Dataset Expocode	**33RO20150714**
Primary Contact	**Name:** Sullivan, Kevin **Organization:** NOAA/AOML CIMAS **Address:** 4301 Rickenbacker Causeway, Miami, Fl 33149 **Phone:** (305) 361-4382 **Email:** kevin.sullivan@noaa.gov
Investigator	**Name:** Wanninkhof, Rik **Organization:** NOAA/Atlantic Oceanographic & Meteorological Laboratory **Address:** 4301 Rickenbacker Causeway, Miami Fl, 33149 **Phone:** 305-361-4379 **Email:** Rik.Wanninkhof@noaa.gov
Investigator	**Name:** Pierrot, Denis **Organization:** NOAA/Atlantic Oceanographic & Meteorological Laboratory **Address:** 4301 Rickenbacker Causeway, Miami Fl, 33149 **Phone:** 305-361-4441 **Email:** Denis.Pierrot@noaa.gov
Dataset	**Funding Info:** NOAA Climate Program Office **Initial Submission (yyyymmdd):** 20160121 **Revised Submission (yyyymmdd):** 20160121
Campaign/Cruise	**Expocode:** 33RO20150714 **Campaign/Cruise Name:** RB-15-04 **Campaign/Cruise Info:** Ocean Acidification, 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):** 20150714 **End Date (yyyymmdd):** 20150731 **Westernmost Longitude:** 156.6 W **Easternmost Longitude:** 122.6 W **Northernmost Latitude:** 60.5 N **Southernmost Latitude:** 48.1 N **Port of Call:** Seattle, WA **Port of Call:** Kodiak, 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 µatm in fCO2_ATM **Atmospheric CO2 Precision:** ± 0.01 µatm 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 µatm in fCO2_SW **Aqueous CO2 Precision:** ± 0.01 µatm 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 Temperature Sensor	**Location:** Inserted into equilibrator ~5 cm below water level **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 Pressure Sensor	**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. **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:** During the first two days of this cruise, the response of the LICOR analyzer was more variable than normal. The increased uncertainty in the calculated fugacities was estimated by comparing the standard deviations of the standard calibration curves during the first two days and during later optimal behavior. A generous estimate of the uncertainty in the fugacities prior to 20:25 on 17 July, 2015, is 5 uatm. The SBE45 salinities were not recorded several times during the cruise. For these intervals, the SBE45 salinities were estimated relative to the SBE21 salinities, if those values were available. Original Data Location: http://www.aoml.noaa.gov/ocd/ocdweb/brown/brown_introduction.html **Citation for this Dataset:** **Other References for this Dataset:**