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October 3, 2007

Cruise Report

Ship Names: M/V *La Vida* (trips 1-6), and M/V *Island Clan* (trip 7).

Dates: December 13, 2006; December 15, 2006; March 29, 2007; June 19, 2007; July 10, 2007; September 5, 2007; September 27, 2007.

Chief Scientists: Molly Baringer and Christopher Meinen

Foreign Participants: None

Operating Institution: NOAA/AOML

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

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 0600, 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 7 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 the there was a failure of the XBT system during the June 19, 2007 cruise and no XBT data was collected during that cruise. During the September 5, 2007 cruise the GPS receiver in the dropsonde was not operating properly and good velocity measurements were not obtained at four of the nine stations. The eighth and final cruise planned for this fiscal year was postponed into early FY08 due to weather issues.

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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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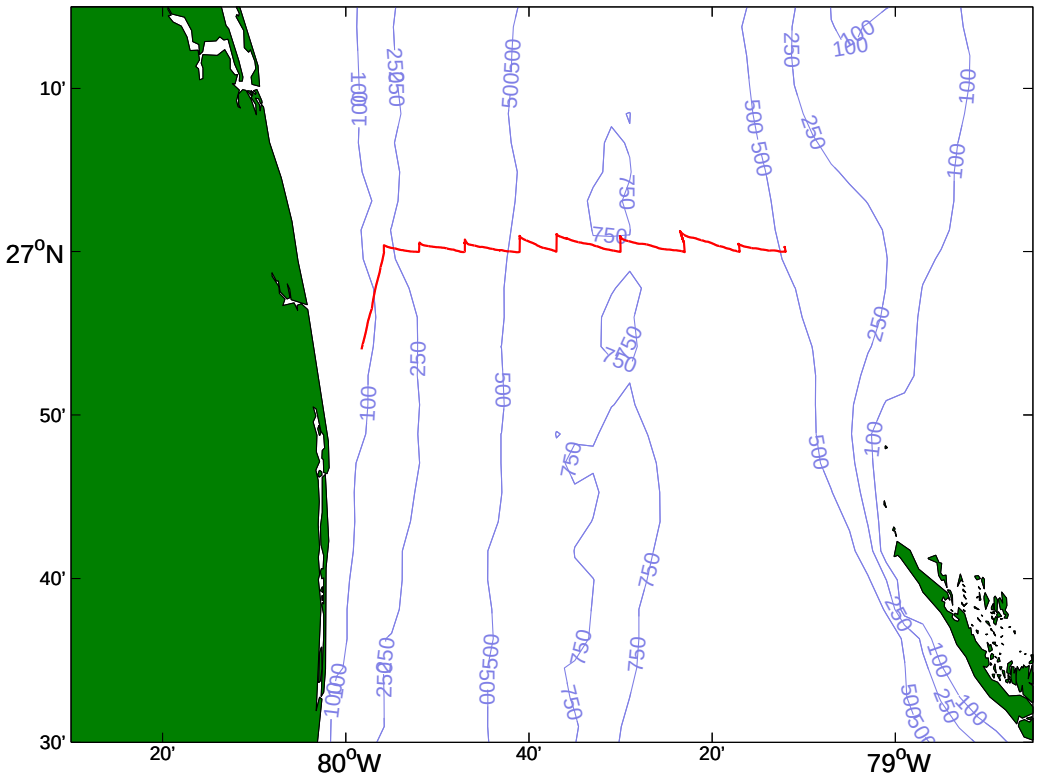


Figure 1: Typical cruise track

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
December 13, 2006								
0	12:30: 3	-79.9301	27.0031	12:37:56	-79.9301	27.0082	-0.82	119.14
1	13:11:17	-79.8662	27.0012	13:24:50	-79.8662	27.0086	0.06	99.22
2	13:57:48	-79.7831	27.0013	14:16:28	-79.7832	27.0101	-1.82	88.07
3	14:51:32	-79.6819	27.0021	15:16:56	-79.6821	27.0136	-1.65	83.38
4	15:41:57	-79.6169	27.0005	16:14:50	-79.6174	27.0160	-1.97	86.80
5	16:53: 3	-79.4999	27.0011	17:29:56	-79.4995	27.0195	2.06	91.71
6	18: 3:34	-79.3839	27.0008	18:35:44	-79.3832	27.0125	3.71	67.22
7	18:59:31	-79.2836	26.9999	19:29:10	-79.2833	27.0062	2.43	39.61
8	19:50:14	-79.1998	26.9997	20:13: 2	-79.2000	27.0018	-1.21	17.73
December 15, 2006								
0	11:37:14	-79.9294	27.0023	11:44:38	-79.9294	27.0072	-0.61	122.50
1	12:41:35	-79.8662	27.0014	12:54:26	-79.8659	27.0097	3.63	118.76
2	13:15:57	-79.7826	27.0024	13:34:26	-79.7816	27.0165	8.15	139.82
3	14: 0:12	-79.6832	27.0007	14:25:38	-79.6823	27.0169	5.46	116.68
4	14:43:58	-79.6158	27.0009	15:15:37	-79.6153	27.0173	2.65	95.00
5	15:42: 8	-79.5003	27.0022	16:18:27	-79.5006	27.0143	-1.90	61.20
6	16:44:12	-79.3831	27.0004	17:17:56	-79.3848	27.0087	-9.19	45.45
7	17:40: 9	-79.2830	27.0003	18:10:26	-79.2849	27.0047	-10.93	26.99
8	18:30:19	-79.1988	26.9997	18:53:38	-79.2008	27.0041	-14.39	35.36
March 29, 2007								
0	11:40: 1	-79.9302	27.0006	11:47:26	-79.9303	27.0052	-3.32	114.93
1	12: 9:36	-79.8661	27.0007	12:23:14	-79.8668	27.0066	-8.61	78.42
2	12:48:17	-79.7835	26.9999	13: 7:19	-79.7847	27.0070	-9.63	68.43
3	13:35:39	-79.6835	27.0002	14: 2:19	-79.6846	27.0113	-6.43	76.36
4	14:26:51	-79.6169	27.0002	14:57:50	-79.6177	27.0123	-3.98	71.35
5	15:28:24	-79.5009	27.0011	16: 5:50	-79.5018	27.0176	-3.90	81.50
6	16:34:35	-79.3835	27.0005	17: 7:20	-79.3848	27.0118	-6.39	64.04
7	17:34: 4	-79.2835	27.0004	18: 4:14	-79.2854	27.0111	-10.18	65.84
8	18:26:43	-79.2015	27.0005	18:50:50	-79.2042	27.0080	-17.91	57.40
June 19, 2007								
0	11: 9:36	-79.9304	27.0003	11:17:26	-79.9309	27.0038	-10.00	79.91
1	11:38:21	-79.8667	27.0003	11:51:50	-79.8669	27.0071	-2.47	92.50
2	12:12:39	-79.7831	27.0009	12:31: 8	-79.7835	27.0099	-2.70	88.86
3	12:52:51	-79.6835	27.0004	13:20: 2	-79.6840	27.0123	-2.78	80.81
4	13:36:44	-79.6163	27.0007	14: 9:44	-79.6167	27.0138	-1.88	73.04
5	14:35:41	-79.4999	27.0005	15:12:32	-79.5010	27.0128	-4.88	61.37
6	15:37: 1	-79.3830	27.0003	16:10:26	-79.3843	27.0105	-6.16	56.23
7	16:30:30	-79.2827	27.0000	17: 2: 2	-79.2848	27.0091	-11.39	53.23
8	17:26:47	-79.1991	27.0001	17:49:38	-79.2015	27.0065	-16.81	52.01

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

Sta	Deployed			Surfaced			Mean Velocities	
	Time (GMT)	Lon	Lat	Time (GMT)	Lon	Lat	U cm/s	V cm/s
July 10, 2007								
0	10:53:34	-79.9297	27.0018	11: 1:20	-79.9295	27.0071	2.98	124.87
1	11:22:58	-79.8661	27.0015	11:36:50	-79.8656	27.0109	6.17	123.87
2	12: 1:10	-79.7831	27.0018	12:19:26	-79.7826	27.0137	4.07	119.49
3	12:44:48	-79.6836	27.0005	13:10:55	-79.6834	27.0148	1.25	100.25
4	13:31:42	-79.6167	27.0009	14: 4:20	-79.6165	27.0176	1.09	94.29
5	14:32: 7	-79.4999	27.0001	15: 9:38	-79.5015	27.0155	-7.12	75.43
6	15:37:38	-79.3838	27.0003	16:10:20	-79.3863	27.0139	-12.65	76.88
7	16:37: 3	-79.2840	27.0002	17: 6:56	-79.2862	27.0113	-13.39	69.57
8	17:29:23	-79.1996	26.9999	17:52:26	-79.2021	27.0073	-18.48	59.46
September 5, 2007								
0	99:99: 0	-79.9333	27.0000	99:99: 0	-79.9333	27.0000	-999.00	-999.00
1	11:38:25	-79.8654	27.0006	11:48:25	-79.8646	27.0036	13.31	53.95
2	12: 8: 8	-79.7822	27.0005	12:22:49	-79.7809	27.0075	13.75	86.94
3	12:45:25	-79.6826	27.0006	13: 5:55	-79.6809	27.0118	13.53	100.22
4	13:23:23	-79.6165	27.0005	13:48:37	-79.6146	27.0144	12.42	101.15
5	14:14:26	-79.4996	27.0006	14:43: 7	-79.4983	27.0142	7.30	87.52
6	15: 8:51	-79.3833	27.0003	15:46: 1	-79.3575	27.0080	-999.00	-999.00
7	15:59: 3	-79.2831	26.9996	17:14: 6	-79.2533	26.9873	-999.00	-999.00
8	99:99: 0	-79.2000	27.0000	99:99: 0	-79.2000	27.0000	-999.00	-999.00
September 27, 2007								
0	11:45:45	-79.9298	27.0002	11:52: 8	-79.9300	27.0021	-3.80	54.14
1	12:12:18	-79.8670	27.0051	12:23:20	-79.8673	27.0088	-4.30	62.33
2	12:42: 0	-79.7830	27.0003	12:57:38	-79.7829	27.0081	2.33	91.57
3	13:26:27	-79.6831	27.0001	13:48:44	-79.6826	27.0112	3.07	91.52
4	14: 5: 3	-79.6167	27.0004	14:32: 7	-79.6160	27.0117	4.78	76.56
5	14:55:17	-79.4997	27.0004	15:26:56	-79.4999	27.0119	-1.05	66.89
6	15:58:32	-79.3831	27.0001	16:27: 8	-79.3842	27.0089	-6.26	56.71
7	16:48:27	-79.2831	27.0002	17:13:20	-79.2849	27.0077	-11.99	56.00
8	17:31:36	-79.1996	27.0002	17:51:38	-79.2009	27.0040	-10.35	36.02

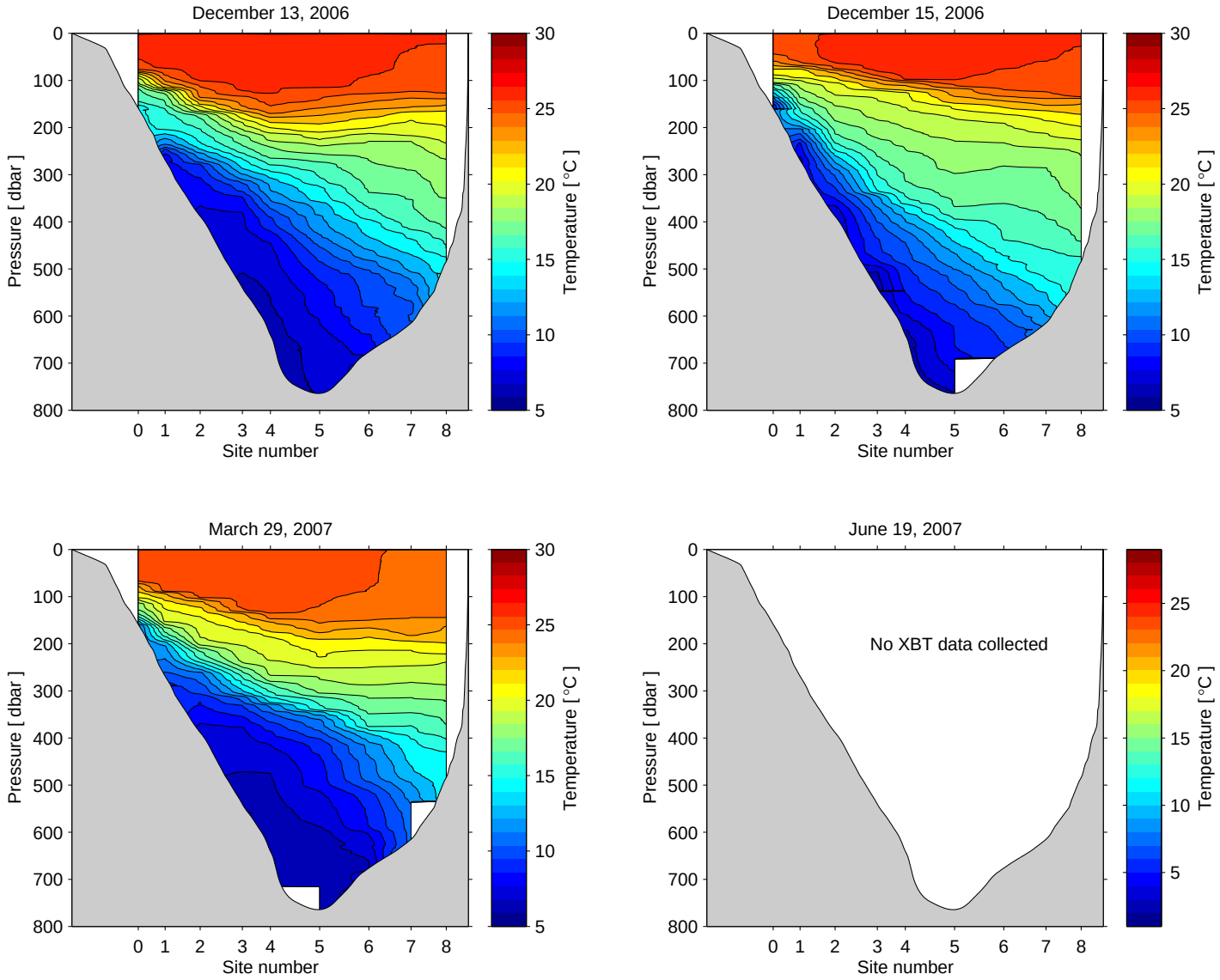
Table 2: Continued.

Date	Station #								
	0	1	2	3	4	5	6	7	8
December 13, 2006	191.41	190.22	40.26	144.31	140.64	116.51	70.61	22.79	-8.37
December 15, 2006	163.00	187.33	228.21	177.43	140.50	101.05	64.52	46.60	-22.04
March 29, 2007	153.54	154.13	138.50	140.39	143.98	107.54	58.85	62.97	34.20
June 19, 2007	143.38	171.46	149.95	124.26	111.12	109.33	70.50	75.70	27.80
July 10, 2007	222.84	237.18	200.73	172.65	160.11	131.96	98.77	36.11	55.92
September 5, 2007	-999.00	90.62	133.22	138.50	139.80	106.40	-999.00	-999.00	-999.00
September 27, 2007	101.56	98.57	149.80	133.22	157.12	120.68	85.00	54.64	13.69

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

.

APPENDIX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March 29, 2007
June 19, 2007
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Temperature [°C]
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400
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600
700
800
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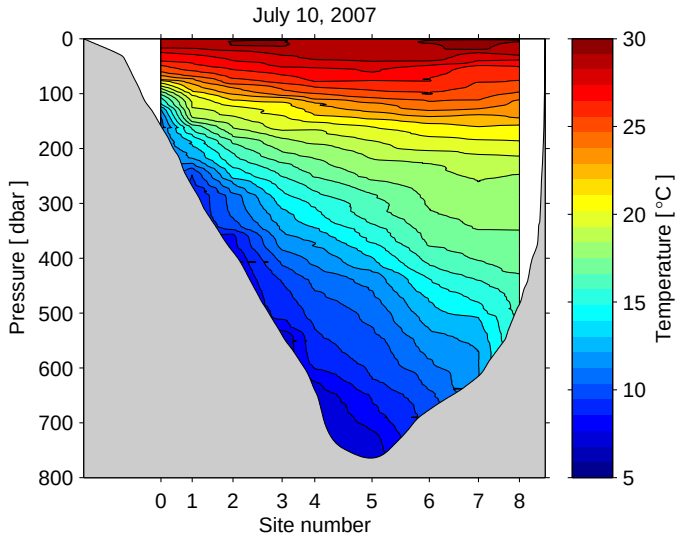
30
25
20
15
10
5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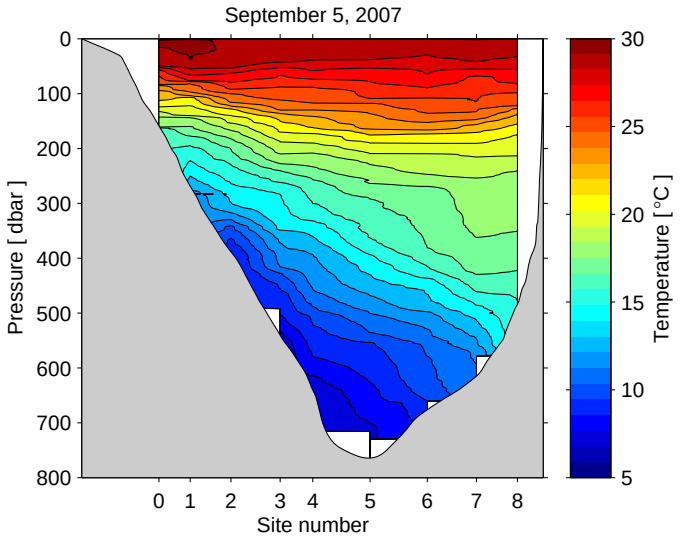
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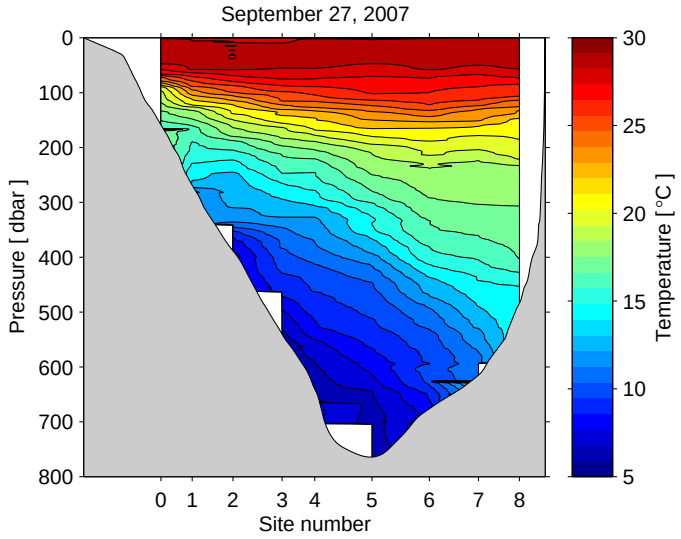
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