No	Metadata element name		Help reference no.
1	Submission Date	12/20/2017	1
2	Accession no. of related data sets	TBD	2
3	Investigator-1 name	Simone R. Alin	3.1
4	Investigator-1 institution	NOAA Pacific Marine Environmental Laboratory	3.2
5	Investigator-1 address	7600 Sand Point Way NE, Building 3, Seattle, WA 98115	3.3
6	Investigator-1 phone	206-526-6819	3.4
7	Investigator-1 email	simone.r.alin@noaa.gov	3.5
8	Investigator-1 researcher ID	1: 0000-0002-8283-1910, 2: J-6836-2017	3.6
9	Investigator-1 ID type (ORCID, Researcher ID, etc.)	1: ORCID; 2: Researcher ID	3.7
10	Investigator-2 name	Richard A. Feely	3.1
11	Investigator-2 institution	NOAA Pacific Marine Environmental Laboratory	3.2
12	Investigator-2 address	7600 Sand Point Way NE, Building 3, Seattle, WA 98115	3.3
13	Investigator-2 phone	206-526-6214	3.4
14	Investigator-2 email	Richard.A.Feely@noaa.gov	3.5
15	Investigator-2 researcher ID		3.6
16	Investigator-2 ID type (ORCID, Researcher ID, etc.)		3.7
17	Investigator-3 name	Ryan M. McCabe	3.1
18	Investigator-3 institution	University of Washington - JISAO	3.2
19	Investigator-3 address	3737 Brooklyn Ave NE, Box 355672, Seattle, WA 98195	3.3
20	Investigator-3 phone	206-685-0599	3.4
21	Investigator-3 email	rmccabe.ocean@gmail.com	3.5
22	Investigator-3 researcher ID		3.6
23	Investigator-3 ID type (ORCID, Researcher ID, etc.)		3.7
405	PI-4 name	Burke Hales	1.1
406	PI-4 institution	Oregon State University, College of Earth, Ocean, and Atmospheric Sciences	1.2
407	PI-4 address	104 CEOAS Administration Bldg, Corvallis, OR 97331	1.3
408	PI-4 phone	541-737-8121	1.4
409	PI-4 email	bhales@coas.oregonstate.edu	1.5
410	Investigator-3 researcher ID		3.6
411	Investigator-3 ID type (ORCID, Researcher ID, etc.)		3.7
410	PI-5 name	Robert H. Byrne	1.1
411	PI-5 institution	University of South Florida, College of Marine Science	1.2
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414	PI-5 email	byrne@marine.usf.edu	1.5
415	Investigator-3 researcher ID		3.6
416	Investigator-3 ID type (ORCID, Researcher ID, etc.)		3.7
415	PI-6 name	William Cochlan	1.1
416	PI-6 institution	Romberg Tiburon Center, San Francisco State University	1.2
417	PI-6 address	Senior Research Scientist, 3150 Paradise Drive, Tiburon, CA 94920	1.3
418	PI-6 phone	415-338-3541	1.4
419	PI-6 email	cochlan@sfsu.edu	1.5
420	Investigator-3 researcher ID		3.6
421	Investigator-3 ID type (ORCID, Researcher ID, etc.)		3.7
24	Data submitter name	Dana Greeley	4.1
25	Data submitter institution	NOAA Pacific Marine Environmental Laboratory	4.2
26	Data submitter address	7600 Sand Point Way NE, Building 3, Seattle, WA 98115	4.3
27	Data submitter phone	206-526-6693	4.4
28	Data submitter email	dana.greeley@noaa.gov	4.5
29	Data submitter researcher ID		4.6
30	Data submitter ID type (ORCID, Researcher ID, etc.)		4.7
31	Title	Chemical and hydrographic profile measurements during the 2016 West Coast Ocean Acidification Cruise (WCOA2016, May 5 to June 7, 2016)	5

No	Metadata element name		Help reference no.
32	**Abstract**	The 2016 cruise represents the most integrated West Coast Ocean Acidification (WCOA) cruise to date. WCOA2016 took place May 5 to June 7, 2016 aboard the NOAA Ship Ronald H. Brown. 132 stations were occupied from Baja California in Mexico to Vancouver Island in Canada along seventeen transect lines. At all stations, CTD casts were conducted, and discrete water samples were collected in Niskin bottles. The cruise was designed to obtain a synoptic snapshot of key carbon, physical, and biogeochemical parameters as they relate to ocean acidification (OA) in the coastal realm. Physical, biogeochemical, and chlorophyll concentration data collected during CTD casts are included with this data set. During the cruise, some of the same transect lines were occupied as during the 2007, 2011, 2012, and 2013 West Coast Ocean Acidification cruises, as well as CalCOFI cruises. This effort was conducted in support of the coastal monitoring and research objectives of the NOAA Ocean Acidification Program (OAP). Data Use Policy: Data from NOAA West Coast Ocean Acidification (WCOA) cruises are made freely available to the public and the scientific community in the belief that their wide dissemination will lead to greater understanding and new scientific and policy insights. The investigators sharing these data rely on the ethics and integrity of the user to ensure that the institutions and investigators involved in producing the WCOA cruise data sets receive fair credit for their work. If the data are obtained for potential use in a publication or presentation, we urge the end user to inform the investigators listed herein at the outset of the nature of this work. If these data are essential to the work, or if an important result or conclusion depends on these data, co-authorship may be appropriate. This should be discussed at an early stage in the work. We request that any manuscripts using these data be sent to all investigators listed in the metadata before they are submitted for publication so that we can ensure that the quality and limitations of the data are accurately represented. Please direct all queries about this data set to Simone Alin and Richard Feely.	6
33	**Purpose**	The major objectives of the cruise were: 1) To characterize ocean acidification (OA) conditions on the North American Pacific Coast; 2) To conduct inter-calibration measurements near other OA observing assets, including moorings, in the study area, allowing inter-calibration of these autonomous assets with high-quality, ship-based measurements; 3) To provide calibration data needed to develop predictive models for aragonite saturation state, pH, and other important OA indicators in the California Current Ecosystem, based on widely measured parameters such as salinity, temperature, and oxygen concentration; 4) To examine relationships between processes leading to OA and hypoxia in coastal ecosystems; 5) To conduct biological measurements in conjunction with physical and chemical OA measurements; and 6) To provide scientific information on OA conditions and trends for resource management and decision support.	7
34	**Start date**	5/5/2016	8.1
35	**End date**	6/7/2016	8.2
36	**Westbd longitude**	-130.876	9.1
37	**Eastbd longitude**	-112.63	9.2
38	**Northbd latitude**	52.399	9.3
39	**Southbd latitude**	25.589	9.4
40	**Geographic names**	U.S. West Coast; California Current Ecosystem; British Columbia, Canada; Baja California, Mexico; North American Pacific Coast; Southern California Bight; Olympic Coast National Marine Sanctuary	11
41	**Funding agency name**	NOAA's Ocean Acidification Program	13.1
42	**Funding project title**	PMEL Sustained Ocean Acidification Large-Scale Survey Observations	13.2
43	**Funding project ID (Grant no.)**		13.3
44	**Research projects**	PMEL Sustained Ocean Acidification Large-Scale Survey Observations; NOAA Ocean Acidification Observing Network	14
45	**Platform-1 name**	Ronald H. Brown	15.1
46	**Platform-1 ID**	33RO	15.2
47	**Platform-1 type**	Research vessel	15.3
48	**Platform-1 owner**	NOAA SHIP	15.4
49	**Platform-1 country**	USA	15.5
50	**EXPOCODE**	33RO20160505	16
51	**Cruise ID**	WCOA2016	17
52	**Section**		18
53	**Author list for citation**	Alin, Simone R.; Feely, Richard A.; Hales, Burke; Byrne, Robert; Cochlan, William; Liu, Xuewu; Greeley, Dana.	19
54	**References**		20
55	**Supplemental information**	http://www.pmel.noaa.gov/co2/story/2016+West+Coast+Ocean+Acidification+Cruise https://westcoastoa.wordpress.com/	21
56	**DIC: Variable abbreviation in data files**	DIC_UMOL_KG	22.1
57	**DIC: Variable unit**	micromoles/kg	22.5

No	Metadata element name		Help reference no.
