No	Metadata element name	Your input	Help reference no.
1	**Submission Date**	5/14/2019	1
2	**Accession no. of related data sets**		2
3	**Investigator-1 name**	Leticia Barbero	3.1
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9	**Investigator-1 ID type (ORCID, Researcher ID, etc.)**		3.7
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16	**Investigator-2 ID type (ORCID, Researcher ID, etc.)**		3.7
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23	**Investigator-3 ID type (ORCID, Researcher ID, etc.)**		3.7
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513	**Investigator-5 researcher ID**		3.6
514	**Investigator-5 ID type (ORCID, Researcher ID, etc.)**		3.7
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520	**Investigator-6 researcher ID**		3.6
521	**Investigator-6 ID type (ORCID, Researcher ID, etc.)**		3.7
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527	**Investigator-7 researcher ID**			3.6
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534	**Investigator-8 researcher ID**			3.6
535	**Investigator-8 ID type (ORCID, Researcher ID, etc.)**			3.7
24	**Data submitter name**	Leticia Barbero		4.1
25	**Data submitter institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration (NOAA)		4.2
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27	**Data submitter phone**	(305) 361-4453		4.4
28	**Data submitter email**	Leticia.Barbero@noaa.gov		4.5
29	**Data submitter researcher ID**			4.6
30	**Data submitter ID type (ORCID, Researcher ID, etc.)**			4.7
31	**Title**	GOMECC-3 discrete station data and surface underway discrete sampling		5
32	**Abstract**	The third Gulf of Mexico Ecosystems and Carbon Cruise (GOMECC-3) on board the NOAA R/V Ronald H. Brown, occupied the coastal waters of the Gulf of Mexico, including US, Mexican and Cuban waters, departing and returning from Miami, FL in the summer of 2017. The effort was in support of the coastal monitoring and research objectives of the NOAA Ocean Acidification Program (OAP). The cruise was designed to obtain a snapshot of key carbon, physical, and biogeochemical parameters as they relate to ocean		6
33	**Purpose**	To measure key carbon, physical and biogeochemical parameters in coastal waters of the US in relation to Ocean Acidification and monitor changes over time.		7
34	**Start date**	7/18/2017		8.1
35	**End date**	8/21/2017		8.2
36	**Westbd longitude**		-97.7	9.1
37	**Eastbd longitude**		-79.18	9.2
38	**Northbd latitude**		29.5	9.3
39	**Southbd latitude**		18.8	9.4
40	**Spatial reference system**	WGS 84		10
41	**Geographic names**	Gulf of Mexico, SAB		11
42	**Location of organism collection**			12
43	**Funding agency name**	NOAA's Ocean Acidification Program		13.1
44	**Funding project title**	East and Gulf Coast OA Observing - Gulf of Mexico Ecosystem Carbon Cruise, GOMECC-3		13.2
45	**Funding project ID (Grant no.)**			13.3
46	**Research projects**	none		14
47	**Platform-1 name**	RV Ronald H. Brown		15.1
48	**Platform-1 ID**	33RO		15.2
49	**Platform-1 type**	Research Vessel		15.3
50	**Platform-1 owner**	NOAA, U.S. Government		15.4
51	**Platform-1 country**	United States		15.5
52	**EXPOCODE**	33RO		16
53	**Cruise ID**	RB17-04		17
54	**Section**	GOMECC-3		18
55	**Author list for citation**	Barbero, Leticia; Pierrot, Denis; Wanninkhof, Rik; Baringer, Molly; Byrne, Robert; Langdon, Chris; Zhang, Jia-Zhong; and Stauffer, Beth.		19
56	**References**			20
57	**Supplemental information**	Additional information is available on the cruise's website: https://www.aoml.noaa.gov/ocd/gcc/GOMECC3/		21
58	**DIC: Variable abbreviation in data files**	DIC_UMOL_KG		22.1
59	**DIC: Observation type**	Profile and underway (flow through)		22.2

60	**DIC: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	22.3
61	**DIC: Manipulation method (SPECIAL USE ONLY) (SPECIAL USE ONLY)**		22.4
62	**DIC: Variable unit**	micro-mol/kg	22.5
63	**DIC: Measured or calculated**	Measured	22.6
64	**DIC: Calculation method and parameters**		22.7
65	**DIC: Sampling instrument**	Niskin bottle and flow through system	22.8
66	**DIC: Analyzing instrument**	Two systems consisting of a coulometer (UIC Inc.) coupled with a Dissolved Inorganic Carbon Extractor (DICE) inlet system. DICE was developed by Esa Peltola and Denis Pierrot of NOAA/AOML and Dana Greeley of NOAA/PMEL to modernize a carbon extractor called SOMMA (Johnson et al. 1985, 1987, 1993, and 1999; Johnson 1992)	22.9
67	**DIC: Detailed sampling and analyzing information**	Samples for total dissolved inorganic carbon (DIC) measurements were drawn according to procedures outlined in the Guide to best practices for ocean CO2 measurements (Dickson et al., 2007) from Niskin bottles into cleaned 294-ml glass bottles. Bottles were rinsed and filled from the bottom, leaving 6 ml of headspace; care was taken not to entrain any bubbles. After 0.2 ml of saturated HgCl2 solution was added as a preservative, the sample bottles were sealed with glass stoppers lightly covered with Apiezon-L grease and were stored at room temperature to be analyzed within 48 hours of collection. The analysis was done by coulometry with two analytical systems (AOML3 and AOML4) used simultaneously. In the coulometric analysis of DIC, all carbonate species are converted to CO2 (gas) by addition of excess hydrogen ion (acid) to the seawater sample, and the evolved CO2 gas is swept into the titration cell of the coulometer with pure air or compressed nitrogen, where it reacts quantitatively with a proprietary reagent based on ethanolamine to generate hydrogen ions. In this process, the solution changes from blue to colorless, triggering a current through the cell and causing coulometrical generation of OH minus ions at the anode. The OH ions react with the H+ and the solution turns blue	22.10
68	**DIC: Field replicate information**	Duplicates were collected on every station as well as on the underway discrete sampling. In total, 1899 samples were run, each 250-ml, 222 sets of duplicate samples.	22.11
69	**DIC: Standardization technique description**	The coulometers were calibrated by injecting aliquots of pure CO2 (99.99%) by means of an 8-port valve outfitted with two sample loops with known gas volumes bracketing the amount of CO2 extracted from the water samples for the two AOML systems.	22.12.1
70	**DIC: Frequency of standardization**	The stability of each coulometer cell solution was confirmed three different ways: two sets of gas loops were measured at the beginning; also the Certified Reference Material (CRM), supplied by Dr. A. Dickson of UCSD, were measured at the beginning; and the duplicate samples at the beginning, middle, and end of each cell solution. The coulometer cell solution was replaced after 25 mg of carbon was titrated, typically after 9 to 12 hours of continuous use.	22.12.2
71	**DIC: CRM manufacturer**	Dr. A. Dickson of UCSD	22.12.3.1
72	**DIC: Batch number**	Batch 153	22.12.3.2
73	**DIC: Poison used to kill the sample**	saturated HgCl2	22.13.1
74	**DIC: Poison volume**	0.2 ml	22.13.2
75	**DIC Poisoning correction description**	The DIC values were corrected for dilution by 0.2 ml of saturated HgCl2 used for sample preservation. The total water volume of the sample bottles was 288 ml (calibrated by Esa Peltola, AOML). The correction factor used for dilution was 1.00037.	22.13.3
76	**DIC: Uncertainty**		22.14
77	**DIC: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	22.15
78	**DIC: Method reference (citation)**	Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.) 2007. Guide to best practices for ocean CO2 measurements. PICES Special Publication 3, 191 pp.	22.16
79	**DIC: Researcher Name**	Rik Wanninkhof; Leticia Barbero	22.17.1
80	**DIC: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration (NOAA)	22.17.2
81	**TA: Variable abbreviation in data files**	TA_UMOL_KG	23.1
82	**TA: Observation type**	Profile and surface underway (flow through)	23.2
83	**TA: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	23.3
84	**TA: Manipulation method (SPECIAL USE ONLY)**		23.4
85	**TA: Variable unit**	micro-mol/kg	23.5
86	**TA: Measured or calculated**	Measured	23.6

87	**TA: Calculation method and parameters**		23.7
88	**TA: Sampling instrument**	Niskin bottle and flow through system	23.8
89	**TA: Analyzing instrument**	Semi-automatic titration systems, System 1 consists of a Metrohm 765 Dosimat titrator, a pH meter (Orion 720A, ThermoScientific), a ROSS half cell pH glass electrode (Orion 9101BN, ThermoScientific) and a reference electrode (Orion 900200, ThermoScientific).	23.9
90	**TA: Type of titration**	Full Titration	23.10
91	**TA: Cell type (open or closed)**	Open	23.11
92	**TA: Curve fitting method**	Least-Square Analysis	23.12
93	**TA: Detailed sampling and analyzing information**	Samples for total alkalinity (TAlk) measurements were drawn according to procedures outlined in the Guide to best practices for ocean CO2 measurements (Dickson et al., 2007) from Niskin bottles into cleaned 500-ml glass bottles. Bottles were rinsed and filled from the bottom, leaving approximately 6 ml of headspace; care was taken not to entrain any bubbles. After 0.2 ml of saturated HgCl2 solution was added as a preservative, the sample bottles were sealed with glass stoppers lightly covered with Apiezon-L grease and were stored at room temperature for analysis onboard within 48 hours of collection. For each measurement, approximately 200 ml of water sample were titrated with an HCl solution in ~0.55 molal NaCl solution provided by Dr. Andrew Dickson of UCSD (0.25175 moles per kilogram-solution).	23.13
94	**TA: Field replicate information**	1452 samples each 500-ml, 86 sets of duplicate samples.	23.14
95	**TA: Standardization technique description**	2 CRM samples were run daily on each cell, before and after the seawater samples. The Total Alkalinity for the water samples was corrected using the daily averaged ratios between the certified and measured values of the 2 CRMs run on each cell. This TA titration system has a precision of 0.1 %. All the TA values were directly measured with reference to Certified Reference Material. The accuracy after correction is 0.1%.	23.15.1
96	**TA: Frequency of standardization**	All values were directly measured with reference to Certified Reference Material (Dickson, UCSD). 2 CRM samples were run daily on each cell.	23.15.2
97	**TA: CRM manufacturer**	Dr. A. Dickson of UCSD	23.15.3.1
98	**TA: Batch Number**	CRM batch: 153	23.15.3.2
99	**TA: Poison used to kill the sample**	saturated HgCl2	23.16.1
100	**TA: Poison volume**	0.2 ml	23.16.2
101	**TA: Poisoning correction description**		23.16.3
102	**TA: Magnitude of blank correction**		23.17
103	**TA: Uncertainty**	The precision of this method is better than 0.1% and accuracy is 0.1%.	23.18
104	**TA: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	23.19
105	**TA: Method reference (citation)**	Millero, F. J., Zhang, J. Z., Lee, K., & Campbell, D. M. (1993). Titration alkalinity of seawater. *Marine Chemistry* , *44* (2), 153-165.	23.20
106	**TA: Researcher Name**	Denis Pierrot: Leticia Barbero	23.21.1
107	**TA: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration (NOAA)	23.21.2
108	**pH: Variable abbreviation in data files**	PH_TOT_MEA	24.1
109	**pH: Observation type**	Profile and surface underway (flow through)	24.2
110	**pH: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	24.3
111	**pH: Manipulation method (SPECIAL USE ONLY)**		24.4
112	**pH: Measured or calculated**	Measured	24.5
113	**pH: Calculation method and parameters**		24.6
114	**pH: Sampling instrument**	Niskin bottle and flow through system	24.7
115	**pH: Analyzing instrument**	Agilent 8453 spectrometer setup with a custom-made temperature-controlled cell holder	24.8
116	**pH: pH scale**	Total	24.9
117	**pH: Temperature of measurement**	25 (+/- 0.05) degrees Celsius	24.10

118	**pH: Detailed sampling and analyzing information**	Samples were collected for pH analysis immediately following O2 in the Niskin/Rosette sampling sequence. Seawater samples were collected from the Niskin bottles directly in 10-cm cylindrical optical cells (~30 mL volume) using a section of silicone tubing (about 15 cm long). One end of the silicone tubing was attached to the optical cell and the other end was attached to the nipple of the Niskin bottle. The Niskin bottle nipple was pushed in to initiate flow and the silicone tubing was squeezed to eliminate air bubbles. The optical cell was agitated to eliminate bubbles and, after 15 seconds of sample flow, the cell was capped at one end. The silicone tubing was then detached from the optical cell and, with the water still flowing, the cap was rinsed and used to seal the optical cell. Samples collected this way were not exposed to the atmosphere, and each cell was flushed with approximately three cell volumes of seawater. The samples were collected, taken into the lab, and rinsed with tap water to get rid of salt outside of the cells. The cells were dried and the optical windows were cleaned with Kimwipes. Samples were thermostatted at 25 (±0.05) ºC in a custom made 36-position cell warmer. A custom macro program running on Agilent ChemStation was used to guide the measurements and data processing. The macro automated the procedures of sample input, blank and sample scans, quality control, and data archiving. The quality control steps included checking the baseline shift after dye injection and monitoring the standard deviation of multiple scans. Absorbance blanks were taken for each sample and 10 µL of purified m-cresol purple (10 mmol kg-1) were added for the analysis. pHT (total scale) was calculated according to Liu et al. (2011).	24.11
119	**pH: Field replicate information**	A total of 1,530 pH samples were collected from the 107 stations, and 154 underway samples during transits. Duplicate pH samples, collected from discrete samples taken from Bullister bottles (N = 173), displayed a standard deviation of 0.001.	24.12
120	**pH: Standardization technique description**	The pH is calibration-free.	24.13.1
121	**pH: Frequency of standardization**		24.13.2
122	**pH: pH values of the standards**		24.13.3
123	**pH: Temperature of standardization**		24.13.4
124	**pH: Temperature correction method**		24.14
125	**pH: at what temperature was pH reported**	25 degrees Celsius	24.15
126	**pH: Uncertainty**	Precision was equal to ±0.0004.	24.16
127	**pH: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	24.17
128	**pH: Method reference (citation)**	Liu, X.; Patsavas, M.C.; and Byrne, R. H. (2011). Purification and characterization of meta-cresol purple for spectrophotometric seawater pH measurements. Environmental Science and Technology, 45(11), 4862-4868. doi: 10.1021/es200665d	24.18
129	**pH: Researcher Name**	Robert Byrne	24.19.1
130	**pH: Researcher Institution**	University of South Florida	24.19.2
131	**pCO2A: Variable abbreviation in data files**		25.1
132	**pCO2A: Observation type**		25.2
133	**pCO2A: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**		25.3
134	**pCO2A: Manipulation method (SPECIAL USE ONLY)**		25.4
135	**pCO2A: Variable unit**		25.5
136	**pCO2A: Measured or calculated**		25.6
137	**pCO2A: Calculation method and parameters**		25.7
138	**pCO2A: Sampling instrument**		25.8
139	**pCO2A: Location of seawater intake**		25.9
140	**pCO2A: Depth of seawater intake**		25.10
141	**pCO2A: Analyzing instrument**		25.11
142	**pCO2A: Detailed sampling and analyzing information**		25.12
143	**pCO2A: Equilbrator type**		25.13.1
144	**pCO2A: Equilibrator volume (L)**		25.13.2
145	**pCO2A: Vented or not**		25.13.3
146	**pCO2A: Water flow rate (L/min)**		25.13.4
147	**pCO2A: Headspace gas flow rate (L/min)**		25.13.5

148	**pCO2A: How was temperature inside the equilibrator measured .**		25.13.6
149	**pCO2A: How was pressure inside the equilibrator measured.**		25.13.7
150	**pCO2A: Drying method for CO2 gas**		25.14
151	**pCO2A: Manufacturer of the gas detector**		25.15.1
152	**pCO2A: Model of the gas detector**		25.15.2
153	**pCO2A: Resolution of the gas detector**		25.15.3
154	**pCO2A: Uncertainty of the gas detector**		25.15.4
155	**pCO2A: Standardization technique description**		25.16.1
156	**pCO2A: Frequency of standardization**		25.16.2
157	**pCO2A: Manufacturer of standard gas**		25.16.3.1
158	**pCO2A: Concentrations of standard gas**		25.16.3.2
159	**pCO2A: Uncertainties of standard gas**		25.16.3.3
160	**pCO2A: Water vapor correction method**		25.17
161	**pCO2A: Temperature correction method**		25.18
162	**pCO2A: at what temperature was pCO2 reported**		25.19
163	**pCO2A: Uncertainty**		25.20
164	**pCO2A: Data quality flag description**		25.21
165	**pCO2A: Method reference (citation)**		25.22
166	**pCO2A: Researcher Name**		25.23.1
167	**pCO2A: Researcher Institution**		25.23.2
168	**pCO2D: Variable abbreviation in data files**	PCO2_MEA_UATM	26.1
169	**pCO2D: Observation type**	Profile and surface underway	26.2
170	**pCO2D: In-situ observation / manipulation condition / response variable (SPECIAL USE**	In-situ observation	26.3
171	**pCO2D: Manipulation method (SPECIAL USE ONLY)**		26.4
172	**pCO2D: Variable unit**	microatmospheres	26.5
173	**pCO2D: Measured or calculated**	Measured	26.6
174	**pCO2D: Calculation method and parameters**	Niskin bottle and flow through pump	26.7
175	**pCO2D: Sampling instrument**		26.8
176	**pCO2D: Analyzing instrument**	LI-COR© (model 840)	26.9
177	**pCO2D: Storage method**	The sample bottles were sealed with glass stoppers lightly covered with Apiezon-L grease and were stored at room temperature for a maximum of twelve hours prior to analysis. When twelve bottles were moved into the primary water bath for analyses, the next twelve bottles were moved into the secondary water bath. No sample bottle spent less than one hour in the secondary water bath prior to being moved to the analytical water bath.	26.10
178	**pCO2D: Seawater volume (mL)**	500 ml	26.11
179	**pCO2D: Headspace volume (mL)**	5 ml	26.12
180	**pCO2D: Temperature of measurement**	20 ºC	26.13
181	**pCO2D: Detailed sampling and analyzing information**	Samples were drawn from 10-L Niskin bottles into 500 ml glass bottles using Tygon© tubing with a Silicone adapter that fit over the drain cock to avoid contamination of DOM samples. Bottles were rinsed twice, the second time while inverted. They were filled from the bottom, overflowing half a volume while taking care not to entrain any bubbles. About 5 ml of water was withdrawn to allow for expansion of the water as it warms and to provide space for the stopper and tubing of the analytical system. Saturated mercuric chloride solution (0.2 ml) was added as a preservative. The sample bottles were sealed with glass stoppers lightly covered with Apiezon-L grease and were stored at room temperature for a maximum of twelve hours prior to analysis.The analyses for pCO2 were done with the discrete samples at 20°C. A primary water bath was kept within 0.03°C of the analytical temperature; a secondary bath was kept within 0.15°C the analytical temperature. The majority of the samples were analyzed in batches of twelve bottles, which with standards took approximately 2.5 hours. When twelve bottles were moved into the primary water bath for analyses, the next twelve bottles were moved into the secondary water bath. No sample bottle spent less than one hour in the secondary water bath prior to being moved to the analytical water bath.	26.14

182	pCO2D: Field replicate information	Over 1300 samples were drawn from 113 CTD casts. From the UW seawater line, 153 samples were drawn. Seventy-eight sets of duplicate bottles were drawn at numerous depths. The average relative standard error was 0.21%, while the median relative error was 0.15%.	26.15
183	pCO2D: Manufacturer of the gas detector	LiCOR 840 infrared analyzer. The system was built by Colm Sweeney and Tim Newberger	26.16.1
184	pCO2D: Model of the gas detector	Prototype	26.16.2
185	pCO2D: Resolution of the gas detector		26.16.3
186	pCO2D: Uncertainty of the gas detector	The average relative standard error was 0.21%, while the median relative error was 0.15%.	26.16.4
187	pCO2D: Standardization technique description	To ensure analytical accuracy, a set of six gas standards (ranging from 248 to 1534 ppm) was run through the analyzer before and after every sample batch. The standards were obtained from Scott-Marin and referenced against primary standards purchased from C.D. Keeling in 1991, which are on the WMO-78 scale.	26.17.1
188	pCO2D: Frequency of standardization	Before and after each batch of 12 samples.	26.17.2
189	pCO2D: Temperature of standardization		26.17.3
190	pCO2D: Manufacturer of standard gas	Scott Marin	26.17.4.1
191	pCO2D: Concentrations of standard gas	248.73, 384.14, 567.40, 792.51, 1036.95, and 1533.7 ppm	26.17.4.2
192	pCO2D: Uncertainties of standard gas		26.17.4.3
193	pCO2D: Water vapor correction method	The details of the data reduction are described in Pierrot, et.al. (2009).	26.18
194	pCO2D: Temperature correction method	The details of the data reduction are described in Pierrot, et.al. (2009).	26.19
195	pCO2D: at what temperature was pCO2 reported	20 ºC	26.20
196	pCO2D: Uncertainty	The average relative standard error was 0.21%, while the median relative error was 0.15%.	26.21
197	pCO2D: Data quality flag description	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	26.22
198	pCO2D: Method reference (citation)	Wanninkhof, R.; and Thoning, K. (1993). Measurement of fugacity of CO2 in surface water using continuous and discrete sampling methods. Mar. Chem., v. 44, no. 2-4, pp. 189-205. Pierrot, D.; Neill, C.; Sullivan, K.; Castle, R.; Wanninkhof, R.; Luger, H.; Johannessen, T.; Olsen, A.; Feely, R.A.; and Cosca, C.E. (2009). Recommendations for autonomous underway pCO2 measuring systems and data-reduction routines. Deep-Sea Res., II, v. 56, pp. 512-522.	26.23
199	pCO2D: Researcher Name	Rik Wanninkhof	26.24.1
200	pCO2D: Researcher Institution	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	26.24.2
201	Var1: Variable abbreviation in data files	CTDPRS_DBAR	27.1
202	Var1: Full variable name	CTD pressure	27.2
203	Var1: Observation type	Profile	27.4
204	Var1: In-situ observation / manipulation condition / response variable (SPECIAL USE	In-situ observation	27.5
205	Var1: Variable unit	dbars	27.7
206	Var1: Measured or calculated	Measured	27.8
207	Var1: Calculation method and parameters		27.9
208	Var1: Sampling instrument	CTD	27.10
209	Var1: Analyzing instrument	Sea-Bird SBE-911plus CTD system	27.11
210	Var1: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)		27.12
211	Var1: Detailed sampling and analyzing information	A detailed and more complete description is available in the cruise report at: http://www.aoml.noaa.gov/ocd/gcc/GOMECC3/Cruise_Report.pdf. CTD/rosette casts were performed with a package consisting of a 24-place, 10-liter rosette frame (AOML's white frame), a 24-place water sampler/pylon (SBE32) and 24, 10-liter Bullister/Niskin-style bottles. This package was deployed on all stations/casts. Underwater electronic components consisted of a Sea-Bird Electronics (SBE) 9 plus CTD with dual pumps and the following sensors: dual temperature (SBE3), dual conductivity (SBE4C), dual dissolved oxygen (SBE43), and a Paroscientific Digiquartz Pressure Sensor. The CTDs 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 operation. 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. Shipboard CTD data processing was performed automatically at the end of each deployment using SEABIRD SBE Seasave software version 7.23.2 and AOML Matlab processing software.	27.13
212	Var1: Field replicate information		27.14

213	**Var1: Uncertainty**	Pressure sensor calibration coefficients derived from the pre-cruise calibrations were applied to raw pressure data during each cast. Residual pressure offsets between the first and last near surface pressures and before and after on deck pressures were examined to check for calibration shifts. Pressure sensor s/n 1292 was used for the entirety of the cruise with an initial pressure offset of 0.47 dbar applied to the configuration file for a total offset of -0.3. On deck pressure before and after the cast were stable at -0.04 +/- 0.03 dbar and -0.03 +/- 0.07 dbar, respectively. Near surface pressure values at the start and end of the cast were stable at 3.02 +/- 0.63 dbar and 3.02 +/- 0.53 dbar, respectively.	27.15
214	**Var1: Data quality flag description**		27.16
215	**Var1: Method reference (citation)**		27.17
216	**Var1: Biological subject (SPECIAL USE ONLY)**		27.18
217	**Var1: Species Identification code (SPECIAL USE ONLY)**		27.19
218	**Var1: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
219	**Var1: Researcher Name**	Molly Baringer	27.21.1
220	**Var1: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	27.21.2
221	**Var2: Variable abbreviation in data files**	CTDTMP_ITS-90_DEG_C	27.1
222	**Var2: Full variable name**	CTD temperature	27.2
223	**Var2: Observation type**	profile	27.4
224	**Var2: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.5
225	**Var2: Variable unit**	degree C	27.7
226	**Var2: Measured or calculated**	Measured	27.8
227	**Var2: Calculation method and parameters**		27.9
228	**Var2: Sampling instrument**	CTD	27.10
229	**Var2: Analyzing instrument**	Sea-Bird SBE-911plus CTD system	27.11
230	**Var2: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.12
231	**Var2: Detailed sampling and analyzing information**	A detailed and more complete description is available in the cruise report at: http://www.aoml.noaa.gov/ocd/gcc/GOMECC3/Cruise_Report.pdf. CTD/rosette casts were performed with a package consisting of a 24-place, 10-liter rosette frame (AOML's white frame), a 24-place water sampler/pylon (SBE32) and 24, 10-liter Bullister/Niskin-style bottles. This package was deployed on all stations/casts. Underwater electronic components consisted of a Sea-Bird Electronics (SBE) 9 plus CTD with dual pumps and the following sensors: dual temperature (SBE3), dual conductivity (SBE4C), dual dissolved oxygen (SBE43), and a Paroscientific Digiquartz Pressure Sensor. The CTDs 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 operation. 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. Shipboard CTD data processing was performed automatically at the end of each deployment using SEABIRD SBE Seasave software	27.13
232	**Var2: Field replicate information**		27.14
233	**Var2: Uncertainty**	Temperature sensor calibration coefficients derived from the pre-cruise calibrations were applied to raw primary and secondary temperature data during each cast. Calibration accuracy was examined by comparing T1-T2 over a range of station numbers and pressures (bottle trip locations) for each cast. The median temperature difference between the two sensors was 0.001 ºC with a standard deviation of 0.02 ºC (0.0015 ºC and a standard deviation of 0.0007 ºC below 1000m).	27.15
234	**Var2: Data quality flag description**		27.16
235	**Var2: Method reference (citation)**		27.17
236	**Var2: Biological subject (SPECIAL USE ONLY)**		27.18
237	**Var2: Species Identification code (SPECIAL USE ONLY)**		27.19
238	**Var2: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
239	**Var2: Researcher Name**	Molly Baringer	27.21.1
240	**Var2: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	27.21.2
241	**Var3: Variable abbreviation in data files**	CTDSAL_PSS78	27.1

242	**Var3: Full variable name**	CTD salinity	27.2
243	**Var3: Observation type**	profile	27.4
244	**Var3: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.5
245	**Var3: Variable unit**		27.7
246	**Var3: Measured or calculated**	Calculated from conductivity measurements.	27.8
247	**Var3: Calculation method and parameters**		27.9
248	**Var3: Sampling instrument**	CTD	27.10
249	**Var3: Analyzing instrument**	Sea-Bird SBE-911plus CTD system	27.11
250	**Var3: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.12
251	**Var3: Detailed sampling and analyzing information**	A detailed and more complete description is available in the cruise report at: http://www.aoml.noaa.gov/ocd/gcc/GOMECC3/Cruise_Report.pdf. CTD/rosette casts were performed with a package consisting of a 24-place, 10-liter rosette frame (AOML's white frame), a 24-place water sampler/pylon (SBE32) and 24, 10-liter Bullister/Niskin-style bottles. This package was deployed on all stations/casts. Underwater electronic components consisted of a Sea-Bird Electronics (SBE) 9 plus CTD with dual pumps and the following sensors: dual temperature (SBE3), dual conductivity (SBE4C), dual dissolved oxygen (SBE43), and a Paroscientific Digiquartz Pressure Sensor. The CTDs 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 operation. 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. Shipboard CTD data processing was performed automatically at the end of each deployment using SEABIRD SBE Seasave software	27.13
252	**Var3: Field replicate information**		27.14
253	**Var3: Uncertainty**	Conductivity sensor calibration coefficients derived from the pre-cruise calibrations were applied to raw primary and secondary conductivities. Comparisons between the primary and secondary sensors and between each of the sensors to check sample conductivities (conductivity calculated from bottle salinities) were used to derive conductivity corrections. For the entire cruise, only one set of conductivity sensors was used. The two sensors show a median difference of -0.001 mS/cm and a standard deviation of 0.05 mS/cm (-0.001 mS/cm and a standard deviation of 0.0006 mS/cm below 1000m).	27.15
254	**Var3: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value.	27.16
255	**Var3: Method reference (citation)**		27.17
256	**Var3: Biological subject (SPECIAL USE ONLY)**		27.18
257	**Var3: Species Identification code (SPECIAL USE ONLY)**		27.19
258	**Var3: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
259	**Var3: Researcher Name**	Molly Baringer	27.21.1
260	**Var3: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	27.21.2
261	**Var4: Variable abbreviation in data files**	SALINITY_PSS78	27.1
262	**Var4: Full variable name**	Bottle salinity	27.2
263	**Var4: Observation type**	Profile	27.4
264	**Var4: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.5
265	**Var4: Variable unit**		27.7
266	**Var4: Measured or calculated**	Measured	27.8
267	**Var4: Calculation method and parameters**	Niskin bottle	27.9
268	**Var4: Sampling instrument**	Guildline Autosal, model 8400B salinometer (S/N 60843)	27.10
269	**Var4: Analyzing instrument**		27.11
270	**Var4: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.12

271	**Var4: Detailed sampling and analyzing information**	The 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 custom-made plastic insert thimbles and Nalgene screw caps. This assembly provides very low container dissolution and sample evaporation. Prior to sample collection, inserts were inspected for proper fit and loose inserts replaced to insure an airtight seal. Laboratory temperature was also monitored electronically throughout the cruise. 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. The difference (if any) between the initial and final vials of standard seawater was then applied to each sample as a linear function of elapsed run time. Salinity analyses were performed after samples had equilibrated to laboratory temperature, usually at least 24 hours after collection. The salinometer was standardized for each group of samples analyzed (usually 2 casts and up to 50 samples) using two bottles of standard seawater: one at the beginning and end of each set of measurements. The salinometer output was logged to a computer file. The software prompted the analyst to flush the instrument's cell and change samples when appropriate. For each sample, the salinometer cell was initially flushed at least 3 times before a set of conductivity ratio readings were taken. IAPSO Standard Seawater Batch P-160 was used to standardize all casts.	27.13
272	**Var4: Field replicate information**	679 salinity measurements were taken, including 31 duplicates, and approximately 40 vials of standard seawater were used. Up to two duplicate samples were drawn, primarily for the deep casts (>1000 m), to determine total analytical precision.	27.14
273	**Var4: Uncertainty**	Throughout the course of the cruise, the autosal standards had a range of 0.0002 in conductivity ratio (about 0.003 in salinity). The duplicates for the bottle salinity had a median of 0.0003 psu +/- 0.001 psu.	27.15
274	**Var4: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	27.16
275	**Var4: Method reference (citation)**		27.17
276	**Var4: Biological subject (SPECIAL USE ONLY)**		27.18
277	**Var4: Species Identification code (SPECIAL USE ONLY)**		27.19
278	**Var4: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
279	**Var4: Researcher Name**	Molly Baringer	27.21.1
280	**Var4: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	27.21.2
281	**Var5: Variable abbreviation in data files**	CTDOXY_UMOL_KG	27.1
282	**Var5: Full variable name**	CTD oxygen	27.2
283	**Var5: Observation type**	Profile	27.4
284	**Var5: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.5
285	**Var5: Variable unit**	micromol/kg	27.7
286	**Var5: Measured or calculated**	Measured	27.8
287	**Var5: Calculation method and parameters**		27.9
288	**Var5: Sampling instrument**	CTD	27.10
289	**Var5: Analyzing instrument**	Sea-Bird SBE-911plus CTD system	27.11
290	**Var5: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.12
291	**Var5: Detailed sampling and analyzing information**	A detailed and more complete description is available in the cruise report at: http://www.aoml.noaa.gov/ocd/gcc/GOMECC3/Cruise_Report.pdf. CTD/rosette casts were performed with a package consisting of a 24-place, 10-liter rosette frame (AOML's white frame), a 24-place water sampler/pylon (SBE32) and 24, 10-liter Bullister/Niskin-style bottles. This package was deployed on all stations/casts. Underwater electronic components consisted of a Sea-Bird Electronics (SBE) 9 plus CTD with dual pumps and the following sensors: dual temperature (SBE3), dual conductivity (SBE4C), dual dissolved oxygen (SBE43), and a Paroscientific Digiquartz Pressure Sensor. The CTDs 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 operation. 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. Shipboard CTD data processing was performed automatically at the end of each deployment using SEABIRD SBE Seasave software version 7.23.2 and AOML Matlab processing software.	27.13
292	**Var5: Field replicate information**		27.14
293	**Var5: Uncertainty**	Two SBE43 dissolved O2 (DO) sensors were used on this cruise. Both sensors tracked each other well. The sensors show a median difference of 1.92 µmol/kg and a standard deviation of 0.66 µmol/kg.	27.15

294	**Var5: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	27.16
295	**Var5: Method reference (citation)**		27.17
296	**Var5: Biological subject (SPECIAL USE ONLY)**		27.18
297	**Var5: Species Identification code (SPECIAL USE ONLY)**		27.19
298	**Var5: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
299	**Var5: Researcher Name**	Molly Baringer	27.21.1
300	**Var5: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	27.21.2
301	**Var6: Variable abbreviation in data files**	OXYGEN_UMOL_KG	27.1
302	**Var6: Full variable name**	bottle dissolved oxygen	27.2
303	**Var6: Observation type**	Profile and surface underway	27.4
304	**Var6: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.5
305	**Var6: Variable unit**	micromol/kg	27.7
306	**Var6: Measured or calculated**	Measured	27.8
307	**Var6: Calculation method and parameters**		27.9
308	**Var6: Sampling instrument**	Niskin bottle and flow through pump	27.10
309	**Var6: Analyzing instrument**	Automated oxygen titrator using amperometric end-point detection (Langdon 2010).	27.11
310	**Var6: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.12
311	**Var6: Detailed sampling and analyzing information**	Samples were drawn from all casts and all Niskin bottles into volumetrically calibrated 125 ml iodine titration flasks using Tygon tubing with a silicone adaptor that fit over the petcock to avoid contamination of DOC samples. Bottles were rinsed three times and filled from the bottom, overflowing three volumes while taking care not to entrain any bubbles. The draw temperature was taken using a digital thermometer with a flexible thermistor probe that was inserted into the flask while the sample was being drawn during the overflow period. These temperatures were used to calculate concentrations, and a diagnostic check of Niskin bottle integrity. One ml of MnCl2 and one ml of NaOH/NaI were added immediately after drawing of the sample was concluded using a Repipetor, the flasks were then stoppered and shaken well. DIW was added to the neck of each flask to create a water seal. The flasks were stored in the lab in plastic totes at room temperature for at least 1 hour before analysis. Twenty-four samples plus duplicates were drawn from each station except the shallow coastal stations where fewer samples were drawn depending on the depth or as directed by the chief scientist. Dissolved oxygen analyses were performed with an automated oxygen titrator using amperometric end-point detection (Langdon 2010). The titration of the samples and the data logging and graphical display was performed on a PC running a LabView program written by Ulises Rivero of AOML. The titrations were performed in a climate controlled lab at 18.5°C-20°C. Thiosulfate was dispensed by a 2 ml Gilmont syringe driven with a stepper motor controlled by the titrator. Tests in the lab were performed to confirm that the precision and accuracy of the volume dispensed were comparable or superior to the Dosimat 665. The whole-bottle titration technique of Carpenter (1965) with modifications by Culberson et al. (1991) was used. Four to three replicate 10 ml iodate standards were run 13 times during the cruise. The reagent blank was determined at the beginning and end of the cruise. A titration was made to 1 ml of iodate standard. The volume of thiosulfate required for the titration is V1. An additional 1 ml of standard was added to the titrated sample and titrated again. The volume of thiosulfate used for the second titration is V2. The reagent blank was determined as the difference between V1 and V2.	27.13
312	**Var6: Field replicate information**	Duplicate samples were drawn at two depths on every cast. The Bullister bottles selected for the duplicates and hence the oxygen flasks were changed for each cast. However, if the CTD tripped less than four Bullister bottles at a certain station, then only one depth was duplicated. A total of 189 duplicates were run during the cruise. The average standard deviation of all duplicates was 0.164 µmol kg-1.	27.14
313	**Var6: Uncertainty**	A total of 14 standardizations were performed (mean=706.120, mean SD=0.359 uL). Reagent blanks were run at the beginning of the cruise (2.1±1.0 uL), and at the end. The average standard deviation of all duplicates was 0.164 µmol kg-1.	27.15

314	**Var6: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	27.16
315	**Var6: Method reference (citation)**	Carpenter, J.H. (1965). The Chesapeake Bay Institute technique for the Winkler dissolved oxygen method. Limnol. Oceanogr. 10: 141-143 Culberson, C.H. and Huang, S. (1987). Automated amperometric oxygen titration. Deep-Sea Res. 34: 875-880. Culberson, C.H.; Knapp, G.; Stalcup, M.; Williams, R.T. and Zemlyak, F. (1991). A comparison of methods for the determination of dissolved oxygen in seawater. WHP Operations and Methods. Langdon, C. (2010). Determination of dissolved oxygen in seawater by Winkler titration using the amperometric technique. The GO-SHIP Repeat Hydrography Manual: A Collection of Expert Reports and Guidelines. E. M. Hood, C. L. Sabine and B. M. Sloyan, IOCCP Report Number 14, ICPO Publication Series Number 134.	27.17
316	**Var6: Biological subject (SPECIAL USE ONLY)**		27.18
317	**Var6: Species Identification code (SPECIAL USE ONLY)**		27.19
318	**Var6: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
319	**Var6: Researcher Name**	Chris Langdon	27.21.1
320	**Var6: Researcher Institution**	Rosenstiel School of Marine and Atmospheric Science/University of Miami	27.21.2
321	**Var7: Variable abbreviation in data files**	SILICATE_UMOL_KG	27.1
322	**Var7: Full variable name**	Orthosilicic acid	27.2
323	**Var7: Observation type**	Profile and surface underway	27.4
324	**Var7: In-situ observation / manipulation condition / response variable (SPECIAL USE**	In-situ observation	27.5
325	**Var7: Variable unit**	micromol/kg	27.7
326	**Var7: Measured or calculated**	Measured	27.8
327	**Var7: Calculation method and parameters**		27.9
328	**Var7: Sampling instrument**	Niskin bottle and flow through pump	27.10
329	**Var7: Analyzing instrument**	Continuous flow analyzer (CFA) using the standard and analysis protocols for the WOCE hydrographic program as set forth in the manual by L.I. Gordon, et al. (1993).	27.11
330	**Var7: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.12
331	**Var7: Detailed sampling and analyzing information**	Nutrient samples were collected from Niskin bottles, after at least three seawater rinses. Sample analysis typically began within a few hours of sample collection after the samples had warmed to room temperature. Those samples not analyzed within 3 hours were refrigerated for later analysis. Samples were analyzed for phosphate (PO_4^{-3}), nitrate (NO_3^-), nitrite (NO_2^-) and orthosilicic acid (H_4SiO_4). Silicic acid was analyzed using a modification of Armstrong et al. (1967). The sample is reacted with ammonium molybdate in an acidic solution to form molybdosilicic acid. The molybdosilicic acid was then reduced with ascorbic acid to form molybdenum blue. The absorbance of the molybdenum blue was measured at 660 nm.	27.13
332	**Var7: Field replicate information**		27.14
333	**Var7: Uncertainty**	A mixed stock standard consisting of silicic acid, phosphate and nitrate was prepared by dissolving high purity standard materials (KNO_3, KH_2PO_4 and Na_2SiF_6) in deionized water using a two step dilution for phosphate and nitrate. This standard was stored at room temperature. A nitrite stock standard was prepared dissolving $NaNO_2$ in distilled water, and this standard was stored in the ship's refrigerator. Working standards were prepared fresh daily by diluting the stock solutions in low nutrient seawater. The mixed standards were verified against commercial standards, and in-lab standards.	27.15
334	**Var7: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	27.16
335	**Var7: Method reference (citation)**	Armstrong, F.A.J., Stearns, C.R. and Strickland, J.D.H. (1967). The measurement of upwelling and subsequent biological processes by means of the Technicon AutoAnalyzer and associated equipment. Deep-Sea Res. 14:381-389. Gordon, L.I., Jennings Jr., J.C., Ross, A.A. and Krest, J.M. (1993). A suggested protocol for the continuous automated analysis of seawater nutrients (phosphate, nitrate, nitrite and silicic acid) in the WOCE Hydrographic program and the Joint Global Ocean Fluxes Study. WOCE Operations Manual, vol. 3: The Observational Programme, Section 3.2: WOCE Hydrographic Programme, Part 3.1.3: WHP Operations and Methods. WHP Office Report WHPO 91-1; WOCE Report No. 68/91. November 1994, Revision 1, Woods Hole, MA., USA, 52 loose-leaf pages.	27.17
336	**Var7: Biological subject (SPECIAL USE ONLY)**		27.18

337	**Var7: Species Identification code (SPECIAL USE ONLY)**		27.19
338	**Var7: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
339	**Var7: Researcher Name**	Jia-Zhong Zhang	27.21.1
340	**Var7: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	27.21.2
341	**Var8: Variable abbreviation in data files**	NITRITE_UMOL_KG	27.1
342	**Var8: Full variable name**	Nitrite	27.2
343	**Var8: Observation type**	Profile and surface underway	27.4
344	**Var8: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.5
345	**Var8: Variable unit**	micromol/kg	27.7
346	**Var8: Measured or calculated**	Measured	27.8
347	**Var8: Calculation method and parameters**		27.9
348	**Var8: Sampling instrument**	Niskin bottle and flow through pump	27.10
349	**Var8: Analyzing instrument**	Continuous flow analyzer (CFA) using the standard and analysis protocols for the WOCE hydrographic program as set forth in the manual by L.I. Gordon, et al. (1993).	27.11
350	**Var8: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.12
351	**Var8: Detailed sampling and analyzing information**	Nutrient samples were collected from Niskin bottles, after at least three seawater rinses. Sample analysis typically began within a few hours of sample collection after the samples had warmed to room temperature. Those samples not analyzed within 3 hours were refrigerated for later analysis. Samples were analyzed for phosphate (PO4− 3), nitrate (NO3−), nitrite (NO2−) and orthosilicic acid (H4SiO4). Nitrite was determined by diazotizing the sample with sulfanilamide and coupling with N-1 naphthyl ethylenediamine dihydrochloride to form an azo dye. The color produced is measured at 540 nm.	27.13
352	**Var8: Field replicate information**		27.14
353	**Var8: Uncertainty**	A mixed stock standard consisting of silicic acid, phosphate and nitrate was prepared by dissolving high purity standard materials (KNO3, KH2PO4 and Na2SiF6) in deionized water using a two step dilution for phosphate and nitrate. This standard was stored at room temperature. A nitrite stock standard was prepared dissolving NaNO2 in distilled water, and this standard was stored in the ship's refrigerator. Working standards were prepared fresh daily by diluting the stock solutions in low nutrient seawater. The mixed standards were verified against commercial standards, and in-lab standards.	27.15
354	**Var8: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	27.16
355	**Var8: Method reference (citation)**	Armstrong, F.A.J., Stearns, C.R. and Strickland, J.D.H. (1967). The measurement of upwelling and subsequent biological processes by means of the Technicon AutoAnalyzer and associated equipment. Deep-Sea Res. 14:381-389. Gordon, L.I., Jennings Jr., J.C., Ross, A.A. and Krest, J.M. (1993). A suggested protocol for the continuous automated analysis of seawater nutrients (phosphate, nitrate, nitrite and silicic acid) in the WOCE Hydrographic program and the Joint Global Ocean Fluxes Study. WOCE Operations Manual, vol. 3: The Observational Programme, Section 3.2: WOCE Hydrographic Programme, Part 3.1.3: WHP Operations and Methods. WHP Office Report WHPO 91-1; WOCE Report No. 68/91. November 1994, Revision 1, Woods Hole, MA., USA, 52 loose-leaf pages.	27.17
356	**Var8: Biological subject (SPECIAL USE ONLY)**		27.18
357	**Var8: Species Identification code (SPECIAL USE ONLY)**		27.19
358	**Var8: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
359	**Var8: Researcher Name**	Jia-Zhong Zhang	27.21.1
360	**Var8: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	27.21.2
361	**Var9: Variable abbreviation in data files**	NITRATE_UMOL_KG	27.1
362	**Var9: Full variable name**	nitrate	27.2
363	**Var9: Observation type**	Profile and surface underway	27.4
364	**Var9: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.5

365	**Var9: Variable unit**	micromol/kg	27.7
366	**Var9: Measured or calculated**	Measured	27.8
367	**Var9: Calculation method and parameters**		27.9
368	**Var9: Sampling instrument**	Niskin bottle and flow through pump	27.10
369	**Var9: Analyzing instrument**	Continuous flow analyzer (CFA) using the standard and analysis protocols for the WOCE hydrographic program as set forth in the manual by L.I. Gordon, et al. (1993).	27.11
370	**Var9: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.12
371	**Var9: Detailed sampling and analyzing information**	Nutrient samples were collected from Niskin bottles, after at least three seawater rinses. Sample analysis typically began within a few hours of sample collection after the samples had warmed to room temperature. Those samples not analyzed within 3 hours were refrigerated for later analysis. Samples were analyzed for phosphate ($PO4^{-}$ 3), nitrate ($NO3^{-}$), nitrite ($NO2^{-}$) and orthosilicic acid (H4SiO4). Samples for nitrate analysis were passed through a cadmium column, which reduced nitrate to nitrite, and the resulting nitrite concentration (i.e. the sum of nitrate + nitrite which is signified as N+N) was then determined as described above. Nitrate concentrations were determined from the difference of N+N and nitrite.	27.13
372	**Var9: Field replicate information**		27.14
373	**Var9: Uncertainty**	A mixed stock standard consisting of silicic acid, phosphate and nitrate was prepared by dissolving high purity standard materials (KNO3, KH2PO4 and Na2SiF6) in deionized water using a two step dilution for phosphate and nitrate. This standard was stored at room temperature. A nitrite stock standard was prepared dissolving NaNO2 in distilled water, and this standard was stored in the ship's refrigerator. Working standards were prepared fresh daily by diluting the stock solutions in low nutrient seawater. The mixed standards were verified against commercial standards, and in-lab standards.	27.15
374	**Var9: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	27.16
375	**Var9: Method reference (citation)**	Armstrong, F.A.J., Stearns, C.R. and Strickland, J.D.H. (1967). The measurement of upwelling and subsequent biological processes by means of the Technicon AutoAnalyzer and associated equipment. Deep-Sea Res. 14:381-389. Gordon, L.I., Jennings Jr., J.C., Ross, A.A. and Krest, J.M. (1993). A suggested protocol for the continuous automated analysis of seawater nutrients (phosphate, nitrate, nitrite and silicic acid) in the WOCE Hydrographic program and the Joint Global Ocean Fluxes Study. WOCE Operations Manual, vol. 3: The Observational Programme, Section 3.2: WOCE Hydrographic Programme, Part 3.1.3: WHP Operations and Methods. WHP Office Report WHPO 91-1; WOCE Report No. 68/91. November 1994, Revision 1, Woods Hole, MA., USA, 52 loose-leaf pages.	27.17
376	**Var9: Biological subject (SPECIAL USE ONLY)**		27.18
377	**Var9: Species Identification code (SPECIAL USE ONLY)**		27.19
378	**Var9: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
379	**Var9: Researcher Name**	Jia-Zhong Zhang	27.21.1
380	**Var9: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	27.21.2
381	**Var10: Variable abbreviation in data files**	NITRATE_NITRITE_UMOL_KG	27.1
382	**Var10: Full variable name**	Sum of nitrate + nitrite	27.2
383	**Var10: Observation type**	Profile and surface underway	27.4
384	**Var10: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.5
385	**Var10: Variable unit**	micromol/kg	27.7
386	**Var10: Measured or calculated**	Measured	27.8
387	**Var10: Calculation method and parameters**		27.9
388	**Var10: Sampling instrument**	Niskin bottle and flow through pump	27.10
389	**Var10: Analyzing instrument**	Continuous flow analyzer (CFA) using the standard and analysis protocols for the WOCE hydrographic program as set forth in the manual by L.I. Gordon, et al. (1993).	27.11
390	**Var10: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.12

391	**Var10: Detailed sampling and analyzing information**	Nutrient samples were collected from Niskin bottles, after at least three seawater rinses. Sample analysis typically began within a few hours of sample collection after the samples had warmed to room temperature. Those samples not analyzed within 3 hours were refrigerated for later analysis. Samples were analyzed for phosphate (PO4− 3), nitrate (NO3−), nitrite (NO2−) and orthosilicic acid (H4SiO4). Samples were passed through a cadmium column, which reduced nitrate to nitrite, and the resulting nitrite concentration (i.e. the sum of nitrate + nitrite which is signified as N+N) was then determined as described above.	27.13
392	**Var10: Field replicate information**		27.14
393	**Var10: Uncertainty**	A mixed stock standard consisting of silicic acid, phosphate and nitrate was prepared by dissolving high purity standard materials (KNO3, KH2PO4 and Na2SiF6) in deionized water using a two step dilution for phosphate and nitrate. This standard was stored at room temperature. A nitrite stock standard was prepared dissolving NaNO2 in distilled water, and this standard was stored in the ship's refrigerator. Working standards were prepared fresh daily by diluting the stock solutions in low nutrient seawater. The mixed standards were verified against commercial standards, and in-lab standards.	27.15
394	**Var10: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	27.16
395	**Var10: Method reference (citation)**	Armstrong, F.A.J., Stearns, C.R. and Strickland, J.D.H. (1967). The measurement of upwelling and subsequent biological processes by means of the Technicon AutoAnalyzer and associated equipment. Deep-Sea Res. 14:381-389. Gordon, L.I., Jennings Jr., J.C., Ross, A.A. and Krest, J.M. (1993). A suggested protocol for the continuous automated analysis of seawater nutrients (phosphate, nitrate, nitrite and silicic acid) in the WOCE Hydrographic program and the Joint Global Ocean Fluxes Study. WOCE Operations Manual, vol. 3: The Observational Programme, Section 3.2: WOCE Hydrographic Programme, Part 3.1.3: WHP Operations and Methods. WHP Office Report WHPO 91-1; WOCE Report No. 68/91. November 1994, Revision 1, Woods Hole, MA., USA, 52 loose-leaf pages.	27.17
396	**Var10: Biological subject (SPECIAL USE ONLY)**		27.18
397	**Var10: Species Identification code (SPECIAL USE ONLY)**		27.19
398	**Var10: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
399	**Var10: Researcher Name**	Jia-Zhong Zhang	27.21.1
400	**Var10: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	27.21.2
401	**Var11: Variable abbreviation in data files**	PHOSPHATE_UMOL_KG	28.1
402	**Var11: Full variable name**	phosphate	28.2
403	**Var11: Observation type**	Profile and surface underway	27.4
404	**Var11: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.5
405	**Var11: Variable unit**	micromol/kg	27.7
406	**Var11: Measured or calculated**	Measured	27.8
407	**Var11: Calculation method and parameters**		27.9
408	**Var11: Sampling instrument**	Niskin bottle and flow through pump	27.10
409	**Var11: Analyzing instrument**	Continuous flow analyzer (CFA) using the standard and analysis protocols for the WOCE hydrographic program as set forth in the manual by L.I. Gordon, et al. (1993).	27.11
410	**Var11: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.12
411	**Var11: Detailed sampling and analyzing information**	Nutrient samples were collected from Niskin bottles, after at least three seawater rinses. Sample analysis typically began within a few hours of sample collection after the samples had warmed to room temperature. Those samples not analyzed within 3 hours were refrigerated for later analysis. Samples were analyzed for phosphate (PO4− 3), nitrate (NO3−), nitrite (NO2−) and orthosilicic acid (H4SiO4). Phosphate was determined by reacting the sample with molybdic acid to form phosphomolybdic acid. This complex was subsequently reduced with hydrazine, and the absorbance of the resulting phosphomolybdous acid was measured at 710 nm.	27.13
412	**Var11: Field replicate information**		27.14

413	**Var11: Uncertainty**	A mixed stock standard consisting of silicic acid, phosphate and nitrate was prepared by dissolving high purity standard materials (KNO3, KH2PO4 and Na2SiF6) in deionized water using a two step dilution for phosphate and nitrate. This standard was stored at room temperature. A nitrite stock standard was prepared dissolving NaNO2 in distilled water, and this standard was stored in the ship's refrigerator. Working standards were prepared fresh daily by diluting the stock solutions in low nutrient seawater. The mixed standards were verified against commercial standards, and in-lab standards.	27.15
414	**Var11: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	27.16
415	**Var11: Method reference (citation)**	Armstrong, F.A.J., Stearns, C.R. and Strickland, J.D.H. (1967). The measurement of upwelling and subsequent biological processes by means of the Technicon AutoAnalyzer and associated equipment. Deep-Sea Res. 14:381-389. Gordon, L.I., Jennings Jr., J.C., Ross, A.A. and Krest, J.M. (1993). A suggested protocol for the continuous automated analysis of seawater nutrients (phosphate, nitrate, nitrite and silicic acid) in the WOCE Hydrographic program and the Joint Global Ocean Fluxes Study. WOCE Operations Manual, vol. 3: The Observational Programme, Section 3.2: WOCE Hydrographic Programme, Part 3.1.3: WHP Operations and Methods. WHP Office Report WHPO 91-1; WOCE Report No. 68/91. November 1994, Revision 1, Woods Hole, MA., USA, 52 loose-leaf pages.	27.17
416	**Var11: Biological subject (SPECIAL USE ONLY)**		27.18
417	**Var11: Species Identification code (SPECIAL USE ONLY)**		27.19
418	**Var11: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
419	**Var11: Researcher Name**	Jia-Zhong Zhang	27.21.1
420	**Var11: Researcher Institution**	Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration	27.21.2
421	**Var12: Variable abbreviation in data files**	CARBONATE_UMOL_KG	28.1
422	**Var12: Full variable name**	carbonate ion concentration	27.4
423	**Var12: Observation type**	Profile and surface underway	27.5
424	**Var12: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.7
425	**Var12: Variable unit**	micromol/kg	27.8
426	**Var12: Measured or calculated**	Measured	27.9
427	**Var12: Calculation method and parameters**		27.10
428	**Var12: Sampling instrument**	Niskin bottle and flow through pump	27.11
429	**Var12: Analyzing instrument**	Agilent 8453 spectrometer setup with a custom-made temperature-controlled cell holder.	27.12
430	**Var12: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.13
431	**Var12: Detailed sampling and analyzing information**	The carbonate ion samples were sampled into quartz cells in the same manner as the pH samples. After the pH samples were taken, the quartz cells were attached to the silicone tubing to collect samples for carbonate ion concentration measurements. Samples were analyzed on an Agilent 8453 spectrophotometer. A UV blank was taken for each sample and 20 µL of 0.022 M PbClO4 were added (Acros Organics, Lot A0301399 – 99% purity). Absorbances, A, were measured at two wavelengths (1λ = 234 nm and 2λ = 250 nm), along with the absorbance at a non-absorbing wavelength (350 nm).	27.14
432	**Var12: Field replicate information**	Duplicates were drawn at each station and for underway discrete measurements.	27.15
433	**Var12: Uncertainty**	All spectrophotometric CO32- measurements were tentatively flagged if the baseline shifted more than 0.004 absorbance units for carbonate ion measurements. A series of at least three spectra were averaged for each determination and samples were rerun if the overall standard deviations were higher than 0.002. This process was repeated until the standard deviation of multiple readings was within 0.002. Absorbance values were saved so that the quality criteria can be evaluated in the future. Data for directly measured carbonate are reported in terms of both concentrations and the R-Ratios taken at 250 nm and 234 nm. Data for CO32-, are reported at the analysis temperature of 25 ºC.	27.16
434	**Var12: Data quality flag description**	WOCE quality control flags are used: 2 = good value, 3 = questionable value, 4 = bad value, 5 = value not reported, 6 = mean of replicate measurements, 9 = sample not drawn.	27.17

435	**Var12: Method reference (citation)**	Byrne, R.H.; & Yao, W. (2008). Procedures for measurement of carbonate ion concentrations in seawater by direct spectrophotometric observations of Pb(II) complexation. Marine Chemistry, 112(1-2), 128-135. Clayton, T.D.; & Byrne, R.H. (1993). Spectrophotometric seawater pH measurements: total hydrogen ion concentration scale calibration of m-cresol purple and at-sea results. Deep Sea Research Part I: Oceanographic Research Papers, 40(10), 2115-2129. doi: Doi: 10.1016/0967-0637(93)90048-8 Liu, X.; Patsavas, M.C.; & Byrne, R. H. (2011). Purification and characterization of meta-cresol purple for spectrophotometric seawater pH measurements. Environmental Science & Technology, 45(11), 4862-4868. doi: 10.1021/es200665d.	27.18
436	**Var12: Biological subject (SPECIAL USE ONLY)**		
437	**Var12: Species Identification code (SPECIAL USE ONLY)**		27.19
438	**Var12: Life stage of the Biological subject (SPECIAL USE ONLY)**	Robert Byrne	27.20
439	**Var12: Researcher Name**	Robert Byrne	27.21.1
440	**Var12: Researcher Institution**	University of South Florida	27.21.2
441	**Var13: Variable abbreviation in data files**	CHLA_MG_M3	28.1
442	**Var13: Full variable name**	Chlorophyll a concentration	27.4
443	**Var13: Observation type**	Profile	27.5
444	**Var13: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)**	In-situ observation	27.7
445	**Var13: Variable unit**	microgram/liter	27.8
446	**Var13: Measured or calculated**	Measured	27.9
447	**Var13: Calculation method and parameters**		27.10
448	**Var13: Sampling instrument**	Niskin bottle	27.11
449	**Var13: Analyzing instrument**	Turner Designs Fluorometer (10-AU)	27.12
450	**Var13: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)**		27.13
451	**Var13: Detailed sampling and analyzing information**	100-150 ml was filtered from whole seawater (WSW) and 20 micron-screened samples that were collected at the surface, the depth of the chlorophyll maximum, and below the chlorophyll maximum (where appropriate) for extracted Chlorophyll-a. WSW and < 20 micron samples were each filtered in duplicate onto glass-fiber filters (total: 4 filters/depth), extracted overnight in 90% acetone at -20C, and quantified using a Turner Designs Fluorometer calibrated with chlorophyll in acetone standards and checked with a blank and solid secondary standards before each set of analyses. Chlorophyll-a in the > 20 micron size-fraction is calculated as the difference between the WSW and < 20 micron average concentrations. 231 average values were reported to the database.	27.14
452	**Var13: Field replicate information**	No duplicates were taken	27.15
453	**Var13: Uncertainty**		27.16
454	**Var13: Data quality flag description**		27.17
455	**Var13: Method reference (citation)**		27.18
456	**Var13: Biological subject (SPECIAL USE ONLY)**		
457	**Var13: Species Identification code (SPECIAL USE ONLY)**		27.19
458	**Var13: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
459	**Var13: Researcher Name**	Beth Stauffer	27.21.1
460	**Var13: Researcher Institution**	University of Louisiana at Lafayette	27.21.2
461	**Var14: Variable abbreviation in data files**	CHLA_MG_M3 <20	28.1
462	**Var14: Full variable name**	Chlorophyll a concentration for fraction size smaller than 20 microns	27.4
463	**Var14: Observation type**	Profile	27.5

464	Var14: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)	In-situ observation	27.7
465	Var14: Variable unit	microgram/liter	27.8
466	Var14: Measured or calculated	Measured	27.9
467	Var14: Calculation method and parameters		27.10
468	Var14: Sampling instrument	Niskin bottle	27.11
469	Var14: Analyzing instrument	Turner Designs Fluorometer (10-AU)	27.12
470	Var14: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)		27.13
471	Var14: Detailed sampling and analyzing information	100-150 ml was filtered from whole seawater (WSW) and 20 micron-screened samples that were collected at the surface, the depth of the chlorophyll maximum, and below the chlorophyll maximum (where appropriate) for extracted Chlorophyll-a. WSW and < 20 micron samples were each filtered in duplicate onto glass-fiber filters (total: 4 filters/depth), extracted overnight in 90% acetone at -20C, and quantified using a Turner Designs Fluorometer calibrated with chlorophyll in acetone standards and checked with a blank and solid secondary standards before each set of analyses. Chlorophyll-a in the > 20 micron size-fraction is calculated as the difference between the WSW and < 20 micron average concentrations. 231 average values were reported to the database.	27.14
472	Var14: Field replicate information	No duplicates were taken	27.15
473	Var14: Uncertainty		27.16
474	Var14: Data quality flag description		27.17
475	Var14: Method reference (citation)		27.18
476	Var14: Biological subject (SPECIAL USE ONLY)		
477	Var14: Species Identification code (SPECIAL USE ONLY)		27.19
478	Var14: Life stage of the Biological subject (SPECIAL USE ONLY)		27.20
479	Var14: Researcher Name	Beth Stauffer	27.21.1
480	Var14: Researcher Institution	University of Louisiana at Lafayette	27.21.2
481	Var15: Variable abbreviation in data files	CHLA_MG_M3 >20	28.1
482	Var15: Full variable name	Chlorophyll a concentration for fraction size larger than 20 microns	27.4
483	Var15: Observation type	Profile	27.5
484	Var15: In-situ observation / manipulation condition / response variable (SPECIAL USE ONLY)	In-situ observation	27.7
485	Var15: Variable unit	microgram/liter	27.8
486	Var15: Measured or calculated	Measured	27.9
487	Var15: Calculation method and parameters		27.10
488	Var15: Sampling instrument	Niskin bottle	27.11
489	Var15: Analyzing instrument	Turner Designs Fluorometer (10-AU)	27.12
490	Var15: Duration (for settlement/colonization methods) (SPECIAL USE ONLY)		27.13
491	Var15: Detailed sampling and analyzing information	100-150 ml was filtered from whole seawater (WSW) and 20 micron-screened samples that were collected at the surface, the depth of the chlorophyll maximum, and below the chlorophyll maximum (where appropriate) for extracted Chlorophyll-a. WSW and < 20 micron samples were each filtered in duplicate onto glass-fiber filters (total: 4 filters/depth), extracted overnight in 90% acetone at -20C, and quantified using a Turner Designs Fluorometer calibrated with chlorophyll in acetone standards and checked with a blank and solid secondary standards before each set of analyses. Chlorophyll-a in the > 20 micron size-fraction is calculated as the difference between the WSW and < 20 micron average concentrations. 231 average values were reported to the database.	27.14
492	Var15: Field replicate information	No duplicates were taken	27.15
493	Var15: Uncertainty		27.16

494	**Var15: Data quality flag description**		27.17
495	**Var15: Method reference (citation)**		27.18
496	**Var15: Biological subject (SPECIAL USE ONLY)**		
497	**Var15: Species Identification code (SPECIAL USE ONLY)**		27.19
498	**Var15: Life stage of the Biological subject (SPECIAL USE ONLY)**		27.20
499	**Var15: Researcher Name**	Beth Stauffer	27.21.1
500	**Var15: Researcher Institution**	University of Louisiana at Lafayette	27.21.2