Combined water sample data from variety of sampling devices from USCGC Polar Star cruise PS02_2002 in the Southern Ocean, south of New Zealand in 2002 (SOFeX project)

Website: https://www.bco-dmo.org/dataset/2804
Version: 27 February 2007
Version Date: 2007-02-27

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
Chandler, Cynthia L.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Dataset Description

combined water sample data from variety of sampling devices

Methods & Sampling

```
dates:          14 February 2002 to 21 February 2002  (20020214-20020221)
location:       N: -65.23  S: -66.59  W: -173.00  E: -170.53
project/cruise:  SOFeX/USCGC Polar Star (WAGB-10) cruise: PS02
platform:        USCGC Polar Star
```

Methodology

SOFeX 2002 Polar Star cruise
PI notes for all water sample bottle data

13 February 2007: Prepared for OCB data system by Cyndy Chandler, OCB DMO (WHOI).
Contact: Ken Buesseler (WHOI) with any questions pertaining to this dataset.

Bottle sample data included in Master Water File:
SF6/DOC/DIC/pCO2/23Th/HPLC/bSi/salinity/nutrients/Chl/phyto/bacteria

Original Excel file downloaded from MBARI:
copy of original Excel file

All Polar Star data are preliminary & comparisons to other cruises should be made
with caution until final QC and intercalibration work are completed.
For further inquiries contact Ken Buesseler (kbuesseler@whoi.edu)

The original Excel file contained multiple spreadsheets:
The Master Water File includes sample information for all water samples
collected underway and from casts as well as associated nutrient, SF6, FRRf,
chlorophyll, TCO2, TA and CTD data. This data set was updated 12/3/02 with nutrient
values rerun at MBARI. All original nutrient values were deleted (KJ).

Sampling and analysis methods for many of the data types are described in a SOFeX
'cruise report' contributed in April 2002 by Bob Bidigare and converted to a
href="http://ocb.whoi.edu/SOFeX/PI-NOTES/SOFeX_Cruise_Report_UH_MIT.pdf">PDF file. Sampling methods described in
the cruise report are listed in the table below.

Fraction Analyzed	Method	Samples
Total phytoplankton	Fluorometric Chlorophyll	170-280 ml, filtered
Group-specific autotrophs	HPLC Pigments	1-2 liter, filtered/frozen
Autotrophic pico- & microplankton	Large volume FCM, ship	5-10 ml, live
Bacteria and picophytoplankton	Dual-beam FCM, lab	1 ml, preserved/frozen
Auto- & heterotrophic nanoplankton	Epifluor. Microscopy	20-250 ml, preserved
Heterotrophic microplankton	Inverted Microscopy	100-500 ml, preserved
Mesozooplankton populations	Microscopy - Dissecting	Net tows, preserved
Mesozooplankton biomass	CHN Analyses	Net tows, screened/frozen

Publications associated with this dataset

Buesseler, K.O., 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).
Limnology and Oceanography, 50: 311-327. [PDF]

Notes regarding this dataset:

chlorophyll

One complexity with the Polar Star chlorophyll data is that chlorophyll was measured on board (Turner fluorometer);
Dick Barber's group measured chlorophyll in the lab (reported in the larger bottle file, with size fractionated data too)
and there are some HPLC pigment data, which also result in a measure of HPLC derived total Chl-a. Users of this dataset are encouraged to read the documentation carefully to ascertain which analysis technique was used to estimate
chlorophyll values.

notes pertaining to chlorophyll (A. Hilting)
1. Peter Croot calibrated the fluorometer on the Polar Star with a one-point calibration using a chla standard made on board ship from a powder. The concentration of the standard can not be verified. The calibration assumes constant extraction volumes (8 ml) and filtration volumes (500 ml). Contact R. Barber or P. Croot for calibration equations.

2. Unless the volumes vary, Fo and Fa can be read directly from the fluorometer.

3. The edited spreadsheets correct for variation in filtration volumes (extraction volume does not appear to vary).

4. Chl-a is calculated as (Fo-Fa)1.909. 1.909 is = (r/r-1) where r is the before to after acidification ratio specific to Duke's Turner 10-AU fluorometer (The fluorometer used on the Melville during SOFeX) and r = 2.1. Polar Star used a Turner 10-AU fluorometer. The equation is from EPA Method 445.0 (Revision 1.2), In Vitro Determination of Chlorophyll a and Pheophytin a in Marine and Freshwater Algae by Fluorescence. (Arar and Collins, September 1997). The equations [chl a] = [r/(r-1)(Fo-Fa)]v/V and [phaeophytin a] = [(r/(r-1)(rFa-Fo)]v/V.

5. Phaeophytin is calculated as (2.1Fa-Fo)1.909

6. Unspecified (not logged) filter sizes are assumed to be GF/F and unspecified filtration volumes are assumed to be 500 ml.

7. CH Stations and Underway grid samples 28 A-I are settling column experiments samples. See Ed Abraham for methods.

8. Bottle Cast two values are not included in the merged file. We are not sure which bottles the samples came from.

9. The size fractionation used a stacked set of funnels, with the water draining through the set by gravity, except for the lowermost 0.2 um filter,which was attached to a vacuum pump. (Size (Size Fractions: 0.22 mm, 2 mm, 5 mm, 20 mm). Note that this method differs from the methods used on the Melville and the Revelle.

10. GF/Fs were filtered separately on a 25 mm rig.

11. Per K. Buesseler, the sea surface water intake was 6 meters or less. We have assumed a actual depth of 6 meters for all underway samples.

12. A more detailed version is available. Contact K. Buesseler or R. Barber for more information.

FRRF estimation of chlorophyll

The shipboard surface/underway sampling system used a Fast Repetition Rate Fluorometer (FRRF) as another way
to determine chlorophyll concentration in the surface waters. The change in the quantum yield of chlorophyll fluorescence induced by actinic light is used to derive photosynthetic parameters related to Photosystem II (PS II). The functional (i.e., the photochemically effective) absorption cross-section of PS II (Sigma PS II) describes the maximal efficiency of light utilization for photochemistry in PS II in units of angstrom^2/quanta. The FRRF measures fluorescence transients induced by a series of brief subsaturating excitation
pulses, or `flashlets,' where the intensity, duration, and interval between them is independently controlled (Kolber *et al.*, 1998).

For an in depth explanation of techniques used for determining FRRF results (including equations), please see the
complete reference:
Kolber, Z.S., O. Prasil, and P.G. Falkowski. 1998. Measurements of variable chlorophyll fluorescence using fast repetition rate techniques: defining methodology and experimental protocols. Biochimica et Biophysica Acta (BBA) - Bioenergetics, **1367**(1-3), pgs. 88-106. [ScienceDirect href="http://www.sciencedirect.com/science/article/B6T1S-3V3M4TP-3/2/672f628df...">PDF or DOI: doi:10.1016/S0005-2728(98)00135-2]

SF6 data

Surface & Transect data: see worksheet "underwaySF6" for complete SF6 dataset
SF6 still considered preliminary as of Feb 2007 version of .xls merged file

Notes extracted from Excel comments

this information was extracted from comments embedded within the Excel worksheet data cells
(organized here by data parameter name)

station
T1: 5 stations with subsurface sampling using 10L Niskin on Kevlarsurface SF6
per usual "W to E" Transect
T2: is A. Hilting satellite image transect

cast or sample comments:
T2: Th I and J do not correspond to chl I and J
uw grid 3: ahilting: Station number of the 5 um SF changed from uwg 5 to uwg 3. Date & time matched other uwg 3 stations.
uw grid 4: ahilting: no station number logged. Uw station 4 assumed from date & time logged.
uw grid 7: ahilting: station for 20 SF changed from uwg 2 to uwg 7. Date & time matched other uwg7 stations.
SC28 *: ahilting: Ed Abraham's settling column experiment. Size Fraction, volume extracted from E. Abraham.

depth:
BC: see comments in BC methods .html
T1: 25 m sample depth is an estimate from 'wire out'

