Carbon chemistry (TCO2, TALK, POC, PON, dC13_POM, dN15_POM) from CTD bottles from RVIB Nathaniel B. Palmer cruise NBP1302 in the Ross Sea, Antarctica from February to March 2013 (TRACERS project)

Website: https://www.bco-dmo.org/dataset/658394
Data Type: Cruise Results
Version:
Version Date: 2016-09-15

Project
» TRacing the fate of Algal Carbon Export in the Ross Sea (TRACERS)

Contributors	Affiliation	Role
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Coverage

Temporal Extent: 2013-02-12 - 2013-03-18

Dataset Description

This dataset includes important measures related to the carbon system in the Ross Sea, Antarctica.

Physical data from the R/V Nathaniel B. Palmer cruise NBP 1302 collected along with this dataset are archived by the Marine Geoscience Data System. Data held there include shipboard continuous underway (e.g., thermosalinograph and fluorescence), bathymetry, CTD, meteorological, XBT, and navigation. The project link: http://www.marine-geo.org/tools/search/entry.php?id=NBP1302

Methods & Sampling

For explanation and units of acronyms such as **dC13_POM** used below, please refer to the "Parameters" section.

Water column samples for TCO2 and TA were collected in 250 mL BOD bottles following the protocols of Dickson et al. (2007) and poisoned immediately with 50 uL saturated mercuric chloride.

TCO2:

Samples were allowed to warm to room temperature prior to analysis, which was typically performed within 4 hours of collection. A volume of 1.25 mL of sample was acidified using an automated custom-built injection and bubble stripping system coupled to an infrared gas analyzer (LICOR LI7000). Integrating the infrared

absorbance signal with respect to time for each stripped gas sample yields the total amount of CO2 evolved from the sample. TCO2 measurements were calibrated using certified reference materials (CRMs) obtained from Andrew Dickson at UCSD (Batch 122). CRM's were run periodically as unknowns over the course of a run to constrain instrument drift. All unknowns were run in triplicate. Precision estimated on the basis of triplicate analysis of unknown seawater samples (>3500 runs) and CRM replicates (n=855) for NBP 1302 is ±3 umol kg-1.

Total Alkalinity (TA):

Samples were prefiltered through 0.45 um polyvinylidene fluoride filter and were typically analyzed within 12 hours of collection with a potentiometric titrator (Metrohm 855 Robotic Titrosampler). TA calculations follow Dickson et al. (2003). Measurements were calibrated using CRMs (Batch 122) and precision estimated on the basis of CRM replicates (n=108) is ±1.5 umol kg-1.

POC, PON, dC13_POM, dN15_POM:

POM was collected by filtering between 0.5 and 4 liters of seawater through precombusted (450C for 4.5 hours) Whatman GFC filters following the protocols of Knap et al. (1996). Filters were rinsed immediately after filtration with 10 mL of 0.1N HCl to remove calcium carbonate. The filters were air dried and analyzed shore-based using a Carlo Erba NA1500 Series 2 elemental analyzer coupled to a Finnigan Delta+ mass spectrometer with a ConFloII open split interface.

References:

Dickson, A. G., Afghan, J. D., and Anderson, G. C.: Reference materials for oceanic CO2 analysis: a method for the certification of total alkalinity, Mar. Chem., 80, 185–197, doi:10.1016/S0304-4203(02)00133-0, 2003.

Dickson, A. G., Sabine, C. L., and Christian, J. R.: Guide to best practices for ocean CO2 measurements, PICES Spec. Publ., 3, p. 191, doi:10.1159/000331784, 2007.

Knap, A., Michaels A., Close A., Ducklow, H., and A. Dickson: Protocols for the Joint Global Ocean Flux Study (JGOFS) Core Measurements, JGOFS Rep., 19, 1–170, 1996.

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Data Files

File
carbon_CTD.csv(Comma Separated Values (.csv), 81.44 KB) MD5:51a67867c86a2fd070b8a8e1aae06170 Primary data file for dataset ID 658394

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Parameters

Parameter	Description	Units
STATION	Station number	unitless
BOTTLE	Bottle number	unitless
LATITUDE	Latitude	decimal degrees
LONGITUDE	Longitude	decimal degrees
DEPTH	Depth of sample (water depth)	meters
SAL	Salinity from the CTD	practical salinity unit (PSU)
TEMP	Temperature from the CTD	Degrees Celsius
TCO2	Total carbon dioxide	micromoles per kg
TALK	Total alkalinity	micromoles per kg
POC	Particulate organic carbon	micrograms per L
d13C_POM	Carbon stable isotope composition of particulate organic matter relative to the PBD standard	parts per thousand (per mil)
PON	Particulate Organic Nitrogen	micrograms per L
d15N_POM	Nitrogen stable isotope composition of particulate organic matter relative to atmospheric N2	parts per thousand (per mil)
DATE	Station date in format mm/dd/yy	unitless

Instruments

Dataset-specific Instrument Name	potentiometric titrator (Metrohm 855 Robotic Titrosampler)
Generic Instrument Name	Automatic titrator
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	
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	modified LICOR LI7000
Generic Instrument Name	LI-COR LI-7000 Gas Analyzer
Dataset-specific Description	A volume of 1.25 mL of sample was acidified using an automated custom-built injection and bubble stripping system coupled to an infrared gas analyzer (LICOR LI7000)
Generic Instrument Description	The LI-7000 CO2/H2O Gas Analyzer is a high performance, dual cell, differential gas analyzer. It was designed to expand on the capabilities of the LI-6262 CO2/ H2O Gas Analyzer. A dichroic beam splitter at the end of the optical path provides radiation to two separate detectors, one filtered to detect radiation absorption of CO2 and the other to detect absorption by H2O. The two separate detectors measure infrared absorption by CO2 and H2O in the same gas stream. The LI-7000 CO2/ H2O Gas Analyzer is a differential analyzer, in which a known concentration (which can be zero) gas is put in the reference cell, and an unknown gas is put in the sample cell.

Dataset-specific Instrument Name	Finnigan Delta+ mass spectrometer
Generic Instrument Name	Mass Spectrometer
Dataset-specific Description	Carlo Erba NA1500 Series 2 elemental analyzer coupled to a Finnigan Delta+ mass spectrometer with a ConFloII open split interface.
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

Dataset-specific Instrument Name	
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.

Deployments

NBP1302

Website	https://www.bco-dmo.org/deployment/547873
Platform	RVIB Nathaniel B. Palmer
Report	http://dmoserv3.whoi.edu/data_docs/TRACERS/NBP1302_data_report.pdf
Start Date	2013-02-12
End Date	2013-04-05
Description	Ross Sea, Antarctica (53 days) RVIB Nathaniel B. Palmer : February-April 2013 McMurdo Station, Antarctica - Punta Arenas, Chile Project Title: "TRacing the fate of Algal Carbon Export in the Ross Sea" (TRACERS)Chief Scientist: Dennis Hansell, UM-RSMASProject Description: The research focus of this cruise was to investigate the biogeochemistry associated after a phytoplankton bloom at the end of the Antarctic Austral Summer. I helped analyze and coordinate analyses of nutrients (silicic acid, phosphate, and nitrate) and collect samples for dissolved organic carbon (DOC). Note R2R Link takes user to Marine Geoscience Data System (MGDS):NBP1302 Nathaniel B. Palmer Systems and Specifications

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Project Information

TRacing the fate of Algal Carbon Export in the Ross Sea (TRACERS)

Coverage: Ross Sea

Sinking particles are a major element of the biological pump and they are commonly assigned to two fates: mineralization in the water column and accumulation at the seafloor. However, there is another fate of export hidden within the vertical decline of carbon, the transformation of sinking organic matter to fine suspended and/or dissolved organic fractions. This process has been suggested but has rarely been observed or quantified. As a result, it is presumed that the solubilized fraction is largely mineralized over short time scales. However, global ocean surveys of dissolved organic carbon are demonstrating a significant water column accumulation of organic matter under high productivity environments. This proposal will investigate the transformation of organic particles from sinking to solubilized phases of the export flux in the Ross Sea. The Ross Sea experiences high export particle production, low dissolved organic carbon export with overturning circulation, and the area has a predictable succession of production and export events. In addition, the basin is shallow (< 1000 m) so the products the PIs will target are relatively concentrated. To address the proposed hypothesis, the PIs will use both well-established and novel biochemical and optical measures of export production and its fate. The outcomes of this work will help researchers close the carbon budget in the Ross Sea.

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Funding

Funding Source	Award
NSF Division of Polar Programs (NSF PLR)	PLR-1142044

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