MIRAI MR02-K01 Primary Production

Last Modified: 2013-08-23

ReadMe | Observation Data | Data Format | Quality Information

Cruise ID: MR02-K01
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/MR02-K01_all.pdf

For Using Data

Principal Investigator
Takeshi Kawano (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 MR02-K01 cruise were obtained by the following methods :
- In-situ incubation method (IS)
- Simulated in-situ incubation method (SIS)
- Photosynthesis and irradiation curve method during underway (PI_underway)
- Photosynthesis and irradiation curve method at stations (PI_at stations)

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) In-situ incubation (IS) Outline figure
1.1) Vertical sampling : Niskin
1.2) Surface sampling : Bucket
1.3) Sampling layer : 13
1.4) Tracer : $NaH^{13}CO_3$
1.5) Incubation period : 24hours
1.6) Filtration : Whatman GF/F filter was used at dark place.
1.7) Preservation : Filters were kept to freeze at -20degC and dried in the oven at 45degC.
1.8) Preservation period of frozen filter paper : within 45 days
1.9) Analysis place : MIRAI
1.10) Analysis device : CN mass spectrometer (see section 3 and 4 for detail)
1.11) Analysis method : Dumas method, Mass spectrometry

2) Simulated in-situ incubation (SIS) Outline figure
2.1) Vertical sampling : Niskin
2.2) Surface sampling : Bucket
2.3) Sampling layer : 2
2.4) Tracer : $NaH^{13}CO_3$
2.5) Incubation period : 24hours
2.6) Filtration : Whatman GF/F filter was used at dark place.
2.7) Preservation : Filters were kept to freeze at -20degC and dried in the oven at 45degC.
2.8) Preservation period of frozen filter paper : within 45 days
2.9) Analysis place : MIRAI
2.10) Analysis device : CN mass spectrometer (see section 3 and 4 for detail)
2.11) Analysis method : Dumas method, Mass spectrometry
3) Photosynthesis and irradiation curve underway (PI_underway) Outline figure
3.1) Surface sampling : Sea surface water is continuously pumped up at 4.5 meters depth to the sea surface monitoring laboratory and then flowed into each analysis device through a steel pipe and a vinyl-chloride pipe.
3.2) Sampling layer : 1
3.3) Tracer : $NaH^{13}CO_3$
3.4) Incubation period : 3hours
3.5) Filtration : Whatman GF/F filter was used at dark place.
3.6) Preservation : Filters were kept to freeze at -20degC and dried in the oven at 45degC

3.6) Preservation : Filters were kept to freeze at -20degC and dried in the oven at 45degC.
3.7) Preservation period of frozen filter paper : within 45 days
3.8) Analysis place : MIRAI
3.9) Analysis device : CN mass spectrometer (see section 3 and 4 for detail)
3.10) Analysis method: Dumas method, Mass spectrometry
4) Photosynthesis and irradiation curve at stations (PI_at stations) **Outline figure** 4.1) Vertical sampling : Niskin
4.2) Surface sampling : Bucket
4.3) Sampling layer : 0m, Chlorophyll a. max
4.4) Tracer : $NaH^{13}CO_3$
4.5) Incubation period : 3hours
4.6) Filtration : Whatman GF/F filter was used at dark place.
4.7) Preservation : Filters were kept to freeze at -20degC and dried in the oven at 45degC.
4.8) Preservation period of frozen filter paper : within 45 days
4.9) Analysis place : MIRAI
4.10) Analysis device : CN mass spectrometer (see section 3 and 4 for detail)
4.11) 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 “ROBOPLEP-SL” and stable isotope ratio mass spectrometer “EUROPA20-20”.

(1) ROBOPLEP-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. MR02-K01_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 (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 ‰)

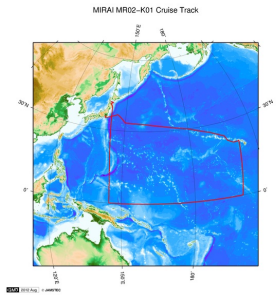
(4) Data processing
Device control and processing soft : ANCA ver.3.5 (former PDZ Europa Ltd.)
Fully compatible with Windows 3.1 or Windows 95.

(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



Enlarge Image

MR02-K01
Ship Name: MIRAI
Period: 2002-01-07 - 2002-02-15
Chief Scientist: Takeshi Kawano (JAMSTEC)

Update History

2013-08-23	An observation data was registerd.
2012-12-25	An observation data was registerd.

MIRAI MR02-K01 Primary Production

Last Modified: 2013-08-23

ReadMe | Observation Data | Data Format | Quality Information

Cruise ID: MR02-K01

Primary Production: Processed (DMO)-QCed

Data Policy: JAMSTEC

PPD IS (MR02-K01)

Format information describes column no., column heading mnemonic and comments of In-situ incubation data sheet in MR02-K01.

Missing value is presented by -999.

Column No.	Column Heading Mnemonic	Comments
1	CruiseNO	CruiseID
2	STNNBR	Station number
3	CASTNO	Cast number (refer to CTD cast table of cruise report)
4	Inc.Type	Incubation method (IS : 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
11	CTD Depth	CTD Depth (m)
12	CTD PRS	CTD Pressure (dbar)
13	Chlorophyll	Chlorophyll a. quantity (mg/m3)
14	Inc.Depth	Incubation depth (m)
15	Inc.Time	Incubation time (hour)
16	POC-A	POC (Sample A) (µg)
17	POC-B	POC (Sample B) (µg)
18	13C-A	Ratio of 13C (Sample A) (atom%)
19	13C-B	Ratio of 13C (Sample B) (atom%)
20	Flag-A	Flag of Sample A (for explanation see Quality flags)
21	Flag-B	Flag of Sample B (for explanation see Quality flags)
22	delta POC-A	delta POC of Sample A (mgC/day)
23	delta POC-B	delta POC of Sample B (mgC/day)
24	AVE of dPOC	Average of delta POC (mgC/day)
25	Flag-AVE	Flag of Average of delta POC (for explanation see Quality flags)
26	Remarks	Flag explanation etc.

about 13)

Analyze method was Welschmeyer.

about 22 and 23)

The equation to be used in the calculations of delta POC-A and delta POC-B.

delta POC=1.025×POC×(13C-1.084)/{(2000×0.01084+200)/22-1.084}

1.025 : ^{13}C Stable Isotope discrimination factor

1.084 : ^{13}C ratio of zero time blank POC

(2000×0.01084+200)/22 : Amount of ^{13}C in which 10% of Total dissolved inorganic carbon in seawater was added as tracer.

about 24)

Only the “Flag 1” data in “delta POC-A” and “delta POC-B” are used for the calculation of “AVE of dPOC”.

(see column No.20 and No.21)

Literature cited for the equation

Meteorological Agency. 1990. Manuals for oceanographic observation. Japan Weather Association. 253-256pp.

PPD PI (MR02-K01)

Format information describes column no., column heading mnemonic and comments of PI at stations data sheet in MR02-K01.

PI:Photosynthesis and irradiation curve

Missing value is presented by -999.

Column No.	Column Heading Mnemonic	Comments
1	CruiseNO	CruiseID
2	STNNBR	Station number
3	CASTNO	Cast number (refer to CTD cast table of cruise report)
4	Inc.Type	Incubation method (PI : Photosynthesis and irradiation curve)
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
11	CTD Depth	CTD Depth (m)
12	CTD PRS	CTD Pressure (dbar)
13	Chlorophyll	Chlorophyll a. quantity (mg/m3)
14	Layer	Sampling layer
15	Light Intensity	Light intensity (µenstein/sec)
16	Inc. Time	Incubation Time (hour)
17	POC	POC (mg/L)

Column No.	Column Heading Mnemonic	Comments
17	POC	POC (mg/L)
18	13C	Ratio of 13C (atom%)
19	dPOC	delta POC (mgC/h)
20	Pb	delta POC/Chlorophyll a./hour (mgC/mgChl/h)
21	Flag	Flag of sample (for explanation see Quality flags)
22	Remarks	Flag explanation etc.

about 13)
Analyse method was Welschmeyer.

about 19)
The equation to be used in the calculations.
dPOC=1.025×POCRatio(13C-1.084)/{(2000×0.01084+200)/22-1.084}
1.025 : ^{13}C Stable Isotope discrimination factor
1.084 : ^{13}C ratio of zero time blank POC
(2000×0.01084+200)/22 : Amount of ^{13}C in which 10% of Total dissolved inorganic carbon in seawater was added as tracer.

about 20)
Pb=dPOC/Chlorophyll a.

Literature cited for the equation
Meteorological Agency. 1990. Manuals for oceanographic observation. Japan Weather Association. 253-256pp.

PPD Plu (MR02-K01)

Format information describes column no., column heading mnemonic and comments of PI underway data sheet in MR02-K01.
PI : Photosynthesis and irradiation curve

Missing value is presented by -999.

Column No.	Column Heading Mnemonic	Comments
1	CruiseNO	CruiseID
2	Inc.Type	Incubation method (PI : Photosynthesis and irradiation curve)
3	UTC Date	Sampling start UTC date (refer to Thermosalinograph)
4	UTC Time	Sampling start UTC time (refer to Thermosalinograph)
5	LST Date	Sampling start LST date (LST : Local Ship Time, refer to Thermosalinograph)
6	LST Time	Sampling start LST time (LST : Local Ship Time, refer to Thermosalinograph)
7	Latitude	Sampling start position Latitude degree (refer to Thermosalinograph)
8	Longitude	Sampling start position Longitude degree (refer to Thermosalinograph)
9	Sampling depth	Sampling depth (m)
10	Chlorophyll	Chlorophyll a. quantity (mg/m3)
11	Light intensity	Light intensity (µenstein/sec)
12	Inc.Time	Incubation Time (hour)
13	POC	POC (mg/L)
14	13C	Ratio of 13C (atom%)
15	dPOC	delta POC (mg/m3/h)
16	Pb	delta POC/Chlorophyll a./hour (mgC/mgChl/m3/h)
17	Flag	Flag of sample (for explanation see Quality flags)
18	Remarks	Flag explanation etc.

about 5)
The same day is generated in LST in the vicinity of the date line on the second.

about 10)
Analyse method was Welschmeyer.

about 15)
The equation to be used in the calculations.
dPOC=1.025×POC×(13C-1.084)/{(2000×0.01084+200)/22-1.084}
1.025 : ^{13}C Stable Isotope discrimination factor
1.084 : ^{13}C ratio of zero time blank POC
(2000×0.01084+200)/22 : Amount of ^{13}C in which 10% of Total dissolved inorganic carbon in seawater was added as tracer.

about 16)
Pb=dPOC/Chlorophyll a.

Literature cited for the equation
Meteorological Agency. 1990. Manuals for oceanographic observation. Japan Weather Association. 253-256pp.

PPD SIS (MR02-K01)

Format information describes column no., column heading mnemonic and comments of Simulated in-situ incubation data sheet in MR02-K01.
Missing value is presented by -999.

Column No.	Column Heading Mnemonic	Comments
1	CruiseNO	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)
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10	BTLNBR_FLAG	Bottle quality flag
11	CTD Depth	CTD Depth (m)
12	CTD PRS	CTD Pressure (dbar)

Column No.	Column Heading Mnemonic	Comments
13	Chlorophyll	Chlorophyll a. quantity (mg/m3)
14	Incubator	Optical transmittance (%)
15	Inc.Time	Incubation time (hour)
16	POC	POC (µg)
17	13C	Ratio of 13C (atom%)
18	Carbon uptake	delta POC (µgC/L/day)
19	Flag	Flag of sample (for explanation see Quality flags)
20	Remarks	Flag explanation etc.

about 13)

Analyze method was Welschmeyer.

about 18)

The equation to be used in the calculations.

Carbon uptake=1.025×POC×(13C-1.084)/{(2000×0.01084+200)/22-1.084}

1.025 : ^{13}C Stable Isotope discrimination factor

1.084 : ^{13}C ratio of zero time blank POC

(2000×0.01084+200)/22 : Amount of ^{13}C in which 10% of Total dissolved inorganic carbon in seawater was added as tracer.

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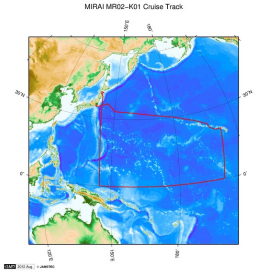
Related Information



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Chief Scientist: Takeshi Kawano (JAMSTEC)

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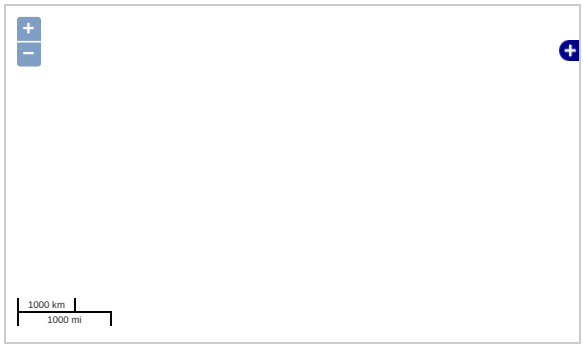
Observation Map



Imagery reproduced from ...

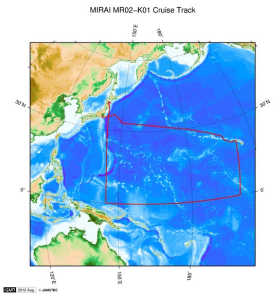
... Observation Line ... Navigation ... Observation, Dive Point, Hole

Data List

Add to Basket

File names
MR02-K01_pp_IS.csv
MR02-K01_pp_PI.csv
MR02-K01_pp_PIu.csv
MR02-K01_pp_SIS.csv

Related Information



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