OOI Global Southern Ocean Array CTD and Discrete Water Sampling Data from R/V Atlantis, RVIB Nathaniel B. Palmer, RRS Discovery AT26-29, NBP1511, NBP1610, NBP1709, DY096, DY112 in the Southern Pacific Ocean from 2015-2020 (OOI Cruise Data project)

Website: https://www.bco-dmo.org/dataset/923545
Data Type: Cruise Results
Version: 1
Version Date: 2024-05-10

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

Program
» Ocean Observatories Initiative (OOI)

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Abstract
The hydrographic sampling performed by OOI-CGSN (the Ocean Observatories Initiative - Coastal and Global Scale Nodes) part of each Array turn represents a significant collection of valuable physical, chemical, and biological information. In addition to the CTD, collected hydrographic data include discrete oxygen, salinity, nutrient (nitrate, nitrite, silicate, phosphate, ammonium), chlorophyll, and carbon system measurements. These data serve several important functions. First, they are necessary for the calibration and evaluation of the moored instrumentation at each Array. Furthermore, the annual (Global) or biannual (Coastal) 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 moorings. The analyses of collected water samples for the parameters listed above are performed by a number of outside labs on behalf of OOI-CGSN. Consequently, the water sampling data for a given cruise is distributed among a number of different files. The Discrete Sampling Summary integrates the related CTD, metadata, and discrete water sample data into a single 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. The final product is the Discrete Sampling Summary spreadsheet which contains the metadata, CTD data and discrete water sample data into a single spreadsheet with data quality flags. This dataset includes hydrographic data from the Global Southern Ocean Array. The Global Southern Ocean Array was located in the high-latitude South Pacific, west of the Southern tip of Chile in an area of large scale thermohaline circulation, intermediate water formation , and CO2 sequestration. It permitted examination of linkages between the Southern Ocean and the Antarctic, including strengthening westerly winds and upwelling. This array was in place from February 2015 to January 2020 when it was removed.

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Coverage

Location: South Pacific Ocean
Spatial Extent: **N**:-52.653 **E**:-77.226166666667 **S**:-59.982833 **W**:-89.75
Temporal Extent: 2015-02-13 - 2020-01-06

Dataset Description

OOI-CGSN CTD Sampling Guidelines

In general, water samples are collected for analysis at depths that correspond to instrumentation making in situ measurements. For example, Near Surface Instrument Frames (NSIFs) have instrumentation that measure dissolved oxygen (DO), salinity (CTD), nitrate (NUTNR), the partial pressure of CO_2 (CO_2), and chlorophyll a fluorescence, so water samples should be collected at the depth of the NSIF for analyses of all those parameters. Additionally, as noted above, OOI water sampling data are valid long-term datasets in and of themselves. Thus, some measurement locations are driven by broader science questions.

Soak Time – The CTD rosette should be allowed to equilibrate (e.g., the CTD sensor readout stabilizes) at the desired target depth for at least 1 minute or more depending on conditions. Longer soak times may occur to accommodate acoustic release testing or other activities.

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 Global Array Sampling Guidelines

Global Arrays are comprised of 2 sub-surface Flanking Moorings, 1 sub-surface Hybrid Profiler Mooring, and at the Irminger Sea Array 1 Surface Mooring. Open Ocean Gliders and Global Profiling Gliders are also present at the Arrays. Subsections below define the strategy for sampling in the vicinity of each type of platform. Given the number of depths required to be sampled at Global Arrays, a 24-bottle CTD rosette is required.

There are a few general guidelines which also inform the strategies defined below:

- Nutrient data are useful for the validation of Carbon system data.
- Water samples should span the full water depth at a minimum of one site..
- Only sample Chlorophyll in the euphotic zone where there is a fluorescence signal detected on the CTD casts.
- Collect at least one sample per Array where the fluorescence signal is negligible to confirm lack of Chlorophyll.

Sampling at the Global Surface Mooring Location

- Sample the full suite (O2, Salts, Carbon, Nutrients, Chlorophyll) at the surface, 12, 40, 80, 130 m.
- Sample Carbon at additional depths where pH sensors are mounted (at 20, 100 m).

- Also sample O2 and Salts at intervals below 130 where there are CTD sensors.

Sampling at Global Flanking Mooring Locations

- Sample the full suite (O2, Salts, Carbon, Nutrients, Chlorophyll) at 30 m.
- Sample Chlorophyll additionally at surface and the chlorophyll max.
- Sample Nutrients additionally at 130 m.
- Also sample O2 and Salts at 60, 90, 130, 250, 500, 1000, 1500 m

Sampling at the Global Hybrid Profiler Mooring Location

- Sample the full suite (O2, Salts, Carbon, Nutrients, Chlorophyll) at 30 m.
- Sample Chlorophyll additionally at surface and the chlorophyll max, and also at 150 m if there is fluorescence signal.
- Sample O2 and Salts at 150 m, and ~4-6 places along the profiler path(s)

Sampling at Global Profiling Glider Deployment and Recovery Locations

- Sample O2, Salts and Nutrients at the surface, 30, 50, 100 and 200 m.
- Sample Chlorophyll at the surface, 30, 50, 100, and 200 m (if there is a fluorescence signal).

Sampling at Open Ocean Glider Deployment and Recovery Locations

- Sample O2 and Salts at the surface, 30, 50, and every 100 m from 100-1000 m.
- Sample Chlorophyll at the surface, 30, 50, 100, and 200 m (if there is a fluorescence signal).

Methodology

Salinity

Salinity measurements are performed following the methodology outlined in the WHOI Hydrography Blue Book, *Automated Oxygen Titration and Salinity Determination* (Knapp et al. 1990). Measurements are performed using a Guildline Autosal 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 Autosal daily before runs.

Oxygen

Dissolved oxygen measurements are performed following the methodology outlined in the WHOI Hydrography Blue Book, *Automated Oxygen Titration and Salinity Determination* (Knapp et al. 1990). Measurements are performed using a Metrohm Model 888 Titrando dosing device, with the titration endpoint determined amperometrically. Stated accuracy is 0.02 ml/l, with a precision of 0.001 ml/l.

Nutrients

All nutrient values are reported as the average of triplicate analysis on a single collected sample.

Carbon System

Carbon system measurements are performed by the Wang lab (Woods Hole Oceanographic Institution). DIC and TA measurements follow the methodology of Wang and Cai (2004) with uncertainties of 2 umol/kg. DIC measurements are performed with an Apollo Sci-Tech AS-C3. TA measurements are performed with an Apollo Sci-Tech AS-ALK2 and ROSS electrode. pH measurements follow the methodology of Clayton and Byrne (1993) with an uncertainty of 0.002 pH units using an Agilent 8453.

Chlorophyll and Phaeo

Analysis was completed using a Turner Designs Aquafluor Handheld 800446.

Sampling on DY096 (OOI deployment 5) and DY111 (OOI deployment 6)

These cruises were performed in conjunction with the British National Oceanographic Centre as part of their CUSTARD project. All water sampling was performed by them. Data from these samples is also available via the British Oceanographic Data Centre (BODC), thus this data product contains data supplied by the Natural

Environmental Research Council.

Data Processing Description

File/row Representation of Water Samples

There should be one row for each station-cast-niskin bottle. 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.

Additionally, these data flags an assessment of the collection and processing of the relevant data or samples, and are not an assessment of the *accuracy* of the data. For example, a conductivity sensor which has the correct calibration coefficients and functions normally will receive a quality flag of 0000000000000100 (acceptable measurement). However, the calibration coefficients may be out of date and off with respect to the discrete salinity results; this does not affect the assigned flag.

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

- Units removed from column header names
- Spaces in column headers removed and replaced with underscores ("_")
- -999999 no data values replaced with blank values
- "not detected" lab values (<0.01, <0.011, <0.024, etc.)replaced with blank values
- Latitude and longitude values rounded to 6 degrees of precision

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Data Files

File
923545_v1_ooi_southern_ocean_discrete_water_sampling.csv (Comma Separated Values (.csv), 1,016.63 KB) MD5:dbd6911d135e43dbc1293cb61fb9f015 Primary data file for dataset ID 923545, version 1

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Supplemental Files

File	
OOI-CGSN ReadMe File for Discrete Water Sampling Data from the Southern Ocean Array Deployment 1 (AT26-29) filename: Southern_Ocean-01_AT26-29_Discrete_Summary_README.txt	(Plain Text, 10.24 KB) MD5:e11b662a0858e246e119e36da0267ab0
OOI-CGSN ReadMe File for Discrete Water Sampling Data from the Southern Ocean Array Deployment 2 (NBP1511) filename: Southern_Ocean-02_NBP1511_Discrete_Summary_README.txt	(Plain Text, 10.64 KB) MD5:d814d6d079f48913cd0d2a3a394be846
OOI-CGSN ReadMe File for Discrete Water Sampling Data from the Southern Ocean Array Deployment 3 (NBP1610) filename: Southern_Ocean-03_NBP1610_Discrete_Summary_README.txt	(Plain Text, 10.57 KB) MD5:b7a3aabf08239af1300d4cf6f731a9f1
OOI-CGSN ReadMe File for Discrete Water Sampling Data from the Southern Ocean Array Deployment 4 (NBP1709) filename: Southern_Ocean-04_NBP1709_Discrete_Summary_README.txt	(Plain Text, 10.09 KB) MD5:734be394f6acbfdc3e071ca4cb18af98
OOI-CGSN ReadMe File for Discrete Water Sampling Data from the Southern Ocean Array Deployment 5 (DY096) filename: Southern_Ocean-05_DY096_Discrete_Summary_README.txt	(Plain Text, 10.24 KB) MD5:ffeab45ff82033cfb7613b2f39f2f6b8
OOI-CGSN ReadMe File for Discrete Water Sampling Data from the Southern Ocean Array Deployment 6 (DY111) filename: Southern_Ocean-06_DY111_Discrete_Summary_README.txt	(Plain Text, 12.08 KB) MD5:beeec987dbec3cc486e3fb299a60fe0f

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Related Publications

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:10.1016/0967-0637(93)90048-8
Methods

Knapp, G. P., Stalcup, M. C., & Staney, R. J. (1990). Automated oxygen titration and salinity determination. https://doi.org/10.1575/1912/1020
Methods

Wang, Z. A., & Cai, W.-J. (2004). Carbon dioxide degassing and inorganic carbon export from a marsh-dominated estuary (the Duplin River): A marsh CO2pump. Limnology and Oceanography, 49(2), 341–354. doi:10.4319/lo.2004.49.2.0341
Methods

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Related Datasets

IsRelatedTo

Moore, C. M., Wyatt, N. J., Ussher, S., Milne, A., Pabortsava, K., Baker, C. A., Wright, A., & Martin, A. P. (2023). *Nutrient amendment bioassay bottle experiments conducted between 59S 89W and 60S and 89W on cruise DY111 (CUSTARD).* (Version 1) [Data set]. NERC EDS British Oceanographic Data Centre NOC. https://doi.org/10.5285/FE06072E-D4C4-2201-E053-6C86ABC067DE https://doi.org/10.5285/fe06072e-d4c4-2201-e053-6c86abc067de

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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.	unitless
Start_Longitude	Longitude derived from the elog reading at the beginning of the cast.	unitless
Start_Time	Start time of the cast.	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
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.	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 seafloor at the CTD_Bottle_Closure_Time.	meters
CTD_Latitude	Latitude of CTD at the CTD_Bottle_Closure_Time.	unitless
CTD_Longitude	Longitude of CTD at the CTD_Bottle_Closure_Time.	unitless
CTD_Temperature_1	Temperature measurement from CTD ITS-90 temperature sensor at the CTD_Bottle_Closure_Time.	deg C
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.	deg C
CTD_Temperature_2_Flag	16-bit array data quality flag indicating any relevant nuances or details related to CTD_Temperature_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.	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.	unitless
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.	unitless
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.	%
CTD_Transmissometer_Flag	16-bit array data quality flag indicating any relevant nuances or details related to CTD_Beam_Attenuation. 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. CGSN does not measure this parameter on CTD casts.	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 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. 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_Oxygen 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 phospate 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 nutrient 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 value 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 value taken from water sample.	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_OmegaC	Calculated Omega C value from water sample.	unitless
Calculated_OmegaA	Calculated Omega A value from water sample.	unitless

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Instruments

Dataset-specific Instrument Name	Apollo Sci-Tech AS-ALK2 and ROSS electrode
Generic Instrument Name	Apollo SciTech AS-ALK2 total alkalinity titrator
Dataset-specific Description	Carbon system measurements are performed by the Wang lab (Woods Hole Oceanographic Institution). DIC and TA measurements follow the methodology of Wang and Cai (2004) with uncertainties of 2 umol/kg. DIC measurements are performed with an Apollo Sci-Tech AS-C3. TA measurements are performed with an Apollo Sci-Tech AS-ALK2 and ROSS electrode. pH measurements follow the methodology of Clayton and Byrne (1993) with an uncertainty of 0.002 pH units using an Agilent 8453.
Generic Instrument Description	An automated acid-base titrator for use in aquatic carbon dioxide parameter analysis. The titrator provides standardisation and sample analysis, using the Gran titration procedure for alkalinity determination of seawater and brackish waters. It is designed for both shipboard and land based laboratory use. The precision of the instrument is 0.1 percent or higher, and sample volumes may range from 10-25 ml. Titration takes approximately 8 minutes per sample, and the repeatability is within plus or minus 1-2 micromoles per kg.

Dataset-specific Instrument Name	Metrohm Model 888 Titrando dosing device
Generic Instrument Name	Automatic titrator
Dataset-specific Description	Dissolved oxygen measurements are performed following the methodology outlined in the WHOI Hydrography Blue Book Automated Oxygen Titration and Salinity Determination (Knapp et al. 1990). Measurements are performed using a Metrohm Model 888 Titrando dosing device, with the titration endpoint determined amperometrically. Stated accuracy is 0.02 ml/L, with a precision of 0.001 ml/L.
Generic Instrument Description	Instruments that incrementally add quantified aliquots of a reagent to a sample until the end-point of a chemical reaction is reached.

Dataset-specific Instrument Name	8400B salinometer (Guildline Instruments of Canada)
Generic Instrument Name	Autosal salinometer
Dataset-specific Description	Salinity measurements are performed following the methodology outlined in the WHOI Hydrography Blue Book, Automated Oxygen Titration and Salinity Determination (Knapp et al. 1990). Measurements are performed using a Guildline Autosal 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 Autosal daily before runs.
Generic Instrument Description	The salinometer is an instrument for measuring the salinity of a water sample.

Dataset-specific Instrument Name	Niskin
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Niskin bottles on CTD rosette used to collect water samples.
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	SBE 43
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
Dataset-specific Description	SBE used to determine CTD oxygen values.
Generic Instrument Description	The Sea-Bird SBE 43 dissolved oxygen sensor is a redesign of the Clark polarographic membrane type of dissolved oxygen sensors. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	WL CSTAR Trans
Generic Instrument Name	WET Labs {Sea-Bird WETLabs} C-Star transmissometer
Dataset-specific Description	Wet Labs CSTAR Transmissometer was used to determine Beam Attenuation and Beam Transmission values.
Generic Instrument Description	The C-Star transmissometer has a novel monolithic housing with a highly intgrated opto-electronic design to provide a low cost, compact solution for underwater measurements of beam transmittance. The C-Star is capable of free space measurements or flow-through sampling when used with a pump and optical flow tubes. The sensor can be used in profiling, moored, or underway applications. Available with a 6000 m depth rating. More information on Sea-Bird website: https://www.seabird.com/c-star-transmissometer/product?id=60762467717

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Deployments

AT26-29

Website	https://www.bco-dmo.org/deployment/923560
Platform	R/V Atlantis
Start Date	2015-02-12
End Date	2015-03-05
Description	Start Port: Punta Arenas, Chile End Port: Port: Punta Arenas, Chile Project: Ocean Observatories Initiative (OOI): Southern Ocean Array, Leg 1

NBP1511

Website	https://www.bco-dmo.org/deployment/923562
Platform	RVIB Nathaniel B. Palmer
Start Date	2015-12-07
End Date	2016-01-04
Description	Start Port: Punta Arenas, Chile End Port: Punta Arenas, Chile Project: Ocean Observatories Initiative (OOI): Southern Ocean Array, Leg 2

NBP1610

Website	https://www.bco-dmo.org/deployment/923564
Platform	RVIB Nathaniel B. Palmer
Start Date	2016-11-20
End Date	2016-12-16

NBP1709

Website	https://www.bco-dmo.org/deployment/923849
Platform	RVIB Nathaniel B. Palmer
Start Date	2017-11-23
End Date	2017-12-09
Description	Start Port: Punta Arenas, Chile End Port: Punta Arenas, Chile Project: Ocean Observatories Initiative (OOI) Southern Hemisphere Cruise

DY096

Website	https://www.bco-dmo.org/deployment/923851
Platform	RRS Discovery
Start Date	2018-11-28
End Date	2018-12-14
Description	Start Port: Punta Arenas, Chile End Port: Punta Arenas, Chile Project: Ocean Observatories Initiative (OOI): Southern Ocean Array, Leg 5

DY112

Website	https://www.bco-dmo.org/deployment/923853
Platform	RRS Discovery
Start Date	2020-01-16
End Date	2020-01-26
Description	Start Port: Punta Arenas, Chile End Port: Punta Arenas, Chile Project: Ocean Observatories Initiative (OOI): Southern Ocean Array, Leg 6

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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 CO_2) 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.

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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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1743430
NSF Division of Ocean Sciences (NSF OCE)	OCE-2244833
United Kingdom Natural Environmental Research Council (NERC)	NE/P021247/1

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