

Dataset Expocode 74X120090912

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Campaign/Cruise **Expocode:** 74X120090912
Campaign/Cruise Name: LasC10-09
Campaign/Cruise Info: AOML_SOOP_CO2
Platform Type:
CO2 Instrument Type: Equilibrator-IR or CRDS or GC
Survey Type: SOOP Line
Vessel Name: M/V Las Cuevas
Vessel Owner: Greenlight Transport S.A
Vessel Code: 74X1

Coverage **Start Date (yyyymmdd):** 20090912
End Date (yyyymmdd): 20090927
Westernmost Longitude: 97 W
Easternmost Longitude: 61.4 W
Northernmost Latitude: 30.2 N
Southernmost Latitude: 10.3 N

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

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

Variable **Name:** xCO2_ATM_interpolated_ppm
Unit:
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:

Description: Barometric pressure in the equilibrator headspace (hPa)

Variable

Name: PRES_ATM@SSP_hPa

Unit:

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

Variable

Name: TEMP_EQU_C

Unit:

Description: Water temperature in equilibrator (°C)

Variable

Name: SST_C

Unit:

Description: Sea surface temperature (°C)

Variable

Name: SAL_permil

Unit:

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

Variable

Name: fCO2_SW@SST_uatm

Unit:

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

Variable

Name: fCO2_ATM_interpolated_uatm

Unit:

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

Variable

Name: dfCO2_uatm

Unit:

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

Variable

Name: WOCE_QC_FLAG

Unit:

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

Variable

Name: QC_SUBFLAG

Unit:

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

Sea Surface Temperature

Location: From Beginning to 16 Nov 2011, a SBE48 (Magnetic Hull mounted) sensor was used. It was located on the wall of the sea chest.

Manufacturer: Seabird

Model: SBE-48 (11July2009-16Nov2011)

Accuracy: 0.001 (°C if units not given)

Precision: 0.00025 (°C if units not given)

Calibration: Factory calibration.

Comments: Manufacturer's Resolution is taken as Precision.

Sea Surface Salinity

Location: In the ship's engine room 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.

Atmospheric Pressure

Location: On deck above bridge at ~20 m above sea surface.

Normalized to Sea Level: yes

Manufacturer: Druck
Model: RPT350
Accuracy: ± 0.08 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.

Atmospheric CO2

Measured/Frequency: Yes, 5 readings in a group every ~4.5 hours
Intake Location: On mast above the bridge at ~20 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).
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: 7 meters
Intake Location: Sea chest under the engine room
Equilibration Type: Sprayhead 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 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 ~4.5 hours using ESRL standards that are directly traceable to the WMO scale. Ultra-High Purity air (0.0 ppm CO2) and the high standard are used to zero and span the LI-COR analyzer.
Number Non-Zero Gas Standards:
Calibration Gases:

Std 1: CA3095, 247.01 ppm, owned by AOML, used every 4.5 hours.
Std 2: CA3880, 318.94 ppm, owned by AOML, used every 4.5 hours.
Std 3: CA5979, 381.89 ppm, owned by AOML, used every 4.5 hours.
Std 4: CA6380, 448.29 ppm, owned by ESRL, used every 4.5 hours.

Comparison to Other CO2 Analyses:
Comments: Instrument is located next to a walkway in the engine room.

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 the 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: Manufacturer's Resolution is taken as Precision.

**Equilibrator
Pressure Sensor**

Location: Attached to equilibrator headspace. Combined with Licor Pressure

Manufacturer: Licor

Model: None

Accuracy: 15 (hPa if units not given)

Precision: 1 (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: Before Julian Day 264.7656, GPS was taken from Bridge record and interpolated. Position is slightly approximate for that time. Seawater flow was intermittent. No Water flow from year days [254-259, 260-263 and 269 on].

This data was reduced using the Matlab program pCO₂ Sys v1.06. The geographic area the dataset refers to: Gulf of Mexico, Caribbean Sea . Original Data Location: http://www.aoml.noaa.gov/ocd/gcc/lascuevas_introduction.php

Citation for this Dataset:

Other References for this Dataset: