

# Fe enrichment, DOC and TOC, Pico- and Nanoplankton biomass incubation from U.S. JGOFS cruises in the Southern Ocean, 1997-1998 (U.S. JGOFS AESOPS project)

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## Project

» [U.S. JGOFS Antarctic Environment and Southern Ocean Process Study](#) (AESOPS)

## Program

» [U.S. Joint Global Ocean Flux Study](#) (U.S. JGOFS)

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## Dataset Description

Six enrichment experiments were conducted on three cruises to the Southern Ocean during the US JGOFS program. One of these cruises was in the Ross Sea during the austral summer (Ross Sea Process 2 cruise aboard R/V Nathaniel B. Palmer cruise 97-1; PII-3 and PII-4). The other two cruises were conducted in waters immediately north and south of the Antarctic Polar Front Zone (APFZ) Survey 1 KIWI6 cruise (in austral fall) and Survey 2 KIWI8 cruise (in austral spring) aboard R/V Roger Revelle.

Results from Fe enrichment, DOC and TOC incubation experiments and Pico- and Nanoplankton biomass incubation experiments are summarized in tables and an Excel file.

## Methods & Sampling

These data are available only as a downloadable excel format file. The excel file contains enrichment and incubation experiment data from the Southern Ocean.

[ [Excel format file](#) ]

## Data Processing Description

Six enrichment experiments were conducted on three cruises to the Southern Ocean during the US JGOFS program. One of these cruises was in the Ross Sea (PII-E3 and PII-E4) during the austral summer. The other two cruises were conducted in waters immediately north and south of the Antarctic Polar Front Zone in fall (SI-E1, SI-E2) and spring (SII-E3, SII-E4).

Seawater was collected using acid cleaned, teflon-coated, 30-L Go-Flo bottles suspended on nonmetallic kevlar line at mid mixed layer depths (Bruland et al., 1979). The Go-Flo bottles were placed in a rack on the portable clean laboratory that was accessible from the inside. New 22 liter polycarbonate carboys were used for the enrichment experiments. They were equipped with Nalgene filling/venting closures with 3 tubing ports. A 6mm ID Bev-A-line tube ran from one of the two large tubing ports to the bottom of the bottle (Coale, 1991). All parts were cleaned according to the protocol described in Martin et al.(1991).

Eight carboys were rinsed and filled with raw seawater, with its resident phytoplankton population, in the clean laboratory van at each enrichment site. Incubation carboys were filled serially from each Go-Flo bottle to assure homogeneity. Four casts of 2 Go-Flo bottles were required to fill all the enrichment carboys. The carboys were spiked with 1000 ppm  $\text{Fe}(\text{NO}_3)_3$  (Fisher iron reference solution) producing approximate concentrations of 0.2, 0.5, 1.0 and 2.5 nM Fe. Two more carboys were spiked to ~5 nM Zn, one with 2.5 nM Fe and one without Fe. Two replicate carboys with nothing added served as controls.

Initial samples for chlorophyll a, nutrients, particulate organic carbon (POC), total organic carbon(TOC), dissolved organic carbon (DOC), and phytoplankton species counts were drawn directly from the Go-Flo bottles to save enrichment water for future sampling. An initial trace metal sample for ambient iron and zinc was drawn from each enrichment carboy directly. These were immediately acidified for future analysis.

The enrichment bottles were placed in deckboard incubators with ambient flowing surface seawater for temperature control. Carboys were incubated for 7-16 days. Sub-samples were taken by attaching an acid cleaned Bev-A-line tube from an air tank to the tubing ports of the caps. Air was used first to mix the carboys by bubbling, then pressurizing the carboy to expel the required volume of sample (Coale, 1991). Chlorophyll a, TOC and nutrient samples were taken every day or every other day. POC samples were drawn daily once the experiment started to show a significant change in the chlorophyll a and nutrient values. Samples for epifluorescent microscopy were taken initially and again, near the end of the experiment.

Trace metal samples were analyzed in the laboratory using organic extraction with APDC/DDDC into chloroform (Bruland et al., 1979). Nitrate, nitrite, soluble reactive phosphate and silicic acid were analyzed by standard autoanalytical methods immediately onboard the ship (Gordon et al., 2000). Chlorophyll a samples were concentrated onto a 25mmGF/F Whatman filter and pigments were extracted in 90% cold acetone for 24 hrs. The concentration of chlorophyll a was measured using a Turner Design fluorometer. Samples for epifluorescent microscopy were collected on 25 mm polycarbonate filters (0.8 mm pore size) and fixed with gluteraldehyde, then stained with diamidino phenylindole dihydrochloride (DAPI). These samples were then enumerated according to Chavez et al. (1991).

POC samples (< 800mL) were pressure filtered with compressed breathing air onto a pre charred 25mm GF/F Whatman filter. Filters were stored on pre-charred aluminum foil in petri dishes and analyzed in the laboratory on a Control Equipment Corporation 440 Elemental analyzer. Unfiltered TOC samples were collected in triple rinsed charred glass 40ml vials and stored frozen. These were thawed in the laboratory and 5 mL of 50% phosphoric acid was added per 1mL of sample. The samples were bubbled with ultra pure grade oxygen (grade 5) and TOC was measured in filtered and unfiltered samples on a Dohrmann DC-190. DOC was obtained by subtracting POC from the unfiltered measurement. Protocols for sampling and analysis followed Sharp (1993) and Sharp et al. (1995).

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## References:

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## Parameters

*Parameters for this dataset have not yet been identified*

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## Deployments

### KIWI6

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/57724">https://www.bco-dmo.org/deployment/57724</a>
<b>Platform</b>	R/V Roger Revelle
<b>Report</b>	<a href="http://usjgofs.whoi.edu/aesops/RRs1.html">http://usjgofs.whoi.edu/aesops/RRs1.html</a>
<b>Start Date</b>	1997-10-20
<b>End Date</b>	1997-11-24
<b>Description</b>	Polar Front Survey I. Additional information about this cruise can be found at <a href="https://usjgofs.whoi.edu/aesops/aboutrr6.html">https://usjgofs.whoi.edu/aesops/aboutrr6.html</a>

### KIWI8

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/57726">https://www.bco-dmo.org/deployment/57726</a>
<b>Platform</b>	R/V Roger Revelle
<b>Report</b>	<a href="http://usjgofs.whoi.edu/aesops/RRs2.html">http://usjgofs.whoi.edu/aesops/RRs2.html</a>
<b>Start Date</b>	1998-01-08
<b>End Date</b>	1998-02-08
<b>Description</b>	Polar Front Survey II. Additional information about this cruise can be found at <a href="https://usjgofs.whoi.edu/aesops/aboutrr8.html">https://usjgofs.whoi.edu/aesops/aboutrr8.html</a>

### NBP-97-01

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/57720">https://www.bco-dmo.org/deployment/57720</a>
<b>Platform</b>	RVIB Nathaniel B. Palmer
<b>Report</b>	<a href="http://usjgofs.whoi.edu/aesops/p2.html">http://usjgofs.whoi.edu/aesops/p2.html</a>
<b>Start Date</b>	1997-01-13
<b>End Date</b>	1997-02-11
<b>Description</b>	Ross Sea Process Study 2

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## Project Information

**U.S. JGOFS Antarctic Environment and Southern Ocean Process Study (AESOPS)**

**Website:** <http://usjgofs.whoi.edu/research/aesops.html>

**Coverage:** Southern Ocean, Ross Sea

The U.S. Southern Ocean JGOFS program, called Antarctic Environment and Southern Ocean Process Study (AESOPS), began in August 1996 and continued through March 1998. The U.S. JGOFS AESOPS program focused on two regions in the Southern Ocean: an east/west section of the Ross-Sea continental shelf along 76.5°S, and a second north/south section of the Southern Ocean spanning the Antarctic Circumpolar Current (ACC) at ~170°W (identified as the Polar Front). The science program, coordinated by Antarctic Support Associates (ASA), comprised eleven cruises using the R.V.I.B Nathaniel B. Palmer and R/V Roger Revelle as observational platforms and for deployment and recovery of instrumented moorings and sediment-trap arrays. The Ross-Sea region was occupied on six occasions and the Polar Front five times. Mapping data were obtained from SeaSoar, ADCP, and bathymetric systems. Satellite coverage was provided by the NASA SeaWiFS and the NOAA/NASA Pathfinder programs.

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## Program Information

### U.S. Joint Global Ocean Flux Study (U.S. JGOFS)

**Website:** <http://usjgofs.whoi.edu/>

**Coverage:** Global

The United States Joint Global Ocean Flux Study was a national component of international JGOFS and an integral part of global climate change research.

The U.S. launched the Joint Global Ocean Flux Study (JGOFS) in the late 1980s to study the ocean carbon cycle. An ambitious goal was set to understand the controls on the concentrations and fluxes of carbon and associated nutrients in the ocean. A new field of ocean biogeochemistry emerged with an emphasis on quality measurements of carbon system parameters and interdisciplinary field studies of the biological, chemical and physical process which control the ocean carbon cycle. As we studied ocean biogeochemistry, we learned that our simple views of carbon uptake and transport were severely limited, and a new "wave" of ocean science was born. U.S. JGOFS has been supported primarily by the U.S. National Science Foundation in collaboration with the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, the Department of Energy and the Office of Naval Research. U.S. JGOFS, ended in 2005 with the conclusion of the Synthesis and Modeling Project (SMP).

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