Microbial Biomass and Productivity from ARSV Laurence M. Gould, RVIB Nathaniel B. Palmer LMG0402, NBP0606 in the Southern Drake Passage and Scotia Sea from 2004-2006 (BWZ project)

Website: https://www.bco-dmo.org/dataset/3477
Version: 10 May 2011
Version Date: 2011-05-10

Project
» Blue Water Zone (BWZ)

Contributors	Affiliation	Role
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Dataset Description

Microbial Biomass and Productivity

One component of a Biological dataset collected from Southern Drake Passage and Scotia Sea

Ocean biology data were collected in Southern Drake Passage and Scotia Sea during two research cruises supported by NSF awards. These two cruises, namely LMG0402 and NBP0606, were conducted during Feb. to March 2004 and Jul. to Aug 2006, respectively. Dataset includes concentration of pigments in phytoplankton, particulate organic matter concentration, macronutrients, primary productivity and microbial biomass and productivity

As part of the data collection from the collaborative research, this dataset was for the study of plankton community structure and their response to the distribution and natural variability of dissolved iron in Southern Drake Passage and Scotia Sea

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Data Files

File
Bacteria.csv (Comma Separated Values (.csv), 13.84 KB) MD5:fe4cb9a04cba4ef14b16b0533d3ad633 Primary data file for dataset ID 3477

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Parameters

Parameter	Description	Units
cruise_id	Cruise name	text
cast_id	identification of CTD/TMC cast	text
date	Date (GMT)	YYYYMMDD
time	Time (GMT)	HHMM
lat	Station latitude (South is negative)	decimal degrees
lon	Station longitude (West is negative)	decimal degrees
depth	Depth where sample taken	meters
Bact_abund	Abundance of bacteria; Bacteria	per ml
Bact_prod	productivity of bacteria; Bacteria	mgC l-1 d-1

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Deployments

LMG0402

Website	https://www.bco-dmo.org/deployment/58666
Platform	ARSV Laurence M. Gould
Report	http://bcodata.whoi.edu/BWZ/071126_2007_Report_Mitchell_0444134.pdf
Start Date	2004-02-13
End Date	2004-03-23

NBP0606

Website	https://www.bco-dmo.org/deployment/57976
Platform	RVIB Nathaniel B. Palmer
Start Date	2006-07-01
End Date	2006-08-15
Description	NBP (Nathaniel B. Palmer) R/V Nathaniel B. Palmer July2006: The research was conducted in the same region of the Drake Passage as the AMLR cruise. Samples were obtained aboard the R/V Nathaniel B. Palmer Lat/Lon bounding box -60.4991Lat, -58.5613Lon -62.3599Lat, -58.0392Lon -60.2783Lat, -57.4509Lon -61.2683Lat, -54.2852Lon

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Project Information

Blue Water Zone (BWZ)

Coverage: Antarctica, Drake Passage, N: -52.6061, S: -65.1877 , E: -52.965, W: -68.325

NSF Proposal Title: Collaborative Research: Plankton Community Structure and Iron Distribution in the Southern Drake Passage and Scotia Sea

The Shackleton Fracture Zone (SFZ) in Drake Passage of the Southern Ocean defines a boundary between low and high phytoplankton waters. Low chlorophyll water flowing through the southern Drake Passage emerges as high chlorophyll water to the east, and recent evidence indicates that the Southern Antarctic Circumpolar Current Front (SACCF) is steered south of the SFZ onto the Antarctic Peninsula shelf where mixing between the water types occurs. The mixed water is then advected off-shelf with elevated iron and phytoplankton biomass. The SFZ is therefore an ideal natural laboratory to improve the understanding of plankton community responses to natural iron fertilization, and how these processes influence export of organic carbon to the ocean interior. The bathymetry of the region is hypothesized to influence mesoscale circulation and transport of iron, leading to the observed patterns in phytoplankton biomass. The position of the Antarctic Circumpolar Current (ACC) is further hypothesized to influence the magnitude of the flow of ACC water onto the peninsula shelf, mediating the amount of iron transported into the Scotia Sea. To address these hypotheses, a research cruise will be conducted near the SFZ and to the east in the southern Scotia Sea. A mesoscale station grid for vertical profiles, water sampling, and bottle incubation enrichment experiments will complement rapid surface surveys of chemical, plankton, and hydrographic properties. Distributions of manganese, aluminum and radium isotopes will be determined to trace iron sources and estimate mixing rates. Phytoplankton and bacterial physiological states (including responses to iron enrichment) and the structure of the plankton communities will be studied. The primary goal is to better understand how plankton productivity, community structure and export production in the Southern Ocean are affected by the coupling between bathymetry, mesoscale circulation, and distributions of limiting nutrients. The proposed work represents an interdisciplinary approach to address the fundamental physical, chemical and biological processes that contribute to the abrupt transition in chl-a which occurs near the SFZ. Given recent indications that the Southern Ocean is warming, it is important to advance the understanding of conditions that regulate the present ecosystem structure in order to predict the effects of climate variability. This project will promote training and learning across a broad spectrum of groups. Funds are included to support postdocs, graduate students, and undergraduates. In addition, this project will contribute to the development of content for the Polar Science Station website, which has been a resource since 2001 for instructors and students in adult education, home schooling, tribal schools, corrections education, family literacy programs, and the general public.

PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH

Hewes, C. D., Reiss, C.S., .Kahru, M. , Mitchell, B.G. , and Holm-Hansen, O.. "Control of phytoplankton biomass by dilution and mixed layer depth in the western Weddell-Scotia Confluence (WSC)," Marine Ecology Progress Series, v.366, 2008, p. 15.

Hiscock, M. , Lance, V. , Apprill, A., Bidigare, R , Mitchell, B., Smith Jr. W., Barber, R.. "Photosynthetic maximum quantum yield increases are an essential component of the Southern Ocean phytoplankton response to iron," Proceedings of the National Academy of Sciences, v.105(2), 2008, p. 4775.

Holm-Hansen, O., Kahru, M., Hewes, C.. "Deep chlorophyll a maxima (DCMs) in pelagic Antarctic waters. II. Relation to bathymetric features and dissolved iron concentrations," Marine Ecology-Progress Series, v.297, 2005, p. 71.

Hopkinson, B., Mitchell, B. G., Reynolds, R. A., Wang, H., Selph, K., Measures, C., Hewes, C., Holm-Hansen, O., Barbeau, K.. "Iron limitation Across Chlorophyll Gradients in the Southern Drake Passage: Phytoplankton Responses to Iron Addition and Photosynthetic Indicators of Iron Stress," Limnology and Oceanography, 2007, p. 2540.

Hopkinson, B., Mitchell, B. G., Reynolds, R. A., Wang, H., Selph, K., Measures, C., Hewes, C., Holm-Hansen, O., Barbeau, K.. "Iron limitation Across Chlorophyll Gradients in the Southern Drake Passage: Phytoplankton Responses to Iron Addition and Photosynthetic Indicators of Iron Stress," Limnology and Oceanography, v.52, 2007, p. 2540.

Kahru, M., Mitchell, B. G., Gille, S. T., Hewes, C. D. and Holm-Hansen, O.. "Eddies enhance biological production in the Weddell-Scotia Confluence of the Southern Ocean," Geophys. Res. Let., 34,, v.24, 2007, p. L14603.

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Funding

Funding Source	Award
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