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Dataset Information:

Funding_Info: NOAA Climate Program Office; NOAA Ocean Acidification Program
Initial_Submission: 2013mmdd
Revised_Submission: 2013mmdd

Cruise Information:

Experiment Name: GU1201_Leg3
Experiment Type: Research Cruise
Platform Type: Ship
Co2 Instrument Type: Equilibrator-IR or CRDS or GC

Cruise ID: 33GG20120429
Cruise Info: AOML_SOOP_CO2
Geographical Region:
- Westernmost Longitude: -89.6
- Easternmost Longitude: -82.2
- Northernmost Latitude: 30.3
- Southernmost Latitude: 23.9

Cruise Dates (YYYYMMDD)
- Start_Date: 20120429
- End_Date: 20120511

Ports of Call:
- Pascagoula, MS
- Key West, FL

Vessel Name: R/V Gordon Gunter
Vessel ID: 33GG

Vessel Owner: NOAA

Variables Information:

Variable Name: xCO2_EQU_ppm
Description of Variable: Mole fraction of CO2 in the equilibrator headspace (dry) at equilibrator temperature (ppm)
Unit of Variable: ppm

Variable Name: xCO2_ATM_ppm
Description of Variable: Mole fraction of CO2 measured in dry outside air (ppm)
Unit of Variable: ppm

Variable Name: xCO2_ATM_interpolated_ppm
Description of Variable: 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)
Unit of Variable: ppm

Variable Name: PRES_EQU_hPa
Description of Variable: Barometric pressure in the equilibrator headspace (hPa)
Unit of Variable: hPa

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

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

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

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

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

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

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

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

Variable Name: QC_SUBFLAG

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

Method Description:

Equilibrator Design:

Depth of Seawater Intake: 5 meters
Location of Seawater Intake: Bow
Equilibrator Type: Spray head above dynamic pool, no thermal jacket
Equilibrator Volume: 0.95 L (0.4 L water, 0.55 L headspace)
Water Flow Rate: 1.5 - 2.0 L/min
Headspace Gas Flow Rate: 70 - 150 ml/min
Vented: Yes
Drying Method for CO2 in Water:
Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).
Additional Information: Primary equilibrator is vented through a secondary equilibrator.

CO2 in Marine Air:

Measurement: Yes, 5 readings in a group every 3 hours
Location and Height: 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).

CO2 Sensor:
Measurement Method: IR
Manufacturer: LI-COR
Model: 7000
Frequency: Every 140 seconds, except during calibration
Resolution Water: ± 0.01 µatm in fCO2_SW
Uncertainty Water: ± 2 µatm in fCO2_SW
Resolution Air: ± 0.01 µatm in fCO2_ATM
Uncertainty Air: ± 0.5 µatm in fCO2_ATM
Manufacturer of Calibration Gas:
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 3: JB03296, 382.61 ppm, owned by AOML, used every ~3.0 hours. Std 4: JA02689, 520.79 ppm, owned by AOML, used every ~3.0 hours.
Number of Non Zero Gas Standards: 3
CO2 Sensor Calibration:
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.
Other Comments:
Instrument is located in an air-conditioned laboratory. Ultra-High Purity air (0.0 ppm CO2) and the high standard gas are used to zero and span the LI-COR analyzer.
Method References:
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.

Details Co2 Sensing:
details of CO2 sensing (not required)
Measured Co2 Params:
xco2(dry)

Sea Surface Temperature:
Location: hull mounted, ~3 m below sea surface
Manufacturer: Furuno
Model: T2000
Accuracy Degrees Celsius: 0.2
Precision Degrees Celsius: 0.1
Calibration: Factory calibration
Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Equilibrator Temperature:
Location: Inserted into equilibrator ~5 cm below water level
Manufacturer: Hart
Model: 1521
Accuracy Degrees Celsius: 0.025
Precision Degrees Celsius: 0.001
Calibration: Factory calibration
Comments: Resolution is taken as Precision.

Equilibrator Pressure:
Location: Attached to equilibrator headspace. Combined with Licor Pressure
Manufacturer: Licor
Model: None
Accuracy hPa: 1.2
Precision hPa: 0.02
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.

Atmospheric Pressure:
Location: Next to the bridge, ~15 m above the sea surface water
Manufacturer: RMYoung
Model: 61201
Accuracy: ± 0.5 hPa
Precision: 0.01 hPa
Calibration: Factory calibration
Normalized: yes
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.

Additional Information:

LI-7000 Firmware 2.0 bug correction according to LICOR was applied on xCO2 values.There are 2 regions where licor drifted down (YDay 129 and 132). Water is negative in these regions The correction assumes xH20 = 0 when it is negative and applies the correction to xCO2. Effect should be small if xH2O is small which is the case here. Both SST and equT became very noisy on YDay 129 and 130??? It looks like something happened to the water. Data for which -0.5 < Delta T < 1 has been flagged 3 automatically. Analyzer misbehaved on Days 129-132 and showed large drifts. Data when drift is large has been flagged 3 - other appropriately. All original data can be found at: http://www.aoml.noaa.gov/ocd/ocdweb/gunter /gunter_introduction.html

Preliminary Quality Control:

NA

Form Type:

underway