Carbon and nitrogen concentration from filtered in situ LVP pump samples from SOFeX cruises PS02_2002, COOK19MV from the Southern Ocean, south of New Zealand, Southern Ocean in 2002 (SOFeX project)

Website: https://www.bco-dmo.org/dataset/2817
Version: 04 May 2007
Version Date: 2007-05-04

Project
» Southern Ocean Iron Experiment (SOFeX)

Programs
» Ocean Carbon and Biogeochemistry (OCB)
» Iron Synthesis (FeSynth)

Contributors	Affiliation	Role
Buesseler, Kenneth O.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator, Contact
Chandler, Cynthia L.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Dataset Description

Carbon and Nitrogen concentration from filtered in situ LVP pump samples

Methodology:

Buesseler, et al. 2005 "Particle export during the Southern Ocean Iron Experiment (SOFeX)". Limnol. Oceanogr., 50(1). American Society of Limnology and Oceanography, Inc. pp.311-327. URI: http://hdl.handle.net/1912/908 This is the author's version of the work posted here by permission of the publisher for personal use, not for redistribution. These data are part of a multi-ship data set (see full data set).

Change history: YYMMDD

070323: data contributed by Ken Buesseler as emailed Excel file
070418: added to OCB database by Cyndy Chandler, OCB DMO, (cchandler@whoi.edu)
LVP event, date, time, lon and lat agree with cruise event logs;
the patch_loc values are not identical to those in the cruise event logs
070504: adjust parameter names for database consistency

PI and OCB DMO Notes: processing notes

Methods & Sampling

SOFeX 2002 Melville and Polar Star cruises

DMO processing notes for in situ LVP data

PI: Ken Buesseler (WHOI)

18 April 2007: Prepared for OCB data system by Cyndy Chandler, OCB DMO (WHOI).

These data are from the filters from in-situ pumps (LVP)
operated by Ken Buesseler's group and used on both the Melville and Polar Star. These data have also been published in:

K. O. Buesseler, J. E. Andrews, S. Pike, M. A. Charette, L. E. Goldson, M. A. Brzezinski, and V. P. Lance, 2005. "Particle export during the Southern Ocean Iron Experiment (SOFeX)".
Limnol. Oceanogr., 50(1). American Society of Limnology and Oceanography, Inc. pp.311-327.
(download PDF). The sampling and analysis methodology is also described in that publication.

Original Excel file received via email from PI:
copy of original Excel file

The 13C and 15N measurements were done by people in Mark Altabet's lab at UMass Dartmouth. Some notes from David Timothy (School for Marine Science and Technology
University of Massachusetts, Dartmouth, MA) accompanied the original Excel data file:

> "These results are NOT blank subtracted! I don't think I included columns for
> POC and PN per filter, but you'll see these can be calculated easily (volumes filtered are on the spreadsheet). I won't be surprised if after blank subtraction there are negative values;
> some of the > 54um samples had very low POM."

PI notes

The Buesseler lab "large volume pumps" used on the Melville and Polar Star were of similar design. These casts and data are also reported elsewhere in the OCB database. MULVFS, multiple unit large volume filtration system, another sampling device was only used on the Melville. The LVP's yield about 200-500L per sample, while MULVFS yield on order of 2000L or more. Also, MULVFS casts tend to go deeper, to 1000m, where as LVP samples concentrated on the upper 100-200m.

Contact: Ken Buesseler (WHOI)

Data Processing Description

DMO processing notes

Melville sampling dates: At some point the sampling dates for the Melville data were put into MS Excel on a Mac system. MS Excel on a Mac uses a different date system from Windows. On a Mac, serial day 1 = Jan 1, 1904 and on Windows, Excel serial day 1 = Jan 1, 1900, and 1900 is an exception to the 4 year leap year rule because it is divisible by 100. When the Excel data file was first ingested into the OCB database, the dates were all off by 4 years and 1 day. However, the actual Excel serial day of 37280.32292 that was entered in the original file is equivalent to Jan 24 2002 07:45:00 - notice the correct year and the time agrees with the event log GMT. The data were copied from the original file and pasted into a new MS Windows Excel file prior to ingestion into the database. This resulted in new sampling dates that matched the cruise's event log except as noted in the next section.

Also, after the date offset (Mac vs. Windows Excel) issue was resolved, the original datafile reported data from station 4 at 08:45 GMT on 25-Jan (according to the MV event log, station 4 was reportedly occupied on 29-Jan, but station 2 had a pump cast on 25-Jan at 08:43). Also, several rows of data were reported from station ? on 29-Jan. The DMO determined this to be station 4. Station 34 data were reported for 11-Feb, but according to

the cruise event log, this station was actually done on 12-Feb. The LVP data file was adjusted accordingly to agree with the Melville cruise event log.

The 'patch_loc' field: The SOFeX 'patch_loc' field is usually one of four abbreviation codes indicating the sampling location relative to the 'iron fertilized patches'; N indicates North Patch, S = South Patch, and whether the location is within or outside the patch area or on the edge of the patch. For the Polar Star cruise, it appears that only the relative in/out information was recorded. There were two fertilized patches, one north and one south of the Antarctic Polar Front Zone (APFZ near 61°S) along 170°W. All of the Polar Star sampling events for which patch_loc is recorded were conducted south of 61°S, implying the south patch.

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Data Files

File
LVP_pump.csv (Comma Separated Values (.csv), 12.56 KB) MD5:add45f006993a9b054e1f04e4fe53c30 Primary data file for dataset ID 2817

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Parameters

Parameter	Description	Units
ship_name	research ship name	dimensionless
patch_loc	sampling location relative to patch	dimensionless
event	event number from cruise event log Melville event is doYhhmm and Polar Star event is DDMMYY_hhmm	doYhhmm or DDMMYY_hhmm
date	date sampling began (UTC)	YYYYMMDD
time	time sampling began (UTC)	hhmm
yrday	day of year	doY
lon	longitude, negative denotes West	decimal degrees
lat	latitude, negative denotes South	decimal degrees
comments	notes regarding sampling	dimensionless

station	station location number	dimensionless
depth	depth, calculated from pressure	meters
sample_ID	sample identification	dimensionless
filter_size	filter size	micrometers
frac_anlyd	fraction of total volume analyzed	dimensionless
volume_filt	sample volume filtered	liters
PON	Particulate Organic Nitrogen	micromolar
POC	Particulate Organic Carbon	micromolar
C_to_N	Carbon to Nitrogen ratio	molar ratio
dN15_POM	delta 15N of particulate organic matter relative to atmospheric N2	per mil
dC13_POM	delta 13C of particulate organic matter relative to the PDB standard	per mil

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Instruments

Dataset-specific Instrument Name	Large Volume Pumping System
Generic Instrument Name	McLane Large Volume Pumping System WTS-LV
Dataset-specific Description	in situ pumping/filtration (battery-powered from McLane Labs) units were deployed at multiple depths per cast
Generic Instrument Description	The WTS-LV is a Water Transfer System (WTS) Large Volume (LV) pumping instrument designed and manufactured by McLane Research Labs (Falmouth, MA, USA). It is a large-volume, single-event sampler that collects suspended and dissolved particulate samples in situ. Ambient water is drawn through a modular filter holder onto a 142-millimeter (mm) membrane without passing through the pump. The standard two-tier filter holder provides prefiltering and size fractioning. Collection targets include chlorophyll maximum, particulate trace metals, and phytoplankton. It features different flow rates and filter porosity to support a range of specimen collection. Sampling can be programmed to start at a scheduled time or begin with a countdown delay. It also features a dynamic pump speed algorithm that adjusts flow to protect the sample as material accumulates on the filter. Several pump options range from 0.5 to 30 liters per minute, with a max volume of 2,500 to 36,000 liters depending on the pump and battery pack used. The standard model is depth rated to 5,500 meters, with a deeper 7,000-meter option available. The operating temperature is -4 to 35 degrees Celsius. The WTS-LV is available in four different configurations: Standard, Upright, Bore Hole, and Dual Filter Sampler. The high-capacity upright WTS-LV model provides three times the battery life of the standard model. The Bore-Hole WTS-LV is designed to fit through a narrow opening such as a 30-centimeter borehole. The dual filter WTS-LV features two vertical intake 142 mm filter holders to allow simultaneous filtering using two different porosities.

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Deployments

PS02_2002

Website	https://www.bco-dmo.org/deployment/57825
Platform	USCGC Polar Star
Report	http://ocb.whoi.edu/SOFeX/CRUISES/proj_description.pdf
Start Date	2002-02-11
End Date	2002-02-21

Description	Cruise dates provided by David Forcucci, USCG Science Liaison Brief cruise plan description: Three ships were involved in the SOFeX experiment. Each ship operated in the study area at a different time to afford the longest observation time. The designations SOFeX-N and SOFeX-S are sometimes used to distinguish between two iron enriched patches - one in low silicate waters north of the polar front (SOFEX-N), and the other in high silicate waters south of the polar front (SOFEX-S). All three ships, Melville (MV), Revelle (RR) and Polar Star (PS), worked in SOFEX-S, but only the Revelle and Melville worked in the SOFeX N patch and shuttled between the two patches. The USCGC Polar Star was the third of the three vessels to occupy the SOFeX study area in 2002. The main focus of the scientific party aboard the Polar Star was to assess how much carbon was removed from the iron fertilized patches. The cruise report includes a more complete description of the Polar Star cruise and a cruise logbook includes daily entries filed by the Chief Scientist aboard each vessel. **Methods & Sampling** SOFeX 2002 Melville and Polar Star cruises DMO processing notes for in situ LVP data PI: Ken Buesseler (WHOI) 18 April 2007: Prepared for OCB data system by Cyndy Chandler, OCB DMO (WHOI). These data are from the filters from in-situ pumps (LVP) operated by Ken Buesseler's group and used on both the Melville and Polar Star. These data have also been published in: K. O. Buesseler, J. E. Andrews, S. Pike, M. A. Charette, L. E. Goldson, M. A. Brzezinski, and V. P. Lance, 2005. "Particle export during the Southern Ocean Iron Experiment (SOFeX)". Limnol. Oceanogr., 50(1). American Society of Limnology and Oceanography, Inc. pp.311-327. (download PDF). The sampling and analysis methodology is also described in that publication. Original Excel file received via email from PI: copy of original Excel file The 13C and 15N measurements were done by people in Mark Altabet's lab at UMass Dartmouth. Some notes from David Timothy (School for Marine Science and Technology University of Massachusetts, Dartmouth, MA) accompanied the original Excel data file: "These results are NOT blank subtracted! I don't think I included columns for POC and PN per filter, but you'll see these can be calculated easily (volumes filtered are on the spreadsheet). I won't be surprised if after blank subtraction there are negative values; some of the > 54um samples had very low POM." PI notes The Buesseler lab "large volume pumps" used on the Melville and Polar Star were of similar design. These casts and data are also reported elsewhere in the OCB database. MULVFS, multiple unit large volume filtration system, another sampling device was only used on the Melville. The LVP's yield about 200-500L per sample, while MULVFS yield on order of 2000L or more. Also, MULVFS casts tend to go deeper, to 1000m, where as LVP samples concentrated on the upper 100-200m. Contact: Ken Buesseler (WHOI) **Processing Description** DMO processing notes Melville sampling dates: At some point the sampling dates for the Melville data were put into MS Excel on a Mac system. MS Excel on a Mac uses a different date system from Windows. On a Mac, serial day 1 = Jan 1, 1904 and on Windows, Excel serial day 1 = Jan 1, 1900, and 1900 is an exception to the 4 year leap year rule because it is divisible by 100. When the Excel data file was first ingested into the OCB database, the dates were all off by 4 years and 1 day. However, the actual Excel serial day of 37280.32292 that was entered in the original file is equivalent to Jan 24 2002 07:45:00 - notice the correct year and the time agrees with the event log GMT. The data were copied from the original file and pasted into a new MS Windows Excel file prior to ingestion into the database. This resulted in new sampling dates that matched the cruise's event log except as noted in the next section. Also, after the date offset (Mac vs. Windows Excel) issue was resolved, the original datafile reported data from station 4 at 08:45 GMT on 25-Jan (according to the MV event log, station 4 was reportedly occupied on 29-Jan, but station 2 had a pump cast on 25-Jan at 08:43). Also, several rows of data were reported from station ? on 29-Jan. The DMO determined this to be station 4. Station 34 data were reported for 11-Feb, but according to the cruise event log, this station was actually done on 12-Feb. The LVP data file was adjusted accordingly to agree with the Melville cruise event log. The 'patch_loc' field: The SOFeX 'patch_loc' field is usually one of four abbreviation codes indicating the sampling location relative to the 'iron fertilized patches'; N indicates North Patch, S = South Patch, and whether the location is within or outside the patch area or on the edge of the patch. For the Polar Star cruise, it appears that only the relative in/out information was recorded. There were two fertilized patches, one north and one south of the Antarctic Polar Front Zone (APFZ near 61°S) along 170°W. All of the Polar Star sampling events for which patch_loc is recorded were conducted south of 61°S, implying the south patch.

COOK19MV

Website	https://www.bco-dmo.org/deployment/57826
Platform	R/V Melville
Report	http://ocb.whoi.edu/SOFeX/CRUISES/proj_description.pdf
Start Date	2002-01-19
End Date	2002-02-26

Description	Brief cruise plan description: Three ships were involved in the SOFeX experiment. Each ship operated in the study area at a different time to afford the longest observation time. The designations SOFeX-N and SOFeX-S are sometimes used to distinguish between two iron enriched patches - one in low silicate waters north of the polar front (SOFEX-N), and the other in high silicate waters south of the polar front (SOFEX-S). All three ships, Melville (MV), Revelle (RR) and Polar Star (PS), worked in SOFEX-S, but only the Revelle and Melville worked in the SOFeX N patch and shuttled between the two patches. The R/V MELVILLE sailed several weeks after the R/V REVELLE to arrive in the study area just as the 'patches' were forming in response to iron fertilization. The MELVILLE's team planned to make detailed measurements of phytoplankton physiology and rate processes, and to sample daily for phytoplankton growth rates and biomass, soluble and particulate iron and zooplankton biomass. A cruise logbook includes daily entries filed by the Chief Scientist aboard each vessel. **Methods & Sampling** SOFeX 2002 Melville and Polar Star cruises DMO processing notes for in situ LVP data PI: Ken Buesseler (WHOI) 18 April 2007: Prepared for OCB data system by Cyndy Chandler, OCB DMO (WHOI). These data are from the filters from in-situ pumps (LVP) operated by Ken Buesseler's group and used on both the Melville and Polar Star. These data have also been published in: K. O. Buesseler, J. E. Andrews, S. Pike, M. A. Charette, L. E. Goldson, M. A. Brzezinski, and V. P. Lance, 2005. "Particle export during the Southern Ocean Iron Experiment (SOFeX)". Limnol. Oceanogr., 50(1). American Society of Limnology and Oceanography, Inc. pp.311-327. (download PDF). 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Project Information

Southern Ocean Iron Experiment (SOFeX)

Website: http://www.mbari.org/expeditions/SOFeX2002/

Coverage: Southern Ocean, south of New Zealand

Before he passed away in 1993, John Martin suggested that an increase in the flow of iron-rich dust to the ocean causes phytoplankton (single celled algae) to grow. The increased photosynthesis removes carbon dioxide from surface waters as the algae create biomass. This carbon dioxide is replaced by carbon dioxide gas that flows into the sea from the atmosphere. Reduced carbon dioxide in the atmosphere cools the planet (CO2 is a greenhouse gas that warms the earth). The results of this work, funded by the National Science Foundation, the Department of Energy, and the US Coast Guard, will be a much better understanding of how biological processes may regulate climate. (see Related Info: Fe cycle)

A direct test of the 'Martin Hypothesis' that trace concentrations of Fe are responsible for phytoplankton's ability to grow by direct experimental addition of Fe to the surface waters. Consequently the distribution of bioavailable Fe in the surface waters determines large geographical areas primary production and the following flux of fixed organic matter to the deep sea. The aim of the SOFeX project is to investigate the effects of iron fertilization on the productivity of the Southern Ocean. The results of this work will contribute significantly to our understanding of important biogeochemical processes which bear directly on the global carbon cycle, atmospheric carbon dioxide concentration, and climate control.

The SOFeX-N and SOFeX-S designations are sometimes used to distinguish between two iron enriched patches - one in low silicate waters north of the polar front (SOFEX-N), and the other in high silicate waters south of the polar front (SOFEX-S). All three ships, Melville (MV), Revelle (RR) and Polar Star (PS), worked in SOFEX-S, but only the Revelle and Melville worked in the SOFeX N patch and shuttled between the two patches.

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Program Information

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

Iron Synthesis (FeSynth)

Coverage: Global

The two main objectives of the Iron Synthesis program (SCOR Working Group proposal, 2005), are:
1. Data compilation: assembling a common open-access database of the *in situ* iron experiments, beginning with the first period (1993-2002; Ironex-1, Ironex-2, SOIREE, EisenEx, SEEDS-1; SOFeX, SERIES) where primary articles have already been published, to be followed by the 2004 experiments where primary articles are now in progress (EIFEX, SEEDS-2; SAGE, FeeP); similarly for the natural fertilizations S.O.JGOFS (1992), CROZEX (2004/2005) and KEOPS (2005).

2. Modeling and data synthesis of specific aspects of two or more such experiments for various topics such as physical mixing, phytoplankton productivity, overall ecosystem functioning, iron chemistry, CO2 budgeting, nutrient uptake ratios, DMS(P) processes, and combinations of these variables and processes.

SCOR Working Group proposal, 2005. "The Legacy of *in situ* Iron Enrichments: Data Compilation and Modeling".
http://www.scor-int.org/Working_Groups/wg131.htm

See also: SCOR Proceedings Vol. 42 Concepcion, Chile October 2006, pgs: 13-16 2.3.3 Working Group on The Legacy of *in situ* Iron Enrichments: Data Compilation and Modeling.

The first objective of the Iron Synthesis program involves a data recovery effort aimed at assembling a common, open-access database of data and metadata from a series of *in-situ* ocean iron fertilization experiments conducted between 1993 and 2005. Initially, funding for this effort is being provided by the Scientific Committee on Oceanic Research (SCOR) and the U.S. National Science Foundation (NSF).

Through the combined efforts of the principal investigators of the individual projects and the staff of Biological and Chemical Oceanography Data Management Office (BCO-DMO), data currently available primarily through individuals, disparate reports and data agencies, and in multiple formats, are being collected and prepared for addition to the BCO-DMO database from which they will be freely available to the community.

As data are contributed to the BCO-DMO office, they are organized into four overlapping categories:
1. Level 1, basic metadata
(e.g., description of project/study, general location, PI(s), participants);
2. Level 2, detailed metadata and basic shipboard data and routine ship's operations
(e.g., CTDs, underway measurements, sampling event logs);
3. Level 3, detailed metadata and data from specialized observations
(e.g., discrete observations, experimental results, rate measurements) and
4. Level 4, remaining datasets
(e.g., highest level of detailed data available from each study).

Collaboration with BCO-DMO staff began in March of 2008 and initial efforts have been directed toward basic project descriptions, levels 1 and 2 metadata and basic data, with detailed and more detailed data files being incorporated as they become available and are processed.

Related file

Program Documentation

The Iron Synthesis Program is funded jointly by the Scientific Committee on Oceanic Research (SCOR) and the U.S. National Science Foundation (NSF).

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Funding

Funding Source	Award
National Science Foundation (NSF)	unknown SOFeX NSF

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