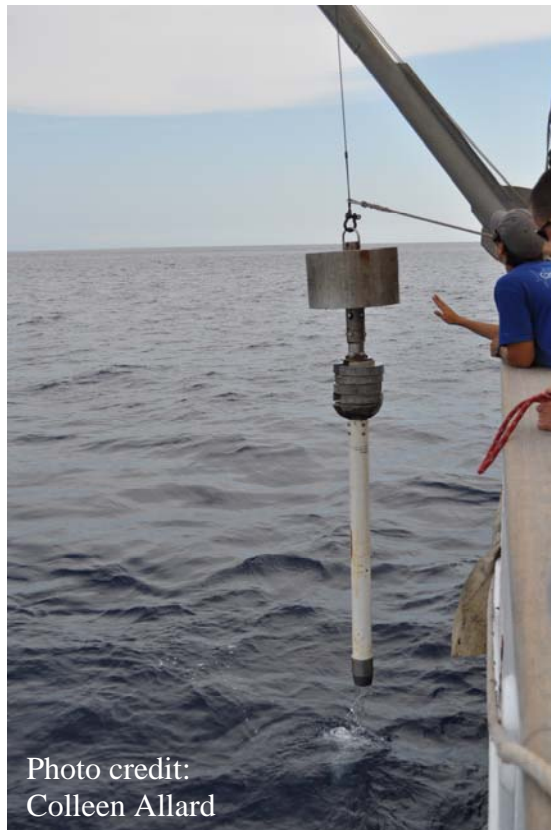


Cruise Report C-229

Scientific Data Collected Aboard
SSV Corwith Cramer

Charleston, South Carolina, USA –
Hamilton, Bermuda
21 May 2010 – 4 June 2010



Sea Education Association
Woods Hole, Massachusetts

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Ship's Company

SSV *Corwith Cramer*, Cruise C-229

Nautical Staff

Beth Doxsee	Captain
Heather Stone	Chief Mate
Colleen Allard	Second Mate
Meredith Helfrich	Third Mate
Tom Howland	Engineer
Mandy Lamb	Steward
Becca Hamilton	Assistant Steward
Janice Lewis	Deckhand
Ashley Meyer	Deckhand
Carolyn Tarpey	Deckhand

Scientific Staff

Amy Siuda	Chief Scientist
Gorka Sancho	Co-Chief Scientist (College of Charleston)
Scott Harris	Co-Chief Scientist (College of Charleston)
Leslie Sautter	Co-Chief Scientist (College of Charleston)
Maia Theophanis	First Assistant Scientist
Erin Roach	Second Assistant Scientist
Alina Corcoran	Third Assistant Scientist

College of Charleston Students

Bobby Baranello
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Brent DeArmond
Jason Enfinger
Erin Fannin
Kirk Gillen
John Hildreth
Alex Hoang
Daniel Hodge
Coti Phillips
Hollis Romanchik
Brittany Sapyta
Lindsey Sydow
Stephanie Vogtman
Dan Zurlo

Visitors

Emily Allen	Charleston, SC
Gary McGraw	Charleston, SC
Wally Yost	Charleston, SC

Introduction

This cruise report provides a summary of scientific activities aboard the SSV *Corwith Cramer* during cruise C-229 (21 May – 4 June 2010), a collaborative program with the College of Charleston. Extensive oceanographic sampling was conducted for both student research projects and the ongoing SEA research program. Students examined physical, chemical, biological, and environmental oceanographic characteristics in accordance with their written proposals and presented their final results in oral presentations and papers (available upon request from SEA).

The brief summary of data contained in this report is not intended to represent final data interpretation and should not be excerpted or cited without written permission from SEA.

Amy NS Siuda
Chief Scientist, C-229

Data Description

This section provides a record of data collected aboard the SSV *Corwith Cramer* cruise C-229 (US State Department Cruise: 2009-115, Leg 1) from Charleston, South Carolina, USA to Hamilton, Bermuda (Figure 1).

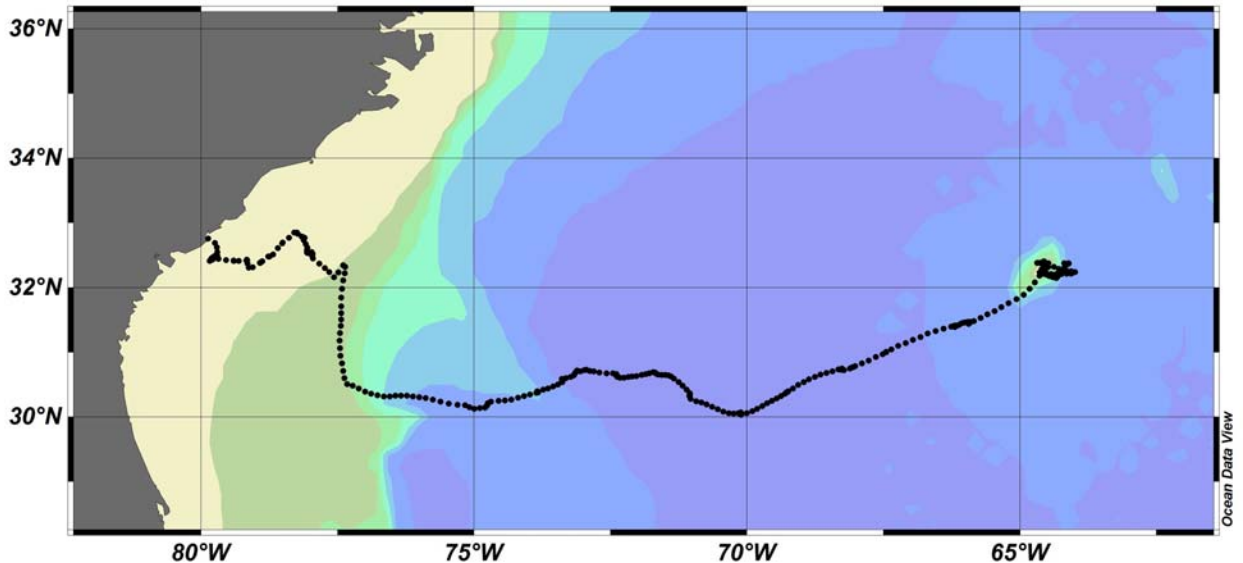


Figure 1. Hourly positions along the C-229 cruise track.

During the two-week voyage, we sampled at 52 discrete oceanographic stations (Table 1). The 30 surface sampling stations were independent of hydrocast stations (Table 2). Additionally, we continuously sampled water depth and sub-bottom profiles (CHIRP system), upper ocean currents (ADCP, Figure 2), and sea surface temperature, salinity, and *in vivo* fluorescence, CDOM, and transmittance (seawater flow-through system, Figure 3 – temperature, salinity and fluorescence).

Discrete CTD measurements of vertical temperature and salinity profiles are presented in Figure 4. Additional instrumentation on the CTDs allowed for profiling of dissolved oxygen, fluorescence, transmittance, PAR and CDOM (Figure 5). Summaries of sea surface and water column chemical and biological properties are found in Tables 2-4. Sediment composition from Shipek Grab samples is described in Table 5. Lengthy CTD, CHIRP, ADCP and flow-through data are not fully presented here. All unpublished data can be made available by arrangement with the SEA data archivist (contact information, p. 2).

Table 1. Oceanographic sampling stations. X indicates type of station. (NT = Neuston Tow, MN = Meter Net, 2MN = 2-Meter Net, PN = Phytoplankton Net, HC = Hydrocast with CTD, CTD = Free CTD, SPAR = Surface Radiation Detection, GC = Gravity Core, SG = Shipek Grab.

Station	Date	Time	Lat (°N)	Lon (°W)	NT	MN	2MN	PN	HC	CTD	SPAR	GC	SG	General Locale
C229-001	21-May-10	2153	32°29.2'	79°43.1'	X				X	X				Carolina Shelf
C229-002	22-May-10	1034	32°24.7'	79°23.1'	X			X	X	X				Carolina Shelf
C229-003	22-May-10	1910	32°18.4'	79°07.4'							X			Carolina Shelf
C229-004	22-May-10	2209	32°23.9'	78°53.4'	X	X							X	Carolina Shelf
C229-005	23-May-10	0141	32°28.8'	78°45.1'		X							X	Carolina Shelf
C229-006	23-May-10	0510	32°41.1'	78°30.5'		X					X		X	100 m isobath
C229-007	23-May-10	0540	32°41.6'	78°30.8'							X			100 m isobath
C229-008	23-May-10	0843	32°52.5'	78°16.8'									X	100 m isobath
C229-009	23-May-10	0918	32°50.9'	78°14.3'		X							X	100 m isobath
C229-010	23-May-10	1043	32°47.7'	78°10.3'									X	100 m isobath
C229-011	23-May-10	1124	32°46.9'	78°08.5'									X	Shelf Edge
C229-012	23-May-10	1149	32°46.5'	78°07.1'				X						Shelf Edge
C229-013	23-May-10	1204	32°46.4'	78°06.9'									X	Georgetown Hole
C229-014	23-May-10	1220	32°46.4'	78°07.2'									X	Georgetown Hole
C229-015	23-May-10	1615	32°46.0'	78°06.8'								X		Georgetown Hole
C229-016	23-May-10	1800									X			Gulf Stream
C229-017	24-May-10	0008	32°32.0'	78°03.1'				X		X				Gulf Stream
C229-018	24-May-10	0455	32°32.2'	77°59.3'							X			Gulf Stream
C229-019	24-May-10	0944	32°30.6'	77°57.2'	X			X	X	X				Gulf Stream
C229-020	24-May-10	1704	32°09.9'	77°34.3'							X			Gulf Stream
C229-021	25-May-10	0025	31°46.8'	77°26.1'				X						Gulf Stream
C229-022	25-May-10	0357	31°25.6'	77°26.2'							X			Gulf Stream
C229-023	25-May-10	1210	30°30.5'	77°19.9'				X						Gulf Stream
C229-024	25-May-10	1721	30°19.4'	76°44.4'							X			Gulf Stream
C229-025	25-May-10	2357	30°18.1'	76°02.4'				X						Gulf Stream

Table 1 continued.

Station	Date	Time	Lat (°N)	Lon (°W)	NT	MN	2MN	PN	HC	CTD	SPAR	GC	SG	General Locale
C229-026	26-May-10	0410	30°12.1'	75°27.4'							X			Gulf Stream
C229-027	26-May-10	1009	30°08.2'	74°47.9'	X			X	X	X	X			Sargasso Sea
C229-028	26-May-10	1735	30°16.5'	74°16.3'							X			Sargasso Sea
C229-029	26-May-10	2144	30°22.4'	73°49.8'	X			X	X	X				Sargasso Sea
C229-030	27-May-10	0435	30°30.8'	73°25.6'							X			Sargasso Sea
C229-031	27-May-10	1015	30°38.4'	73°09.9'	X			X	X	X				Sargasso Sea
C229-032	27-May-10	1843	30°41.6'	72°44.9'							X			Sargasso Sea
C229-033	27-May-10	2227	30°39.3'	72°22.3'	X			X	X					Sargasso Sea
C229-034	28-May-10	0400	30°37.1'	72°06.5'							X			Sargasso Sea
C229-035	28-May-10	1000	30°41.2'	71°40.9'	X			X	X		X			Sargasso Sea
C229-036	28-May-10	2202	30°20.4'	71°02.8'	X				X					Sargasso Sea
C229-037	29-May-10	0407	30°09.0'	70°38.3'							X			Sargasso Sea
C229-038	29-May-10	1000	30°04.1'	70°06.6'	X			X	X		X			Sargasso Sea
C229-039	29-May-10	2202	30°22.9'	69°15.3'	X				X					Sargasso Sea
C229-040	30-May-10	0407	30°33.9'	68°53.5'							X			Sargasso Sea
C229-041	30-May-10	1005	30°44.6'	68°15.2'	X			X	X					Sargasso Sea
C229-042	30-May-10	1703	30°46.5'	68°02.0'							X			Sargasso Sea
C229-043	30-May-10	2200	30°59.6'	67°26.5'	X				X					Sargasso Sea
C229-044	31-May-10	0408	31°13.9'	66°49.7'							X			Sargasso Sea
C229-045	31-May-10	1008	31°24.6'	66°11.3'	X			X	X	X	X			Sargasso Sea
C229-046	31-May-10	1800	31°26.9'	66°02.4'							X			Sargasso Sea
C229-047	31-May-10	2133	31°27.9'	65°55.5'	X				X					Sargasso Sea
C229-048	1-Jun-10	0400	31°31.2'	65°44.2'							X			Sargasso Sea
C229-049	2-Jun-10	1140	32°22.9'	64°36.6'									X	Bermuda
C229-050	2-Jun-10	1326	32°24.0'	64°34.1'									X	Bermuda
C229-051	2-Jun-10	1352	32°24.2'	64°33.5'									X	Bermuda
C229-052	2-Jun-10	2141	32°14.2'	64°00.0'			X							Bermuda

Table 2. Surface sampling station data (SS-XXX). Blanks indicate no sample collected.

Station	Date	Time	Lat (°N)	Lon (°W)	Temp (°W)	Salinity (PSU)	Fluor. (mV)	Chl-a (µg/L)	PO ₄ (µM)	SiO ₂ (µM)	Alkalinity (µmol/kg)	pH
SS-001	22-May-10	1248	32°24.6'	79°21.4'	25.5	34.730	1062.4				1996.8	7.976
SS-002	22-May-10	2217	32°23.9'	78°53.5'	26.1	36.480	1198.3	0.061	0.087	0.869		
SS-003	23-May-10	0100	32°27.6'	78°47.8'	26.3	36.490	1185.6				2432.4	8.070
SS-004	23-May-10	1155	32°46.4'	78°06.9'	25.1	36.220	991.6	0.098	0.041	1.154		
SS-005	23-May-10	1300	32°45.0'	78°05.4'	25.3	35.980	1001.1				2999.6	8.104
SS-006	24-May-10	0100	32°32.3'	78°02.8'	26.8	36.480	1127.8				2890.4	8.076
SS-007	24-May-10	1300	32°27.2'	77°57.4'	26.4	36.370	1250.5				2456.6	8.118
SS-008	25-May-10	0000	31°51.2'	77°25.5'	26.6	36.550	1272.6	0.077	0.073	2.508		
SS-009	25-May-10	0110	31°42.9'	77°26.1'	25.3	36.680	1233.5				2410.6	8.104
SS-010	25-May-10	1210	30°30.5'	77°19.9'	25.6	36.620	942.0	0.043	0.096			
SS-011	25-May-10	1300	30°28.9'	77°14.0'	25.6	36.640	942.2				2365.7	8.131
SS-012	25-May-10	2357	30°18.1'	76°02.4'	25.3	36.660	1053.3	0.037	0.018	2.020		
SS-013	26-May-10	0100	30°17.4'	75°54.8'	25.4	36.610	1056.6				2339.7	7.746
SS-014	26-May-10	1300	30°12.0'	74°44.8'	25.8	36.600	924.0				2374.6	8.088
SS-015	26-May-10	0100	30°24.6'	73°45.3'	23.7	36.800	1038.2				2117.2	8.035
SS-016	27-May-10	1300	30°24.3'	73°45.3'	24.2	36.488	942.3				2519.2	8.061
SS-017	28-May-10	0105	30°36.2'	72°19.8'	23.6	36.607	1151.8				4570.3	8.083
SS-018	28-May-10	1250	30°39.0'	71°35.3'	23.2	36.526	975.3					8.075
SS-019	29-May-10	0100	30°14.4'	70°57.0'	23.6	36.731	1025.6				2378.1	8.098
SS-020	29-May-10	0200	30°14.4'	70°51.7'	23.6	36.720	1104.3					
SS-021	29-May-10	1300	30°02.7'	69°55.1'	23.4	36.616	860.9				2717.5	8.088
SS-022	30-May-10	0000	30°22.9'	69°15.5'	22.4	36.686	1103.2				2876.3	8.039
SS-023	30-May-10	1300	30°44.3'	68°15.1'	22.4	36.670	830.8				3283.5	8.021
SS-024	31-May-10	0100	31°05.1'	68°15.1'	22.4	36.650	1712.3				1653.9	8.063
SS-025	31-May-10	1300	31°23.3'	67°11.5'	21.9	36.651	830.6				3441.1	8.036
SS-026	31-May-10	2330	31°27.5'	66°54.9'	22.0	36.717	999.9				2524.5	8.050
SS-027	1-Jun-10	1300	32°11.5'	65°37.6'	23.3	36.670	888.9				3214.5	7.988
SS-028	2-Jun-10	0100	32°18.1'	64°31.6'	22.8	36.805	980.5				3196.8	8.109

Table 2 continued.

Station	Date	Time	Lat (°N)	Lon (°W)	Temp (°W)	Salinity (PSU)	Fluor. (mV)	Chl-a (µg/L)	PO ₄ (µM)	SiO ₂ (µM)	Alkalinity (µmol/kg)	pH
SS-029	2-Jun-10	1410	32°24.4'	64°33.8'	22.6	36.734	1134.4				2381.6	8.067
SS-030	3-Jun-10	0105	32°12.6'	64°07.8'	22.6	36.757	1164.0				2353.9	8.113

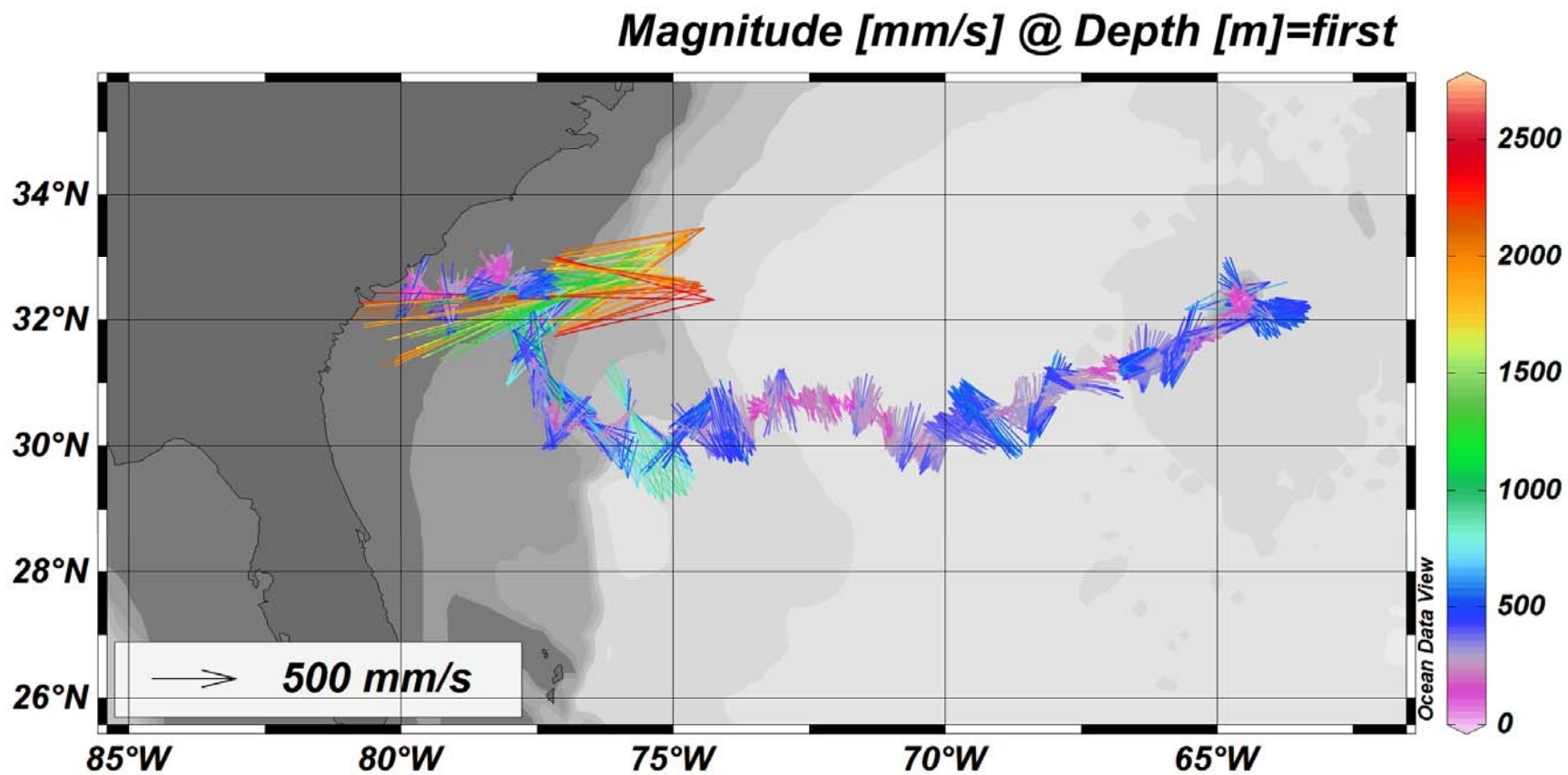


Figure 2. Surface current direction and velocity measured with the ADCP.

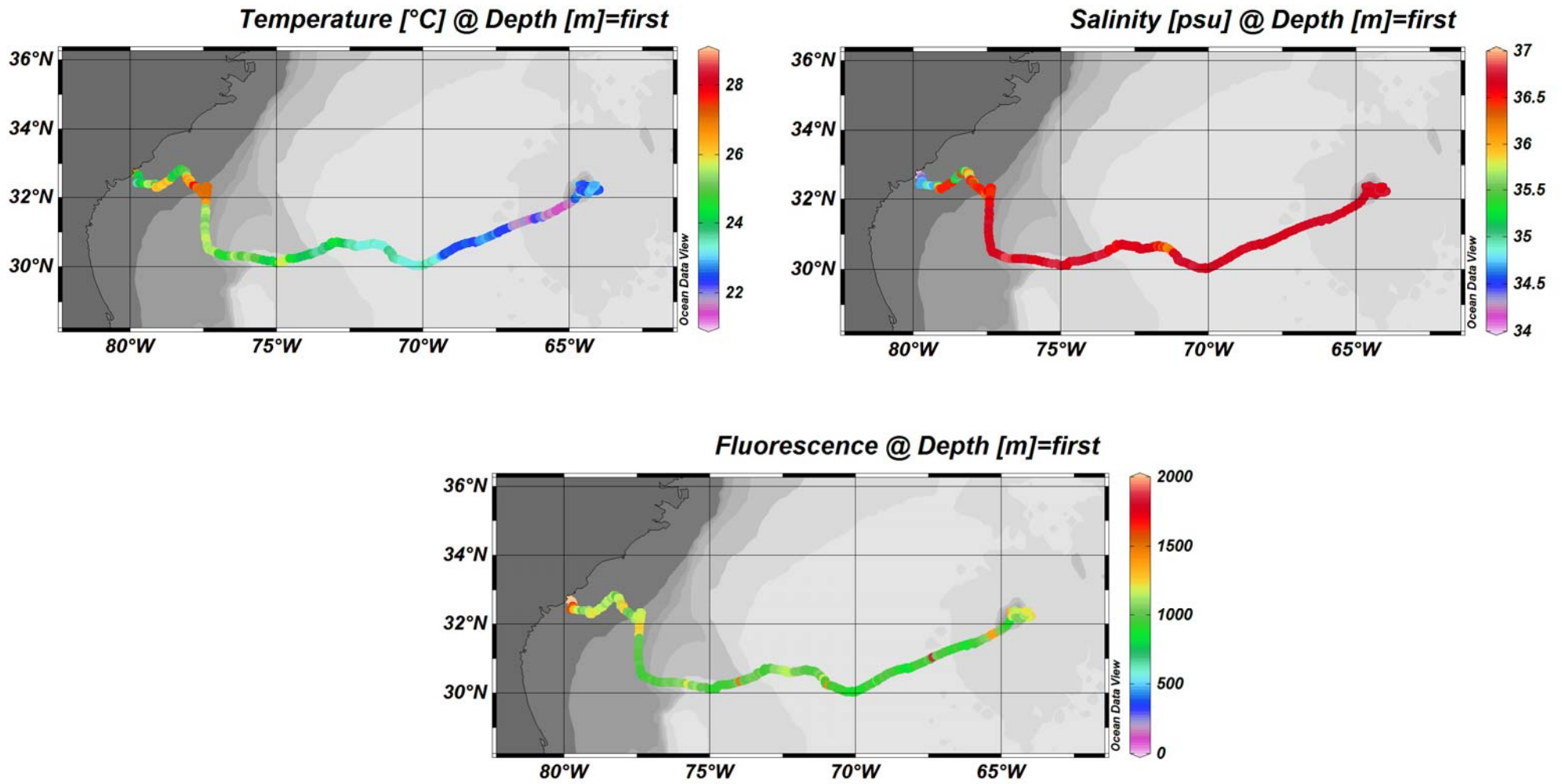


Figure 3. Surface temperature (top left), salinity (top right) and fluorescence (bottom) measurements from the continuous flow-through data logger.

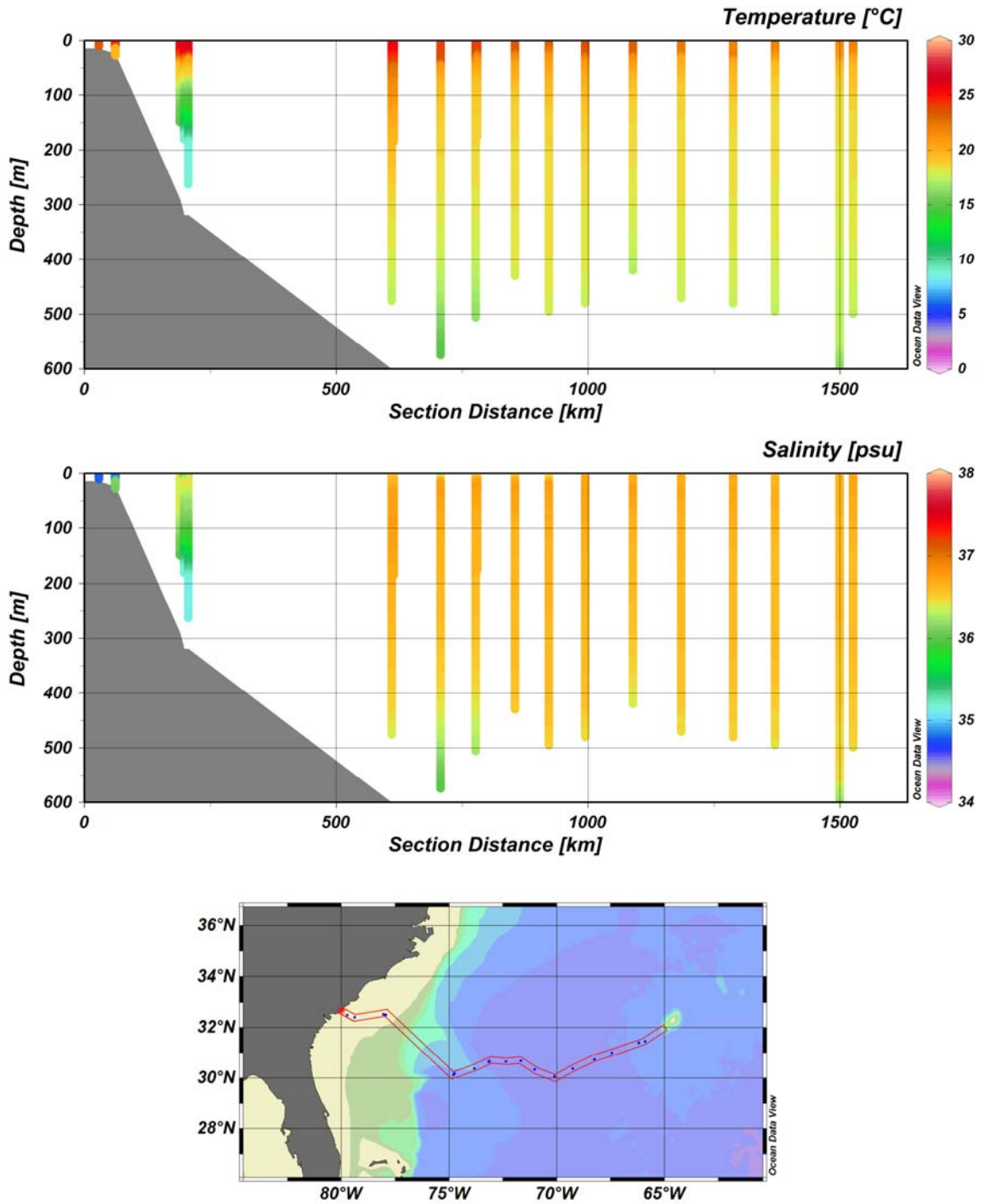


Figure 4. Temperature (top) and salinity (bottom) cross sections created from CTD data collected along the entire cruise track. Map (bottom) indicates which stations were included in the section.

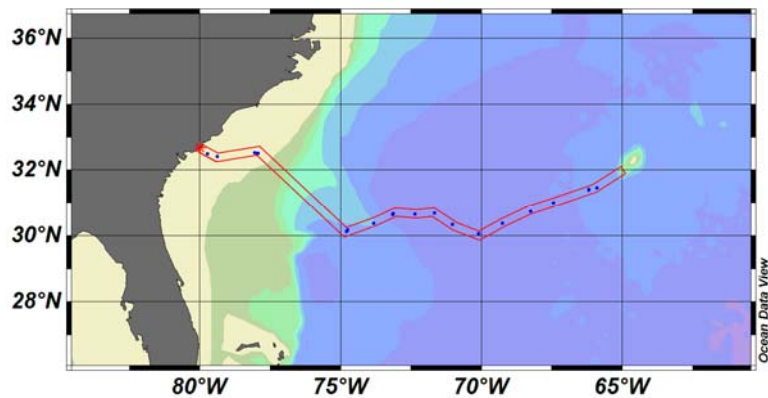
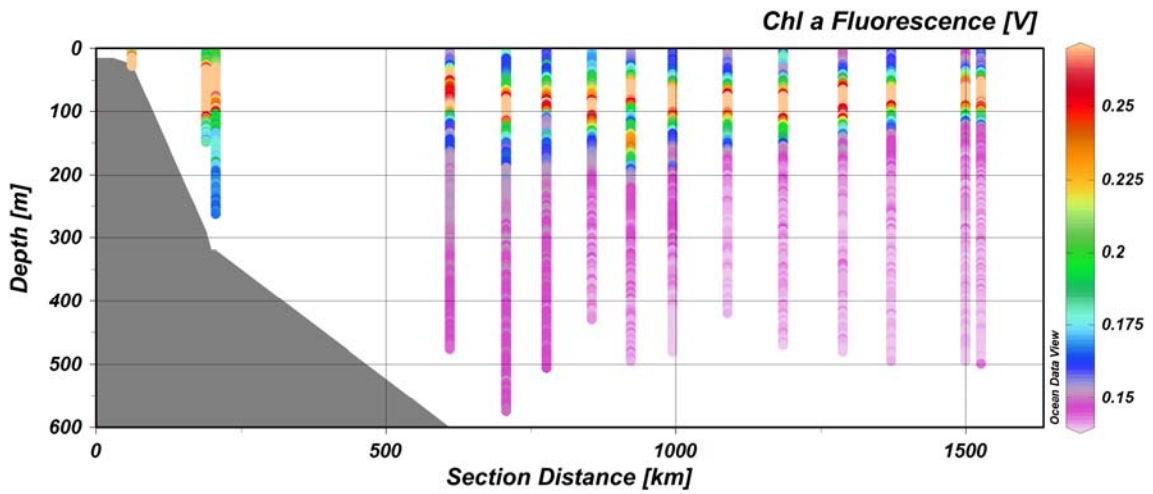
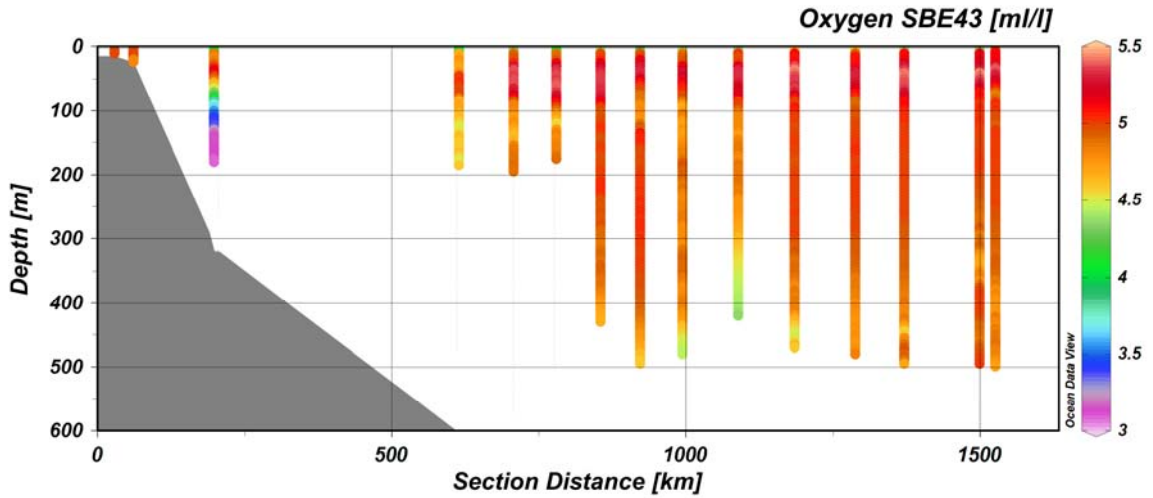


Figure 5. Oxygen (top) and raw fluorescence (middle) cross sections. The oxygen and fluorescence sensors are mounted on different CTDs. Map (bottom) indicates which stations were included in the section.

Table 3. Hydrocast bottle data. Blanks indicate no sample collected.

Station	Bottle	Depth	Chl a: 0.45 μm ($\mu\text{g/L}$)	Chl a: 8 μm ($\mu\text{g/L}$)	Chl a 20 μm ($\mu\text{g/L}$)	PO_4 (μM)	SiO_2 (μM)
C229-001	1	12.7	0.577	0.524		0.216	1.615
	7	5.3	0.130	0.097		0.055	1.642
	12	1.3	0.174	0.090		0.096	0.851
C229-002	1	20.4	1.566	3.484	0.004	0.115	2.047
	5	10.6	0.352	0.315	0.016	0.258	1.698
	9	3.0	0.130	0.074	0.293	0.083	1.440
C229-019	1	74.6	0.641	0.346	0.028	0.493	4.478
	7	35.5	0.214	0.123	0.007	0.027	0.961
	13	0.0	0.167	0.117	0.017	0.106	2.867
C229-027	1	92.6	0.117	0.058	0.001	0.069	2.977
	7	26.9	0.048	0.029	0.001	0.101	
	13	0.0	0.043	0.017	0.001	0.027	2.904
C229-029	1	93.9	0.219	0.064	0.004	0.060	3.014
	7	24.7	0.082	0.040	0.002	0.106	3.244
	13	0.0	0.076	0.065	0.001	0.161	3.622
C229-031	1	83.0	0.247	0.119	0.003	0.078	2.876
	7	26.4	0.027	0.022	0.003	0.041	1.965
	13	0.0	0.048	0.016	0.001	0.055	2.535
C229-033	1	83.5	0.334	0.197	0.003	0.073	1.707
	7	26.9	0.046	0.040	0.001	0.156	
	13	3.0	0.053	0.030	0.001	0.041	1.550
C229-035	1	95.1	0.071	0.057	0.002	0.419	2.563
	7	27.1	0.071	0.040	0.002	0.009	
	13	3.0	0.035	0.025	0.002	0.064	1.228
C229-036	1	60.4	0.151	0.098	0.002	0.050	1.449
	7	26.0	0.044	0.026	0.002	0.041	2.333
	13	3.0	0.041	0.019	0.001	0.018	0.980
C229-038	1	74.6	0.269	0.178	0.004	0.073	1.596
	7	25.8	0.045	0.031	0.001	0.318	2.204
	13	3.0	0.036	0.024	0.000	0.037	1.274
C229-039	1	85.0	0.430	0.271	0.005	0.060	1.283
	7	25.3	0.053	0.014	0.004	0.143	
	13	3.0	0.130	0.092	0.001	0.133	1.062
C229-041	1	85.1	0.285	0.123	0.004	0.124	2.011
	7	25.0	0.035	0.033	0.002	0.018	1.734
	13	3.0	0.028	0.023	0.001	0.064	1.053
C229-043	1	84.9	0.242	0.147	0.015	0.013	2.241
	7	24.0	0.041	0.029	0.002	0.046	
	13	3.0	0.053	0.044	0.002	0.101	2.075

Table 3 continued.

Station	Bottle	Depth	Chl a: 0.45 μm ($\mu\text{g/L}$)	Chl a: 8 μm ($\mu\text{g/L}$)	Chl a 20 μm ($\mu\text{g/L}$)	PO_4 (μM)	SiO_2 (μM)
C229-045	1	75.2	0.437	0.292	0.016	0.027	2.121
	7	24.4	0.055	0.039	0.002	0.069	
	13	3.0	0.046	0.028	0.005	0.000	1.771
C229-047	1	65.2	0.855	0.363	0.004		
	7	24.7	0.047	0.033	0.001		
	13	3.0	0.049	0.042	0.001	0.004	

Table 4. Neuston net tow data. Blank indicates no data collected.

Station	Tow Distance (m)	Zoop. Biomass (mL)	Zoop. Density (mL m ⁻²)	Leptocephali (#)	<i>Halobates</i> (#)	Myctophid (#)	<i>Sargassum natans</i> (g)	<i>Sargassum fluitans</i> (g)	Plastic Pellets (#)	Plastic Pieces (#)	Tar Pieces (#)
C229-001	1586.8	88.0	0.0555	0	0	0	1	0	0	1	0
C229-002	2772.98	160.0	0.0577	0	0	0	0	0	0	0	0
C229-004	910.26	72.0	0.0791	0	0	0	65	0	0	0	0
C229-019	1597.7	13.0	0.0081	0	0	0	0	0	0	0	0
C229-027	2788.3	18.6	0.0067	0	0	0	600	0	0	4	1
C229-029	1219.3	14.0	0.0115	0	0	1	0	8	0	4	0
C229-031	2299.9	8.0	0.0035	0	0	0	1	0	0	19	0
C229-033	1345.8	25.0	0.0186	1	0	1	1	0	0	5	0
C229-035	2023	3.6	0.0018	0	0	0	1	0	0	2	3
C229-036	1789.3	10	0.0056	0	0	3	35	0	0	1	0
C229-038	2312.9	3.5	0.0015	0	0	0	6	0	0	21	4
C229-039	1812.4	27.0	0.0149	0	0	10	0	0	1	10	0
C229-041	2872.8	22.0	0.0077	0	0	0	0	0	0	80	0
C229-043	1585.2	55.0	0.0347	0	0	1	0	0	0	63	2
C229-045	1207.0	3.0	0.0025	0	0	0	0	0	0	94	0
C229-047	721.9	24.0	0.0332	0	0	9	0	0	0	61	0

Table 5. Shipek Grab data.

Station	Depth	Color Description	General size	Sediment Shape
C229-002	25	Moderate Yellowish Brown (10YR 5/4)	coarse sand	angular lithogenics, shell hash
C229-004	91	Light Olive Gray (5Y 5/2)	medium sandy	little shell hash at surface, mostly rounded
C229-005	118	Yellowish Gray (5Y 7/2)	medium fine sand	sediments are rounded, lots of biogenic calcite (forams pteropods, sponge spics)
C229-006	85	Moderate Yellowish Brown (10YR 5/4)	coarse sand	lots of biogenics, shell hash sediments are rounded
C229-008	36	Dark Yellowish Orange (10YR 6/2)	coarse biogenic sand with gravel fragments	angular and rounded sands, coarse material is shells
C229-009	112	Light Olive Gray (5Y 5/2)	pebbly biogenics and coarse sand	angular sands with black round grains
C229-010	169	Pale Yellowish Brown (10YR 6/2)		
C229-011	160	Light Olive Gray (5Y 5/2)		
C229-013	196			
C229-014	179	Dusky Yellowish Brown (10YR 2/2)		
C229-049	17		a few small carbonate grains recorded	angular to rounded
C229-050	36	very little sample recovered	very little sample recovered	very little sample recovered
C229-051	95			