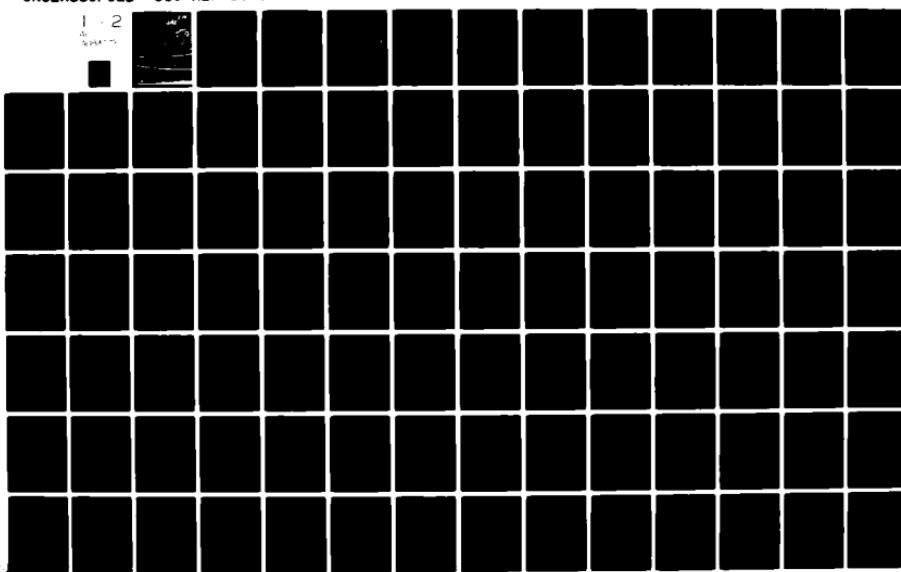
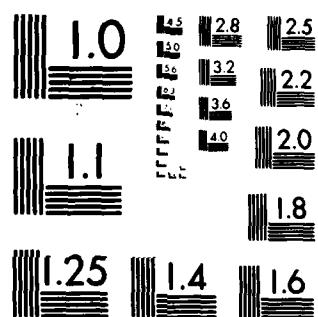


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MAR 80 R A KNOX, M J MCPHADEN N00014-75-C-0152
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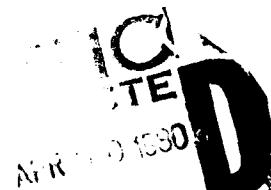
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University of California, San Diego
Scripps Institution of Oceanography

PROFILES OF VELOCITY AND TEMPERATURE NEAR THE
INDIAN OCEAN EQUATOR

by



R. A. Knox and M. J. McPhaden

March 1980

SIO Reference Number
80-6
(revision of 76-11)

This report is a revision of SIO reference number 76-11. It corrects a programming oversight in the calculation of relative deep velocities which were used to produce absolute velocity profiles. This oversight lead to significant errors in the original report in only three cases. Deep zonal velocities calculated for 19 April and 28 December 1973 were too small by 29.3 and 49.3 cm/sec respectively; that of 28 June 1973 was too large by 26.6 cm/sec. In all other instances, errors were below the 25 cm/sec noise level.

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INTRODUCTION

Between January 1973 and May 1975, quasi-weekly vertical profiles of temperature and velocity were obtained near the equatorial island of Gan ($00^{\circ}41'S$, $73^{\circ}10'E$) in the Central Indian Ocean. This report presents the profiles directly. One analysis of the data, treating the seasonal cycle of near-surface currents, has been published (Knox, 1976); others are in progress.

METHODS

A full discussion of techniques and errors is given by Knox (1976) but a brief summary follows for convenience. The profiles were made using the profiling current meter (PCM) described by Duing and Johnson (1972). Lowerings were made once per week, barring instrument failures and/or higher priority duties for the personnel of the Royal Air Force base on Gan who carried out the work. Sites for the lowerings were alternated weekly between points 15 n.mi. north and south of the atoll, due to considerations of interference to the current by the atoll (Knox, 1974; 1976). Measurement of ship drift, not successful on all profiles, was by radar tracking from Gan; use of these occasional tracks and an interpolation scheme to convert the PCM relative velocities to absolute velocities is discussed by Knox (1976).

DATA REDUCTION AND PRESENTATION

Data from the Aanderaa recorder in the PCM were converted to scientific units as follows:

1. Pressure. The manufacturer furnishes a linear calibration equation relating recorded counts to applied pressure. His value for the slope was used throughout, and by checking against a deadweight tester during the final months of the project it was found not to have changed. The intercept (reading at atmospheric pressure) did change sporadically, and was individually noted for each profile.

2. Temperature. Manufacturer's calibrations were used throughout.

3. Speed. Manufacturer's calibrations were used throughout.

4. Compass. A deviation table was constructed for the instrument, and during the project the compass was checked against known headings. No shifts in calibration were found.

With these calibrations, the data from each lowering were converted to a series of 4-item samples: depth (m), relative eastward velocity (cm/sec), relative northward velocity (cm/sec), and temperature ($^{\circ}$ C). A few obviously bad values were manually edited by linear interpolation. Ship drift components, either directly measured or inferred from the relative deep velocities as discussed by Knox (1976) were added to the relative velocity data to produce the final series. The depth interval between samples depends on the sinking speed of the PCM, and hence on current speed and wire angles. All data samples are plotted, so on profiles with slow sinking speeds there appears to be more small scale vertical structure than on those with fast sinking speeds. Velocity errors are considered by Knox (1976); ± 25 cm/sec is a conservative overall estimate.

Each page presents for one lowering the three profiles (temperature, eastward velocity UVEL, northward velocity VVEL) plotted against depth. The lower right corner gives the date, an identifying number, and an approximate location. Also plotted are one week average wind stress vectors from standard meteorological observations on Gan, as discussed by Knox (1976).

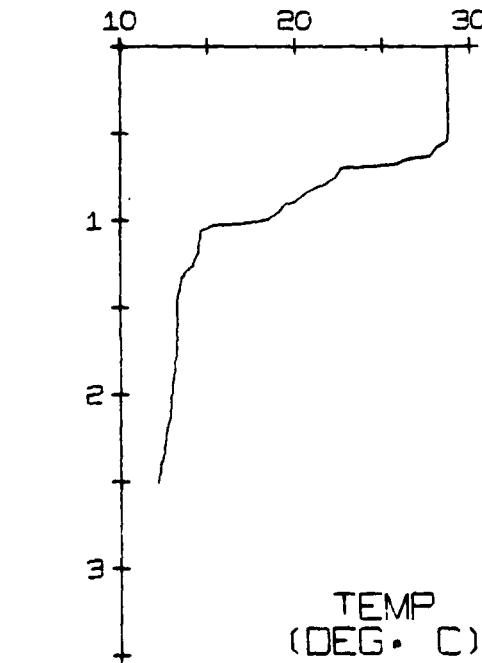
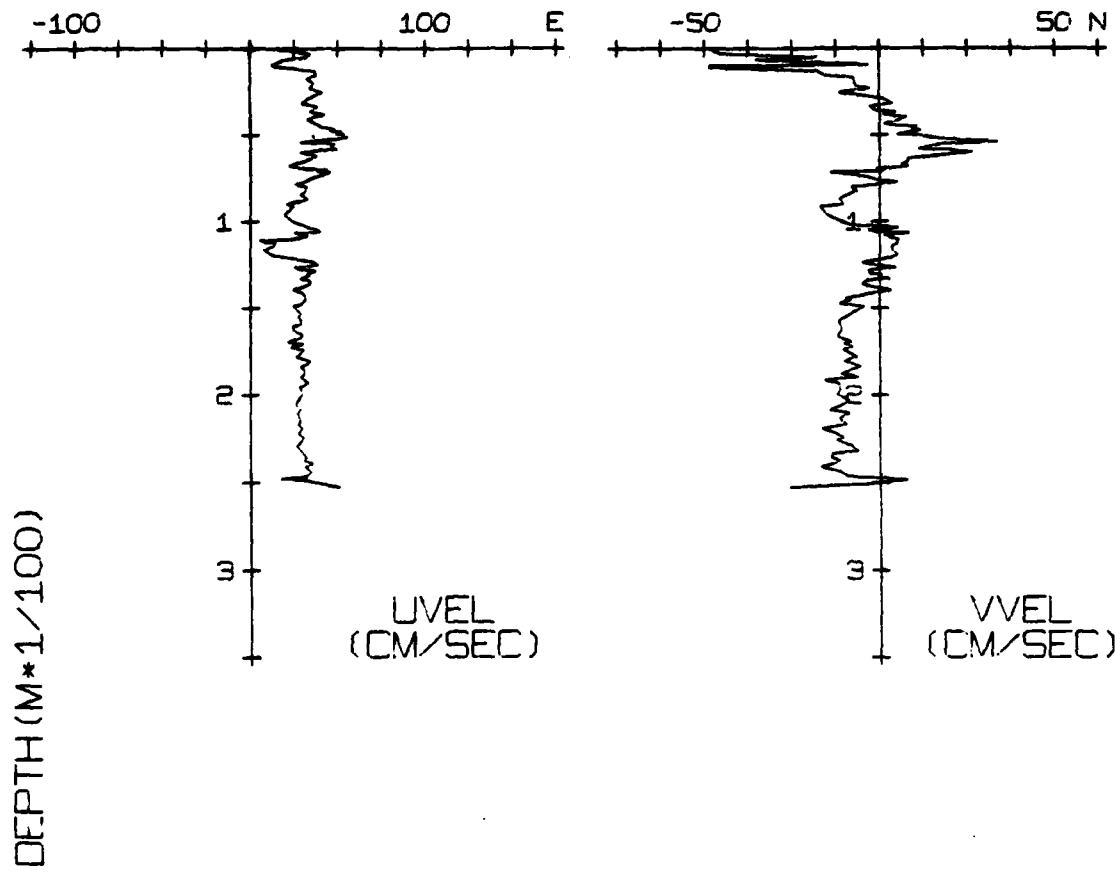
ACKNOWLEDGEMENTS

This work would not have been possible without the goodwill and competent collaboration of numerous men of the Royal Air Force and the British Meteorological Office who were stationed on Gan. Support of the Office of Naval Research through contract N00014-69-A-0200-6006 to the University of California, Scripps Institution of Oceanography, is gratefully acknowledged.

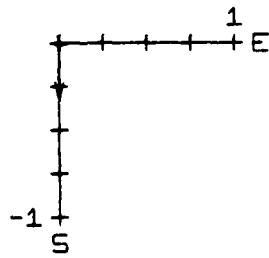
REFERENCES

- Duing, W. and D. Johnson (1972) High resolution current profiling in the Straits of Florida. Deep-Sea Research 19, 259-274.
- Knox, R. A. (1974) Reconnaissance of the Indian Ocean equatorial undercurrent near Addu Atoll. Deep-Sea Research, 21, 123-129.
- Knox, R. A. (1976) On a long series of measurements of Indian Ocean equatorial currents near Addu Atoll. Deep-Sea Research, 23, 211-221.

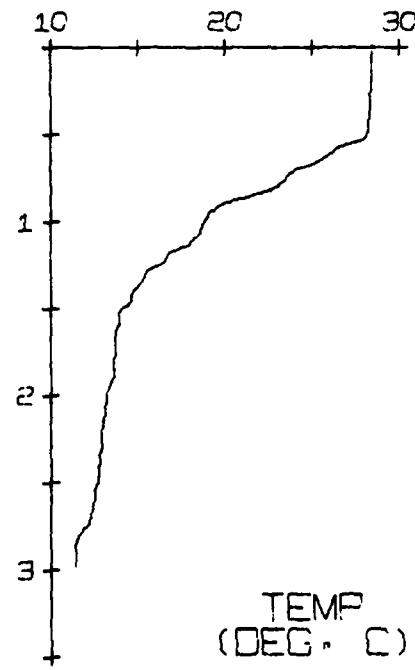
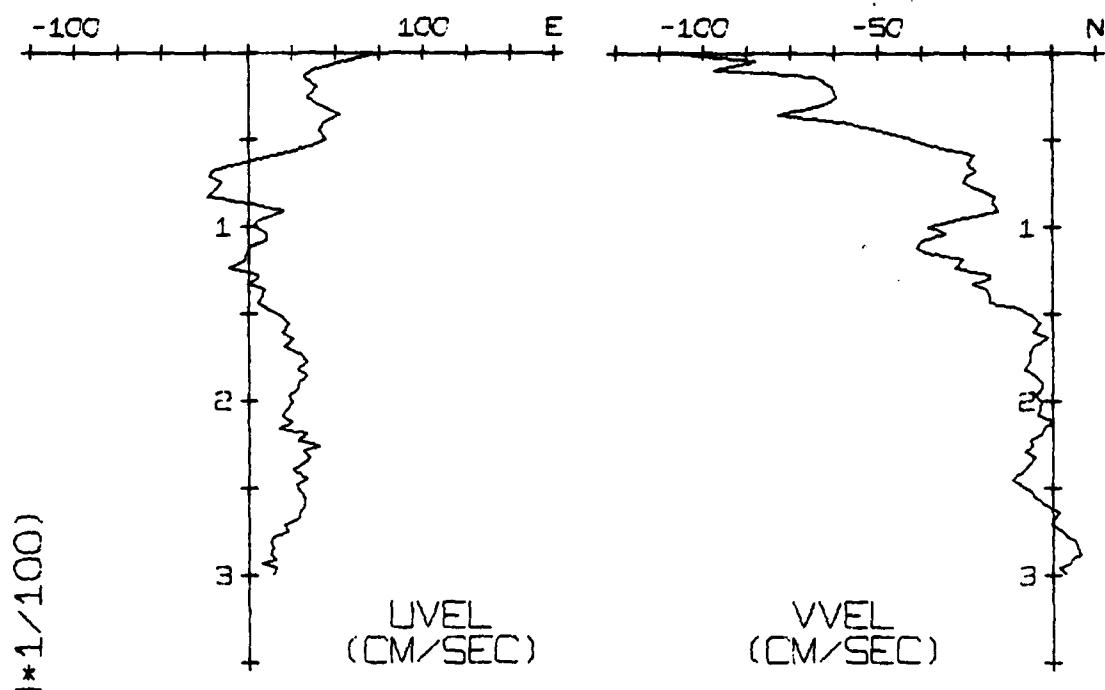
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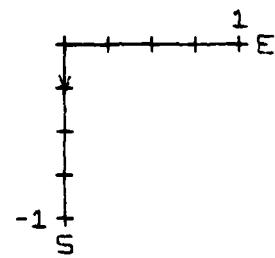
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FOR WEEK ENDING
18/01/73



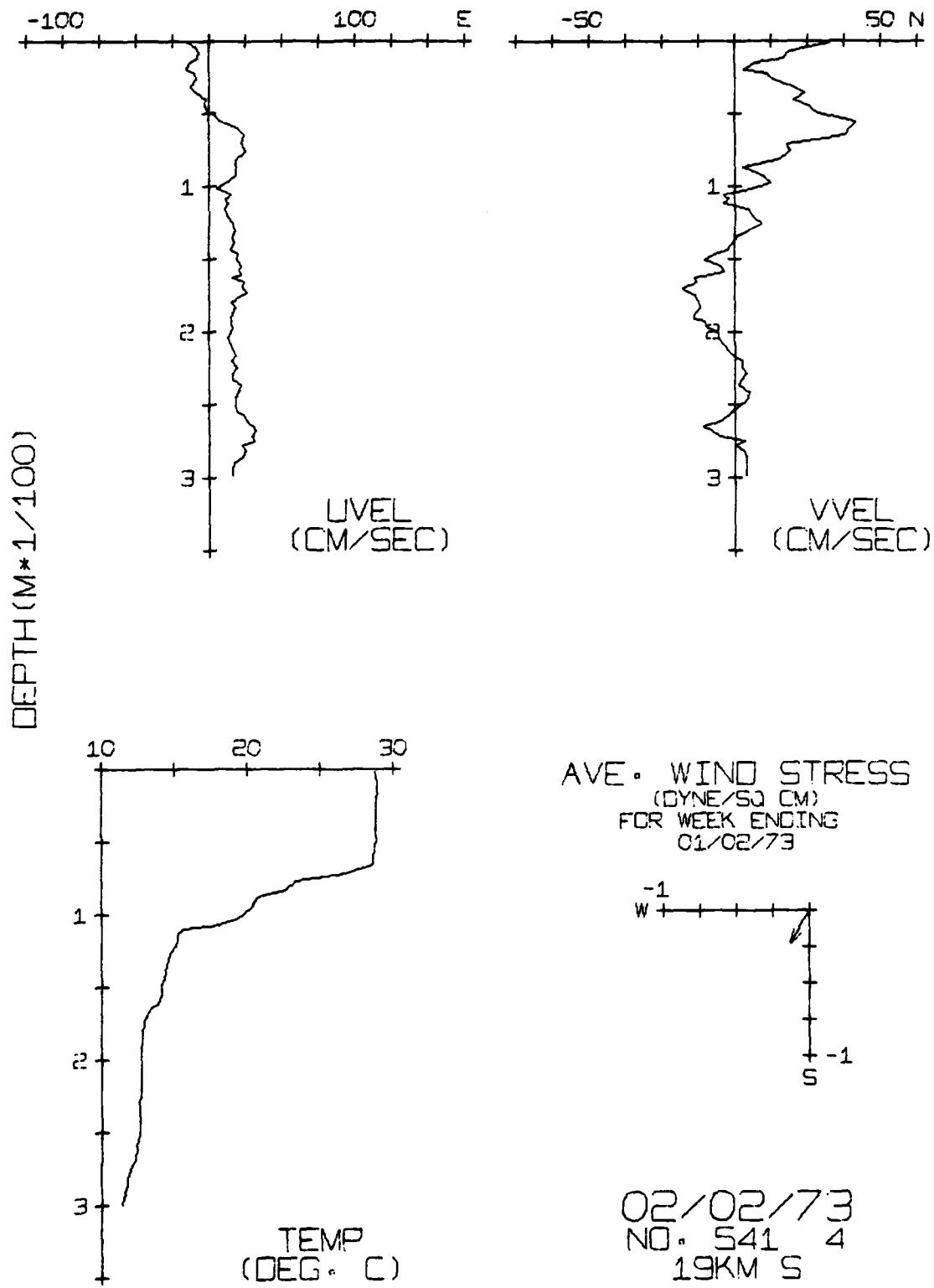
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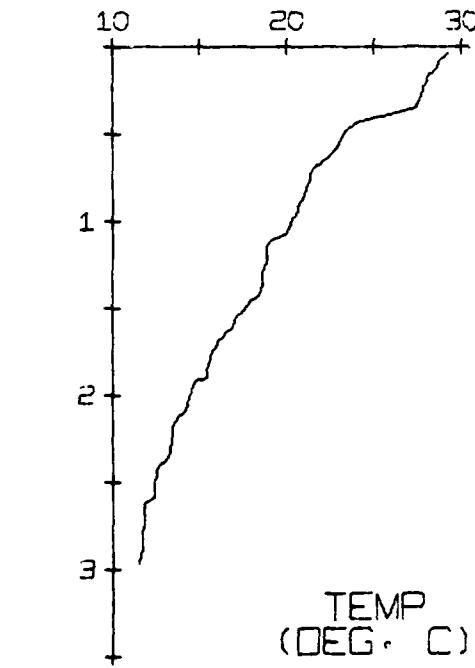
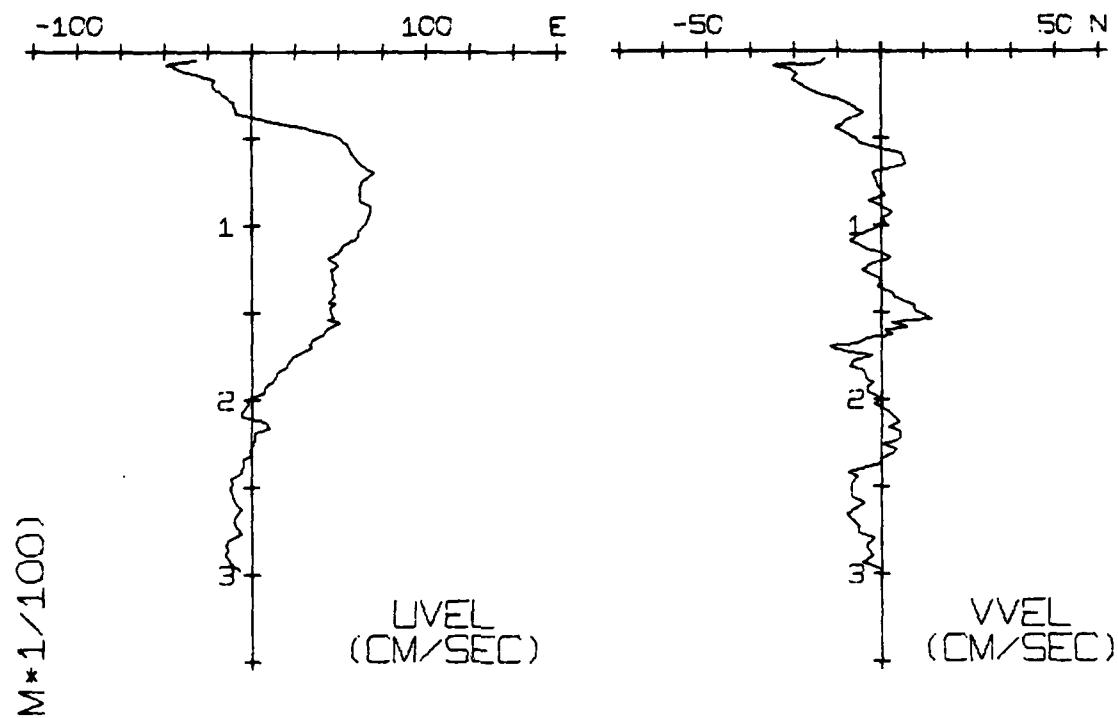


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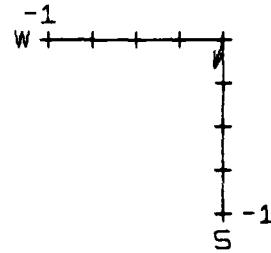


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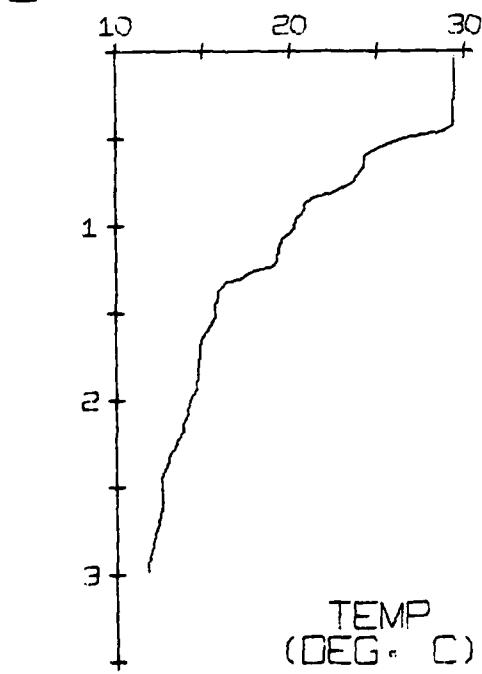
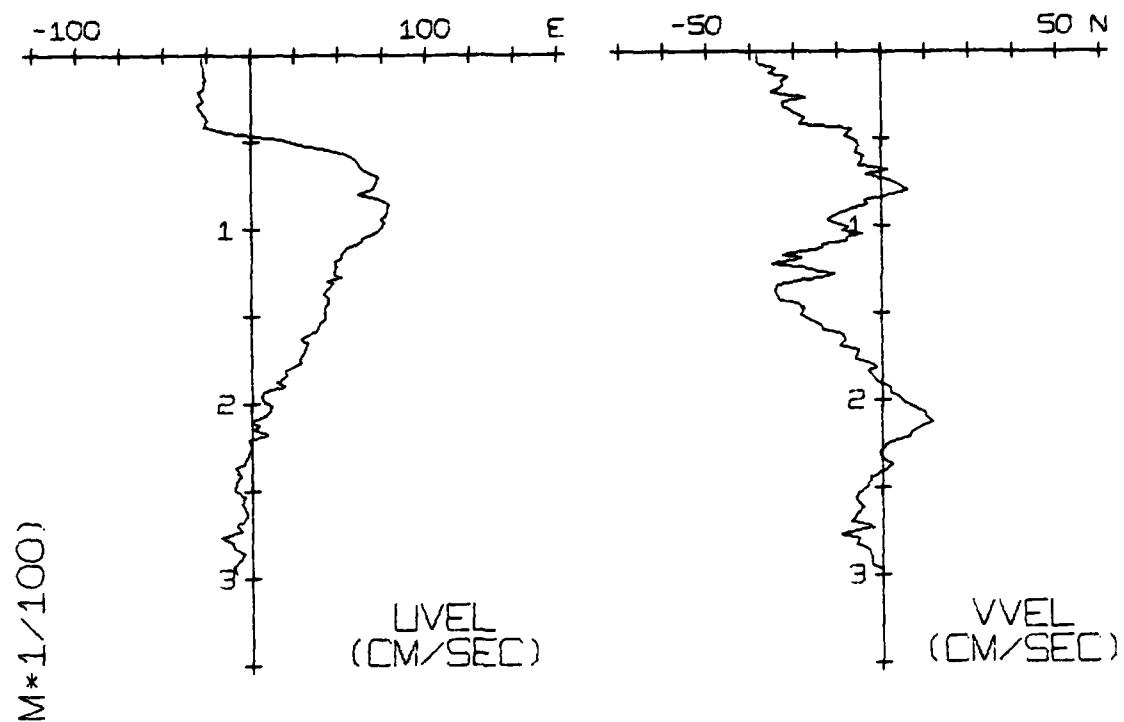




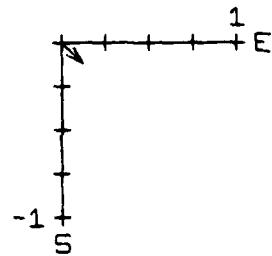
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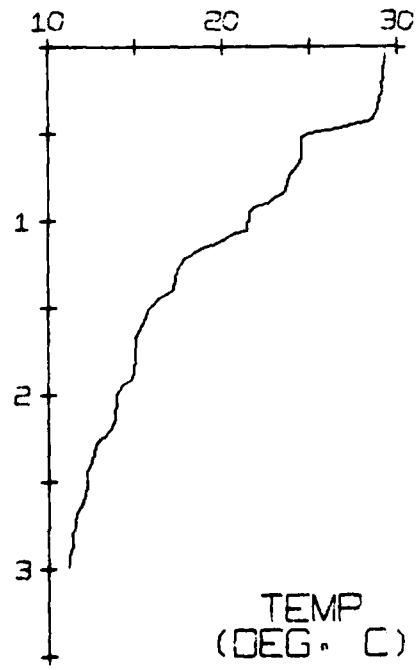
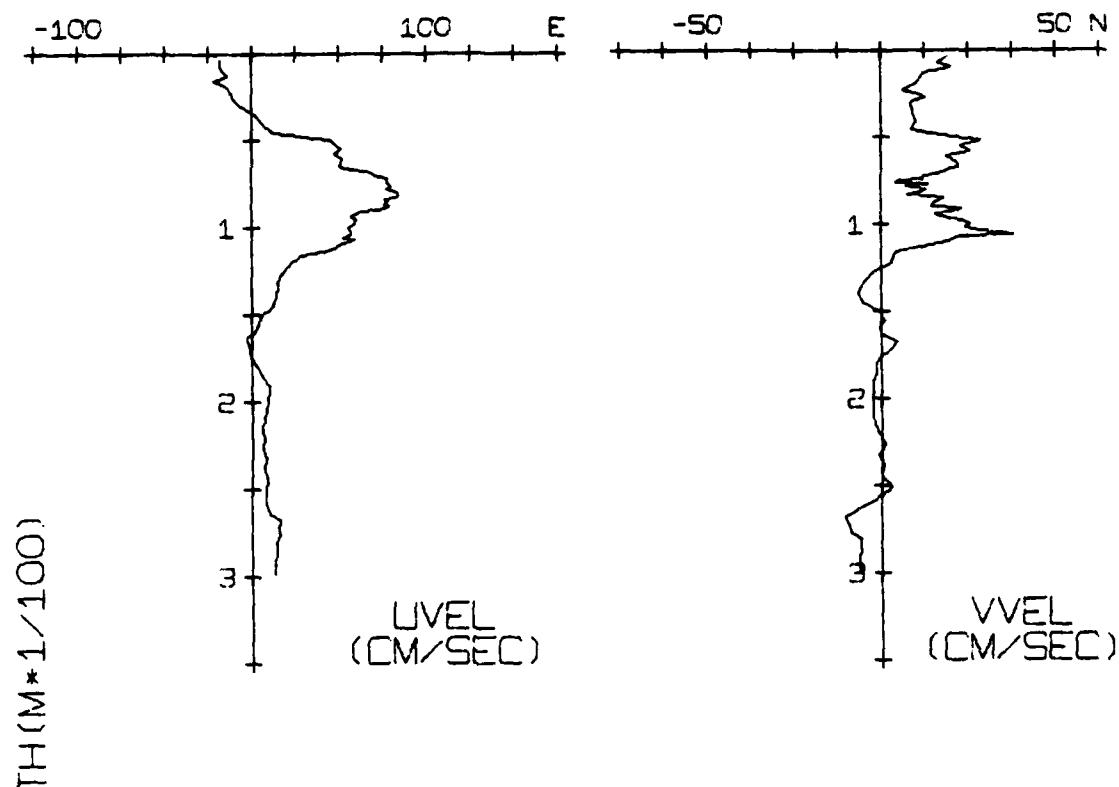


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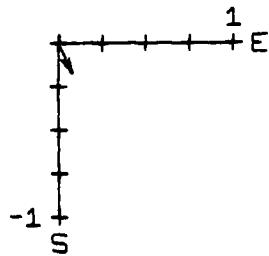


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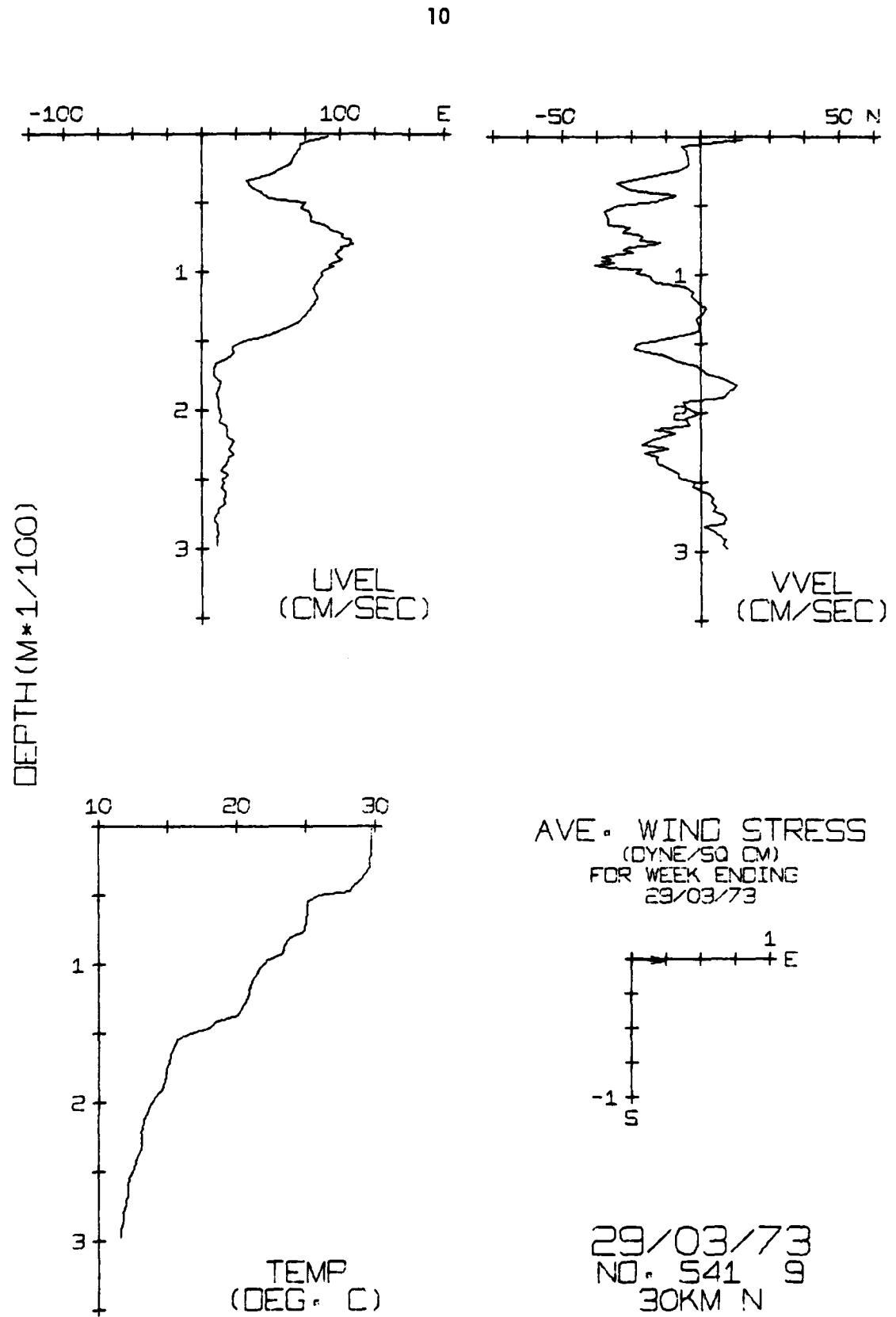
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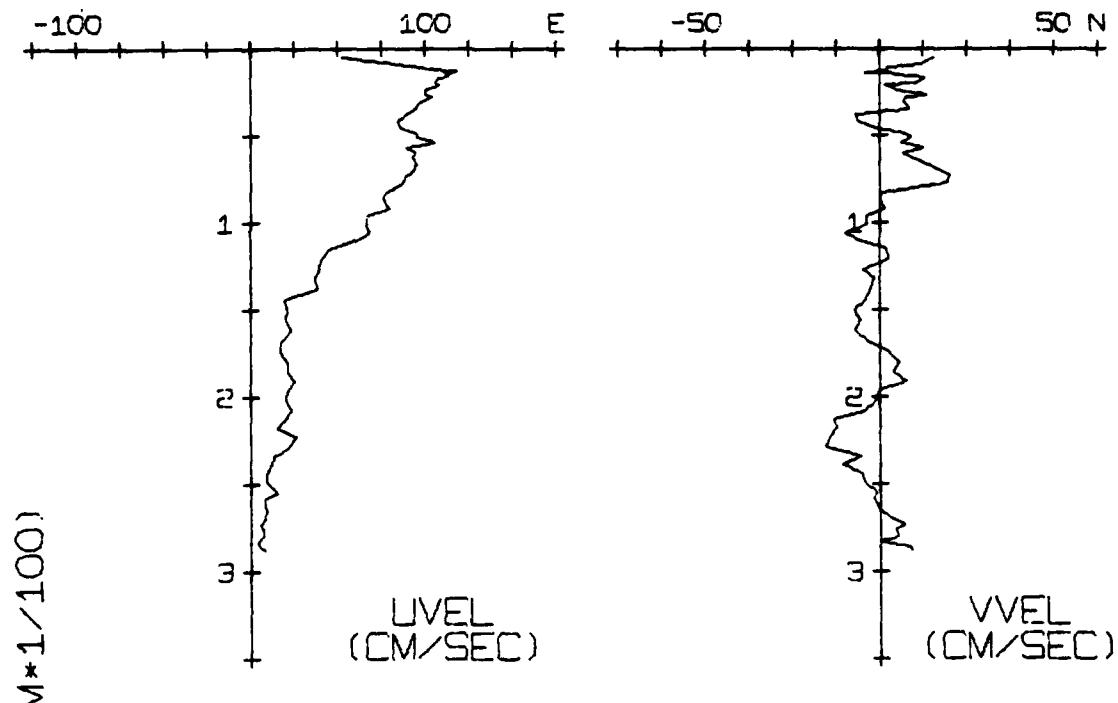


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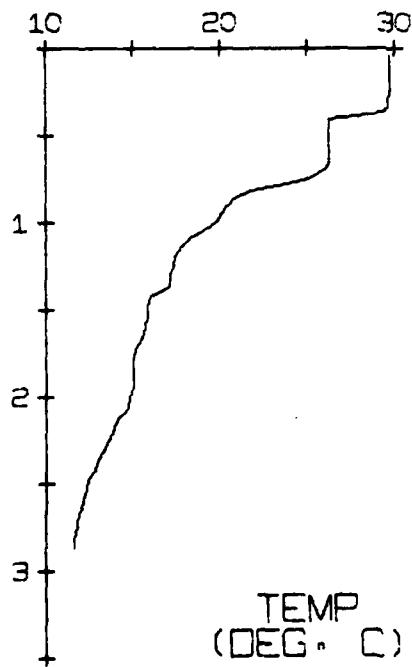


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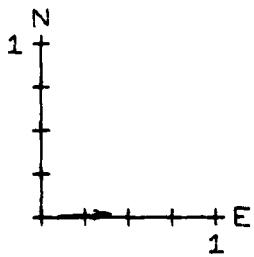




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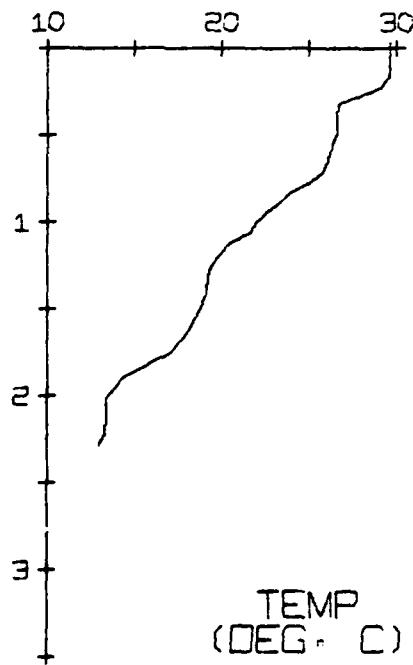
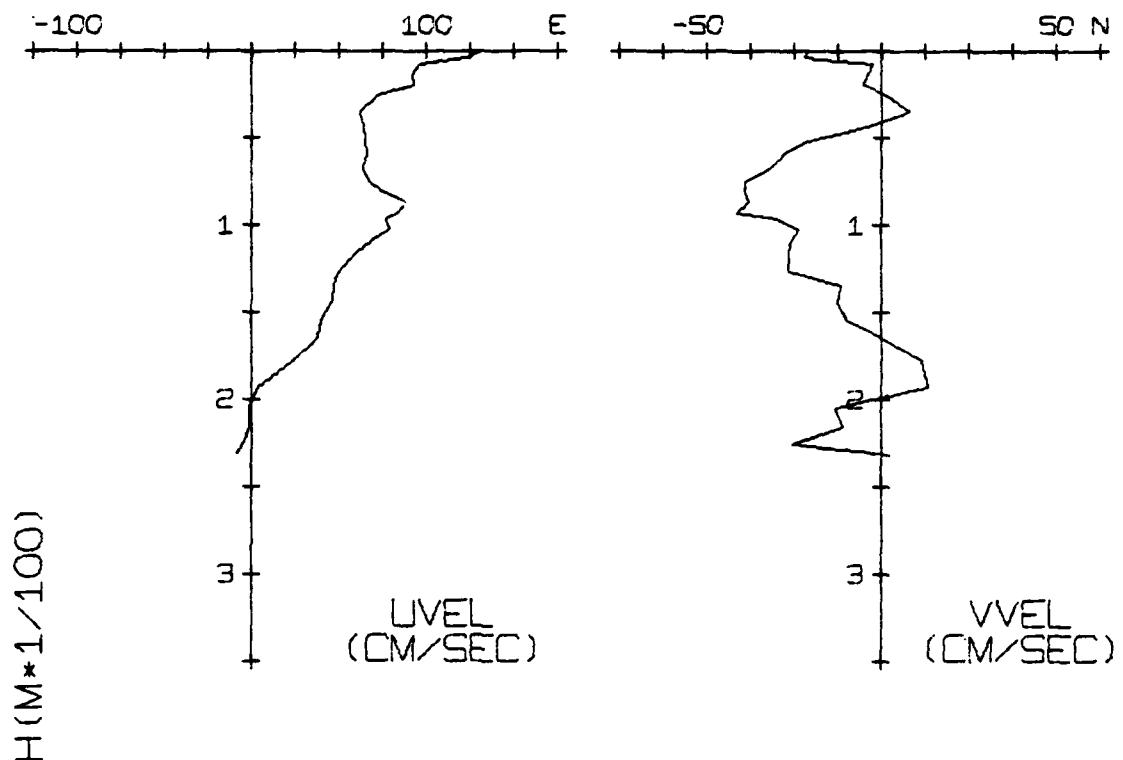


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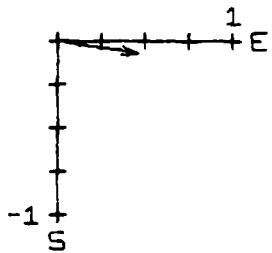


