

OOI Regional Cabled Array CTD and Discrete Water Sampling Data from Maintenance Cruises in the Northeast Pacific Ocean from 2015-2024 (OOI Cruise Data project)

Website: <https://www.bco-dmo.org/dataset/1001459>

Data Type: Cruise Results

Version: 1

Version Date: 2026-06-22

Project

» [OOI Discrete CTD and Water Sampling Cruise Data](#) (OOI Cruise Data)

Program

» [Ocean Observatories Initiative](#) (OOI)

Contributors	Affiliation	Role
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Abstract

The hydrographic sampling performed by OOI as part of each Array turn represents a significant collection of valuable physical, chemical, and biological information. The collected hydrographic data include oxygen, salinity, nutrients (nitrate, nitrite, silicate, phosphate, and ammonium), chlorophyll, and carbon system (dissolved inorganic carbon, total alkalinity, pH, and partial pressure of CO₂) measurements. These data serve several important functions. First, they are necessary for the validation and evaluation of the moored instrumentation at each Array. Furthermore, the annual (CGSN Global, RCA) or biannual (CGSN Coastal, Endurance) collection of data at the same locations provides a unique time series of a large set of water properties following established community standards and methods, independent of its association with the OOI instrumentation. The analyses of collected water samples for the parameters listed above are performed by a number of outside laboratories on behalf of OOI-RCA. Consequently, the water sampling data for a given cruise are distributed among a number of different files. The Discrete Sampling Summary integrates the related CTD, metadata, and discrete water sample data into a single CSV file. Additionally, it synthesizes qualitative and quantitative information about the quality of a measurement into data quality flags for each associated parameter, which follow WOCE standards. This dataset includes hydrographic data collected near the Regional Cabled Array in the Northeast Pacific Ocean, extending from the Oregon coast across the continental shelf and terminating at Axial Seamount approximately 300 miles offshore. The region has some of the most productive waters in the world, hosting myriad seafloor and water-column organisms, as well as novel microbial communities found at methane seeps and hydrothermal vents. It is impacted by offshore seismic activity and tsunamis and is vulnerable to ocean acidification, low-oxygen events, and large storms. Data from the RCA significantly add to the broader suite of observatory sites in the Northeast Pacific.

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
 - [BCO-DMO Processing Description](#)
- [Data Files](#)
- [Supplemental Files](#)
- [Related Publications](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)

- [Program Information](#)
 - [Funding](#)
-

Coverage

Location: Northeast Pacific Ocean 44-46 N from Oregon coast to Axial Seamount. Seafloor depths between 80 m (continental shelf) and 2900 m. Three water column profiling infrastructures.

Spatial Extent: N:45.9548407 E:-124.305 S:44.35919 W:-130.0254

Temporal Extent: 2015-07-06 - 2024-09-02

Dataset Description

Citing OOI Data

Refer to specific guidance related to citing OOI data on the OOI website at <https://oceanobservatories.org/how-to-use-acknowledge-and-cite-data/>.

Methods & Sampling

OOI Regional Cabled Array Sampling Guidelines

RCA includes 3 Shallow Profiler Moorings, 3 Deep Profiler Moorings, 2 Benthic Experiment Packages (BEP) and a host of seafloor instruments, along with primary nodes and junction boxes along the 900 km of high-power, high-bandwidth backbone fiber optic cables. Niskin bottles attached to the Remotely Operated Vehicle (ROV) capture water samples near seafloor instruments. In general, water samples are collected for analysis at depths that correspond to instrumentation making in situ measurements at platforms and profilers. A 24-bottle CTD rosette is allowed to equilibrate at target depths for at least 1 minute or more (depending on conditions) and a minimum of 30 seconds between duplicates.

Sampling at the RCA mooring locations entails the full suite of measurements (O₂, Salts, Carbon, Nutrients, Chlorophyll). Sampling near the seafloor instruments vary depending on which sensors are present at the location.

Carbon System Measurements

Carbon system measurements were provided by the laboratory of Burke Hales at Oregon State University. All carbon parameters were reported at in situ temperatures. Calculated carbon parameters were generated by Hales using custom software routines and published values for the relevant carbon chemistry constants. The carbonic acid dissociation constants were from Millero (2010), with full-resolution constants provided by Millero via private communication and equal to Lueker's constants at salinities greater than 25. Additional constants used in the calculations were Kw from Millero (1995), Kb from Dickson (1990), Ksp for calcite and aragonite from Mucci (1980), and Kh from Weiss (1973). Alkalinity was modeled as $\text{HCO}_3^- + 2\text{CO}_3^{2-} + \text{B(OH)}_4^- + \text{OH}^- - \text{H}^+$.

Data Processing Description

File/Row Representation of Water Samples

There should be one row for each station-cast-niskin bottle set. Multiple samples for the same parameter from a single niskin bottle are split into separate rows, with the associated CTD data copied to the new row. The first row of the file is the column headers.

Data Fill Values and Flag Description

The data flags are presented in the summary sheet as a 16-bit array, read from right-to-left, where a 1 in a particular bit position indicates a particular flag meaning applies. For example, a flag of 0000000000000010 for the column ****CTD_File_Flag**** indicates that the cast was a data cast only.

For full details about flag meanings, refer to the Readme files available for download in the Supplemental Files section of this metadata page.

BCO-DMO Processing Description

- Loaded 10 CSV files (Cabled-6_TN326_Discrete_Summary.csv, Cabled-8_RR1713-RR1717_Discrete_Summary.csv, Cabled-7_SKQ201610S_Discrete_Summary.csv, Cabled-9_RR1809-RR1812_Discrete_Summary.csv, Cabled-10_AT4212_Discrete_Summary.csv, Cabled-11_TN382_Discrete_Summary.csv, Cabled-12_TN393_Discrete_Summary.csv, Cabled-13_TN407_Discrete_Summary.csv, Cabled-14_TN422_Discrete_Summary.csv, Cabled-15_AT50-29_Discrete_Summary.csv) using filenames as table names; empty strings, "nd", and "-9999999" treated as missing values
- Concatenated all 10 tables into a single table named 1001459_v1_ooi_regional_cabled_array_discrete_water_sampling_data, mapping 80 columns by name; empty strings, "nd", and "-9999999" treated as missing values
- Renamed all 80 columns to use underscores in place of spaces and special characters (e.g., "Target Asset" to Target_Asset, "Start Latitude [degrees]" to Start_Latitude, "CTD Bottle Closure Time [UTC]" to CTD_Bottle_Closure_Time, "Discrete pH [Total scale]" to Discrete_pH, "Calculated Omega-A" to Calculated_Omega_A, etc.)
- Set data types for all columns: Start_Time and CTD_Bottle_Closure_Time as datetime (format %Y-%m-%dT%H:%M:%S.%fZ); numeric columns for CTD measurements, discrete sample measurements, and calculated carbonate system parameters; integer types for Calculated_DIC, Calculated_pCO2, Discrete_Alkalinity, Discrete_pH, Discrete_pH_Replicate_Flag, pH_Analysis_Temp; string types for flag columns, Cast, Cruise, Station, Target_Asset, CTD_File, and Niskin_Bottle_Position
- Applied BCO-DMO metadata (standard_name_id, supplied_units, description, and is_primary flags) to all 80 columns; CTD_Depth and CTD_Latitude designated as primary parameters
- Output written to 1001459_v1_ooi_regional_cabled_array_discrete_water_sampling_data.csv

[[table of contents](#) | [back to top](#)]

Data Files

File
1001459_v1_ooi_regional_cabled_array_discrete_water_sampling_data.csv (Comma Separated Values (.csv), 910.57 KB) MD5:d80245ca26cc641ddd31ad1925c5e368 Primary data file for dataset ID 1001459, version 1 This file contains discrete water sampling data associated with CTD casts performed during OOI Regional Cabled Array (RCA) maintenance cruises from 2015 to 2024.

[[table of contents](#) | [back to top](#)]

Supplemental Files

File	
Cabled-10_AT4212_Discrete_Summary-README_2019-10-21.pdf	(Portable Document Format (.pdf), 388.78 KB) MD5:729eb439c69db806385649aebf8e6dd7
OOI-RCA ReadMe File for Discrete Water Sampling Data from the Regional Cabled Array Cruise 10 (AT42-12)	
Cabled-11_TN382_Discrete_Summary-README_2021-05-14_ver_2.00.pdf	(Portable Document Format (.pdf), 412.17 KB) MD5:8d3aefb5ba6a5adfc606a1146f25b902
OOI-RCA ReadMe File for Discrete Water Sampling Data from the Regional Cabled Array Cruise 11 (TN382)	
Cabled-12_TN393_Discrete_Summary-README_2021-12-14_ver_2-00.pdf	(Portable Document Format (.pdf), 414.55 KB) MD5:d1ed9a012cb757703d4e08a0feb85f6a
OOI-RCA ReadMe File for Discrete Water Sampling Data from the Regional Cabled Array Cruise 12 (TN393)	
Cabled-13_TN407_Discrete_Summary-README.pdf	(Portable Document Format (.pdf), 386.96 KB) MD5:51742f548a7122a9e45ec0e0f450e02c
OOI-RCA ReadMe File for Discrete Water Sampling Data from the Regional Cabled Array Cruise 13 (TN407)	
Cabled-14_TN422_Discrete_Summary-README.pdf	(Portable Document Format (.pdf), 387.86 KB) MD5:483905204618a80a3f9d56fb1ffa9de2
OOI-RCA ReadMe File for Discrete Water Sampling Data from the Regional Cabled Array Cruise 14 (TN422)	
Cabled-15_AT50-29_Discrete_Summary-README.pdf	(Portable Document Format (.pdf), 401.66 KB) MD5:79ef75117cb22cd5040f547a992dd3ca
OOI-RCA ReadMe File for Discrete Water Sampling Data from the Regional Cabled Array Cruise 15 (AT50-29)	
Cabled-6_TN326_Discrete_Summary_README_2019-10-21.pdf	(Portable Document Format (.pdf), 327.19 KB) MD5:42e9584c0af4cca6cd49e779db2d908a
OOI-RCA ReadMe File for Discrete Water Sampling Data from the Regional Cabled Array Cruise 6 (TN326)	
Cabled-7_SKQ201610S_Discrete_Summary_README_2019-10-21.pdf	(Portable Document Format (.pdf), 309.81 KB) MD5:c94ce23f9c9ddd0dbf6af90420980233
OOI-RCA ReadMe File for Discrete Water Sampling Data from the Regional Cabled Array Cruise 7 (SKQ201610S)	
Cabled-8_RR1713-RR1717_Discrete_Summary-README_2019-10-21.pdf	(Portable Document Format (.pdf), 309.48 KB) MD5:420dbd28c62c5dbb2597158eb0fe9e75
OOI-RCA ReadMe File for Discrete Water Sampling Data from the Regional Cabled Array Cruise 8 (RR1713-RR1717)	
Cabled-9_RR1809-RR1812_Discrete_Summary-README_2019-10-21.pdf	(Portable Document Format (.pdf), 420.24 KB) MD5:b02bf81ffb5844fa89d369ee615e13e9
OOI-RCA ReadMe File for Discrete Water Sampling Data from the Regional Cabled Array Cruise 9 (RR1809-RR1812)	

[[table of contents](#) | [back to top](#)]

Related Publications

Carpenter, J. H. (1965). THE ACCURACY OF THE WINKLER METHOD FOR DISSOLVED OXYGEN ANALYSIS1. *Limnology and Oceanography*, 10(1), 135–140. Portico. <https://doi.org/10.4319/lo.1965.10.1.0135>
Methods

Dickson, A. G. (1990). Thermodynamics of the dissociation of boric acid in synthetic seawater from 273.15 to 318.15 K. *Deep Sea Research Part A. Oceanographic Research Papers*, 37(5), 755–766. doi:10.1016/0198-0149(90)90004-f [https://doi.org/10.1016/0198-0149\(90\)90004-F](https://doi.org/10.1016/0198-0149(90)90004-F)
Methods

Millero, F. J. (1995). Thermodynamics of the carbon dioxide system in the oceans. *Geochimica et*

Cosmochimica Acta, 59(4), 661–677. doi:10.1016/0016-7037(94)00354-o [https://doi.org/10.1016/0016-7037\(94\)00354-O](https://doi.org/10.1016/0016-7037(94)00354-O)

Methods

Millero, F. J. (2010). Carbonate constants for estuarine waters. Marine and Freshwater Research, 61(2), 139–142. <https://doi.org/10.1071/mf09254> <https://doi.org/https://doi.org/10.1071/MF09254>

Methods

Millero, F. J., Graham, T. B., Huang, F., Bustos-Serrano, H., & Pierrot, D. (2006). Dissociation constants of carbonic acid in seawater as a function of salinity and temperature. Marine Chemistry, 100(1-2), 80–94. <https://doi.org/10.1016/j.marchem.2005.12.001>

Methods

Mucci, A. (1983). The solubility of calcite and aragonite in seawater at various salinities, temperatures, and one atmosphere total pressure. American Journal of Science, 283(7), 780–799. doi:[10.2475/ajs.283.7.780](https://doi.org/10.2475/ajs.283.7.780)

Methods

Valderrama, J. C. (1981). The simultaneous analysis of total nitrogen and total phosphorus in natural waters. Marine Chemistry, 10(2), 109–122. [https://doi.org/10.1016/0304-4203\(81\)90027-x](https://doi.org/10.1016/0304-4203(81)90027-x) [https://doi.org/10.1016/0304-4203\(81\)90027-X](https://doi.org/10.1016/0304-4203(81)90027-X)

Methods

Weiss, R. F. (1974). Carbon dioxide in water and seawater: the solubility of a non-ideal gas. Marine Chemistry, 2(3), 203–215. doi:[10.1016/0304-4203\(74\)90015-2](https://doi.org/10.1016/0304-4203(74)90015-2)

Methods

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
Cruise	Cruise name associated with data collection.	unitless
Station	Station ID number. Station numbers are unique per cruise but not unique within the overall dataset.	unitless
Target_Asset	OOI platform located near to where the cast is made. Typically this is representative of a mooring or glider deployment or recovery location, or the location of a test cast.	unitless
Start_Latitude	Latitude derived from the elog reading at the beginning of the cast.	decimal degrees
Start_Longitude	Longitude derived from the elog reading at the beginning of the cast.	decimal degrees
Start_Time	Start time of the cast in UTC.	unitless
Cast	Cast ID number.	unitless

Cast_Flag	16-bit array data quality flag indicating any relevant nuances or details related to the particular cast. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Bottom_Depth_at_Start_Position	Depth of seafloor at the start time of a cast.	meters (m)
CTD_File	File name of CTD file generated during a cast.	unitless
CTD_File_Flag	16-bit array data quality flag indicating any relevant nuances or details related to the CTD file. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Niskin_Bottle_Position	Position of niskin bottle in the CTD rosette.	unitless
Niskin_Flag	16-bit array data quality flag indicating any relevant nuances or details related to the Niskin bottle. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
CTD_Bottle_Closure_Time	Datetime of Niskin bottle closure in UTC.	unitless
CTD_Pressure	Pressure measurement from CTD digiquartz pressure sensor.	db
CTD_Pressure_Flag	16-bit array data quality flag indicating any relevant nuances or details related to the CTD pressure reading. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
CTD_Depth	Depth of CTD at the CTD_Bottle_Closure_Time.	meters (m)
CTD_Latitude	Latitude of CTD at the CTD_Bottle_Closure_Time.	decimal degrees
CTD_Longitude	Longitude of CTD at the CTD_Bottle_Closure_Time.	decimal degrees
CTD_Temperature_1	Temperature measurement from CTD ITS-90 temperature sensor at the CTD_Bottle_Closure_Time.	degrees Celsius

CTD_Temperature_1_Flag	16-bit array data quality flag indicating any relevant nuances or details related to CTD_Temperature_1. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
CTD_Temperature_2	Temperature measurement from CTD ITS-90 temperature sensor at the CTD_Bottle_Closure_Time.	degrees Celsius
CTD_Temperature_2_Flag	16-bit array data quality flag indicating any relevant nuances or details related to CTD_Temperature_1. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
CTD_Conductivity_1	CTD conductivity measurement at the CTD_Bottle_Closure_Time.	S/m
CTD_Conductivity_1_Flag	16-bit array data quality flag indicating any relevant nuances or details related to CTD_Conductivity_1. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	q_flag
CTD_Conductivity_2	CTD conductivity measurement at the CTD_Bottle_Closure_Time.	S/m
CTD_Conductivity_2_Flag	16-bit array data quality flag indicating any relevant nuances or details related to CTD_Conductivity_2. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	q_flag
CTD_Salinity_1	Salinity value calculated from CTD_Conductivity_1.	PSU
CTD_Salinity_2	Salinity value calculated from CTD_Conductivity_2.	PSU
CTD_Oxygen	Oxygen measurement taken at CTD_Bottle_Closure_Time by the SBE 43 sensor.	mL/L
CTD_Oxygen_Flag	16-bit array data quality flag indicating any relevant nuances or details related to CTD_Oxygen. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless

CTD_Oxygen_Saturation	Derived oxygen saturation value at time of CTD_Bottle_Closure_Time. This calculation is based on the Garcia & Gordon equation.	mL/L
CTD_Fluorescence	CTD fluorescence measurement taken at time of CTD_Bottle_Closure_Time. CGSN does not typically measure this parameter on CTD casts.	mg/m ³
CTD_Fluorescence_Flag	16-bit array data quality flag indicating any relevant nuances or details related to CTD_Fluorescence. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
CTD_Beam_Attenuation	Beam Attenuation measurement from WET Labs C-Star sensor taken at CTD_Bottle_Closure_Time.	1/m
CTD_Beam_Transmission	Beam transmission measurement from WET Labs C-Star sensor taken at time of CTD_Bottle_Closure_Time.	percentage transmittance
CTD_Transmissometer_Flag	16-bit array data quality flag indicating any relevant nuances or details related to CTD_Beam_Transmission. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
CTD_pH	pH measurement taken from CTD cast.	unitless
CTD_pH_Flag	16-bit array data quality flag indicating any relevant nuances or details related to CTD_pH. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page. These flags can be traced back to comments written in the CTD Sampling Log.	unitless
Discrete_Oxygen	Discrete Oxygen value taken from the collected water sample.	mL/L
Discrete_Oxygen_Flag	16-bit array data quality flag indicating any relevant nuances or details related to Discrete_Oxygen. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page. These flags can be traced back to comments written in the CTD Sampling Log.	unitless

Discrete_Oxygen_Replicate_Flag	16-bit array data quality flag indicating any relevant nuances or details related to Discrete_Oxygen_Replicate. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page. These flags can be traced back to comments written in the CTD Sampling Log.	unitless
Discrete_Chlorophyll	Discrete Chlorophyll measurement taken from the collected water sample.	ug/L
Discrete_Phaeopigment	Discrete phaeopigment measurement taken from the collected water sample.	ug/L
Discrete_Fo_Fa_Ratio	Acidification ratio for pure Chl. CGSN does not measure this parameter.	unitless
Discrete_Fluorescence_Flag	16-bit array data quality flag indicating any relevant nuances or details related to Discrete_Fluorescence. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Discrete_Fluorescence_Replicate_Flag	16-bit array data quality flag indicating any relevant nuances or details related to discrete fluorescence replicates. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Discrete_Phosphate	Average discrete phosphate value taken from across replicate values from water sample.	uM
Discrete_Silicate	Average discrete silicate value taken from across replicate values from water sample.	uM
Discrete_Nitrate	Average discrete nitrate value taken from across replicate values from water sample.	uM
Discrete_Nitrite	Average discrete nitrite value taken from across replicate values from water sample.	uM
Discrete_Ammonium	Average discrete ammonium value taken from across replicate values from water sample.	uM

Discrete_Nutrients_Flag	16-bit array data quality flag indicating any relevant nuances or details related to discrete nutrient values. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page. Commonly flagged issues include leaking Niskin or open vent (1000).	unitless
Discrete_Nutrients_Replicate_Flag	16-bit array data quality flag indicating any relevant nuances or details related to Discrete_Nutrients_Replicate values. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page. If two samples were taken from the same niskin the flag value will be 1000.	unitless
Discrete_Salinity	Discrete salinity taken from water sample.	psu
Discrete_Salinity_Flag	16-bit array data quality flag indicating any relevant nuances or details related to Discrete_Salinity. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Discrete_Salinity_Replicate_Flag	16-bit array data quality flag indicating any relevant nuances or details related to discrete salinity replicates. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Discrete_Alkalinity	Discrete alkalinity value taken from water sample.	umol/kg
Discrete_Alkalinity_Flag	16-bit array data quality flag indicating any relevant nuances or details related to Discrete_Alkalinity. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Discrete_Alkalinity_Replicate_Flag	16-bit array data quality flag indicating any relevant nuances or details related to discrete alkalinity replicates. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Discrete_DIC	Discrete dissolved inorganic carbon (DIC) value from water sample.	umol/kg

Discrete_DIC_Flag	16-bit array data quality flag indicating any relevant nuances or details related to Discrete_DIC. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Discrete_DIC_Replicate_Flag	16-bit array data quality flag indicating any relevant nuances or details related to discrete dissolved inorganic carbon (DIC) replicates. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Discrete_pCO2	Discrete partial pressure of carbon dioxide (pCO2) taken from water sample. CGSN typically does not measure this parameter.	uatm
pCO2_Analysis_Temp	Discrete partial pressure of carbon dioxide (pCO2) analysis temperature. CGSN typically does not measure this parameter.	deg C
Discrete_pCO2_Flag	16-bit array data quality flag indicating any relevant nuances or details related to Discrete_pCO2. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Discrete_pCO2_Replicate_Flag	16-bit array data quality flag indicating any relevant nuances or details related to discrete pCO2 replicates. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Discrete_pH	Discrete pH value taken from water sample. Typically not as many pH samples are taken as DIC or Total Alkalinity samples.	unitless
pH_Analysis_Temp	pH analysis temperature.	deg C
Discrete_pH_Flag	16-bit array data quality flag indicating any relevant nuances or details related to Discrete_pH. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless

Discrete_pH_Replicate_Flag	16-bit array data quality flag indicating any relevant nuances or details related to discrete pH replicates. For full flag details, see the Readme file for this dataset, available in the Supplemental Files section of the related BCO-DMO metadata page.	unitless
Calculated_Alkalinity	Calculated alkalinity value from water sample.	umol/kg
Calculated_DIC	Calculated dissolved inorganic carbon (DIC) value from water sample.	umol/kg
Calculated_pCO2	Calculated partial pressure of carbon. dioxide (pCO2) value from water sample.	uatm
Calculated_pH	Calculated pH value from water sample.	unitless
Calculated_CO2aq	Calculated carbon dioxide dissolved in an aqueous solution (CO2aq) value from water sample.	umol/kg
Calculated_Bicarb	Calculated sodium bicarbonate (bicarb) value from water sample.	umol/kg
Calculated_CO3	Calculated carbon trioxide (CO3) value from water sample.	umol/kg
Calculated_Omega_C	Calculated Omega C value from water sample.	unitless
Calculated_Omega_A	Calculated Omega A value from water sample.	unitless

[[table of contents](#) | [back to top](#)]

Instruments

Dataset-specific Instrument Name	Turner Designs TD-700 fluorometer
Generic Instrument Name	Fluorometer
Dataset-specific Description	Chlorophyll sample analysis is acetone extraction onboard, and fluorometric detection on a Turner Designs TD-700 fluorometer by University of Washington Marine Chemistry Laboratory with a Manufacturer Detection Limit of 0.02ug/L. Measurements follow the methodology outlined in UNESCO (1994) Protocols for the joint global ocean flux study (JGOFS) core measurements. Vol. 29.
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

Dataset-specific Instrument Name	Niskin bottle
Generic Instrument Name	Niskin bottle
Dataset-specific Description	The bottles are deployed in a 24 bottle Rosette systems mounted on a frame and combined with a CTD for our cruises. We also employed 10L handheld Niskin bottles attached to an ROV (Remotely Operated Vehicle) to capture water samples next to seafloor instrumentation. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

Dataset-specific Instrument Name	Seal Analytical AA3
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	Nutrient sample analysis is conducted at University of Washington Marine Chemistry Laboratory. Analyses and calibration follow the protocols of the WOCE Hydrographic Program using a Seal Analytical AA3. Measurements follow the methodology outlined in UNESCO (1994) Protocols for the joint global ocean flux study (JGOFS) core measurements. Vol. 29, and Valderrama (1981) The simultaneous analysis of total nitrogen and total phosphorus on natural waters. Mar.Chem (10), 109-122.
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

Dataset-specific Instrument Name	Guildline Autosol model 8400B salinometer (Guildline Instruments of Canada)
Generic Instrument Name	Salinometer
Dataset-specific Description	Salinity sample analysis is conducted at University of Washington Marine Chemistry Laboratory following the methodology outlined in UNESCO (1994) Protocols for the joint global ocean flux study (JGOFS) core measurements. Vol. 29. Measurements are performed using a Guildline Autosol model 8400B salinometer (Guildline Instruments of Canada). Manufacturer stated accuracy and precision at 35 psu is +/- 0.003 psu and 0.0002 psu. IAPSO standard seawater is used to standardize the Autosol daily before runs Calibration is with IAPSO Standard Seawater.
Generic Instrument Description	A salinometer is a device designed to measure the salinity, or dissolved salt content, of a solution.

Dataset-specific Instrument Name	Metrohm Dosimat plus model 865
Generic Instrument Name	Titration
Dataset-specific Description	The analytical method for dissolved oxygen measurements is the Winkler titration as modified by Carpenter (1965). Measurements are performed using a Metrohm Dosimat plus model 865. In our procedure, we use Metrohm autoburette operated manually using a visual end-point. We achieve $\pm 0.1\%$ reproducibility routinely.
Generic Instrument Description	Titration is an instrument that incrementally adds quantified aliquots of a reagent to a sample until the end-point of a chemical reaction is reached.

[[table of contents](#) | [back to top](#)]

Deployments

TN326

Website	https://www.bco-dmo.org/deployment/1001544
Platform	R/V Thomas G. Thompson
Start Date	2015-07-04
End Date	2015-08-07

SKQ201610S

Website	https://www.bco-dmo.org/deployment/1001545
Platform	R/V Sikuliaq
Start Date	2016-07-11
End Date	2016-08-13

RR1713

Website	https://www.bco-dmo.org/deployment/1001546
Platform	R/V Roger Revelle
Start Date	2017-07-27
End Date	2017-08-07

RR1714

Website	https://www.bco-dmo.org/deployment/1001547
Platform	R/V Roger Revelle
Start Date	2017-08-09
End Date	2017-08-18

RR1715

Website	https://www.bco-dmo.org/deployment/1001548
Platform	R/V Roger Revelle
Start Date	2017-08-20
End Date	2017-08-27

RR1809

Website	https://www.bco-dmo.org/deployment/1001549
Platform	R/V Roger Revelle
Start Date	2018-06-23
End Date	2018-06-29

RR1810

Website	https://www.bco-dmo.org/deployment/1001550
Platform	R/V Roger Revelle
Start Date	2018-07-01
End Date	2018-07-11

RR1811

Website	https://www.bco-dmo.org/deployment/1001551
Platform	R/V Roger Revelle
Start Date	2018-07-14
End Date	2018-07-18

RR1812

Website	https://www.bco-dmo.org/deployment/1001552
Platform	R/V Roger Revelle
Start Date	2018-07-20
End Date	2018-08-03

AT42-12

Website	https://www.bco-dmo.org/deployment/990422
Platform	R/V Atlantis
Start Date	2019-06-02
End Date	2019-07-09
Description	See more information at R2R: https://www.rvdata.us/search/cruise/AT42-12

TN382

Website	https://www.bco-dmo.org/deployment/1001553
Platform	R/V Thomas G. Thompson
Start Date	2020-08-01
End Date	2020-08-26

TN393

Website	https://www.bco-dmo.org/deployment/1001588
Platform	R/V Thomas G. Thompson
Start Date	2021-08-01
End Date	2021-09-03

TN407

Website	https://www.bco-dmo.org/deployment/990428
Platform	R/V Thomas G. Thompson
Start Date	2022-08-08
End Date	2022-09-16
Description	See more information at R2R: https://www.rvdata.us/search/cruise/TN407

TN422

Website	https://www.bco-dmo.org/deployment/990430
Platform	R/V Thomas G. Thompson
Start Date	2023-08-14
End Date	2023-09-18
Description	See more information from R2R: https://www.rvdata.us/search/cruise/TN422

AT50-29

Website	https://www.bco-dmo.org/deployment/959814
Platform	R/V Atlantis
Start Date	2024-08-08
End Date	2024-09-08
Description	AT50-29 is split up into 2 legs, described by OOI: AT50-29A & AT50-29B

[[table of contents](#) | [back to top](#)]

Project Information

OOI Discrete CTD and Water Sampling Cruise Data (OOI Cruise Data)

Website: <https://oceanobservatories.org/>

The hydrographic sampling performed by the Ocean Observatories Initiative (OOI) as part of each research array turn represents a significant collection of valuable physical, chemical, and biological information. The collected hydrographic data include oxygen, salinity, nutrient (nitrate, nitrite, silicate, phosphate, ammonium), chlorophyll, and carbon system (dissolved inorganic carbon, total alkalinity, pH and partial pressure of CO₂) measurements. These data serve several important functions. First, they are necessary for the validation and evaluation of the moored instrumentation at each Array. Furthermore, the annual (Global Arrays and the Regional Cabled Array (RCA) or biannual (Coastal Arrays and the Endurance Array) collection of data at the same locations provides a unique timeseries of a large set of water properties following established community standards and methods, independent of its association with the OOI instrumentation.

[[table of contents](#) | [back to top](#)]

Program Information

Ocean Observatories Initiative (OOI)

Website: <http://oceanobservatories.org/>

The Ocean Observatories Initiative (OOI) is a science-driven ocean observing network that delivers real-time data to address critical science questions regarding the world's oceans. Funded by the National Science Foundation to encourage scientific investigation, OOI data are freely available online to anyone with an Internet connection. OOI was designed as a long-term project to collect ocean data for up to 30 years. This longevity makes it possible to measure and directly observe both short-lived episodic events and longer-term changes occurring in the ocean. Such data make it possible to better understand ocean processes and how the ocean is changing.

The OOI has five active research arrays that comprise the three major observatory elements linked together by instrument, infrastructure, and information management systems. Global Ocean Arrays consist of moored arrays and autonomous vehicles that provide time-series observations and mesoscale spatial sampling at sparsely sampled, high-latitude regions critical to our understanding of climate, the carbon cycle, and ocean circulation. The Regional Cabled Array consists of fiber-optic cables off the Oregon coast that provide unprecedented power, bandwidth, and communication to seafloor instrumentation and profiler moorings, enabling monitoring of volcanic and hydrothermal activity, methane seeps, earthquakes, and myriad ocean processes in coastal and blue water environments. Coastal Arrays consist of cross-shelf moored arrays and autonomous vehicles that observe the dynamic coastal environment, enabling examination of upwelling, shelf

break fronts, and cross-shelf exchanges.

These marine arrays are outfitted with more than 900 instruments — of 45 different types — measuring more than 200 different parameters. These instruments gather physical, chemical, geological, and biological data – from the air-sea interface to the seafloor. The data collected are transmitted through a cyberinfrastructure, an information management system that allows users to access real- to near real-time data from suites of sensors. The OOI provides annotations and automated quality control for data streams and is working to meet the IOOS Quality Assurance of Real Time Ocean Data (QARTOD) standards.

[[table of contents](#) | [back to top](#)]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1026342
NSF Division of Ocean Sciences (NSF OCE)	OCE-1743430
NSF Division of Ocean Sciences (NSF OCE)	OCE-2244833

[[table of contents](#) | [back to top](#)]