

Dataset Expocode	33HH20220804
Primary Contact	Name: Sullivan, Kevin Organization: NOAA/Atlantic Oceanographic & Meteorological Laboratory Address: 4301 Rickenbacker Causeway 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/AOML CIMAS Address: 4301 Rickenbacker Causeway, Miami, FL 33149 Phone: (305) 361-4441 Email: Denis.Pierrot@noaa.gov
Dataset	Funding Info: NOAA Climate Program Office; NOAA Ocean Acidification Program Initial Submission (yyyymmdd): 20220831 Revised Submission (yyyymmdd): 20220831
Campaign/Cruise	Expocode: 33HH20220804 Campaign/Cruise Name: HB2205, Mesopelagic Ecosystem Campaign/Cruise Info: AOML_SOOP_OA Platform Type: CO2 Instrument Type: Equilibrator-IR or CRDS or GC Survey Type: Research Cruise Vessel Name: R/V Henry B. Bigelow Vessel Owner: NOAA Vessel Code: 33HH
Coverage	Start Date (yyyymmdd): 20220804 End Date (yyyymmdd): 20220816 Westernmost Longitude: 71.5 W Easternmost Longitude: 70 W Northernmost Latitude: 41.5 N Southernmost Latitude: 38.8 N Port of Call: Newport, RI
Variable	Name: xCO2_EQU_ppm Unit: ppm Description: Mole fraction of CO2 in the equilibrator headspace (dry) at equilibrator temperature (ppm)
Variable	Name: xCO2_ATM_ppm Unit: ppm Description: Mole fraction of CO2 measured in dry outside air (ppm)
Variable	Name: xCO2_ATM_interpolated_ppm Unit: ppm 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: hPa
Description: Barometric pressure in the equilibrator headspace (hPa)

Variable **Name:** PRES_ATM@SSP_hPa
Unit: hPa
Description: Barometric pressure measured outside, corrected to sea level (hPa)

Variable **Name:** TEMP_EQU_C
Unit: Degree C
Description: Water temperature in equilibrator (°C)

Variable **Name:** SST_C
Unit: Degree C
Description: Sea surface temperature (°C)

Variable **Name:** SAL_permil
Unit: ppt
Description: Sea surface salinity on Practical Salinity Scale (o/oo)

Variable **Name:** fCO2_SW@SST_uatm
Unit: µatm
Description: Fugacity of CO2 in sea water at SST and 100% humidity (µatm)

Variable **Name:** fCO2_ATM_interpolated_uatm
Unit: µatm
Description: Fugacity of CO2 in air corresponding to the interpolated xCO2 at SST and 100% humidity (µatm)

Variable **Name:** dfCO2_uatm
Unit: µatm
Description: Sea water fCO2 minus interpolated air fCO2 (µatm)

Variable **Name:** WOCE_QC_FLAG
Unit: None
Description: Quality control flag for fCO2 values (2=good, 3=questionable)

Variable **Name:** QC_SUBFLAG
Unit: None
Description: Quality control subflag for fCO2 values, provides explanation when QC flag=3

Sea Surface Temperature **Location:** Through starboard hull at 3 meters depth
Manufacturer: AirMar
Model: B17-S-Temp
Accuracy: 0.17 (°C if units not given)
Precision: 0.01 (°C if units not given)
Calibration: Factory calibration
Comments: Manufacturer's Resolution is taken as Precision; 'MidSea' Sensor, maintained by the ship.

Sea Surface Salinity **Location:** In dry lab after a debubbler, next to CO2 system
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; Maintained by the ship.

Atmospheric Pressure	Location: On mast above the bridge at ~18 m above sea surface water Normalized to Sea Level: yes Manufacturer: Vaisala Model: PTB220 Accuracy: ± 0.15 hPa (hPa if units not given) Precision: 0.01 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: Mast above the bridge, ~18 meters above 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: 3 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 with field standards that in turn were calibrated with primary standards that are directly traceable to the WMO X2019 scale. The zero gas is ultra-high purity air. Number Non-Zero Gas Standards: 4 Calibration Gases: Std 1: JA02280, 233.51 ppm, owned by AOML, used every ~4.5 hours. Std 2: JA02264, 326.30 ppm, owned by AOML, used every ~4.5 hours. Std 3: JB03592, 422.43 ppm, owned by AOML, used every ~4.5 hours. Std 4: JA02647, 561.46 ppm, owned by AOML, used every ~4.5 hours. Std 5: LL100000, 0.00 ppm, owned by AOML, used every ~23.5 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: 1523

Accuracy: 0.015 (°C if units not given)

Precision: 0.0003 (°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 this cruise. The ship suspended operations in two intervals totaling 72 hours. The SBE38 SST sensor was replaced at the start of this field season, and for an undetermined reason, the measured SST values were not reliable. The data from one of the ship's through hull sensors (MidSea at 3 meters) was used for SST values. A bracketing 1-minute average of this sensor showed smooth, reliable behavior and was used for processing. Original Data Location: http://www.aoml.noaa.gov/ocd/ocdweb/bigelow/bigelow_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: