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Hydrographic Measurements Collected in 2020 During Western Boundary Time Series Cruises in the Florida Current aboard the Research Vessel R/V *Walton Smith*, (FC2002, FC2012, FC2012B)

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The findings and conclusion on this report are those of the authors and do not necessarily represent the views of the funding agency.

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Abstract

This report presents final calibrated conductivity, temperature, depth (CTD) data collected in the Florida Straits during three Western Boundary Time Series project (WBTS) research cruises conducted in 2020. These cruises took place aboard the UNOLS ship R/V *F. G. Walton Smith* (FC2002, FC2012, FC2012B). Funded through the Climate Program Office (CPO) of the National Oceanic and Atmospheric Administration (NOAA), these WBTS surveys were completed as part of a long term effort to monitor the strength and water mass properties of the Florida Current at 27°N in the Florida Straits.

1 Introduction

In 1982, NOAA began to regularly monitor the Florida Current across 27°N in the Florida Straits in an effort to develop a long-term record of the current's transport and water mass properties. As a leg of the Gulf Stream system in the North Atlantic Ocean, the Florida Current is the last component of this important western boundary current which is constrained by shallow channel bathymetry, as it flows through the Straits of Florida, making the section at 27°N an ideal location for a monitoring program.

It was recognized that a better understanding of the current's behavior and characteristics, including temporal and spatial modes of variability, is critical to determining the strength and variability of the North Atlantic Subtropical Gyre. The powerful Gulf Stream system transports heat and salt from lower latitudes poleward in the North Atlantic Ocean. The flow is comprised of water recirculating within the Subtropical Gyre as well as components from farther regions of the global ocean. For this reason, documenting the natural variations and characteristics of the current helps scientists to gain a better understanding of variations in the earth's climate and can potentially provide an early warning to anomalous changes.

NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML) in Miami, Florida, manages the WBTS project and monitors the Florida Current using a submarine cable, running across the Straits of Florida, which provides daily transport estimates of the current; regular small boat cruises at 27°N, which measure the current transport using a GPS dropsonde device, and regular hydrographic surveys at 27°N using larger research vessels. Moored instruments have also been used to estimate current transport over portions of the project's history.

This report documents final CTD data collected during WBTS hydrographic surveys of 27°N in 2020. It also provides some additional details regarding other measurements conducted during these research cruises. In 2020, three hydrographic surveys were completed. These were conducted using the University of Miami's R/V *F. G. Walton Smith* (FC2002, FC2012, FC2012B).

On each survey, a CTD package, equipped with sensors designed to measure pressure, temperature, conductivity (to derive salinity), dissolved oxygen, and water velocity (via an attached lowered acoustic Doppler profiler, LADCP, system), was lowered from the surface to 10-20 m above the sea floor, at 9 historical locations extending across the Florida Straits between West Palm Beach, Florida and the Bahamas (Figure 1 and Tables 1 - 3). During each CTD cast, water samples were also collected at various depths. Of these, samples collected for salinity and dissolved oxygen analysis were used to calibrate CTD sensor data to a final state. These methods are detailed further in subsequent sections of this report.

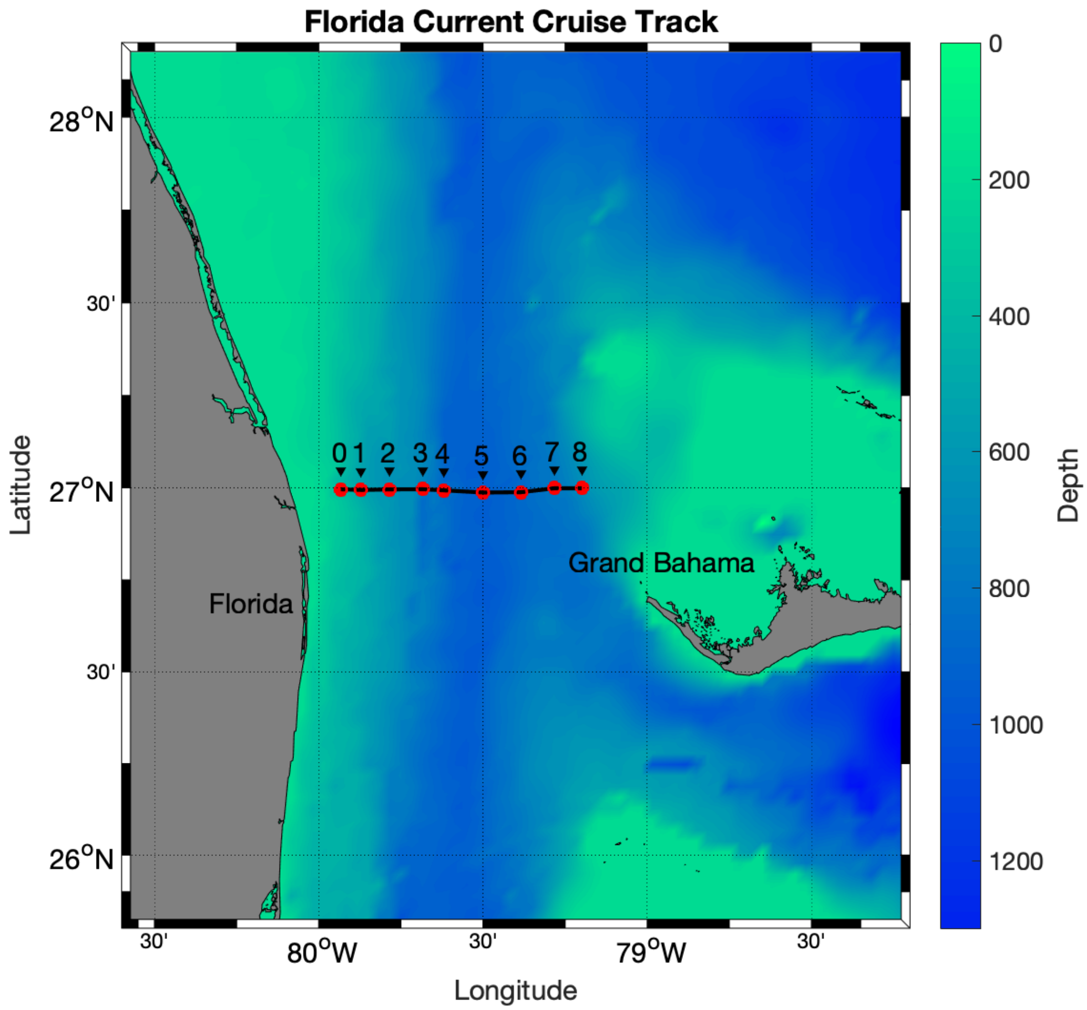


Figure 1: Historical sampling stations across the Straits of Florida at 27°N are shown above (red dots). CTD casts were conducted at each location (0-8) during each research cruise.

Table 1: Florida Current (FC2002) – CTD Cast Summary

Station	Date	Time (GMT)	Latitude	Longitude	Pressure
0	02/05/20	11:25:12	26.998N	79.930W	144
1	02/05/20	10:32:39	26.989N	79.869W	256
2	02/05/20	09:11:41	26.996N	79.784W	378
3	02/05/20	07:28:40	27.005N	79.685W	524
4	02/05/20	05:56:15	27.004N	79.614W	643
5	02/05/20	04:14:22	27.002N	79.502W	755
6	02/05/20	02:34:22	26.998N	79.385W	676
7	02/05/20	01:04:20	26.999N	79.287W	617
8	02/04/20	23:36:01	27.004N	79.197W	465

Table 2: Florida Current (FC2012) – CTD Cast Summary

Station	Date	Time (GMT)	Latitude	Longitude	Pressure
0	12/05/20	13:41:41	26.995N	79.928W	149
1	12/05/20	12:26:02	27.006N	79.864W	261
2	12/05/20	10:53:34	27.002N	79.783W	381
3	12/05/20	09:10:33	27.008N	79.677W	537
4	12/05/20	07:35:12	27.000N	79.616W	645
5	12/05/20	05:19:30	26.999N	79.498W	756
6	12/05/20	03:35:00	26.994N	79.386W	669
7	12/05/20	02:02:31	26.999N	79.285W	615
8	12/05/20	00:30:15	26.999N	79.204W	486

Table 3: Florida Current (FC2012B) – CTD Cast Summary

Station	Date	Time (GMT)	Latitude	Longitude	Pressure
0	12/15/20	12:58:50	27.001N	79.931W	137
1	12/15/20	12:04:55	26.991N	79.869W	246
2	12/15/20	10:54:10	27.002N	79.783W	371
3	12/15/20	09:04:34	27.002N	79.684W	520
4	12/15/20	07:48:01	27.000N	79.617W	628
5	12/15/20	06:05:36	27.000N	79.503W	749
6	12/15/20	04:18:39	26.991N	79.386W	687
7	12/15/20	02:39:50	26.993N	79.283W	607
8	12/15/20	01:13:30	27.006N	79.195W	446

2 Additional Sampling

Discrete nutrient and dissolved inorganic carbon samples were taken during the 2020 Florida Current FC2002 cruise. Table 4 summarize the bottle trip locations for each cruise.

Table 4: FC2002: Discrete Carbon and Nutrient Sampling positions.

Niskin	Station								
	0	1	2	3	4	5	6	7	8
1	C,N(d)	C,N	C,N	C,N	C,N	C,N	C,N	C,N	C,N
2	C,N	C,N	C,N(d)	C,N	C,N(d)	C,N	C,N	C,N	C,N
3	C,N	C,N	C,N	C,N	C,N	C,N(d)	C,N	C,N	C,N
4	C,N(d)	C,N(d)	C,N(d)	C,N	C,N	C,N	C,N	C,N	C,N
5		C,N	C,N	C,N	C,N	C,N(d)	C,N	C,N	C,N(d)
6			C,N	C,N(d)	C,N(d)	C,N	C,N	C,N(d)	C,N
7				C,N	C,N	C,N	C,N(d)	C,N	
13						C,N	C,N		

C - carbon sample, N - nutrient sample, (d) - nutrient duplicate sample

3 Standards and Pre-Cruise Calibrations

The CTD system is a real-time data acquisition system with the data from a Sea-Bird Electronics, Inc. (SBE) 9plus underwater unit transmitted via a conducting cable to a SBE11plus deck unit (V2). The serial data from the underwater unit is sent to the deck unit in RS-232 NRZ format. The deck unit decodes the serial data and sends it to a networked Windows computer for display and data storage using Sea-Bird Seasave software.

The SBE911plus system transmits data from primary, secondary and auxiliary sensors in the form of binary numbers equivalent to the frequency or voltage outputs from those sensors. These are referred to as the raw data. The SBE software performs the calculations required to convert raw data to engineering units.

The SBE911plus system is electrically and mechanically compatible with the standard, unmodified carousel water sampler, also made by Sea-Bird Electronics, Inc. A modem and carousel interface allows the 911plus system to control the operations of the carousel directly without interrupting the flow of data from the CTD.

The SBE9plus underwater unit is configured with dual standard modular temperature (SBE3plus) and conductivity (SBE4) sensors, which are mounted near the lower end cap. The conductivity cell entrance is co-planar with the tip of the temperature sensor probe. The pressure sensor is mounted inside the underwater unit main housing. A centrifugal pump module flushes water through sensor tubing at a constant rate independent of the CTD's motion to improve dynamic performance. Dual dissolved oxygen sensors (SBE43) are added to the pumped sensor configuration following the temperature-conductivity (TC) pair. A reference temperature sensor is mounted to the SBE9plus. A list of sensors used during the cruise can be seen in Table 5.

Table 5: FC2020 - Equipment used during CTD casts.

Instrument	SN	Stations	Use	Comment
AOML orange frame		0-8		FC2002, 2012, 2012B
Sea-Bird SBE 32 24-palce Carousel Water Sampler	32 - 0980	0-8		FC2002, 2012, 2012B
Sea-Bird SBE9plus CTD	1165	0-8		FC2002, 2012, 2012B
Paroscientific Digiquartz Pressure Sensor	128030	0-8		
Sea-Bird SBE3plus Temperature Sensor	1692	0-8	Primary	FC2002, 2012, 2012B
Sea-Bird SBE3plus Temperature Sensor	1075	0-8	Secondary	FC2002, 2012, 2012B
Sea-Bird SBE4C Conductivity Sensor	2973	0-8	Primary	FC2002, 2012, 2012B
Sea-Bird SBE4C Conductivity Sensor	1387	0-8	Secondary	FC2002, 2012, 2012B
Sea-Bird SBE43 Dissolved Oxygen Sensor	0730	0-8	Primary	FC2002, 2012, 2012B
Sea-Bird SBE43 Dissolved Oxygen Sensor	2949	6-8	Secondary	FC2002
Sea-Bird SBE43 Dissolved Oxygen Sensor	2712	0-5	Secondary	FC2002
Sea-Bird SBE43 Dissolved Oxygen Sensor	2712	0-8	Secondary	2012, 2012B
Simrad 807 Altimeter	gold	0-8	scale: 15.0	FC2002, 2012, 2012B
RDI LADCP - 300 kHz Workhorse (AOML)	13493	0-8	Upward	FC2002, 2012, 2012B
RDI LADCP - 300 kHz Workhorse (AOML)	20550	0-8	Downward	FC2002, 2012
RDI LADCP - 300 kHz Workhorse (AOML)	10198	0-8	Downward	2012B

3.1 Pressure

The Paroscientific series 4000 Digiquartz high pressure transducer uses a quartz crystal resonator whose frequency of oscillation varies with pressure induced stress measuring changes in pressure as small as 0.01 parts per million with an absolute range of 0 to 10,000 psia (0 to 6885 dbar). Repeatability, hysteresis and pressure conformance are 0.002% of full-scale. The nominal pressure frequency (0 to full scale) is 34 to 38 kHz. The nominal temperature frequency is 172 kHz ± 50 ppm/°C.

The pressure sensor utilized during the Florida Straits cruises was s/n 1165. Pre-cruise sensor calibrations were performed at Sea-Bird Electronics, Inc. in Bellevue, Washington. The calibration date and coefficients in Table 6 were entered into SEASAVE R using the configuration file.

Pressure coefficients are first formulated into:

$$
\begin{aligned}
c &= c_1 + c_2 * U + c_3 * U^2 \\
d &= d_1 + d_2 * U \\
t_0 &= t_1 + t_2 * U + t_3 * U^2 + t_4 * U^3 + t_5 * U^4
\end{aligned}
$$

where U is temperature in degrees Celsius. Pressure is computed according to:

$$P\ (psia) = c * \left(1 - \frac{t_0^2}{t}\right) * \left[1 - d * \left(1 - \frac{t_0^2}{t}\right)\right]$$

where t is pressure period (μs). SEASAVE R automatically implements this equation.

Table 6: FC2020 – Pressure Calibration Date and Coefficients.

s/n 1165 October 30, 2019
c_1 = -3.955514e+04
c_2 = -4.332890e-01
c_3 = 1.291600e-02
d_1 = 3.518300e-02
d_2 = 0.000000e+00
t_1 = 2.988000e+01
t_2 = -3.947610e-04
t_3 = 4.178490e-06
t_4 = 2.677760e-09
t_5 = 0.000000e+00
Slope = 0.99999
Offset = -2.79502
AD590M = 1.279100e-02
AD590B = -9.005810e+000

3.2 Temperature

The temperature-sensing element is a glass-coated thermistor bead, pressure protected by a stainless steel tube. The sensor output frequency ranges from 5–13 kHz corresponding to temperatures from -5 to 35°C. The output frequency is inversely proportional to the square root of the thermistor resistance, which controls the output of a patented Wien Bridge circuit. The thermistor resistance is exponentially related to temperature. The SBE3plus thermometer has a typical accuracy/stability of ±0.004°C per year and resolution of 0.0003°C at 24 samples per second. The SBE3plus thermometer has a fast response time of 0.070 seconds.

Two temperature sensors were used during the 2020 Florida Straits cruises, s/n 1692 and 1075. Pre-cruise sensor calibrations were performed at Sea-Bird Electronics, Inc. in Bellevue, Washington. The calibration dates and coefficients in Table 7 were entered into SEASAVE R using the configuration file. SEASAVE R automatically implements the equation below and converts between ITS-90 and IPTS-68 temperature scales as desired. The Temperature (ITS-90) is computed from g, h, i, j and f_0 and f is the instrument frequency (kHz) coefficients as follows:

$$T\,(^\circ C) = \frac{1}{\left\{g + h * \left[\ln\left(\frac{f_0}{f}\right)\right] + i * \left[\ln^2\left(\frac{f_0}{f}\right)\right] + j * \left[\ln^3\left(\frac{f_0}{f}\right)\right]\right\}} - 273.15$$

Table 7: FC2020 – Temperature Calibration Dates and Coefficients.

s/n 1692 December 20, 2019	s/n 1075 December 20, 2019
g = 4.80224314e-03	g = 4.86402484e-03
h = 6.72390716e-04	h = 6.81574437e-04
i = 2.57958670e-05	i = 2.63469117e-05
j = 2.05151435e-06	j = 1.93342825e-06
f_0 = 1000.0	f_0 = 1000.0

3.3 Conductivity

The flow-through conductivity-sensing element is a glass tube (cell) with three platinum electrodes (SBE4). The resistance measured between the center electrode and the end electrode pair is determined by the cell geometry and the specific conductance of the fluid within the cell, and controls the output frequency of a Wein Bridge circuit. The sensor has a frequency output of approximately 3 to 12 kHz corresponding to conductivity from 0 to 7 Siemens/meter (0 to 70 mmho/cm). The SBE4 has a typical accuracy/stability of ±0.0003 $S{\cdot}m^{-1}$/month and resolution of 0.00004 $S{\cdot}m^{-1}$ at 24 scans per second.

Two conductivity sensors were used during the 2020 Florida Straits cruises, s/n 2973 and 1387. Pre-cruise sensor calibrations were performed at Sea-Bird Electronics, Inc. in Bellevue, Washington. The calibration dates and coefficients shown in Table 8 were entered into Seasave R using the configuration file.

Conductivity calibration certificates show an equation containing the appropriate pressure-dependent correction term to account for the effect of hydrostatic loading (pressure) on the conductivity cell:

$$C\ (Siemens/meter) = \frac{(g + h * f^2 + i * f^3 + j * f^4)}{[10 * (1 + c_{t_{cor}} * t + c_{p_{cor}} * p)]}$$

where g, h, i, j, $c_{t_{cor}}$, and $c_{p_{cor}}$ are the calibrations coefficients shown above, f is the instrument frequency (kHz), t is the water temperature (degrees Celsius), and p is the water pressure (dbar). SEASAVE R automatically implements this equation.

Table 8: FC2020 – Conductivity Calibration Dates and Coefficients.

s/n 2973 December 31, 2019	s/n 1387 January 9, 2020
g = -9.96358339e+00	g = -1.06617235e+01
h = 1.34712395e-00	h = 1.59713874e+00
i = -2.08134976e-04	i = -1.15159907e-03
j = 9.76320821e-05	j = 1.77095413e-04
CPcor = -9.5700e-08	CPcor = -9.5700e-08
CTcor = 3.2500e-06	CTcor = 3.2500e-06

3.4 Dissolved Oxygen

The SBE 43 dissolved oxygen sensor uses a membrane polarographic oxygen detector (MPOD). Oxygen sensors determine the dissolved oxygen concentration by counting the number of oxygen molecules per second (flux) that diffuse through a membrane. By knowing the flux of oxygen and the geometry of the diffusion path, the concentration of oxygen can be computed. The permeability of the membrane to oxygen is a function of temperature and ambient pressure. In order to minimize the errors in the oxygen measurement due to the temperature differences between the water and the oxygen sensor, a temperature compensation is calculated using a temperature measured near the active surface of the sensor. The interface electronics output voltages proportional to the temperature-compensated oxygen current. Initial computation of dissolved oxygen in engineering units is done in the software. The range for dissolved oxygen is 120% of surface saturation in all natural waters, fresh and salt, and the nominal accuracy is 2% of saturation.

Under extreme pressure, changes can occur in gas permeable Teflon membranes that affect their permeability characteristics. Some of these changes (plasticization and amorphous/crystalinity ratios) have long time constants and depend on the sensor's time-pressure history. These slow processes result in hysteresis in long, deep casts. The hysteresis correction algorithm operates through the entire data profile and corrects the oxygen voltage values for changes in membrane permeability as pressure varies. At each measurement, the correction to the membrane permeability is calculated based on the current pressure and how long the sensor spent at previous pressures.

Sea-Bird has implemented an optional hysteresis correction for dissolved oxygen data. The correction algorithm requires a continuous time series of data, with no temporal data gaps (although a continuous time series is necessary, a constant sampling interval is not required). Prior to processing, do not remove any data from the downcast or upcast (if to be used), other than a surface soak at the beginning of the downcast.

Three oxygen sensors were used during the 2020 Florida Straits cruises, s/n 0730, 2949 and 2712. During the FC2002 cruise the secondary oxygen sensor, s/n 2949, was determined to be bad after the first three stations (stations 6-8) and was replaced with s/n 2712, which was used for the remainder of the cruises. The calibration dates and coefficients in Table 9 were entered into SEASAVE R using the configuration file.

Table 9: FC2020 – Oxygen Calibration Dates and Coefficients.

s/n 0730	s/n 2949	s/n 2712
January 7, 2020	January 1, 2020	January 1, 2020
Soc = 0.53208	Soc = 0.42295	Soc = 0.48528
Voffset = -0.5106	Voffset = -0.5223	Voffset = -0.5140
Tau20 = 1.45	Tau20 = 1.60	Tau20 = 1.08
A = -4.1445e-03	A = -4.8463e-03	A = -3.6308e-03
B = 1.5109e-04	B = 2.4772e-04	B = 1.7025e-04
C = -2.4274e-06	C = -3.2025e-06	C = -2.6995e-06
$E_{nominal}$ = 0.036	$E_{nominal}$ = 0.036	$E_{nominal}$ = 0.036

The use of these constants in linear equations of the form $I = mV + b$ and $T = kV + c$ yield sensor membrane current and temperature (with maximum error of about 0.5 °C) as a function of sensor output voltage.

Dissolved oxygen concentration is calculated according to:

$$O\ (ml/l) = \{Soc * (V + V_{offset} + tau(T,S) * \frac{\delta v}{\delta t}) + p1 * station\}$$
$$*(1.0 + A*T + B*T^2 + C*T^3) * OXSAT(T,S) * e^{E*(\frac{P}{K})}$$

where Soc, V_{offset}, tau, A, B, C, E and $p1$ are the calibration coefficients shown above and V is the instrument voltage (V). T, S and P are the temperature, salinity and pressure measured by the CTD. K is the temperature in the absolute scale (K), $\delta v/\delta t$ is the oxygen voltage time derivative, $station$ is the station number, and $OXSAT$ is the oxygen saturation value calculated according to (Weiss, 1970):

$$OXSAT(\theta, S) = \exp\left\{A_1 + A_2 * \left(\frac{100}{\theta}\right) + A_3 * \ln\left(\frac{\theta}{100}\right) + A_4 * \left(\frac{\theta}{100}\right) + S * \left[B_1 + B_2 * \left(\frac{\theta}{100}\right) + B_3 * \left(\frac{\theta}{100}\right)^2\right]\right\}$$

where θ is the absolute temperature (K); and

$$\begin{aligned} A_1 &= -173.4292 & B_1 &= -0.033096 \\ A_2 &= 249.6339 & B_2 &= 0.014259 \\ A_3 &= 143.3483 & B_3 &= -0.00170 \\ A_4 &= -21.8492. \end{aligned}$$

SEASAVE ® automatically implements this equation.

The hysteresis correction is calculated, using the oxygen voltages, with the following algorithm:

$$D = 1 + H_1 * (e^{\left(\frac{P(i)}{H2}\right)} - 1)$$

$$C = e(-1 * \left(\frac{Time(i) - Time(i-1))}{H3}\right)$$

$$O_V(i) = O_{volt}(i) + V_{offset}$$

$$O_{newvolts}(i) = a * \frac{a}{D}$$

$$O_{finalvolts}(i) = O_{newvolts}(i) - V_{offset}$$

Where:

i = indexing variable (must be a continuous time series to work; can be performed on bin averaged data), where i = 1:end (end is largest data index point plus 1).
$P(i)$ = pressure (decibars) at index point i .
$Time(i)$ = time (seconds) from start of index point i.
$O_{volt}(i)$ = SBE 43 oxygen voltage output directly from sensor, with no calibration or hysteresis corrections, at index point i.
V_{offset} = correction for an electronic offset that is applied to voltage output of sensor. V_{offset} correction is always negative (see factory calibration sheet for this coefficient). V_{offset} is added to raw voltages prior to hysteresis correction. At end of hysteresis corrections, V_{offset} is removed prior to data conversion using SBE 43 calibration equation (see $O_{finalvolts}(i)$).
$O_V(i)$ = dissolved oxygen voltage value with V_{offset} correction (made prior to hysteresis correction) at index point i.
D and C are temporary variables used to simplify expression in processing loop.
$H1$ = amplitude of hysteresis correction function. Default = -0.033, range = -0.02 to -0.05 (varies from sensor to sensor).
$H2$ = function constant or curvature function for hysteresis. Default = 5000.
$H3$ = time constant for hysteresis (seconds). Default = 1450, range = 1200 to 2000 (varies from sensor to sensor).
$O_{newvolts}(i)$ = hysteresis-corrected oxygen value at index point i.
$O_{finalvolts}(i)$ = hysteresis-corrected oxygen value at index point i with V_{offset} removed.

This step is necessary prior to computing oxygen concentration using SBE 43 calibration equation.

4 CTD Data Acquisition

CTD casts were performed with a package consisting of a 24-place, 10-liter rosette frame (AOML's orange frame), a 24-place water sampler pylon (SBE32) and 24, 10-liter Bullister-style Niskin bottles. This package was deployed on all casts. Underwater electronic components consisted of a SBE9plus CTD with dual pumps and the following sensors: dual temperature (SBE3plus), dual conductivity (SBE4), dual dissolved oxygen (SBE43) and an altimeter. The additional underwater electronic components consisted of two RDI 300 kHz LADCPs, one upward facing instrument and one downward facing instrument to measure water velocities. A total of 27 CTD casts were conducted during the four cruises usually to within 10-20 m of the bottom.

The CTD's supplied a standard Sea-Bird format data stream at a data rate of 24 frames/second. The SBE9plus CTD was connected to the SBE32 24-place pylon providing for single-conductor sea cable operations. Power to the SBE9plus CTD, SBE32 pylon, auxiliary sensors, and altimeter was provided through the sea cable from the SBE11plus deck unit in the computer lab. The CTD frame was suspended from a UNOLS-standard three-conductor 0.322" electro-mechanical sea cable.

The CTD was mounted vertically attached to the bottom center of the rosette frame. All SBE4 conductivity and SBE3plus temperature sensors and their respective pumps were mounted vertically as recommended by SBE, outboard of the CTD. The CTD was outfitted with dual pumps. Primary temperature, conductivity, and dissolved oxygen were plumbed on one pump and secondary temperature, conductivity, and dissolved oxygen on the other. Pump exhausts were attached to outside corners of the CTD cage and directed downward. The altimeter was mounted on the inside of the support struts adjacent to the bottom frame ring. The LADCP's were vertically mounted inside the bottle rings with one 300 kHz pointing down, the other 300 kHz transducer pointing up. The R/V *Walton Smith's* stern A-frame CTD winch was used with the 24-place 10-liter rosette for all station/casts during FC2002, FC2012 and FC2012B. However, at most 23 water samples are collected due to the presence of an upward looking ADCP in place of one Niskin bottle. O-rings were changed as necessary and Niskin bottle maintenance was performed each day to insure proper closure and sealing. Valves were inspected for leaks and repaired or replaced as needed.

4.1 CTD Operations

Prior to each cast, the deck watch prepared the CTD rosette for sampling. All valves, vents, and lanyards were checked for proper orientation. Niskin bottles were cocked, and all hardware and connections rechecked. Fifteen minutes or so prior to station, the deck unit was powered on and an on-deck pre-cast pressure was obtained. Once on station, the syringes were removed from the CTD sensor intake ports. Tag lines were used if necessary for both deployments and recoveries during the cruises. As directed by the deck watch leader, the CTD was lowered to 10 m for a 2-minute soak to remove any air bubble from the sensor lines and to make sure the sensors were behaving appropriately. The CTD was then brought back to just below the surface, with the console operator recording a Mark Scan just prior to beginning the descent. The profiling rate was no more than 30 m/min to 100 m and no more than 60 m/min deeper than 100 m. Upon recovery, the CTD deck unit was turned off once the on-deck pressure was recorded. The CTD frame was left on deck for sampling. The bottles and rosette were examined before samples were taken and anything unusual was noted on the sample log.

A console operator monitored the progress of the deployment and quality of the CTD data through interactive graphics and operational displays of the Seasave software. Additionally, the operator created a sample log for each cast, to be used later used to record the correspondence between rosette bottles and analytical samples taken. The altimeter channel, CTD pressure, wire-out and bathymetric depth were all monitored to determine the distance of the CTD package from the bottom, usually allowing a safe approach to within 10-20 m.

On the up-cast, the winch operator stopped at each predetermined bottle trip depth following instructions from the CTD console operator. The CTD console operator then waited 30 seconds before closing a bottle. The data acquisition system responded with trip confirmation messages and the corresponding CTD data in a rosette bottle trip window on the display. All tripping attempts were noted on the console log. The console operator then directed the winch operator to raise the package up to the next bottle trip location. After the last bottle was tripped, the console operator directed the deck watch to bring the CTD package back on deck.

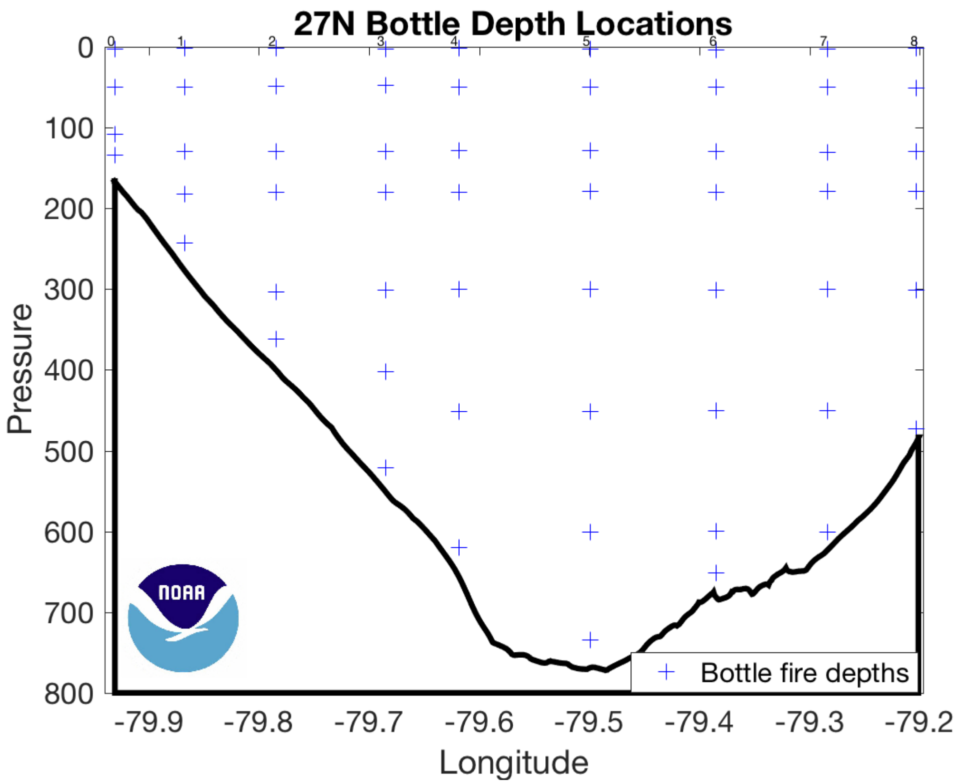


Figure 2: Nominal bottle locations for 27°N section in the Florida Straits.

4.2 Shipboard CTD Data Processing

Shipboard CTD data processing was performed automatically at the end of each deployment using SEABIRD SBE Data Processing version 7.26.7.114 and AOML Matlab processing software. The raw CTD data and bottle trips acquired by SBE Seasave on the Windows 10 workstation were copied onto the CTD-PROC workstation, and processed to a 1-dbar series and a 1-second time series. Bottle trip values were extracted and a 1-decibar (dbar) down cast pressure series created.

Raw data are acquired from the instruments and are stored unmodified. The conversion module DATCNV uses the instrument configuration and pre-cruise factory calibration coefficients to create a converted engineering unit data file that is utilized by all SBEDataProc R post processing modules. Unless otherwise noted, all calibration parameters given are factory default values recommended by Sea Bird Electronics, Inc. The following is the SBEDataProc R processing module sequence and specifications for calibrated data (1 dbar averages) in order for reduction of CTD/O2 data from this cruise:

1. DATCNV converts raw data into engineering units and creates a .ROS bottle file. Both down and up casts were processed for scan, elapsed time(s), depth, pressure, t0 ITS-90 C, t1 ITS-90 C, c0 S/m, c1 S/m, salinity (PSU), salinity 2 (PSU), oxygen voltage V, oxygen 2 voltage V, altimeter, optical sensor, oxygen umol/kg, oxygen 2 umol/kg, oxygen ml/l, oxygen 2 ml/l, oxygen dv/dt, oxygen dv/dt 2, latitude, and longitude. MARKSCAN was used to determine the number of scans acquired on deck and while priming the system to exclude these scans from processing.

2. ALIGNCTD aligns temperature, conductivity, and oxygen measurements in time relative to pressure to ensure that derived parameters are made using measurements from the same parcel of water. Primary and secondary conductivity were automatically advanced by 0.073 seconds. Primary and secondary oxygen were advanced by 1.073.

3. FILTER applies a low pass filter to pressure with a time constant of 0.15 seconds. In order to produce zero phase (no time shift), the filter is first run forward through the file and then run backwards through the file.

4. LOOPEDIT removes scans associated with pressure slowdowns and reversals. If the CTD velocity is less than 0.25 m/s or the pressure is not greater than the previous maximum scan, the scan is omitted.

5. CELLTM uses a recursive filter to remove conductivity cell thermal mass effects from measured conductivity. In areas with steep temperature gradients the thermal mass correction is on the order of 0.005 PSS-78. In other areas the correction is negligible. The value used for the thermal anomaly amplitude (alpha) was 0.03°C. The value used

for the thermal anomaly time constant (1/beta) was 7.0°C.

6. WILDEDIT computes the standard deviation of 100 point bins, and then makes two passes through the data. The first pass flags points that differ from the mean by more than 2 standard deviations. A new standard deviation is computed excluding the flagged points and the second pass marks bad values greater than 20 standard deviations from the mean.

7. BOTTLESUM creates a summary of the bottle data. Bottle position, date, and time were output automatically. Pressure, temperature, conductivity, salinity, oxygen voltage and preliminary oxygen values were averaged over a 5 second interval.

8. DERIVE uses pressure, temperature, and conductivity to compute primary and secondary salinities, potential temperatures and densities. Oxygen voltage is used to calculate oxygen concentrations.

9. BINAVG averages the data into 1 dbar bins. Each bin is centered on an integer pressure value, e.g., the 1 dbar bin averages scans where pressure is between 0.5 dbar and 1.5 dbar. There is no surface bin. The number of points averaged in each bin is included in the data file.

10. TRANS converts the binary data file into ASCII format.

11. SPLIT separates the cast into upcast and downcast values.

CTD data were examined at the completion of each deployment for clean corrected sensor response and any calibration shifts. As bottle salinity and oxygen results became available, they were used to refine shipboard conductivity and oxygen sensor calibrations.

A total of 27 casts were processed.

4.3 CTD Calibration Procedures

Laboratory calibrations of the CTD pressure, temperature, conductivity, and oxygen sensors were all performed at SBE. The calibration dates are listed in Table 5.

A dual sensor configuration was employed on the CTD for temperature (T), conductivity (C), and dissolved oxygen (DO2). The secondary sensor set served as a calibration check for the primary sensors. During every cast, in-situ salinity and DO2 bottle samples were collected for use in calibrating both the primary and secondary C and O2 sensors. During this particular cruise, it was determined that the primary temperature, conductivity and dissolved oxygen sensors each behaved more stably than their secondary counterparts.

4.3.1 Salinity Analysis

A Guildline Autosal, model 8400B laboratory salinometer, located in the climate-controlled salt van outside of AOML was used to determine the salinity of all water samples collected. Salinometer data output was logged to a computer file using Ocean Scientific International's (OSI) logging hardware and software interface. As a standard operating practice, the Autosal's water bath temperature was maintained at 24°C. In conjunction with this, to help further stabilize the Autosal and to improve measurement accuracy, the climate-controlled laboratory temperature was maintained at 1 to 2 degrees below 24°C. Salinity analyses were performed after samples had equilibrated to laboratory temperature, usually within a couple days after collection. The salinometer was routinely *standardized* for each group of salinity samples analyzed (up to 58 samples) using two bottles of standard seawater: one at the beginning, and one at the end of each group of samples. For each calibration standard, the salinometer cell was initially flushed 6 times before a set of conductivity ratio reading was taken. For each salinity sample, the salinometer cell was initially flushed at least 3 times before a set of conductivity ratio readings were taken. The analyst flushed the cell of the Autosal and changed samples as prompted by the OSI software. Before each analysis session (or *run*) a sub-standard flush of the Autosal, with approximately 200 ml of seawater, was performed prior to the standardization mentioned above. This assured that any deionized water that may have been stored in the cell of the Autosal between extended periods of inactivity was completely flushed from the system.

IAPSO Standard Seawater Batch P-161 (FC2002) and P-163 (FC2012, FC2012B) were used to standardize all casts (Tables 10 & 11).

Table 10: FC2020 - Nominal values for the batches of IAPSO standard seawater.

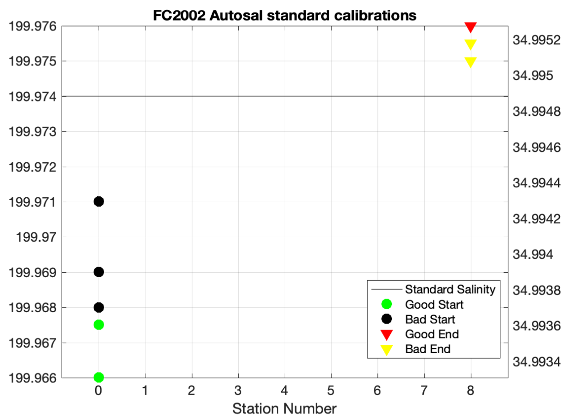
P-161
Use By: May 2020
K15: 0.99987
Salinity: 34.995

Table 11: FC2020 - Nominal values for the batches of IAPSO standard seawater.

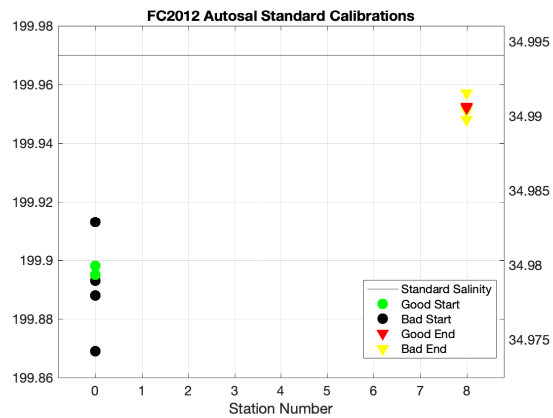
P-163
Use By: April 2022
K15: 0.99985
Salinity: 34.994

Salinity samples were collected in 200 ml Kimax high-alumina borosilicate bottles that had been rinsed at least three times with sample water prior to filling. The bottles were sealed with polypropylene screw caps fitted with *Polyseal* poly cone inserts to prevent sample evaporation. PSS-78 salinity [UNES81] was calculated for each sample from the measured conductivity ratios. The offset between the initial standard seawater value and its reference value was applied to each sample. Then the difference (if any) between the initial and final vials of standard seawater was applied to each sample as a linear function of elapsed run time. The corrected salinity data was then incorporated into the cruise dataset. When duplicate measurements were deemed to have been collected and run properly, they were averaged and submitted with a quality flag of 6. On the four Florida Straits cruises, a total of 170 salinity measurements were taken.

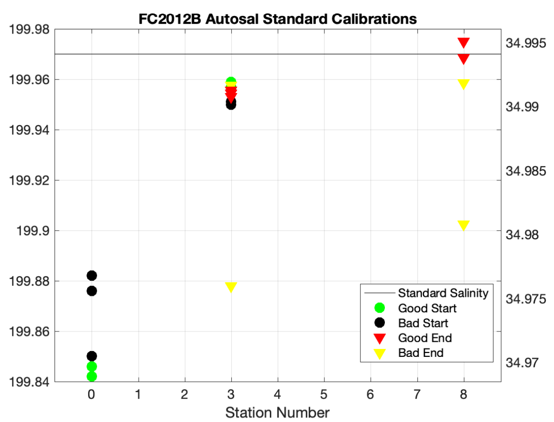
The running standard calibration values are shown in Figure . For FC2002 the autosal standards drift were minimal (about 0.002 in salinity). For FC2012 and FC2012B the autosal standards drifts were large, 0.01 and 0.025 in salinity, respectively. For FC2012 it was determined the beginning standard calibration was bad and only the ending calibrations was used to correct the salinity values. The salts for FC2012B were done in two separate runs, stations 0-3 and stations 4-8. It was determined that the beginning standard calibration for the stations 0-3 run was bad and only the end calibrations was used to correct the salinity values.



(a) FC2002



(b) FC2012



(c) FC2012B

Figure 3: Standard vial calibrations throughout the cruise before and after each Autosal run. The green dots and red triangles are the good values used before and after each run to calculate salinity and drift corrections, respectively. The black dots and yellow triangles are the bad values not used.

4.3.2 Oxygen Analysis

Dissolved oxygen samples were drawn from Niskin bottles into calibrated 125 iodine titration flasks using silicon tubing. Bottles were rinsed three times and filled from the bottom via the tubing, overflowing three volumes while taking care not to entrain any bubbles. 1 ml of $MnCl_2$ and 1 ml of $NaOH/NaI$ were added immediately after drawing the sample was concluded using a ThermoScientific REPIPET II. The flasks were then stoppered and well shaken. Deionized water was added to the neck of each flask to create a water seal. 194 oxygen samples were collected during the 3 cruises, including 25 duplicate samples (up to two duplicates taken randomly during each cast). Samples were stored on the ship in plastic totes and brought back to the AOML oxygen lab for analysis. After analysis it was determined that the oxygens for FC2012 were bad and not able to be used for calibrations. Instead and average of the oxygen calibration coefficients for FC2002 and FC2012B were used for FC2012. It was also determined that the oxygen samples for stations 0-2 for FC2012B were bad and only the oxygen samples from stations 3-8 were used to calculate the oxygen calibration coefficients. They bad oxygen samples for FC2012 and FC2012B were caused by oxygen contaminations due to loose flask caps. The result was 154 oxygen samples were used, including 22 duplicates.

Dissolved oxygen analyses were performed with an automated titrator using amperometric end-point detection (Langdon, 2010). The titrator was interfaced with a computer running LabView software customized by Ulises Rivero (NOAA/AOML). The software handled the sample titration and data logging; it also provided a graphical display of the data for the analyst. Thiosulfate (17.5 g per 500 ml) was dispensed by a 2 ml Gilmont burette driven with a stepper motor controlled by the titrator. The titration methodology follows techniques outlined by Carpenter (1965) and Culberson et al. (1991). Four replicate 10 ml iodate standards were run initially or once the thiosulfate bottle had reached half its volume, which ever came first. The reagent blank (the difference between thiosulfate volumes required to titrate two 1 ml aliquots of the iodate standard) was determined at the lab prior to running the oxygen samples. Thiosulfate normality was calculated from the laboratory temperature for each sample run. The dispenser used for the standard solution (SOCOREX Calibrex 520) and the burette were calibrated gravimetrically immediately prior to the cruise. Oxygen flask volumes were also determined gravimetrically with degassed deionized water at AOML prior to use.

The data collected from the oxygen titrations performed were incorporated into the cruise dataset shortly after analysis.

5 Post-Cruise Calibrations

Post cruise sensor calibrations were not done at Sea-Bird Electronics, Inc. Secondary temperature, conductivity and dissolved oxygen sensors served as calibration checks for the reported primary sensors. In-situ salinity and dissolved oxygen samples collected during each cast were used to calibrate the conductivity and dissolved oxygen sensors. The same pressure sensor as well as primary and secondary temperature, and conductivity sensors were used during the cruises as listed in Table 5. The secondary oxygen sensor, s/n 2949, was swapped after the first three stations of FC2002. For the remaining stations and cruises secondary oxygen sensor, s/n 2712, was used. For Florida Current cruises in 2020 the primary T, C, and O were selected for final data reduction.

5.1 CTD Data Processing

In addition to the Seasave R processing modules, a group of Matlab script files collectively referred to as the AOML/CTDCAL Toolbox were used. These scripts are based on earlier work of different groups and modern statistical tools. They cover all the steps of the CTD data processing, from the preliminary comparisons between sensors or bottle samples, to data reductions and final sensors calibrations.

- FILL_SURFACE was used to copy the first good value of salinity, temperature, oxygen and oxygen current back to the surface. The program then calculated potential temperature and conductivity, and zeroed doc/dt of oxygen current for those records.
- DESPIKE1 removed spikes from primary temperature, salinity and oxygen data. Data were linearly interpolated over de-spiked records. Conductivity was back calculated, and sigma-theta and potential temperature were recomputed for the interpolated records.
- DESPIKE2 removed spikes from secondary sensors in the same method as DESPIKE1.
- CTD package slowdown and reversals due to ship roll can move mixed water in tow in front of the CTD sensors. This mixture can create artificial density inversions and other artifacts. In addition to the Seasave R module LOOPEDIT, DELOOP, computes values of density locally referenced between every 1 dbar of pressure to compute N^2 = (- g/p) (dp/dz) and linearly interpolated measured parameters over those records where $N^2 \leq$ -1.0 e -05 s^{-2}.

Final calibrations are applied to delooped data files. ITS-90 temperature, PSS-78 salinity, and oxygen are computed, and WOCE quality flags are created (these flags and other CTD processing standards were established during the World Ocean Circulation Experiment in the 1990's).

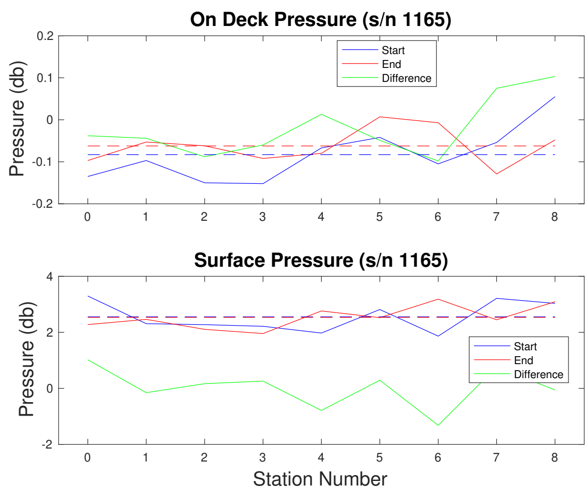
5.2 CTD Pressure

The Seabird pre-cruise pressure sensor calibration coefficients were applied to raw pressure data during each cast. Residual pressure offsets (the difference between the first and last submerged pressures) were examined to check for calibration shifts (see Figure 4 and Tables 12 - 14. All cruises used pressure sensor s/n 1165. Prior to each cruise a pressure offset of -0.524 was applied to the original offset, -2.271, in the pressure configuration file for a total pressure offset of -2.795. On deck pressures recorded before and after each cast are plotted in Figure 4.

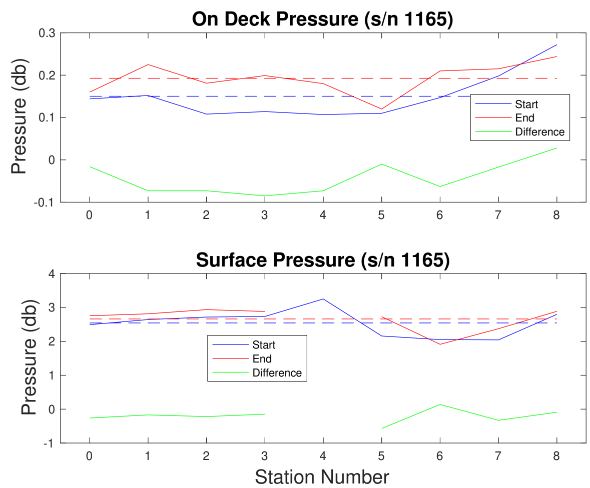
For FC2002 the on deck pressure before and after the cast was stable at -0.08 $\pm$ 0.07 dbar and -0.06 $\pm$ 0.04 dbar (median $\pm$ standard deviation). No pressure correction offset was necessary before final calibration of the data. Near surface pressure values (which is taken as the near-surface pressure at the markscan and the last fired bottle pressure) showed little variability over the cruise (2.55 $\pm$ 0.54 dbar before and 2.54 $\pm$ 0.42 dbar after).

For FC2012 the on deck pressure before and after the cast was stable at 0.15 $\pm$ 0.05 dbar and 0.19 $\pm$ 0.04 dbar (median $\pm$ standard deviation). No pressure correction offset was necessary before final calibration of the data. Near surface pressure values (which is taken as the near-surface pressure at the markscan and the last fired bottle pressure) showed little variability over the cruise (2.54 $\pm$ 0.40 dbar before and 2.66 $\pm$ 0.35 dbar after).

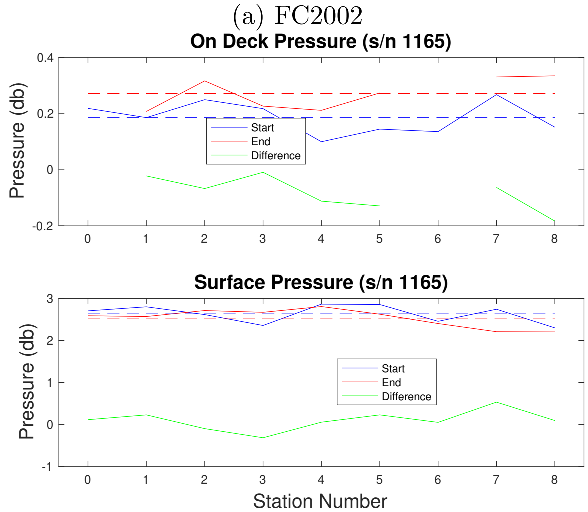
For FC2012Bthe on deck pressure before and after the cast was stable at 0.19 $\pm$ 0.06 dbar and 0.27 $\pm$ 0.06 dbar (median $\pm$ standard deviation). No pressure correction offset was necessary before final calibration of the data. Near surface pressure values (which is taken as the near-surface pressure at the markscan and the last fired bottle pressure) showed little variability over the cruise (2.63 $\pm$ 0.21 dbar before and 2.53 $\pm$ 0.21 dbar after).



(a) FC2002



(b) FC2012



(c) FC2012B

Figure 4: Top panel are the pressures (s/n 1165) measured on deck before the cast (blue), at the end of the upcast (red) and differences (green). Bottom panel are the near sea surface pressure values measured at the start of the downcast (blue), at the end of the upcast (red) and the difference (green).

Table 12: FC2002 - Near surface Pressure values and scan number used to remove surface soak and on-deck values (-999s are data no recorded).

Station	Markscan	Deck Prs Start	Deck Prs End	Sfc Prs Start	Sfc Prs End
0	4279	-0.1350	-0.0970	3.2973	2.2770
1	4311	-0.0970	-0.0530	2.3093	2.4630
2	4347	-0.1500	-0.0620	2.2741	2.1070
3	4935	-0.1520	-0.0920	2.2161	1.9570
4	3537	-0.0670	-0.0800	1.9749	2.7640
5	4612	-0.0420	0.0070	2.8151	2.5250
6	3974	-0.1050	-0.0070	1.8646	3.1850
7	4738	-0.0540	-0.1290	3.2140	2.4488
8	4176	0.0550	-0.0480	3.0340	3.0920

Table 13: Near surface Pressure values and scan number used to remove surface soak and on-deck values.

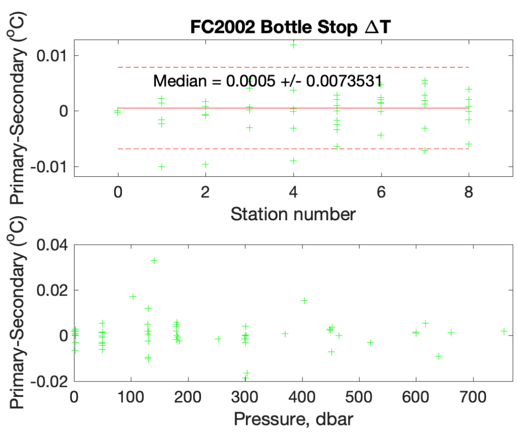
Station	Markscan	Deck Prs Start	Deck Prs End	Sfc Prs Start	Sfc Prs End
0	3696	0.1440	0.1600	2.4940	2.7560
1	3598	0.1520	0.2250	2.6440	2.8140
2	3324	0.1080	0.1810	2.7180	2.9370
3	3736	0.1140	0.1990	2.7350	2.8830
4	1873	0.1070	0.1800	3.2520	NaN
5	5698	0.1100	0.1200	2.1590	2.7300
6	3714	0.1470	0.2100	2.0520	1.9130
7	4291	0.1980	0.2150	2.0440	2.3740
8	4154	0.2720	0.2440	2.7980	2.8880

Table 14: FC2012B - Near surface Pressure values and scan number used to remove surface soak and on-deck values (-999s are data no recorded).

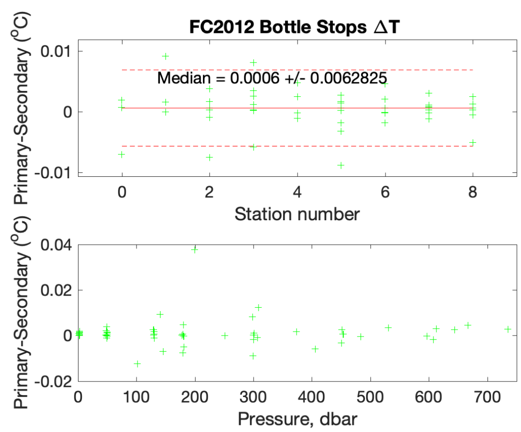
Station	Markscan	Deck Prs Start	Deck Prs End	Sfc Prs Start	Sfc Prs End
0	2493	0.2190	-999.0000	2.7047	2.5880
1	3219	0.1860	0.2080	2.8003	2.5700
2	2763	0.2500	0.3170	2.6159	2.7120
3	3304	0.2180	0.2270	2.3566	2.6700
4	2964	0.1000	0.2120	2.8642	2.8070
5	4105	0.1450	0.2740	2.8554	2.6250
6	2944	0.1360	-999.0000	2.4558	2.4030
7	3327	0.2680	0.3310	2.7430	2.2090
8	2941	0.1520	0.3350	2.3005	2.2040

5.3 CTD Temperature

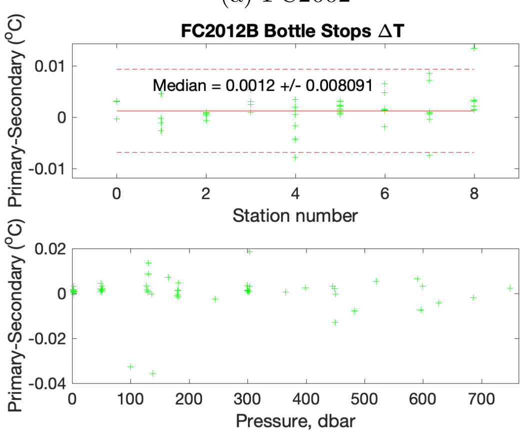
Temperature sensor calibration coefficients derived from the pre-cruise calibrations were applied to raw primary and secondary temperature data during each cast. Data accuracy, reproducibility and stability were examined by tabulating the difference between the two different temperature sensors over a range of pressures (bottle trip locations) for each cast. These comparisons are summarized in Figure 5, which shows the median temperature difference between the two sensors. For FC2002 there was a median of 0.0005 °C and a standard deviation of 0.007 °C. For FC2012 there was a median of 0.0006 °C and a standard deviation of 0.006 °C. For FC2012B there was a median of 0.0012 °C and a standard deviation of 0.008 °C.



(a) FC2002



(b) FC2012



(c) FC2012B

Figure 5: Temperature differences between sensors by station number (top) and pressure (bottom). The green represents all the cruise data. The red solid line represents the median with the red dashed representing the standard deviation (same for top and bottom).

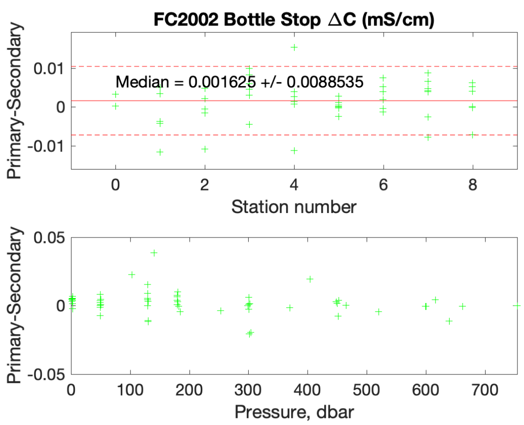
5.4 Conductivity

The Seabird pre-cruise conductivity sensor calibration coefficients were applied to raw primary and secondary conductivity data during each cast. Comparisons between the primary and secondary sensors and between each of the sensors to conductivity calculated from bottle salinities were used to derive conductivity corrections. Uncorrected C1-C2 are shown in Figure 6 to help identify sensor drift. The AOML/CTDCAL Toolbox automatically applies a quality control to the data based on comparison with a normal distribution.

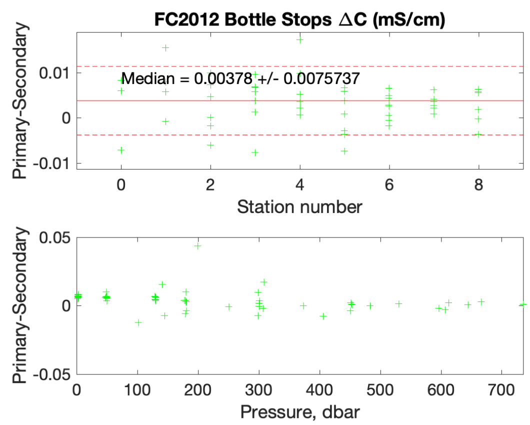
For FC2002 the sensors show a median difference of 0.002 mS/cm and a standard deviation of 0.009 mS/cm (Figure 6). Both sensors showed reasonable values for the residuals. The primary sensor, s/n 1692, was used for all the final data values (Figure 7).

For FC2012 the sensors show a median difference of 0.004 mS/cm and a standard deviation of 0.008 mS/cm (Figure 6). Both sensors showed reasonable values for the residuals. The primary sensor, s/n 1692, was used for all the final data values (Figure 7).

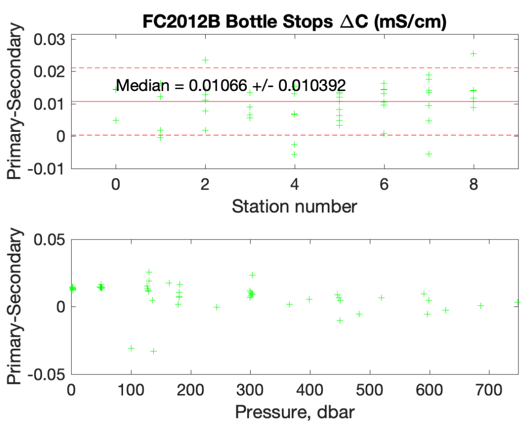
For FC2012B the sensors show a median difference of 0.01 mS/cm and a standard deviation of 0.01 mS/cm (Figure 6). Both sensors showed reasonable values for the residuals. The primary sensor, s/n 1692, was used for all the final data values (Figure 7).



(a) FC2002



(b) FC2012



(c) FC2012B

Figure 6: Conductivity upcast bottle stop (mS/cm) differences between sensors by station (top) and pressure (bottom). The green represents all the cruise data. The red solid line represents the median with the red dashed representing the standard deviation.

In order to calibrate the CTD conductivity data against the sample conductivity we assume a constant additive correction (offset), multiplicative correction (slope), time drift correction (represented by station number) and where needed, a linear pressure-dependent term. A non-linear function is used to derive these coefficients and are applied to

$$C_{new} = [m * C_{CTD} + (p_1 * station) + b + pcor * P]$$

with

FC2002 s/n 1692	FC2012 s/n 1692	FC2012B s/n 1692
m= 9.990029E-01	m= 9.993109E-01	m= 9.989868E-01
p_1= 0	p_1= 0	p_1= 0
b= 5.116166E-02	b= 3.022131E-02	b= 3.890872E-02
$pcor$= -1.420712E-05	$pcor$= -3.826491E-06	$pcor$= -1.148751E-05

Table 15: Conductivity calibration coefficients applied for final calibration.

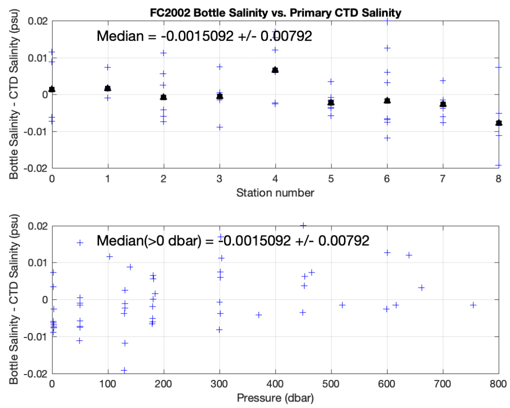
where C_{bottle} is bottle conductivity (S/m), C_{CTD} is pre-cruise calibrated CTD conductivity (S/m), m is the conductivity slope, b is the offset (S/m), P is the pressure, $pcor$ is the pressure correction coefficient, $station$ is the station number and p_1 is the polynomial coefficient. The fit is also weighted in such way that the final solution is preferentially forced to fit the data below a specified depth, in this case 1000 dbar. Final calibration coefficients are listed in Tables 15.

For FC2002 the coefficients estimated by the equation above were then applied to the CTD conductivities and the final results (Figure 8 to Figure 9) show a median of -7.0 · 10-5 psu and a standard deviation of 0.007 psu. After data reduction 54 data points (93.1 %) were used in the final calculations.

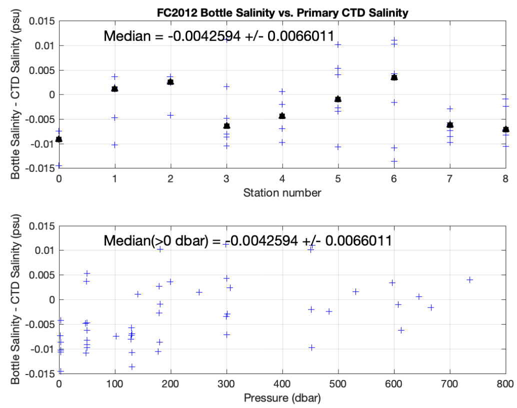
For FC2012 the coefficients estimated by the equation above were then applied to the CTD conductivities and the final results (Figure 8 to Figure 9) show a median of -1.0 · 10-3 psu and a standard deviation of 0.006 psu. After data reduction 49 data points (89.1 %) were used in the final calculations.

For FC2012B the coefficients estimated by the equation above were then applied to the CTD conductivities and the final results (Figure 8 to Figure 9) show a median of -2.8 · 10-4 psu and a standard deviation of 0.006 psu. After data reduction 53 data points (96.4 %) were used in the final calculations.

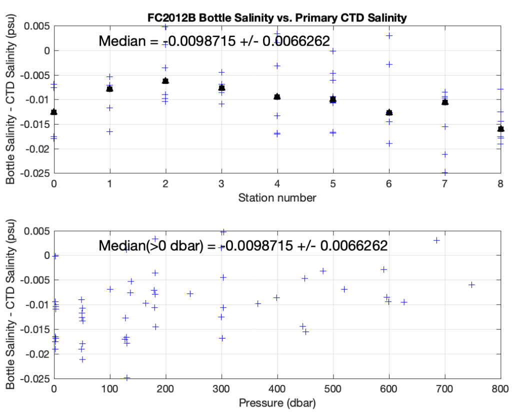
A final verification about the quality of the data was made by comparing the results of this cruise with some historical data (Figure 10 & 11).



(a) FC2002

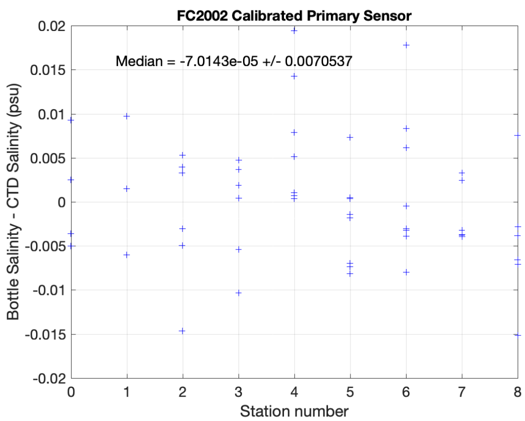


(b) FC2012

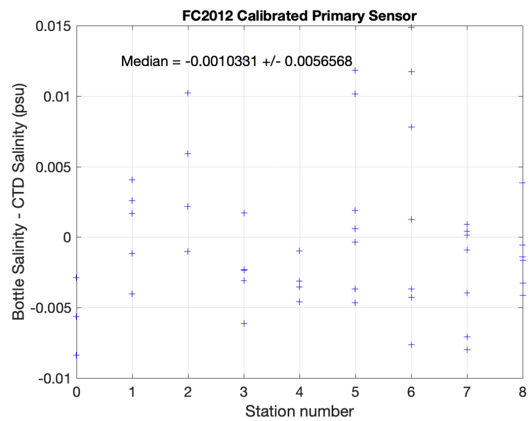


(c) FC2012B

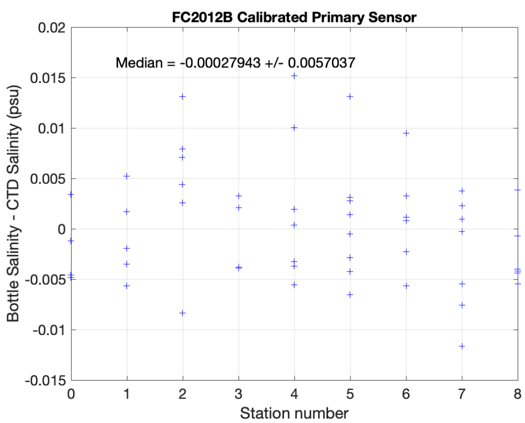
Figure 7: Bottle and uncalibrated CTD salinity differences plotted by station and pressure. The blue crosses represent all data points and the black square represent the median for each station. The overall median and standard deviation was calculated using all data points.



(a) FC2002

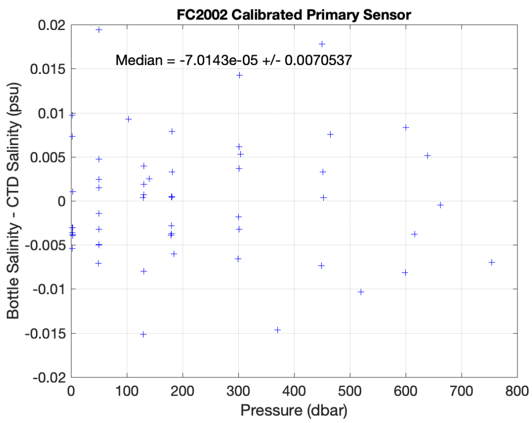


(b) FC2012

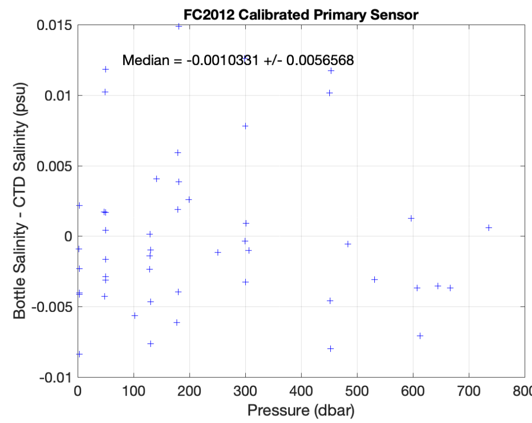


(c) FC2012B

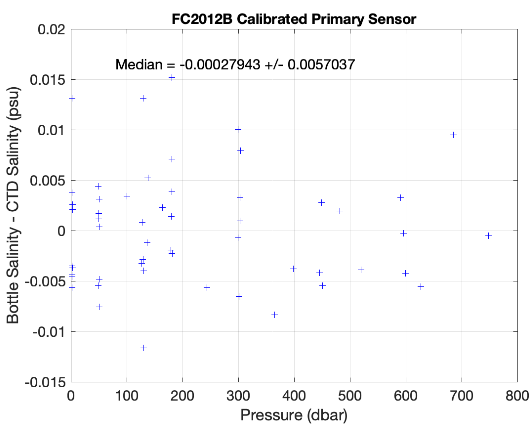
Figure 8: Bottle and calibrated CTD salinity differences plotted vs. station. The blue crosses represent all data points. The median values shown were calculated using all data.



(a) FC2002

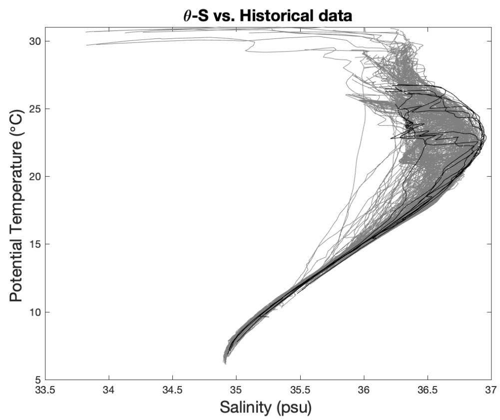


(b) FC2012

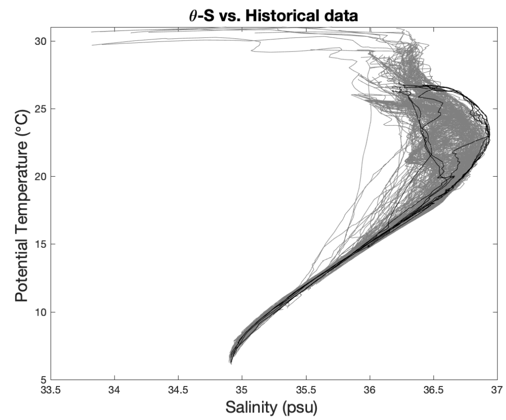


(c) FC2012B

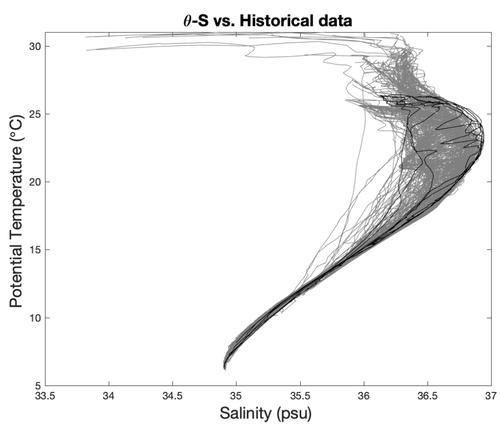
Figure 9: Bottle and calibrated CTD salinity differences plotted vs. pressure. The blue crosses represent all data points. The median values shown were calculated using all data.



(a) FC2002

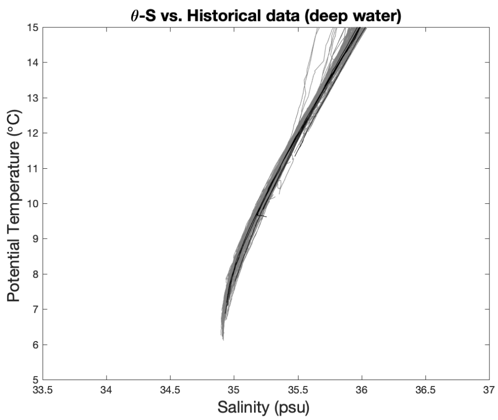


(b) FC2012

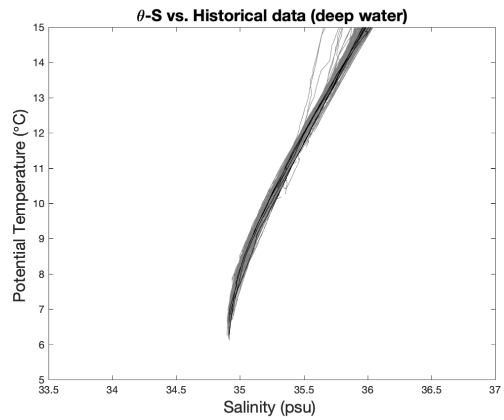


(c) FC2012B

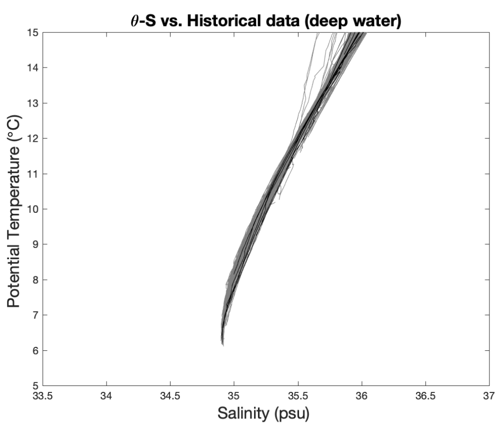
Figure 10: Potential Temperature (θ) - Salinity diagram for all stations. The solid black lines are the data collected during the 2020 cruises. Solid gray lines are historical data collected during the project.



(a) FC2002



(b) FC2012



(c) FC2012B

Figure 11: Potential Temperature (θ) - Salinity diagram for all stations (deep water). The solid black lines are the data collected during the 2020 cruises. Solid gray lines are historical data collected during the project.

5.5 Dissolved Oxygen

Three SBE43 dissolved O_2 (DO) sensors were used these four cruises (Table 5). Due to a hysteresis problem with the oxygen sensors, the oxygen sensors were calibrated to dissolved O_2 samples by matching the up cast bottle trips to down cast CTD data along neutral density surfaces, calculating CTD dissolved O_2, and then minimizing the residuals using a non-linear least-squares fitting procedure.

The algorithm used for converting oxygen sensor current and probe temperature measurements as described, requires a non-linear least squares regression technique in order to determine the best fit coefficients of the model for oxygen sensor behavior to the water sample observations. A non-linear least squares regression using the Gauss-Newton algorithm with Levenberg-Marquardt modifications for global convergence is used to profiles to the bottle data. This algorithm is independent of the first coefficients guess and demonstrates excellent convergence. This `oxfit.m` routine includes an optional time drift term (related with the station number), allowing all stations to be calibrated without breaking into discrete groupings. The Owens and Millard (1985) algorithm was modified as follows:

$$O\ (ml/l) = \{Soc * (V + V_{offset} + tau(T,S) * \frac{\delta v}{\delta t}) + p1 * station\}$$
$$*(1.0 + A * T + B * T^2 + C * T^3) * OXSAT(T,S) * e^{E*(\frac{P}{K})}$$

with

	FC2002 S/N 0730	FC2012 S/N 0730	FC2012B S/N 0730
Soc	0.5024837	0.5247291	0.5469745
V_offset	-0.5359110	-0.5315507	-0.5271904
A	0.0159720	0.00581965	-0.0043327
B	-0.0010221	-4.57982E-05	1.061498E-04
C	1.861082E-05	8.36986E-06	-1.871095-06
E	0.0487801	0.04019373	0.0316073
tau	1.122737	0	0
$p1$	0	0	0

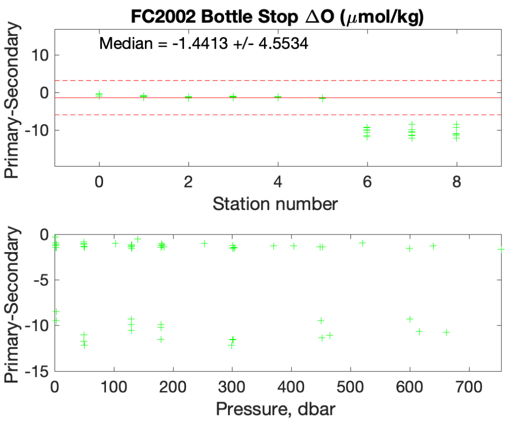
where Soc, tau, V_{offset}, A, B, C, E and $p1$ are the calibration coefficients shown above and V is the instrument voltage (V). T, S and P are the temperature, salinity and pressure measured by the CTD. K is the temperature in the absolute scale, $station$ is the station number, and $OXSAT$ is the oxygen saturation.

For FC2002 a comparison between the primary and secondary sensors (Figure 12) was evaluated. The sensors show a median difference of -1.44 $umol/kg$ and a standard deviation of 4.55 $umol/kg$. The primary sensor was used for all the final data values (Figure 13). After data reduction 56 data points (96.55%) were used in the final calculations. By minimizing the differences between the oxygen samples and the CTD oxygen estimated from the equation described in this section, the new coefficients above were calculated and then applied to the CTD original data (Figure 14 to Figure 15). The median is -0.22 $umol/kg$ and the standard deviation 1.34 $umol/kg$.

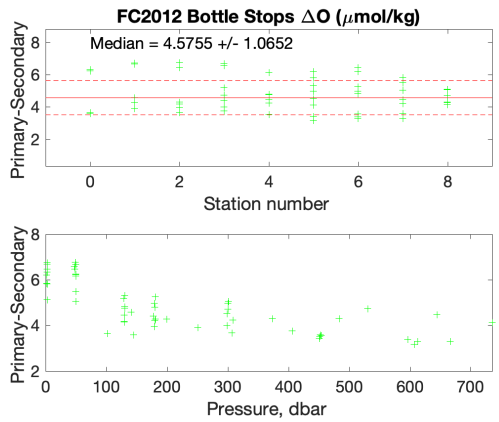
For FC2012 a comparison between the primary and secondary sensors (Figure 12) was evaluated. The sensors show a median difference of 4.58 $umol/kg$ and a standard deviation of 1.07 $umol/kg$. The primary sensor was used for all the final data values. Due to the contaminated oxygen samples there is no oxygen sensor comparison with bottle bottle samples. And average of the oxygen calibrations coefficients from FC2002 and FC2012B were used to calibrate the FC2012 sensors.

For FC2012B a comparison between the primary and secondary sensors (Figure 12) was evaluated. The sensors show a median difference of 4.48 $umol/kg$ and a standard deviation of 0.99 $umol/kg$. The primary sensor was used for all the final data values (Figure 13). After data reduction 35 data points (87.5%) were used in the final calculations. By minimizing the differences between the oxygen samples and the CTD oxygen estimated from the equation described in this section, the new coefficients above were calculated and then applied to the CTD original data (Figure 14 to Figure 15). The median is 0.13 $umol/kg$ and the standard deviation 0.88 $umol/kg$.

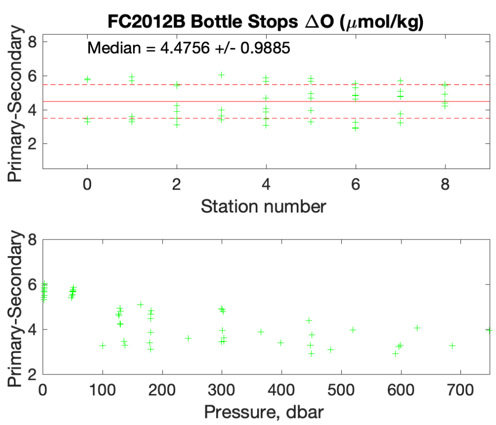
A final verification about the quality of the data, like in the salinity data, was made by comparing the results of this cruise with some historical data available at the location of the Florida Straits section (Figure 16 & 17).



(a) FC2002

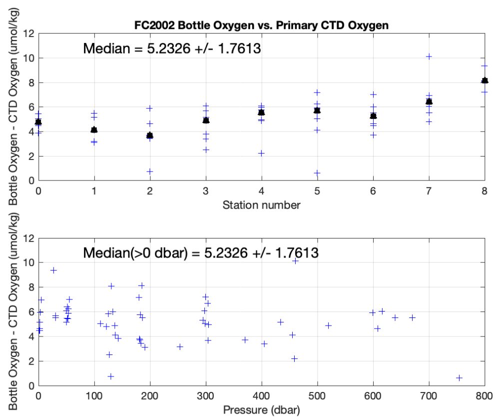


(b) FC2012

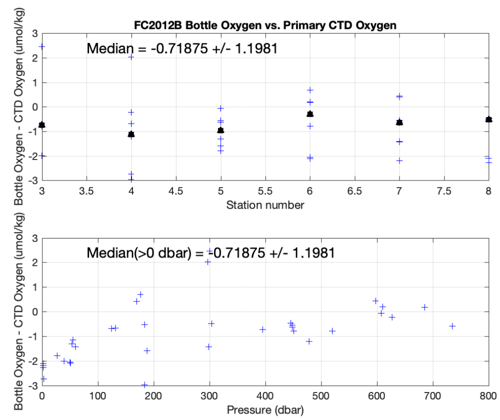


(c) FC2012B

Figure 12: Dissolved oxygen upcast bottle stop differences between sensors by station (top) and pressure (bottom). The green represents all the cruise data. The red solid line represents the median with the red dashed representing the standard deviation.

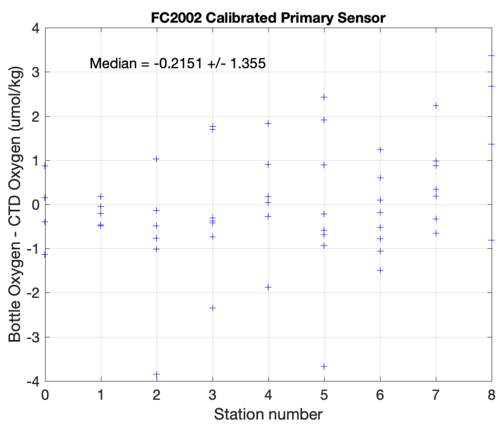


(a) FC2002

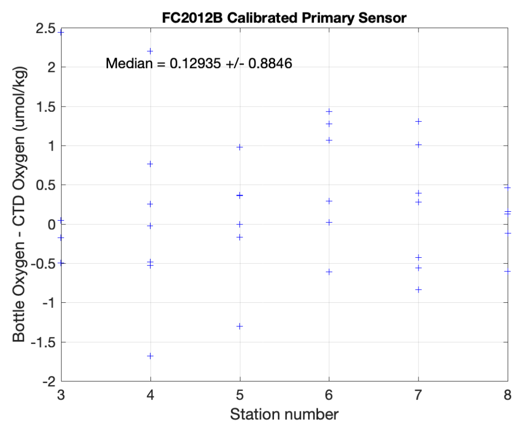


(b) FC2012B

Figure 13: Bottle and uncalibrated CTD oxygen differences plotted by station and pressure. The blue crosses represent all data points and the black square represent the median for each station. The overall median and standard deviation was calculated using all data points.

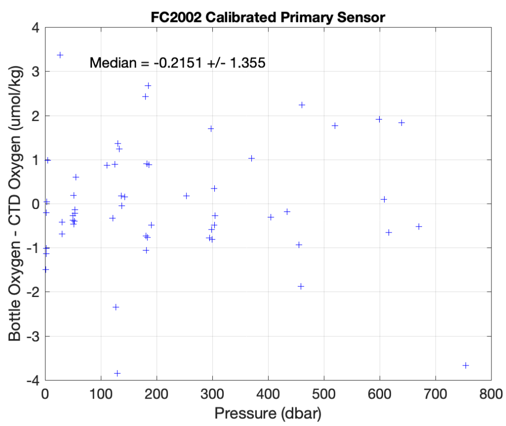


(a) FC2002

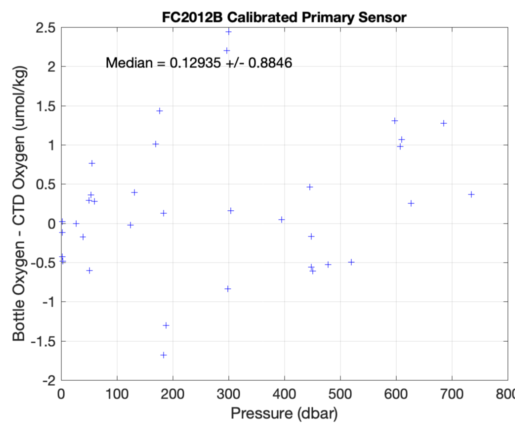


(b) FC2012B

Figure 14: Bottle and calibrated CTD oxygen differences plotted vs. station. The blue crosses represent all data points. The median values shown were calculated using all data.

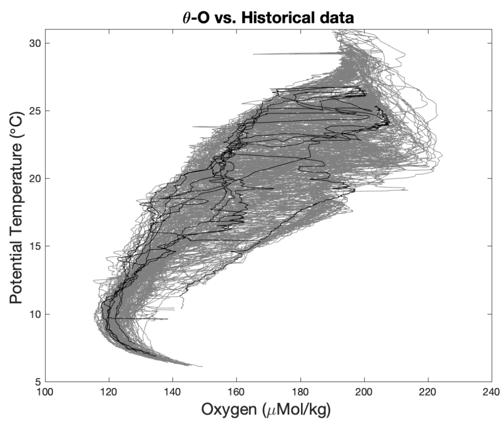


(a) FC2002

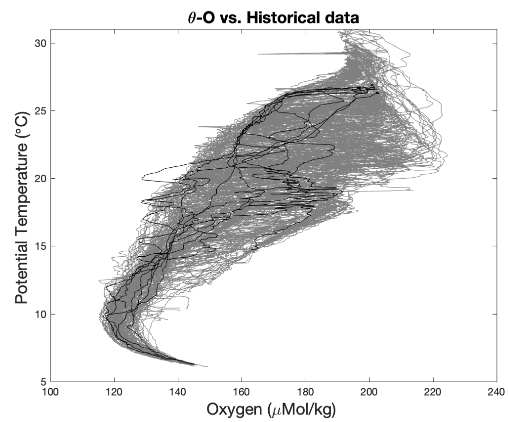


(b) FC2012B

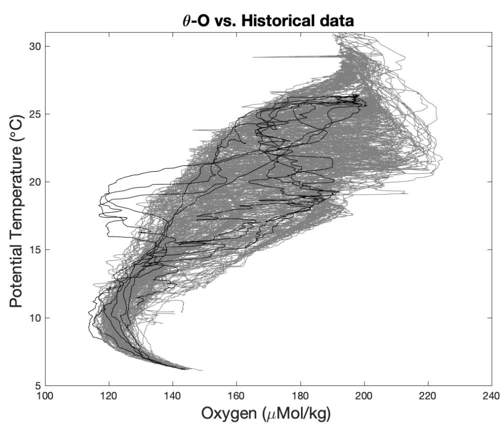
Figure 15: Bottle and calibrated CTD oxygen differences plotted vs. pressure. The blue crosses represent all data points. The median values shown were calculated using all data.



(a) FC2002

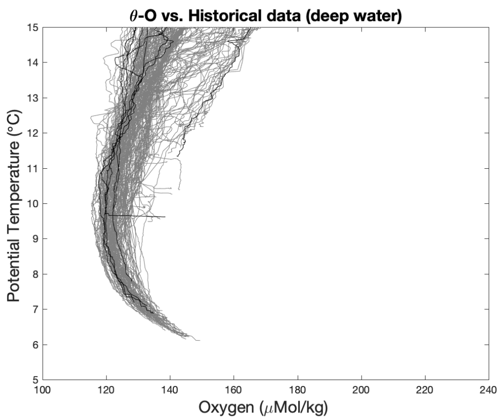


(b) FC2012

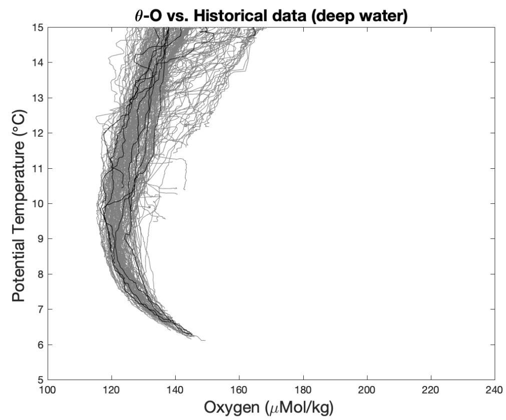


(c) FC2012B

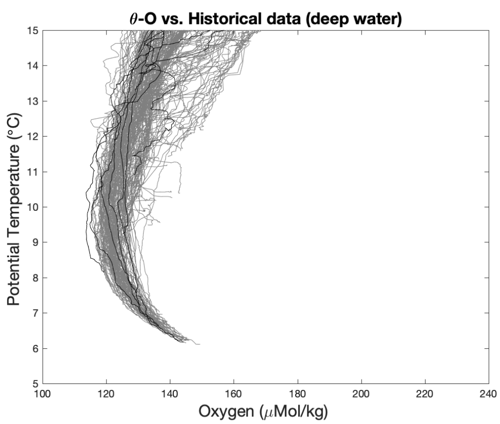
Figure 16: Potential Temperature (θ) - Oxygen diagram for all stations. The solid black lines are the data collected during the 2020 cruises. Solid gray lines are historical data collected during the project.



(a) FC2002



(b) FC2012



(c) FC2012B

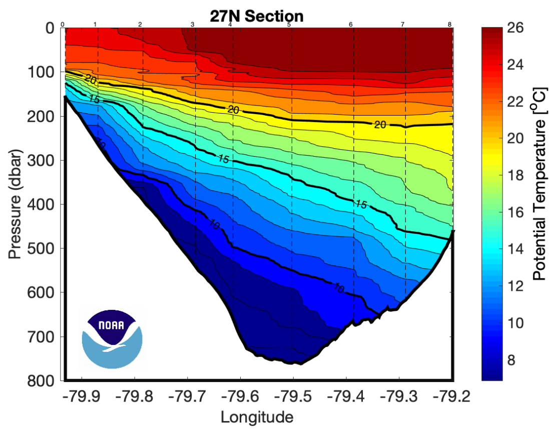
Figure 17: Potential Temperature (θ) - Oxygen diagram for all stations (deep water). The solid black lines are the data collected during the 2020 cruises. Solid gray lines are historical data collected during the project.

6 *Final CTD Data Presentation*

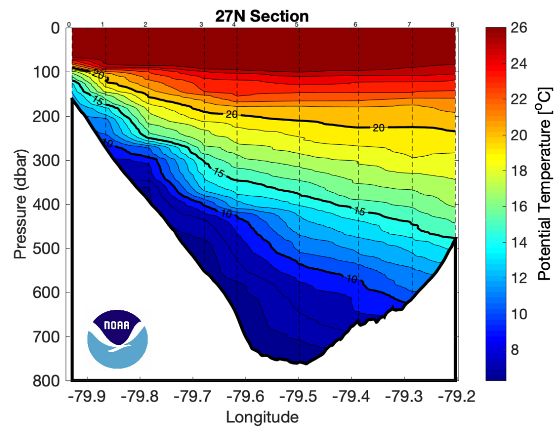
Post-cruise calibrations, determined from bottle data, were applied to CTD data associated with bottle data using Matlab sub-routines (`apply_calibration.m`). WOCE quality flags were appended to bottle data records. "bad values" (WOCE quality control value = 4) were flagged if the bottle samples failed the initial quality control and were not used for the calibration (which meant they fell outside 2.57 standard deviations of the difference between samples and uncalibrated CTD values). A second pass was applied, using the value of 2.5 times the standard deviation of the difference between calibrated CTD values and bottle samples, where bottle values may be flagged as "bad values".

The final calibrated CTD data files were used to produce the section plots that follow and the tables and station profile plots presented in the appendices. Vertical sections of potential temperature, CTD salinity, potential density, and CTD oxygen are contoured with pressure as the vertical axis. The Florida Current Section uses longitude as the horizontal axis (Figure 18 to Figure 21).

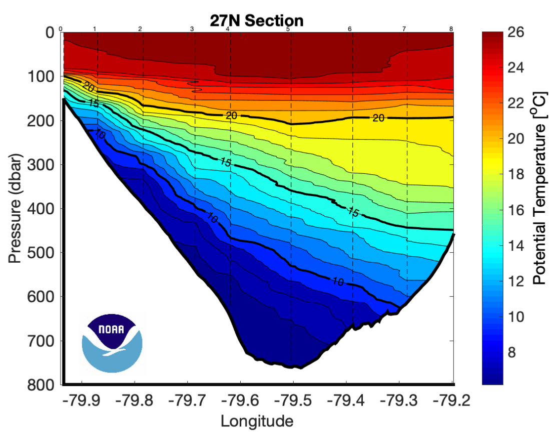
In Appendix A, for each CTD station, the upper table presents "standard depths" of the CTD cast, while the lower table lists the bottle CTD trip depths for the cast. Following the two tables, a page of 4 plots illustrate the data collected of the stations. Niskin bottle depths are indicated on the right side of the larger profile plot and bottle salinity and oxygen values are plotted as points in the three smaller plots. A WOCE formatted CTD cast summary file is shown in Appendix B. It lists information regarding the beginning, middle (bottom of the cast), and end of each CTD cast. Finally, a bottle summary file (WOCE formatted) is presented in Appendix C. This table lists the specific details associated with each Niskin bottle trip over the course of the entire cruise. The -999's in the tables represent missing data.



(a) FC2002

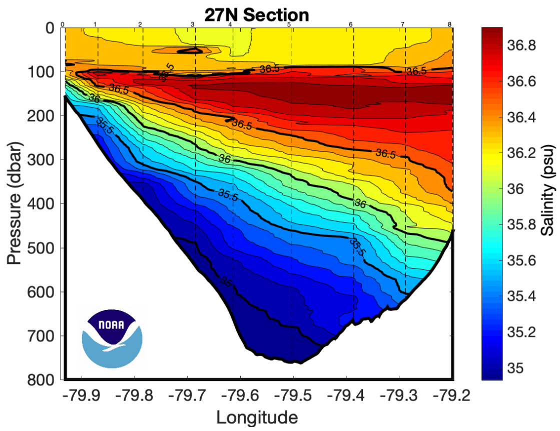


(b) FC2012

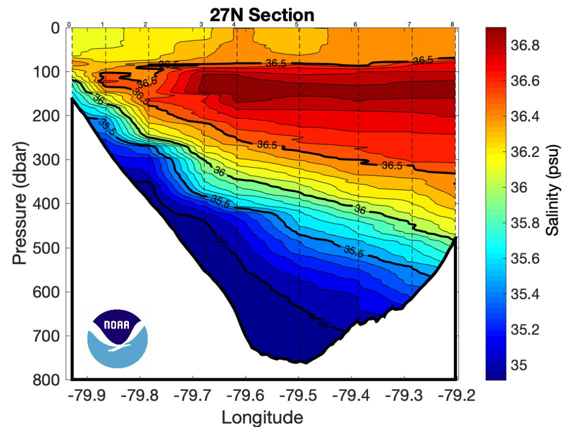


(c) FC2012B

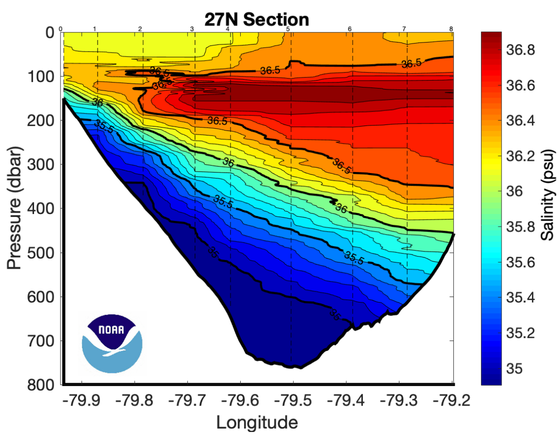
Figure 18: Potential Temperature (°C) for the 27°N section. Dashed vertical lines are the CTD station locations.



(a) FC2002

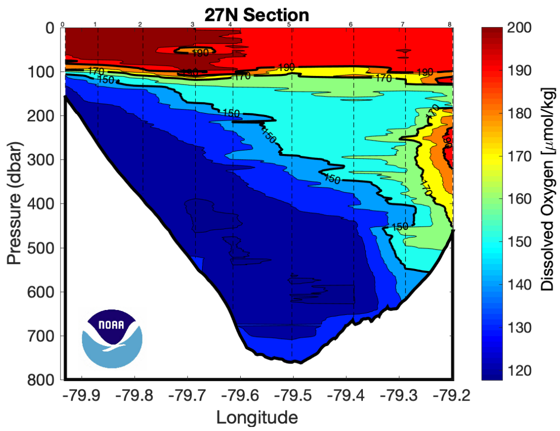


(b) FC2012

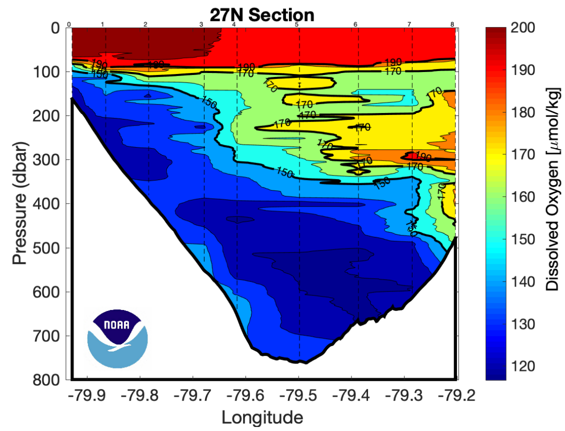


(c) FC2012B

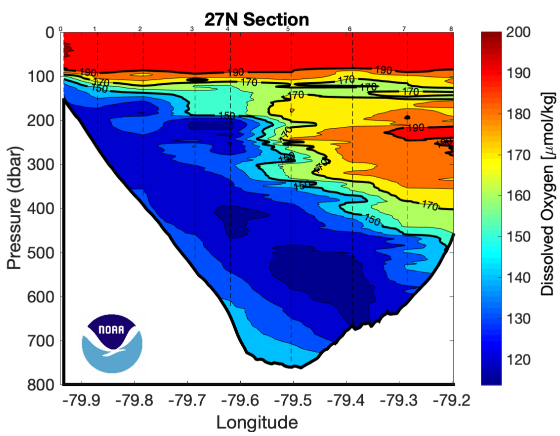
Figure 19: Salinity (PSS 78) for the 27°N section. Dashed vertical lines are the CTD station locations.



(a) FC2002

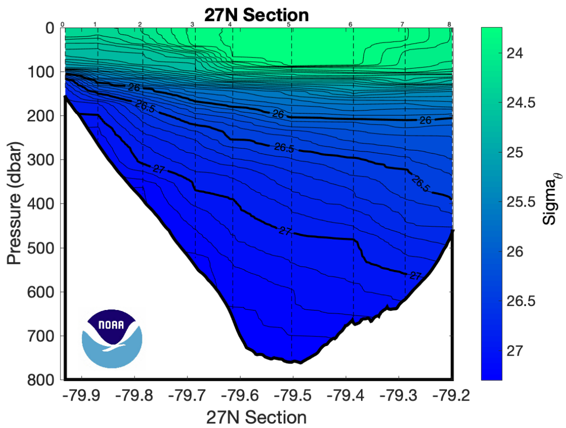


(b) FC2012

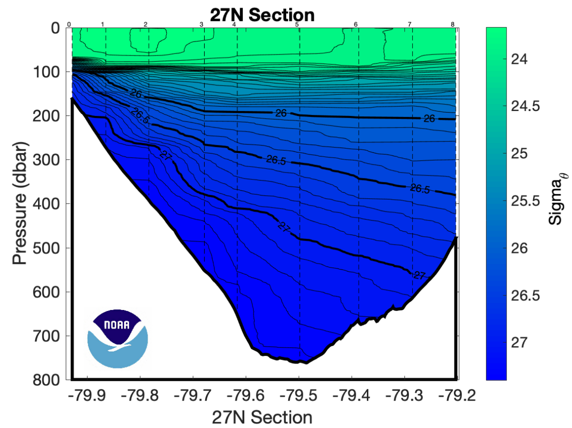


(c) FC2012B

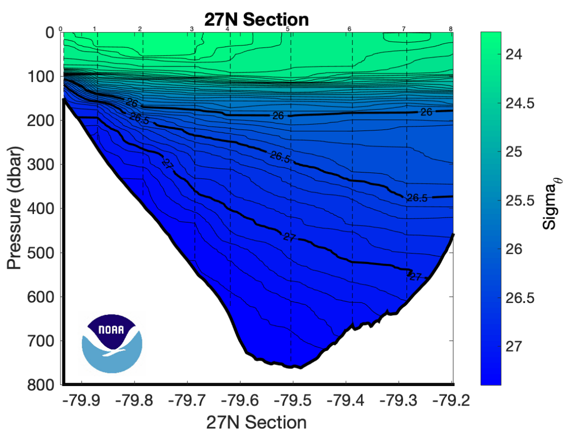
Figure 20: Dissolved Oxygen (μmol/kg) for the 27°N section. Dashed vertical lines are the CTD station locations.



(a) FC2002



(b) FC2012



(c) FC2012B

Figure 21: Neutral density (kg/m3) for the 27°N section. Dashed vertical lines are the CTD station locations.

7 Acknowledgements

The successful completion of the cruise relied on dedicated assistance from many individuals on shore and at sea. Western Boundary Time Series project members were instrumental in planning and executing the cruise, and we offer special thanks to our research cruise participants in 2020: Denis Volkov, Andrew Stefanick, Diego Ugaz, Ulises Rivero, Grant Rawson, Pedro Pena, Christian Saiz, Heidi VanBuskirk, Austin Schlenz and Nicolas Rivas. Additionally we would like to thank the officers and crew of the R/V *F. G. Walton Smith*, who exhibited a high degree of professionalism and assistance to accomplish our work, while at the same time making us feel at home during the voyages. We also thank NOAA program managers for their continued support of our efforts. This research was also made possible with support of the Cooperative Institute for Marine and Atmospheric Studies (CIMAS), a Cooperative Institute of the University of Miami and NOAA via cooperative agreement #NA15OAR4320064 (FC2002) and #NA20OAR4320472 (FC2012,FC2012B). Additional support was provided by OAR's Atlantic Oceanographic and Meteorological Laboratory. SPECIAL NOTE: A portion of this research was conducted within the jurisdictional waters of the Bahamas. Bahamian research clearance was obtained prior to conducting the research outlined in this report. We thank the Bahamian government for granting our request to conduct research in Bahamian waters.

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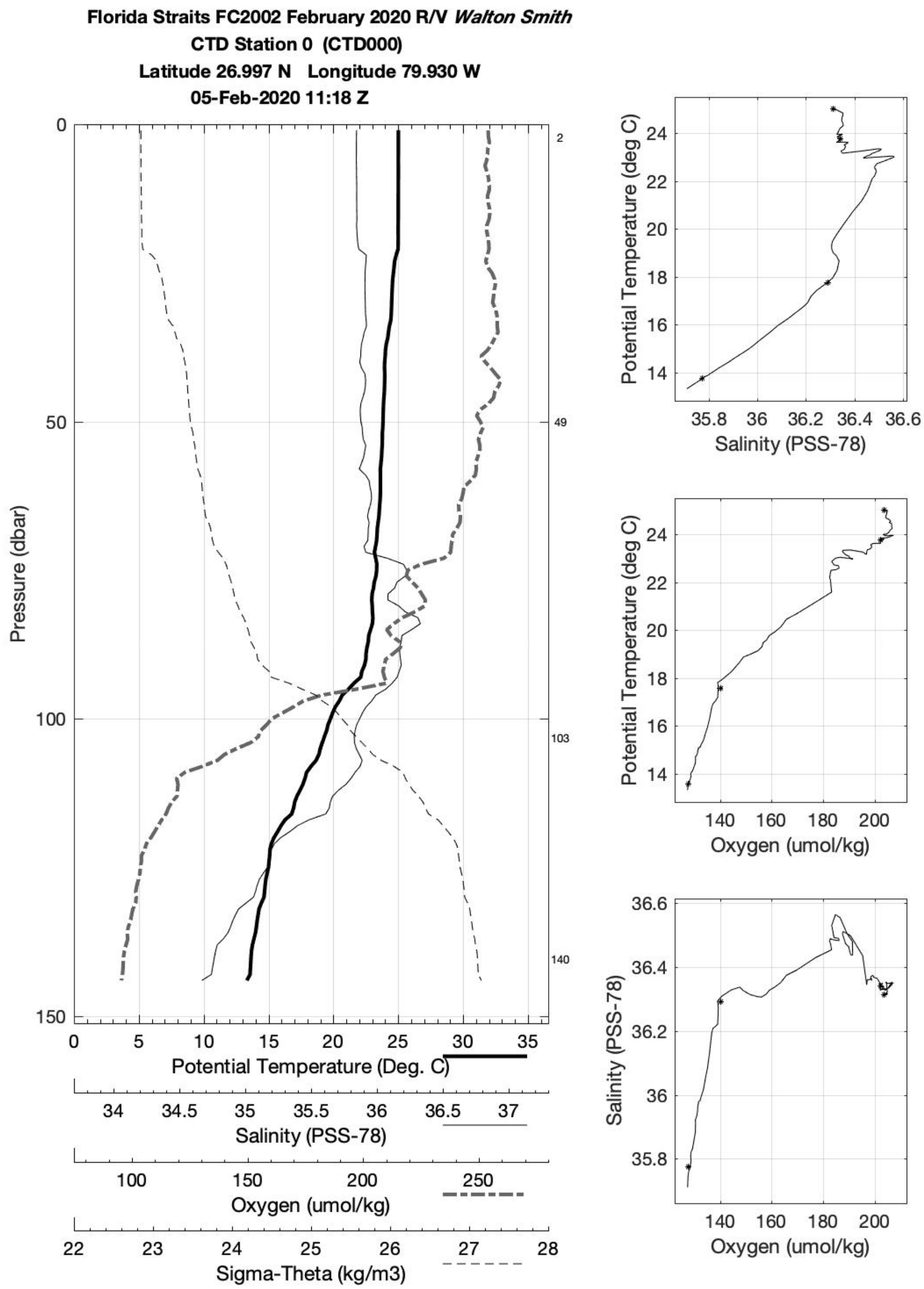
A Hydrographic CTD Data

A.1 FC2002 - February 2020

Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 0 (CTD000)
Latitude 26.997N Longitude 79.930W
05-Feb-2020 11:18Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	25.013	25.013	36.315	204.7	0.004	24.332
10	25.010	25.008	36.316	204.9	0.036	24.334
20	25.000	24.996	36.320	204.8	0.072	24.341
30	24.502	24.496	36.350	205.6	0.106	24.515
50	23.839	23.828	36.332	203.0	0.173	24.701
75	23.354	23.338	36.512	187.7	0.251	24.982
100	19.792	19.774	36.327	159.1	0.319	25.835
125	15.016	14.997	35.966	131.4	0.362	26.718

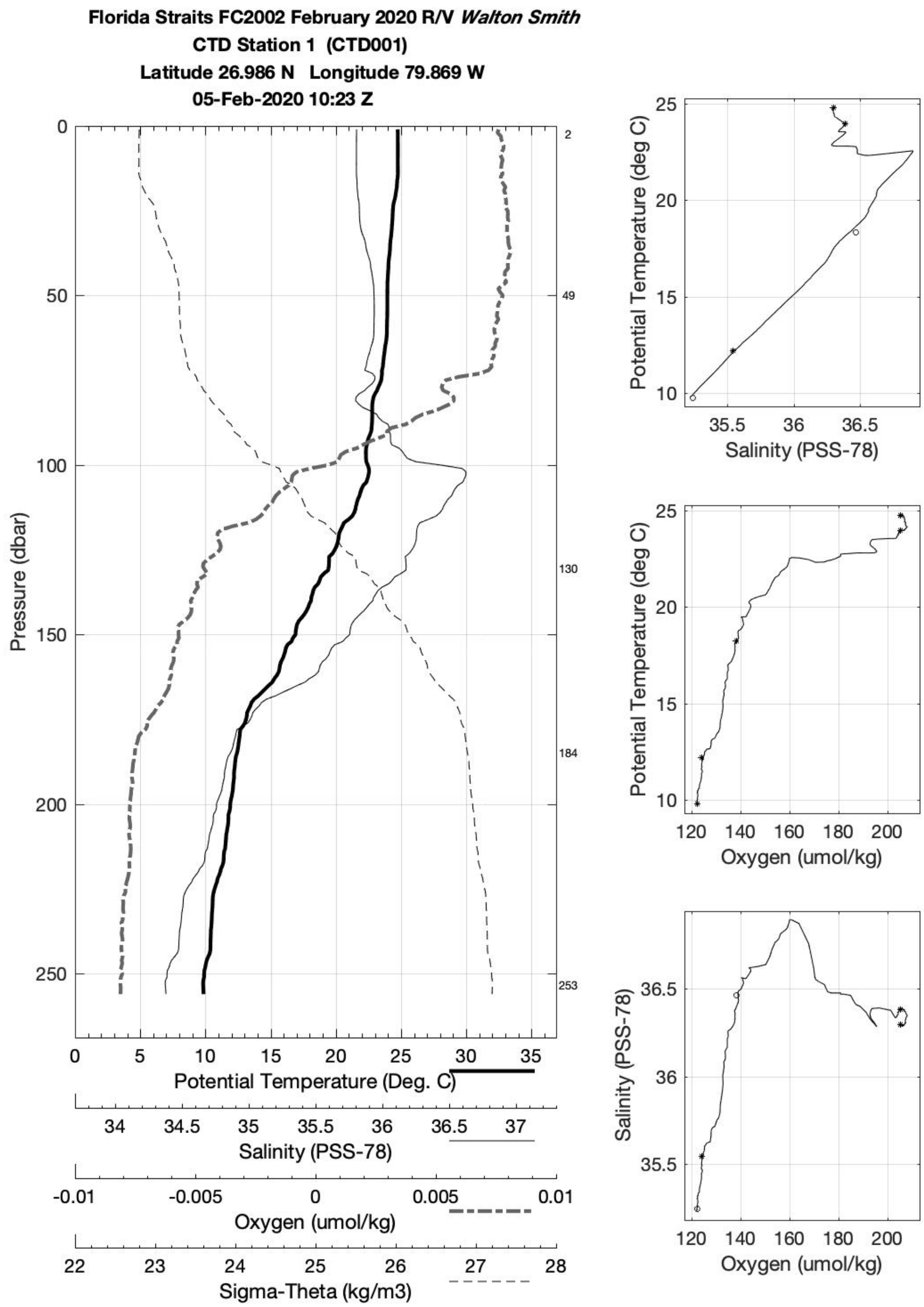
Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
140	1	13.788	13.768	35.775	127.8
103	2	17.764	17.746	36.291	140.1
50	3	23.782	23.772	36.340	202.3
2	4	25.013	25.012	36.313	203.6


Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 0 (CTD000)
Latitude 26.997 N Longitude 79.930 W
05-Feb-2020 11:18 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 1 (CTD001)
Latitude 26.986N Longitude 79.869W
05-Feb-2020 10:23Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}	DynHt m^2·s^{-2}	SigT kg·m^{-3}
1	24.751	24.750	36.289	205.6	0.004	24.392
10	24.758	24.756	36.288	206.4	0.035	24.390
20	24.600	24.596	36.296	207.0	0.071	24.444
30	24.304	24.298	36.312	207.4	0.105	24.546
50	23.965	23.954	36.386	206.5	0.171	24.705
75	23.495	23.479	36.389	193.8	0.251	24.847
100	22.465	22.444	36.757	167.9	0.323	25.427
125	19.936	19.913	36.596	144.0	0.381	26.003
150	16.929	16.904	36.251	134.9	0.425	26.498
200	11.926	11.899	35.513	124.3	0.487	27.007
250	9.930	9.901	35.238	122.5	0.539	27.155

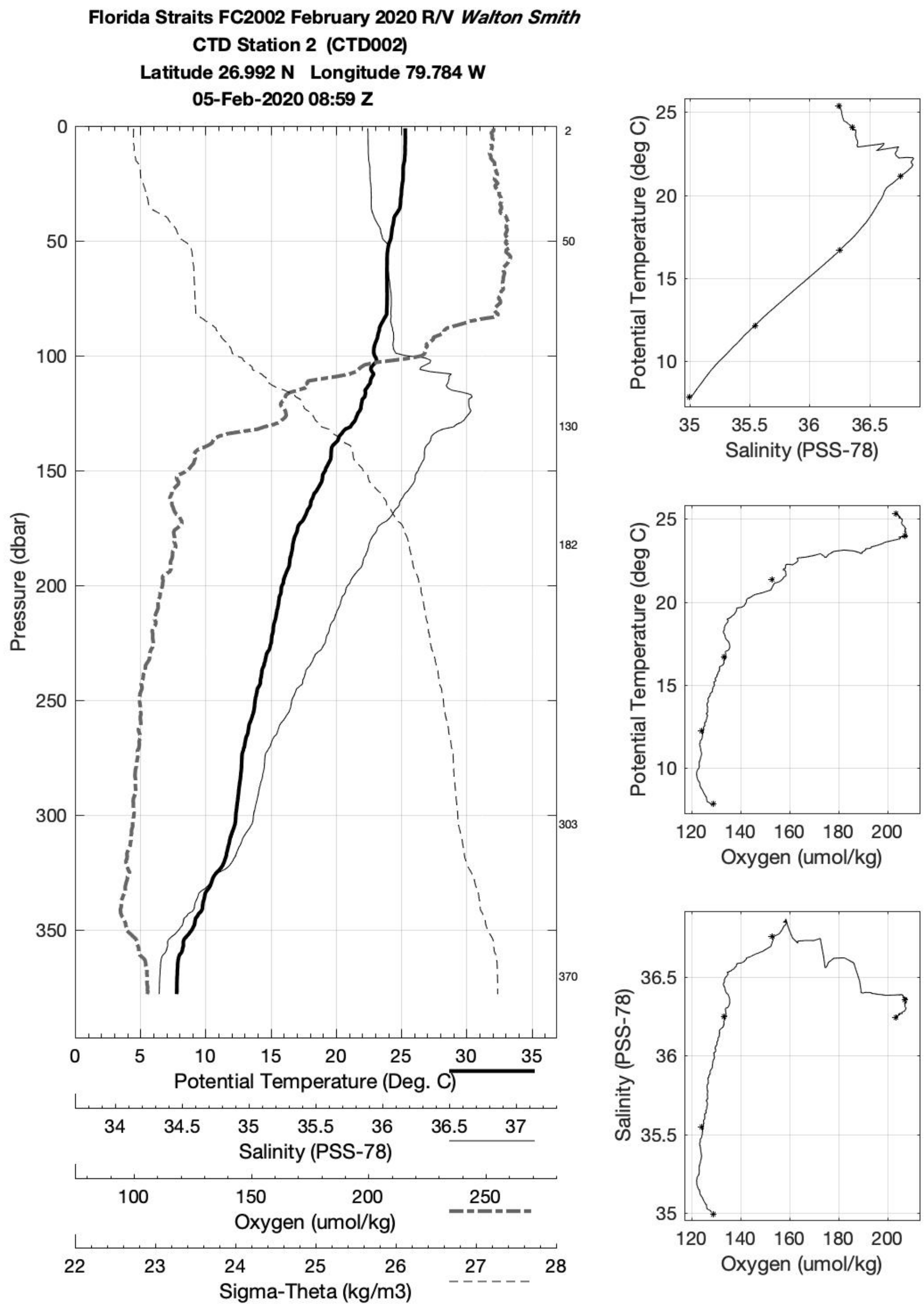
Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}
253	1	9.811	9.782	35.244	122.3
185	2	12.204	12.180	35.543	124.2
130	3	18.344	18.321	36.466	138.4
50	4	23.967	23.956	36.385	205.4
2	5	24.769	24.768	36.297	205.4


Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 1 (CTD001)
Latitude 26.986 N Longitude 79.869 W
05-Feb-2020 10:23 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
2
49
130
184
253
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 2 (CTD002)
Latitude 26.992N Longitude 79.784W
05-Feb-2020 08:59Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	25.303	25.303	36.248	204.1	0.004	24.191
10	25.297	25.294	36.250	203.7	0.037	24.196
20	25.150	25.146	36.260	204.8	0.074	24.249
30	25.014	25.008	36.268	205.4	0.111	24.298
50	24.150	24.140	36.346	207.0	0.180	24.619
75	23.930	23.914	36.387	205.3	0.262	24.718
100	22.975	22.955	36.475	188.5	0.339	25.066
125	21.709	21.684	36.853	158.4	0.405	25.716
150	19.211	19.184	36.548	136.8	0.457	26.157
200	15.901	15.870	36.129	131.3	0.538	26.647
250	13.836	13.799	35.796	126.3	0.606	26.845
300	12.361	12.321	35.568	125.0	0.667	26.968

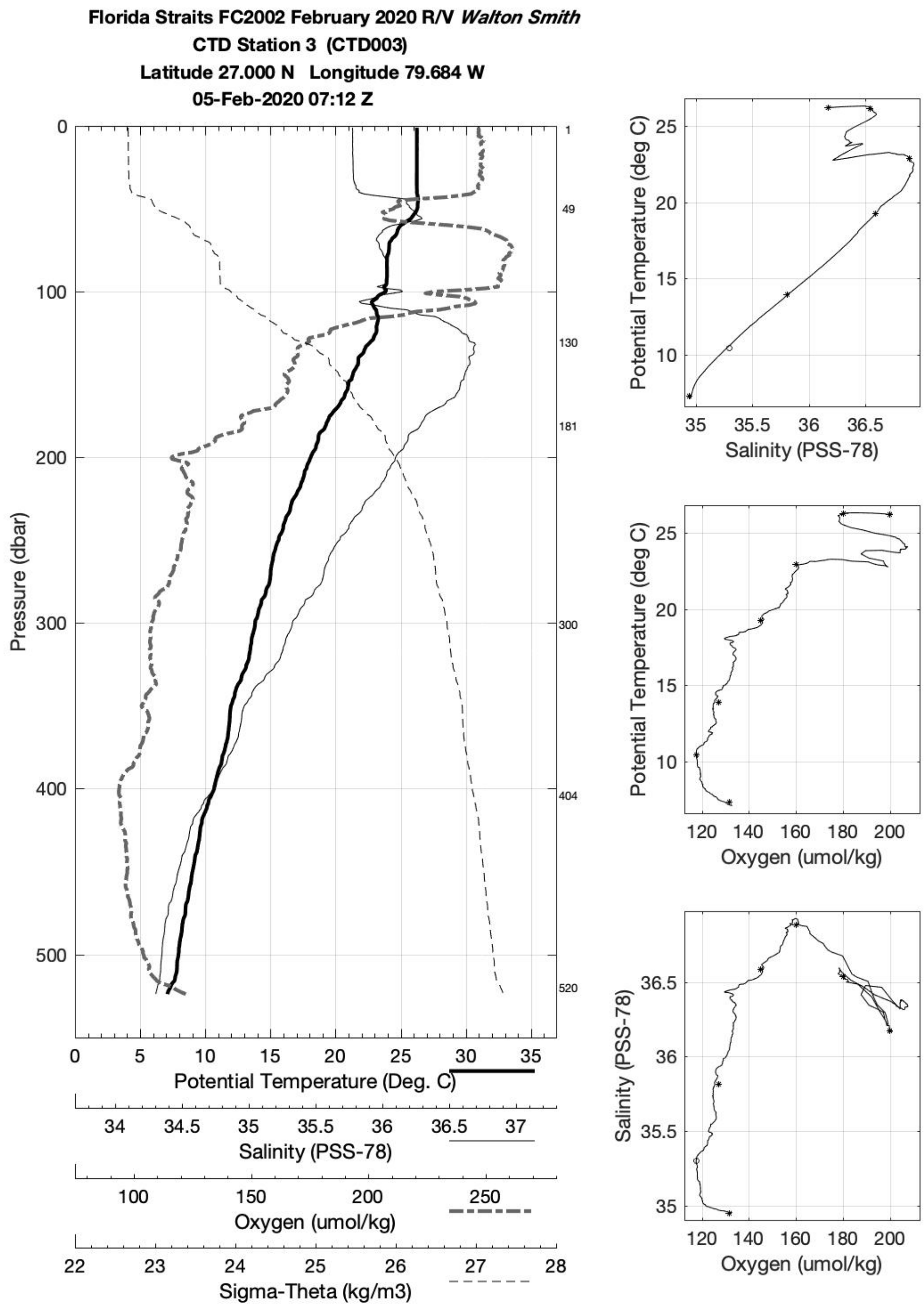
Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
370	1	7.866	7.828	34.995	128.9
304	2	12.181	12.140	35.545	124.2
182	3	16.699	16.669	36.250	133.4
131	4	21.142	21.117	36.757	152.8
50	5	24.075	24.064	36.358	206.9
2	6	25.352	25.351	36.244	203.2


Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 2 (CTD002)
Latitude 26.992 N Longitude 79.784 W
05-Feb-2020 08:59 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 3 (CTD003)
Latitude 27.000N Longitude 79.684W
05-Feb-2020 07:12Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$	DynHt $m^2 \cdot s^{-2}$	SigT $kg \cdot m^{-3}$
1	26.241	26.241	36.168	200.0	0.004	23.839
10	26.244	26.242	36.169	200.3	0.041	23.839
20	26.242	26.238	36.171	200.3	0.081	23.842
30	26.241	26.234	36.173	200.2	0.122	23.845
50	26.284	26.273	36.530	180.4	0.201	24.102
75	24.108	24.092	36.345	207.4	0.289	24.633
100	23.869	23.848	36.478	189.6	0.371	24.806
125	23.139	23.113	36.846	165.7	0.444	25.301
150	21.366	21.336	36.864	155.4	0.504	25.821
200	18.126	18.091	36.435	129.7	0.603	26.349
250	15.666	15.627	36.088	132.1	0.682	26.670
300	13.866	13.822	35.796	125.1	0.750	26.840
400	10.723	10.673	35.311	117.7	0.868	27.077
500	7.992	7.940	34.989	123.2	0.965	27.274

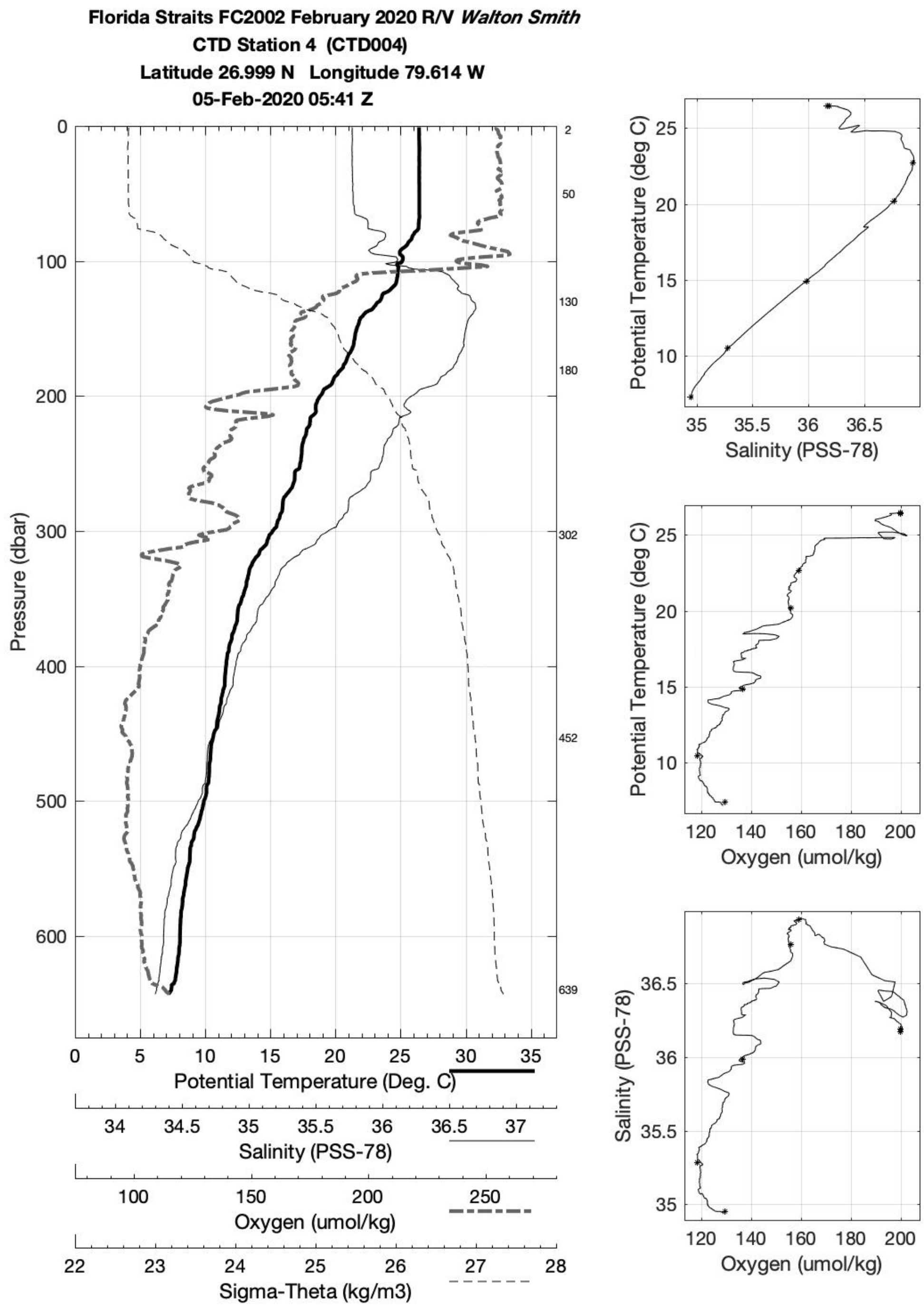
Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$
520	1	7.339	7.288	34.948	131.8
404	2	10.473	10.424	35.297	117.6
301	3	13.960	13.916	35.813	127.2
181	4	19.276	19.243	36.585	145.1
130	5	22.924	22.897	36.887	160.2
50	6	26.198	26.187	36.541	180.1
2	7	26.216	26.216	36.171	199.9


Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 3 (CTD003)
Latitude 27.000 N Longitude 79.684 W
05-Feb-2020 07:12 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 4 (CTD004)
Latitude 26.999N Longitude 79.614W
05-Feb-2020 05:41Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$	DynHt $m^2 \cdot s^{-2}$	SigT $kg \cdot m^{-3}$
1	26.416	26.416	36.170	199.6	0.004	23.786
10	26.426	26.423	36.172	200.3	0.041	23.784
20	26.438	26.434	36.170	199.7	0.082	23.780
30	26.438	26.431	36.171	200.3	0.123	23.781
50	26.448	26.437	36.176	200.0	0.206	23.783
75	26.397	26.380	36.269	196.1	0.309	23.871
100	25.158	25.136	36.451	190.8	0.403	24.397
125	23.622	23.595	36.892	163.6	0.483	25.195
150	21.672	21.643	36.879	155.6	0.546	25.747
200	18.864	18.828	36.541	142.7	0.651	26.244
250	17.329	17.287	36.345	137.2	0.736	26.478
300	15.226	15.179	36.020	139.5	0.812	26.719
400	11.647	11.595	35.443	122.5	0.936	27.010
500	9.955	9.896	35.210	119.9	1.045	27.134
600	8.124	8.062	34.995	122.8	1.142	27.260

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$
640	1	7.391	7.327	34.952	129.6
453	2	10.547	10.492	35.280	118.7
302	3	14.932	14.886	35.984	136.6
181	4	20.244	20.210	36.766	156.0
130	5	22.705	22.678	36.934	159.1
50	6	26.454	26.443	36.188	199.8
3	7	26.432	26.432	36.170	199.8

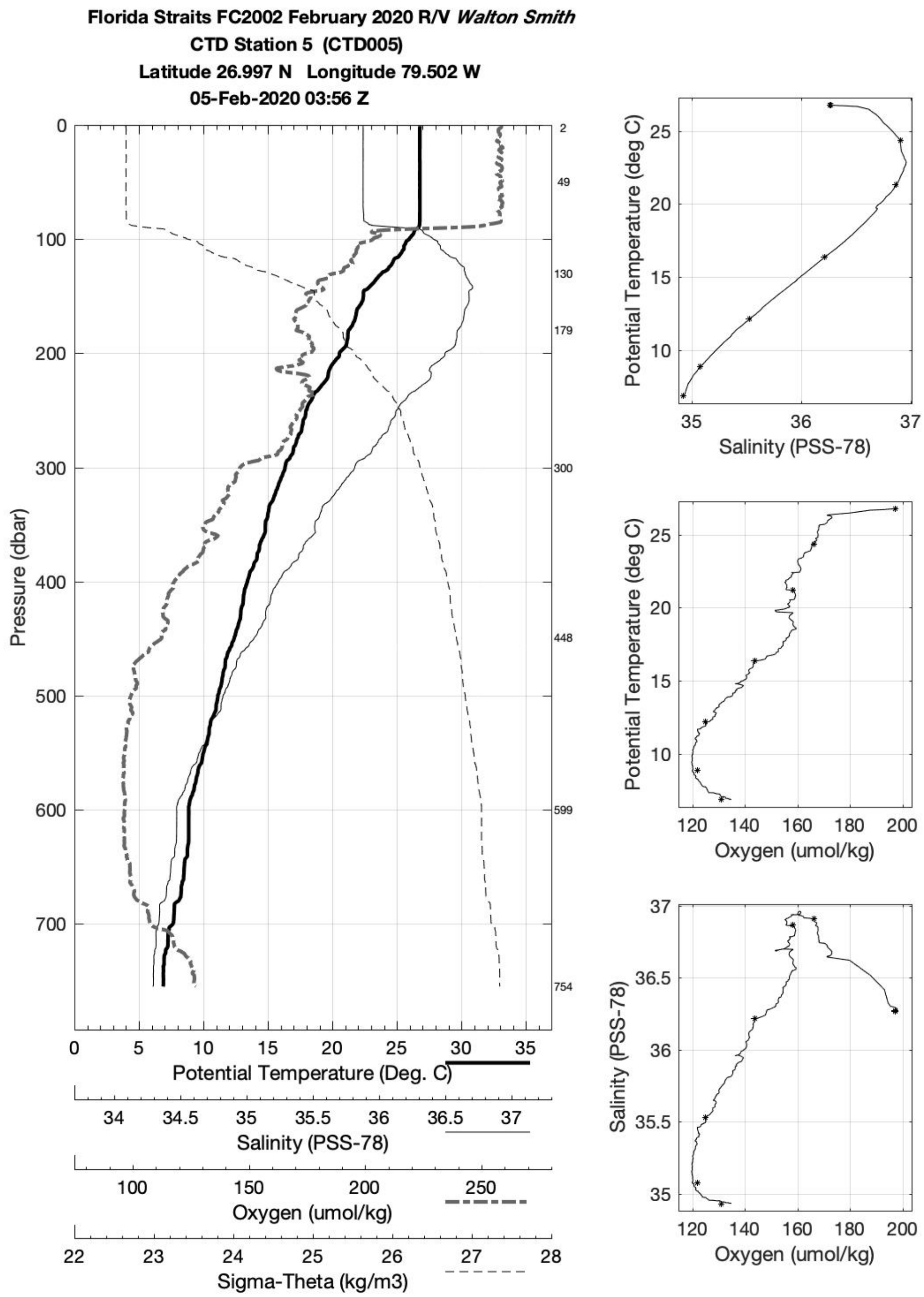


Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 4 (CTD004)
Latitude 26.999 N Longitude 79.614 W
05-Feb-2020 05:41 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 5 (CTD005)
Latitude 26.997N Longitude 79.502W
05-Feb-2020 03:56Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	26.780	26.780	36.266	198.0	0.004	23.742
10	26.775	26.773	36.266	197.7	0.041	23.744
20	26.776	26.772	36.265	198.4	0.083	23.744
30	26.772	26.765	36.266	198.2	0.125	23.747
50	26.786	26.774	36.265	197.8	0.208	23.743
75	26.791	26.774	36.267	197.3	0.312	23.745
100	25.975	25.952	36.711	171.5	0.412	24.340
125	24.384	24.357	36.909	165.6	0.495	24.980
150	22.429	22.398	36.939	158.6	0.562	25.578
200	20.582	20.544	36.786	157.9	0.676	25.979
250	18.003	17.960	36.477	156.4	0.771	26.414
300	16.375	16.326	36.212	144.0	0.852	26.605
400	13.470	13.412	35.729	130.4	0.992	26.873
500	11.185	11.122	35.375	121.5	1.113	27.045
600	8.928	8.861	35.080	120.1	1.218	27.203
700	7.718	7.647	34.967	125.5	1.314	27.300

Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
754	1	6.953	6.880	34.924	131.0
600	2	8.953	8.887	35.075	122.1
449	3	12.229	12.168	35.530	125.1
301	4	16.423	16.374	36.215	143.8
180	5	21.378	21.343	36.870	158.2
130	6	24.364	24.336	36.908	166.4
50	7	26.781	26.769	36.263	197.2
3	13	26.763	26.762	36.274	197.3

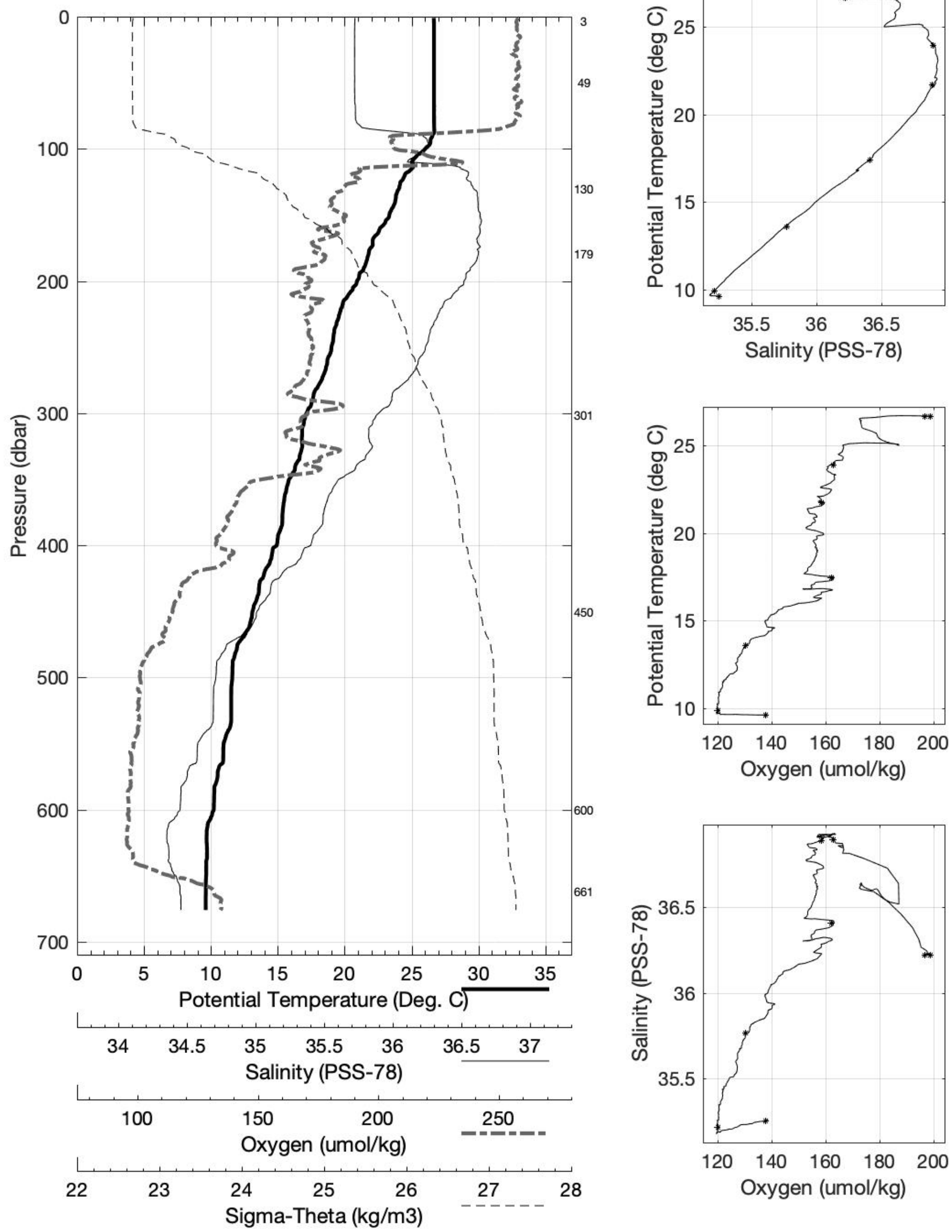

Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 5 (CTD005)
Latitude 26.997 N Longitude 79.502 W
05-Feb-2020 03:56 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 6 (CTD006)
Latitude 26.995N Longitude 79.385W
05-Feb-2020 02:18Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	26.661	26.661	36.226	198.4	0.004	23.750
10	26.682	26.680	36.225	198.1	0.041	23.743
20	26.683	26.679	36.224	198.0	0.083	23.743
30	26.686	26.679	36.225	198.0	0.125	23.743
50	26.688	26.676	36.224	197.9	0.208	23.744
75	26.698	26.680	36.229	198.7	0.312	23.746
100	26.037	26.015	36.629	173.4	0.412	24.259
125	24.196	24.170	36.872	166.2	0.495	25.009
150	23.377	23.345	36.924	163.6	0.567	25.293
200	20.959	20.920	36.835	156.7	0.687	25.913
250	19.059	19.014	36.620	157.1	0.785	26.256
300	17.204	17.153	36.359	155.9	0.872	26.521
400	14.994	14.932	35.981	137.4	1.023	26.743
500	11.662	11.597	35.451	122.1	1.150	27.016
600	10.289	10.216	35.252	119.8	1.263	27.111

Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
662	1	9.698	9.621	35.252	137.8
600	2	9.984	9.913	35.218	120.0
450	3	13.635	13.570	35.768	130.1
301	4	17.466	17.414	36.410	162.2
180	5	21.724	21.689	36.887	158.3
130	6	23.980	23.952	36.893	162.8
50	7	26.669	26.658	36.221	196.9
3	13	26.662	26.661	36.222	198.8

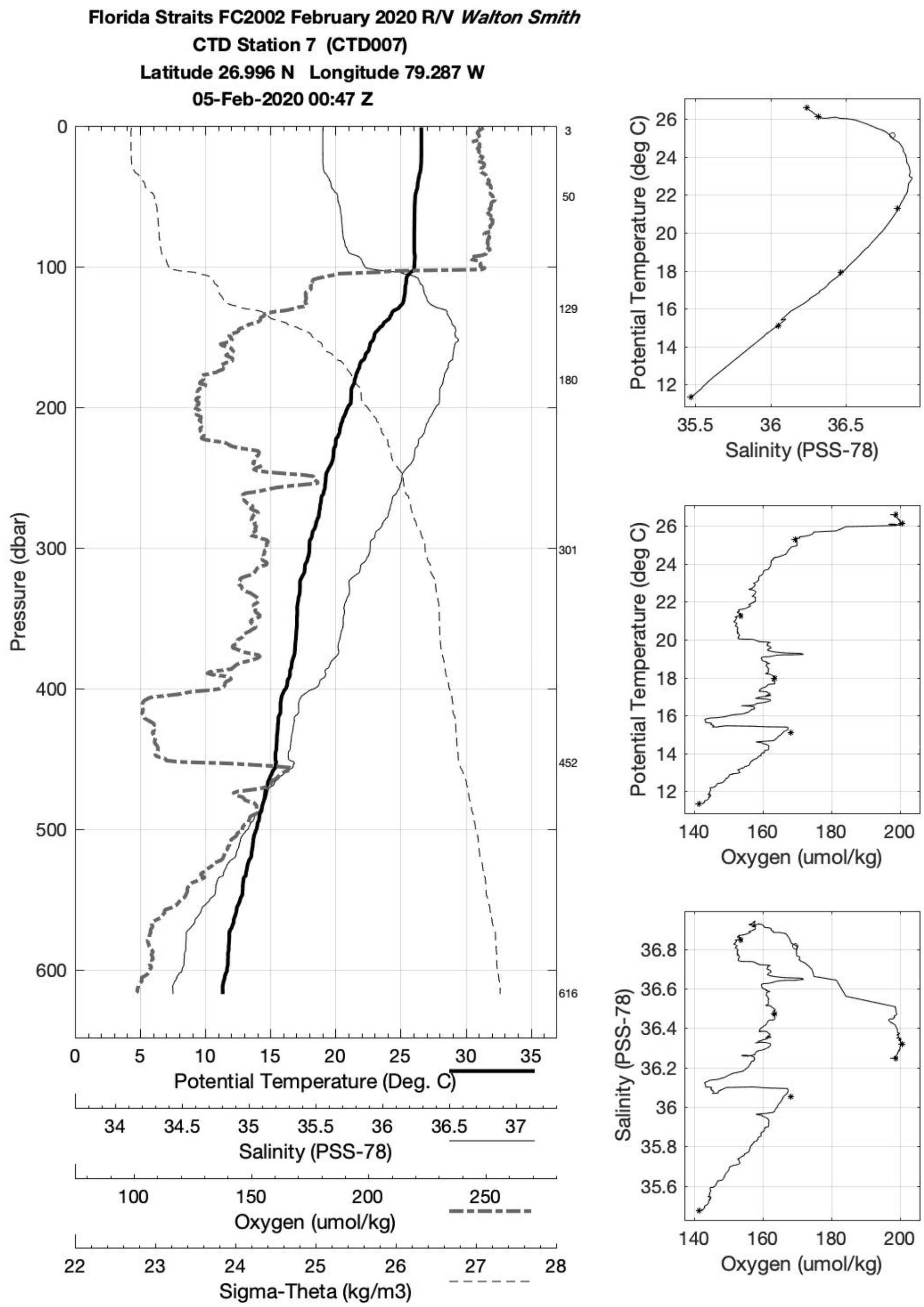
Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 6 (CTD006)
Latitude 26.995 N Longitude 79.385 W
05-Feb-2020 02:18 Z



Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 7 (CTD007)
Latitude 26.996N Longitude 79.287W
05-Feb-2020 00:47Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}	DynHt m^2·s^{-2}	SigT kg·m^{-3}
1	26.587	26.587	36.248	198.9	0.004	23.790
10	26.604	26.601	36.247	198.1	0.041	23.784
20	26.601	26.597	36.247	197.9	0.082	23.786
30	26.558	26.551	36.250	198.5	0.123	23.803
50	26.132	26.121	36.323	200.4	0.204	23.994
75	26.068	26.051	36.348	200.0	0.301	24.035
100	26.070	26.048	36.461	198.4	0.398	24.121
125	25.239	25.211	36.786	169.7	0.485	24.627
150	22.988	22.957	36.927	157.6	0.559	25.409
200	20.985	20.946	36.824	151.5	0.676	25.898
250	19.302	19.257	36.652	171.1	0.777	26.218
300	18.048	17.996	36.489	163.5	0.868	26.414
400	16.235	16.171	36.202	155.7	1.030	26.633
500	14.006	13.932	35.862	159.5	1.174	26.868
600	11.748	11.669	35.525	144.2	1.297	27.060

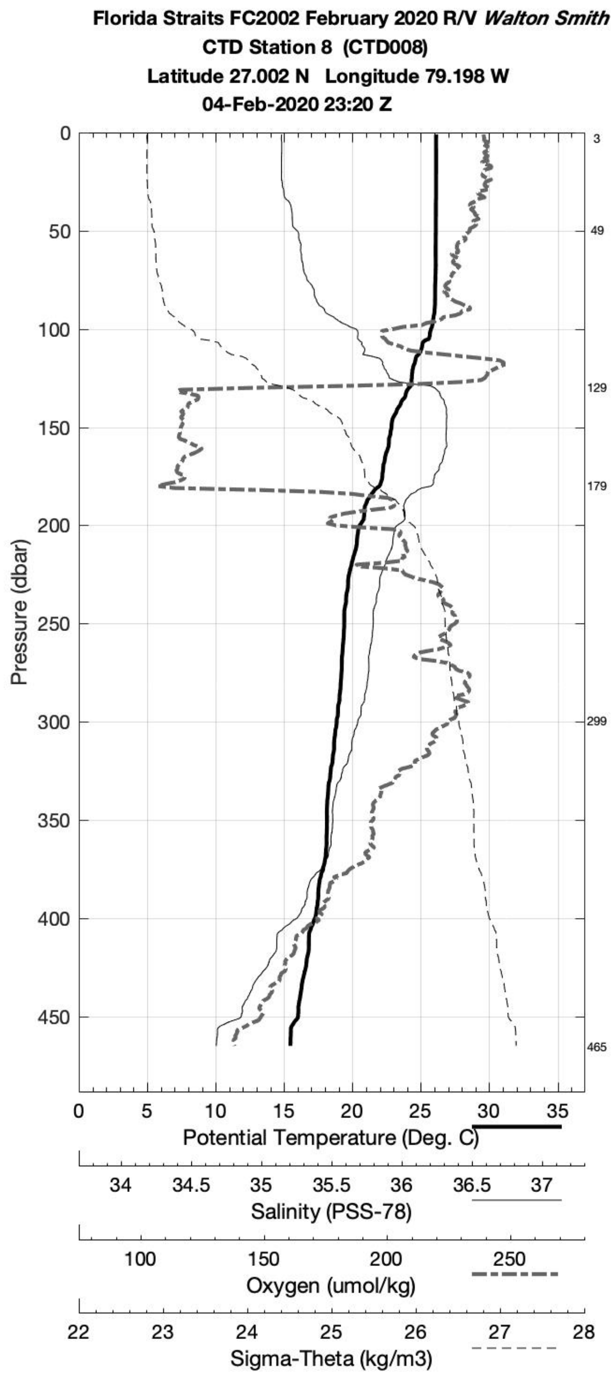
Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}
616	1	11.419	11.339	35.474	141.5
452	2	15.166	15.095	36.050	168.1
301	3	17.954	17.902	36.470	163.4
180	4	21.346	21.311	36.845	153.6
130	5	25.179	25.151	36.814	169.6
50	6	26.149	26.138	36.319	200.6
3	7	26.590	26.590	36.243	198.9


Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 7 (CTD007)
Latitude 26.996 N Longitude 79.287 W
05-Feb-2020 00:47 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

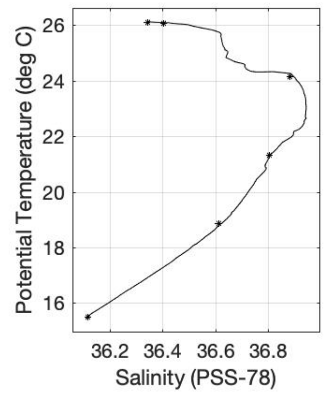
Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 8 (CTD008)
Latitude 27.002N Longitude 79.198W
04-Feb-2020 23:20Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}	DynHt m^2·s^{-2}	SigT kg·m^{-3}
1	26.118	26.118	36.344	199.0	0.004	24.011
10	26.122	26.120	36.345	199.1	0.039	24.011
20	26.123	26.119	36.344	199.1	0.078	24.011
30	26.123	26.117	36.353	198.4	0.117	24.018
50	26.107	26.096	36.402	197.3	0.195	24.061
75	26.084	26.067	36.437	194.6	0.291	24.097
100	25.768	25.746	36.615	187.7	0.385	24.332
125	24.369	24.342	36.737	199.2	0.469	24.854
150	22.890	22.859	36.945	160.7	0.539	25.450
200	20.575	20.537	36.766	180.3	0.658	25.965
250	19.449	19.403	36.678	195.4	0.757	26.200
300	18.903	18.849	36.622	194.4	0.851	26.300
400	17.339	17.271	36.401	177.9	1.025	26.525

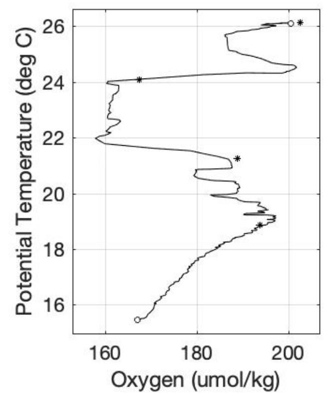
Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}
465	1	15.550	15.477	36.115	166.9
299	2	18.901	18.847	36.612	193.9
180	3	21.346	21.311	36.805	189.0
130	4	24.156	24.129	36.882	167.3
49	5	26.063	26.052	36.404	200.4
3	6	26.100	26.100	36.342	202.5



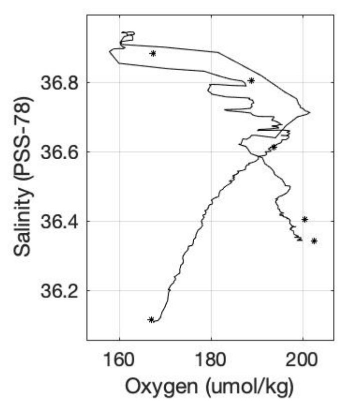
Florida Straits FC2002 February 2020 R/V *Walton Smith*
CTD Station 8 (CTD008)
Latitude 27.002 N Longitude 79.198 W
04-Feb-2020 23:20 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
3
49
129
179
299
465



Potential Temperature (deg C)
Salinity (PSS-78)



Potential Temperature (deg C)
Oxygen (umol/kg)



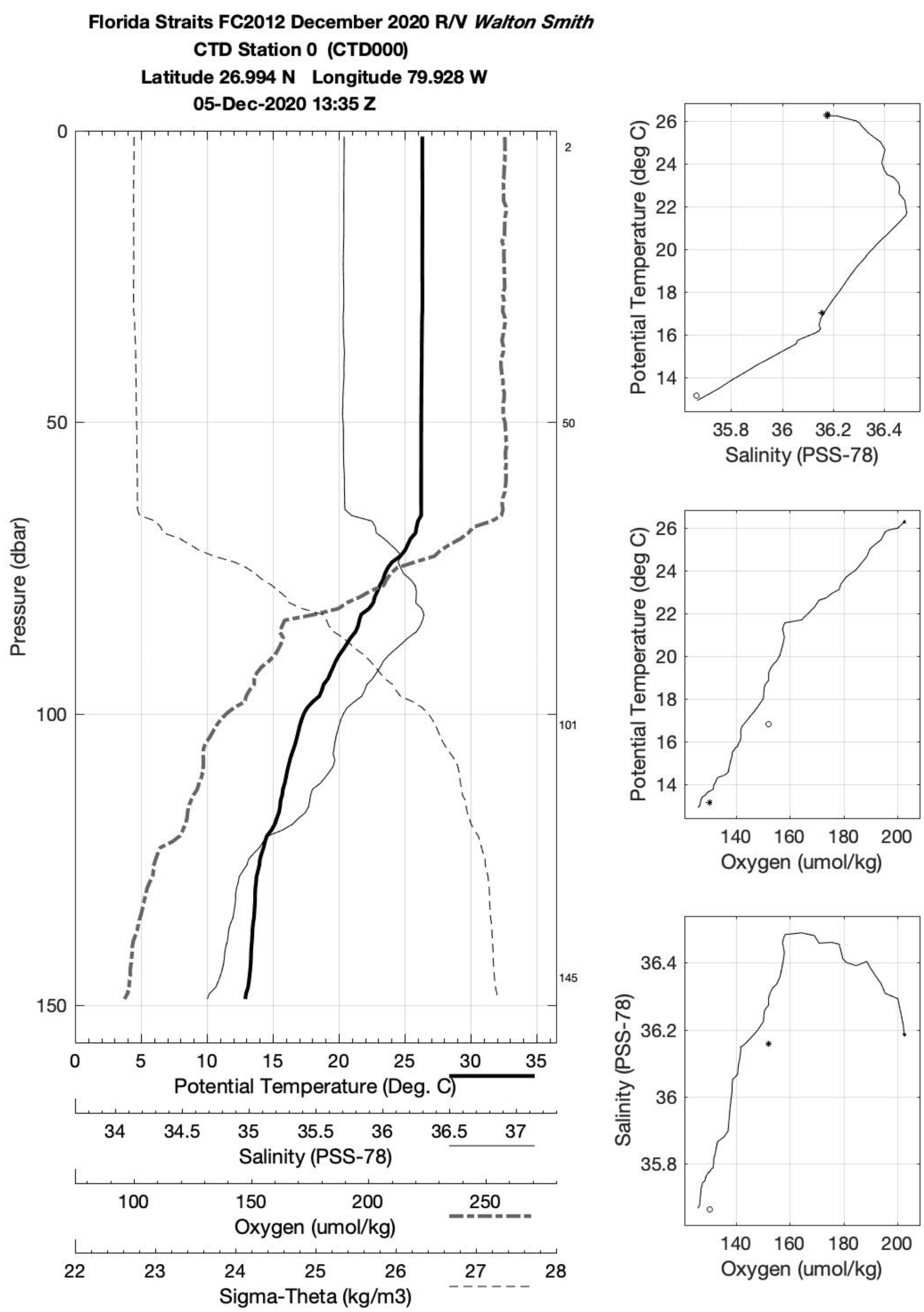
Salinity (PSS-78)
Oxygen (umol/kg)

A.2 FC2012 - December 2020

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 0 (CTD000)
Latitude 26.994N Longitude 79.928W
05-Dec-2020 13:35Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	26.341	26.340	36.186	202.8	0.004	23.822
10	26.349	26.347	36.185	202.6	0.041	23.819
20	26.348	26.343	36.184	202.7	0.082	23.819
30	26.355	26.348	36.185	202.5	0.122	23.818
50	26.272	26.261	36.182	202.9	0.204	23.844
75	23.735	23.719	36.400	181.0	0.302	24.785
100	17.379	17.362	36.184	146.5	0.361	26.336
125	14.040	14.022	35.825	132.2	0.398	26.820

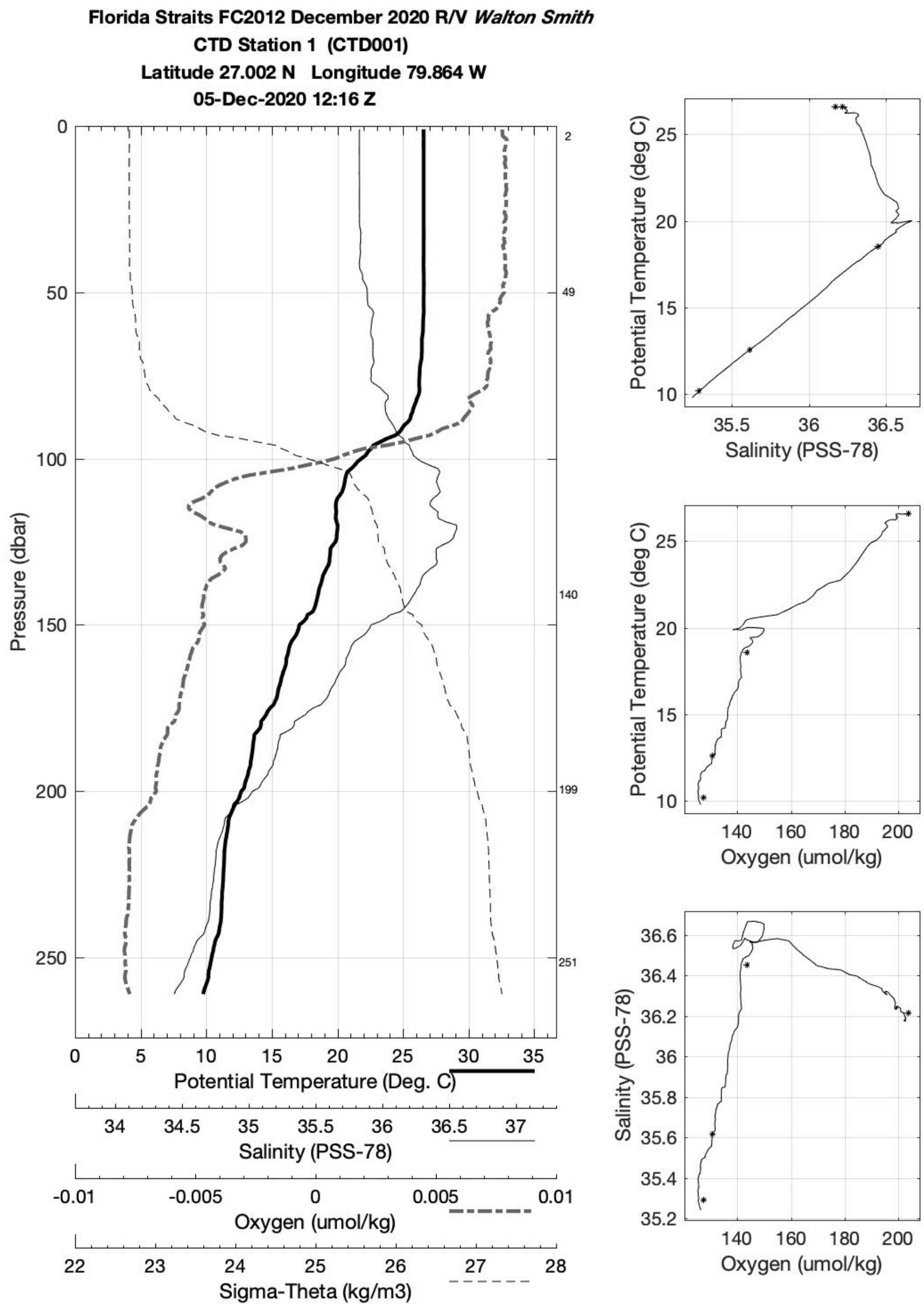
Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
145	1	13.179	13.159	35.666	130.3
102	2	17.030	17.013	36.157	152.2
50	3	26.273	26.262	36.176	208.5
3	4	26.343	26.342	36.176	209.0


Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 0 (CTD000)
Latitude 26.994 N Longitude 79.928 W
05-Dec-2020 13:35 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 1 (CTD001)
Latitude 27.002N Longitude 79.864W
05-Dec-2020 12:16Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	26.569	26.569	36.177	202.0	0.004	23.742
10	26.574	26.571	36.176	202.7	0.041	23.741
20	26.577	26.572	36.176	202.7	0.083	23.741
30	26.578	26.572	36.177	202.6	0.125	23.741
50	26.591	26.579	36.216	202.4	0.208	23.768
75	26.274	26.257	36.237	199.0	0.310	23.886
100	21.843	21.823	36.466	168.1	0.399	25.382
125	19.883	19.860	36.629	150.0	0.453	26.042
150	17.117	17.092	36.235	141.6	0.499	26.441
200	12.703	12.676	35.638	131.8	0.567	26.952
250	10.441	10.411	35.324	125.4	0.620	27.133

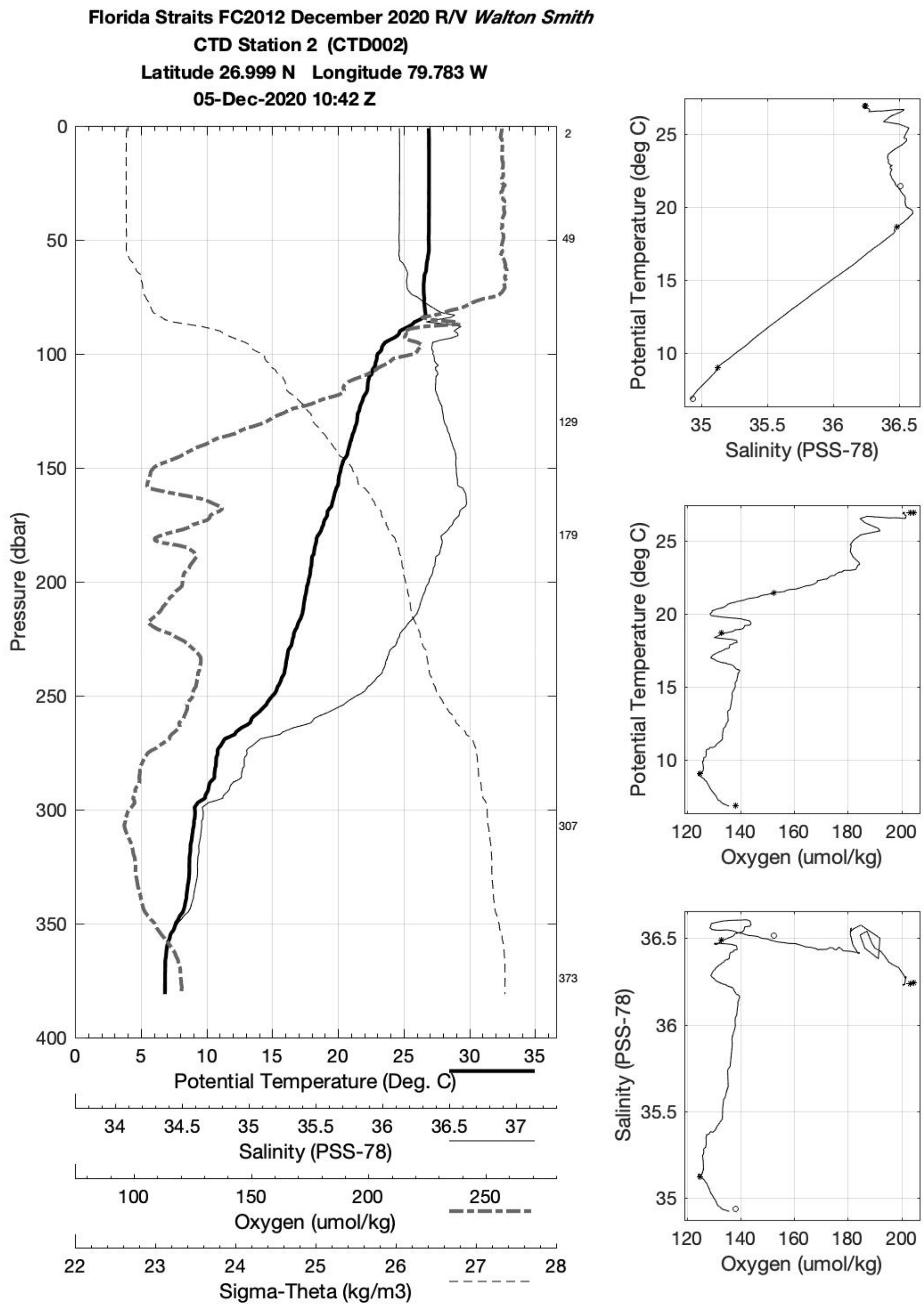
Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
251	1	10.220	10.191	35.291	127.3
199	2	12.545	12.518	35.616	130.7
141	3	18.544	18.519	36.450	143.7
50	4	26.585	26.574	36.216	203.9
3	5	26.584	26.584	36.172	219.8


Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 1 (CTD001)
Latitude 27.002 N Longitude 79.864 W
05-Dec-2020 12:16 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 2 (CTD002)
Latitude 26.999N Longitude 79.783W
05-Dec-2020 10:42Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}	DynHt m^2·s^{-2}	SigT kg·m^{-3}
1	26.918	26.918	36.232	200.7	0.004	23.673
10	26.933	26.931	36.233	200.9	0.042	23.669
20	26.937	26.933	36.233	201.0	0.084	23.668
30	26.937	26.930	36.232	200.7	0.127	23.668
50	26.924	26.913	36.230	201.0	0.211	23.672
75	26.584	26.567	36.330	199.0	0.315	23.858
100	23.054	23.033	36.418	183.0	0.405	25.000
125	21.640	21.615	36.471	157.2	0.475	25.444
150	20.267	20.239	36.549	130.1	0.534	25.880
200	17.793	17.758	36.397	135.9	0.628	26.402
250	15.075	15.037	35.993	138.1	0.706	26.730
300	9.148	9.115	35.133	125.1	0.760	27.204

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}
374	1	6.882	6.847	34.932	138.1
307	2	9.035	9.001	35.121	124.9
179	3	18.643	18.611	36.487	132.8
130	4	21.432	21.406	36.513	152.5
49	5	26.957	26.946	36.244	204.6
3	6	26.929	26.928	36.238	203.4

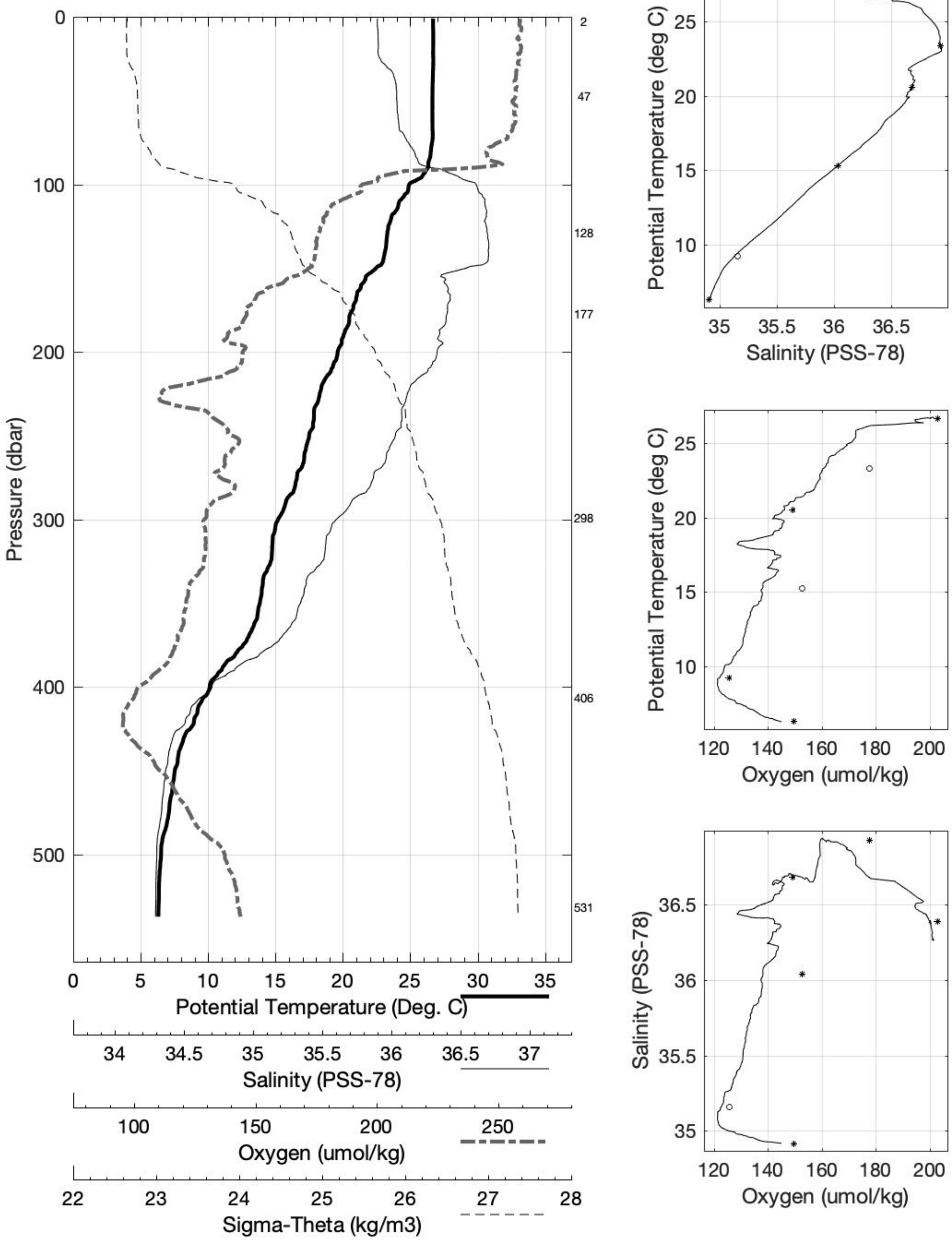

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 2 (CTD002)
Latitude 26.999 N Longitude 79.783 W
05-Dec-2020 10:42 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
2
49
129
179
307
373
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 3 (CTD003)
Latitude 27.005N Longitude 79.678W
05-Dec-2020 08:56Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}	DynHt m^2·s^{-2}	SigT kg·m^{-3}
1	26.693	26.693	36.264	201.3	0.004	23.768
10	26.709	26.707	36.268	201.4	0.041	23.767
20	26.703	26.699	36.268	201.4	0.083	23.770
30	26.708	26.701	36.321	200.9	0.124	23.809
50	26.657	26.646	36.382	199.8	0.205	23.872
75	26.633	26.616	36.453	196.9	0.306	23.935
100	24.947	24.925	36.864	169.5	0.400	24.774
125	23.405	23.379	36.925	161.2	0.474	25.283
150	22.497	22.467	36.803	158.7	0.540	25.456
200	19.655	19.618	36.627	145.4	0.651	26.104
250	17.543	17.500	36.373	143.4	0.741	26.448
300	15.230	15.183	36.013	137.6	0.819	26.713
400	10.172	10.124	35.259	124.4	0.946	27.133
500	6.561	6.515	34.924	141.8	1.031	27.425

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}
531	1	6.383	6.335	34.913	149.5
406	2	9.302	9.256	35.160	125.5
299	3	15.334	15.288	36.039	152.8
178	4	20.587	20.553	36.684	149.4
129	5	23.367	23.341	36.929	177.5
47	6	26.672	26.661	36.386	202.9
3	7	26.677	26.677	36.272	216.1

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 3 (CTD003)
Latitude 27.005 N Longitude 79.678 W
05-Dec-2020 08:56 Z

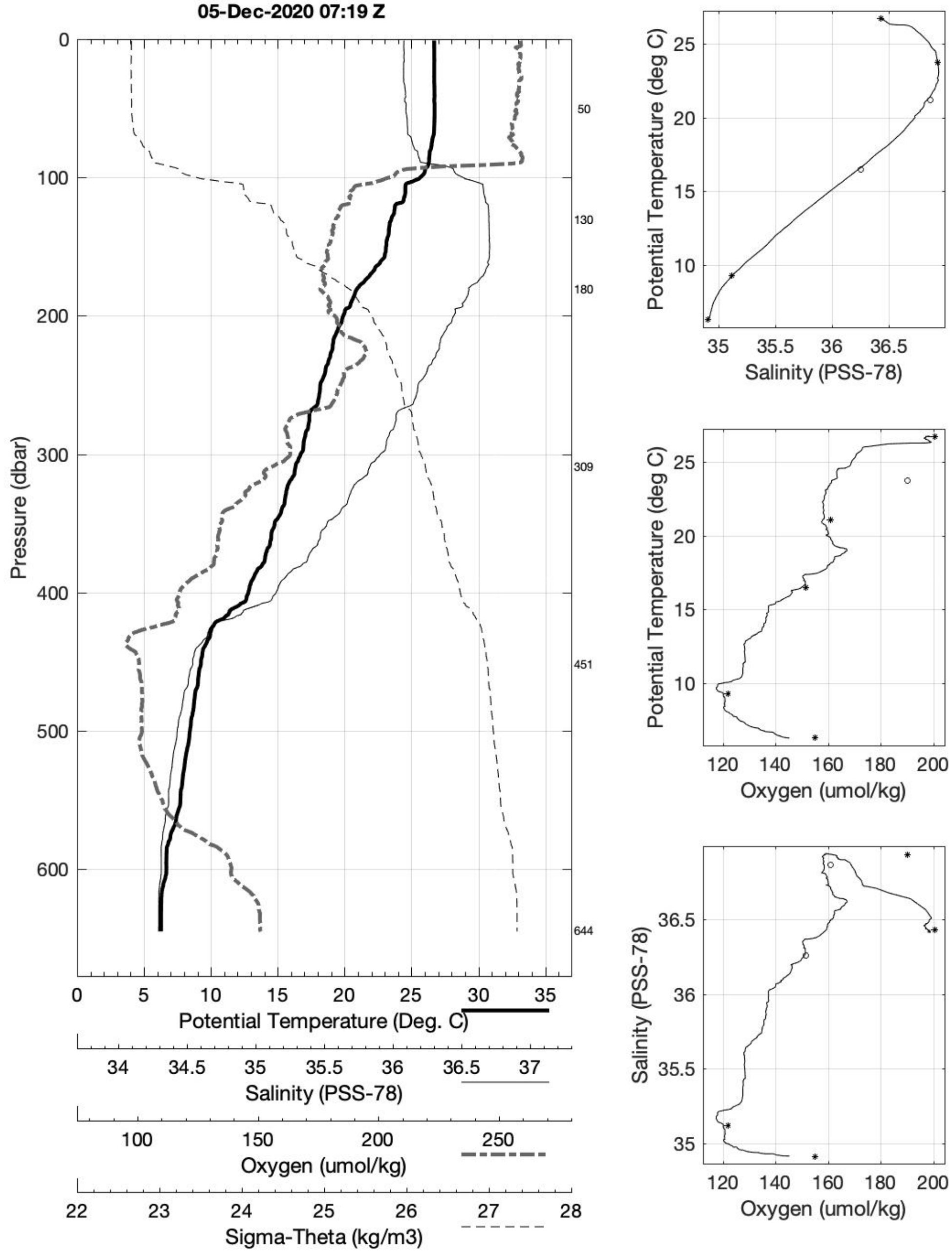


Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 4 (CTD004)
Latitude 26.995N Longitude 79.616W
05-Dec-2020 07:19Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$	DynHt $m^2 \cdot s^{-2}$	SigT $kg \cdot m^{-3}$
1	26.700	26.700	36.418	198.8	0.004	23.882
10	26.708	26.706	36.419	198.6	0.040	23.881
20	26.705	26.700	36.416	198.4	0.080	23.880
30	26.707	26.700	36.416	198.5	0.121	23.881
50	26.737	26.725	36.430	198.1	0.201	23.883
75	26.541	26.524	36.469	197.3	0.302	23.977
100	25.675	25.652	36.779	171.8	0.396	24.485
125	23.737	23.711	36.937	161.3	0.472	25.195
150	23.133	23.102	36.942	159.4	0.540	25.378
200	19.940	19.903	36.723	160.5	0.655	26.103
250	18.227	18.183	36.505	161.7	0.748	26.380
300	16.762	16.713	36.273	151.4	0.830	26.561
400	12.858	12.802	35.633	128.6	0.971	26.923
500	8.496	8.442	35.028	120.9	1.072	27.228
600	6.733	6.677	34.930	139.3	1.158	27.408

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$
644	1	6.336	6.277	34.910	155.0
452	2	9.342	9.291	35.117	122.2
309	3	16.536	16.485	36.257	151.7
180	4	21.191	21.156	36.868	160.8
131	5	23.744	23.716	36.934	190.3
50	6	26.730	26.719	36.429	200.6

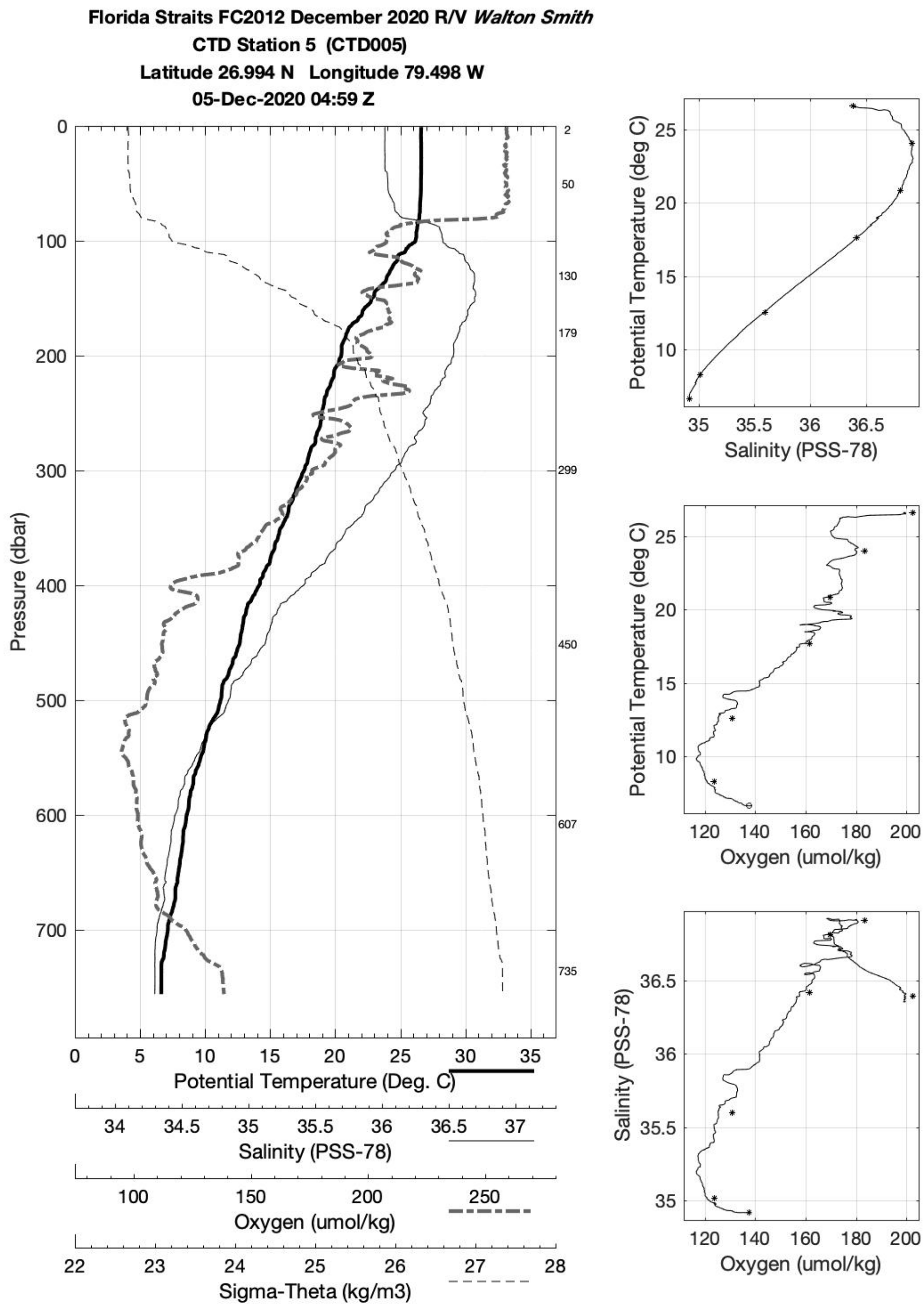
Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 4 (CTD004)
Latitude 26.995 N Longitude 79.616 W
05-Dec-2020 07:19 Z



Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 5 (CTD005)
Latitude 26.994N Longitude 79.498W
05-Dec-2020 04:59Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$	DynHt $m^2 \cdot s^{-2}$	SigT $kg \cdot m^{-3}$
1	26.598	26.597	36.356	199.4	0.004	23.868
10	26.593	26.590	36.355	199.7	0.040	23.870
20	26.605	26.601	36.354	199.5	0.081	23.866
30	26.611	26.604	36.356	199.5	0.121	23.866
50	26.598	26.586	36.374	199.4	0.202	23.885
75	26.522	26.505	36.426	198.7	0.302	23.950
100	26.184	26.162	36.718	173.5	0.397	24.279
125	24.310	24.283	36.891	180.4	0.479	24.989
150	22.844	22.813	36.916	170.8	0.549	25.442
200	20.484	20.446	36.783	170.4	0.662	26.003
250	18.999	18.954	36.593	158.8	0.759	26.251
300	17.644	17.593	36.415	157.5	0.848	26.457
400	14.217	14.158	35.846	127.3	0.998	26.808
500	11.243	11.179	35.376	122.0	1.122	27.036
600	8.648	8.583	35.042	120.1	1.226	27.217
700	7.204	7.135	34.929	130.4	1.317	27.344

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$
735	1	6.709	6.639	34.916	137.6
608	2	8.370	8.305	35.013	123.9
451	3	12.604	12.542	35.596	130.8
299	4	17.680	17.629	36.420	161.8
180	5	20.868	20.833	36.812	169.9
130	6	24.052	24.024	36.911	183.4
50	7	26.591	26.580	36.390	202.7
3	13	26.595	26.597	−999.000	−999.0

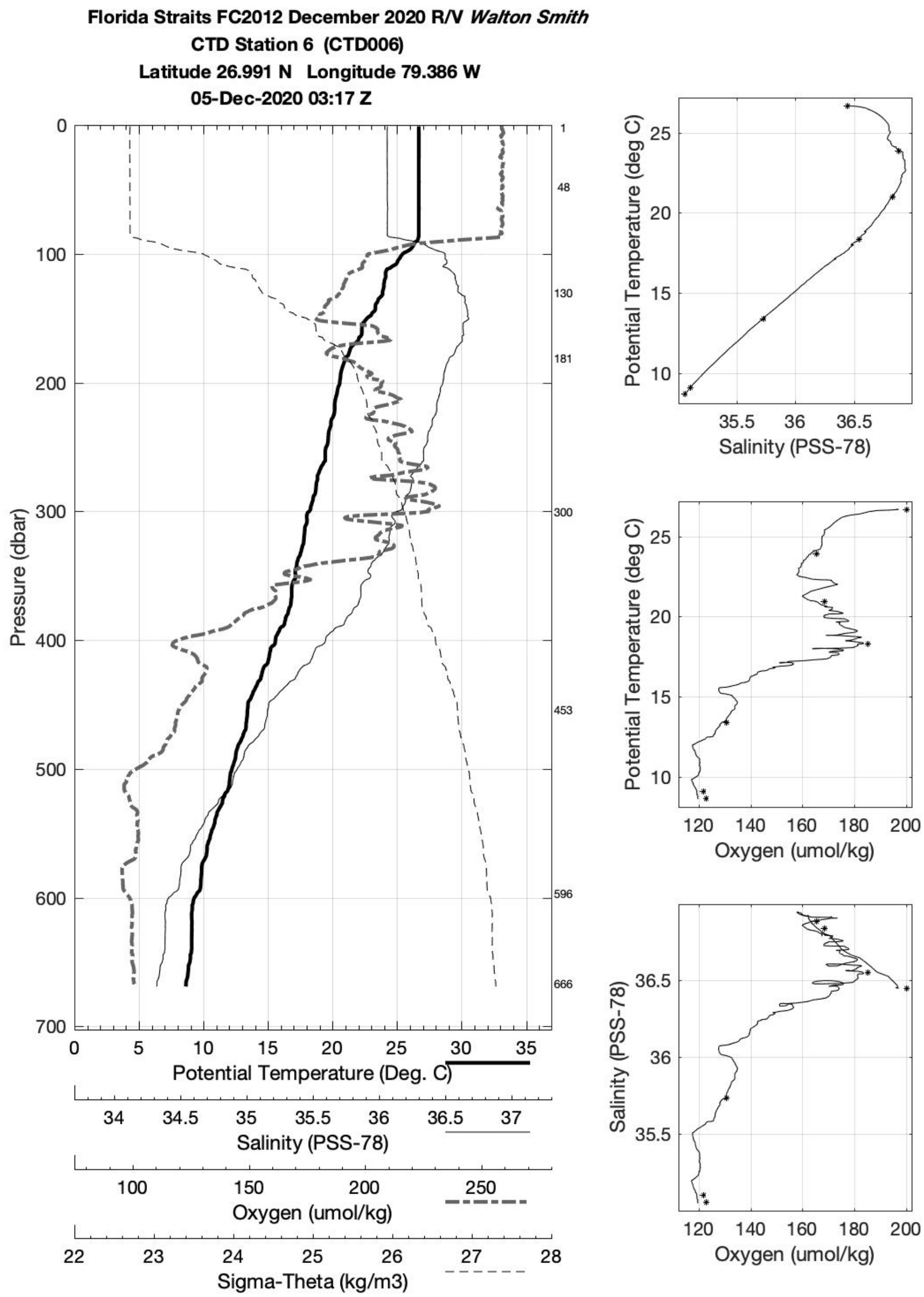


Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 5 (CTD005)
Latitude 26.994 N Longitude 79.498 W
05-Dec-2020 04:59 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
2
50
130
179
299
450
607
735
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 6 (CTD006)
Latitude 26.991N Longitude 79.386W
05-Dec-2020 03:17Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$	DynHt $m^2 \cdot s^{-2}$	SigT $kg \cdot m^{-3}$
1	26.675	26.675	36.449	196.7	0.004	23.914
10	26.685	26.682	36.448	197.0	0.040	23.911
20	26.686	26.682	36.448	196.9	0.080	23.911
30	26.688	26.681	36.448	197.2	0.120	23.911
50	26.692	26.680	36.449	196.9	0.200	23.912
75	26.695	26.678	36.449	196.9	0.300	23.913
100	25.449	25.427	36.800	169.0	0.397	24.570
125	24.010	23.983	36.881	163.6	0.474	25.071
150	22.700	22.669	36.944	158.3	0.544	25.505
200	20.594	20.556	36.786	171.7	0.657	25.976
250	19.546	19.500	36.675	174.5	0.758	26.172
300	18.244	18.191	36.512	181.5	0.850	26.383
400	15.642	15.579	36.074	128.9	1.013	26.671
500	12.273	12.205	35.538	120.2	1.147	26.968
600	9.358	9.290	35.123	118.7	1.259	27.167

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$
667	1	8.803	8.730	35.055	122.7
597	2	9.145	9.078	35.100	122.0
454	3	13.460	13.395	35.731	130.7
300	4	18.374	18.321	36.548	185.4
181	5	21.002	20.967	36.836	168.5
130	6	23.882	23.855	36.882	165.4
48	7	26.695	26.684	36.444	200.2
2	13	26.677	26.678	−999.000	−999.0

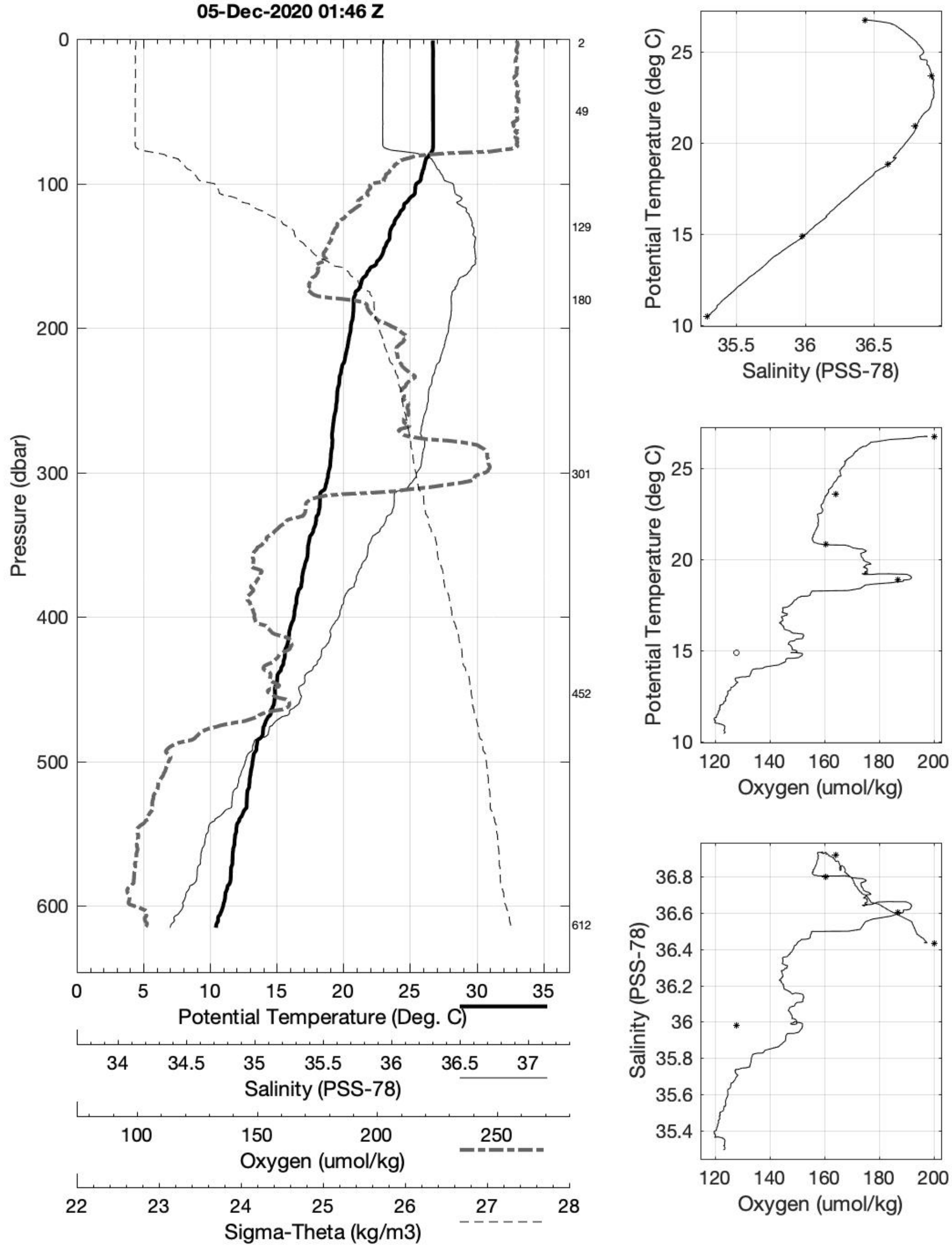

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 6 (CTD006)
Latitude 26.991 N Longitude 79.386 W
05-Dec-2020 03:17 Z
Pressure (dbar)
1
48
130
181
300
453
596
666
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 7 (CTD007)
Latitude 26.998N Longitude 79.285W
05-Dec-2020 01:46Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	26.714	26.714	36.436	197.2	0.004	23.891
10	26.730	26.728	36.435	197.2	0.040	23.887
20	26.727	26.722	36.436	197.2	0.080	23.888
30	26.728	26.721	36.436	197.2	0.120	23.889
50	26.739	26.727	36.435	197.3	0.201	23.887
75	26.743	26.726	36.441	197.0	0.302	23.892
100	25.514	25.492	36.811	168.5	0.394	24.559
125	23.932	23.905	36.910	162.3	0.473	25.116
150	22.901	22.871	36.934	158.8	0.542	25.439
200	20.592	20.554	36.789	172.9	0.654	25.979
250	19.558	19.512	36.680	174.8	0.754	26.173
300	18.928	18.874	36.619	191.0	0.848	26.292
400	16.355	16.290	36.199	145.0	1.018	26.603
500	13.257	13.186	35.697	128.0	1.160	26.895
600	11.058	10.982	35.365	121.1	1.283	27.063

Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
613	1	10.550	10.474	35.292	−999.0
453	2	14.936	14.867	35.978	127.9
301	3	18.859	18.805	36.601	186.9
181	4	20.923	20.889	36.800	160.4
130	5	23.679	23.652	36.918	164.1
50	6	26.740	26.729	36.432	200.2
2	7	26.729	26.729	36.432	200.0

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 7 (CTD007)
Latitude 26.998 N Longitude 79.285 W
05-Dec-2020 01:46 Z

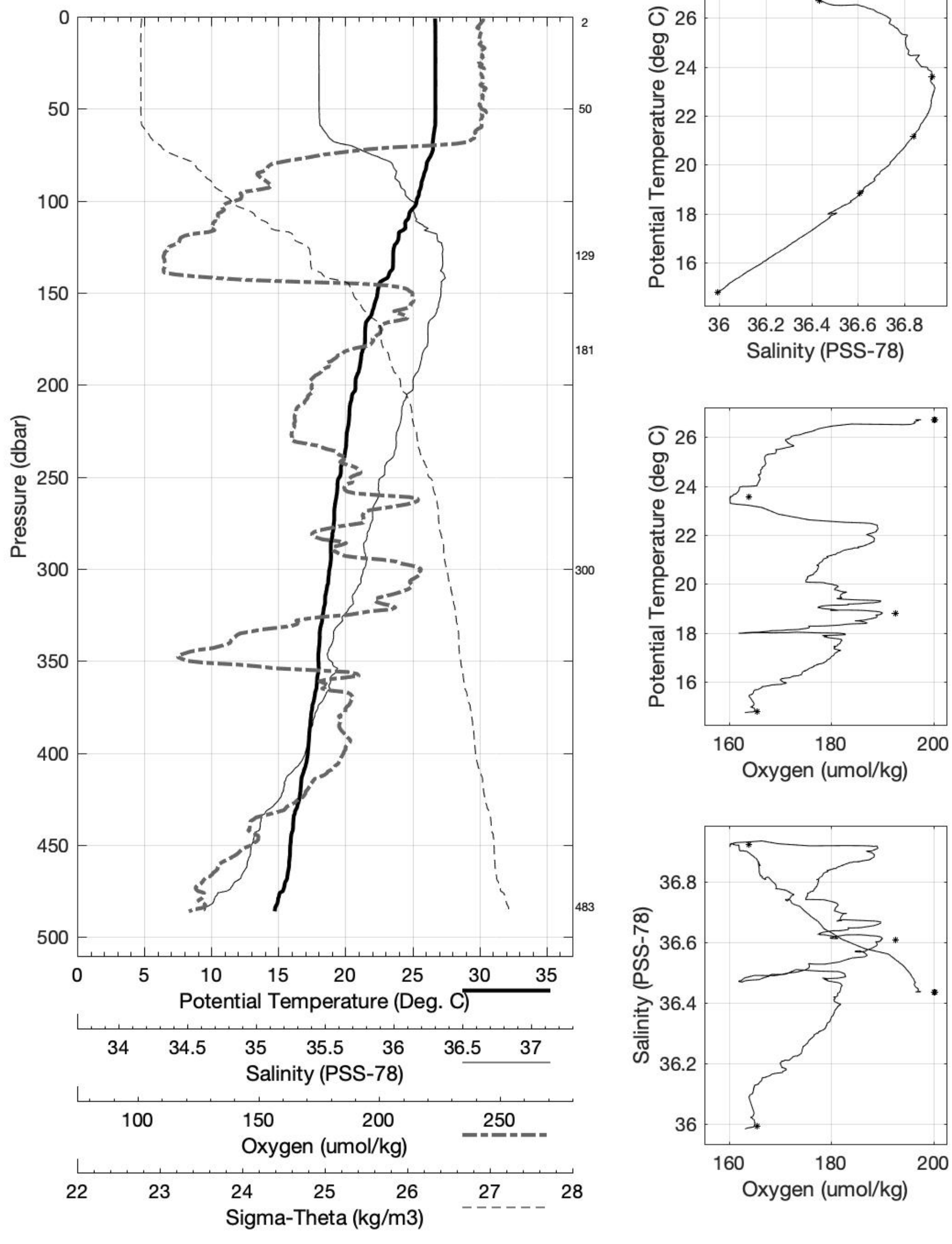


Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 8 (CTD008)
Latitude 26.998N Longitude 79.203W
05-Dec-2020 00:12Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	26.699	26.699	36.438	197.2	0.004	23.898
10	26.715	26.713	36.436	196.9	0.040	23.892
20	26.720	26.715	36.436	197.3	0.080	23.891
30	26.718	26.711	36.437	197.3	0.120	23.893
50	26.727	26.716	36.437	197.0	0.201	23.891
75	26.414	26.397	36.644	178.6	0.300	24.149
100	25.343	25.321	36.800	168.5	0.388	24.604
125	23.675	23.648	36.922	160.8	0.466	25.202
150	22.433	22.402	36.917	189.0	0.533	25.561
200	20.793	20.755	36.807	177.4	0.647	25.937
250	19.627	19.581	36.685	182.0	0.749	26.158
300	18.874	18.820	36.613	190.0	0.843	26.301
400	17.266	17.198	36.382	181.1	1.016	26.528

Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
483	1	14.857	14.783	35.993	165.4
300	2	18.866	18.812	36.609	192.5
181	3	21.202	21.167	36.841	203.8
130	4	23.620	23.593	36.923	163.8
50	5	26.722	26.711	36.435	200.2
3	6	26.716	26.716	36.434	200.3

Florida Straits FC2012 December 2020 R/V *Walton Smith*
CTD Station 8 (CTD008)
Latitude 26.998 N Longitude 79.203 W
05-Dec-2020 00:12 Z

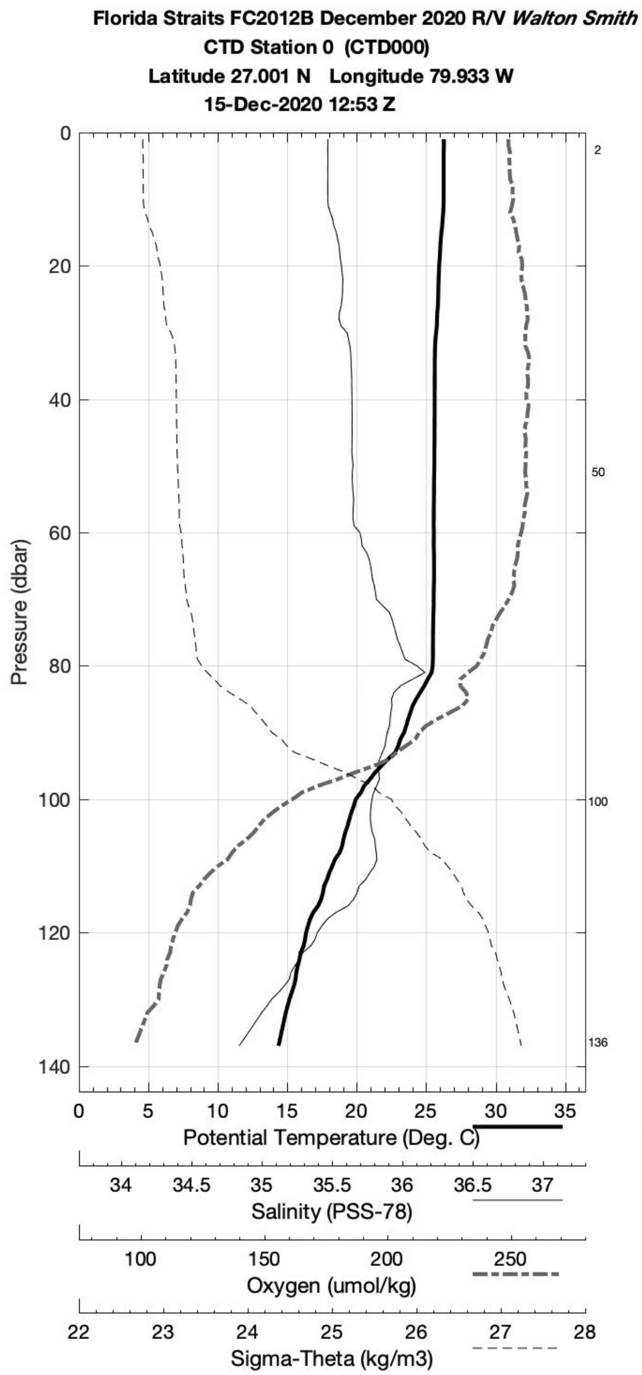


A.3 FC2012B - December 2020

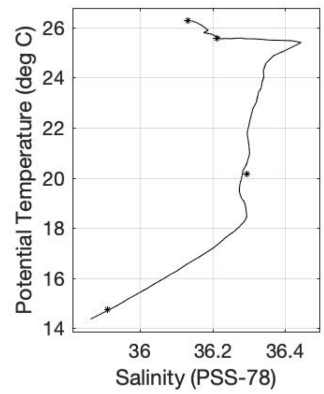
Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 0 (CTD000)
Latitude 27.001N Longitude 79.933W
15-Dec-2020 12:53Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	26.269	26.269	36.141	197.2	0.004	23.810
10	26.258	26.256	36.140	198.1	0.041	23.814
20	25.936	25.932	36.183	199.7	0.081	23.948
30	25.718	25.711	36.200	200.3	0.120	24.030
50	25.600	25.589	36.220	200.3	0.197	24.082
75	25.511	25.494	36.353	194.1	0.292	24.212
100	19.949	19.930	36.279	158.5	0.372	25.756
125	15.772	15.752	36.038	135.9	0.417	26.603

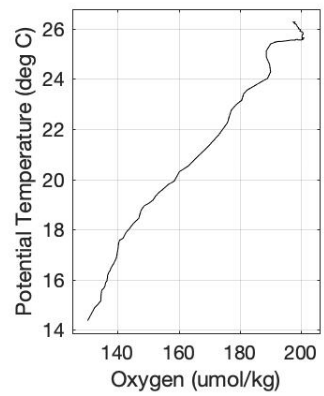
Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
136	1	14.761	14.741	35.909	−999.0
100	2	20.175	20.156	36.295	−999.0
51	3	25.576	25.564	36.211	−999.0
3	4	26.268	26.267	36.133	−999.0



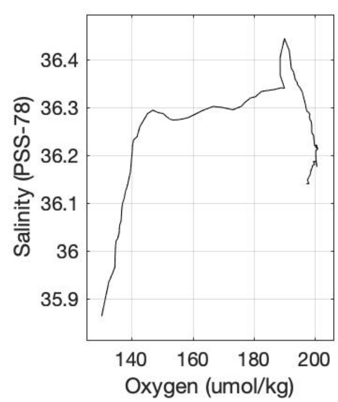
Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 0 (CTD000)
Latitude 27.001 N Longitude 79.933 W
15-Dec-2020 12:53 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)



Potential Temperature (deg C)
Salinity (PSS-78)



Potential Temperature (deg C)
Oxygen (umol/kg)



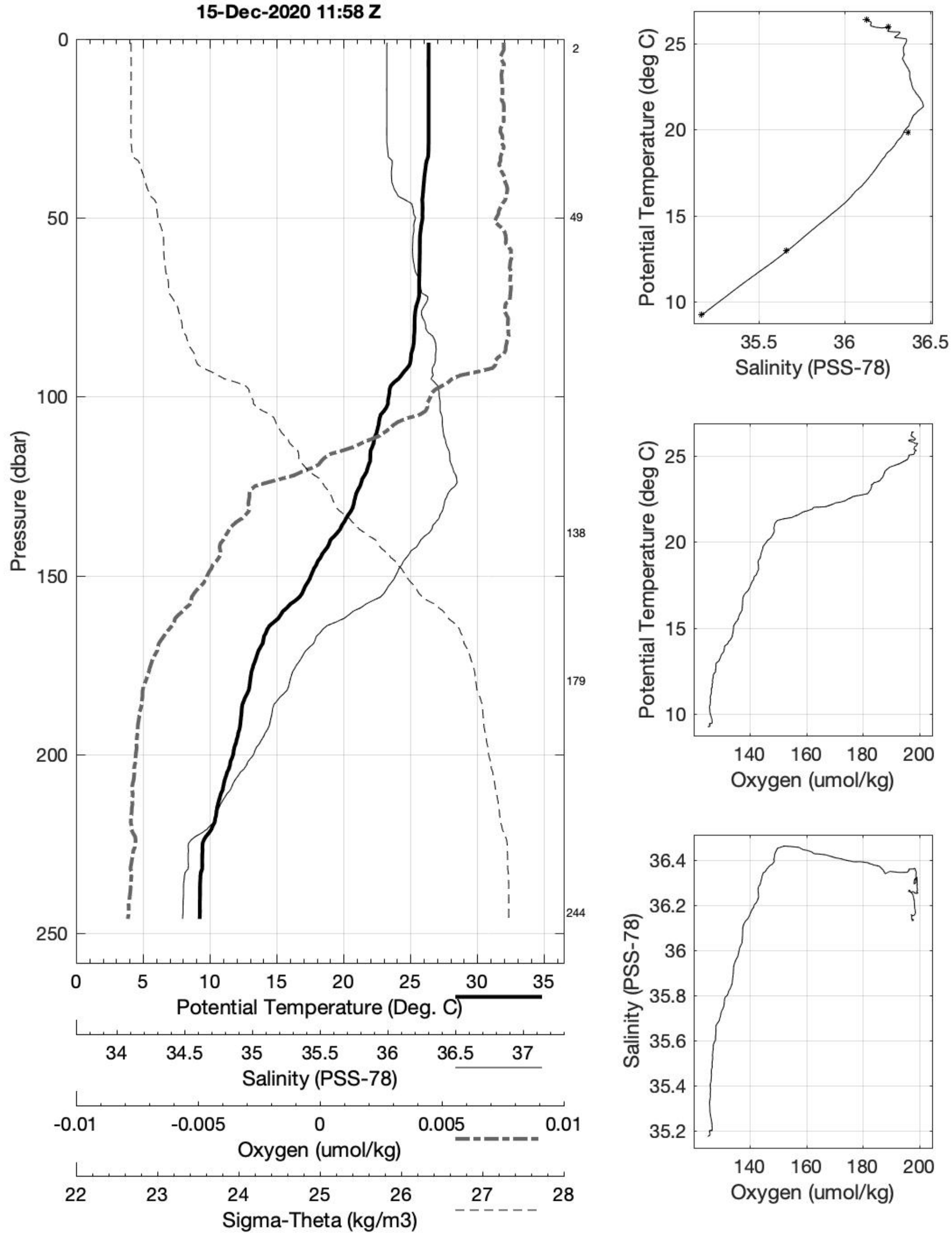
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 0 (CTD000)
Latitude 27.001N Longitude 79.933W
15-Dec-2020 12:53Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	26.269	26.269	36.141	197.2	0.004	23.810
10	26.258	26.256	36.140	198.1	0.041	23.814
20	25.936	25.932	36.183	199.7	0.081	23.948
30	25.718	25.711	36.200	200.3	0.120	24.030
50	25.600	25.589	36.220	200.3	0.197	24.082
75	25.511	25.494	36.353	194.1	0.292	24.212
100	19.949	19.930	36.279	158.5	0.372	25.756
125	15.772	15.752	36.038	135.9	0.417	26.603

Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
136	1	14.761	14.741	35.909	−999.0
100	2	20.175	20.156	36.295	−999.0
51	3	25.576	25.564	36.211	−999.0
3	4	26.268	26.267	36.133	−999.0

Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 1 (CTD001)
Latitude 26.990 N Longitude 79.869 W
15-Dec-2020 11:58 Z

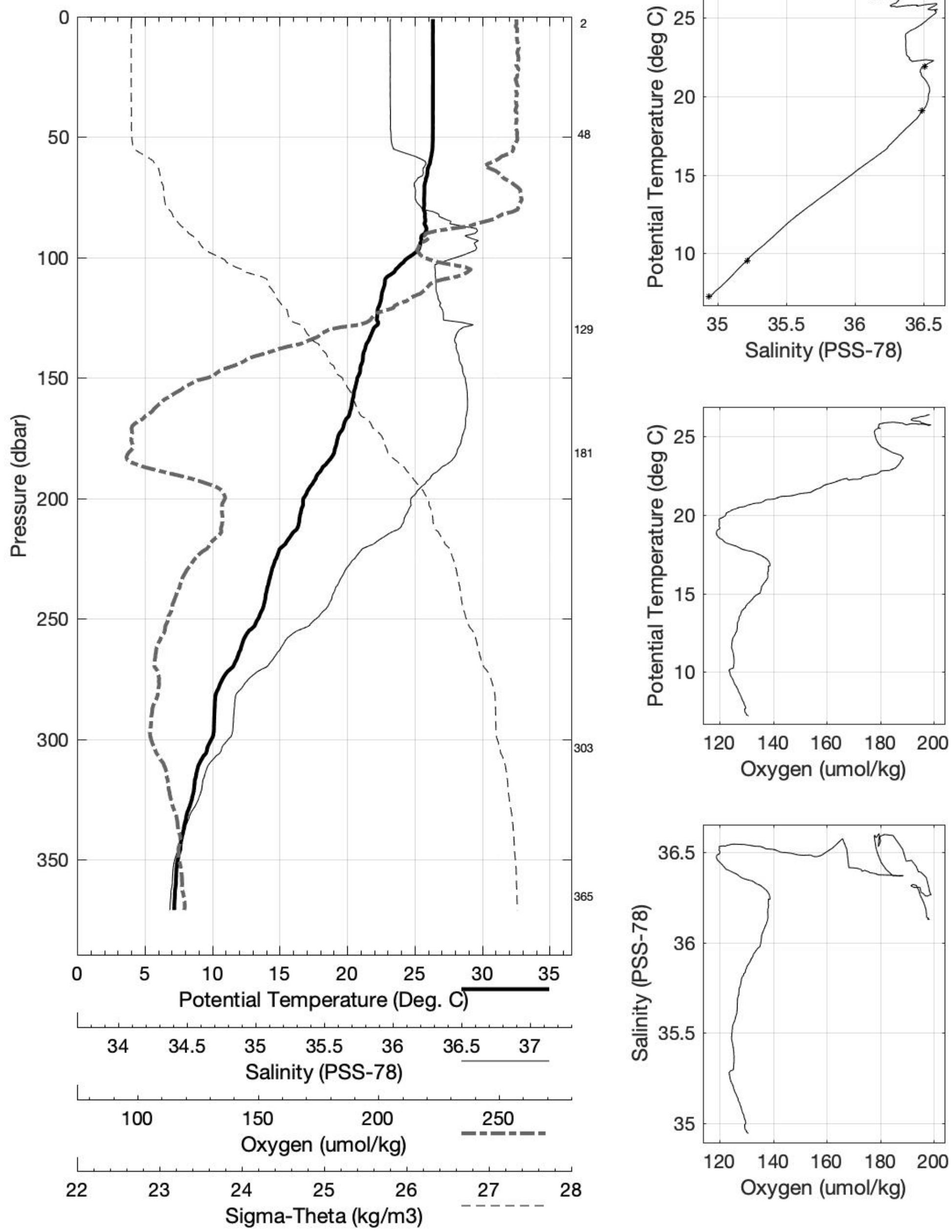


Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 2 (CTD002)
Latitude 27.000N Longitude 79.783W
15-Dec-2020 10:45Z

Pressure	Temp90	PoTemp90	Salinity	Oxygen	DynHt	SigT
dbar	°C	°C	PSS-78	μmol·kg^{-1}	m^2·s^{-2}	kg·m^{-3}
1	26.359	26.359	36.129	197.9	0.004	23.773
10	26.360	26.358	36.129	198.1	0.041	23.773
20	26.367	26.362	36.129	197.8	0.082	23.772
30	26.368	26.361	36.129	197.9	0.124	23.772
50	26.364	26.353	36.134	198.1	0.206	23.778
75	25.729	25.712	36.263	198.8	0.306	24.077
100	24.578	24.556	36.486	179.2	0.397	24.600
125	22.245	22.220	36.415	168.6	0.472	25.232
150	20.787	20.758	36.533	135.3	0.535	25.728
200	16.805	16.772	36.241	138.9	0.633	26.522
250	13.456	13.421	35.731	127.3	0.703	26.874
300	9.993	9.958	35.258	123.9	0.756	27.160

Pressure	Niskin	Temp90	PoTemp90	Salinity	Oxygen
dbar		°C	°C	PSS-78	μmol·kg^{-1}
365	1	7.266	7.230	34.936	−999.0
304	2	9.558	9.524	35.216	−999.0
181	3	19.091	19.058	36.494	−999.0
130	4	21.884	21.858	36.512	−999.0
49	5	26.362	26.351	36.140	−999.0
3	6	26.359	26.358	36.132	−999.0

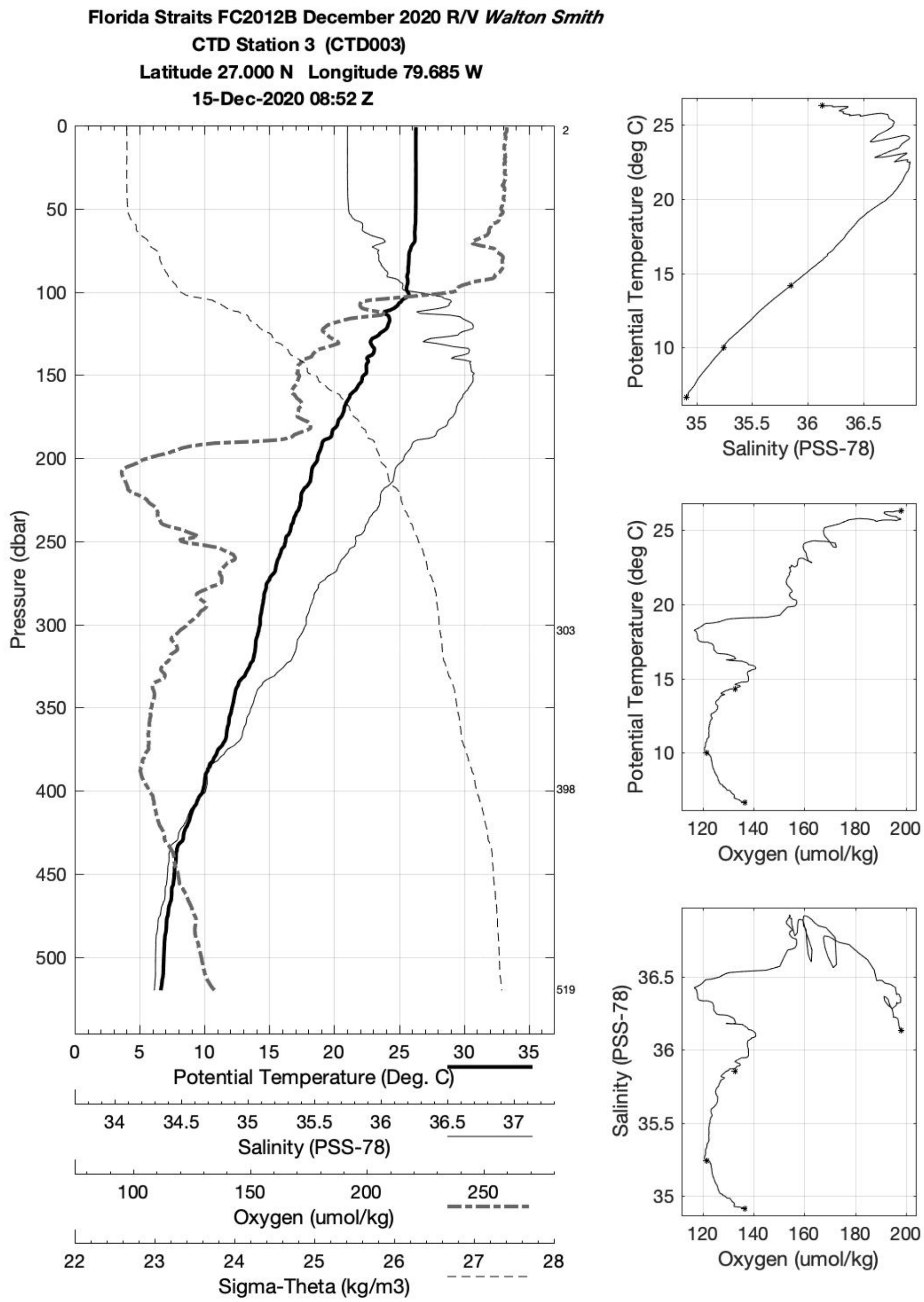
Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 2 (CTD002)
Latitude 27.000 N Longitude 79.783 W
15-Dec-2020 10:45 Z



Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 3 (CTD003)
Latitude 27.000N Longitude 79.685W
15-Dec-2020 08:52Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}	DynHt m^2·s^{-2}	SigT kg·m^{-3}
1	26.293	26.293	36.129	198.7	0.004	23.793
10	26.291	26.288	36.128	198.4	0.041	23.794
20	26.292	26.288	36.128	198.2	0.082	23.794
30	26.300	26.293	36.128	198.5	0.123	23.793
50	26.293	26.282	36.134	197.5	0.205	23.801
75	25.882	25.865	36.325	196.3	0.306	24.076
100	25.683	25.661	36.547	187.4	0.400	24.307
125	23.538	23.512	36.830	160.4	0.479	25.172
150	22.334	22.304	36.916	154.6	0.545	25.588
200	18.751	18.715	36.482	122.5	0.650	26.228
250	16.294	16.253	36.182	129.4	0.733	26.599
300	14.332	14.287	35.869	130.7	0.803	26.798
400	9.917	9.871	35.237	122.6	0.921	27.159
500	6.912	6.864	34.923	133.7	1.005	27.377

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen μmol·kg^{-1}
519	1	6.692	6.644	34.912	136.9
399	2	10.046	9.998	35.242	121.8
303	3	14.241	14.196	35.852	133.0
3	4	26.284	26.283	36.130	198.1

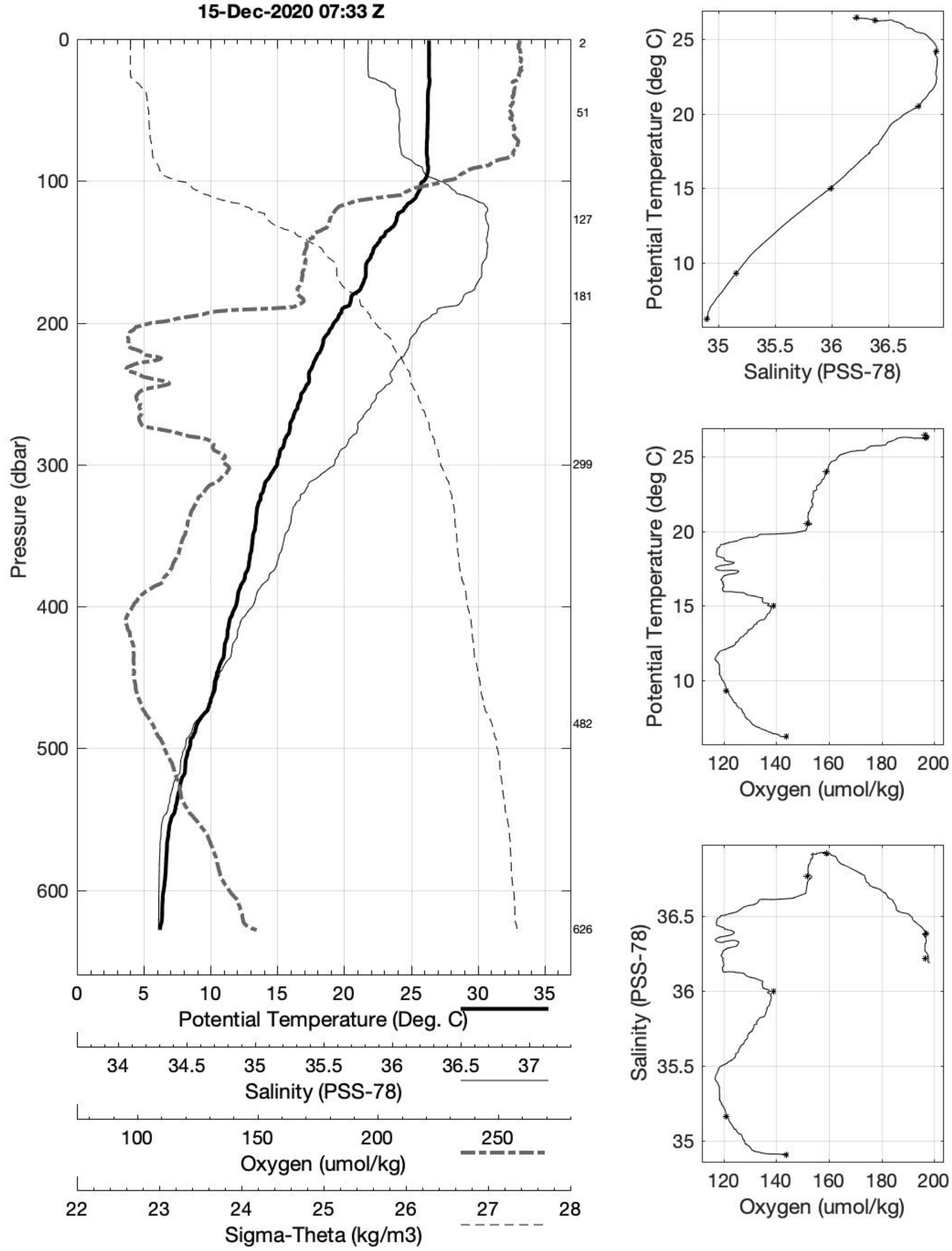

Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 3 (CTD003)
Latitude 27.000 N Longitude 79.685 W
15-Dec-2020 08:52 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 4 (CTD004)
Latitude 26.997N Longitude 79.618W
15-Dec-2020 07:33Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$	DynHt $m^2 \cdot s^{-2}$	SigT $kg \cdot m^{-3}$
1	26.351	26.351	36.192	197.8	0.004	23.823
10	26.357	26.355	36.191	198.1	0.041	23.821
20	26.358	26.354	36.190	198.2	0.082	23.821
30	26.407	26.401	36.271	196.4	0.122	23.866
50	26.277	26.265	36.382	195.6	0.201	23.993
75	26.205	26.188	36.385	197.4	0.300	24.020
100	26.005	25.982	36.625	182.4	0.396	24.265
125	23.997	23.970	36.911	159.0	0.478	25.098
150	22.181	22.151	36.920	153.7	0.545	25.635
200	19.284	19.248	36.518	122.1	0.654	26.118
250	16.842	16.800	36.246	119.3	0.742	26.519
300	15.031	14.985	35.984	137.5	0.816	26.734
400	11.930	11.877	35.482	118.2	0.943	26.987
500	8.462	8.408	35.067	124.8	1.048	27.264
600	6.550	6.494	34.909	138.0	1.129	27.416

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$
627	1	6.281	6.224	34.901	143.8
482	2	9.381	9.327	35.161	121.0
300	3	15.058	15.012	35.996	138.8
181	4	20.567	20.533	36.769	151.7
127	5	24.193	24.166	36.919	159.0
52	6	26.269	26.258	36.381	196.9
3	7	26.455	26.455	36.218	196.6

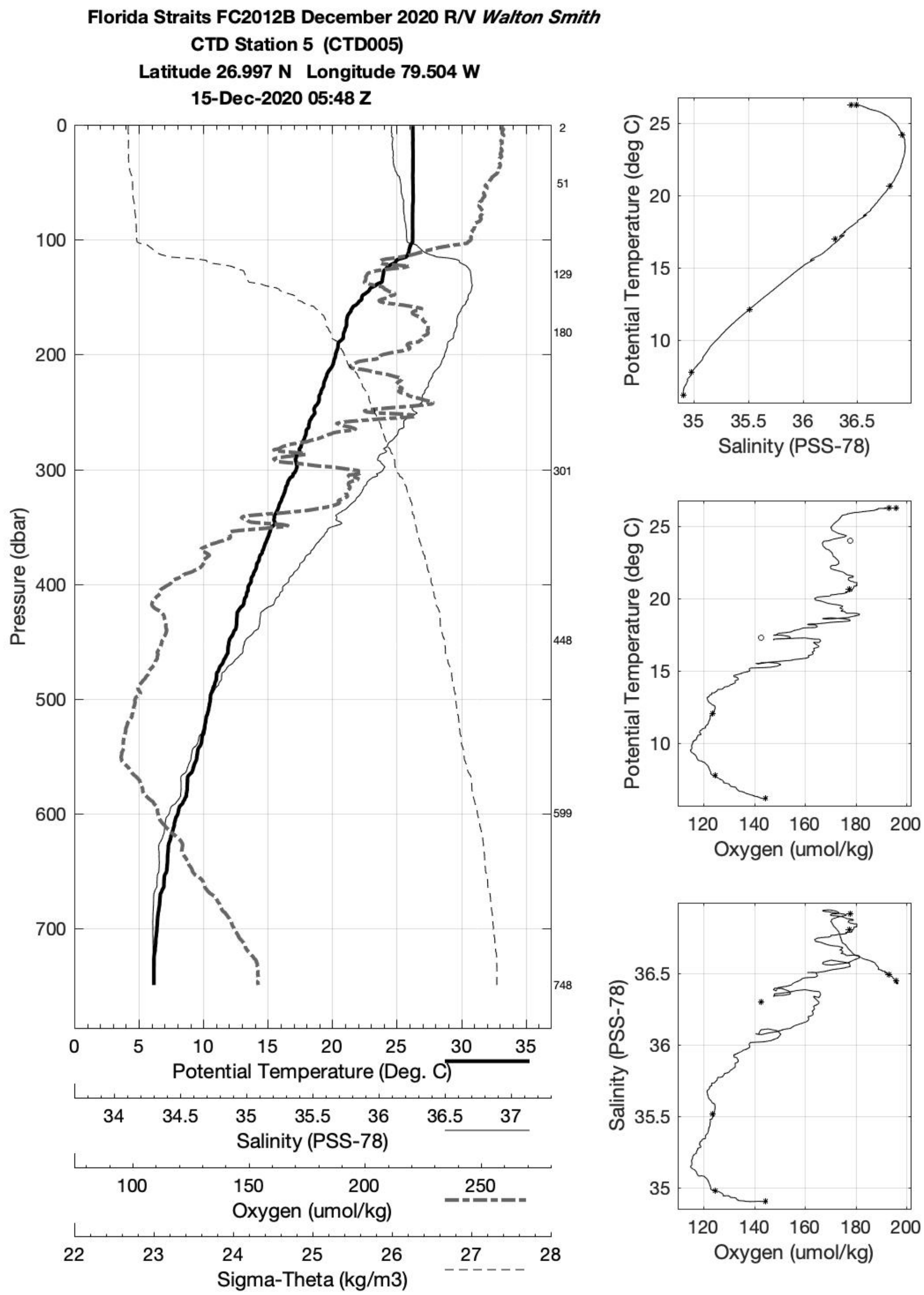
Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 4 (CTD004)
Latitude 26.997 N Longitude 79.618 W
15-Dec-2020 07:33 Z



Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 5 (CTD005)
Latitude 26.997N Longitude 79.504W
15-Dec-2020 05:48Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$	DynHt $m^2 \cdot s^{-2}$	SigT $kg \cdot m^{-3}$
1	26.250	26.250	36.427	196.2	0.004	24.032
10	26.250	26.248	36.426	196.5	0.039	24.032
20	26.263	26.258	36.433	196.1	0.077	24.033
30	26.269	26.262	36.438	195.6	0.116	24.037
50	26.269	26.258	36.484	193.5	0.194	24.072
75	26.255	26.238	36.504	192.2	0.290	24.094
100	26.254	26.232	36.524	189.7	0.386	24.111
125	24.217	24.190	36.917	173.5	0.473	25.037
150	22.324	22.294	36.913	172.2	0.542	25.589
200	20.299	20.261	36.765	170.9	0.652	26.039
250	18.671	18.626	36.577	167.3	0.747	26.323
300	17.245	17.194	36.374	163.5	0.832	26.522
400	13.647	13.590	35.751	125.2	0.976	26.854
500	10.610	10.548	35.279	117.9	1.096	27.074
600	8.092	8.029	35.008	122.7	1.197	27.276
700	6.469	6.404	34.905	139.0	1.279	27.425

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$
748	1	6.237	6.169	34.905	144.4
599	2	7.859	7.797	34.983	124.5
449	3	12.177	12.117	35.513	123.6
301	4	17.047	16.996	36.300	142.7
180	5	20.684	20.649	36.803	177.3
130	6	24.181	24.153	36.915	177.9
51	7	26.280	26.268	36.491	193.1
3	13	26.247	26.246	36.444	196.1

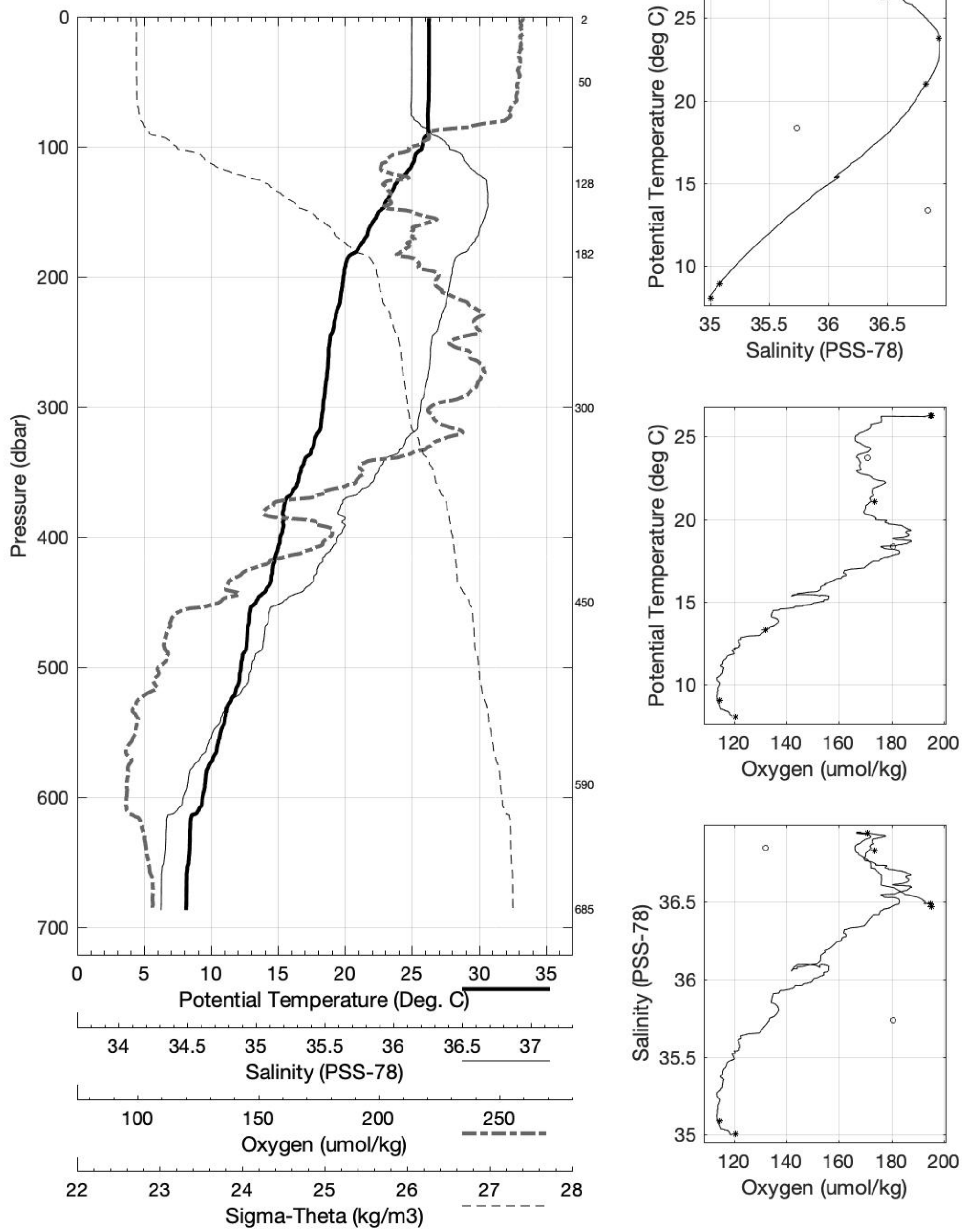

Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 5 (CTD005)
Latitude 26.997 N Longitude 79.504 W
15-Dec-2020 05:48 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 6 (CTD006)
Latitude 26.989N Longitude 79.387W
15-Dec-2020 04:02Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$	DynHt $m^2 \cdot s^{-2}$	SigT $kg \cdot m^{-3}$
1	26.290	26.290	36.491	195.5	0.004	24.067
10	26.284	26.282	36.491	195.2	0.038	24.070
20	26.287	26.282	36.490	195.1	0.077	24.069
30	26.287	26.280	36.491	194.8	0.115	24.070
50	26.284	26.273	36.491	194.5	0.192	24.073
75	26.215	26.198	36.487	192.6	0.289	24.094
100	25.767	25.744	36.715	172.5	0.382	24.408
125	24.099	24.073	36.929	170.9	0.464	25.081
150	22.561	22.530	36.933	172.6	0.531	25.537
200	19.924	19.887	36.725	178.0	0.641	26.108
250	18.907	18.862	36.609	180.4	0.737	26.287
300	18.418	18.365	36.543	176.5	0.826	26.363
400	15.232	15.170	36.050	155.7	0.985	26.744
500	12.292	12.224	35.538	120.4	1.117	26.964
600	9.435	9.366	35.132	113.8	1.229	27.162

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$
686	1	8.157	8.085	35.005	120.8
591	2	9.021	8.955	35.086	114.9
450	3	13.454	13.389	36.844	132.1
301	4	18.411	18.359	35.734	180.7
182	5	21.058	21.023	36.827	173.5
128	6	23.792	23.765	36.936	170.8
50	7	26.288	26.276	36.482	194.7
2	13	26.284	26.284	36.467	195.3

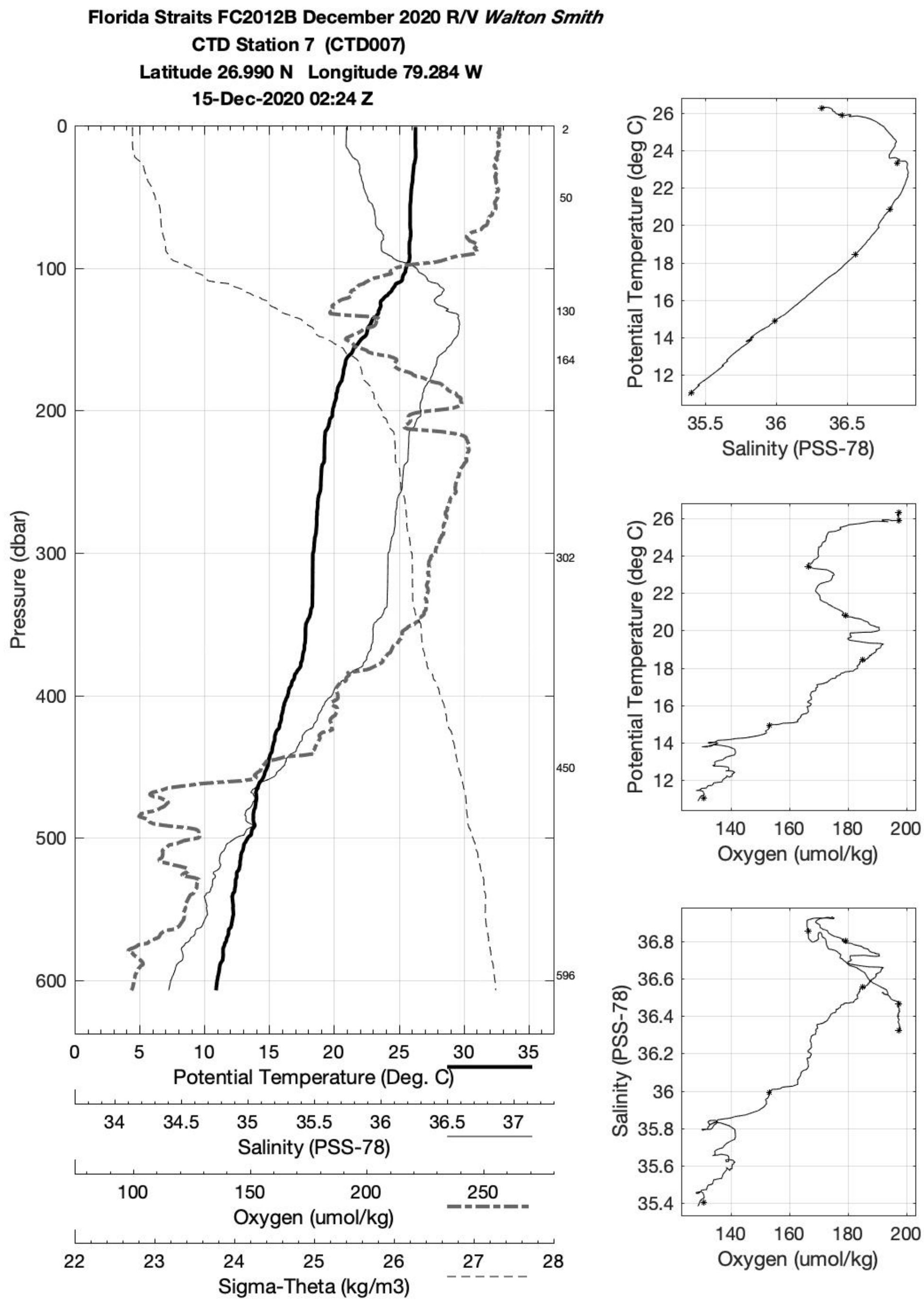
Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 6 (CTD006)
Latitude 26.989 N Longitude 79.387 W
15-Dec-2020 04:02 Z



Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 7 (CTD007)
Latitude 26.990N Longitude 79.284W
15-Dec-2020 02:24Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$	DynHt $m^2 \cdot s^{-2}$	SigT $kg \cdot m^{-3}$
1	26.282	26.282	36.329	197.7	0.004	23.948
10	26.280	26.278	36.328	197.9	0.040	23.948
20	26.304	26.299	36.351	197.4	0.079	23.959
30	26.147	26.140	36.401	197.1	0.118	24.047
50	25.938	25.927	36.441	197.4	0.195	24.144
75	25.931	25.914	36.517	192.5	0.289	24.206
100	25.571	25.549	36.700	178.3	0.381	24.458
125	23.610	23.584	36.806	167.1	0.460	25.133
150	22.131	22.101	36.902	168.9	0.526	25.635
200	19.941	19.903	36.726	185.4	0.633	26.105
250	19.037	18.992	36.627	189.7	0.727	26.267
300	18.431	18.378	36.551	185.8	0.817	26.366
400	16.494	16.428	36.251	167.5	0.988	26.611
500	13.421	13.349	35.739	141.3	1.130	26.895
600	11.061	10.985	35.394	129.2	1.250	27.085

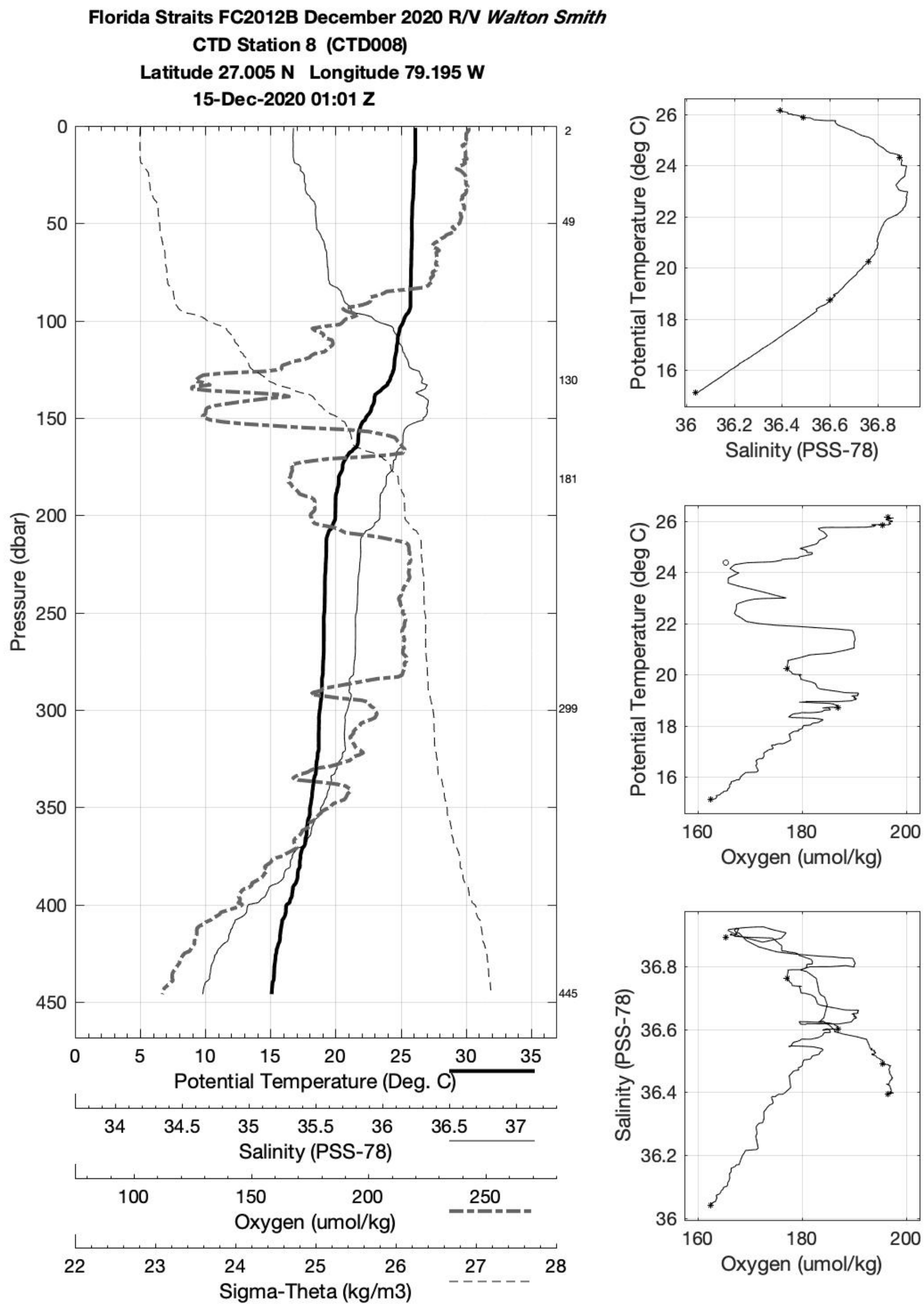
Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$
596	1	11.132	11.056	35.403	130.8
451	2	14.970	14.900	35.993	153.2
303	3	18.476	18.422	36.557	184.9
164	4	20.893	20.861	36.805	179.1
130	5	23.322	23.295	36.855	166.4
51	6	25.904	25.892	36.466	197.1
2	7	26.261	26.260	36.324	197.3


Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 7 (CTD007)
Latitude 26.990 N Longitude 79.284 W
15-Dec-2020 02:24 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
2
50
130
164
302
450
596
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 8 (CTD008)
Latitude 27.005N Longitude 79.195W
15-Dec-2020 01:01Z

Pressure dbar	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$	DynHt $m^2 \cdot s^{-2}$	SigT $kg \cdot m^{-3}$
1	26.116	26.116	36.398	197.6	0.004	24.052
10	26.119	26.117	36.397	196.9	0.039	24.051
20	26.083	26.078	36.419	196.9	0.077	24.080
30	25.997	25.990	36.445	197.3	0.115	24.127
50	25.865	25.854	36.487	196.6	0.190	24.202
75	25.803	25.786	36.534	193.5	0.283	24.258
100	25.257	25.235	36.719	183.3	0.373	24.569
125	24.496	24.469	36.865	176.2	0.453	24.913
150	22.348	22.318	36.906	167.4	0.522	25.576
200	20.020	19.982	36.736	179.4	0.630	26.091
250	19.180	19.135	36.645	190.0	0.724	26.244
300	18.831	18.778	36.609	186.8	0.817	26.308
400	16.316	16.250	36.222	171.7	0.989	26.630

Pressure dbar	Niskin	Temp90 °C	PoTemp90 °C	Salinity PSS-78	Oxygen $\mu mol \cdot kg^{-1}$
446	1	15.186	15.117	36.040	162.6
299	2	18.808	18.755	36.602	187.0
181	3	20.277	20.243	36.762	177.2
130	4	24.330	24.302	36.892	165.4
49	5	25.877	25.866	36.490	195.5
2	6	26.131	26.131	36.393	196.6



Florida Straits FC2012B December 2020 R/V *Walton Smith*
CTD Station 8 (CTD008)
Latitude 27.005 N Longitude 79.195 W
15-Dec-2020 01:01 Z
Pressure (dbar)
Potential Temperature (Deg. C)
Salinity (PSS-78)
Oxygen (umol/kg)
Sigma-Theta (kg/m3)
2
49
130
181
299
445
Potential Temperature (deg C)
Salinity (PSS-78)
Potential Temperature (deg C)
Oxygen (umol/kg)
Salinity (PSS-78)
Oxygen (umol/kg)

B WOCE Summary File

B.1 FC2002 - February 2020

Table 16: FC2002 – WOCE Summary File

SHIP/CRS EXPOCODE	WOCE SECT	STN	CAST	CAST TYPE	CAST DATE	UTC TIME	EVENT CODE	LAT	LON	NAV	UNC DPH	HT ABV BTM	MAX PRS	NO. BTLS	PARA-METERS
FCTSWS	FC2002	0	1	ROS	02/05/2020	11:18:35	BE	26.993N	79.930W	GPS					
FCTSWS	FC2002	0	1	ROS	02/05/2020	11:25:12	BO	26.998N	79.930W	GPS	139	14	144	4	1,2
FCTSWS	FC2002	0	1	ROS	02/05/2020	11:35:38	EN	27.007N	79.931W	GPS					
FCTSWS	FC2002	1	1	ROS	02/05/2020	10:23:17	BE	26.980N	79.869W	GPS					
FCTSWS	FC2002	1	1	ROS	02/05/2020	10:32:39	BO	26.989N	79.869W	GPS	252	13	256	5	1,2
FCTSWS	FC2002	1	1	ROS	02/05/2020	10:46:07	EN	27.000N	79.870W	GPS					
FCTSWS	FC2002	2	1	ROS	02/05/2020	08:59:42	BE	26.985N	79.784W	GPS					
FCTSWS	FC2002	2	1	ROS	02/05/2020	09:11:41	BO	26.996N	79.784W	GPS	368	22	378	6	1,2
FCTSWS	FC2002	2	1	ROS	02/05/2020	09:29:24	EN	27.011N	79.783W	GPS					
FCTSWS	FC2002	3	1	ROS	02/05/2020	07:12:22	BE	26.990N	79.684W	GPS					
FCTSWS	FC2002	3	1	ROS	02/05/2020	07:28:40	BO	27.005N	79.685W	GPS	516	19	524	7	1,2
FCTSWS	FC2002	3	1	ROS	02/05/2020	07:51:52	EN	27.025N	79.686W	GPS					
FCTSWS	FC2002	4	1	ROS	02/05/2020	05:41:27	BE	26.992N	79.613W	GPS					
FCTSWS	FC2002	4	1	ROS	02/05/2020	05:56:15	BO	27.004N	79.614W	GPS	635	19	643	7	1,2
FCTSWS	FC2002	4	1	ROS	02/05/2020	06:18:36	EN	27.020N	79.615W	GPS					
FCTSWS	FC2002	5	1	ROS	02/05/2020	03:57:07	BE	26.991N	79.502W	GPS					
FCTSWS	FC2002	5	1	ROS	02/05/2020	04:14:22	BO	27.002N	79.502W	GPS	748	13	755	8	1,2
FCTSWS	FC2002	5	1	ROS	02/05/2020	04:39:31	EN	27.018N	79.501W	GPS					
FCTSWS	FC2002	6	1	ROS	02/05/2020	02:18:40	BE	26.990N	79.385W	GPS					
FCTSWS	FC2002	6	1	ROS	02/05/2020	02:34:22	BO	26.998N	79.385W	GPS	657	8	676	8	1,2
FCTSWS	FC2002	6	1	ROS	02/05/2020	02:57:15	EN	27.009N	79.385W	GPS					
FCTSWS	FC2002	7	1	ROS	02/05/2020	00:47:52	BE	26.990N	79.288W	GPS					
FCTSWS	FC2002	7	1	ROS	02/05/2020	01:04:20	BO	26.999N	79.287W	GPS	611	12	617	7	1,2
FCTSWS	FC2002	7	1	ROS	02/05/2020	01:26:51	EN	27.010N	79.286W	GPS					
FCTSWS	FC2002	8	1	ROS	02/04/2020	23:21:10	BE	26.998N	79.200W	GPS					
FCTSWS	FC2002	8	1	ROS	02/04/2020	23:36:01	BO	27.004N	79.197W	GPS	462	9	465	6	1,2
FCTSWS	FC2002	8	1	ROS	02/04/2020	23:56:13	EN	27.011N	79.197W	GPS					

Note:Parameter 1 - salinity sampled, Parameter 2 - oxygen sampled

B.2 FC2012 - December 2020

Table 17: FC2012 – WOCE Summary File

SHIP/CRS EXPOCODE	WOCE SECT	STN	CAST	CAST TYPE	CAST DATE	UTC TIME	EVENT CODE	LAT	LON	NAV	UNC DPH	HT ABV BTM	MAX PRS	NO. BTLS	PARA-METERS
FCTSWS	FC2012	0	1	ROS	12/05/2020	13:35:23	BE	26.990N	79.928W	GPS					
FCTSWS	FC2012	0	1	ROS	12/05/2020	13:41:41	BO	26.995N	79.928W	GPS	144	14	149	4	1,2
FCTSWS	FC2012	0	1	ROS	12/05/2020	13:53:04	EN	27.004N	79.927W	GPS					
FCTSWS	FC2012	1	1	ROS	12/05/2020	12:16:37	BE	26.997N	79.865W	GPS					
FCTSWS	FC2012	1	1	ROS	12/05/2020	12:26:02	BO	27.006N	79.864W	GPS	249	60	261	5	1,2
FCTSWS	FC2012	1	1	ROS	12/05/2020	12:42:52	EN	27.021N	79.862W	GPS					
FCTSWS	FC2012	2	1	ROS	12/05/2020	10:42:48	BE	26.993N	79.784W	GPS					
FCTSWS	FC2012	2	1	ROS	12/05/2020	10:53:34	BO	27.002N	79.783W	GPS	371	17	381	6	1,2
FCTSWS	FC2012	2	1	ROS	12/05/2020	11:12:21	EN	27.018N	79.781W	GPS					
FCTSWS	FC2012	3	1	ROS	12/05/2020	08:57:07	BE	26.998N	79.679W	GPS					
FCTSWS	FC2012	3	1	ROS	12/05/2020	09:10:33	BO	27.008N	79.677W	GPS	527	15	537	7	1,2
FCTSWS	FC2012	3	1	ROS	12/05/2020	09:34:03	EN	27.026N	79.675W	GPS					
FCTSWS	FC2012	4	1	ROS	12/05/2020	07:19:28	BE	26.988N	79.616W	GPS					
FCTSWS	FC2012	4	1	ROS	12/05/2020	07:35:12	BO	27.000N	79.616W	GPS	639	8	645	6	1,2
FCTSWS	FC2012	4	1	ROS	12/05/2020	08:05:00	EN	27.025N	79.615W	GPS					
FCTSWS	FC2012	5	1	ROS	12/05/2020	04:59:51	BE	26.987N	79.498W	GPS					
FCTSWS	FC2012	5	1	ROS	12/05/2020	05:19:30	BO	26.999N	79.498W	GPS	729	29	756	8	1,2
FCTSWS	FC2012	5	1	ROS	12/05/2020	05:57:43	EN	27.025N	79.499W	GPS					
FCTSWS	FC2012	6	1	ROS	12/05/2020	03:17:56	BE	26.987N	79.386W	GPS					
FCTSWS	FC2012	6	1	ROS	12/05/2020	03:35:00	BO	26.994N	79.386W	GPS	661	8	669	8	1,2
FCTSWS	FC2012	6	1	ROS	12/05/2020	04:01:55	EN	27.008N	79.387W	GPS					
FCTSWS	FC2012	7	1	ROS	12/05/2020	01:47:12	BE	26.994N	79.284W	GPS					
FCTSWS	FC2012	7	1	ROS	12/05/2020	02:02:31	BO	26.999N	79.285W	GPS	608	12	615	7	1,2
FCTSWS	FC2012	7	1	ROS	12/05/2020	02:26:10	EN	27.008N	79.286W	GPS					
FCTSWS	FC2012	8	1	ROS	12/05/2020	00:12:40	BE	26.997N	79.201W	GPS					
FCTSWS	FC2012	8	1	ROS	12/05/2020	00:30:15	BO	26.999N	79.204W	GPS	480	12	486	6	1,2
FCTSWS	FC2012	8	1	ROS	12/05/2020	00:55:01	EN	27.000N	79.203W	GPS					

Note:Parameter 1 - salinity sampled, Parameter 2 - oxygen sampled

B.3 FC2012B - December 2020

Table 18: FC2012B – WOCE Summary File

SHIP/CRS EXPOCODE	WOCE SECT	STN	CAST	CAST TYPE	CAST DATE	UTC TIME	EVENT CODE	LAT	LON	NAV	UNC DPH	HT ABV BTM	MAX PRS	NO. BTLS	PARA-METERS
FCTSWS	FC2012B	0	1	ROS	12/15/2020	12:54:07	BE	26.999N	79.932W	GPS					
FCTSWS	FC2012B	0	1	ROS	12/15/2020	12:58:50	BO	27.001N	79.931W	GPS	136	17	137	4	1,2
FCTSWS	FC2012B	0	1	ROS	12/15/2020	13:07:33	EN	27.006N	79.929W	GPS					
FCTSWS	FC2012B	1	1	ROS	12/15/2020	11:58:34	BE	26.988N	79.870W	GPS					
FCTSWS	FC2012B	1	1	ROS	12/15/2020	12:04:55	BO	26.991N	79.869W	GPS	242	22	246	5	1,2
FCTSWS	FC2012B	1	1	ROS	12/15/2020	12:17:45	EN	27.001N	79.867W	GPS					
FCTSWS	FC2012B	2	1	ROS	12/15/2020	10:45:40	BE	26.997N	79.785W	GPS					
FCTSWS	FC2012B	2	1	ROS	12/15/2020	10:54:10	BO	27.002N	79.783W	GPS	363	26	371	6	1,2
FCTSWS	FC2012B	2	1	ROS	12/15/2020	11:11:03	EN	27.013N	79.781W	GPS					
FCTSWS	FC2012B	3	1	ROS	12/15/2020	08:52:41	BE	26.995N	79.687W	GPS					
FCTSWS	FC2012B	3	1	ROS	12/15/2020	09:04:34	BO	27.002N	79.684W	GPS	515	19	520	4	1,2
FCTSWS	FC2012B	3	1	ROS	12/15/2020	09:20:56	EN	27.013N	79.680W	GPS					
FCTSWS	FC2012B	4	1	ROS	12/15/2020	07:34:06	BE	26.992N	79.621W	GPS					
FCTSWS	FC2012B	4	1	ROS	12/15/2020	07:48:01	BO	27.000N	79.617W	GPS	622	20	628	7	1,2
FCTSWS	FC2012B	4	1	ROS	12/15/2020	08:09:57	EN	27.013N	79.611W	GPS					
FCTSWS	FC2012B	5	1	ROS	12/15/2020	05:48:22	BE	26.991N	79.506W	GPS					
FCTSWS	FC2012B	5	1	ROS	12/15/2020	06:05:36	BO	27.000N	79.503W	GPS	742	19	749	8	1,2
FCTSWS	FC2012B	5	1	ROS	12/15/2020	06:31:47	EN	27.016N	79.497W	GPS					
FCTSWS	FC2012B	6	1	ROS	12/15/2020	04:02:49	BE	26.985N	79.389W	GPS					
FCTSWS	FC2012B	6	1	ROS	12/15/2020	04:18:39	BO	26.991N	79.386W	GPS	680	20	687	8	1,2
FCTSWS	FC2012B	6	1	ROS	12/15/2020	04:44:23	EN	27.002N	79.381W	GPS					
FCTSWS	FC2012B	7	1	ROS	12/15/2020	02:24:39	BE	26.988N	79.287W	GPS					
FCTSWS	FC2012B	7	1	ROS	12/15/2020	02:39:50	BO	26.993N	79.283W	GPS	592	30	607	7	1,2
FCTSWS	FC2012B	7	1	ROS	12/15/2020	03:03:48	EN	27.000N	79.276W	GPS					
FCTSWS	FC2012B	8	1	ROS	12/15/2020	01:01:56	BE	27.003N	79.196W	GPS					
FCTSWS	FC2012B	8	1	ROS	12/15/2020	01:13:30	BO	27.006N	79.195W	GPS	442	18	446	6	1,2
FCTSWS	FC2012B	8	1	ROS	12/15/2020	01:30:47	EN	27.009N	79.194W	GPS					

Note:Parameter 1 - salinity sampled, Parameter 2 - oxygen sampled

C WOCE Bottle Summary File

C.1 FC2002 - February 2020

Table 19: FC2002 – WOCE Bottle Summary File

SHIP/CRS EXPOCODE	WOCE SECT	STN	CAST	BTL#	BTL# Flag	DATE	UTC TIME	LAT	LON	DEPTH	CTD PRS	CTD TMP	CTD SAL	SAL FLAG	BTL SAL	SAL FLAG	CTD OXY	OXY FLAG	BTL OXY	OXY FLAG
FCTSWS	FC2002	0	1	1	2	20200205	1127	27.000N	79.930W	139	140	13.788	35.773	2	35.775	2	127.6	2	127.8	2
FCTSWS	FC2002	0	1	2	2	20200205	1129	27.002N	79.931W	103	103	17.764	36.282	2	36.291	2	139.3	2	140.1	2
FCTSWS	FC2002	0	1	3	2	20200205	1132	27.005N	79.931W	50	50	23.782	36.345	2	36.340	2	202.7	2	202.3	2
FCTSWS	FC2002	0	1	4	2	20200205	1135	27.008N	79.931W	2	2	25.013	36.317	2	36.313	2	204.7	2	203.6	2
FCTSWS	FC2002	1	1	1	2	20200205	1034	26.990N	79.869W	252	253	9.811	35.215	2	35.244	4	122.1	2	122.3	2
FCTSWS	FC2002	1	1	2	2	20200205	1037	26.992N	79.869W	184	185	12.204	35.549	2	35.543	2	124.7	2	124.2	2
FCTSWS	FC2002	1	1	3	2	20200205	1040	26.995N	79.869W	129	130	18.344	36.412	2	36.466	4	138.4	2	138.4	2
FCTSWS	FC2002	1	1	4	2	20200205	1043	26.998N	79.870W	50	50	23.967	36.383	2	36.385	2	205.9	2	205.4	2
FCTSWS	FC2002	1	1	5	2	20200205	1045	27.000N	79.870W	2	2	24.769	36.287	2	36.297	2	205.6	2	205.4	2
FCTSWS	FC2002	2	1	1	2	20200205	0913	26.998N	79.784W	368	370	7.866	35.010	2	34.995	2	127.9	2	128.9	2
FCTSWS	FC2002	2	1	2	2	20200205	0916	27.000N	79.784W	302	304	12.181	35.539	2	35.545	2	124.7	2	124.2	2
FCTSWS	FC2002	2	1	3	2	20200205	0920	27.004N	79.783W	181	182	16.699	36.247	2	36.250	2	134.1	2	133.4	2
FCTSWS	FC2002	2	1	4	2	20200205	0923	27.006N	79.783W	130	131	21.142	36.753	2	36.757	2	156.7	2	152.8	2
FCTSWS	FC2002	2	1	5	2	20200205	0926	27.009N	79.783W	50	50	24.075	36.362	2	36.358	2	207.0	2	206.9	2
FCTSWS	FC2002	2	1	6	2	20200205	0929	27.012N	79.783W	2	2	25.352	36.247	2	36.244	2	204.2	2	203.2	2
FCTSWS	FC2002	3	1	1	2	20200205	0730	27.007N	79.685W	516	520	7.339	34.958	2	34.948	2	130.1	2	131.8	2
FCTSWS	FC2002	3	1	2	2	20200205	0734	27.010N	79.685W	401	404	10.473	35.265	2	35.297	4	117.9	2	117.6	2
FCTSWS	FC2002	3	1	3	2	20200205	0738	27.013N	79.685W	299	301	13.960	35.810	2	35.813	2	125.5	2	127.2	2
FCTSWS	FC2002	3	1	4	2	20200205	0742	27.017N	79.685W	180	181	19.276	36.584	2	36.585	2	145.8	2	145.1	2
FCTSWS	FC2002	3	1	5	2	20200205	0745	27.019N	79.685W	130	130	22.924	36.885	2	36.887	2	162.5	2	160.2	2
FCTSWS	FC2002	3	1	6	2	20200205	0748	27.023N	79.686W	50	50	26.198	36.536	2	36.541	2	180.5	2	180.1	2
FCTSWS	FC2002	3	1	7	2	20200205	0751	27.025N	79.686W	2	2	26.216	36.176	2	36.171	2	200.3	2	199.9	2
FCTSWS	FC2002	4	1	1	2	20200205	0558	27.005N	79.614W	635	640	7.391	34.947	2	34.952	2	127.8	2	129.6	2
FCTSWS	FC2002	4	1	2	2	20200205	0603	27.009N	79.614W	449	453	10.547	35.280	2	35.280	2	120.5	2	118.7	2
FCTSWS	FC2002	4	1	3	2	20200205	0607	27.012N	79.614W	300	302	14.932	35.969	2	35.984	2	136.9	2	136.6	2
FCTSWS	FC2002	4	1	4	2	20200205	0611	27.015N	79.614W	179	181	20.244	36.758	2	36.766	2	155.1	2	156.0	2
FCTSWS	FC2002	4	1	5	2	20200205	0613	27.017N	79.614W	129	130	22.705	36.934	2	36.934	2	158.9	2	159.1	2
FCTSWS	FC2002	4	1	6	2	20200205	0615	27.019N	79.615W	50	50	26.454	36.169	2	36.188	2	200.1	2	199.8	2
FCTSWS	FC2002	4	1	7	2	20200205	0617	27.021N	79.615W	3	3	26.432	36.169	2	36.170	2	199.7	2	199.8	2
FCTSWS	FC2002	5	1	1	2	20200205	0415	27.003N	79.502W	748	754	6.953	34.931	2	34.924	2	134.7	2	131.0	2
FCTSWS	FC2002	5	1	2	2	20200205	0419	27.005N	79.502W	595	600	8.953	35.083	2	35.075	2	120.2	2	122.1	2
FCTSWS	FC2002	5	1	3	2	20200205	0423	27.007N	79.502W	445	449	12.229	35.537	2	35.530	2	126.0	2	125.1	2
FCTSWS	FC2002	5	1	4	2	20200205	0427	27.010N	79.502W	299	301	16.423	36.217	2	36.215	2	144.4	2	143.8	2
FCTSWS	FC2002	5	1	5	2	20200205	0431	27.013N	79.501W	179	180	21.378	36.870	2	36.870	2	155.7	2	158.2	2
FCTSWS	FC2002	5	1	6	2	20200205	0432	27.014N	79.501W	129	130	24.364	36.907	2	36.908	2	165.6	2	166.4	2
FCTSWS	FC2002	5	1	7	2	20200205	0435	27.016N	79.501W	50	50	26.781	36.264	2	36.263	2	197.9	2	197.2	2
FCTSWS	FC2002	5	1	13	2	20200205	0438	27.018N	79.501W	3	3	26.763	36.267	2	36.274	2	197.5	2	197.3	2
FCTSWS	FC2002	6	1	1	2	20200205	0236	26.999N	79.385W	657	662	9.698	35.253	2	35.252	2	138.4	2	137.8	2
FCTSWS	FC2002	6	1	2	2	20200205	0238	27.000N	79.385W	595	600	9.984	35.210	2	35.218	2	119.9	2	120.0	2
FCTSWS	FC2002	6	1	3	2	20200205	0242	27.002N	79.385W	447	450	13.635	35.750	2	35.768	2	130.3	2	130.1	2
FCTSWS	FC2002	6	1	4	2	20200205	0246	27.004N	79.385W	299	301	17.466	36.404	2	36.410	2	163.0	2	162.2	2
FCTSWS	FC2002	6	1	5	2	20200205	0250	27.006N	79.385W	178	180	21.724	36.891	2	36.887	2	159.3	2	158.3	2
FCTSWS	FC2002	6	1	6	2	20200205	0251	27.007N	79.385W	129	130	23.980	36.901	2	36.893	2	161.6	2	162.8	2
FCTSWS	FC2002	6	1	7	2	20200205	0254	27.008N	79.385W	49	50	26.669	36.224	2	36.221	2	198.3	2	196.9	2
FCTSWS	FC2002	6	1	13	2	20200205	0257	27.010N	79.385W	3	3	26.662	36.225	2	36.222	2	198.2	2	198.8	2
FCTSWS	FC2002	7	1	1	2	20200205	0106	27.000N	79.287W	611	616	11.419	35.477	2	35.474	2	142.1	2	141.5	2
FCTSWS	FC2002	7	1	2	2	20200205	0111	27.003N	79.287W	449	452	15.166	36.046	2	36.050	2	165.8	2	168.1	2
FCTSWS	FC2002	7	1	3	2	20200205	0115	27.004N	79.287W	299	301	17.954	36.473	2	36.470	2	163.1	2	163.4	2
FCTSWS	FC2002	7	1	4	2	20200205	0118	27.006N	79.287W	179	180	21.346	36.849	2	36.845	2	152.7	2	153.6	2
FCTSWS	FC2002	7	1	5	2	20200205	0120	27.007N	79.286W	129	130	25.179	36.786	2	36.814	4	169.9	2	169.6	2
FCTSWS	FC2002	7	1	6	2	20200205	0123	27.009N	79.286W	50	50	26.149	36.317	2	36.319	2	200.4	2	200.6	2
FCTSWS	FC2002	7	1	7	2	20200205	0126	27.010N	79.286W	3	3	26.590	36.247	2	36.243	2	197.9	2	198.9	2
FCTSWS	FC2002	8	1	1	2	20200204	2336	27.005N	79.197W	462	465	15.550	36.108	2	36.115	2	154.1	2	166.9	4
FCTSWS	FC2002	8	1	2	2	20200204	2342	27.007N	79.197W	297	299	18.901	36.619	2	36.612	2	194.7	2	193.9	2
FCTSWS	FC2002	8	1	3	2	20200204	2346	27.008N	79.197W	179	180	21.346	36.807	2	36.805	2	186.3	2	189.0	2
FCTSWS	FC2002	8	1	4	2	20200204	2348	27.009N	79.197W	129	130	24.156	36.897	2	36.882	2	165.9	2	167.3	2
FCTSWS	FC2002	8	1	5	2	20200204	2352	27.010N	79.197W	49	49	26.063	36.412	2	36.404	2	189.2	2	200.4	4
FCTSWS	FC2002	8	1	6	2	20200204	2355	27.011N	79.197W	3	3	26.100	36.346	2	36.342	2	199.1	2	202.5	2

C.2 FC2012 - December 2020

Table 20: FC2012 – WOCE Bottle Summary File

SHIP/CRS EXPOCODE	WOCE SECT	STN	CAST	BTL#	BTL# Flag	DATE	UTC TIME	LAT	LON	DEPTH	CTD PRS	CTD TMP	CTD SAL	SAL FLAG	BTL SAL	SAL FLAG	CTD OXY	OXY FLAG	BTL OXY	OXY FLAG
FCTSWS	FC2012	0	1	1	2	20201205	1344	26.997N	79.928W	144	145	13.179	35.702	2	35.666	4	126.2	2	-999.0	9
FCTSWS	FC2012	0	1	2	2	20201205	1346	26.999N	79.928W	101	102	17.030	36.163	2	36.157	2	139.3	2	-999.0	9
FCTSWS	FC2012	0	1	3	2	20201205	1349	27.001N	79.928W	50	50	26.273	36.179	2	36.176	2	202.6	2	-999.0	9
FCTSWS	FC2012	0	1	4	2	20201205	1352	27.004N	79.927W	3	3	26.343	36.185	2	36.176	2	202.6	2	-999.0	9
FCTSWS	FC2012	1	1	1	2	20201205	1228	27.008N	79.864W	249	251	10.220	35.292	2	35.291	2	125.4	2	-999.0	9
FCTSWS	FC2012	1	1	2	2	20201205	1232	27.012N	79.863W	198	199	12.545	35.614	2	35.616	2	131.1	2	-999.0	9
FCTSWS	FC2012	1	1	3	2	20201205	1236	27.016N	79.863W	140	141	18.544	36.446	2	36.450	2	141.5	2	-999.0	9
FCTSWS	FC2012	1	1	4	2	20201205	1239	27.019N	79.863W	49	50	26.585	36.215	2	36.216	2	202.3	2	-999.0	9
FCTSWS	FC2012	1	1	5	2	20201205	1242	27.022N	79.862W	3	3	26.584	36.176	2	36.172	2	200.0	2	-999.0	9
FCTSWS	FC2012	2	1	1	2	20201205	1055	27.004N	79.782W	371	374	6.882	34.916	2	34.932	4	135.5	2	-999.0	9
FCTSWS	FC2012	2	1	2	2	20201205	1058	27.006N	79.782W	305	307	9.035	35.122	2	35.121	2	124.1	2	-999.0	9
FCTSWS	FC2012	2	1	3	2	20201205	1102	27.009N	79.782W	178	179	18.643	36.481	2	36.487	2	134.0	2	-999.0	9
FCTSWS	FC2012	2	1	4	2	20201205	1104	27.012N	79.782W	129	130	21.432	36.482	2	36.513	4	153.1	2	-999.0	9
FCTSWS	FC2012	2	1	5	2	20201205	1108	27.015N	79.781W	49	49	26.957	36.234	2	36.244	2	200.7	2	-999.0	9
FCTSWS	FC2012	2	1	6	2	20201205	1110	27.017N	79.781W	3	3	26.929	36.236	2	36.238	2	201.0	2	-999.0	9
FCTSWS	FC2012	3	1	1	2	20201205	0912	27.010N	79.677W	527	531	6.383	34.917	2	34.913	2	144.5	2	-999.0	9
FCTSWS	FC2012	3	1	2	2	20201205	0916	27.012N	79.677W	403	406	9.302	35.131	2	35.160	4	121.8	2	-999.0	9
FCTSWS	FC2012	3	1	3	2	20201205	0919	27.015N	79.676W	297	299	15.334	36.027	2	36.039	2	135.0	2	-999.0	9
FCTSWS	FC2012	3	1	4	2	20201205	0923	27.018N	79.676W	176	178	20.587	36.690	2	36.684	2	145.9	2	-999.0	9
FCTSWS	FC2012	3	1	5	2	20201205	0925	27.020N	79.676W	128	129	23.367	36.932	2	36.929	2	158.5	2	-999.0	9
FCTSWS	FC2012	3	1	6	2	20201205	0929	27.023N	79.675W	47	47	26.672	36.384	2	36.386	2	200.4	2	-999.0	9
FCTSWS	FC2012	3	1	7	2	20201205	0932	27.025N	79.675W	3	3	26.677	36.275	2	36.272	2	198.0	2	-999.0	9
FCTSWS	FC2012	4	1	1	2	20201205	0736	27.001N	79.616W	639	644	6.336	34.914	2	34.910	2	145.2	2	-999.0	9
FCTSWS	FC2012	4	1	2	2	20201205	0741	27.004N	79.615W	448	452	9.342	35.122	2	35.117	2	120.2	2	-999.0	9
FCTSWS	FC2012	4	1	3	2	20201205	0745	27.008N	79.615W	307	309	16.536	36.231	2	36.257	4	149.7	2	-999.0	9
FCTSWS	FC2012	4	1	4	2	20201205	0752	27.014N	79.615W	179	180	21.191	36.840	2	36.868	4	158.0	2	-999.0	9
FCTSWS	FC2012	4	1	5	2	20201205	0755	27.016N	79.615W	130	131	23.744	36.935	2	36.934	2	159.2	2	-999.0	9
FCTSWS	FC2012	4	1	6	2	20201205	0759	27.020N	79.615W	50	50	26.730	36.432	2	36.429	2	198.0	2	-999.0	9
FCTSWS	FC2012	5	1	1	2	20201205	0523	27.002N	79.498W	729	735	6.709	34.916	2	34.916	2	136.4	2	-999.0	9
FCTSWS	FC2012	5	1	2	2	20201205	0527	27.004N	79.498W	603	608	8.370	35.017	2	35.013	2	120.9	2	-999.0	9
FCTSWS	FC2012	5	1	3	2	20201205	0533	27.007N	79.498W	447	451	12.604	35.586	2	35.596	2	125.4	2	-999.0	9
FCTSWS	FC2012	5	1	4	2	20201205	0538	27.011N	79.498W	297	299	17.680	36.420	2	36.420	2	157.9	2	-999.0	9
FCTSWS	FC2012	5	1	5	2	20201205	0542	27.014N	79.498W	178	180	20.868	36.810	2	36.812	2	167.6	2	-999.0	9
FCTSWS	FC2012	5	1	6	2	20201205	0546	27.017N	79.498W	130	130	24.052	36.916	2	36.911	2	179.9	2	-999.0	9
FCTSWS	FC2012	5	1	7	2	20201205	0551	27.021N	79.499W	50	50	26.591	36.378	2	36.390	2	199.3	2	-999.0	9
FCTSWS	FC2012	5	1	13	2	20201205	0555	27.024N	79.499W	3	3	26.595	36.362	2	-999.000	9	196.2	2	-999.0	9
FCTSWS	FC2012	6	1	1	2	20201205	0337	26.995N	79.386W	661	667	8.803	35.059	2	35.055	2	119.6	2	-999.0	9
FCTSWS	FC2012	6	1	2	2	20201205	0340	26.997N	79.386W	592	597	9.145	35.099	2	35.100	2	119.2	2	-999.0	9
FCTSWS	FC2012	6	1	3	2	20201205	0344	26.999N	79.386W	450	454	13.460	35.719	2	35.731	2	128.9	2	-999.0	9
FCTSWS	FC2012	6	1	4	2	20201205	0349	27.001N	79.387W	298	300	18.374	36.540	2	36.548	2	183.4	2	-999.0	9
FCTSWS	FC2012	6	1	5	2	20201205	0352	27.003N	79.387W	180	181	21.002	36.821	2	36.836	2	165.1	2	-999.0	9
FCTSWS	FC2012	6	1	6	2	20201205	0354	27.004N	79.387W	129	130	23.882	36.890	2	36.882	2	163.3	2	-999.0	9
FCTSWS	FC2012	6	1	7	2	20201205	0357	27.006N	79.387W	48	48	26.695	36.448	2	36.444	2	197.3	2	-999.0	9
FCTSWS	FC2012	6	1	13	2	20201205	0400	27.008N	79.387W	2	2	26.677	36.452	2	-999.000	9	196.7	2	-999.0	9
FCTSWS	FC2012	7	1	1	2	20201205	0204	27.000N	79.285W	608	613	10.550	35.299	2	35.292	2	-999.0	9	-999.0	9
FCTSWS	FC2012	7	1	2	2	20201205	0209	27.002N	79.285W	449	453	14.936	35.986	2	35.978	2	143.6	2	-999.0	9
FCTSWS	FC2012	7	1	3	2	20201205	0213	27.003N	79.285W	299	301	18.859	36.600	2	36.601	2	189.2	2	-999.0	9
FCTSWS	FC2012	7	1	4	2	20201205	0217	27.005N	79.286W	179	181	20.923	36.804	2	36.800	2	159.8	2	-999.0	9
FCTSWS	FC2012	7	1	5	2	20201205	0219	27.006N	79.286W	129	130	23.679	36.918	2	36.918	2	161.0	2	-999.0	9
FCTSWS	FC2012	7	1	6	2	20201205	0222	27.007N	79.286W	49	50	26.740	36.432	2	36.432	2	197.4	2	-999.0	9
FCTSWS	FC2012	7	1	7	2	20201205	0225	27.008N	79.286W	2	2	26.729	36.433	2	36.432	2	197.6	2	-999.0	9
FCTSWS	FC2012	8	1	1	2	20201205	0028	26.999N	79.204W	480	483	14.857	35.994	2	35.993	2	163.8	2	-999.0	9
FCTSWS	FC2012	8	1	2	2	20201205	0038	27.000N	79.204W	298	300	18.866	36.612	2	36.609	2	190.0	2	-999.0	9
FCTSWS	FC2012	8	1	3	2	20201205	0042	27.000N	79.204W	180	181	21.202	36.838	2	36.841	2	176.5	2	-999.0	9
FCTSWS	FC2012	8	1	4	2	20201205	0045	27.000N	79.204W	129	130	23.620	36.924	2	36.923	2	160.1	2	-999.0	9
FCTSWS	FC2012	8	1	5	2	20201205	0048	27.000N	79.204W	50	50	26.722	36.437	2	36.435	2	196.8	2	-999.0	9
FCTSWS	FC2012	8	1	6	2	20201205	0050	27.000N	79.203W	3	3	26.716	36.438	2	36.434	2	197.2	2	-999.0	9

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Table 21: FC2012B – WOCE Bottle Summary File

SHIP/CRS EXPOCODE	WOCE SECT	STN	CAST	BTL#	BTL# Flag	DATE	UTC TIME	LAT	LON	DEPTH	CTD PRS	CTD TMP	CTD SAL	SAL FLAG	BTL SAL	SAL FLAG	CTD OXY	OXY FLAG	BTL OXY	OXY FLAG
FCTSWS	FC2012B	0	1	1	2	20201215	1259	27.001N	79.931W	136	136	14.761	35.911	2	35.909	2	131.2	2	-999.0	9
FCTSWS	FC2012B	0	1	2	2	20201215	1302	27.002N	79.930W	100	100	20.175	36.292	2	36.295	6	152.8	2	-999.0	9
FCTSWS	FC2012B	0	1	3	2	20201215	1304	27.004N	79.930W	51	51	25.576	36.216	2	36.211	2	201.8	2	-999.0	9
FCTSWS	FC2012B	0	1	4	2	20201215	1307	27.007N	79.929W	3	3	26.268	36.137	2	36.133	2	200.1	2	-999.0	9
FCTSWS	FC2012B	1	1	1	2	20201215	1207	26.993N	79.869W	242	244	9.292	35.174	2	35.168	2	125.7	2	-999.0	9
FCTSWS	FC2012B	1	1	2	2	20201215	1209	26.995N	79.868W	178	179	13.009	35.663	2	35.662	6	128.5	2	-999.0	9
FCTSWS	FC2012B	1	1	3	2	20201215	1211	26.997N	79.868W	137	138	19.850	36.366	2	36.371	2	144.4	2	-999.0	9
FCTSWS	FC2012B	1	1	4	2	20201215	1214	26.999N	79.868W	49	50	25.959	36.257	2	36.259	2	198.3	2	-999.0	9
FCTSWS	FC2012B	1	1	5	2	20201215	1217	27.001N	79.867W	3	3	26.363	36.132	2	36.129	2	199.6	2	-999.0	9
FCTSWS	FC2012B	2	1	1	2	20201215	1056	27.004N	79.782W	363	365	7.266	34.944	2	34.936	2	130.9	2	-999.0	9
FCTSWS	FC2012B	2	1	2	2	20201215	1059	27.006N	79.782W	301	304	9.558	35.208	2	35.216	2	125.1	2	-999.0	9
FCTSWS	FC2012B	2	1	3	2	20201215	1103	27.008N	79.782W	180	181	19.091	36.487	2	36.494	2	121.2	2	-999.0	9
FCTSWS	FC2012B	2	1	4	2	20201215	1105	27.010N	79.782W	129	130	21.884	36.499	2	36.512	2	156.9	2	-999.0	9
FCTSWS	FC2012B	2	1	5	2	20201215	1107	27.011N	79.781W	49	49	26.362	36.136	2	36.140	2	199.5	2	-999.0	9
FCTSWS	FC2012B	2	1	6	2	20201215	1110	27.013N	79.781W	3	3	26.359	36.129	2	36.132	6	199.7	2	-999.0	9
FCTSWS	FC2012B	3	1	1	2	20201215	0906	27.003N	79.684W	515	519	6.692	34.916	2	34.912	2	137.4	2	136.9	2
FCTSWS	FC2012B	3	1	2	2	20201215	0910	27.006N	79.683W	396	399	10.046	35.245	2	35.242	2	121.7	2	121.8	2
FCTSWS	FC2012B	3	1	3	2	20201215	0913	27.008N	79.682W	301	303	14.241	35.849	2	35.852	6	130.6	2	133.0	6
FCTSWS	FC2012B	3	1	4	2	20201215	0921	27.013N	79.680W	3	3	26.284	36.128	2	36.130	2	198.2	2	198.1	2
FCTSWS	FC2012B	4	1	1	2	20201215	0750	27.001N	79.616W	622	627	6.281	34.907	2	34.901	2	143.6	2	143.8	2
FCTSWS	FC2012B	4	1	2	2	20201215	0754	27.004N	79.615W	479	482	9.381	35.159	2	35.161	2	121.5	2	121.0	2
FCTSWS	FC2012B	4	1	3	2	20201215	0759	27.007N	79.614W	297	300	15.058	35.986	2	35.996	2	136.6	2	138.8	2
FCTSWS	FC2012B	4	1	4	2	20201215	0802	27.009N	79.613W	180	181	20.567	36.754	2	36.769	2	153.4	2	151.7	2
FCTSWS	FC2012B	4	1	5	2	20201215	0804	27.010N	79.612W	126	127	24.193	36.922	2	36.919	2	159.0	2	159.0	6
FCTSWS	FC2012B	4	1	6	2	20201215	0807	27.012N	79.611W	51	52	26.269	36.381	2	36.381	6	196.2	2	196.9	2
FCTSWS	FC2012B	4	1	7	2	20201215	0809	27.014N	79.611W	3	3	26.455	36.222	2	36.218	2	197.1	2	196.6	2
FCTSWS	FC2012B	5	1	1	2	20201215	0607	27.001N	79.503W	742	748	6.237	34.905	2	34.905	2	144.0	2	144.4	2
FCTSWS	FC2012B	5	1	2	2	20201215	0612	27.004N	79.502W	594	599	7.859	34.987	2	34.983	2	123.5	2	124.5	6
FCTSWS	FC2012B	5	1	3	2	20201215	0616	27.007N	79.501W	445	449	12.177	35.511	2	35.513	2	123.7	2	123.6	2
FCTSWS	FC2012B	5	1	4	2	20201215	0620	27.009N	79.500W	299	301	17.047	36.307	2	36.300	2	161.8	2	142.7	4
FCTSWS	FC2012B	5	1	5	2	20201215	0624	27.011N	79.499W	179	180	20.684	36.801	2	36.803	6	178.6	2	177.3	2
FCTSWS	FC2012B	5	1	6	2	20201215	0626	27.012N	79.499W	129	130	24.181	36.918	2	36.915	2	167.5	2	177.9	4
FCTSWS	FC2012B	5	1	7	2	20201215	0628	27.014N	79.498W	51	51	26.280	36.488	2	36.491	2	192.8	2	193.1	2
FCTSWS	FC2012B	5	1	13	2	20201215	0632	27.016N	79.497W	3	3	26.247	36.430	2	36.444	2	196.1	2	196.1	2
FCTSWS	FC2012B	6	1	1	2	20201215	0421	26.992N	79.386W	680	686	8.157	34.995	2	35.005	2	119.5	2	120.8	6
FCTSWS	FC2012B	6	1	2	2	20201215	0424	26.994N	79.385W	586	591	9.021	35.083	2	35.086	6	113.8	2	114.9	2
FCTSWS	FC2012B	6	1	3	2	20201215	0428	26.995N	79.384W	447	450	13.454	35.739	2	36.844	4	132.7	2	132.1	2
FCTSWS	FC2012B	6	1	4	2	20201215	0432	26.997N	79.383W	298	301	18.411	36.548	2	35.734	4	176.5	2	180.7	4
FCTSWS	FC2012B	6	1	5	2	20201215	0435	26.998N	79.383W	181	182	21.058	36.830	2	36.827	2	172.1	2	173.5	2
FCTSWS	FC2012B	6	1	6	2	20201215	0437	26.999N	79.382W	127	128	23.792	36.935	2	36.936	2	168.5	2	170.8	4
FCTSWS	FC2012B	6	1	7	2	20201215	0441	27.001N	79.381W	50	50	26.288	36.481	2	36.482	2	194.4	2	194.7	2
FCTSWS	FC2012B	6	1	13	2	20201215	0444	27.002N	79.381W	2	2	26.284	36.473	2	36.467	2	195.2	2	195.3	2
FCTSWS	FC2012B	7	1	1	2	20201215	0242	26.994N	79.282W	592	596	11.132	35.403	2	35.403	2	129.4	2	130.8	6
FCTSWS	FC2012B	7	1	2	2	20201215	0247	26.995N	79.281W	447	451	14.970	35.998	2	35.993	2	153.8	2	153.2	2
FCTSWS	FC2012B	7	1	3	2	20201215	0251	26.997N	79.280W	301	303	18.476	36.556	2	36.557	6	185.7	2	184.9	2
FCTSWS	FC2012B	7	1	4	2	20201215	0255	26.998N	79.279W	163	164	20.893	36.802	2	36.805	2	178.1	2	179.1	2
FCTSWS	FC2012B	7	1	5	2	20201215	0258	26.998N	79.278W	129	130	23.322	36.866	2	36.855	2	166.0	2	166.4	2
FCTSWS	FC2012B	7	1	6	2	20201215	0301	26.999N	79.277W	50	51	25.904	36.474	2	36.466	2	196.9	2	197.1	2
FCTSWS	FC2012B	7	1	7	2	20201215	0303	27.000N	79.276W	2	2	26.261	36.320	2	36.324	2	197.8	2	197.3	2
FCTSWS	FC2012B	8	1	1	2	20201215	0114	27.006N	79.195W	442	446	15.186	36.044	2	36.040	2	162.1	2	162.6	2
FCTSWS	FC2012B	8	1	2	2	20201215	0118	27.006N	79.194W	297	299	18.808	36.603	2	36.602	2	186.8	2	187.0	2
FCTSWS	FC2012B	8	1	3	2	20201215	0122	27.007N	79.194W	180	181	20.277	36.758	2	36.762	2	177.1	2	177.2	6
FCTSWS	FC2012B	8	1	4	2	20201215	0124	27.007N	79.194W	130	130	24.330	36.896	2	36.892	6	172.3	2	165.4	4
FCTSWS	FC2012B	8	1	5	2	20201215	0127	27.008N	79.194W	49	49	25.877	36.496	2	36.490	2	196.1	2	195.5	2
FCTSWS	FC2012B	8	1	6	2	20201215	0130	27.009N	79.193W	2	2	26.131	36.398	2	36.393	2	196.8	2	196.6	2