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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: EX1445
Experiment Type: SOOP Line
Platform Type: Ship
Co2 Instrument Type: Equilibrator-IR or CRDS or GC
Cruise ID: 33KF20141129
Cruise Info: AOML_SOOP_CO2
Geographical Region:
    Westernmost Longitude: -87.0
    Easternmost Longitude: -77.3
    Northernmost Latitude: 28.4
    Southernmost Latitude: 20.5
Cruise Dates (YYYYMMDD)
    Start_Date: 20141129
    End_Date: 20141204
Ports of Call:
    Port Canaveral, FL
    Cozumel, Mexico
    Nassau, Bahamas
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 during this cruise.

Preliminary Quality Control:

NA
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