

* =mandatory field)

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 - **Dataset_Info:**
 - Dataset_ID*: [TAO140W_0N_Nov2010_Sep2011](#)
 - **Submission_Dates:**
 - Initial_Submission: [20130827](#) (YYYYMMDD)
 - Revised_Submission: (YYYYMMDD)
 - **Cruise_Info:**
 - **Experiment:**
 - Experiment_Name*:
 - **Cruise:(-)**
 - Cruise_ID: (EXPOCODE)
 - Section: (Leg)
 - **Geographical_Coverage:**
 - Geographical_Region:
 - **Bounds:**
 - Westernmost_Longitude:
Enter decimal fractions of degrees:
or Degrees, Minutes, Seconds:
 - Easternmost_Longitude:
Enter decimal fractions of degrees: [-139.87](#) (+ = E, - = W)
or Degrees, Minutes, Seconds:
 - Northernmost_Latitude:
Enter decimal fractions of degrees: [-0.04](#) (+ = N, - = S)
 - Southernmost_Latitude:
Enter decimal fractions of degrees:
 - **Temporal_Coverage:**
 - Start_Date: [20101126](#) (YYYYMMDD)
 - End_Date: [20110901](#) (YYYYMMDD)
 - **Vessel:** [Mooring platform](#)
 - Vessel_Name:
 - Vessel_ID:
 - Country:
 - Vessel_Owner:
- **Variables_Info:**
 - **Variable:**
 - Variable_Name and Description*:
- [xCO₂ SW \(wet\) \(umol/mol\) - Mole fraction of CO₂ in air in equilibrium with the seawater at sea surface temperature and measured humidity.](#)
- [CO₂ SW QF – Quality Flag for xCO₂ SW \(wet\).](#)
- [H₂O SW \(mmol/mol\) - 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.](#)
- [CO₂ Air QF – Quality Flag for xCO₂ Air \(wet\)](#)
- [H₂O Air \(mmol/mol\) - Mole fraction of H₂O in air from airblock, 4 feet above the sea surface.](#)

- Licor Atm Pressure (hPa) – Atmospheric pressure at the airblock, 4 feet above the sea surface
- Licor Temp (C) – Temperature of the Infrared Licor 820 in degrees Celsius
- % O₂ - The percent oxygen of the surface seawater divided by the percent oxygen of the atmosphere at 4 feet above the sea surface. Disclaimer: The oxygen measurement is made in the equilibrated air. We have found that the oxygen does not come to complete equilibrium so any rapid changes in oxygen do not get properly captured using this system. Therefore, we tend to use the oxygen data only as a qualitative sense of the biology. It is not a quantitative measure.
- SST (C) - Sea Surface Temperature collected by NOAA/PMEL/TAO provide internally recorded SST data at 10 minute resolution. The sea surface temperature collected during the equilibration period is reported in this dataset. NOAA/PMEL/TAO 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. Papa records conductivity data at 10 minute intervals and then computes hourly averaged salinity during post-processing. Daily data was only available at time of CO₂ QC. NOAA/PMEL/TAO advises to check the TAO site at the time of use for the most accurate data available.
- 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 at the 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 at the 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 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, 546.33 umol/mol, from ESRL. ESRL

standards are traceable to WMO x93 scale with a stated reproducibility of 0.06 micromole/mole.

- **Other_Sensors:**
 - Manufacturer: Oxygen Sensor
Maxtec
 - Model: Max-250
 - Resolution: 0.01 %
 - Uncertainty: $\pm 2.0\%$ Full Scale over operating temperature range
 $\pm 1.0\%$ 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.)
Factory calibrated before purchase. Recalibrated to sea level atmospheric air every 7 days.
- **Other_Sensors:**
 - Manufacturer: Humidity Sensor
Sensirion
 - Model: SHT71
 - Resolution: 0.01 %
 - Uncertainty: Measurement range: 0-100% RH
Absolute RH accuracy: $\pm 3\%$ RH (20-80% RH)
Repeatability RH: $\pm 0.1\%$ 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.
- 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.

- Additional Information

- 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 immediately downstream of the detector.

- As part of the QC process, each data set is compared with the Marine Boundary Layer (MBL) data from GlobalView-CO₂. The CO₂ air data from this deployment were -2.4 ± 0.3 umol/mol on average of the MBL data and therefore a correction of -2 umol/mol was applied to the air and seawater (wet) data.

GLOBALVIEW-CO₂: Cooperative Atmospheric Data Integration Project - Carbon Dioxide. CD-ROM, NOAA ESRL, Boulder, Colorado [Also available on Internet via anonymous FTP to ftp.cmdl.noaa.gov, Path: ccg/co2/GLOBALVIEW], 2010

-During the QC process, an adjustment to the Licor pressure is also made based on each sensor's bias to barometric pressure as measured in the lab. This test has not been run on this system yet.

- No data = -9.999 or -999

- Data_set_References: (Publication(s) describing data set) None
- Citation: (How to cite this data set) Sutton, A., C. Sabine, and S. Maenner. 2011. High-resolution ocean and atmosphere pCO₂ time-series measurements from mooring TAO140W.

• **Data_Set_Link:**

- URL*: http://www.pmel.noaa.gov/co2/moorings/eq_pco2/eq_pco2.htm
- Label*: PMEL CO₂ Group – TAO140W mooring

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

Quality Flags definitions:

- 2 = Acceptable measurement;
- 3 = Questionable measurement;
- 4 = Bad measurement
- 5 = Not reported;
- 9 = Sample not drawn for this measurement from this bottle.

Quality Flag Log for this dataset.

Date	Measurement	Value (Dry)	Flag	Comments
12/17/2010 0:17	xCO ₂ _SW	515.0592	4	bad CO ₂ sw measurement due to pressure problem in equilibrator cycle
12/17/2010 18:17	xCO ₂ _SW	490.2269958	4	bad CO ₂ sw measurement due to pressure problem in equilibrator cycle
12/18/2010 3:17	xCO ₂ _SW	508.2178829	4	bad CO ₂ sw measurement due to pressure problem in equilibrator cycle
12/21/2010 18:17	xCO ₂ _SW	479.6072596	4	bad CO ₂ sw measurement due to pressure problem in equilibrator cycle
12/21/2010 21:17	xCO ₂ _SW	484.3747294	4	bad CO ₂ sw measurement due to pressure problem in equilibrator cycle
12/22/2010 0:17	xCO ₂ _SW	491.5105023	4	bad CO ₂ sw measurement due to pressure problem in equilibrator cycle
1/5/2011 21:17	xCO ₂ _SW	480.0953259	4	bad CO ₂ sw measurement due to pressure problem in equilibrator cycle
1/6/2011 0:17	xCO ₂ _SW	491.0716761	4	bad CO ₂ sw measurement due to pressure problem in equilibrator cycle

1/6/2011 3:17	xCO2_SW	474.634328	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/6/2011 6:17	xCO2_SW	477.4441655	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/6/2011 9:17	xCO2_SW	467.0346695	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/6/2011 12:17	xCO2_SW	490.2293911	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/6/2011 15:17	xCO2_SW	476.7736393	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/6/2011 18:17	xCO2_SW	497.5503189	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/6/2011 21:17	xCO2_SW	480.0577233	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/7/2011 0:17	xCO2_SW	469.0194188	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/7/2011 3:17	xCO2_SW	468.0717042	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/7/2011 6:17	xCO2_SW	498.2818769	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/7/2011 9:17	xCO2_SW	470.7323691	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/7/2011 12:17	xCO2_SW	495.7480322	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/7/2011 15:17	xCO2_SW	491.1748461	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/7/2011 18:17	xCO2_SW	491.5139849	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/7/2011 21:17	xCO2_SW	483.6549502	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/8/2011 0:17	xCO2_SW	473.5507778	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/8/2011 3:17	xCO2_SW	475.6809947	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/8/2011 6:17	xCO2_SW	463.7197992	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/8/2011 9:17	xCO2_SW	473.5406578	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/8/2011 12:17	xCO2_SW	474.4746628	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/8/2011 15:17	xCO2_SW	472.3570509	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/8/2011 18:17	xCO2_SW	466.0005605	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/8/2011 21:17	xCO2_SW	474.9089467	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/9/2011 0:17	xCO2_SW	466.329182	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/9/2011 3:17	xCO2_SW	470.740646	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/9/2011 6:17	xCO2_SW	455.3422883	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/9/2011 9:17	xCO2_SW	478.7947842	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/9/2011 12:17	xCO2_SW	484.7007667	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/9/2011 15:17	xCO2_SW	470.2168697	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				

1/9/2011 18:17	xCO2_SW	475.9574558	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/9/2011 21:17	xCO2_SW	498.4450044	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/10/2011 0:17	xCO2_SW	513.046612	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/10/2011 3:17	xCO2_SW	491.319285	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/10/2011 6:17	xCO2_SW	491.6650957	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/10/2011 9:17	xCO2_SW	511.328139	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/10/2011 12:17	xCO2_SW	514.5185897	4	bad CO2 sw measurement due to pressure
problem in equilibrator cycle				
1/10/2011 21:17	xCO2_SW	517.7456733	4	bad CO2 sw measurement due to pressure
problem in equilibrator cycle				
1/11/2011 0:17	xCO2_SW	530.6265525	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/11/2011 3:17	xCO2_SW	506.6636566	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/11/2011 18:17	xCO2_SW	532.235927	4	bad CO2 sw measurement due to pressure
problem in equilibrator cycle				
1/11/2011 21:17	xCO2_SW	525.365441	4	bad CO2 sw measurement due to pressure
problem in equilibrator cycle				
1/12/2011 0:17	xCO2_SW	537.512224	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/12/2011 3:17	xCO2_SW	528.081294	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/18/2011 6:17	xCO2_SW	560.2884339	4	bad CO2 sw measurement due to pressure problem in
equilibrator cycle				
1/19/2011 0:17	xCO2_SW	522.5209439	3	likely bad CO2 sw measurement due to pressure problem
in equilibrator cycle				
1/19/2011 3:17	xCO2_SW	519.8320631	3	likely bad CO2 sw measurement due to pressure problem
in equilibrator cycle				
1/19/2011 6:17	xCO2_SW	499.5564655	3	likely bad CO2 sw measurement due to pressure problem
in equilibrator cycle				
1/19/2011 9:17	xCO2_SW	513.6427619	3	likely bad CO2 sw measurement due to pressure problem
in equilibrator cycle				
1/19/2011 12:17	xCO2_SW	504.7927765	3	likely bad CO2 sw measurement due to pressure
problem in equilibrator cycle				
1/19/2011 15:17	xCO2_SW	532.2781362	3	likely bad CO2 sw measurement due to pressure
problem in equilibrator cycle				
1/19/2011 18:17	xCO2_SW	526.4471106	3	likely bad CO2 sw measurement due to pressure
problem in equilibrator cycle				
1/19/2011 21:17	xCO2_SW	526.3598246	3	likely bad CO2 sw measurement due to pressure
problem in equilibrator cycle				
1/20/2011 0:17	xCO2_SW	537.9576196	3	likely bad CO2 sw measurement due to pressure problem
in equilibrator cycle				
1/20/2011 3:17	xCO2_SW	523.838302	3	likely bad CO2 sw measurement due to pressure problem
in equilibrator cycle				
1/20/2011 6:17	xCO2_SW	502.9335435	3	likely bad CO2 sw measurement due to pressure problem
in equilibrator cycle				
1/20/2011 9:17	xCO2_SW	517.2132773	3	likely bad CO2 sw measurement due to pressure problem
in equilibrator cycle				
1/20/2011 12:17	xCO2_SW	535.8240914	3	likely bad CO2 sw measurement due to pressure
problem in equilibrator cycle				
1/20/2011 15:17	xCO2_SW	521.88801	3	likely bad CO2 sw measurement due to pressure
problem in equilibrator cycle				

1/20/2011 18:17	xCO2_SW	513.4385951	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/20/2011 21:17	xCO2_SW	520.4234225	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/21/2011 0:17	xCO2_SW	517.775535	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/21/2011 3:17	xCO2_SW	504.8492073	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/21/2011 6:17	xCO2_SW	493.5877172	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/21/2011 9:17	xCO2_SW	501.5911209	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/21/2011 12:17	xCO2_SW	505.0362739	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/21/2011 15:17	xCO2_SW	502.8318334	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/21/2011 18:17	xCO2_SW	504.5939038	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/21/2011 21:17	xCO2_SW	507.1013157	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/22/2011 0:17	xCO2_SW	503.3668621	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/22/2011 3:17	xCO2_SW	485.5026968	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/22/2011 6:17	xCO2_SW	479.9318359	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/22/2011 9:17	xCO2_SW	479.9032981	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/22/2011 12:17	xCO2_SW	483.9580291	3	likely bad CO2 sw measurement due to pressure problem in equilibrator cycle
5/17/2011 3:17	xCO2_SW	511.7748778	3	CO2 data submitted was adjusted by + 4 ppm b/c span calibration was off as predicted by change in Licor temperature
5/17/2011 3:17	xCO2_Air	391.7535484	3	CO2 data submitted was adjusted by + 4 ppm b/c span calibration was off as predicted by change in Licor temperature
8/27/2011 9:17	xCO2_SW	526.5490128	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/27/2011 12:17	xCO2_SW	510.0621261	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/27/2011 15:17	xCO2_SW	494.1163546	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/27/2011 18:17	xCO2_SW	496.7497981	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/27/2011 21:17	xCO2_SW	505.1305317	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/28/2011 0:17	xCO2_SW	499.2747921	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/28/2011 3:17	xCO2_SW	502.9489736	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/28/2011 6:17	xCO2_SW	495.2157546	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/28/2011 9:17	xCO2_SW	497.9634611	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/28/2011 12:17	xCO2_SW	509.1997796	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/28/2011 15:17	xCO2_SW	504.9120782	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
8/28/2011 18:17	xCO2_SW	511.08749	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle