Bulk sediment physical and geochemical properties for cores collected post-hurricane Harvey at the Aransas and Anahuac National Wildlife Refuges, Texas on January 2018

Website: https://www.bco-dmo.org/dataset/827477
Data Type: Other Field Results
Version: 1
Version Date: 2020-10-22

Project
» Hurricane Harvey Impacts on Local and Landscape Scale Salt Marsh Carbon Storage (Harvey Marsh Carbon Storage)

Contributors	Affiliation	Role
Arriola, Jill	University of North Carolina at Chapel Hill (UNC-Chapel Hill)	Principal Investigator
Cable, Jaye	University of North Carolina at Chapel Hill (UNC-Chapel Hill)	Co-Principal Investigator
Pavelsky, Tamlin	University of North Carolina at Chapel Hill (UNC-Chapel Hill)	Co-Principal Investigator
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
This dataset reports porosity, organic content, stable isotopes 13-carbon and 15-nitrogen, activity of 137-cesium and excess 210-lead from two sites at the Aransas National Wildlife Refuge (NWR) and the Anahuac NWR. These sites coincide with locations of salt marsh carbon burial studies performed in 2014.

Table of Contents

Coverage

Spatial Extent: **N**:29.57492 **E**:-94.55827 **S**:28.30363 **W**:-96.8036
Temporal Extent: 2018-02-05 - 2018-02-08

Methods & Sampling

Sediments were extracted using a polycarbonate push core (7 cm ID x 50 cm L) with beveled edges pushed into the marsh surface. Cores were sectioned into 1-cm intervals on site on the day of collection and stored cold until laboratory analysis. All sediment samples were weighed damp, placed into a drying oven at 60°C for at least 48 hours for evaporation of water content and re-weighed dry. Porosity of samples was calculated using the difference between the wet and dry weight multiplied by the assumed density of water to estimate the volume of the void space. The void space volume was then divided by the total volume to calculate porosity. The dry bulk densities were calculated by dividing the mass of the dry sediment by the known volume of the sample. Bulk plant material, such as root mats and rhizomes, was manually removed with tweezers after the samples dried. Dried sediment samples were then homogenized using a mortar and pestle. Percent organic matter (OM) was determined on an aliquot of the homogenized sediments via loss on ignition. Between 1.0 and 3.0 g of sediment was distributed into pre-weighed porcelain crucibles and ignited in a Lindberg Blue M1100 muffle furnace at 550°C for 4 hours and reweighed to obtain percent OM content.

An additional aliquot, between 15 and 60 mg, of the original homogenized sediment underwent one of two acid treatments depending on the amount of inorganic carbon determined by LOI. For low inorganic carbon content samples (< 10 % IC) treatment consisted of weighing sediment into silver capsules, vapor acidifying with 12N trace metal grade hydrochloric acid overnight, and then dried at 80°C for one hour before being sealed. For high inorganic carbon content samples (> 10 % IC) treatment consisted of rinsing sediments with 3 mL of a 10% 12N trace metal grade hydrochloric acid solution. Sediments underwent three rinses of 5 mL of deionized water, approximately 4 hours apart to allow sediments to settle, to bring the samples back to a neutral pH. Samples were then dried for 48 hours at 60 °C, weighed into silver capsules, and sealed. Samples were analyzed for TOC, TN, delta13C, and delta15N by the Stable Isotope Facility at the University of California, Davis, CA.

Aliquots of the dried homogenized sediment samples, ranging from 12 to 20 g, were prepared for 210Pb analysis by gamma spectrometry. Sediment was packed into plastic petri dishes (50 mm x 9 mm), sealed with tape, and stored for at least 4 weeks for equilibration of 226Ra with 222Rn. Samples were counted for 24 hours on one of two planar germanium detectors for 210Pb, 137Cs, and 226Ra (as 214Pb and 214Bi) (25% relative efficiency). Germanium detectors were corrected for background activity and calibrated using IAEA-300 Baltic Sea marine sediment standards. The activity of 226Ra was subtracted from the total 210Pb activity and decay corrected to the time of collection to calculate unsupported 210Pb (210Pbex).

Data were analyzed using Excel and R.

Carbon and nitrogen were below detection for station F. Data listed as nd.

Data Processing Description

BCO-DMO Processing Notes:
- data submitted in Excel file "Anahuac 2018 Sediment properties.xlsx" and "Aransas 2018 Sediment.xlsx" extracted to csv
- extracted station, lat, and lon data into a separate stations .csv file
- removed empty rows and duplicate header rows from Anahuac and Aransas files
- concatenated tables from Anahuac and Aransas into a single table
- created new columns for station and sample by splitting the Sample_ID column for use as a join key to the stations file
- rounded values C13 and N15 to 1 digit to match the bulk of data in those columns
- added conventional header with dataset name, PI name, version date
- renamed columns to conform with BCO-DMO naming conventions (removed units and special characters)

[table of contents | back to top]

Data Files

File
2018_sediment.csv (Comma Separated Values (.csv), 16.41 KB) MD5:d5c2131ee712d9443cb2cce50f119183 Primary data file for dataset ID 827477

[table of contents | back to top]

