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    - o **Email:** chris.sabine@noaa.gov
- **Dataset_Info**:*
    - o Dataset_ID*: Papa_145W_50N_Jun2007_Jun2008
    - o **Submission_Dates**:*
        - Initial_Submission: 20100929 (YYYYMMDD)
        - Revised_Submission: (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: -144.83 (+ = E, - = W)
                    or Degrees, Minutes, Seconds:
                    - Northernmost_Latitude:
                    Enter decimal fractions of degrees:+50.12 (+ = E, - = W)
                    - Southernmost_Latitude:
                    Enter decimal fractions of degrees:
            - **Temporal_Coverage**:
                - Start_Date: 20070608 (YYYYMMDD)
                - End_Date: 20080610 (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/Papa. 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/Papa advises to check the Papa site at the time of use for the most accurate data available.

- Salinity - Sea Surface Salinity collected by NOAA/PMEL/Papa. Papa 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. NOAA/PMEL/Papa advises to check the Papa 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, 419.61 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 data from this deployment, June 2007 to June 2008, were -1.7 ± 1.5 umol/mol on average of the MBL data and therefore no correction was applied.

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. We have not yet run this test on this system.

- No data = -9.999 or -999

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

- Citation: (How to cite this data set)   Sabine, C. 2008. High-resolution ocean and atmosphere pCO2 time-series measurements from mooring Papa.
- **Data_Set_Link**:
    o   URL*: http://www.pmel.noaa.gov/co2/moorings/papa/papa_main.htm

    o   Label*:PMEL CO2 Group - Papa 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
6/26/2007 0:16 xCO2_SW   394.6370581   3   CO2 data submitted was adjusted by + 2 ppm b/c span calibration was off as predicted by change in Licor temperature
6/26/2007 0:16 xCO2_Air   383.3538262   3   CO2 data submitted was adjusted by + 2 ppm b/c span calibration was off as predicted by change in Licor temperature
6/26/2007 12:16   xCO2_SW   382.4640124   3   CO2 data submitted was adjusted by - 2 ppm b/c span calibration was off as predicted by change in Licor temperature
6/26/2007 12:16   xCO2_Air   383.1516734   3   CO2 data submitted was adjusted by - 2 ppm b/c span calibration was off as predicted by change in Licor temperature
6/27/2007 0:16 xCO2_SW   383.8241538   3   CO2 data submitted was adjusted by - 3 ppm b/c span calibration was off as predicted by change in Licor temperature
6/27/2007 0:16 xCO2_Air   382.9004392   3   CO2 data submitted was adjusted by - 3 ppm b/c span calibration was off as predicted by change in Licor temperature
6/29/2007 3:16 xCO2_SW   381.6233404   3   CO2 data submitted was adjusted by + 3 ppm b/c span calibration was off as predicted by change in Licor temperature
6/29/2007 3:16 xCO2_Air   382.6431248   3   CO2 data submitted was adjusted by + 3 ppm b/c span calibration was off as predicted by change in Licor temperature
6/30/2007 18:16   xCO2_SW   382.3810126   3   CO2 data submitted was adjusted by + 2 ppm b/c span calibration was off as predicted by change in Licor temperature

Date/Time	Variable	Value	Flag	Comment
6/30/2007 18:16	xCO2_Air	382.1084206	3	CO2 data submitted was adjusted by + 2 ppm b/c span calibration was off as predicted by change in Licor temperature
9/19/2007 0:16	xCO2_SW	370.5687278	4	high StDev in CO2sw measurement
9/30/2007 9:16	xCO2_SW	386.5728797	3	likely bad CO2 sw due to change in equil pump pressure
10/1/2007 9:16	xCO2_SW	408.5052739	4	bad CO2 sw due to change in equil pump pressure
10/15/2007 6:16	xCO2_Air	375.3793911	4	bad CO2air measurement - high std dev
10/17/2007 6:16	xCO2_SW	381.6635729	3	likely bad CO2 sw due to change in equil pump pressure
10/23/2007 15:16	xCO2_SW	351.1700053	4	high StDev in CO2sw measurement
10/25/2007 18:16	xCO2_SW	376.792487	4	bad CO2 sw due to change in equil pump pressure
10/30/2007 3:16	xCO2_SW	397.2046235	4	bad CO2 sw due to change in equil pump pressure
11/1/2007 21:16	xCO2_SW	367.7372089	4	bad CO2 sw due to change in equil pump pressure
11/15/2007 21:16	xCO2_SW	377.2377395	3	likely bad CO2 sw due to change in equil pump pressure
11/16/2007 0:16	xCO2_SW	380.2694059	3	likely bad CO2 sw due to change in equil pump pressure
11/16/2007 3:16	xCO2_SW	386.2289771	3	likely bad CO2 sw due to change in equil pump pressure
11/16/2007 6:16	xCO2_SW	383.2180863	3	likely bad CO2 sw due to change in equil pump pressure
11/16/2007 9:16	xCO2_SW	384.7297649	4	high StDev in CO2sw measurement
11/16/2007 12:16	xCO2_SW	372.3136437	3	likely bad CO2 sw due to change in equil pump pressure
11/16/2007 15:16	xCO2_SW	396.927538	4	bad CO2 sw due to change in equil pump pressure
11/20/2007 15:16	xCO2_SW	367.1173079	3	CO2 data submitted was adjusted by + 3 ppm b/c span calibration was off as predicted by change in Licor temperature
11/20/2007 15:16	xCO2_Air	384.637022	3	CO2 data submitted was adjusted by + 3 ppm b/c span calibration was off as predicted by change in Licor temperature
11/22/2007 6:16	xCO2_SW	381.0466603	4	bad CO2 sw due to change in equil pump pressure
11/22/2007 12:16	xCO2_SW	395.9840073	4	bad CO2 sw due to change in equil pump pressure
11/22/2007 18:16	xCO2_SW	367.6877352	3	CO2 data submitted was adjusted by - 2 ppm b/c span calibration was off as predicted by change in Licor temperature
11/22/2007 18:16	xCO2_Air	383.0888146	3	CO2 data submitted was adjusted by - 2 ppm b/c span calibration was off as predicted by change in Licor temperature
11/25/2007 12:16	xCO2_SW	386.1616077	4	bad CO2 sw due to change in equil pump pressure
11/25/2007 18:16	xCO2_SW	386.6366155	4	bad CO2 sw due to change in equil pump pressure
12/14/2007 12:16	xCO2_SW	388.4987337	3	likely bad CO2 sw due to change in equil pump pressure
12/14/2007 15:16	xCO2_SW	399.4232324	4	bad CO2 sw due to change in equil pump pressure
12/14/2007 18:16	xCO2_SW	386.5698298	4	likely bad CO2 sw due to change in equil pump pressure
12/16/2007 15:16	xCO2_SW	386.419612	4	bad CO2 sw due to change in equil pump pressure
12/23/2007 0:16	xCO2_SW	385.8527422	3	likely bad CO2 sw due to change in equil pump pressure
12/23/2007 3:16	xCO2_SW	389.4934776	3	likely bad CO2 sw due to change in equil pump pressure
12/23/2007 6:16	xCO2_SW	390.6041295	3	likely bad CO2 sw due to change in equil pump pressure

Date/Time	Variable	Value	Flag	Comment
12/23/2007 9:16	xCO2_SW	400.2099583	4	high StDev in CO2sw measurement
12/23/2007 21:16	xCO2_SW	393.2752337	4	high StDev in CO2sw measurement
12/25/2007 15:16	xCO2_SW	369.959728	4	high StDev in CO2sw measurement
12/25/2007 21:16	xCO2_SW	379.6186909	3	likely bad CO2 sw due to change in equil pump pressure
12/29/2007 15:16	xCO2_SW	393.8291841	4	bad CO2 sw due to change in equil pump pressure
12/29/2007 18:16	xCO2_SW	382.2823322	3	likely bad CO2 sw due to change in equil pump pressure
12/31/2007 9:16	xCO2_SW	390.1334489	3	likely bad CO2 sw due to change in equil pump pressure
12/31/2007 12:16	xCO2_SW	399.1630684	3	likely bad CO2 sw due to change in equil pump pressure
1/5/2008 0:16	xCO2_SW	401.6465021	3	likely bad CO2 sw due to change in equil pump pressure
1/5/2008 18:16	xCO2_SW	401.8472244	3	likely bad CO2 sw due to change in equil pump pressure
1/6/2008 12:16	xCO2_SW	395.42151	3	likely bad CO2 sw due to change in equil pump pressure
1/8/2008 9:16	xCO2_SW	396.4968367	4	high StDev in CO2sw measurement
1/9/2008 18:16	xCO2_SW	393.1261567	3	likely bad CO2 sw due to change in equil pump pressure
1/15/2008 21:16	xCO2_SW	380.2884113	3	likely bad CO2 sw due to change in equil pump pressure
1/24/2008 12:16	xCO2_SW	388.8562119	3	likely bad CO2 sw due to change in equil pump pressure
1/28/2008 18:16	xCO2_SW	389.1664138	3	likely bad CO2 sw due to change in equil pump pressure
1/28/2008 21:16	xCO2_SW	391.8788766	3	likely bad CO2 sw due to change in equil pump pressure
1/29/2008 0:16	xCO2_SW	393.9241251	3	likely bad CO2 sw due to change in equil pump pressure
1/30/2008 15:16	xCO2_SW	393.2865878	3	likely bad CO2 sw due to change in equil pump pressure
1/30/2008 18:16	xCO2_SW	405.8975094	3	likely bad CO2 sw due to change in equil pump pressure
1/30/2008 21:16	xCO2_SW	411.8528178	3	likely bad CO2 sw due to change in equil pump pressure
1/31/2008 0:16	xCO2_SW	394.5716892	3	likely bad CO2 sw due to change in equil pump pressure
1/31/2008 3:16	xCO2_SW	398.3291018	3	likely bad CO2 sw due to change in equil pump pressure
2/4/2008 12:16	xCO2_SW	406.8788929	3	likely bad CO2 sw due to change in equil pump pressure
2/9/2008 12:16	xCO2_SW	408.2923514	3	likely bad CO2 sw due to change in equil pump pressure
2/17/2008 6:16	xCO2_SW	400.9693664	4	high StDev in CO2sw measurement
2/17/2008 9:16	xCO2_SW	408.423784	3	likely bad CO2 sw due to change in equil pump pressure
2/17/2008 15:16	xCO2_SW	393.3834244	3	CO2 data submitted was adjusted by - 2 ppm b/c span calibration was off as predicted by change in Licor temperature
2/17/2008 15:16	xCO2_Air	386.0105307	3	CO2 data submitted was adjusted by - 2 ppm b/c span calibration was off as predicted by change in Licor temperature
2/19/2008 12:16	xCO2_SW	417.8630608	3	likely bad CO2 sw due to change in equil pump pressure
2/26/2008 18:16	xCO2_SW	409.7799249	3	likely bad CO2 sw due to change in equil pump pressure
2/26/2008 21:16	xCO2_SW	408.1459758	4	high StDev in CO2sw measurement
2/27/2008 0:16	xCO2_SW	406.046938	3	likely bad CO2 sw due to change in equil pump pressure
2/27/2008 3:16	xCO2_SW	398.8974955	3	likely bad CO2 sw due to change in equil pump pressure
3/8/2008 12:16	xCO2_SW	420.4697766	4	bad CO2 sw due to change in equil pump pressure
3/8/2008 21:16	xCO2_Air	382.4014328	4	high StDev in CO2air measurement
3/23/2008 9:16	xCO2_SW	410.177745	4	bad CO2 sw due to change in equil pump pressure
3/30/2008 6:16	xCO2_SW	373.572767	4	high StDev in CO2sw measurement
4/3/2008 3:16	xCO2_SW	370.3748937	4	high StDev in CO2sw measurement
4/12/2008 12:16	xCO2_SW	413.736699	3	likely bad CO2 sw due to change in equil pump pressure

4/12/2008 15:16	xCO2_SW	398.9877556	3	likely bad CO2 sw due to change in equil pump pressure

4/12/2008 18:16	xCO2_SW	419.2939807	4	high StDev in CO2sw measurement

4/25/2008 15:16	xCO2_SW	391.7118677	3	CO2 data submitted was adjusted by - 2 ppm b/c span calibration was off as predicted by change in Licor temperature

4/25/2008 15:16	xCO2_Air	390.1336759	3	CO2 data submitted was adjusted by - 2 ppm b/c span calibration was off as predicted by change in Licor temperature

4/27/2008 3:16	xCO2_SW	407.6579317	3	likely bad CO2 sw due to change in equil pump pressure

4/27/2008 18:16	xCO2_SW	418.3675839	4	bad CO2 sw due to change in equil pump pressure

4/28/2008 21:16	xCO2_SW	402.239885	4	bad CO2 sw due to change in equil pump pressure

5/7/2008 9:16	xCO2_SW	388.4985256	3	CO2 data submitted was adjusted by - 2 ppm b/c span calibration was off as predicted by change in Licor temperature

5/7/2008 9:16	xCO2_Air	391.6462722	3	CO2 data submitted was adjusted by - 2 ppm b/c span calibration was off as predicted by change in Licor temperature

5/11/2008 21:16	xCO2_SW	413.3841282	3	likely bad CO2 sw due to change in equil pump pressure

5/14/2008 0:16	xCO2_SW	406.5397441	3	likely bad CO2 sw due to change in equil pump pressure

5/14/2008 3:16	xCO2_SW	399.5852296	3	likely bad CO2 sw due to change in equil pump pressure

5/14/2008 6:16	xCO2_SW	400.1214173	3	likely bad CO2 sw due to change in equil pump pressure

5/14/2008 9:16	xCO2_SW	401.5976644	3	likely bad CO2 sw due to change in equil pump pressure

5/14/2008 12:16	xCO2_SW	403.8975467	3	likely bad CO2 sw due to change in equil pump pressure

5/14/2008 15:16	xCO2_SW	434.2340463	3	likely bad CO2 sw due to change in equil pump pressure

5/14/2008 18:16	xCO2_SW	419.4982008	4	high StDev in CO2sw measurement

5/14/2008 21:16	xCO2_SW	423.9651725	3	likely bad CO2 sw due to change in equil pump pressure

5/21/2008 18:16	xCO2_SW	374.263056	3	CO2 data submitted was adjusted by + 2 ppm b/c span calibration was off as predicted by change in Licor temperature

5/21/2008 18:16	xCO2_Air	388.7427743	3	CO2 data submitted was adjusted by + 2 ppm b/c span calibration was off as predicted by change in Licor temperature

5/29/2008 21:16	xCO2_SW	388.0612875	3	likely bad CO2 sw due to change in equil pump pressure

5/30/2008 0:16	xCO2_SW	404.5044049	3	likely bad CO2 sw due to change in equil pump pressure

5/30/2008 3:16	xCO2_SW	400.9274945	3	likely bad CO2 sw due to change in equil pump pressure

5/30/2008 6:16	xCO2_SW	394.1690813	3	likely bad CO2 sw due to change in equil pump pressure

5/30/2008 9:16	xCO2_SW	386.9148575	3	likely bad CO2 sw due to change in equil pump pressure

6/9/2008 21:16	xCO2_SW	410.3250414	3	likely bad CO2 sw due to change in equil pump pressure

6/10/2008 0:16	xCO2_SW	414.4651284	3	likely bad CO2 sw due to change in equil pump pressure

6/10/2008 3:16	xCO2_SW	410.5249688	3	likely bad CO2 sw due to change in equil pump pressure