

Vertical Fe GoFlo measurements from R/V Tangaroa cruise 61TG_3052 in the Southern Ocean in 1999 (SOIREE project)

Website: <https://www.bco-dmo.org/dataset/2835>

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Project

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

Program

» [Iron Synthesis](#) (FeSynth)

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Dataset Description

SOIREE Vertical Fe GoFlo Data

During the cruise we had the following three objectives:

- (1) Undertake continuous sampling of the infused patch for dissolved/total iron
- (2) Obtain samples from vertical profiles, using Go-Flo bottles, to examine the partitioning between dissolved and particulate iron within the water column, both inside and outside the patch.
- (3) Undertake measurements to determine iron speciation within the water column.

Go-Flo casts were taken both inside and outside the patch during the course of the experiment. Typically, water samples were obtained from four standard depths (20, 40, 60 and 80 m) throughout the water column at each station. Deeper samples (> 80 m) were obtained at some stations to examine the concentration of iron below the mixed layer. Both filtered (0.2 μ m) and unfiltered samples were collected. These samples will be analysed for Fe and other trace metals (Zn, Cd, Mn, Cu) back in the clean laboratory at the University of Otago.

The speciation of iron was measured using competitive ligand exchange cathodic stripping voltammetry (CLE CSV) on samples from 40 m depth from stations both inside and outside the patch. This technique determines the total concentration of iron binding ligands present in the sample and their relative binding strengths. From the data generated an estimation of the inorganic iron concentration, Fe²⁺, can also be made, this value can be used to approximate the amount of iron that may be available for uptake by the phytoplankton.

References

Bowie, A.R., Maldonado, M.T., Frew, R.D., Croot P.L., Achterberg, E.A., Mantoura, R.F.C., Worsfold, P.J., Law, C.S., Boyd P.W., The Fate of Added Iron during a Mesoscale Fertilisation Experiment in the Southern Ocean, Deep-Sea Research II (2001), SOIREE special issue, in the press.

Bruland, K.W., Franks, R.P., Knauer, G.A., Martin, J.H., 1979. Sampling and analytical methods for the determination of copper, cadmium, zinc and nickel at the nanogram per litre level in seawater. Analytica Chimica Acta 105, 233-245.

Danielsson, L.G., Magnusson, B., Westerlund, S., Zhang, K., 1982. Trace-metal determinations in estuarine waters by electrothermal atomic-absorption spectrometry after extraction of dithiocarbamate complexes into freon. Analytica Chimica Acta 144, 183-188.

Methods & Sampling

See [SOIREE Preliminary Voyage Report](#)

Go-Flo casts were taken both inside and outside the patch during the course of the experiment. Typically, water samples were obtained from four standard depths (20, 40, 60 and 80 m) throughout the water column at each station. Deeper samples (> 80 m) were obtained at some stations to examine the concentration of iron below the mixed layer. Both filtered (0.2 μm) and unfiltered samples were collected. These samples will be analysed for Fe and other trace metals (Zn, Cd, Mn, Cu) back in the clean laboratory at the University of Otago.

The speciation of iron was measured using competitive ligand exchange cathodic stripping voltammetry (CLE CSV) on samples from 40 m depth from stations both inside and outside the patch. This technique determines the total concentration of iron binding ligands present in the sample and their relative binding strengths. From the data generated an estimation of the inorganic iron concentration, Fe^{II} , can also be made, this value can be used to approximate the amount of iron that may be available for uptake by the phytoplankton.

Data Processing Description

See [SOIREE Preliminary Voyage Report](#)

BCO-DMO Processing Notes

Generated from original file Vertical Fe.xls, Tabs: Notes and Vertical Fe provided on the Deep-Sea Research II 48 (2001) accompanying CD-Rom

Comments preserved from the original file:

1. Dissolved (DFe) and total iron (TFe) vertical data (nM)
2. Sampling and analyses based on the methods of Bruland et al. (1979) and Danielsson et al. (1982). For full details, see Bowie et al. (2001)
3. Decimal time is given as days in February 1999 (GMT), with 1 February 1999 0:00 = 1.0000
4. T1136: FI-CL method
5. T1143: FI-CL method

Sample analysis: Russell D. Frew (University of Otago)

Data processing and interpretation: Andrew R. Bowie (University of Plymouth and Plymouth Marine Laboratory)

BCO-DMO Edits

- parameter names modified to conform to BCO-DMO convention
- date reformatted to YYYYMMDD
- negative depths made positive for consistency with other SOIREE data
- Custom parameters generated for In/Out GFAAS Mean/StdDev from multiple header lines
- date.UTC, time.UTC, lat, lon added from SOIREE_Stations_GoFlosSampling.xls
- 2 original column header records re-organized into one header line
- "nd" inserted in blank cells

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Data Files

File
VerticalFe.csv (Comma Separated Values (.csv), 6.10 KB) MD5:e7db027f5213e77c6e94fa30f99d228b
Primary data file for dataset ID 2835

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Parameters

Parameter	Description	Units
date_local	local date	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
Patch	Patch Location (In/Out)	text
depth	Collection Depth	meters
Infusion	Iron Infusion Number	text
DaysSinceStartOfExperiment	Days Since Start of Experiment	decimal days
MappingDay	Mapping Day	integer
TimeDecimal	Days in February 1999 (GMT) with 1 February 1999 0:00 = 1.0000. (local)	decimal days
station	Cruise Station Id	text
In_GFAAS_Mean_Dfe	Mean Dissolved Fe In	nM
In_GFAAS_Dfe_StdDev	Std Deviation for Dissolved Fe In	nM
In_GFAAS_Mean_Tfe	Mean Total Fe In	nM
Out_GFAAS_Mean_Dfe	Mean Dissolved Fe Out	nM
Out_GFAAS_Dfe_StdDev	Std Deviation for Dissolved Fe Out	nM
Out_GFAAS_Mean_Tfe	Mean Total Fe Out	nM
Out_GFAAS_StdDev_Tfe	Std Deviation for Dissolved Fe Out	nM
In_GFAAS_StdDev_Tfe	Std Deviation for Total Fe In	nM

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Instruments

Dataset-specific Instrument Name	Go-flo Bottle
Generic Instrument Name	GO-FLO Bottle
Dataset-specific Description	Vertical profiling samples were collected from 5L and 30L trace metal Go-Flo sampling bottles deployed on Kevlar rope.
Generic Instrument Description	GO-FLO bottle cast used to collect water samples for pigment, nutrient, plankton, etc. The GO-FLO sampling bottle is specially designed to avoid sample contamination at the surface, internal spring contamination, loss of sample on deck (internal seals), and exchange of water from different depths.

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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 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.

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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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