

Dataset Expocode 61TG20140521

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Dataset **Funding Info:** NIWA Core Funding
Initial Submission (yyyymmdd): 20160113
Revised Submission (yyyymmdd):

Campaign/Cruise **Expocode:** 61TG20140521
Campaign/Cruise Name: TAN1406
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):** 20140521
End Date (yyyymmdd): 20140601
Westernmost Longitude: 167.1 E
Easternmost Longitude: 170.7 E
Northernmost Latitude: 41.8 S
Southernmost Latitude: 44.1 S
Port of Call: Wellington
Port of Call: Gisborne

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: located in ship-board lab next to pCO₂ system (approx 0 metres depth)
Manufacturer: SeaBird Electronics
Model: SBE21
Accuracy: 0.1 (°C if units not given)
Precision: 0.01 (°C if units not given)
Calibration: Returned to Seabird for calibration every 2 years
Comments: IPTS-68 scale, warming en route from hull intake to SEB21 not accounted for, therefore SST accuracy decreased to 0.1oC and fCO₂ accuracy decreased to 3uatm

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: 3 uatm
Aqueous CO2 Precision: fCO2: 3 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 (Estimate) (hPa if units not given)
Precision: 0.05 hPa (Estimate) (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: