

MIRAI MR09-03 Leg2 Primary Production

Last Modified: 2018-02-24

ReadMe Observation Data Data Format Quality Information

Cruise ID: [MR09-03 Leg2](#)

Primary Production: Processed (DMO)-QCed

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/MR09-03_leg1-3_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

Primary Production Data during MR09-03 Leg2 cruise were obtained by the following methods : - Simulated in-situ incubation method (SIS) See Data List for available data at each station. 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

Simulated in-situ incubation (SIS)

- 1) Vertical sampling : Niskin
- 2) Surface sampling : Bucket
- 3) Sampling layer : 5
- 4) Tracer : $\text{NaH}^{13}\text{CO}_3$, K^{15}NO_3 , $^{15}\text{NH}_4\text{Cl}$
- 5) Incubation period : 3hours
- 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 : within 45 days
- 9) Analysis place : MIRAI
- 10) Analysis device : CN mass spectrometer
- 11) Analysis method : Dumas method, Mass spectrometry

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 "ROBOLEP-SL" and stable isotope ratio mass spectrometer "EUROPA20-20".

(1) ROBOLEP-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 "EUROPA20-20".

(2) EUROPA20-20

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. MR09-03_pp_ANCA-SL [PDF file](#)

Specifications of CN mass spectrometer

(1) ROBOPLEP-SL

Manufacturer : SerCon Ltd. (former PDZ Europa Ltd.)
Instruments : ANCA-SL ROBOPREP-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) EUROPA 20-20

Manufacturer : SerCon Ltd. (former PDZ Europa Ltd.)
Instruments : ANCA-SL EUROPA 20-20
S/N : 9007-075
Analyzer and Analysis tube : 120° extended geometry with an 11 cm radius magnetic sector
Resolution : m/Δm=95 (N₂) 10% valley definition
Sensitivity : Inside Vacuum level is 4×10⁻⁶mbar in an atmosphere of helium
20 nmol CO₂
15 nmol N₂
Abundance Sensitivity : Inside Vacuum level is 4×10⁻⁶mbar in an atmosphere of helium
30 ppm for CO₂ at 4×10⁻⁶mbar in continuous flow mode.
5 ppm for N₂ at 4×10⁻⁶mbar 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.

¹³C (0.2 ‰)

¹⁵N (0.5 ‰)

(4) Data processing

Device control and processing soft : ANCA ver.3.5 (former PDZ Europa Ltd.)
Fully compatible with Windows 3.1 or Windows 95.

(5) Reference material

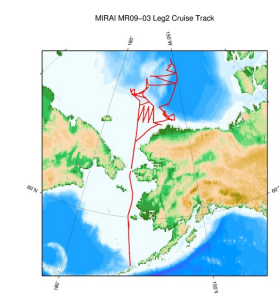
The third-order reference materials whose data values were decided by the second reference materials (IAEA-N-1, IAEA-N-2, and IAEA-CH-6) dealt in International Atomic Energy Agency (IAEA) were used.

Note

In this cruise, there is an observation log sheet at the time of the data acquisitions.

If necessary, please contact us from "Contact Us" above.

Related Information



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MR09-03 Leg2

Ship Name: MIRAI
Period: 2009-09-07 - 2009-10-15
Chief Scientist: Takashi Kikuchi (JAMSTEC)
Project Name: [Arctic Ocean Climate System Reaserch]
Proposal ▶ Multi-disciplinary observation cruise for the Arctic Ocean
Title:

Update History

2018-02-24	An observation data was registerd.
2013-08-29	An observation data was registerd.
2012-09-28	An observation data was registerd.

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MIRAI MR09-03 Leg2 Primary Production

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Primary Productivity Data Sheet Format

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

primary productivity data sheet in MR09-03 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	CTD Depth	CTD Depth (m)
11	Light intensity	Optical transmittance (%)
12	Inc.Time	Incubation time (hour)
13	Bottle name	Sample name
14	Spike 13C	Spiked 13C solution (μM)
15	Filt. Vol	Filtering volume (mL)
16	POC	POC (μg)
17	POC_FLAG	Flag of POC (for explanation see Quality flags)
18	13C	Ratio of 13C (atom%)
29	13C_FLAG	Flag of 13C (for explanation see Quality flags)
20	DIC	Total dissolved inorganic carbon (μmol/kg)
21	Salinity	Salinity (PSU)
22	Chl.a	Chlorophyll a. quantity (μg/L)
23	Density	Seawater density (kg/L)
24	DIC	Total dissolved inorganic carbon (μmol/L)
25	POC	POC (mg/m3)
26	13C0	13C ratio of zero time blank (atom%)
27	13Cxs	Ratio of 13C - 13C0 (atom%)
28	13Csw	Concentration of 13C of ambient seawater with a tracer(%)
29	d-POC	Delta POC/hour (mgC/m3/h)
30	PB	d-POC/Chl.a (mgC/mg chl.a/h)
31	Remarks	Comment of incubation, filtration and analysis.

about 14)

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

about 26)

Bottle name 0time data (Natural abundance) or 1.084atom%

about 28)

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

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

about 29)

$d\text{-POC} = 1.025 \times 13C_{xs} \times POC / (13C_{sw} - 13C0) / \text{Inc. Time}$

1.025 : ¹³C Stable Isotope discrimination factor

about 30)

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

Regenerated Production Data Sheet Format

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

regenerated production data sheet in MR09-03.

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	CTD Depth	CTD Depth (m)

Column No.	Column Heading Mnemonic	Comments
11	Light intensity	Optical transmittance (%)
12	Inc. Time	Incubation time (hour)
13	Bottle name	Sample name
14	Spike 15NH4	Spiked 15N solution (μM)
15	Filt. Vol	Filtering volume (mL)
16	PON	PON (μg)
17	PON_FLAG	Flag of PON (for explanation see Quality flags)
18	15N	Ratio of 15N (atom%)
19	15N_FLAG	Flag of 15N (for explanation see Quality flags)
20	TIN	Dissolved Nitrate, Nitrite, Ammonium(μmol/kg)
21	Salinity	Salinity (PSU)
22	Chl.a	Chlorophyll a. quantity (μg/L)
23	Density	Seawater density (kg/L)
24	TIN	Dissolved Nitrate, Nitrite, Ammonium (μmol/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 14)

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

about 26)

Natural abundance 0.366 atom%

about 28)

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

about 29)

d-N=PON×15Nxs/15Nenr/Inc. Time

about 30)

NB=d-N/Chl.a

New Production Data Sheet Format

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

new production data sheet in MR09-03.

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	CTD Depth	CTD Depth (m)
11	Light intensity	Optical transmittance (%)
12	Inc. Time	Incubation time (hour)
13	Bottle name	Sample name
14	Spike 15NO3	Spiked 15N solution (μM)
15	Filt. Vol	Filtering volume (mL)
16	PON	PON (μg)
17	PON_FLAG	Flag of PON (for explanation see Quality flags)
18	15N	Ratio of 15N (atom%)
19	15N_FLAG	Flag of 15N (for explanation see Quality flags)
20	TIN	Dissolved Nitrate, Nitrite, Ammonium(μmol/kg)
21	Salinity	Salinity (PSU)
22	Chl.a	Chlorophyll a. quantity (μg/L)
23	Density	Seawater density (kg/L)
24	TIN	Dissolved Nitrate, Nitrite, Ammonium (μmol/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 14)

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

about 26)

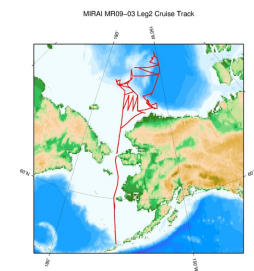
Natural abundance 0.366 atom%

about 28)
 $15N_{\text{enr}} = (\text{Spike } 15\text{NO}_3 + \text{TIN} \times 0.366/100) / (\text{Spike } 15\text{NO}_3 + \text{TIN}) \times 100 - 15\text{N}_0$

about 29)
 $d\text{-N} = \text{PON} \times 15\text{Nxs} / 15N_{\text{enr}} / \text{Inc. Time}$

about 30)
 $\text{NB} = d\text{-N} / \text{Chl.a}$

Related Information



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MR09-03 Leg2

Ship Name: MIRAI
Period: 2009-09-07 - 2009-10-15
Chief Scientist: Takashi Kikuchi (JAMSTEC)
Project Name: [Arctic Ocean Climate System Research]
Proposal ▶ Multi-disciplinary observation cruise for the Arctic Ocean
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Dive ID:

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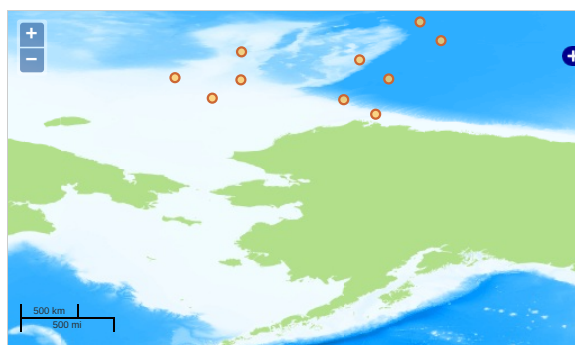
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Observation Map

1. Clicking the icon displays a balloon with observation information.



— ... Observation Line — ... Navigation ● ... Observation, Dive Point, Hole

Imagery reproduced from ...

Data List

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☐ File names

☐ MR09-03_leg2_pp_SIS.csv

☐ MR09-03_leg2_pp_SIS_nh4.csv

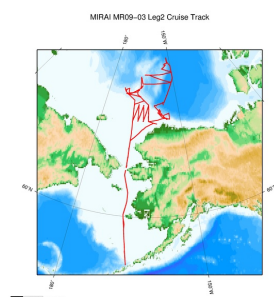
☐ MR09-03_leg2_pp_SIS_no3.csv

● Observation List

The list of observation is shown as follows.

Observation	Time and Date	Lat. [°]	Lon. [°]
04	2009-09-11 00:00	73.0000	-167.9800
10	2009-09-13 00:00	74.6100	-170.9100
15	2009-09-15 00:00	76.6400	-165.6800
25	2009-09-17 00:00	76.0100	-156.4000
33	2009-09-19 00:00	77.5200	-150.0000
35	2009-09-20 00:00	78.9900	-151.6500
58	2009-09-26 00:00	74.5100	-154.1100
62	2009-09-28 00:00	71.7400	-155.1400
75	2009-09-30 00:00	72.8800	-157.6500
83	2009-10-05 00:00	74.4400	-165.7300

Related Information



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MR09-03 Leg2

Ship Name: MIRAI

Period: 2009-09-07 - 2009-10-15

Chief Scientist: Takashi Kikuchi (JAMSTEC)

Project Name: [Arctic Ocean Climate System Research]

Proposal ▶ Multi-disciplinary observation cruise for the Arctic Ocean

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