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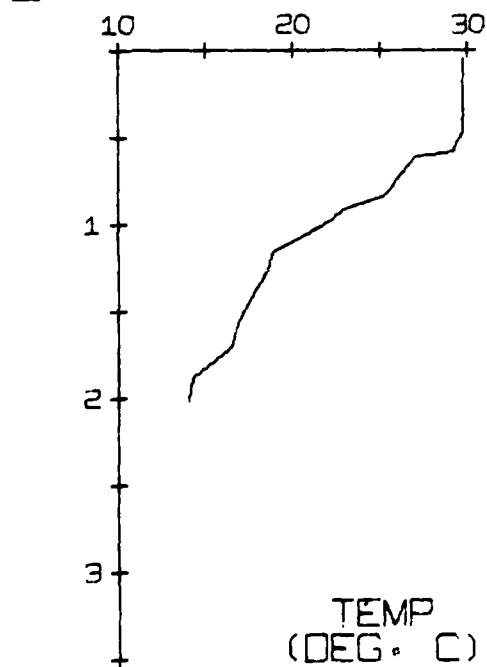
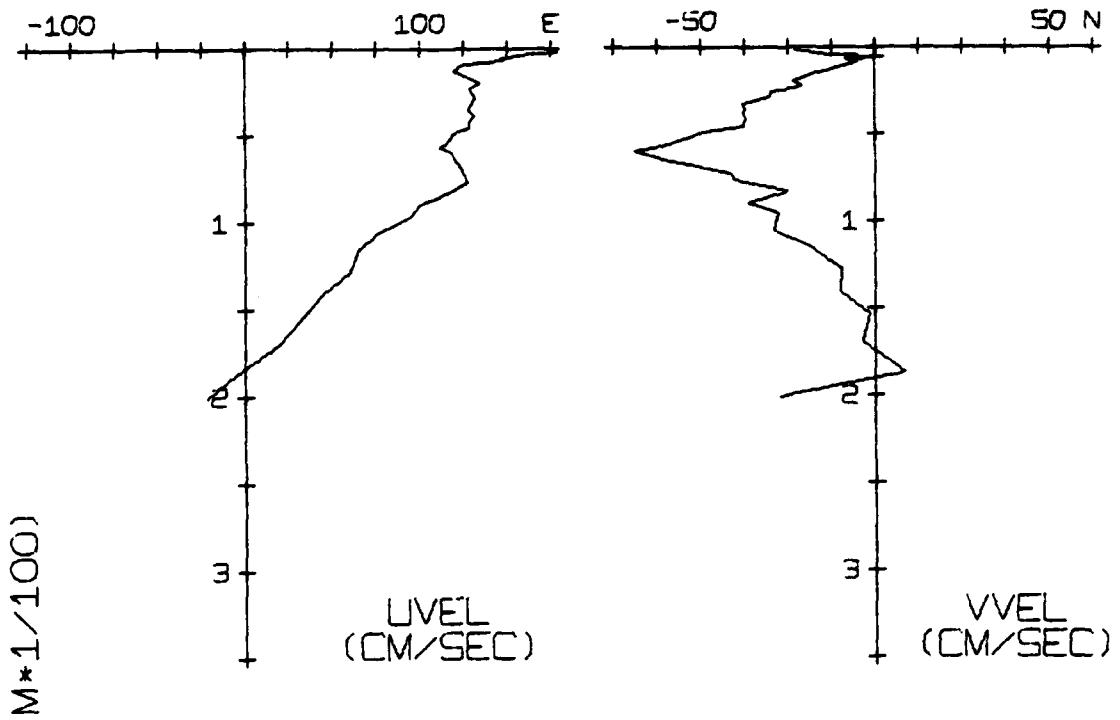
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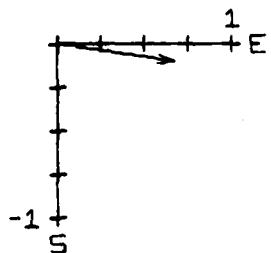
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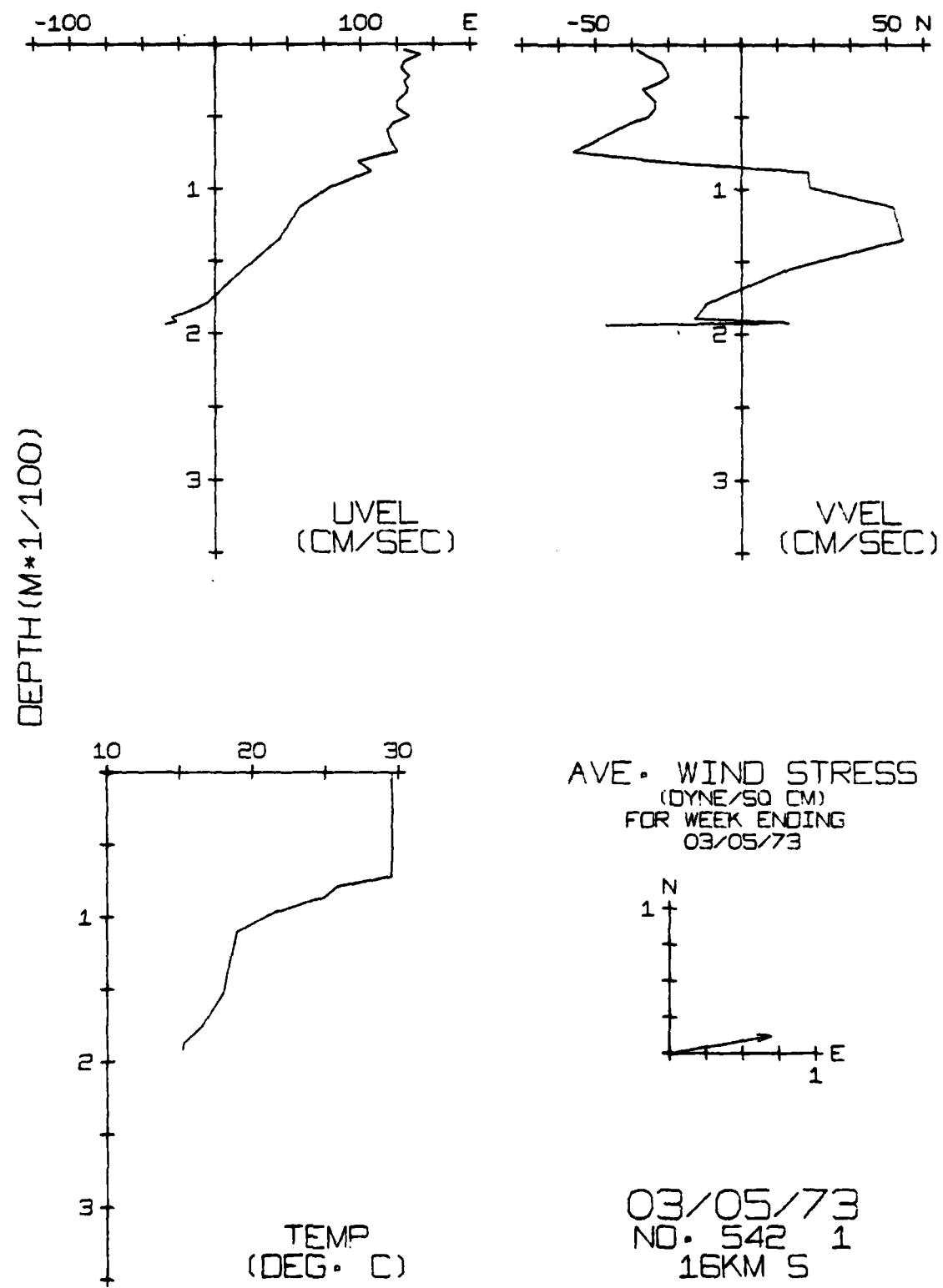
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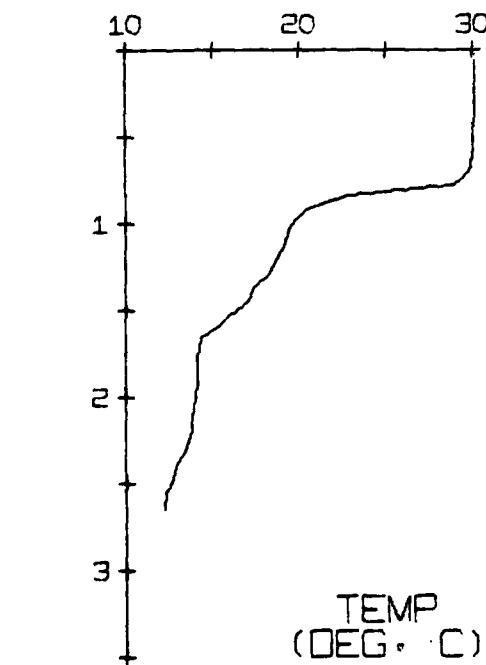
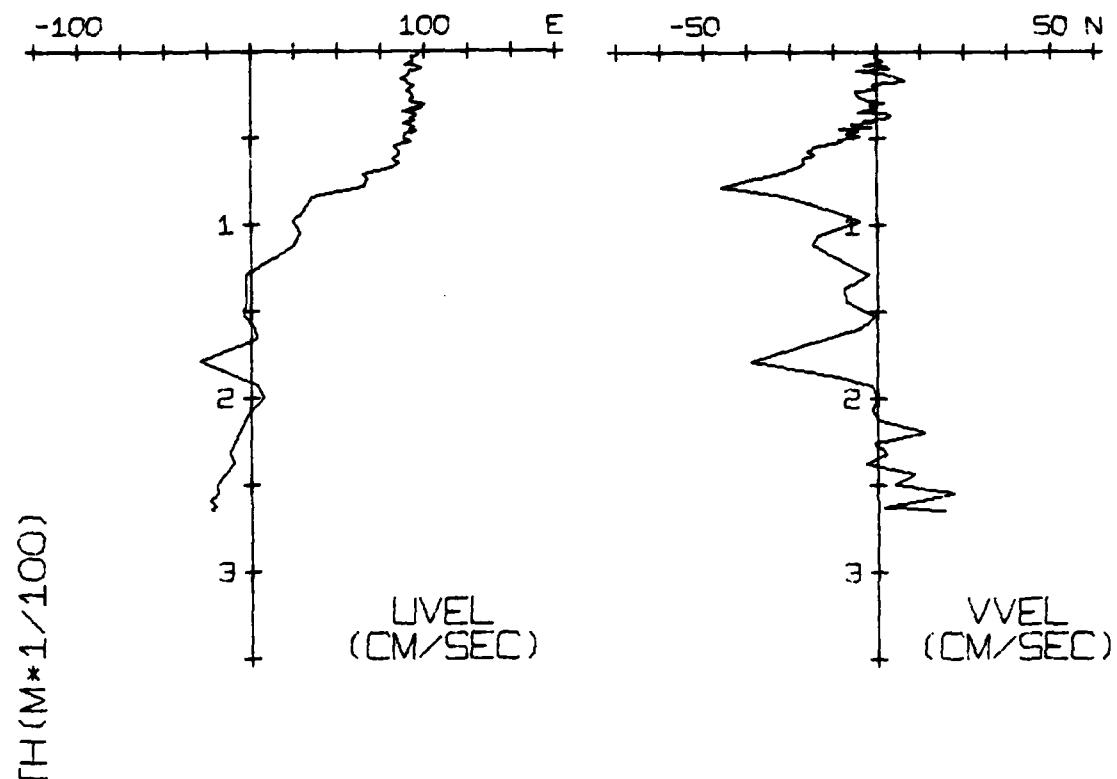


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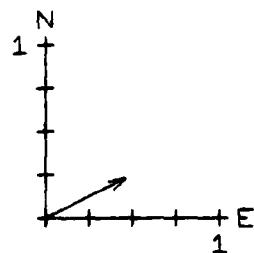


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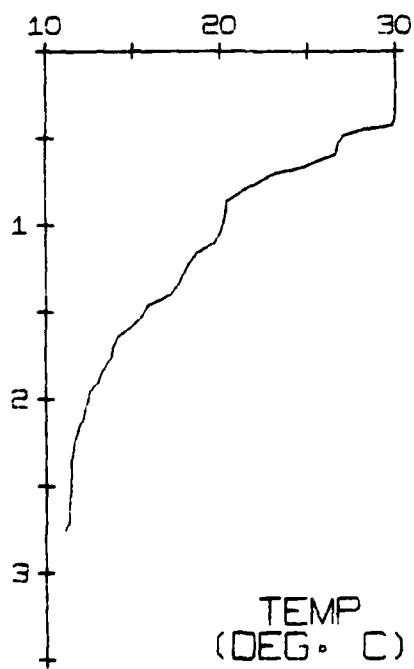
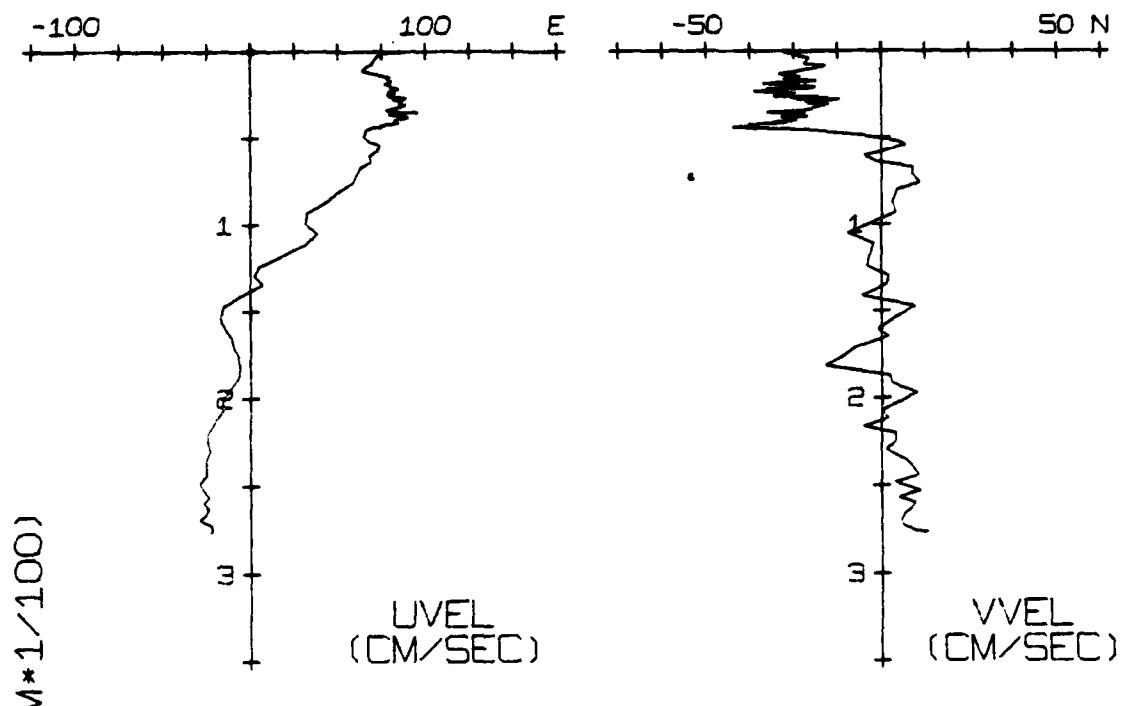




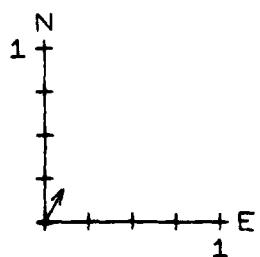
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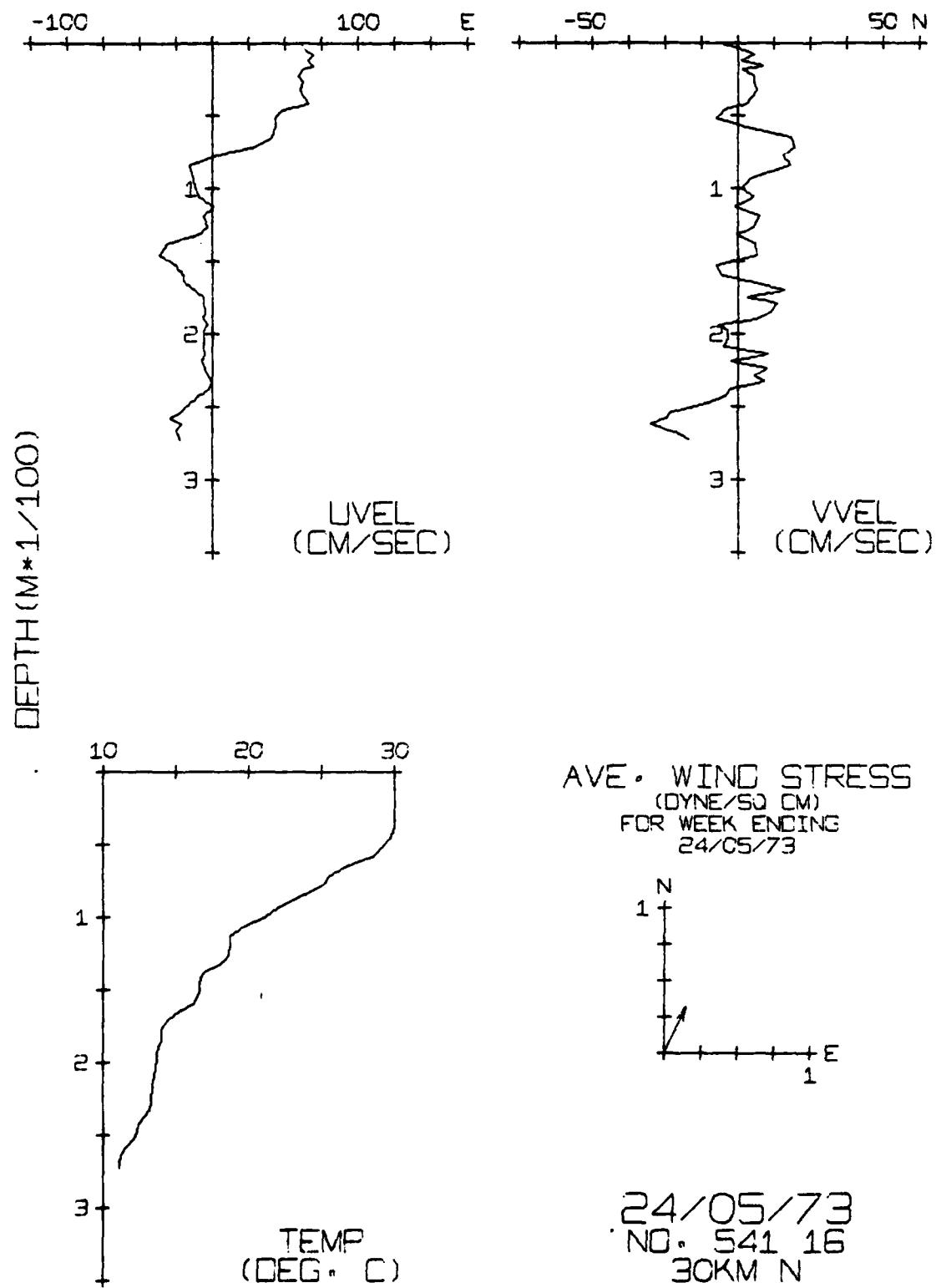
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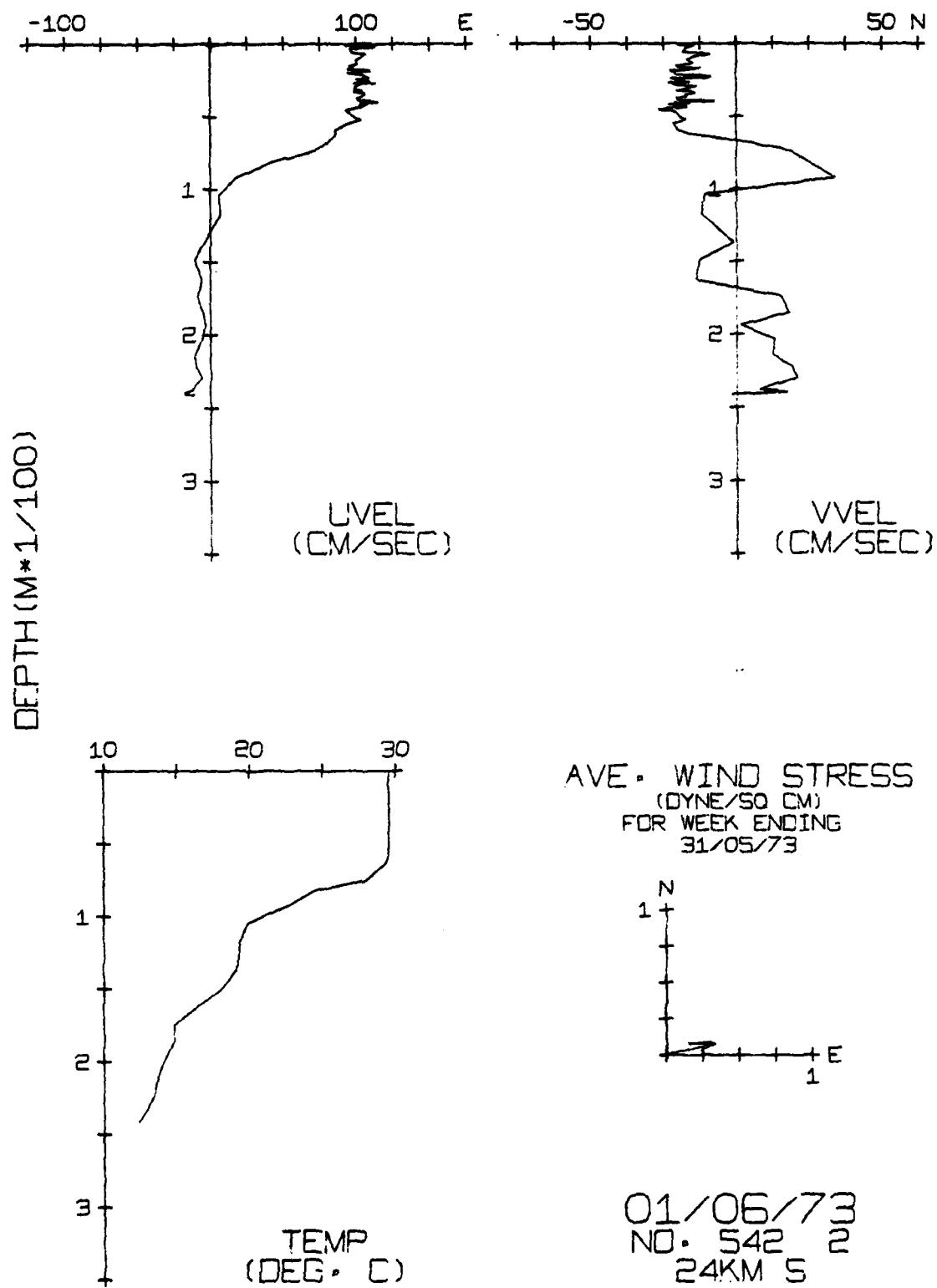
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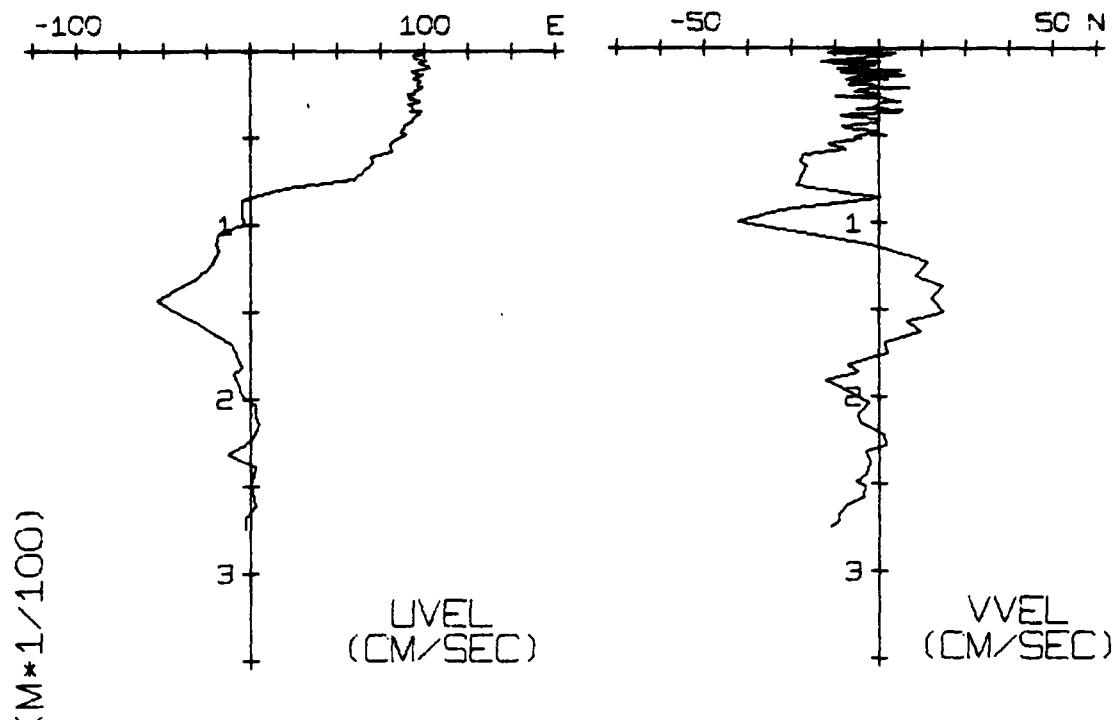


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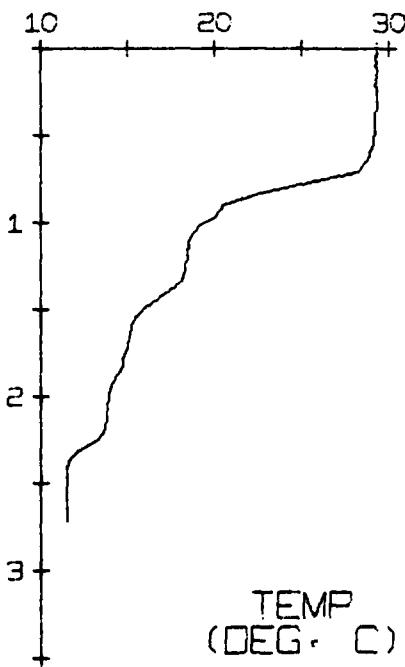


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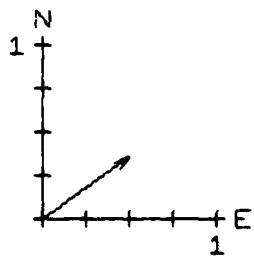




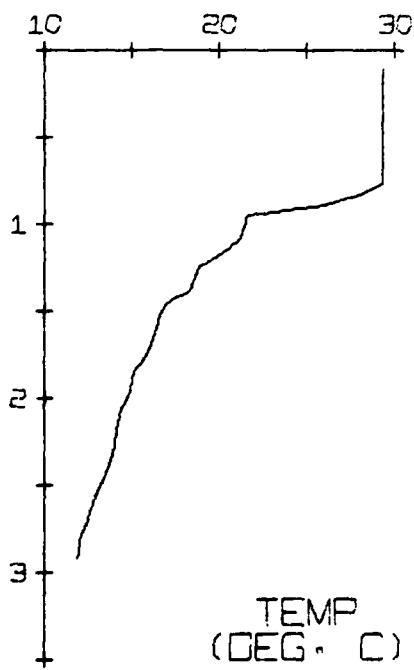
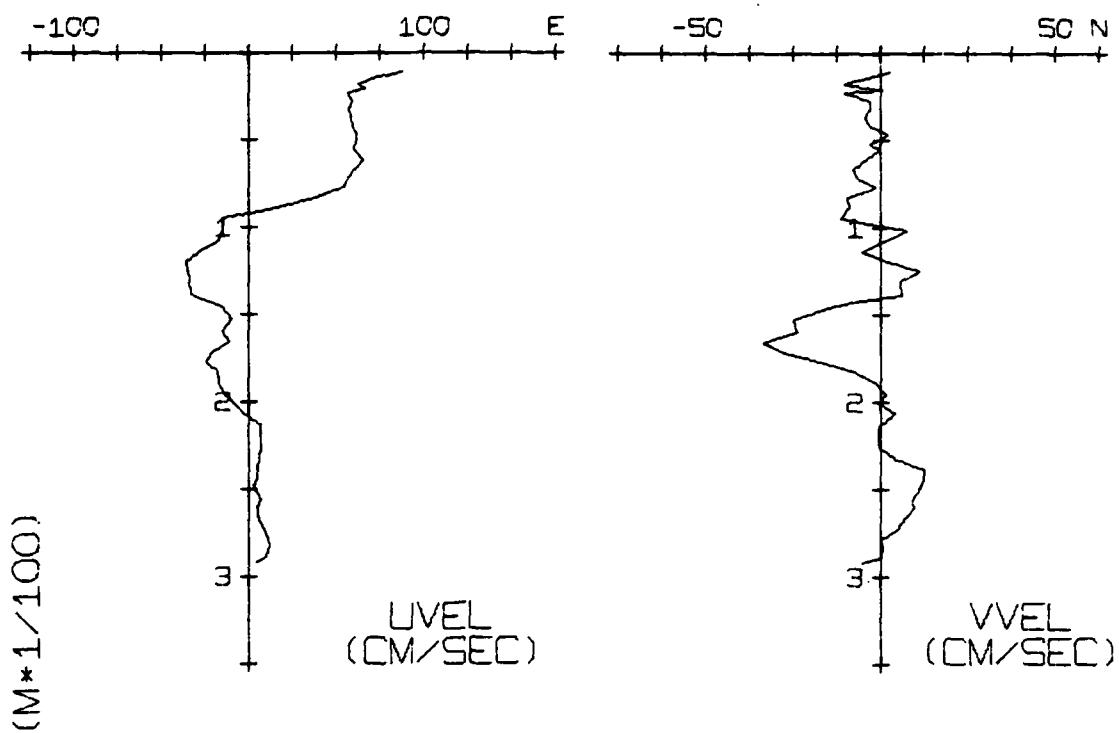
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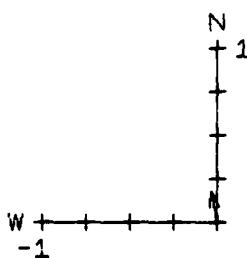
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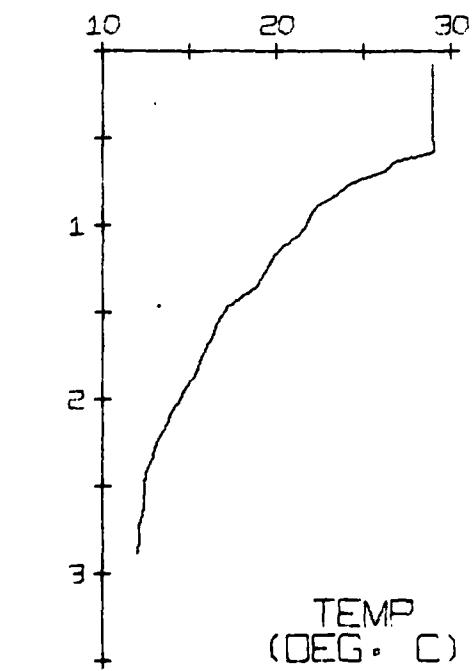
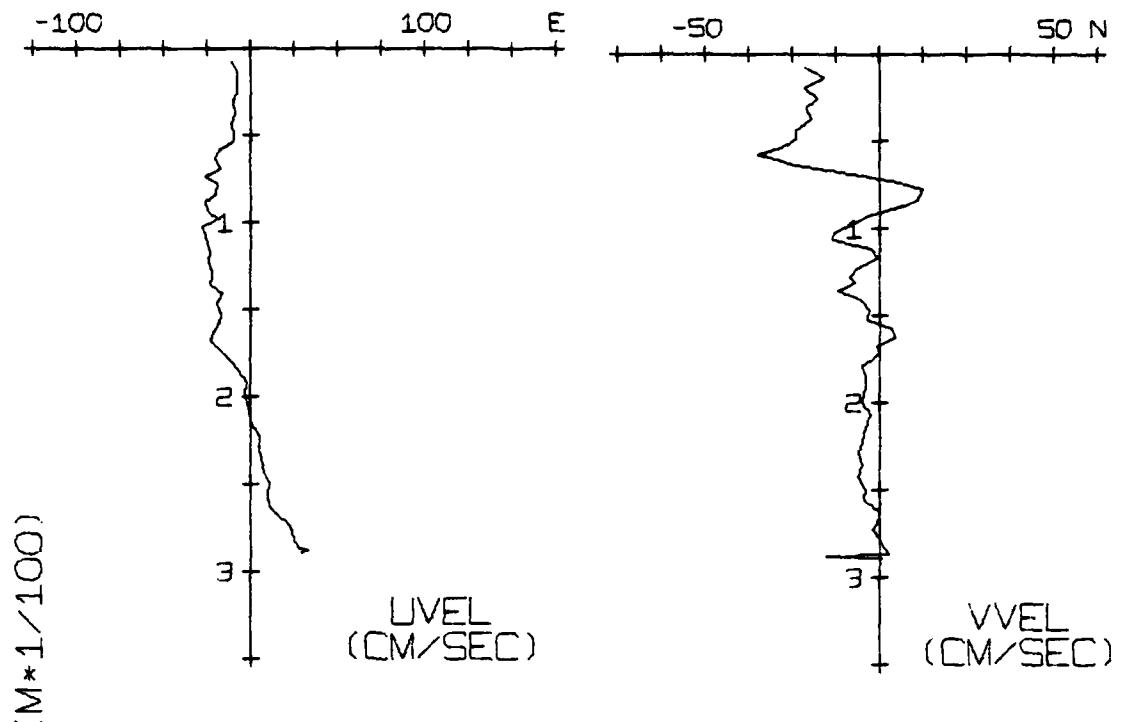
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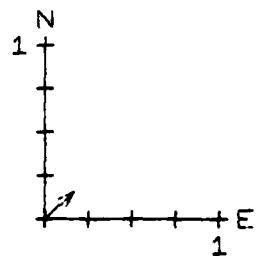
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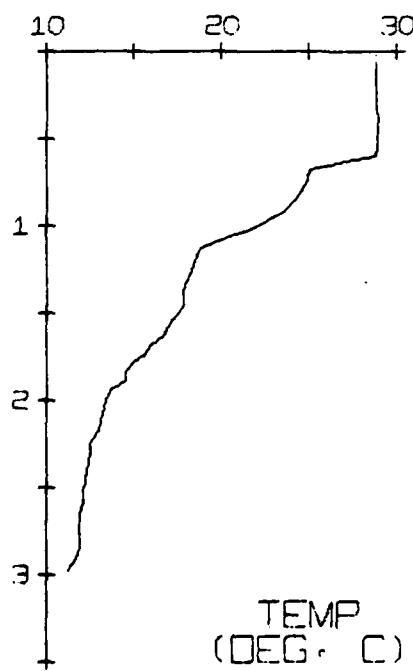
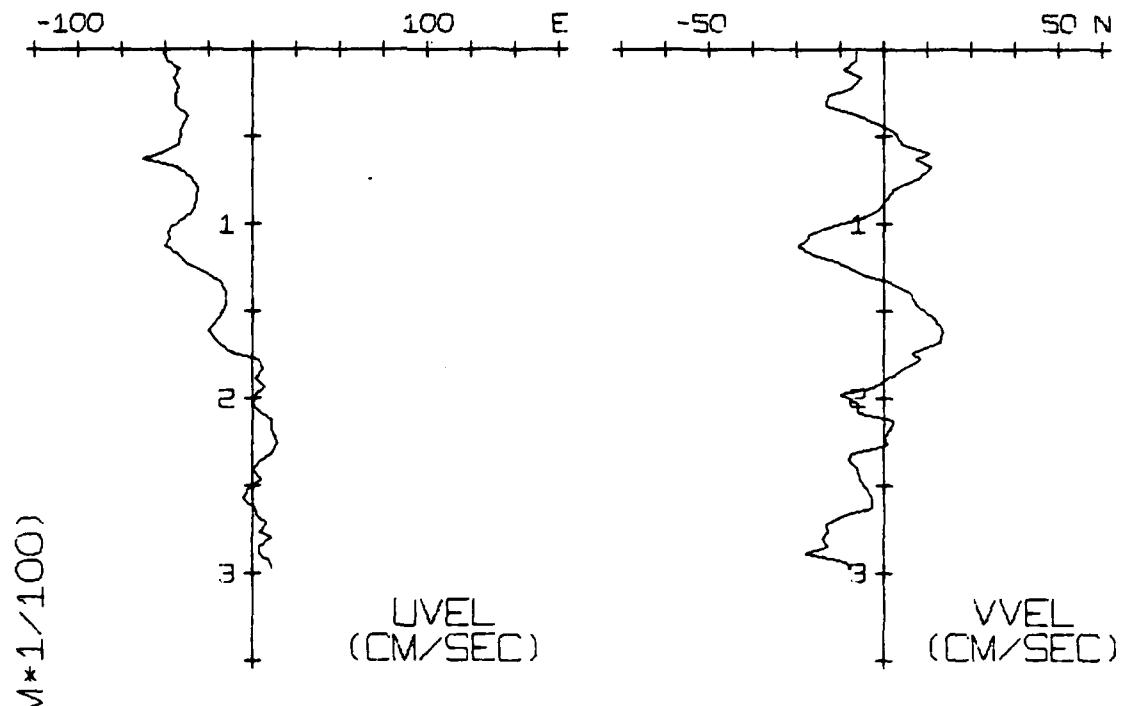
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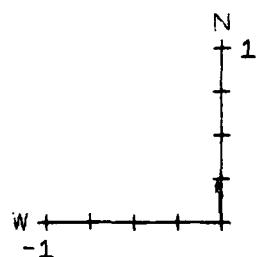
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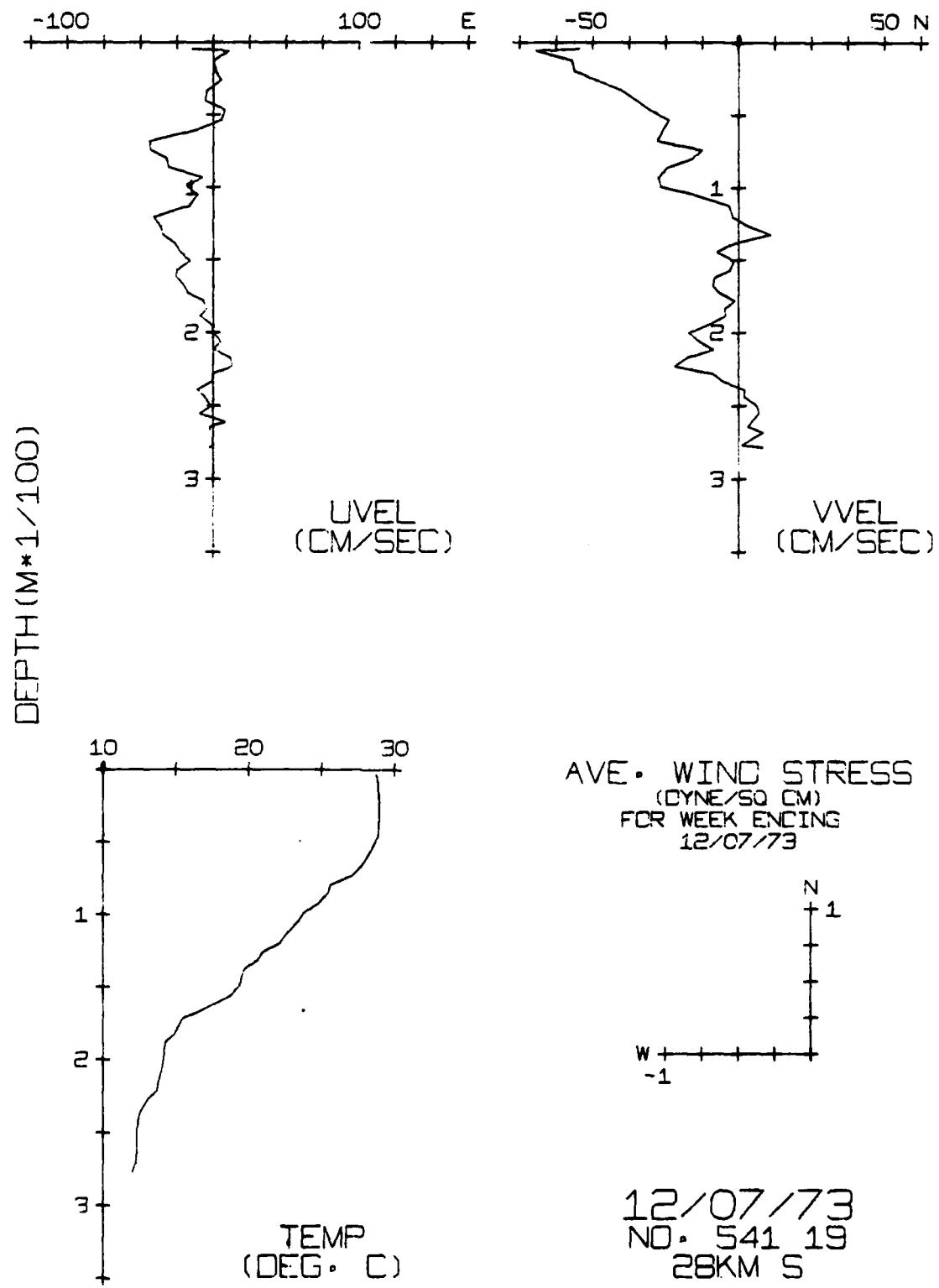
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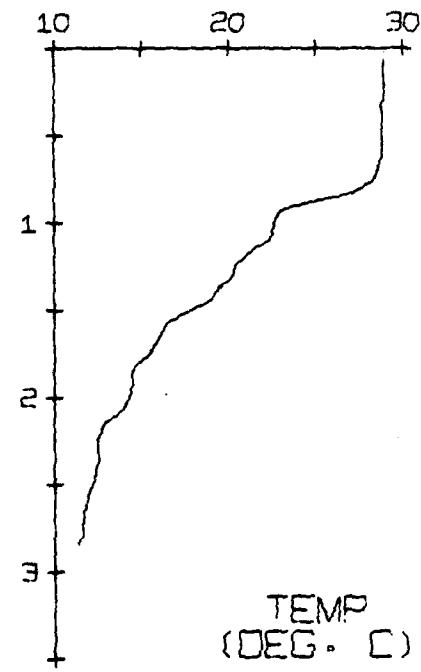
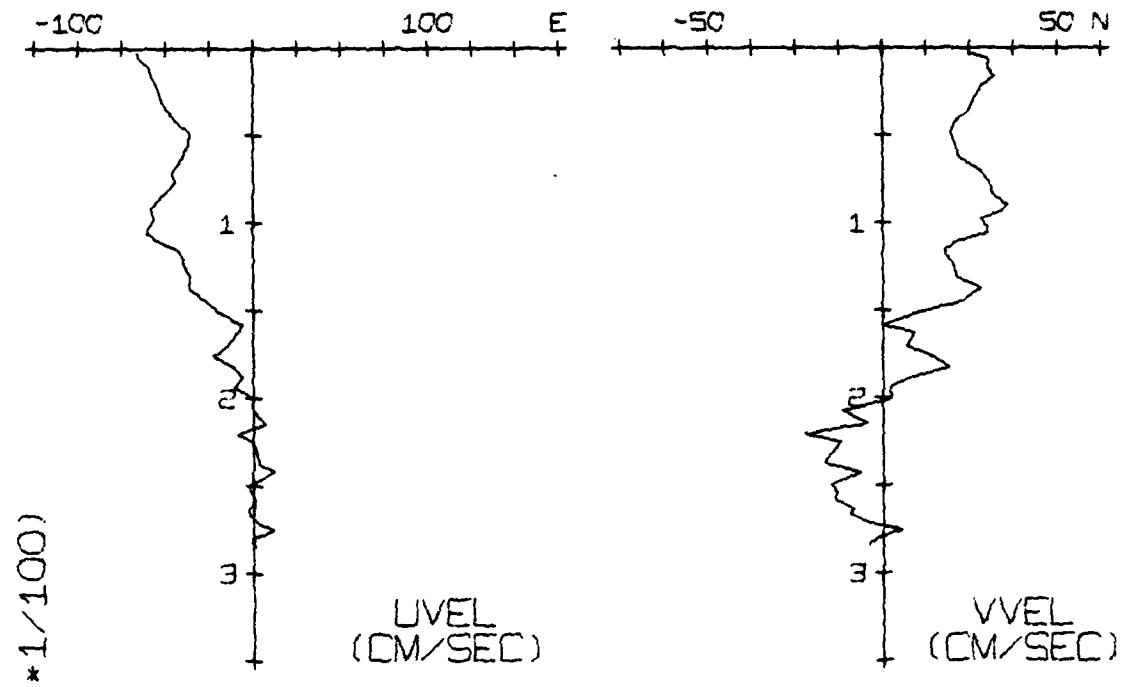


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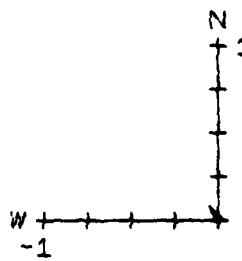


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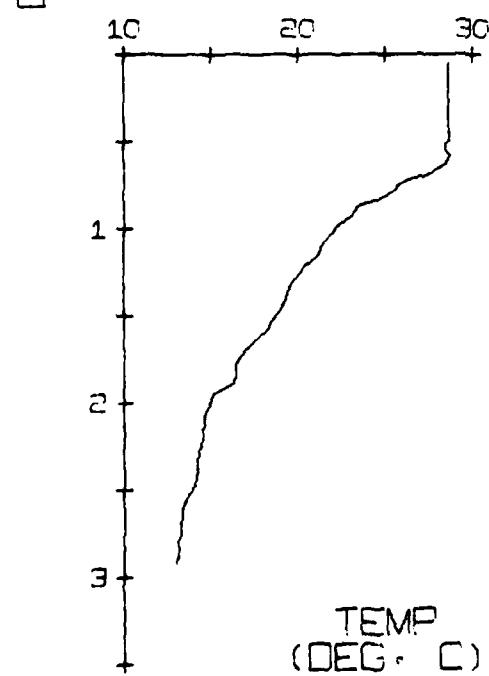
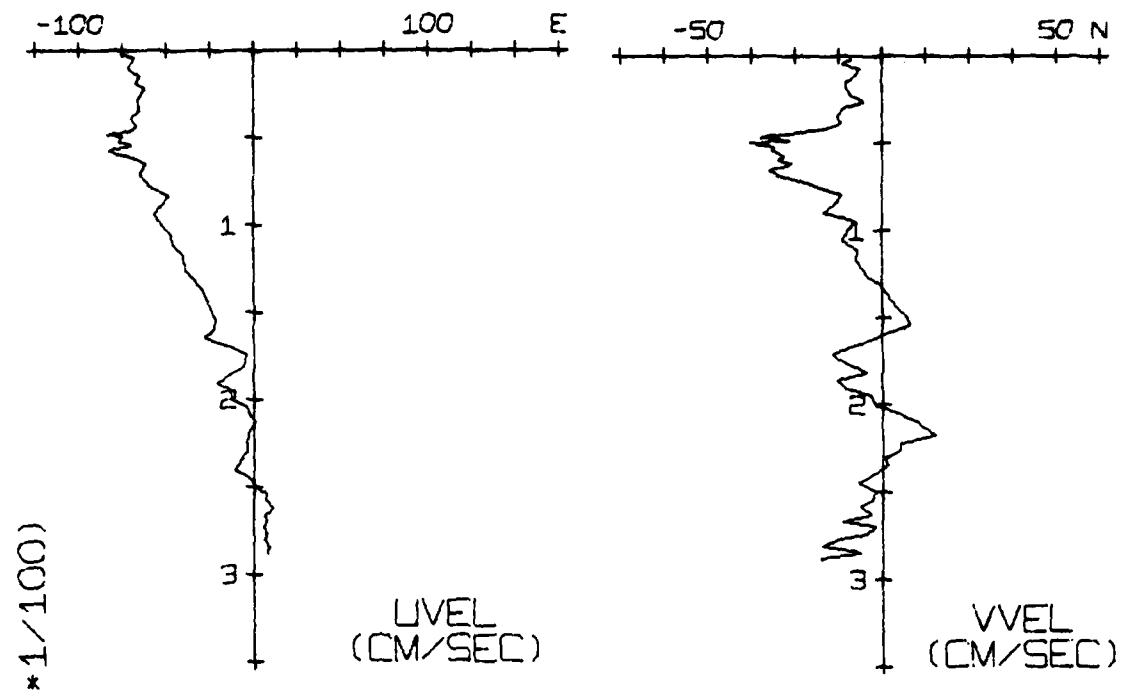




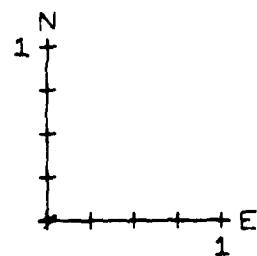
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
19/07/73



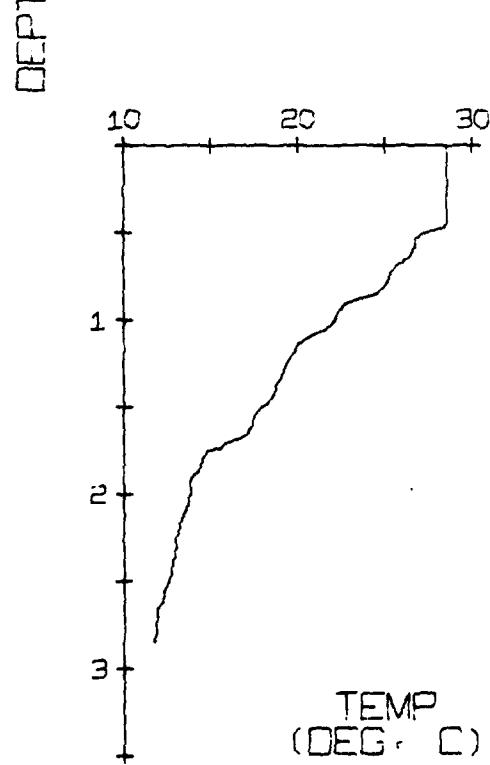
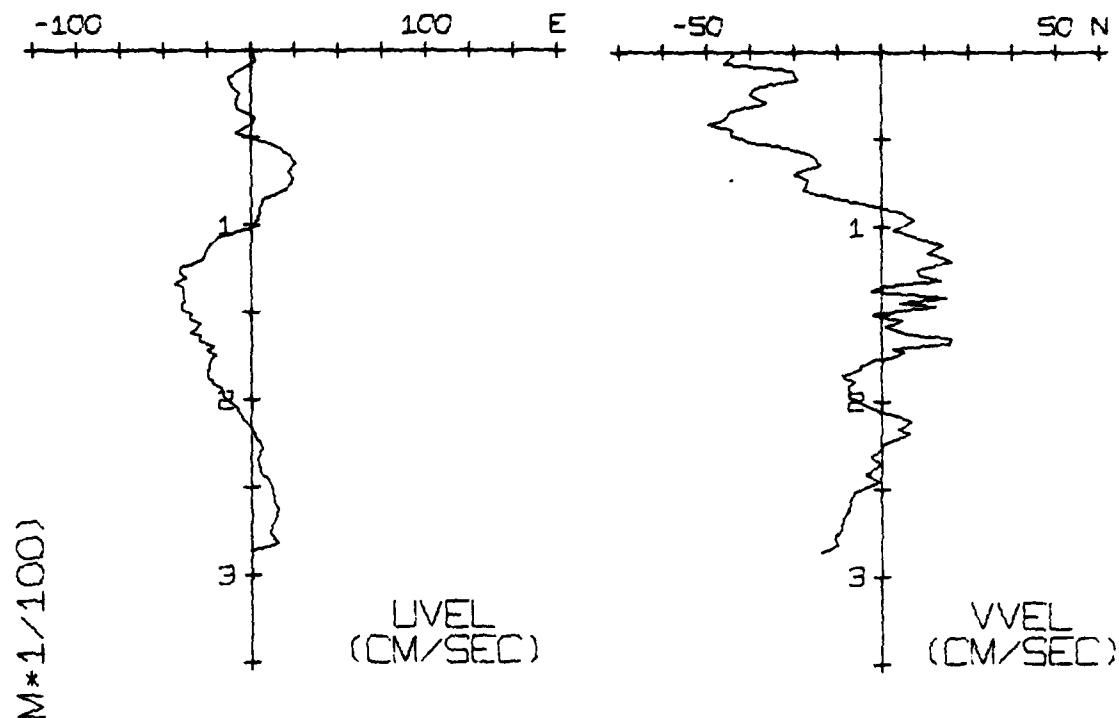
19/07/73
NO. 541 20
30KM N



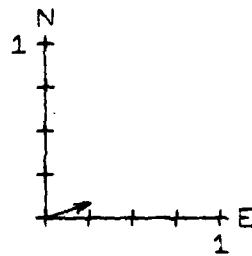
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
26/07/73



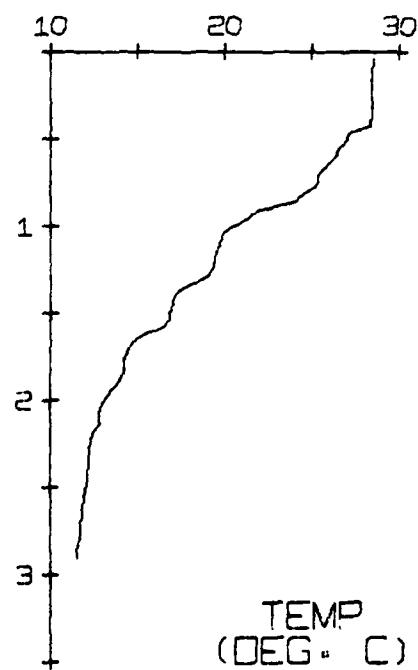
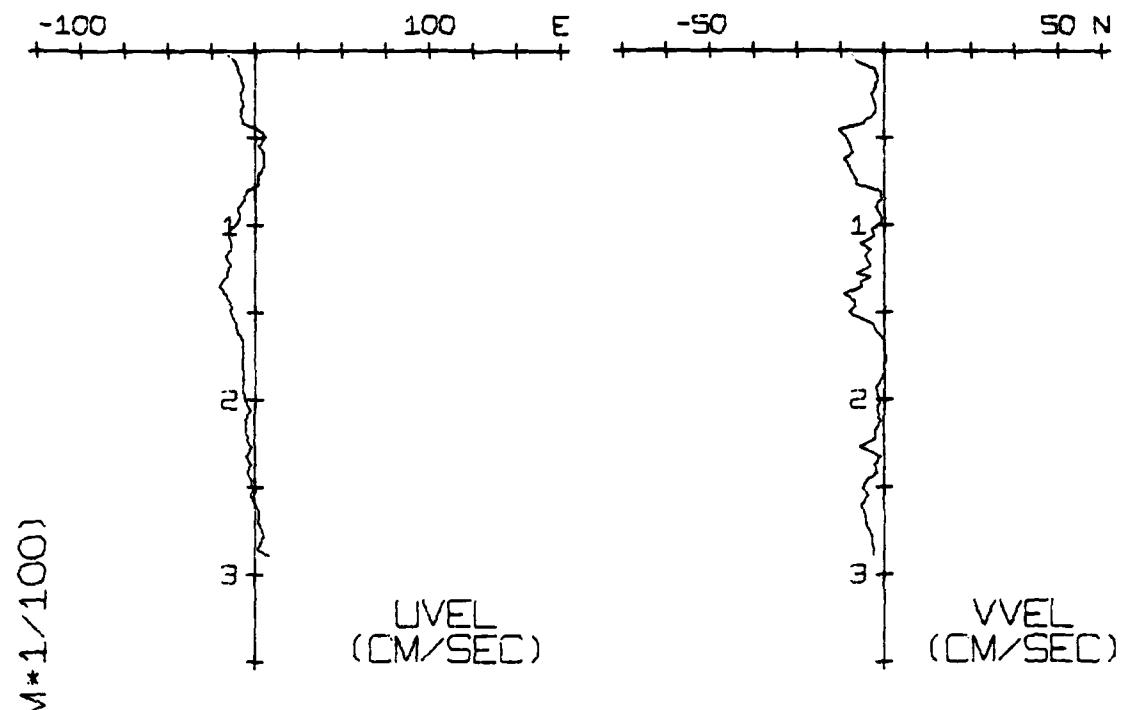
25/07/73
NO. 541 22
24KM S



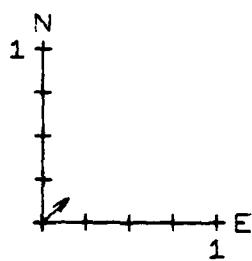
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
02/08/73



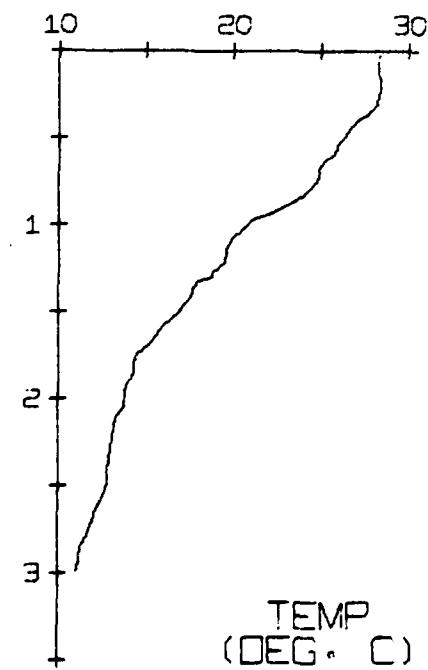
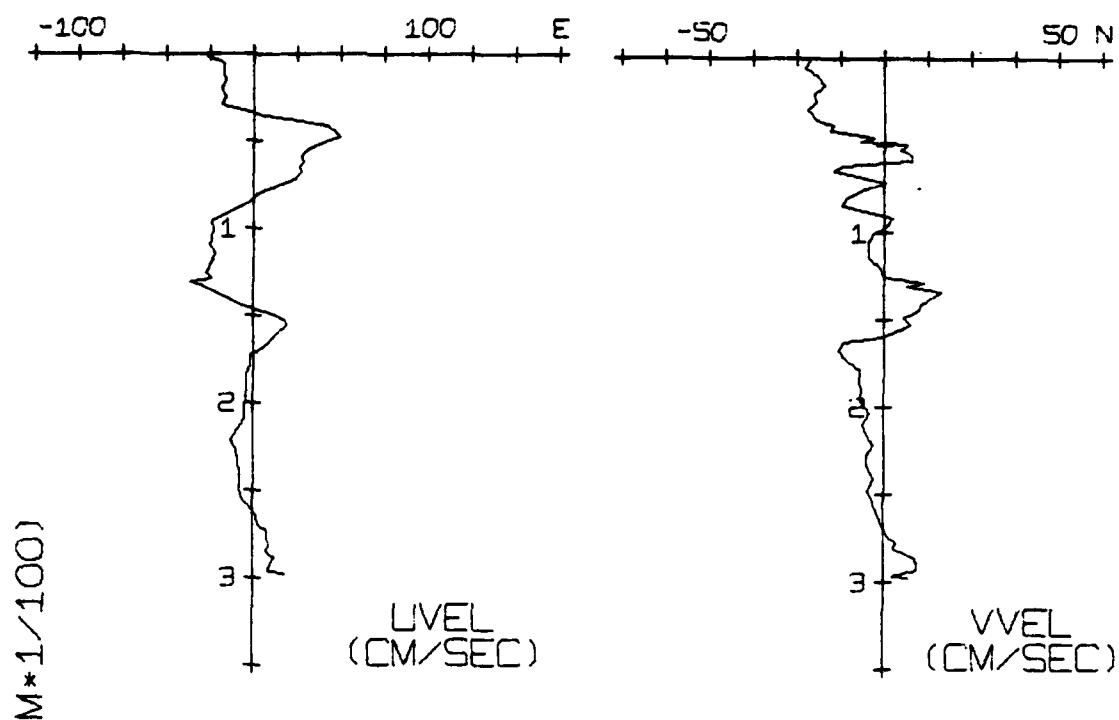
02/08/73
NO. 541 23
30KM N



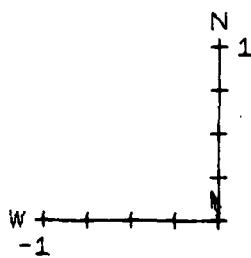
AVE. WIND STRESS
(DYNE/50 CM)
FOR WEEK ENDING
09/08/73



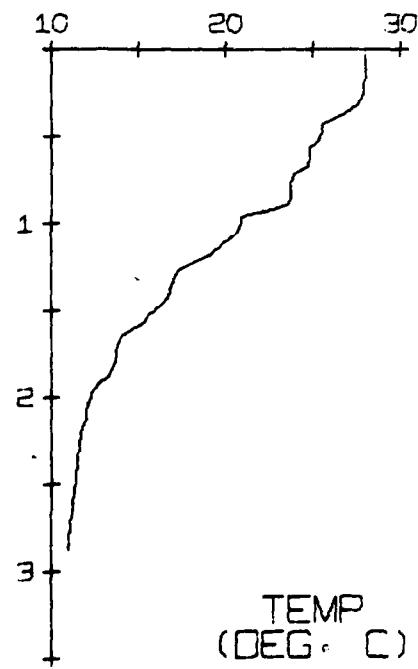
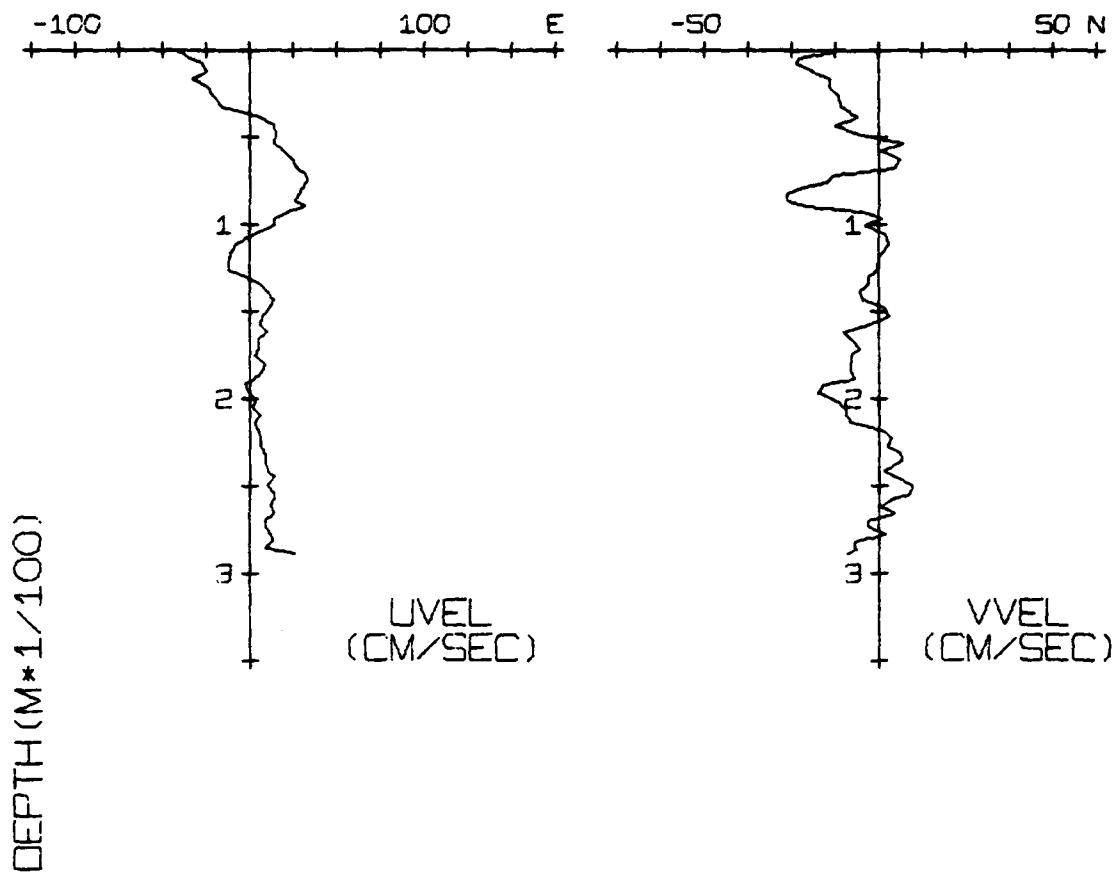
09/08/73
NO. 541 24
24KM S



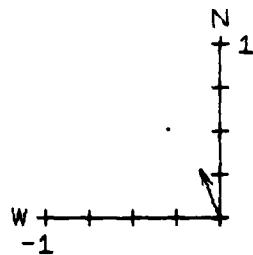
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
16/08/73



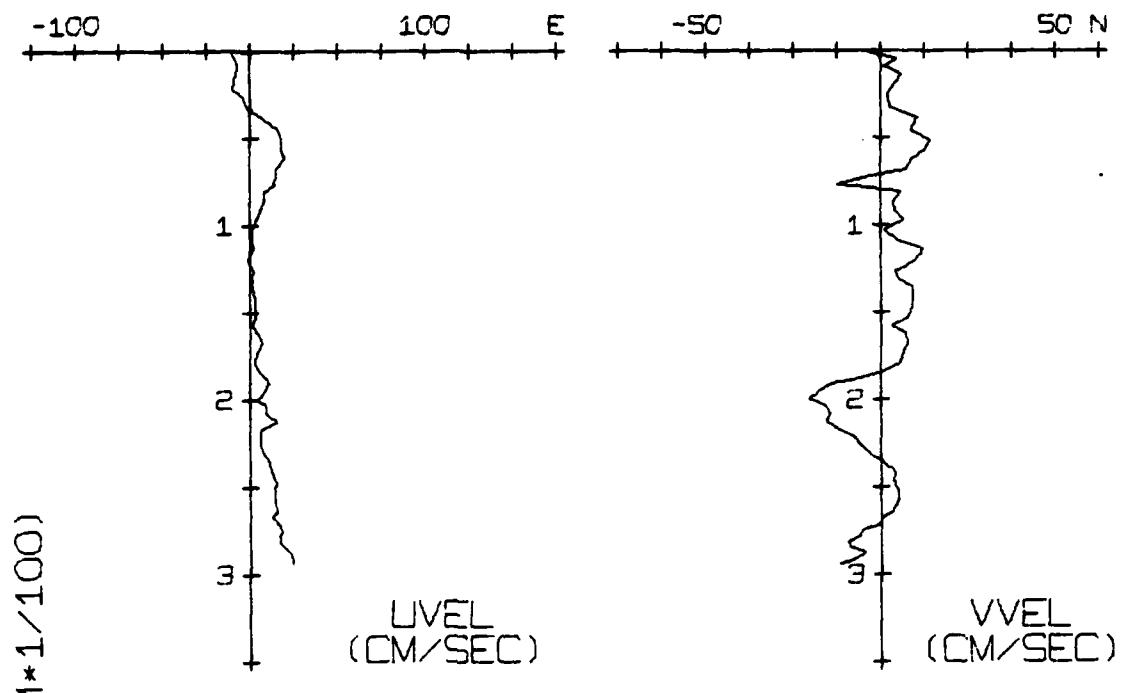
16/08/73
NO. 541 25
30KM N



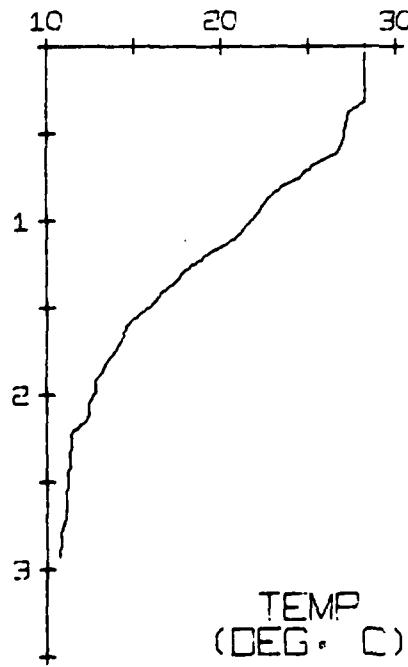
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
30/08/73



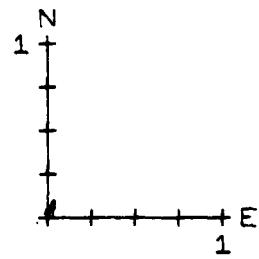
30/08/73
NO. 541 27
30KM N



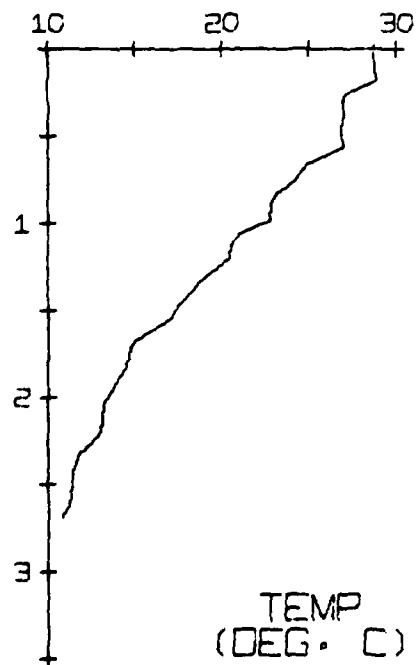
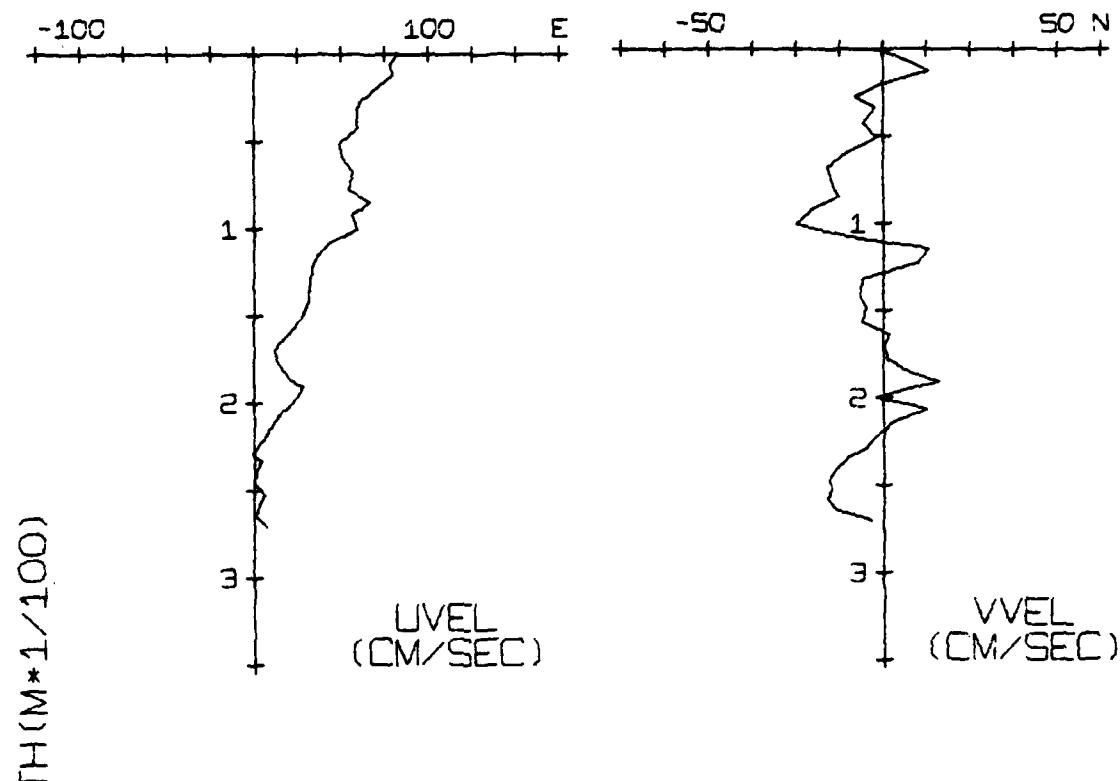
DEPTH (M * 1/100)

UVEL
(CM/SEC)VVEL
(CM/SEC)TEMP
(DEG. C)

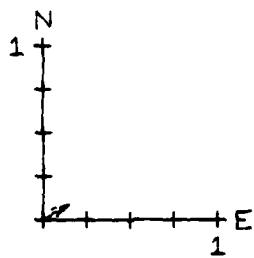
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
06/09/73



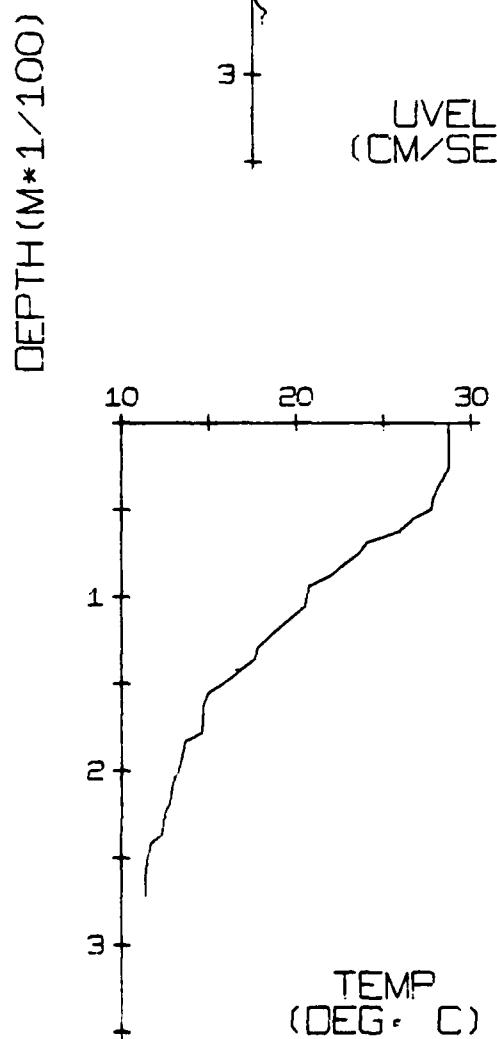
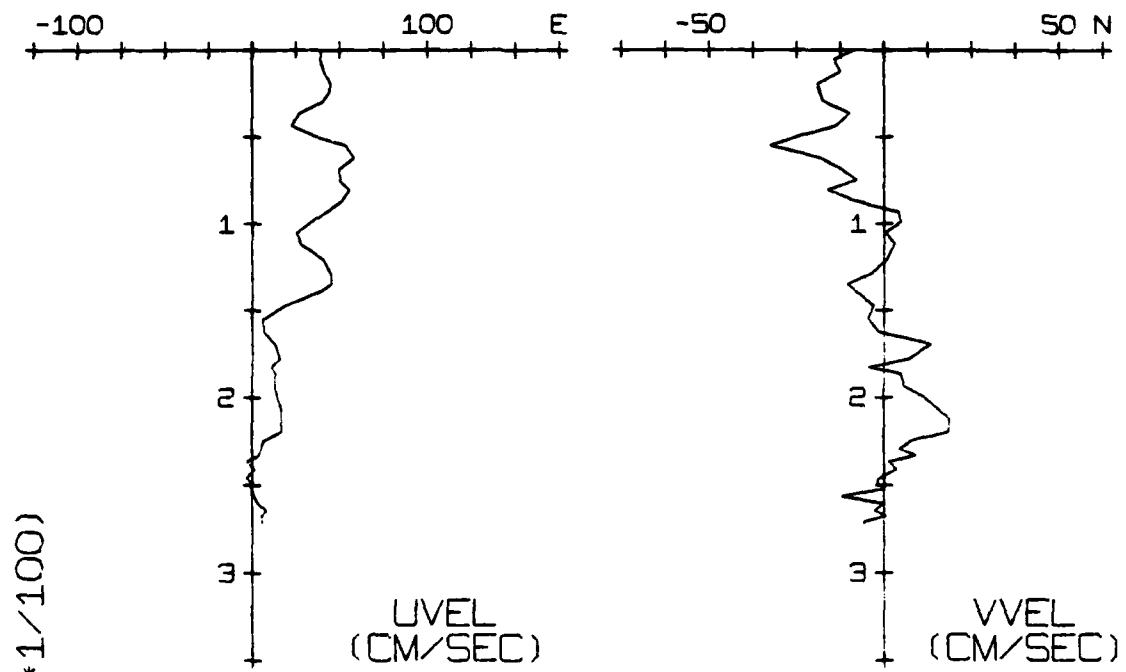
06/09/73
NO. 541 28
24KM N



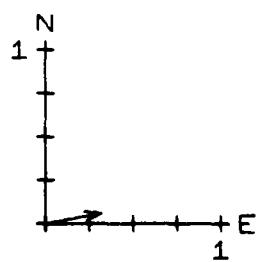
AVE. WIND STRESS
(CYNE/SQ CM)
FOR WEEK ENDING
13/09/73



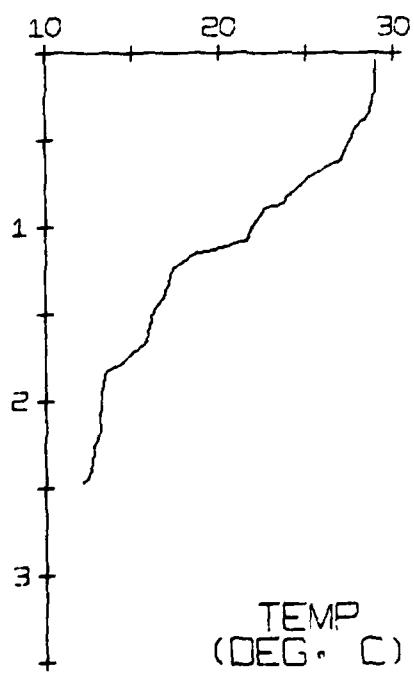
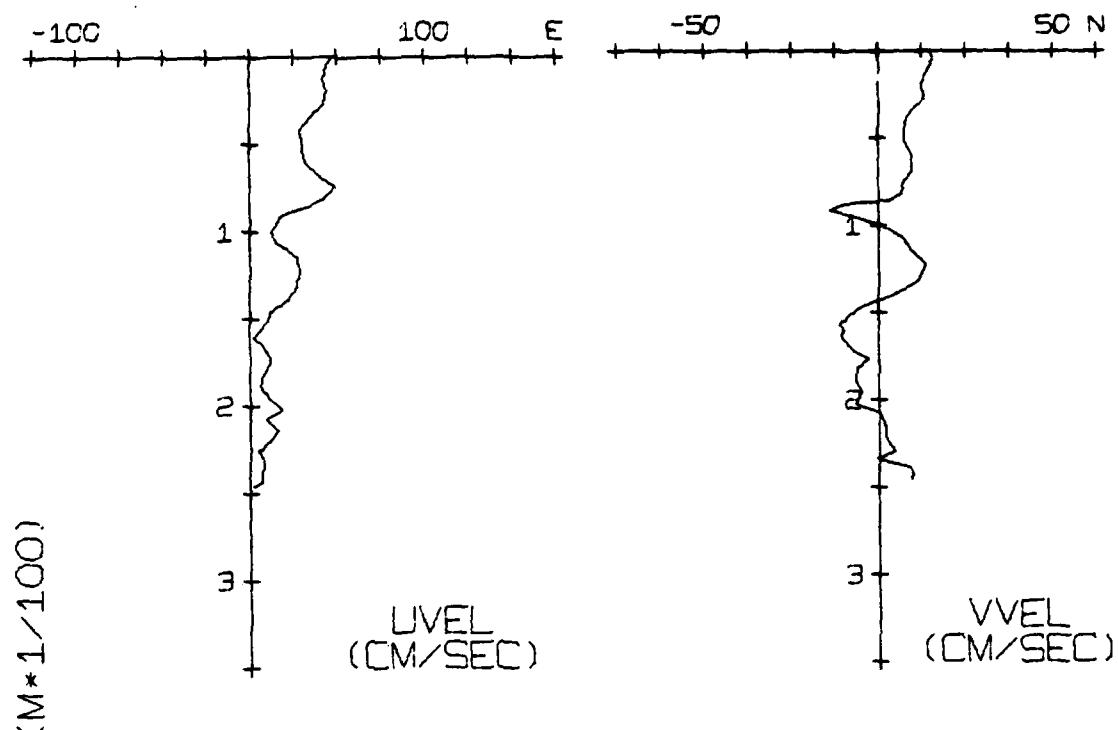
13/09/73
NO. 542 6
30KM N



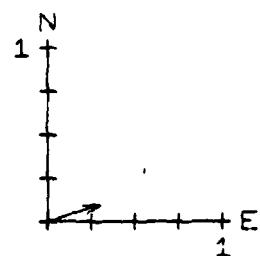
AVE. WIND STRESS
(DYN/50 CM)
FOR WEEK ENDING
20/09/73



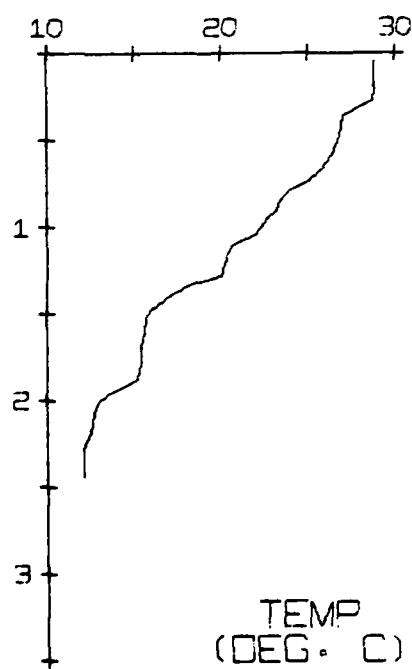
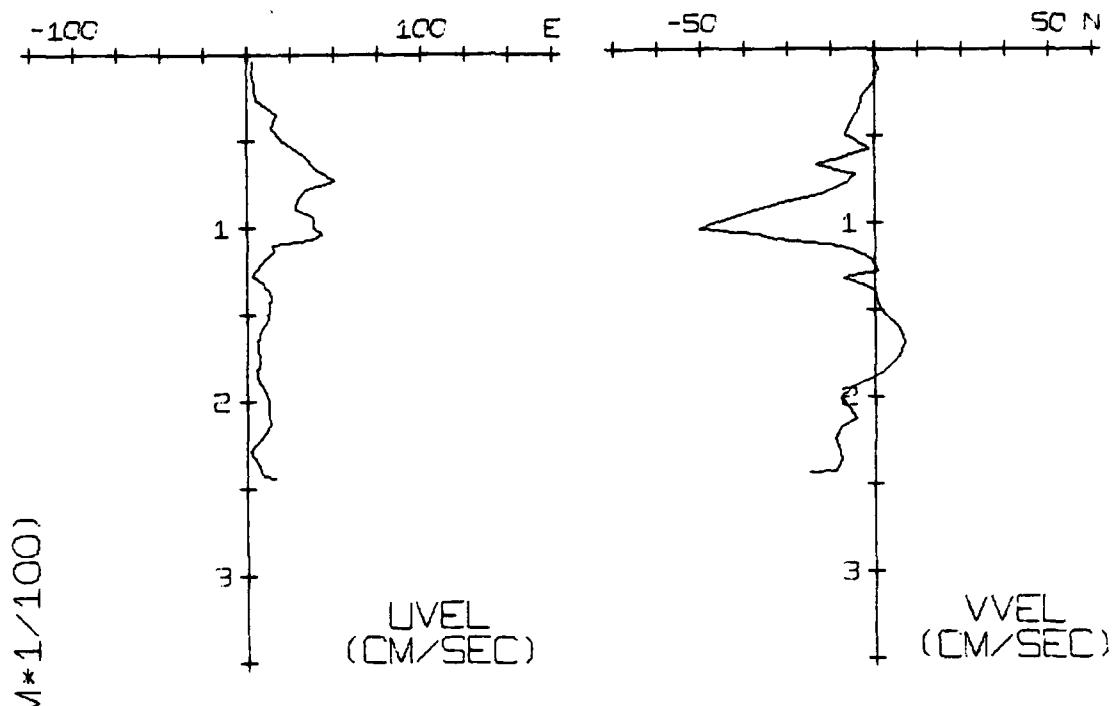
20/09/73
NO. 542 7
26KM S



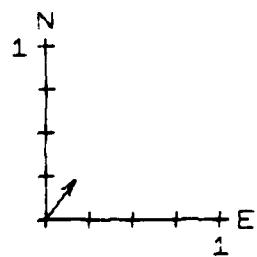
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
27/09/73



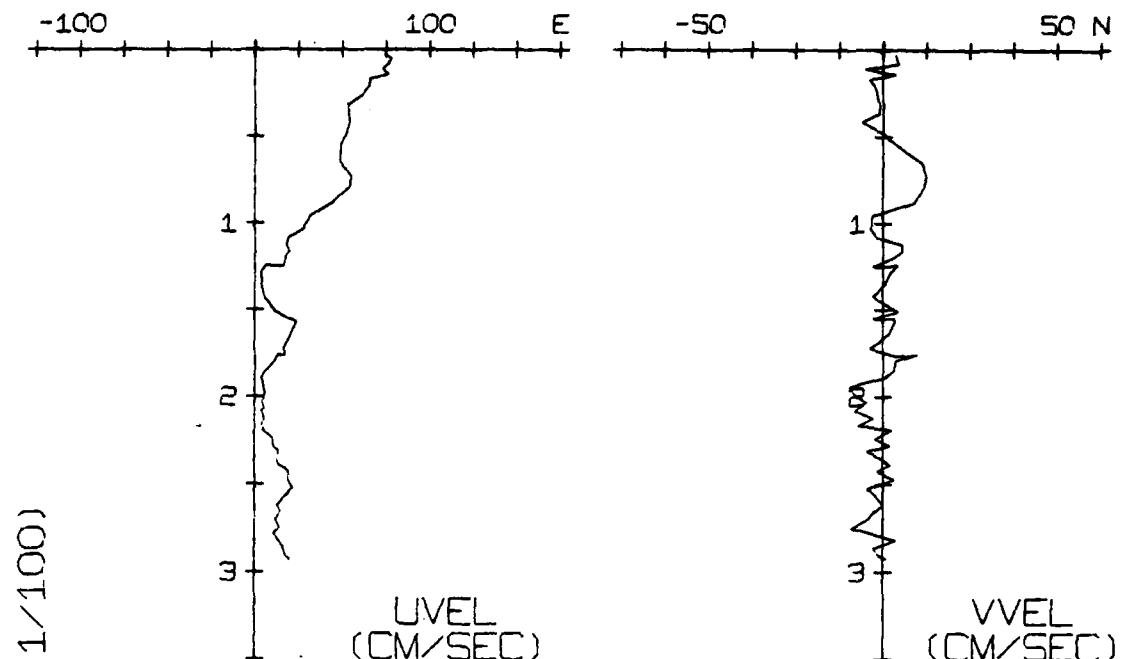
28/09/73
NO. 542 8
30KM N



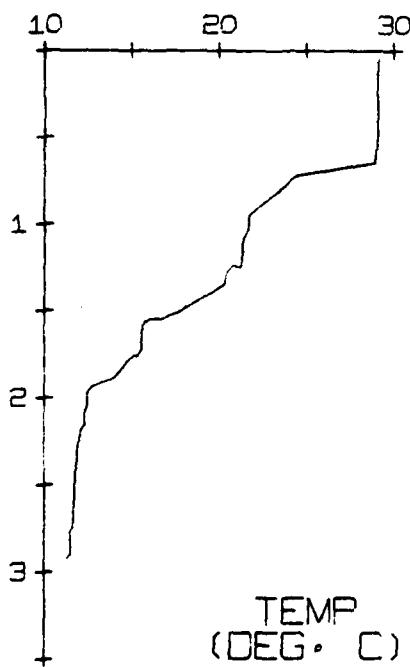
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
04/10/73



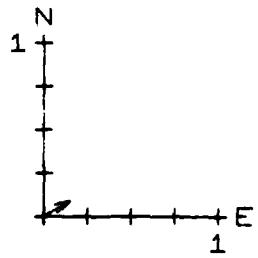
05/10/73
NO. 542 9
24KM S



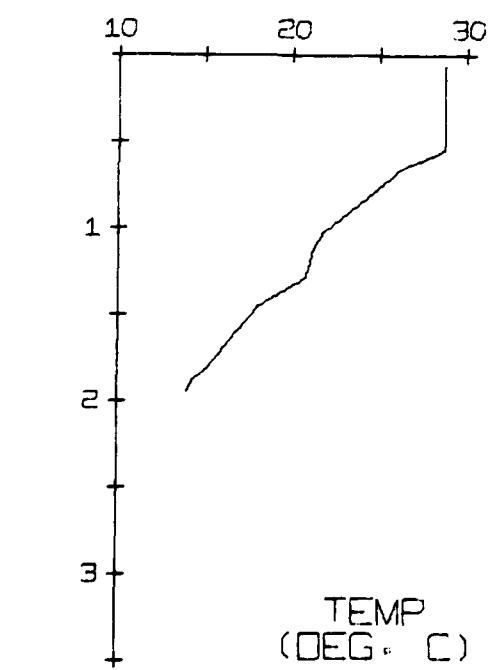
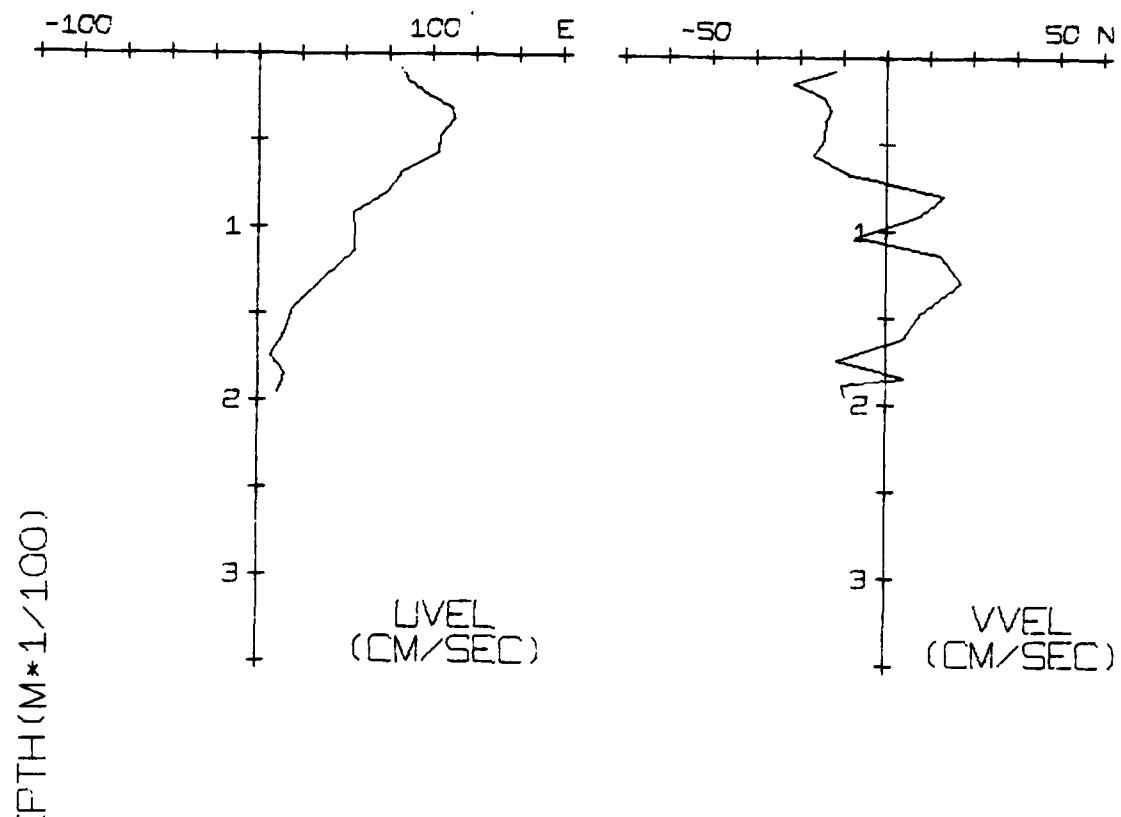
DEPTH (M * 1/100)

TEMP
(DEG. C)

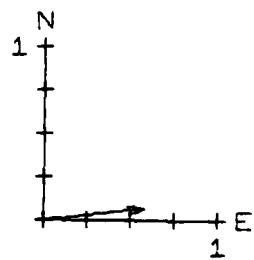
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
11/10/73



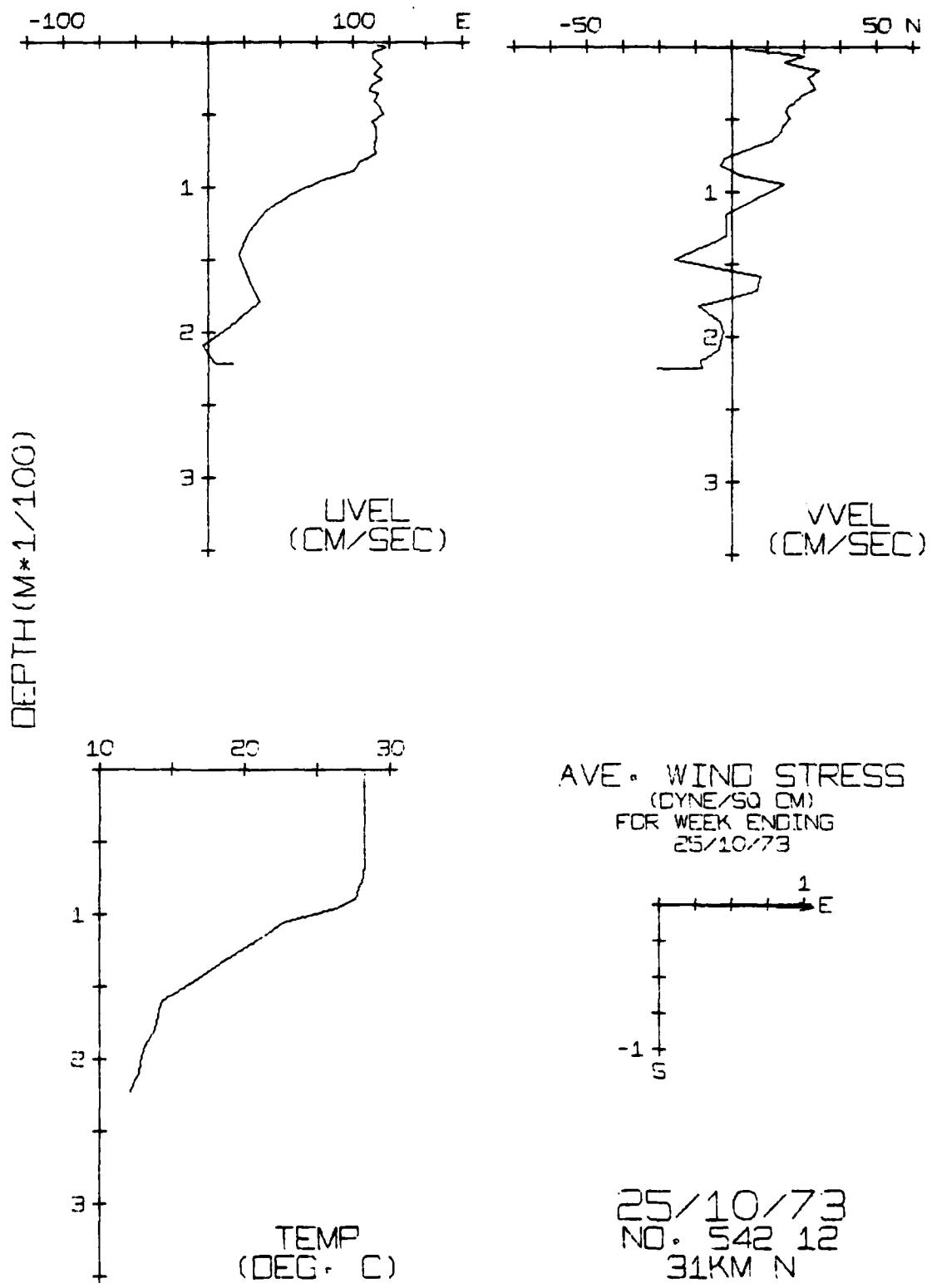
11/10/73
NO. 542 10
20KM N

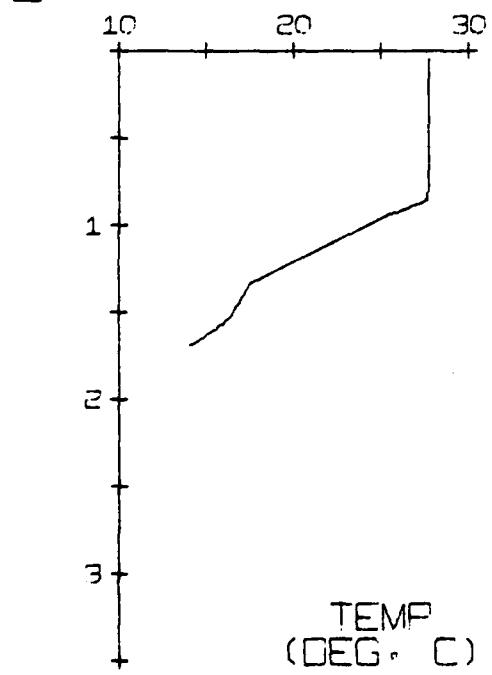
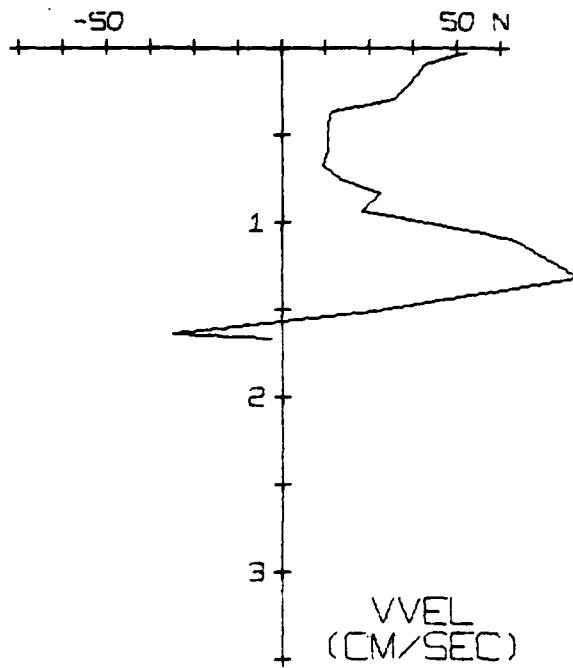
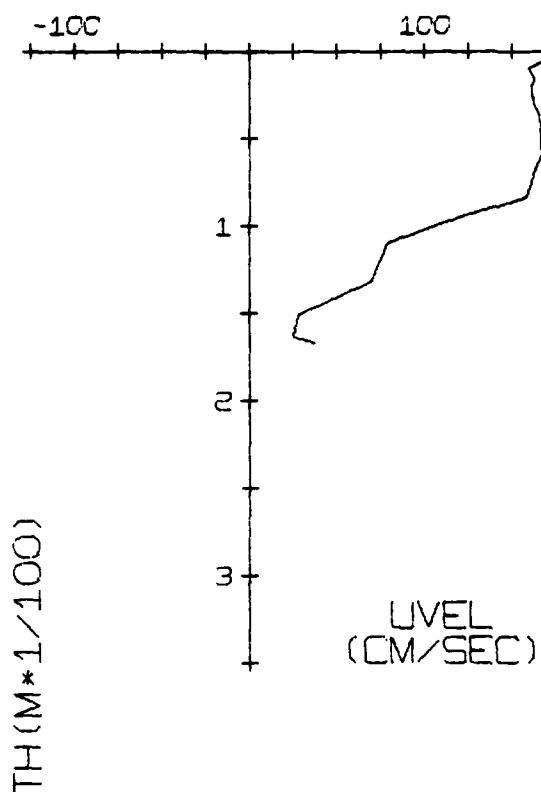


AVE. WIND STRESS
(CYNE/SQ CM)
FOR WEEK ENDING
18/10/73

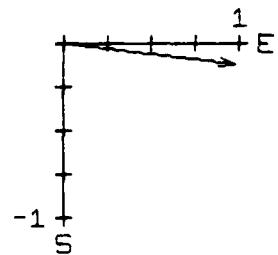


19/10/73
NO. 542 11
24KM S

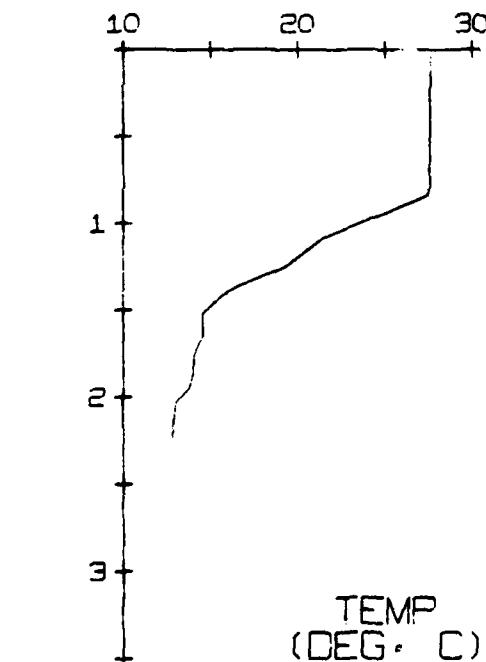
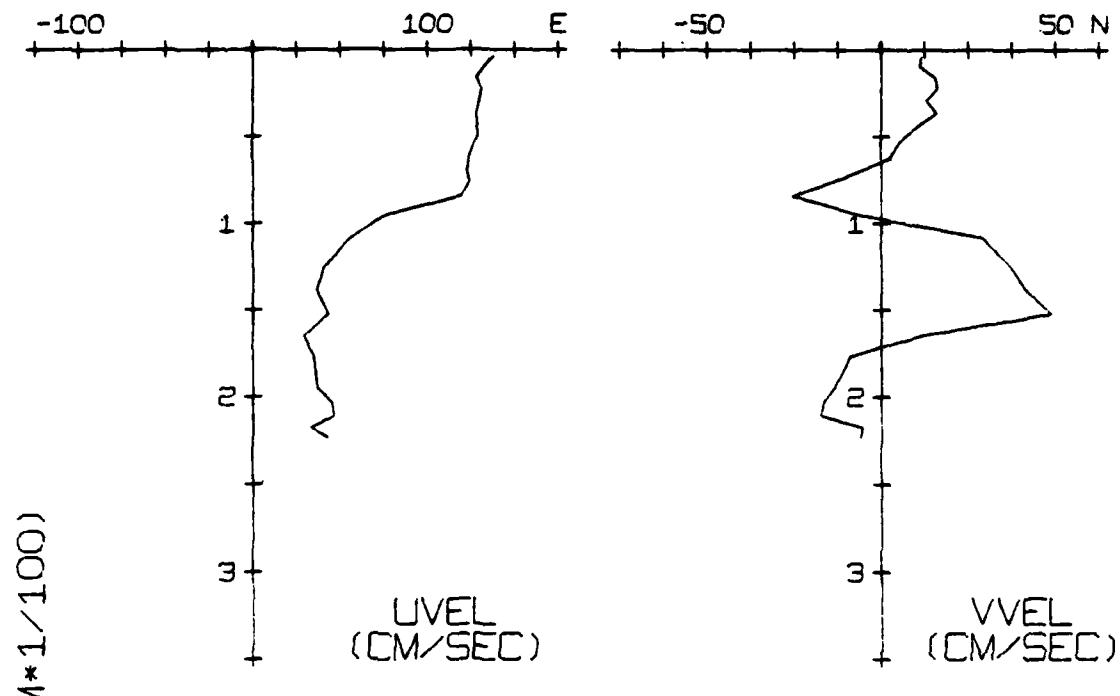




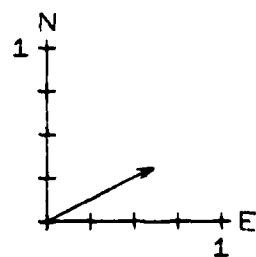
AVE. WIND STRESS
(CYNE/SQ CM)
FOR WEEK ENDING
01/11/73



02/11/73
NO. 542 13
19KM S

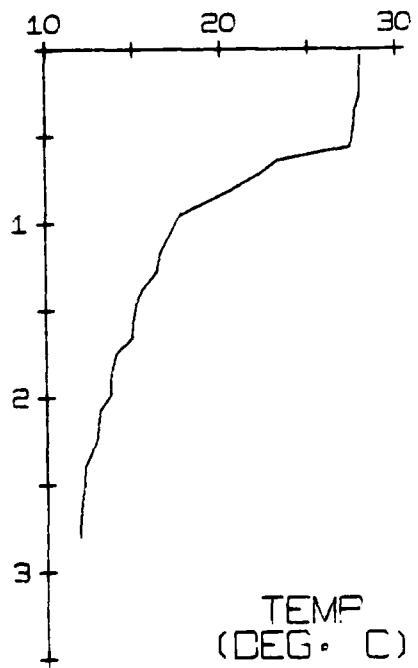
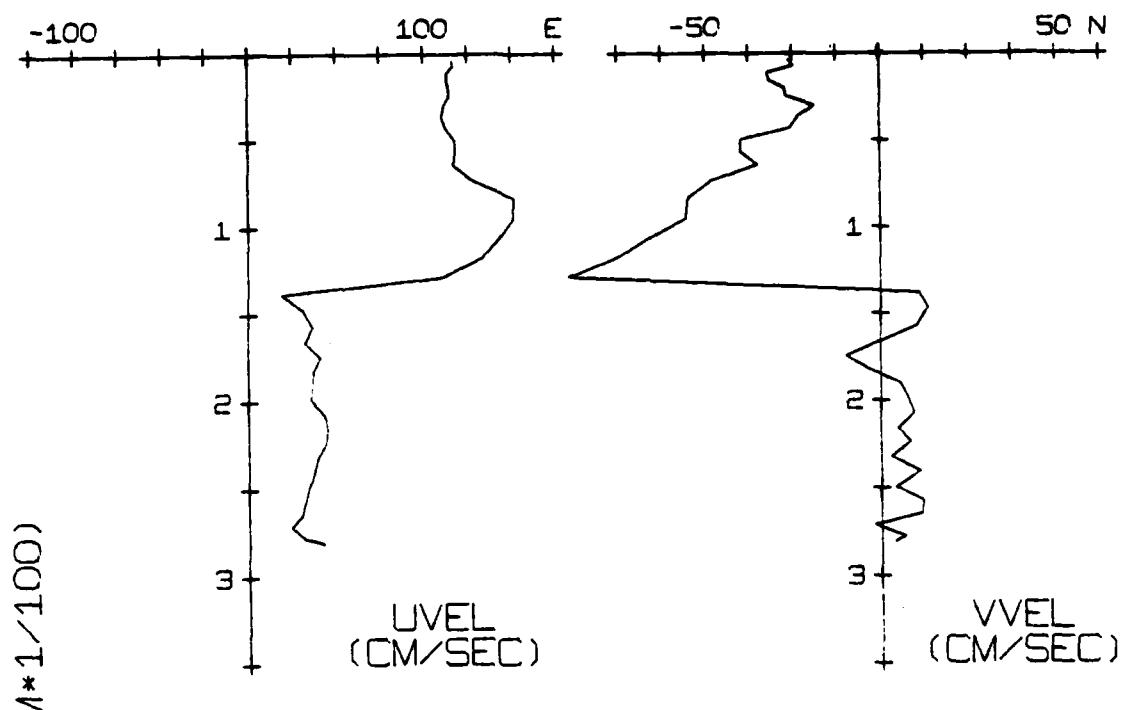


AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
08/11/73

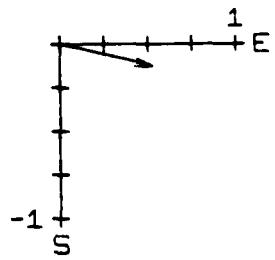


08/11/73
NO. 541 29
19KM N

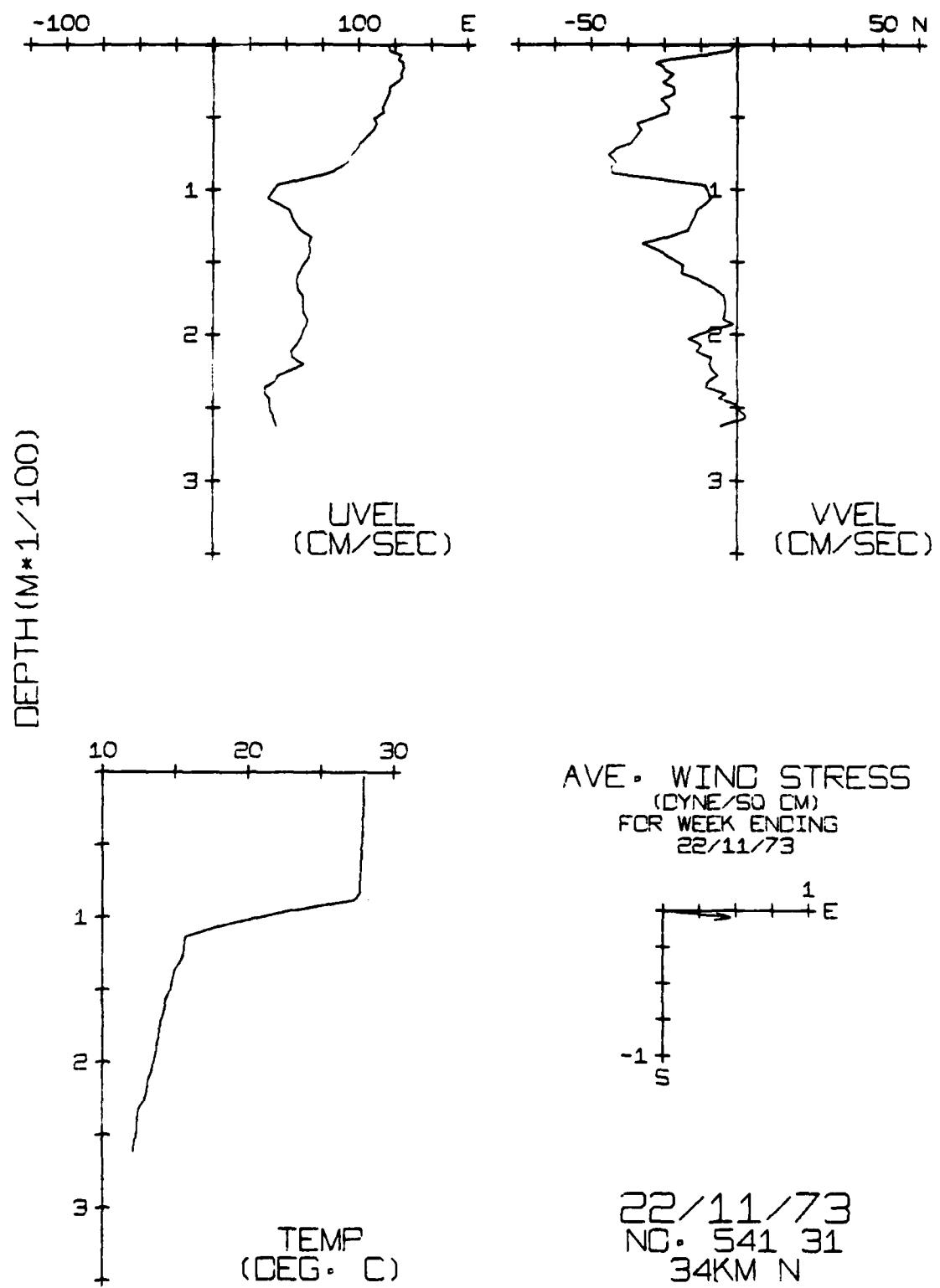
40

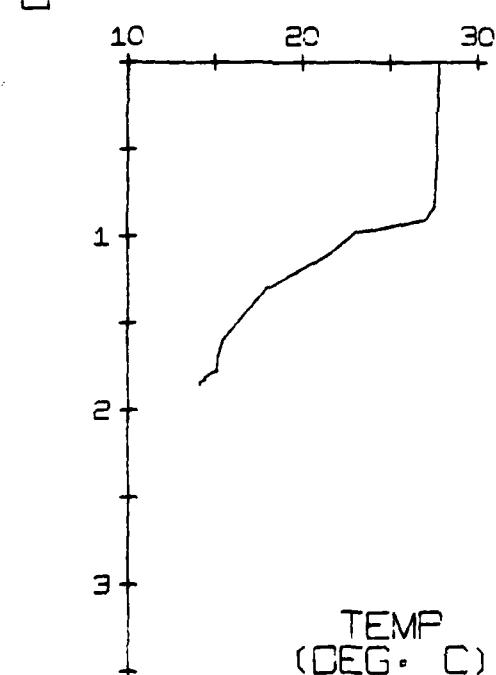
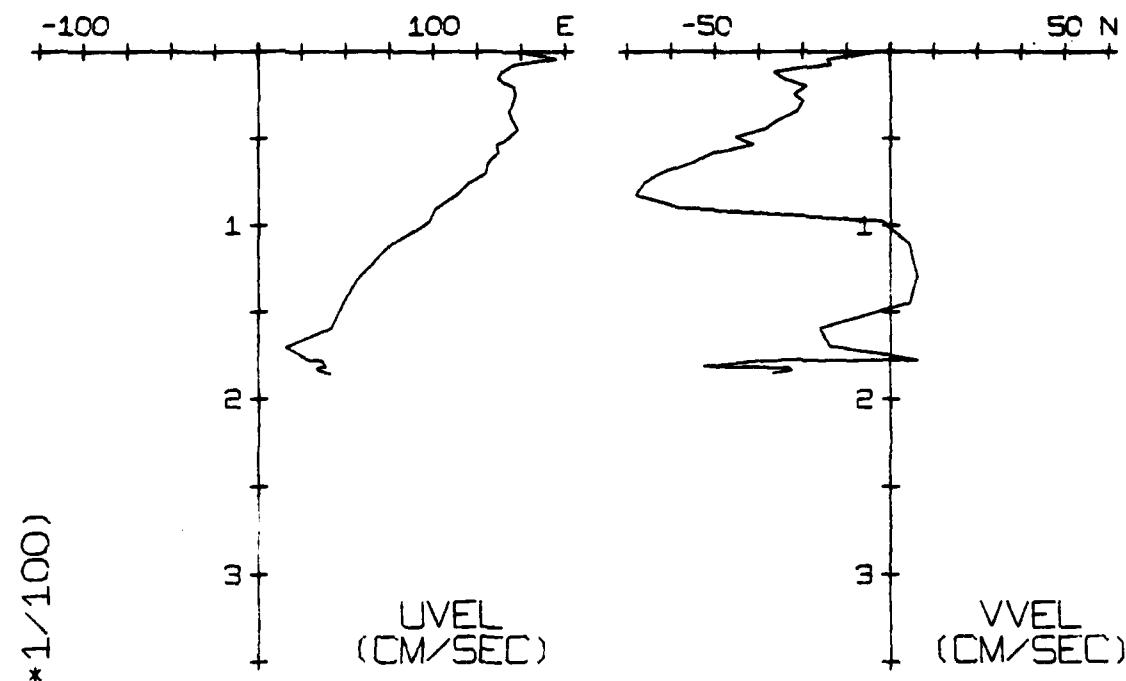


AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
15/11/73

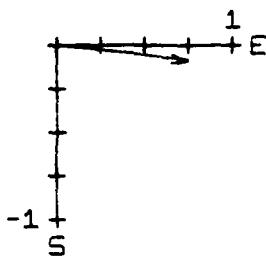


15/11/73
NO. 541 30
25KM S

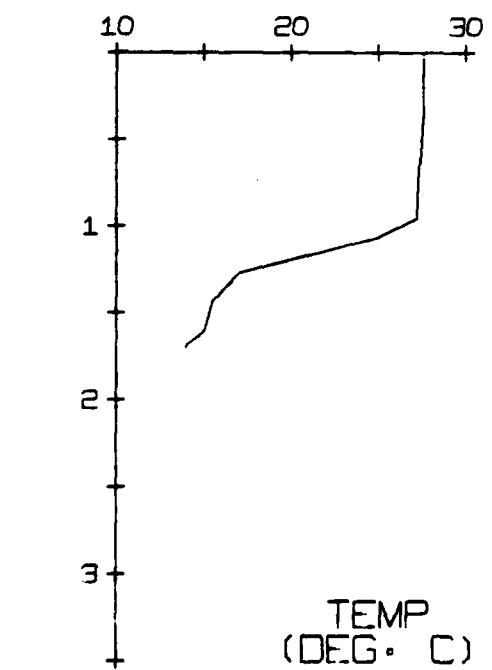
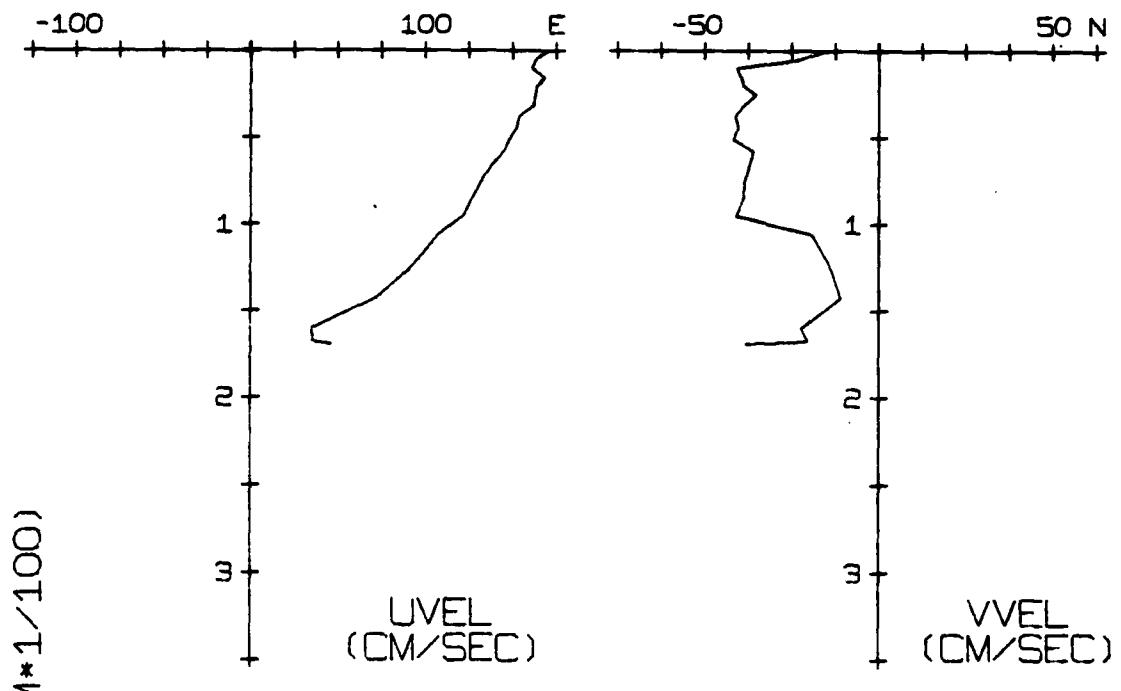




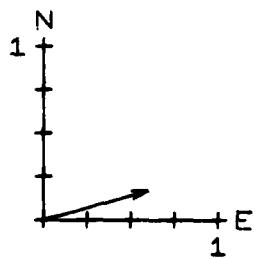
AVE. WIND STRESS
(CYNE/SQ CM)
FOR WEEK ENDING
29/11/73



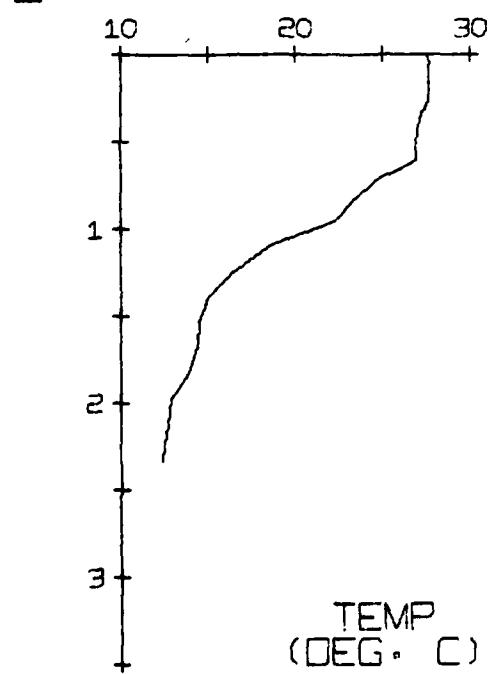
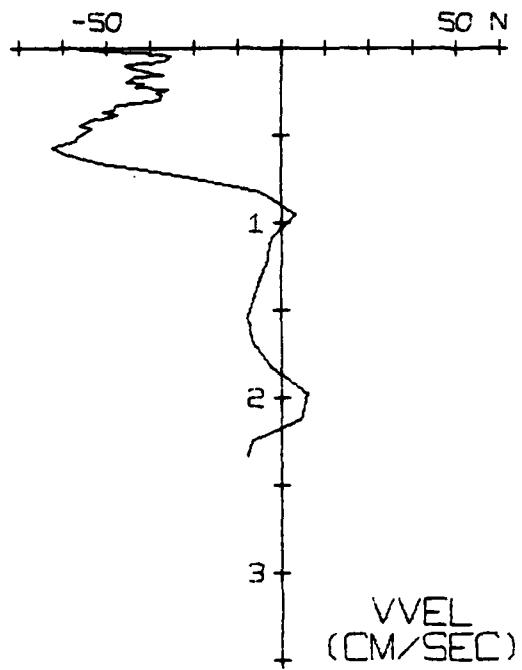
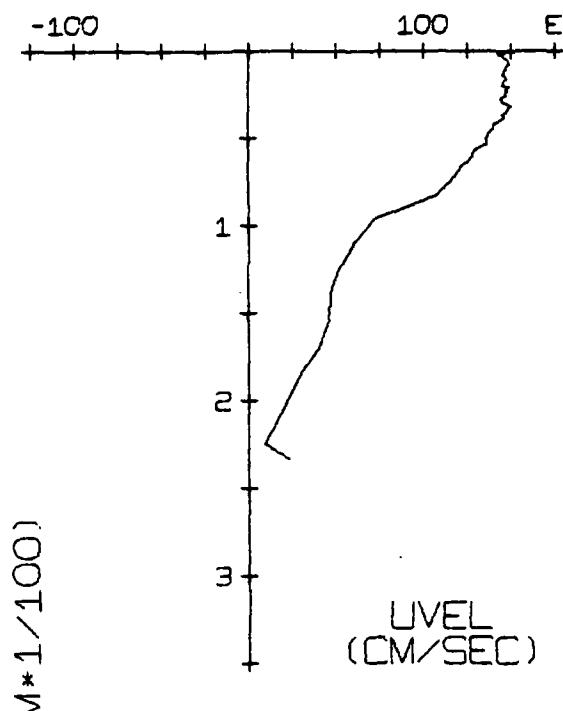
28/11/73
NO. 541 32
27KM S



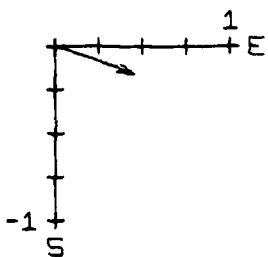
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
06/12/73



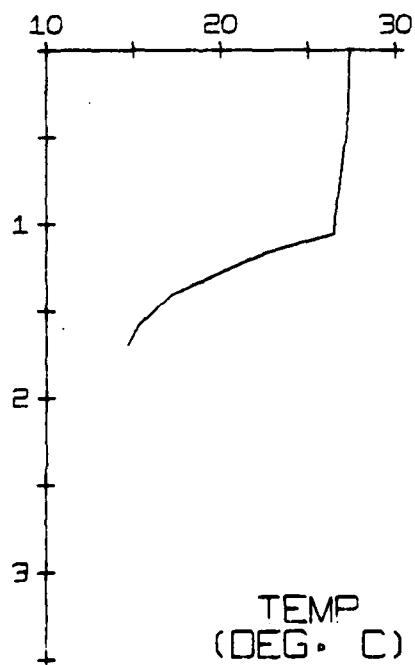
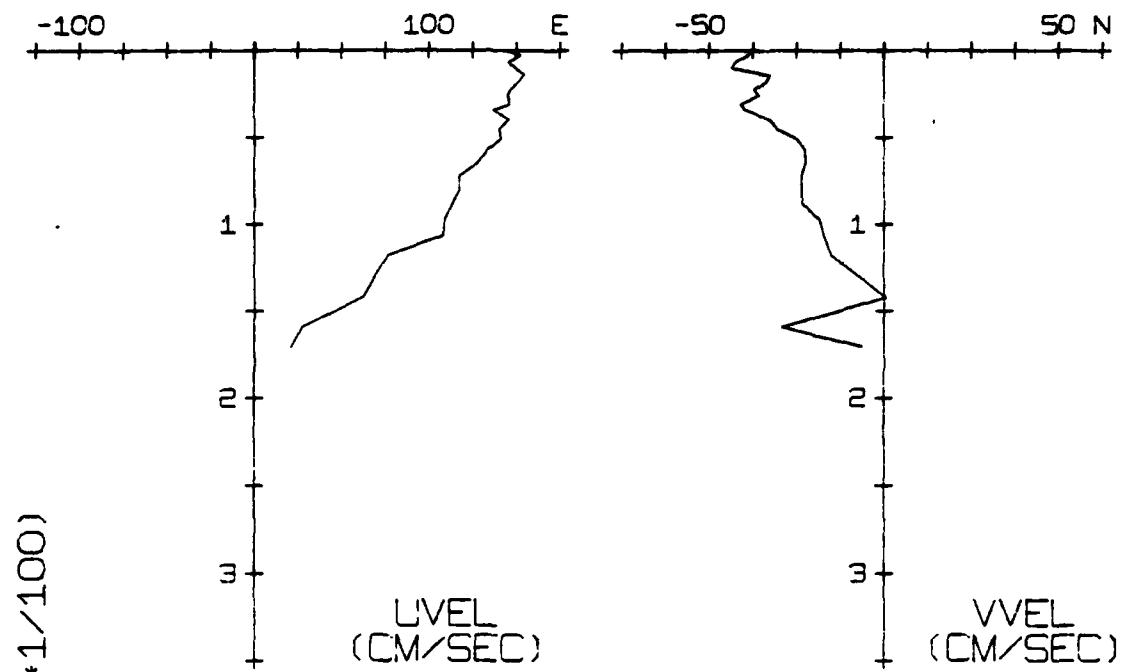
06/12/73
NO. 541 33
26KM N



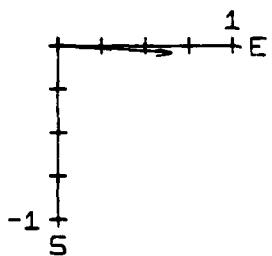
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
13/12/73



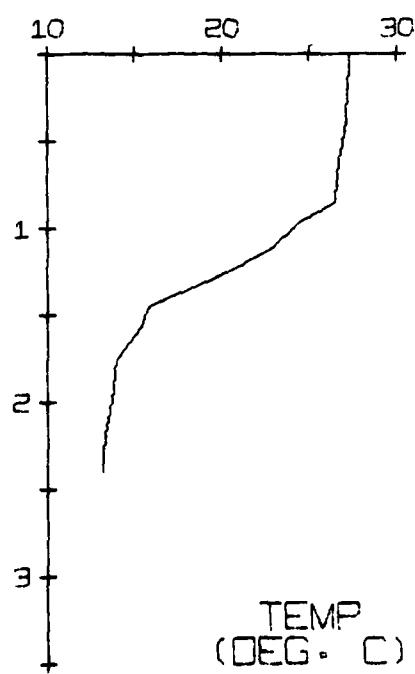
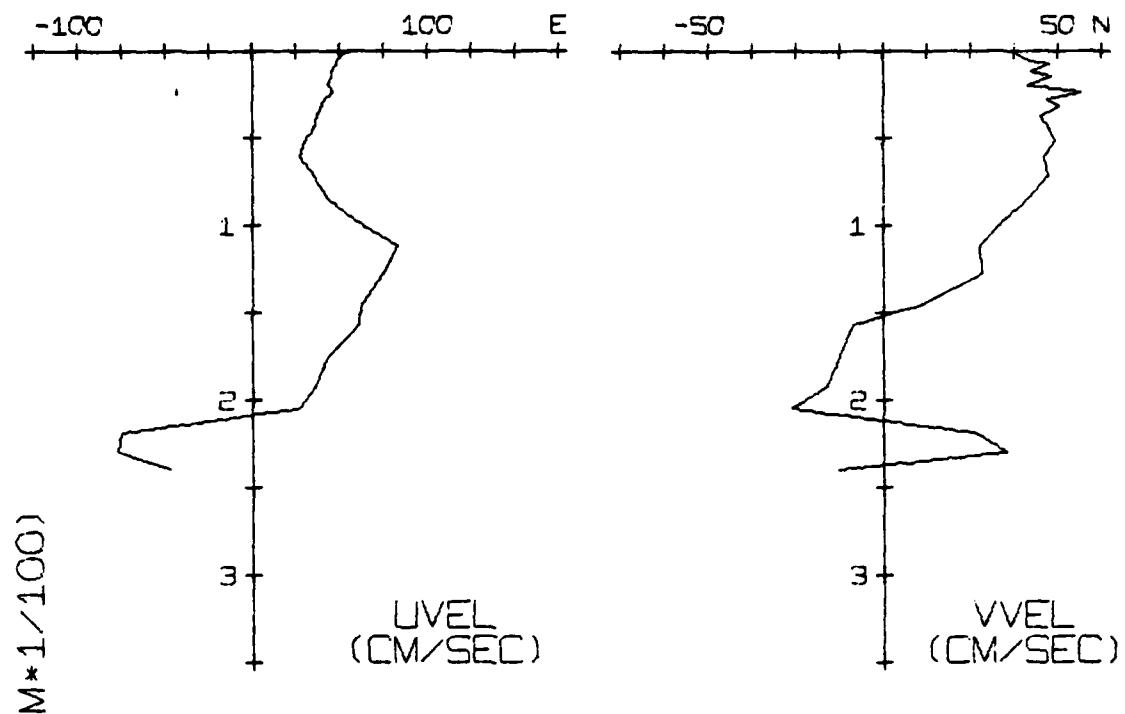
13/12/73
NO. 541 34
24KM S



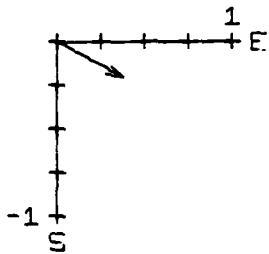
AVE. WIND STRESS
(DYNE/50 CM)
FOR WEEK ENDING
20/12/73



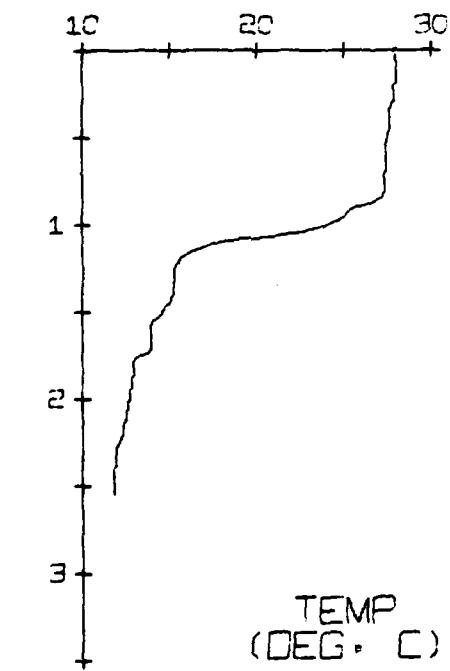
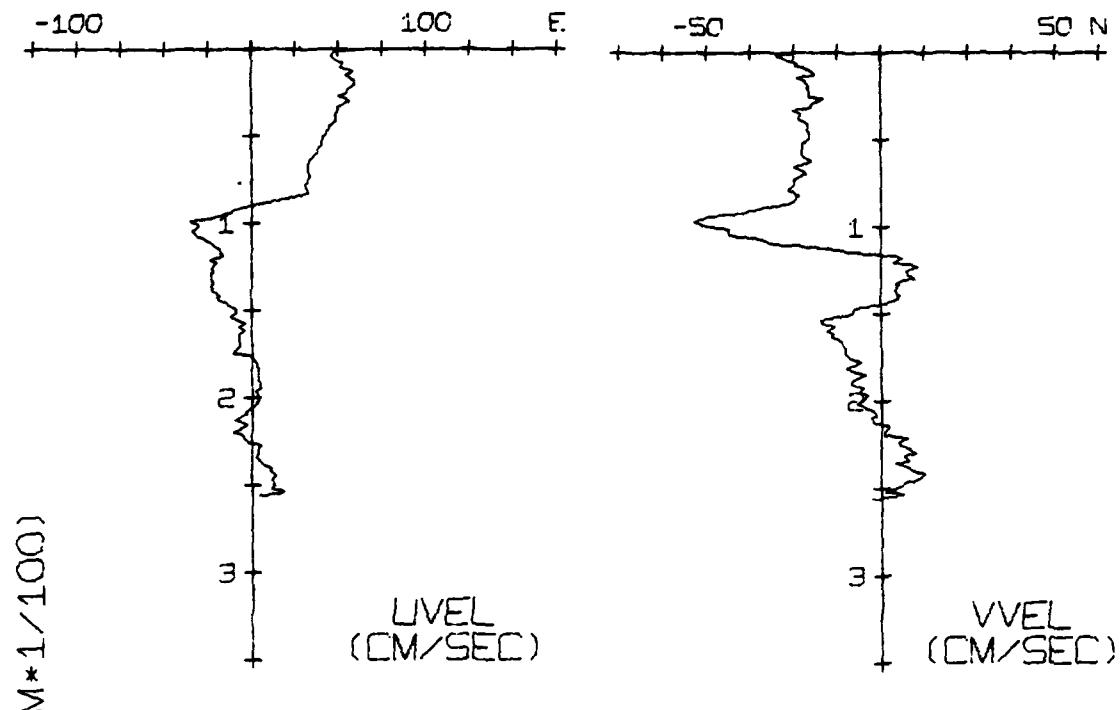
20/12/73
NO. 542 14
26KM N



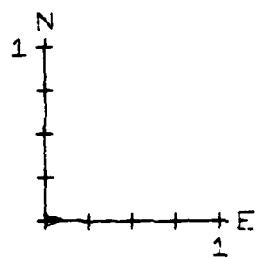
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
27/12/73



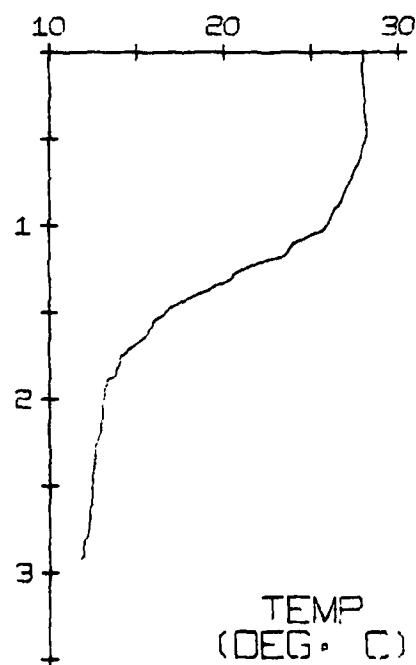
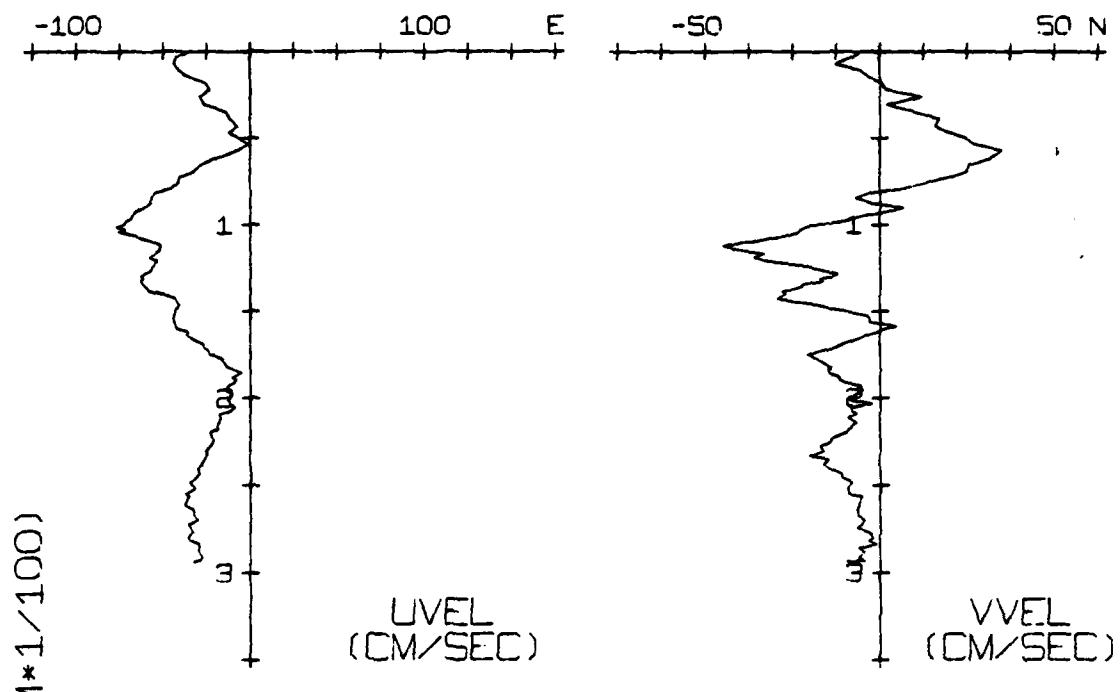
28/12/73
NO. 542 15
24KM S



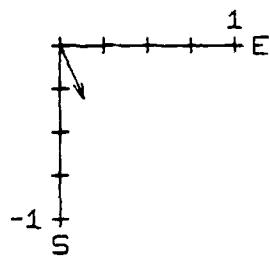
AVE. WIND STRESS
(DYNES/50 CM)
FOR WEEK ENDING
03/01/74



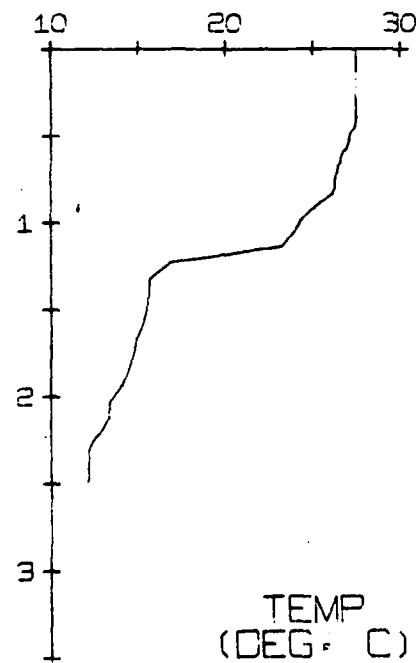
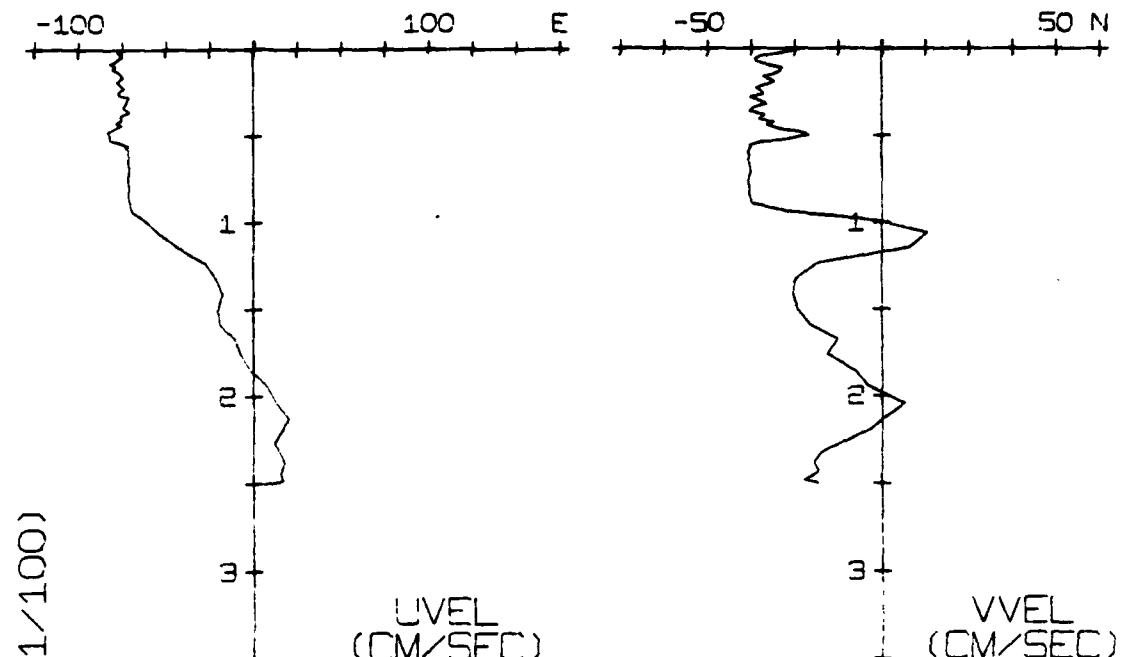
03/01/74
NO. 541 35
30KM N



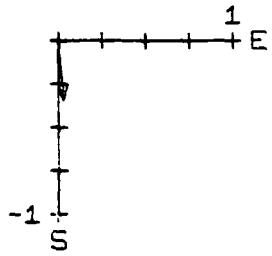
AVE. WIND STRENGTH
(DYNE/SQ CM)
FOR WEEK ENDING
10/01/74



10/01/74
NO. 541 36
25KM S

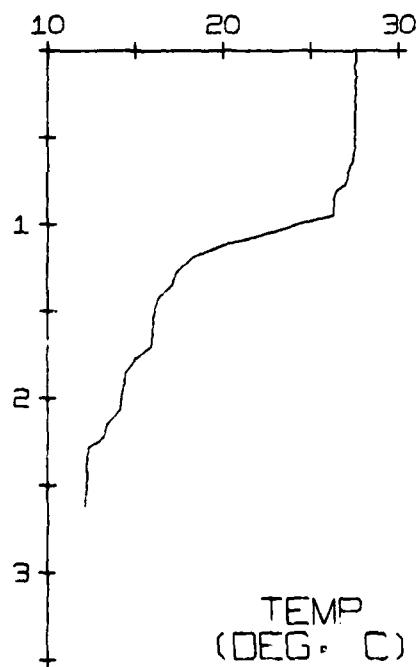
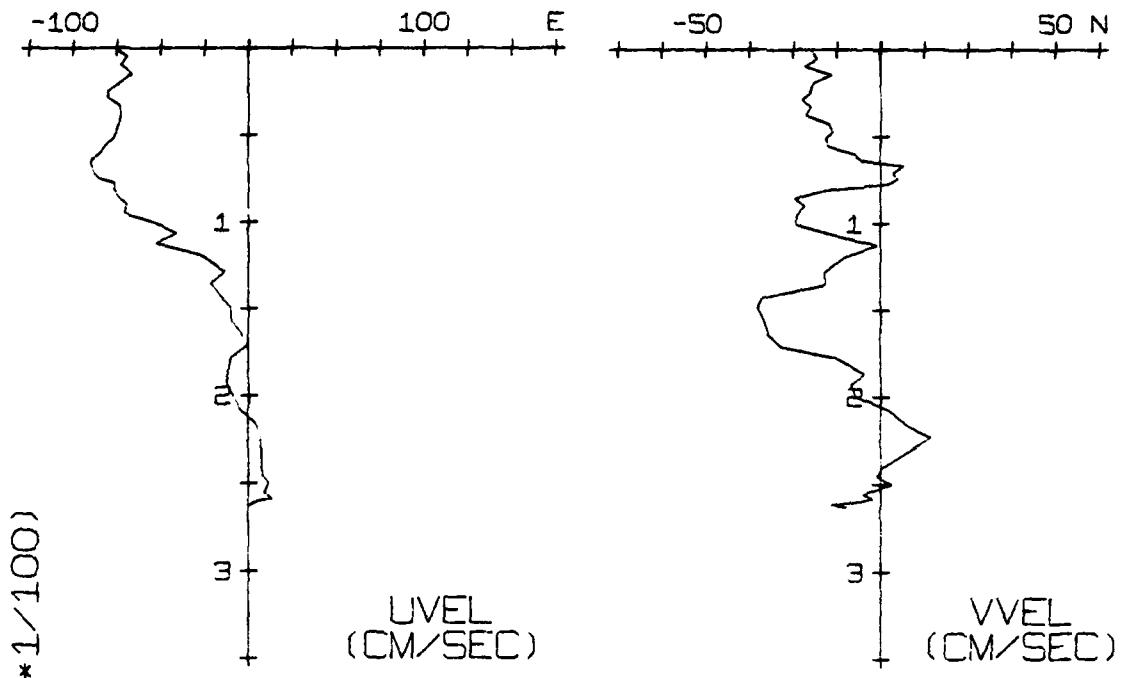


AVE. WIND STRESS
(CYNE/SQ CM)
FOR WEEK ENDING
17/01/74

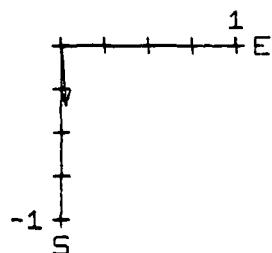


17/01/74
NO. 541 37
19KM N

50

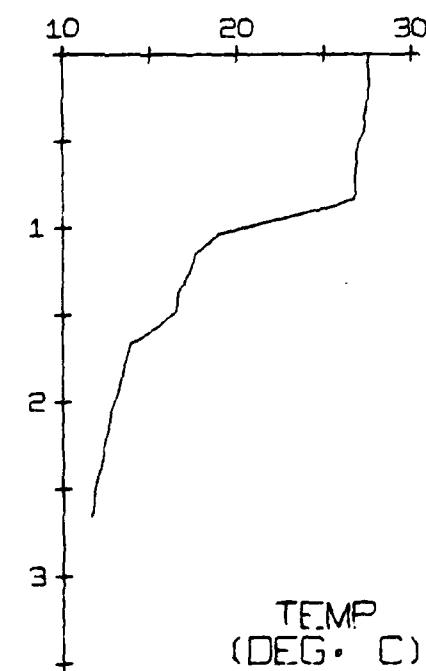
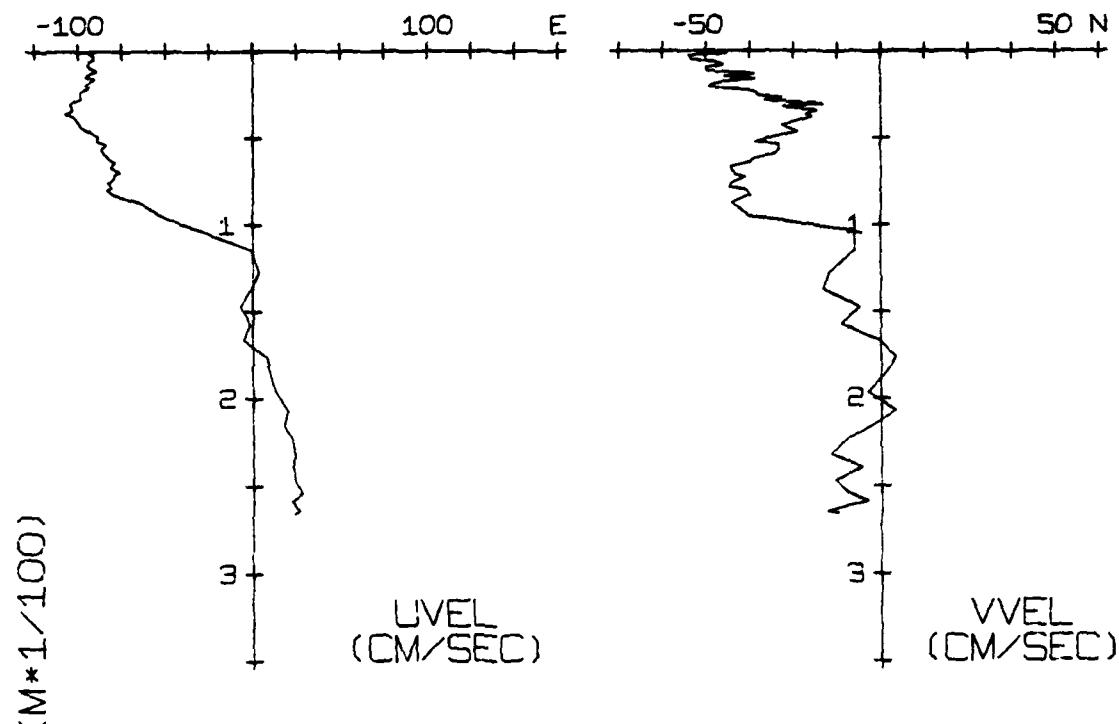


AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
17/01/74

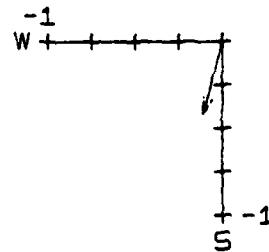


18/01/74
NO. 541 38
30KM N

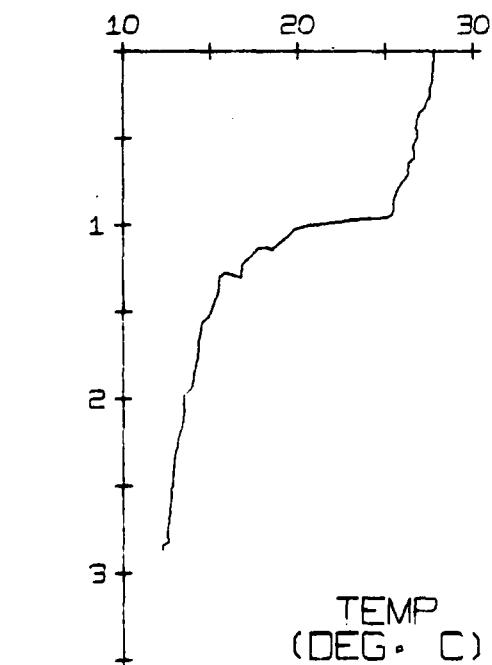
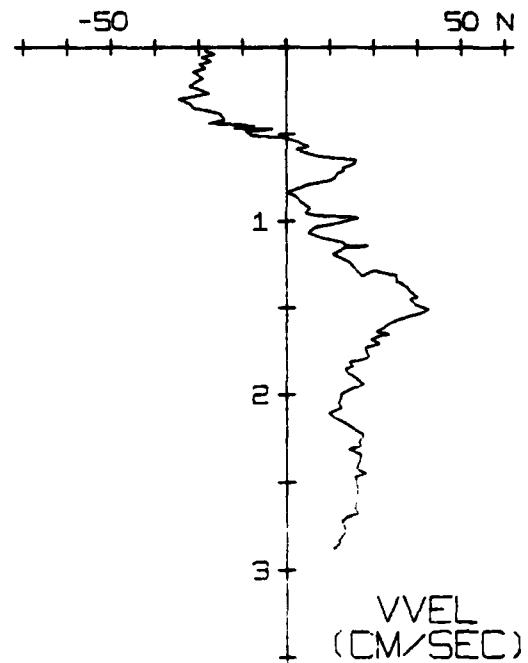
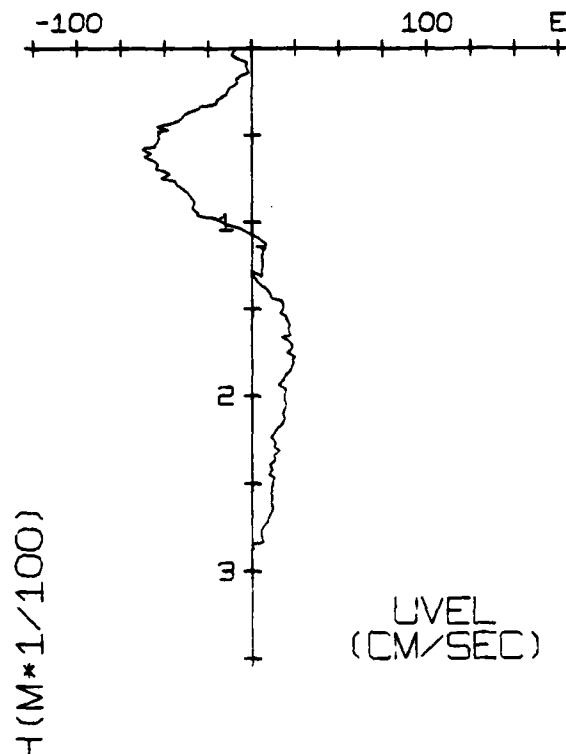
51



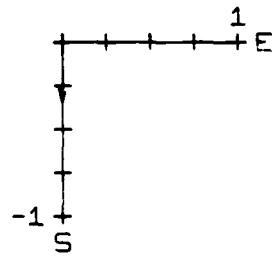
AVE. WIND STRESS
(CYNE/SQ CM)
FOR WEEK ENDING
24/01/74



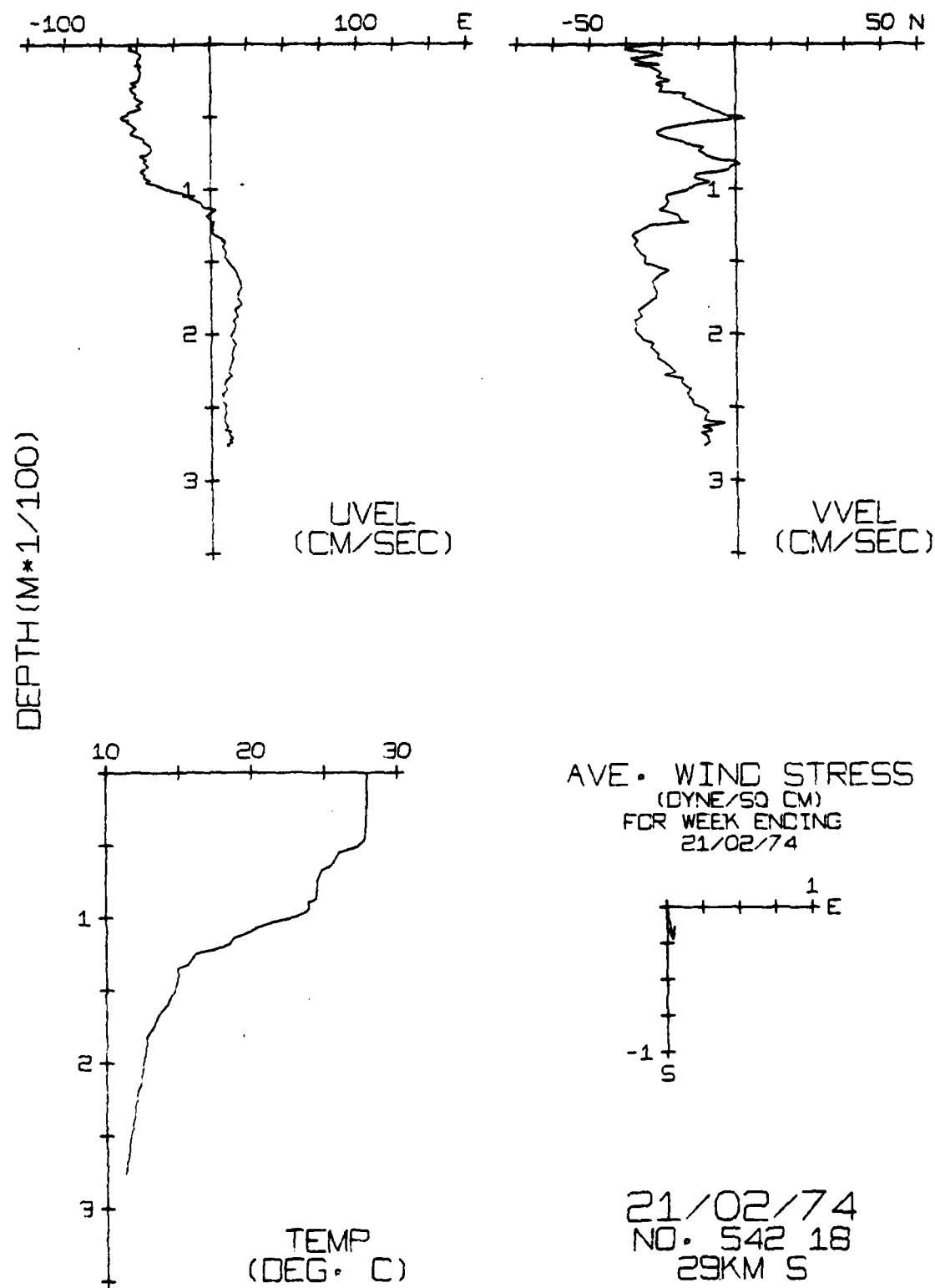
24/01/74
NO. 541 39
28KM S

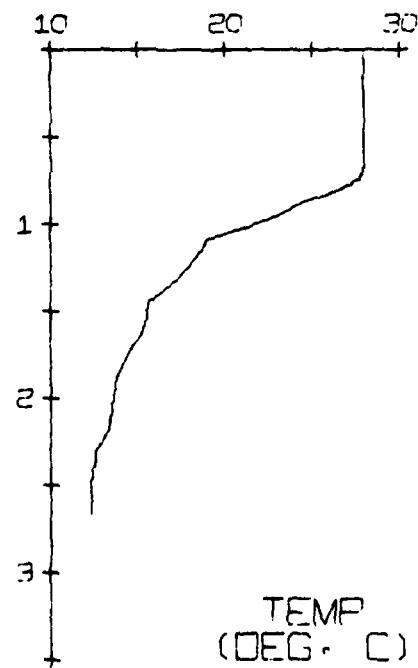
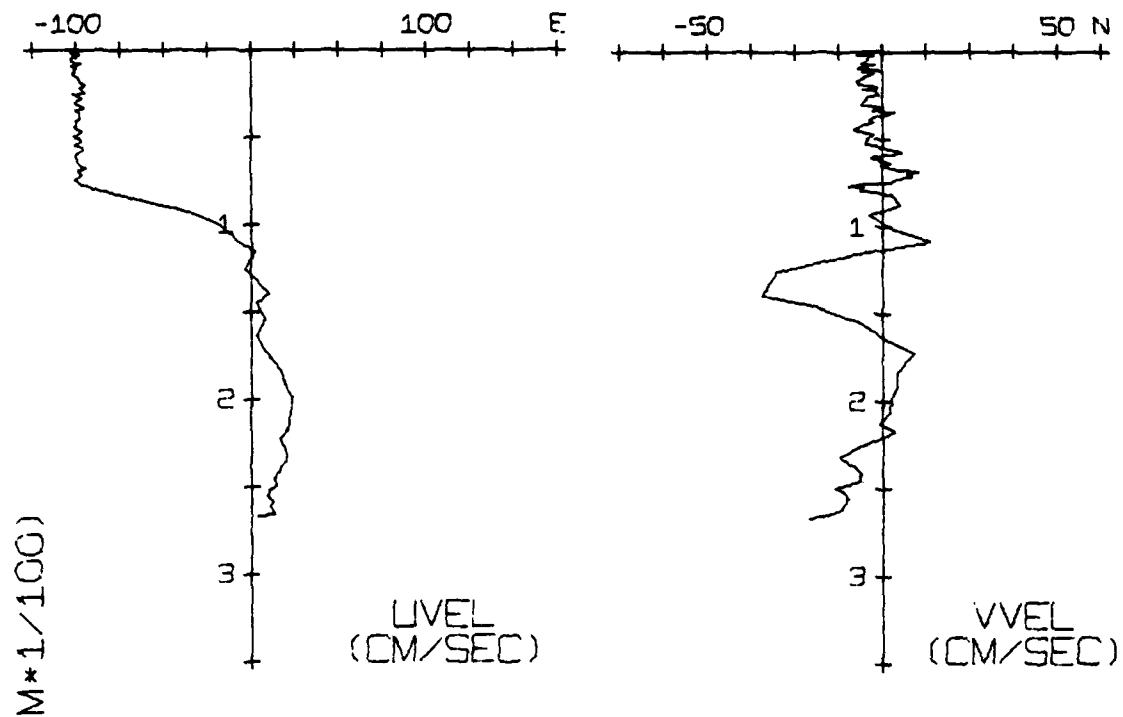


AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
14/02/74

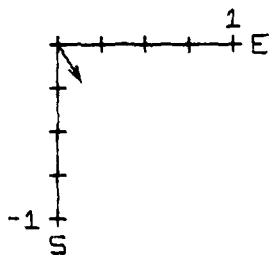


14/02/74
NO. 542 17
28KM N

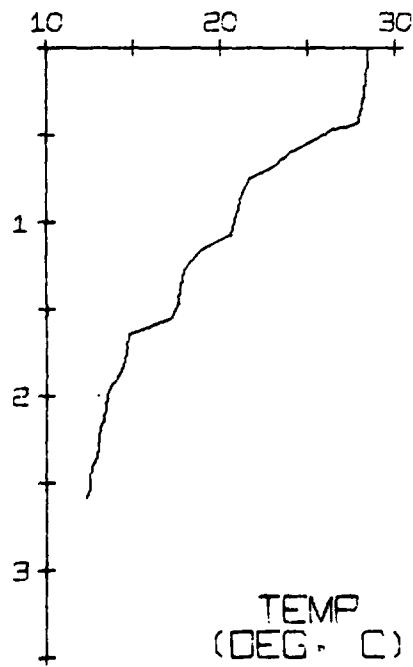
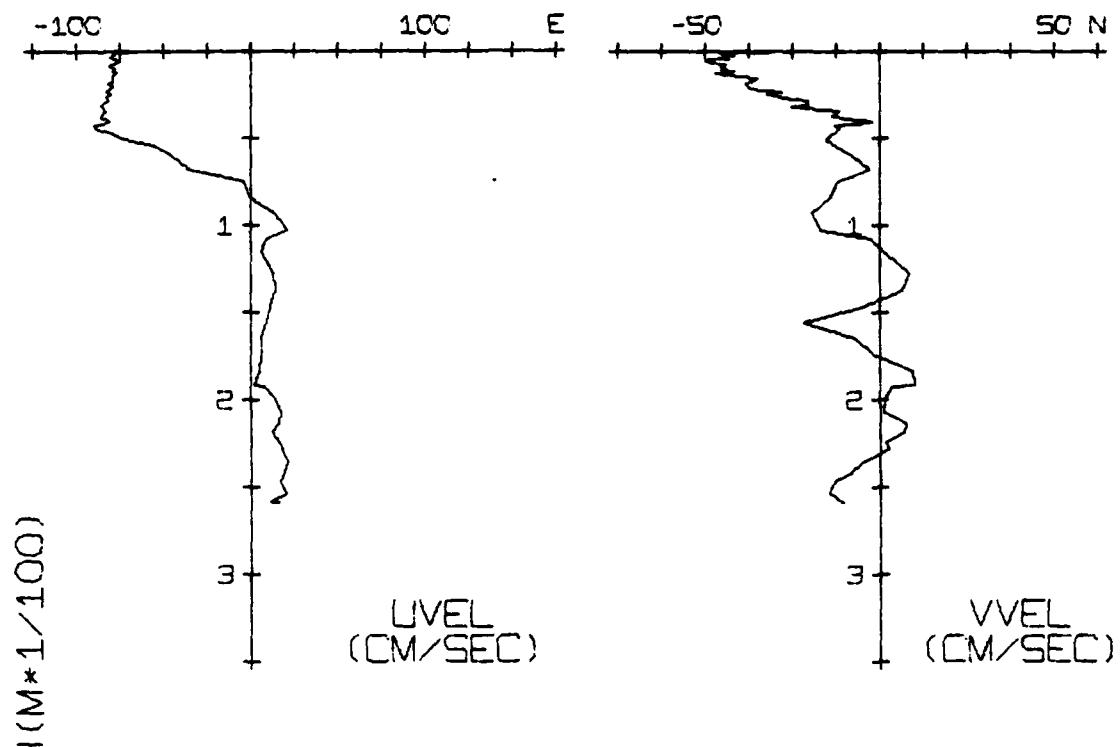




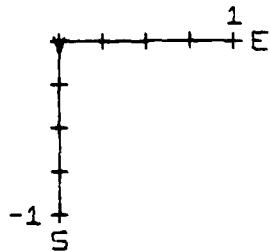
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
28/02/74



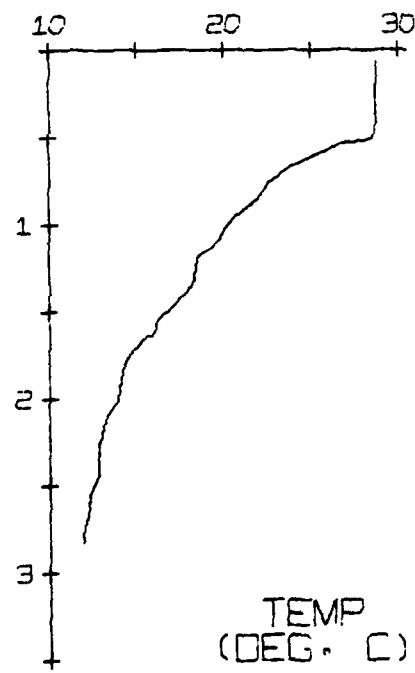
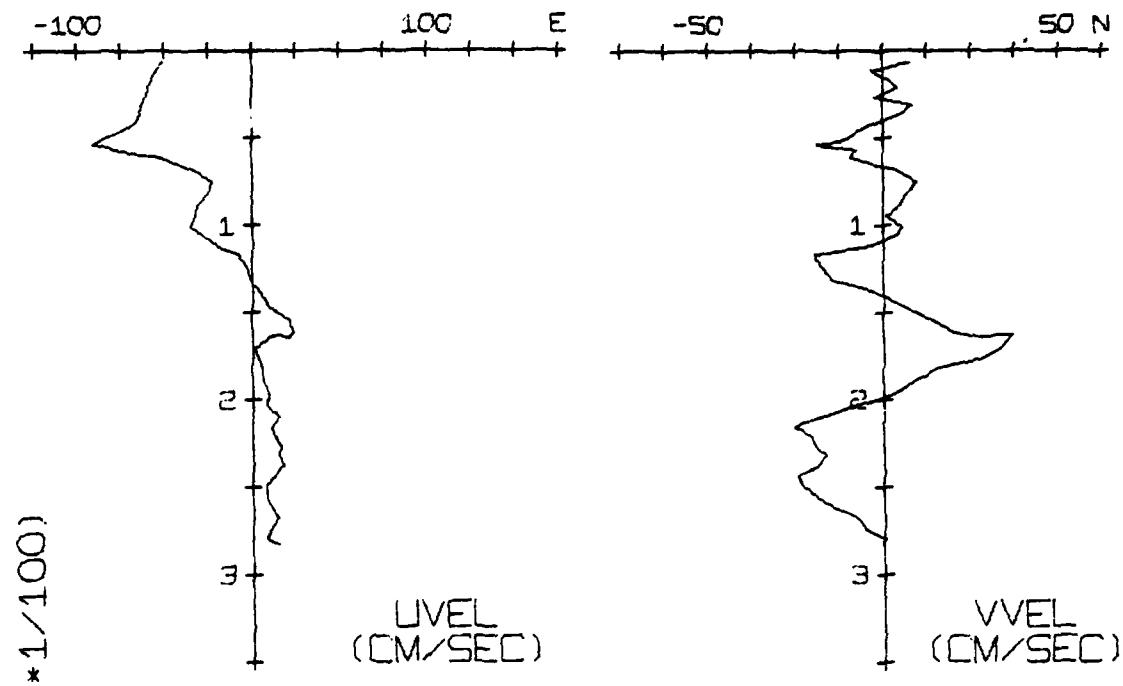
28/02/74
NO. 542 19
30KM N



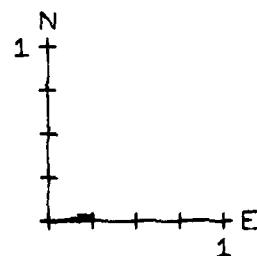
AVE. WIND STRESS
(DYN/50 CM)
FOR WEEK ENDING
07/03/74



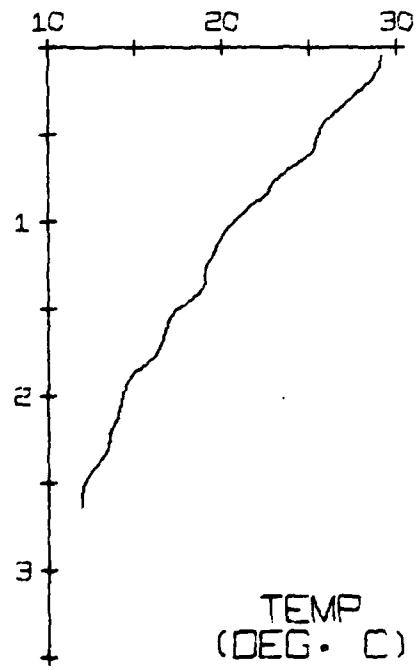
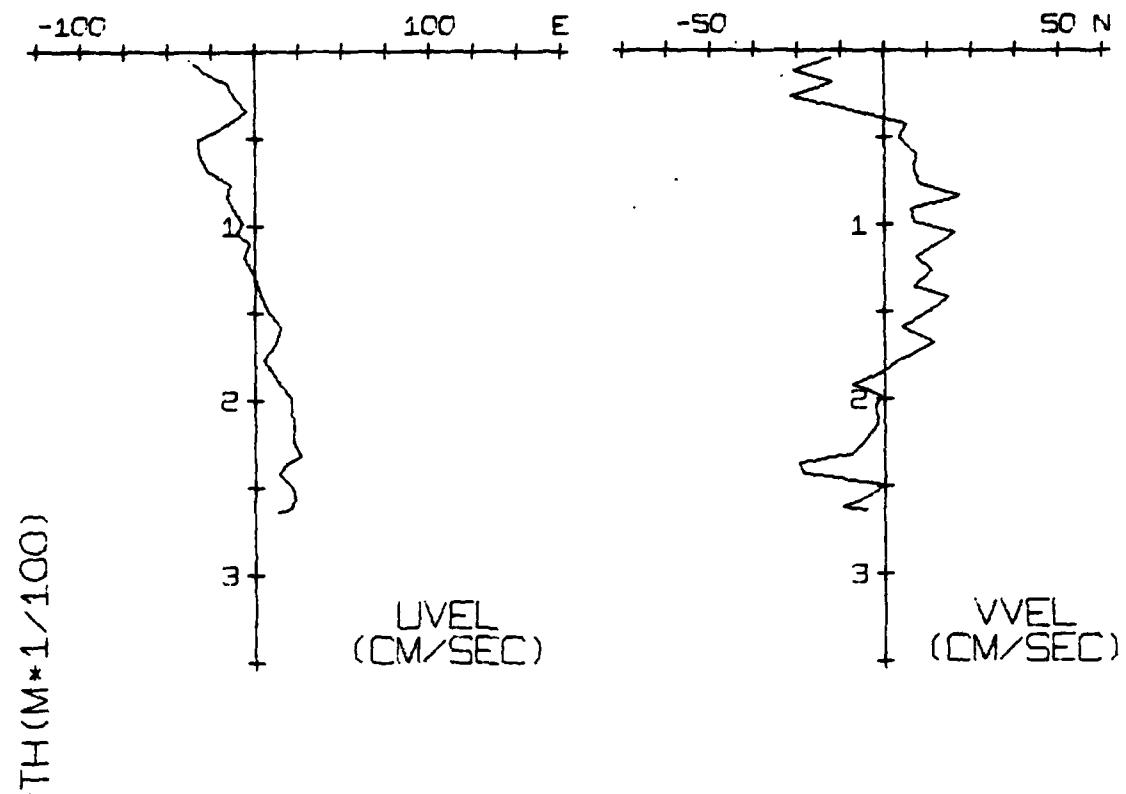
07/03/74
NO. 542 20
24KM S



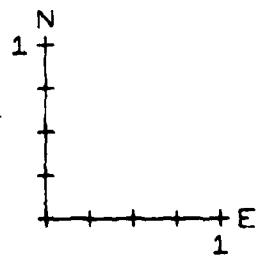
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
21/03/74



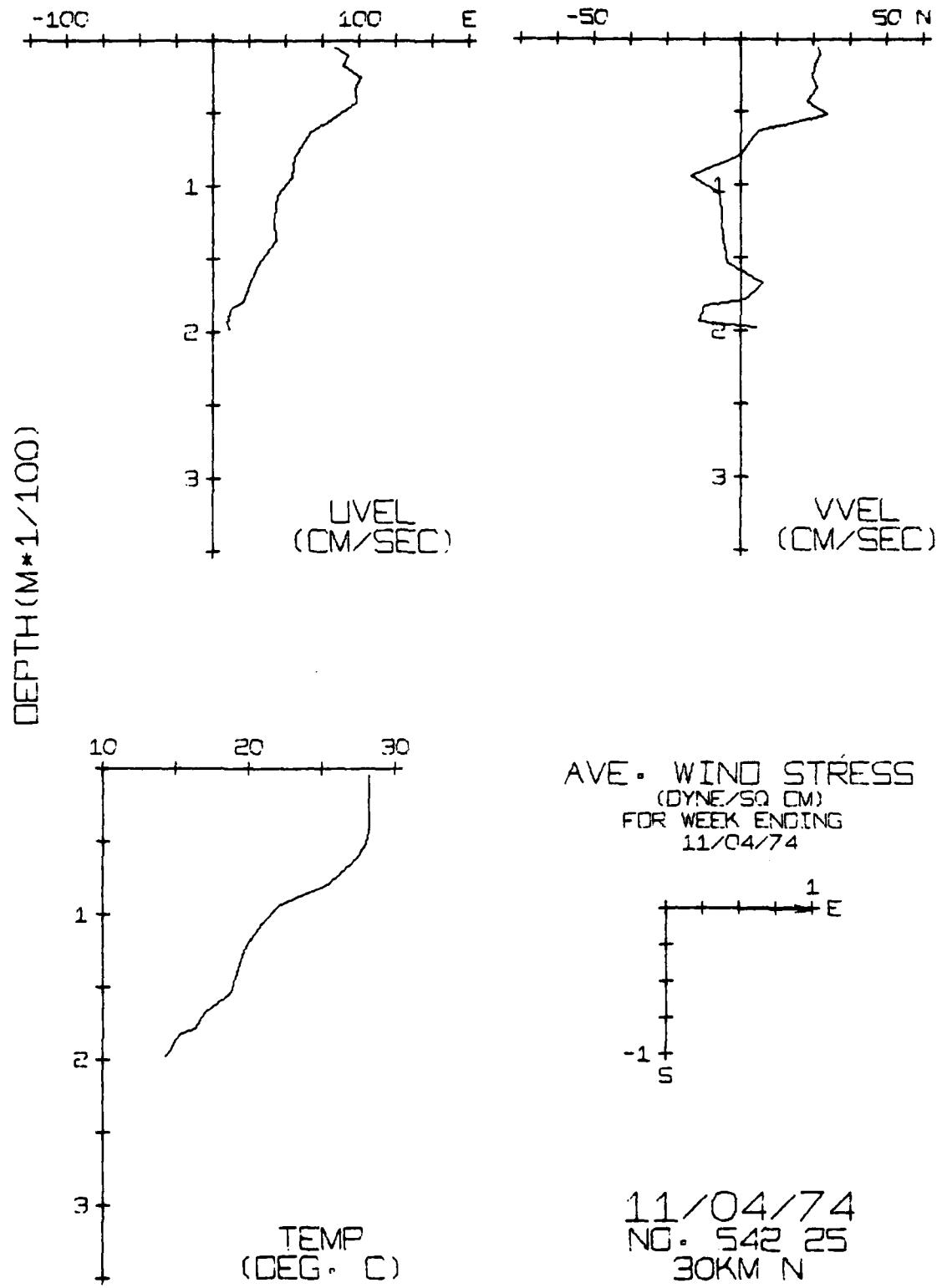
21/03/74
NO. 542 22
30KM N

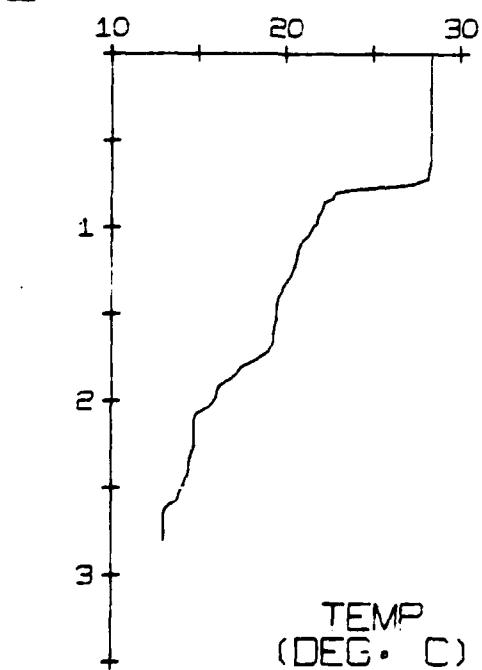
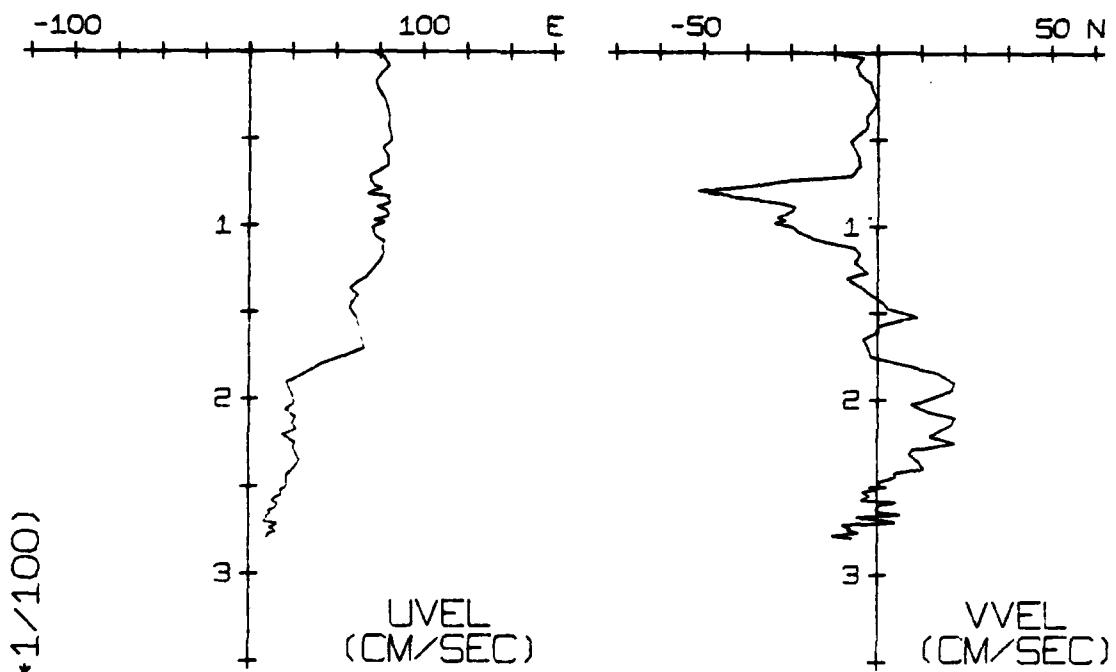


AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
04/04/74

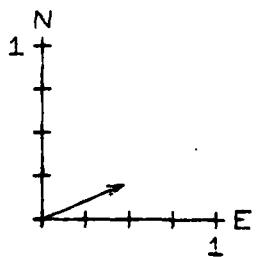


04/04/74
NO. 542 24
24KM S



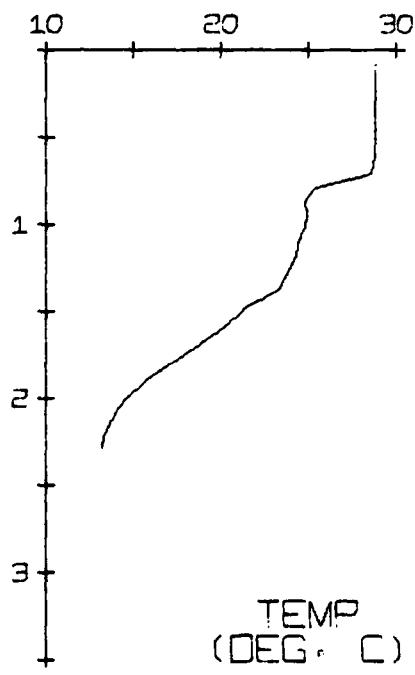
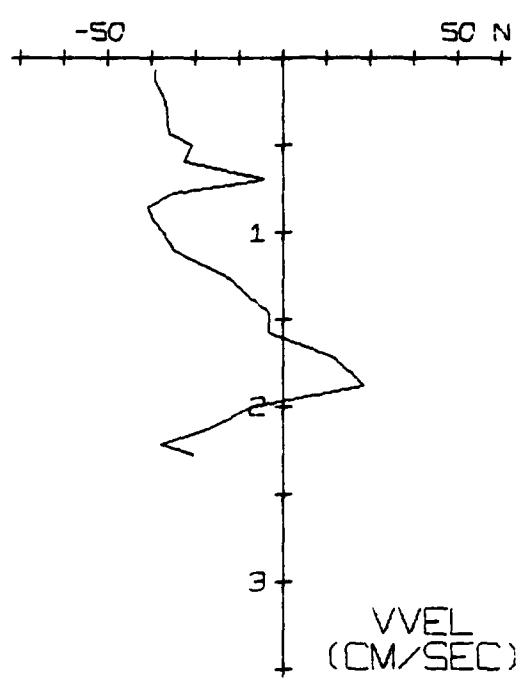
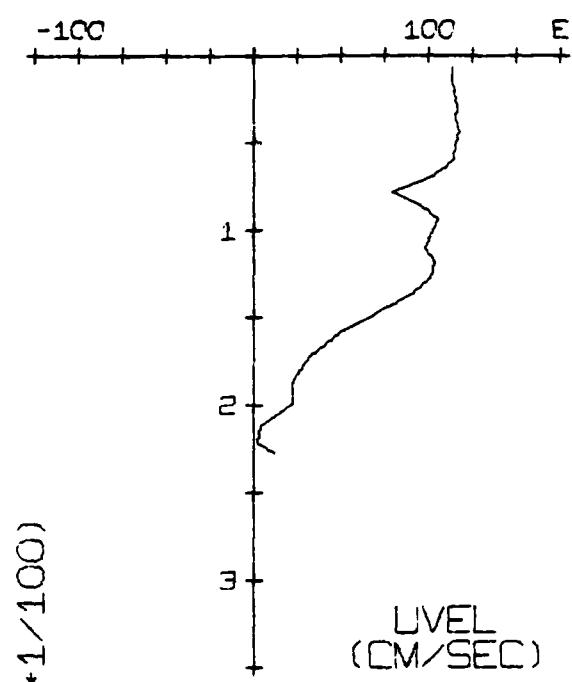


AVE. WIND STRESS
(DYNE/50 CM)
FOR WEEK ENDING
18/04/74

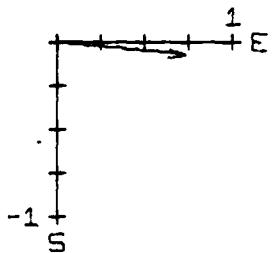


18/04/74
NO. 541 41
28KM S

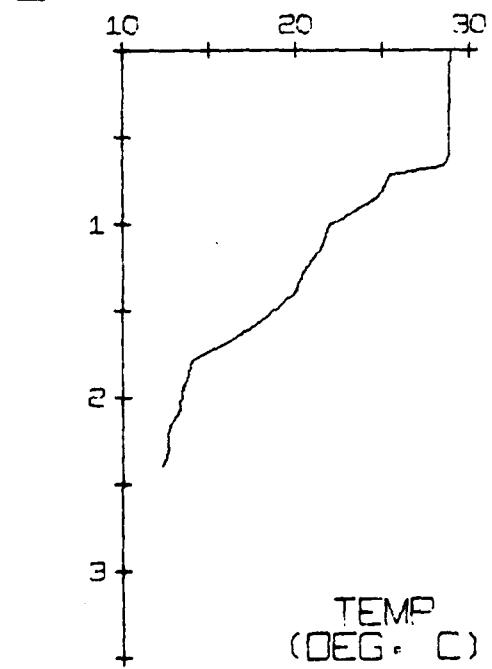
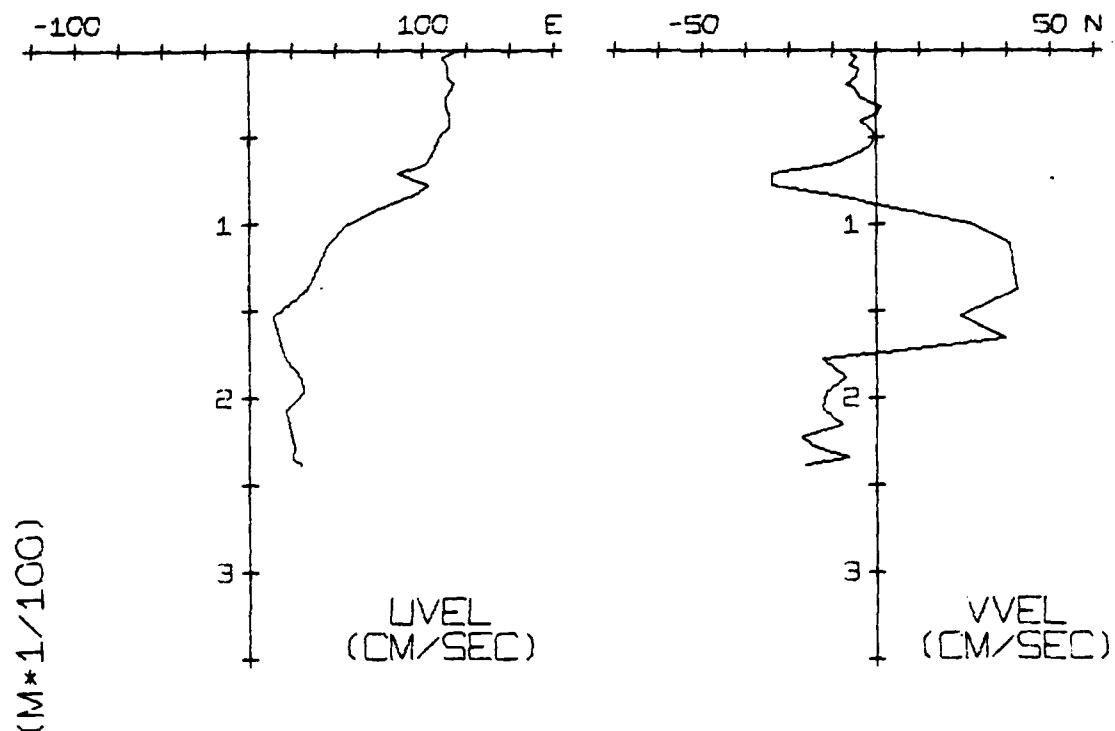
60



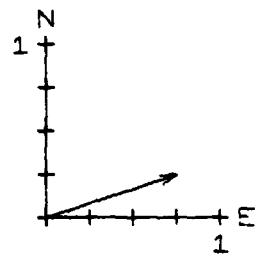
AVE. WIND STRESS
(CYNE/50 CM)
FOR WEEK ENDING
25/04/74



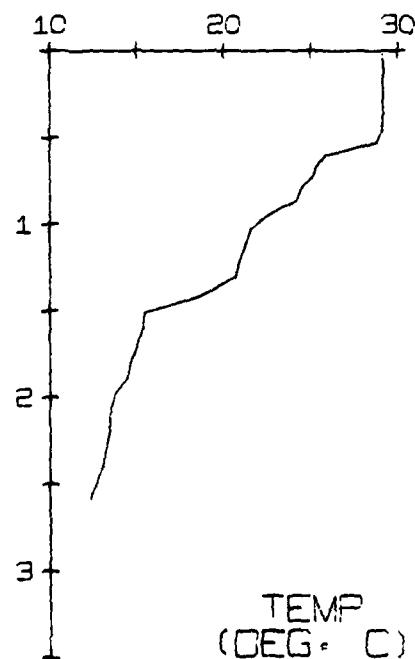
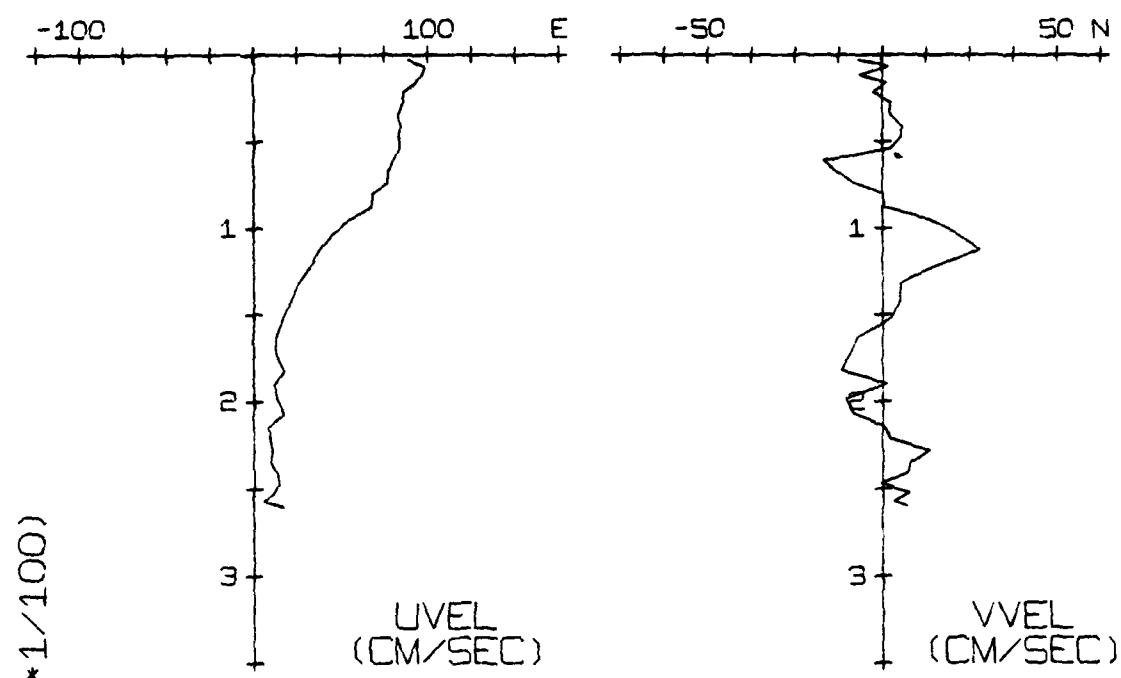
25/04/74
NO. 541 42
30KM N



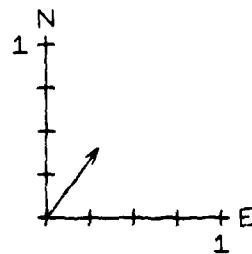
AVE. WIND STRESS
(CYNE/SQ CM)
FOR WEEK ENDING
02/05/74



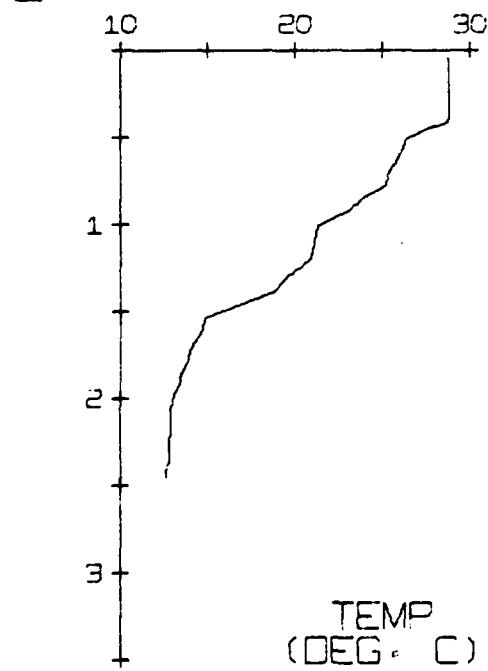
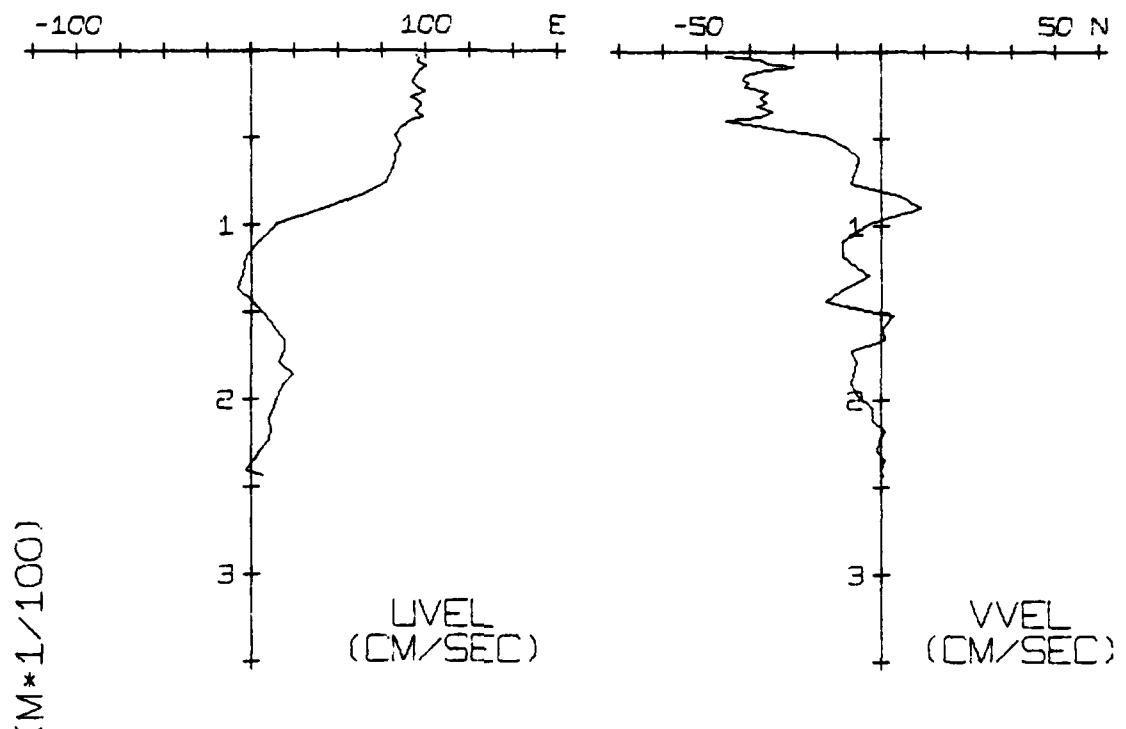
02/05/74
NO. 541 43
24KM S



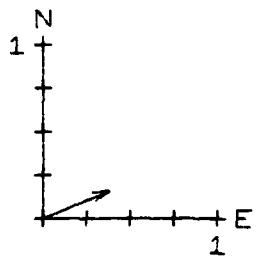
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
09/05/74



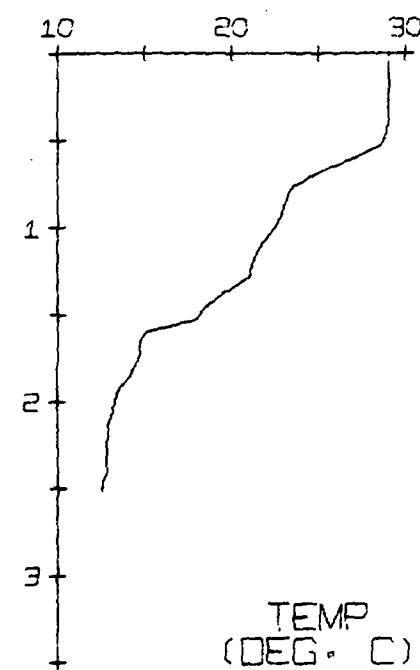
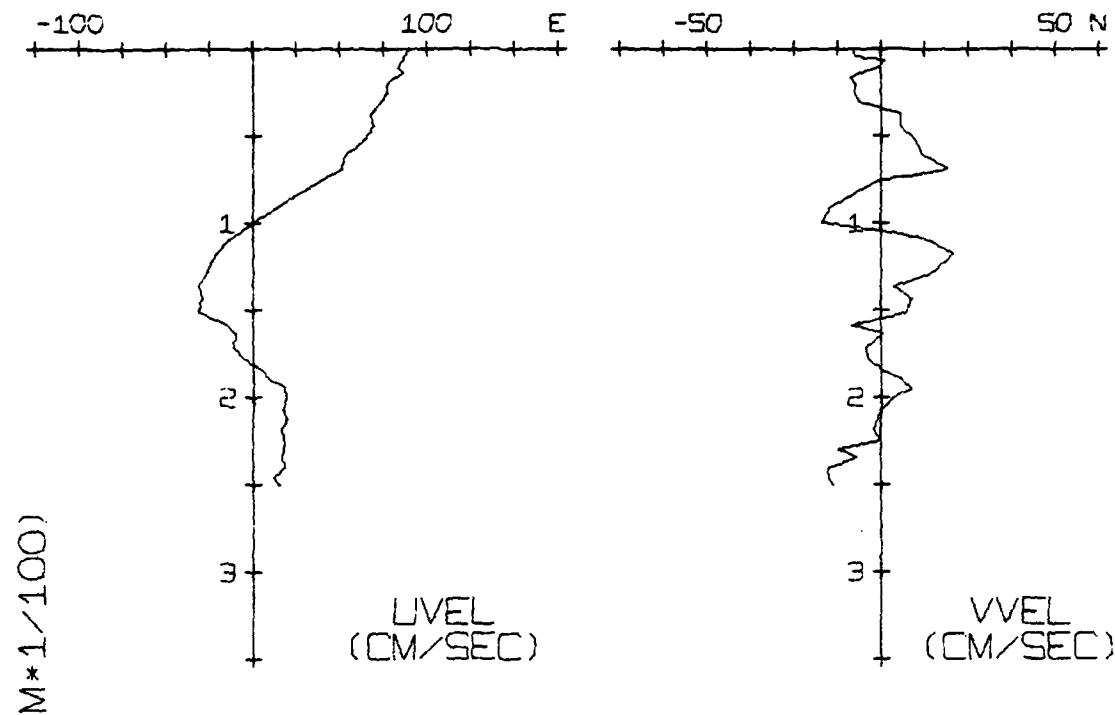
09/05/74
NO. 541 44
34KM N



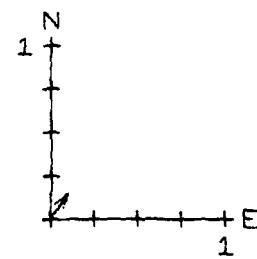
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
16/05/74



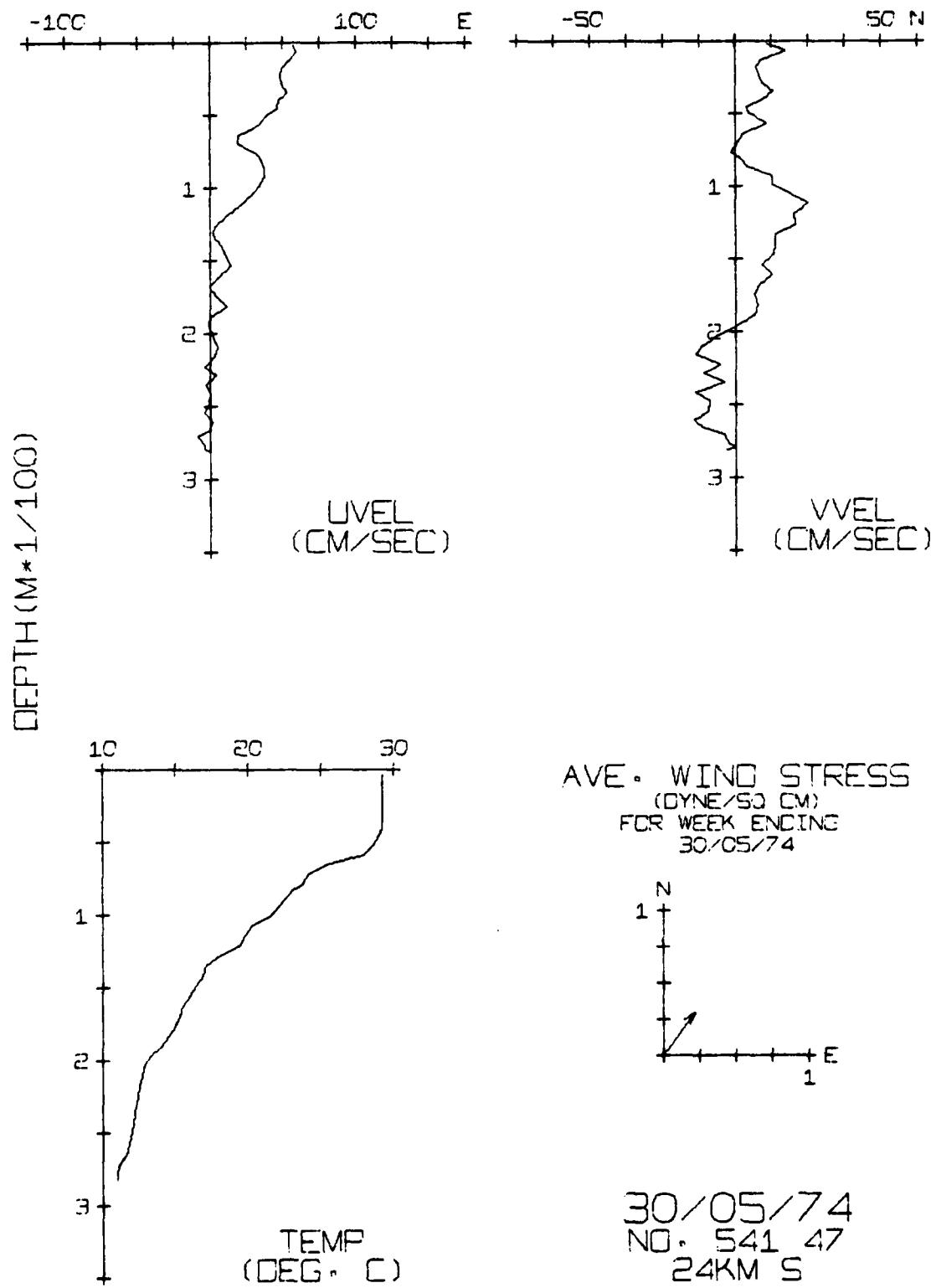
16/05/74
NO. 541 45
24KM S

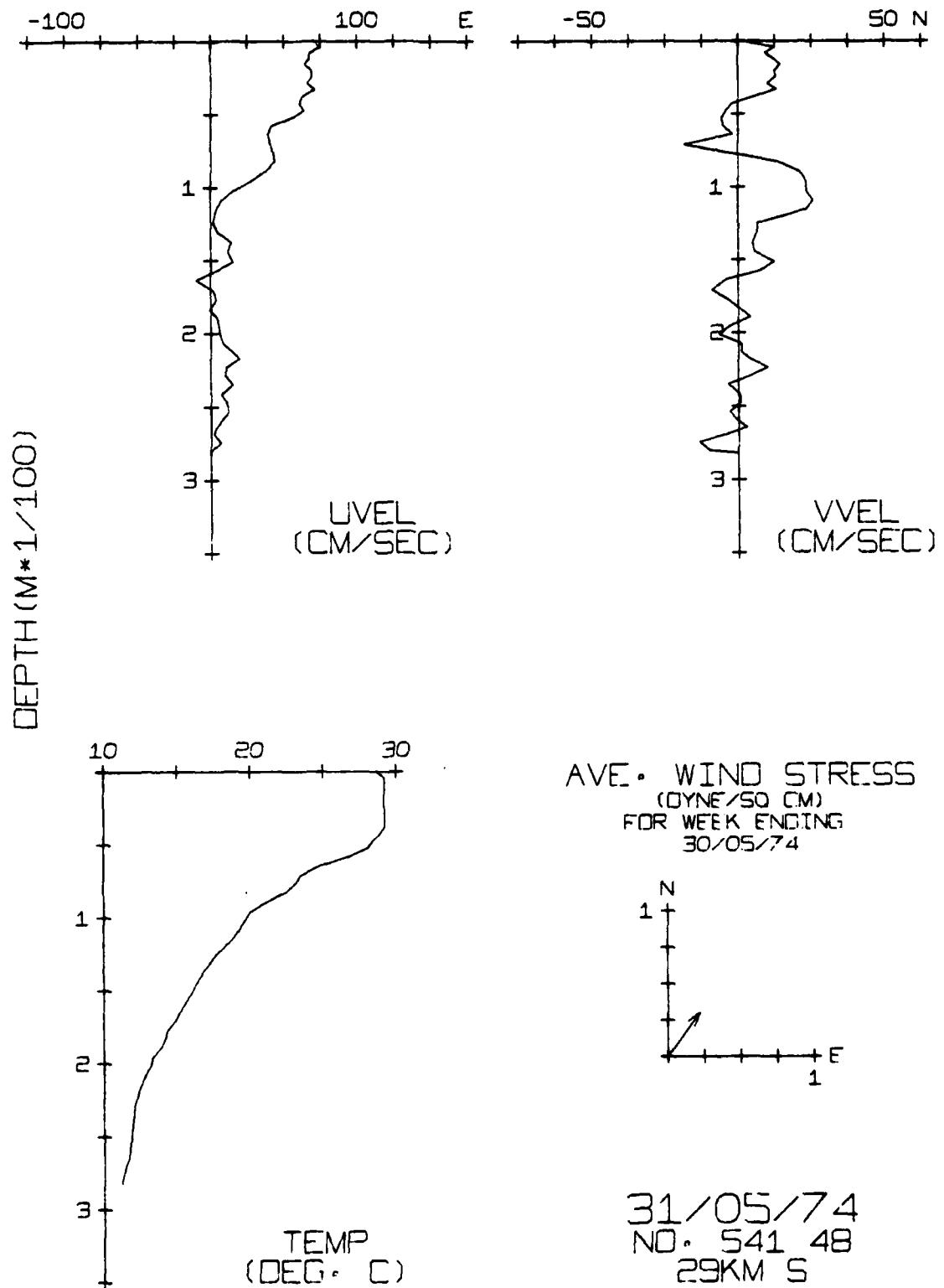


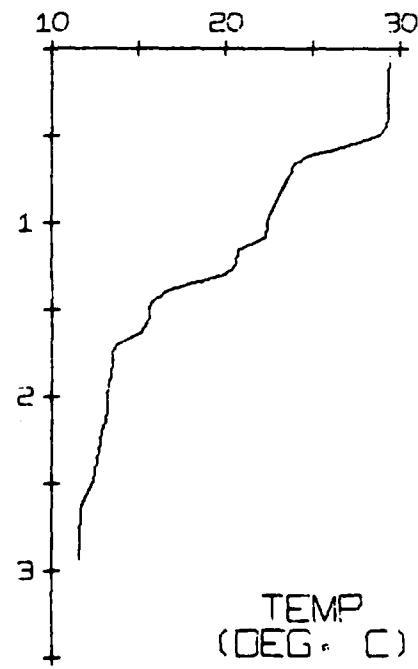
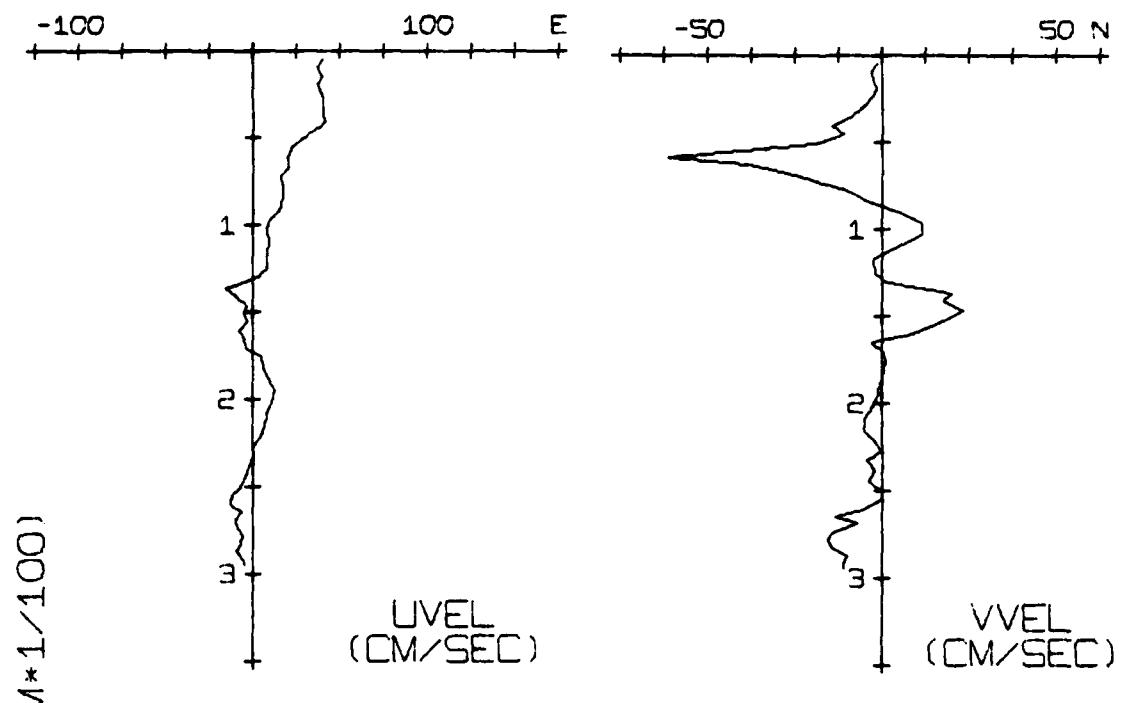
AVE. WIND STRESS
(DYNES/50 CM)
FOR WEEK ENDING
23/05/74



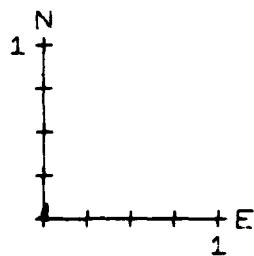
23/05/74
NO. 541 46
30KM N



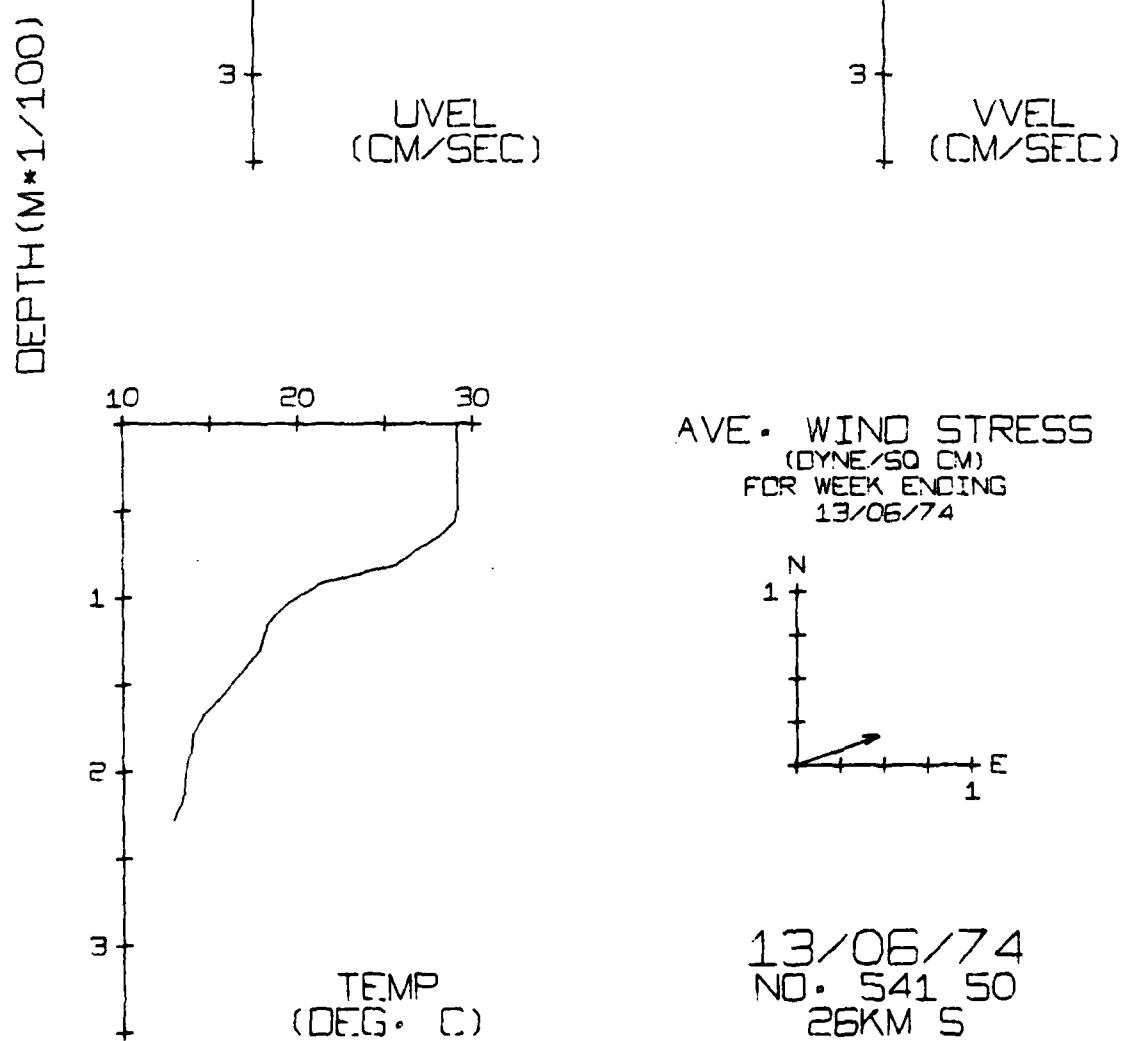
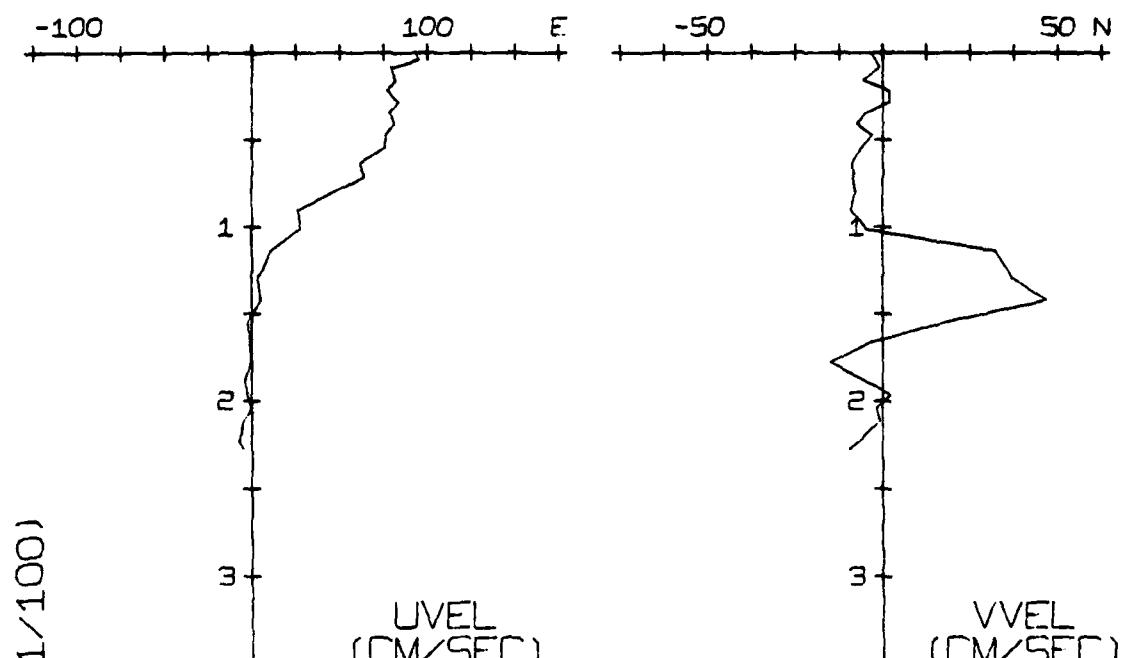




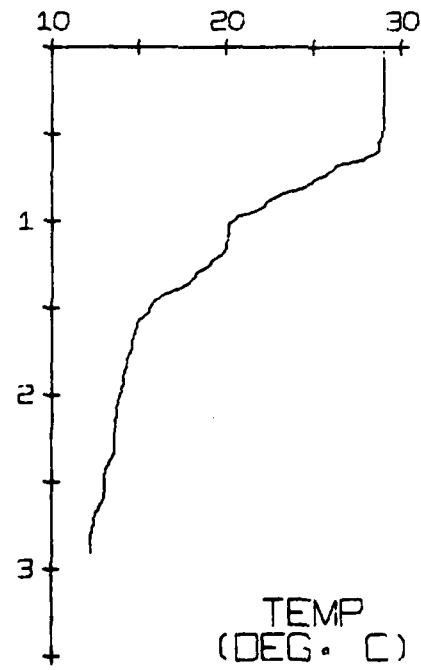
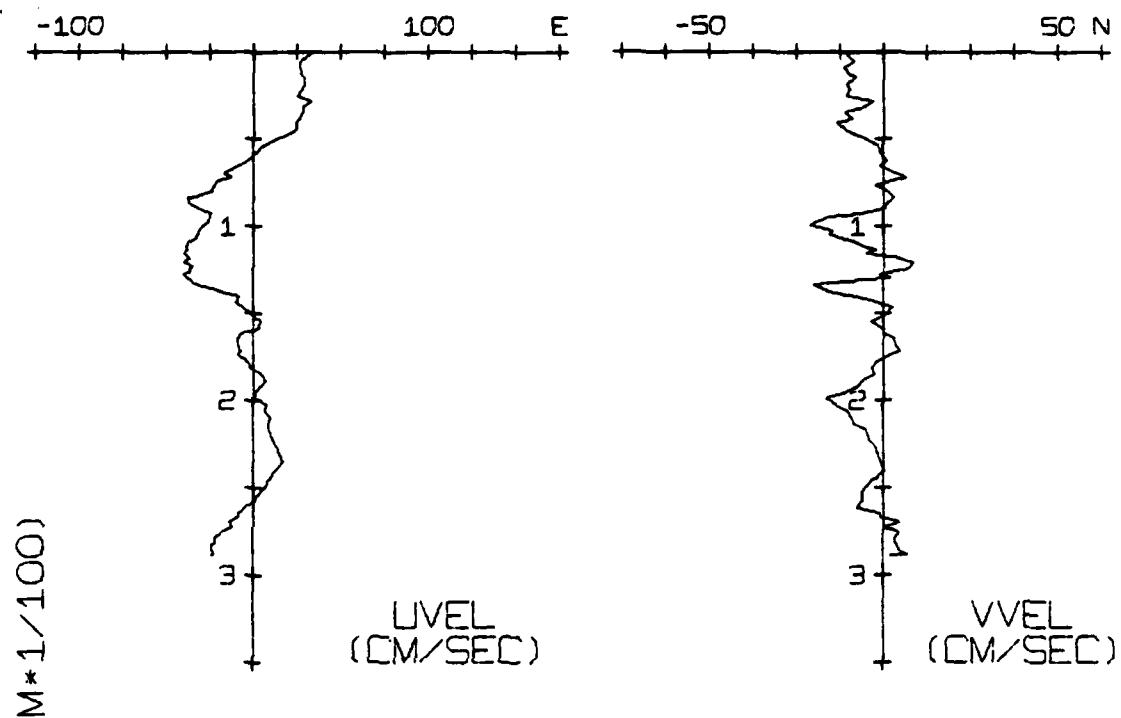
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
06/06/74



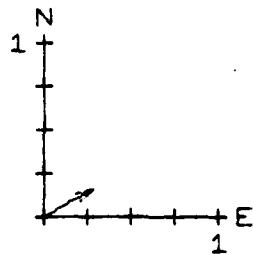
06/06/74
NO. 541 49
30KM N



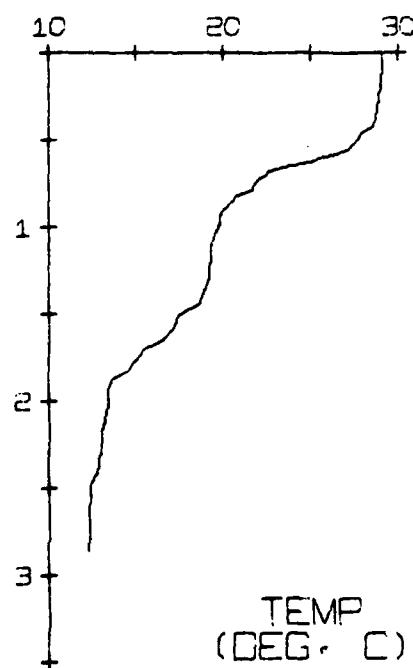
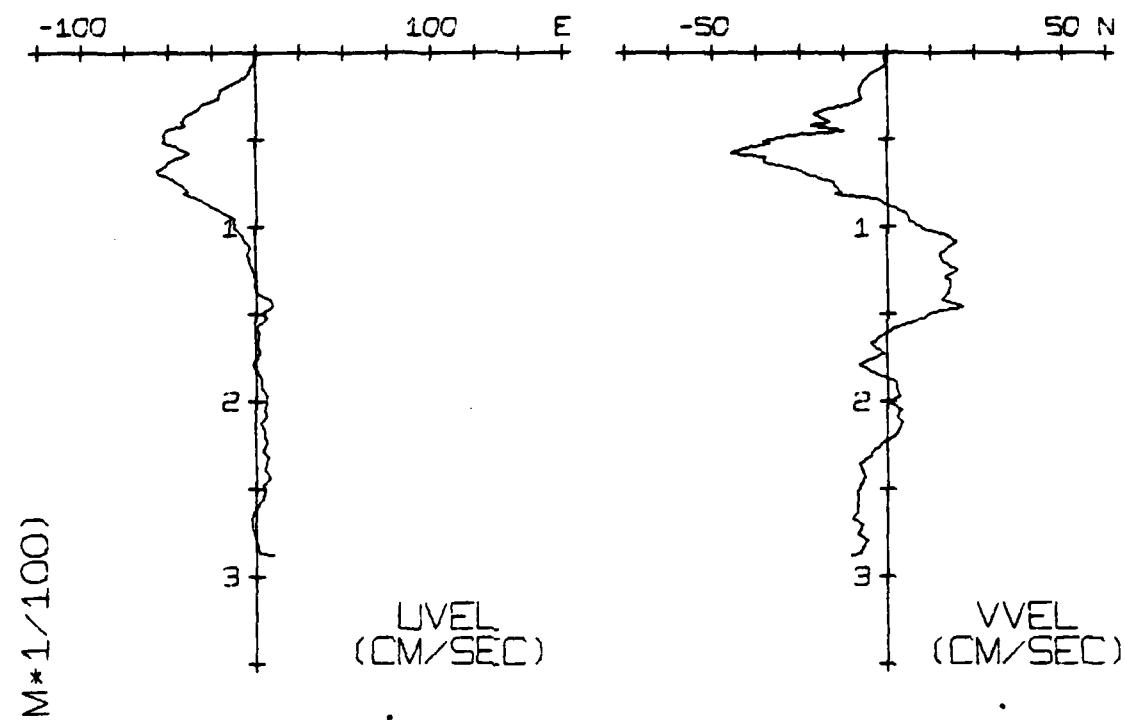
13/06/74
NO. 541 50
26KM S



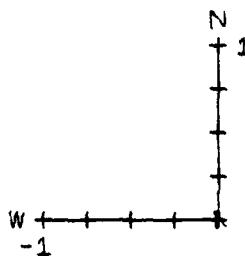
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
20/06/74



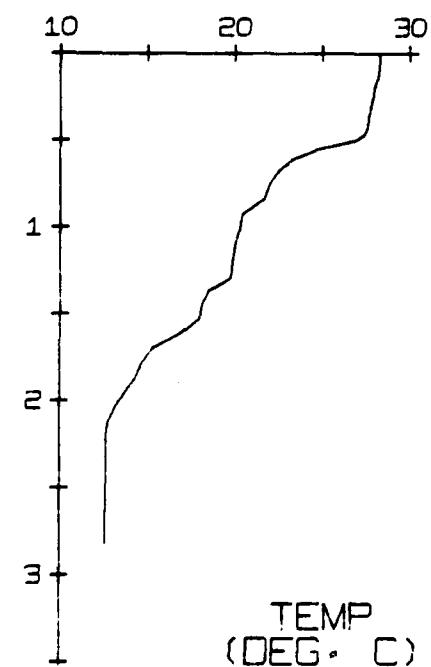
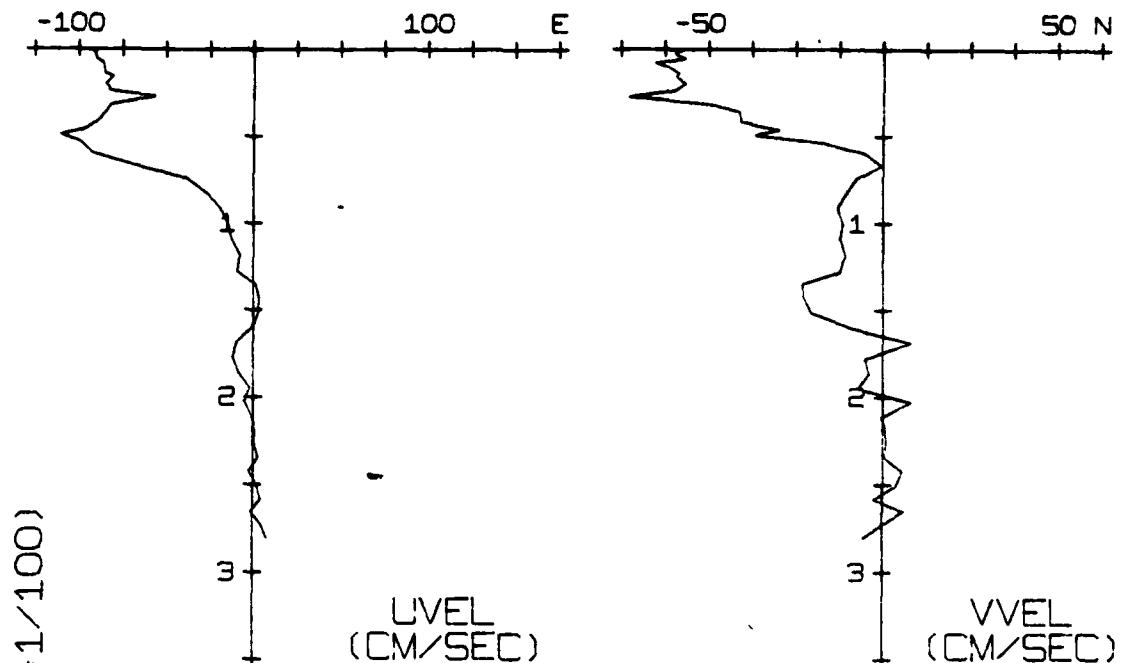
20/06/74
NO. S41 S1
30KM N



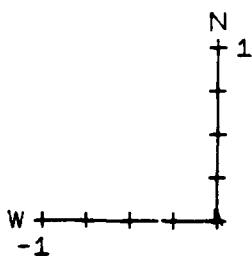
AVE. WIND STRESS
(CYNE/SQ CM)
FOR WEEK ENDING
27/06/74



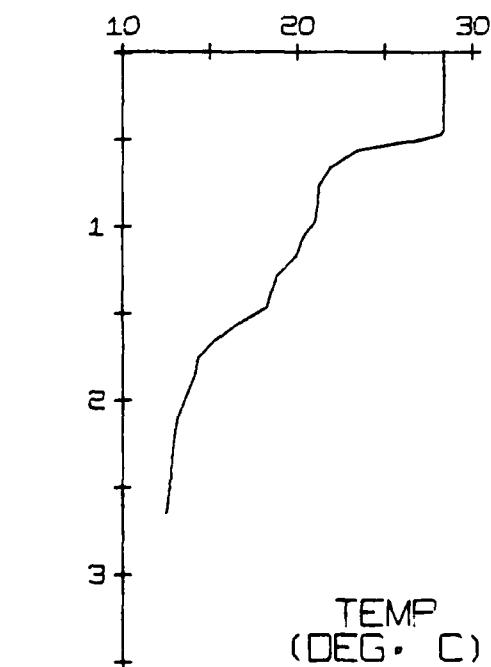
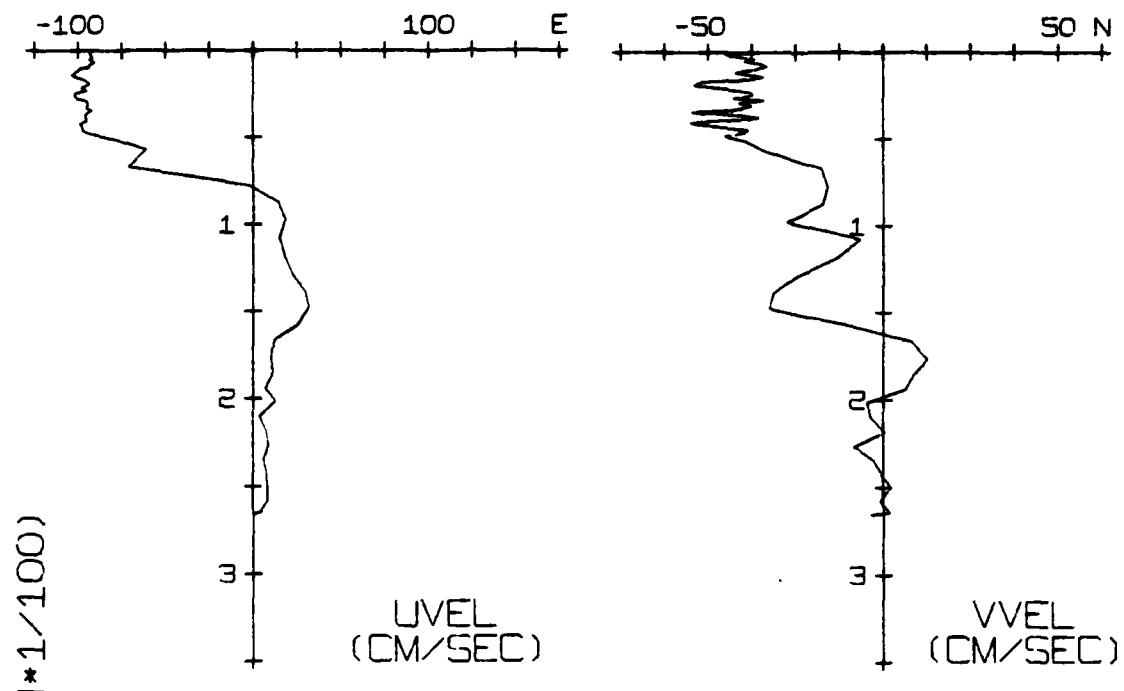
27/06/74
NO. S41 S2
24KM S



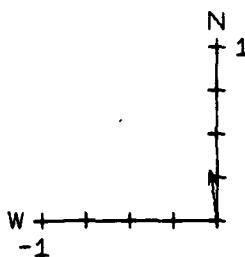
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
04/07/74



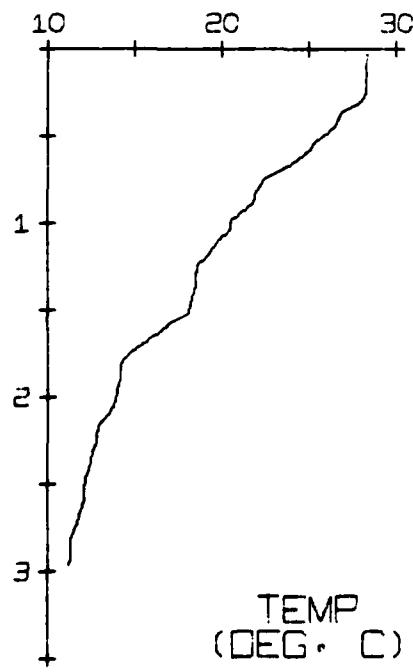
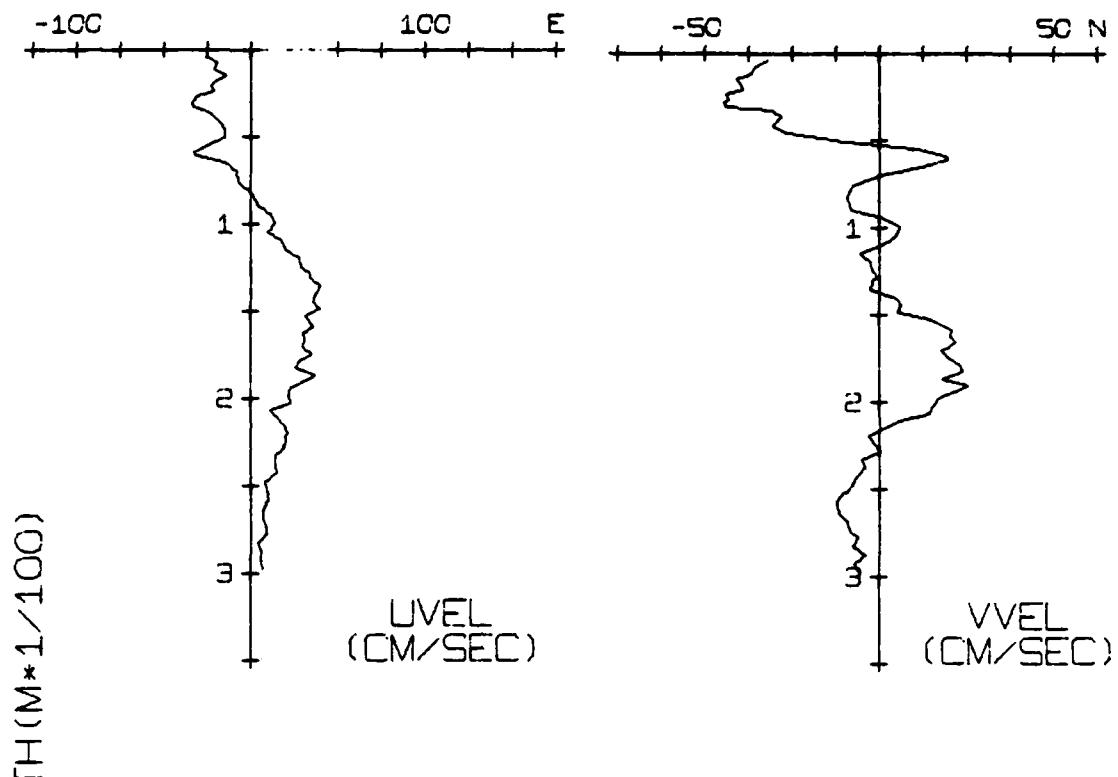
04/07/74
NO. 541 53
26KM N



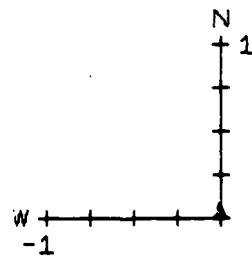
AVE. WIND STRESS
(CYNE/SQ CM)
FOR WEEK ENDING
11/07/74



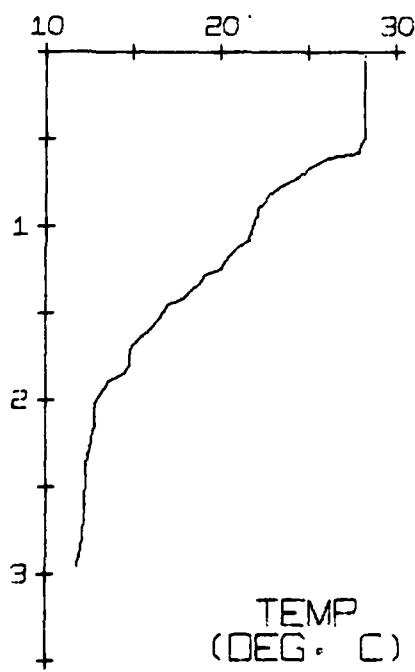
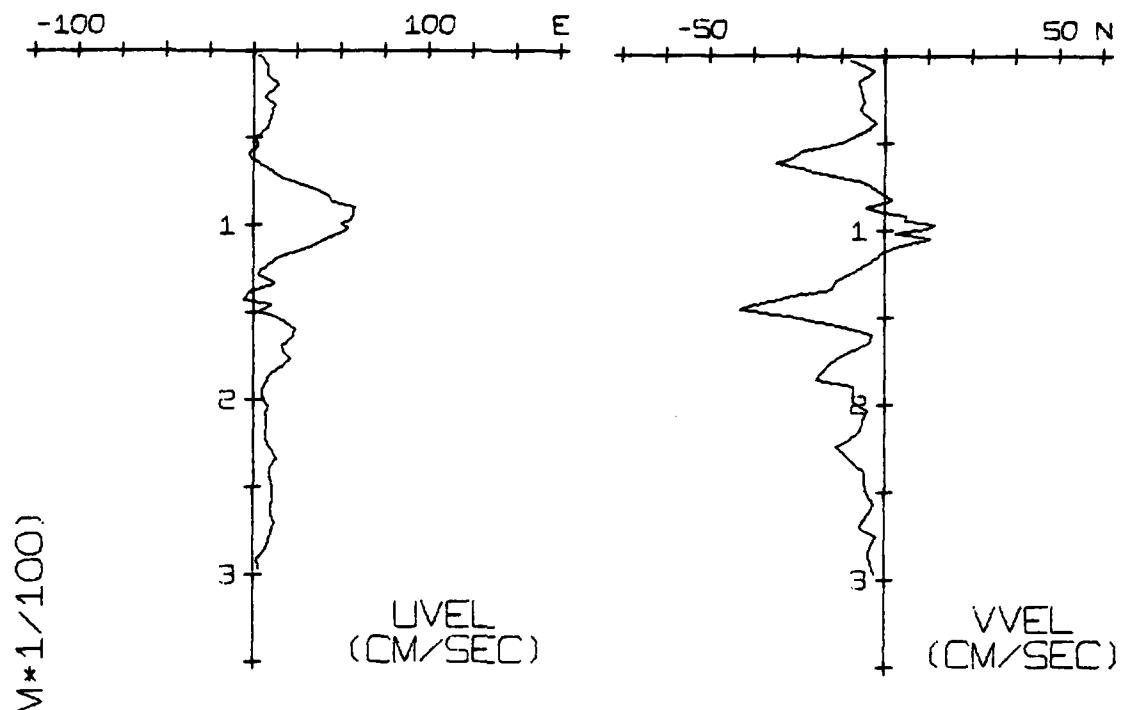
11/07/74
NO. 541 54
22KM S



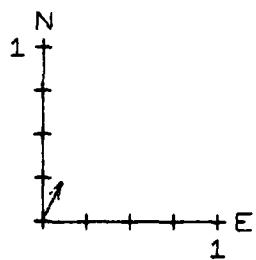
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
18/07/74



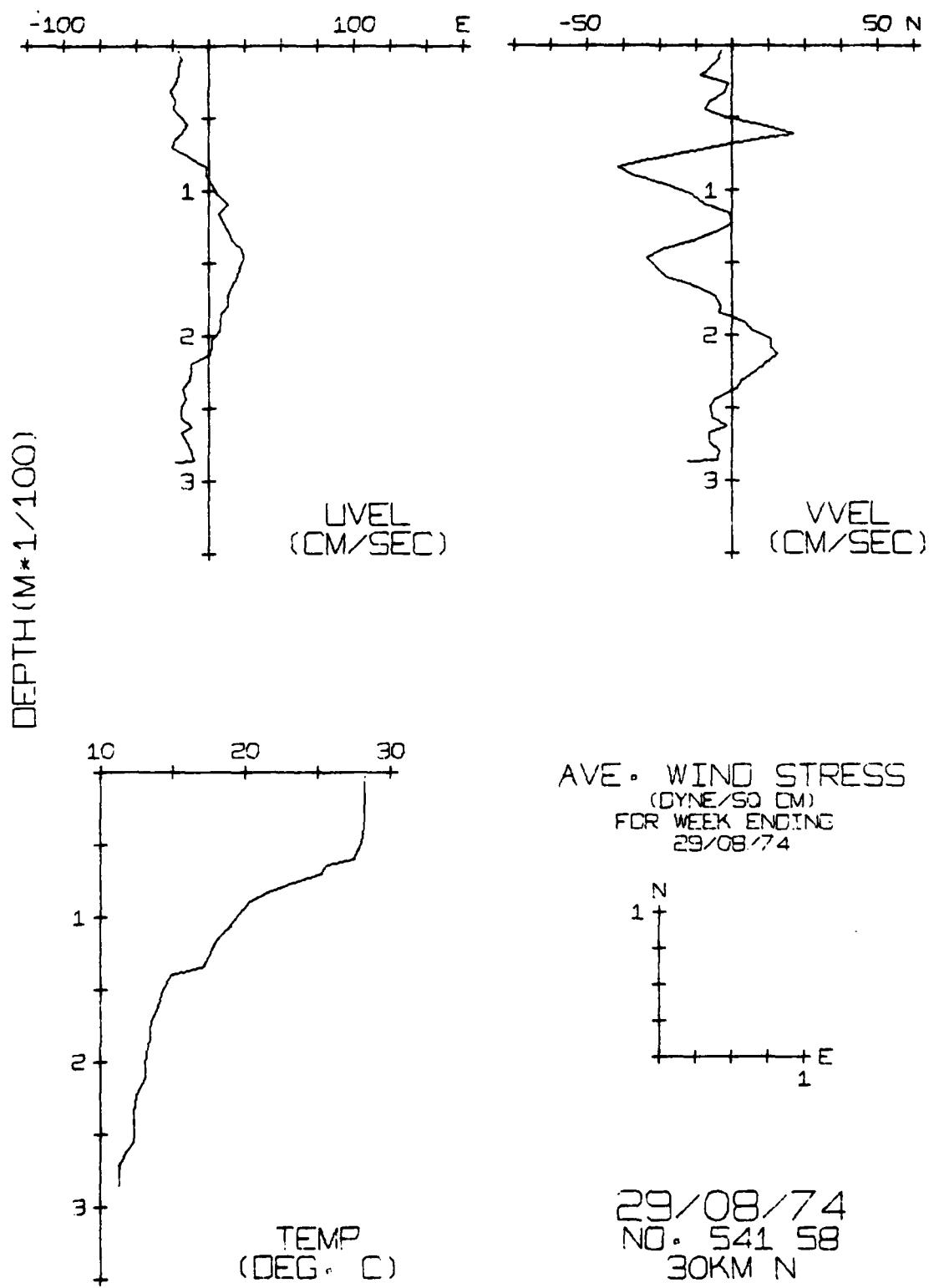
18/07/74
NO. 541 55
30KM N

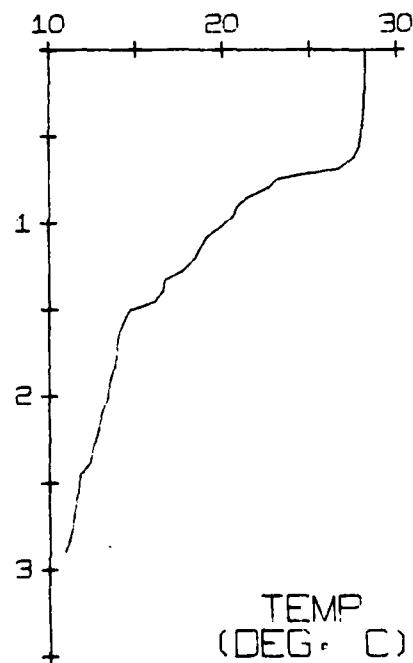
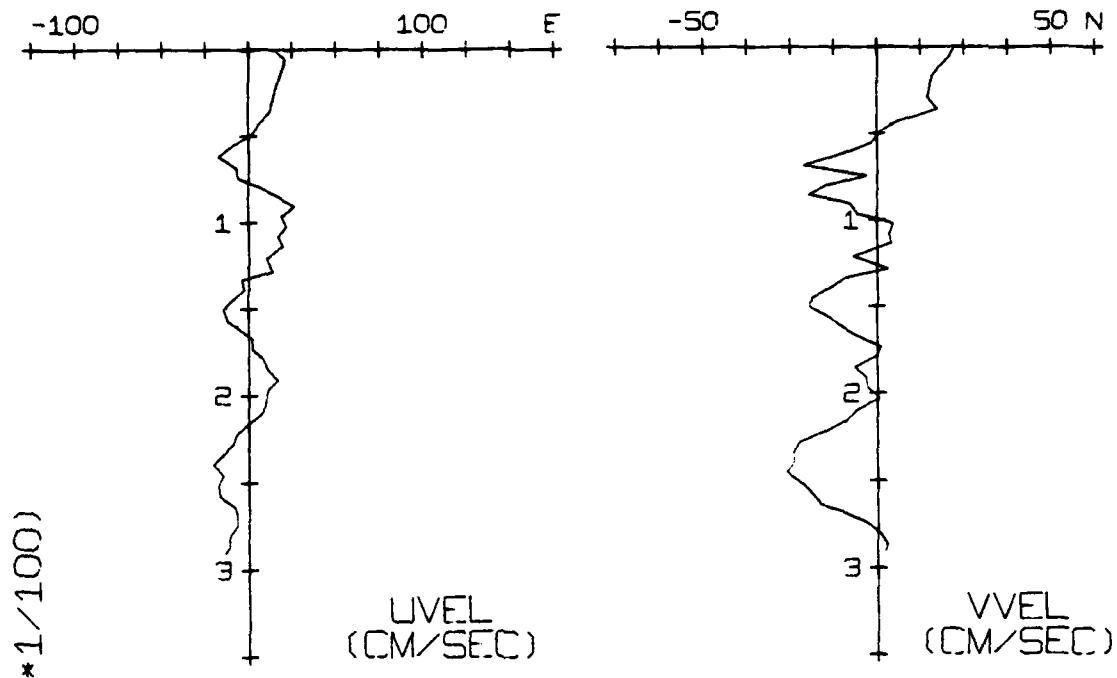


AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
01/08/74

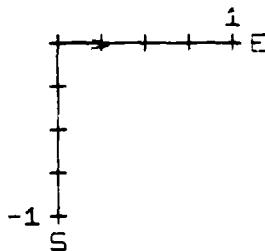


01/08/74
NO. 541 56
26KM N

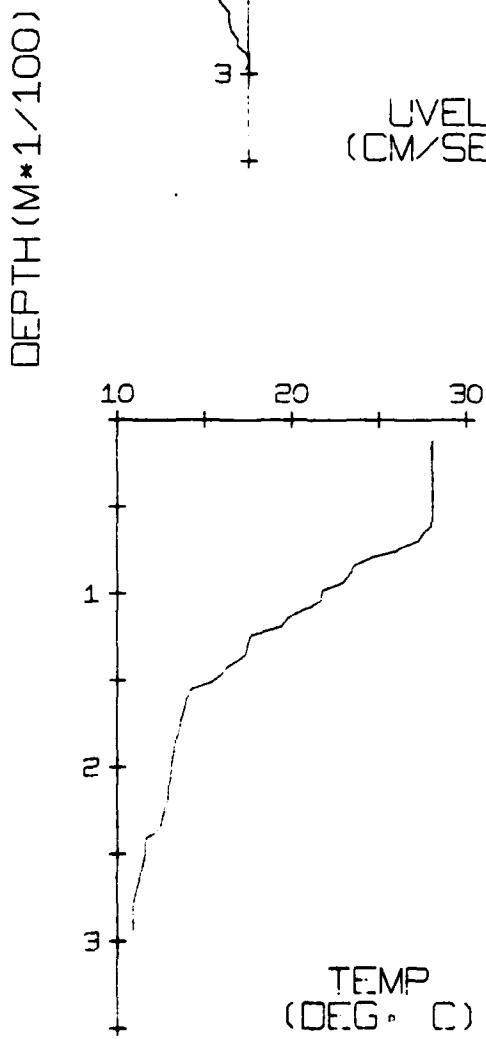
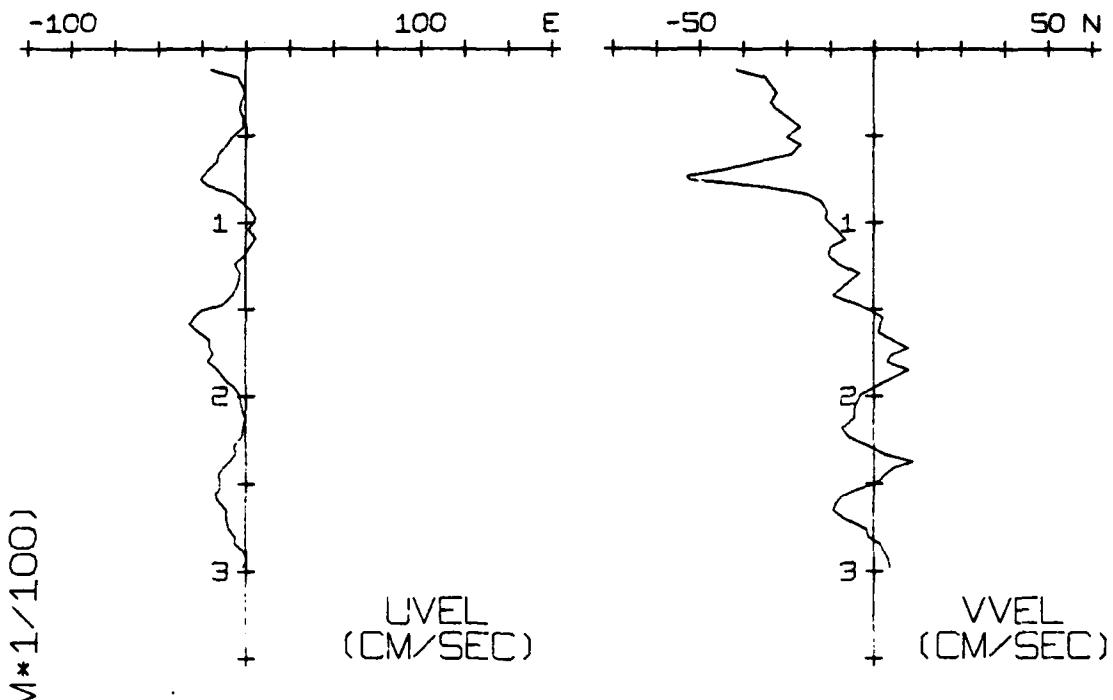




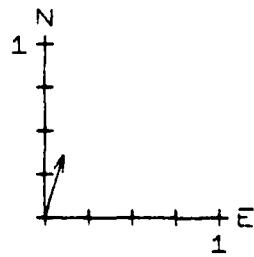
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
05/09/74



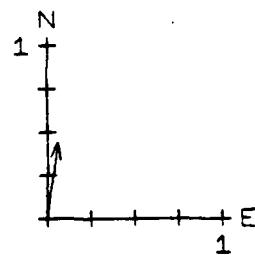
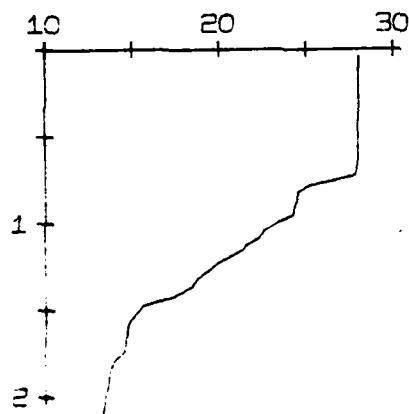
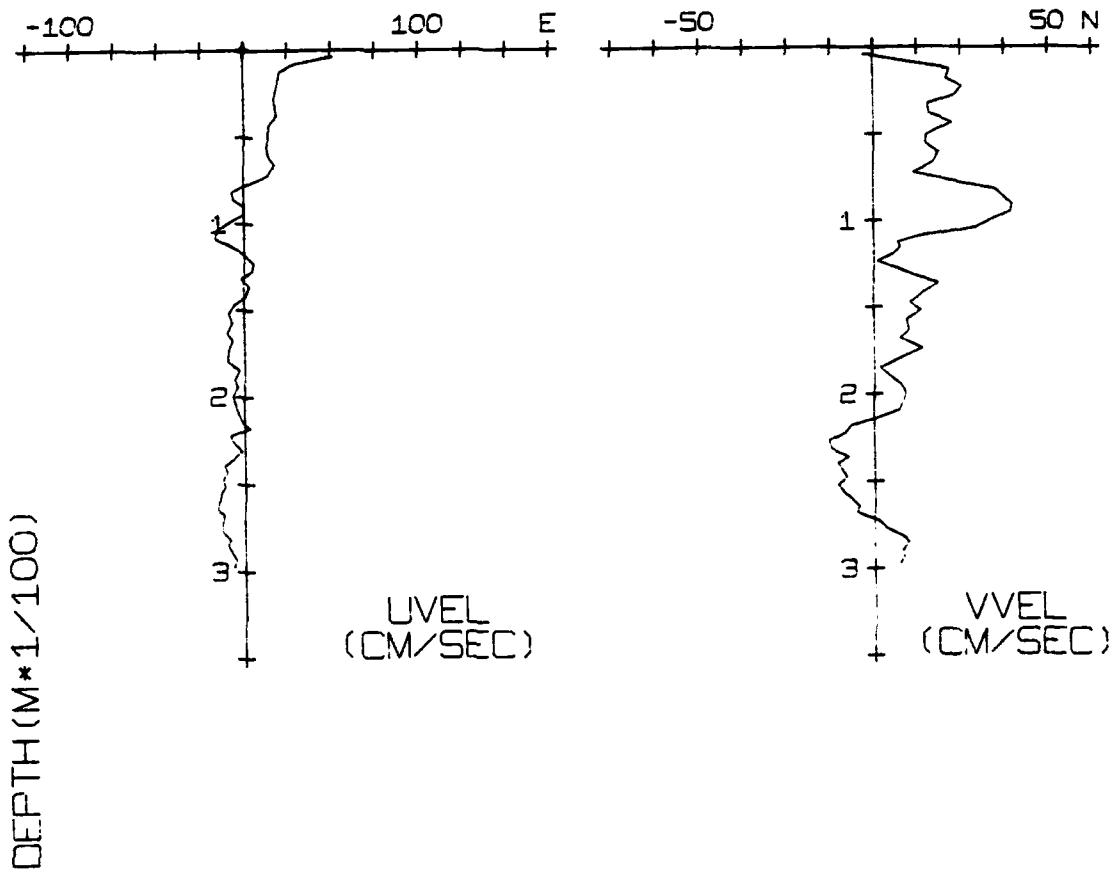
05/09/74
NO. 541 59
23KM S



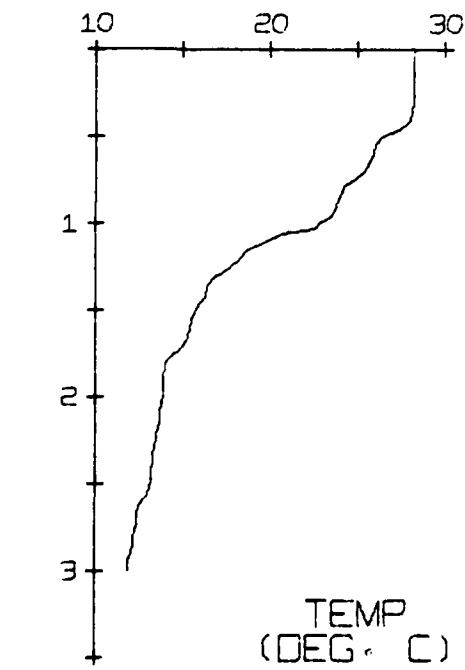
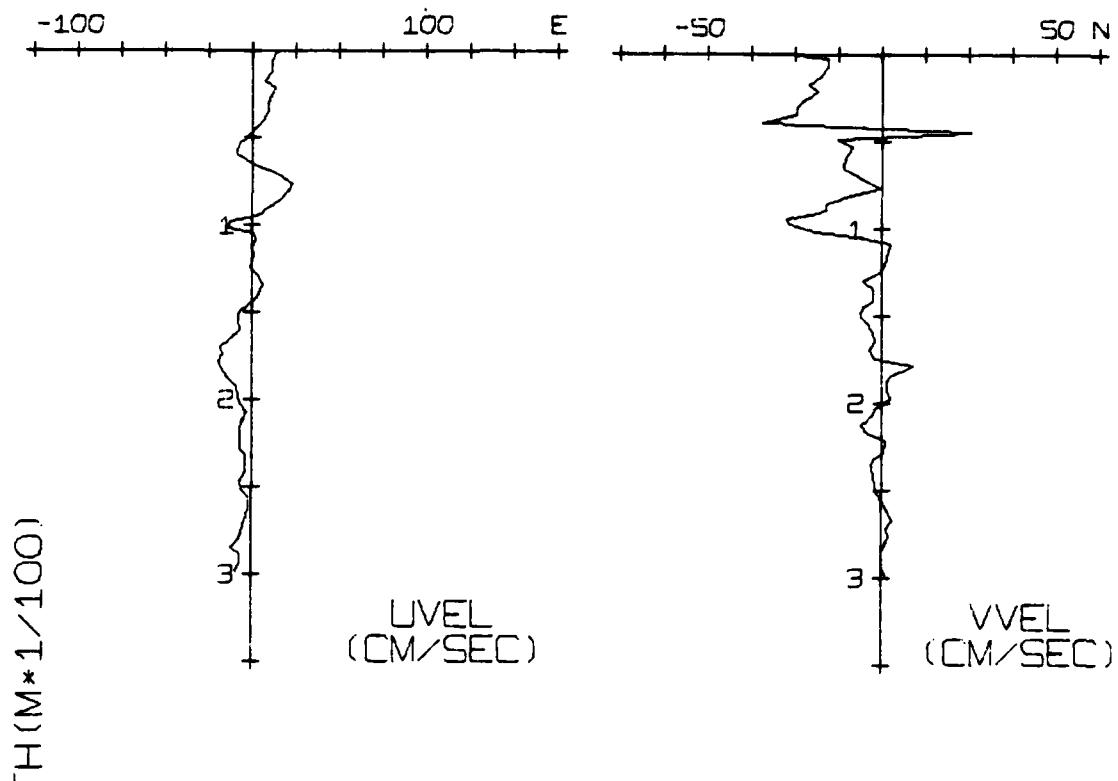
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
12/09/74



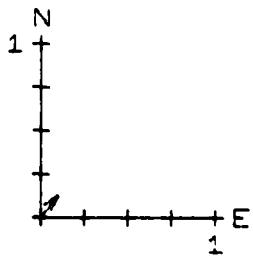
12/09/74
NO. 542 26
28KM N



20/09/74
NO. 542 27
24KM S

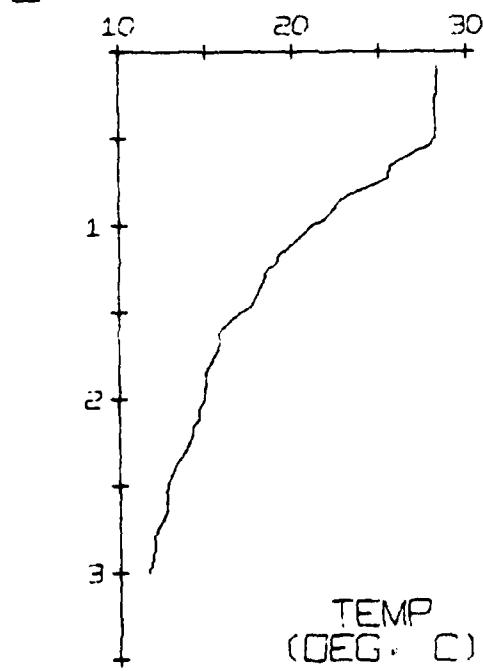
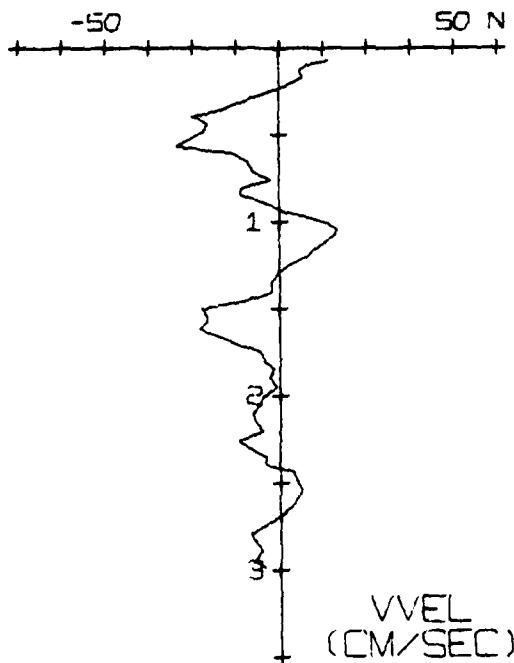
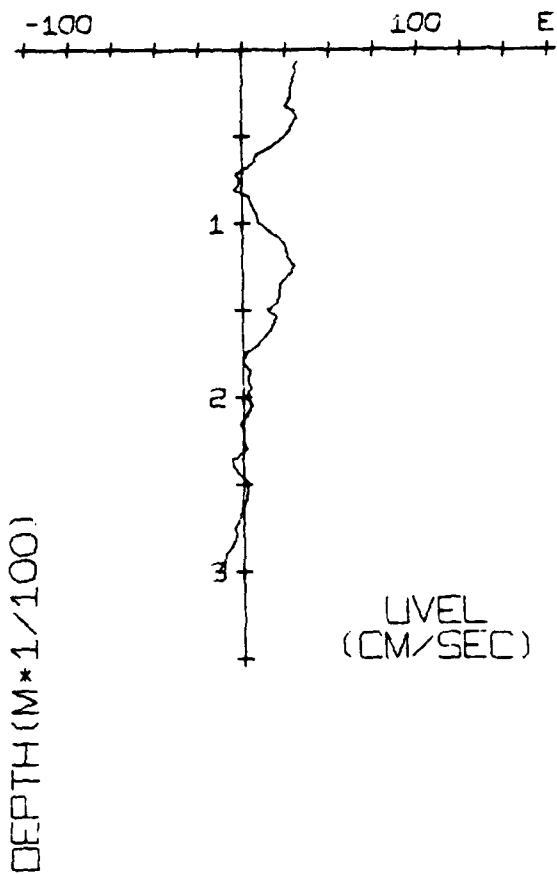


AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
25/09/74

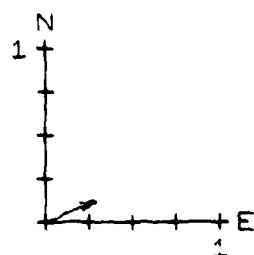


26/09/74
NO. 542 28
24KM N

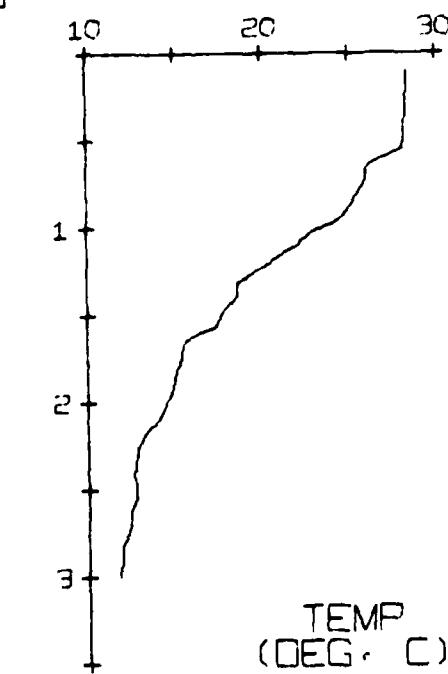
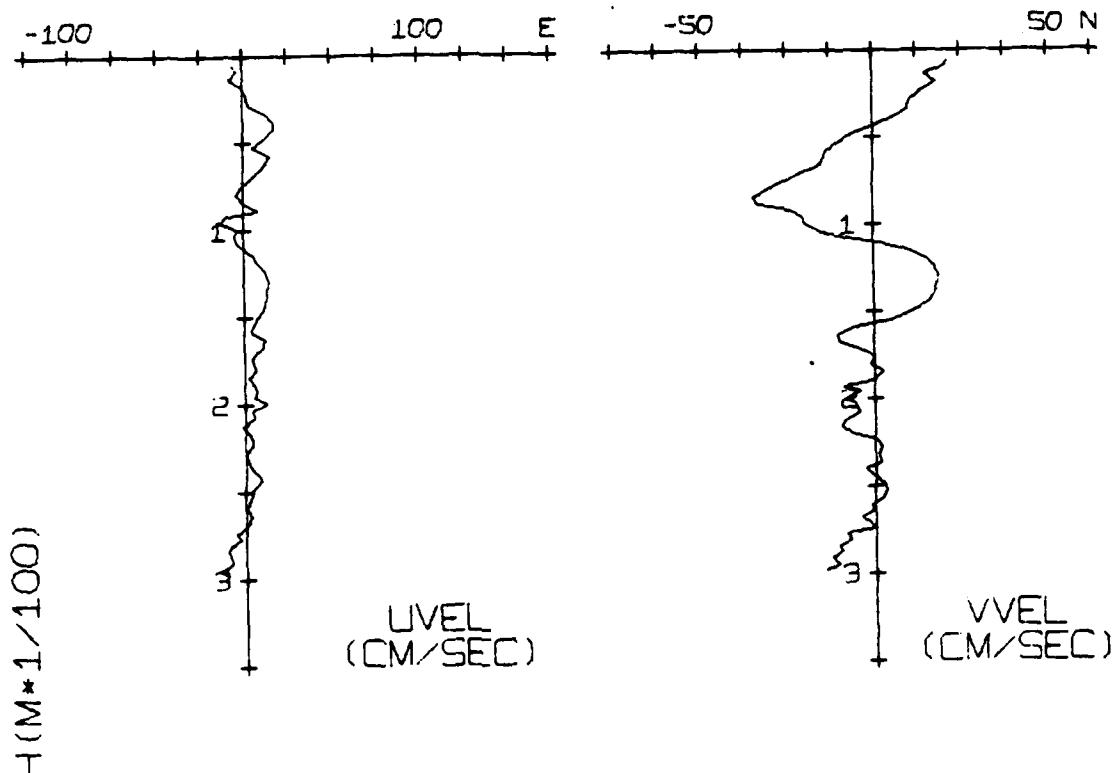
80



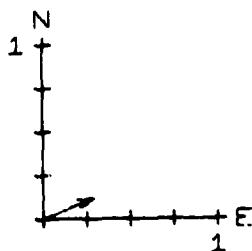
AVE. WIND STRESS
(DYNE/50 CM)
FOR WEEK ENDING
03/10/74



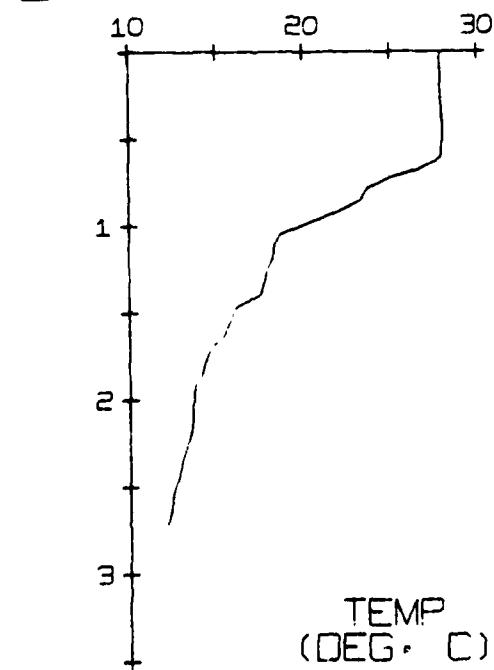
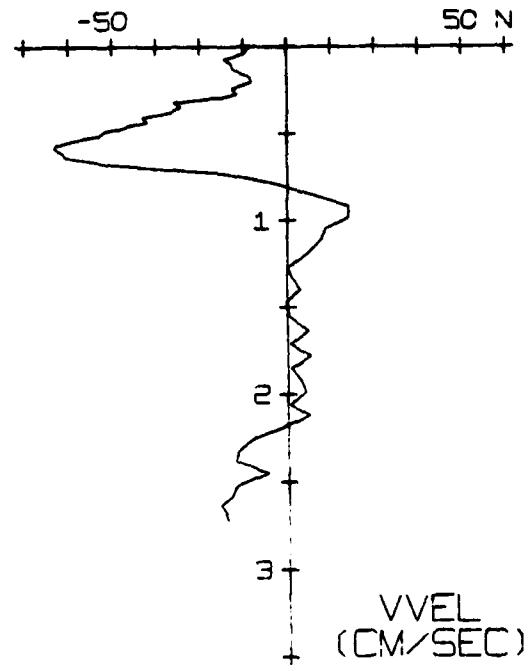
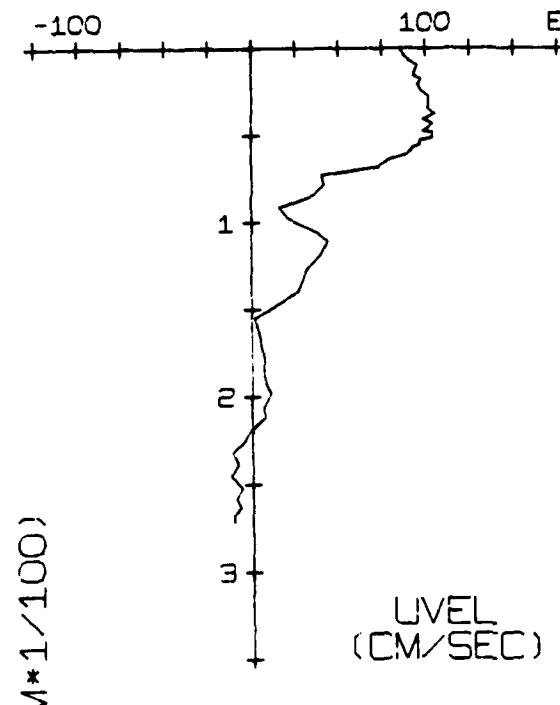
03/10/74
NO. 542 29
24KM S



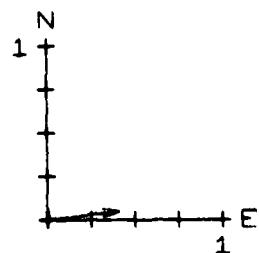
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
03/10/74



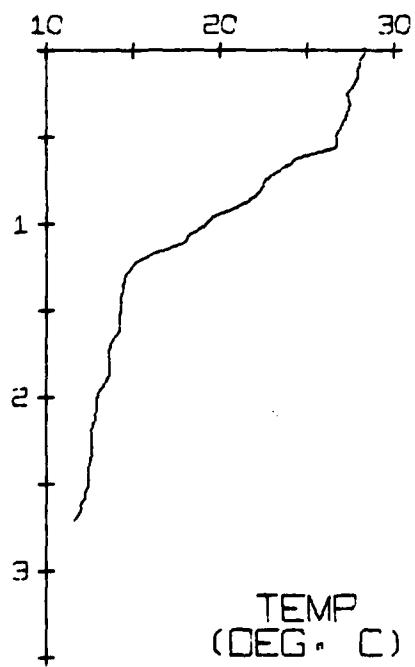
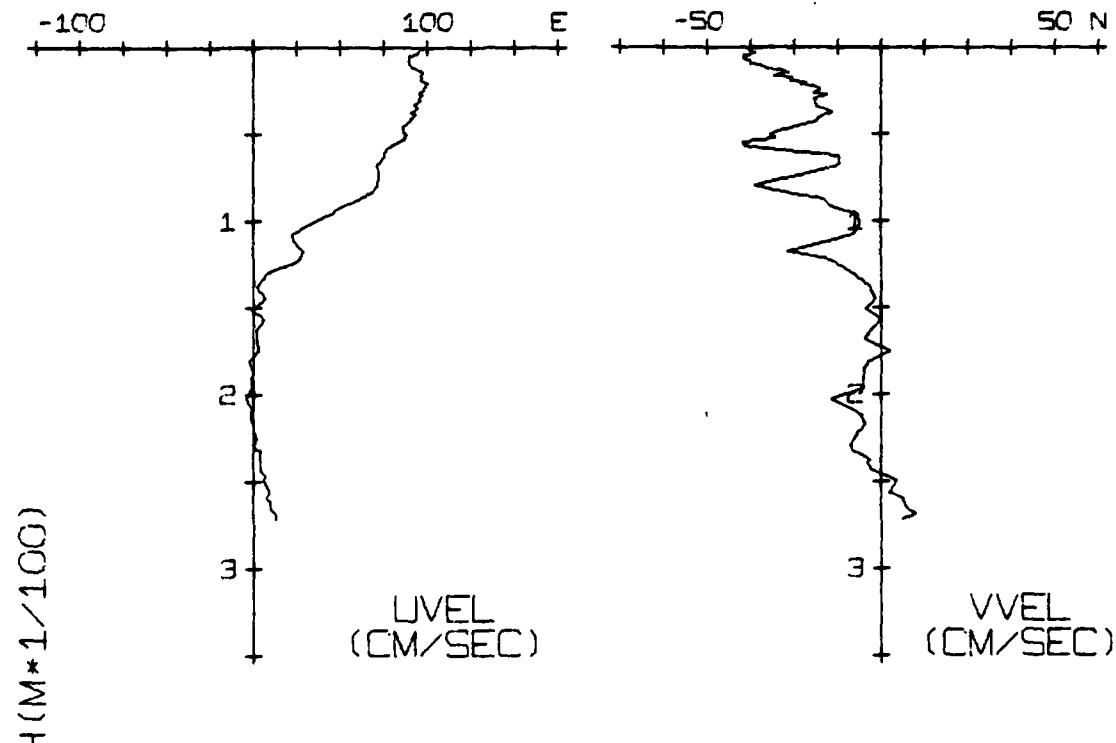
04/10/74
NO. 542 30
24KM S



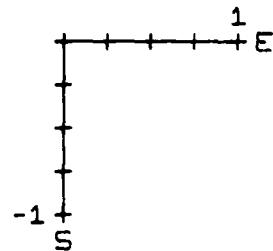
AVE. WIND STRESS
(DYNE/50 CM)
FOR WEEK ENDING
24/10/74



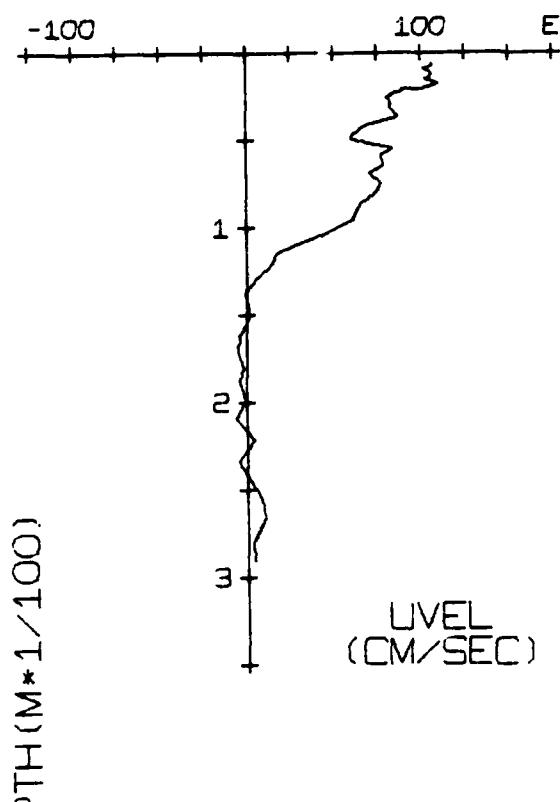
24/10/74
NO. 541 60
29KM S



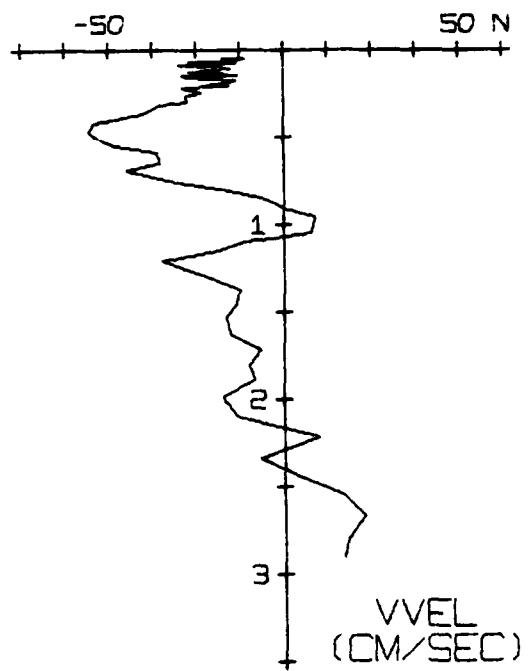
AVE. WIND STRESS
(DYNE/50 CM)
FOR WEEK ENDING
12/12/74



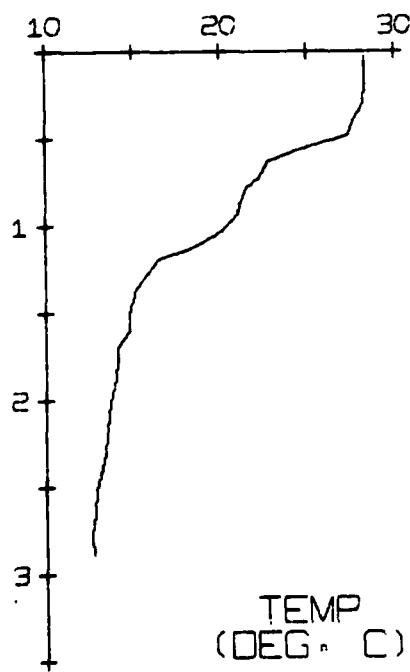
13/12/74
NO. 541 32
30KM N



UVEL
(CM/SEC)

