Cruise Report

R/V OCEANUS Cruise 291 to Georges Bank

24 - 31 October 1996

Acknowledgments

This cruise and preliminary data report was prepared by Jim Irish and Bill Williams from cruise logs and notes as a first draft document of the activities, positions, and data collected during R/V OCEANUS Cruise OC291. We acknowledge the superior support by Captain Paul Howland, and the crew of the Research Vessel OCEANUS. We believe that the OCEANUS with its crew is the best of the small vessels in the UNOLS fleet. Their outstanding assistance and hard work allowed us to successfully deploy the GLOBEC Long-Term Moored Program's moorings and take supportive CTD profiles.

The GLOBEC research effort is sponsored by the National Science Foundation and the National Oceanic and Atmospheric Administration. Support for the Long-Term Moored Program as part of the U.S. GLOBEC Northwest Atlantic/Georges Bank Study was provided by NSF research grant OCE-96-32348. All data and results in this report are to be considered preliminary.

Cruise Report

GLOBEC R/V OCEANUS Cruise OC291

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Cruise Report

GLOBEC R/V OCEANUS-OC291

US State Department Cruise No. 96-085
Woods Hole to Georges Bank to Woods Hole
24 -31 October 1996

Purpose

The primary purpose of OCEANUS Cruise OC291 was (1) to deploy the GLOBEC Program's Long-Term Moorings on Georges Bank for the start of the third year of the GLOBEC field effort, and (2) to take supportive *in situ* CTD calibration profiles and our standard CTD sections. As time allowed, additional work would be done checking the operation of the WHOI Coastal Research Center's new FSI CTD system, and checking on Dr. Peter Smith's and Dr. Robert Pickart's moorings. The ship's track sailed on OC291 is shown in Figure 1.

Accomplishment Summary

Before the mooring deployments, a one day test of the FSI CTD was conducted in Wilkinson Basin. Several minor problems were identified (bad fluorometer, non-optimum PAR sensor logarithmic amplifier scaling, and FSI software). Some repairs were made prior to sailing on the main deployment leg. The CTD system performed adequately on the cruise, but still requires further development to become a standard oceanographic tool.

The Southern Flank and Northeast Peak mooring sites were cleared of all instrumentation in September 1996 on ENDEAVOR Cruise EN290. All buoys and sensors were serviced, calibrated, and prepared for redeployment during the last month. The Southern Flank main scientific mooring, two guard moorings, and a bottom pressure instrument were successfully deployed at the Southern Flank site. Peter Smith, under GLOBEC funding, had deployed two guard buoys at the Northeast Peak site in September 1996. We successfully deployed the Northeast Peak main scientific mooring between them. After each mooring deployment, a one hour yo-yo CTD series was taken as an *in situ* calibration at the start of each deployment. Our two standard CTD sections were made after the mooring work was complete. These extend from the center of the Northeast Channel up onto the Crest of the bank through the Northeast Peak mooring site, and from the Crest through Southern Flank mooring to the continental slope into North Atlantic waters.

Finally, a courtesy check of Dr. Peter Smith's Southern Flank moorings and Dr. Robert Pickart's ADCP and guard moorings was made on the way back into port at the end of the cruise. The three Smith moorings were observed in position and guard lights working. Both of Pickart's subsurface ADCP moorings were in position, but both guard buoys were missing. Finally, the Coastal Mixing and Optics experiment's main moored array was also passed on the way into WHOI. All their moorings were present and in place.

cell battery to power the light. The scientific buoy has four 20 watt solar panels charging three 40-AH batteries. The guard buoys have no scientific instrumentation on them, and are chain moorings from the buoy to the anchor (Figure 2). The scientific mooring has an electro-mechanical cable with temperature and conductivity sensors at 5 meters increments. At three depths (20, 30 and 72 meters) the temperature and conductivity is measured by internally recording Sea Bird Seacats. Two bio-optical packages are deployed at 10 and 40 meters depth. Each contains a Sea Bird temperature/conductivity pair, a Sea Tech transmissometer, Sea Tech fluorometer and LiCor PAR (Photosynthetically Active Radiation) sensor. This data is digitized and recorded internally on FLASH PCMCIA media. The temperature and conductivity observations at the odd 5 meter increments are telemetered to the surface buoy, digitized and sent back to the laboratory via ARGOS and GOES telemetry. This data is also recorded on PCMCIA RAM as a primary data storage. An RD Instruments Workhorse ADCP is mounted in the mooring line just under the buoy in a downward looking configuration to measure the current structure from 7 to 69 meters depth in 1 meter increments. Finally, the buoy has a full suite of meteorological sensors consisting of winds, air temperature and relative humidity, long and short wave radiation and PAR. Figure 3 shows and Table 2 lists the sensor type and depths for the Southern Flank mooring.

The weather was good for deployment on 26 October 1996, the wind blowing about 10 kts, with seas 3 to 4 feet. The steel guard buoy C was deployed first in the most easterly position as listed in Table 1 and shown in Figure 4. This gave us a visual sight for deploying the

Table 1. Mooring Deployment Times and Positions.

Location	Instrument	ID	Deployment Date	Time (UTC)	North Latitude	West Longitude	Depth (m)
Southern Flank Mooring							
	Guard Buoy	C	26-Oct-96	13:12	40 58.113	67 19.143	76
	Science Buoy	E	26-Oct-96	19:39	40 58.037	67 19.219	76
	Guard Buoy	F	26-Oct-96	20:44	40 58.012	67 19.320	76
	Bottom Pressure		26-Oct-96	21:13	40 58.050	67 19.269	76
Northeast Peak Mooring							
	Science Buoy	B	28-Oct-96	14:50	41 43.922	66 32.147	73
	Canadian Guard	L	Sep-96		41 43.96	66 31.87	73
	Canadian Guard	AC	Sep-96		41 43.90	66 32.46	73

rest of the moorings, and acted as a trainer mooring to get the ship's and scientific party working together to launch the scientific moorings. The scientific buoy E was deployed second to the west of Guard C, along the 76 meter depth contour (about heading 60° true). This mooring had to be deployed twice, because on the first deployment, lines from the ship got tangled in the wind sensor, and broke it off the buoy. The buoy was then released to be free drifting, and was recovered in normal fashion. The wind sensor from the last deployment was then placed back on

Table 2. Sensor Type, Depth and Serial Number

			Southern Flank		**Northeast Peak**
			Serial		Serial
Sensor Type		Company	Number		Number
Air Temperature		Rotronics	35851		WHOI type
Relative Humidity		Rotronics	35851		None
PAR		LiCor	5018		4948
Wind Speed and Dir		R.M. Young			None
Long wave Rad		Eppley	28379F3		None
Short wave Rad		Eppley	28771		None
SST		Sea Bird	31617		32080
SSC		Sea Bird	None		41379
ADCP		RDInstruments	125		130
T@5		Sea Bird	31624		None
C@5		Sea Bird	41365		None
Biop @ 10		Paul Fucile	1		4
	Temperature	Sea Bird	484		482
	Conductivity	Sea Bird	68		56
	Transmissometer	Sea Tech	620		628
	Fluorometer	Sea Tech	295		306
	PAR	LiCor	1794		1792
	OBS	Sea Point	102		None
T @ 15		Sea Bird	31623		None
C @ 15		Sea Bird	41343		None
T/C@20	Sea Cat	Sea Bird	1818		1820
T @ 25		Sea Bird	31621		None
C @ 25		Sea Bird	41341		None
T/C@30	Sea Cat	Sea Bird	1819		2006
T @ 35		Sea Bird	493		None
C @ 35		Sea Bird	41340		None
Biop @ 40		Paul Fucile	2		None
	Temperature	Sea Bird	481		32173
	Conductivity	Sea Bird	59		41370
	Transmissometer	Sea Tech	621		None
	Fluorometer	Sea Tech	296		None
	PAR	LiCor	1971		None
T @ 45		Sea Bird	30478		None
C @ 45		Sea Bird	41333		None
T @ 50		Sea Bird	30490		32176
C @ 50		Sea Bird	41342		41377
T/C@72	Sea Cat	Sea Bird	1736		1735

temperature and conductivity observations over one hour, so CTDs used for comparison should be averaged over the same time interval, extending from the half hour to the next half hour. These results are discussed below in the CTD section of this report. While the CTD yo-yo was being made, the ARGOS transmissions from the buoy were being monitored to assure that all was well. Finally, before leaving the site, the acoustic releases on the science buoy and the bottom pressure instrument were checked and disabled.

Northeast Peak Mooring Site

With funding from this program (passed through Dr. Dan Lynch of Dartmouth), Peter Smith of Bedford Institute of Oceanography deployed two guard buoys (labeled L and AC in Table 1) in September 1996 to mark the Northeast Peak Mooring site for our science mooring. We would then deploy our science buoy between these guards to protect it from fishing and shipping activity. This mooring uses the steel Crest buoy and data system, and has temperature and conductivity sensors at 10 meter depth increments as shown in the configuration in Figure 5 and listed in Table 2. This buoy does not have the meteorological sensor suite of the Southern Flank mooring, but does have air temperature and PAR. Several problems were discovered on this system when it was being assembled which were caused by careless handling by WHOI technicians. This required that the data system be taken off the buoy and repaired. In this process the antenna to transmitter RG8 cable junction was remade. This then caused later problems when a drop of water got in the connector and caused a bad transmitted-to-reflected power ratio. After this was repaired the buoy was deployed in the late afternoon of 7 October 1996. Monitoring the ARGOS transmissions during the CTD yo-yo series showed up a problem with bad initialization of the data system. Therefore, the mooring was recovered on the morning of 28 October 1996, reinitialized and successfully redeployed in working order a couple of hours later. The positions of the Canadian guard buoys and our scientific moorings are listed in Table 2 and shown in Figure 6.

During the mooring deployment and while working at the Northeast Peak site, the currents were a major problem. They were so strong that they were nearly pulling the Canadian guard buoys under water. We were steaming at about 3.7 kts through the water to obtain an over the ground speed of 0.7 kts, implying a 3 kts tidal current in the region. It was time of spring tides, but the currents are generally a factor of two faster than at the Southern Flank site. This same phenomena was observed when the moorings were recovered in September from the ENDEAVOR. The Northeast Channel region is a unique and harsh environment for moorings. After the second deployment, a single profile was made as the earlier profile showed a well mixed water column which did not change significantly within the hour series.

NE Peak Mooring

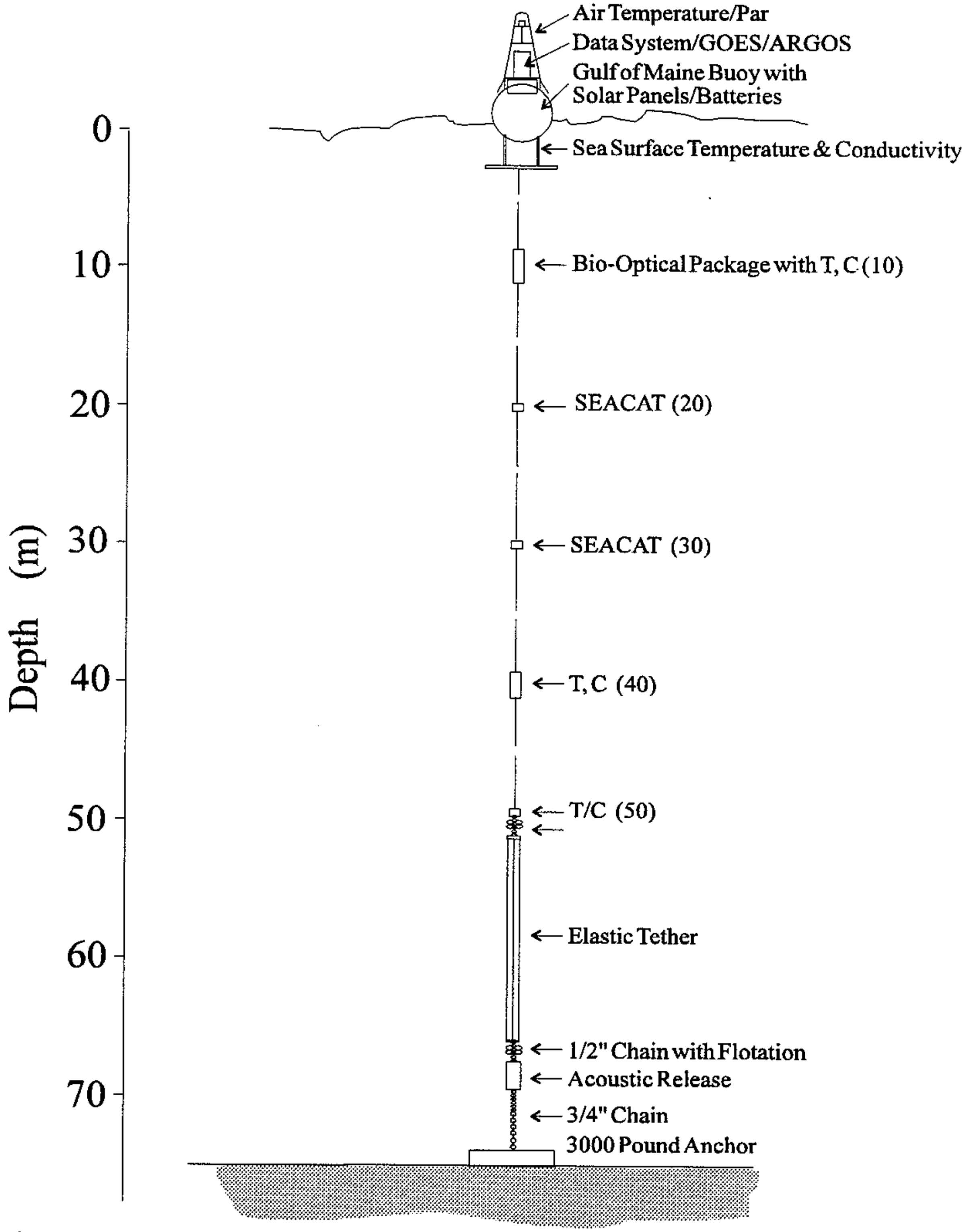

Figure 5. Configuration of the scientific mooring deployed on the Northeast Peak of Georges Bank on OC291.

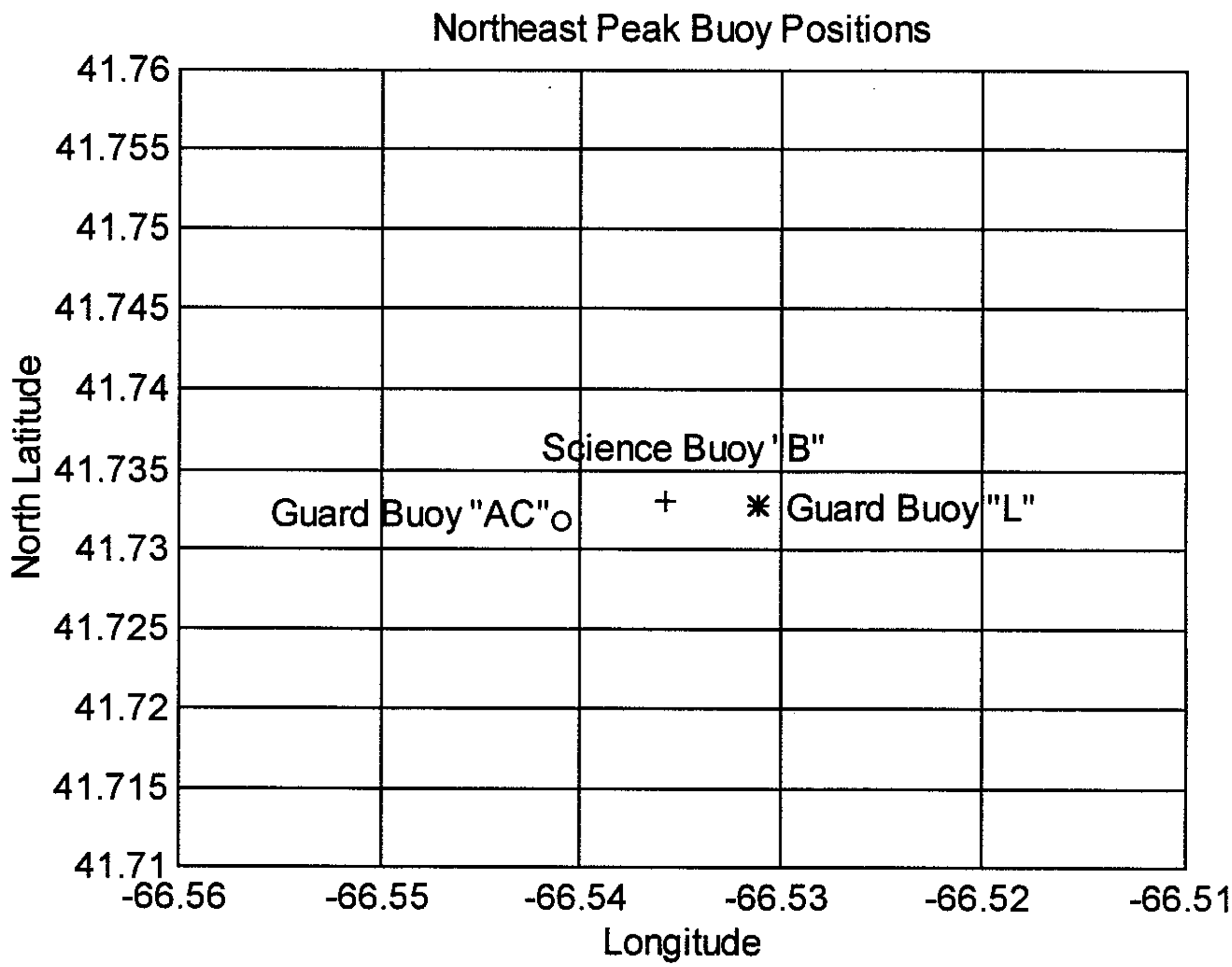

Figure 6. Location of the Canadian guard moorings and WHOI science mooring at the Northeast Peak of Georges Bank.

CTD Profiles and Sections

FSI CTD Checkout: Prior to using the FSI (Falmouth Scientific, Inc.) CTD as the primary profiling instrument on the cruise, we scheduled a test of the system in Wilkinson Basin (closest 200 m deep site to WHOI) in which to test the instrument (see Figure 1). The altimeter (to digitally measure the distance from the CTD to the bottom and allow full water column profiles) had been sent back to Datasonics for repair after our April 1996 cruise. To improve the range of the LiCor PAR (Photosynthetically Active Radiation) sensor, FSI had added a log amplifier in the sensor interface. Finally, in conjunction with Marshall Swartz/Bob Millard of WHOI, the telemetry link was improved to work reliably over the longer UNOLS cables on the WHOI vessels.

To assist in this test and gain hands-on experience at sea, Tom Hurst and Paul Dugas of FSI went along on the cruise to see what working at sea with the FSI equipment is like, and to evaluate the performance of the instrument. Three profiles were made during the cruise, the first on the way out in Vineyard Sound, the second in Wilkinson Basin in 190 meters of water, and the third in the Northern Great South Channel on the way back in, just before Great Round Shoal Channel.

The LiCor PAR sensor interface was a problem during the last cruise, as the output of the sensor in full light was nowhere near the full scale signal that it should have been. Therefore, we lost range, and the profiles were not very useful. Also, using a linear scale reduced the range of light that it was possible to resolve. A log amplifier amplifies the low light levels more, and so produces profiles where the extinction coefficient may be better estimated. A profile of the log amp output (as originally set for this cruise) for the PAR sensor is shown in Figure 7. The nearly linear decay of light with depth is evident, and gives an extinction coefficient, K, of about 0.3 m^{-1} in surface waters , which decreases to about 0.2 m^{-1} at about 40 meters. This is an e-folding attenuation distance for integrated light of about 3 to 4 meters, and very realistic for these waters. By 50 meters the light is below the level of sensitivity of the log amplifier. As a result of this profile, the gain on the log amplifier was adjusted to give the lowest level current to provide the largest range possible for the main cruise. This extended the range another half decade toward lower light levels.

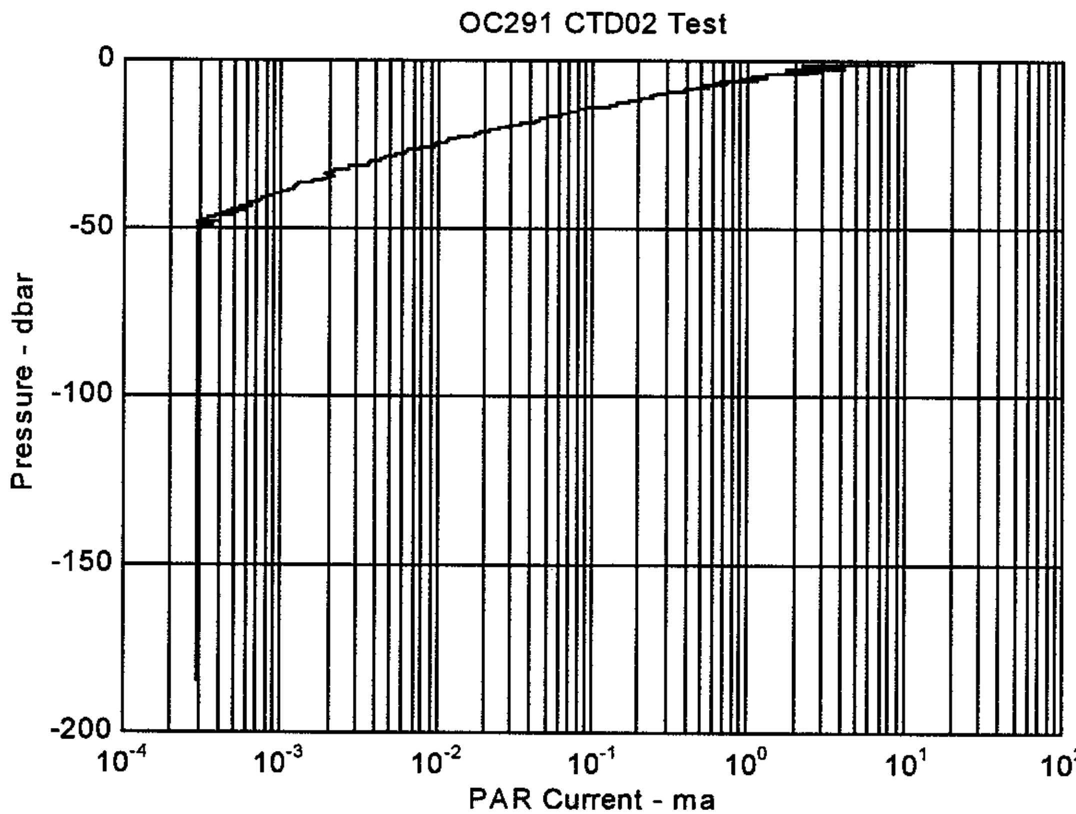

Figure 7. A profile of log of PAR current showing the nearly linear decay with depth, and observed light extending to about 50 meters depth in the Northern Great South Channel.

The altimeter appeared to work well during this test. On OCEANUS Cruise OC276 in April, the altimeter had about 1/3 dropouts, or bad data points where it appeared that the instrument was closer to the bottom than it actually was. After revision by Datasonics there were almost no bad points or dropouts, but the altimeter didn't start working until about 60 meters off the bottom, rather than about 100 m during the last test. Nevertheless the altimeter is very useful with this reduced range, as one generally knows the depth to within 50 meters anyway in coastal waters. However, on the actual cruise, the altimeter did not work at all! It is not clear whether the unit actually failed after our test cruise, or the changes made at FSI after the test cruise affected the unit's operation (that is, the pass through of the data to the deck unit). This loss of information required the use of a standard pinger and PDR to determine distance to bottom, and required considerably more effort and was not as precise. It was a great step backward to have lost the use of the altimeter.

The Sea Tech fluorometer (S/N 324) supplied with and used on the CTD in the spring OCEANUS cruise, was not functioning on this test cruise. It had been used on another experiment in Russia over the summer, and might have been damaged in shipping, or at sea there. The WHOI CTD group providing support for this cruise did not catch this problem in their precruise checkout of equipment. Therefore, to fulfill our cruise requirements, we used a Sea Tech fluorometer from one of our bio-optical packages. This functioned successfully during the cruise.

Yo-Yo *In Situ* Calibration profiles:

Immediately after the deployment of the moorings at both the Southern-Flank site and the Northeast Peak site, a one hour yo-yo of the CTD package was done as close as possible to the newly deployed moorings. The sample rate of the telemetery data system is one hour averages of 1 minute samples. The bio-optical packages sample at 3.75 minute intervals, and the SeaCats sample at 2 minute intervals. A one hour yo-yo of about 12 profiles then brackets at least one sample from every sensor on the mooring allowing calibration between the CTD package and the mooring. The averaged profile will be used to compare with the hourly averaged data, and the individual profiles closest to the sampling of the other instruments will be used to compare with their results for *in situ* calibrations.

Standard CTD Sections:

Northeast Peak Section: The standard Northeast Peak section (see Figure 1) was done on 28 October 1996. Contour plots of the raw data for this section are shown in Figures 8 through 12 (temperature, salinity, calculated density, transmissometer output and fluorometer output). The continuous series of profiles was interrupted at CTD15 for the Northeast Peak mooring deployment, and so an additional 6 hours was consumed in taking the section. Typically the section takes 12 to 14 hours to make. The section stretches from the well-mixed region over the crest of the bank out over the Northeast Peak and into the center of the Northeast Channel. It does not cross the Atlantic shelf-break so the shelf-slope front is absent. Four distinct water masses can be seen in the section (see T-S plot in Figure 13). There is a well mixed region within the tidal mixing front over the top of the bank. This water has a temperature of about 12° C and a salinity of about 32 PSU. Although the crest of the bank is well mixed vertically (to 0.03° C and 0.005 PSU), there is a horizontal gradient of properties as one moves out over the bank. The tidally mixed front appeared to be at about the 70-m isobath, but it was not as clear as on the Southern Flank section. Offshore of this front, the water was vertically stratified. The "cold band" of Gulf of Maine Intermediate water (which probably started out around 4° C and 32 PSU in Wilkinson Basin) flowing along the northern flank and around the bank was present at the bottom just beyond the edge of the bank (Figure 8). It appears as a 15-km wide 40 m thick band of 6.5-7.0° C and 33-34 PSU water. It is interesting that the signature is largely in the temperature, and that the salinity does not show the standard "bulls eye" signature as seen in temperature.

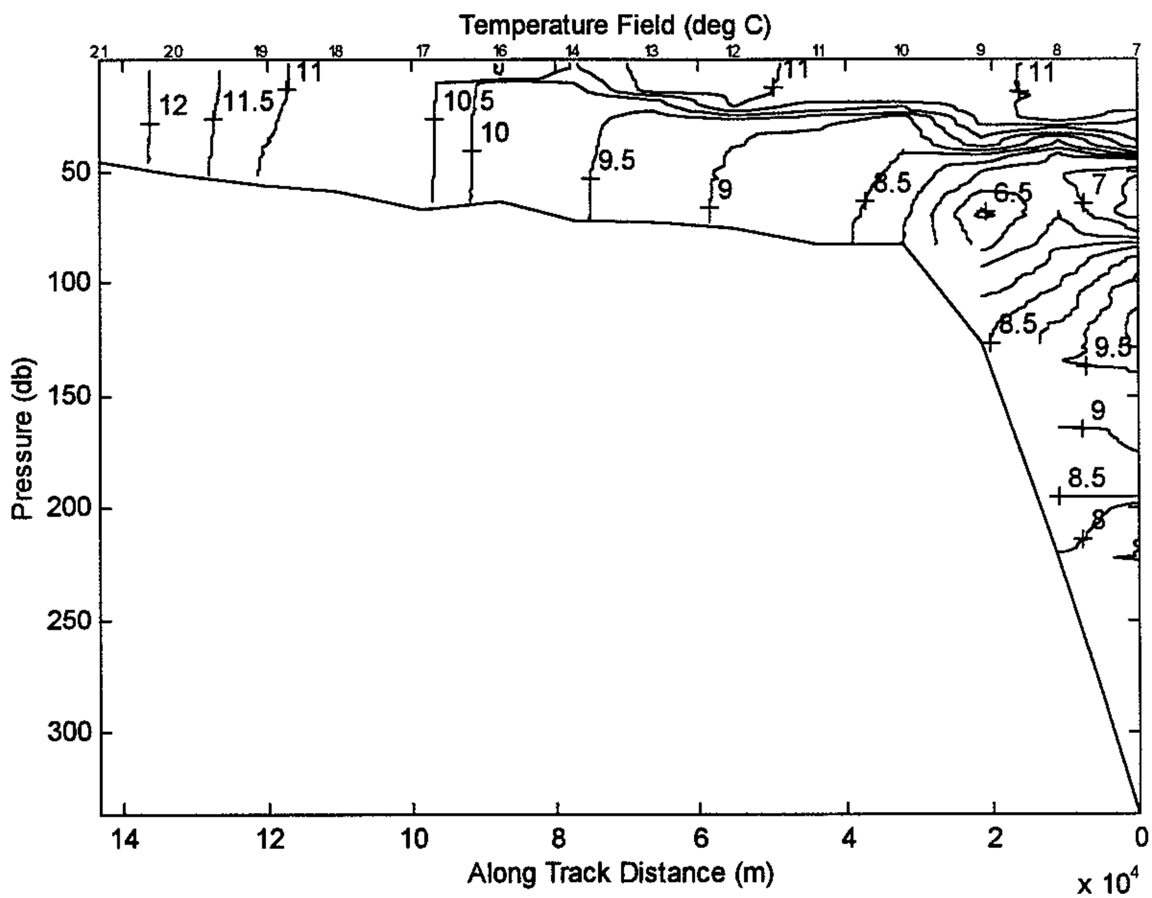

Figure 8. Contours of temperature at 0.5 °C intervals for the Northeast Peak section conducted on 28/10/96. The blanked out region shows the depth to which data was collected and closely follows the bathymetry. The numbers at the top of the figure are the CTD cast numbers and mark the position of each profile in the section.

The deeper waters continued to get warmer and more saline toward the Northeast Channel. Here we get the maximum temperature of about 10 °C with a maximum salinity of 35 PSU at about 150 m depth. This is the North Atlantic warm slope water that flows into the Gulf of Maine through the Northeast Channel. Deeper in the Northeast Channel, the cooler slope water has the same salinity, but colder temperatures. The surface waters changed little on moving out over the Northeast Channel. The temperature was about 11 °C and the salinity about 32 PSU. There is no clear pictures of cooler fresher Scotian Shelf water extending across the Northeast Channel, although there is a hint in the surface waters of the Northeast Channel profile (CTD07).

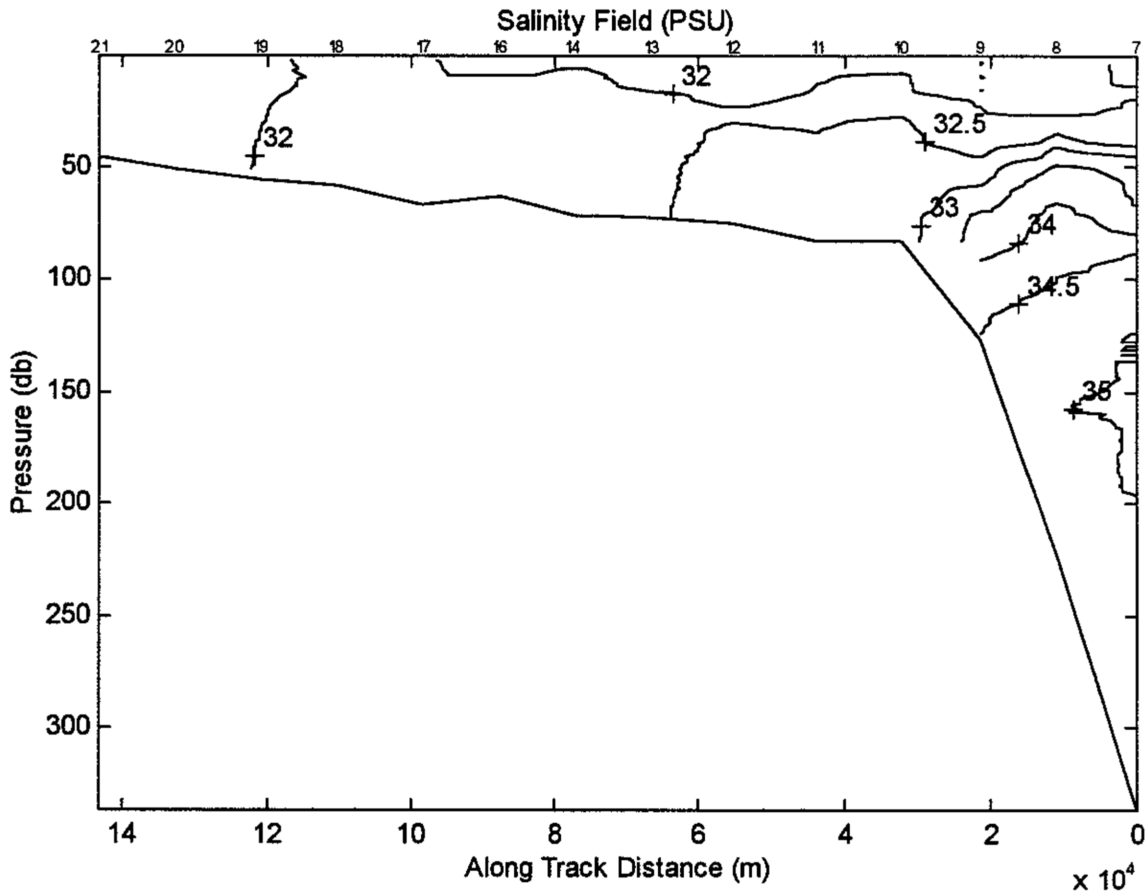

Figure 9. Contours of salinity at 0.5 PSU intervals for the Northeast Peak section conducted on 28/10/96. The blanked out region shows the depth to which data was collected and closely follows the bathymetry. The numbers at the top of the figure are the CTD cast numbers and mark the position of each profile in the section.

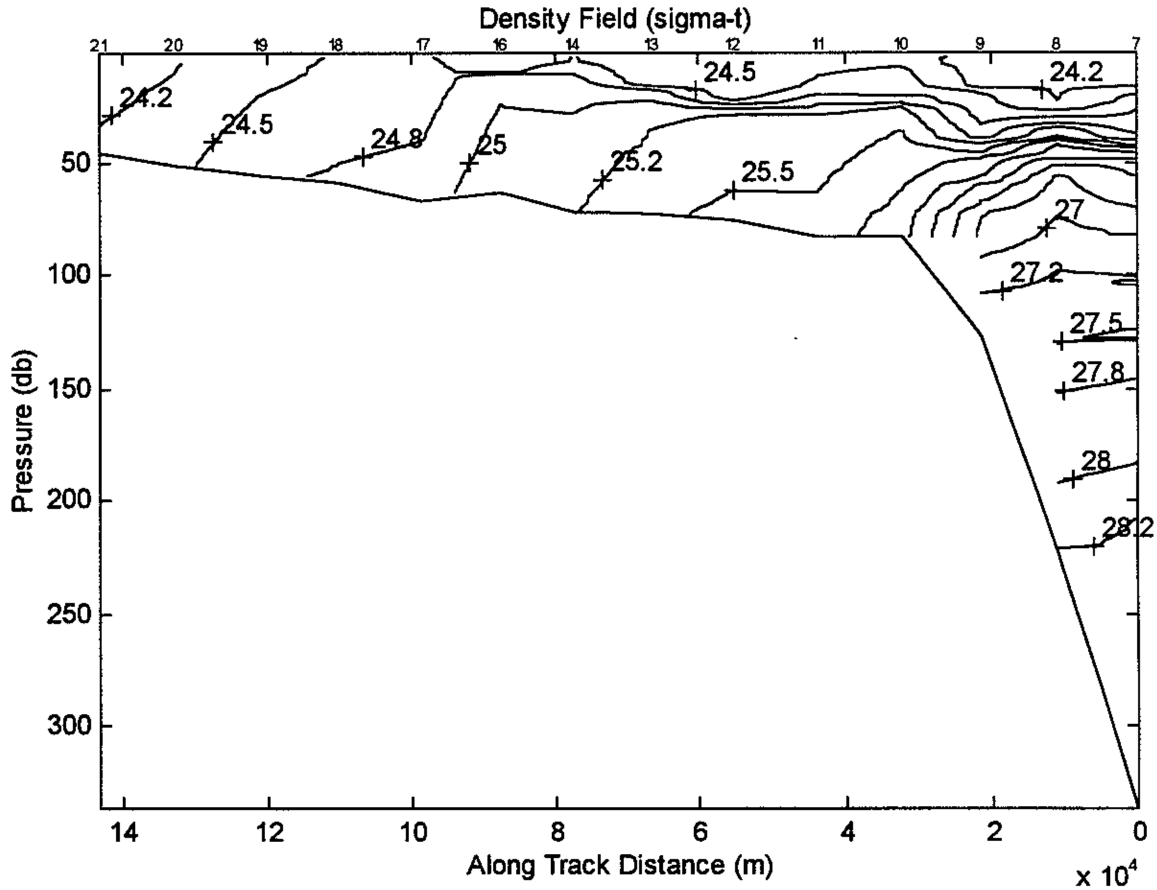

Figure 10. Contours of density at 0.25 sigma-t unit intervals for the Northeast Peak section conducted on 28/10/96. The blanked out region shows the depth to which data was collected and closely follows the bathymetry. The numbers at the top of the figure are the CTD cast numbers and mark the position of the cast in the section.

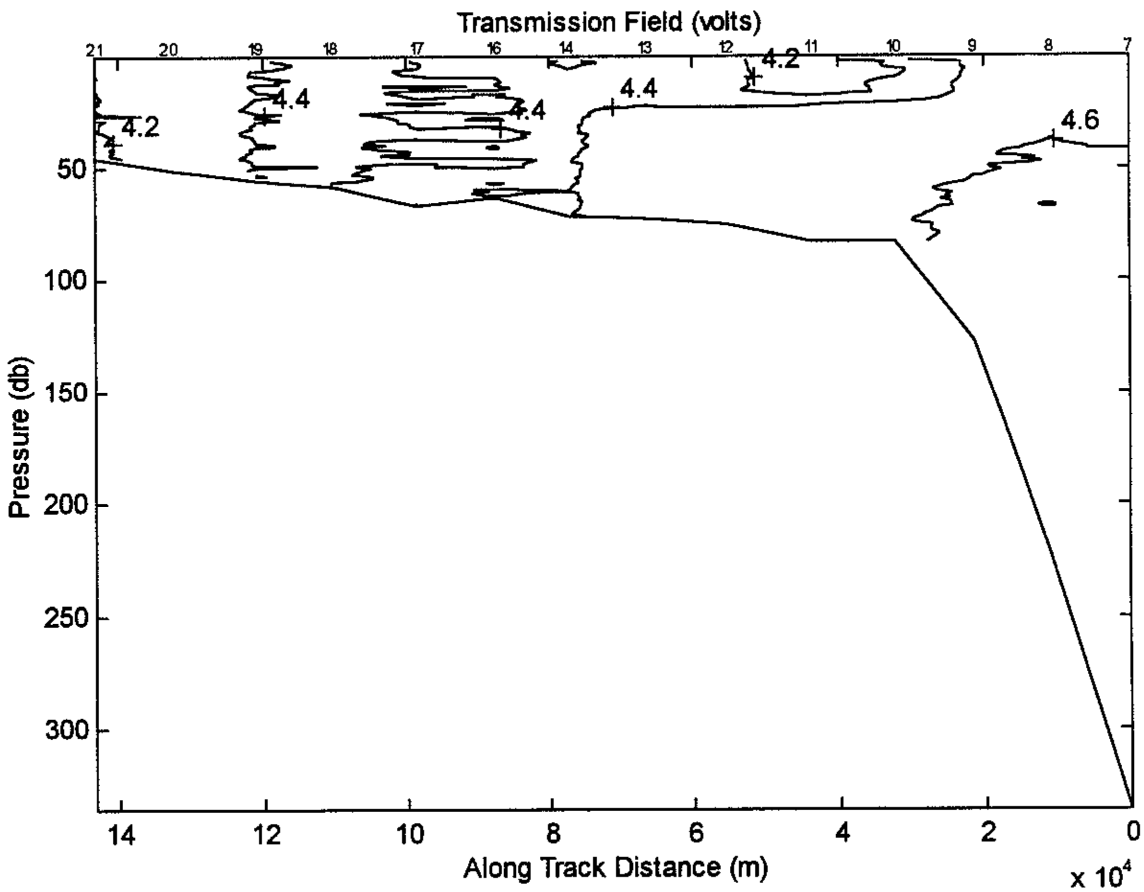

Figure 11. Contours of transmission at 0.2 V intervals for the Northeast Peak section conducted on 28/10/96. The blanked out region shows the depth to which data was collected and closely follows the bathymetry. The numbers at the top of the figure are the CTD cast numbers and mark the position of each profile in the section.

The transmissometer results (Figure 11) are displayed in volts output by the Sea Tech transmissometer. For practical purposes 4.8 volts represents 100% transmission and 0 volts is 0% transmission. Therefore, regions of lower voltage in Figure 11 represent higher particle (or scatterer) concentrations and hence lower beam transmission. The fluorometer results (Figure 12) are also plotted in unnormalized voltages, where higher voltage represents higher chlorophyll-a concentrations. Figure 12 shows that the deep Northeast Channel has the lowest chlorophyll-a concentrations. Normally we expect the Crest to be highest; here it is higher going up on the bank. However, the highest concentrations in this section (which are typical of the top of the bank) are found just above the shelf break in the top 20 meters of the water column. This pattern is echoed in the transmissometer data (Figure 11), but is not a visible signal in the temperature or salinity fields (Figures 8 and 9).

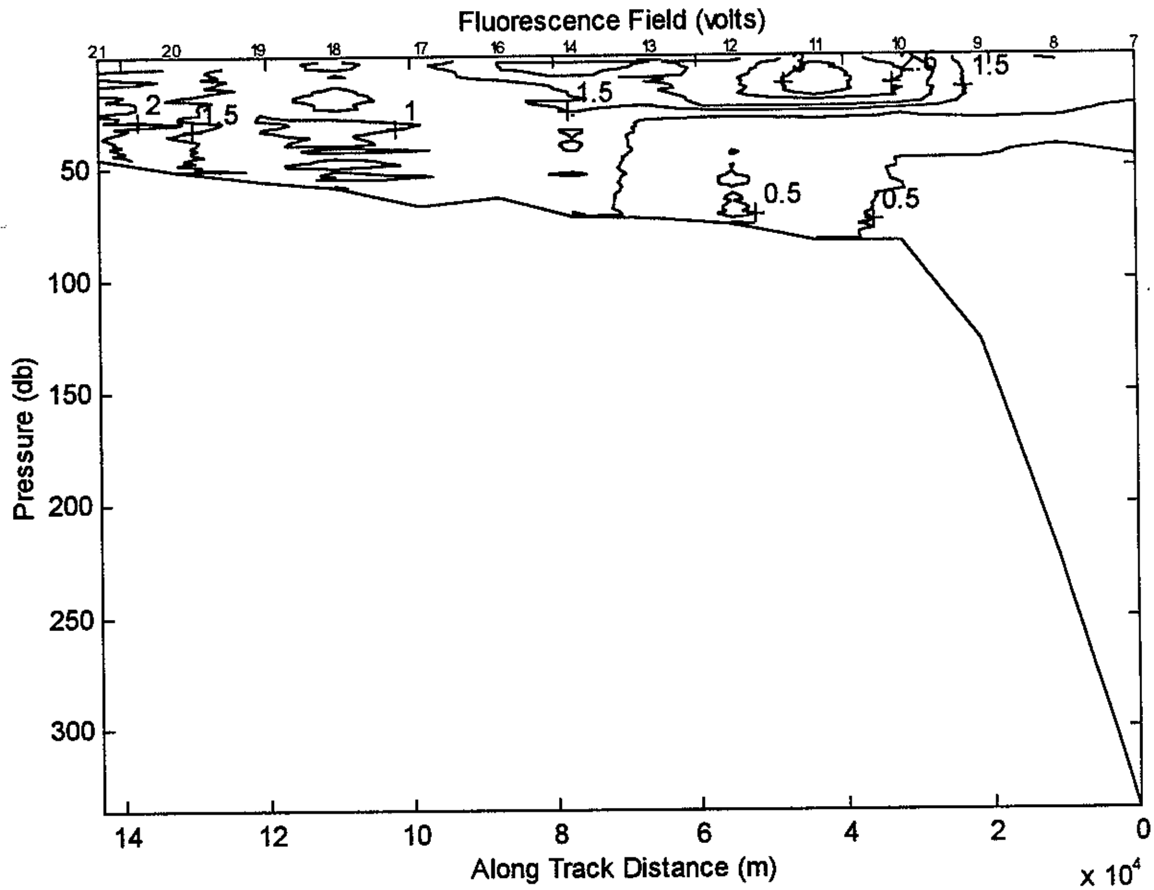

Figure 12. Contours of temperature at 0.5 V intervals for the Northeast Peak section conducted on 28/10/96. The blanked out region shows the depth to which data was collected and closely follows the bathymetry. The numbers at the top of the figure are the CTD cast numbers and mark the position of each profile in the section.

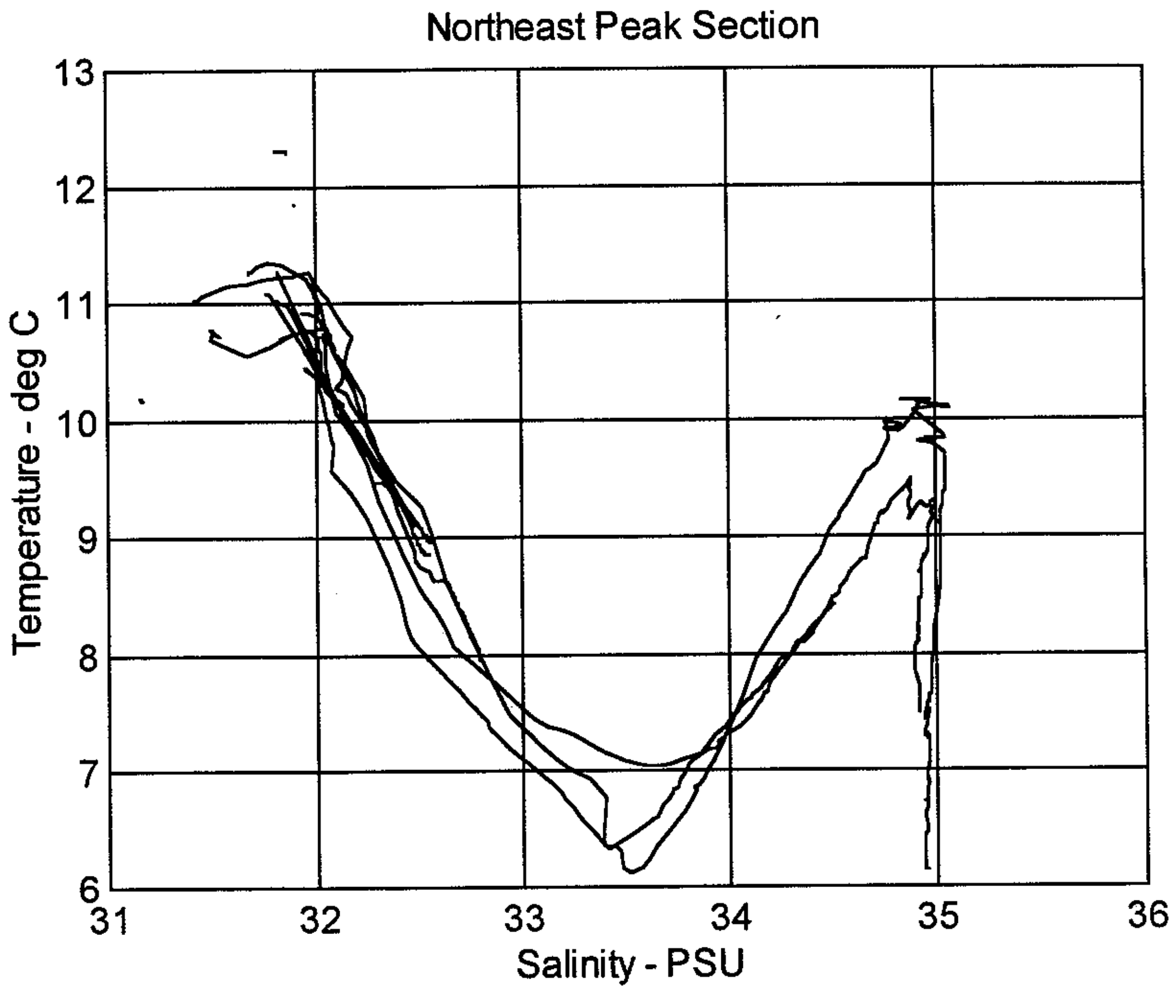

Figure 13. Northeast Peak Section Temperature-Salinity relationship from the 12 profiles in the section. Four water masses are evident. The 35 PSU water from the warm slope water (10° C) and cooler slope water (6° C) are seen flowing in through the Northeast Channel. The cold 6.5 and 33.5 PSU water flowing out of the Gulf of Maine as remnants of the Maine Intermediate Water are also clear. The surface waters over the crest show the warmest (11-12° C) and freshest (32 PSU) waters.

Long-Term (Southern Flank) Section: The Long-Term Section across the Southern Flank of Georges Bank from the Crest mooring site through the Southern Flank mooring site was made on 19 October 1996. The contour plots of temperature, salinity, sigma-t, transmissometer voltage and fluorometer voltage for this section are shown in Figures 14 through 18. The temperature - salinity relationship for the profiles in the section is shown in Figure 19. The section shows vertically well mixed water on top of the bank. (Temperatures are uniform to 0.01° C and salinities to 0.01 PSU). This water again had temperature of 11.5-12.5° C and salinity of less than 32 PSU. It extended out to the tidal mixed front which was located approximately over the 60 m isobath. Beyond the tidally mixed front, the water was vertically stratified over the Southern Flank out to the shelf slope front. The surface waters were typically 11 °C and 32 PSU. At the bottom, the temperature decreases and the salinity increases toward the shelf-break. At the shelf break the cold band can again be seen as a 20-km wide 40 m deep band of 8 °C, 33.5 PSU water (see T-S plot in Figure 19, and compare the T-S plot of this sample water in the Northeast Peak section. The salinity is the same, but the temperature has warmed up nearly 2° C.) Seaward of the cold band and the shelf break, the base of the shelf/slope front is present at roughly the 150-m isobath. The temperature increases across the front from 8 °C to 12 °C and the salinity increases across the front from 33.5 PSU to 35 PSU.

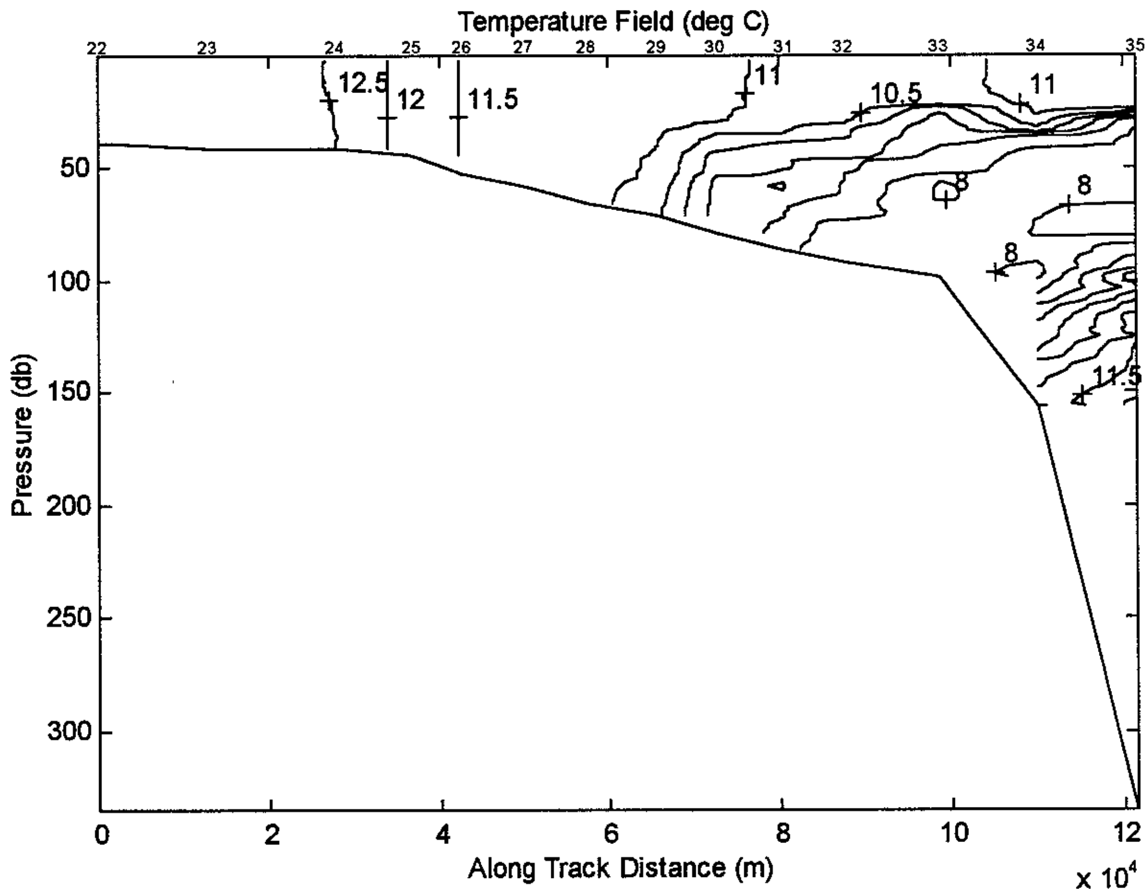

Figure 14. Contours of temperature at 0.5 °C intervals for the Long Term section conducted on 28/10/96. The blanked out region shows the depth to which data was collected and closely follows the bathymetry. The numbers at the top of the figure are the CTD cast numbers and mark the position of each profile in the section.

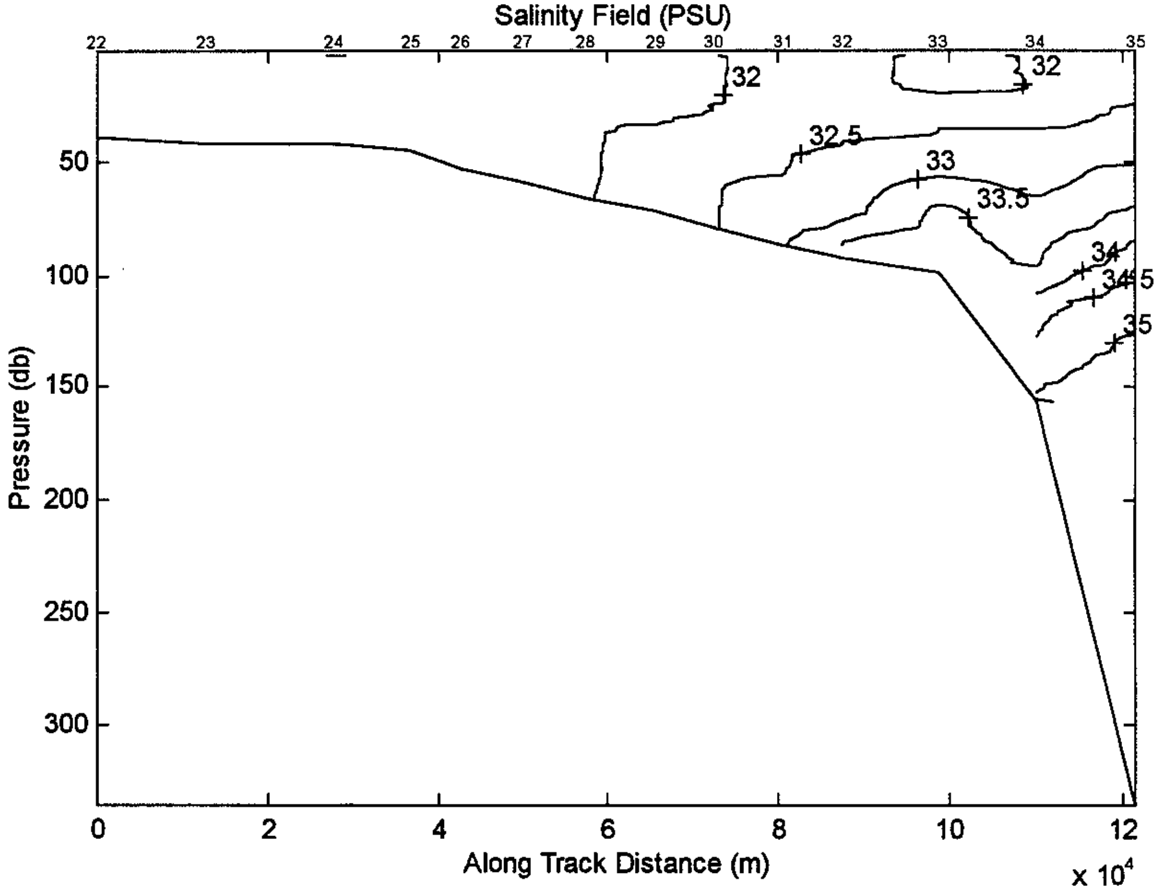

Figure 15. Contours of salinity at 0.5 PSU intervals for the Southern Flank section conducted on 28/10/96. The blanked out region shows the depth to which data was collected and closely follows the bathymetry. The numbers at the top of the figure are the CTD cast numbers and mark the position of each profile in the section.

FSI CTD Performance: Since the FSI CTD system was new, we noted down problems to allow us to evaluate its performance as a Level II CTD system for coastal oceanography. The system is not the same as other WHOI FSI CTDs since it does not have an oxygen sensor, and does have fluorometer, transmissometer and PAR sensors. This is the suite required for GLOBEC and many coastal, biological - physical oceanographic programs. It is similar to capabilities provided on the R/V SEWARD JOHNSON and last year on the R/V ENDEAVOR. (This year the ENDEAVOR has switched to a Sea Bird 911+ system, which does not yet have a PAR sensor.)

The FSI CTD (S/N 1358) had not been calibrated since its delivery from FSI in March 1996. To obtain an estimate of the long term temperature stability, the differences in temperatures measured in the bottom 30 meters of profile CTD02 were calculated. The fast thermistor and redundant PRT temperature agreed to within 0.000,4° C. The primary

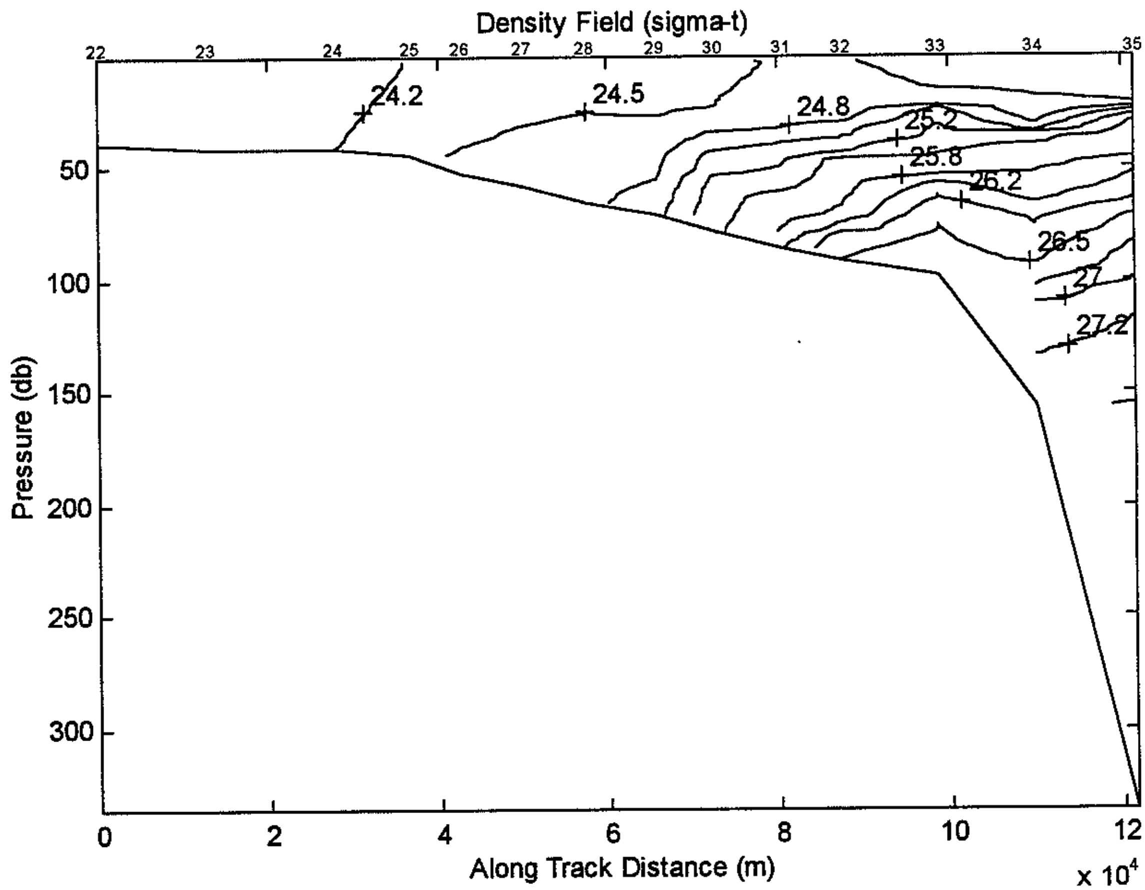

Figure 16. Contours of density at 0.25 sigma-t unit intervals for the Southern Flank section conducted on 28/10/96. The blanked out region shows the depth to which data was collected and closely follows the bathymetry. The numbers at the top of the figure are the CTD cast numbers and mark the position of each profile in the section.

PRT temperature was cooler than the redundant PRT by 0.002,4° C. These results are encouraging in that the temperatures appear to be consistent and stable.

The conductivity sensor was noisy on two profiles, CTD06 and CTD07. Other than that it performed well. There were more individual bad points on each profile on this cruise than on OC276 last spring. A mechanical disadvantage was noted in the FSI water sampler which did not come with an aluminum ring around the top of the sampler as does the Sea Bird system. This made it difficult to grab the CTD system with a snap hook before it was lifted out of the water to prevent swinging and damage to the CTD, ship or personnel. One should be added for safety. Again we did not use the FSI processing software, but used the old EG&G/Neil Brown software as before. Also, we had problems with the FSI acquisition software. If we terminated a downcast, and started an upcast, the software hung the computer nearly every time. This was

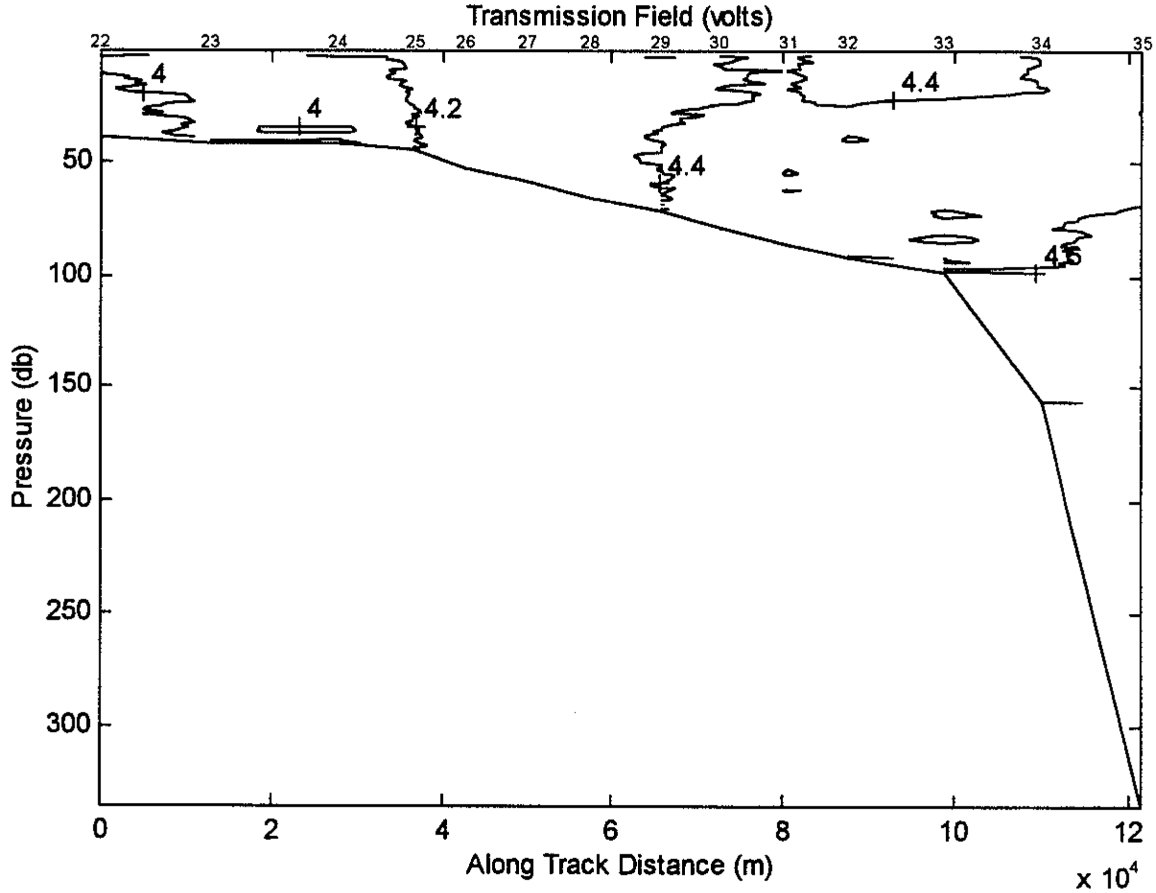

Figure 17. Contours of transmission at 0.2 V intervals for the Southern Flank section conducted on 28/10/96. The blanked out region shows the depth to which data was collected and closely follows the bathymetry. The numbers at the top of the figure are the CTD cast numbers and mark the position of each profile in the section.

noted several times on the OCEANUS Cruise OC276 where we were using a fast Pentium PC, and it was attributed to this faster machine. This time we were using a 66 MHz486 (a more standard PC), and the problem was worse. In addition, twice during the cruise something corrupted the Windows directory, not deleting any files, but messing up the FAT table so that the computer thought the files were not present and we could not run Windows. Disk Doctor managed to get things back up and running each time, but it is disquieting that this happened at all. This Gateway PC system has been very stable for the past four years, and this has never happened before, and so must be the result of an interaction with the FSI software. The FSI software is the very weak point in the FSI system. To be competitive FSI will have to rework the software so that it is more user friendly and robust.

Table 3 - OCEANUS Cruise OC291 Event Log

EVENT	INSTRUMENT	CAST	STATIOM	Year	Month	Day	HR:MN	S/E	N. Latitude	W. Longitude	Cast Depth	Water Depth	Comments
1	FSI CTD	1	Test	96	Oct	24	14:39	S	41 26.74	70 07.17	15	15	No bottle
2	FSI CTD	2	Wilkinson	96	Oct	24	18:40	S	41 41.44	69 18.22	180	191	Hit bottom
3	FSI CTD	3	Test	96	Oct	24	21:10	S	41 27.38	69 41.35	18	18	no fluorometer
4	Guard Buoy C		Southern Flank	96	Oct	26	13:12		40 58.113	67 19.143		76	Steel CODE Buoy
5	Science Mooring E		Southern Flank	96	Oct	26	19:39		40 58.037	67 19.219		76	Second Foam Science
6	Guard Buoy F		Southern Falnk	96	Oct	26	20:44		40 58.012	67 19.320		76	Foam Guard Buoy
7	Bottom Pressure		Southern Flank	96	Oct	26	21:13		40 58.050	67 19.269		76	
8	FSI CTD yo-yo	4	LT08	96	Oct	26	21:47	S	40 57.66	67 19.70		78	Altimeter not working
9	FSI CTD yo-yo	5	LT08	96	Oct	26	22:32	S	40 58.02	67 19.45	72	76	12 profiles
							23:35	E	40 58.50	67 19.42			Bottle # E1
10	Science Mooring B		Northeast Peak	96	Oct	27			41 43.923	66 32.225		73	First Setting
11	FSI CTD yo-yo	6		96			21:14	S	41 43.65	66 32.29		76	Bottle # E2
							22:19	E	41 43.71	66 32.59			
12	FSI CTD	7	NE14	96	Oct	28	3:17	S	41 59.27	65.37.46	335	800	Bottle # E3
							3:33	E	41 59.27	65 37.53			
13	FSI CTD	8	NE13	96	Oct	28	4:14	S	41 56.79	65 44.66	225		Bottle # E4
							4:35	E	41 56.67	65 44.66			
14	FS CTD	9	NE12	96	Oct	28	5:15	S	41 54.58	65 51.67	130	135	Bottle # E5
							5:28	E	41 54.42	65 51.40			
15	FSI CTD	10	NE11	96	Oct	28	6:16	S	41 51.94	65 58.72	83	93	Bottle # AJ1
							6:25	E	41 51.82	65 58.42			
16	FSI CTD	11	NE10	96	Oct	28	7:15	S	41 49.64	66 06.59	82	90	Bottle # JA2
							7:26	E	41 49.34	66 06.21			
17	FSI CTD	12	NE09	96	Oct	28	8:13	S	41 47.32	66 14.23	76	83	Bottle # AJ3
							8:24	E	41 47.02	66 14.06			
18	FSI CTD	13	NE08	96	Oct	28	9:11	S	41 44.91	66 21.65	72	76	Bottle # AJ4
							3:14	E	41 44.84	66 21.63			
19	FSI CTD	14	NE07	96	Oct	28	9:55	S	41 42.53	66 28.82	72	76	Bottle # AJ5
							9:59	E	41 42.49	66 28.85			
20	Science Mooring B		Northeast Peak	96	Oct	28	14:50		41 43.922	66 32.147		76	Second Setting
21	FSI CTD	15	Northeast Peak	96	Oct	28	15:18	S	41 44.23	66 32.31	70	75	Bottle # AJ6
							15:31	E	41 44.20	66 32.27			

Alberto Collasius, Jr. Eng.
Jennifer Serois, Jr. Eng.
Carl Wood, Steward
Christopher Jewitt, M/A.

0900 - Scientific Safely Meeting
0930 - Fire and Boat Drill
1030 - Test CTD#1 in Vineyard Sound in 15 m
Usual first cast problems in setting set up and in water
Fluorometer didn't appear to be working
Probably set CTD on bottom
Didn't home the water sampler before taking first sample
got error message and requested that the water
sampler home, then couldn't take water sample
1050 - Steaming on to deep water
1100 - Check of SF Science buoy
From present ARGOS and last night's GOES transmissions
STATUS=980 and 981 (temp changes) from GOES overnight
10-22°C or 22-35°C
No F/R errors
44 to 46 db out (satellite says 50, 49, 50, 48, 50 for last 5 transmissions)
11.5 to 12 v after GOES transmission
reported as 1252 in sunlight at 1400 (10 AM EDT)
10-22°C
No F/R errors
46 to 48 db out
12 to 12.5 volts
PAR = -3 overnight and 67 at 10 am, so appears to be working
SST(31617)=2672=>8534.4 Hz
T5 (31624)=3157=>8631.4 Hz
C5 (41365)=-25890=>2822 Hz
T15(31623)=4895=>8979 Hz
C15(41343)=-26055=>2789 Hz
T25(31623)=4495=>8899 Hz
C25(41341)=-26380=>2724 Hz
T35(30493)=4287=>8857.4 Hz
C35(41340)=-26255=>2749 Hz
T45(30478)=3844=>8768.8 Hz
C45(41333)=-26645=>2671 Hz
T50(30490)=2230=>8446 Hz
C50(41342)=-26140=>2882 Hz
Air Temp(35851)=1538
Rel Hum (35851)=9095=>93.6 %
East=-1334
North=303
Speed=1486

Short Wave Radiation=-8
Long Wave Radiation=146
B1=4209=>12.627 v
B2=4211=>12.633 v
B3=4210=>12.630 v
Battery voltage after GOES = 11.44 and 11.52

1440 - CTD02 in 191 meters in Southern Wilkinson Basin
Set CTD on bottom
Fluorometer doesn't appear to work
PAR appears overly sensitive, pegged in air and zero by 30 m
Transmissometer, Temperature and Salinity appear to work OK
Altimeter started to work at about 60 m above bottom

1500 - Started back to WHOI, processing data on way
LiCor PAR amp appears to be on lowest gain, but changed to k=5 to see what happens
Fluorometer appears to give constant output, finger in front of lens didn't change. Put battery into CTD input and saw appropriate change. Called Luigi, and he will have the fourth transmissometer at dock in morning.
Still appears to be a 0.02 v noise on transmissometer and fluorometer channels.

1700 - CTD03 without fluorometer in 20 meters of well mixed water
PAR appears to peg right at surface with reduced light levels so really don't want k=5.
Transmissometer still has about 0.02 volt noise, so is not due to fluorometer since was not on fish.
Primary and redundant temperatures about 1 millideg C different
Fast temperature about 5 millideg higher than primary temperature

1900 - covered guard lights or turned off at request of bridge

2200 - at WHOI dock

Friday 25 October 1996

0845 - Luigi arrived with three Bio-optical packages
Also brought down spare fluorometer for 4th package
Pat loaded his hardware

1500 - Paul Dugas arrived with FSI CTD
Plugged in and checked out
Fluorometer reads 100-200, with finger 6000-8000
PAR reads 3000-4000 on deck, pegged at zero with bag over sensor
System looks OK
Working on software for processing and display of CTD data

13:45:00 - Zero time for Bottom Pressure

14:00:00.5 - wrote sample #32
closed, painted and put in bottom frame ready to launch

1500 - Continued check of Southern Flank buoy
ARGOS looks good with good STATUS
Checked PCMCIA and also looks good
Weather report sounds good for weekend
Winds 10-20 on Sat and 10 on Sun
Seas 4-6 decreasing to 2-4 foot
No real weather in sight through Wed
1745 - depart WHOI dock
1900 - fired up Navigation program, 10 hours to site, 140 nm, tide must be helping
Checked ADCP programs:
30 minute ensembles of 400 pings each
70 bins of 1 m depth starting at 7 m depth
RMS error 0.6 cm/sec
Requires 1000 watt hours of power and 11 MB of storage
Saved ADCP setups as:
SFLA5.CMD and
NEPK5.CMD
Set computer time to UTC to start ADCPs

Saturday 26 October 1996

0615 - Still dark, full moon setting
Winds about 8-9 kts out of North, seas about 4', no whitecaps
Nice sunrise, few clouds in sky
0630 - about 1 hour to station, partly cloudy
0645 - Guard Buoy "C" preped for launch first
Light #30112
4 Bulb changer with internal photocell fixed last
Light working when dark
Shutoff when bag taken off light
Solar panels #2 and 12
Buoy ready to launch
0720 - Southern Flank Science Mooring
Biop @ 10 m #1 with Seapoint Sensor S/N 102
PAR S/N 1794
WBOT S/N 484
WBOC S/N 068
TRANS S/N 620
FLUOR S/N 295
Biop @ 40 m #2
PAR S/N 1971
WBOT S/N 481
WBOC S/N 059
TRANS S/N 621
FLUOR S/N 296

0730 - Starting Seacats and ADCP
ADCP S/N 0125
Leaving test on recorder, immediate start
Computer time set to UTC within 1 second
Deploy with command file SFLA5.cmd
0830 - Starting launch of buoy "C"
starting 1/2 nm from position
0845 - Buoy in water - tags not cleared quickly
Quick release jammed as buoy swung around
Paying out chain
0855 - Chain out to slip line, towing buoy into position
0905 - 5 minutes to drip site
0907 - Slowing down and transferring load to anchor
0912 - Anchor released, and ship's position is
40° 58.103 x 67° 19.101
0918 - Approaching steel guard buoy "C"
Buoy at bow of ship with heading North
40° 58.112' N x 67° 19.143' W
Buoy riding at water line
Looks like a good launch
PDR says water depth is 73.2 meters on paper
Stern draft = 18' and less 1 ' => 5.2m
Therefore depth is 78.4 m by PDR
0930 - Moving Science Buoy "E" into position for launch
0940 - Covers off long and short wave radiation sensors
Seacats S/N 1736 at 73 meters on chain
S/N 1818 on mooring at 20 m depth
S/N 1819 on mooring at 30 m depth
T50 S/N 490
C50 S/N 1342
T45 S/N 478
C45 S/N 1333
T35 S/N 493
C35 S/N 1340
T25 S/N 1621
C25 S/N 1341
T15 S/N 1623
C15 S/N 1343
T05 S/N 1624
C05 S/N 1365
SST S/N 1617
ADCP S/N 0125
Checking Shackles, poison tubes, etc.
1231 - ADCP, T5/C5 and BIOP@10m over side on rail
1250 - Launch of buoy

Lines were not cleared as buoy went in water, but afterward
Quick release not released at once, and headache ball and
quick release rope caught in anemometer and tore off
sensing element.

1300 - dropped bottom end of array before tether for recovery
buoy successfully recovered without damage
Replaced anemometer
6 black + grey
7 yellow
8 orange
9 red
Speed indicator replaced with spare (old one used last year)
but with new electronics (i.e. did not change)
Check of system
Black is common
+ voltage is 6.18v
vane varies from 0 to 6.18 v
wind reads 5 mv with no rotation
goes up to 120 mv with gusts on deck
RTVd cables etc.
Air temp/rel. hum. sensors straightened
Light still works on switch
Checking ARGOS data, looks good

1500 - starting to launch buoy again
tag line broke because being held too tight
retagged and continued to launch
when line broke, ADCP pulled back aboard and crashed into deck
released buoy as hit water, not later when problems have occurred
Relatively smooth launch
Cables paid out well with no problems

1539 - Anchor away about 300' from Guard buoy "C"
Ship's position at drop was
40° 58.111' N x 67° 19.203' W
Run-by of buoy, buoy off port beam with heading 110°
40° 58.037' N x 67° 19.219' W
Bearing between buoys is 045° T
Wind up to 20-25 kts with seas 5-6'
Setting up for Guard Buoy "F" Launch

1620 - Light plugged in and connection taped.
Light turns on and off with photocell shutoff

1625 - Buoy astern and paying out chain

1644 - Buoy deployed - missed anchor drop on ship's GPS
About 40° 58.12 x 67š 19.3
Run-by buoy F on starboard bow
40° 58.012' N x 67° 19.320' W

1713 - Deploying Bottom Pressure
40° 58.050' N x 67° 19.269' W
Note GPS probably a bit south of drop site
1727 - Guard "F" light flashing
1739 - Acoustic Check
Ship put starboard side to weather pointing at buoys
Acoustic range 253 m - can hear two replies
Disable Southern Flank mooring - ok
Range 324 m \
Disable pressure acoustic release
Pressure is vertical and not released
Everything asleep - no replies
Enable release
Range 743 to SF mooring
Disable A ok
Disable B - only 3 pings at 7 seconds
Both releases, both channels asleep
1800 - Getting ready for CTD
Altimeter not working, channel reads 65535 continuously
Winds steady at 18 kts and seas about 6'
1839 - started 1 hour yo-yo series
1936 - end 1 hour yo-yo with 12 profiles.
2000 - off to Northeast Peak site with check of Peter Smith's buoys

Sunday - 27 October 1996

0048 - Arrived at Peter Smith's Tip site
Three Guard buoys were present and all lights working
E - 41° 19.735' N x 66° 28.451' W
F - 41° 19.211' N x 66° 28.937' W
AB - 41° 19.254' N x 66° 27.974' W
0155 - Depart for Northeast Peak site
0400 - On station, two buoys present
0615 - Daylight savings time
Sunny and clear, winds about 15 kts and whitecaps
Getting people up to lay down NEPeak buoy to rig for deployment
Will plan on doing Yo-yo series from stern at NEP site
0645 - Started ADCP S/N 130
0830 - Buoy "B" Light not working, no power, fuse probably blown
Take Tower off buoy
Take Electronics Can out of tower
Fuse was blown, replaced with 8 amp
One broken bulb in light changer
Switch to spare light - new one with 12 v bulbs
Light now works, shuts off in sunlight - OK

Battery in lab -
White - 13.025 v
Black - 13.004 v
12.775 v at power out
Batteries and supply looks OK

1033 - ARGOS back on air
Light plugged in and working
Cables plugged in with sensors
A4 - 3697 Hz
A5 - 2844 Hz
A6 - 3877 Hz
A7 - 2742 Hz
A8 - 3612 Hz
A9 - 2959 Hz

1139 - System start and await test
Seacats S/N 1735 at 73 meters on chain
S/N 1820 on mooring at 20 m depth
S/N 2006 on mooring at 30 m depth
T50 S/N 2176
C50 S/N 1377
T40 S/N 2173
C40 S/N 1370
SST S/N 2080
SSC S/N 1379
ADCP S/N 0130
Atm PAR S/N UWQ4948
Solar Panels 3, 6, 7, 10
Checking Shackles, poison tubes, etc.
Biop @ 10 m #4
PAR S/N 1792
WBOT S/N 482
WBOC S/N 056
TRANS S/N 628
FLUOR S/N 306

1330 - problem with Antenna - F/R power error
removed and cleaned top "N" connector
GOES Antenna S/N 746
reassembled for tests
TDS is OK

1408 - Test GOES transmission
Status OK now
Connection restarted

1455 - Buoy in water smoothly 1/4 mile from site

1458 - Tethers in water
Steaming 3.7 kts through water to get 0.7 kts over ground

1555 - Anchor dropped
41° 43.923' N x 66° 32.225' W
a bit SE of midpoint between Canadian Guard Buoys
1614 - start of Yo-yo by NEP mooring
1630 - ARGOS check shows data not updated, and system not working properly! Data is old data. Will have to recover.
1720 - end NEP yo-yo
1730 - Acoustic check with mooring, 750 m range, disabled OK
Heading for CTD station NE14 - 45 nm
2217 - CTD07 @ NE14
2314 - CTD08 @ NE13

Monday 28 October 1996

0015 - CTD09 @ NE12
0116 - CTD10 @ NE11
0215 - CTD11 @ NE10
0313 - CTD12 @ NE09
0411 - CTD13 @ NE08
0455 - CTD14 @ NE07
Heading for NEP mooring site
0647 - overcast, seas 2-3' wind down to 10 kts but picking up from SW.
0758 - wind up to 14 kts
0816 - Acoustic Command Transducer in water
Enable release - OK
Release commanded, acknowledged, subsurface floatation on surface
0830 - Buoy on board
0835 - Plugging into buoy, to reset software
logfile in AGAIN.LOG
0338 - time checks OK to second
A1 - OK
A2 - OK
START
START - with error
0841 - ARGOS message OK day 12 hour 13
A4 changes every minute showing running
Battery voltages 12.759 v
Next GOES is 15:04:10 UTC
0849 - TDS reset
Dumped data and logs in AGAIN.TDS
Data looks OK
Zeroed PCMCIA card
Restarted, 5 second hash OK
0916 - Wind about 12 kts with black clouds
0930 - ARGOS wrote new messages OK

0940 - Deploying buoy
0945 - Strung out and towing
0950 - Deploy Anchor
41° 43.922' N x 66° 32.147' W
Nearly in line, NEP mooring is slightly to north of guard line
1004 - Acoustic release check and disable - OK
1018 - CTD15 by NEP Mooring
1030 - ARGOS changed, GOES transmission and STATUS OK
1038 - Overcast, gray, rain, lightning, wind about 15 kts.
1107 - CTD16 @ NE6
1155 - CTD17 @ NE5
1255 - CTD18 @ NE4
1343 - CTD19 @ NE3
1347 - Wind 18 kts very overcast with sprinkles
1447 - CTD20 @ NE2
1530 - CTD21 @ NE1
1731 - CTD22 @ LT01
1829 - CTD23 @ LT02
Decided to add the Oceanographer Canyon section if weather does not get too bad
1933 - CTD24 @ LT03
2017 - CTD25 @ LT04
2053 - CTD26 @ LT05
2030 - Wind up sharply to about 25 kts
2136 - CTD27 @ LT06
2217 - CTD28 @ LT07
2257 - CTD29 @ LT08 - by Southern Flank Station
Wind still about 25 kts
Three buoys there, all lights working!
ARGOS reception poor, no data
2334 - CTD30 @ LT09

Tuesday - 29 October 1996

0020 - CTD31 @ LT010
0120 - CTD32 @ LT012
0210 - CTD33 @ LT012
0318 - CTD34 @ LT013
0413 - CTD35 @ LT014
0900 - Winds >30 kts, seas 10', canceled Oceanographer Canyon CTD section
plan to move slowly to Pickart's mooring
2100 - Winds down to 10 kts and seas calming rapidly
at Pickart's mooring site
No sign of moved guard buoy, lots of high flyers around
2130 - Back to ADCP site,
Enabling ADCP, range 690 m, Disable - OK

Off to inshore mooring site to check

Wednesday - 30 October 1996

0600 - Visual search of area for guard buoys, none in site
Wind down to 10 kts, seas a few feet and very pleasant.
0930 - Phone call to Pickart and end of survey, on way home.

1230 - Check Coastal Mixing and Optics central mooring site on way in.
All moorings appear present, wave rider buoy may be a bit out of position.
ETA 1800