Onslow Bay
Physical/Dynamical Experiments
Summer-Fall, 1975
Data Report

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onslow bay
physical / dynamical
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By
L.J.Pietrafesa
D.A.Brooks
R.D'Amato
L.P.Atkinson

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L. J. Pietrafesa,

D. A. Brooks,

R. D'Amato

and

L. P. Atkinson

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I. Introduction

The objectives of this data report are to provide a commentary on the logistics and methodology of, and also to serve as a documentation of, the experimental/observational data sets obtained during the Summer and Fall/Winter of 1975. Beyond the inclusion of the reduced, i.e., computer processed and filtered, data no interpretation is provided. It is anticipated that this report will serve as an effective guidebook for future field programs.

This report includes data from four cruises (two deployment, two retrieval) of the R/V Advance II during the Summer through Fall/Winter, 1975.

These cruises constituted part of the North Carolina State University (NCSU) - Skidaway Institute of Oceanography (SKIO) combined efforts to contemporaneously measure: the temperature and salinity, i.e., hydrography; the current speeds and direction at several locations; and sea level and meteorology local and regional to Onslow Bay, North Carolina. Personnel from SKIO also measured various biological parameters along the hydrographic grid (cf. Figure 3). This work constitutes the initial effort of a multi-discipline, multi-institutional program partially sponsored by the Energy Research and Development Administration and in part by the National Oceanographic and Atmospheric Administration and the University of North Carolina - Sea Grant College Program, to study the continental shelf processes affecting the oceanography of the South Atlantic Bight. The immediate problems being addressed were those of understanding the processes by which nutrients are transported onto the North Carolina Shelf from offshore and to establish possible transport pathways for effluents discharged into North Carolina coastal waters.

The purpose of these cruises was to deploy (retrieve) fixed position current meter moorings (Figure 2) and to make detailed hydrographic and biological parametric measurements in Onslow Bay. The results of the latter surveys are presented in a series of SKIO data reports. (Atkinson, Singer and Pietrafesa, 1976 a, b)

Endeco 105 current meters were used to measure speed and direction at specified temporal intervals and spatial locations.

A reporting of the raw, i.e., unprocessed and unfiltered, data was made in a separate and preliminary data report (Pietrafesa, Brooks, Atkinson, D'Amato and Bane, 1976).

Figure 1 South Atlantic Bight

Figure 2 Onslow Bay, North Carolina study area

Figure 3 SKIO/NCSU
hydrography grid (also SKIO biological
sampling grid)

II. Purpose/Description of 1975 Experiment

The essential part of the 1975 Summer-Fall Experiment was a fixed-level array of 4 Endeco 105 - film recording current meters and 4 General Oceanics film - recording thermographs. Specifications of both types of instruments are given in pages 13 - 15 of this report. Two moorings were set at the "focal points" of the cusped shaped Onslow Bay (cf. Figure 2). The current meters were set two to a mooring at depths of 10 and 25 meters from the surface in 28 meters of water, at each of the mooring sites, A and B (Figure 4). The array was designed to observe the propagation of phenomena across and along the inner to mid-shelf and to establish insights into the physics of the vertical and horizontal modal structure of the horizontal currents.

The data from the upper part of the water column were collected to address the "possibility of siting ocean-out-falls" problem (Pietrafesa, 1974) while the lower elements were specific to the "intrusion" (Pietrafesa and Atkinson, 1975) problem. More generally, Onslow Bay was chosen as an initial study site in the context of a study of the whole of the continental margin of the South Atlantic Bight because it is the more densely populated region of the North Carolina coast and, consequently, the waste disposal problem is more critical there than elsewhere. The reason for siting the study of the intrusion of nutrients onto the continental shelf of the South Atlantic Bight in Onslow Bay was primarily based on the fact that there is/has been more historical data, i.e., background information needed to plan such a study, collected in Onslow Bay than anywhere else in the South Atlantic Bight. Given the cusped nature of the embayment, the fact of potential outfall sites at either end of the bay and the obvious horizontal and vertical plane (three dimensional) character of the property distributions in Onslow Bay (Stefannson, Atkinson and Bumpus, 1971), the initial moorings were located at sites A and B.

The initial periods of study; August - September, 1975 and October - December, 1975 were intended to offer quasi-seasonal time series of current observations. These time series were intended to be used, not only for understanding the physical/dynamical character of the observational period but also as a guide for future larger field studies, such as the planned (and completed) Summer-Fall-Winter, 1976-1977 and Summer, 1977 field programs planned in the same area under ERDA and NOAA-U.N.C. Sea Grant sponsorship (cf. Figures 5-7).

III. Equipment and Mooring Description

The moorings, established at sites A and B during both of the 1975 experiments, i.e., Summer and Fall/Winter, had a taut line (wire) configuration. A subsurface float was used to keep

Figure 4 Vertical Section of instrument depths at sites A and B

Figure 5 Mooring site locations for Summer, 1976 experiment (OBIS V)

Figure 6 Mooring site locations for Fall-Winter, 1976 experiment

Figure 7 Mooring site locations for Summer, 1977 experiment

a bottom anchored cable taut. Fixed level recording equipment was attached to and suspended (away) from the cable. Additionally, a bottom anchored, auxiliary surface marker was located 190 meters from the main mooring line. The bottom "auxiliary" anchor was connected to the "main" anchor by a 200 meter polypropylene ground line, which floats approximately a meter from the ocean floor. The mooring configuration is depicted in Figure 8.

The operational logistics of installing moorings A and B were initiated in such a way as to maximize repeatability of location in subsequent experiments. The R/V Advance II was used during all deployment and retrieval phases of these 1975 experiments and mooring position locations (Table 1) were taken by the ship's Loran A system at the time of installation. The absolute error (accuracy) of the position is estimated to be less than ± 1 minute of latitude and longitude. The relative error (precision) is estimated to be less than ± 0.5 minute in either co-ordinate. Depths were taken by fathometer and are accurate to within ± 0.5 meters.

The recording instruments used on these moorings were Endeco-105 film recording current meters and General Oceanics 3070 film recording thermographs. The specifications of the instruments are given in Table 2. This current meter is of the axial flow, ducted impeller, film recording type and is tethered to the taut line mooring. It is specifically designed for continental shelf and estuarine environmental monitoring. The E-105 (Figure 8) records analog signals from direction and speed transducers on 16 millimeter photographic film. The ducted impeller acts as the speed sensor with an internal conversion of its rotation converted to a light trace on the film. The light trace, which is generated by sensor output, is lengthened or shortened at a rate proportional to the speed of the current. A light bar, whose length is representative of the current speed integrated over the timing interval, is produced by the advancing light trace. The length of the displacement of the light trace divided by the time interval yields the speed, averaged over the timing interval. Consecutive thirty-minute time exposures are taken of the continuous light traces and a timing pulse is provided by a crystal timer (accuracy of 1 part in 420) every 24 hours. Instantaneous instrument direction is given by the displacement of a light trace from a datum line. The directional light trace is generated by a magnetic compass coupled with an analog encoder. The time integrated signal appears as a bar of light which varies in intensity along its length as a function of the length of time that the instrument is aligned in a particular direction. The displacement of the point of maximum intensity from the datum line then yields the average direction for the thirty minute period of actual recording.

Figure 8 Fixed position current meter mooring

Table 1*

Experiment	Mooring	Latitude- Longitude Location	Loran A Location	Water Depth	Meter Depth	Meter No.	Meter Notation
(1) 6 August - 26 September, 1975	A	34° 17.6'N 76° 51'W	4856 2056	28 m	10 m	(E-105) 318	A1 _{top}
	A				25 m	(E-105) 317	A1 _{bot}
	B	33° 56.7'N 77° 25.0'W	4889 2495	28 m	11 m	(G.O.3070) 3	B1 _{top}
	B				25 m	(E-105) 247	B1 _{bot}
(2) 14 October - 9 December, 1975	A	34° 17.6'N 76° 50.8'W	4854 2060	28 m	10 m	(E-105) 316	A2 _{top}
	A				23 m	(E-105) 247	A2 _{bot}

* Note: Only instruments that functioned are recorded here.
Each mooring (A & B) had, for each experiment, 2 Endecos
and 2 Thermographs.

Table 2

SPECIFICATIONS: ENDECO Type 105 in-situ Tethered Current Meter

1. CURRENT VELOCITY

Sensor Type:	Ducted Impeller
Sensitivity:	53.7 RPM/knot
Speed Range:	0 - 1.75 knots (0-90.1 cm/sec) at one Reading/60 minutes
	0 - 3.5 knots (0.180.2 cm/sec) at one Reading/30 minutes
	0 - 7.0 knots (0-360.4 cm/sec) at one Reading/15 minutes
Impeller Threshold:	Less than .05 knot (2.57 cm/sec)
Resolution:	.05 knot
Speed Accuracy:	± 3 percent of Full Scale

2. CURRENT DIRECTION

Magnetic Direction:	0 - 360°
Sensitivity:	$\pm 5^\circ$ at 0.05 knot (2.57 cm/sec)
Resolution:	$\pm 1^\circ$
Accuracy:	± 2 percent above 0.05 knot, when referenced to computer calibration

3. TILT

The instrument orients to the flow thus eliminating the need for tilt indication or correction.

4. RECORDING TIME AND RATE

Number of Readings:	3600
Recording Rate:	1 Reading/15 minutes
	1 Reading/30 minutes
	1 Reading/60 minutes
Time Reference Mark:	24-hour Light Emitting Diode indication provided by timer
Maximum Recording Period:	75 days at 1 Reading/30 minutes
Time Stability:	± 1.5 second/day at 20°C
	± 4 second/day from -5 to +30°C
Timer Type:	ENDECO Type 124 Crystal Timer

Table 2 (Cont'd)

5. RECORDER	
Method:	Direct photographic time exposure of sensor outputs
Light Source:	Light Emitting Diodes continuously energized
Format:	Analog/Bar Graph
Film Type:	50 feet - 16 mm Tri-Z Cine Kodak Magazine, Modified
Power:	Four, 1-1/2 volt standard "D" size cells (Use only carbon-zinc batteries in non-ferrous cases)
6. OPERATING ENVIRONMENT	
Operating Medium:	Salt, fresh, or polluted water
Operating Temperature Range:	-2° to 45°C (28° to 113°F)
Storage Temperature Range:	-24° to 65°C (-29° to 149°F)
Maximum Depth:	500 feet (pressure cases to 10,000 psi available)
7. INSTRUMENT HOUSING	
Material:	P.V.C. Plastic
Finish:	All surfaces painted for resistance to marine growth
Hardware:	300 Series Stainless Steel and Plastic
8. PHYSICAL SIZE	
Weight:	27 pounds (in air)
Buoyancy:	Approximately neutral; adjustable for salt, fresh, or polluted water
Dimensions:	30" long X 16" diameter
Shipping Weight:	45 pounds
Shipping Crate Dimensions:	38" long X 22" diameter
<u>Specifications:</u> General Oceanics Model 3070 Film Recording Thermograph	
WEIGHT:	3 kgs. (6½ lbs.) in air; approximately 1 kg. (2.2 lbs.) positively buoyant in water
EXPOSED MATERIALS:	Rigid polyvinyl chloride (PVC) housing, end caps, and thermometer bulb guard; stainless steel hardware and thermometer bulb

Table 2 (Cont'd)

DIMENSIONS:	11.4 cm. (4½") O.D.x 38 cm. (15") overall length less thermometer bulb guard piece.
DEPTH RATING:	50 meters (72 psi)
TEMPERATURE RANGE:	0° to 55°
ACCURACY:	+1% of full scale (.55°C)
TIME REFERENCE:	Battery powered calendar watch with second, minute and hour hands plus date window
WATCH ACCURACY:	+0.0035% (30 seconds per 24 hours)
DATE INTERVAL:	Selectable at 5, 15, 30, or 60 minutes. Timing intervals chosen by changing timing plugs in data logger circuit. A 15 minute range was used in this study.
MAIN BATTERY SUPPLY:	16 manganese-alkaline penlight cells. (Mallory MN 1500, size AA, or equal).
OPERATING LIFE:	5 months or, if sooner, 11,000 camera operations. (Watch battery, one year).

The General Oceanics Model 3070 Film Recording Thermograph is a self-contained instrument for measurement and recording of air and water temperatures over extended periods of time. The Model 3070 sensor is a large dial thermometer mounted on one end cap of the cylindrical instrument housing. The bimetallic sensing element of the thermometer protrudes through the end cap out into the environment for quick response to temperature changes. This thermometer bulb is protected by a small guard piece with a number of through-holes for easy circulation of air or water. The thermometer dial is photographed at periodic intervals (15 min. interval used) by a film data logger at the opposite end of the housing. A battery powered calendar watch is mounted in the center of the thermometer dial to provide an accurate time and date reference for each film frame.

IV. Data Processing

Data from three different sources are included in this report. Each data set presented unique processing problems and each is discussed separately. Most of the computer programs used to process and analyze the data are members of a time series analysis library known as FESTSA (Brooks, 1976).

Current Meters. Endeco type 105 film-recording current meters were used in the 1975 Onslow Bay observational program. The sampling interval was 0.5 hours. The film magazines were transcribed by Endeco to 9-track magnetic tapes containing files of speed and direction. The speed and direction values were converted to u and v components in several ways. The Carolina Cape region is defined by an irregular, cusped, scallop like coastline which extends into shoals and consequently it is difficult to specify a spatial co-ordinate system. Coherency and phase relationships between components of a vector time series are functions of the co-ordinate system in which the components are specified. The natural tendencies are to choose either a north-south, east-west horizontal axis or to assume a straight coastline of uniform cross-section so that the horizontal co-ordinate system axes lie parallel to and perpendicular to the straight isobaths. Unfortunately, however, the isobaths in the Carolina Capes region are not uniform or straight and the choice of a co-ordinate system is less than obvious. Two tactics were taken herein. The first co-ordinate system chosen is one based on the direction of the local bathymetric contours at approximately mid shelf to the shelf break, which tend to run southwest to northeast at an angle 55.6° clockwise from North (cf. Figure 9). The second co-ordinate system used is one oriented on a basis determined by the characteristics of the data itself. A co-ordinate system which maximizes the variance in any given direction gives the so-called "Principal Axis" of variance. This system, in which the estimated phase difference between u

Figure 9 Rotated Co-ordinate system for Onslow Bay

ROTATED COORDINATE SYSTEM

and v is identically $+90^\circ$ is also called the "Normal" system (Fofonoff, 1969) and the "Hodograph" system (Mooers, 1970). As a function of the physical, dynamical processes causing the measured hydrodynamics, the principal axis of variance may vary with frequency and geographic location. The "Principal Axis" for a given vector time series is obtained by rotating the covariance matrix until the cross-covariance between orthogonal velocity components is zero. The rotation of the co-ordinate system into the principal axis does not fix the sign of the 90° phase shift between u and v . This is determined by the data. Since the principal axis for a given vector time series will vary with frequency, we can construct, hodographs which will allow for the vector time series to be decomposed into cyclonic and anticyclonic rotating motions of different amplitude and phase. The sum of these two polarized motions yields an ellipse whose semi-major axis is oriented along the principal axis of variance at that particular frequency. The principal axis herein is given as a function of frequency rather than as an average over a large frequency band.

Within this report, the vector time series have been variously represented in the different possible ways described above. The figure captions indicate the nature of the representation. The raw current data were low pass filtered with a three hour low pass (3HRLP) Lanczos filter to reduce surface wave noise, and then subsampled hourly. The current data were then low pass filtered by convolution with a Lanczos data window to separate the inertial, semi-diurnal, and diurnal fluctuations from longer period motions. The energy response envelope of the 40-hour low pass (40HRLP) filter is shown in Figure 10. The filter attenuation is everywhere at least as great as that shown by the envelope. The 40HRLP time series were decimated to provide a sampling interval of 6 hours.

Start times, stop times, and record lengths of the original and filtered time series for both the summer and fall experiments are shown in Table 3.

Meteorological Data. Three-hourly values of surface wind speed, wind direction, atmospheric pressure, and temperature were obtained from NOAA, Environmental Data Service, Asheville, North Carolina. Wind vector and wind stress vector components were computed for the rotated coordinate system, with the positive vector sense in the direction toward which the wind blows. The wind stress vector components were computed from the wind vector components using a quadratic drag law with the drag coefficient $C_D = 1.5 \times 10^{-3}$. Two low pass filters were used for the meteorological data. A 48 hour low pass (2DLP) Lanczos filter was used, with subsequent decimation to a 9 hour interval and linear interpolation to an 8 hour interval, for initial examination of the meteorological data. Figure 11 shows the filter energy response envelope. Later, a 40HRLP filter equivalent to the one used for the current data was used to facilitate comparisons between the data sets.

Figure 10 Filter energy response envelope for 40HRLP

TABLE 3

Instrument #	Original Data	40HRLP	3HRLP
(318 & 317) A1 _{top} & A1 _{bot}			
Start Time (EST)	6 Aug. '75 1000 hrs.	10 Aug. '75 1800 hrs.	6 Aug. '75 1800 hrs.
Stop Time (EST)	26 Sept. '75 0630 hrs.	21 Sept. '75 1800 hrs.	25 Sept. '75 2300 hrs.
# of Points	2442	169	1205
Interval	0.5 hrs.	6 hrs.	1 hr.
(247) B1 _{bot}			
Start Time (EST)	7 Aug. '75 1100 hrs.	11 Aug. '75 1900 hrs.	7 Aug. '75 1900 hrs.
Stop Time (EST)	25 Sept. '75 1700 hrs.	21 Sept. '75 0700 hrs.	25 Sept. '75 1000 hrs.
# of Points	2365	163	1167
Interval	0.5 hrs.	6 hrs.	1 hr.
(316 & 247) A2 _{top} & A2 _{bot}			
Start Time (EST)	14 Oct. '75 0930 hrs.	18 Oct. '75 1730 hrs.	14 Oct. '75 1730 hrs.
Stop Time (EST)	9 Dec. '75 1230 hrs.	4 Dec. '75 2330 hrs.	9 Dec. '75 0500 hrs.
# of Points	2696	190	1332
Interval	0.5 hrs.	6 hrs.	1 hr.

Sea Level. Hourly sea level heights from coastal tide gauges were obtained in punched card form from NOAA, National Ocean Survey, Rockville, Maryland. The long period sea level fluctuations were separated from the semidiurnal and diurnal tidal fluctuations with a 2DLP filter; the time series were then decimated to provide a sampling interval of 8 hours. The filter energy response envelope is shown in Figure 11.

Frequency Domain Presentations: Spectral representations of data in this report are given in two formats:

- a) Graphs of variance (spectrum density times frequency) versus the logarithm of frequency. These are "quick look" calculations based on the fast Fourier transform (FFT). The FFT's of original data were smoothed by block averaging over five adjacent estimates, yielding about ten degrees of freedom for each averaged estimate. The FFT's of low passed data were not smoothed, yielding two degrees of freedom for each estimate.
- b) Auto and cross spectra, phase and coherence squared computed for paired input time series. The spectral calculations were performed by Fourier transforming correlation functions. The maximum correlation lag, spectral bandwidth, degrees of freedom, and input time series names are shown on each figure. The first named time series corresponds to "spectrum x". Additionally, positive phase values indicate series y leading series x.

Figure Formats: The current meter information in figures 12-51 is shown in six different basic formats. For the low passed records, the following quantities are displayed: time series of current components u and v, vector stick diagrams, FFT's, and spectra. For the raw (unfiltered) records, the following quantities are displayed: time series of current components u and v, progressive vector diagrams (PVD's) of original (unfiltered) data and FFT's. 3HRLP records were used for spectra (u vs. v for same meter) and hodograph parameters. The current meter naming convention used in this report is

A(B) 1(2)_{top (bottom)},

where A(B) and 1(2) respectively identify the mooring location and date, as shown in Table 1, and the top (bottom) subscript identifies the location of the instrument on the mooring string. For example, the notation A1_{top} refers to the uppermost instrument on mooring A during the summer experiment. First-order statistics for the unfiltered current data are given in Table 4.

Intermooring and intramooring spectra for the low passed currents are shown in Figures 52-83. Figures 52-67 are in the

Figure 11 Filter energy response envelope for 2DLP

Table 4
First Order Statistics

Meter	Meter Depth(m)	Min.	Max.	Avg.	S.D.	Parameter (cm/sec)
A1 _{top} (318)	10	-34.0	42.0	2.78	13.40	u
		-27.0	43.0	5.29	10.85	v
A1 _{bot} (317)	25	-20.0	21.0	0.18	7.47	u
		-21.0	26.0	1.95	7.29	v
B1 _{bot} (247)	25	-26.0	21.0	-1.53	8.45	u
		-23.0	19.0	-0.32	5.68	v
A2 _{top} (316)	10	-41.0	35.0	-2.72	13.55	u
		-33.0	48.0	2.43	11.34	v
A2 _{bot} (247)	23	-28.0	24.0	1.89	9.15	u
		-32.0	26.0	2.44	7.59	v

topographic coordinate system ($R \sim 56^\circ$) while Figures 68-83 are in the principal axis coordinate system computed for each meter. Time series and FFT's of low passed and unfiltered meteorological data from Cape Hatteras and Wilmington are shown in Figures 84-115. Time series comparisons between current and wind stress vectors are shown in Figures 116-117, and cross spectra between currents and meteorological variables are shown in Figures 118-177. Figures 138-177 is a special case series. Here the wind stress is maintained in the topographic coordinate system and the currents are seen in the principal axis coordinate system which is computed for each meter. Figures 138-157 have no detrending while Figures 158-177 are detrended. Time series of low passed sea level at Wilmington, N. C. and Charleston, S. C. are shown in Figures 178-179.

Additionally, a time series of temperature data, collected at 15 minute intervals at mooring B (top) during the August-September experiment, is presented, unfiltered, in Figure 180 and, 40 HRLP filtered, in Figure 181. A case study of bottom intrusion is presented in Figure 182. Figure 183 is a graphic presentation comparing wind and current averaged vectors.

V. Current Meter Data

ENDECO 318 #A TOP 10AUG75 R56 U-CMP 40HRLP (CM/SEC)

ENDECO 318 #A TOP 10AUG75 R56 V-CMP 40HRLP (CM/SEC)

Figure 12 Low pass current velocity components and vectors from meter Al_{top}

Figure 13 FFT of low pass current velocity components 27.
from meter A1_{top}

Figure 14 Spectra of low pass current velocity components from meter A1 top

ENDECO 318 U/V 10AUG-22SEP 75 R56
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7

LNDECO 318 #A TOP 06AUG75 R56 U-CMP (CM/SEC)

ENDECO 318 #A TOP 06AUG75 R56 V-CMP (CM/SEC)

Figure 15 Unfiltered current velocity components from
(a,b,c,d) meter A1_{top}

ENDECO 318 #A TOP 06AUG75 R56 U-CMP (CM/SEC)

ENDECO 318 #A TOP 06AUG75 R56 V-CMP (CM/SEC)

Figure 15b

ENDECO 318 #A TOP 06AUG75 R56 U-CMP (CM/SEC)

ENDECO 318 #A TOP 06AUG75 R56 V-CMP (CM/SEC)

Figure 15c

ENDECO 318 #A TOP 06AUG75 R56 U-CMP (CM/SEC)

ENDECO 318 #A TOP 06AUG75 R56 V-CMP (CM/SEC)

Figure 15d

Figure 16 Progressive vector diagram of unfiltered current velocity from meter Al_{top}

ENDECO 318 06AUG-26SEP75 R56 UCMP

ENDECO 318 06AUG-26SEP75 R56 VCMP

Figure 17 FFT of unfiltered current velocity components from meter Al_{top}

ENDECO 319 U/V 10 AUG-22 SEPT 75 R56 3HRLP
DOF=40.1 LAGS=80.0 BW= 0.200 CPD

SPKTRA REV 7(NCSU)

Figure 18 Spectra of 3HRLP current velocity components from meter Al_{top}

Figure 19 Hodograph parameters of 3HRLP
current velocity from meter Al_{top}

ENDECO 317 #A BOT 10AUG75 R56 U-CMP 40HRLP (CM/SEC)

ENDECO 317 #A BOT 10AUG75 R56 V-CMP 40HRLP (CM/SEC)

Figure 20 Low pass current velocity components and vectors from meter Al_{bot}

ENDECO 317 10AUG22SEP75 R56 UCMP40HRLP

ENDECO 317 10AUG22SEP75 R56 VCMP40HRLP

Figure 21 FFT of low pass current velocity components from meter Al_{bot}

Figure 22 Spectra of low pass current velocity components from meter Albot

ENDECO 317 U/V 10AUG-22SEP 75 R56
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7

ENDECO 317 #A BOT 06AUG75 R56 U-CMP (CM/SEC)

ENDECO 317 #A BOT 06AUG75 R56 V-CMP (CM/SEC)

Figure 23 Unfiltered current velocity components
(a,b,c,d) from meter Al_{bot}

ENDECO 317 #A BOT 06AUG75 R56 U-CMP (CM/SEC)

ENDECO 317 #A BOT 06AUG75 R56 V-CMP (CM/SEC)

Figure 23b

ENDECO 317 #A BOT 06AUG75 R56 U-CMP (CM/SEC)

ENDECO 317 #A BOT 06AUG75 R56 V-CMP (CM/SEC)

Figure 23c

Figure 23d

Figure 24 Progressive vector diagram of unfiltered current velocity from meter Al_{bot}

Figure 25 FFT of unfiltered current velocity components from meter Al_{bot}

ENDECO 317 06AUG-26SEP75 R56 UCMP

ENDECO 317 06AUG-26SEP75 R56 VCMP

ENDECO 317 U/V 10 AUG-22 SEPT 75 R56 3HRLP
DOF=40.1 LAGS=80.0 BW= 0.200 CPD

SPKTRA REV 7(NCSU)

Figure 26 Spectra of 3HRLP current velocity components from meter Al_{bot}

HOLOGRAPH PARAMETERS : Al_{Bot}, Aug.6 - Sept.26 '75

Figure 27 Holograph parameters of 3HRLP current velocity from meter Al_{bot}

ENDECO 247 #B BOT 11AUG75 R56 U-CMP 40HRLP (CM/SEC)

ENDECO 247 #B BOT 11AUG75 R56 V-CMP 40HRLP (CM/SEC)

Figure 28 Low pass current velocity components and vectors from meter Bl_{bot}

Figure 29 FFT of low pass current velocity components from meter Bl_{bot}

Figure 30 Spectra of low pass current velocity components from meter Blot

ENDECO 297 U/V 11AUG-21SEP 75 R56
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7

Figure 31 Unfiltered current velocity components
(a,b,c,d) from meter B1_{bot}

ENDECO 247 #B BOT 07AUG75 R56 U-CMP (CM/SEC)

ENDECO 247 #B BOT 07AUG75 R56 V-CMP (CM/SEC)

Figure 31b

ENDECO 247 #B BOT 07AUG75 R56 U-CMP (CM/SEC)

ENDECO 247 #B BOT 07AUG75 R56 V-CMP (CM/SEC)

Figure 31c

ENDECO 247 #B BOT 07AUG75 R56 U-CMP (CM/SEC)

ENDECO 247 #B BOT 07AUG75 R56 V-CMP (CM/SEC)

Figure 31d

Figure 32 Progressive vector diagram of unfiltered current velocity from meter Bl_{bot}.

Figure 33 FFT of unfiltered current velocity components from meter Bl_{bot}

ENDECO 247 07AUG-25SEP75 R56 UCMP

ENDECO 247 07AUG-25SEP75 R56 VCOMP

Figure 34 Spectra of 3HRLP current velocity components from meter B1_{bot}

ENDECO 247 U/V 11 AUG-21 SEPT 75 R56 3HRLP
DOF=38.9 LAGS=80.0 BW= 0.200 CPD

SPKTRA REV 7(NCSU)

Figure 35 Hodograph parameters of 3HRLP current velocity from meter Bl_{bot}.

Figure 36 Low pass current velocity components and vectors from meter A2_{top}

Figure 37 FFT of low pass current velocity components from meter A2_{top}

ENDECO 316 18OCT05DEC75 R56 UCMP40HRLP

ENDECO 316 18OCT05DEC75 R56 VCMP40HRLP

Figure 38 Spectra of low pass current velocity components from meter A2 top

ENDECO 316 U/V 180CT-05DEC 75 R56
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD
SPKTRA REV 7

ENDECO 316 #A TOP 140CT75 R56 U-CMP (CM/SEC)

ENDECO 316 #A TOP 140CT75 R56 V-CMP (CM/SEC)

Figure 39 Unfiltered current velocity components (a,b,c,d,e) from meter A2_{top}

ENDECO 316 #A TOP 140CT75 R56 U-CMP (CM/SEC)

ENDECO 316 #A TOP 140CT75 R56 V-CMP (CM/SEC)

Figure 39b

ENDECO 316 #A TOP 140CT75 R56 U-CMP (CM/SEC)

ENDECO 316 #A TOP 140CT75 R56 V-CMP (CM/SEC)

Figure 39c

ENDECO 316 #A TOP 140CT75 R56 U-CMP (CM/SEC)

ENDECO 316 #A TOP 140CT75 R56 V-CMP (CM/SEC)

Figure 39d

Figure 39e

Figure 40 Progressive vector diagram of unfiltered current velocity from meter A2_{top}

ENDECO 316 14OCT-09DEC75 R56 UCMP

Figure 41 FFT of unfiltered current velocity components from meter A2_{top}

ENDECO 316 14OCT-09DEC75 R56 VCMP

Figure 42 Spectra of 3HRLP current velocity components from meter A2_{top}

ENDECO 316 U/V 18OCT-05DEC 75 R56 3HRLP NO DETREND
DOF=44.4 LAGS=80.0 BW= 0.200 CPD
SPKTRA REV 7(NCSU)

HOLOGRAPH PARAMETERS : A2_{Top}, Oct.14-Dec.9 '75

Figure 43 Holograph parameters of 3HRLP current velocity from meter A2_{top}

ENDECO 247 #A BOT 18OCT75 R56 U-CMP 40HRLP (CM/SEC)

ENDECO 247 #A BOT 18OCT75 R56 V-CMP 40HRLP (CM/SEC)

Figure 44 Low pass current velocity components and vectors from meter A2_{bot}

Figure 45 FFT of low pass current velocity components from meter A2_{bot}

ENDECO 247 U/V 18OCT-05:DEC75 R56
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7

Figure 46 Spectra of low pass current velocity components from meter A2_{bot}

Figure 47 Unfiltered current velocity components
(a,b,c,d,e) from meter A2_{bot}

ENDECO 247 #A BOT 14OCT75 R56 U-CMP (CM/SEC)

ENDECO 247 #A BOT 14OCT75 R56 V-CMP (CM/SEC)

Figure 47b

ENDECO 247 #A BOT 140CT75 R56 U-CMP (CM/SEC)

ENDECO 247 #A BOT 140CT75 R56 V-CMP (CM/SEC)

Figure 47c

ENDECO 247 #A BOT 14OCT75 R56 U-CMP (CM/SEC)

ENDECO 247 #A BOT 14OCT75 R56 V-CMP (CM/SEC)

Figure 47d

ENDECO 247 #A BOT 14OCT75 R56 U-CMP (CM/SEC)

ENDECO 247 #A BOT 14OCT75 R56 V-CMP (CM/SEC)

Figure 47e

Figure 48 Progressive vector diagram of unfiltered current velocity from meter A2_{bot}

ENDECO 247 14OCT-09DEC75 R56 UCMP

Figure 49 FFT of unfiltered current velocity components from meter A2_{bot}

ENDECO 247 14OCT-09DEC75 R56 VCMP

Figure 50 Spectra of 3HRLP current velocity components from meter A2_{bot}

ENDECO 247 U/V 18 OCT-05DEC 75 R56 3HRLP
DOF=99.4 LAGS=80.0 BW= 0.200 CPD

SPKTRM REV 7(NCSU)

Figure 51 Hodograph parameters of 3HRLP
current velocity from meter A2_{bot}

ENDECO 317U/318U 10 AUG-22 SEPT 75 40HRLP
DOF=10.0 LA03-15.0 BW= 0.0593 CPD
SPKTRA REV 7.

Figure 52 Spectra of low pass current velocity components from meter Al_{bot} (u component) and meter Al_{top} (u component)

Figure 53 Spectra of low pass current velocity components from meter Al_{bot} (v component) and meter Al_{top} (v component) 84.

ENDECO 317 V/318 V 10 AUG-22 SEPT 75 40HRLP
 DOF=10.0 LAGS=45.0 BW= 0.0593 CPD
 SPKTRA REV 7

317-U/318-V AUG-SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAOS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 55

Spectra of low pass current velocity components from meter Al_{bot} (v component) and meter Al_{top} (u component)

317-V/318-U AUG-SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.6593 CPD

SPECTRA REV 7(NCSU)

ENDECO 247 U/317 U 11AUG-21SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 56 Spectra of low pass current velocity components from meter Bl_{bot} (u component) and meter Al_{bot} (u component)

ENDECO 247 V/317 V 11AUG-21SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 57 Spectra of low pass current velocity components from meter Bl_{bot} (v component) and meter Al_{bot} (v component)

Figure 58

Spectra of low pass current velocity components from meter Bl_{bot} (u component) and meter Al_{bot} (v component)

247-U/317-V AUG-SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRN REV 7(NCSU)

Figure 59
Spectra of low pass current velocity components from meter El_{bot} (v component) and meter Al_{bot} (u component)

247-V/317-U AUG-SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

ENDECO 247 U/318 U 11AUG-21SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 60 Spectra of low pass current velocity components from meter Bl_{bot} (u component) and meter Al_{top} (u component)

ENDECO 247 V/318 V 11AUG-21SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 61 Spectra of low pass current velocity components from meter B1_{bot} (v component) and meter A1_{top} (v component)

247-U/318-V AUG-SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

UM X

Figure 53

Spectra of low pass current velocity components from meter B1_{bot} (v component) and meter A1_{top} (u component)

CROSS PHASE

297-V/318-U AUG-SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

ENDECO 247 U/316 U 18 OCT - 05 DEC 75 40HRLP
 DOF=11.3 LAOS=45.0 BW= 0.0593 CPD
 SPKTRA REV 7

Figure 64 Spectra of low pass current velocity components from meter A2_{bot} (u component) and meter A2_{top} (u component)

Figure 65 Spectra of low pass current velocity components from meter A2_{bot} (v component) and meter A2_{top} (v component)

ENDECO 247V/316V 18 OCT-05 DEC. 75 40HRLP
DGF-11.3 LA09-45.0 BW- 0.0593 CPD

SPKTRA REV 7

Figure 66

Spectra of low pass current velocity components from meter A2_{bot} (u component) and meter A2_{top} (v component)

ENDECO 247U/316V 18 OCT-05 DEC 75 40HRLP
DOF=11.3 LAOS=45.0 BW= 0.0593 CPD

SPKTRN REV 7

Figure 67

Spectra of low pass current velocity components from meter A2_{bot} (v component) and meter A2_{top} (u component)

217-V / 316-U AUG-SEP 75 R56 40IRLP NO DETREND
DOF=17.2 LAOS=45.0 BW= 0.0593 CPD

SPKTRN REV 7(NCSU)

Figure 68

Spectra of low pass current velocity components from meter Al_{bot} (u component, Principal Axis = 65.26°) and meter Al_{top} (u component, Principal Axis = 6.20°)

317-U/318-U (R65.26/R6.20) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 69

Spectra of low pass current velocity components from meter Al_{bot} (v component, Principal Axis = 65.26°) and meter Al_{top} (v component, Principal Axis = 6.20°)

317-V/318-V (R65.26/R6.20) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LA03=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NC3U)

Figure 70

Spectra of low pass current velocity components from meter Al_{bot} (u component, Principal Axis = 65.26°) and meter Al_{top} (v component, Principal Axis = 6.20°)

317-U/318-V (R65.26/R6.20) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LAOS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 71

Spectra of low pass current velocity components from meter Al_{bot} (v component, Principal Axis = 65.26°) and meter Al_{top} (u component, Principal Axis = 6.20°)

317-V/318-U (R65.26/R6.20) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LAG=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NC3U)

Figure 72

Spectra of low pass current velocity components from meter B1_{bot} (u component, Principal Axis = 2.42°) and meter A1_{bot} (u component, Principal Axis = 65.26°)

247-U/317-U (R2.42/R65.26) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LA03=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 73

Spectra of low pass current velocity components from meter Bl_{pot} (v component, Principal Axis = 2.42°) and meter Al_{pot} (v component, Principal Axis = 65.26°)

247-V/317-V (R2.42/R65.26) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LAG=45.0 BW= 0.0593 CPD

9PKTRA REV 7(NCSU)

Figure 74

Spectra of low pass current velocity components from meter B1_{bot} (u component, Principal Axis = 2.42°) and meter A1_{bot} (v component, Principal Axis = 65.26°)

247-U/317-V (R2.42/R65.26) AU0-SEP 75 401RLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

SPL. X

Figure 75 Spectra of low pass current velocity components from meter B1_{bot} (v component, principal Axis = 2.42°) and meter A1_{bot} (u component, Principal Axis = 65.26°)

CROSS PHASE

247-V/317-U (R2.42/R65.26) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LAGS=15.0 BW= 0.0593 CPD

SPKTRM REV 7(NCSU)

Figure 76

Spectra of low pass current velocity components from meter B1_{bot} (u component, Principal Axis = 2.42°) and meter A1_{top} (u component, Principal Axis = 6.20°)

247-U/318-U (R2.42/R6.20) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSI)

Figure 77

Spectra of low pass current velocity components from meter B1_{bot} (v component, Principal Axis = 2.42°) and meter A1_{top} (v component, Principal Axis = 6.20°)

247-V/318-V (R2.42/R6.20) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

247-U/318-V (R2.12/R6.20) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 79

Spectra of low pass current velocity components from meter B1_{bot} (v component, Principal Axis = 2.42°) and meter A1_{top} (u component, Principal Axis = 6.20°)

247-V/318-U (R2.42/R6.20) AUG-SEP 75 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 80

Spectra of low pass current velocity components from meter A2_{bot} (u component, Principal Axis = 89.34°) and meter A2_{top} (u component, Principal Axis = 11.12°)

247-U/316-U (R89.34/R11.12) OCT-DEC 75 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BN= 0.0593 CPD

SPKTRA REV 7(NCSU)

SPECTRA X

Figure 81

Spectra of low pass current velocity components from meter A2_{bot} (v component, Principal Axis = 89.34°) and meter A2_{top} (v component, Principal Axis = 11.12°)

CROSS PHASE

217-V/316-V (R89.34/R11.12) OCT-DEC 75 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 82

Spectra of low pass current velocity components from meter A2_{bot} (u component, Principal Axis = 89.34°) and meter A2_{top} (v component, Principal Axis = 11.12°)

247-U/316-V (R89.34/R11.12) OCT-DEC 75 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 83

Spectra of low pass current velocity components from meter A2_{bot} (v component, Principal Axis = 89.34°) and meter A2_{top} (u component, Principal Axis = 11.12°)

297-V/316-U (R89.34/R11.12) OCT-DEC 75 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

VI. Meteorological Data

Figure 84 Low pass wind velocity components at Cape Hatteras, Aug-Sept 1975

Figure 85 Low pass temperature and pressure at Cape
Hatteras, Aug-Sept 1975

HATTERAS 6AUG75 UWC

HATTERAS 6AUG75 VWC

Figure 86 FFT of low pass wind velocity components
at Cape Hatteras, Aug-Sept 1975

HATTERAS 6AUG75 TEMP

HATTERAS 6AUG75 PRESS

Figure 87 FFT of low pass temperature and pressure at Cape Hatteras, Aug-Sept 1975

Figure 88 Low pass wind stress components and
at Cape Hatteras, Aug-Sept 1975

HATTERAS STRESS 2DLP

τ (dynes/cm²)

0 .5

HATTERAS 6AUG75 USC

HATTERAS 6AUG75 VSC

Figure 89 FFT of low pass wind stress components at Cape Hatteras, Aug-Sept 1975

Figure 90 Unfiltered wind velocity components at Cape Hatteras, Aug-Sept 1975

HAT UWC 6AUG75 ORIG DATA

HAT VWC 6AUG75 ORIG DATA

Figure 91 FFT of unfiltered wind velocity components at Cape Hatteras, Aug-Sept 1975.

HATTERAS 14OCT75 UWC

HATTERAS 14OCT75 VWC

Figure 92 Low pass wind velocity components at Cape Hatteras, Oct-Dec 1975

Figure 93 Low pass temperature and pressure at Cape Hatteras, Oct-Dec 1975

HATTERAS 14OCT75 UWC

HATTERAS 14OCT75 VWC

Figure 94 FFT of low pass wind velocity components at Cape Hatteras, Oct-Dec 1975

HAT TEMP 11 OCT 75 40HRLP

*DM

HAT PRESS 11 OCT 75 40HRLP

*DM

Figure 95 FFT of low pass temperature and pressure at Cape Hatteras, Oct-Dec 1975 127.

Figure 96 Low pass wind stress components and vectors at Cape Hatteras, Oct-Dec 1975

HATTERAS 14OCT75 USC

HATTERAS 14OCT75 VSC

Figure 97 FFT of low pass wind stress components at
Cape Hatteras, Oct-Dec 1975

Figure 98 Unfiltered wind velocity components at
Cape Hatteras, Oct-Dec 1975

CAPE HATTERAS 14OCT75

UWC

CAPE HATTERAS 14OCT75

VWC

14 OCT.
0930 hrs

HATTERAS UWC ORIG DATA, 14OCT75

HATTERAS VWC ORIG DATA, 14OCT75

Figure 99 FFT of unfiltered wind velocity components 131.
at Cape Hatteras, Oct-Dec 1975

Figure 100 Low pass wind velocity components at Wilmington, Aug-Sept 1975

Figure 101 Low pass temperature and pressure at Wilmington, Aug-Sept 1975

WILMG 6AUG75 UWC

WILMG 6AUG75 VWC

Figure 102 FFT of low pass wind velocity components at
Wilmington, Aug-Sept 1975

WILMG 6AUG75 TEMP

WILMG 6AUG75 PRESS

Figure 103 FFT of low pass temperature and pressure at Wilmington, Aug-Sept 1975

WILMG 6AUG75 USC

WILMG 6AUG75 VSC

WILMINGTON STRESS 2DLP

Figure 104 Low pass wind stress components and vectors at Wilmington, Aug-Sept 1975

WILMG 6AUG75 USC

WILMG 6AUG75 VSC

Figure 105 FFT of low pass wind stress components at
Wilmington, Aug-Sept 1975

WILMINGTON 6AUG75

UWC

WILMINGTON 6AUG75

VWC

Figure 106 Unfiltered wind velocity components at
Wilmington, Aug-Sept 1975

WIL UWC 6AUG75 ORIG DATA

WIL VWC 6AUG75 ORIG DATA

Figure 107 FFT of unfiltered wind velocity components at Wilmington, Aug-Sept 1975 139.

Figure 108 Low pass wind velocity components at Wilmington, Oct-Dec 1975

Figure 109 Low pass temperature and pressure at Wilmington, Oct-Dec 1975

WILMG 14OCT75 UWC

WILMG 14OCT75 VWC

Figure 110 FFT of low pass wind velocity components
at Wilmington, Oct-Dec 1975

WIL TEMP 11 OCT 75 40HRLP

*DM

WIL PRESS 11 OCT 75 40HRLP

*DM

Figure 111 FFT of low pass temperature and pressure at
Wilmington, Oct-Dec 1975

WILMG 14OCT75 USC

WILMG 14OCT75 VSC

WILMINGTON STRESS 2DLP

Figure 112 Low pass wind stress components and vectors at Wilmington, Oct-Dec 1975

WILMG 14OCT75 USC

WILMG 14OCT75 VSC

Figure 113 FFT of low pass wind stress components at Wilmington, Oct-Dec 1975

WILMINGTON 14OCT75

UWC

WILMINGTON 14OCT75

VWC

Figure 114 Unfiltered wind velocity components at
Wilmington, Oct-Dec 1975

WILMINGTON UWC ORIG DATA, 14OCT75

WILMINGTON VWC ORIG DATA, 14OCT75

Figure 115 FFT of unfiltered wind velocity components 147.
at Wilmington, Oct-Dec 1975

VII. Intravariab!e Comparisons Between Current
and Meteorological Data

Figure 116 Comparison of low pass current vectors from meters Al_{top}, Al_{bot}, Bl_{bot} and the low pass wind stress vector at Cape Hatteras, Aug-Sept 1975

Figure 117 Comparison of low pass current vectors from meters A2_{top} and A2_{bot} and the low pass wind stress vector at Cape Hatteras, Oct-Dec 1975

Figure 118

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity u component from meter A1_{top} Aug-Sept 1975

Figure 119

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter A1_{top} Aug-Sept 1975

WIL VSC/E318 V 10AUG-22SEP 75 R56 40HRLP NO DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

WIL USC/E318 V 10AUG-22SEP 75 R56 40HRLP NO DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSII)

Figure 120 Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter Al_{top} Aug-Sept 1975

WIL VSC/E318 U 10AUG-22SEP 75 R56 40HRLP NO DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 121 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter A1_{top} Aug-Sept 1975

151
 Spectra of the velocity components at Wilmington and the low pass current velocity u component from meter Al_{bot} Aug-
 Spet 1975 (detrended)

CROSS PHASE

WIL USC/317 U AUG-SEP75 RS6 40HRLP DETREND
 DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 123

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter A1_{bot} Aug-Sept 1975 (detrended)

WIL VSC/317 V AUG-SEP75 R56 40HRLP DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 124

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter A_{bot} Aug-Sept 1975 (detrended)

WIL USC/317 V AUG-SEP75 R56 40IRLP DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

JM X

Figure 125

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter Al_{bot} Aug-Sept. 1975 (detrended)

WIL VSC/317 U AUG-SEP75 R56 40HRLP DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 126

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity u component from meter Bl_{bot} Aug-Sept 1975

WIL USC/E247 U 11AUG-21SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 127

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter Bl_{bot} Aug-Sept 1975

WIL VSC/E247 V 11AUG-21SEP 75 R56 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 128

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter B1_{bot} Aut-Sept 1975 (detrended)

WIL USC/247 V AUG-SEP75 R56 40HRLP DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

RUM X

Figure 129

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter Bl_{bot} Aug-Sept 1975 (detrended)

CROSS PHASE

WIL VSC/247 U AUG-SEP75 R56 40HRLP DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 130
Spectra of the low pass wind stress u
component at Wilmington and the low pass
current velocity u component from meter
A2_{top} Oct-Dec 1975

WIL USC/E316 U 18OCT-05DEC 75 R5G 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

WIL VSC/E316 V 18OCT-05DEC 75 R56 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

WIL USC/E316 V 18OCT-05DEC 75 R56 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

WIL VSC/E316 U 18OCT-05DEC 75 R56 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 134

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity u component from meter A2_{bot} Oct-Dec 1975

WIL USC/E247 U 18OCT-05DEC 75 R56 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 135

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter A2_{bot} Oct-Dec 1975

WIL VSC/E247 V 18OCT-05DEC 75 R56 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 136

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter A2_{bot} Oct-Dec 1975 (detrended)

WIL USC/247 V OCT-DEC/75 R56 40HRLP DETREND
DOF=11.3 LNO=45.0 BW= 0.0593 CPD
SPKTRA REV 7(NCSU)

TRUM X

Figure 137

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter A2_{bot} Oct-Dec 1975 (detrended)

CROSS PHASE

WIL VSC/247 U OCT-DEC75 R56 40HRLP DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(HCSU)

Figure 138 Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity u component from meter A1_{top} (Principal Axis = 06°), Aug-Sept 1975

WIL USC/E318 U 10AUG-22SEP 75 R06 40HRLP NO DETREND
 UOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRH REV 7(NCSU)

Figure 139 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter Al_{top} (Principal Axis = 06°), Aug-Sept 1975

WIL VSC/E318 V 10AUG-22SEP 75 R06 40HRLP NO DETREND
DOF=9.39 LAGS=45.0 BW= 0.0556 CPD

SPKTRA REV 7(NCSU)

Figure 140 Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter Al_{top} (Principal Axis = 06°), Aug-Sept 1975

WIL USC/E318 V 10AUG-22SEP 75 R06 10HRLP NO DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSII)

Figure 141 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter Al_{top} (Principal Axis = 06°), Aug-Sept 1975

WIL VSC/E318 U 10AUG-22SEP 75 R06 40HRLP NO DETREND
DOF=9.39 LAGS=45.0 BW= 0.0556 CPD

SPKTRA REV 7(NCSU)

Figure 142

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity u component from meter Al_{bot} (Principal Axis = 65°), Aug-Sept 1975

WIL USC/E317 U 10AUG-22SEP 75 R65 40HRLP NO DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Fig 43 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter Al_{bot} (Principal Axis = 65°), Aug-Sept 1975

WIL VSC/E317 V 10AUG-22SEP 75 R65 40HRLP NO DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD
SPKTRA REV 7(NCSU)

F1 144 Spectra of the low pass wind stress u
component at Wilmington and the low pass
current velocity v component from meter
Al_{bot} (Principal Axis = 65°), Aug-Sept 1975

CROSS PHASE

WIL USC/E317 V 10AUG-22SEP 75 R65 40HRLP NO DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 145

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter Al_{bot} (Principal Axis = 65°), Aug-Sept. 1975

WIL VSC/E317 U 10AUG-22SEP 75 R65 40HRLP NO DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

WIL USC/E247 U 11AUG-21SEP 75 R02 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 147

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter B1_{bot} (Principal Axis = 02°), Aug-Sept 1975

CROSS PHASE

WIL VSC/E247 V 11AUG-21SEP 75 R02 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSI)

figure 148

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter Bl_{bot} (Principal Axis = 02°), Aug-Sept 1975

WIL USC/E247 V 11AUG-21SEP 75 R02 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SFKTRA REV 7(NCSU)

Figure 149

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter Bl_{bot} (Principal Axis = 02°), Aug-Sept 1975

WIL VSC/E247 U 11AUG-21SEP 75 R02 40HRLP NO DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SFKTRA REV 7(NCSU)

1-0--e 150

Spectra of the low pass wind stress u
component at Wilmington and the low pass
current velocity u component from meter
A2_{top} (Principal Axis = 11°), Oct-Dec 1975

WIL USC/E316 U 18OCT-05DEC 75 R11 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 151 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter A2_{top} (Principal Axis = 11°), Oct-Dec 1975

WIL VSC/E316 V 18OCT-05DEC 75 R11 40HRLP NO DETREND
DOF=11.3 LAGS=15.0 BW= 0.0593 CPD

SPKTR REV 7(NCSU)

Figure 152 Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter A2_{top} (Principal Axis = 11°), Oct-Dec 1975

Figure 153 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter A2_{top} (Principal Axis = 11°), Oct-Dec 1975

WIL VSC/E316 U 18OCT-05DEC /5 R11 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 154 Spectra of the low pass wind stress u component
at Wilmington and the low pass current
velocity u component from meter A2_{bot}
(Principal Axis = 89°), Oct-Dec 1975

WIL USC/E247 U 18OCT-05DEC 75 R09 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 155 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter A2_{bot} (Principal Axis = 89°), Oct-Dec 1975

WIL VSC/E247 V 18OCT-05DEC 75 R89 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTR REV 7(NCSU)

Figure 156

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter A2_{bot} (Principal Axis = 89°), Oct-Dec 1975

WIL USC/E247 V 18OCT-05DEC 75 R89 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

SPECTRUM X Figure 157

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter A2_{bot} (Principal Axis = 89°), Oct-Dec 1975

CROSS PHASE

WIL VSC/E247 U 18OCT-05DEC 75 R89 40HRLP NO DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

re 158

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity u component from meter Al_{top} (Principal Axis = 06°), Aug-Sept 1975 (detrended)

CROSS PHASE

WIL USC/E318 U 10AUG-22SEP 75 R06 40HRLP DETREND
DOF=10.0 LAOS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Fig 159 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter Al_{top} (Principal Axis = 06°), Aug-Sept 1975

WIL VSC/E318 V 10AUG-22SEP 75 R06 40HRLP DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD
SPKTRA REV 7(NCSU)

F1 e 160

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter Al_{top} (Principal Axis = 06°), Aug-Sept 1975 (detrended)

CROSS PHASE

WIL USC/E318 V 10AU0-22SEP 75 R06 40HRLP DETREND
DOF=10.0 LAOS=45.0 BW= 0.0593 CPD
SPKTRA REV 7(NCSU)

Fig 61 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter Al_{top} (Principal Axis = 06°), Aug-Sept 1975 (detrended)

CROSS PHASE

WIL VSC/E318 U 10AUG-22SEP 75 R06 40HRLP DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 162 Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity u component from meter Al_{bot} (Principal Axis = 65°), Aug-Sept 1975 (detrended)

WIL USC/E317 U 10AUG-22SEP 75 R65 40HRLP DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD
SPKTRA REV 7(NCSU)

163
SPECTRUM X

Spectra of the low pass wind stress v
component at Wilmington and the low pass
current velocity v component from meter
Al_{bot} (Principal Axis = 65°), Aug-Sept 1975
(detrended)

CROSS PHASE

WIL VSC/E317 V 10AUG-22SEP 75 R65 40HRLP DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD
SPKTRA REV 7(NCSU)

re 164

Spectra of the low pass wind stress u
component at Wilmington and the low pass
current velocity v component from meter
Al_{bot} (Principal Axis = 65°), Aug-Sept 1975
(detrended)

CROSS PHASE

WIL USC/E317 V 10AUG-22SEP 75 R65 40HRLP DETREND
DOF=10.0 LAGS=45.0 BW= 0.0593 CPD

SPKTRN REV 7(NCSU)

Fig .65 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter Al_{bot} (Principal Axis = 65°), Aug-Sept 1975 (detrended)

WIL VSC/E317 U 10AUG-22SEP 75 R65 40HRLP DETREND
DOF=10.0 LAGS=15.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

re 166

Spectra of the low pass wind stress u
component at Wilmington and the low pass
current velocity u component from meter
Bl_{bot} (Principal Axis = 02°), Aug-Sept 1975
(detrended)

WIL USC/E247 U 11AUG-21SEP 75 R02 40HRLP DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

F1 167 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter Bl_{bot} (Principal Axis = 02°), Aug-Sept 1975 (detrended)

WIL VSC/E247 V 11AUG-21SEP 75 R02 40HRLP DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 168

Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter Bl_{bot} (Principal Axis = 02°), Aug-Sept 1975 (detrended)

WIL USC/E247 V 11AUG-21SEP 75 R02 40HRLP DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 9 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter Bl_{bot} (Principal Axis = 02°), Aug-Sept 1975 (detrended)

WIL VSC/E247 U 11AUG-21SEP 75 R02 40HRLP DETREND
DOF=9.66 LAGS=45.0 BW= 0.0593 CPD
SPKTRA REV 7(NCSU)

Fig 70 Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity u component from meter A2_{top} (Principal Axis = 11°), Oct-Dec 1975 (detrended)

WIL USC/E316 U 18OCT-05DEC 75 R11 40HRLP DETREND
DOF=11.3 LAOS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Figure 171 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity v component from meter A2_{top} (Principal Axis - 11°), Oct-Dec 1975 (detrended)

WIL VSC/E316 V 18OCT-05DEC 75 R11 40HRLP DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD
SPKTRA REV 7(NCSU)

F1

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Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter $A2_{top}$ (Principal Axis = 11°), Oct-Dec 1975 (detrended)

WIL USC/E316 V 18OCT-05DEC 75 R11 40HRLP DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

File 173
SPECTRUM X

Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter A2_{top} (Principal Axis = 11°), Oct-Dec 1975 (detrended)

CROSS PHASE

WIL VSC/E316 U 18OCT-05DEC 75 R11 40HRLP DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

Fig 174 Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity u component from meter A2_{bot} (Principal Axis = 89°), Oct-Dec 1975 (detrended)

WIL USC/E247 U 18OCT-05DEC 75 R89 40HRLP DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD
SPKTRA REV 7(NCSU)

F1 175 Spectra of the low pass wind stress v
component at Wilmington and the low pass
current velocity v component from meter
A2_{bot} (Principal Axis = 89°), Oct-Dec 1975
(detrended)

CROSS PHASE

WIL VSC/E247 V 18OCT-05DEC 75 R89 40HRLP DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

176 Spectra of the low pass wind stress u component at Wilmington and the low pass current velocity v component from meter A2_{bot} (Principal Axis = 89°), Oct-Dec 1975 (detrended)

WIL USC/E247 V 18OCT-05DEC 75 R89 40HRLP DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD
SPKTRA REV 7(NCSU)

e 177 Spectra of the low pass wind stress v component at Wilmington and the low pass current velocity u component from meter A2_{bot} (Principal Axis = 89°), Oct-Dec 1975 (detrended)

CROSS PHASE

WIL VSC/E247 U 18OCT-05DEC 75 R89 40HRLP DETREND
DOF=11.3 LAGS=45.0 BW= 0.0593 CPD

SPKTRA REV 7(NCSU)

VIII. Coastal Sea Level Data

Figure 178 Low pass sea level at Wilmington, N.C.
Charleston, S.C. Aug-Sept 1975

Figure 179 Low pass sea level at Wilmington, N.C.
Charleston, S.C. Oct-Dec 1975

IX. Temperature Data

BI_{Top} TEMPERATURE (7AUG75-14SEP75)

Figure 180 Unfiltered temperature from BI_{top} thermograph

Figure 181 Low pass temperature from Bl_{top}
thermograph

Bl_{Top} TEMPERATURE °C (11AUG 75-06SEP 75) 40HRLP

Figure 182 Case study of bottom intrusion during period Aug 9-24, 1975

Figure 183 Daily averaged vectors of wind stress squared (Cape Hatteras) and currents during specific events of wind

Daily averaged vectors of wind stress squared (Cape Hatteras) and currents during specific events of wind. (a) 42-day average currents (only); (b) NE wind stress, 12 Aug.; (c) NE wind stress, 14 Aug.; (d) SW wind stress, 19 Aug.; (e) NE wind stress, 12 Sept.; (f) SW wind stress, 14 Sept. Wind stress vectors are depicted north-west of the shoreline in each illustration except the first. In (a), multiply vector lengths by 0.05 for true speeds. Dotted arrows represent currents at 10 meters depth; solid arrows represent currents at 25 meters depth.

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