

# Underway Metadata Form

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(\* = mandatory field)

## Metadata Creator:\*

Name: \* Shu Saito  
Organization: Marine Division, Global Environment and Marine Department, Japan Meteorological Agency  
Address: 1-3-4 Otemachi, Chiyoda-ku, Tokyo, 100-8122, Japan  
Telephone: +81-3-3212-8341 Ext.5133  
Email: \* seadata@climar.kishou.go.jp

*On submission of a metadata record a notification is sent to the metadata creator with a link to metadata that was created.*

## Investigator #1:\*

Name: \* Saito, Shu (example: Jones, Dr. Robert W.)  
Organization: Marine Division, Global Environment and Marine Department, Japan Meteorological Agency  
Address:  
1-3-4 Otemachi  
Chiyoda-ku  
Tokyo  
Phone: +81-3-3212-8341 Ext.5133  
Email: seadata@climar.kishou.go.jp

## Investigator #2:\*

Name: \* Nakadate, Akira  
Organization: Pollutants Chemical Analysis Center, Marine Division, Global Environment and Marine Department, Japan Meteorological Agency  
Address:  
Japan Meteorological Agency, 1-3-4 Otemachi Chiyoda-ku Tokyo 100-8122, Japan  
Phone: +81-3-3212-8341 Ext.5133  
Email: seadata@climar.kishou.go.jp

Total Investigators in the Data Set: 2 ▼

## Dataset Info:

- Funding Information (funder, project name, grant number, e.g. MEXT Grant-in-Aid for Scientific Research (16310018), NOAA Climate Program or European Union CarboChange FP7 264879) :  
"Observation for Monitoring Background Marine Pollution" Project of Japan Meteorological Agency
- Submission Dates:
  - Initial Submission: 20040621 (yyyymmdd)
  - Revised Submission: 20140228 (yyyymmdd)

## Cruise Info:

- Cruise Information for the Expocode:
  - NODC Platform (Ship) Code List: 49UP [4 character NODC](#)
  - Start Date (cruise or data set, for Expocode): 19950716 (yyyymmdd)
  - Cruise Information for the expocode: 49UP19950716
- Other Cruise Info:
  - Survey type (e.g. VOS Lines, Research Cruise, Moored Buoy, Drifting Buoy):  
Research Cruise
  - Vessel Name:  
R/V Ryofu Maru III
  - Vessel Owner: Ministry of Land, Infrastructure, Transport and Tourism
  - Cruise Info (e.g. SAVE, TTO-NAS, SOIREE, AMT08, Antares):  
VOS\_Ryofu\_Maru\_1995\_1999

- o Cruise Name (including Leg) (e.g. ANTV-2, Biscay\_979815C, D198):

RF9507 - RF9909

- o End Date: 19991105 (yyyymmdd)

- o Ports of Call: (One per line)

Tokyo, Japan

- o Mooring ID if applicable:

- Geographical Coverage:

- o Geographical Region:

Pacific Ocean

- o Bounds:

- Westernmost Longitude:

Enter decimal fractions of degrees: 126.25 (+ = E, - = W)

- Easternmost Longitude:

Enter decimal fractions of degrees: 165.49 (+ = E, - = W)

- Northernmost Latitude:

Enter decimal fractions of degrees: 50.03 (+ = N, - = S)

- Southernmost Latitude:

Enter decimal fractions of degrees: -6.75 (+ = N, - = S)

## Variables Info:

- Variable:

- o Variable Name: Cruise

- o Description of Variable: (units)

Variable #2:

- o Variable Name: Date

- o Description of Variable: (units) Observation date (yyyy/mm/dd)

Variable #3:

- o Variable Name: Time

- o Description of Variable: (units) Observation time (hh:mm)

Variable #4:

- o Variable Name: Lat

- o Description of Variable: (units) Latitude (degrees north)

Variable #5:

- o Variable Name: Lon

- o Description of Variable: (units) Longitude (degrees east)

Variable #6:

- o Variable Name: xCO2a

- o Description of Variable: (units) Mole fraction of CO2 in ambient atmosphere (micro mol/mol in dry air)

Variable #7:

- o Variable Name: Flag\_xCO2a

- o Description of Variable: (units) 2: Acceptable, 4: Not measured with missing value "-999" on the left.

Variable #8:

- o Variable Name: xCO2eq

- o Description of Variable: (units) Mole fraction of CO2 in air from equilibrator (micro mol/mol in dry air)

Variable #9:

- o Variable Name: Flag\_xCO2eq

- o Description of Variable: (units) 2: Acceptable, 4: Not measured with missing value "-999" on the left.

Variable #10:

- o Variable Name: AtmPrs

- o Description of Variable: (units) Atmospheric pressure at sea-surface pressure (hPa)

Variable #11:

- o Variable Name: Flag\_AtmsPrs

- o Description of Variable: (units) 2: Acceptable, 4: Not measured with missing value "-999" on the left.

Variable #12:

- o Variable Name: TmpEq

- o Description of Variable: (units) Temperature at equilibration (DEG\_C)

Variable #13:

- o Variable Name: Flag\_TmpEq

- Description of Variable: (units) 2: Acceptable, 4: Not measured with missing value "-999" on the left.
- Variable #14:
- Variable Name: SST
  - Description of Variable: (units) In situ sea surface temperature (DEG\_C)
- Variable #15:
- Variable Name: Flag\_SST
  - Description of Variable: (units) 2: Acceptable, 4: Not measured with missing value "-999" on the left.
- Variable #16:
- Variable Name: SSS
  - Description of Variable: (units) Sea surface salinity (psu)
- Variable #17:
- Variable Name: Flag\_SSS
  - Description of Variable: (units) 2: Acceptable, 4: Not measured with missing value "-999" on the left.
- Total Variables in the Data Set: 17 ▼

## Surface Water CO<sub>2</sub> Method Description:

- Sampling and Equilibrator Design:
  - Depth of Seawater Intake (m): 5
  - Location of Seawater Intake: Port sea-chest at the center in the longitudinal direction of a hull.
  - Equilibrator type: Shower head
  - Equilibrator volume (L): 2 (air), 20 (seawater)
  - Water\_Flow\_Rate (L/min): 5
  - Headspace\_Gas\_Flow\_Rate (mL/min): 500
  - Equilibrator Vented:  Yes  No
  - Drying method for CO<sub>2</sub> in water and extent of drying: Thermoelectric cooling units followed by permeable membrane dryer and magn
  - Additional comments on equilibration:
- CO<sub>2</sub> in marine air method:
  - Measurement of CO<sub>2</sub> in marine air (yes/no) & frequency: Yes, every 1 hour.
  - Location and height of marine air intake: Bow tip, 6m.
  - Drying method for CO<sub>2</sub> in air and extent of drying:
- CO<sub>2</sub> Sensors:
  - Measurement Method CO<sub>2</sub>: Infra-red analysis on dry gas
  - Manufacturer of CO<sub>2</sub> sensor: Fisher-Rosimount GmbH & Co.
  - Model of CO<sub>2</sub> sensor: BINOS 4.1
  - Frequency of CO<sub>2</sub> measurements (e.g. Every 120 sec, except during calibration routines): Every 1 hour
  - Accuracy of CO<sub>2</sub>water (specify parameter and unit):
  - Precision of CO<sub>2</sub>water (specify parameter and unit): 2.2 micro mol/mol (xCO<sub>2</sub>eq)
  - Accuracy of CO<sub>2</sub>air (specify parameter and unit):
  - Precision of CO<sub>2</sub>air (specify parameter and unit): 0.2 micro mol/mol (xCO<sub>2</sub>a)
  - Calibration of CO<sub>2</sub> calibration gases (document traceability to an internationally recognized scale, including frequency of calibration, and location of calibrations): Frequency: Every 1 hour, Scale: WMO mole fraction scale
  - CO<sub>2</sub> calibration gases (manufacturer, number and approximate mixing ratio of CO<sub>2</sub> standards, and frequency of calibration): Japan Fine Products Co., Ltd. (Japan)
  - Additional comments on CO<sub>2</sub> analysis: CO<sub>2</sub> Calibration gases: 4 or 5 cylinders range from 270-420 micromol/mol

- CO<sub>2</sub> method references (publications describing method):

Hirota, M., Nemoto, K., Murata, A., and Fushimi, K. 1991. Observation of carbon dioxide in air and surface seawater in the western North Pacific Ocean. Oceanogr. Mag., 41, 19-28.

- Sea Surface Temperature (SST):

- Location and depth of SST sensor: Port sea-chest at the center in the longitudinal direction of a hull. Depth 5m.
- Manufacturer SST sensor: Falmouth Scientific Inc.
- Model SST sensor: OTM 1364
- Accuracy SST: 0.003 degreeC
- Precision SST:
- Calibration of SST (document traceability to an internationally recognized scale, including dates and location of calibrations):

- Additional comments on SST analysis:

- Equilibrator Temperature (T<sub>equ</sub>):

- Location of T<sub>equ</sub> sensor: Shower head
- Manufacturer T<sub>equ</sub> sensor: M-System Co., Ltd.
- Model T<sub>equ</sub> sensor: JR-35-B
- Accuracy T<sub>equ</sub>: +/-0.1 degreeC
- Precision T<sub>equ</sub>:
- Calibration of T<sub>equ</sub> (document traceability to an internationally recognized scale, including dates and location of calibrations):

- Average warming of water from seawater inlet to equilibrator with standard deviation:

0.20 +/- 0.21 DEG\_C

- Additional comments on T<sub>equ</sub> analysis:

- Equilibrator Pressure (P<sub>equ</sub>):

- Location of P<sub>equ</sub> sensor:
- Manufacturer P<sub>equ</sub> sensor:
- Model P<sub>equ</sub> sensor:
- Accuracy P<sub>equ</sub>:
- Precision P<sub>equ</sub>:
- Calibration of P<sub>equ</sub> (document traceability to an internationally recognized scale, including dates and location of calibrations):

- Additional comments on P<sub>equ</sub> analysis:

- Atmospheric Pressure (sea level) (P<sub>atm</sub>):

- Location and height of P<sub>atm</sub> sensor: At the same laboratory in the ship
- Manufacturer P<sub>atm</sub>: Yokogawa Weathac Corporation
- Model P<sub>atm</sub>: Cylinder oscillation barometer, AP-100
- Accuracy P<sub>atm</sub> (specify unit):
- Precision P<sub>atm</sub> (specify unit):
- Calibration of P<sub>atm</sub> (document traceability to an internationally recognized scale, including dates and location of calibrations):

- Additional comments on P<sub>atm</sub> analysis:

- Sea Surface Salinity (SSS):
  - Location and depth of SSS sensor:
  - Manufacturer SSS sensor:
  - Model SSS sensor:
  - Accuracy SSS:
  - Precision SSS:
  - Calibration of SSS (document traceability to an internationally recognized scale, including dates and location of calibrations):
  - Additional comments on SSS analysis:
  
- Other Sensors # 1:
  - Manufacturer:
  - Accuracy:
  - Model:
  - Precision:
  - Calibration (For each sensor of pressure, temperature, and salinity, document traceability to an internationally recognized scale, including date and place of the last calibration):
  - Additional Information:
  
- Add More Sensors:  ▼

**Additional Information:**

**Data Set References: (Publication(s) describing data set)**

Inoue, H. Y., Ishii, M., Matsueda, H., Saito, S., Midorikawa, T., and Nemoto, K. 1999. MRI measurements of partial pressure of CO<sub>2</sub> in surface waters of the Pacific during 1968 to 1970: re-evaluation and comparison of data with those of 1980s and 1990s. *Tellus*, 51B, 830-848.

**Citation: (How to cite this data set)**

Saito, S. and A. Nakadate. 2014. Underway air and surface seawater pCO<sub>2</sub> data measured on board the R/V Ryofu Maru during the 1995-1999 cruises.  
[http://cdiac.ornl.gov/ftp/oceans/VOS\\_Ryofu\\_Maru\\_V2/RyofuMaru\\_1995\\_1999](http://cdiac.ornl.gov/ftp/oceans/VOS_Ryofu_Maru_V2/RyofuMaru_1995_1999). Carbon Dioxide Information Analysis Center, Oak Ridge National

**Append Measurement or Calibration reports here:**

**Data Set Link:**

- URL:
- Label: