

Dataset Expocode 33RO20150822

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Dataset **Funding Info:** NOAA Climate Program Office
Initial Submission (yyyymmdd): 20160121
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Campaign/Cruise **Expocode:** 33RO20150822
Campaign/Cruise Name: RB-15-06
Campaign/Cruise Info: Bioeffects, AOML_SOOP_CO2
Platform Type:
CO2 Instrument Type: Equilibrator-IR or CRDS or GC
Survey Type: Research Cruise
Vessel Name: R/V Ronald H. Brown
Vessel Owner: NOAA
Vessel Code: 33RO

Coverage **Start Date (yyyymmdd):** 20150822
End Date (yyyymmdd): 20150904
Westernmost Longitude: 169 W
Easternmost Longitude: 153.3 W
Northernmost Latitude: 72.1 N
Southernmost Latitude: 53.9 N
Port of Call: Dutch Harbor, AK

Variable **Name:** xCO2_EQU_ppm
Unit:
Description: Mole fraction of CO2 in the equilibrator headspace (dry) at equilibrator temperature (ppm)

Variable **Name:** xCO2_ATM_ppm
Unit:
Description: Mole fraction of CO2 measured in dry outside air (ppm)

Variable **Name:** xCO2_ATM_interpolated_ppm
Unit:
Description: Mole fraction of CO2 in outside air associated with each water analysis. These values are interpolated between the bracketing averaged good xCO2_ATM analyses (ppm)

Variable **Name:** PRES_EQU_hPa

Unit:
Description: Barometric pressure in the equilibrator headspace (hPa)

Variable **Name:** PRES_ATM@SSP_hPa

Unit:
Description: Barometric pressure measured outside, corrected to sea level (hPa)

Variable **Name:** TEMP_EQU_C

Unit:
Description: Water temperature in equilibrator (°C)

Variable **Name:** SST_C

Unit:
Description: Sea surface temperature (°C)

Variable **Name:** SAL_permil

Unit:
Description: Sea surface salinity on Practical Salinity Scale (o/oo)

Variable **Name:** fCO2_SW@SST_uatm

Unit:
Description: Fugacity of CO2 in sea water at SST and 100% humidity (µatm)

Variable **Name:** fCO2_ATM_interpolated_uatm

Unit:
Description: Fugacity of CO2 in air corresponding to the interpolated xCO2 at SST and 100% humidity (µatm)

Variable **Name:** dfCO2_uatm

Unit:
Description: Sea water fCO2 minus interpolated air fCO2 (µatm)

Variable **Name:** WOCE_QC_FLAG

Unit:
Description: Quality control flag for fCO2 values (2=good, 3=questionable)

Variable **Name:** QC_SUBFLAG

Unit:
Description: Quality control subflag for fCO2 values, provides explanation when QC flag=3

Sea Surface Temperature **Location:** Bow thruster room, before sea water pump, ~5 m below water line.
Manufacturer: Seabird
Model: SBE-21
Accuracy: 0.01 (°C if units not given)
Precision: 0.001 (°C if units not given)
Calibration: Factory calibration
Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Sea Surface Salinity **Location:** Attached to underway system at sea water input.
Manufacturer: Seabird
Model: SBE 45
Accuracy: ± 0.005 o/oo
Precision: 0.0002 o/oo
Calibration: Factory calibration
Comments: Manufacturer's Resolution is taken as Precision

Atmospheric Pressure **Location:** On bulkhead exterior on the port side of the radio room aft of the bridge at ~14 m above the sea surface.

Normalized to Sea Level: yes

Manufacturer: Vaisala

Model: PTB330

Accuracy: ± 0.2 hPa (hPa if units not given)

Precision: ± 0.08 hPa (hPa if units not given)

Calibration: Factory calibration

Comments: Manufacturer's resolution is taken as precision. Maintained by ship.

Atmospheric CO2

Measured/Frequency: Yes, 5 readings in a group every 3.5 hours

Intake Location: Bow tower ~10 m above the sea surface.

Drying Method: Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).

Atmospheric CO2 Accuracy: ± 0.5 μ atm in fCO2_ATM

Atmospheric CO2 Precision: ± 0.01 μ atm in fCO2_ATM

Aqueous CO2 Equilibrator Design

System Manufacturer:

Intake Depth: 5 meters

Intake Location: Bow

Equilibration Type: Spray head above dynamic pool, with thermal jacket

Equilibrator Volume (L): 0.95 L (0.4 L water, 0.55 L headspace)

Headspace Gas Flow Rate (ml/min): 70 - 150 ml/min

Equilibrator Water Flow Rate (L/min): 1.5 - 2.0 L/min

Equilibrator Vented: Yes

Equilibration Comments: Primary equilibrator is vented through a secondary equilibrator.

Drying Method: Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).

Aqueous CO2 Sensor Details

Measurement Method: IR

Method details: details of CO2 sensing (not required)

Manufacturer: LI-COR

Model: 6262

Measured CO2 Values: xco2(dry)

Measurement Frequency: Every 140 seconds, except during calibration

Aqueous CO2 Accuracy: ± 2 μ atm in fCO2_SW

Aqueous CO2 Precision: ± 0.01 μ atm in fCO2_SW

Sensor Calibrations:

Calibration of Calibration Gases: The analyzer is calibrated every ~3.5 hours using field standards that were calibrated with primary standards that are directly traceable to the WMO scale. Ultra-High Purity air (0.0 ppm CO2) and the high standard are used to zero and span the LI-COR analyzer.

Number Non-Zero Gas Standards: 4

Calibration Gases:

Std 1: CA04957, 282.55 ppm, owned by ESRL, used every ~3.5 hours.

Std 2: CC105863, 380.22 ppm, owned by ESRL, used every ~3.5 hours.

Std 3: CB09696, 453.04 ppm, owned by ESRL, used every ~3.5 hours.

Std 4: CB09032, 539.38 ppm, owned by ESRL, used every ~3.5 hours.

Std 5: 0.00 ppm, owned by AOML, used every ~20.0 hours.

Comparison to Other CO2 Analyses:

Comments:

Method Reference:

Pierrot, D., C. Neil, K. Sullivan, R. Castle, R. Wanninkhof, H. Lueger, T. Johannessen, A. Olsen, R. A. Feely, and C. E. Cosca (2009), Recommendations for autonomous underway pCO₂ measuring systems and data reduction routines, Deep-Sea Res II, 56, 512-522.

Equilibrator

Location: Inserted into equilibrator ~5 cm below water level

Temperature Sensor

Manufacturer: Hart

Model: 1521

Accuracy: 0.025 (°C if units not given)

Precision: 0.01 (°C if units not given)

Calibration: Factory calibration

Comments: Resolution is taken as Precision.

Equilibrator

Location: Attached to equilibrator headspace. Differential pressure reading from Setra 239 attached to the equilibrator headspace is added to the pressure reading from the LICOR, which is measured by an external Setra 270 connected to the exit of the analyzer.

Pressure Sensor

Manufacturer: Setra

Model: 270

Accuracy: 0.15 (hPa if units not given)

Precision: 0.015 (hPa if units not given)

Calibration: Factory calibration

Comments: Manufacturer's Resolution is taken as Precision.

**Additional
Information**

Suggested QC flag from Data Provider: NA

Additional Comments: The analytical system performed well during this cruise. The GPS position was not recorded for ~3.5 hours starting at 23:48 on 26 August. For this interval, the positions were interpolated between the surrounding good values by assuming a constant velocity. Original Data Location: http://www.aoml.noaa.gov/ocd/ocdweb/brown/brown_introduction.html

Citation for this Dataset:

Other References for this Dataset: