Macronutrient analysis and selected hydrographic data from the R/V Falkor ProteOMZ expedition (FK160115) in the Central Pacific in 2016.

Website: https://www.bco-dmo.org/dataset/730912
Data Type: Cruise Results
Version: 1
Version Date: 2018-11-19

Project
» The ProteOMZ Expedition: Investigating Life Without Oxygen in the Pacific Ocean (ProteOMZ (Proteomics in an Oxygen Minimum Zone))

Contributors	Affiliation	Role
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Abstract
Macronutrient data analyses including phosphate, nitrate + nitrite (N+N), silicic acid (silcate), nitrite, ammonia, and nitrate. Selected hydrographic data and derived values (temperature, salinity, density, chlorophyll, oxygen, and sigmatheta) from corresponding depths from the R/V Falkor's CTD and the Trace Metal Rosette (TMR) SeaBird SBE19 CTD.

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Coverage

Spatial Extent: **N**:10.544984 **E**:-158.320979 **S**:-26.364655 **W**:-179.289931
Temporal Extent: 2016-01-17 - 2016-02-04

Dataset Description

R/V Falkor (160115) nutrient data from the ProteOMZ expedition in the Central Pacific in 2016.

Methods & Sampling

Nutrient samples were filtered through 0.2 micron Supor filters and frozen in acid-washed 60-mL high-density polyethylene bottles until analysis. The frozen samples were thawed in a warm water bath and stored in the dark for 20– 24 h prior to analyses. This protocol has been found to increase the recovery efficiency of silicic

acid in frozen samples and has no observed adverse effects on the other nutrients. Immediately before analysis, aliquots of the samples were transferred to 15-mL polypropylene cups and an Alpkem autosampler. Technicon AutoAnalyzer IITM components were used to measure phosphate and ammonium; and Alpkem rapid flow analyzer (RFA) 300TM components were used for silicic acid, nitrate + nitrite, and nitrite. All five of the macronutrients were analyzed simultaneously. The nutrient methods were essentially those employed by the Oregon State University lab during the World Ocean Circulation Experiment and Southern Ocean Joint Global Ocean Flux Study (JGOFS) cruises. The phosphate method was a modification of the molybdenum blue procedure of Bernhardt and Wilhelms (1967), in which phosphate was determined as reduced phosphomolybdic acid employing hydrazine as the reductant. The nitrate + nitrite analysis used the basic method of Armstrong et al. (1967). Sulfanilamide and N-(1-napthyl) ethylenediamine dihydrochloride react with nitrite to form a colored diazo compound. For the nitrate + nitrite analysis, nitrate is first reduced to nitrite using an open tubular cadmium reductor and imidazole buffer as described by Patton (1983). Nitrite analysis was performed on a separate channel, omitting the cadmium reductor and the buffer. The determination of silicic acid was based on that of Armstrong et al. (1967) as adapted by Atlas et al. (1971). Addition of an acidic molybdate reagent forms silicomolybdic acid, which is then reduced by stannous chloride. An indophenol blue ammonium method was modified from Alpkem RFA methodology, which references Methods for Chemical Analysis of Water and Wastes, March 1984, EPA-600/4-79-020, ‘‘Nitrogen Ammonia,’’ Method 350.1 (Colorimetric, Automated Phenate). A detailed description of the continuous segmented flow procedures used can be found in Gordon et al. (1994).

Data were collected using the Trace Metal Rosette (TMR, Sea-Bird SEACAT 19+), equipped standard conductivity, temperature and pressure sensors, as well as an added optional SBE 43 dissolved oxygen sensor. All four sensors were factory refurbished/calibrated immediately prior to the expedition in November of 2015 by Sea-Bird Electronics (Bellevue WA).

R/V Falkor CTD data are described at the R2R repository: http://www.rvdata.us/catalog/FK160115

Data Processing Description

BCO-DMO Data Processing Notes:

- reformatted column names to comply with BCO-DMO standards.
- added columns: cruise, date, lat, lon

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Data Files

File
nutrients.csv (Comma Separated Values (.csv), 32.86 KB) MD5:d263946cc53aa45afd5047b1a37a0ac7 Primary data file for dataset ID 730912

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Related Publications

Armstrong, F. A. J., Stearns, C. R., & Strickland, J. D. H. (1967). The measurement of upwelling and subsequent biological process by means of the Technicon Autoanalyzer® and associated equipment. Deep Sea Research and Oceanographic Abstracts, 14(3), 381–389. doi:10.1016/0011-7471(67)90082-4
Methods

Atlas, E. L., Hager, S. W,, Gordon, L. I., & Park, P. K. (1971). A practical manual for use of the Technicon Autoanalyzer in sea water nutrient analyses. Oregon State University, Department of Oceanography. Technical report.
Methods

Bernhardt, H., and A. Wilhelms. 1967. The continuous determination of low level iron, soluble phosphate and

total phosphate with the AutoAnalyzer. Technicon Symp. 1:385-89.
Methods

EPA (1984). Methods for Chemical Analysis of Water and Wastes, March 1984. EPA-600/4-79-020, "Nitrogen Ammonia", Method 350.1 (Colorimetric, Automated Phenate). https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=30000Q10.TXT
Methods

Gordon, L. I., J. C. Jennings, JR, A. A. Ross, and J. M. Krest. (1994). A suggested protocol for continuous flow analysis of seawater nutrients (phosphate, nitrate, nitrite, and silicic acid) in the WOCE Hydrographic Program and the Joint Global Ocean Fluxes Study. WHP Office Report 91-1. Revision 1, Nov. 1994. WOCE Hydrographic Program Office, Woods Hole, MA.
Related Research

Patton, C. J. (1983) Design, characterization and applications of a miniature continuous flow analysis system. Ph.D. Thesis, Mich. State Univ. U. Microfilms International, Ann Arbor, Mich. 150 pp.
Methods

Rolling Deck To Repository. (2016). CTD (Conductivity, Temperature, Depth) data collected during research cruise FK160115 using a Sea-Bird SBE-911+ instrument system onboard the platform RV Falkor [Data set]. Rolling Deck to Repository (R2R) Program. https://doi.org/10.7284/121562
Results

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Related Datasets

IsRelatedTo

Saito, M. A., Saunders, J. (2022) **Relative protein abundance from scaled and corrected exclusive peptide spectral counts from the ProteOMZ R/V Falkor expedition cruise FK160115 in the Pelagic central Pacific Ocean in 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-01-13 doi:10.26008/1912/bco-dmo.868030.1 [view at BCO-DMO]
Relationship Description: This dataset was collected asynchronously using another instrument at the same stations during the expedition.

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Parameters

Parameter	Description	Units
cruise	Deployment	unitless
station	Station number	unitless
date	Date of sampling; YYYY/MM/DD	unitless
lat	Latitude	decimal degrees
lon	Longitude	decimal degrees
Depth	Depth of sampling	meters

Sample	Sampler number	unitless
PO4	Phosphate	micromoles per liter
N_N	Nitrate + Nitrite	micromoles per liter
Silicate	Silicic acid	micromoles per liter
NO2	Nitrite	micromoles per liter
NH4	Ammonia	micromoles per liter
NO3	Nitrate	micromoles per liter
ctd_temp2	Temperature from Falkor CTD [ITS-90]	Celsius
ctd_sal2	Salinity from Falkor CTD	Practical Salinity Units
ctd_density2	Density from Falkor CTD	kilograms per meter cubed
ctd_sigmatheta2	Sigma Theta Density from Falkor CTD	kilograms per meter cubed
ctd_chla	Chlorophyll A from Falkor CTD	milograms per meter cubed
ctd_O2_2	Oxygen from Falkor CTD	micromoles per kilogram
tmrd_temp	Temperature from Trace Metal Rosette downcast [ITS-90]	Celsius
tmrd_sal	Salinity from Trace Metal Rosette downcast	Practical Salinity Units
tmrd_density	Density from Trace Metal Rosette downcast	kilograms per meter cubed
tmrd_sigmatheta	Sigma Theta Density from Trace Metal Rosette downcast	kilograms per meter cubed
tmru_temp	Temperature from Trace Metal Rosette upcast [ITS-90]	Celsius
tmru_sal	Salinity from Trace Metal Rosette upcast	Practical Salinity Units

tmru_density	Density from Trace Metal Rosette upcast	kilograms per meter cubed
tmru_sigmatheta	Sigma Theta Density from Trace Metal Rosette upcast	kilograms per meter cubed
tmru_O2	Oxygen from Trace Metal Rosette upcast	micromoles per kilogram

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Instruments

Dataset-specific Instrument Name	Alpkem Autosampler
Generic Instrument Name	Alpkem RFA300
Dataset-specific Description	Used in nutrient analysis
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	SeaBird SBE19 CTD
Generic Instrument Name	CTD Sea-Bird
Dataset-specific Description	Used for water sampling
Generic Instrument Description	A Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics. This instrument designation is used when specific make and model are not known or when a more specific term is not available in the BCO-DMO vocabulary. Refer to the dataset-specific metadata for more information about the specific CTD used. More information from: http://www.seabird.com/

Dataset-specific Instrument Name	Technicon AutoAnalyzer II
Generic Instrument Name	Technicon AutoAnalyzer II
Dataset-specific Description	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	Trace Metal Rosette
Generic Instrument Name	Trace Metal Bottle
Dataset-specific Description	Used for nutrient sampling
Generic Instrument Description	Trace metal (TM) clean rosette bottle used for collecting trace metal clean seawater samples.

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Deployments

FK160115

Website	https://www.bco-dmo.org/deployment/708387
Platform	R/V Falkor
Report	https://service.rvdata.us/data/cruise/FK160115/doc/FK160115_OfficialCruiseReport_Saito_v3.pdf
Start Date	2016-01-16
End Date	2016-02-11
Description	Project: Using Proteomics to Understand Oxygen Minimum Zones (ProteOMZ) More information is available from the ship operator at https://schmidtocean.org/cruise/investigating-life-without-oxygen-in-the... Additional cruise information is available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/FK160115

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Project Information

The ProteOMZ Expedition: Investigating Life Without Oxygen in the Pacific Ocean (ProteOMZ (Proteomics in an Oxygen Minimum Zone))

Website: https://schmidtocean.org/cruise/investigating-life-without-oxygen-in-the-tropical-pacific/#team

Coverage: Central Pacific Ocean (Hawaii to Tahiti)

From Schmidt Ocean Institute's ProteOMZ Project page:

Rising temperatures, ocean acidification, and overfishing have now gained widespread notoriety as human-caused phenomena that are changing our seas. In recent years, scientists have increasingly recognized that there is yet another ingredient in that deleterious mix: a process called deoxygenation that results in less oxygen available in our seas.

Large-scale ocean circulation naturally results in low-oxygen areas of the ocean called oxygen deficient zones (ODZs). The cycling of carbon and nutrients – the foundation of marine life, called biogeochemistry – is fundamentally different in ODZs than in oxygen-rich areas. Because researchers think deoxygenation will greatly expand the total area of ODZs over the next 100 years, studying how these areas function now is important in predicting and understanding the oceans of the future. This first expedition of 2016 led by Dr. Mak Saito from the Woods Hole Oceanographic Institution (WHOI) along with scientists from University of Maryland Center for Environmental Science, University of California Santa Cruz, and University of Washington aimed to do just that, investigate ODZs.

During the 28 day voyage named “ProteOMZ,” researchers aboard R/V *Falkor* traveled from Honolulu, Hawaii to Tahiti to describe the biogeochemical processes that occur within this particular swath of the ocean’s ODZs. By doing so, they contributed to our greater understanding of ODZs, gathered a database of baseline measurements to which future measurements can be compared, and established a new methodology that could be used in future research on these expanding ODZs.

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Funding

Funding Source	Award
Gordon and Betty Moore Foundation: Marine Microbiology Initiative (MMI)	GBMF3782
Alfred P. Sloan Foundation (Sloan)	Unknown ProteOMZ Sloan Foundation
Schmidt Ocean Institute (SOI)	R/V Falkor 160115 SOI ProteOMZ Expedition

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