Data from GOVARS iRobot Seaglider AUV-SG-503 released off Ross Island near Cape Crozier, Southern Ross Sea; 2010-2011 (GOVARS project)

Website: https://www.bco-dmo.org/dataset/532643
Data Type: Other Field Results
Version: 1
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Project
» Seasonal Evolution of Chemical and Biological Variability in the Ross Sea (GOVARS)

Contributors	Affiliation	Role
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Abstract
Data from GOVARS iRobot Seaglider AUV-SG-503 released off Ross Island near Cape Crozier, Southern Ross Sea; 2010-2011. Temperature, salinity, oxygen, fluorescence, and optical backscatter data reported in 2-month deployment. The glider was released into the southern Ross Sea from Ross Island near Cape Crozier. The Southern Ross Sea, bounded by -77.436 and 169.517E, and extending to 76.109 and 175.099E; the glider made repeated short transects in a restricted area using a repeated bow-tie pattern.

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Coverage

Spatial Extent: **N**:-76.0905 **E**:179.9128 **S**:-77.4702 **W**:169.5168
Temporal Extent: 2010-11-29 - 2011-01-30

Dataset Description

These results were published in:
Kaufman et al. (2014): peer-reviewed paper describing the project and the physical-biological results.
Smith et al. (2014): peer-reviewed paper describing the results in conjunction with other ongoing projects in the area.
Quest et al. (2015): peer-reviewed paper describing the results of the oxygen dynamics.

All of the above have maps showing the study area and data.

Methods & Sampling

Latitude and longitude (parameter names lat and lon) were measured at the surface and linearly interpolated when the glider was at depth. Parameter name GPS value id indicates measurements while glider was at the surface (value = 1) or interpolated while diving (value = 0). No interpolation or smoothing was performed on other data.

Temperature and salinity (parameter names temp and sal): Temperature and salinity data were calculated using pre deployment calibration coefficients. A first-order lag correction was applied to raw measurements of temperature and conductivity (due to temperature latency). For each dive, out of range measurements and spikes (3 interquartile ranges above or below the median in windows of 15 contiguous measurements) were flagged and replaced with NaNs, which were repopulated by linear interpolation. Data were smoothed with an 11-point median filter. Parameters potemp and sigma_0 were calculated from the smoothed temp and sal datasets.

Dissolved oxygen, O2 (parameter name O2_cal): Oxygen data from the Aanderaa optode were corrected for time lags in oxygen and temperature. The resulting oxygen has an error of ±2 µmol kg-1.

Particulate backscattering coefficients, bbp (parameter names bbp470, bbp700): Backscattering digital counts were converted to at 117° by subtracting factory-provided dark counts and β multiplying by factory calibration scale factors.

Particulate organic carbon (POC) derived from bbp(700) (parameter name POC_bbp): The regression to convert ship downcast bbp at 700 nm to POC is: POC (mg C m-3) = 19607*bbp700 + 17.621; $R2 = 0.85$, $p < 0.01$. Because all backscatter sensors were cross calibrated with the ship CTD downcast, this regression was directly applied to glider bbp at 700 nm to compute glider POC.

Chlorophyll fluorescence (parameter names chl_raw): Chlorophyll fluorescence measured by glider ECOPuck BB2F was calibrated with discrete chlorophyll samples taken from calibration profiles. The regression was CHL = (FL -141)*0.00225 ($R2 = 0.94$, $p < 0.01$).

Data Processing Description

Data Processing: All data were analyzed for peaks and lost data, and if unexplained values were recorded, replaced by a smoothed average from +/- ten points above and below the spike. Sigma-T values are calculated using standard algorithms.

BCO-DMO Processing Notes
- Generated from original file: "SG503.csv" contributed by Walker Smith

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Data Files

File
GOVARS_SG503.csv (Comma Separated Values (.csv), 26.56 MB) MD5:27d7b0fbbdd4f56fb4fe63dde1540ad2 Primary data file for dataset ID 532643

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Related Publications

Kaufman, D. E., Friedrichs, M. A. M., Smith, W. O., Queste, B. Y., & Heywood, K. J. (2014). Biogeochemical variability in the southern Ross Sea as observed by a glider deployment. Deep Sea Research Part I: Oceanographic Research Papers, 92, 93–106. doi:10.1016/j.dsr.2014.06.011

Results

Queste, B. Y., Heywood, K. J., Smith, W. O., Kaufman, D. E., Jickells, T. D., & Dinniman, M. S. (2015). Dissolved oxygen dynamics during a phytoplankton bloom in the Ross Sea polynya. Antarctic Science, 27(4), 362–372. doi:10.1017/s0954102014000881 https://doi.org/10.1017/S0954102014000881
Results

Smith, W., Goetz, K., Kaufman, D., Queste, B., Asper, V., Costa, D., … Lee, C. (2014). Multiplatform, Multidisciplinary Investigations of the Impacts of Modified Circumpolar Deep Water in the Ross Sea, Antarctica. Oceanography, 2(2). doi:10.5670/oceanog.2014.36
Results

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Parameters

Parameter	Description	Units
dive_id	dive identification number	dimensionless
date	date (UTC) start of sampling	YYYYMMDD
julian_day_yr0	time when sample was taken in decimal days since Jan-0-0000	dimensionless
lat	latitude (South is negative)	decimal degrees
lon	longitude (West is negative)	decimal degrees
GPS_id	GPS value id; measurement taken while on surface (value=1) or interpolated while diving (value=0)	integer
depth	depth at which sample was taken	meters
temp	Temperature	degrees Celsius
potemp	Potential Temperature	degrees Celsius
sal	Salinity	dimensionless
sigma_0	potential density minus 1000	kilograms/meter^3
O2_cal	dissolved oxygen concentration measured from Aanderaa Optode 3830 oxygen sensor;	micromol/kilogram

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Instruments

Dataset-specific Instrument Name	Aanderaa Oxygen Optodes
Generic Instrument Name	Aanderaa Oxygen Optodes
Generic Instrument Description	Aanderaa Oxygen Optodes are instrument for monitoring oxygen in the environment. For instrument information see the Aanderaa Oxygen Optodes Product Brochure.

Dataset-specific Instrument Name	Druck PDCR 4020
Generic Instrument Name	Druck PDCR 4020 pressure sensor
Generic Instrument Description	The PDCR 4000 Series provides a complete range of mV output pressure transducers offering advanced levels of measurement accuracy stability and flexibility from a standard production device.

Dataset-specific Instrument Name	Seaglider
Generic Instrument Name	Seaglider
Generic Instrument Description	The Seaglider is an autonomous underwater vehicle developed through a collaboration between The Applied Physics Laboratory -University of Washington and the University of Washington School of Oceanography. These small, free-swimming vehicles can gather conductivity-temperature-depth (CTD) data from the ocean for months at a time and transmit it to shore in near-real time via satellite data telemetry. Seagliders make oceanographic measurements traditionally collected by research vessels or moored instruments. They can survey along a transect, profile at a fixed location, and can be commanded to alter their sampling strategies throughout a mission.

Dataset-specific Instrument Name	Wet Labs ECO Puck BB2F-VMG
Generic Instrument Name	Wet Labs ECO Puck BB2F-VMG
Generic Instrument Description	The ECO BB measures scattering at 117 degrees, the angle determined as a minimum convergence point for variations in the volume scattering function (VSF) induced by suspended materials and water itself. As a result, the signal measured by this meter is less determined by the type and size of the materials in the water and is more directly correlated to the concentration of the materials. Conversely, the meter provides unparalleled accuracy for any single-angle measurement in determining the optical backscattering coefficient: an important parameter for remote sensing and in many in-water bio-optical applications.

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Deployments

AUV-SG-503

Website	https://www.bco-dmo.org/deployment/529703
Platform	iRobot Seaglider
Start Date	2010-11-29
End Date	2011-01-30
Description	Southern Ross Sea, bounded by -77.436 and 169.517E, and extending to 76.109 and 175.099E; the glider made repeated short transects in a restricted area using a repeated bow-tie pattern

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Project Information

Seasonal Evolution of Chemical and Biological Variability in the Ross Sea (GOVARS)

Coverage: Southern Ross Sea, bounded by -77.436° and 169.517E°, and extending to -76.3403° and 180°

Extracted from the NSF award abstract:

This award is funded under the American Recovery and Reinvestment Act of 2009 (Public Law 111-5).

The Ross Sea is a highly productive area within the Southern Ocean, but it experiences substantial variability in both physical (temperature, ice concentrations, salinity, winds, and current velocities) and biogeochemical (chlorophyll, productivity, micronutrients, higher trophic level standing stocks, gases, etc.) conditions. Understanding the temporal and spatial oceanographic variations in physical forcing is essential to understanding the ecological functioning within the Ross Sea. There are a number of models of the physical oceanography of the Ross Sea that characterize the observed circulation. Unfortunately, data on the appropriate time scales (daily, monthly, seasonal, and interannual) to completely evaluate those models are lacking. The proposed research is a demonstration project to characterize the physical and biological oceanography of the southern Ross Sea using newly developed Glider technology to sample the region continuously through the growing season, to collect temperature, salinity, fluorescence, oxygen and optical transmission data. These field data will be used to assist in evaluation of an eddy-resolving ROMS-based coupled circulation-biological model, and, along with satellite ocean color information, will be assimilated into an ecosystem model. Data assimilation techniques will reduce the model uncertainties of the circulation and food webs of the region. The intellectual merit of this effort arises from the combination of field-based investigations using a novel technology (one that is far more cost-effective than ship-based studies) with state-of-the-art biological-physical models and advanced data assimilation techniques. The research will provide new insights into the complex oceanographic phenomena of the Antarctic continental shelves and is a novel method of continuing the studies of the southern Ross Sea. Broader impacts of the proposed research include training of graduate and undergraduate students and partnership with several ongoing outreach programs dealing with scientific research in the Southern Ocean. At least 2 graduate students will be supported by this research, and it will be a critical component of a variety of outreach programs in Virginia, including a High School Marine Science Day, Boy and Girl Scout education, and middle school curriculum improvement. The investigators also will create a web site to foster immediate release of the data collected by the glider, and seek a linkage with schools at various levels (middle, high school and Universities) that potentially could incorporate the data into classroom activities

Related files:
1. Kaufman et al. (2014): peer-reviewed paper describing the project and the physical-biological results (kaufman et al. 2014 DSR.pdf)
2. Smith et al. (2014): peer-reviewed paper describing the results in conjunction with other ongoing projects in the area (smith et al. 2014 oceanogr.pdf)
3. Quest et al. (2014): peer-reviewed paper (in press) describing the results of the oxygen dynamics (quest et al. 2014 ant sci.pdf)

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Funding

Funding Source	Award
NSF Antarctic Sciences (NSF ANT)	ANT-0838980

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