

<b>Dataset Expocode</b>	<b>33LG20201201</b>
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<b>Dataset</b>	<b>Funding Info:</b> NSF PLR-1543457 <b>Initial Submission (yyyymmdd):</b> 20210119 <b>Revised Submission (yyyymmdd):</b>
<b>Campaign/Cruise</b>	<b>Expocode:</b> 33LG20201201 <b>Campaign/Cruise Name:</b> LMG2010 <b>Campaign/Cruise Info:</b> VOS_LMG Cruises <b>Platform Type:</b> <b>CO2 Instrument Type:</b> <b>Survey Type:</b> VOS Lines <b>Vessel Name:</b> ARSV Laurence M. Gould <b>Vessel Owner:</b> Edison Chouest Offshore, Inc. <b>Vessel Code:</b> 33LG
<b>Coverage</b>	<b>Start Date (yyyymmdd):</b> 20201201 <b>End Date (yyyymmdd):</b> <b>Westernmost Longitude:</b> E <b>Easternmost Longitude:</b> E <b>Northernmost Latitude:</b> N <b>Southernmost Latitude:</b> N

**Port of Call:** Punta Arenas, Chile

**Variable**

**Name:** XCO2\_EQ

**Unit:**

**Description:** UMOL/MOL

**Variable**

**Name:** XH2O

**Unit:**

**Description:** UMOL/MOL

**Variable**

**Name:** EQ\_PRE

**Unit:**

**Description:** HPA

**Variable**

**Name:** EQ\_TMP

**Unit:**

**Description:** DEG\_C

**Variable**

**Name:** ATM\_PRE

**Unit:**

**Description:** HPA

**Variable**

**Name:** SST

**Unit:**

**Description:** DEG\_C

**Variable**

**Name:** SSS

**Unit:**

**Description:** PSS

**Variable**

**Name:** XCO2\_AIR\_INT

**Unit:**

**Description:** UMOL/MOL

**Variable**

**Name:** FCO2\_WAT\_SST

**Unit:**

**Description:** UATM

**Variable**

**Name:** PCO2\_WAT\_SST

**Unit:**

**Description:** UATM

**Variable**

**Name:** XCO2\_WAT\_SST

**Unit:**

**Description:** UMOL/MOL

**Sea Surface  
Temperature**

**Location:** Located within a few meters of the seawater intake, five meters below sea level

**Manufacturer:** Sea-Bird Electronics

**Model:** SBE-38

**Accuracy:** +/- 0.001 DEG\_C (°C if units not given)

**Precision:** +/- 0.00025 DEG\_C (°C if units not given)

**Calibration:** Factory calibration

**Comments:**

**Sea Surface Salinity**

**Location:** Located in the aft wetlab, within several meters of the equilibrator

**Manufacturer:** Sea-Bird Electronics

**Model:** SBE-45

**Accuracy:** +/- 0.005 per mil

**Precision:** +/- 0.0002 per mil

**Calibration:** Factory calibration  
**Comments:** An additional SBE-45 is located just downstream of the SSS sensor in the aft wetlab, see below

**Atmospheric Pressure**

**Location:** On science mast, located mid-ship  
**Normalized to Sea Level:** yes  
**Manufacturer:** R.M. Young Company  
**Model:** 61201  
**Accuracy:** +/- 2.0 hPa (hPa if units not given)  
**Precision:** (hPa if units not given)  
**Calibration:** Factory calibration  
**Comments:**

**Atmospheric CO2**

**Measured/Frequency:** Yes six measurements every two hours  
**Intake Location:** Bow mast ten meters above sea level  
**Drying Method:**  
**Atmospheric CO2 Accuracy:**  
**Atmospheric CO2 Precision:**

**Aqueous CO2 Equilibrator Design**

**System Manufacturer:**  
**Intake Depth:** 5  
**Intake Location:**  
**Equilibration Type:**  
**Equilibrator Volume (L):** 30  
**Headspace Gas Flow Rate (ml/min):** 60  
**Equilibrator Water Flow Rate (L/min):** 12  
**Equilibrator Vented:** Yes  
**Equilibration Comments:**  
**Drying Method:** Gas stream passes through a Perma Pure (Nafion) dryer with a 2:1 nitrogen to sample countercurrent flow

