Bottle data including phosphate, nitrate, total nitrite and nitrate, ammonium, silicate, chlorophyll, particulate organic carbon and nitrogen (POC, PON), and biogenic silica from multiple cruises to the southern Ross Sea, 2001-2006 (IVARS project)

Website: https://www.bco-dmo.org/dataset/710112
Data Type: Cruise Results
Version: 1
Version Date: 2017-07-28

Project
» Interannual Variability in the Antarctic-Ross Sea (IVARS): Nutrients and Seasonal Production (IVARS)

Contributors	Affiliation	Role
Smith, Walker O.	Virginia Institute of Marine Science (VIMS)	Principal Investigator
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
The IVARS project was a field effort to document the interannual variations in surface chemical and biological properties in the southern Ross Sea. In involved placed sediment traps and moorings at two sites, and completing hydrographic analyses between the two locations.

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Coverage

Spatial Extent: **N**:-74.9643 **E**:180 **S**:-77.9893 **W**:166.3218
Temporal Extent: 2001-12-19 - 2006-02-01

Methods & Sampling

All methods were standard JGOFS procedures (nutrients, particulate matter concentrations). Nutrient samples were frozen and returned to the US for analyses; chlorophyll determinations were completed at sea using fluorometry. Particulate organic carbon/nitrogen samples were filtered, dried at 60C, and returned to the US for analysis on an elemental analyzer. Complete details can be found in Smith et al. (2006, 2011a,b).

Data Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date

- modified parameter names to conform with BCO-DMO naming conventions
- reformatted date so all seasons are same: mm/dd/yyyy
- reformatted time to HHMM from HMM
- added column 'season'

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Data Files

File
bottle.csv (Comma Separated Values (.csv), 159.16 KB) MD5:16820f8d098690c460aa9967162f7011 Primary data file for dataset ID 710112

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Related Publications

Smith Jr, W. O., Shields, A. R., Peloquin, J. A., Catalano, G., Tozzi, S., Dinniman, M. S., & Asper, V. A. (2006). Interannual variations in nutrients, net community production, and biogeochemical cycles in the Ross Sea. Deep Sea Research Part II: Topical Studies in Oceanography, 53(8-10), 815-833. https://doi.org/10.1016/j.dsr2.2006.02.014
Methods

Smith, W. O., Asper, V., Tozzi, S., Liu, X., & Stammerjohn, S. E. (2011). Surface layer variability in the Ross Sea, Antarctica as assessed by in situ fluorescence measurements. Progress in Oceanography, 88(1-4), 28–45. doi:10.1016/j.pocean.2010.08.002
Methods

Smith, W. O., Shields, A. R., Dreyer, J. C., Peloquin, J. A., & Asper, V. (2011). Interannual variability in vertical export in the Ross Sea: Magnitude, composition, and environmental correlates. Deep Sea Research Part I: Oceanographic Research Papers, 58(2), 147–159. doi:10.1016/j.dsr.2010.11.007
Results

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Parameters

Parameter	Description	Units
season	season of sampling	unitless
Station	station identifier	unitless
Date_GMT	UTC date formatted as mm/dd/yyyy	unitless
Time_GMT	UTC time formatted as HHMM	unitless
Latitude	latitude; north is positive	decimal degrees
Longitude	longitude; east is postivie	decimal degrees
Depth	sample depth	meters
PO4	Phosphate concentration	microMolar
NO2	Nitrite concentration	microMolar
NO2_NO3	Nitrite and nitrate concentration	microMolar
NH4	Ammonium concentration	microMolar
SiOH4	Silicate concentration	microMolar
Chl	Chlorophyll concentration	milligrams/cubic meter
POC	Particulate Organic Carbon concentration	milligrams/cubic meter
PON	Particulate Organic Nitrogen concentration	microMolar
BSi	biogenic silica concentration	microMolar

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	CTD - profiler
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.

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Deployments

Ross_Sea_2001-2006_Smith

Website	https://www.bco-dmo.org/deployment/710087
Platform	Unknown Vessel
Start Date	2001-12-24
End Date	2006-01-30
Description	A series of cruises to the southern Ross Sea that used either the USCGC Polar Star, USCGC Polar Sea, or the N.B. Palmer.

IVARS_cruises

Website	https://www.bco-dmo.org/deployment/770343
Platform	USCGC Polar Star
Start Date	2001-12-20
End Date	2005-02-01

NBP0601A

Website	https://www.bco-dmo.org/deployment/838309
Platform	RVIB Nathaniel B. Palmer
Start Date	2006-01-30
End Date	2006-02-02
Description	IVARS cruise

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Project Information

Interannual Variability in the Antarctic-Ross Sea (IVARS): Nutrients and Seasonal Production

(IVARS)

Coverage: Southern Ross Sea

NSF Award Abstract:
During the past few decades of oceanographic research, it has been recognized that significant variations in biogeochemical processes occur among years. Interannual variations in the Southern Ocean are known to occur in ice extent and concentration, in the composition of herbivore communities, and in bird and marine mammal distributions and reproductive success. However, little is known about the interannual variations in production of phytoplankton or the role that these variations play in the food web. This project will collect time series data on the seasonal production of phytoplankton in the southern Ross Sea, Antarctica. Furthermore, it will assess the interannual variations of the production of the two major functional groups of the system, diatoms and Phaeocystis Antarctica, a colonial haptophyte. The Ross Sea provides a unique setting for this type of investigation for a number of reasons. For example, a de facto time-series has already been initiated in the Ross Sea through the concentration of a number of programs in the past ten years. It also is well known that the species diversity is reduced relative to other systems and its seasonal production is as great as anywhere in the Antarctic. Most importantly, seasonal production of both the total phytoplankton community (as well as its two functional groups) can be estimated from late summer nutrient profiles. The project will involve short cruises on the US Coast Guard ice breakers in the southern Ross Sea that will allow the collection of water column nutrient and particulate after data at specific locations in the late summer of each of five years. Additionally, two moorings with in situ nitrate analyzers moored at fifteen will be deployed, thus collecting for the first time in the in the Antarctic a time-series of euphotic zone nutrient concentrations over the entire growing season. All nutrient data will be used to calculate seasonal production for each year in the southern Ross Sea and compared to previously collected information, thereby providing an assessment of interannual variations in net community production. Particulate matter data will allow us to estimate the amount of export from the surface layer by late summer, and therefore calculate the interannual variability of this ecosystem process. Interannual variations of seasonal production (and of the major taxa of producers) are a potentially significant feature in the growth and survival of higher trophic levels within the food web of the Ross Sea. They are also important in order to understand the natural variability in biogeochemical processes of the region. Because polar regions such as the Ross Sea are predicted to be impacted by future climate change, biological changes are also anticipated. Placing these changes in the context of natural variability is an essential element of understanding and predicting such alterations. This research thus seeks to quantify the natural variability of an Antarctic coastal system, and ultimately understand its causes and impacts on food webs and biogeochemical cycles of the Ross Sea.

Related publications:
Smith, W.O., Jr., M.S. Dinniman, J.M. Klinck, and E. Hofmann. 2003. Biogeochemical climatologies in the Ross Sea, Antarctica: seasonal patterns of nutrients and biomass. **Deep-Sea Res. II** 50: 3083-3101.

Smith, W.O., Jr., A.R. Shields, J.A. Peloquin, G. Catalano, S. Tozzi, M.S. Dinniman and V.A. Asper. 2006. Biogeochemical budgets in the Ross Sea: variations among years. **Deep-Sea Res. II** 53: 815-833.

Tremblay, J.-E. and *W.O. Smith, Jr.* 2007. Phytoplankton processes in polynyas. In: Polynyas: Windows to the World's Oceans (W.O. Smith, Jr. and D.G. Barber, eds.), Elsevier, Amsterdam, Pp. 239-270.

Smith, W.O. Jr. and D.G. Barber (Eds.). 2007. Polynyas: Windows to the World's Oceans. Elsevier, Amsterdam. 437 pp.

Smith, W.O. Jr. and D.G. Barber. 2007. Polynyas and climate change: a view to the future. In: Polynyas: Windows to the World's Oceans (W.O. Smith, Jr. and D.G. Barber, eds.), Elsevier, Amsterdam, Pp. 409-417.

Smith, W.O. Jr., D.G. Ainley and R. Cattaneo-Vietti. 2007. Trophic interactions within the Ross Sea continental shelf ecosystem. **Phil. Trans. Roy. Soc., ser. B** 362: 95-111.

Peloquin, J. A., and *W. O. Smith, Jr.* 2007. Phytoplankton blooms in the Ross Sea, Antarctica: Interannual variability in magnitude, temporal patterns, and composition. **J. Geophys. Res.** 112: C08013, doi:10.1029/2006JC003816.

Smith, W.O. Jr. and J.C. Comiso. 2009. Southern Ocean primary productivity: variability and a view to the future. In *Smithsonian at the Poles: Contributions to International Polar Year Science* (I. Krupnik, M.A. Lang, and S.E. Miller, Eds.), Smithsonian Inst. Scholarly Press, Washington, D.C., pp. 309-318.

Smith, W.O. Jr., M. Dinniman, G.R. DiTullio, S. Tozzi, O. Mangoni, M. Modigh and V. Saggiomo. 2010. Phytoplankton photosynthetic pigments in the Ross Sea: Patterns and relationships among functional groups. **J. Mar. Systems** 82: 177-185.

Smith, W.O. Jr., V. Asper, S. Tozzi, X. Liu and S.E. Stammerjohn. 2011a. Surface layer variability in the Ross Sea, Antarctica as assessed by in situ fluorescence measurements. **Prog. Oceanogr.** 88: 28-45 (doi: 10.1016/j.pocean.2010.08.002).

Smith, W.O. Jr., A.R. Shields, J. Dreyer, J.A. Peloquin and V. Asper. 2011b. Interannual variability in vertical export in the Ross Sea: magnitude, composition, and environmental correlates. **Deep-Sea Res. I** 58: 147-159.

Liu, X. and *W.O. Smith, Jr.* 2012. A statistical analysis of the controls on phytoplankton distribution in the Ross Sea, Antarctica. **J. Mar. Systems** 94: 135-144.

Smith, W.O. Jr., P.N. Sedwick, K.R. Arrigo, D.G. Ainley, and A.H. Orsi. 2012. The Ross Sea in a sea of change. **Oceanography** 25: 44-57.

Peloquin, J., C. Swan, N. Gruber, M. Vogt, H. Claustre, J. Ras, J. Uitz, J-C. Marty, R. Barlow, M. Behrenfeld, R. Bidigare, H. Dierssen, G. DiTullio, E. Fernandez, C. Gallienne, S. Gibb, R. Goericke, L. Harding, E. Head, P. Holligan, S. Hooker, D. Karl, T. Knap, M. Landry, R. Letelier, C.A. Llewellyn, M. Lomas, M. Lucas, A. Mannino, J.-C. Marty, B. G. Mitchell, F. Müller-Karger, N. Nelson, C. O'Brien, B. Prezelin, D. Repeta, *W. O. Smith, Jr.,* D. Smythe-Wright, R. Stumpf, A. Subramaniam, K. Suzuki, C. Trees, M. Vernet, K. Wasmund, and S. Wright. 2014. The MAREDAT global database of high performance liquid chromatography marine pigment measurements. **Earth System Science Data** 5: 109-123.

Smith, W.O. Jr., D.G. Ainley, K.R. Arrigo, and M.S. Dinniman. 2014. The oceanography and ecology of the Ross Sea. **Annu. Rev. Mar. Sci.** 6: 469-487.

Smith, W.O., Jr. and K. Donaldson. 2015. Photosynthesis-irradiance responses in the Ross Sea, Antarctica: a meta-analysis. **Biogeosciences** 12: 1-11.

Asper, V.L. and *W.O. Smith, Jr.* Variations in the abundance and distribution of aggregates in the Ross Sea, Antarctica. **Deep-Sea Res. I** (submitted).

Smith, W.O., Jr. and D.E. Kaufman. Particulate organic carbon climatologies in the Ross Sea: evidence for seasonal acclimations within phytoplankton. **Prog. Oceanogr.** (submitted).

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Funding

Funding Source	Award
NSF Division of Polar Programs (NSF PLR)	PLR-0087401

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