MIRAI MR00-K01 Partial Pressure of CO2 (pCO2)

Last Modified: 2012-12-25

ReadMe | Observation Data | Data Format

Cruise ID: MR00-K01
Partial Pressure of CO2 (pCO2): Processed (PI)
Data Policy: JAMSTEC
Observation Items: CO2, Air temperature, Atmospheric pressure, Wind direction, Wind speed, Sea surface temperature, Sea surface salinity
Science Keywords:
OCEANS > OCEAN CHEMISTRY > CARBON DIOXIDE

Cruise Report
http://www.godac.jamstec.go.jp/catalog/data/doc_catalog/media/MR00-K01_all.pdf

For Using Data

Principal Investigator
Akihiko Murata (JAMSTEC)

Use Constraints
See Terms and Conditions about constrain of use.

Data Citation
See Terms and Conditions about data citation.

Instrument

Instrument:
pCO2 measurement system (- MR10-06)

Information on pCO2 measurement

Investigator: Dr. Akihiko Murata
Organization: Research Institute for Global Change (RIGC)/Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
Address: 2-15, Natsushima-cho, Yokosuka, Kanagawa, 237-0061, Japan

Vessel:
Vessel Name: Mirai
Vessel ID: JNSR
Country: Japan
Vessel Owner: JAMSTEC

Equilibrator Design:
Equilibrator type: Shower-head type equilibrator
Equilibrator volume (L): 1.2
Water_Flow_Rate (L/min): 5-8
Headspace_Gas_Flow_Rate (L/min): 0.6-0.8
Vented: During equilibrium, closed circulation of air. When measured by NDIR, vented to ambient air.

Measurement Method:
Continuous underway measurements of atmospheric and surface seawater pCO_2 were made with the CO_2 measuring system (Nippon ANS, Ltd) installed in the R/V Mirai of JAMSTEC. The system comprises of a non-dispersive infrared gas analyzer (NDIR; BINOSR model 4.1, Fisher-Rosemount) or the variations, an air-circulation module and a showerhead-type equilibrator. To measure concentrations (mole fraction) of CO_2 in dry air (xCO_2a), air sampled from the bow of the ship (approx. 30 m above the sea level) was introduced into the NDIR through a dehydrating route with an electric dehumidifier (kept at ~ 2 °C), a Perma Pure dryer (GL Sciences Inc.), and a chemical desiccant (Mg(ClO4)2). The flow rate of the air was 500 ml min-1. To measure surface seawater concentrations of CO_2 in dry air (xCO_2s), the air equilibrated with seawater within the equilibrator was introduced into the NDIR through the same flow route as the dehydrated air used in measuring xCO_2a. The flow rate of the equilibrated air was 600 - 800 ml min-1. The seawater was taken by a pump from the intake placed at the approx. 4.5 m below the sea surface. The flow rate of seawater in the equilibrator was 500 - 800 ml min-1.

The CO_2 measuring system was set to repeat the measurement cycle such as 4 kinds of CO_2 standard gases (Table 1), xCO_2a (twice), xCO_2s (7 times). This measuring system was run automatically throughout cruises by a PC control. Effects of water temperature increased between the inlet of surface seawater and the equilibrator on xCO_2s were adjusted based on Gordon and Jones (1973), although the temperature increases were slight, being ~ 0.5 °C at maximum.

Gordon, L. I. and L. B. Jones (1973), The effect of temperature on carbon dioxide partial pressure in seawater. Mar. Chem., 1, 317 - 322.

Manufacturer of Calibration Gas:
Concentrations of CO_2 of the standard gases are listed in Table 1, which were calibrated by the JAMSTEC primary standard gases after 2000 (MR00-K01 and later). Before that time, the standard gases were calibrated against the scale of the Meteorological Research Institute, Tsukuba, Japan, and fitted to the 1985 World Meteorological Organization scale by using the equation of Inoue et al. (1995). The CO_2 concentrations of the primary standard gases were calibrated by C. D. Keeling of the Scripps Institution of Oceanography, La Jolla, CA, USA. The values are 230.33 ppm (Cyl. No. 11325), 259.74 (11326), 279.67 (11327), 308.93 (11328), 328.25 (11329), 348.79 (11330), 369.55 (11331), 389.54 (11333), 411.60 (11334), 440.94 (11335), 460.42 (11336), and 478.54 (11337).

Since differences of concentrations of the standard gases between before and after the cruise were all allowable (< 0.1 ppmv), the averaged concentrations (Table 1) were adopted for the subsequent calculations.

Table 1. Concentrations of standard gases used in individual cruises.

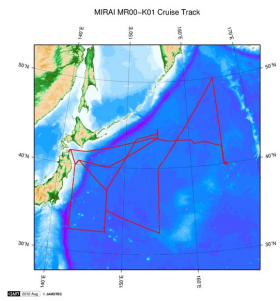
Cruise #	STD1	STD2	STD3	STD4	Remark
MR98-06	-	-	-	-	No records left
MR98-K01	270.28	330.95	360.48	410.85	
MR99-K02	270.28	330.95	360.48	410.85	
MR99-K04	270.26	330.98	360.43	410.85	
MR99-K05	247.74	304.98	333.32	382.57	
MR00-K01	329.71	359.17	409.39	439.94	
MR00-K03	269.60	329.71	359.17	439.94	
	269.60	329.71	359.17	409.39	
MR00-K06	246.95	305.13	333.44	382.74	
	305.13	333.44	382.74	409.40	
MR01-K02	269.60	329.74	359.22	409.39	
MR01-K03	269.60	329.74	359.22	409.39	
MR01-K04 Leg1	298.56	321.17	370.75	439.95	
MR01-K04 Leg2	298.56	321.17	370.75	439.95	
MR01-K05 Leg1-2	247.99	298.56	321.17	370.75	
MR01-K05 Leg3-4	247.99	298.56	321.17	370.75	
MR02-K03	269.20	329.52	359.11	408.76	
MR02-K05 Leg1	246.69	297.83	320.05	391.66	
MR03-K01	270.16	340.21	371.39	389.97	
MR03-K02	270.08	328.87	359.10	409.23	
MR03-K04 Leg1	270.08	328.87	359.10	409.23	
MR03-K04 Leg2	270.08	328.87	359.10	409.23	
MR03-K04 Leg4	270.08	328.87	359.10	409.23	
MR03-K04 Leg5	268.84	330.16	369.37	414.39	
MR04-04	268.85	328.87	369.39	414.43	
MR04-05	268.84	330.16	369.37	414.39	
MR05-02	262.94	320.42	381.04	420.76	
MR05-05 Leg1	262.94	320.42	381.04	420.76	
MR05-05 Leg2	262.94	320.42	381.04	420.76	
MR05-05 Leg3	262.94	320.42	381.04	420.76	
MR06-04 Leg1	289.76	349.00	393.75	439.72	
MR06-04 Leg2	289.76	349.00	393.75	439.72	
MR07-04	289.77	349.02	393.77	439.75	
MR07-05	289.77	349.02	393.77	439.75	
MR07-06 Leg1	270.02	330.40	369.28	419.68	
MR07-06 Leg2	270.02	330.40	369.28	419.68	
MR09-01 Leg1	270.22	330.43	360.04	420.32	
MR09-01 Leg2	270.22	330.43	360.04	420.32	

Inoue, H. Y., H. Matsueda, M. Ishii, K. Fushimi, M. Hirota, I. Asanuma, and Y. Takasugi (1995), Long-term trend of the partial pressure of carbon dioxide (pCO_2) in surface waters of the western North Pacific 1984 - 1993. Tellus 47B, 391 - 413.

CO_2 Sensors:

Manufacturer: Rosemount Analytical
Model: BINOS 4.1
Resolution: -
Uncertainty: -

Related Information



Enlarge Image

MR00-K01
Ship Name: MIRAI
Period: 2000-01-05 - 2000-02-06
Chief Scientist: Makio Honda (JAMSTEC)
Project Name: [Station KEO,Station KNOT]

Update History

2012-12-25 An observation data was registerd.

MIRAI MR00-K01 Partial Pressure of CO2 (pCO2)

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pCO2 FORMAT_J

Air-xCO_2

The file is in fixed length, comma separated text file (csv) format.

The "missing value" is defined as -999.

Column NO.	Column Heading	Comments
1	Date	Year/Month/Day (YYYY/MM/DD) in UTC
2	Time	Hour:Minute:Second (HH:MM:SS) in UTC
3	Latitude	Latitude (degree) ; Positive in north
4	Longitude	Longitude (degree) ; degree in eastward (0 - 360)
5	Atm_Tmp	Air temperature (degree C)
6	Atm_Prs	Barometric pressure (hPa)
7	Wind_Dir	Wind direction (degree)
8	Wind_Spd	Wind speed (m/s)
9	SST	Sea surface temperature (degree C)
10	SSS	Sea surface salinity (PSU)
11	xCO2_Air	CO_2 mixing ratio (ppmv) in the 'dry air' taken from the fore-mast of the ship.

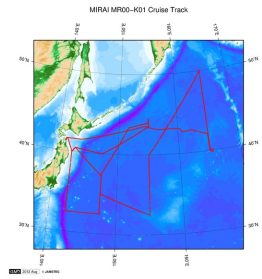
Sea-xCO_2

The file is in fixed length, comma separated text file (csv) format.

The "missing value" is defined as -999.

Column NO.	Column Heading	Comments
1	Date	Year/Month/Day (YYYY/MM/DD) in UTC
2	Time	Hour:Minute:Second (HH:MM:SS) in UTC
3	Latitude	Latitude (degree) ; Positive in north
4	Longitude	Longitude (degree) ; degree in eastward (0 - 360)
5	Eq_Tmp	Temperature in equilibrator (degree C)
6	Eq_Prs	Pressure in equilibrator (mmHg)
7	SST	Sea surface temperature (degree C)
8	Atm_Prs	Air pressure (hPa)
9	SSS	Sea surface salinity (PSU)
10	xCO2_Sea	CO_2 mixing ratio (ppmv) in the 'dry air' equilibrated with surface.

Related Information



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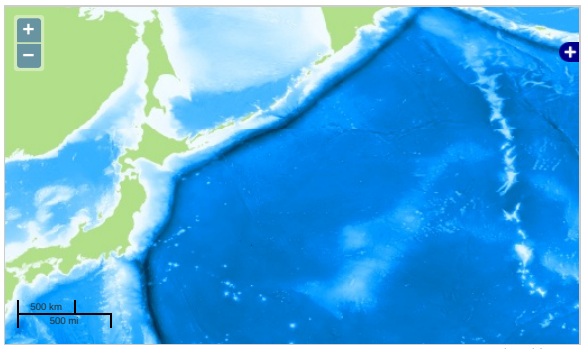
Observation Map



Imagery reproduced from ...

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

Data List

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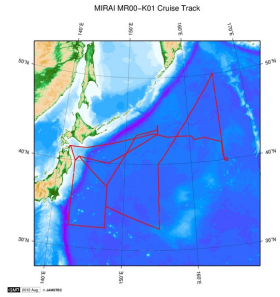
	File names
☐	MR00-K01_pco2.zip

Related Information



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