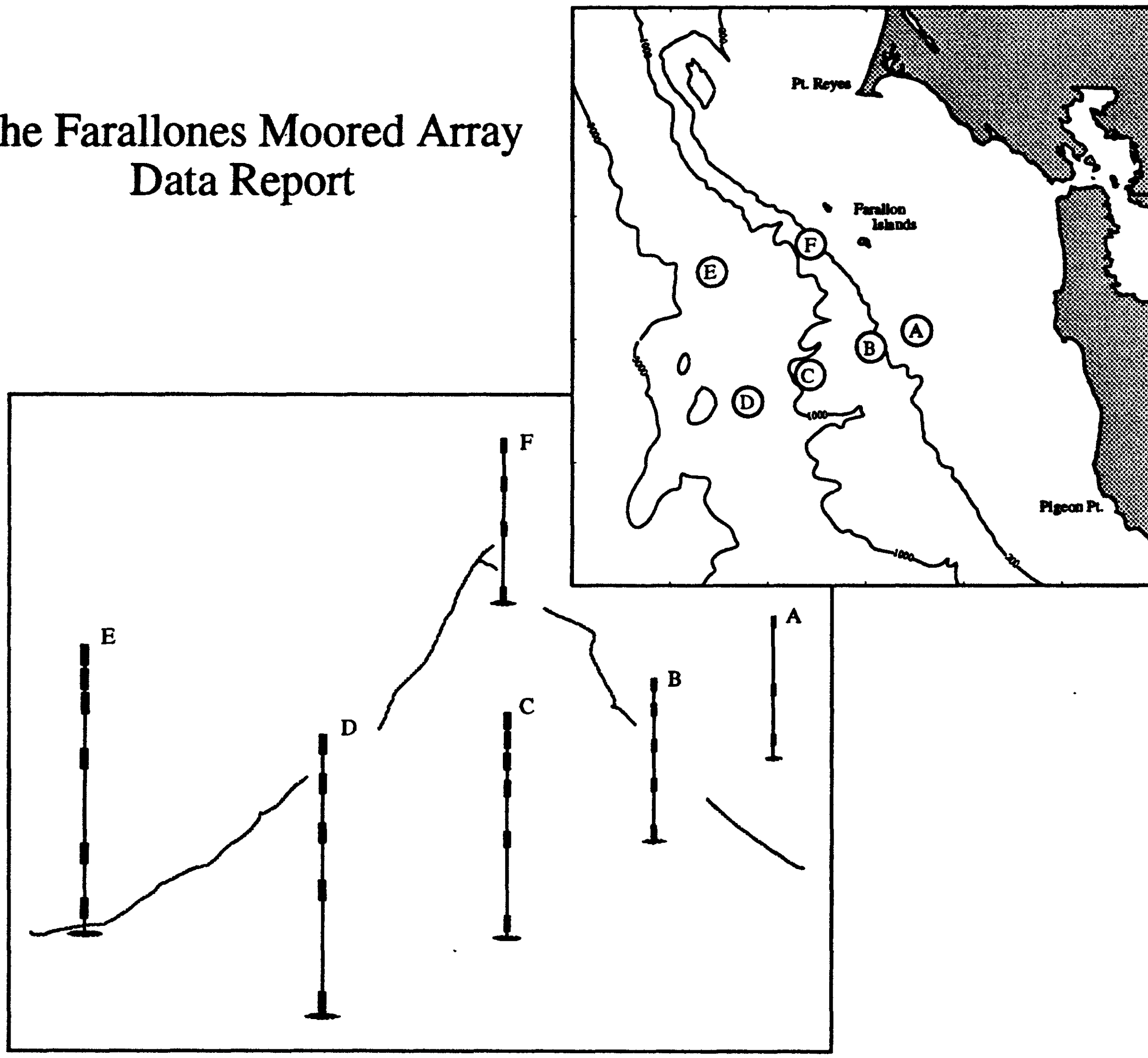
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The Farallones Moored Array Data Report



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Open-File Report 93-11

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INTRODUCTION

In February 1991, a year-long study was begun of the circulation and the related transport of suspended materials in the Gulf of the Farallones and over the adjacent continental slope. As part of this program, an array of current-meter moorings was deployed in the region. The data from the moored array provides the core of this data report.

The information gathered by the moored array and by allied programs in the study was designed to provide both a basic description of the current field and an understanding of the underlying physical processes in the region. It was necessary to gather this knowledge so that models could be developed that would allow the Environmental Protection Agency (EPA) to choose appropriate sites for the deposition of materials dredged from San Francisco Bay. The observed currents will also be used with simple advection/dispersion models to allow the EPA to predict the ultimate fate of materials deposited at those sites.

There are four primary sites of interest to the EPA, one on the shelf and three on the mid to outer slope (Figure 1). Because the historical data record is sparse, an extensive measurement program was developed in the region so that the EPA could evaluate these sites . While currents have been

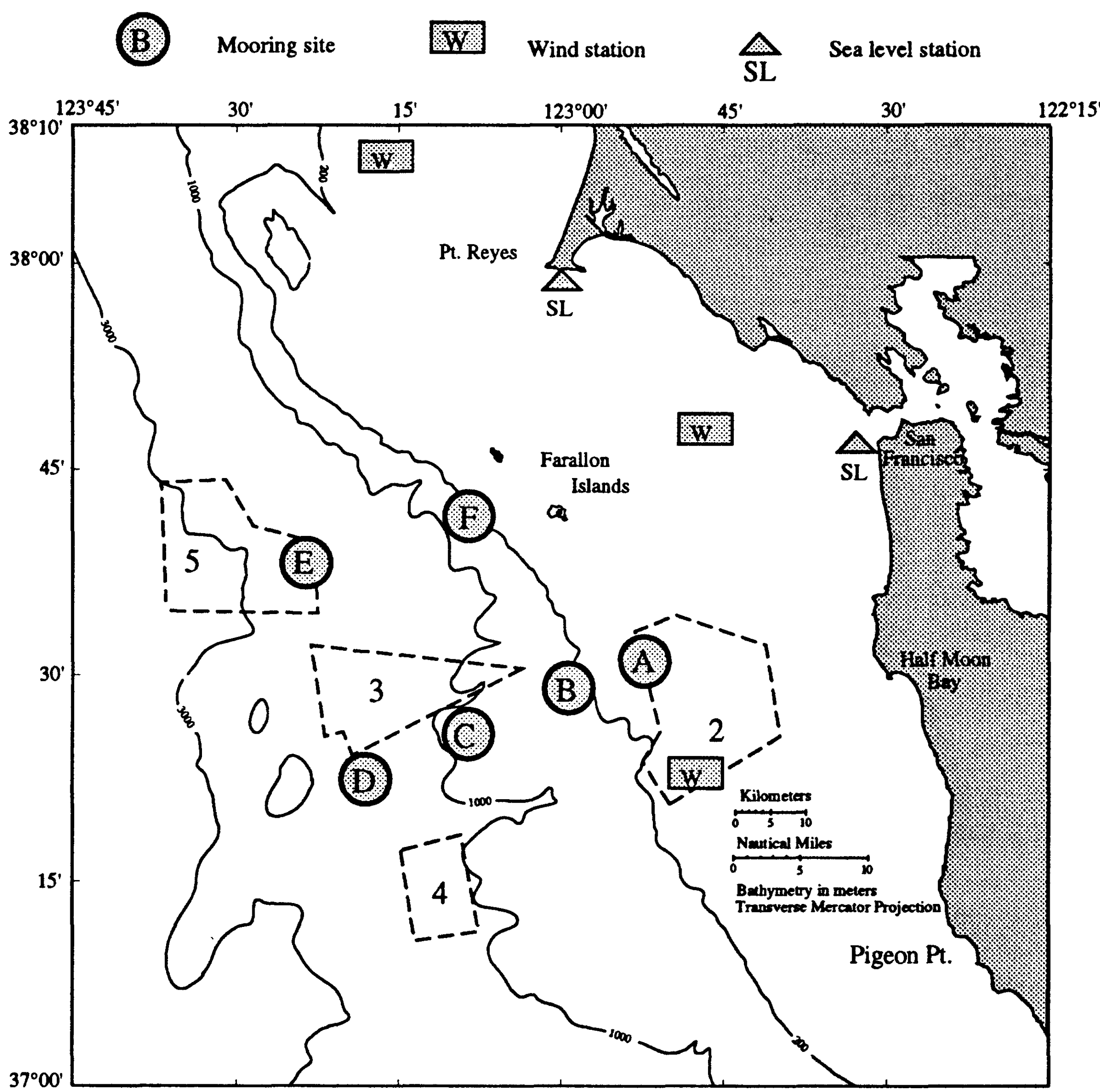

Figure 1. The locations of moorings A-F and the approximate location of EPA study areas 2-5.

monitored for several years on the shelf near candidate disposal site 2 (Strub et al., 1987; Sherwood et al., 1990), the historical data base for currents over the slope is almost nonexistent. It consists of a few short records collected mainly by the U. S. Navy in a variety of locations. Hence, the existing data records are too limited, both in duration and in spatial coverage, to provide the extensive knowledge necessary for the development of reliable transport models in the regions of interest.

The extensive, year-long field program begun in February 1991 gathered the data necessary to address the above issues. The program was developed and carried out by a consortium of agencies, companies and research institutions. Personnel from the EPA, U. S. Navy, U. S. Geological Survey (USGS), National Marine Fisheries, Naval Postgraduate School (NPS), Monterey Bay Aquarium Research Institute (MBARI), and Science Applications International Corporation (SAIC) cooperated in the design and execution of the project. The comprehensive program consisted of three elements. An array of moorings that collect measurements of current, temperature, salinity, and pressure was deployed for a year over the shelf and slope. Five quasi-synoptic surveys of the spatial structure of the currents above 300 m and the physical characteristics of the entire water column were conducted during February, May, August, and November 1991 and February 1992. Satellite images of the near-surface thermal structure were collected and processed. In addition, records of the wind velocity over the water and sea level height at the coast were obtained from the National Data Buoy Office and the National Ocean Service.

In March, 1991, the moored array portion of the Farallones project was begun. SAIC and NPS deployed an extensive array of equipment at 6 sites, A-F, in the region of the Gulf of the Farallones (Figure 1, Table 1). The array was designed to monitor the current velocity, water temperature and several other physical characteristics of the water column for an entire year in order that seasonal changes in the measured parameters could be resolved. The selection of the exact locations for the measurement sites was based on several criteria. It was important to determine the spatial structure of the measured parameters and how that structure changed with time, depth and horizontal location. The array was designed to allow an evaluation of possible connections between the circulation and sediment transport patterns on the shelf and the slope. The locations were also chosen to provide information on characteristics of the circulation in candidate dredge disposal sites. The mooring sites are either adjacent to or within all areas of interest to the EPA.

The main line in the array, which contains sites A-D, monitors the changes in the physical oceanographic parameters with water depth. Changes in water depth typically cause the largest spatial gradients in the circulation and sediment transport pathways. Site A monitors currents and other properties of the water column in 92 m of water, a depth found on the outer shelf (Figures 1 and 2). Site B measures these same quantities in 400 m of water, over the upper slope. Sites C and D, located in 800 m and 1400 m of water, respectively, provide information on water movements over the mid and lower slope.

A primary purpose of the secondary line in the array, sites E and F, is to provide information on how the characteristics of the circulation patterns change with distance along the isobaths. Mooring F is in 400 m of water, the same depth but displaced from mooring B (Figures 1 and 2). Mooring E is paired with mooring D. Mooring E is also located on the inshore edge of candidate disposal site 5, the most northerly of the possible disposal sites.

Each mooring in the array had between 3 and 6 instruments that measured current and temperature at specific locations in the water column (Figure 2). Some of the instruments also measured salinity (or conductivity) and pressure at selected sites (Table 1). At each site, the instrument location was designed to resolve the expected vertical structure of the current and temperature fields. The instruments were closely spaced in the upper portions of the water column, where the vertical gradients were expected to be strongest (Figure 2, Table 1). The distance between instruments more than doubled in the lower half of the moorings, where vertical gradients were expected to be smaller. Instruments on all the moorings were placed at similar water depths in order to resolve changes in the horizontal structure of the circulation patterns with depth (Figure 2, Table 1). Currents in the upper 75 m of the water column were monitored at all locations by 1 or 2 instruments. Other common instrument levels were 150 m, 250 m, 400 m and 800 m. In addition, all moorings had instruments within 12 m of the sea floor in order to monitor the strength of currents that could possible resuspend deposited dredged materials. Unfortunately, not all of the instruments in the moored arrays worked and a more limited data set than planned was collected (Figure 3).

To ensure a quality data product, specialized current meters, either EG&G vector-measuring current meters (VACMs), Interocean S4's or Neil Brown acoustic current meters (ACM2's), were deployed in the upper 150 m of the water column (Table 1). These current meters are designed to monitor current fluctuations even when oscillatory currents from large surface waves are present.

SITE	WATER DEPTH (m)	START TIME (M/D/Y)	STOP TIME (M/D/Y)	DATA FILLE D IN FROM APPROX. (M/D/Y GMT)	DATA FILLE D IN TO APPROX. (M/D/Y GMT)	INSTRUMENT	POSTION LATITUDE	POSTION LONGITUDE	SENSOR DEPTH (m)	DATA TYPE	CURRENT DATA SAMPLE INTERVAL (MINUTES)	TEMP/SALINITY DATA SAMPLE INTERVAL (MINUTES)
A	92	03/08/91	01/05/92	---	---	S4	37 32.69 N	122 51.24 W	10	C, T, S	30	30
A	92	03/08/91	02/08/92	---	---	S4	37 32.69 N	122 51.24 W	50	C, T, S	30	30
A	92	03/08/91	08/13/91	---	---	S4	37 32.69 N	122 51.24 W	80	C, T, S	30	30
B	400	07/04/91	09/23/91	---	---	VMCM	37 28.63 N	122 59.76 W	10	C, T,	3.75	*1T=40, *2T=150
B	400	03/09/91	02/08/92	08/13/91 1800	08/14/91 2200	ACM2	37 28.71 N	123 00.30 W	150	C, T	*1=4, *2=15	*1T=40, *2T=15
B	400	03/09/91	02/08/92	08/13/91 0300	08/14/91 2100	RCM4	37 28.71 N	123 00.30 W	260	C, T, S	30	30
B	400	03/09/91	02/08/92	08/06/91 1600	08/14/91 2100	RCM4/5	37 28.71 N	123 00.30 W	390	C, T, S	30	30
C	800	03/09/91	02/09/92	---	---	VMCM	37 25.29 N	123 08.10 W	10	C, T	*1=4, *2=4, *3=30	*1=4, *2=4, *3=30
C	800	03/09/91	02/09/92	10/30/91 1600	10/31/91 0100	S4	37 25.29 N	123 08.10 W	75	C, T, S	30	30
C	800	03/09/91	08/13/91	---	---	ACM2	37 25.72 N	123 08.03 W	150	C	4	–
C	800	03/09/91	08/13/91	---	---	RCM4	37 25.72 N	123 08.03 W	250	C, T, S	30	30
C	800	03/09/91	09/11/91	---	---	RCM5	37 25.72 N	123 08.03 W	400	C, T, S	30	30
C	800	03/09/91	03/11/92	---	---	RCM5	37 25.72 N	123 08.03 W	790	C, T, S	30	30
D	1400	03/10/91	02/13/92	10/30/91 1600	10/31/91 2300	S4	37 21.19 N	123 16.20 W	75	C, T	30	30
D	1400	03/10/91	09/03/91	08/13/91 1400	08/14/91 1800	RCM4	37 21.83 N	123 16.05 W	250	C, T	30	30
D	1400	03/10/91	02/13/92	08/13/91 1500	08/14/91 2000	RCM5	37 21.83 N	123 16.05 W	400	C, T, S	30	30
D	1400	03/10/91	02/13/92	08/13/91 1300	08/14/91 1800	RCM5	37 21.83 N	123 16.05 W	800	C, T, S	30	30
D	1400	08/14/91	02/13/92	---	---	RCM5	37 21.83 N	123 16.00 W	1390	C, T, S	30	30
E	2040	03/11/91	04/16/91	---	---	VMCM	37 38.39 N	123 18.03 W	75	C, T	4	4
E	2000	03/11/91	08/15/91	---	---	RCM8	37 38.39 N	123 18.03 W	272	C, T, S, P	60	60
E	2000	03/11/91	02/12/92	---	---	RCM8	37 38.39 N	123 18.03 W	420	C, T	60	60
E	2000	03/11/91	02/12/92	---	---	RCM8	37 38.39 N	123 18.03 W	820	C, T	30	60
E	2000	03/11/91	02/12/92	---	---	RCM8	37 38.39 N	123 18.03 W	1400	C, T	30	60
E	2000	03/11/91	02/12/92	---	---	RCM8	37 38.39 N	123 18.03 W	1987	C, T	30	60
F	400	03/11/91	02/10/92	10/31/91 1600	10/31/91 1900	S4	37 41.97 N	123 08.63 W	75	C,T	30	30
F	430	03/12/91	02/13/92	---	---	S4	37 41.97 N	123 08.63 W	180/222	C, T, S, P	30	60
F	430	03/11/91	02/13/92	---	---	RCM8	37 41.97 N	123 08.63 W	280/322	C, T, S, P	30	60
F	430	03/11/91	02/13/92	---	---	RCM8	37 41.97 N	123 08.63 W	417/459	C, T, S, P	30	60

Table 1. Data availability for all moorings.

ACM2 = Neil Brown Acoustic Current Meter
S4 = Interocean S4
VMCM = EG&G Vector Measuring Current Meter
RCM4, RCM5, RCM8 = Aaendera

C = current data * Deployment No.
T = sea temperature
S = salinity
P = pressure

SAIC = Science Applications International Corporation
NPS = Naval Post Graduate School, Monterey, CA

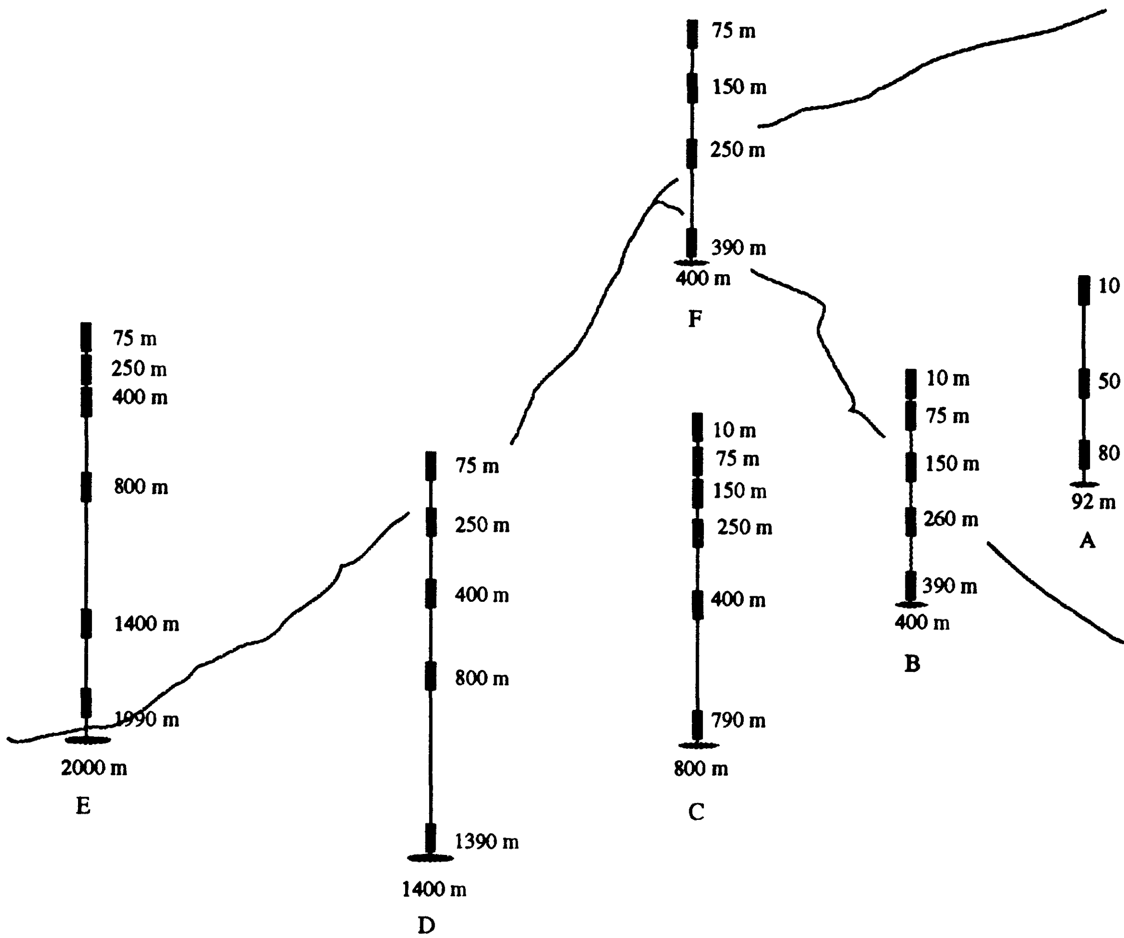

Figure 2. Location of instruments in the moored array

The current meters below 150 m were Aanderra RCM4, RCM5 or RCM8, instruments that provide quality data at the deeper sites where currents from surface waves do not exist. The sampling intervals were chosen to be appropriate for the instrument depth and type (Table 1). The moored instruments were recovered and redeployed on 3 to 6 month intervals in order that an entire year of data could be collected at each site.

The direction and strength of the wind during the measurement program was obtained from 4 sites along the shelf. Winds were obtained off Point Reyes, on the shelf opposite the entrance to San Francisco Bay, at a location adjacent to site A and at a station within Monterey Bay (Figure 1). The height of sea level along the coast was collected near 3 of the 4 wind stations (Figure 1). There were some gaps in the wind and sea level data records, but they existed for the most part over the entire year of the program (Figure 4).

This data report is a statistical and pictorial description of the data collected in the moored array portion of the field program and the wind and sea level data provided by the other government agencies. The different data sets have been decoded and processed through the initial quality control steps by the individual laboratories that collected the data (Table 1). The data have then been passed through additional quality control procedures at the USGS. Some common conventions have been used to standardize the basic data sets. Greenwich mean time (GMT) is used as the common time base for the data.

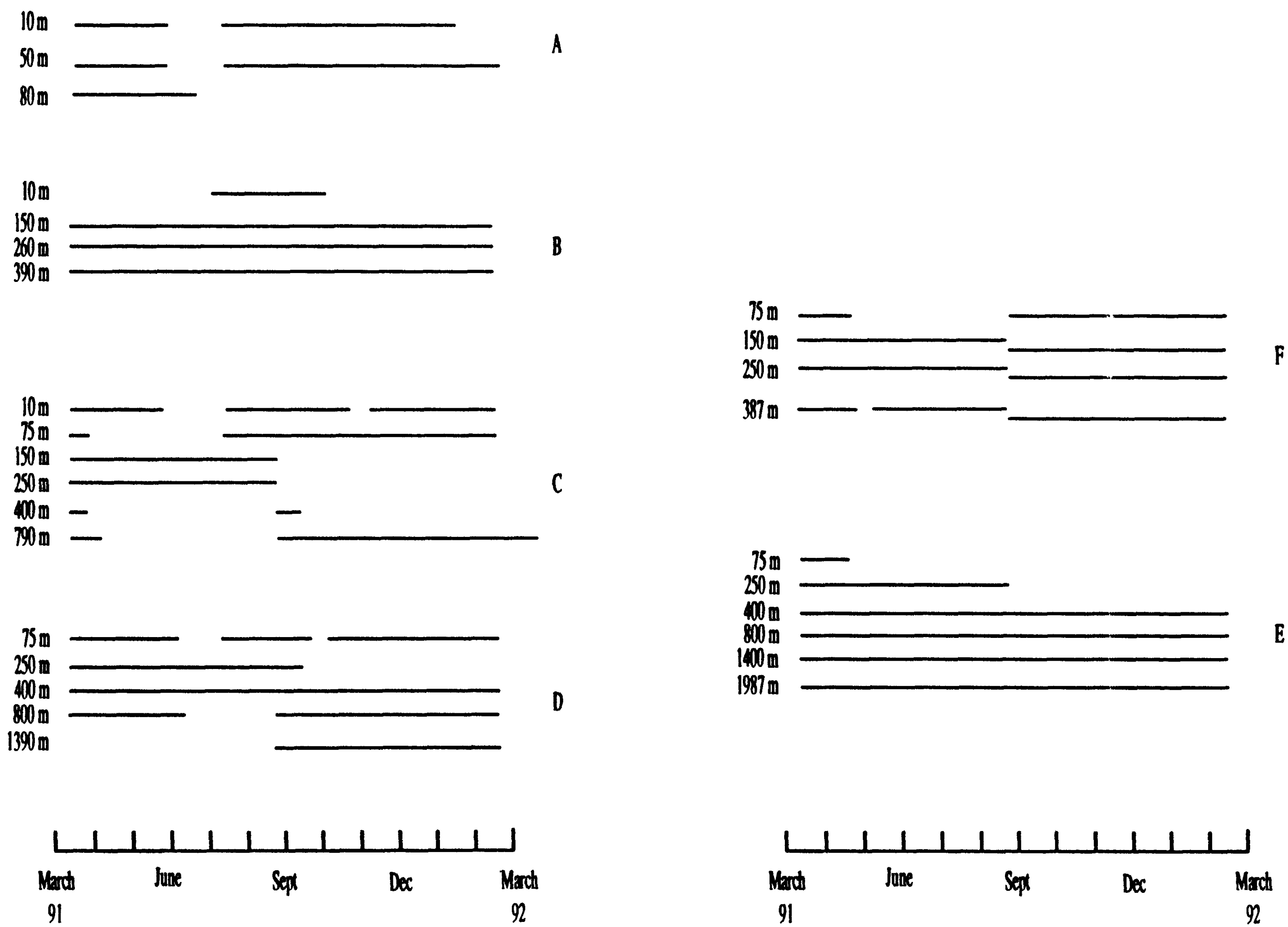

Figure 3. Timelines showing the dates when valid data from the current meters exists.

All vector quantities, such as current and wind stress, have been rotated into a coordinate system that is aligned with or perpendicular to the mean alongslope isobaths. Variables that were sampled at less than one hour were averaged into an hour sampling interval. Data sets that had longer initial sampling intervals have been averaged into 2 or 3 hour sampling intervals. If the initial sampling interval was incommensurate with a 1 to 3 hour sampling interval, the records were averaged, then subsampled into one of the common sampling intervals. The data was subsequently lowpass filtered to remove fluctuations with periods shorter than 33 hours. Both the hour-averaged and lowpass records from the current meters are included in this data report. Only the subtidal wind stress and sea level records are depicted, though tidal parameters are calculated for the sea level records. The data in the report is grouped by type. The first 4 appendices describe and depict the currents (Appendices A-D). The wind and sea level data are in appendix E.

Moored current observations

The moored current observations were collected over the shelf and slope off of San Francisco, California from March 1991 to March 1992. The entire data set consisted of 29 current meters deployed at 6 locations (Figures 1 and 2). To insure quality data, the current meters located within 150 m of the surface were designed to function in a combined wave and current environment (Table 1). The instruments deployed below 150 m were suitable for the deeper waters over the slope. The sampling intervals for each instrument were selected to be compatible with the expected current environment (Table 1). The sampling intervals generally lengthen as the water deepens. All data sets were averaged to hourly or longer sampling intervals in the post-processing procedures. The filter principally removes the tidal currents from the record; hence the predominate flow directions are more easily seen. The filtered currents will be called subtidal currents. Both the hourly and subtidal currents are included in this report.

The currents were rotated into a coordinate system that is aligned parallel and perpendicular to the average orientation of the shelf break. Positive alongslope currents flow toward 328°; positive cross-slope currents flow toward 58°. This coordinate orientation is within a few degrees of the mean isobath orientation at all sites except site D. The isobaths at this deep station are nearly north/south. However, the subtidal, mid-water currents at site D, and at most of the other sites, flow parallel to the shelf break. Hence, currents at all stations were rotated into the same coordinate orientation. The near bottom current meter at site E was located within a small submarine canyon. Hence, currents at this site flow mainly along the canyon axis which is oriented in the cross-slope direction.

Several statistical quantities of the hour-averaged and subtidal currents are included in this data report (Appendix A). The mean, standard deviation, minimum and maximum of each current component are calculated whenever the current record existed for the time periods from March 1991 through August 1991, from September 1991 through March 1992 and for the entire year (Tables A1-A6). The statistics were broken into half yearly and yearly sections for two reasons. First, some instruments only recorded data for the first half of the measurement program (site C at 150 and 250 m). Other instruments only recorded data during the last half of the program (site C at 790 m). These records cannot be directly compared because they were not taken at the same time. The second reason to compute half-yearly statistics is to examine possible seasonal structures in the data set. The standard summer period for the shelf circulation off central California is March through August. The circulation returns to a normal winter pattern in September and lasts until the following March. Hence, the time periods for the half-yearly statistics were chosen to correspond to the standard seasons.

The statistical quantities for each instrument location were computed whenever the records existed in the temporal window of interest. Because of instrument failures, the data records were often broken into two or more sections within one temporal window. Hence, the statistical quantities given in the tables had to be calculated over several pieces of record. The mean in the tables is an average of the mean of each piece, weighted by the number of points in that piece.

$$\overline{X} = \frac{\sum_{i=1}^{N} n_i \overline{x_i}}{\sum_{i=1}^{N} n_i} \qquad (1)$$

Here, $\overline{X}$ is the mean for the entire time period of interest. N is the number of pieces in the time period of interest, $\overline{x_i}$ is the mean and n_i is the number of points in piece i. The standard deviation given in the tables is similarly weighted by record size.

$$\Phi = \left[\left(\sum_{i=1}^{N}(n_i - 1)\sigma_i^2 + n_i\left(\overline{X} - \overline{x_i}\right)^2\right) \Big/ \left(\sum_{i=1}^{N} n_i - 1\right)\right]^{1/2} \qquad (2)$$

where Φ is the standard deviation for the period of interest and σ_i is the standard deviation for piece i. The means for the hour-averaged and subtidal records have the same value. The amplitude of the standard deviation for the subtidal records is less than for the hour-averaged records mainly because fluctuations due to tidal currents have been removed for the subtidal records.

The error bars around the mean values are calculated at the 95% confidence levels. If the absolute value of the mean is not larger than the error bars, then the mean direction has no statistical significance. The sites that did have significant mean directions are highlighted in the tables.

The formula for the error bar around the mean is

$$\frac{\Phi t_{m;\alpha/2}}{\sqrt{m+1}} \qquad (3)$$

where $t_{m,\alpha/2}$ is the student t statistic with m degrees of freedom at the $100(1-\alpha)\%$ confidence level. Φ is the standard deviation of the subtidal data set. The degrees of freedom of a record is the record length divided by the autocorrelation scale. The autocorrelation scale for all the cross-slope currents and the mid-depth currents at site F is 2 days. The autocorrelation scale for the rest of the alongslope currents varied between 5 and 7.5 days.

The average correlations and covariances among the subtidal currents at each mooring site over the year of record are given in Table A7. The correlations indicate how similar subtidal currents observed at one depth on a particular mooring are to those found at a deeper depth. A value of 1 denotes perfect similarity. Values below 0.25 suggest that the characteristics of the subtidal current field change considerably between the two different depths.

The average annual correlations and covariances were not computed over an entire year of data record because there were gaps in the data records during various portions of the year (Figure 3). The values reported in Table A7 are calculated for the times when data at the two sites of interest both existed. The average coherences are a weighted sum of the individual coherence estimates, similar to the weighted sum for the standard deviation (Equation 2). The average covariance amplitudes have been adjusted slightly to correct for the expected temporal changes in the variance of each instrument over time. If a particular current record existed for less than 6 months and was within 150 m of an adjacent record that existed for most of the year, the best estimate of the yearly variance is reported in Table A7. The best estimate is defined to be

$$\Phi_{ay}^2 = \Phi_{a1}^2 \frac{\Phi_{ny}^2}{\Phi_{n1}^2} \qquad (4)$$

where Φ_{ay}^2 is the estimated yearly variance at site a, Φ_{ny}^2 is the measured yearly variance at the neighbor site, Φ_{a1}^2 is the measured variance for the time period site a existed and Φ_{n1}^2 is the measured variance at the neighbor site for the same time period. Hence, the ratio of the variances for the different time periods is the same for the two sites. The adjusted covariance was then calculated using the estimated yearly variance and coherence values.

The potential to disperse material in suspension or to resuspend material from the sea floor is enhanced at locations where the tidal currents are relatively large. Hence, the characteristics of the major diurnal (O_1 and K_1) and semidiurnal (M_2 and S_2) tidal constituents are calculated for each measurement site (Tables B1 and B2). The tidal amplitudes are a weighted average of the data within the collection times listed in the tables because the records of currents were often broken into several pieces. The strong tidal currents near the bed at sites B, C and E suggest that material deposited on the sea floor in these regions may be more frequently resuspended.

The next several sections of this data report contain a series of figures that display characteristics of the measured currents. The first collection of figures shows the time series of the hour-averaged along and cross-slope currents an entire year (Appendix B). The time axes and the vertical scales are the same for all current sites so that comparisons can easily be made among the instruments. All hour-averaged files are grouped together. The next section of appendix B contains time-series plots of the subtidal data. Again, all plots share the same axes.

An additional plot type, a vector plot is shown in appendix C. These figures display the direction and amplitude of the subtidal current vectors simultaneously.

The energy in the currents at each measurement site is depicted as a function of the frequency of the process in appendix D. A variance-conserving autospectra is calculated for both the along and cross-slope currents. We chose a variance-conserving spectra in order to highlight those frequencies that had the largest energies; the dominant processes occupy the biggest areas on the plots. The tidal frequencies generally have a large fraction of the energy; these large spectral peaks are found at frequencies above 10^{-5} hertz (1.2 days).

Not all spectral plots have the same vertical scales because the tidal amplitudes had significant variations over the array. Nor is there a unique vertical scale for each measurement location because it would become impossible to compare the different spectra. As a compromise, there are only 4 vertical scales for the entire data collection, 400, 2000, 4000 and 6000 cm^2/s^2.

All spectra for the moored array are calculated with similar Fourier transform parameters. Each record was divided into pieces that contained at most 1/3 of the available data (Table A1). The pieces were windowed with a Hanning window shape in order to reduce leakage of energy from the dominant frequencies into the less energetic frequencies. The pieces overlapped each other by 50%, so a Fourier transform for a minimum of 5 pieces was computed at each station. The spectra for all pieces at one location were averaged together. The length of each piece changed among the measurement sites, but each length was chosen so that both the diurnal and semidiurnal tidal periods were near a natural Fourier frequency (Table D1). Note that the spectra are calculated at different times for different instruments. Spectra for the longest continuous record were calculated at each site.

Wind and sea level observations

Records of wind velocity, atmospheric pressure and sea level were obtained from the National Oceanographic Data Center in Washington D. C and the National Ocean Service in Rockland, Maryland from March 1991 to March 1992. Winds were measured by offshore meteorological buoys at 4 locations between Point Reyes and Monterey, California (Figures 1 and 4, Table 2). The sea level stations were located at the coast, but in the same general area as the meteorological stations.

The hourly observations of wind velocity were converted into estimates of wind stress because wind stress represents the actual force that causes water to move over the shelf and slope. Wind stress was calculated from the formula by Wu (1980).

$$\tau = \rho c_D \mathbf{W}|\mathbf{W}| \qquad (5)$$

where ρ is the air density (0.0012 g cm^{-3}), c_D the drag coefficient and **W** the wind velocity. The drag coefficient increases with wind strength

$$c_D = \left(0.8 + 0.065|W_{10}|\right) \times 10^{-3} \qquad (6)$$

where W_{10} is the wind speed 10 m above the surface in meters per second. The wind stress was low-pass filtered and rotated into an alongslope/cross-slope coordinated system. The positive alongslope wind stress direction is 330°, parallel to this alongslope topography. The positive cross-slope direction is 60°.

STATION	START TIME (M/D/Y)	STOP TIME (M/D/Y)	POSITION LATITUDE	POSITION LONGITUDE	DATA TYPE	SAMPLE INTERVAL (MINUTES)
Wind						
46012 - Half Moon Bay	*01/01/91	03/31/92	37 23.12 N	122 43.23W	W,AT,ST,P	60
46013 - Bodega Bay	01/01/91	03/17/92	38 13.54 N	123 18.06 W	W,AT,ST,P	60
46026 - Gulf of the Farallones	01/01/91	03/31/92	37 45.00 N	122 41.24 W	W,AT,ST,P	60
46042 - Monterey Bay	01/01/91	03/31/92	36 45.01 N	122 24.27 W	W,AT,P	60
	01/01/91	10/02/91			ST	60
Sea level						
Arena Cove	01/01/91	03/31/92	38 55.20 N	123 08.10 W	SL	60
Pt. Reyes	01/01/91	03/31/92	37 59.80 N	122 58.50 W	SL	60
San Francisco Bay	01/01/91	03/31/92	37 48.40 N	122 27.90 W	SL	60
Monterey Harbor	01/01/91	03/31/92	36 36.30 N	121 53.30 W	SL	60

*Data filled in from 04/08/91 1000 to 07/30/91 0600, see notes in data section

Table 2. National Oceanographic Data Center (NODC) wind and sea level data availability.

ST = sea temperature
P = pressure
SL = sea level
AT = air temperature
W = wind (speed and direction)

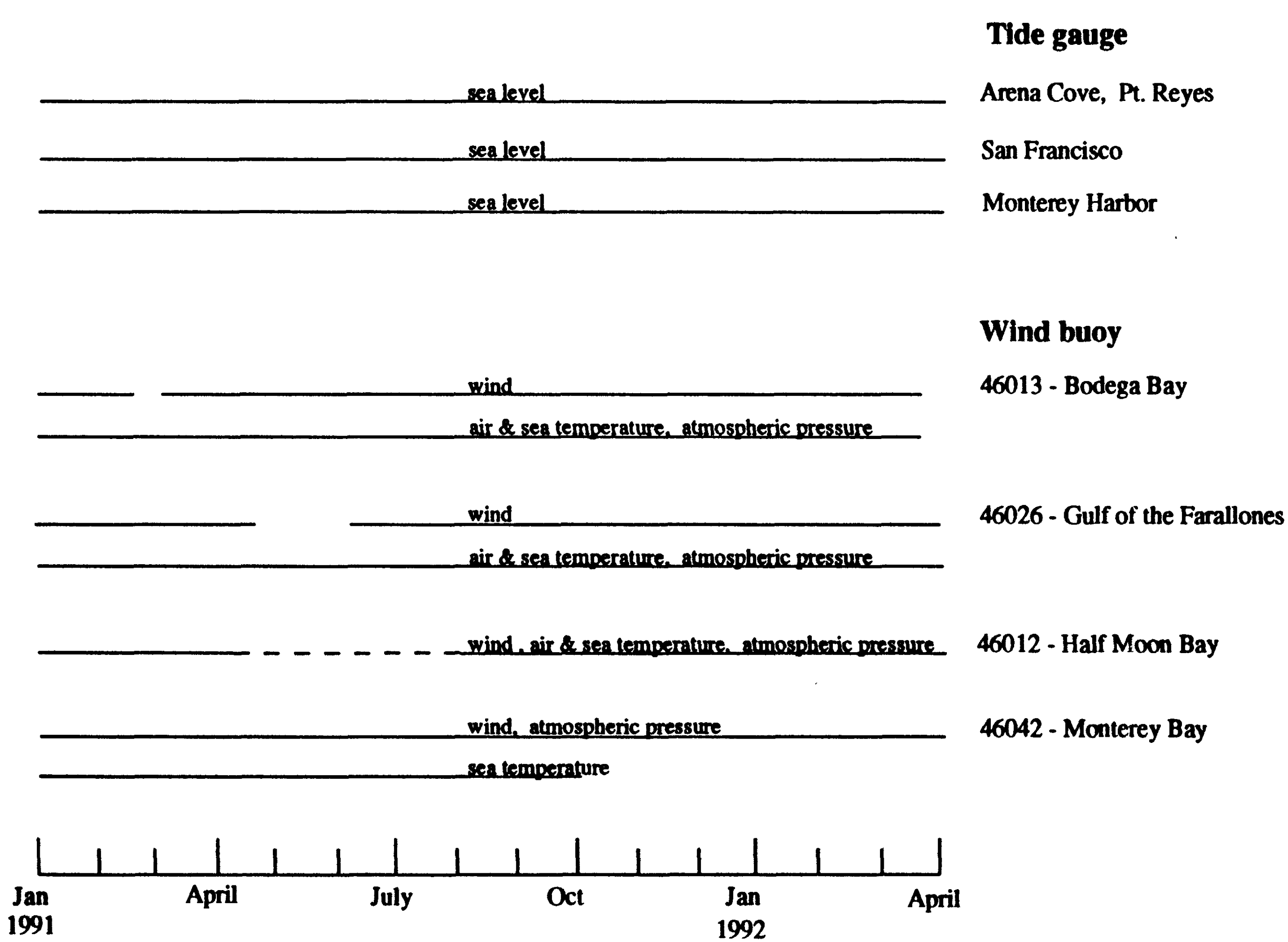

Figure 4. Timelines showing the period when wind, sea level, temperature (sea and air) and atmospheric pressure data exists. Dashed line indicates where data was filled in using data from another buoy.

The hourly observations of wind velocity were converted into estimates of wind stress because wind stress represents the actual force that causes water to move over the shelf and slope. Wind stress was calculated from the formula by Wu (1980).

$$\tau = \rho c_D \mathrm{W}|\mathrm{W}| \qquad (5)$$

where ρ is the air density (0.0012 g cm^{-3}), c_D the drag coefficient and W the wind velocity. The drag coefficient increases with wind strength

$$c_D = \left(0.8 + 0.065|W_{10}|\right) \times 10^{-3} \qquad (6)$$

where W_{10} is the wind speed 10 m above the surface in meters per second. The wind stress was low-pass filtered and rotated into an alongslope/cross-slope coordinated system. The positive alongslope wind stress direction is 330°, parallel to this alongslope topography. The positive cross-slope direction is 60°.

The wind stress record at the site nearest our moored array, Buoy 46012 (Half Moon Bay), had a large data gap from April 11 through July 30, 1991. It was possible to fill in this temporal gap with data from the other meteorological sites because the along and cross-slope components of subtidal wind stress were very similar from Point Reyes to Monterey. The correlations among the alongslope wind stresses were uniformly greater than 0.88. The cross-slope winds had similar high correlations. The best correlations were between Buoy 46012 (Half Moon Bay) and 46042 (Monterey). Correlations between the most energetic component of wind stress, the alongslope winds, were above 0.95. Hence data from the latter site were used to fill in the gap in the Half Moon Bay buoy. The wind stress amplitude during the temporal gap was adjusted slightly to correct for a minor difference in wind stress amplitude at the two locations.

The coastal sea level records were converted into records of synthetic subsurface pressure (SSP) by adding atmospheric pressure to the sea level records. SSP is a better representation of the pressure forces that cause currents to move along the coast because changes in sea level caused by high and low pressure systems are removed from the record. The mean was removed from each SSP record. The record was low-pass filtered to remove the tidal signal.

The wind stress and sea level information is presented in appendix E. The tidal amplitudes computed from the unfiltered SSP records are given in Table E2. The basic statistics for the subtidal wind stress records are given in Table E3. The subsequent section displays the temporal and spectral plots of winds stress and SSP data.

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Appendix A - Current tables

SITE	WATER DEPTH (m)	START TIME GMT (M/D/Y)	STOP TIME GMT (M/D/Y)	INSTRUMENT	DATA SOURCE	SENSOR DEPTH (m)	CROSS-SLOPE MEAN	CROSS-SLOPE SD	CROSS-SLOPE MAX	CROSS-SLOPE MIN	ALONGSLOPE MEAN	ALONGSLOPE SD	ALONGSLOPE MAX	ALONGSLOPE MIN	MAX SPEED
A	92	03/08/91	01/05/92	S4	SAIC	10	0.0 ±1.0	11.1	42.2	-37.1	-2.9 ±21.8	12.3	41.3	-61.3	61.3
A	92	03/08/91	02/08/92	S4	SAIC	50	**2.4 ±0.5**	7.6	31.0	-28.9	1.1 ±2.1	10.9	37.4	-49.4	49.5
A	92	03/08/91	08/13/91	S4	SAIC	80	0.3 ±0.6	7.4	28.1	-39.6	0.2 ±2.7	10.6	34.4	-46.8	47.4
B	400	07/04/91	09/23/91	VMCM	SAIC	10	1.3 ±2.2	11.9	41.4	-37.6	-0.63 ±3.3	13.4	38.4	-44.8	47.6
B	400	03/09/91	02/08/92	ACM2	SAIC	150	**2.0 ±0.9**	7.7	28.4	-28.0	**7.2 ±1.5**	12.3	44.3	-34.3	44.8
B	400	03/09/91	02/08/92	RCM4	SAIC	260	**3.0 ±0.7**	7.0	30.2	-29.8	**5.4 ±1.1**	9.0	36.2	-27.9	39.1
B	400	03/09/91	02/08/92	RCM4/5	SAIC	390	**1.0 ±0.3**	6.3	27.2	-32.0	**-0.7 ±0.6**	11.1	30.4	-41.5	43.0
C	800	03/09/91	02/08/92	VMCM	SAIC	10	1.7 ±3.1	12.3	48.7	-69.5	**9.5 ±3.2**	20.3	53.8	-82.7	99.1
C	800	07/05/91	02/08/92	S4	SAIC	75	1.3 ±3.3	12.1	48.0	-48.2	**5.7 ±1.9**	12.4	52.9	-42.8	57.6
C	800	03/09/91	08/13/91	ACM2	SAIC	150	2.1 ±2.6	8.6	31.3	-24.7	**7.9 ±2.6**	13.4	47.9	-37.1	49.7
C	800	03/09/91	08/13/91	RCM4	SAIC	250	**3.6 ±1.9**	8.6	31.3	-24.7	**7.6 ±2.1**	13.4	47.9	-37.1	50.1
C	800	03/09/91	09/10/91	RCM5	SAIC	400	1.1 ±4.0	5.4	15.6	-17.8	**-3.3 ±1.8**	7.0	24.3	-22.7	24.7
C	800	03/09/91	03/11/92	RCM5	SAIC	790	**2.9 ±1.6**	8.6	23.7	-32.0	**3.4 ±0.8**	11.1	35.9	-33.2	37.3
D	1400	03/10/91	02/13/92	S4	SAIC	75	1.7 ±2.8	10.3	46.5	-40.9	**10.1 ±1.9**	11.5	57.4	-40.3	57.9
D	1400	03/10/91	09/03/91	RCM4	SAIC	250	0.7 ±2.3	6.5	34.9	-26.8	**7.3 ±1.8**	9.4	37.8	-21.0	39.5
D	1400	03/10/91	02/13/92	RCM5	SAIC	400	0.8 ±1.1	5.4	22.0	-19.9	**5.5 ±1.0**	7.8	37.0	-18.3	38.5
D	1400	03/10/91	02/13/92	RCM5	SAIC	800	0.0 ±1.1	5.4	22.5	-18.9	**1.5 ±1.0**	8.2	29.8	-24.6	31.8
D	1400	08/14/91	02/13/92	RCM5	SAIC	1390	-0.4 ±0.5	4.5	16.2	-16.4	-0.2 ±0.5	6.9	29.6	-21.6	30.2
E	2040	03/11/91	04/16/91	VMCM	NPS	75	-6.3 ±8.0	8.3	16.7	-30.5	**6.0 ±2.5**	8.4	29.6	-24.4	34.1
E	2000	03/11/91	08/15/91	RCM8	NPS	272	0.3 ±2.1	6.1	23.9	-22.4	**8.8 ±2.4**	11.2	35.7	-30.3	37.5
E	2000	03/11/91	02/12/92	RCM8	NPS	420	0.1 ±1.2	5.5	21.8	-27.4	**4.0 ±1.3**	9.7	35.1	-30.7	35.1
E	2000	03/11/91	02/12/92	RCM8	NPS	820	0.3 ±1.0	4.5	19.7	-24.9	0.4 ±0.9	7.1	23.1	-29.8	34.5
E	2000	03/11/91	02/12/92	RCM8	NPS	1400	0.4 ±0.4	12.5	16.6	-13.3	**1.0 ±0.4**	15.0	16.8	-14.3	18.2
E	2000	03/11/91	02/12/92	RCM8	NPS	1987	**4.2 ±0.6**	12.9	41.7	-38.7	**-0.2 ±0.1**	4.2	16.9	-15.8	43.0
F	400	03/11/91	02/10/92	S4	SAIC	75	**-2.4 ±0.9**	7.1	22.4	-32.7	**7.1** ±[illegible].0	12.1	55.6	16.4	51.2
F	430	03/12/91	02/13/92	S4	NPS	180/222	**0.4 ±0.2**	4.5	28.2	-17.4	**2.4 ±0.6**	7.5	31.0	-27.2	34.1
F	430	03/11/91	02/13/92	RCM8	NPS	280/322	**0.7 ±0.1**	2.6	14.1	-11.1	0.4 ±0.4	4.7	19.8	-20.1	21.6
F	430	03/11/91	02/13/92	RCM8	NPS	417/459	0.0 ±0.1	2.8	12.0	-13.6	**-0.2 ±0.6**	1.5	22.5	-8.0	23.9

Table A1. Hour-averaged horizontal current components (cm/s): March 1991 - February 1992

SAIC = Science Applications International Corporation
NPS = Naval Post Graduate School, Monterey, CA

S4 = Interocean S4
VMCM = EG&G Vector Measuring Current Meter

ACM2 = Neil Brown Acoustic Current Meter
RCM4, RCM5, RCM8 = Aaendera

SITE	WATER DEPTH (m)	START TIME GMT (M/D/Y)	STOP TIME GMT (M/D/Y)	INSTRUMENT	DATA SOURCE	SENSOR DEPTH (m)	CROSS-SLOPE MEAN		CROSS-SLOPE SD	CROSS-SLOPE MAX	CROSS-SLOPE MIN	ALONGSLOPE MEAN		ALONGSLOPE SD	ALONGSLOPE MAX	ALONGSLOPE MIN	MAX SPEED
A	92	03/08/91	08/31/91	S4	SAIC	10	0.5	±1.5	11.6	42.2	-33.5	**-7.0**	**±4.2**	12.3	29.5	-61.3	61.4
A	92	03/08/91	08/31/91	S4	SAIC	50	**2.0**	**±1.0**	8.1	30.5	-28.9	-2.1	±3.4	11.5	29.4	-49.4	32.5
A	92	03/08/91	08/13/91	S4	SAIC	80	0.4	±0.6	7.4	28.1	-39.6	0.3	±2.7	10.6	34.4	-46.8	47.4
B	400	07/04/91	08/31/91	VMCM	SAIC	10	1.1	±2.6	11.5	41.5	-35.5	-1.5	±7.5	14.4	38.4	-44.8	47.6
B	4 00	03/09/91	08/31/91	ACM2	SAIC	150	**1.5**	**±0.5**	6.2	28.3	-24.6	**7.3**	**±3.6**	12.3	40.0	-34.3	44.8
B	400	03/09/91	08/31/91	RCM4	SAIC	260	**4.5**	**±1.3**	7.6	30.2	-29.8	**7.8**	**±2.7**	9.7	36.2	-27.9	39.1
B	400	03/09/91	08/31/91	RCM4/5	SAIC	390	**-1.0**	**±0.3**	5.8	27.2	-32.0	0.2	±1.3	8.8	28.7	-38.5	43.0
C	800	03/09/91	08/31/91	VMCM	SAIC	10	-1.4	±2.2	12.6	46.9	-69.6	0.0	±-1.1	22.1	51.6	-82.7	99.1
C	800	03/09/91	08/31/91	S4	SAIC	75	2.4	±3.0	11.4	46.3	-47.0	**10.2**	**±0.0**	15.3	45.9	-46.7	50.1
C	800	03/09/91	08/13/91	ACM2	SAIC	150	**2.1**	**±1.3**	8.6	31.3	-24.7	**7.9**	**±5.4**	13.4	47.9	-37.2	49.7
C	800	03/09/91	08/13/91	RCM4	SAIC	250	**3.7**	**±0.9**	6.7	28.1	-19.2	**7.6**	**±4.3**	10.9	47.5	-27.3	50.1
C	800	03/09/91	08/31/91	RCM5	SAIC	400	0.7	±2.1	5.3	12.7	-17.8	-2.5	±6.2	6.4	24.4	-16.9	24.7
C	800	03/09/91	08/31/91	RCM5	SAIC	790	**-1.9**	**±1.8**	8.5	23.7	-28.4	3.0	±6.0	10.6	30.9	-31.8	32.9
D	1400	03/10/91	08/31/91	S4	SAIC	75	0.5	±2.0	10.1	32.6	-40.9	5.4	±6.29	13.8	49.0	-40.3	49.8
D	1400	03/10/91	08/31/91	RCM4	SAIC	250	0.6	±1.2	6.6	34.9	-26.8	**7.3**	**±3.9**	9.5	37.8	-21.1	39.5
D	1400	03/10/91	08/31/91	RCM5	SAIC	400	**1.3**	**±0.8**	5.23	22.0	-18.2	**6.4**	**±3.2**	8.5	37.0	-18.3	38.5
D	1400	03/10/91	08/31/91	RCM5	SAIC	800	-0.1	±0.9	5.3	22.5	-18.9	2.1	±4.6	10.1	22.5	-18.9	31.8
D	1400	08/14/91	08/31/91	RCM5	SAIC	1390	**1.7**	**±1.0**	4.5	7.7	-14.1	-3.0	±12.0	6.2	13.1	-18.2	19.4
E	2040	03/11/91	04/16/91	VMCM	NPS	75	**-6.4**	**±3.0**	8.3	16.7	-30.6	6.0	±6.7	8.4	29.6	-24.4	34.1
E	2000	03/11/91	08/15/91	RCM8	NPS	272	0.3	±1.1	6.1	23.9	-22.5	**8.8**	**±4.8**	11.2	35.7	-30.3	37.5
E	2000	03/11/91	08/31/91	RCM8	NPS	420	0.4	±0.7	5.1	21.8	-18.8	**6.7**	**±3.6**	9.1	35.1	-26.7	35.1
E	2000	03/11/91	08/31/91	RCM8	NPS	820	0.2	±0.9	5.4	19.7	-24.9	-0.2	±2.7	7.5	23.1	-29.8	34.5
E	2000	03/11/91	08/31/91	RCM8	NPS	1400	**0.6**	**±0.3**	3.6	13.4	-12.6	**1.0**	**±1.0**	3.8	16.8	-14.3	17.1
E	2000	03/11/91	08/31/91	RCM8	NPS	1987	**4.8**	**±0.4**	13.3	40.9	-31.0	**-0.4**	**±0.4**	4.0	14.3	-15.8	43.0
F	400	03/11/91	08/31/91	S4	SAIC	75	0.6	±1.0	50.6	22.4	-18.4	-4.4	±9.3	9.9	24.6	-37.8	38.6
F	430	03/12/91	08/31/91	S4	NPS	180/222	-0.1	±0.3	5.4	28.2	-17.4	**4.1**	**±1.0**	8.2	31.0	-20.4	34.1
F	430	03/11/91	08/31/91	RCM8	NPS	280/322	0.7	±0.2	2.9	13.2	-11.1	-0.1	±0.5	5.3	19.8	-20.1	21.6
F	430	03/11/91	08/31/91	RCM8	NPS	417/459	0.0	±0.1	2.6	7.8	-13.6	-0.2	±0.1	2.0	22.5	-8.0	23.9

Table A2. Hour-averaged horizontal current components (cm/s): March 1991 - August 1991

SAIC = Science Applications International Corporation
NPS = Naval Post Graduate School, Monterey, CA

S4 = Interocean S4
VMCM = EG&G Vector Measuring Current Meter

ACM2 = Neil Brown Acoustic Current Meter
RCM4, RCM5, RCM8 = Aaendera

SITE	WATER DEPTH (m)	START TIME GMT (M/D/Y)	STOP TIME GMT (M/D/Y)	INSTRUMENT	DATA SOURCE	SENSOR DEPTH (m)	CROSS-SLOPE MEAN	CROSS-SLOPE SD	CROSS-SLOPE MAX	CROSS-SLOPE MIN	ALONGSLOPE MEAN	ALONGSLOPE SD	ALONGSLOPE MAX	ALONGSLOPE MIN	MAX SPEED
A	92	09/01/91	01/05/92	S4	SAIC	10	-0.7 ±1.3	10.9	38.9	-37.1	1.1 ±3.2	10.5	41.3	-30.8	41.6
A	92	09/01/91	02/08/92	S4	SAIC	50	2.7 ±0.6	7.2	31.0	-22.8	3.6 ±2.5	9.7	37.4	-34.0	37.5
A	92	---	---	S4	SAIC	80	--- ---	---	---	---	--- ---	---	---	---	---
B	400	09/01/91	09/23/91	VMCM	SAIC	10	0.7 ±4.7	11.2	29.0	-37.6	1.3 ±9.1	10.5	24.7	-36.0	39.0
B	4 00	09/01/91	02/08/92	ACM2	SAIC	150	2.5 ±1.3	9.1	28.4	-28.0	7.5 ±3.6	12.1	44.3	-32.1	44.8
B	400	09/01/91	02/08/92	RCM4	SAIC	260	1.6 ±0.5	5.8	23.7	-20.2	2.9 ±1.8	7.6	32.3	-23.7	32.3
B	400	09/01/91	02/08/92	RCM4/5	SAIC	390	-1.1 ±0.3	6.7	24.8	-27.9	-1.6 ±1.6	13.0	30.4	-41.5	41.9
C	800	09/01/91	02/09/92	VMCM	SAIC	10	-1.9 ±2.2	12.2	48.7	-49.3	17.7 ±5.6	13.9	53.8	-35.8	55.2
C	800	09/0191	02/09/92	S4	SAIC	75	0.8 ±2.1	12.4	48.0	-48.2	3.8 ±4.0	11.6	52.9	-42.8	57.6
C	800	---	---	ACM2	SAIC	150	--- ---	---	---	---	--- ---	---	---	---	---
C	800	---	---	RCM4	SAIC	250	--- ---	---	---	---	--- ---	---	---	---	---
C	800	09/01/91	09/10/91	RCM5	SAIC	400	2.2 ±1.8	4.7	15.2	-10.7	-5.9 ±∞	6.6	9.8	-22.7	23.3
C	800	09/01/91	03/11/92	RCM5	SAIC	790	-2.6 ±0.4	8.6	22.4	-32.0	3.5 ±1.7	11.1	35.9	-33.2	37.3
D	1400	09/01/91	02/13/92	S4	SAIC	75	-3.7 ±2.0	10.1	46.5	-38.1	14.3 ±4.6	12.0	57.4	-23.3	57.9
D	1400	09/01/91	09/03/91	RCM4	SAIC	250	1.9 ±∞	2.7	7.4	-3.0	0.60 ±∞	3.3	5.5	-8.6	8.7
D	1400	09/01/91	02/13/92	RCM5	SAIC	400	0.1 ±0.9	5.5	19.1	-19.9	4.6 ±2.3	6.9	28.1	-17.4	31.2
D	1400	09/01/91	02/13/92	RCM5	SAIC	800	0.2 ±0.7	5.5	19.4	-16.5	1.2 ±1.9	6.5	24.6	-21.0	26.5
D	1400	09/01/91	02/13/91	RCM5	SAIC	1390	-0.3 ±0.3	4.5	16.2	-16.4	0.1 ±0.1	7.0	29.6	-21.6	30.2
E	2040	---	---	VMCM	NPS	75	--- ---	---	---	---	--- ---	---	---	---	---
E	2000	---	---	RCM8	NPS	272	--- ---	---	---	---	--- ---	---	---	---	---
E	2000	09/01/91	02/12/92	RCM8	NPS	420	-0.2 ±1.0	5.8	21.6	-27.4	1.4 ±3.8	9.5	34.0	-30.7	34.2
E	2000	09/01/91	02/12/92	RCM8	NPS	820	0.5 ±0.5	3.2	18.4	-10.2	-0.6 ±2.5	6.7	20.2	-28.4	29.2
E	2000	09/01/91	02/12/92	RCM8	NPS	1400	0.3 ±0.3	3.5	16.6	-13.3	0.9 ±1.1	3.9	14.0	-14.0	18.2
E	2000	09/01/91	02/12/92	RCM8	NPS	1987	3.7 ±0.4	12.6	41.7	-38.7	0.0 ±0.4	4.3	16.9	-13.3	41.7
F	400	09/01/91	02/10/92	S4	SAIC	75	-3.2 ±1.0	7.0	15.5	-32.7	9.9 ±4.0	11.0	55.6	-25.0	51.2
F	430	09/01/91	02/13/92	S4	NPS	180/222	0.8 ±0.2	3.4	13.9	-12.6	0.8 ±0.6	6.28	23.9	-27.2	28.8
F	430	09/01/91	02/13/92	RCM8	NPS	280/322	0.7 ±0.2	2.3	14.1	-8.9	1.0 ±0.4	4.0	19.8	-13.9	20.3
F	430	09/01/91	02/13/92	RCM8	NPS	417/459	-0.1 ±0.1	3.0	9.1	-13.7	-0.3 ±0.0	0.8	3.4	-3.3	13.7

Table A3. Hour-averaged horizontal current components (cm/s): September 1991 - March 1992

SAIC = Science Applications International Corporation
NPS = Naval Post Graduate School, Monterey, CA

S4 = Interocean S4
VMCM = EG&G Vector Measuring Current Meter

ACM2 = Neil Brown Acoustic Current Meter
RCM4, RCM5, RCM8 = Aaendera

SITE	WATER DEPTH (m)	START TIME GMT (M/D/Y)	STOP TIME GMT (M/D/Y)	INSTRUMENT	DATA SOURCE	SENSOR DEPTH (m)	CROSS-SLOPE MEAN	CROSS-SLOPE SD	CROSS-SLOPE MAX	CROSS-SLOPE MIN	ALONGSLOPE MEAN	ALONGSLOPE SD	ALONGSLOPE MAX	ALONGSLOPE MIN
A	92	03/08/91	01/05/92	S4	SAIC	10	0.0 ±1.0	5.5	22.3	-18.1	-2.9 ±21.8	9.8	27.8	-34.3
A	92	03/08/91	02/08/92	S4	SAIC	50	2.4 ±0.5	3.2	13.8	-7.4	1.1 ±2.1	7.9	21.4	-26.8
A	92	03/08/91	08/13/91	S4	SAIC	80	0.3 ±0.6	2.8	8.4	-9.9	0.2 ±2.7	7.2	18.1	-27.8
B	400	07/04/91	09/23/91	VMCM	SAIC	10	1.3 ±2.2	6.8	18.3	-16.6	-0.63 ±3.3	10.1	19.4	-32.5
B	400	03/09/91	02/08/92	ACM2	SAIC	150	2.0 ±0.9	4.5	17.8	-17.7	7.2 ±1.5	10.1	35.2	-16.3
B	400	03/09/91	02/08/92	RCM4	SAIC	260	3.0 ±0.7	4.8	15.6	-16.7	5.4 ±1.1	6.9	24.6	-10.6
B	400	03/09/91	02/08/92	RCM4/5	SAIC	390	1.0 ±0.3	1.3	4.0	-9.4	-0.7 ±0.6	4.0	10.2	-14.5
C	800	03/09/91	02/08/92	VMCM	SAIC	10	1.7 ±3.1	8.9	34.0	-45.0	9.5 ±3.2	18.8	42.2	-52.7
C	800	07/05/91	02/08/92	S4	SAIC	75	1.3 ±3.3	9.0	33.8	-26.7	5.7 ±1.9	10.3	34.9	-21.3
C	800	03/09/91	08/13/91	ACM2	SAIC	150	2.1 ±2.6	5.6	22.5	-21.1	7.9 ±2.6	11.6	34.9	-21.3
C	800	03/09/91	08/13/91	RCM4	SAIC	250	3.6 ±1.9	4.1	20.5	-13.9	7.6 ±2.1	9.3	39.9	-23.0
C	800	03/09/91	09/10/91	RCM5	SAIC	400	1.1 ±4.0	2.6	4.7	-8.0	-3.3 ±1.8	3.2	8.7	-10.8
C	800	03/09/91	03/11/92	RCM5	SAIC	790	2.9 ±1.6	4.2	9.8	-8.9	3.4 ±0.8	4.0	13.8	-7.0
D	1400	03/10/91	02/13/92	S4	SAIC	75	1.7 ±2.8	8.4	30.3	-32.3	10.1 ±1.9	11.6	48.1	-26.6
D	1400	03/10/91	09/03/91	RCM4	SAIC	250	0.7 ±2.3	5.3	27.7	-20.0	7.3 ±1.8	8.3	32.0	-12.8
D	1400	03/10/91	02/13/92	RCM5	SAIC	400	0.8 ±1.1	3.7	19.3	-14.7	5.5 ±1.0	6.4	23.6	-11.2
D	1400	03/10/91	02/13/92	RCM5	SAIC	800	0.0 ±1.1	3.3	14.2	-9.9	1.5 ±1.0	6.2	22.3	-8.8
D	1400	08/14/91	02/13/92	RCM5	SAIC	1390	-0.4 ±0.5	1.3	2.8	-4.1	-0.2 ±0.5	2.5	6.9	-6.7
E	2040	03/11/91	04/16/91	VMCM	NPS	75	-6.3 ±8.0	5.8	5.4	-21.5	6.0 ±2.5	4.9	16.9	-3.7
E	2000	03/11/91	08/15/91	RCM8	NPS	272	0.3 ±2.1	4.7	17.4	-18.1	8.8 ±2.4	10.5	30.5	-24.9
E	2000	03/11/91	02/12/92	RCM8	NPS	420	0.1 ±1.2	4.0	12.8	-19.9	4.0 ±1.3	8.8	25.3	-22.2
E	2000	03/11/91	02/12/92	RCM8	NPS	820	0.3 ±1.0	3.4	10.1	-16.5	0.4 ±0.9	5.9	17.8	-21.3
E	2000	03/11/91	02/12/92	RCM8	NPS	1400	0.4 ±0.4	1.3	5.7	-3.2	1.0 ±0.4	2.4	11.0	-5.4
E	2000	03/11/91	02/12/92	RCM8	NPS	1987	4.2 ±0.6	1.9	9.9	-0.7	-0.2 ±0.1	0.9	2.7	-4.7
F	400	03/11/91	02/10/92	S4	SAIC	75	-2.4 ±0.9	4.4	5.6	-18.0	7.1 ±2.0	10.2	37.5	-13.7
F	430	03/12/91	02/13/92	S4	NPS	180/222	0.4 ±0.2	1.4	5.8	-4.2	2.4 ±0.6	4.2	18.8	-10.7
F	430	03/11/91	02/13/92	RCM8	NPS	280/322	0.7 ±0.1	0.8	4.2	-1.8	0.4 ±0.4	2.3	7.6	-7.7
F	430	03/11/91	02/13/92	RCM8	NPS	417/459	0.0 ±0.1	0.6	1.4	-2.8	-0.2 ±0.0	0.5	2.1	-2.1

Table A4. Low-passed horizontal current components (cm/s): March 1991 - February 1992

SAIC = Science Applications International Corporation
NPS = Naval Post Graduate School, Monterey, CA

S4 = Interocean S4
VMCM = EG&G Vector Measuring Current Meter

ACM2 = Neil Brown Acoustic Current Meter
RCM4, RCM5, RCM8 = Aaendera

SITE	WATER DEPTH (m)	START TIME GMT (M/D/Y)	STOP TIME GMT (M/D/Y)	INSTRUMENT	DATA SOURCE	SENSOR DEPTH (m)	CROSS-SLOPE MEAN	CROSS-SLOPE SD	CROSS-SLOPE MAX	CROSS-SLOPE MIN	ALONGSLOPE MEAN	ALONGSLOPE SD	ALONGSLOPE MAX	ALONGSLOPE MIN
A	92	03/08/91	08/31/91	S4	SAIC	10	0.5 ±1.5	5.9	22.3	-15.0	**-7.0 ±4.2**	10.0	13.4	-34.3
A	92	03/08/91	08/31/91	S4	SAIC	50	**2.0 ±1.0**	3.7	13.8	-7.4	-2.1 ±3.4	8.1	13.2	-26.8
A	92	03/08/91	08/13/91	S4	SAIC	80	0.4 ±0.6	2.8	8.4	-9.9	0.3 ±2.7	7.3	18.1	-27.8
B	400	07/04/91	08/31/91	VMCM	SAIC	10	1.1 ±2.6	6.6	18.3	-16.6	-1.5 ±7.5	11.3	19.4	-32.5
B	4 00	03/09/91	08/31/91	ACM2	SAIC	150	**1.5 ±0.5**	2.3	8.8	-6.0	**7.3 ±3.6**	10.2	30.6	-16.3
B	400	03/09/91	08/31/91	RCM4	SAIC	260	**4.5 ±1.3**	5.9	15.6	-16.70	**7.8 ±2.7**	7.6	24.7	-9.1
B	400	03/09/91	08/31/91	RCM4/5	SAIC	390	**-1.0 ±0.3**	1.4	2.5	-9.4	0.2 ±1.3	3.6	10.2	-9.3
C	800	03/09/91	08/31/91	VMCM	SAIC	10	-1.4 ±2.2	8.3	21.3	-45.0	0.0 ±-1.1	21.0	42.2	-52.7
C	800	03/09/91	08/31/91	S4	SAIC	75	2.4 ±3.0	8.4	34.1	-26.8	**10.2 ±0.0**	12.6	35.0	-21.4
C	800	03/09/91	08/13/91	ACM2	SAIC	150	**2.1 ±1.3**	5.6	22.5	-21.1	**7.9 ±5.4**	11.6	35.0	-21.30
C	800	03/09/91	08/13/91	RCM4	SAIC	250	**3.7 ±0.9**	4.2	20.5	-14.0	**7.6 ±4.3**	9.3	39.0	-23.0
C	800	03/09/91	08/31/91	RCM5	SAIC	400	0.7 ±2.1	2.9	4.8	-8.0	-2.5 ±6.2	2.1	2.6	-5.7
C	800	03/09/91	08/31/91	RCM5	SAIC	790	**-1.9 ±1.8**	3.3	9.8	-7.3	3.0 ±6.0	4.1	13.8	-3.2
D	1400	03/10/91	08/31/91	S4	SAIC	75	0.5 ±2.0	7.8	17.0	-23.5	5.4 ±6.3	11.9	37.3	-26.6
D	1400	03/10/91	08/31/91	RCM4	SAIC	250	0.6 ±1.2	5.3	27.7	-20.0	**7.3 ±3.9**	8.5	32.0	-12.8
D	1400	03/10/91	08/31/91	RCM5	SAIC	400	**1.3 ±0.8**	3.5	19.3	-10.2	**6.4 ±3.2**	7.4	23.6	-11.29
D	1400	03/10/91	08/31/91	RCM5	SAIC	800	-0.1 ±0.9	3.4	12.0	-7.9	2.1 ±4.6	8.2	22.3	-8.8
D	1400	08/14/91	08/31/91	RCM5	SAIC	1390	**1.7 ±1.0**	1.1	0.3	-4.1	-3.0 ±12.0	1.5	-0.0	-6.7
E	2040	03/11/91	04/16/91	VMCM	NPS	75	**-6.4 ±3.0**	5.9	5.4	-21.5	6.0 ±6.7	4.9	16.9	-3.7
E	2000	03/11/91	08/15/91	RCM8	NPS	272	0.3 ±1.1	4.7	17.4	-18.2	**8.8 ±4.8**	10.5	30.5	-24.9
E	2000	03/11/91	08/31/91	RCM8	NPS	420	0.4 ±0.7	3.3	12.8	-11.3	**6.7 ±3.6**	8.2	25.2	-18.2
E	2000	03/11/91	08/31/91	RCM8	NPS	820	0.2 ±0.9	4.3	10.1	-16.5	-0.2 ±2.7	6.2	17.8	-21.3
E	2000	03/11/91	08/31/91	RCM8	NPS	1400	**0.6 ±0.3**	1.3	5.7	-3.2	**1.0 ±1.0**	2.3	11.0	-3.9
E	2000	03/11/91	08/31/91	RCM8	NPS	1987	**4.8 ±0.4**	1.7	9.9	-0.4	**-0.4 ±0.4**	1.0	2.6	-4.7
F	400	03/11/91	08/31/91	S4	SAIC	75	0.6 ±1.0	2.0	5.6	-4.5	-4.4 ±9.3	7.0	7.5	-24.2
F	430	03/12/91	08/31/91	S4	NPS	180/222	-0.1 ±0.3	1.5	5.8	-4.2	**4.1 ±1.0**	4.7	**18.8**	-10.7
F	430	03/11/91	08/31/91	RCM8	NPS	280/322	0.7 ±0.2	0.9	4.6	-1.8	-0.1 ±0.5	2.5	6.0	-7.7
F	430	03/11/91	08/31/91	RCM8	NPS	417/459	0.0 ±0.1	0.5	1.2	-1.7	-0.2 ±0.1	0.6	2.1	-2.2

Table A5. Low-passed horizontal current components (cm/s): March 1991 - August 1991

SAIC = Science Applications International Corporation
NPS = Naval Post Graduate School, Monterey, CA

S4 = Interocean S4
VMCM = EG&G Vector Measuring Current Meter

ACM2 = Neil Brown Acoustic Current Meter
RCM4, RCM5, RCM8 = Aaendera

SITE	WATER DEPTH (m)	START TIME GMT (M/D/Y)	STOP TIME GMT (M/D/Y)	INSTRUMENT	DATA SOURCE	SENSOR DEPTH (m)	CROSS-SLOPE				ALONGSLOPE			
							MEAN	SD	MAX	MIN	MEAN	SD	MAX	MIN
A	92	09/01/91	01/05/92	S4	SAIC	10	-0.7 ±1.3	5.0	14.2	27.8	1.1 ±3.2	7.8	27.8	-16.9
A	92	09/01/91	02/08/92	S4	SAIC	50	2.7 ±0.6	2.8	11.4	-4.2	3.6 ±2.5	6.8	21.4	-19.1
A	92	---	---	S4	SAIC	80	--- ---	---	---	---	--- ---	---	---	---
B	400	09/01/91	09/23/91	VMCM	SAIC	10	0.7 ±4.7	6.7	14.6	-14.1	1.3 ±9.1	6.0	12.4	-9.5
B	400	09/01/91	02/08/92	ACM2	SAIC	150	2.5 ±1.3	5.9	17.6	-17.8	7.5 ±3.6	10.0	35.2	-15.2
B	400	09/01/91	02/08/92	RCM4	SAIC	260	1.6 ±0.5	2.0	8.2	-5.0	2.9 ±1.8	4.9	17.2	-9.4
B	400	09/01/91	02/08/92	RCM4/5	SAIC	390	-1.1 ±0.3	1.3	4.0	-5.5	-1.6 ±1.6	4.3	8.5	-14.5
C	800	09/01/91	02/09/92	VMCM	SAIC	10	-1.9 ±2.2	9.3	34.1	-37.2	17.7 ±5.6	11.4	38.9	-16.2
C	800	09/0191	02/09/92	S4	SAIC	75	0.8 ±2.1	9.2	25.1	-23.6	3.8 ±4.0	8.6	16.3	-19.9
C	800	---	---	ACM2	SAIC	150	--- ---	---	---	---	--- ---	---	---	---
C	800	---	---	RCM4	SAIC	250	--- ---	---	---	---	--- ---	---	---	---
C	800	09/01/91	09/10/91	RCM5	SAIC	400	2.2 ±1.8	1.2	4.4	-0.1	-5.9 ±∞	2.8	-2.8	-10.8
C	800	09/01/91	03/11/92	RCM5	SAIC	790	-2.6 ±0.4	1.9	2.4	-9.0	3.5 ±1.7	4.04	12.7	-7.0
D	1400	09/01/91	02/13/92	S4	SAIC	75	-3.7 ±2.0	8.4	30.3	-32.8	14.3 ±4.6	9.8	47.9	-5.2
D	1400	09/01/91	09/03/91	RCM4	SAIC	250	1.9 ±∞	0.7	2.9	1.2	0.60 ±∞	0.7	1.6	-0.4
D	1400	09/01/91	02/13/92	RCM5	SAIC	400	0.1 ±0.9	3.9	9.5	-14.7	4.6 ±2.3	5.3	17.9	-6.3
D	1400	09/01/91	02/13/92	RCM5	SAIC	800	0.2 ±0.7	3.3	14.3	-9.8	1.2 ±1.9	4.3	16.5	-7.8
D	1400	09/01/91	02/13/91	RCM5	SAIC	1390	-0.3 ±0.3	1.2	2.8	-3.7	0.1 ±0.1	0.3	6.9	-5.8
E	2040	---	---	VMCM	NPS	75	--- ---	---	---	---	--- ---	---	---	---
E	2000	---	---	RCM8	NPS	272	--- ---	---	---	---	--- ---	---	---	---
E	2000	09/01/91	02/12/92	RCM8	NPS	420	-0.2 ±1.0	4.7	12.6	-19.9	1.4 ±3.8	8.6	25.3	-22.2
E	2000	09/01/91	02/12/92	RCM8	NPS	820	0.5 ±0.5	2.1	10.1	-3.1	-0.6 ±2.5	5.5	10.5	-20.6
E	2000	09/01/91	02/12/92	RCM8	NPS	1400	0.3 ±0.3	1.3	4.4	-3.1	0.9 ±1.1	2.5	8.2	-5.4
E	2000	09/01/91	02/12/92	RCM8	NPS	1987	3.7 ±0.4	1.9	9.9	-0.7	0.0 ±0.4	0.8	2.7	-2.2
F	400	09/01/91	02/10/92	S4	SAIC	75	-3.2 ±1.0	4.5	5.2	-18.0	9.9 ±4.0	8.8	37.3	-13.6
F	430	09/01/91	02/13/92	S4	NPS	180/222	0.8 ±0.2	1.1	5.5	-2.4	0.8 ±0.6	2.8	11.1	-9.2
F	430	09/01/91	02/13/92	RCM8	NPS	280/322	0.7 ±0.2	0.8	4.2	-1.8	1.0 ±0.4	2.0	7.6	-6.7
F	430	09/01/91	02/13/92	RCM8	NPS	417/459	-0.1 ±0.1	0.6	1.4	-2.8	-0.3 ±0.0	0.2	0.6	-1.1

Table A6. Low-passed horizontal current components (cm/s): September 1991 - March 1992

SAIC = Science Applications International Corporation
NPS = Naval Post Graduate School, Monterey, CA

S4 = Interocean S4
VMCM = EG&G Vector Measuring Current Meter

ACM2 = Neil Brown Acoustic Current Meter
RCM4, RCM5, RCM8 = Aaendera

SITE AND SENSOR DEPTH (m)	CROSS-SLOPE CORRELATION WITH					ALONGSLOPE CORRELATION WITH				
A	**10**	**50**	**80**			**10**	**50**	**80**		
10	1.00	0.22	–			1.00	.83	.77		
50	2.38	1.00	–			64.22	1.00	.89		
80	–	–	1.00			59.35	55.27	1.00		
Variance	29.67	10.77	8.48			96.30	62.52	61.70		
B	**10**	**150**	**260**	**390**		**10**	**150**	**260**	**390**	
10	1.00	–	–	–		1.00	0.38	0.11	–	
150	–	1.00	–	–		38.57	1.00	0.60	–	
260	–	–	1.00	–		7.64	41.83	1.00	0.21	
390	–	–	–	1.00		–	–	5.92	1.00	
Variance	45.40*	20.06	23.09	1.82		101.00	102.60	47.71	16.29	
C	**10**	**75**	**150**	**250**	**790**	**10**	**75**	**150**	**250**	**790**
10	1.00	–	–	–	–	1.00	–	–	–	–
75	–	1.00	.90	.59	–	–	1.00	.94	.94	–
150	–	29.59	1.00	.53	–	–	150.95	1.00	.95	–
250	–	14.28	12.34	1.00	–	–	120.78	102.21	1.00	–
790	–	--	–	–	1.00	–	–	–	–	1.00
Variance	74.24	34.18	31.63	17.14	3.43	348.67	191.78	134.46	86.09	13.49
D	**75**	**250**	**400**	**800**	**1390**	**75**	**250**	**400**	**800**	**1390**
75	1.00	.75	.52	.16	–	1.00	.80	.73	.47	–
250	28.55	1.00	.84	.19	–	78.57	1.00	.95	.80	.20
400	16.47	14.03	1.00	.35	–	55.44	51.08	1.00	.85	.33
800	4.38	2.74	4.20	1.00	–	28.32	34.13	28.04	1.00	.45
1390	–	–	–	–	1.00	–	4.14	5.29	5.72	1.00
Variance	72.18	20.08	13.89	10.39	1.56	138.70	69.54	41.58	26.17	6.17
E	**250**	**400**	**800**	**1400**	**1987**	**250**	**400**	**800**	**1400**	**1987**
250	1.00	.72	–	–	–	1.00	.90	–	–	–
400	13.64	1.00	.23	–	–	82.86	1.00	.42	–	–
800	–	3.06	1.00	–	–	–	21.40	1.00	.28	–
1400	–	–	–	1.00	–	–	–	3.82	1.00	–
1987	–	–	–	–	1.00	–	–	–	–	1.00
Variance	21.97	16.33	11.34	1.73	3.50	110.36	76.81	34.37	5.62	0.79

Table A7. Average correlations and covariances among the subtidal currents measured at different depths for each mooring site over a 1 year period. For alongslope currents, correlations less than 0.25 are not significant at the 95% confidence level; neither are the associated covariances statistically stable. For cross-slope currents, correlations less than 0.15 are not significant. There were no correlations among alongslope or cross-slope currents at mooring site F.

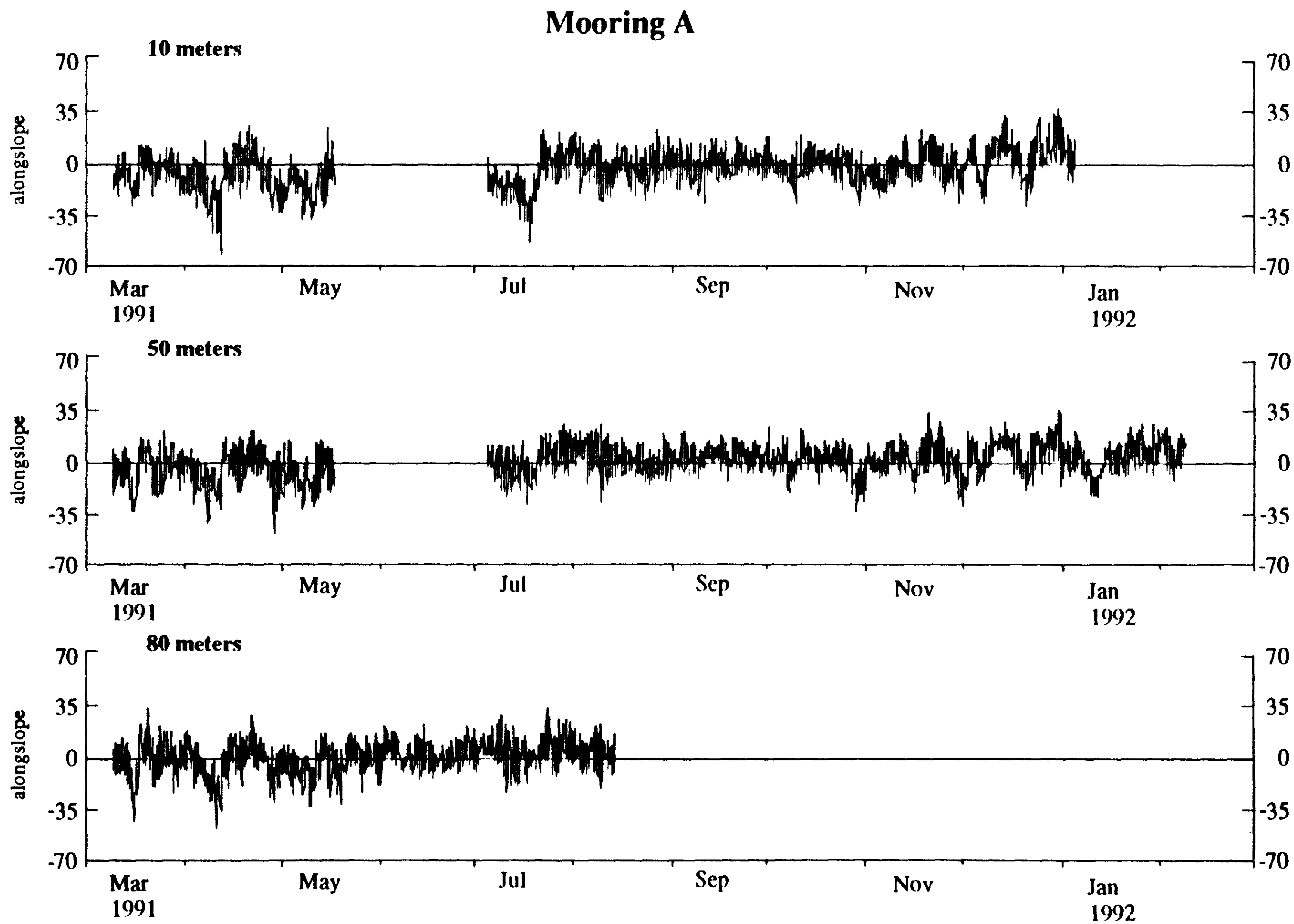
Appendix B - Time Series Plots

SITE	Start time GMT (M/D/Y)	Stop time GMT (M/D/Y)	O_1 Major axis (cm/s)	O_1 Minor axis (cm/s)	O_1 Inclination (degrees)	K_1 Major Axis (cm/s)	K_1 Minor axis (cm/s)	K_1 Inclination (degrees)
A10	07/05/91	01/05/92	2.5	-1.4	69	5.4	-2.8	74
A50	07/05/91	01/05/92	2.6	-1.4	77	5.6	-2.8	83
A80	03/09/91	08/13/91	2.8	-1.2	112	5.5	-2.0	125
B10	07/05/91	09/23/91	0.5	0.1	153	1.3	-0.8	96
B150	03/10/91	02/08/92	1.2	0.1	75	2.8	-0.6	82
B260	03/10/91	02/08/92	1.0	-0.2	111	1.9	-0.4	108
B390	03/10/91	02/08/92	1.1	-0.1	117	1.7	-0.1	143
C10	03/10/91	02/08/92	1.7	-0.5	123	2.9	-0.7	86
C75	07/05/91	02/08/92	1.2	-0.3	68	2.9	-1.0	83
C150	03/10/91	08/13/91	1.2	0.2	99	2.5	-0.4	94
C250	03/10/91	08/13/91	0.8	0.2	73	1.9	-0.2	91
C790	08/15/91	03/11/92	3.9	-0.8	81	6.7	-1.8	78
D75	03/11/91	02/13/92	0.9	0.2	99	2.2	-0.2	110
D250	03/11/91	08/13/91	0.9	0.3	95	1.7	-	101
D400	03/1191	02/13/92	1.0	0.1	81	1.5	0.1	87
D800	03/11/91	02/03/92	1.2	0.1	71	2.0	-0.2	68
D1390	08/15/91	02/13/92	1.0	-0.6	103	1.4	-1.1	128
E75	03/12/91	04/16/92	1.9	0.3	141	1.3	-0.6	165
E250	03/1291	08/15/91	1.3	0.3	114	1.9	0.1	117
E400	03/12/91	02/12/92	1.2	0.2	123	1.8	0.2	120
E800	03/12/91	02/12/92	0.7	-0.1	124	1.0	-0.2	121
E1400	03/12/91	02/12/92	0.8	-0.6	26	1.4	-1.0	3
E1987	03/12/91	02/12/92	2.5	0.2	16	2.8	0.2	16
F75	08/16/91	02/10/92	2.6	-1.0	110	4.3	-1.5	118
F150	03/13/91	02/13/92	2.8	-0.1	123	4.0	0.1	121
F250	03/13/91	02/13/92	1.6	0.1	125	2.4	0.1	125
F387	03/13/91	02/13/92	0.3	-	71	0.5	-	83

TableB1. Diurnal tidal currents. A negative minor axis indicates a clockwise rotation for the tidal currents. The inclination angle is counterclockwise from east.

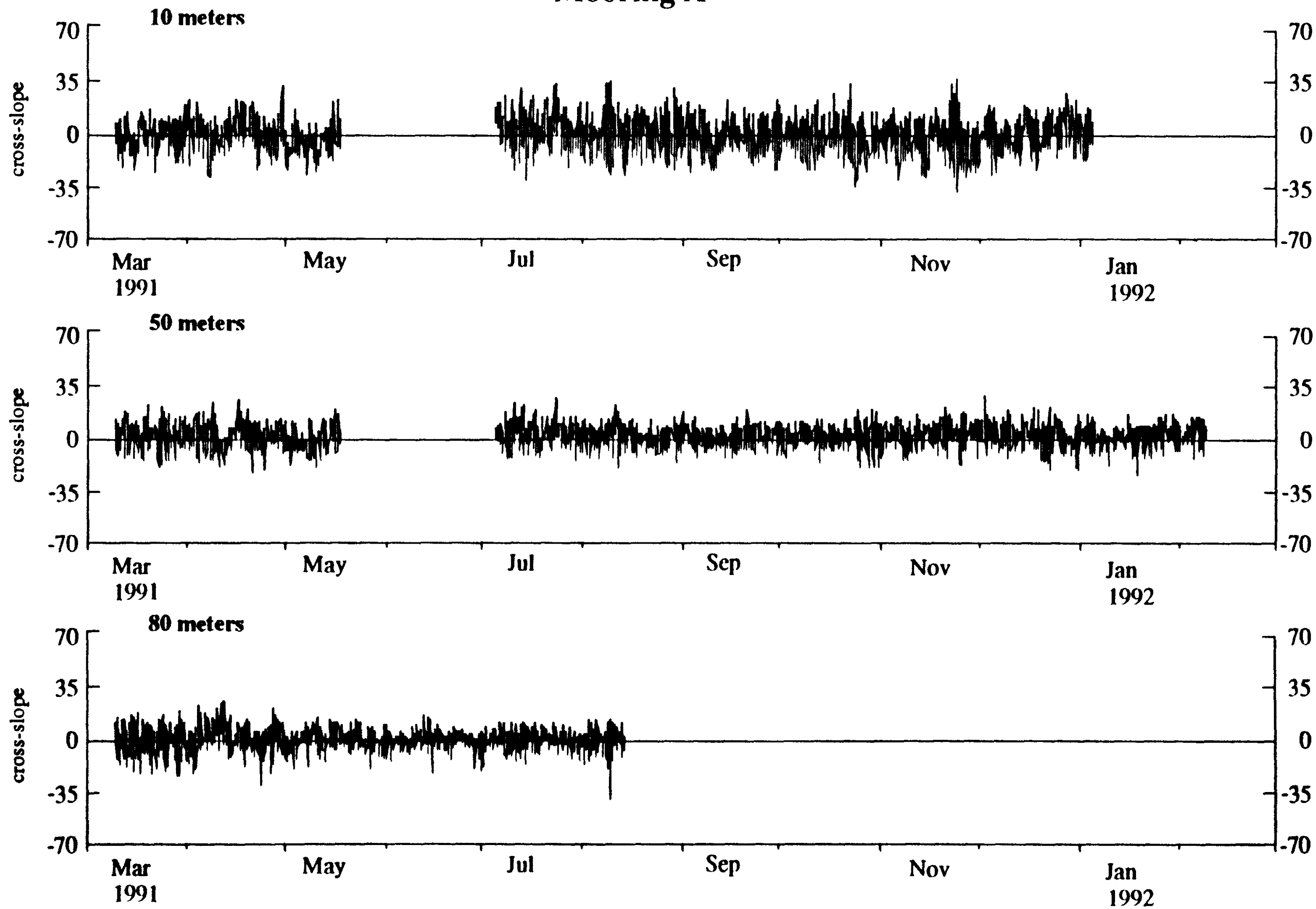
Site	Start time GMT (M/D/Y)	Stop time GMT (M/D/Y)	M_2 Major axis cm/s	M_2 Minor axis cm/s	M_2 Inclination degrees	S_2 Major Axis cm/s	S_2 Minor axis cm/s	S_2 Inclination degrees
A10	07/05/91	01/05/92	7.0	0.2	47	2.3	0.3	61
A50	07/05/91	01/05/92	4.1	1.0	110	1.5	-0.4	144
A80	03/09/91	08/13/91	4.1	1.3	84	2.2	-	142
B10	07/05/91	09/23/91	1.0	-0.6	157	1.8	-0.9	128
B150	10/31/91	02/08/92	4.2	0.3	75	2.2	-0.7	76
B260	03/10/91	02/08/92	4.5	0.4	122	1.6	0.5	138
B390	03/10/91	02/08/92	10.4	-1.9	125	5.0	-0.5	145
C10	03/10/91	02/08/92	4.1	2.0	108	1.9	0.9	119
C75	07/05/91	02/08/92	4.9	-0.3	75	4.7	-2.2	60
C150	03/10/91	08/13/91	4.3	-0.1	76	2.6	-1.6	78
C250	03/10/91	08/13/91	4.6	-0.3	76	1.6	-1.2	97
C790	08/15/91	03/11/92	8.6	-2.6	105	5.0	-2.3	126
D75	03/11/91	02/13/92	4.7	-0.4	113	1.9	-0.4	107
D250	03/11/91	08/13/91	2.4	1.4	115	1.3	-0.1	68
D400	03/11/91	02/13/92	3.0	0.2	100	1.1	-0.3	68
D800	03/11/91	02/03/92	5.2	-1.2	91	2.6	-1.0	109
D1390	08/1591	02/13/92	5.1	0.5	117	2.9	-0.1	119
E75	03/12/91	04/16/91	3.0	-1.9	133	1.6	-0.2	143
E250	03/12/91	08/15/91	2.6	1.1	53	1.1	0.1	30
E400	03/12/91	02/12/92	2.3	1.7	87	1.1	0.2	110
E800	03/12/91	02/12/92	3.7	-1.0	138	1.3	-0.2	143
E1400	03/12/91	02/12/92	2.3	-0.6	105	1.0	-0.2	124
E1987	03/12/91	02/12/92	10.4	0.3	23	3.2	-0.1	21
F75	08/16/91	02/10/92	3.5	0.2	19	1.8	-0.4	73
F150	03/13/91	02/13/92	3.3	0.4	143	1.1	-0.1	76
F250	03/13//91	02/13/92	1.2	0.2	138	0.5	-	148
F387	03/13/91	02/1392	0.8	0.1	62	0.4	-0.1	58

Table B2. Semidiurnal tidal currents. A negative minor axis indicates a clockwise rotation for the tidal currents. The inclination angle is counterclockwise from east.



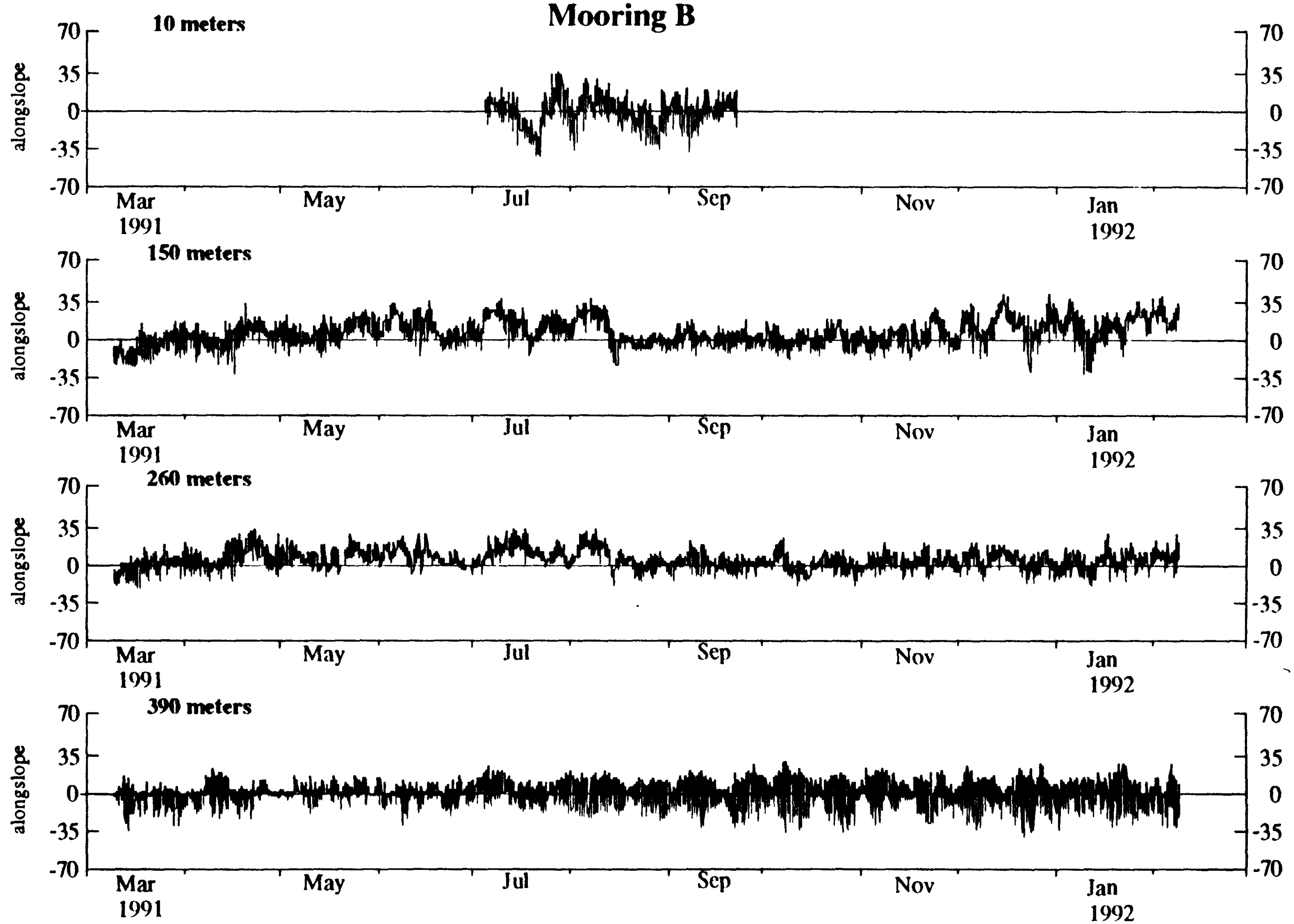
Hour-averaged alongslope current

Mooring A



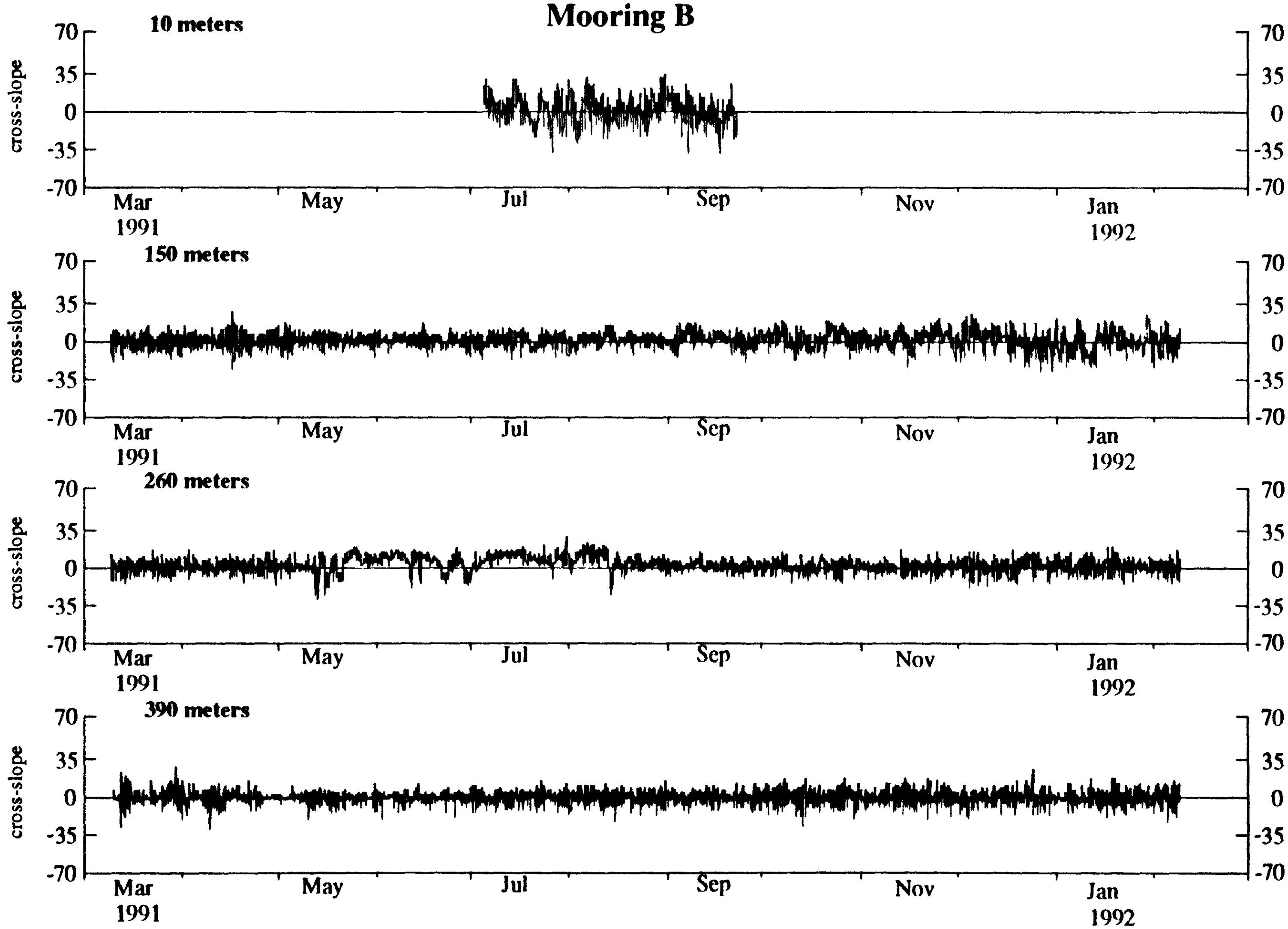
Hour-averaged cross-slope current

Mooring B



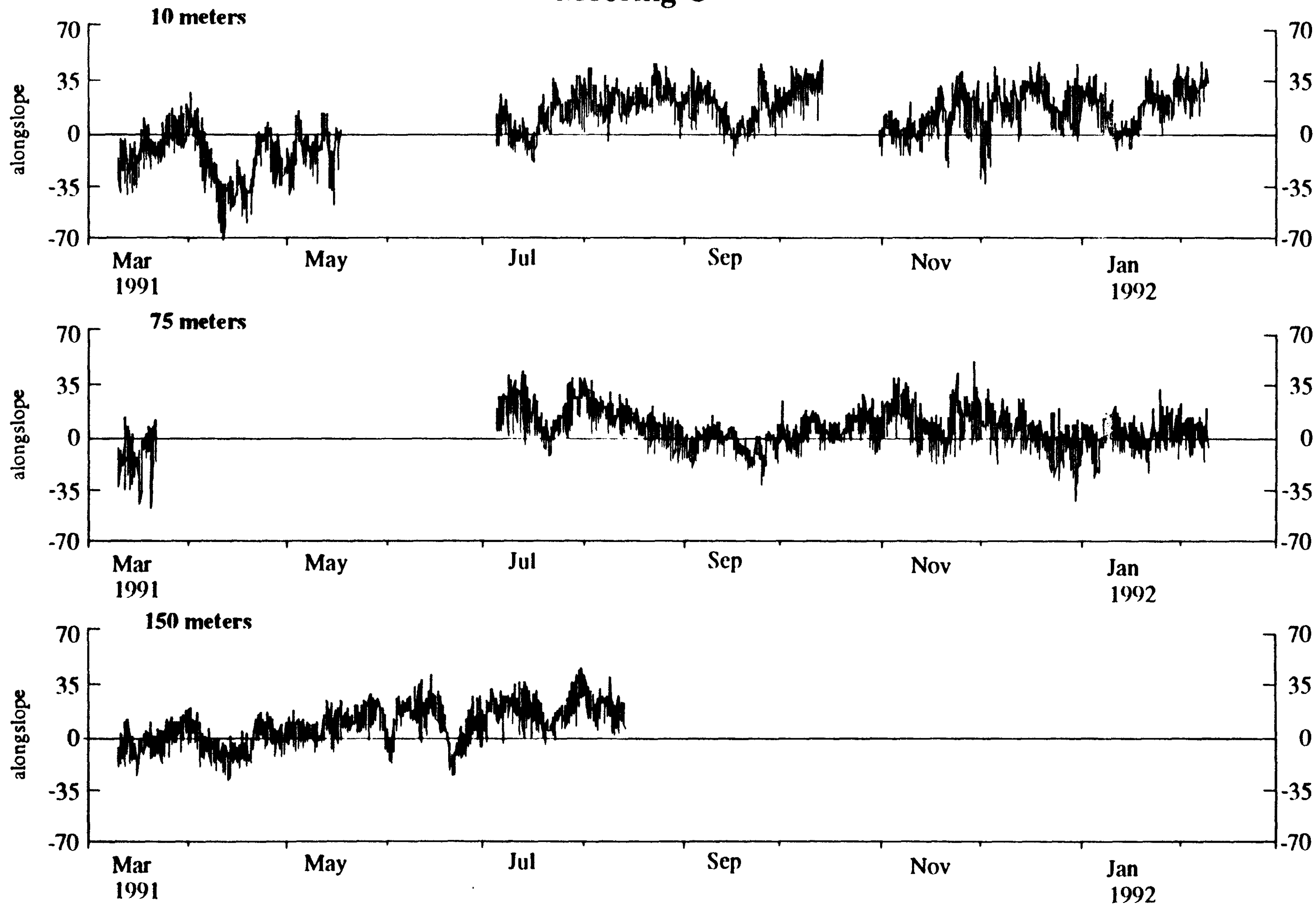
Hour-averaged alongslope current

Mooring B



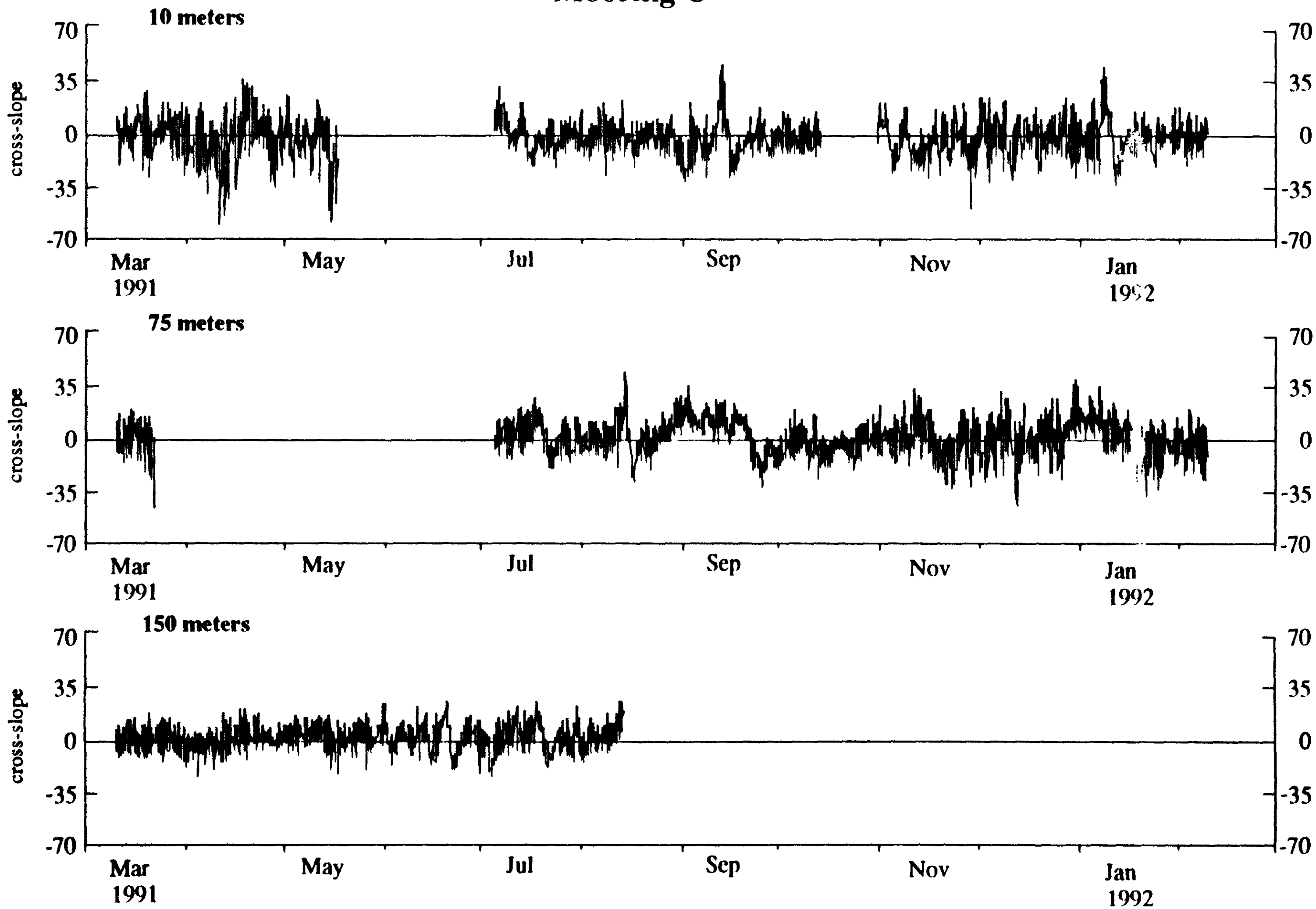
Hour-averaged cross-slope current

Mooring C



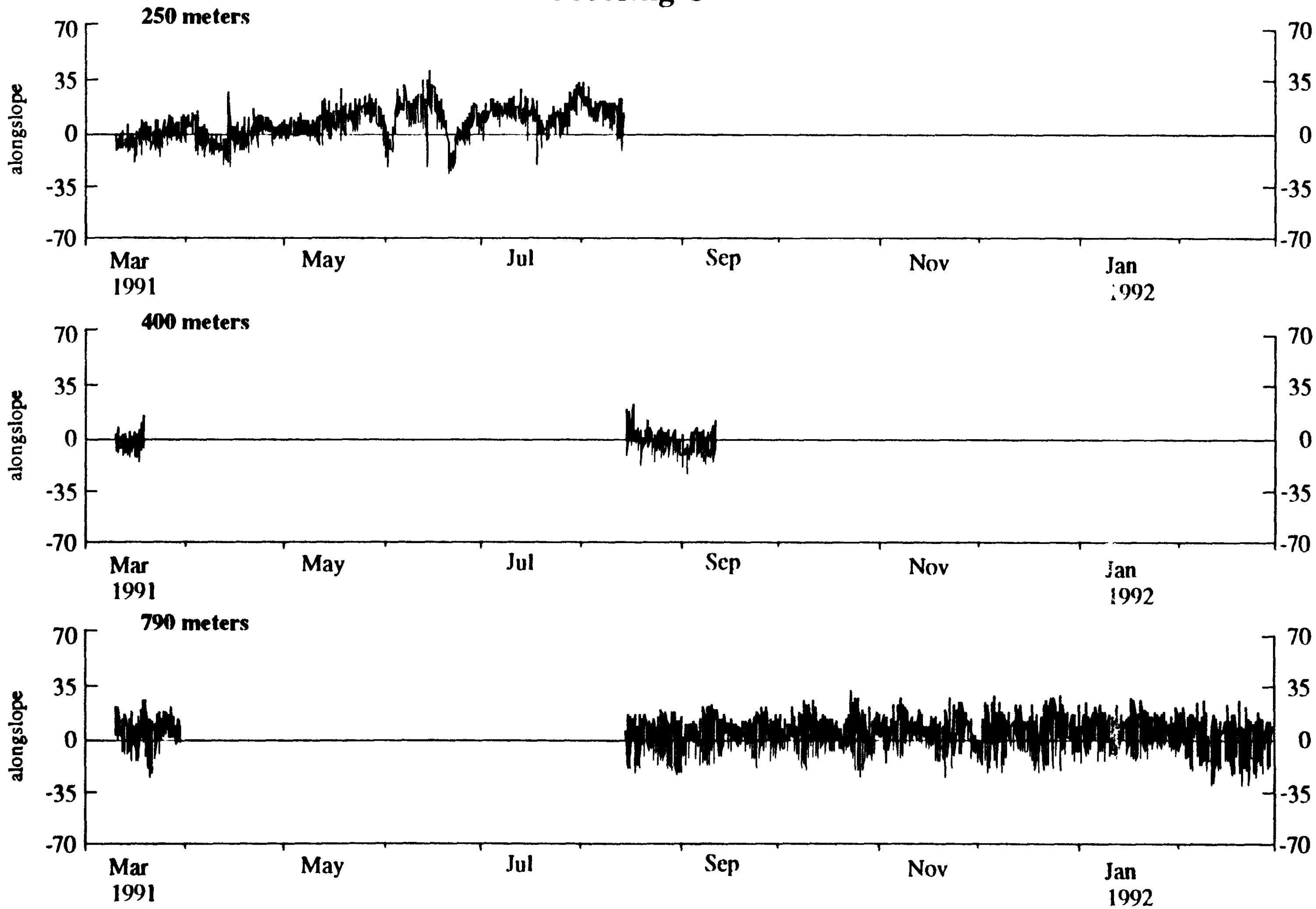
Hour-averaged alongslope current

Mooring C



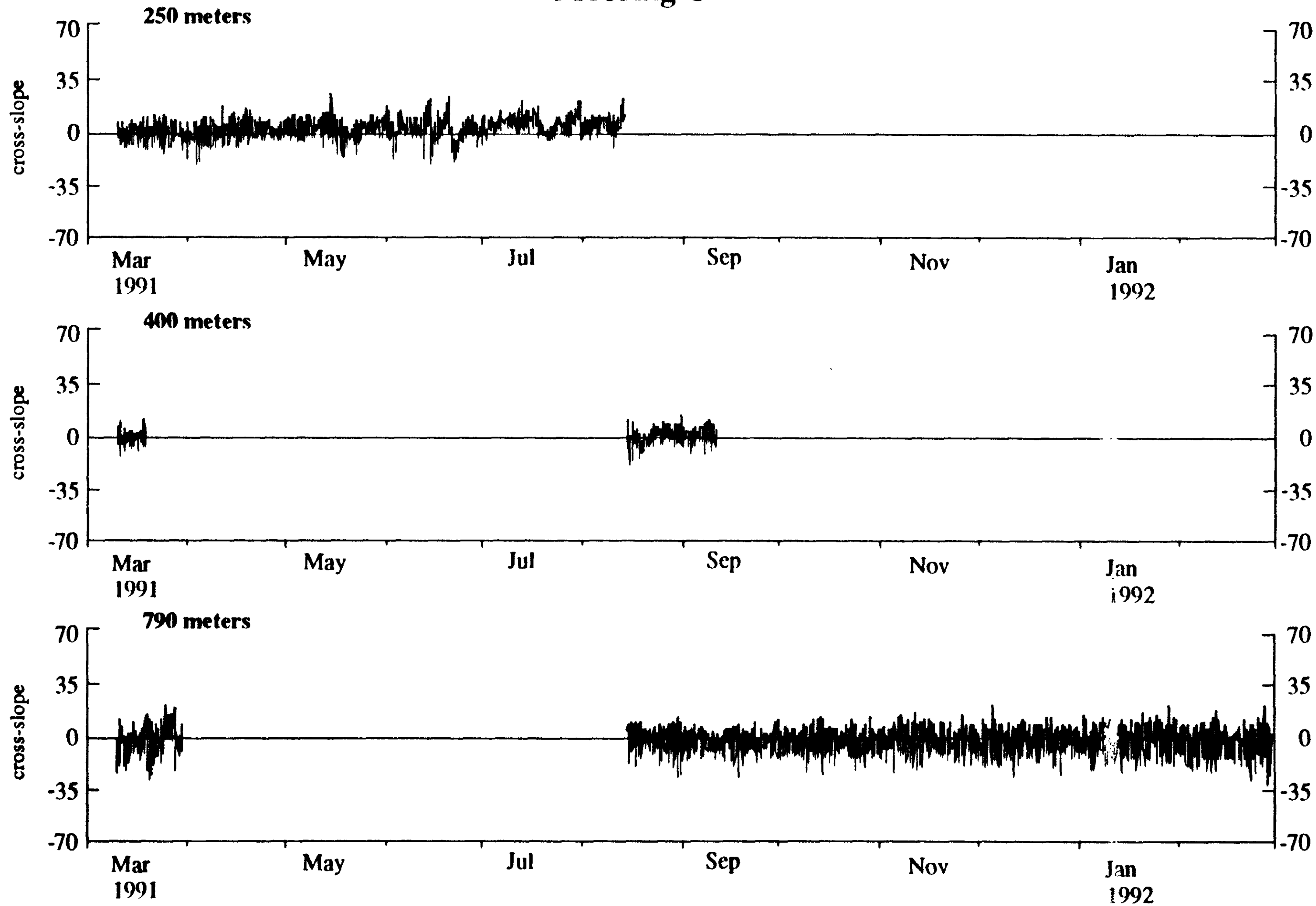
Hour-averaged cross-slope current

Mooring C



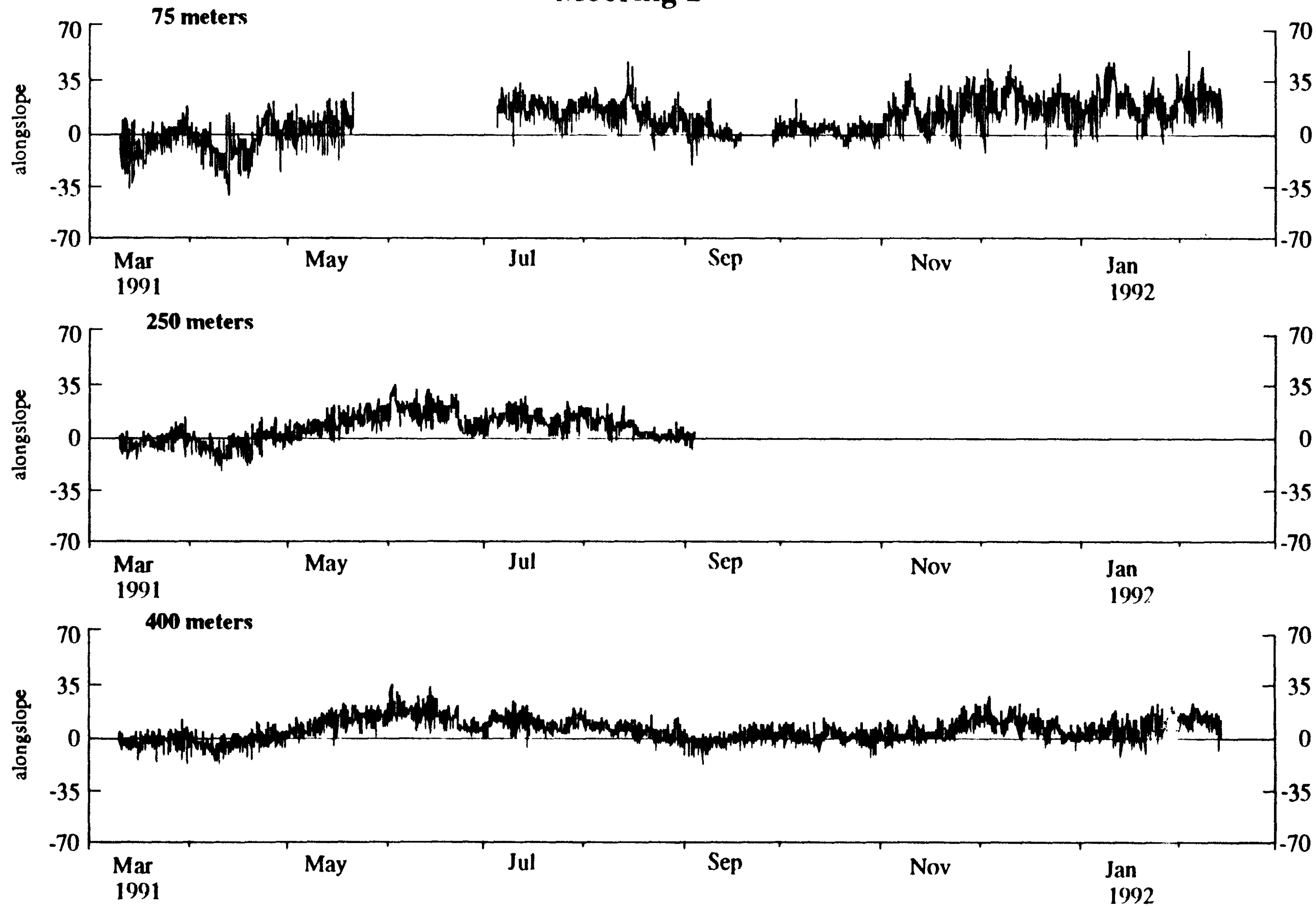
Hour-averaged alongslope current

Mooring C



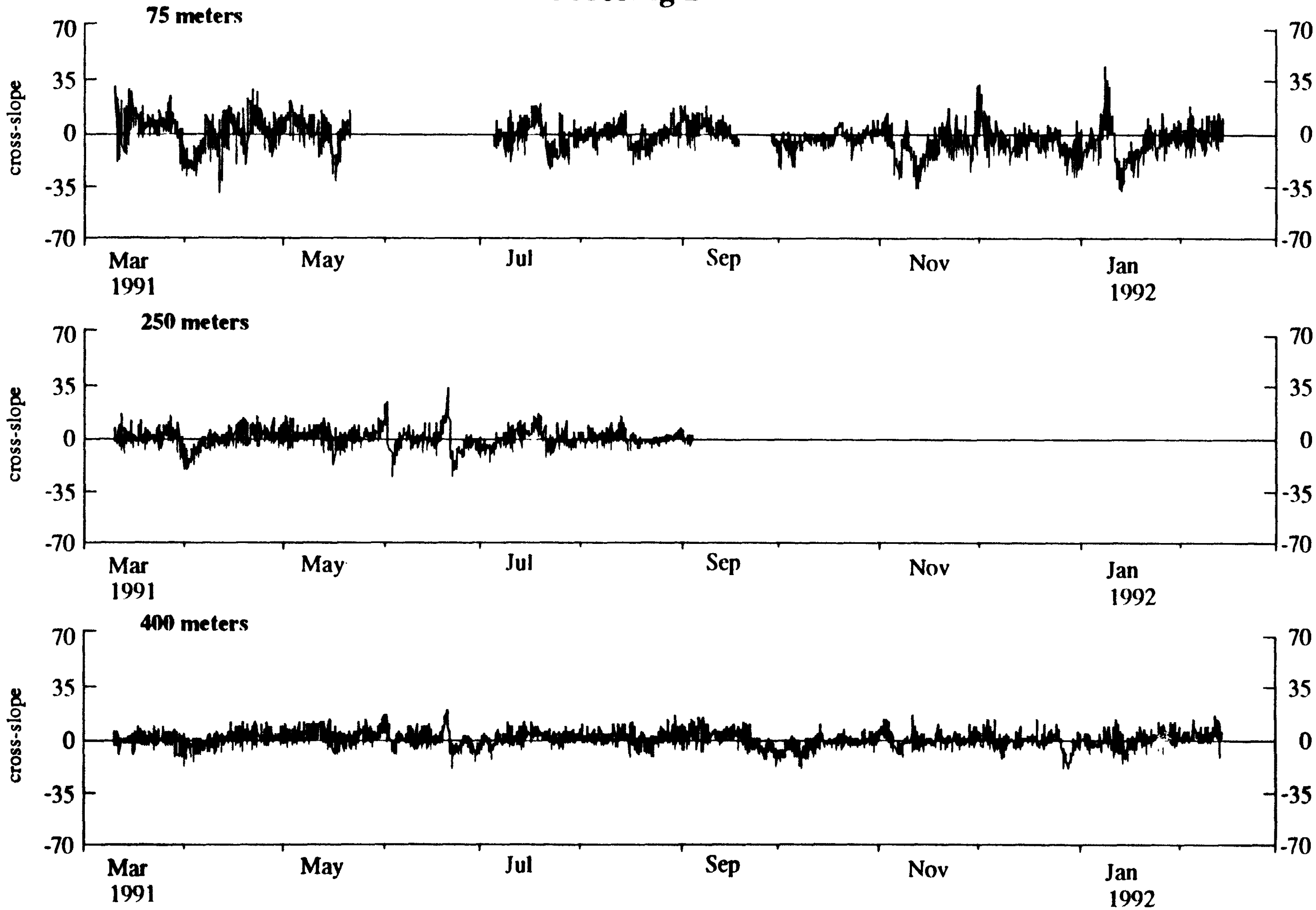
Hour-averaged cross-slope current

Mooring D

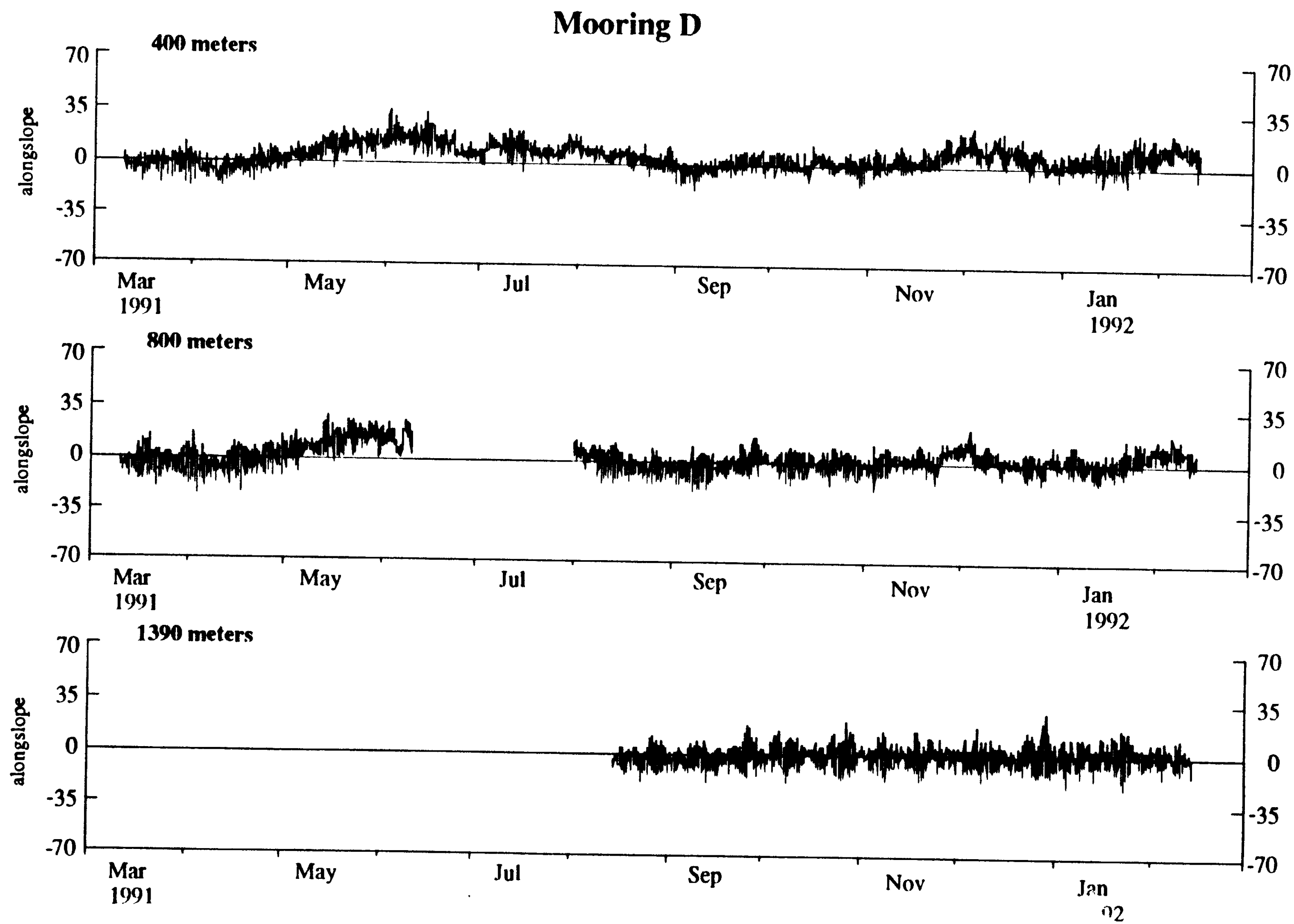


Hour-averaged alongslope current

Mooring D

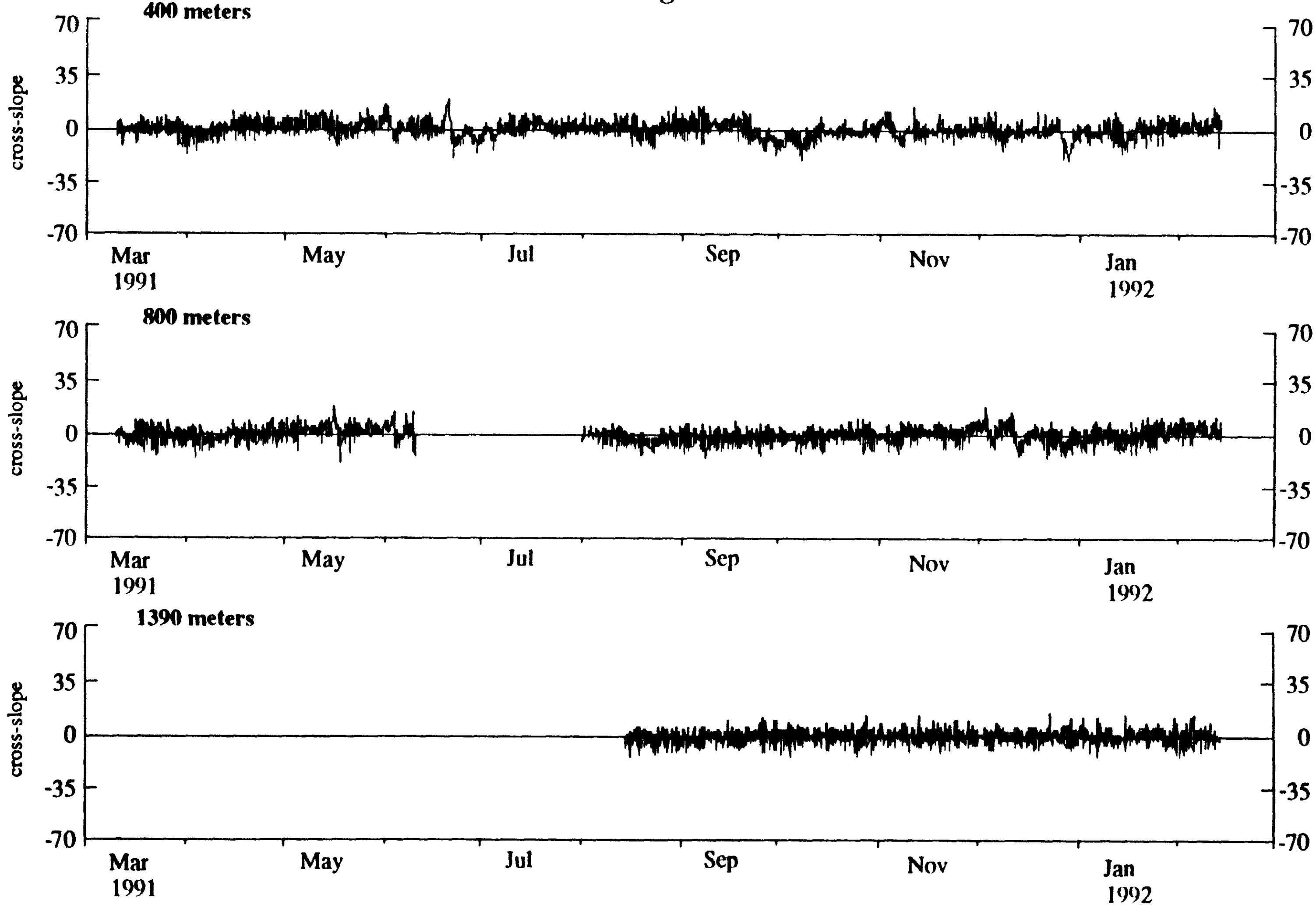


Hour-averaged cross-slope current

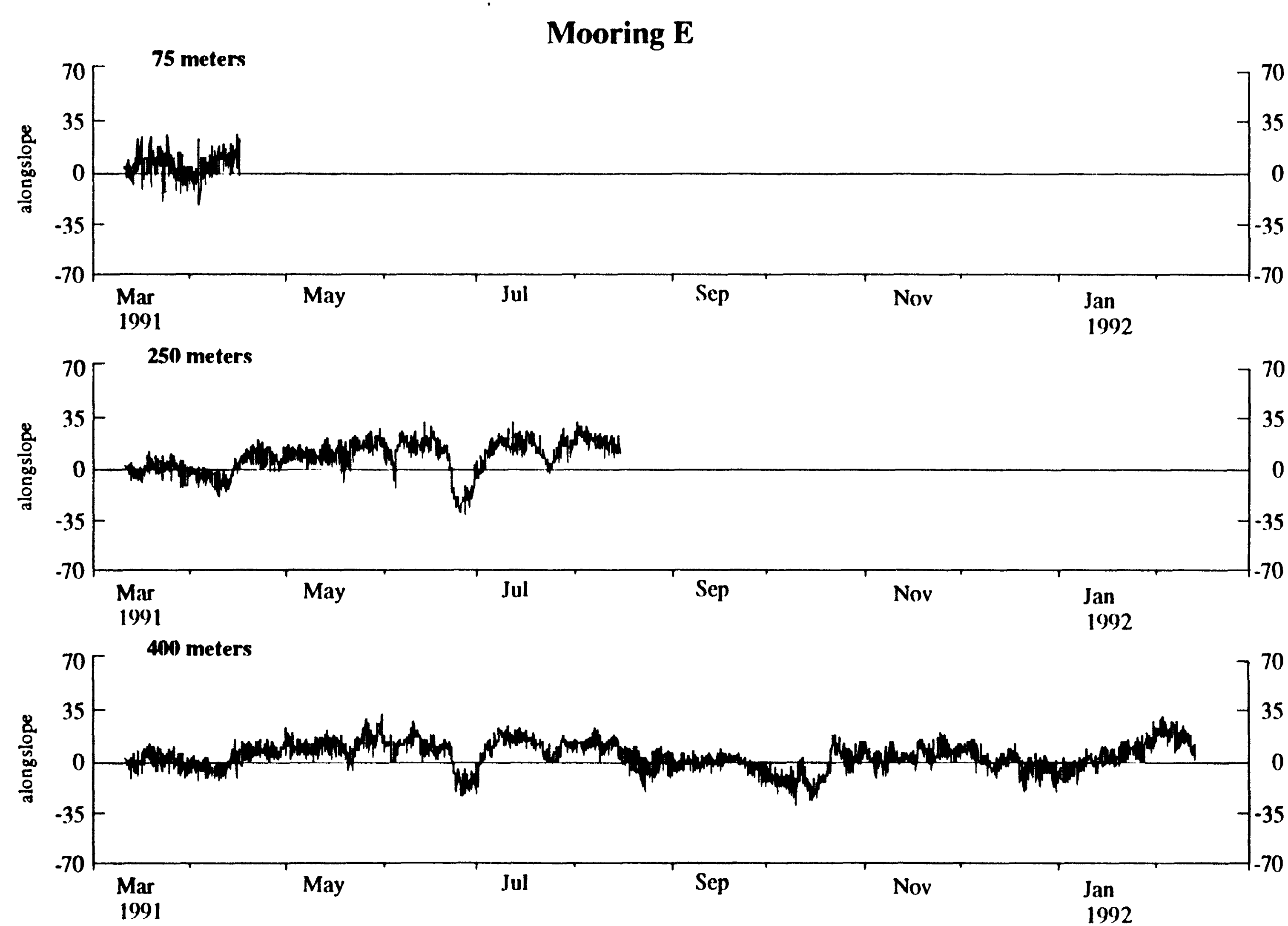


Hour-averaged alongslope current

Mooring D

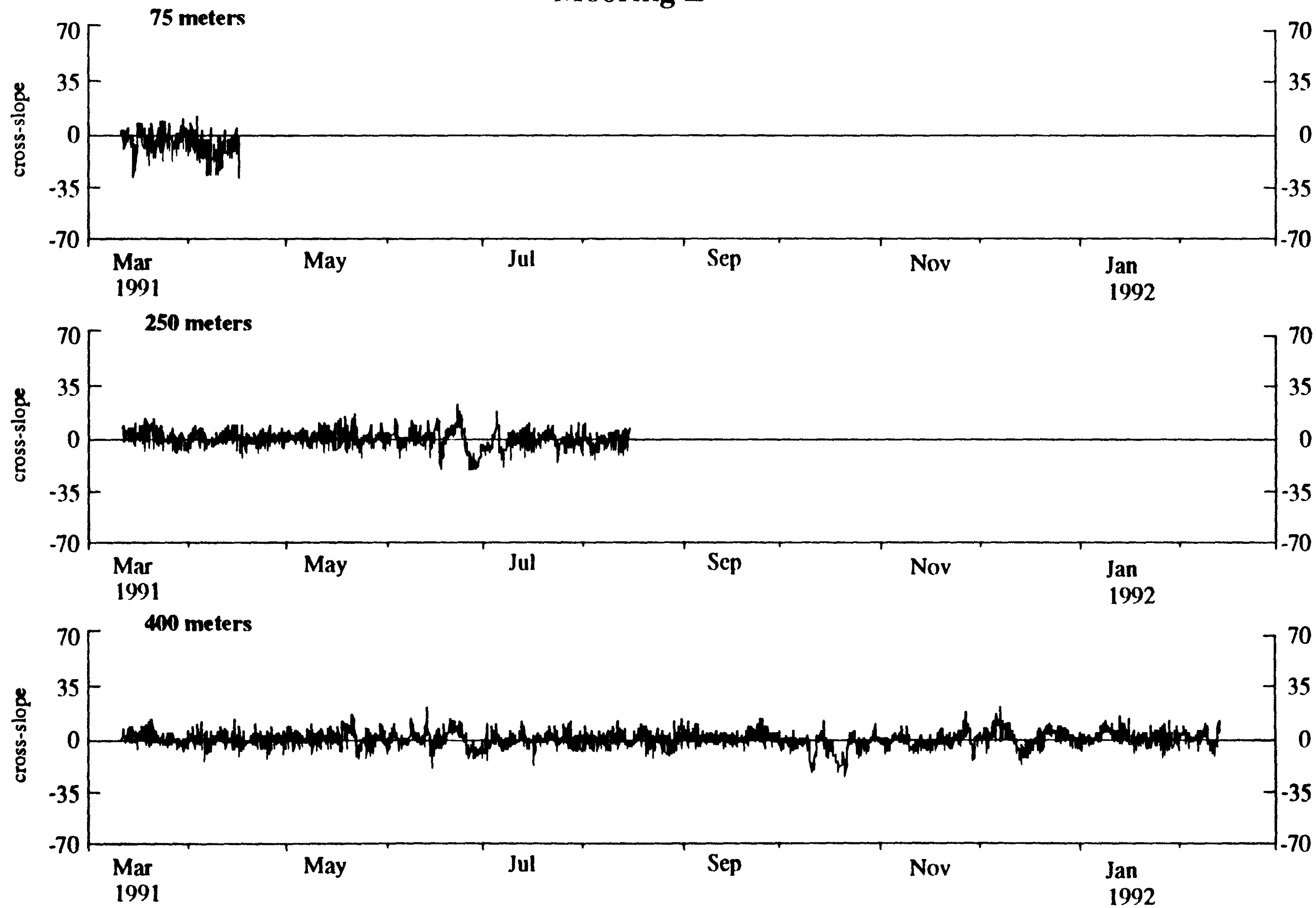


Hour-averaged cross-slope current



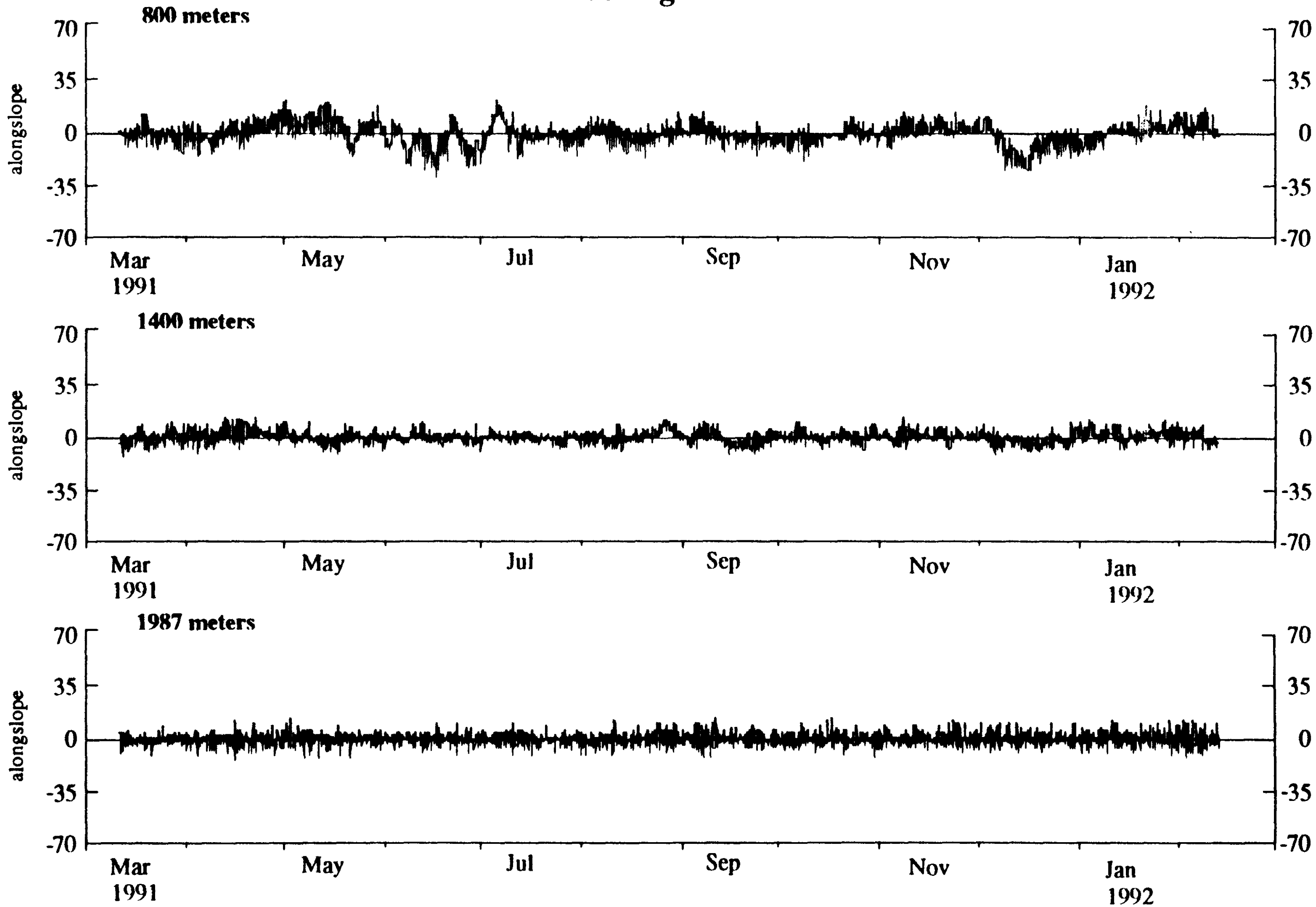
Hour-averaged alongslope current

Mooring E



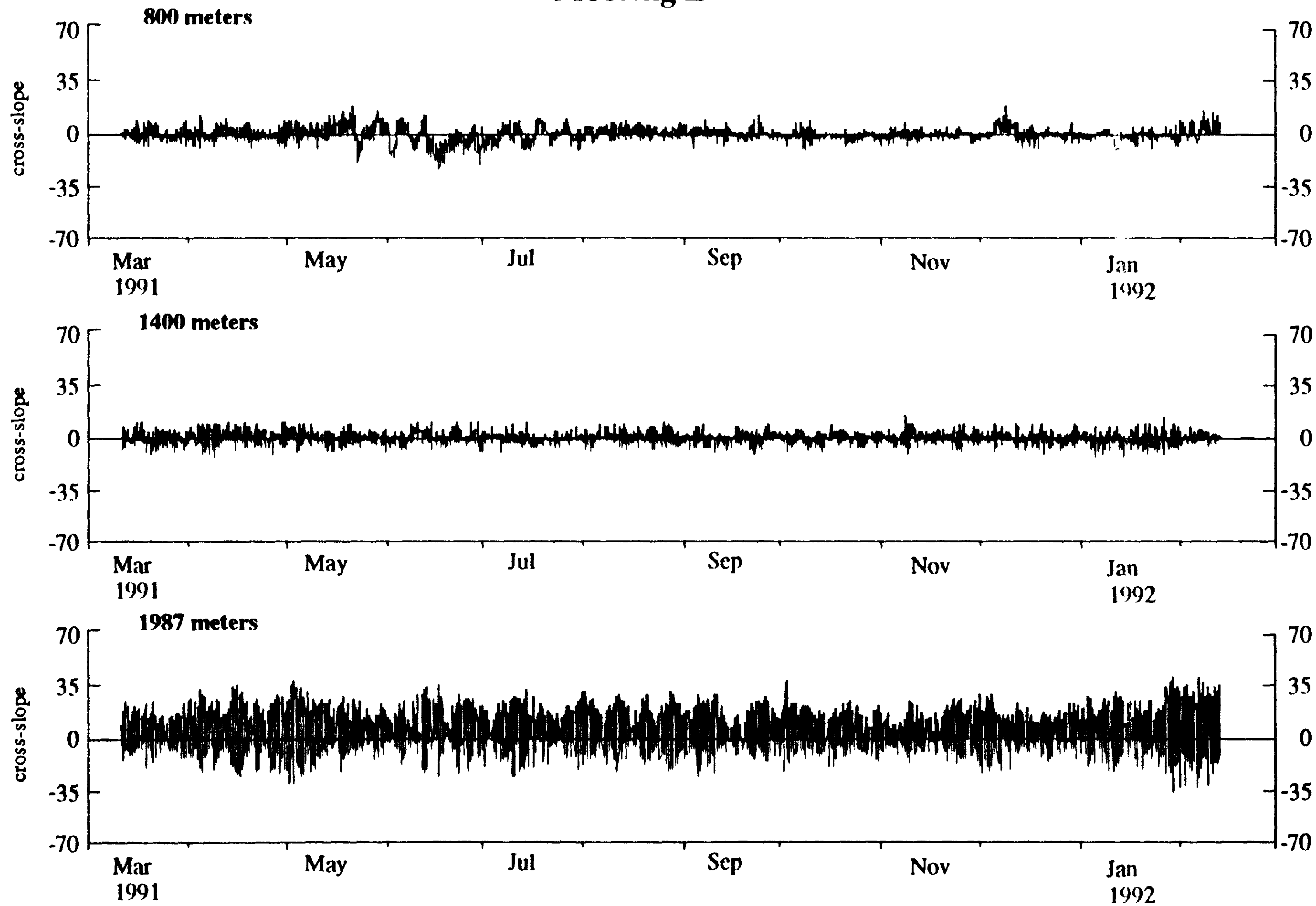
Hour-averaged cross-slope current

Mooring E



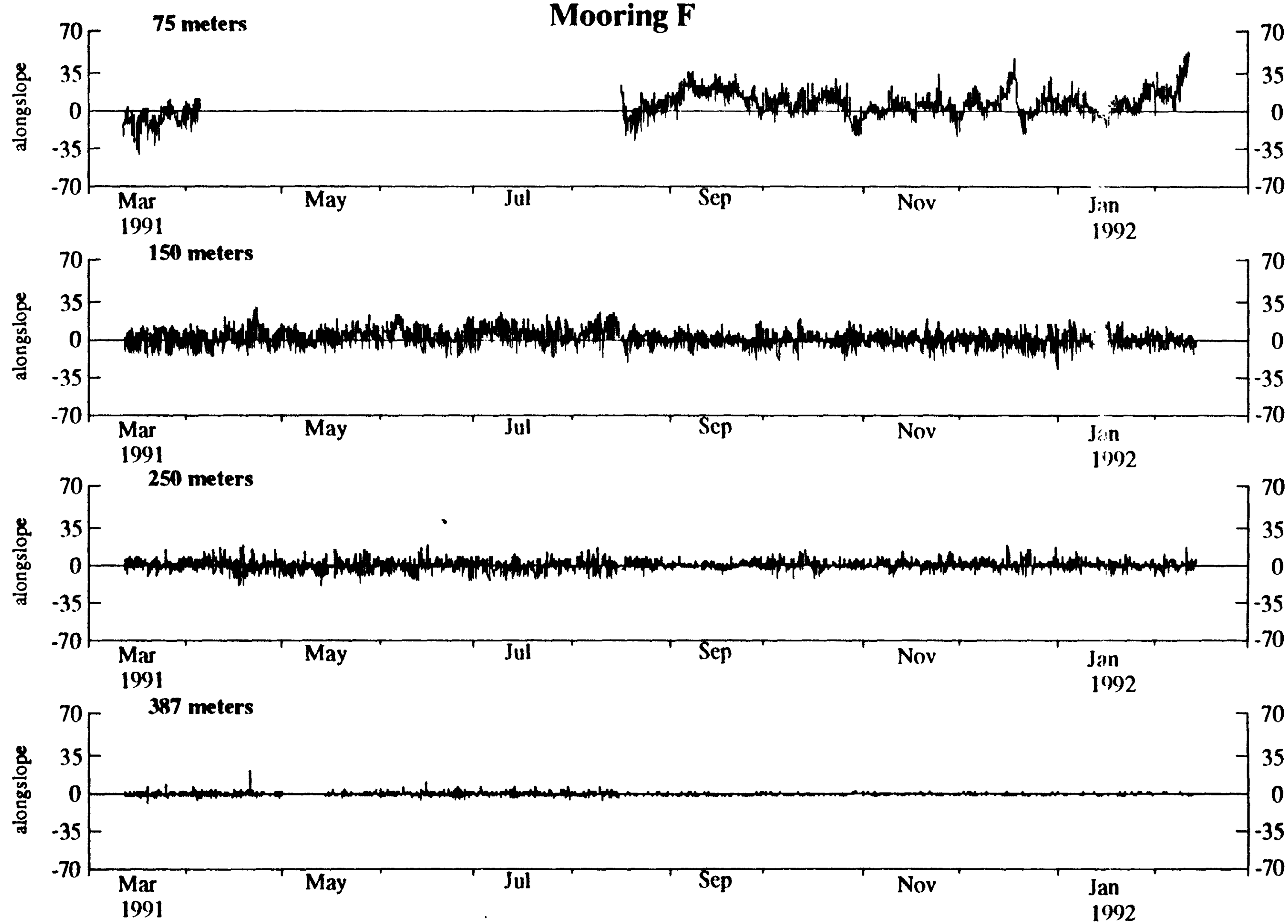
Hour-averaged alongslope current

Mooring E

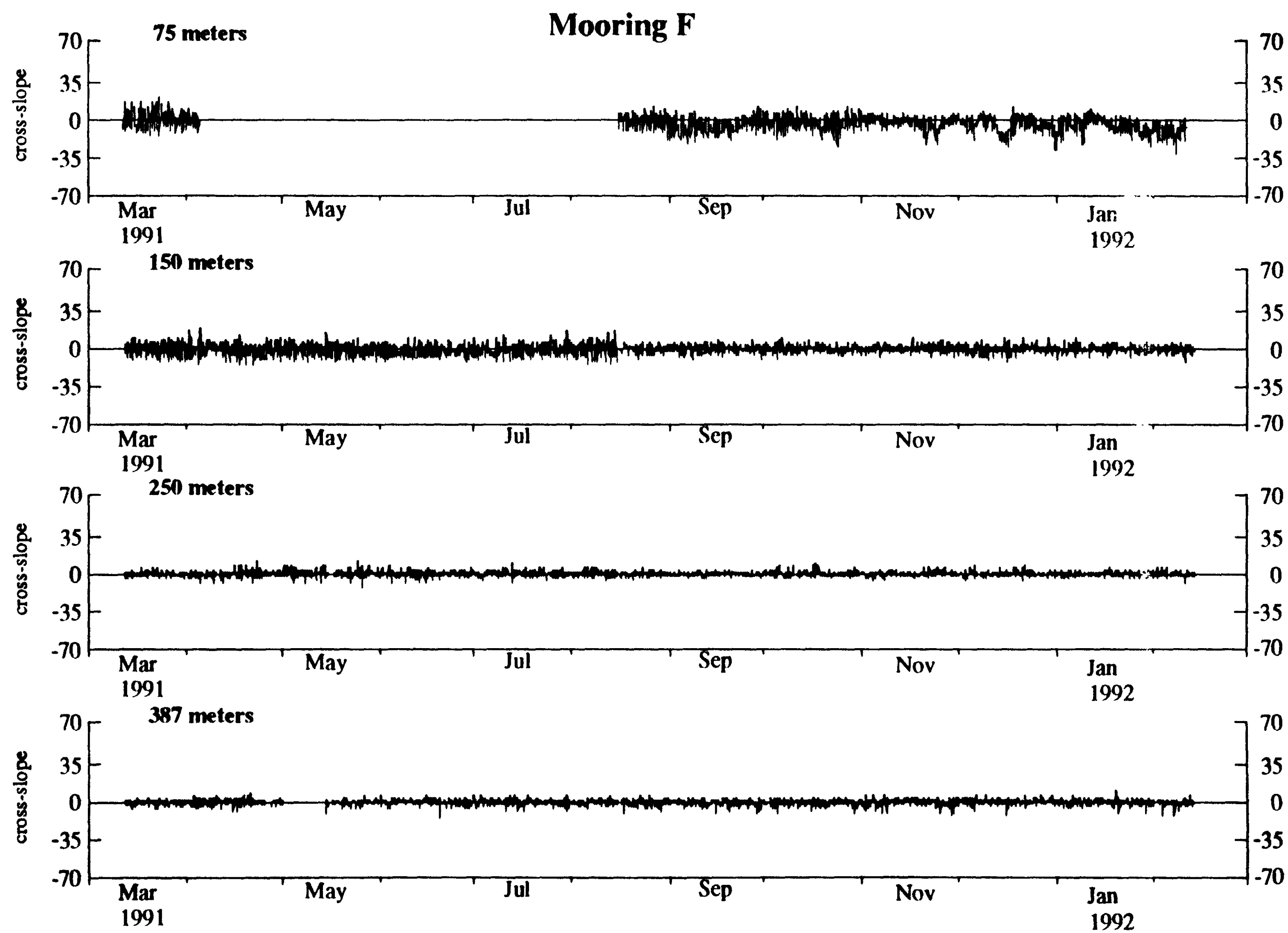


Hour-averaged cross-slope current

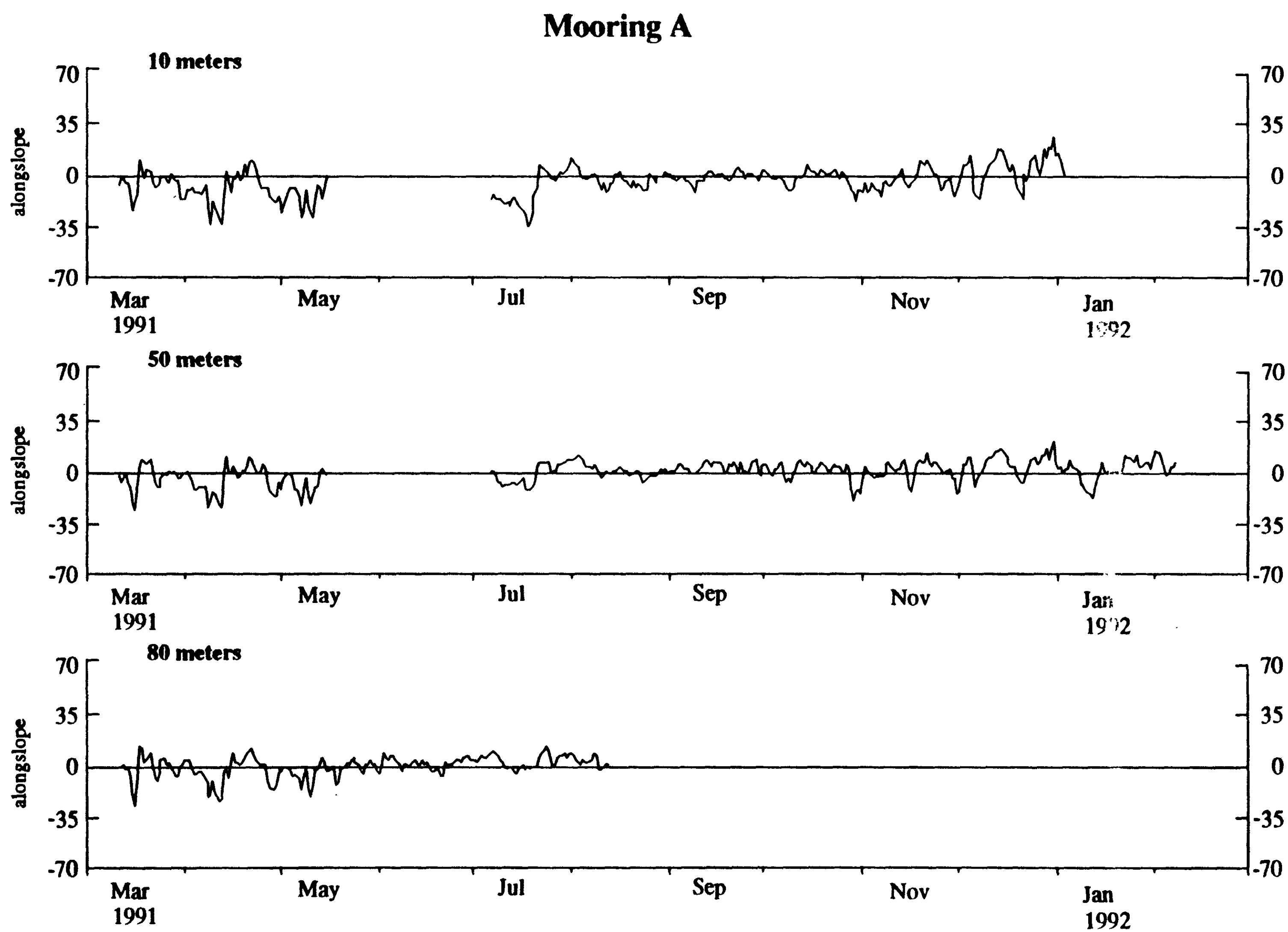
Mooring F



Hour-averaged alongslope current

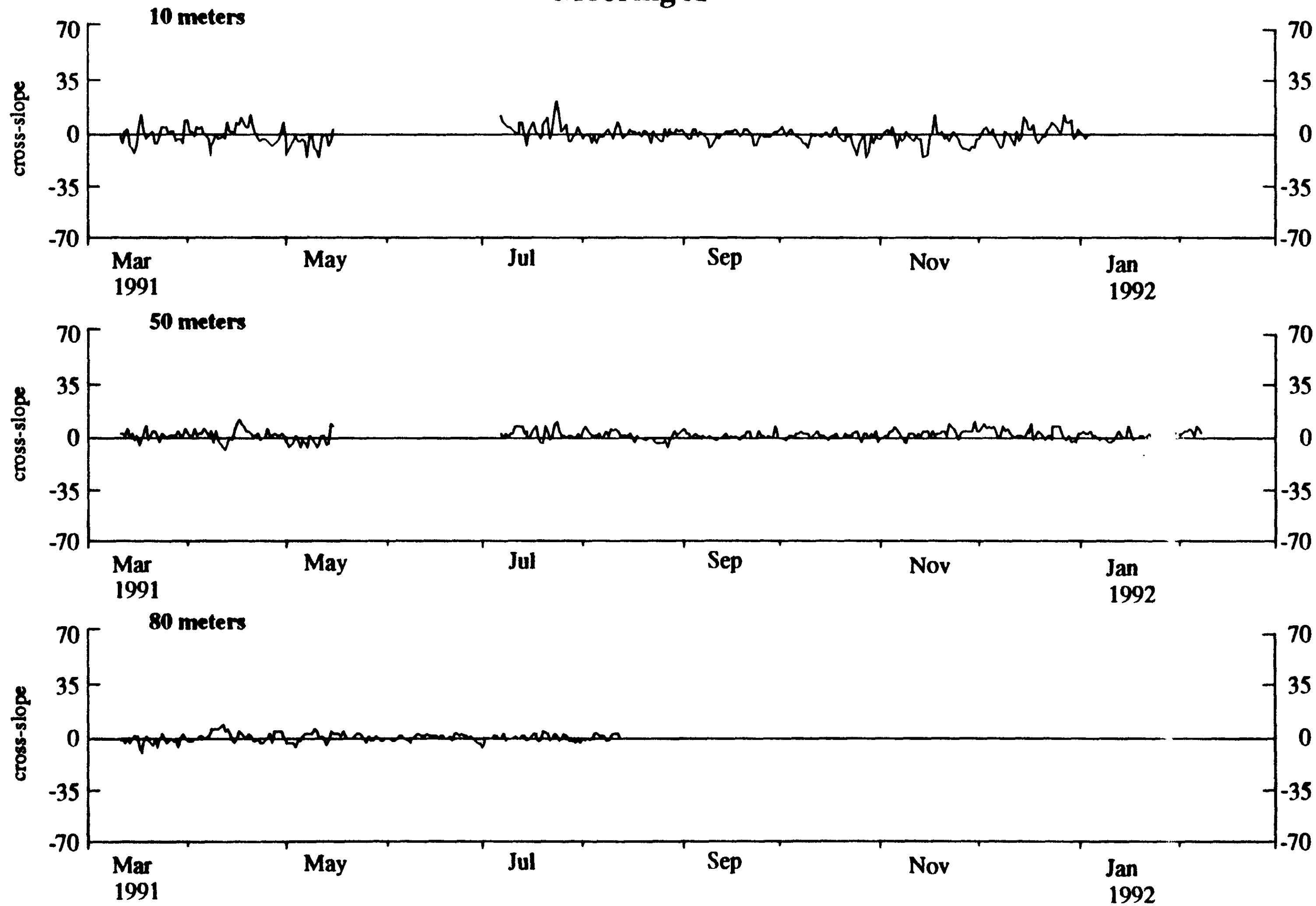


Hour-averaged cross-slope current



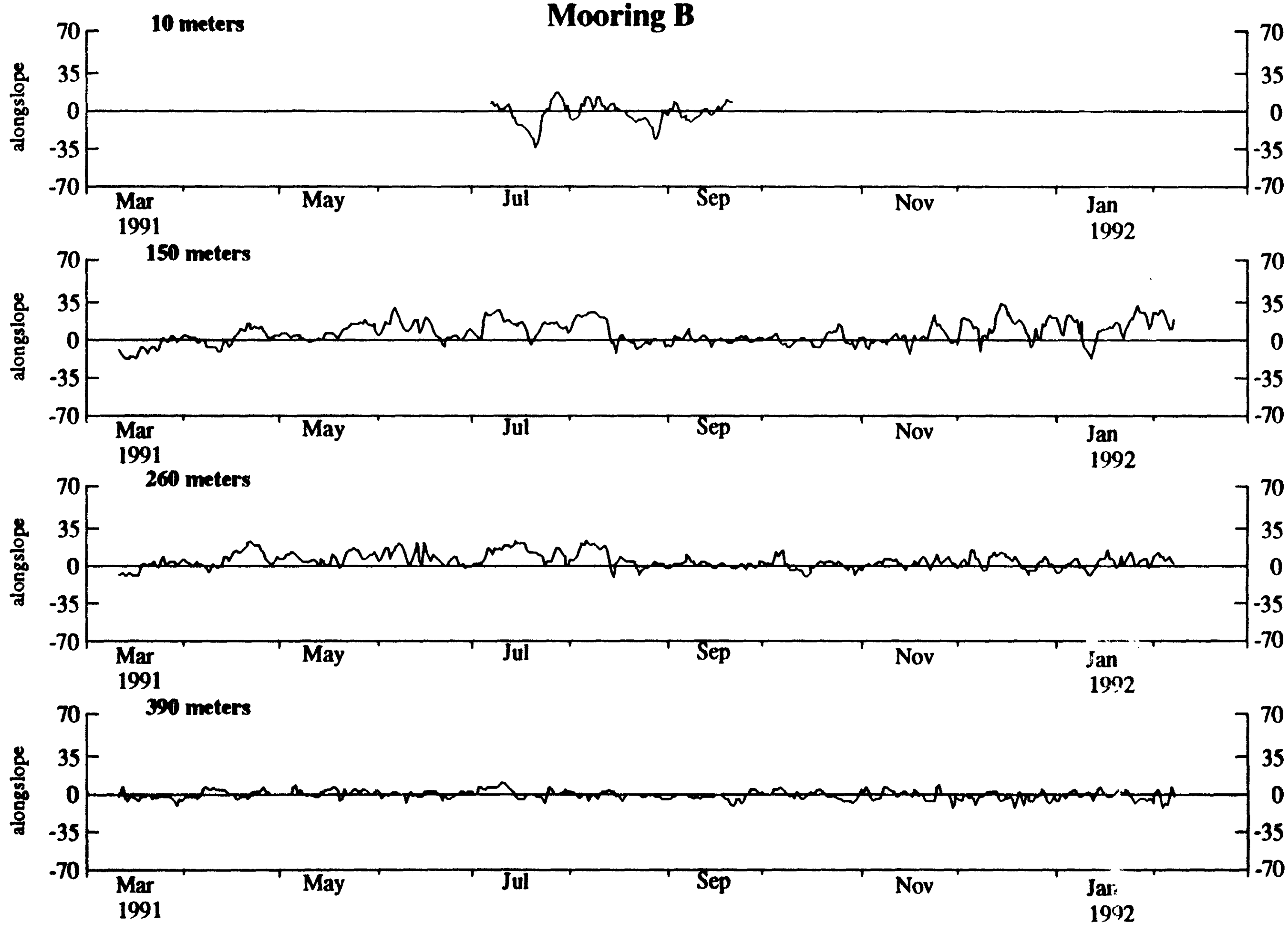
Subtidal alongslope current

Mooring A



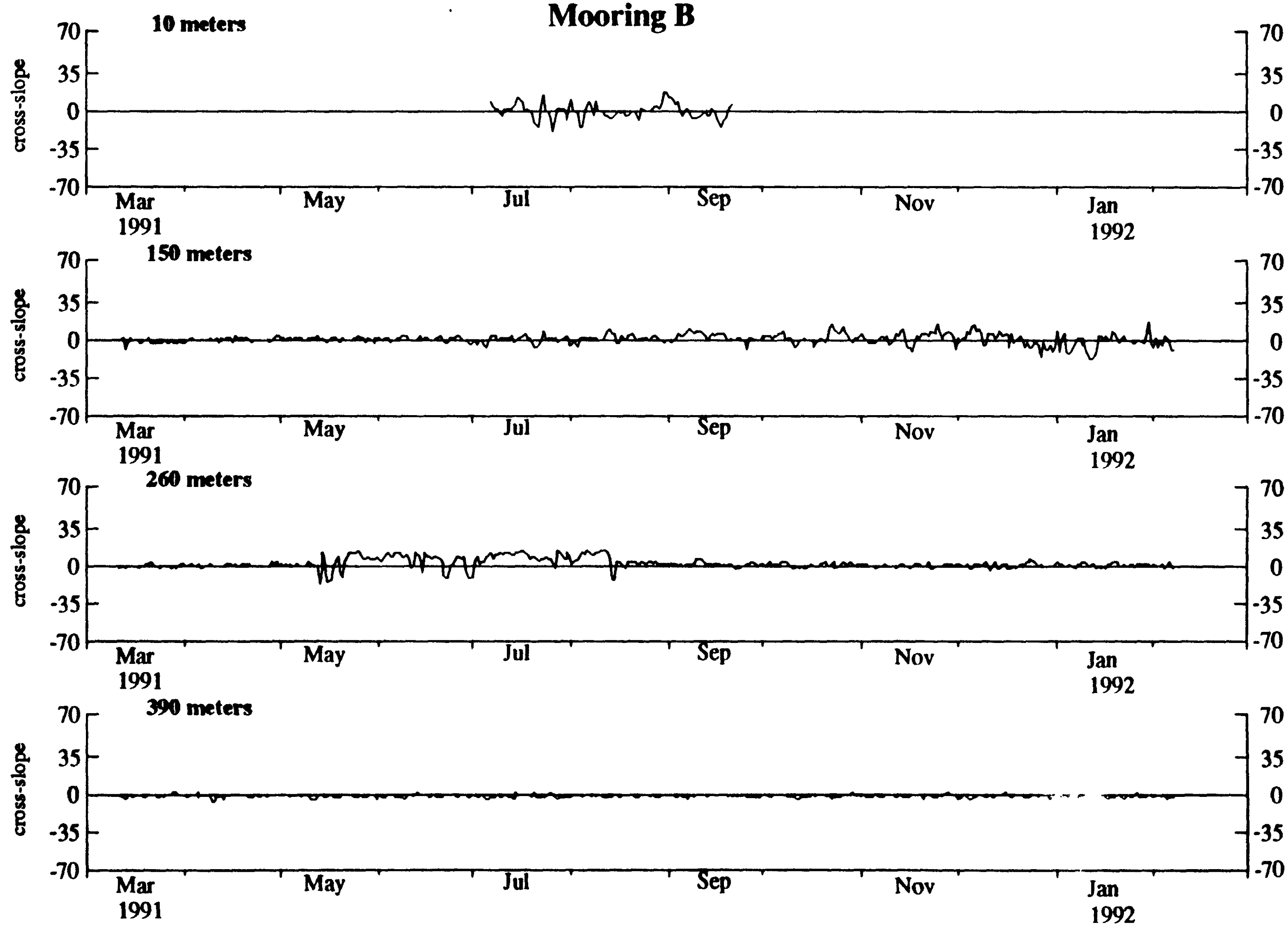
Subtidal cross-slope current

Mooring B

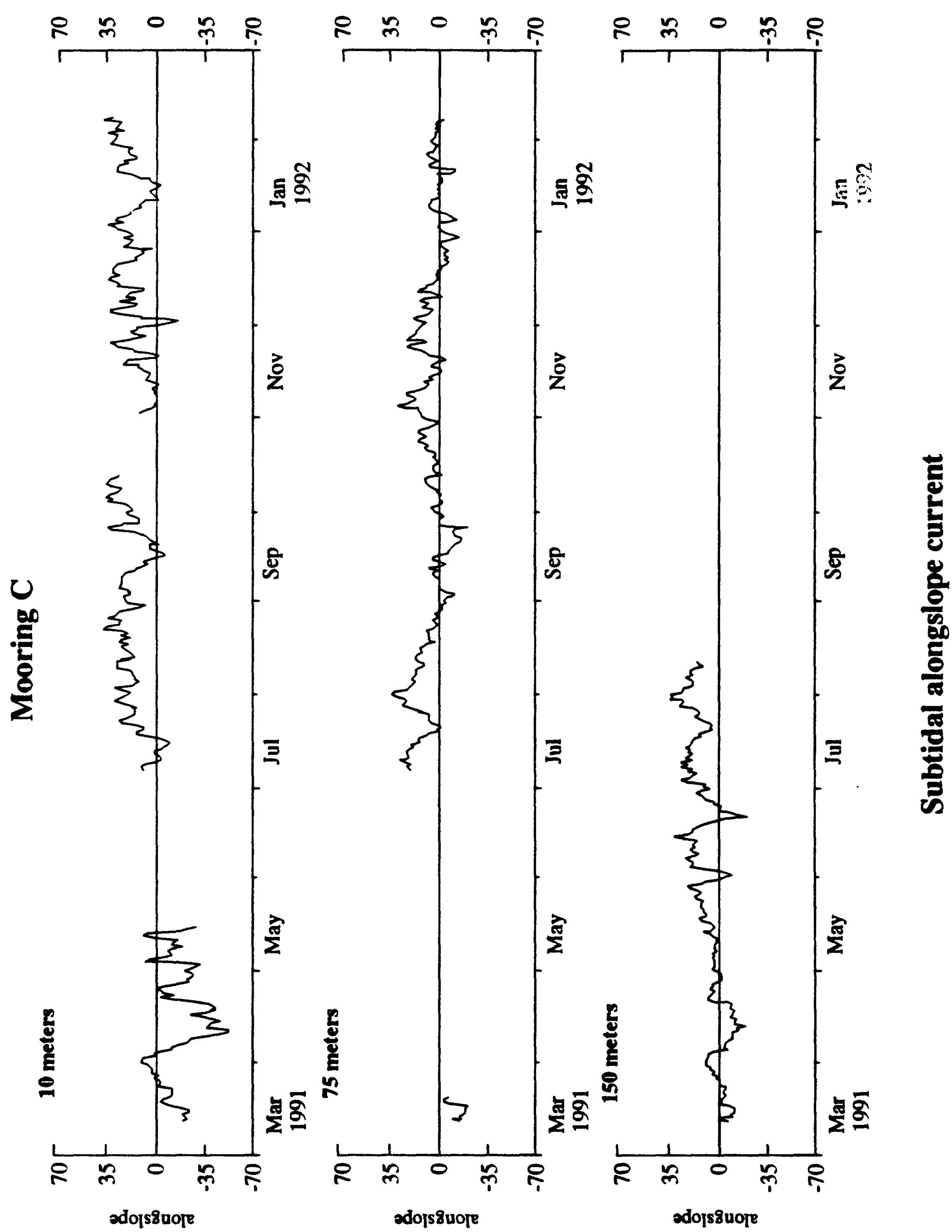


Subtidal alongslope current

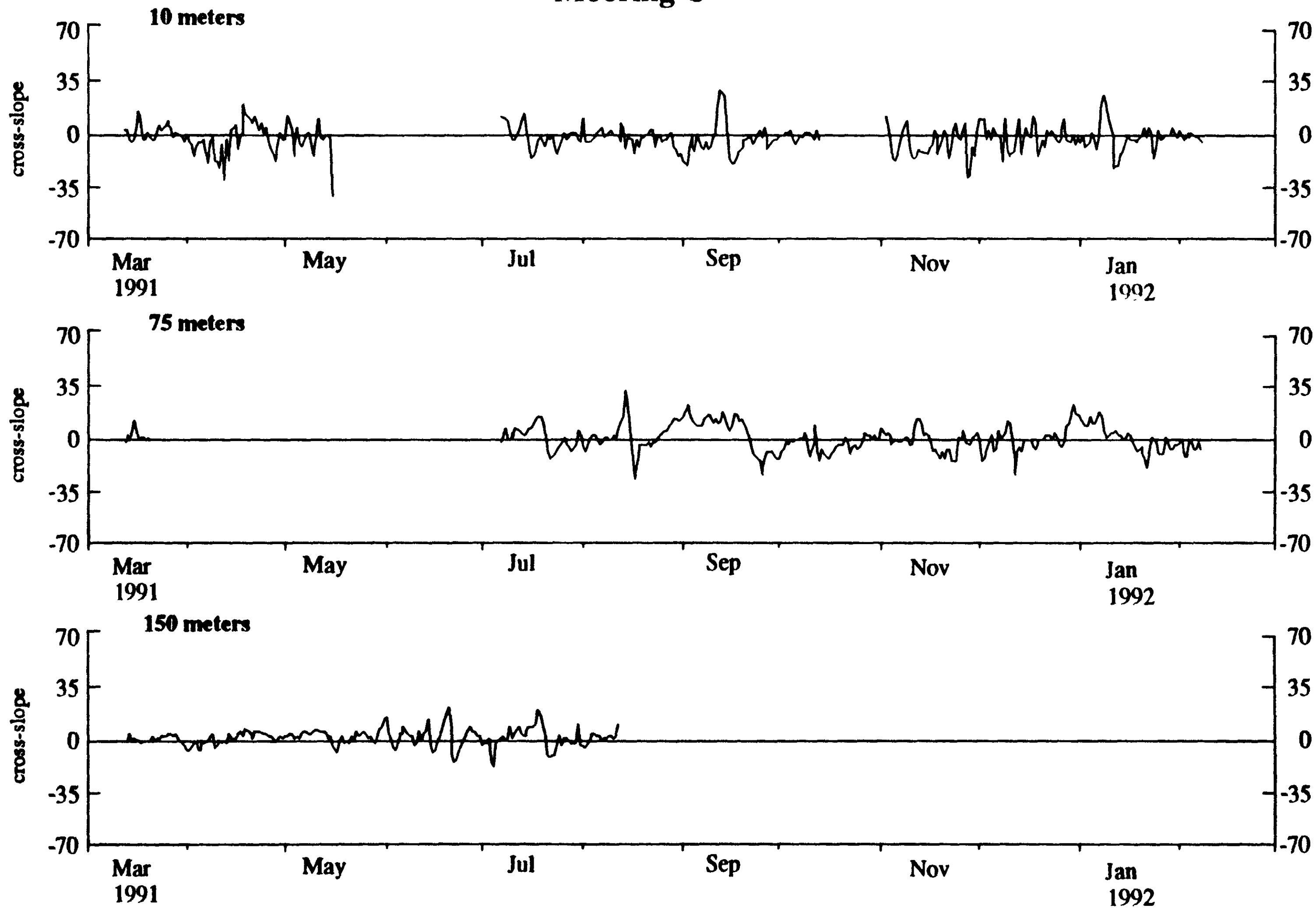
Mooring B



Subtidal cross-slope current

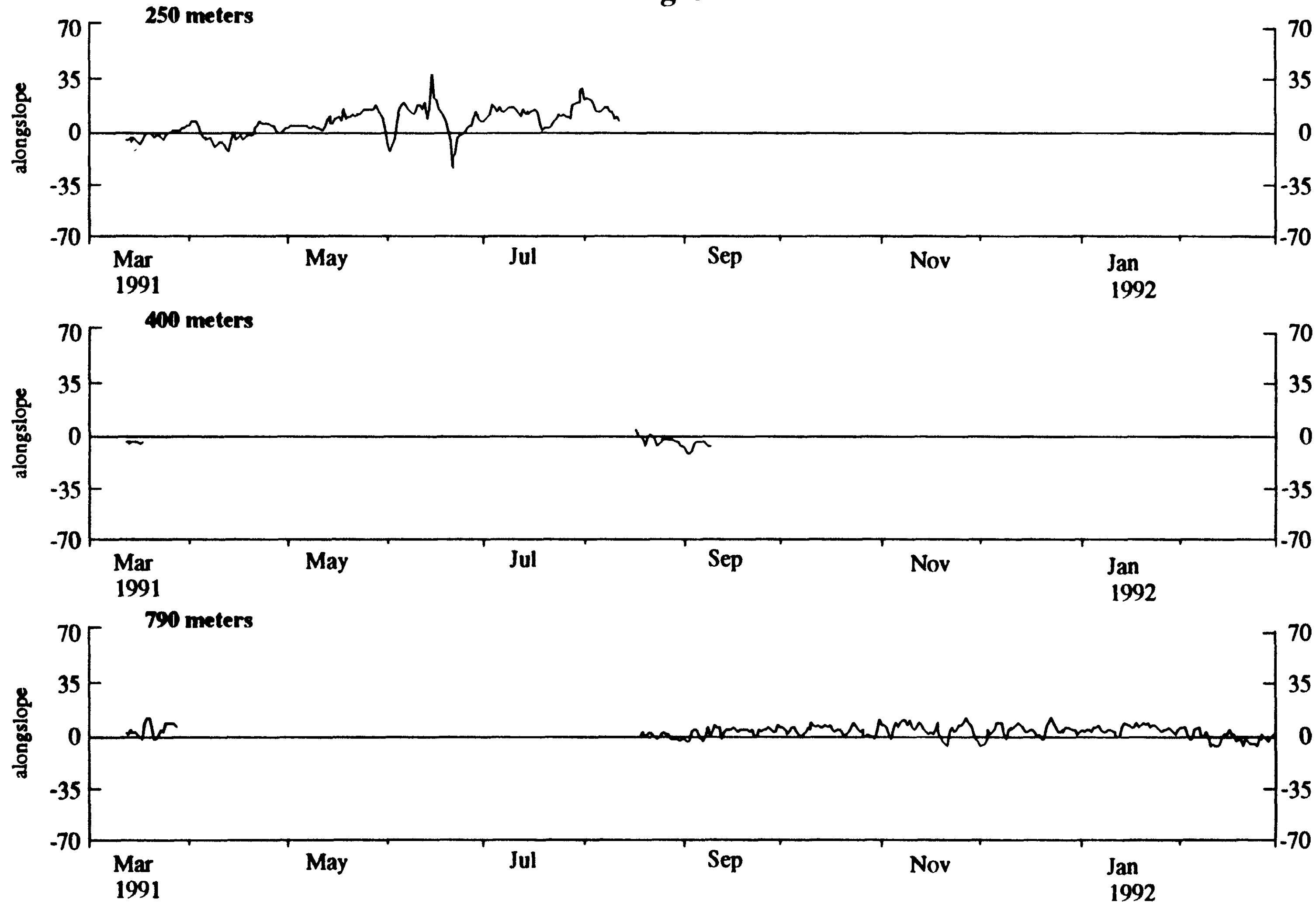

Mooring C
10 meters
75 meters
150 meters
alongslope
70
35
0
-35
-70
Mar
1991
May
Jul
Sep
Nov
Jan
1992
Subtidal alongslope current

Mooring C



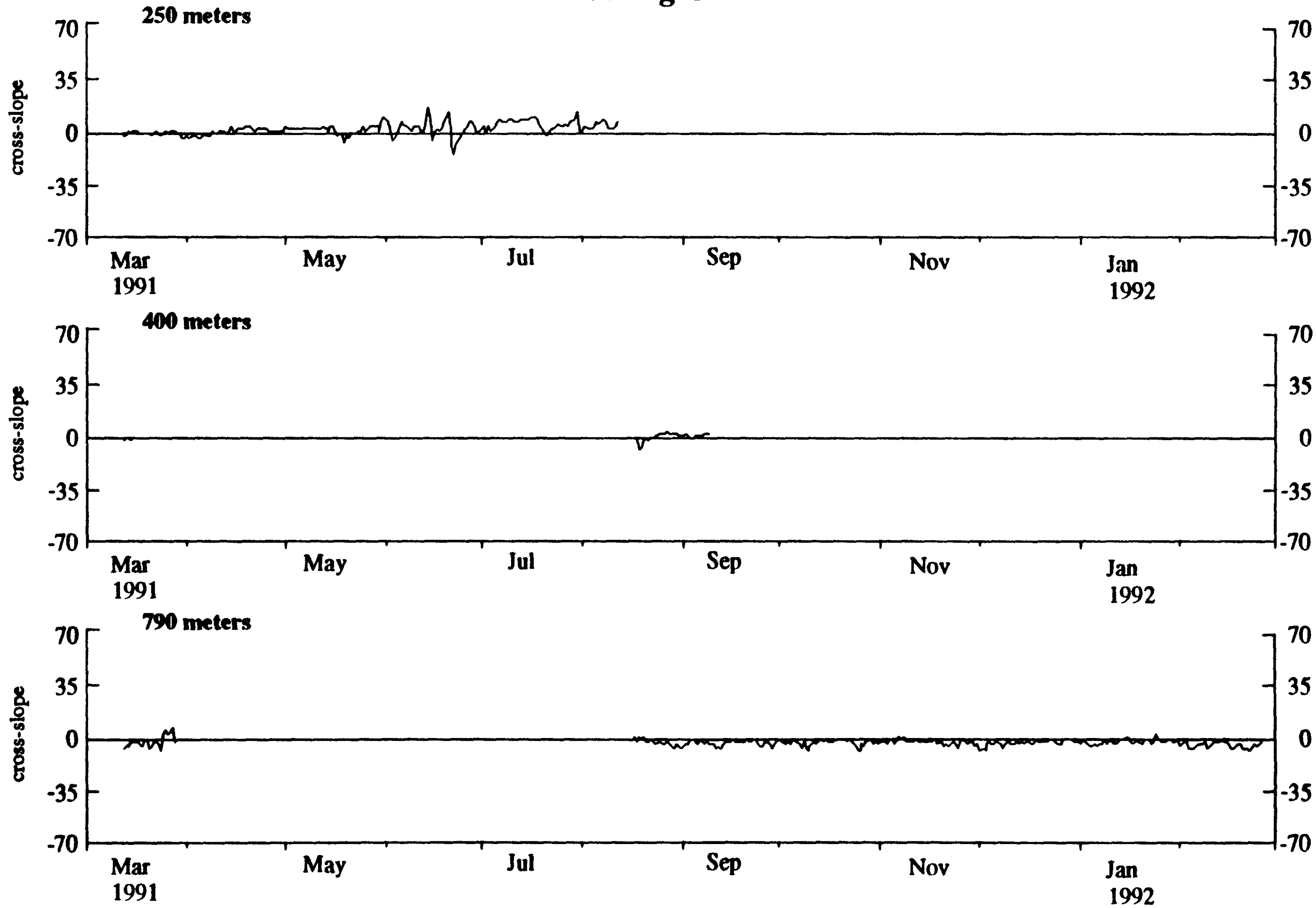
Subtidal cross-slope current

Mooring C



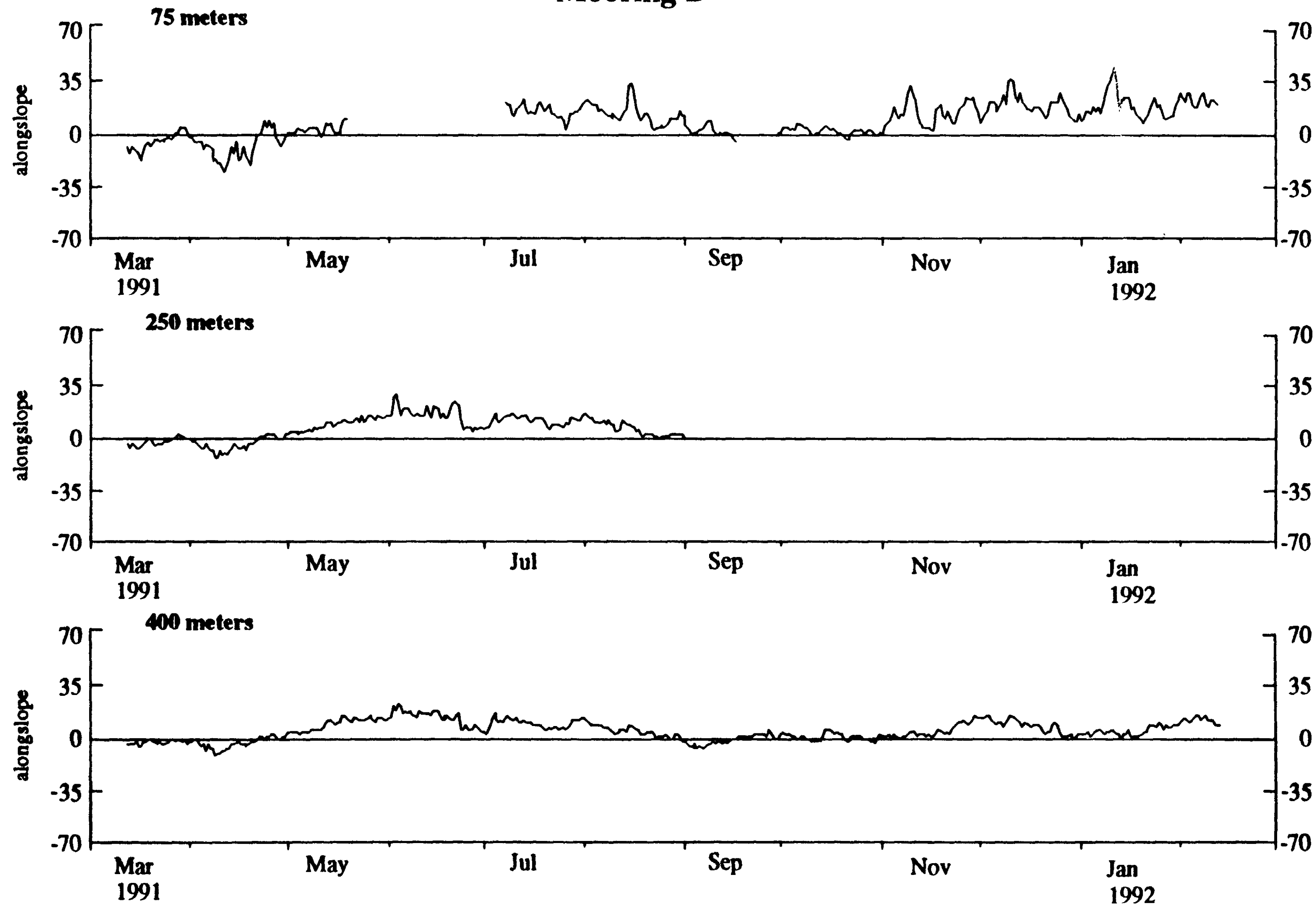
Subtidal alongslope current

Mooring C



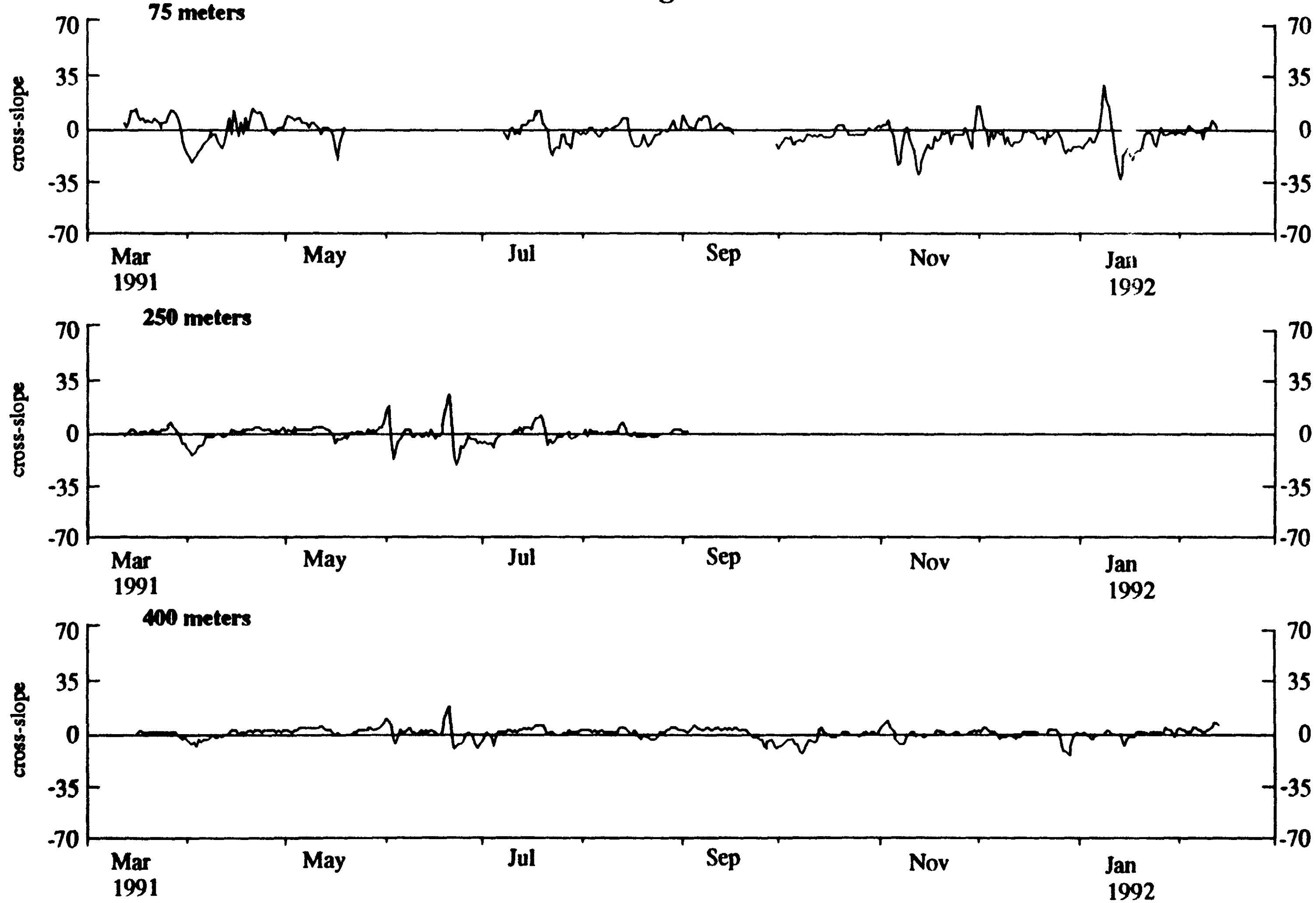
Subtidal cross-slope current

Mooring D



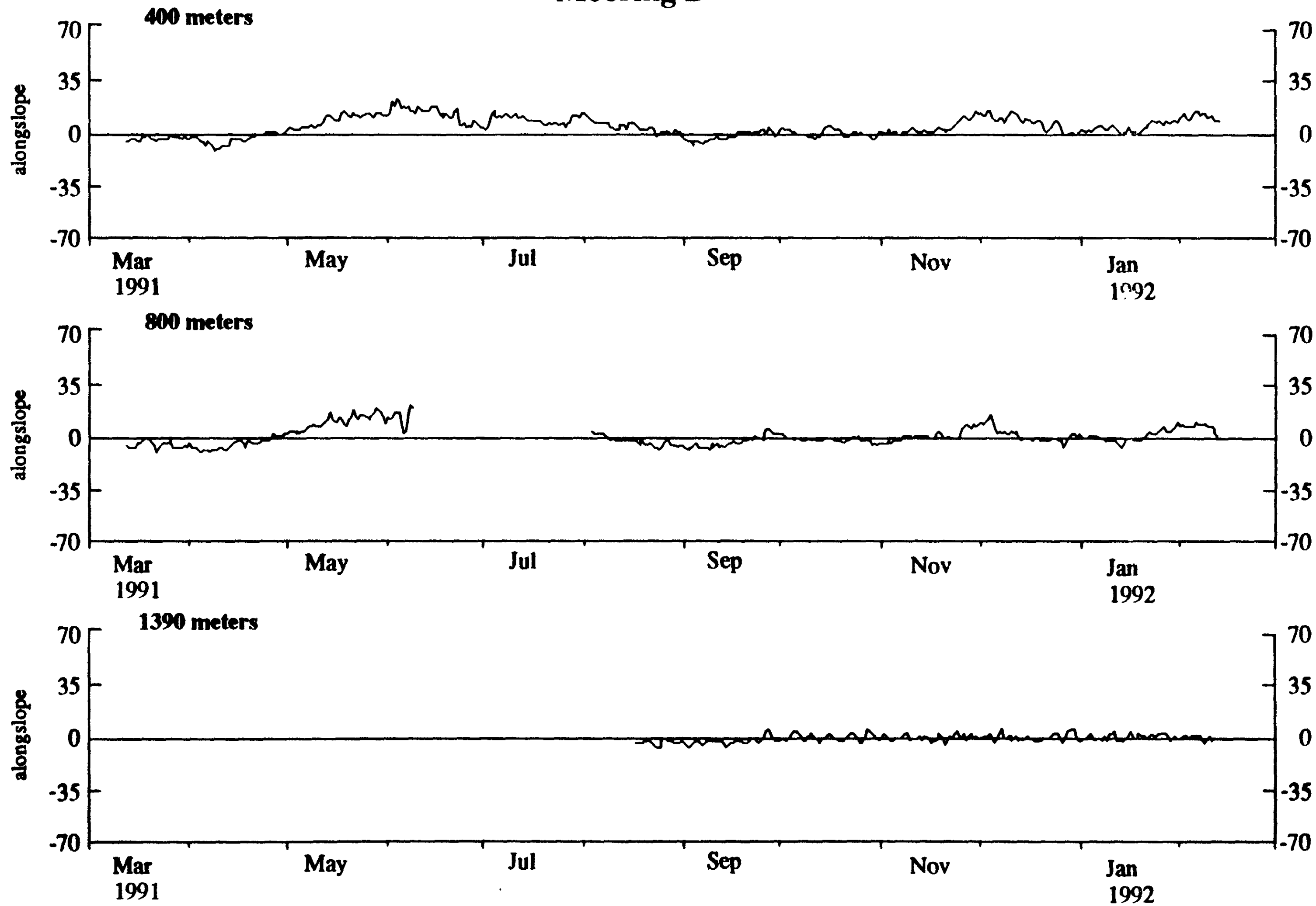
Subtidal alongslope current

Mooring D



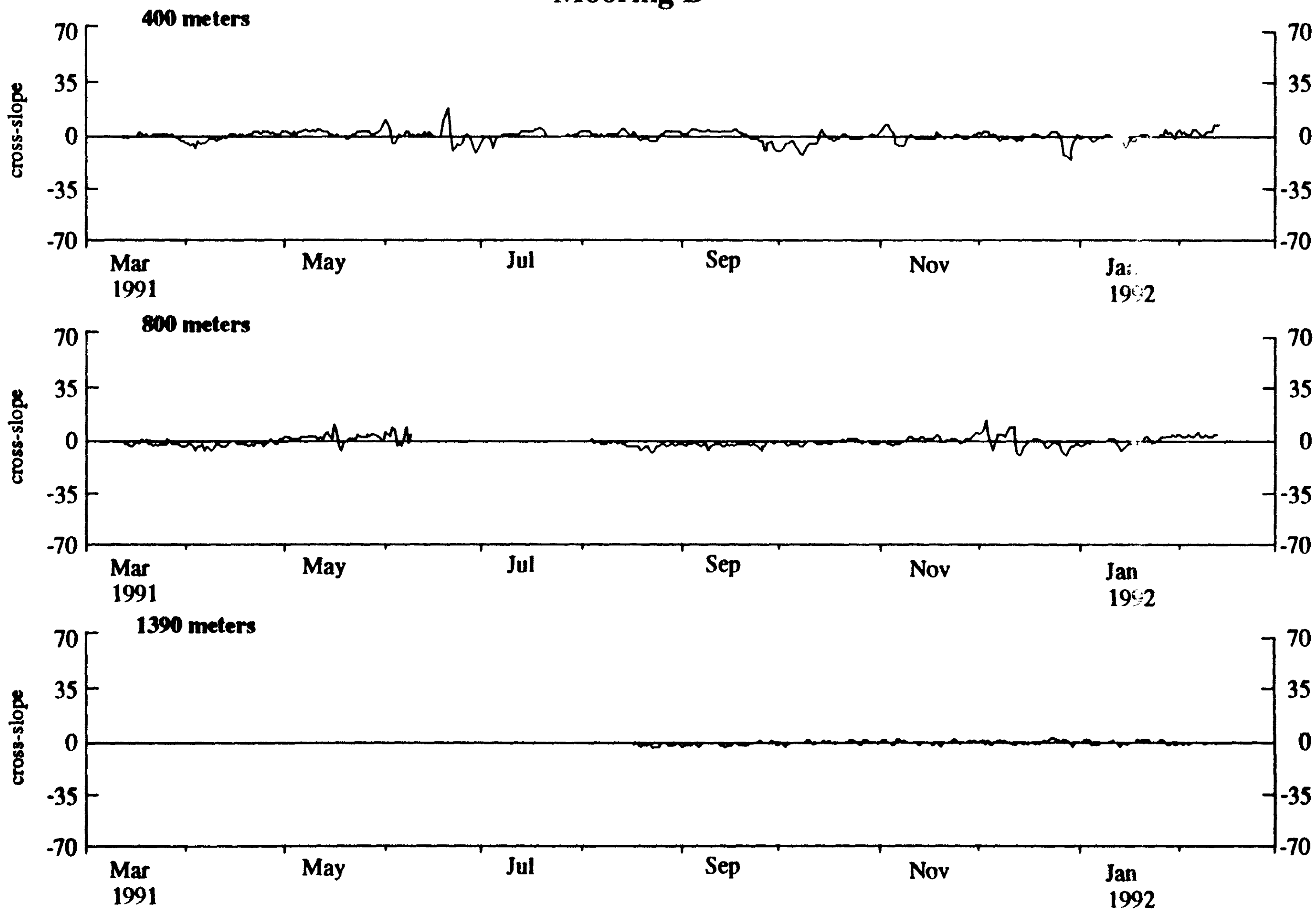
Subtidal cross-slope current

Mooring D



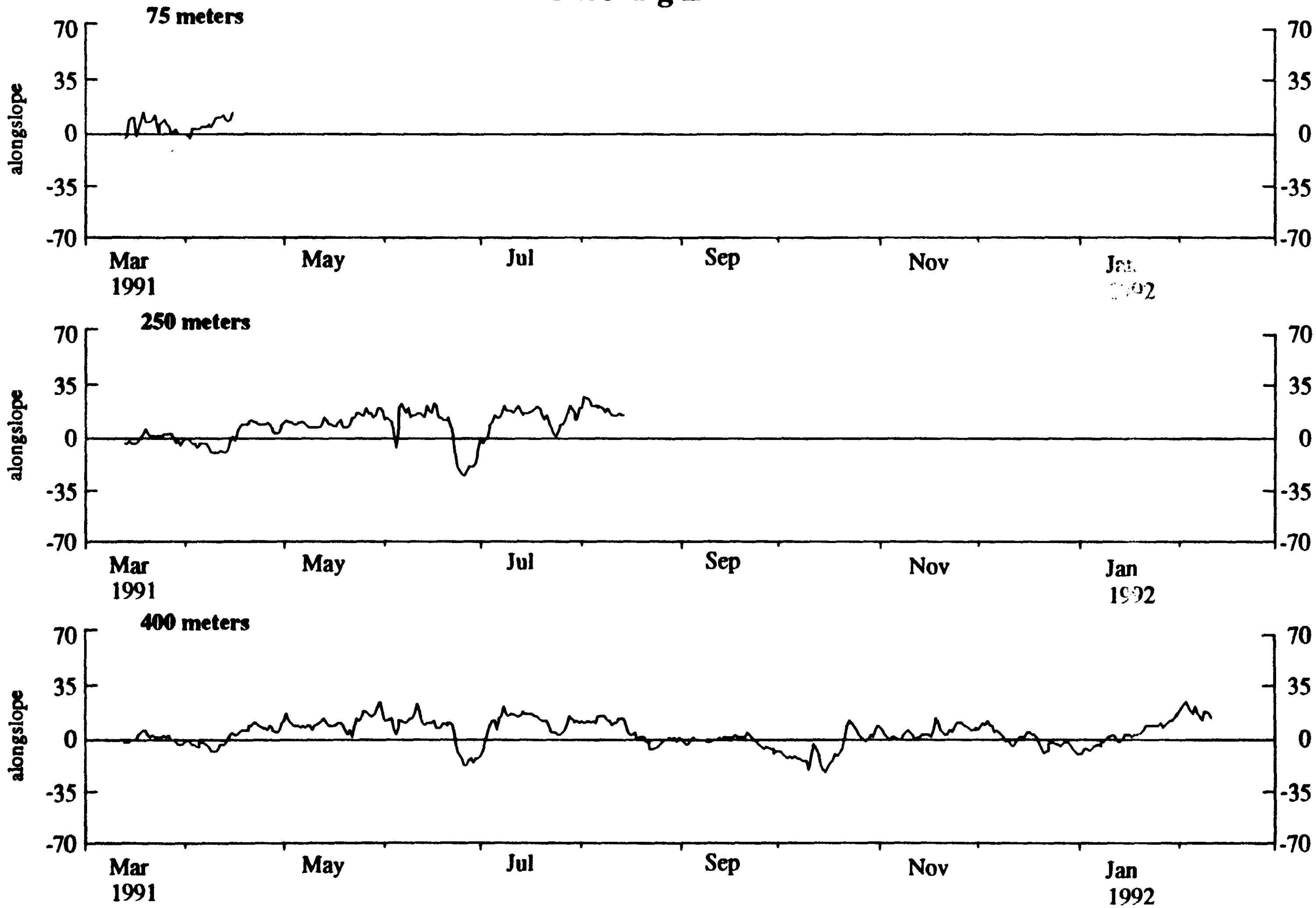
Subtidal alongslope current

Mooring D



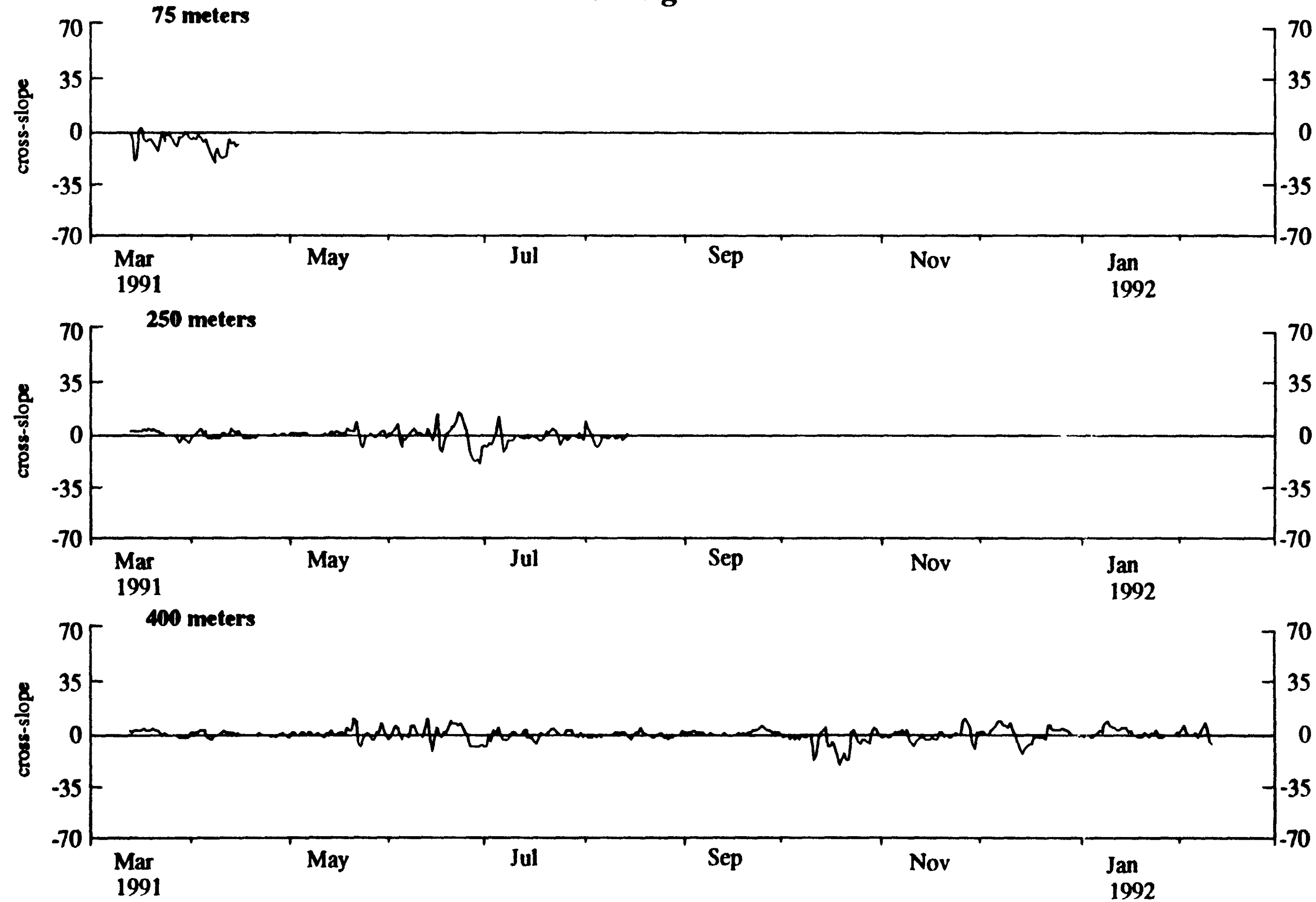
Subtidal cross-slope current

Mooring E



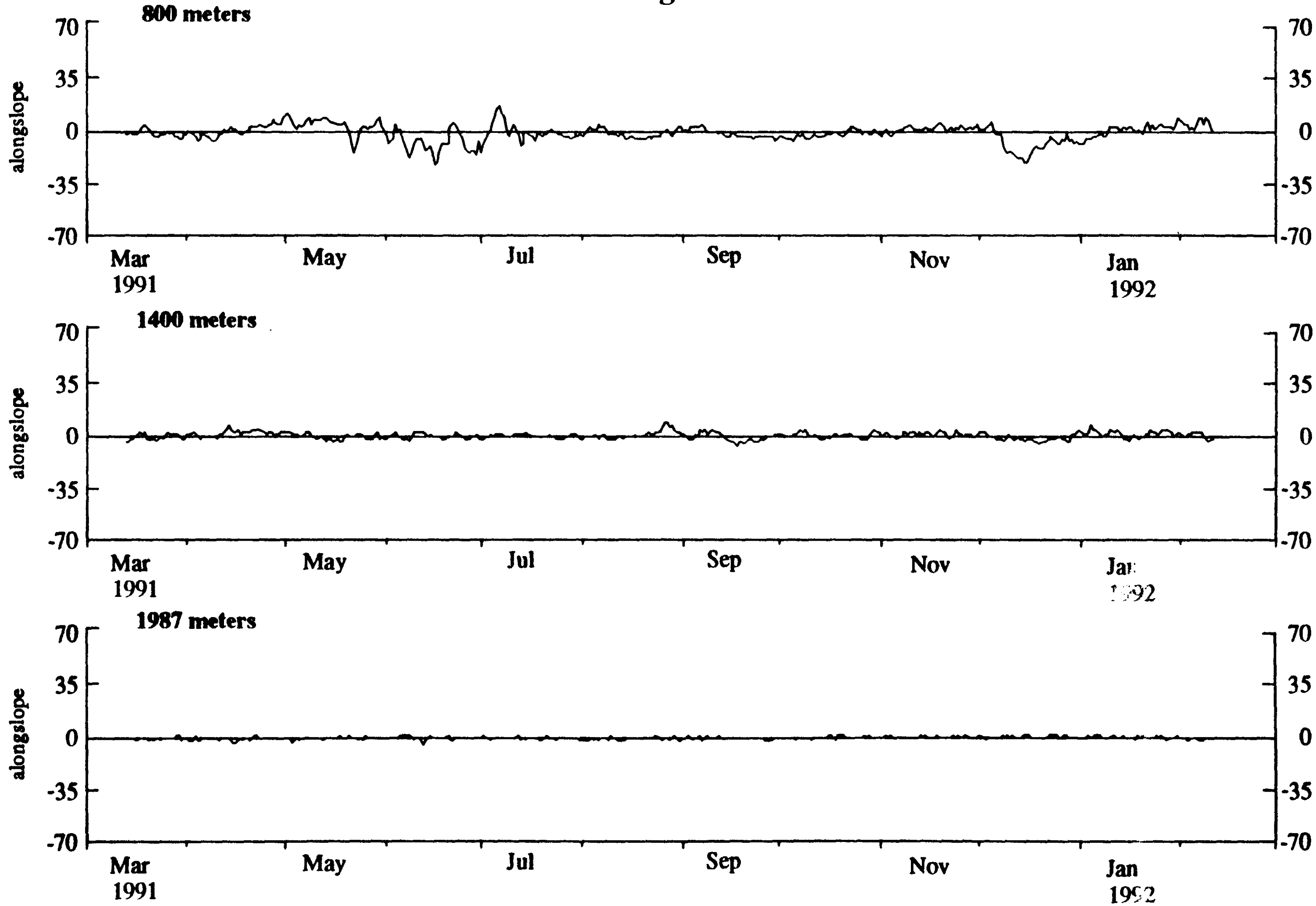
Subtidal alongslope current

Mooring E



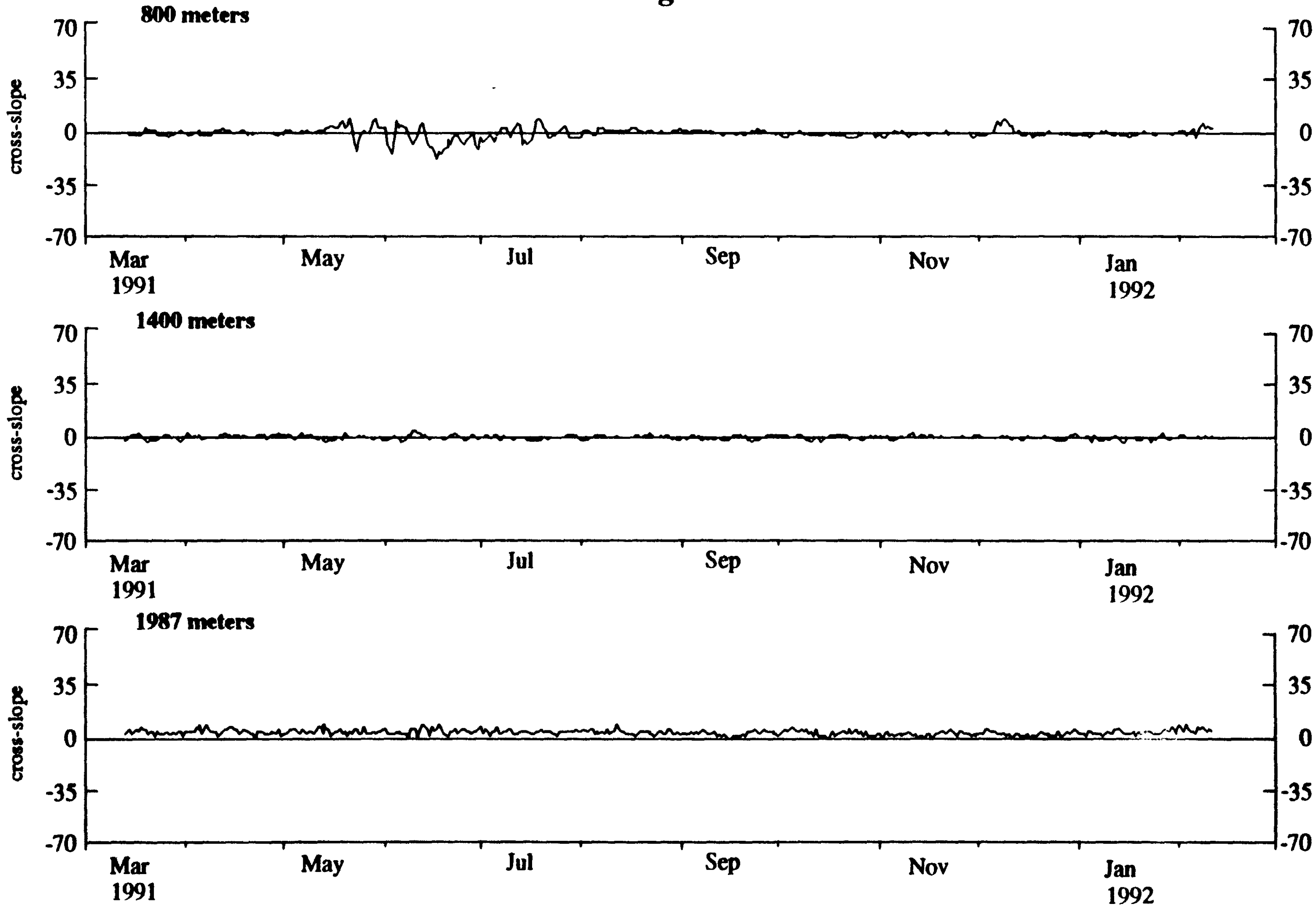
Subtidal cross-slope current

Mooring E

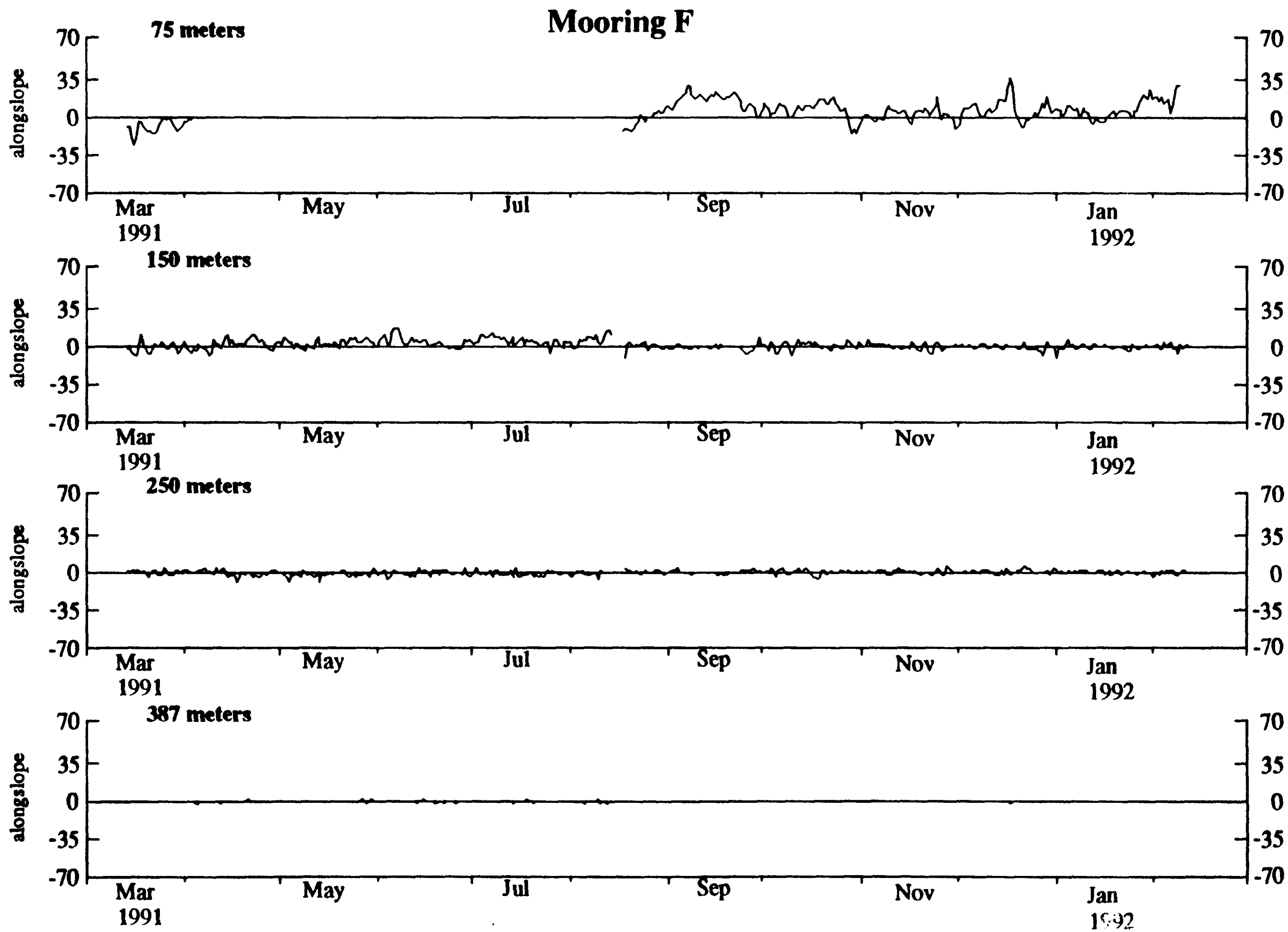


Subtidal alongslope current

Mooring E

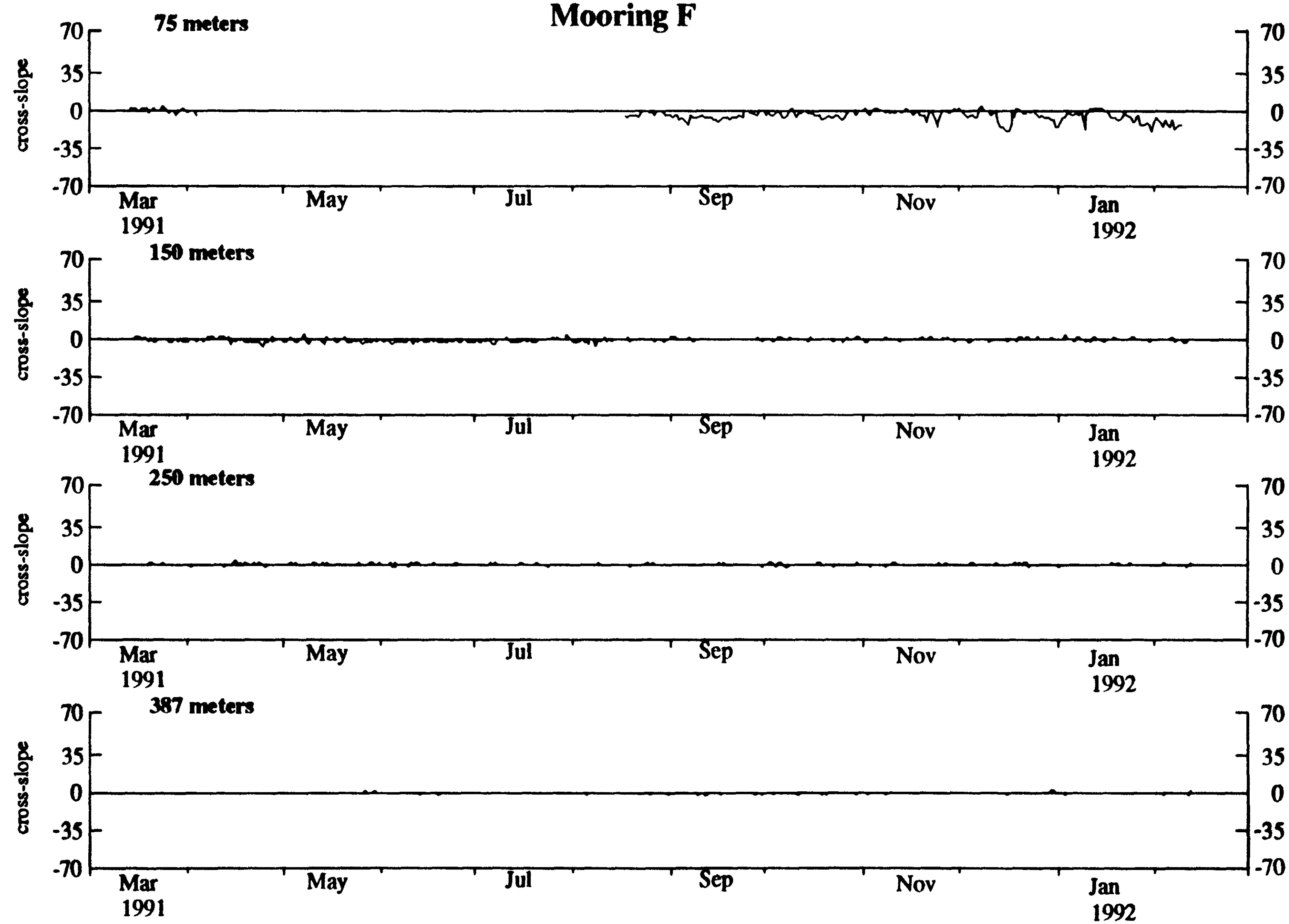


Subtidal cross-slope current



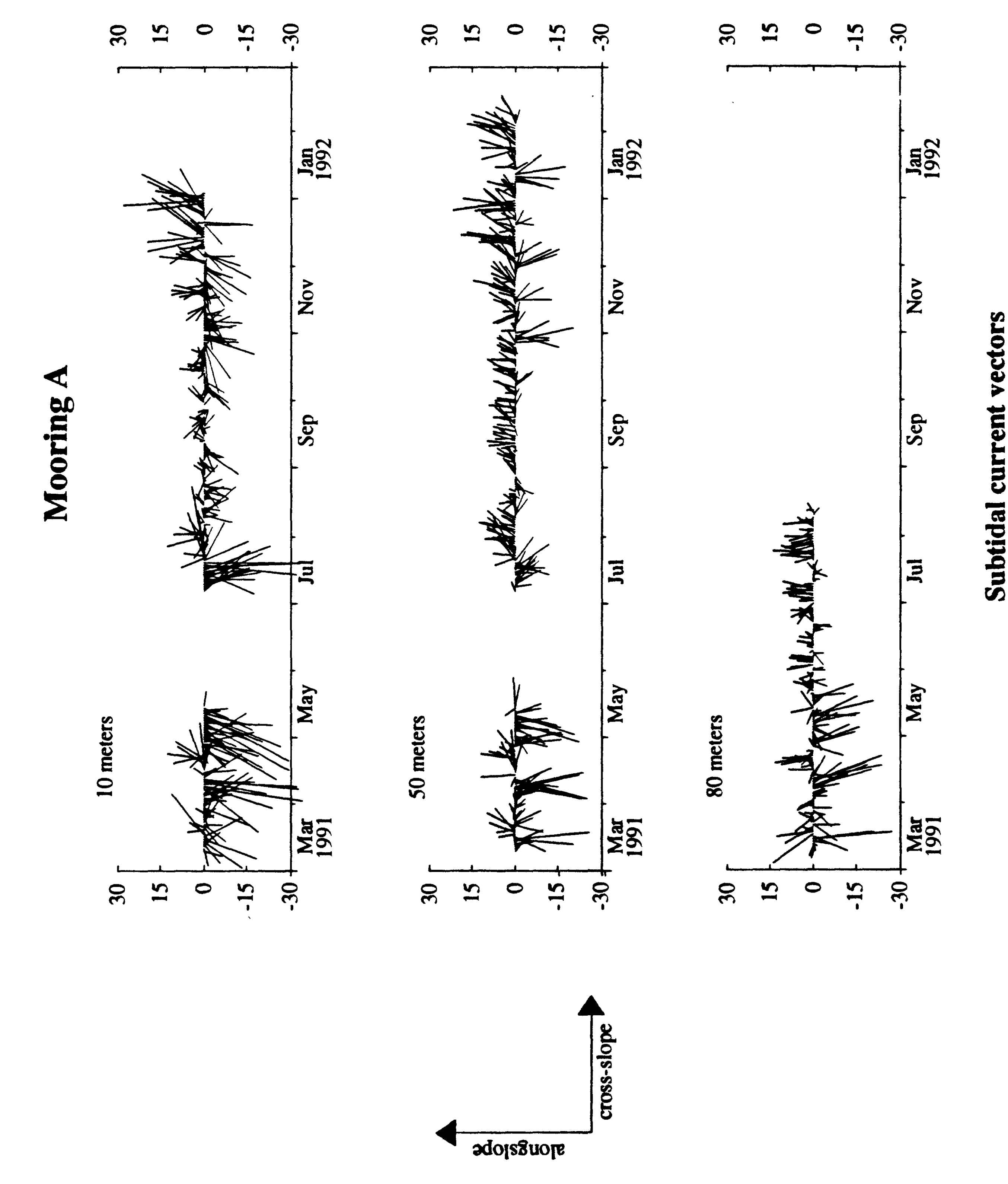
Subtidal alongslope current

Mooring F

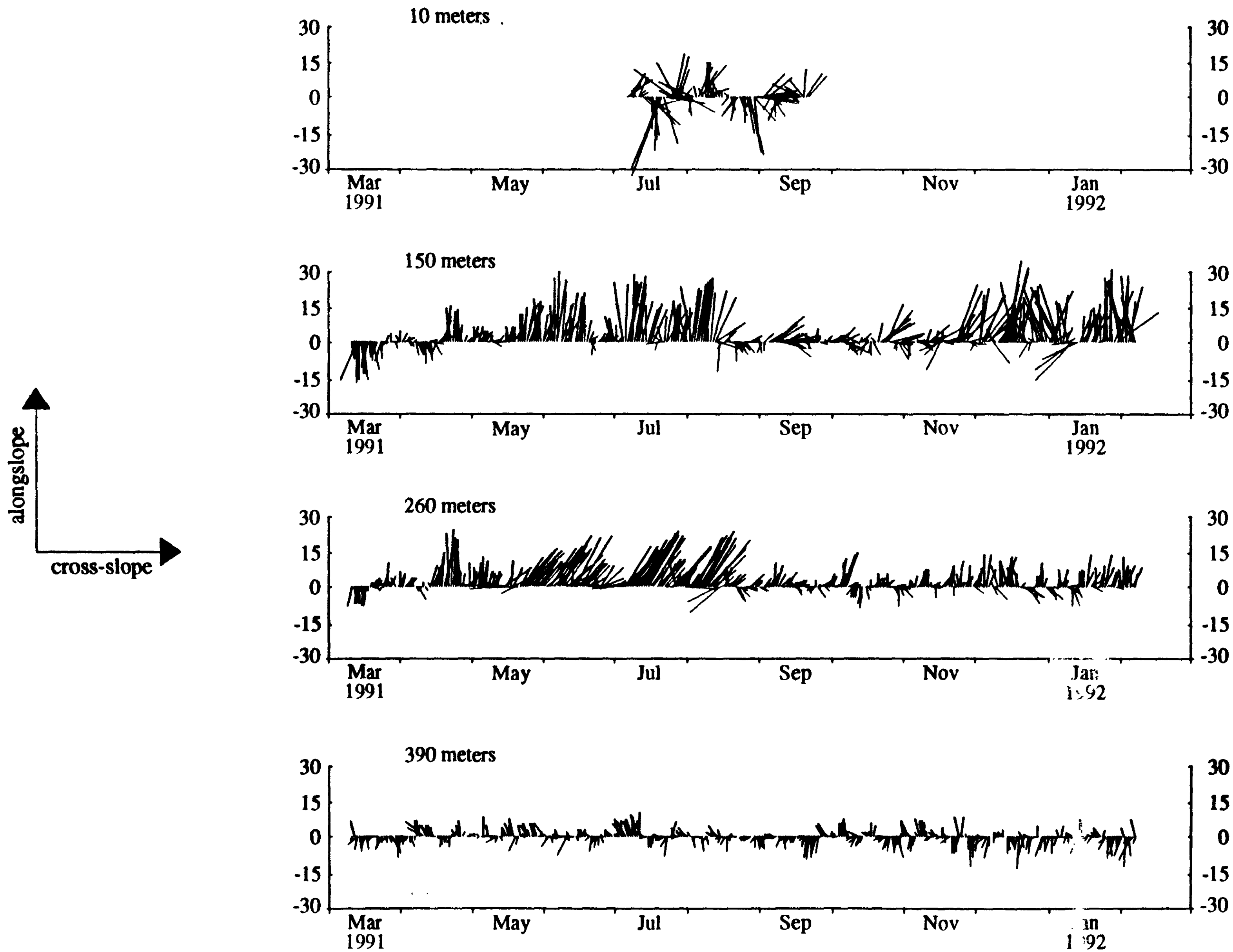


Subtidal cross-slope current

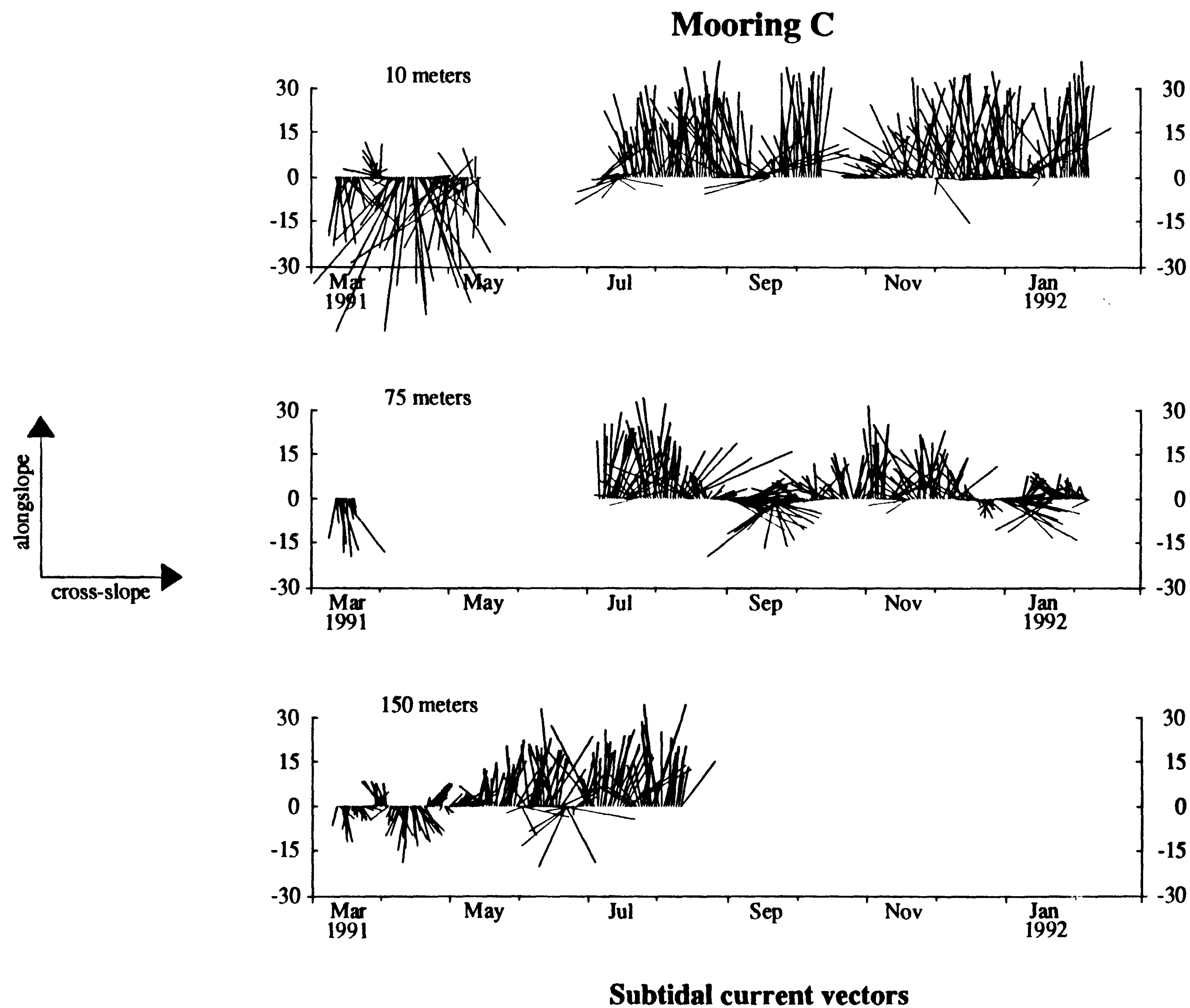
Appendix C - Subtidal current vectors


Mooring A
10 meters
50 meters
80 meters
30
15
0
-15
-30
Mar
1991
May
Jul
Sep
Nov
Jan
1992
Subtidal current vectors
alongslope
cross-slope

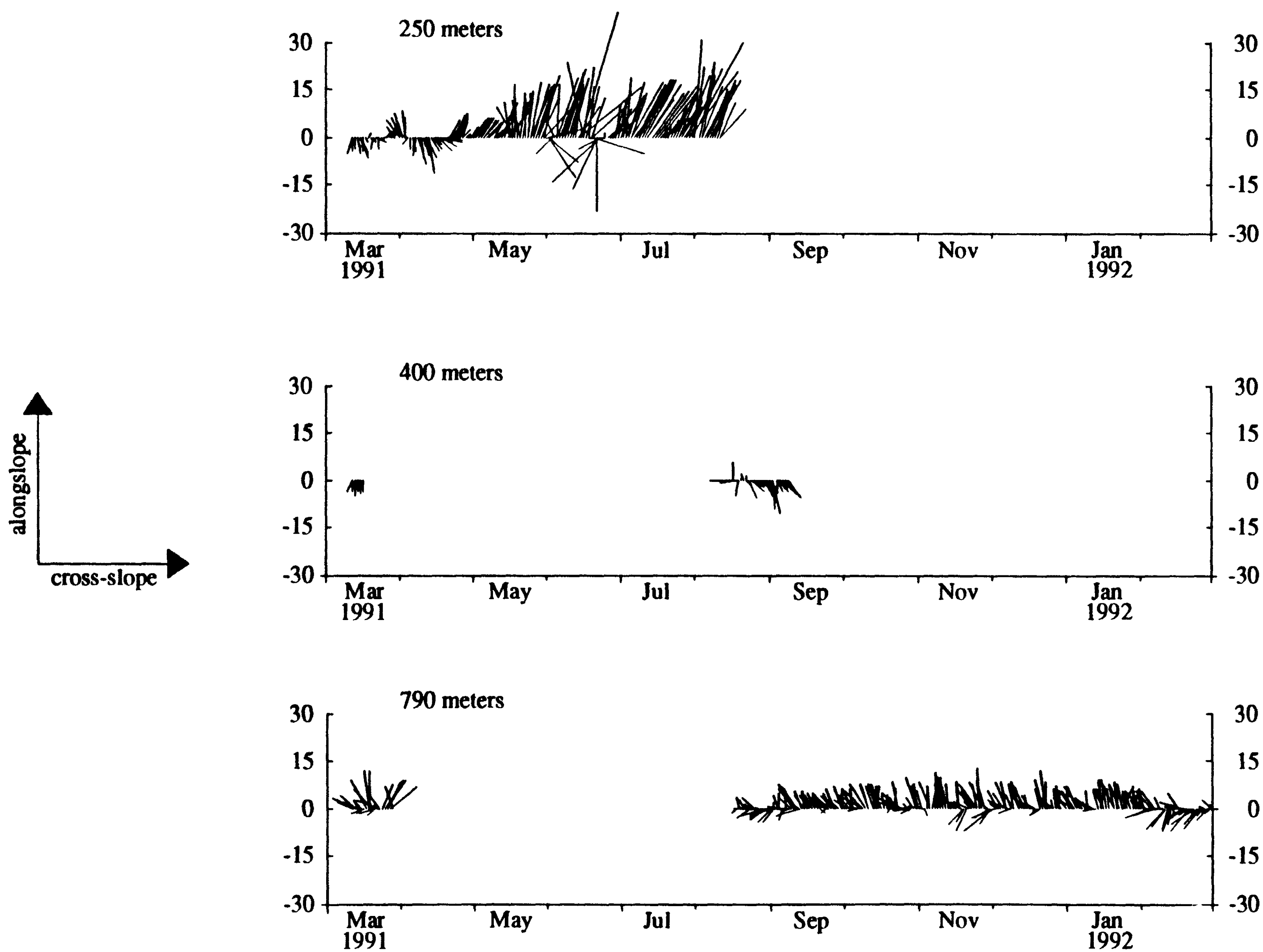
Mooring B



Subtidal current vectors

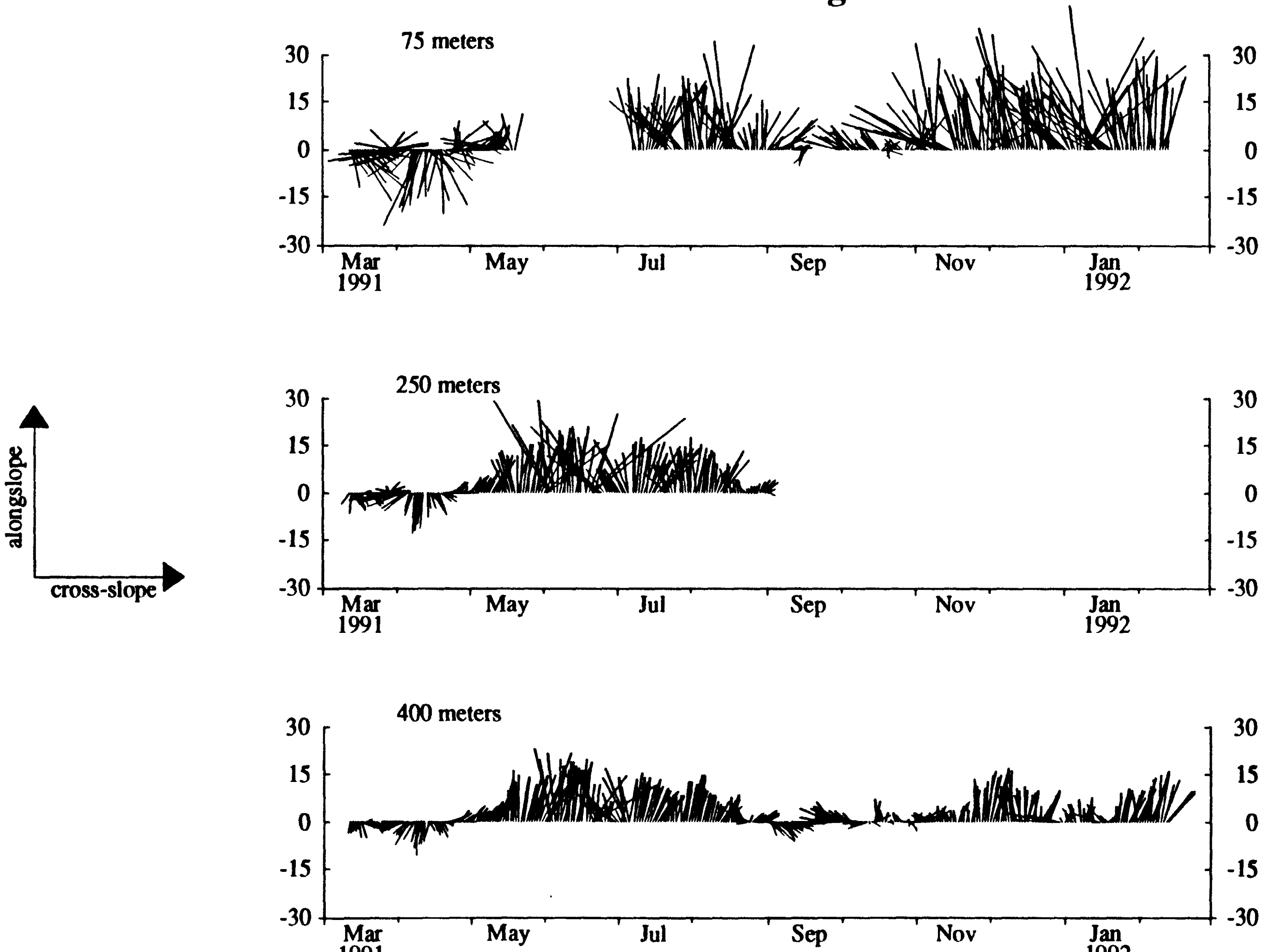

Mooring C
10 meters
75 meters
150 meters
30
15
0
-15
-30
Mar 1991
May
Jul
Sep
Nov
Jan 1992
alongslope
cross-slope
Subtidal current vectors

Mooring C



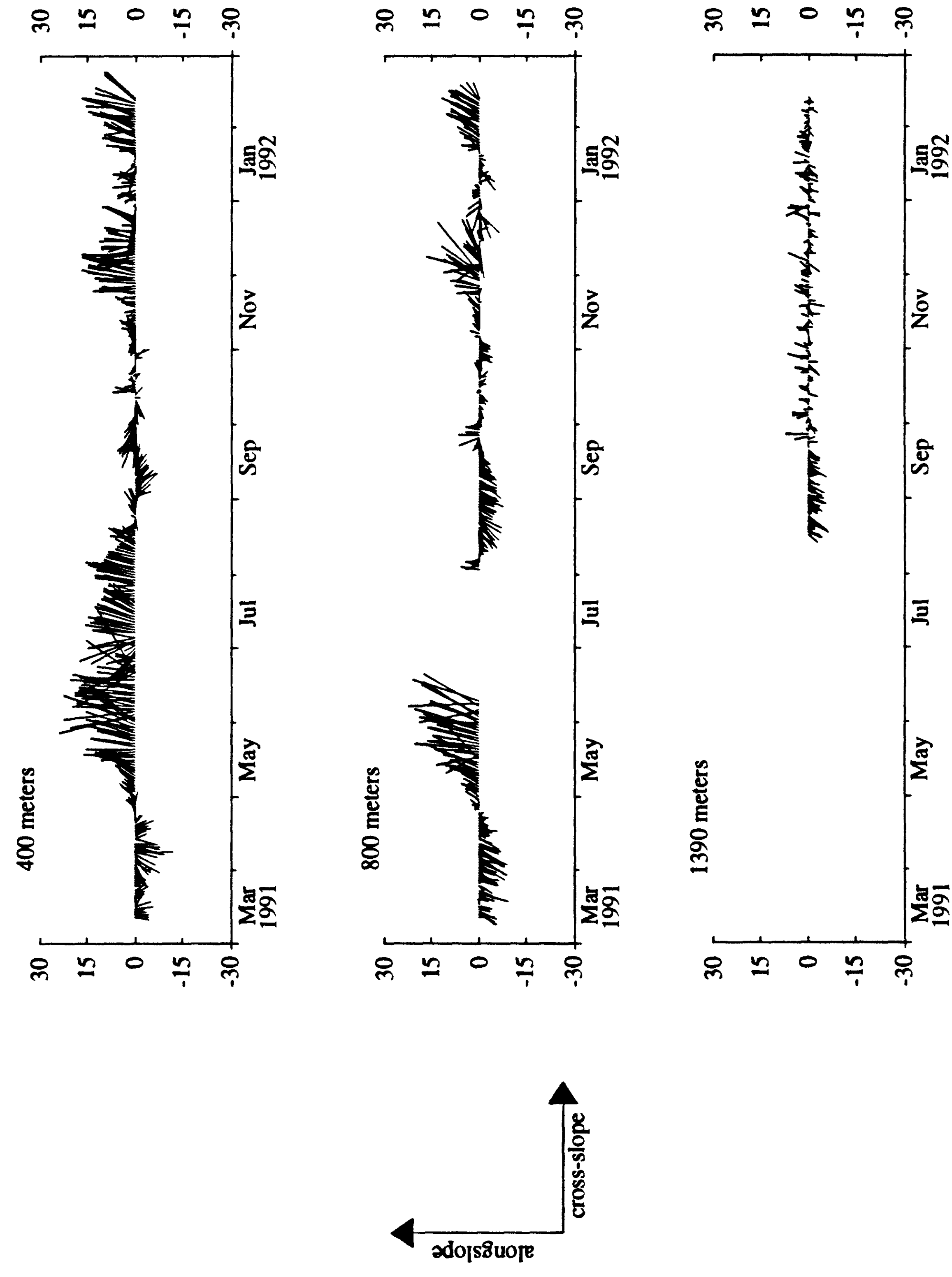
Subtidal current vectors

Mooring D



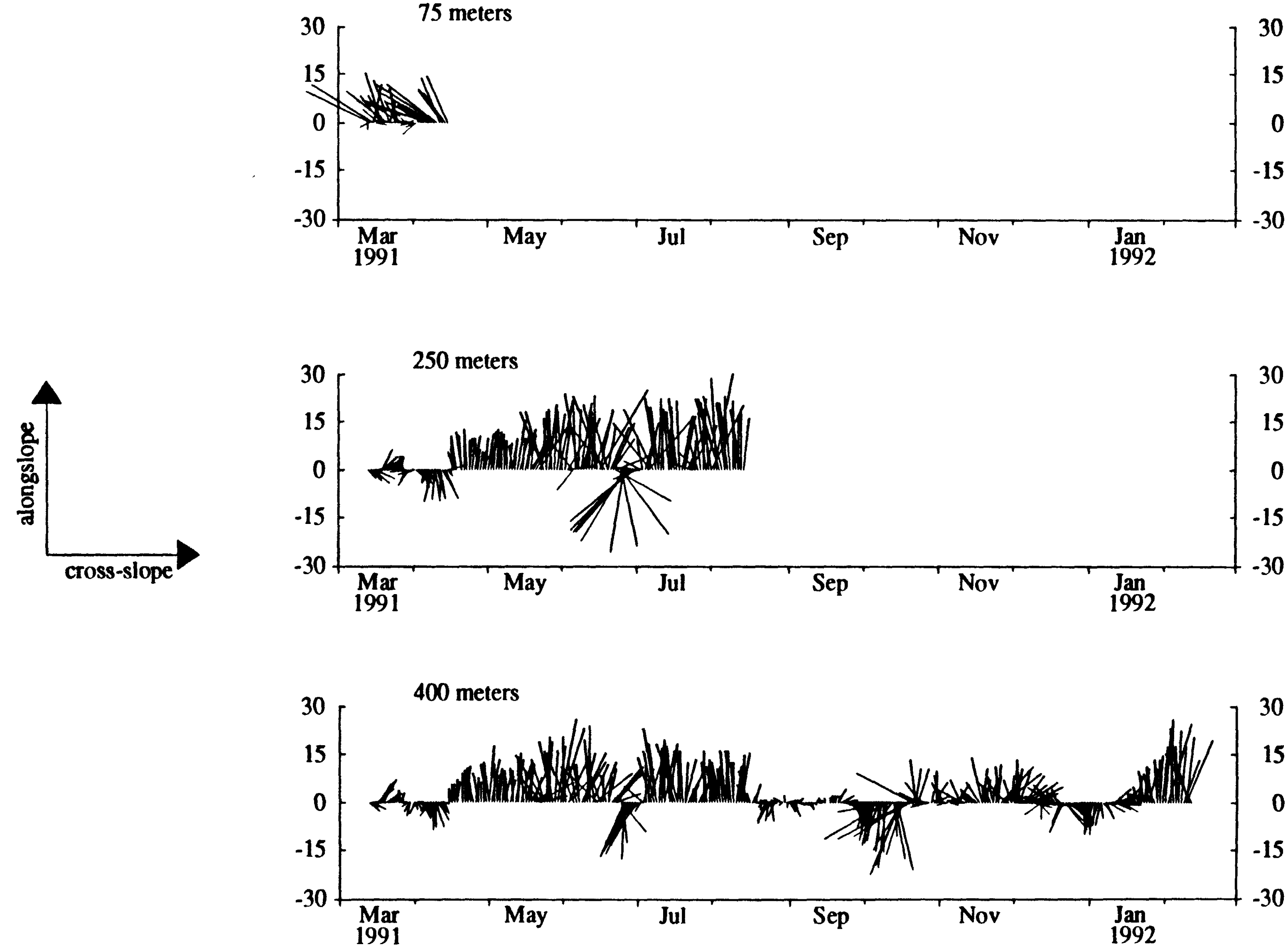
Subtidal current vectors

Mooring D



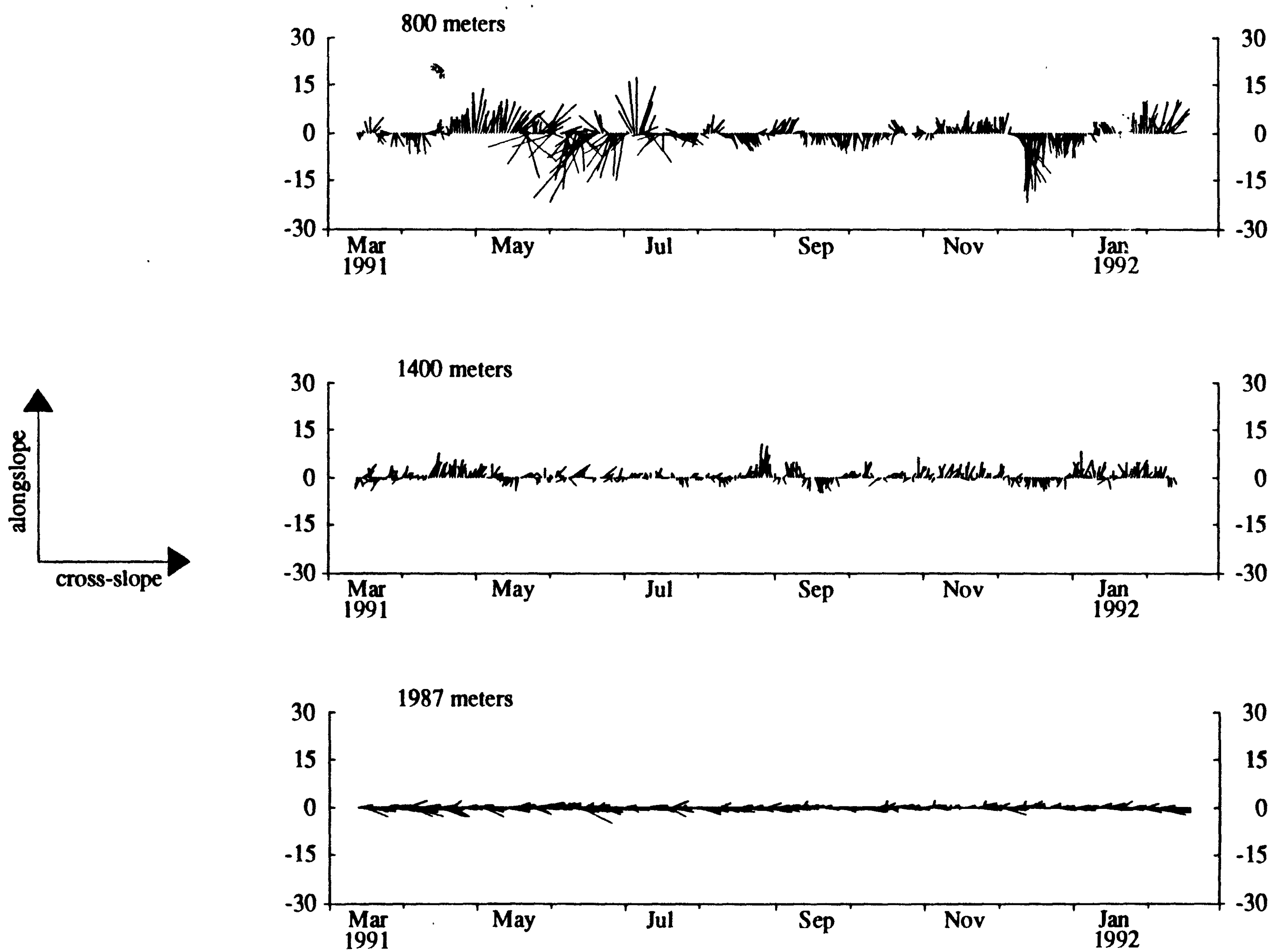
Subtidal current vectors

Mooring E



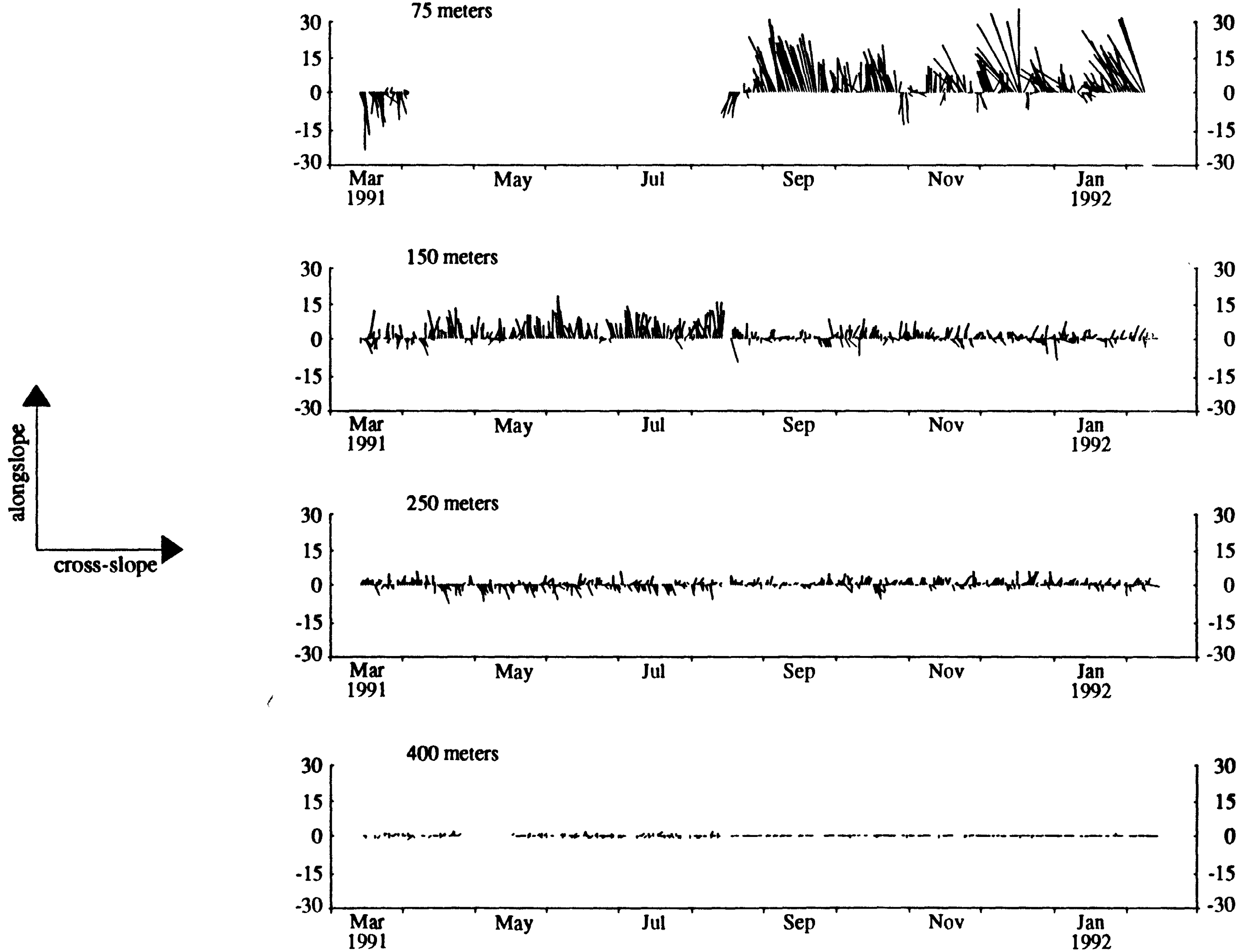
Subtidal current vectors

Mooring E



Subtidal current vectors

Mooring F



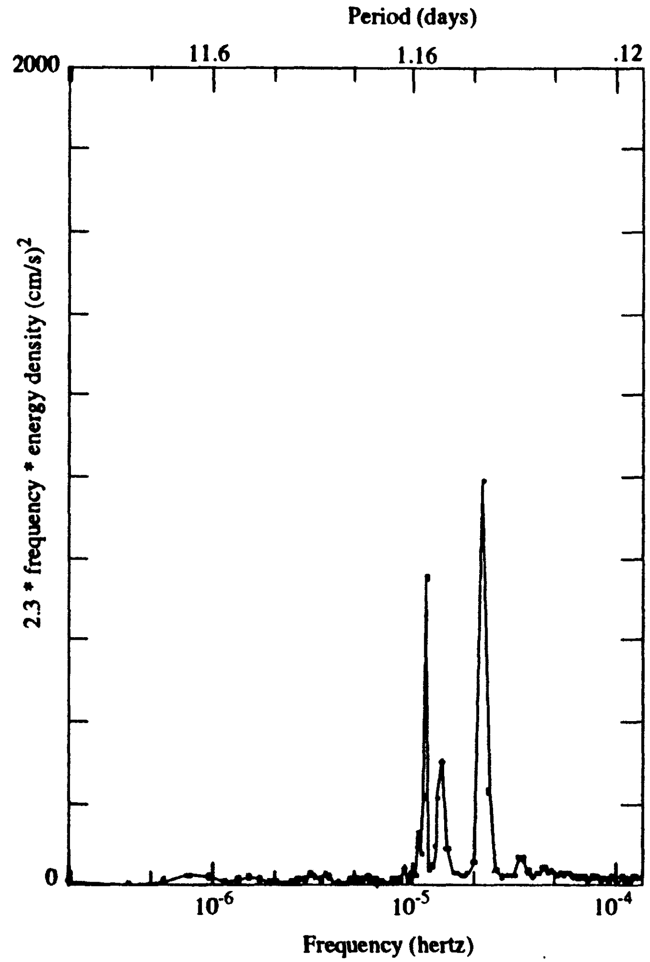
Subtidal current vectors

Appendix D - Variance-conserving auto spectra currents

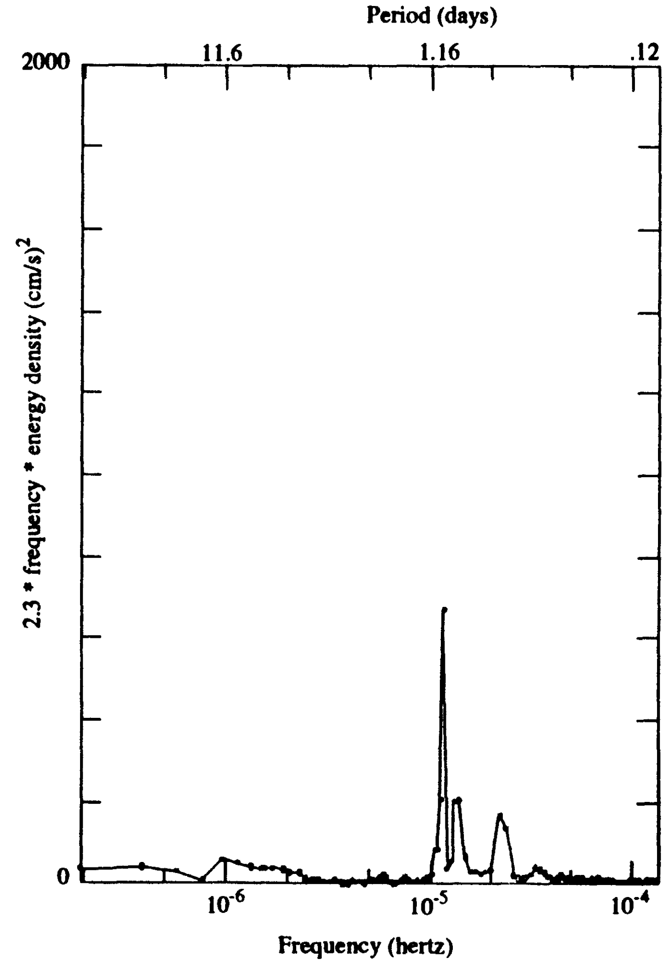
Site	Start time GMT (M/D/Y)	Stop time GMT (M/D/Y)	Piece length hours
A10	07/05/91	01/05/92	1456
A50	07/05/91	01/05/92	1456
A80	03/09/91	08/12/91	1242
B10	07/05/91	09/23/91	624
B150	08/15/91	02/08/92	1408
B250	08/15/91	02/08/92	1408
B390	08/15/91	02/08/92	1408
C10	07/05/91	10/13/91	784
C75	07/06/91	10/30/91	918
C150	03/10/91	08/13/91	1242
C250	03/10/91	08/13/91	1242
C790	08/15/91	03/11/92	1650
D75	11/01/91	02/13/92	832
D250	03/1191	08/13/91	1242
D400	08/15/91	02/13/92	1456
D800	08/15/91	02/13/92	1456
D1390	08/15/91	02/13/92	1456
E75	03/12/91	04/16/91	288
E250	03/12/91	08/15/91	1242
E400	03/12/91	02/12/92	2560
E800	03/12/91	02/12/92	2560
E1400	03/12/91	02/12/92	2560
E1987	03/12/912	02/12/92	2560
F75	11/01/91	02/10/92	784
F150	08/17/91	02/13/92	1408
F250	08/17/91	02/13/92	1408
F387	08/17/91	02/13/92	1408

Table D1. Dates and piece lengths used for the spectral plots.

Mooring A



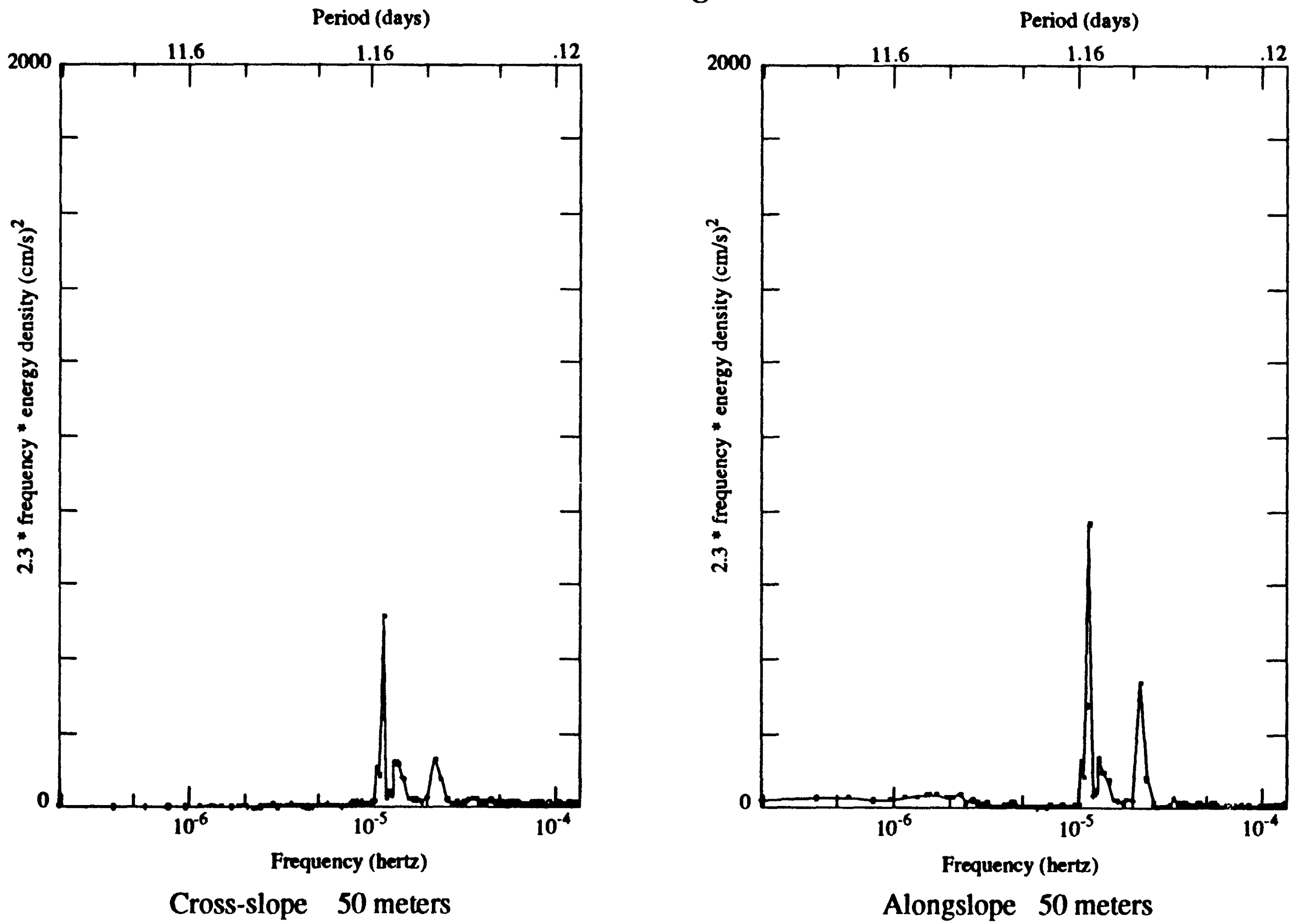
Cross-slope 10 meters



Alongslope 10 meters

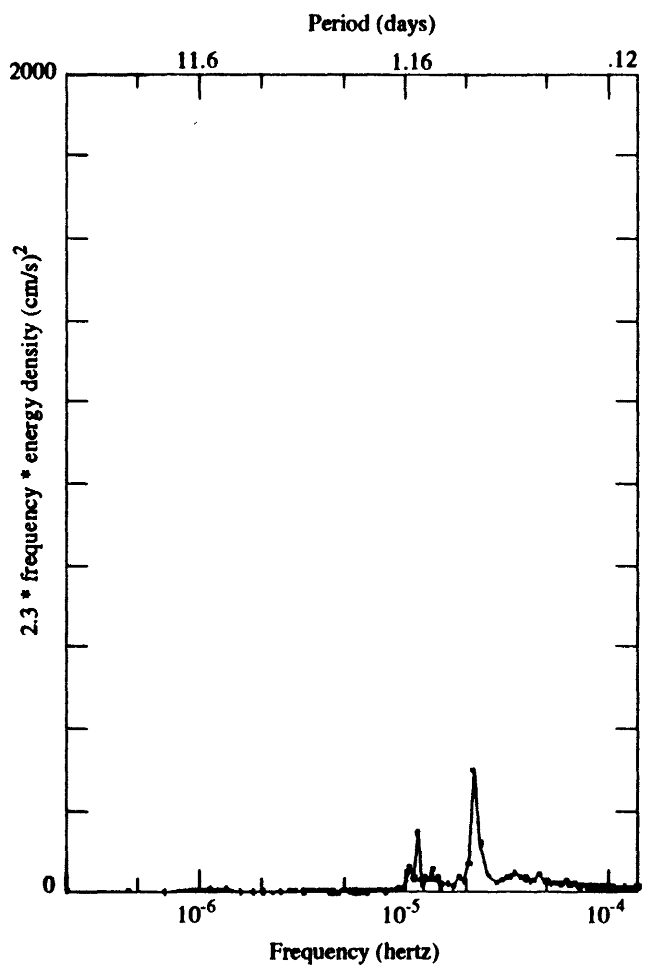
Variance conserving auto spectra

Mooring A

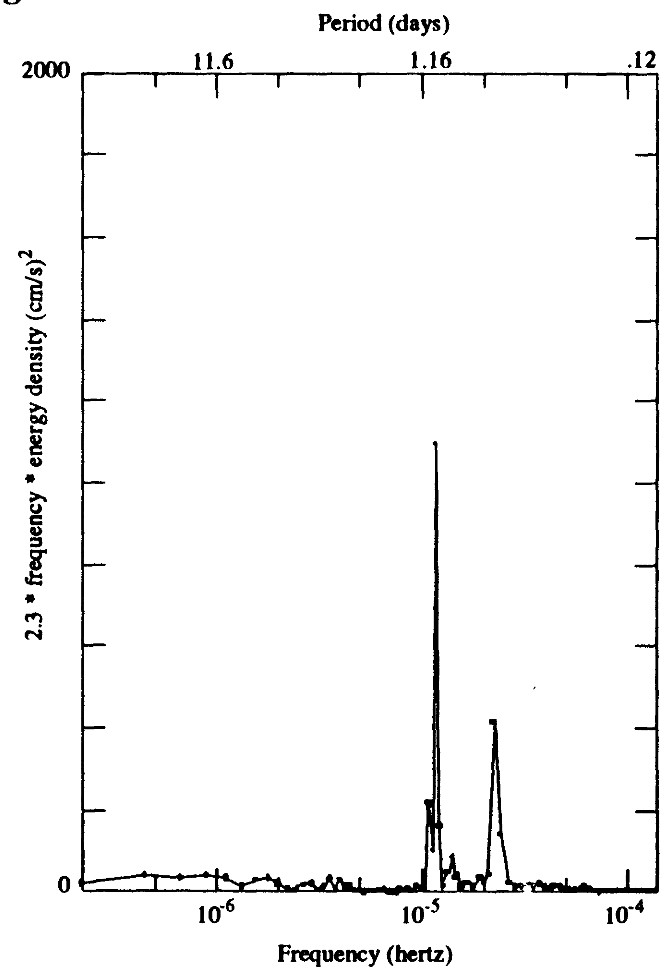


Variance conserving auto spectra

Mooring A



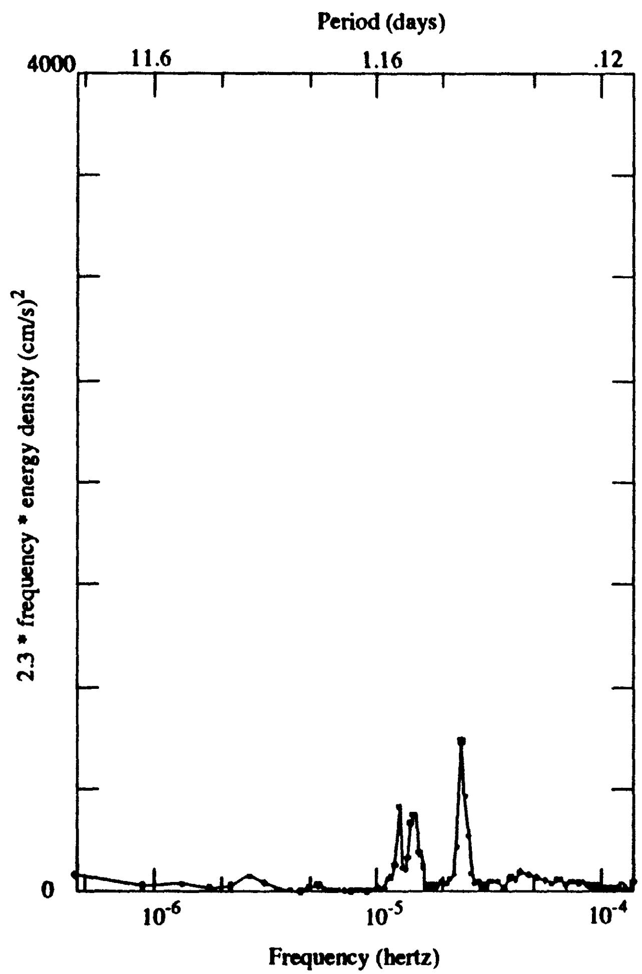
Cross-slope 80 meters



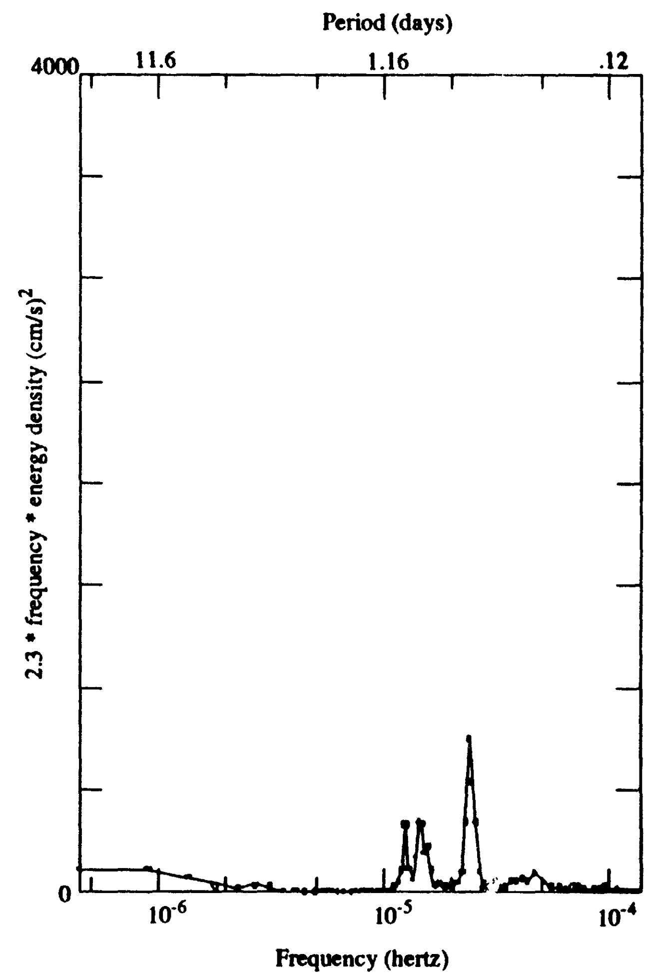
Alongslope 80 meters

Variance conserving auto spectra

Mooring B



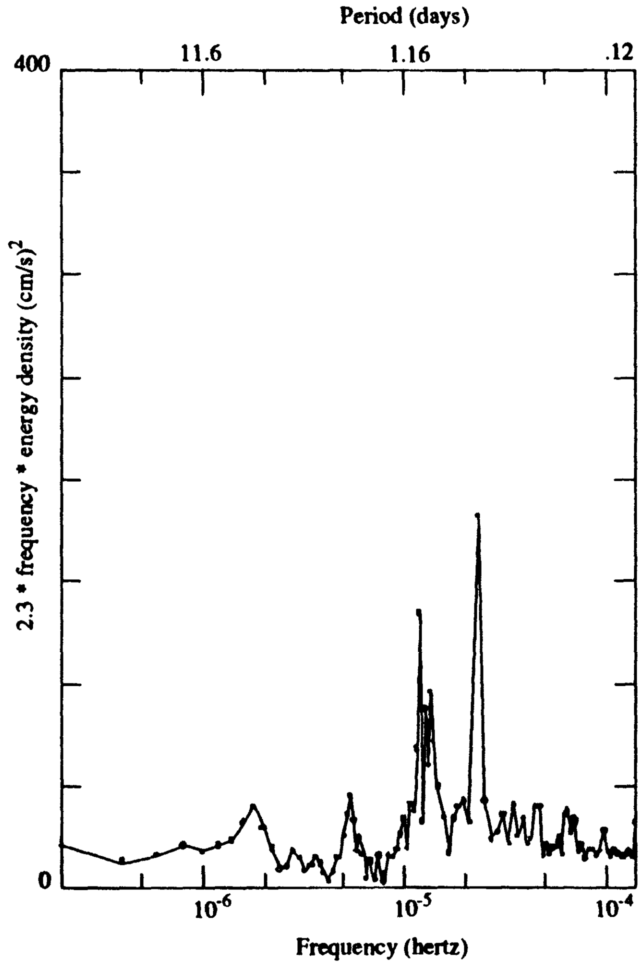
Cross-slope 10 meters



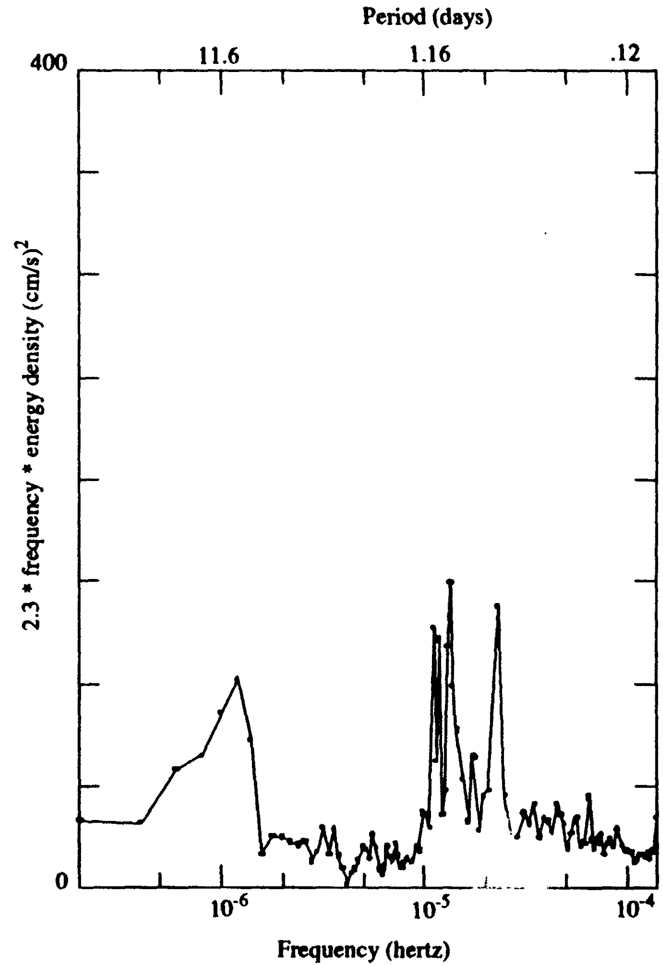
Alongslope 10 meters

Variance conserving auto spectra

Mooring B



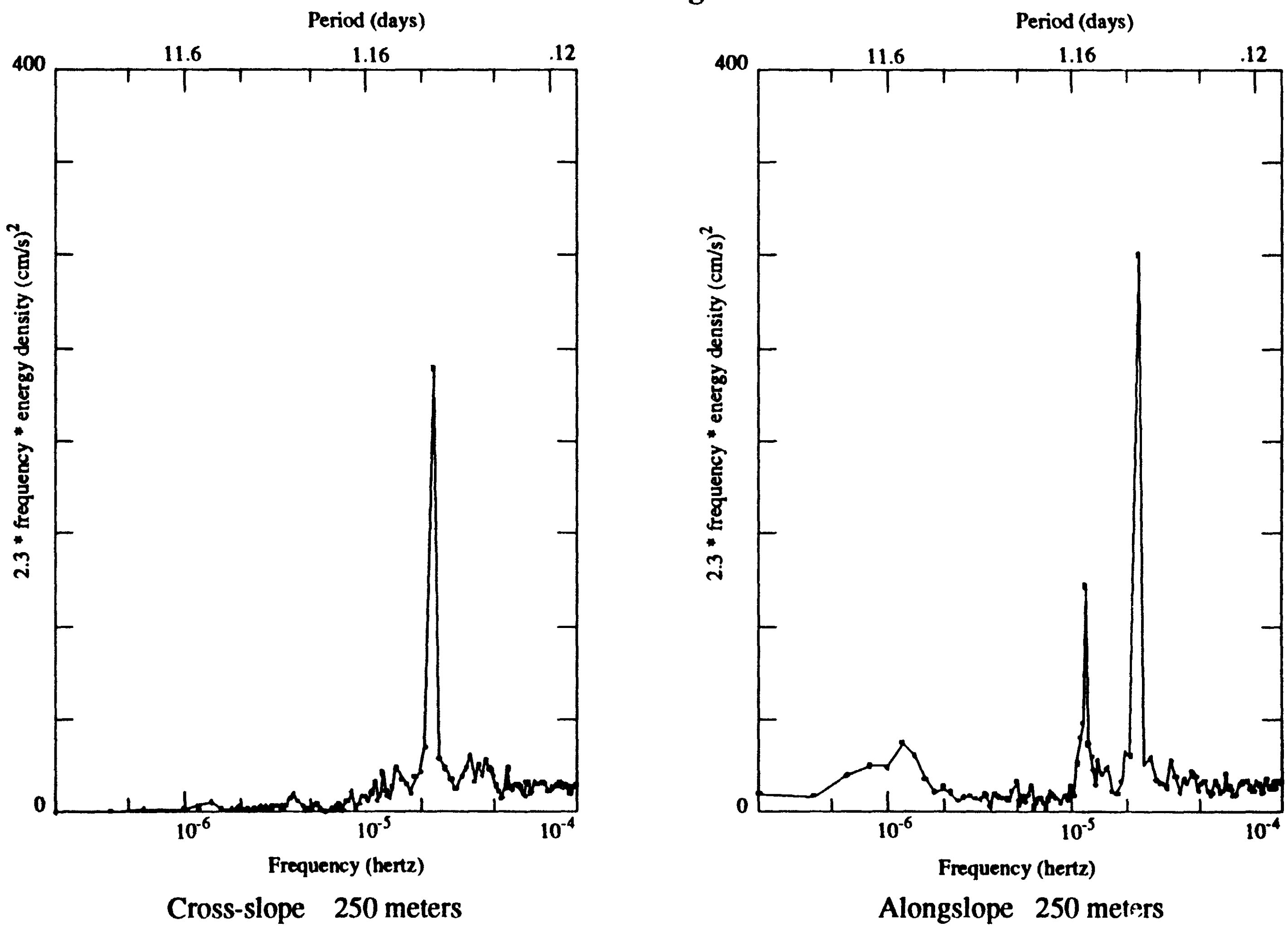
Cross-slope 150 meters



Alongslope 150 meters

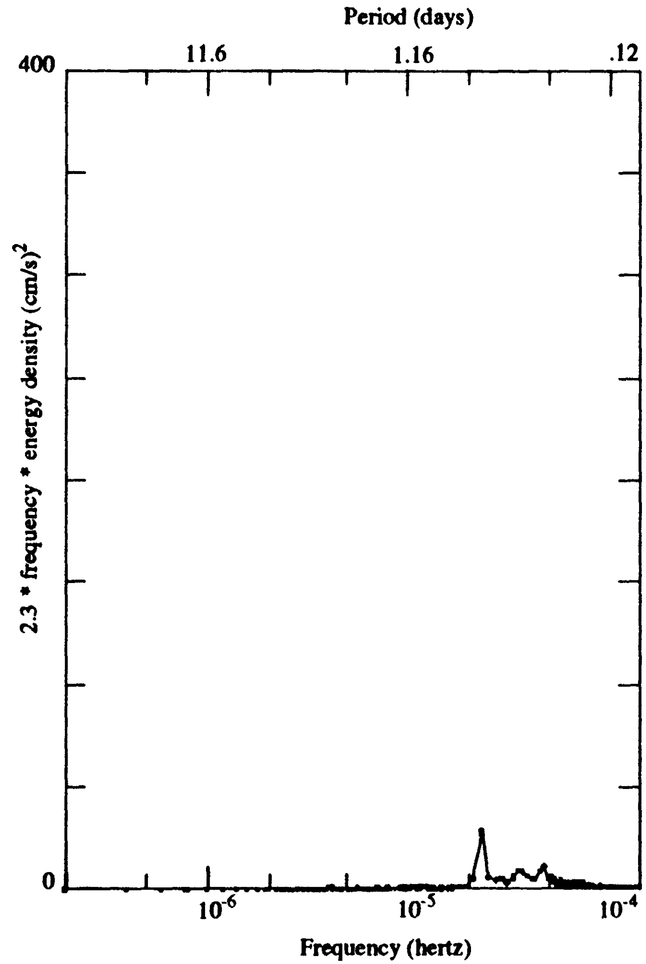
Variance conserving auto spectra

Mooring B

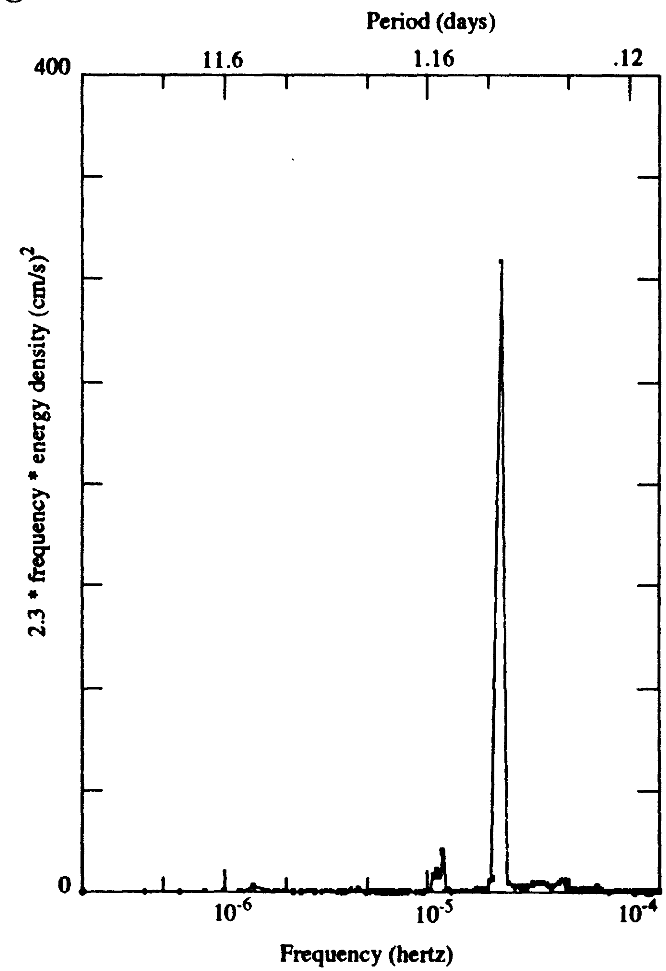


Variance conserving auto spectra

Mooring B



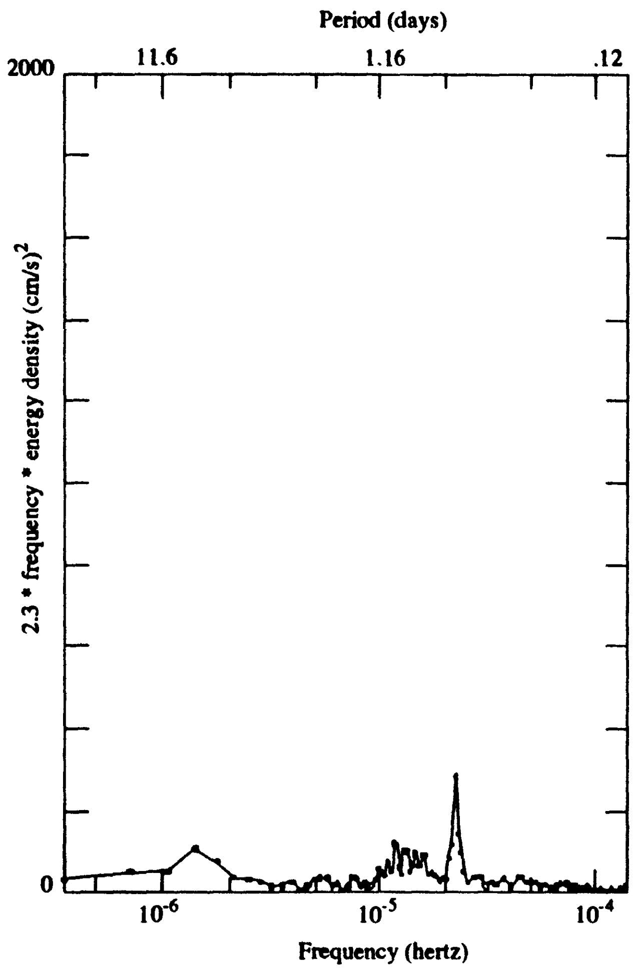
Cross-slope 390 meters



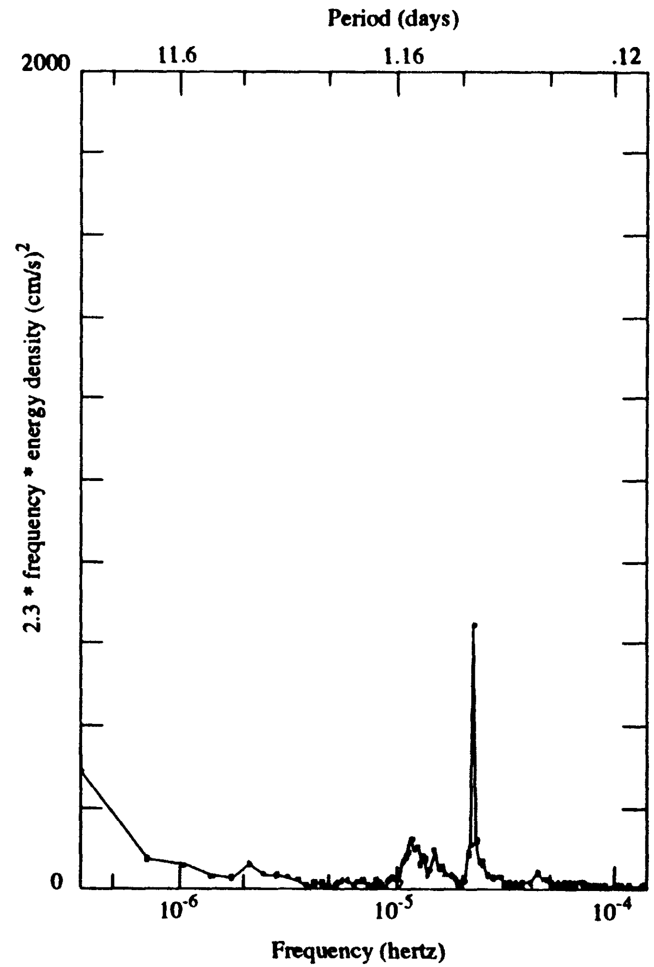
Alongslope 390 meters

Variance conserving auto spectra

Mooring C



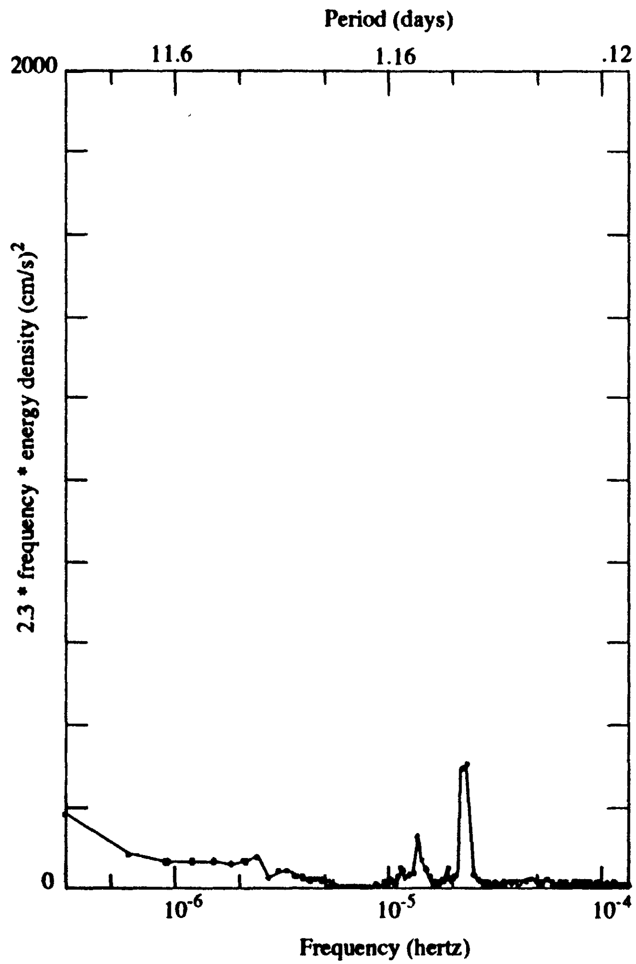
Cross-slope 10 meters



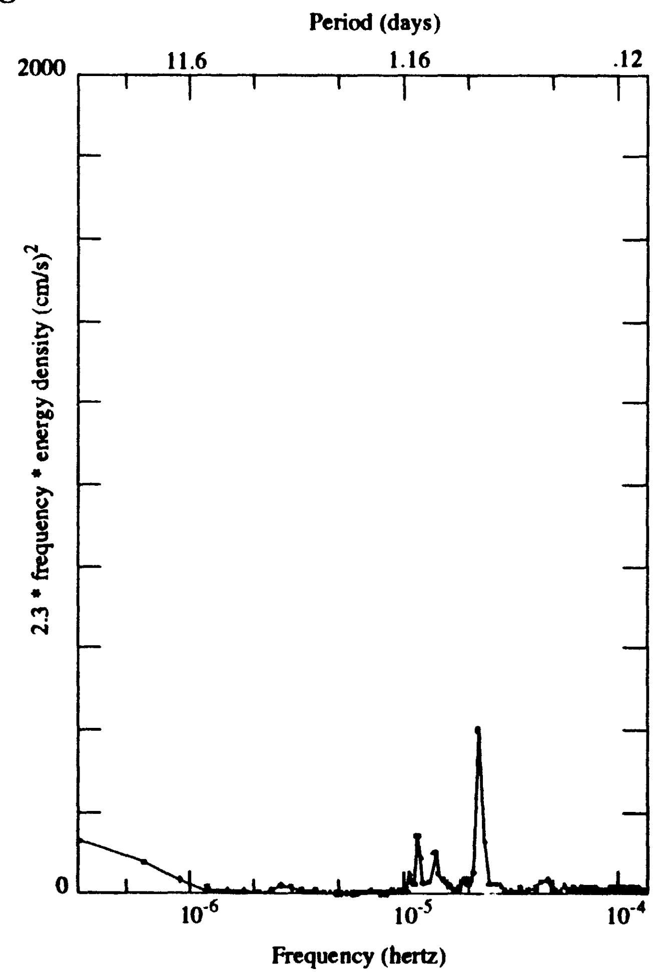
Alongslope 10 meters

Variance conserving auto spectra

Mooring C



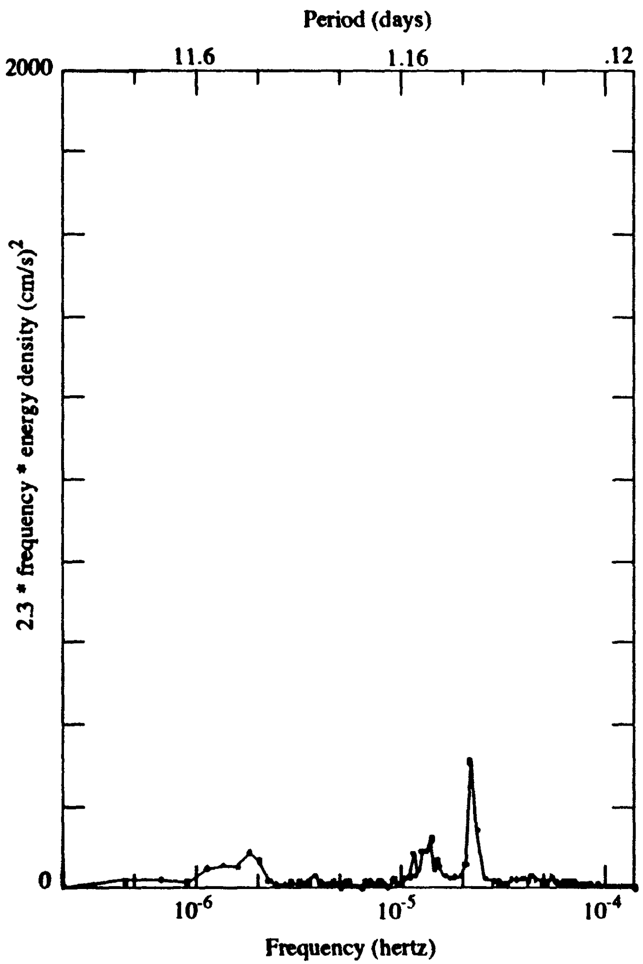
Cross-slope 75 meters



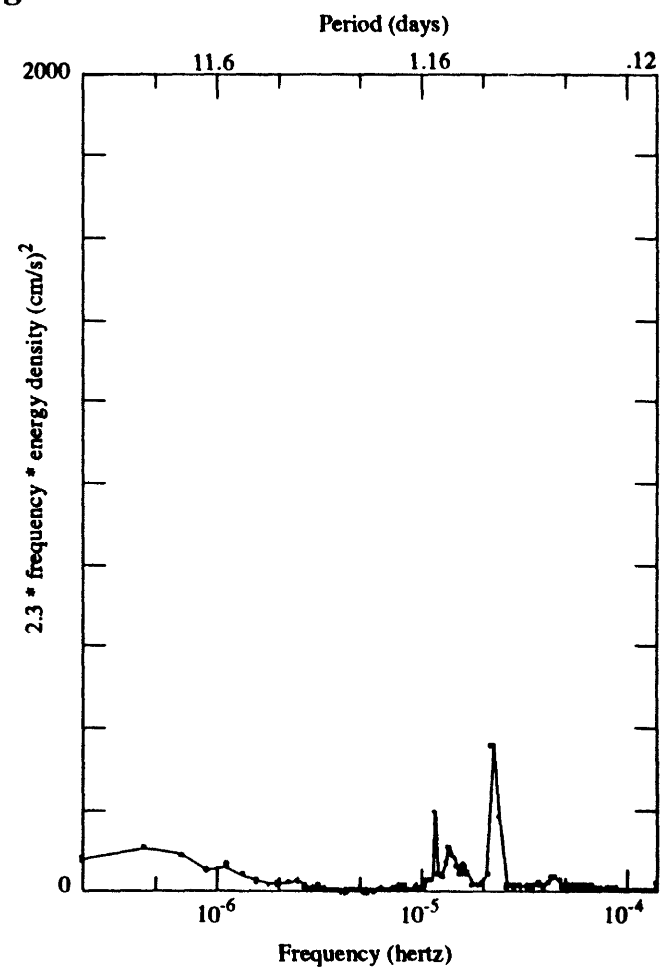
Alongslope 75 meters

Variance conserving auto spectra

Mooring C



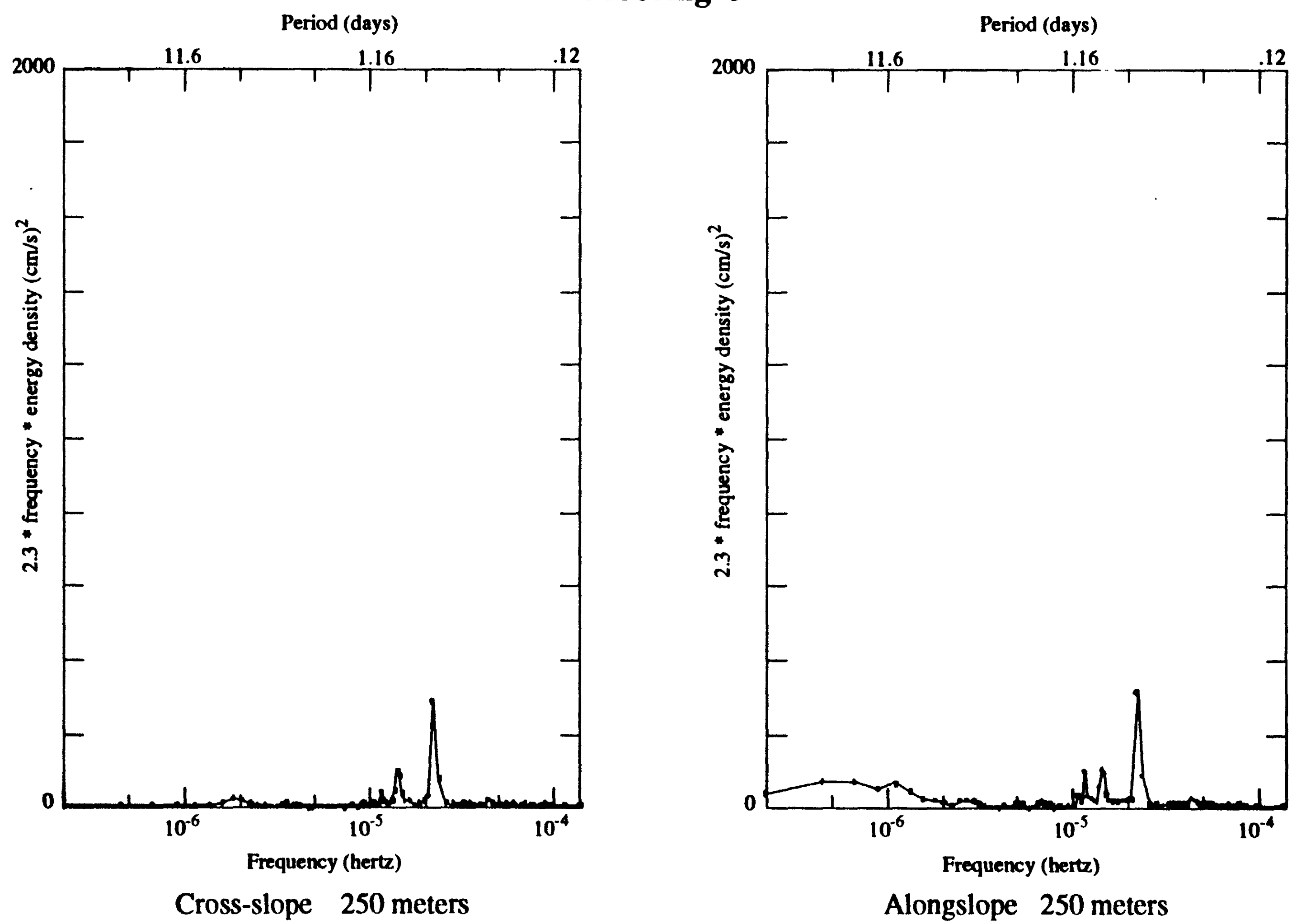
Cross-slope 150 meters



Alongslope 150 meters

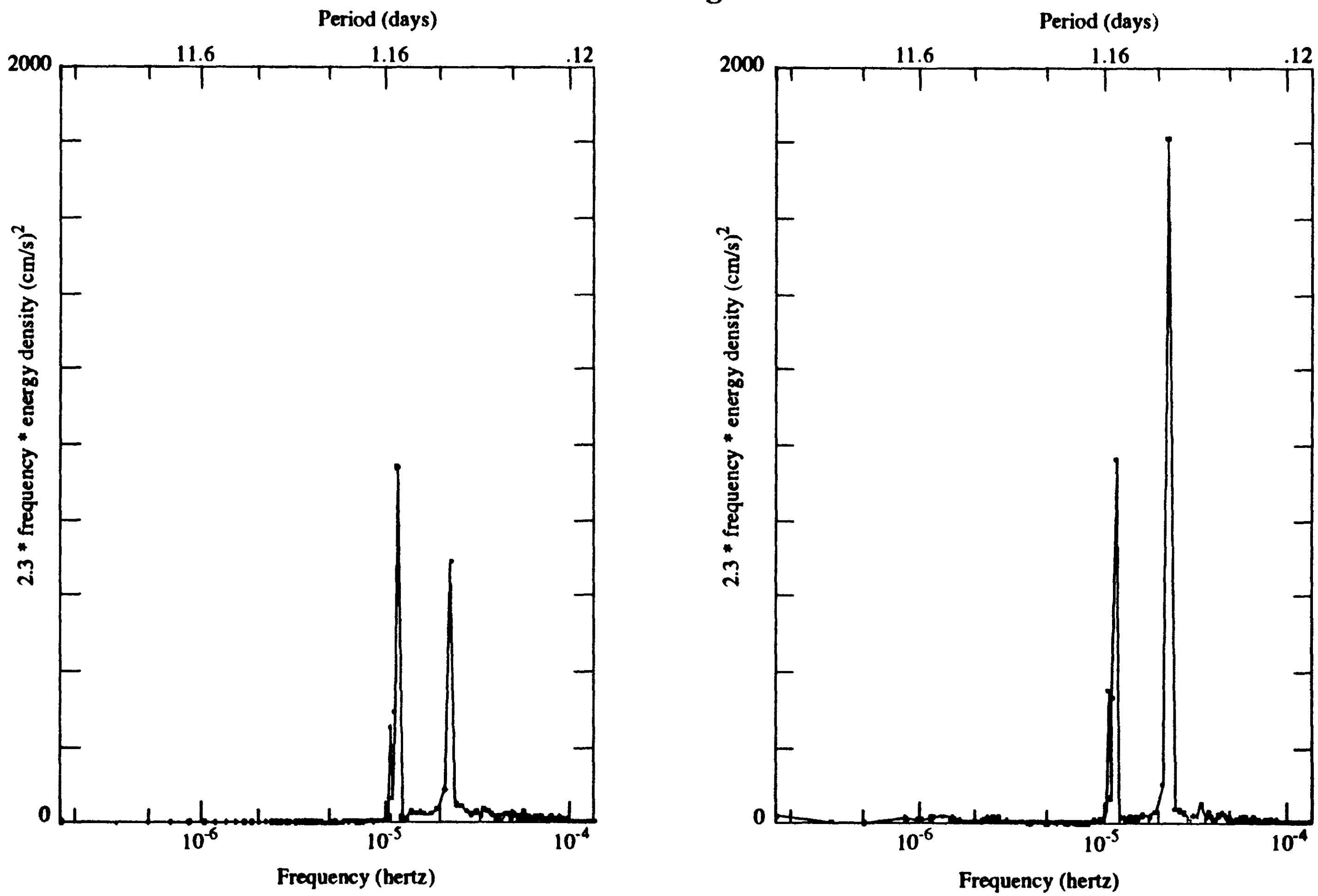
Variance conserving auto spectra

Mooring C



Variance conserving auto spectra

Mooring C

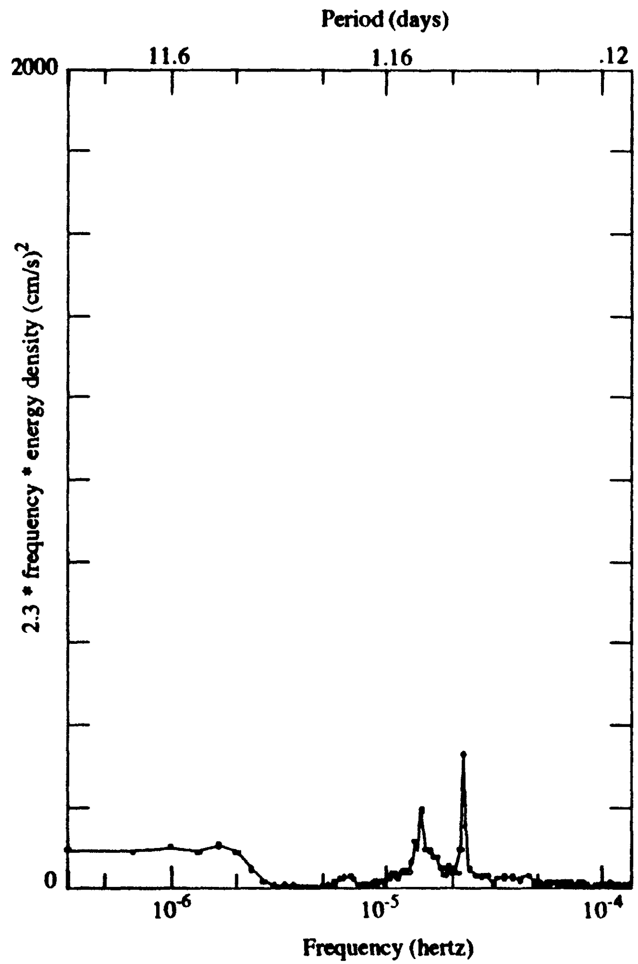


Cross-slope 790 meters

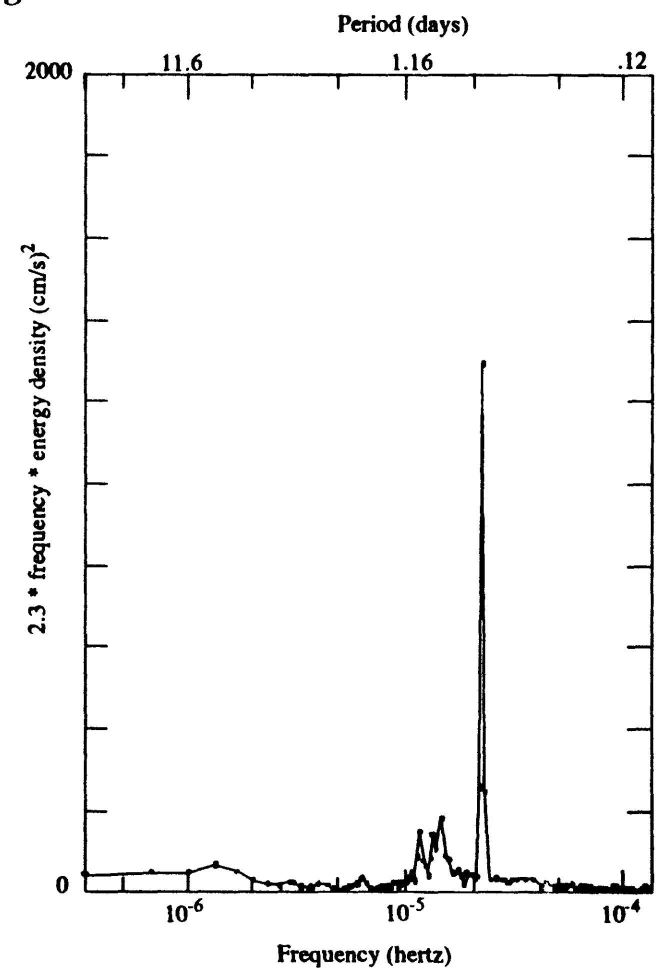
Alongslope 790 meters

Variance conserving auto spectra

Mooring D



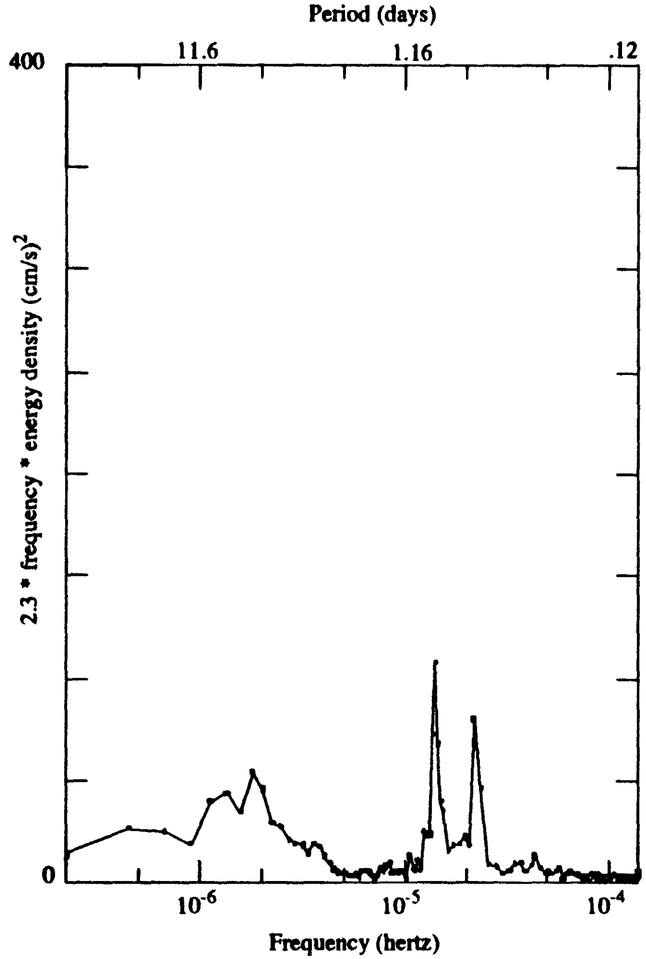
Cross-slope 75 meters



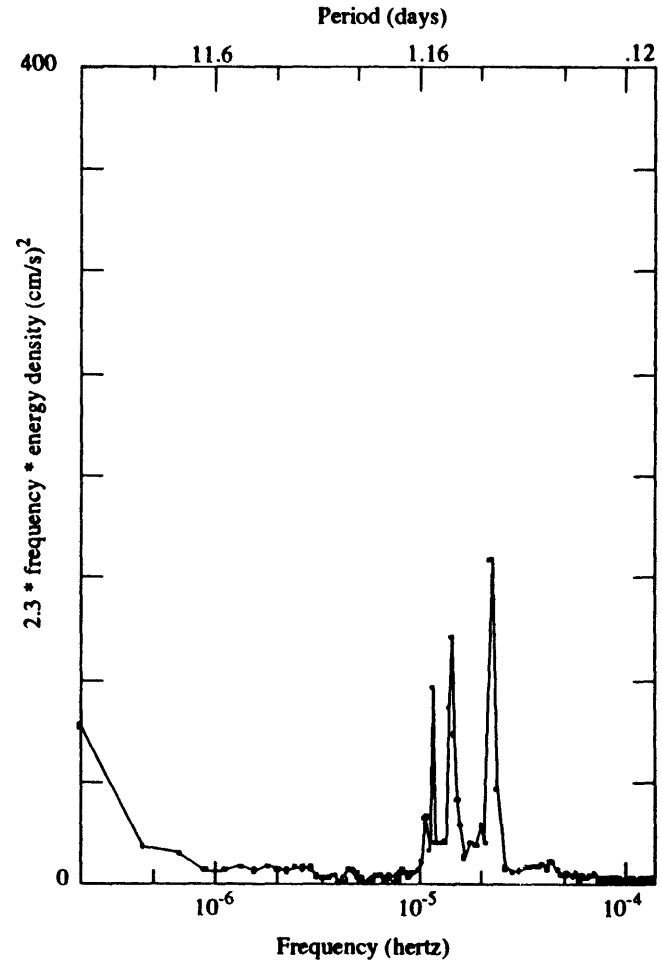
Alongslope 75 meters

Variance conserving auto spectra

Mooring D



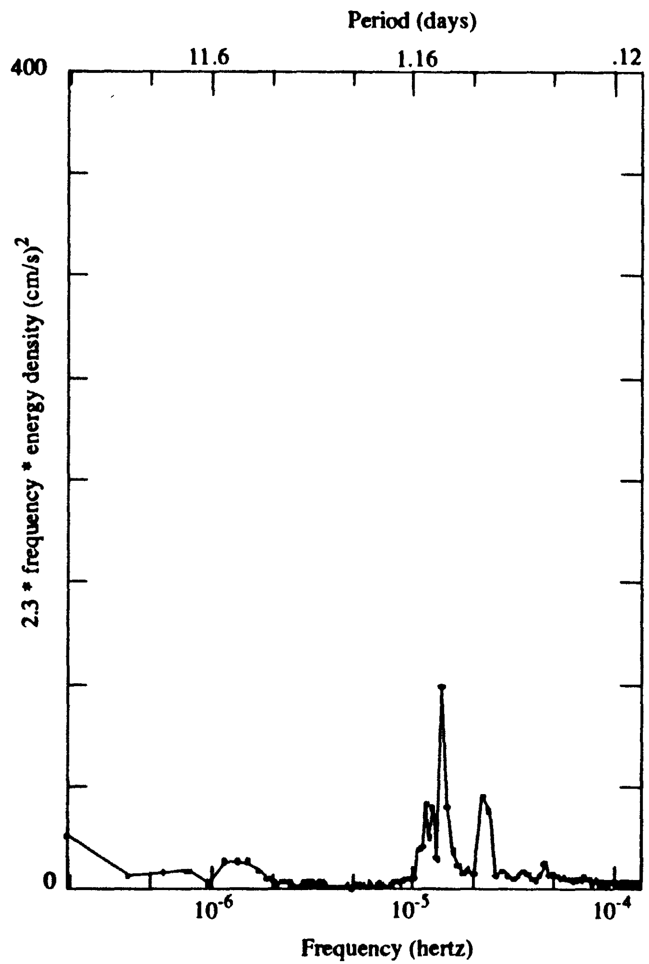
Cross-slope 250 meters



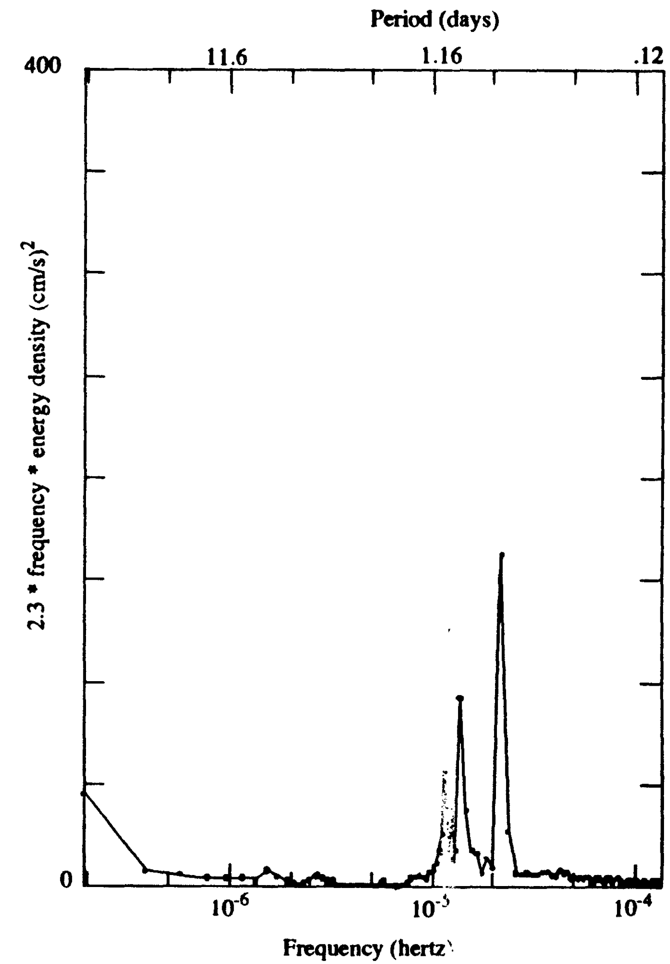
Alongslope 250 meters

Variance conserving auto spectra

Mooring D



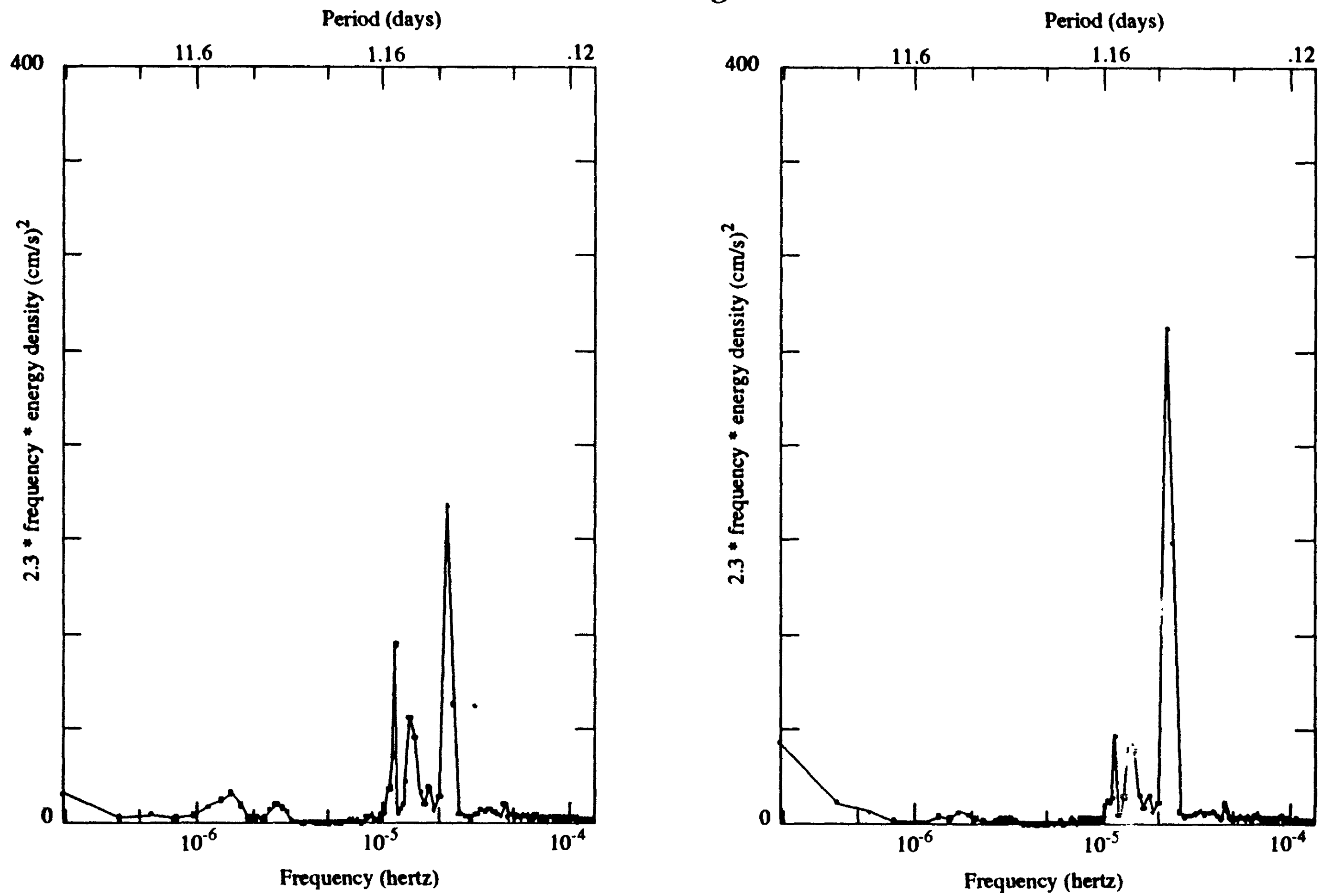
Cross-slope 400 meters



Alongslope 400 meters

Variance conserving auto spectra

Mooring D

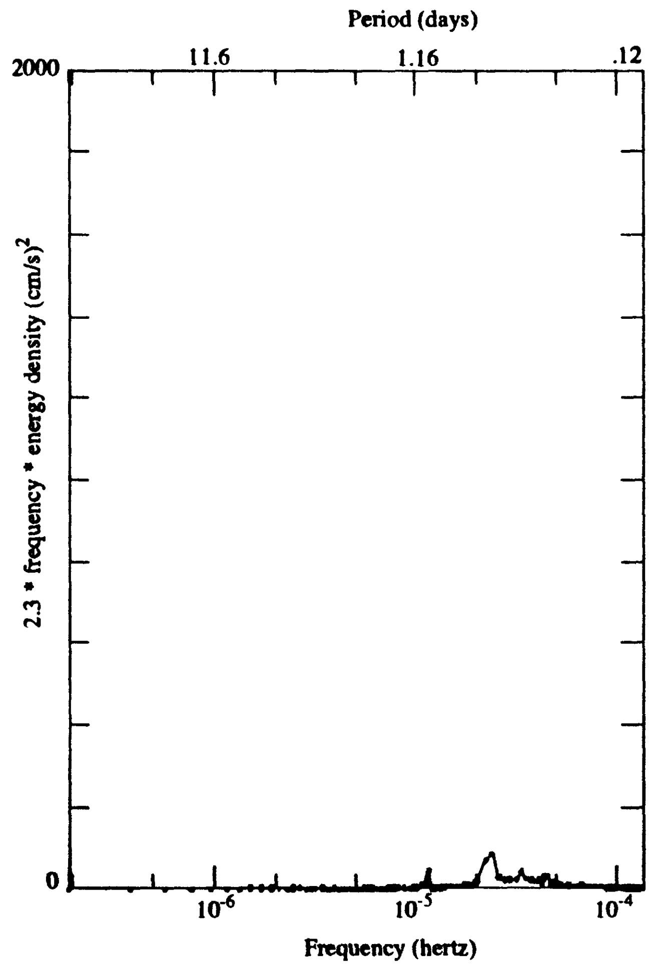


Cross-slope 800 meters

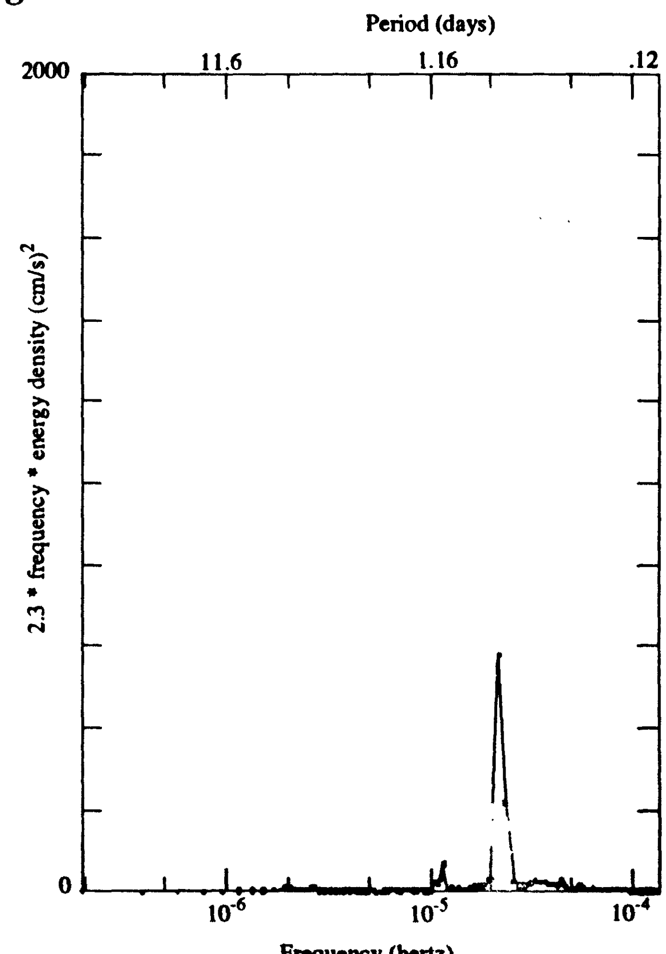
Alongslope 800 meters

Variance conserving auto spectra

Mooring D



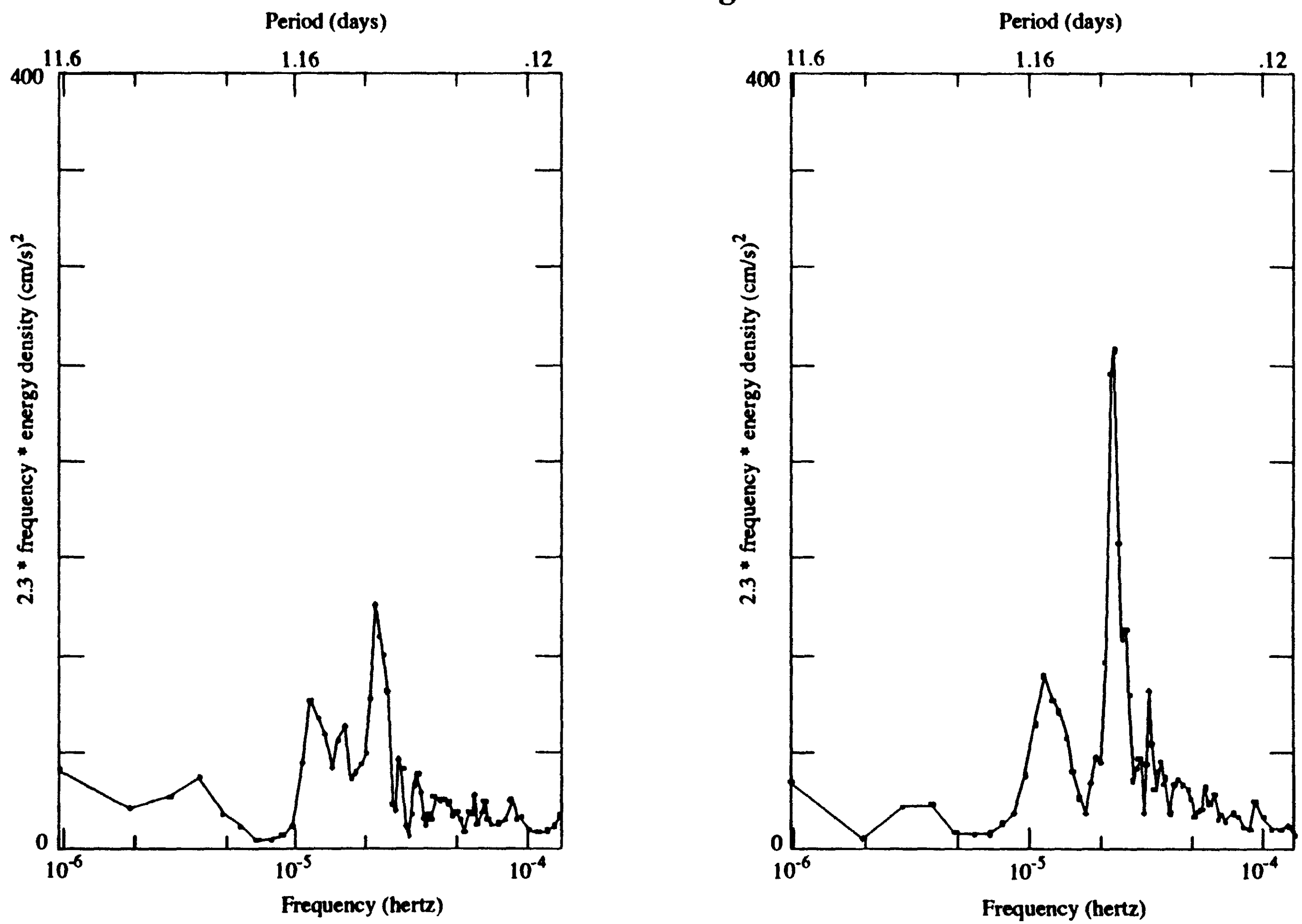
Cross-slope 1390 meters



Alongslope 1390 meters

Variance conserving auto spectra

Mooring E

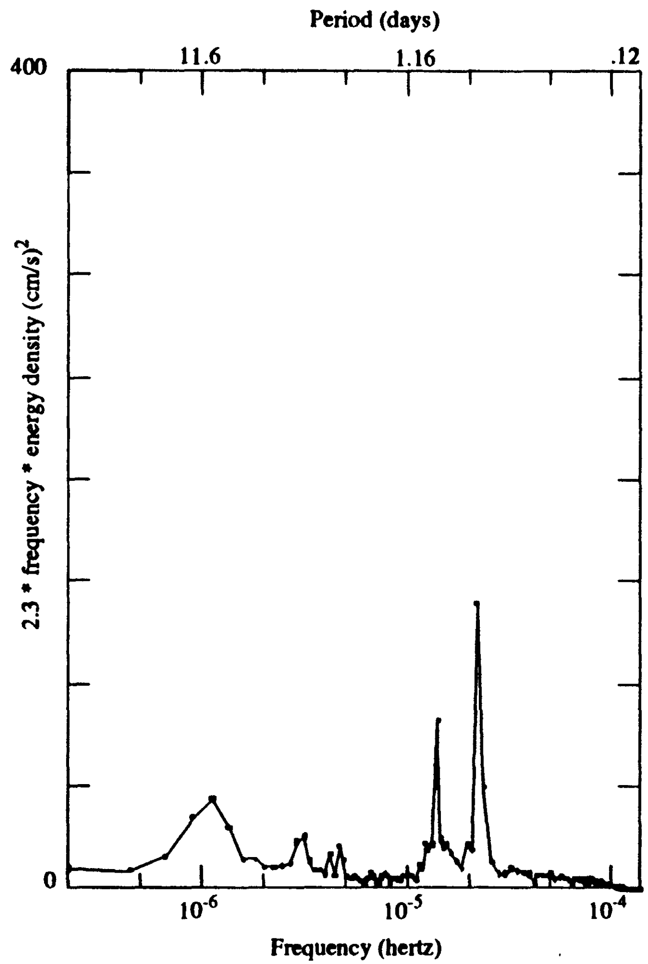


Cross-slope 75 meters

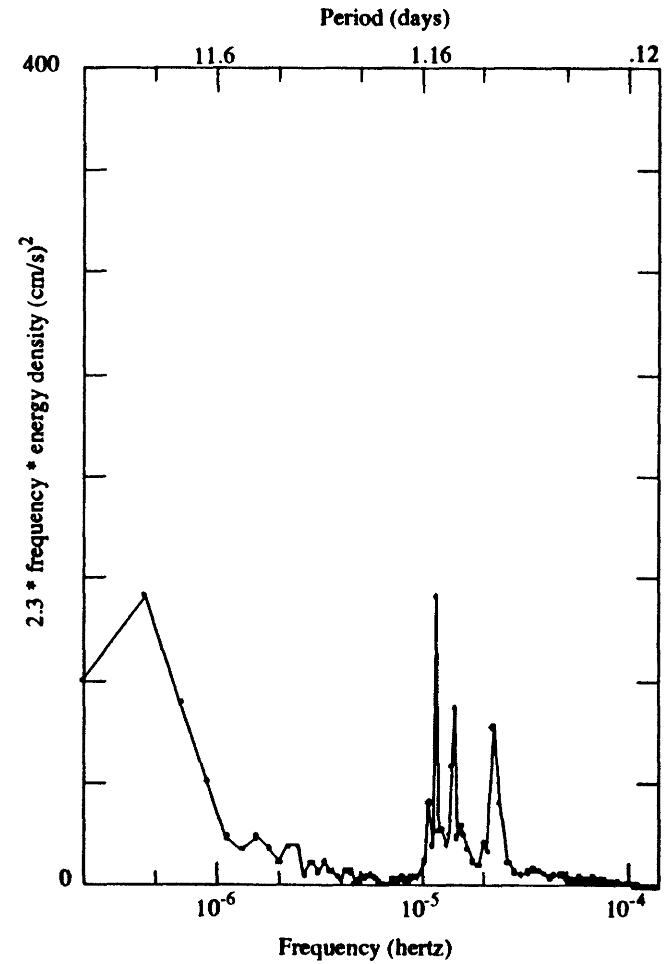
Alongslope 75 meters

Variance conserving auto spectra

Mooring E



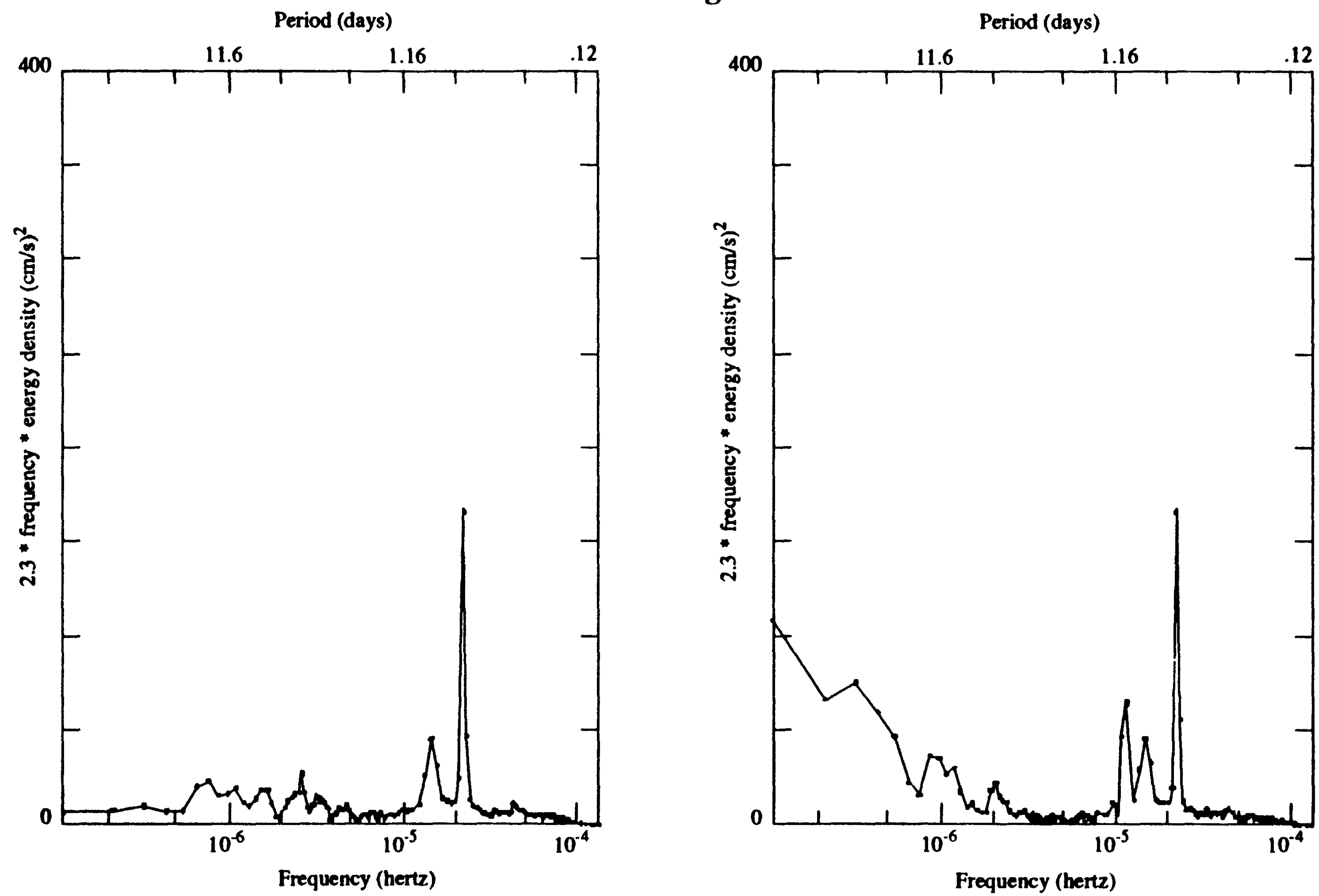
Cross-slope 250 meters



Alongslope 250 meters

Variance conserving auto spectra

Mooring E

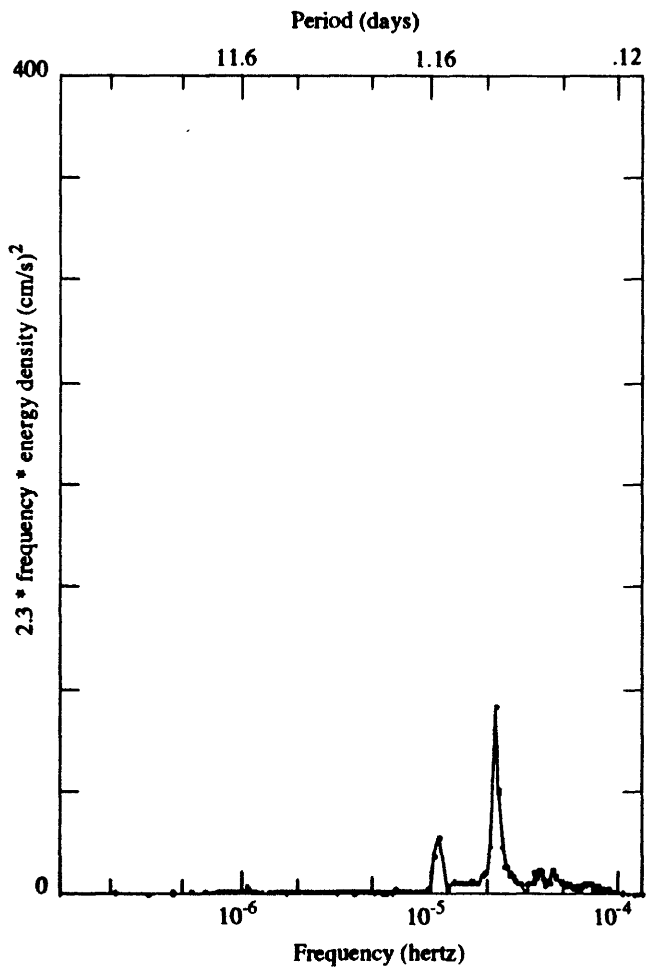


Cross-slope 400 meters

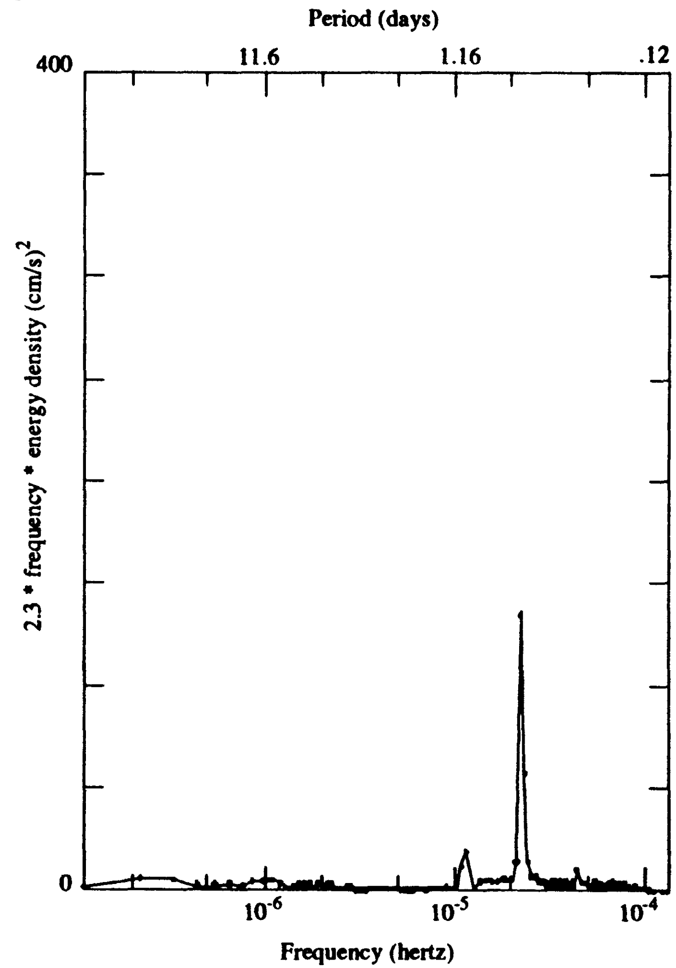
Alongslope 400 meters

Variance conserving auto spectra

Mooring E



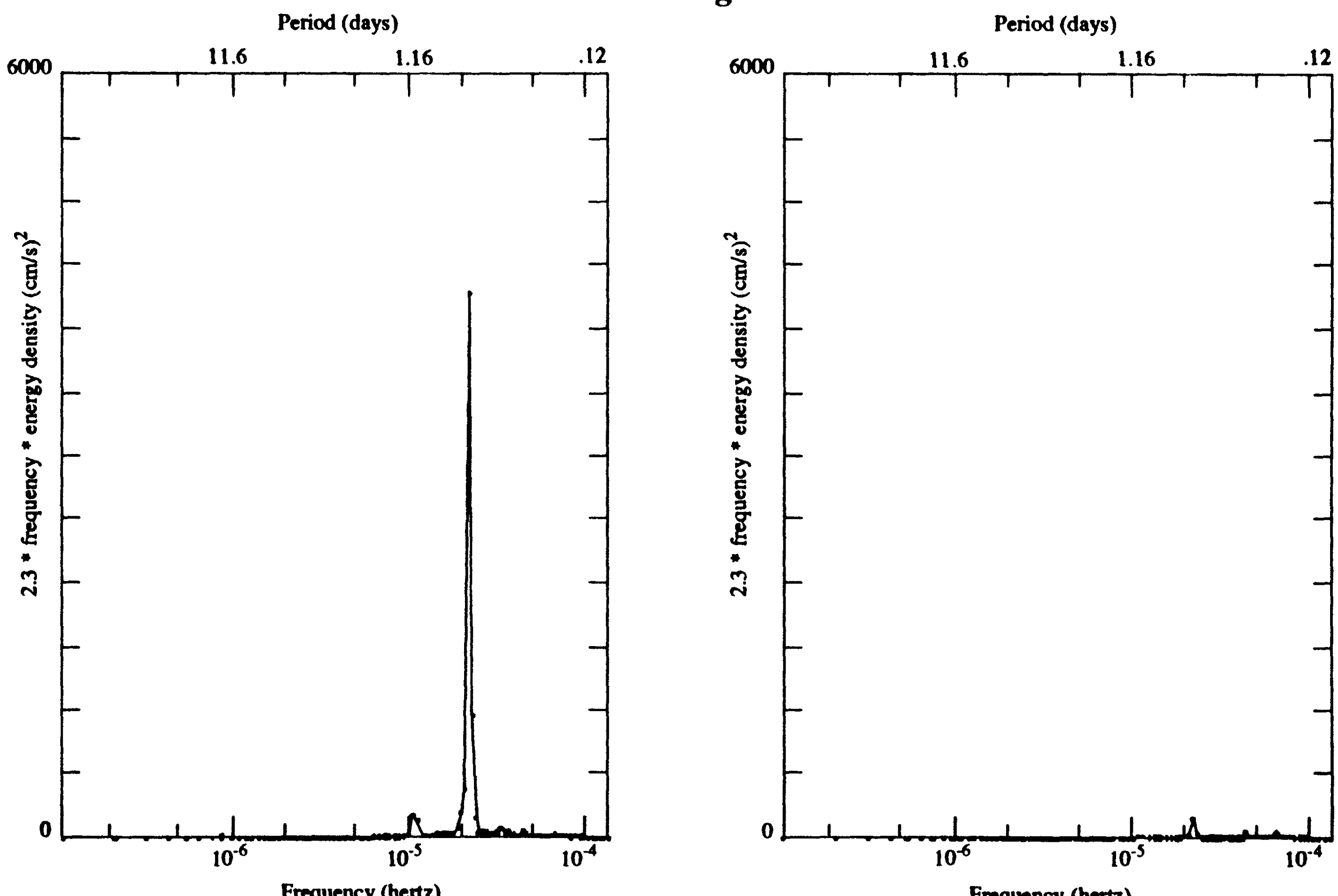
Cross-slope 1400 meters



Alongslope 1400 meters

Variance conserving auto spectra

Mooring E

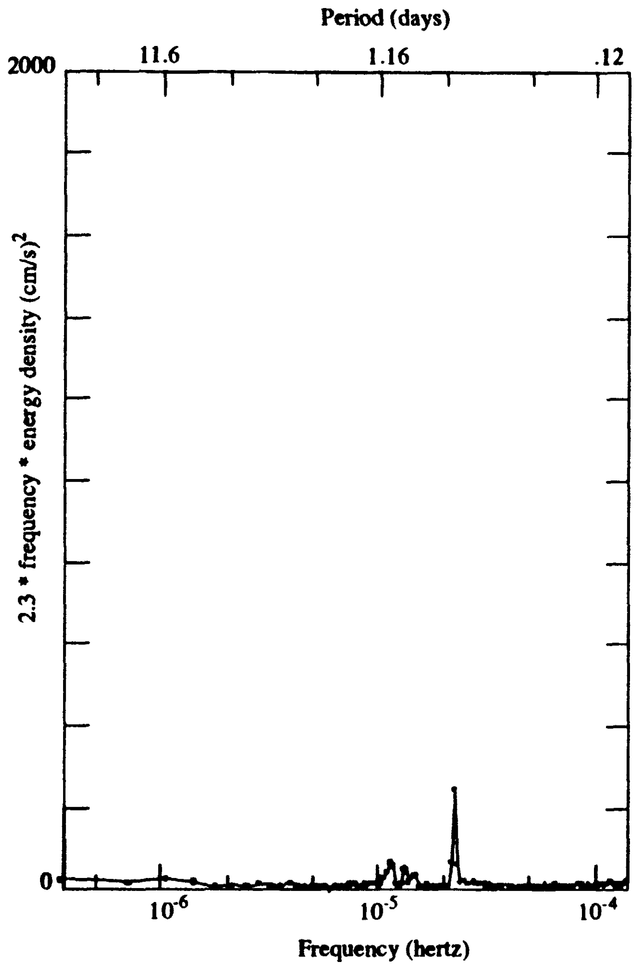


Cross-slope 1987 meters

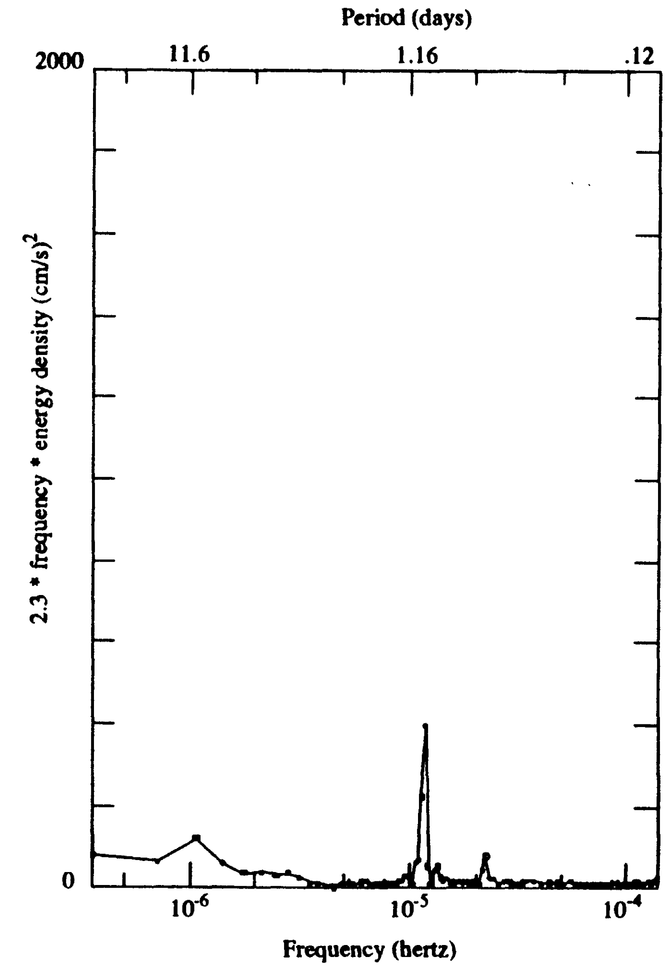
Alongslope 1987 meters

Variance conserving auto spectra

Mooring F



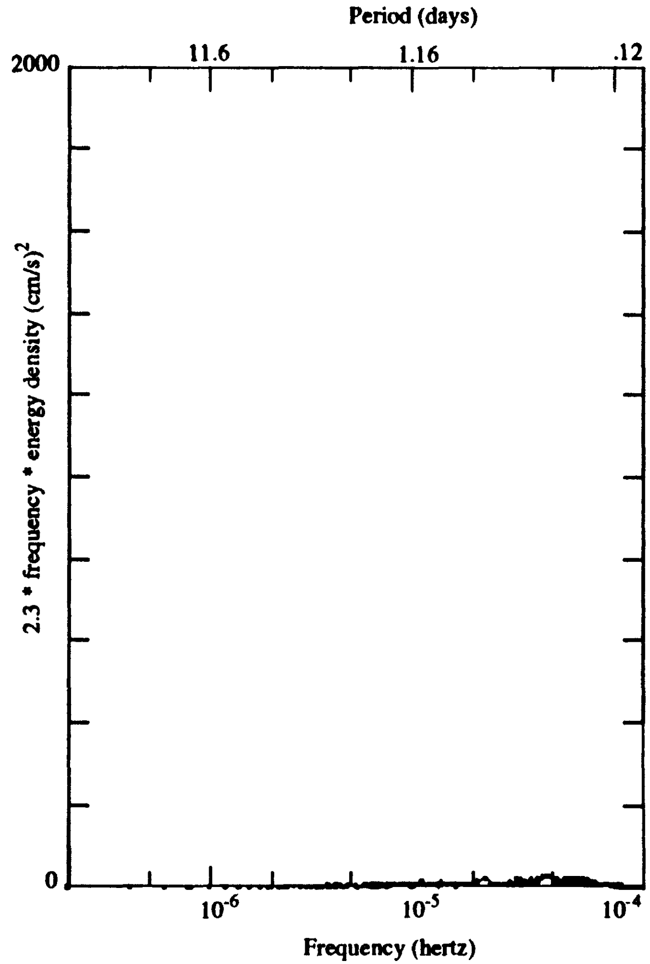
Cross-slope 75 meters



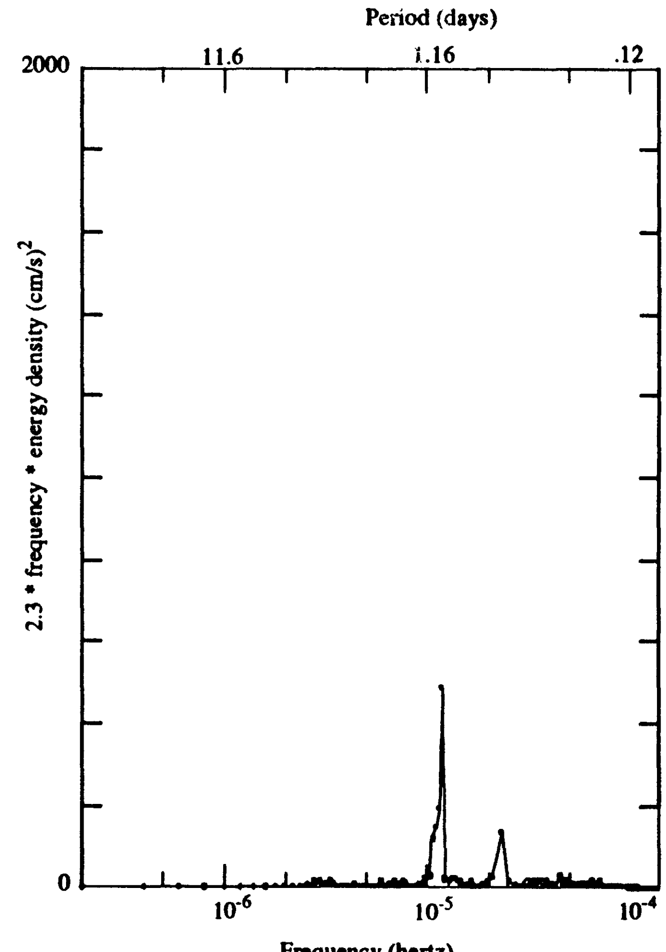
Alongslope 75 meters

Variance conserving auto spectra

Mooring F



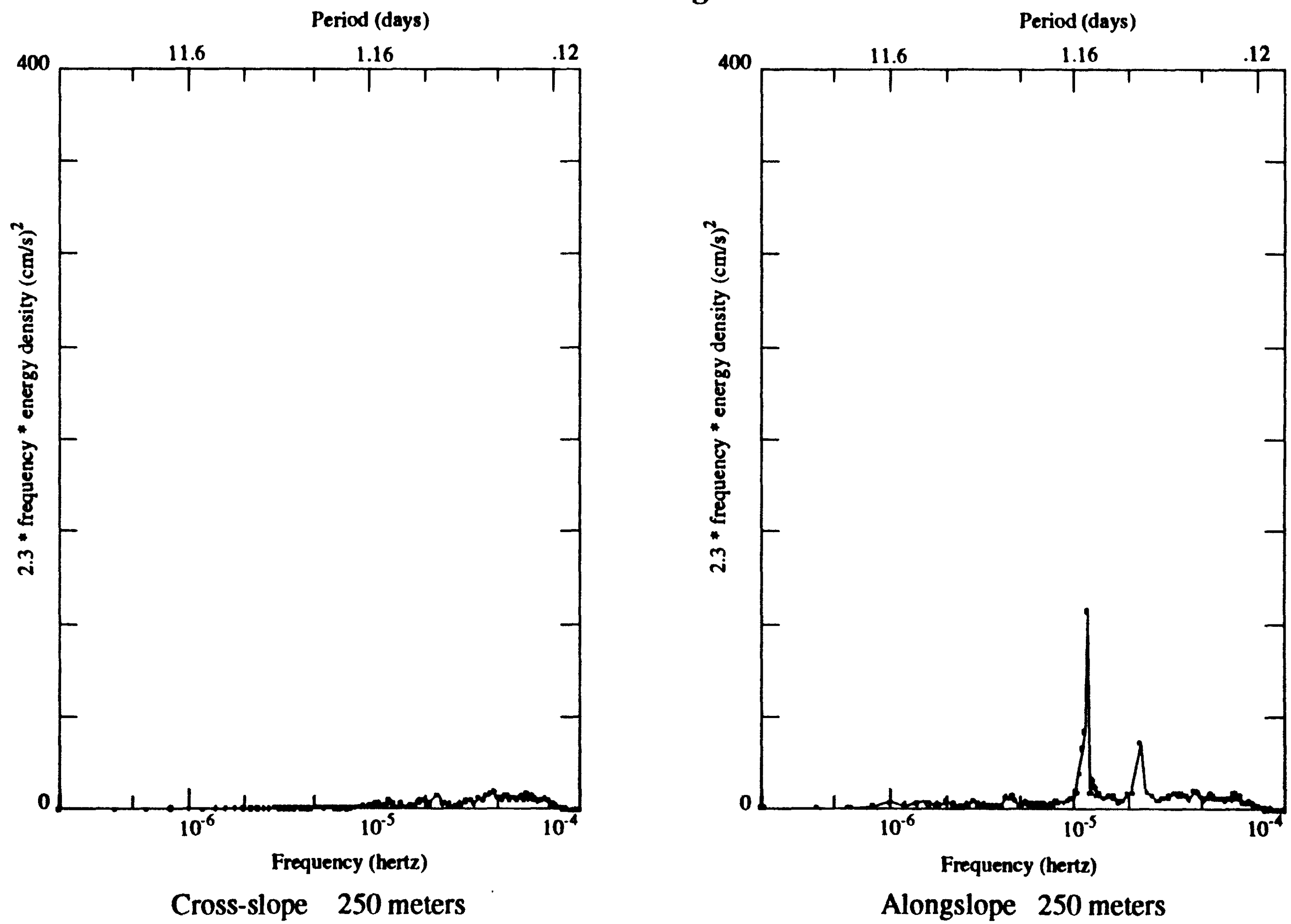
Cross-slope 150 meters



Alongslope 150 meters

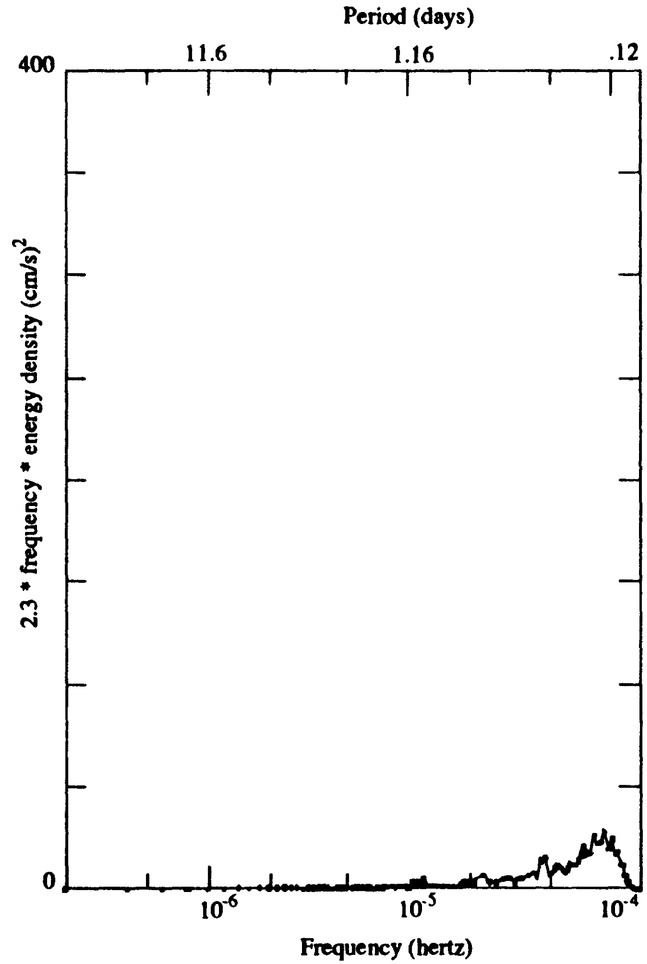
Variance conserving auto spectra

Mooring F

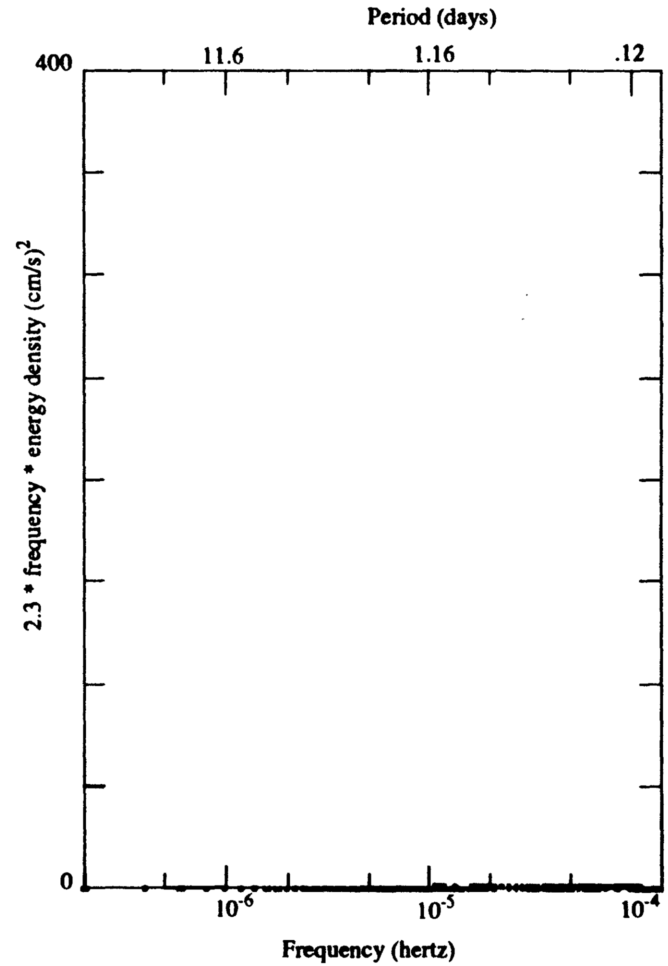


Variance conserving auto spectra

Mooring F



Cross-slope 387 meters



Alongslope 387 meters

Variance conserving auto spectra

Appendix E. - Wind and sea level

Station	Start time GMT (M/D/Y)	Stop time GMT (M/D/Y)	Piece length (hours)
Wind			
46012 - Half Moon Bay	03/01/91	03/15/92	2400
46013 - Bodega Bay	02/28/91	03/15/92	2400
46026 - Gulf of the Farallones	06/04/91	03/30/92	2400
46042 - Monterey Bay	03/01/91	03/15/92	2400
Sea level			
Arena Cove	03/01/91	03/15/92	2560
Pt. Reyes	03/01/91	03/15/92	2560
San Francisco Bay	03/01/91	03/15/92	2560
Monterey Harbor	03/01/91	03/15/92	2560

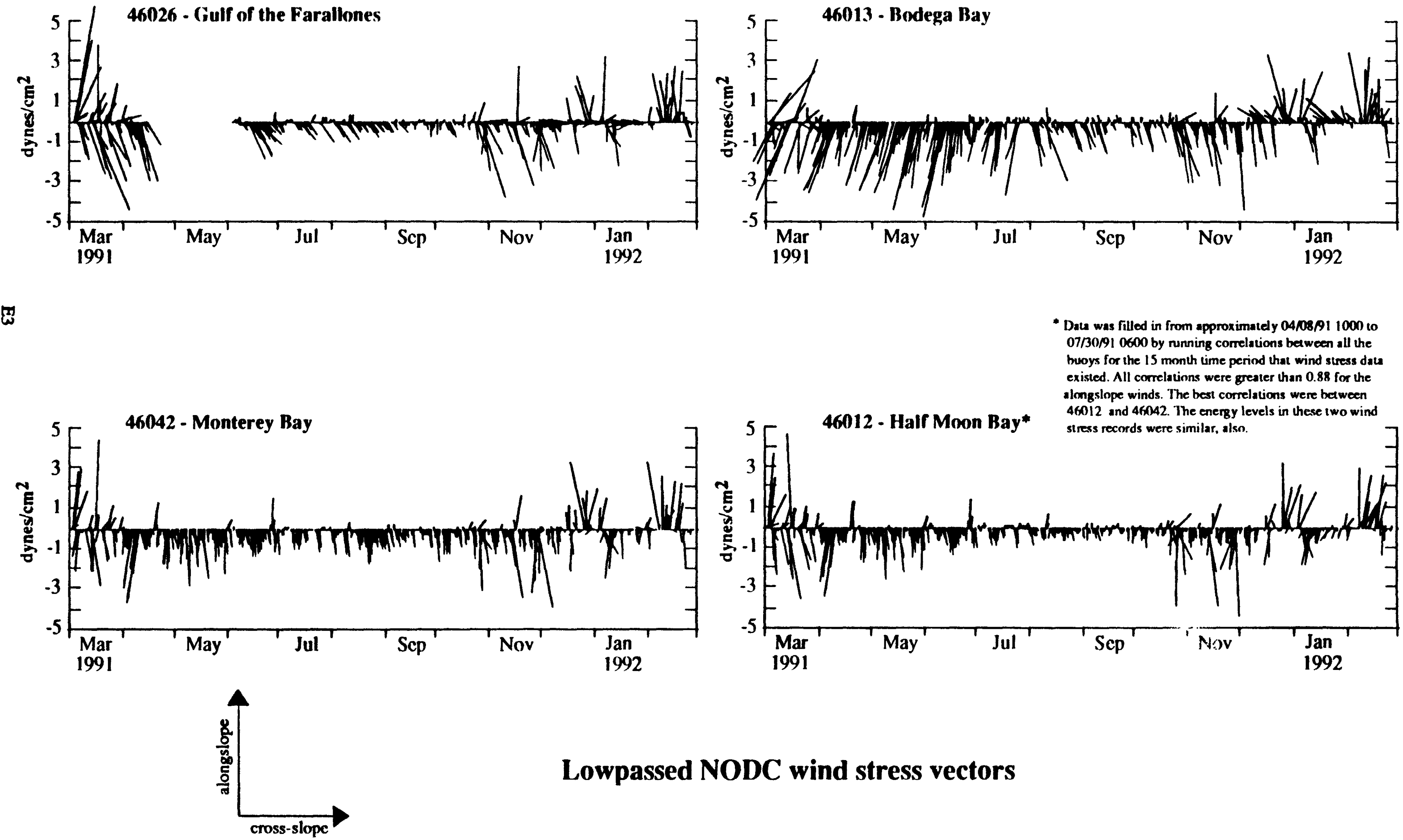
Table E1. Dates and piece lengths used for wind and sea level spectral plots.

Station	Start time (GMT) (M/D/Y)	Stop time GMT (M/D/Y)	O_1 (cm)	K_1 (cm)	M_2 (cm)	S_2 (cm)
Arena Cove	03/10/91	03/01/92	23.4	37.3	57.1	14.4
Pt. Reyes	03/10/91	03/01/92	23.2	37.9	54.8	13.5
San Francisco Bay	03/10/91	03/01/92	23.0	37.2	58.7	13.3
Monterey Harbor	03/10/91	03/01/92	22.8	36.5	48.9	13.0

Table E2. Sea level tidal components.

STATION	START TIME GMT (M/D/Y)	STOP TIME GMT (M/D/Y)	CROSS-SLOPE				ALONGSLOPE			
			MEAN	SD	MAX	MIN	MEAN	SD	MAX	MIN
March 1991-February 1992										
46012 - Half Moon Bay	03/08/91	03/30/92	0.0 ±0.0	0.2	1.2	-0.9	**-0.3 ±0.2**	0.9	4.7	-4.3
46013 - Bodega Bay	03/08/91	03/15/92	-0.1 ±0.1	0.5	1.7	-2.1	**-0.6 ±0.3**	1.2	3.9	-4.9
46026 - Gulf of the Farallones	03/08/91	03/30/92	0.1 ±0.1	0.5	2.1	-2.2	-0.2 ±0.2	0.8	3.9	-4.3
46042 - Monterey Bay	03/08/91	03/30/92	0.0 ±0.0	0.2	0.9	-0.8	**-0.4 ±0.3**	0.9	4.5	-4.0
March 1991 - August 1991										
46012 - Half Moon Bay	03/08/91	08/31/91	0.1 ±0.0	0.2	1.1	-0.6	**-0.4 ±0.3**	0.8	4.7	-3.5
46013 - Bodega Bay	03/08/91	08/31/91	**-0.2 ±0.1**	0.5	1.7	-2.1	**-1.0 ±0.4**	1.2	3.3	-4.9
46026 - Gulf of the Farallones	03/08/91	08/31/91	**0.4 ±0.1**	0.4	2.1	-0.3	-0.3 ±0.4	0.9	3.9	-4.3
46042 - Monterey Bay	03/08/91	08/31/91	0.1 ±0.1	0.2	0.7	-0.7	**-0.6 ±0.3**	0.8	4.5	-3.7
September 1991 - February 1992										
46012 - Half Moon Bay	09/01/91	03/30/92	0.0 ±0.1	0.2	1.2	-0.9	-0.1 ±0.3	0.9	3.64	-4.3
46013 - Bodega Bay	09/01/91	03/15/92	0.0 ±0.1	0.4	1.5	-2.1	-0.2 ±0.3	1.0	3.9	-4.5
46026 - Gulf of the Farallones	09/01/91	03/30/92	0.0 ±0.1	0.5	1.8	-2.2	-0.1 ±0.2	0.8	3.3	-3.7
46042 - Monterey Bay	09/01/91	03/30/92	0.0 ±0.0	0.2	0.9	-0.8	-0.2 ±0.2	0.9	4.0	-4.0

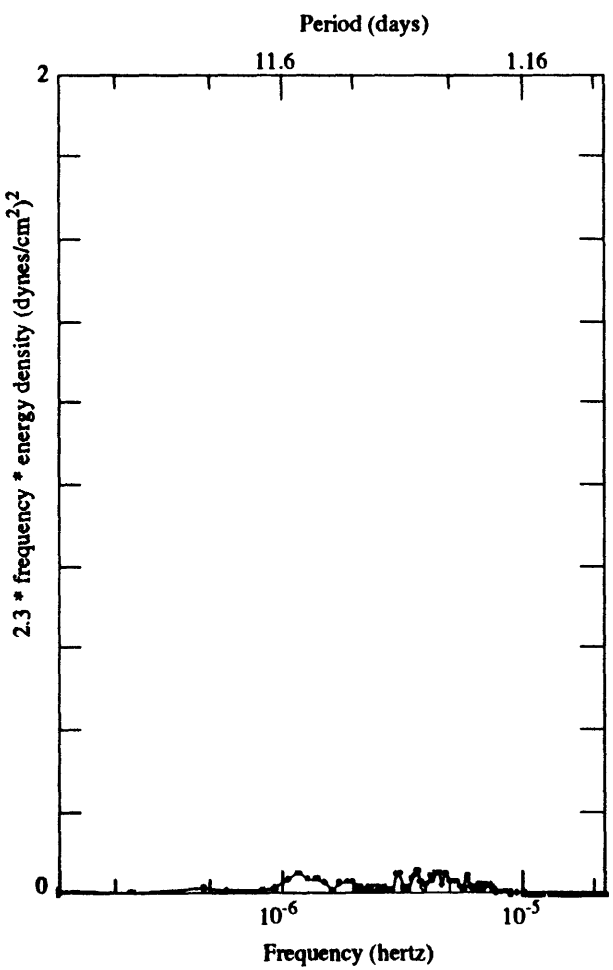
Table E3. Lowpassed horizontal wind stress components (cm/s).



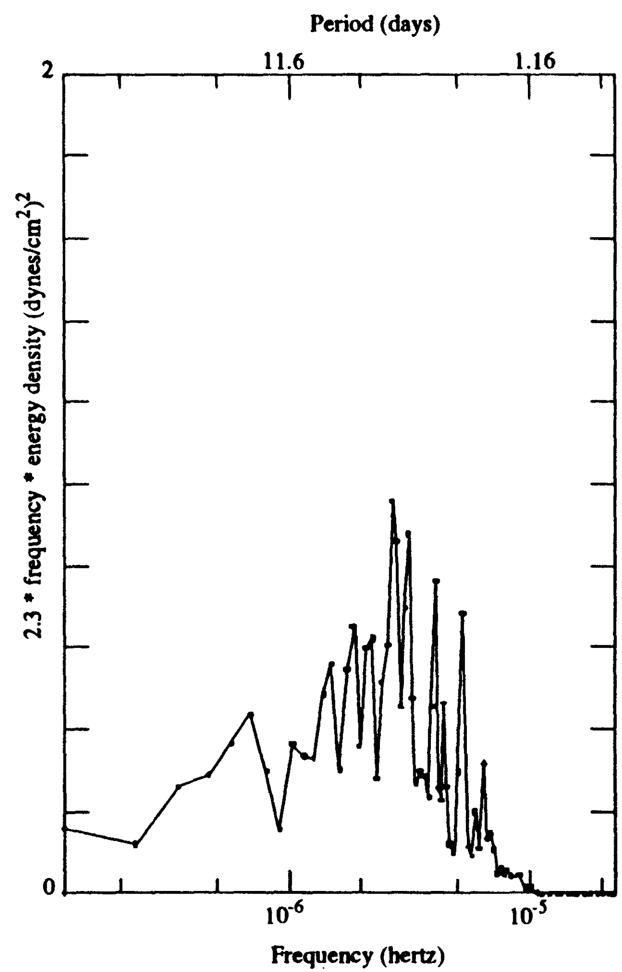
* Data was filled in from approximately 04/08/91 1000 to 07/30/91 0600 by running correlations between all the buoys for the 15 month time period that wind stress data existed. All correlations were greater than 0.88 for the alongslope winds. The best correlations were between 46012 and 46042. The energy levels in these two wind stress records were similar, also.

Lowpassed NODC wind stress vectors

46012 - Half Moon Bay



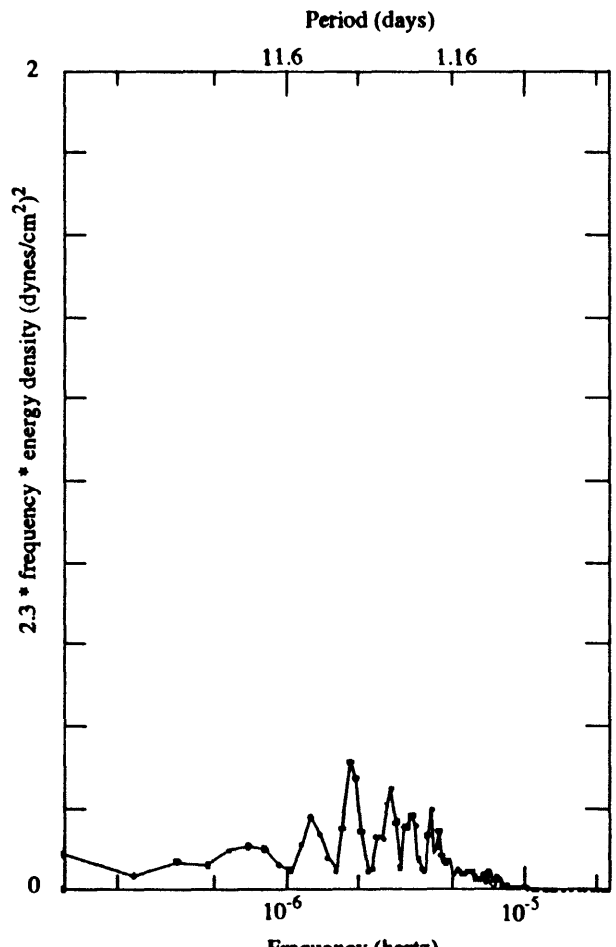
Cross-slope



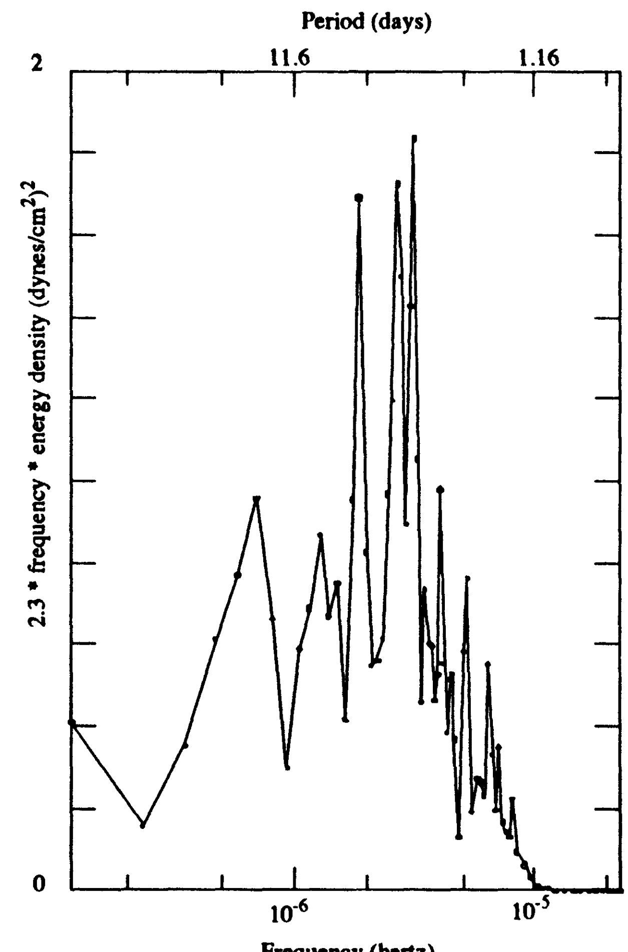
Alongslope

Variance conserving auto spectra

46013 - Bodega Bay



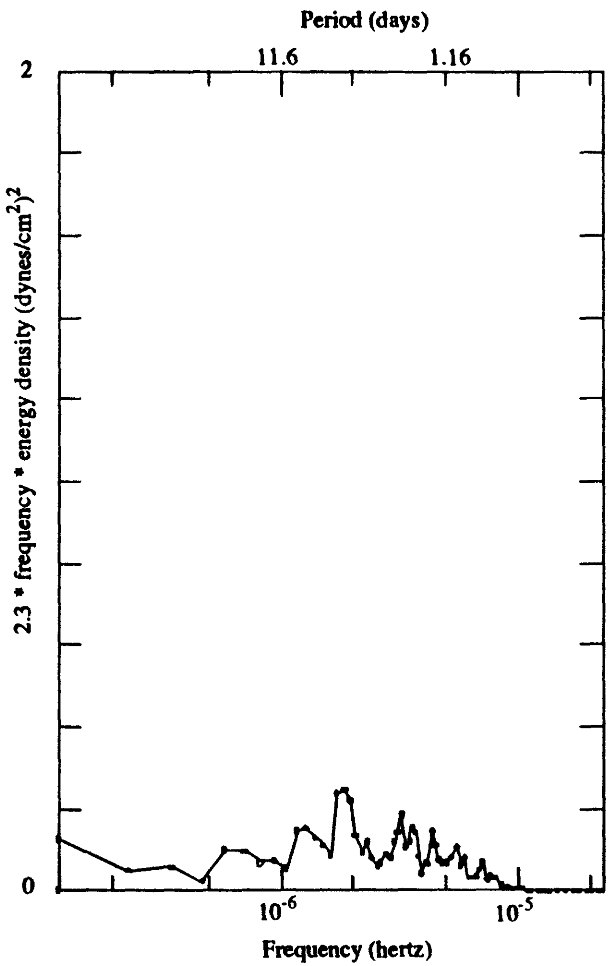
Cross-slope



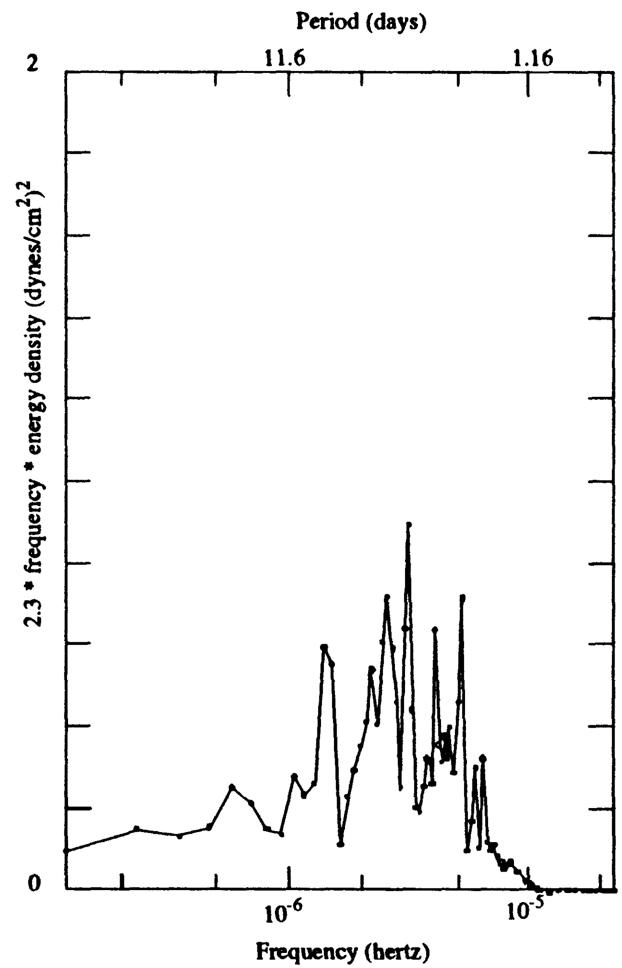
Alongslope

Variance conserving auto spectra

46026 - Gulf of the Farallones



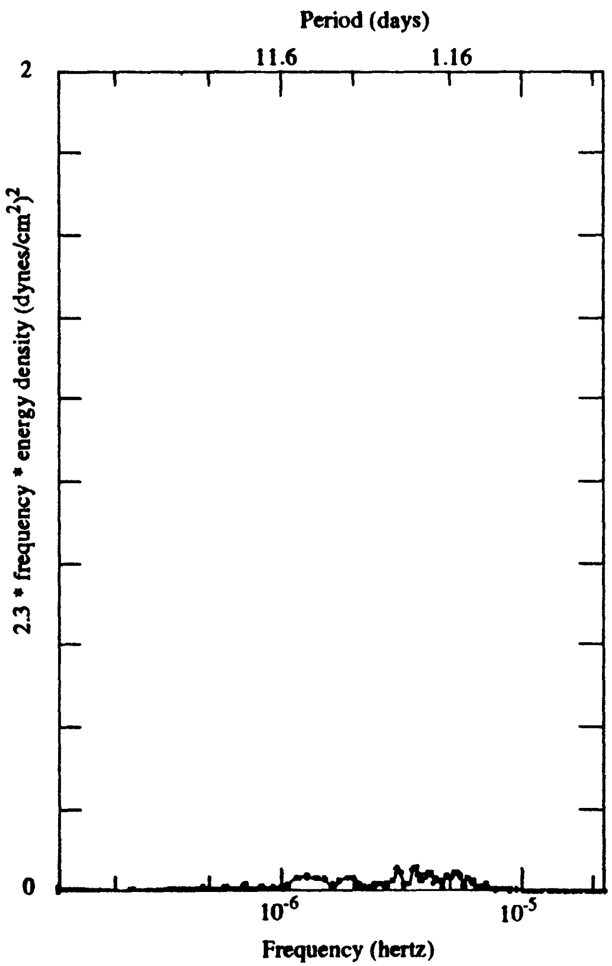
Cross-slope



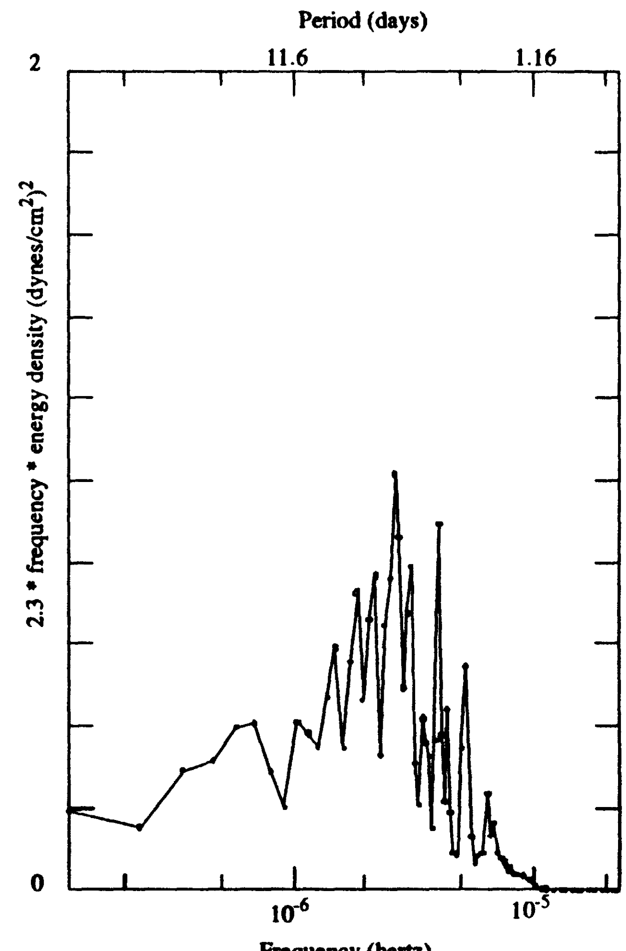
Alongslope

Variance conserving auto spectra

46042 - Monterey Bay

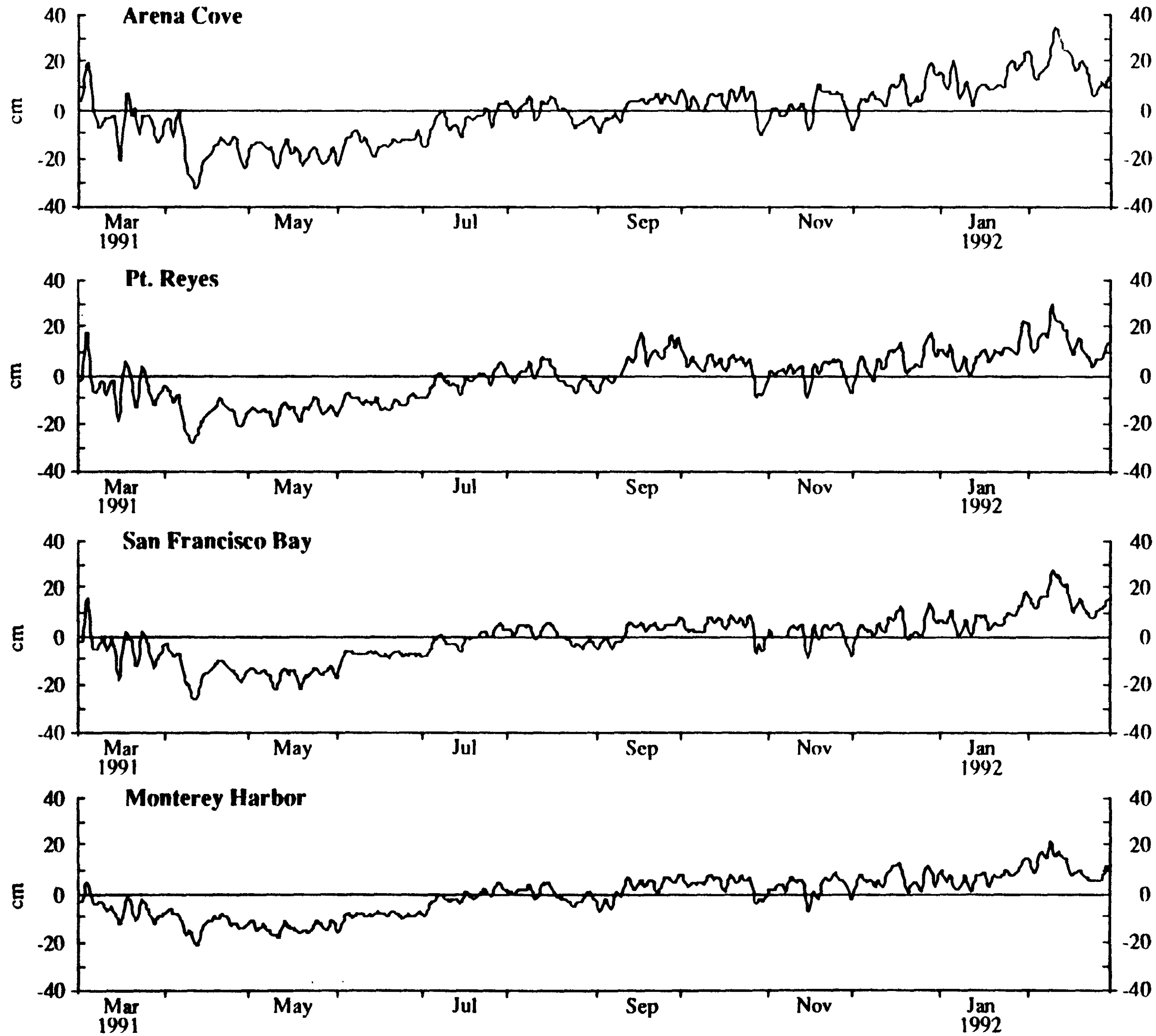


Cross-slope



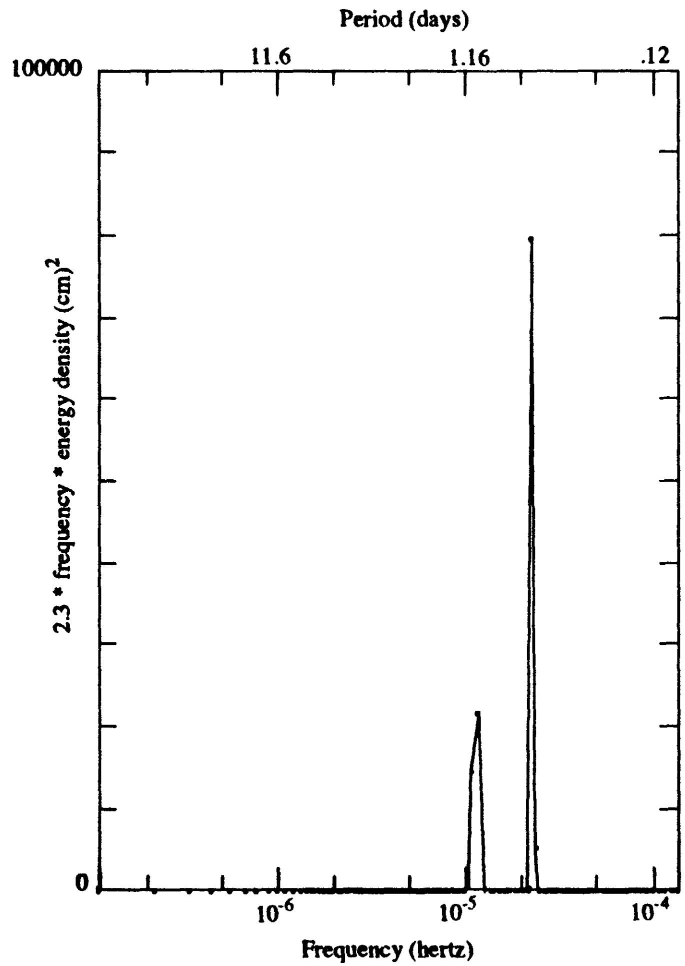
Alongslope

Variance conserving auto spectra

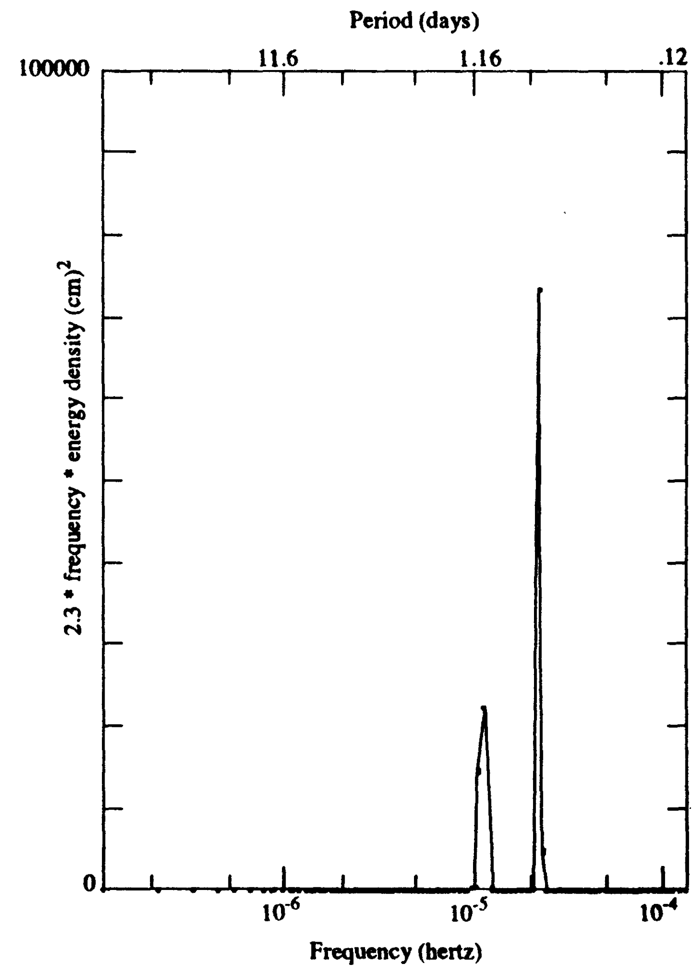


Subtidal synthetic subsurface pressure

Subtidal synthetic subsurface pressure



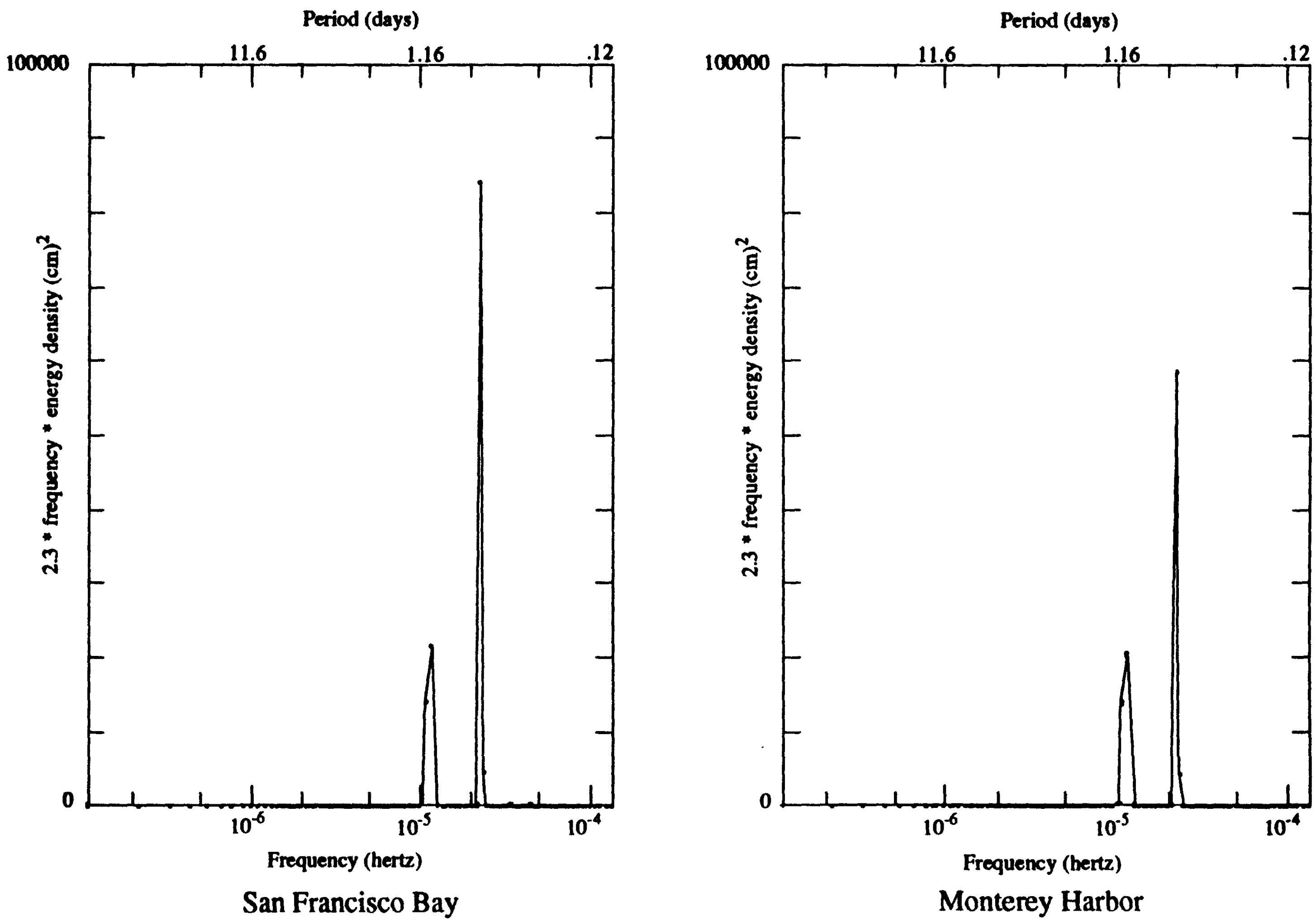
Arena Cove



Pt. Reyes

Variance conserving auto spectra

Subtidal synthetic subsurface pressure



Variance conserving auto spectra