Depth profiles of pore water constituents from sediment cores collected on the Louisiana Shelf of the Northern Gulf of Mexico during 2020, 2021, and 2022 on R/V Savannah cruises SAV-20-07, SAV-21-25, SAV-21-24, SAV-22-06, and SAV-22-11

Website: https://www.bco-dmo.org/dataset/904417
Data Type: Cruise Results
Version: 2
Version Date: 2025-07-16

Project
» Importance of Riverine Discharge on the Benthic Flux of Alkalinity to Continental Margins (NGoM Benthic Alk Flux)

Contributors	Affiliation	Role
Taillefert, Martial	Georgia Institute of Technology (GA Tech)	Principal Investigator
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
This data set reports depth profiles of pore water concentrations of dissolved inorganic carbon (DIC), orthophosphate (PO43-), ammonium (NH4+), total alkalinity (TA), carbon isotopic fractionation of DIC (13C-DIC), dissolved manganese (Mnd), dissolved calcium (Cad), reduced iron (Fe(II)), total dissolved Fe (Fed), and dissolved Fe(III) (Fe(III)d) by the difference of total dissolved Fe and Fe(II). Data were collected during five R/V Savannah cruises in fall 2020, summer and fall 2021, and fall and spring 2022. On each cruise pore water data were obtained from sediment cores collected with an MC-800 multi-corer at multiple stations. Cruise IDs were: SAV-20-07, SAV-21-25, SAV-21-24, SAV-22-06, SAV-22-11. All cores were processed within a few hours after collection. The pore waters were first extracted by slicing sediment cores of < 40 centimeters (cm) long and centrifugation of the pore waters under N2 atmosphere to avoid air contamination. Pore waters were then immediately filtered through 0.22-micrometer (um) PSE syringe filters under N2 atmosphere and either analyzed immediately onboard (Fe speciation, orthophosphate, DIC), preserved acidified with hydrochloric acid at 4 degrees Celsius (Cad, Mnd), frozen (ammonium), or preserved at 4 degrees Celsius after addition of HgCl2 (TA) until analysis. In addition, samples for TA and carbon isotopic analyses were preserved in glass bottles, whereas other samples were preserved in polypropylene containers. DIC was analyzed by flow injection analysis (Hall and Aller, 1992), orthophosphate, ammonium, and Fe speciation by spectrophotometry (Murphy and Riley, 1962; Strickland and Parsons, 1972; Stookey, 1970), TA by Gran titration (Gran, 1952), the carbon isotopic signature by isotope ratio mass spectrometry (Wang et al, 2018), and Mnd and Cad by ICP-MS (Magette et al., 2025 In preparation).

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Coverage

Spatial Extent: **N**:28.94785 **E**:-88.605316666667 **S**:28.199167 **W**:-91.337123
Temporal Extent: 2020-11-03 - 2022-07-21

Dataset Description

2020 data:
These pore water data were obtained from sediment cores collected at five different stations on the Louisiana Shelf on the Northern Gulf of Mexico during the week of November 3-6, 2020 using an MC-800 multi-corer. These stations extend from the middle of the shelf offshore from Cocodrie, LA to the mouth of the Mississippi River North West Pass. All cores were processed within a few hours after collection. The field sampling was conducted during R/V Savannah cruise SAV-20-07.

2021 and 2022 data:
In July 2021, the pore water data were obtained from sediment cores collected with a MC-800 multi-corer at ten different stations on the Louisiana Shelf and slope in the Northern Gulf of Mexico during July 16-26, 2021. These stations span two transects, one from the middle of the shelf offshore from Cocodrie, LA to the mouth of the Mississippi River's South West Pass, and another one from North West Pass of the Mississippi River mouth to the south, across the slope. A single station (St. 15) was also sampled on the eastern side of the second transect in the transition from the shelf break to the mid-slope.

In October 2021, the pore water data were obtained from sediment cores collected with a MC-800 multi-corer at twelve different stations on the Louisiana Shelf and slope in the Northern Gulf of Mexico between October 25 and November 10, 2021. These stations extend from the middle of the shelf offshore from Cocodrie, LA to the mouth of the Mississippi River's South West Pass. Two stations (St. 15 and St. 12) were also sampled on a second transect from the shelf break to the slope southeast of the Bird's Foot.

In spring 2022, the pore water data were obtained from sediment cores collected with a MC-800 multi-corer at ten different stations on the Louisiana Shelf and slope in the Northern Gulf of Mexico during April 9-20, 2021. These stations span two transects, one from the middle of the shelf offshore from Cocodrie, LA to the mouth of the Mississippi River's South West Pass, and another from South West Pass of the Mississippi River mouth to the south, across the slope. Two stations (St. 15 and St. 12) were also sampled on a second transect from the shelf break to the slope southeast of the Bird's Foot.

In summer 2022, the pore water data were obtained from sediment cores collected with a MC-800 multi-corer at eleven different stations on the Louisiana Shelf and slope in the Northern Gulf of Mexico during July 9 -23, 2022. These stations span two transects, one from the middle of the shelf offshore from Cocodrie, LA to the mouth of the Mississippi River's South West Pass, and another from South West Pass of the Mississippi River mouth to the south, across the slope. Two stations (St. 15 and St. 12) were also sampled on a second transect from the shelf break to the slope southeast of the Bird's Foot.

All data:
The pore waters were first extracted by slicing sediment cores of < 25 centimeters (cm) long and centrifugation of the pore waters under N2 atmosphere to avoid air contamination. Pore waters were then immediately filtered through 0.22-micrometer (um) PSE syringe filters under N2 atmosphere and either analyzed immediately onboard (Fe speciation, orthophosphate, DIC), preserved acidified with hydrochloric acid at 4 degrees Celsius (Cad, Mnd), frozen (ammonium), or preserved at 4 degrees Celsius after addition of HgCl2 (TA) until analysis. In addition, samples for TA and carbon isotopic analyses were preserved in glass bottles, whereas other samples were preserved in polypropylene containers. DIC was analyzed by flow injection analysis (Hall and Aller, 1992), orthophosphate, ammonium, and Fe speciation by spectrophotometry (Murphy and Riley, 1962; Strickland and Parsons, 1972; Stookey, 1970), TA by Gran titration (Gran, 1952), the carbon isotopic signature by isotope ratio mass spectrometry (Wang et al, 2018), and Mnd and Cad by ICP-MS (Magette et al., 2025 In preparation).

Methods & Sampling

Sediments were collected and pore waters were extracted within 30 minutes after sampling. Pore waters were obtained by centrifugation at 3000 rotations per minute (rpm) for less than 10 minutes after slicing the cores in a sealed anaerobic two-hands bag flushed three times with UHP N2 gas. Pore waters were immediately filtered onto 0.22-micrometer (µm) Whatman 25-millimeter (mm) Acrodisc syringe filters (PES membrane) and either preserved until analysis or analyzed immediately onboard the ship. Samples were preserved at 4° Celsius after acidification (dissolved Ca, dissolved Mn, NH4+) or addition of HgCl2 (δ13C-DIC, TA), dispensed directly

into reagents for analysis (Fe(II), total dissolved Fe, ΣPO43-), or analyzed immediately (DIC). Sealed borosilicate glass vials were used for TA and δ13C-DIC as recommended (Dickson et al., 2007; Wang et al., 2018).

NH4+ was measured spectrophotometrically by the indophenol blue method (Strickland and Parsons, 1972), total dissolved Fe and Fe(II) were measured spectrophotometrically by the ferrozine method after the addition or not of hydroxylamine (Stookey, 1970). ΣPO43- was measured spectrophotometrically using the molybdate-blue method after natural color correction to avoid interferences from dissolved silica and sulfides (Murphy and Riley, 1962).

For the 2020 data, DIC was measured by flow injection analysis with conductivity detection after spiking samples with 10 millimoles (mM) ZnCl2 to prevent dissolved sulfide interferences (Hall and Aller, 1992). TA was measured by acid titration in an open-cell with continuous pH measurements (Dickson et al., 2007; Rassmann et al., 2016).

For the 2021 and 2022 data, DIC was measured by flow injection analysis with conductivity detection (Hall and Aller, 1992) after spiking samples with 10 mM Na2MoO4 to prevent dissolved sulfide interferences (Lustwerk and Burdige, 1995), except in July 2022 when DIC was measured by cavity ring-down spectrometry (CRDS, Picarro G2131-i) with an automatic CO2 extraction system (Apollo SciTech AS-D1).

δ13C-DIC was measured using an isotope ratio mass spectrometer with high-performance liquid chromatography preparation module for gas samples (Brandes, 2009; Wang et al., 2018). Finally, dissolved Ca and dissolved Mn were measured by ICP-MS with collision cell to prevent argon interferences. Internal standards were used to correct for the drift of the instrument, quality control blanks, standard checks, and certified seawater references were run several times during each run to control accuracy and reproducibility. All calibrations were conducted with at least five standards prepared in a 0.54 molar (M) NaCl matrix prior to each series of measurements. Blanks and quality control checks were run routinely during each analysis. Finally, calibration sensitivities were compared routinely to ensure accuracy of the methods. For DIC analyses, Dickson DIC-certified seawater samples were run routinely during analyses to validate the accuracy of the method. Errors of all reported concentrations represent the analytical error propagated from calibration curves, dilution, and instrumental drift.

Instruments:
Sediment cores were collected with an MC-800 multi-corer (Ocean Instruments). Core barrels of 10 cm inner diameter and 75 cm long were used to collect sediments. Aldrich two-glove atmospheric bags were used to control the atmosphere during pore water extraction and centrifugation with an ELMI CM-7S clinical centrifuge.

All spectrophotometric measurements were conducted with a Beckman Coulter DU 720 UV-vis spectrophotometer.

DIC measurements were conducted with an in-house system consisting of a Dynamax peristaltic pump, Rheodyne injection valve, Amber Science conductivity detector, and Analytical Instruments, Inc. LCC-100 integrator with computer control. In July 2022, DIC was measured with a Picarro G2131-i cavity ring-down spectrometry and an Apollo SciTech AS-D1 automatic CO2 extraction system.

TA measurements were obtained with a computer-controlled Metrohm 877 Titrino plus.

δ13C-DIC measurements were conducted with a Thermo Electron SurveyorLite autosampler, a Surveyor MS HPLC pump, and a LC Isolink interface coupled to a Thermo Scientific Delta V plus stable isotope mass spectrometer.

Finally, Cad and Mnd measurements were conducted with an Agilent 7900e ICP-MS with SPS4 Autosampler.

All data provided have been analytically validated via the procedures described above.

Data Processing Description

Data Processing:
Spectrophotometric measurements were recorded on paper forms specifically designed for each analysis and digitized to process the data. DIC, TA, δ13C-DIC, and ICP-MS data were acquired by computers. DIC chromatographic data were integrated using Matlab-based software developed in-house (Bristow and Taillefert, 2008). TA, δ13C-DIC, and ICP-MS data were processed through Excel macro spreadsheet routines developed for each of these analyses.

In the data file, standard deviations of either duplicate analyses or analytical error are provided with each parameter.

BCO-DMO Curation Notes

Version 1:
(version date: 2024-07-02)
- imported original file named "GOM_Fall2020_PoreWaterData_BCO-DMO.xlsx" into the BCO-DMO system;
- added "Date" column from the separate "Year", "Month", and "Day" columns;
- renamed fields to comply with BCO-DMO naming conventions;
- rounded the following columns to 3 decimal places: PO4, NH4, Cad, FeII, FeD, FeIII (and their standard deviations);
- named the final file "904417_v1_pore_water_fall2020.csv".

