Dataset Expocode	**PAT520140225**
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Dataset	**Funding Info:** NIES, MOE, MEXT, DIAS **Initial Submission (yyyymmdd):** 20160114 **Revised Submission (yyyymmdd):**
Campaign/Cruise	**Expocode:** PAT520140225 **Campaign/Cruise Name:** TF5-72T **Campaign/Cruise Info:** Volunteer Observing Ship (VOS) project **Platform Type:** **CO2 Instrument Type:** Equilibrator-IR or CRDS or GC **Survey Type:** VOS Lines **Vessel Name:** M/S Trans Future 5 **Vessel Owner:** Toyofuji Shipping Co. **Vessel Code:** PAT5
Coverage	**Start Date (yyyymmdd):** 20140225 **End Date (yyyymmdd):** **Westernmost Longitude:** 130 E **Easternmost Longitude:** 180 E **Northernmost Latitude:** 35 N **Southernmost Latitude:** 45 S **Port of Call:** Brisbane - Nelson
Variable	**Name:** yyyymmdd **Unit:** GMT **Description:** date (year-month-day)
Variable	**Name:** hhmmss **Unit:** GMT **Description:** time (hour-min-sec)
Variable	**Name:** utc **Unit:** day **Description:** serial number since January 1, 1900
Variable	**Name:** Lat **Unit:** degree N **Description:** Latitude
Variable	**Name:** Lon **Unit:** degree E **Description:** Longitude
Variable	**Name:** Ambient Temp **Unit:** degree Celsius

Description: air temperature on the deck

Variable
Name: Hum(%)
Unit: %
Description: relative humidity on the deck

Variable
Name: Solar Radiation (W/m2)
Unit: W/m2
Description: Solar Radiation

Variable
Name: Rel WV(m/s)
Unit: m/s
Description: Ship Speed

Variable
Name: Ship Speed(kt)
Unit: knots
Description: ship speed

Variable
Name: Abs WV(m/s)
Unit: m/s
Description: absolute wind velocity

Variable
Name: Atmos. RM Press cal (hPa)
Unit: hPa
Description: calibrated atmospheric pressure at sea level

Variable
Name: Air xCO2 cal
Unit: parts per million
Description: calibrated atmospheric xCO2

Variable
Name: Air fCO2 cal
Unit: micro atm
Description: calibrated atmospheric fCO2

Variable
Name: Air pCO2 cal
Unit: micro atm
Description: calibrated atmospheric pCO2

Variable
Name: Eq Temp cal
Unit:
Description: calibrated temperature in Equilibrator

Variable
Name: SST cal
Unit: degree Celsius
Description: calibrated sea surface temperature (SST)

Variable
Name: xCO2_Eq
Unit: parts per million
Description: calibrated sea water xCO2 at equilibrator temperature

Variable
Name: fCO2_Eq
Unit: micro atm
Description: sea water fCO2 at equilibrator temperature

Variable
Name: fCO2_SST
Unit: micro atm
Description: sea water fCO2 at SST

Variable
Name: xCO2_SST
Unit: parts per million
Description: sea water xCO2 at SST

Variable	**Name:** pCO2_SST **Unit:** micro atm **Description:** sea water pCO2 at SST
Variable	**Name:** delta fCO2 **Unit:** micro atm **Description:** [fCO2 SW] - [fCO2 Air]
Variable	**Name:** delta xCO2 **Unit:** parts per million **Description:** [xCO2 SW] - [xCO2 Air]
Variable	**Name:** delta pCO2 **Unit:** micro atm **Description:** [pCO2 SW] - [pCO2 Air]
Variable	**Name:** Sal verified **Unit:** **Description:** verified salinity from calibrated SBE salinity
Variable	**Name:** Bubble Flag **Unit:** **Description:** 0: normal; 1: possible to bubble in pipe by ship rolling/pitching
Variable	**Name:** Eq. RM Press cal(hPa) **Unit:** hPa **Description:** calibrated Equilibrator Room Pressure
Sea Surface Temperature	**Location:** Ship bottom (7m) **Manufacturer:** SeaBird Electronics. Inc. **Model:** SBE38 **Accuracy:** 0.001 (°C if units not given) **Precision:** 0.001 (°C if units not given) **Calibration:** not necessary **Comments:**
Sea Surface Salinity	**Location:** Ocean observation room **Manufacturer:** SeaBird Electronics. Inc. **Model:** SBE21 and SBE45 **Accuracy:** 0.005 **Precision:** 0.003 **Calibration:** SBE21 Salinity is calibrated by sal bottle value which is measured by Guildline Portable Salinometer 8410A. **Comments:**
Atmospheric Pressure	**Location:** Bridge (height above sea level: 32m) **Normalized to Sea Level:** yes **Manufacturer:** COPAL electronics **Model:** PG-200 **Accuracy:** 0.5hPa (hPa if units not given) **Precision:** 0.1hPa (hPa if units not given) **Calibration:** Calibration is performed every 6 hours by JMA certified barometer. **Comments:**
Atmospheric CO2	**Measured/Frequency:** yes, every 10 seconds **Intake Location:** 30m above sea level **Drying Method:** **Atmospheric CO2 Accuracy:** 0.1ppm

Atmospheric CO2 Precision: 0.01 ppm

Aqueous CO2 Equilibrator Design

System Manufacturer: Kimoto Electric Co., Osaka, Japan.
Intake Depth: 7
Intake Location: bottom at stern
Equilibration Type: Tandem Type Equilibrator
Equilibrator Volume (L): approx. 30L
Headspace Gas Flow Rate (ml/min): 500 ml/min
Equilibrator Water Flow Rate (L/min): 20 L/min
Equilibrator Vented: Yes
Equilibration Comments:
Drying Method: Dehumidifier and Membrane Dryer

Aqueous CO2 Sensor Details

Measurement Method: IR
Method details:
Manufacturer: Kimoto Electric Co., Osaka, Japan.
Model: MOG-701 using LI-7000 CO2 Analyzer by LI-COR
Measured CO2 Values: dry base xCO2
Measurement Frequency: 10sec (except during calibration routines 90min*2/day)
Aqueous CO2 Accuracy: 0.1ppm
Aqueous CO2 Precision: 0.01 ppm
Sensor Calibrations: WMO traceable, frequency every 8 hours for air every 12 hrs. for sea
Calibration of Calibration Gases: Mooring
Number Non-Zero Gas Standards: 4
Calibration Gases:
Taiyo Nippon Sanso Corporation, Japan 360,380,400,420ppm 8min each (32 min. total) at 1:00, 7:00, 13:00 & 19:00 (4times/day) for air.ref, 0,270,330,390,450ppm 15min each (90 min. total) at 1:00 & 13:00 (twice/day) for seawater
Comparison to Other CO2 Analyses:
Comments:
Method Reference:

Equilibrator Temperature Sensor

Location: Ocean observation room
Manufacturer: SeaBird Electronics. Inc.
Model: SBE38
Accuracy: 0.001 (°C if units not given)
Precision: 0.001 (°C if units not given)
Calibration: not necessary
Comments:

Equilibrator Pressure Sensor

Location: Ocean Observation Room
Manufacturer: COPAL electronics
Model: PG-200
Accuracy: 0.5 (hPa if units not given)
Precision: 0.1 (hPa if units not given)
Calibration: Differential pressure gauge between the equilibrator and the room periodically checked with observation room pressure. Calibration is performed every 6 hours.
Comments:

Additional Information

Suggested QC flag from Data Provider: NB
Additional Comments:
Citation for this Dataset:
Other References for this Dataset:

Murphy, P. P., K. K. Kelly, R. A. Feely, and R. H. Gammon (1995): Carbon dioxide concentrations in surface water and the atmosphere during 1986-1989NOAA/PMEL cruises in the Pacific and Indian Oceans (Oak Ridge Natl. Lab., Oak Ridge, TN), Rep. NRNL/CDIAC-75, NDP-047.
Murphy, P. P., Y. Nojiri, Y. Fujinuma, C. S. Wong, J. Zeng, T. Kimoto, and H. Kimoto (2001): Measurements of surface seawater fCO2 from volunteer commercial Ship: Techniques and experiences from Skaugran. J. Atmospheric and Oceanic Technology, 18, 1719-1734.