* =mandatory field)

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- **Dataset_Info**:*
    - o Dataset_ID*:   TAO140W_0N_Nov2010_Mar2011
    - o **Submission_Dates**:*
        - ▪ Initial_Submission: 20130827   (YYYYMMDD)
        - ▪ Revised_Submission: 20131216   (YYYYMMDD)
- **Cruise_Info**:*
    - o **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: 20110323   (YYYYMMDD)
    - o **Vessel**:* Mooring platform
        - ▪ Vessel_Name:
        - ▪ Vessel_ID:
        - ▪ Country:
        - ▪ Vessel_Owner:
- **Variables_Info**:*
    - o **Variable**:
- ▪   Variable_Name and Description*:
- xCO_2 SW (wet) (umol/mol) - Mole fraction of CO_2 in air in equilibrium with the seawater at sea surface temperature and measured humidity.

- CO2 SW QF – Quality Flag for xCO_2 SW (wet).

- H_2O SW (mmol/mol) - Mole fraction of H_2O in air from equilibrator .

- xCO_2 Air (wet) (umol/mol) - Mole fraction of CO_2 in air from airblock, 4 feet above the sea surface at measured humidity.

- CO2 Air QF – Quality Flag for xCO_2 Air (wet)

- H_2O Air (mmol/mol) - Mole fraction of H_2O 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

- % O_2 - 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.

- xCO_2 SW (dry) (umol/mol) – Mole fraction of CO_2 in air in equilibrium with the seawater at sea surface temperature (dry air).

- xCO_2 Air (dry) (umol/mol) – Mole fraction of CO_2 in air at the airblock, 4 feet above the sea surface (dry air).

- fCO_2 SW (sat) uatm – Fugacity of CO_2 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.

- fCO_2 Air (sat) uatm – Fugacity of CO_2 in air at the airblock, 4 feet above the sea surface (100% humidity).

- $dfCO_2$ – Difference of the fugacity of the CO_2 in seawater and the fugacity of the CO_2 in air (fCO_2 SW - fCO_2 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)

    - **CO_2_Sensors**:
        - **CO_2_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
            - CO_2_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.

- o **Other_Sensors**:   Oxygen Sensor
  - Manufacturer: Maxtec
  - Model: Max-250
  - Resolution: 0.01 %
  - Uncert-ainty: ± 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.)
    Factory calibrated before purchase. Recalibrated to sea level atmospheric air every 7 days.

- o **Other_Sensors**:   Humidity Sensor
  - Manufacturer: 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.

- o Method_References: (Publication(s) describing method)

Sabine, C. (2005): High-resolution ocean and atmosphere pCO_2 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.
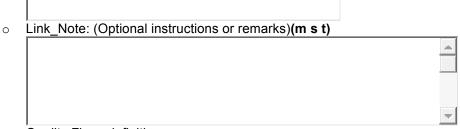
- Additional Information

- 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 xCO_2 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-CO_2. 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-CO $_2$: 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**:
    o URL*: http://www.pmel.noaa.gov/co2/moorings/eq_pco2/eq_pco2.htm
    o Label*:PMEL CO2 Group – TAO140W mooring

    o 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 drown for this measurement from this bottle.

Quality Flag Log for this dataset.

Date	Measurement	Value (Dry)	Flag	Comments
12/17/2010 0:17	xCO2_SW	515.0592	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
12/17/2010 18:17	xCO2_SW	490.2269958	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
12/18/2010 3:17	xCO2_SW	508.2178829	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
12/21/2010 18:17	xCO2_SW	479.6072596	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
12/21/2010 21:17	xCO2_SW	484.3747294	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
12/22/2010 0:17	xCO2_SW	491.5105023	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/5/2011 21:17	xCO2_SW	480.0953259	4	bad CO2 sw measurement due to pressure problem in equilibrator cycle
1/6/2011 0:17	xCO2_SW	491.0716761	4	bad CO2 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