Raw sediment C isotope values collected in Massachusetts from 2012 to 2015

Website: https://www.bco-dmo.org/dataset/668475
Data Type: experimental
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Project
» Eutrophication Effects on Sediment Metabolism and Benthic Algal-bacterial Coupling: An Application of Novel Techniques in a LTER Estuary (Benthic_PP_at_TIDE)

Contributors	Affiliation	Role
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Abstract
Raw sediment C isotope values collected in Massachusetts from 2012 to 2015

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Coverage

Temporal Extent: 2012 - 2015

Dataset Description

Raw sediment C isotope values.

Methods & Sampling

Methodology from Spivak, AC and J Ossolinski. 2016. Limited effects of nutrient enrichment on bacterial carbon sources in salt marsh tidal creek sediments. Marine Ecology Progress Series. 544:107-130. 10.3354/meps11587

Sediment samples for organic matter composition were collected by placing a hard plastic sleeve around a polyvinyl chloride (PVC) corer (5 cm diameter x 15 cm deep) and then removing the corer. The plastic sleeve remained in place to maintain the integrity of the sediment column and mark the core location. The top 0.5 cm of each core was collected into pre-combusted vials and frozen (-80 deg C) until analysis for total organic carbon content and stable isotopes ($d_{13}C$). Samples were dried to constant mass (60 deg C), homogenized with a Retsch Mixer Mill 200, and acidified to remove carbonates prior to analysis by the WHOI Organic Mass Spectrometry Facility with a Carlo Erba 1108 elemental analyzer interfaced to Finnigan-MAT DeltaPlus isotope ratio mass spectrometer (IRMS). Isotopic data are reported as d-values in units of per mil (0/00). For sediments from the isotope labeling experiments, resulting d-values were converted to atom % to calculate excess $_{13}C$ (absolute amount $_{13}C$ incorporated), using the equations:

$$R_{\text{sample}} = \frac{^{13}\text{C}}{^{12}\text{C}} = \left(\frac{\delta^{13}\text{C}\ ‰}{1000} + 1\right) \times \frac{^{13}\text{C}}{^{12}\text{C}}\text{VPDB} \qquad (1)$$

$$^{13}\text{C atom\%} = [R_{\text{sample}} / (R_{\text{sample}} + 1)] \times 100 \qquad (2)$$

$$^{13}\text{C}_{\text{excess}}(\text{mmol m}^{-2}) = \qquad (3)$$
$$(^{13}\text{C atom\%}_{\text{sample}} - {}^{13}\text{C atom\%}_{\text{control}}) / 100 \times \text{concentration}_{\text{sample}}$$

where VPDB is the Vienna Pee Dee Belemnite standard (0.011237) and concentrations are expressed in moles carbon per m2, by accounting for sediment bulk density (0.52 g cm_{-3}) and core depth (0.5 cm). Sediment samples collected just prior to application of $_{13}C$-labeled $NaHCO_3$ or *S. alterniflora* detritus served as controls.

Data Processing Description

BCO-DMO Data Processing Notes:

-reformatted column names to comply with BCO-DMO standards.

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Data Files

File
bulkSediment.csv (Comma Separated Values (.csv), 3.18 KB) MD5:ae4796245d767885487a71bcf1141063 Primary data file for dataset ID 668475

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Related Publications

Spivak, A., & Ossolinski, J. (2016). Limited effects of nutrient enrichment on bacterial carbon sources in salt marsh tidal creek sediments. Marine Ecology Progress Series, 544, 107–130. doi:10.3354/meps11587
Methods

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Parameters

Parameter	Description	Units
month	Month samples were collected; mm	unitless
core_ID	Core ID	unitless
estuary	Estuary where samples were collected.	unitless
time	Time refers to the number of hours elapsed since application of the 13C label. The 0 h interval represents samples collected immediately before label application.	hours
experiment	Experiment refers to whether the 13C label was added as NaHCO3 (i.e. BMA) or S. alterniflora (i.e. S. alt) detritus.	unitless
d13C	Total organic carbon content and stable isotopes.	per mil

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Instruments

Dataset-specific Instrument Name	1108 Elemental analyzer
Generic Instrument Name	Elemental Analyzer
Dataset-specific Description	Used for analysis
Generic Instrument Description	Instruments that quantify carbon, nitrogen and sometimes other elements by combusting the sample at very high temperature and assaying the resulting gaseous oxides. Usually used for samples including organic material.

Dataset-specific Instrument Name	Retsch Mixer Mill 200
Generic Instrument Name	Homogenizer
Dataset-specific Description	Used to homogenize samples
Generic Instrument Description	A homogenizer is a piece of laboratory equipment used for the homogenization of various types of material, such as tissue, plant, food, soil, and many others.

Dataset-specific Instrument Name	Hewlett-Packard 6890 GC interfaced to a DeltaPlus IRMS
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Usted to determine stable isotope ratios
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	polyvinyl chloride (PVC) corer
Generic Instrument Name	Push Corer
Dataset-specific Description	5 cm diameter x 15 cm deep
Generic Instrument Description	Capable of being performed in numerous environments, push coring is just as it sounds. Push coring is simply pushing the core barrel (often an aluminum or polycarbonate tube) into the sediment by hand. A push core is useful in that it causes very little disturbance to the more delicate upper layers of a sub-aqueous sediment. Description obtained from: http://web.whoi.edu/coastal-group/about/how-we-work/field-methods/coring/

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Deployments

Spivak_2012

Website	https://www.bco-dmo.org/deployment/668449
Platform	shoreside Massachusetts
Start Date	2012-09-01
End Date	2015-08-15

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Project Information

Eutrophication Effects on Sediment Metabolism and Benthic Algal-bacterial Coupling: An Application of Novel Techniques in a LTER Estuary (Benthic_PP_at_TIDE)

Coverage: Plum Island Estuary, Rowley Massachusetts

Extracted from the NSF award abstract:
This project will address how rates of benthic microalgal production respond to eutrophication and geomorphological changes in human-impacted tidal creeks. Excess nutrient loading increases benthic algal biomass and likely stimulates production rates but the magnitude of nutrient and geomorphological effects on rates of production is unknown. Will changes in benthic algal productivity affect algal-bacterial coupling? Furthermore, how is algal-bacterial coupling affected by geomorphological changes, which may be exacerbated by excess nutrient loading but can also occur in pristine marshes?

This project will take advantage of the infrastructure of the TIDE project, a long-term saltmarsh eutrophication experiment at the Plum Island Ecosystem - Long Term Ecological Research site in Northeastern Massachusetts. Specifically, the PIs will measure benthic metabolism and examine algal- bacterial coupling in fertilized and ambient nutrient tidal creeks in the first field season. The following field season, they will compare sediment metabolism and carbon dynamics on slumped tidal creek walls (i.e. areas where low marsh has collapsed into the tidal creek) to that on the bottom of tidal creeks. In both years, gross and net production will be determined using an innovative triple oxygen isotope technique and traditional dissolved oxygen and inorganic carbon flux measurements. Comparisons between these methods will be useful in informing studies of sediment metabolism. Lipid biomarkers will be used to characterize the sources of organic matter to creek sediments, and stable isotope analysis of bacterial specific biomarkers to identify the sources of organic carbon utilized by sediment bacteria. The biomarkers will reveal whether sediment bacteria use organic matter substrates, such as benthic microalgal carbon, selectively or in proportion to availability. Overall, results from the proposed study will provide important information about how sediment carbon dynamics in shallow tidal creeks respond to long term eutrophication. Furthermore, findings will enhance understanding of the role of tidal creeks in coastal biogeochemistry.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1233678

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