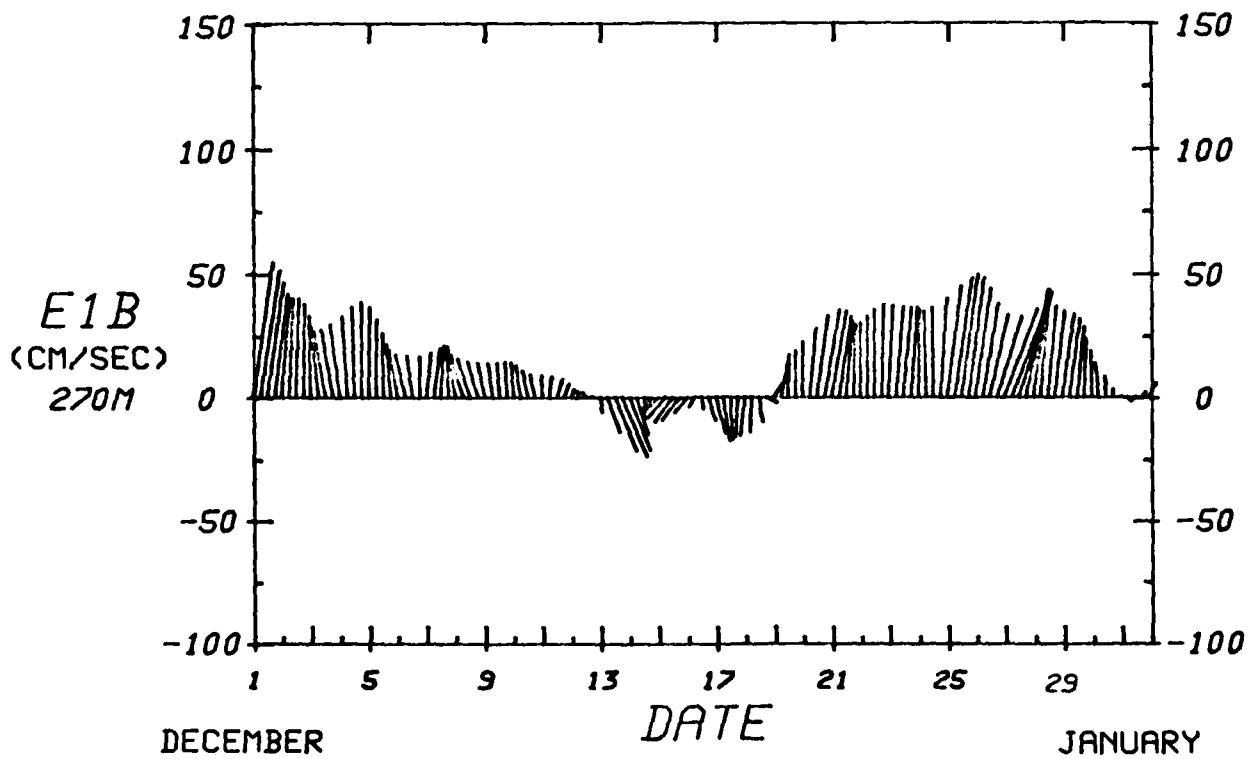
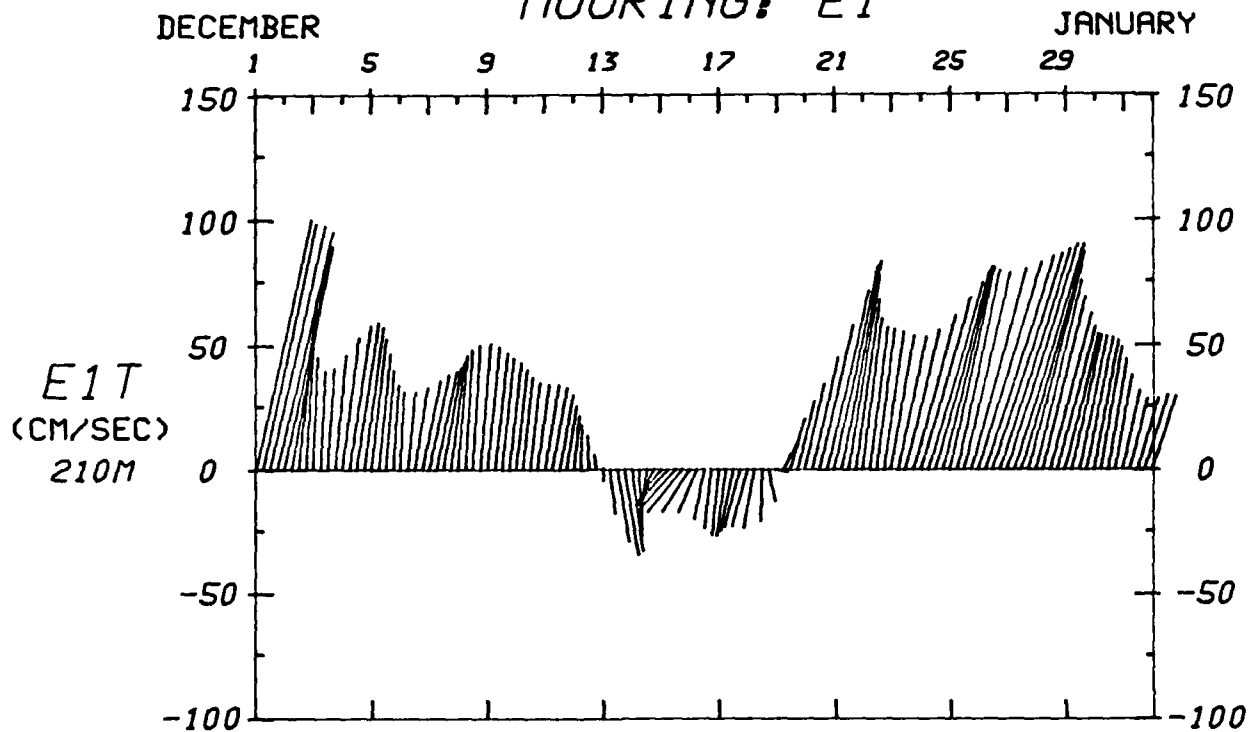
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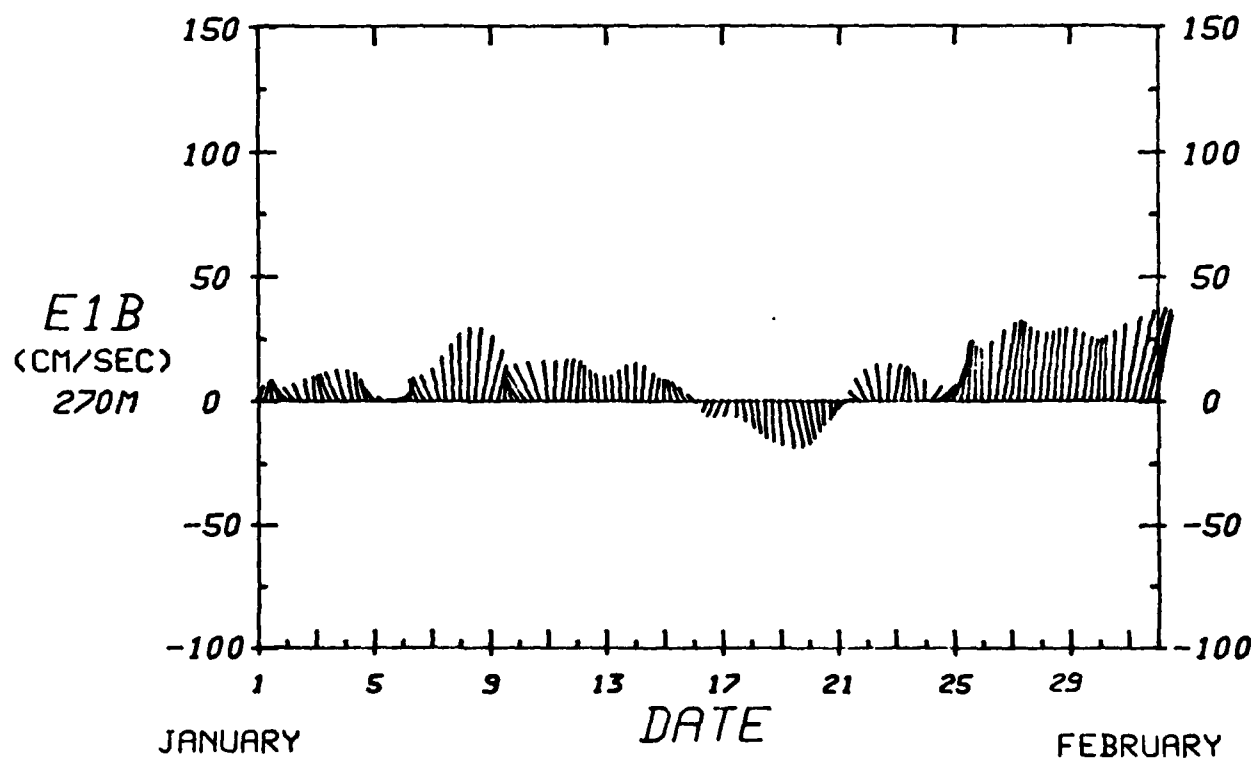
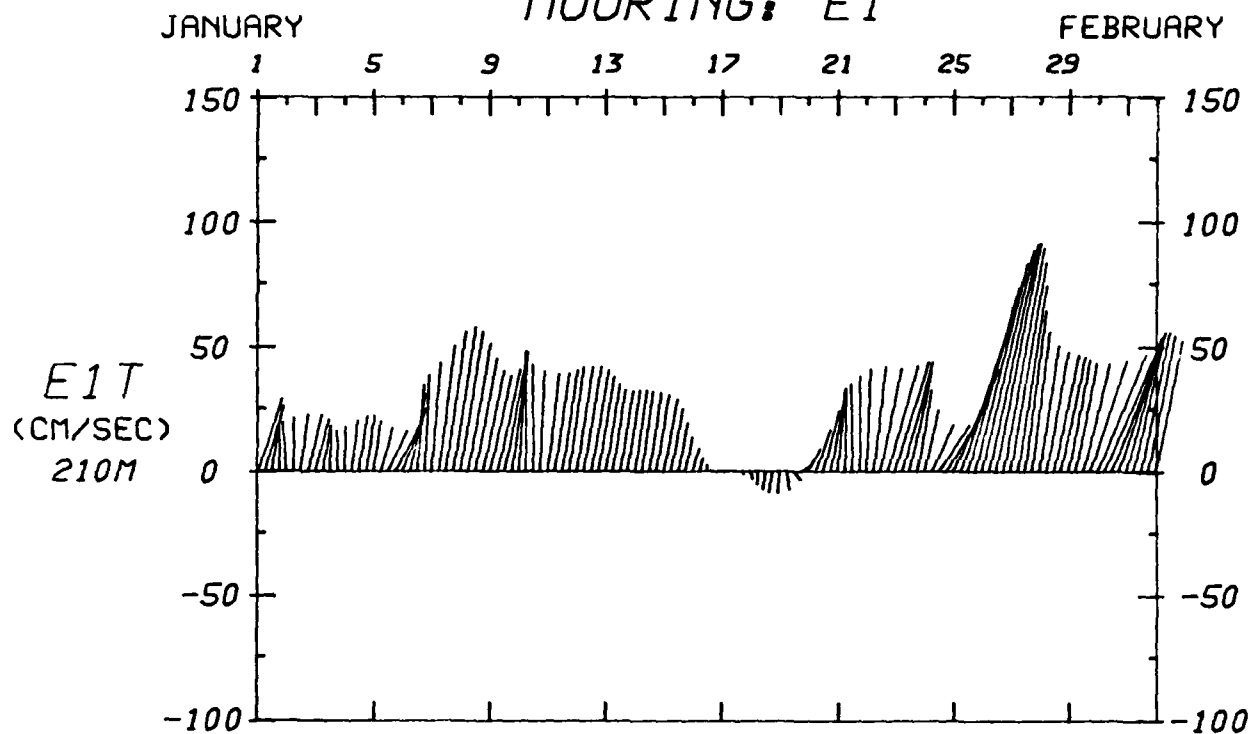
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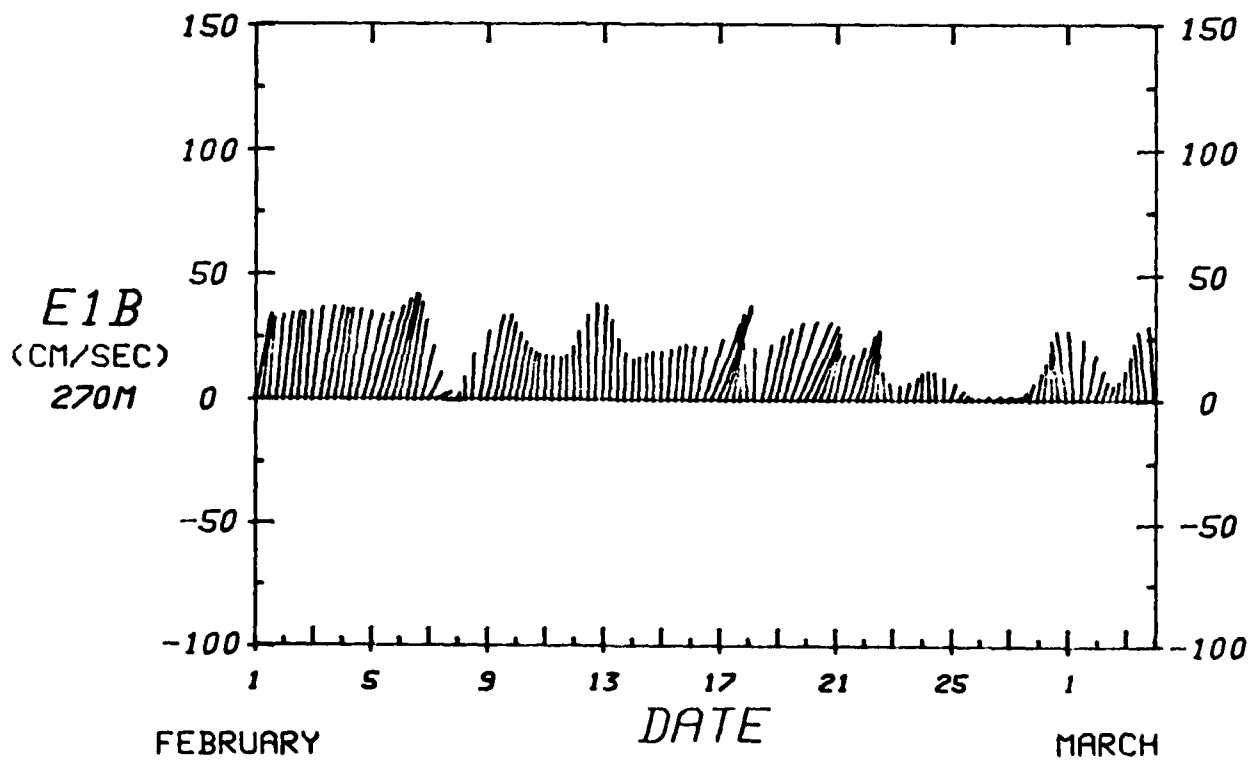
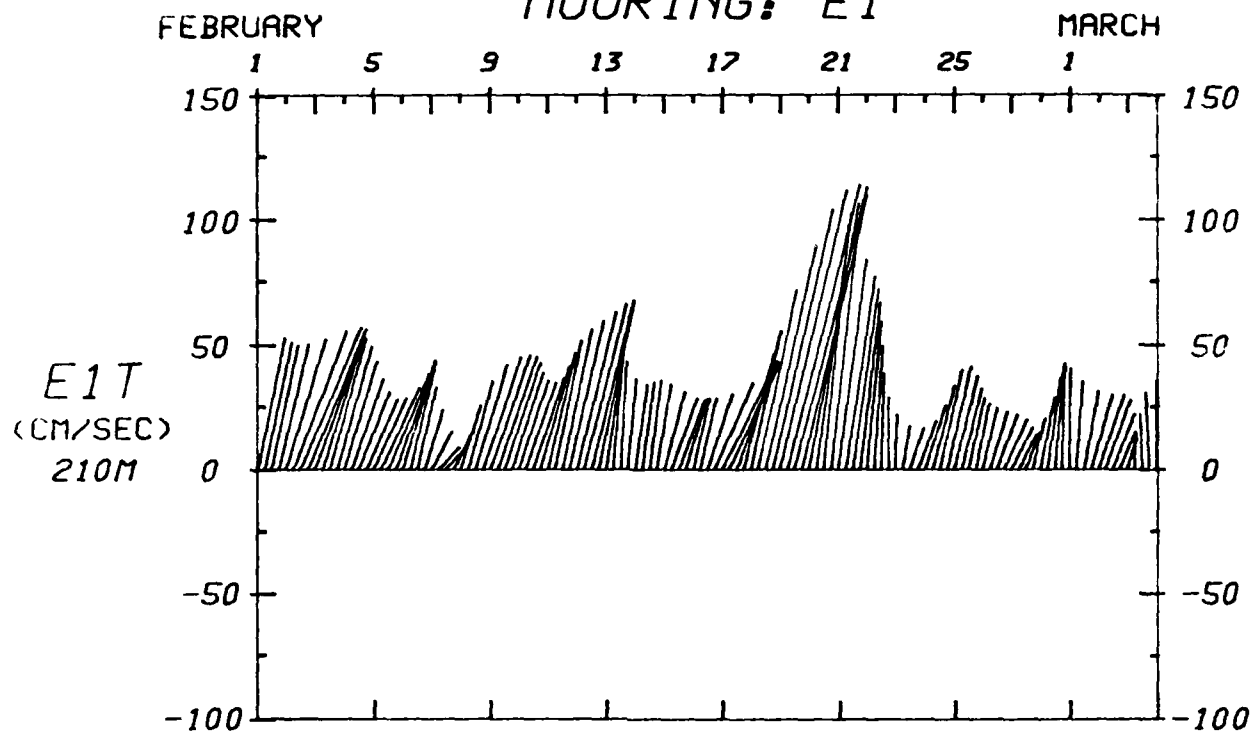
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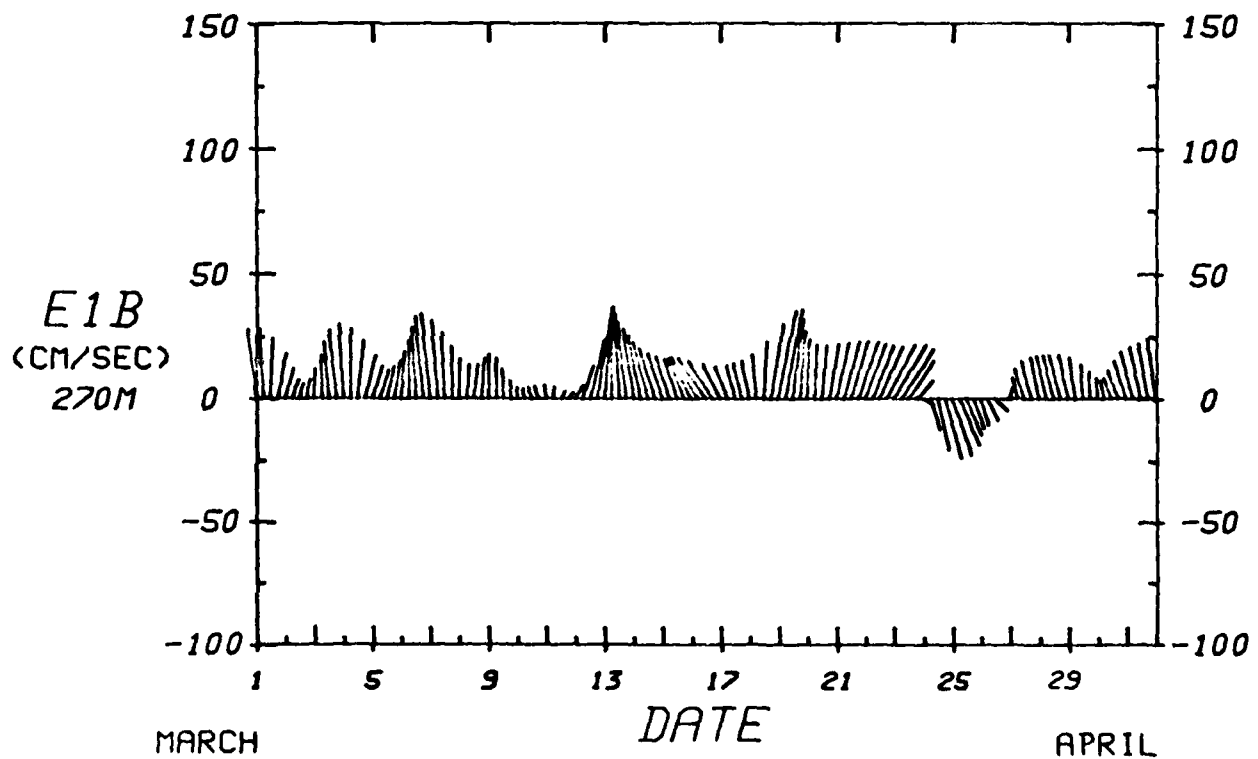
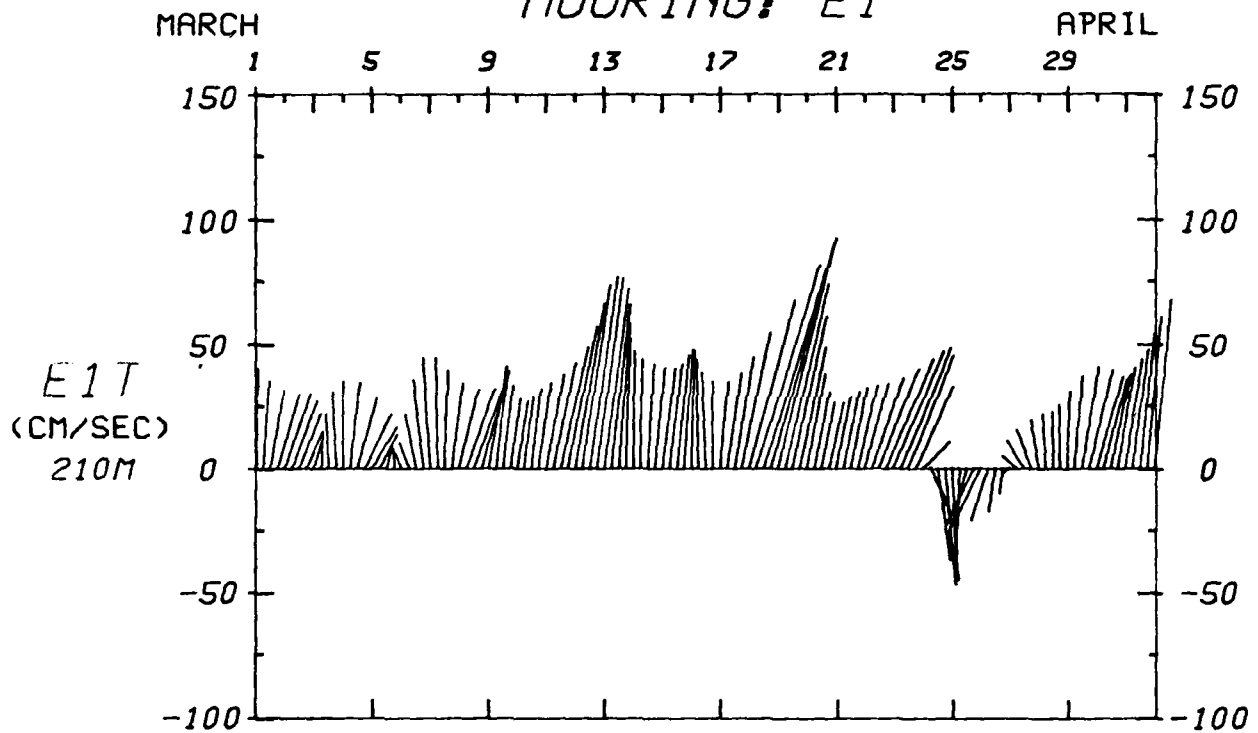
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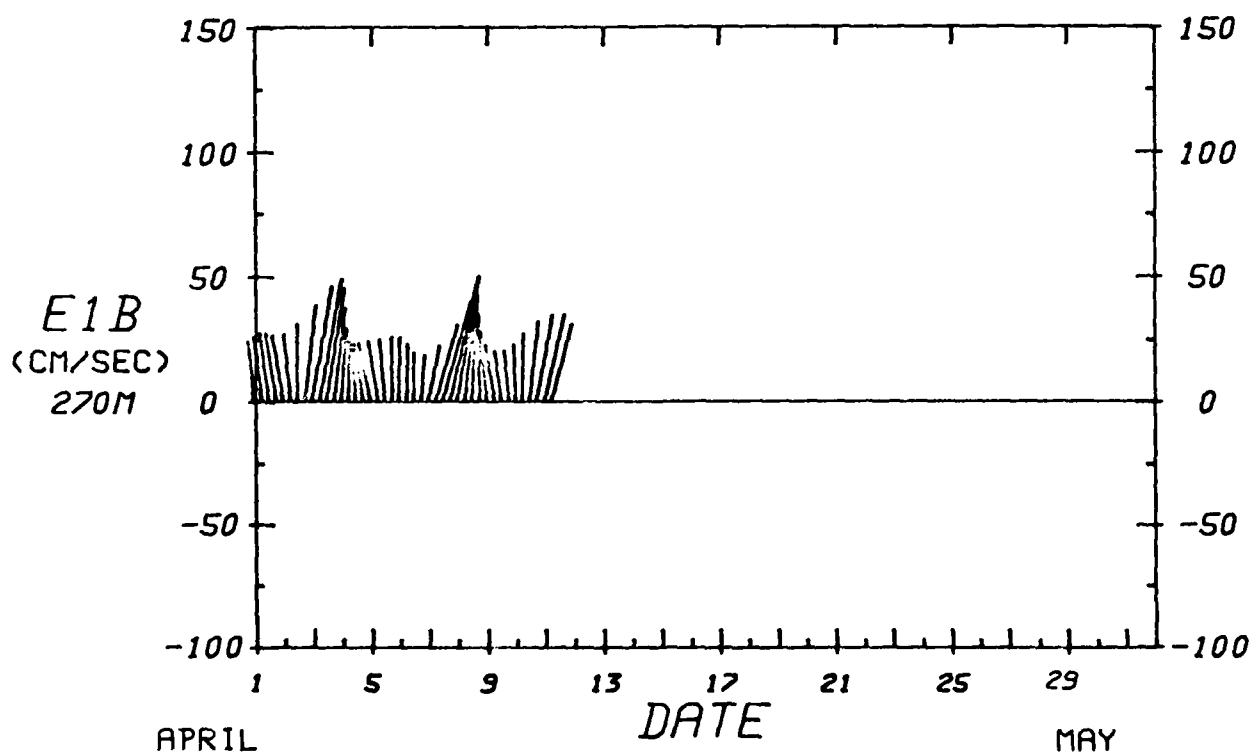
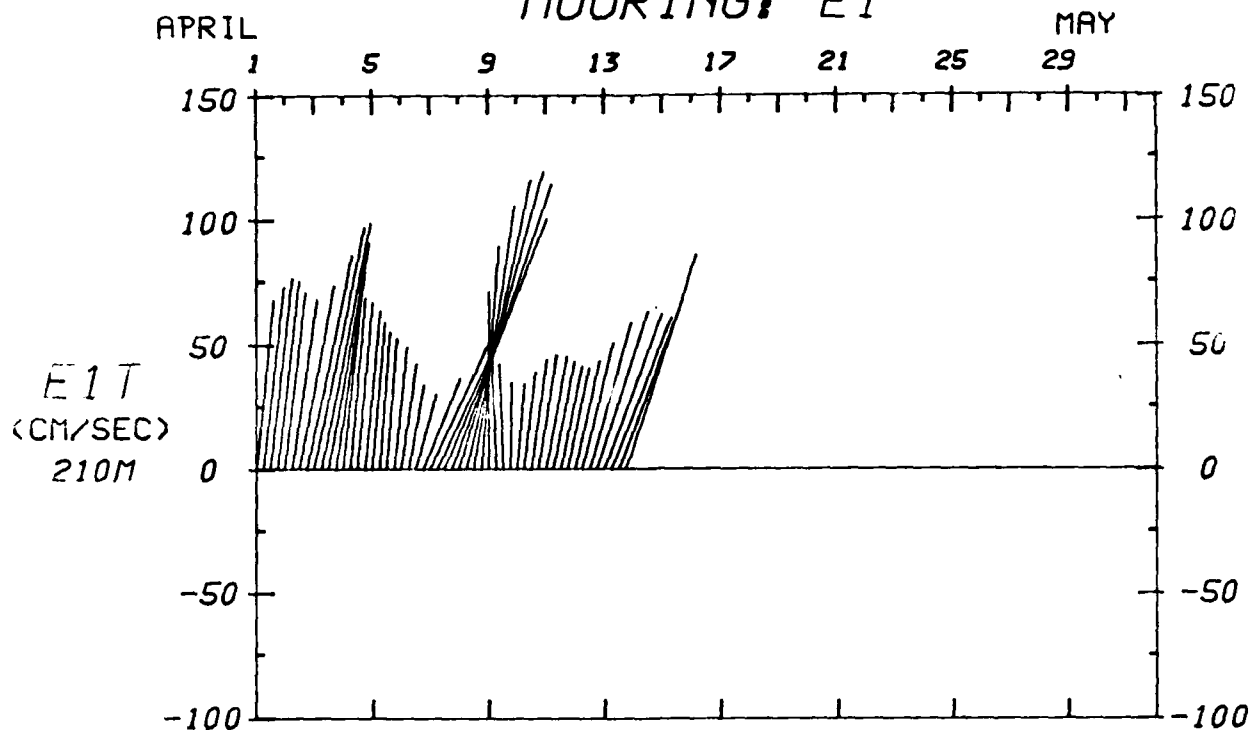
40HRLP VECTOR VELOCITY
MOORING: E1



40HRLP VECTOR VELOCITY MOORING: E1

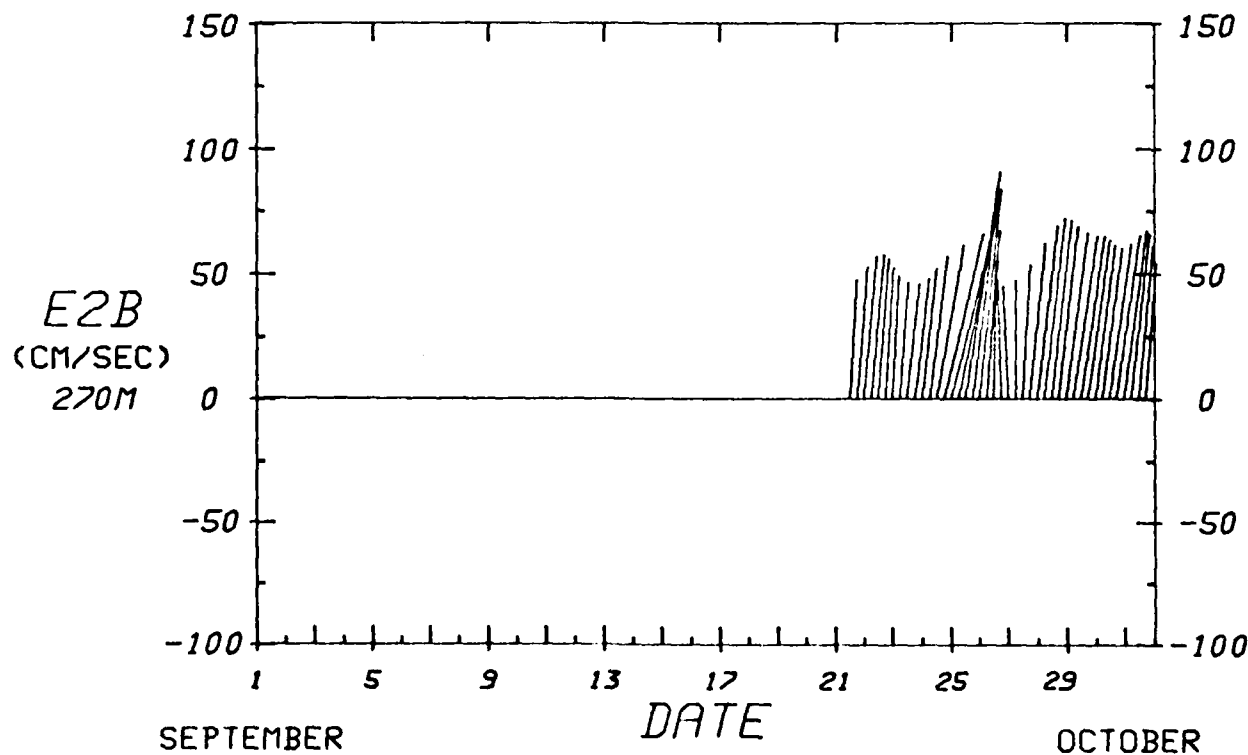
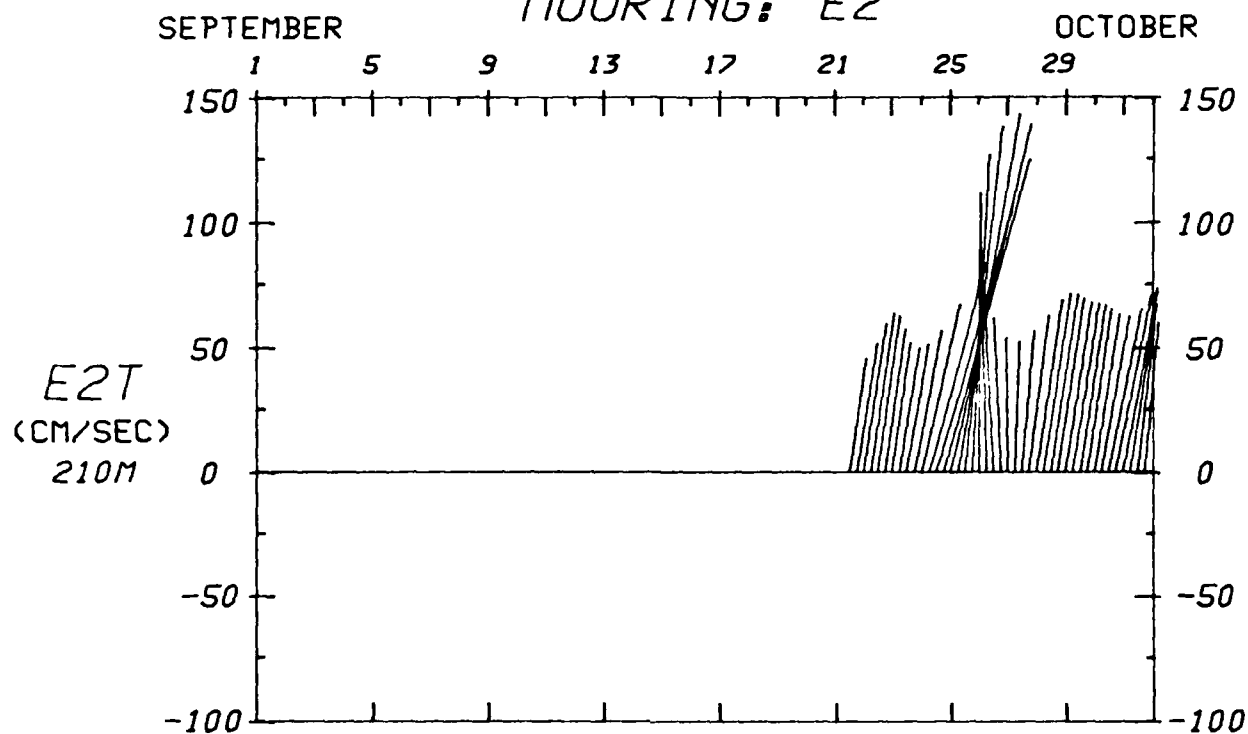


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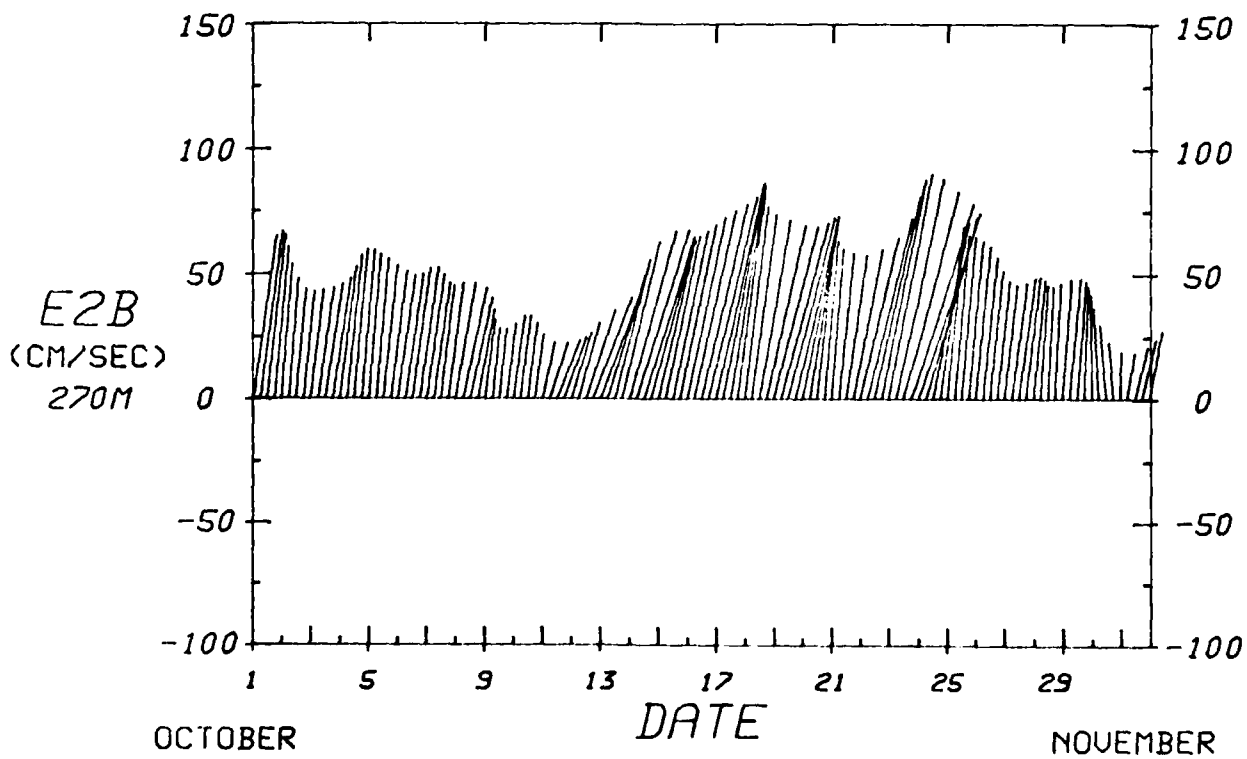
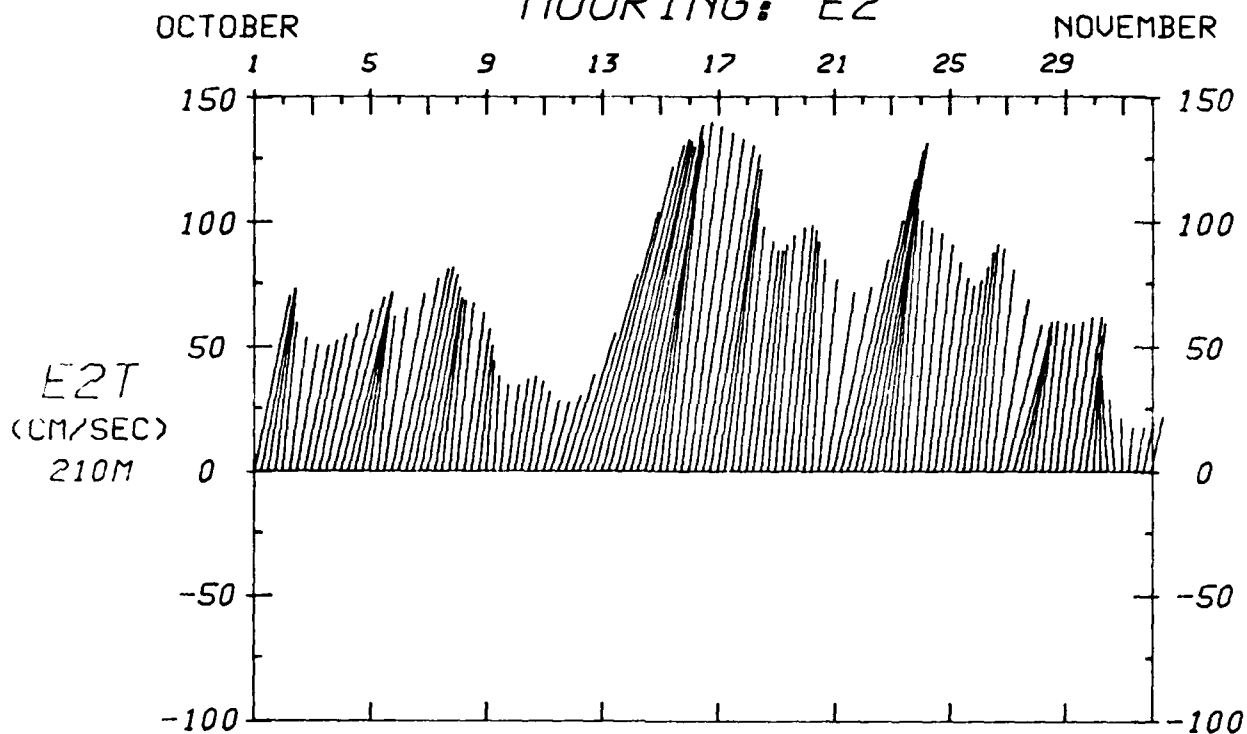


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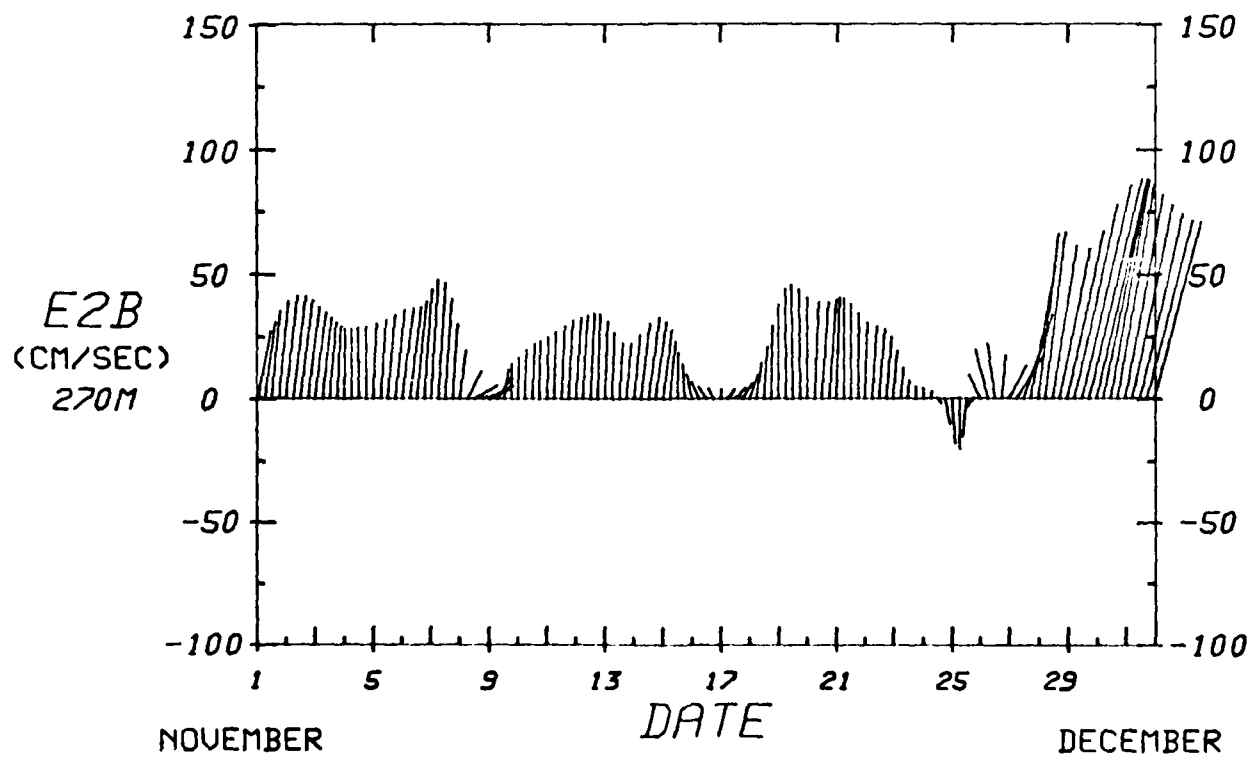
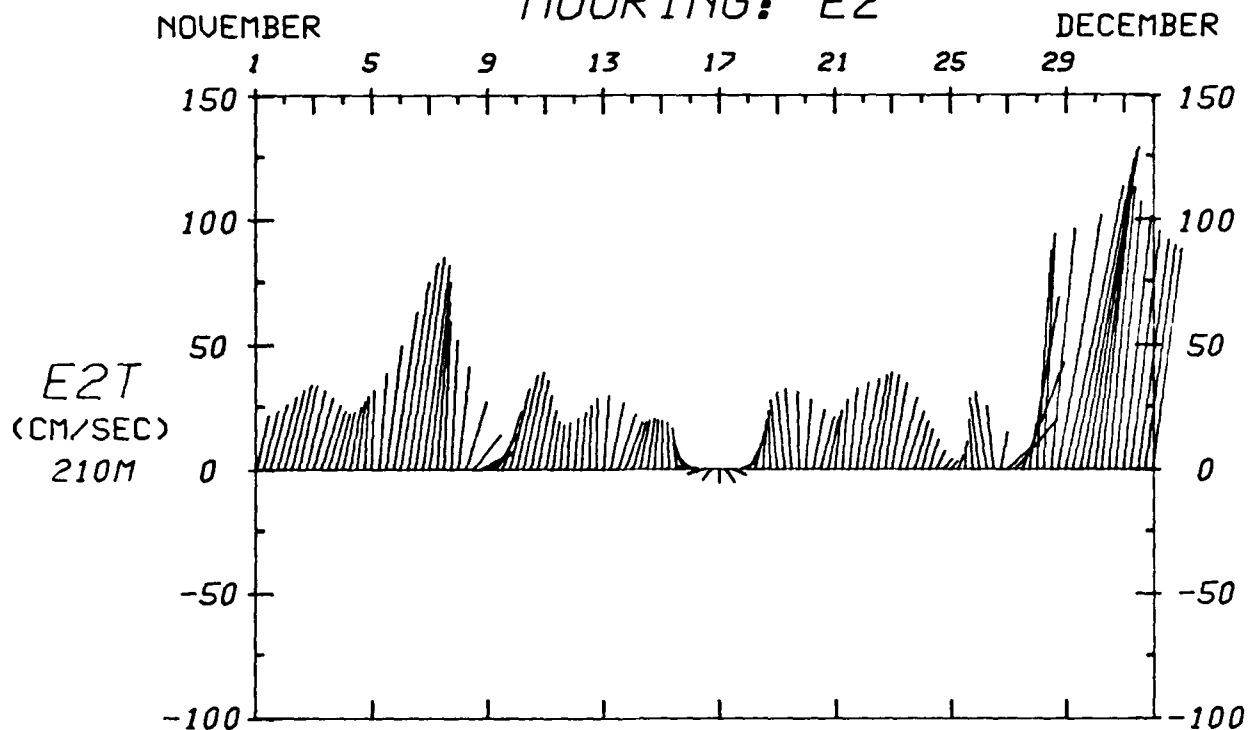
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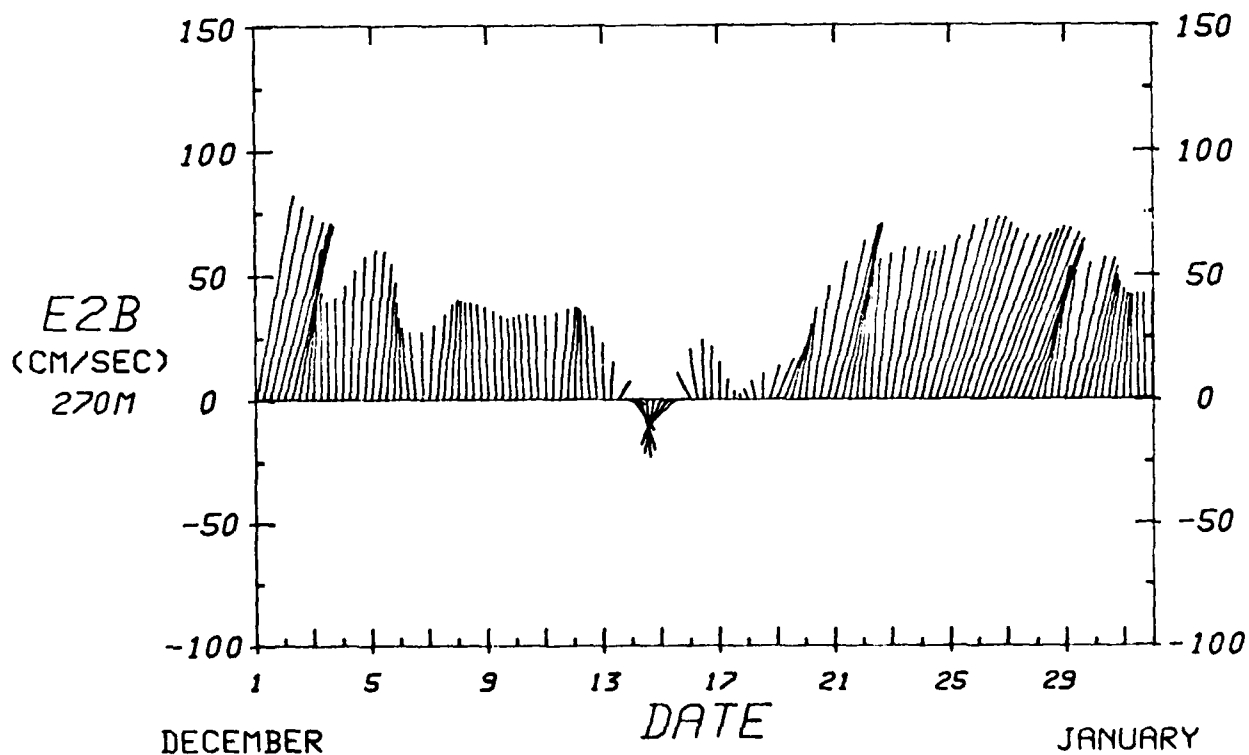
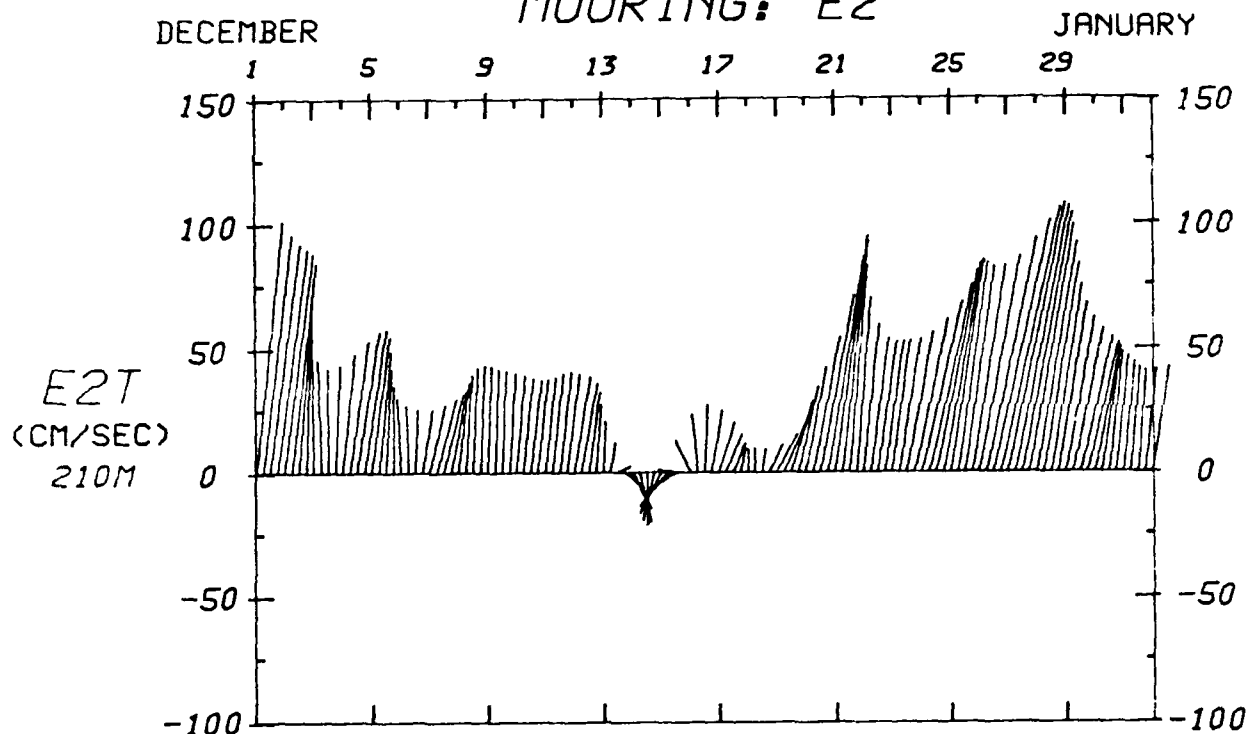
40HRLP VECTOR VELOCITY
MOORING: E2



40HRLP VECTOR VELOCITY MOORING: E2



40HRLP VECTOR VELOCITY MOORING: E2



AD-A144 977

THE GULF STREAM DEFLECTION AND MEANDER ENERGETICS
EXPERIMENT CURRENT METE. (U) NORTH CAROLINA UNIV AT
CHAPEL HILL J M BANE ET AL. DEC 83 CMS-83-2

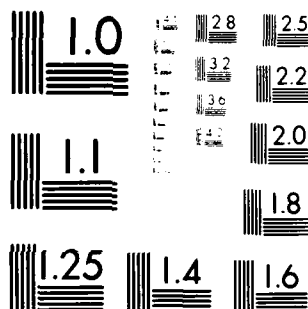
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F/G 8/3

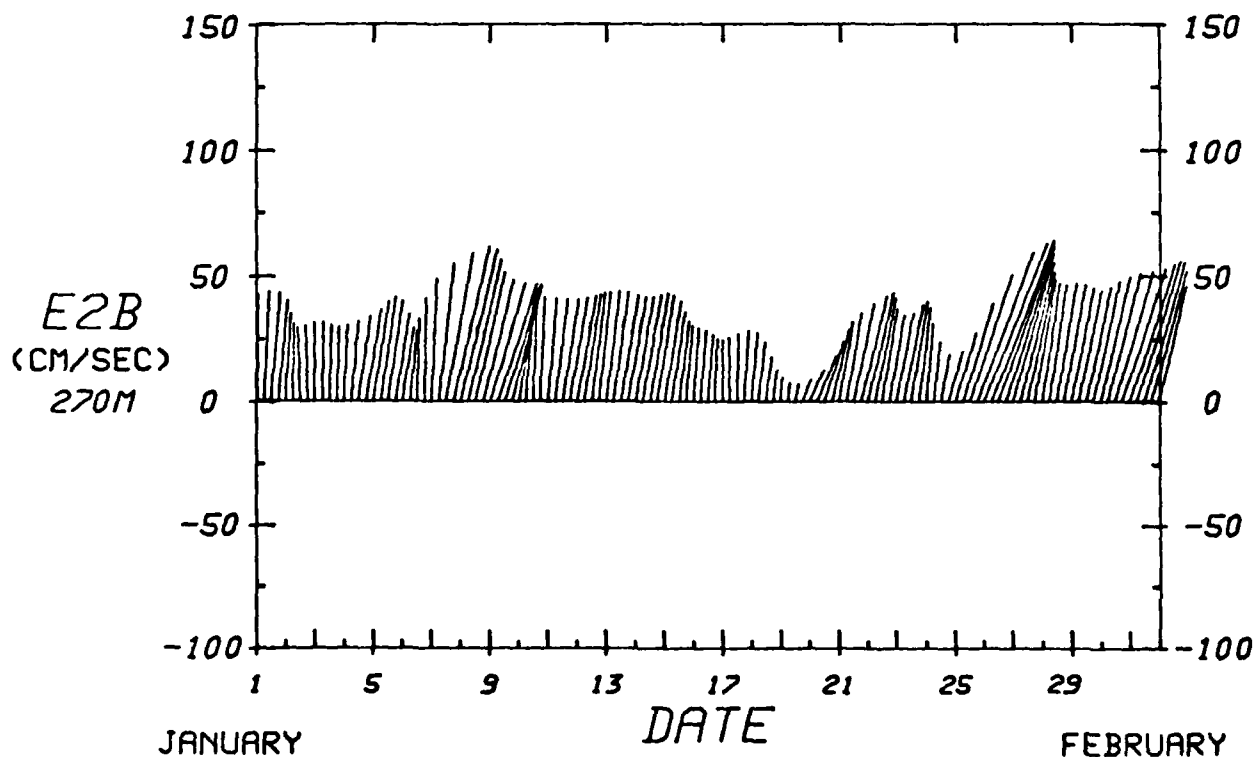
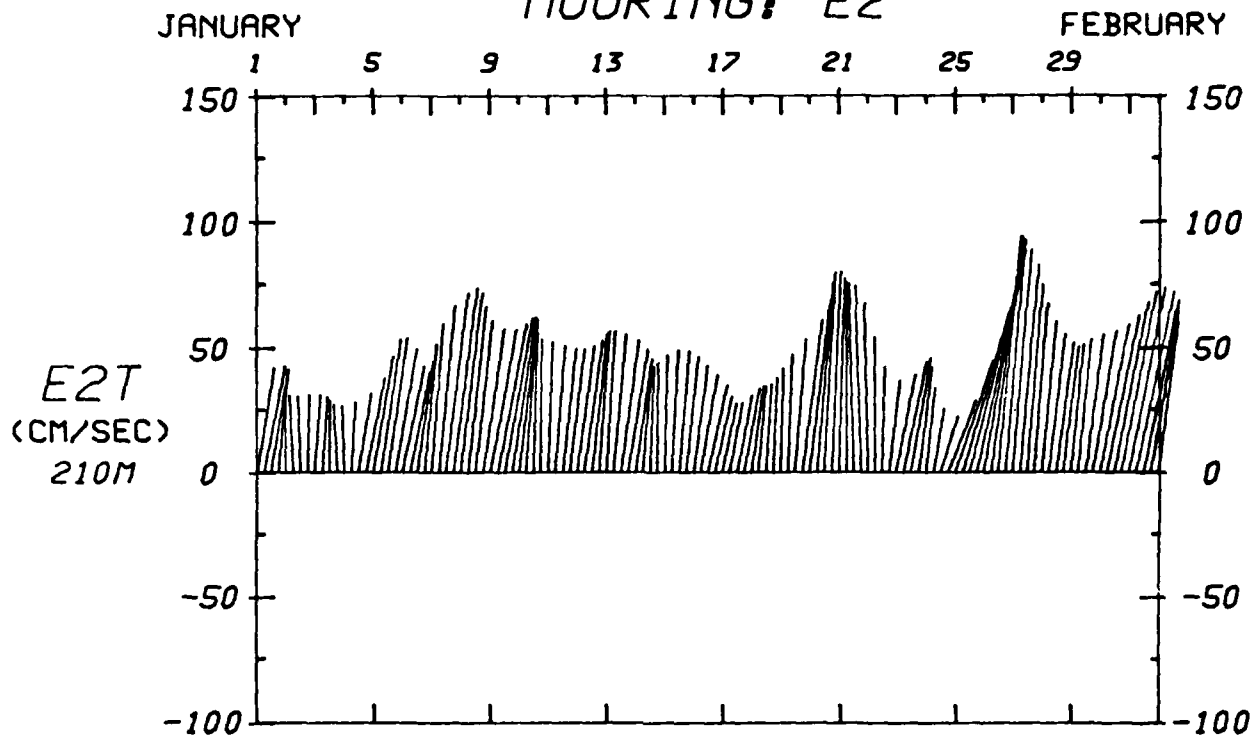
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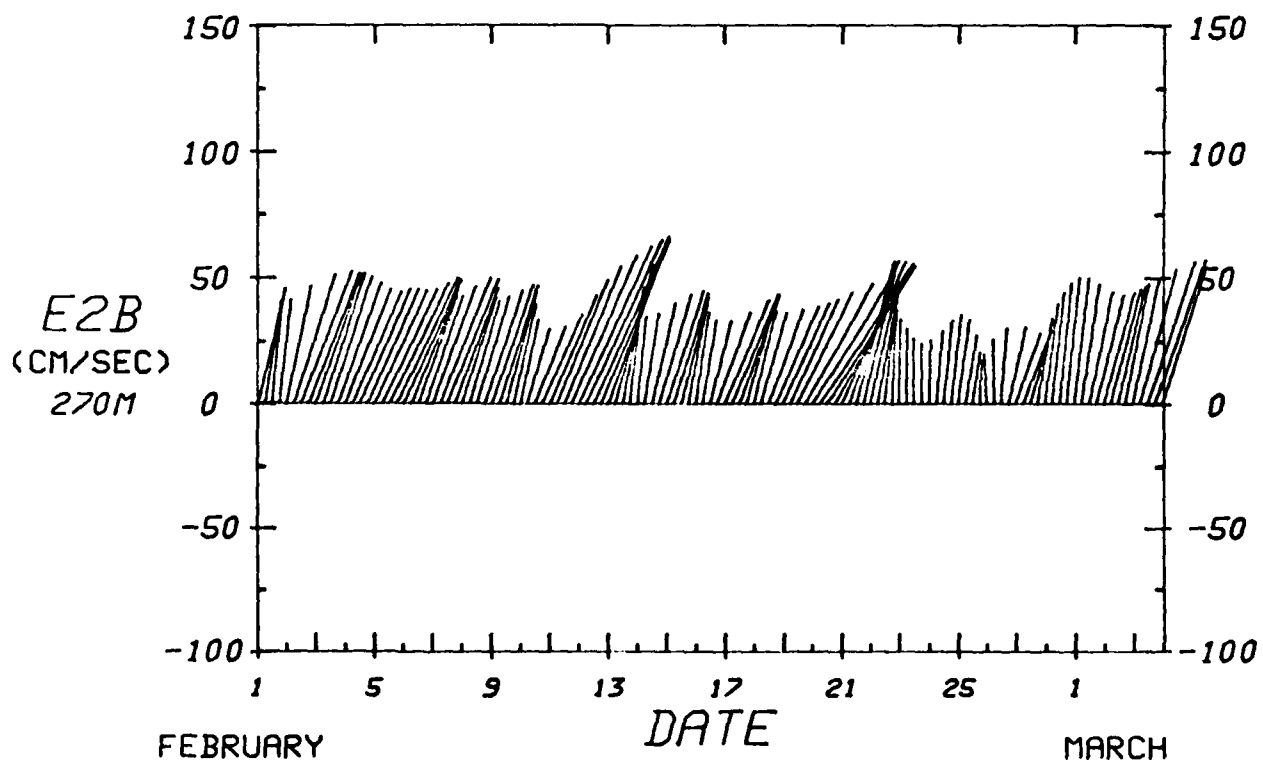
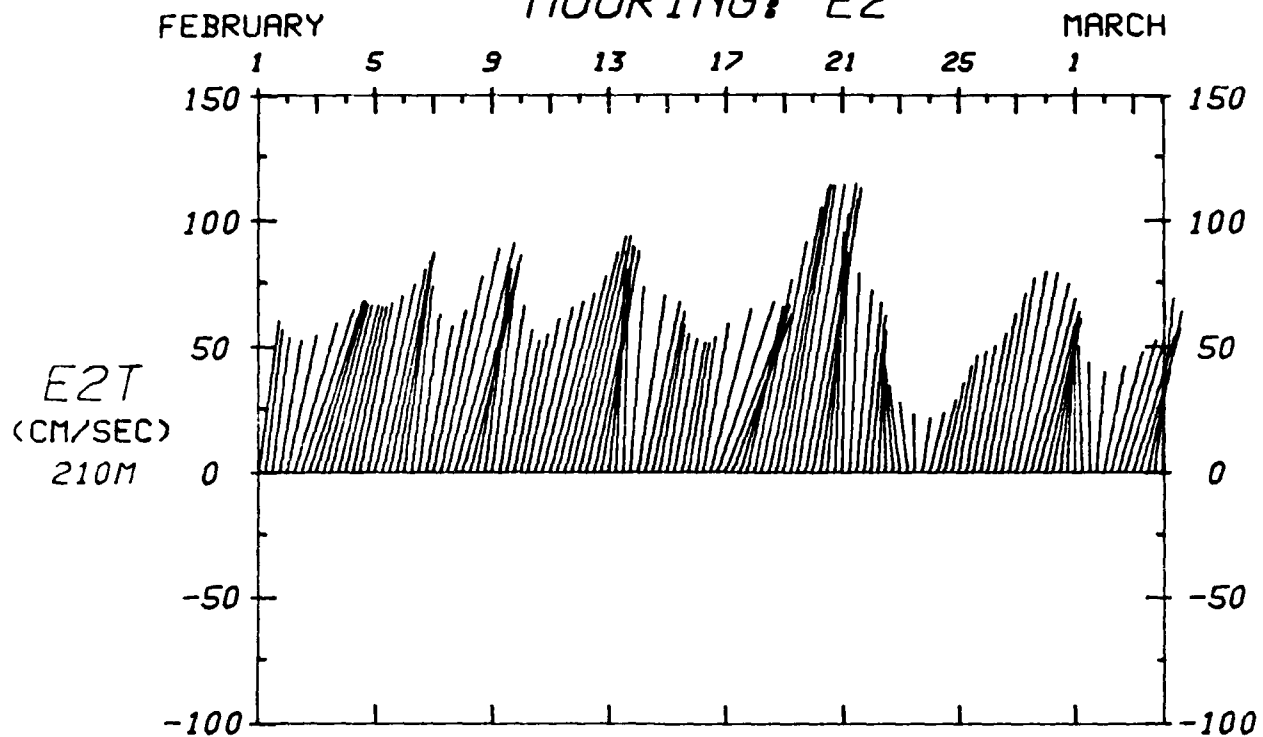


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

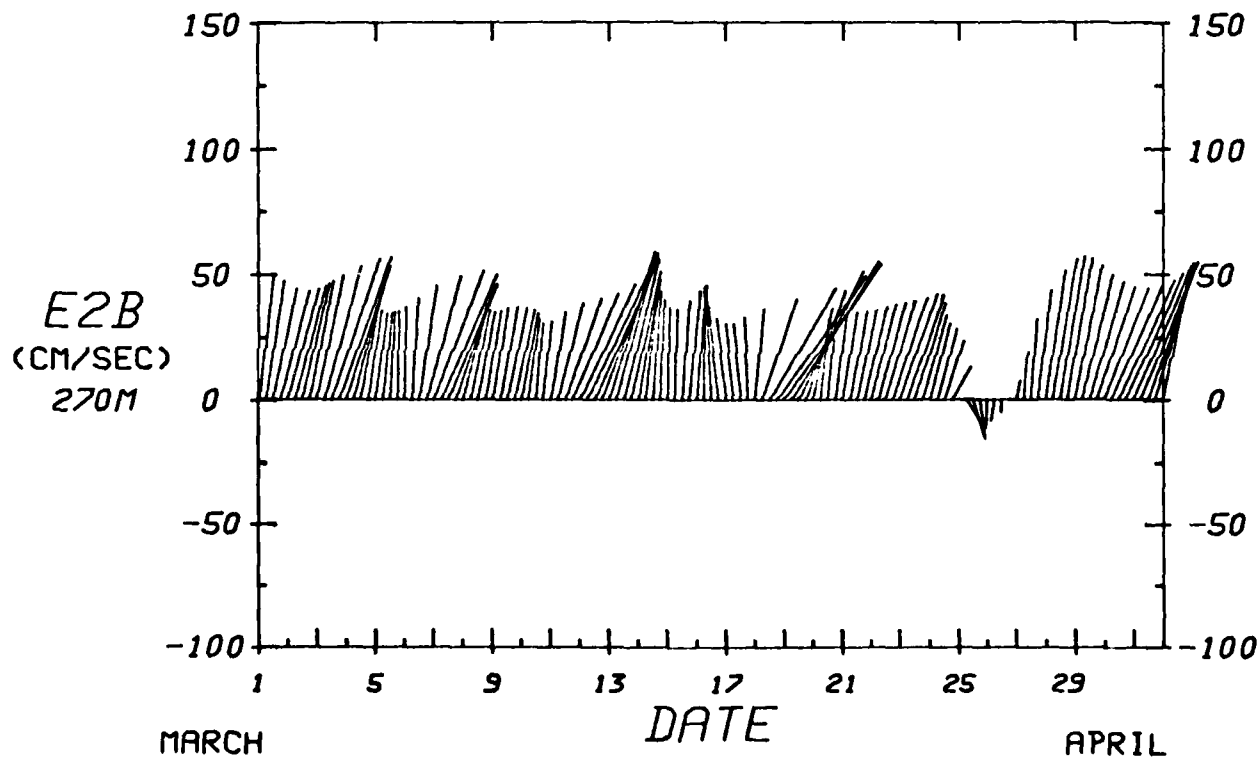
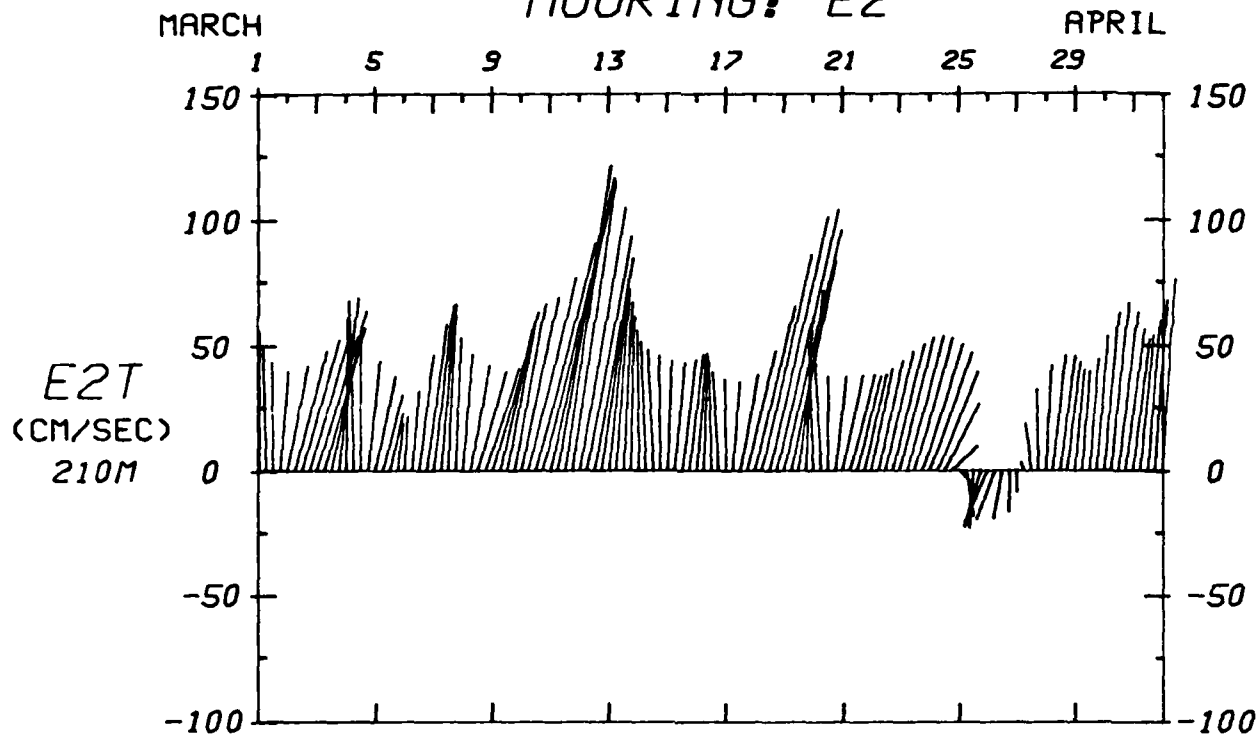
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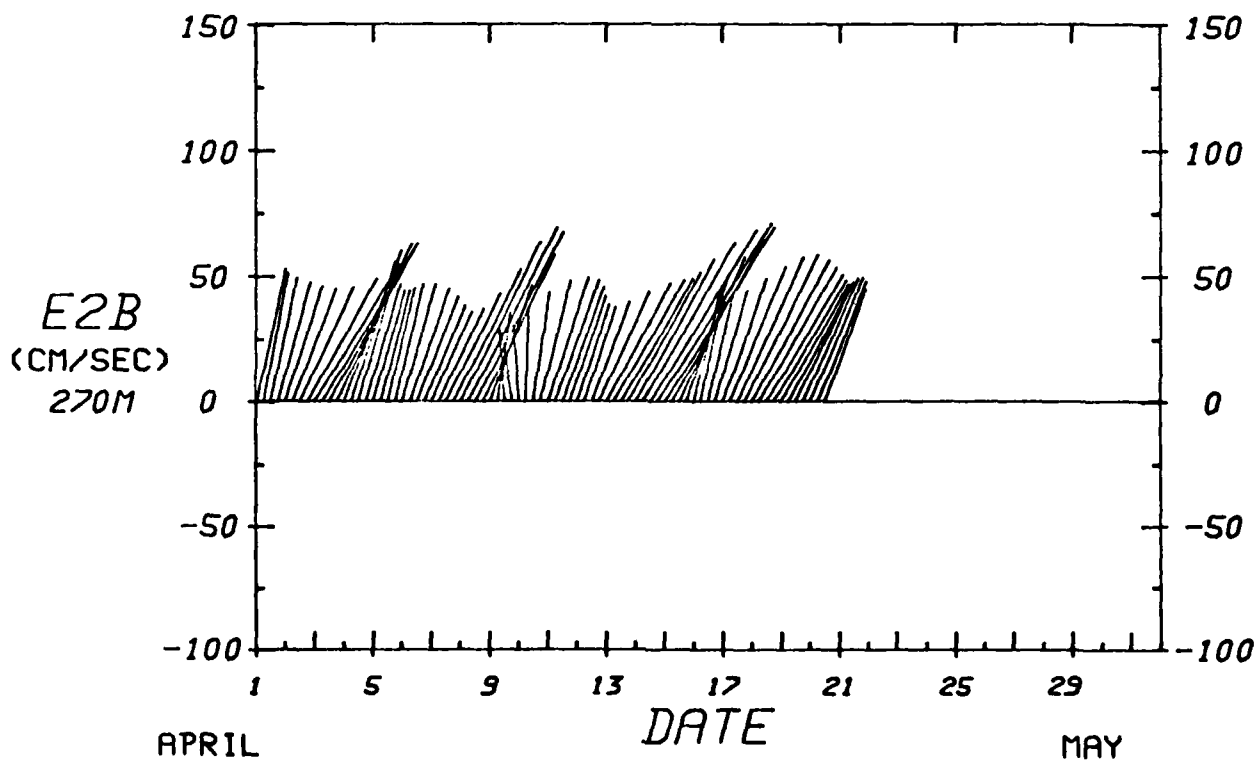
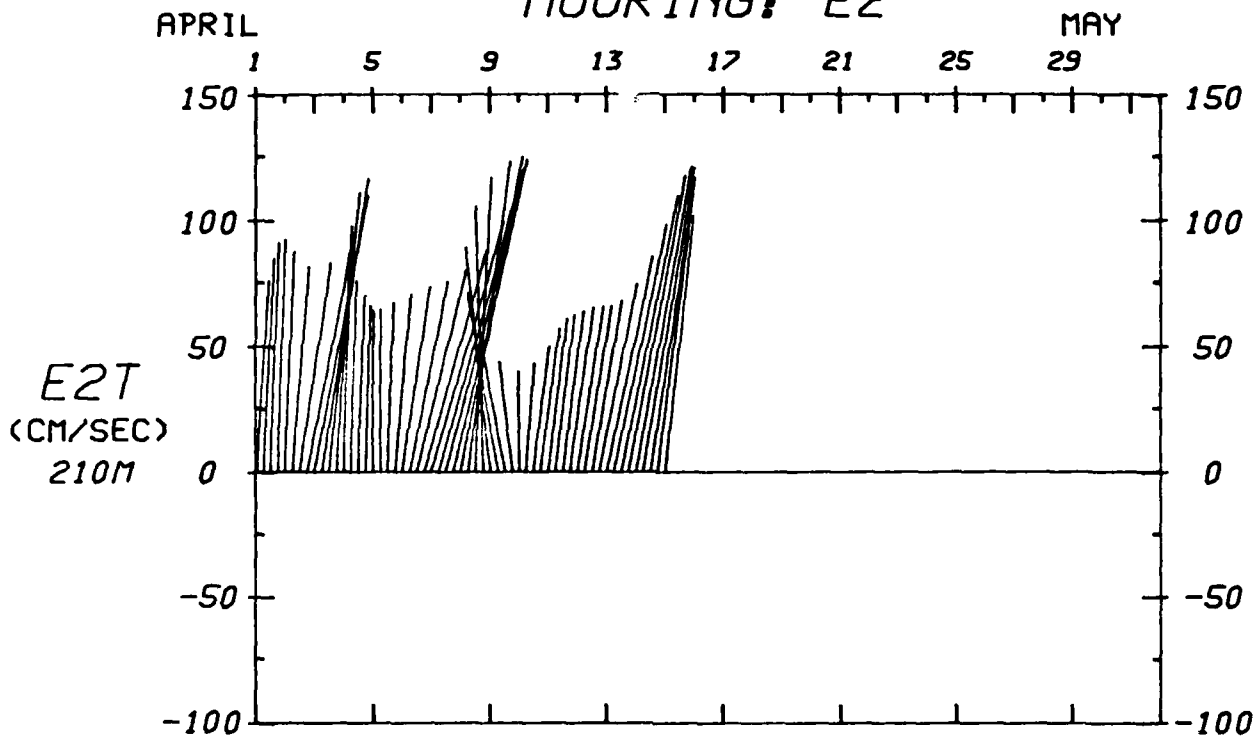
40HRLP VECTOR VELOCITY
MOORING: E2



40HRLP VECTOR VELOCITY
MOORING: E2

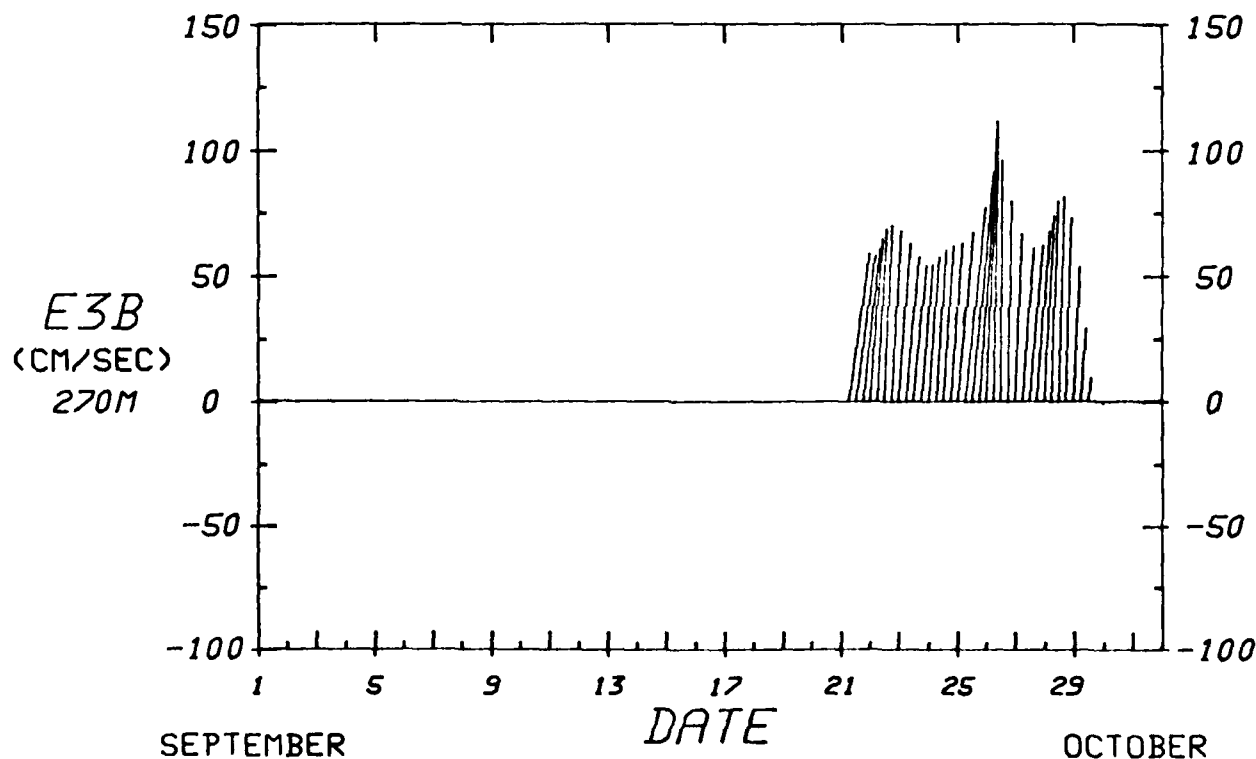
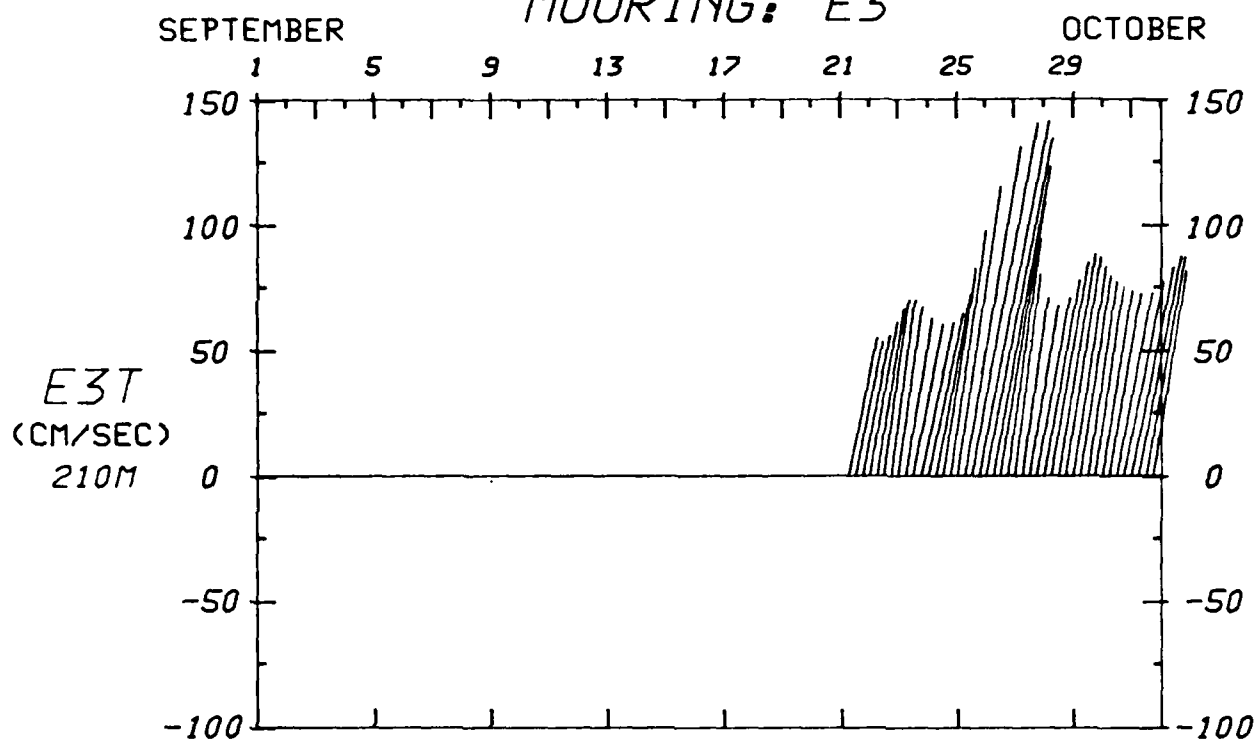


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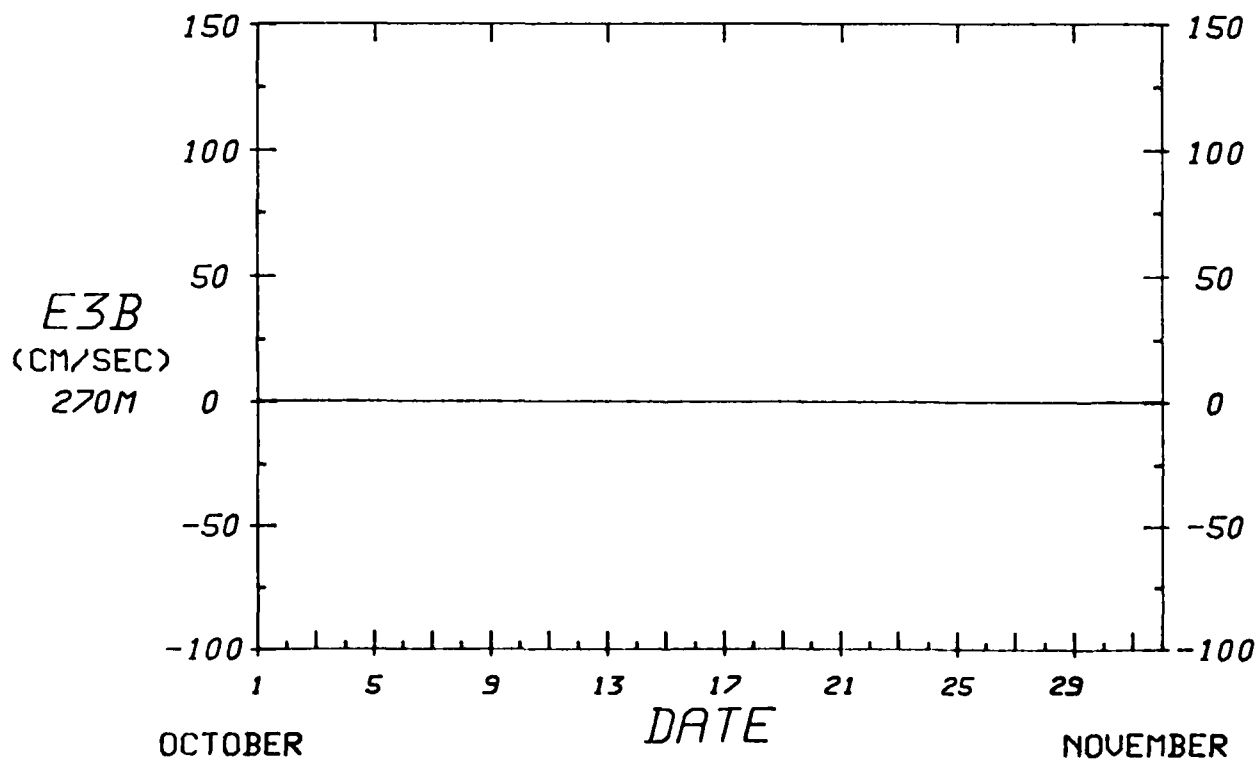
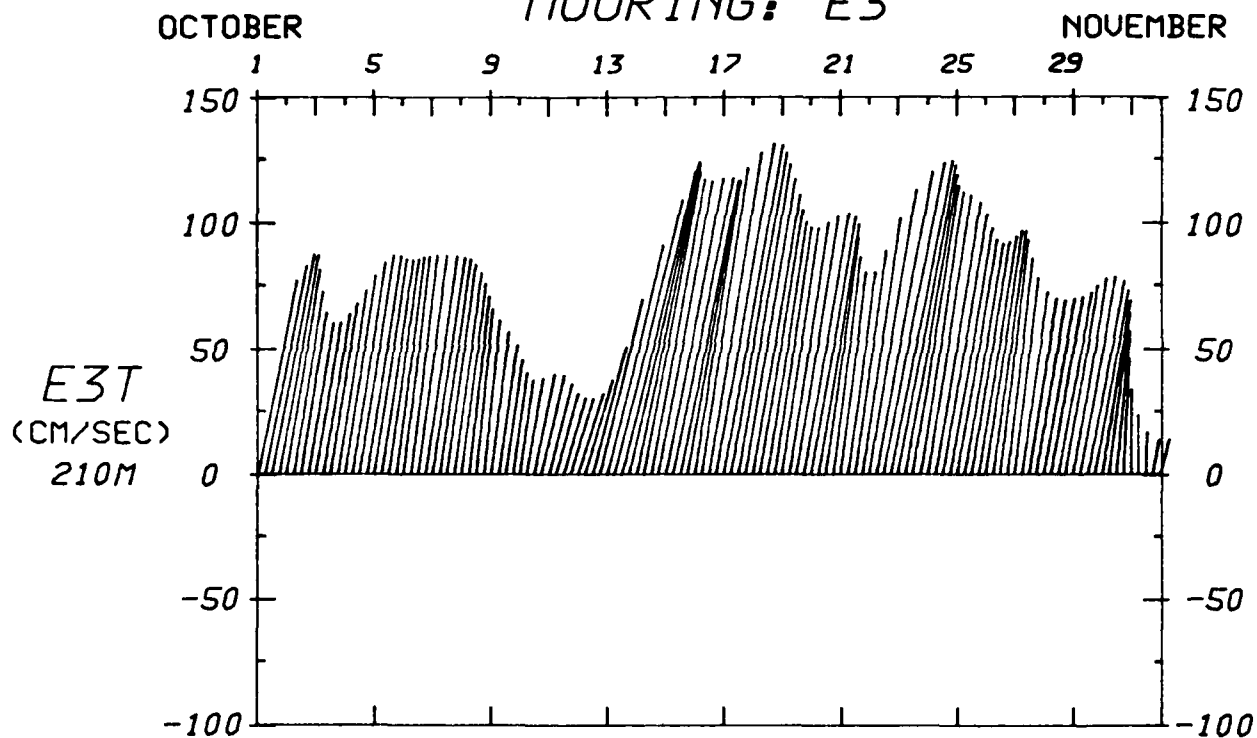


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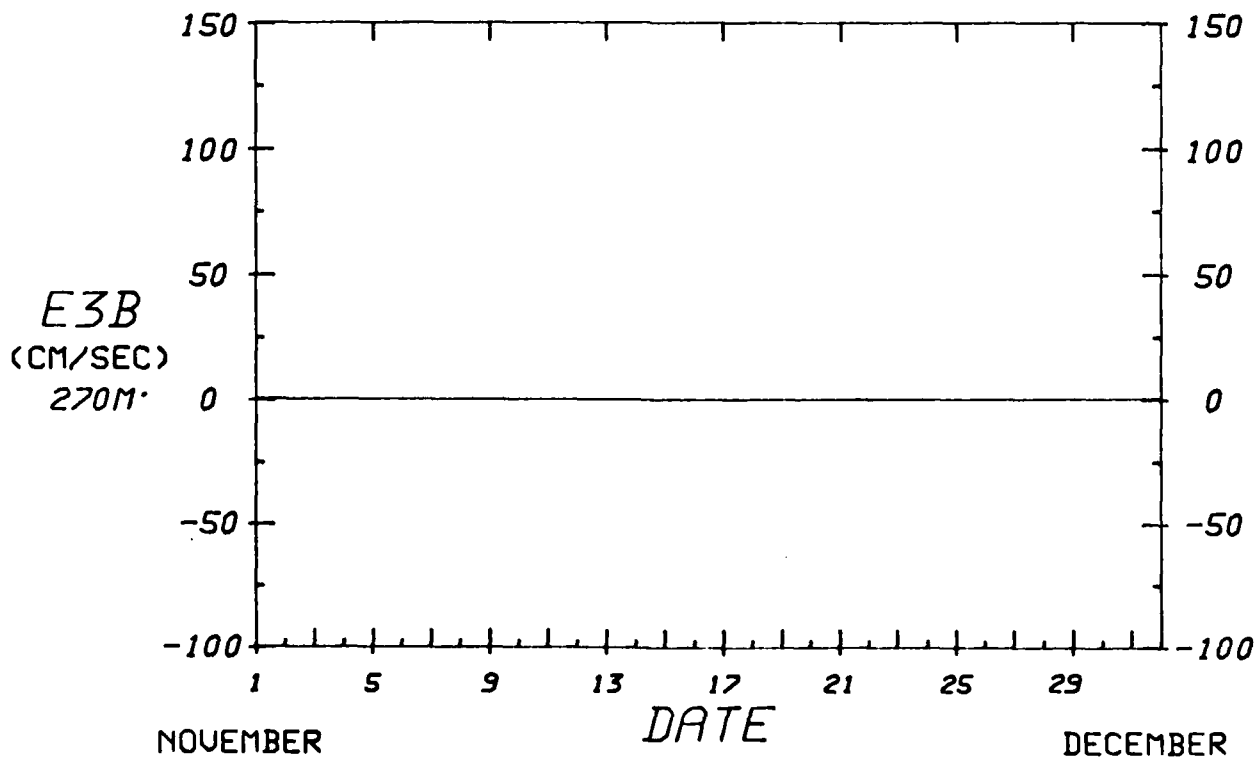
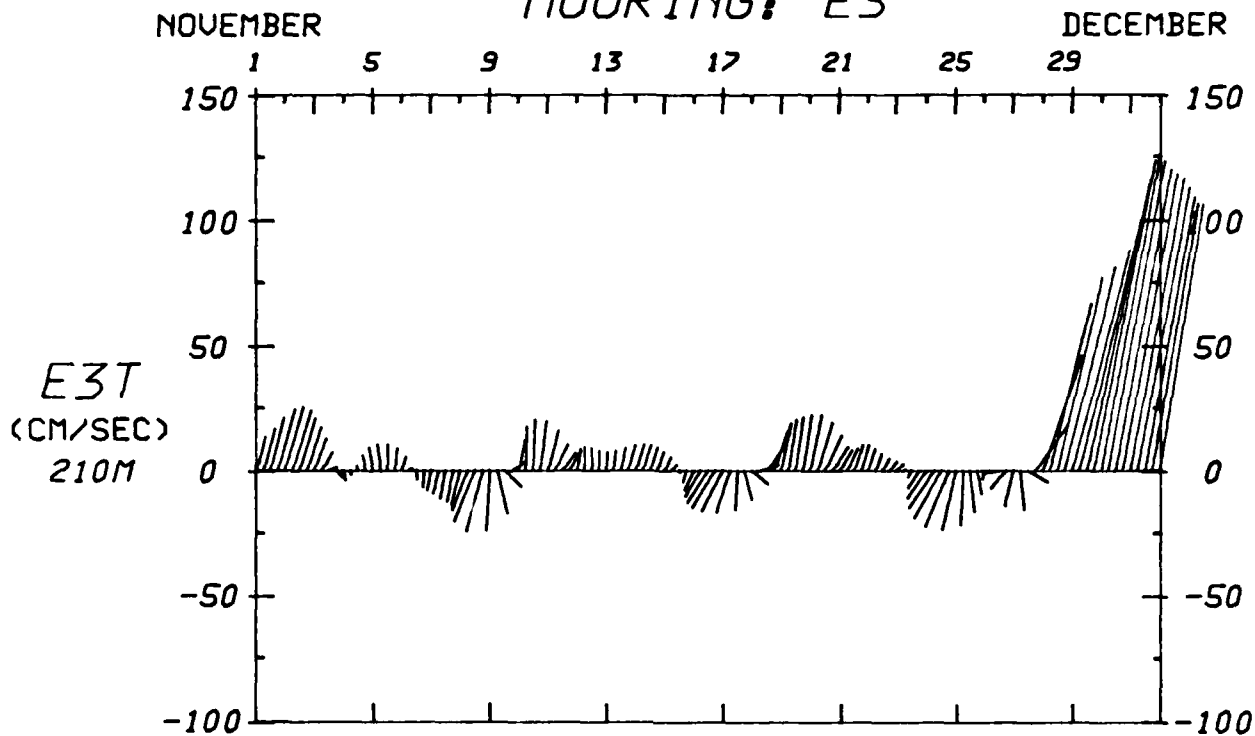
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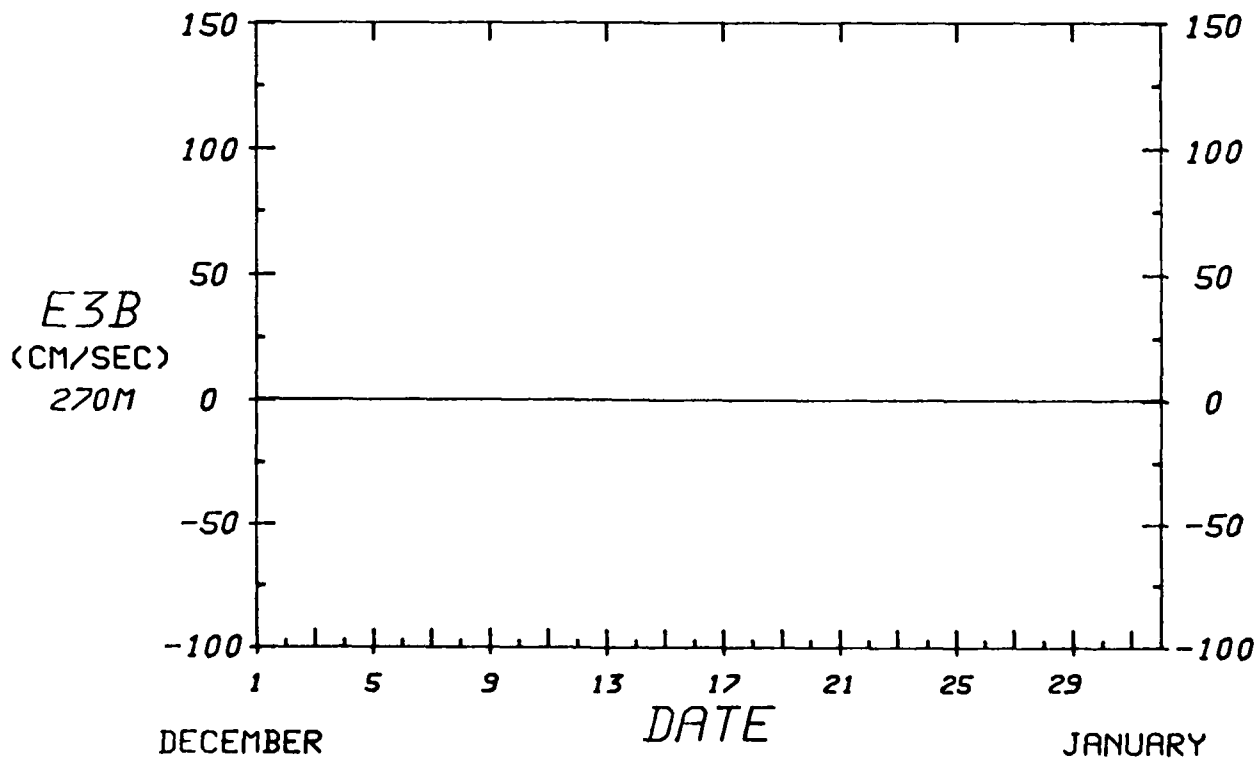
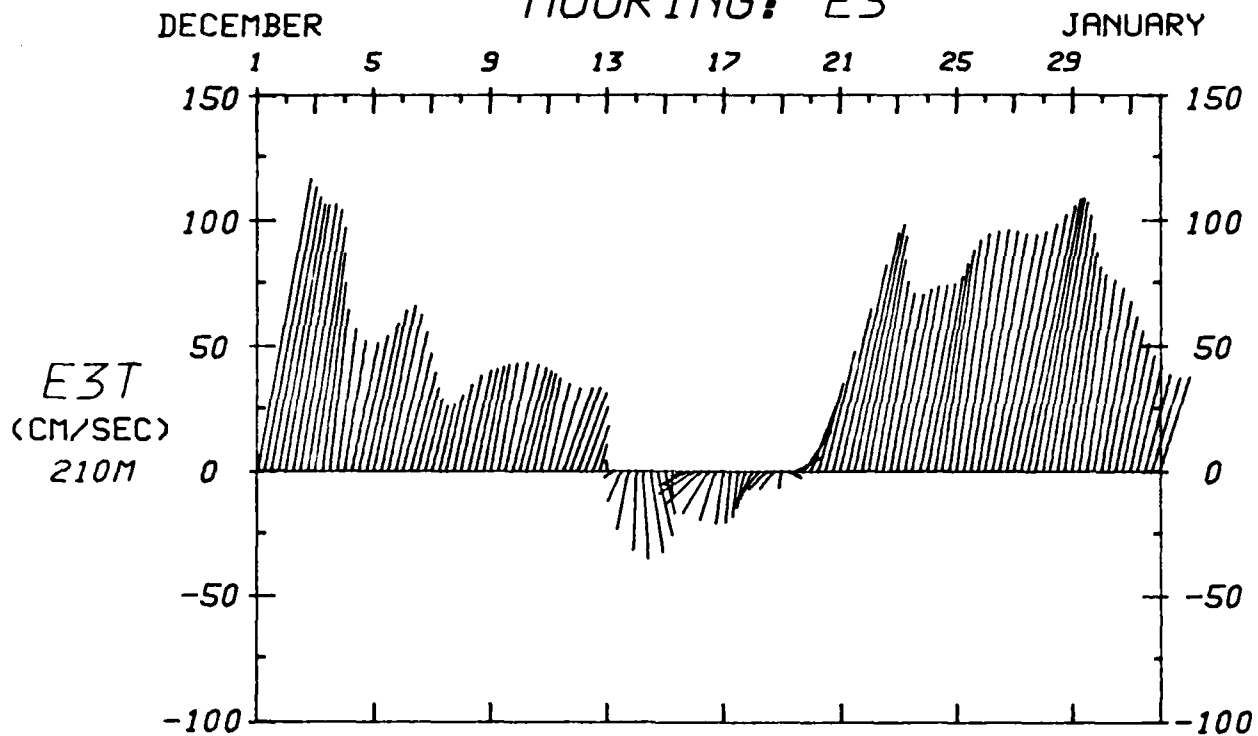
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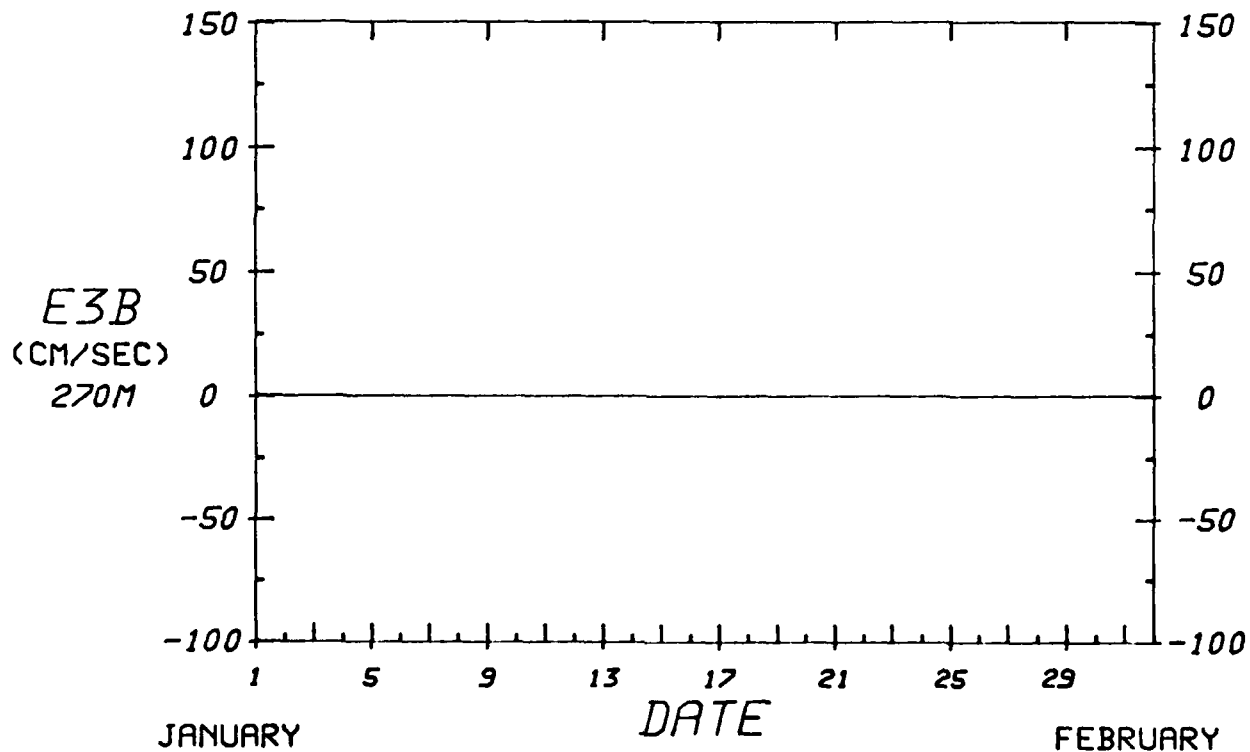
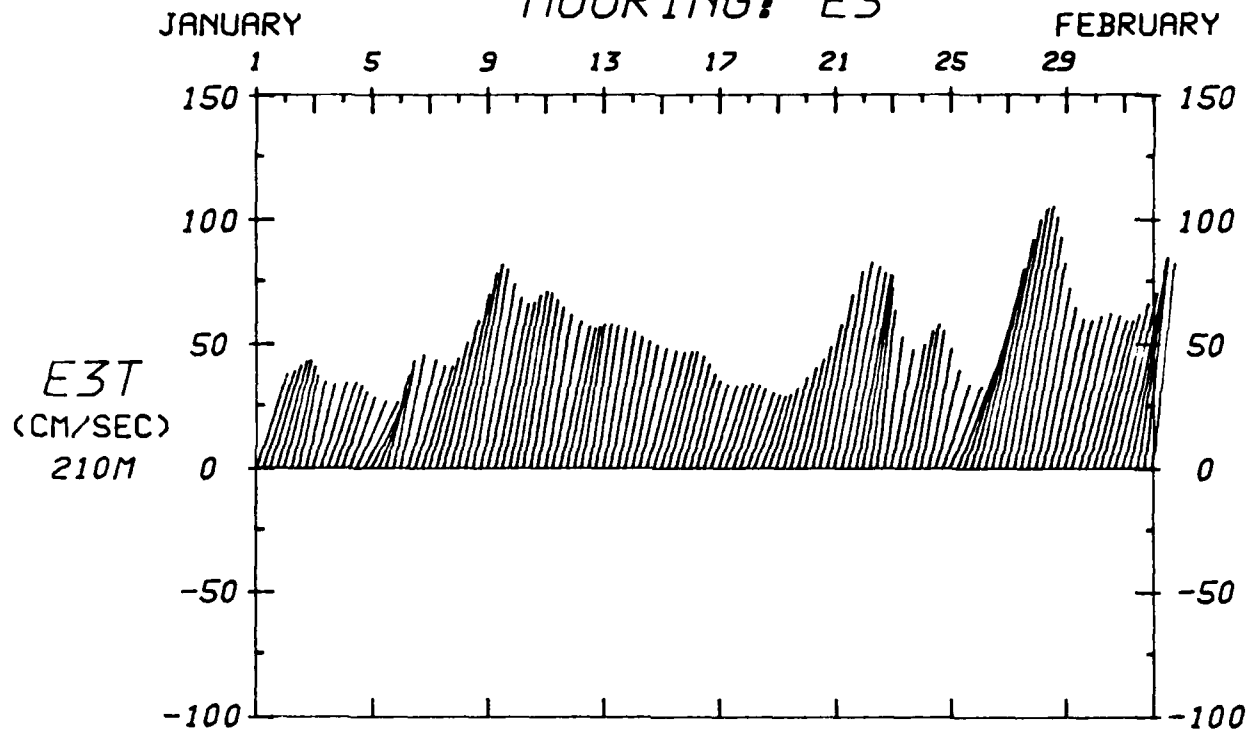
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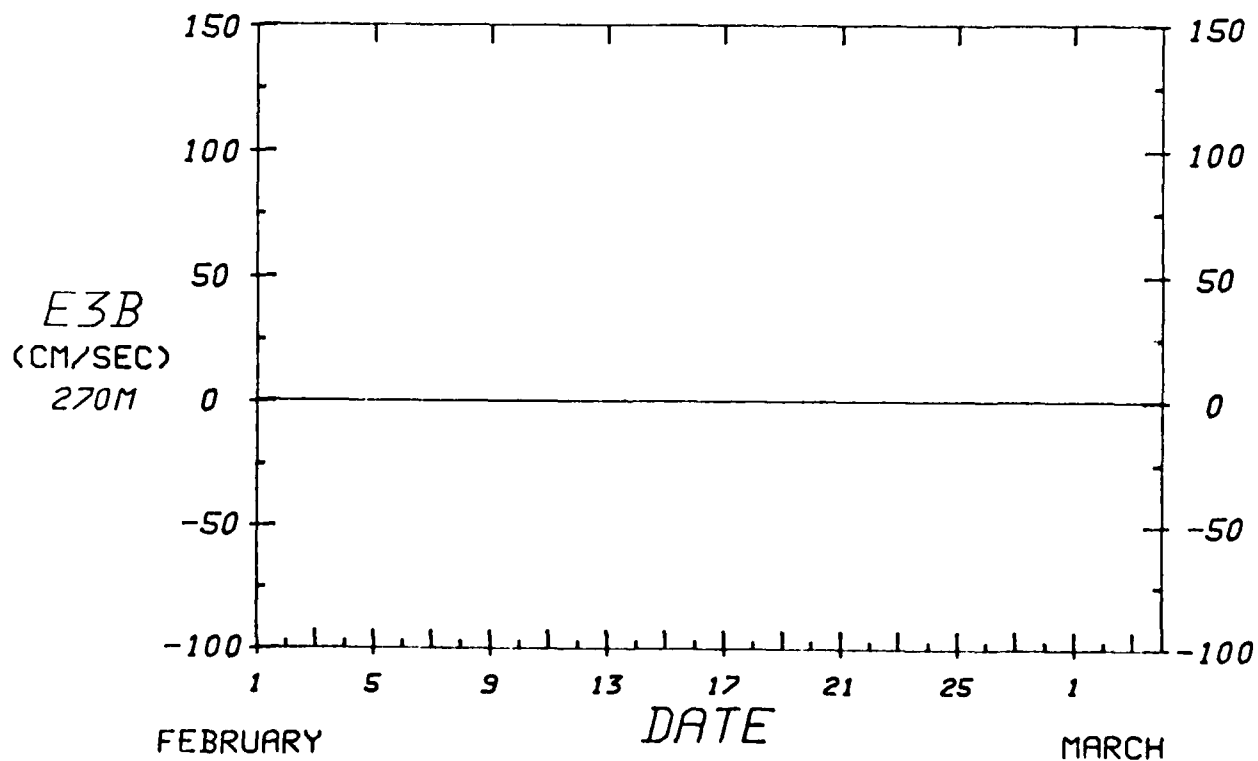
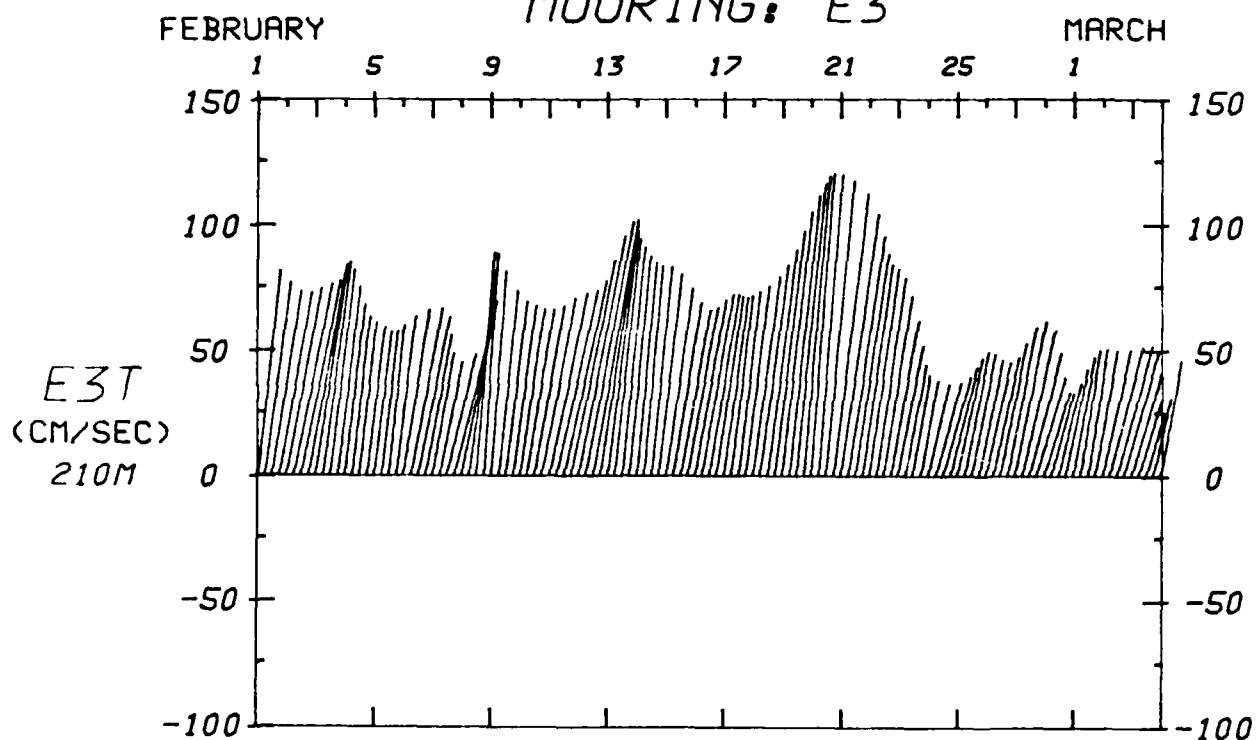
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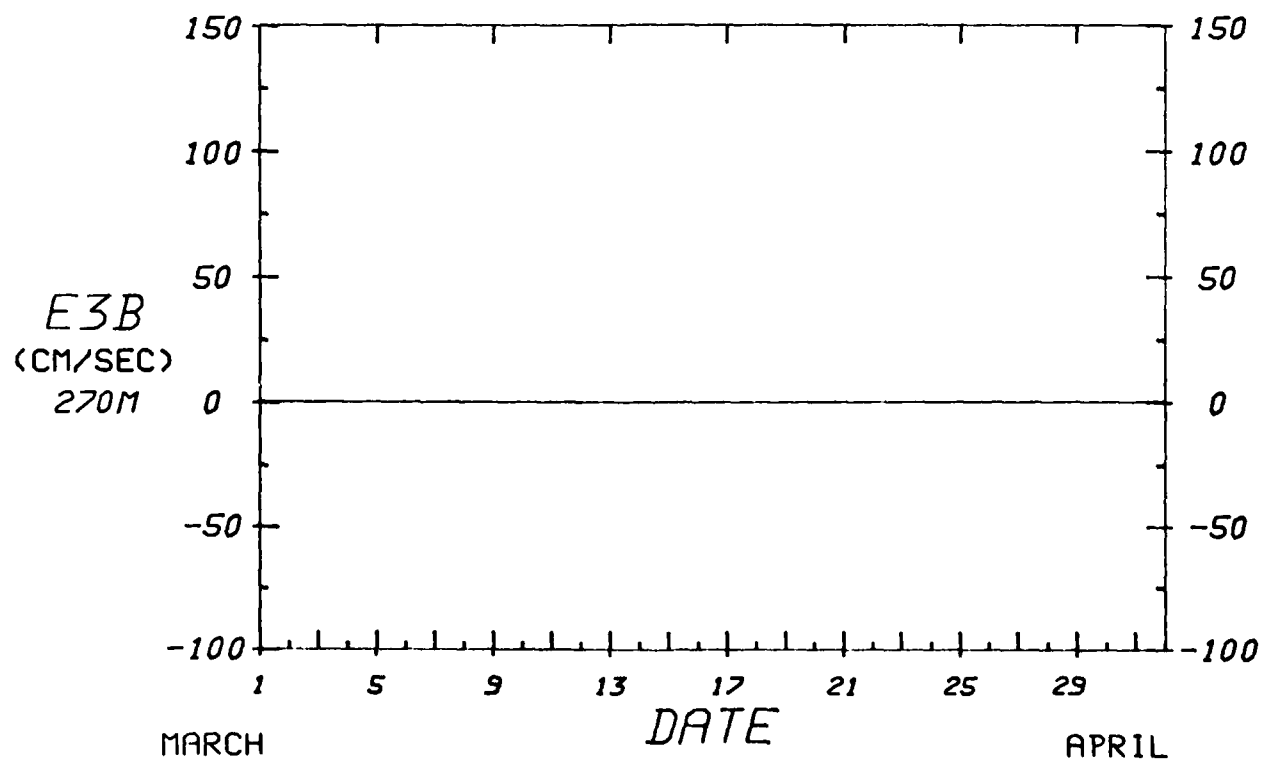
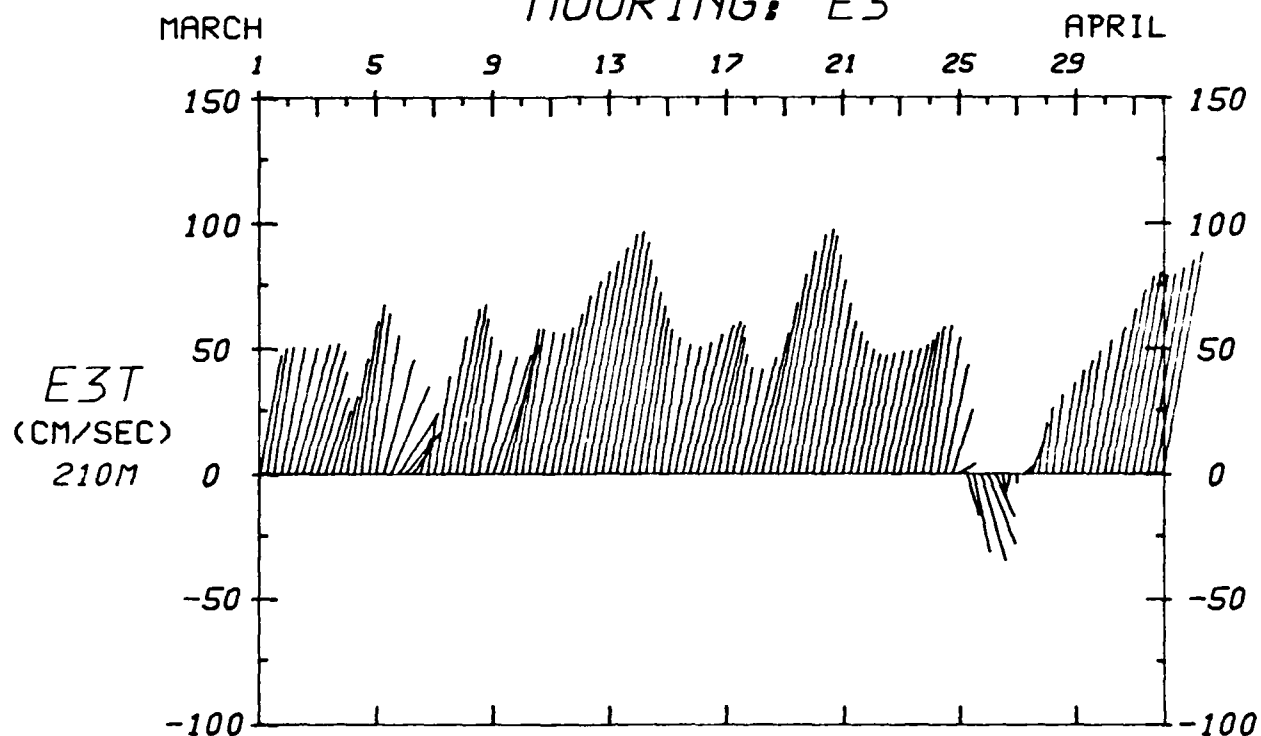
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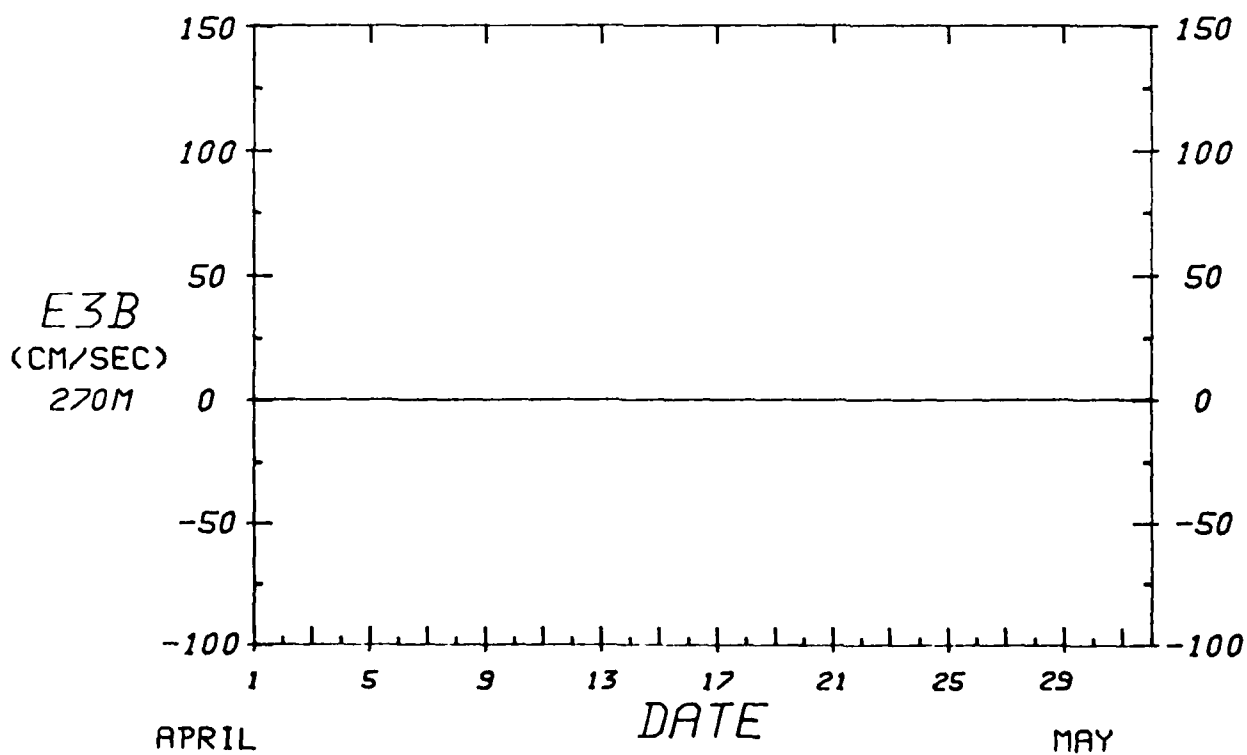
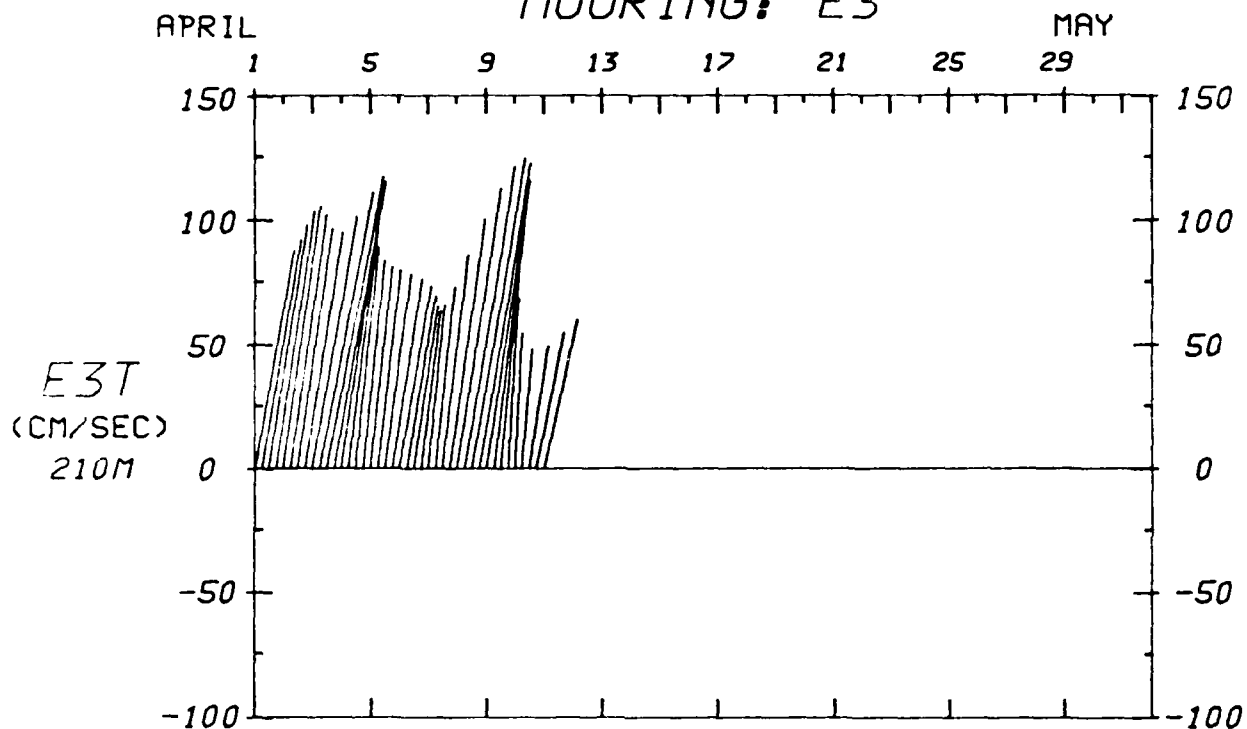
40HRLP VECTOR VELOCITY MOORING: E3



40HRLP VECTOR VELOCITY MOORING: E3

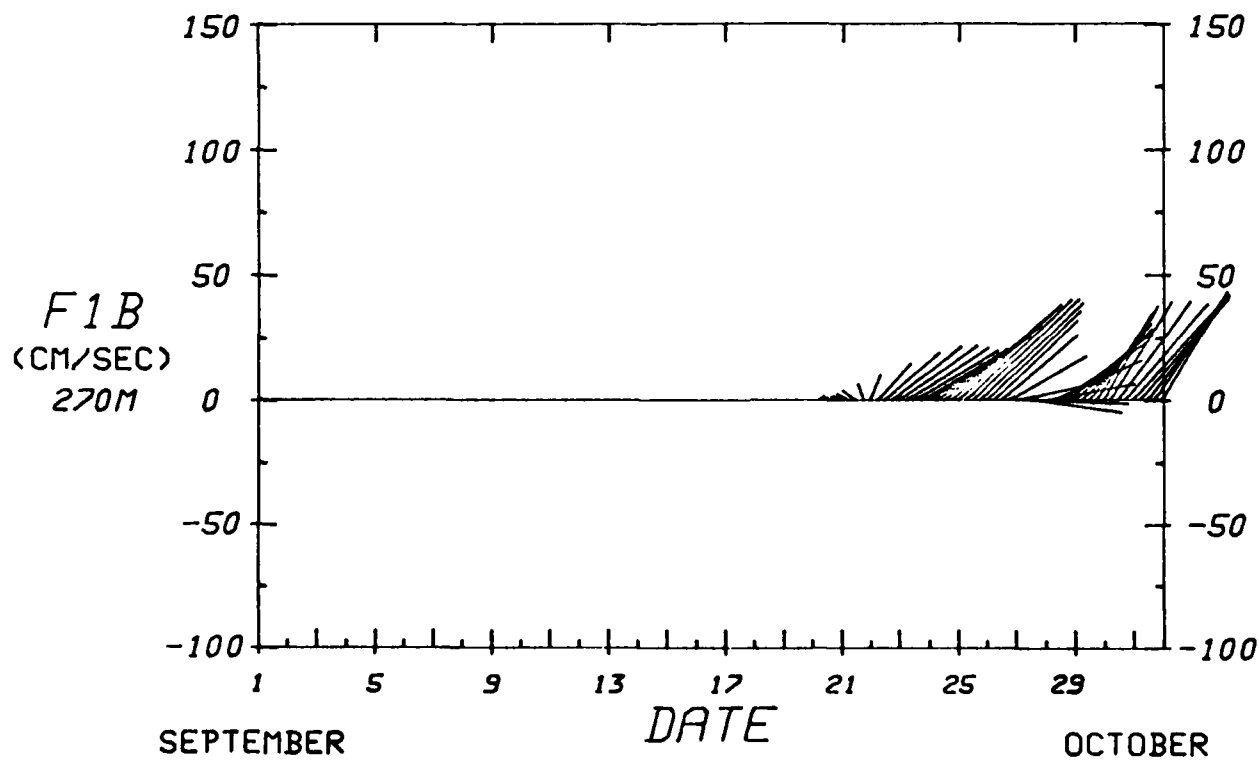
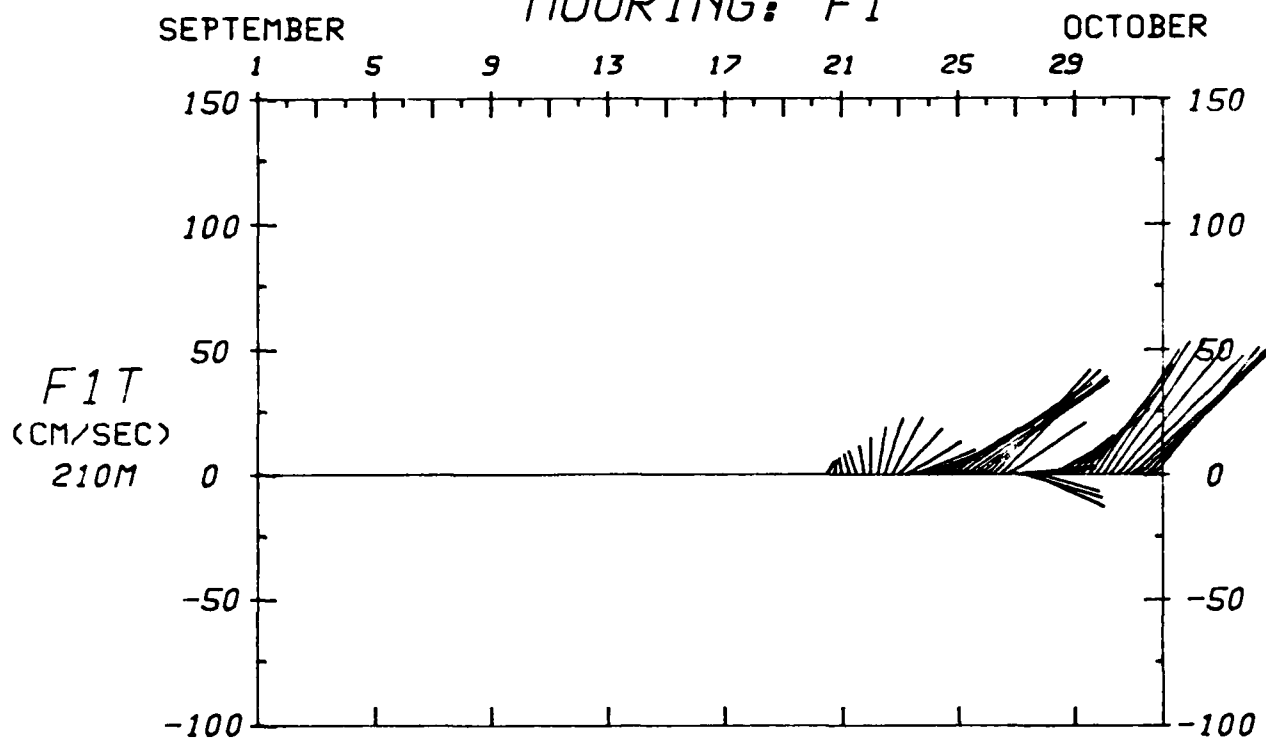


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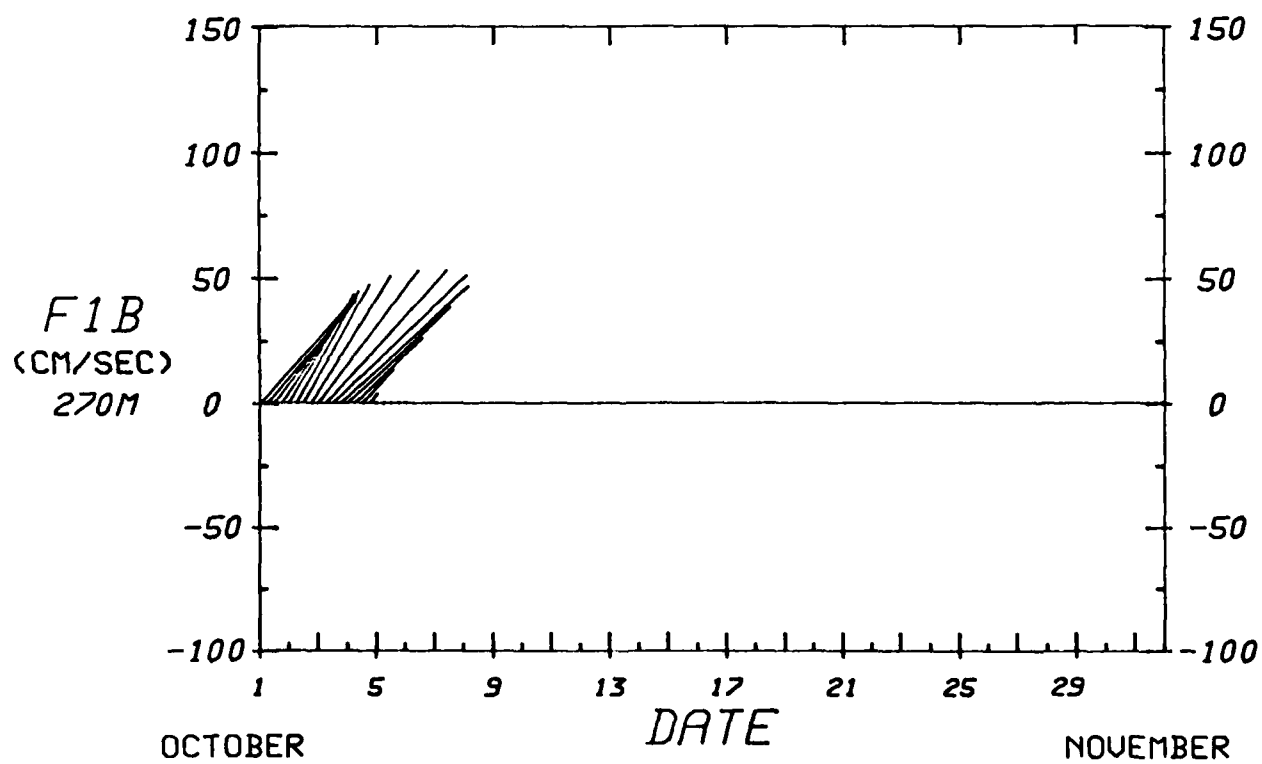
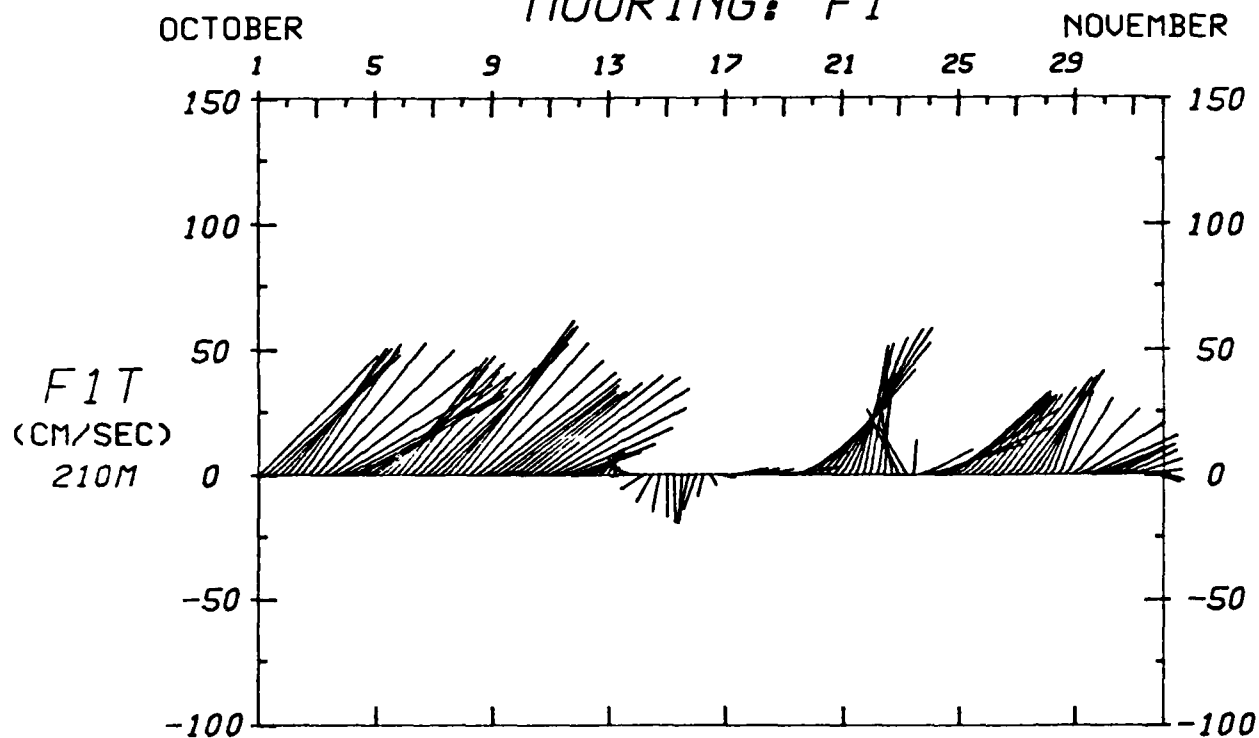


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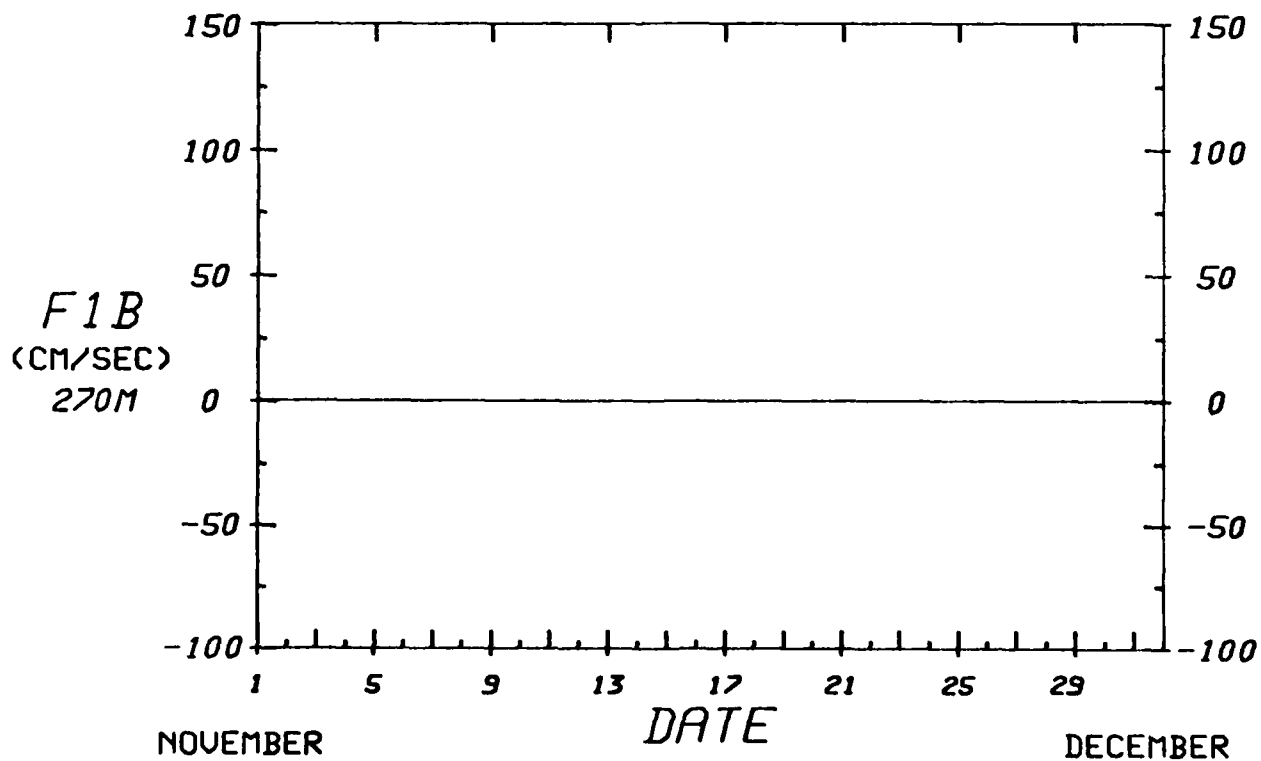
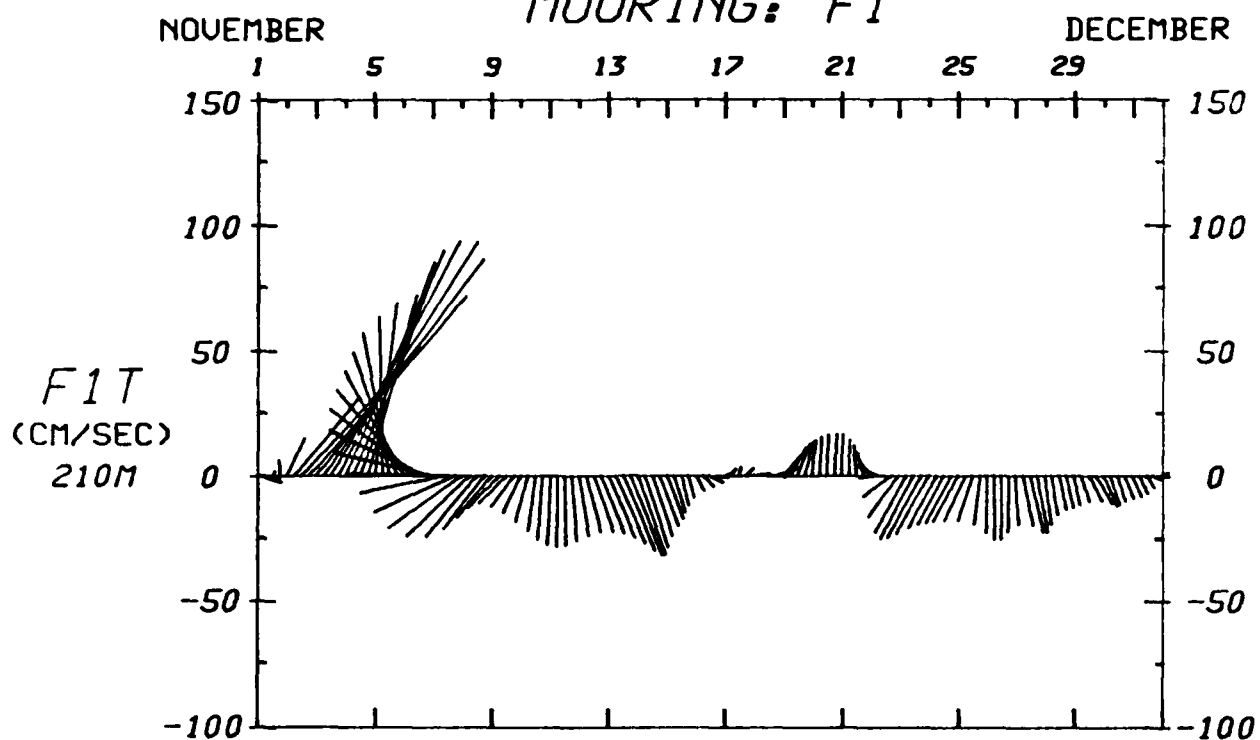
40HRLP VECTOR VELOCITY
MOORING: F1



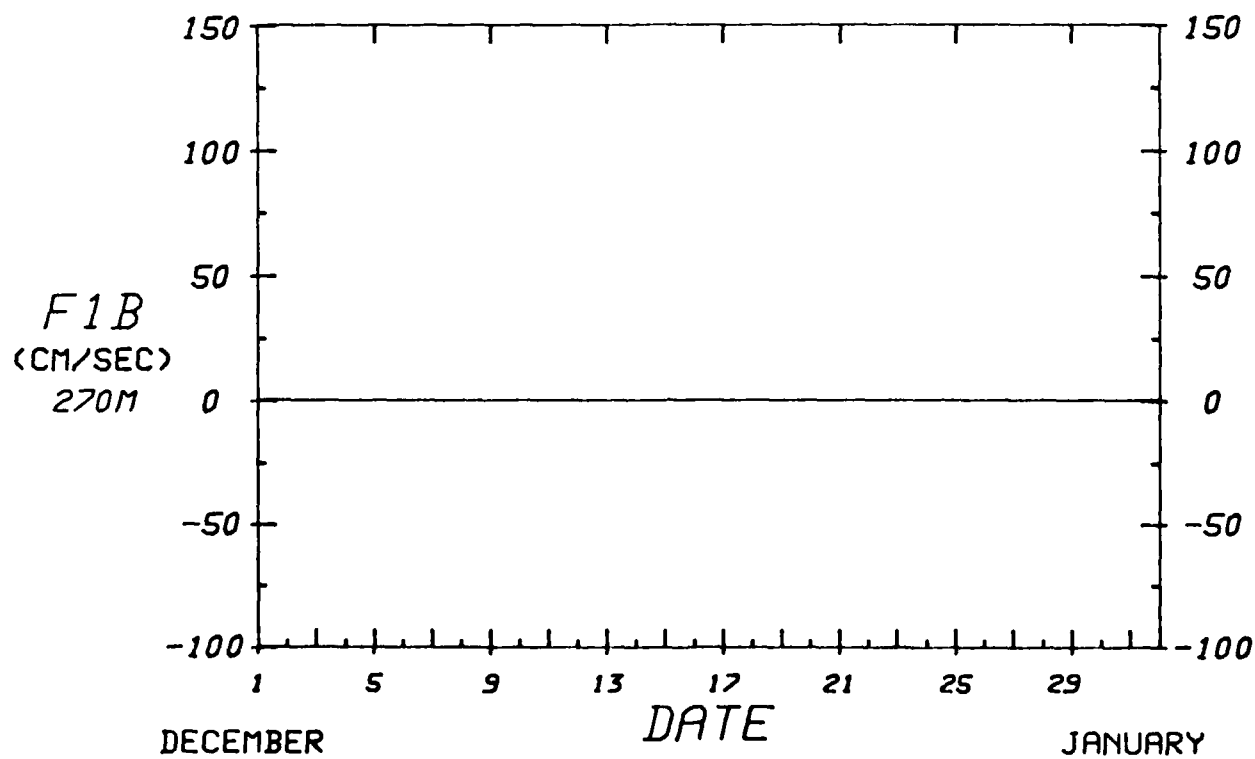
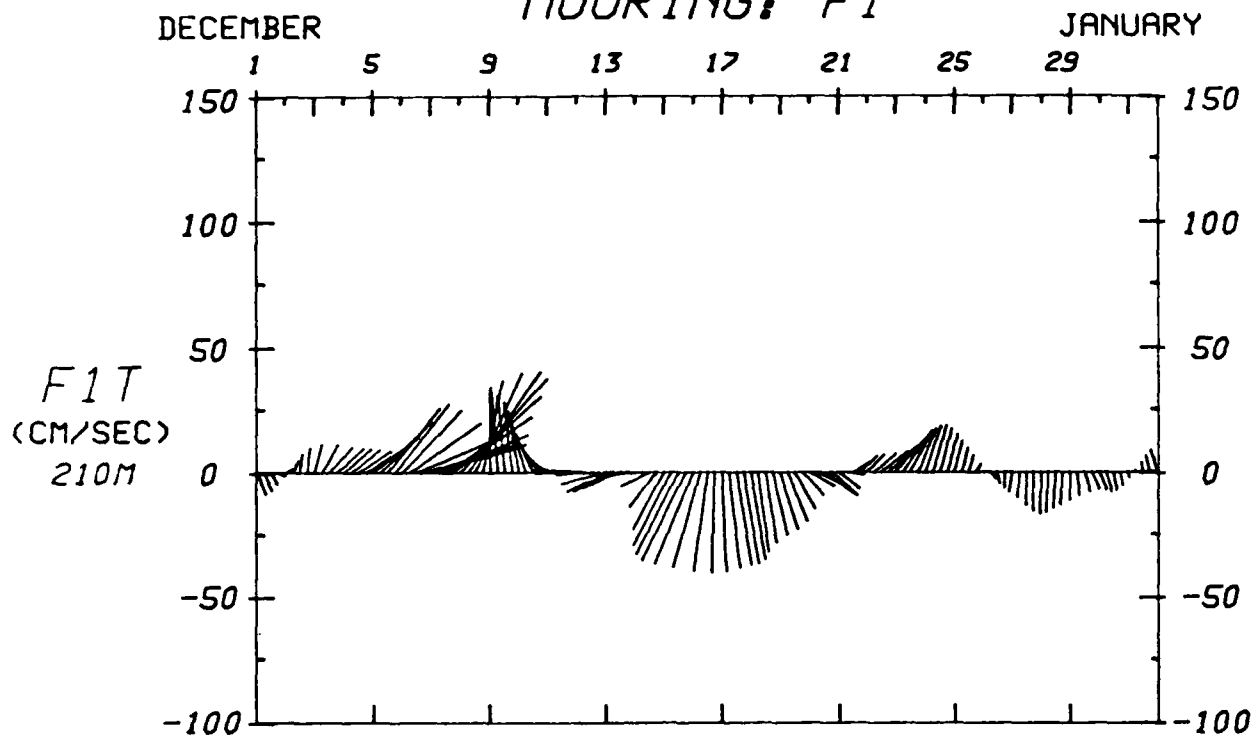
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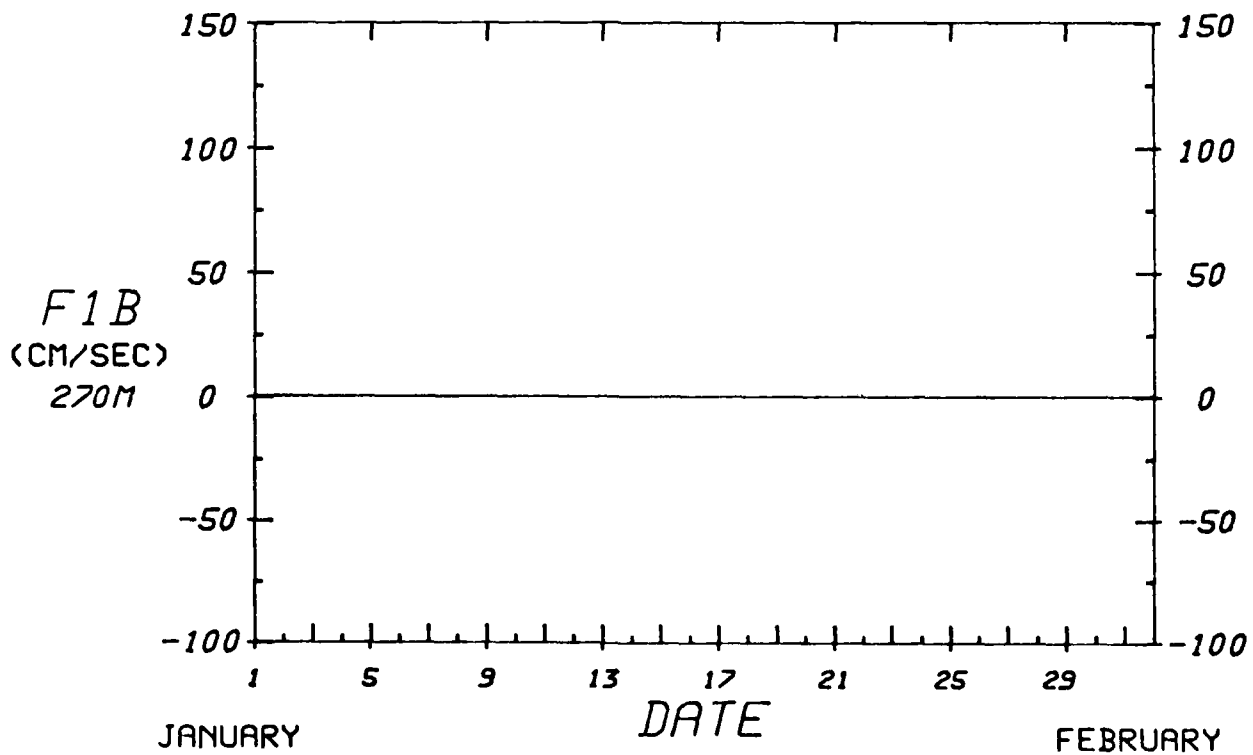
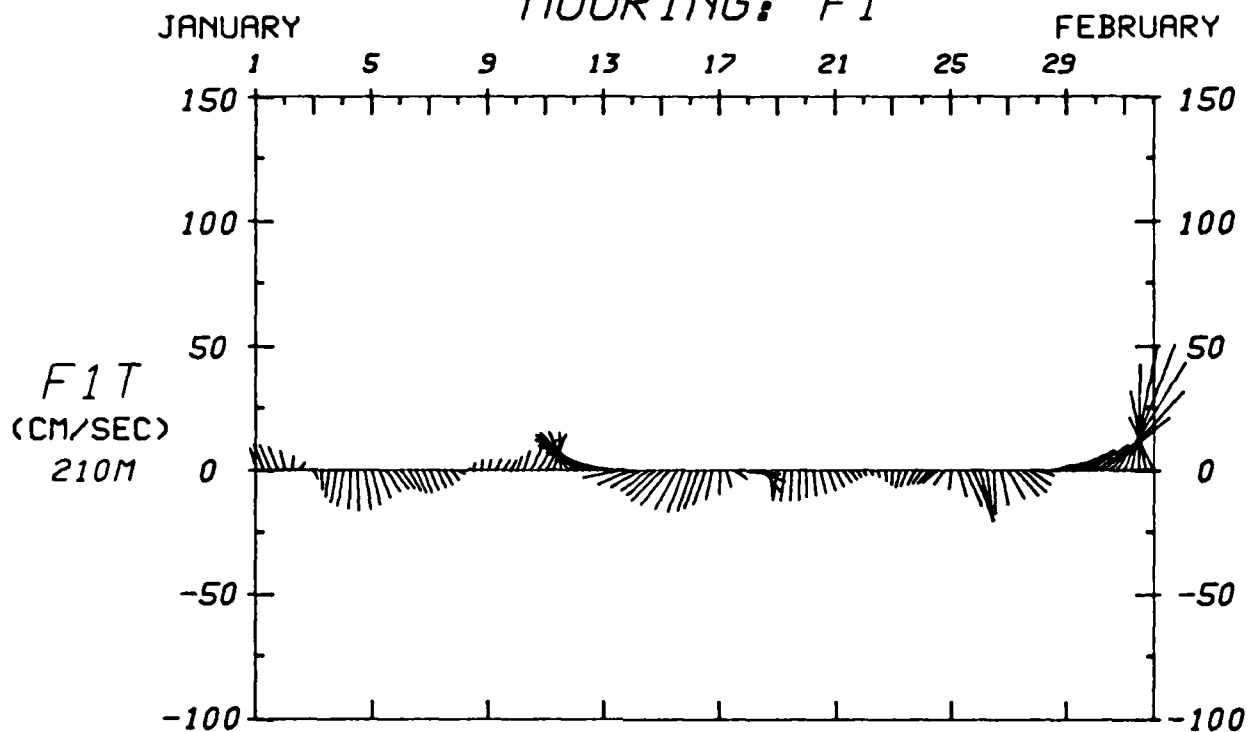
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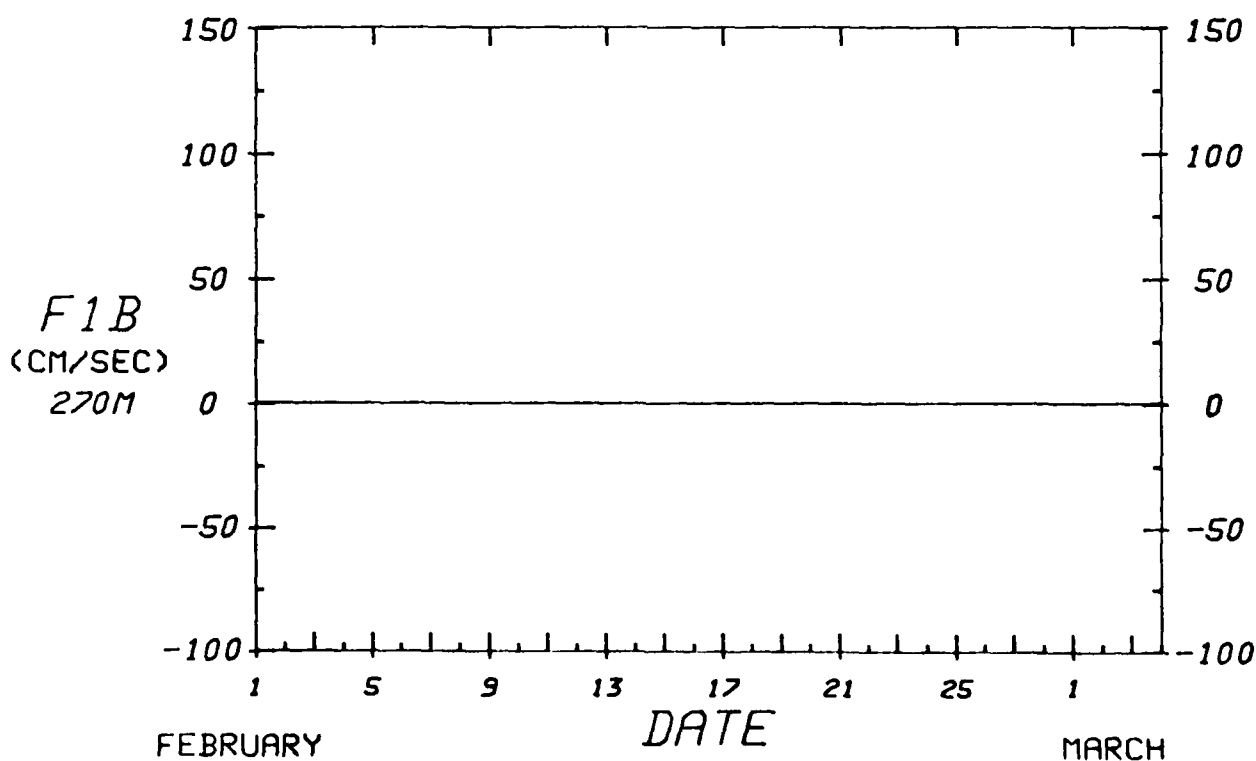
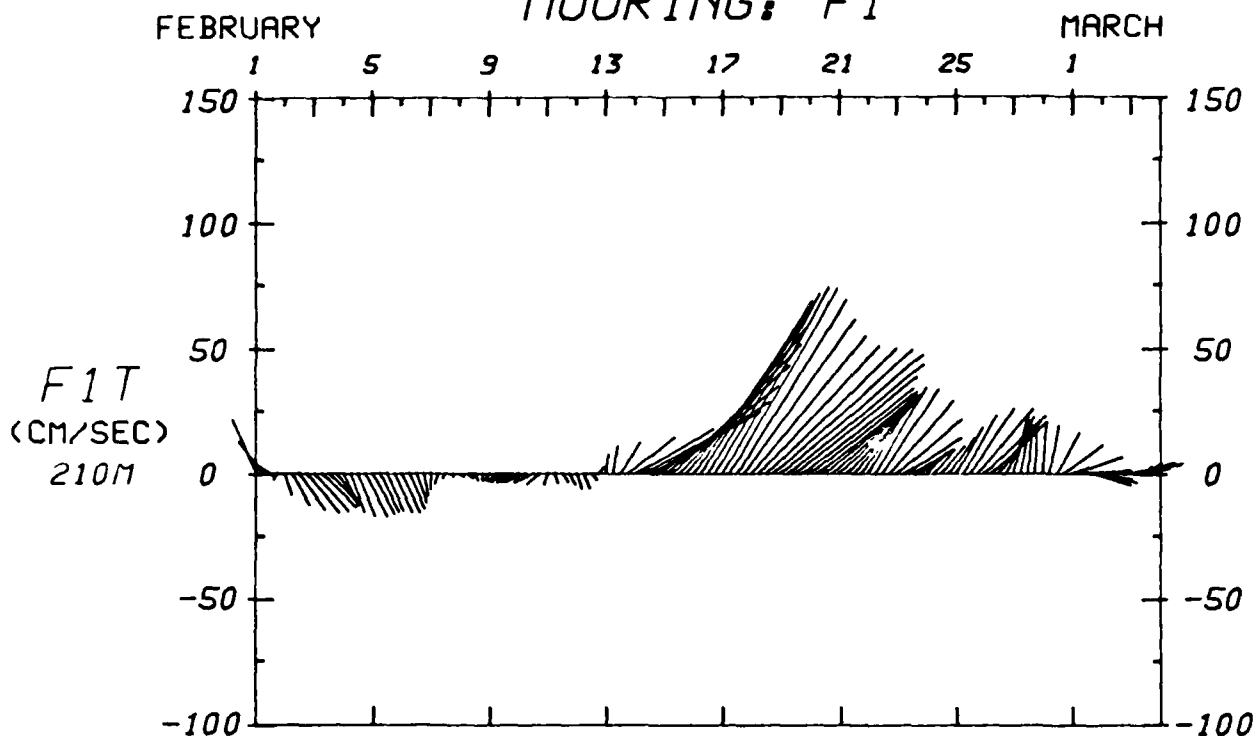
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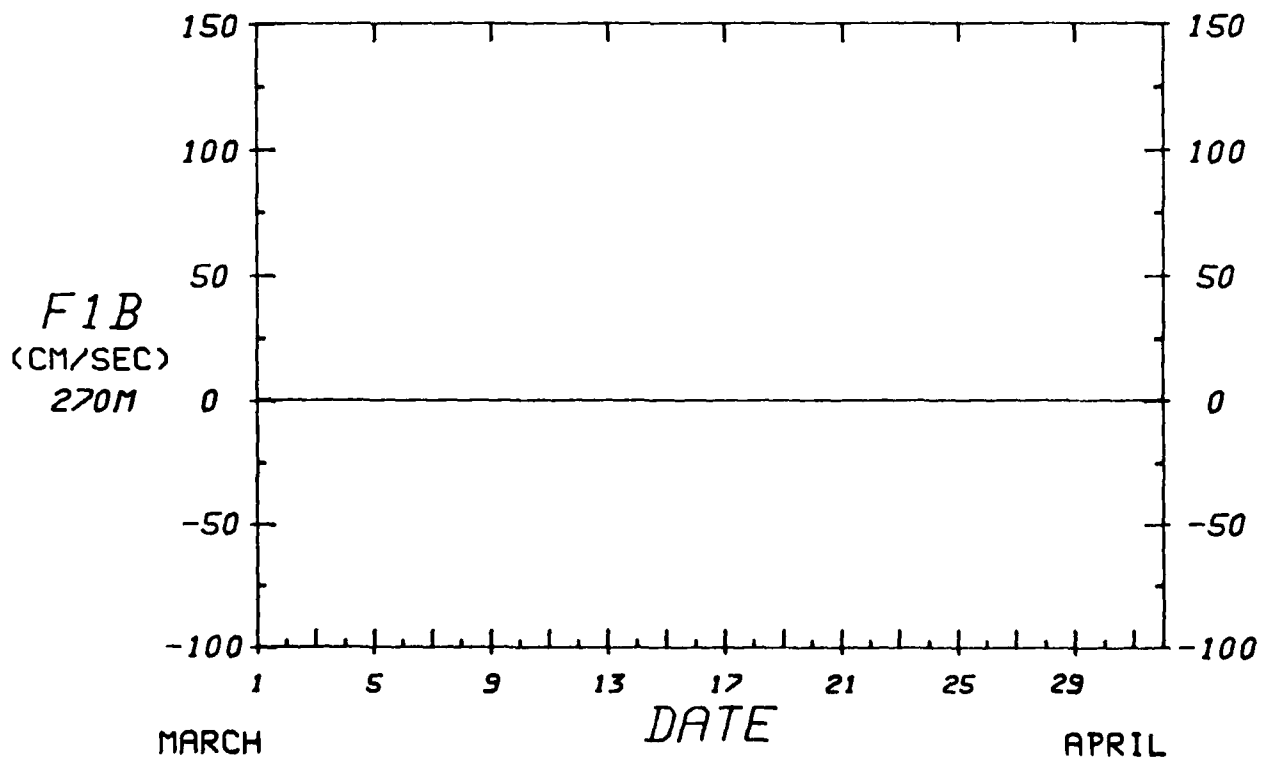
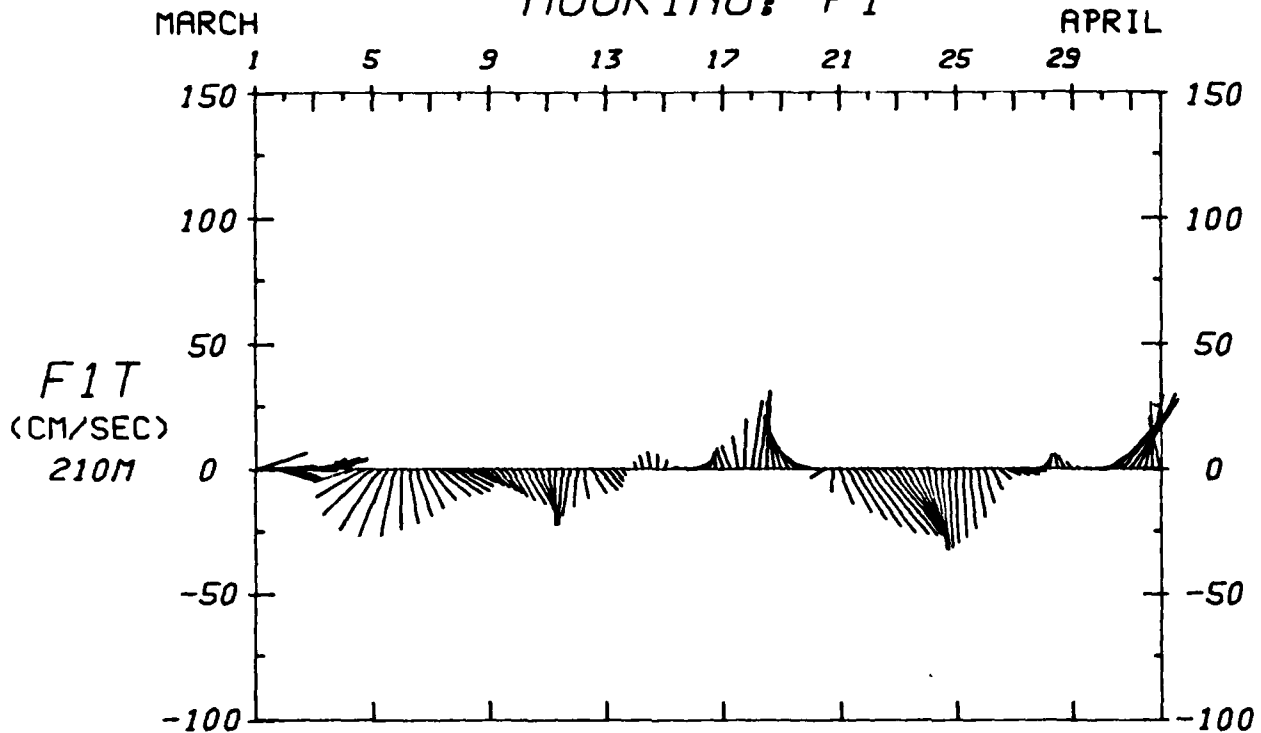
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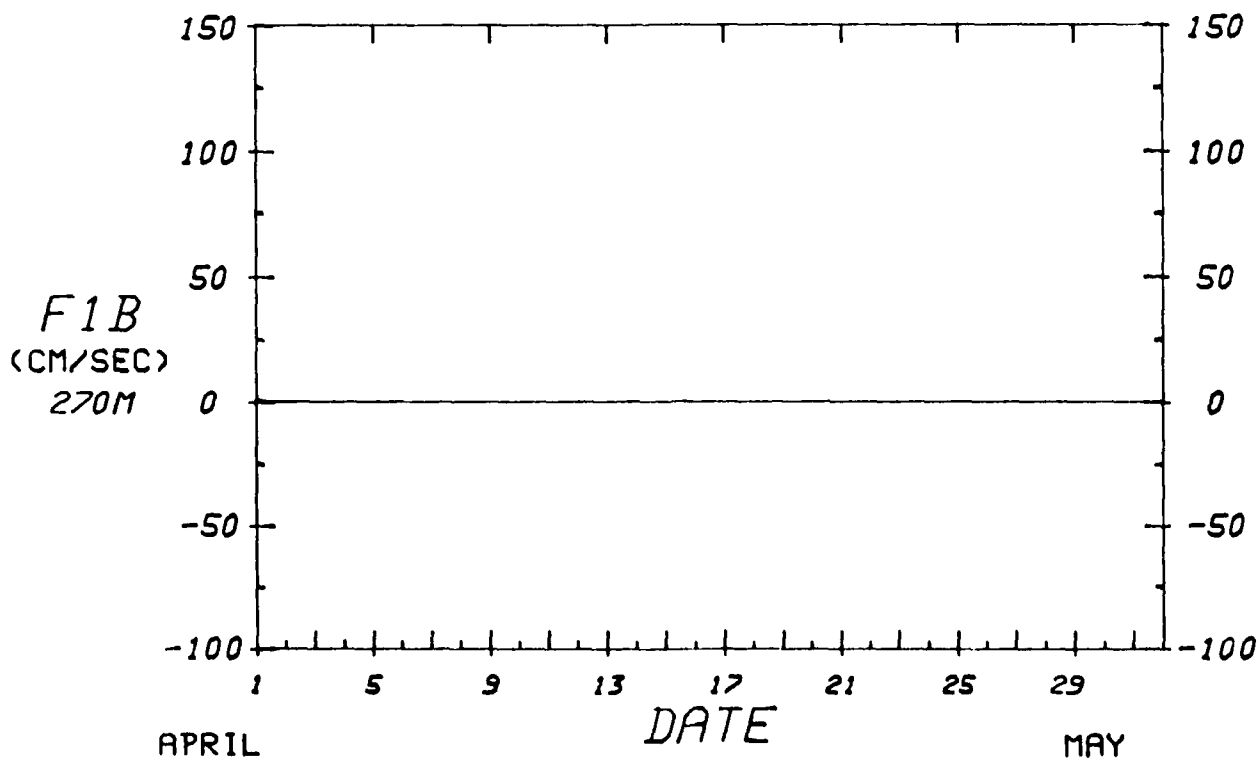
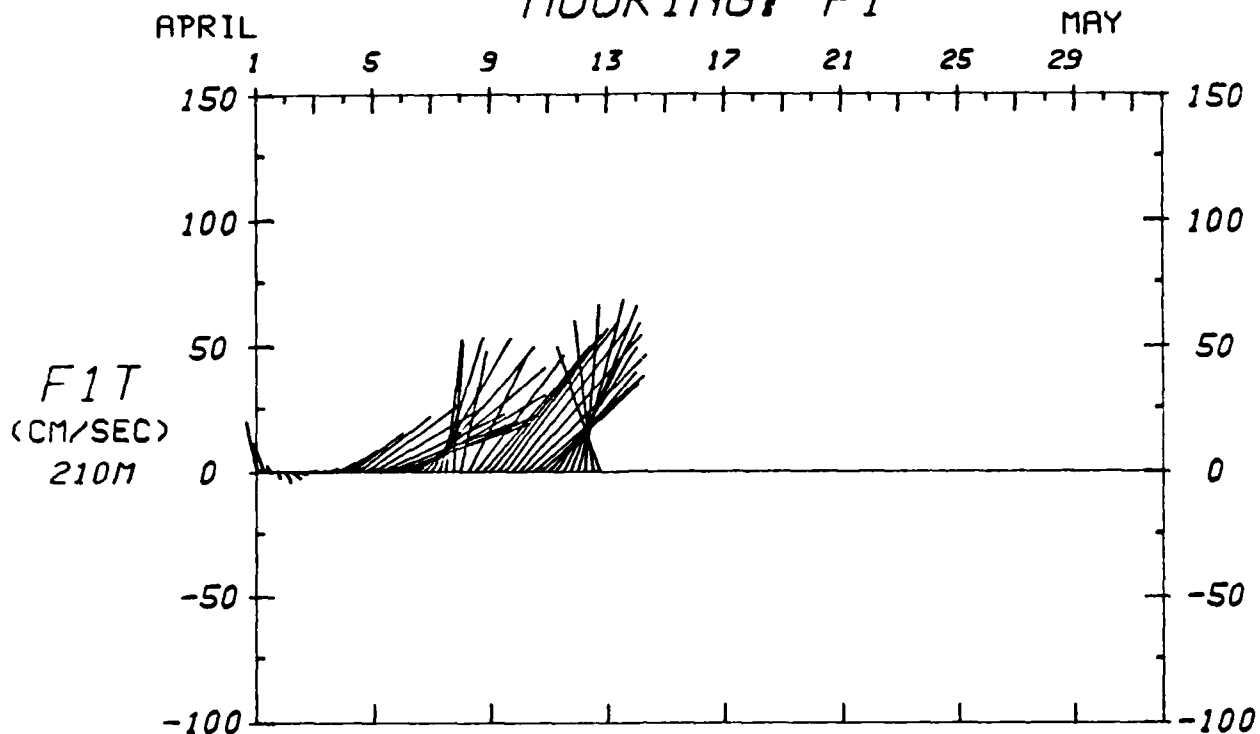
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40HRLP VECTOR VELOCITY MOORING: F1

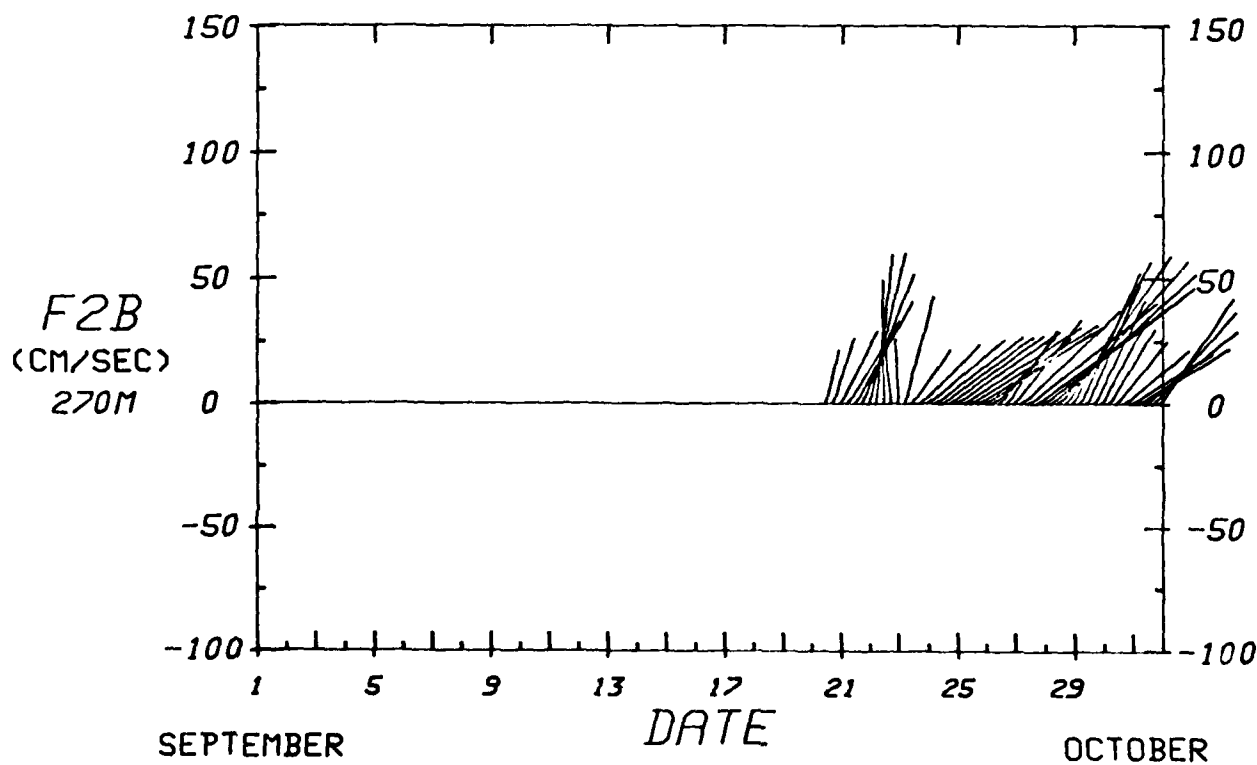
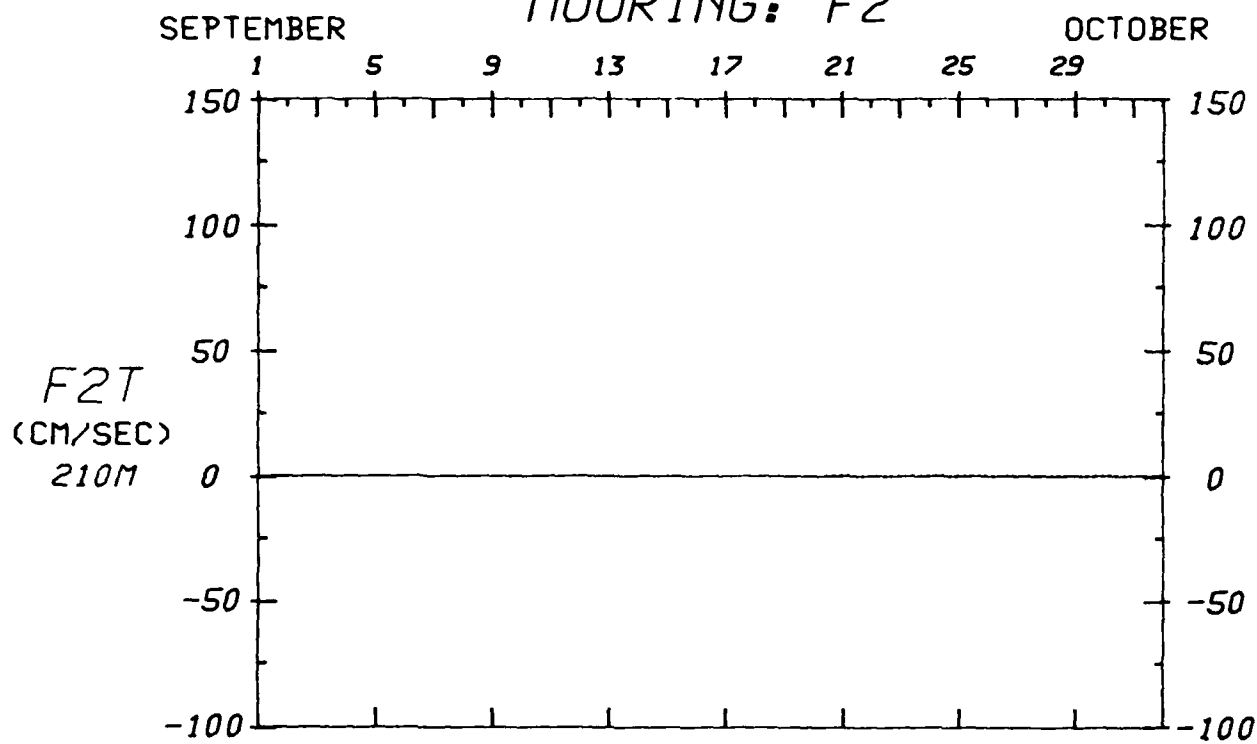


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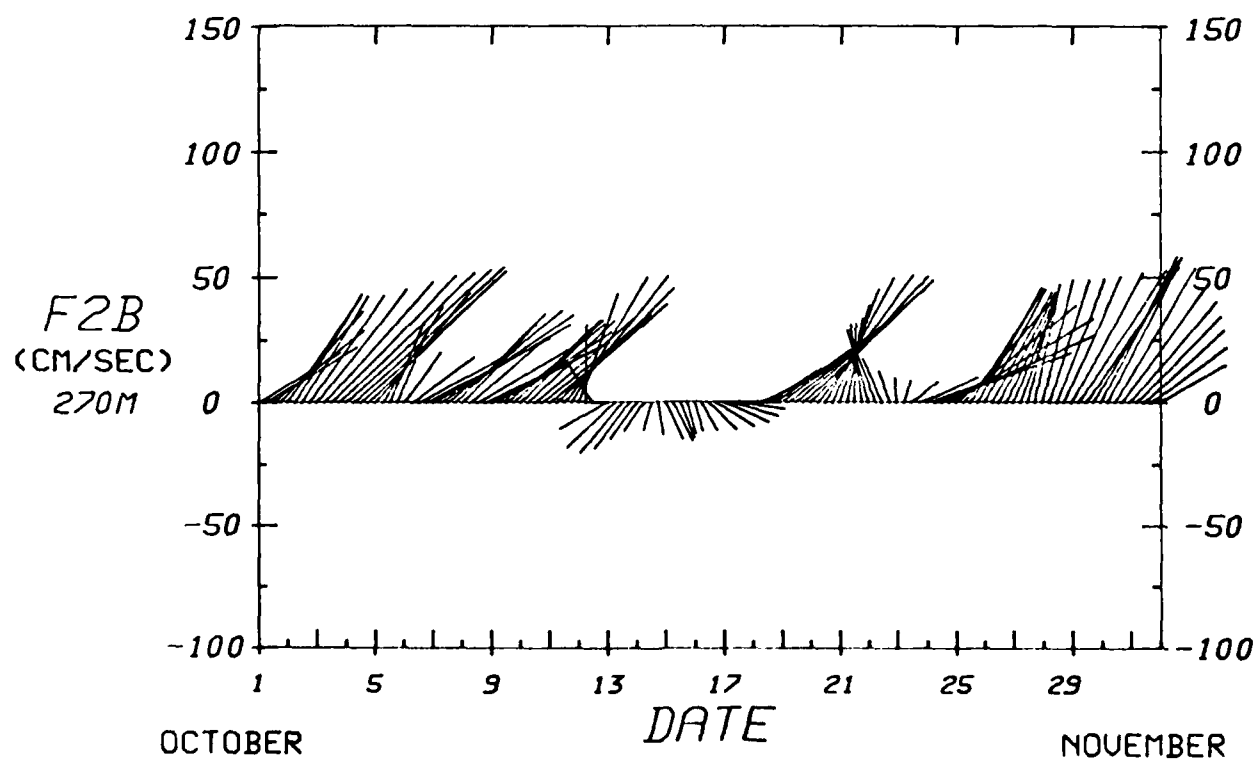
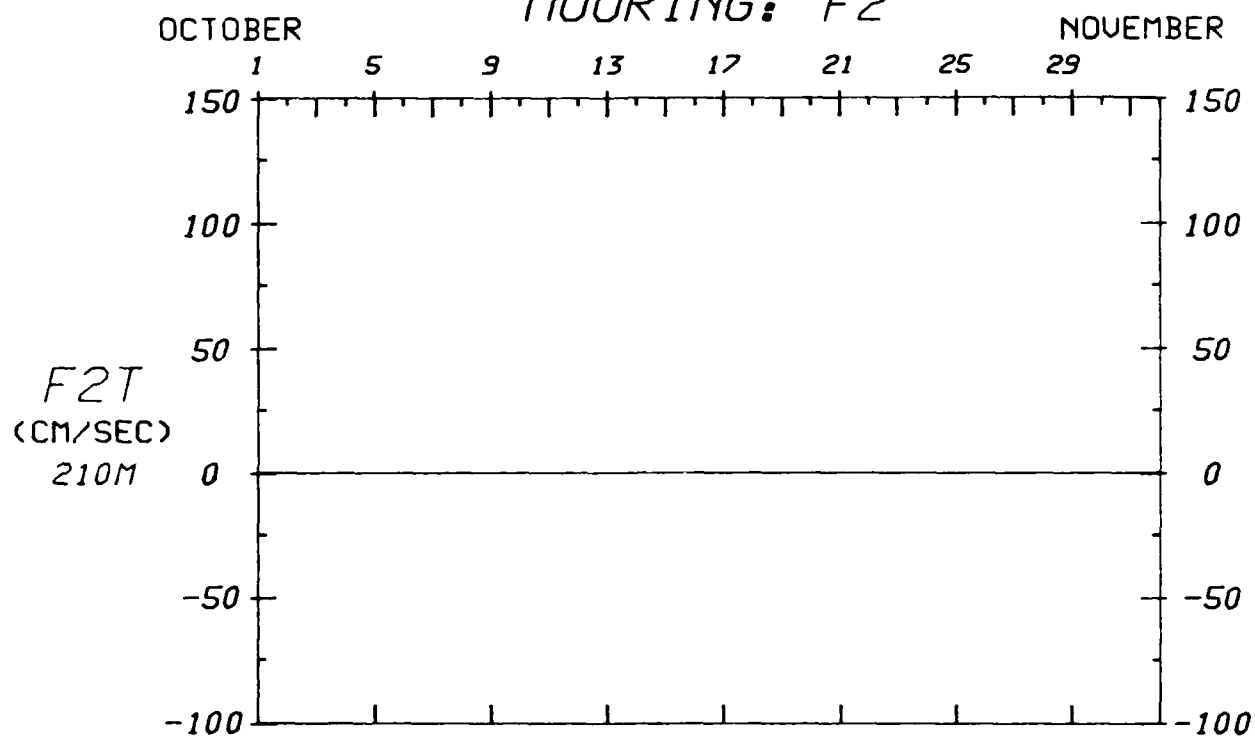


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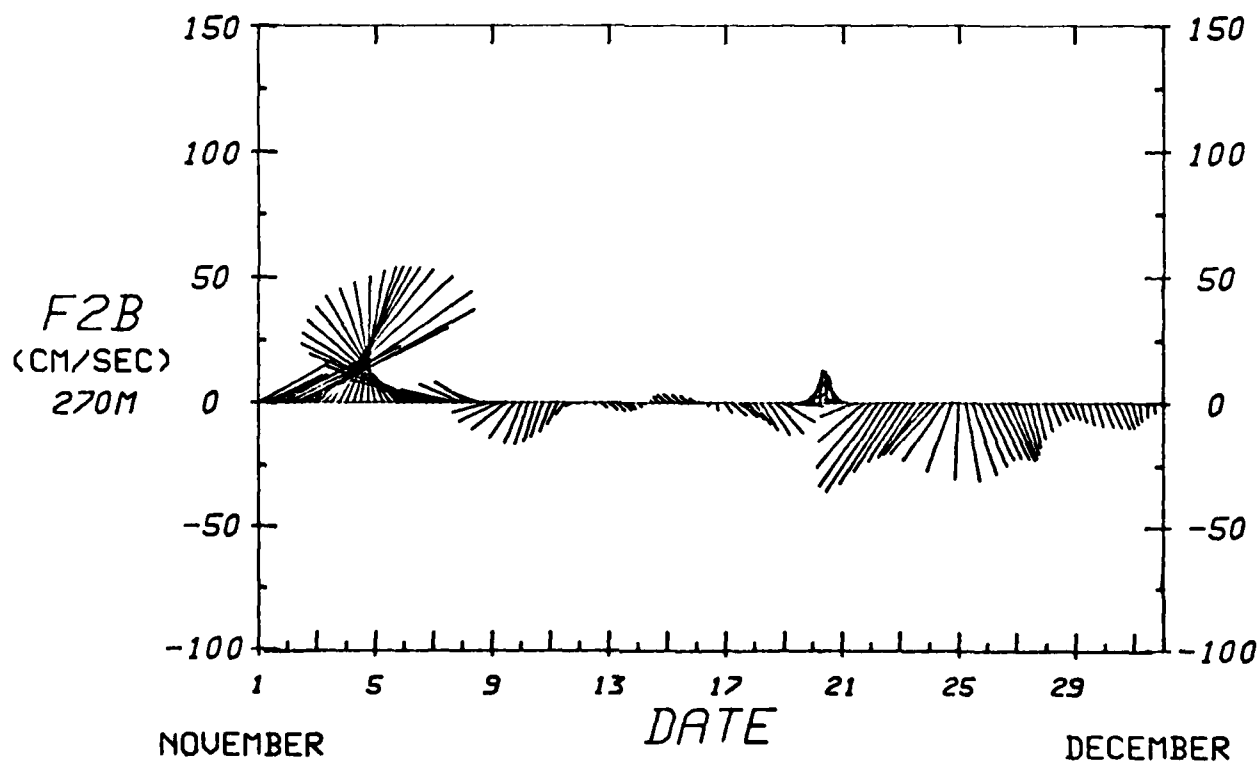
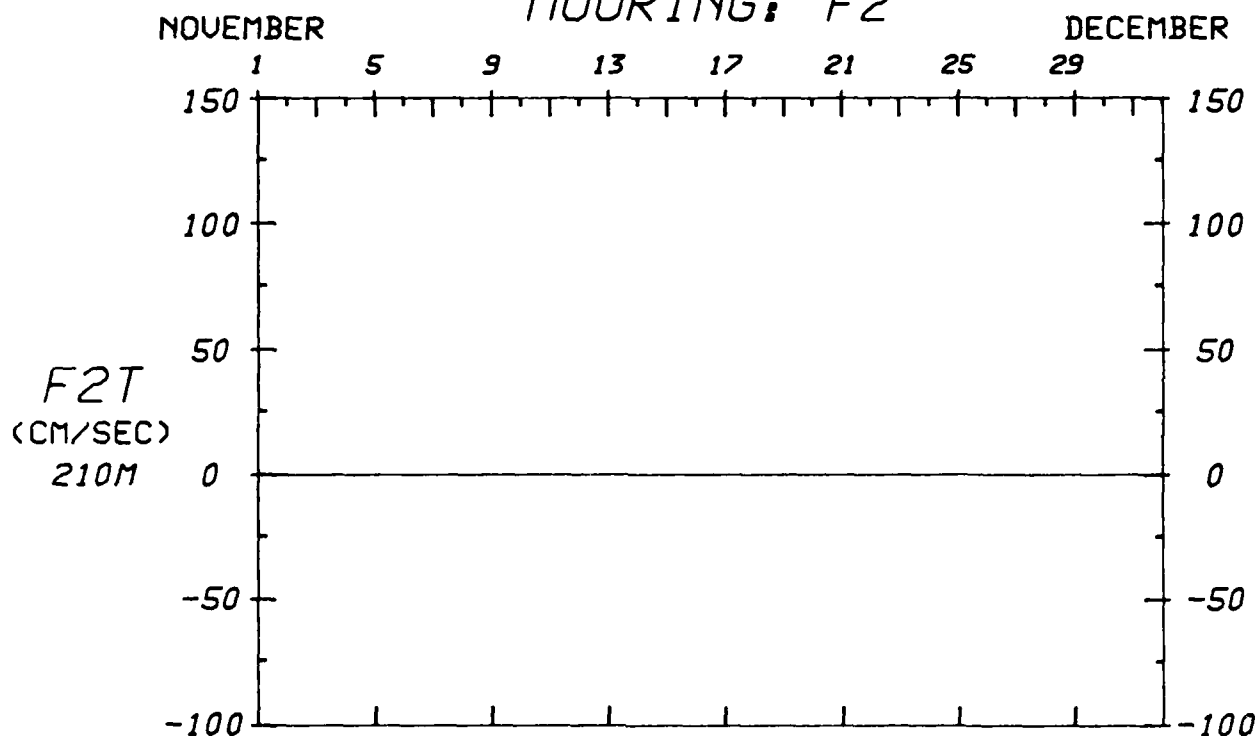
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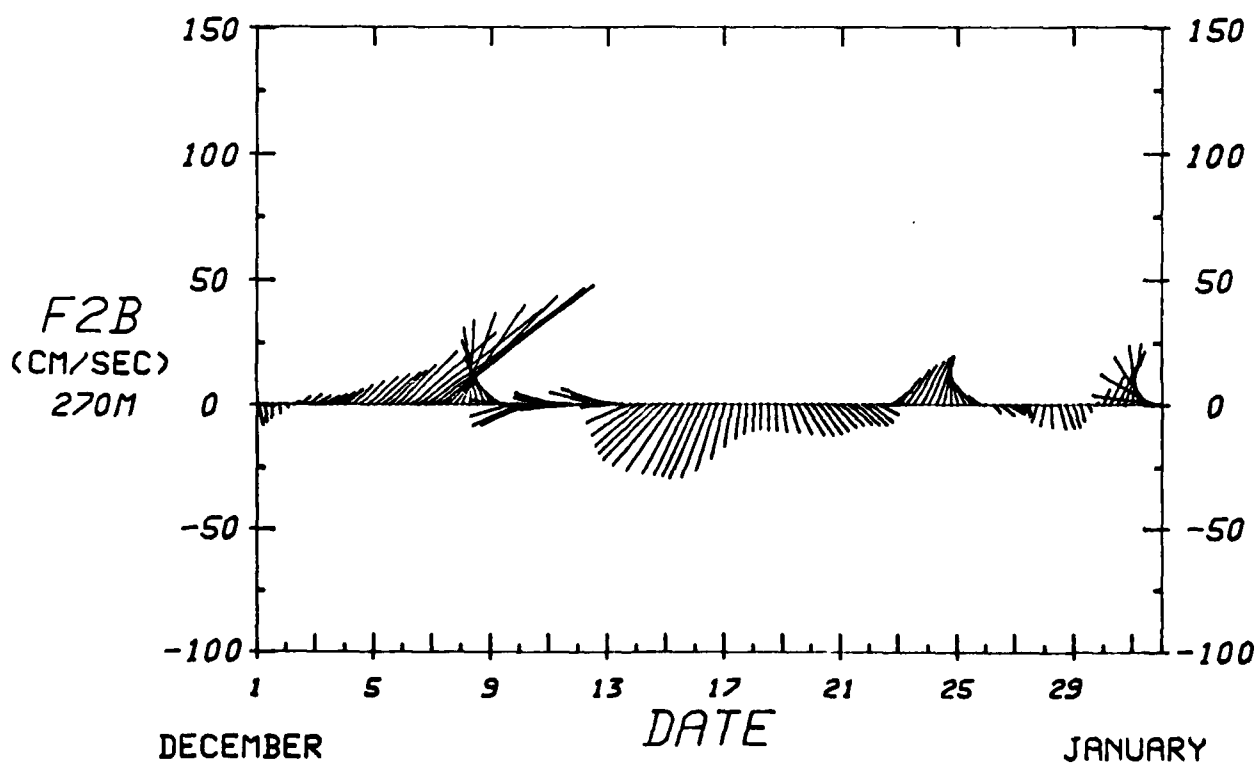
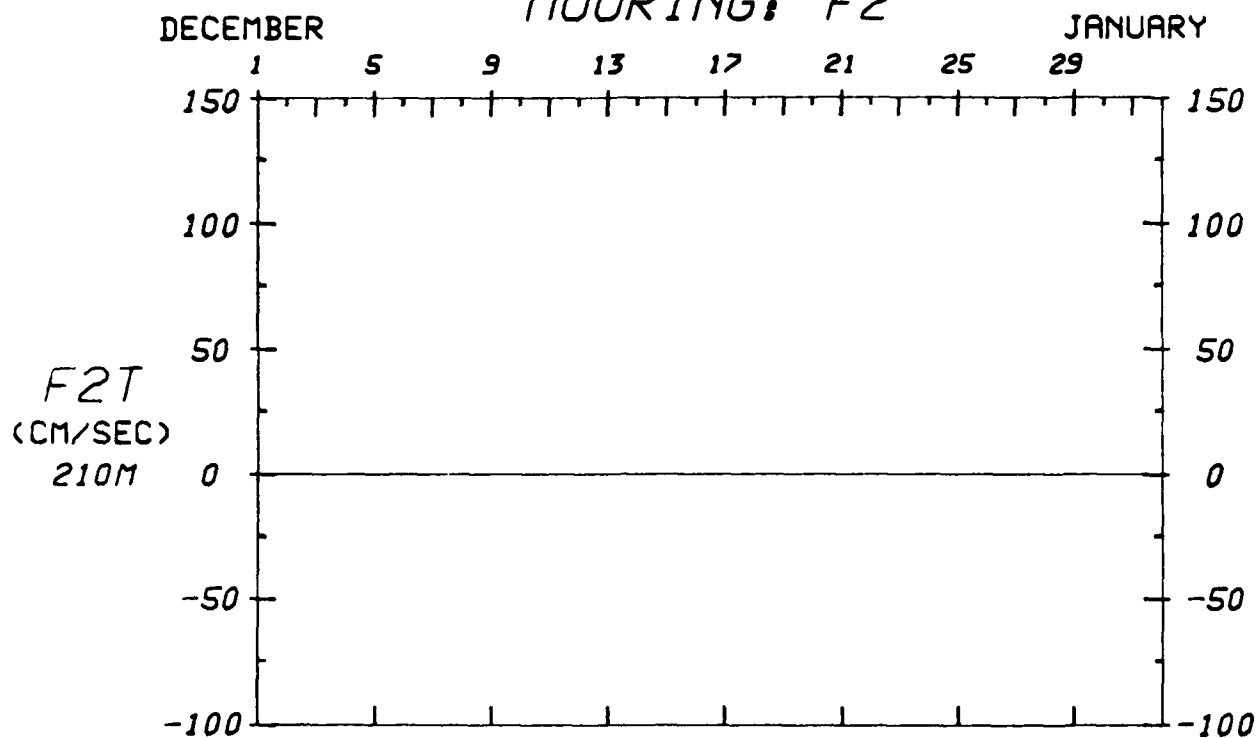
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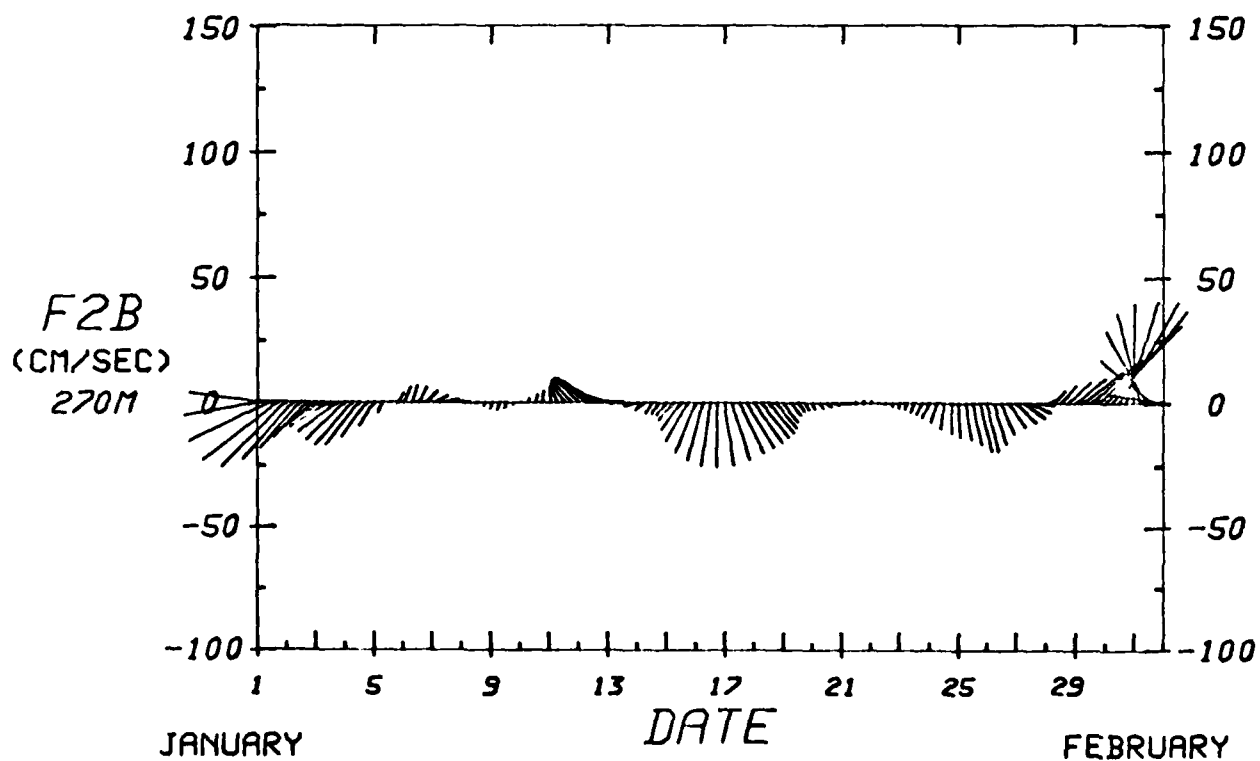
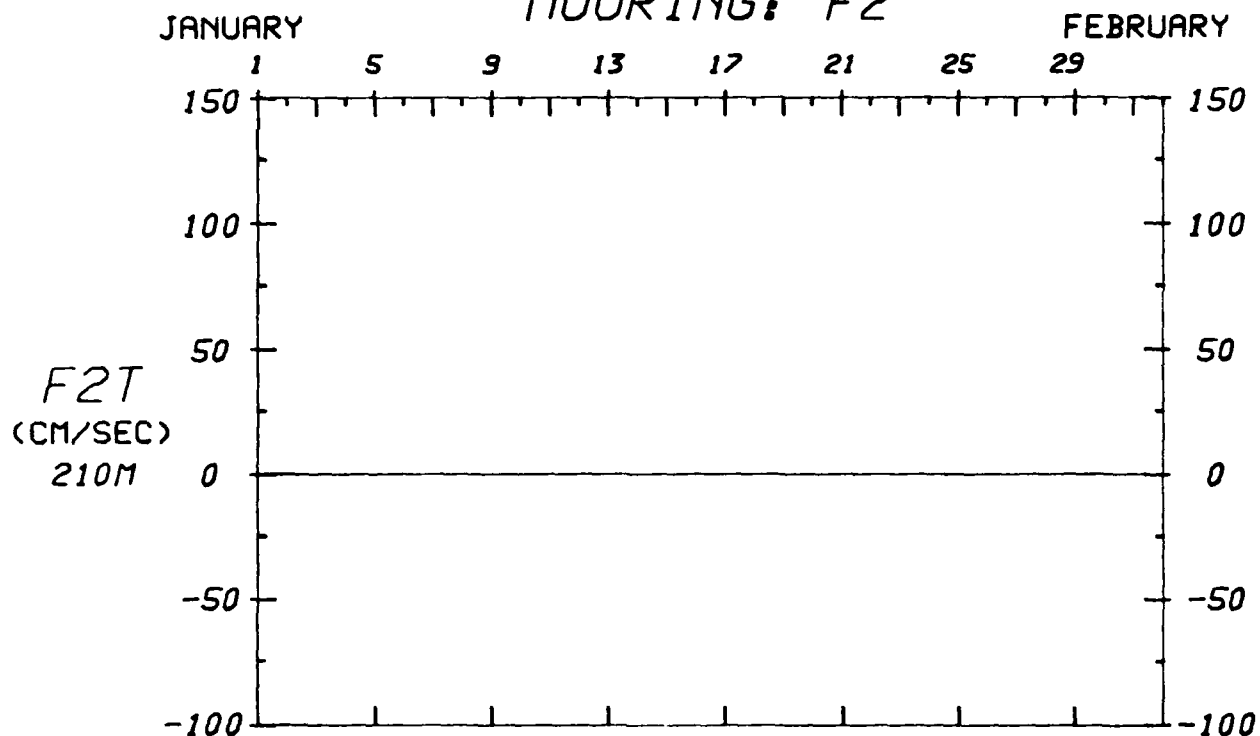
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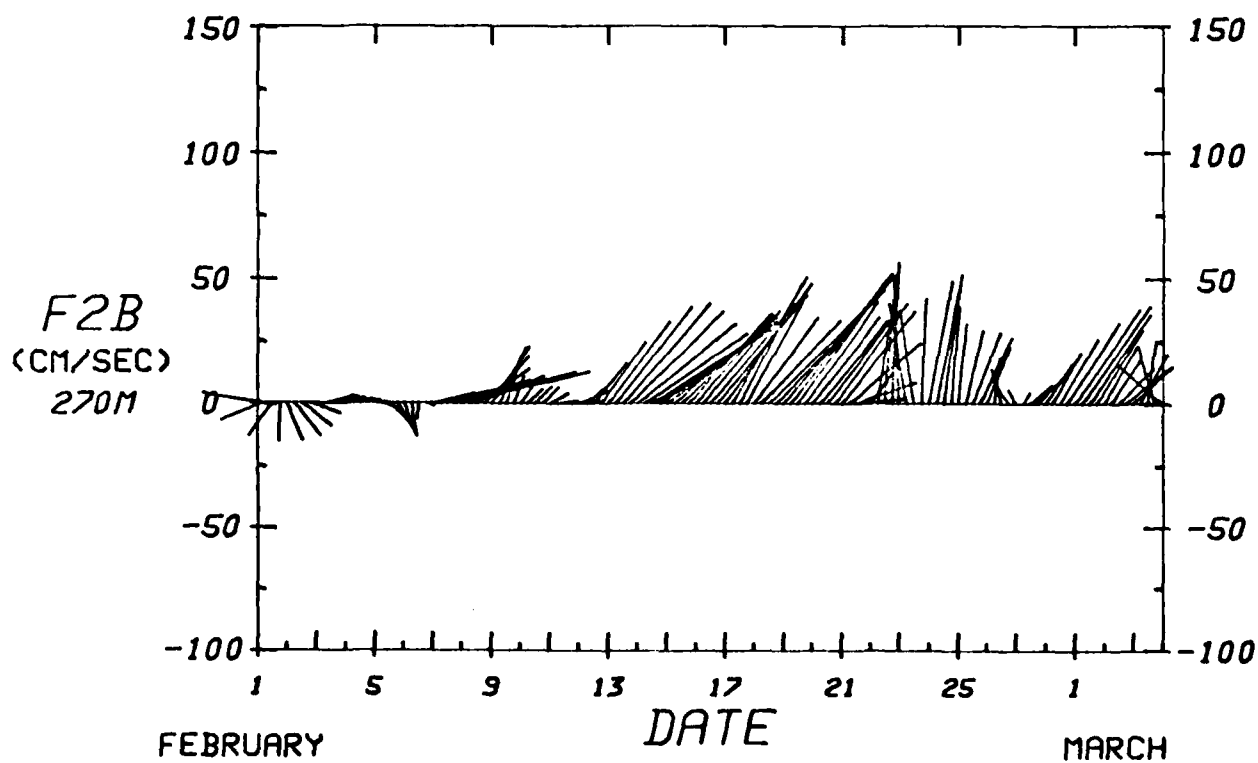
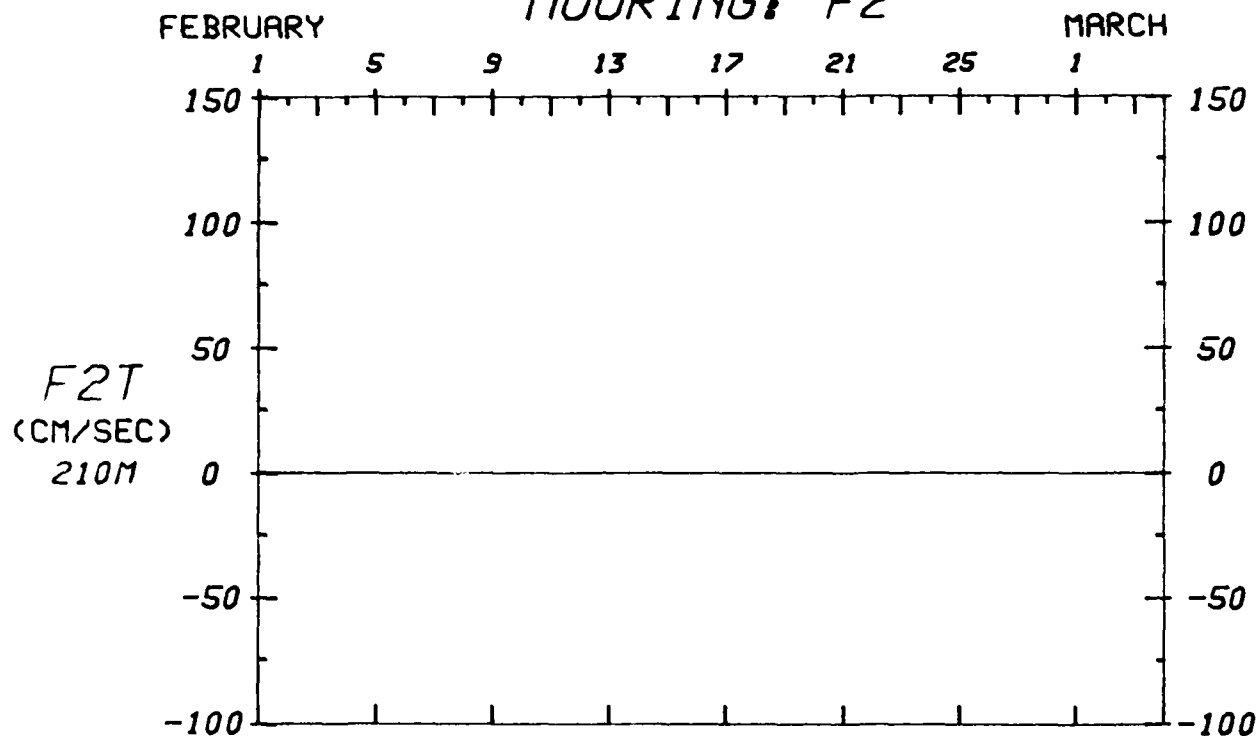
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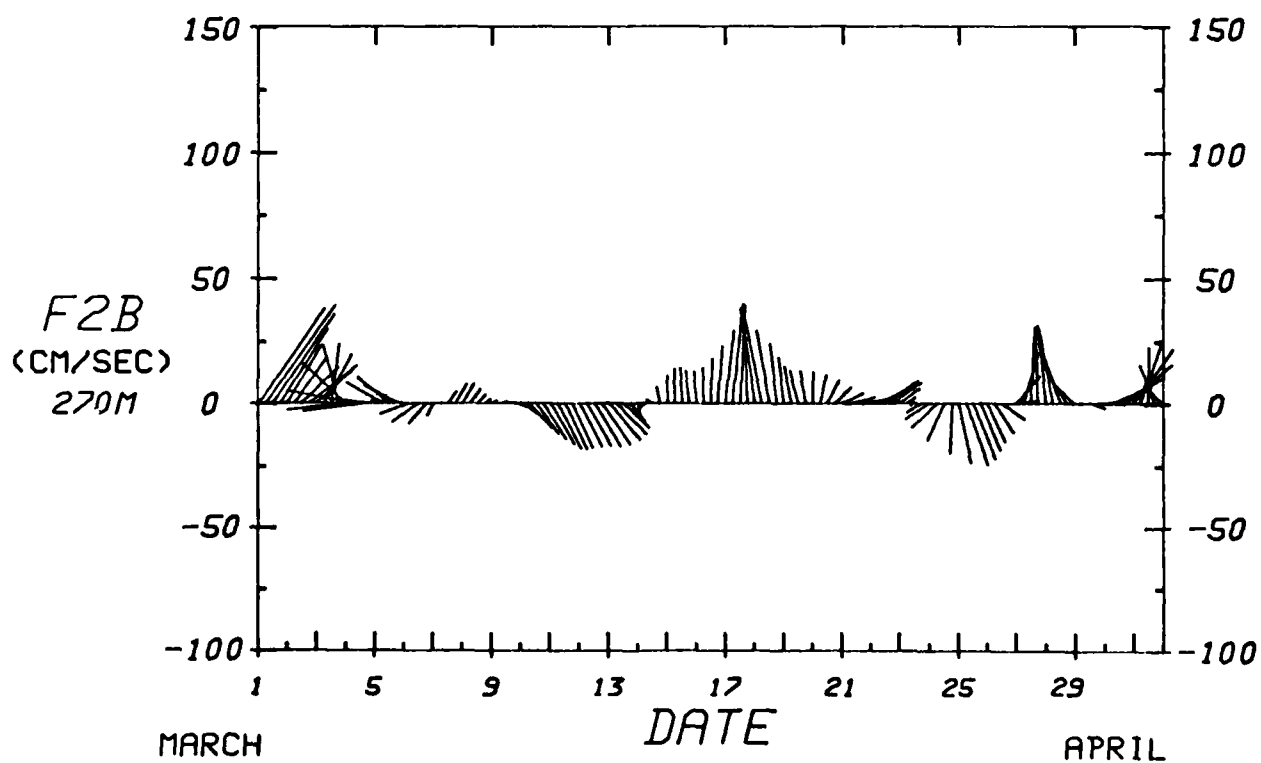
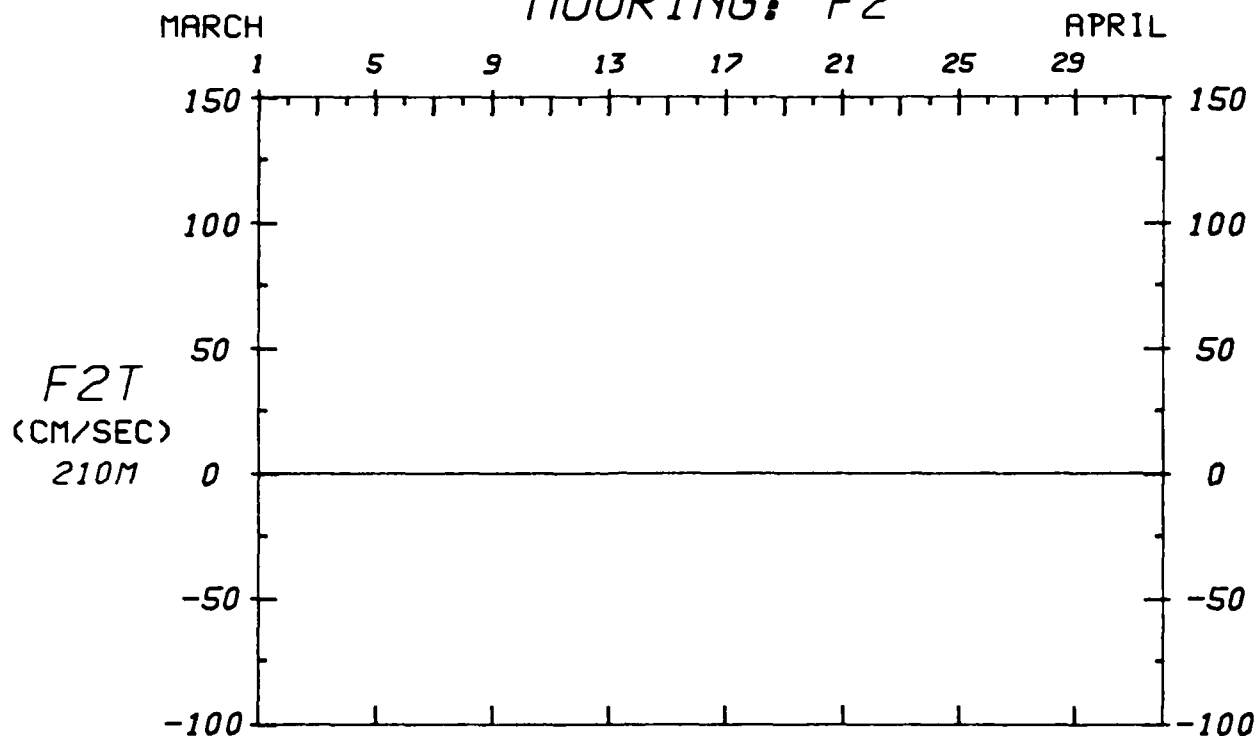
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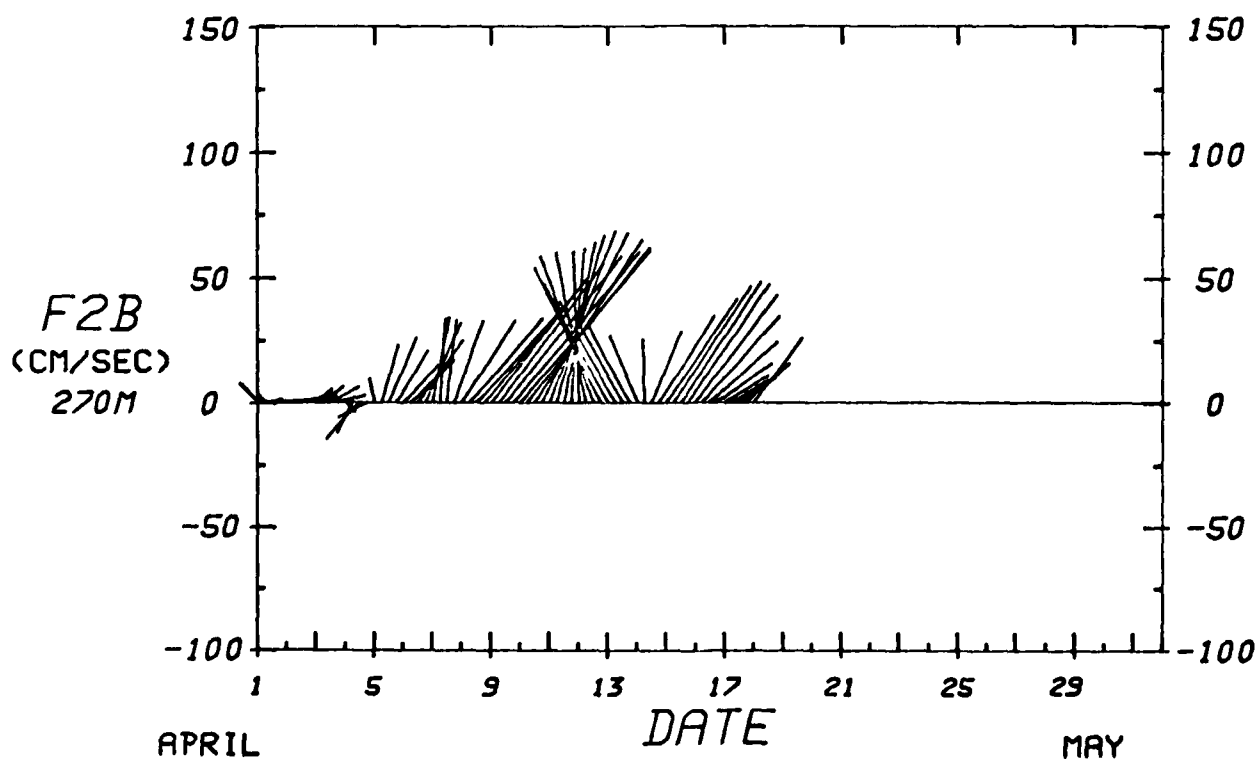
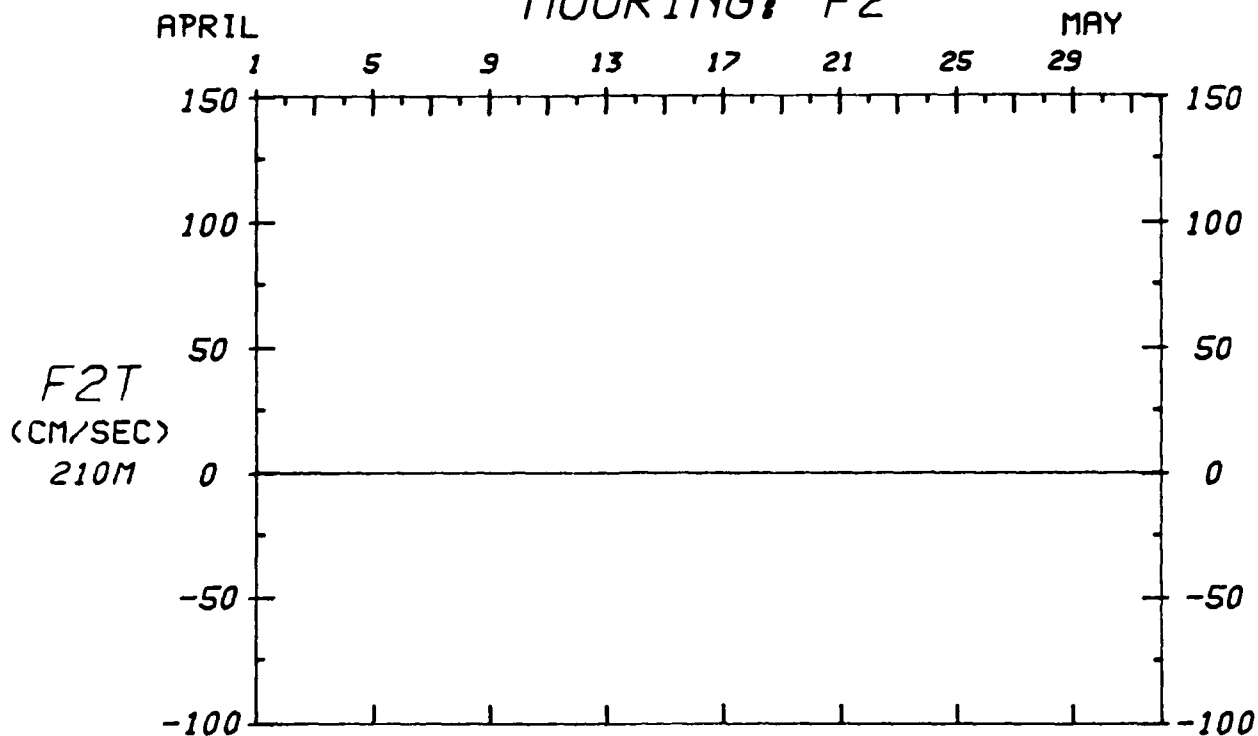
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40HRLP VECTOR VELOCITY MOORING: F2

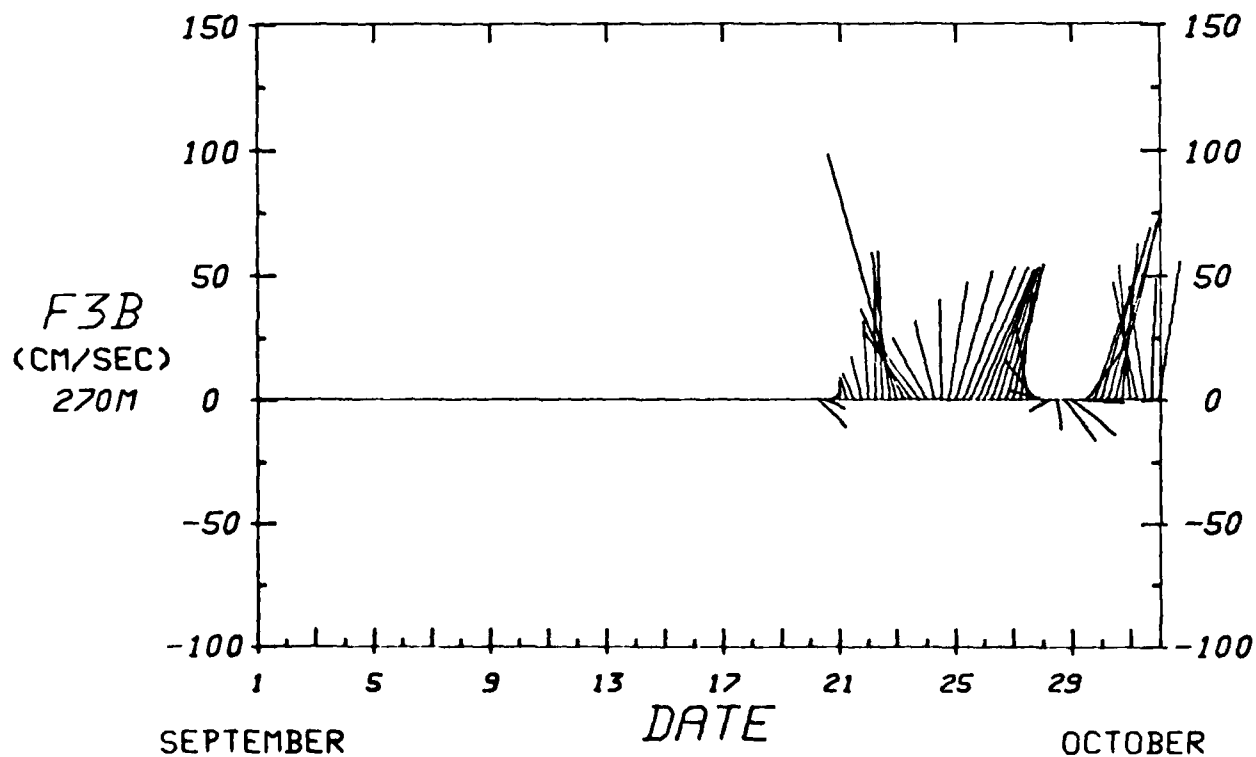
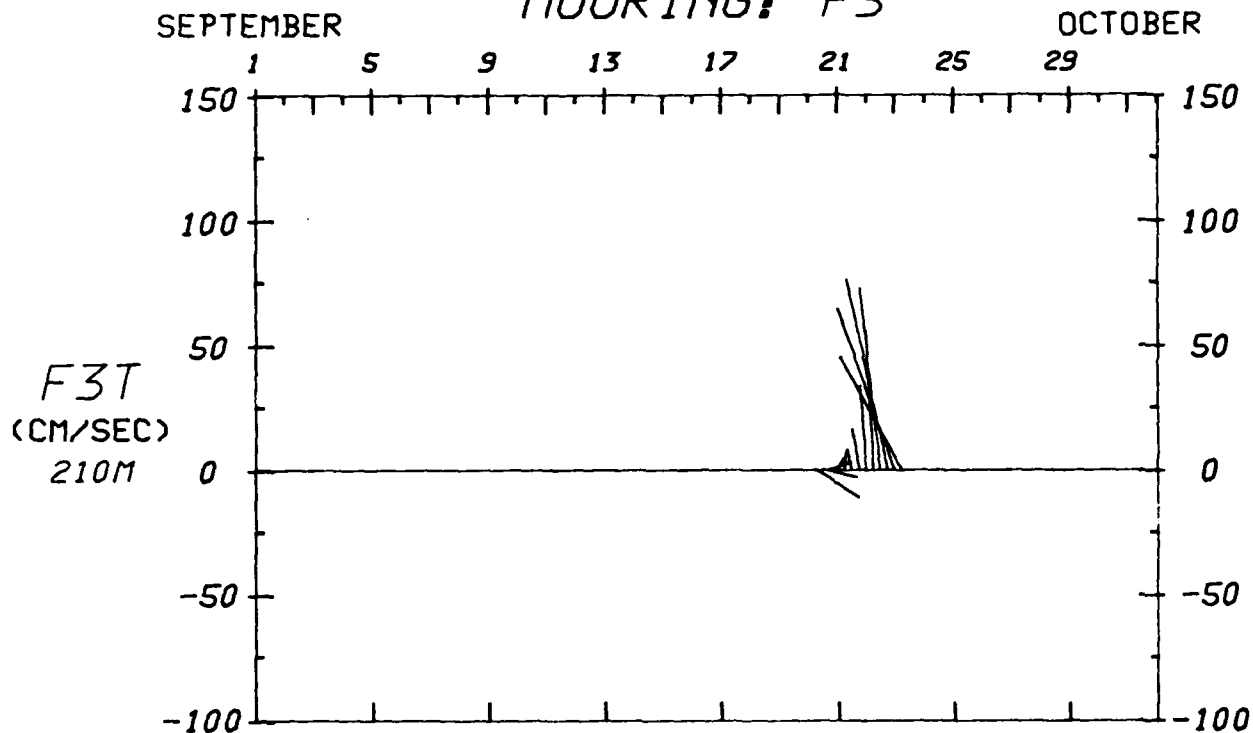


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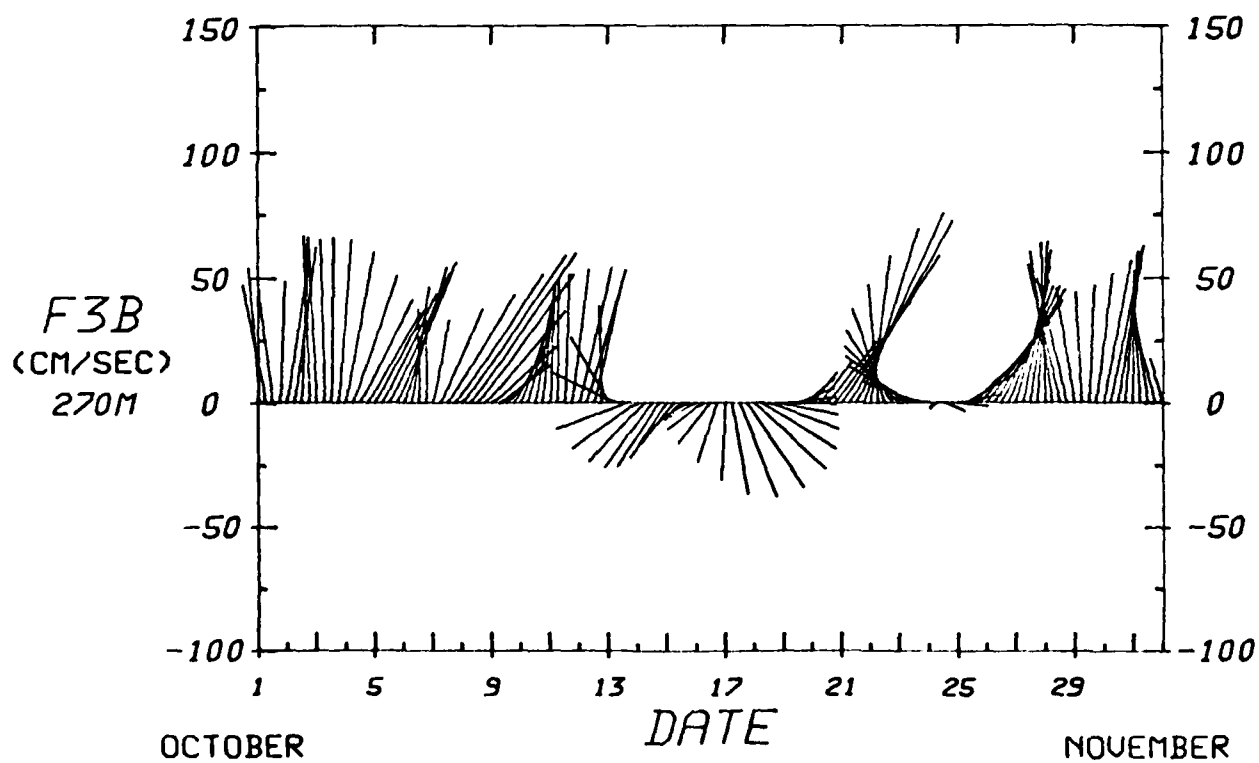
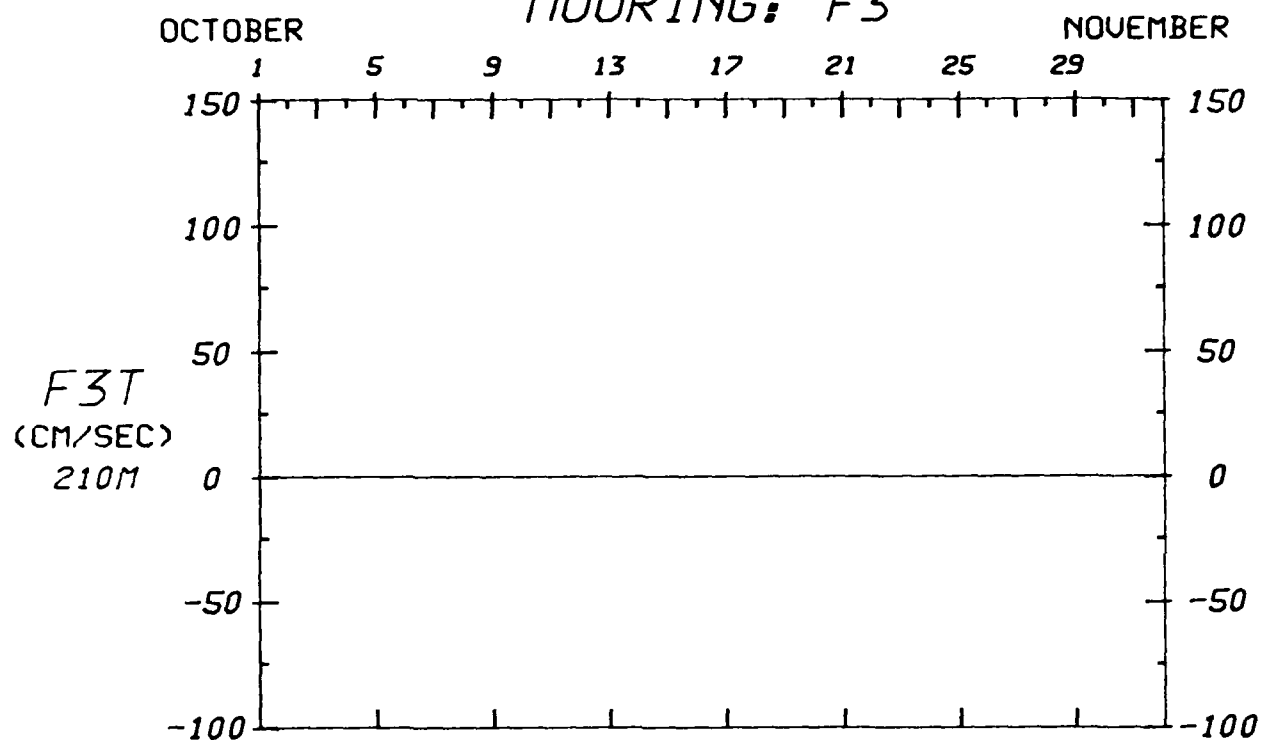


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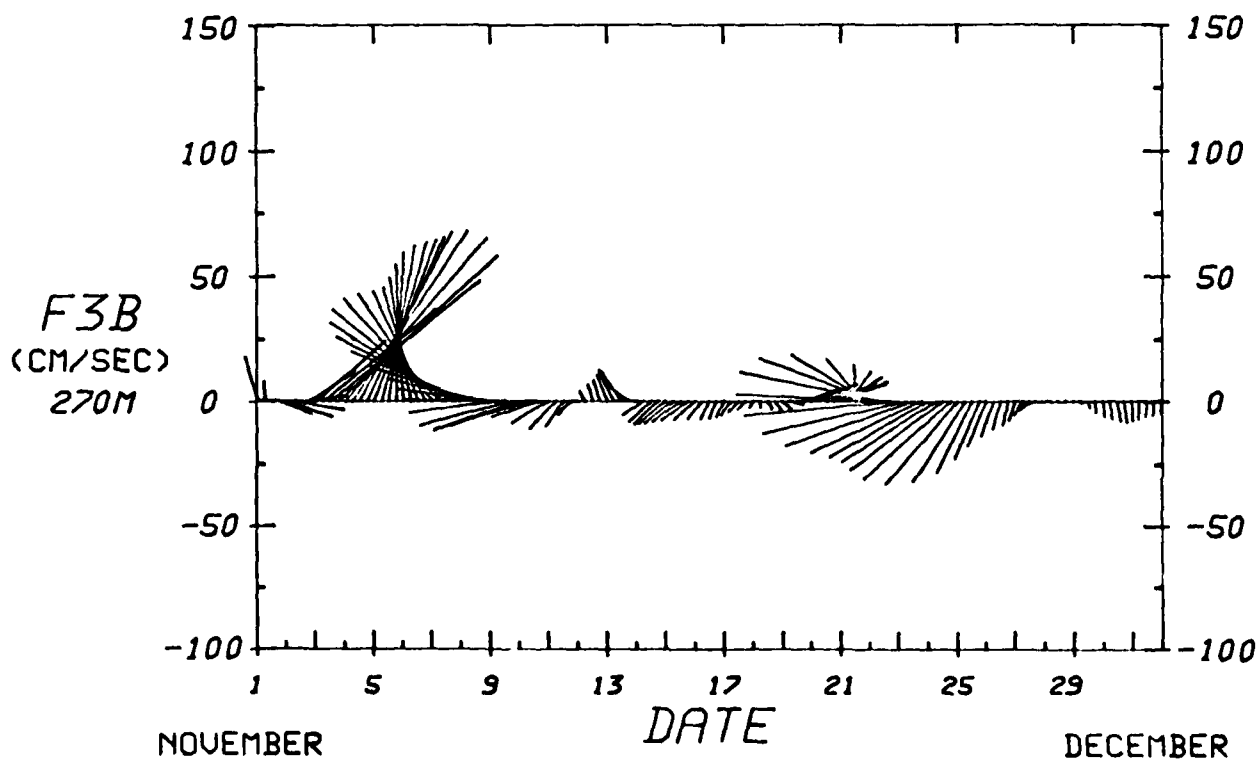
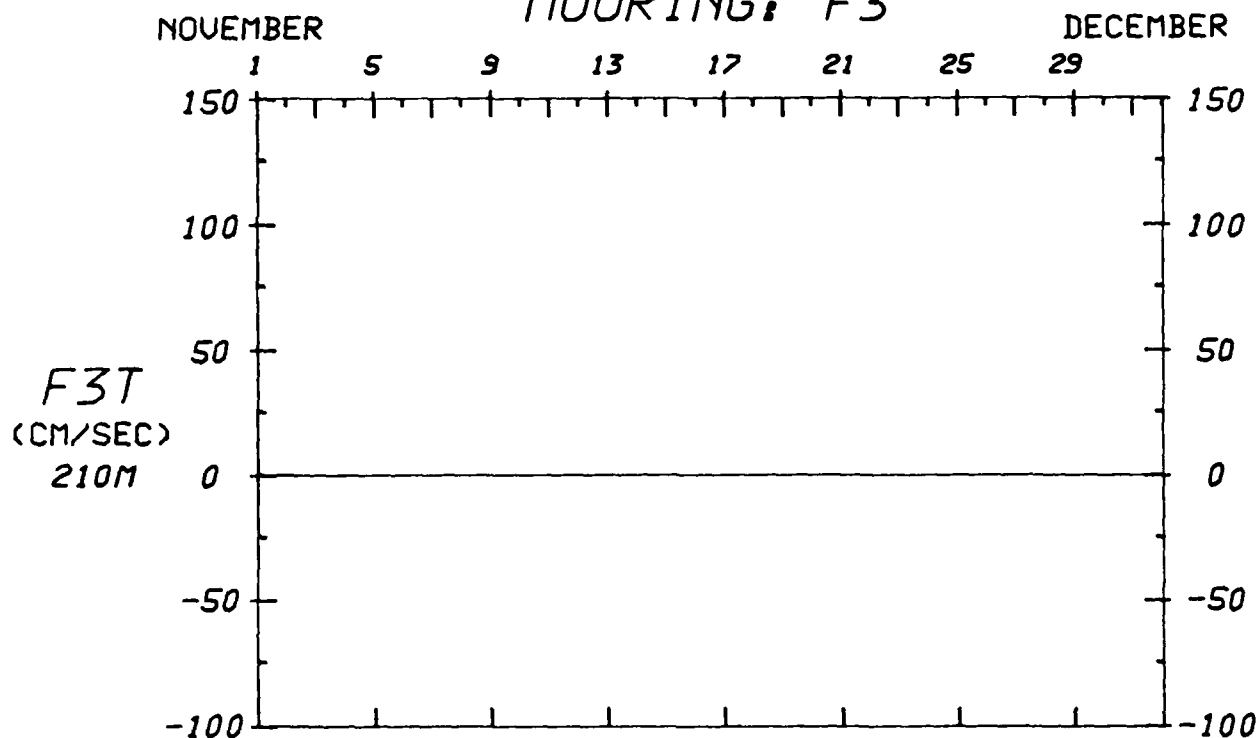
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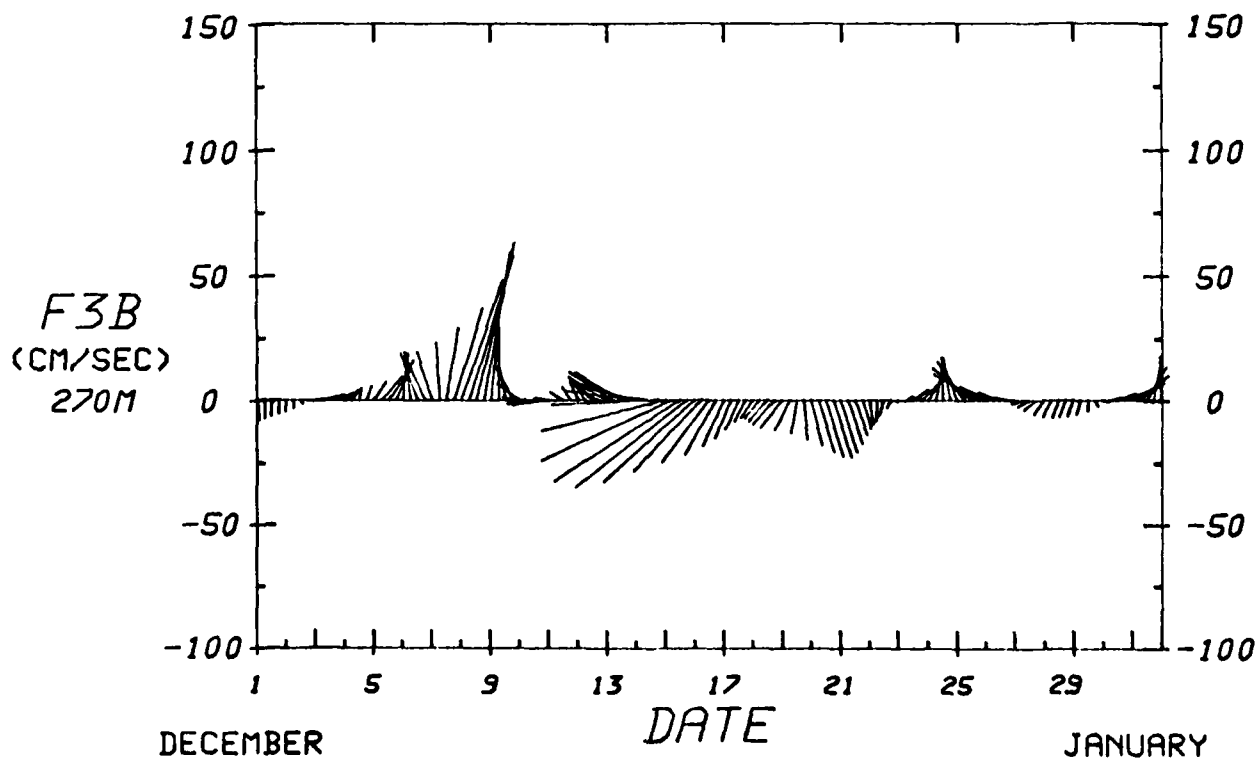
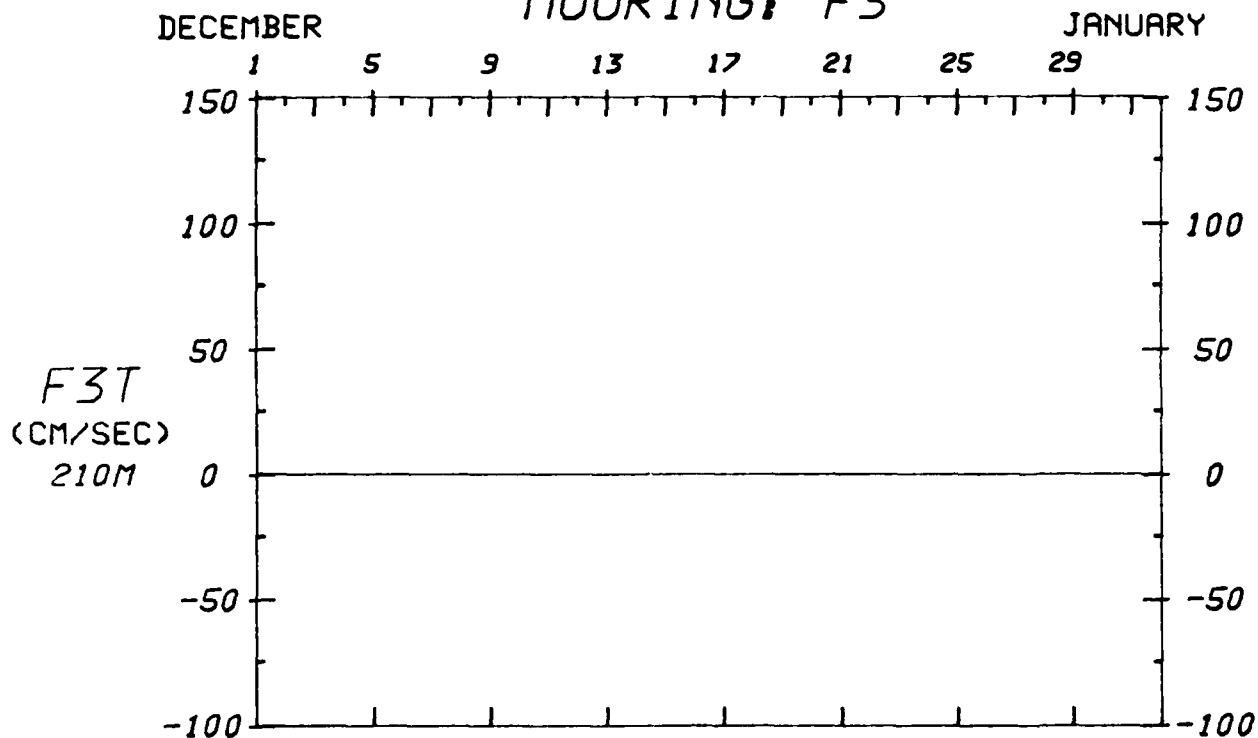
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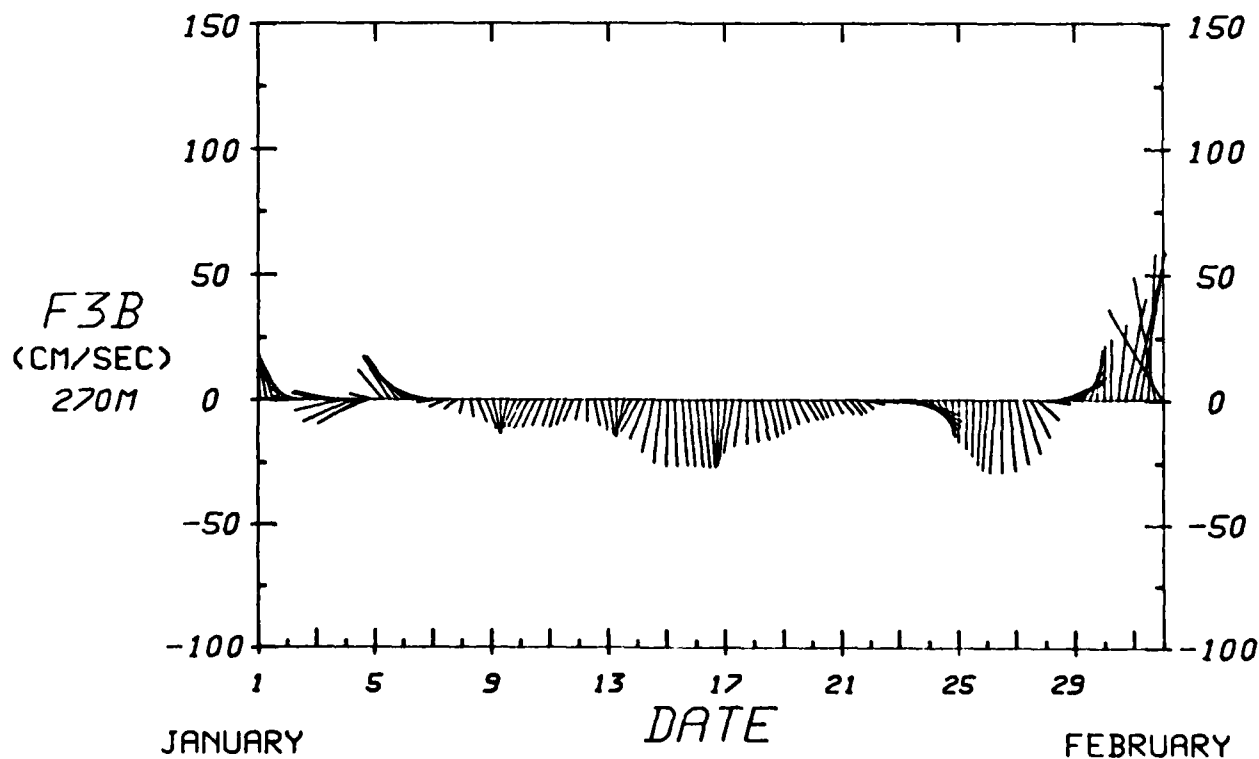
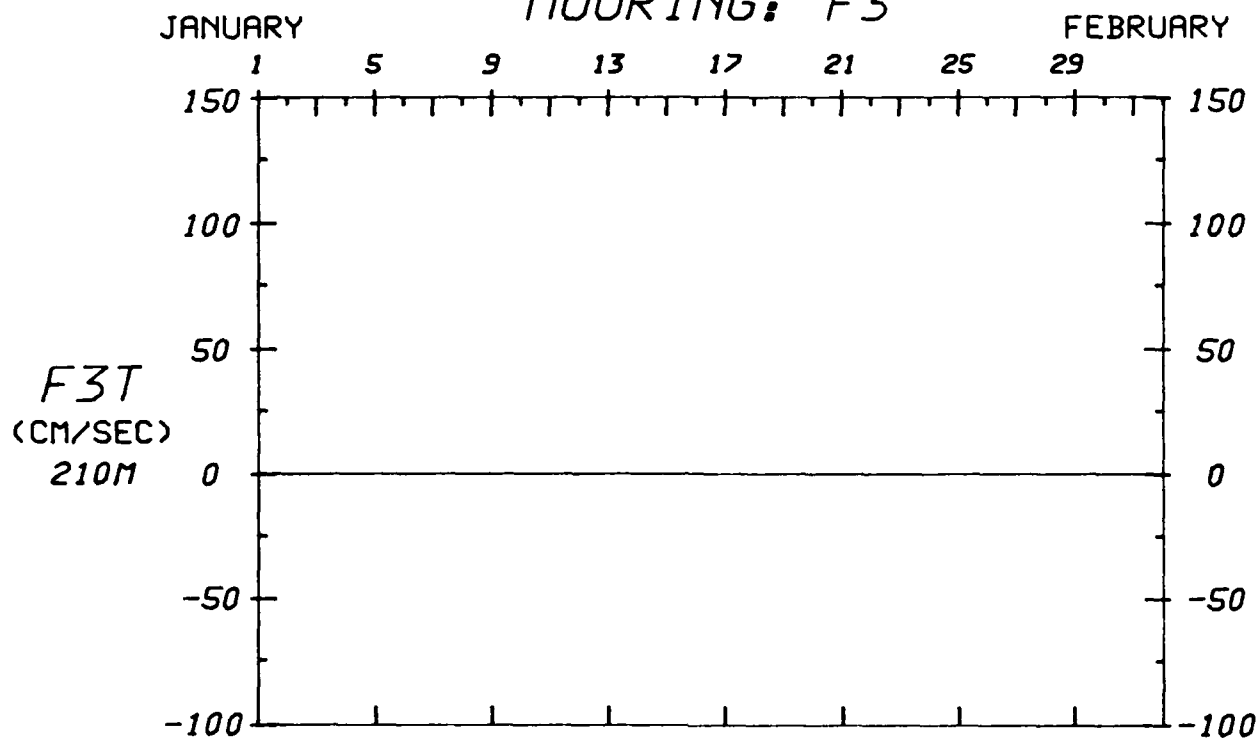
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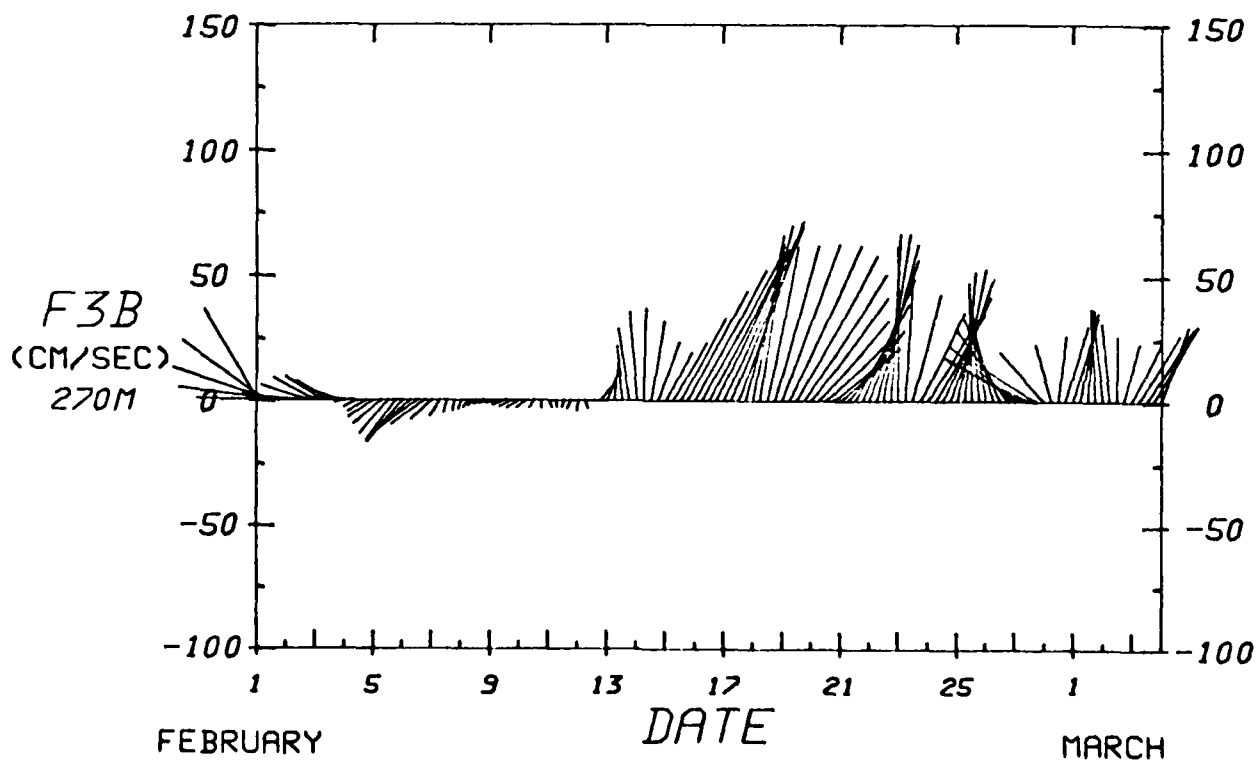
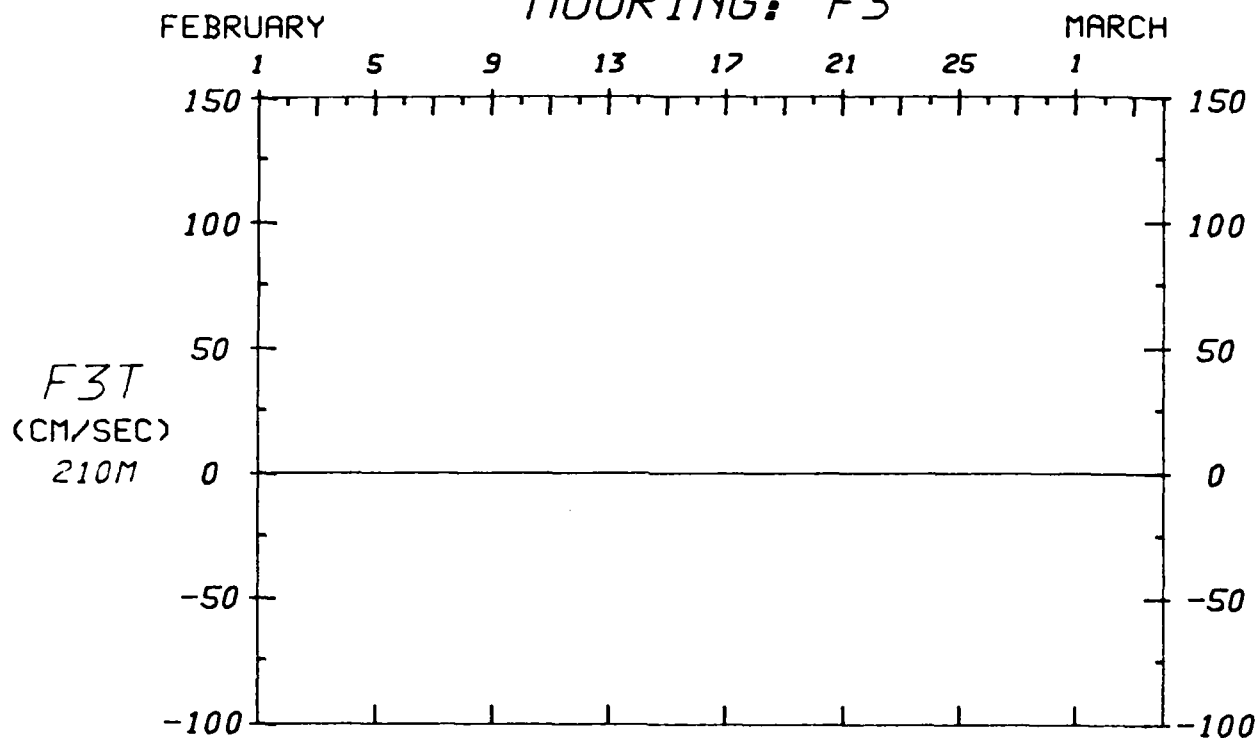
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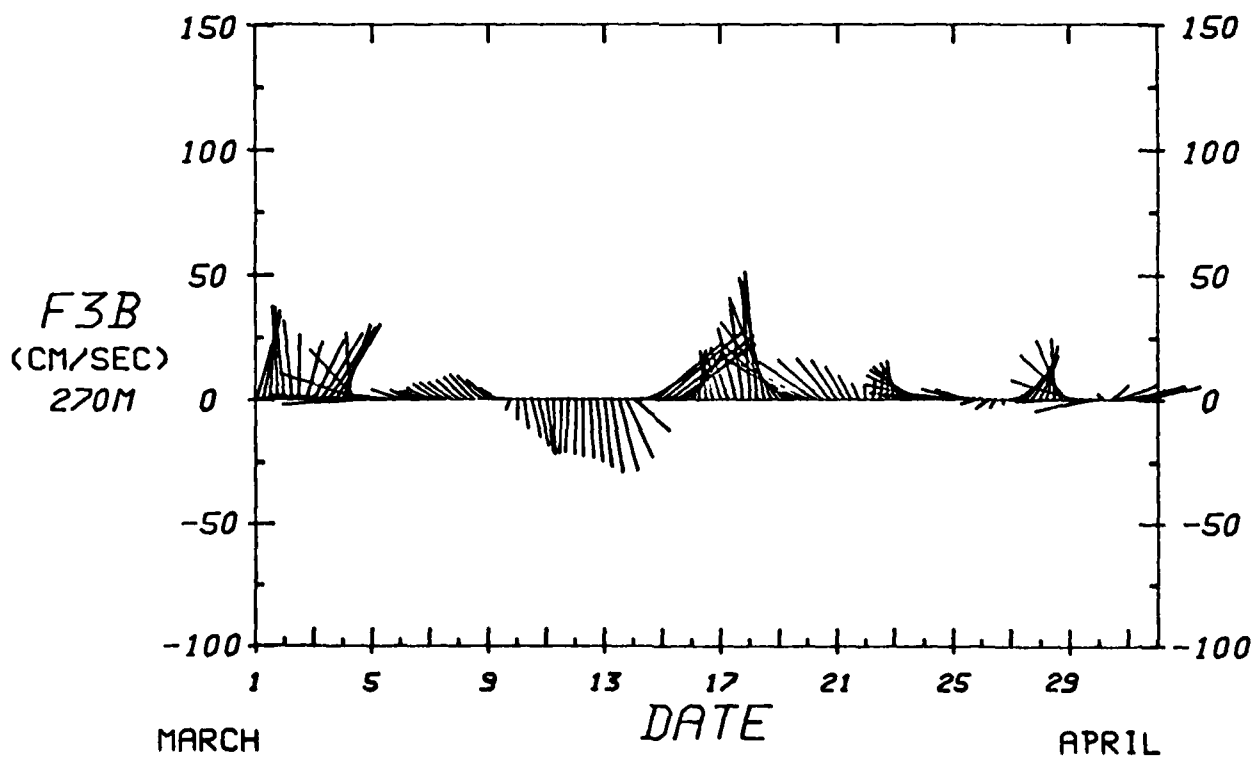
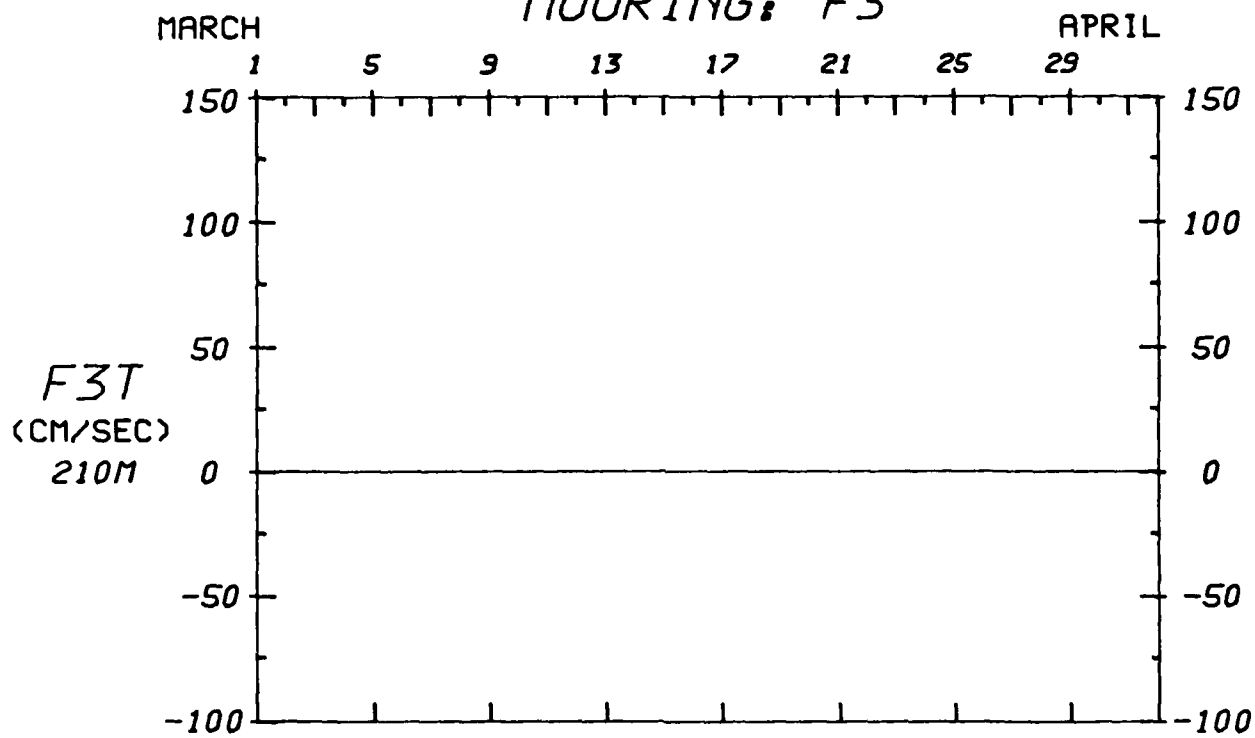
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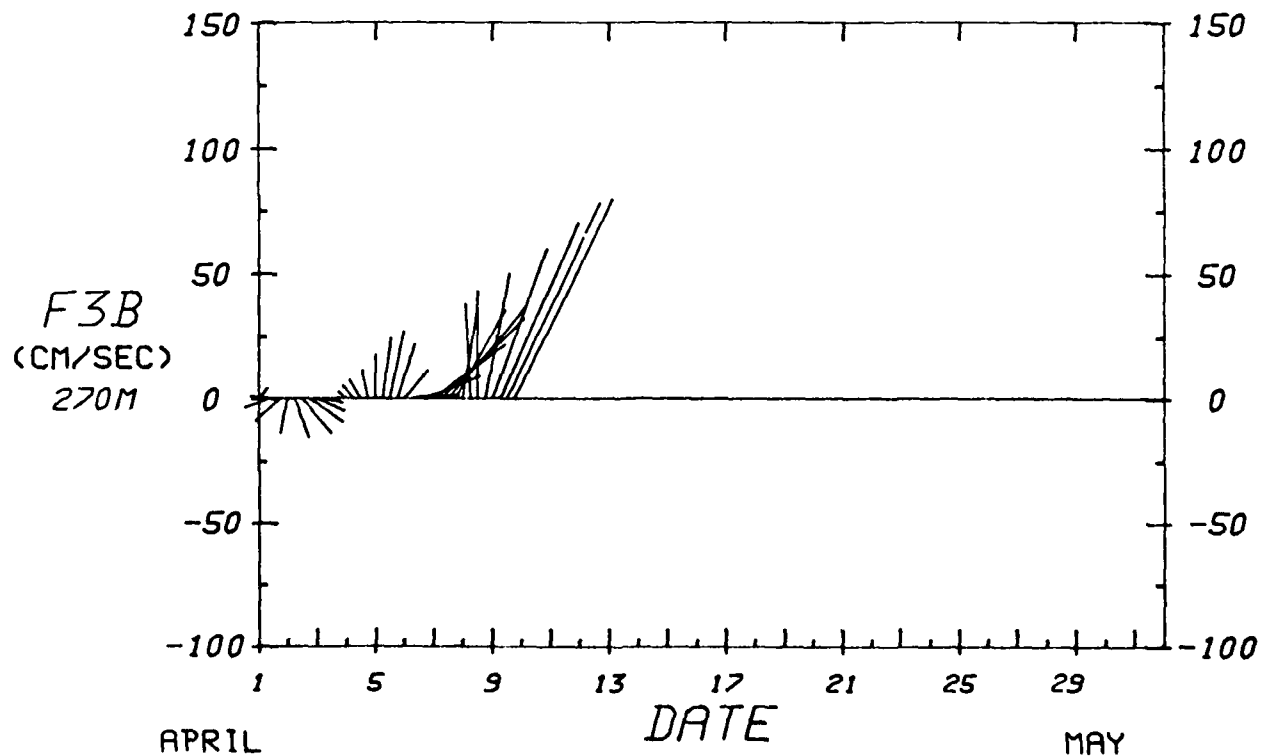
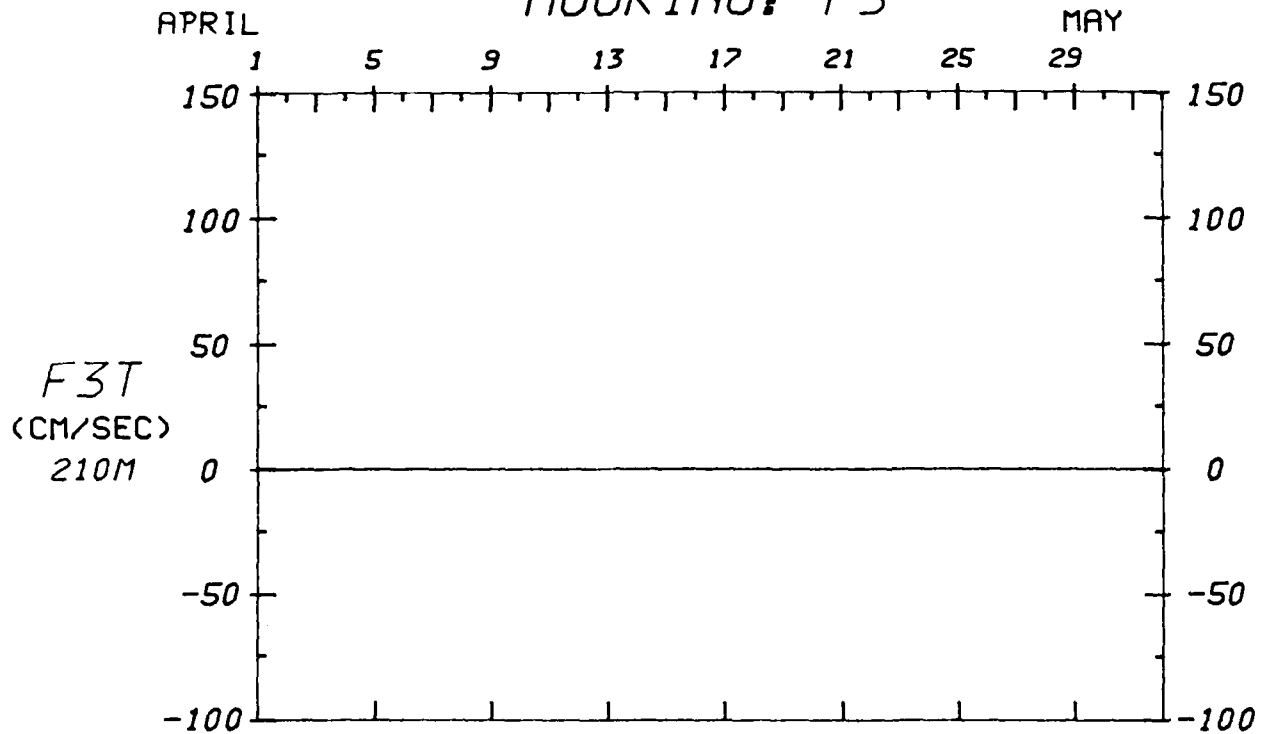
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40HRLP VECTOR VELOCITY MOORING: F3

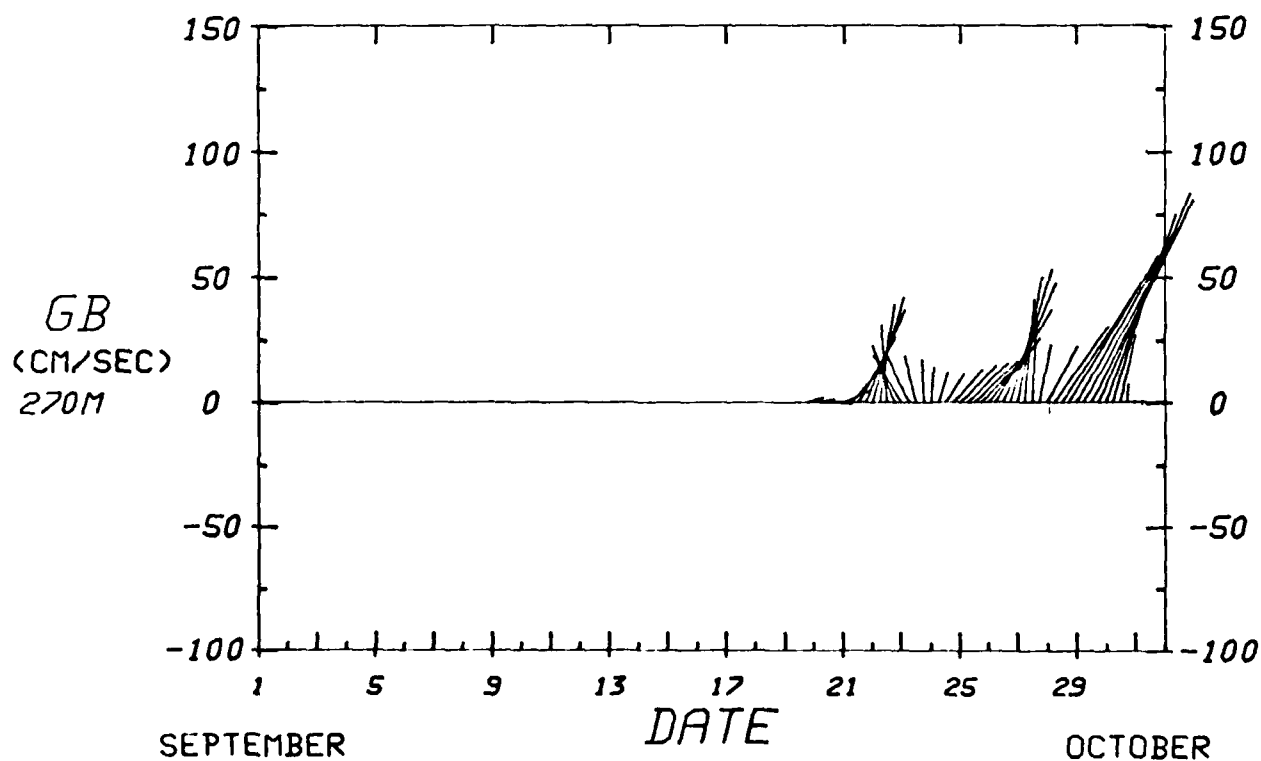
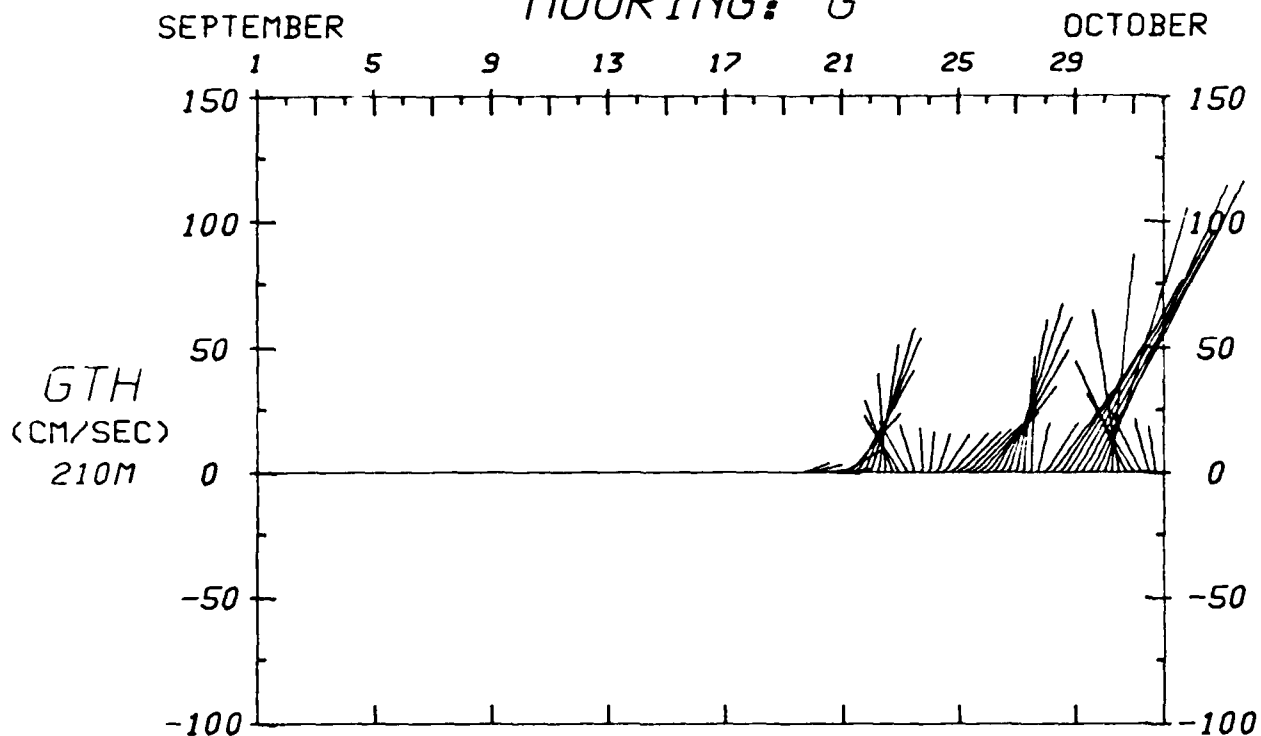


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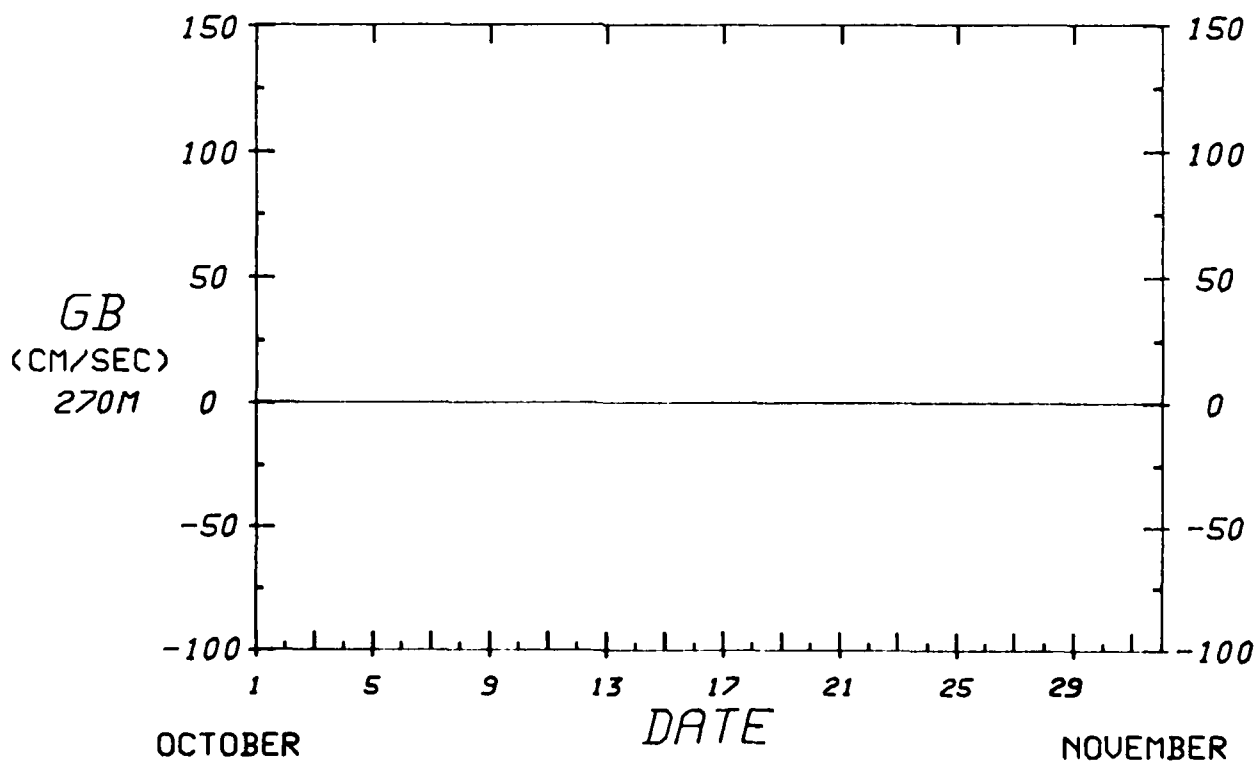
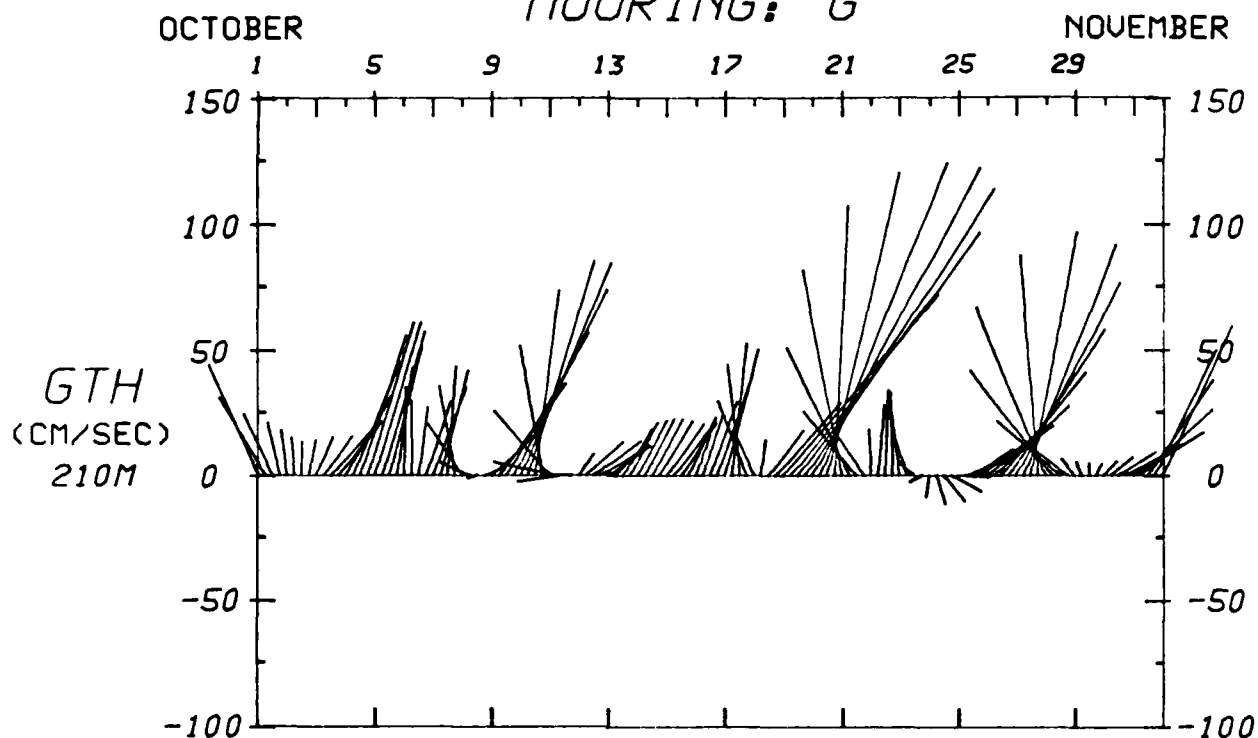


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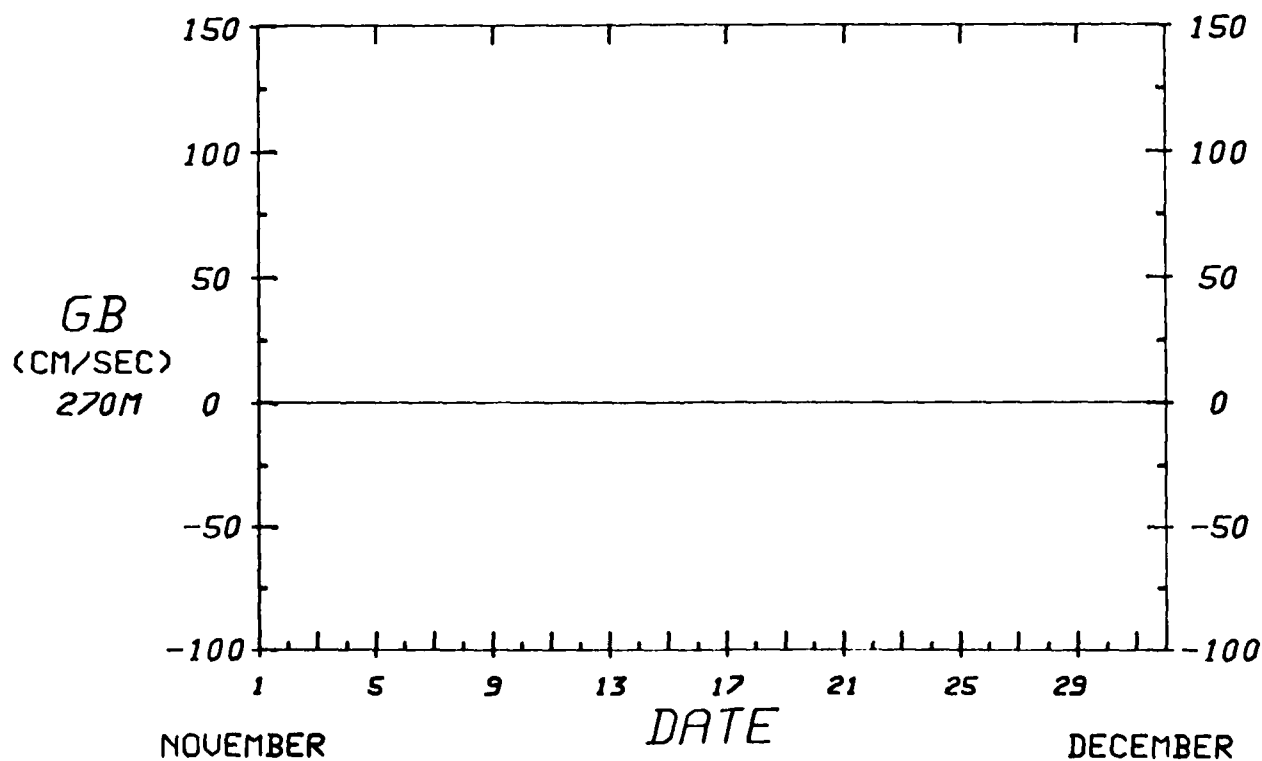
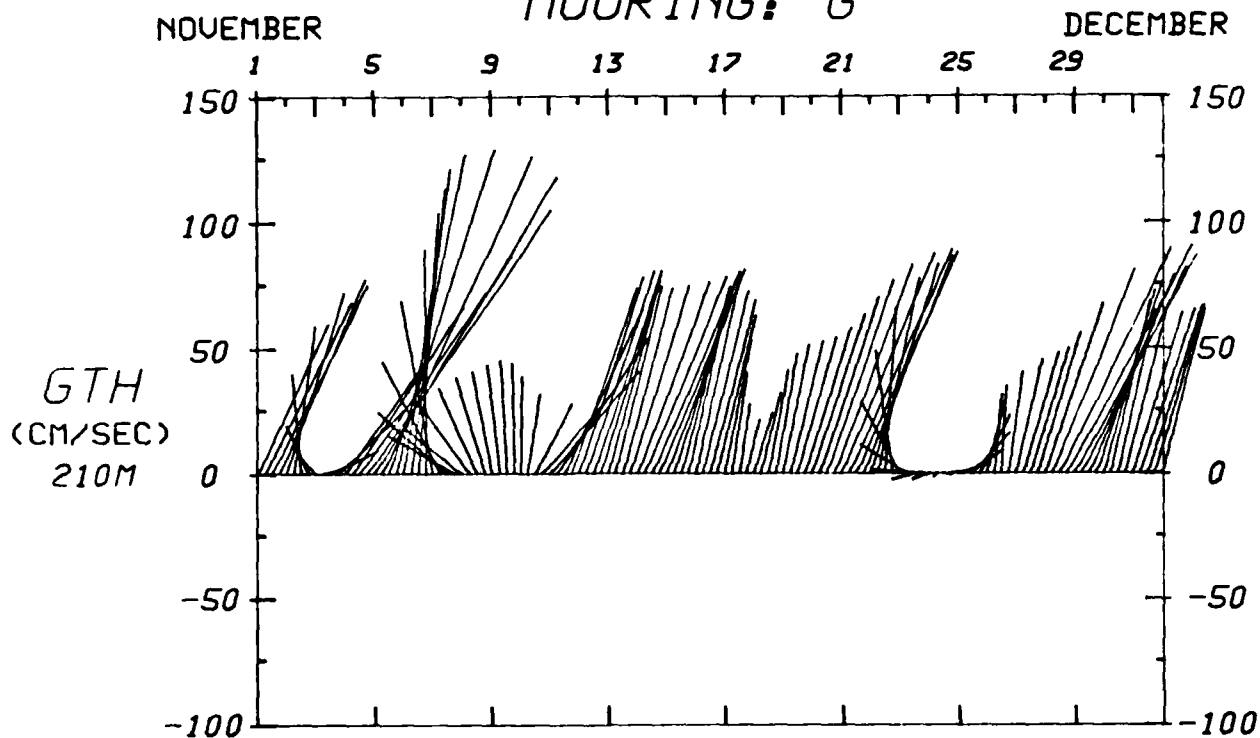
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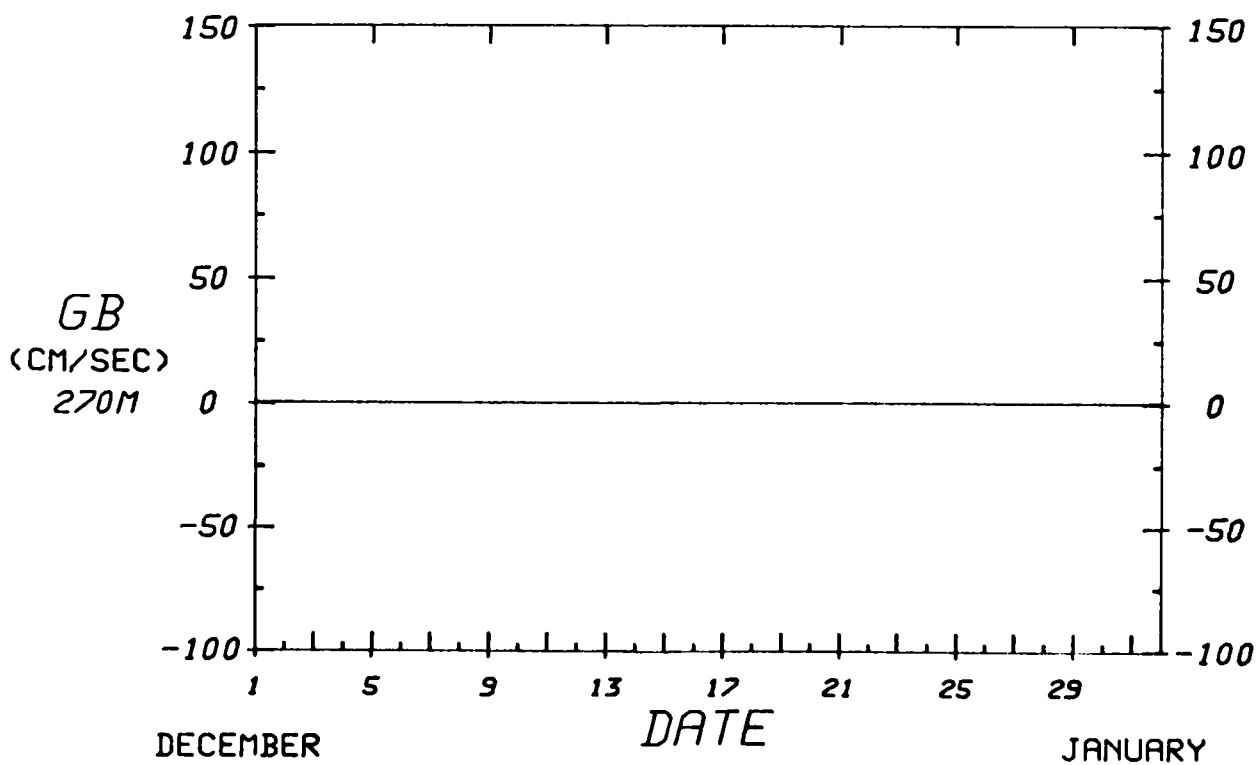
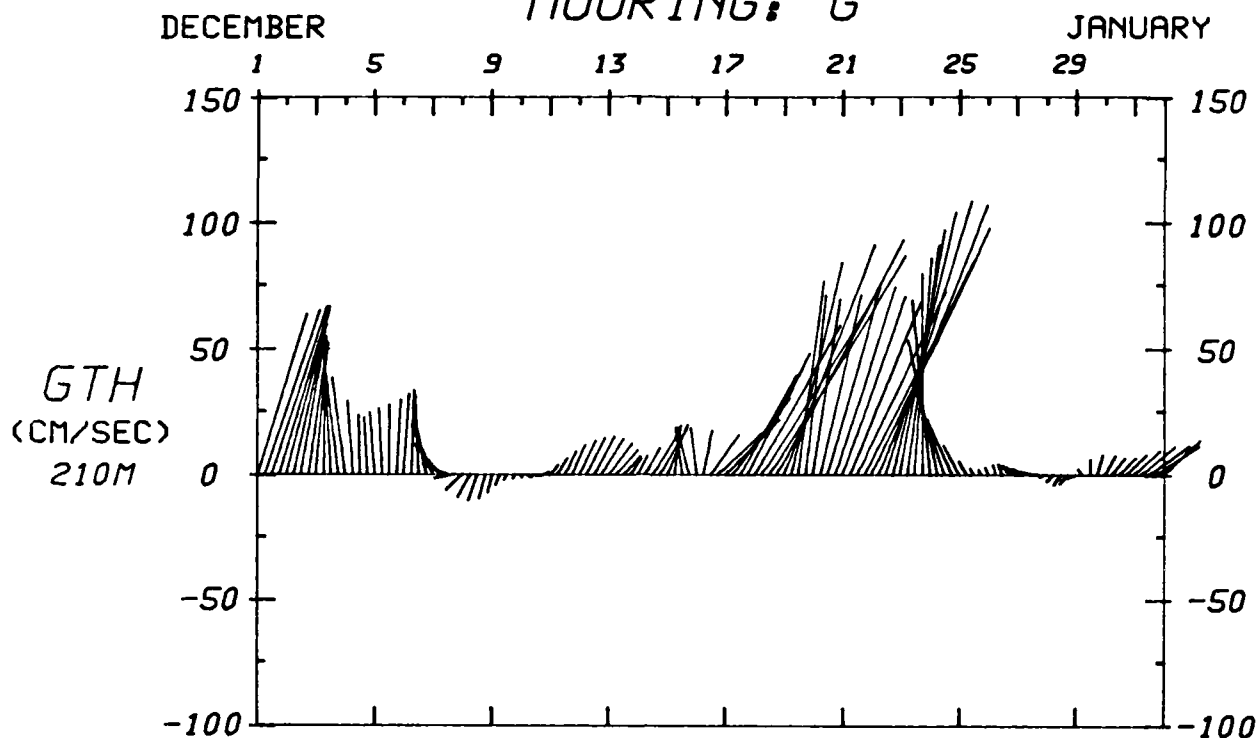
40HRLP VECTOR VELOCITY
MOORING: G



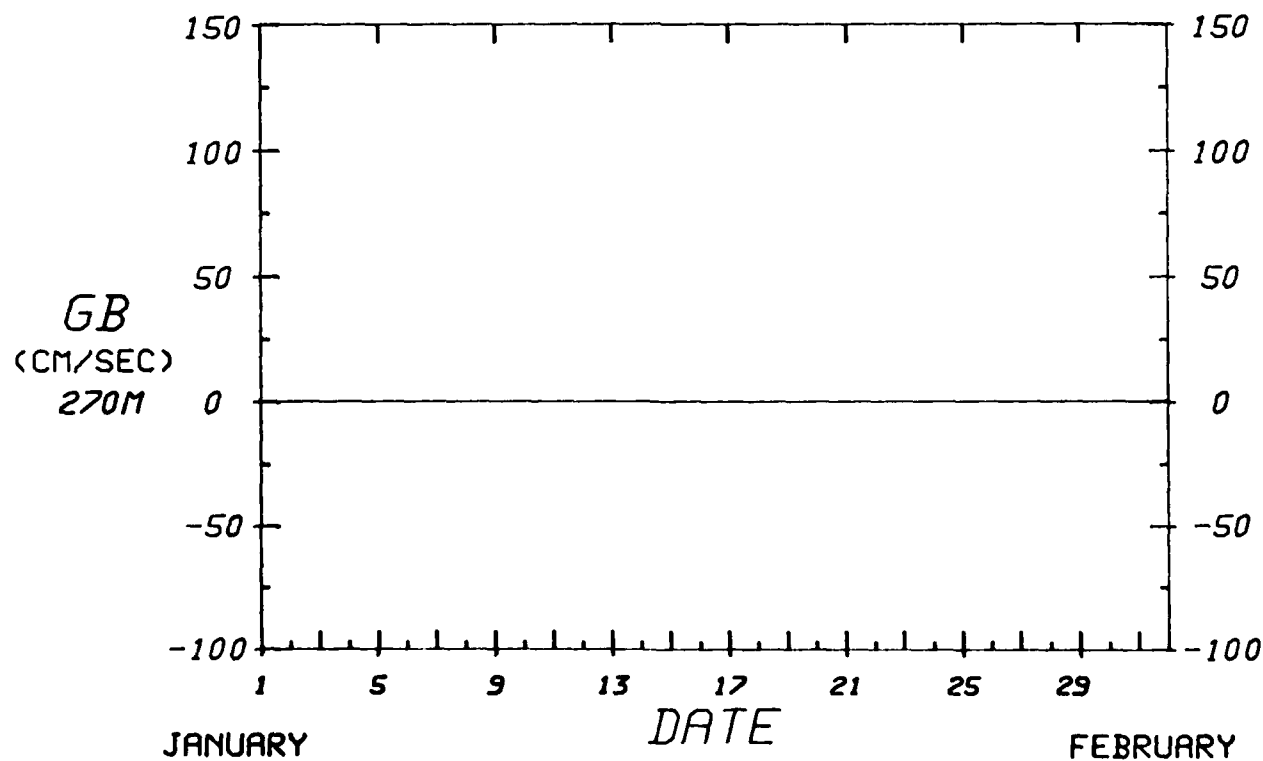
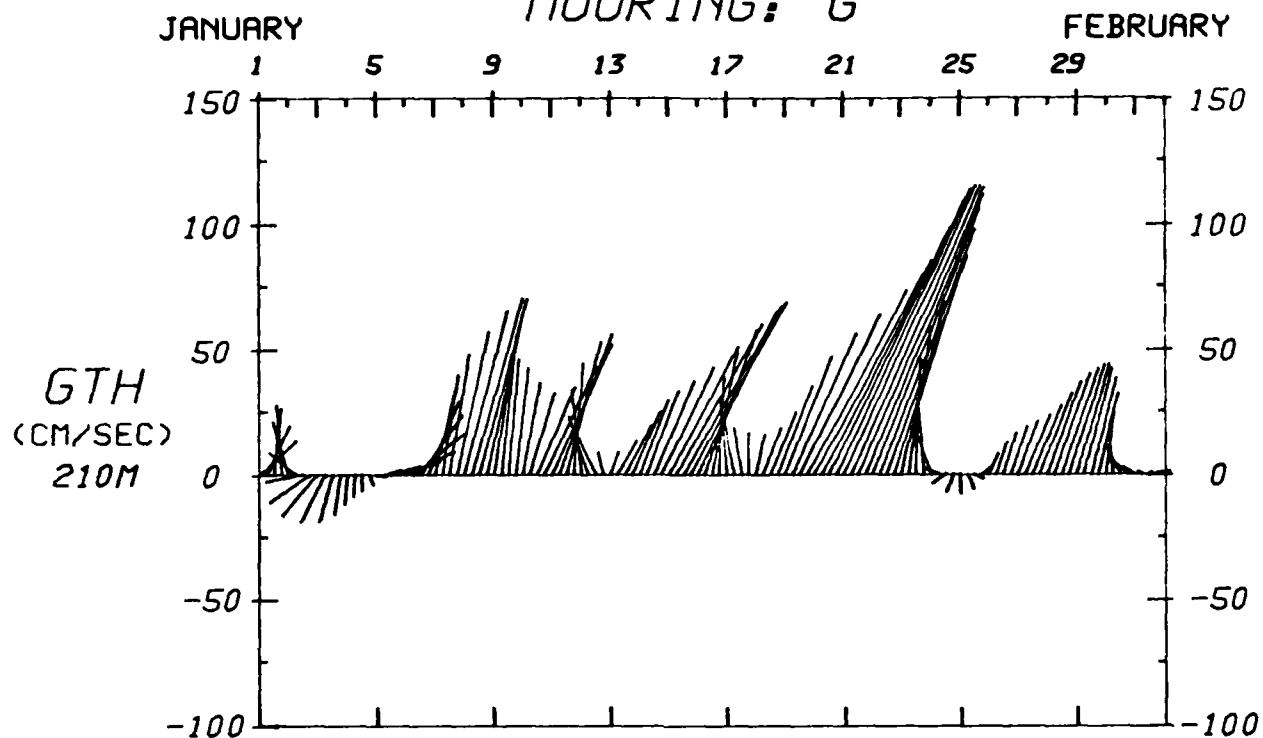
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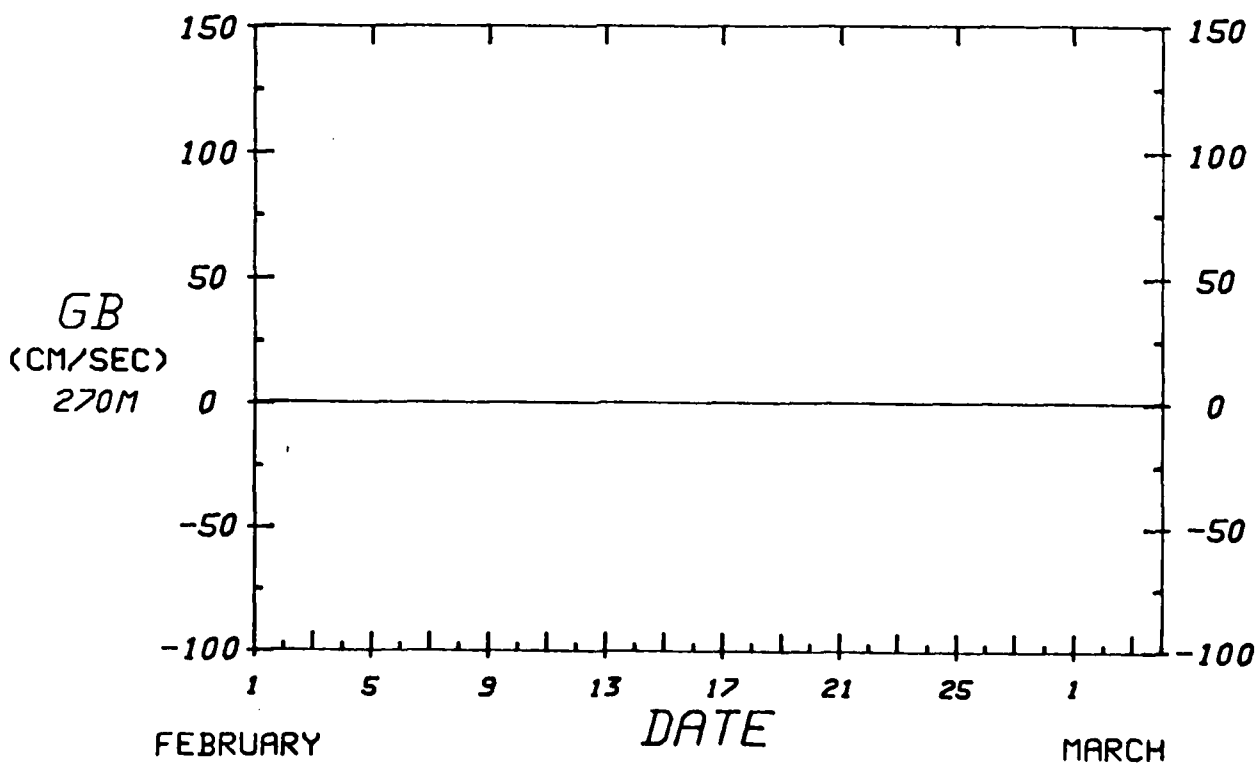
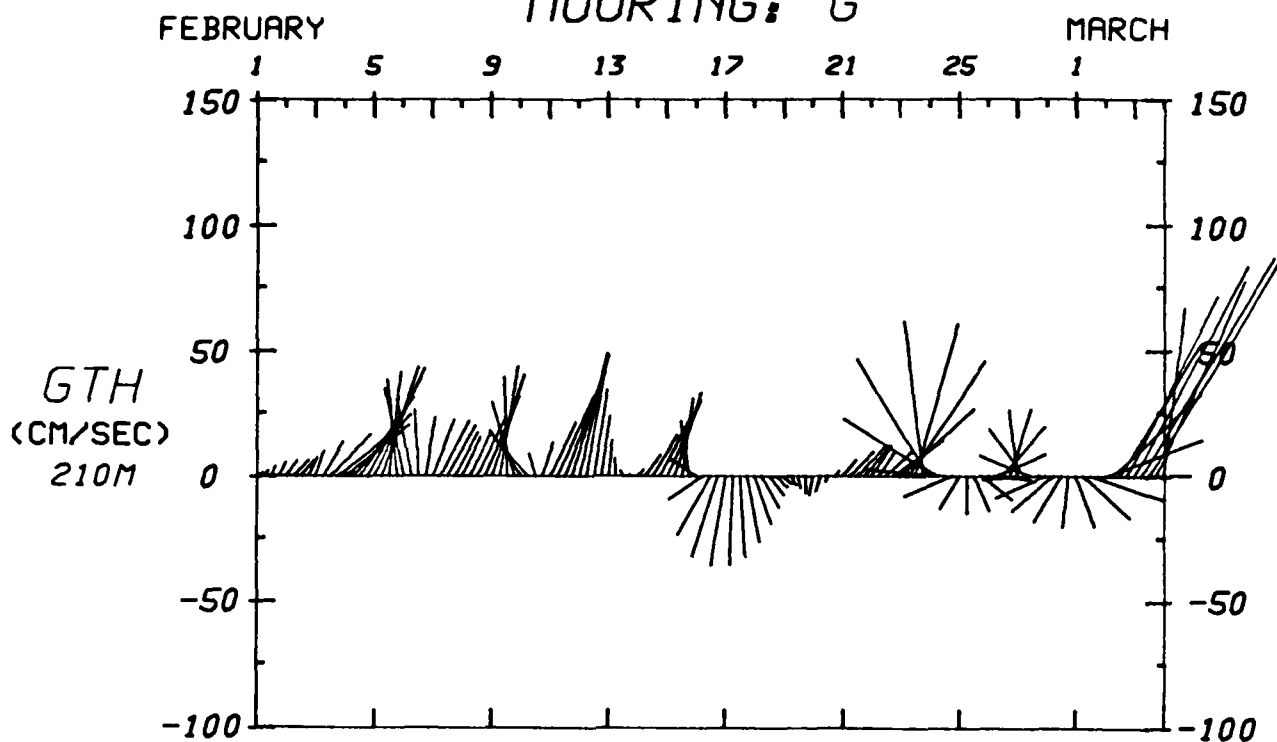
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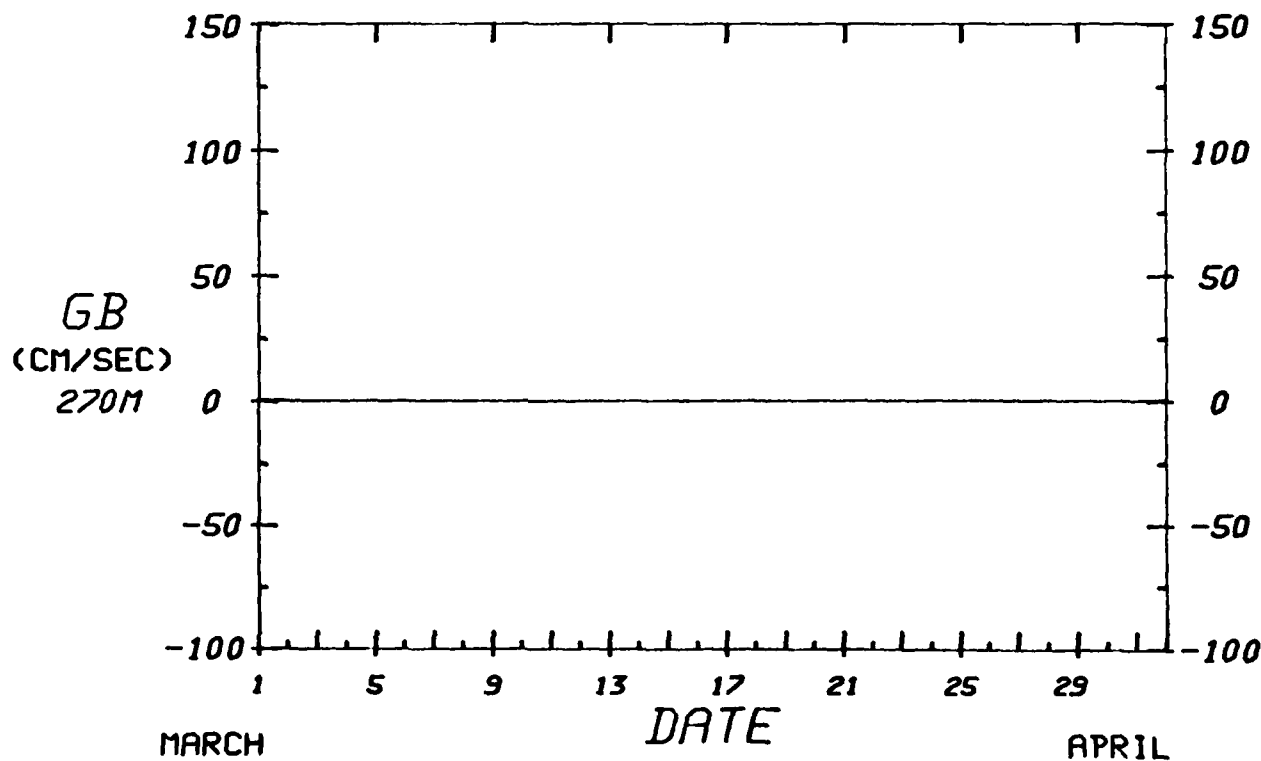
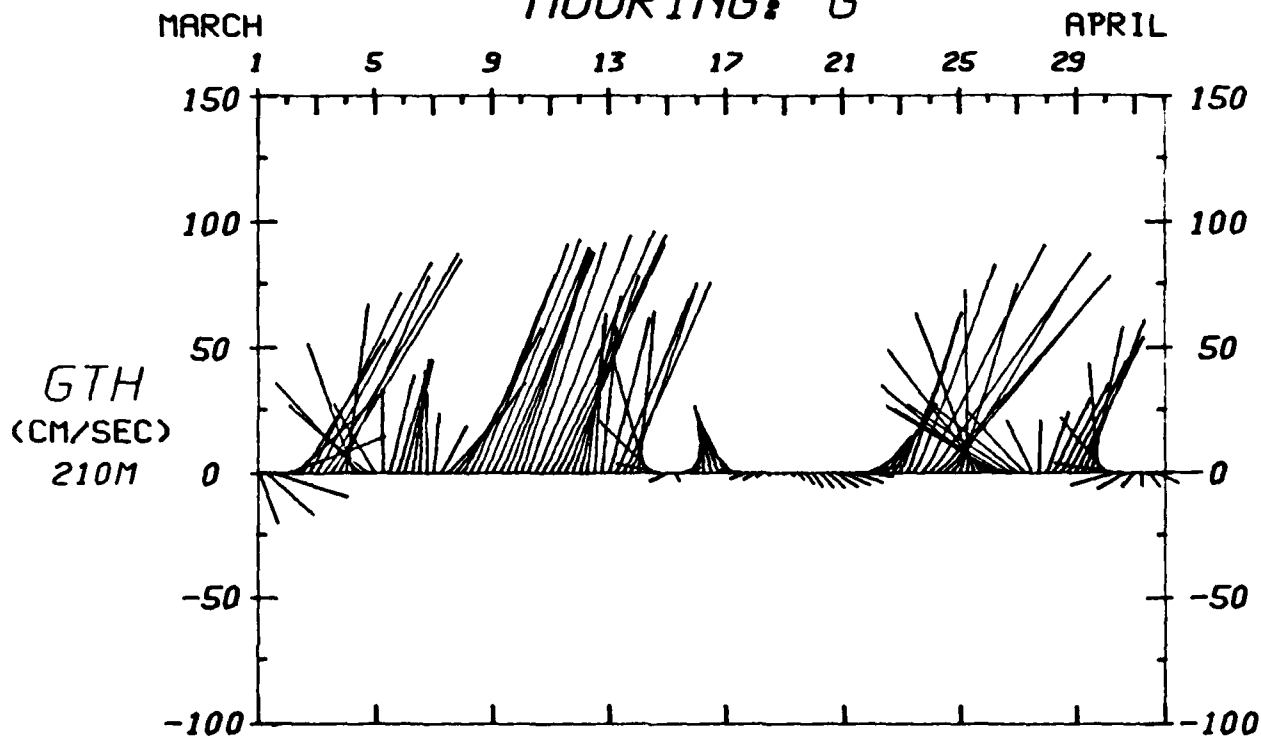
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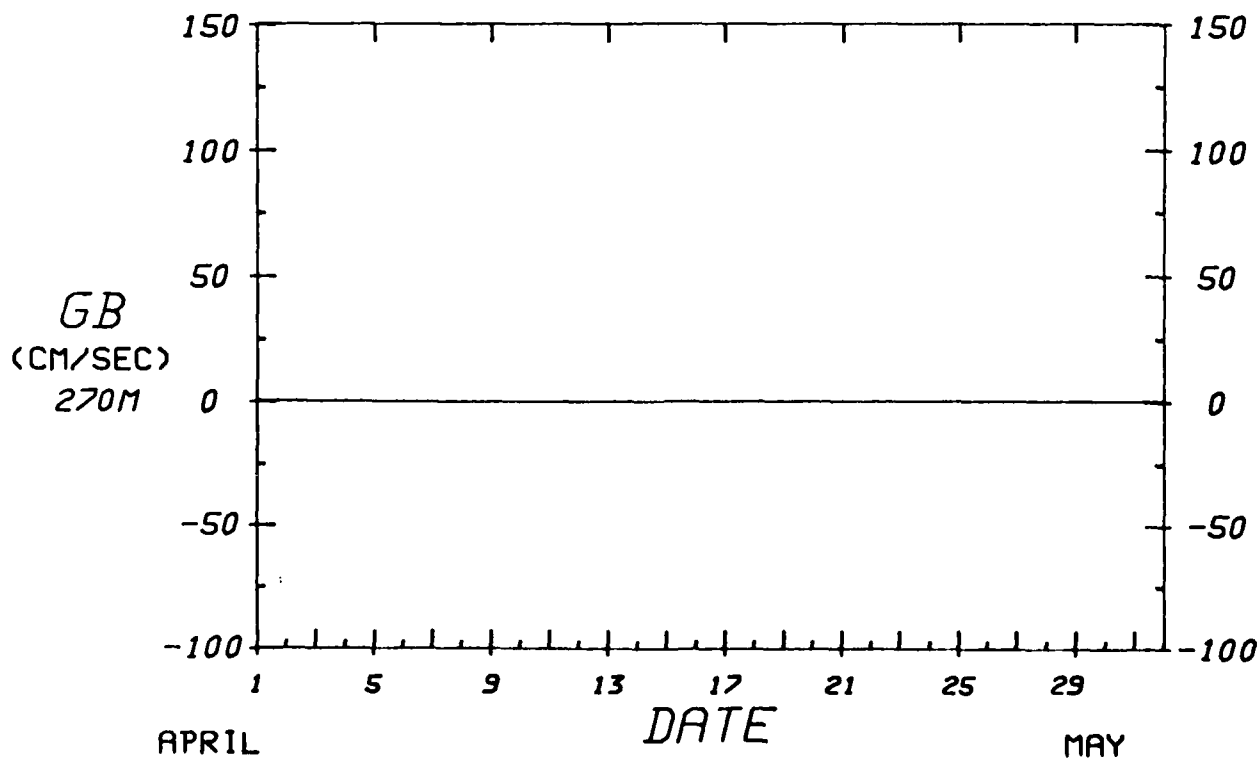
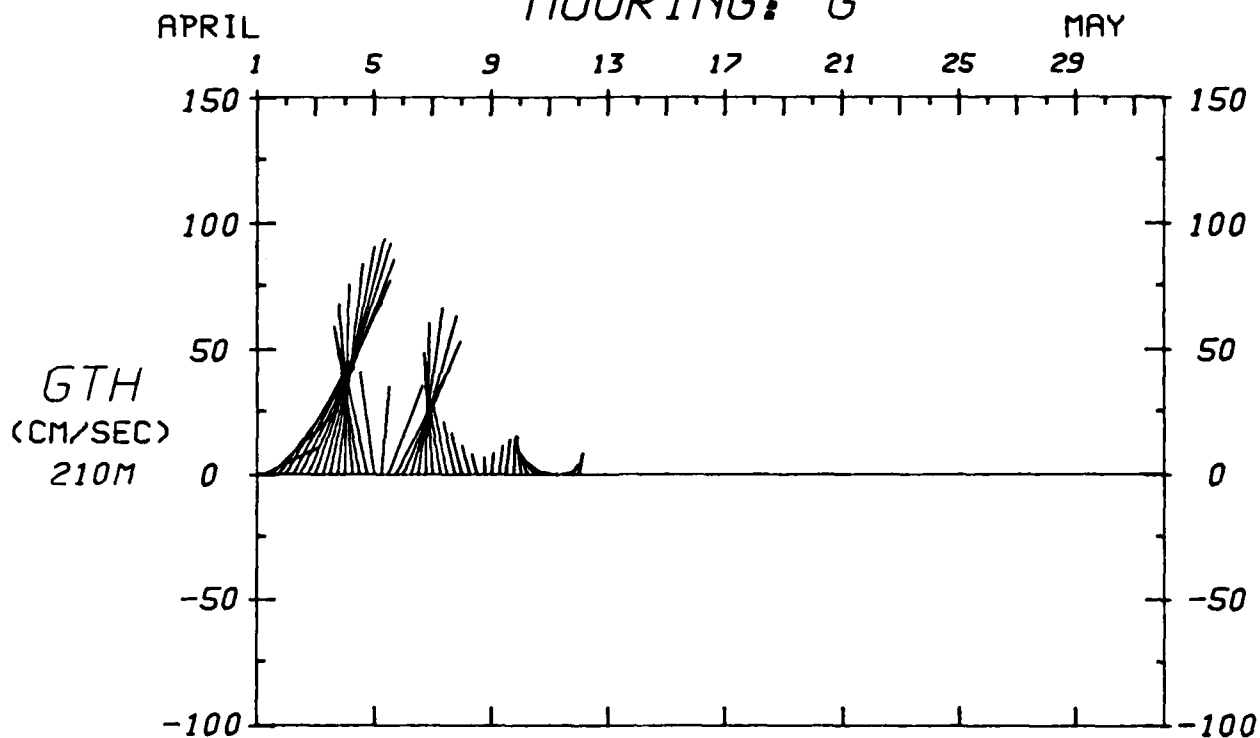
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40HRLP VECTOR VELOCITY MOORING: G



40HRLP VECTOR VELOCITY MOORING: G



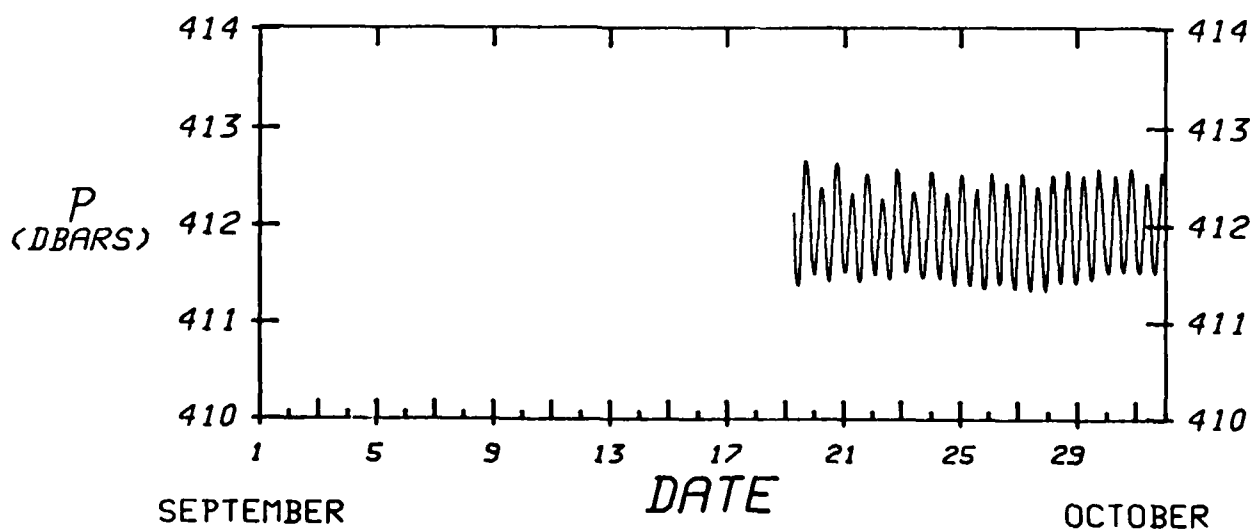
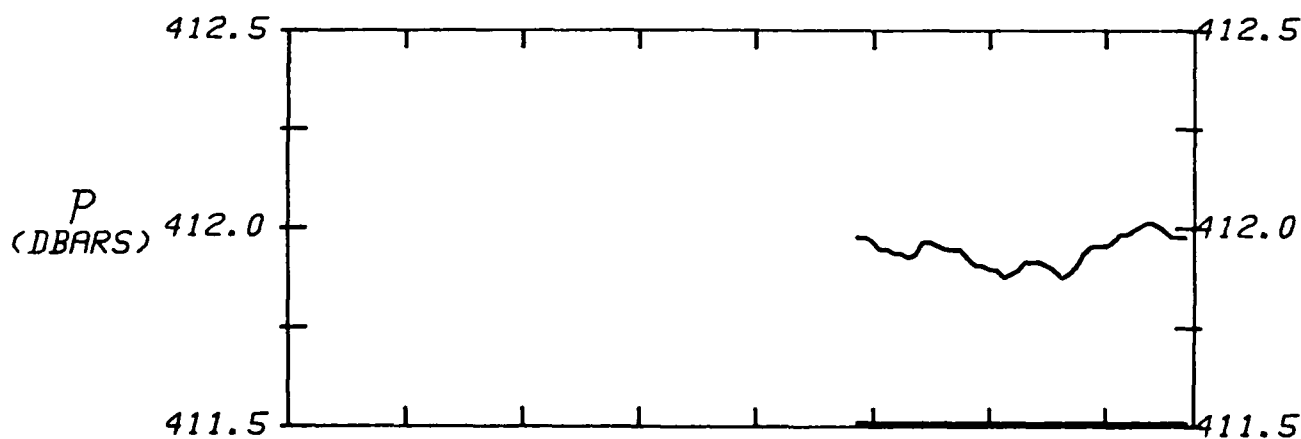
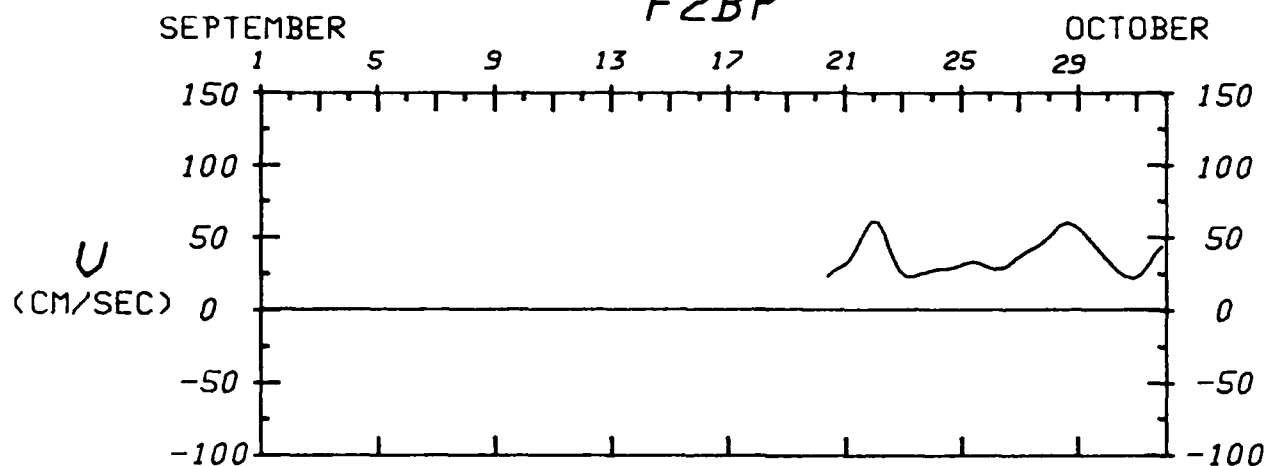
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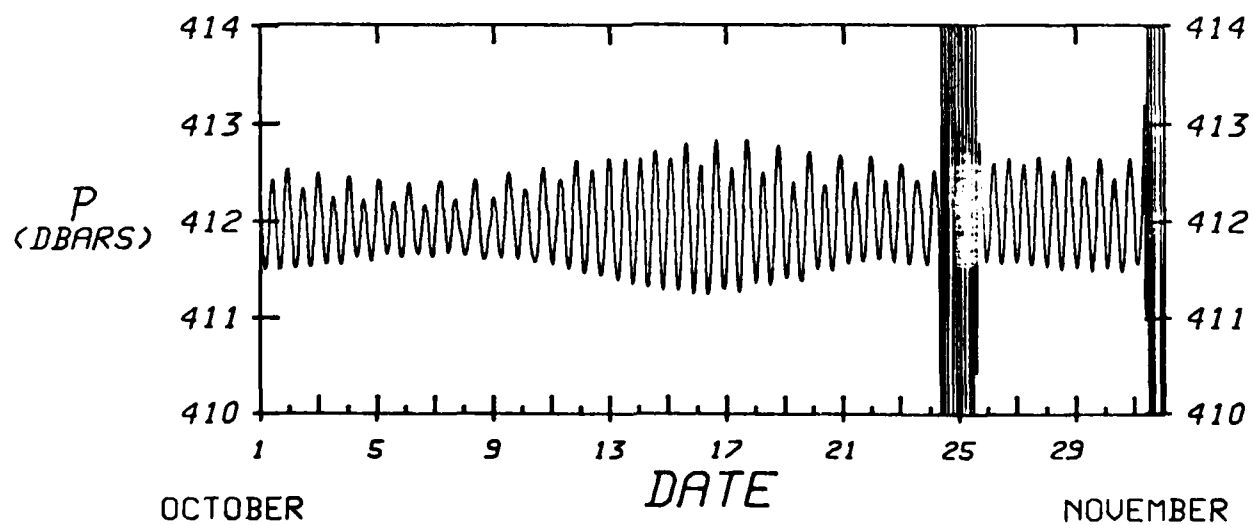
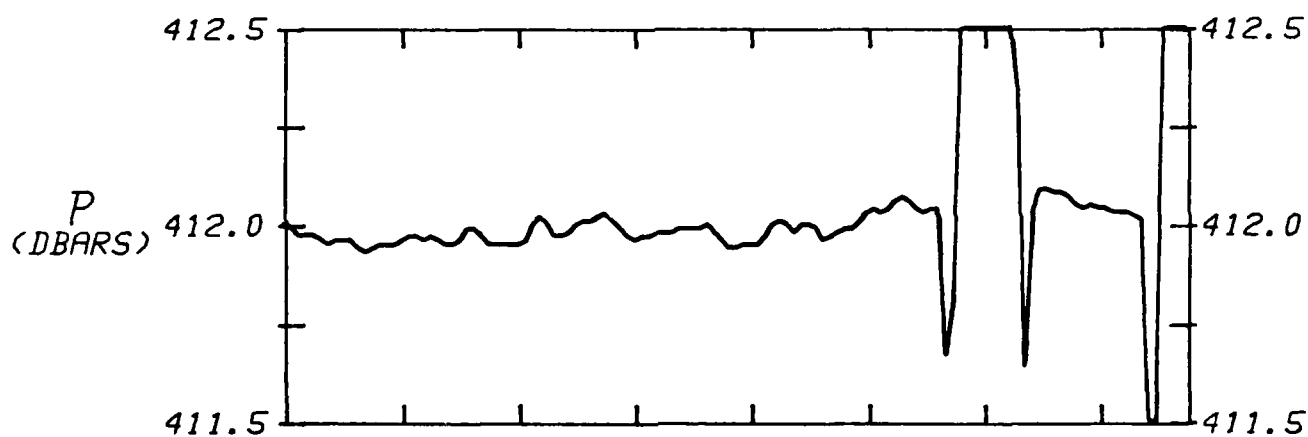
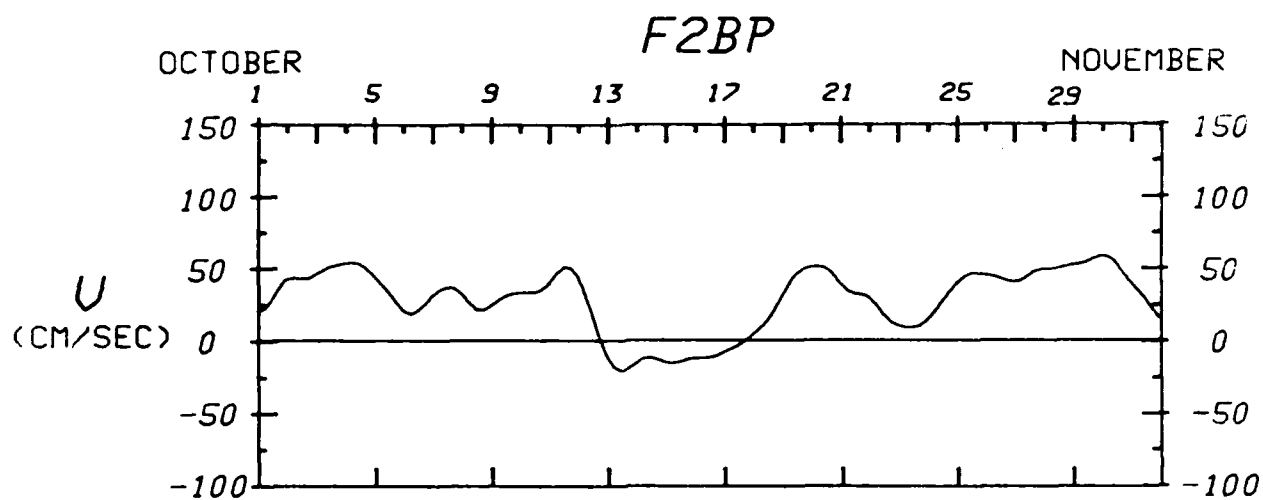
Section 7

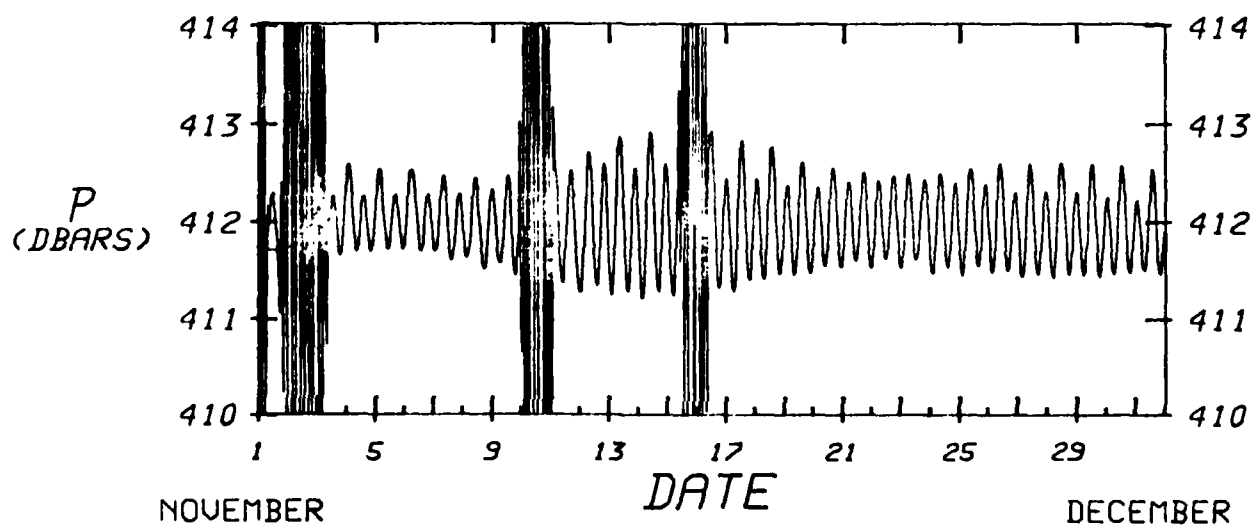
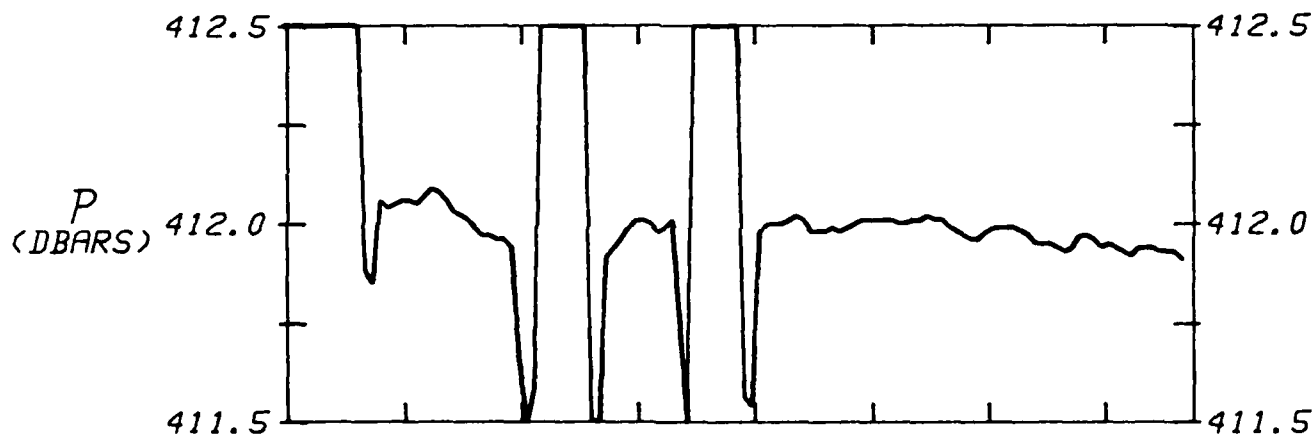
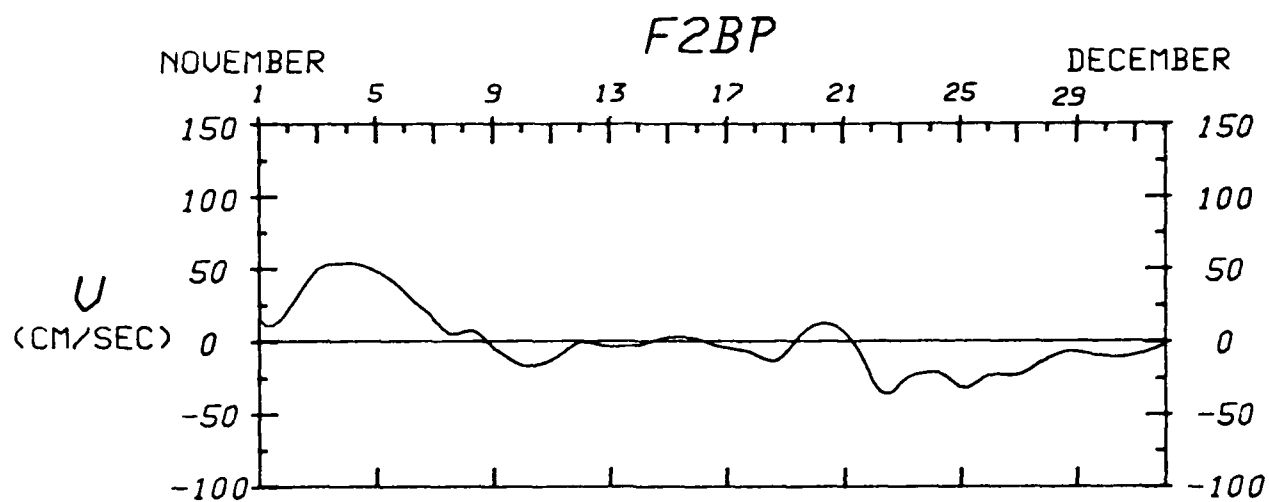
Bottom Pressure Data

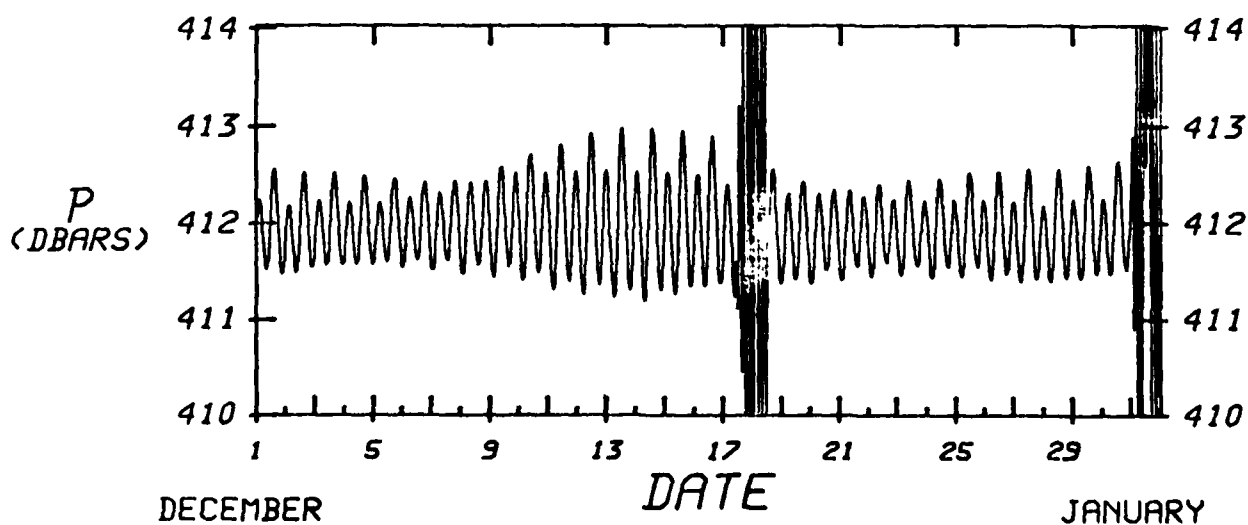
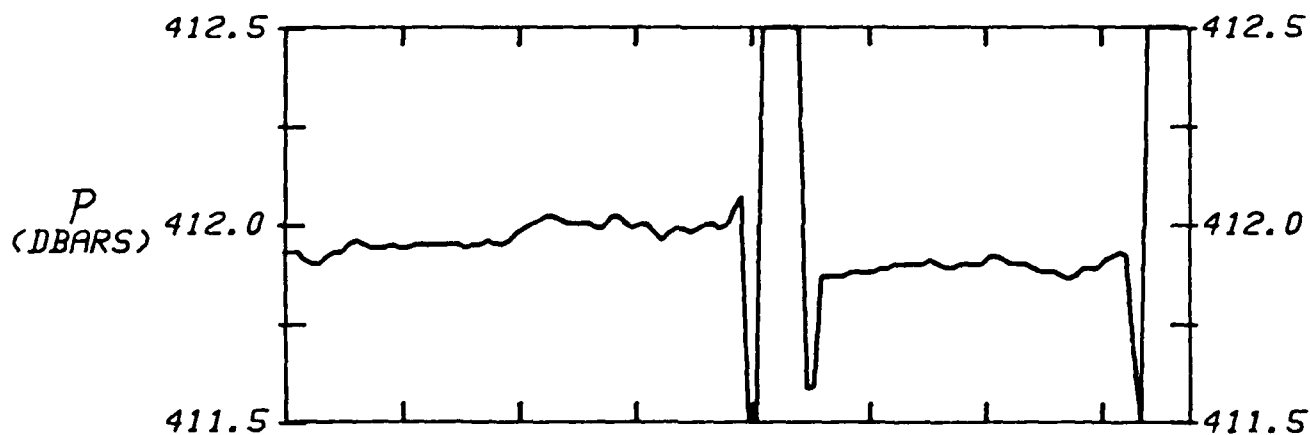
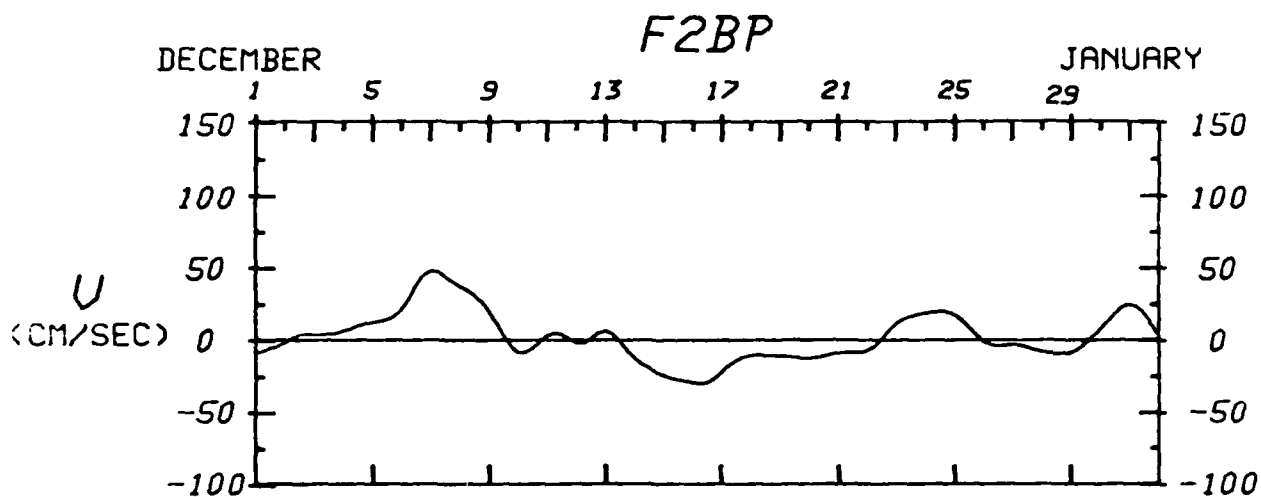
The 3 HRLP and 40 HRLP bottom pressure data from mooring F2 are presented along with the downstream component of velocity, v , from F2T in a monthly format. The same scaling is used for all plots.

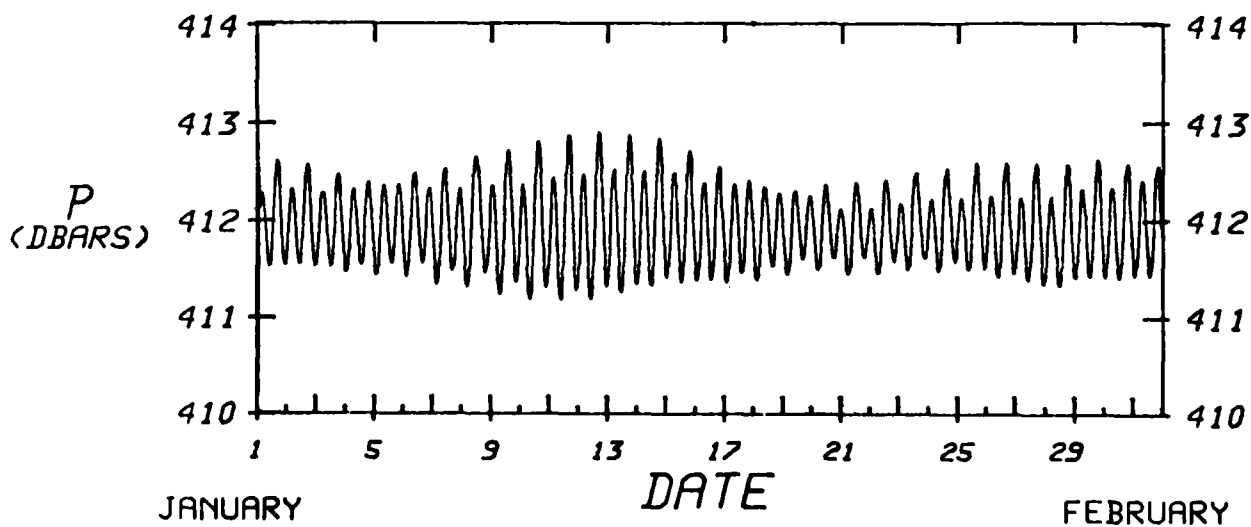
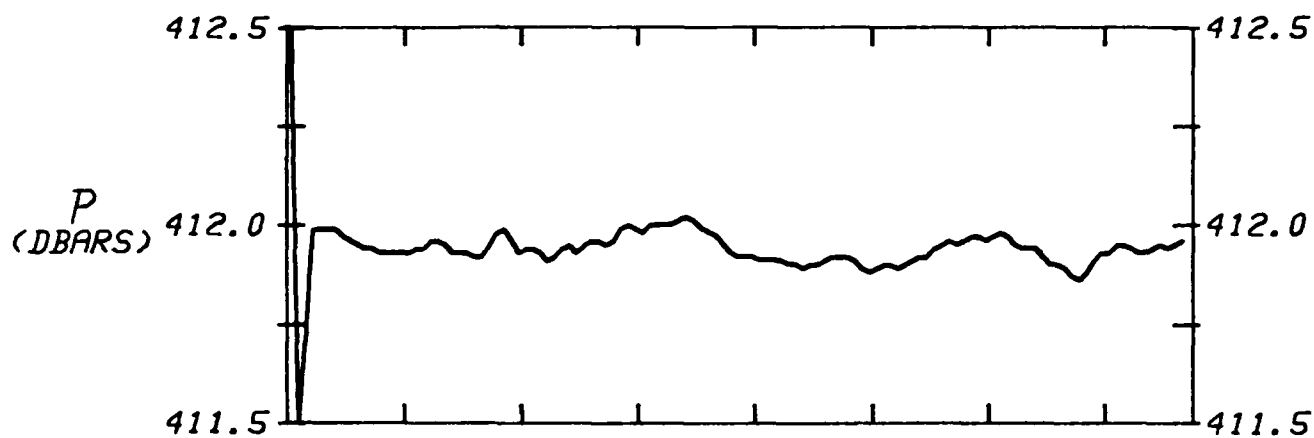
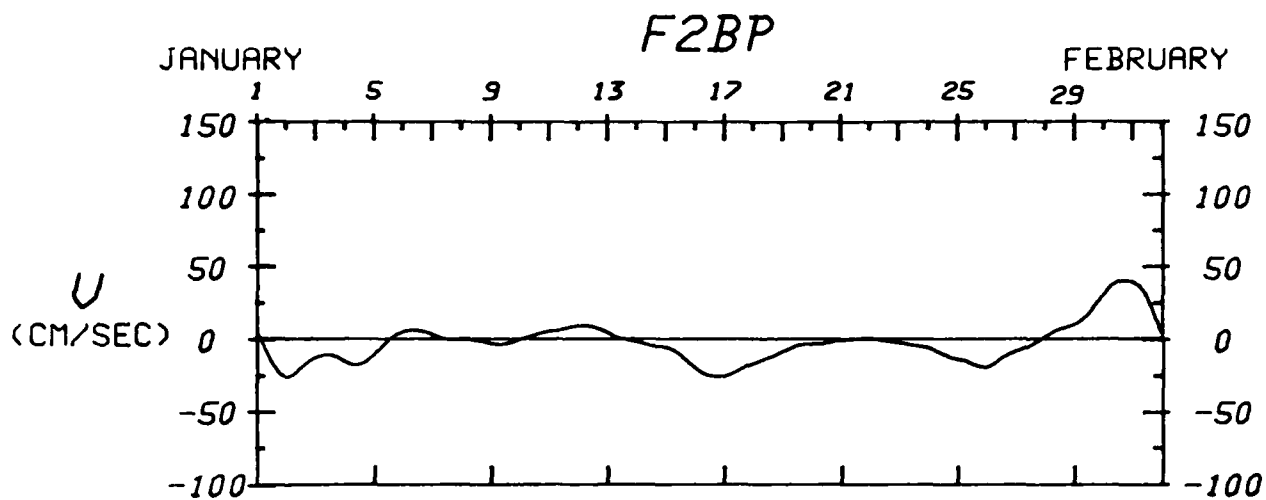
F2BP

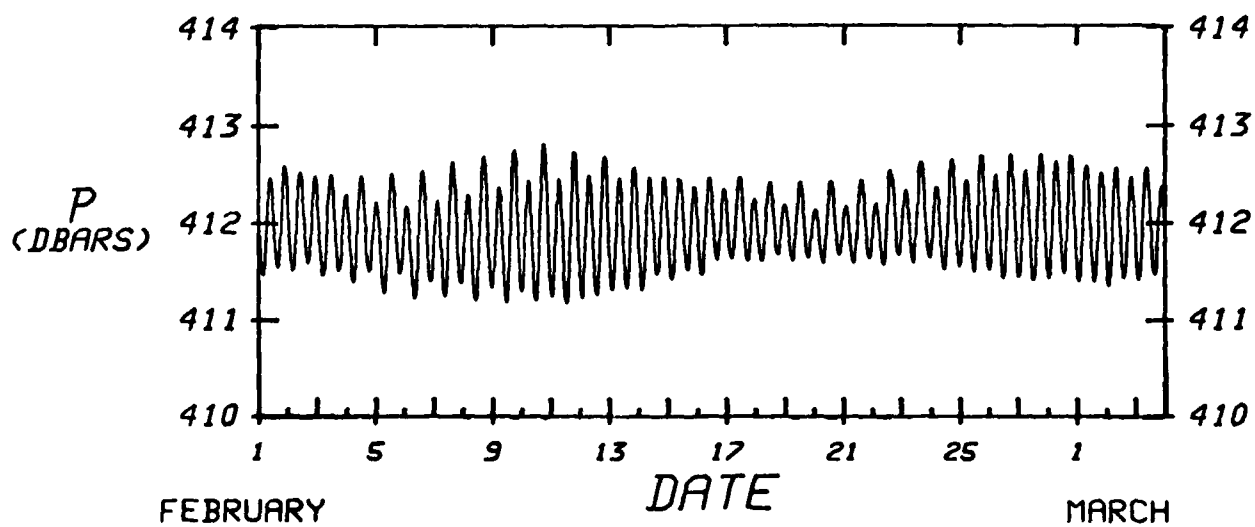
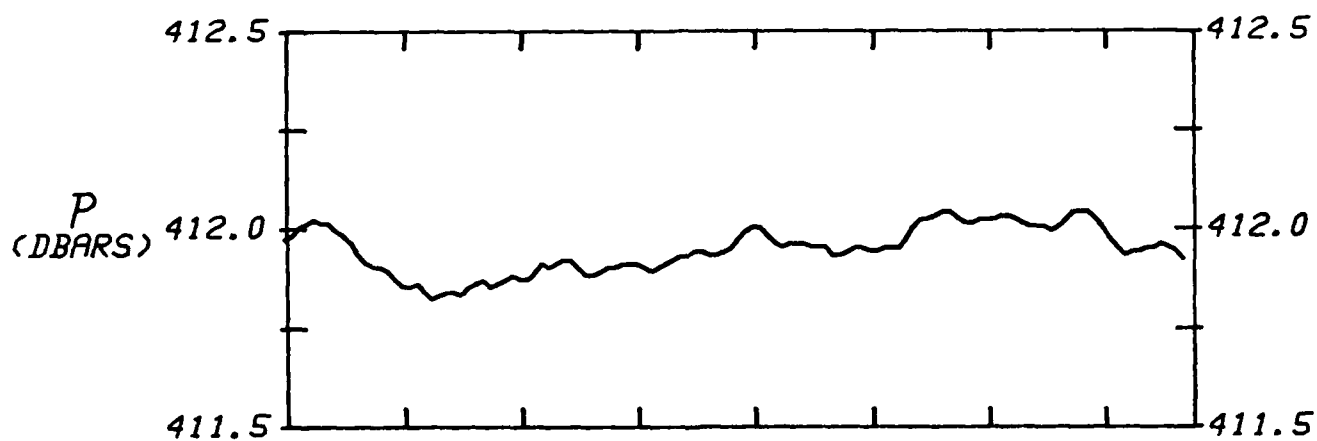
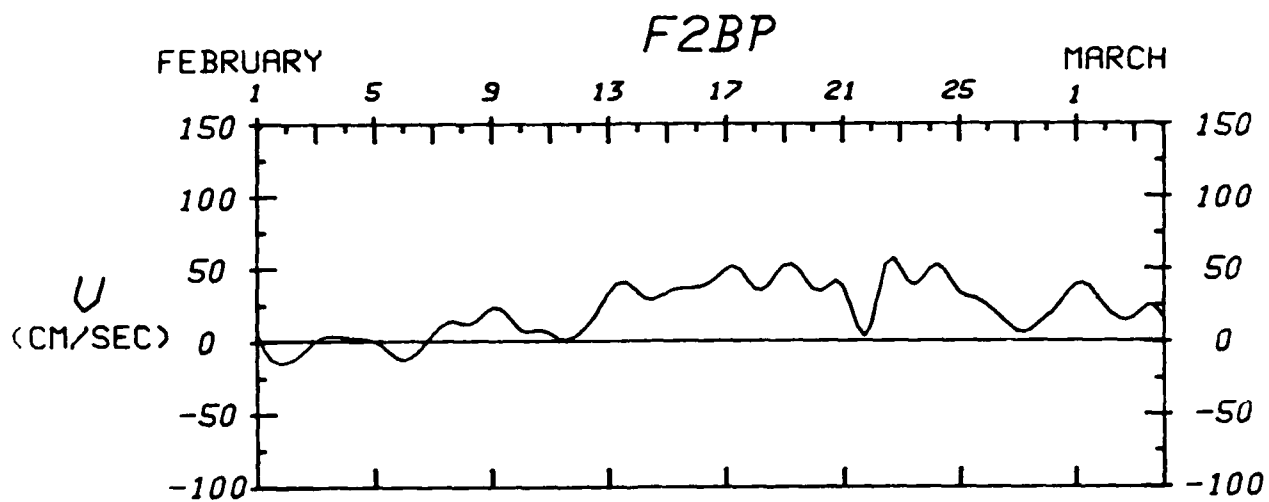


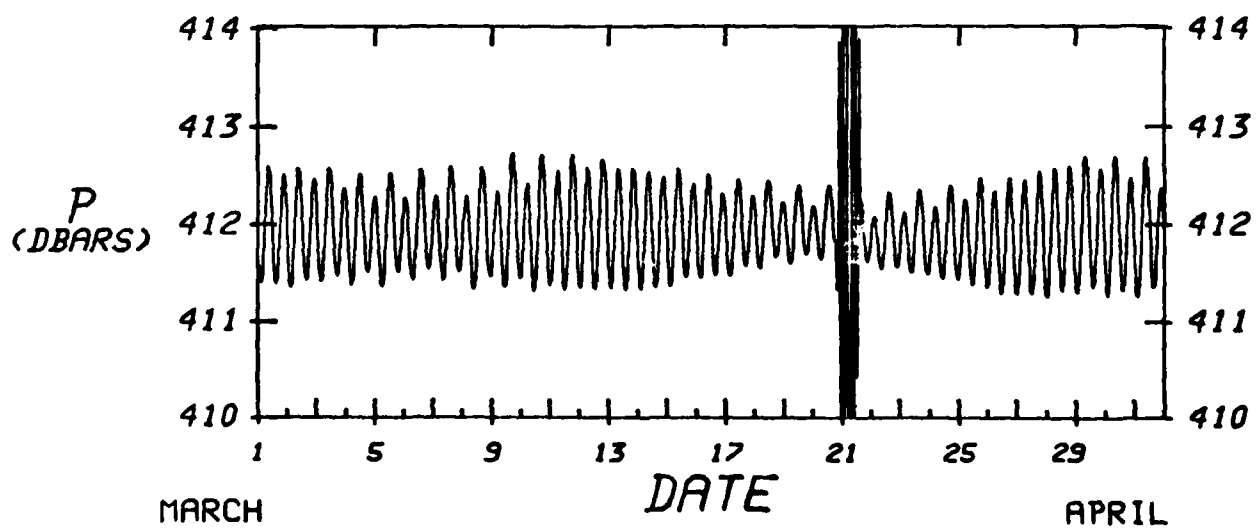
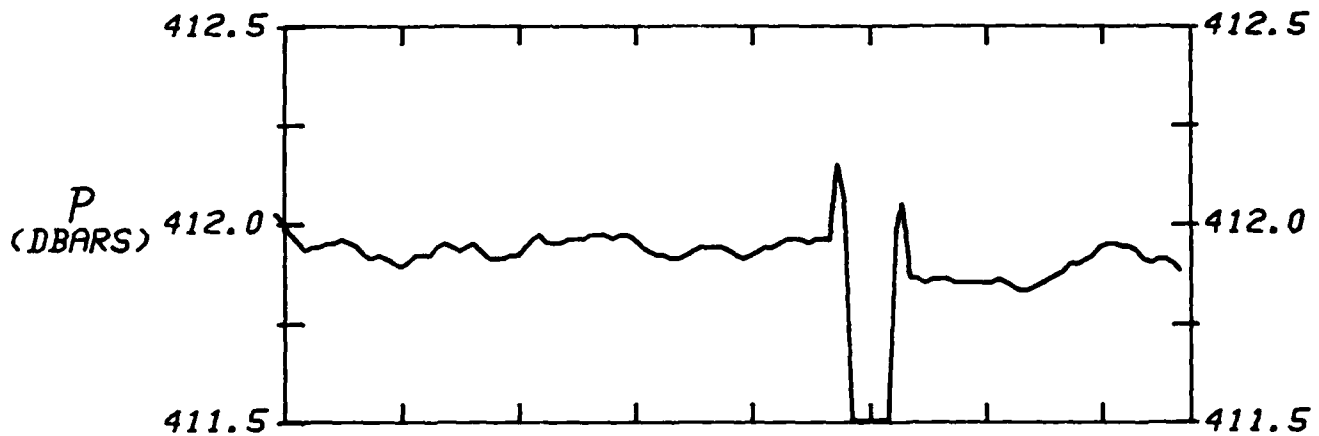
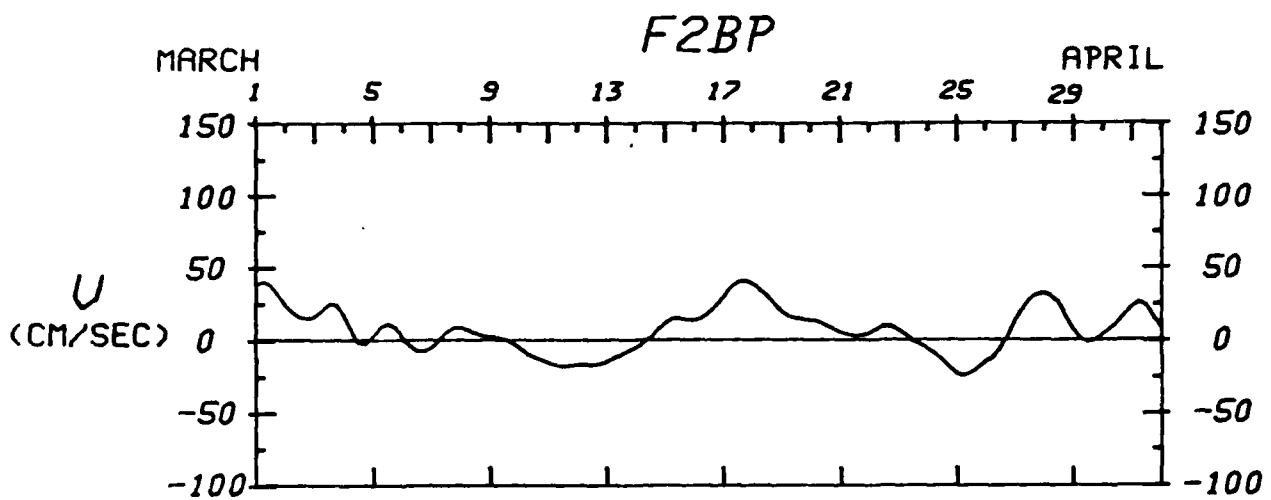


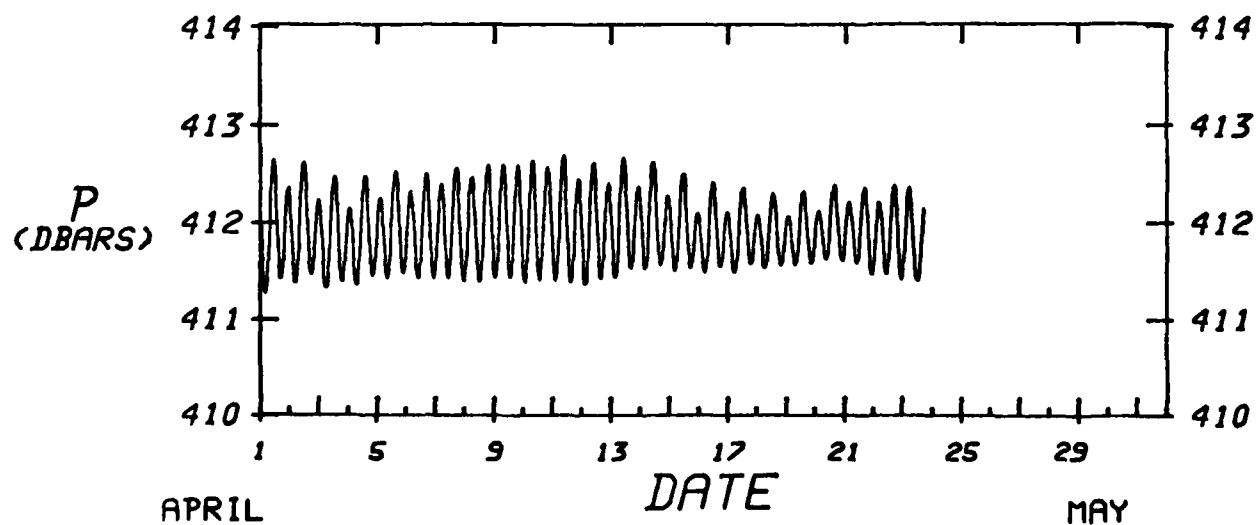
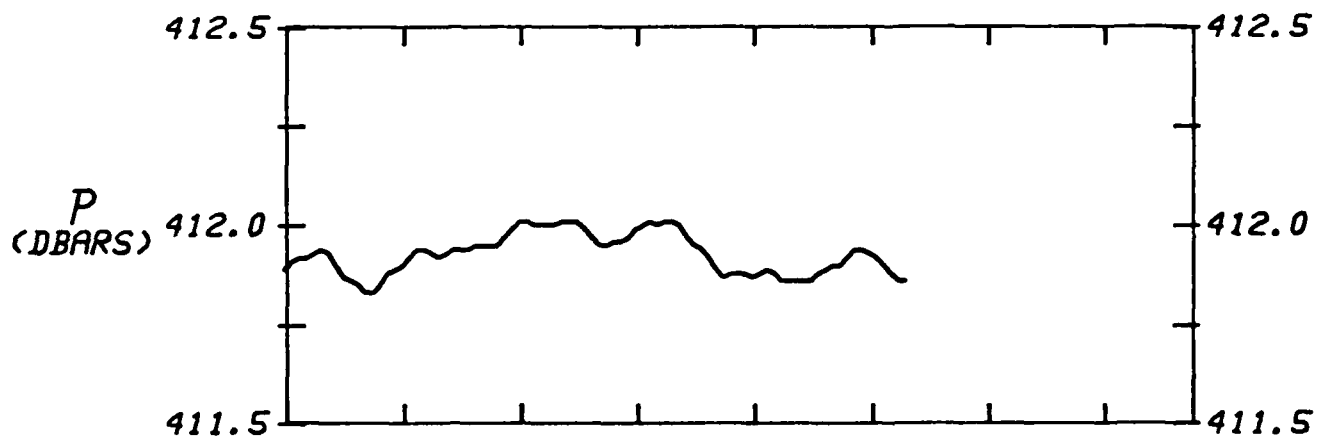
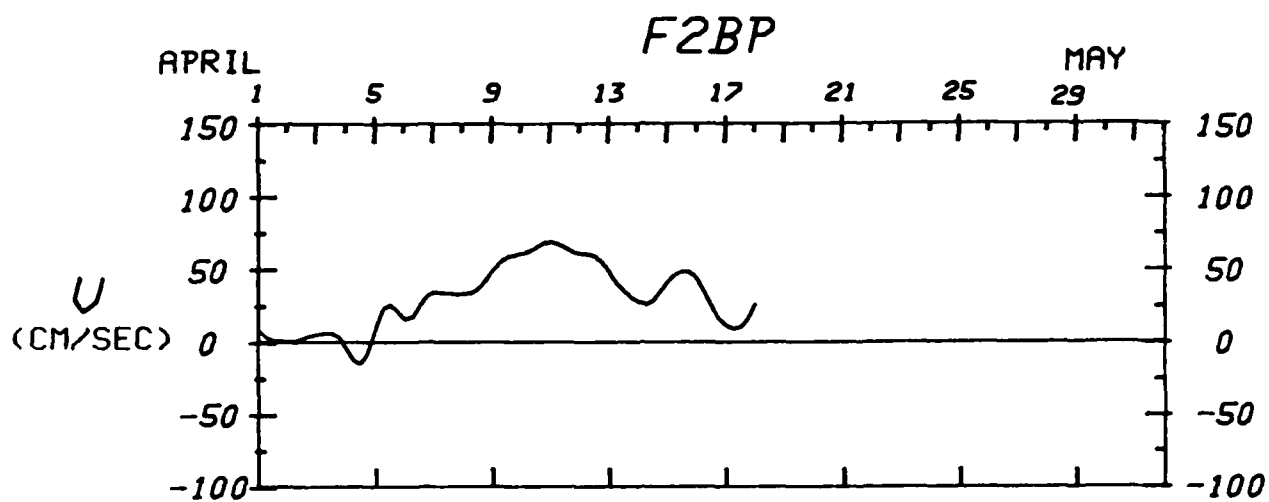












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ACKNOWLEDGEMENTS

The Gulf Stream Deflection and Meander Energetics Experiment was supported by the Office of Naval Research under contract number N00014-77-C-0354. We thank the crews of the Research Vessels RESEARCHER (NOAA) and CAPE HATTERAS (UNC/Duke) for their efforts at sea during the mooring cruises. Special thanks go to Paul Blankinship and Joe Woods for mooring design and construction, instrument preparation, mooring deployment and recovery. Numerous persons assisted in the data processing tasks; among them are Kimberly Clark, Nancy Bane, and several graduate students at the University of North Carolina. We thank Russell Ault for excellent programming assistance, and Schatzie Fisher for patiently typing the text.

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