

MIRAI MR10-05 Leg2 Primary Production

Last Modified: 2018-02-24

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Cruise ID: [MR10-05 Leg2](#)

Primary Production: Processed (PI)

Data Policy: [JAMSTEC](#)

Observation Items: POC

Science Keywords:

BIOSPHERE > AQUATIC ECOSYSTEMS > PLANKTON > PHYTOPLANKTON
BIOSPHERE > ECOLOGICAL DYNAMICS > ECOSYSTEM FUNCTIONS > PRIMARY PRODUCTION
BIOSPHERE > ECOLOGICAL DYNAMICS > ECOSYSTEM FUNCTIONS > PHOTOSYNTHESIS

Cruise Report

http://www.godac.jamstec.go.jp/catalog/data/doc_catalog/media/MR10-05_leg1-2_all.pdf

For Using Data

Principal Investigator

Shigeto Nishino (JAMSTEC)

Use Constraints

See [Terms and Conditions](#) about constrain of use.

Data Citation

See [Terms and Conditions](#) about data citation.

Instrument

Instrument:

CN mass spectrometer



Overview

· 25 Nov. 2013 add "New production" and "Regenerated production" data were added.
Primary, new and regenerated production data during MR10-05 Leg2 cruise were obtained by the following methods :
- Simulated in-situ incubation method (SIS)
Water sampling, incubation, and devices and tracers for analysis for each method are outlined below.
For further information, please see Cruise Report.

Outline of water sampling, incubation, and analysis

- | | |
|---|---|
| 1) Vertical sampling : | Niskin |
| 2) Surface sampling : | Bucket |
| 3) Sampling layer : | 7-8 |
| 4) Tracer : | $\text{NaH}^{13}\text{CO}_3$, K^{15}NO_3 , $^{15}\text{NH}_4\text{Cl}$ |
| 5) Incubation period : | 3hours (except Stn.126 and Stn.165 for primary production) |
| 6) Filtration : | Whatman GF/F 25mm filter was used at dark place. |
| 7) Preservation : | Filters were kept to freeze at -20degC and dried in the oven at 45degC. |
| 8) Preservation period of frozen filter paper : | - |
| 9) Analysis place : | MIRAI |
| 10) Analysis device : | CN mass spectrometer |
| 11) Analysis method : | Mass spectrometry refer to Lee and Whitedge (2005) |

About CN mass spectrometer

CN mass spectrometer system equipped with R/V Mirai can measure stable isotope ratios of ^{13}C and ^{15}N comprised in liquid, solid, and gas states of biological or biogenic samples, simultaneously and continuously.
This system consists of two devices, preprocessing equipment "ANCA-SL, former ROBOPLEP-SL" and stable isotope ratio mass spectrometer "20-20, former EUROPA20-20".

(1) ANCA-SL

A tin capsule containing the sample falls into the combustion tube and is converted in the presence of oxygen to CO_2 , N_2 , NO_x and H_2O .
An elemental copper stage reduces NO_x , a MgClO_4 trap removes water vapour, a switchable Carbosorb trap can be used to remove CO_2 (for ^{15}N only analyses) and a GC column separates CO_2 from N_2 (allowing dual isotope analysis).
And then, it is introduced into the "20-20".

(2) 20-20

CO_2 and N_2 are collided with thermion and ionized in the high vacuum ion source. When the generated ions are accelerated by constant voltage and pass through the analysis tube, differences in mass (m) and electric charge (z) of isotope ions make the different orbits by the magnetic field in the analysis tube. Thus, isotopes can be separated by the displacement of the orbits. These signals are converted into the frequency at the detector, and transmitted to control PC. Blank and drift corrections are conducted on the control software.

see flow diagram. [PDF file](#)

Specifications of CN mass spectrometer

(1) ANCA-SL

Manufacturer : SerCon Ltd. (former PDZ Europa Ltd.)
Instruments : ANCA-SL
S/N : 17001-051
Sample Range Solids/Liquids : 10 to 1000 µgN, 10 to 1000 µgC.
Autosampler : 60 position pneumatic autosampler that takes (standard) capsules with up to 47mm in diameter.

(2) 20-20

Manufacturer : SerCon Ltd. (former PDZ Europa Ltd.)
Instruments : 20-20
S/N : 9007-075
Analyzer and Analysis tube : 120° extended geometry with an 11 cm radius magnetic sector
Resolution : $m/\Delta m=95$ (N_2) 10% valley definition
Sensitivity : Inside Vacuum level is 4×10^{-6} mbar in an atmosphere of helium
20 nmol CO_2
15 nmol N_2
Abundance Sensitivity : Inside Vacuum level is 4×10^{-6} mbar in an atmosphere of helium
30 ppm for CO_2 at 4×10^{-6} mbar in continuous flow mode.
5 ppm for N_2 at 4×10^{-6} mbar in continuous flow mode.

(3) Precision

All specifications are for n=5 samples.

It is a natural amount and five time standard deviation of the analysis as for amount 100 µg of the sample.

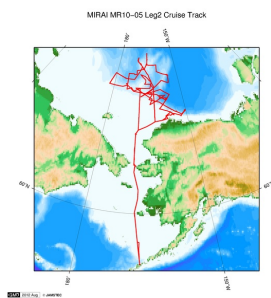
^{13}C (0.2 ‰)

^{15}N (0.5 ‰)

Reference

Lee and Whitledge (2005) Primary and new production in the deep Canada Basin during summer 2002. Polar Biol 28 : 190-197

Related Information



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MR10-05 Leg2

Ship Name: MIRAI
Period: 2010-09-02 - 2010-10-16
Chief Scientist: Motoyo Ito (JAMSTEC)
Project Name: [Arctic Ocean Climate System Reaserch]
Proposal ▶ Arctic Climate Oceanography
Title:

Update History

2018-02-24	An observation data was registerd.
2013-12-03	An observation data was registerd.
2013-07-24	An observation data was registerd.

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6K Sonar DEEP TOW
KM-ROV
POWER GRAB SAMPLER (SHELL)
POWER GRAB SAMPLER (CLOW)
BMS

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Cruise ID:

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Dive ID:



MIRAI MR10-05 Leg2 Primary Production

Last Modified: 2018-02-24

ReadMe Observation Data **Data Format** Quality Information

Cruise ID: [MR10-05 Leg2](#)

Primary Production: Processed (PI)

Data Policy: [JAMSTEC](#)

Primary Productivity Data Sheet Format (MR10-05_leg2_pp_SIS)

Format information describes column no., column heading mnemonic and comments of simulated in-situ incubation primary productivity data sheet in MR10-05 Leg2.
Missing value is presented by -999.

Column No.	Column Heading Mnemonic	Comments
1	CruiseID	CruiseID
2	STNNBR	Station name
3	CASTNO	Cast number (refer to CTD cast table of cruise report)
4	Inc.Type	Incubation method (SIS : simulated in-situ incubation)
5	UTC Date	CTD start UTC date (refer to CTD cast table of cruise report)
6	UTC Time	CTD start UTC time (refer to CTD cast table of cruise report)
7	Latitude	CTD start position Latitude north degree (refer to CTD cast table of cruise report)
8	Longitude	CTD start position Longitude east degree (refer to CTD cast table of cruise report)
9	BTLNBR	Bottle identification number
10	BTLNBR_FLAG	Bottle identification number(for explanation see Definition of Quality Control Flags for Bottle Data)
11	CTD Depth	CTD Depth (m)
12	CTD PRS	CTD Pressure (dbar)
13	Light intensity	Incubation light intensity relative to the surface (%)
14	Inc.Time	Incubation time (hour)
15	Bottle name	Sample name
16	Spike 13C	Spiked 13C solution (μM)
17	Filt. Vol	Filtering volume (mL)
18	POC	POC (μg)
19	POC_FLAG	Flag of POC (for explanation see Quality flags)
20	13C	Ratio of 13C (atom%)
21	13C_FLAG	Flag of 13C (for explanation see Quality flags)
22	DIC	Total dissolved inorganic carbon (μmol/kg)
23	Salinity	Salinity (PSU)
24	Chl.a	Chlorophyll a. quantity (μg/L)
25	Density	Seawater density (kg/L)
26	DIC	Total dissolved inorganic carbon (μmol/L)
27	POC	POC (mgC/m3)
28	13C0	Natural abundance of 13C (atom%)
29	13Cxs	Ratio of 13C - 13C0 (atom%)
30	13Csw	Concentration of 13C of ambient seawater with a tracer (%)
31	d-POC	Delta POC/hour (mgC/m3/h)
32	PB	d-POC/Chl.a (mgC/mg chl.a/h)
33	Remarks	Comment of incubation, filtration and analysis.

about 16)

Amount of ¹³C in which 10% of Total dissolved inorganic carbon in seawater was added as tracer.

about 28)

Bottle name 0time average data (Natural abundance).

about 30)

$13Csw = (DIC \times 0.011 + \text{Spike } 13C) / (DIC + \text{Spike } 13C) \times 100$

0.011:Ratio of ¹³C included in the Total dissolved inorganic carbon

about 31)

$d\text{-POC} = 1.025 \times 13Cxs \times POC / (13Csw - 13C0) / \text{Inc.Time}$

1.025 : ¹³C Stable Isotope discrimination factor

about 32)

$PB = d\text{-POC} / \text{Chl.a}$

Regenerated Productivity Data Sheet Format (MR10-05 Leg2_rp_SIS_nh4)

Format information describes column no., column heading mnemonic and comments of simulated in-situ incubation regenerated productivity data sheet in MR10-05 Leg2.
Missing value is presented by -999.

Column No.	Column Heading Mnemonic	Comments
1	CruiseID	CruiseID
2	STNNBR	Station number
3	CASTNO	Cast number (refer to CTD cast table of cruise report)
4	Inc.Type	Incubation method (SIS : simulated in-situ incubation)
5	UTC Date	CTD start UTC date (refer to CTD cast table of cruise report)
6	UTC Time	CTD start UTC time (refer to CTD cast table of cruise report)
7	Latitude	CTD start position Latitude degree (refer to CTD cast table of cruise report)
8	Longitude	CTD start position Longitude degree (refer to CTD cast table of cruise report)
9	BTLNBR	Bottle identification number
10	BTLNBR_FLAG	Bottle quality flag (for explanation see Definition of Quality Control Flags for Bottle Data)

Column No.	Column Heading Mnemonic	Comments (m)
12	CTD PRS	CTD Pressure (dbar)
13	Light intensity	Optical transmittance (%)
14	Inc.Time	Incubation time (hour)
15	Bottle name	Sample name
16	Spike 15NH4	Spiked 15N solution (μM)
17	Filt. Vol	Filtering volume (mL)
18	PON	PON (μg)
19	PON_FLAG	Flag of PON (for explanation see Quality flags)
20	15N	Ratio of 15N (atom%)
21	15N_FLAG	Flag of 15N (for explanation see Quality flags)
22	Salinity	Salinity (PSU)
23	Chl.a	Chlorophyll a. quantity (μg/L)
24	Density	Seawater density (kg/L)
25	PON	PON (mg/m3)
26	15N0	15N of natural abundance (atom%)
27	15Nxs	Ratio of 15N - 15N0 (atom%)
28	15Nenr	Concentration of 15N of ambient seawater with a tracer (%)
29	d-N	NH4 uptake rate (mgN/m3/h)
30	NB	NH4 uptake rate per Chlorophyll a.(mgN/mg chl.a/h)
31	Remarks	Comment of incubation, filtration and analysis.

about 16)

Amount of ¹⁵N in which 10% of Total Nitrogen in seawater was added as tracer.

about 26)

Bottle name 0time average data (Natural abundance).

about 28)

15Nenr=(Spike 15NH4+NH4×0.366/100)/(Spike 15NH4+NH4)×100-15N0

Natural abundance 0.366 atom%

about 29)

d-N=PON×15Nxs/15Nenr/Inc.Time

about 30)

NB=d-N/Chl.a

New Productivity Data Sheet Format (MR10-05_leg2_np_SIS_no3)

Format information describes column no., column heading mnemonic and comments of simulated in-situ incubation

new production data sheet in MR10-05 Leg2.

Missing value is presented by -999.

Column No.	Column Heading Mnemonic	Comments
1	CruiseID	CruiseID
2	STNNBR	Station number
3	CASTNO	Cast number (refer to CTD cast table of cruise report)
4	Inc.Type	Incubation method (SIS : simulated in-situ incubation)
5	UTC Date	CTD start UTC date (refer to CTD cast table of cruise report)
6	UTC Time	CTD start UTC time (refer to CTD cast table of cruise report)
7	Latitude	CTD start position Latitude degree (refer to CTD cast table of cruise report)
8	Longitude	CTD start position Longitude degree (refer to CTD cast table of cruise report)
9	BTLNBR	Bottle identification number
10	BTLNBR_FLAG	Bottle quality flag (for explanation see Definition of Quality Control Flags for Bottle Data)
11	CTD Depth	CTD Depth (m)
12	CTD PRS	CTD Pressure (dbar)
13	Light intensity	Optical transmittance (%)
14	Inc.Time	Incubation time (hour)
15	Bottle name	Sample name
16	Spike 15NO3	Spiked 15N solution (μM)
17	Filt. Vol	Filtering volume (mL)
18	PON	PON (μg)
19	PON_FLAG	Flag of PON (for explanation see Quality flags)
20	15N	Ratio of 15N (atom%)
21	15N_FLAG	Flag of 15N (for explanation see Quality flags)
22	Salinity	Salinity (PSU)
23	Chl.a	Chlorophyll a. quantity (μg/L)
24	Density	Seawater density (kg/L)
25	PON	PON (mg/m3)
26	15N0	15N of natural abundance (atom%)
27	15Nxs	Ratio of 15N - 15N0 (atom%)
28	15Nenr	Concentration of 15N of ambient seawater with a tracer (%)
29	d-N	NO3 uptake rate (mgN/m3/h)
30	NB	NO3 uptake rate per Chlorophyll a.(mgN/mg chl.a/h)
31	Remarks	Comment of incubation, filtration and analysis.

about 16)

Amount of ¹⁵N in which 10% of Total Nitrogen in seawater was added as tracer.

about 26)

Bottle name 0time average data (Natural abundance).

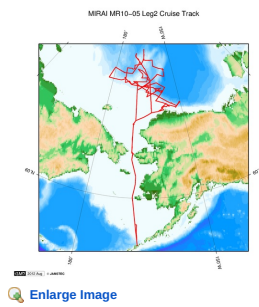
about 28)

15Nenr=(Spike 15NO3+NO3×0.366/100)/(Spike 15NO3+NO3)×100-15N0

Natural abundance 0.366 atom%

about 29)
d-N=PON×15Nxs/15Nenr/Inc.Time
about 30)
NB=d-N/Chl.a

Related Information



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Period: 2010-09-02 - 2010-10-16
Chief Scientist: Motoyo Ito (JAMSTEC)
Project Name: [Arctic Ocean Climate System Reaserch]
Proposal ▶ Arctic Climate Oceanography
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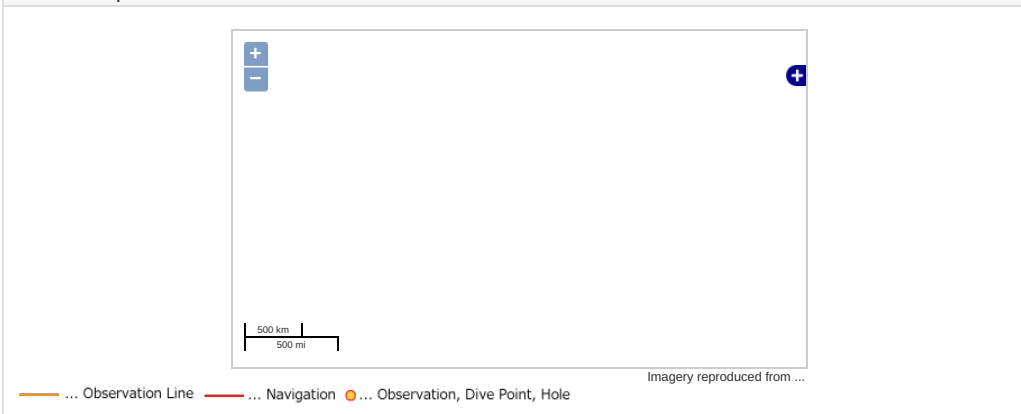
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Observation Map

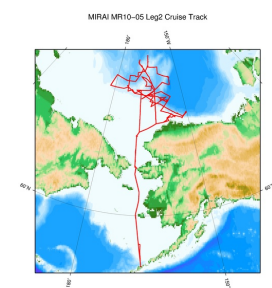


Data List

File names

☐ MR10-05_leg2_np_SIS_no3.csv
☐ MR10-05_leg2_pp_SIS.csv
☐ MR10-05_leg2_rp_SIS_nh4.csv

Related Information



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MR10-05 Leg2

Ship Name: MIRAI
Period: 2010-09-02 - 2010-10-16
Chief Scientist: Motoyo Ito (JAMSTEC)
Project Name: [Arctic Ocean Climate System Research]
Proposal ▶ Arctic Climate Oceanography
Title:

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