Physical environmental data from Little Lagoon, Alabama collected from 2012-2013.

Website: https://www.bco-dmo.org/dataset/723993
Data Type: Other Field Results
Version: 1
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Project
» Groundwater Discharge, Benthic Coupling and Microalgal Community Structure in a Shallow Coastal Lagoon (LittleLagoonGroundwater)

Contributors	Affiliation	Role
Mortazavi, Behzad	National Science Foundation (NSF-DEB)	Principal Investigator, Contact
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Abstract
Physical environmental data from Little Lagoon, Alabama collected from 2012-2013.

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Coverage

Spatial Extent: **Lat**:30.241929 **Lon**:-87.773756
Temporal Extent: 2012-02 - 2013-02

Dataset Description

Physical environmental data from Little Lagoon, Alabama.

Methods & Sampling

Little Lagoon is a shallow coastal lagoon that is tidally connected to the Gulf of Mexico but has no riverine inputs. The water in the lagoon is replenished solely from precipitation and groundwater inputs primarily on the East end (Su et al. 2012). Because of the rapid development in Baldwin County, a large amount of NO3- enters the Little Lagoon system through SGD (Murgulet & Tick 2008). In this region, there can be rapid changes in the depth to groundwater (Fig. 4.1 inset) and episodic SGD inputs to the lagoon (Su et al.2013). Within the lagoon, three sites were selected (East, Mouth, and West) to represent the gradient that exists across the lagoon from the input of groundwater. Sites were sampled on a near-monthly basis from February 2012 to February 2013.

Abiotic Parameters

At each site, point measurements of temperature, salinity, pH, and dissolved oxygen (DO) were recorded with a YSI 556 Multiparameter Meter. Triplicate sediment porewater samples were collected with a modified coring device (2.7 cm ID), sectioned at 10 mm intervals to 60 mm, and extracted in 10 mL of 1 M NaCl (Smith & Caffrey 2009) prior to filtering and freezing. The filtered (GF/F, 0.7 micron) supernatant was analyzed for DIN (NO_2^-, NO_3^-, NH_4^+) and phosphate (PO_4^{3-}), and represents total extractable porewater nutrients. Standard wet chemical techniques modified for the Skalar SAN+ Autoanalyzer (Pennock & Cowan 2001) were performed for all nutrient concentration analysis. Water column and sediment chlorophyll-α content were determined fluorometrically (Welschmeyer 1994) after cold extraction in 90% acetone from filters and in triplicate, respectively.

Additional methodology can be found in:

Bernard, Rebecca & Mortazavi, Behzad & A. Kleinhuizen, Alice. (2015). Dissimilatory nitrate reduction to ammonium (DNRA) seasonally dominates NO_3^- reduction pathways in an anthropogenically impacted sub-tropical coastal lagoon. Biogeochemistry. 125. 47-64. 10.1007/s10533-015-0111-6.

Data Processing Description

Data were flagged as below detection limits if no measurable rates were returned after calculations. See equations in methodology section of:

Bernard, Rebecca & Mortazavi, Behzad & A. Kleinhuizen, Alice. (2015). Dissimilatory nitrate reduction to ammonium (DNRA) seasonally dominates NO_3^- reduction pathways in an anthropogenically impacted sub-tropical coastal lagoon. Biogeochemistry. 125. 47-64. 10.1007/s10533-015-0111-6.

Statistical Analysis

To test the seasonal flux variability between sites in Little Lagoon, two-way ANOVAs with site and date as independent variables were performed. When data could not be transformed to meet ANOVA assumptions, Wilcoxon/Kruskal-Wallis nonparametric tests were used. When significant differences occurred, Tukey HSD or Steel-Dwass post hoc tests were used to determine significant interactions. A Principal component analysis (PCA) was conducted on all biogeochemical parameters to identify underlying multivariate components that may be influencing N fluxes. Spearman's rho correlation analysis was used to examine the relationship between the principal components and fluxes. Statistical significance of the data set was determined at $\alpha=0.05$ and error is reported as standard error. All statistical analyses were performed in SAS JMP 10 (SAS Institute Inc.).

BCO-DMO Data Processing Notes:

- Data reorganized into one table under one set of column names from both original files
- Units removed from column names
- Column names reformatted to meet BCO-DMO standards
- Created column Year to describe to capture the metadata in the file name

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Data Files

File
abiotic.csv (Comma Separated Values (.csv), 3.83 KB) MD5:922f79579b5c1f25ca1ddded558dbca2 Primary data file for dataset ID 723993

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Related Publications

Bernard, R. J., Mortazavi, B., & Kleinhuizen, A. A. (2015). Dissimilatory nitrate reduction to ammonium (DNRA)

seasonally dominates NO3 − reduction pathways in an anthropogenically impacted sub-tropical coastal lagoon. Biogeochemistry, 125(1), 47–64. doi:10.1007/s10533-015-0111-6
Methods

Murgulet, D., & Tick, G. R. (2008). Assessing the extent and sources of nitrate contamination in the aquifer system of southern Baldwin County, Alabama. Environmental Geology, 58(5), 1051–1065. doi:10.1007/s00254-008-1585-5
Methods

Su, N., Burnett, W.C., Eller, K.T., MacIntyre, H.L., Mortazavi, B., Leifer, J., Novoveska, L. (2012). Radon and radium isotopes, groundwater discharge and harmful algal blooms in Little Lagoon, Alabama. Interdisciplinary Studies on Environmental Chemistry, 6, 329–337.
Methods

Su, N., Burnett, W.C., MacIntyre, H.L., Liefer, J.D., Peterson, R.N., Viso, R. (2013). Natural radon and radium isotopes for assessing groundwater discharge into Little Lagoon, AL: implications for harmful algal blooms. Estuaries Coasts, 1–18
Methods

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Parameters

Parameter	Description	Units
Year	Year ID that samples were taken	unitless
Date	Month and day that samples were taken; MMM-DD	unitless
avg_sediment_chla	Average sediment chlorophyll-a content from all sites	miligrams per m-2
avg_sediment_chla_SE	Standard error of average sediment chlorophyll-a content	miligrams per m-2
avg_waterColumn_chla	Average water column cholorphyll-a content from all sites	ug L-1
avg_waterColumn_chla_SE	Standard error of average water column chlorophyll-a content	ug L-1
avg_temperature	Average temperature across sites	Celsius
avg_temperature_SE	Standard error of average temperatures across sites	Celsius
avg_salinity	Average salinity across sites	PSU
avg_salinity_SE	Standard error of average salinity across sites	PSU
avg_waterColumn_Nox	Average water column values for nitrate plus nitrite	micromoles
avg_waterColumn_Nox_SE	Standard error of average water column values for nitrate plus nitrite	micromoles
avg_waterColumn_NH4	Average water column values for ammonium	micromoles
avg_waterColumn_NH4_SE	Standard error of average water column values for ammonium	micromoles
avg_waterColumn_PO4	Average water column values for PO4 3-	micromoles
avg_waterColumn_PO4_SE	Standard error of average water column values for PO4 3-	micromoles
Mouth_Temperature	Temperature sampled at the site Mouth; location of site is 30.243683, -87.738407	Celsius
East_Temperature	Temperature sampled at the site East; location of site is 30.253347, -87.724729	Celsius
West_Temperature	Temperature sampled at the site West; location of site is 30.247181, -87.767856	Celsius
Mouth_Salinity	Salinity at the site Mouth; location of site is 30.243683, -87.738407	PSU

East_Salinity	Salinity at the site East; location of site is 30.253347, -87.724729	PSU
West_Salinity	Salinity at the site West; location of site is 30.247181, -87.767856	PSU
Mouth_sediment_chla	Sediment chlorophyll-a content from the site Mouth; location of site is 30.243683, -87.738407	miligrams per m-2
Mouth_sediment_chla_SE	Standard error of sediment chlorophyll-a content.	miligrams per m-3
East_sediment_chla	Sediment chlorophyll-a content from the site East location of site is 30.253347, -87.724729	miligrams per m-2
East_sediment_chla_SE	Standard error of sediment chlorophyll-a content.	miligrams per m-3
West_sediment_chla	Sediment chlorophyll-a content from the site West location of site is 30.247181, -87.767856	miligrams per m-2
West_sediment_chla_SE	Standard error of sediment chlorophyll-a content.	miligrams per m-3
Mouth_waterColumn_NH4	NH4+ concentration in the water column of site Mouth; location of site is 30.243683, -87.738407	micromoles
Mouth_waterColumn_NH4_SE	Standard error of NH4+ concentration in the water column.	micromoles
East_waterColumn_NH4	NH4- concentration in the water column of site East; location of site is 30.253347, -87.724729	micromoles
East_waterColumn_NH4_SE	Standard error of NH4+ concentration in the water column.	micromoles
West_waterColumn_NH4	NH4+ concentration in the water column of site West; location of site is 30.247181, -87.767856	micromoles
West_waterColumn_NH4_SE	Standard error of NH4+ concentration in the water column.	micromoles
Mouth_waterColumn_NO3	NO3- concentration in the water column of site Mouth; location of site is 30.243683, -87.738407	micromoles
Mouth_waterColumn_NO3_SE	Standard error of NO3- concentration in the water column.	micromoles
East_waterColumn_NO3	NO3- concentration in the water column of site East; location of site is 30.253347, -87.724729	micromoles
East_waterColumn_NO3_SE	Standard error of NO3- concentration in the water column.	micromoles
West_waterColumn_NO3	NO3- concentration in the water column of site West; location of site is 30.247181, -87.767856	micromoles
West_waterColumn_NO3_SE	Standard error of NO3- concentration in the water column.	micromoles
Mouth_waterColumn_PO4	PO4 3- concentration in the water column of site Mouth; location of site is 30.243683, -87.738407	micromoles
Mouth_waterColumn_PO4_SE	Standard error of PO4 3- concentration in the water column.	micromoles
East_waterColumn_PO4	PO4 3- concentration in the water column of site East; location of site is 30.253347, -87.724729	micromoles
East_waterColumn_PO4_SE	Standard error of PO4 3- concentration in the water column.	micromoles
West_waterColumn_PO4	PO4 3- concentration in the water column of site West; location of site is 30.247181, -87.767856	micromoles
West_waterColumn_PO4_SE	Standard error of PO4 3- concentration in the water column.	micromoles

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Instruments

Dataset-specific Instrument Name	Thermometer
Generic Instrument Name	digital thermometer
Dataset-specific Description	Used to collect temperature
Generic Instrument Description	An instrument that measures temperature digitally.

Dataset-specific Instrument Name	YSI 556 Multiparameter Meter
Generic Instrument Name	Oxygen Sensor
Dataset-specific Description	Used to determine DO
Generic Instrument Description	An electronic device that measures the proportion of oxygen (O2) in the gas or liquid being analyzed

Dataset-specific Instrument Name	pH sensor
Generic Instrument Name	pH Sensor
Dataset-specific Description	Used to determine pH
Generic Instrument Description	An instrument that measures the hydrogen ion activity in solutions. The overall concentration of hydrogen ions is inversely related to its pH. The pH scale ranges from 0 to 14 and indicates whether acidic (more H+) or basic (less H+).

Dataset-specific Instrument Name	Salinity Sensor
Generic Instrument Name	Salinity Sensor
Dataset-specific Description	Used to sample salinity
Generic Instrument Description	Category of instrument that simultaneously measures electrical conductivity and temperature in the water column to provide temperature and salinity data.

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Deployments

LittleLagoon

Website	https://www.bco-dmo.org/deployment/528089
Platform	SmallBoat_FSU
Start Date	2010-04-05
End Date	2013-08-17
Description	The sampling sites were all accessed from small boats, here amalgamated to one deployment called LittleLagoon.

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Project Information

Groundwater Discharge, Benthic Coupling and Microalgal Community Structure in a Shallow Coastal Lagoon (LittleLagoonGroundwater)

Coverage: southern Alabama, east of Mobile

This project investigated the link between submarine groundwater discharge (SGD) and microalgal dynamics in Little Lagoon, Alabama. In contrast to most near-shore environments, it is fully accessible; has no riverine inputs; and is large enough to display ecological diversity (c. 14x 0.75 km) yet small enough to be comprehensively sampled on appropriate temporal and spatial scales. The PIs have previously demonstrated that the lagoon is a hot-spot for toxic blooms of the diatom *Pseudo-nitzchia spp.* that are correlated with discharge from the surficial aquifer. This project assessed variability in SGD, the dependence of benthic nutrient fluxes on microphytobenthos (MPB) abundance and productivity, and the response of the phytoplankton to nutrient enrichment and dilution. The work integrated multiple temporal and spatial scales and demonstrated both the relative importance of SGD vs. benthic recycling as a source of nutrients, and the role of SGD in structuring the microalgal community. (*paraphrased from Award abstract*)

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0962008

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