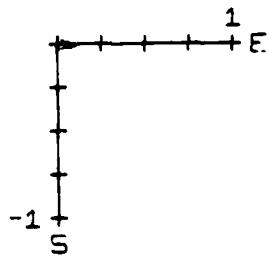


VVEL
(CM/SEC)



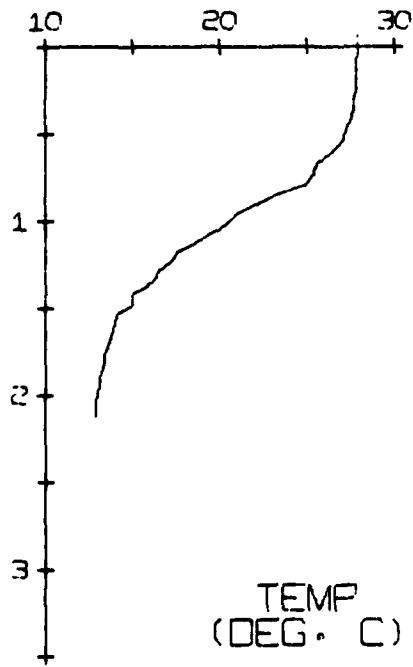
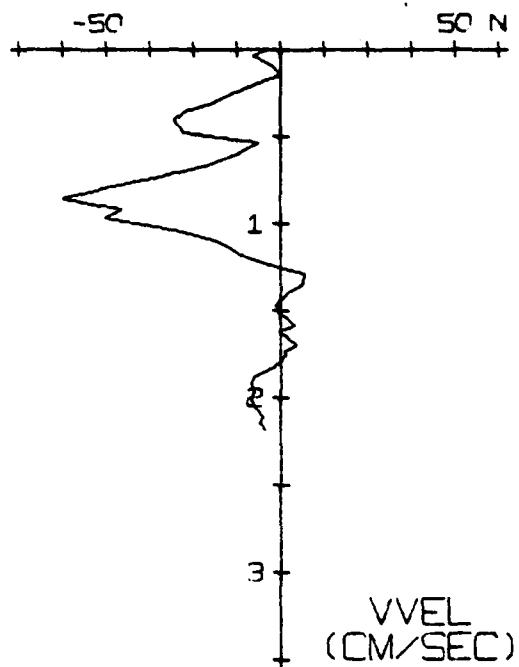
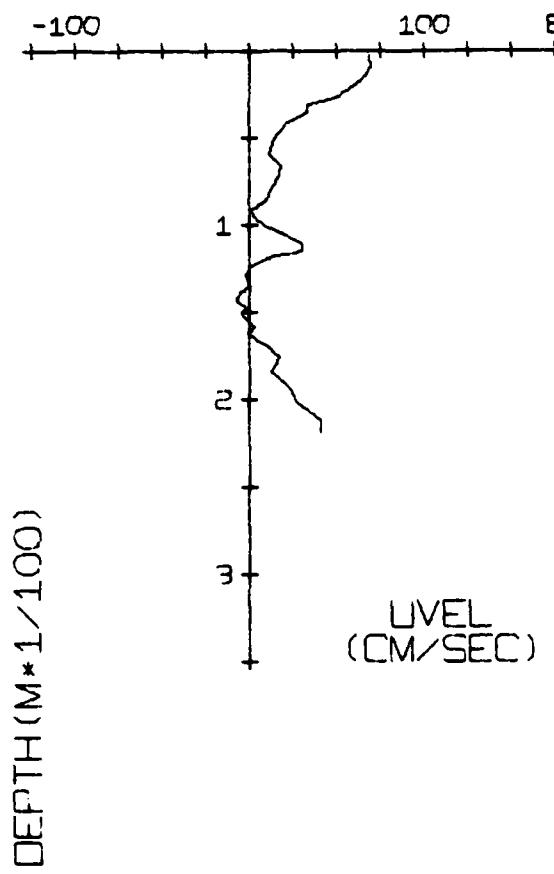
TEMP
(DEG. C)

AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
19/12/74

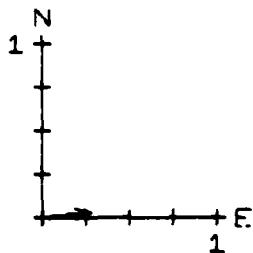


19/12/74
NO. 542 33
24KM S

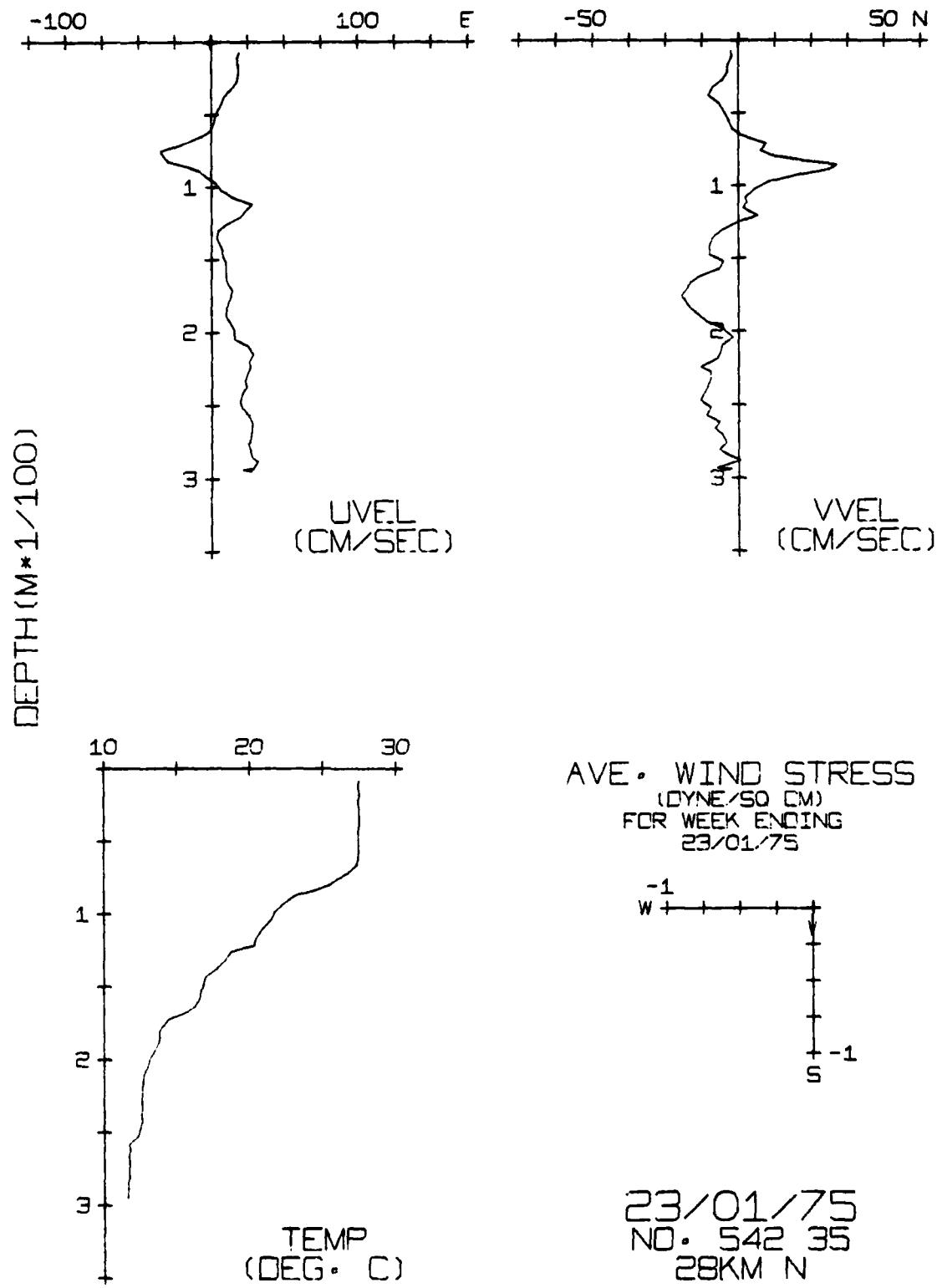
85

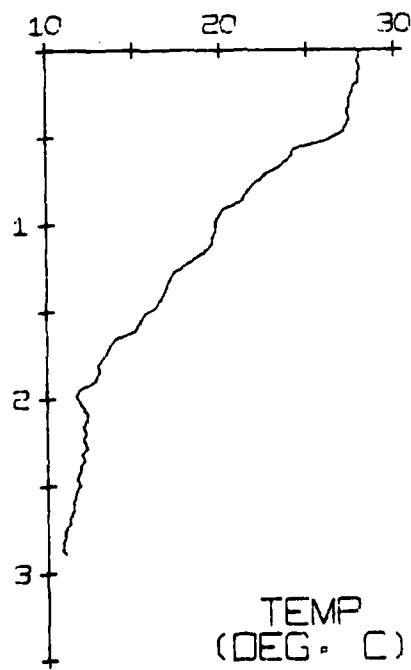
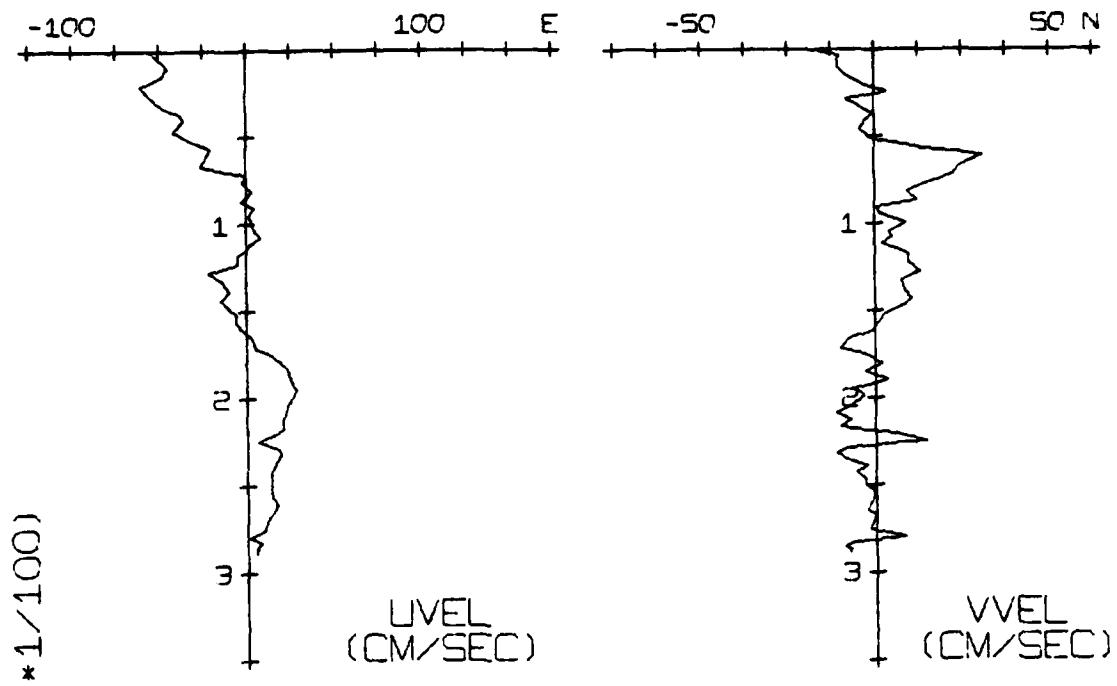


AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
09/01/75

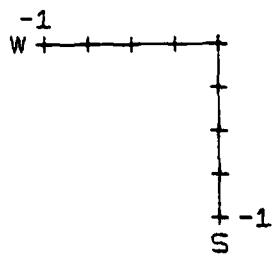


09/01/75
NO. 542 34
30KM N

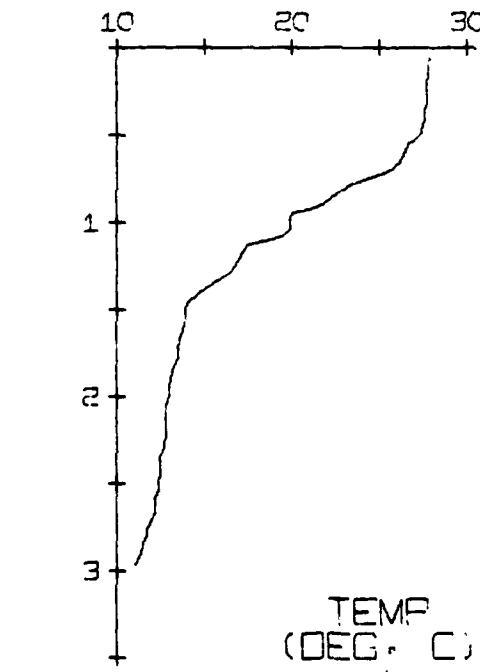
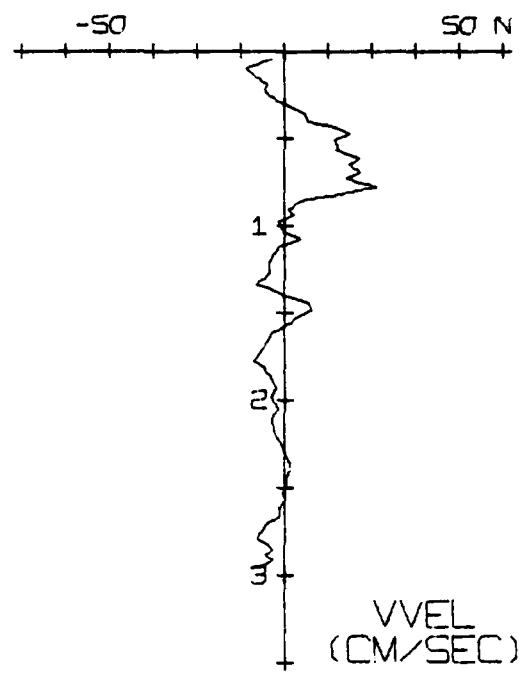
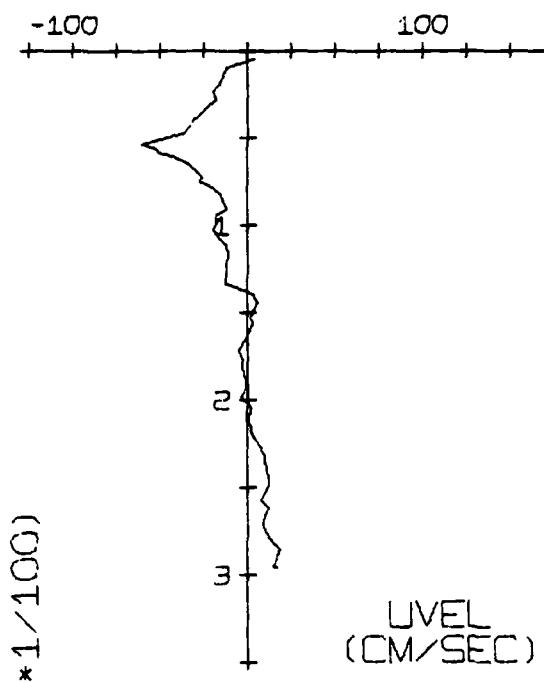




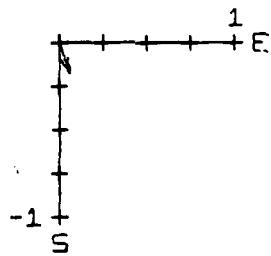
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
30/01/75



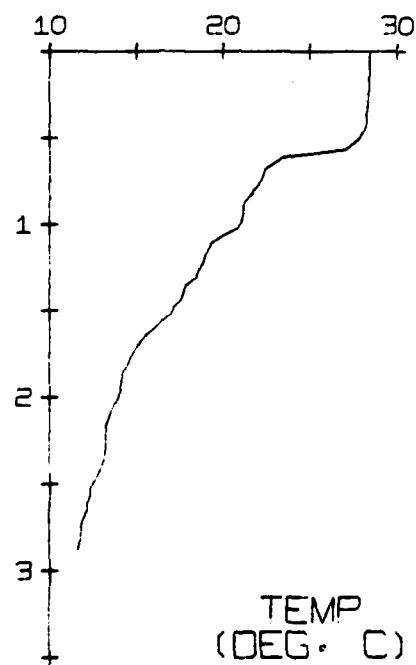
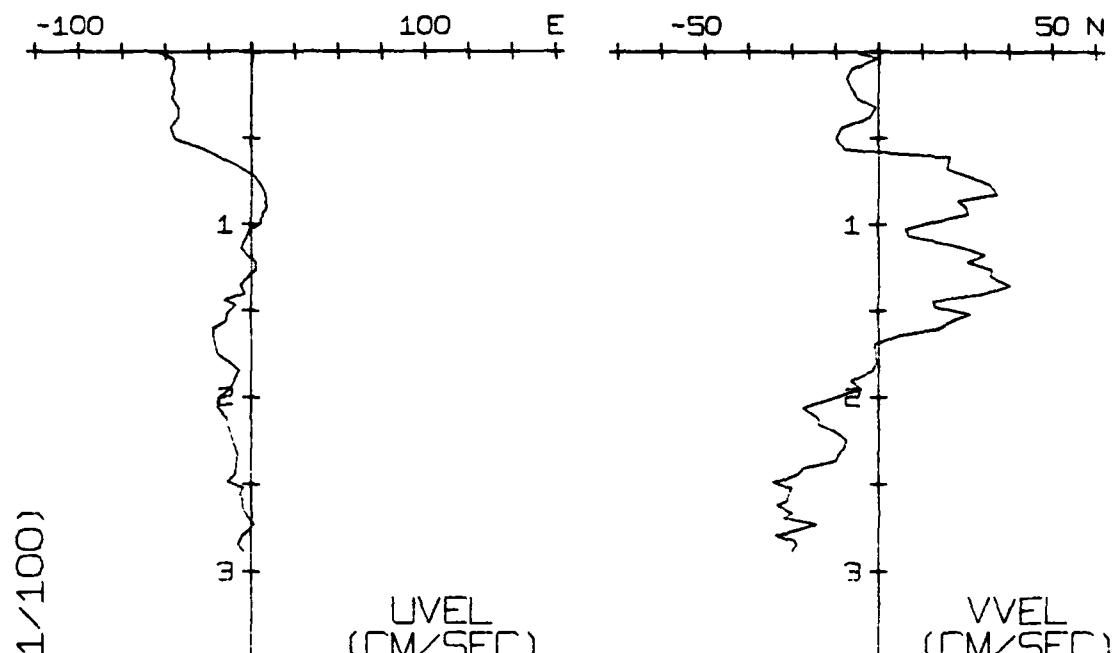
30/01/75
NO. 542 36
24KM S



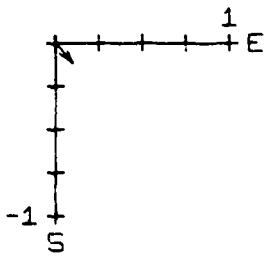
AVE. WIND STRESS
(CYNE/SQ CM)
FOR WEEK ENDING
06/02/75



06/02/75
NO. 542 37
30KM N

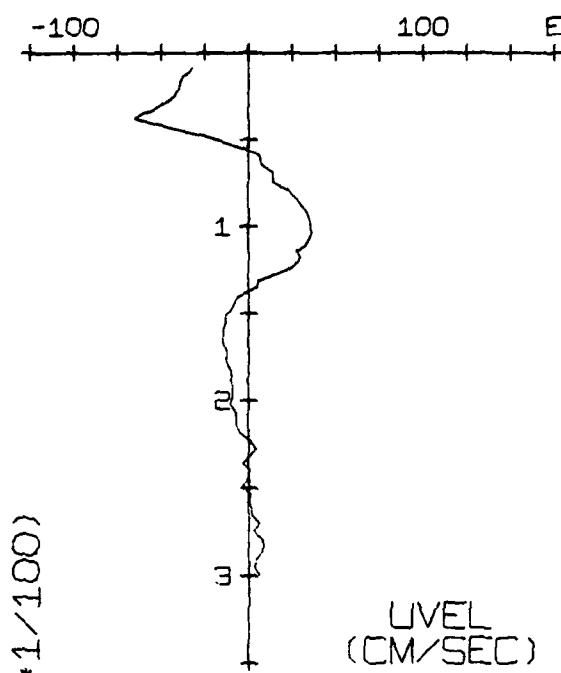
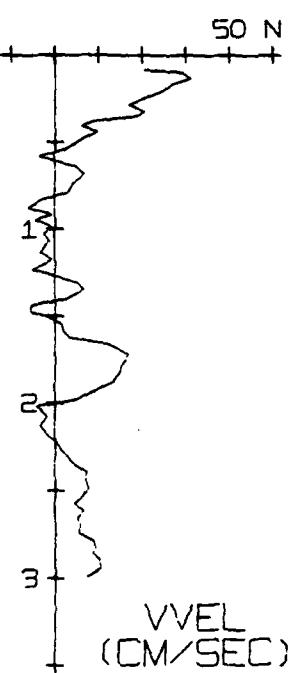


AVE. WIND STRESS
(DYNES/50 CM)
FOR WEEK ENDING
20/02/75

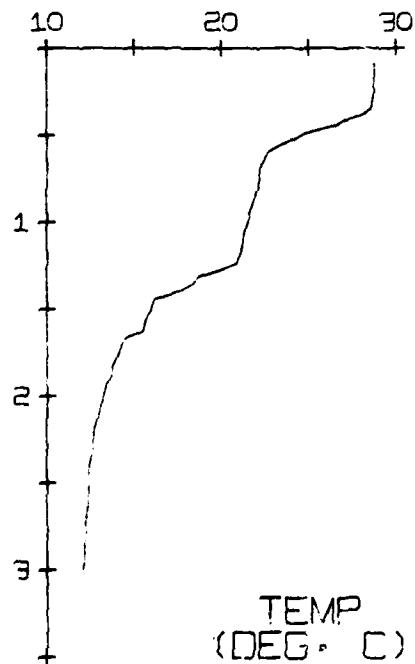


21/02/75
NO. 542 38
28KM S

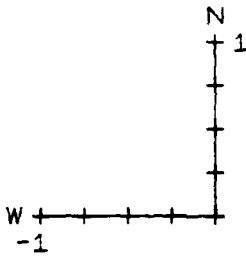
90

UVEL
(CM/SEC)VVEL
(CM/SEC)

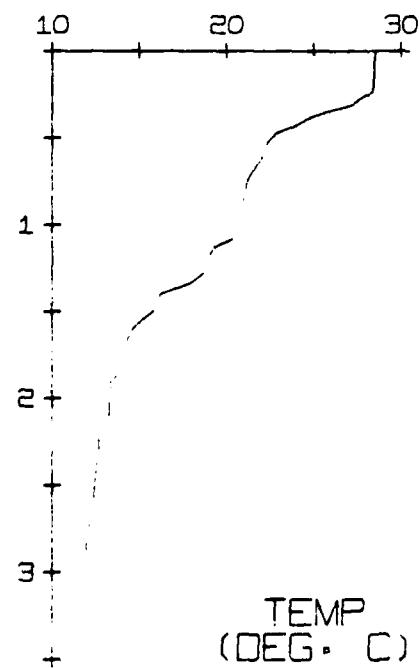
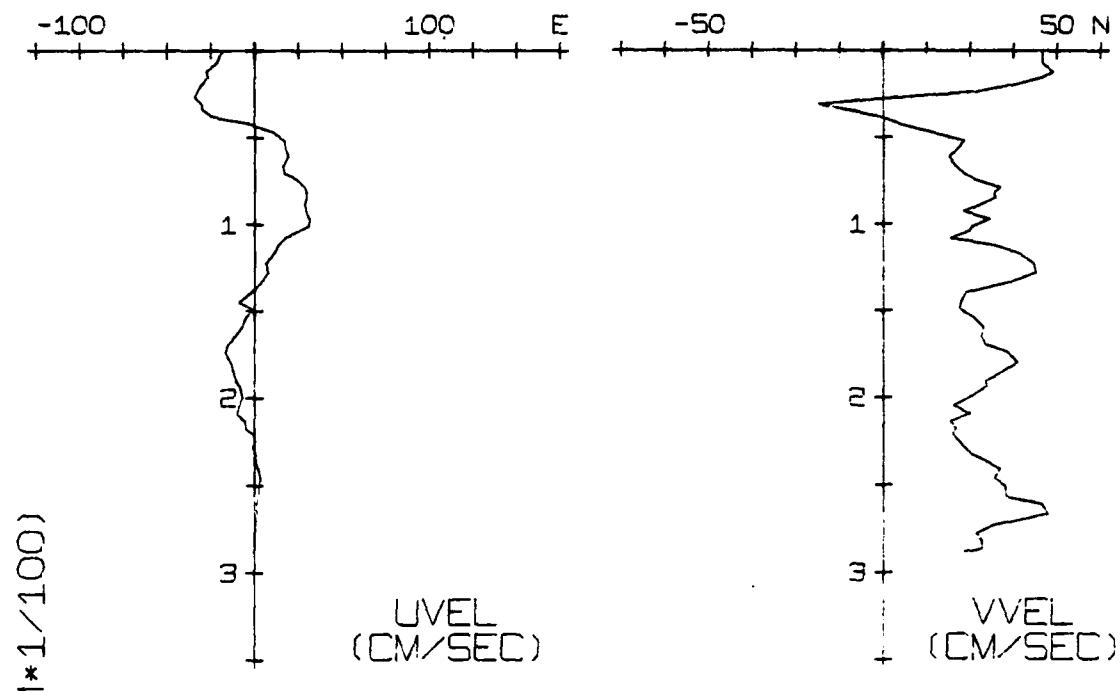
DEPTH (M * 1/100)

TEMP
(DEG. C)

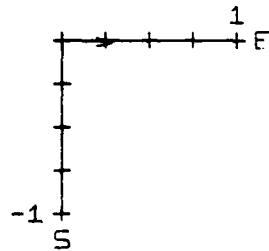
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
27/02/75



28/02/75
NO. 542 39
32KM N



AVE. WIND STRESS
(DYN/50 CM)
FOR WEEK ENDING
06/03/75



07/03/75
NO. 542 40
26KM S

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SCRIPPS INSTITUTION OF OCEANOGRAPHY LA JOLLA CA

F/6 8/3

PROFILES OF VELOCITY AND TEMPERATURE NEAR THE INDIAN OCEAN EQUA--ETC(U)

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NL

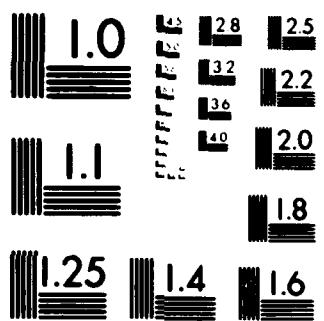
UNCLASSIFIED

MAR 80 R A KNOX, M J MCPHADEN

SIO-REF-80-6

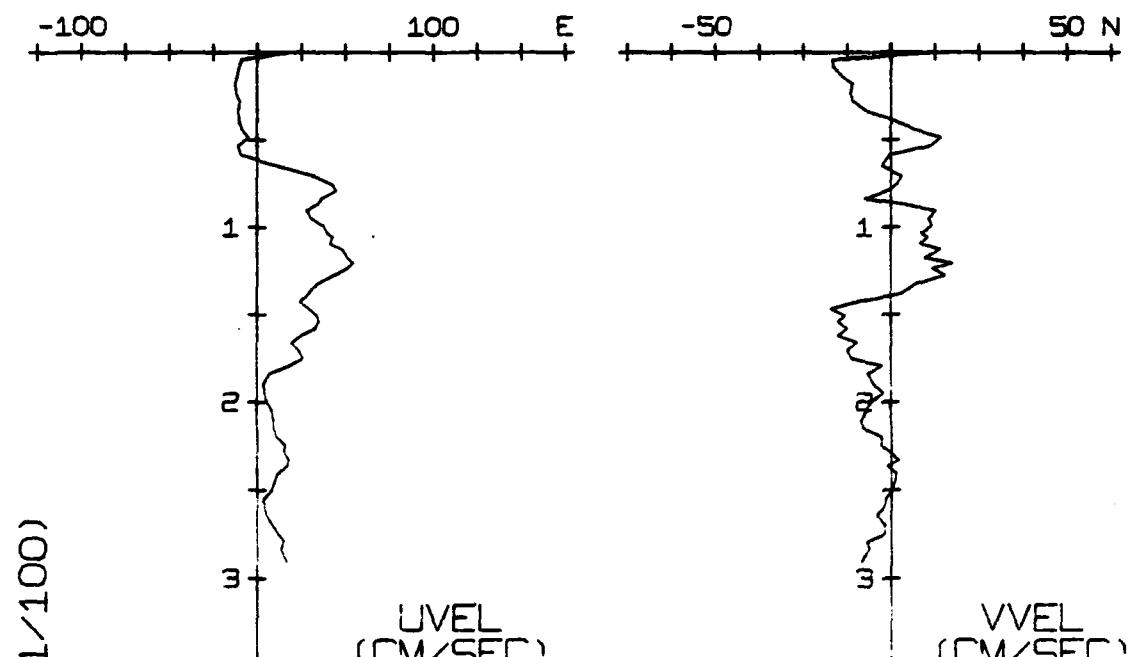
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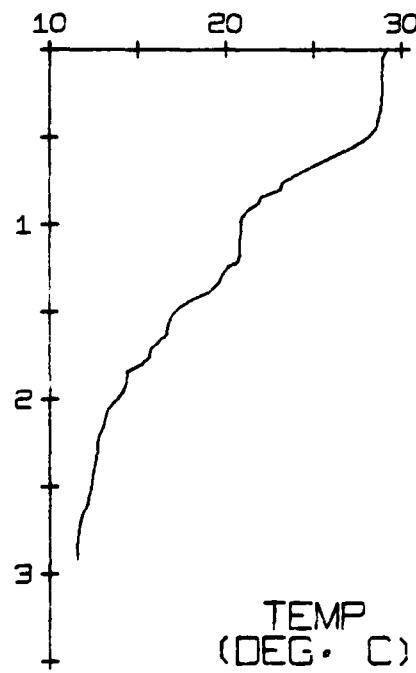
92



DEPTH (M * 1/100)

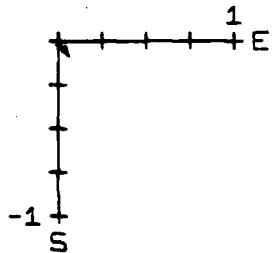
UVEL
(CM/SEC)

VVEL
(CM/SEC)

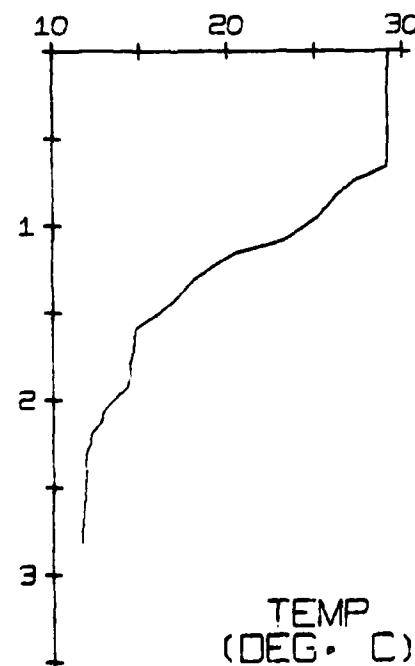
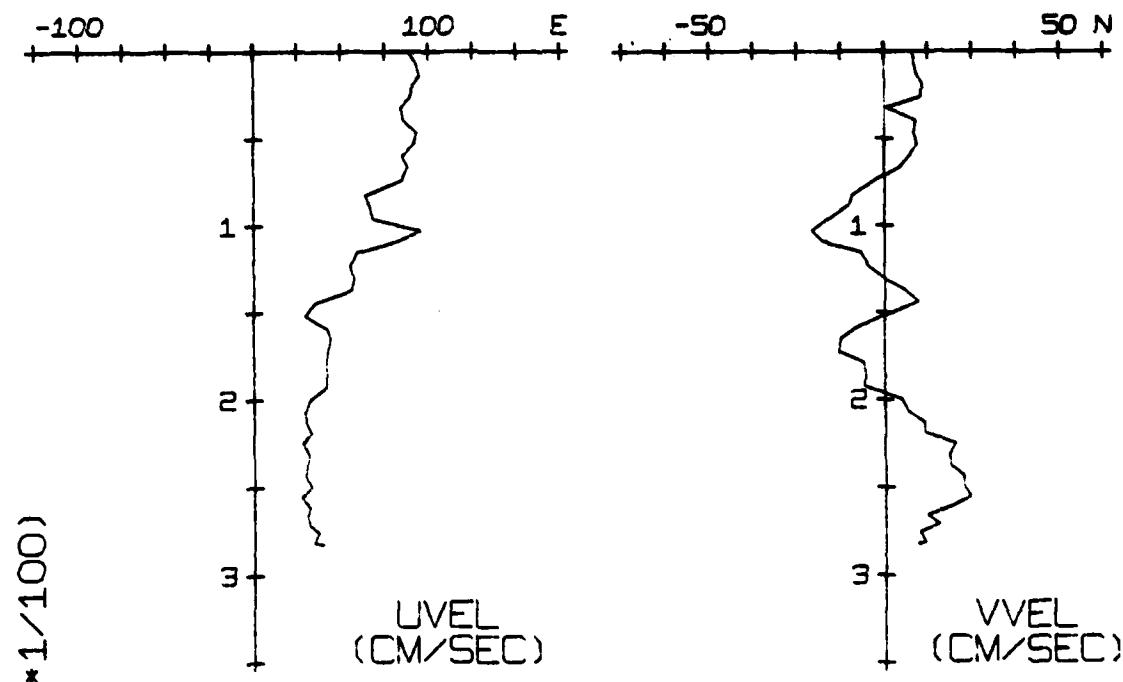


TEMP
(DEG. C)

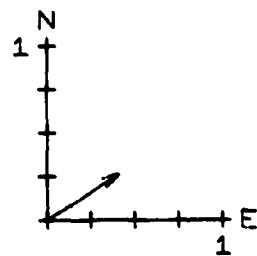
AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
13/03/75



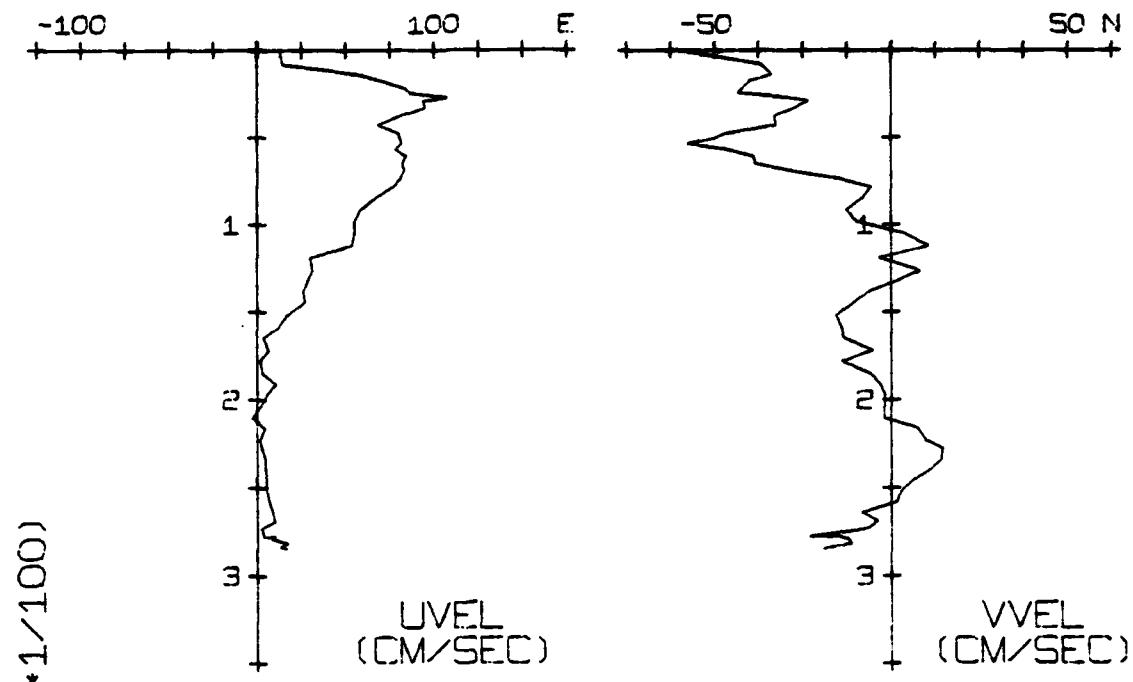
13/03/75
NO. 542 41
31KM N



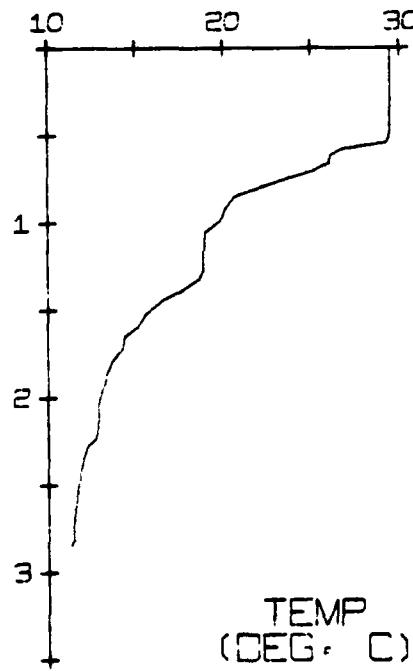
AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
24/04/75



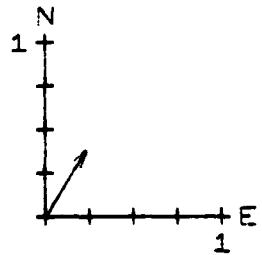
24/04/75
NO. 541 63
30KM S



DEPTH (M * 1/100)

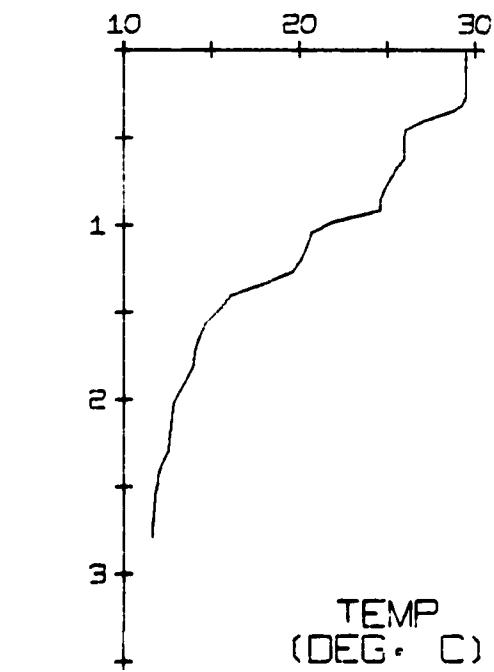
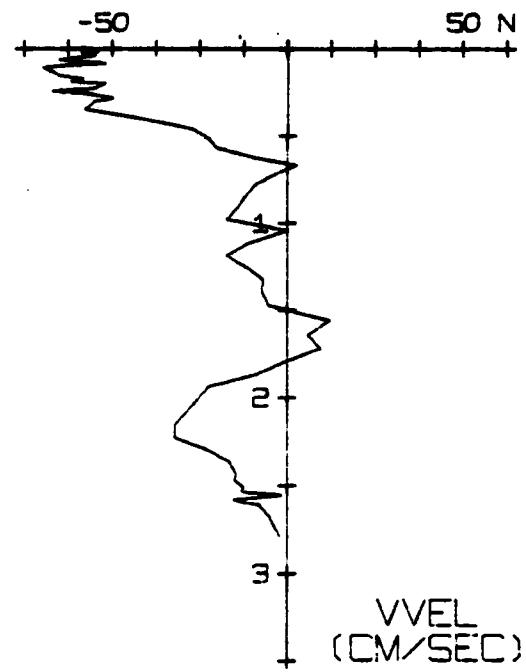
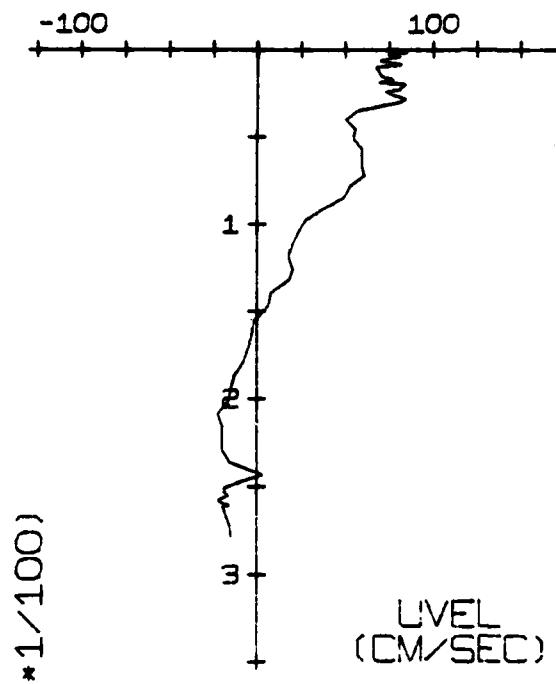


AVE. WIND STRESS
(DYNES/50 CM)
FOR WEEK ENDING
01/05/75

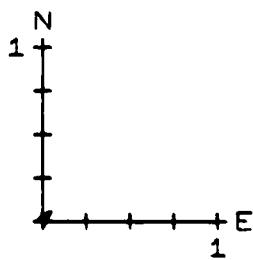


01/05/75
NO. 541 64
32KM N

95

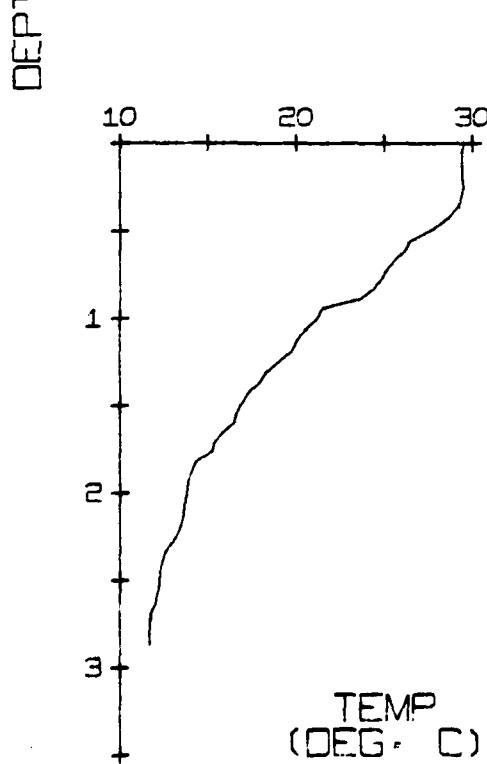
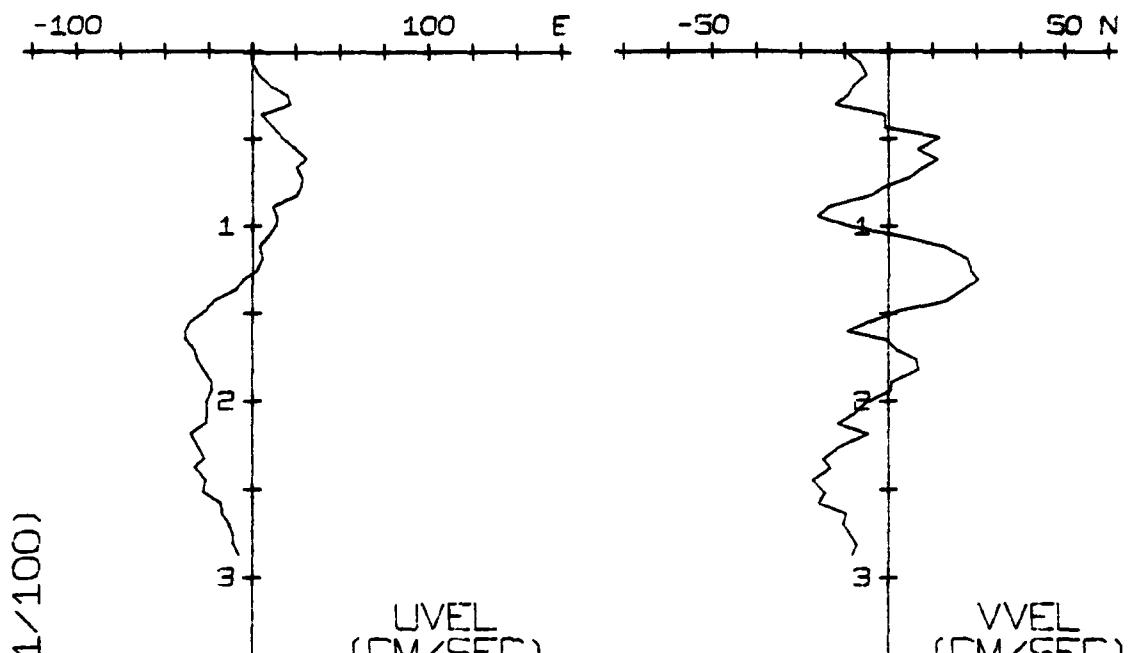


AVE. WIND STRESS
(DYNE/SQ CM)
FOR WEEK ENDING
08/05/75

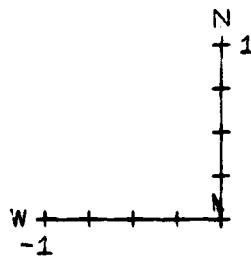


09/05/75
NO. 541 65
10KM S

96



AVE. WIND STRESS
(DYNES/SQ CM)
FOR WEEK ENDING
15/05/75



15/05/75
NO. 541 66
30KM N