Southern Ocean nutrients from CTD bottles from ARSV Laurence M. Gould LMG0104, LMG0106, LMG0203, LMG0205 in the Southern Ocean from 2001-2002 (SOGLOBEC project)

Website: https://www.bco-dmo.org/dataset/3208
Data Type: Cruise Results
Version: 1
Version Date: 2009-09-01

Project
» U.S. GLOBEC Southern Ocean (SOGLOBEC)

Program
» U.S. GLOBal ocean ECosystems dynamics (U.S. GLOBEC)

Contributors	Affiliation	Role
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Abstract
Nitrate, nitrite, phosphate, ammonia, and silica were measured from selected niskin bottle tripped from hydrocasts on RV\LMGould cruises from 2001 and 2002 in the Southern Ocean. Water samples were not taken on all casts. All concentrations are reported in micromoles per liter. For 2002 cruises, the oxygen is also reported.

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Coverage

Spatial Extent: **N**:-65.5383 **E**:-66.6837 **S**:-69.8885 **W**:-72.6998
Temporal Extent: 2001-04-29 - 2002-09-09

Dataset Description

Nitrate, nitrite, phosphate, ammonia, and silica were measured from selected niskin bottle tripped from hydrocasts on LMGould cruises from 2001 and 2002 in the Southern Ocean. Water samples were not taken on all casts. All concentrations are reported in micromoles per liter. For 2002 cruises, the oxygen is also reported.

Methods & Sampling

Analytical methods used for silica, phosphate, nitrite, and nitrate follow the recommendations of Gordon et al.

(1993) for the WOCE WHP project. (pdf)

Data Processing Description

Protocol for measuring nutrients (pdf)

Final data report for nutrients, LMG0205 (pdf)

Oxygen analysis: Prior to each series of analysis the titrator was standardized with a solution of KIO3 (standard solution concentrations are listed in the calculation workbook). Standards were titrated until agreement reached +/- 2 *u*L. A reagent blank determination was conducted at the start of the cruise and used throughout. Titrations performed on the Langford Amperometric system were logged during operation and the titration data stored.

Nutrient determinations were conducted on an Alpkem Flow Solutions segmented flow autoanalyzer. Operation and standardization of the system is described in detail in the Flow Solutions manual under the file "Alpkem manuals". Linearity checks were conducted at the beginning of the cruise for each of the ions and conducted at the start and completion of each sample sequence. Efficiency checks on the Nitrate reduction column (OTRC, Alpkem) were run after introduction of the column into the analytical stream. Analysis integrity was also checked by sampling surface and bottom water bottles in duplicate. This process was repeated on most casts.

Significant difficulty was experienced with the SBE oxygen sensor on the CTD instrument package. Agreement between the titration determinations of oxygen and logged values through the CTD instrument package was extremely variable and suggested several sources of error. Under the directory containing bottle data, two jpeg format files contain comparisons of the SBE output and other parameters taken by the CTD package and the Winkler determinations. In property:property comparisons with other parameters collected by the package (i.e. Temperature, Salinity) variability was obvious and difficult to explain. Investigation into this variability suggested dependence on the rate of decent as well as strong dependence on the extreme cold temperatures and ice problems. During the cruise a second sensor was installed as a secondary. This sensor reported higher concentrations but similar trends. An intercomparison with the CTD package operated on the NBP was carried out on September 1 (Event 201/LMG24402.001). Comparison of the data files showed significantly higher concentrations reported by the NBP system agreeing with the Winkler titration values.

Shortened Reagent Prep. list for Nutrient Analysis (pdf) Aug 2001

1. ANALYSIS OF NO_2^- + NO_3^- / NO_2^-

Sulfanilamide: 10gm Sulf. dissolved and diluted to 1000ml in 10%HCl. Store at room temp.

NEDA (N-1-Napthylethylene-diamine dihydrochloride): 1.0 gm NEDA dissolved and diluted to 1000ml in DIW. Store in amber bottle at room temp. for short term or refrigerate if long term.

Imidazole Buffer: 13.6gm Imidazole dissolved in approx. 3800ml DIW. Add 60ml of prepared NH_4Cl-$CuSO_4$ stock solution (stir for ~ 10 min.). Dropwise, add 10% HCL to a final pH: 7.8-7.85. Dilute to 4000ml with DIW. Store at room temperature.

Copper Sulfate stock: 20gm $CuSO_4$ dissolved and diluted to 1000ml in DIW. Store at room temp.

Ammonium Chloride-Copper Sulfate stock (NH_4Cl-$CuSO_4$): 250gm NH_4Cl dissolved in approx. 950ml DIW. Add 60 drops (~2.8ml) of $CuSO_4$ stock and then dilute to 1000ml in DIW. Store at room temperature.

2. ANALYSIS OF SiO_4^{4-}

Ammonium Molybdate: 10.8gm NH_4Molyb. dissolved in approx. 900ml DIW. Add 2.8ml conc. H_2SO_4 and then dilute to 1000ml in DIW. Store in amber bottle at room temperature for short term, otherwise refrigerate if long term. Label as Ammonium Molybdate for Silicate analysis.

Tartaric Acid: 200gm Tart. dissolved and diluted to 1000ml in DIW. Store at room temperature.

Stannous Chloride stock ($SnCl_2$): 10gm $SnCl_2$ dissolved and diluted to 20cc in 50% HCl. Dissolves faster if freshly made warm 50% HCl is used. Store in freezer.

Stannous Chloride Working: 1ml of stock $SnCl_2$ diluted to 50ml in 10%HCl.

3. ANALYSIS of PO_4^{3-}

Hydrazine Sulfate: 5.0gm Hydrazine Sulf. dissolved and diluted to 500ml in DIW. Store at room temperature for short term, otherwise refrigerate if long term.

Ammonium Molybdate: 27.25gm NH_4Molyb. dissolved and diluted to 250ml in DIW. Add cooled H_2SO_4 stock solution. Label as Ammonium Molybdate for Phosphate analysis.

Sulfuric Acid stock (H_2SO_4): Slowly add 320ml conc. H_2SO_4 to 405ml DIW while stirring. Caution: This solution gets HOT! Place DIW in ice bath prior to addition of H_2SO_4.

4. ANALYSIS of NH_4^{4+}

Complex Reagent: 140gm Sodium Citrate dissolved to approx. 950ml in DIW. Adjust pH to 7.0 w/ 10%HCl Bring to final volume of 1000ml with DIW.

Phenol: Add 60ml of 10N NaOH to approx. 700ml DIW. Add 12ml of liquefied phenol (88%). Dilute to 1000ml with DIW. 10N NaOH: 400gm Sodium Hydroxide dissolved and diluted to 1000ml in DIW (HOT!!!).

Sodium Nitroferricyanide: .5gm NFeCN dissolved and diluted to 1000ml in DIW.

Sodium Hypochlorite: Add 2.5ml of 5.25% NaOCl (household bleach, eg. CLOROX) to 75ml of DIW and dilute to 100ml with DIW. If using extra-strength, dilute 2ml of NaOCl to 100 ml DIW.

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Data Files

File
nutrients_lmg.csv (Comma Separated Values (.csv), 120.29 KB) MD5:14f17ece2507bcc5c97166b8788fb8d7 Primary data file for dataset ID 3208

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Related Publications

Gordon, L.I., J.C. Jennings, Jr., A.A. Ross, and J.M. Krest (1993) A Suggested Protocol For Continuous Flow Automated Analysis of Seawater Nutrients, in WOCE Operation Manual, WHP Office Report 90-1, WOCE Report 77 No. 68/91, 1-52. https://cchdo.github.io/hdo-assets/documentation/manuals/pdf/91_1/gordnut.pdf *Methods*

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Parameters

Parameter	Description	Units
cruiseid	cruise identification	
year	year	

station	station identification per event log	
cast	CTD rosette cast number	
lat	latitude, negative = South	DD.D
lon	longitude, negative = West	DDD.D
yrday_local	year day local based on Julian calendar	YYY
day_local	day of month, local (01-31)	
month_local	month of year, local(01-12)	
depth_n	nominal depth of sample	meters
bottle	bottle number	
NO3_NO2	nitrate + nitrite	umoles/liter
NO2	nitrite	umoles/liter
SiOH_4	silicate	umoles/liter
NH4	ammonium	umoles/liter
PO4	phosphate	umoles/liter
NO3	nitrate	umoles/liter
comments	free text comments	
event	event or operation number sometimes derived from cruise/yearday/time of sampling is a unique sampling identifier/data processing key.	
depth_w	depth of water	meters

O2_umol_L	oxygen, dissolved	micromoles per liter
O2_ml_L	oxygen, dissolved	milliliters per liter
time_local	local time	unitless
nut_id	nutrients sample identifier	unitless

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Instruments

Dataset-specific Instrument Name	Conductivity, Temperature, Depth
Generic Instrument Name	CTD - profiler
Dataset-specific Description	Seabird, model not identified
Generic Instrument Description	The Conductivity, Temperature, Depth (CTD) unit is an integrated instrument package designed to measure the conductivity, temperature, and pressure (depth) of the water column. The instrument is lowered via cable through the water column. It permits scientists to observe the physical properties in real-time via a conducting cable, which is typically connected to a CTD to a deck unit and computer on a ship. The CTD is often configured with additional optional sensors including fluorometers, transmissometers and/or radiometers. It is often combined with a Rosette of water sampling bottles (e.g. Niskin, GO-FLO) for collecting discrete water samples during the cast. This term applies to profiling CTDs. For fixed CTDs, see https://www.bco-dmo.org/instrument/869934.

Dataset-specific Instrument Name	Niskin Bottle
Generic Instrument Name	Niskin bottle
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	Alpkem Flow Solutions segmented flow autoanalyzer
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	Used to measure nutrient concentrations in samples.
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	
Generic Instrument Name	Winkler Oxygen Titrator
Generic Instrument Description	A Winkler Oxygen Titration system is used for determining concentration of dissolved oxygen in seawater.

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Deployments

LMG0104

Website	https://www.bco-dmo.org/deployment/57637
Platform	ARSV Laurence M. Gould
Report	http://www.ccpo.odu.edu/Research/globec/cruises/gould0103_0104.doc
Start Date	2001-04-20
End Date	2001-06-05

LMG0106

Website	https://www.bco-dmo.org/deployment/57639
Platform	ARSV Laurence M. Gould
Report	http://www.ccpo.odu.edu/Research/globec/cruises01/lmg0106_menu.html
Start Date	2001-07-21
End Date	2001-09-01

LMG0203

Website	https://www.bco-dmo.org/deployment/57642
Platform	ARSV Laurence M. Gould
Report	http://www.ccpo.odu.edu/Research/globec/main_cruises02/lmg0203/menu.html
Start Date	2002-04-07
End Date	2002-05-20

LMG0205

Website	https://www.bco-dmo.org/deployment/57644
Platform	ARSV Laurence M. Gould
Report	http://www.ccpo.odu.edu/Research/globec/main_cruises02/lmg0205/report_lmg0205.pdf
Start Date	2002-07-29
End Date	2002-09-18

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Project Information

U.S. GLOBEC Southern Ocean (SOGLOBEC)

Website: http://www.ccpo.odu.edu/Research/globec_menu.html

Coverage: Southern Ocean

The fundamental objectives of United States Global Ocean Ecosystems Dynamics (U.S. GLOBEC) Program are dependent upon the cooperation of scientists from several disciplines. Physicists, biologists, and chemists must make use of data collected during U.S. GLOBEC field programs to further our understanding of the interplay of physics, biology, and chemistry. Our objectives require quantitative analysis of interdisciplinary data sets and, therefore, data must be exchanged between researchers. To extract the full scientific value, data must be made available to the scientific community on a timely basis.

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Program Information

U.S. GLOBal ocean ECosystems dynamics (U.S. GLOBEC)

Website: http://www.usglobec.org/

Coverage: Global

U.S. GLOBEC (GLOBal ocean ECosystems dynamics) is a research program organized by oceanographers and fisheries scientists to address the question of how global climate change may affect the abundance and production of animals in the sea.

The U.S. GLOBEC Program currently had major research efforts underway in the Georges Bank / Northwest Atlantic Region, and the Northeast Pacific (with components in the California Current and in the Coastal Gulf of Alaska). U.S. GLOBEC was a major contributor to International GLOBEC efforts in the Southern Ocean and Western Antarctic Peninsula (WAP).

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Funding

Funding Source	Award
NSF Antarctic Sciences (NSF ANT)	unknown SOGLOBEC NSF ANT

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