

# Water column Particulate Organic Carbon (POC) and Particulate Organic Nitrogen (PON) results 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/2866>

**Version:** 24August2009

**Version Date:** 2009-08-24

## Project

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

## Program

» [Iron Synthesis](#) (FeSynth)

Contributors	Affiliation	Role
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## Dataset Description

SOIREE Sediment Traps - Water column POC and PON results **METHOD**

Two litre samples filtered through preweighed, precombusted (450°C for 4 hours) GF/F filters; assumed negligible carbonate so samples non-acidified; whole filters analysed on CHN analyser

Corrected values were calculated based on a filtered volume of 2 litres, rather than 500 ml as reported for the initial values

## NOTES

1. The initial and OUTSIDE PATCH water column integrated POC values from SOIREE are higher than expected for Southern Ocean HNLC waters. For example, unpublished data provided by Wilford Gardner (USA) from the US JGOFS AESOPS transect, show that between 52-72°S 170°W integrated POC standing stocks (0-50 m) in summer ranged from 3002-14413 mgC/m<sup>2</sup> in Dec 1997 and 3603-10209 mgC/m<sup>2</sup> in Jan 1998 SOIREE POC (MLD integrated) range from 4500-6200 mgC/m<sup>2</sup> outside the iron-fertilised patch which were not substantially different from that measured inside the patch during the SOIREE bloom (5100-8500 mgC/m<sup>2</sup>)

2. There is no obvious indication from either sampling or analytical techniques that the POC 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  $^{234}\text{Th}$  deficit relative to  $^{238}\text{U}$ , 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  $\text{pCO}_2$  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. "Live" biological carbon in HNLC waters outside the patch represented a significant or similar amount of the organic carbon that was measured in the water column, ranging from 78-100% of the MLD-integrated POC (see Table A below). If we assume that the water column samples would have sampled only the phytoplankton and the microzooplankton (and not heterotrophic bacteria and mesozooplankton) then this proportion decreases to 40-60% but is still relatively substantial.

5. POC 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)

6. Therefore, we conclude that perhaps there was a significant POC component in the water column at the time that the SOIREE site was occupied, representing relict organic material derived from a previous bloom/export event.

7. Given the uncertainties, however, it is wise to treat the interpretation of the above POC data with caution.

**Table A** mixed layer (0-65 m)

col integrated POC											
OUT stations only		mg C m-2	mg C m-2	%	%						
STATION	phyto	hbact	microzoo	mesozoo	total	POC	water column	Difference (ALL)	Diff (phyto + micro only)		
12-Feb-99 T1141/1	1595	504	772	1600	4471	5615	79.6	42.2			
16-Feb-99 T1152/1	2023	346	620	1600	4589	5881	78.0	44.9			
18-Feb-99 T1157/1	1595	290	616	1600	4101	5157	79.5	42.9			
21-Feb-99 T1168/1	1885	374	706	1600	4565	4564	100.0	56.8			

## Methods & Sampling

See [SOIREE Preliminary Voyage Report](#)

### METHOD

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## Data Processing Description

See [SOIREE Preliminary Voyage Report](#)

See NOTES in Dataset description and Methods & Sampling description

## BCO-DMO Processing Description

Generated from original file SOIREE\_Export\_final.xls, Tab: PONPNwatercolumn 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.UTC, time.UTC, lat, lon added from files:  
SOIREE\_Stations\_MasterStationList.xls  
SOIREE\_CTD\_Summary
- Blank rows in original sheet removed
- 'nd' added to blank cells
- Added Sum\_[Client\_Id] to Client\_Id field in summation rows
- Moved Averages to three sets of rows/columns at end

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## Data Files

File
<b>traps_POCPONwcol.csv</b> (Comma Separated Values (.csv), 18.02 KB) MD5:10323882968b2a61413b835083925b59
Primary data file for dataset ID 2866

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## Parameters

Parameter	Description	Units
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
SOIREE_Day	SOIREE Experiment Day T1 = 0000 h NZST 10/02/99 + 24 hours	Text
Patch_Location	Patch Location (In/Out)	Text
station	CTD Station Id	Text
Client_ID	Client ID	text
Date_Collected	Date Collected	text
POC_mg_per_m3	POC in mg per m3	mg/m3
PN_mg_per_m3	PN in mg per m3	mg/m3
Corrected_POC	Corrected POC  Corrected values were calculated based on a filtered volume of 2 litres, rather than 500 ml as reported for the initial values	mg/m3

Corrected_PN	Corrected PN  Corrected values were calculated based on a filtered volume of 2 litres, rather than 500 ml as reported for the initial values	mg/m3
POC_mmol_per_m3	POC in mmol per m3	mmol/m3
PN_mmol_per_m3	PN in mmol per m3	mmol/m3
Int_POC	Int POC	mmol/m2
C_to_N	Ratio of C to N	molar
MLD_0_to_65_m_Int_POC	MLD 0-65 m Int POC	mmol/m2
MLD_0_to_20_m_Int_POC	MLD 0-20 m Int POC	mmol/m2
MLD	MLD  Based on calculations of MLD by E. Abraham where MLD is defined as the maximum depth at which the density is less than that at 5 m + 1 kg/m3. Values here are average MLDs determined fom up and downcasts (n=2) unless otherwise stated	meters
Int_MLD_POC_mmol_per_m2	Int MLD POC in mmol per m2  Based on calculations of MLD by E. Abraham where MLD is defined as the maximum depth at which the density is less than that at 5 m + 1 kg/m3. Values here are average MLDs determined fom up and downcasts (n=2) unless otherwise stated	mmol/m2
Int_MLD_POC_mg_per_m2	Int MLD POC in mg per m2  Based on calculations of MLD by E. Abraham where MLD is defined as the maximum depth at which the density is less than that at 5 m + 1 kg/m3. Values here are average MLDs determined fom up and downcasts (n=2) unless otherwise stated	mg/m2
Average_Int_0_to_65_m_POC_IN	Average Int 0-65 m POC IN	mmol/m2
Average_Int_0_to_65_m_POC_OUT	Average Int 0-65 m POC OUT	mmol/m2

Average_Int_0_to_20_m_POC_IN	Average Int 0-20 m POC IN	mmol/m2
Average_Int_0_to_20_m_POC_OUT	Average Int 0-20 m POC OUT	mmol/m2
Average_Int_MLD_POC_IN	Average Int MLD POC IN	mmol/m2
Average_Int_MLD_POC_OUT	Average Int MLD POC OUT	mmol/m2

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## Instruments

<b>Dataset-specific Instrument Name</b>	CTD Seabird 911
<b>Generic Instrument Name</b>	CTD Sea-Bird 911
<b>Dataset-specific Description</b>	NIWA's Seabird 911plus CTD and related instrumentation
<b>Generic Instrument Description</b>	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.

<b>Dataset-specific Instrument Name</b>	Sediment Trap
<b>Generic Instrument Name</b>	Sediment Trap
<b>Dataset-specific Description</b>	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
<b>Generic Instrument Description</b>	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.

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## Deployments

### 61TG\_3052

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/57827">https://www.bco-dmo.org/deployment/57827</a>
<b>Platform</b>	R/V Tangaroa
<b>Report</b>	<a href="http://bcodata.whoi.edu/Fe_Synthesis/SOIREE/SOIREE_cruisereport.pdf">http://bcodata.whoi.edu/Fe_Synthesis/SOIREE/SOIREE_cruisereport.pdf</a>
<b>Start Date</b>	1999-01-31
<b>End Date</b>	1999-03-01
<b>Description</b>	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  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  and 165 g of the tracer sulphur hexafluoride ( $\text{SF}_6$ ) were added to a 65-m deep surface mixed layer over an area of  $\sim 50 \text{ km}^2$ . Initially, mean dissolved iron concentrations were  $\sim 2.7 \text{ nM}$ , but decreased to ambient levels within days, requiring subsequent additions of 1550-1750 kg of acidified  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  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  $2 \mu\text{g l}^{-1}$ ) and production rates (up to  $1.3 \text{ gCm}^{-2}\text{d}^{-1}$ ). 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  $\text{CO}_2$ .

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](#)

## 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, SOIRE, 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, CO<sub>2</sub> 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](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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