

Dataset Expocode	09FS20100908
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Dataset	Funding Info: Australian Climate Change Science Program Initial Submission (yyyymmdd): 20160202 Revised Submission (yyyymmdd):
Campaign/Cruise	Expocode: 09FS20100908 Campaign/Cruise Name: Heron Island_2 Campaign/Cruise Info: Platform Type: CO2 Instrument Type: Equilibrator-IR or CRDS or GC Survey Type: Moored Buoy Vessel Name: Heron Island Vessel Owner: CSIRO Vessel Code: 09FS
Coverage	Start Date (yyyymmdd): 20100908 End Date (yyyymmdd): 20110309 Westernmost Longitude: 151.925 E Easternmost Longitude: 151.927 E Northernmost Latitude: 23.458 S

Southernmost Latitude: 23.459 S

Variable	Name: DATE Unit: YYYY-MM-DD hh:mm:ss Description: date and time of measurement
Variable	Name: LATITUDE Unit: degree +ve=N Description:
Variable	Name: LONGITUDE Unit: degree +=E Description:
Variable	Name: xCO2_dry_SW Unit: micromol/mol Description: mole fraction of carbon dioxide (dry) in surface water and at equilibrator temperature and salinity
Variable	Name: SD_xCO2_dry_SW Unit: micromol/mol Description: standard deviation of 58 determinations over 30 seconds of XCO2_DRY_SW at each time stamp
Variable	Name: XCO2_DRY_SW_WOCE_FLAG Unit: Description: woce flag for XCO2_DRY_SW (good=2, questionable=3, bad=4)
Variable	Name: XCO2_DRY_AIR Unit: micromol/mol Description: mole fraction of carbon dioxide (dry) in air
Variable	Name: SD_XCO2_DRY_AIR Unit: micromol/mol Description: standard deviation of 58 determinations over 30 seconds of XCO2_DRY_AIR at each time stamp
Variable	Name: XCO2_DRY_AIR_WOCE_FLAG Unit: micromol/mol Description: fugacity of carbon dioxide in seawater at sea surface temperature and salinity and 100% humidity
Variable	Name: fCO2_WET_SW Unit: microatmospheres Description:
Variable	Name: SD_fCO2_WET_SW Unit: microatmospheres Description: standard deviation of 58 calculations over 30 seconds of fCO2_WET_SW at each time stamp
Variable	Name: fCO2_WET_SW_WOCE_FLAG Unit: Description: woce flag for fCO2_WET_SW (2=good, 3-questionable, 4=bad)
Variable	Name: D_fCO2 Unit: microatmospheres Description: Delta fCO2 = (fCO2_WET_SW - fCO2_WET_AIR)
Variable	Name: SD_D_fCO2

Unit: microatmospheres

Description: standard deviation of 58 determinations of D_fCO2 at each time stamp

Variable

Name: D_fCO2_WOCE_FLAG

Unit:

Description: woce flag for D_fCO2 (2=good, 3-questionable, 4=bad)

Variable

Name: ATMOSPHERIC_PRESSURE

Unit: kPa

Description: atmospheric pressure

Variable

Name: SD_ATMOSPHERIC_PRESSURE

Unit: kPa

Description: standard deviation of 58 measurements of ATMOSPHERIC_PRESSURE over 30 seconds at each time stamp

Variable

Name: ATMOSPHERIC_PRESSURE_WOCE_FLAG

Unit:

Description: woce flag for ATMOSPHERIC_PRESSURE (2=good, 3-questionable, 4=bad)

Variable

Name: EQUILIBRATOR_PRESSURE

Unit: kPa

Description: pressure of equilibrator

Variable

Name: SD_EQUILIBRATOR_PRESSURE

Unit: kPa

Description: standard deviation of 58 measurements of EQUILIBRATOR_PRESSURE over 30 seconds at each time stamp

Variable

Name: EQUILIBRATOR_PRESSURE_WOCE_FLAG

Unit:

Description: woce flag for EQUILIBRATOR_PRESSURE (2=good, 3-questionable, 4=bad)

Variable

Name: SEA_SURFACE_TEMPERATURE

Unit: degree centigrade

Description: sea surface temperature

Variable

Name: SEA_SURFACE_TEMPERATURE_WOCE_FLAG

Unit:

Description: woce flag for SEA_SURFACE_TEMPERATURE (2=good, 3=questionable, 4=bad)

Variable

Name: EQUILIBRATOR_TEMPERATURE

Unit: degree centigrade

Description: equilibrator temperature

Variable

Name: EQUILIBRATOR_TEMPERATURE_WOCE_FLAG

Unit:

Description: woce quality control flag for EQUILIBRATOR_TEMPERATURE (2=good, 3=questionable, 4=bad)

Variable

Name: SALINITY

Unit:

Description: sea surface salinity

Variable

Name: SALINITY_WOCE_FLAG

Unit:

Description: woce flag for SALINITY (2=good, 3=questionable, 4=bad)

Variable

Name: DISSOLVED_OXYGEN

Unit: micromol/litre

Description: dissolved oxygen

Variable

Name: SD_DISSOLVED_OXYGEN

Unit: micromol/litre

Description: standard deviation of DISSOLVED_OXYGEN measurements

Variable

Name: DISSOLVED_OXYGEN_WOCE_FLAG

Unit:

Description: woce quality control flag for DISSOLVED_OXYGEN (2=good, 3=questionable, 4=bad)

**Sea Surface
Temperature**

Location: 1m on mooring next to equilibrator

Manufacturer: Sea-Bird Electronics

Model: SBE 16plusV2

Accuracy: 0.005 (°C if units not given)

Precision: 0.001 (°C if units not given)

Calibration: 30/01/2010, factory calibrated before purchase

Comments:

Sea Surface Salinity

Location: 1m

Manufacturer: Sea-Bird Electronics

Model: SBE 16plusV2

Accuracy: 0.01

Precision: 0.003

Calibration: 30-Jan-10, factory calibrated before purchase

Comments:

**Atmospheric
Pressure**

Location: Sensor is connected to an air block on mooring at 1m above sea level that is vented at the time of measurement

Normalized to Sea Level: yes

Manufacturer: LICOR

Model: LICOR 820 internal sensor

Accuracy: 0.5 kPa (hPa if units not given)

Precision: 0.01 kPa (hPa if units not given)

Calibration: Date not recorded and based on laboratory comparison against Druck DPI 142 pressure indicator carried out pre and post deployment

Comments:

Atmospheric CO2

Measured/Frequency: Yes, 3 hourly

Intake Location: 1m above sea level

Drying Method: Silica Gel dried to 50-60% and relative humidity measurement used to correct for water vapour

Atmospheric CO2 Accuracy: 2 micromol/mol

Atmospheric CO2 Precision: 0.2 micromol/mol

**Aqueous CO2
Equilibrator Design**

System Manufacturer: Battelle

Intake Depth: 1

Intake Location: base of surface mooring buoy

Equilibration Type: headspace equilibrator as described in Sutton et al., 2014

Equilibrator Volume (L): 0.1

Headspace Gas Flow Rate (ml/min): 200

Equilibrator Water Flow Rate (L/min): see Sutton et al., 2014

Equilibrator Vented: Yes

Equilibration Comments:

Drying Method: partial using silica gel, typically 50-60% humidity and a relative humidity sensor is used to correct for water vapour

**Aqueous CO2
Sensor Details**

Measurement Method: IR

Method details: NDIR

Manufacturer: LI-COR

Model: 820

Measured CO2 Values: xCO2(dry)

Measurement Frequency: 2 hourly

Aqueous CO2 Accuracy: 2 micromol/mol

Aqueous CO2 Precision: 0.2 micromol/mol

Sensor Calibrations: Sensor deployment is checked each two hourly measurement cycle using a zero and span gas. The sensor was checked post deployment against a range of 4 CO2-in-air standards to ensure measurements are within 2 micromol/mol of reference standard values between zero and 450 micromol/mol

Calibration of Calibration Gases: Ship

Number Non-Zero Gas Standards: 1

Calibration Gases:

MANUFACTURER:NOAA Earth Systems Laboratory, USA

CYLINDER NUMBER: JA02189

GAS CYLINDER PRESSURE, PRE-DEPLOYMENT: Unknown psi

GAS CYLINDER PRESSURE, POST-DEPLOYMENT: Unknown psi

CO2-IN-AIR CONCENTRATION (WMO X2007): 574.47 PPM

CALIBRATION DATE: 2008-12-02

Zero gas reference is generated by circulating air through soda-lime at each measurement cycle.

Comparison to Other CO2 Analyses:

Comments:

Method Reference:

Sutton, A.J., C. L. Sabine, S. Maenner-Jones, N. Lawrence-Slavas, C. Meinig, R. A. Feely, J. T. Mathis, S. Musielewicz, R. Bott, P. D. McLain, H. J. Fought, and A. Kozyr (2014) A high-frequency atmospheric and seawater pCO2 data set from 14 open-ocean sites using a moored autonomous system. Earth System Science Data, 6, 353-366. doi:10.5194/essd-6-353-2014.

**Equilibrator
Temperature Sensor**

Location: Tequ is the same as the Sea Surface Temperature, and is located next to the equilibrator

Manufacturer: Sea Bird Electronics

Model: SBE 16plusV2

Accuracy: 0.005 (°C if units not given)

Precision: 0.001 (°C if units not given)

Calibration: 30/01/2010, factory calibrated before purchase

Comments:

**Equilibrator
Pressure Sensor**

Location: Airblock at about 1m above sea level is used to even the LI-COR pressure sensor

Manufacturer: LI-COR

Model: 820

Accuracy: 5 (hPa if units not given)

Precision: 0.1 (hPa if units not given)

Calibration: Based on laboratory comparison against Druck DPI 142 pressure indicator that were carried out pre and post deployment

Comments: Pequ is considered the same as Patm due to the venting of the LI-COR 820 pressure sensor through an air block at the time of each measurement

Other Sensor

Description: Dissolved oxygen

Manufacturer: Aanderaa

Model: 3835

Accuracy: 1 micromol/litre

Precision: 1 micromol/litre

Calibration: calibration date: 18-Oct-2010 and post-deployment: 14-Jun-2011

Comments: The optodes are calibrated at CSIRO, Hobart, using a purpose built calibration system, referenced to dissolved oxygen measurements made using modified Winkler titrations (Culberson, 1991). The calibrations cover a range of temperatures and oxygen concentrations that occur in the field and new calibration coefficients are generated to fit a Stern-Volmer equation (Uchida et al., 2008).

Additional Information

Suggested QC flag from Data Provider: NA

Additional Comments: The CO₂/acidification mooring at the Heron Island was funded through and Ocean Carbon and Acidification project of the Australian Climate Change Science Program awarded to BT. Users of these data are requested to cite the data source as below and to send copies of manuscripts to the PI prior to submission to ensure data are accurately represented.

Citation for this Dataset:

We rely on users of these data to recognise the effort required to obtain data by citing these data as:

B. Tilbrook, E. van Ooijen, C. Neill, A. Sutton and C. Sabine (2011) High frequency ocean and atmosphere fCO₂ timeseries measurements from Wistari Channel, Heron Island [insert dates], Australia. <http://imos.aodn.org.au/imos123/>.

Other References for this Dataset:

<http://imos.aodn.org.au/imos123/>