SiO4
Johnson: MBARI VALUES
Selected Polar Star nutrients were reanalyzed at MBARI.
All of the original values are deleted and only the rerun values are listed here.

fluor_chl
R200: ahilting: u/w fluor logged under 20 SF

GFF Chl Rep1
R259: ahilting: not in SI transect 2 worksheet. Found in Uw_all worksheet
R279: ahilting:0.27 was reported as 5 um. GF/F was not reported. There were two 5 um values. Assumed error.

several Total HPLC Chls (mg/l) observations are mean values:
station depth
BC6 38.5
CTD5 19.6
CTD6 10.2
CTD6 35.4
CTD6 80.2

PI notes (embedded comments from the Excel column named: orign sample # or comments)

comments:
B1 68.0 4 10L bottles on Kevlar w/WHOI pressure & T logger on deepest bottleshallow bottle did not tripSample for SF6, DOC, DIC, salts, nuts, chl, FRRF, 234Th
B2 125.0 6 10L bottles on Kevlar w/WHOI pressure & T logger on deepest bottleSample for SF6, DIC, salts, nuts, chl, FRRF, settle, 234Th, bacteria
CTD2 5.2 ahilting:IN PATCH "shoulder?"24 x 10 L bottlesTransmission, Flu, & CTD1st In patch station w/Melville Sample for SF6, DOC, DIC, salts, nuts, chla, HPLC, 234Th, POC, 15N, 13C, 3H, DNA, bSi (0.6 um), phyto (lugols)CTD to 250m, 1st bottle at 150m
B3 119.0 6 10L bottles on Kevlar w/Polar Star CTD logger on end of line (20m below last bottle) Sample for SF6, DOC, DIC, salts, nuts, chl, FRRF, bSi, HPLC, 234Th
B4 132.4 OUT STATION "low chl". 6 10L bottles on Kevlar w/Polar Star CTD logger & Flu senso on end of line (20m below last bottle) Sample for SF6, DOC, DIC, salts, nuts, 234Th, Chl, HPLC, bSi, phyto (lugols)
B5 106.6 OUT STATION "high chl"6 10L bottles on Kevlar w/Polar Star CTD logger & Flu senso on end of line (20m below last bottle) Sample for SF6, DOC, DIC, sals, nuts, 23Th, Chl, HPLC, bSi, phyto (lugols), bacteria
B6 118.5 OUT STATION "NW station"6 10L bottles on Kevlar w/Polar Star CTD logger & Flu senso on end of line (20m below last bottle) Sample for SF6, DOC, DIC, salts, nuts, 234Th, Chl, HPLC, bSi, phyto (lugols), 15N, 13C, bacteria
CTD4 9.7 ahilting:IN PATCH "deep cast"24 x 10 L bottlesTransmission, Flu, & CTD Sample for SF6, DOC, DIC, salts, nuts, chla, AP, bSi (0.6 um) , phyto (lugols), settling, 234Th, 15N, 13C, bacteria, DNA, CTD to 500m, 1st bottle at 500m
CTD4 30.2 bottle 19 and 15: nutrients from Nis 19 & 15 both labeled 15; so could be switched
CTD5 9.3 OUT STN "east"24 x 10 L btlsTrans., Flu, & CTD Sample for SF6, DIC, salts, nuts, chla-SF, AP, bSi (1um), phyto (lugols), settling, HPLC, 234Th, 15N, 13C, bacteria, DNA, CTD to 250m, 1st btl at 150m subsurface chl max @ 50-60mswitch to 1.0 nucleopores for this cast & all later bSi on cruise
CTD6 4.9 ahilting:IN PATCH "last call station"24 x 10 L bottlesTransmission, Flu, & CTD Sample for SF6, DOC, DIC, salts, nuts, chla, AP, bSi (1um), phyto (lugols), CTD to 250m, 1st bottle at 150muse 1.0um for bSi

In addition, this information from email exchanges (August 2002) between Ann Hilting (Duke University NSEES Marine Laboratory) and Edward Abraham (National Institute of Water and Atmospheric Research, New

Zealand) may be useful.

