Chemical analysis from sediment core bottom water samples collected in the northern Gulf of Mexico, May 2017

Website: https://www.bco-dmo.org/dataset/745932
Data Type: Other Field Results
Version: 1
Version Date: 2018-08-06

Project
» Toward an Improved Understanding of Blue Carbon: The Role of Seagrasses in Sequestering CO2 (Seagrass Blue Carbon)

Contributors	Affiliation	Role
Burdige, David J.	Old Dominion University (ODU)	Principal Investigator
Long, Matthew H.	Woods Hole Oceanographic Institution (WHOI)	Co-Principal Investigator
Zimmerman, Richard C.	Old Dominion University (ODU)	Co-Principal Investigator
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
This dataset includes results of analysis on sediment core bottom water samples collected from the northern Gulf of Mexico in May 2017 - initial pH, alkalinity, sulfate, DIC, and DOC.

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Coverage

Spatial Extent: **N**:29.907 **E**:-84.456 **S**:29.853 **W**:-84.552
Temporal Extent: 2017-07-11 - 2017-07-20

Dataset Description

This dataset includes results of analysis on sediment core bottom water samples collected from the northern Gulf of Mexico in May 2017 - initial pH, alkalinity, sulfate, DIC, and DOC.

Methods & Sampling

Sediment cores were collected by divers, sealed in the field with rubber stoppers and returned to the lab for processing. Pore waters were collected by inserting rhizon samplers (Seeberg-Elverfeldt et al., 2005) through pre-drilled holes in the core tubes. Samples were collected in gas-tight glass syringes and filtered through 0.45 µm nylon filters into storage vials. Alkalinity samples were titrated within 12hr of collection; other samples were returned to the lab for analysis, using techniques routinely used in my lab: alkalinity and initial pH - Hu and Burdige (2008); sulfate, DIC, ammonium and DOC - Burdige and Komada (2011), Komada et al. (2016); sulfide - Cline (1969), Abdulla et al. (in prep.).

Alkalinity and initial pH were determined by Gran Titration using a Metrohm automatic titrator (model 785 DMP Titrino) combined with a Cole-Parmer pH electrode, calibrated using pH 4.00, 7.00 and 10.00 NIST-traceable buffers (Hu and Burdige, 2008).

Sulfate was determined by ion chromatography and conductivity detection with a Thermo-Fisher Dionex ICS-5000 ion chromatograph.

DOC was determined by high temperature combustion using a Shimadzu TOC-V total carbon analyzer (Burdige and Komada, 2011; Komada et al. 2016).

DIC were determined by FIA analysis using a home-built system consisting of a Rainin Rabbit peristaltic pump and a Dionex CDM-II conductivity detector (Hall and Aller, 1992; Lustwerk and Burdige, 1995).

Note: "ns" stands for "samples not collected for this analysis".

Data Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- added columns for site, lat, and lon
- reformatted collection date and time from m/d/yyyy H:MM to YYYY-MM-DDTHH:MM:SS (ISO 8601:2004E)

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Data Files

File
GOM_2017_bottom_water.csv (Comma Separated Values (.csv), 1.18 KB) MD5:c088f4cf4b294f85927f8fece35dc576 Primary data file for dataset ID 745932

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Related Publications

Abdulla, H. A., Burdige, D. J., & Komada, T. (2020). Abiotic formation of dissolved organic sulfur in anoxic sediments of Santa Barbara Basin. Organic Geochemistry, 139, 103879. https://doi.org/10.1016/j.orggeochem.2019.05.009
Methods

Burdige, D. J., & Komada, T. (2011). Anaerobic oxidation of methane and the stoichiometry of remineralization processes in continental margin sediments. Limnology and Oceanography, 56(5), 1781–1796. doi:10.4319/lo.2011.56.5.1781
Methods

Cline, J. D. (1969). Spectrophotometric Determination of Hydrogen Sulfide in Natural Waters. Limnology and Oceanography, 14(3), 454–458. doi:10.4319/lo.1969.14.3.0454
Methods

Hall, P. . J., & Aller, R. C. (1992). Rapid, small-volume, flow injection analysis for total CO2, and NH4+ in marine and freshwaters. Limnology and Oceanography, 37(5), 1113–1119. doi:10.4319/lo.1992.37.5.1113
Methods

Hu, X., & Burdige, D. J. (2008). Shallow marine carbonate dissolution and early diagenesis—Implications from an incubation study. Journal of Marine Research, 66(4), 489–527. doi:10.1357/002224008787157449
Methods

Komada, T., Burdige, D. J., Li, H.-L., Magen, C., Chanton, J. P., & Cada, A. K. (2016). Organic matter cycling across the sulfate-methane transition zone of the Santa Barbara Basin, California Borderland. Geochimica et

Cosmochimica Acta, 176, 259–278. doi:10.1016/j.gca.2015.12.022
Methods

Lustwerk, R. L., & Burdige, D. J. (1995). Elimination of dissolved sulfide interference in the flow injection determination of SCO2, by addition of molybdate. Limnology and Oceanography, 40(5), 1011–1012. doi:10.4319/lo.1995.40.5.1011
Methods

Seeberg-Elverfeldt, J., Schlüter, M., Feseker, T., & Kölling, M. (2005). Rhizon sampling of porewaters near the sediment-water interface of aquatic systems. Limnology and Oceanography: Methods, 3(8), 361–371. doi:10.4319/lom.2005.3.361
Methods

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Parameters

Parameter	Description	Units
sample_id	sample id	unitless
site	site	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
ISO_DateTime_Local_collected	local date and time collected formatted as YYYY-MM-DDTHH:MM:SS (ISO 8601:2004€)	unitless
num_replicate_bottles	number of replicate bottles collected	bottles
initial_pH	initial pH determined during alkalinity titrations	NBS scale
initial_pH_stdev	initial pH determined during alkalinity titrations	NBS scale
Alk	pore water alkalinity	milliMoles
Alk_stdev	pore water sulfate	milliMoles
Sulfate	standard deviation of sulfate concentration	milliMoles
Sulfate_stdev	pore water dissolved inorganic carbon	milliMoles
DIC	pore water dissolved iron	microMoles
DIC_stdev	pore water dissolved ammonium	microMoles
DOC	pore water total dissolved sulfide	microMoles
DOC_stdev	pore water dissolved organic carbon	microMoles

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Automatic titrator
Dataset-specific Description	Used to measure alkalinity
Generic Instrument Description	Instruments that incrementally add quantified aliquots of a reagent to a sample until the end-point of a chemical reaction is reached.

Dataset-specific Instrument Name	Metrohm automatic titrator (model 785 DMP Titrino)
Generic Instrument Name	Automatic titrator
Dataset-specific Description	Used to measure alkalinity and initial pH.
Generic Instrument Description	Instruments that incrementally add quantified aliquots of a reagent to a sample until the end-point of a chemical reaction is reached.

Dataset-specific Instrument Name	Dionex CDM-II conductivity detector
Generic Instrument Name	Conductivity Meter
Dataset-specific Description	Used to measure dissolved inorganic carbon.
Generic Instrument Description	Conductivity Meter - An electrical conductivity meter (EC meter) measures the electrical conductivity in a solution. Commonly used in hydroponics, aquaculture and freshwater systems to monitor the amount of nutrients, salts or impurities in the water.

Dataset-specific Instrument Name	Thermo-Fisher Dionex ICS-5000 ion chromatograph
Generic Instrument Name	Ion Chromatograph
Dataset-specific Description	Used to measure sulfate.
Generic Instrument Description	Ion chromatography is a form of liquid chromatography that measures concentrations of ionic species by separating them based on their interaction with a resin. Ionic species separate differently depending on species type and size. Ion chromatographs are able to measure concentrations of major anions, such as fluoride, chloride, nitrate, nitrite, and sulfate, as well as major cations such as lithium, sodium, ammonium, potassium, calcium, and magnesium in the parts-per-billion (ppb) range. (from http://serc.carleton.edu/microbelife/research_methods/biogeochemical/ic....)

Dataset-specific Instrument Name	Shimadzu TOC-V total carbon analyzer
Generic Instrument Name	Total Organic Carbon Analyzer
Dataset-specific Description	Used to measure dissolved organic carbon.
Generic Instrument Description	A unit that accurately determines the carbon concentrations of organic compounds typically by detecting and measuring its combustion product (CO2). See description document at: http://bcodata.whoi.edu/LaurentianGreatLakes_Chemistry/bs116.pdf

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Project Information

Toward an Improved Understanding of Blue Carbon: The Role of Seagrasses in Sequestering CO2 (Seagrass Blue Carbon)

Coverage: Chesapeake Bay, Northern Gulf of Mexico, and Bahamas Banks

NSF abstract:

This research will develop a quantitative understanding of the factors controlling carbon cycling in seagrass meadows that will improve our ability to quantify their potential as blue carbon sinks and predict their future response to climate change, including sea level rise, ocean warming and ocean acidification. This project will advance a new generation of bio-optical-geochemical models and tools (ECHOES) that have the potential to be transform our ability to measure and predict carbon dynamics in shallow water systems.

This study will utilize cutting-edge methods for evaluating oxygen and carbon exchange (Eulerian and eddy covariance techniques) combined with biomass, sedimentary, and water column measurements to develop and test numerical models that can be scaled up to quantify the dynamics of carbon cycling and sequestration in seagrass meadows in temperate and tropical environments of the West Atlantic continental margin that encompass both siliciclastic and carbonate sediments. The comparative analysis across latitudinal and geochemical gradients will address the relative contributions of different species and geochemical processes to better constrain the role of seagrass carbon sequestration to global biogeochemical cycles. Specifically the research will quantify: (i) the relationship between C stocks and standing biomass for different species with different life histories and structural complexity, (ii) the influence of above- and below-ground metabolism on carbon exchange, and (iii) the influence of sediment type (siliciclastic vs. carbonate) on Blue Carbon storage. Seagrass biomass, growth rates, carbon content and isotope composition (above- and below-ground), organic carbon deposition and export will be measured. Sedimentation rates and isotopic composition of PIC, POC, and iron sulfide precipitates, as well as porewater concentrations of dissolved sulfide, CO2, alkalinity and salinity will be determined in order to develop a bio-optical-geochemical model that will predict the impact of seagrass metabolism on sediment geochemical processes that control carbon cycling in shallow waters. Model predictions will be validated against direct measurements of DIC and O2 exchange in seagrass meadows, enabling us to scale-up the density-dependent processes to predict the impacts of seagrass distribution and density on carbon cycling and sequestration across the submarine landscape.

Status, as of 09 June 2016: This project has been recommended for funding by NSF's Division of Ocean Sciences.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1635403
NSF Division of Ocean Sciences (NSF OCE)	OCE-1633951

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