Oxygen profiles from sediment core samples collected in the northern Gulf of Mexico, May 2017

Website: https://www.bco-dmo.org/dataset/745997

Data Type: Other Field Results

Version: 1

Version Date: 2018-10-15

Project

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

Contributors	Affiliation	Role
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Abstract

This dataset includes oxygen profiles from sediment core samples collected in the northern Gulf of Mexico in May 2017.

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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 oxygen profiles from sediment core samples collected in the northern Gulf of Mexico in May 2017.

Acquisition Description

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. Oxygen profiles in the cores were collected with polarographic microelectrodes (Luther et al., 2008) using a DLK 70 WebPstat electrochemical analyzer (AIS, Inc.) and a computer-controlled micro-profiler.

Note: 'sd' in this dataset means that the electrode signal deterioriated, likely due to sulfide interference.

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)-
- transformed table to flat format by reproducing rows core, profile, datetime_collected and scanned to columns for each depth/O2 record
- re-ordered records by site name
- changed Spidercrab Bay core id's from SC* to SP*

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Related Publications

Luther, G. W., Glazer, B. T., Ma, S., Trouwborst, R. E., Moore, T. S., Metzger, E., … Brendel, P. J. (2008). Use of voltammetric solid-state (micro)electrodes for studying biogeochemical processes: Laboratory measurements to real time measurements with an in situ electrochemical analyzer (ISEA). Marine Chemistry, 108(3-4), 221–235. doi:10.1016/j.marchem.2007.03.002

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

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Parameters

Parameter	Description	Units
site	sample collection site identifier	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
core	core number	unitless
profile	profile replicate identifier	unitless
ISO_DateTime_Local_collected	local date and time sample was collected; formatted as YYYY-MM-DDTHH:MM:SS (ISO 8601:2004€)	unitless
ISO_DateTime_Local_scan	local date and time when oxygen profiling began; formatted as YYYY-MM-DDTHH:MM:SS (ISO 8601:2004€)	unitless
depth_cm	depth of oxygen reading within the core sample; bottom water refers to scan collected approximately 0.5 cm above the sediment surface	centimeters
O2_uM	dissolved oxygen concentration	microMoles

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Instruments

Dataset-specific Instrument Name	DLK 70 WebPstat electrochemical analyzer (AIS, Inc.)
Generic Instrument Name	Oxygen Microelectrode Sensor
Dataset-specific Description	Oxygen was measured with polarographic microelectrodes using a DLK 70 WebPstat electrochemical analyzer (AIS, Inc.) and a computer-controlled micro-profiler.
Generic Instrument Description	A miniaturized Clark-type dissolved oxygen instrument, including glass micro-sensors with minute tips (diameters ranging from 1 to 800 um). A gold or platinum sensing cathode is polarized against an internal reference and, driven by external partial pressure, oxygen from the environment penetrates through the sensor tip membrane and is reduced at the sensing cathode surface. A picoammeter converts the resulting reduction current to a signal. The size of the signal generated by the electrode is proportional to the flux of oxygen molecules to the cathode.The sensor also includes a polarized guard cathode, which scavenges oxygen in the electrolyte, thus minimizing zero-current and pre-polarization time.With the addition of a meter and a sample chamber, the respiration of a small specimen can be measured. Example: Strathkelvin Inst. http://www.strathkelvin.com

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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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