Dataset Expocode	**09AR20140309**
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Dataset	**Funding Info:** Integrated Marine Observing System **Initial Submission (yyyymmdd):** 20160201 **Revised Submission (yyyymmdd):**
Campaign/Cruise	**Expocode:** 09AR20140309 **Campaign/Cruise Name:** AA1314V6 **Campaign/Cruise Info:** AAV6 **Platform Type:** **CO2 Instrument Type:** Equilibrator-IR or CRDS or GC **Survey Type:** Research Cruise **Vessel Name:** Aurora Australis **Vessel Owner:** P&O Maritime Services **Vessel Code:** 09AR
Coverage	**Start Date (yyyymmdd):** 20140309 **End Date (yyyymmdd):** 20140419 **Westernmost Longitude:** 62.00 E **Easternmost Longitude:** 147.35 E **Northernmost Latitude:** 42.88 S **Southernmost Latitude:** 67.05 S **Port of Call:** Hobart **Port of Call:** Davis Base **Port of Call:** Mawson Base
Variable	**Name:** Group/Ship **Unit:** IMOS/Aurora Australis **Description:**
Variable	**Name:** CruiseID **Unit:** AAYyYyV# **Description:** Cruise designation
Variable	**Name:** JD_GMT **Unit:** ddd.hhhh **Description:** Decimal day of year, UTC
Variable	**Name:** Date **Unit:** yyyymmdd **Description:** Date of year, UTC
Variable	**Name:** Time **Unit:** HH:MM:SS **Description:** UTC time

Variable	**Name:** Lat **Unit:** degree **Description:** Latitude, decimal degrees -=S
Variable	**Name:** Long **Unit:** degree **Description:** Longitude, decimal degrees +=E
Variable	**Name:** xCO2EQ_PPM **Unit:** ppm **Description:** Mole fraction CO2 in equilibrator head space (dry)
Variable	**Name:** xCO2ATM_PPM **Unit:** ppm **Description:** Mole fraction of CO2 in the atmosphere (dry) interpolated
Variable	**Name:** xCO2ATM_PPM_INTERPOLATED **Unit:** ppm **Description:**
Variable	**Name:** Press_Equil **Unit:** hPa **Description:** Equilibrator pressure
Variable	**Name:** Press_ATM **Unit:** hPa **Description:** Atmospheric pressure
Variable	**Name:** Teq **Unit:** °C **Description:** Equilibrator water temperature
Variable	**Name:** SST **Unit:** °C **Description:** Sea surface temperature
Variable	**Name:** SAL **Unit:** **Description:** Salinity
Variable	**Name:** fCO2SW_UATM **Unit:** **Description:** Fugacity of carbon dioxide at sea surface temperature and salinity
Variable	**Name:** fCO2ATM_UATM_INTERPOLATED **Unit:** microatmosphere **Description:** Fugacity of carbon dioxide in air
Variable	**Name:** DfCO2 **Unit:** microatmosphere **Description:** Sea to air gradient in the fugacity of carbon dioxide, fCO2SW-fCO2ATM
Variable	**Name:** LICORflow **Unit:** millilitre per minute **Description:** Gas flow through infrared gas analyser
Variable	**Name:** H2Oflow **Unit:** litre per minute **Description:** Seawater flow to equilibrator

Variable	**Name:** WindSpd_True **Unit:** knots **Description:** Wind speed, true
Variable	**Name:** WindDirn_True **Unit:** degree **Description:** Wind direction, true
Variable	**Name:** Type **Unit:** **Description:** Type of measurement (EQU = equilibrator; ATM= air)
Variable	**Name:** WOCE_QC_FLAG **Unit:** **Description:** Quality flag, 2=good, 3=questionable
Variable	**Name:** SUBFLAG **Unit:** **Description:** Quality Control sub flag for questionable data after Pierrot et al., 2009
Sea Surface Temperature	**Location:** Approximately 150mm inboard from the intake at 4m depth **Manufacturer:** Sea-Bird Electronics **Model:** SBE-38 **Accuracy:** 0.01 (°C if units not given) **Precision:** 0.0005 (°C if units not given) **Calibration:** Calibrated at certified national testing facility for temperature at CSIRO, Hobart. **Comments:** The SST sensor is maintained by the Australian Antarctic Division and are calibrated each year before the beginning of the Antarctic field season by either Seabird Electronics or the a National Australian Testing Authority testing facility at CSIRO, Hobart that is certified for temperature calibrations
Sea Surface Salinity	**Location:** Next to fCO2 system and inline with water supply to fCO2 system **Manufacturer:** Seabird Electronics **Model:** SBE-45 **Accuracy:** 0.01 **Precision:** 0.003 **Calibration:** Calibrated prior to Antarctic field season at National Australian Testing Authority testing facility at CSIRO, Hobart, and checked occasionally during season by comparison with salinity samples collected from the underway seawater line and analysed using a Guideline Autosal, references to IAPSO seawater **Comments:**
Atmospheric Pressure	**Location:** Mounted ~16m above sea level on the bridge deck outside the Meteorological lab on the port side with a velocity head. **Normalized to Sea Level:** yes **Manufacturer:** Vaisala **Model:** PTB220 **Accuracy:** 0.15 hPa (hPa if units not given) **Precision:** 0.01 hPa (hPa if units not given) **Calibration:** Calibrated prior to each field season by the Australian Bureau of Meteorology against a reference barometer **Comments:** Sensor maintained by Australian Antarctic Division
Atmospheric CO2	**Measured/Frequency:** Yes, 3 hourly

Intake Location: Mounted ~16m above sea level on the bridge deck outside the Met lab on the port side of ship
Drying Method: Thermoelectric condenser (2-5 °C), and Perma Pure (Nafion dryers). Dried to <2 H2O mmol/mol.
Atmospheric CO2 Accuracy: 2 ppm
Atmospheric CO2 Precision: 0.01 ppm

Aqueous CO2 Equilibrator Design	**System Manufacturer:** General Oceanics 8050 **Intake Depth:** 4 **Intake Location:** Ship propeller shaft tunnel approximately 4m below the water line and 10m forward of the stern gland on the port side of the vessel. **Equilibration Type:** Shower equilibrator **Equilibrator Volume (L):** 1.2 **Headspace Gas Flow Rate (ml/min):** 70-150 **Equilibrator Water Flow Rate (L/min):** 2.3 **Equilibrator Vented:** Yes **Equilibration Comments:** Equilibrator is water jacketed **Drying Method:** Thermoelectric condenser (2-5 °C), and Perma Pure (Nafion dryers). Dried to <2 H2O mmol/mol
Aqueous CO2 Sensor Details	**Measurement Method:** IR **Method details:** General Oceanics 8050 underway pCO2 system **Manufacturer:** LICOR **Model:** 7000 **Measured CO2 Values:** xCO2(dry) **Measurement Frequency:** Every 120 sec, except during calibration routines **Aqueous CO2 Accuracy:** 2 ppm **Aqueous CO2 Precision:** 0.01 ppm **Sensor Calibrations:** Sensor is checked and calibrated against a set of CO2 in air reference gases prior to cruise. During cruises, the sensor is calibrated with **Calibration of Calibration Gases:** CSIRO, Melbourne, Victoria **Number Non-Zero Gas Standards:** 3 **Calibration Gases:** Manufacturer, CSIRO Reference standards were calibrated on WMO-X2007 mole fraction scale for CO2-in-air at CSIRO Oceans and Atmosphere, Melbourne. Uncertainty = ± 0.05 ppm. Std 1 CA06898: 0 ppm 04 Jun 2008, Std 2 CA01610: 299.41 ppm 17 Aug 2004, Std 3 CA01669: 353.00 ppm 17 Aug 2004, Std 4 CA01673: 402.15 ppm 23 Aug 2004. Reference standards were calibrated on WMO-X2007 mole fraction scale for CO2-in-air at CSIRO Marine and Atmospheric Research, Melbourne. Uncertainty = ± 0.05 ppm. **Comparison to Other CO2 Analyses:** **Comments:** **Method Reference:** Pierrot, D., C. Neill, K. Sullivan, R. Castle, R. Wanninkhof, H. Lüger, T. Johannessen, A. Olsen, R. A. Feely, C. E. Cosca (2009) Recommendations for Autonomous Underway pCO2 Measuring Systems and Data Reduction Routines, Deep-Sea Research II, doi:10.1016/j.dsr2.2008.12.005
Equilibrator Temperature Sensor	**Location:** Probe 6mm below water line in equilibrator **Manufacturer:** Fluke Hart Scientific **Model:** 1521

Accuracy: 0.025 (°C if units not given)
Precision: 0.001 (°C if units not given)
Calibration: Calibrated prior to each Antarctic field season at National Australian Testing Authority facility, at CSIRO, Hobart
Comments:

Equilibrator Pressure Sensor	**Location:** Attached to equilibrator headspace **Manufacturer:** Setra **Model:** 239 **Accuracy:** 0.05 (hPa if units not given) **Precision:** 0.01 (hPa if units not given) **Calibration:** factory calibration **Comments:**
Additional Information	**Suggested QC flag from Data Provider:** NA **Additional Comments:** CO2 data were sourced as part of the Integrated Marine Observing System (IMOS) – supported by the Australian Government through the National Collaborative Research Infrastructure Strategy and the Super Science Initiative. Graeme Snow (Australian Antarctic Division) helped run the pCO2 system during this cruise. **Citation for this Dataset:** Tilbrook, B., C. Neill and J. Akl (2014) Integrated Marine Observing System underway CO2 data for Aurora Australis voyage AA1314V1, http://www.imos.org.au. **Other References for this Dataset:**