

Dataset Expocode 33GG20120911

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Dataset **Funding Info:** NOAA Climate Program Office; NOAA Ocean Acidification Program
Initial Submission (yyyymmdd): 20160329
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Campaign/Cruise **Expocode:** 33GG20120911
Campaign/Cruise Name: GU1203_Leg2
Campaign/Cruise Info: AOML_SOOP_CO2
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):** 20120913
End Date (yyyymmdd): 20120928
Westernmost Longitude: 88.6 W
Easternmost Longitude: 81.6 W
Northernmost Latitude: 30.3 N
Southernmost Latitude: 23.9 N
Port of Call: Pascagoula, MS

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:** hull mounted, ~3 m below sea surface
Manufacturer: Furuno
Model: T2000
Accuracy: 0.2 (°C if units not given)
Precision: 0.1 (°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 21
Accuracy: ± 0.05 o/oo
Precision: 0.002 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 μ atm in fCO2_ATM
Atmospheric CO2 Precision: ± 0.01 μ atm 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: 7000
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 hours with field standards that in turn were calibrated with primary standards that are directly traceable to the WMO scale. The zero gas is ultra-high purity air.
Number Non-Zero Gas Standards: 2
Calibration Gases:

Std 1: LL100000, 0.00 ppm, owned by AOML, used every ~3.0 hours.
Std 2: JA02267, 247.72 ppm, owned by AOML, used every ~3.0 hours.
Std 4: JA02689, 520.79 ppm, owned by AOML, used every ~3.0 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. Combined with Licor Pressure Manufacturer: Licor Model: None Accuracy: 1.2 (hPa if units not given) Precision: 0.02 (hPa if units not given) Calibration: Factory calibration Comments: Differential pressure reading from Setra-239 attached to the equilibrator headspace was added to the pressure reading from the LICOR analyzer to yield equilibrator pressure. Manufacturer's Resolution is taken as Precision.
Additional Information	Suggested QC flag from Data Provider: NA Additional Comments: For xml:The LICOR water channel was negative so that STDs are ~0.2 ppt and recalculated the CO2 values. There were some issues with the standards:STD3 (~400ppm) ran out so only 2 non-zero standards were available. Some jumps were observed in LICOR response which showed in the standard measurements as well. A few standards were flagged 4. SST issues: Because the SST sensor is the Furuno T-2000, the resolution of which is 0.1 °C, all data have been flagged 3 - questionable SST. A few equilibrator temp and SST values were interpolated and flagged 3 but the interpolated values should be quite good. Original Data Location: http://www.aoml.noaa.gov/ocd/ocdweb/gunter/gunter_introduction.html Citation for this Dataset: Other References for this Dataset: