

Water column biogenic silica (Psi) values from sediment traps from R/V Tangaroa cruise 61TG_3052 in the Southern Ocean in 1999 (SOIREE project)

Website: <https://www.bco-dmo.org/dataset/2852>

Version: 24August2009

Version Date: 2009-08-24

Project

» [Southern Ocean Iron Release Experiment](#) (SOIREE)

Program

» [Iron Synthesis](#) (FeSynth)

Contributors	Affiliation	Role
Nodder, Scott	New Zealand National Institute of Water and Atmospheric Research (NIWA)	Principal Investigator
Mackie, Doug	University of Otago	Contact
Gegg, Stephen R.	Woods Hole Oceanographic Institution (WHOI)	BCO-DMO Data Manager

Table of Contents

- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
 - [BCO-DMO Processing Description](#)
- [Data Files](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Program Information](#)

Dataset Description

SOIREE Sediment Traps - Water column PSi (biogenic) results

METHOD:

Biogenic silica content was determined on filtered samples (47 mm , 0.4 um Nuclepore) after digestion in 0.2 M NaOH, following the methods of Ragueneau and Tréguer (1994).

Estimated accuracy of replicate analyses: $\pm 5-10\%$

Blank filter: 15 ug

Digest blanks (no filter): indistinguishable from background levels

NOTES

1. The initial and OUTSIDE PATCH water column integrated PSi values from SOIREE were higher than expected for Southern Ocean HNLC waters. For example, published data from Bernard Quesinuer (France) in the Atlantic sector of the Southern Ocean indicates maximum BSi concentrations of 1.6 $\mu\text{molSi/l}$ in the vicinity of the Polar Front (53-54°S), with maximums in surrounding HNLC waters of 0.25 $\mu\text{molSi/l}$. SOIREE PSi water column concentrations reached a maximum of 25 $\mu\text{molSi/l}$ with an average across all profiles of 5.8 $\mu\text{molSi/l}$ and surface values outside the iron-fertilised patch (2-4 $\mu\text{mol/l}$) which were not substantially different from that measured inside the patch during the SOIREE bloom (except on Day T10)

2. There is no obvious indication from either sampling or analytical techniques that the PSi values are artificially inflated due to sample handling, etc.

3. Charette & Buesseler (2000, G3) suggest that a previous export event must have occurred prior to SOIREE due to a substantial ^{234}Th deficit relative to ^{238}U , which might explain the SOIREE POC results. Since there is no indication from daily SeaWiFS images of a surface bloom from Nov 1998-Jan 1999 (C. Law pers. comm., 1999), nor any "memory" of such an event in the pCO_2 data (Watson et al., 2000, Nature), Charette & Buesseler (2000) suggested that such a bloom is likely to have been a subsurface feature, or that there was a significant delay in export
4. P_{Si} values inside and outside the SOIREE patch were similar despite 6-fold and 3-fold increases in chlorophyll a concentrations and phytoplankton abundance, respectively, inside the iron-fertilised patch (Boyd et al., 2000, Nature)
5. Therefore, we conclude that perhaps there was a significant detrital P_{Si} component in the water column at the time that the SOIREE site was occupied, representing organic material derived from a previous bloom/export event.
6. Given the uncertainties, however, it is wise to treat the interpretation of the above P_{Si} data with caution.

Methods & Sampling

See [SOIREE Preliminary Voyage Report](#)

METHOD:

Biogenic silica content was determined on filtered samples (47 mm , 0.4 μm Nuclepore) after digestion in 0.2 M NaOH, following the methods of Ragueneau and Tréguer (1994).

Estimated accuracy of replicate analyses: $\pm 5\text{-}10\%$

Blank filter: 15 μg

Digest blanks (no filter): indistinguishable from background levels

NOTES

1. The initial and OUTSIDE PATCH water column integrated P_{Si} values from SOIREE were higher than expected for Southern Ocean HNLC waters. For example, published data from Bernard Queginuer (France) in the Atlantic sector of the Southern Ocean indicates maximum BSi concentrations of 1.6 $\mu\text{molSi/l}$ in the vicinity of the Polar Front (53-54°S), with maximums in surrounding HNLC waters of 0.25 $\mu\text{molSi/l}$. SOIREE P_{Si} water column concentrations reached a maximum of 25 $\mu\text{molSi/l}$ with an average across all profiles of 5.8 $\mu\text{molSi/l}$ and surface values outside the iron-fertilised patch (2-4 $\mu\text{mol/l}$) which were not substantially different from that measured inside the patch during the SOIREE bloom (except on Day T10)
2. There is no obvious indication from either sampling or analytical techniques that the P_{Si} values are artificially inflated due to sample handling, etc.
3. Charette & Buesseler (2000, G3) suggest that a previous export event must have occurred prior to SOIREE due to a substantial ^{234}Th deficit relative to ^{238}U , which might explain the SOIREE POC results. Since there is no indication from daily SeaWiFS images of a surface bloom from Nov 1998-Jan 1999 (C. Law pers. comm., 1999), nor any "memory" of such an event in the pCO_2 data (Watson et al., 2000, Nature), Charette & Buesseler (2000) suggested that such a bloom is likely to have been a subsurface feature, or that there was a significant delay in export
4. P_{Si} values inside and outside the SOIREE patch were similar despite 6-fold and 3-fold increases in chlorophyll a concentrations and phytoplankton abundance, respectively, inside the iron-fertilised patch (Boyd et al., 2000, Nature)
5. Therefore, we conclude that perhaps there was a significant detrital P_{Si} component in the water column at the time that the SOIREE site was occupied, representing organic material derived from a previous bloom/export event.
6. Given the uncertainties, however, it is wise to treat the interpretation of the above P_{Si} data with caution.

Data Processing Description

See [SOIREE Preliminary Voyage Report](#)

See NOTES in Dataset description and Methods & Sampling

BCO-DMO Processing Description

Generated from original file SOIREE_Export_final.xls, Tab: PSiwatercolumn provided on the Deep-Sea Research II 48 (2001) accompanying CD-Rom

BCO-DMO Notes

For some stations, there was no match for StationId and Patch location
The StationId would not agree with the patch location of In/Out in other files

In these cases, what seemed to be the most reasonable match was used

These problem station are identified below by StationId

StationId T1144-2 Out: Date.UTC, Time.UTC, Lon, Lat are questionable

StationId T1147-1 In: Date.UTC, Time.UTC, Lon, Lat are questionable

StationId T1151-1 In: Date.UTC, Time.UTC, Lon, Lat are questionable

StationId T1154 In: Date.UTC, Time.UTC, Lon, Lat are questionable

BCO-DMO Edits

- parameter names modified to conform to BCO-DMO convention

- date.UTC, time.UTC, lat, lon added from files:

SOIREE_Stations_CTDSampling.xls

SOIREE_Stations_MasterStationList.xls

SOIREE_CTD_Summary

- Blank rows in original sheet removed

- 'nd' added to blank cells

- Made column header record one line

- Formatted Date (NZST) to YYYYMMDD

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

Data Files

File
traps_PSiwatercol.csv (Comma Separated Values (.csv), 7.33 KB) MD5:8d33f49ad1525e62de4bbba983f71ffe
Primary data file for dataset ID 2852

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

Parameters

Parameter	Description	Units
Date_NZST	Date NZST	YYYYMMDD
lon	longitude, negative denotes West	decimal degrees
lat	latitude, negative denotes South	decimal degrees
date.UTC	UTC Date	YYYYMMDD
time.UTC	UTC time	HHMM
depth	Sample depth	meters
SOIREEDay	SOIREE Experiment Day T1 = 0000 h NZST 10/02/99 + 24 hours	Text
Patch	Patch Location (In/Out)	Text
StationId	CTD Station/Cast Id	Text
Vol_Filtered	Volume filtered	mlitres
Psi_B	Psi in mmol/m ³ or umol/litre	mmol/m ³ ; umol/litre
Psi_A	Psi in ug/litre	ug/litre
POC	POC	mmol/m ³
Si_C	Si_C	molar

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

Instruments

Dataset-specific Instrument Name	CTD Seabird 911
Generic Instrument Name	CTD Sea-Bird 911
Dataset-specific Description	NIWA's Seabird 911plus CTD and related instrumentation
Generic Instrument Description	The Sea-Bird SBE 911 is a type of CTD instrument package. The SBE 911 includes the SBE 9 Underwater Unit and the SBE 11 Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 and SBE 11 is called a SBE 911. The SBE 9 uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 and SBE 4). The SBE 9 CTD can be configured with auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). More information from Sea-Bird Electronics.

Dataset-specific Instrument Name	Sediment Trap
Generic Instrument Name	Sediment Trap
Dataset-specific Description	MULTI-trap dimensions: Length (L, m): 0.58 Trap length with baffles inserted; L without baffles: 0.525 m AR without baffles: 7.50 Trap volume without baffles: 2.021 litres Inside diameter (Di, m): 0.07 Outside diameter (Do, m): 0.08 Aspect ratio (AR): 8.29 Aspect ratio with salt (AR): 7.29 Basal brine added to a height of 1-trap diameter (7 cm) Collection area (A, m2): 0.00385 Trap volume (V, m3): 0.00223 Trap volume (V, litres): 2.232 Baffle length (Lb, m): 0.08 Baffle diameter (Dib, m): 0.01 Baffle aspect ratio (ARb): 5.77
Generic Instrument Description	Sediment traps are specially designed containers deployed in the water column for periods of time to collect particles from the water column falling toward the sea floor. In general a sediment trap has a jar at the bottom to collect the sample and a broad funnel-shaped opening at the top with baffles to keep out very large objects and help prevent the funnel from clogging. This designation is used when the specific type of sediment trap was not specified by the contributing investigator.

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

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.

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

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 µg l⁻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.

© 2001 Elsevier Science Ltd. All rights reserved.

Related files

[SOIREE Preliminary Voyage Report](#)

[SOIREE Introduction and Summary, Deep-Sea Research II 48 \(2001\) 2425-2438](#)

[SOIREE Cruise Track](#)

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

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).



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