

Ice core bacteria data from RVIB Nathaniel B. Palmer and ARSV Laurence M. Gould cruises NBP0104, LMG0106, NBP0204, and LMG0205 in the Southern Ocean from 2001-2002 (SOGLOBEC project; Sea Ice Microbes project)

Website: <https://www.bco-dmo.org/dataset/2348>

Data Type: Cruise Results

Version: 1

Version Date: 2003-12-03

Project

- » [U.S. GLOBEC Southern Ocean](#) (SOGLOBEC)
- » [GLOBEC: Sea Ice Microbial Communities](#) (Sea Ice Microbes)

Programs

- » [U.S. GLOBal ocean ECosystems dynamics](#) (U.S. GLOBEC)
- » [U.S. GLOBal ocean ECosystems dynamics](#) (U.S. GLOBEC)

Contributors	Affiliation	Role
Fritsen, Chris H.	Desert Research Institute (DRI)	Principal Investigator
Allison, Dicky	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract

Ice core bacteria data from RVIB Nathaniel B. Palmer and ARSV Laurence M. Gould cruises NBP0104, LMG0106, NBP0204, and LMG0205 in the Southern Ocean from 2001-2002 (SOGLOBEC project; Sea Ice Microbes project)

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Acquisition Description](#)
 - [Processing Description](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Program Information](#)
- [Funding](#)

Coverage

Spatial Extent: N:-65.62 E:-65.61 S:-69.25 W:-76.781

Temporal Extent: 2001-07-28 - 2002-09-07

Dataset Description

Bacteria Abundance, Biomass and Chlorophyll *a* in Ice Cores

NOTES:

NBP0104: Cores labelled with "DNA" were collected for DNA analysis.

Contributor:

Dr. Christian Fritsen
University and Community College System of Nevada
Desert Research Institute
Div. of Earth and Ecosystem Sciences
2215 Raggio Parkway
Reno, NV 89512

Office: 775/673-7487

BG 235 - Methods used for chlorophyll *a* (chl_a) analysis and bacteria biomass determination

Core Sampling techniques:

Sampling methods for recovery of chlorophyll *a* and bacteria from sea ice cores follows those described in:

Garrison, D.L. and K.R. Buck(1986), Organism losses during ice melting: a serious bias in sea ice community studies. *Polar Biol.*, **6**:237-239.

Recommendations for reporting were used as outlined by:

Horner, R. *et al.*,(1992), Ecology of Sea Ice Biota. I: Habitat, Terminology and Methodology. *Polar Biol.* **12**:417-427

Analytic Techniques:

Chla (mg m^{-3}):

- determined fluorometrically (Turner Designs 10AU Fluorometer) following extraction in 90% acetone (Parsons *et al.*, 1984)
- ice core chla corrected to account for chla in filtered sea water (FSW) added to core sections during melting

Bacteria cell abundance (cells m^{-3}) and biomass (mg C m^{-3}):

LMG 0106

- preserved (0.5% glutaraldehyde) samples stained with 4',6-diamidino-2-phenylindole (DAPI; 0.1 to 0.3% final concentration), filtered through 0.2 mm black, polycarbonate membrane filters, and mounted onto glass microscope slides on the ship (within 24 hours following collection)
- bacteria enumerated using epifluorescence microscopy and sized using digital images taken with Image Pro Plus
- bacteria biomass determined using cell abundance, cell biovolume (BV ; mm^3 ; as determined from mean length and width measurements), and an allometric conversion factor for bacterial carbon per volume specific for DAPI-stained bacteria (cellular carbon = $218 \times \text{BV}^{0.86}$; Loferer-Kribacher *et al.*, 1998).
- ice core samples corrected for FSW dilution

NBP 0104

- preserved (0.5% glutaraldehyde) samples stained with Sybri Gold (0.01% final concentration), filtered through 0.2 mm Anodisc filters (Whatman), and mounted onto glass microscope slides at home institution (~1-2 months following collection)
- bacteria enumerated using epifluorescence microscopy and sized using digital images taken with Image Pro Plus
- bacteria biomass determined using cell abundance, cell biovolume (BV ; mm^3), and an allometric conversion factor for bacterial carbon per volume specific for Acridine Orange-stained bacteria (cellular carbon = $89.9 \times \text{BV}^{0.59}$; Simon and Azam, 1989). Note: an AO-specific carbon per volume conversion factor was used in calculating biomass in Sybri Gold-stained samples because both AO and Sybri Gold stain bacteria cells similarly relative to DAPI (unpublished data).
- ice core samples corrected for FSW dilution

Loferer-Kribacher, M., Klima, J., and R. Psenner. 1998. Determination of bacterial cell dry mass by transmission electron microscopy and densitometric image analysis. *Applied and Environmental Microbiology*. 64:688-694.

Parsons, T.R., Maita, Y., and C.M. Lalli. 1984. A manual of chemical and biological methods for seawater analysis. Pergamon Press. Elmsford, New York.

Simon, M., and F. Azam. 1989. Protein content and protein synthesis rates of planktonic marine bacteria. *Marine Ecology Progress Series*. 51, 201-213.

updated: April 20, 2006

Acquisition Description

Sampling methods for recovery of chlorophyll *a* and bacteria from sea ice cores follows those described in:

Garrison, D.L. and K.R. Buck(1986), Organism losses during ice melting: a serious bias in sea ice community studies. *Polar Biol.*, **6**:237-239.

Recommendations for reporting were used as outlined by:

Horner, R. *et al.*, (1992), Ecology of Sea Ice Biota. I: Habitat, Terminology and Methodology. *Polar Biol.* **12**:417-427

```
# Ice core bacteria data from Southern Ocean GLOBEC
# C. Fritsen and F. Stewart
#      * BactAbun = bacterial abundance = cells m-3
#      * BactBio = bacterial biomass = mg C m-3 = ug C l-1
#      * chl a = mg chl a m-3 = ug chl a l-1
#      * sect_top_depth = depth(m) at top of core section
```

Processing Description

Sampling methods for recovery of chlorophyll *a* and bacteria from sea ice cores follows those described in:

Garrison, D.L. and K.R. Buck(1986), Organism losses during ice melting: a serious bias in sea ice community studies. *Polar Biol.*, **6**:237-239.

Recommendations for reporting were used as outlined by:

Horner, R. *et al.*,(1992), Ecology of Sea Ice Biota. I: Habitat, Terminology and Methodology. *Polar Biol.* **12**:417-427

LMG 0106

- preserved (0.5% glutaraldehyde) samples stained with 4',6-diamidino-2-phenylindole (DAPI; 0.1 to 0.3% final concentration), filtered through 0.2 mm black, polycarbonate membrane filters, and mounted onto glass microscope slides on the ship (within 24 hours following collection)
- bacteria enumerated using epifluorescence microscopy and sized using digital images taken with Image Pro Plus
- bacteria biomass determined using cell abundance, cell biovolume (BV; mm³; as determined from mean length and width measurements), and an allometric conversion factor for bacterial carbon per volume specific for DAPI-stained bacteria (cellular carbon = 218 X BV^{0.86}; Loferer-Kribacher *et al.*, 1998).
- ice core samples corrected for FSW dilution

LMG0106: "a" "b" "c" labels appended to core numbers denote replicate cores.
" (1) " " (2) " " (3) " labels appended to core numbers denote different

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
cruiseid	cruise identification	
year	year	
station	station identification	
event	event number from event log	
month_gmt	month of year	GMT
day_gmt	day of month	GMT
lat	latitude, negative = South	decimal degrees
lon	longitude, negative = West	decimal degrees
core_no	ice core number/identification	
sect_top_depth	top depth of ice core interval sampled	decimal meters
sect_bot_depth	bottom depth of ice core interval sampled	decimal meters
bact_abun	bacteria abundance	cells/meter ³
bact_biomass_C	bacteria carbon biomass	milligrams C/meter ³
chl_a_ugm	total chlorophyll a pigment concentration	micrograms/liter
yday_gmt		GMT

[[table of contents](#) | [back to top](#)]

Instruments

Dataset-specific Instrument Name	IceCoring
Generic Instrument Name	Ice Corer
Dataset-specific Description	Ice Cores used to collect Bacteria Abundance, Biomass and Chlorophyll a data
Generic Instrument Description	An ice corer is used to drill into deep ice and remove long cylinders of ice from which information about the past and present can be inferred. Polar ice cores contain a record of the past atmosphere - temperature, precipitation, gas content, chemical composition, and other properties. This can reveal a broad spectrum of information on past environmental, and particularly climatic, changes. They can also be used to study bacteria and chlorophyll production in the waters from which the ice core was extracted.

[[table of contents](#) | [back to top](#)]

Deployments

NBP0104

Website	https://www.bco-dmo.org/deployment/57638
Platform	RVIB Nathaniel B. Palmer
Report	http://www.ccpo.odu.edu/Research/globec/cruises01/nbp0104_menu.html
Start Date	2001-07-22
End Date	2001-08-31
Description	<p>Acquisition Description</p> <p>Sampling methods for recovery of chlorophyll a and bacteria from sea ice cores follows those described in: Garrison, D.L. and K.R. Buck(1986), Organism losses during ice melting: a serious bias in sea ice community studies. Polar Biol., 6:237-239.</p> <p>Recommendations for reporting were used as outlined by: Horner, R. et al.,(1992), Ecology of Sea Ice Biota. I: Habitat, Terminology and Methodology. Polar Biol. 12:417-427 # Ice core bacteria data from Southern Ocean GLOBEC # C. Fritsen and F. Stewart # * BactAbun = bacterial abundance = cells m-3 # * BactBio = bacterial biomass = mg C m-3 = ug C l-1 # * chla = mg chla m-3 = ug chla l-1 # * sect_top_depth = depth(m) at top of core section</p> <p>Processing Description</p> <p>Chla (mg m-3): determined fluorometrically (Turner Designs 10AU Fluorometer) following extraction in 90% acetone (Parsons et al., 1984) ice core chla corrected to account for chla in filtered sea water (FSW) added to core sections during melting NBP 0104 preserved (0.5% glutaraldehyde) samples stained with Sybr® Gold (0.01% final concentration), filtered through 0.2 mm Anodisc filters (Whatman®), and mounted onto glass microscope slides at home institution (~1-2 months following collection) bacteria enumerated using epifluorescence microscopy and sized using digital images taken with Image Pro Plus bacteria biomass determined using cell abundance, cell biovolume (BV; mm3), and an allometric conversion factor for bacterial carbon per volume specific for Acridine Orange-stained bacteria (cellular carbon = 89.9 X BV^{0.59}; Simon and Azam, 1989). Note: an AO-specific carbon per volume conversion factor was used in calculating biomass in Sybr® Gold-stained samples because both AO and Sybr® Gold stain bacteria cells similarly relative to DAPI (unpublished data). ice core samples corrected for FSW dilution # NBP0104: core 4, sect_top_depth changed from -0.39 to 0.00 (mda 8/18/03) # : CR-27DNA renumbered CR-26DNA. (mda 8/18/03)</p>

LMG0106

Website	https://www.bco-dmo.org/deployment/57639
Platform	ARSV Laurence M. Gould
Report	http://www.ccpo.odu.edu/Research/globec/cruises01/lmg0106_menu.html
Start Date	2001-07-21
End Date	2001-09-01
Description	<p>Acquisition Description</p> <p>Sampling methods for recovery of chlorophyll a and bacteria from sea ice cores follows those described in: Garrison, D.L. and K.R. Buck(1986), Organism losses during ice melting: a serious bias in sea ice community studies. Polar Biol., 6:237-239.</p> <p>Recommendations for reporting were used as outlined by: Horner, R. et al.,(1992), Ecology of Sea Ice Biota. I: Habitat, Terminology and Methodology. Polar Biol. 12:417-427 # Ice core bacteria data from Southern Ocean GLOBEC # C. Fritsen and F. Stewart # * BactAbun = bacterial abundance = cells m-3 # * BactBio = bacterial biomass = mg C m-3 = ug C l-1 # * chla = mg chla m-3 = ug chla l-1 # * sect_top_depth = depth(m) at top of core section</p> <p>Processing Description</p> <p>Sampling methods for recovery of chlorophyll a and bacteria from sea ice cores follows those described in: Garrison, D.L. and K.R. Buck(1986), Organism losses during ice melting: a serious bias in sea ice community studies. Polar Biol., 6:237-239.</p> <p>Recommendations for reporting were used as outlined by: Horner, R. et al.,(1992), Ecology of Sea Ice Biota. I: Habitat, Terminology and Methodology. Polar Biol. 12:417-427 LMG 0106 preserved (0.5% glutaraldehyde) samples stained with 4',6-diamidino-2-phenylindole (DAPI; 0.1 to 0.3% final concentration), filtered through 0.2 mm black, polycarbonate membrane filters, and mounted onto glass microscope slides on the ship (within 24 hours following collection) bacteria enumerated using epifluorescence microscopy and sized using digital images taken with Image Pro Plus bacteria biomass determined using cell abundance, cell biovolume (BV; mm³; as determined from mean length and width measurements), and an allometric conversion factor for bacterial carbon per volume specific for DAPI-stained bacteria (cellular carbon = 218 X BV^{0.86}; Loferer-KrÄbächer et al., 1998). ice core samples corrected for FSW dilution # LMG0106: "a" "b" "c" labels appended to core numbers denote replicate cores. # "(1)" "(2)" "(3)" labels appended to core numbers denote different</p>

Website	https://www.bco-dmo.org/deployment/57643
Platform	RVIB Nathaniel B. Palmer
Report	http://globec.who.edu/so-dir/reports/nbp0204/nbp0204b.html
Start Date	2002-07-31
End Date	2002-09-18
Description	<p>Acquisition Description</p> <p>Sampling methods for recovery of chlorophyll a and bacteria from sea ice cores follows those described in: Garrison, D.L. and K.R. Buck(1986), Organism losses during ice melting: a serious bias in sea ice community studies. Polar Biol., 6:237-239.</p> <p>Recommendations for reporting were used as outlined by: Horner, R. et al.,(1992), Ecology of Sea Ice Biota. I: Habitat, Terminology and Methodology. Polar Biol. 12:417-427 # Ice core bacteria data from Southern Ocean GLOBEC # C. Fritsen and F. Stewart # * BactAbun = bacterial abundance = cells m-3 # * BactBio = bacterial biomass = mg C m-3 = ug C l-1 # * chl a = mg chl a m-3 = ug chl a l-1 # * sect_top_depth = depth(m) at top of core section</p> <p>Processing Description</p> <p>Chla (mg m-3): determined fluorometrically (Turner Designs 10AU Fluorometer) following extraction in 90% acetone (Parsons et al., 1984) ice core chl a corrected to account for chl a in filtered sea water (FSW) added to core sections during melting # NBP0204: Bacteria Abundance and Bacteria Carbon Biomass # were not routinely sampled on this cruise. # The term slush in the core interval field for core_no 17 # indicates that slush/unconsolidated ice existed between # sections of ice cores from the same ice coring hole.</p>

LMG0205

Website	https://www.bco-dmo.org/deployment/57644
Platform	ARSV Laurence M. Gould
Report	http://www.ccpo.odu.edu/Research/globec/main_cruises02/lmg0205/report_lmg0205.pdf
Start Date	2002-07-29
End Date	2002-09-18
Project Information	<p>Acquisition Description</p> <p>Sampling methods for recovery of chlorophyll a and bacteria from sea ice cores follows those described in: Garrison, D.L. and K.R. Buck(1986), Organism losses during ice melting: a serious bias in sea ice community studies. Polar Biol., 6:237-239.</p> <p>Recommendations for reporting were used as outlined by: Horner, R. et al.,(1992), Ecology of Sea Ice Biota. I: Habitat, Terminology and Methodology. Polar Biol. 12:417-427 # Ice core bacteria data from Southern Ocean GLOBEC # C. Fritsen and F. Stewart</p>
	<p># * BactAbun = bacterial abundance = cells m-3 # * BactBio = bacterial biomass = mg C m-3 = ug C l-1 # * chl a = mg chl a m-3 = ug chl a l-1 # * sect_top_depth = depth(m) at top of core section</p> <p>Processing Description</p> <p>Chla (mg m-3): determined fluorometrically (Turner Designs 10AU Fluorometer) following extraction in 90% acetone (Parsons et al., 1984) ice core chl a corrected to account for chl a in filtered sea water (FSW) added to core sections during melting # LMG0205: Bacteria Abundance and Bacteria Carbon Biomass were not routinely # sampled on this cruise. # Corrections have been applied to the data per Fritsen e-mail of 12/03/03</p>

U.S. GLOBEC Southern Ocean (SOGLOBEC)

Website: http://www.ccpo.odu.edu/Research/globec_menu.html

Coverage: Southern Ocean

The fundamental objectives of United States Global Ocean Ecosystems Dynamics (U.S. GLOBEC) Program are dependent upon the cooperation of scientists from several disciplines. Physicists, biologists, and chemists must make use of data collected during U.S. GLOBEC field programs to further our understanding of the interplay of physics, biology, and chemistry. Our objectives require quantitative analysis of interdisciplinary data sets and, therefore, data must be exchanged between researchers. To extract the full scientific value, data must be made available to the scientific community on a timely basis.

GLOBEC: Sea Ice Microbial Communities (Sea Ice Microbes)

Coverage: Southern Ocean

The U.S. Global Ocean Ecosystems Dynamics (U.S. GLOBEC) program has the goal of understanding and ultimately predicting how populations of marine animal species respond to natural and anthropogenic changes in climate. Research in the Southern Ocean (SO) indicates strong coupling between climatic processes and ecosystem dynamics via the annual formation and destruction of sea ice. The Southern Ocean GLOBEC Program (SO GLOBEC) will investigate the dynamic relationship between physical processes and ecosystem responses through identification of critical parameters that affect the distribution, abundance and population dynamics of target species. The overall goals of the SO GLOBEC program are to elucidate shelf circulation processes and their effect on sea ice formation and krill distribution, and to examine the factors which govern krill survivorship and availability to higher trophic levels, including penguins, seals and whales. The focus of the U.S. contribution to the international SO GLOBEC program will be on winter processes. This component will focus on the distribution and activities of sea ice microbial communities. This will be accomplished using an integrated combination of sampling (vertical profiles, horizontal surveys, and under-ice surveys) and observational protocols. Experiments will be designed to estimate microbial activity within the sea ice and at the ice-seawater interface. The research will be coordinated with components studying the water column productivity and the sea ice habitat. The result of the integrated SO GLOBEC program will be to improve the predictability of living marine resources, especially with respect to local and global climatic shifts.

Program Information

U.S. GLOBal ocean ECosystems dynamics (U.S. GLOBEC)

Website: <http://www.usglobec.org/>

Coverage: Global

U.S. GLOBEC (GLOBal ocean ECosystems dynamics) is a research program organized by oceanographers and fisheries scientists to address the question of how global climate change may affect the abundance and production of animals in the sea. The U.S. GLOBEC Program currently had major research efforts underway in the Georges Bank / Northwest Atlantic Region, and the Northeast Pacific (with components in the California Current and in the Coastal Gulf of Alaska). U.S. GLOBEC was a major contributor to International GLOBEC efforts in the Southern Ocean and Western Antarctic Peninsula (WAP).

U.S. GLOBal ocean ECosystems dynamics (U.S. GLOBEC)

Website: <http://www.usglobec.org/>

Coverage: Global

U.S. GLOBEC (GLOBal ocean ECosystems dynamics) is a research program organized by oceanographers and fisheries scientists to address the question of how global climate change may affect the abundance and production of animals in the sea. The U.S. GLOBEC Program currently had major research efforts underway in the Georges Bank / Northwest Atlantic Region, and the Northeast Pacific (with components in the California Current and in the Coastal Gulf of Alaska). U.S. GLOBEC was a major contributor to International GLOBEC efforts in the Southern Ocean and Western Antarctic Peninsula (WAP).

Funding

Funding Source	Award
NSF Antarctic Sciences (NSF ANT)	ANT-9910098

[[table of contents](#) | [back to top](#)]