CTD sampling logs from R/V Hakuho-maru and R/V Kilo Moana cruises KH04xx-01, KH04xx-02,and KM0415 in the Northwestern Sub-Arctic Pacific in 2004 (SEEDS II project)

Website: https://www.bco-dmo.org/dataset/3159
Version: 23June2010
Version Date: 2009-07-15

Project
» Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study II (SEEDS II)

Program
» Iron Synthesis (FeSynth)

Contributors	Affiliation	Role
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Table of Contents

Dataset Description

SEEDS 2004 CTD Sampling Log
CTD Station Locations and Samples Taken at Each Station

The first iron addition was carried out from 0:50 GMT on 20 July to 0:00 GMT on 21 July (GMT). Day 1 was defined as 21 July (GMT).

Methods & Sampling

This worksheet describes samples taken at each CTD station
Prepared by Doug Mackie, August 2008
xl tab number refers to the numbering system used in the accompanying word file
column headings are fully explained in the accompanying word file

BCO-DMO/Doug Mackie Note:
Throughout these data, stations are identified as D2-I, D2-O, etc.
D2-I indicates "Day 2, in patch station".
while D2-O indicates "Day 2, out patch station".

Data Processing Description

BCO-DMO Processing Notes

CSV file generated from original spreadsheet SEEDS_II_CTD_rosette_samples.xls by Doug Mackie

BCO-DMO Edits
- X (no sample) replaced with ns
- xl tab number prepended to corresponding parameter name
- Parameter names modified to conform to BCO-DMO convention
- Patch variable added to indicate pre/In/Out of Patch

[table of contents | back to top]

Data Files

File
CTD_Sampling.csv (Comma Separated Values (.csv), 8.64 KB) MD5:94ece1ba436ef347160816d75e10724e Primary data file for dataset ID 3159

[table of contents | back to top]

Parameters

Parameter	Description	Units
station	Station id	text
date	Station date (GMT)	YYYYMMDD
time	Station time (GMT)	HHMM
lon	Station longitude (West is negative)	decimal degrees
lat	Station latitude (South is negative)	decimal degrees
Patch	Station location relative to the Patch (In; Out; Pre)	text
xl_05_DO	Sample status for xl_05_DO	text
xl_06_NUTS	Sample status for xl_06_NUTS	text
xl_07_CHL_a	Sample status for xl_07_CHL_a	text
xl_08_zooplank	Sample status for xl_08_zooplank	text
xl_09_Sal	Sample status for xl_09_Sal	text

xl_10_snow	Sample status for xl_10_snow	text
xl_11_POC_to_N	Sample status for xl_11_POC_to_N	text
xl_12_P_Si	Sample status for xl_12_P_Si	text
xl_13_P_13C	Sample status for xl_13_P_13C	text
xl_14_P_Ca	Sample status for xl_14_P_Ca	text
xl_15_Phyt_taxn	Sample status for xl_15_Phyt_taxn	text
xl_16_HNF	Sample status for xl_16_HNF	text
xl_17_Virus_infect	Sample status for xl_17_Virus_infect	text
xl_18_Chl_size	Sample status for xl_18_Chl_size	text
xl_19_13C_prodn	Sample status for xl_19_13C_prodn	text
xl_20_15N_uptake	Sample status for xl_20_15N_uptake	text
xl_21_Bacterial_production	Sample status for xl_21_Bacterial_production	text
xl_22_DOM	Sample status for xl_22_DOM	text
xl_23_DMS_DMSP	Sample status for xl_23_DMS_DMSP	text
xl_24_DMS_prodn	Sample status for xl_24_DMS_prodn	text
xl_25_Ra_Th_P_Be	Sample status for xl_25_Ra_Th_P_Be	text
xl_26_PUV	Sample status for xl_26_PUV	text
xl_27_PRR	Sample status for xl_27_PRR	text
xl_28_Susp_part	Sample status for xl_28_Susp_part	text

xl_29_SF6	Sample status for xl_29_SF6	text
xl_30_HPLC_pigment	Sample status for xl_30_HPLC_pigment	text
xl_31_microzoo	Sample status for xl_31_microzoo	text
xl_32_FCM_bacteria	Sample status for xl_32_FCM_bacteria	text
xl_33_FRRF	Sample status for xl_33_FRRF	text
xl_34_Proteins	Sample status for xl_34_Proteins	text
xl_35_algal_cell_viability	Sample status for xl_35_algal_cell_viability	text
xl_36_13C_PE	Sample status for xl_36_13C_PE	text
xl_37_a_star	Sample status for xl_37_a_star	text
xl_38_Particulate_P	Sample status for xl_38_Particulate_P	text
xl_39_TEP	Sample status for xl_39_TEP	text
xl_40_FCM_phyto	Sample status for xl_40_FCM_phyto	text
xl_41_CH4	Sample status for xl_41_CH4	text
xl_42_NO	Sample status for xl_42_NO	text
xl_43_CO	Sample status for xl_43_CO	text
xl_44_NMHC	Sample status for xl_44_NMHC	text
xl_45_dilution	Sample status for xl_45_dilution	text
xl_46_DIC_alk	Sample status for xl_46_DIC_alk	text
xl_47_T_D_FE	Sample status for xl_47_T_D_FE	text

xl_48_soluble_Fe	Sample status for xl_48_soluble_Fe	text
xl_49_Fe_solubility	Sample status for xl_49_Fe_solubility	text
xl_50_Fe_to_C_ratio	Sample status for xl_50_Fe_to_C_ratio	text
xl_51_trace_metals	Sample status for xl_51_trace_metals	text
xl_52_REE	Sample status for xl_52_REE	text
xl_53_T_D_Po_Pb	Sample status for xl_53_T_D_Po_Pb	text
xl_54_dissolved_Fe_L	Sample status for xl_54_dissolved_Fe_L	text

[table of contents | back to top]

Deployments

KH04xx-01

Website	https://www.bco-dmo.org/deployment/57836
Platform	R/V Hakuho Maru
Start Date	2004-07-09
End Date	2004-08-02
Description	Tsuda, A., et al. (2007): Evidence for the grazing hypothesis: Grazing reduces phytoplankton responses of the HNLC ecosystem to iron enrichment in the western subarctic pacific (SEEDS II). J. Oceanogr. 63(6), 983-994. The first iron addition was carried out from 0:50 GMT on 20 July to 0:00 GMT on 21 July (GMT). Day 1 was defined as 21 July (GMT). The ship started to inject iron and sulfur hexafluoride (SF6) as an inert tracer of the water mass, executing an 8 km by 8 km grid pattern centered on the buoy with an interval of 400 m. The ship was navigated with a lagrangian coordination system (Tsumune et al., 2005), and buoy position was transmitted to the ship every 10 min to update the navigation frame of reference to account for surface water advection. The amount of iron added to the patch was 332 kg Fe as FeSO4. During the iron fertilization, 4000 L of saturated SF6 solution was also simultaneously injected. The saturated SF6 solution was made onboard using the method previously detailed in Tsumune et al. (2005). Note that the saturated SF6 concentration in seawater is about 0.2 mM (Ledwell and Watson, 1991). A second iron addition was performed on day 6 without SF6 tracer, when an additional 159 kg of iron was added to the patch, which was traced using the SF6 signal.

KH04xx-02

Website	https://www.bco-dmo.org/deployment/57837
Platform	R/V Hakuho Maru
Start Date	2004-08-06
End Date	2004-08-25
Description	Tsuda, A., et al. (2007): Evidence for the grazing hypothesis: Grazing reduces phytoplankton responses of the HNLC ecosystem to iron enrichment in the western subarctic pacific (SEEDS II). J. Oceanogr. 63(6), 983-994. The first iron addition was carried out from 0:50 GMT on 20 July to 0:00 GMT on 21 July (GMT). Day 1 was defined as 21 July (GMT). The ship started to inject iron and sulfur hexafluoride (SF6) as an inert tracer of the water mass, executing an 8 km by 8 km grid pattern centered on the buoy with an interval of 400 m. The ship was navigated with a lagrangian coordination system (Tsumune et al., 2005), and buoy position was transmitted to the ship every 10 min to update the navigation frame of reference to account for surface water advection. The amount of iron added to the patch was 332 kg Fe as FeSO4. During the iron fertilization, 4000 L of saturated SF6 solution was also simultaneously injected. The saturated SF6 solution was made onboard using the method previously detailed in Tsumune et al. (2005). Note that the saturated SF6 concentration in seawater is about 0.2 mM (Ledwell and Watson, 1991). A second iron addition was performed on day 6 without SF6 tracer, when an additional 159 kg of iron was added to the patch, which was traced using the SF6 signal.

KM0415

Website	https://www.bco-dmo.org/deployment/57838
Platform	R/V Kilo Moana
Start Date	2004-07-15
End Date	2004-08-25
Description	Cruise information and original data are available from the NSF R2R data catalog.

[table of contents | back to top]

Project Information

Subarctic Pacific Iron Experiment for Ecosystem Dynamics Study II (SEEDS II)

Website: http://www.seeds-exp.jp/en/index.html

Coverage: Western subarctic gyre in the North Pacific at 48.5°N, 165°E, (i.e. 93 km SE of SEEDS I)

As at August 2008 the Tsuda 2007 paper is the only one to carry a general description.

The first iron addition was carried out from 0:50 GMT on 20 July to 0:00 GMT on 21 July (GMT). Day 1 was defined as 21 July (GMT).

Tsuda, A., et al. (2007): Evidence for the grazing hypothesis: Grazing reduces phytoplankton responses of the HNLC ecosystem to iron enrichment in the western subarctic pacific (SEEDS II). J. Oceanogr. 63(6), 983-994.

A mesoscale iron-enrichment study (SEEDS II) was carried out in the western subarctic Pacific in the summer of 2004. The iron patch was traced for 26 days, which included observations of the development and the decline of the bloom by mapping with sulfur hexafluoride. The experiment was conducted at almost the same location and the same season as SEEDS (previous iron- enrichment experiment). However, the results were very different between SEEDS and SEEDS II. A high accumulation of phytoplankton biomass (~18 mg chl m-3) was characteristic of SEEDS. In contrast, in SEEDS II, the surface chlorophyll-a accumulation was lower, 0.8 to 2.48 mg m-3, with no prominent diatom bloom. Photosynthetic competence in terms of Fv/Fm for the total

phytoplankton community in the surface waters increased after the iron enrichments and returned to the ambient level by day 20. These results suggest that the photosynthetic physiology of the phytoplankton assemblage was improved by the iron enrichments and returned to an iron-stressed condition during the declining phase of the bloom. Pico-phytoplankton (<2 um) became dominant in the chlorophyll-a size distribution after the bloom.

We observed a nitrate drawdown of 3.8 uM in the patch (day 21), but there was no difference in silicic acid concentration between inside and outside the patch. Mesozooplankton (copepod) biomass was three to five times higher during the bloom-development phase in SEEDS II than in SEEDS. The copepod biomass increased exponentially. The grazing rate estimation indicates that the copepod grazing prevented the formation of an extensive diatom bloom, which was observed in SEEDS, and led to the change to a pico- phytoplankton dominated community towards the end of the experiment.

SEEDS II was conduced in the same western subarctic Pacific region as the initial SEEDS experiment, and was an international collaborative study utilizing two research vessels (R.V. Hakuho Maru and R.V. Kilo Moana). This experiment was designed to characterize the evolution of the fertilized patch over a longer time scale (1 month) and with a greater range of parameters than measured during SEEDS.

The preliminary results from SEEDS II showed both the iron-induced increase and subsequent decline in phytoplankton biomass. However, the iron-initiated bloom was much less intense than observed in SEEDS. Chlorophyll-a concentrations increased only 2 to 3 times over initial values, and the drawdown of nutrients and pCO2 were small.

Related files

SEEDS II Project Documentation
SEEDS II Workshop Summary

[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]