Dataset Expocode	**33GG20210612**
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Dataset	**Funding Info:** NOAA Climate Program Office; NOAA Ocean Acidification Program **Initial Submission (yyyymmdd):** 20210913 **Revised Submission (yyyymmdd):** 20210913
Campaign/Cruise	**Expocode:** 33GG20210612 **Campaign/Cruise Name:** GU2103-Leg1, AMAPPS **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 Gordon Gunter **Vessel Owner:** NOAA **Vessel Code:** 33GG
Coverage	**Start Date (yyyymmdd):** 20210612 **End Date (yyyymmdd):** 20210703 **Westernmost Longitude:** 79.6 W **Easternmost Longitude:** 71.4 W **Northernmost Latitude:** 41.4 N **Southernmost Latitude:** 32.6 N **Port of Call:** Newport, RI **Port of Call:** Charleston, SC
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:** In engine room, about 2 m after the seachest, before the SW pumps. **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:** In Chem lab, 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 ship.

Atmospheric Pressure

Location: Next to the bridge, ~15 m above the sea surface water
Normalized to Sea Level: yes
Manufacturer: RMYoung
Model: 61201
Accuracy: ± 0.5 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 hours
Intake Location: Bow mast, ~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 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, no 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 hours with field standards that in turn were calibrated with primary standards that are directly traceable to the WMO X2007 scale. The zero gas is ultra-high purity air.
Number Non-Zero Gas Standards: 3
Calibration Gases:

Std 1: LL100000, 0.00 ppm, owned by AOML, used every ~4.5 hours.
Std 2: JA02140, 234.21 ppm, owned by AOML, used every ~4.5 hours.
Std 3: JA02689, 406.90 ppm, owned by AOML, used every ~4.5 hours.
Std 4: JB03276, 471.65 ppm, owned by AOML, used every ~4.5 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: 1521
Accuracy: 0.025 (°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.
Manufacturer: Setra
Model: 270
Accuracy: 0.05 (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 well for the first 2 days of this cruise until a fuse blew. The fuse issue was resolved so that data was collected for the last 1.3 days of the cruise; unfortunately, the equilibrator pressure transducer did not work. The equilibrator pressure was estimated by adding 0.638 mbar to the LICOR pressure. For the first 2 days of this cruise, the difference between the equilibrator and LICOR pressures was 0.638 (+/- 0.301) mbar. This value was consistent with the offset determined for the entire preceeding cruise, 0.648 (+/- 0.481) mbar. The uncertainity in estimating the equilibrator pressure from the LICOR pressure was determined for two prior cruises. The impact of this uncertainity increases the uncertainity of the calculated fCO2_SW@SST to greater than 2 uatm, but not greater than 5 uatm for the last 1.3 days of data. Original Data Location: http://www.aoml.noaa.gov/ocd/ocdweb/gunter/gunter_introduction.html . Full unprocessed data files from analytical instrument including flow information and ship's meteorological and TSG data at time of sampling can be obtained upon request.
Citation for this Dataset:
Other References for this Dataset: