Dataset Expocode	**61TG20140203**
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Investigator	**Name:** Currie, Dr. Kim I **Organization:** NIWA **Address:** NIWA / UoO Research Centre for Oceanography PO Box 56, Dunedin, New Zealand **Phone:** 64-3-4795249 **Email:** kim.currie@niwa.co.nz
Dataset	**Funding Info:** NIWA Core Funding **Initial Submission (yyyymmdd):** 20160121 **Revised Submission (yyyymmdd):**
Campaign/Cruise	**Expocode:** 61TG20140203 **Campaign/Cruise Name:** TAN1402 **Campaign/Cruise Info:** **Platform Type:** **CO2 Instrument Type:** Equilibrator-IR or CRDS or GC **Survey Type:** Research ship, opportunistic sampling **Vessel Name:** RV Tangaroa **Vessel Owner:** NIWA **Vessel Code:** 61TG
Coverage	**Start Date (yyyymmdd):** 20140203 **End Date (yyyymmdd):** 20140305 **Westernmost Longitude:** 174.7 E **Easternmost Longitude:** 164.1 W **Northernmost Latitude:** 35.2 S **Southernmost Latitude:** 41.7 S **Port of Call:** Wellington **Port of Call:** Wellington
Variable	**Name:** Expocode **Unit:** none **Description:** Expocode where 61 is New Zealand, followed by two letter vessel code, then date voyage left port in format yyyymmdd (UTC)ruise
Variable	**Name:** Group_Ship **Unit:** none **Description:** NIWA- Vessel name
Variable	**Name:** Cruise ID **Unit:** none **Description:** NIWA cruise number, in format VVVyyNN where VVV is the vessel name, yy is the year, and NN is the numerical cruise ID
Variable	**Name:** YD_UTC **Unit:** day **Description:** Year Day (= Julian day, where 1 = January 1 UTC)
Variable	**Name:** DATE_UTC__ddmmyyyy **Unit:** ddmmyyyy

	Description: Date in UTC
Variable	**Name:** TIME_UTC_hh:mm:ss **Unit:** hh:mm:ss **Description:** Time in UTC
Variable	**Name:** LAT_dec_degree **Unit:** decimal degrees **Description:** Latitiude (positive = North, negative = South)
Variable	**Name:** LONG_dec_degree **Unit:** decimal degrees **Description:** Longtiude (positive = East, negative = West)
Variable	**Name:** xCO2_EQU_ppm **Unit:** ppm = micromol CO2 per mol air **Description:**
Variable	**Name:** xCO2_ATM_ppm **Unit:** ppm = micromol CO2 per mol dry air **Description:**
Variable	**Name:** xCO2_ATM_interpolated_ppm **Unit:** ppm = micromol CO2 per mol dry air **Description:** mole fraction of CO2 in the atmosphere (dry) with values linearly interpolated to the times shown
Variable	**Name:** PRES_EQU_hPa **Unit:** hectoPascal **Description:** equilibrator head space pressure
Variable	**Name:** PRES_ATM@SSP_hPa **Unit:** hectoPascal **Description:** barometric pressure from ship’s weather station
Variable	**Name:** TEMP_EQU_C **Unit:** degrees Celsius **Description:** Equilibrator water temperature
Variable	**Name:** SST_C **Unit:** degrees Celsius **Description:** Sea surface temperature from SBE38
Variable	**Name:** SAL_permil **Unit:** **Description:** Sea-surface-salinity from SBE21
Variable	**Name:** fCO2_SW@SST_uatm **Unit:** microatmosphere **Description:** fugacity of CO2 in surface seatwater at the in situ temperature
Variable	**Name:** fCO2_ATM_interpolated_uatm **Unit:** microatmosphere **Description:** fugacity of CO2 in the atmosphere, with values linearly interpolated to the times shown
Variable	**Name:** dfCO2_uatm **Unit:** microatmospheres **Description:** Difference between fCO2SW and fCO2ATM
Variable	**Name:** WOCE_QC_FLAG

	Unit: no unit **Description:** WOCE quality control flag: 2 = Good 3 = Questionable 4 = Bad (data identified as bad are not reported).
Variable	**Name:** WOCE_QC_SUBFLAG **Unit:** no unit **Description:** text describing reason for questionable WOCE FLAG
Sea Surface Temperature	**Location:** bow intake, 5.5m depth **Manufacturer:** SeaBird Electronics **Model:** SBE38 **Accuracy:** 0.001 (°C if units not given) **Precision:** 0.001 (°C if units not given) **Calibration:** Returned to Seabird for calibration every 2 years **Comments:** IPTS-68 scale
Sea Surface Salinity	**Location:** located in ship-board lab next to pCO2 system (approx 0 metres depth) **Manufacturer:** SeaBird Electronics **Model:** SBE21 **Accuracy:** 0.05 permille (estimate) **Precision:** 0.05 permille (estimate) **Calibration:** Returned to Seabird for calibration every 2 years **Comments:**
Atmospheric Pressure	**Location:** 12.5m **Normalized to Sea Level:** yes **Manufacturer:** Vaisala DPA21 **Model:** DPA21 **Accuracy:** 0.3hPa (hPa if units not given) **Precision:** 0.3hPa (hPa if units not given) **Calibration:** checked annually by New Zealand Met Service **Comments:**
Atmospheric CO2	**Measured/Frequency:** yes, every 130 minutes (2 hours 15 mins, approximately) **Intake Location:** 12.5 metres, away from exhausts at rear of monkey island **Drying Method:** **Atmospheric CO2 Accuracy:** XCO2: 1 uatm **Atmospheric CO2 Precision:** XCO2: 1 uatm
Aqueous CO2 Equilibrator Design	**System Manufacturer:** **Intake Depth:** 5.5m **Intake Location:** bow intake **Equilibration Type:** General Oceanics equilibrator, with water jacket **Equilibrator Volume (L):** bow intake, 5.5m depth **Headspace Gas Flow Rate (ml/min):** 100 (approx) **Equilibrator Water Flow Rate (L/min):** 2.5 (approx) **Equilibrator Vented:** Yes **Equilibration Comments:** **Drying Method:** Permapure Nafion Dryer, > 90 %
Aqueous CO2 Sensor Details	**Measurement Method:** IR **Method details:** infra red gas analysis **Manufacturer:** LI-COR **Model:** LI-7000 **Measured CO2 Values:** xCO2(dry) **Measurement Frequency:** Every 58 sec, except during calibration routines

Aqueous CO2 Accuracy: fCO2: 2 uatm
Aqueous CO2 Precision: fCO2: 2 uatm
Sensor Calibrations: Calibrations of CO2 sensor using four standards approx every 2.25 hours. Standards calibrated on WMO-X2007 mole fraction scale for CO2-in-air at NIWA Wellington. Standard XCO2 values: 0.00, 334.15, 394.59, 416.31 ppm. Uncertainty 0.05ppm
Calibration of Calibration Gases: CO2-in-air prepared and calibrated at NIWA, Wellington, against the WMO-X2007 mole fraction scale
Number Non-Zero Gas Standards: 3
Calibration Gases:
0.00ppm, provided by BOC New Zealand, Zero gas run every 2.25 hours
334.15 ppm, prepared and calibrated by NIWA, Wellington, run every 2.25 hours
394.59 ppm, prepared and calibrated by NIWA, Wellington, run every 2.25 hours
416.31 ppm, prepared and calibrated by NIWA, Wellington, run every 2.25 hours
Comparison to Other CO2 Analyses:
Comments:
Method Reference:
Dickson, A.G., C. Sabine and J. R. Christian (2007) Guide to best practices for Ocean CO2 measurements. PICES Special Publ. 3, 191 pp.
Pierrot, D., C. Neill, K. Sullivan, R. Castle, R. Wanninkhof, H. Lüger, T. Johannessen, A. Olsen, R. A. Feely, C. E. Cosca (2009) Recommendations for Autonomous Underway pCO2 Measuring Systems and Data Reduction Routines, Deep-Sea Research II, doi:10.1016/j.dsr2.2008.12.005

Equilibrator Temperature Sensor

Location: equilibrator temperature measured by Hart probe placed in equilibrator
Manufacturer: Fluke (Hart Scientific)
Model: 1523 (s/n 2120040) paired with probe 5610-9-P (s/n B272601)
Accuracy: 0.009 (°C if units not given)
Precision: 0.005 (°C if units not given)
Calibration: Factory calibrated 2012
Comments:

Equilibrator Pressure Sensor

Location: directly above the equilibrator
Manufacturer: Setra dfferential pressure transducer,
Model: Setra model 239
Accuracy: 0.05 (hPa if units not given)
Precision: 0.05 (hPa if units not given)
Calibration: use initial calibration, not checked
Comments:

Additional Information

Suggested QC flag from Data Provider: NB
Additional Comments: Institutional Reference: https://www.niwa.co.nz/atmosphere/programme-overview/oceanic-control-of-atmospheric-composition Instrumentation: Andrew Marriner (NIWA), John McGregor (NIWA) Data Quality Control: Andrew Marriner (NIWA), Murray Smith (NIWA) Thanks to Fiona Elliot and Mark Gall for the maintenance of the underway system.
Citation for this Dataset:
Please follow the SOCAT data use policy
Other References for this Dataset: