CRUISE REPORT

Cruise Number:	RB-06-02
Project:	Western Boundary Current Time Series
Cruise dates:	March 9-28, 2006
Chief Scientist:	Molly Baringer, NOAA/AOML
Working Area:	Atlantic Ocean, Florida Straits & East of the Bahamas
Itinerary:	Depart: Bridgetown, Barbados on 9 March
	Arrive: Charleston, SC on 28 March

1. Introduction and Objectives

The Western Boundary Time Series began in earnest in August 1984 when NOAA extended its Straits of Florida program to include measurements of western boundary current transports and water mass properties east of Abaco, the Bahamas. Since 1986, more than 20 hydrographic sections have been obtained east of Abaco, most including direct velocity observations by Pegasus and/or Lowered Acoustic Doppler Current Profiler (LADCP). Transient tracer (CFC) measurements have been made on 7 of these sections, at roughly 2-year intervals. Current meter arrays were also maintained from April 1986 to April 1997.

A new international program funded by the United Kingdom's Rapid Climate Change Program and the United States National Science Foundation began in March 2004 and is scheduled to end in 2008. Included in this program is a new deployment of current meter moorings along the Abaco section (the UK segment of the program continues with moorings across to the east edge of the Atlantic basin). Independently, the National Oceanic and Atmospheric Administration began a monitoring program in September 2004 utilizing inverted echo sounder moorings (some including bottom pressure measurements and near-bottom current meters) along the Abaco section. All of these programs are collaborating on scientific analysis and on logistics. The repeated hydrographic and tracer sampling at Abaco has established a high-resolution record of water mass properties in the Deep Water Boundary Current (DWBC) at 26ºN, which for temperature and salinity can be reasonably constructed back to about 1985 (Vaughan and Molinari, 1997; Molinari et al., 1998). Events such as the intense convection period in the Labrador Sea and renewal of classical Labrador Sea Water in the 1980's are clearly reflected in the cooling and freshening of the DWBC waters off Abaco, and the arrival of a strong CFC pulse, approximately 10 years later. This program is unique in that it is not just a single time series site but instead is a section from which transport can be directly calculated, of which very few are available in the ocean that approach a decade or more in length.

In colloboration with NOAA's WBTS program, the international RAPID/MOCHA program is a joint research effort between the National Oceanography Centre (Southampton, U.K.), the University of Miami's Rosenstiel School of Marine and Atmospheric Science (RSMAS). The objective of this program is to establish a pre-operational prototype system to continuously observe the strength and structure of the Atlantic meridional overturning circulation across the basin at 26º N. The U.K. program is referred to as "RAPID-MOC" and is part of the U.K. Rapid Climate Change Program (RAPID) funded by the National Environmental Research Council (NERC). The U.S. program is referred to as "MOCHA" (Meridional Overturning Circulation and Heat-flux Array) and is funded by the National Science Foundation (NSF).

The purpose of RB0602 was threefold:

1) to conduct hydrographic (CTDO_2) and direct current profiling (lowered-ADCP, "LADCP") stations along the 26.5 º N mooring section off Abaco, Bahamas; and along sections in the Northwest Providence Channel and Florida Current at 27º N, and
2) to deploy two inverted echo sounder (IES) and recover data (via acoustic telemetry) from IESs deployed previously along the Abaco 26.5ºN line.
3) to service a set of moorings that constitute the "western boundary array" of the RAPID/MOCHA transbasin moored array

The cruise operations fell naturally into 3 segments. First, a CTDO_2/LADCP section was completed from east-to-west across the width of the western boundary array, then mooring servicing operations were conducted from west-to-east across the array, and then final CTDO_2/LADCP sections were competed in the Northwest Providence Channel and the Florida Straits. The CTDO_2/LADCP sections are important for calibration and cross-checking of results from the western boundary moored array. The main hydrographic section that is east of Abaco Island Grand Bahamas, sampled the Deep Western Boundary Current and Antilles Current region east of the Bahamas and are part of an ongoing time series of these currents collected since 1984 by AOML.

2. Scientific Personnel

Name	Sex	Nationality	Affiliation
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Robert Roddy	M	USA	NOAA/AOML
Carlos Fonseca	M	Brazil	UM/CIMAS
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Dallas Murphy	M	USA	volunteer
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Shari Yvon-Lewis	F	USA	Texas A&M
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Kim Pratt	F	USA	NOAA Teacher at Sea
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Darren Rayner	M	United Kingdom	NOC
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3. Participating Institutions

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4. Cruise Operations

4a. $CTDO_2$/LADCP Stations

A total of 70 $CTDO_2$/LADCP stations were conducted during the cruise (Table 4, Figure 2). At each station, profiles of temperature, salinity (conductivity), and dissolved oxygen concentration were collected from the surface to within approximately 20 m of the bottom, using a Sea-Bird SBE-911plus CTD system. Water samples for calibration of the salinity and dissolved oxygen profiles were collected using a 24-bottle Rosette system containing 10 liter Niskin bottles. Current profiles were also measured using a paired downward-looking 150 kHz Broadband and upward-looking 300 kHz Workhorse Acoustic Doppler Current Profiling 'hybrid" system (LADCP).

Some of the $CTDO_2$ casts were used to perform calibration checks on the temperature, salinity, and pressure measurements obtained from various types of moored instruments (including SBE Microcats, Interocean S4 and Aanderaa RCM current meters) after their recovery or prior to deployment. During these casts, the outer rack of Niskin bottles was removed from the Rosette to accommodate the moored instruments and the CTD package was lowered to typically 3000 m with 5-minute waits at each bottle stops upon the package retrieval. These casts were not part of the regular $CTDO_2$ /LADCP hydrographic sampling performed on the cruise and are indicated by a * in Table 4. Some CTD stations were used soley for the purpose of calibrating the moored Inverted Echo Sounders (these stations are marked with a Π). At all these calibration stations no discrete oxygen samples were obtained.

Table 1. $CTDO_2$ Station Locations

Station	Latitude			Longitude			Depth (m)
0	24	27.98	N	67	33.53	W	2000
1	26	30.00	N	69	30.00	W	5229
2	26	30.00	N	70	0.00	W	5229
3	26	30.00	N	70	30.00	W	5229
4	26	30.00	N	71	0.00	W	5470
5	26	30.00	N	71	30.00	W	5410
6	26	30.00	N	72	0.40	W	5229
7	26	30.00	N	72	23.00	W	5110
8	26	30.00	N	72	46.00	W	5088
9	26	30.00	N	73	9.00	W	5019
10	26	30.00	N	73	32.00	W	4890

11	26	30	N	73	55	W	4630
12	26	30	N	74	14	W	4521
13	26	30	N	74	31	W	4479
14	26	30	N	74	48	W	4506
15	26	30	N	75	5	W	4595
16 ∇	26	30	N	75	18	W	4604
17	26	30	N	75	30	W	4652
18	26	30.00	N	75	42.20	W	4658
19	26	30.2	N	75	52.00	W	4710
20	26	30.0	N	76	0.00	W	4780
21	26	30.00	N	76	5.70	W	4808
22	26	30.03	N	76	13.00	W	4808
23	26	30.03	N	76	21.00	W	4800
24	26	30.00	N	76	28.00	W	4800
25	26	30.00	N	76	33.00	W	4500
26	26	30.45	N	76	38.00	W	4000
27	26	30.0	N	76	43.00	W	4074
28	26	30.00	N	76	46	W	3572
29	26	31.00	N	76	50.00	W	1101
30	26	31	N	76	54	W	590
31	26	31.0	N	76	56.00	W	25
32 Π ∇	26	30.67	N	76	50.39	W	1065
33 *	26	30.0	N	76	28	W	4826
34 *	26	30.0	N	76	28	W	3500
35 Π	26	30.16	N	75	42.27	W	4658
36 *	26	30.00	N	76	1.77	W	3000
37 *	26	30.00	N	76	36.72	W	3000
38 *	26	29.99	N	76	5.64	W	4808
39 *	26	30.00	N	76	5.70	W	4808
40 *	26	30.0	N	76	28	W	4000
41	26	26	N	78	40	W	750
42	26	20	N	78	43	W	700
43	26	15	N	78	46	W	500
44	26	10	N	78	48	W	450
45	26	4	N	78	51	W	300
46	26	3	N	79	13.98	W	318
47	26	3	N	79	18.78	W	481
48	26	3	N	79	23.94	W	575
49	26	3	N	79	28.86	W	661
50	26	3	N	79	34.02	W	751
51	26	3	N	79	39.9	W	687
52	26	3	N	79	45.96	W	572
53	26	3	N	79	51	W	300
54	26	3	N	79	55.98	W	243
55	26	3	N	79	59.94	W	228
56	26	3	N	80	3.9	W	125

57	27	0	N	79	56	W	141
58	27	0	N	79	52	W	273
59	27	0	N	79	47	W	377
60	27	0	N	79	41	W	540
61	27	0	N	79	37	W	661
62	27	0	N	79	30	W	760
63	27	0	N	79	23	W	681
64	27	0	N	79	17	W	607
65	27	0	N	79	12	W	470
66 Ω	27	0	N	79	37	W	661
67 Ω	27	0	N	79	37	W	661
68 Ω	27	0	N	79	37	W	661
69 Ω	27	0	N	79	37	W	661
70 Ω	27	0	N	79	37	W	661
71 Ω	27	0	N	79	37	W	661

***** **Mooring Calibration Stations**
Π **Inverted Echo Sounder Calibration station**
∇ **No LADCP Data collected at this station**
Ω **Inertial Period Stations**

4b. Inverted Echo Sounders

One inverted echo sounder (IES) mooring was recovered and replaced (re-deployed) with IES including pressure and telemetry near the top of the continental shelf during the cruise (Table 3). Another IES equipped with a current meter (a C-PIES) was recovered and replaced due to design problems associated with battery life. Acoustic telemetry was used to download data from four inverted echo sounder moorings that were deployed in September-October 2004 and September 2005 (Table 3). Two of the telemetry moorings were 'PIES', inverted echo sounders additionally equipped with a bottom pressure gauge, and one was a 'C-PIES', an inverted echo sounder additionally equipped with both a bottom pressure gauge and an acoustic current meter. The telemetry moorings will be visited once or twice a year to download travel time, pressure, and velocity data that can be combined with hydrographic data to estimate the variability of the transports of the Deep Western Boundary Current and the Antilles Current.

Table 2. Inverted Echo Sounder Operations

IES site	Ser. #	Moor. Type	Latitude (N)	Longitude (W)	Depth (m)	Date	Time GMT	Activity
A	24	IES	26° 30.67'	76° 50.39'	1065	3/19/06		Recovered
A	159	PIES	26° 30.984'	76° 49.995'	1092	3/19/06	1941	Deployed
B	169	PIES	26° 30.04'	76° 28.06'	4843			Telemeter
C		PIES	26° 30.00'	76° 05.7'	4690			Telemeter

D	139	C-PIES	26° 29.97'	75° 42.19'	4690	3/21/06	0123	Recovered
D	139	C-PIES	26° 30.158'	75° 42.267'	4690	3/21/06	0304	Deployed
E	140	PIES	26° 29.93'	72° 00.26'	5294			Telemeter

4c. Mooring Operations

Mooring Recoveries

Three moorings were successfully recovered from the locations listed in Table 1. These moorings contained a mixture of current meters, Acoustic Doppler Current Profilers (ADCPs), and temperature/salinity recorders. These moorings were deployed in May 2005 aboard the R/V Knorr as part of the first deployment of the RAPID/MOCHA Array.

Sometime during October 2005 WB2 was compromised such that the top floatation was lost. As a result, the top part of WB2 had "slumped" over for the remainder of the record.

Table 3. Mooring Recoveries

Mooring Site	Date of Recovery	GMT Release	GMT on deck	Latitude (N)	Longitude (W)	Depth (m)	Date of Deployment
WBADCP	3/19/06	1412	1505	26° 31.50'	76° 52.13'	609 m	05/10/05
WB2	3/20/06	1313	1742	26° 30.62'	76° 44.63'	3893 m	05/14/05
WB4	3/21/06	1300	NA	26° 30.21'	76° 02.70'	4793 m	05/25/05

Mooring Deployments

A total of six moorings were deployed at the locations listed in Table 2. The moorings denoted WBADCP, WB2, and WB4 were replacement moorings for the ones recovered at those same sites. Mooring WB1 was a replacement for a similar mooring deployed in May 2005 that had broken free in October 2005 and was recovered on the Walton Smith during a quarterly hydrographic section occupied as part of the NOAA Western Boundary Time Series project. Moorings WB2-L and WB4-L are new "bottom-lander" type moorings that replaced the "drop- off" bottom pressure sensors previously deployed at the base of tall moorings WB2, B, WB4, and E.

Mooring WB2 contained a surface telemetry buoy developed by NOC that was intended to provide near-real time data from the instruments on those moorings. The instrument data is relayed via inductive telemetry directly to the surface buoy (NOC mooring WB2). If successful, this mooring will provide near real-time estimates of the time varying, spatially-averaged baroclinic flow in the western boundary region.

Table 4. Mooring Deployments

Mooring Site	Latitude (N)	Longitude (W)	Depth (m)	Date of Deployment	GMT anchor away
WBADCP	26° 31.50'	76° 52.10'	599 m	03/19/05	2220
WB1	26° 29.81'	76° 49.01'	1403 m	03/23/05	2308
WB2	26° 30.50'	76° 44.5'	3909 m	03/23/05	1739
WBL1	26° 30.42'	76° 44.60'	1400 m	03/14/05	0118
WB4	26° 29.32'	76° 04.19'	4807 m	03/22/05	1841
WBL2	26° 30.02'	76° 02.95'	4810 m	03/22/05	2228

5. Drifter Deployments

A total of 2 surface drifters were deployed during the cruise at the locations listed in Table 5. The drifters were of the "WOCE Standard" type including holey sock drogues at 15 m depth. The drifters are tracked by NOAA/AOML's Global Drifter Center in Miami via ARGOS. The drifter data includes drifter position and local sea surface temperature. The drifters have been adopted by the Searles Elementary School, the Key Biscayne Elementary School and the Cabello School. For information of the Adopt a drifter program see http://osmc.noaa.gov/OSMC/adopt_a_drifter.html

Table 5. Drifter Launches

Drifter ID	WMO ID	Launch Date	Time (GMT)	Latitude (N)	Longitude (W)
62310	41622	03/18/2006	1652	26º 30.017	76º 29.107
62311	41623	03/26/2006	2239	27º 00.015	79º 37.004

6. ARGO Deployments

Three profiling ARGO floats were deployed on this cruise. The location of the deployments are given in Table 6.

Table 6. ARGO Deployments

ARGO ID	Launch Date	Time (GMT)	Latitude (N)	Longitude (W)
554/57482	03/12/2006	0632	23º 11.412	66º 21.267
557/57485	03/15/2006	2009	26º 29.961	73º 31.567
557/57485	03/18/2006	1650	26º 30.016	76º 28.674

7. Underway Measurements

Thermosalinograph

Values of surface temperature and salinity were continuously monitored and logged on the ship's computer using a Sea-Bird temperature-conductivity recorder installed in the ship's seawater intake line.

Shipboard Acoustic Doppler Current Profiler
Upper ocean currents were continuously measured with an Acoustic Doppler Current Profiler (ADCP) mounted in the ship's transducer well. The ADCP was a 75 kHz Ocean Surveyor. The depth range of good velocity data typically extended to 750 m for the 75 kHz ADCP, depending on sea state conditions.

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8. Release of Project Data

In accordance with the provisions specified in the cruise prospectus and application for foreign clearances, the full data results from this experiment will be provided to the Commonwealth of the Bahamas according to the following schedule:

Shipboard Measurements
All shipboard measurements, including underway data records and $CTDO_2$/LADCP station data, will be provided within 3 years of the termination of the cruise (nominally March, 2009).

Moored Instrumentation
Time series data records from the moored instruments will be provided within 3 years of recovery of the instruments (nominally March, 2009).

9. Acknowledgements

The support and able assistance provided by the Captain and crew of the *R/V Ronald H. Brown,* operated by the National Oceanic and Atmospheric Administration, is gratefully acknowledged. The financial support for the scientific research was provided by the NOAA Office of Global Programs, the U.S. National Science Foundation and the U.K. National Environmental Research Council. The Commonwealth of the Bahamas graciously granted privileges to conduct scientific research in their territorial waters.

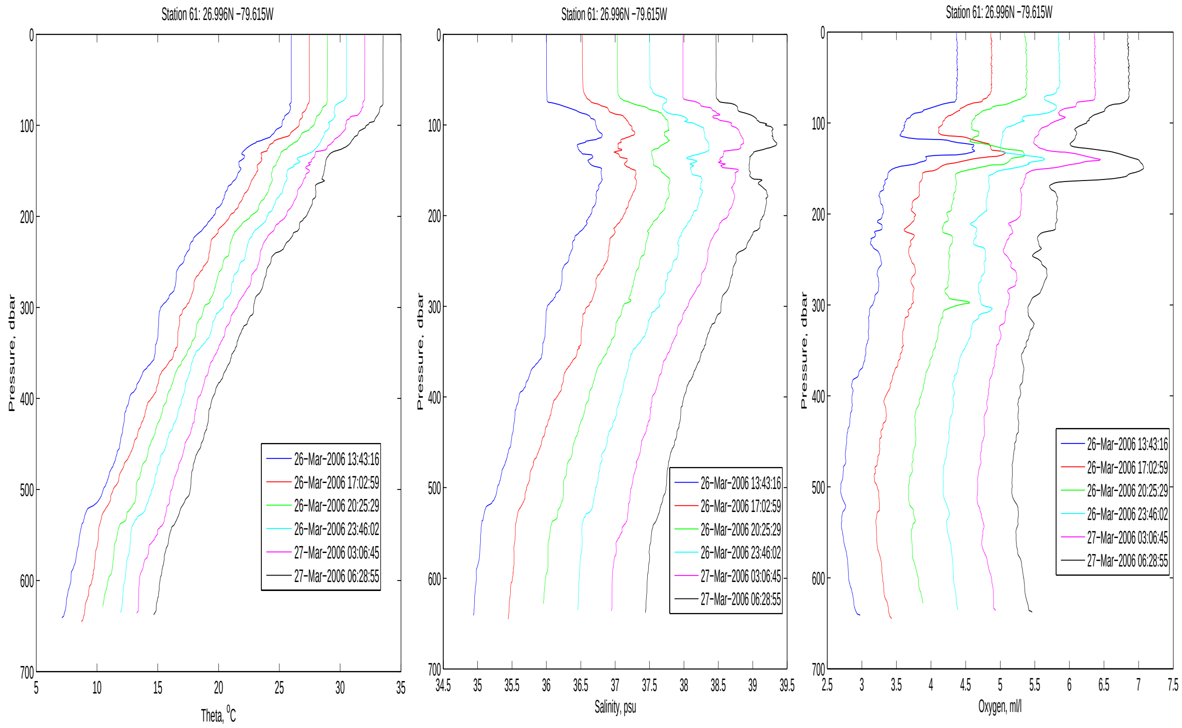


Figure 2. Temperature, Salinity and Oxygen taken at repeat stations during interial cycle experiment.

AB0603 ADCP Report: Lisa Beal and Tania Casal

SADCP operations were run throughout the cruise without incident, beginning the moment we exited Caribbean coastal waters and were legally able to collect measurements. The instrument was configured with an 8 m blank and 50 bins of 16 m length using the command file that Beal implemented during AB0509. First-pass processing was completed on the full cruise of SADCP measurements, but a manual heading correction will be required in post-cruise processing before the final ocean velocities can be obtained.

For LADCP operations we ran a hybrid system, consisting of a down-looking 150 kHz broadband instrument (BB150) and an up-looking 300 kHz Workhorse (WH300), both instruments run on a single 60 V rechargeable battery pack. Operations were plagued with problems for several days during the cruise, resulting in the loss of ten stations of data on the eastern end of the main Deep Western Boundary Current (DWBC) section. Station 14 and following (with the exception of station 16 where BB150 data was lost due to operator error) are complete and of good quality. These stations include the core of the DWBC and the Gulf Stream sections.

Shipboard Acoustic Doppler Current Profiler (SADCP)

The SADCP aboard the NOAA Ship *Ronald H Brown* is a 75 kHz Ocean Surveyor, which was installed in mid 2005. Since the last Abaco cruise the GPS acquisition system and antenna placement has changed on the *Brown*, affecting the quality of the SADCP ocean velocities. GPS is now acquired via FURUNO, since P-code has become obsolete, with the antenna situated over the bridge rather than on the stern. This should be an advantage, producing cleaner data which no longer requires a post-processing fix for the GPS-SADCP offset.

The SADCP was configured in narrowband mode, using command file *beal_rb_nb16.txt*, with a heading correction of 22.7 degrees and ensembles times of 2 s dialed in using the VmDAS GUI. Near real-time ocean velocities are obtained using ship's gyro, which is fed into the snychro-feed on the back of the deck box. These velocities are immediately displayed by VmDAS and have order ±10 cm s^{-1} error. Data from a MAHRS (an accelerometer assisted gyrocompass) is logged by VmDAS via a serial port for later off-line heading correction. SADCP data acquisition was started at 19:30 on the 11th March; half an hour after the ship entered international waters and ended at 03:00 on 28th March. Bottom track data for improved calibrations was obtained during the final five days of the cruise, when water depth was shallow.

Lowered Acoustic Doppler Current Profiler (LADCP)

LADCP operations were run without the aid of a knowledgeable technician, owing to the last minute replacement of Ulyses Rivero with first-timer Rigoberto Garcia (Rivero suffered an injury the weekend prior to the cruise.) The BB150 had recently been returned from Teledyne-RDI, where a transducer head was replaced (beam 2, although it was later discovered that the beam numbers were switched during repair). We ran the "hybrid" LADCP system, with a down-looking BB150 and an up-looking WH300.

Data Acquisition Set-Up: The LADCP PC was set up in the aft wet lab. Three deck leads were run out through a bulkhead conduit to the deck: one power cable with two stripped wires at one end and a two pin sea connector at the other; one communications cable with an RS232 connector at one end and an eight pin sea connector at the other; a second communications cable with an RS232 connector at one end and a square seven pin sea connector at the other. The power cable was hooked up to the 60 V power source in the lab. There was some confusion over whether to hook the black (negative) wire into the white or black pin on the power source: the white pin was found to be correct, so the colours were switched on the box to avoid future confusion (to non-technicians!). The eight-pin comms. cable was connected into COM1 of the PC, so that communication to the BB150 was via COM1. The seven-pin comms. cable was connected to COM2, so that communication with the WH300 was via COM2.

Pre-cruise Tests: Once communications were established with the LADCP's a number of standard tests were performed to check that the instruments were healthy. For the BB150 *bbtest.exe* was opened and all tests run, including the rub beams test. All tests were passed, except the wide bandwidth ($BITest$), which was not considered significant, although RDI manuals were not available to check this. For the WH300 the command *pa* was run in $BBTALK$ which carried out a suite of tests. Again, only the wide bandwith test failed.

Instrument Configuration: The BB150 was configured with an 8 m blank, 16× 16 m bins, and a staggered ping cycle to minimise bottom interference layer problems (see command file *bblisa.cmd* in LADCP directory for all set-up details). The WH300 was configured with 16× 10 m bins, a 1 second ensemble, and zero blank-after-transmit, which has been shown to reduce bias problems in the close bins (see *whlisa.cmd*). The first bin, which is contaminated by ringing, is then discarded during processing.

Deployment and Recovery: Deployment and recovery were achieved by using the RDI $BBTALK$ software to communicate with the instruments and send command files etc, except downloading of the BB150 which was achieved using a shortcut called $BBRecovery$. Upon deployment and recovery of the first ten casts battery voltage was checked via the power supply, but this was found to be of limited use. Subsequently, instrument voltages were checked directly using commands $PT2$ for BB150 and $PT4$ for WH300 (this has been done in past cruises and was initially forgotten). Moreover, after some recharging problems, instrument voltages were checked BEFORE the power supply was reconnected to recharge the battery after a cast. This was found to provide voltages more representative of the remaining charge left on the instruments at the end of a deployment. A copy of the LADCP log sheet is included at the end of this section.

Processing: Version 9 of Visbeck's software was used to process all LADCP data. This version is the same as 8b in terms of the modal energy cascade and in terms of the close agreement in the amplitude of the top-to-bottom shear to Firing's shear method. However, version 9 has some added editing (from Thurnherr) that better suits BB150 processing. For first pass processing only ancillary navigation data was used to obtain a realistic barotropic current; CTD and bottom-tracking velocities were not used in the initial inversion. In this way the first pass gives a true representation of the quality of the profile and the operator can easily diagnose poor signal-to-noise and bias error problems. After station 30, first pass processing was performed without navigation data, since the acquisition PC took far too long to parse the ship's 1-second (cruise-long) navigation file. (This is not a limitation on a linux or MAC OSX, where the use of awk scripts can parse a 50 MB file in less than one minute). Hence, first-pass profiles are referenced to zero mean in the NW Providence Channel and Gulf Stream sections and should not be expected to match the shown bottom-tracking velocities.

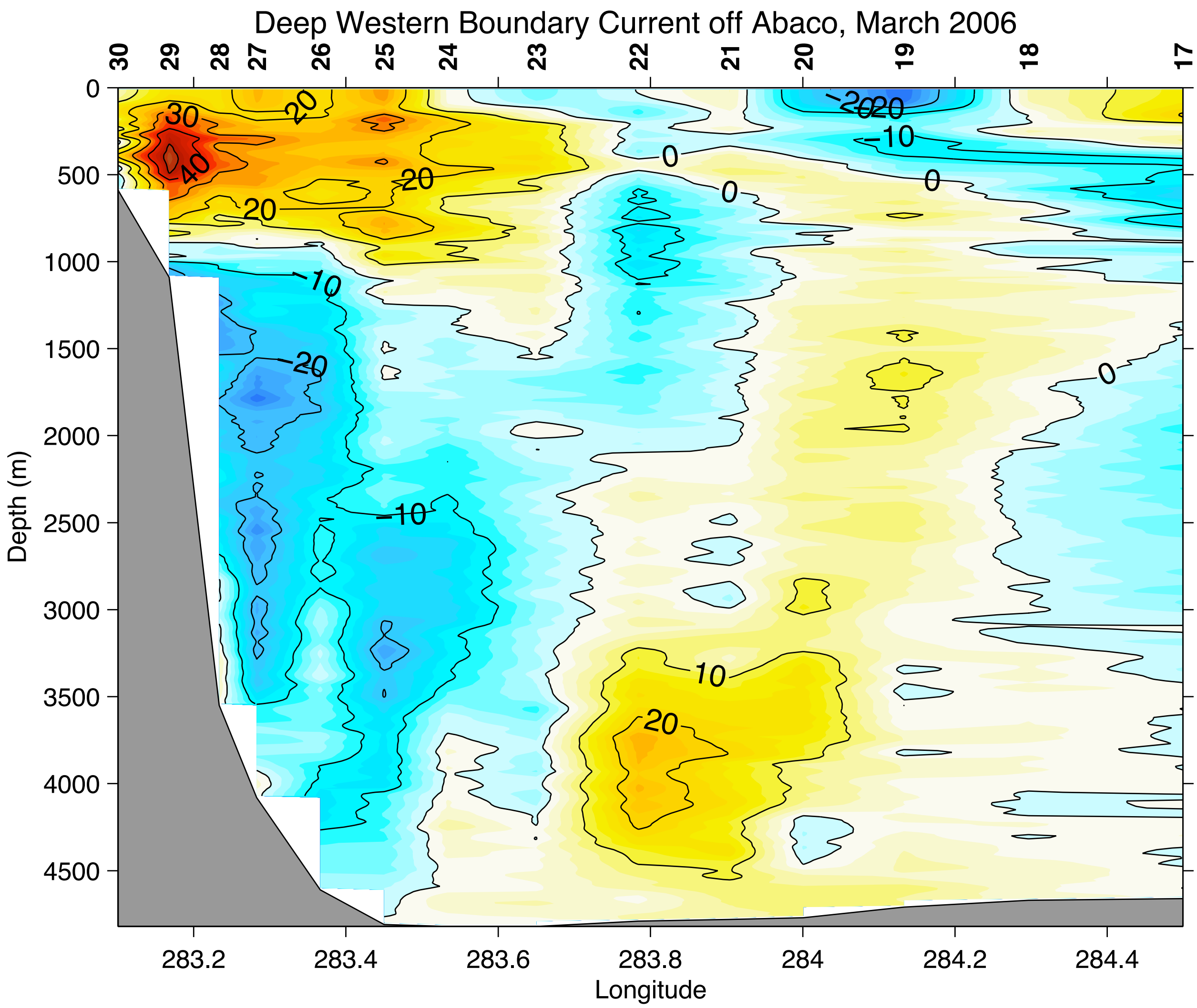
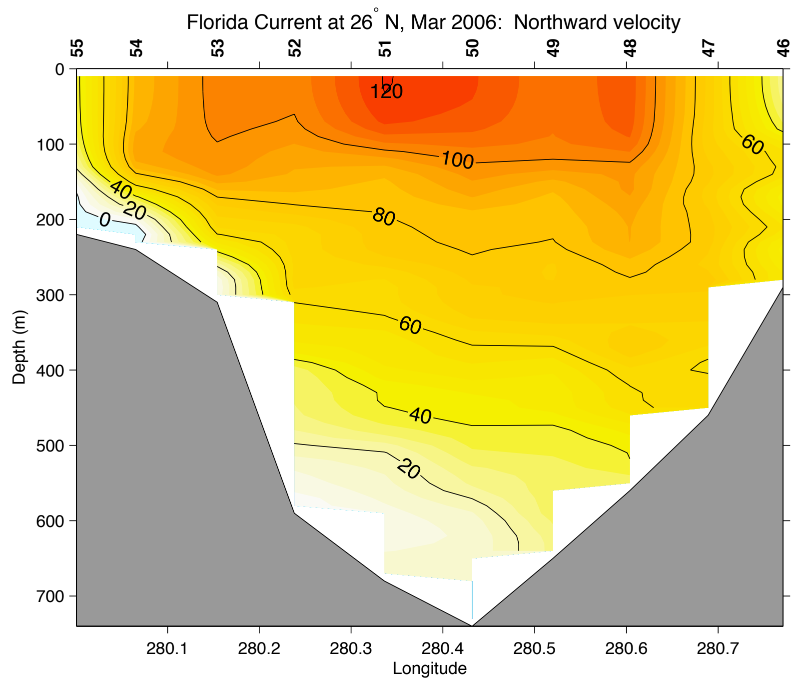


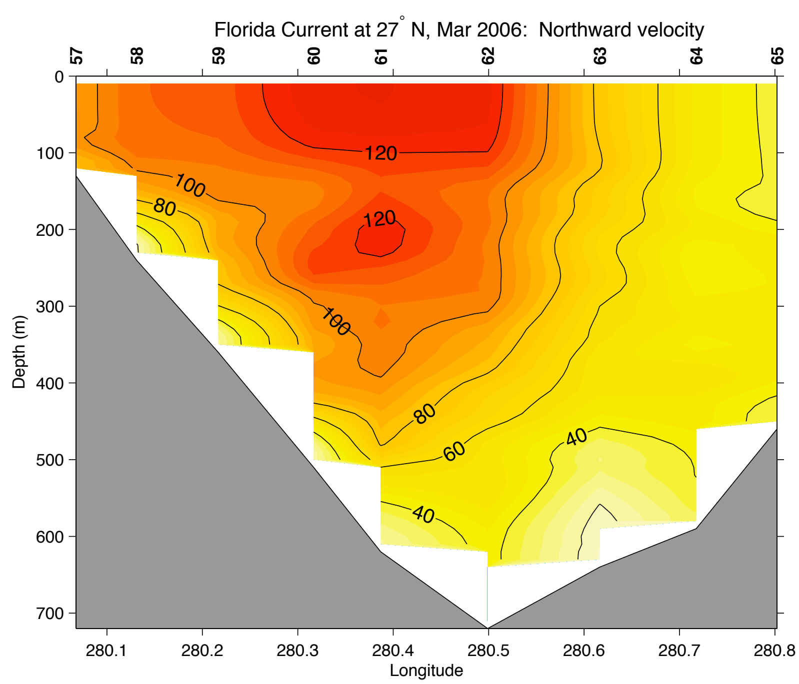
Figure 1: Deep Western Boundary Current and Antilles Current with sub-surface core. Off Abaco Island, March 2006, stations AB0603: 17 - 30

For second pass processing time series CTD data (standard SeaBird output: $*WE\text{-}CTM\text{-}Filt.cnv$), bottom-tracking velocities, and navigation data were used to constrain the LADCP full-depth ocean velocity profile. Second-passed LADCP profiles are available as of cruise end. The remaining processing step, to utilise SADCP velocities in the inversion, is left for after the cruise when SADCP final data will be available.

Problems: On station 4 the BB150 was diagnosed with a broken beam (no. 2) during first-pass processing. Prior to this, the echo amplitude had been decreasing steadily. On station 5 beam 2 was "broken" and beam 3 "bad". In addition, the up-looking WH300 (S/N 1856) stopped pinging during the cast. The BB150 was swapped out for a down-looking WH300 (S/N 1410) and the package redeployed with 1410 slaved to 1856. Both instruments stopped pinging after about half an hour. For station 7 the package was deployed with 1856 slaved to 1410 and this time 1410 collected good data, but 1856 still failed. On cast 8 the star cable was switched around where it connects into each instrument to test whether cabling issues were causing a lack of power. Still 1856 failed. On



Florida Current at 26° N, Mar 2006: Northward velocity
Depth (m)
Longitude



Florida Current at 27° N, Mar 2006: Northward velocity
Depth (m)
Longitude

Table 1: Summary of LADCP Data problems

Station(s)	Configuration	Outcome
1, 2, 3	Hybrid	**good data**
4, 5	Hybrid	no BB150 data
6	Dual WH	no data
7, 8	Dual WH	no up-looker data
9	Dual WH	no data
10, 11	Dual WH	**good data**
12, 13	Dual WH	no up-looker data
14	Hybrid	BB150 wrong date
15	Hybrid	**good data**
16	Hybrid	BB150 no data
17 onwards	Hybrid	**good data**

station 9 both instruments failed and it was clearly diagnosed as a power problem. The batteries appeared to be holding charge, yet the instruments were not recharging. WH300 voltages were found to be 41.5 V and 45 V - but due to the lack of documentation we were not sure what their voltage should be. (Power supply voltage is $\pm 30V$.) Intermittent communication with the uplooker was also a problem.

Before station 10 a disposable battery pack was fitted to the frame and both WH300's re-cabled to receive power from it. Good data was collected from both WH300s for stations 10 and 11. After two casts in 5000 m of water the disposable batteries were run down to about 40 V and needed replacing. However, communications problems with the up-looker meant that the data was not downloaded successfully. By stations 12 and 13 communication with the up-looker even for deployment was not reliable and the down-looker was deployed alone. Deck leads were swapped out, connector pins cleaned, and finally the COM port on the PC was thought to be faulty. The PC was rebooted, but communications problems persisted. Eventually they were traced to a bent pin on the up-looking instrument connector.

Between stations 12 and 13 tests were run on the BB150 in the hangar and all beams were found to be working. The diagnosis of a broken beam was incorrect. During this test the beams were identified and labelled for easier testing in the future. A lesson learned: the Visbeck software should not be relied upon to accurately diagnose instrument problems. At the least, a beam rub test should have been carried out before removing the instrument from the package. In addition, the spare rechargeable battery pack was tested (50 V) and charged. Finally, the power supply in the lab was checked and the stripped connectors re-secured.

Before station 14 the disposable battery pack and down-looking WH300 (S/N 1410) were removed from the frame and replaced with the spare rechargeable battery pack and the BB150. At last both instruments worked with no problems and good data was collected for the remainder of the cruise. This is with the exception of station 16, for which the BB150 data was lost due to operator error. It should be noted that on station 14 the date and time on the BB150 is incorrect, also due to operator error. A summary of data availability for each station is given in Table 1.

L A D C P L O G S H E E T

Operator Name:

Instrument set-up (e.g. dual workhorse, BB down-WH up, BB):________________________________

Station No.______________ Nominal Latitude_________________ Longitude________________

Date (dd/mm/yyyy)______________ Decimal Day______________ Depth (m)_______________

Deployment

	Down-looker (e.g. BB or WHM)	Up-looker (e.g. WHM or WHS)
Time at wake-up (BBTALK <END>)		
Instrument Voltage (PT4 or PT2)		
Memory Remaining (RS): Erased?		
Check LADCP clock (TS?): Reset?		
Load Command File (F2)		
Log File		
Time at start pinging		

Exit BBTALK. Power down, disconnect cables, plug in dummies.

At the Bottom note: Time____________ Latitude________________ Longitude________________

CTD max. depth (m)___________________ Height off Bottom (m)____________________

Recovery

At **END** of cast note: Time______________ Latitude______________ Longitude______________

Rinse connectors with fresh water and DRY. Remove dummies, connect comms, wake up instruments and check voltages. Connect power cable, place cover on up-looker, and switch on POWER supply.

	Down-looker (e.g. BB or WHM)	Up-looker (e.g. WHM or WHS)
Time stop pinging (BBTALK **B**)		
Instrument Voltage (PT4 OR PT2)		
No. of deployments (RA?)		
Download filename and size (Kb)		
Copied to station filenames		
Processed? Script name.		
Check Max. Depth from intW		

Comments:

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