

Dataset Expocode	33WA20160713
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): 20161013 Revised Submission (yyyymmdd): 20161013
Campaign/Cruise	Expocode: 33WA20160713 Campaign/Cruise Name: WS16195 Campaign/Cruise Info: SOOP_CO2, 27N 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): 20160713 End Date (yyyymmdd): 20160714 Westernmost Longitude: 80.2 W Easternmost Longitude: 79.1 W Northernmost Latitude: 27.1 N Southernmost Latitude: 25.7 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 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, 607.85 ppm, owned by RSMAS, used every ~4.5 hours.
Std 4: 1537.18 ppm, owned by RSMAS, used every ~4.5 hours.
Std 5: 0.00 ppm, owned by AOML, used every ~NaN 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

Pressure Sensor

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

Suggested QC flag from Data Provider: NA

Information

Additional Comments: System performed well. Adjustment made to flowing system increased water flow to system. No Ship data from Yrday 196.985 - 197.009, values estimated and flagged 3. Original Data Location: http://www.aoml.noaa.gov/ocd/ocdweb/wsmith/wsmith_introduction.html

Citation for this Dataset:

Other References for this Dataset: