Discrete fluorometric chlorophyll-a data from RVIB Nathaniel B. Palmer NBP1005 in the Amundsen Sea, Southern Ocean 73 S 115 W from 2010-2011 (ASPIRE project)

Website: https://www.bco-dmo.org/dataset/546372
Version: 29 January 2015
Version Date: 2015-01-29

Project
» Amundsen Sea Polynya International Research Expedition (ASPIRE)

Contributors	Affiliation	Role
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Methods & Sampling

Seawater samples collected from Niskin bottles were filtered over 25 mm Whatman GF/F filters under low vacuum pressure, extracted overnight at 4C in 5mL 90% acetone and analyzed on a Turner Model 10AU fluorometer before and after acidification. The fluorometer was calibrated with pure chlorophyll a from Sigma.

Data Processing Description

BCO-DMO Processing Notes
- Generated from original file "ASPIRE_chlorophyll.xls" contributed by Gert van Dijken
- Parameter names edited to conform to BCO-DMO naming convention found at Choosing Parameter Name
- Local Date reformatted to YYYYMMDD
- Chl_a data displayed to 2 decimal places

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Data Files

File
Chlorophyll_a.csv (Comma Separated Values (.csv), 12.46 KB) MD5:4294b9e88c6c6c668b066282ed6b7c08 Primary data file for dataset ID 546372

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Parameters

Parameter	Description	Units
Bottle_Number	Bottle Number	text
Event	Event	dimensionless
Station	Station	dimensionless
Local_Date	Local Date	YYYYMMHH
Local_Time	Local Time	HHMM
Year_Day_GMT	Year Day GMT	integer
Time_GMT	Time GMT	HHMM
Latitude	Latitude	decimal degrees
Longitude	Longitude	decimal degrees
Chl_a	Chl a	ug/L

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Instruments

Dataset-specific Instrument Name	CTD SBE 911plus
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	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	Turner Fluorometer -10AU
Generic Instrument Name	Turner Designs Fluorometer 10-AU
Dataset-specific Description	Seawater samples collected from Niskin bottles were filtered over 25 mm Whatman GF/F filters under low vacuum pressure, extracted overnight at 4C in 5mL 90% acetone and analyzed on a Turner Model 10AU fluorometer before and after acidification. The fluorometer was calibrated with pure chlorophyll a from Sigma.
Generic Instrument Description	The Turner Designs 10-AU Field Fluorometer is used to measure Chlorophyll fluorescence. The 10AU Fluorometer can be set up for continuous-flow monitoring or discrete sample analyses. A variety of compounds can be measured using application-specific optical filters available from the manufacturer. (read more from Turner Designs, turnerdesigns.com, Sunnyvale, CA, USA)

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Deployments

NBP1005

Website	https://www.bco-dmo.org/deployment/58154
Platform	RVIB Nathaniel B. Palmer
Start Date	2010-11-26
End Date	2011-01-16
Description	Expedition by the USAP RV Nathaniel B. Palmer during austral summer 2010-11 to sampled the Amundsen Sea Polynya during the Amundsen Sea Polynya International Research Expedition (ASPIRE). Also identified as OSO 2010-11 (Oden Southern Ocean – two vessel operation 2010-11) The US Research Icebreaker Nathaniel B. Palmer was joined by the Swedish Icebreaker Oden for a two-vessel expedition to the Amundsen Sea. Scientists on the Palmer focused on understanding the climate-sensitive dynamics of the open water region, known as a "polynya." Oden scientists investigated the sea ice ecosystem nearby. The aim of both groups was to improve our understanding of how climate change will impact this important ecosystem. Note R2R Link takes user to Marine Geoscience Data System (MGDS): NBP1005 NBP1005A Data at MGDS were available as NBP1005 and NBP1005A. The data are from the same expedition and are combined in BCO-DMO into the one deployment - NBP1005. Nathaniel B. Palmer Systems and Specifications

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Project Information

Amundsen Sea Polynya International Research Expedition (ASPIRE)

Website: http://AntarcticASPIRE.org/

Coverage: Amundsen Sea, South Pacific Sector of Antarctica, Southern Ocean 73 S 115 W

The Amundsen Sea Polynya is areally the most productive Antarctic polynya, exhibits higher chlorophyll levels during peak bloom and greater interannual variability than the better-studied Ross Sea Polynya ecosystem. Polynyas may be the key to understanding the future of polar regions as their extent is expected to increase with anthropogenic warming. The project will examine 1) sources of iron to the Amundsen Sea Polynya as a function of climate forcing, 2) phytoplankton community structure in relation to iron supply and mixed-layer depths, 3) the efficiency of the biological pump of carbon to depth and 4) the net flux of carbon as a function of climate and micronutrient forcing. The research also will compare results for the Amundsen Sea to existing data synthesis and modeling efforts for the Palmer LTER and Ross Sea. The project will 1) build close scientific collaborations between US and Swedish researchers; 2) investigate climate change implications with broad societal relevance; 3) train new researchers; 4) encourage participation in research science by underrepresented groups, and 5) involve broad dissemination of results via scientific literature and public outreach, including close interactions with NSF-supported PolarTrec and COSEE K-12 teachers.

This project brings together experienced US and Swedish investigators (trace metal and carbon chemists, phytoplankton physiologists, microbial and zooplankton ecologists, and physical oceanographers) to investigate climate controls on carbon dioxide uptake by one of the most productive ecosystems in the Antarctic.

The Amundsen Sea Polynya is the most productive Antarctic polynya per square meter, and exhibits higher chlorophyll levels during peak bloom and greater interannual variability than the better-studied Ross Sea polynya ecosystem to the west.

Polynyas, or recurring areas of seasonally open water surrounded by ice, are foci for energy and material transfer between the atmosphere, polar surface ocean and deep sea. Most help take up large amounts of carbon dioxide from the atmosphere.

These polar ecosystems are characterized by high biological productivity and intense biogeochemical cycling - a bit like an oasis. Polynyas may be the key to understanding the future of polar regions since their extent is expected to increase with anthropogenic warming. On the other hand, if seasonal sea ice disappears completely, the unique nature of polynyas may also be lost.

Regional reductions or growth in sea-ice over the past decade have been extensive and are coupled to climate-sensitive global cycles such as ENSO and the Southern Annular Mode. Without many historical measurements, this regional and interannual variability is our best present-day indication for what controls or “forces” these critical polar ecosystems and their sensitivity to future change.

Variability in the productivity of Antarctic polynyas is high for reasons the science community do not currently understand. The supply of trace metals such as iron is thought to determine phytoplankton community structure and production in the Southern Ocean, particularly in conjunction with mixed-layer depth controls on light limitation. A key question is whether interannual variability is driven by these two climate-sensitive factors, and whether we can expect climate-sensitive shifts in ecosystem function and carbon flux in the future. Understanding critical feedbacks between climate and the marine biosphere becomes increasingly urgent as we project rates of change into the future.

Special ASPIRE journal feature in ELEMENTA

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Funding

Funding Source	Award
NSF Antarctic Sciences (NSF ANT)	ANT-0944727

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