SOFeX Revelle SF6 Patch Determination Table from R/V Roger Revelle cruise DRFT08RR from the Southern Ocean, south of New Zealand in 2002 (SOFeX project)

Website: https://www.bco-dmo.org/dataset/2938
Data Type: document
Version: 22 August 2008
Version Date: 2008-08-22

Project
» Southern Ocean Iron Experiment (SOFeX)

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

Contributors	Affiliation	Role
Sullivan, Kevin	National Oceanic and Atmospheric Administration (NOAA-AOML)	Principal Investigator
Chandler, Cynthia L.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

Dataset Description

This SF6 Patch Determination Table was a preliminary attempt at a quantitative answer to the question of whether a cast on the Revelle was in or out of the patch.

Methods & Sampling

22 August 2008: Contributed by Kevin Sullivan (NOAA-AOML)
Prepared for OCB data system by Cyndy Chandler, OCB DMO (WHOI).

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Description
This table was a preliminary attempt at a quantitative answer to the question of whether a cast on the Revelle was in or out of the patch. The ten largest underway analyses were averaged for each half day. A regression fit between the year-day (x) and the average half-day maximum (y) yielded an exponential equation. This equation was used to provide a maximum SF6 concentration within the patch when each cast was done. The percentage of that maximum SF6 concentration was calculated for three values associated with each cast: the SF6 in the surface bottle, the largest SF6 measured in any niskin, and the SF6 measured with the underway system (average of ten analyses) during the cast. The largest differences among these three values are seen within the first days of dispersal of the patch. The occurrence of percentages significantly larger than 100% also illustrates the spatial variability of the tracer gas and the difficulties in estimating the half-day maxima.

Contact: Kevin Sullivan (NOAA-AOML)

North Patch – Revelle

percent of interpolated ½ day maximum SF_6

station	cast	max on cast[1]	surface niskin[2]	avg 10 UW[3]
8	1	52%	23%	13%
9	1	89%	89%	65%
10	1	82%	82%	79%
10	2	5%	5%	36%
10	3	74%	74%	74%

South Patch - Revelle

percent of interpolated ½ day maximum SF_6

station	cast	max on cast	surface niskin	avg 10 UW
20	2	116%	106%	54%
21	1	110%	110%	59%
21	2	104%	54%	63%
22	1	157%	157%	109%
24	1	76%	76%	66%
24	3	89%	89%	77%
25	2	49%	25%	52%
26	1	74%	74%	71%
26	3	80%	78%	70%
27	1	8%	8%	21%
28	1	58%	55%	70%
28	3	65%	64%	87%
29	1	65%	65%	98%

[1] percentage = 100 x maximum SF_6 on cast / interpolated maximum SF_6
[2] percentage = 100 x SF_6 in surface niskin / interpolated maximum SF_6
[3] percentage = 100 x average of 10 UW SF_6 values (time match) / inter'd max' SF_6

[table of contents | back to top]

Parameters

Parameters for this dataset have not yet been identified

[table of contents | back to top]

Deployments

DRFT08RR

Website	https://www.bco-dmo.org/deployment/57824
Platform	R/V Roger Revelle
Report	http://ocb.whoi.edu/SOFeX/CRUISES/proj_description.pdf
Start Date	2002-01-06
End Date	2002-02-14
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 ROGER REVELLE from Scripps Institution of Oceanography sailed first. The REVELLE team added iron to two areas referred to as 'the North and South patches'. After the iron and an inert chemical tracer (SF6) were added, the REVELLE's primary mission was to map the size and characteristics of the South patch using a SeaSOAR fish towed behind the ship that pumped water up to the ship for sampling and analysis. The REVELLE also collected samples for initial biological shipboard mapping of iron concentrations, nutrients, chlorophyll, and photosynthetic efficiency. A cruise logbook includes daily entries filed by the Chief Scientist aboard each vessel. **Methods & Sampling** 22 August 2008: Contributed by Kevin Sullivan (NOAA-AOML) Prepared for OCB data system by Cyndy Chandler, OCB DMO (WHOI). Original MS Word file downloaded from MBARI: get MS Word file or converted to PDF format file Description This table was a preliminary attempt at a quantitative answer to the question of whether a cast on the Revelle was in or out of the patch. The ten largest underway analyses were averaged for each half day. A regression fit between the year-day (x) and the average half-day maximum (y) yielded an exponential equation. This equation was used to provide a maximum SF6 concentration within the patch when each cast was done. The percentage of that maximum SF6 concentration was calculated for three values associated with each cast: the SF6 in the surface bottle, the largest SF6 measured in any niskin, and the SF6 measured with the underway system (average of ten analyses) during the cast. The largest differences among these three values are seen within the first days of dispersal of the patch. The occurrence of percentages significantly larger than 100% also illustrates the spatial variability of the tracer gas and the difficulties in estimating the half-day maxima. Contact: Kevin Sullivan (NOAA-AOML)

[table of contents | back to top]

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 (CO_2 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.

[table of contents | back to top]

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).

[table of contents | back to top]