

Cruise Report

**RV/ENDEAVOR Cruise EN246
to Georges Bank**

US GLOBEC



28 June - 1 July 1994

Cruise Report

R/V ENDEAVOR Cruise 246

Narragansett to Georges Bank to Woods Hole

June 28 - July 1, 1994

Acknowledgments

This report was prepared by Jim Irish, Ann Martin and Brian Racine from cruise notes and logs as a first draft document of the activities, positions, etc. We gratefully acknowledge the excellent support provided by the Captain and crew of the R/V ENDEAVOR on their first cruise after her mid-life refit. Their hard work at getting the ship functional again allowed this cruise to accomplish our primary goals.

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R/V ENDEAVOR Cruise EN-246

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Cruise Report
R/V ENDEAVOR Cruise 246
US State Department Cruise No. 94-15
Narragansett, RI to Georges Bank to Woods Hole
June 28 - July 1, 1994

Purpose

The primary purpose of EN-246 was to conduct Precision Depth Recorder (PDR) surveys of the two proposed Crest mooring sites for the U.S. GLOBEC NW Atlantic/Georges Bank Program's Long-term Moorings. Additionally, the cruise would (1) make a CTD section from offshore of the 500 m isobath up onto the crest, (2) recover the three Guard Buoys and any other instrumentation at the WHOI Buoy Farm, and (3) make a CTD section through the Stratification mooring sites as time permits.

Accomplishment Summary

The R/V ENDEAVOR had just come from mid-life overhaul, and this was the first cruise of the newly outfitted vessel. As such, some operations were slowed down as the crew adjusted, fixed and completed the tasks of getting the ship ready for operations. No major problems were encountered with the ship or crew, who worked hard to accomplish the work.

After leaving Narragansett, RI, the ship stopped at the WHOI Buoy Farm to recover the three guard buoys deployed in early May. All three buoys were there, and looked in great shape. However, the seas were too great so that the ship's motion exceeded the limits for the new crane, so recovery of the buoys was postponed until the end of the cruise. By then, the seas had calmed down, and all three buoys were successfully recovered, including mooring hardware and anchors.

The main CTD section included nine stations from outside the shelf-slope front up onto the crest. A major reason for making the section was to ascertain that the across-shelf location of the Southern Flank mooring was inshore of the shelf slope front. The nine stations made extend from the warm core ring water present off the shelf, up to the well-mixed water within the tidally mixed top of Georges Bank. The shelf-slope front was very evident; it is surprising that the warmer offshore water did not extend up onto the bank. The South Flank mooring is placed well upslope from the front in the stratified regions.

Two tentative sites were selected from standard nautical charts as the sites for the Long-Term Mooring at the crest of the bank. Previous surveys by Page Valentine at WHOI/USGS of one of these sites, while giving a good detailed picture of what was there, did not indicate that we had selected the best site. Therefore, two surveys were run on the selected locations, and the picture of the crest of the bank that emerged was of a generally 40 m nominal depth bottom with ridges extending upward from it. The location of the Crest mooring must be in the deeper water between these ridges, and they must not move on the six month time frame of a mooring deployment.

Cruise Results

EN246 was successful. Figure 1 shows the ship's track for the entire cruise from the SAIL log. We were able to recover the three buoys from the Woods Hole Oceanographic Institution's Buoy Farm which will be redeployed in October on Georges Bank. The buoys survived the spring at the Buoy Farm without problems. A CTD section was made from the offshore up onto Georges Bank to check the water properties and structure to assure that the Southern Flank Mooring is properly placed. And finally, a bathymetric survey was made of the two crest site possibilities in order to select the final deployment position.

CTD Survey:

Figure 1 shows the cruise track from Narragansett to Georges Bank to the Buoy Farm then WHOI. Figure 2 shows a more detailed chart of the locations of the CTDs in the section. The section was started offshore of the shelf-slope front, offshore of any shelf water. As can be seen from CTD01 (Figure 3), there is very warm water showing the presence of a warm Gulf Stream ring. For these profiles, the University of Rhode Island's R/V ENDEAVOR Sea Bird CTD with transmissometer and fluorometer was used. Since the ship was just out of the yard, the winch was hard to control, and the speed was not as slow or as predictable as would be desired. Also, the CTD was new to this crew, and we had to get used to the techniques of using it without help from the ship's personnel who were worried about making the ship function properly. Therefore, the quality of the profiles for the first five casts is not as good as obtained later. After CTD05, the pressure sensor was changed to a shallow range, and the CTD was lowered to 10 meters, then brought back to the surface before lowering. This gave time for the pump to turn on and the instrument to stabilize. The top 10 - 20 meters of the first few profiles is very different on the up and down casts showing this problem. The first profile recorded no up cast as the CTD's logger stopped functioning at 825 meters on the down cast. No reason could be determined, and no further problems were noticed.

CTD01, 02 and 03 show temperatures exceeding 20°C at the surface (Figures 3, 4 and 5). The cooler 8°C shelf water is not seen in CTD01 and 02 (Figures 3 and 4), but is seen in CTD03 (Figure 5), indicating that the shelf slope front is positioned between CTD02 and CTD03. While CTD03 just sees the surface effects of the warmer offshore water, it has the fresher (<34 PSU) water not seen in CTD02 indicating that CTD03 is indeed on the shelf. CTD04A and B (Figures 6 and 7) at the Southern Flank Mooring site show a typically stratified upper 20 meters as we planned for the mooring. CTD05 (Figure 8) shows this same stratification further up the shelf, but CTD06 (Figure 9) shows little stratification, indicating that it is within the tidally well-mixed region at the top of the bank. CTD07, 08 (at the Crest Site A) and 09, show the well mixed water at the crest of the Georges Bank. There is some structure, but not the strong stratification seen at CTD04 and CTD05.

The fluorometer was tuned to the Chlorophyll A fluorescence band to get an indication of the vertical location of primary productivity. The data has not been processed, but merely displayed. A strong peak is seen in the thermocline regions of CTD02, 03, 04 05, with the largest signals seen at about 18 meters in CTD05 in the stratified region. The shallower, well mixed CTDs do not show the peak in fluorescence, but they have higher values similar to CTD04.

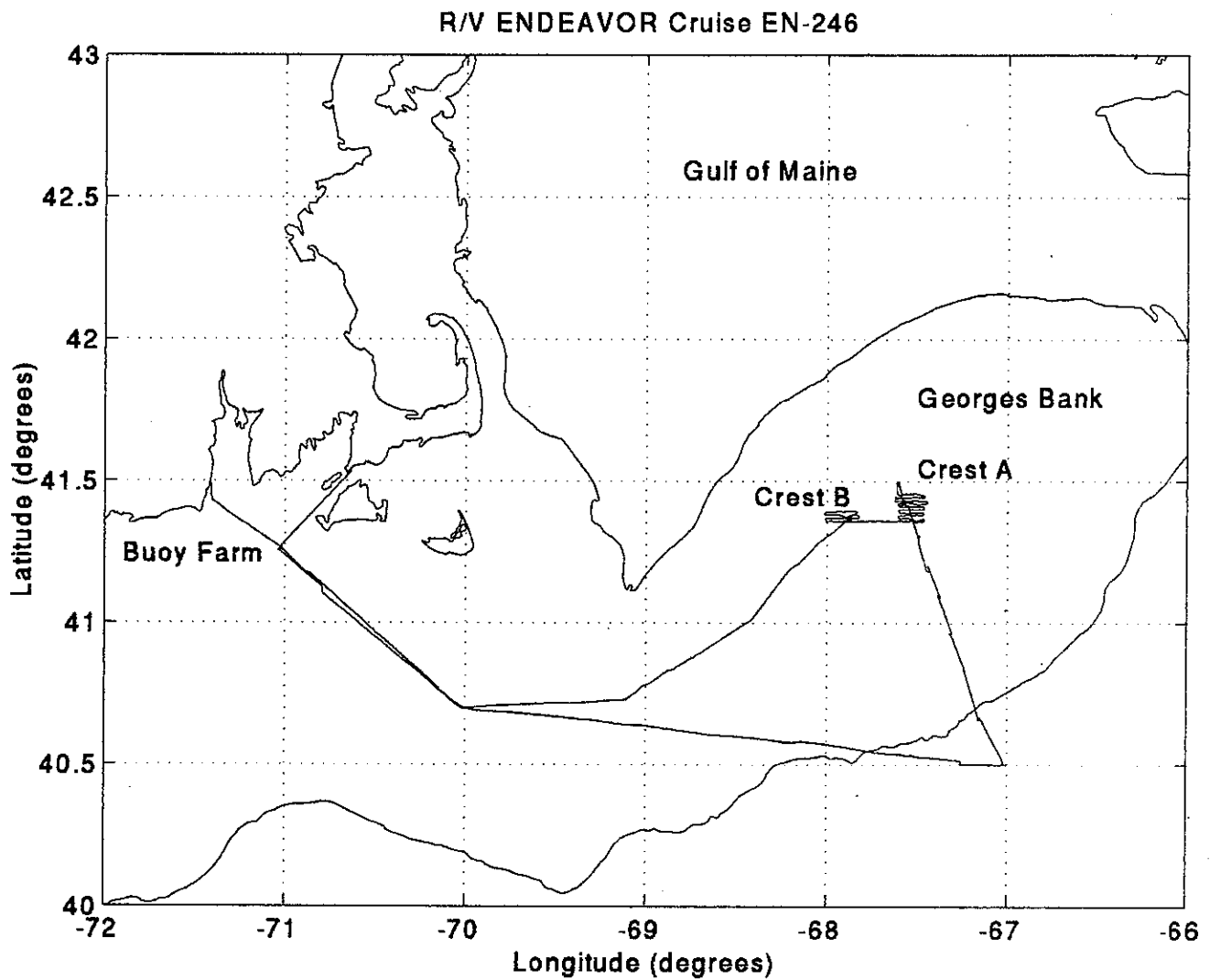
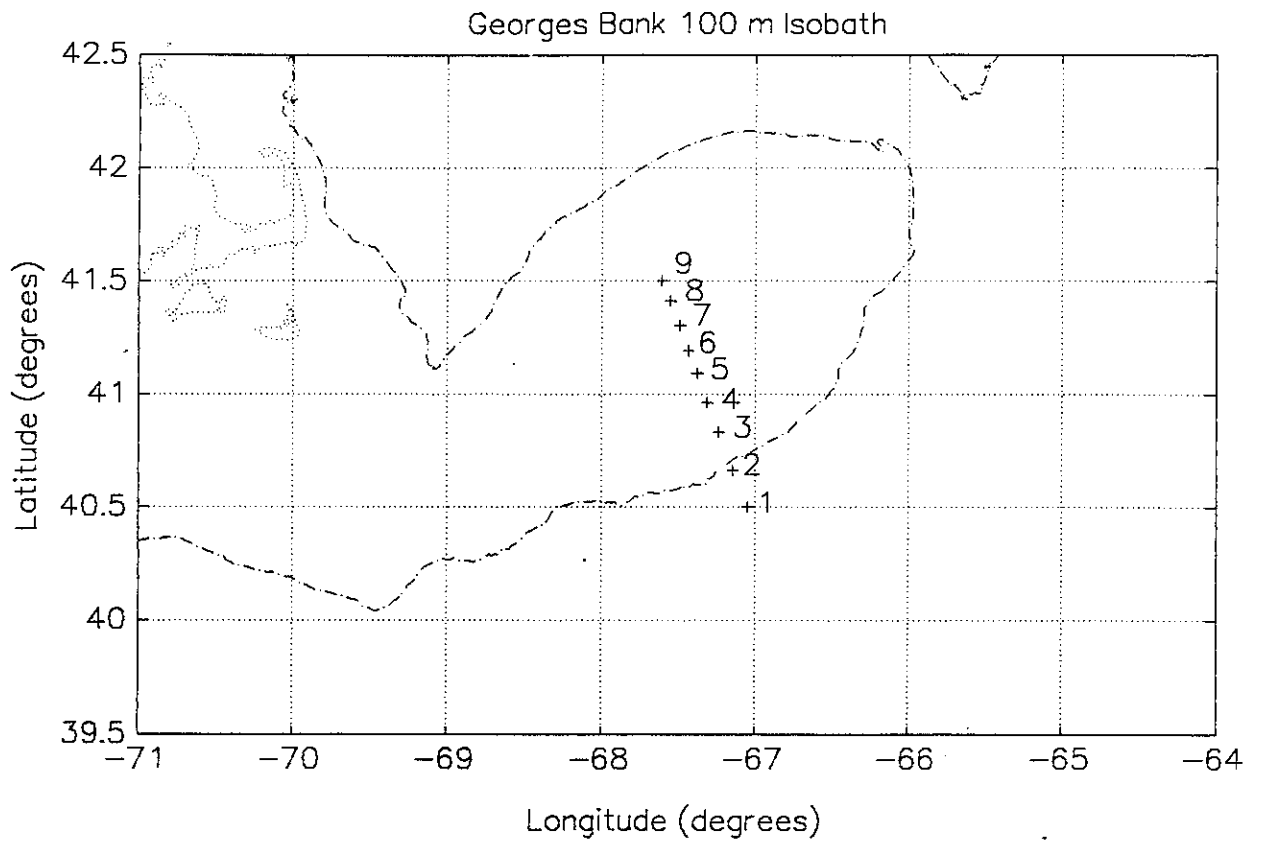


Figure 1: Ship's track from R/V ENDEAVOR cruise EN246 to Georges Bank. The ship departed Narragansett, RI and proceeded to a position offshore of Georges Bank, then proceeded up onto the bank taking a CTD section along the way. On Georges Bank PDR surveys were made of the Crest A and Crest B proposed mooring sites. Then the ship moved to the Buoy Farm to recover three buoys, then to WHOI for offloading.



EN246 CTD Log

Stn#	Lat	Lon	Year	Mth	Day	Hr	Min	Depth
1	4029.96	6703.00	1994	07	29	13	32	780
2	4039.88	6709.07	1994	07	29	17	15	100
3	4050.00	6714.40	1994	07	29	18	56	88
4a	4057.87	6718.87	1994	07	29	20	13	72
4b	4057.90	6718.69	1994	07	29	20	20	72
5	4105.66	6722.66	1994	07	29	21	45	60
6	4111.44	6726.24	1994	07	29	23	08	44
7	4118.32	6729.32	1994	07	30	01	03	42
8a	4124.77	6733.28	1994	07	30	02	20	40
8b	4124.67	6733.41	1994	07	30	02	27	39
9	4130.00	6736.27	1994	07	30	03	20	37

Figure 2: The CTD section locations on Georges Bank.

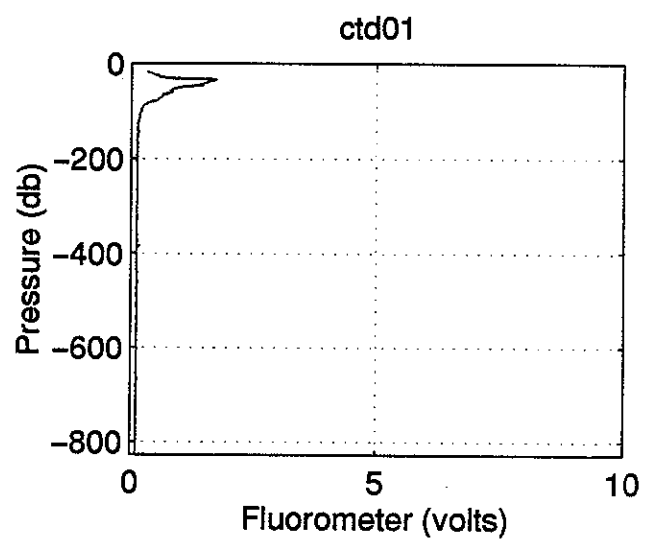
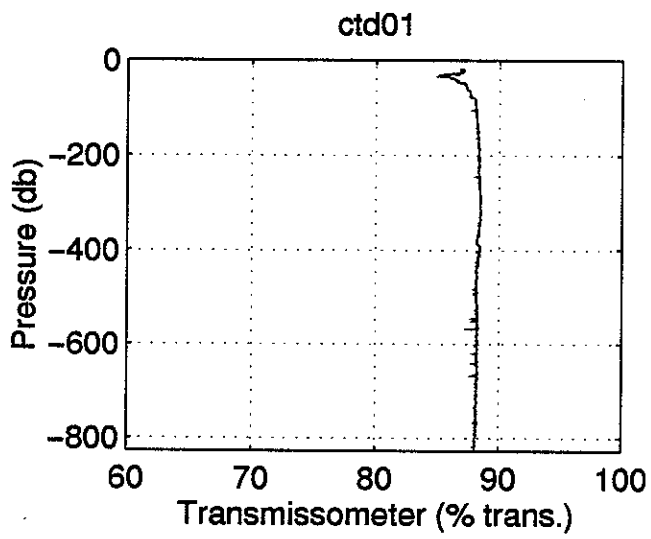
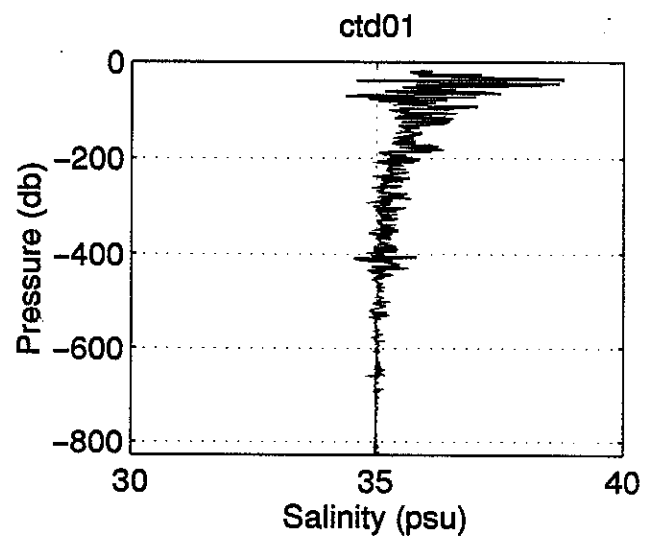
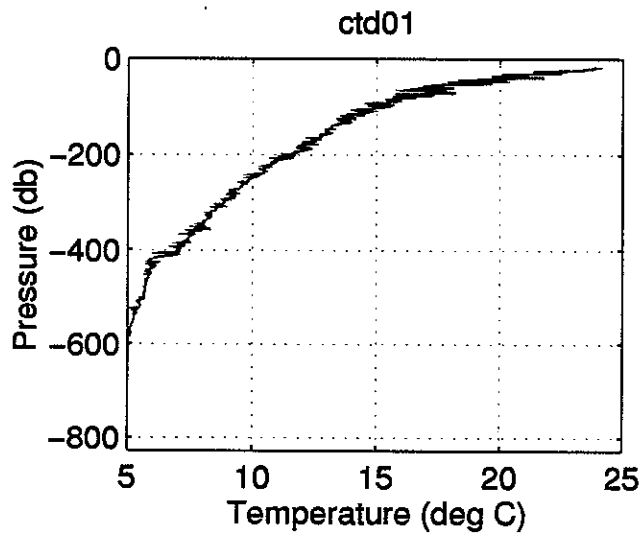


Figure 3. CTD01 in warm Gulf Stream ring water.

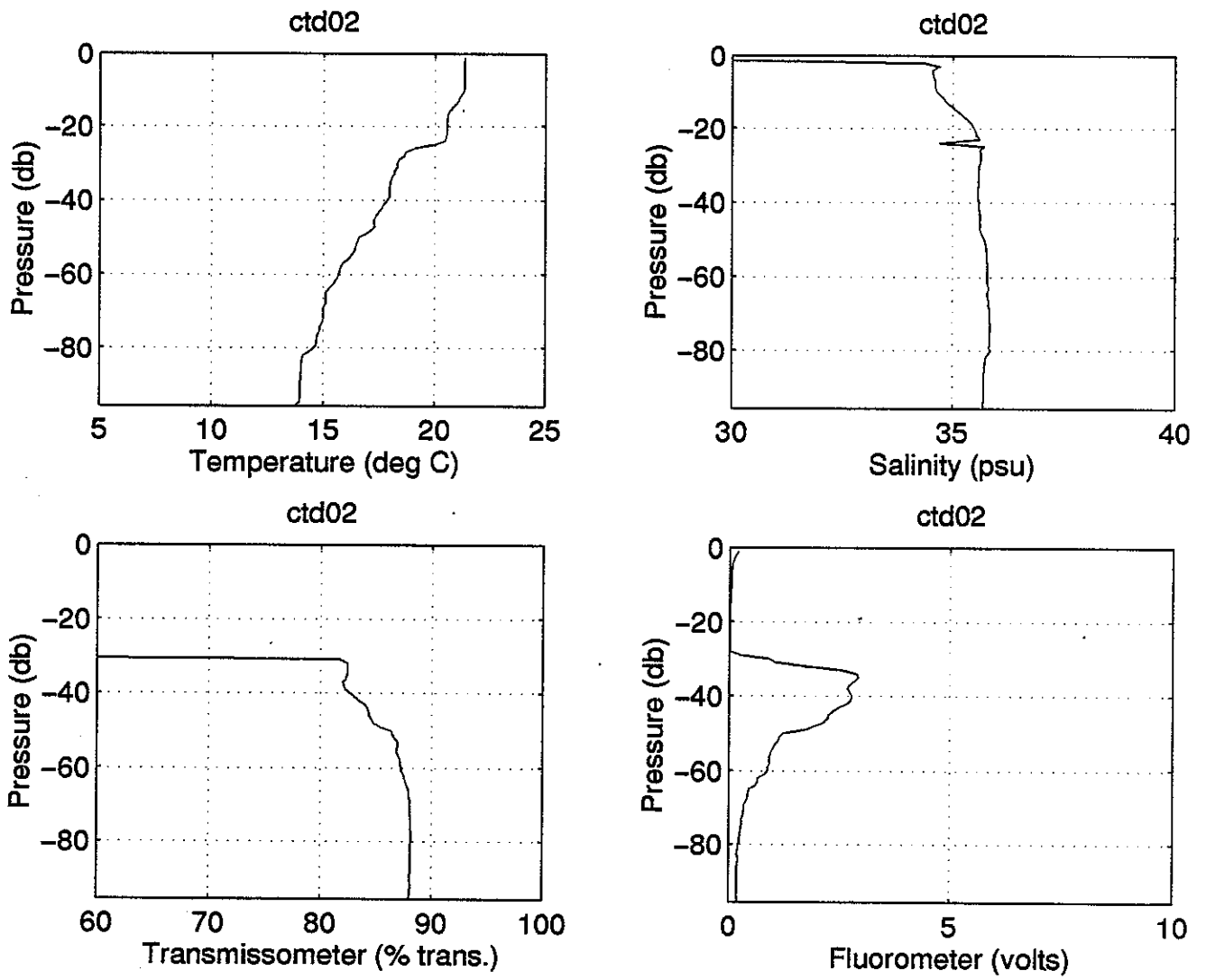


Figure 4. CTD02 near the shelf slope front, but still in offshore waters.

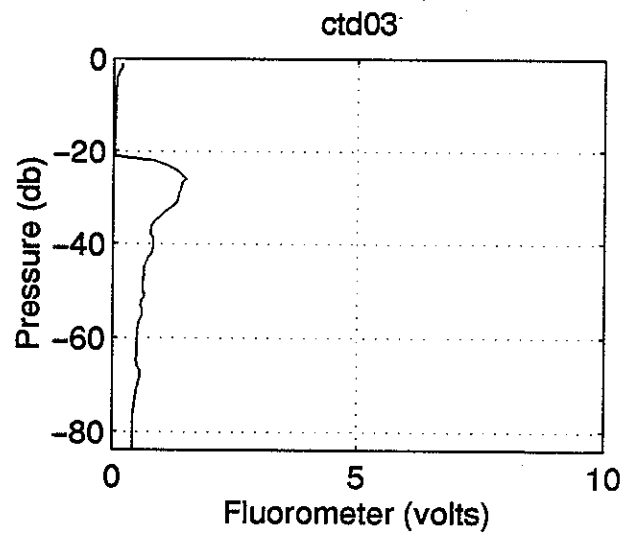
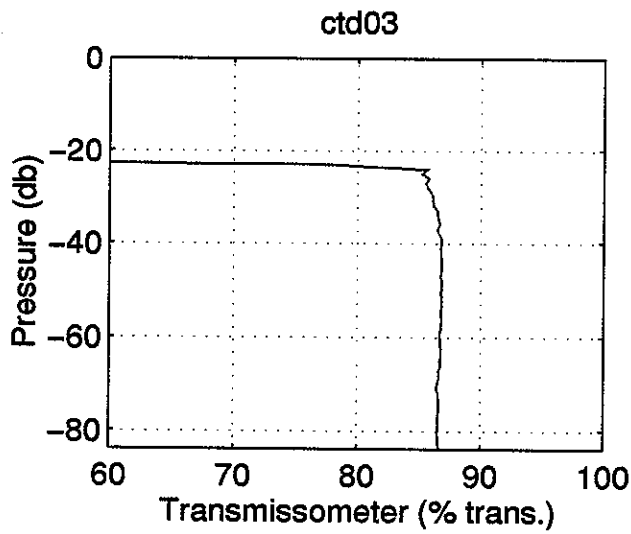
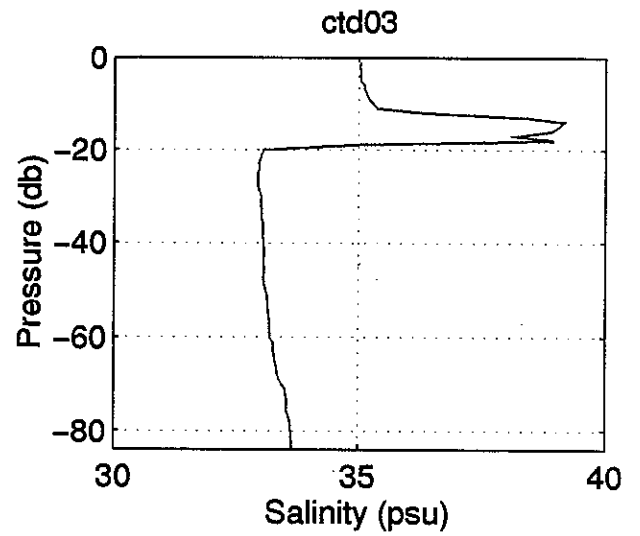
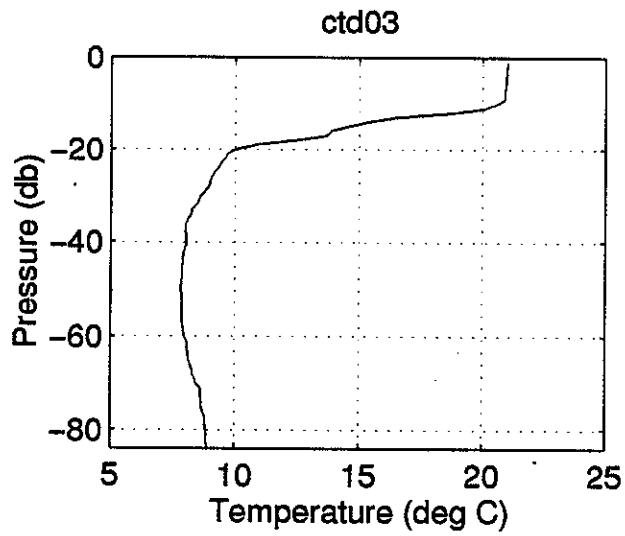


Figure 5. CTD03 shows offshore water in the surface, but shelf waters below 20 m.

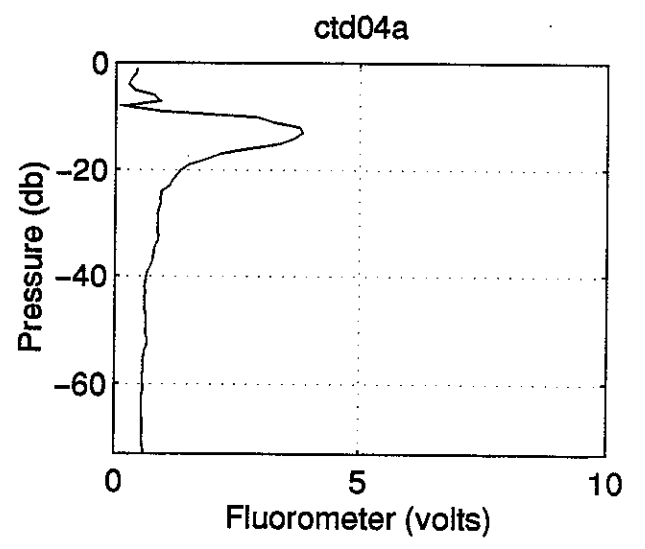
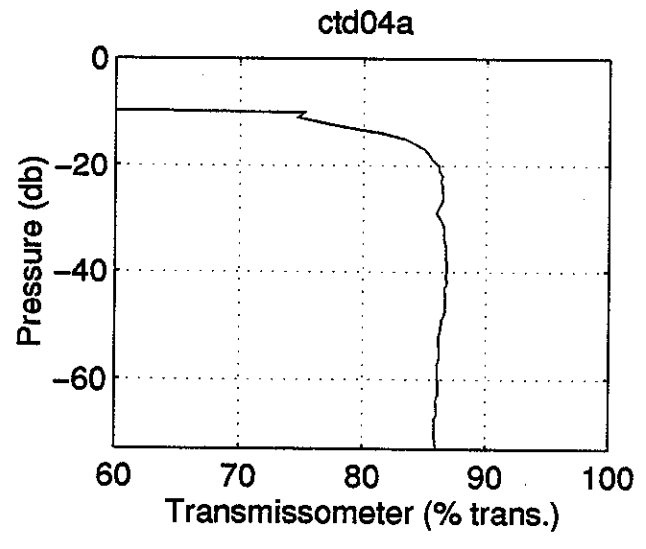
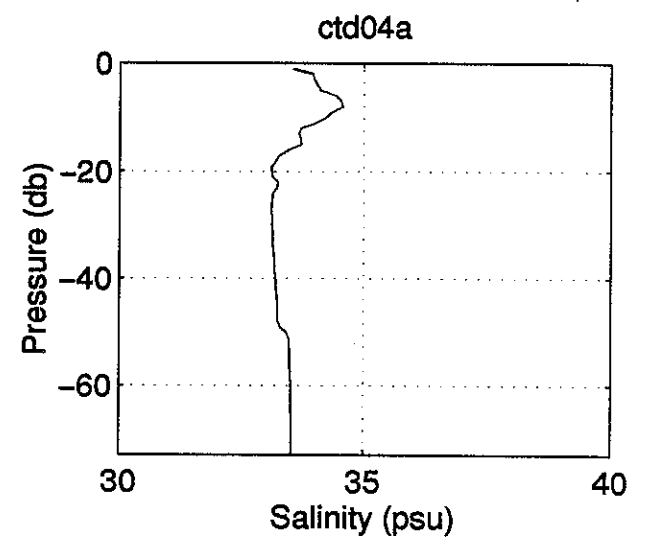
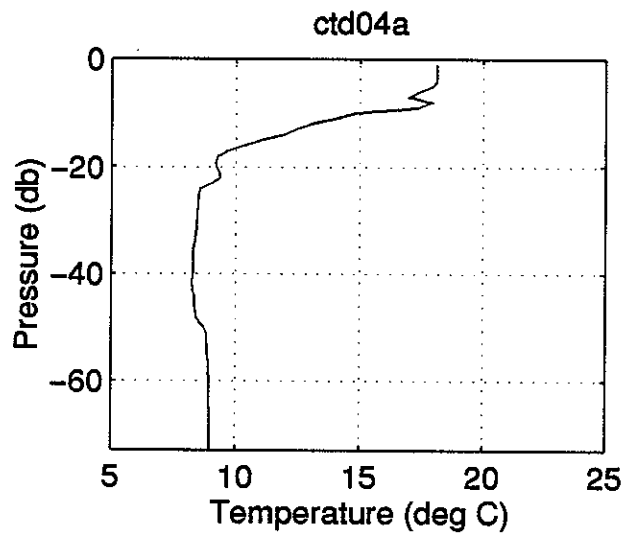


Figure 6. CTD04A at the South Flank mooring site shows strong stratification as expected.

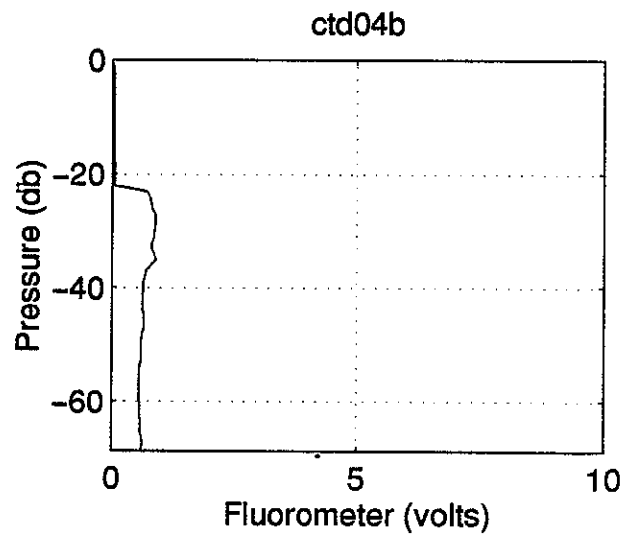
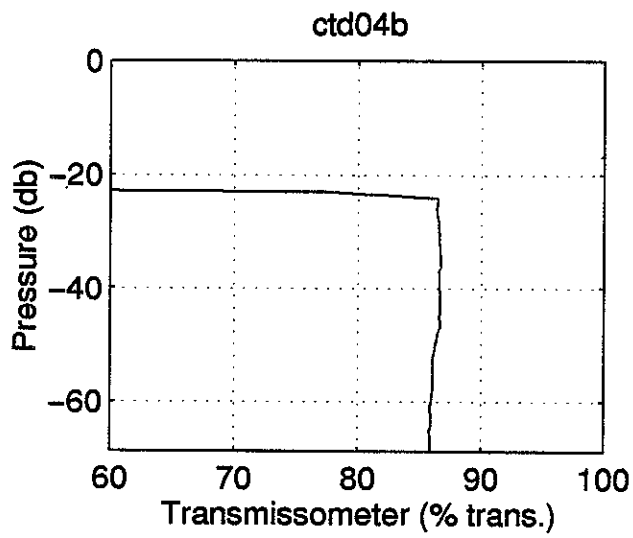
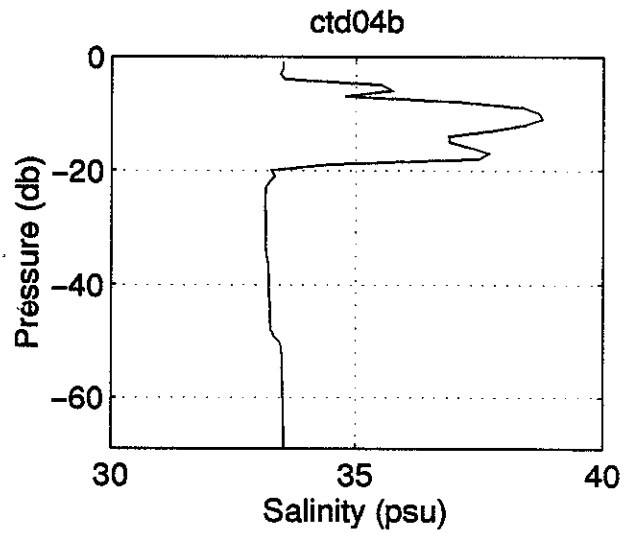
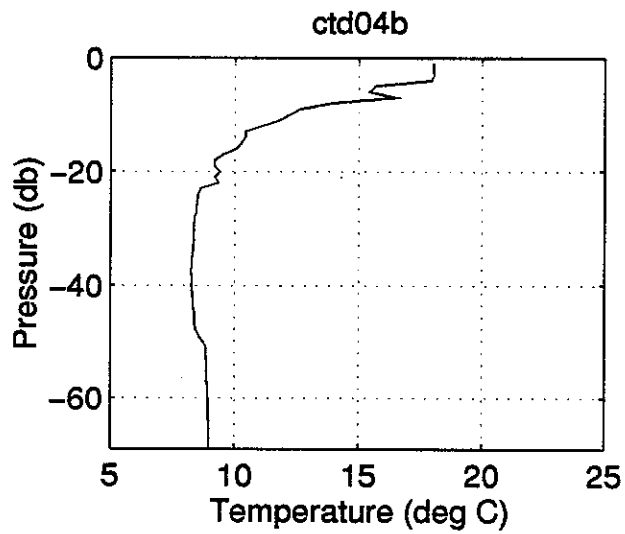


Figure 7. CTD04B similar to Figure 6.

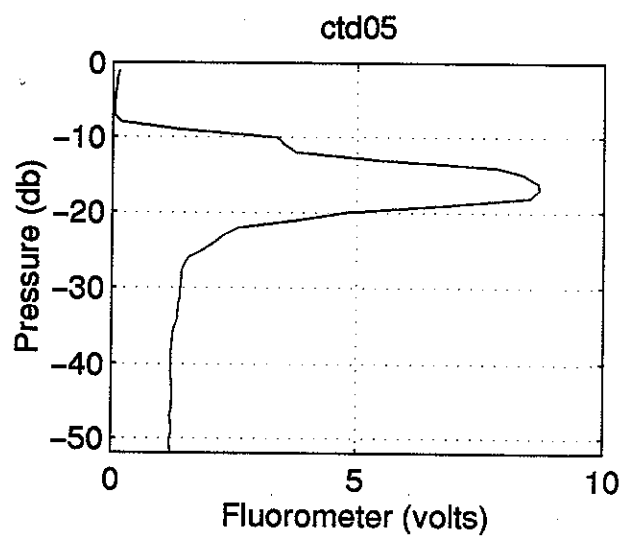
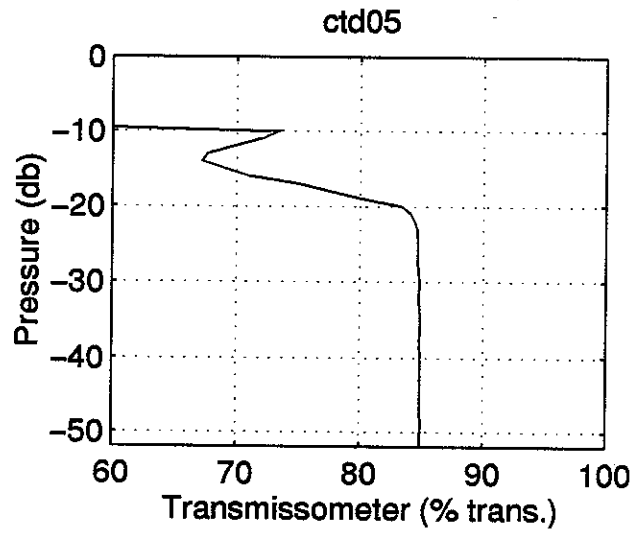
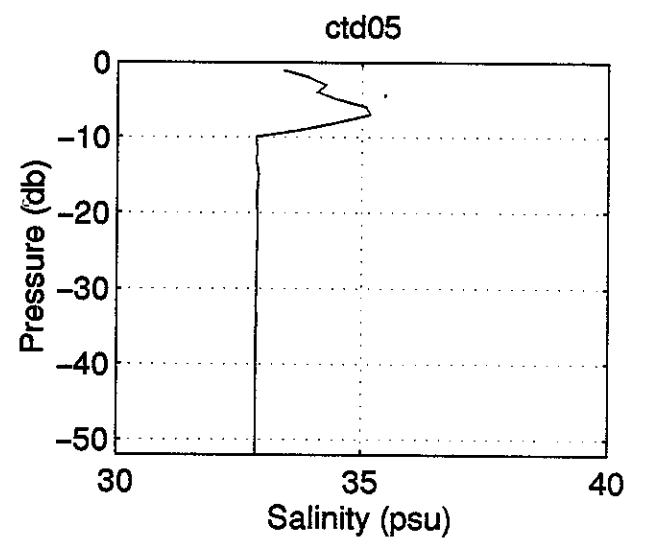
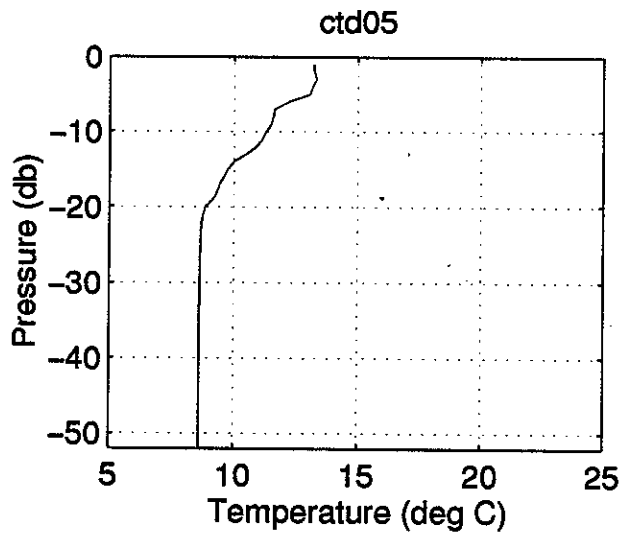


Figure 8. CTD05 further up the Bank in stratified water.

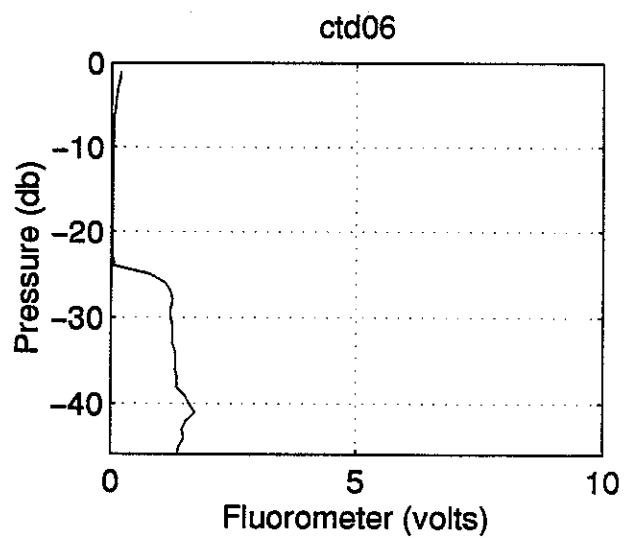
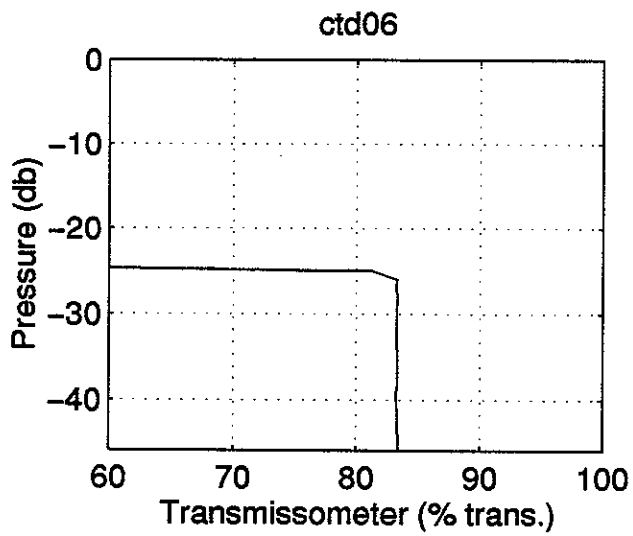
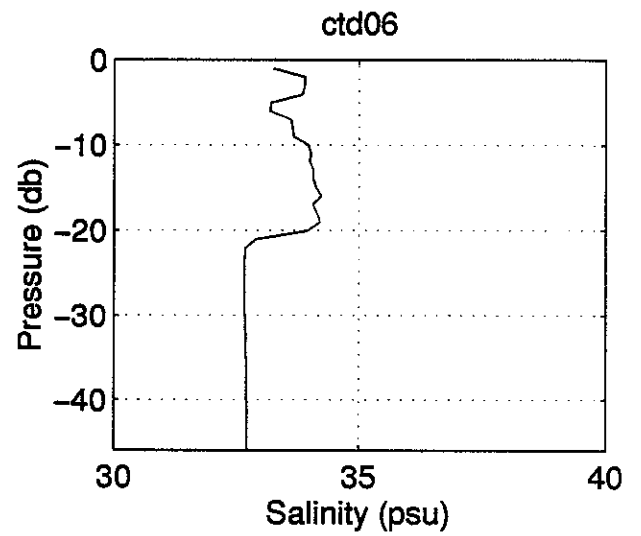
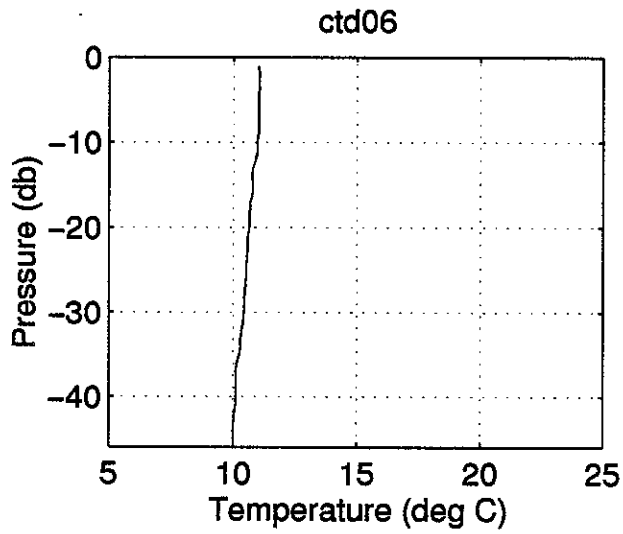


Figure 9. CTD06 further up the Bank near the tidally mixed region.

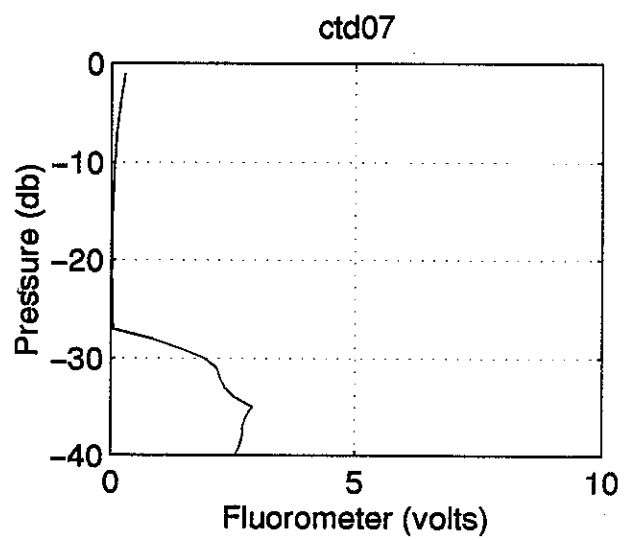
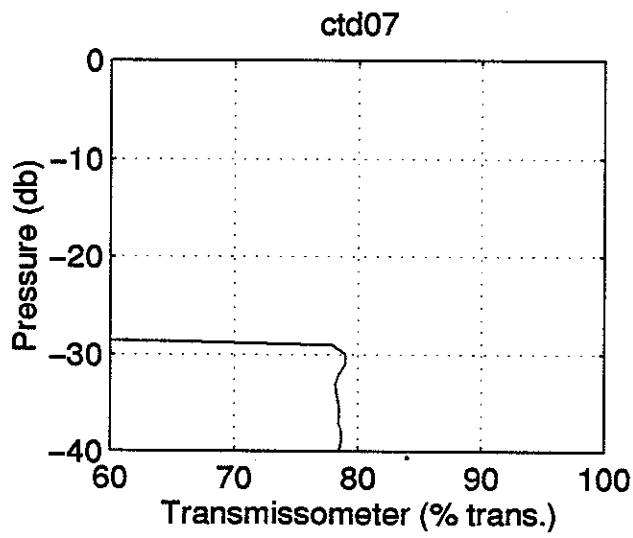
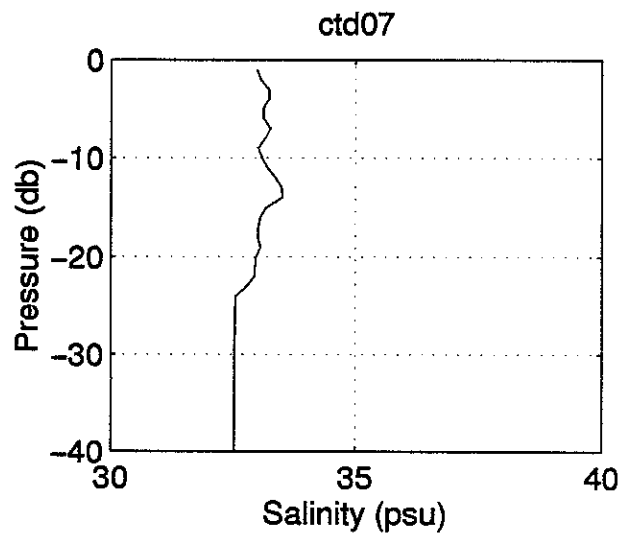
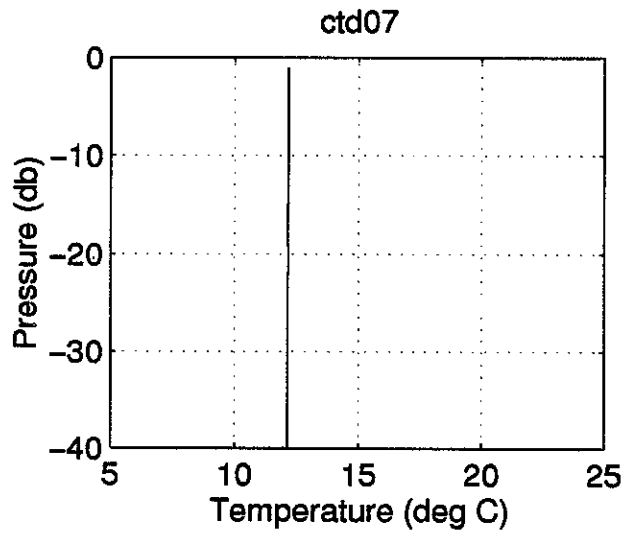


Figure 10. CTD07 in the tidally mixed region with little stratification.

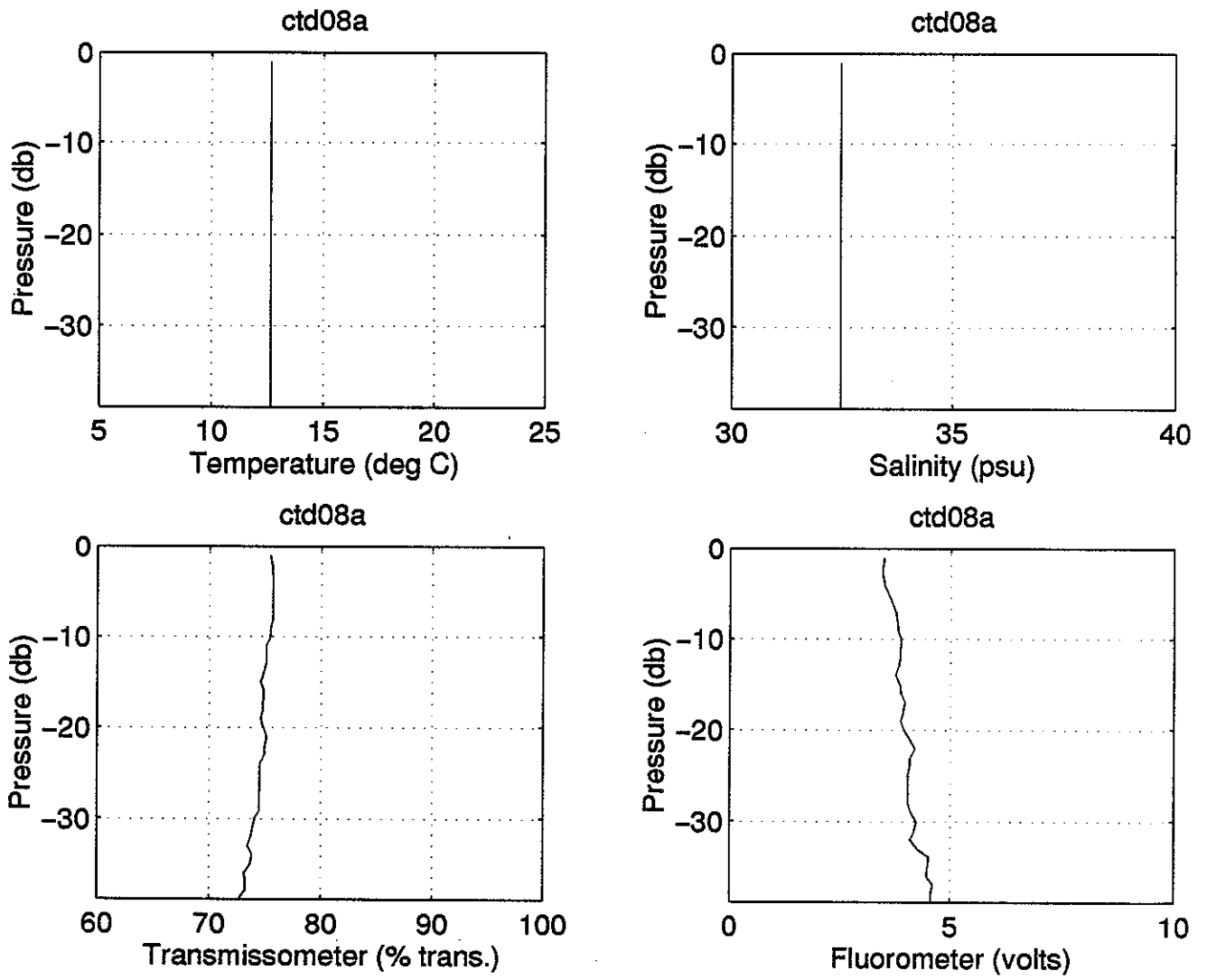


Figure 11. CTD08A in the tidally mixed region at Crest Mooring site A with little stratification.

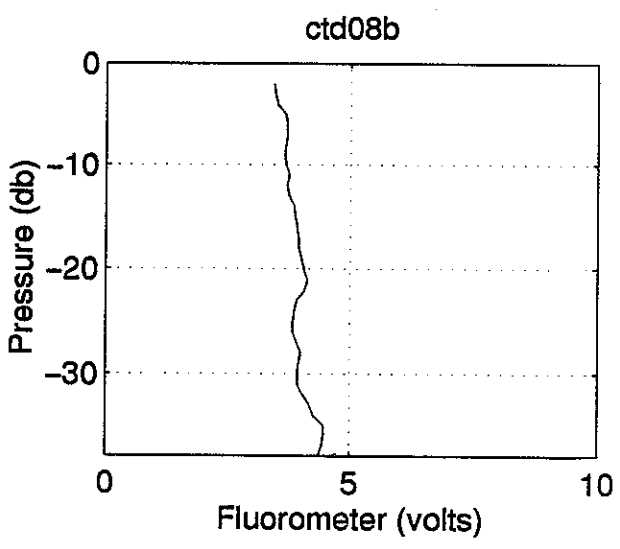
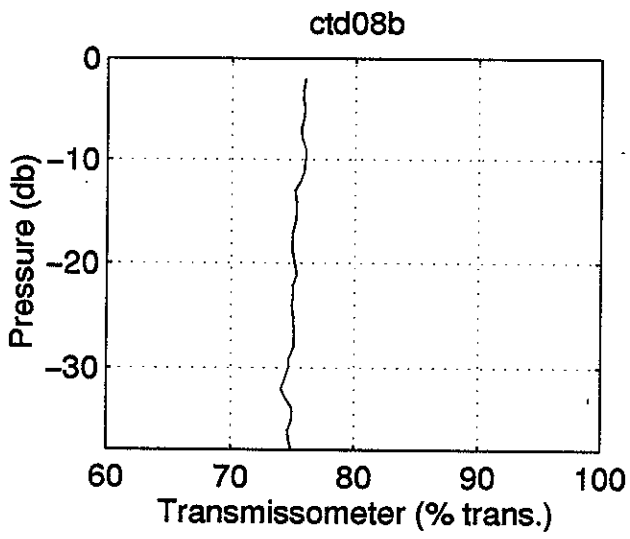
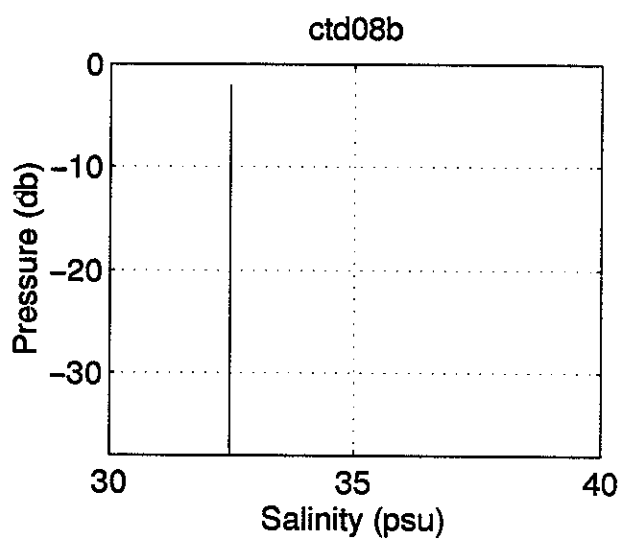
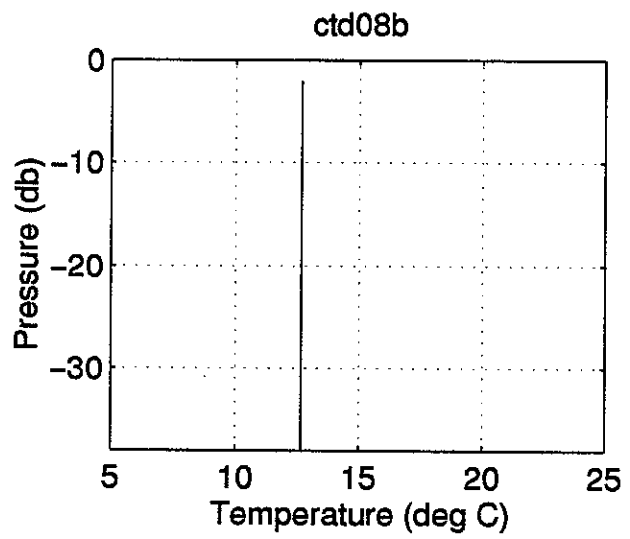


Figure 12. CTD08B similar to Figure 11.

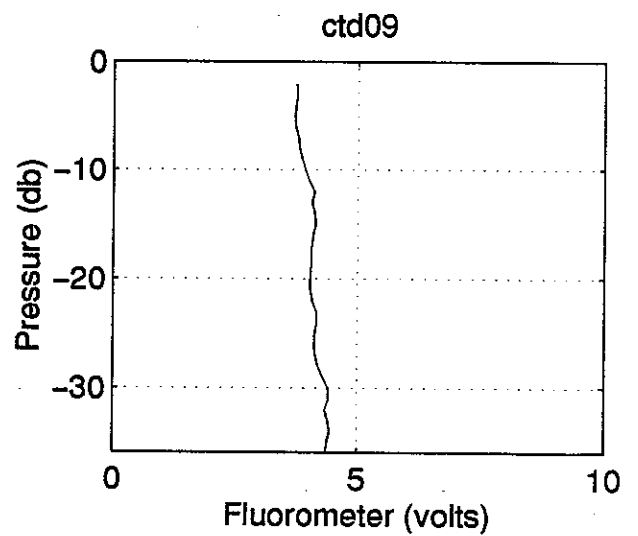
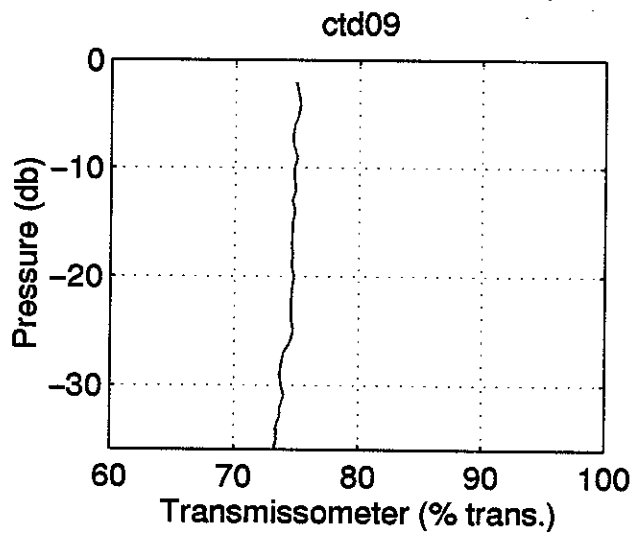
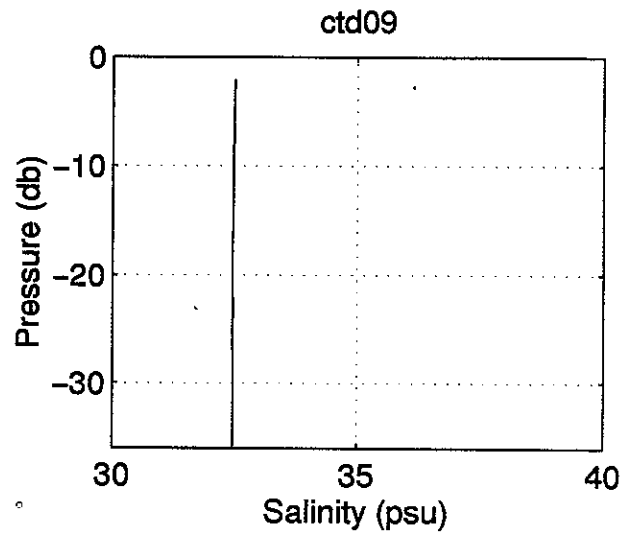
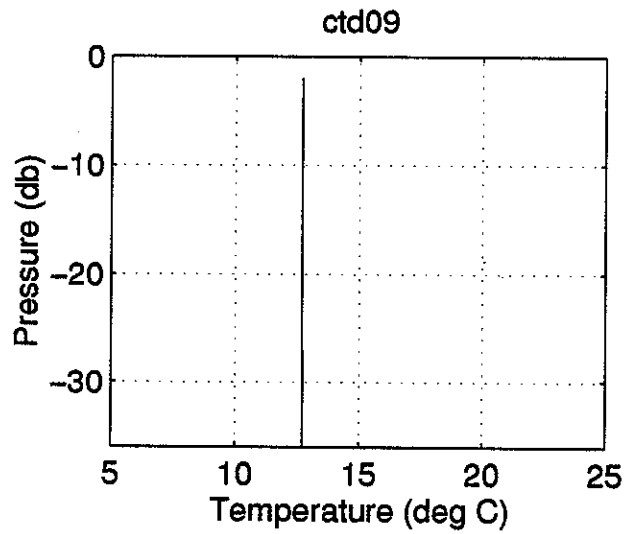


Figure 13. CTD09 in the tidally mixed region on bank shows little structure.

The temperature structure is summarized in the contoured section in Figure 14. The location of the well mixed region on the shelf, and the shelf slope front with the Warm Core Ring waters offshore is evident. Similar structure is seen in the salinity section, which is somewhat contaminated by the noisy salinities due to improper CTD usage which shows up in the earlier, offshore profiles.

Bathymetric Survey:

In order to deploy the Crest mooring, we required a detailed survey of the Crest Sites. The mooring being deployed there utilizes elastic tether technology to reduce wear on the mooring to keep the buoy in position. To give adequate depth for the elastic elements, the water should be as deep as possible. Based on the American and Canadian bathymetric charts, two sites were selected (labeled Crest A and Crest B on Figure 1). On an earlier National Marine Fisheries Service ALBATROSS cruise, Page Valentine of the USGS/WHOI, took a sidescan survey through the axis of Crest Site A along with a standard PDR record. These records appeared to show the Crest of the Bank in the region of interest is a 40 meter deep region with large sand/gravel ridges of up to 12 meters amplitude superimposed. (Not the bumpy topography with holes which we interpreted from the charts.) The detailed track survey from the survey pattern (see Cruise Log and PDR Survey Tables for the way points) is shown in Figure 15. The poor weather degraded the ability of the ship to make straight survey paths, but doesn't degrade the effectiveness of a general survey of the region.

Figure 16 shows two sections of 12 kHz survey record. The basic depth shown is 39 to 40 meters deep, and extending up from this are the 10 m high ridges mentioned earlier. These are representative of the features seen in the survey work done in the crest regions marked. It is obvious that we will be able to select a deployment site in one of the rather broad troughs as indicated, and also seen on the earlier sidescan and PDR survey. The exact site will have to be selected by detailed survey at deployment time to assure that we are in the middle of one of the broader troughs.

Cruise Personnel:

James D. Irish, Chief Scientist
Patrick O'Malley, Deck Chief
Sean Kery, Engineer
Ann Martin, Programmer
Brian Racine, Graduate Student

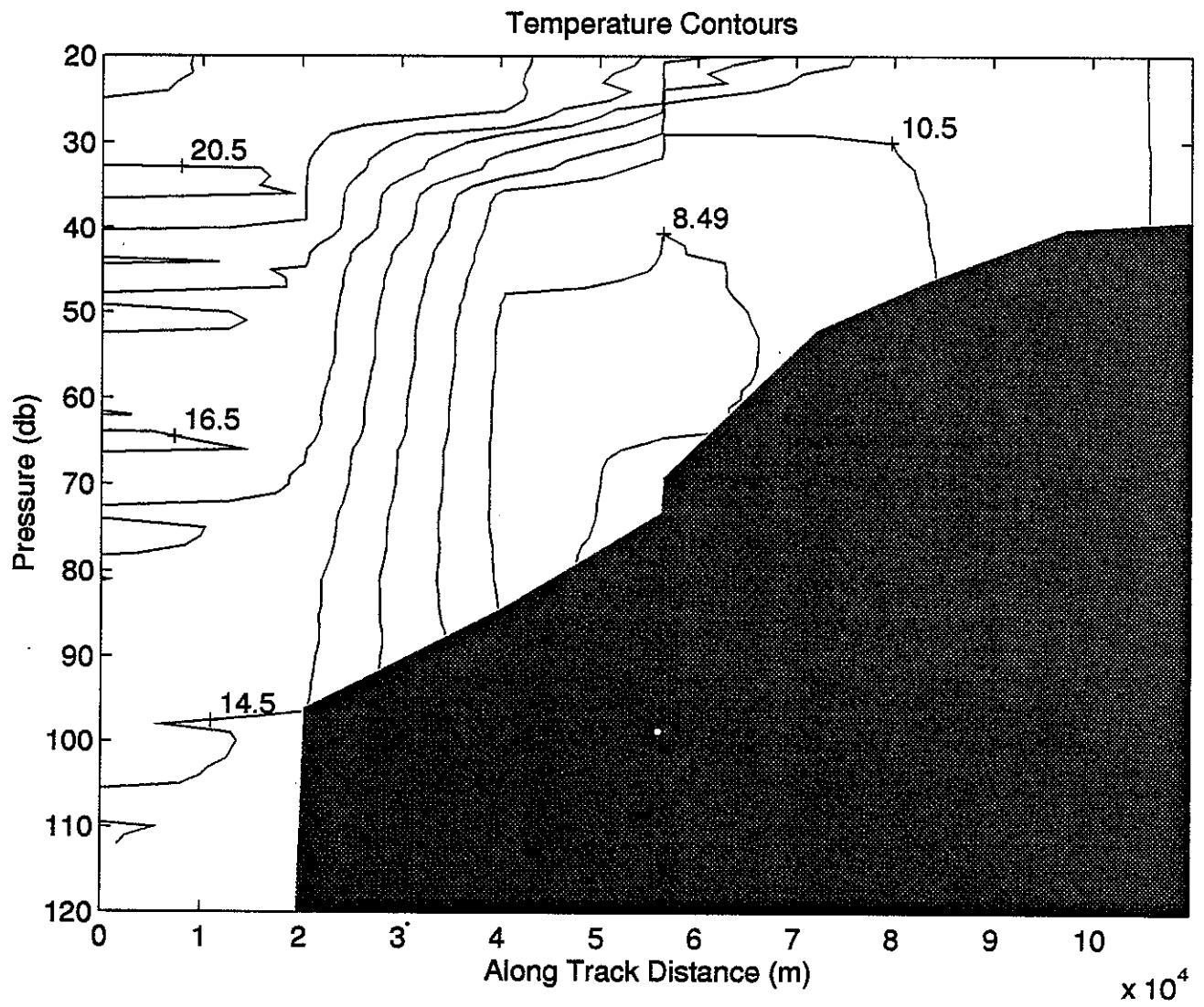


Figure 14. Temperature section looking West along the Southern Flank of Georges Bank

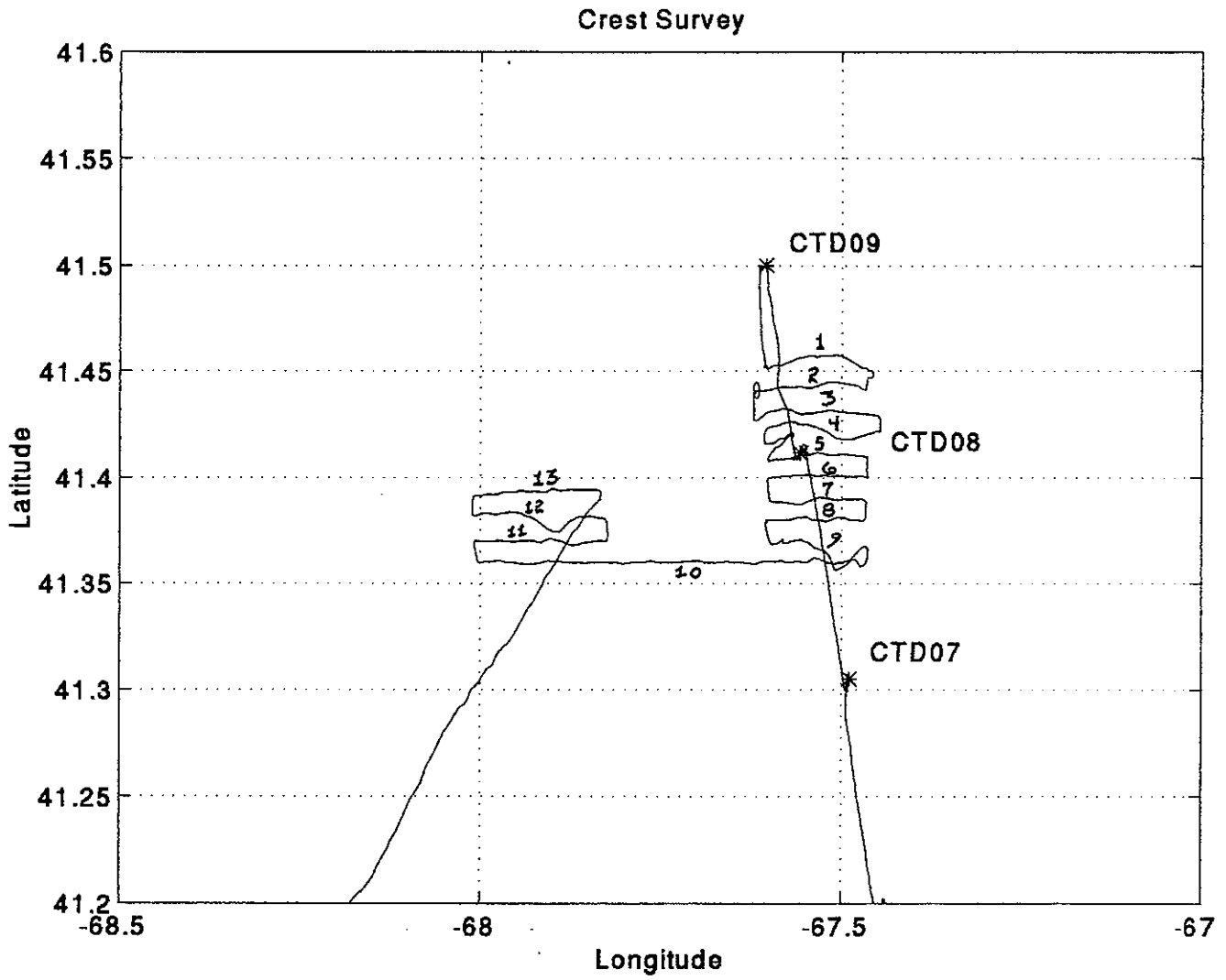


Figure 15. Detail track chart of the Crest PDR Survey indicating the positions of the CTD profiles and the Legs of the Survey at Site A (right) and Site B (left).

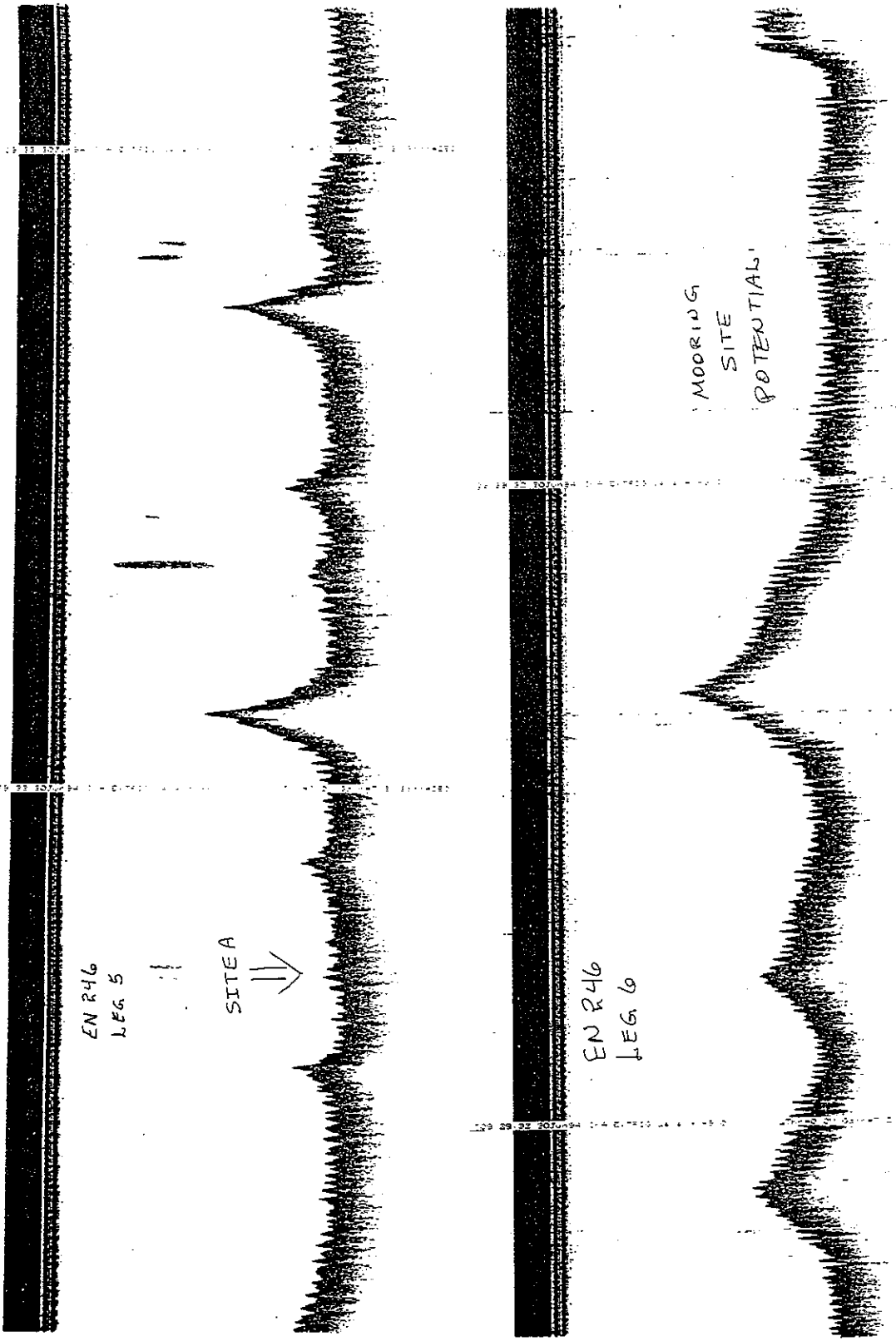


Figure 16. PDR records from Crest Site A. Top shows Leg 5 with the proposed mooring site indicated. Bottom shows Leg 6 with an alternative potential site listed. The 10 meter "sand" waves are very evident throughout the survey region.

Table of CTD Stations EN-246

Date	Station	GMT Time	N Latitude	W Longitude	Comments	
29 June 1994	CTD01	1332	40 29.956	67 02.996	Start CTD01 in 780 m water	
		1400			Bottom Water Samples 171,152,161,172	
		1410			Fouled in fishing line of boat from NJ	
			1452	40 30.117	67 01.564	End CTD01 in 625 m water
		CTD02	1715	40 39.882	67 09.073	Start CTD01 in 100 m water
			1720			Bottom Water Samples 197 & 181
			1727			40 39.736
		CTD03	1856	40 49.996	67 14.399	Start CTD03
			1900			Bottom Samples 196 & 198
			1906			40 49.933
	CTD04A	2013	40 57.864	67 18.862	Start CTD04A in 72 m water	
					Bottom Samples 183 & 163	
	CTD04B	2020	40 57.903	67 18.685	Surface in 72 m of Water	
		2024			Bottom Samples 173 & 194	
		2027			40 57.889	67 18.505
	CTD05	2145	41 05.656	67 22.660	Start CTD05 in 60 m of Water	
		2147			Bottom Samples 174 & 184	
		2151			41 05.576	67 22.486
	CTD06	2308	41 05.656	67 26.238	Start CTD06 in 44 m of Water	
		2311			Bottom Samples 154 & 155	
		2313			41 11.300	67 26.052
30 June 1994	CTD07	0103	41 18.315	67 29.317	Start CTD07 in 42 m of Water	
					0104	Bottom Samples 165 & 175
					0109	41 18.225
		CTD08A	0220	41 24.770	67 33.279	Start CTD08A in 40 m of Water
			0223			Bottom Samples 166 & 176
		CTD08B	0227	41 24.667	67 33.412	Surface in 39 m of water
			0229			Bottom Samples 185 & 195
			0232			41 25.595
		CTD09	0320	41 29.999	67 36.265	Start CTD09 in 37 m Water
	0323		Bottom Samples 186 & 187			
	0325		41 30.041			67 36.341

CTD SUMMARY TABLE

CTD01 start - 13:32 GMT - 40° 29.956 67° 02.996 - Depth 780 m

bottom - 14:00 GMT - fire two bottles -

GO bottle #1 - Water samples #171 & 152

#2 - Water samples #161 172

Surface - 14:52 GMT - 40° 30.117 67° 01.564 - Depth 625 m

Dumped to "CTD01RAW.HEX"

CTD02 start - 17:15 GMT - 40° 39.882 67° 09.073 - Depth 100 m

bottom - 17:20 GMT fire GO bottle #3 - water samples #197 & #181

surface - 17:27 GMT - 40° 39.736 67° 09.158

dumped to "CTD02RAW.HEX"

CTD03 start - 18:56 GMT - 40° 49.996 67° 14.399

bottom - 19:00 GMT - GO bottle #4 - sample bottles #196 & #198

surface - 19:06 GMT - 40° 49.933 67° 14.272 - Depth 88 m

Dumped to CTD03RAW.HEX

CTD04 start start 20:13 GMT - 40° 57.864 67° 18.862 - Depth 72 m

bottom - fire GO bottle #5 - sample bottles #183 & #163

surface - 20:20 GMT - 40° 57.903 67° 18.685 depth 72.5 m

bottom - 20:24 GMT - fire GO Bottle #6 - sample bottles #173 & #194

surface - 20:27 GMT - 40° 57.889 67° 18.505 - Depth 72.5 m

Dumped to CTD04RAW.HEX

CTD05 start 21:45 GMT - 41° 05.656 67° 22.660 - Depth 60 m

bottom 21:47 GMT - GO bottle #1 - sample bottles #174 & #184

Surface - 21:51 GMT - 41° 05.576 67° 22.486 - Depth 60 m

Dumped to CTD05RAW.HEX

CTD06 start 23:08 GMT - 41° 11.438 67° 26.238 - Depth 44 m

bottom 23:11 GMT - GO bottle #2 - sample bottles #154 & #155

surface 23:13 GMT - 41° 11.300 67° 26.052 - Depth 46 m

Dumped to CTD06RAW.HEX

CTD07 start 01:03 GMT - 41° 18.315 67° 29.317 - Depth 42 m

bottom 01:04 GMT - GO bottle #3 - sample bottles #165 and #175

surface 01:09 GMT - 41° 18.225 67° 29.424 - Depth 41 m

Dumped to CTD07RAW.HEX

CTD08 start 02:20 GMT - 41° 24.770 67° 33.279 - Depth 40 m

bottom 02:23 GMT - GO bottle #4 - sample bottles #166 #176

surface 02:27 GMT - 41° 24.667 67° 33.412 - Depth 39

bottom 02:29 GMT - GO bottle #5 - sample bottles #185 & #195

surface 02:32 GMT - 41° 24.595 67° 33.476 - Depth 38 m

Dumped to CTD08RAW.HEX

CTD09 start 03:20 GMT - 41° 29.999 67° 36.265 - Depth 37 m

bottom 03:23 GMT - GO bottle #6 - sample bottles #186 & #187

surface 03:25 GMT - 41° 30.041 67° 36.341 - Depth 36 m

Dumped to CTD09RAW.HEX

Crest Site A Survey

Date	GMT Time	Survey Leg	Latitude (Deg North)	Longitude (Deg West)	Direction Ship head	Depth (m)	Sand Wave Height (m)
30 June	04:29	Leg 1 - Start	41 27.0	67 36.0	East	31	12
	05:09	Leg 1 - End	41 27.0	67 28.0	East	30	8
	05:20	Leg 2 - Start	41 26.4	67 28.0	West	36	10
	05:58	Leg 2 - End	41 26.4	67 36.0	West	32	10
	06:22	Leg 3 - Start	41 25.8	67 36.0	East	34	6
	07:01	Leg 3 - End	41 25.8	67 28.0	East	36	5
	07:15	Leg 4 - Start	41 25.2	67 28.0	West	33	3
	08:01	Leg 4 - End	41 25.2	67 36.0	West	36	5
	08:40	Leg 5 - Start	41 24.6	67 36.0	East	36	8
	09:17	Leg 5 - End	41 24.6	67 28.0	East	38	5
	09:22	Leg 6 - Start	41 24.0	67 28.0	West	30	10
	10:10	Leg 6 - End	41 24.0	67 36.0	West	34	6
	10:15	Leg 7 - Start	41 23.4	67 36.0	East	32	12
	10:45	Leg 7 - End	41 23.4	67 28.0	East	39	6
	10:52	Leg 8 - Start	41 22.8	67 28.0	West	32	5
	11:33	Leg 8 - End	41 22.8	67 36.0	West	35	12
	11:41	Leg 9 - Start	41 22.2	67 36.0	East	32	8
	12:18	Leg 9 - End	41 22.2	67 28.0	East	40	5
	12:22	Leg 10 - Start	41 21.6	67 28.0	West	37	4

Crest Site B Survey

Date	GMT Time	Survey Leg	Latitude (Deg North)	Longitude (Deg South)	Direction Ship head	Depth (m)	Sand Wave Height (m)
30 June	15:05	Leg 10 - End	41 21.6	68 00.0	West	35	12
	15:12	Leg 11 - Start	41 22.2	68 00.0	East	35	12
	16:02	Leg 11 - End	41 22.2	67 50.0	East	34	8
	16:10	Leg 12 - Start	41 22.8	67 50.0	West	37	8
	16:53	Leg 12 - End	41 22.8	68 00.0	West	35	8
	17:01	Leg 13 - Start	41 23.4	68 00.0	East	30	10
	18:01	Leg 13 - End	41 23.4	67 50.0	East	31	8

Cruise Log

ENDEAVOR EN-246

Mon - 27 June 1994

EDT - (GMT=EDT+4)

1430 - Load rental car and depart for Narragansett, RI

1620 - Arrive at R/V ENDEAVOR and start loading

Capt Tyler - home phone (203) 536-8944

Rhet (Mate on ISELIN cruise)

Steve (Bosn on ISELIN cruise)

Called Capt to get ship's charts of Georges Bank region to pick way points listed below

Selecting locations for stations during cruise:

I. WHOI Buoy Farm: Buoy Recovery

Buoy A in center of farm - $41^{\circ} 15.832' N \times 71^{\circ} 01.666' W$

Buoy B in NW corner of farm - $41^{\circ} 15.792' N \times 71^{\circ} 01.814' W$

Buoy C in SW corner of farm - $41^{\circ} 15.906' N \times 71^{\circ} 013804' W$

II. CTDs - Along Main Line from deep water through Crest Site A

1 - $40^{\circ} 30.0' N \times 67^{\circ} 04.2' W$

2 - $40^{\circ} 40.0' N \times 67^{\circ} 09.0' W$

3 - $40^{\circ} 50.0' N \times 67^{\circ} 14.4' W$

4 - $40^{\circ} 58.0' N \times 67^{\circ} 19.0' W$ - Southern Flank Mooring Site

5 - $41^{\circ} 05.8' N \times 67^{\circ} 23.0' W$

6 - $41^{\circ} 12.2' N \times 67^{\circ} 26.5' W$

7 - $41^{\circ} 18.5' N \times 67^{\circ} 29.7' W$

8 - $41^{\circ} 25.0' N \times 67^{\circ} 33.0' W$ - Crest Site A

9 - $41^{\circ} 30.0' N \times 67^{\circ} 36.0' W$

III. Crest Site A Survey - Corner Points for E-W Survey

from $41^{\circ} 27.0' N \times 67^{\circ} 36.0' W$

east to $41^{\circ} 7.0' N \times 67^{\circ} 28.0' W$

south to $41^{\circ} 26.4' N \times 67^{\circ} 28.0' W$

west to $41^{\circ} 26.4' N \times 67^{\circ} 36.0' W$

south to $41^{\circ} 25.8' N \times 67^{\circ} 36.0' W$

east to $41^{\circ} 25.8' N \times 67^{\circ} 28.0' W$

south to $41^{\circ} 25.2' N \times 67^{\circ} 28.0' W$

west to $41^{\circ} 25.2' N \times 67^{\circ} 36.0' W$

south to $41^{\circ} 24.6' N \times 67^{\circ} 36.0' W$

east to $41^{\circ} 24.6' N \times 67^{\circ} 28.0' W$

south to $41^{\circ} 24.0' N \times 67^{\circ} 28.0' W$

west to $41^{\circ} 24.0' N \times 67^{\circ} 36.0' W$

south to $41^{\circ} 23.4' N \times 67^{\circ} 36.0' W$

east to 41° 23.4 N x 67°28.0' W
south to 41° 22.8 N x 67° 28.0' W
west to 41° 22.8 N x 67° 36.0' W
south to 41° 22.2 N x 67° 36.0' W
east to 41° 22.2 N x 67° 28.0' W
south to 41° 21.6 N x 67° 28.0' W
east to 41° 21.6 N x 68° 00.0' W

Crest Site B

north to 41° 22.2' N x 68° 00.00' W
west to 41° 22.2' N x 67° 50.00' W
north to 41° 22.8' N x 67° 50.00' W
east to 41° 22.8' N x 68° 00.00' W
north to 41° 23.4' N x 68° 00.00' W
west to 41° 23.4' N x 67° 50.00' W
north to 41° 24.0' N x 67° 50.00' W
east to 41° 24.0' N x 68° 00.00' W
north to 41° 24.6' N x 68° 00.00' W
west to 41° 24.6' N x 67° 50.00' W
north to 41° 25.2' N x 67° 50.00' W
east to 41° 25.2' N x 68° 00.00' W
north to 41° 25.8' N x 68° 00.00' W
west to 41° 25.8' N x 67° 50.00' W
north to 41° 26.4' N x 67° 50.00' W
east to 41° 26.4' N x 68° 00.00' W
north to 41° 27.0' N x 68° 00.00' W
west to 41° 27.0' N x 67° 50.00' W
north to 41° 27.6' N x 67° 50.00' W
east to 41° 27.6' N x 68° 00.00' W

CTDs - Stratification Line from Crest Site B to deep water

10 - 41° 25.0' N x 67° 56.0' W - Crest Site B
11 - 41° 18.0' N x 67° 51.0' W
12 - 41° 11.2' N x 67° 46.4' W
13 - 41° 05.0' N x 67° 42.0' W
14 - 40° 59.2' N x 67° 38.0' W
15 - 40° 52.6' N x 67° 33.2' W
no CTD (40°1.8' N x 67° 31.9' W - Stratification Mooring Site)
16 - 40° 45.7' N x 67° 28.5' W
17 - 40° 39.5' N x 67° 24.6' W
18 - 40° 32.6' N x 67° 20.0' W
19 - 40° 26.0' N x 67° 15.5' W

Tues - 28 June 1994

EDT

0800 - NOAA Weather - Georges & Nantucket Shoals Buoys - 6' & 12-18kts.

Prediction for 25 kts offshore & 8' to 10' seas Wed

0930 - Underway to WHOI buoy farm - Wind 20 kts - light chop

1020 - Safety and Lifeboat drill

1100 - Mucking with ADCP - Beam 4 error every ping. Ran diagnostics and got error on sig, spw, freq. Try plotting relative to ship, no go, try relative to bottom track, and bottom track appears to be failing also. Bottom track reading -1999 cm/sec. Both components off scale, AGC amplitude looks normal.

1200 - Approaching buoy farm. Seas still 6' and wind 17, with moderate chop. All three buoys still there, appear to be in good shape. Capt Tyler worried about stability of ENDEAVOR during recovery. Appears roll at times exceeds 15° and heave exceeds 2'. Seas building slightly. Listened to NOAA weather prediction: seas to 10' and winds to 30 kts offshore. Prediction constant over region. No prediction for Thurs, but high pressure building Fri and Sat. Possibly better weather on Fri AM. Captain does not want to recover now as ship is rolling and heaving too much for crane.

1300 - Waiting for updated NOAA weather report. Wind to 25 kts on Wed and seas to 10'. Seas presently 6' at Nantucket Shoals buoy and 7' at Georges Bank. Distance to CTD#01 is 191nm @ 11 kts = 17:30. If leave Buoy farm at 13:30, then get to station at 07:00 on Wed. Distance from Crest Site B to buoy farm is 170 nm @ 11 kts = 16h. To get to Buoy farm at 06:00 on Fri, need to leave Crest Site B by 1400. To do this we may have to cut the second CTD section off Georges Bank. If at buoy farm by 0600 and 1 hour per buoy + 3 hours to WHOI dock means we still get in about noon.

1355 - Securing deck of lines, deck box, recovery poles, etc. for steaming. Heading for CTD#01 site. ETA 0700 to 0730 on Wed.

Wednesday 29 June (JD180) 1994

0700 - Working on continual condensation problem on air conditioning ducts. Also working on sea water leak around stuffing tubes in aft companionway. 8.5 nm from station. ADCP working fine - Tom Orvosh said that when ship slowed down to 8 kts earlier, worked well so problem must be related to speed of vessel - e.g. bubbles under transducer. Wind speed ~ 20 kts, seas 6' to 8'.

08?? - On CTD01 station, checking PDR, depth about 580 m. Trying to sort out PDR. If 1 second is full chart length, then a ping reflecting off a 750 meter bottom would take 1 second to get back. Therefore, 75 m per division on chart. Chart division lines very weak and many times non-existent. Starting CTD - using Sea Bird SEASOFT software on PC#7. Use "TERM25" to talk with CTD and initialize it. Talk with the CTD on deck cable at 9600 baud
Send IL and Y then ^Y to "initialize logger"
then GL to "go log" and Y and ^Y

Then switch to sea cable, and set baud rate to 600 to watch the data coming in. Need to have CTD switch on to do so. Use "SEASAVE" to log the data and show profile with a subset of the data sent up the sea cable. Data is stored within fish. Note at time of initialization, should press "DS" to get status and check internal battery voltage. Fresh this is 11.8 volts but it will decay with time, and when it reaches 10.5 volts then it needs to be changed. This is after 5 or 6 hours of continuous use.

- 0910 - Cocking bottles, bottom 575 m, air temp 26°C
- 0920 - working with winch - in and out to see how it works
- 0930 - CTD unbolted from deck
- 0932 - CTD01 in water, 40° 29.952' N x 67° 03.170' W, SST = 23.7°C, SSSS = 36.73 PSU
- 0941 - going down 40° 29.956' N x 67° 02.996' W, bottom 780 m
- 0958 - bottom about 875 m, going down to 850 m.
- 1006 - fire two bottles
- 1007 - CTD wire appears hooked on long line - bringing CTD in slowly, school of porpoises snagged on longline of fishing vessel OLYMPIC JAVELIN, Barnaget Light, NJ
- 1052 - Surface 40° 30.117' N x 67° 01.564' W

CTD01 start - 13:32 GMT - 40° 29.956 67° 02.996 - Depth 780 m
bottom - 14:00 GMT - fire two bottles -
GO bottle #1 - Water samples #171 & 152
GO bottle #2 - Water samples #161 & 172
fouled in fishing line of boat from Barnaget Light, NJ
Surface - 14:52 GMT - 40° 30.117 67° 01.564 - Depth 625 m
Dumped to CTD01RAW.HEX, 18470 samples

- 1120 - Start for CTD02 site finally
CTD sensor IDs: SBE temp = 1186, SBE salinity = 856, press = 290103
Had to redump data with sensor IDs
Good file CTD01A.HEX
- 1159 - fathometer on 1/2 second sweep with auto mark every 10 minutes - time is GMT
- 1215 - 10-15 minutes to station, initialize CTD, batteries = 11.8v
- 1230 - Initialize CTD, SST=21°C, SSS=34.6 PSU, putting pinger on CTD
- 1247 - Pinger dead and replacing, new one works
- 1300 - running back to position, depth steady 100 m
- 13:15:12 - CTD02 in water 40° 39.882' N x 67° 09.073'W
SST=21.482°C, SSS=34.608 PSU
Can't see pinger on PDR
- 1320 - Bottle #3 tripped, can't run CTD slower than 35-40 meters/minute.
- 1327 - Surface -
SST=21.475°C, SSS=34.595 PSU
- 1334 - Dump data to CTD02RAW.HEX
GO Bottle #3 to sample bottles 197 & 181
can see pressure sensor least count/resolution clearly in data

CTD02 start - 17:15 GMT - 40° 39.882 67° 09.073 - Depth 100 m
bottom - 17:20 GMT fire GO Bottle #3 - water samples #197 & #181
surface - 17:27 GMT - 40° 39.736 67° 09.158
dumped to CTD02RAW.HEX

1443 - 5 minutes to station, CTD awake, battery 11.8v, initialize
1454 - waiting for winch
1456 - CTD in water, 40° 49.996' N x 67° 14.399' W, sample bottles to be 196 & 198
1500 - Trip GO bottle #4
1506 - surface, 40° 49.923' N x 67° 14.272' W
1513 - on to CTD04

CTD03 start - 18:56 GMT - 40° 49.996 67° 14.399
bottom - 19:00 GMT - GO Bottle #4 - sample bottles #196 & #198
surface - 19:06 GMT - 40° 49.933 67° 14.272 - Depth 88 m
Dumped to CTD03RAW.HEX

1600 - slowing down for station, CTD battery 11.8, depth 74 m (South Flank Site)
1613 - CTD04 in water, 40° 57.864' N x 67° 18.862' W
SST=18.33°C, SSS=33.57 PSU
CTD appeared to hit bottom, wire slack for second, trip bottle #5.
1620 - Back at surface, 40° 57.903' N x 67° 18.685' W, depth 72.5 meters
1624 - Tripped bottle #6 @ 71 m
1627 - Surface, 40° 57.889' N x 67° 18.505' W, depth 72.5 meters
First bottle, sample bottles 183 and 163
Second bottle, sample bottles 173 and 194
1540 - heading for CTD05

CTD04 start start 20:13 GMT - 40° 57.864 67° 18.862 - Depth 72 m
bottom - fire GO Bottle #5 - sample bottles #183 & #163
surface - 20:20 GMT - 40° 57.903 67° 18.685 depth 72.5 m
bottom - 20:24 GMT - fire GO Bottle #6 - sample bottles #173 & #194
surface - 20:27 GMT - 40° 57.889 67° 18.505 - Depth 72.5 m
Dumped to CTD04RAW.HEX

1730 - approaching CTD05 site, depth 60 m
1735 - initializing CTD, battery 11.6 v
1745 - CTD05 in water, 41° 05.576' N x 67° 22.486' W, depth 60 meters
1759 - On deck, dumping to CTD05RAW.HEX
sample bottles 174 & 184
1802 - underway to CTD06

CTD05 start 21:45 GMT - 41° 05.656 67° 22.660 - Depth 60 m
bottom 21:47 GMT - GO Bottle #1 - Sample bottles #174 & #184
Surface - 21:51 GMT - 41° 05.576 67° 22.486 - Depth 60 m

Dumped to CTD05RAW.HEX

1852 - initializing CTD, battery 11.6v, depth about 45 meters
1908 - Start CTD06 at surface, 41° 11.438' N x 67° 26.238' W, depth 44 meters
1911 - on bottom, GO Bottle #2 tripped
CTD appears to have 1 m depth resolution on display??
1913 - surface, 41° 11.300' N x 67° 26.052' W, depth 46 m
1917 - CTD battery 11.2 v, 4321 scans
[NOTE: PRESSURE SENSORS CHANGED FROM 290103 to 290105]

CTD06 start 23:08 GMT - 41° 11.438 67° 26.238 - Depth 44 m
bottom 23:11 GMT - GO bottle #2 - sample bottles #154 & #155
surface 23:13 GMT - 41° 11.300 67° 26.052 - Depth 46 m
Dumped to CTD06RAW.HEX
ASCII Normalized file CTD06ASC.CNV

2048 - initializing CTD for CTD07, battery 11.6 v
2103 - At surface 41° 18.315' N x 67° 29.317' W
2104 - bottom, trigger Bottle #3, samples 165 & 175
2109 - CTD on deck, 41° 18.225' N x 67° 29.424' W, depth 41 m
after profile, CTD battery 11.2 v

CTD07 start 01:03 GMT - 41° 18.315 67° 29.317 - Depth 42 m
bottom 01:04 GMT - GO bottle #3 - sample bottles #165 and #175
surface 01:09 GMT - 41° 18.225 67° 29.424 - Depth 41 m
Dumped to CTD07RAW.HEX
ASCII Normalized file CTD07ASC.CNV

2210 - Nearing station CTD08, CTD battery 11.5 v
2220 - At surface CTD08, 41° 24.770' N x 67° 33.279' W, depth 40 meters
2223 - At bottom, trigger GO bottle #4, sample bottles 166 & 176
41° 24.776' N x 67° 33.354' W, depth 40 m
2227 - Surface 41° 24.667' N x 67° 33.412' W
2229 - Bottom again, trigger GO bottle #5, sample bottles 185 and 195
2232 - CTD on deck, 41° 24.595' N x 67° 33.476' W, depth 38 meters
2235 - CTD battery 10.9 v

CTD08 start 02:20 GMT - 41° 24.770 67° 33.279 - Depth 40 m
bottom 02:23 GMT - GO Bottle #4 - sample bottles #166 #176
surface 02:27 GMT - 41° 24.667 67° 33.412 - Depth 39
bottom 02:29 GMT - GO bottle #5 - sample bottles #185 & #195
surface 02:32 GMT - 41° 24.595 67° 33.476 - Depth 38 m
Dumped to CTD08RAW.HEX
ASCII Normalized file CTD08ASC.CNV

- 2306 - nearing Station, CTD battery 11.4 v
- 2320 - At surface, 41° 29.999' N x 67° 36.265' W, depth 37 m
- 2323 - Bottom, trigger GO Bottle #6, sample bottles 186 and 187
- 2325 - at surface, 41° 30.041' N x 67° 36.341' W, depth 36 meters
dumped to CTD09RAW.HEX, CTD battery down to 11.0 v

CTD09 start 03:20 GMT - 41° 29.999 67° 36.265 - Depth 37 m
bottom 03:23 GMT - GO #6 - sample bottles #186 & #187
surface 03:25 GMT - 41° 30.041 67° 36.341 - Depth 36 m
Dumped to CTD09RAW.HEX
ASCII Normalized file CTD09ASC.CNV

Thursday 30 June (JD181) 1994

- 0000 - about to start bathymetry survey of CREST A site.
- 0030 - Steady on 41° 27.0' minute line heading east for the start of the survey.
After this time for the duration of the survey, the annotations are on the PDR chart and a summary of times and positions is given in PDR survey tables of Site A and B. The charts for this cruise are stored in 307 Smith, Woods Hole Oceanographic Institution.
- 1400 - Terminating survey and heading for buoy farm to retrieve buoys.

Friday 1 July (JD182) 1994

- 0530 - On station, three buoys there, 1 light appears to be out, or shut off early, fog light, breezy, 3-4' swell with 1' chop.
- 0600 - Deck nearly setup
- 0730 - Buoy B with data canister aboard
- 0810 - Buoy A aboard
- 0850 - Buoy C aboard
- 0900 - secured deck and heading for WHOI.
- 1111 - at WHOI dock, and starting to unload.