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Cruise Report

Ship Names: M/V *Playing Hooky* (trips 1-5, 7), and M/V *La Vita* (trip 6).

Dates: November 19, 2004; November 29, 2004; February 17, 2005; February 24, 2005; May 18, 2005; June 21, 2005; August 31, 2005.

Chief Scientists: Molly Baringer and Christopher Meinen

Foreign Participants: None

Operating Institution: NOAA/AOML

Cruise Report by: Christopher Meinen, Molly Baringer and Rigoberto Garcia

Project Title: Atlantic Climate Change Program: Volunteer Observing Ship High Resolution XBT line AX7 and Direct Observations in Support of Operational Monitoring in the Straits of Florida.

Clearance Countries: Bahamas

Port Calls: West Palm Beach, FL to West Palm Beach, FL.

Description of the Scientific Program:

Voltages induced on a submarine cable by the Florida Current have been shown to be proportional to the total current transport. In order to calibrate the cable measurements, direct transport observations are needed at a few times during each year. A dropsonde is an instrument consisting of an expendable weight and a glass tube containing electronic sensors, including a Global Positioning System (GPS) receiver. The instruments determine vertically-averaged horizontal velocity by sinking to the ocean bottom, dropping the weight, and then rising to the ocean surface, with the GPS providing an accurate location for the start and end of the profile. Using the dropsonde technique, horizontal velocity is estimated at nine stations across the Straits. AOML has obtained these vertically-averaged velocities across the Strait of Florida on several cruises during this year, and horizontal-integration of the velocity values has yielded calibration values for submarine cable transport measurements. Cable voltages have been monitored and daily total transport values obtained since 1982.

Beginning in 1995 the cable calibration effort was augmented in support of the Volunteer Observing Ship Program (VOS) that deploys expendable bathythermographs (XBTs) in the interior Atlantic. The goal of this VOS/XBT program is to study the upper ocean thermal structure of the subtropical North Atlantic using volunteer observing merchant ships. Repeat XBT sections, approximately every 3 months, have been conducted since October 1984 with the intent of determining and monitoring the seasonal-to-interannual variability of the upper ocean heat content. The ship-track, which roughly follows along 30°N, is designated as AX7 and it is ideal for monitoring heat flux variability in the Atlantic because it lies near the center of the subtropical gyre, which has been shown to be the latitude of the maximum heat flux in the ocean. The upper ocean thermal structure obtained using the expendable temperature probes (XBTs) is being used to correlate the subtropical gyre intensity with atmospheric forcing as well as for determining the heat transport.

Essential to the goal of monitoring the meridional heat transport is a measure of the heat content and transport within the Florida Straits. Therefore, on each of the cable calibration cruises completed using the vessels charted through Sailfish Marina, the dropsonde measurements are augmented by XBT casts at all nine of the nominal station locations to measure the vertical temperature profile. Two crossings are typically attempted during each quarterly AX7 cruise, roughly one week apart, in an attempt to capture an estimate of the mean transport of the Florida Current that is not contaminated by the seven to ten day waves observed in the Straits.

Data Observations and Samples Collected:

This report refers to the last 7 cruises performed in the Florida Current. On a typical cruise a single AOML participant drives to Palm Beach the evening prior to the departure. The boat departs Palm Beach at about 0500, conducts a total of seven hours of work at the nine stations plus five hours of steaming time, and returns to Palm Beach at roughly 1700. The AOML participant then returns to Miami that same day. Expendable Bathythermographs (XBTs) are launched at each station to obtain temperature profiles of the water column beneath the ship. The XBTs are numbered as the station numbers, whose positions are given in Table 1. Plots of the XBT temperature sections are shown in the Appendix.

The GPS/dropsonde used in all 9 stations is a glass tube housing a Geologger 8 portable GPS receiver/logger, RDF beacon, pinger, and batteries. A second Magellan 5000 Pro GPS receiver is used to determine the ship positions on all cruises. In addition to vertically integrated velocities, after surfacing the GPS/dropsonde was allowed to drift for five minutes, to obtain a surface velocity estimate.

The station locations are listed in Table 1 and a typical cruise trackline is shown in Figure 1. Table 2 lists the dropsonde deployment and surface time positions, and the computed vertically integrated velocities for each cruise. Surface positions are determined using the dropsonde GPS record. The midpoint time for all profiles is used as the time for the cruise. Table 3 lists the observed meridional surface velocities for each station.

Problems/issues observed during cruises:
During this fiscal year we had a number of serious issues. On two cruises the dropsonde instrument was lost and no water velocity measurements were obtained (Nov. 19, 2004 and Jun. 21, 2005). Note on the latter cruise XBT data was still collected. On the cruise on Feb. 24, 2005 the weather deteriorated significantly during the cruise and the latter five stations were abandoned without making any measurements.

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Schedule of Delivery of Data and Reports: All data are contained herein. No further report is planned.

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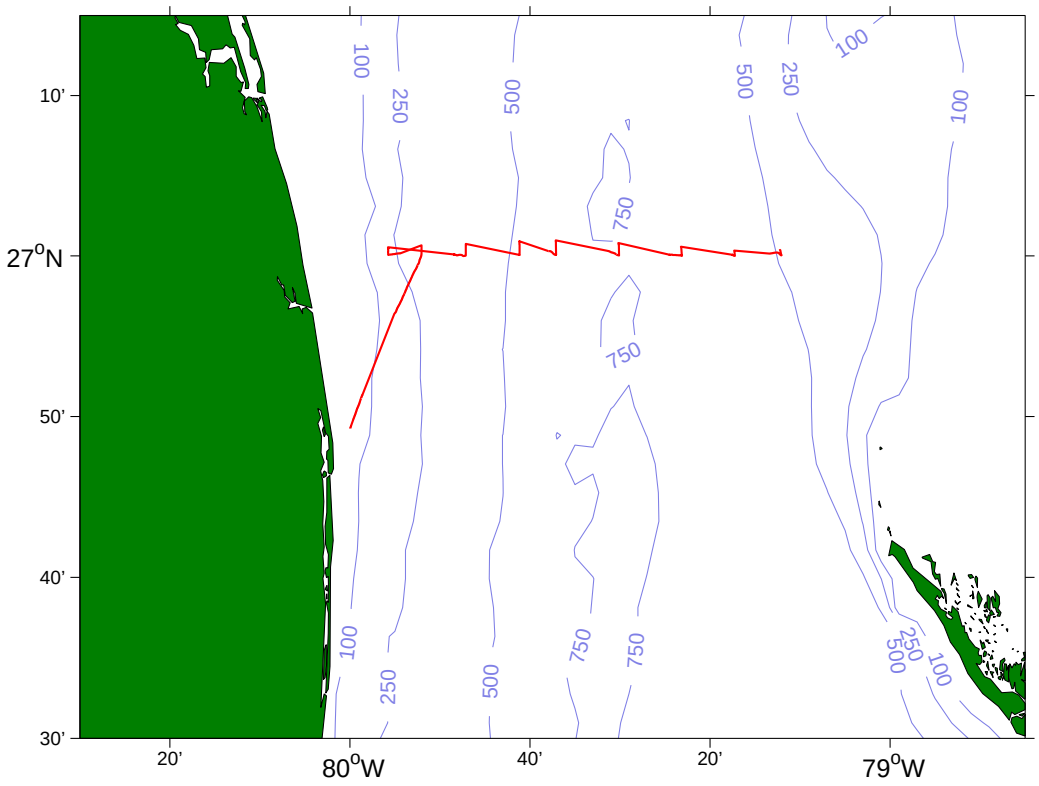

Figure 1: Typical cruise track

Station	Latitude	Longitude	Depth
0	27 00.00 N	79 55.80 W	139 M
1	27 00.00 N	79 52.00 W	261 M
2	27 00.00 N	79 47.00 W	389 M
3	27 00.00 N	79 41.00 W	540 M
4	27 00.00 N	79 37.00 W	661 M
5	27 00.00 N	79 30.00 W	783 M
6	27 00.00 N	79 23.00 W	708 M
7	27 00.00 N	79 17.00 W	624 M
8	27 00.00 N	79 12.00 W	485 M

Table 1: Station Locations.

Sta	Deployed			Surfaced			Mean Velocities	
	Time (GMT)	Lon	Lat	Time (GMT)	Lon	Lat	U cm/s	V cm/s
November 29, 2004								
0	12:20:33	-79.9298	27.0002	12:26: 3	-79.9298	27.0033	0.06	105.06
1	12:42:24	-79.8665	27.0004	12:52:50	-79.8662	27.0062	5.47	100.88
2	13:14: 2	-79.7834	27.0001	13:27:45	-79.7830	27.0079	3.97	104.33
3	13:51:45	-79.6836	27.0008	14:10: 3	-79.6834	27.0110	2.40	102.29
4	14:29:24	-79.6167	26.9998	14:53: 3	-79.6163	27.0115	3.26	91.43
5	15:16:38	-79.5000	26.9996	15:44:51	-79.4999	27.0105	1.08	71.30
6	16: 8:29	-79.3833	26.9999	16:31:33	-79.3838	27.0063	-3.52	50.79
7	16:56:50	-79.2834	27.0001	17:18:51	-79.2845	27.0043	-7.51	35.91
8	17:37:30	-79.2001	26.9996	17:54:21	-79.2013	27.0028	-11.36	35.93
February 17, 2005								
0	12: 0:50	-79.9301	27.0001	12: 6:18	-79.9301	27.0036	1.69	117.04
1	12:21:22	-79.8669	26.9994	12:31: 9	-79.8671	27.0045	-2.52	96.02
2	12:48:56	-79.7835	26.9999	13: 2:51	-79.7836	27.0072	-1.82	97.30
3	13:23:24	-79.6835	26.9999	13:42:21	-79.6838	27.0100	-2.69	98.58
4	13:58:45	-79.6170	26.9998	14:22:27	-79.6168	27.0099	1.30	78.39
5	14:44:29	-79.5006	26.9990	15:11:27	-79.5010	27.0074	-2.37	56.86
6	15:33:30	-79.3833	26.9999	15:58:45	-79.3838	27.0053	-3.18	40.03
7	16:19:52	-79.2832	26.9994	16:42: 9	-79.2837	27.0036	-3.58	35.26
8	16:58:52	-79.2000	26.9998	17:16:21	-79.2008	27.0031	-8.48	36.15
May 18, 2005								
0	11: 8:19	-79.9298	27.0003	11:14:57	-79.9297	27.0028	5.44	68.52
1	11:31: 6	-79.8666	26.9995	11:42:51	-79.8664	27.0046	3.56	78.97
2	12: 3: 5	-79.7832	26.9994	12:20:27	-79.7826	27.0070	5.93	79.26
3	12:45:32	-79.6833	27.0002	13: 9:15	-79.6832	27.0116	0.27	87.99
4	13:25:30	-79.6166	27.0001	13:54:15	-79.6157	27.0151	5.51	95.86
5	14:17:54	-79.4999	26.9993	14:51:21	-79.4998	27.0162	0.39	93.53
6	15:16:30	-79.3838	26.9997	15:46: 9	-79.3850	27.0106	-7.35	67.99
7	16: 9:39	-79.2833	26.9998	16:35:51	-79.2846	27.0066	-7.54	48.42
8	16:54:52	-79.2002	26.9998	17:15: 9	-79.2015	27.0040	-9.78	38.77
August 31, 2005								
0	11:13:31	-79.9306	27.0012	11:19:49	-79.9308	27.0029	-5.26	47.83
1	11:37:54	-79.8668	27.0005	11:49: 9	-79.8667	27.0061	0.34	91.82
2	12:10:26	-79.7833	27.0005	12:26:15	-79.7832	27.0095	0.30	104.79
3	12:48:54	-79.6832	27.0004	13:10:27	-79.6826	27.0114	4.55	94.13
4	13:28:10	-79.6167	27.0004	13:54: 3	-79.6159	27.0127	4.51	87.08
5	14:19:56	-79.4999	27.0006	14:50:50	-79.4996	27.0130	1.39	73.70
6	15:15:26	-79.3834	26.9999	15:43:44	-79.3831	27.0100	1.68	66.18
7	16: 5:59	-79.2832	27.0001	16:31:27	-79.2838	27.0078	-3.70	55.56
8	16:51:23	-79.2000	27.0002	17:10:26	-79.2007	27.0044	-6.33	41.28

Table 2: Dropsonde Data: Values of -999 indicate instrument failure.

Date	Station #								
	0	1	2	3	4	5	6	7	8
November 29, 2004	147.09	169.74	149.32	124.83	110.56	88.41	58.53	30.60	-4.92
February 17, 2005	154.13	142.19	136.72	111.26	98.57	99.27	45.54	14.79	11.29
May 18, 2005	141.24	167.63	155.94	153.36	141.47	92.27	86.79	40.42	19.51
August 31, 2005	151.15	198.34	176.24	161.30	152.94	130.78	78.86	61.23	30.87

Table 3: Meridional Surface Velocities in cm/s. Values of -999 indicate instrument failure.

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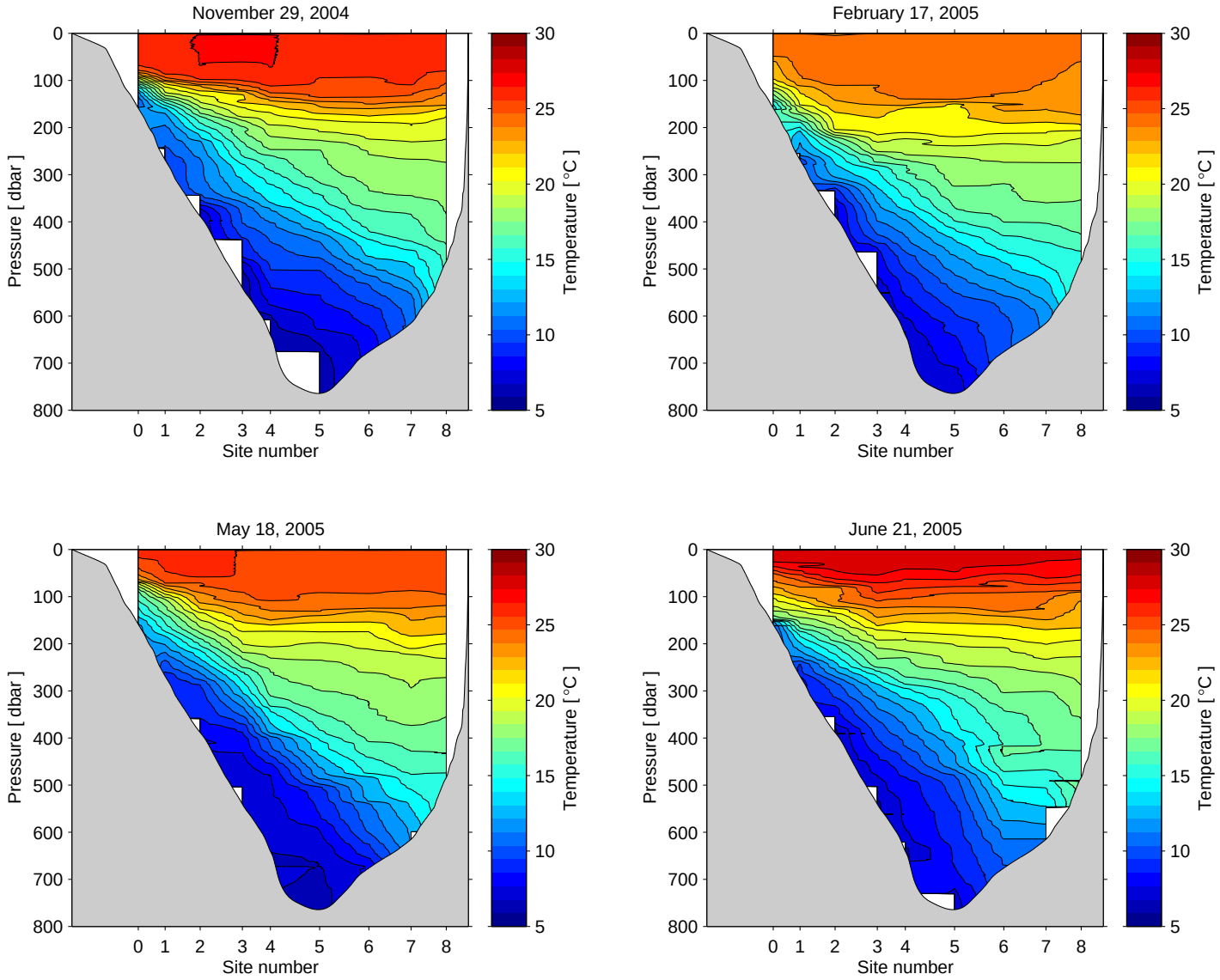
APPENDIX


November 29, 2004
February 17, 2005
May 18, 2005
June 21, 2005
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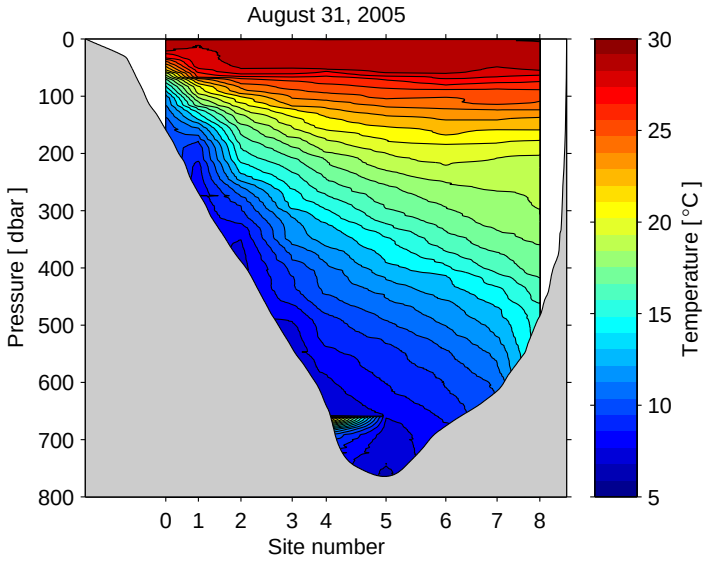
Site number
Temperature [°C]
0
100
200
300
400
500
600
700
800
0 1 2 3 4 5 6 7 8
30
25
20
15
10
5


August 31, 2005
Pressure [dbar]
0
100
200
300
400
500
600
700
800
0 1 2 3 4 5 6 7 8
Site number
30
25
20
15
10
5
Temperature [°C]