Hydrography sensor data from trace metal rosette (TMR) casts at 26 stations near coastal Antarctica during RVIB Nathaniel B. Palmer cruise NBP18-01 from Dec 2017 to Feb 2018

Website: https://www.bco-dmo.org/dataset/874909
Data Type: Cruise Results
Version: 1
Version Date: 2024-04-01

Project
» Collaborative Research: Cobalamin and Iron Co-Limitation Of Phytoplankton Species in Terra Nova Bay (CICLOPS)

Contributors	Affiliation	Role
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Abstract
This dataset provides the trace metal rosette (TMR) hydrography data from the Amundsen and Ross Seas, including from Terra Nova Bay, collected onboard the R/V Nathaniel B. Palmer as part of the Cobalamin and Iron Co-Limitation of Phytoplankton Species (CICLOPS) expedition from December 11, 2017 to March 3, 2018. Sensor information and calibration dates are available in the report 'NBP1801_Data_Report.pdf' available as a supplemental file.

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Coverage

Location: Amundsen and Ross Seas, including from Terra Nova Bay
Spatial Extent: **N**:-72.751 **E**:-116.001 **S**:-77.495 **W**:179.819
Temporal Extent: 2018-01-03 - 2018-02-18

Methods & Sampling

Sensors were deployed on a titanium trace metal rosette (TMR) in tandem with trace metal clean bottle samples during the RVIB Nathaniel B. Palmer cruise (NBP18-01) from December 2017 to February 2018 in coastal Antarctica. TMR casts were performed at 26 stations in the Amundsen Sea, Ross Sea and Terra Nova Bay. Parameters collected include pressure, temperature, conductivity, oxygen, fluorescence, beam

transmission, PAR, and salinity.

The profiles in the dataset are from the up-cast of the TMR cast. More information on sensor data acquisition and processing can be found in "Data Report NBP18-01" from the United States Antarctic Program prepared by Matt Pullen and Bryan Chambers (see Supplemental Docs section). Trace metal rosette sensors are detailed on p.29.

For all duplicate sensors, the primary sensor was used for temperature and conductivity, and the secondary sensor was used for oxygen in the final hydrography dataset.

Problem report:
The PAR sensor was only included on the TMR beginning at station 35.

Data Processing Description

The profiles in the dataset are from the up-cast of the TMR cast. More information on sensor data acquisition and processing can be found in "Data Report NBP18-01" (see Supplemental Docs section)

BCO-DMO Processing Description

- converted latitude and longitude to decimal degrees (from degrees, decimal mins)
- converted Date to YMD format
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions

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Data Files

File
Hydrography sensor data from trace metal rosette casts filename: nbp1801_tmr_hydrography.csv (Comma Separated Values (.csv), 1.85 MB) MD5:21754d2faa8fa66ef69d3e118e7ae0f7 Primary data file for dataset ID 874909, version 1

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Supplemental Files

File
NBP1801 Science Data Report filename: NBP1801_Data_Report.pdf (Portable Document Format (.pdf), 4.98 MB) MD5:b556331a57dcbd36698f0f01aedab884 Science data report from Nathaniel B. Palmer cruise NBP1801

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Related Publications

Noble, A. E., Lamborg, C. H., Ohnemus, D. C., Lam, P. J., Goepfert, T. J., Measures, C. I., ... Saito, M. A. (2012). Basin-scale inputs of cobalt, iron, and manganese from the Benguela-Angola front to the South Atlantic Ocean. Limnology and Oceanography, 57(4), 989–1010. doi:10.4319/lo.2012.57.4.0989

Methods

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Related Datasets

IsRelatedTo

Saito, M. A., DiTullio, G. (2022) **Dissolved nutrient data from RVIB Nathaniel B Palmer cruise (NBP18-01) in the Amundsen and Ross Seas from December 2017 to March 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-05-25 doi:10.26008/1912/bco-dmo.874841.1 [view at BCO-DMO]

Saito, M. A., DiTullio, G. (2022) **Event log from RVIB Nathaniel B. Palmer cruise NBP1801 in the Southern Ocean for the CICLOPS project.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-05-09 http://lod.bco-dmo.org/id/dataset/874099 [view at BCO-DMO]

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Parameters

Parameter	Description	Units
Latitude	Latitude of sampling location (South is negative)	decimal degrees
Longitude	Longitude of sampling location (West is negative)	decimal degrees
TMR_Start_DateTime_UTC	Trace metal rosette Start datetime	unitless
Station	Station number	unitless
Pressure	Pressure of seawater from CTD pressure sensor	decibar
Depth	Depth of rosette from CTD altimeter	meter
Temperature	Temperature of seawater from CTD temperature sensor	degrees Celsius
Conductivity	Conductivity of seawater from CTD conductivity sensor	milliSiemens per centimeter (mS/cm)
Oxygen	Concentration of dissolved oxygen from CTD oxygen sensor	milliliter per liter (mL/L)
Fluorescence	Fluorescence of seawater from CTD fluorometer	milligrams per cubic meter (mg/m^3)
Beam	Beam Transmission from CTD Transmissometer	percent (%)
PAR_Irradiance	Photosynthetically Active Radiation (PAR) from CTD PAR sensor	watts per square meter (W/m^2)
Salinity	Salinity derived from conductivity measurements	practical salinity unit (PSU)

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Instruments

Dataset-specific Instrument Name	Valeport VA-500
Generic Instrument Name	Altimeter
Generic Instrument Description	An instrument that measures height above a fixed surface. The data can be used to map ocean-surface topography and generate gridded surface height fields.

Dataset-specific Instrument Name	Biospherical Instruments QSP-2350
Generic Instrument Name	Biospherical PAR sensor
Generic Instrument Description	An irradiance sensor designed to measure Photosynthetically Active Radiation (PAR), manufactured by Biospherical Instruments Inc.

Dataset-specific Instrument Name	
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Generic Instrument Description	The Sea-Bird SBE 911 plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911 plus includes the SBE 9plus Underwater Unit and the SBE 11plus Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 plus and SBE 11 plus is called a SBE 911 plus. The SBE 9 plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 plus and SBE 4). The SBE 9 plus CTD can be configured with up to eight auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). more information from Sea-Bird Electronics

Dataset-specific Instrument Name	Paroscientific 410K-134 CTD pressure sensor
Generic Instrument Name	Paroscientific 410K Pressure Transducer
Generic Instrument Description	The Paroscientific 410K Pressure Transducer is an absolute pressure transducer with a Digiquartz pressure sensor and precision thermometer. Operates over a temperature range of 0-125 degC and a pressure range of 0-10000 psia with a typical accuracy of 0.01% and a resolution of 0.0001%.

Dataset-specific Instrument Name	PRR
Generic Instrument Name	Radiometer
Dataset-specific Description	PRR (Underwater): Biospherical Instruments PRR-800 PRR (Mast): Biospherical Instruments PRR-810
Generic Instrument Description	Radiometer is a generic term for a range of instruments used to measure electromagnetic radiation (radiance and irradiance) in the atmosphere or the water column. For example, this instrument category includes free-fall spectral radiometer (SPMR/SMSR System, Satlantic, Inc), profiling or deck cosine PAR units (PUV-500 and 510, Biospherical Instruments, Inc). This is a generic term used when specific type, make and model were not specified.

Dataset-specific Instrument Name	Sea-Bird 3plus 10500m
Generic Instrument Name	Sea-Bird SBE 3plus Temperature Sensor
Dataset-specific Description	Trace metal rosette had hydrographic sensors including Sea-Bird 3plus 10500m temperature sensor
Generic Instrument Description	The Sea-Bird SBE 3plus water temperature sensor is designed for use on the SBE 9plus CTD system. The sensor operates over the range -5 to +35 °C, a resolution of 0.0003 °C at 24 Hz and an initial accuracy of ± 0.001 °C. The typical sampling rate is 24 Hz, and the sensor has a depth rating of 6800 meters (aluminium housing) or 10500 meters (titanium housing).

Dataset-specific Instrument Name	Sea-Bird SBE 43 7000m
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
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	Sea-Bird 4C 10500m conductivity sensor
Generic Instrument Name	Sea-Bird SBE-4 Conductivity Sensor
Dataset-specific Description	Trace metal rosette had hydrographic sensors including Sea-Bird 4C 10500m conductivity sensor
Generic Instrument Description	The Sea-Bird SBE-4 conductivity sensor is a modular, self-contained instrument that measures conductivity from 0 to 7 Siemens/meter. The sensors (Version 2; S/N 2000 and higher) have electrically isolated power circuits and optically coupled outputs to eliminate any possibility of noise and corrosion caused by ground loops. The 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, making the measured resistance (and instrument calibration) independent of calibration bath size or proximity to protective cages or other objects.

Dataset-specific Instrument Name	TMR
Generic Instrument Name	Trace Metal Bottle
Generic Instrument Description	Trace metal (TM) clean rosette bottle used for collecting trace metal clean seawater samples.

Dataset-specific Instrument Name	WetLabs ECO-FL fluorometer
Generic Instrument Name	Wet Labs ECO-AFL/FL Fluorometer
Generic Instrument Description	The Environmental Characterization Optics (ECO) series of single channel fluorometers delivers both high resolution and wide ranges across the entire line of parameters using 14 bit digital processing. The ECO series excels in biological monitoring and dye trace studies. The potted optics block results in long term stability of the instrument and the optional anti-biofouling technology delivers truly long term field measurements. more information from Wet Labs

Dataset-specific Instrument Name	WetLabs C-Star
Generic Instrument Name	WET Labs {Sea-Bird WETLabs} C-Star transmissometer
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

NBP1801

Website	https://www.bco-dmo.org/deployment/778919
Platform	RVIB Nathaniel B. Palmer
Report	https://service.rvdata.us/data/cruise/NBP1801/doc/NBP1801DATA.pdf
Start Date	2017-12-16
End Date	2018-03-03
Description	Start Port: Punta Arenas, Chile End Port: Hobart, Australia

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Project Information

Collaborative Research: Cobalamin and Iron Co-Limitation Of Phytoplankton Species in Terra Nova Bay (CICLOPS)

Coverage: Amundsen Sea, Ross Sea, Terra Nova Bay

NSF abstract:
Phytoplankton blooms in the coastal waters of the Ross Sea, Antarctica are typically dominated by either diatoms or Phaeocystis Antarctica (a flagellated algae that often can form large colonies in a gelatinous matrix).

The project seeks to determine if an association of bacterial populations with Phaeocystis antarctica colonies can directly supply Phaeocystis with Vitamin B12, which can be an important co-limiting micronutrient in the Ross Sea. The supply of an essential vitamin coupled with the ability to grow at lower iron concentrations may put Phaeocystis at a competitive advantage over diatoms. Because Phaeocystis cells can fix more carbon than diatoms and Phaeocystis are not grazed as efficiently as diatoms, the project will help in refining understanding of carbon dynamics in the region as well as the basis of the food web webs. Such understanding also has the potential to help refine predictive ecological models for the region. The project will conduct public outreach activities and will contribute to undergraduate and graduate research. Engagement of underrepresented students will occur during summer student internships. A collaboration with Italian Antarctic researchers, who have been studying the Terra Nova Bay ecosystem since the 1980s, aims to enhance the project and promote international scientific collaborations.

The study will test whether a mutualistic symbioses between attached bacteria and Phaeocystis provides colonial cells a mechanism for alleviating chronic Vitamin B12 co-limitation effects thereby conferring them with a competitive advantage over diatom communities. The use of drifters in a time series study will provide the opportunity to track in both space and time a developing algal bloom in Terra Nova Bay and to determine community structure and the physiological nutrient status of microbial populations. A combination of flow cytometry, proteomics, metatranscriptomics, radioisotopic and stable isotopic labeling experiments will determine carbon and nutrient uptake rates and the role of bacteria in mitigating potential vitamin B12 and iron limitation. Membrane inlet and proton transfer reaction mass spectrometry will also be used to estimate net community production and release of volatile organic carbon compounds that are climatically active. Understanding how environmental parameters can influence microbial community dynamics in Antarctic coastal waters will advance an understanding of how changes in ocean stratification and chemistry could impact the biogeochemistry and food web dynamics of Southern Ocean ecosystems.

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Funding

Funding Source	Award
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1644073
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1643684
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1643845

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