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Dataset Information:

Funding_Info: NOAA Climate Program Office; NOAA Ocean Acidification Program  
Initial_Submission: 20150703  
Revised_Submission: 20160130

Cruise Information:

Experiment Name: EX1420  
Experiment Type: SOOP Line  
Platform Type: Ship  
Co2 Instrument Type: Equilibrator-IR or CRDS or GC  
Cruise ID: 33KF20140531  
Cruise Info: AOML_SOOP_CO2  
Geographical Region:  
  Westernmost Longitude: -74.0  
  Easternmost Longitude: -64.5  
  Northernmost Latitude: 40.6  
  Southernmost Latitude: 32.3  
Cruise Dates (YYYYMMDD):  
  Start_Date: 20140531  
  End_Date: 20140605  
Ports of Call:  
  Bayonne, NJ  
  Kings Wharf, Bermuda  
Vessel Name: Explorer of the Seas  
Vessel ID: 33KF  
Vessel Owner: Royal Caribbean International

Variables Information:

Variable Name: xCO2_EQU_ppm  
Description of Variable: Mole fraction of CO2 in the equilibrator headspace (dry) at equilibrator temperature
(ppm)
Unit of Variable: ppm

Variable Name: xCO2_ATM_ppm
Description of Variable: Mole fraction of CO2 measured in dry outside air (ppm)
Unit of Variable: ppm

Variable Name: xCO2_ATM_interpolated_ppm
Description of Variable: 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)
Unit of Variable: ppm

Variable Name: PRES_EQU_hPa
Description of Variable: Barometric pressure in the equilibrator headspace (hectopascals)
Unit of Variable: hPa

Variable Name: PRES_ATM@SSP_hPa
Description of Variable: Barometric pressure measured outside, corrected to sea level (hectopascals)
Unit of Variable: hPa

Variable Name: TEMP_EQU_C
Description of Variable: Water temperature in equilibrator (degrees Celsius)
Unit of Variable: Degree C

Variable Name: SST_C
Description of Variable: Sea surface temperature (degrees Celsius)
Unit of Variable: Degree C

Variable Name: SAL_permil
Description of Variable: Sea surface salinity on Practical Salinity Scale (permil)
Unit of Variable: ppt

Variable Name: fCO2_SW@SST_uatm
Description of Variable: Fugacity of CO2 in sea water at SST and 100% humidity (microatmospheres)
Unit of Variable: μatm

Variable Name: fCO2_ATM_interpolated_uatm
Description of Variable: Fugacity of CO2 in air corresponding to the interpolated xCO2 at SST and 100% humidity (microatmospheres)
Unit of Variable: μatm

Variable Name: dfCO2_uatm
Description of Variable: Sea water fCO2 minus interpolated air fCO2 (microatmospheres)
Unit of Variable: μatm

Variable Name: WOCE_QC_FLAG
Description of Variable: Quality control flag for fCO2 values (2=good, 3=questionable)
Unit of Variable: None

Variable Name: QC_SUBFLAG
Description of Variable: Quality control subflag for fCO2 values, provides explanation when QC flag=3
Unit of Variable: None

Method Description:

Equilibrator Design:
Depth of Seawater Intake: 5 meters
Location of Seawater Intake: Forward port side, just above the bow thruster tunnel
Equilibrator Type: Sprayhead above dynamic pool, with thermal jacket
Equilibrator Volume: 0.95 L (0.4 L water, 0.55 L headspace)
Water Flow Rate: 1.5 - 2.5 L/min
Headspace Gas Flow Rate: 70 - 150 ml/min
Vented: Yes
Drying Method for CO2 in Water:
  Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).
Additional Information: Primary equilibrator is vented through a secondary equilibrator

CO2 in Marine Air:
Measurement: Yes, 5 readings in a group every 3.2 hours
Location and Height: On bow mast at ~20 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).

CO2 Sensor:
Measurement Method: Infrared absorption of dry sample gas
Manufacturer: LI-COR
Model: 6262
Frequency: Every 140 seconds, except during calibration
Resolution Water: 0.01 microatmosphere
Uncertainty Water: ± 1 microatmospheres
Resolution Air: 0.01 ppm
Uncertainty Air: ± 0.2 ppm
Manufacturer of Calibration Gas:
  ESRL, Boulder - Std 1: Commercial UHP Nitrogen, 0.00 ppm / Std 2: CA04890, 282.59 ppm / Std 3: CC115007, 381.54 ppm / Std 4: CB09022, 537.45 ppm
Number of Non Zero Gas Standards: 3
CO2 Sensor Calibration:
  The analyzer is calibrated every 3.2 hours using standards directly traceable to the WMO scale.
Other Comments:
  Instrument is located in the ship's air-conditioned bow thruster space. Ultra-High Purity nitrogen gas (0.0 ppm CO2) and the high standard are used to zero and span the LI-COR analyzer.
Method References:
Details Co2 Sensing:
  details of CO2 sensing (not required)
Measured Co2 Params:
  xco2(dry)

Sea Surface Temperature:
  Location: In bow thruster room between the inlet and sea water pump
  Manufacturer: Seabird
Model: SBE-38  
Accuracy Degrees Celsius: 0.001  
Precision Degrees Celsius: 0.00025  
Calibration: Factory calibration.  
Comments: Manufacturer's Resolution is taken as Precision; Maintained by other scientists.

Equilibrator Temperature:  
Location: Inserted into equilibrator ~ 5 cm below the water level.  
Manufacturer: Hart  
Model: 1523  
Accuracy Degrees Celsius: 0.015  
Precision Degrees Celsius: 0.001  
Calibration: Factory calibration  
Comments: Manufacturer's Resolution is taken as Precision.

Equilibrator Pressure:  
Location: Attached to equilibrator headspace  
Manufacturer: Setra  
Model: 239  
Accuracy hPa: 0.052  
Precision hPa: 0.01  
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.

Atmospheric Pressure:  
Location: On mast above bridge and atmospheric lab, ~59 m above sea surface.  
Manufacturer: R.M.Young  
Model: 61302V  
Accuracy: ± 0.3 hPa  
Precision: 0.15 hPa  
Calibration: Factory calibration  
Normalized: yes  
Comments: Manufacturer's Resolution is taken as Precision; Maintained by other scientists.

Sea Surface Salinity:  
Location: In bow thruster space, 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; Maintained by other scientists.

Additional Information:  
The CO2 analytical system performed well throughout this cruise. During the transit to Bermuda, the seawater pump was cycling on and off due to gas entering the water inlet.

Preliminary Quality Control:  
NA
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