

## MIRAI MR00-K08 Primary Production

Last Modified: 2013-08-09

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Cruise ID: [MR00-K08](#)

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

### 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 MR00-K08 cruise were obtained by the following methods :

- In-situ incubation method (IS)
- Simulated in-situ incubation method (SIS)
- 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 :  $\text{NaH}^{13}\text{CO}_3$
- 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 : 7
- 2.4) Tracer :  $\text{NaH}^{13}\text{CO}_3$
- 2.5) Incubation period : 3hours
- 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 at stations (PI\_at stations) [Outline figure](#)

- 3.1) Vertical sampling : Niskin
- 3.2) Surface sampling : Bucket
- 3.3) Sampling layer : 0m, Chlorophyll a. max
- 3.4) Tracer :  $\text{NaH}^{13}\text{CO}_3$
- 3.5) Incubation period : 3hours
- 3.6) Filtration : Whatman GF/F filter was used at dark place.
- 3.7) Preservation : Filters were kept to freeze at -20degC and dried in the oven at 45degC.
- 3.8) Preservation period of frozen filter paper : within 45 days
- 3.9) Analysis place : MIRAI

3.10) Analysis device : CN mass spectrometer (see section 3 and 4 for detail)

3.11) 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  $^{13}\text{C}$  and  $^{15}\text{N}$  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  $\text{CO}_2$ ,  $\text{N}_2$ ,  $\text{NO}_x$  and  $\text{H}_2\text{O}$ .

An elemental copper stage reduces  $\text{NO}_x$ , a  $\text{MgClO}_4$  trap removes water vapour,

a switchable Carbosorb trap can be used to remove  $\text{CO}_2$  (for  $^{15}\text{N}$  only analyses)

and a GC column separates  $\text{CO}_2$  from  $\text{N}_2$  (allowing dual isotope analysis).

And then, it is introduced into the "EUROPA20-20".

##### (2) EUROPA20-20

$\text{CO}_2$  and  $\text{N}_2$  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. MR00-K08\_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  $\mu\text{gN}$ , 10 to 1000  $\mu\text{gC}$ .

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 :  $120^\circ$  extended geometry with an 11 cm radius magnetic sector

Resolution :  $m/\Delta m = 95$  ( $\text{N}_2$ ) 10% valley definition

Sensitivity : Inside Vacuum level is  $4 \times 10^{-6}$  mbar in an atmosphere of helium

20 nmol  $\text{CO}_2$

15 nmol  $\text{N}_2$

Abundance Sensitivity : Inside Vacuum level is  $4 \times 10^{-6}$  mbar in an atmosphere of helium

30 ppm for  $\text{CO}_2$  at  $4 \times 10^{-6}$  mbar in continuous flow mode.

5 ppm for  $\text{N}_2$  at  $4 \times 10^{-6}$  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  $\mu\text{g}$  of the sample.

$^{13}\text{C}$  (0.2 ‰)

$^{15}\text{N}$  (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

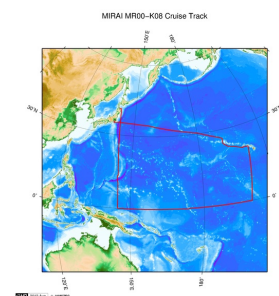
(IAEA-N-1, IAEA-N-2, and IAEA-CH-6) dealt in International Atomic Energy Agency (IAEA) were used.

#### 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](#)

##### MR00-K08

Ship Name: MIRAI

Period: 2000-12-27 - 2001-02-07

Chief Scientist: Takeshi Kawano (JAMSTEC)

#### Update History

|            |                                     |
|------------|-------------------------------------|
| 2013-08-09 | An observation data was registered. |
| 2012-12-25 | An observation data was registered. |

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## MIRAI MR00-K08 Primary Production

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Cruise ID: **MR00-K08**

Primary Production: Processed (DMO)-QCed

Data Policy: **JAMSTEC**

### PPD IS (MR00-K08)

Format information describes column no., column heading mnemonic and comments of In-situ incubation data sheet in MR00-K08.

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 (Welschmeyer method) (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         | dPOC/d-A                | delta POC of Sample A (mgC/day)  |
| 23         | dPOC/d-B                | delta POC of Sample B (mgC/day)  |
| 24         | AVE of dPOC             | Average of dPOC (mgC/day)  |
| 25         | Flag-AVE                | Flag of AVE of dPOC (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 dPOC/d-A and dPOC/d-B.

$$dPOC/d = 1.025 \times POC \times (13C - 1.084) / \{100 \times (2000 \times 0.01084 + 200) / (2000 + 200) - 1.084\}$$

1.025 : <sup>13</sup>C Stable Isotope discrimination factor

1.084 : <sup>13</sup>C ratio of zero time blank POC

 $100 \times (2000 \times 0.01084 + 200) / (2000 + 200)$  : Amount of <sup>13</sup>C in which 10% of Total dissolved inorganic carbon in seawater was added as tracer.

about 24)

Only the "Flag 1" data in "dPOC/d-A" and "dPOC/d-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 (MR00-K08)

Format information describes column no., column heading mnemonic and comments of PI at stations data sheet in MR00-K08.

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 (μEinst/m2/sec)  |
| 16         | Inc. Time               | Incubation Time (hour)   |

| Column No. | Column Heading Mnemonic | Comments   |
|------------|-------------------------|--|
| 18         | 13C                     | Ratio of <sup>13</sup> C (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.

$dPOC = 1.025 \times POC \times (13C - 1.084) / \{100 \times (2000 \times 0.01084 + 200) / (2000 + 200) - 1.084\} / 3$

1.025 : <sup>13</sup>C Stable Isotope discrimination factor

1.084 : <sup>13</sup>C ratio of zero time blank POC

$100 \times (2000 \times 0.01084 + 200) / (2000 + 200)$  : Amount of <sup>13</sup>C in which 10% of Total dissolved inorganic carbon in seawater was added as tracer.

about 20)

$Pb = dPOC / \text{Chlorophyll a.}$

Literature cited for the equation

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

#### PPD SIS (MR00-K08)

Format information describes column no., column heading mnemonic and comments of Simulated in-situ incubation data sheet in MR00-K08.

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)  |
| 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 Quality flags)                        |
| 11         | CTD Depth               | CTD Depth (m)  |
| 12         | CTD PRS                 | CTD Pressure (dbar)  |
| 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 <sup>13</sup> C (atom%)   |
| 18         | Carbon uptake           | delta POC (μgC/L/h)  |
| 19         | Flag                    | Flag of sample (for explanation see Quality flags)                             |
| 20         | Remarks                 | Flag explanation etc.  |

about 13)

Analyse method was Welschmeyer.

about 18)

The equation to be used in the calculations.

$\text{Carbon uptake} = 1.025 \times POC \times (13C - 1.084) / \{ (2000 \times 0.01084 + 200) / 22 - 1.084 \} / 3$

1.025 : <sup>13</sup>C Stable Isotope discrimination factor

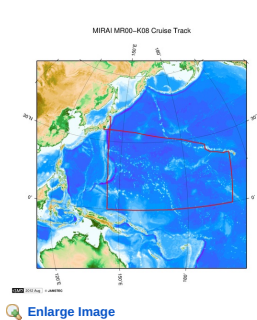
1.084 : <sup>13</sup>C ratio of zero time blank POC

$(2000 \times 0.01084 + 200) / 22$  : Amount of <sup>13</sup>C in which 10% of Total dissolved inorganic carbon in seawater was added as tracer.

Literature cited for the equation

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

#### Related Information



**MR00-K08**  
Ship Name: MIRAI  
Period: 2000-12-27 - 2001-02-07  
Chief Scientist: Takeshi Kawano (JAMSTEC)

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#### Update History

2013-08-09 An observation data was registered.  
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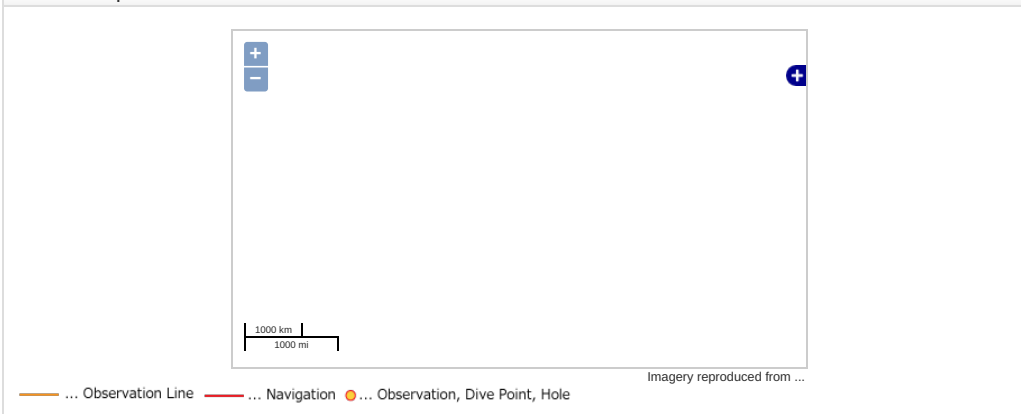
Data Policy: [JAMSTEC](#)

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BIOSPHERE > ECOLOGICAL DYNAMICS > ECOSYSTEM FUNCTIONS > PRIMARY PRODUCTION  
BIOSPHERE > ECOLOGICAL DYNAMICS > ECOSYSTEM FUNCTIONS > PHOTOSYNTHESIS

### Observation Map



### Data List

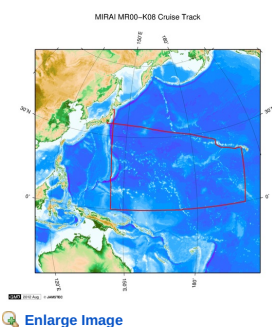
☐ File names

☐ MR00-K08\_pp\_IS.csv

☐ MR00-K08\_pp\_PL.csv

☐ MR00-K08\_pp\_SIS.csv

### Related Information



#### MR00-K08

Ship Name: MIRAI

Period: 2000-12-27 - 2001-02-07

Chief Scientist: Takeshi Kawano (JAMSTEC)

### Update History

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