		ACCESSION NUMBER	75-0531

DATA DOCUMENTATION FORM

NODC TAPE 7112
5222

DDF A14106

NOAA FORM 24-13
(72)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEANOGRAPHIC DATA CENTER
RECORDS SECTION
ROCKVILLE, MARYLAND 20852

FORM APPROVED
O.M.B. No. 41-R2651

BL1942 - BL1948
C100

This form should accompany all data submissions to NODC. Section A, Originator Identification, must be completed when the data are submitted. It is highly desirable for NODC to also receive the remaining pertinent information at that time. This may be most easily accomplished by attaching reports, publications, or manuscripts which are readily available describing data collection, analysis, and format specifics. Readable, handwritten submissions are acceptable in all cases. All data shipments should be sent to the above address.

L01444 - L01445
L142

A. ORIGINATOR IDENTIFICATION

THIS SECTION MUST BE COMPLETED BY DONOR FOR ALL DATA TRANSMITTALS

1. NAME AND ADDRESS OF INSTITUTION, LABORATORY, OR ACTIVITY WITH WHICH SUBMITTED DATA ARE ASSOCIATED

UNIVERSITY OF MIAMI, RSMAS DEPT. OF PHYSICAL OCEANOGRAPHY
4600 RICKENBACKER CAUSEWAY
MIAMI, FLA. 33149

2. EXPEDITION, PROJECT, OR PROGRAM DURING WHICH DATA WERE COLLECTED

CUEA / IDOE
(COASTAL UPWELLING ECOSYS. ANALY.)

3. CRUISE NUMBER(S) USED BY ORIGINATOR TO IDENTIFY DATA IN THIS SHIPMENT

CAYUSE - C7208-F1 AND C7208-F2
YAQUINA - Y7207-E

4. PLATFORM NAME(S): YAQUINA, CAYUSE

5. PLATFORM TYPE(S) (E.G., SHIP, BUOY, ETC.): SHIP

6. PLATFORM AND OPERATOR NATIONALITY(IES)

PLATFORM	OPERATOR
USA	USA

7. DATES

FROM: MO/DAY/YR	TO: MO/DAY/YR
7-31-72	8-7-72
8-15-72	8-19-72
8-21-72	8-25-72

8. ARE DATA PROPRIETARY?

[X] NO [ ] YES

IF YES, WHEN CAN THEY BE RELEASED FOR GENERAL USE? YEAR____ MONTH____

9. ARE DATA DECLARED NATIONAL PROGRAM (DNP)?
(I.E., SHOULD THEY BE INCLUDED IN WORLD DATA CENTERS HOLDINGS FOR INTERNATIONAL EXCHANGE?)

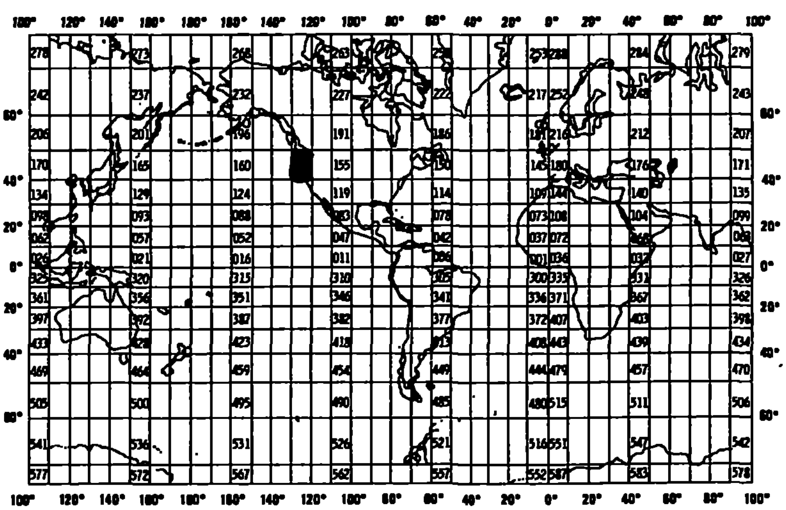
[ ] NO [X] YES [ ] PART *(SPECIFY BELOW)*

10. PERSON TO WHOM INQUIRIES CONCERNING DATA SHOULD BE ADDRESSED WITH TELEPHONE NUMBER *(AND ADDRESS IF OTHER THAN IN ITEM 1)*

DR. C.N.K. MOOERS
THOS. B. CURTIN
(305) 350-7546

11. PLEASE DARKEN ALL MARSDEN SQUARES IN WHICH ANY DATA CONTAINED IN YOUR SUBMISSION WERE COLLECTED.

GENERAL AREA



B. SCIENTIFIC CONTENT

Include enough information concerning manner of observation, instrumentation, analysis, and data reduction routines to make them understandable to future users. Furnish the minimum documentation considered relevant to each data type. Documentation will be retained as a permanent part of the data and will be available to future users. Equivalent information already available may be substituted for this section of the form (i.e., publications, reports, and manuscripts describing observational and analytical methods). If you do not provide equivalent information by attachment, please complete the scientific content section in a manner similar to the one shown in the following example.

EXAMPLE (HYPOTHETICAL INFORMATION)

NAME OF DATA FIELD	REPORTING UNITS OR CODE	METHODS OF OBSERVATION AND INSTRUMENTS USED (SPECIFY TYPE AND MODEL)	ANALYTICAL METHODS (INCLUDING MODIFICATIONS) AND LABORATORY PROCEDURES	DATA PROCESSING TECHNIQUES WITH FILTERING AND AVERAGING
Salinity	‰	Nansen bottles	Inductive salinometer (Hytech model S510)	N/A (Not applicable)
		STD Bissett-Berman Model 9006	N/A	Values averaged over 5-meter intervals
Water color	Forel scale	Visual comparison with Forel bottles	N/A	N/A
Sediment size	φ units and percent by weight	Ewing corer	Standard sieves. Carbonate fraction removed by acid treatment	Same as "Sedimentary Rock Manual," Folk '65

(SPACE IS PROVIDED ON THE FOLLOWING TWO PAGES FOR THIS INFORMATION)

UNIVERSITY OF MIAMI
Dorothy H. and Lewis Rosenstiel
SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE
10 RICKENBACKER CAUSEWAY
MIAMI, FLORIDA 33149
(305) 350-7211
Cable: UOFMIAMI

NODC TAPE
SL TAPE 5222
VOL = SER = 005222
LRECL = 80
BLK FACTOR = 12
9TRK 1600 BPI

June 28, 1974

NODC TAPE
NL TAPE 7112
LREL = 80
BLK Factor = 1
9 TRACK 1600 bpi

National Oceanographic Data Center
Washington, D. C. 20390

Gentlemen:

Enclosed please find the following items:

1. one 600 foot, 1/2 inch magnetic tape containing data taken by the University of Miami during the Coastal Upwelling Experiment-I (1972);

2. one reel of microfilm (280 frames) displaying all data as they appear on the tape;

3. two data reports (UM-RSMAS 74003 and UM-RSMAS 74015) that contain summary and graphical description of all data on the tape;

4. copies of the Data Tape Key and Notes to assist in reading and interpreting the data.

Please direct any inquiries concerning these items to either of the undersigned for a prompt reply.

Sincerely,

CNK Mooers /ld

Christopher N. K. Mooers
Associate Professor
Division of Physical Oceanography

Thomas B. Curtin /ld

Thomas B. Curtin
Division of Physical Oceanography

CNKM/TBC/ld

Enclosure

NODC
SL TAPE .5222

CUE-I DATA TAPE KEY

DATA TAPE		CROSS REFERENCE			
FILE NUMBER	FORMAT	DATA REPORT	PAGE	SECTION	
1	1	UM-RSMAS#74003	13	initial offshore section	VESSEL: CAYUSE
2	1	"	13	anchor station time series	
3	1	"	14	final offshore section	
4	1	"	35	initial offshore section	
5	2	"	35	second offshore section	
6	2	"	35	anchor station time series	
7	2	"	37	final offshore section	
8	3	UM-RSMAS#74015	19	anchor station at 44°45.0'N, 124°37.5'W	YAQUINA
9	3	"	19	anchor station at 44°40.0'N, 124°37.5'W	
10	profiling current lors 3	"	19	anchor station at 44°39.0'N, 124°32.0'W	
11	3	"	20	anchor station at 44°39.1'N, ~~124°17.3'W~~	
12	3	"	57	anchor station at 44°38.6'N, 124°17.3'W	Cayuse
13	3	"	81	anchor station at 44°38.9'N, 124°16.6'W	

FORMATS:

1. NODC Standard Hydrographic Format (time is local time; that is, PDT)
2. Station Number, Depth (meters), Temperature (°C), Salinity (°/oo)
3. Station Number, Time (relative hours), Depth (meters), Temperature (°C), Salinity (°/oo), (cm/sec, north positive), (I4,6F10.3)
   NONE

TAPE 7112 Contains Last part of file 11, only.

CUE-I DATA TAPE NOTES

1. For header and other information in all cases, station numbers on tape files correspond to station numbers in referenced reports.

2. 888.880 is a dummy variable indicating no data were taken for that parameter. This may appear anywhere in a data field depending on circumstances.

3. The tape's physical characteristics are:

   7 ~~9~~ track
   BCD
   556 BPI
   Even Parity
   80 Character Records (Card image)
   Blocked 12 (~~980~~ 960 characters per block)

Replaced with NODC TAPE

UNIVERSITY OF MIAMI
ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE

SCIENTIFIC REPORT

February 1974

COASTAL UPWELLING EXPERIMENT - I

HYDROGRAPHIC DATA REPORT

R/V CAYUSE Cruises C7208-F1 and C7208-F2
(15-19 August and 21-25 August 1972)

by

Thomas B. Curtin

and

Christopher N. K. Mooers

10 Rickenbacker Causeway
Miami, Florida 33149

Warren S. Wooster
Dean

I. Introduction

The objectives of this data report are to provide documentation of and a visual guide to the experimental data set and, therefore, the associated data tape. Hence, beyond the inclusion of contoured fields, no interpretation is provided. As a corollary, it is expected to serve as an efficient guidebook for making decisions on selective data analyses from the total data set. Since this data report format is itself an experiment directed toward evolving a routine, standard product, any comments on its adequacy are welcomed.

This report includes data from two cruises of the R/V CAYUSE during the summer of 1972: 15-19 August (C7208-F1) and 21-25 August (C7208-F2). These cruises constituted part of the first Coastal Upwelling Experiment (CUE-I), a multi-institutional program sponsored by the Office for the International Decade of Ocean Exploration, National Science Foundation, to study coastal upwelling off Oregon.

The purpose of these cruises was to make detailed hydrographic and current profiles in a coastal upwelling frontal zone. Both cruises were operationally similar in structure: a two- to three-day anchor station at one position preceded and followed by series of stations along a line perpendicular to the coast and through the anchor station position. Two instruments supplied the core of each station's data: A Bissett-Berman (Plessey) self-contained salinity-temperature-depth (STD) unit and a profiling current meter (PCM); i.e., two Aanderaa current meters adapted for use in a buoyancy controlled vehicle. Together (with some redundancy) these instruments provide temperature, salinity, current speed, and current direction as functions of depth at each station and as functions of time at one station. In addition, van Dorn bottle casts were taken at regular intervals to provide samples for chlorophyll analysis.

This report contains the hydrographic data obtained with the STD system in the above-described experiments. Data from the PCM system are contained in a separate publication (Curtin and Mooers, 1974), and the chlorophyll data are given in Phytoplankton Pigment Data in CUE-I Experimental Area (Small, 1972). All data described herein are stored and available on magnetic tape under file designations 72CUESTD1 through 72CUESTD5, copies of which are being submitted to NODC and the University of Washington. Detailed tape and format specifications are available upon request.

II. Procedures

A. Hydrographic Data Input

The Bissett-Berman self-contained STD unit used in this experiment had the following rated accuracy and resolution:

	Salinity	Temperature	Depth
Accuracy	±0.05 °/oo	±0.1°C	±0.75 m
Resolution	0.02 °/oo	0.05°C	0.30 m

The response times of the conductivity sensor and temperature probe were 0.01 second and 0.35 second, respectively.

Temperature and salinity as functions of depth are recorded internally on pressure sensitive paper with a dual pen X1-X2-Y type recorder. As used, the instrument recorded data during both its descent and ascent through the water column. Upon initial immersion, the unit was held for several seconds just below the surface to allow for sensor equilibration. During this time a bucket sample was obtained; its temperature was logged, and a salinity sample was acquired. On 15 of 148 casts, a cocked water sampling bottle was attached to the wire immediately above the STD unit; it was tripped using an ordinary messenger after a two-minute wait at the maximum cast depth. Reversing thermometers were attached to the bottle.

Position and meteorological observations for each cast were made by the ship's officers.

B. Hydrographic Data Processing

After each cast the expended chart paper with the measured analog STD traces was removed from the instrument, annotated, and stored with other pertinent cast data. Ashore, each temperature and salinity profile was retraced on an overlaid grid as a preparation for digitizing the data. During this process, up and down traces, when distinct, were bisected; and obviously anomalous spikes were smoothed. No serious salinity spikes were present in this data. The overlays were then manually digitized using a Bendix Model 2427015 programmable digitizer with a resolution of 0.032 meters, 0.002 ^{o}/oo, and 0.003^{o}C. The vertical digitizing interval was preset at 0.160 meter. The data points were output on punched cards via an interfaced keypunch machine. All other related information was punched on a header card for each cast. These header cards were merged with the appropriate digitized STD traces to produce a complete STD data file for each section or time series.

Each data file was processed on the University of Miami's UNIVAC 1106. After an initial editing stage to detect mispunched cards, salinity and temperature profiles were corrected using input calibration values. These were taken to be, in order of priority, (1) the deep bottle cast values or (2) the directly read deepest values from the STD traces themselves corrected by the mean difference between subsurface bottle samples and subsurface direct trace readings. The data were then interpolated to uniform five-meter intervals using a third-order Aitken interpolation technique. Sigma-t and the Väisälä-Brunt frequency squared (N^2) were then computed at each interpolated depth. Sigma-t was calculated using the empirical formula developed by Knudsen (1901) and rewritten for programming by Fofonoff and Tabata (1958). N^2 was derived from the difference of buoyancy of two fluid elements transferred isentropically to the mean pressure between the two levels considered. The Ekman (1908) equation of state was used to calculate the specific volume. The adiabatic lapse rate was computed by an empirical formula given by Fofonoff (1962). Corrections to Fofonoff's formula, as pointed out by Wang and Millero (1973), were considered negligible over the pressure range of this data and were not applied.

The profiles of temperature, salinity, sigma-t, and N^2 are shown in this data report.

C. Error Analysis

The ultimate accuracy of the processed data presented here is a function of the rated errors of the STD unit, tracing errors, digitizing errors, and applied calibration value errors. The rated accuracy of the STD unit as given in section A is less than that of the tracing and digitizing reduction procedures described in the previous section by about an order of magnitude. Calibration temperatures were read from a reversing thermometer with an accuracy of ±0.03°C. Bucket and subsurface salinities were determined on a bench salinometer with a stated accuracy of about ±0.003 °/oo. These values are an order of magnitude smaller than those quoted for the STD system. Therefore, under stable conditions, the processed data are accurate to within the STD system specifications. However, time variabilities must also be considered to estimate overall accuracy during an experiment.

Figure 1 shows the distributions of the difference between water samples and STD readings versus the sample value for cruise C7208-F1. Figure 2 gives the analogous distributions for cruise C7208-F2.

On C7208-F1, both temperature and salinity differences exhibit a considerable range of scatter (±0.8°C and ±0.3 °/oo) in the surface values. The standard deviations of the surface differences are an order of magnitude greater than those of the subsurface values. This can be attributed to the high noise factor associated with data taken from bucket samples at the surface (for example, the thermometer used is less accurate (±0.15°C) than the STD temperature rating (±0.10°C)) combined with the poor STD trace resolution produced during the initial immersion of the instrument. In both the surface and subsurface intercomparisons, the mean values of the temperature differences are within instrumental error bounds, and no temperature corrections were applied. However, the mean salinity difference in both cases is over twice the rated accuracy; and a correction of -0.14 °/oo (the mean value of the subsurface differences) was applied to the salinity data from this cruise. With this correction the salinity data are accurate to within rated instrumental bounds (±0.05 °/oo). Due to its belated discovery, this salinity correction has not been applied to the graphical displays herein but is incorporated in the archived data files.

On C7208-F2, the STD unit was inoperable for most of the cruise. Thus, comparatively fewer intercomparative samples were taken; and all of these were at the surface. No corrections were applied to the data from this cruise.

To check for systematic errors in time, the differences between STD temperatures and sample temperatures and STD salinities and sample salinities were plotted versus cast number (Figure 3). No corrections for systematic variations were applied to the data.

It is concluded that the data reported here is accurate to within the STD system specifications given in section A.

75-0531

UNIVERSITY OF MIAMI
ROSENSTIEL SCHOOL OF MARINE AND ATMOSPHERIC SCIENCE

SCIENTIFIC REPORT

April 1974

COASTAL UPWELLING EXPERIMENT - I

PROFILING CURRENT METER DATA REPORT

R/V YAQUINA Cruise Y7207-E
(31 July - 7 August 1972)

R/V CAYUSE Cruises C7208-F1 and C7208-F2
(15-18 August and 21-24 August 1972)

by

Thomas B. Curtin

and

Christopher N. K. Mooers

4600 Rickenbacker Causeway
Miami, Florida 33149

Warren S. Wooster
Dean

UM-RSMAS 74015

I. Introduction

The objectives of this data report are to provide documentation of and a visual guide to the experimental data set and, therefore, the associated data tape. Hence, beyond the inclusion of contoured fields, no interpretation is provided. As a corollary, it is expected to serve as an efficient guidebook for making decisions on selective data analyses from the total data set. Since this data report format is itself an experiment directed toward evolving a routine, standard product, any comments on its adequacy will be welcomed.

This report includes data acquired during the summer of 1972 on one cruise of the R/V YAQUINA (Y7207-E, 31 July to 7 August) and two cruises of the R/V CAYUSE (C7208-F1, 15-18 August; and C7208-F2, 21-24 August). These cruises constituted part of the first Coastal Upwelling Experiment (CUE-I), a multi-institutional program sponsored by the Office for the International Decade of Ocean Exploration, National Science Foundation, to study upwelling off the Oregon coast.

The purpose of these cruises was to make detailed hydrographic and current observations in a coastal upwelling frontal zone. The cruise on the R/V YAQUINA was divided into two legs. On the first leg, hydrographic stations were occupied in a grid adjacent to the coast; and bottle casts were made along two lines for optical, phytoplankton, and nutrient analyses. Underway sampling of the water at 2 meters for nutrient analysis was carried out during the first leg and one short profiling current meter (PCM) anchor station was occupied. On the second leg, three PCM anchor stations of various durations were occupied; and one line of hydrographic stations was traversed twice. Both R/V CAYUSE cruises were operationally similar to each other in structure: a two-to-three-day anchor station at one position preceded and followed by series of hydrographic stations along a line perpendicular to the coast and through the anchor station position. Van Dorn bottle casts were taken at regular intervals during the anchor stations to provide samples for chlorophyll analysis.

Hydrographic data on the R/V YAQUINA were obtained using a Geodyne remote recording conductivity-temperature-depth (CTD) system; on the R/V CAYUSE cruises, a Bissett-Berman (Plessey) self-contained salinity-temperature-depth (STD) unit was used. A description of the profiling current meter technique is given by Düing and Johnson (1971, 1972). The particular hardware configuration devised for this experiment was equipped with two Aanderaa current meters. Together (with some redundancy) these instruments provide temperature, salinity, current speed, and current direction as functions of depth at each station and as functions of time at one station.

This report contains all the PCM data obtained in the above-described experiments. The hydrographic data from these cruises are contained in two separate publications: CUE-I Hydrographic Data Report, YAQUINA Cruise Y7207E, 31 July - 7 August 1972 (Anonymous, 1972) and Curtin and Mooers (1974a). The chlorophyll data are given in Phytoplankton Pigment Data in CUE-I Experimental Area (Small, 1972). All data described herein are stored and available on magnetic tape under file designations 72CUEPCM1 through 72CUEPCM6 and 72CUEPCM1A through 72CUEPCM6A, copies of which are being submitted to NODC and the University of Washington. Detailed tape and format specifications are available upon request.

II. Procedures

A. Profiling Current Meter Data Input

Each of the two Aanderaa current meters used in this experiment is capable of measuring and recording pressure, temperature, current speed, and current direction. In the particular PCM designed for this study, one meter was fixed with its rotor axis oriented perpendicular to gravity (horizontal) and the other meter with its axis parallel to gravity (vertical). A detailed description of the complete instrument is contained in Curtin and Mooers (1974b). The two meters had the following rated accuracies and resolutions:

	Pressure	Temperature	Direction
Accuracy	±3.5 m (vertical)	±0.1°C (vertical)	±5° (vertical)
	±2.4 m (horizontal)	±0.1°C (horizontal)	±5° (horizontal)
Resolution	0.3 m (vertical)	0.05°C (vertical)	0.3° (vertical)
	0.2 m (horizontal)	0.05°C (horizontal)	0.3° (horizontal)

The response time (63%) of both temperature sensors was 2.5 seconds. A Savonius-type rotor is used with tungsten-carbide bearings. Rotor threshold speed for the vertical meter was 2.8 cm/sec and for the horizontal meter, 5.0 cm/sec. This threshold speed difference is caused by the different way in which the two rotors rest on their bearings.

The output from all sensors is measured serially, the sampling rate in this experiment for each parameter being 25.6 and 30.3 seconds for the vertical and horizontal meters, respectively. The signals are mechanically encoded into a ten-bit binary word and stored on a reel of standard ¼ inch magnetic tape. Each meter is self-contained and self-powered. Tapes were processed onshore at the completion of each particular cruise.

Pressure and temperature sensors for both meters were carefully calibrated in the laboratory at the University of Miami just prior to the summer set of experiments. Compasses were swung both in July and September at Oregon State University's calibration facility. Pre- and post-experiment speed calibrations were undertaken at the Bonneville Dam test flume in Bonneville, Oregon. The results of the pressure, temperature, and direction calibrations are given in Appendix I. A separate report (Curtin and Mooers, 1974b) contains the results of the speed calibration work.

When functioning properly, the instrument recorded useful data during both its descent and ascent through the water column. In order to thoroughly examine the entire vertical structure, the PCM was pre-set to descend to within 3 meters of the bottom where, upon the automatic release of a small ballast weight, it began its slow ascent to the surface. Both sinking and rising rates were set to be about 10 cm/sec.

Position and meteorological observations were made by the ships' officers.

B. Profiling Current Meter Data Processing

At sea, each time the PCM began its descent through the water column, the time was logged together with other pertinent station data. Ascending profile start times were calculated later during the data processing from the descending start times and the elapsed descent time based on the meter's internal sampling rate.

Occasionally, during the course of the summer's experiment, segments of PCM-generated tapes were translated on Oregon State University's DEC PDP-15 computer for the purpose of monitoring the functioning of the instruments. However, the principal translation and processing of the data tapes were done at the completion of the summer fieldwork on the University of Miami's UNIVAC 1106. A detailed description of the processing programs and procedure is given by Hallock in Düing (1973, Sections 5.1 and 5.2) with the following modifications that were adopted in processing this data: polynomial calibration curves of any order were allowed; no wire angle correction was applied; and all interpolation was linear. A 2.5 meter interpolation interval in depth was used for all the data; and a 0.5 hour interval in time was adopted for all data with the exception of the first two short anchor stations, where a 0.25 hour interval was used.

PCM velocity data as gathered with the presently used system are inherently noisy in the surface layer (0 to 10 meters). This noise is due to combination of high frequency ship motion directly translated to the tethering wire and the as yet unknown influence of the steel hull on the magnetic compasses in the current meters. This noise has been directly observed in the field and also through examination of the raw data from each profile. The magnitudes of these noise sources are related inversely and directly, respectively, to the size of the vessel used. An additional feature of the surface layer data is that each profile contains a relatively high density of data points in this region. This is due to the fact that the surface layer spans the reset and turnaround point in the PCM's cycle through the water column. To retain as much credible data as possible, the velocity data from each profile in the upper 10 meters of the water column were averaged. The surface layer mean velocity was subsequently substituted as a uniform velocity from 0 to 10 meters in the measured profile; i.e., a moving slab was substituted for the surface layer. The influence of this approximation is obvious in the contours of velocity data; viz., the surface layer contours generally tend to be vertically oriented. It is believed that this is a valid approximation which permits analysis over the entire water column.

In cases where a particular profile did not contain a value for the surface temperature; that is, the PCM surfaced, was reset, and began its descent between temperature channel interrogations, the surface temperature obtained from bucket samples was incorporated in the temperature profile at 0 meters.

The main reason the PCM system was designed with two independent meters was to provide a backup set of data in the event of a sensor malfunction or an interpretive ambiguity. Fortunately, both meters performed satisfactorily for the duration of the experiment. The data from each meter were processed independently and similarly, and both finalized data sets are presently stored on magnetic tape. For the display purposes of this report, data from only the vertically oriented meter have been graphically illustrated. To check the consistency between meters over the total time span of the experiment, the data from the first anchor station and the last two anchor stations of the summer were time averaged at each depth to produce an average measured profile for each parameter. Figures 1 and 2 demonstrate the excellent agreement between the averages for the two meters. The mean difference between temperature profiles is 0.2°C or twice the instruments' rated accuracy. However, as can be seen from Fig. 1, this difference is caused almost exclusively by a small inaccuracy in the zeroth order calibration term. Higher order features are very well reproduced, and the difference in precision between the two temperature sensors is well within rated instrumental error. The mean differences

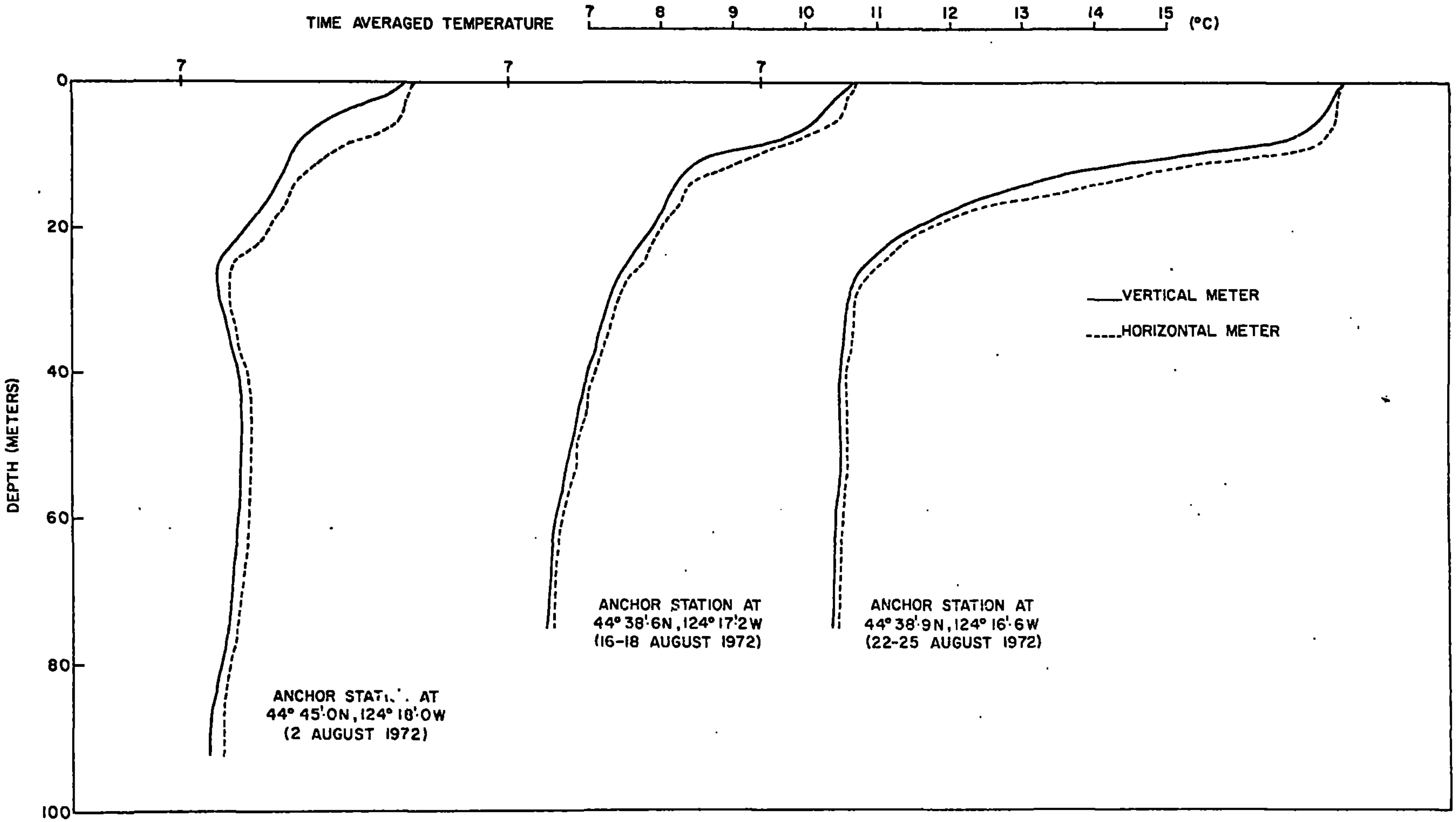


FIGURE 1

Intercomparison of temperature data from the two independent sensors on the profiling current meter

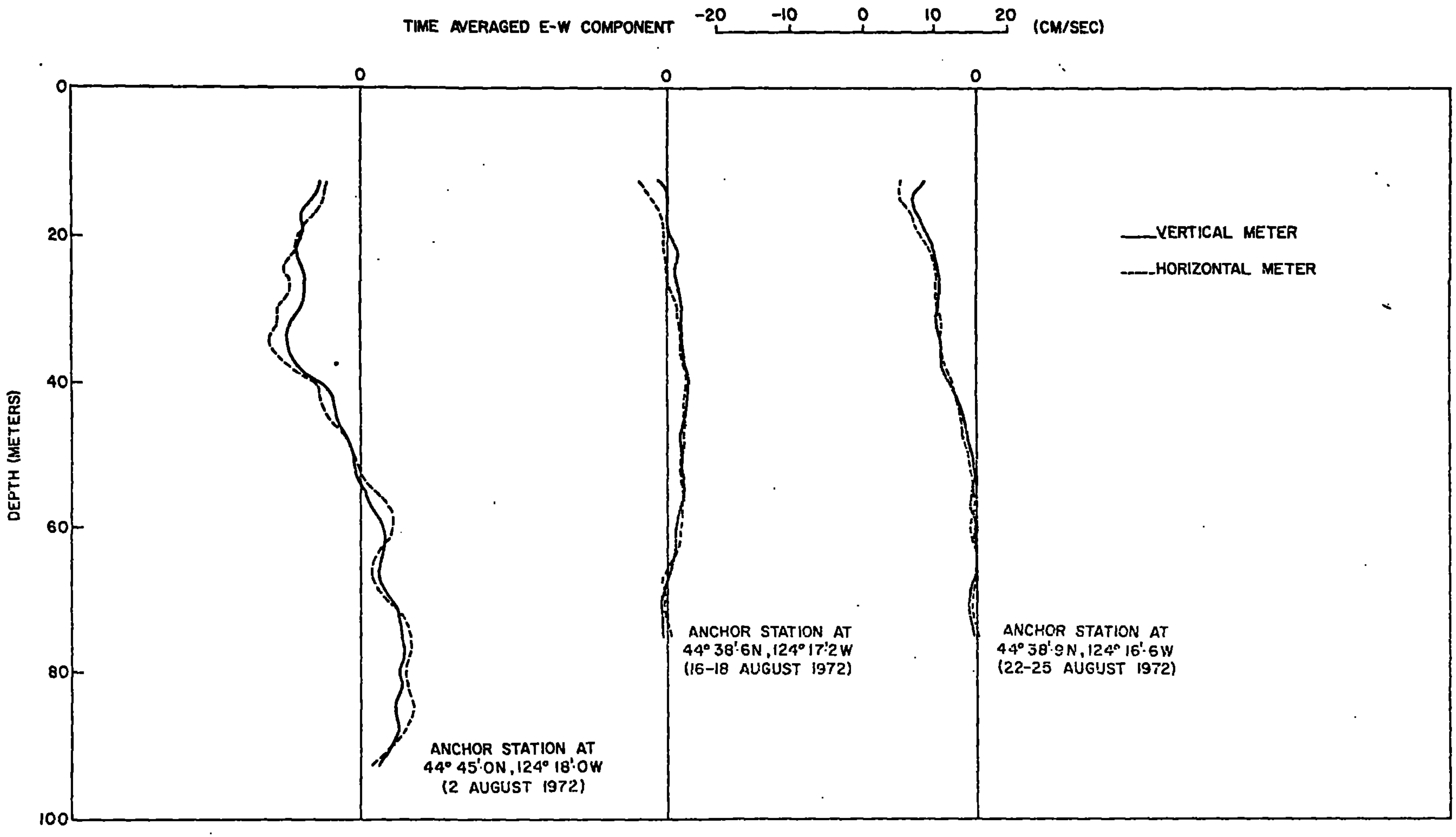


FIGURE 2A

Intercomparison of velocity data from the two independent sensor systems on the profiling current meter

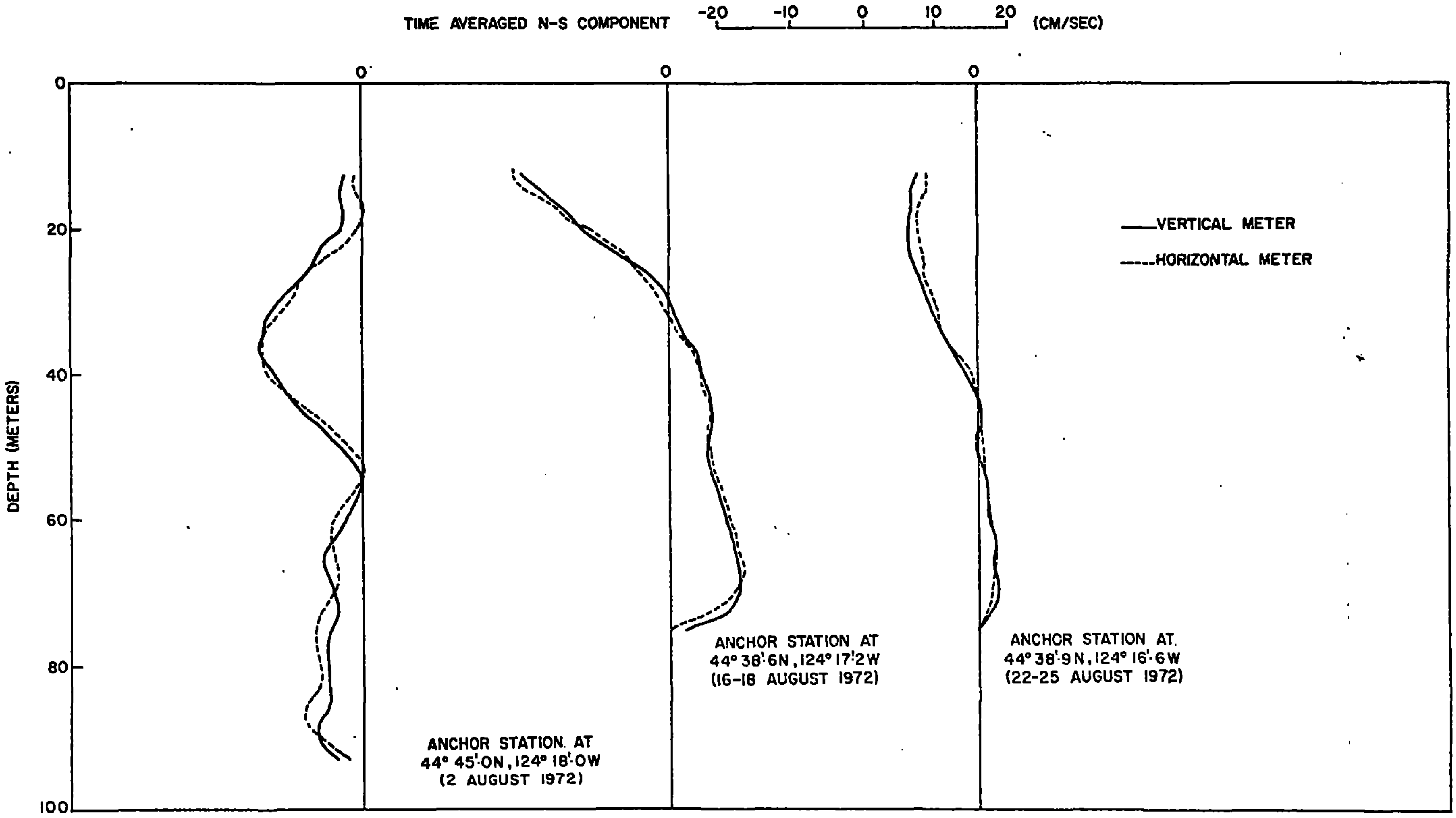

TIME AVERAGED N-S COMPONENT
-20 -10 0 10 20 (CM/SEC)
0
0
0
DEPTH (METERS)
0
20
40
60
80
100
VERTICAL METER
HORIZONTAL METER
ANCHOR STATION AT
44° 45'.0N, 124° 18'.0W
(2 AUGUST 1972)
ANCHOR STATION AT
44° 38'.6N, 124° 17'.2W
(16-18 AUGUST 1972)
ANCHOR STATION AT
44° 38'.9N, 124° 16'.6W
(22-25 AUGUST 1972)

FIGURE 2B

between velocity profiles (Fig. 2) is, in all cases, within rated instrumental error. This close correspondence has reinforced confidence in the decision to focus primary attention on the data from only one meter.

The profiles of temperature, current speed, current direction, north-south velocity component, and east-west velocity component from the vertically oriented meter are shown in this report.

C. Error Analysis

The ultimate accuracy of the processed data presented here is a function of the rated errors of the Aanderaa current meter sensors, digitizing and processing errors, applied calibration value errors, and errors introduced by the profiling technique itself. As given in section A, the digital resolution of the current meters is about an order of magnitude smaller than their rated accuracies. Furthermore, a step in the data processing procedure was a careful point-by-point editing of the data from computer generated plots and listings. During this process, obvious digitization and/or tape translation errors were removed. This operation, albeit a subjective one, is believed to have preserved the validity of the instruments' rated accuracy. Future plans include an objective scheme to perform and quantify this function. As described in Appendix I, pressure, temperature, and direction sensors were calibrated against standards with accuracies about an order of magnitude better than the rated accuracies of the sensors themselves; and the order of the derived polynomial calibration curves was chosen to be sufficiently high to reduce the error in the least squares fit to below that of the manufacturer's rated accuracies. Therefore, under stable, nonprofiling conditions, the data are accurate to within the current meter specifications. However, the time variabilities and the errors introduced by the profiling technique itself remain to be estimated.

As mentioned in Appendix I, the differences between pre- and post-experiment calibrations of each of the sensors were within rated instrumental error bounds. Thus, drifts in sensor accuracy over the time span of the experiment were considered negligible. Düing (1973, Section 4.2) has elaborated on the errors introduced by the profiling technique and has concluded that a reasonably good estimate of the resultant accuracy of the speed measurements is ±5% in the upper half of the water column, approaching ±10% in the bottom layer, with an estimate of overall precision at ±5%. These estimates were made for data taken from an anchored ship in the high speed Florida Current where wire angle (40° to 60°) is the principal source of error. Off Oregon, no significant wire angles were experienced, and precision depth recorder (PDR) traces of each instrument profile showed a constant descent rate in most cases. Experience has indicated that a change in wire angle is almost immediately detectable as a modification in descent rate as shown by the PDR. Therefore, for these data, wire angle errors and their subsequent corrections were not considered significant. However, the advantages of insignificant wire angles may be offset by the tendency for increased local accelerations due to the ship's yawing at anchor--an obviated situation in a strong current. In the data presented here, velocity corrections were only made (and tabulated within the appropriate sections following) when the ship was detectably dragging anchor and when the drift could be calculated from loran and radar fixes. Otherwise, no velocity corrections were made; but, when available, the ship's movement at anchor as referenced to a fixed buoy is presented graphically. From calculations based on these motions, as well as from a consideration of those factors examined by Düing (1973), accuracy of the speed data contained in this report is estimated to be ±10% overall.

Direction accuracy, as a function of the profiling technique off Oregon, is difficult to quantify precisely. Many of the factors, particularly the ship's motion about its anchor, which influence the speed accuracy also affect the direction accuracy. A reasonable estimate of the direction accuracy for these data is considered to be $\pm 10^{\circ}$.

Temperature and pressure accuracies are independent of the profiling technique; their values are those of the current meter specifications given in section A.

During the profiling operations at the anchor stations, chip log data were occasionally obtained. That is, the time for a small, neutrally buoyant "chip" to traverse the distance from bow to stern was measured. Then, from the ship's length and its heading, surface current speed and direction were calculated. Table 1 and Fig. 3 show the comparison of these data with the average surface layer data measured by the PCM. Considerable scatter in the comparison is evident, but the mean difference is close to zero. With all the uncertainties in both types of surface layer measurements, such a comparison cannot be weighted too heavily. It is included here for reference and completeness.

III. Data Graphics

Each of the following three sections, which correspond to each of the three cruises (Y7207-E, C7208-F1, C7208-F2), is organized in a similar fashion whenever possible. A figure showing the overall station locations for the cruise (Figs. 4, 10, and 14) is followed by a table giving the positions, times, and sampling statistics for all profiles taken during the cruise (Tables 2, 9, and 12). All times are Greenwich mean times (GMT). Wind data as recorded by the ship's officers are graphically displayed (Figs. 5, 11, and 15). The meteorological reference frame has been retai[illegible] that is, the directions are the directions from which the wind was blowing.

TABLE 1

Chronology of chip log observations

OBSERVATION NUMBER	DATE (MONTH/DAY)	TIME (GMT)	CHIP LOG		PCM		CHIP LOG - PCM	
			SPEED (CM/SEC)	DIRECTION (°T)	SPEED (CM/SEC)	DIRECTION (°T)	SPEED (CM/SEC)	DIRECTION (°T)
1	8/2	2205	23	NT	26	NA	- 3	---
2	8/18	1345	41	NT	38	NA	3	---
3	8/23	0112	35	170	29	150	6	20
4	8/23	0338	48	050	35	220	13	-170
5	8/23	0745	27	205	35	260	- 8	- 55
6	8/24	0907	19	005	32	220	-13	-215(+145)
7	8/24	1652	24	NT	27	NA	- 3	---
8	8/24	2327	32	190	31	170	1	20

NT: NOT TAKEN

NA: NOT APPLICABLE

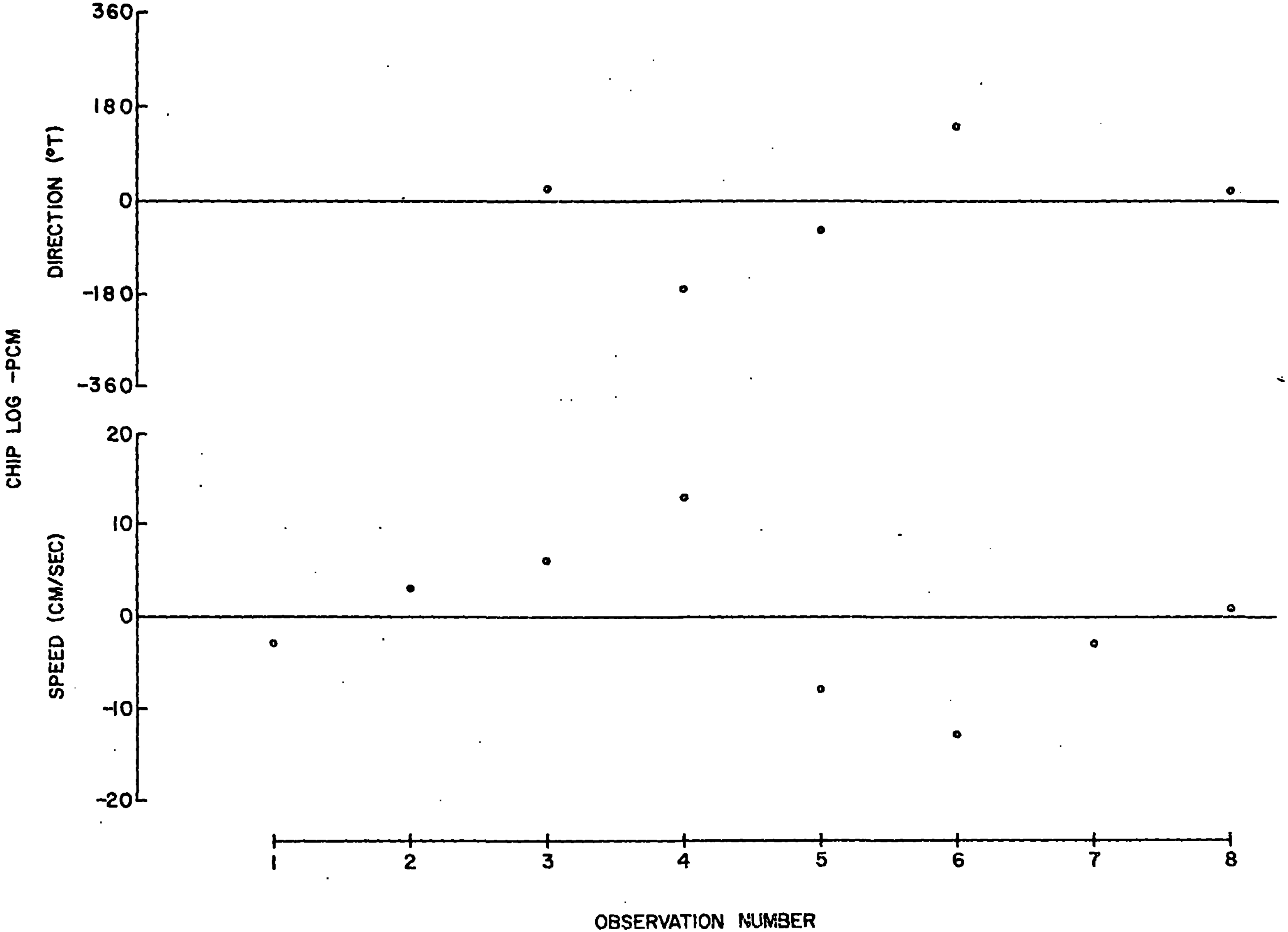


FIGURE 3

...data from the profiling current meter and visual chip log data

Anemometer height was 10 meters for the R/V YAQUINA and 6 meters for the R/V CAYUSE. Next appears a table of interpretive observations annotated during the cruise (Tables 3, 10, and 13). This is included to aid in further insight into specific segments of the data set. If any corrections were applied to the data, they then follow in tabular form (Table 4). For the two cruises on the R/V CAYUSE, no corrections were applied to the anchor station data; however, the ship's heading and distance to a fixed buoy (Beta buoy) were recorded hourly and are presented for reference graphically in Figs. 12 and 16.

The remaining figures and tables display and describe the observed and derived parameters from each discrete experiment on a particular cruise. A standard layout is adhered to with subdivisions of each figure as follows:

A - a chart showing station positions (Figs. 6A, 7A, 8A, 9A, 13A, and 17A);

B - the data (current speed, direction, east-west velocity component, north-south velocity component, and temperature) arranged as a series of consecutively measured profiles (Figs. 6B, 7B, 8B, 9B, 13B, and 17B); and

C - the data (temperature, east-west velocity component, and north-south velocity component) plotted as contours (Figs. 6C, 7C, 8C, 9C, 13C, and 17C).

Following the contours, a table is given that lists the sampling statistics for the data presented as a function of time rather than of depth (time series versus profiles) (Tables 5, 6, 7, 8, 11, and 14).

The contours were computer generated by a subroutine called ECHKON written for the National Hurricane Center, NOAA, Coral Gables. The characteristics of the contour subroutine are documented in Appendix II.

Figure 18 shows the position of the two anchor stations occupied on the two R/V CAYUSE cruises (C7208-F1 and C7208-F2) relative to the Beta buoy that was installed by Oregon State University.

Password:

accNo	fleA	refNo	proj	inst	ship	startDate	cruise	catId
7500531	L142	L01445	0048	3125	31YU	1972/08/15	C-7208 F1-	288615
7500531	L142	L01444	0048	3125	31YQ	1972/07/31	Y-7207E	288614
7500531	C100	BL1942	0071	3125	31YU	1972/08/01	C7208-F2	288607
7500531	C100	BL1943	0071	3125	31YU	1972/08/01	C7208-F1	288608
7500531	C100	BL1944	0071	3125	31YQ	1972/08/01	Y7207-E	288609
7500531	C100	BL1945	0071	3125	31YU	1972/08/01	C7208-F1	288610
7500531	C100	BL1946	0071	3125	31YU	1972/08/01	C7208-F2	288611
7500531	C100	BL1947	0071	3125	31YU	1972/08/01	C7208-F1	288612
7500531	C100	BL1948	0071	3125	31YU	1972/08/01	C7208-F2	288613

(9 rows affected)

Password:

accNo	fleA	refNo	ship	staCnt	recCnt	startDate	endDate
7500531	L142	L01445	31YU	179	9699	Aug 15 1972	Aug 25 1972
7500531	L142	L01444	31YQ	78	78	Jul 31 1972	Aug 7 1972
7500531	C100	BL1942	31YU	56	0	Aug 1 1972	Aug 1 1972
7500531	C100	BL1943	31YU	21	0	Aug 1 1972	Aug 1 1972
7500531	C100	BL1944	31YQ	15	0	Aug 1 1972	Aug 1 1972
7500531	C100	BL1945	31YU	66	0	Aug 1 1972	Aug 1 1972
7500531	C100	BL1946	31YU	11	0	Aug 1 1972	Aug 1 1972
7500531	C100	BL1947	31YU	9	0	Aug 1 1972	Aug 1 1972
7500531	C100	BL1948	31YU	17	0	Aug 1 1972	Aug 1 1972

(9 rows affected)