Dataset Expocode	**316420170930**
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Dataset	**Funding Info:** NOAA **Initial Submission (yyyymmdd):** 01/11/2020 **Revised Submission (yyyymmdd):**
Campaign/Cruise	**Expocode:** 316420170930 **Campaign/Cruise Name:** **Campaign/Cruise Info:** **Platform Type:** **CO2 Instrument Type:** **Survey Type:** Moored Buoy **Vessel Name:** **Vessel Owner:** **Vessel Code:** WA_1
Coverage	**Start Date (yyyymmdd):** 20170930 **End Date (yyyymmdd):** 20171119 **Westernmost Longitude:** 124.747 W **Easternmost Longitude:** 124.747 W **Northernmost Latitude:** 47.355 N **Southernmost Latitude:** 47.355 N
Variable	**Name:** Date Time **Unit:** **Description:** Date and Time (UTC)
Variable	**Name:** xCO2 SW (wet) **Unit:** **Description:** (umol/mol) Mole fraction of CO2 in air in equilibrium with the seawater at sea surface temperature and measured humidity.
Variable	**Name:** CO2 SW QF **Unit:** **Description:** Flag for xCO2 sw (wet)
Variable	**Name:** H2O SW **Unit:** **Description:** (mmol/mol) Mole fraction of H2O in air from equilibrator.
Variable	**Name:** xCO2 Air (wet) **Unit:** **Description:** umol/mol) Mole fraction of CO2 in air from airblock, 4 feet above the sea surface at measured humidity.
Variable	**Name:** CO2 Air QF

Unit:
Description: Quality Flag for xCO2 Air (wet)

Variable **Name:** H2O Air
Unit:
Description: (mmol/mol) Mole fraction of H2O in air from airblock, 4 feet above the sea surface.

Variable **Name:** Licor Atm Pressure
Unit:
Description: (hPa) Atmospheric pressure at the airblock, 4 feet above the sea surface.

Variable **Name:** Licor Temp
Unit:
Description: (C) Temperature of the Infrared Licor 820 in degrees Celsius.

Variable **Name:** MAPCO2 %O2
Unit:
Description: 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.

Variable **Name:** SST
Unit:
Description: (C) Sea Surface Temperature.

Variable **Name:** Salinity
Unit:
Description: (PSU) Sea Surface Salinity.

Variable **Name:** xCO2 SW (dry)
Unit:
Description: (umol/mol) Mole fraction of CO2 in air in equilibrium with the seawater at sea surface temperature (dry air).

Variable **Name:** xCO2 Air (dry)
Unit:
Description: (umol/mol) Mole fraction of CO2 in air at the airblock, 4 feet above the sea surface (dry air).

Variable **Name:** fCO2 SW (sat)
Unit:
Description: (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.

Variable **Name:** fCO2 Air (sat)
Unit:
Description: (uatm) Fugacity of CO2 in air at the airblock, 4 feet above the sea surface (100% humidity).

Variable **Name:** dfCO2
Unit:

	Description: Difference of the fugacity of the CO2 in seawater and the fugacity of the CO2 in air (fCO2 SW - fCO2 Air).
Variable	**Name:** pCO2 SW (wet) **Unit:** **Description:** (uatm) Partial Pressure of CO2 in air in equilibrium with the seawater at sea surface temperature (100% humidity)
Variable	**Name:** pCO2 Air (wet) **Unit:** **Description:** (uatm) Partial Pressure of CO2 in air at the airblock, 4 feet above the sea surface (100% humidity).
Variable	**Name:** dpCO2 **Unit:** **Description:** Difference of the partial pressure of CO2 in seawater and air (pCO2 SW - pCO2 Air
Variable	**Name:** pH SW **Unit:** **Description:** pH of Seawater (total scale)
Variable	**Name:** pH QF **Unit:** **Description:** Quality Flag for pH
Sea Surface Temperature	**Location:** 1m **Manufacturer:** SeaBird **Model:** SBE 37 **Accuracy:** < 0.01 (°C if units not given) **Precision:** (°C if units not given) **Calibration:** ~ Annually by SeaBird **Comments:** Temperature data are internally recorded and collected during the equilibration period. Data are not post-calibrated. Annual drift for this deployment was minimal and does not impact the fCO2 and pCO2 calculations (within the degree of accuracy of the CO2 measurement). Contact us if you would like the CTD post-calibration information.
Sea Surface Salinity	**Location:** 1m **Manufacturer:** SeaBird **Model:** SBE 37 **Accuracy:** < 0.05 **Precision:** **Calibration:** ~ Annually by SeaBird **Comments:** Conductivity data are internally recorded and collected during the equilibration period. Data are not post-calibrated. Annual drift for this deployment was minimal and does not impact the fCO2 and pCO2 calculations (within the degree of accuracy of the CO2 measurement). Contact us if you would like the CTD post-calibration information.
Atmospheric Pressure	**Location:** **Normalized to Sea Level:** **Manufacturer:** **Model:** **Accuracy:** (hPa if units not given) **Precision:** (hPa if units not given) **Calibration:**

Comments:

Atmospheric CO2

Measured/Frequency: yes, 3hr cycle
Intake Location: unused
Drying Method: unused
Atmospheric CO2 Accuracy: 1 uatm
Atmospheric CO2 Precision: 0.6 uatm

Aqueous CO2 Equilibrator Design

System Manufacturer:
Intake Depth: 14cm - 20cm
Intake Location:
Equilibration Type: Bubble Equilibrator
Equilibrator Volume (L): N/A
Headspace Gas Flow Rate (ml/min): ~600 cc/min
Equilibrator Water Flow Rate (L/min): N/A
Equilibrator Vented: Yes
Equilibration Comments:
Drying Method:

Aqueous CO2 Sensor Details

Measurement Method: Absolute, non-dispersive infrared (NDIR) gas analyzer
Method details:
Manufacturer: Licor
Model: LI-820
Measured CO2 Values:
Measurement Frequency: 3hr cycle
Aqueous CO2 Accuracy: 2 uatm
Aqueous CO2 Precision: 0.7 uatm
Sensor Calibrations:
Calibration of Calibration Gases: 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, 457.43 umol/mol, from ESRL. ESRL standards are traceable to WMO x93 scale with a stated reproducibility of 0.06 micromole/mole. For more information on estimates of accuracy and precision of the MAPCO2 system, see Sutton et al. 2014 (reference below).
Number Non-Zero Gas Standards:
Calibration Gases:
NOAA Earth System Research& #xD;Laboratory (ESRL)
Comparison to Other CO2 Analyses:
Comments:
Method Reference:
Sutton, A.J., Sabine, C.L., Maenner-Jones, S., Lawrence-Slavas, N., Meinig, C., Feely, R.A., Mathis, J.T., Musielewicz, S., Bott, R., McLain, P.D., Fought, J., Kozyr, A., 2014b. A high-frequency atmospheric and seawater pCO2 data set from 14 open ocean sites using a moored autonomous system. Earth Sys. Sci. Data, 6, doi: 10.5194/essd-6-353-2014, 353-366.

Equilibrator Temperature Sensor

Location:
Manufacturer:
Model:
Accuracy: (°C if units not given)
Precision: (°C if units not given)
Calibration:

	Comments:
Equilibrator Pressure Sensor	**Location:** **Manufacturer:** **Model:** **Accuracy:** (hPa if units not given) **Precision:** (hPa if units not given) **Calibration:** **Comments:**
Other Sensor	**Description:** **Manufacturer:** Maxtec Oxygen Sensor **Model:** Max-250 **Accuracy:** 2.0% Full Scale over operating temperature range. 1.0% Full Scale @ constant temperature and pressure **Precision:** **Calibration:** Factory calibrated before purchase. Recalibrated to sea level atmospheric air every 7 days **Comments:**
Other Sensor	**Description:** **Manufacturer:** Sensirion Humidity Sensor **Model:** SHT71 **Accuracy:** > 0.01% **Precision:** **Calibration:** Factory calibrated before purchase. **Comments:**
Additional Information	**Suggested QC flag from Data Provider:** **Additional Comments:** o All measurements are at sea surface temperature and atmospheric pressure. o 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. o 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. o 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. o 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. o 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. o As part of the QC process, each data set is compared with the Marine Boundary Layer (MBL) data from GlobalView-CO2.As part of the QC process, xCO2 air measurements are compared to the following data sets when available: previous MAPCO2 deployment if overlap on recovery/deployment, following MAPCO2 deployment if overlap on recovery/deployment, and Marine Boundary Layer (MBL) xCO2 air data from GlobalView-CO2. The available comparison data sets are in good agreement with the MAPCO2 air data and no adjustment was made. 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 o 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 system has Licor pressure bias of +0.300 applied. Averaged wet xCO2 measurements are post-calibrated using a simple linear regression between original averaged measurements and span coefficients, a method similar to the post-cal established by the underway pCO2 community as described here: Feely, R.A., R. Wanninkhof, H.B. Milburn, C.E. Cosca, M. Stapp, and P.P. Murphy, A new automated underway system for making high precision pCO2 measurements onboard research ships, Analytica Chim. Acta, 377, 185-191, 1998. Post calculation correlation between Licor temperature and coefficient is: Licor coef = -0.001887 * Temp + 0.8379 r^2 = 0.94 o No data = -999 o These data are made freely available to the public and the scientific community in the belief that their wide dissemination will lead to greater understanding and new scientific insights. The availability of these data does not constitute publication of the data. We rely on the ethics and integrity of the user to assure that PMEL receives fair credit for our work. Please send manuscripts using this data to PMEL for review before they are submitted for publication so we can insure that the quality and limitations of the data are accurately represented.

Citation for this Dataset:

Sutton, A., C. Sabine, S. Maenner, S. Musielewicz, R. Bott, and J. Osborne. 2017. High-resolution ocean and atmosphere pCO2 time-series measurements from mooring WA_125W_47N.

Other References for this Dataset:

None