Model input: hydro-meteorological forcing from the R/V Tangaroa 61TG_3052cruise in the Southern Ocean during 1999 (SOIREE project)

Website: https://www.bco-dmo.org/dataset/2888
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Project
» Southern Ocean Iron Release Experiment (SOIREE)

Program
» Iron Synthesis (FeSynth)

Contributors	Affiliation	Role
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Dataset Description

SOIREE Modeling - hydro-meteorological forcings
Time series of daily averaged wind velocity (m s-1), sea surface temperature (°C), and mixed layer depth (m).

SOIREE Modeling
Updated October 2000
Authors: E. Hannon, C. Lancelot, P.W. Boyd
Contact: Prof. C. Lancelot (ESA-ULB, CP221, Campus Plaine, Bd du Triomphe, B-1050 Brussels, Belgium, lancelot@ulb.ac.be)

Note: these model runs were performed with the SWAMCO model.

See details relative to model concepts, parameterization and adaptation to SOIREE in:
Lancelot, C., E. Hannon, S. Becquevort, C. Veth, and H. J. W. de Baar. 2000.
Modelling phytoplankton blooms and related carbon export production in the Southern Ocean: application to the Atlantic sector in Austral spring 1992. Deep-Sea Res., Part I, 47, 1621-1662.

Hannon, E., P. W. Boyd, M. Silvoso and C. Lancelot. (this issue). Modeling the bloom evolution and carbon flows during SOIREE: Implications for future in situ iron-enrichments in the Southern Ocean. Deep-Sea Res. II.

Model results are compiled in the file "SOIREEmodel.xls"
This file includes 7 sheets:
Var.out: state variables time series (outside the patch)
Var.in: state variables time series (inside the patch)
Act.out: activities (biogenic elements fluxes) time series (outside the patch)
Act.in: activities (biogenic elements fluxes) time series (inside the patch)
BudgetC: integrated carbon budget
pCO2: surface pCO2 time series
Forcing: hydro-meteorological forcings

Comments:
Sheet 1 (Var.out):
60 days (10/02/1999 to 10/04/1999) time series of the state variables values, averaged daily and over the upper mixed layer (UML)
See state variables list in Table 1 below.
Diatoms and autotrophic nanoflagellates chlorophyll a (columns AH, AI) are estimated on the basis of the functional and structural metabolites concentration (state variables DAF and NFF), using a conversion factor of 0.5 mg chla / mmol C

Sheet 2 (Var.in):
see Sheet 1

Sheet 3 (Act.out):
activities time series (outside the patch)
60 days (10/02/1999 to 10/04/1999) time series of the activities (biogenic elements fluxes) values, integrated over the upper mixed layer (UML) and daily averaged.
See activities list in Table 2 below.

Sheet 4 (Act.in):
see Sheet 3

Sheet 5 (BudgetC):
Carbon budget of the Upper Mixed Layer, calculated over 13 days (site occupation of SOIREE) and 60 days since the initial iron release (inside and outside the fertilized patch)

Sheet 6 (pCO2):
Time series of daily averaged surface water pCO2 (in situ temperature, 100% wet) (inside and outside the fertilized patch)

Sheet 7 (Forcing):
Time series of daily averaged wind velocity (m s-1), sea surface temperature (°C), and mixed layer depth (m).

Table 1. SWAMCO state variables

activity	***code***	***unit***
diatoms photosynthesis	photDA	mmol m-2 day-1
diatoms respiration	respDA	mmol m-2 day-1
diatoms growth	sDAF	mmol m-2 day-1
diatoms lysis l	ysDA	mmol m-2 day-1
nanoflagellates photosynthesis	photNF	mmol m-2 day-1
nanoflagellates respiration	respNF	mmol m-2 day-1
nanoflagellates growth	sNFF	mmol m-2 day-1
nanoflagellates lysis	lysNF	mmol m-2 day-1
NO3 uptake	NO3upt	mmol m-2 day-1
NH4 uptake by phytoplankton	NH4upt	mmol m-2 day-1
mesozooplankton grazing on diatoms	MSgDA	mmol m-2 day-1
mesozooplankton grazing on microzoo	MSgMC	mmol m-2 day-1
MCZ grazing on autotrophic nanofalg.	MCgNF	mmol m-2 day-1
MCZ grazing on heterotrophic nanoflag.	MCgHNF	mmol m-2 day-1
HNF grazing on bacteria	HNFgBAC	mmol m-2 day-1
bacteria growth	muBAC	mmol m-2 day-1

ammonification NregBAC mmol m-2 day-1
NH4 regeneration by protozooplankton NregZOO mmol m-2 day-1
PO4 regeneration by protozooplankton Preg mmol m-2 day-1
Fe regeneration by protozooplankton Fereg µmol m-2 day-1
POC export production (110m) sed mmol m-2 day-1
diatoms (C) export production (110m) sedDA mmol m-2 day-1
diatoms (Si) export production (110m) sedBSi mmol m-2 day-1
sea to air CO2 flux CO2flux mmol m-2 day-1
DIC upwelling upwDIC mmol m-2 day-1
Fe upwelling upwFe µmol m-2 day-1
bacteria autolysis lysBAC mmol m-2 day-1
HNF autolysis lysHNF mmol m-2 day-1
MCZ autolysis lysMCZ mmol m-2 day-1
POC export production out of the UML sedUML mmol m-2 day-1

Table 2. SWAMCO activities (fluxes of biogenic elements)
activity code unit
Functional and structural metabolites (diatoms) DAF mmol C m-3
Monomeric substrates (diatoms) DAS mmol C m-3
Reserve material (diatoms) DAR mmol C m-3
Functional and structural metabolites (nanoflag.) NFF mmol C m-3
Monomeric substrates (nanoflag.) NFS mmol C m-3
Reserve material (nanoflag.) NFR mmol C m-3
Microzooplankton MCZ mmol C m-3
Heterotrophic nanoflagellates HNF mmol C m-3
Bacteria BAC mmol C m-3
monomeric substrates for bacteria (C) BSC mmol C m-3
dissolved organic C (high biodeg.) DC1 mmol C m-3
dissolved organic C (low biodeg.) DC2 mmol C m-3
particulate organic C (high biodeg.) PC1 mmol C m-3
particulate organic C (low biodeg.) PC2 mmol C m-3
monomeric substrates for bacteria (N) BSN mmol N m-3
dissolved organic N (high biodeg.) DN1 mmol N m-3
dissolved organic N (low biodeg.) DN2 mmol N m-3
particulate organic N (high biodeg.) PN1 mmol N m-3
particulate organic N (low biodeg.) PN2 mmol N m-3
dissolved organic P (high biodeg.) DP1 mmol P m-3
dissolved organic P (low biodeg.) DP2 mmol P m-3
particulate organic P (high biodeg.) PP1 mmol P m-3
particulate organic P (low biodeg.) PP2 mmol P m-3
nitrate NO3 mmol N m-3
ammonium NH4 mmol N m-3
phosphate PO4 mmol P m-3
silicic acid DSi mmol Si m-3
biogenic Si BSi mmol Si m-3
total dissolved iron DFe µmol Fe m-3
total dissolved inorganic carbon DIC µmol kg-1
total alkalinity ALK µmol kg-1

Methods & Sampling

See SOIREE Introduction and Summary, Deep-Sea Research II 48 (2001) 2425-2438

Data Processing Description

See SOIREE Introduction and Summary, Deep-Sea Research II 48 (2001) 2425-2438

BCO-DMO Processing Notes

Generated from original file SOIREEmodel.xls, Tab: forcing provided on the

Deep-Sea Research II 48 (2001) accompanying CD-Rom

BCO-DMO Edits

- parameter names modified to conform to BCO-DMO convention

- date formatted as YYYYMMDD

- number values padded to two decimal places

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Data Files

File
model_forcing.csv (Comma Separated Values (.csv), 1.58 KB) MD5:b9b3d84b31697ff4d09214b2a0c4bfca Primary data file for dataset ID 2888

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Parameters

Parameter	Description	Units
date	Date	YYYYMMDD
Uwind	Daily Averaged Wind Velocity	m/sec
SST	Daily Averaged Sea Surface Temperature	degrees celsius
MLD	Daily Averaged Mixed Layer Depth	meters * -1.0

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Deployments

61TG_3052

Website	https://www.bco-dmo.org/deployment/57827
Platform	R/V Tangaroa
Report	http://bcodata.whoi.edu/Fe_Synthesis/SOIREE/SOIREE_cruisereport.pdf
Start Date	1999-01-31
End Date	1999-03-01
Description	Cruise to the Southern Ocean as part of the Fe Sythesis project whose aim was to maintain a coherent patch of iron-enriched seawater for the duration of SOIREE and to interpret any iron-mediated effects on the patch by conducting measurements and performing experiments during this period.

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Project Information

Southern Ocean Iron Release Experiment (SOIREE)

Coverage: Southern Ocean

Project in the Southern Ocean aimed at maintaining a coherent patch of iron-enriched seawater for the duration of project and to interpret any iron-mediated effects on the patch by conducting measurements and performing experiments during this period of the project.

The Southern Ocean Iron RElease Experiment (SOIREE), was the first in situ iron fertilization experiment performed in the polar waters of the Southern Ocean. SOIREE was an interdisciplinary study involving participants from six countries, and took place in February 1999 south of the Polar Front in the Australasian-Pacific sector of the Southern Ocean.

Approximately 3800 kg of acidified FeSO4.7H2O and 165 g of the tracer sulphur hexafluoride (SF6) were added to a 65-m deep surface mixed layer over an area of ~50 km2. Initially, mean dissolved iron concentrations were ~2.7 nM, but decreased to ambient levels within days, requiring subsequent additions of 1550-1750 kg of acidified FeSO4.7H2O on days 3, 5 and 7 of the experiment.

During the 13-day site occupation, there were iron-mediated increases in phytoplankton growth rates, with marked increases in chlorophyll a (up to 2 µgl-1) and production rates (up to 1.3 gCm-2d-1). These resulted in subsequent changes in the pelagic ecosystem structure, and in the cycling of carbon, silica and sulphur, such as a 10% drawdown of surface CO2.

The SOIREE bloom persisted for >40 days following our departure from the site, as observed via SeaWiFS remotely sensed observations of Ocean Colour.

BCO-DMO Note:
All original data and metadata provided on a CD-Rom accompanying the Deep-Sea Research II 48 (2001) volume. The CD-Rom contains the main SOIREE datasets and ancillary information including the pre-experiment 'desktop' database study for site-selection, and satellite images of the SOIREE bloom.

Related files

SOIREE Preliminary Voyage Report
SOIREE Introduction and Summary, Deep-Sea Research II 48 (2001) 2425-2438
SOIREE Cruise Track

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Program Information

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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