Dataset Expocode	**MLCE20250104**
Primary Contact	**Name:** Pierrot, Denis **Organization:** NOAA/AOML CIMAS **Address:** 4301 Rickenbacker Causeway, Miami, Fl 33149 **Phone:** (305) 361-4441 **Email:** denis.pierrot@noaa.gov
Investigator	**Name:** Wanninkhof, Rik **Organization:** NOAA/Atlantic Oceanographic & Meteorological Laboratory **Address:** 4301 Rickenbacker Causeway, Miami Fl, 33149 **Phone:** 305-361-4379 **Email:** Rik.Wanninkhof@noaa.gov
Investigator	**Name:** Pierrot, Denis **Organization:** NOAA/Atlantic Oceanographic & Meteorological Laboratory **Address:** 4301 Rickenbacker Causeway, Miami Fl, 33149 **Phone:** 305-361-4441 **Email:** Denis.Pierrot@noaa.gov
Dataset	**Funding Info:** NOAA Climate Program Office; NOAA Ocean Acidification Program **Initial Submission (yyyymmdd):** 20250203 **Revised Submission (yyyymmdd):**
Campaign/Cruise	**Expocode:** MLCE20250104 **Campaign/Cruise Name:** EQNX_20250104 **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 Equinox **Vessel Owner:** Royal Caribbean International **Vessel Code:** MLCE
Coverage	**Start Date (yyyymmdd):** 20250104 **End Date (yyyymmdd):** 20250111 **Westernmost Longitude:** 80.6 W **Easternmost Longitude:** 62.7 W **Northernmost Latitude:** 28.4 N **Southernmost Latitude:** 17.2 N **Port of Call:** Port Canaveral, FL
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 Bow Thruster room, about 1m after the intake which is directly through the ship's hull, before the SW pump. **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 University of Miami's MTG group.
Sea Surface Salinity	**Location:** Next to the pCO2 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 University of Miami's MTG group.
Atmospheric Pressure	**Location:** At the base of the radar mast, 48 meter above sea level. **Normalized to Sea Level:** no **Manufacturer:** RM Young **Model:** 61202V **Accuracy:** ± 0.3 hPa (hPa if units not given) **Precision:** 0.1 hPa (hPa if units not given) **Calibration:** Factory Calibration **Comments:** Manufacturer's Resolution is taken as Precision; Maintained by University of Miami's MTG group.
Atmospheric CO2	**Measured/Frequency:** Yes, 5 readings in a group every 5 hours. **Intake Location:** At forward-most, grated opening in the starboard hull on the mooring deck, which is 12 meters above sea level. **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, with 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 5 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:** 4 **Calibration Gases:** Std 1: CA07347, 246.72 ppm, owned by ESRL-X2019, used every ~11.0 hours.Std 2: CA06769, 368.10 ppm, owned by ESRL-X2019, used every ~11.0 hours.Std 3: CA05998, 419.51 ppm, owned by AOML-X2019, used every ~11.0 hours.Std 4:

CC749968, 498.60 ppm, owned by AOML-X2019, used every ~11.0 hours.Std 5: LL100000, 0.00 ppm, owned by AOML, used every ~26.0 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: 1523
Accuracy: 0.015 (°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. The differential pressure reading from Setra 239, which is attached to the equilibrator headspace, is added to the pressure reading from the LICOR analyzer, which is measured by an external Setra 270 connected to the exit of the analyzer.
Manufacturer: Setra
Model: 270
Accuracy: 0.15 (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: About one third of SST values are interpolated due to sensor communication issues.Those values are flagged 3 but should be good to within ± 0.05 °CSystem shutdown a couple days in the cruise.Very few ATM measurements and no ATM pressure.A lot of gaps in SST which were interpolated and flagged 3, as well as SSS.An offset of 0.46 minutes between SST and equ T was applied to minimize Delta T.
Citation for this Dataset:
Other References for this Dataset: