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A COMPILATION OF MOORED CURRENT METER AND WIND OBSERVATIONS

Volume V
(1966 MEASUREMENTS)

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TECHNICAL REPORT

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ABSTRACT

Summaries of wind and current measurements made with current meters and wind recorders by the Woods Hole Oceanographic Institution during the year 1966 are presented.

Averaged quantities are presented in computer-generated output as histograms, basic statistics, spectra, progressive vector diagrams, and east-north component plots.

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PREFACE

This report is the fifth of a series (Webster and Fofonoff, 1965, 1966, 1967; Pollard, 1970) intended to summarize the results of wind and current measurements collected as part of the Moored Array Program at the Woods Hole Oceanographic Institution. It covers the year 1966. Although there was poor equipment performance that year, the data that are summarized here are of good quality and have been of value in developing a description of time-dependent ocean currents.

The format of this report is slightly modified from the earlier ones. As experience in working with the data grows new techniques are developed. These are reflected in the choice of presentations in the data summary.

Comments or suggestions for improvements in future volumes of this series are invited.

Acknowledgements

The collection of ocean data requires the combined efforts of many people, from those who design the moorings, maintain the equipment and instruments, to those who write the computer programs and process and analyze the data. During 1966 the people who were involved in mooring preparation and sea

operations were: Nellie Anderson, Harold Armstrong, Henri Berteaux, Clayton Collins, James Gifford, Robert Heinmiller, Myron Howland, David Simoneau, Paul Stimson, Gordon Volkmann and Avron Zwilling.

Those concerned with data processing and analysis included: Marie Andrade, Dolores Daniels, Nick Fofonoff, John Maltais, Robert Millard, Susan Tarbell, Ferris Webster and Audrey Williams.

This report was prepared with the help of Caroline Harlow who handled the computer runs and Audrey Williams did the typing.

INTRODUCTION

Instrument Summary

During 1966 twenty-six moorings were set with a total of 107 instruments measuring current and wind. Of these, 45 were lost due to mooring failure; 9 had mechanical sensor failure; in 10 the film jammed; 1 film was light-struck; 2 had flooded cases and 17 were too short to be worth presenting in this report. The breakdown of instruments is shown in the following table:

	Instruments Set	Lost	Too Short Failures etc.	Presented in this report
Magnetic Tape Recording C.M.	51	25	18	8
Film Recording C.M.	37	17	11	9
Film Recording Wind Sensor	15	3	6	6
Digitizing Current/Temperature Sensor	4	-	4	-
Total	107	45	39	23

A time vs. depth presentation of the 23 data records is shown in Figure 1.

Moorings were set at five locations in 1966. Most were set at Site D (39° 20'N, 70°W) which lies about 50 km. south

of the Continental Shelf south of Cape Cod in water approximately 2600 meters deep. The others were set at the sites shown in Figure 2. Measurements were begun at Site J (36°N , 70°W) with the intention of obtaining a long-term series of measurements parallel to those at Site D. Because the difficulties of obtaining reliable moorings were much more severe at Site J than at Site D, the Site J program was discontinued in 1967.

Data Reduction

A system for editing and presenting data collected by various types of instruments has evolved as different data-collecting techniques and computer programs have been developed. Most data, whether collected on film or magnetic tape, are interval sampled (Webster, 1967). That is, bursts of rapid samples are separated by intervals in which no samples are taken. Some short term series, usually collected for studies of high-frequency phenomena, are sampled continuously with samples uniformly spaced in time.

During 1966, the first current meters with data storage on magnetic tape cartridges were used. This method of recording, using electronic techniques, is easier to match with digital computer processing than the earlier film recording, using optical-photographic techniques.

Data from both film-recording and tape-recording instruments were transcribed onto computer magnetic tape by Geodyne Corporation. For the work summarized here the data are stored on magnetic tape in the W.H.O.I.-standard format described by Maltais(1969).

The data are edited to remove bad values, such as erroneously high speeds. The data are then vector-averaged over each burst to give one velocity vector per interval. These vectors are listed in terms of speed and direction and obvious bad points are deleted and replaced by values linearly interpolated from the east and north Cartesian components. The resultant data is an evenly spaced time series which is used as the basic input for all further processing and graphic displays. This series may be further averaged to reduce the amount of data and to smooth high frequency noise which is sometimes evident in the basic vector series.

To insure that each data series has a unique identifier a set of informal guidelines has been established. For example, 1951WA900:

- 195 - The first three digits are the mooring number.
- 1 - The fourth digit indicates the position of the instrument on the mooring counting from the top down.

- W - When present 'W' signifies a wind recorder.
- A - The presence of a letter indicates that some editing of the data has been done, otherwise a '\$' symbol is used. Usually the amount of editing can be inferred from the position the letter has in the alphabet.
- 900 - Indicates that the data series has been averaged over 900 seconds.

1951WAlH is the 1-hour averaged series derived from 1951WA900. Another example is 2034F900: mooring 203, instrument position 4. Tape errors created when the file was transferred to a new computer system were corrected in versions 2034A through 2034D. 2034D was vector-averaged over the 15-minute recording bursts (2034D900). The bad points then evident were removed (2034E900) and replaced by linearly interpolated values (2034F900). 2034F900 is the best version of the data and is here used as the basic series.

Data Presentation

For each mooring there is a two-page mooring summary. This is followed by a four-page data summary for each instrument on the mooring that gave good data.

Mooring Summary

The first page of the mooring summary lists the instruments on the mooring. The instrument type is indicated by the following code:

- FCM - Film-recording current meter
- MCM - Magnetic tape-recording current meter
- FWR - Film-recording wind sensor
- D - Digitizer (A current meter with 4 separate channels for digitizing the voltage from temperature sensors.)

An asterisk (*) following the data name indicates that the data are included in the report. The depth of the instrument below the sea surface is in meters and is accurate to within about ten percent. The instrument numbers and brief comments about performance conclude the information on this page.

The second page contains the basics of the mooring; when, where and why the mooring was set with comments on the results.

Data Summary

The first page of the summary for each instrument lists the main features of the data series collected from that instrument. The START and STOP time give the period of usable data. All times are Greenwich Mean Time and are given as year, month, day (66-V-18) followed by hour, minute, second (060259). The sampling scheme and the timing of the sampling are included as well as more detailed comments on instrument behavior and data quality.

The presentations on the remaining pages are described below.

HISTOGRAM (HISTO):

The HISTOGRAMS presented are SPEED histograms derived from vector-averaged data. The speeds seen on histograms of raw data appear to be higher due to the presence of high-frequency noise. The noise is usually caused by mooring motion and/or surface waves. Vector-averaging over the burst of samples serves to reduce such noise so that a more meaningful histogram can be obtained.

The bars of the histogram are scaled so that the class interval with the greatest frequency has a bar the full width of the printing space.

The frequency is the number of occurrences of speed within each class interval. For instance, 170 speeds out of 2055 in record 1921E1800 fell between 5.0 and 5.5 cm./sec. The mid-point of each class interval is listed.

The average speed, printed at the end of the histogram, is an arithmetic mean.

The number of data out of range are the number of speed values exceeding the maximum chosen for the histogram plot.

Statistics (STATS):

Standard statistical parameters are calculated for data in the time-range given at the bottom of the table. If there are n speed and direction values in a sample,

(S_i, θ_i) , $i = 1, 2, \dots, n$, and we define

$E_i = S_i \sin \theta_i$, $N_i = S_i \cos \theta_i$, then

$$\text{mean, } \bar{A} = \frac{1}{n} \sum_{i=1}^n A_i \quad (\text{for } A = E, N, \text{ and } S)$$

$$\text{variance, } \sigma_A^2 = \frac{1}{n} \sum_{i=1}^n A_i^2 - \bar{A}^2$$

standard error of the mean = $\frac{\sigma_A}{\sqrt{n}}$

standard deviation = σ_A

$$\text{skewness} = \frac{1}{\sigma_A^3} \left[\frac{1}{n} \sum_{i=1}^n A_i^3 - \frac{3\bar{A}}{n} \sum_{i=1}^n A_i^2 + 2\bar{A}^3 \right]$$

$$\text{kurtosis} = \frac{1}{\sigma_A^4} \left[\frac{1}{n} \sum_{i=1}^n A_i^4 - \frac{4\bar{A}}{n} \sum_{i=1}^n A_i^3 + \frac{6\bar{A}^2}{n} \sum_{i=1}^n A_i^2 - 3\bar{A}^4 \right]$$

The units of speed are given in the heading for each section of the table.

The program also calculates "East and North" statistics,

$$\text{covariance, } M = \frac{1}{n} \sum_{i=1}^n E_i N_i - \bar{E} \bar{N}$$

standard deviation of covariance, σ_m

$$= \sqrt{\frac{1}{n} \sum_{i=1}^n (E_i N_i)^2 - \overline{E_i N_i}^2}$$

standard error of covariance = $\frac{\sigma_m}{\sqrt{n}}$

correlation coefficient, $M' = \frac{M}{\sigma_E \sigma_N}$.

The program also calculates vector quantities, defined by
vector mean, $V_m = \sqrt{\bar{E}^2 + \bar{N}^2}$

vector variance, $V_v^2 = \frac{1}{2} (\sigma_E^2 + \sigma_N^2)$

standard deviation = V_v .

Spectrum:

Spectra are plotted in log-log format, the scale being 1" per decade. (A log-log grid suitable for overlaying is inserted in the back of the report for convenience.) Data in the time range given are split into a number of pieces. The number of estimates in each piece may be reduced by averaging. The program uses the Fast Fourier Transform algorithm (Singleton, 1969) and is restricted to the set of numbers that can be factored by 2, 3, 4 or 5. Thus the time range is usually shorter than the length of good record. The number of degrees of freedom (d.f.) for the plotted points for low-frequency values on the plot is given by $(4 \times \text{number of pieces} \times \text{number of frequency bands averaged})$.

over), e.g. for 1933G900 (p. 14) the number of d. f. = $4 \times 2 \times 3 = 24$. Since the log-log plot bunches points closer together as the frequency increases, averaging over more frequency bands is done for larger values of the frequency. This smooths the plot and increases the number of degrees of freedom for the larger frequency values. It has the further advantage of resolving the low-frequency peaks (usually inertial and semidiurnal) as finely as possible while increasing the number of degrees of freedom in the internal wave region of the spectra. The algorithm is as follows: counting from the left of the plot, the first 40 plotted points are averaged as stated in the label, the next 15 plotted points are averaged over twice as many frequency bands as in the label, the next 6 points over 5 times as many, the next 30 points over 10 times as many, the next 15 points over 20 times as many, the next 6 points over 50 times as many, and further points, if any, over 100 times as many.

PROGRESSIVE VECTOR DIAGRAM (PROVEC):

The EAST and NORTH progressive displacements are computed from SPEED and DIRECTION values which were derived from the 1-hour vector averaged data. The plot begins with an asterisk (*) on a day boundary. All following day boundaries are

indicated with a (+) except the few cases where the data was less than 1-day long. For instance, 1962WF300 on page 27. This type of plot accentuates very low frequency events at the expense of higher frequency oscillations which may be hidden by a large amplitude low-frequency current.

EAST vs. NORTH SCATTERPLOT:

The EAST and NORTH components are plotted against each other to give a pictorial indication of the DIRECTION and SPEED of the velocity vectors. This type plot can be helpful in finding instrument malfunctions and characteristics not easily noticed elsewhere.

EAST and NORTH vs. TIME PLOT:

This is a diagram of EAST and NORTH components plotted as a function of TIME. The plot is usually generated from the 1-hour vector averaged series. This type of plot is complementary to the PROGRESSIVE VECTOR diagram since it accentuates higher frequency events such as inertial and tidal oscillations.

FIGURES

Figure 1. Time-depth diagram of the data in this report

Figure 2. Map showing sites at which data were collected for this report.

1966

+ Jan + Feb + Mar + Apr + May + Jun + Jul + Aug + Sep + Oct + Nov + Dec +

Figure 1

Figure 2

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Mooring No. 192

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
1921*	FCM	3270 m.	H-305	

Water Depth 3300 m.

Mooring No. 192

Set:

<u>38° 28.8'N</u>	<u>66</u>	<u>Jan</u>	<u>5</u>	<u>14</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>70° 00.5'W</u>	<u>66</u>	<u>Feb</u>	<u>17</u>	<u>18</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set
by: J. Bruce Ship R. V. Atlantis II Cruise 18

MOORING:

Subsurface gasoline filled float with 9/16" plaited nylon and 200-pound anchor. Current meter 30 m. above ocean bottom.

PURPOSE OF MOORING:

Current measurements under the Gulf Stream. (Site G).

COMMENTS ON RESULTS:

Routine set and recovery.

Data number: 1921

Instrument No.: H-305

Type: Film current meter

Depth: 3270 m.

Water depth: 3300 m.

Start time: 66-I-05 14.35.37

Stop time: 66-II-17 09.35.37

Duration: 42 days, 19 hours

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 15

interval time = 30 minutes

COMMENTS:

Film transport problems. Alternate intervals were lost and only every other interval could be used. Instead of 30 strobes every 15 minutes (900 sec.), only 15 strobes every half hour could be read from the film record.

STATS DATA/1921E1800

*** EAST (MM/SEC) ***

MEAN = -42.74 STD ERR = 0.83

VARIANCE = 1408.26

STD. DEV. = 37.53

KURTOSIS = 5.63

SKENNESS = -0.704

*** NORTH (MM/SEC) ***

MEAN = -14.68 STD ERR = 0.54

VARIANCE = 599.93

STD. DEV. = 24.49

KURTOSIS = 3.89

SKENNESS = -0.487

*** SPEED (MM/SEC) ***

MEAN = 53.72 STD ERR = 0.75

VARIANCE = 1164.21

STD. DEV. = 34.12

KURTOSIS = 3.60

SKENNESS = 0.915

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = 39.31 STD ERR = 35.97

STD. DEV. OF COVARIANCE = 1630.72

CORRELATION COEFFICIENT = 0.043

***** VECTOR MEANS *****

*** EAST & NORTH (MM/SEC) ***

MEAN = 45.19

VARIANCE = 1004.09

STD. DEV. = 31.69

SAMPLE SIZE = 2055 POINTS

SPANNING RANGE

FROM 66- I-05 14.35,37

TO 66-II-17 09.35,37

1921E1800
3270.00M.
66-I-05 TO 66-II-17
1 PIECES WITH 1024 ESTIMATES
PER PIECE. AVERAGED OVER
5 ADJACENT FREQUENCY BANDS

1921E1H

Mooring No. 193

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
1931	FCM	92 m.	H-660	Instrument malfunction damaged film so that it could not be read.
1932*	FCM	492 m.	H-550	
1933*	FCM	994 m.	H-302	
1934	FCM	1994 m.	H-542	Stuck compass and vane. Speeds only are good, but are not included in this report.

Water Depth 2604 m.

Mooring No. 193

Set:

<u>39° 19'N</u>	<u>66</u>	<u>Feb</u>	<u>7</u>	<u>11</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>70° 00'W</u>	<u>66</u>	<u>Jun</u>	<u>24</u>	<u>22</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set
by: P. Stimson Ship R. V. Chain Cruise 56B

MOORING:

Subsurface 4' sphere with 1/4" poly-covered steel tow cable
and 1500-pound anchor.

PURPOSE OF MOORING:

To maintain Site D.

COMMENTS ON RESULTS:

Acoustic release did not respond. Mooring was recovered after
back-up timer on release fired.

Data number: 1932

Instrument No.: H-550

Type: Film current meter

Depth: 492 m.

Water depth: 2604 m.

Start time: 66-II-07 11.43.30

Stop time: 66-III-28 22.58.30

Duration: 49 days, 11 hours, 15 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 20

interval time = 15 minutes

COMMENTS: Apparently data is of good quality.

TOTAL NUMBER OF INPUT DATA * 4750 WITH AVERAGE VALUE * 7.29 CH/SEC
 HIGHEST SPEED * 25.60 CH/SEC
 NUMBER OF DATA OUT OF RANGE * 0
 SPANNING RANGE
 FROM 66-III-07 11.43.30
 TO 66-III-28 22.58.30

STATS DATA/1932J900

*** EAST (MM/SEC) ***
 MEAN = -61.99 STD ERR = 0.62
 VARIANCE = 1823.66
 STD. DEV. = 42.70
 KURTOSIS = 3.08
 SKEWNESS = -0.416

*** NORTH (MM/SEC) ***
 MEAN = 9.38 STD ERR = 0.49
 VARIANCE = 1159.33
 STD. DEV. = 34.05
 KURTOSIS = 3.87
 SKEWNESS = 0.423

*** SPEED (MM/SEC) ***
 MEAN = 72.27 STD ERR = 0.60
 VARIANCE = 1691.66
 STD. DEV. = 41.13
 KURTOSIS = 3.05
 SKEWNESS = 0.550

*** EAST & NORTH (MM/SEC) ***
 COVARIANCE = 152.56 STD ERR = 43.74
 STD. DEV. OF COVARIANCE = 3014.40
 CORRELATION COEFFICIENT = 0.105

***** VECTOR MEANS *****
 *** EAST & NORTH (MM/SEC) ***
 MEAN = 62.70
 VARIANCE = 1491.50
 STD. DEV. = 38.62

SAMPLE SIZE = 4750 POINTS

SPANNING RANGE
 FROM 66-III-07 11.43.30
 TO 66-III-28 22.58.30

1932J900
 492.00M.
 66-II-07 TO 66-III-27
 2 PIECES WITH 1152 ESTIMATES
 PER PIECE. AVERAGED OVER
 3 ADJACENT FREQUENCY BANDS

1932J1H

1932J1H
492 M

Data number: 1933

Instrument No.: H-302

Type: Film current meter

Depth: 994 m.

Water depth: 2604 m.

Start time: 66-II-07 12.00.30

Stop time: 66-III-30 10.15.30

Duration: 50 days, 22 hours, 15 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 22

interval time = 15 minutes

COMMENTS:

Because of wiring error during instrument maintenance, chronometer is not accurate. Particularly, the final tenth of this record suffers from erratic film advance and chronometer pulses. The rest of the record seems to be of good quality.

CV/SEC

8.32

TOTAL NUMBER OF INPUT DATA * 4890 * WITH AVERAGE VALUE *
HIGHEST SPEED * 22.80 CV/SEC
NUMBER OF DATA OUT OF RANGE * 0
SPANNING RANGE
FROM 66-11-07 12:00:30
TO 66-11-30 10:15:30

STATS

DATA/1933G900

*** EAST (MM/SEC) ***

MEAN = -62.65 STD ERR = 0.72
VARIANCE = 2565.76
STD. DEV. = 50.65
KURTOSIS = 3.06
SKEWNESS = 0.182

*** NORTH (MM/SEC) ***

MEAN = 11.62 STD ERR = 0.64
VARIANCE = 1990.30
STD. DEV. = 44.61
KURTOSIS = 3.39
SKEWNESS = 0.348

*** SPEED (MM/SEC) ***

MEAN = 82.50 STD ERR = 0.61
VARIANCE = 1808.79
STD. DEV. = 42.53
KURTOSIS = 2.50
SKEWNESS = 0.392

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = 105.82 STD ERR = 56.33
STD. DEV. OF COVARIANCE = 3939.31
CORRELATION COEFFICIENT = 0.047

***** VECTOR MEANS *****

*** EAST & NORTH (MM/SEC) ***

MEAN = 63.71
VARIANCE = 2278.03
STD. DEV. = 47.73

SAMPLE SIZE = 4890 POINTS

SPANNING RANGE
FROM 66-11-07 12:00:30
TO 66-11-30 10:15:30

1933G900
994.00M.
66-II-07 TO 66-III-29
2 PIECES WITH 1200 ESTIMATES
PER PIECE. AVERAGED OVER
3 ADJACENT FREQUENCY BANDS

1933G1H

1933G1H
994 M

Mooring No. 195

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
1951*	FWR	-2 m.	W-126	
1952	FCM	20 m.	H-548	Instrument case leaked. Seawater severely damaged film. Vane did not oper- ate, and rotor failed dur- ing period of exposure.
1953	FCM	500 m.	H-664	Film transport failed due to clock malfunction.
1954	FCM	4000 m.	H-284	Film transport failed due to gear breakdown.

Water Depth 4500 m.

Mooring No. 195

Set:

<u>35° 59'N</u>	<u>66</u>	<u>Feb</u>	<u>18</u>	<u>19</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>69° 58'W</u>	<u>66</u>	<u>Apr</u>	<u>26</u>	<u>19</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set
by: N. Fofonoff Ship R. V. Chain Cruise 57

MOORING:

Surface toroid with 1/4" tow cable and 9/16" plaited nylon and 1500-pound anchor.

PURPOSE OF MOORING:

First of Site J moorings.

COMMENTS ON RESULTS:

Mooring seems to have drifted. Buoy retrieved at 36° 20.5'N, 69° 37.5'W. Acoustic release had mud on both ends. Only wind recorder gave good quality data from this mooring.

Data number 1951

Instrument No.: W-126

Type: Film wind recorder

Depth: surface

Water depth: 4500 m.

Start time: 66-II-18 19.15.00

Stop time: 66-IV-27 05.15.00

Duration: 67 days, 10 hours

Sampling scheme: Continuous

one reading every 600 seconds

COMMENTS:

Film was read manually rather than with automatic film reader.

Data were used by Day (1970) in comparison between moored anemometers and Weather Bureau charts.

STATS DATA/1951WA1800

*** EAST (DM/SEC) ***

MEAN = 25.39
VARIANCE = 2376.70
STD. DEV. = 48.75
KURTOSIS = 2.10
SKEWNESS = -0.344

STD ERR = 0.86

*** NORTH (DM/SEC) ***

MEAN = -2.51
VARIANCE = 3133.25
STD. DEV. = 55.98
KURTOSIS = 2.17
SKEWNESS = 0.316

STD ERR = 0.98

*** SPEED (DM/SEC) ***

MEAN = 75.30
VARIANCE = 491.21
STD. DEV. = 22.16
KURTOSIS = 2.93
SKEWNESS = -0.025

STD ERR = 0.39

*** EAST & NORTH (DM/SEC) ***

COVARIANCE = -227.97
STD. DEV. OF COVARIANCE = 2352.72
CORRELATION COEFFICIENT = -0.084

STD ERR = 41.35

***** VECTOR MEANS *****

*** EAST & NORTH (DM/SEC) ***

MEAN = 25.51
VARIANCE = 2754.97
STD. DEV. = 52.49

SAMPLE SIZE = 3237 POINTS

SPANNING RANGE
FROM 66-II-18 19.15.00
TO 66-IV-27 05.15.00

1951WA1800
WIND
66-II-18 TO 66-IV-26
1 PIECES WITH 1600 ESTIMATES
PER PIECE. AVERAGED OVER
5 ADJACENT FREQUENCY BANDS

1951WA1H

0. 5000.
KILOMETERS

1951WA1H

WIND

66- II -19 TO 66- IV -27

1951W11H
WIND

Mooring No. 196

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
1961	FWR	-2 m.	W-123	
1962*	FWR	-2 m.	W-161	Wind recorder W-123 (1961) was replaced after about 24 hours of exposure by wind recorder W-161. The high sampling rate (0.5 sec.) uses up a film capacity in about a day.

Water Depth 37 m.

Mooring No. 196

Set:

<u>41° 09.6'N</u>	<u>66</u>	<u>Apr</u>	<u>15</u>	<u>16</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>70° 41.8'W</u>	<u>66</u>	<u>Apr</u>	<u>17</u>	<u>16</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set

by: R. Heinmiller Ship R. V. Crawford Cruise 139

MOORING:

Surface toroid in 37 m. of water. Three-point mooring with 9/16" plaited nylon and three 200-pound anchors.

PURPOSE OF MOORING:

To compare the quality of wind data collected from a toroid-mounted anemometer with that collected from a stable spar-mounted anemometer.

COMMENTS ON RESULTS:

Results discussed by Day (1970).

Data number 1962

Instrument No.: W-161

Type: Film current meter

Depth: surface

Water depth: 37 m.

Start time: 66-IV-16 17.16.30

Stop time: 66-IV-17 14.01.30

Duration: 20 hours, 45 minutes

Sampling Scheme: Continuous

one reading every 0.5 seconds

COMMENTS:

STATS

DATA/1962WF300

*** EAST (DM/SEC) ***

MEAN = -9.77 STD ERR = 0.57
 VARIANCE = 80.87
 STD. DEV. = 8.99
 KURTOSIS = 3.09
 SKEWNESS = 0.504

*** NORTH (DM/SEC) ***

MEAN = 25.64 STD ERR = 1.17
 VARIANCE = 344.46
 STD. DEV. = 18.56
 KURTOSIS = 2.05
 SKEWNESS = 0.256

*** SPEED (DM/SEC) ***

MEAN = 30.36 STD ERR = 1.01
 VARIANCE = 256.33
 STD. DEV. = 16.01
 KURTOSIS = 1.95
 SKEWNESS = 0.393

*** EAST & NORTH (DM/SEC) ***

COVARIANCE = -9.15 STD ERR = 19.69
 STD. DEV. OF COVARIANCE = 311.37
 CORRELATION COEFFICIENT = -0.055

***** VECTOR MEANS *****

*** EAST & NORTH (DM/SEC) ***

MEAN = 27.44
 VARIANCE = 212.67
 STD. DEV. = 14.58

SAMPLE SIZE = 250 POINTS

SPANNING RANGE
 FROM 66-IV-16 17.16.30
 TO 66-IV-17 14.01.30

1962WF300

0. 60.
KILOMETERS

1962WF300

WIND

66- IV -16 TO 66- IV -17

Mooring No. 198

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
1981*	FWR	-2 m.	W-159	Short, anemometer failed after one week.
1982*	FCM	6 m.	H-788	
	Electrode	9 m.	#1	
1983	FCM	98 m.	H-789	Film transport jammed — no data.
	Electrode	700 m.	#2	
1984	MCM	1000 m.	M-103	Instrument lost.

Water Depth 2565 m.

Mooring No. 198

Set:

<u>39° 22.5'N</u>	<u>66</u>	<u>Apr</u>	<u>20</u>	<u>15</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>69° 58.0'W</u>	<u>66</u>	<u>May</u>	<u>23</u>	<u>18</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set

by: R. Heinmiller Ship R. V. Crawford Cruise 140

MOORING:

Surface toroid with 1/4" tow cable and 9/16" plaited nylon and 1500-pound anchor.

PURPOSE OF MOORING:

To maintain Site D data collection, and to measure electric potential between the surface and 500 meters.

COMMENTS ON RESULTS:

The mooring started drifting on May 8th at 1200 hours. The toroid and upper two current meters were picked up by the tanker "Sinclair Venezuela" at 39° 30'N, 71° 22'W. The electric potential measurements are discussed by Sanford (1967).

Data number 1981

Instrument No.: W-159

Type: Film wind recorder

Depth: surface

Water depth: 2565 m.

Start time: 66-IV-20 14.35.07

Stop time: 66-IV-28 01.35.07

Duration: 7 days, 11 hours

Sampling scheme: Interval

time between strobes = .5 seconds

no. of strobes per interval = 30

interval time = 15 minutes

COMMENTS:

Data given here only until time of anemometer failure.

DATA/1981WB900

STATS

*** EAST (DM/SEC) ***

MEAN = -5.87
VARIANCE = 2310.56
STD. DEV. = 48.07
KURTOSIS = 1.83
SKEWNESS = 0.016

STD ERR = 1.80

*** NORTH (DM/SEC) ***

MEAN = 3.74
VARIANCE = 1033.60
STD. DEV. = 32.15
KURTOSIS = 2.12
SKEWNESS = -0.305

STD ERR = 1.20

*** SPEED (DM/SEC) ***

MEAN = 54.36
VARIANCE = 437.57
STD. DEV. = 20.92
KURTOSIS = 3.02
SKEWNESS = 0.234

STD ERR = 0.78

*** EAST & NORTH (DM/SEC) ***

COVARIANCE = 234.20
STD. DEV. OF COVARIANCE = 1589.10
CORRELATION COEFFICIENT = 0.152

STD ERR = 59.35

***** VECTOR MEANS *****

*** EAST & NORTH (DM/SEC) ***

MEAN = 6.96
VARIANCE = 1672.08
STD. DEV. = 40.89

SAMPLE SIZE = 717 POINTS

SPANNING RANGE
FROM 66-IV-20 14.35.07
TO 66-IV-28 01.35.07

TOTAL NUMBER OF INPUT DATA * 717 WITH AVERAGE VALUE * 5.49

HIGHEST SPEED * 111.20 M/SEC

NUMBER OF DATA OUT OF RANGE * 0

SPANNING RANGE
FROM 66-IV-20 14.35.07
TO 66-IV-28 01.35.07

1981WB900
WIND
66-IV-20 TO 66-IV-27
1 PIECES WITH 324 ESTIMATES
PER PIECE. AVERAGED OVER
5 ADJACENT FREQUENCY BANDS

Data number 1982

Instrument No.: H-788

Type: Film current meter

Depth: 6 m.

Water depth: 2565 m.

Start time: 66-IV-22 05.50.30

Stop time: 66-V-08 13.35.30

Duration: 16 days, 07 hours, 45 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 20

interval time 15 minutes

COMMENTS:

Film record of generally good quality. Occasional vane sticking and a few erratic rotor pulses.

Mooring went adrift 1200 on May 8th.

Results of a comparison between currents at Site D (1982) and Site J (1992) are given by Fofonoff and Webster (1971).

STATS

DATA/1982A900

*** EAST (MM/SEC) ***

MEAN = -135.81
VARIANCE = 40127.77
STD. DEV. = 200.32
KURTOSIS = 2.76
SKEWNESS = 0.328
STD ERR = 5.06

*** NORTH (MM/SEC) ***

MEAN = 27.17
VARIANCE = 43792.01
STD. DEV. = 209.27
KURTOSIS = 2.46
SKEWNESS = 0.032
STD ERR = 5.28

*** SPEED (MM/SEC) ***

MEAN = 291.84
VARIANCE = 17934.01
STD. DEV. = 133.92
KURTOSIS = 2.35
SKEWNESS = 0.098
STD ERR = 3.38

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = 1430.03
STD. DEV. OF COVARIANCE = 48501.46
CORRELATION COEFFICIENT = 0.034
STD ERR = 1224.85

***** VECTOR MEANS *****

*** EAST & NORTH (MM/SEC) ***

MEAN = 138.50
VARIANCE = 41959.89
STD. DEV. = 204.84

SAMPLE SIZE = 1568 POINTS

SPANNING RANGE

FROM 66-IV-22 05.50.30

TO 66- V-08 13.35.30

1982A900
6.00 M.
66-IV-22 TO 66-V-08
1 PIECES WITH 768 ESTIMATES
PER PIECE. AVERAGED OVER
5 ADJACENT FREQUENCY BANDS

1982A1H

Mooring No. 199

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
1991	FWR	-2 m.	W-160	No data, film did not run through.
1992*	FCM	6 m.	H-304	
1993	MCM	50 m.	M-104	No data, tape capstan did not engage.
1994*	FCM	500 m.	H-792	
1995*	FCM	1000 m.	H-137	
1996	FCM	2000 m.	H-787	Instrument lost.
1997	FCM	4000 m.	H-305	Instrument lost.

Water Depth 4500 m.

Mooring No. 199

Set:

<u>35° 57'N</u>	<u>66</u>	<u>Apr</u>	<u>22</u>	<u>19</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>70° 02.8'W</u>	<u>66</u>	<u>May</u>	<u>19</u>	<u>03</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set
by: R. Heinmiller Ship R. V. Crawford Cruise 140

MOORING:

Surface toroid with 9/16" plaited nylon and 1/4" tow cable and 3000-pound anchor.

PURPOSE OF MOORING:

To maintain Site J data collection.

COMMENTS ON RESULTS:

Lowest two current meters lost. Mooring was adrift when recovered by R. V. Crawford at 36° 03.5'N, 70° 20.5'W. The mooring was reported on station on April 26th.

Data number: 1992

Instrument No.: H-304

Type: Film current meter

Depth: 6 m.

Water depth: 4500 m.

Start time: 66-IV-22 20.27.30

Stop time: 66-V-19 01.12.30

Duration: 26 days, 04 hours, 45 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 20

interval time = 15 minutes

COMMENTS:

High mean speed, with a lot of fluctuation in the vane.

Data generally good.

Results here from Site J compared with simultaneous measurements at Site D (1982) by Fofonoff and Webster (1971).

STATS DATA/1992B900

*** EAST (MM/SEC) ***

MEAN = -148.88
 VARIANCE = 27878.68
 STD. DEV. = 166.97
 KURTOSIS = 2.73
 SKEWNESS = -0.054

STD ERR = 3.33

*** NORTH (MM/SEC) ***

MEAN = 76.25
 VARIANCE = 39782.53
 STD. DEV. = 199.46
 KURTOSIS = 2.84
 SKEWNESS = -0.225

STD ERR = 3.98

*** SPEED (MM/SEC) ***

MEAN = 277.10
 VARIANCE = 18855.98
 STD. DEV. = 137.32
 KURTOSIS = 2.51
 SKEWNESS = 0.313

STD ERR = 2.74

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = 3165.76
 STD. DEV. OF COVARIANCE = 46853.44
 CORRELATION COEFFICIENT = 0.095

STD ERR = 934.08

***** VECTOR MEANS *****

*** EAST & NORTH (MM/SEC) ***

MEAN = 167.27
 VARIANCE = 33830.60
 STD. DEV. = 183.93

SAMPLE SIZE = 2516 POINTS

SPANNING RANGE
 FROM 66-IV-22 20:27.30
 TO 66-V-19 01:12.30

1992B900
 6.00 M.
 66-IV-22 TO 66-V-16
 1 PIECES WITH 1152 ESTIMATES
 PER PIECE. AVERAGED OVER
 5 ADJACENT FREQUENCY BANDS

1992B1H

0. 150.
KILOMETERS

1992B1H

6 M

66- IV -23 TO 66- V -19

Data number: 1994

Instrument No.: H-792

Type: Film current meter

Depth: 500 m.

Water depth: 4500 m.

Start time: 66-IV-22 21.04.30

Stop time: 66-V-19 02.49.30

Duration: 26 days, 05 hours, 45 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 16

interval time = 15 minutes

COMMENTS:

Film was difficult to read with automatic film reader and bad data points were removed by subsequent editing.

STATS

DATA/1994D900

*** EAST (MM/SEC) ***
 MEAN = -198.27
 VARIANCE = 9327.73
 STD. DEV. = 96.58
 KURTOSIS = 3.06
 SKEWNESS = 0.162

STD ERR = 1.92

*** NORTH (MM/SEC) ***
 MEAN = 110.06
 VARIANCE = 15951.36
 STD. DEV. = 126.30
 KURTOSIS = 2.08
 SKEWNESS = -0.001

STD ERR = 2.52

*** SPEED (MM/SEC) ***
 MEAN = 260.82
 VARIANCE = 8679.04
 STD. DEV. = 93.16
 KURTOSIS = 2.94
 SKEWNESS = -0.319

STD ERR = 1.86

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = 37.13
 STD. DEV. OF COVARIANCE = 26849.85
 CORRELATION COEFFICIENT = 0.003

STD ERR = 534.86

***** VECTOR MEANS *****

*** EAST & NORTH (MM/SEC) ***

MEAN = 226.77
 VARIANCE = 12639.55
 STD. DEV. = 112.43

SAMPLE SIZE = 2520 POINTS

SPANNING RANGE
 FROM 66-IV-22 21.04.30
 TO 66-V-19 02.49.30

1994D900
 500.00M.
 66-IV-22 TO 66-V-16
 1 PIECES WITH 1152 ESTIMATES
 PER PIECE. AVERAGED OVER
 5 ADJACENT FREQUENCY BANDS

1994D1H

Data number: 1995

Instrument No.: H-137

Type: Film current meter

Depth: 1000 m.

Water depth: 4500 m.

Start time: 66-IV-22 22.08.30

Stop time: 66-V-19 02.08.30

Duration: 26 days, 04 hours

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 18

interval time = 15 minutes

COMMENTS:

Film was difficult to read with automatic film reader.

Bad data points were removed by subsequent editing.

STATS

DATA/19956900

*** EAST (MM/SEC) ***

MEAN = -53.71
VARIANCE = 5149.11
STD. DEV. = 71.76
KURTOSIS = 3.29
SKEWNESS = 0.440
STD ERR = 1.43

*** NORTH (MM/SEC) ***

MEAN = 53.96
VARIANCE = 5153.59
STD. DEV. = 71.79
KURTOSIS = 3.24
SKEWNESS = -0.694
STD ERR = 1.43

*** SPEED (MM/SEC) ***

MEAN = 118.59
VARIANCE = 2035.57
STD. DEV. = 45.12
KURTOSIS = 2.62
SKEWNESS = 0.125
STD ERR = 0.90

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = 157.13
STD. DEV. OF COVARIANCE = 6785.21
CORRELATION COEFFICIENT = 0.031
STD ERR = 135.35

***** VECTOR MEANS *****

*** EAST & NORTH (MM/SEC) ***

MEAN = 76.14
VARIANCE = 5151.35
STD. DEV. = 71.77

SAMPLE SIZE = 2513 POINTS

SPANNING RANGE
FROM 66-IV-22 22.08.30
TO 66-V-19 02.08.30

1995G900
1000.00M.
66-IV-22 TO 66-V-16
1 PIECES WITH 1152 ESTIMATES
PER PIECE. AVERAGED OVER
5 ADJACENT FREQUENCY BANDS

1995G1H

Mooring No. 202

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
2021*	FWR	-2 m.	W-123	
2022	MCM	7 m.	M-111	Very high noise level and inter-record gaps that were too short prevented a use- ful recovery of data from magnetic tape record.
2023	FCM	50 m.	H-792	Instrument lost.
2024	FCM	100 m.	H-284	Instrument lost.
2025	FCM	500 m.	H-304	Instrument lost.

Water Depth 2560 m.

Mooring No. 202

Set:

<u>39° 20.5'N</u>	<u>66</u>	<u>Jun</u>	<u>24</u>	<u>14</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>69° 53.5'W</u>	<u>66</u>	<u>Aug</u>	<u>9</u>	<u>19</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set
by: R. Heinmiller Ship R. V. Crawford Cruise 143

MOORING:

Surface toroid with 1/4" tow cable and 9/16" plaited nylon and 1500-pound anchor with weak link.

PURPOSE OF MOORING:

To maintain Site D data collection.

COMMENTS ON RESULTS:

Mooring broke at swaged wire termination just above second current meter as the mooring was being hauled on recovery. Apparently weak link was stronger than wire termination.

Data number: 2021

Instrument No.: W-123

Type: Film wind recorder

Depth: Surface

Water depth: 2560 m.

Start time: 66-VI-24 13.50.02

Stop time: 66-VIII-09 19.50.02

Duration: 46 days, 6 hours

Sampling scheme: Interval

time between strobes = .5 seconds

no. of strobes per interval = 9

interval time = 50 minutes

COMMENTS:

Apparently good data quality.

STATS DATA/2021WD50M

*** EAST (DM/SEC) ***

MEAN = 8.82
 VARIANCE = 1732.09
 STD. DEV. = 41.62
 KURTOSIS = 2.89
 SKEWNESS = -0.322

STD ERR = 1.14

*** NORTH (DM/SEC) ***

MEAN = 9.66
 VARIANCE = 2117.14
 STD. DEV. = 46.01
 KURTOSIS = 3.25
 SKEWNESS = -0.436

STD ERR = 1.26

*** SPEED (DM/SEC) ***

MEAN = 55.70
 VARIANCE = 917.47
 STD. DEV. = 30.29
 KURTOSIS = 3.21
 SKEWNESS = 0.595

STD ERR = 0.83

*** EAST & NORTH (DM/SEC) ***

COVARIANCE = 1074.07
 STD. DEV. OF COVARIANCE = 1950.63
 CORRELATION COEFFICIENT = 0.561

STD ERR = 53.43

***** VECTOR MEANS *****

*** EAST & NORTH (DM/SEC) ***

MEAN = 13.09
 VARIANCE = 1924.61
 STD. DEV. = 43.87

SAMPLE SIZE = 1333 POINTS

SPANNING RANGE
 FROM 66-VI-24 13.50.02
 TO 66-VIII-09 19.50.02

2021WD50M
 WIND
 66-VI-24 TO 66-VIII-08
 1 PIECES WITH 648 ESTIMATES
 PER PIECE. AVERAGED OVER
 5 ADJACENT FREQUENCY BANDS

2021WD50M

2021WD50M
WIND

Mooring No. 203

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
	Depth Recorder	100 m.		
2031*	MCM	104 m.	M-110	
	Pressure Recorder	105 m.		
2032*	MCM	502 m.	M-112	
2033	MCM	1003 m.	M-114	Case flooded due to pinched O-ring. Data could not be recovered from magnetic tape record.
2034*	MCM	2004 m.	M-113	

Water Depth 2540 m.

Mooring No. 203

Set:

<u>39° 22.3'N</u>	<u>66</u>	<u>Jun</u>	<u>24</u>	<u>17</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>69° 55.0'W</u>	<u>66</u>	<u>Aug</u>	<u>30</u>	<u>21</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set
by: R. Heinmiller Ship R. V. Crawford Cruise 143

MOORING:

4' subsurface sphere with 1/4" tow cable and 5/16" plaited nylon and 1500-pound anchor.

PURPOSE OF MOORING:

To maintain Site D data collection.

COMMENTS ON RESULTS:

Routine set and recovery. First mooring to recover useful data with new magnetic tape recording current meters.

Data number: 2031

Instrument No.: M-110

Type: Magnetic tape current meter

Depth: 104 m.

Water depth: 2540 m.

Start time: 66-VI-24 17.34.30

Stop time: 66-VII-19 16.49.30

Duration: 24 days, 23 hours, 15 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 31

interval time = 15 minutes

COMMENTS:

Data of generally good quality.

```

STATS
DATA/2031UC09

*** EAST (MM/SEC) ***

MEAN      = -16.31
VARIANCE  = 5321.21
STD. DEV. = 72.95
KURTOSIS  = 2.98
SKEWNESS  = 0.158

STD ERR = 1.49

*** NORTH (MM/SEC) ***

MEAN      = 42.31
VARIANCE  = 7284.67
STD. DEV. = 85.35
KURTOSIS  = 2.88
SKEWNESS  = 0.142

STD ERR = 1.74

*** SPEED (MM/SEC) ***

MEAN      = 108.54
VARIANCE  = 2881.88
STD. DEV. = 53.68
KURTOSIS  = 2.96
SKEWNESS  = 0.748

STD ERR = 1.10

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = -216.29
STD. DEV. OF COVARIANCE = 6214.23
CORRELATION COEFFICIENT = -0.035

STD ERR = 126.90

***** VECTOR MEANS *****
*** EAST & NORTH (MM/SEC) ***

MEAN      = 45.35
VARIANCE  = 6302.94
STD. DEV. = 79.39

SAMPLE SIZE = 2398 POINTS

SPANNING RANGE
FROM 66-VI -24 17.34,30
TO 66-VII-19 16.49,30

```

2031UC900
104.00M.
66-VI-24 TO 66-VII-18
1 PIECES WITH 1152 ESTIMATES
PER PIECE. AVERAGED OVER
5 ADJACENT FREQUENCY BANDS

2031UC1H

104 M

66- VI -25 TO 66- VII-19

2031UC1H

Data number: 2032

Instrument No.: M-112

Type: Magnetic tape current meter

Depth: 502 m.

Water depth: 2540 m.

Start time: 66-VI-24 15.40.30

Stop time: 66-VII-19 06.25.30

Duration: 24 days, 14 hours, 45 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 31

interval time = 15 minutes

COMMENTS:

Data of generally good quality.

STATS DATA/2032UC900

*** EAST (MM/SEC) ***

MEAN = -28.70 STD ERR = 0.90
 VARIANCE = 1917.27
 STD. DEV. = 43.79
 KURTOSIS = 2.15
 SKEWNESS = 0.199

*** NORTH (MM/SEC) ***

MEAN = 3.69 STD ERR = 0.77
 VARIANCE = 1384.10
 STD. DEV. = 37.20
 KURTOSIS = 3.49
 SKEWNESS = -0.539

*** SPEED (MM/SEC) ***

MEAN = 58.64 STD ERR = 0.54
 VARIANCE = 699.51
 STD. DEV. = 26.45
 KURTOSIS = 2.32
 SKEWNESS = 0.323

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = -478.24 STD ERR = 34.36
 STD. DEV. OF COVARIANCE = 1670.69
 CORRELATION COEFFICIENT = -0.294

***** VECTOR MEANS *****

*** EAST & NORTH (MM/SEC) ***

MEAN = 28.93
 VARIANCE = 1650.69
 STD. DEV. = 40.63

SAMPLE SIZE = 2364 POINTS

SPANNING RANGE
 FROM 66-VI-24 15.40.30
 TO 66-VII-19 06.25.30

TOTAL NUMBER OF INPUT DATA = 2364 WITH AVERAGE VALUE = 59.1
 HIGHEST SPEED = 111.3 CM/SEC
 NUMBER OF DATA OUT OF RANGE = 0
 SPANNING RANGE:
 FROM 66-VI-24 15.40.30
 TO 66-VII-19 06.25.30

2032UC900
 502.00M.
 66-VI-24 TO 66-VII-18
 1 PIECES WITH 1152 ESTIMATES
 PER PIECE. AVERAGED OVER
 5 ADJACENT FREQUENCY BANDS

2032UC1H

0 30

KILOMETERS

2032UC1H

502 M

66- VI -25 TO 66- VII-19

Data number: 2034

Instrument No.: M-113

Type: Magnetic tape current meter

Depth: 2004 m.

Water depth: 2540 m.

Start time: 66-VI-24 18.01.35

Stop time: 66-VII-20 11.31.35

Duration: 25 days, 17 hours, 30 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 30

interval time = 15 minutes

COMMENTS:

Data of generally good quality.

STATS

DATA/2034F900

*** EAST (MM/SEC) ***

MEAN = -29.81 STD ERR = 0.95
 VARIANCE = 2208.74
 STD. DEV. = 47.00
 KURTOSIS = 3.08
 SKEWNESS = 0.933

*** NORTH (MM/SEC) ***

MEAN = 7.31 STD ERR = 0.87
 VARIANCE = 1868.32
 STD. DEV. = 43.22
 KURTOSIS = 2.99
 SKEWNESS = -0.766

*** SPEED (MM/SEC) ***

MEAN = 65.60 STD ERR = 0.54
 VARIANCE = 715.90
 STD. DEV. = 26.76
 KURTOSIS = 3.23
 SKEWNESS = 0.447

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = -1575.19 STD ERR = 43.21
 STD. DEV. OF COVARIANCE = 2147.97
 CORRELATION COEFFICIENT = -0.775

***** VECTOR MEANS *****

*** EAST & NORTH (MM/SEC) ***

MEAN = 30.69
 VARIANCE = 2038.53
 STD. DEV. = 45.15

SAMPLE SIZE = 2471 POINTS

SPANNING RANGE
 FROM 66- VI -24 18.01.35
 TO 66- VII-20 11.31.35

2034F900
 2004.00M.
 66-VI-24 TO 66-VII-18
 1 PIECES WITH 1152 ESTIMATES
 PER PIECE. AVERAGED OVER
 5 ADJACENT FREQUENCY BANDS

2034F1H

0. 20.
KILOMETERS

2034F1H

2004 M

66- VI -25 TO 66- VII-20

25 JUN 66 20 JUL 66 2034F1H 2004 M

Mooring No. 205

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instrument Number</u>	<u>Comments</u>
2051*	FCM	4168 m.	H-137	
Water Depth		4200 m.		

Mooring No. 205

Set:

<u>37° 31.5'N</u>	<u>66</u>	<u>Jun</u>	<u>27</u>	<u>23</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>70° 00.0'W</u>	<u>66</u>	<u>Aug</u>	<u>10</u>	<u>23</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set

by: R. Heinmiller Ship R. V. Crawford Cruise 143

MOORING:

Subsurface gasoline-filled float with 9/16" plaited nylon line and 200-pound anchor. Current meter 30 m. above ocean bottom.

PURPOSE OF MOORING:

To make current measurements at 70°W longitude under the Gulf Stream axis (Site H).

COMMENTS ON RESULTS:

Mooring was set in strongest part of near-surface Gulf Stream. Buoy was upside-down for 5 minutes after it was launched; otherwise the setting and recovery was routine.

Data number: 2051

Instrument No.: H-137

Type: Film current meter

Depth: 4168 m.

Water depth: 4200 m.

Start time: 66-VI-27 23.23.30

Stop time: 66-VIII-10 16.53.30

Duration: 43 days, 17 hours, 30 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 20

interval time = 15 minutes

COMMENTS:

Data of good quality. Remarkably high speeds were found running at right angles to the Gulf Stream axis.

STATS DATA/2051L900

*** EAST (MM/SEC) ***

MEAN = -106.97 STD ERR = 1.18
 VARIANCE = 5874.45
 STD. DEV. = 76.64
 KURTOSIS = 1.88
 SKEWNESS = -0.044

*** NORTH (MM/SEC) ***

MEAN = 68.22 STD ERR = 1.93
 VARIANCE = 15594.31
 STD. DEV. = 124.88
 KURTOSIS = 3.53
 SKEWNESS = -0.837

*** SPEED (MM/SEC) ***

MEAN = 177.67 STD ERR = 1.20
 VARIANCE = 6001.40
 STD. DEV. = 77.47
 KURTOSIS = 2.62
 SKEWNESS = 0.343

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = -4127.92 STD ERR = 267.46
 STD. DEV. OF COVARIANCE = 17331.14
 CORRELATION COEFFICIENT = -0.431

***** VECTOR MEANS *****

*** EAST & NORTH (MM/SEC) ***

MEAN = 126.88
 VARIANCE = 10734.38
 STD. DEV. = 103.61

SAMPLE SIZE = 4199 POINTS

SPANNING RANGE
 FROM 66-VI -27 23.23.30
 TO 66-VIII-10 16.53.30

2051L900
 4168.00M.
 66-VI-27 TO 66-VIII-04
 1 PIECES WITH 1800 ESTIMATES
 PER PIECE. AVERAGED OVER
 5 ADJACENT FREQUENCY BANDS

2051L1H

2051L1H
4168 M

Mooring No. 208

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
2081*	FWR	-2 m.	W-123	
	Transport Recorder	-2 m.		
	Electrode	7 m.		
	Electrode	1007 m.		
Water Depth		2549		

Mooring No. 208

Set:

<u>39° 18.4'N</u>	<u>66</u>	<u>Aug</u>	<u>30</u>	<u>05</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>69° 50.0'W</u>	<u>66</u>	<u>Sep</u>	<u>1</u>	<u>07</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set
by: R. Heinmiller Ship R. V. Atlantis II Cruise 25

MOORING:

Surface toroid with 1/4" armored wire and 9/16" laid nylon and 1500-pound anchor.

PURPOSE OF MOORING:

To measure electric potential along the mooring line at Site D.

COMMENTS ON RESULTS:

Electric potential measurement equipment did not function.

Data number: 2081

Instrument No.: W-123

Type: Film wind recorder

Depth: Surface

Water depth: 2549 m.

Start time: 66-VIII-30 05.06.30

Stop time: 66-VIII-31 19.41.30

Duration: 1 day, 14 hours, 35 minutes

Sampling scheme: Continuous

one reading every second

COMMENTS:

Data of generally good quality.

TOTAL NUMBER OF INPUT DATA * 464 * WITH AVERAGE VALUE * 38.48 *
 HIGHEST SPEED * 49.75 *
 NUMBER OF DATA OUT OF RANGE * 0 *
 SPANNING RANGE
 FROM 66-VIII-30 05.06.30
 TO 66-VIII-31 19.41.30

STATS

DATA/2081WE300

*** EAST (DM/SEC) ***

MEAN = 38.48
 VARIANCE = 187.65
 STD. DEV. = 13.70
 KURTOSIS = 4.54
 SKEWNESS = -0.961
 STD ERR = 0.64

*** NORTH (DM/SEC) ***

MEAN = 32.06
 VARIANCE = 274.45
 STD. DEV. = 16.57
 KURTOSIS = 2.70
 SKEWNESS = 0.017
 STD ERR = 0.77

*** SPEED (DM/SEC) ***

MEAN = 52.31
 VARIANCE = 233.43
 STD. DEV. = 15.28
 KURTOSIS = 3.45
 SKEWNESS = -0.982
 STD ERR = 0.71

*** EAST & NORTH (DM/SEC) ***

COVARIANCE = 16.47
 STD. DEV. OF COVARIANCE = 725.80
 CORRELATION COEFFICIENT = 0.073
 STD ERR = 33.69

***** VECTOR MEANS *****

*** EAST & NORTH (DM/SEC) ***

MEAN = 50.08
 VARIANCE = 231.05
 STD. DEV. = 15.20

SAMPLE SIZE = 464 POINTS

SPANNING RANGE
 FROM 66-VIII-30 05.06.30
 TO 66-VIII-31 19.41.30

2081WE300

0. 250.
KILOMETERS

2081WE300

WIND

66-VIII-30 TO 66-VIII-31

2081 WE 300

WIND

31
AUG
66

Mooring No. 211

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
2111*	FWR	-2 m.	W-126	
2112	MCM	10 m.	M-145	Battery leaked; only 20 hours of recording were obtained.
2113	MCM	50 m.	M-140	Instrument lost.
2114	MCM	100 m.	M-139	Instrument lost.
2115	MCM	500 m.	M-141	Instrument lost.
2116	Depth Recorder	1000 m.	#227	Instrument lost.

Water Depth 2575 m.

Mooring No. 211

Set:

<u>39° 19.7'N</u>	<u>66</u>	<u>Oct</u>	<u>4</u>	<u>16</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>69° 54.7'W</u>	<u>66</u>	<u>Dec</u>	<u>3</u>	<u>13</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set

by: J. Gifford Ship R. V. Atlantis II Cruise 27

MOORING:

Surface toroid with 1/4" polyethylene covered tow cable and 9/16" plaited nylon and 1500-pound anchor.

PURPOSE OF MOORING:

To maintain Site D data collection.

COMMENTS ON RESULTS:

Lost last three current meters. Toroid at 39° 23.5'N, 68° 42'W when recovered by R. V. Atlantis II.

Data number: 2111

Instrument No.: W-126

Type: Film wind recorder

Depth: Surface

Water depth: 2575

Start time: 66-X-04 03.33.04

Stop time: 66-XI-17 23.48.04

Duration: 44 days, 20 hours, 15 minutes

Sampling scheme: Interval

time between strobes = .5 seconds

no. of strobes per interval = 18

interval time = 15 minutes

COMMENTS:

Data of generally good quality. Some editing was done to remove errors introduced by automatic film reader.

DATA/2111WG900

***	EAST	(DM/SEC)	***
	MEAN	=	20.89
	VARIANCE	=	3202.59
	STD. DEV.	=	56.59
	KURTOSIS	=	2.59
	SKEWNESS	=	0.124

STD ERR = 0,86

```
*** NORTH (DM/SEC) ***
      MEAN      =   -10.38
  VARIANCE      =   4705.74
  STD. DEV.     =    68.60
  KURTOSIS      =     2.46
  SKEWNESS      =     0.027
```

STD ERR = 1.05

```
*** SPEED (DM/SEC) ***
```

MEAN	=	83.57
VARIANCE	=	1468.04
STD. DEV.	=	38.32
KURTOSIS	=	3.13
SKEWNESS	=	0.298

STD ERR = 0.58

*** EAST & NORTH (DM/SEC)

COVARIANCE	=	243.29
STD. DEV. OF COVARIANCE	=	3774.28
CORRELATION COEFFICIENT	=	0.063

STD ERR = 57.52

***** VECTOR MEANS *****
*** EAST & NORTH (DM/SEC) ***

MEAN	=	23.33
VARIANCE	=	3954.16
STD. DEV.	=	62.88

SAMPLE SIZE = 4306 POINTS

SPANNING RANGE
FROM 66- X-04 03.33.04
TO 66-XI-17 23.48.04

2111WG900
WIND

66-X-04 TO 66-XI-10
1 PIECES WITH 1800 ESTIMATES
PER PIECE, AVERAGED OVER
5 ADJACENT FREQUENCY BANDS

2111WG1H

0. 1500.
KILOMETERS

2111WG1H

WIND

66- X -05 TO 66- XI -18

Mooring No. 212

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
2121*	MCM	50 m.	M-125	
2122	Depth Recorder	51 m.	#215	
2123*	MCM	450 m.	M-127	
2124*	MCM	950 m.	M-122	
2125*	MCM	1950 m.	M-129	

Water Depth 2545 m.

Mooring No. 212

Set:

<u>39° 20.0'N</u>	<u>66</u>	<u>Oct</u>	<u>8</u>	<u>14</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>69° 51.5'W</u>	<u>66</u>	<u>Dec</u>	<u>7</u>	<u>17</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set
by: J. Gifford Ship R. V. Atlantis II Cruise 27

MOORING:

Subsurface sphere with 1/4" tow cable and 3/8" plaited nylon
and 1500-pound anchor.

PURPOSE OF MOORING:

To maintain Site D data collection.

COMMENTS ON RESULTS:

Routine set and recovery.

Data number: 2121

Instrument No.: M-125

Type: Magnetic tape current meter

Depth: 50 m.

Water depth: 2545 m.

Start time: 66-X-08 16.41.30

Stop time: 66-XII-07 07.56.30

Duration: 59 days, 15 hours, 15 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 15

interval time = 15 minutes

COMMENTS:

Data of good quality.

2121J900
50.00M.
66-X-08 TO 66-XII-03
2 PIECES WITH 1350 ESTIMATES
PER PIECE. AVERAGED OVER
3 ADJACENT FREQUENCY BANDS

2121J1HA
50 M

Data number: 2123

Instrument No.: M-127

Type: Magnetic tape current meter

Depth: 450 m.

Water depth: 2545 m.

Start time: 66-X-8 14.20.40

Stop time: 66-X-27 08.35.40

Duration: 18 days, 18 hours, 15 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 15

interval time = 15 minutes

COMMENTS:

Vane missing on recovery. Data seem to be of good quality.

STATS DATA/2123V900

*** EAST (MM/SEC) ***

MEAN = -72.90 STD ERR = 1.51
 VARIANCE = 4118.59
 STD. DEV. = 64.18
 KURTOSIS = 2.20
 SKEWNESS = -0.348

*** NORTH (MM/SEC) ***

MEAN = -2.97 STD ERR = 1.25
 VARIANCE = 2809.21
 STD. DEV. = 53.00
 KURTOSIS = 3.59
 SKEWNESS = 0.354

*** SPEED (MM/SEC) ***

MEAN = 95.98 STD ERR = 1.30
 VARIANCE = 3039.51
 STD. DEV. = 55.13
 KURTOSIS = 2.39
 SKEWNESS = 0.534

*** EAST & NORTH (MM/SEC) ***

COVARIANCE = -393.99 STD ERR = 126.48
 STD. DEV. OF COVARIANCE = 5369.04
 CORRELATION COEFFICIENT = -0.116

***** VECTOR MEANS *****

*** EAST & NORTH (MM/SEC) ***

MEAN = 72.96
 VARIANCE = 3463.90
 STD. DEV. = 58.85

SAMPLE SIZE = 1802 POINTS

SPANNING RANGE
 FROM 66-X-08 14.20.40
 TO 66-X-27 08.35.40

2123V900
 450.00M.
 66-X-08 TO 66-X-26
 1 PIECES WITH 864 ESTIMATES
 PER PIECE. AVERAGED OVER
 5 ADJACENT FREQUENCY BANDS

2123V1H

0. 30.
KILOMETERS

2123V1H

450 M

66- X -09 TO 66- X -27

Data number: 2124

Instrument No.: M-122

Type: Magnetic tape current meter

Depth: 950 m.

Water depth: 2545 m.

Start time: 66-X-8 14.38.30

Stop time: 66-XII-7 13.23.30

Duration: 59 days, 22 hours, 45 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 15

interval time = 15 minutes

COMMENTS:

Data of generally good quality.

TOTAL NUMBER OF INPUT DATA * 3786 * 17th AVERAGE VALUE * 5.71 C/SEC
 HIGHEST SPEED * 15.20 C/SEC
 NUMBER OF DATA NOT IN RANGE * 0
 SPANNING RANGE
 FROM 66-X-08 14.38.30
 TO 66-XII-07 13.23.30

STATS DATA/2124H900

*** EAST (MM/SEC) ***
 MEAN = -34.43 STD ERR = 0.56
 VARIANCE = 1778.81
 STD. DEV. = 42.18
 KURTOSIS = 3.18
 SKEWNESS = 0.023

 *** NORTH (MM/SEC) ***
 MEAN = 5.72 STD ERR = 0.42
 VARIANCE = 1038.04
 STD. DEV. = 32.22
 KURTOSIS = 2.76
 SKEWNESS = 0.198

 *** SPEED (MM/SEC) ***
 MEAN = 56.66 STD ERR = 0.38
 VARIANCE = 823.83
 STD. DEV. = 28.70
 KURTOSIS = 3.11
 SKEWNESS = 0.873

 *** EAST & NORTH (MM/SEC) ***
 COVARIANCE = -419.32 STD ERR = 20.86
 STD. DEV. OF COVARIANCE = 1582.39
 CORRELATION COEFFICIENT = -0.309

 ***** VECTOR MEANS *****
 *** EAST & NORTH (MM/SEC) ***
 MEAN = 34.90
 VARIANCE = 1408.43
 STD. DEV. = 37.53

 SAMPLE SIZE = 5756 POINTS

 SPANNING RANGE
 FROM 66-X-08 14.38.30
 TO 66-XII-07 13.23.30

2124H900
 950.00M.
 66-X-08 TO 66-XII-03
 2 PIECES WITH 1350 ESTIMATES
 PER PIECE, AVERAGED OVER
 3 ADJACENT FREQUENCY BANDS

2124H1H

2124H1H

950 M

66- X -09 TO 66- XII-07

2124H1H
950 M

Data number: 2125

Instrument No.: M-129

Type: Magnetic tape current meter

Depth: 1950 m.

Water depth: 2545 m.

Start time: 66-X-08 16.52.22

Stop time: 66-XI-18 00.52.22

Duration: 40 days, 8 hours

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 15

interval time = 15 minutes

COMMENTS:

Data of generally good quality.

2125A900
1950.00M.
66-X-08 TO 66-XI-15
1 PIECES WITH 1800 ESTIMATES
PER PIECE. AVERAGED OVER
5 ADJACENT FREQUENCY BANDS

2125A1HA

0. 20.
KILOMETERS

2125A1HA

1950 M

66- X -09 TO 66- XI -18

Mooring No. 215

<u>Data Number</u>	<u>Type</u>	<u>Depth Meters</u>	<u>Instru- ment Number</u>	<u>Comments</u>
2151*	MCM	120 m.	M-143	
2152	MCM	420 m.	M-128	Instrument lost.
2153	MCM	920 m.	M-155	Instrument lost.
2154	MCM	1920 m.	M-144	Instrument lost.

Water Depth 2610 m.

Mooring No. 215

Set:

<u>39° 17.5'N</u>	<u>66</u>	<u>Dec</u>	<u>7</u>	<u>15</u>	<u>GMT</u>
Latitude	Year	Month	Day	Hour	

Retrieved:

<u>70° 05.0'W</u>	<u>69</u>	<u>Aug</u>	<u>6</u>	<u>18</u>	<u>GMT</u>
Longitude	Year	Month	Day	Hour	

Set

by: R. Heinmiller Ship R. V. Atlantis II Cruise 29

MOORING:

Subsurface boilerhead pressurized to 150 psi with wire and 5/16" nylon and 2000-pound anchor.

PURPOSE OF MOORING:

To maintain Site D data collection.

COMMENTS ON RESULTS:

Wire parted at termination above second current meter.
Boilerhead drifted for over 2 1/2 years until picked up by U.S.S. Sunbird at 39° 29'N, 71° 06'W

Data number: 2151

Instrument No.: M-143

Type: Magnetic tape current meter

Depth: 120 m.

Water depth: 2610 m.

Start time: 66-XII-15 18.07.30

Stop time: 67-I-03 15.22.30

Duration: 18 days, 21 hours, 15 minutes

Sampling scheme: Interval

time between strobes = 5 seconds

no. of strobes per interval = 31

interval time = 15 minutes

COMMENTS:

Data of generally good quality. After two and a half years adrift, instrument looked remarkably clean inside.

BAR PLUT	DATA/ 2151D900	/	SPEED	FREQUENCY	CH/SEC
1	1			1	0.550
2	2			2	1.550
3	3			3	2.550
4	4			4	3.550
5	5			5	4.550
6	6			6	5.550
7	7			7	6.550
8	8			8	7.550
9	9			9	8.550
10	10			10	9.550
11	11			11	10.550
12	12			12	11.550
13	13			13	12.550
14	14			14	13.550
15	15			15	14.550
16	16			16	15.550
17	17			17	16.550
18	18			18	17.550
19	19			19	18.550
20	20			20	19.550
21	21			21	20.550
22	22			22	21.550
23	23			23	22.550
24	24			24	23.550
25	25			25	24.550
26	26			26	25.550
27	27			27	26.550
28	28			28	27.550
29	29			29	28.550
30	30			30	29.550
31	31			31	30.550
32	32			32	31.550
33	33			33	32.550
34	34			34	33.550
35	35			35	34.550
36	36			36	35.550
37	37			37	36.550
38	38			38	37.550
39	39			39	38.550
40	40			40	39.550
41	41			41	40.550
42	42			42	41.550
43	43			43	42.550
44	44			44	43.550
45	45			45	44.550
46	46			46	45.550
47	47			47	46.550
48	48			48	47.550
49	49			49	48.550
50	50			50	49.550
51	51			51	50.550
52	52			52	51.550
53	53			53	52.550
54	54			54	53.550
55	55			55	54.550
56	56			56	55.550
57	57			57	56.550
58	58			58	57.550
59	59			59	58.550
60	60			60	59.550
61	61			61	60.550
62	62			62	61.550
63	63			63	62.550
64	64			64	63.550
65	65			65	64.550
66	66			66	65.550
67	67			67	66.550
68	68			68	67.550
69	69			69	68.550
70	70			70	69.550
71	71			71	70.550
72	72			72	71.550
73	73			73	72.550
74	74			74	73.550
75	75			75	74.550
76	76			76	75.550
77	77			77	76.550
78	78			78	77.550
79	79			79	78.550
80	80			80	79.550
81	81			81	80.550
82	82			82	81.550
83	83			83	82.550
84	84			84	83.550
85	85			85	84.550
86	86			86	85.550
87	87			87	86.550
88	88			88	87.550
89	89			89	88.550
90	90			90	89.550

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Averaged quantities in computer-generated output as histograms, basic statistics, spectra, progressive vector diagrams, and east-north component plots.

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