

Dataset Expocode	33LG20200216
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Dataset	Funding Info: NSF PLR-1543457 Initial Submission (yyyymmdd): 20210119 Revised Submission (yyyymmdd):
Campaign/Cruise	Expocode: 33LG20200216 Campaign/Cruise Name: LMG2002 Campaign/Cruise Info: VOS_LMG Cruises Platform Type: CO2 Instrument Type: Survey Type: VOS Lines Vessel Name: ARSV Laurence M. Gould Vessel Owner: Edison Chouest Offshore, Inc. Vessel Code: 33LG
Coverage	Start Date (yyyymmdd): 20200216 End Date (yyyymmdd): Westernmost Longitude: E Easternmost Longitude: E Northernmost Latitude: N Southernmost Latitude: 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.