Underway grid, Samples 28, A-I had no filter size associated with them originally.
Per Chrissy's instructions, they should be GF/F samples but I think it is likely that
they are from different sized filters.

I gathered as much information as I could for each sample. For underway stations,
I used time and date to get location and other information from the underway files.
For the bottle and CTD stations, I gathered data from bottle and CTD summary files.
The spreadsheet "merged all chl values" contains all of the gathered information.
We will select parameters from this spreadsheet for the file that will be distributed.

Because I am not sure of the time and date of the CH stations (and thus the location),
I have not yet included them in the merged spreadsheet ("merged all chl values"). Because
I am not sure of the filter size for Samples 28, A-I, I have not entered the calculated (GF/F)
chlorophyll values in the merged spreadsheet. I am also not including chlorophyll data for
bottle cast two because we are not sure which bottles or depths the samples came from.

Remaining issues to be resolved:

Need correct time and date for the CH stations?
Need filter sizes for underway grid sample 28 A-I?
Need confirmation that these are the only Settling Column samples included in the spreadsheets?
Which rig was used for the GF/Fs and were the GF/F filters 47 mm?

Edward Abraham noted that the fluorometric chl's were on the low side compared
with those observed on the Revelle.

The settling column sample numbers were all samples that began with the prefix SC. They were experimental
treatments put into a darkened, still, column to let the phytoplankton settle before sampling
out of the top and the bottom after 2 hours. The concentrations will therefore vary relative to what
was in the original sample, and this reflects phytoplankton sinking (and floating).
Although they won't be of use to other people, they may as well be left on the master sheet so that the
same calibration can be applied to all the data.

Data Processing Description

Change history: YYMMDD
070209: Polar_Star_Masterfile_Final_Nutrerun.xls original data downloaded from SOFeX project Web site
070213: added to OCB database by Cyndy Chandler, OCB DMO, (cchandler@whoi.edu)

OCB DMO Notes:
070213: no final event log with which to compare geospatial, temporal data
070213: data is not final; awaiting PI review

Many notes and comments regarding original sample collection were embedded
as comments within the Excel spreadsheet data cells. The comments were collected
and can be viewed in the Methodology document.

The u/w indicates samples from shipboard surface/underway sea water intake;
measurement devices included at least a Fast Repetition Rate Fluorometer (FRRF,
PI was Edward Abraham), a CO2 sensor (PI was Ric Wanninkof), and a fluorometer.

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Data Files

File
bottle_samples.csv(Comma Separated Values (.csv), 68.92 KB) MD5:9dd5dfb675597bae908f03ff70fe8075 Primary data file for dataset ID 2804

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Parameters

Parameter	Description	Units
event	unique sampling event composite of day, month, year and time (GMT)	DDMMYY_hhmm
date	date sampling began (GMT)	YYYYMMDD
yrDay	decimal day of year	DD.ddd
pDay_S	Patch Day South	DD.ddd
lon	longitude, negative denotes West	decimal degrees
lat	latitude, negative denotes South	decimal degrees
patch_loc	sampling location relative to patch	dimensionless
ev_type	event type ID, uw or Transect	dimensionless
station	station location name	alpha_numeric
bot	Niskin bottle number (Nis.pos)	dimensionless
depth_n	depth, nominal; target depth	meters
depth	depth sample taken	meters
temp	temperature, from CTD, ITS-90 (from the WHOI logger system)	degrees Celsius
sal_CTD	salinity, from CTD, PSS-78 (PSU) (from the WHOI logger system)	dimensionless
sal_bot	salinity, bottle sample (PSU) (from salinometer)	dimensionless
SF6	SF6 (preliminary from ship) (fM = femtomolar = 10^-15 mol per liter)	femtomolar
SiO4	Silicate (MBARI)	micromolar
PO4	Phosphate (MBARI)	micromolar
NO3_NO2	Nitrate + Nitrite (MBARI)	micromolar
NO3Si_ratio	NO3/Si	dimensionless
FRRF_Fo	initial fluorescence (FRRF surface/underway)	relative
FRRF_Fm	maximal fluorescence (FRRF surface/underway)	relative
FRRF_FvFm	variable to maximal FRRF fluorescence ratio (photosynthetic efficiency)	dimensionless
FRRF_sigma	FRRF Sigma (FRRF surface/underway)	angstrom^2/quanta
FRRF_tau	FRRF Tau (FRRF surface/underway)	unknown
fluor	fluorescence	unknown
Fv_Fm	ratio of variable to maximal fluorescence (photosynthetic efficiency)	dimensionless
pCO2_approx	approx. pCO2	unknown
chl_fluor	logged U/W fluor Chl	unknown
fluoro_val	Fluoro-Value surface/underway (from underway files)	unknown

chl_a_GFF1	chlorophyll-a, GFF (Rep 1)	milligrams Chl per meter^3
chl_a_GFF2	chlorophyll-a, GFF (Rep 1)	milligrams Chl per meter^3
chl_a_20	chlorophyll-a, 20 micron filter	milligrams Chl per meter^3
chl_a_5	chlorophyll-a, 5 micron filter	milligrams Chl per meter^3
chl_a_2	chlorophyll-a, 2 micron filter	milligrams Chl per meter^3
chl_a_0d22	chlorophyll-a, 0.22 micron filter	milligrams Chl per meter^3
phaeo_a_GFF1	Phaeophytin a, GFF (Rep 1)	unknown
phaeo_a_GFF2	Phaeophytin a, GFF (Rep 2)	unknown
phaeo_a_20	Phaeophytin a, 20 micron filter	unknown
phaeo_a_5	Phaeophytin a, 5 micron filter	unknown
phaeo_a_2	Phaeophytin a, 2 micron filter	unknown
phaeo_a_d222	Phaeophytin a, 0.222 micron filter	unknown
chla_tot_HPLC	Total HPLC Chla (need to QC- may be more data)	milligrams/liter
POC	particulate organic Carbon (analyzed at WHOI by CHN)	micromolar
PON	particulate organic Nitrogen	micromolar
TALK	Total Alkalinity	micromol/kilogram SW
TCO2	Total CO2	micromol/kilogram SW
comments	comments	dimensionless

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Instruments

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.

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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

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

dates: 14 February 2002 to 21 February 2002 (20020214-20020221) location: N: -65.23 S: -66.59 W: -173.00 E: -170.53 project/cruise: SOFeX/USCGC Polar Star (WAGB-10) cruise: PS02 platform: USCGC Polar Star Methodology SOFeX 2002 Polar Star cruise PI notes for all water sample bottle data 13 February 2007: Prepared for OCB data system by Cyndy Chandler, OCB DMO (WHOI). Contact: Ken Buesseler (WHOI) with any questions pertaining to this dataset. Bottle sample data included in Master Water File: SF6/DOC/DIC/pCO2/23Th/HPLC/bSi/salinity/nutrients/Chl/phyto/bacteria Original Excel file downloaded from MBARI:copy of original Excel file All Polar Star data are preliminary & comparisons to other cruises should be made with caution until final QC and intercalibration work are completed. For further inquiries contact Ken Buesseler (kbuesseler@whoi.edu) The original Excel file contained multiple spreadsheets: The Master Water File includes sample information for all water samples collected underway and from casts as well as associated nutrient, SF6, FRRf, chlorophyll, TCO2, TA and CTD data. This data set was updated 12/3/02 with nutrient values rerun at MBARI. All original nutrient values were deleted (KJ). Sampling and analysis methods for many of the data types are described in a SOFeX 'cruise report' contributed in April 2002 by Bob Bidigare and converted to a href="http://ocb.whoi.edu/SOFeX/PI-NOTES/SOFeX_Cruise_Report_UH_MIT.pdf">PDF file. Sampling methods described in the cruise report are listed in the table below. Fraction Analyzed Method Samples Total phytoplankton Fluorometric Chlorophyll 170-280 ml, filtered Group-specific autotrophs HPLC Pigments 1-2 liter, filtered/frozen Autotrophic pico- & microplankton Large volume FCM, ship 5-10 ml, live Bacteria and picophytoplankton Dual-beam FCM, lab 1 ml, preserved/frozen Auto- & heterotrophic nanoplankton Epifluor. Microscopy 20-250 ml, preserved Heterotrophic microplankton Inverted Microscopy 100-500 ml, preserved Mesozooplankton populations Microscopy - Dissecting Net tows, preserved Mesozooplankton biomass CHN Analyses Net tows, screened/frozen Publications associated with this dataset Buesseler, K.O., 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).Limnology and Oceanography, 50: 311-327. [PDF] Notes regarding this dataset: chlorophyll One complexity with the Polar Star chlorophyll data is that chlorophyll was measured on board (Turner fluorometer); Dick Barber's group measured chlorophyll in the lab (reported in the larger bottle file, with size fractionated data too) and there are some HPLC pigment data, which also result in a measure of HPLC derived total Chl-a. Users of this dataset are encouraged to read the documentation carefully to ascertain which analysis technique was used to estimate chlorophyll values. notes pertaining to chlorophyll (A. Hilting) 1. Peter Croot calibrated the fluorometer on the Polar Star with a one-point calibration using a chla standard made on board ship from a powder. The concentration of the standard can not be verified. The calibration assumes constant extraction volumes (8 ml) and filtration volumes (500 ml). Contact R. Barber or P. Croot for calibration equations. 2. Unless the volumes vary, Fo and Fa can be read directly from the fluorometer. 3. The edited spreadsheets correct for variation in filtration volumes (extraction volume does not appear to vary). 4. Chl-a is calculated as (Fo-Fa)1.909. 1.909 is = (r/r-1) where r is the before to after acidification ratio specific to Duke's Turner 10-AU fluorometer (The fluorometer used on the Melville during SOFeX) and r = 2.1. Polar Star

Description	used a Turner 10-AU fluorometer. The equation is from EPA Method 445.0 (Revision 1.2), In Vitro Determination of Chlorophyll a and Pheophytin a in Marine and Freshwater Algae by Fluorescence. (Arar and Collins, September 1997). The equations [chl a] = [r/(r-1)(Fo-Fa)]v/V and [phaeophytin a] = [(r/(r-1)(rFa-Fo)]v/V. 5. Phaeophytin is calculated as (2.1Fa-Fo)1.909 6. Unspecified (not logged) filter sizes are assumed to be GF/F and unspecified filtration volumes are assumed to be 500 ml. 7. CH Stations and Underway grid samples 28 A-I are settling column experiments samples. See Ed Abraham for methods. 8. Bottle Cast two values are not included in the merged file. We are not sure which bottles the samples came from. 9. The size fractionation used a stacked set of funnels, with the water draining through the set by gravity, except for the lowermost 0.2 um filter,which was attached to a vacuum pump. (Size (Size Fractions: 0.22 mm, 2 mm, 5 mm, 20 mm). Note that this method differs from the methods used on the Melville and the Revelle. 10. GF/Fs were filtered separately on a 25 mm rig. 11. Per K. Buesseler, the sea surface water intake was 6 meters or less. We have assumed a actual depth of 6 meters for all underway samples. 12. A more detailed version is available. Contact K. Buesseler or R. Barber for more information. FRRF estimation of chlorophyll The shipboard surface/underway sampling system used a Fast Repetition Rate Fluorometer (FRRF) as another way to determine chlorophyll concentration in the surface waters. The change in the quantum yield of chlorophyll fluorescence induced by actinic light is used to derive photosynthetic parameters related to Photosystem II (PS II). The functional (i.e., the photochemically effective) absorption cross-section of PS II (Sigma PS II) describes the maximal efficiency of light utilization for photochemistry in PS II in units of Å^2/quanta. The FRRF measures fluorescence transients induced by a series of brief subsaturating excitation pulses, or `flashlets,' where the intensity, duration, and interval between them is independently controlled (Kolber et al., 1998). For an in depth explanation of techniques used for determining FRRF results (including equations), please see the complete reference: Kolber, Z.S., O. Prasil, and P.G. Falkowski. 1998. Measurements of variable chlorophyll fluorescence using fast repetition rate techniques: defining methodology and experimental protocols. Biochimica et Biophysica Acta (BBA) - Bioenergetics, 1367(1-3), pgs. 88-106. [ScienceDirect href="http://www.sciencedirect.com/science/article/B6T1S-3V3M4TP-3/2/672f628df...">PDF or DOI: doi:10.1016/S0005-2728(98)00135-2] SF6 data Surface & Transect data: see worksheet "underwaySF6" for complete SF6 dataset SF6 still considered preliminary as of Feb 2007 version of .xls merged file Notes extracted from Excel comments this information was extracted from comments embedded within the Excel worksheet data cells (organized here by data parameter name) station T1: 5 stations with subsurface sampling using 10L Niskin on Kevlarsurface SF6 per usual "W to E" Transect T2: is A. Hilting satellite image transect cast or sample comments: T2: Th I and J do not correspond to chl I and J uw grid 3: ahilting: Station number of the 5 um SF changed from uwg 5 to uwg 3. Date & time matched other uwg 3 stations. uw grid 4: ahilting: no station number logged. Uw station 4 assumed from date & time logged. uw grid 7: ahilting: station for 20 SF changed from uwg 2 to uwg 7. Date & time matched other uwg7 stations. SC28 *: ahilting: Ed Abraham's settling column experiment. Size Fraction, volume extracted from E. Abraham. depth: BC: see comments in BC methods .html T1: 25 m sample depth is an estimate from 'wire out' SiO4 Johnson: MBARI VALUES Selected Polar Star nutrients were reanalyzed at MBARI. All of the original values are deleted and only the rerun values are listed here. fluor_chl R200: ahilting: u/w fluor logged under 20 SF GFF Chl Rep1 R259: ahilting: not in SI transect 2 worksheet. Found in Uw_all worksheet R279: ahilting:0.27 was reported as 5 um. GF/F was not reported. There were two 5 um values. Assumed error. several Total HPLC Chls (mg/l) observations are mean values: station depth BC6 38.5 CTD5 19.6 CTD6 10.2 CTD6 35.4 CTD6 80.2 PI notes (embedded comments from the Excel column named: orign sample # or comments) comments: B1 68.0 4 10L bottles on Kevlar w/WHOI pressure & T logger on deepest bottleshallow bottle did not tripSample for SF6, DOC, DIC, salts, nuts, chl, FRRF, 234Th B2 125.0 6 10L bottles on Kevlar w/WHOI pressure & T logger on deepest bottleSample for SF6, DIC, salts, nuts, chl, FRRF, settle, 234Th, bacteria CTD2 5.2 ahilting:IN PATCH "shoulder?"24 x 10 L bottlesTransmission, Flu, & CTD1st In patch station w/Melville Sample for SF6, DOC, DIC, salts, nuts, chla, HPLC, 234Th, POC, 15N, 13C, 3H, DNA, bSi (0.6 um), phyto (lugols)CTD to 250m, 1st bottle at 150m B3 119.0 6 10L bottles on Kevlar w/Polar Star CTD logger on end of line (20m below last bottle) Sample for SF6, DOC, DIC, salts, nuts, chl, FRRF, bSi, HPLC, 234Th B4 132.4 OUT STATION "low chl". 6 10L bottles on Kevlar w/Polar Star CTD logger & Flu senso on end of line (20m below last bottle) Sample for SF6, DOC, DIC, salts, nuts, 234Th, Chl, HPLC, bSi, phyto (lugols) B5 106.6 OUT STATION "high chl"6 10L bottles on Kevlar w/Polar Star CTD logger & Flu senso on end of line (20m below last bottle) Sample for SF6, DOC, DIC, sals, nuts, 23Th, Chl, HPLC, bSi, phyto (lugols), bacteria B6 118.5 OUT STATION "NW station"6 10L bottles on Kevlar w/Polar Star CTD logger & Flu senso on end of line (20m below last bottle) Sample for SF6, DOC, DIC, salts, nuts, 234Th, Chl, HPLC,

| | bSi, phyto (lugols), 15N, 13C, bacteria CTD4 9.7 ahilting:IN PATCH "deep cast"24 x 10 L bottlesTransmission, Flu, & CTD Sample for SF6, DOC, DIC, salts, nuts, chla, AP, bSi (0.6 um) , phyto (lugols), settling, 234Th, 15N, 13C, bacteria, DNA, CTD to 500m, 1st bottle at 500m CTD4 30.2 bottle 19 and 15: nutrients from Nis 19 & 15 both labeled 15; so could be switched CTD5 9.3 OUT STN "east"24 x 10 L btlsTrans., Flu, & CTD Sample for SF6, DIC, salts, nuts, chla-SF, AP, bSi (1um), phyto (lugols), settling, HPLC, 234Th, 15N, 13C, bacteria, DNA, CTD to 250m, 1st btl at 150m subsurface chl max @ 50-60mswitch to 1.0 nucleopores for this cast & all later bSi on cruise CTD6 4.9 ahilting:IN PATCH "last call station"24 x 10 L bottlesTransmission, Flu, & CTD Sample for SF6, DOC, DIC, salts, nuts, chla, AP, bSi (1um), phyto (lugols), CTD to 250m, 1st bottle at 150muse 1.0um for bSi In addition, this information from email exchanges (August 2002) between Ann Hilting (Duke University NSEES Marine Laboratory) and Edward Abraham (National Institute of Water and Atmospheric Research, New Zealand) may be useful. Underway grid, Samples 28, A-I had no filter size associated with them originally. Per Chrissy's instructions, they should be GF/F samples but I think it is likely that they are from different sized filters. I gathered as much information as I could for each sample. For underway stations, I used time and date to get location and other information from the underway files. For the bottle and CTD stations, I gathered data from bottle and CTD summary files. The spreadsheet "merged all chl values" contains all of the gathered information. We will select parameters from this spreadsheet for the file that will be distributed. Because I am not sure of the time and date of the CH stations (and thus the location), I have not yet included them in the merged spreadsheet ("merged all chl values"). Because I am not sure of the filter size for Samples 28, A-I, I have not entered the calculated (GF/F) chlorophyll values in the merged spreadsheet. I am also not including chlorophyll data for bottle cast two because we are not sure which bottles or depths the samples came from. Remaining issues to be resolved: Need correct time and date for the CH stations? Need filter sizes for underway grid sample 28 A-I? Need confirmation that these are the only Settling Column samples included in the spreadsheets? Which rig was used for the GF/Fs and were the GF/F filters 47 mm? Edward Abraham noted that the fluorometric chl's were on the low side compared with those observed on the Revelle. The settling column sample numbers were all samples that began with the prefix SC. They were experimental treatments put into a darkened, still, column to let the phytoplankton settle before sampling out of the top and the bottom after 2 hours. The concentrations will therefore vary relative to what was in the original sample, and this reflects phytoplankton sinking (and floating). Although they won't be of use to other people, they may as well be left on the master sheet so that the same calibration can be applied to all the data.

Processing Description
Change history: YYMMDD 070209: http://ocb.whoi.edu/SOFeX/PI-NOTES/Polar_Star_Masterfile_Final_Nutrerun.... original data downloaded from SOFeX project Web site 070213: added to OCB database by Cyndy Chandler, OCB DMO, (cchandler@whoi.edu) OCB DMO Notes: 070213: no final event log with which to compare geospatial, temporal data 070213: data is not final; awaiting PI review Many notes and comments regarding original sample collection were embedded as comments within the Excel spreadsheet data cells. The comments were collected and can be viewed in the Methodology document. The u/w indicates samples from shipboard surface/underway sea water intake; measurement devices included at least a Fast Repetition Rate Fluorometer (FRRF, PI was Edward Abraham), a CO2 sensor (PI was Ric Wanninkof), and a fluorometer. |

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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

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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