Parameters

Parameter	Description	Units
Site	site identifier	unitless
station	station identifier	unitless
Sample_ID	sample identifier includes station and depth	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is postiive	decimal degrees
midDepth_cm	Mid-depth of sample	centimeters (cm)
Porosity	Porosity (ratio of void to occupied space)	unitless
Org_Matter_pcnt	Organic content	percent
DBD_g_cm3	dry bulk density of sample	grams/cenitmeter^3 (g/cm3
C_13	Stable isotope 13C	parts per thousand (ppt)
N_15	Stable isotope 15N	parts per thousand (ppt)
TOC_mg_g	Total organic carbon	milligrams organic carbon/grams sediment (mg OC/g sed)
TN_mg_g	Total nitrogen	mg N/g sed
Pb_210_ex_Bq_kg	Activity of excess 210Pb	bequerel/kilogram (Bq/kg)
Cs_137_Bq_kg	Activity of 137Cs	bequerel/kilogram (Bq/kg)

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Canberra germanium detectors
Generic Instrument Name	Gamma Ray Spectrometer
Dataset-specific Description	Used to measure 210Pb, 137Cs, and 226Ra (as 214Pb and 214Bi) .
Generic Instrument Description	Instruments measuring the relative levels of electromagnetic radiation of different wavelengths in the gamma-ray waveband.

Dataset-specific Instrument Name	Lindberg Blue M1100 muffle furnace
Generic Instrument Name	muffle furnace
Dataset-specific Description	Used to obtain the percent of organic matter in the sediment samples. (Standard instrument vocabulary name needed)
Generic Instrument Description	A muffle furnace or muffle oven (sometimes retort furnace in historical usage) is a furnace in which the subject material is isolated from the fuel and all of the products of combustion, including gases and flying ash. A type of jacketed enclosure that is used to heat a material to significantly high temperatures while keeping it contained and fully isolated from external contaminants, chemicals or substances. Muffle furnaces are usually lined with stainless steel, making them largely corrosion-resistant.

Dataset-specific Instrument Name	Polycarbonate push core (7 cm ID x 50 cm L) with beveled edges
Generic Instrument Name	Push Corer
Dataset-specific Description	Used to collect the sediment samples.
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/

[table of contents | back to top]

Project Information

Hurricane Harvey Impacts on Local and Landscape Scale Salt Marsh Carbon Storage (Harvey Marsh Carbon Storage)

Coverage: Salt marshes in the Heron Flats at the Mission-Aransas NERR, Texas, and in the Aransas NWR, Texas

NSF Award Abstract:
Coastal wetlands store more than 20% of global carbon, and salt marshes are estimated to have the highest carbon burial rates of all coastal wetlands. Disturbances, like large storms, have the potential to reduce the storage of carbon in salt marshes and lower their overall impact on the global carbon cycle. Previous studies have shown that large quantities of sediment were deposited on salt marshes in Louisiana after Hurricanes Katrina and Rita in 2005, but little was known about the state of the marshes before these impacts. Consequently, we can only speculate about the true impact of those storms on sediment carbon storage. Comparing pre-storm carbon storage to post-storm storage immediately (weeks to months) following landfall allows us to quantify the storm impacts and capture critical data before inventory signals are lost to the next event. This project will take advantage of the fact that the investigators have recently (2014) sampled salt marshes near both of the locations where Hurricane Harvey made landfall in August, 2017. They will collect new salt marsh sediment samples and compare their data to 2014 data in order to study the impact of storm passage on these important systems.

Hurricane Harvey made landfall as a Category 4 storm at Rockport, TX, on 25 Aug 2017, moved inland, circled back, and made a second landfall as a tropical storm east of Port Arthur, TX, on 30 Aug 2017. These two major storm landfalls coincide with locations of salt marsh carbon burial studies performed in 2014 by this research group at the Aransas National Wildlife Refuge (NWR) and the Anahuac NWR. These data provide a baseline against which to assess the impacts of recent major storm landfalls on marsh accretion and carbon burial. It is imperative to return to these study sites as soon as possible to ensure that the perishable data resulting from the impacts of this storm on these marshes are not altered by other meteorological events or human disturbances. The investigators hypothesize hurricanes redistributed sediments from offshore and within the fringing salt marsh onto the marsh platform, increasing the elevation of the marsh and burying organic matter as stored carbon. The objectives of this research are 1) to quantify the impact of extratropical storm sediment accretion on carbon storage in two salt marshes at the local scale using 2014 baseline data; and 2) to extend these local storm-induced carbon changes to the landscape scale using pre- and post-storm LiDAR and satellite imagery. To address these objectives and preserve the perishable data, field work will take place at the Aransas and Anahuac NWRs during the week of 16 Oct 2017. Four 50 cm cores, two from each site, will be collected and sectioned based on stratigraphic changes. Sediment will be analyzed for total organic carbon, carbon-14, lead-210, and sediment physical properties (Obj. 1). Ground-truth measurements across

the marsh will be obtained using a Macaulay auger and used to validate post- hurricane LiDAR measurements, which will be compared to pre-hurricane measurements from 2014 (Obj. 1 & 2). Freely available archived and new satellite imagery and LiDAR will be used to measure changes in marsh height and area (Obj. 2). The project will form part of the doctoral research of a graduate student, and will also support a senior undergraduate student.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1760556

[table of contents | back to top]