Version 2:
(version 2 date: 2025-07-16)
- Imported the v1 data file, "904417_v1_pore_water_fall2020.csv", into the BCO-DMO processing system.
- Imported the four original files into the BCO-DMO system (original file names: GOM_Summer2021_PoreWaterData_BCO-DMO.xlsx, GOM_Fall2021_PoreWaterData_BCO-DMO.xlsx, GOM_Spring2022_PoreWaterData_BCO-DMO.xlsx, GOM_Summer2022_PoreWaterData_BCO-DMO.xlsx).
- Flagged "nd" and "#N/A" as missing data values; missing data are empty/blank in the final CSV file.
- Renamed fields to comply with BCO-DMO naming conventions.
- Added "Date" column from the separate "Year", "Month", and "Day" columns.
- Concatenated all data files into a single data file.
- Added columns for the cruise ID and collection time period.
- Saved the final file as "904417_v2_pore_water.csv"

Problem Description

"nd" in the dataset was originally provided when the chemical species was not determined, typically because pore water volumes were too small to be able to conduct all analyses in the same sample. Note that in the final BCO-DMO .csv file, "nd" has been replaced by blank/empty values.

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Data Files

File
904417_v2_pore_water.csv (Comma Separated Values (.csv), 204.47 KB) MD5:082575d195424d9dd8d97d49b50ea012 Primary data file for dataset ID 904417, version 2

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Related Publications

Brandes, J. A. (2009). Rapid and precise δ13C measurement of dissolved inorganic carbon in natural waters using liquid chromatography coupled to an isotope-ratio mass spectrometer. Limnology and Oceanography: Methods, 7(11), 730–739. Portico. https://doi.org/10.4319/lom.2009.7.730
Methods

Bristow, G., & Taillefert, M. (2008). VOLTINT: A Matlab®-based program for semi-automated processing of geochemical data acquired by voltammetry. Computers & Geosciences, 34(2), 153–162. doi:10.1016/j.cageo.2007.01.005
Methods

Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.) 2007. Guide to Best Practices for Ocean CO2

Measurements. PICES Special Publication 3, 191 pp https://isbnsearch.org/isbn/1-897176-07-4
Methods

Ferreira, E., Lansard, B., Monvoisin, G., Magette, E., Boever, A., Bridgham, H., Bombled, B., Beckler, J. S., Taillefert, M., & Rabouille, C. (2025). Benthic biogeochemical processes and fluxes in the hypoxic and acidified northern Gulf of Mexico (nGoM), part I: Carbonate dissolution from in situ microprofiles. Marine Chemistry, 270, 104515. https://doi.org/10.1016/j.marchem.2025.104515
Results

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

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

Magette, E., Boever, A., Bridgham, H., Ferreira, E., Silvera, O., Bombled, B., Beckler, J.S., Rabouille, C., & Taillefert, M. (2025). Benthic biogeochemical processes and fluxes in the hypoxic and acidified northern Gulf of Mexico, Part II: Seasonal and spatial variability in benthic alkalinity and dissolved inorganic carbon fluxes. In Review.
Results

Murphy, J., & Riley, J. P. (1962). A modified single solution method for the determination of phosphate in natural waters. Analytica Chimica Acta, 27, 31–36. doi:10.1016/s0003-2670(00)88444-5
Methods

Rassmann, J., Lansard, B., Pozzato, L., & Rabouille, C. (2016). Carbonate chemistry in sediment porewaters of the Rhone River delta driven by early diagenesis (northwestern Mediterranean). Biogeosciences, 13(18), 5379–5394. doi:10.5194/bg-13-5379-2016
Methods

Stookey, L. L. (1970). Ferrozine---a new spectrophotometric reagent for iron. Analytical Chemistry, 42(7), 779–781. doi:10.1021/ac60289a016
Methods

Strickland, J. D. H. and Parsons, T. R. (1972). A Practical Hand Book of Seawater Analysis. Fisheries Research Board of Canada Bulletin 157, 2nd Edition, 310 p.
Methods

Wang, H., Hu, X., Rabalais, N. N., & Brandes, J. (2018). Drivers of Oxygen Consumption in the Northern Gulf of Mexico Hypoxic Waters—A Stable Carbon Isotope Perspective. Geophysical Research Letters, 45(19). Portico. https://doi.org/10.1029/2018gl078571 https://doi.org/10.1029/2018GL078571
Methods

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Related Datasets

IsRelatedTo

Taillefert, M. (2024) **Electrochemical data from sediment cores collected on the Louisiana Shelf of the Northern Gulf of Mexico during November 2020 on R/V Savannah cruise SAV-20-07.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-07-20 doi:10.26008/1912/bco-dmo.904782.1 [view at BCO-DMO]
Relationship Description: The electrochemical depth profiles were obtained in separate sediment cores, yet from the same cast as the pore water dataset.

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Parameters

Parameter	Description	Units
Year	4-digit year when samples were collected	unitless
Month	Month when samples were collected	unitless
Day	Day of month when samples were collected	unitless
Date	Date when samples were collected	unitless
Collection_Type	Type of sample collection (porewater)	unitless
Station	Station identifier	unitless
Lon	Longitude where samples were collected; negative values = West	decimal degrees
Lat	Latitude where samples were collected; positive values = North	decimal degrees
sample_ID	Sample ID number	unitless
Sediment_depth_cm	Sediment depth	centimeters (cm)
DIC	Dissolved inorganic carbon (DIC)	millimoles per liter (mM)
sd_DIC	Standard deviation of DIC	millimoles per liter (mM)
PO4	Orthophosphate (PO4)	micromoles per liter (uM)
sd_PO4	Standard deviation of PO4	micromoles per liter (uM)
NH4	Ammonium (NH4)	micromoles per liter (uM)
sd_NH4	Standard deviation of NH4	micromoles per liter (uM)
TA	Total alkalinity (TA)	millimoles per liter (mM)
sd_TA	Standard deviation of TA	millimoles per liter (mM)

d13C_DIC	The carbon isotopic fractionation of DIC (d13-DIC)	per mil (‰)
sd_d13C_DIC	Standard deviation of d13C_DIC	per mil (‰)
Mnd	Dissolved manganese (Mn)	micromoles per liter (uM)
sd_Mnd	Standard deviation of Mnd	micromoles per liter (uM)
Cad	Dissolved calcium (Ca)	millimoles per liter (mM)
sd_Cad	Standard deviation of Cad	millimoles per liter (mM)
Fe_II	Reduced iron (Fe(II))	micromoles per liter (uM)
sd_Fe_II	Standard deviation of Fe_II	micromoles per liter (uM)
Fed	Total dissolved iron (Fe)	micromoles per liter (uM)
sd_Fed	Standard deviation of Fed	micromoles per liter (uM)
Fe_III_d	Dissolved Fe(III); the difference of Fed and Fe_II	micromoles per liter (uM)
sd_Fe_III_d	Standard deviation of Fe_III_d	micromoles per liter (uM)

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Instruments

Dataset-specific Instrument Name	Apollo SciTech AS-D1
Generic Instrument Name	Apollo AS-D1 DIC and d13C-DIC Analyzer
Dataset-specific Description	In July 2022, DIC was measured with a Picarro G2131-i cavity ring-down spectrometry and an Apollo SciTech AS-D1 automatic CO2 extraction system.
Generic Instrument Description	The AS-D1 is an instrument designed to prepare natural water samples for Dissolved Inorganic Carbon (DIC) and delta13C analysis and provide the user with the analyses outputs. It has features that are specifically useful for seawater and coastal water samples. The instrument provides the user with DIC values (micromol per kg) and the delta13C content of the DIC (per mille). It consists of a digital syringe pump for delivery of reagent and samples, a mass flow controller to regulate flow rate, a CO2 stripping reactor, and an electronic cooling system to remove moisture. The AS-D1 does not measure the sample but is designed to send the gas to a different analyzer. This second instrument then sends the measurements back to the AS-D1 after analysis. The AS-D1 then calculates the desired DIC and delta13C outputs. This instrument is designed for automatic sampling from multiple bottles. It can be used in laboratories on shore or at sea. The instrument was created to be paired with the Picarro G-2131i Carbon Isotope Analyser, however, other models that measure the isotopic ratio of CO2 may be compatible. The precision is +/- 0.1 % for DIC of seawater and +/- 0.07 % for DIC-delta13C. Sample volume is 1-7 milliliters per analysis, and sample time is under 12 minutes. Additional information from the manufacturer is available at: https://apolloscitech.com/dicdelta.html

Dataset-specific Instrument Name	ELMI CM-7S centrifuge
Generic Instrument Name	Centrifuge
Dataset-specific Description	Aldrich two-glove atmospheric bags were used to control the atmosphere during pore water extraction and centrifugation with an ELMI CM-7S clinical centrifuge.
Generic Instrument Description	A machine with a rapidly rotating container that applies centrifugal force to its contents, typically to separate fluids of different densities (e.g., cream from milk) or liquids from solids.

Dataset-specific Instrument Name	Agilent 7900e ICP-MS
Generic Instrument Name	Inductively Coupled Plasma Mass Spectrometer
Dataset-specific Description	Dissolved Ca and dissolved Mn measurements were conducted with an Agilent 7900e ICP-MS with SPS4 Autosampler.
Generic Instrument Description	An ICP Mass Spec is an instrument that passes nebulized samples into an inductively-coupled gas plasma (8-10000 K) where they are atomized and ionized. Ions of specific mass-to-charge ratios are quantified in a quadrupole mass spectrometer.

Dataset-specific Instrument Name	ICP-MS
Generic Instrument Name	Inductively Coupled Plasma Mass Spectrometer
Generic Instrument Description	An ICP Mass Spec is an instrument that passes nebulized samples into an inductively-coupled gas plasma (8-10000 K) where they are atomized and ionized. Ions of specific mass-to-charge ratios are quantified in a quadrupole mass spectrometer.

Dataset-specific Instrument Name	Thermo Scientific Delta V plus stable isotope mass spectrometer
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	δ13C-DIC measurements were conducted with a Thermo Electron SurveyorLite autosampler, a Surveyor MS HPLC pump, and a LC Isolink interface coupled to a Thermo Scientific Delta V plus stable isotope mass spectrometer.
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

Dataset-specific Instrument Name	Thermo Electron SurveyorLite autosampler
Generic Instrument Name	Laboratory Autosampler
Dataset-specific Description	δ13C-DIC measurements were conducted with a Thermo Electron SurveyorLite autosampler, a Surveyor MS HPLC pump, and a LC Isolink interface coupled to a Thermo Scientific Delta V plus stable isotope mass spectrometer.
Generic Instrument Description	Laboratory apparatus that automatically introduces one or more samples with a predetermined volume or mass into an analytical instrument.

Dataset-specific Instrument Name	SPS4 Autosampler
Generic Instrument Name	Laboratory Autosampler
Dataset-specific Description	Dissolved Ca and dissolved Mn measurements were conducted with an Agilent 7900e ICP-MS with SPS4 Autosampler.
Generic Instrument Description	Laboratory apparatus that automatically introduces one or more samples with a predetermined volume or mass into an analytical instrument.

Dataset-specific Instrument Name	MC-800 multi-corer
Generic Instrument Name	Multi Corer
Dataset-specific Description	Sediment cores were collected with an MC-800 multi-corer (Ocean Instruments). Core barrels of 10 centimeters (cm) inner diameter and 75 cm long were used to collect sediments.
Generic Instrument Description	The Multi Corer is a benthic coring device used to collect multiple, simultaneous, undisturbed sediment/water samples from the seafloor. Multiple coring tubes with varying sampling capacity depending on tube dimensions are mounted in a frame designed to sample the deep ocean seafloor. For more information, see Barnett et al. (1984) in Oceanologica Acta, 7, pp. 399-408.

Dataset-specific Instrument Name	Beckman Coulter DU 720 UV-vis spectrophotometer
Generic Instrument Name	Spectrometer
Dataset-specific Description	All spectrophotometric measurements were conducted with a Beckman Coulter DU 720 UV-vis spectrophotometer.
Generic Instrument Description	A spectrometer is an optical instrument used to measure properties of light over a specific portion of the electromagnetic spectrum.

Dataset-specific Instrument Name	Picarro G2131-i cavity ring-down spectrometry
Generic Instrument Name	Spectrometer
Dataset-specific Description	In July 2022, DIC was measured with a Picarro G2131-i cavity ring-down spectrometry and an Apollo SciTech AS-D1 automatic CO2 extraction system.
Generic Instrument Description	A spectrometer is an optical instrument used to measure properties of light over a specific portion of the electromagnetic spectrum.

Dataset-specific Instrument Name	Metrohm 877 Titrino plus
Generic Instrument Name	Titrator
Dataset-specific Description	TA measurements were obtained with a computer-controlled Metrohm 877 Titrino plus.
Generic Instrument Description	Titrators are instruments that incrementally add quantified aliquots of a reagent to a sample until the end-point of a chemical reaction is reached.

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Deployments

SAV-20-07

Website	https://www.bco-dmo.org/deployment/904422
Platform	R/V Savannah
Start Date	2020-10-23
End Date	2020-11-21
Description	See more information at R2R: https://www.rvdata.us/search/cruise/SAV-20-07

SAV-21-15

Website	https://www.bco-dmo.org/deployment/959038
Platform	R/V Savannah
Start Date	2021-07-02
End Date	2021-07-30
Description	See more information at R2R: https://www.rvdata.us/search/cruise/SAV-21-15

SAV-21-24

Website	https://www.bco-dmo.org/deployment/959040
Platform	R/V Savannah
Start Date	2021-10-18
End Date	2021-11-19
Description	See more information at R2R: https://www.rvdata.us/search/cruise/SAV-21-24

SAV-22-06

Website	https://www.bco-dmo.org/deployment/959044
Platform	R/V Savannah
Start Date	2022-04-01
End Date	2022-05-01
Description	See more information at R2R: https://www.rvdata.us/search/cruise/SAV-22-06

SAV-22-11

Website	https://www.bco-dmo.org/deployment/959047
Platform	R/V Savannah
Start Date	2022-07-01
End Date	2022-07-29
Description	See more information at R2R https://www.rvdata.us/search/cruise/SAV-22-11

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Project Information

Importance of Riverine Discharge on the Benthic Flux of Alkalinity to Continental Margins (NGoM Benthic Alk Flux)

NSF Award Abstract
Ocean acidification is the process that lowers the pH of the ocean over time due to uptake of atmospheric carbon dioxide. This project investigates how chemical reactions in marine sediments exposed to high riverine sediment loads influence ocean acidification in coastal waters. Although we know that ocean acidification affects marine life and commercial fisheries in coastal waters, little is known about how acidification processes in the water column are influenced by reactions occurring in sediments on the sea floor. The role of large sediment deposits from rivers in these processes has also never been investigated. This study will be conducted in the Mississippi River and Gulf of Mexico. The Mississippi River transports a high sediment load to the continental shelf in the Gulf of Mexico and plays an important role in the economy of the southern coast of the United States. Results from this study will be useful to the oceanographic community for increasing understanding of ocean acidification processes in delta and shelf environments. It will also benefit decision makers interested in predicting the role of sediments on the nutrient -rich Louisiana shelf for discharge control purposes. This project also has an important educational component by training undergraduate, graduate, and postdoctoral students, providing experiences at sea for undergraduates, and conducting outreach activities with K-12 students.

The geochemical and microbiological processes responsible for the transformation of particles deposited on the seafloor will be characterized near the Mississippi River mouth and along the nearby continental slope. The release of acids (CO_2) and bases (alkalinity) from the sediment will be quantified using autonomous instruments deployed on the seafloor to determine whether sediments contribute to the acidity of the surrounding water column or instead provide bases to buffer the water column from atmospheric CO_2 inputs. As the Mississippi River discharge during the later Winter and Spring provides much more sediment to the coastal zone compared to the rest of the year, research cruises will be taken twice a year to determine how seasonal variations in riverine discharge affect the release of acids and bases into the water column. Mathematical models will then be used to predict the effect of seasonal variations on acids or bases release to the water column. This study will therefore provide a quantitative understanding of the role of large sediment depositions to the seafloor on sediment geochemical and microbiological processes and their feedback to the overlying waters. Simultaneously, a large data set will be generated and used to calibrate mathematical models and better characterize benthic-pelagic interactions. Such efforts are needed to predict how continental margins respond to constantly increasing stress from anthropogenic activities.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1948914

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