Dataset Expocode	**33WA20190128**
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Dataset	**Funding Info:** NOAA Climate Program Office; NOAA Ocean Acidification Program **Initial Submission (yyyymmdd):** 20200505 **Revised Submission (yyyymmdd):** 20200505
Campaign/Cruise	**Expocode:** 33WA20190128 **Campaign/Cruise Name:** WS19028 **Campaign/Cruise Info:** SOOP_CO2, SFER **Platform Type:** **CO2 Instrument Type:** Equilibrator-IR or CRDS or GC **Survey Type:** Research Cruise **Vessel Name:** R/V F.G. Walton Smith **Vessel Owner:** University of Miami **Vessel Code:** 33WA
Coverage	**Start Date (yyyymmdd):** 20190128 **End Date (yyyymmdd):** 20190201 **Westernmost Longitude:** 82.9 W **Easternmost Longitude:** 80 W **Northernmost Latitude:** 27.2 N **Southernmost Latitude:** 24.3 N **Port of Call:** Miami, FL, USA
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:** After sea water pump in the forward, port hull **Manufacturer:** Seabird, Inc. **Model:** SBE 38 **Accuracy:** 0.001 (°C if units not given) **Precision:** 0.0003 (°C if units not given)

	Calibration: Factory calibration **Comments:** Manufacturer's Resolution is taken as Precision; Maintained by ship.
Sea Surface Salinity	**Location:** Near the sea water pump in the forward, port hull. **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 mast above bridge at ~13 m above sea surface. **Normalized to Sea Level:** yes **Manufacturer:** R.M. Young **Model:** 61302 **Accuracy:** ± 0.3 hPa (hPa if units not given) **Precision:** 0.1 hPa (hPa if units not given) **Calibration:** Factory calibration **Comments:** Manufacturer's Resolution is taken as Precision.
Atmospheric CO2	**Measured/Frequency:** Yes, 5 readings in a group every 4.5 hours **Intake Location:** On mast above the bridge at ~13 meters 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:** 1.5 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 ~4.5 hours using field standards that were calibrated with primary standards at AOML 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: FF4297, 213.54 ppm, owned by RSMAS, used every ~4.5 hours.
Std 2: FF42246, 382.17 ppm, owned by RSMAS, used every ~4.5 hours.
Std 3: FF8858, 611.01 ppm, owned by RSMAS, used every ~4.5 hours.
Std 4: FF3582, 1530.42 ppm, owned by RSMAS, used every ~4.5 hours.
Std 5: LL100000, 0.00 ppm, owned by AOML, used every ~23.0 hours.
Comparison to Other CO2 Analyses:
Comments: Instrument is located in an air-conditioned laboratory.
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: 1523
Accuracy: 0.015 (°C if units not given)
Precision: 0.001 (°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: The analytical system operated fine during the cruise, though the equilibrator temperature was not recorded for 2.6 days in the middle of the cruise. The ship's sensors were not recorded for the last hour of the cruise and for a shorter interval on the second day. Missing Equilibrator temperature values were estimated by adding 0.39 degrees to the SST values. Missing SST values were estimated by subtracting 0.39 degrees from the Equilibrator temperature. For the ~1.5 days with both measurements, the average difference between the SST and Equilibrator temperature is 0.39 (+/- 0.12) degree Celsius. Missing barometric pressure values were estimated by adding 0.07 mbar to the LICOR pressure. For ~4 days with both measurements, the average difference between the barometric and LICOR pressures is 0.07 (+/- 0.09) mbar. Missing salinity values were estimated from adjacent measured values. Original Data Location: http://www.aoml.noaa.gov/ocd/ocdweb/wsmith/wsmith_introduction.html . Full unprocessed data files from analytical instrument including flow information plus meteorological and TSG data at time of sampling can be obtained upon request.
Citation for this Dataset:
Other References for this Dataset: