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Dataset Information:

Funding_Info: NOAA Climate Program Office; NOAA Ocean Acidification Program
Initial_Submission: 20211006
Revised_Submission: 20211006

Cruise Information:

Experiment Name: CapeHatteras-2006, UGA Coastal Cruise
Experiment Type: Research Cruise
Platform Type: Ship
Co2 Instrument Type: Equilibrator-IR or CRDS or GC

Cruise ID: 32KZ20060517
Cruise Info: AOML_SOOP_CO2
Geographical Region:

Westernmost Longitude: -81.4
Easternmost Longitude: -76.6
Northernmost Latitude: 34.8
Southernmost Latitude: 27.7

Cruise Dates (YYYYMMDD)
Start_Date: 20060517
End_Date: 20060527

Ports of Call:
Savannah, GA

Vessel Name: R/V Cape Hatteras
Vessel ID: 32KZ
Vessel Owner: Duke / U. North Carolina

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:

Variable Name: xCO2_ATM_ppm

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

Unit of Variable:

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:

Variable Name: PRES_EQU_hPa

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

Unit of Variable:

Variable Name: PRES_ATM@SSP_hPa

Description of Variable: Barometric pressure measured outside, corrected to sea level (hPa)

Unit of Variable:

Variable Name: TEMP_EQU_C

Description of Variable: Water temperature in equilibrator (°C)

Unit of Variable:

Variable Name: SST_C

Description of Variable: Sea surface temperature (°C)

Unit of Variable:

Variable Name: SAL_permil

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

Unit of Variable:

Variable Name: fCO2_SW@SST_uatm

Description of Variable: Fugacity of CO2 in sea water at SST and 100% humidity (µatm)

Unit of Variable:

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:

Variable Name: dfCO2_uatm

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

Unit of Variable:

Variable Name: WOCE_QC_FLAG

Description of Variable: Quality control flag for fCO2 values (2=good, 3=questionable)

Unit of Variable:

Variable Name: QC_SUBFLAG

Description of Variable: Quality control subflag for fCO2 values, provides explanation when QC flag=3

Unit of Variable:

Method Description:**Equilibrator Design:**

Depth of Seawater Intake: 1.5 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. The system is a CCN-Gen2 system.

CO₂ in Marine Air:

Measurement: Yes, 5 readings in a group every 2.1 hours

Location and Height: 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).

CO₂ Sensor:

Measurement Method: IR

Manufacturer: LI-COR

Model: 6262

Frequency: Every 140 seconds, except during calibration

Resolution Water: $\pm 0.01 \mu\text{atm}$ in fCO₂_SW

Uncertainty Water: $\pm 2 \mu\text{atm}$ in fCO₂_SW

Resolution Air: $\pm 0.01 \mu\text{atm}$ in fCO₂_ATM

Uncertainty Air: $\pm 0.5 \mu\text{atm}$ in fCO₂_ATM

Manufacturer of Calibration Gas:

Std 1: CA04563, 192.34 ppm, owned by ESRL, used every ~2.1 hours. Std 2: CA03880, 318.94 ppm, owned by AOML, used every ~2.1 hours. Std 3: CA03910, 372.81 ppm, owned by ESRL, used every ~2.1 hours. Std 4: CA03758, 514.24 ppm, owned by ESRL, used every ~2.1 hours.

Number of Non Zero Gas Standards: 4

CO₂ Sensor Calibration:

The analyzer is calibrated every ~2.1 hours using field standards that were calibrated with primary standards at AOML that are directly traceable to the WMO scale (CO₂_X2007).

Other Comments:**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: In lab

Manufacturer: Seabird, Inc.

Model: SBE 45

Accuracy Degrees Celsius:

Precision Degrees Celsius:

Calibration: Factory calibration, degree Celsius

Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Equilibrator Temperature:

Location: Inserted into equilibrator ~5 cm below water level

Manufacturer: Omega Engineering, Inc

Model: RTD Probe, IEC/DIN Class A

Accuracy Degrees Celsius:

Precision Degrees Celsius:

Calibration: Factory calibration, degree Celsius

Comments: Resolution is taken as Precision.

Equilibrator Pressure:

Location: Attached to equilibrator headspace. Differential pressure reading from Setra 239 attached to the equilibrator headspace is added to the pressure reading from the LI-COR.

Manufacturer: LI-COR internal sensor

Model: 6262-03

Accuracy hPa:

Precision hPa:

Calibration: Factory calibration, hPa

Comments:

Manufacturer's Resolution is taken as Precision.

Atmospheric Pressure:

Location: In deck box mounted in front of bridge, ~10 m above sea surface.

Manufacturer: Druck

Model: RPT350

Accuracy: ± 0.08

Precision: 0.01

Calibration: Factory calibration, hPa

Normalized: no

Comments: Manufacturer's Resolution is taken as Precision.

Sea Surface Salinity:

Location: In lab

Manufacturer: Seabird, Inc

Model: SBE 45

Accuracy: ± 0.005

Precision: 0.0002

Calibration: Factory calibration, o/oo psu

Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Additional Information:

The analytical system operated well during the cruise. The ship's seawater sensors were not recorded during a couple intervals. Missing SST values were estimated by subtracting 0.37 degrees from the equilibrator temperature. When all the sensors were recorded, the average difference between the equilibrator and sea surface temperatures was 0.368 (+/- 0.067) degree Celsius. Missing salinities were assigned a value of 35 o/oo

psu. This cruise included two underway pCO₂ systems; so two data sets will have the same Expocode. The other system was from the University of Georgia laboratory of Dr. Wei-Jun Cai. Original Data Location: <http://www.aoml.noaa.gov/ocd/ocdweb/occ.html> under "Completed Collections". Full unprocessed data files from analytical instrument including flow information plus meteorological and TSG data at time of sampling can be obtained upon request.

Preliminary Quality Control:

NA

Form Type:

underway