58	**DIC: Observation type**	Discrete measurements from samples collected on CTD casts	22.2
59	**DIC: Measured or calculated**	Measured	22.6
60	**DIC: Calculation method and parameters**	Not Calculated	22.7
61	**DIC: Sampling instrument**	Niskin bottle	22.8
62	**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
63	**DIC: Detailed sampling and analyzing information**	PLEASE NOTE: DIC may also be referred to as TCO2, TCARBN, or C(sub)T in other data sets. All of these abbreviations refer to the total dissolved inorganic carbon concentration (i.e., the combined concentration of dissolved CO2, bicarbonate ion, and carbonate ion). Samples for DIC measurements were drawn according to procedures outlined in the 2007 PICES Special Publication, Guide to Best Practices for Ocean CO_2 Measurements, from Niskin bottles into 310 ml borosilicate glass flasks using silicone tubing. The flasks were rinsed once and filled from the bottom with care not to entrain any bubbles, overflowing by at least one-half volume. The sample tube was pinched off and withdrawn, creating a ~7.5 ml headspace, and 0.12 ml of saturated $HgCl_2$ solution was added as a preservative. The sample bottles were then sealed with glass stoppers lightly covered with Apiezon-L grease. DIC samples were collected from variety of depths with approximately 10% of these samples taken as duplicates. The accuracy of the DICE measurement is determined with the use of standards (Certified Reference Materials (CRMs), consisting of filtered and UV irradiated seawater) supplied by Dr. Andrew Dickson of Scripps Institution of Oceanography (SIO). The CRM accuracy is determined manometrically on land in San Diego and the DIC data reported to the Ocean Carbon and Acidification Data Portal have been corrected to this batch 154 CRM value. The CRM certified value for this batch is 2037.68 umol/kg. System 1 averaged 2033.64 and system 2 averaged 2036.88. The overall performance of the analytical equipment was quite good. Water from 1704 niskin bottles were analyzed for dissolved inorganic carbon.	22.10
64	**DIC: Field replicate information**	Duplicate samples were collected from approximately 10% of the Niskins sampled, as a check of our precision. These replicate samples were interspersed throughout the station analysis for quality assurance and integrity of the coulometer cell solutions. The average absolute difference from the mean of these replicates is 0.82 umol/kg. No systematic differences between the replicates were observed.	22.11
65	**DIC: Standardization technique description**	Each coulometer was calibrated by injecting aliquots of pure CO2 (99.999%) by means of an 8-port valve (Wilke et al. 1993) outfitted with two calibrated sample loops of different sizes (~1 mL and ~2 mL). The instruments were each separately calibrated at the beginning of each cell with a minimum of two sets of these gas loop injections.	22.12.1
66	**DIC: Frequency of standardization**	1) Gas loops were run near the beginning of each cell; 2) CRM's supplied by Dr. A. Dickson of SIO, were also measured near the beginning; and 3) Duplicate samples were typically run throughout the life of the cell solution.	22.12.2
67	**DIC: CRM manufacturer**	Dr. Andrew Dickson (Scripps Institution of Oceanography)	22.12.3.1
68	**DIC: Batch number**	154	22.12.3.2
69	**DIC: Poison used to kill the sample**	Saturated mercuric chloride solution	22.13.1
70	**DIC: Poison volume**	0.12 ml	22.13.2
71	**DIC Poisoning correction description**	The DIC values were corrected for dilution by 0.12 ml of saturated $HgCl_2$ used for sample preservation. The total water volume of the sample bottles was 302.55 ml. The correction factor used for dilution was 1.000397.	22.13.3
72	**DIC: Uncertainty**	±0.1%	22.14
73	**DIC: Data quality flag description**	DIC_FLAG_W, 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

No	Metadata element name		Help reference no.
74	DIC: Method reference (citation)	Dickson, A.G., C.L. Sabine, and J.R. Christian (eds.). 2007. Guide to best practices for ocean CO2 measurements. PICES Special Publication 3, 191 pp. Johnson, K.M., A.E. King, and J. McN. Sieburth. 1985. Coulometric DIC analyses for marine studies: An introduction. Mar. Chem., 16, 61–82. Johnson, K.M., P.J. Williams, L. Brandstrom, and J. McN. Sieburth. 1987. Coulometric total carbon analysis for marine studies: Automation and calibration. Mar. Chem., 21, 117–133. Johnson, K.M. 1992. Operator's manual: Single operator multiparameter metabolic analyzer (SOMMA) for total carbon dioxide (CT) with coulometric detection. Brookhaven National Laboratory, Brookhaven, N.Y., 70 pp. Johnson, K.M., K.D. Wills, D.B. Butler, W.K. Johnson, and C.S. Wong. 1993. Coulometric total carbon dioxide analysis for marine studies: Maximizing the performance of an automated continuous gas extraction system and coulometric detector. Mar. Chem., 44, 167–189. Johnson, K.M., Kortzinger, A.; Mintrop, L.; Duinker, J.C.; and Wallace, D.W.R. 1999. Coulometric total carbon dioxide analysis for marine studies: Measurement and internal consistency of underway surface TCO2 concentrations. Marine Chemistry 67(1):123-144.	22.16
75	DIC: Researcher Name	Dana Greeley, Brendan Carter, Martin Davelaar, Wiley Evans	22.17.1
76	DIC: Researcher Institution	Pacific Marine Environmental Laboratory, National Oceanic and Atmospheric Administration; PI: Simone Alin	22.17.2
77	TA: Variable abbreviation in data files	TA_UMOL_KG	23.1
78	TA: Variable unit	micromoles/kg	23.5
79	TA: Observation type	Discrete measurements from samples collected on CTD casts.	23.2
80	TA: Measured or calculated	Measured	23.6
81	TA: Calculation method and parameters	Not Calculated	23.7
82	TA: Sampling instrument	Niskin bottle	23.8
83	TA: Analyzing instrument	Custom instrument built in Dr. Andrew Dickson's lab at Scripps-UCSD in 2016.	23.9
84	TA: Type of titration	Two-stage, potentiometric, open-cell titration using coulometrically analyzed hydrochloric acid.	23.10
85	TA: Cell type (open or closed)	Open	23.11
86	TA: Curve fitting method	Non-linear least squares	23.12
87	TA: Detailed sampling and analyzing information	PLEASE NOTE: TA may be referred to as TALK, ALKALI, or A(sub)T in other data sets. All of these abbreviations refer to the total alkalinity. Seawater samples for total alkalinity were drawn directly from Niskin bottles into 310 mL borosilicate glass (Corning Pyrex/Schott Duran) bottles as described in SOP1 of "The Guide to Best Practices for Ocean CO2 Measurements" (Dickson A.G., Sabine L.S. and Christian J.R, Eds., 2007 PICES Special Publication 3), using silicone tubing. The flasks were rinsed three times and filled from the bottom with care not to entrain any bubbles, overflowing by at least one full volume. The sample tube was pinched off and withdrawn, creating a ~6.2 mL headspace and preserved with 0.12 mL of a saturated mercuric chloride solution and the final alkalinity concentration corrected for this addition. The bottles were then sealed with glass stoppers lightly coated with Apiezon-L grease. The samples were subsequently analyzed according to SOP3b of "The Guide to Best Practices for Ocean CO2 Measurements" (as above), using an open cell titration system built by the Dickson Lab in 2016 at Scripps Institution of Oceanography, University of California San Diego. Sample and analysis cell temperatures were controlled and sample size was measured volumetrically and subsequently corrected to mass. The instrument was controlled and alkalinity determined by LabVIEW software written by the Dickson Lab. Instrument accuracy was monitored at regular intervals using Certified Reference Materials (CRMs), consisting of filtered and UV irradiated seawater supplied by the Dickson Lab (SIO-UCSD). Precision was monitored by analyzing replicate samples drawn from approximately 10% of the Niskins sampled. Samples were analyzed within 12 hours of being collected except for stations 134 and 135, which were run ashore.	23.13
88	TA: Field replicate information	We collected and analyzed duplicate samples from approximately 10% of the Niskins sampled.	23.14

No	Metadata element name		Help reference no.
89	TA: Standardization technique description	Analytical accuracy was assessed by periodic analysis of Certified Reference Materials (CRMs) throughout the cruise. CRMs were analyzed approximately every 20 samples or less as needed. For both legs of this cruise, the CRM used was Batch 154 (certified = 2224.30). The average measured CRM on Leg 1 was 2224.93 with a standard deviation of 1.65 and a range of 7.04. For Leg 2, the average CRM was 2225.07 with a standard deviation of 1.35 and a range of 6.82. These higher than typical SD and range resulted from a less precise commercially sourced voltage amplifier used during the cruise. Samples analyzed on shore after the cruise (Stations 134 and 135), used CRM batches 154 and 145 (certified = 2226.16) with average measurements of 2223.20 (SD = 0.76, range = 2.06) and 2226.03 (SD = 1.34, range = 3.27). No corrections were made for the offset between the certified and measured CRM's. Precision was monitored by analyzing replicates drawn from approximately 10% of the Niskins sampled.	23.15.1
90	TA: Frequency of standardization	Every 20 samples or less as needed.	23.15.2
91	TA: CRM manufacturer	Dr. Andrew Dickson (Scripps Institution of Oceanography)	23.15.3.1
92	TA: Batch Number	154 and 145	23.15.3.2
93	TA: Poison used to kill the sample	Saturated mercuric chloride solution	23.16.1
94	TA: Poison volume	0.12 ml	23.16.2
95	TA: Poisoning correction description	The TA values were corrected for the resulting dilution of the added 0.12 ml of saturated HgCl2 used for sample preservation.	23.16.3
96	TA: Magnitude of blank correction	NA	23.17
97	TA: Uncertainty	±0.1%	23.18
98	TA: Data quality flag description	TA_FLAG_W, 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
99	TA: 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.	23.20
100	TA: Researcher Name	Julian Herndon, Morgan Langis, Martin Hernandez-Ayon, and Remy Okazaki	23.21.1
101	TA: Researcher Institution	Pacific Marine Environmental Laboratory, National Oceanic and Atmospheric Administration; PI: Simone Alin	23.21.2
102	pH: Variable abbreviation in data files	PH_TOT_MEA	24.1
103	pH: pH scale	Total	24.9
104	pH: Observation type	Discrete measurements from samples collected on CTD casts	24.2
105	pH: Measured or calculated	Measured	24.5
106	pH: Calculation method and parameters	Not Calculated	24.6
107	pH: Sampling instrument	Niskin bottle	24.7
108	pH: Analyzing instrument	The pH of each sample was determined on the total pH scale on an Agilent 8453 spectrometer set up with a custom-made temperature-controlled cell holder.	24.8
109	pH: Temperature of measurement	25°C	24.10
110	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)°C 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 microliters of purified m-cresol purple (10 mmol/kg) were added for the analysis. pHT (total scale) for shipboard conditions (25 °C at atmospheric pressure) was calculated according to Liu et al. (2011).	24.11
111	pH: Field replicate information	Duplicate pH samples were collected from discrete samples taken from the Niskin bottles (N = ~80) with a precision of +-0.0012	24.12
112	pH: Standardization technique description	calibration-free	24.13.1
113	pH: Frequency of standardization	NA	24.13.2
114	pH: pH values of the standards	NA	24.13.3
115	pH: Temperature of standardization	NA	24.13.4
116	pH: Temperature correction method	NA	24.14
117	pH: at what temperature was pH reported	25°C	24.15
118	pH: Uncertainty	Precision was equal to +- 0.0012	24.16

No	Metadata element name		Help reference no.
119	pH: Data quality flag description	PH_FLAG_W, 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
120	pH: Method reference (citation)	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	24.18
121	pH: Researcher Name	Dr. Xuewu (Sherwood) Liu	24.19.1
122	pH: Researcher Institution	University of South Florida; PI: Robert Byrne	24.19.2
123	pCO2A: Variable abbreviation in data files		25.1
124	pCO2A: Variable unit		25.5
125	pCO2A: Observation type		25.2
126	pCO2A: Measured or calculated		25.6
127	pCO2A: Calculation method and parameters		25.7
128	pCO2A: Sampling instrument		25.8
129	pCO2A: Location of seawater intake		25.9
130	pCO2A: Depth of seawater intake		25.10
131	pCO2A: Analyzing instrument		25.11
132	pCO2A: Detailed sampling and analyzing information		25.12
133	pCO2A: Equilbrator type		25.13.1
134	pCO2A: Equilibrator volume (L)		25.13.2
135	pCO2A: Vented or not		25.13.3
136	pCO2A: Water flow rate (L/min)		25.13.4
137	pCO2A: Headspace gas flow rate (L/min)		25.13.5
138	pCO2A: How was temperature inside the equilibrator measured .		25.13.6
139	pCO2A: How was pressure inside the equilibrator measured.		25.13.7
140	pCO2A: Drying method for CO2 gas		25.14
141	pCO2A: Manufacturer of the gas detector		25.15.1
142	pCO2A: Model of the gas detector		25.15.2
143	pCO2A: Resolution of the gas detector		25.15.3
144	pCO2A: Uncertainty of the gas detector		25.15.4
145	pCO2A: Standardization technique description		25.16.1
146	pCO2A: Frequency of standardization		25.16.2
147	pCO2A: Manufacturer of standard gas		25.16.3.1
148	pCO2A: Concentrations of standard gas		25.16.3.2
149	pCO2A: Uncertainties of standard gas		25.16.3.3
150	pCO2A: Water vapor correction method		25.17
151	pCO2A: Temperature correction method		25.18
152	pCO2A: at what temperature was pCO2 reported		25.19
153	pCO2A: Uncertainty		25.20
154	pCO2A: Data quality flag description		25.21
155	pCO2A: Method reference (citation)		25.22
156	pCO2A: Researcher Name		25.23.1
157	pCO2A: Researcher Institution		25.23.2
158	pCO2D: Variable abbreviation in data files		26.1
159	pCO2D: Variable unit		26.5
160	pCO2D: Observation type		26.2
161	pCO2D: Measured or calculated		26.6
162	pCO2D: Calculation method and parameters		26.7
163	pCO2D: Sampling instrument		26.8
164	pCO2D: Analyzing instrument		26.9
165	pCO2D: Storage method		26.10
166	pCO2D: Seawater volume (mL)		26.11
167	pCO2D: Headspace volume (mL)		26.12
168	pCO2D: Temperature of measurement		26.13
169	pCO2D: Detailed sampling and analyzing information		26.14

No	Metadata element name		Help reference no.
170	pCO2D: Field replicate information		26.15
171	pCO2D: Manufacturer of the gas detector		26.16.1
172	pCO2D: Model of the gas detector		26.16.2
173	pCO2D: Resolution of the gas detector		26.16.3
174	pCO2D: Uncertainty of the gas detector		26.16.4
175	pCO2D: Standardization technique description		26.17.1
176	pCO2D: Frequency of standardization		26.17.2
177	pCO2D: Temperature of standardization		26.17.3
178	pCO2D: Manufacturer of standard gas		26.17.4.1
179	pCO2D: Concentrations of standard gas		26.17.4.2
180	pCO2D: Uncertainties of standard gas		26.17.4.3
181	pCO2D: Water vapor correction method		26.18
182	pCO2D: Temperature correction method		26.19
183	pCO2D: at what temperature was pCO2 reported		26.20
184	pCO2D: Uncertainty		26.21
185	pCO2D: Data quality flag description		26.22
186	pCO2D: Method reference (citation)		26.23
187	pCO2D: Researcher Name		26.24.1
188	pCO2D: Researcher Institution		26.24.2
189	Var1: Variable abbreviation in data files	CTDPRS_DBAR	27.1
191	Var1: Full variable name	CTD pressure	27.2
190	Var1: Variable unit	decibars	27.7
192	Var1: Observation type	profile	27.4
193	Var1: Sampling instrument	Sea-Bird 9plus CTD	27.10
194	Var1: Analyzing instrument		27.11
195	Var1: Detailed sampling and analyzing information	The Sea-Bird 9plus CTD uses a Paroscientific Digiquartz pressure sensor. This 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 decibars). Also, a quartz crystal temperature signal is used to compensate for a wide range of temperature changes. Repeatability, hysteresis, and pressure conformance are 0.005% FS. The nominal pressure frequency (0 to full scale) is 34 to 38 kHz. The nominal temperature frequency is 172 kHz + 50 ppm/°C. Data are acquired at 24 Hz. Discrete pressure data were averaged over an 8-second interval, ±4 seconds of the sample confirm bit. Periodic pressure sensor calibrations are performed at Sea-Bird Electronics, Inc. No additional adjustments were applied.	27.13
196	Var1: Field replicate information		27.14
197	Var1: Uncertainty	On deck pressure readings after casts were within 1 dbar of calibration.	27.15
198	Var1: Data quality flag description		27.16
199	Var1: Method reference (citation)		27.17
200	Var1: Researcher Name	Ryan M. McCabe	27.21.1
201	Var1: Researcher Institution	University of Washington - JISAO	27.21.2
202	Var2: Variable abbreviation in data files	CTDTMP_ITS90_DEG_C	27.1
204	Var2: Full variable name	CTD temperature, ITS-90 scale	27.2
203	Var2: Variable unit	°C	27.7
205	Var2: Observation type	profile	27.4
206	Var2: Sampling instrument	Sea-Bird 3 temperature sensor	27.10
207	Var2: Analyzing instrument		27.11
208	Var2: Detailed sampling and analyzing information	The Sea-Bird temperature sensing element is a glass-coated thermistor bead, pressure-protected inside an 0.8 mm diameter thin-walled stainless steel tube. Exponentially related to temperature, the thermistor resistance is the controlling element in an optimized Wien Bridge oscillator circuit. The resulting sensor frequency is inversely proportional to the square root of the thermistor resistance and ranges from approximately 2 to 6 kHz, corresponding to temperatures from -5 to 35°C. The 3plus temperature sensor has a typical accuracy/stability of 0.0002°C per month; and resolution of 0.0002°C at 24 Hz. Discrete temperature data were averaged over an 8-second interval, ±4 seconds of the sample confirm bit. Only a uniform viscous heating correction of -0.0006°C was applied.	27.13
209	Var2: Field replicate information		27.14
210	Var2: Uncertainty	Calibrations and checks with duplicate sensors suggest uncertainty on the order of ±0.001°C. The viscous heating correction results in errors of no more than ±0.00015°C for the full range of oceanographic temperature and salinity.	27.15
211	Var2: Data quality flag description		27.16

No	Metadata element name		Help reference no.
212	Var2: Method reference (citation)		27.17
213	Var2: Researcher Name	Ryan M. McCabe	27.21.1
214	Var2: Researcher Institution	University of Washington - JISAO	27.21.2
215	Var3: Variable abbreviation in data files	CTDSAL_PSS78	28.1
216	Var3: Full variable name	CTD salinity	28.2
227	Var3: Variable unit	1978 Practical Salinity Scale	28.7
228	Var3: Observation type	profile	28.4
229	Var3: Sampling instrument	Sea-Bird 4 conductivity sensor	28.10
230	Var3: Analyzing instrument		28.11
231	Var3: Detailed sampling and analyzing information	The Sea-Bird conductivity sensing element is a cylindrical, flow-through, borosilicate glass cell with three internal platinum electrodes. Because the outer electrodes are connected together, electric fields are confined inside the cell. The cell resistance controls the output frequency of a Wien Bridge oscillator circuit. The sensor has a frequency output of approximately 3 to 12 kHz corresponding to conductivities from 0 to 7 Siemens/meter (0 to 70 mmho/cm). The conductivity sensor has a typical accuracy/stability of 0.0003 S/m per month, and resolution of 0.00004 S/m at 24 Hz. Discrete conductivity data were averaged over an 8-second interval, ±4 seconds of the sample confirm bit. An overall linear fit of CTD and bottle data, including a station-dependent slope, single conductivity bias, and a linear pressure term (modified beta; with a coefficient multiplied by CTD pressure), produced the best results for stations 4-86 and 87-135. The fitting routine recursively throws out data greater than 2.8 standard deviations and returns a single conductivity bias, conductivity slope, and pressure term coefficient for each station. A station-dependent slope coefficient best models the gradual shift in the conductivity sensor within each station grouping with time. The order of the polynomial was chosen to keep the standard deviation of each grouping to a minimum while avoiding fitting to fluctuations due to noise in standardizations of salinity sample runs. Discrete salinity values were derived from calibrated conductivity, temperature, and pressure measurements.	28.13
232	Var3: Field replicate information		28.14
233	Var3: Uncertainty	80% of points were used in the fit of stations 4-86 with a residual standard deviation of 0.0017; 84% of points were used in the fit of stations 87-135 with a residual standard deviation of of 0.0051 mS/cm.	28.15
234	Var3: Data quality flag description		28.16
235	Var3: Method reference (citation)		28.17
236	Var3: Researcher Name	Ryan M. McCabe	28.21.1
237	Var3: Researcher Institution	University of Washington - JISAO	28.21.2
238	Var4: Variable abbreviation in data files	SALINITY_PSS78	29.1
239	Var4: Full variable name	Bottle salinity	29.2
240	Var4: Variable unit	1978 Practical Salinity Scale	29.7
241	Var4: Observation type	profile	29.4
242	Var4: Sampling instrument	~250 ml Kimax bottle	29.10
243	Var4: Analyzing instrument	Guildline Autosal, model 8400B salinometer (S/N 68981)	29.11
244	Var4: Detailed sampling and analyzing information	Niskin sample salinity measurements were made using Guildline 8400B Autosal salinometer s/n 68981 located in a temperature-controlled room in the Marine Chemistry Laboratory at the University of Washington (manager K.A. Krogslund). Two salinity samples were collected from the majority of casts. Samples were collected in ~250 ml Kimax high-alumina borosilicate bottles, sealed with custom clear plastic inserts and Nalgene caps. Salinity samples were stored during the cruise and analyzed post cruise. The Autosal bath temperature was set to 24°C. After initiating the software program, a bottle of standard seawater (batch P156) was used to determine an offset correction to be applied to the following measurements. 214 discrete salinity samples were run to validate CTD observations.	29.13
245	Var4: Field replicate information		29.14
246	Var4: Uncertainty		29.15
247	Var4: Data quality flag description	SALINITY_FLAG_W, 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.	29.16
248	Var4: Method reference (citation)		29.17
249	Var4: Researcher Name	Ryan M. McCabe	29.21.1
250	Var4: Researcher Institution	University of Washington - JISAO	29.21.2
251	Var5: Variable abbreviation in data files	CTDOXY_UMOL_KG	30.1
252	Var5: Full variable name	CTD Oxygen	30.2
253	Var5: Variable unit	micromoles/kg	30.7
254	Var5: Observation type	profile	30.4
255	Var5: Sampling instrument	Sea-Bird 43 oxygen sensor	30.10
256	Var5: Analyzing instrument		30.11

No	Metadata element name		Help reference no.
257	Var5: Detailed sampling and analyzing information	The Sea-Bird oxygen sensor uses an electrochemical cell that is constantly polarized. The sensor is temperature compensated using special temperature sensing and an internal microcomputer. The interface electronics reports voltages for oxygen current only. A linear equation of the form I=mV+b, where m=1.0e-6 and b=0.0, yields sensor current as a function of sensor output voltage. The sensor has a thermal time constant of approximately 2.5 seconds; and an oxygen response time constant that is temperature dependent, increasing with cooler temperatures, ranging from 2 to 12 seconds. Hysteresis between the down and up oxygen profiles at deep stations warranted using the downcast oxygen data for calibration, matched by potential density anomalies referenced to the closest 1000-m interval. An overall least squares fit was determined for each of the two oxygen sensors used during this cruise.	30.13
258	Var5: Field replicate information		30.14
259	Var5: Uncertainty	83% of the points were used in the fit with a residual standard deviation of 1.7623 µmol/kg for stations 4-135.	30.15
260	Var5: Data quality flag description		30.16
261	Var5: Method reference (citation)		30.17
262	Var5: Researcher Name	Ryan M. McCabe	30.21.1
263	Var5: Researcher Institution	University of Washington - JISAO	30.21.2
264	Var6: Variable abbreviation in data files	OXYGEN_UMOL_KG	31.1
265	Var6: Full variable name	bottle dissolved oxygen	31.2
266	Var6: Variable unit	micromol/kg	31.7
267	Var6: Observation type	Discrete measurements from samples collected on CTD casts	31.4
268	Var6: Sampling instrument	Niskin bottle	31.10
269	Var6: Analyzing instrument	Brinkman Dosimat automated titrator	31.11
270	Var6: Detailed sampling and analyzing information	The analysis method is based upon the Carpenter (1965) whole flask titration of iodine, which is produced by an equivalent amount of dissolved oxygen. An automated titrator (Brinkman Dosimat) uses an amperometric end-point detection as described by Culberson and Huang (1987) and modified for IBM-PC computers by Knapp et al. (1990). The nominal 125-ml iodine flasks are used for sampling are pre-calibrated so their volumes are precisely known. Samples were titrated within a few hours of being collected. 1055 discrete oxygen samples were analyzed to validate sensor O2 observations on the CTD package.	31.13
271	Var6: Field replicate information		31.14
272	Var6: Uncertainty	1.4 micromol per kilogram	31.15
273	Var6: Data quality flag description	OXYGEN_FLAG_W, 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.	31.16
274	Var6: Method reference (citation)		31.17
275	Var6: Researcher Name	Dale Hubbard and Carrie Weekes	31.21.1
276	Var6: Researcher Institution	Oregon State University, College of Earth, Ocean, and Atmospheric Sciences; PI: Burke Hales	31.21.2
277	Var7: Variable abbreviation in data files	CARBONATE_UMOL_KG	32.1
278	Var7: Full variable name	Carbonate ion (CO_3^{-2}) concentration	32.2
279	Var7: Variable unit	micromoles/kg	32.7
280	Var7: Observation type	Discrete measurements from samples collected on CTD casts	32.4
281	Var7: Sampling instrument	Niskin bottle	32.10
282	Var7: Analyzing instrument	The total carbonate ion concentration of each sample was determined on an Agilent 8453 spectrometer set up with a custom-made temperature-controlled cell holder.	32.11
283	Var7: Detailed sampling and analyzing information	Samples were collected for carbonate (CO3) analysis immediately following pH in the Niskin/Rosette sampling sequence, following the same sampling and thermostatting procedure as the pH samples. 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 20 microliters of Pb(ClO4)2 (22 mmol/kg) were added for the analysis. Total carbonate ion concentration ([CO32-]T) at shipboard conditions (25 □C and atmospheric pressure) was calculated according to the equations of Sharp et al. (2017) and the modified –log[CO32-]T model of Byrne and Yao (2008) (Eq. 8 of Sharp et al., 2017).	32.13
284	Var7: Field replicate information	Duplicate [CO32-]T samples were collected from discrete samples taken from the Niskin bottles (N = ~80) with a precision equal to 1.9 micromol/kg.	32.14
285	Var7: Uncertainty	1.9 micromol/kg	32.15
286	Var7: Data quality flag description	CARBONATE_FLAG_W, 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.	32.16
287	Var7: Method reference (citation)	Sharp, J.D.; Byrne, R.H.; Liu, X; Feely, R.A.; Cuyler, E.E.; Wanninkhof, R.; Alin, S.R. (2017). Spectrophotometric Determination of Carbonate Ion Concentrations: Elimination of Instrument-Dependent Offsets and Calculation of In Situ Saturation States. Environmental Science & Technology 51, 9127-9136.	32.17
288	Var7: Researcher Name	Dr. Xuewu (Sherwood) Liu	32.21.1

No	Metadata element name		Help reference no.
289	Var7: Researcher Institution	University of South Florida, PI: Robert Byrne	32.21.2
290	Var8: Variable abbreviation in data files	SILICATE_UMOL_KG	33.1
291	Var8: Full variable name	Orthosilicic acid	33.2
292	Var8: Variable unit	micromoles/kg (converted from umol per Liter by Dana Greeley using a sigma theta calculated from a lab temperature of 22 C)	33.7
293	Var8: Observation type	Discrete measurements from samples collected on CTD casts	33.4
294	Var8: Sampling instrument	Niskin bottle	33.10
295	Var8: Analyzing instrument	Alpkem RFA 300	33.11
296	Var8: Detailed sampling and analyzing information	Alpkem RFA 300 components were used for silicic acid, nitrate, and nitrite. All five of the macronutrients are analyzed simultaneously. Nutrient samples were collected in 30 ml HDPE bottles and were stored in a freezer on board. Once the ship returned to port the samples were sent to the lab and analyzed. The Silicic Acid method is based on that of Armstrong et al. (1967) as adapted by Atlas et al. (1971). Addition of an acidic molybdate reagent forms silicomolybdic acid, which is then reduced by stannous chloride.	33.13
297	Var8: Field replicate information		33.14
298	Var8: Uncertainty	1.0 micromol per kilogram	33.15
299	Var8: Data quality flag description	NUTRIENTS_FLAG_W, One flag used for all nutrient samples, 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.	33.16
300	Var8: Method reference (citation)	Gordon et. al. (1993). A Suggested Protocol for Continuous Flow Automated Analysis of Seawater Nutrients (Phosphate, Nitrate, Nitrite and Silicic Acid) in the WOCE Hydrographic Program and the Joint Global Ocean Fluxes Study. Methods Manual WHPO. 91-1.	33.17
301	Var8: Researcher Name	Joe Jennings	33.21.1
302	Var8: Researcher Institution	Oregon State University, College of Earth, Ocean, and Atmospheric Sciences; PI: Burke Hales	33.21.2
303	Var9: Variable abbreviation in data files	AMMONIUM_UMOL_KG	34.1
304	Var9: Full variable name	Ammonium	34.2
305	Var9: Variable unit	micromoles/kg (converted from umol per Liter by Dana Greeley using a sigma theta calculated from a lab temperature of 22 C)	34.7
306	Var9: Observation type	Discrete measurements from samples collected on CTD casts	34.4
307	Var9: Sampling instrument	Niskin bottle	34.1
308	Var9: Analyzing instrument	Alpkem RFA 300	34.11
309	Var9: Detailed sampling and analyzing information	Alpkem RFA 300 components were used for silicic acid, nitrate, and nitrite. All five of the macronutrients are analyzed simultaneously. Nutrient samples were collected in 30 ml HDPE bottles and were stored in a freezer on board. Once the ship returned to port the samples were sent to the lab and analyzed. An indophenol blue ammonium method is modified from ALPKEM RFA methodology which references Methods for Chemical Analysis of Water and Wastes, March 1984, EPA-600/4-79-020, "Nitrogen Ammonia", Method 350.1 (Colorimetric, Automated Phenate)	34.13
310	Var9: Field replicate information		34.14
311	Var9: Uncertainty	0.06 micromoles per kilogram	34.15
312	Var9: Data quality flag description	NUTRIENTS_FLAG_W, One flag used for all nutrient samples, 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.	34.16
313	Var9: Method reference (citation)	Gordon et. al. (1993). A Suggested Protocol for Continuous Flow Automated Analysis of Seawater Nutrients (Phosphate, Nitrate, Nitrite and Silicic Acid) in the WOCE Hydrographic Program and the Joint Global Ocean Fluxes Study. Methods Manual WHPO. 91-1.	34.17
314	Var9: Researcher Name	Joe Jennings	34.21.1
315	Var9: Researcher Institution	Oregon State University, College of Earth, Ocean, and Atmospheric Sciences; PI: Burke Hales	34.21.2
316	Var10: Variable abbreviation in data files	NITRATE_UMOL_KG	35.1
317	Var10: Full variable name	Nitrate	35.2
318	Var10: Variable unit	micromoles/kg (converted from umol per Liter by Dana Greeley using a sigma theta calculated from a lab temperature of 22 C)	35.7
319	Var10: Observation type	Discrete measurements from samples collected on CTD casts	35.4
320	Var10: Sampling instrument	Niskin bottle	35.1
321	Var10: Analyzing instrument	Alpkem RFA 300	35.11
322	Var10: Detailed sampling and analyzing information	Alpkem RFA 300 components were used for silicic acid, nitrate, and nitrite. All five of the macronutrients are analyzed simultaneously. Nutrient samples were collected in 30 ml HDPE bottles and were stored in a freezer on board. Once the ship returned to port the samples were sent to the lab and analyzed. The nitrate + nitrite analysis uses the basic method of Armstrong et al. (1967), with modifications to improve the precision and ease of operation. Sulfanilamide and N-(1-Napthyl)ethylenediamine dihydrochloride react with nitrite to form a colored diazo compound. For the nitrate + nitrite analysis, nitrate is first reduced to nitrite using an OTCR and imidazole buffer as described by Patton (1983). Nitrite analysis is performed on a separate channel, omitting the cadmium reductor and the buffer.	35.13
323	Var10: Field replicate information		35.14
324	Var10: Uncertainty	0.2 micromol per kilogram	35.15

No	Metadata element name		Help reference no.
325	Var10: Data quality flag description	NUTRIENTS_FLAG_W, One flag used for all nutrient samples, 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.	35.16
326	Var10: Method reference (citation)	Gordon et. al. (1993). A Suggested Protocol for Continuous Flow Automated Analysis of Seawater Nutrients (Phosphate, Nitrate, Nitrite and Silicic Acid) in the WOCE Hydrographic Program and the Joint Global Ocean Fluxes Study. Methods Manual WHPO. 91-1.	35.17
327	Var10: Researcher Name	Joe Jennings	35.21.1
328	Var10: Researcher Institution	Oregon State University, College of Earth, Ocean, and Atmospheric Sciences; PI: Burke Hales	35.21.2
329	Var11: Variable abbreviation in data files	NITRITE_UMOL_KG	36.1
330	Var11: Full variable name	Nitrite	36.2
331	Var11: Variable unit	micromoles/kg (converted from umol per Liter by Dana Greeley using a sigma theta calculated from a lab temperature of 22 C)	36.7
332	Var11: Observation type	Discrete measurements from samples collected on CTD casts	36.4
333	Var11: Sampling instrument	Niskin bottle	36.1
334	Var11: Analyzing instrument	Alpkem RFA 300	36.11
335	Var11: Detailed sampling and analyzing information	Alpkem RFA 300 components were used for silicic acid, nitrate, and nitrite. All five of the macronutrients are analyzed simultaneously. Nutrient samples were collected in 30 ml HDPE bottles and were stored in a freezer on board. Once the ship returned to port the samples were sent to the lab and analyzed. The nitrate + nitrite analysis uses the basic method of Armstrong et al. (1967), with modifications to improve the precision and ease of operation. Sulfanilamide and N-(1-Napthyl)ethylenediamine dihydrochloride react with nitrite to form a colored diazo compound. For the nitrate + nitrite analysis, nitrate is first reduced to nitrite using an OTCR and imidazole buffer as described by Patton (1983). Nitrite analysis is performed on a separate channel, omitting the cadmium reductor and the buffer.	36.13
336	Var11: Field replicate information		36.14
337	Var11: Uncertainty	0.03 micromol per kilogram	36.15
338	Var11: Data quality flag description	NUTRIENTS_FLAG_W, One flag used for all nutrient samples, 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.	36.16
339	Var11: Method reference (citation)	Gordon et. al. (1993). A Suggested Protocol for Continuous Flow Automated Analysis of Seawater Nutrients (Phosphate, Nitrate, Nitrite and Silicic Acid) in the WOCE Hydrographic Program and the Joint Global Ocean Fluxes Study. Methods Manual WHPO. 91-1.	36.17
340	Var11: Researcher Name	Joe Jennings	36.21.1
341	Var11: Researcher Institution	Oregon State University, College of Earth, Ocean, and Atmospheric Sciences; PI: Burke Hales	36.21.2
342	Var12: Variable abbreviation in data files	PHOSPHATE_UMOL_KG	37.1
343	Var12: Full variable name	Phosphate	37.2
344	Var12: Variable unit	micromoles/kg (converted from umol per Liter by Dana Greeley using a sigma theta calculated from a lab temperature of 22 C)	37.7
345	Var12: Observation type	Discrete measurements from samples collected on CTD casts	37.4
346	Var12: Sampling instrument	Niskin bottle	37.1
347	Var12: Analyzing instrument	Alpkem RFA 300	37.11
348	Var12: Detailed sampling and analyzing information	Alpkem RFA 300 components were used for silicic acid, nitrate, and nitrite. All five of the macronutrients are analyzed simultaneously. Nutrient samples were collected in 30 ml HDPE bottles and were stored in a freezer on board. Once the ship returned to port the samples were sent to the lab and analyzed. The phosphate method is a modification of the molybdenum blue procedure of Bernhardt and Wilhelms (1967), in which phosphate is determined as reduced phosphomolybdic acid employing hydrazine as the reductant.	37.13
349	Var12: Field replicate information		37.14
350	Var12: Uncertainty	0.02 micromol per kilogram	37.15
351	Var12: Data quality flag description	NUTRIENTS_FLAG_W, One flag used for all nutrient samples, 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.	37.16
352	Var12: Method reference (citation)	Gordon et. al. (1993). A Suggested Protocol for Continuous Flow Automated Analysis of Seawater Nutrients (Phosphate, Nitrate, Nitrite and Silicic Acid) in the WOCE Hydrographic Program and the Joint Global Ocean Fluxes Study. Methods Manual WHPO. 91-1.	37.17
353	Var12: Researcher Name	Joe Jennings	37.21.1
354	Var12: Researcher Institution	Oregon State University, College of Earth, Ocean, and Atmospheric Sciences; PI: Burke Hales	37.21.2
355	Var13: Variable abbreviation in data files	CHL_A_UG_L_GFF	38.1
356	Var13: Full variable name	Total extracted chlorophyll a	38.2
357	Var13: Variable unit	micrograms per liter	38.7
358	Var13: Observation type	Discrete measurements from samples collected on CTD casts	38.4
359	Var13: Sampling instrument	Niskin bottle	38.1
360	Var13: Analyzing instrument	Turner Designs Trilogy	38.11

No	Metadata element name		Help reference no.
361	Var13: Detailed sampling and analyzing information	Samples were collected in amber 250 mL HDPE bottles and filtered onto Whatman GF/F filters (25-mm diameter) within 30 minutes of collection. Each filter was then placed inside a borosilicate glass tube and stored frozen (-20 deg C) until analysis. Chlorophyll was extracted in the dark at -20 deg C using 90 % (v/v) over a period not exceeding 24 h, and subsequently analyzed by in vitro fluorometry using the non-acidification method of Welschmeyer (1994). Concentrations of chlorophyll estimated from samples collected with these glass fiber filters (nominal pore size of 0.7 um) represent the chlorophyll from the total phytoplankton community.	38.13
362	Var13: Field replicate information	None collected	38.14
363	Var13: Uncertainty		38.15
364	Var13: Data quality flag description	CHL_A_FLAG_W, 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	38.16
365	Var13: Method reference (citation)	Welschmeyer, N.A. 1994. Fluorometric analysis of chlorophyll a in the presence of chlorophyll b and pheopigments. Limnology and Oceanography 39: 1985-1992.	38.17
366	Var13: Researcher Name	Christopher Ikeda	38.21.1
367	Var13: Researcher Institution	San Francisco State University, Romberg Tiburon Center for Environmental Studies; PI: William Cochlan	38.21.2
368	Var14: Variable abbreviation in data files	CHL_A_UG_L_PC	39.1
369	Var14: Full variable name	Size-fractionated chlorophyll a from cells larger than 10 um	39.2
370	Var14: Variable unit	micrograms per liter	39.7
371	Var14: Observation type	Discrete measurments from samples collected on CTD casts	39.4
372	Var14: Sampling instrument	Niskin bottle	39.1
373	Var14: Analyzing instrument	Turner Designs Trilogy	39.11
374	Var14: Detailed sampling and analyzing information	Samples were collected in amber 250 mL HDPE bottles and filtered onto a 10-um polycarbonate filters (25-mm diameter) within 30 minutes of collection. Each filter was then placed inside a borosilicate glass tube and stored frozen (-20 deg C) until analysis. Chlorophyll was extracted in the dark at -20 deg C using 90 % (v/v) over a period not exceeding 24 h, and subsequently analyzed by in vitro fluorometry using the non-acidification method of Welschmeyer (1994). Concentrations of chlorophyll estimated from samples collected with these 10-um polycarbonate filters represent the chlorophyll from phytoplankton 10 um or larger in size.	39.13
375	Var14: Field replicate information	None collected	39.14
376	Var14: Uncertainty		39.15
377	Var14: Data quality flag description	CHL_A_FLAG_W, 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	39.16
378	Var14: Method reference (citation)	Welschmeyer, N.A. 1994. Fluorometric analysis of chlorophyll a in the presence of chlorophyll b and pheopigments. Limnology and Oceanography 39: 1985-1992.	39.17
379	Var14: Researcher Name	Christopher Ikeda	39.21.1
380	Var14: Researcher Institution	San Francisco State University, Romberg Tiburon Center for Environmental Studies; PI: William Cochlan	39.21.2
381	Var15: Variable abbreviation in data files	STATION_NO	28.1
382	Var15: Full variable name	CTD Station number	28.2
383	Var16: Variable abbreviation in data files	CAST_NO	28.1
384	Var16: Full variable name	CTD Cast number	28.2
385	Var17: Variable abbreviation in data files	NISKIN_NO	28.1
386	Var17: Full variable name	Niskin bottle position	28.2
387	Var18: Variable abbreviation in data files	SAMPLE_ID	28.1
388	Var18: Full variable name	Identifier, (STATION_NO*10000)+(CAST_NO*100)+NISKIN_NO	28.2
389	Var19: Variable abbreviation in data files	YEAR_UTC	28.1
390	Var19: Full variable name	date (yyyy - UTC)	28.2
391	Var20: Variable abbreviation in data files	MONTH_UTC	28.1
392	Var20: Full variable name	month (mm - UTC)	28.2
393	Var21: Variable abbreviation in data files	DAY_UTC	28.1
394	Var21: Full variable name	day (dd - UTC)	28.2
395	Var22: Variable abbreviation in data files	TIME_UTC	28.1
396	Var22: Full variable name	time (hh:mm:ss - UTC)	28.2
397	Var23: Variable abbreviation in data files	LATITUDE_DEC	28.1
398	Var23: Full variable name	Latitude (positive is north) Decimal Degrees	28.2
399	Var24: Variable abbreviation in data files	LONGITUDE_DEC	28.1
400	Var24: Full variable name	Longitude (negative is West) Decimal Degrees	28.2

No	Metadata element name		Help reference no.
401	**Var25: Variable abbreviation in data files**	DEPTH_BTM_METER	28.1
402	**Var25: Full variable name**	depth of bottom at the CTD location (meters)	28.2
403	**Var26: Variable abbreviation in data files**	LINE	28.1
404	**Var26: Full variable name**	Line Number, Each Line represents a separate transect.	28.2