

Dataset Expocode	PWCS20141022
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Dataset	Funding Info: Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) Physical and biogeochemical processes controlling carbon exchanges at the air-sea interface and ocean acidification in the South Atlantic continental shelf and slope 445506/2014-8 Fundação de Amparo à pesquisa do Estado do RS (FAPERGS) Physical and biogeochemical processes controlling carbon exchanges at the air-sea interface and ocean acidification in the South Atlantic continental shelf and slope 2075-2551/13-7 Fundação Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) Estudos avançados em oceanografia de médias e altas latitudes 23038.001421/2014-30
Campaign/Cruise	Expocode: PWCS20141022 Campaign/Cruise Name: Campaign/Cruise Info: Platform Type: repeat hydrography (vessel) CO2 Instrument Type: LICOR - LI 7000 CO2/H2O gas analyzer (NDIR) Survey Type: Vessel Name: Cruzeiro do Sul Vessel Owner: Marinha do Brasil Vessel Code: PWCS
Coverage	Start Date (yyyymmdd): 2014-10-22 End Date (yyyymmdd): 2014-10-30 Westernmost Longitude: 51.2781 W Easternmost Longitude: 41.8917 W Northernmost Latitude: 23.4857 S Southernmost Latitude: 33.0595 S Port of Call:
Variable	Name: pCO2_water Description: Sea water partial pressure of carbon dioxide Unit: µatm Uncertainty: ± 0.1 µatm for atmospheric pCO2 and ± 2 µatm for seawater pCO2
Variable	Name: pCO2_atm Description: Atmospheric partial pressure of carbon dioxide Unit: µatm

Uncertainty:**Variable****Name:** fCO₂_water**Description:** Sea water fugacity of carbon dioxide**Unit:** μatm **Uncertainty:****Variable****Name:** xCO₂_water**Description:** Sea water CO₂ mole fraction**Unit:** $\mu\text{mol/mol}$ **Uncertainty:****Variable****Name:** SST**Description:** Sea surface temperature**Unit:** Celsius**Uncertainty:** ± 0.0015 deg C**Variable****Name:** SSS**Description:** Sea surface salinity**Unit:** PSU**Uncertainty:** ± 0.0015 mS/cm (conductivity for seawater)**Sea Surface
Temperature****Name:** SST**Description:** Sea surface temperature**Unit:** Celsius**Uncertainty:** ± 0.0015 deg C**Sampling Instrument:** CTD Flow-through**Sensor:** Idronaut® Multiparameter Sensor Module model 314–7**Uncertainty:** ± 0.0015 deg C**Calibration:****Comments:****Sea Surface Salinity****Name:** SSS**Description:** Sea surface salinity**Unit:** PSU**Uncertainty:** ± 0.0015 mS/cm (conductivity for seawater)**Sampling Instrument:** CTD Flow-through**Sensor:** Idronaut® Multiparameter Sensor Module model 314–7**Uncertainty:** ± 0.0015 mS/cm (conductivity for seawater)**Calibration:****Normalized to Sea Level:** N/A**Comments:****Sea Surface
Pressure****Name:** pCO₂_atm**Description:** Atmospheric partial pressure of carbon dioxide**Unit:** μatm **Uncertainty:****Sensor:****Uncertainty:****Calibration:****Normalized to Sea Level:** N/A**Comments:****CO₂ Information****Location of Seawater Intake:** Moon pool**Depth of Seawater Intake:** 5

Sampling Instrument: General Oceanics Model 8050 Automated Flowing pCO₂ Measuring System

Analyzing Instrument: LICOR - LI 7000 CO₂/H₂O gas analyzer (NDIR)

Additional Information: The seawater flows through a chamber (the equilibrator) where the CO₂ contained in the water equilibrates with the gas present in the chamber (the headspace gas). To determine the CO₂ in this headspace gas, it is pumped through a non-dispersive infrared analyzer, which measures its CO₂ mole fraction (xCO₂) instantaneously, and then returned to the equilibrator thus forming a closed loop. Pierrot et al (2009); Automated Flowing pCO₂ Measuring System Instruction Manual, General Oceanics Inc. (2007).

Method Description: **Reference:** Pierrot, D., Neill, C., Sullivan, K., Castle, R., Wanninkhof, R., Lüger, H., Cosca, C.E. (2009). Recommendations for autonomous underway pCO₂ measuring systems and data-reduction routines. Deep Sea Research Part II: Topical Studies in Oceanography, 56(8-10), 512-522.

Changes from SOP:

pCO₂ Calculation Method: Weiss, R. F. and B. A. Price (1980). "Nitrous oxide solubility in water and seawater." Marine Chemistry 8: 347–359.

fCO₂ Calculation Method: Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.) 2007. Guide to Best Practices for Ocean CO₂ Measurements. PICES Special Publication 3, 191 pp. (Ocean Data View ver. 5.8.2 subroutine).

Gas Drying Method: scrubber tube with Ascarite II (LICOR: : Li-7000 manual + guide: Using CO₂ and H₂O Scrubbers with LI-COR Gas Analyzer)

Water Vapor Correction: scrubber tube with Magnesium perchlorate (LICOR: Li-7000 manual + guide: Using CO₂ and H₂O Scrubbers with LI-COR Gas Analyzer)

Temperature Correction: Corrected to SST based on the temperature dependence (Takahashi et al., 1993)

CO₂ Report Temperature: The temperature inside the equilibrator

Equilibrator: **Type:** Spray-type

Volume: 3

Vented: true

Water Flow Rate: 2 L/min

Gas Flow Rate: 0.1 L/min

Temp Measurement: Measured with a Hart Scientific 1522 Thermometer

Temp Sensor Calibration: "Calibrate Sensors.exe" program using polynomial equations

Pressure Measurement: Measured with Setra ASL pressure transducer

Pressure Sensor Calibration: "Calibrate Sensors.exe" program using polynomial equations

Total Pressure: **Method:** Pressure difference between the equilibrator air and the surrounding air
Uncertainty: ± 0.07% of Full Scale (FS) Setra systems, achieved through the "End Point Method" calibration

Gas Detector: **Manufacturer:** LICOR

Model: LI-7000

Resolution: 0.01 µmol/mol

Uncertainty: ± 0.1%

Calibration: **Method:** N₂ and four CO₂ standard gases at regular intervals

Frequency: ~24 hours, with standards checking every 3-4 hours

Standard Gasses:

- 1: **Manufacturer:** White Martins
Concentration: 250.17 μatm
Uncertainty: 3.5 μatm
WMO Traceability:
- 2: **Manufacturer:** White Martins
Concentration: 381.2 μatm
Uncertainty: 4.1 μatm
WMO Traceability:
- 3: **Manufacturer:** White Martins
Concentration: 470.4 μatm
Uncertainty: 4.7 μatm
WMO Traceability:
- 4: **Manufacturer:** White Martins
Concentration: 600.6 μatm
Uncertainty: 5.4 μatm
WMO Traceability: