Dataset Expocode	**AGFO20141115**
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Dataset	**Funding Info:** NOAA Climate Program Office; NOAA Ocean Acidification Program **Initial Submission (yyyymmdd):** 20160715 **Revised Submission (yyyymmdd):** 20160715
Campaign/Cruise	**Expocode:** AGFO20141115 **Campaign/Cruise Name:** SKO20141115 **Campaign/Cruise Info:** AOML_SOOP_CO2 **Platform Type:** **CO2 Instrument Type:** **Survey Type:** SOOP Line **Vessel Name:** M/V Skogafoss **Vessel Owner:** Bockstiegel Reederei, Enden, Germany **Vessel Code:** AGFO
Coverage	**Start Date (yyyymmdd):** 20141115 **End Date (yyyymmdd):** 20141217 **Westernmost Longitude:** 70.3 W **Easternmost Longitude:** 22.1 W **Northernmost Latitude:** 64.2 N **Southernmost Latitude:** 43.1 N **Port of Call:** Portland, ME **Port of Call:** Argentia, Newfoundland, Canada **Port of Call:** St. Anthony, Newfoundland, Canada **Port of Call:** Sortland, Norway **Port of Call:** Reykjavik, Iceland
Variable	**Name:** xCO2_EQU_ppm **Unit:** **Description:** Mole fraction of CO2 in the equilibrator headspace (dry) at equilibrator temperature (ppm)
Variable	**Name:** xCO2_ATM_ppm **Unit:** **Description:** Mole fraction of CO2 measured in dry outside air (ppm)
Variable	**Name:** xCO2_ATM_interpolated_ppm **Unit:** **Description:** Mole fraction of CO2 in outside air associated with each water analysis. These values are interpolated between the bracketing averaged good xCO2_ATM analyses (ppm)
Variable	**Name:** PRES_EQU_hPa **Unit:**

	Description: Barometric pressure in the equilibrator headspace (hectopascals)
Variable	**Name:** PRES_ATM@SSP_hPa **Unit:** **Description:** Barometric pressure measured outside, corrected to sea level (hectopascals)
Variable	**Name:** TEMP_EQU_C **Unit:** **Description:** Water temperature in equilibrator (degrees Celsius)
Variable	**Name:** SST_C **Unit:** **Description:** Sea surface temperature (degrees Celsius)
Variable	**Name:** SAL_permil **Unit:** **Description:** Sea surface salinity on Practical Salinity Scale (permil)
Variable	**Name:** fCO2_SW@SST_uatm **Unit:** **Description:** Fugacity of CO2 in sea water at SST and 100% humidity (microatmospheres)
Variable	**Name:** fCO2_ATM_interpolated_uatm **Unit:** **Description:** Fugacity of CO2 in air corresponding to the interpolated xCO2 at SST and 100% humidity (microatmospheres)
Variable	**Name:** dfCO2_uatm **Unit:** **Description:** Sea water fCO2 minus interpolated air fCO2 (microatmospheres)
Variable	**Name:** WOCE_QC_FLAG **Unit:** **Description:** Quality control flag for fCO2 values (2=good, 3=questionable)
Variable	**Name:** QC_SUBFLAG **Unit:** **Description:** Quality control subflag for fCO2 values, provides explanation when QC flag=3
Sea Surface Temperature	**Location:** In ship's engine room at a side port off the piping carrying cooling water for the engines. Between the sea chest and the side port there is ~10 meters of pipe (~0.1-0.25meter dia). During the transit, the seawater warms an estimated 0.2-0.25 deg C. The reported SST is the value measured at the side port. **Manufacturer:** Seabird **Model:** SBE-38 **Accuracy:** ± 0.001 °C (°C if units not given) **Precision:** 0.00025 °C (°C if units not given) **Calibration:** Factory calibration. **Comments:** Manufacturer's Resolution is taken as Precision.
Sea Surface Salinity	**Location:** In alcove of the ship's air-conditioned engine room next to CO2 system. **Manufacturer:** Seabird **Model:** SBE 45 **Accuracy:** ± 0.005 permil **Precision:** 0.0002 permil

	Calibration: Factory calibration **Comments:** Manufacturer's Resolution is taken as Precision.
Atmospheric Pressure	**Location:** On mast above bridge at ~9 m above sea surface. **Normalized to Sea Level:** **Manufacturer:** Druck **Model:** RPT350 **Accuracy:** ± 0.08 hPa (hPa if units not given) **Precision:** 0.01 hPa (hPa if units not given) **Calibration:** Factory calibration **Comments:** Manufacturer's Resolution is taken as Precision.
Atmospheric CO2	**Measured/Frequency:** Yes, 5 readings in a group every ~4.5 hours **Intake Location:** On mast above the bridge at ~9 meters above the sea surface **Drying Method:** Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry). **Atmospheric CO2 Accuracy:** ± 0.2 ppm **Atmospheric CO2 Precision:** 0.01 ppm
Aqueous CO2 Equilibrator Design	**System Manufacturer:** **Intake Depth:** 7 meters **Intake Location:** Sea chest under the engine room **Equilibration Type:** Sprayhead above dynamic pool, with thermal jacket **Equilibrator Volume (L):** 0.95 L (0.4 L water, 0.55 L headspace) **Headspace Gas Flow Rate (ml/min):** 70 - 150 ml/min **Equilibrator Water Flow Rate (L/min):** 1.5 - 2.0 L/min **Equilibrator Vented:** Yes **Equilibration Comments:** Primary equilibrator is vented through a secondary equilibrator. **Drying Method:** Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).
Aqueous CO2 Sensor Details	**Measurement Method:** Infrared absorption of dry sample gas **Method details:** **Manufacturer:** LI-COR **Model:** 6262 **Measured CO2 Values:** **Measurement Frequency:** Every 140 seconds, except during calibration **Aqueous CO2 Accuracy:** ± 1 microatmospheres **Aqueous CO2 Precision:** 0.01 microatmosphere **Sensor Calibrations:** **Calibration of Calibration Gases:** The analyzer is calibrated every ~4.5 hours using ESRL standards that are directly traceable to the WMO scale and using other field standards that in turn were calibrated with primary standards that are directly traceable to the WMO scale. Ultra-High Purity air (0.0 ppm CO2) and the high standard are used to zero and span the LI-COR analyzer. **Number Non-Zero Gas Standards:** **Calibration Gases:** ESRL, Boulder for Std1 & 4; Scott-Marrin, Inc. for others -Std 1: CA05998, 205.07 ppm /Std 2: JB03284, 287.45 ppm /Std 3: JB03592, 397.80 ppm /Std 4: CA07923, 428.07 ppm /Std 5: LL104118, 0.0 ppm **Comparison to Other CO2 Analyses:**

Comments: Instrument is located in an alcove of ship's air-conditioned engine room.
Method Reference:
Pierrot, D., C. Neil, K. Sullivan, R. Castle, R. Wanninkhof, H. Lueger, T. Johannessen, A. Olsen, R. A. Feely, and C. E. Cosca (2009), Recommendations for autonomous underway pCO2 measuring systems and data reduction routines, Deep-Sea Res II, 56, 512-522.

Equilibrator Temperature Sensor

Location: Inserted into equilibrator ~ 5 cm below the water level.
Manufacturer: Hart
Model: 1523
Accuracy: ± 0.015 °C (°C if units not given)
Precision: 0.001 °C (°C if units not given)
Calibration: Factory calibration
Comments: Manufacturer's Resolution is taken as Precision.

Equilibrator Pressure Sensor

Location: Attached to equilibrator headspace
Manufacturer: Setra
Model: 239
Accuracy: ± 0.052 hPa (hPa if units not given)
Precision: 0.01 hPa (hPa if units not given)
Calibration: Factory calibration
Comments: Differential pressure reading from Setra-239 attached to the equilibrator headspace was added to the pressure reading from the Setra-270 on the exit of the analyzer to yield equilibrator pressure. Manufacturer's Resolution is taken as Precision.

Other Sensor

Description:
Manufacturer: Setra
Model: 270
Accuracy: ± 0.05 hPa
Precision:
Calibration: Factory calibration
Comments: Pressure reading from the Setra-270 on the exit of the analyzer was added to the differential pressure reading from Setra-239 attached to the equilibrator headspace to yield the equilibrator pressure.

Additional Information

Suggested QC flag from Data Provider:
Additional Comments: Water flow was unstable, ranging from >2 to ~0.5 L/min. Temperatures track each other well but the CO2 trace shows delay in equilibration, indicating low flow. Points that have clearly not equilibrated have been flagged 4. Not as much as previous cruises, only usually the first point after atm measurement. Water flow low limit set to 0.3 l/min. STD1 was still a bit unstable (Deltas from 0 to 15 ppm at times). Twice, all stds read low (20 to 40 ppm off) right after leaving port.
Citation for this Dataset:
Other References for this Dataset: