Dissolved nutrient data from RVIB Nathaniel B Palmer cruise (NBP18-01) in the Amundsen and Ross Seas from December 2017 to March 2018

Website: https://www.bco-dmo.org/dataset/874841
Data Type: Cruise Results
Version: 1
Version Date: 2022-05-25

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

Contributors	Affiliation	Role
Saito, Mak A.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
DiTullio, Giacomo	College of Charleston - Hollings Marine Lab (CoC-HML)	Co-Principal Investigator
Chmiel, Rebecca J.	Woods Hole Oceanographic Institution (WHOI)	Contact
Gerlach, Dana Stuart	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
This dataset provides seawater macronutrient concentrations 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. Samples analyzed for phosphate, nitrite, nitrate + nitrite, silicate and ammonia were collected from full depth profiles via a trace-metal-clean rosette (TMR), filtered with a 0.2 um filter, and stored frozen until analysis via a nutrient autoanalyzer. Sensor hydrography data from each sample depth is also provided.

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Coverage

Spatial Extent: **N**:-70 **E**:-115 **S**:-80 **W**:160
Temporal Extent: 2017-12-31 - 2018-01-03

Methods & Sampling

Hydrographic data was collected during the RVIB Nathaniel B. Palmer cruise (NBP1801) from December 31st, 2017 to March 3rd, 2018. Samples were collected by trace metal rosette (TMR) using the Saito laboratory 8L X-Niskin bottles. Bottles were brought into a clean van, pressurized with high-purity nitrogen gas and filtered through 0.2 micron 142mm Supor membrane filters. Nutrient samples were filled in acid-washed 60mL HDPE bottles and frozen until analysis.

Nutrient analyses were conducted by Joe Jennings at Oregon State University using a nutrient autoanalyzer following the methods of Noble et al. (2012). Technicon AutoAnalyzer II components were used to measure phosphate and ammonium. Alpkem rapid flow analyzer (RFA) 300 components were used to measure silicic acid, nitrate+nitrite, and nitrite.

For quality control (QC) notes, please see the document "Quality Control notes for NBP1801 nutrients" in the Supplemental Files section.

NOTE: The PAR sensor was not present on the first leg of the cruise, so PAR values were not measured until Station 35.

Data Processing Description

BCO-DMO processing
- 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
ciclops_nutrients.csv (Comma Separated Values (.csv), 39.44 KB) MD5:63a054ad30505e4ef55941027b5604de Primary data file for dataset ID 874841

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Supplemental Files

File
Quality Control notes for NBP1801 nutrients filename: QC_notes_NBP1801_nutrients.pdf (Portable Document Format (.pdf), 412.57 KB) MD5:7a6a8ec6f83598697cfda51740f7bd11 Quality Control notes for NBP1801 nutrients

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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) **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]

Saito, M. A., DiTullio, G., Chmiel, R. J. (2024) **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.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-04-01 doi:10.26008/1912/bco-dmo.874909.1 [view at BCO-DMO]

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Parameters

Parameter	Description	Units
Date_sampled	Date of sampling	unitless
Cruise	Cruise ID	unitless
Station	Station	unitless
Latitude	Latitude	decimal degrees
Longitude	Longitude	decimal degrees
Bottle_Number	Niskin bottle number	unitless
Depth	Depth at which water sample was collected	meters (m)
Bottom_depth	Depth of seafloor	meters (m)
Temperature	Temperature from primary sensor	degrees Celsius (°C)
Conductivity	Conductivity from primary sensor	milliSiemens per centimeter (mS/cm)
dO2	Dissolved Oxygen from secondary sensor	milligrams per liter (mg/L)
Fluorescence	Fluorescence	milligrams per cubic meter (mg/m^3)
Transmisson_pct	Percent transmission	percent (%)
PAR	Photosynthetically active radiation	watts per square meter (W/m^2)
Salinity	Salinity	PSU

PO4	Phosphate	micromolar (uM)
NO3_NO2	Nitrate plus nitrite	micromolar (uM)
Silicate	Silicate	micromolar (uM)
NO2	Nitrite	micromolar (uM)
NH4	Ammonia	micromolar (uM)

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Instruments

Dataset-specific Instrument Name	Alpkem rapid flow analyzer (RFA 300)
Generic Instrument Name	Alpkem RFA300
Dataset-specific Description	Alpkem rapid flow analyzer (RFA) 300 components were used to measure silicic acid, nitrate+nitrite, and nitrite.
Generic Instrument Description	A rapid flow analyser (RFA) that may be used to measure nutrient concentrations in seawater. It is an air-segmented, continuous flow instrument comprising a sampler, a peristaltic pump which simultaneously pumps samples, reagents and air bubbles through the system, analytical cartridge, heating bath, colorimeter, data station, and printer. The RFA-300 was a precursor to the smaller Alpkem RFA/2 (also RFA II or RFA-2).

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

Dataset-specific Instrument Name	8L X-Niskin bottles
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Samples were collected using Saito laboratory 8L X-Niskin bottles.
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	Sea-Bird SBE3 plus (SBE 3P)
Generic Instrument Name	Sea-Bird SBE 3plus 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
Dataset-specific Description	Trace metal rosette had hydrographic sensors including Sea-Bird SBE 43 7000m 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 the manufacturer: https://www.seabird.com/products/sbe-43-dissolved-oxygen-sensor

Dataset-specific Instrument Name	
Generic Instrument Name	Sea-Bird SBE 911plus CTD
Generic Instrument Description	[tethered, real-time] 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	Sea-Bird 4C conductivity sensor
Generic Instrument Name	Sea-Bird SBE-4 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	Technicon AutoAnalyzer II
Generic Instrument Name	Technicon AutoAnalyzer II
Dataset-specific Description	Technicon AutoAnalyzer II components were used to measure phosphate and ammonium
Generic Instrument Description	A rapid flow analyzer that may be used to measure nutrient concentrations in seawater. It is a continuous segmented flow instrument consisting of a sampler, peristaltic pump, analytical cartridge, heating bath, and colorimeter. See more information about this instrument from the manufacturer.

Dataset-specific Instrument Name	WetLabs ECO-FL (FLRTD-3928)
Generic Instrument Name	Wet Labs ECO-AFL/FL Fluorometer
Dataset-specific Description	Trace metal rosette had hydrographic sensors including WetLabs ECO-FL (FLRTD-3928) flourometer
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

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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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