Department of OCEANOGRAPHY

SCHOOL OF SCIENCE

OREGON STATE UNIVERSITY

A Compilation of Observations from Moored Current Meters and Thermographs

Volume III: Oregon Continental Shelf
May-June 1967
April-September 1968

by

R. D. Pillsbury
R. L. Smith
J. G. Pattullo

National Science Foundation
Grants GA 1435, GA 295
Office of Naval Research
Contracts 1286 (10) and N00014-67-A-0369-0007
Project 083-102

Data Report 40 Reference 70-3
June 1970

Department of Oceanography
School of Science
Oregon State University
Corvallis, Oregon 97331

A COMPILATION OF OBSERVATIONS FROM MOORED CURRENT METERS AND THERMOGRAPHS

VOLUME III: OREGON CONTINENTAL SHELF
MAY - JUNE 1967
APRIL - SEPTEMBER 1968

by

R. D. Pillsbury
R. L. Smith
J. G. Pattullo

Data Report No. 40

National Science Foundation
Grant GA 1435

Office of Naval Research
Contracts 1286(10) and N00014-67-A-0369-0007
Project NR 083-102

Reference 70-3
June 1970

John V. Byrne
Chairman

TABLE OF CONTENTS

Abstract

List of Figures

List of Tables

Introduction 1

Observational Program 2

Instruments 6

Temperature Spectra 6

Hydrographic Sampling Program. 6

1967 Long Run, DB5 Installation Details 9

1967 Long Run, DB7 Installation Details 19

1967 Long Run DB10 Installation Details 27

1967 Short Run, DB7 Installation Details 31

1968 17 April - 27 May (Installation A) Installation Details 37

1968 24 May-19 June (Installation B) Installation Details 47

1968 23 June-1 August (Installation C) Installation Details 57

1968 1 August-11 September (Installation D) Installation Details . 71

Personnel 86

Acknowledgements 86

References 87

Appendix 88

Distribution List 102

ABSTRACT

A summary of one phase of a direct observational program conducted in the coastal region off Oregon is presented. The measurements were made primarily on the continental shelf during most of the coastal upwelling season (May and June 1967; April through September 1968). The principal measurements were time series of horizontal current velocity and temperature fields; these observations were made with an array of moored, recording meters. Supplementary measurements of hydrographic variables, wind, atmospheric pressure, and mean sea level were also made.

LIST OF FIGURES

Figure No.	Caption	Page
1	Locations of Array and Hydrographic Stations off Depoe Bay, Oregon, May-June 1967; April-September 1968	3
2	Summary of Available Data from 1967	4
3	Summary of Available Data from 1968	5

LIST OF TABLES

Table No.	Title	Page
I	Temperature Statistics	
	A. 1967	7
	B. 1968	7
II	Changes in Temperature associated with changes in wind components	
	A. DB5, 1967	83
	B. DB7, 1967	84
	C. DB7, 1968	85

INTRODUCTION

This is the third data report of a program designed to study physical processes in the Oregon coastal regime by means of moored arrays containing recording instrumentation and by use of complementary hydrographic and atmospheric data. Various first-order statistics and plots of error-corrected and numerically-tapered data are presented for time series of current velocity and temperature. Plots of numerically-tapered wind velocity, both of geostrophic winds as calculated from atmospheric pressure distribution and of directly observed winds are shown. The data were collected in May and June 1966 and April through September 1968, principally on the Oregon continental shelf. The report will be presented in two halves, one concerning the 1967 data and the other, the 1968 data.

Data reports of the first phase (Collins, Creech, and Pattullo, 1966) and second phase (Mooers, Bogert, Smith and Pattullo, 1968) have been compiled in similar formats. A more complete description of the mooring system used is given in a paper by Pillsbury, Smith and Tipper (1969). An analysis of the relationships between temperature and winds has been given in a M. S. thesis by Fisher (1970). A comprehensive summary of the results from the first phase of this program has been given in a Ph. D. thesis by Collins (1968) while an excellent theoretical discussion of much of our work is given in a Ph. D. thesis by Mooers (1969).

Rather than tabulate our "data bank", we think it is of greater interest to display our data records in graphical and tabular forms of first-order statistics. By pursuing this approach, we can provide feedback for subsequent measurements and calculations rather rapidly--months to years in advance of formal publication of only the principal results. A secondary objective is to indicate the need for "auxiliary data" of good quality by showing the utility of that which has actually been available. Since we think it is important to develop the descriptive art of time series and vertical profile presentation at an intermediate stage, i. e., preliminary to correlation and spectral analyses, we expect to continue to experiment with various graphical and tabular representations in the future, rather than to adhere to a rigid format. In a data report of this nature, it will be necessary to record some items only once, others on all occasions. By exposing ourselves to internal and external review, we hope to stimulate constructive criticism. We believe it is also true that our work is most useful to a broad audience of oceanographers in this intermediate form; the subsequent, more sophisticated analyses are likely to be chiefly of interest to dynamical or theoretical physical oceanographers.

OBSERVATIONAL PROGRAM

The observational program during 1967 was nearly a repeat of the 1966 program. The emphasis was on an array extending perpendicular to the bottom contours near Depoe Bay (Fig. 1). Figure 2 gives the available data both in terms of position and time. Again, as in 1966, a supporting hydrographic sampling program was maintained in much the same fashion as before. This sampling procedure included special bottle spacing to obtain a higher definition of the complex structure as previously observed during 1966.

In 1968 the program was oriented toward gathering a long series of data at a single point. The station we call DB7 was selected for this series of observations. The success of this data series can be seen in Figure 3. While there are many blanks on the table, the currents at 50 meters were measured for over 100 days with only a minor interruption.

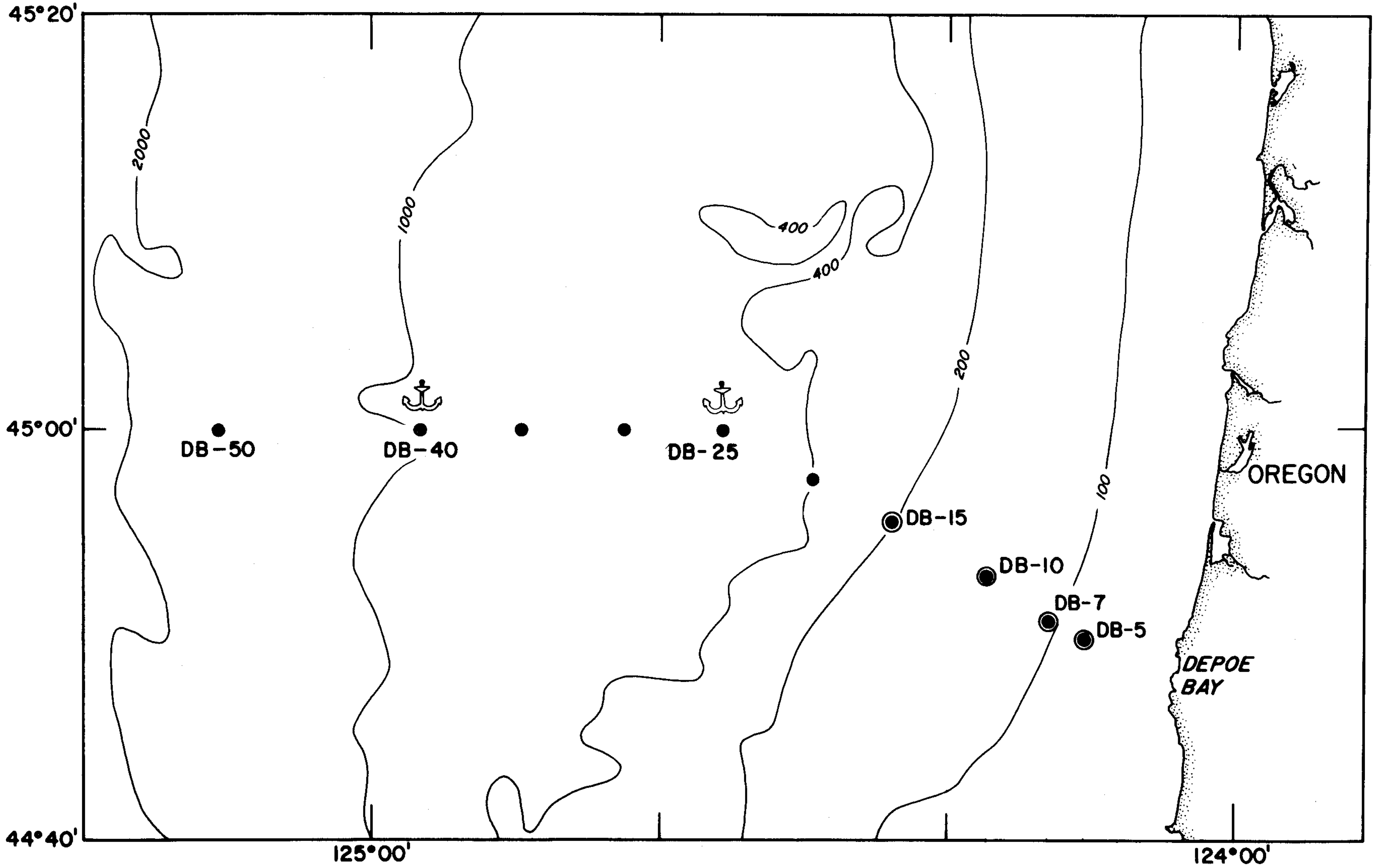


Figure 1. Locations of Array and Hydrographic Stations off Depoe Bay, Oregon, May-June 1967; April-September 1968. Legend: Hydrographic Station - • Anchor Station - •⚓ Instrument Installation - ● Depoe Bay - DB
Station numbers are given in nautical miles offshore and depth contours in meters.

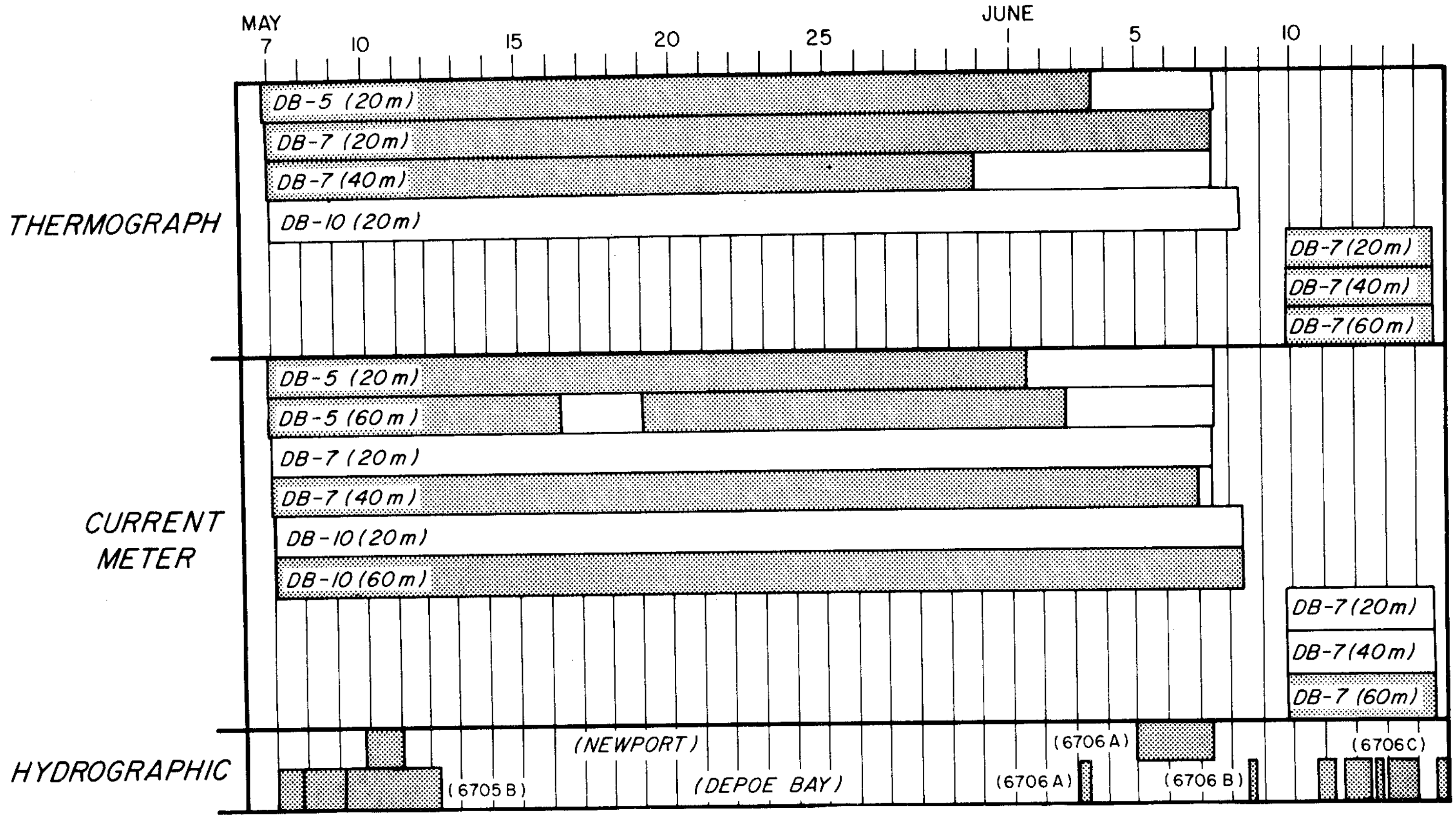


Figure 2. Summary of Available Data from 1967

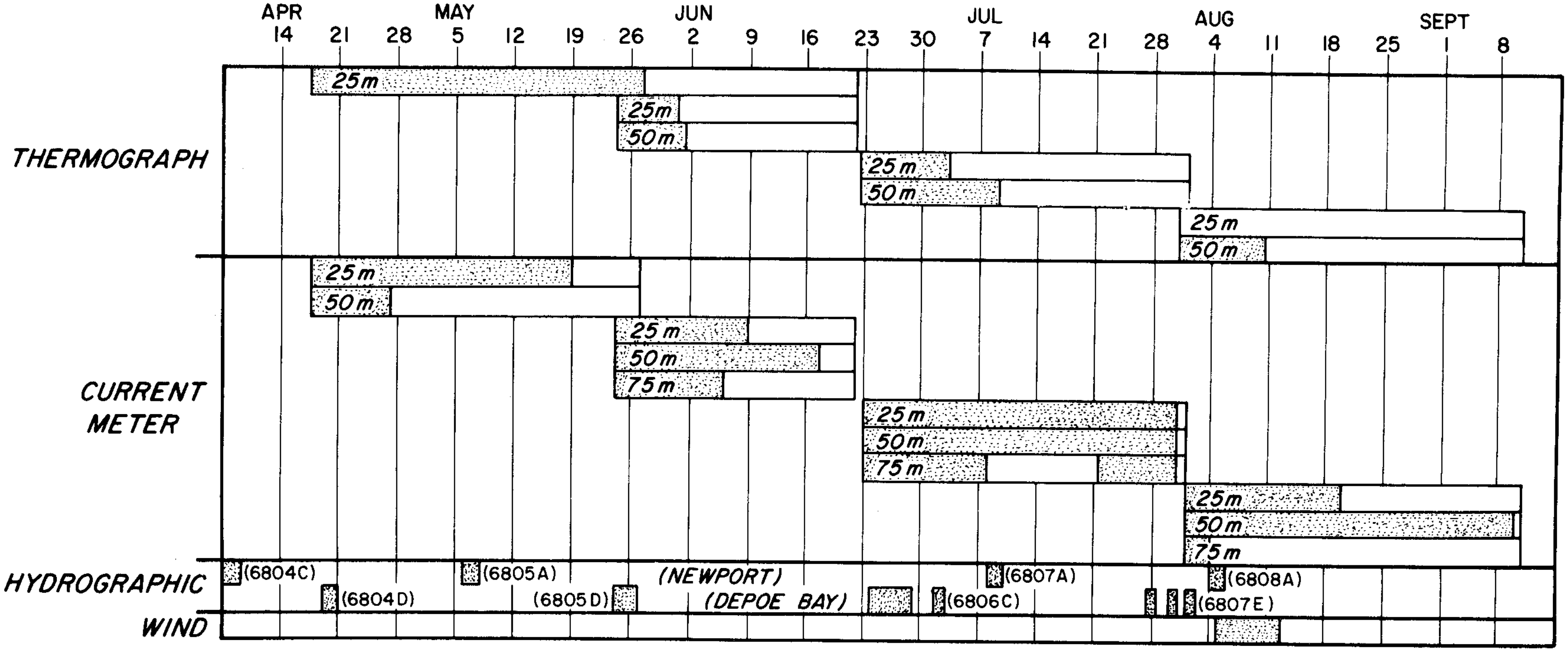


Figure 3. Summary of Available Data from 1968.

INSTRUMENTS

Current velocity in the sensor array was measured by Braincon Type 316 Histogram Current Meters (Braincon Corporation, 1965; Sunblad, 1965). Current observations were made continuously over 10- and 20-minute periods and recorded on photographic film. Actually, one minute of the sampling period was used for film advance so only nine minutes of data were recorded at the 10-minute rate. Current speed was integrated by the meter over this period. (Note: It is possible to obtain a speed sample by taking the difference between the "arc-value" at the beginning of the speed arc on successive film frames.) Current direction was sampled by the meter as a quasi-frequency curve serving as a low quality histogram which is usually sufficient to identify the extremes and the mode of direction. The mode of direction is taken to be the "mean direction." The "mean direction" and the speed are then combined in a polar coordinate format to give the mean velocity in an observational interval, since a true vector mean is impossible to achieve with the present recording procedure.

The operational characteristics of the Type 316 Histogram current meter are summarized in Mooers _et al._ (1968).

TEMPERATURE SPECTRA

Power spectra for the longer temperature records have been included here. These spectra cover the frequency range from 0 cycles/hour to 1/4 cycle/hour. Of note are the statistically significant peaks, in most of them, at about 0.083 cycles/hour and/or 0.057 cycles/hour. The semidiurnal frequency is 0.083 cycles/hour, corresponding to a period of 12 hours, and 0.057 cycles/hour is the inertial frequency at latitude 45 N. These oscillations can also be seen in the low-passed temperature plots. Some of the peaks that appear at higher frequencies in the spectra are harmonics of the semidiurnal and inertial oscillations.

HYDROGRAPHIC SAMPLING PROGRAM

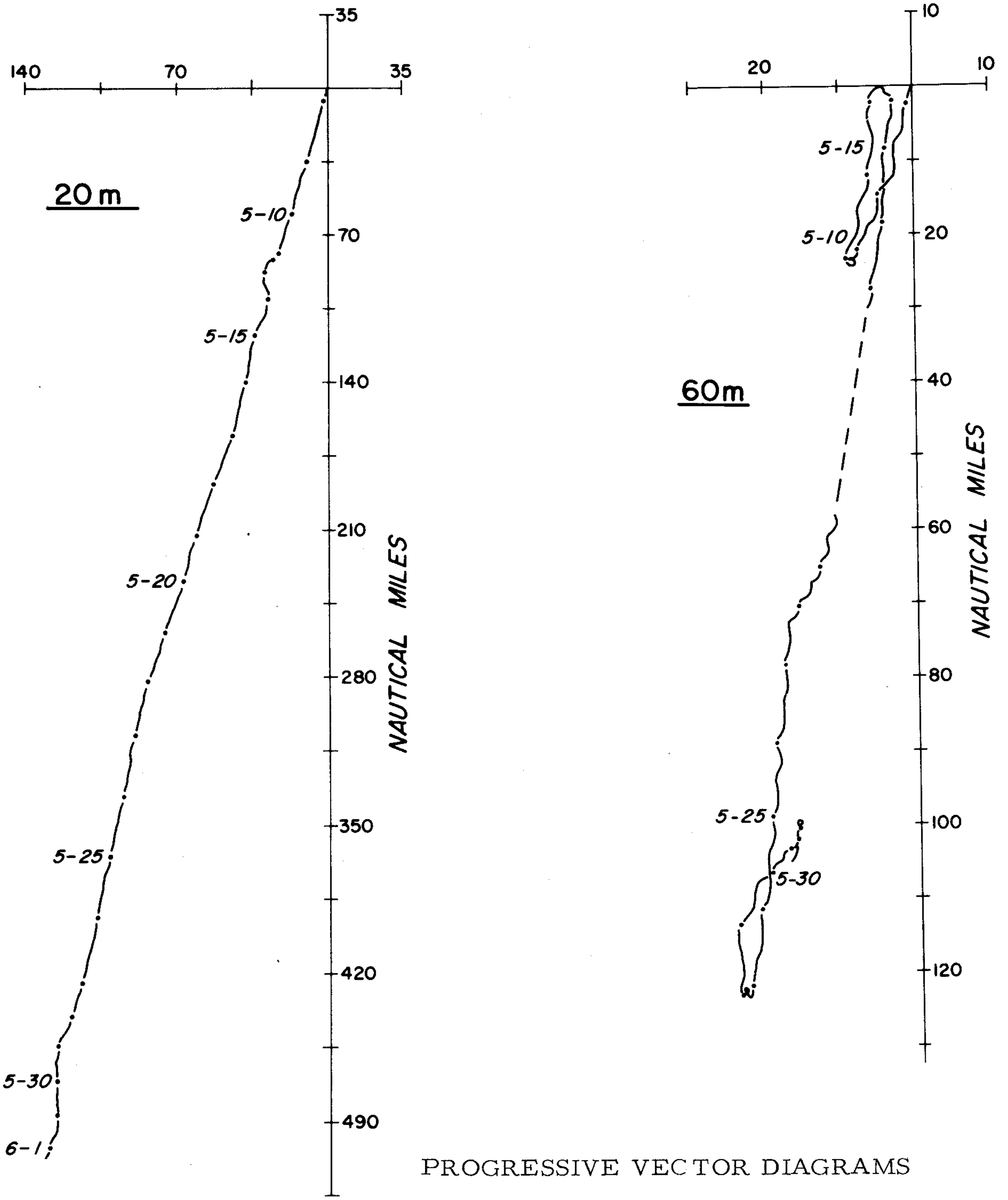
Hydrographic data are also available for this period. For the 1967 data see Barstow, Gilbert, and Wyatt (February 1969) and for the 1968 hydrographic data see Barstow, Gilbert, and Wyatt (November 1969).

Table I. A. 1967 Temperature Statistics

Station	Depth	Dates	Number of Observations	Mean Temperature	Standard Deviation
DB-5	20 m	7 May 67 to 3 June 67	3876	8.72°C	0.56°C
DB-7	20 m	7 May 67 to 8 June 67	4496	9.15	0.52
		9 June 67 to 14 June 67	682	8.59	0.41
	40 m	7 May 67 to 30 May 67	3282	8.53	0.24
		9 June 67 to 14 June 67	683	8.02	0.10
	60 m	9 June 67 to 14 June 67	681	7.46	0.15

Table I. B. 1968 Temperature Statistics

DB-7	25 m	17 April 68 to 27 May 68	5731	8.72° C	0.57° C
		24 May 68 to 31 May 68	1018	8.88	0.88
		22 June 68 to 1 July 68	1543	7.85	0.24
	50 m	24 May 68 to 1 June 68	1169	7.86	0.20
		22 June 68 to 10 July 68	2487	7.64	0.08
		1 Aug 68 to 10 Aug 68	1248	7.48	0.05



PROGRESSIVE VECTOR DIAGRAMS

Symbols indicate 0000 GMT on successive days
DB 5: 44 50.3'N, 124 10.5'W

1967 LONG RUN

DB 5

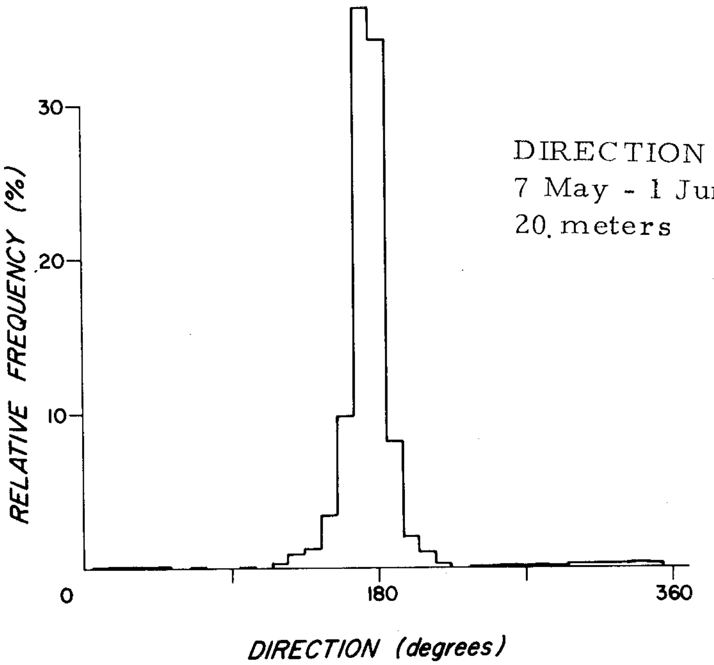
Position: 44°50.3'N, 124°10.5'W
Depth of Water: 78 meters
Set at 1900 GMT, 7 May 1967 by R/V YAQUINA
Retrieved at 1600 GMT, 7 June 1967 by R/V YAQUINA
Data Interval: 1800 GMT 7 May - 1720 GMT 2 June 1967

Instrumentation

Current meters and thermographs were placed at depths of 20 and 60 meters as follows:

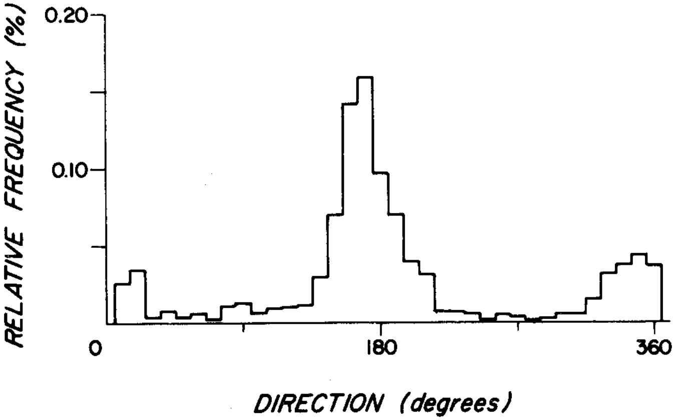
Depth	Histogram Current Meter Serial No.	Thermograph Serial No.
20 m	3160049	1460087
60 m	3160054	

Current meters and thermograph cycled every 10 minutes.

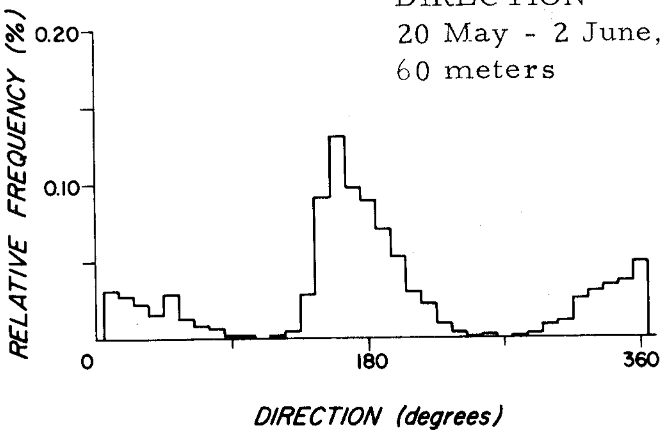


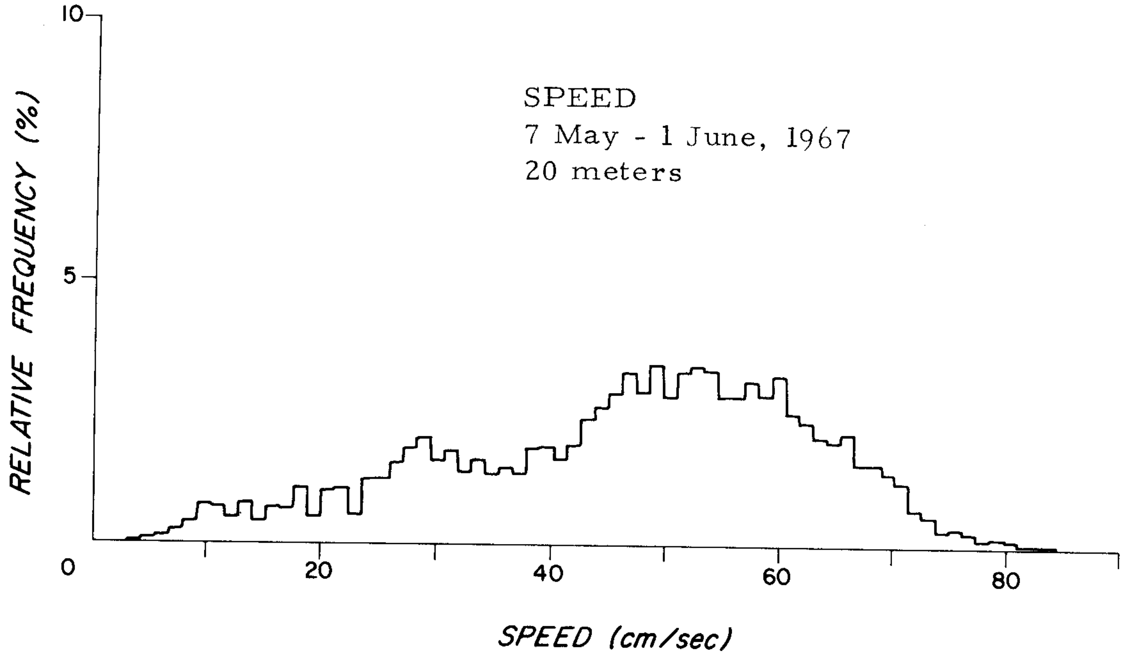
DIRECTION
7 May - 1 June, 1967
20 meters

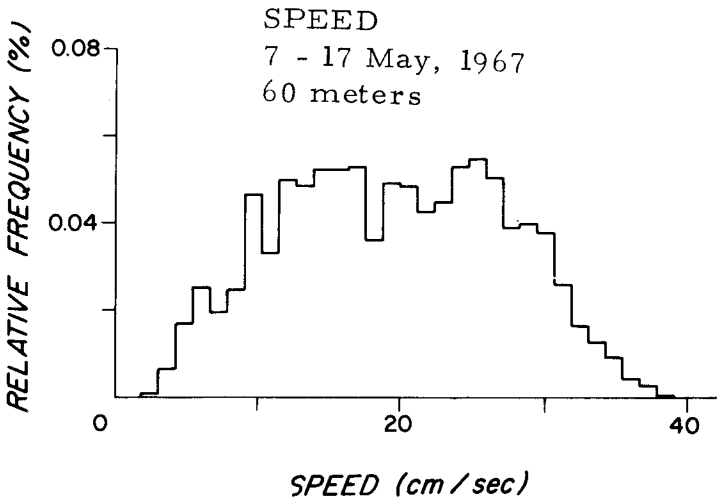
DIRECTION
7 - 17 May, 1967
60 meters

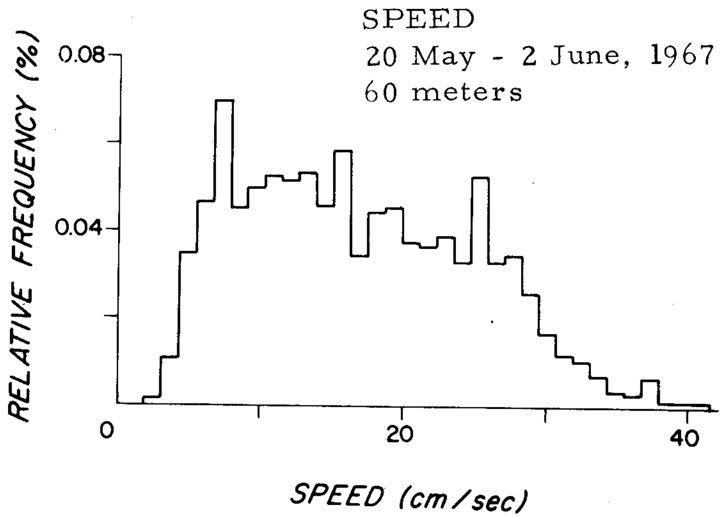


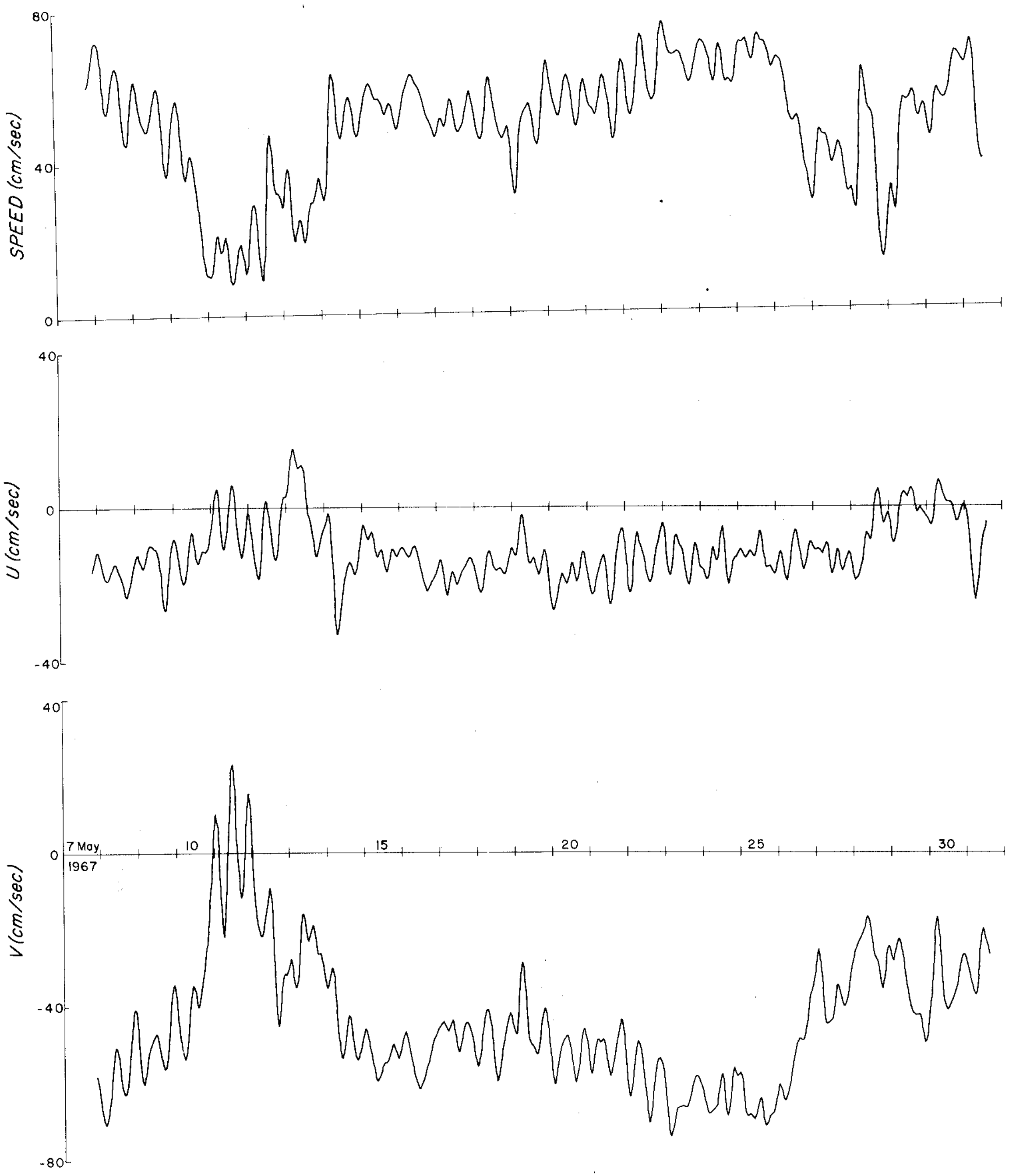
DIRECTION
20 May - 2 June, 1967
60 meters



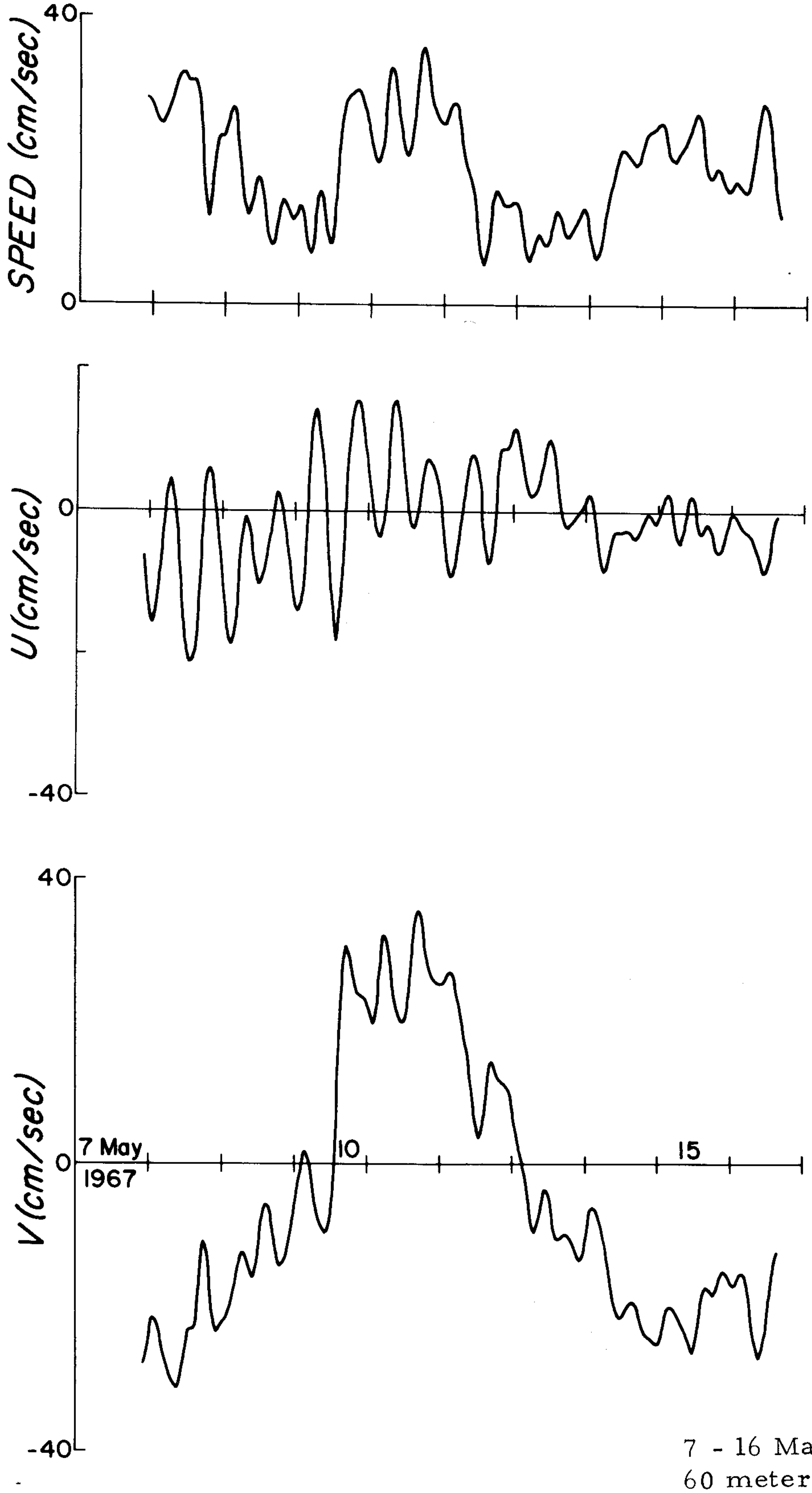

SPEED
7 May - 1 June, 1967
20 meters
RELATIVE FREQUENCY (%)
10
5
0
20
40
60
80
SPEED (cm/sec)


SPEED
7 - 17 May, 1967
60 meters
RELATIVE FREQUENCY (%)
0.08
0.04
0
20
40
SPEED (cm/sec)

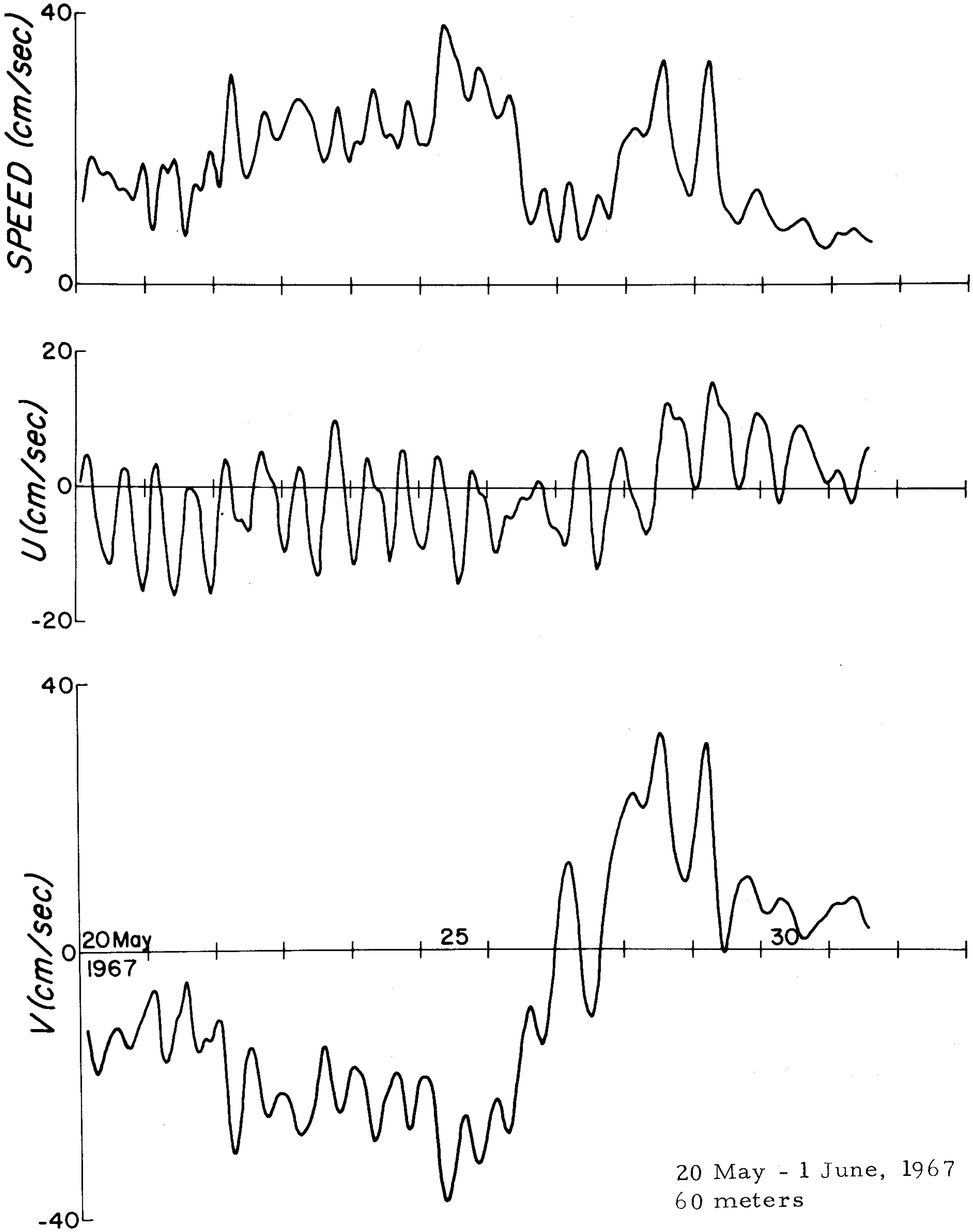

SPEED
20 May - 2 June, 1967
60 meters
RELATIVE FREQUENCY (%)
0.08
0.04
0
20
40
SPEED (cm/sec)



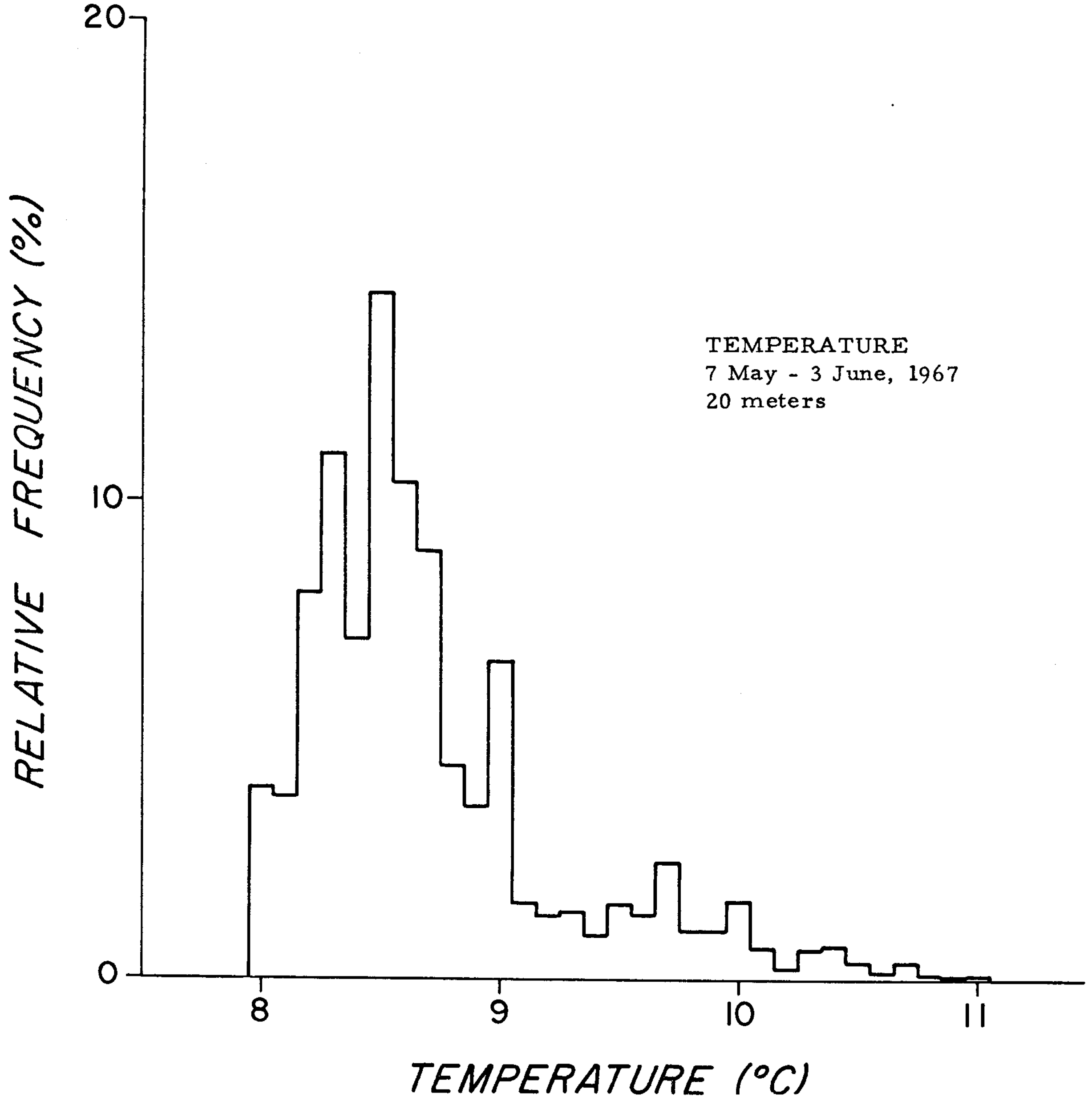
7 - 31 May, 1967
20 meters



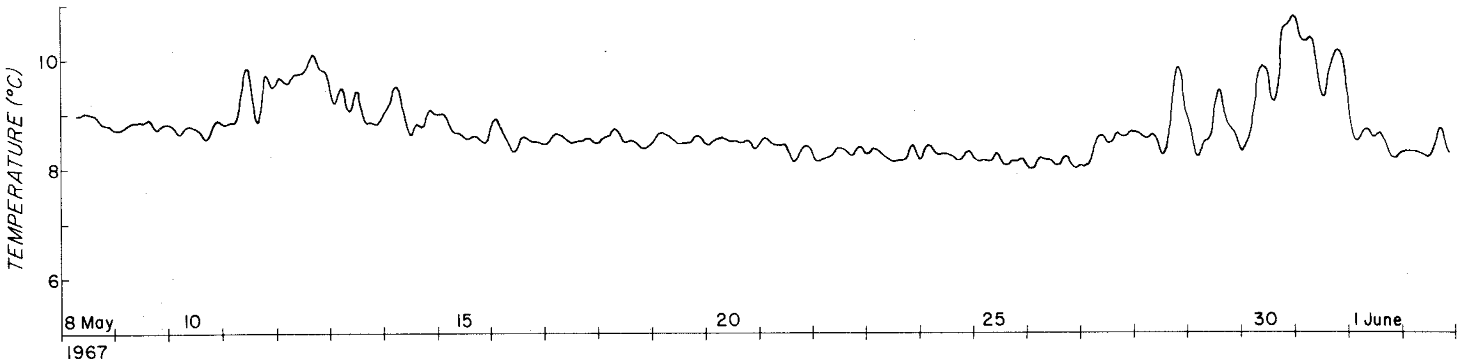
7 - 16 May, 1967
60 meters



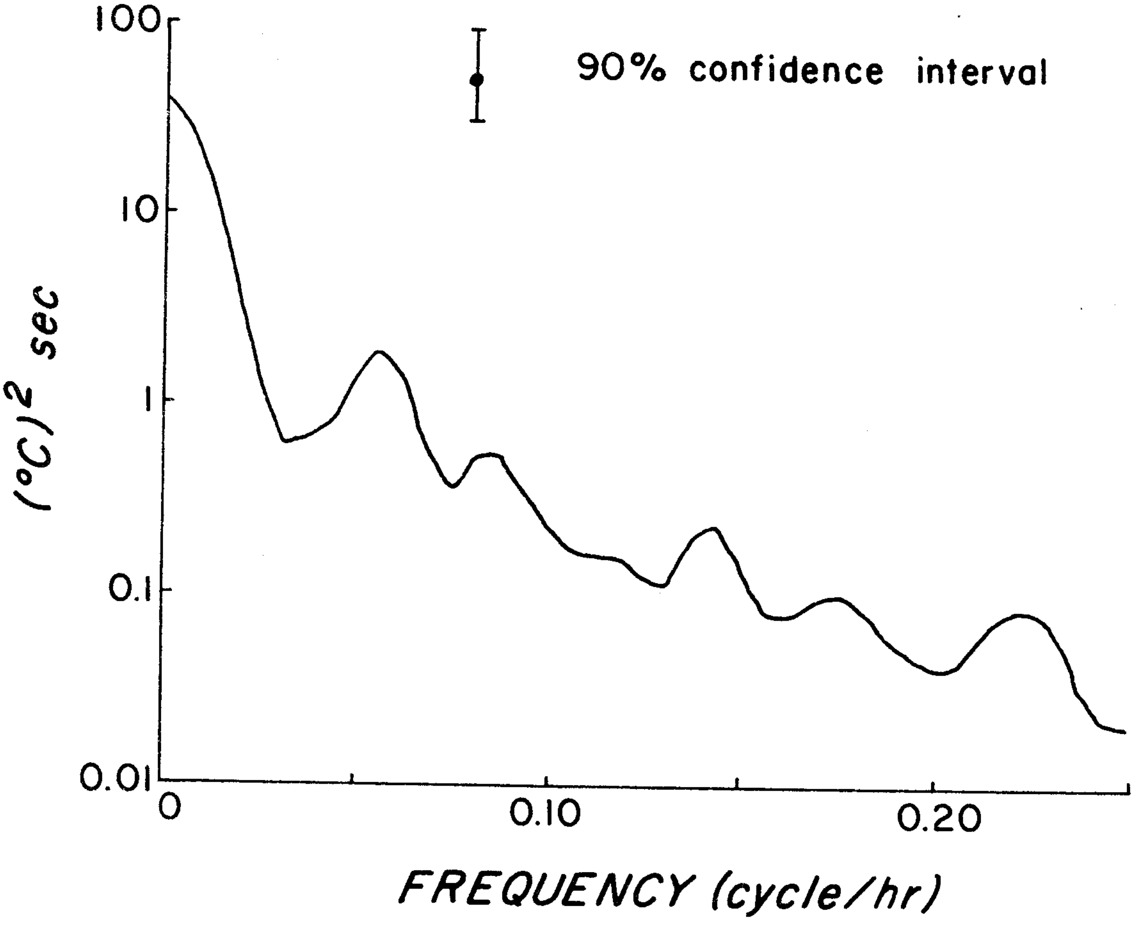
20 May - 1 June, 1967
60 meters



TEMPERATURE
7 May - 3 June, 1967
20 meters
RELATIVE FREQUENCY (%)
20
10
0
8
9
10
11
TEMPERATURE (°C)

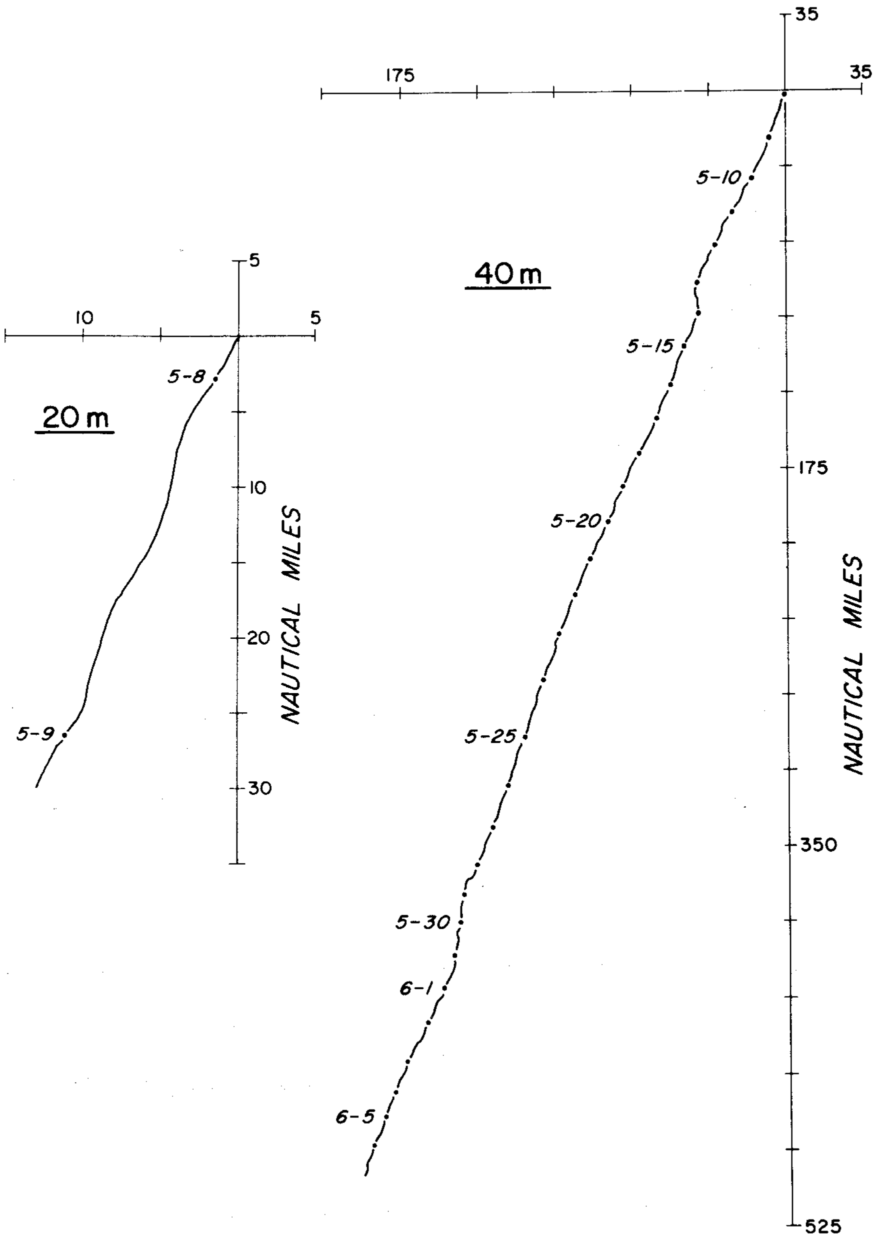


TEMPERATURE
8 May - 2 June, 1967
20 meters



TEMPERATURE POWER SPECTRUM

7 May - 3 June 1967
20 meters



PROGRESSIVE VECTOR DIAGRAMS

Symbols indicate 0000 GMT on successive days
DB 7: 44 51.4'N, 124 12.0'W

1967 LONG RUN
DB 7

Position: 44°51.4'N, 124°12.0'W
Depth of Water: 102 meters
Set at 2100 GMT 7 May 1967 by R/V YAQUINA
Retrieved at 1500 GMT 7 June 1967 by R/V YAQUINA
Data Interval: 2120 GMT 7 May - 0230 GMT 8 June 1967

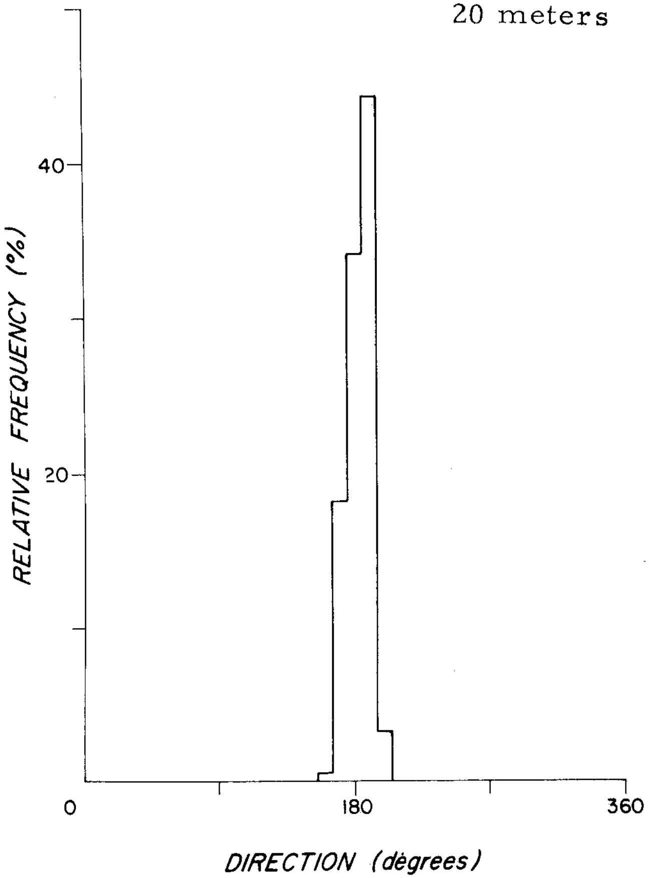
Instrumentation

Current meters and thermographs were placed at depths of 20 and 40 meters as follows:

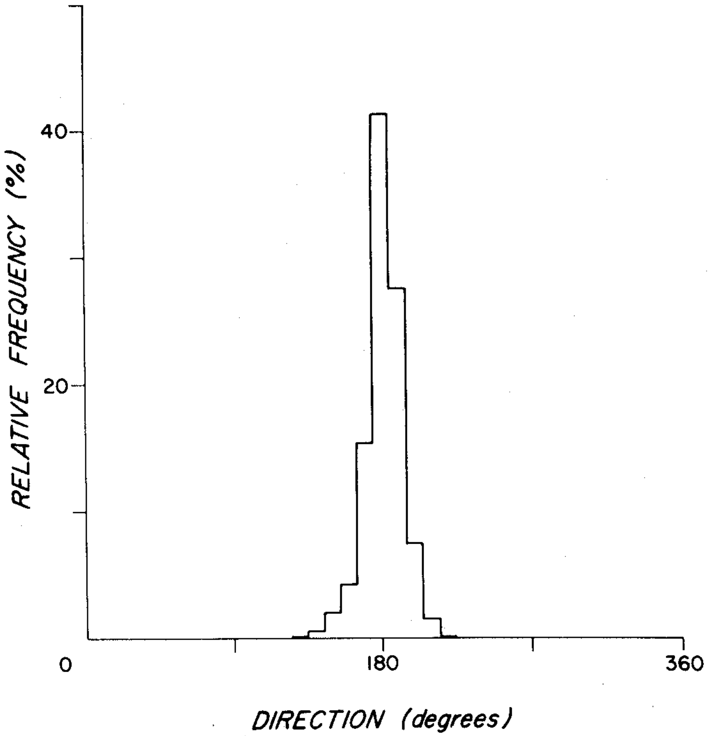
Depth	Histogram Current Meter Serial No.	Thermograph Serial No.
20 m	3160055	14600088
40 m	3160088	14600115

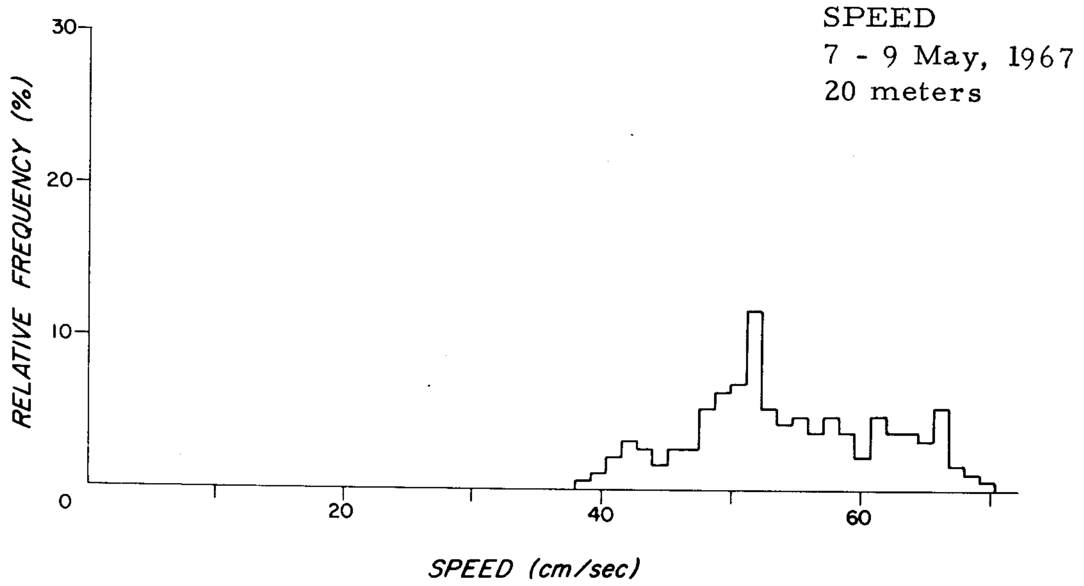
Current meters cycled every 10 minutes; thermograph cycled every 5 minutes.

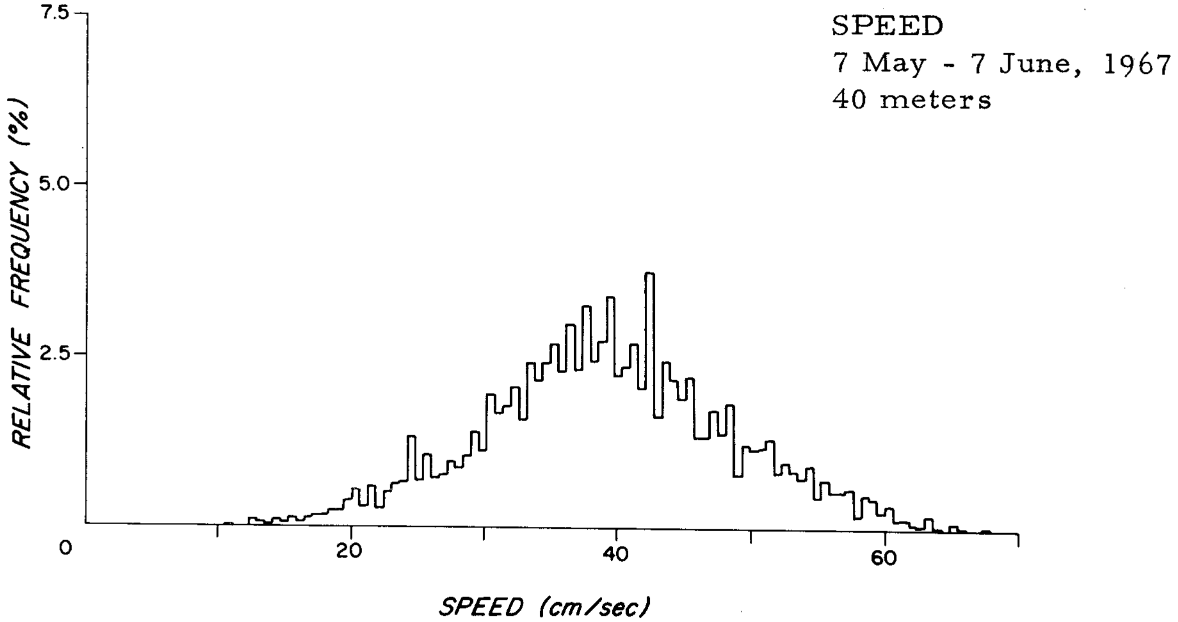
DIRECTION
7 - 9 May, 1967
20 meters

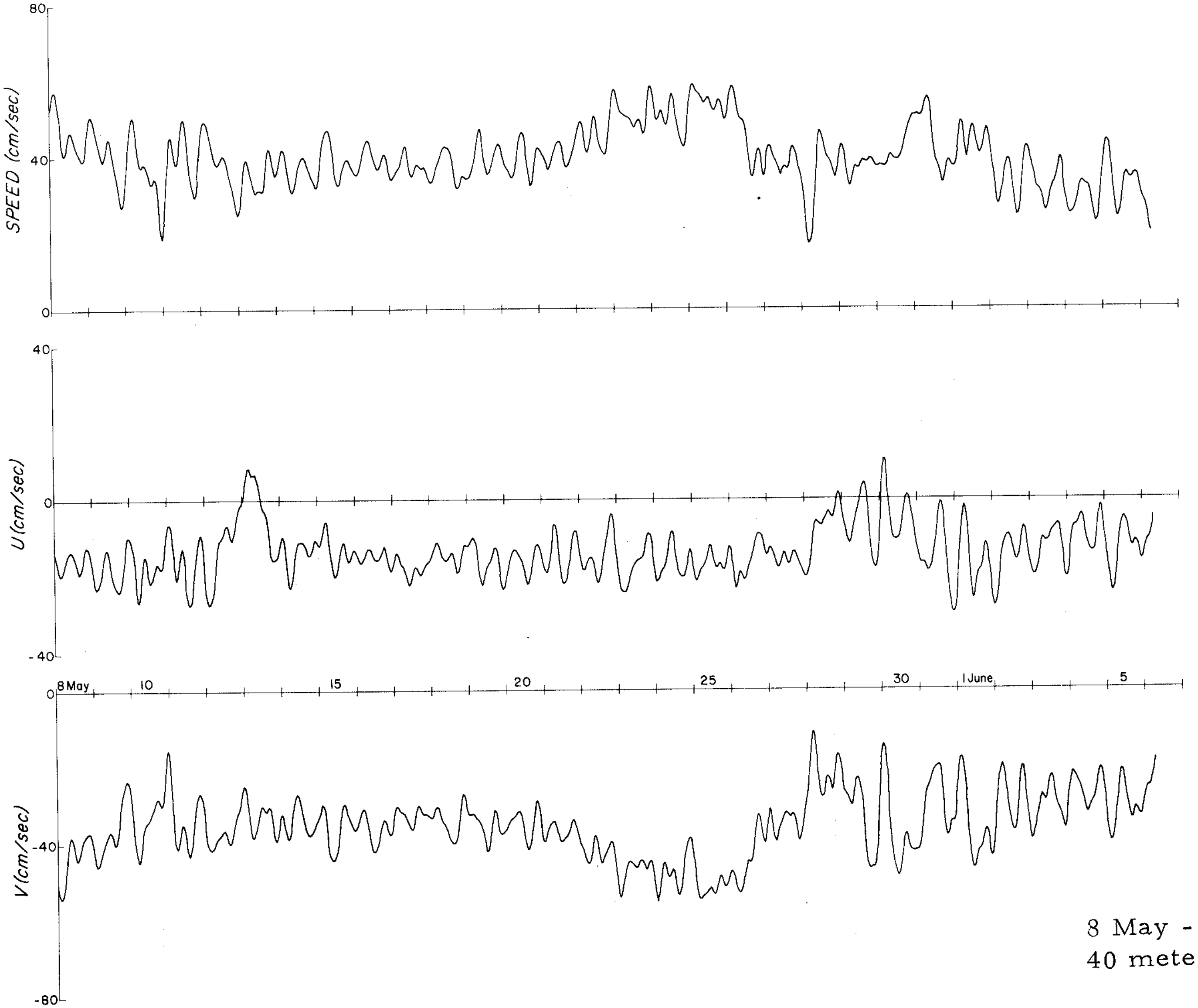


DIRECTION
7 May - 7 June, 1967
40 meters

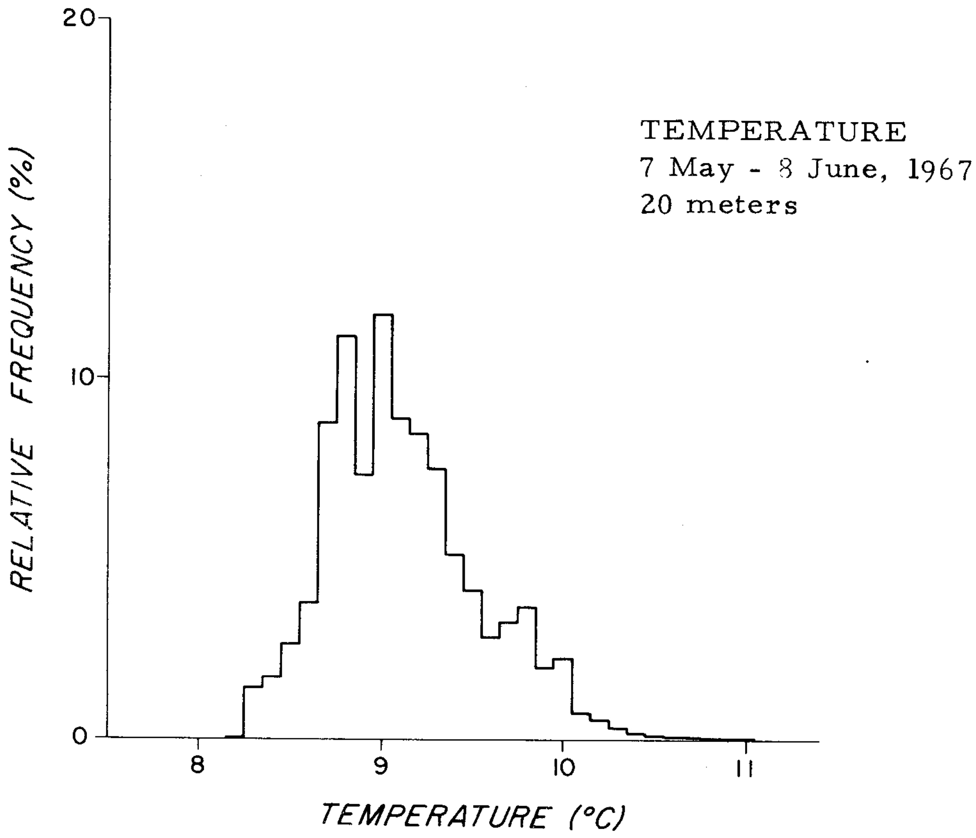


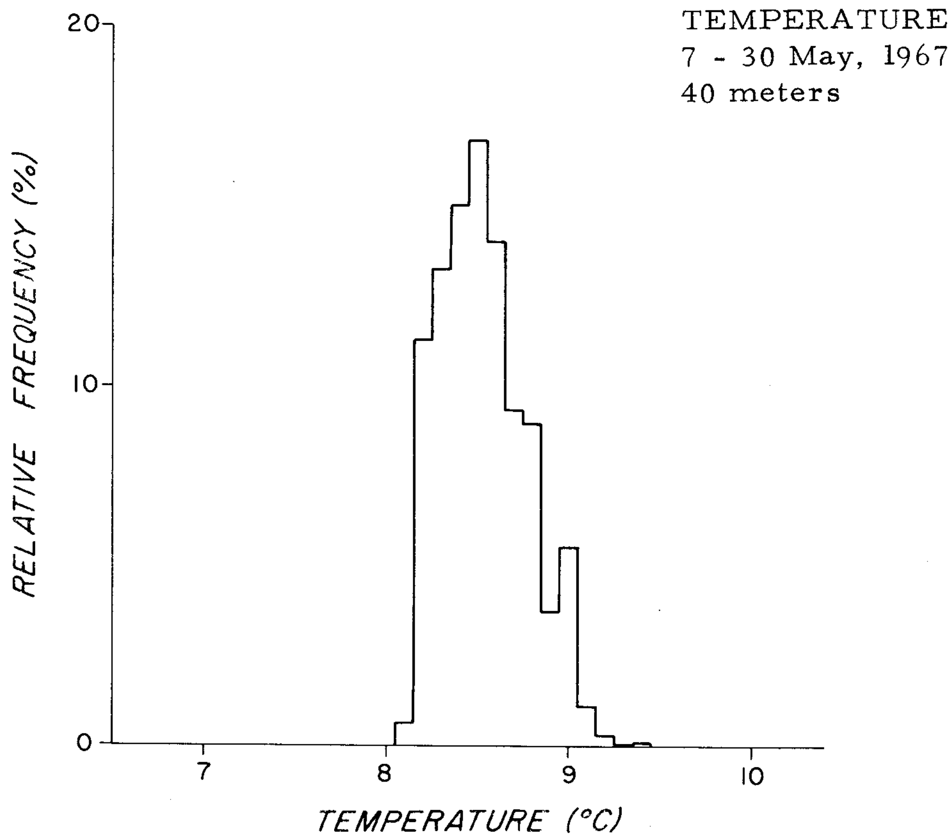

SPEED
7 - 9 May, 1967
20 meters
RELATIVE FREQUENCY (%)
30
20
10
0
20
40
60
SPEED (cm/sec)


SPEED
7 May - 7 June, 1967
40 meters
RELATIVE FREQUENCY (%)
7.5
5.0
2.5
0
20
40
60
SPEED (cm/sec)

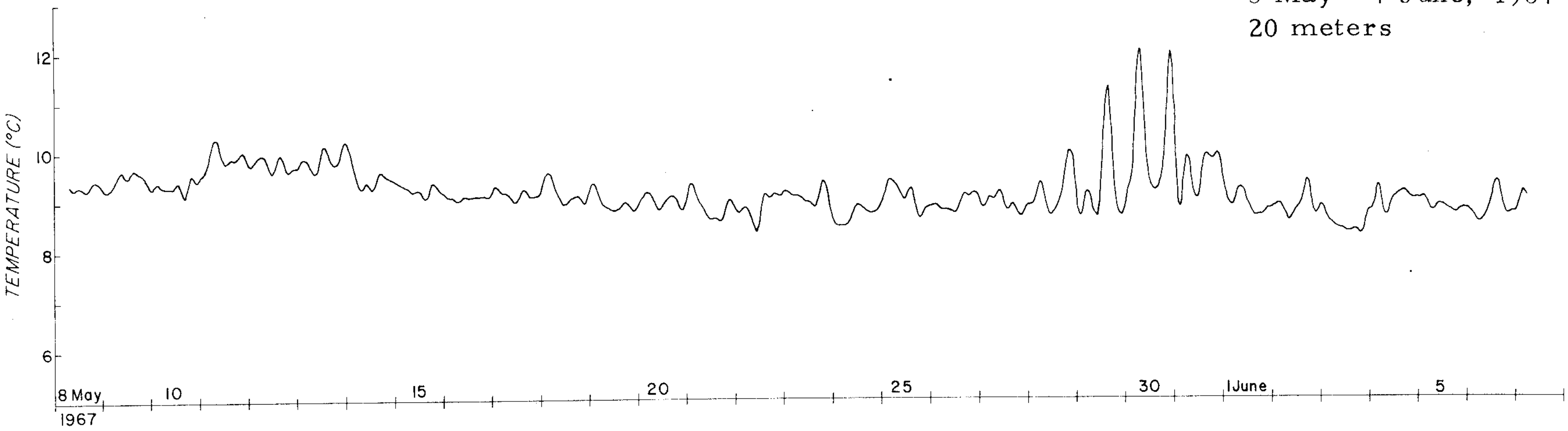


8 May - 6 June, 1967
40 meters

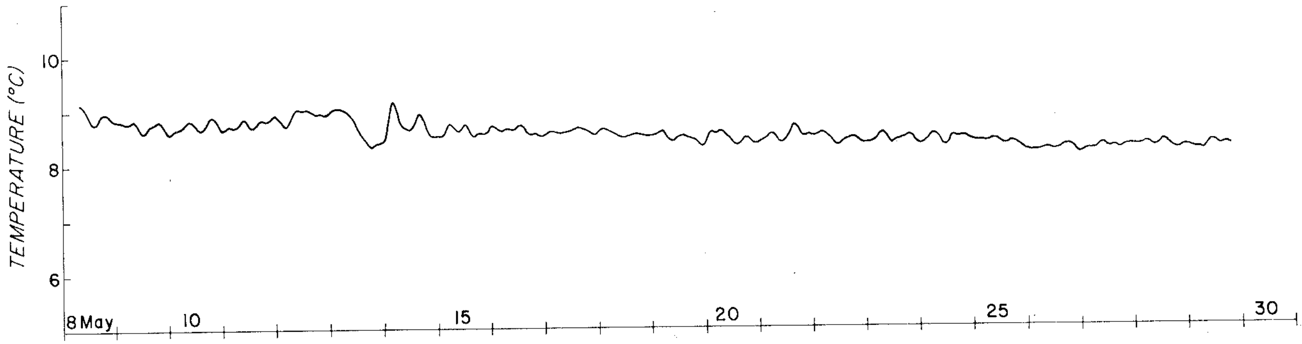

TEMPERATURE
7 May - 8 June, 1967
20 meters
RELATIVE FREQUENCY (%)
20
10
0
8
9
10
11
TEMPERATURE (°C)


TEMPERATURE
7 - 30 May, 1967
40 meters
RELATIVE FREQUENCY (%)
20
10
0
7
8
9
10
TEMPERATURE (°C)

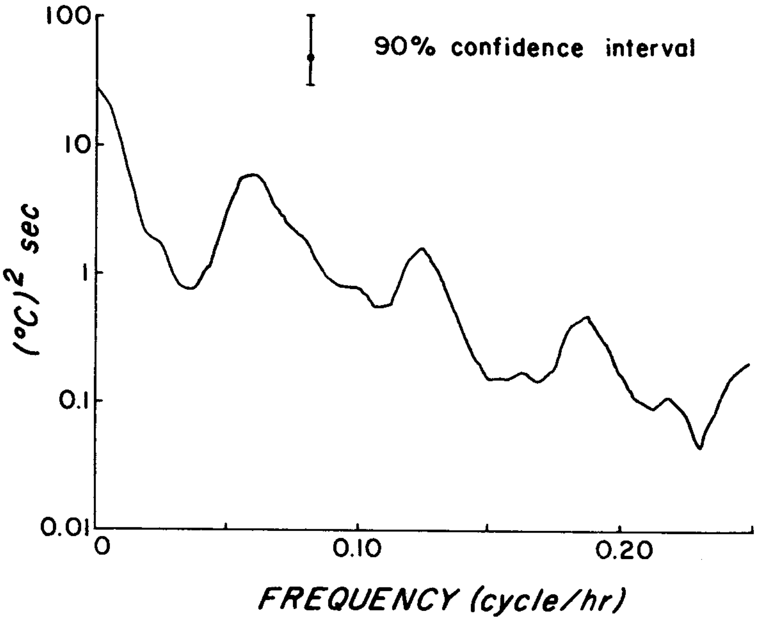
TEMPERATURE
8 May - 7 June, 1967
20 meters



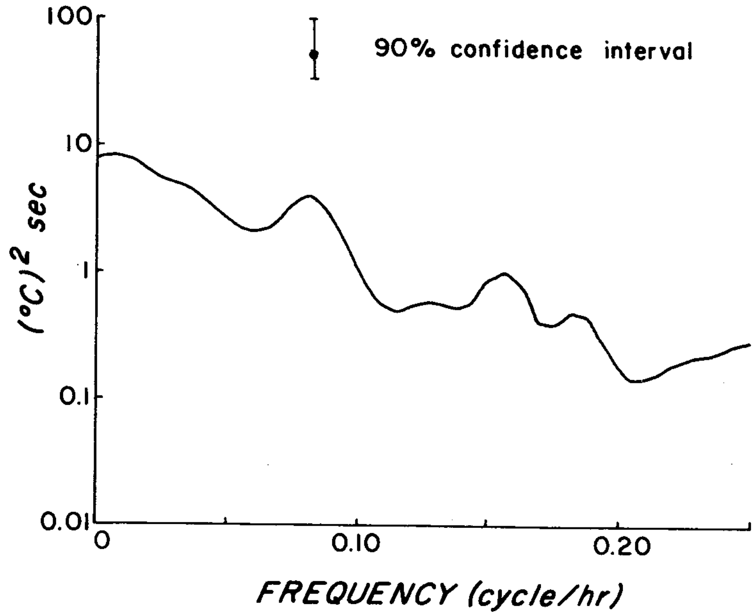
TEMPERATURE
8 - 30 May, 1967
40 meters

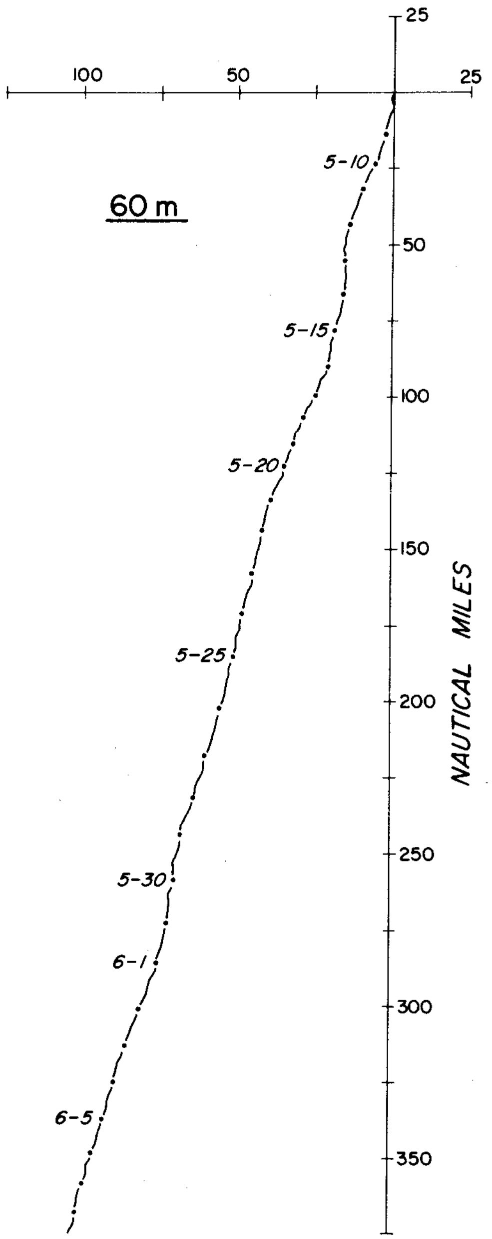


TEMPERATURE POWER SPECTRUM
7 May - 8 June, 1967
20 meters



TEMPERATURE POWER SPECTRUM
7 - 30 May, 1967
40 meters





PROGRESSIVE VECTOR DIAGRAM

Symbols indicate 0000 GMT on successive days
DB 10: 44 50.6'N, 124 17.2'W

1967 LONG RUN
DB 10

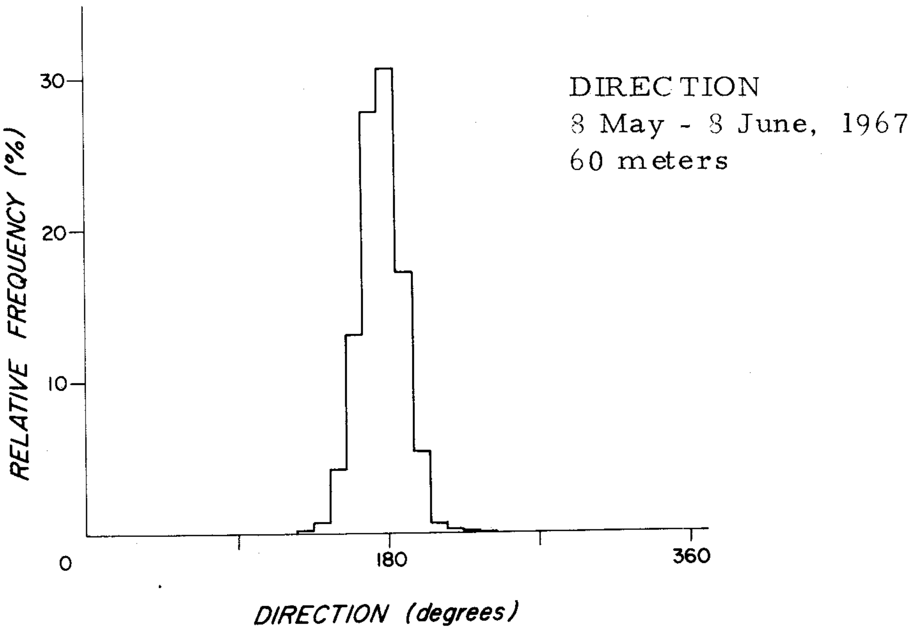
Position: 44°50.6'N, 124°17.2'W
Depth of Water: 140 meters
Set at 2400 GMT 7 May 1967 by R/V YAQUINA
Retrieved at 1400 GMT 8 June 1967 by R/V YAQUINA
Data Interval: 0010 GMT 8 May - 1310 GMT 8 June 1967

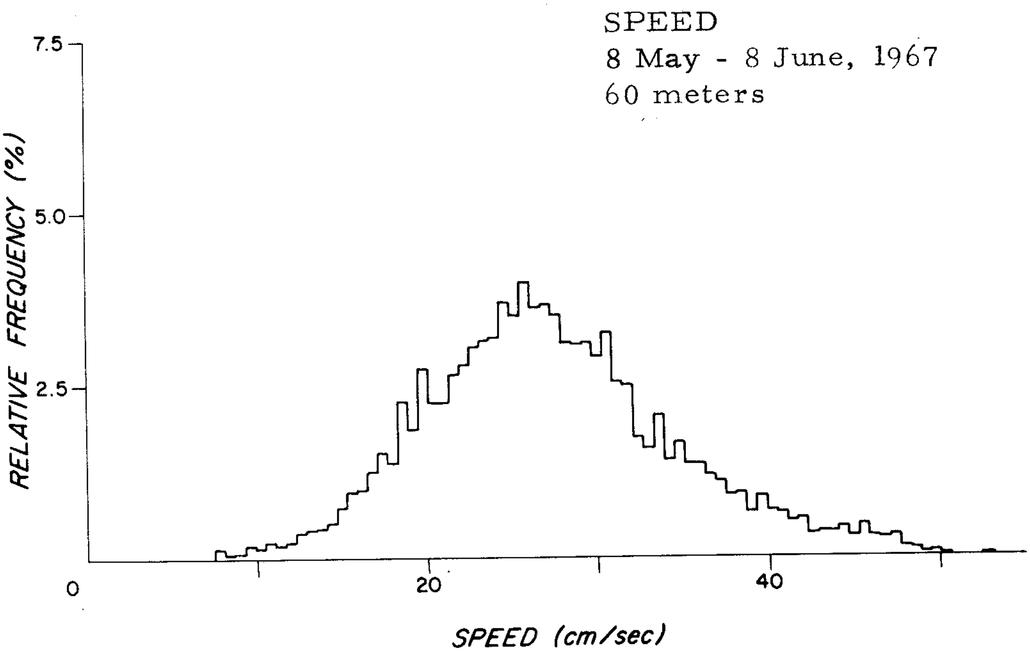
Instrumentation

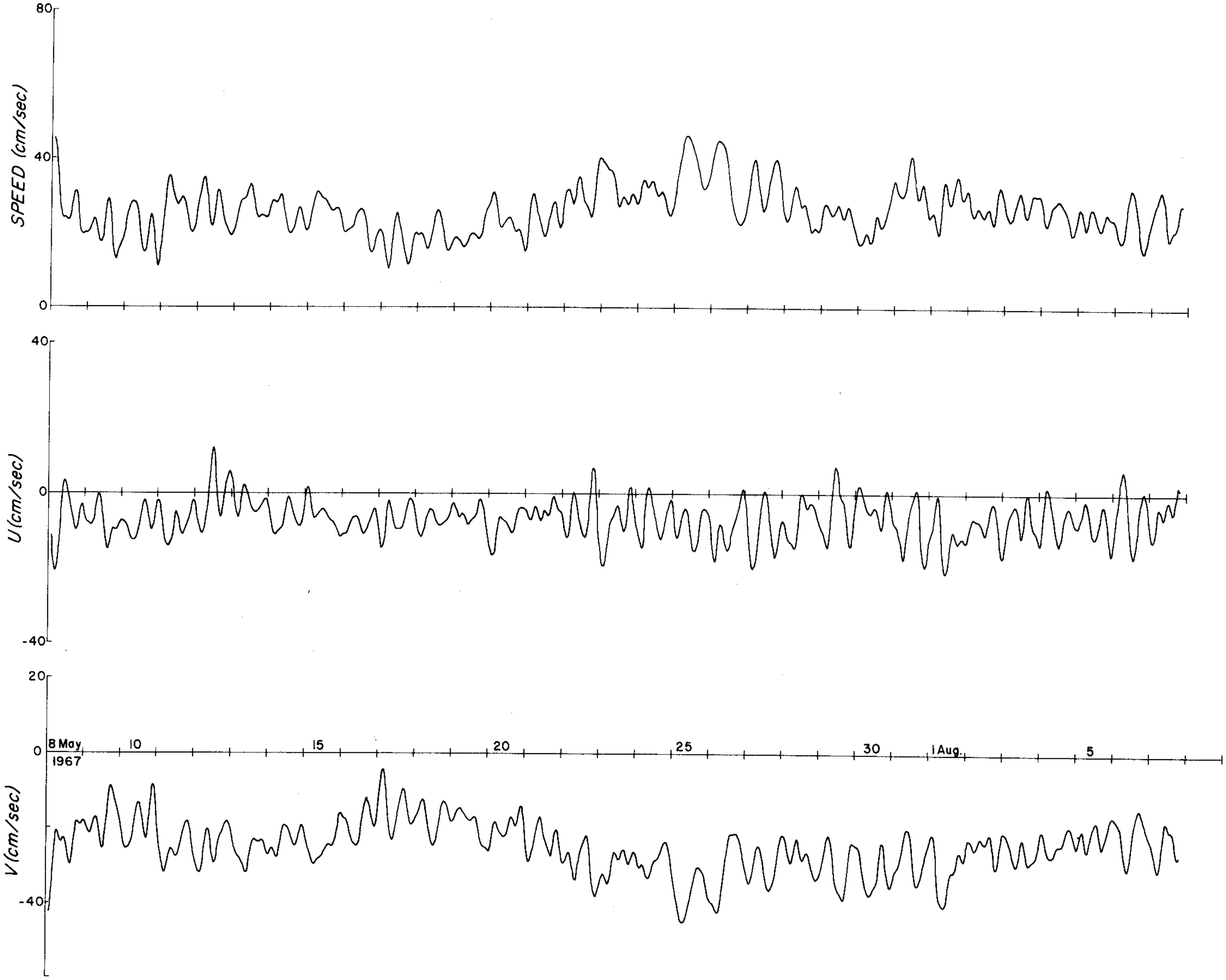
Current meters and a thermograph were set at depths of 20 and 60 meters as follows:

Depth	Histogram Current Meter Serial No.	Thermograph Serial No.
20 m	3160089	1460087
60 m	3160090	

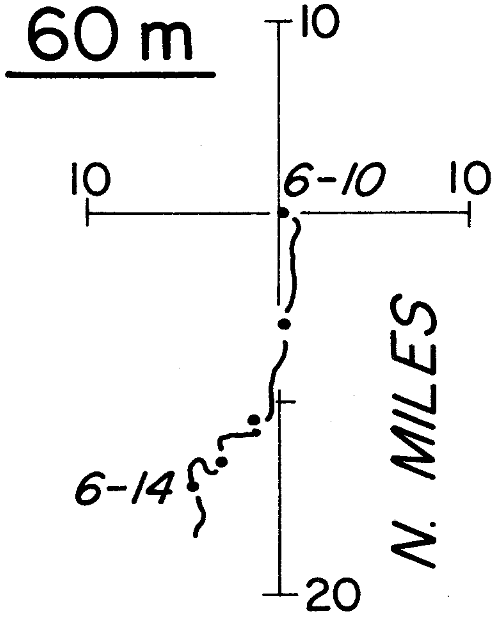
Current meter at 60 meters cycled every 10 minutes; current meter at 20 meters and thermograph didn't run.


DIRECTION
8 May - 8 June, 1967
60 meters
RELATIVE FREQUENCY (%)
30
20
10
0
180
360
DIRECTION (degrees)


SPEED
8 May - 8 June, 1967
60 meters
RELATIVE FREQUENCY (%)
7.5
5.0
2.5
0
20
40
SPEED (cm/sec)



8 May - 8 June, 1967
60 meters



PROGRESSIVE VECTOR DIAGRAM

Symbols indicate 0000 GMT on successive days
DB 7: 44 50.9'N, 124 17.3'W

1967 SHORT RUN
DB 7

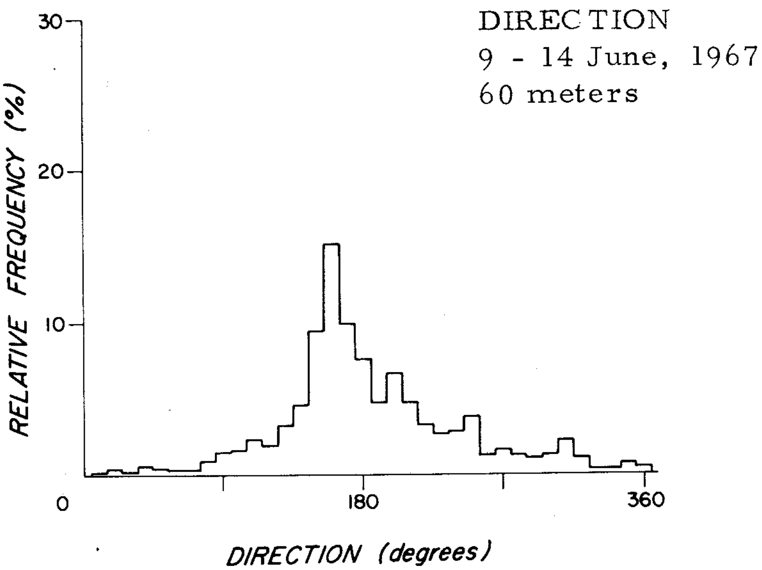
Position: 44°50.9'N, 124°17.3'W
Depth of Water: 104 meters
Set at 2300 GMT 9 June 1967 by R/V YAQUINA
Retrieved at 1700 GMT 14 June 1967 by R/V YAQUINA
Data Interval: 2310 GMT 9 June - 1620 GMT 14 June 1967

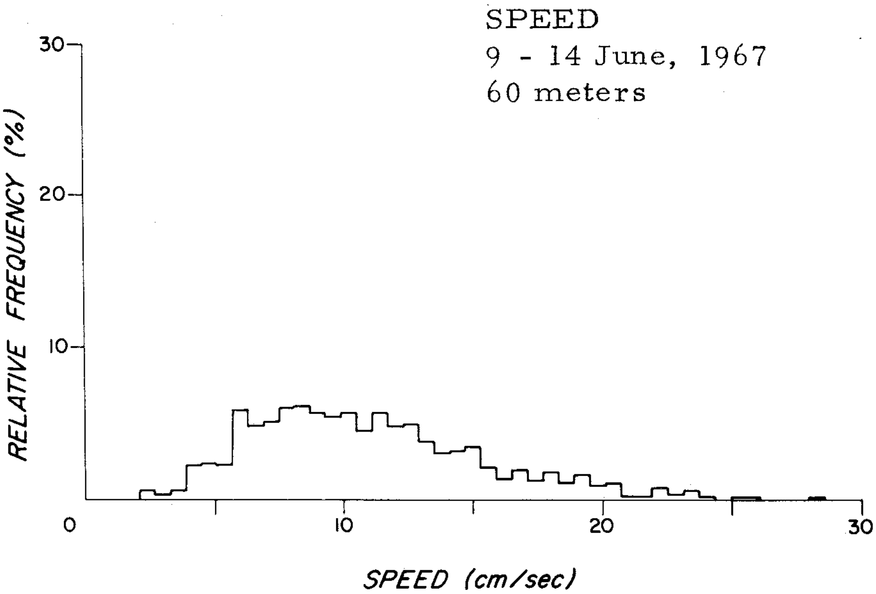
Instrumentation

Current meters and thermographs were placed at depths of 20, 40, and 60 meters as follows:

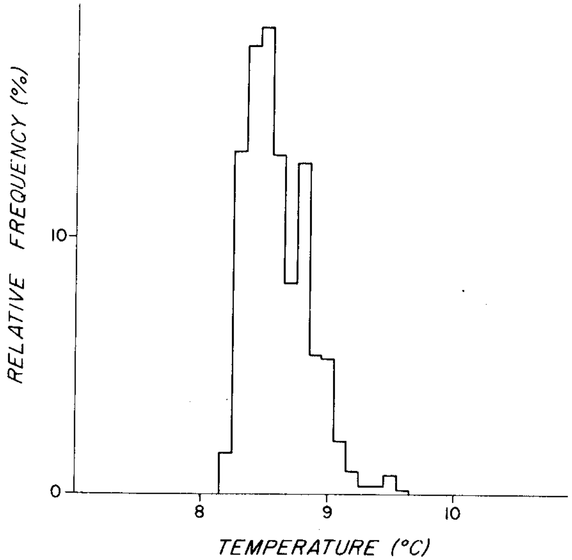
Depth	Histogram Current Meter Serial No.	Thermograph Serial No.
20 m	3160088	14600115
40 m	3160089	14600088
60 m	3160090	14600087

Current meter and thermograph at 60 meters cycled every 10 minutes; thermographs at 20 and 40 meters cycled every 5 minutes; current meters at 20 and 40 meters didn't run.

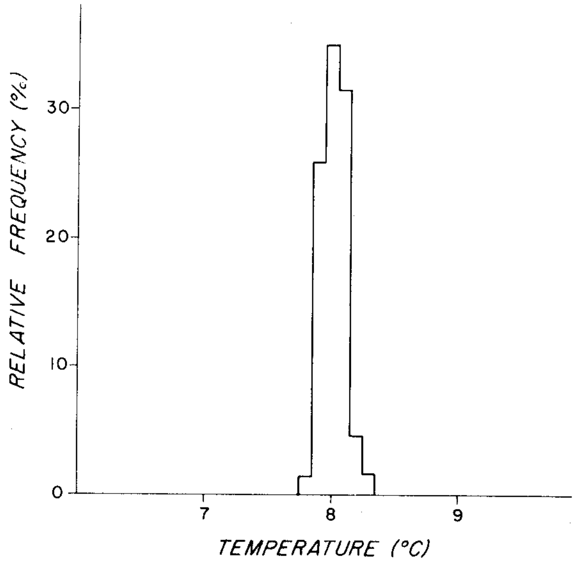

DIRECTION
9 - 14 June, 1967
60 meters
RELATIVE FREQUENCY (%)
30
20
10
0
180
360
DIRECTION (degrees)


SPEED
9 - 14 June, 1967
60 meters
RELATIVE FREQUENCY (%)
30
20
10
0
10
20
30
SPEED (cm/sec)

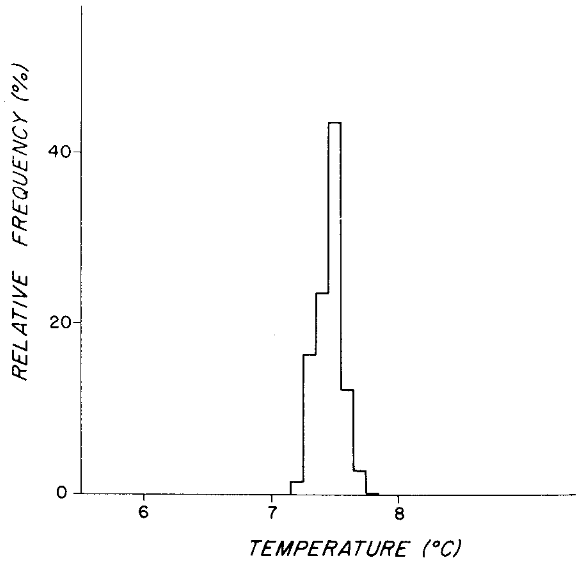
TEMPERATURE
9 - 14 June, 1967
20 meters



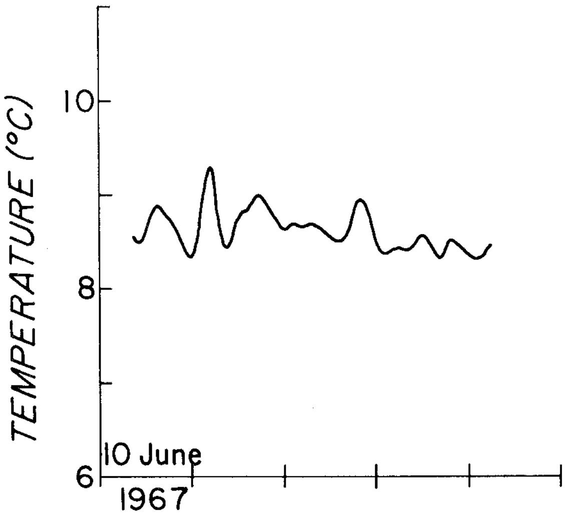
TEMPERATURE
9 - 14 June, 1967
40 meters



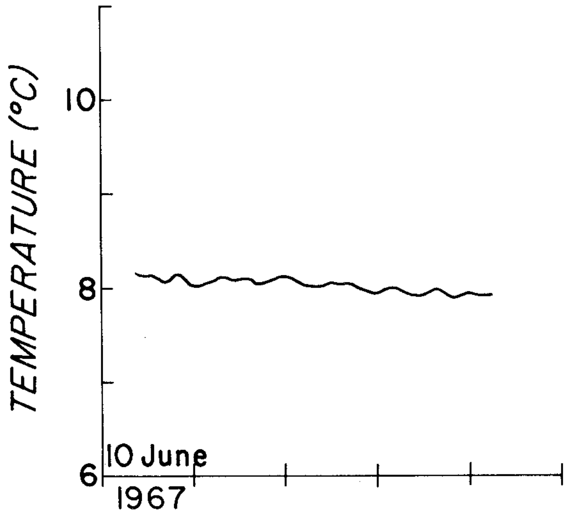
TEMPERATURE
9 - 14 June, 1967
60 meters



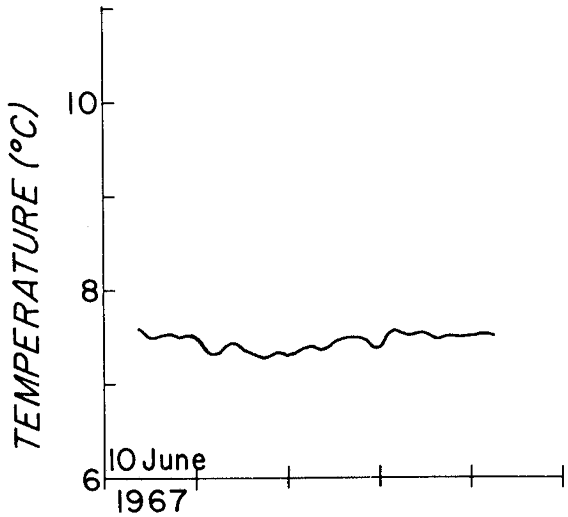
TEMPERATURE
10 - 14 June, 1967
20 meters

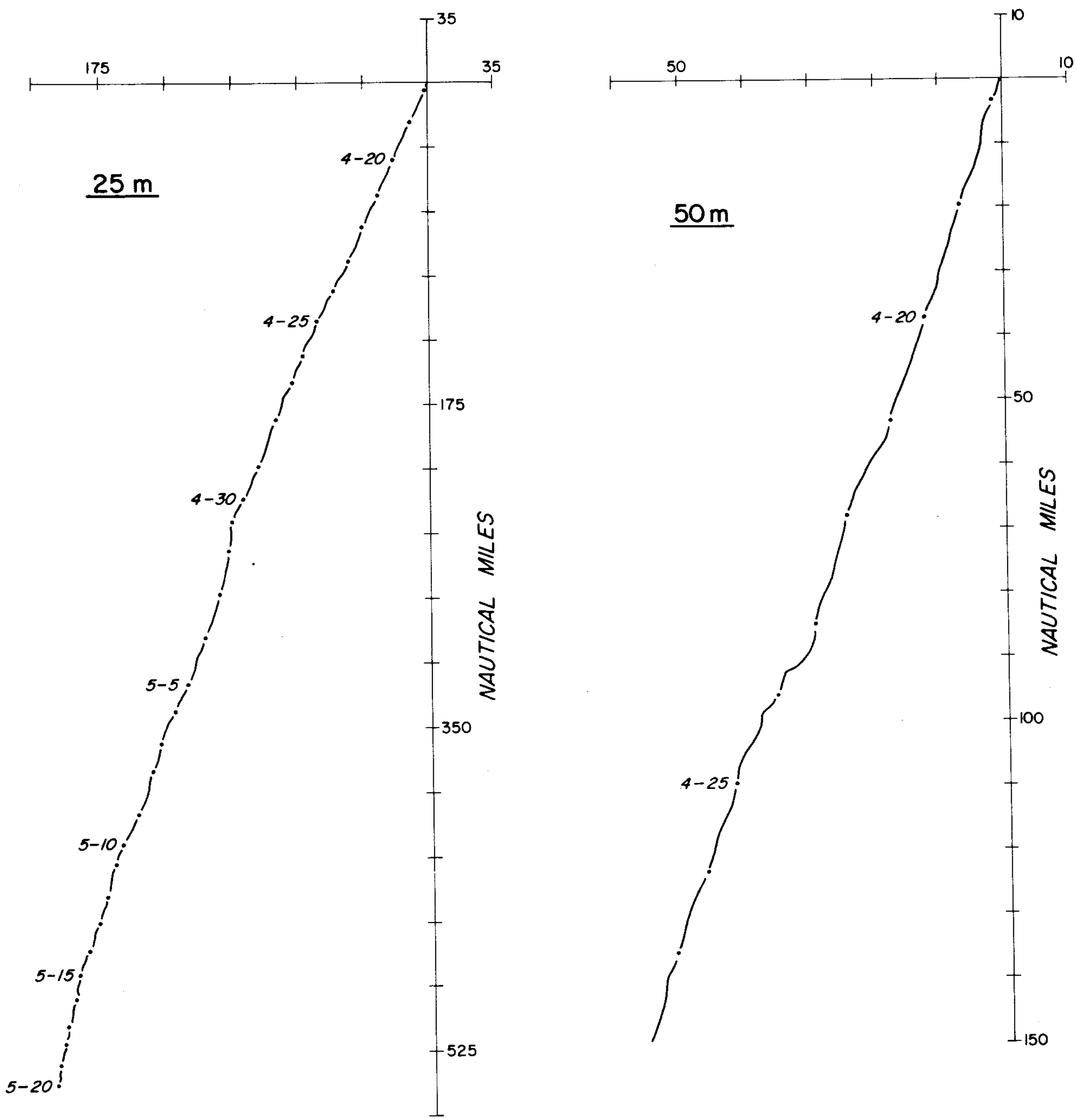


TEMPERATURE
10 - 14 June, 1967
40 meters



TEMPERATURE
10 - 14 June, 1967
60 meters





PROGRESSIVE VECTOR DIAGRAMS

Symbols indicate 0000 GMT on successive days
DB 7: 44 50.5'N, 124 13.8'W

1968 INSTALLATION A

Position: 44°50.5'N, 124°13.8'W, DB 7
Depth of Water: 99 meters
Set at 2000 GMT 17 April 1968 by R/V YAQUINA
Retrieved at 1500 GMT 27 May 1968 by R/V YAQUINA
Data Interval: 2020 GMT 17 April - 1520 GMT 27 May 1968

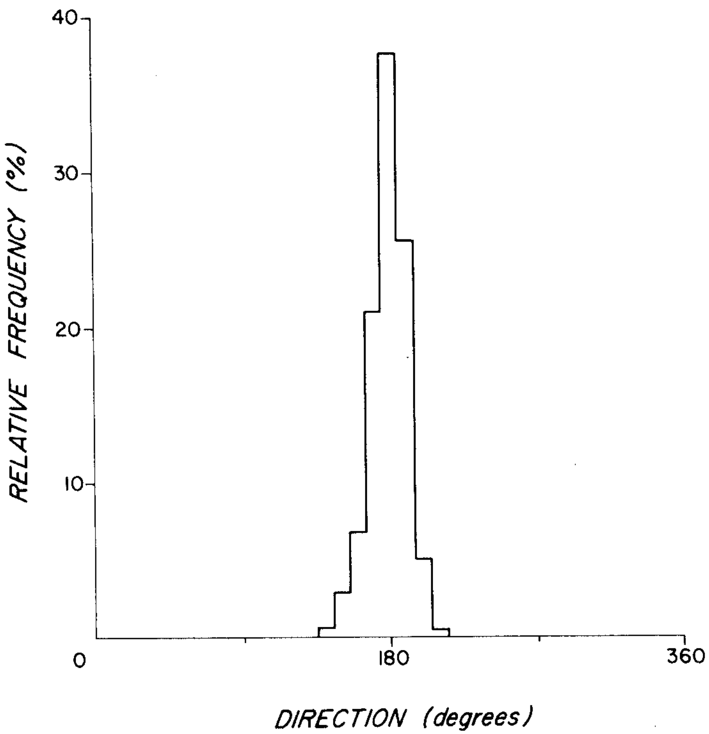
Instrumentation

Current meters and a thermograph were placed at depths of 25 and 50 meters as follows:

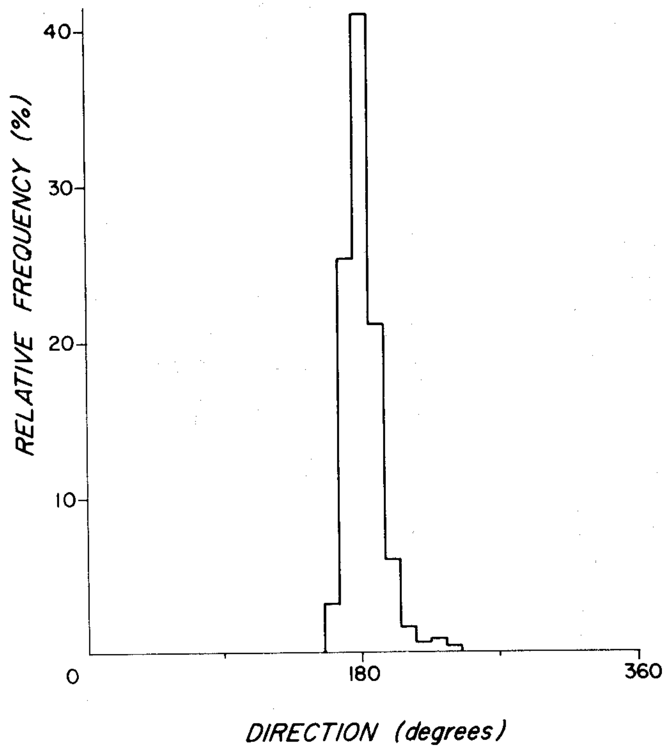
Depth	Histogram Current Meter Serial No.	Thermograph Serial No.
25 m	3160088	14600115
50 m	3160055	

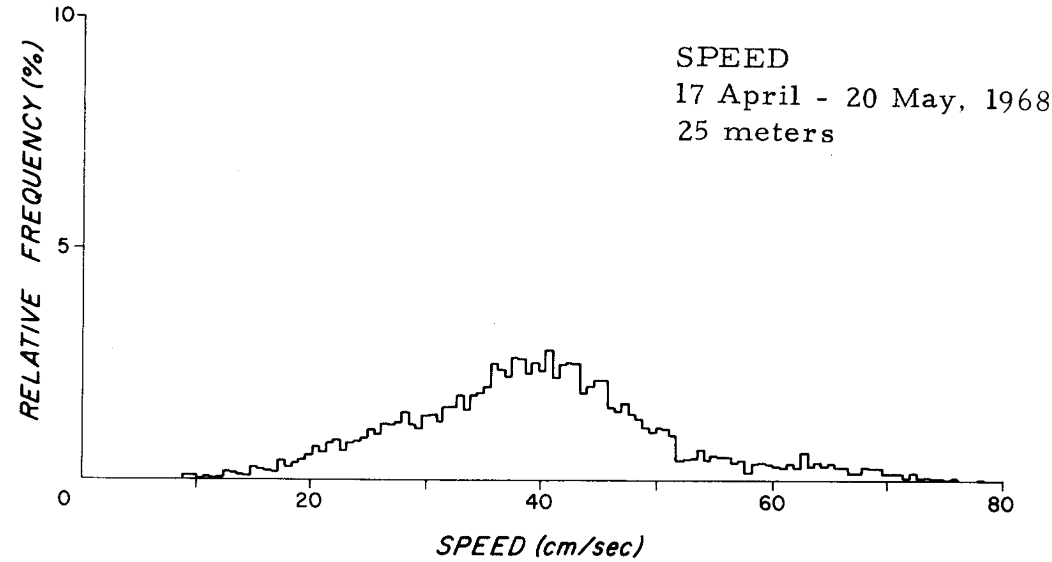
Current meters and thermograph cycled every 10 minutes.

DIRECTION
17 April - 20 May, 1968
25 meters

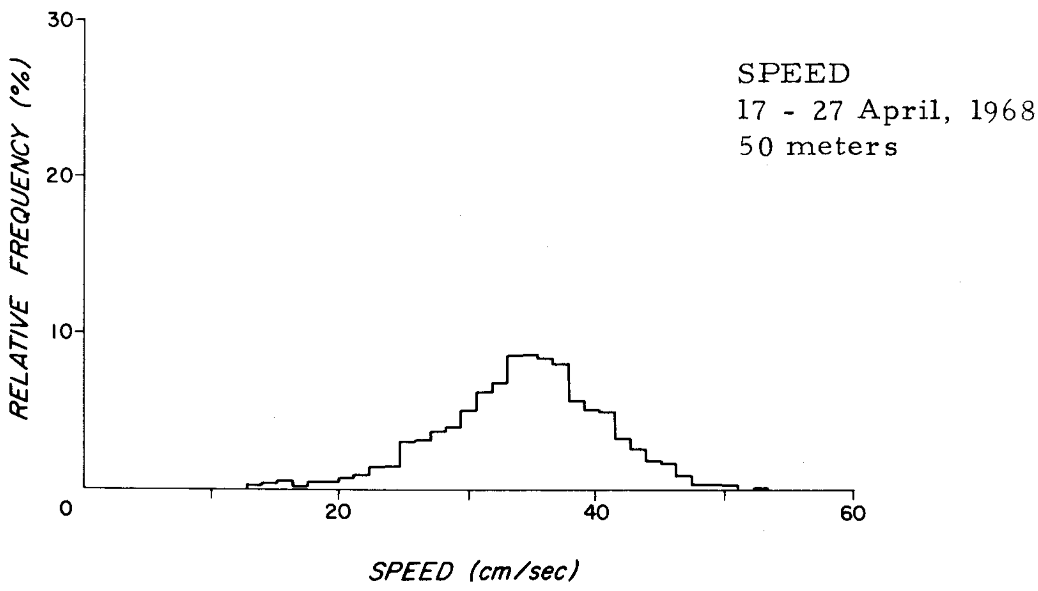


DIRECTION
17 - 27 April, 1968
50 meters

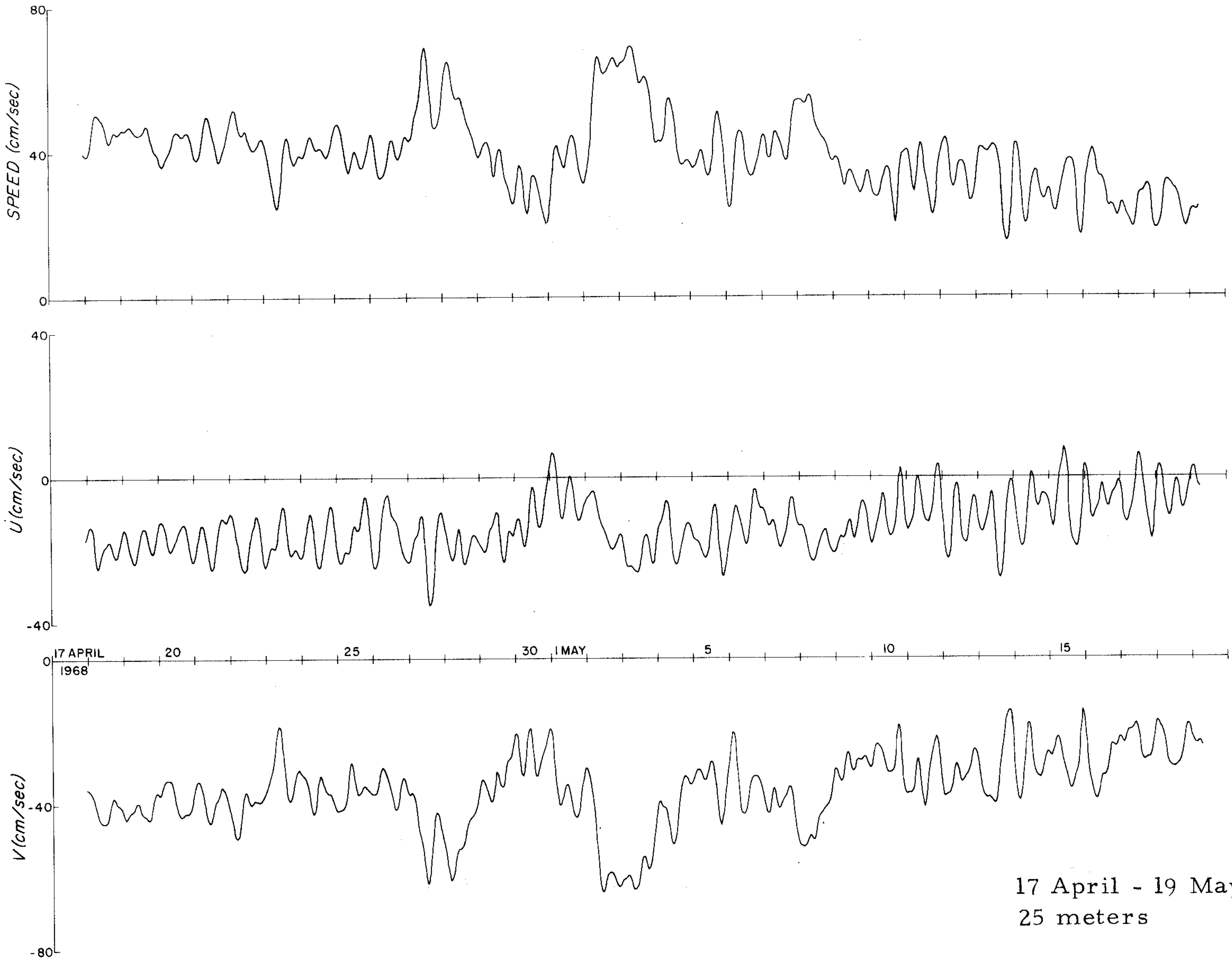




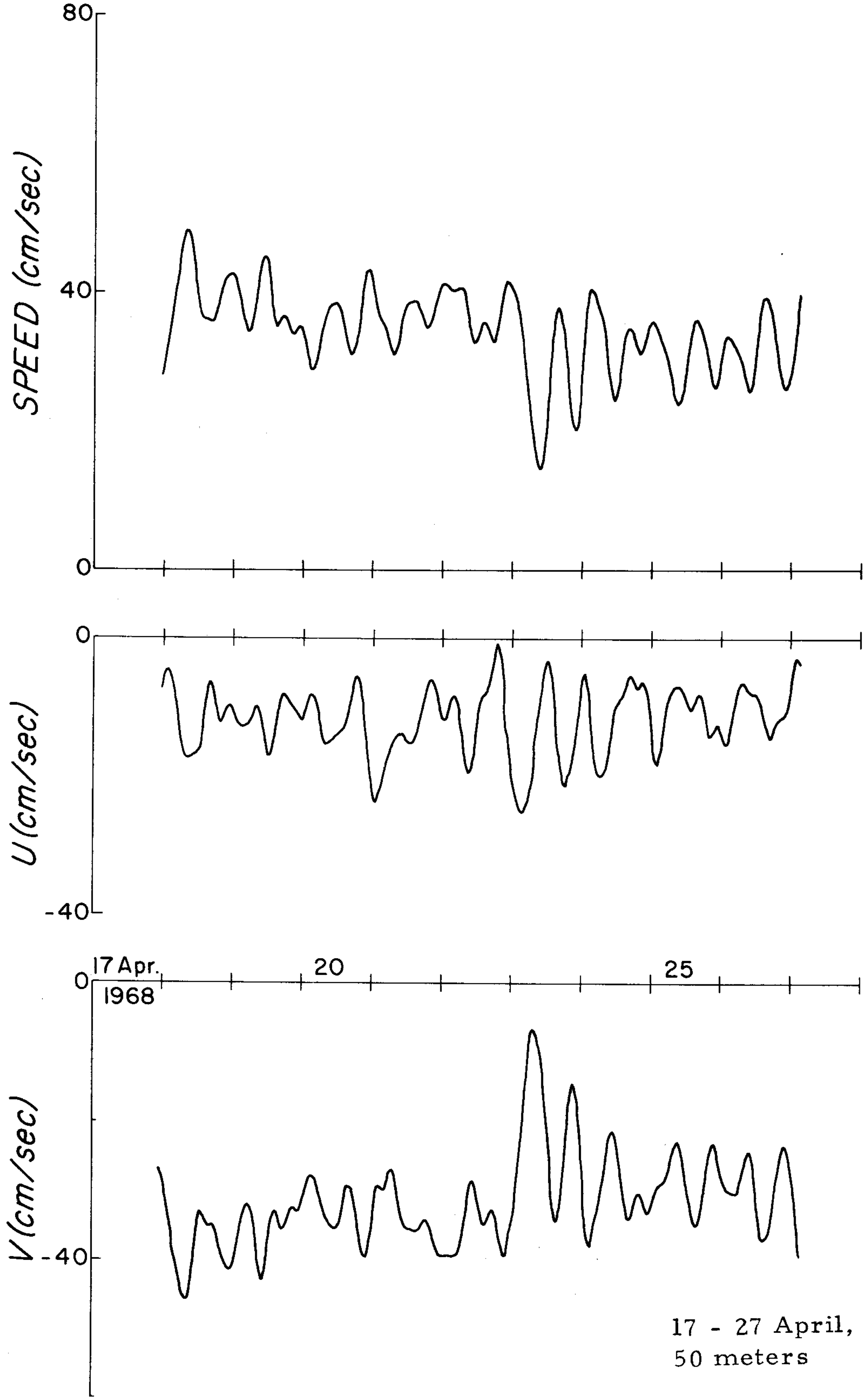
SPEED
17 April - 20 May, 1968
25 meters
RELATIVE FREQUENCY (%)
10
5
0
20
40
60
80
SPEED (cm/sec)



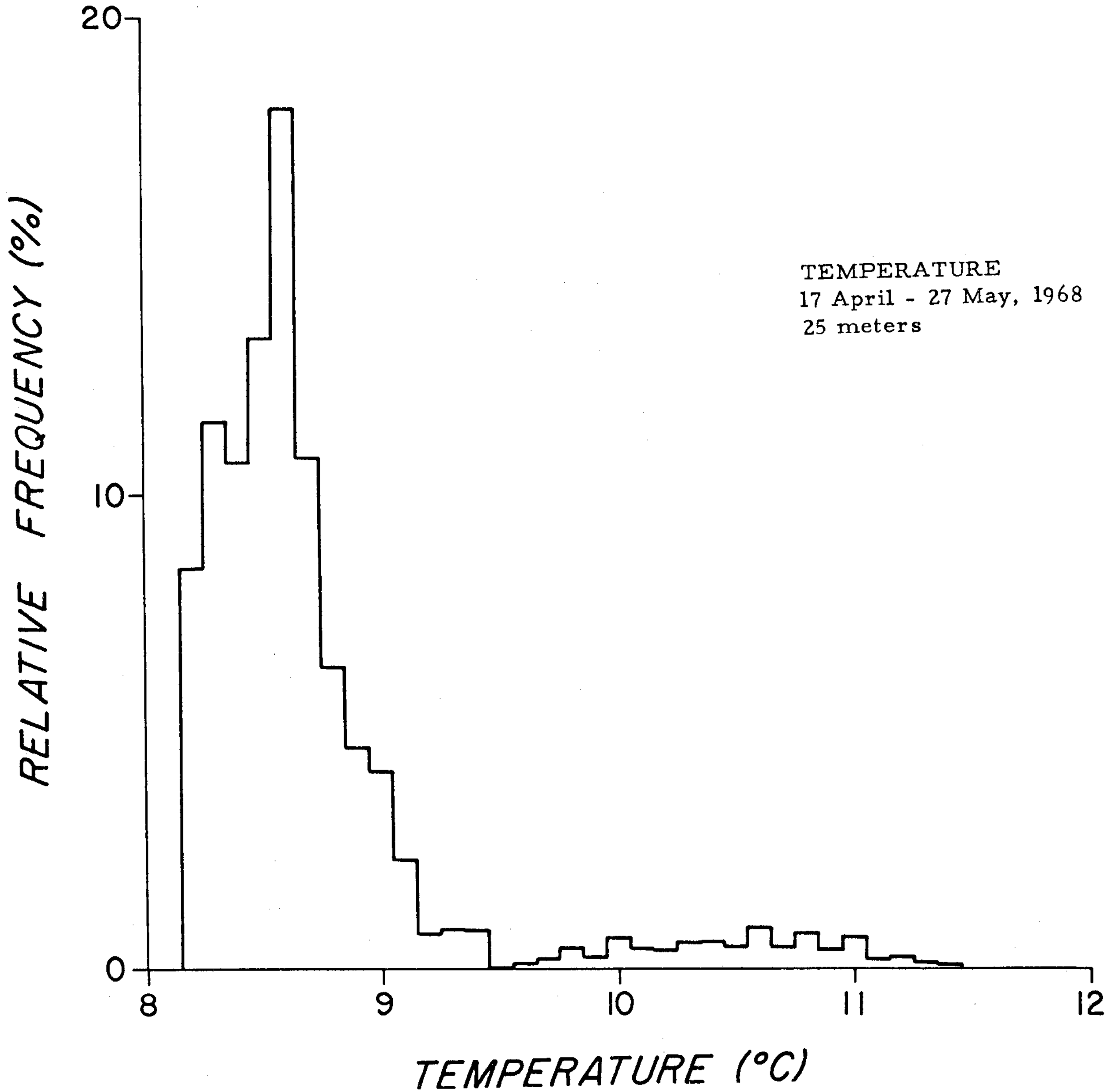
SPEED
17 - 27 April, 1968
50 meters
RELATIVE FREQUENCY (%)
30
20
10
0
20
40
60
SPEED (cm/sec)



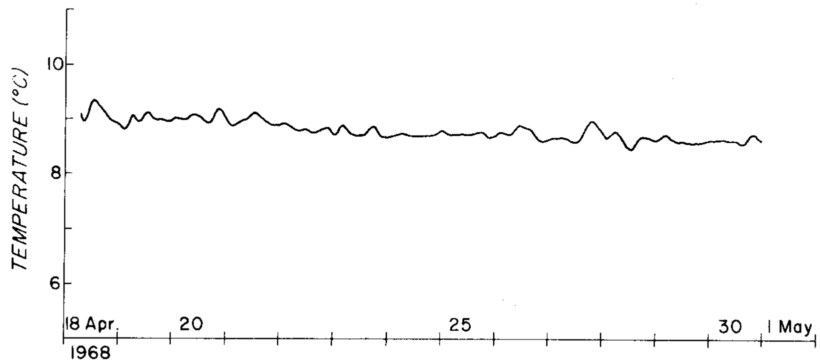
17 April - 19 May, 1968
25 meters



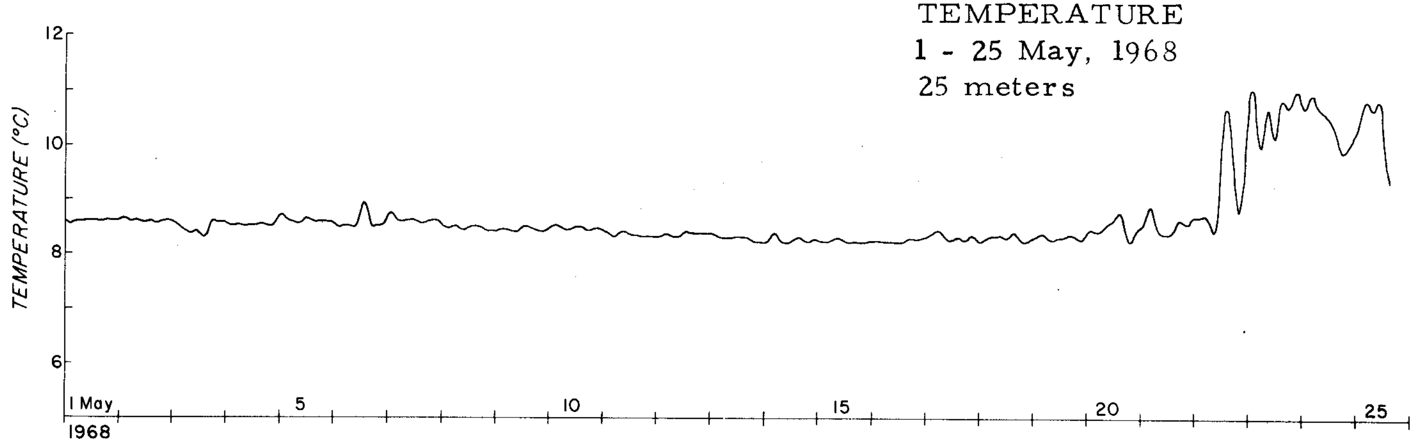
17 - 27 April, 1968
50 meters

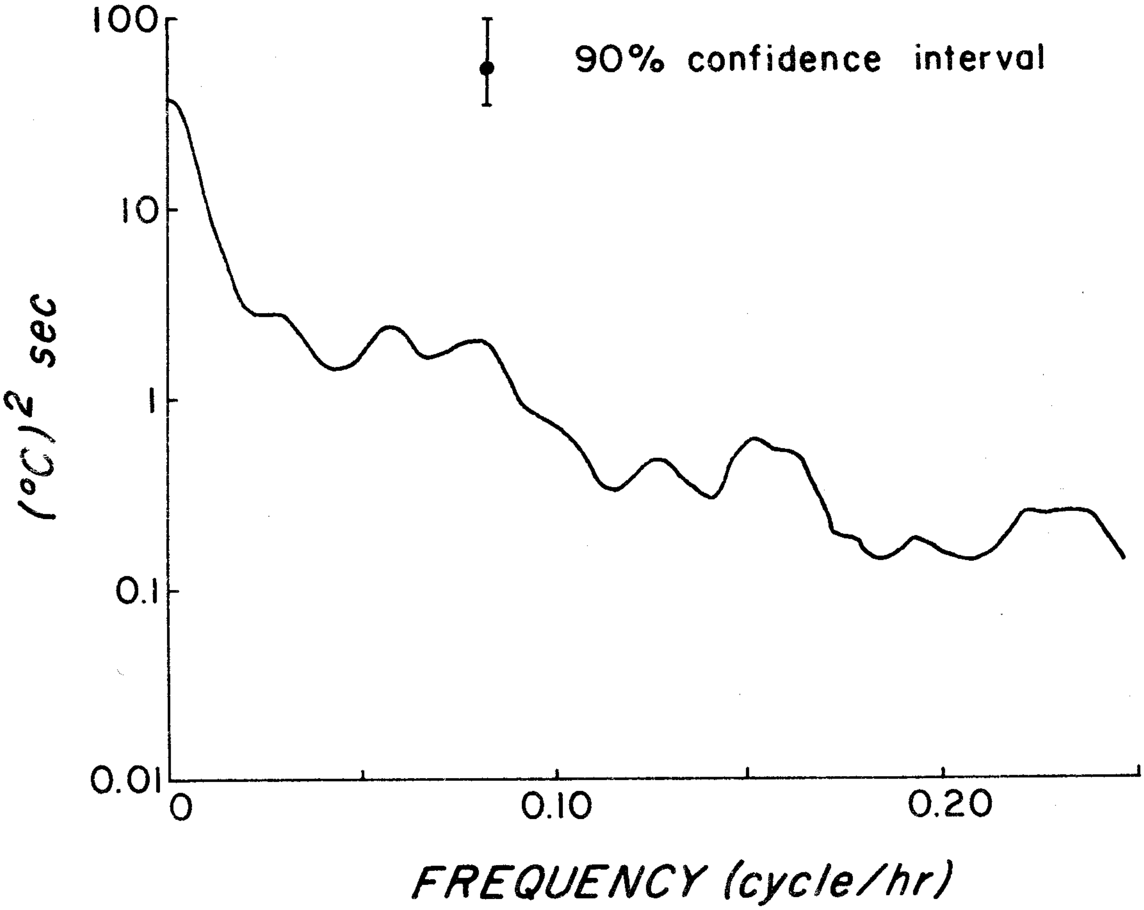

TEMPERATURE
17 April - 27 May, 1968
25 meters
RELATIVE FREQUENCY (%)
20
10
0
8
9
10
11
12
TEMPERATURE (°C)

TEMPERATURE
18 April - 1 May, 1968
25 meters

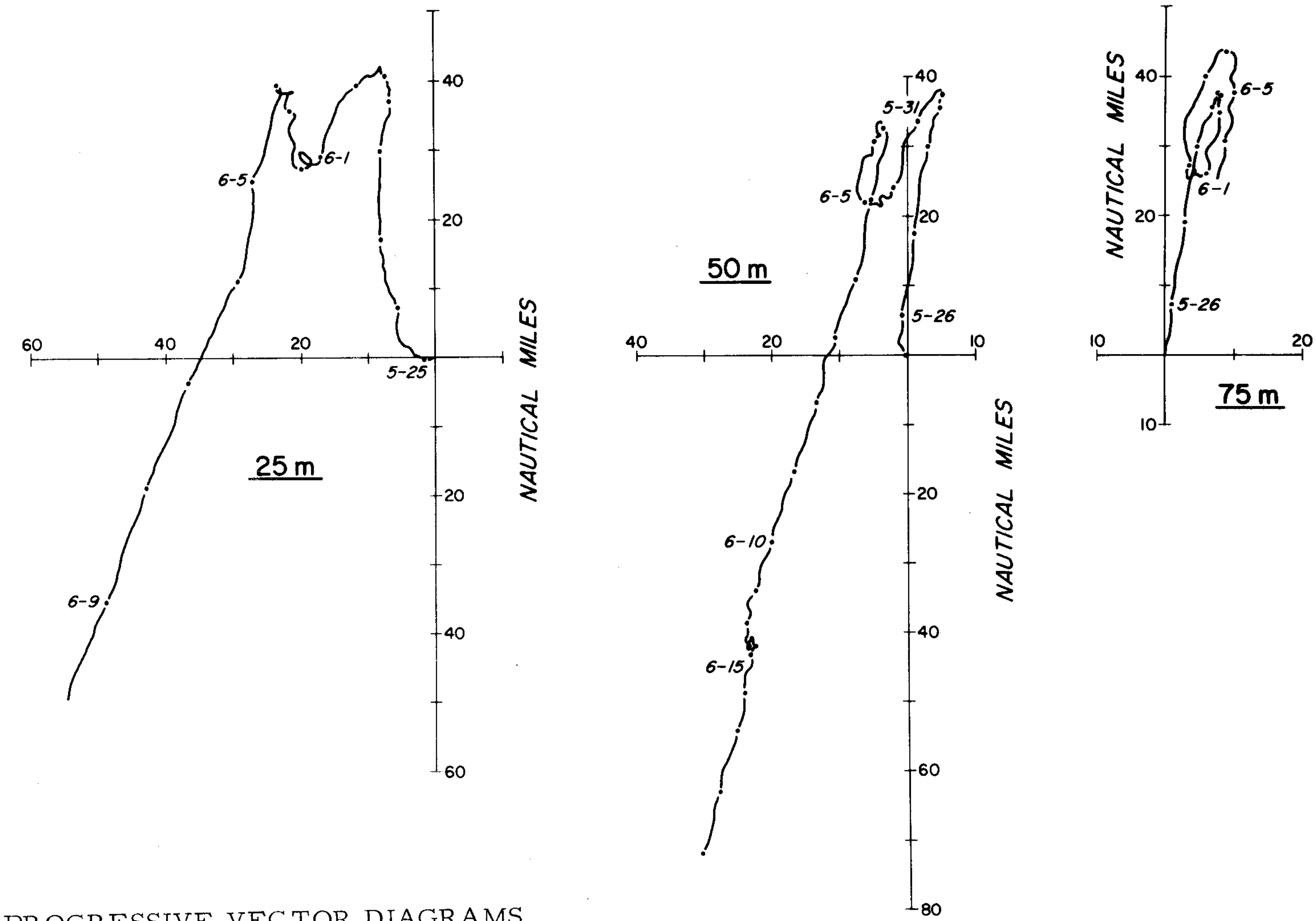


TEMPERATURE
1 - 25 May, 1968
25 meters





TEMPERATURE POWER SPECTRUM
17 - 27 April 1968
25 meters



PROGRESSIVE VECTOR DIAGRAMS

Symbols indicate 0000 GMT on successive days
DB 7: 44 52.4'N, 124 13.0'W

1968 INSTALLATION B

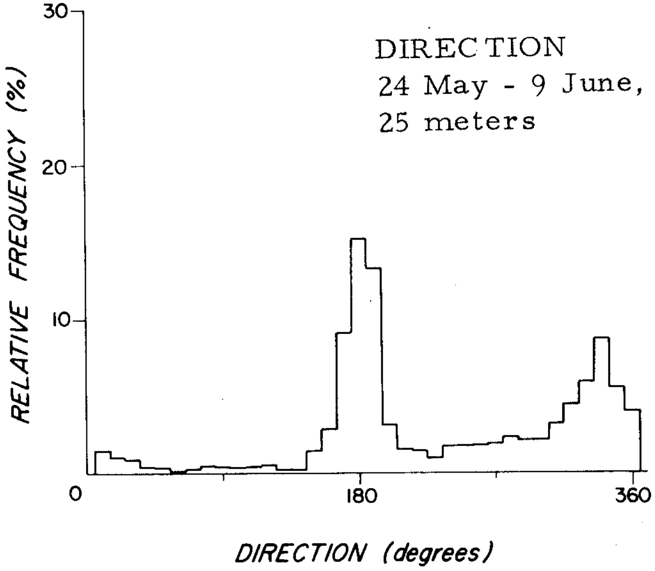
Position: 44°52.4'N, 124°13.0'W, DB 7
Depth of Water: 100 meters
Set at 2000 GMT 24 May 1968 by R/V YAQUINA
Retrieved at 2130 GMT 23 June 1968 by R/V YAQUINA
Data Interval: 2040 GMT 24 May - 0040 GMT 19 June 1968

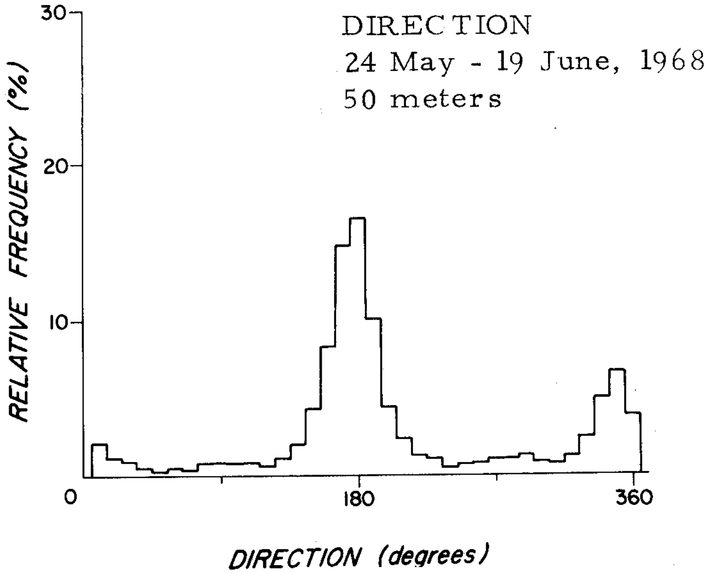
Instrumentation

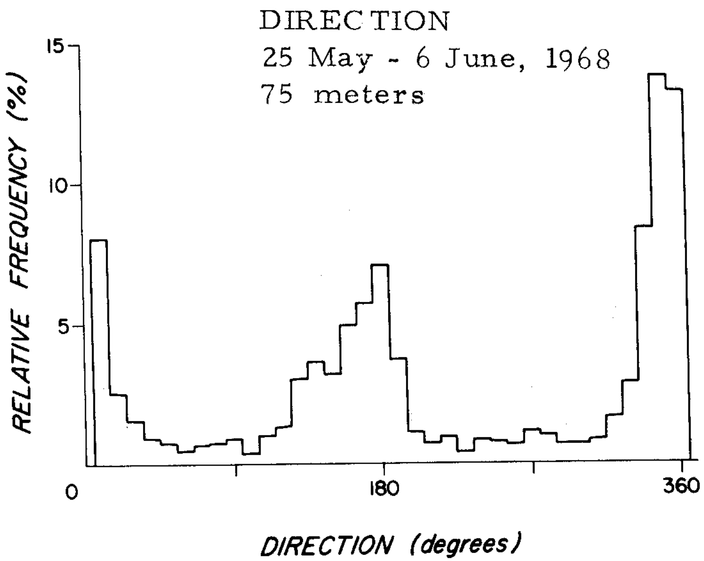
Current meters and thermographs were placed at depths of 25, 50 and 75 meters as follows:

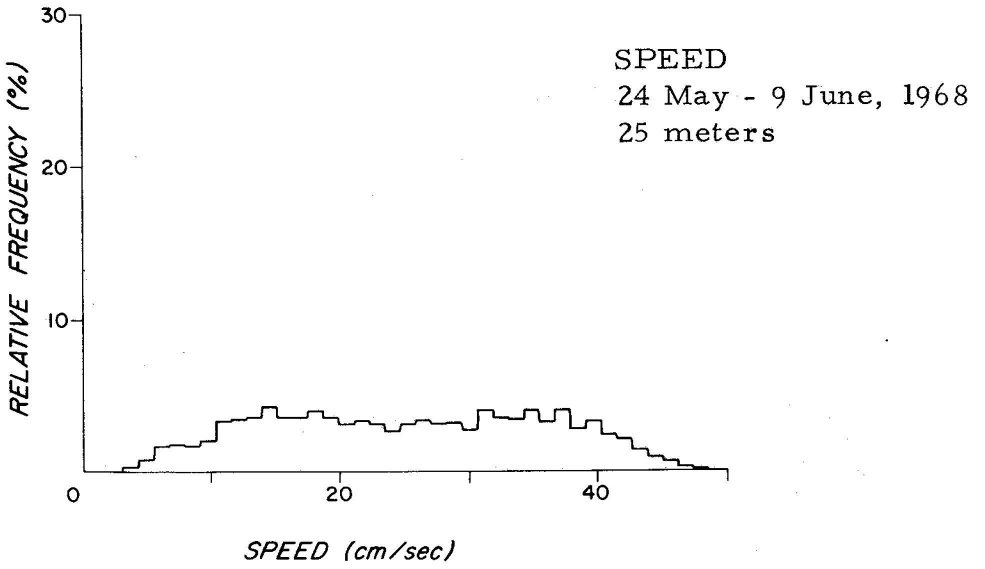
Depth	Histogram Current Meter Serial No.	Thermograph Serial No.
25 m	3160049	14600087
50 m	3160054	14600089
75 m	3160090	

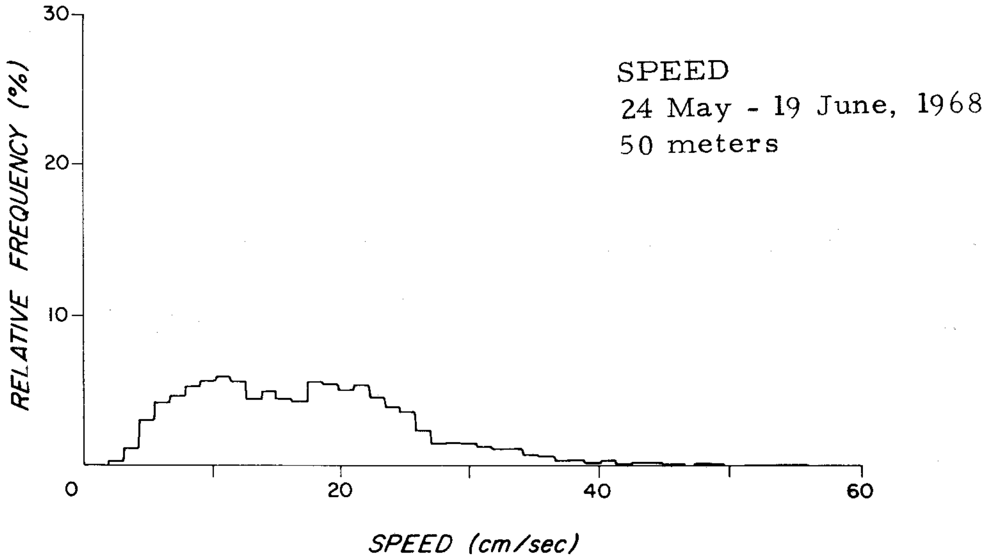
Current meters and thermographs cycled every 10 minutes.

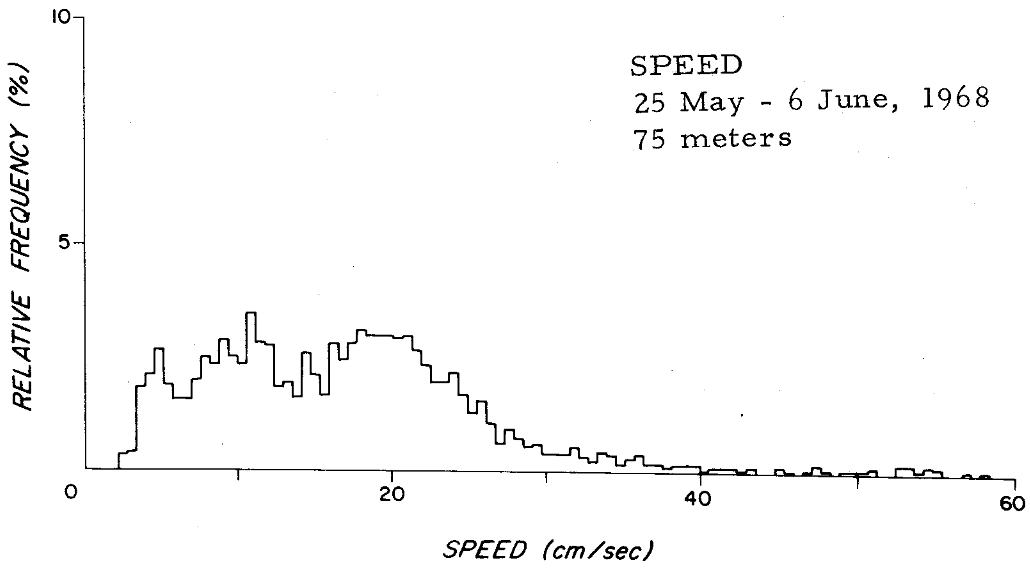

DIRECTION
24 May - 9 June, 1968
25 meters
RELATIVE FREQUENCY (%)
30
20
10
0
180
360
DIRECTION (degrees)

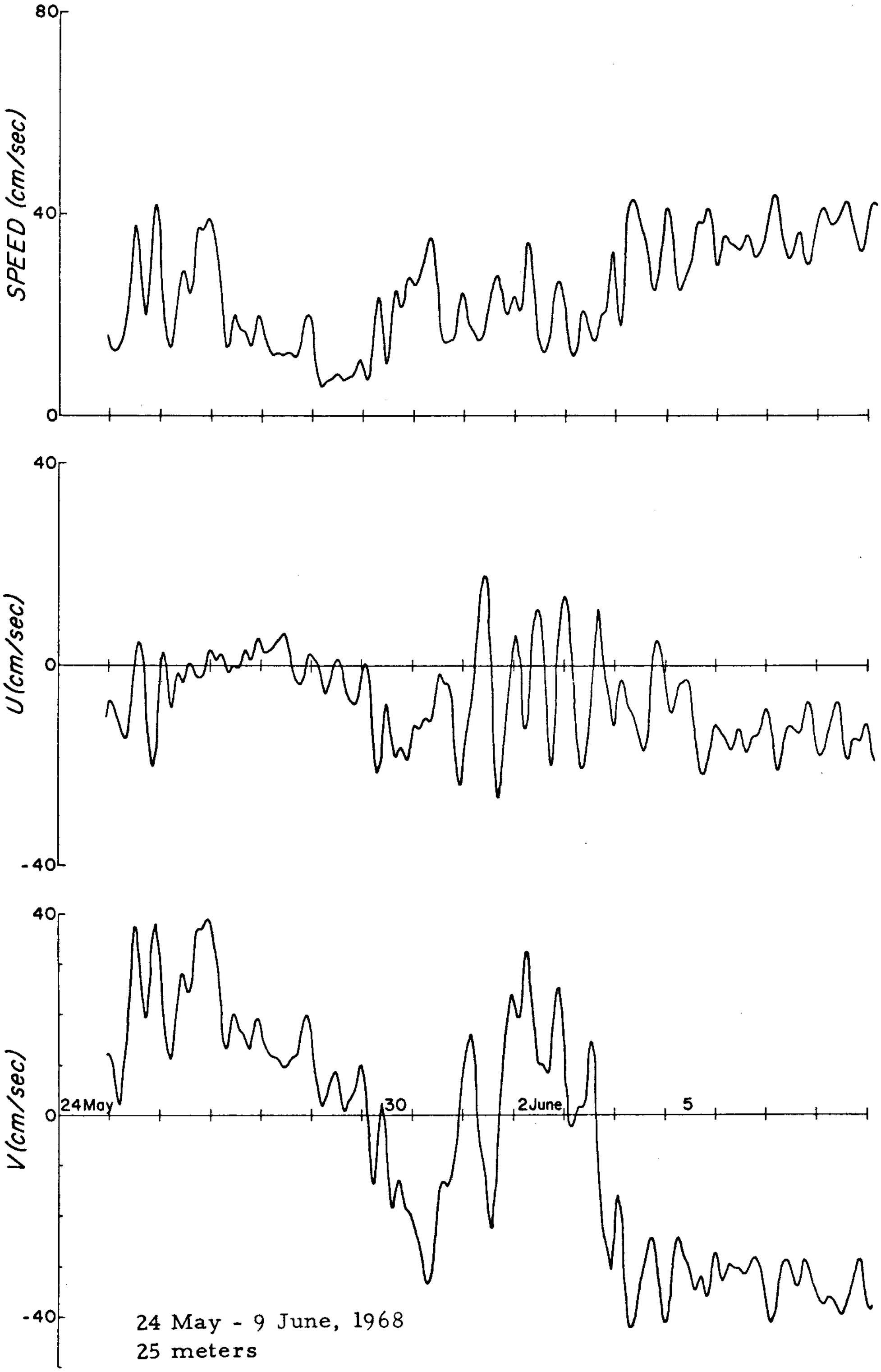

DIRECTION
24 May - 19 June, 1968
50 meters
RELATIVE FREQUENCY (%)
30
20
10
0
180
360
DIRECTION (degrees)


DIRECTION
25 May - 6 June, 1968
75 meters
RELATIVE FREQUENCY (%)
15
10
5
0
180
360
DIRECTION (degrees)

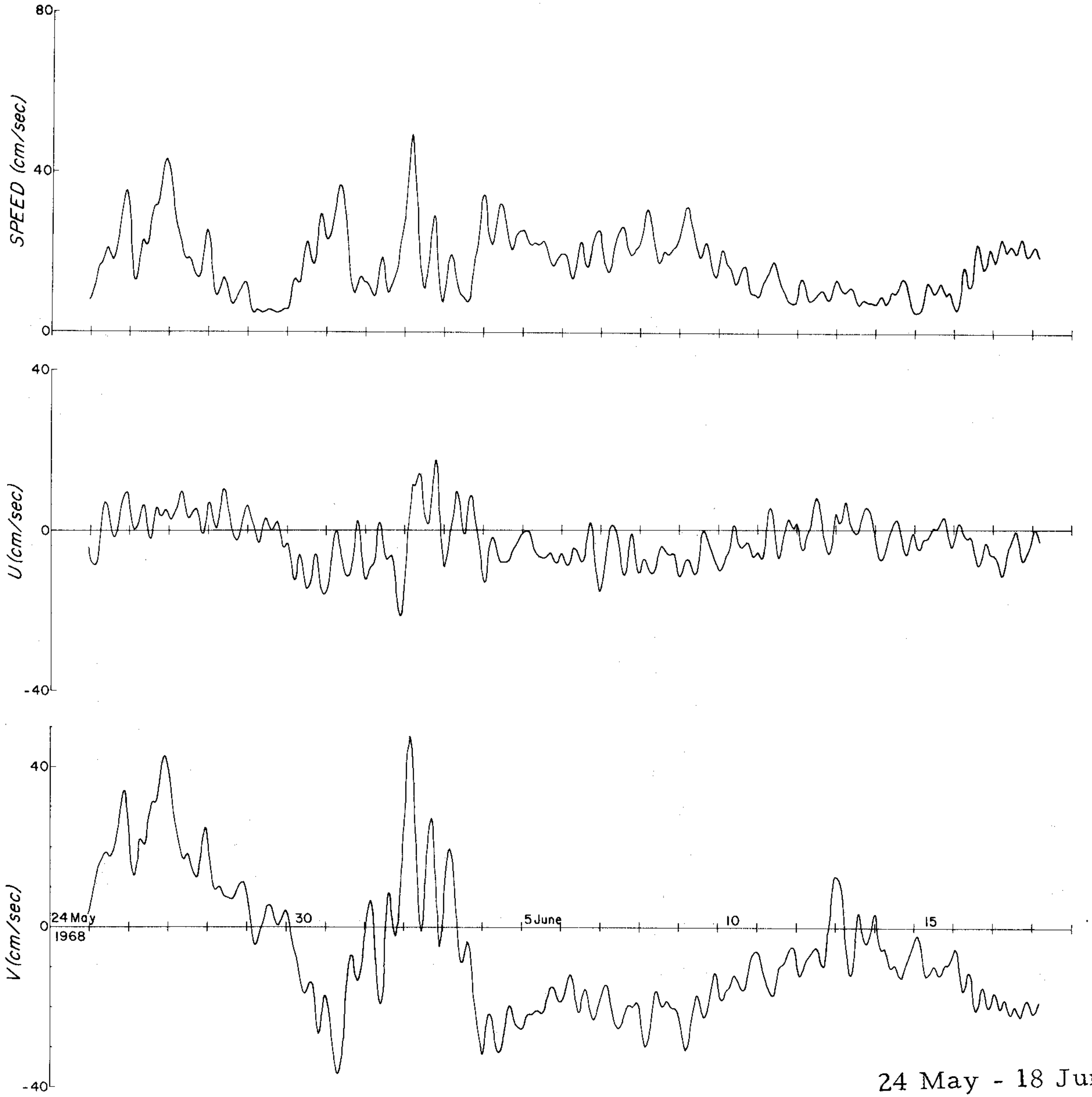

SPEED
24 May - 9 June, 1968
25 meters
RELATIVE FREQUENCY (%)
30
20
10
0
20
40
SPEED (cm/sec)


SPEED
24 May - 19 June, 1968
50 meters
RELATIVE FREQUENCY (%)
30
20
10
0
20
40
60
SPEED (cm/sec)

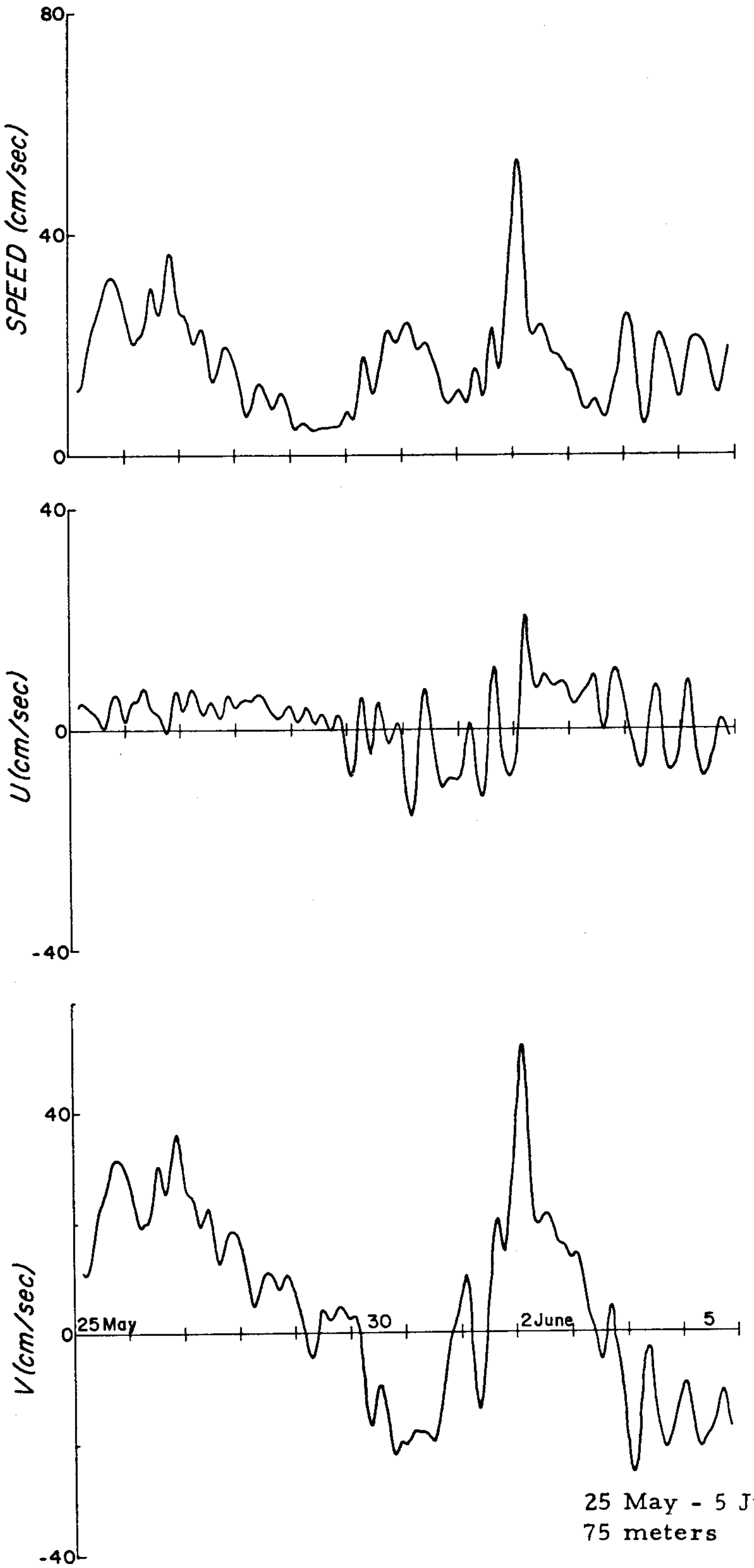

SPEED
25 May - 6 June, 1968
75 meters
RELATIVE FREQUENCY (%)
10
5
0
20
40
60
SPEED (cm/sec)



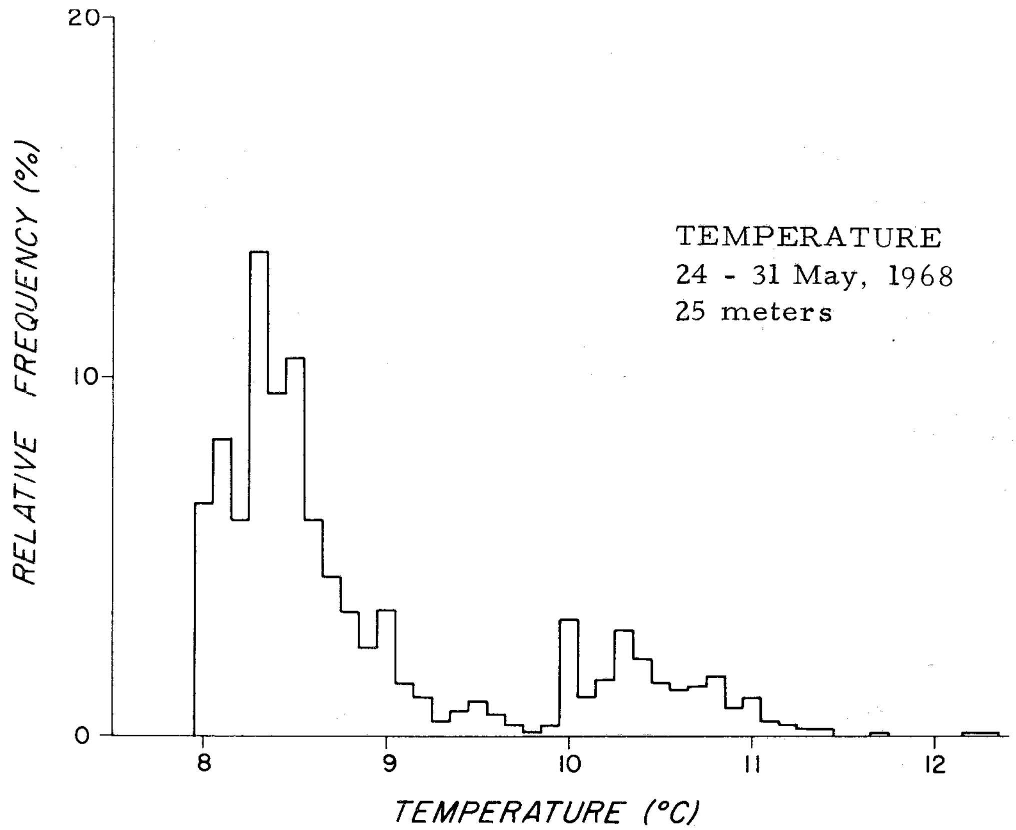
80
40
0
SPEED (cm/sec)
40
0
-40
U (cm/sec)
40
0
-40
V (cm/sec)
24 May
30
2 June
5
24 May - 9 June, 1968
25 meters

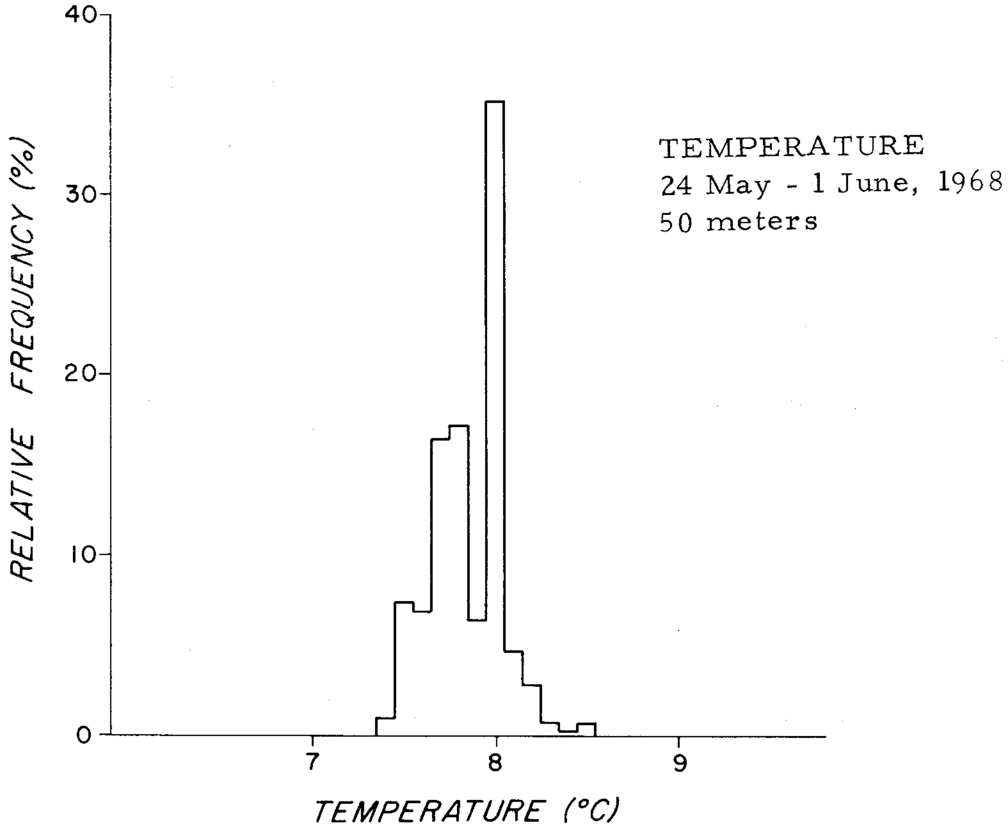


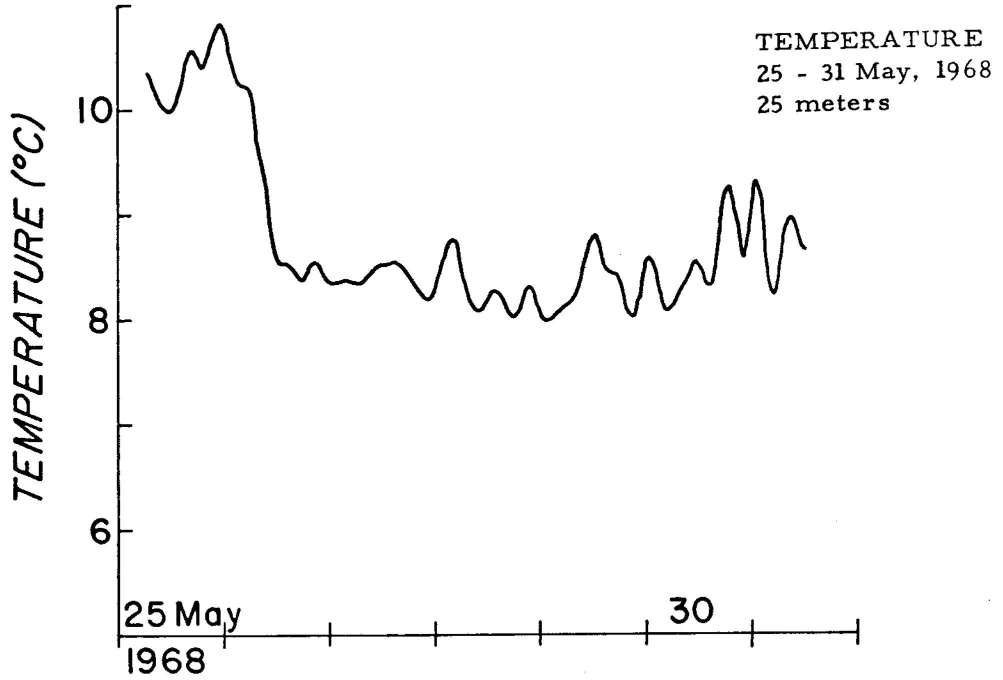
24 May - 18 June, 1968
50 meters

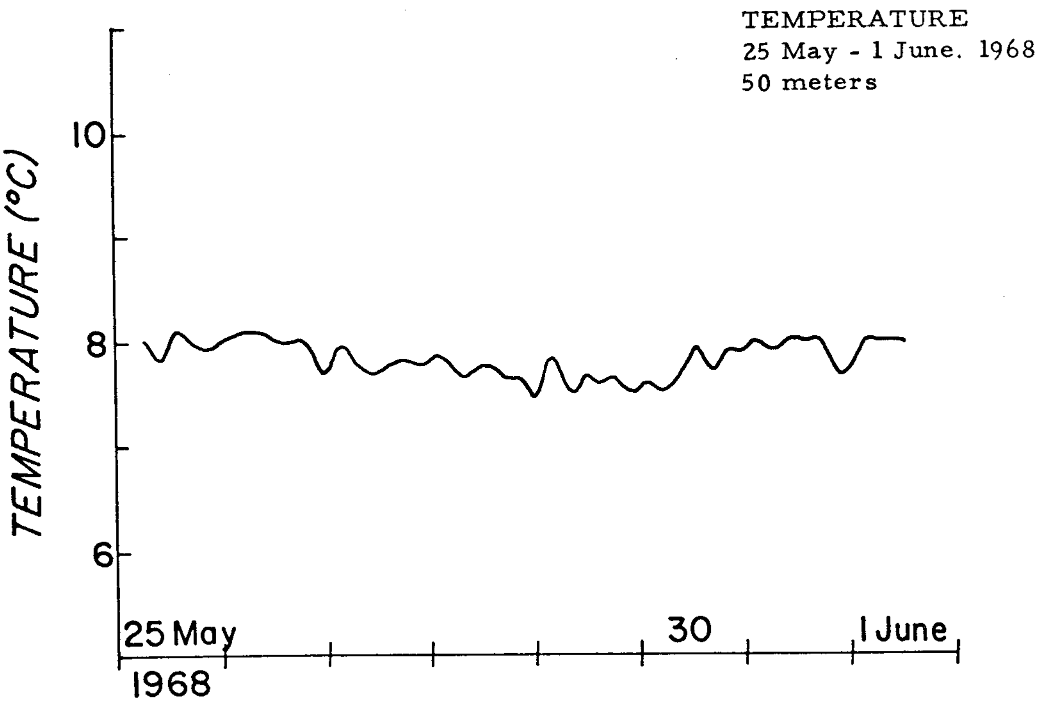


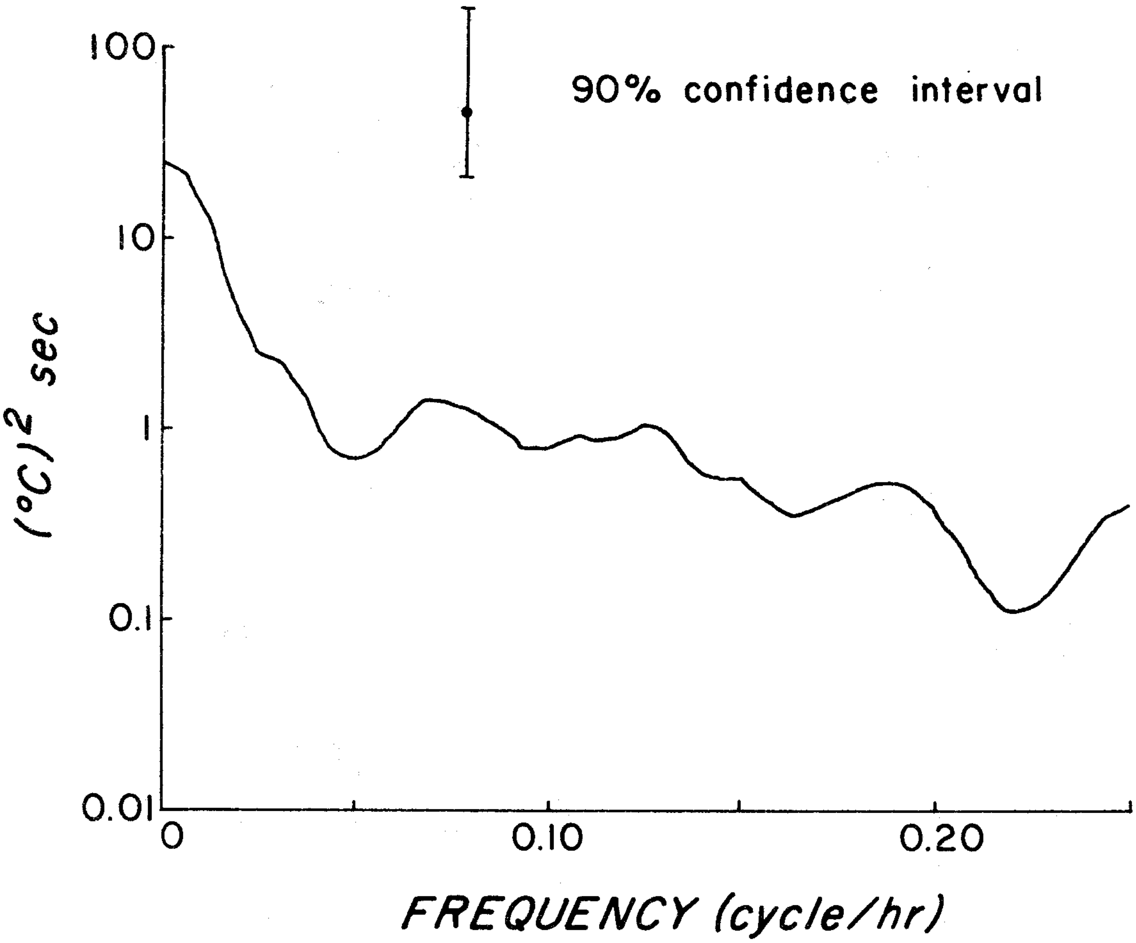
25 May - 5 June, 1968
75 meters


TEMPERATURE
24 - 31 May, 1968
25 meters
RELATIVE FREQUENCY (%)
20
10
0
8
9
10
11
12
TEMPERATURE (°C)

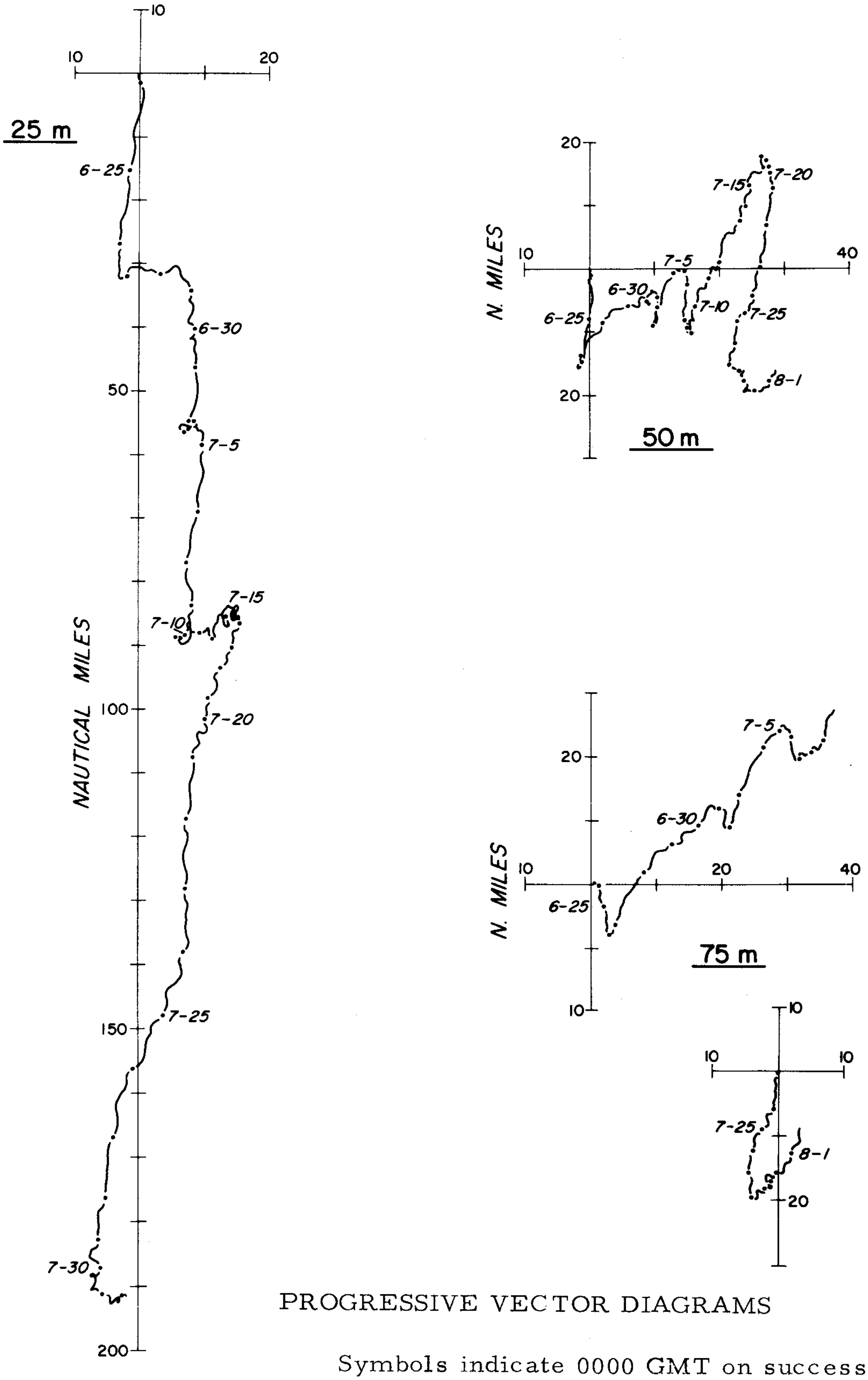

TEMPERATURE
24 May - 1 June, 1968
50 meters
RELATIVE FREQUENCY (%)
40
30
20
10
0
7
8
9
TEMPERATURE (°C)


TEMPERATURE
25 - 31 May, 1968
25 meters
TEMPERATURE (°C)
10
8
6
25 May
1968
30


TEMPERATURE
25 May - 1 June. 1968
50 meters
TEMPERATURE (°C)
10
8
6
25 May
1968
30
1 June



TEMPERATURE POWER SPECTRUM
24 May - 1 June 1968
50 meters



PROGRESSIVE VECTOR DIAGRAMS

Symbols indicate 0000 GMT on successive days
DB 7: 44 49.9'N, 124 13.0'W

1968 INSTALLATION C

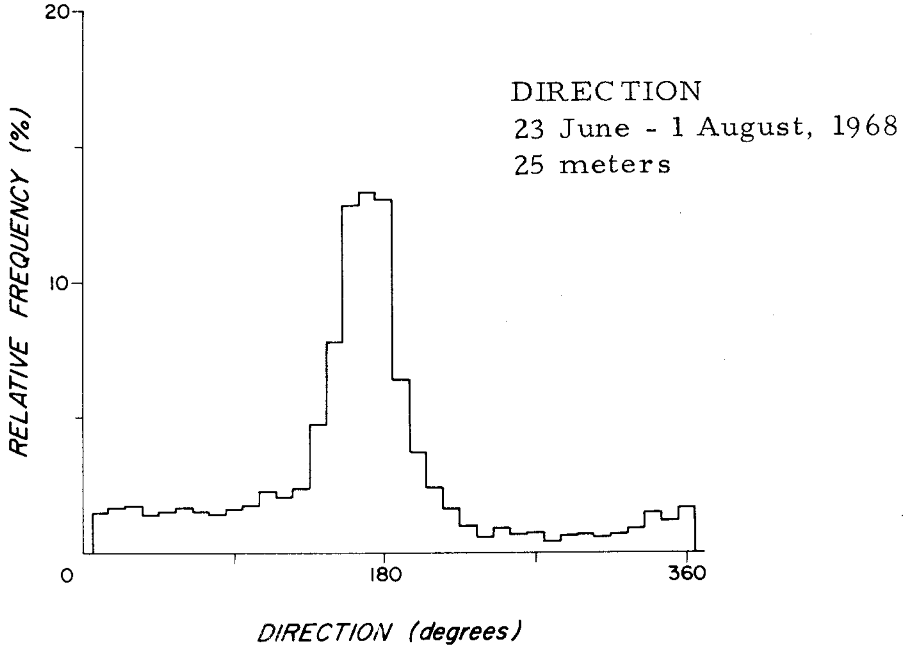
Position: 44°49.9'N, 124°13.0'W, DB 7
Depth of Water: 100 meters
Set at 2000 GMT 23 June 1968 by R/V YAQUINA
Retrieved at 1645 GMT 1 August 1968 by R/V YAQUINA
Data Interval: 1940 GMT 23 June - 1620 GMT 1 August 1968

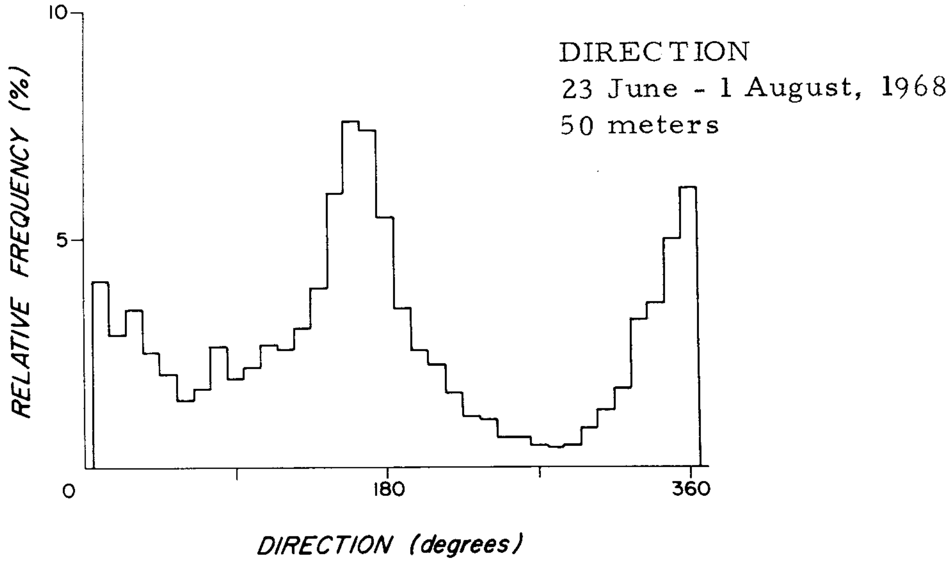
Instrumentation

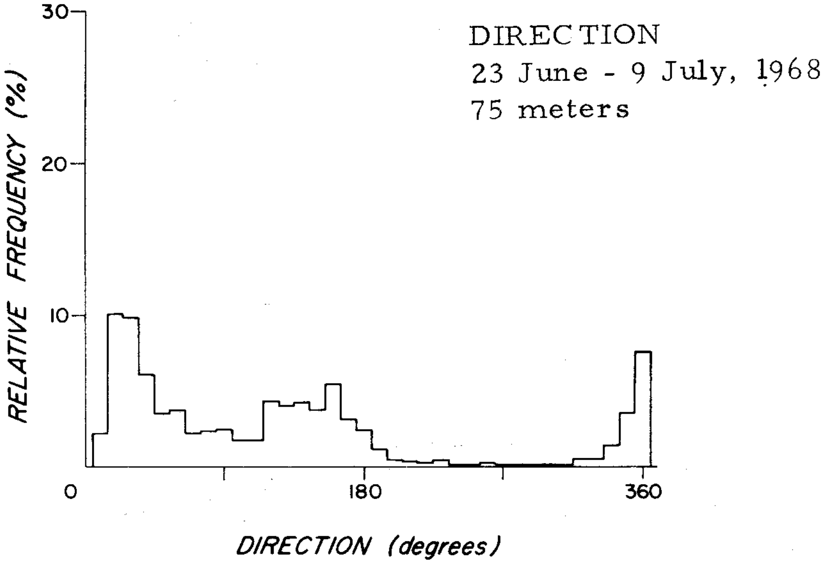
Current meters and thermographs were placed at depths of 25, 50, and 75 meters as follows:

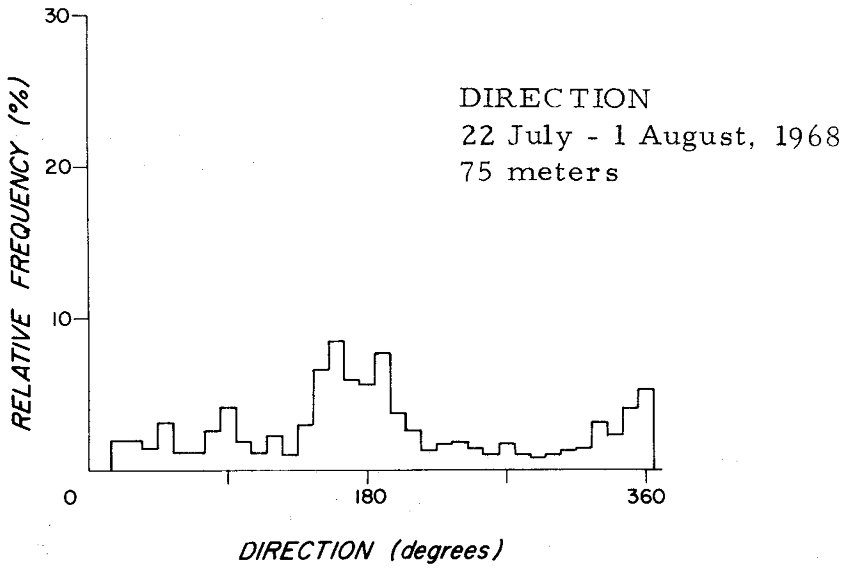
Depth	Histogram Current Meter Serial No.	Thermograph Serial No.
25 m	3160089	14600115
50 m	3160088	14600088
75 m	3160055	

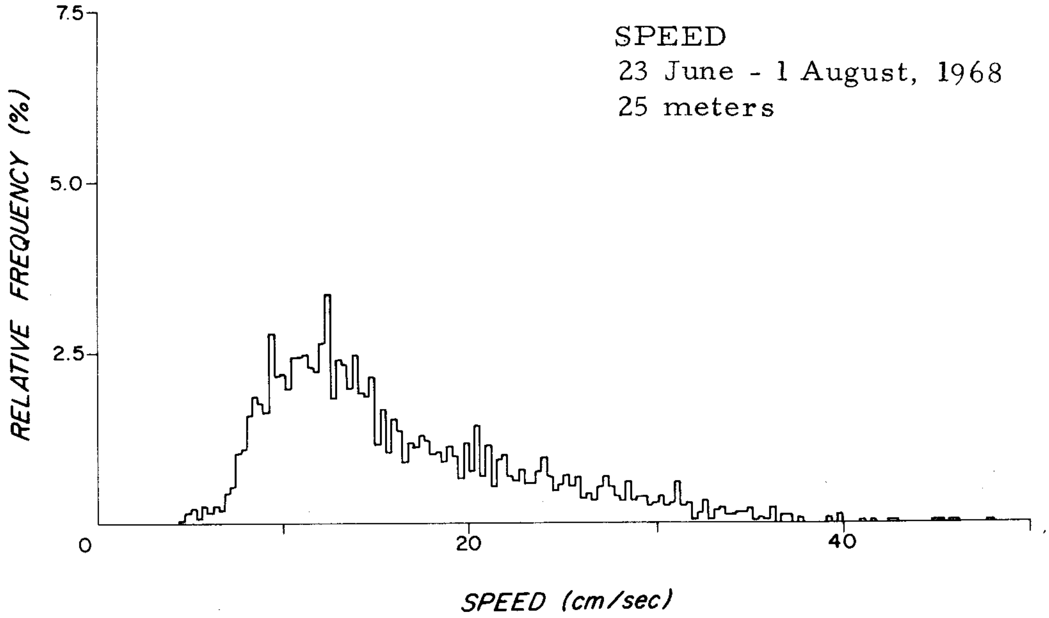
Current meters cycled every 20 minutes; thermographs cycled every 10 minutes.

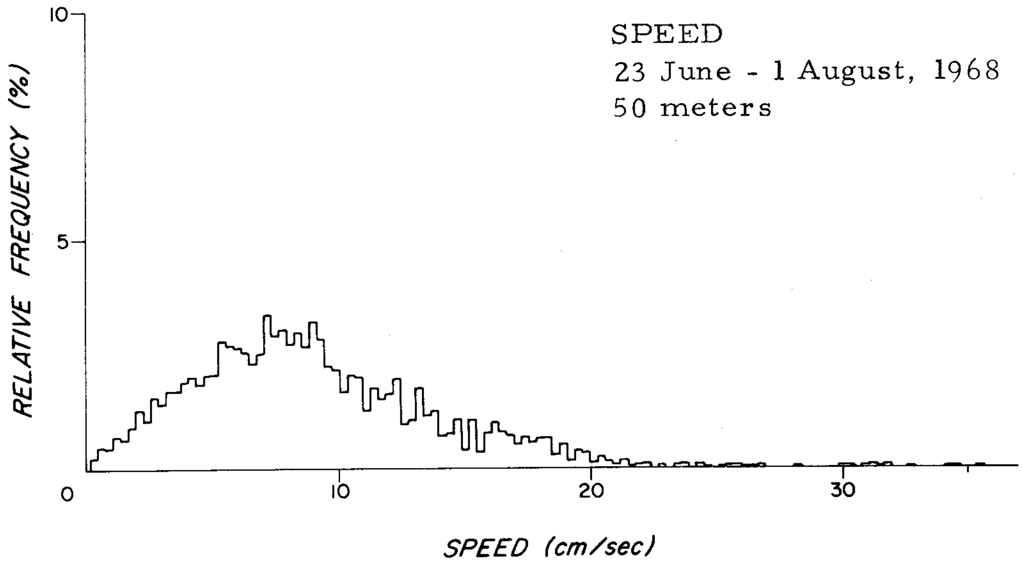

20
10
0
180
360
RELATIVE FREQUENCY (%)
DIRECTION (degrees)
DIRECTION
23 June - 1 August, 1968
25 meters

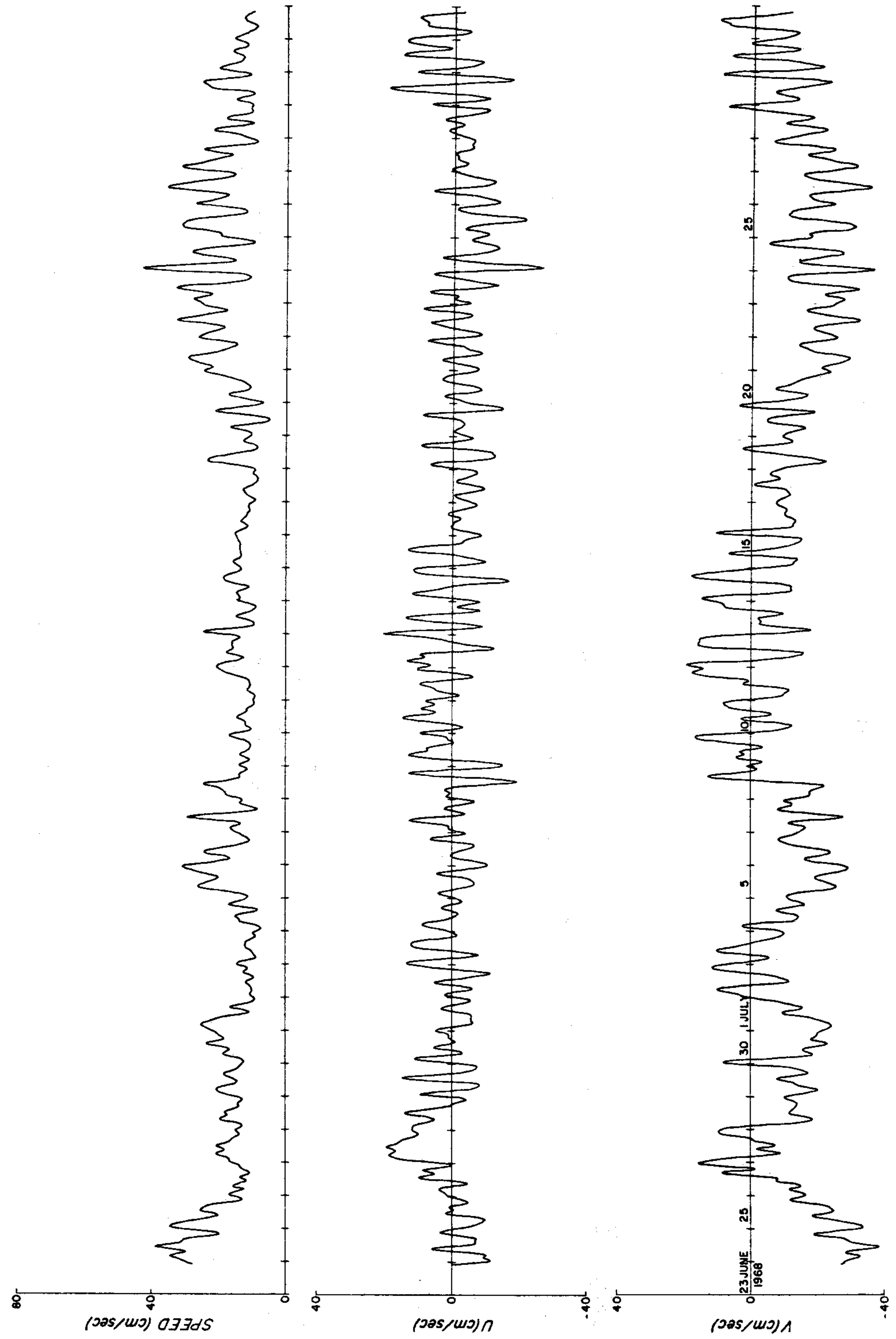

10
5
0
180
360
RELATIVE FREQUENCY (%)
DIRECTION (degrees)
DIRECTION
23 June - 1 August, 1968
50 meters


DIRECTION
23 June - 9 July, 1968
75 meters
RELATIVE FREQUENCY (%)
30
20
10
0
180
360
DIRECTION (degrees)

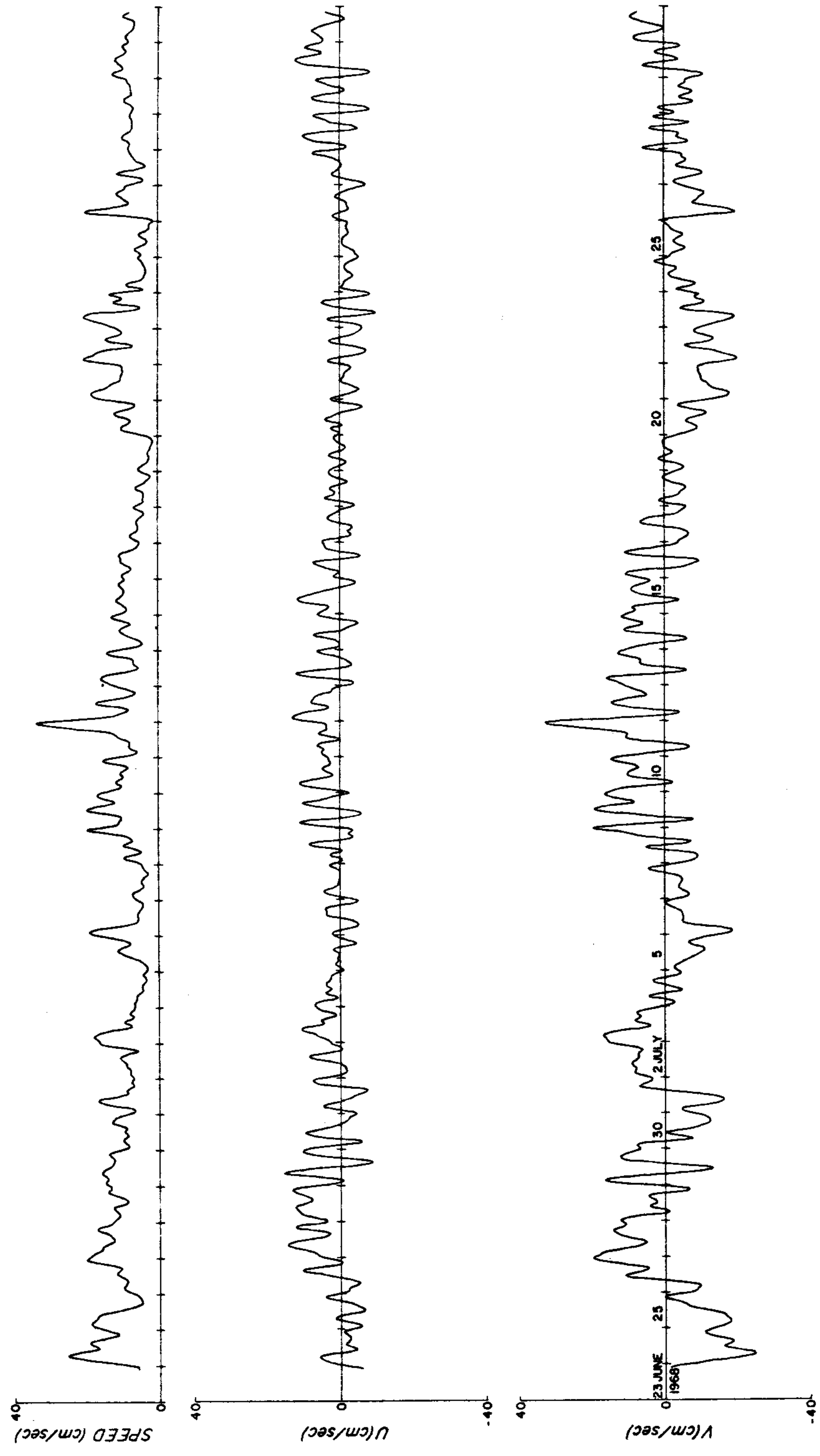

DIRECTION
22 July - 1 August, 1968
75 meters
RELATIVE FREQUENCY (%)
30
20
10
0
180
360
DIRECTION (degrees)


SPEED
23 June - 1 August, 1968
25 meters
RELATIVE FREQUENCY (%)
7.5
5.0
2.5
0
20
40
SPEED (cm/sec)

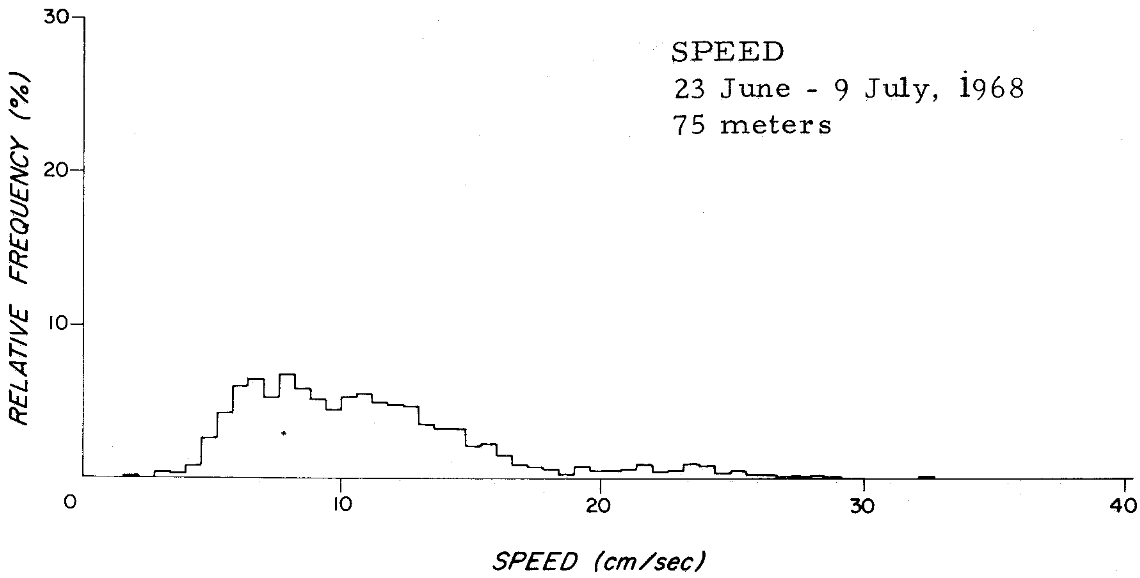

SPEED
23 June - 1 August, 1968
50 meters
RELATIVE FREQUENCY (%)
10
5
0
10
20
30
SPEED (cm/sec)

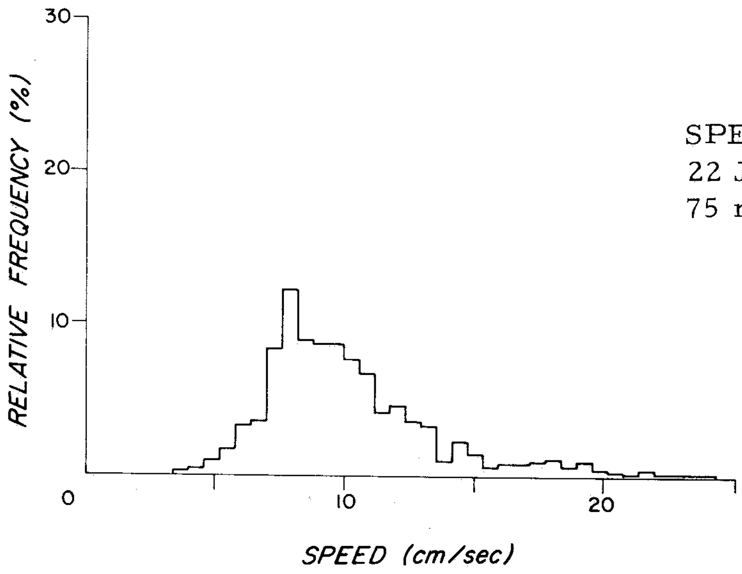


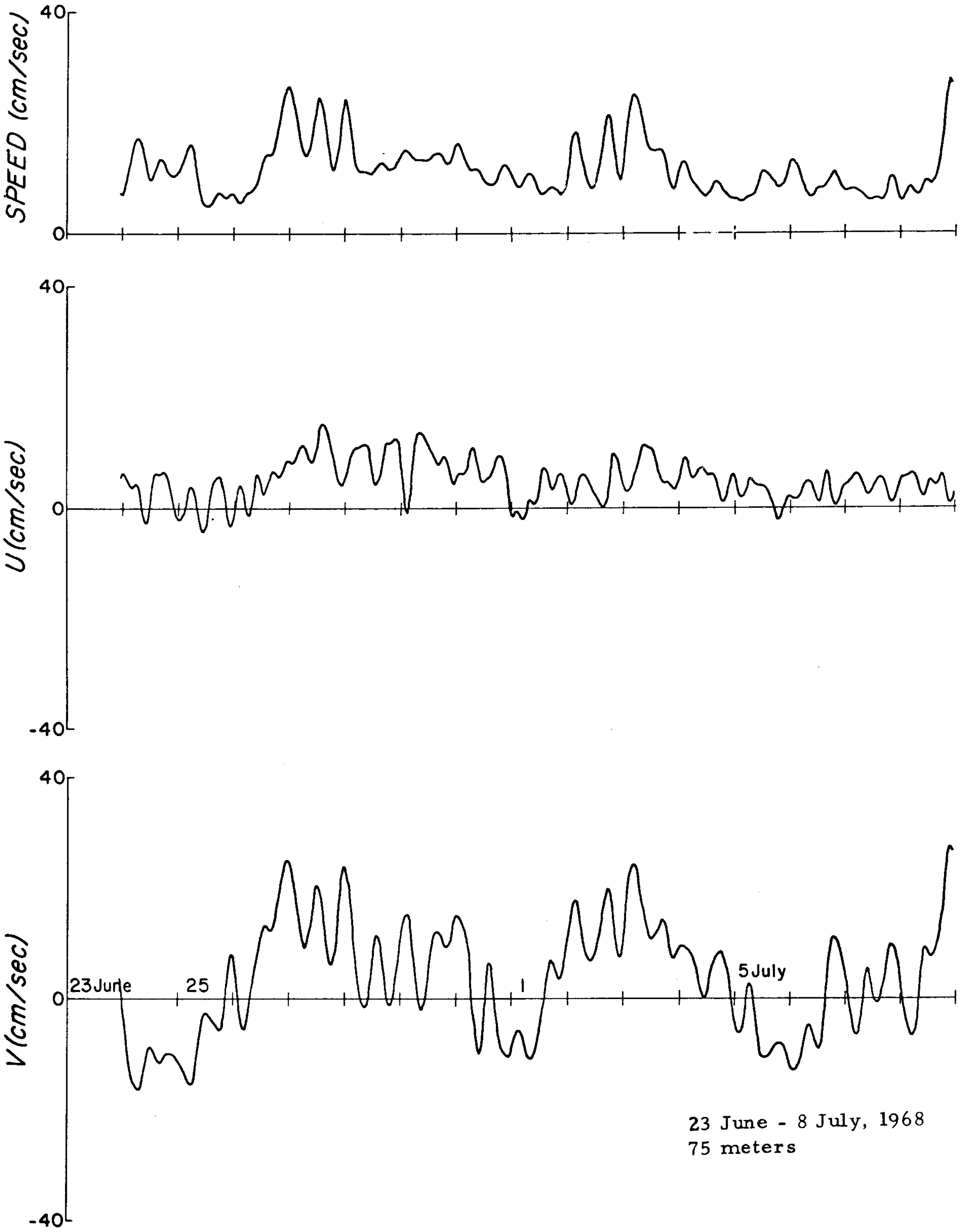
23 June - 31 July 1968
25 meters



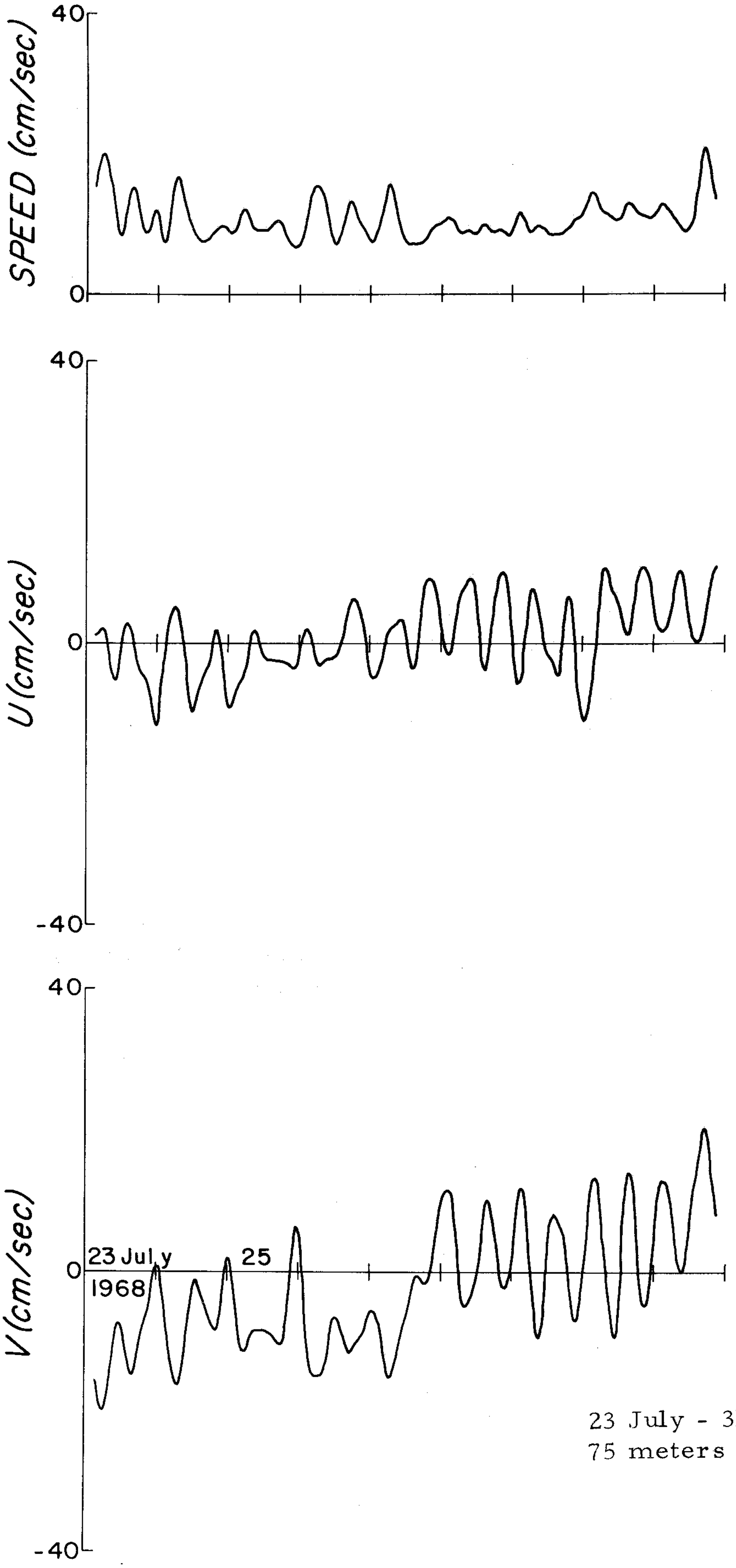
23 June - 31 July 1968
50 meters


SPEED
23 June - 9 July, 1968
75 meters
RELATIVE FREQUENCY (%)
SPEED (cm/sec)
0
10
20
30
40

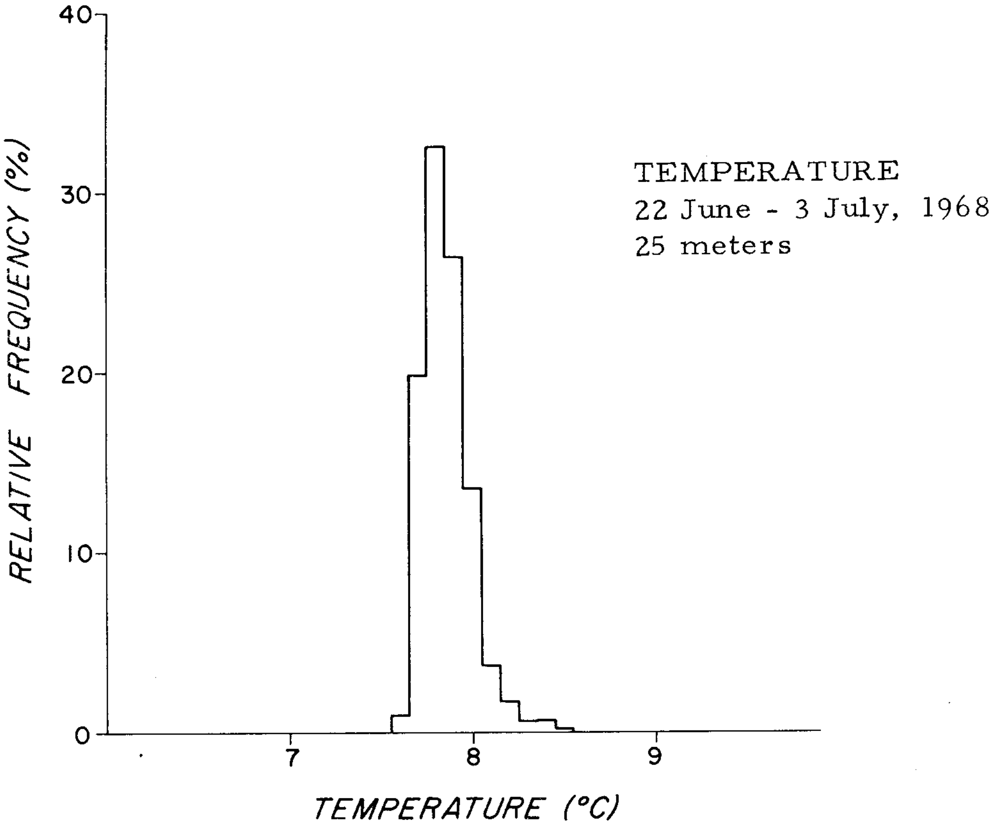

SPEED
22 July - 1 August, 1968
75 meters
RELATIVE FREQUENCY (%)
SPEED (cm/sec)
0
10
20
30



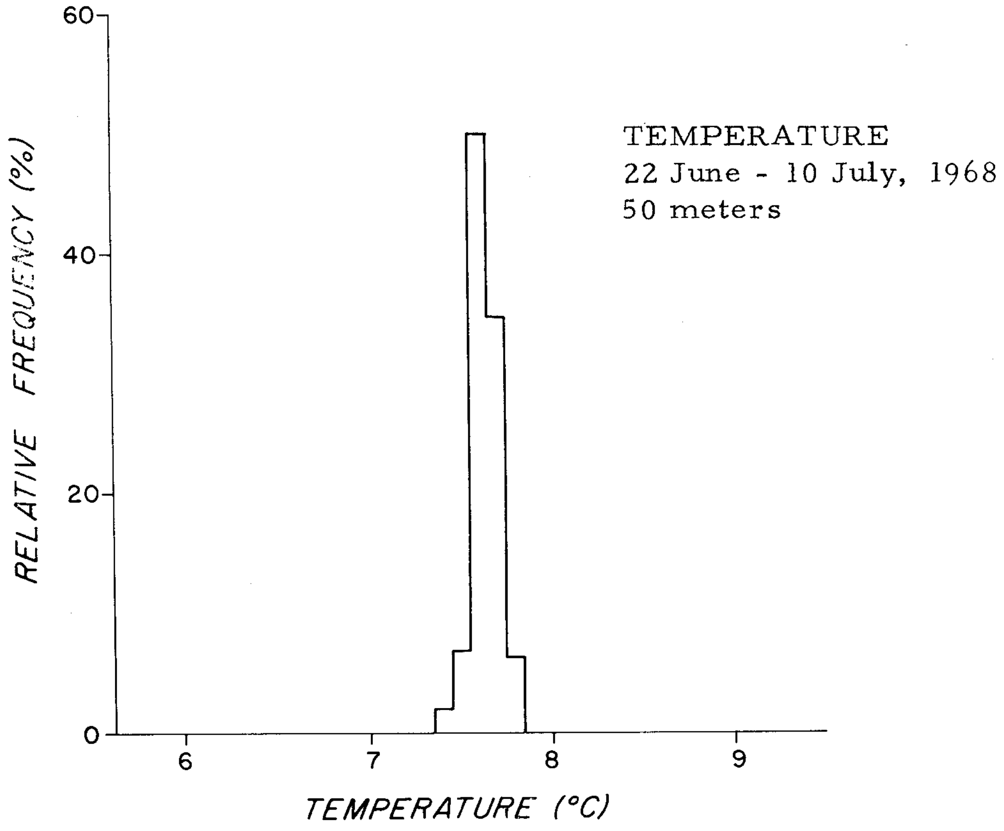
23 June - 8 July, 1968
75 meters



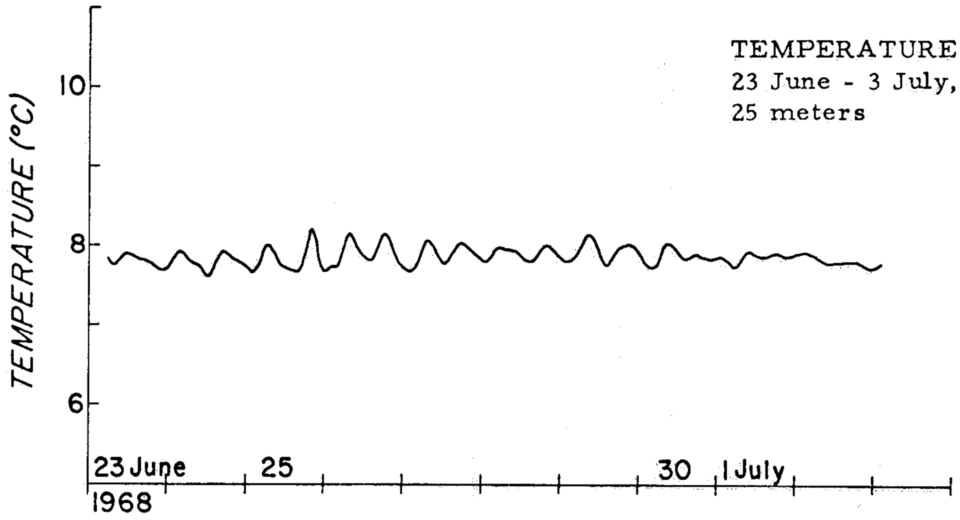
23 July - 31 July, 1968
75 meters

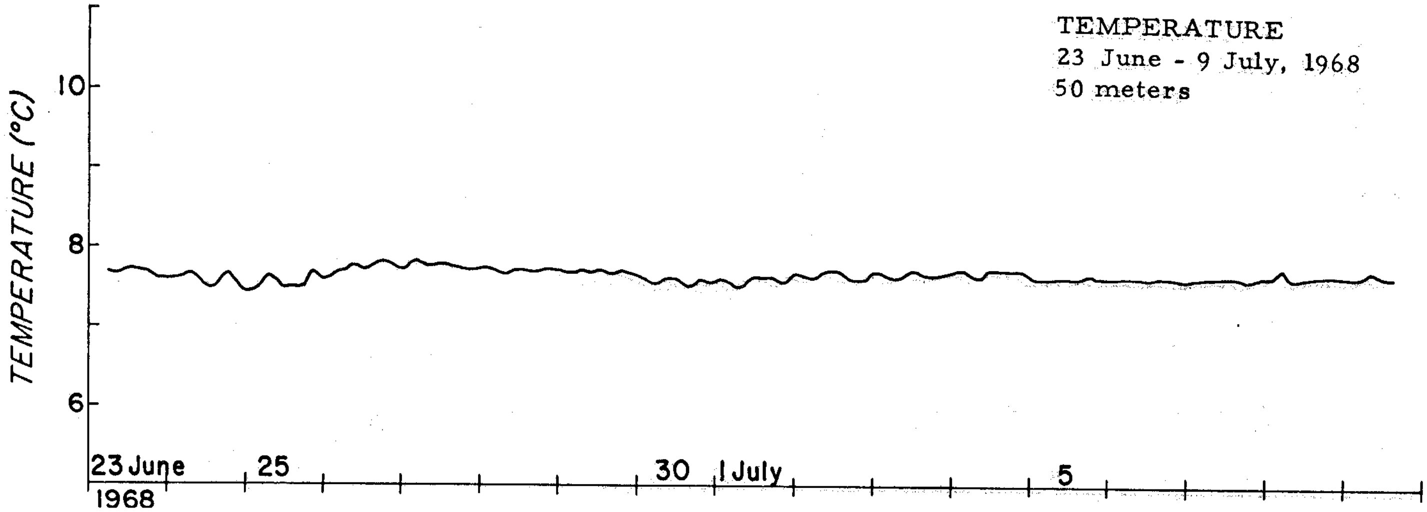


40
30
20
10
0
RELATIVE FREQUENCY (%)
7
8
9
TEMPERATURE (°C)
TEMPERATURE
22 June - 3 July, 1968
25 meters

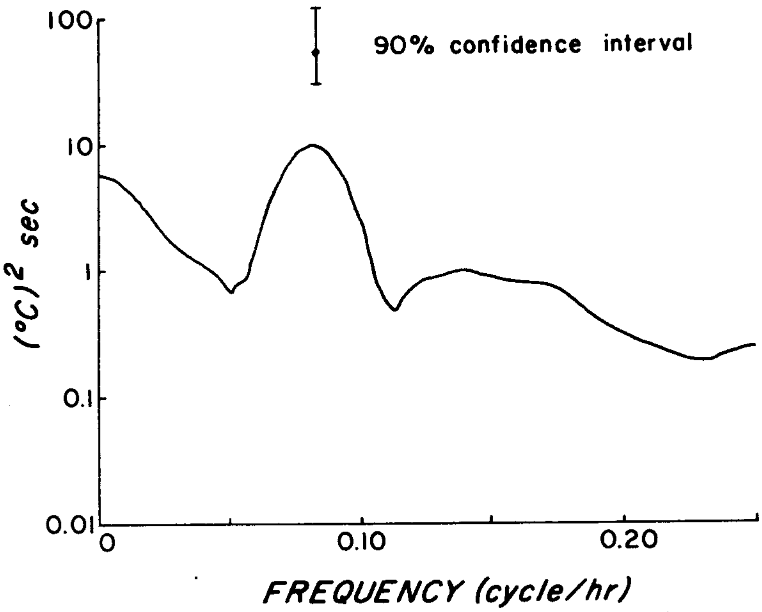


60
40
20
0
RELATIVE FREQUENCY (%)
6
7
8
9
TEMPERATURE (°C)
TEMPERATURE
22 June - 10 July, 1968
50 meters

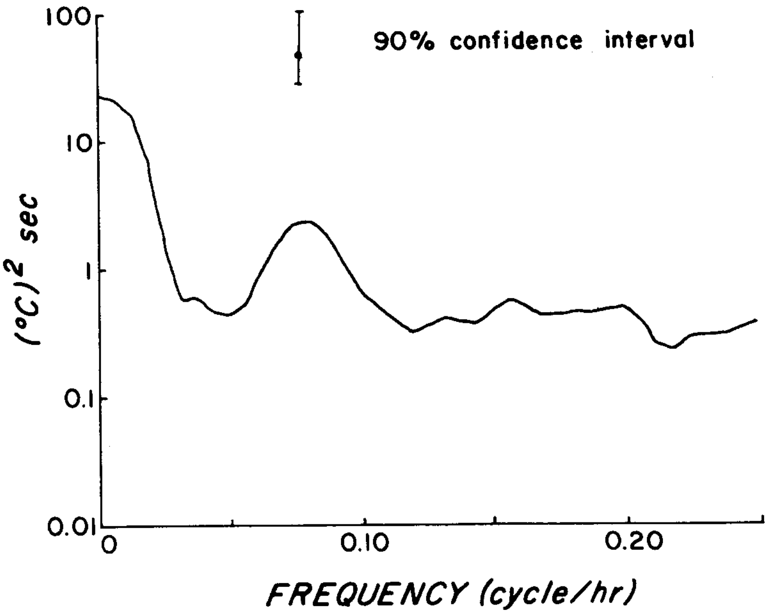

TEMPERATURE
23 June - 3 July, 1968
25 meters
TEMPERATURE (°C)
10
8
6
23 June
1968
25
30
1 July

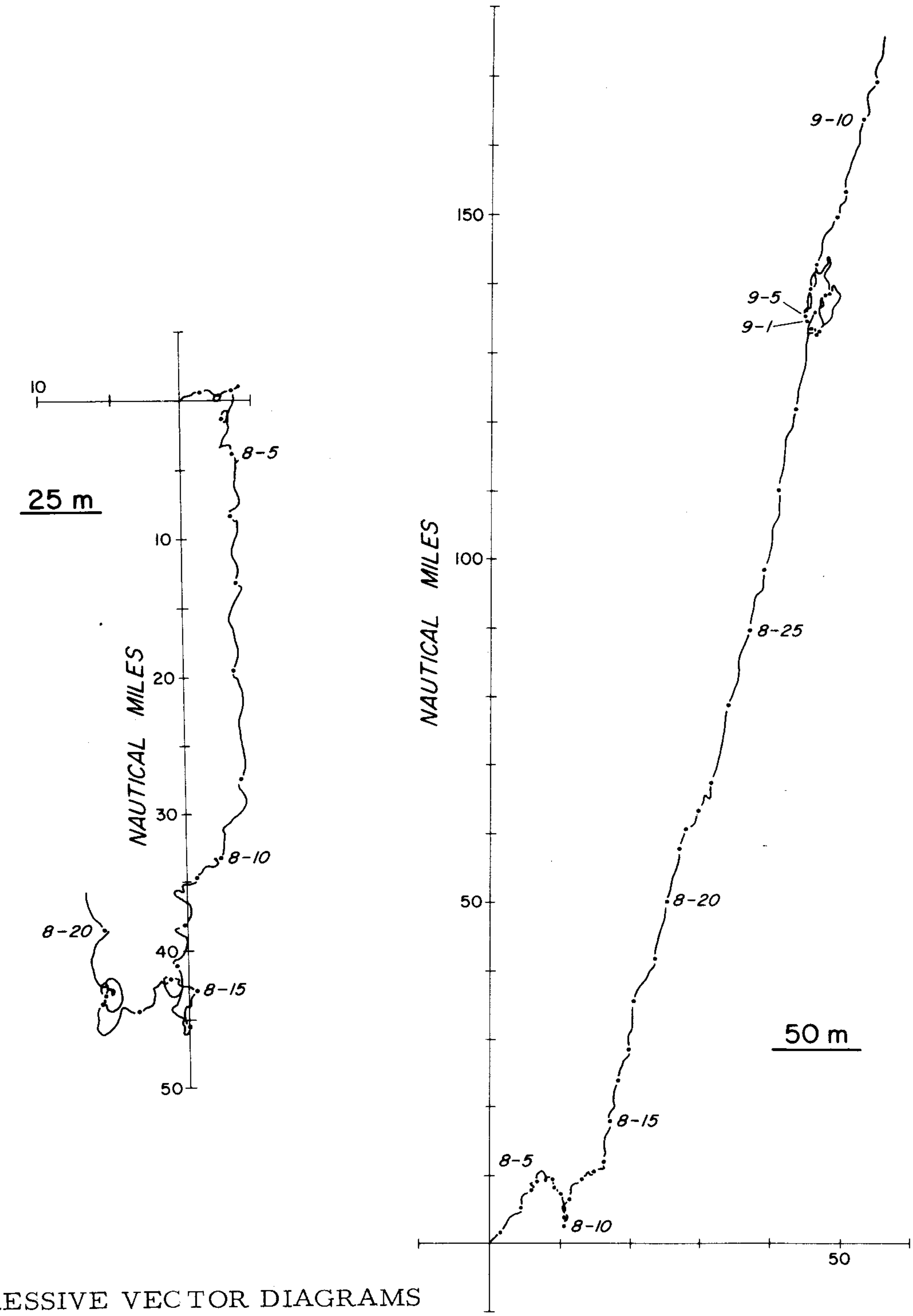

TEMPERATURE
23 June - 9 July, 1968
50 meters
TEMPERATURE (°C)
10
8
6
23 June
1968
25
30
1 July
5

TEMPERATURE POWER SPECTRUM
22 June - 3 July, 1968
25 meters



TEMPERATURE POWER SPECTRUM
22 June - 10 July, 1968
50 meters





PROGRESSIVE VECTOR DIAGRAMS

Symbols indicate 0000 GMT on successive days
DB 7: 44 50.9'N, 124 12.9'W

1968 INSTALLATION D

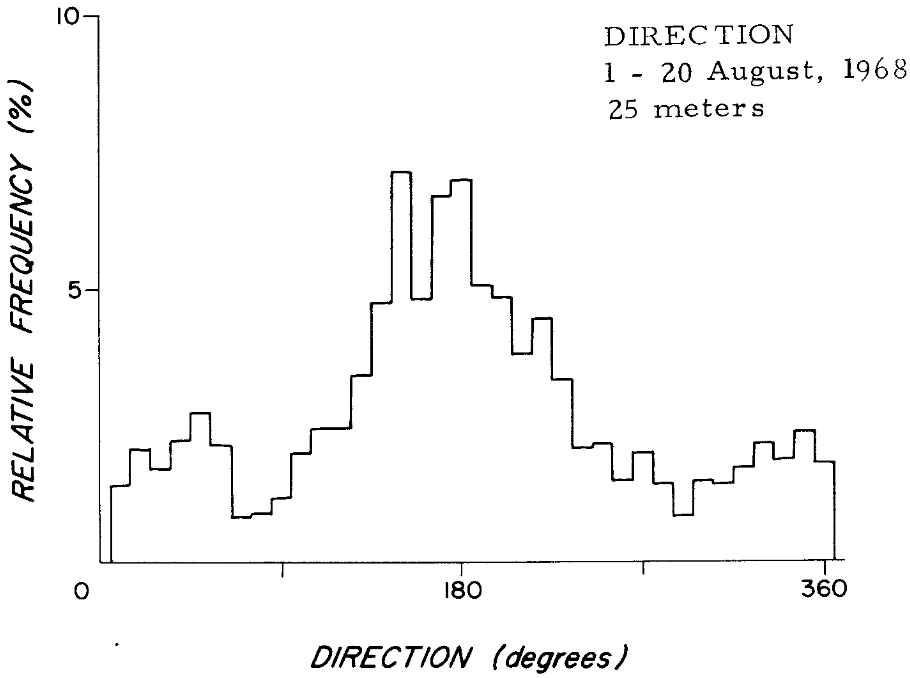
Position: 44°50.9'N, 124°12.9'W, DB 7
Depth of Water: 100 meters
Set at 1530 GMT 1 August 1968 by R/V YAQUINA
Retrieved at 2130 GMT 11 September 1968 by R/V CAYUSE
Data Interval: 1530 GMT 1 August - 1840 GMT 11 September 1968

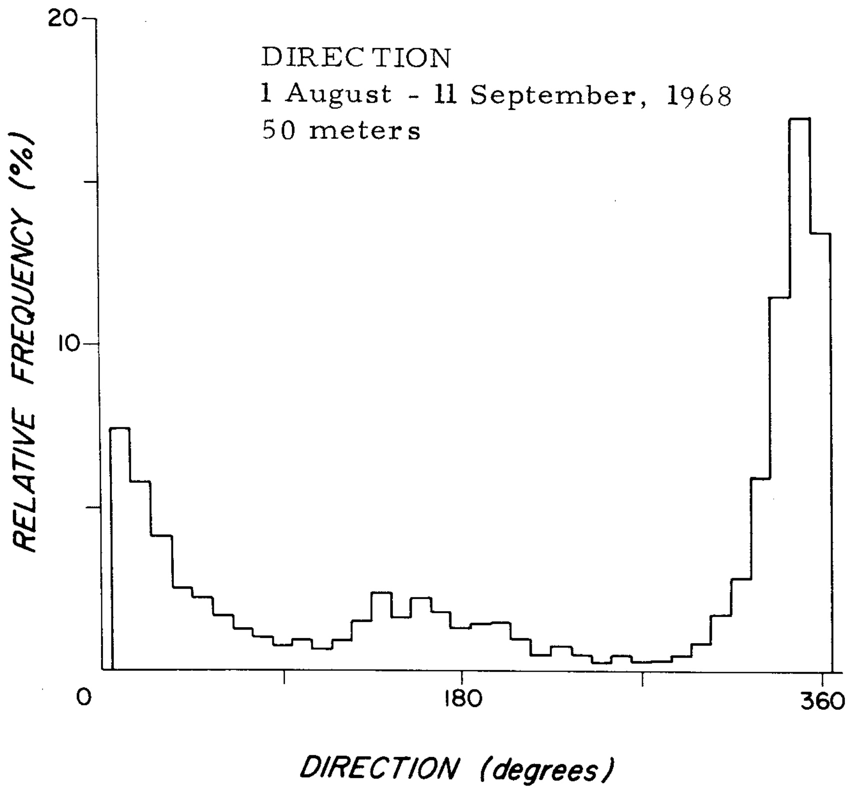
Instrumentation

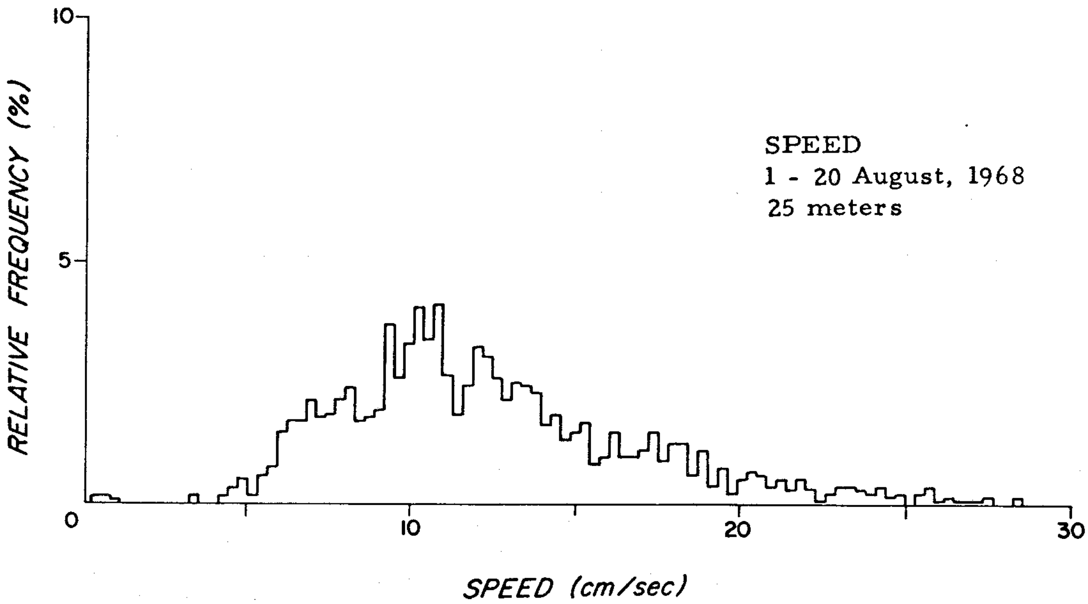
Current meters and a thermograph were placed at depths of 25, 50, and 75 meters as follows:

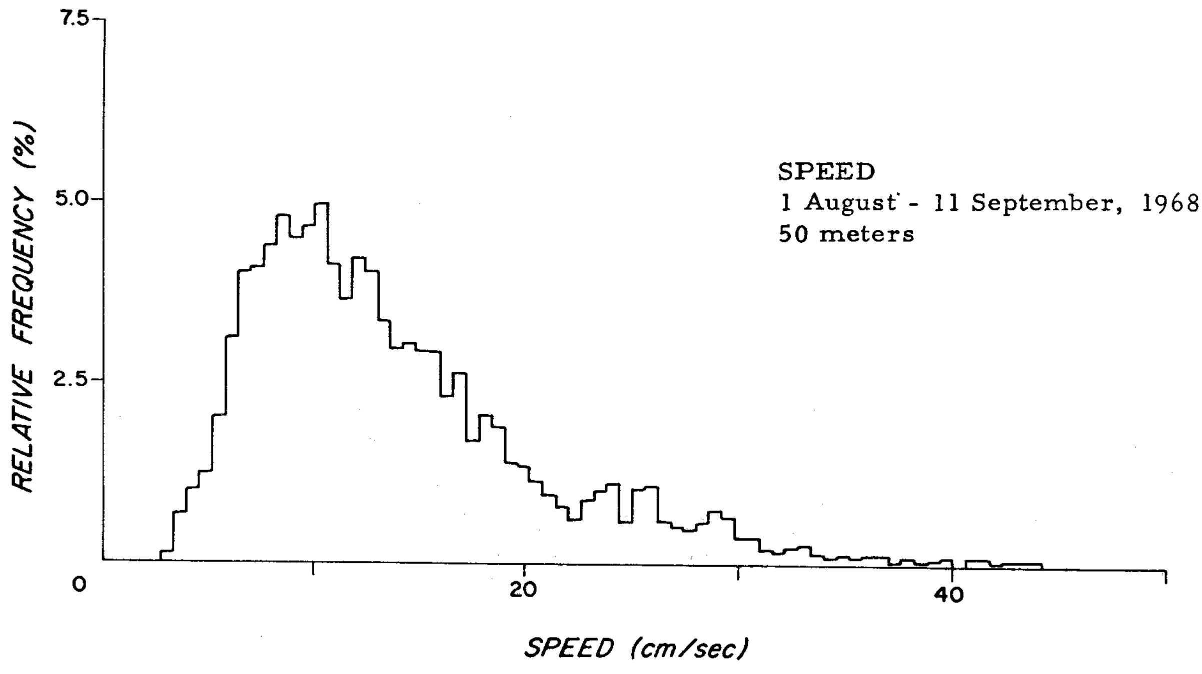
Depth	Histogram Current Meter Serial No.	Thermograph Serial No.
25 m	3160090	5310057
50 m	3160054	14600089
75 m	3810019	

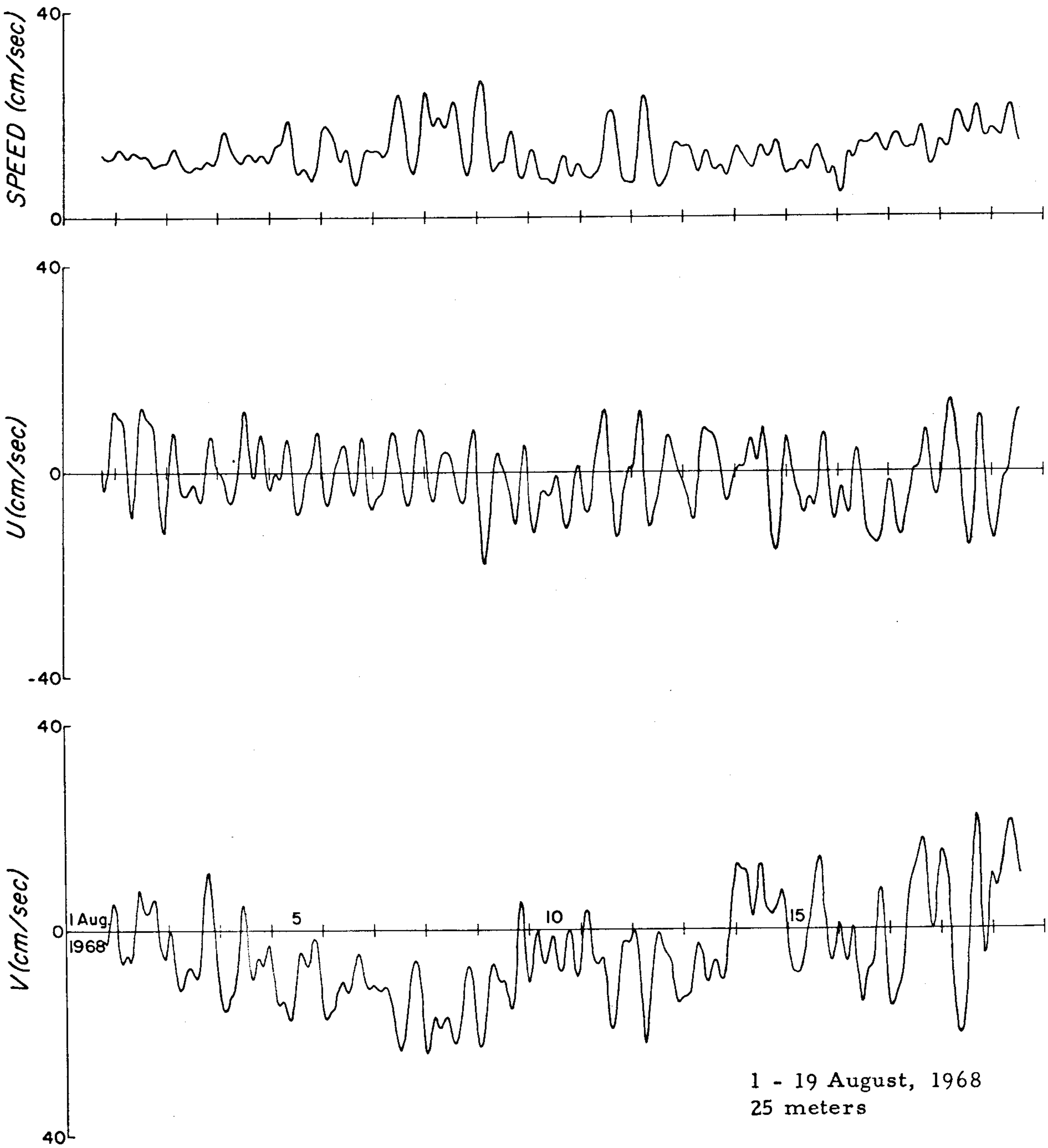
Current meters cycled every 20 minutes; thermographs cycled every 10 minutes. Speed and direction calibration for current meter at 75 meters is in question.


DIRECTION
1 - 20 August, 1968
25 meters
RELATIVE FREQUENCY (%)
10
5
0
180
360
DIRECTION (degrees)

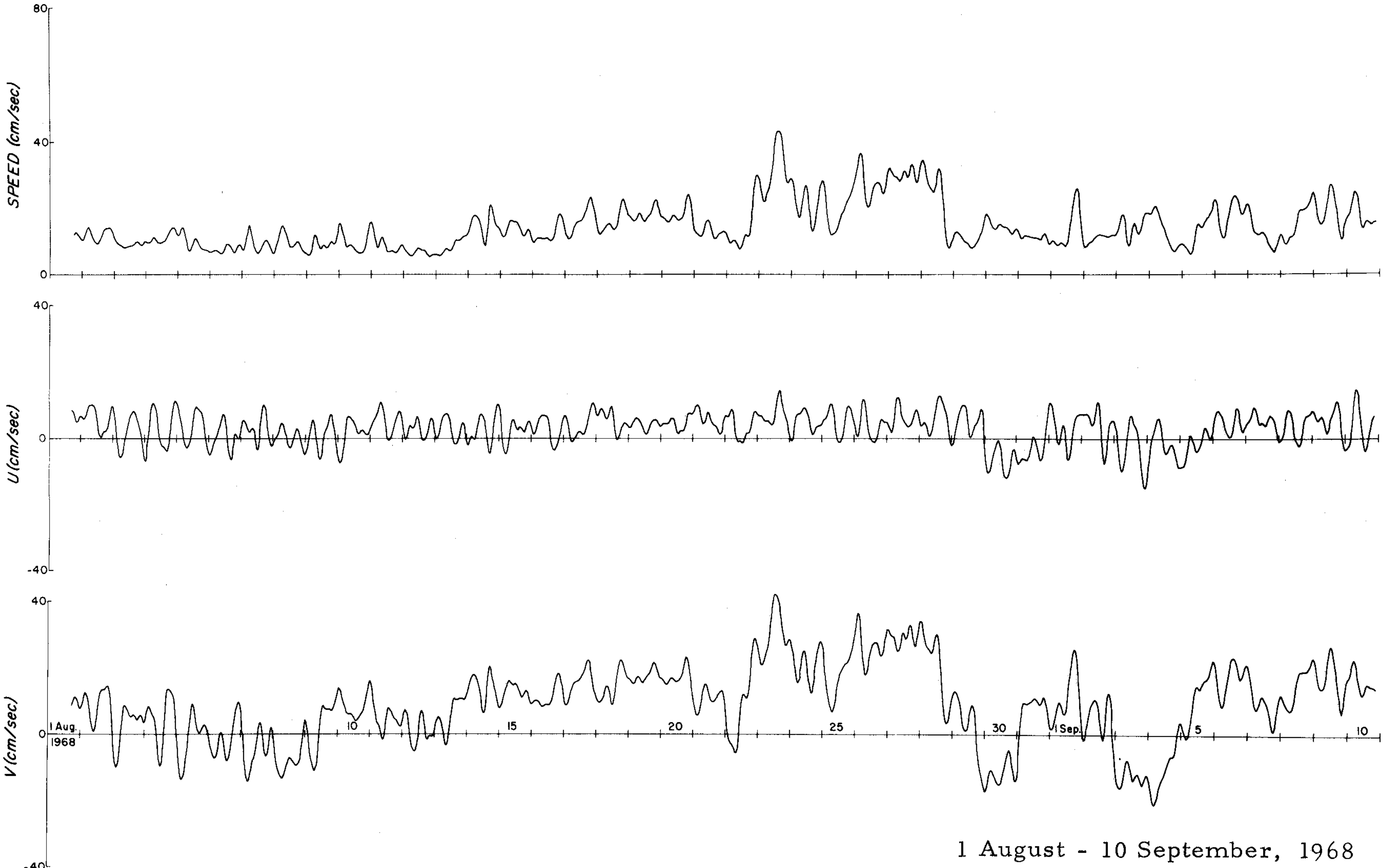

DIRECTION
1 August - 11 September, 1968
50 meters
RELATIVE FREQUENCY (%)
20
10
0
180
360
DIRECTION (degrees)


10
5
0
RELATIVE FREQUENCY (%)
10
20
30
SPEED (cm/sec)
SPEED
1 - 20 August, 1968
25 meters

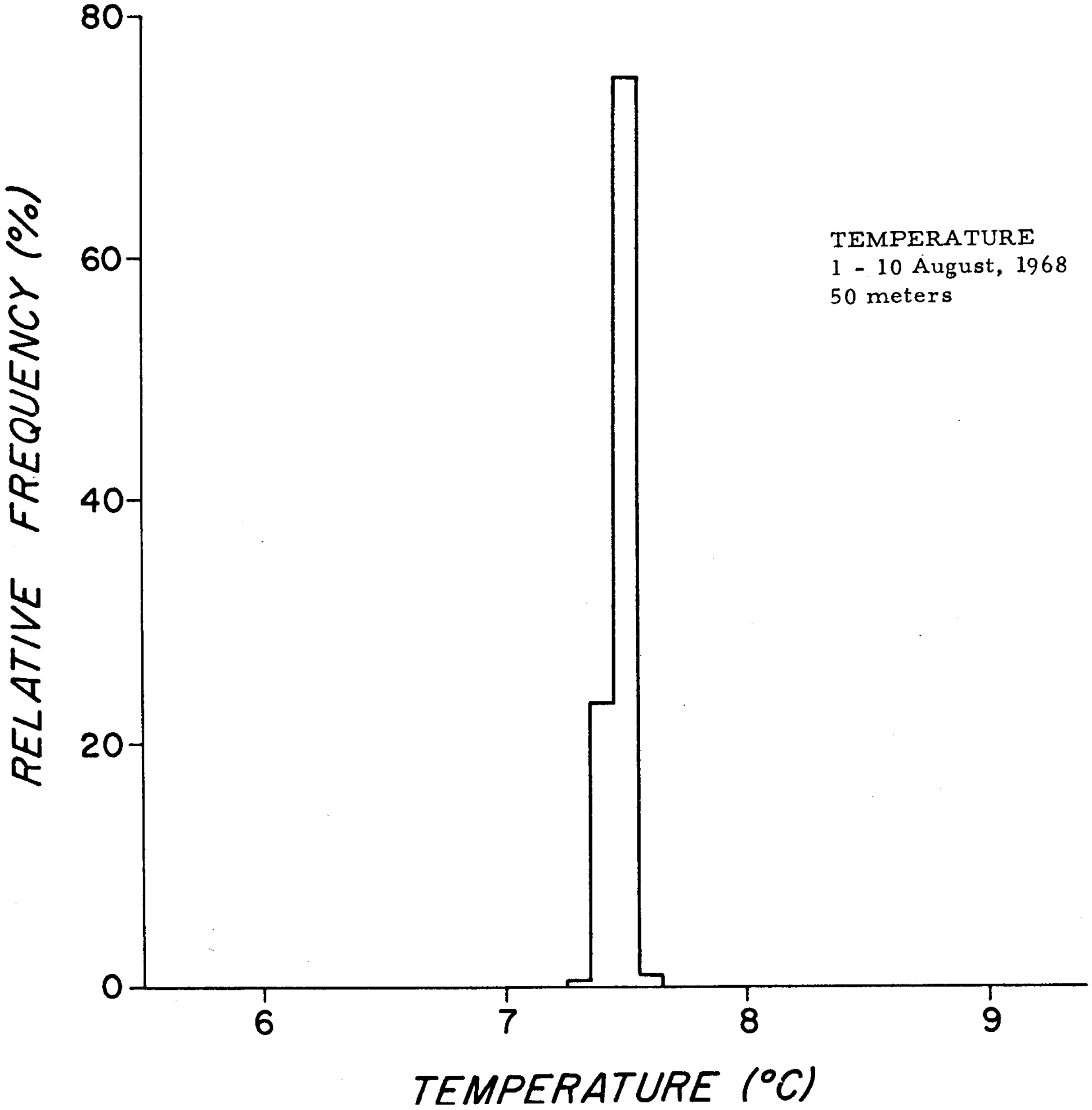

7.5
5.0
2.5
0
RELATIVE FREQUENCY (%)
20
40
SPEED (cm/sec)
SPEED
1 August - 11 September, 1968
50 meters

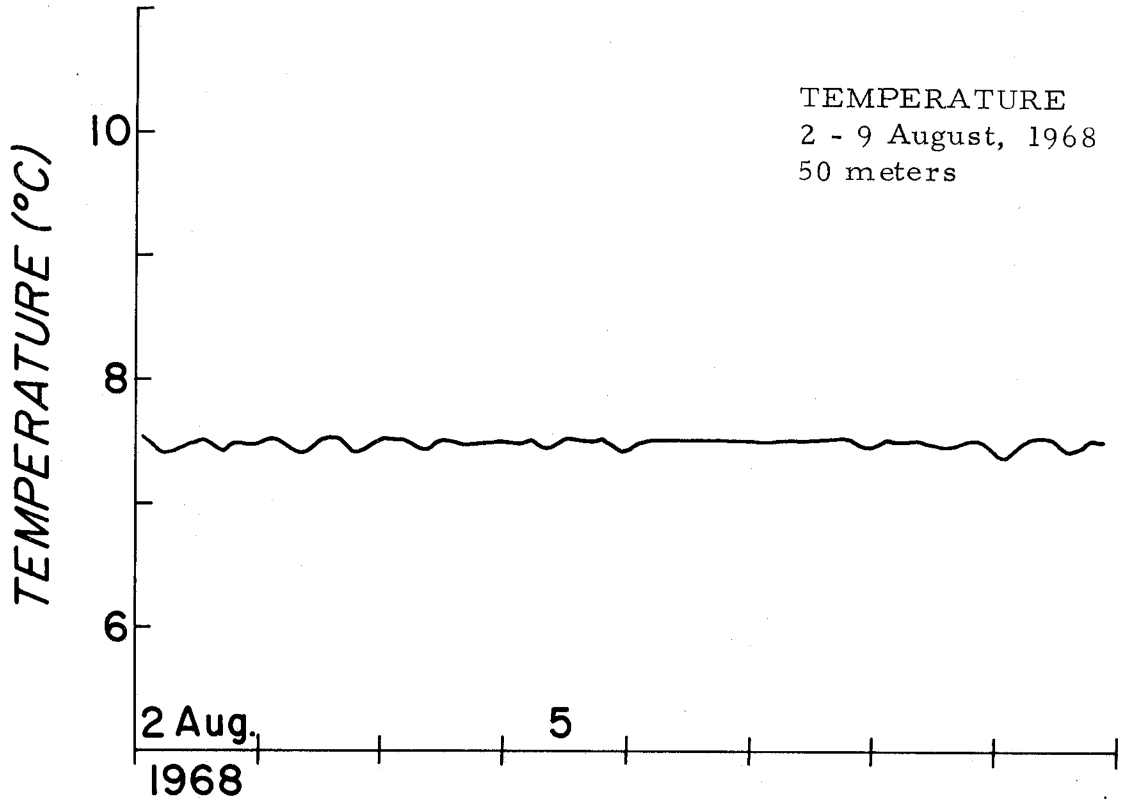


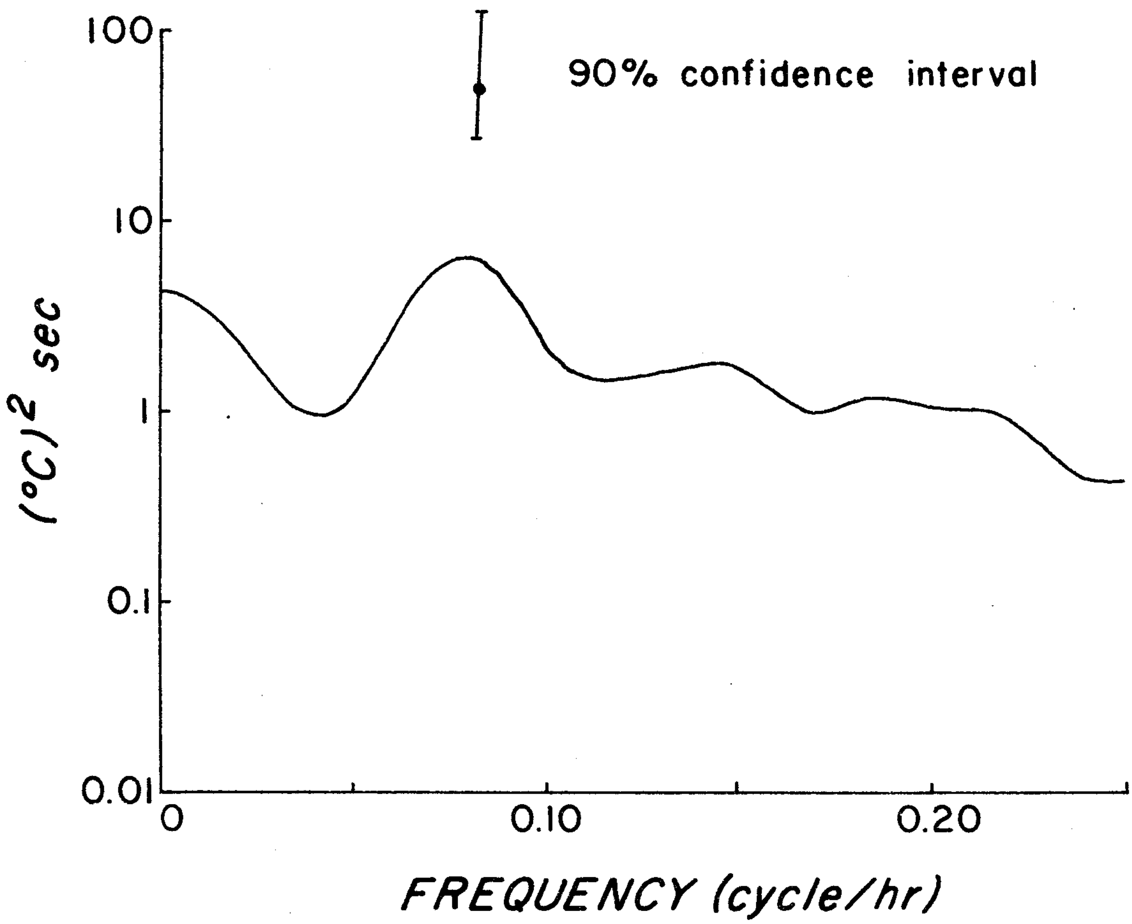
1 - 19 August, 1968
25 meters



1 August - 10 September, 1968
50 meters


TEMPERATURE
1 - 10 August, 1968
50 meters
RELATIVE FREQUENCY (%)
80
60
40
20
0
6
7
8
9
TEMPERATURE (°C)


TEMPERATURE
2 - 9 August, 1968
50 meters
TEMPERATURE (°C)
10
8
6
2 Aug.
1968
5



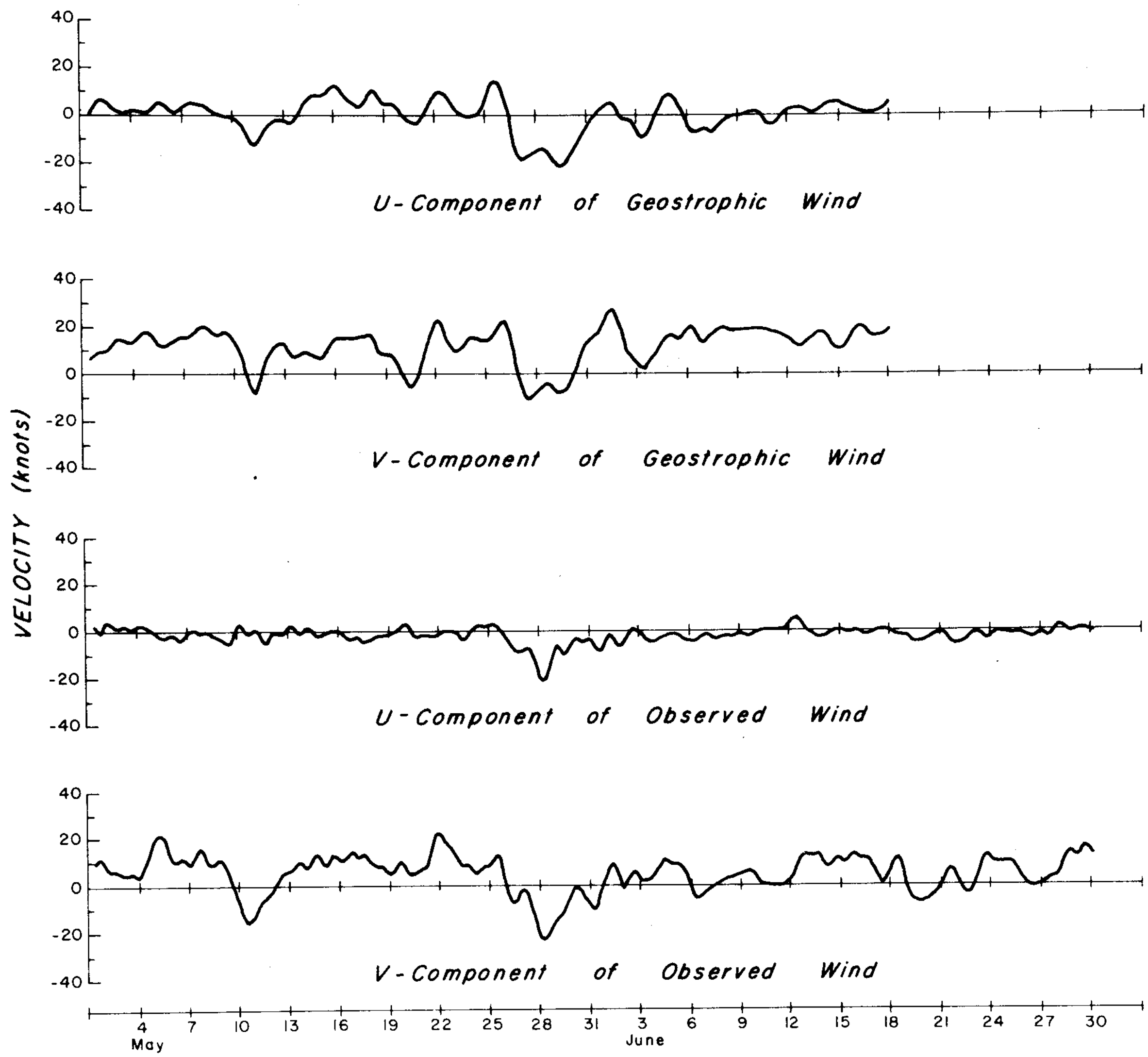
TEMPERATURE POWER SPECTRUM
1 - 10 August 1968
50 meters

WINDS

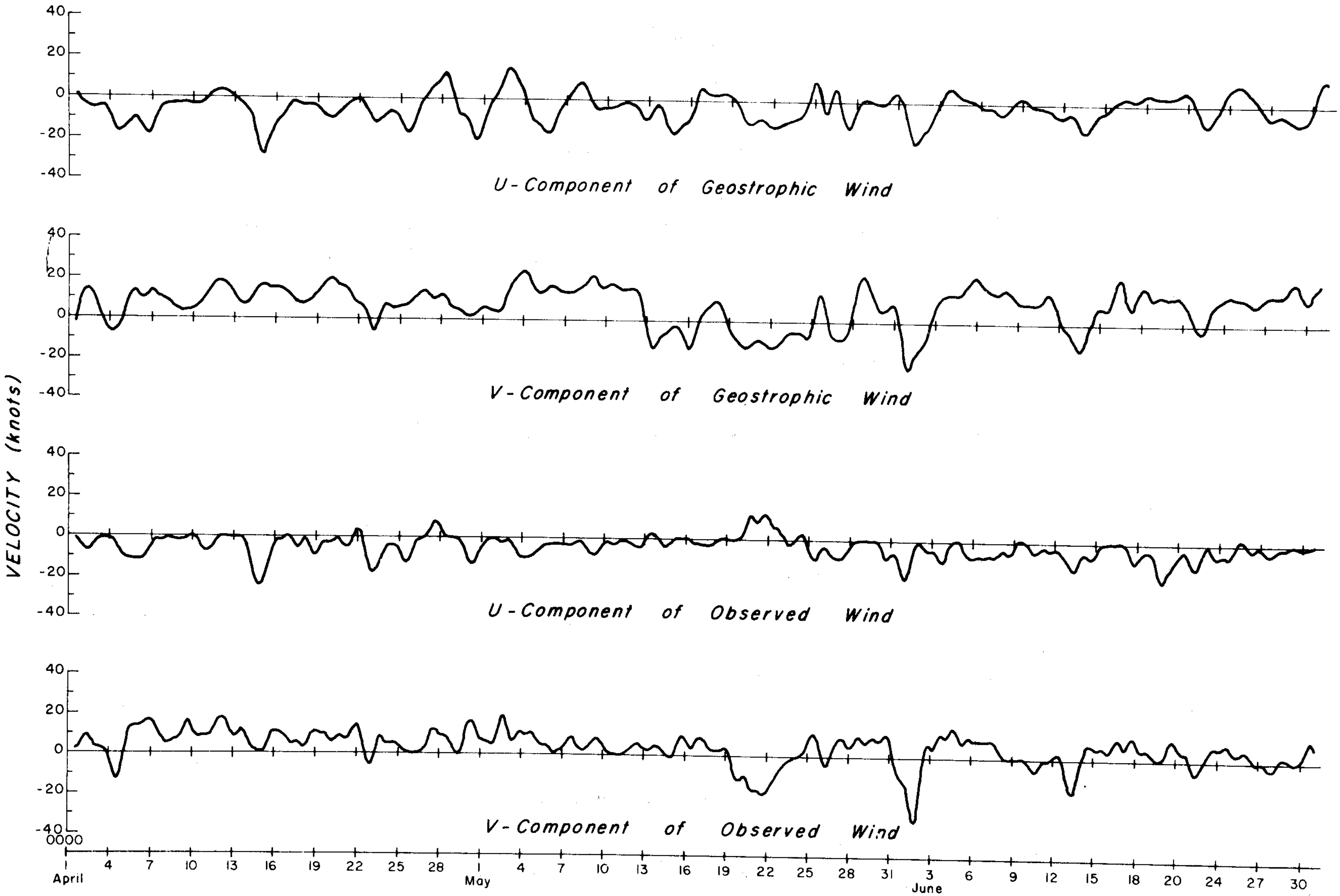
Two kinds of wind data have been included here: observed winds measured at the United States Coast Guard observation tower north of the entrance to Yaquina Bay, and geostrophic winds. The geostrophic winds were calculated from pressure charts prepared by the Northwest Regional Forecast Center of the U. S. Weather Bureau. Calculations were made for the region near 45°N, 125' W, at six-hour intervals. The Yaquina Bay winds were measured every four hours. The graphs shown here coincide in time with the 1967 and 1968 current meter installations, and were made by filtering the original wind series through a low-pass taper with a half-power point at 36 hours.

Also included are tables that show changes in water temperature and associated changes in the geostrophic wind. The temperatures were recorded at 20 meters in 1967, and at 25 meters in 1968.

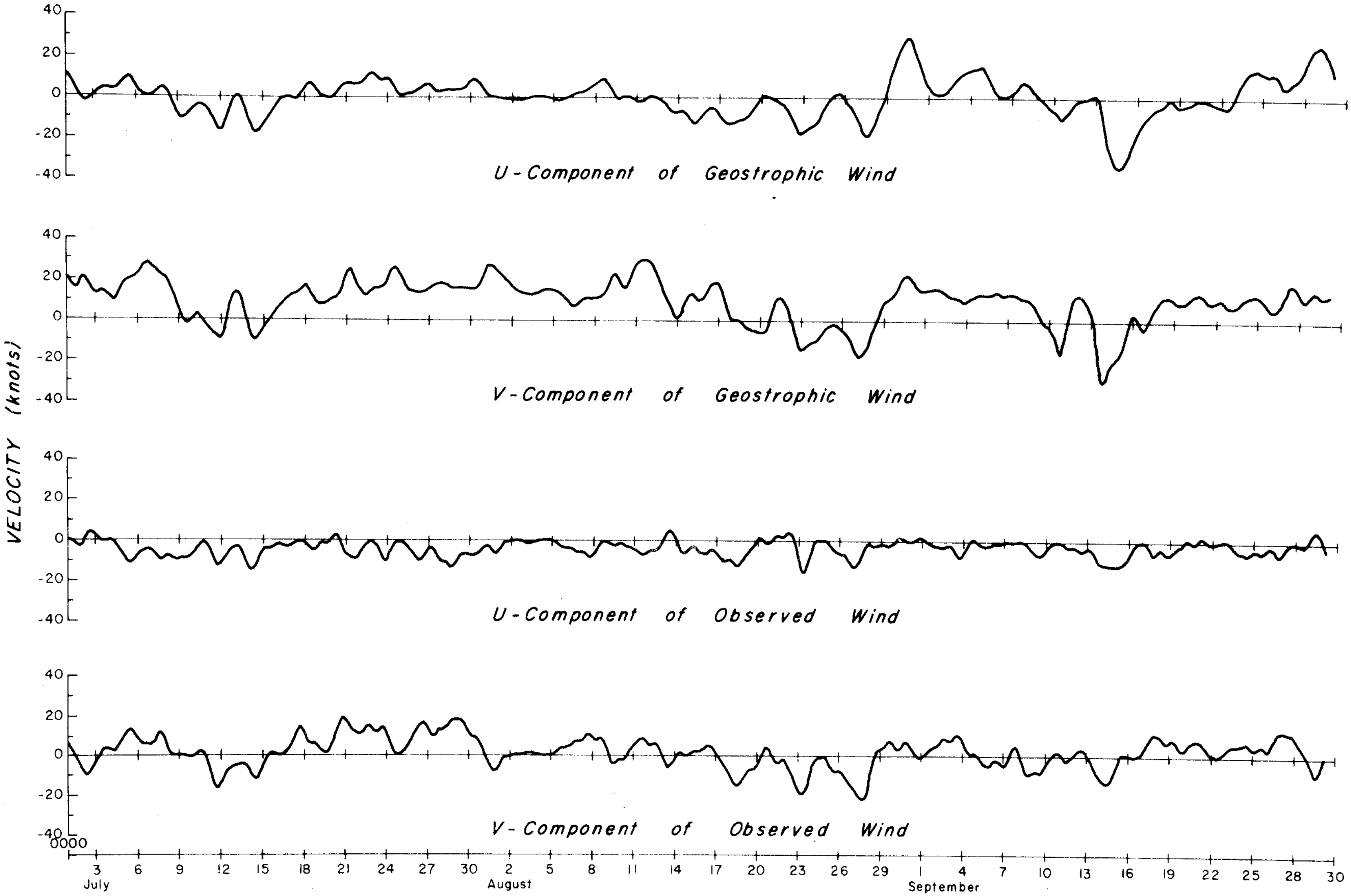
Both the tables and the wind plots were taken from Fisher (1970).



Tapered Wind Components (May - June 1967)



Tapered Wind Components (April - June 1968)



Tapered Wind Components (July - September 1968)

TABLE II-A

Changes in Temperature Associated with Changes in Wind Components
DB 5 1967

Period of Temperature Change		Period of Major Wind Change				Temperature Profile	
Beginning Date and Duration (Days)	Description	U_g Direction and Maximum Velocity	Beginning Date and Duration (Days)	V_g Direction and Maximum Velocity	Beginning Date and Duration (Days)	Date	Description
1910 May 7* (3)	Slightly Decreasing	East 7 kts.	0000 May 1 (8 1/2)	North 20 kts.	0000 May 1 (9 3/4)	0245 May 10	Small vertical temperature gradient. No thermocline.
1900 May 10 (2)	Increasing	West 13 kts.	1200 May 9 (4 1/3)	South 8 kts.	1800 May 10 (11/12)	1528 May 12	Thermocline from surface to 35 m.
1800 May 12 (13 3/4)	Decreasing	East 12 kts.	2000 May 13 (6 1/6)	North 17 kts.	1600 May 11 (8 1/3)		
1200 May 26 (2 1/2)	Slightly Increasing	West 3 kts.	0000 May 20 (4 5/8)	South 6 kts.	0000 May 20 (2 5/8)		
0000 May 29 (3/4)	Slightly Decreasing	East 14 kts.	1500 May 24 (1 3/4)	North 22 kts.	1500 May 22 (4 1/4)		
1800 May 29 (1 1/2)	Increasing	West 21 kts.	0900 May 26 (5 1/8)	South 21 kts.	2000 May 26 (3 5/12)		
0600 May 31 (3 1/2)	Decreasing	East 5 kts.	1200 May 31 (1 1/2)	North 27 kts.	0600 May 30 (3 1/6)	2140 June 2	Thermocline from surface to 10 m. Small vertical temperature gradient below 10 m.
1700 June 3*	End of Temperature Record		0000 June 2		1000 June 2		

* Tapered temperature record does not include this time. Description is made of untapered temperature record.

TABLE II-B

Changes in Temperature Associated with Changes in Wind Components
DB 7 1967

Period of Temperature Change		Period of Major Wind Change				Temperature Profile	
Beginning Date and Duration (Days)	Description	U_g Direction and Maximum Velocity	Beginning Date and Duration (Days)	V_g Direction and Maximum Velocity	Beginning Date and Duration (Days)	Date	Description
2120 May 7* (2 7/8)	Slightly Decreasing	East 7 kts.	0000 May 1 (8 1/2)	North 20 kts.	0000 May 1 (9 3/4)	0153 May 10	Small vertical temperature gradient. No thermocline.
1800 May 10 (3)	Increasing	West 13 kts.	1200 May 9 (4 1/3)	South 8 kts.	1800 May 10 (11/12)	1645 May 12	Weak thermocline from surface to 20 m.
1800 May 13 (8 1/2)	Slightly Decreasing	East 12 kts.	2000 May 13 (6 1/6)	North 17 kts.	1600 May 11 (8 1/3)		
0600 May 22 (1)	Slightly Increasing	West 3 kts.	0000 May 20 (1 5/12)	South 6 kts.	0000 May 20 (1)		
0600 May 23 (1 1/4)	Slightly Decreasing	East 10 kts.	1000 May 21 (1 7/12)	North 23 kts.	0000 May 21 (1 5/8)		
1200 May 24 (3/4)	Slightly Increasing	West 1 kt.	0000 May 23 (1 5/8)	North Minimum 9 kts.	1500 May 22 (2 7/8)		
0600 May 25 (1)	Slightly Decreasing	East 14 kts.	1500 May 24 (1 3/4)	North 22 kts.	1200 May 25 (1 1/3)		
0600 May 26 (4 1/2)	Increasing	West 21 kts.	0900 May 26 (5 1/8)	South 11 kts.	2000 May 26 (3 5/12)		
1800 May 30 (4)	Decreasing	East 5 kts.	1200 May 31 (1 1/2)	North 27 kts.	0600 May 30 (3 1/6)	2222 June 2	Shallow thermocline, surface to 15 m. Small vertical temperature gradient below 15 m.
1800 June 3 (4 1/3)	Increasing	West 10 kts.	0000 June 2 (1 1/6)	North Minimum 2 kts.	1000 June 2 (1 5/6)		
0230 June 8*	End of Temperature Record		0400 June 3		0600 June 4		

* Tapered temperature record does not include this time. Description is made of untapered temperature record.

TABLE II-C

Changes in Temperature Associated with Changes in Wind Components
DB 7 1968

Period of Temperature Change		Period of Major Wind Change				Temperature Profile	
Beginning Date and Duration (Days)	Description	U_g Direction and Maximum Velocity	Beginning Date and Duration (Days)	V_g Direction and Maximum Velocity	Beginning Date and Duration (Days)	Date	Description
2020 April 17* (32 1/6)	Slightly Decreasing	Variable West 20 kts. East 16 kts.	0000 April 17 (25)	North 24 kts.	2100 April 4 (38)	0720 April 19	Small vertical temperature gradient.
0000 May 20 (1 1/2)	Slightly Increasing	West 16 kts.	0000 May 12 (4 5/12)	South 14 kts.	2000 May 12 (4)		
1200 May 21 (3/4)	Slightly Decreasing	East 6 kts.	1000 May 16 (2 7/8)	North 10 kts.	2000 May 16 (2)		
0600 May 22 (2 1/4)	Increasing	West 13 kts.	0700 May 19 (2 3/4)	South 13 kts.	2000 May 18 (4 1/6)		
1200 May 24 (3/4)	Slightly Decreasing	East 10 kts.	1200 May 24 (11/12)	South Minimum 5 kts.	0000 May 23 (1 1/4)	0315 May 25	Thermocline from 10 m. to 50 m.
0600 May 25 (1/2)	Slightly Increasing	West 6 kts.	1000 May 25 (3/4)	South 8 kts.	0600 May 24 (7/8)		
1800 May 25 (1 1/4)	Decreasing	East 6 kts.	0400 May 26 (3/4)	North 13 kts.	0300 May 25 (1)		
0000 May 27 (3/4)	Slightly Increasing	West 13 kts.	2200 May 26 (1 1/3)	South 9 kts.	0400 May 26 (1 5/8)	1356 May 27	Strong thermocline from 10 m. to 30 m. Small vertical temperature gradient below 30 m.
1800 May 27 (1)	Decreasing	East 5 kts.	0600 May 28 (2 1/12)	North 23 kts.	1900 May 27 (2 1/2)		
1800 May 28	End of Temperature Record		0800 May 30		0800 May 30		

PERSONNEL

Drs. June G. Pattullo and Robert L. Smith were the principal investigators for this project. Mr. R. Dale Pillsbury was responsible for instrument preparation, installation, and recovery. Data processing and first-order analysis operations were performed by Miss Lillie Muller, Mr. Nathan Keith, Mr. Mark Ebersole, and Mr. Joseph Bottero. Mr. David Cutchin assisted with instrument calibration and preparation, and wrote the error-detection computer programs. The smoothed plots of temperature and current velocity were made with a low-pass filter designed by Dr. C.N.K. Mooers, who also devised the prediction equation used in the error detection programs. The figures were drafted by Mr. William Gilbert and Mr. Ronald Hill. This data report was assembled and written by Miss Marilynne Hakanson, Joseph Bottero, and Dale Pillsbury.

ACKNOWLEDGEMENTS

This work was begun under Grant GA 331 and has been continued under Grant GA 1435, both from the National Science Foundation. The National Science Foundation provided ship support under Grant GA 295.

It also provided five full-time assistants: one, March 1967 to the present; one, March through September 1967; one, September 1967 through June 1968, September 1968, and April through June 1969; one, August and September 1968 and June 1969; and one, September 1969 to the present. Assistance in computer programming was furnished April 1968 through September 1969. A boat operator for data collection was supported March 1967 through February 1968. The National Science Foundation also provided three students working on an hourly basis: one, April 1967, August 1967 through May 1968, and March 1969; one, June 1967 through May 1968; and one, September 1969 to the present.

This research was also supported by the Office of Naval Research through contract 1286(10) and N00014-67-A-0369-0007 under Project NR 083-102.

REFERENCES

Barstow, Dennis, William Gilbert, and Bruce Wyatt, February 1969. Hydrographic Data from Oregon Waters 1967. Data Report #35, Dept. of Oceanography Ref. 69-3, Oregon State University.

Barstow, Dennis, William Gilbert, and Bruce Wyatt, November 1969. Hydrographic Data from Oregon Waters 1968. Data Report #36, Dept. of Oceanography Ref. 69-6, Oregon State University.

Braincon Corporation, 1965. Type 316 Histogram Current Meter, Instruction Bulletin.

Collins, C. A., 1968. A description of measurements of current velocity and temperature over the Oregon continental shelf, July 1965 - February 1966. Ph. D. Thesis, Oregon State University, Corvallis.

Collins, C. A., H. C. Creech and June G. Pattullo, 1966. A Compilation of Observations from Moored Current Meters and Thermographs; Volume I: Oregon Continental Shelf, July 1965 - February 1966. Data Report #23, Dept. of Oceanography Ref. 66-11, Oregon State University.

Fisher, C. W., 1970. A Statistical study of winds and sea water temperatures during Oregon coastal upwelling. M. S. Thesis. Oregon State University.

Mooers, C. N. K., 1970. The Interaction of an internal tide with the frontal zone of a coastal upwelling region. Ph. D. Thesis. Oregon State University.

Mooers, C. N. K., L. M. Bogert, R. L. Smith, and June G. Pattullo, 1968. A Compilation of Observations from Moored Current Meters and Thermographs (and of Complementary Oceanographic and Atmospheric Data); Volume II: Oregon Continental Shelf, August - September 1966. Data Report #30, Dept. of Oceanography Ref. 68-5, Oregon State University.

Pillsbury, R. D., R. L. Smith, and R. C. Tipper, 1969. A Reliable low-cost Mooring System for Oceanographic Instrumentation. Limnol. Oceanogr. 14: 307-311.

Sunblad, Robert L., 1965. The Histogram Current Meter. Instrument Society of America Conference Reprint, 6 pp.

APPENDIX

PROCESSING THE DATA

The data processing operation is divided into two phases: error detection, and data presentation. All of the thermograph and current meter data collected by the Coastal Oceanography Group are routinely subjected to both phases. The procedure has been automated and much of the work is done by the computer. The error detection routines will be described in some detail below. The data presentation phase will be sketched briefly.

Error Detection

Both the thermographs and the current meters record on photographic film. The measurements are set down in analog form, as lines or arcs of circles or dots whose characteristics indicate speed, temperature, direction, etc. Reading the film is the most time-consuming portion of the processing. Most of the 1967-68 data were read "by hand": that is, the human film reader measured each quantity of interest by eye, and recorded the measurements with pencil and paper. These numbers were then punched onto cards and read into the computer. A few of the current records were digitized automatically with the aid of a device that allows the film reader to enter the measurements directly into magnetic disk storage.

Once digitized, the data were checked for smoothness. Each measured value was compared with a predicted value based on the behavior of the record near the point in question. The underlying philosophy is that the ocean and its measurable characteristics are basically continuous and that discontinuities and unusually high rates of change are to be regarded with suspicion. Isolated values in the current meter and thermograph records can sometimes be traced to equipment malfunctions or to errors in reading the film. In other cases, no apparent cause can be discovered and a decision must be made whether to accept the record as it stands, or change it. If the anomaly is large, the decision is often to smooth the record. The prediction process itself, by which anomalous points are located, and the derivation of the prediction equation, are described in Appendix II of Mooers et al. (1968).

The smoothness test is the only error test applied to thermograph records. Current meter records offer several additional opportunities for checks of internal consistency. An example is the comparison of the length of the speed arc with the distance between successive beginnings of arc. This test, together with several others performed on the current records, serves mainly to detect film-reading errors.

Figure A-1 shows the initial processing and error detection procedure for current meter data. This figure is followed by a series of computer program descriptions. The programs are those used during the processing. The descriptions were originally prepared as standard program documentation, and are included here for the light they shed on the error detection procedure.

Figure A-2, which follows the program descriptions, shows the initial processing and error detection procedure for thermograph data. The smoothness test is performed by a computer program very much like SERDET 5 (which checks the smoothness of current records) and no separate description of it has been included here.

Data Presentation

The final product of the error detection process is a "clean" data file, which is permanently stored on magnetic tape. Two files are produced for each current record: a raw file and a processed file. The raw file contains the analog quantities recorded by the meter: arc lengths, beginnings of arc, etc. Each line of the processed file contains a speed in cm/sec, a direction, the corresponding U and V components, the date and hour at which the measurements were made, and assorted useful numbers. Both files are "clean"; that is, both have been subjected to error detection procedures. Only one data file is produced for each thermograph record; each line of this file contains a temperature and the date and hour at which it was recorded.

To make the data accessible, a series of notebooks have been prepared, one for each temperature or current record. The temperature notebooks each contain

1. A line-by-line printout of the "clean" data file.

2. A temperature frequency histogram.

3. A plot of temperature versus time.

4. A plot of low-passed temperature versus time.

Each current notebook contains

1. A line-by-line printout of the (error free) raw data file.

2. A printout of the processed data file.

3. Frequency histograms for speed and direction.

4. A progressive vector diagram.

5. Plots of U and V versus time.

6. Plots of low-passed speed, U, and V versus time.

All the items listed were produced by the computer, including the plots. Most of the low-pass plots were made with the 121-point Cosine-Lanczos filter described in Appendix III of Mooers et al. (1968). The characteristics of this filter and the other filters used are such that in the low-passed series, frequency components with periods greater than about 8 hours have been preserved undiminished. Those with periods between 8 and 4 hours have been attenuated, and those with periods shorter than 4 hours have been excluded entirely.

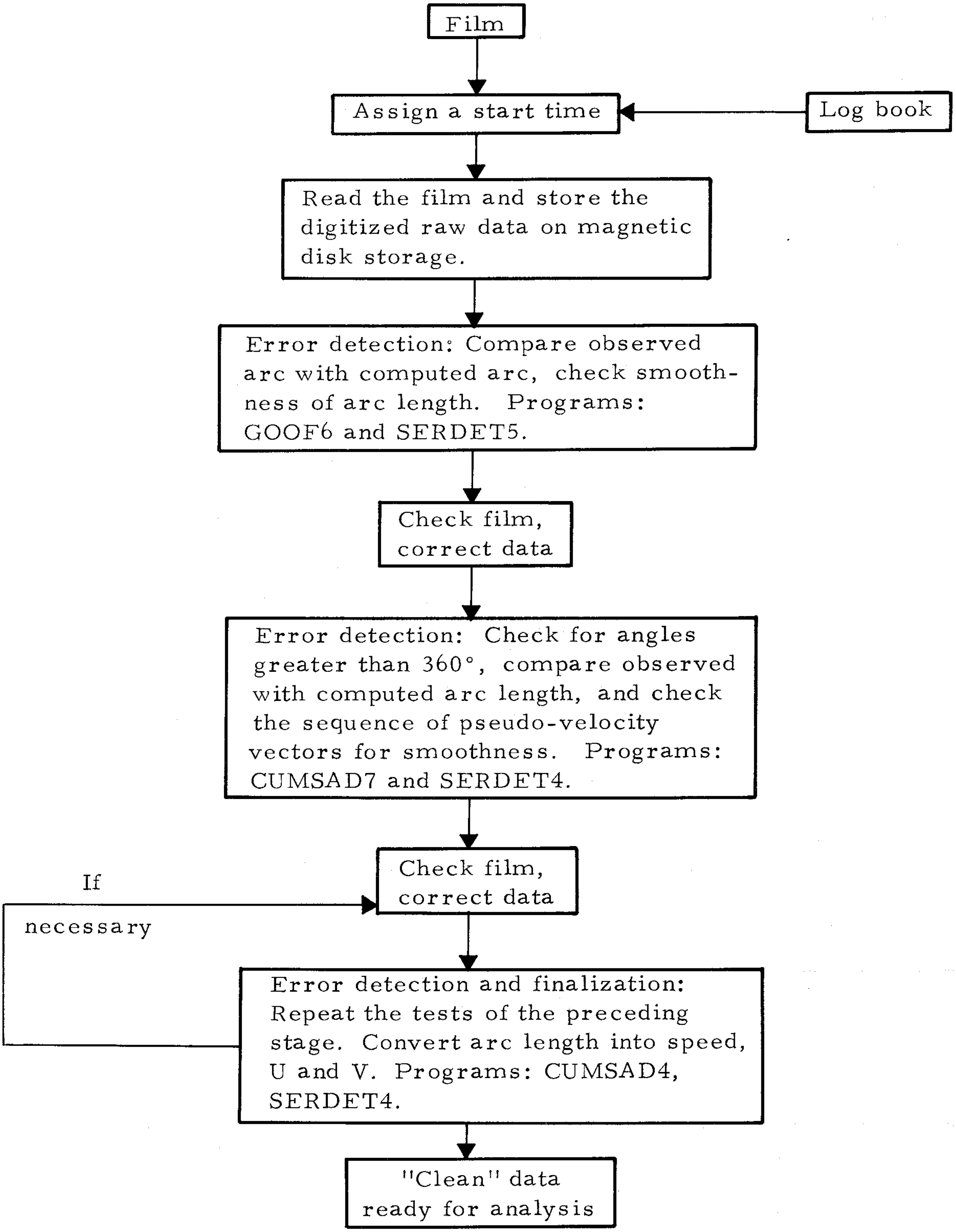


Figure A-1. Error detection procedure for current meter data.

TITLE: GOOF6

SOURCE LANGUAGE: FORTRAN IV

SOFTWARE: OS-3

ORIGINATOR: D. Cutchin

ABSTRACT: This is an error detection routine for digitized current meter data. Two items are checked: the difference between observed arc length and computed arc length, and the smoothness of the sequence of unadjusted computed arc lengths. (Current speed, as measured by the current meter, is registered as an arc of a circle on photographic film. The length of the arc is an indication of the current speed. Observed arc length is the actual length, in degrees, of the indicator arc as it appears on the film; computed arc length is the adjusted difference, in degrees, between the beginnings of successive arcs. The nature of the adjustment is described below.) If the absolute value of (observed length) - (computed length) is larger than a computed criterion, an error message is given. The smoothness test is optional and is performed by the subroutine SERDET5, which is described elsewhere. GOOF6 is run from the teletype.

INPUTS: The program is conversational, and the items listed below in all capitals are questions asked by the teletype.

SMOOTHNESS TEST REQUIRED? Enter 0 for no, 1 for yes.

INPUT LUN. Enter the number of the logical unit to which the data file has been equipped. Each data record should contain, in this order, Date, Hour, Observed arc length, and Beginning of arc.

INPUT FORMAT Enter 40 or fewer characters, including right and left parentheses.

OUTPUT LUN

WINDOW This is the test criterion for the first 4 points. If the absolute value of (observed arc length) - (computed arc length) is greater than WINDOW, an error message results on the output lun. After the first 4 points the criterion for each succeeding point is one-half the average of the 3 preceding observed arc lengths.

FUDGE Computed arc length is set equal to $B_2 - B_1 + A +$ FUDGE, where B_1 and B_2 are two successive beginnings of arc, A is an adjustment related to film advance effects, and FUDGE accounts for systematic bias, if any, introduced by the person who read the film. The unadjusted computed arc length (which is optionally checked for smoothness by SERDET5) is just $B_2 - B_1$.

OUTPUT: Each time the test criterion is exceeded, one line of information is written on the output lun. This line contains all of the inputs for the point in question, as well as the computed arc length and the test criterion. The output of SERDET5 is described elsewhere.

TITLE: SERDET5

SOURCE LANGUAGE: FORTRAN IV

SOFTWARE: OS-3

ORIGINATOR: D. Cutchin

ABSTRACT: SERDET5 is a subroutine called by GOOF6. Its purpose is to test a sequence of unadjusted computed arc lengths for smoothness. Unadjusted computed arc length is the quantity $\Delta B = B_2 - B_1$, where B_1 and B_2 are two successive beginnings of arc, measured in degrees. Smoothness is tested by comparing each actual value of ΔB with a predicted value. The predicted value is a weighted average of the 3 preceding and 3 succeeding actual values:

$$\widehat{\Delta B}_i = 0.75(\Delta B_{i-1} + \Delta B_{i+1}) - 0.3(\Delta B_{i-2} + \Delta B_{i+2}) + 0.05(\Delta B_{i-3}\ L\ \Delta B_{i+3})$$

If the absolute value of (predicted) - (actual) is greater than a computed criterion, an error message results on the teletype. The criterion, which changes from point to point and depends on the variability of the sequence itself, is described below.

INPUTS: The program is conversational, and the items listed below in all capitals are questions asked by the teletype.

FENSTER This is the test criterion for the first 31 points.

NUMBER OF STANDARD ERRORS Suppose N is entered for this input. Then for all points after the 31st the test criterion is N times C, where C is the average value of the 25 immediately preceding differences. That is,

$$C_i = \frac{1}{25} \sum_{j=1}^{25} \left| \text{(predicted)} - \text{(actual)} \right|_{i-j}$$

OUTPUT: Each error message contains the date, the hour, the actual and predicted values (of unadjusted computed arc length), and the quantity C defined above.

TITLE: CUMSAD7

SOURCE LANGUAGE: FORTRAN IV

SOFTWARE: OS-3

ORIGINATORS: D. Cutchin, L. Muller

ABSTRACT: This is an error detection routine for digitized current meter records. The meter records current speed on photographic film as an arc of a circle; the length of the arc indicates speed. Current direction is also recorded as an arc; in this case the midpoint of the arc (or its brightest point if there is one) is taken as the direction of the current. In addition, meter tilt is recorded. The present program reads tilt magnitude, tilt direction, the min, mid, and max current direction values, the length of the speed arc (in degrees), and the value of θ at the beginning of the speed arc (θ is measured counterclockwise from the bottom of each film frame). Each of these is checked for possible errors. If the tilt direction is greater than 360°, or if any of the three current direction values is greater than 360°, or if the speed beginning-of-arc is greater than 360°, an error message results. An error message is also given if the length of the direction arc is greater than 360°. The observed and computed lengths of the speed arc are compared, just as in GOOF6 (q. v.), and an error message results if their difference is too large. Finally, pseudo-U and pseudo-V current components are calculated. (They are pseudo because the individual meter calibration parameters and scale factors are not used.) The subroutine SERDET4 (q. v.) then analyzes the pseudo-vectors for smoothness and gives an error message if they are not smooth enough. CUMSAD7 is run from the teletype.

INPUTS: The program is conversational, and the items listed below in all capitals are questions asked by the teletype.

INPUT LUN The data file equipped to this lun should be terminated by an end-of-file. Each line should contain, in order, the date, hour, tilt magnitude, tilt direction, min, mid (or brightest), and max current directions, speed arc length, and speed beginning-of-arc.

ERROR MESSAGE ON LUN Enter the number of the logical unit that is to receive the error messages.

FUDGE Computed arc length is set equal to $B_2 - B_1 + A +$ FUDGE, where B_1 and B_2 are two successive beginnings of arc, A is an adjustment related to film advance effects, and FUDGE accounts for systematic bias, if any, introduced during the film reading process.

FORMAT INDICATOR This parameter selects an input format. Enter 1 if the data were hand-read, 2 if they were read with the automatic digitizer, and 3 otherwise. If 1 or 2 is entered a special, wired-in format will be used. If 3 is entered the next question is asked.

FORMAT Skip one space and enter the input format, using 40 or fewer characters. This question is not asked unless the answer to the preceding question is 3.

OUTPUT: Each error message contains the date and hour of the suspect point, its value, certain other parameters in some cases, and in some cases a diagnostic label that indicates the nature of the error.

TITLE: SERDET4

SOURCE LANGUAGE: FORTRAN IV

SOFTWARE: OS-3

ORIGINATORS: D. Cutchin, L. Muller

ABSTRACT:

SERDET4 is a subroutine called by programs of the CUMSAD series. Its purpose is to check a sequence of current velocity vectors for smoothness. The principal inputs to the routine are speed, U, and V. (U and V are, respectively, the eastward and northward components of the velocity vector; speed is its modulus.) At each data point predicted values for U, V, and speed are computed by taking a weighted average of the 3 preceding and 3 succeeding values. The predicted value of U is

$$\hat{U}_i = 0.75(U_{i-1} + U_{i+1}) - 0.3(U_{i-2} + U_{i+2})$$

$$+ 0.05(U_{i-3} + U_{i+3})$$

and similarly for V and speed. The modulus of the vector difference between the observed and predicted velocities is then computed, and if it is larger than a calculated criterion, an error message results. An error message is also given if the difference between predicted and measured speed is too great.

INPUTS: The program is run from the teletype. The items listed below in all capitals are questions asked by the teletype.

FENSTER IN CM PER SEC No error detection is done on the first 3 points of the series. For points 4 through 28 the error criterion is FENSTER: if $|(\text{predicted}) - (\text{observed})| >$ FENSTER, an error message is printed.

NUMBER OF STANDARD ERRORS Suppose N is entered for this input. The error criterion for the 29th and all subsequent points is N times C, where C is the average of the 25 preceding differences:

$$C_i = \frac{1}{25} \sum_{j=1}^{25} \left| (\text{predicted}) - (\text{observed}) \right|_{i-j}$$

OUTPUT: Each speed error generates a line of output containing the date, hour, observed speed, the absolute value of predicted speed minus observed speed, and the criterion value. Each vector error produces a line containing the date, hour, observed speed, observed direction (an input to SERDET4 from the calling program), the modulus of the difference between the observed and predicted vectors, and the criterion value. These are written on an output lun specified by the calling program.

TITLE: CUMSAD4

SOURCE LANGUAGE: FORTRAN IV

SOFTWARE: OS-3

ORIGINATOR: D. Cutchin

ABSTRACT: CUMSAD4 is used during the final stages of the basic processing of current meter data. It is largely an error detection routine and performs all the tests described for CUMSAD7 (see the description of CUMSAD7). It differs from CUMSAD7 in that the vector smoothness test (performed by the subroutine SERDET4) operates on actual current vectors rather than pseudo-vectors. Current speed is calculated from a linear calibration relation of the form Speed = a + bx where a and b are calibration constants and x is the unadjusted computed arc length (see the description of SERDET5 for a definition of this term). Current direction is set equal to the measured direction plus an input compass correction. In addition to writing error messages, CUMSAD4 provides a final output file containing (at each point of the series) speed, U, V, direction, and several other useful quantities. The program is run from the teletype.

INPUTS: The program is conversational, and the items listed below in all capitals are questions asked by the teletype.

SERIES NUMBER Enter an arbitrary interger to identify the job or the data file. It will appear in each line of the final output file.

INPUT LUN The input lun must be equipped to a file containing date, hour, tilt magnitude, tilt direction, min, mid, and max current directions, speed arc length, and beginning of arc.

OUTPUT LUN This is the lun for the final output file.

ERROR MESSAGE LUN A separate lun must be equipped to receive the error messages.

SMOOTHNESS TEST REQUIRED? Enter 0 for no, 1 for yes. The smoothness test is performed by the subroutine SERDET4.

DELTA TIME Enter the time interval, in minutes, between data points.

COMPASS CORRECTION Enter the angle (in degrees) between true north and magnetic north. This input rotates the axes with respect to which U and V are computed. If θ is entered, the axes are rotated θ degrees counterclockwise from magnetic north, a feature that permits resolution into components other than north-south, east-west - for example, longshore and offshore.

GEAR Enter the step-down gear ratio of the speed sensor.

FUDGE This is a correction factor that accounts for systematic errors in film-reading. See the description of GOOF6.

FORMAT INDICATOR This parameter selects an input format. Enter 1 if the data were hand-read, 2 if they were read with the automatic digitizer, and 3 otherwise. If 1 or 2 is entered a special, wired-in format will be used. If 3 is entered the next question is asked.

FORMAT Skip one space and enter the input format, using 40 or fewer characters. This question is not asked unless the answer to the preceding question is 3.

OUTPUT: Each error message contains the date and hour of the suspect point, its value, and in some cases various other useful numbers. The output file contains (for every data point) date, hour, speed, U, V, direction, the length of the direction arc, tilt magnitude, tilt direction, the file or job ID number, sum U, sum V, beginning of arc, and a line number. Sum U and sum V at the ith point are

$$(\text{sum U})_i = \sum_{j=1}^{i} U_j$$

$$(\text{sum V})_i = \sum_{j=1}^{i} V_j$$

These are used subsequently in making progressive vector diagrams.

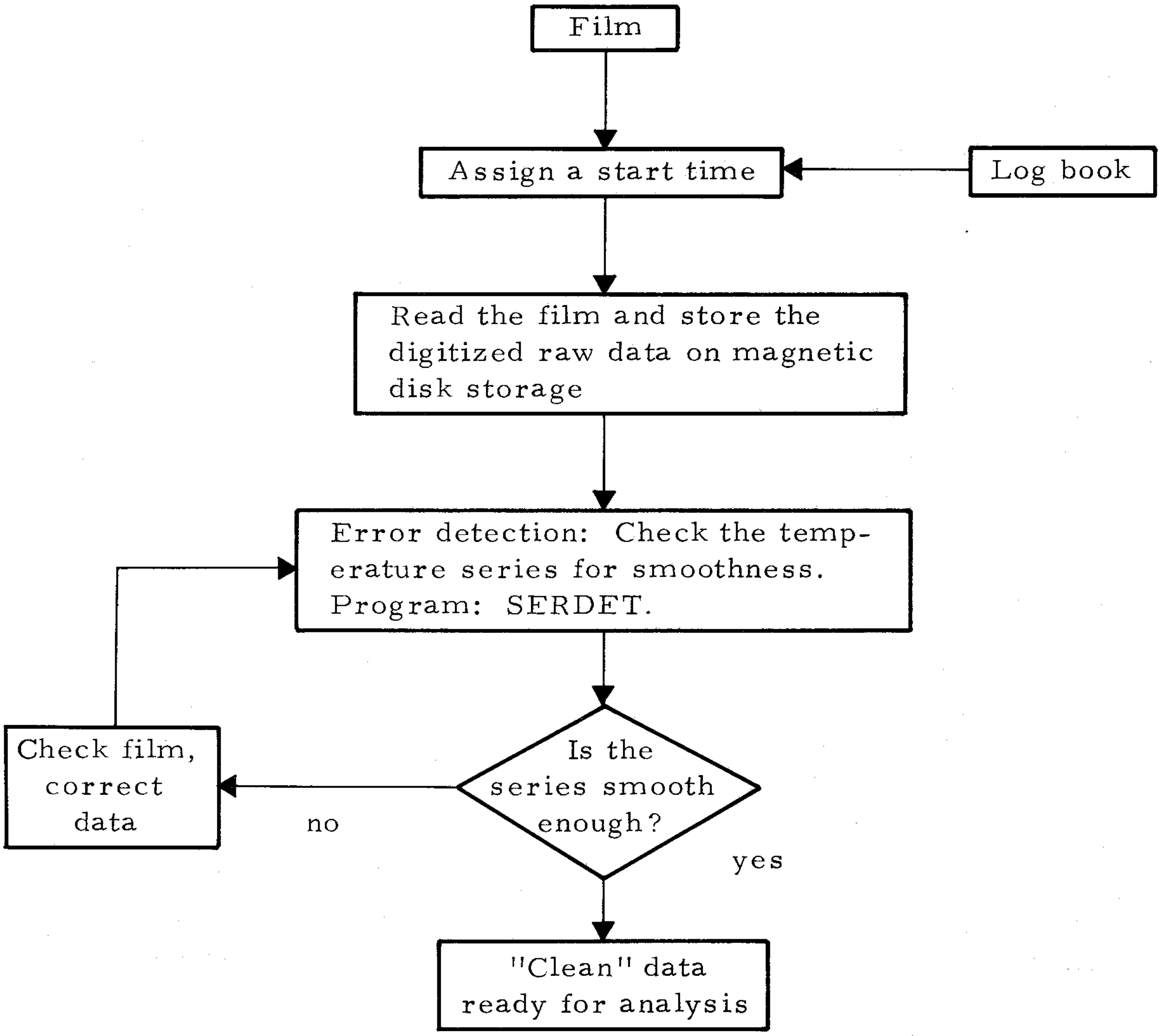


Figure A-2. Error detection procedure for thermograph data.

DISTRIBUTION LIST (INITIAL)

Gross

YAQUINA
OSU Oceanography:
Biologists
Chemists

Internal to OSU

Barstow, Dennis Mr.
Beardsley, George Dr.
Bodvarsson, Gunnar Dr.
Bottero, Joseph Mr.
Bourke, Robert Mr.
Burt, Wayne V. Dr.
Caldwell, Douglas Dr.
Couch, Richard Dr.
Curl, Herbert C., Jr. Dr.
Cutchin, David Mr.
Cutshall, Norman Dr.
Detweiler, John Mr.
Dymond, Jack Dr.
Earle, Marshall Mr.
Elliott, William P. Dr.
Enfield, David Mr.
Evans, Richard Mr.
Fowler, Gerald Dr.
Frolander, Herbert F. Dr.
Gilbert, William Mr.
Gordon, Louis Mr.
Hasse, Lutz Dr.
Hakanson, Marilynne Miss
Heath, G. Ross Dr.
Ho, A. Michael Mr.
Iverson, Richard Mr.
Kulm, L. D. Dr.
Marine Science Center (Weather Bureau)
Mesecar, Roderick Dr.
Mueller, James Mr.
Muller, Lillie Miss
Neshyba, S. N. Dr.
Pattullo, June G. Dr.
Pearcy, William Dr.
Pillsbury, Dale Mr.
Plank, William Mr.
Plutchak, Noel B. Mr.
Pittock, Henry Lt.
Pond, Steven Dr.
Quinn, William Dr.
Sakou, Toshitsugu Dr.
Small, Larry F. Dr.
Smith, Robert Dr.
Wyatt, Bruce Mr.
Zaneveld, Ronald Mr.

External to OSU

Bowden, K. F.
Cartwright, D. E. Mr.
Collins, Curtis A. Dr.
Cox, Charles S.
Csanady, C. S. Dr.
Denner, Warren Dr.
Dobson, Hugh Mr.
Dodimead, A. J. Dr.
Duxbury, A. Dr.
Fisher, Carl Lt.
Fofonoff, N. P. Dr.
Green, Thomas Dr.
Griswold, Gale M.
Hopkins, Thomas Mr.
Laurs, Michael R. Dr.
Longuet-Higgins, M. S. Dr.
Maloney, William Mr.
Morse, Betty-Ann Miss
Mortimer, C. H.
Mysak, Lawrence Dr.
O'Brien, James J.
Reid, R. D. Dr.
Stevenson, Merrit R. Dr.
Stewart, R. W.
Still, Robert
Swanson, Larry F. LCDR
Webster, Ferris Dr.
NSF
Themis-Computer Center (3 copi

UNCLASSIFIED

Security Classification

DOCUMENT CONTROL DATA - R & D

(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)

1. ORIGINATING ACTIVITY (Corporate author) Department of Oceanography Oregon State University Corvallis, Oregon 97331	2a. REPORT SECURITY CLASSIFICATION Unclassified 2b. GROUP

3. REPORT TITLE

A compilation of observations from moored current meters and thermographs, Volume III: Oregon continental shelf, May-June 1967; April-September 1968

4. DESCRIPTIVE NOTES *(Type of report and inclusive dates)*

Date Report - summary of 1967, 1968 current meter and thermograph data

5. AUTHOR(S) *(First name, middle initial, last name)*

R. Dale Pillsbury, Robert L. Smith, June G. Pattullo

6. REPORT DATE	7a. TOTAL NO. OF PAGES	7b. NO. OF REFS
June 1970	102	10

8a. CONTRACT OR GRANT NO. ONR 1286 (10) ONR N00014-67-A-0369-0007 b. PROJECT NO. NR 083-102 c. d.	9a. ORIGINATOR'S REPORT NUMBER(S) Data Report No. 40 9b. OTHER REPORT NO(S) *(Any other numbers that may be assigned this report)* Reference 70-3

10. DISTRIBUTION STATEMENT

Unlimited

11. SUPPLEMENTARY NOTES	12. SPONSORING MILITARY ACTIVITY Ocean Science and Technology Office of Naval Research, Code 481 Washington, D. C.

13. ABSTRACT

Time series of currents and temperatures taken by fixed arrays of self-recording instruments moored on the Oregon continental shelf are presented in graphical form. The data represent the periods from 6 May - 14 June 1967 and 1 April - 30 June 1968. Also included in this report are the observed and geostrophic winds for the same period of time.

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Current meter data Temperature data Oregon waters						