

(* =mandatory field)

- **Investigator:*(-)**
 - **Name*:** Dr. Christopher Sabine
 - **Organization:** NOAA/PMEL
 - **Address:**
 - NOAA/PMEL
 - 7600 Sand Point Way NE
 - Seattle Washington, 98115 USA
 - **Phone:** 206-526-4809
 - **Email:** chris.sabine@noaa.gov
- **Dataset_Info:*(-)**
 - **Dataset_ID*:** TAO140W_0_May04_Sep04
 - **Submission_Dates:*(-)**
 - **Initial_Submission:** 20041024 (YYYYMMDD)
 - **Revised_Submission:** (YYYYMMDD)
- **Cruise_Info:*(-)**
 - **Experiment:(-)**
 - **Experiment_Name*:**
 - **Cruise:(-)**
 - **Cruise_ID:** (EXPOCODE)
 - **Section:** (Leg)
 - **Geographical_Coverage:*(-)**
 - **Geographical_Region:**
 - **Bounds:*(-)** 124.37W 0.18S
 - **Westernmost_Longitude:**
Enter decimal fractions of degrees: -139.86 (+ = E, - = W)
or Degrees, Minutes, Seconds:
 - **Easternmost_Longitude:**
Enter decimal fractions of degrees:
or Degrees, Minutes, Seconds:
 - **Northernmost_Latitude:**
Enter decimal fractions of degrees: +0.01 (+ = E, - = W)
 - **Southernmost_Latitude:**
Enter decimal fractions of degrees:
 - **Temporal_Coverage:(-)**
 - **Start_Date:** 20040523 (YYYYMMDD)
 - **End_Date:** 20040912 (YYYYMMDD)
 - **Vessel:*(-)**
 - **Vessel_Name:**
 - **Vessel_ID:**
 - **Country:**
 - **Vessel_Owner:**

Platform Identifier: Mooring

Mooring Location

Longitude: Enter decimal fractions of degrees: -139.86 (+ = E, - = W)

Latitude: Enter decimal fractions of degrees: +0.01 (+ = E, - = W)

Start_Date: 20040523 (YYYYMMDD)

End_Date: 20040912 (YYYYMMDD)

- **Variables_Info:*(-)**
 - **Variable:(-)**
 - Variable_Name*: (show pick list)
 - Description_of_Variable: (E.g., in dry air)

****General notes:**

- All measurements are at sea surface temperature and atmospheric pressure.
- During the equilibration cycle, a closed loop of air equilibrates with seawater for 10 minutes. Once the equilibration period is complete, the pump stops and the system opens to the atmosphere allowing the pressure to equilibrate with atmospheric pressure. Measurements are recorded for 30 seconds at 2 hertz and then averaged.
- During the air cycle, fresh air is pumped through the detector for 1 minute. Once the pump stops, the system opens to the atmosphere allowing the pressure to equilibrate with atmospheric pressure. Measurements are recorded for 30 seconds at 2 hertz and then averaged.
- The gas streams for both the air cycle and equilibrator cycle are partially dried before entering the detector. The values listed as wet xCO₂ generally have relative humidity levels ranging from 40 to 80 percent. The humidity levels increase over the course of a deployment.
- Sampling occurs every 3 hours. The infrared detector is calibrated at the beginning of every sampling period. Averaged data and standard deviations for each measurement are transmitted back daily.
- To calculate the dry measurements, the water mole fraction in the Licor detector must be known. A relative humidity sensor is located next the detector. The water vapor of the detector can be calculated based on the relative humidity of that sensor. In the lab, it has been determined that the temperature of the relative humidity sensor is generally 0.9°C lower than the temperature of the Licor. To make these calculations, it was assumed that the temperature of the relative humidity sensor was 0.9 less than the temperature of the Licor.
- As a final step in the QC process, each data set is compared with the Marine Boundary Layer data from GlobalView-CO₂. The data from this deployment, May 2004 to December 2004, were consistently low by ~ 4.8 umol/mol. This offset was added to both the xCO₂_SW (wet) and the xCO₂_Air (wet) measurements.

GLOBALVIEW-CO₂: Cooperative Atmospheric Data Integration Project - Carbon Dioxide. CD-ROM, NOAA CMDL, Boulder, Colorado [Also available on Internet via anonymous FTP to ftp.cmdl.noaa.gov, Path: ccg/co2/GLOBALVIEW], 2005

Measured Information: (Variable Name/Description)

xCO₂ SW (wet) (umol/mol) - Mole fraction of CO₂ in air in equilibrium with the seawater at sea surface temperature and measured humidity.

QF – Quality Flag for xCO₂ SW (wet).

H₂O (mmol/mol) - Mole fraction of H₂O in air from equilibrator.

xCO₂ Air (wet) (umol/mol) - Mole fraction of CO₂ in air from airblock, 4 feet above the sea surface at measured humidity.

QF – Quality Flag for xCO₂ Air (wet) .

H₂O (mmol/mol) - Mole fraction of H₂O in air from airblock, 4 feet above the sea surface.

Pressure of Licor (hPa) and Atm – Atmospheric pressure at the airblock, 4 feet above the sea surface.

Licor Temp (C) – Temperature of the Infrared Licor 820 in degrees Celsius.

% Saturation of O₂ - The percent oxygen of the surface seawater divided by the percent oxygen of the atmosphere 4 feet above the sea surface.

SST (C) - Sea Surface Temperature collected by NOAA/PMEL/TAO. Next Generation ATLAS sites provide internally recorded SST data at 10 minute resolution. The sea surface temperature collected during the equilibration period is reported in this dataset. The data presented here are not necessarily from the TAO finalized data set. The TAO Project Office advises to check the TAO site at the time of use for the most accurate data available.

Salinity - Sea Surface Salinity collected by NOAA/PMEL/TAO. TAO records conductivity data at 10 minute intervals and then computes hourly averaged salinity during post-processing. The salinity reported during the equilibration period is reported in this dataset. The data presented here are not necessarily from the TAO finalized data set. The TAO Project Office advises to check the TAO site at the time of use for the most accurate data available.

Derived Parameters:

xCO₂ SW (dry) (umol/mol) – Mole fraction of CO₂ in air in equilibrium with the seawater at sea surface temperature (dry air).

xCO₂ Air (dry) (umol/mol) – Mole fraction of CO₂ in air from airblock, 4 feet above the sea surface (dry air).

fCO₂ SW (sat) uatm – Fugacity of CO₂ in air in equilibrium with the seawater at sea surface temperature (100% humidity). Since the measurements are taken at the sea surface, warming calculations are not necessary.

fCO₂ Air (sat) uatm – Fugacity of CO₂ in air airblock, 4 feet above the sea surface (100% humidity).

dfCO₂ – Difference of the fugacity of the CO₂ in seawater and the fugacity of the CO₂ in air (fCO₂ SW - fCO₂ Air).

- **Method_Description:*(-)**

- **Equilibrator_Design:(-)**

- Equilibrator_Type: (show pick list) Bubble Equilibrator
 - Equilibrator_Volume: (L) N/A
 - Water_Flow_Rate: (L/min) N/A
 - Headspace_Gas_Flow_Rate: (L/min) ~600 cc/min
 - Vented: (show pick list) Yes

- Measurement_Method: Absolute, non-dispersive infrared (NDIR) gas analyzer

- Manufacturer_of_Calibration_Gas: NOAA CMDL (now Earth System Research Laboratory (ESRL))

- **CO₂ Sensors:(-)**

- **CO₂ Sensor:(-)**

- Manufacturer: Licor
 - Model: Environmental_Control: LI-820
 - Resolution: 0.01 ppm
 - Uncertainty: < 2.5% of reading with 14 cm bench (stated)
<1.5 ppm determined in lab
 - CO₂_Sensor_Calibration: (For each calibration gas, document traceability to an internationally recognized scale, including date and place of last calibration. Include uncertainty of assigned value.)

At the beginning of each sample, the instrument self-calibrates using a zero and high standard. The zero standard is generated by cycling a small amount of air through a soda lime chamber. The high standard is from a cylinder of calibrated standard reference gas from CMDL. CMDL standards are traceable to WMO x93 scale with a stated reproducibility of 0.06 micromole/mole. The standard used for this deployment was calibrated in August 2003. The high standard cylinder is still in use, so no post deployment calibration has been performed yet.

- **Other_Sensors:(-)**

- Manufacturer: Oxygen Sensor
 - Model: Maxtec
 - Resolution: Max-250
 - Uncertainty: 0.01 %
 - Calibration: ± 2.0% Full Scale over operating temperature range
± 1.0% Full Scale @ constant temperature and pressure
 - Calibration: (For each sensor of pressure, temperature, and salinity, document traceability to an internationally recognized scale, including date and place of last calibration.)
Calibrated immediately before the deployment, May 23, 2004.

- **Other_Sensors:(-)**

- Manufacturer: Humidity Sensor
 - Sensirion

- Model: SHT71
- Resolution: 0.01 %
- Uncertainty: Measurement range: 0-100% RH
Absolute. RH accuracy: +/- 3% RH (20-80% RH)
Repeatability RH: +/- 0.1% RH
- Calibration: (For each sensor of pressure, temperature, and salinity, document traceability to an internationally recognized scale, including date and place of last calibration.)
Factory calibrated before purchase in June 2003.

○ Method_References: (Publication(s) describing method)

Sabine, C. (2005): High-resolution ocean and atmosphere pCO₂ time-series measurements. The State of the Ocean and the Ocean Observing System for Climate, Annual Report, Fiscal Year 2004, NOAA/OGP/Office of Climate Observation, Section 3.32a, 246–253.

○ Data_set_References: (Publication(s) describing data set) None

• Citation: (How to cite this data set)

• Data_Set_Link: (-)

- URL*:(m s t)
- Label*:(m s t)
- Link_Note: (Optional instructions or remarks)(m s t)

Quality Flags definitions:

- 2 = Acceptable measurement;
- 3 = Questionable measurement;
- 4 = Bad measurement
- 5 = Not reported;

Quality Flag Log for this dataset.

Date	Measurement	Value in Dry Air	Flag	Comments
5/26/2004 0:19	xCO2_SW	490.7	4	Cal error - 17 ppm low (Change in Zero Coefficient)
5/26/2004 0:19	xCO2_Air	394.7	4	Cal error - 17 ppm low (Change in Zero Coefficient)
6/21/2004 6:19	xCO2_SW	464.6	3	Potential Problem with the equilibrator
6/21/2004 9:19	xCO2_SW	471.4	3	Potential Problem with the equilibrator
6/21/2004 12:19	xCO2_SW	478.7	3	Potential Problem with the equilibrator
6/21/2004 15:19	xCO2_SW	465.2	3	Potential Problem with the equilibrator
6/21/2004 18:19	xCO2_SW	-999	5	Problem with the equilibrator
6/21/2004 21:19	xCO2_SW	-999	5	Problem with the equilibrator
6/22/2004 0:19	xCO2_SW	421.6	4	Problem with the equilibrator
7/21/2004 15:19	xCO2_SW	470.7	3	Cal error - Data still seems reasonable
7/21/2004 15:19	xCO2_Air	379.7	3	Cal error - Data still seems reasonable
8/22/2004 3:19	xCO2_SW	-999	5	Not reported - missing data
8/22/2004 3:19	xCO2_Air	-999	5	Not reported - missing data
8/30/2004 0:19	xCO2_SW	444.8	3	Potential Problem with the equilibrator