National Oceanic and Atmospheric Administration
Atlantic Oceanographic and Meteorological Laboratory
4301 Rickenbacker Causeway
Miami, FL 33149-1097

October 27, 2008

Final Cruise Report

U.S. Dept. of State Cruise No: 2007-089.

Ship Names: M/V *Island Clan* (trips 1-9), and M/V *La Vida* (trip 10).

Dates: October 4, 2007; November 6, 2007; November 28, 2007; December 7, 2007; January 23, 2008; January 29, 2008; April 22, 2008; May 7, 2008; July 10, 2008; July 14, 2008.

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 10 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 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 one dropsonde instrument was lost during the July 10, 2008 cruise and no water velocity measurements were obtained. The XBT data was still collected in that cruise.

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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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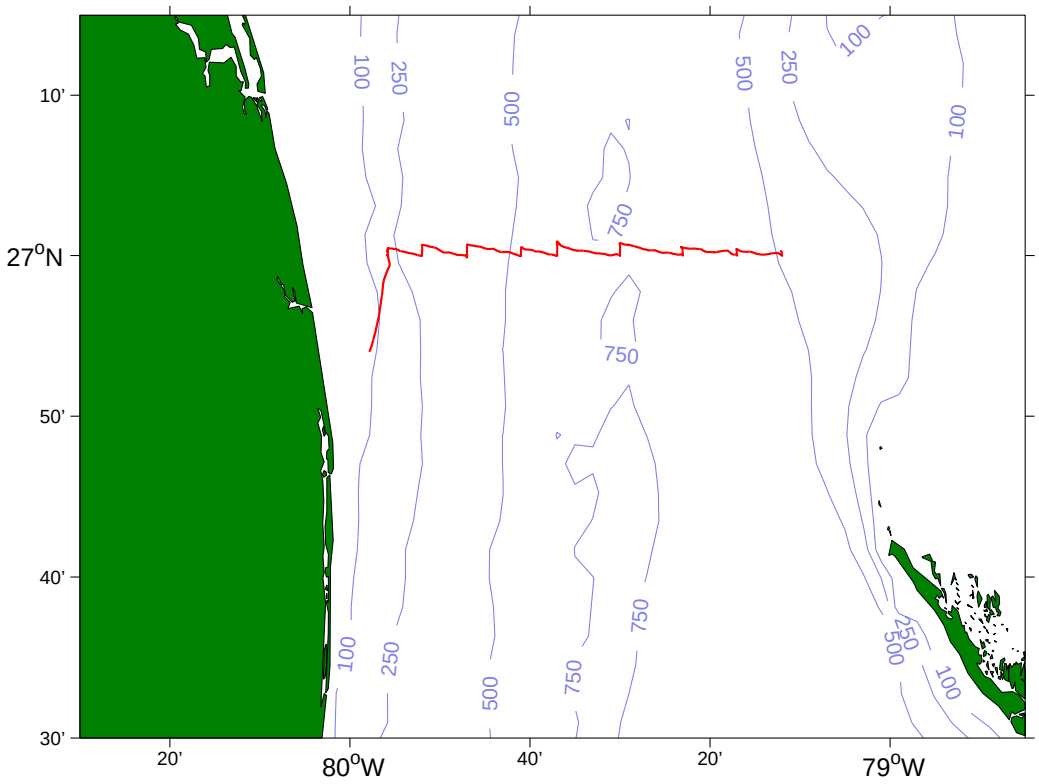


Figure 1: Typical cruise track

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
October 4, 2007								
0	11:28:37	-79.9300	27.0004	11:34:48	-79.9296	27.0028	10.67	70.61
1	11:52: 5	-79.8666	27.0001	12: 3: 8	-79.8661	27.0055	8.02	90.34
2	12:23:22	-79.7832	27.0002	12:39:20	-79.7825	27.0099	6.30	111.77
3	13: 3:23	-79.6831	27.0005	13:25:26	-79.6826	27.0136	3.47	109.55
4	13:44: 7	-79.6165	27.0005	14:10:50	-79.6158	27.0149	4.66	99.73
5	14:33:47	-79.5000	27.0001	15: 4:43	-79.4998	27.0121	1.22	71.53
6	15:27:55	-79.3831	27.0001	15:56:19	-79.3831	27.0089	0.50	57.39
7	16:18:57	-79.2832	27.0002	16:44:26	-79.2831	27.0081	1.01	57.24
8	17: 3:52	-79.2000	27.0003	17:23:26	-79.1999	27.0033	1.42	28.79
November 6, 2007								
0	12:49:12	-79.9302	26.9999	12:55:30	-79.9299	27.0032	6.50	97.45
1	13:13:22	-79.8666	27.0003	13:24:32	-79.8661	27.0062	8.07	98.67
2	13:50: 7	-79.7832	27.0001	14: 6:26	-79.7830	27.0072	1.81	80.87
3	14:31:58	-79.6835	26.9995	14:54:14	-79.6830	27.0080	3.07	71.27
4	15:16: 7	-79.6163	27.0004	15:43: 8	-79.6160	27.0108	2.34	71.81
5	16:10:25	-79.5000	27.0001	16:42: 1	-79.4999	27.0104	0.39	60.22
6	17: 6:45	-79.3835	27.0000	17:35:38	-79.3843	27.0073	-3.79	46.52
7	18: 0:56	-79.2830	27.0000	18:27: 3	-79.2840	27.0059	-5.92	41.80
8	18:46: 9	-79.1998	26.9998	19: 6:14	-79.2004	27.0034	-3.93	33.71
November 28, 2007								
0	12:55:49	-79.9294	27.0012	13: 2:21	-79.9286	27.0042	21.32	82.13
1	13:21:45	-79.8665	27.0006	13:32:50	-79.8666	27.0062	-1.43	92.49
2	13:52:48	-79.7833	27.0001	14: 9:19	-79.7839	27.0101	-6.61	111.64
3	14:31:58	-79.6837	27.0002	14:54:56	-79.6844	27.0147	-4.68	115.95
4	15:18:55	-79.6169	26.9999	15:46: 2	-79.6172	27.0141	-1.30	96.50
5	16:13: 9	-79.4999	27.0000	16:45: 8	-79.5007	27.0127	-4.21	72.98
6	17:12:55	-79.3840	27.0005	17:42: 2	-79.3854	27.0103	-7.55	61.94
7	18: 6: 4	-79.2829	26.9993	18:31:56	-79.2849	27.0090	-12.02	69.64
8	18:51:43	-79.1996	26.9995	19:11:43	-79.2016	27.0052	-16.22	53.57
December 7, 2007								
0	12:33:18	-79.9307	27.0013	12:40:14	-79.9305	27.0070	5.41	153.43
1	12:58:38	-79.8669	27.0004	13:10:32	-79.8663	27.0088	6.74	128.78
2	13:31:35	-79.7837	26.9997	13:49: 2	-79.7837	27.0101	0.67	108.46
3	14:12:40	-79.6835	26.9999	14:35:20	-79.6830	27.0125	4.14	101.87
4	14:53: 7	-79.6171	26.9985	15:20:50	-79.6168	27.0110	1.87	82.70
5	15:55:23	-79.4996	27.0006	16:28:14	-79.5000	27.0120	-1.93	63.88
6	16:56:52	-79.3830	26.9991	17:25:26	-79.3840	27.0071	-5.92	51.16
7	17:50:13	-79.2834	26.9975	18:17:26	-79.2847	27.0037	-7.74	42.62
8	18:36:48	-79.1997	26.9990	18:57:26	-79.2014	27.0037	-13.24	42.71

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
January 23, 2008								
0	12:49:28	-79.9304	27.0005	12:56: 4	-79.9308	27.0044	-10.98	109.53
1	13:14:36	-79.8670	26.9993	13:26: 8	-79.8675	27.0047	-7.56	85.39
2	13:48:34	-79.7833	26.9999	14: 5: 2	-79.7843	27.0067	-9.34	75.82
3	14:27: 0	-79.6832	27.0001	14:50: 7	-79.6840	27.0105	-5.36	82.58
4	15: 8:23	-79.6165	27.0010	15:37:26	-79.6166	27.0129	-0.65	75.51
5	16: 3:56	-79.5003	27.0010	16:38: 1	-79.5003	27.0137	0.62	68.76
6	17:10: 6	-79.3826	27.0000	17:38: 2	-79.3823	27.0069	1.25	45.28
7	18: 0: 4	-79.2830	26.9999	18:25:32	-79.2835	27.0047	-3.22	34.24
8	18:47:48	-79.1992	26.9995	19: 7:38	-79.2011	27.0046	-15.87	47.45
January 29, 2008								
0	12:33: 3	-79.9297	27.0007	12:39:29	-79.9300	27.0038	-6.64	86.91
1	12:56:13	-79.8665	27.0002	13: 7: 8	-79.8671	27.0049	-9.03	79.29
2	13:26:43	-79.7831	27.0001	13:43:14	-79.7841	27.0074	-8.92	81.10
3	14: 9: 8	-79.6836	26.9996	14:33:14	-79.6851	27.0099	-9.93	78.58
4	14:51: 1	-79.6167	27.0003	15:18:25	-79.6182	27.0115	-8.79	75.07
5	15:45:21	-79.5002	27.0012	16:18:50	-79.5018	27.0126	-7.54	62.39
6	16:44:58	-79.3824	27.0000	17:15:32	-79.3838	27.0088	-7.61	52.89
7	17:39:25	-79.2837	26.9990	18: 5:57	-79.2853	27.0072	-9.83	57.24
8	18:25:43	-79.1997	27.0000	18:46:25	-79.2010	27.0029	-10.27	26.61
April 22, 2008								
0	11:37:28	-79.9296	27.0008	11:44: 4	-79.9294	27.0034	3.91	71.32
1	11:58:24	-79.8665	27.0006	12: 9:50	-79.8663	27.0044	2.76	59.99
2	12:28: 9	-79.7828	27.0004	12:45:26	-79.7824	27.0063	4.11	61.52
3	13: 5:40	-79.6833	27.0003	13:28:50	-79.6830	27.0090	2.27	69.25
4	13:44:20	-79.6162	27.0006	14:12: 1	-79.6152	27.0128	6.15	81.86
5	14:40: 2	-79.5005	27.0001	15:13: 2	-79.5003	27.0125	0.84	69.71
6	15:37:10	-79.3834	27.0001	16: 6: 8	-79.3842	27.0088	-4.66	55.46
7	16:32: 1	-79.2836	26.9995	16:58: 2	-79.2850	27.0049	-8.54	38.39
8	17:20: 0	-79.1998	26.9994	17:40:20	-79.2017	27.0049	-15.80	50.19
May 7, 2008								
0	11:35:42	-79.9308	27.0005	11:42:32	-79.9308	27.0035	-1.61	79.69
1	11:59:54	-79.8666	26.9976	12:11:32	-79.8666	27.0031	0.36	86.89
2	12:35:19	-79.7831	26.9995	12:51:44	-79.7833	27.0070	-1.19	83.90
3	13:13: 7	-79.6829	26.9992	13:36:14	-79.6832	27.0081	-2.37	70.37
4	13:53:28	-79.6169	27.0004	14:21: 2	-79.6177	27.0097	-4.46	61.78
5	14:45:36	-79.4991	26.9975	15:17:20	-79.4998	27.0065	-3.80	52.21
6	16: 3:55	-79.3840	26.9979	16:33:26	-79.3847	27.0055	-3.40	47.21
7	17: 8:58	-79.2825	26.9973	17:34:31	-79.2832	27.0032	-4.48	42.78
8	17:52:37	-79.1997	26.9994	18:13: 8	-79.2011	27.0044	-11.79	44.67

Table 2: Continued.

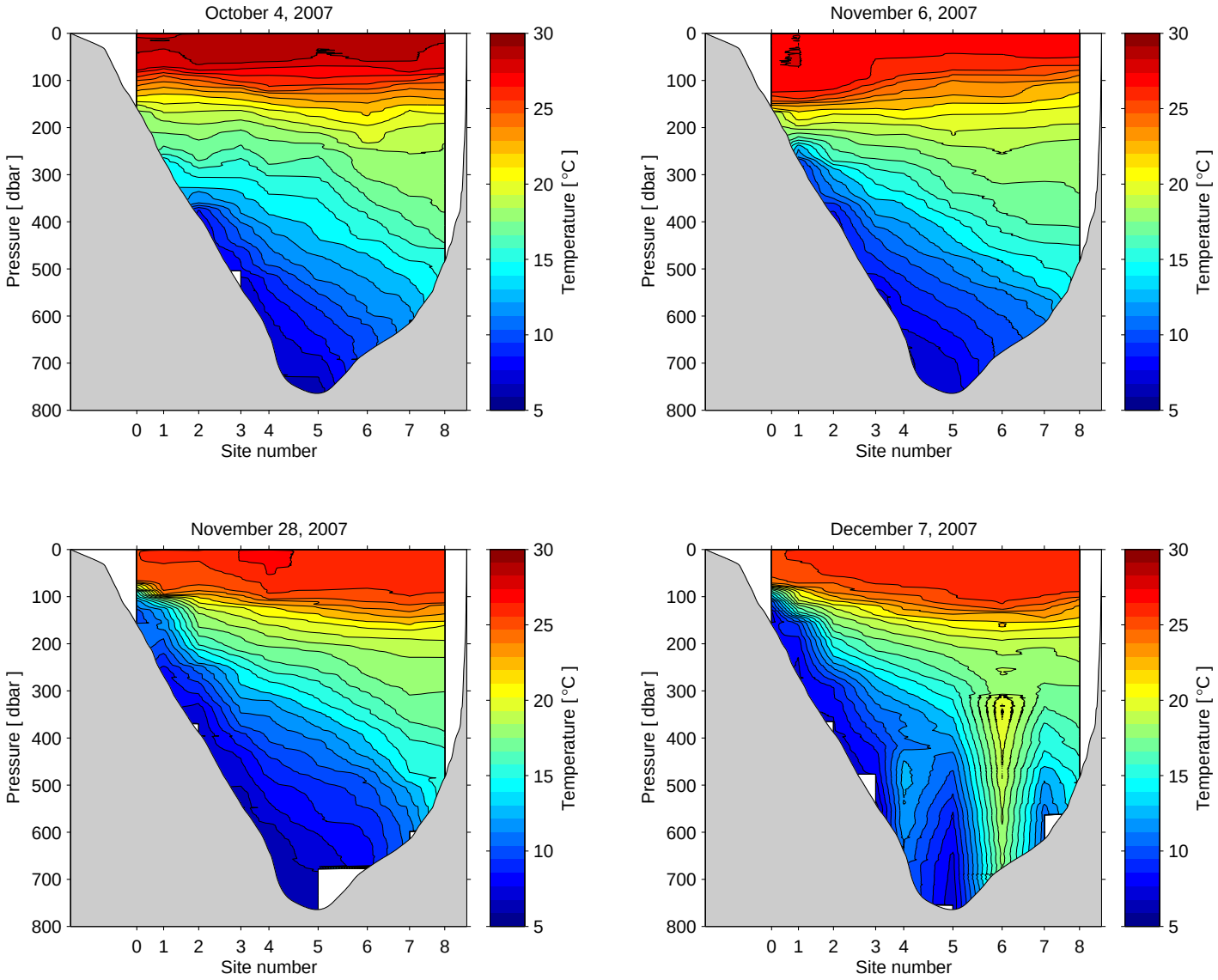
Sta	Deployed			Surfaced			Mean Velocities	
	Time (GMT)	Lon	Lat	Time (GMT)	Lon	Lat	U cm/s	V cm/s
July 14, 2008								
0	11: 2:21	-79.9289	27.0040	11: 8:28	-79.9295	27.0091	-14.53	151.32
1	11:27:37	-79.8667	27.0005	11:38:20	-79.8675	27.0080	-13.00	127.74
2	11:58:33	-79.7835	27.0003	12:13:37	-79.7850	27.0098	-15.49	115.61
3	12:37:46	-79.6830	27.0001	12:59:44	-79.6843	27.0129	-10.94	106.95
4	13:15:38	-79.6160	27.0001	13:39:55	-79.6181	27.0115	-14.65	85.40
5	14: 5:56	-79.4998	27.0001	14:35: 8	-79.5013	27.0109	-9.18	67.44
6	14:59:53	-79.3833	27.0002	15:26:50	-79.3846	27.0096	-8.35	64.65
7	15:50:52	-79.2823	27.0002	16:14:56	-79.2839	27.0064	-11.09	48.28
8	16:34:40	-79.1994	26.9996	16:53:20	-79.2005	27.0035	-9.54	39.65

Table 2: Continued.

Date	Station #								
	0	1	2	3	4	5	6	7	8
October 4, 2007	100.96	97.38	140.99	159.51	117.09	91.73	69.55	44.43	2.37
November 6, 2007	99.95	99.16	73.22	12.22	70.03	72.89	35.38	31.29	38.16
November 28, 2007	145.77	167.28	149.95	175.04	149.35	114.70	103.95	65.48	44.39
December 7, 2007	198.73	176.26	193.56	129.64	133.82	115.30	79.06	36.62	6.45
January 23, 2008	154.76	148.16	139.20	124.86	115.91	113.00	87.22	76.47	61.51
January 29, 2008	95.22	100.46	123.67	126.61	118.29	106.34	83.04	35.37	19.70
April 22, 2008	117.09	133.22	125.46	109.93	93.20	77.59	66.58	15.33	1.93
May 7, 2008	197.75	149.35	149.95	133.22	112.31	81.85	78.26	34.65	19.22
July 14, 2008	236.58	233.59	200.02	193.55	177.72	127.89	61.44	10.47	-2.19

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

APPENDIX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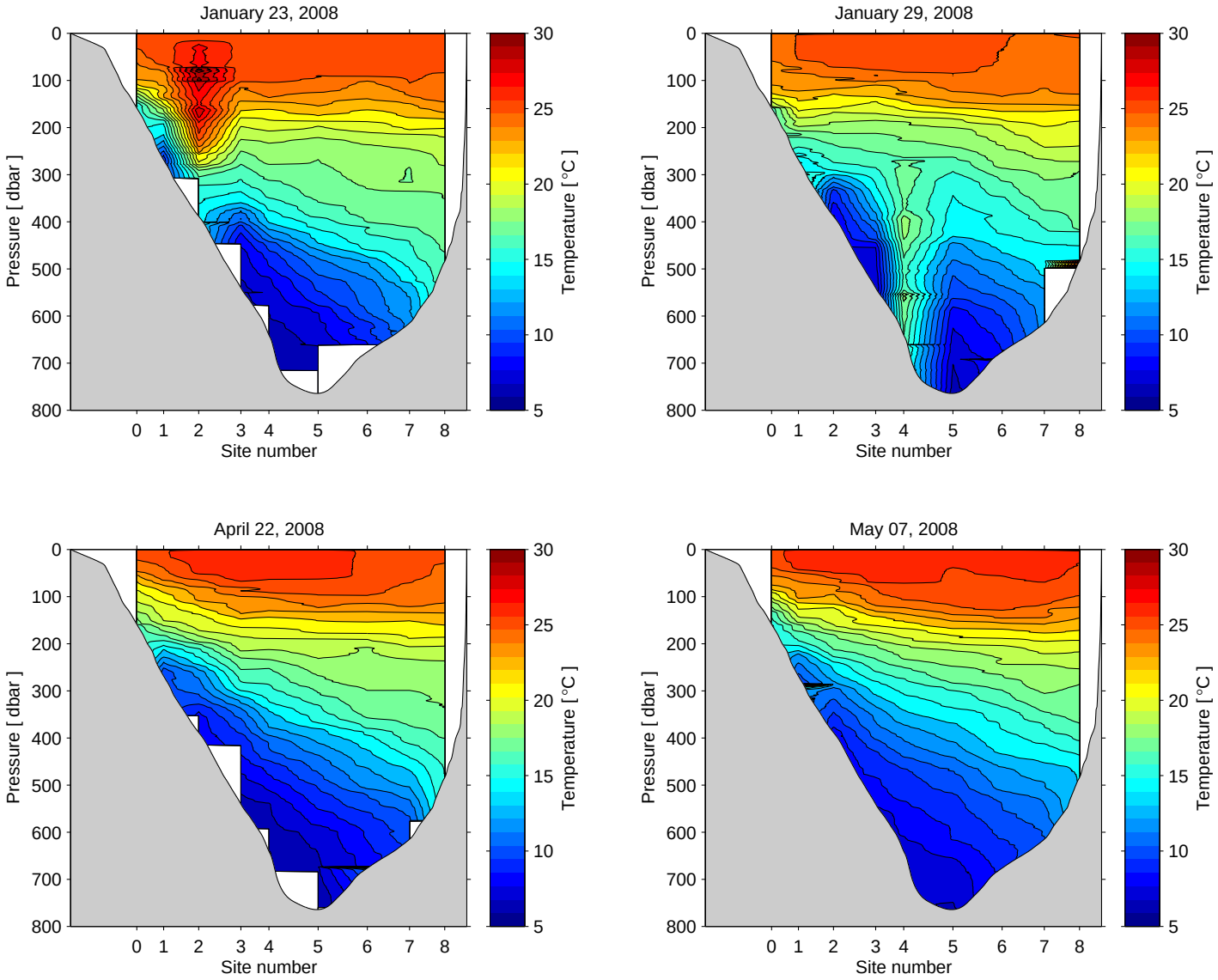
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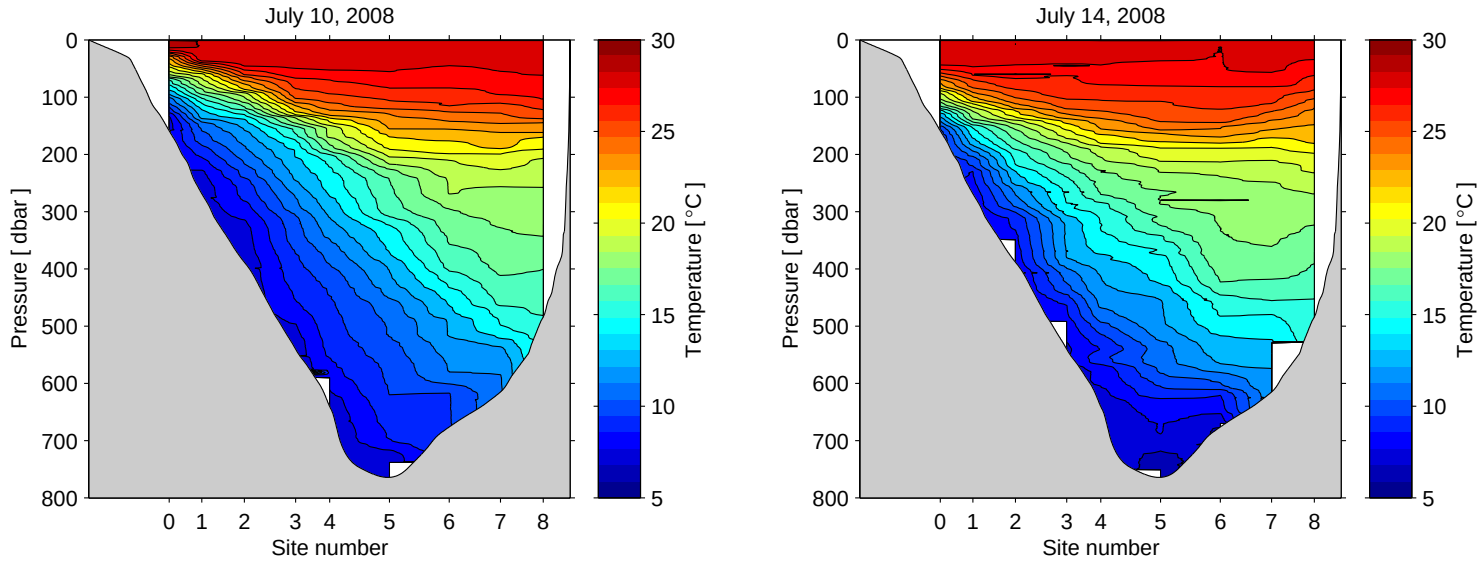
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