

Dataset Expocode 33WA20170619

Primary Contact **Name:** Ryan Woosley
Organization: RSMAS/University of Miami
Address: 4600 Rickenbacker Causeway, Miami FL, 33149
Phone: 305-421-4708
Email: RWoosley@rsmas.miami.edu

Investigator **Name:** Frank Millero
Organization: RSMAS/University of Miami
Address: 4600 Rickenbacker Causeway, Miami FL, 33149
Phone: 305-421-4707
Email: FMillero@rsmas.miami.edu

Investigator **Name:** Rik Wanninkhof
Organization: NOAA/Atlantic Oceanographic & Meteorological Laboratory
Address: 4301 Rickenbacker Causeway, Miami FL, 33149
Phone: 305-361-4379
Email: Rik.Wanninkhof@noaa.gov

Dataset **Funding Info:** NOAA Climate Program Office; NOAA Ocean Acidification Program
Initial Submission (yyyymmdd): 20180515
Revised Submission (yyyymmdd): 20180515

Campaign/Cruise **Expocode:** 33WA20170619
Campaign/Cruise Name: WS17170
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):** 20170619
End Date (yyyymmdd): 20170623
Westernmost Longitude: 82.3 W
Easternmost Longitude: 80 W
Northernmost Latitude: 26.0 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 **Location:** After sea water pump in the forward, port hull

Temperature **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 **Location:** On mast above bridge at ~13 m above sea surface.

Pressure **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 μ atm in fCO2_ATM
Atmospheric CO2 Precision: ± 0.01 μ atm 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 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 ~4.5 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: 201.11 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: FF55054, 668.13 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: 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

Location: Inserted into equilibrator ~5 cm below water level

Temperature Sensor

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

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: No ship data from YrDay 174.7586-174.9423. For data without SBE-38, 0.279 (+/-0.033) was subtracted from EQU-T; for data without Barom-press, 1.43 (+/- 0.12) was added to Licor-P; for data without SSS, 36 was used, data flagged 3. 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: