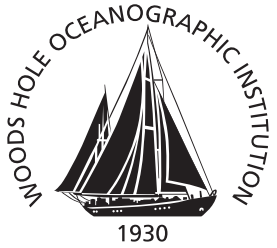
WHOI-2003-07

Woods Hole Oceanographic Institution



SecNav / CBLAST 2002 Field Experiment

Deployment / Recovery Cruises and Data Report, F/V *Nobska,* June 19-20, 2002, F/V *Nobska,* September 4 and 9, 2002, Mooring data, June 19 - September 9, 2002

by

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September 2003

Technical Report

Funding was provided by the Office of Naval Research
under Contract Numbers N00014-01-1-0029 and N00014-99-1-0090.

Upper Ocean Processes Group
Woods Hole Oceanographic Institution
Woods Hole, MA 02543
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Nelson G. Hogg, Chair

Department of Physical Oceanography

ABSTRACT

During the summer of 2002, six surface moorings and one subsurface mooring were deployed south of Martha's Vineyard, Cape Cod, Massachusetts. The moorings were deployed from June to September 2002 to collect meteorological and oceanographic data. This was done both to support the Coupled Boundary Layer Air-Sea Transfer Low wind (CBLAST-Low) cooperative experiment and to address the question of regional predictability in the littoral regime under research supported by a Secretary of the Navy/Chief of Naval Operations (CNO) Chair. The aim was to capture the mesoscale development and response of inner shelf waters to local synoptic atmospheric, tidal and larger scale oceanic forcing under predominantly low wind conditions.

This report covers the operational aspects of the 2002 experiment, including deployment, recovery, and mooring setups, as well as basic data returns.

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I. PROJECT BACKGROUND AND PURPOSE

The long-range goal of the Office of Navel Research (ONR) Coupled Boundary Layer, Air-Sea Transfer Experiment in Low to Moderate Winds (CBLAST-Low) is to understand air-sea interaction and coupled boundary layer dynamics at low to moderate wind speeds. The site chosen for the study was in the North Atlantic, south of Martha's Vineyard Island, Cape Cod, Massachusetts. To achieve the CBLAST-Low objectives, the study has been split into a collaborative effort where specialized groups of investigators concentrate their expertise and resources on specific aspects of the investigation.

Six surface moorings and one subsurface mooring were deployed in June 2002 in an along and across-shelf configuration on the inner New England continental shelf, south of Martha's Vineyard Island, MA. This was done in support of the CBLAST-Low project, and to examine regional predictability in the littoral environment under work funded by a Secretary of the Navy / Chief of Naval Operations (CNO) Chair.

The aim of the deployment was to capture the mesoscale development and response of inner shelf waters to local synoptic atmospheric, tidal and larger scale oceanic forcing under predominantly low wind conditions. Subsurface instrumentation attached to each mooring provided time series of currents, temperature and salinity at each mooring site throughout the deployments.

Data will be used to compare with the modeling efforts of the Naval Postgraduate School at Monterey who are forecasting local atmospheric conditions with the Coupled Ocean Atmosphere Prediction System (COAMPS) local atmospheric model. In addition, in-house efforts using a local mesoscale model (MM5) that is being run as part of the experiment will be compared with the observational data. These efforts are also intended to help and to improve the ongoing development of the Regional Ocean Model System (ROMS) by researchers at Rutgers University.

This report focuses on the deployments, instrumentation and mooring efforts of the Upper Ocean Processes (UOP) group of the Woods Hole Oceanographic Institution (WHOI) during the summer of 2002 in waters south of Martha's Vineyard.

Six surface buoys were deployed during this project. One was developed with support from a Secretary of the Navy / CNO chair. This buoy is referred to as the SecNav mooring, or Mooring E, and had a subsurface mooring deployed next to it. This pair of moorings was designed to provide real-time telemetry of variability over the entire water column.

The meteorological data collected included surface longwave and shortwave radiation, relative humidity, air temperature, wind speed and direction, barometric pressure, precipitation, sea surface temperature and salinity. These measurements enabled the computation of air-fluxes through the Tropical Ocean Global Atmosphere/Coupled Ocean-Atmosphere Response Experiment (TOGA–COARE) 2.6b bulk algorithms. In addition, subsurface hydrographic data, including sea temperature, conductivity, and current speed and direction, were collected throughout the water columns at all six mooring sites.

II. MOORINGS

A. Overview

The fieldwork consisted of mooring deployments in June and recoveries of moorings in September 2002. Table 1 summarizes mooring locations and deployment and recovery times. Figure 1 shows a map of the study area with depth contours and the positions of moorings deployed by UOP during the 2001 pilot study.

Table 1: Positions of 2002 moorings

Mooring	Latitude	Longitude	Deployment Date and Time (UTC)	Recovery Date and Time
A	40° 59.466' N	70° 35.397' W	June 19, 2002 6:56:30	September 4, 2002 02:13:00
B	41° 02.449' N	70° 47.615' W	June 20, 2002 18:02:30	September 3, 2002 23:03:00
C	40° 56.041' N	70° 24.216' W	June 19, 2002 05:10:00	September 4, 2002 09:13:00
D	40° 40.539' N	70° 05.530' W	June 19, 2002 1:50:00	September 4, 2002 06:19:00
E surface	41° 09.161' N	70° 36.211' W	June 20, 2002 14:45:00	September 4, 2002 11:47:00
E subsurface	41° 09.123' N	70° 36.192' W	June 20, 2002 15:15:00	September 9, 2002 18:03:00
F	41° 15.245' N	70° 35.480' W	June 20, 2002 20:10:00	September 4, 2002 14:33:00

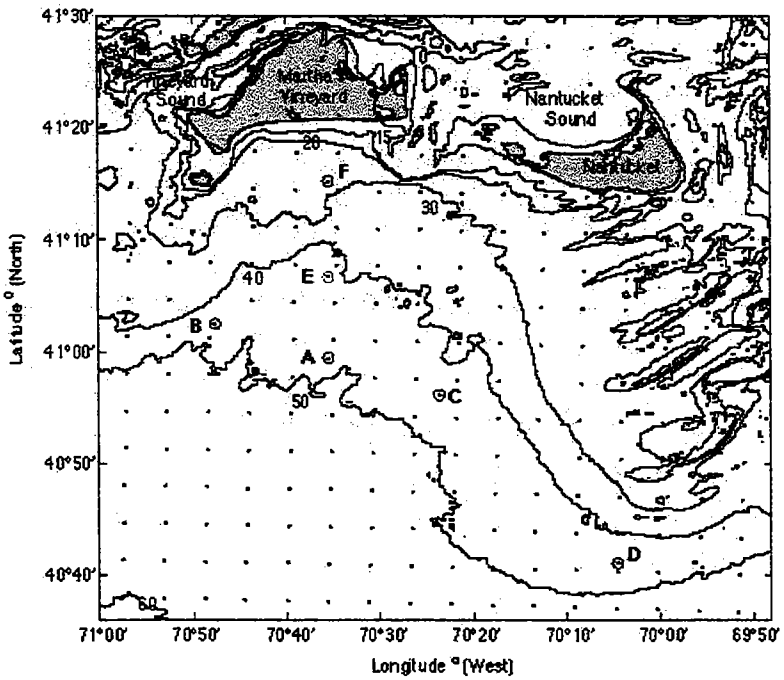


Figure 1: Positions of the six 2002 surface moorings

The ..ht systems were deployed by the Fishing Vessel (F/V) *Nobska* on June 19-20, 2002. The six surface moorings were recovered on September 4, 2002. The small subsurface mooring was recovered on September 9, 2002. Figure 2 shows several of the IMET moorings prior to deployment.

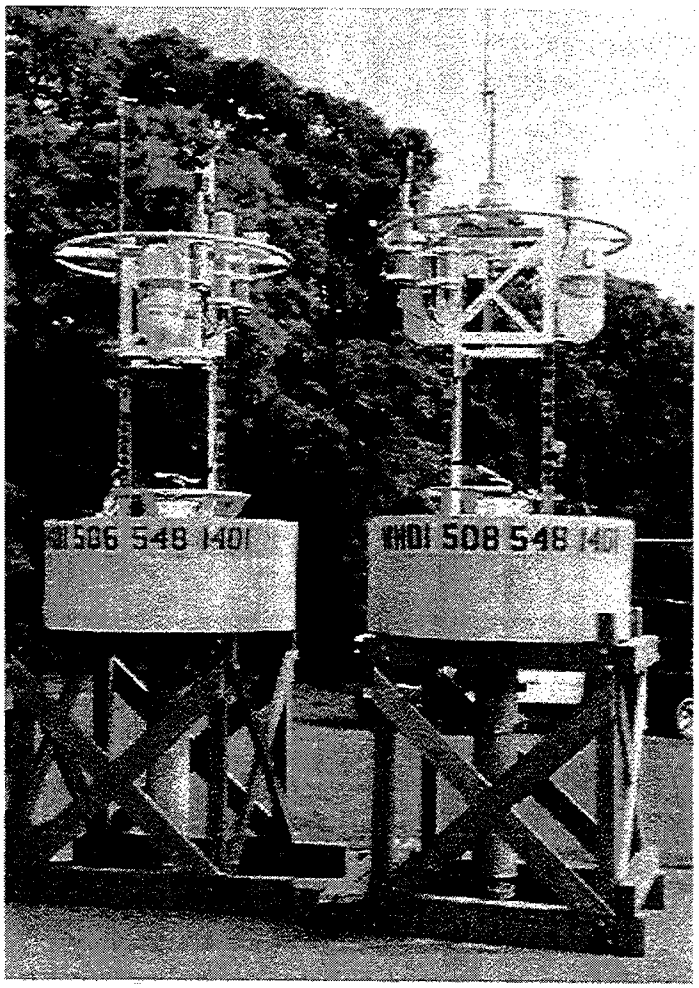


Figure 2: SecNav / CBLAST moorings in preparation for deployment in 2002

B. Surface Instrumentation

The six surface moorings were equipped with Improved METeorological (IMET) systems. A Sea-Bird Model SBE37 attached to the buoy hull provided sea surface temperature and conductivity for each mooring. Tables 2 and 3 below detail the IMET systems used in the fieldwork. Figure 3 shows a close up of the IMET systems.

Table 2: Surface instrumentation accuracies and sampling rates

Instrument	Property	Accuracy	Sampling Rate
IMET System	Relative Humidity	2%	1 minute
	Air Temperature	0.01 °C	1 minute
	Sea Surface Temperature	0.002 °C	1 minute
	Wind Speed	2%	1 minute
	Wind Direction	1°	1 minute
	Barometric Pressure	0.1 MB	1 minute
	Incoming Shortwave Radiation	2%	1 minute
	Incoming Longwave Radiation	2%	1 minute
	Precipitation	1 mm/hr	1 minute

Table 3: IMET serial numbers and instrument heights above buoy deck in centimeters shown in parentheses

Instrument	Mooring A	Mooring B	Mooring C	Mooring D	Mooring E - surface	Mooring F
Data Logger	L14	L15	L13	L12	L11	L16
Rel. Humidity	503 (209.2)	504 (161.3)	506 (161.3)	502 (169.5)	501 (118.4)	505 (161.3)
Air Temperature	503 (209.2)	504 (161.3)	506 (161.3)	502 (169.5)	501 (118.4)	505 (161.3)
Wind	345 (241.9)	347 (196.2)	348 (196.2)	344 (188.3)	343 (198.8)	346 (196.2)
Bar. Pressure	503 (205.1)	504 (155.9)	506 (155.9)	502 (137.8)	501 (62.2)	505 (155.9)
Shortwave Radiation	503 (200.3)	504 (185.7)	506 (185.7)	502 (181.8)	501 (169.5)	505 (174.9)
Longwave Radiation	503 (200)	504 (183)	506 (183)	502 (183.2)	501 (170)	505 (174)
Precipitation	503 (212.4)	955 (141.1)	953 (141.1)	502 (141)	501 (74.8)	943 (141.1)

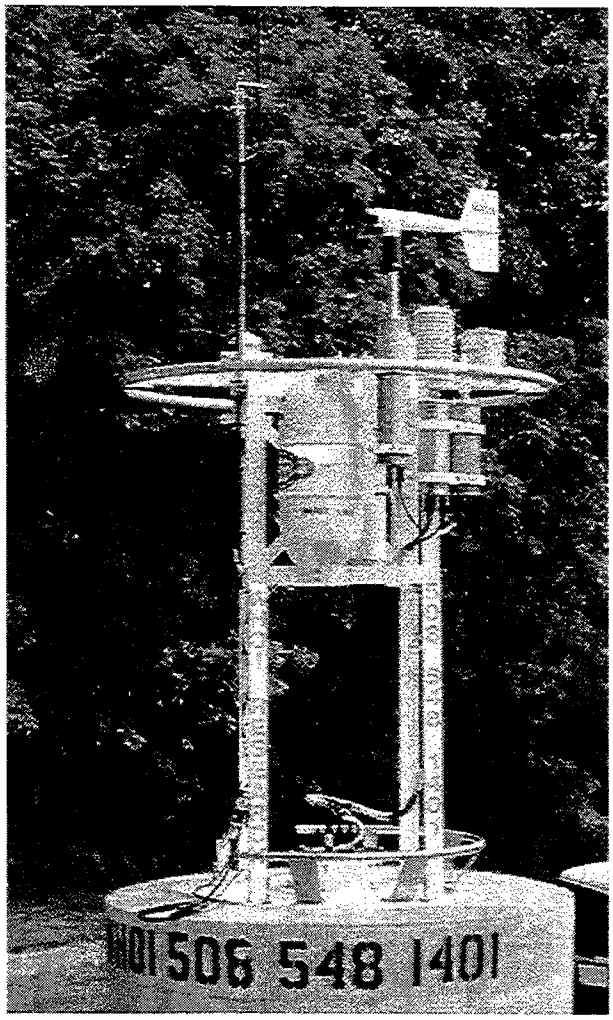


Figure 3: IMET system mounted on one of the surface buoys deployed in 2002

C. Subsurface Instrumentation

The following sections give a brief overview of the subsurface instrumentation. All subsurface instruments were attached to the mooring lines of the buoys. Following these overviews are tables detailing accuracies, sampling rates, and serial numbers (Tables 4 – 10), and mooring diagrams (Figures 4 – 10).

Sea-Bird SBE37

The MicroCat, Sea-Bird model SBE37, is a high-accuracy conductivity and temperature recorder with internal battery and memory. It is designed for long-term mooring deployments and includes a standard serial interface to communicate with a PC. Its recorded data are stored in non-volatile FLASH memory. The temperature range is -5° to +35° C, and the conductivity range is 0 to 6 Siemens/meter. The MicroCat is capable of storing 419,430 samples of

temperature, conductivity and time. The sampling interval of the SBE37's was two minutes. The shallowest SBE37's were mounted beneath the buoy and wired to the IMET systems. These were equipped with RS-485 interfaces. The deeper instruments were mounted on in-line tension bars and deployed at various depths throughout the moorings. The conductivity cell is protected from bio-fouling by the placement of antifoulant cylinders at each end of the conductivity cell tube.

Sea-Bird SBE39

The Sea-Bird model SBE39 is a small, lightweight, durable and reliable temperature logger with a temperature range of –5 to 35° C. These instruments can communicate directly with a computer through a standard RS-232 interface and store data in non-volatile FLASH memory. The SBE39's were set to a sampling rate of one minute.

Brancker Temperature Recorders

The Brancker temperature recorders are self-recording, single-point temperature loggers. The operating temperature range for this instrument is –20 to 50° C. It has an internal battery and logging. A PC is used to communicate with the Brancker via serial cable for instrument set-up and data download. The Branckers were set to record data every 7.5 minutes.

FSI 3D Acoustic Current Meter

The 3D ACM is an acoustic current meter on trial deployment from Falmouth Scientific Instruments (FSI), Inc. The FSI current meter uses four perpendicularly oriented transducers to extract single-point measurements. In addition to current values of north, east and up, the instrument also records temperature, tilt, direction and time. The instrument was set to record once every 10 minutes.

Nortek Aquadopp

The Nortek Aquadopp Open Water Current Meter measures current velocity and direction, as well as temperature, tilt, and pressure. The Aquadopp can be set up through a Windows program and was set to sample every five minutes on Moorings A and B, and every 10 minutes on Moorings C and F.

RDI Workhorse Sentinel

Two RD Instruments (RDI) Workhorse Sentinel Acoustic Doppler Current Profilers (ADCP) were used. The RDI ADCP measures a profile of horizontal current velocities. The RDI was programmed to sample every five minutes on Mooring A and every 10 minutes on Mooring D.

Sontek Argonaut MD

The Sontek Argonaut uses Doppler technology to measure current speed and direction, as well as temperature, tilt, and pressure. The Sontek supports RS232, RS422, and RS385 communications and has 2 MB of internal memory. These instruments were set to sample every 5 minutes.

Vector Measuring Current Meters

The Vector Measuring Current Meter (VMCM) has two orthogonal cosine response propeller sensors that measure the components of horizontal current velocity parallel to the axles of the two-propeller sensors. The orientation of the instrument, relative to magnetic north, is determined by a flux gate compass. East and north components of velocity were computed continuously, averaged and then stored on cassette magnetic tape. Temperature was also recorded using a thermistor mounted in a fast-response pod, which was mounted on the top end cap of the VMCM. The VMCMs were set to record every 3.75 minutes.

Table 4: Subsurface instrument accuracies and sampling rates

Instrument	Property	Accuracy	Sampling Rate
Sea-Bird SBE37	Temperature Conductivity	0.002 ° C 0.0003 S/m	2 minute
Sea-Bird SBE39	Temperature	0.002	1 minute
Brancker XL-200 Brancker XL-100 Brancker XX-105	Temperature Temperature Temperature	0.01° C 0.01 °C 0.01° C	7.5 minute 7.5 minute 7.5 minute
FSI 3D-ACM	Temperature Current Speed Current Direction	0.05° C 2% 2°	10 minute
Nortek Aquadopp	Temperature Current Speed Current Direction	0.2° C 1% ± 0.5 cm/s 2°	5 minute – Moorings A and B 10 minute – Moorings C and F
RDI Workhorse Sentinel	Temperature Current Speed Current Direction	0.4° C 0.5% ± 0.5cm/s 2°	5 minute – Mooring A 10 minute – Mooring D
Sontek Argonaut MD	Temperature Current Speed Current Direction	0.1° C 1% ± 0.5 cm/s 2°	5 minute
VMCM EG&G Models	Temperature Current Speed Current Direction	0.0055° C 0.9 cm/s 5°	3.75 minute

Table 5: Mooring A - subsurface instrumentation

Mooring A		
Depth (meters)	Inst. Type	Serial Number
0.55	SBE37	1839
2.4	VMCM	13
4	SBE37	1325
4.9	SBE39	696
6.6	RDI-600	1825
7.5	VMCM	19
10	SBE37	1906
11	Nortek 2 MHz	357
12	SBE37	2381
13	SBE39	691
14.5	SBE39	687
16	SBE37	2366
17.5	SBE39	35
18.5	SBE39	38
20	SBE37	2043
22	SBE39	40
24	SBE37	2045
26	SBE39	79
28	SBE37	2044
30	TPOD	5466
32	SBE37	2047
40	SBE37	1912

Table 6: Mooring B - subsurface instrumentation

Mooring B		
Depth (meters)	Inst. Type	Serial Number
0.55	SBE37	1838
2.07	SBE39	819
3	SBE39	789
4	SBE37	1304
5	VMCM	22
7	SBE39	821
7.75	SBE37	9
9.5	SBE39	694
11	SBE39	692
12	SBE37	2046
13	SBE39	101
14.5	SBE39	47
16	SBE37	2364
17	NK-2MHz	402
17.5	SBE39	342
18.5	SBE39	332
20	SBE37	1650
22	TPOD	3307
22.5	FSI	1469
24	SBE37	1637
26	TPOD	3294
28	SBE37	1640
30	TPOD	3310
32	SBE37	1638
40	SBE37	1913

Table 7: Mooring C - subsurface instrumentation

Mooring C		
Depth (meters)	Inst. Type	Serial Number
0.55	SBE37	1419
2.1	SBE39	690
2.93	SBE39	820
3.93	SBE37	11
4.95	VMCM	33
8	SBE37	1907
9.6	FSI	1467
11	SBE39	693
12	SBE37	1651
13	SBE39	688
14.5	SBE39	42
16	SBE37	1648
17.5	SBE39	51
18.5	SBE39	341
20	SBE37	1642
22	SBE39	333
23	NK-1MHz	253
24	SBE37	1643
26	TPOD	4487
30	TPOD	3270
40	SBE37	670

Table 8: Mooring D - subsurface instrumentation

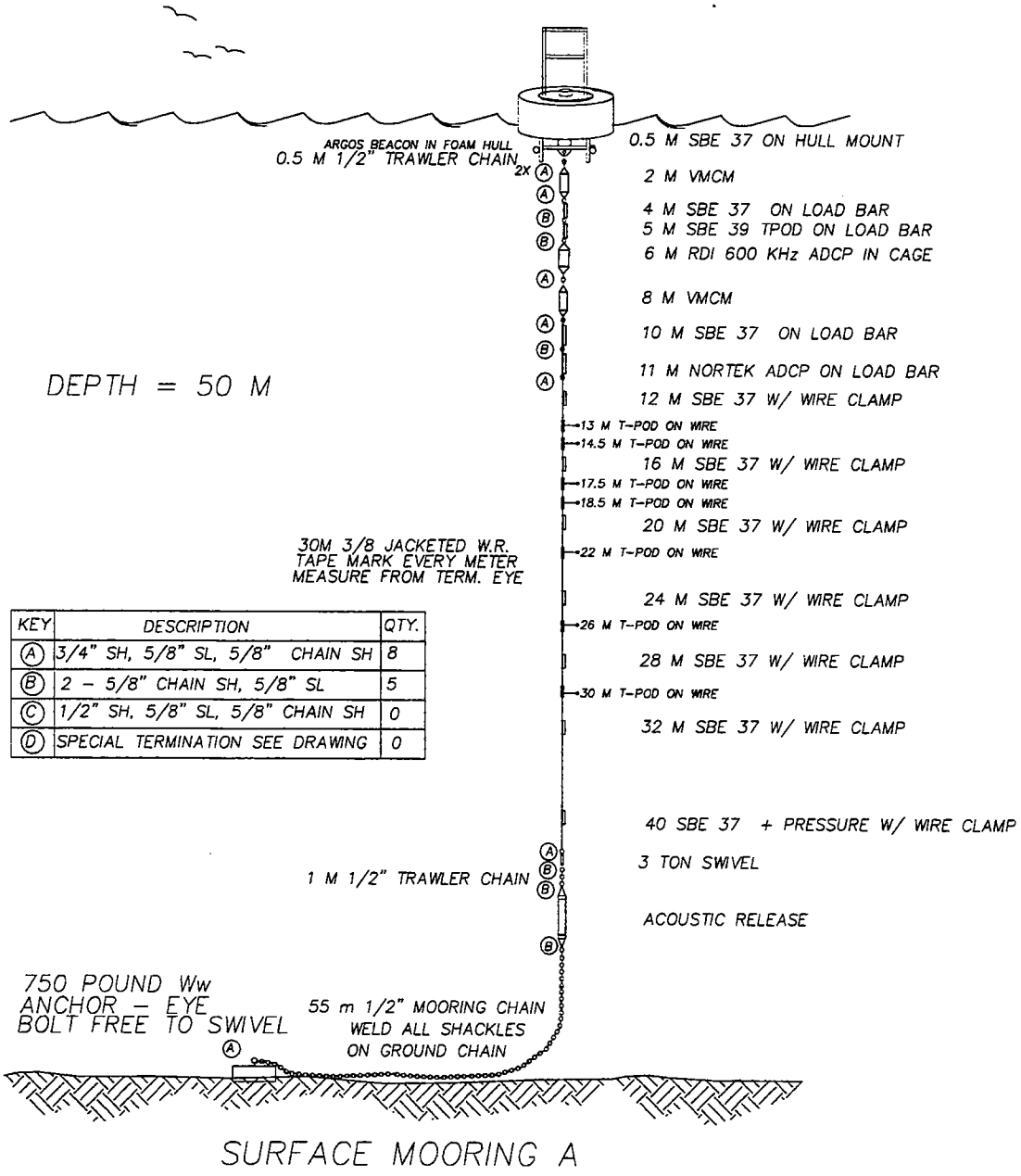
Mooring D		
Depth (meters)	Inst. Type	Serial Number
0.55	SBE37	1835
2.6	RDI-300	100
3.95	SBE39	701
4.4	SBE37	10
5.16	SBE39	653
6.56	SBE39	689
8.15	VMCM	43
10.5	SBE37	1901
11.5	SBE39	721
12	SBE37	1641
13	SBE39	46
14.5	SBE39	45
16	SBE37	1645
17.5	SBE39	340
18.5	SBE39	336
20	SBE37	1649
22	TPOD	3706
24	SBE37	1644
26	TPOD	5458
28	SBE37	686
30	TPOD	3299
40	SBE37	683

Table 9: Mooring E - subsurface instrumentation

Mooring E		
Depth (meters)	Inst. Type	Serial Number
0.45	SBE37	1841
2	SBE39	700
3	SBE39	695
3.5	SONTEK	1902
4	SBE37	D208
6	SBE37	685
6.5	A-BETA	626
7	SBE39	720
8	SBE 39	685
9	TPOD	3312
9.5	SBE39	102
11	SBE39	54
12	SBE37	1903
13	SBE39	339
14	SONTEK	D197
14.5	SBE39	337
15	TPOD	5463
15.5	A-BETA	625
16.5	SBE37	1905
17.5	SBE39	334
18.5	TPOD	3713
20	SBE37	669
22	TPOD	3282
23	SONTEK	D193
26	TPOD	3276
27	TPOD	5457
28	SBE37	671
30	TPOD	3302
Subsurface Mooring		
32	TPOD	3508
33	TPOD	5463
34	TPOD	3714
35	SBE39	103
36	SBE37	1900
37	SONTEK	D171
37.5	SBE39	203
39	SBE37	1909

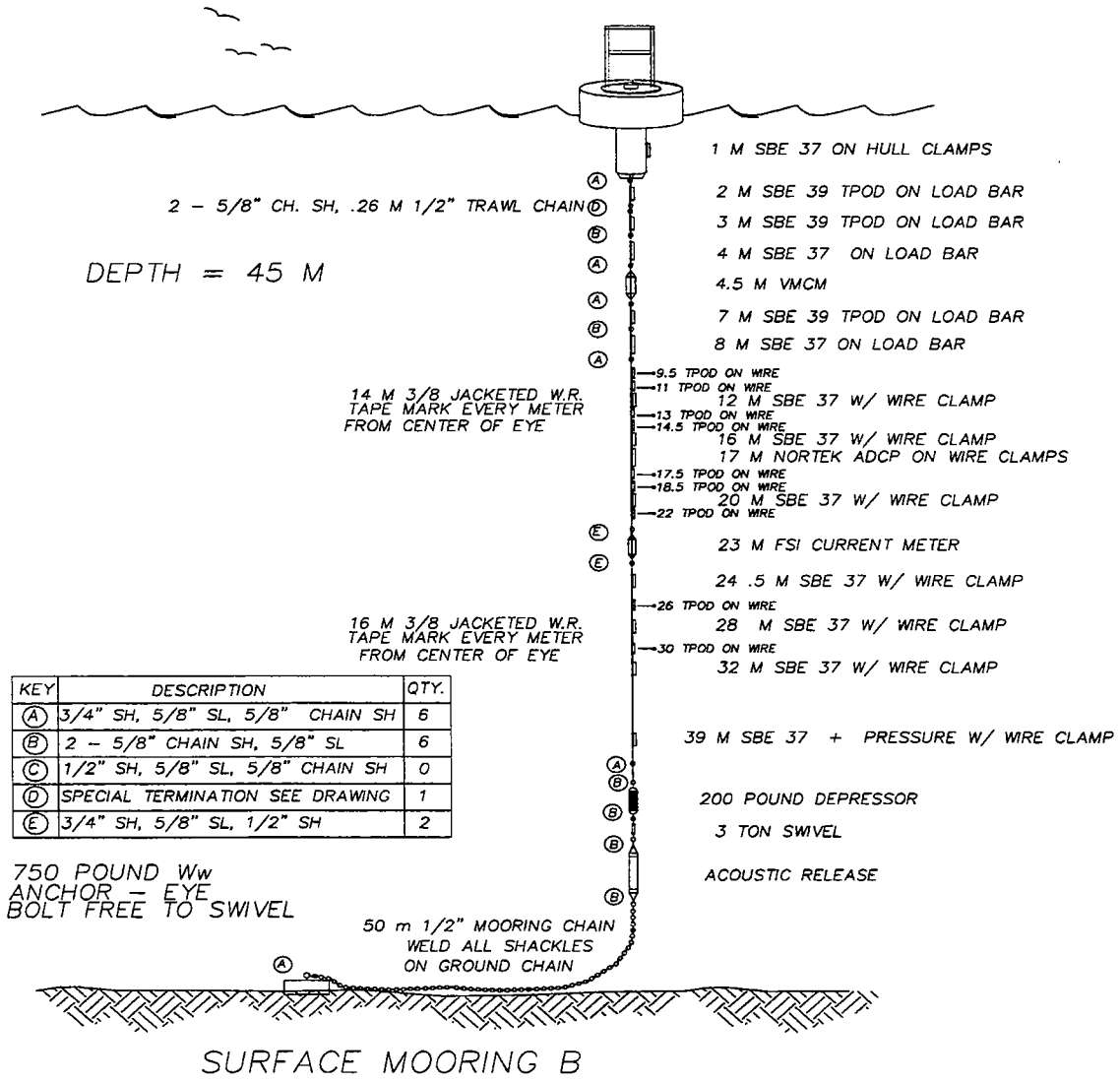
Table 10: Mooring F - subsurface instrumentation

Mooring F		
Depth (meters)	Inst. Type	Serial Number
0.55	SBE37	1840
2.5	SBE37	1908
4	VMCM	53
6	SBE39	719
7	SBE39	41
8	SBE37	2015
9.5	SBE39	39
10.5	SBE39	78
12	SBE37	1760
13	SBE39	53
14.5	TPOD	3277
16	NK-1MHz	333
16.5	SBE37	2011
17.5	TPOD	3304
18.5	TPOD	3281
20	SBE37	1899
22	SBE37	684



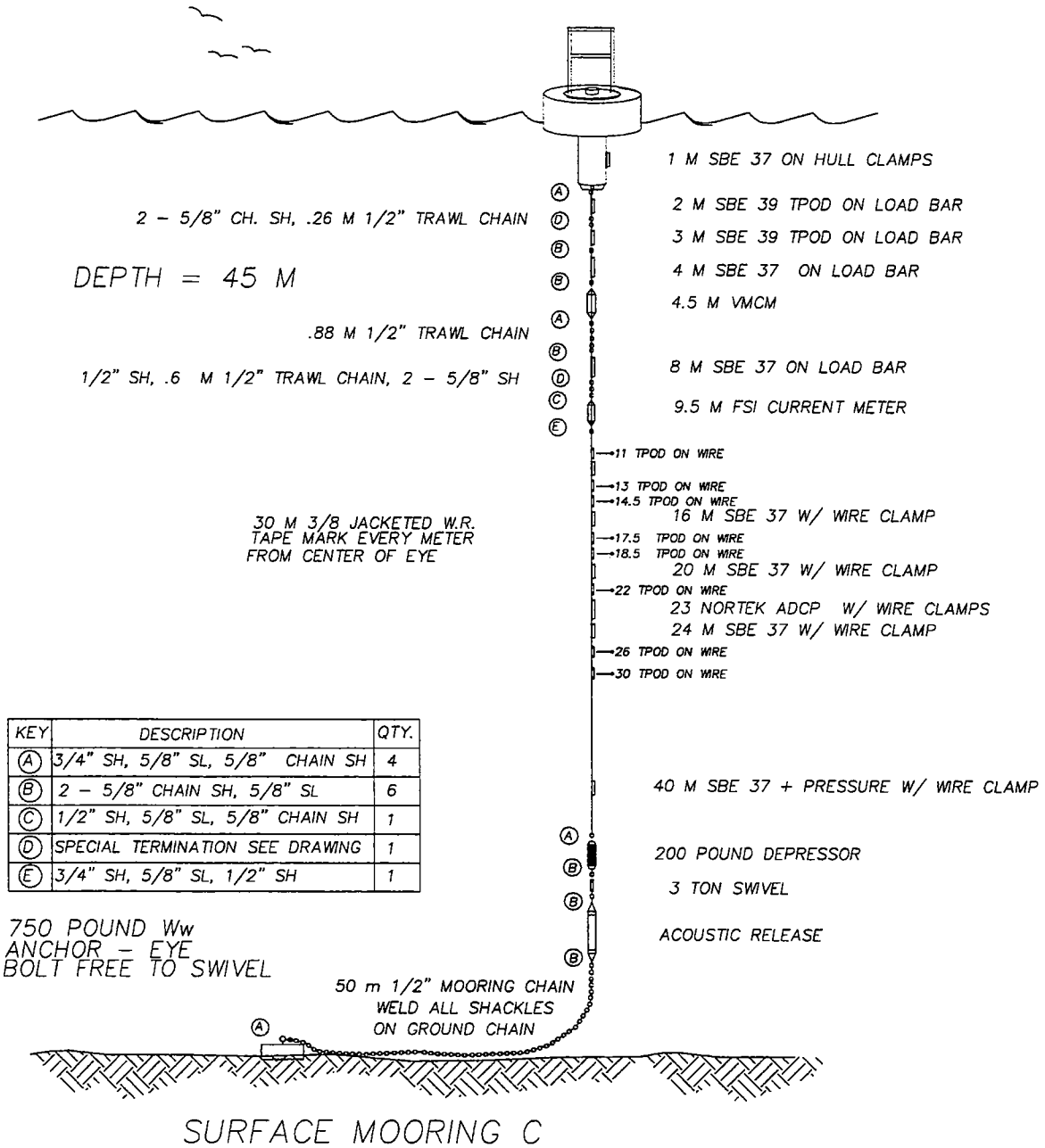
KEY	DESCRIPTION	QTY.
A	3/4" SH, 5/8" SL, 5/8" CHAIN SH	8
B	2 - 5/8" CHAIN SH, 5/8" SL	5
C	1/2" SH, 5/8" SL, 5/8" CHAIN SH	0
D	SPECIAL TERMINATION SEE DRAWING	0

Figure 4: Surface Mooring A diagram



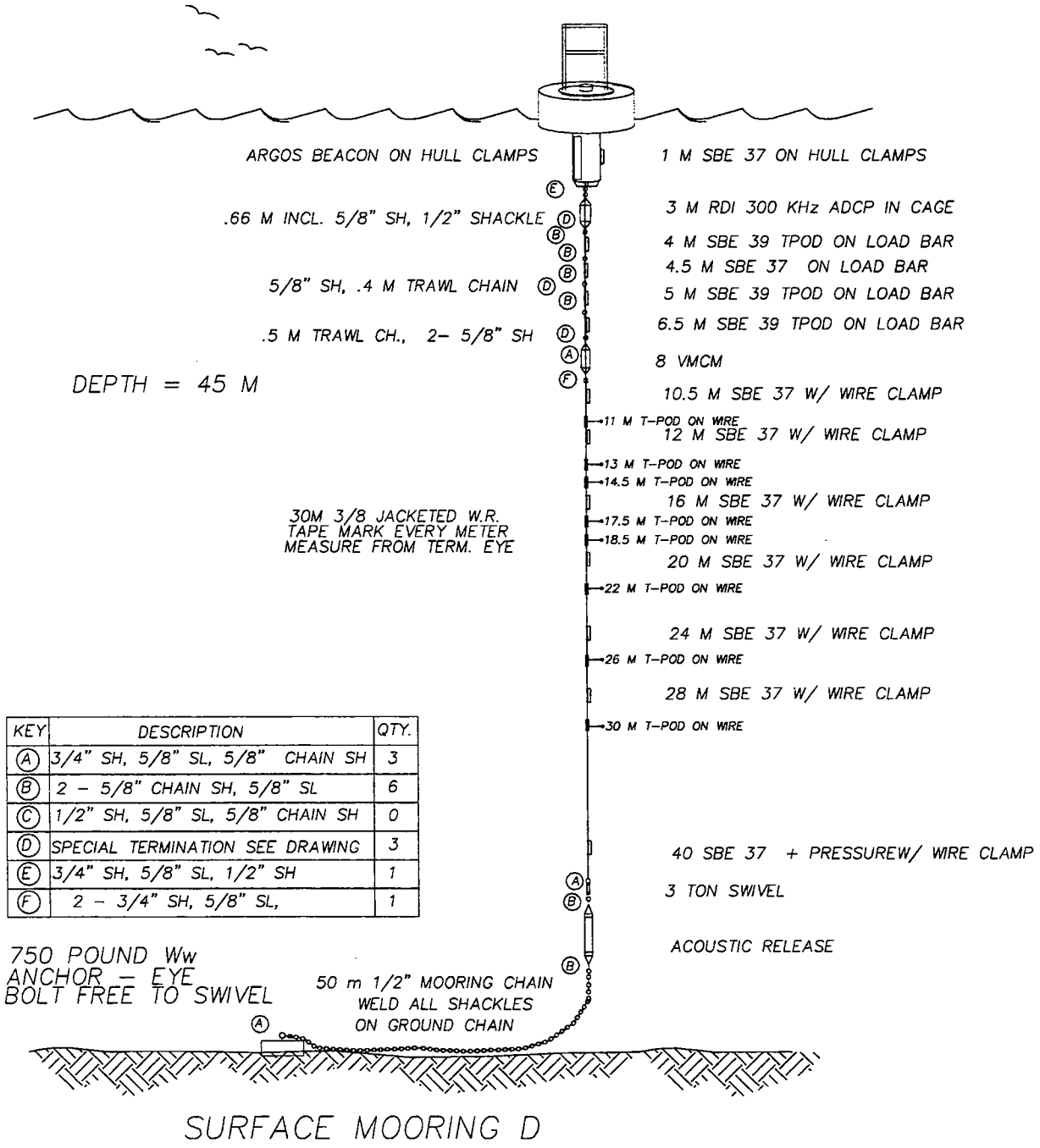
KEY	DESCRIPTION	QTY.
A	3/4" SH, 5/8" SL, 5/8" CHAIN SH	6
B	2 - 5/8" CHAIN SH, 5/8" SL	6
C	1/2" SH, 5/8" SL, 5/8" CHAIN SH	0
D	SPECIAL TERMINATION SEE DRAWING	1
E	3/4" SH, 5/8" SL, 1/2" SH	2

Figure 5: Surface Mooring B diagram



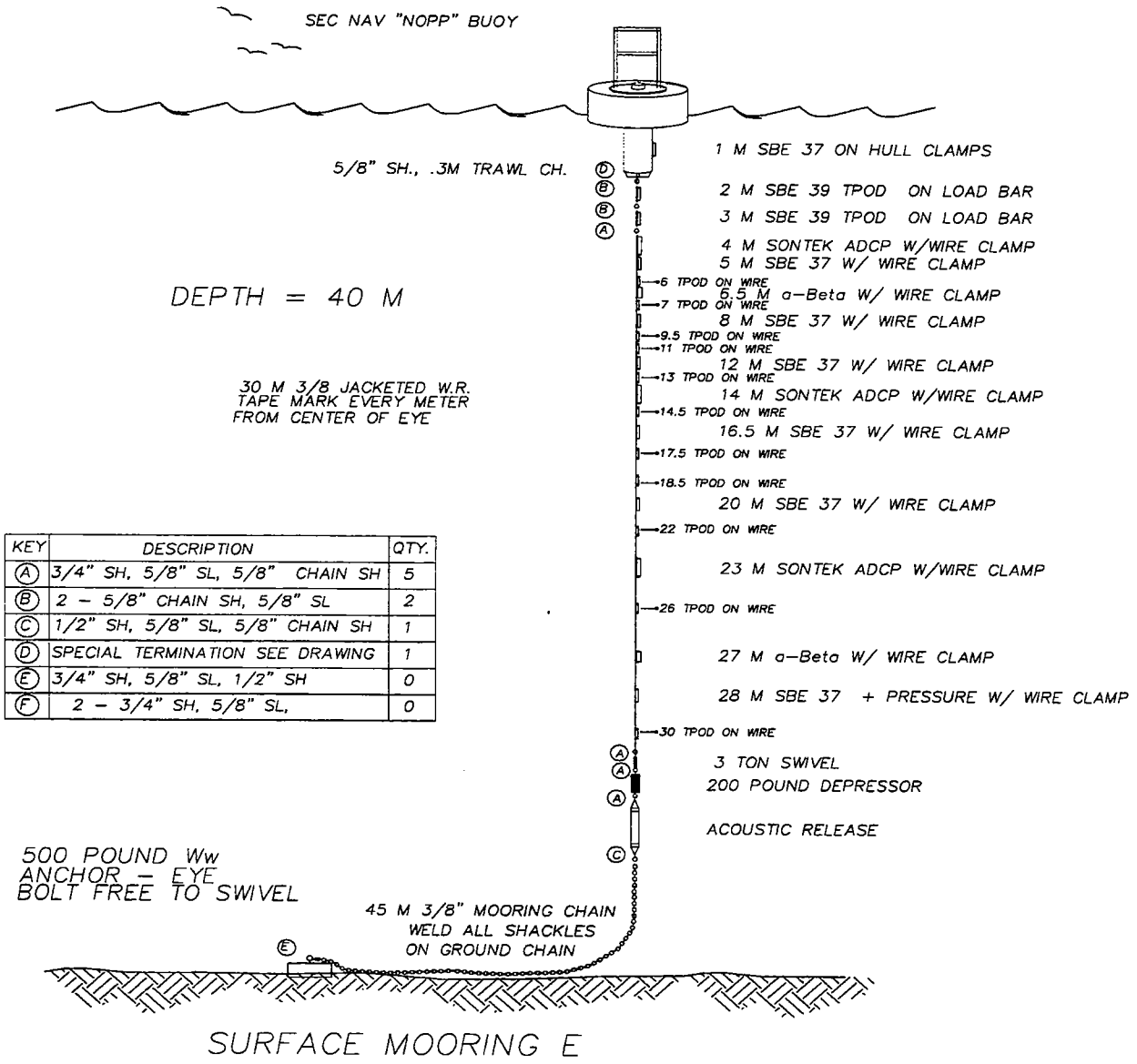
KEY	DESCRIPTION	QTY.
A	3/4" SH, 5/8" SL, 5/8" CHAIN SH	4
B	2 - 5/8" CHAIN SH, 5/8" SL	6
C	1/2" SH, 5/8" SL, 5/8" CHAIN SH	1
D	SPECIAL TERMINATION SEE DRAWING	1
E	3/4" SH, 5/8" SL, 1/2" SH	1

Figure 6: Surface Mooring C diagram



KEY	DESCRIPTION	QTY.
A	3/4" SH, 5/8" SL, 5/8" CHAIN SH	3
B	2 - 5/8" CHAIN SH, 5/8" SL	6
C	1/2" SH, 5/8" SL, 5/8" CHAIN SH	0
D	SPECIAL TERMINATION SEE DRAWING	3
E	3/4" SH, 5/8" SL, 1/2" SH	1
F	2 - 3/4" SH, 5/8" SL,	1

Figure 7: Surface Mooring D diagram



KEY	DESCRIPTION	QTY.
A	3/4" SH, 5/8" SL, 5/8" CHAIN SH	5
B	2 - 5/8" CHAIN SH, 5/8" SL	2
C	1/2" SH, 5/8" SL, 5/8" CHAIN SH	1
D	SPECIAL TERMINATION SEE DRAWING	1
E	3/4" SH, 5/8" SL, 1/2" SH	0
F	2 - 3/4" SH, 5/8" SL,	0

Figure 8: Surface mooring E diagram

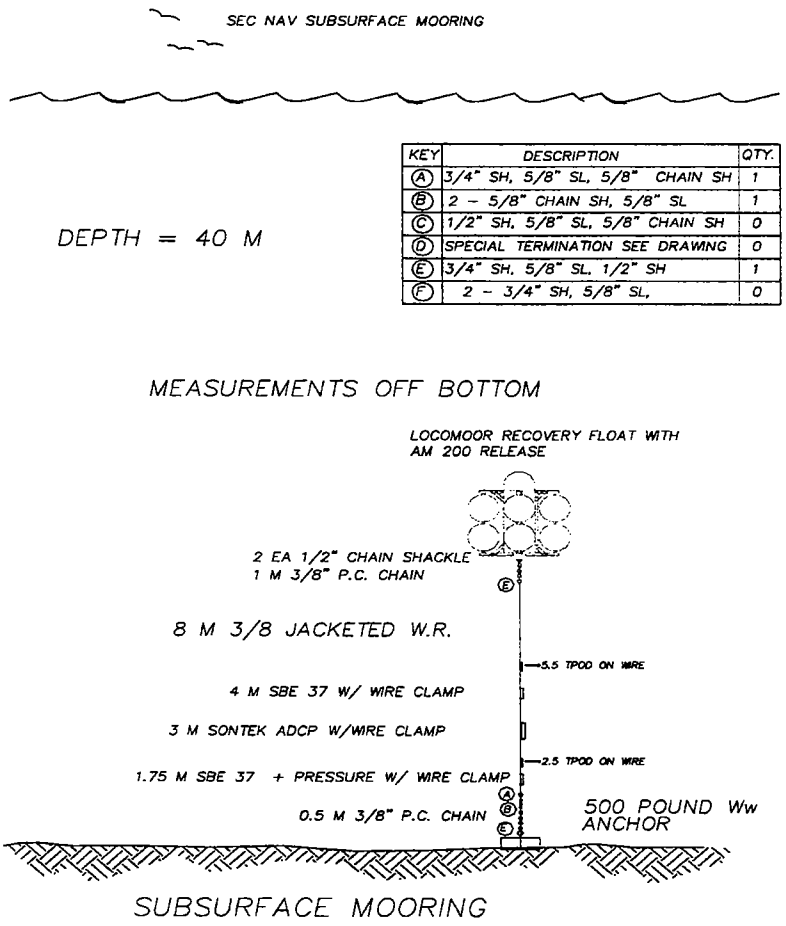
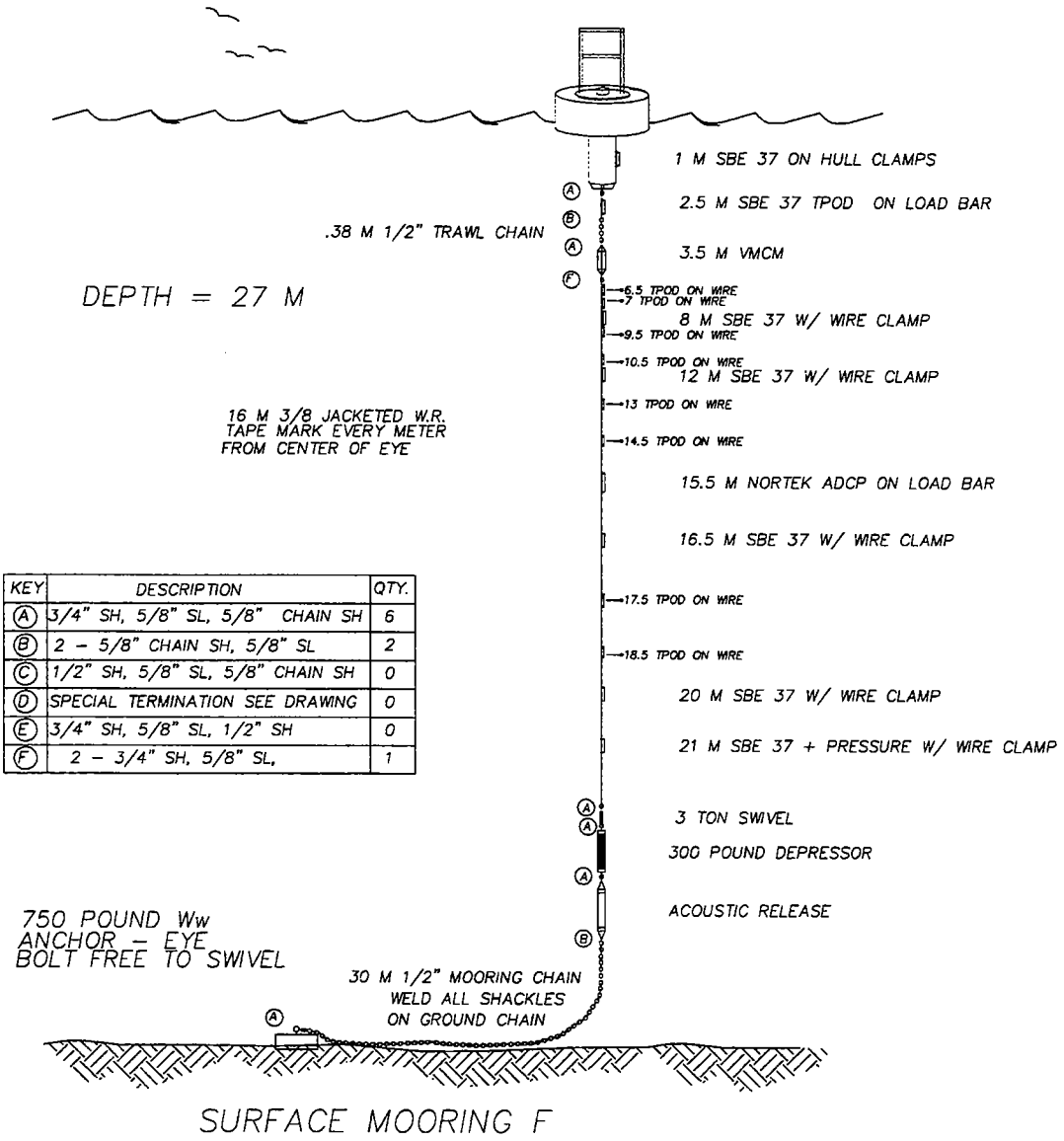


Figure 9: Subsurface Mooring E diagram



KEY	DESCRIPTION	QTY.
A	3/4" SH, 5/8" SL, 5/8" CHAIN SH	6
B	2 – 5/8" CHAIN SH, 5/8" SL	2
C	1/2" SH, 5/8" SL, 5/8" CHAIN SH	0
D	SPECIAL TERMINATION SEE DRAWING	0
E	3/4" SH, 5/8" SL, 1/2" SH	0
F	2 – 3/4" SH, 5/8" SL,	1

Figure 10: Surface Mooring F diagram

D. Recovery and Deployment

The surface moorings used segments of 1/2" trawl chain in the top portion of the mooring. Instruments were installed in cages or mounted on load carrying "tension bars" between sections of chain. A shot of 3/8" jacketed wire rope was attached below the chain, and in most cases, the remaining instruments were clamped to the wire.

The instrumented mooring wire was connected to a Benthos acoustic release about 5 meters from the seabed. A ground line of 1/2" proof coil chain connected the acoustic release to the anchor.

The subsurface mooring, instrumented to within 1.5 meters of the seabed, had a simple design. A float, with a self-contained recovery line, was at the top of the mooring. Eight meters of 3/8" jacketed wire rope held the instruments. A short shot of 3/8" proof coil chain secured the mooring wire to the anchor. The recovery line was released by an Edgetech AM 200 acoustic release.

Mooring Design

Once water depth and instrument allocation had been established, mooring designs were checked using the *WHOI Cable* (Gobat 2000) computer program to simulate the static and dynamic loads on each mooring. Worst-case environmental conditions were used in the simulation to insure the survival of the instrument array (Table 11).

Several of the surface moorings had current meters sensitive to tilt. Mooring simulations run on WHOI Cable showed a need for depressor weights to be added on four of the six surface moorings. The weights varied between 200-300 pounds, and were installed between the instrumented mooring wire and the acoustic release.

Table 11: Environmental parameters used for mooring design

	Average	Worst Case
Current	0.5 meter per second	1 meter per second
Wave Height	1.2 meters	3.6 meters
Period	7 seconds	9 seconds
Wind	5 meters per second	15 meters per second

The small surface buoys were instrumented very heavily, and it was agreed that they might not survive a hurricane. Contingency plans were made to recover the buoys early if severe weather was forecast during the study period.

Mooring Operations

The F/V *Nobska* was used to deploy and recover all of the moorings. On June 18, after three complete surface moorings with instrumentation were loaded onboard, the F/V *Nobska* proceeded to mooring site D for the first deployment.

Preparation for deployment included mounting instruments onto the 3/8" jacketed mooring wire. Installation of instruments prior to deployment significantly reduced ship time required at each site.

The deployment procedure started by attaching the top of the mooring wire to the bottom most instrument in the near-surface instrument/chain cluster. The lower end of the wire was passed around the stern of the vessel and attached to a depressor weight, or directly to the acoustic release. The mooring chain was wound on a net drum and attached to the bottom end of the acoustic release. The anchor was positioned close to the fish ramp and tied in place.

The lowest instrument on a cage or tension bar was lifted from the deck with the ship's jib crane; it was lowered over the side with the upper portion attached to the mooring wire. The cage, or tension bar, was lowered to the rail and stopped off with another line so the crane could be freed to pick another instrument. Moving up toward the surface, each instrument was raised from the deck with the ship's crane, attached to the instrument or section of chain directly below it on the mooring, and then lowered down and stopped off at the rail. As this procedure continued, the instrumented mooring wire was lowered into the water by increments corresponding with those being lowered by the crane. This created a large U-shape of instruments and mooring wire going into the water and coming back to the surface near the stern.

The top-most two meters of instruments and chain were attached to the buoy and the rest of the mooring stopped off at the rail. The next step was to rig the buoy to go over the side. A quick release hook was attached to the buoy hull, and slip lines were rigged on the hull and tower. Tie straps were removed, so the crane and the slip lines held the buoy. The buoy was then lifted over the rail. The load from the hanging instruments was transferred to the bottom of the buoy, and the buoy was lowered into the water.

As the buoy settled into the water, the slip lines were pulled away, and the quick release freed the buoy from the ships crane. As the ship moved ahead, the mooring wire with instruments was paid out by hand. The buoy drifted around to the stern and was towed out straight behind the ship.

Next, the depressor weight and acoustic release were slipped down the fish chute into the water, and chain was spooled off the net drum. Near the end of the chain, the mooring was stopped off. The remaining chain was spooled off the drum and attached to the anchor. The anchor was positioned in the fish chute and held in place with a slip line. As the ship approached the deployment site, the ocean depth was confirmed and the anchor was released. The entire sequence lasted approximately twenty minutes.

Before departing the site, the F/V *Nobska* passed by the buoy to check that it was sitting properly in the water and that all systems were intact. The F/V *Nobska* then proceeded to sites C and A to deploy those buoys using the same procedure outlined above. With three moorings in the water, the vessel steamed back to Woods Hole to pick up three more buoys, the subsurface mooring and the bottom-mounted ADCP sled.

Mooring E had the smallest surface float and the lightest load of instruments. It was the first buoy deployed on the second leg of buoy deployments. Buoy E was also part of an array of current meters that included the buoy, the subsurface mooring and an ADCP sled. The subsurface buoy was easily deployed. First, all the mooring components and instruments were connected. Then, the entire mooring was slid down the fish chute float first. The anchor was held back until the ship was positioned over the target deployment site and then released.

As soon as this array of instruments was deployed the F/V *Nobska* steamed to sites B and F to deploy the last two buoys. All the deployments went as planned with no problems or surprises.

All surface moorings transmitted data from the ASIMET systems via Service Argos. A web page was set up on a WHOI server to monitor the environmental data and to check the buoys' locations. In mid-August, the transmitter on buoy E failed. A small boat went to the buoy and attached a stand-alone position transmitter to the tower. This system would only transmit position data for the remainder of the program.

On September 3, 2002, the F/V *Nobska* loaded buoy recovery gear at the Woods Hole dock and proceeded to the study area to begin the recovery of all the moorings deployed in June. The first mooring to be recovered was mooring B. The F/V *Nobska* arrived at 9:30 pm local time (LT). Although it was dark, the weather was not bad, and a decision was made to begin the recovery effort rather than wait for daylight. Since the weather was good, the recovery commenced without firing the acoustic release to remove the anchor from the rest of the mooring.

The mooring recovery is straightforward and not much different from the deployment. The boat maneuvered up close to the buoy, and the buoy was grabbed using a hook attached to a lifting pendant. The pendant was hooked to the jib crane, and the buoy was lifted out of the water. With the buoy still in the air, a stopper line was attached to a section of chain or hardware below the buoy. The load of the mooring was then transferred to the stopper line as the buoy was lowered to the deck. The shackle connecting the buoy to the instrument cluster was then removed.

Sections of the instrument cluster were lifted with the crane, stopped off, lowered to the deck and removed from the mooring line. Once all of the instruments connected by tension bars, chain, and cages were removed from the mooring, the 3/8" mooring wire was attached to a recovery line on a trawl winch. The stopper line was slowly released to transfer the load to the trawl winch and gallows block. The wire was slowly spooled onto the winch. Each time an instrument approached the block, the winch stopped, and the instrument was removed from the wire. This stop-and-go procedure continued until all the instruments were removed from the wire. At this point the depressor weight or acoustic release was pulled up tight on the block and the jib crane was attached to the mooring to pull these components aboard. The mooring was stopped off, the release and depressor removed, and the mooring wire attached to the ground chain. The trawl winch wound the chain up until the anchor was pulled up tight to the gallows block. Again, the jib crane was used to ease the anchor over the side and onto the deck.

The remaining surface buoys were recovered in the same fashion. All the anchors and ground chain were recovered. After recovering buoys B, A, D, C, and E an attempt was made to recover the subsurface mooring. The deck gear transducer was lowered into the water and the release command was issued. The release failed to operate. The F/V *Nobska* moved around the site of the subsurface mooring and several attempts to fire the release were unsuccessful. A decision was made to recover the ADCP sled and buoy F before spending any more time trying to locate the subsurface mooring. There was some speculation that it may have been hauled away by some fishing activities, but after a short survey using the fish finder to look for the floats, it was believed to be still in its original location; the release had just failed.

The F/V *Nobska* returned to Woods Hole and tied up for the night. All buoys, instrumentation and deck equipment were unloaded on September 5. Plans were immediately made to bring divers out to attach a recovery line to the subsurface float located at 30 meters depth.

On September 9, two divers went on the F/V *Nobska* to recover the subsurface mooring. The divers were unsuccessful in locating the subsurface float because currents were much stronger

than anticipated. At this point, the only other alternative was to drag for the mooring and risk losing or damaging some of the instrumentation. However, this turned out to be an easy process, and the subsurface mooring was recovered with all instruments intact. After all the other equipment was unloaded at WHOI and cleanup was under way, the AM 200 release on the subsurface mooring was test fired. The release functioned on the first try.

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III. RESULTS

A. Overview

Throughout the field experiment, several Quality Assurance/Quality Control (QA/QC) measures were performed. Pre-deployment QA/QC procedures included a burn-in period where IMET instruments were placed on the moorings, turned on, and data was telemetered through Argos. By monitoring this data, any instrument failures or biases could be addressed prior to deployment. Pre-deployment buoy spins were also performed to assess the accuracy of the compasses on the IMET wind modules. Pre-calibrations were performed on the instruments to ensure instrument accuracies. Prior to deployment, timing marks were applied to the subsurface instruments as shown in Appendix B.

After recovery of the instruments, data was downloaded from the loggers and subsurface instruments, and basic data analyses were performed. Deployment and recovery times were used to truncate the data sets, and timing marks were used to ensure that there was no clock drift or errors in time. Many of the SeaBird instruments were incorrectly set for a 12-hour clock rather than a 24-hour clock. This resulted in a 12-hour offset of some of the data sets, but this was easily corrected in light of the timing marks performed. A magnetic variation correction was applied to the wind and current data. Table 12 below gives the values applied for each of the moorings. The data sets were checked for spikes, and any erroneous measurements were flagged. While performing basic QA/QC procedures on the 2002 field data, several instrument failures were brought to light. Known instrument failures are given in Table 13 below.

Table 12: Magnetic variation corrections applied to wind and current instruments

Mooring	Magnetic Variation (degrees)
A	-15.43
B	-15.35
C	-15.5
D	-15.57
E	-15.5
E subsurface	-15.5
F	15.53

Table 13: Known instrument failures

Mooring	Depth (m)	Instrument Type	Serial Number	Failure
A	2.4	VMCM	0013	Current meter fouled, data may be affected.
A	11	Nortek	0357	Partial record – data begins June 23, 2002, 15:40:00 and ends July 30, 2002, 19:05:00.
A	30	TPOD	5466	No data.
B		IMET Logger	15	Partial record – bad shortwave data begins August 25, 2002, 10:01:00.
C	9.6	FSI	1467	Partial record – data ends June 19, 2002, 05:22:01.
E surface		IMET Logger	11	Partial record – data ends August 19, 2002, 23:59:00. A full SST record was recovered from the internally recording SBE37 1841 attached to this IMET system.
E surface	6.5	A-beta	0626	No data.
E surface	9	TPOD	3312	No data.
E surface	9.5	SBE39	0102	No data.
E surface	26	TPOD	3276	No data.
E subsurface	39	SBE37	1909	Found to have sand in the conductivity cell. A shift in conductivity is seen around year day 215, and is probably the point where sand entered the cell. Data after this date should be considered suspicious.
F	16.5	SBE37	2011	Partial Record – data ends September 1, 2002, 00:01:59
F	20	SBE37	1899	Partial Record – data ends September 1, 2002, 07:17:59.
F	22	SBE37	0684	No data.

B. Meteorology and Fluxes

Meteorological data were collected during the 2002 experiment from IMET systems. These data were used to calculate fluxes with the TOGA COARE bulk algorithms. Basic plots of the meteorological data and fluxes are given below (Figures 11a – 16c). The first figure for each mooring (a) gives air temperature, barometric pressure, relative humidity, long- and shortwave radiation, and precipitation rate. The second figure (b) gives wind speed and direction, sea surface temperature, salinity, and current speed and direction. The final figure for each mooring (c) gives latent heat, sensible heat, net shortwave radiation, net longwave radiation, net heat flux, and wind stress.

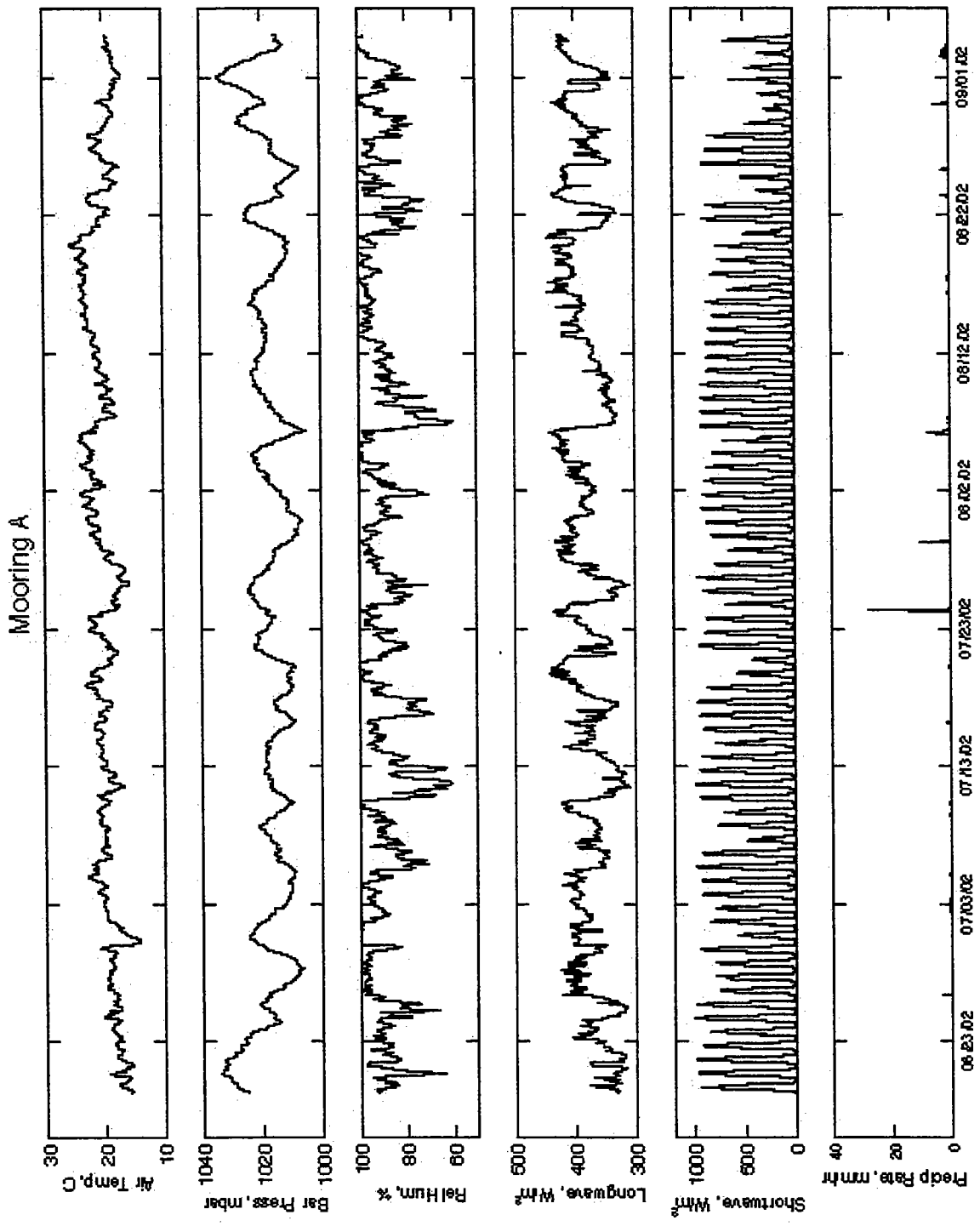

Figure 11a: Mooring A meteorological results, shown as 1-hour averages

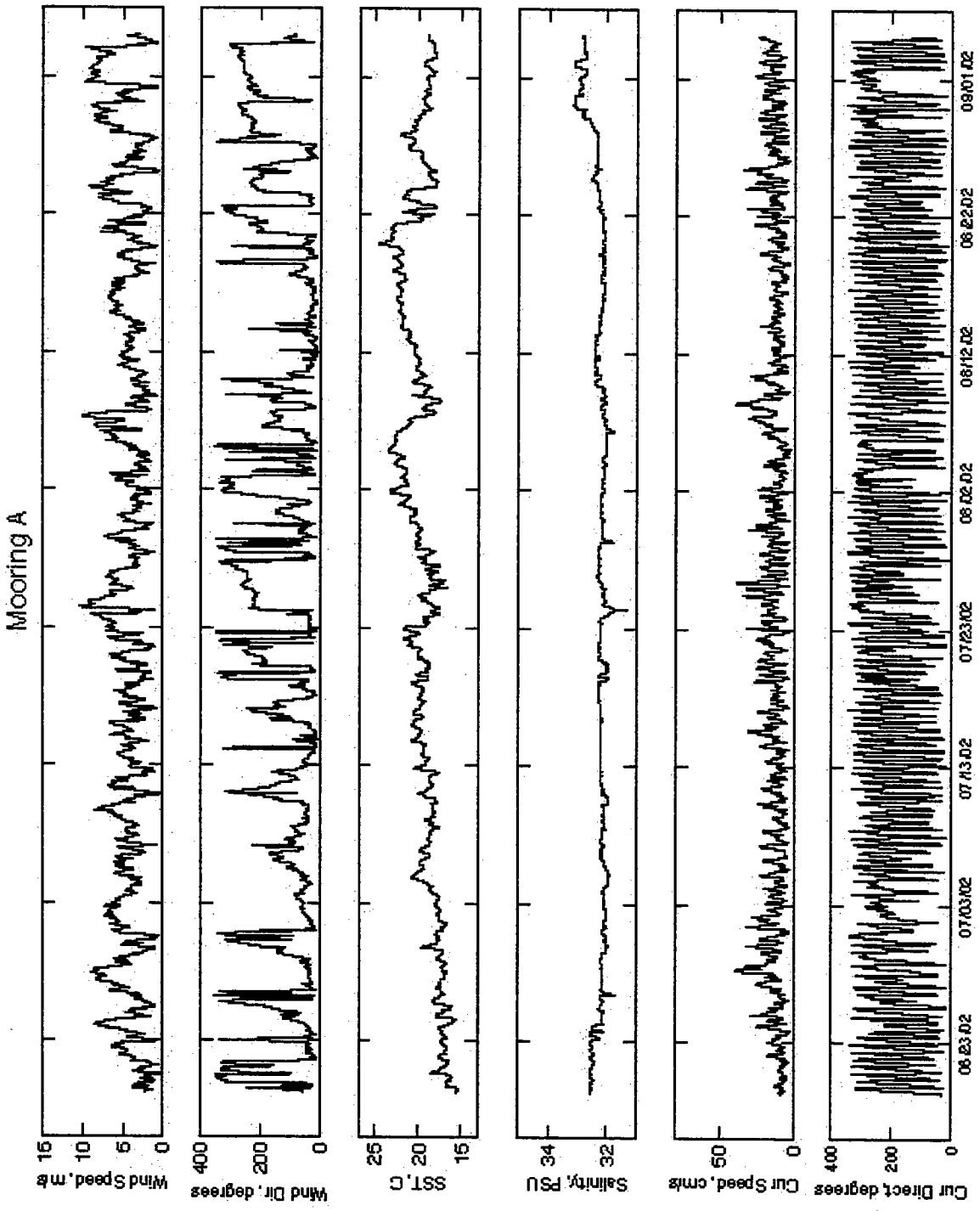

Figure 11b: Mooring A meteorological results, shown as 1-hour averages
Temperature and salinity data were collected at a depth of 0.55 m and currents at 2m.

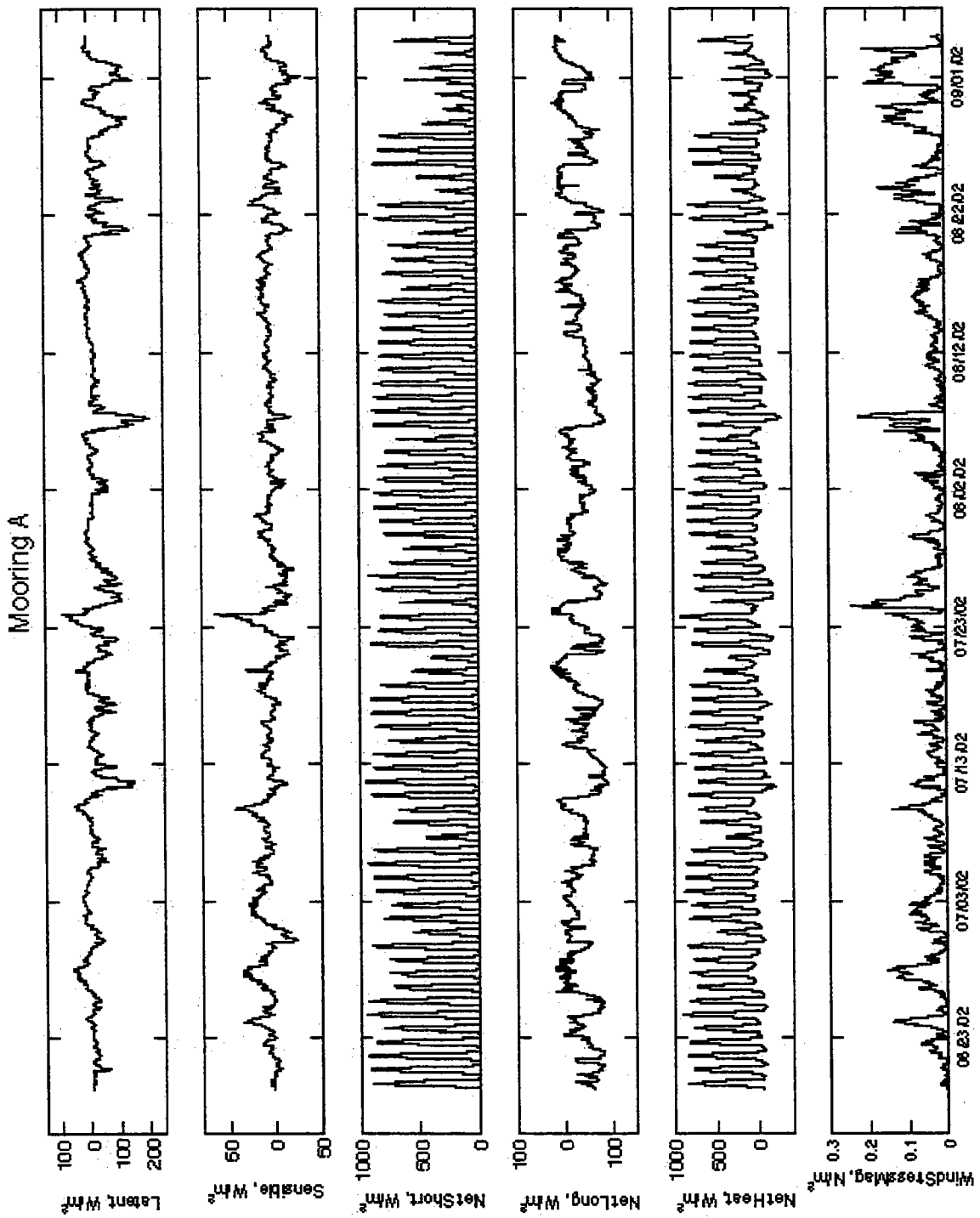

Figure 11c: Mooring A flux data, shown as a 1-hour average.

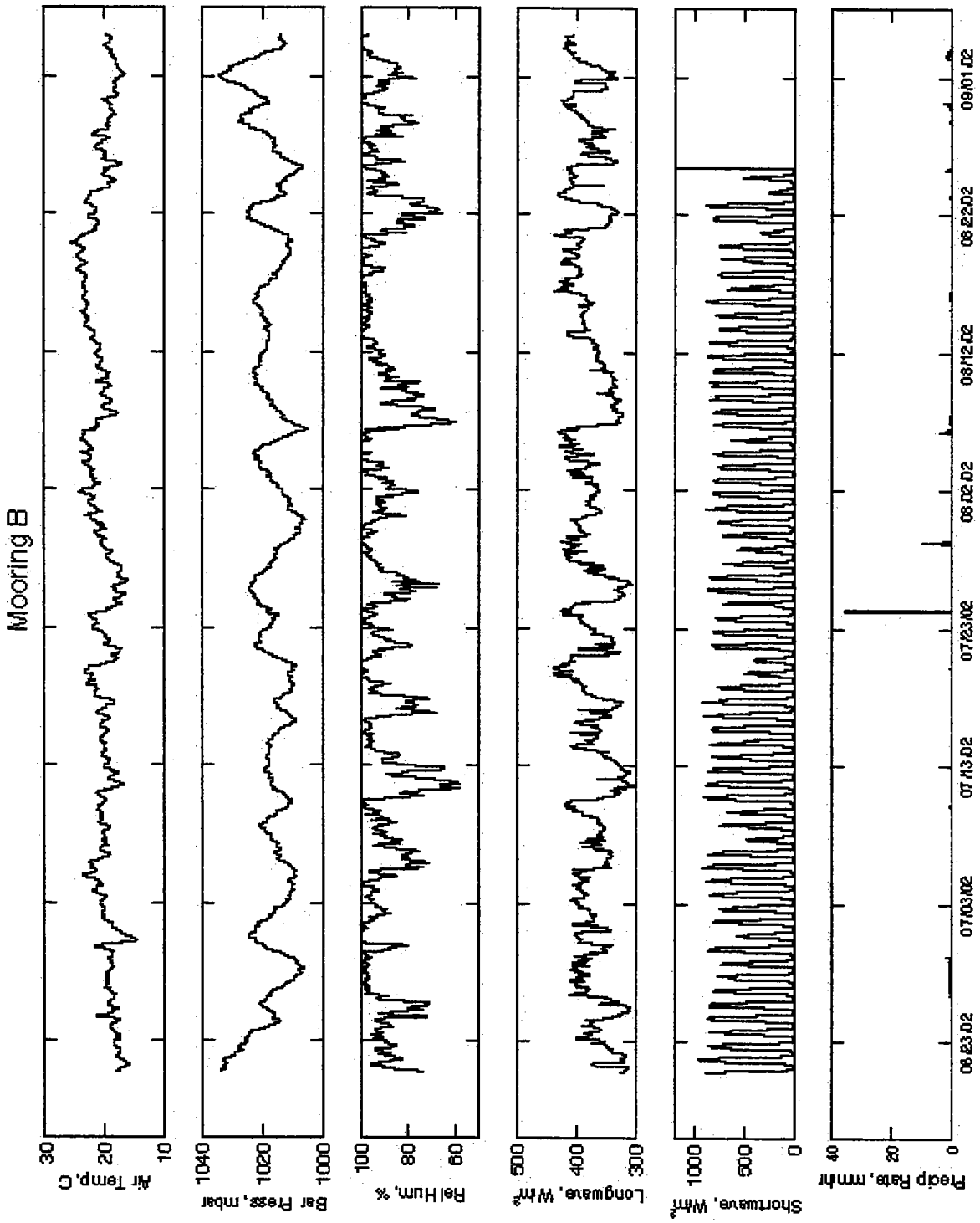

Figure 12a: Mooring B meteorological results, shown as 1-hour averages.

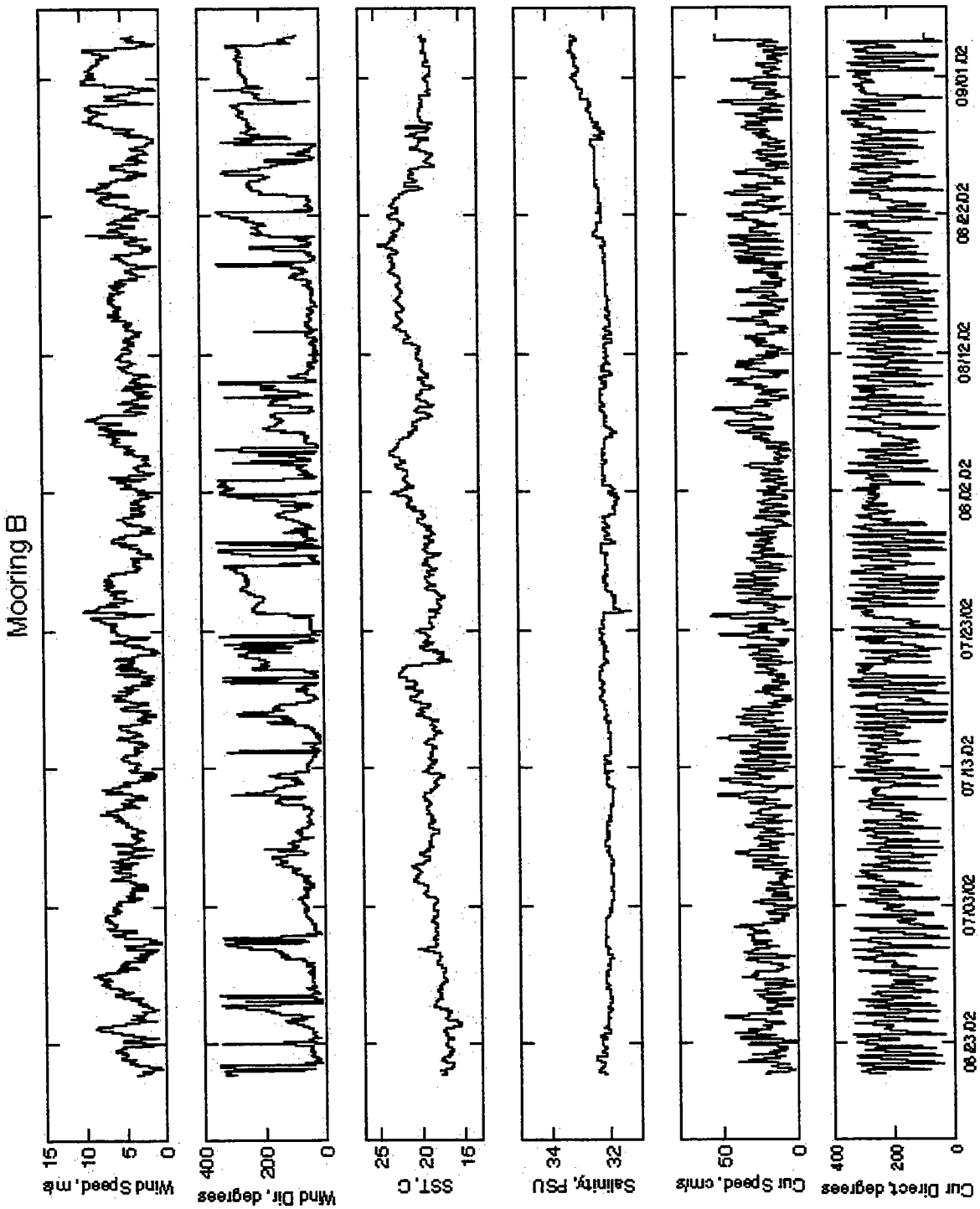

Figure 12b: Mooring B meteorological results, shown as 1-hour averages.
Temperature and salinity data were collected at a depth of 0.55 m and currents at 5 m.

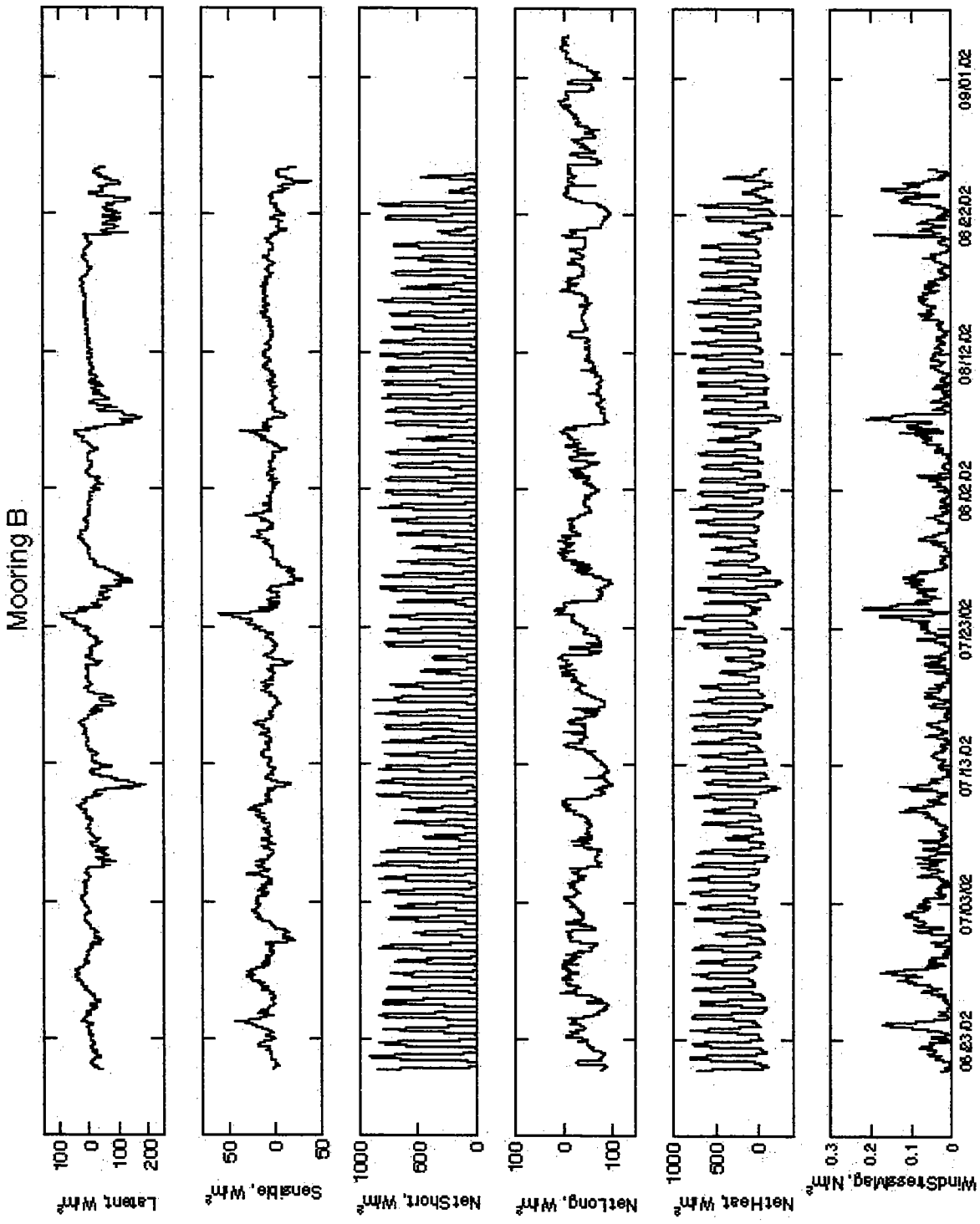

Figure 12c: Mooring B flux data, shown as a 1-hour average.

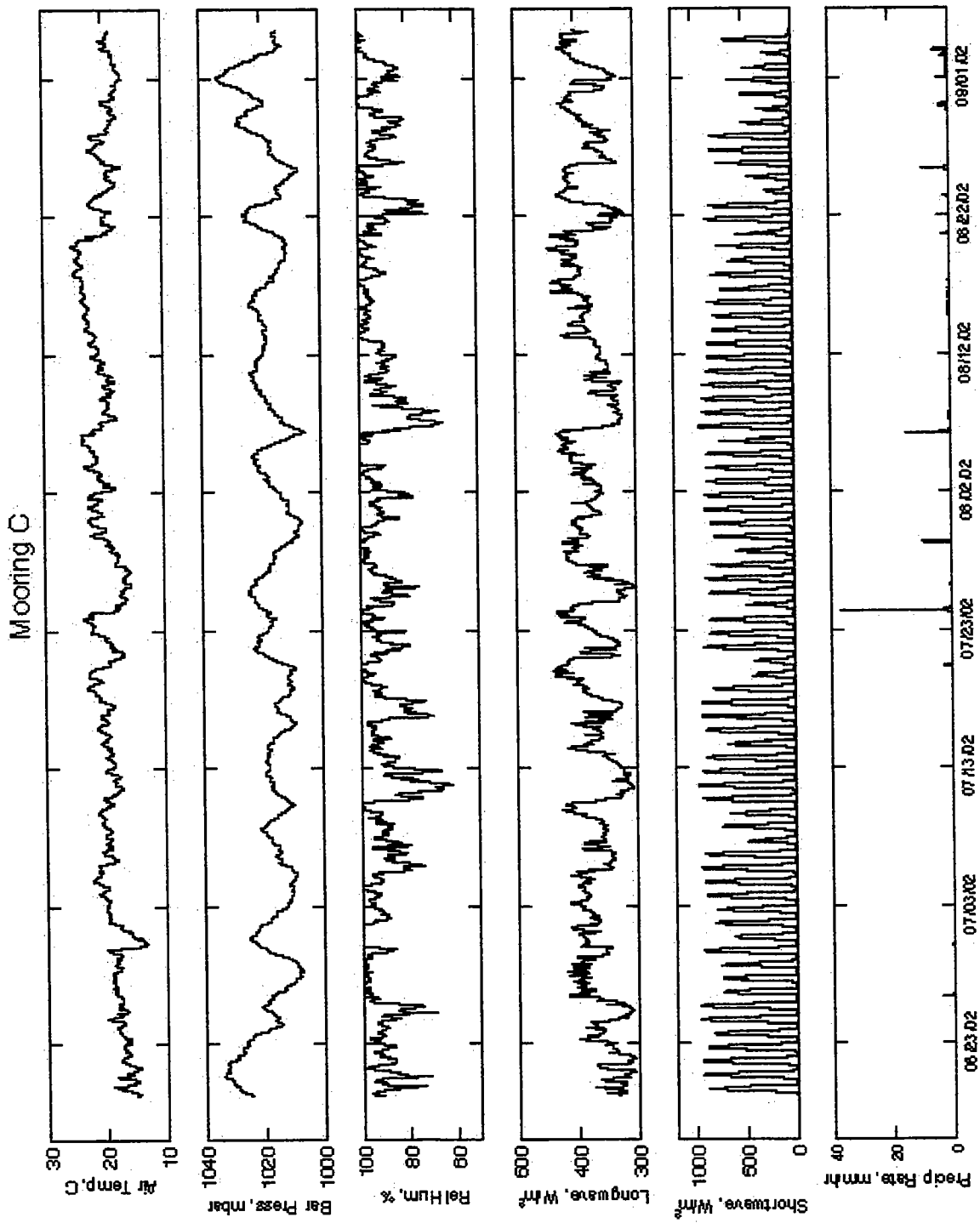

Figure 13a: Mooring C meteorological results, shown as 1-hour averages.

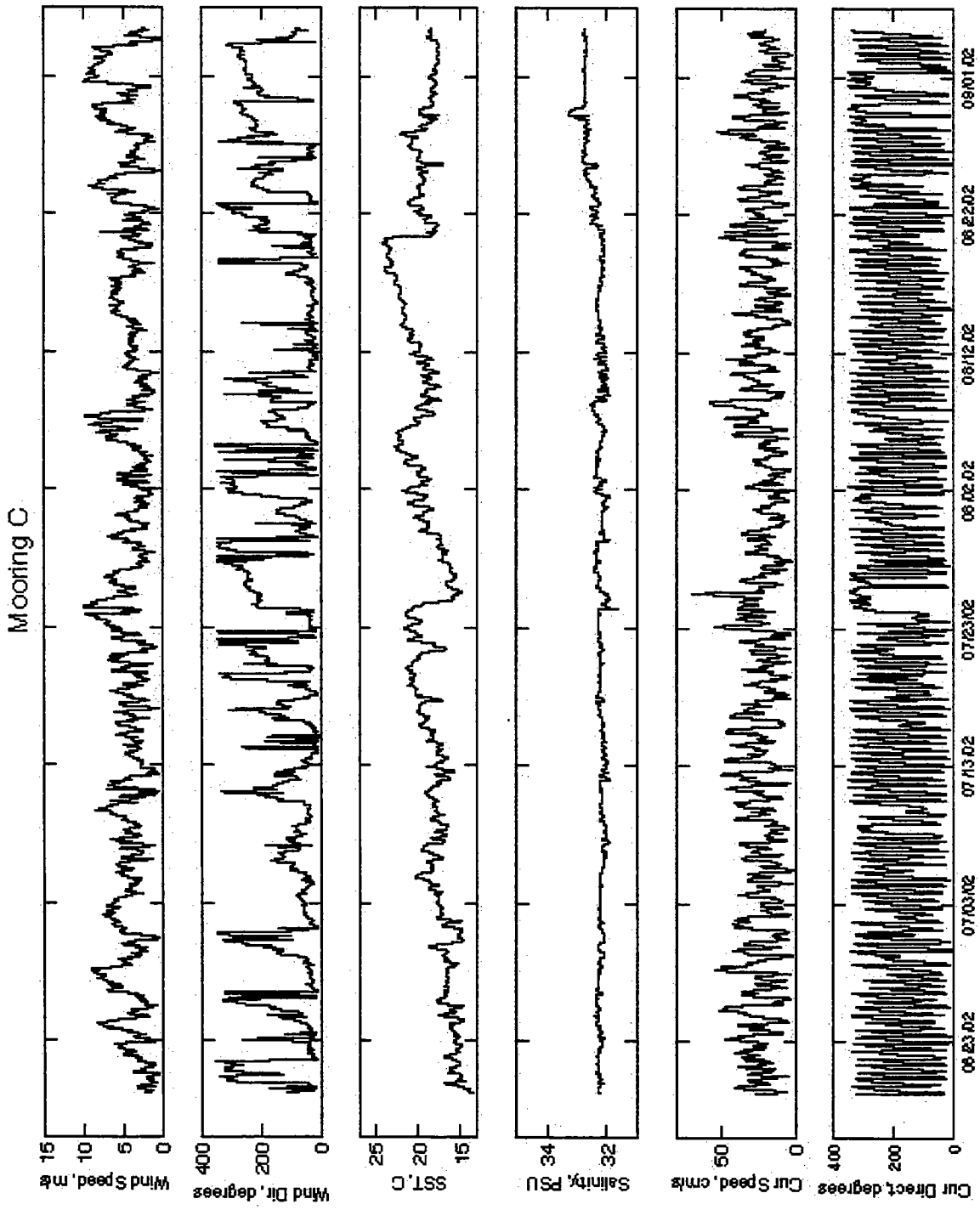

Figure 13b: Mooring C meteorological results, shown as 1-hour averages.
Temperature and salinity data were collected at a depth of 0.55 m and currents at 4.95 m.

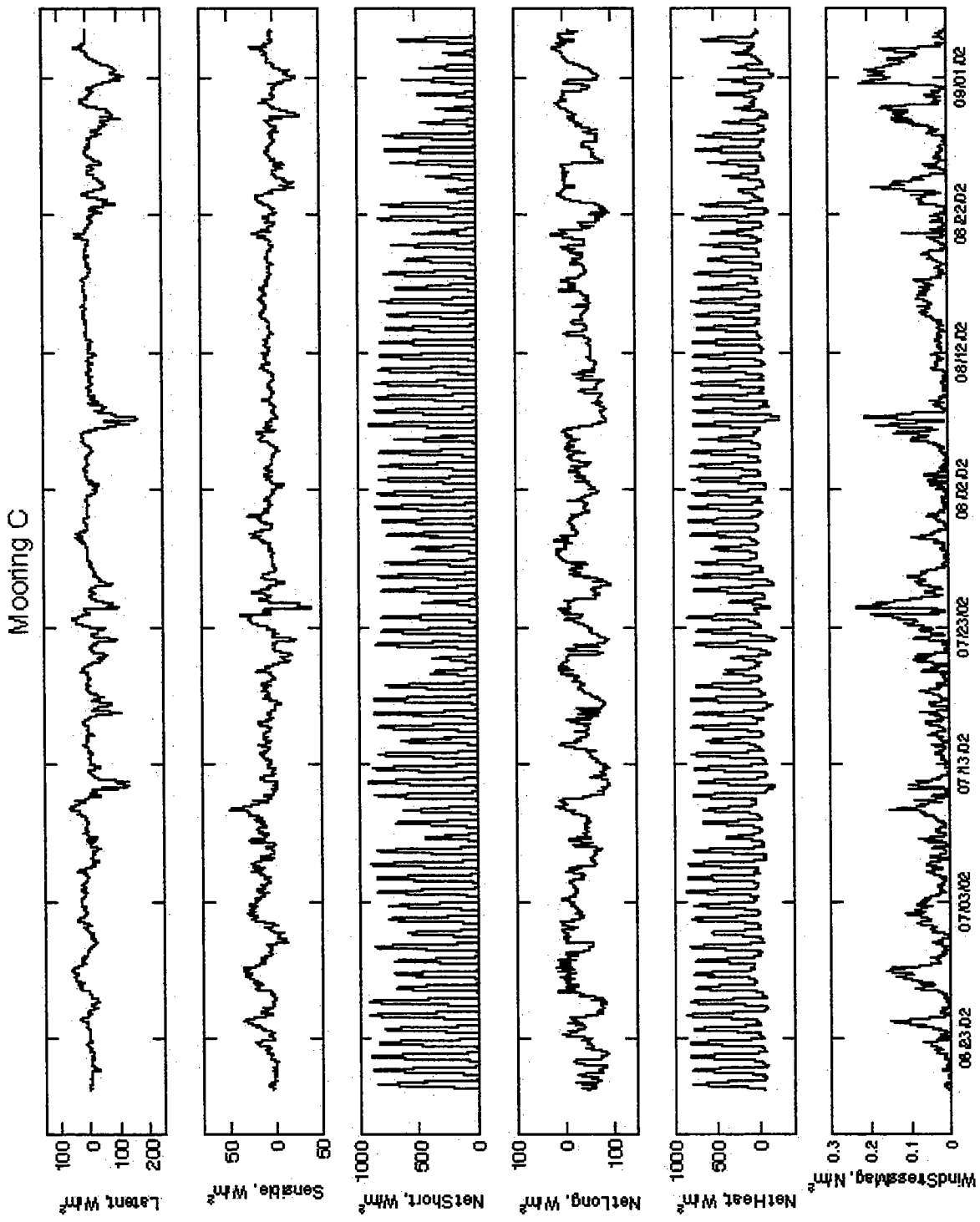

Figure 13c: Mooring C flux data, shown as a 1-hour average.

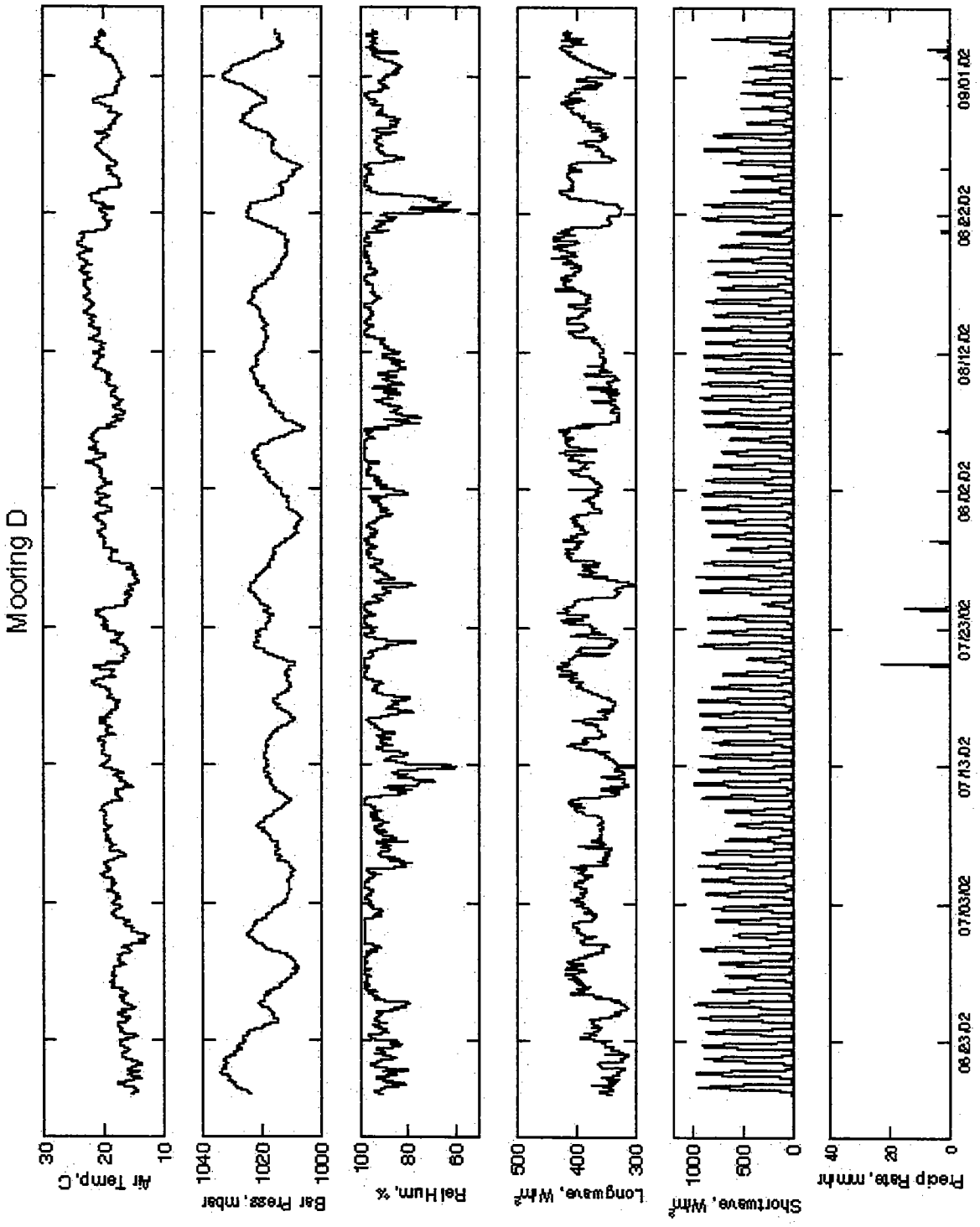

Figure 14a: Mooring D meteorological results, shown as 1-hour averages.

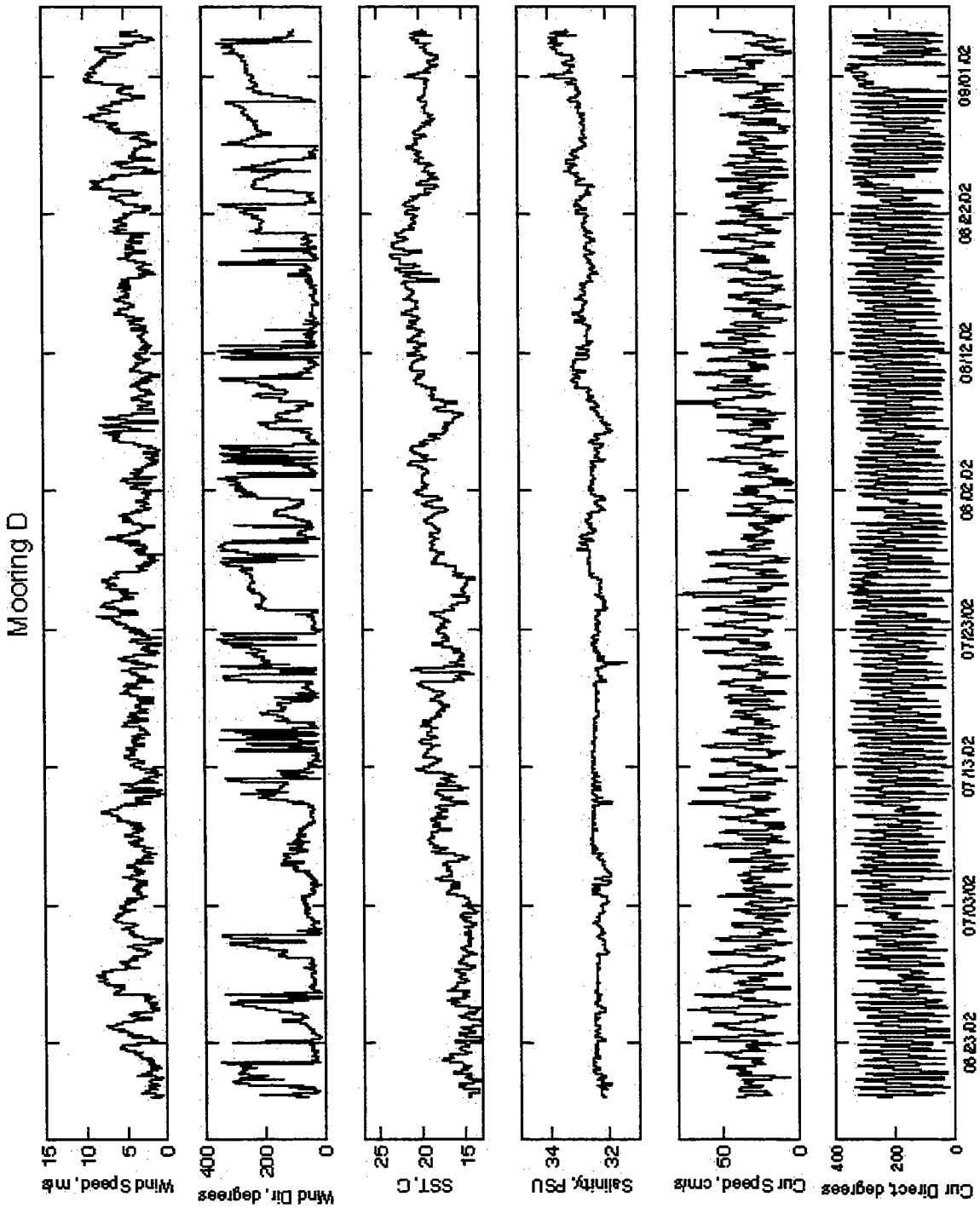

Figure 14b: Mooring D meteorological results, shown as 1-hour averages.
Temperature and salinity data were collected at a depth of 0.55 m and currents at 8.15 m.

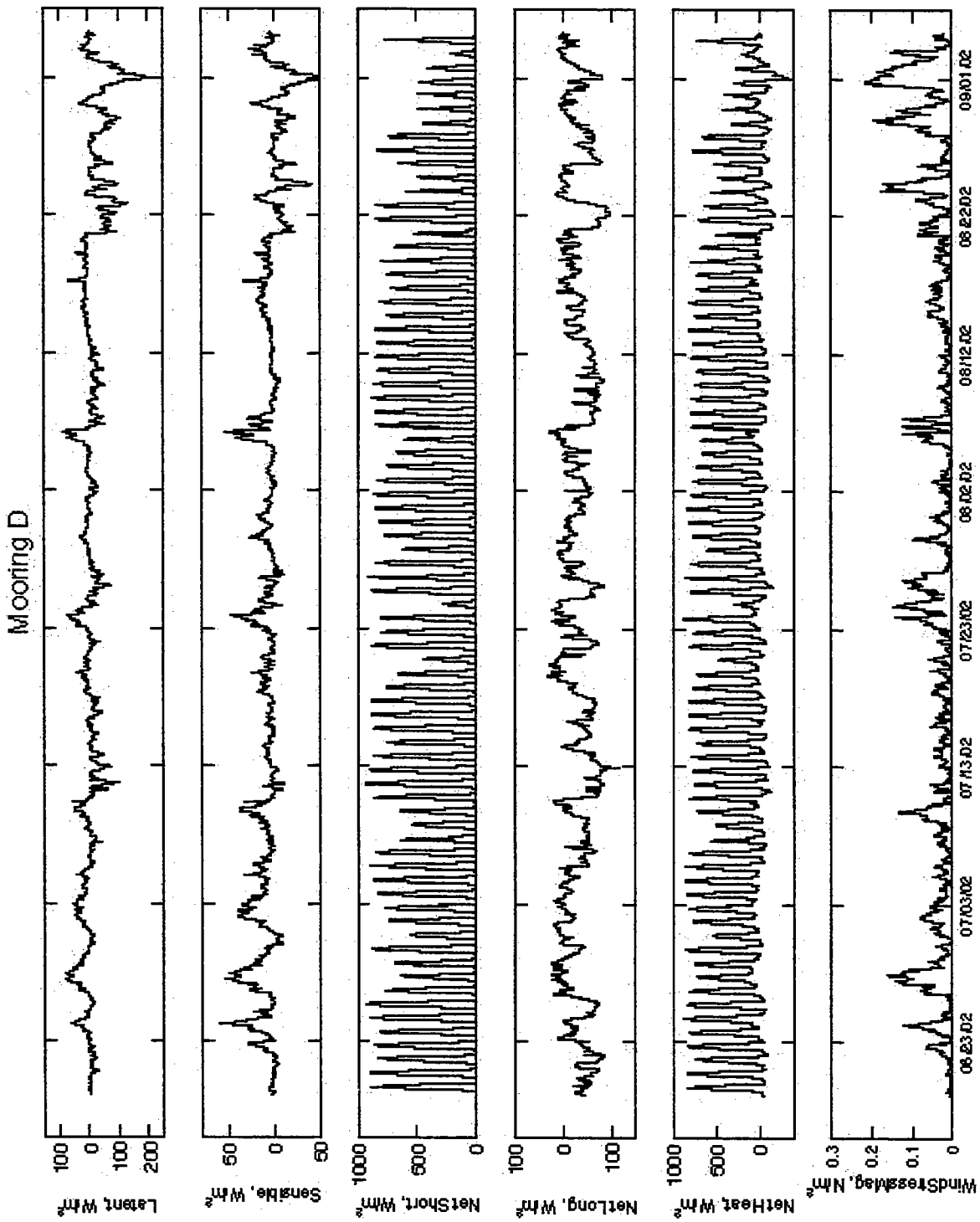

Figure 14c: Mooring D flux data, shown as a 1-hour average.

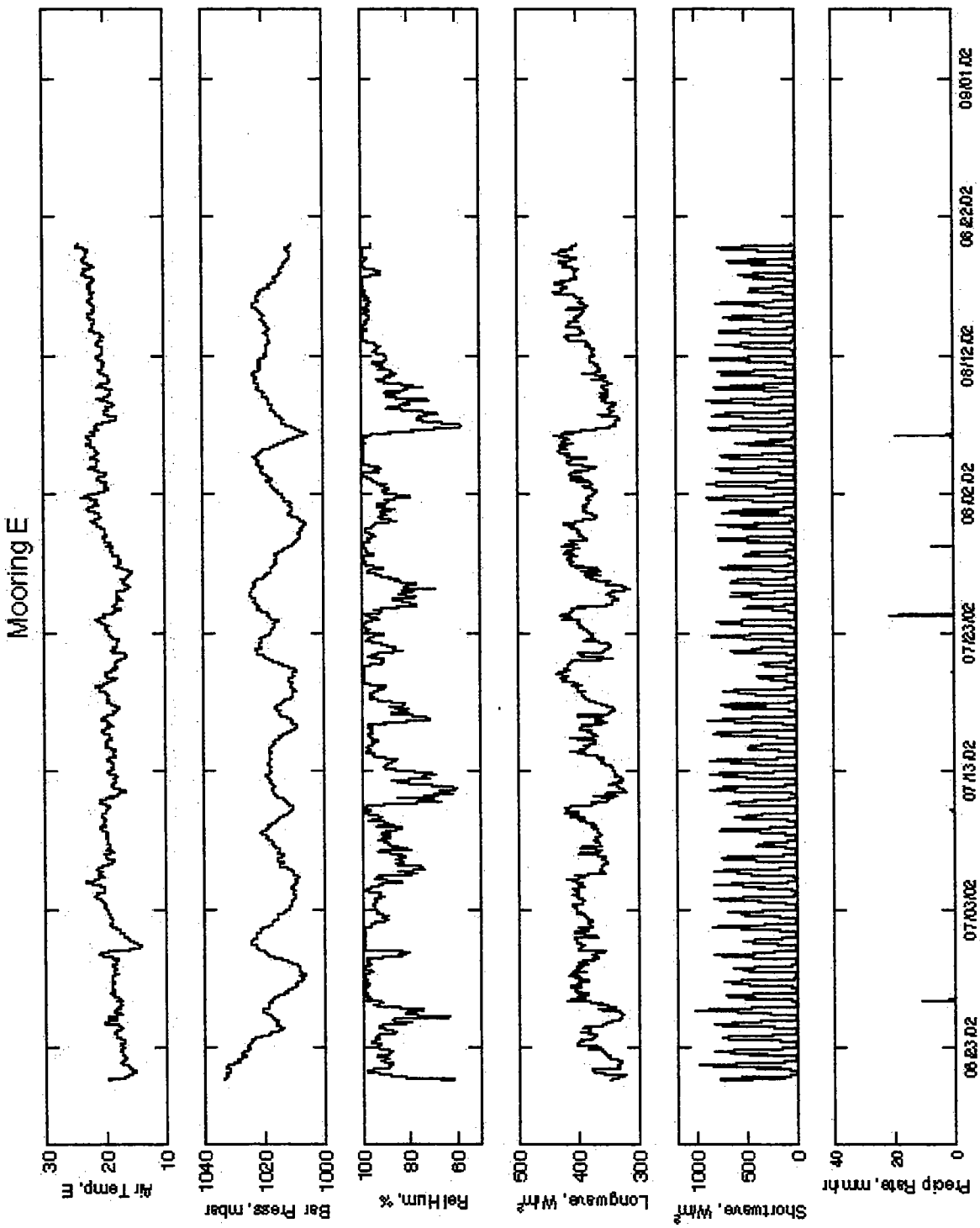

Figure 15a: Mooring E meteorological results, shown as 1-hour averages.
The data record for Mooring E is short due to a logger failure.

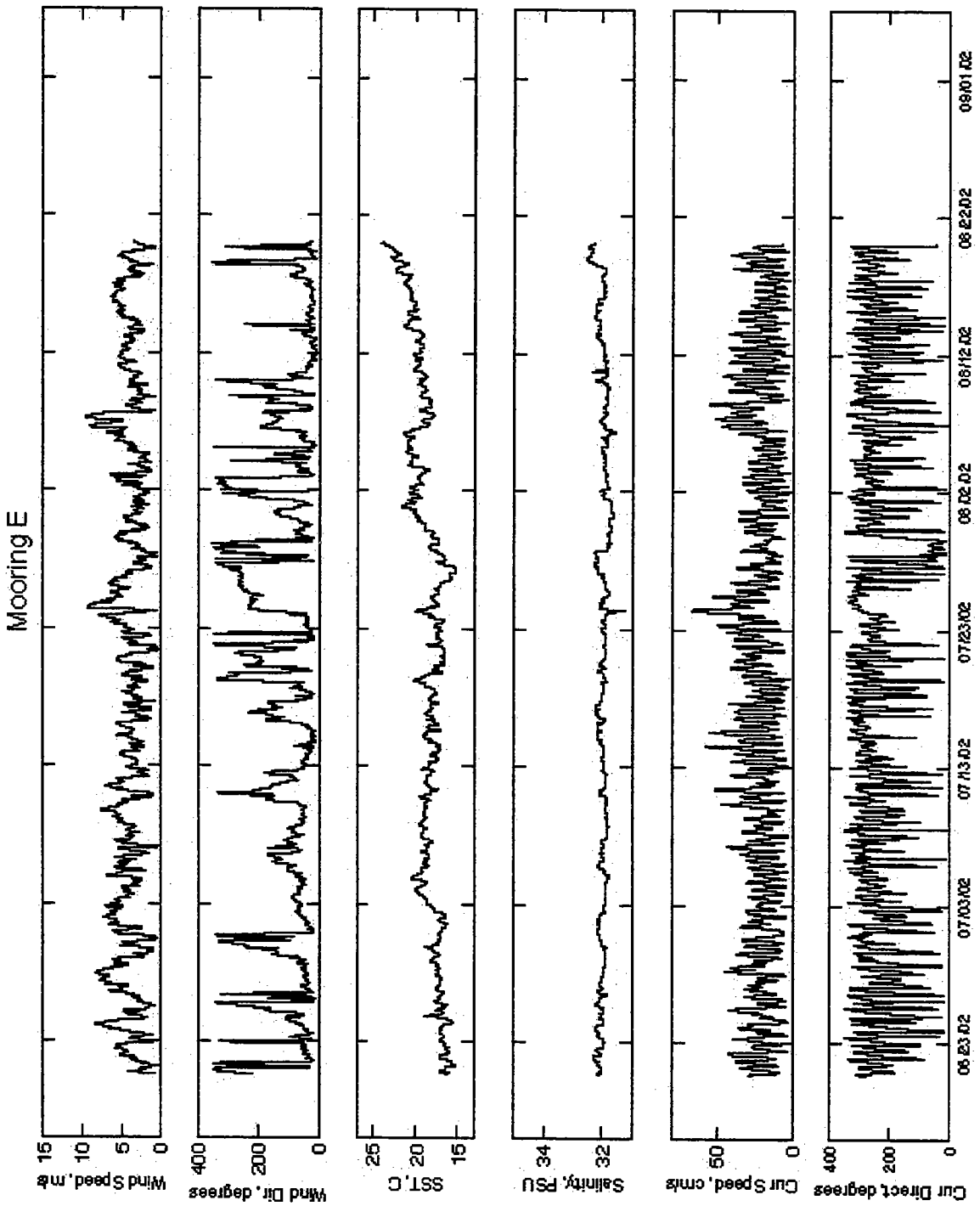

Figure 15b: Mooring E meteorological results, shown as 1-hour averages.
Temperature and salinity data were collected at a depth of 0.45 m and currents at 4 m. The data record for Mooring E is short due to a logger failure.

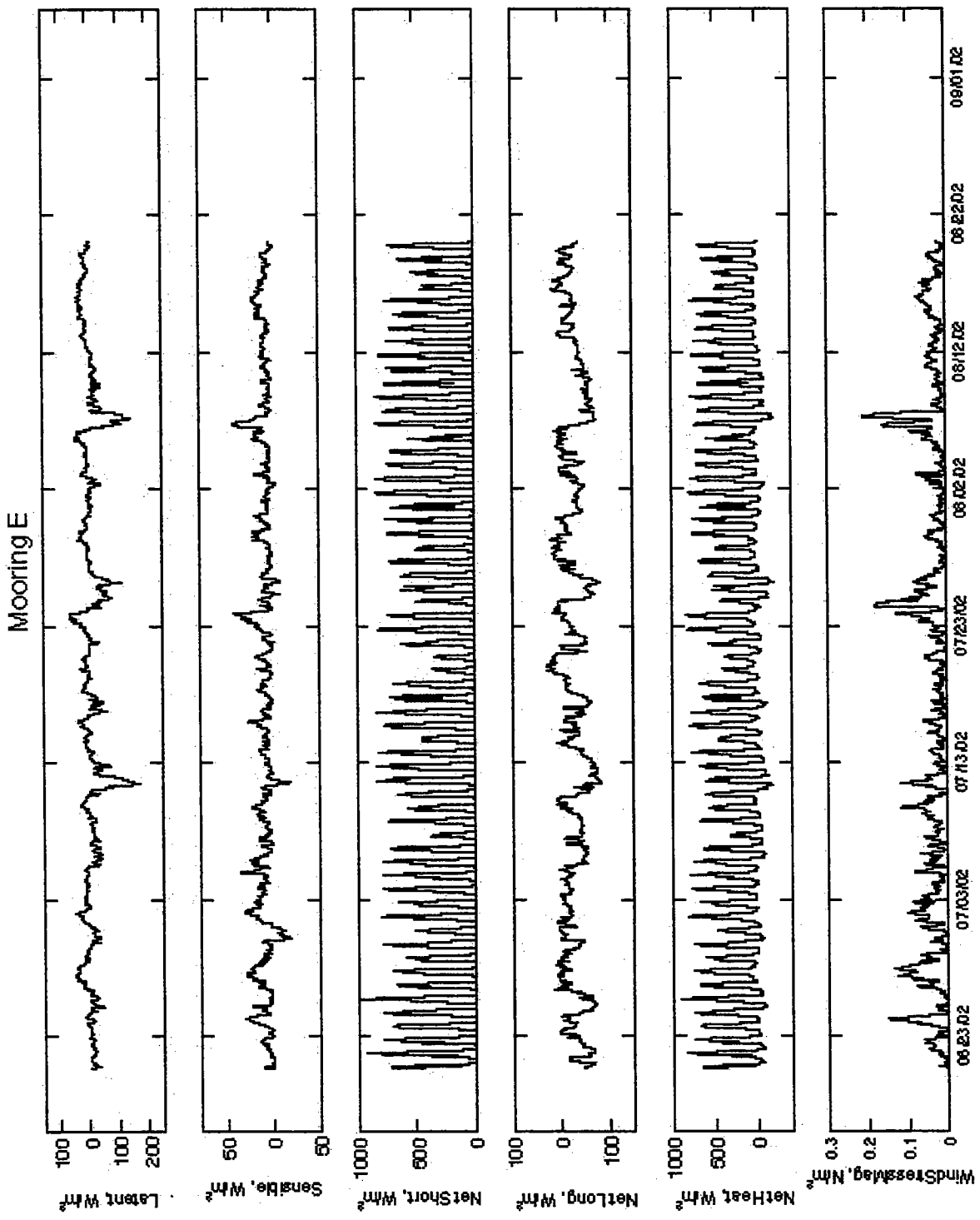

Figure 15c: Mooring E flux data, shown as a 1-hour average.
The data record for Mooring E is short due to a logger failure.

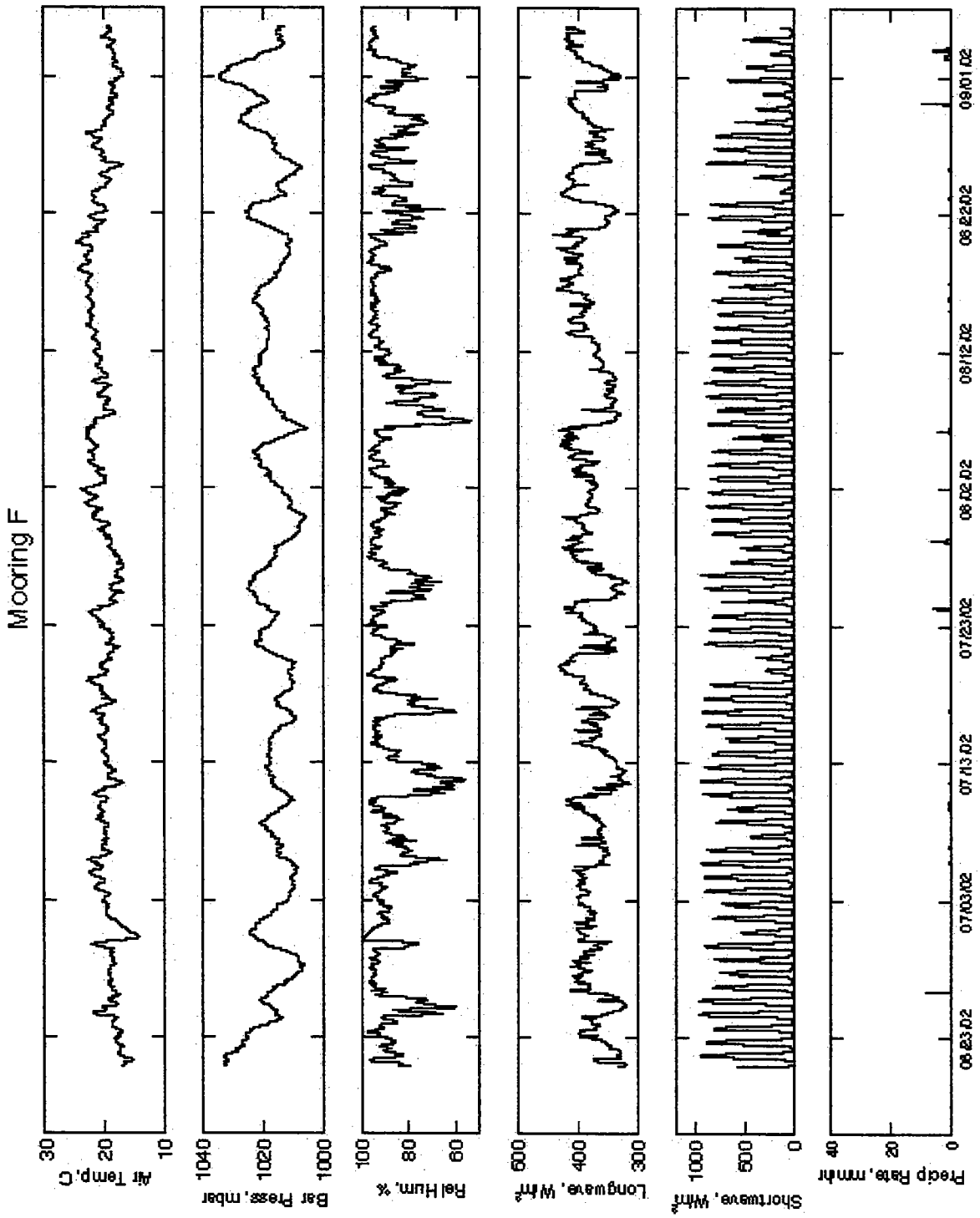

Figure 16a: Mooring F meteorological results, shown as 1-hour averages.

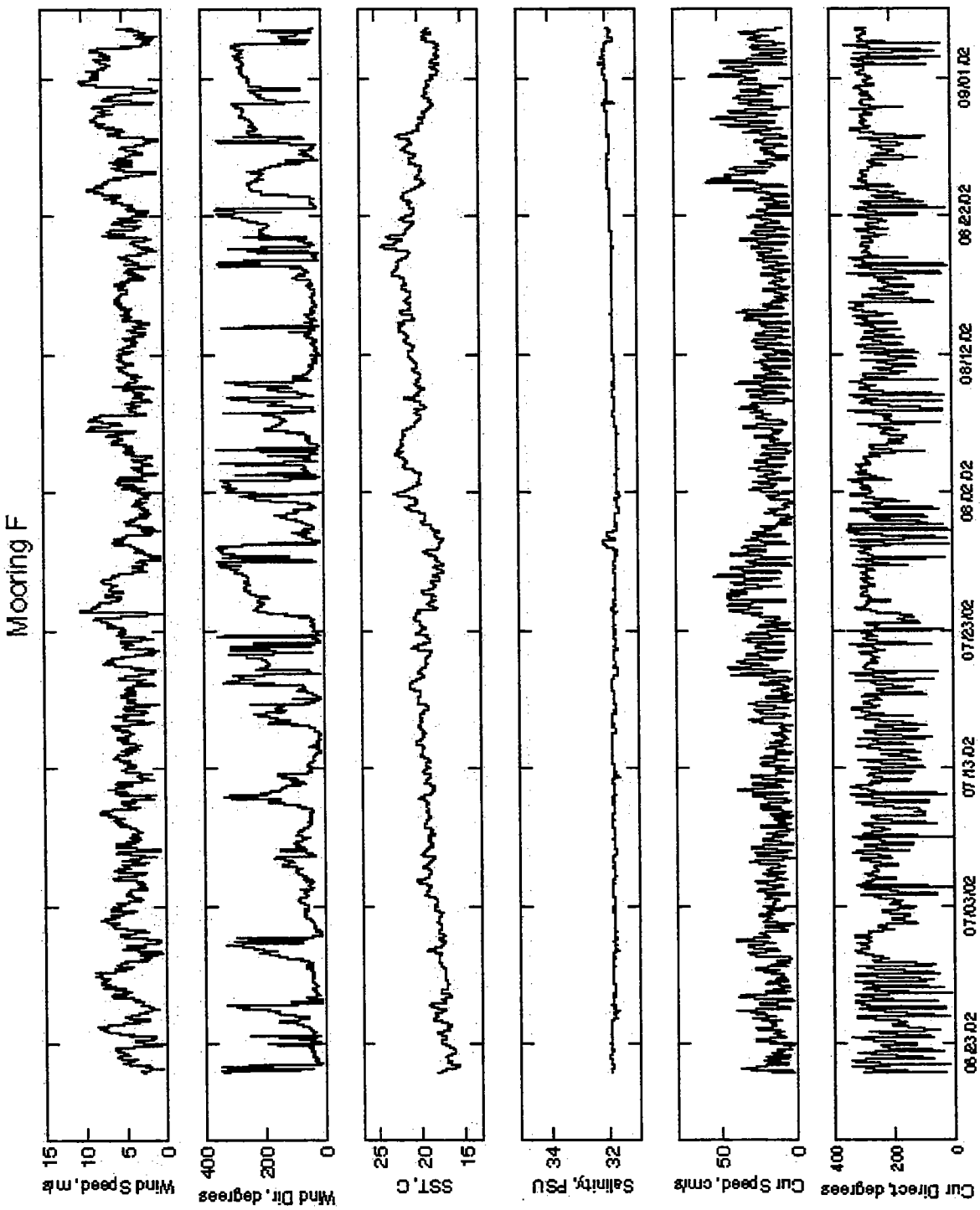

Figure 16b: Mooring F meteorological results, shown as 1-hour averages.
Salinity data was collected at a depth of 0.55 m and currents at 4 m.

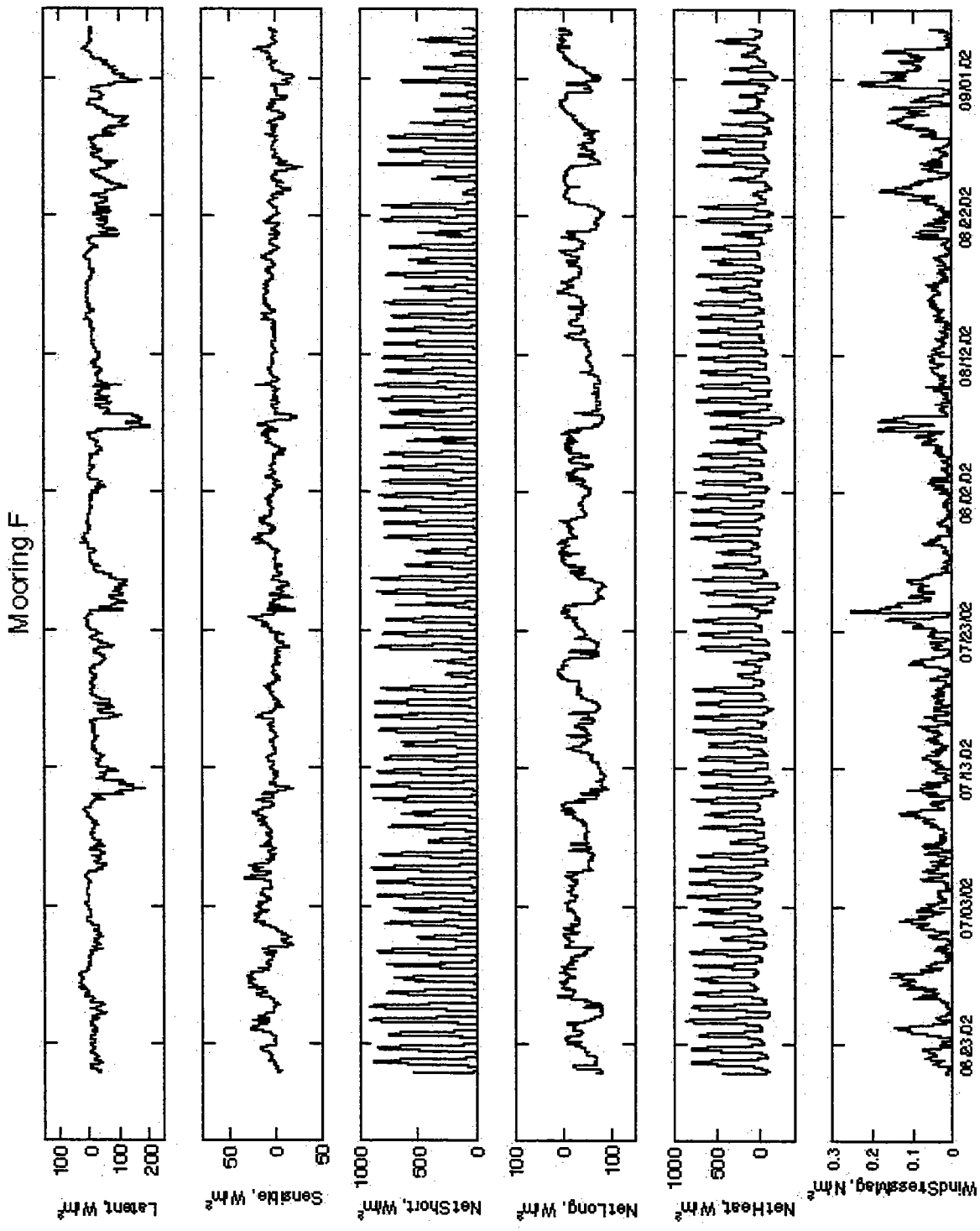

Figure 16c: Mooring F flux data, shown as a 1-hour average.

C. Temperature

Temperature data were collected from a variety of subsurface instruments on the moorings, including SeaBird instruments and current meters. Basic plots of this data are given below (Figures 17 – 23).

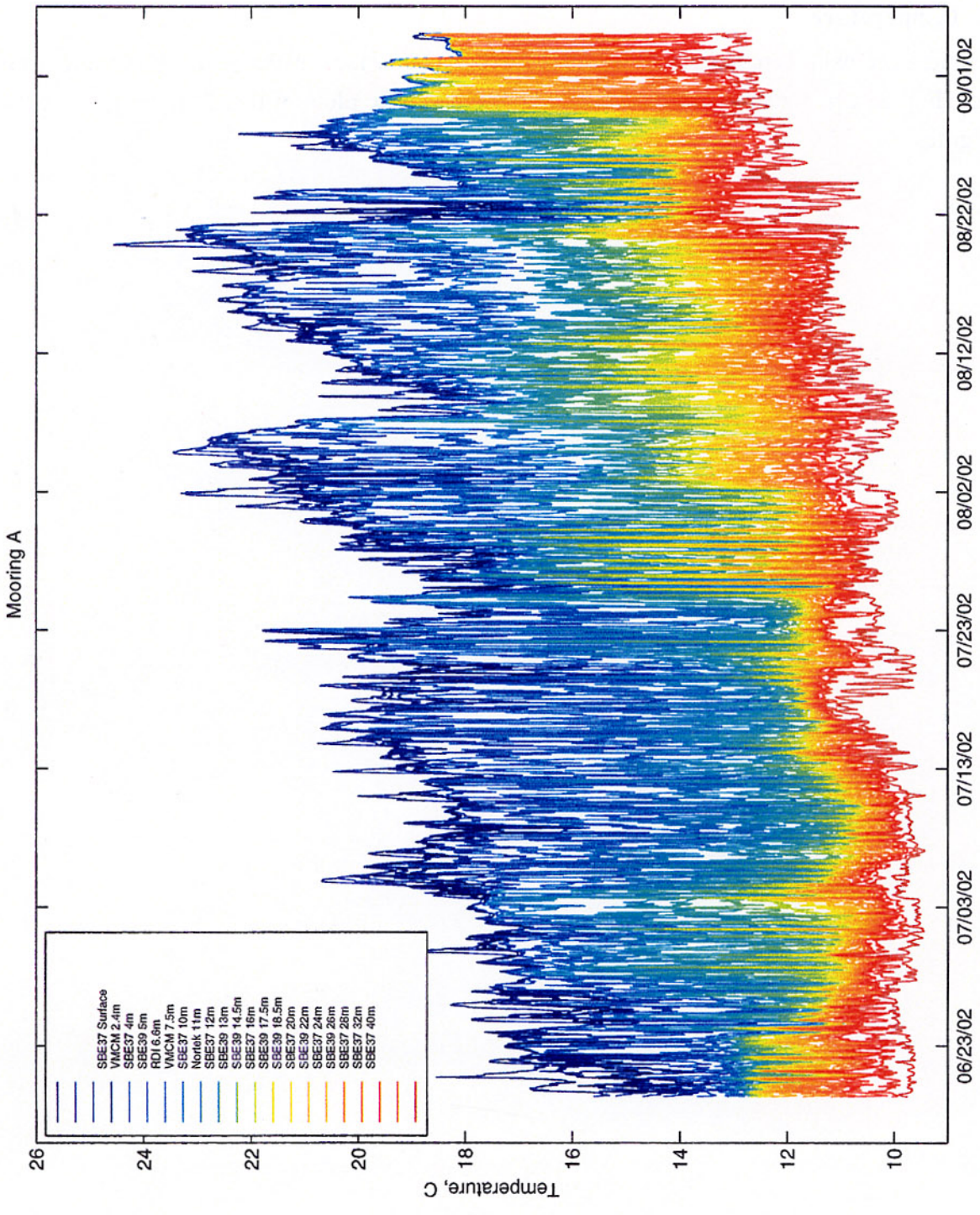

Figure 17: Subsurface temperature data from Mooring A, shown as 1-hour averages.

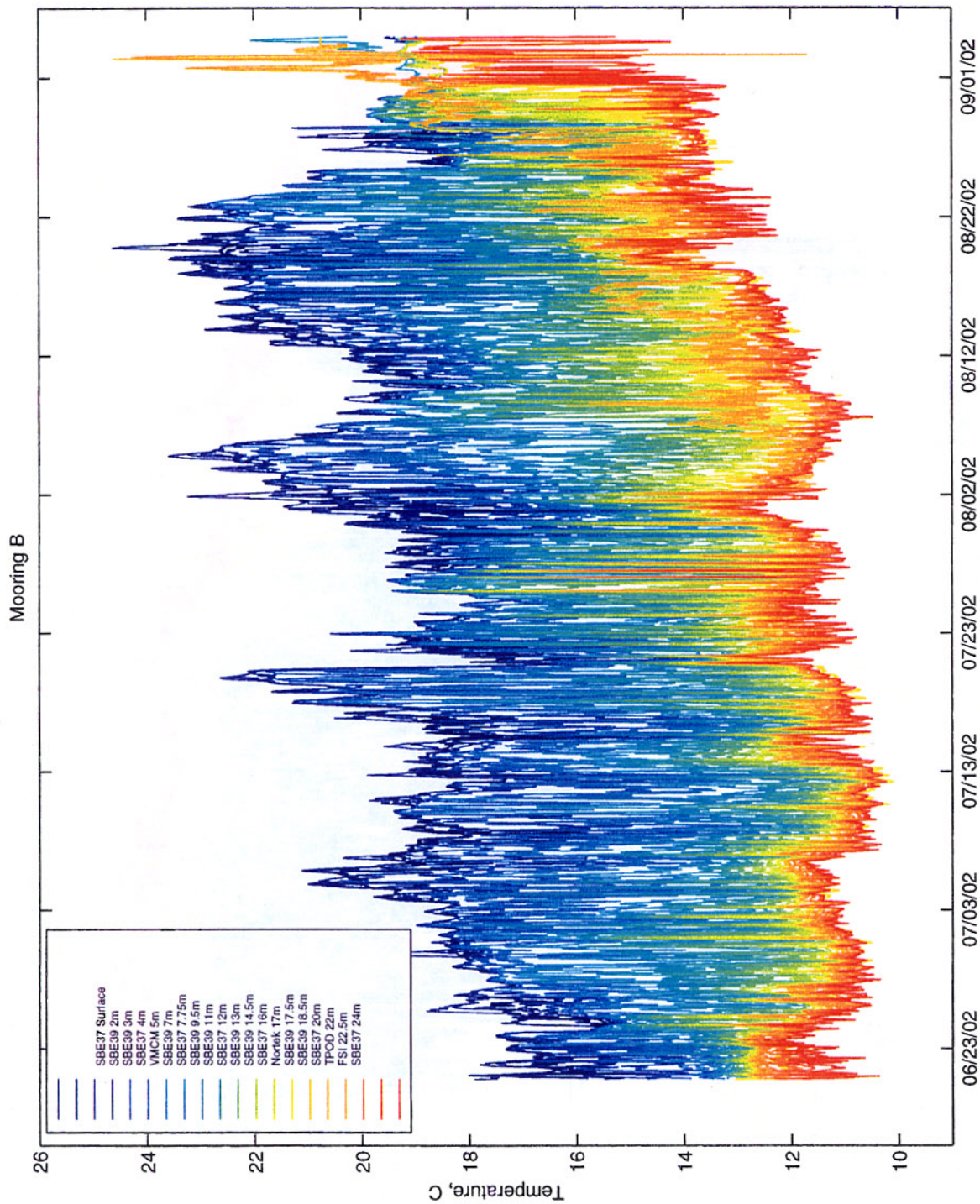

Figure 18: Subsurface temperature data from Mooring B, shown as 1-hour averages.

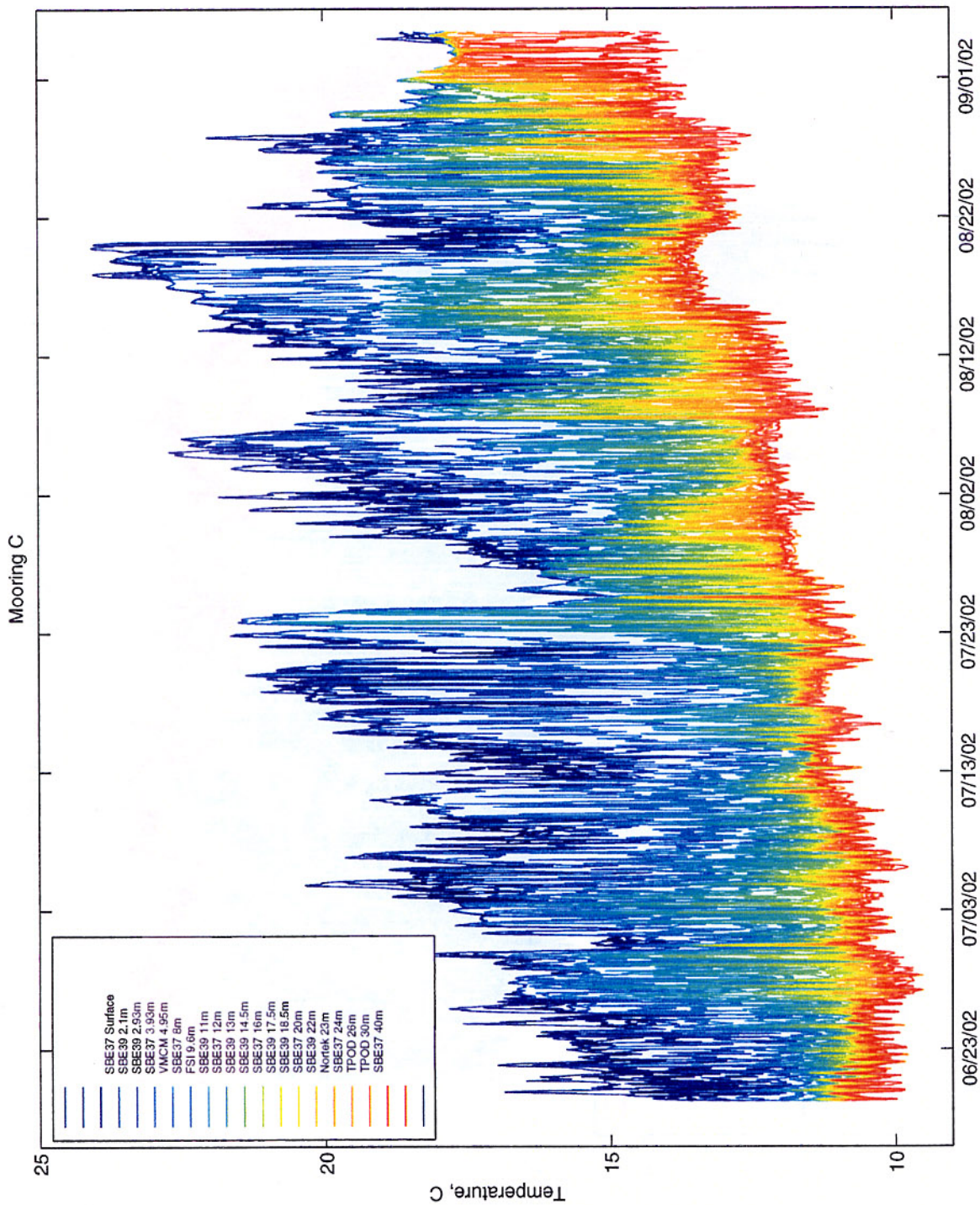

Figure 19: Subsurface temperature data from Mooring C, shown as 1-hour averages.

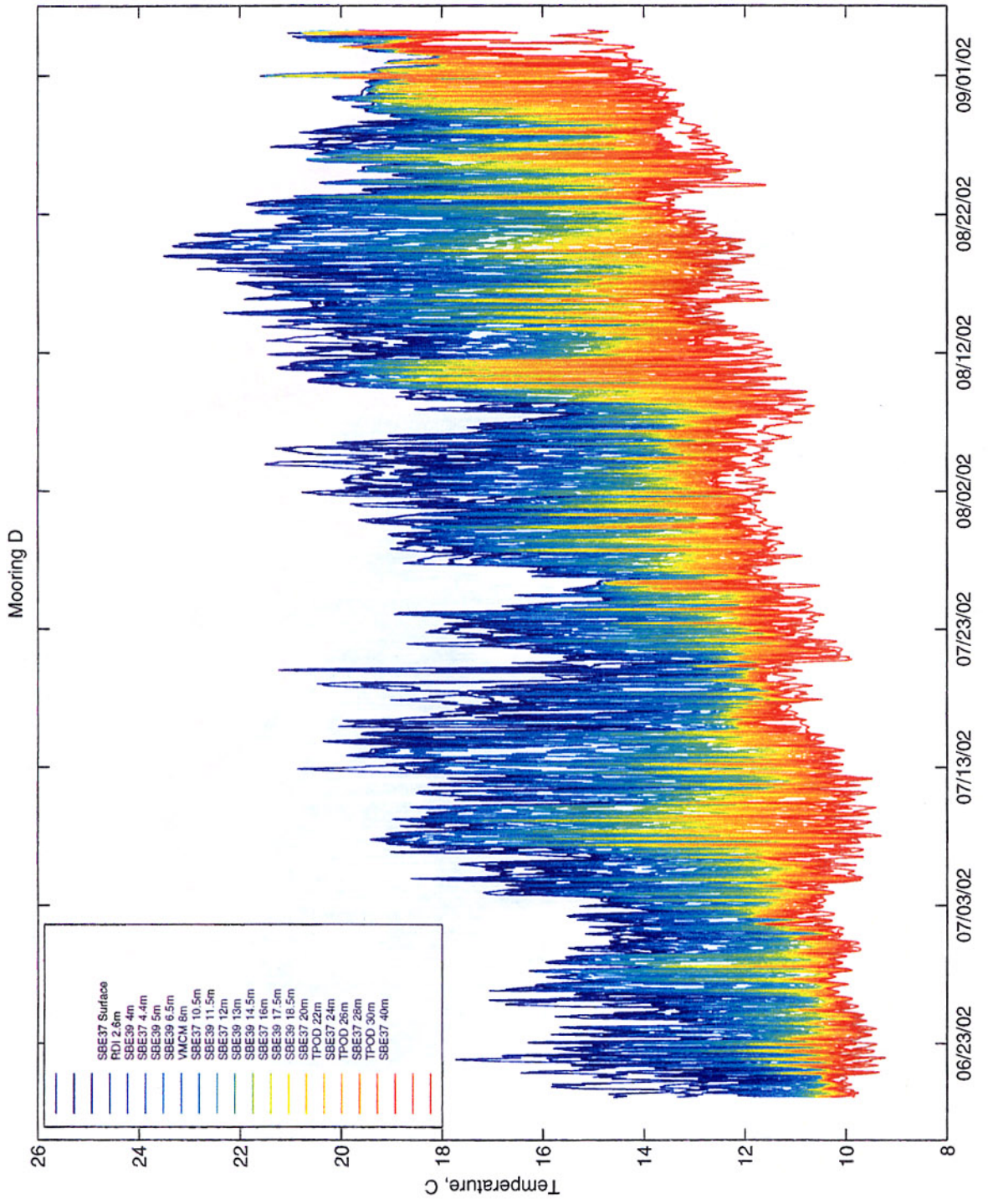

Figure 20: Subsurface temperature data from Mooring D, shown as 1-hour averages.

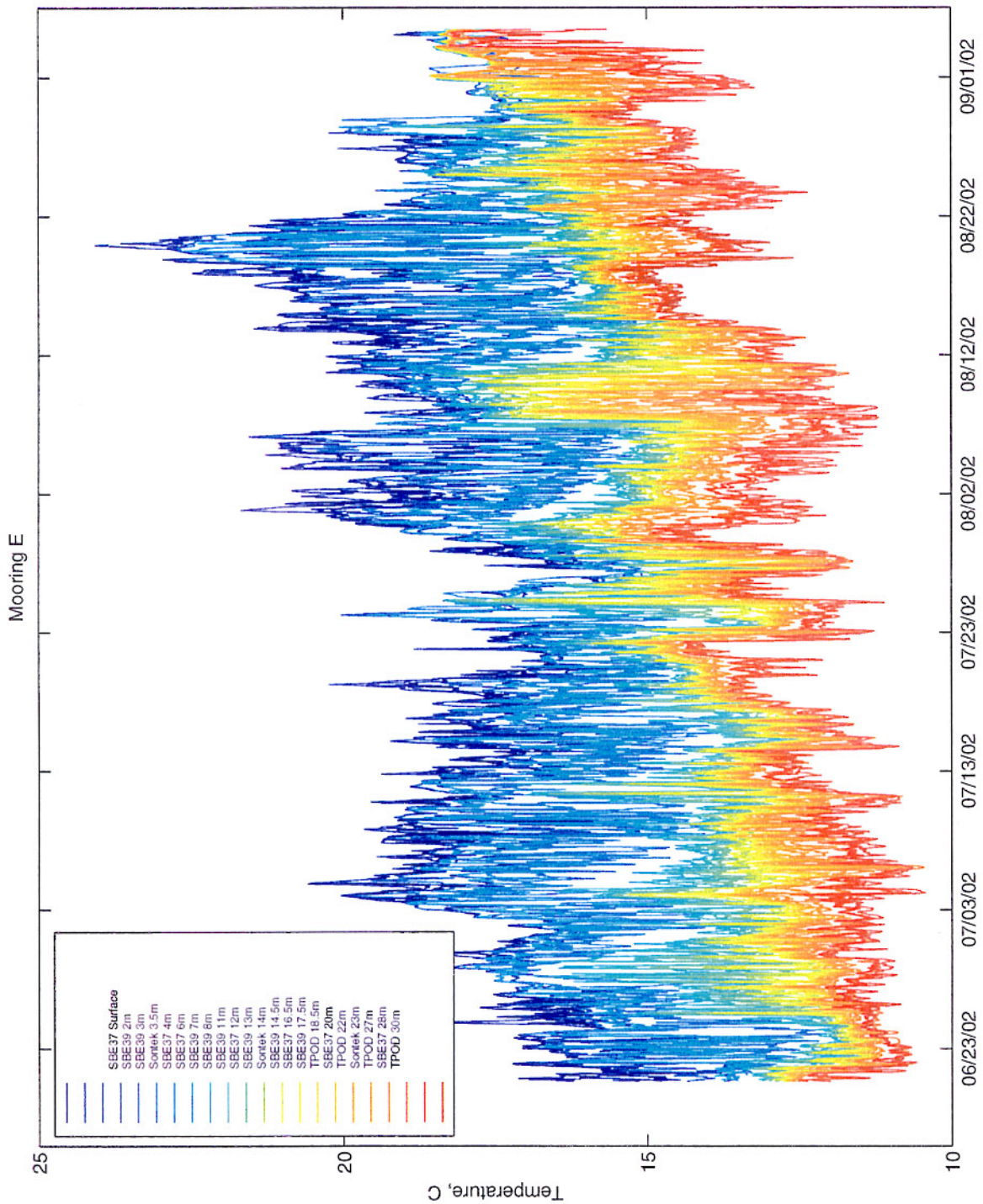

Figure 21: Subsurface temperature data from Mooring E, shown as 1-hour averages.

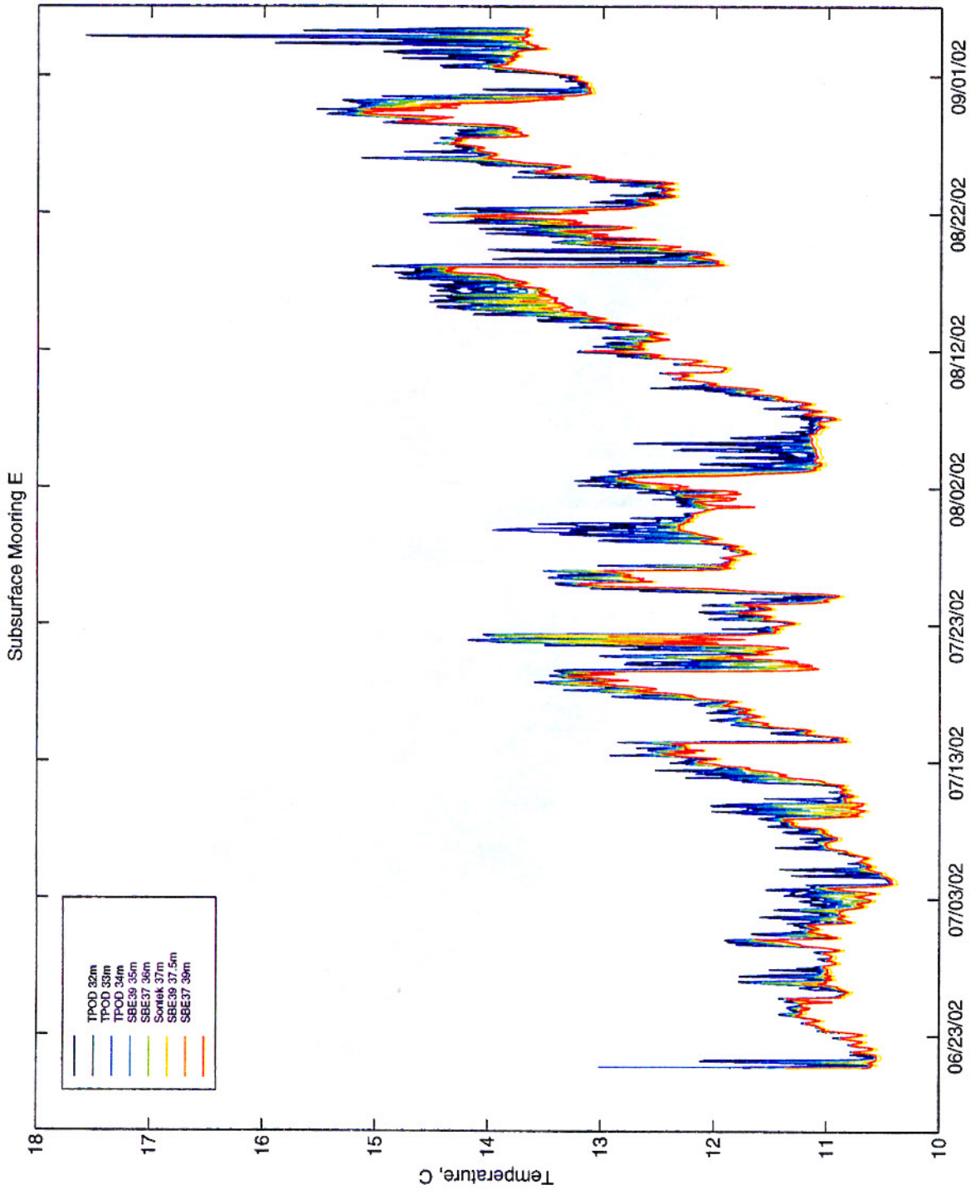

Figure 22: Subsurface temperature data from subsurface Mooring E, shown as 1-hour averages.

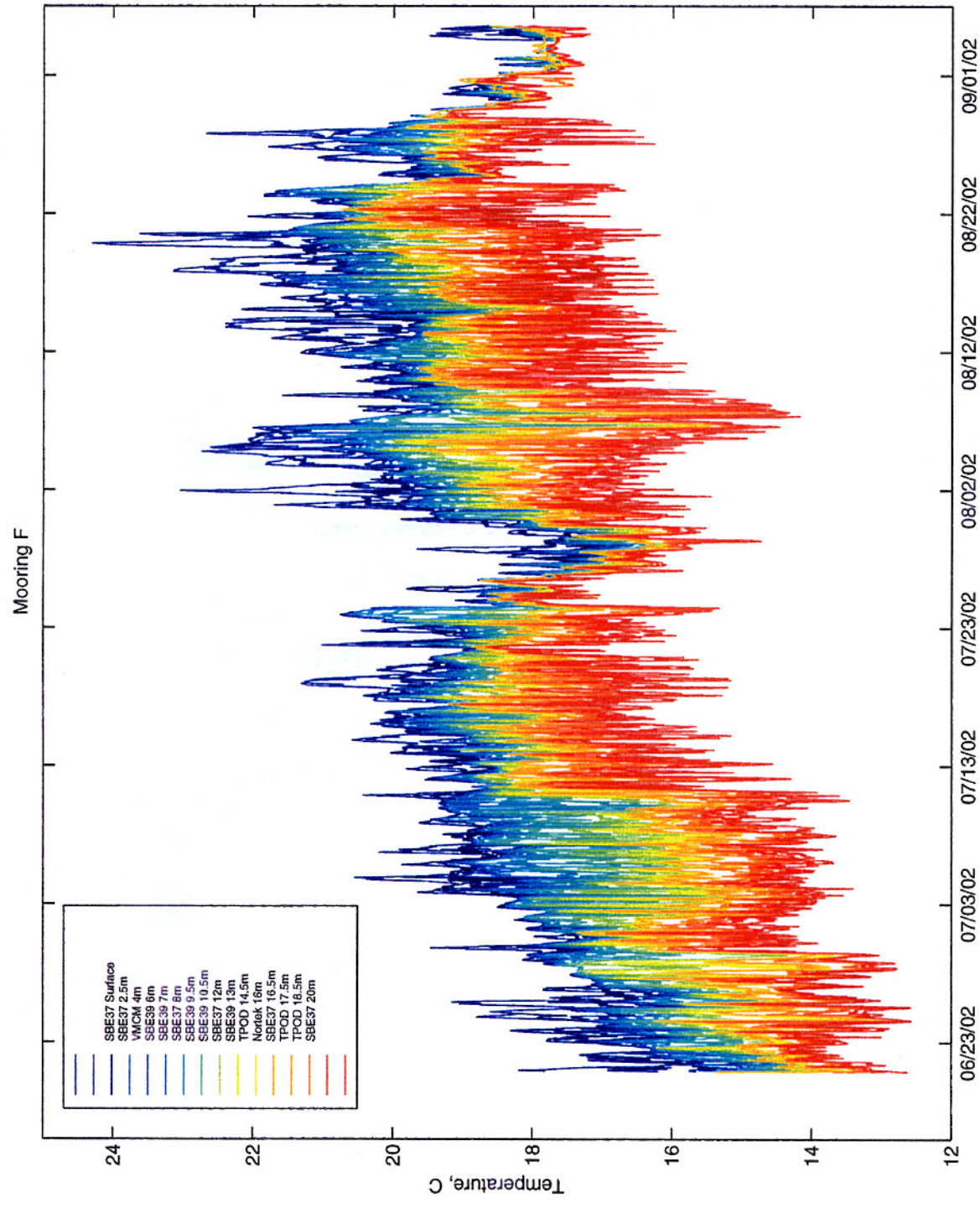

Figure 23: Subsurface temperature data from Mooring F, shown as 1-hour averages.

D. Salinity

Salinity data were collected from several models of SeaBird instruments during the 2002 experiment. Basic plots of this data are given below (Figures 24 – 30).

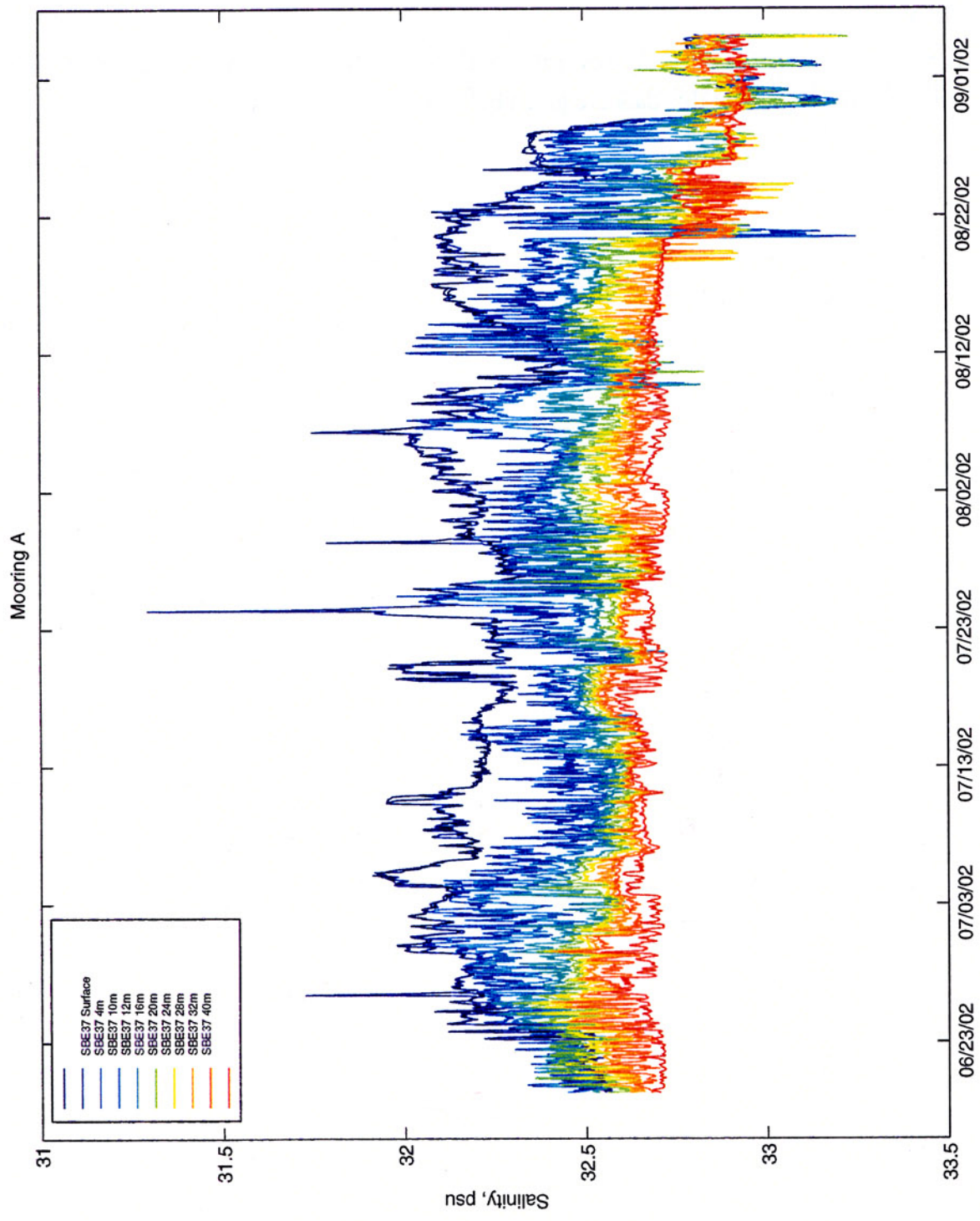

Figure 24: Salinity data from Mooring A, shown as 1-hour averages.

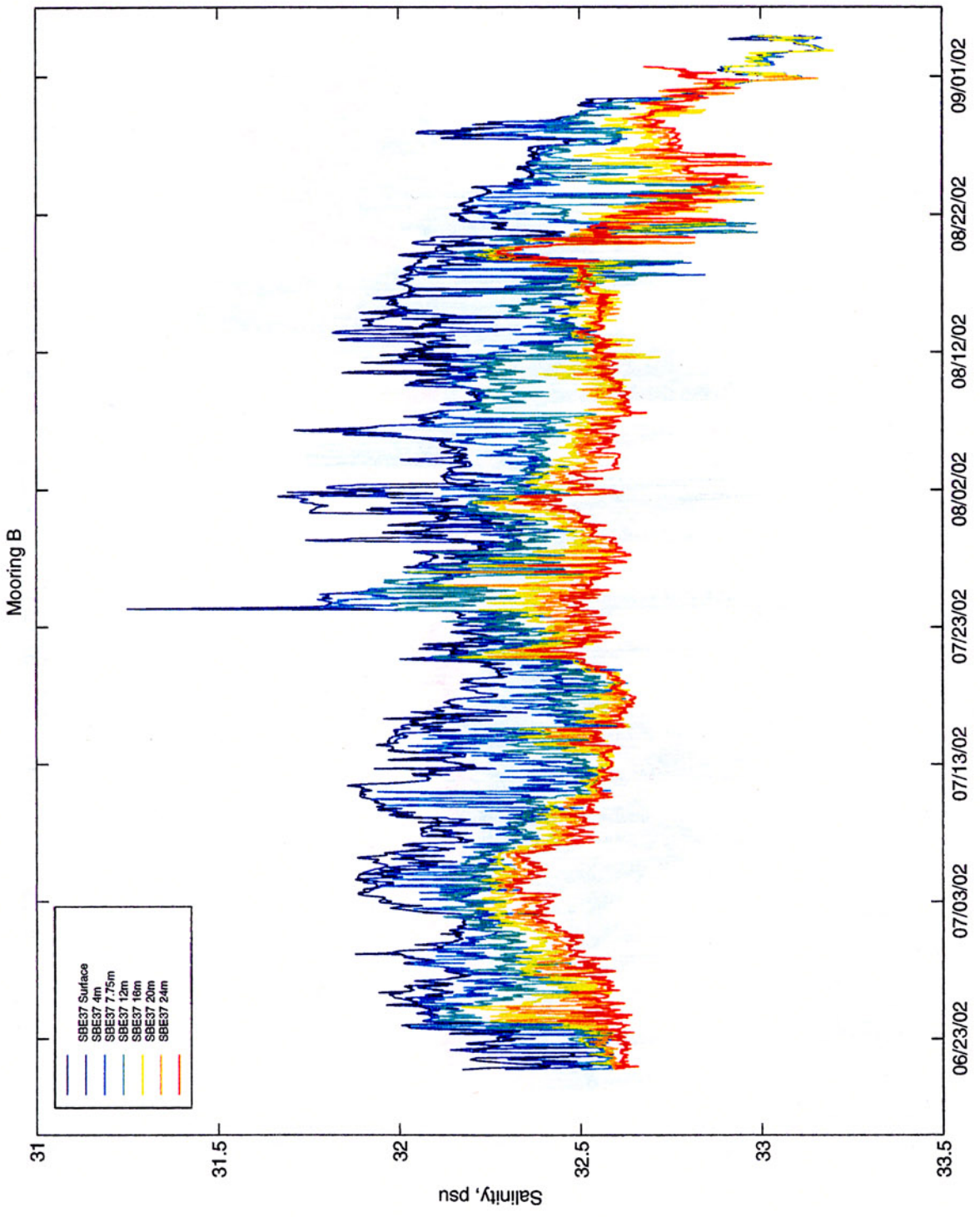

Figure 25: Salinity data from Mooring B, shown as 1-hour averages.

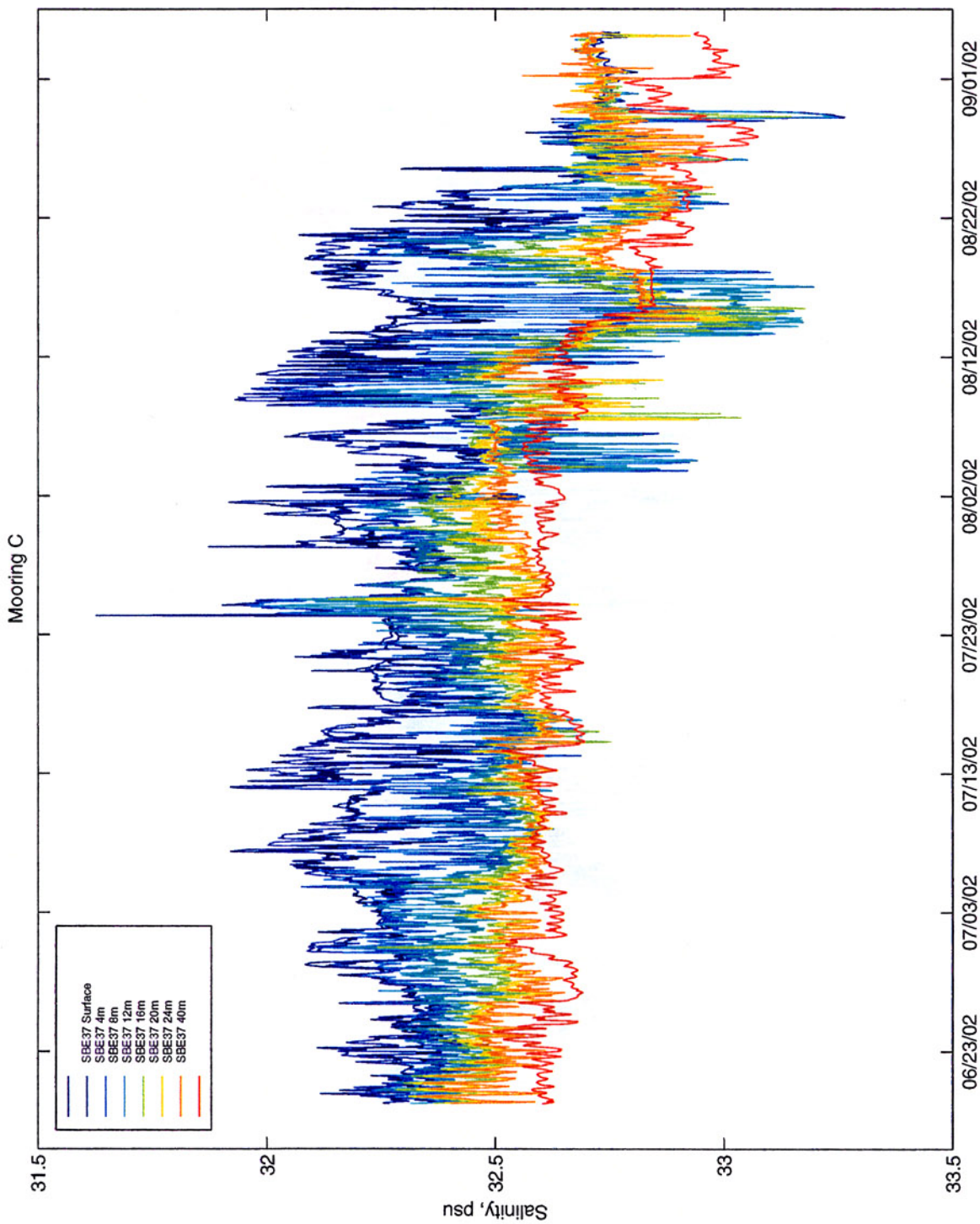

Figure 26: Salinity data from Mooring C, shown as 1-hour averages.

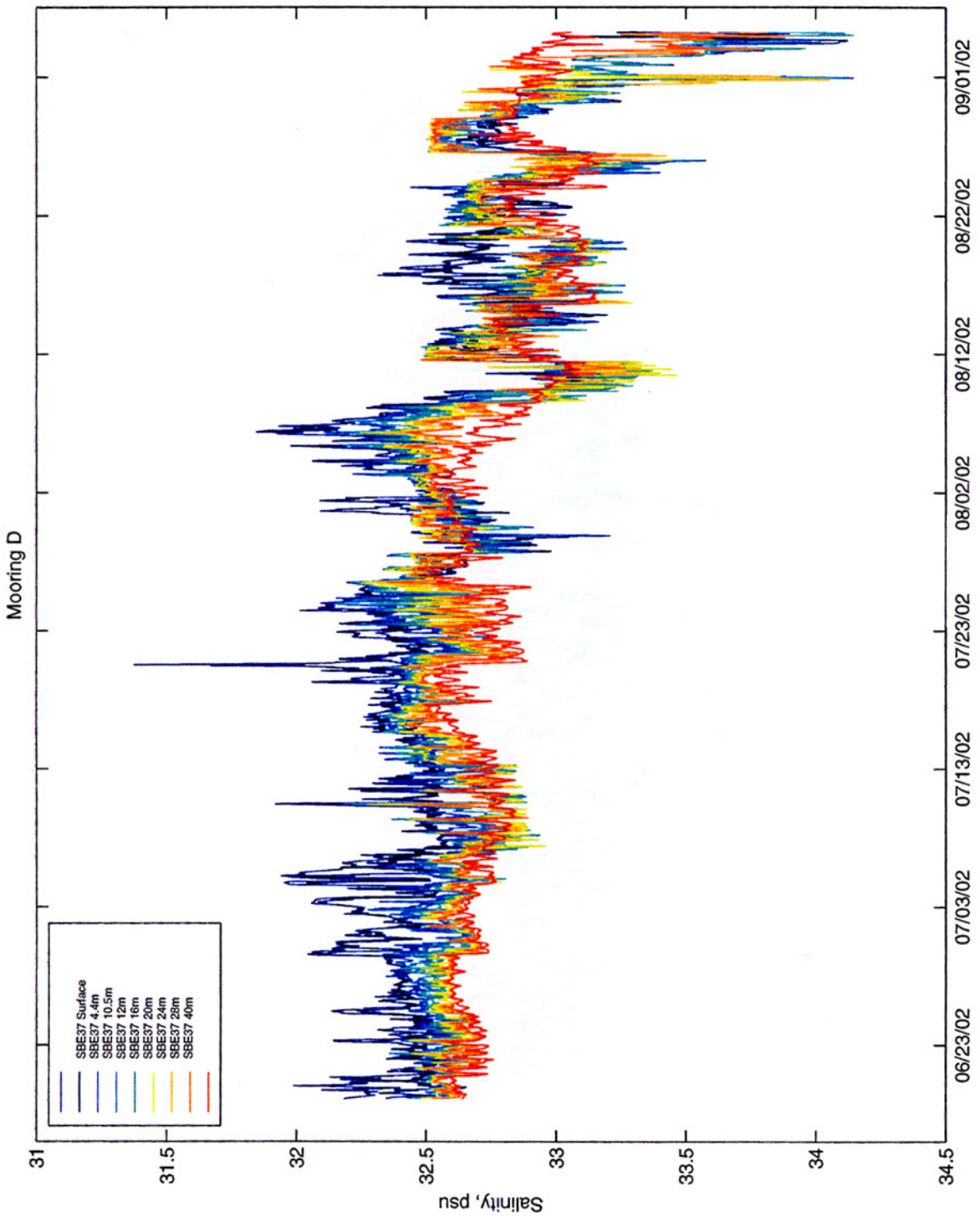

Figure 27: Salinity data from Mooring D, shown as 1-hour averages.

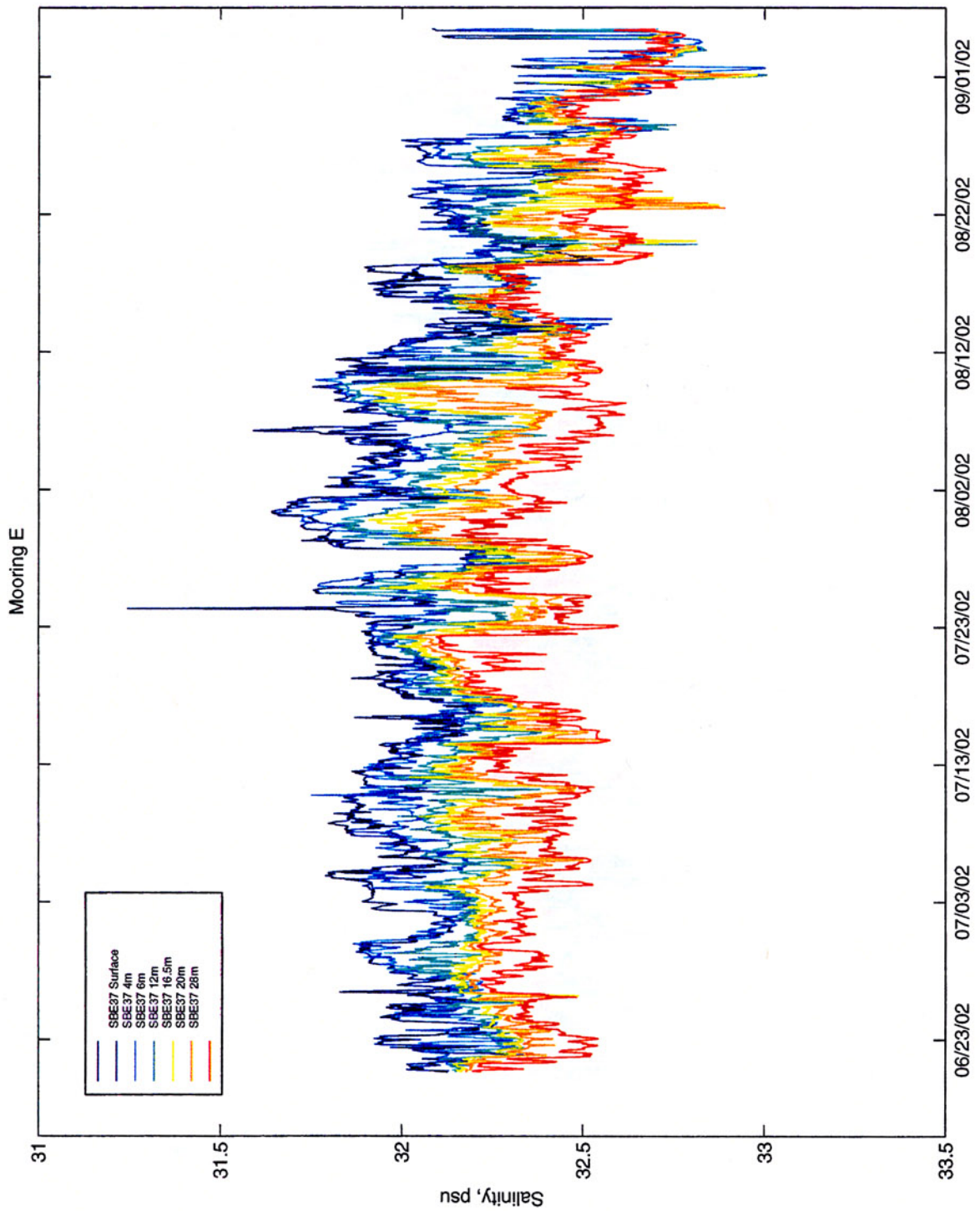

Figure 28: Salinity data from Mooring E, shown as 1-hour averages.

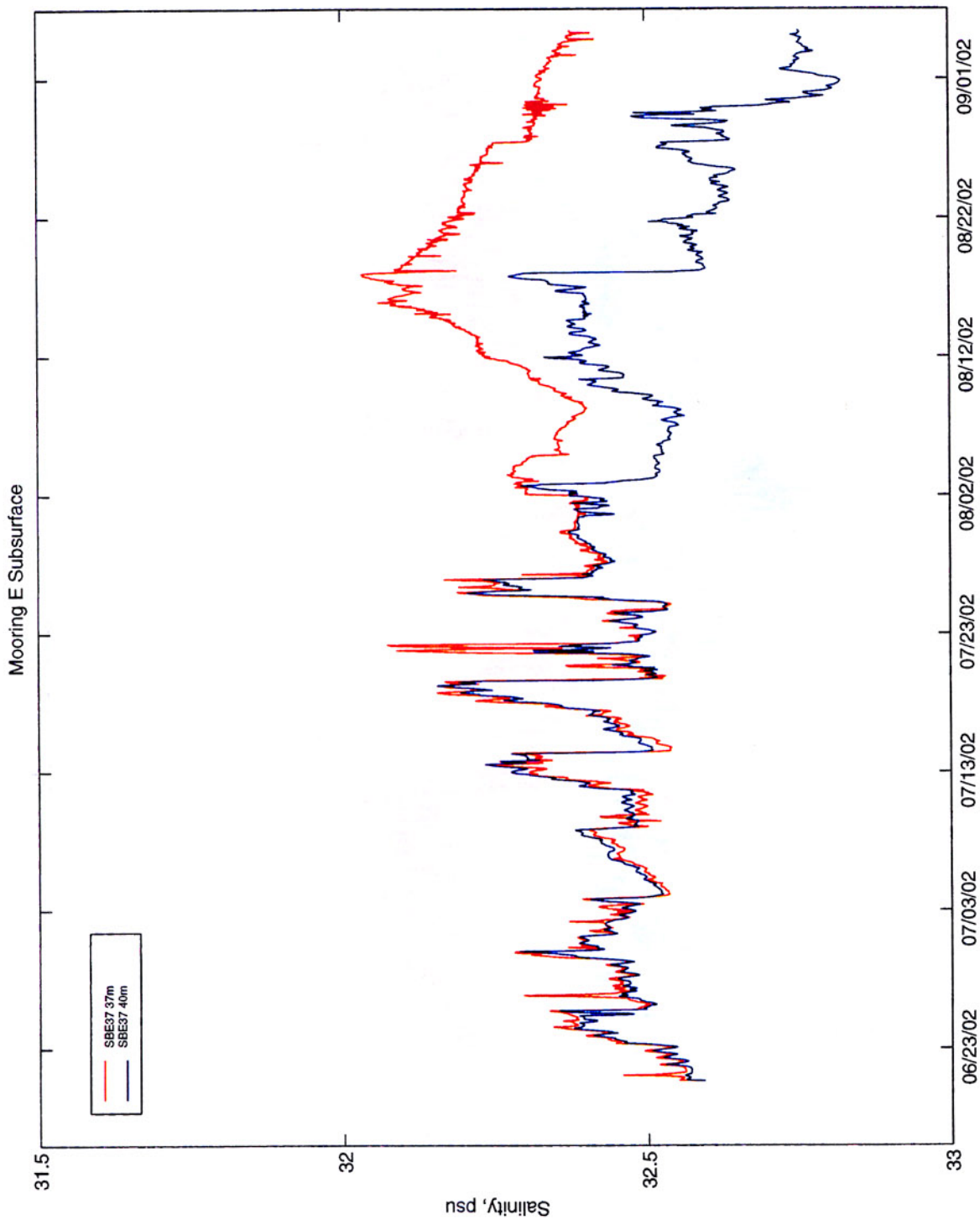

Figure 29: Salinity data from subsurface Mooring E, shown as 1-hour averages.

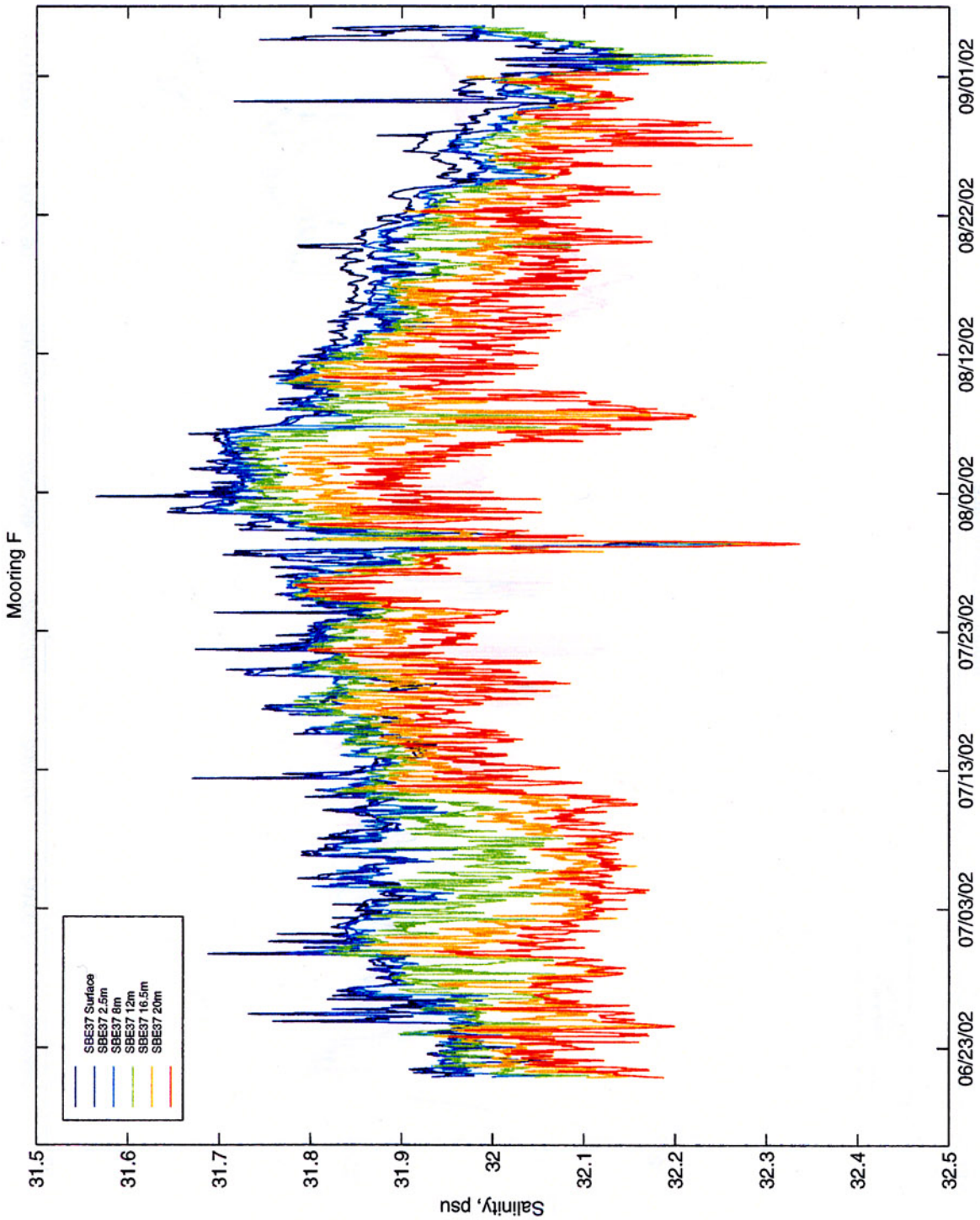

Figure 30: Salinity data from Mooring F, shown as 1-hour averages.

E. Density

Density values were calculated from the salinity and temperature data collected from the SeaBird instruments. Basic density plots are given below (Figures 31 –37).

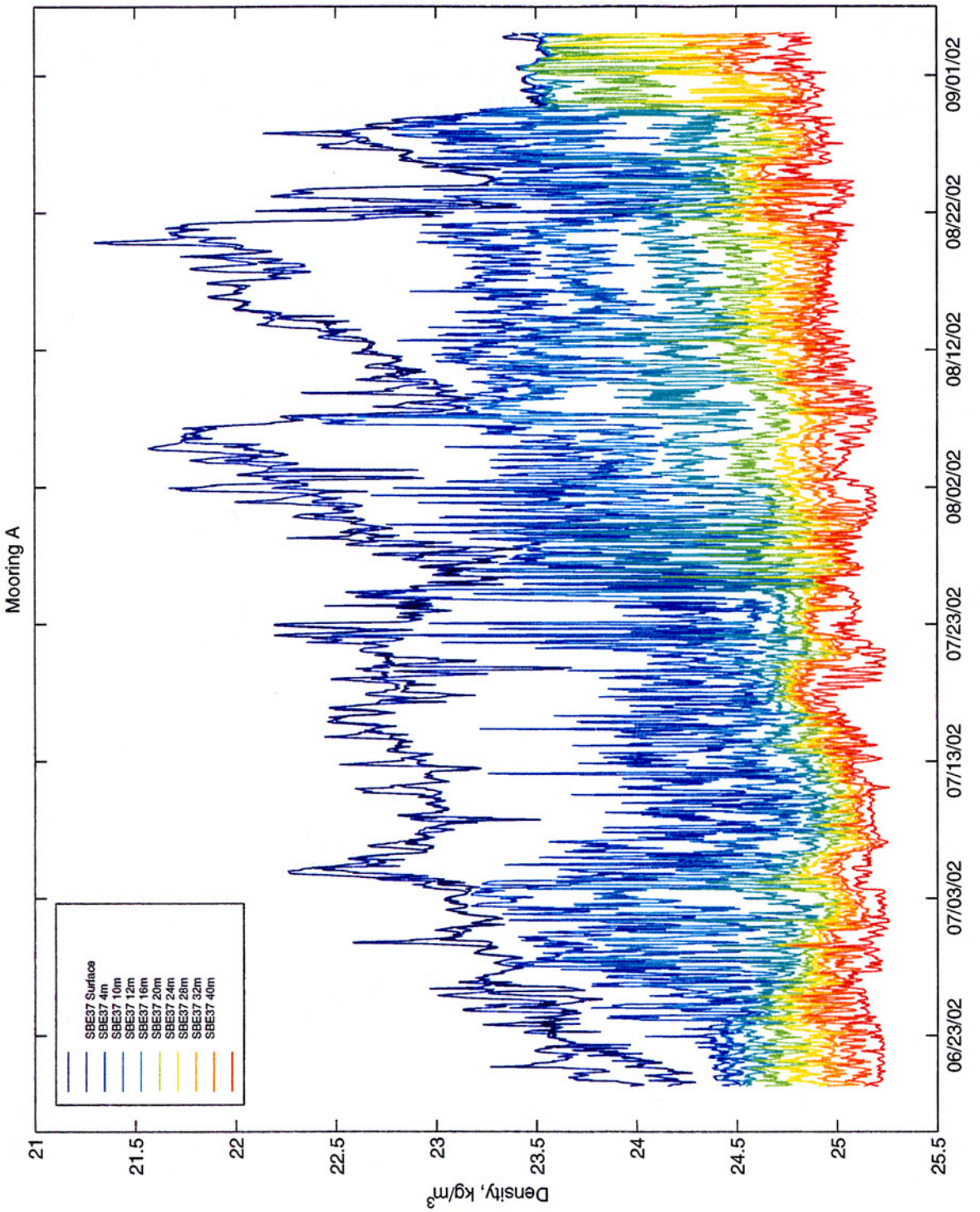

Figure 31: Density data from Mooring A, shown as 1-hour averages.

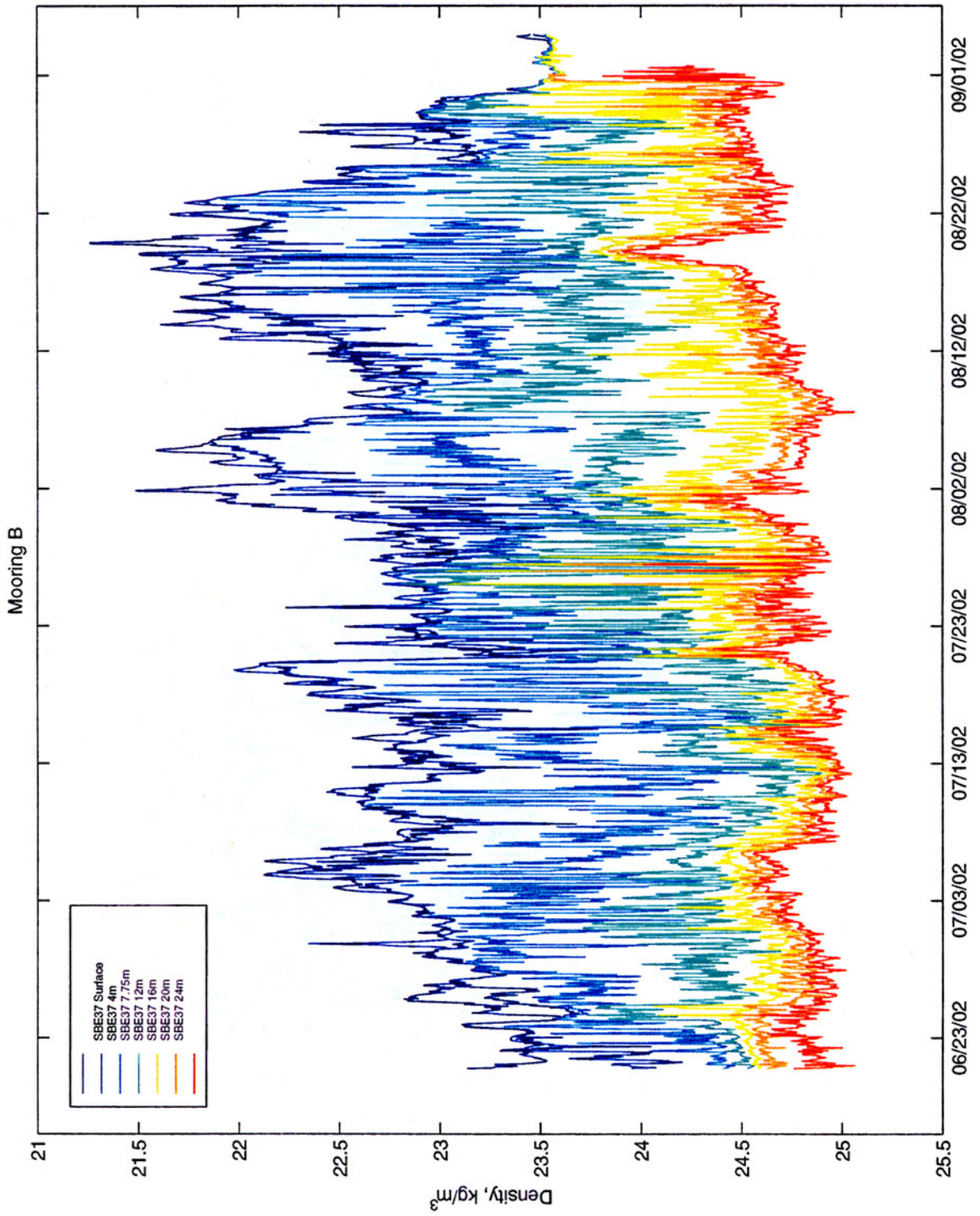

Figure 32: Density data from Mooring B, shown as 1-hour averages.

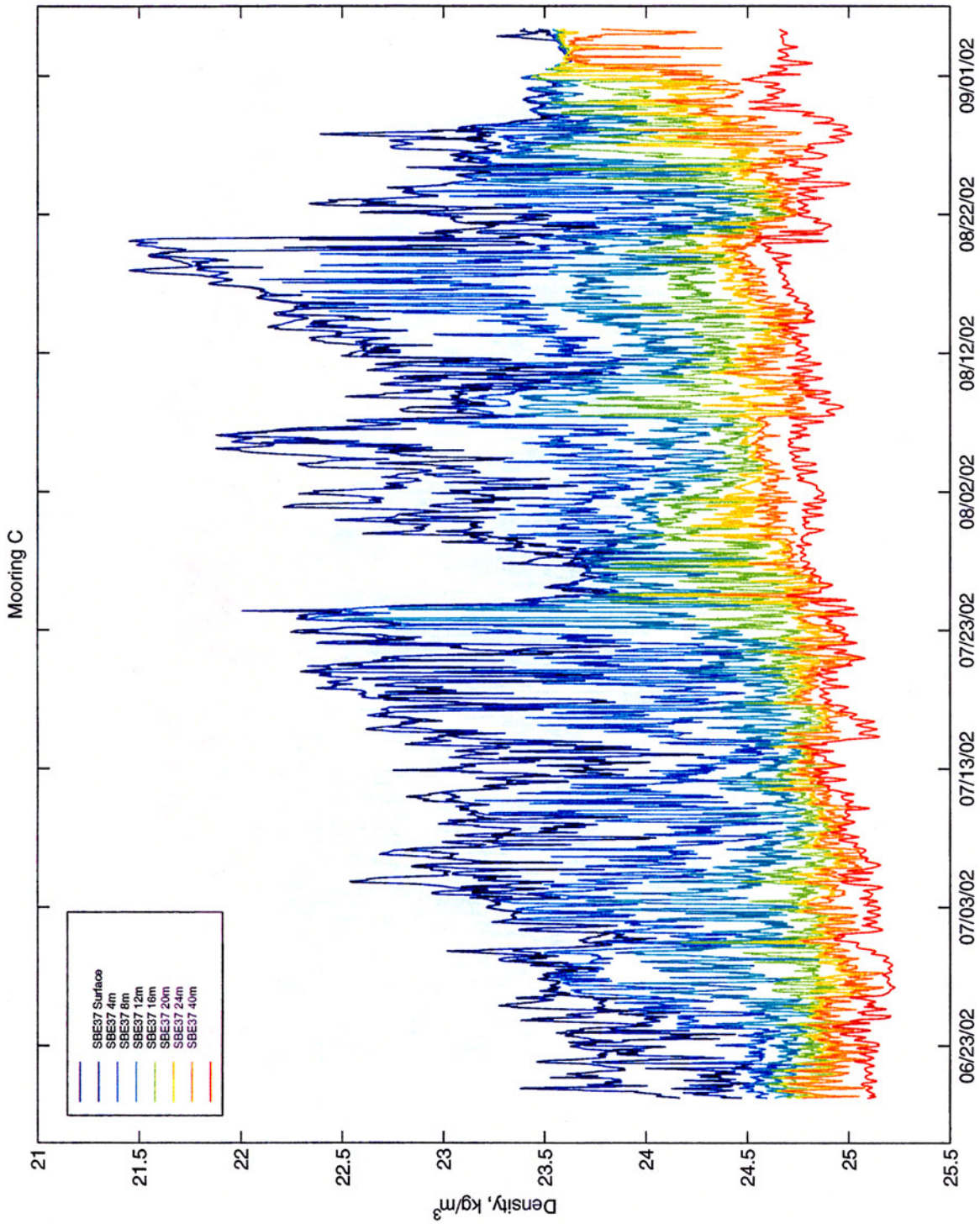

Figure 33: Density data from Mooring C, shown as 1-hour averages.

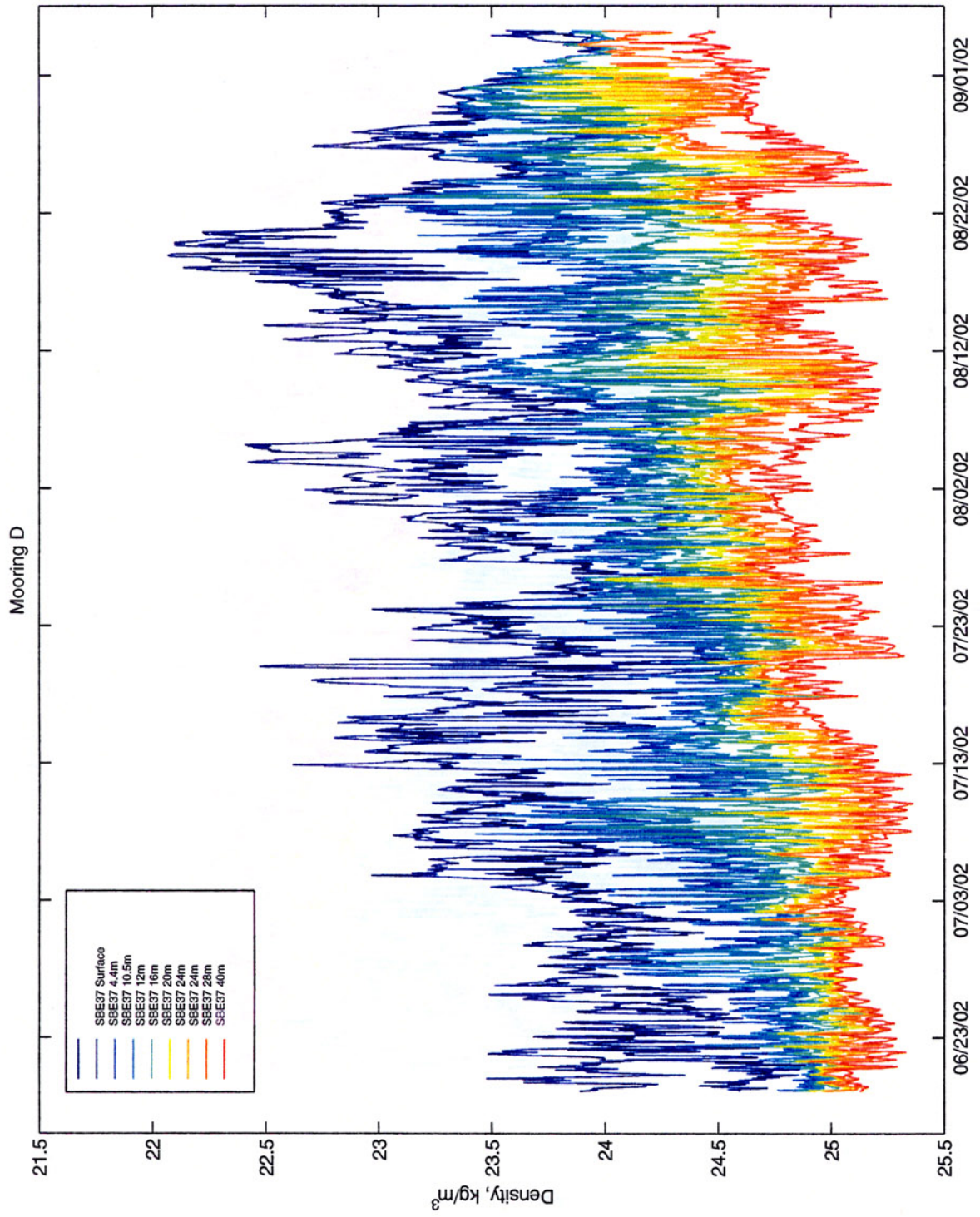

Figure 34: Density data from Mooring D, shown as 1-hour averages.

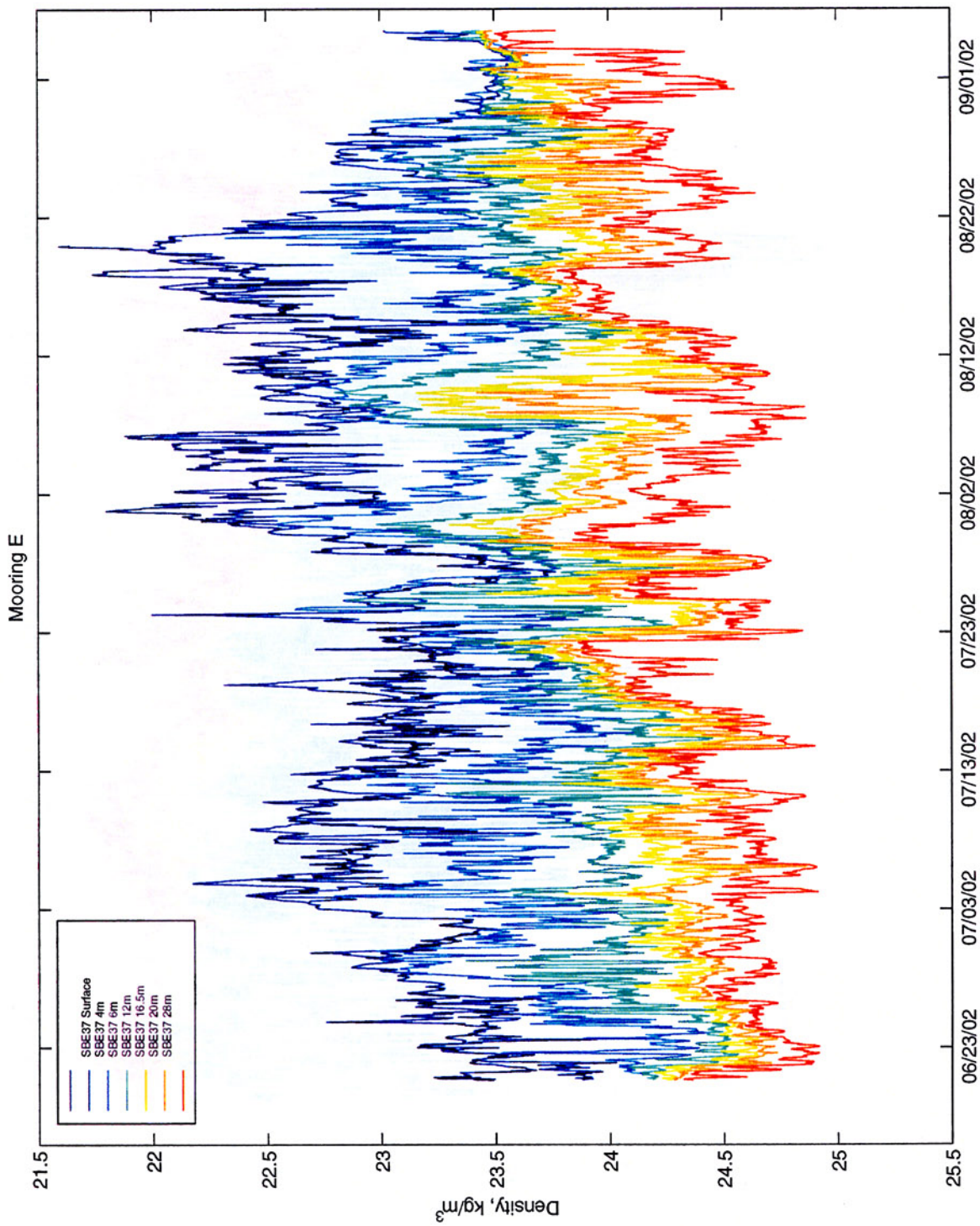

Figure 35: Density data from Mooring E, shown as 1-hour averages.

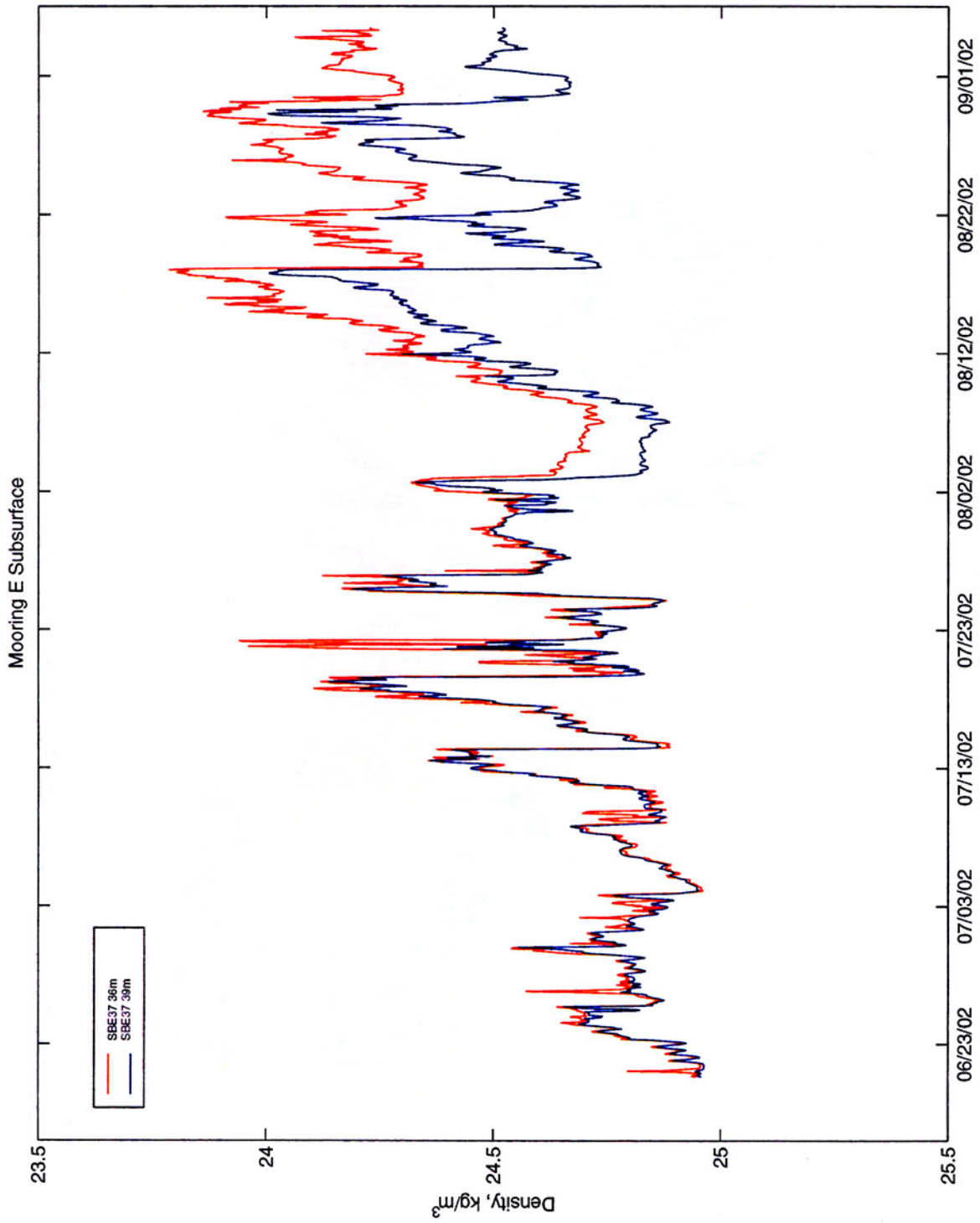

Figure 36: Density data from subsurface Mooring E, shown as 1-hour averages.

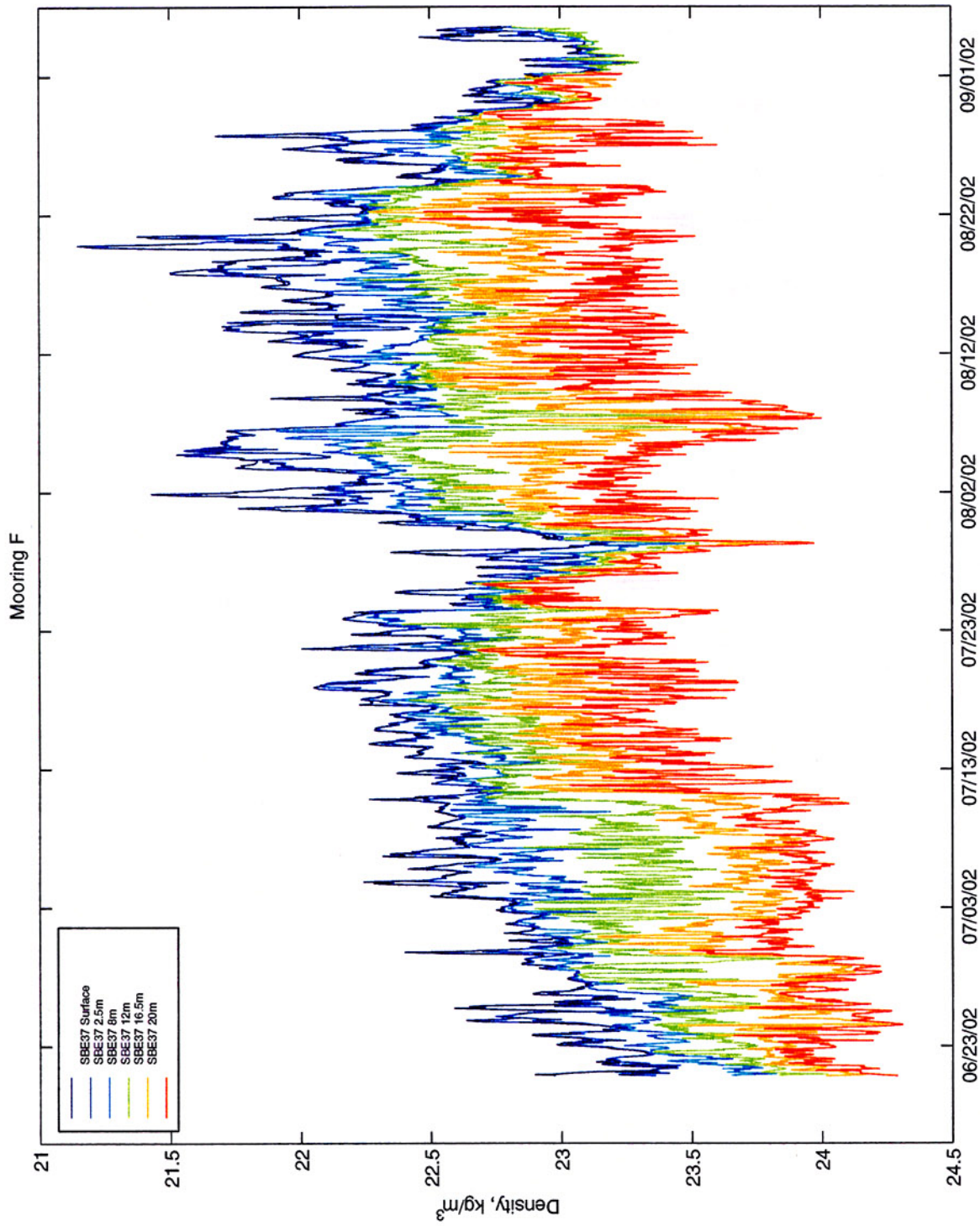

Figure 37: Density data from subsurface Mooring F, shown as 1-hour averages.

IV. ACKNOWLEDGEMENTS

We would like to thank all of the UOP staff who assisted in the project, including Nan Galbraith, Jason Smith, Ryan Brown, Brian Hogue, and Kelan Huang, and WHOI Divers Lary Ball and Glen McDonald. We also appreciate the funding received through the Office of Naval Research (Contract No. N00014-01-1-0029) and the Secretary of Navy / CNO Chair (Grant No. N00014-99-1-0090).

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V. REFERENCES

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Pritchard, Mark, Jason Gobat, William Ostrom, Jeffrey Lord, Paul Bouchard, and Robert Weller, 2002. CBLAST-Low 2001 Pilot Study: Mooring Deployment Cruise and Data Report; FV *Nobska*, June 4 to August 17, 2001. *Woods Hole Oceanographic Institution Technical Report* WHOI-2002-03; UOP Technical Report 2002-02, 61 pp.

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APPENDIX A – MOORED STATION LOGS

Moored station logs were completed during deployment and recover of each mooring. These logs give helpful information, such as deployment and recovery dates and times, water depth, instrument serial numbers, and instrument depths. Surface Mooring E and subsurface Mooring E are combined on one log.

Moored Station Log

PAGE 1

(fill out log with black ball point pen only)

ARRAY NAME AND NO. CBLAST - A MOORED STATION NO. 1090

Launch (anchor over)

Date June 19, 2002 (day-mon-year) Time 6:56:30 UTC

Latitude 40° 59.466 (N) or S (deg-min) Longitude 70° 35.397' E or (W) (deg-min)

Position Source: GPS, LORAN, SAT. NAV., OTHER GPS

Deployed by: Lord, Bouchard Recorder/Observer: Brown ~~Hogue~~

Ship and Cruise No Nobska Intended duration: 90 days

Depth Recorder Reading 48 m Correction Source: _____

Depth Correction 1.5 m _____

Corrected Water Depth 49.5 m Magnetic Variation: _____ E or W

Anchor Position: Lat. — N or S Long. — E or W

Argos Platform ID No. 27380, 27381, 27382 Additional Argos Info may be found on pages 2 and 3.

Acoustic Release Information

Release No. 615 Tested to _____ meters

Receiver No. _____ Release Command C

Interrogate Freq. _____ Reply Freq. _____

Recovery (release fired)

Date September 4, 2002 (day-mon-year) Time _____ UTC

Buoy Out 02:13 UTC

Latitude _____ N or S (deg-min) Longitude _____ E or W (deg-min)

Postion Source: GPS, LORAN, SAT. NAV., OTHER _____

Recovered by: Lord, Weller, Pritchard Bouchard, Hogue Recorder/Observer: Hogue

Ship and Cruise No. Nobska Actual duration: _____ days

Distance from actual waterline to buoy deck _____ meters

Surface Components

Buoy Type ______________ Color(s) Hull __________ Tower ______________

Buoy Markings ____

Surface Instrumentation			
Item	ID	Height *	Comments
Data Logger	L14		
Rel. Humidity	HRH 503	209.2 cm	ASIMET, also air temp
Wind Mod.	WND345	241 9 cm	installed 06:40:00 UTC
Bar. Pressure	BPR 503	205.1 cm	
Shortwave	SWR503	200.3 cm	
Longwave	LWR 503	200 cm	
Precipitation	PRC 503	212.4 cm	
Argos PTT	19456		
	27380		
	27381		
	27382		
* Height above buoy deck in cm.			

Sub-Surface Instrumentation on Buoy and Bridle			
Item	ID	Depth†	Comments
SBE37	1839	0.55	
† Depth below buoy deck			

Sub-Surface Components

	Type	Size(s)	Manufacturer
Chain			
Wire Rope			
Synthetics			
Hardware			

Flotation	Type (G.B.s, Spheres, etc)	Size	Quantity	Color

No. of Flotation Clusters _____

Anchor Dry Weight _____ lbs

MOORED STATION NUMBER 1090

Planned Depth (m)	Item No.	Lgth [m]	Item	Inst No.	Time Over (UTC)	Notes	Data No.	Calc Dpth (m)	Time Back (UTC)	Notes
2	1		VMCM	0013	6:48	mid sting		2.4	10:19	
4	2		SBE 37	1325	6:48	mid cell		4	10:19	
5	3		SBE 39	0696	6:48	probe up		4.9	10:19	
6	4		RDI-600	1825	6:48	point down		6.6	10:19	
8	5		VMCM	0019	6:35	mid sting		7.5	10:22	
9	6		SBE37	1906	6:56	~~probe up~~ on load bar		10	10:22	
10	7		Nortek	357	6:56	2MHz, load bar, head up		11	10:22	
12	8		SBE 37	2381	6:30			12	10:28	
13	9		SBE 39	0691	6:30			13	10:28	
14.5	10		SBE 39	0687	6:30			14.5	10:29	
16	11		SBE 37	2366	6:30			16	10:29	
17.5	12		SBE 39	0035	6:30			17.5	10:29	
18.5	13		SBE39	0038	6:30			18.5	10:30	Bent probe
20	14		SBE37	2043	6:30			20	10:30	
22	15		SBE39	0040	6:30			22	10:31	
24	16		SBE37	2045	6:30			24	10:31	
26	17		SBE39	0079	6:30			26	10:32	
28	18		SBE37	2044	6:30			28	10:32	
30	19		TPOD	5466	6:30			30	10:33	
32	20		SBE37	2047	6:30			32	10:35	

Date/Time	Comments

MOORED STATION NUMBER 1090

Item No.	Lgth [m]	Item	Inst No.	Time Over	Notes	Data No.	Calc Dpth	Time Back	Notes
21		SBE37	1912	6:30	w/pressure		40	10:35	
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Date/Time	Comments

Moored Station Log

PAGE 1

(fill out log with black ball point pen only)

ARRAY NAME AND NO. CBLAST-B MOORED STATION NO. 1091

Launch (anchor over)

Date June 20, 2002 (day-mon-year) Time 18:02:30 UTC

Latitude 41° 02.449 (N) or S (deg-min) Longitude 70° 47.615 (deg-min) E or (W)

Position Source: GPS, LORAN, SAT. NAV., OTHER GPS

Deployed by: Ostrom, Smith Recorder/Observer: Brown ~~Hogue~~

Ship and Cruise No _____ Intended duration: 90 days

Depth Recorder Reading 43.5 m Correction Source: _____

Depth Correction 1.5 m _____

Corrected Water Depth 45 m Magnetic Variation: _____ E or W

Anchor Position: Lat. _____ N or S Long. _____ E or W

Argos Platform ID No. 14708, 14714, 14745 Additional Argos Info may be found on pages 2 and 3.

Acoustic Release Information

Release No. _____ Tested to _____ meters

Receiver No. _____ Release Command _____

Interrogate Freq. _____ Reply Freq. _____

Recovery (release fired)

Date September 3, 2002 (day-mon-year) Time _____ UTC

Buoy 23:03 UTC

Latitude _____ N or S (deg-min) Longitude _____ E or W (deg-min)

Postion Source: GPS, LORAN, SAT. NAV., OTHER _____

Recovered by: Lord, Weller, Pritchard Bouchard, Hogue Recorder/Observer: Hogue

Ship and Cruise No. _____ Actual duration: _____ days

Distance from actual waterline to buoy deck _____ meters

Surface Components

Buoy Type ____________ **Color(s) Hull** ________ **Tower** ____________

Buoy Markings ______________________________

Surface Instrumentation			
Item	**ID**	**Height ***	**Comments**
DataLogger	L15		
Rel Humidity	HRH 504	161.3	
Air Temp	HRH 504	161.3	
Wind Module	WND347	196.2	
Bar. Pressure	BPR 504	155.9	
Shortwave	SWR504	185.7	bagged
Longwave	LWR504	183	
Precipitation	PRC 955	141.1	
Argos PTT	19459		
	14708		
	14714		
	14745		

* Height above buoy deck in cm.

Sub-Surface Instrumentation on Buoy and Bridle			
Item	ID	Depth†	Comments
SBE 37	1838	0.55	
† Depth below buoy deck			

Sub-Surface Components

	Type	Size(s)	Manufacturer
Chain			
Wire Rope			
Synthetics			
Hardware			

Flotation	Type (G.B.s, Spheres, etc)	Size	Quantity	Color
No. of Flotation Clusters _____				
Anchor Dry Weight _____ lbs				

MOORED STATION NUMBER 1091

Item No.	Lgth [m]	Item	Inst No.	Time Over	Notes	Data No.	Calc Dpth	Time Back	Notes
1		SBE39	819	18:02:30			2.07	23:20	
2		SBE39	789	17:58			3	23:20	
3		SBE37	1304	17:58			4	23:20	
4		VMCM	22	17:58			5	23:20	
5		SBE39	821	17:58			7	23:20	
6		SBE37	9	17:58			7.75	23:20	
7		SBE39	694	17:58			9.5	23:34	
8		SBE39	692	17:58			11	23:35	
9		SBE37	2046	17:58			12	23:36	
10		SBE39	101	17:58			13	23:37	
11		SBE39	47	17:58			14.5	23:38	
12		SBE37	2364	17:58			16	23:41	
13		Nortek	402	17:58	2MHz		17	23:41	
14		SBE39	342	17:58			17.5	23:43	
15		SBE39	332	17:58			18.5	23:43	
16		SBE37	1650	17:58			20	23:44	
17		TPOD	3307	17:58			22	23:45	
18		FSI	1469	17:58			22.5	23:51	
19		SBE37	1637	17:58			24	23:55	
20		TPOD	3294	17:58			26	23:50	

Date/Time	Comments

MOORED STATION NUMBER 1091

Item No.	Lgth [m]	Item	Inst No.	Time Over	Notes	Data No.	Calc Dpth	Time Back	Notes
21		SBE 37	1640	17:58			28	23:58	
22		TPOD	3310	17:58	slippidon wire		30	23:59	
23		SBE37	1638	17:58	growth on sensor area		32	00:00	
24		SBE37	1913	17:58	loose on wire against term		40	00:01	
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Date/Time	Comments

Moored Station Log

PAGE 1

(fill out log with black ball point pen only)

ARRAY NAME AND NO. CBLAST-C MOORED STATION NO. 1092

Launch (anchor over)

Date June 19, 2002 (day-mon-year) Time 05 10:00 UTC

Latitude 40° 56.041 (N) or S (deg-min) Longitude 70° 24.216 (deg-min) E or (W)

Position Source: GPS, LORAN, SAT. NAV., OTHER GPS

Deployed by: Lord, Bouchard Recorder/Observer: Brown ~~Hogue~~

Ship and Cruise No _____ Intended duration: 90 days

Depth Recorder Reading 44 m Correction Source: _____

Depth Correction 1.5 m _____

Corrected Water Depth 45.5 m Magnetic Variation: _____ E or W

Anchor Position: Lat. _____ N or S Long. _____ E or W

Argos Platform ID No. 14663, 14677, 14697 Additional Argos Info may be found on pages 2 and 3.

Acoustic Release Information

Release No. 246 Tested to _____ meters

Receiver No. _____ Release Command D

Interrogate Freq. _____ Reply Freq. _____

Recovery (release fired)

Date September 4, 2002 (day-mon-year) Time _____ UTC

Buoy Out 09:13 UTC

Latitude _____ N or S (deg-min) Longitude _____ E or W (deg-min)

Postion Source: GPS, LORAN, SAT. NAV., OTHER _____

Recovered by: Lord, Weller, Pritchard, Bouchard, Hogue Recorder/Observer: Hogue

Ship and Cruise No. _____ Actual duration: _____ days

Distance from actual waterline to buoy deck _____ meters

Surface Components

Buoy Type ______________ **Color(s) Hull** __________ **Tower** ______________

Buoy Markings ____

Surface Instrumentation

Item	ID	Height *	Comments
Data Logger	L13		
Rel. Humidity	HRH 506	161.3 cm	ASIMET
Air Temp	HRH 506	161.3 cm	ASIMET
Wind Module	WND 348	196.2 cm	installed 04:29:00 6/19/02
Bar. Pressure	BPR 506	155.9 cm	
Shortwave	SWR 506	185.7 cm	
Longwave	LWR 50[illegible]	183 cm	
Precipitation	PRC 953	141.1 cm	
Argos PTT	19466		
	14663		
	14677		
	14697		

*** Height above buoy deck**

Sub-Surface Instrumentation on Buoy and Bridle			
Item	ID	Depth†	Comments
SBE-37	1419	0.55 m	
† Depth below buoy deck			

Sub-Surface Components

	Type	Size(s)	Manufacturer
Chain			
Wire Rope			
Synthetics			
Hardware			

Flotation	Type (G.B.s, Spheres, etc)	Size	Quantity	Color

No. of Flotation Clusters _____

Anchor Dry Weight _____ lbs

MOORED STATION NUMBER 1092

Planned Depth (m)	Item No.	Lgth [m]	Item	Inst No.	Time Over	Notes	Data No.	Calc Dpth	Time Back	Notes
2	1		SBE 39	0690	4:46			2.1	5:20	
3	2		SBE 39	0820	4:46			2.93	5:20	
4	3		SBE 37	0011	4:46			3.93	5:20	
5	4		VMCM	0033	4:34			4.95	5:21	
8	5		SBE 37	1907	4:46			8	5:26	
9.5	6		FSI	1467	4:46			9.6	5:26	
11	7		SBE 39	0693	4:46			11	5:29	
12	8		SBE 37	~~0686~~ 1651	4:46			12	5:30	
13	9		SBE 39	0688	4:46			13	5:30	
14.5	10		SBE 39	0042	4:46			14.5	5:30	
16	11		SBE 37	1648	4:46			16	5:30	
17.5	12		SBE 39	0051	4:46			17.5	5:31	
18.5	13		SBE 39	0341	4:46			18.5	5:31	
20	14		SBE 37	1642	4:46			20	5:31	
22	15		SBE 39	0333	4:46			22	5:32	
23	16		Nortek	0253	4:46			23	5:32	
24	17		SBE 37	1643	4:46			24	5:33	
26	18		TPOD	4487	4:46			26	5:34	
30	19		TPOD	3270	4:46			30	5:35	
40	20		SBE 37	0670	4:46			40	5:36	

Date/Time	Comments

Moored Station Log

(fill out log with black ball point pen only)

ARRAY NAME AND NO. CBAST D MOORED STATION NO. 1093

Launch (anchor over)

Date June 19, 2002 (day-mon-year) Time 1:50:00 UTC

Latitude 40° 40.539' (N) or S (deg-min) Longitude 70° 05.530' E or (W) (deg-min)

Position Source: GPS, LORAN, SAT. NAV., OTHER GPS

Deployed by: Lord, Bouchard Recorder/Observer: ~~Brown~~ Hogue

Ship and Cruise No _____ Intended duration: 90 days

Depth Recorder Reading 42.5 m Correction Source: _____

Depth Correction 1.5 m _____

Corrected Water Depth 44 m Magnetic Variation: _____ E or W

Anchor Position: Lat. — N or S Long. — E or W

Argos Platform ID No. _____ Additional Argos Info may be found on pages 2 and 3.

Acoustic Release Information

Release No. 581 Tested to _____ meters

Receiver No. _____ Release Command H

Interrogate Freq. _____ Reply Freq. _____

Recovery (release fired)

Date September 4, 2002 (day-mon-year) Time _____ UTC

Buoy Out 06:19 UTC

Latitude _____ N or S (deg-min) Longitude _____ E or W (deg-min)

Postion Source: GPS, LORAN, SAT. NAV., OTHER _____

Recovered by: Lord, Weller, Pritchard, Bouchard, Hogue Recorder/Observer: Hogue

Ship and Cruise No. _____ Actual duration: _____ days

Distance from actual waterline to buoy deck _____ meters

Surface Components

Buoy Type ____________ **Color(s) Hull** ________ **Tower** ____________

Buoy Markings ______________________________________

Surface Instrumentation			
Item	**ID**	**Height ***	**Comments**
DataLogger	L12		
Rel. Humidity	HRH502	169.5	
Air Temp.	HRH 502	169.5	
Wind Module	WND 344	188.3	
Bar. Pressure	BPR 502	137.8	
Shortwave	SWR 502	181.8	
Longwave	LWR 502	183.2	
Precipitation	PRC 502	141	
Argos PTT	19488		
	14644		
	14652		
	14653		
* Height above buoy deck in cm.			

Sub-Surface Instrumentation on Buoy and Bridle			
Item	ID	Depth†	Comments
SBE 37	1835	0.55	
† Depth below buoy deck			

Sub-Surface Components

	Type	Size(s)	Manufacturer
Chain			
Wire Rope			
Synthetics			
Hardware			

Flotation	Type (G.B.s, Spheres, etc)	Size	Quantity	Color

No. of Flotation Clusters _____

Anchor Dry Weight _____ lbs

MOORED STATION NUMBER 1093

Planned Depth (m)	Item No.	Lgth [m]	Item	Inst No.	Time Over	Notes	Data No.	Calc Dpth	Time Back	Notes
2	1		RDI300	100	1:34			2.6	2:28	
3	2		SBE 39	0701	1:34			3.95	2:32	
4	3		SBE 37	0010	1:34			4.4	2:32	
5	4		SBE 39	0653	1:34			5.16	2:32	
6.5	5		SBE 39	0689	1:34			6.54	2:32	
8.5	6		VMCM	0043	1:20			8.15	2:37	
9.5	7		SBE 37	1091	1:35			10.5	2:40	#1901?
10.5	8		SBE 39	0721	1:35			11.5	2:42	
	9		SBE 37	1641	1:35			12	2:43	
	10		SBE 39	0046	1:35			13	2:43	
	11		SBE 39	0045	1:35			14.5	2:44	
	12		SBE 37	1645	1:35			16	2:44	
	13		SBE 39	0340	1:35			17.5	2:45	
	14		SBE 39	0336	1:35			18.5	2:45	
	15		SBE 37	1649	1:35			20	2:46	
	16		TPOD	3706	1:35			22	2:47	
	17		SBE 37	1644	1:35			24	2:47	
	18		TPOD	5458	1:35			26	2:47	
	19		SBE 37	0686	1:35			28	2:49	
	20		TPOD	3299	1:35			30	2:51	

Date/Time	Comments

MOORED STATION NUMBER 1093

Item No.	Lgth [m]	Item	Inst No.	Time Over	Notes	Data No.	Calc Dpth	Time Back	Notes
21		SBE 37	0683	1:35			40	2:52	
22									
23									
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Date/Time	Comments

Moored Station Log

PAGE 1

(fill out log with black ball point pen only)

ARRAY NAME AND NO. SecNav - E MOORED STATION NO. 1094

Launch (anchor over)

Subsurf 15:15
Sled 13:24

Date June 20, 2002 (day-mon-year) Time 14:45 UTC

Latitude 41° 09.161' (N) or S (deg-min) Longitude 70° 36.211 (deg-min) E or (W)

Position Source: GPS, LORAN, SAT. NAV., OTHER GPS

Deployed by: Ostrom, Smith Recorder/Observer: Brown ~~Hogue~~

Ship and Cruise No _____ Intended duration: 90 days

Depth Recorder Reading _____ m Correction Source: _____

Depth Correction _____ m _____

Corrected Water Depth 40 m Magnetic Variation: _____ E or W

Anchor Position: Lat. — N or S Long. — E or W

Argos Platform ID No. _____ Additional Argos Info may be found on pages 2 and 3.

Acoustic Release Information

Release No. 522 Tested to _____ meters

Receiver No. _____ Release Command B

Interrogate Freq. _____ Reply Freq. _____

Recovery (release fired)

9/4/02 buoy out 11:47
9/9/02 Subsurf 18:03
9/4/02 Sled 13:36

Date September 9, 2002 and September 4, 2002 (day-mon-year) Time _____ UTC

Latitude _____ N or S (deg-min) Longitude _____ E or W (deg-min)

Postion Source: GPS, LORAN, SAT. NAV., OTHER _____

Recovered by: _____ Recorder/Observer: Hogue

Ship and Cruise No. _____ Actual duration: _____ days

Distance from actual waterline to buoy deck _____ meters

Surface Components

Buoy Type ____________ Color(s) Hull ________ Tower ____________

Buoy Markings ____

Surface Instrumentation

Item	ID	Height *	Comments
Data Logger	L11		
Rel. Humidity	HRH501	118.4	
Air Temp	HRH501	118.4	
Wind Module	WND343	198.8	
Bar. Pressure	BPR 501	62.2	
Shortwave	SWR 501	169.5	Bugged 09:54:30 6/20/02
Longwave	LWR501	170	Bugged 10:00:00 6/20/02
Precipitation	PRC 501	74.8	
Argos PTT			

* Height above buoy deck in cm.

Sub-Surface Instrumentation on Buoy and Bridle

Item	ID	Depth†	Comments
SBE37	1841	0.45m	
† Depth below buoy deck			

Sub-Surface Components

	Type	Size(s)	Manufacturer
Chain			
Wire Rope			
Synthetics			
Hardware			

Flotation	Type (G.B.s, Spheres, etc)	Size	Quantity	Color

No. of Flotation Clusters _____

Anchor Dry Weight _____ lbs

MOORED STATION NUMBER 1094 Surface

Mooring E - Surface

Item No.	Lgth [m]	Item	Inst No.	Time Over	Notes	Data No.	Calc Dpth	Time Back	Notes
1		SBE39	700	14:45			2		
2		SBE39	695	14:45			3		
3		SBE37	1902	14:45			3.5		
4		Sontek	D208	14:45			4		
5		SBE39	685	14:45			6		
6		A-Beta	626	14:45			6.5		
7		SBE39	720	14:45			7		
8		SBE37	685	14:45			8		
9		TPOD	3312	14:45			9		
10		SBE39	102	14:45			9.5		
11		SBE39	54	14:45			11		
12		SBE37	1903	14:45			12		
13		SBE39	339	14:45			13		
14		Sontek	D197	14:45			14		
15		SBE39	0337	14:45			14.5		
16		~~TPOD~~	~~5463~~	~~14:45~~			~~15~~		
17		A-Beta	0625	14:45			15.5		
18		SBE37	1905	14:45			16.5		
19		SBE39	0334	14:45			17.5		
20		TPOD	3713	14:45			18.5		

Date/Time	Comments

MOORED STATION NUMBER 1094

Item No.	Lgth [m]	Item	Inst No.	Time Over	Notes	Data No.	Calc Dpth	Time Back	Notes
21		SBE37	0669	14:45		20			
22		TPOD	3282	14:45		22			
23		Sontek	D193	14:45		23			
24		TPOD	3274	14:45		24			
25		TPOD	5457	14'45		27			
26		SBE37	0671	14'45		28			
27		TPOD	3302	14:45		30			
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

Date/Time	Comments

MOORED STATION NUMBER 1096 Subsurf

Mooring E - Subsurface

Item No.	Lgth [m]	Item	Inst No.	Time Over	Notes	Data No.	Calc Dpth	Time Back	Notes
41		TPOD	3508	~ 15:00			33	18:03	
42			5463	15:00			34	18:03	
43			3714	15:00			35	18:03	
44			0103	15:00			36	18:03	
45			1900	15:00			37	18:03	
46			D171	15:00			38	18:03	
47			0203	15 00			39	18:03	
48			1909	15:00			40	18:03	
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									

Date/Time	Comments

Moored Station Log

(fill out log with black ball point pen only)

ARRAY NAME AND NO. CBLAST - F MOORED STATION NO. 1095

Launch (anchor over)

Date June 20, 2002 (day-mon-year) Time 20:10:00 UTC

Latitude 41° 15.245' (N) or S (deg-min) Longitude 70° 35.480 (deg-min) E or (W)

Position Source: GPS, LORAN, SAT. NAV., OTHER GPS

Deployed by: Ostrom, Smith Recorder/Observer: Brown ~~Hogue~~

Ship and Cruise No _____ Intended duration: 90 days

Depth Recorder Reading 25.5 m Correction Source: _____

Depth Correction 1.5 m _____

Corrected Water Depth 27 m Magnetic Variation: _____ E or W

Anchor Position: Lat. — N or S Long. — E or W

Argos Platform ID No. 14766, 14778, 14901 Additional Argos Info may be found on pages 2 and 3.

Acoustic Release Information

Release No. C29 / 033 Tested to _____ meters

Receiver No. _____ Release Command A

Interrogate Freq. _____ Reply Freq. _____

Recovery (release fired)

Date September 4, 2002 (day-mon-year) Time _____ UTC

buoy out 14:33

Latitude _____ (deg-min) N or S Longitude _____ (deg-min) E or W

Postion Source: GPS, LORAN, SAT. NAV., OTHER _____

Recovered by: Lord, Weller, Pritchard, Bouchard, Hogue Recorder/Observer: Hogue

Ship and Cruise No. _____ Actual duration: _____ days

Distance from actual waterline to buoy deck _____ meters

Surface Components

PAGE 2

Buoy Type ____________ **Color(s) Hull** __________ **Tower** ____________

Buoy Markings ________________________________

Surface Instrumentation

Item	ID	Height *	Comments
Data Logger	L16		
Rel. Humidity	HRH 505	161.3	
Air Temp	HRH 505	161.3	
Wind Module	WND 346	196.2	
Bar. Pressure	BPR 505	155.9	
Shortwave	SWR 505	174.9	bagged 10:02:00 6/20/02
Longwave	LWR 505	174	bagged 10:02:45 6/20/02
Precipitation	PRC 943	141.1	
Argos PTT	19472		
	14766		
	14778		
	14901		

*** Height above buoy deck** in cm.

Sub-Surface Instrumentation on Buoy and Bridle

Item	ID	Depth†	Comments
SBE37	1841	0.45m	

† Depth below buoy deck

Sub-Surface Components

	Type	Size(s)	Manufacturer
Chain			
Wire Rope			
Synthetics			
Hardware			

Flotation	Type (G.B.s, Spheres, etc)	Size	Quantity	Color

No. of Flotation Clusters _____

Anchor Dry Weight _____ lbs

MOORED STATION NUMBER 1094 Surface

Mooring E - Surface

Item No.	Lgth [m]	Item	Inst No.	Time Over	Notes	Data No.	Calc Dpth	Time Back	Notes
1		SBE39	700	14:45			2		
2		SBE39	695	14:45			3		
3		SBE37	1902	14:45			3.5		
4		Sontek	D208	14:45			4		
5		SBE39	685	14:45			6		
6		A-Beta	626	14:45			6.5		
7		SBE39	720	14:45			7		
8		SBE37	685	14:45			8		
9		TPOD	3312	14:45			9		
10		SBE39	102	14:45			9.5		
11		SBE39	54	14:45			11		
12		SBE37	1903	14:45			12		
13		SBE39	339	14:45			13		
14		Sontek	D197	14:45			14		
15		SBE39	0337	14:45			14.5		
16		~~TPOD~~	~~5463~~	~~14:45~~			~~15~~		
17		A-Beta	0625	14:45			15.5		
18		SBE37	1905	14:45			16.5		
19		SBE39	0334	14:45			17.5		
20		TPOD	3713	14:45			18.5		

Date/Time	Comments

APPENDIX B – TIMING MARKS

Timing marks were applied to the instruments prior to deployment so that after recovery, spikes in the data could be compared to a known time. Instruments with temperature sensors were placed in the ocean for a short period of time, except for VMCMs, which had rotor spins performed.

Table 14: Timing marks for Mooring A

Depth from surface (m)	Instrument Type	S/N	Date Deployed	Time In water (UTC)	Notes (All times UTC, all dates DD/MM/YY)
1	SBE-37	1839	19/06/02	6:56:30	Spiked: 20:57:00 until 21:12:00 17/06/02
2.4	VMCM	13	19/06/02	6:48:00	Prop Spins: 13:30:00 and 16:38:00 on 18/06/02, Bands Off: 06:37:00 on 19/06/02
4	SBE-37	1325	19/06/02	6:48:00	Spiked: 13:02:45 until 13:27:30 18/06/02
4.9	SBE-39	696	19/06/02	6:48:00	Spiked: 13:02:45 until 13:27:30 18/06/02
6.6	RDI - 600KHz	1825	19/06/02	6:48:00	Spiked: 17:43:00 until 17:59:00 18/06/02
7.5	VMCM	19	19/06/02	6:35:30	Prop Spins: 13:29:00 and 16:36:00 on 18/06/02, Bands Off: 06:28:00 on 19/06/02
10	SBE-37	1906	19/06/02	6:56:30	Spiked: 13:02:45 until 13:27:30 18/06/02
11	Nortek 2MHz	357	19/06/02	6:56:30	Spiked: 17:51:00 until 18:07:00 18/06/02
12	SBE-37	2381	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
13	SBE-39	691	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
14.5	SBE-39	687	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
16	SBE-37	2366	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
17.5	SBE-39	35	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
18.5	SBE-39	38	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
20	SBE-37	2043	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
22	SBE-39	40	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
24	SBE-37	2045	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
26	SBE-39	79	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
28	SBE-37	2044	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
30	Brancker	5466	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
32	SBE-37	2047	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02
40	SBE-37 (P)	1912	19/06/02	6:30:00	Spiked: 13:02:45 until 13:27:30 18/06/02 With Pressure
	Release	615	19/06/03	6:56:30	Release: A Enable: C

Table 15: Timing marks for Mooring B

Depth from surface (m)	Instrument Type	S/N	Date Deployed	Time In water (UTC)	Notes (All times UTC, all dates DD/MM/YY)
1	SBE-37	1838	20/06/02	18:02:30	Spiked: 20:09:00 until 20:24:00 17/06/02
2.07	SBE39	819	20/06/02	18:02:30	Spiked: 10:39:30 until 10:54:30 20/06/02
3	SBE-39	789	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
4	SBE-37	1304	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
5	VMCM	22	20/06/02	17:58:00	Prop Spin: 10:09:15 and 11:22:30 20/06/02 Bands Off: 17:42:30 20/06/02
7	SBE-39	821	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
7.75	SBE-37	9	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
9.5	SBE-39	694	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
11	SBE-39	692	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
12	SBE-37	2046	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
13	SBE-39	101	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
14.5	SBE-39	47	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
16	SBE-37	2364	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
17	Nortek 2MHz	402	20/06/02	17:58:00	Spiked: 10:20:30 until 10:35:30 20/06/02
17.5	SBE-39	342	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
18.5	SBE-39	332	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
20	SBE-37	1650	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
22	Brancker	3307	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
22.5	FSI	1469	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
24	SBE-37	1637	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
26	Brancker	3294	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
28	SBE-37	1640	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
30	Brancker	3310	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
32	SBE-37	1638	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
40	SBE-37	1913	20/06/02	17:58:00	Spiked: 10:39:30 until 10:54:30 20/06/02
	Release	521	20/06/02	18:02:30	Release: 4B

Table 16: Timing marks for Mooring C

Depth from surface (m)	Instrument Type	S/N	Date Deployed	Time In water (UTC)	Notes (All times UTC, all dates DD/MM/YY)
1	SBE-37	1419	19/06/02	5:10:00	Spiked: 18:22:00 until 18:37:00 17/06/02
2.1	SBE-39	690	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
2.93	SBE-39	820	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
3.93	SBE-37	11	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
4.95	VMCM	33	19/06/02	4:34:30	Prop spins: 13:28:45 and 16:36:00 18/06/02 Bands Off: 04:15:00 19/06/02
8	SBE-37	1907	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
9.6	FSI	1467	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
11	SBE-39	693	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
12	SBE-37	1651	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
13	SBE-39	688	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
14.5	SBE-39	42	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
16	SBE-37	1648	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
17.5	SBE-39	51	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
18.5	SBE-39	341	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
20	SBE-37	1642	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
22	SBE-39	333	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
23	Nortek 1MHz	253	19/06/02	4:46:00	Spiked: 13:52:00 until 13:59:00 18/06/02
24	SBE-37	1643	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
26	Brancker	4487	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
30	Brancker	3270	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
40	SBE-37	670	19/06/02	4:46:00	Spiked: 13:02:45 until 13:27:30 18/06/02
	Release	246	19/06/02	5:10:00	Release: D

Table 17: Timing marks for Mooring D

Depth from surface (m)	Instrument Type	S/N	Date Deployed	Time In water (UTC)	Notes (All times UTC, all dates DD/MM/YY)
1	SBE-37	1835	19/06/02	1:50:00	Spiked: 21:13:00 until 21:27:00 on 17/06/02
2.6	RDI-300KHz	100	19/06/02	1:34:00	Head Down, Spike: 17:43:00 until 17:59:00 on 18/06/02
3.95	SBE-39	701	19/06/02	1:34:00	Spiked: 13:02:45 until 13:27:30 18/06/02
4.4	SBE-37	10	19/06/02	1:34:00	Spiked: 13:02:45 until 13:27:30 18/06/02
5.16	SBE-39	653	19/06/02	1:34:00	Spiked: 13:02:45 until 13:27:30 18/06/02
6.56	SBE-39	689	19/06/02	1:34:00	Spiked: 13:02:45 until 13:27:30 18/06/02
8.15	VMCM	43	19/06/02	1:20:00	Prop Spins: 13:28:00 and 16:36:00 18/06/02 Bands off: 00:59:00 19/06/02
10.5	SBE-37	1091	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
11.5	SBE-39	721	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
12	SBE-37	1641	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
13	SBE-39	46	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
14.5	SBE-39	45	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
16	SBE37	1645	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
17.5	SBE-39	340	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
18.5	SBE-39	336	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
20	SBE-37	1649	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
22	Brancker	3706	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
24	SBE-37	1644	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
26	Brancker	5458	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
28	SBE-39	686	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
30	Brancker	3299	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
40	SBE-37	683	19/06/02	1:35:00	Spiked: 13:02:45 until 13:27:30 18/06/02
	Release	581	19/06/02	1:50:00	Release: H Enable: A

Table 18: Timing marks for Mooring E

Depth from surface (m)	Instrument Type	S/N	Date Deployed	Time In water (UTC)	Notes (All times UTC, all dates DD/MM/YY)
1	SBE-37	1841	20/06/02	14:45:00	Spiked: 15:17:00 until 15:32:00 18/06/02
2	SBE-39	700	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
3	SBE-39	695	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
3.5	SBE-37	1902	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
4	Sontek	D208	20/06/02	14:45:00	Spiked: 10:37:30 until 10:52:30 20/06/02
6	SBE-39	685	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
6.5	A-Beta	626	20/06/02	14:45:00	Spiked: 11:07:04 until 11:09:40 20/06/02
7	SBE-39	720	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
8	SBE-37	685	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
9	Brancker	3312	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
9.5	SBE-39	102	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
11	SBE-39	54	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
12	SBE-37	1903	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
13	SBE-39	339	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
14	Sontek	D197	20/06/02	14:45:00	Spiked: 10:57:00 until 11:12:00 20/06/02
14.5	SBE-39	337	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
15	Brancker	5463	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
15.5	A-Beta	625	20/06/02	14:45:00	Spiked: 11:07:04 until 11:09:40 20/06/02
16.5	SBE-37	1905	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
17.5	SBE-39	334	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
18.5	Brancker	3713	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
20	SBE-37	669	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
22	Brancker	3282	20/06/02	14:45:00	Spiked: 12:23:00 until 12:41:00 20/06/02
23	Sontek	D193	20/06/02	14:45:00	Spiked: 10:39:30 until 10:54:30 20/06/02
26	Brancker	3276	20/06/02	14:45:00	Spiked: 10:39:30 until 10:54:30 20/06/02
27	Brancker	5457	20/06/02	14:45:00	Spiked: 10:39:30 until 10:54:30 20/06/02
28	SBE-37	671	20/06/02	14:45:00	Spiked: 10:39:30 until 10:54:30 20/06/02
30	Brancker	3302	20/06/02	14:45:00	Spiked: 10:39:30 until 10:54:30 20/06/02
	Release	522	20/06/02	14:45:00	Release code: B

Table 19: Timing marks for subsurface Mooring E

Depth from surface (m)	Instrument Type	S/N	Date Deployed	Time In water (UTC)	Notes (All times UTC, all dates DD/MM/YY)
31.5	Brancker	3508	20/06/02	15:15:00	Spiked: 12:23:00 until 12:41:00 20/06/02
32.5	Brancker	5463	20/06/02	15:15:00	Spiked: 12:23:00 until 12:41:00 20/06/02
33.5	Brancker	3714	20/06/02	15:15:00	Spiked: 12:23:00 until 12:41:00 20/06/02
34.5	SBE39	103	20/06/02	15:15:00	Spiked: 12:23:00 until 12:41:00 20/06/02
36	SBE-37	1900	20/06/02	15:15:00	Spiked: 12:23:00 until 12:41:00 20/06/02
37	Sontek	D121	20/06/02	15:15:00	Spiked: 10:57:00 until 11:12:00 20/06/02
38	SBE-39	203	20/06/02	15:15:00	Spiked: 12:23:00 until 12:41:00 20/06/02
40	SBE-37	1909	20/06/02	15:15:00	Spiked: 12:23:00 until 12:41:00 20/06/02

Table 20: Timing marks for Mooring F

Depth from surface (m)	Instrument Type	S/N	Date Deployed	Time In water (UTC)	Notes (All times UTC, all dates DD/MM/YY)
1	SBE-37	1840	20/06/02	20:10:00	Spiked: 18:22:00 until 18:37:00 17/06/02
2.5	SBE-37	1908	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
4	VMCM	53	20/06/02	20:10:00	Prop Spins: 10:08:10 and 11:21:30 Bands Off: 19:53:00 20/06/02
6	SBE-39	719	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
7	SBE-39	41	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
8	SBE-37	2015	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
9.5	SBE-39	39	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
10.5	SBE-39	78	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
12	SBE-37	1760	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
13	SBE-39	53	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
14.5	Brancker	3277	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
16	Nortek 1MHz	333	20/06/02	20:10:00	Spiked: 10:18:20 until 10:33:20 20/06/02
16.5	SBE-37	2011	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
17.5	Brancker	3304	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
18.5	Brancker	3281	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
20	SBE-37	1899	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
22	SBE-37 (P)	684	20/06/02	20:10:00	Spiked: 10:39:30 until 10:54:30 20/06/02
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16. Abstract (Limit: 200 words)
During the summer of 2002, six surface moorings and one subsurface mooring were deployed south of Martha's Vineyard, Cape Cod, Massachusetts. The moorings were deployed from June to September 2002 to collect meteorological and oceanographic data. This was done both to support the Coupled Boundary Layer Air-Sea Transfer Low wind (CBLAST-Low) cooperative experiment and to address the question of regional predictability in the littoral regime under research supported by a Secretary of the Navy/Chief of Naval Operations (CNO) Chair. The aim was to capture the mesoscale development and response of inner shelf waters to local synoptic atmospheric, tidal and larger scale oceanic forcing under predominantly low wind conditions. This report covers the operational aspects of the 2002 experiment, including deployment, recovery, and mooring setups, as well as basic data returns.

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air-sea interaction
low wind

b. Identifiers/Open-Ended Terms

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