**Aqueous CO2 Sensor Details**

**Measurement Method:** Infrared analysis on dry gas  
**Method details:**  
**Manufacturer:** LI-COR  
**Model:** 6251  
**Measured CO2 Values:**  
**Measurement Frequency:** Every 165 seconds, except during calibration routines  
**Aqueous CO2 Accuracy:** +/- 1.5 UATM  
**Aqueous CO2 Precision:**  
**Sensor Calibrations:**  
**Calibration of Calibration Gases:** The analyzer is calibrated every two hours using standards directly traceable to the WMO scale  
**Number Non-Zero Gas Standards:**  
**Calibration Gases:**  
NOAA Global Monitoring Laboratory  
CO2 mixing ratios shown are on the WMO X2007 scale  
Std. (1) CB10969, 113.33 ppm, 07 April 2015  
Std. (2) CB08811, 408.58 ppm, 07 April 2017  
Std. (3) CB11622, 254.49 ppm, 30 March 2017  
Std. (4) CC302488, 499.95 ppm, 21 April 2015  
Std. (5) CC71566, 386.72 ppm, 11 April 2017  
**Comparison to Other CO2 Analyses:**  
**Comments:**  
**Method Reference:**

CO2 Group, Lamont-Doherty Earth Observatory (1999), pCO2 Equilibrator Users Manual. LDEO of Columbia University, Palisades, NY, pp. 10.

Bates, N.R., T. Takahashi, D.W. Chipman, and A.H. Knapp (1998), Variability of pCO2 on diel to seasonal time scales in the Sargasso Sea. *Journal of Geophysical Research*, 103, 15,567-15,585.

Takahashi, T., J. Olafsson, J. Goddard, D.W. Chipman, and S.C. Sutherland (1993), Seasonal variation of CO2 and nutrients in the high-latitude surface oceans: A comparative study. *Global Biogeochemical Cycles*, 7, 843-878.

**Equilibrator**

**Temperature Sensor**

**Location:** Inserted into the equilibrator ~20 cm below the water level

**Manufacturer:** Sea-Bird Electronics

**Model:** SBE-38

**Accuracy:** +/- 0.001 DEG\_C (°C if units not given)

**Precision:** +/- 0.00025 DEG\_C (°C if units not given)

**Calibration:** Factory calibration

**Comments:**

**Equilibrator**

**Pressure Sensor**

**Location:** Next to the analyzer, within several meters of the equilibrator

**Manufacturer:** Setra

**Model:** 270

**Accuracy:** +/- 0.3 hPa (hPa if units not given)

**Precision:** +/- 0.1 hPa (hPa if units not given)

**Calibration:** Factory calibration

**Comments:**

**Other Sensor**

**Description:**

**Manufacturer:** Sea-Bird Electronics

**Model:** SBE-45

**Accuracy:** +/- 0.005 per mil

**Precision:**

**Calibration:** Factory calibration

**Comments:**

**Additional**

**Information**

**Suggested QC flag from Data Provider:** NA

**Additional Comments:**

**Citation for this Dataset:**

Sweeney, C., T. Newberger, S.C. Sutherland, and D.R. Munro. 2021. NOAA Reprocessing of Underway pCO2 Measurements in Surface Waters and the Atmosphere During the R/V Laurence M. Gould 2020 Expeditions.

**Other References for this Dataset:**

Munro, D.R., N.S. Lovenduski, T. Takahashi, B.B. Stephens, T. Newberger, and C. Sweeney (2015), Recent evidence for a strengthening CO2 sink in the Southern Ocean from carbonate system measurements in the Drake Passage (2002-2015). *Geophysical Research Letters*, 42, p. 7623-7630, doi:10.1002/2015GL065194.

Munro, D.R., N.S. Lovenduski, B.B. Stephens, T. Newberger, K.R. Arrigo, T. Takahashi, P.D. Quay, J. Sprintall, N.M. Freeman, and C. Sweeney (2015), Estimates of net community production in the Southern Ocean determined from time series observations (2002-2011) of nutrients, dissolved inorganic carbon, and surface ocean pCO2 in Drake Passage. *Deep Sea Research Part II: Topical Studies in Oceanography*, 114, p. 49-63, doi:10.1016/j.dsr2.2014.12.014.