Surface water gas concentrations in coastal waters from Palmer LTER near the Antarctic Peninsula from 2012-2013 (Phytoplankton Seasonal Dynamics project)

Website: https://www.bco-dmo.org/dataset/661954
Data Type: Other Field Results
Version:
Version Date: 2016-10-19

Project
» The seasonal dynamics of CO2, primary production, and DMS in the Western Antarctic Peninsula: Measurements of pools and processes using mass spectrometry (Phytoplankton Seasonal Dynamics)

Contributors	Affiliation	Role
Morel, Francois	Princeton University	Lead Principal Investigator
Dacey, John	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Tortell, Phillippe	University of British Columbia (UBC-EOS)	Contact
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

Dataset Description

Reference:

Tortell, P.D., Asher, E.C., Dacey, J.W.H. Kranz, S., Young, J.N., Goldman, J. Ducklow, H., Grzymski, J. Stanley, R., Morel, F.M.M. (2014) Metabolic balance of coastal Antarctic waters revealed by autonomous high frequency pCO2 and dO2 /Ar measurements. Geophysical Research Letters DOI: 10.1002/2014GL061266

Methods & Sampling

Detailed description of methods are given in Tortell et al., 2014 (exerpt, pdf)

Data Processing Description

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date, reference information
- column names reformatted to comply with BCO-DMO standards
- changed second from 60 to 0 and incremented minute, hour, day, month by 1 as needed
- added lat and lon of PAL-LTER for mapping purposes

[table of contents | back to top]

Data Files

File
Palmer_surf_gas_fast.csv (Comma Separated Values (.csv), 56.54 MB) MD5:701eafbef301a32ee596905845a38c86 Primary data file for dataset ID 661954

[table of contents | back to top]

Parameters

Parameter	Description	Units
year	year of sampling	year
month	month of sampling	month
day	day of sampling	day
hour	UTC hour of sampling	hour
minute	UTC minute of sampling	minute
second	UTC second of sampling	second
yrday_utc	UTC day and decimal time:eg. 326.5 for the 326th day of the year or November 22 at 1200 hours (noon)	julian day and fraction of day
ISO_DateTime_UTC	date/Time (UTC) ISO formatted based on ISO 8601:2004(E) with format YYYY-mm-ddTHH:MM:SS[.xx]Z	year;month;day;hour;minute;second
delta_O2_Ar	biological O2 saturation: the percent deviation in the seawater O2/Ar ratio from air equilibrium; with Ar normalization used to remove physical (e.g. temperature dependent) effects on O2 saturation state"	dimensionless
pCO2	partial pressure of carbon dioxide (CO2)	parts per million (ppm)
DMS_nM	?dimethyl sulfide concentration	nanoMolar
BCO_DMO_comments	comments added by BCO-DMO pertaining to time formatting changes	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	CTD Sea-Bird SBE SEACAT 19plus
Dataset-specific Description	Depth profiles of temperature and salinity measurements
Generic Instrument Description	Self contained self powered CTD profiler. Measures conductivity, temperature and pressure in both profiling (samples at 4 scans/sec) and moored (sample rates of once every 5 seconds to once every 9 hours) mode. Available in plastic or titanium housing with depth ranges of 600m and 7000m respectively. Minature submersible pump provides water to conductivity cell.

Dataset-specific Instrument Name	
Generic Instrument Name	Membrane Inlet Mass Spectrometer
Dataset-specific Description	To measure dissolved gases
Generic Instrument Description	Membrane-introduction mass spectrometry (MIMS) is a method of introducing analytes into the mass spectrometer's vacuum chamber via a semipermeable membrane.

Dataset-specific Instrument Name	unfiltered seawater pump
Generic Instrument Name	Pump
Dataset-specific Description	Used to obtain seawater samples
Generic Instrument Description	A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps

[table of contents | back to top]

Deployments

Morel_PAL-LTER

Website	https://www.bco-dmo.org/deployment/662020
Platform	Palmer LTER
Start Date	2012-10-24
End Date	2013-03-27

[table of contents | back to top]

Project Information

The seasonal dynamics of CO2, primary production, and DMS in the Western Antarctic Peninsula: Measurements of pools and processes using mass spectrometry (Phytoplankton Seasonal Dynamics)

Coverage: Western Antarctic Peninsula, Palmer Station, LTER-PALMER sites A and B

Description from NSF award abstract:
The Southern Ocean plays a key role in marine biogeochemistry and global climate. Along the Western Antarctic Peninsula (WAP), winter air temperatures have increased by more than 5 ºC over the past five decades, and sea ice duration and extent have decreased substantially, leading to dramatic ecological perturbations. The sensitivity of primary production and climate-active gas cycling to on-going changes in the physical and chemical environment of the WAP is the key to understanding potential biogeochemical climate feedbacks in this region. The objective of this project is to characterize and understand the seasonal dynamics of primary production and climate-active gases carbon dioxide (CO2) and dimethylsulfide (DMS) in the WAP. The project will examine (1) the relationships among seasonal changes in pCO2, temperature and light with respect to gross primary production, net primary production, and net community production; (2) the extent to which changes in surface water pCO2 and temperature drive ecological shifts in the dominant phytoplankton species assemblage composition, and alter key processes in the DMS cycle. The research will employ membrane inlet mass spectrometry to monitor dissolved gases in ambient seawater at the Palmer Station LTER site and conduct physiological/biochemical assays with tracer compounds. The research will provide unprecedented information on the temporal evolution of primary production and dissolved gas concentrations in the WAP in relation to surface hydrography and sea ice cover. Field studies will be supported by laboratory experiments with model species subjected to detailed studies of carbon metabolism. This project will contribute significantly to the understanding of seasonal biogeochemical dynamics in a region that is particularly sensitive to ongoing climate perturbations and important for the global air-sea exchange of CO2.

Related publications:
Young, J.N., Goldman, J., Kranz, S., Tortell, P.D., Morel, F.M.M. (2015) Slow carboxylation of Rubisco constrains the rate of carbon fixation during Antarctic phytoplankton blooms. *New Phytologist* 205 (1): 172-181. DOI: 10.1111/nph.13021

Goldman, J., Kranz, S., Young, J.N.**,** Tortell, P.D., Bender, M., Morel, F.M.M. (2015) Gross and net production during the spring bloom along the Western Antarctic Peninsula *New Phytologist* 205 (1): 182-191. DOI: 10.1111/nph.13125

Kranz, S., Young, J.N., Goldman, J., Tortell, P.D., Bender, M., Morel, F.M.M. (2015) Low temperature reduces the energetic requirement for the CO_2 concentrating mechanism in diatoms. *New Phytologist* 205 (1): 192-201. DOI: 10.1111/nph.12976

Tortell, P.D., Asher, E.C., Dacey, J.W.H. Kranz, S., Young, J.N., Goldman, J. Ducklow, H., Grzymski, J. Stanley, R., Morel, F.M.M. (2014) Metabolic balance of coastal Antarctic waters revealed by autonomous high frequency pCO_2 and dO_2 /Ar measurements Geophysical Research Letters DOI: 10.1002/2014GL061266

[table of contents | back to top]

Funding

Funding Source	Award
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	PLR-1043593
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	PLR-1043559

[table of contents | back to top]