

Dataset Expocode 61TG20141125

Primary Contact **Name:** Kim Currie
Organization: NIWA
Address: PO Box 56, Dunedin, New Zealand
Phone: 64-3-4795249
Email: kim.currie@niwa.co.nz

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:** 61TG20141125
Campaign/Cruise Name: TAN1412
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):** 20141126
End Date (yyyymmdd): 20141223
Westernmost Longitude: 166.1 E
Easternmost Longitude: 175.0 E
Northernmost Latitude: 41.7 S
Southernmost Latitude: 53.6 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: Latitude (positive = North, negative = South)

Variable **Name:** LONG_dec_degree

Unit: decimal degrees

Description: Longitude (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 seawater 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: ITS-90 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 differential 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: