Cross-channel geometry of Groves Creek salt marsh, Skidaway Island Georgia, USA, Aug. 2013 to March 2015

Website: https://www.bco-dmo.org/dataset/845216
Data Type: model results
Version: 1
Version Date: 2021-03-17

Project
» Tempo and mode of salt marsh exchange (GrovesCreek)

Contributors	Affiliation	Role
Savidge, William	Skidaway Institute of Oceanography (SkIO)	Principal Investigator
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Abstract
This dataset includes cross-channel geometry data, associated with ADP data, that were extracted from the complete digital elevation model for the Groves Creek marsh (C. Alexander SkIO), see Supplemental Files section.

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Coverage

Spatial Extent: **N**:31.974 **E**:-81.0145 **S**:31.9675 **W**:-81.0277
Temporal Extent: 2013-08-09 - 2015-03-09

Methods & Sampling

Channel geometry was determined from high resolution RTK GPS digital elevation data obtained by Dr. C. Alexander at Skidaway Institute. The Groves Creek digital elevation model has been described in Sullivan et al. 2015 & 2019. To obtain channel profiles, a transect normal to the channel and intersecting the ADP deployment location was established, and the NAVD88 elevations at 0.5-1m intervals along that transect were then estimated from the elevation data set.

Transect endpoints were determined visually from maps. Data shown in bold in the original Excel file (see Data Files section) have been arbitrarily assigned to ensure that the trapezoids obtained for integration of total cross sectional area have a flat top.

This dataset was extracted from the complete digital elevation model for the Groves Creek marsh by C. Alexander (SkIO) [see Supplemental Files], where single-beam data was collected during 23 survey missions between 2010 and 2011 from a small shallow draft electric boat around high tide using an Ohmex Sonarmite echosounder with RTK-GPS positioning. Pedestrian RTK-GPS survey data was collected across the low gradient marsh platforms, creek levees, and throughout creeks found to be too small or shallow for the survey boat. Pedestrian data was acquired during times around low tide using Trimble R6 GPS receivers with RTK correction data obtained through a Virtual Reference System. Location is reported as 31.96667, -81.01667.

Data Processing Description

BCO-DMO Processing notes:
- original file 'BCO channels.xlsx' with one sheet per station
- pre-processed original file: reformatted the top 6 rows:
  - removed blank columns
  - split date range in to date_start and date_end
  - put lat and lon in different rows
  - repeated station id, deployment # in adjacent cells
- added a column for orig_row_num
- unpivoted tables to create flat tables and concatenated them into a single table
- sorted rows by {station}{deployment}{orig_row_num}
- modified parameter names to conform with BCO-DMO naming conventions
- reformatted date as yyyy-mm-dd
- added conventional header with dataset name, PI name, version date

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Data Files

File	
Cross-channel geometry data filename: BCO_channels.xlsx This is the originally submitted Excel file for this cross-channel geometry dataset. They were extracted from the complete C. Alexander data; see Supplemental Files.	(Octet Stream, 40.98 KB) MD5:ee51fa89167c9a13d12c0e43fe18dc98
channel_geometry.csv Primary data file for dataset ID 845216	(Comma Separated Values (.csv), 69.16 KB) MD5:7595f303bafd418c180f5ac9924a3e48
Cross-channel geometry for S0, converted from Excel to csv filename: cross-channel_geometry_S0.csv	(Comma Separated Values (.csv), 2.95 KB) MD5:cd179d17fb24b27760af902fdba2ad00
Cross-channel geometry for S2, converted from Excel to csv filename: cross-channel_geometry_S2.csv	(Comma Separated Values (.csv), 16.19 KB) MD5:eea5a1dc4365277c48825f8cbf35a5b7
Cross-channel geometry for S8, converted from Excel to csv filename: cross-channel_geometry_S8.csv	(Comma Separated Values (.csv), 5.46 KB) MD5:198c61e8146d71c5a132bc8f0a8c123e

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Supplemental Files

File

Complete digital elevation model for the Groves Creek marsh by C. Alexander (SkIO)

filename: DEM_01192011.zip

(ZIP Archive (ZIP), 45.17 MB)
MD5:9e6285092732041703d0392c1ec4ca08

Multi-beam sonar data was collected in December 2009 for the main channel of Groves Creek from the mouth at the intersection of the Wilmington River to the area referred to as “the forks”, where the channel dissects into three more shallow channels. The multi-beam data was collected and processed by Coastal Carolina University resulting in a 0.25m grid of the survey area. Single-beam sonar data was focused on shallow creeks and channels of the study area as well as large areas of un-vegetated tidal flats. Single-beam data was collected during 23 survey missions between 2010 and 2011 from a small shallow draft electric boat around high tide using an Ohmex Sonarmite echosounder with RTK-GPS positioning. Pedestrian RTK-GPS survey data was collected across the low gradient marsh platforms, creek levees, and throughout creeks found to be too small or shallow for the survey boat. Pedestrian data was acquired during times around low tide using Trimble R6 GPS receivers with RTK correction data obtained through a Virtual Reference System. This dataset includes positions from 241 individual survey missions over 169 field days in 2010 and 2011.

The Groves Creek modeling domain in Chatham County, GA exhibits a broad range of salt marsh geomorphic features typical of those found in southeastern salt marsh habitats. The domain includes large vegetated marsh platforms, creeks ranging from 1m to 75 m wide, creek levees, and dissected un-vegetated intertidal flats. Vegetation throughout the study area is dominated by Spartina alterniflora grasses in short, medium and tall forms up to approximately 2m tall in creek and levee regions. Previous modeling studies in the Groves Creek domain using a Light Detection and Ranging (LiDAR) derived coarse resolution digtal elevation model (DEM) (approximately 4.5 m2 cell resolution) identified the necessity for a DEM with both higher spatial resolution and accuracy (Blanton et al., 2010). The coarse resolution elevation model failed to identify many of the small (1-3m wide) creeks that dissect through creek levees and enable a conductive path for water flow between marsh platforms and larger creeks. Because saltmarshes are generally composed of very low relief topography, small vertical errors may have large affects on surface hydrology, tidal inundation and sediment distribution (Blanton et al., 2006; Chasserau et al., 2011; Hladik and Alber, 2012; Rosso et al., 2006).

In order to generate a high-accuracy topographic/bathymetric elevation dataset for use in hydrodynamic modeling studies and for comparison with other remote sensing techniques three survey styles were developed to acquire data from the various habitat zones found throughout the domain: multi-beam sonar, single-beam sonar, and pedestrian RTK-GPS. Multi-beam sonar data was collected in December 2009 for the main channel of Groves Creek from the mouth at the intersection of the Wilmington River to the area referred to as “the forks”, where the channel dissects into three more shallow channels. The multi-beam data was collected and processed by Coastal Carolina University resulting in a 0.25m grid of the survey area. Single-beam sonar data was focused on shallow creeks and channels of the study area as well as large areas of un-vegetated tidal flats. Single-beam data was collected during 23 survey missions between 2010 and 2011 from a small shallow draft electric boat around high tide using an Ohmex Sonarmite echosounder with RTK-GPS positioning. Pedestrian RTK-GPS survey data was collected across the low gradient marsh platforms, creek levees, and throughout creeks found to be too small or shallow for the survey boat. Pedestrian data was acquired during times around low tide using Trimble R6 GPS receivers with RTK correction data obtained through a Virtual Reference System. This dataset includes positions from 241 individual survey missions over 169 field days in 2010 and 2011. Areas of the marsh with low topographic complexity were delineated from aerial photographs guided by detailed knowledge of the field site. These areas were classified as platform habitat. Platforms were surveyed using targeted 5 m grid spacing. Non-platform zones surrounding creeks and levees were surveyed with point spacing from 0.5m to 3m depending on topographic complexity. The 0.25m gridded multi-beam data generated 2,361,154 survey positions, the single-beam data generated 201,310 survey positions, and the pedestrian surveys generated 159,589 positions for digital elevation model creation. The multi-beam and single-beam sonar data was merged with Pedestrian RTK-GPS data using ESRI ArcGIS software and interpolated into a 0.5m cell resolution DEM for use with hydrodynamic modeling efforts. Elevation models were generated with the ArcGIS extension 3D Analyst using the Topo to Raster function.

Results were published in:

Alexander, C.R., Hodgson, J.Y.S. and J.A. Brandes. 2017. Sedimentary Processes and Products in a Mesotidal Salt Marsh Environment: Insights from Groves Creek, Georgia. Geo-Marine Letters. https://doi.org/10.1007/s00367-017-0499-1

This project was funded by DOI, Agency Project No.: 86176-002-10.

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Related Publications

Alexander, C. R., Hodgson, J. Y. S., & Brandes, J. A. (2017). Sedimentary processes and products in a mesotidal salt marsh environment: insights from Groves Creek, Georgia. Geo-Marine Letters, 37(4), 345–359. doi:10.1007/s00367-017-0499-1
Related Research

Sullivan, J. C., Torres, R., & Garrett, A. (2019). Intertidal Creeks and Overmarsh Circulation in a Small Salt Marsh Basin. Journal of Geophysical Research: Earth Surface, 124(2), 447–463. doi:10.1029/2018jf004861 https://doi.org/10.1029/2018JF004861
Methods

Sullivan, J. C., Torres, R., Garrett, A., Blanton, J., Alexander, C., Robinson, M., … Hayes, D. (2015). Complexity in salt marsh circulation for a semienclosed basin. Journal of Geophysical Research: Earth Surface, 120(10), 1973–1989. doi:10.1002/2014jf003365 https://doi.org/10.1002/2014JF003365

Methods

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Related Datasets

IsSupplementTo

Savidge, W., Brandes, J., Stubbins, A., Edwards, C. (2017) **Tidal water velocities in Groves Creek salt marsh, Skidaway Island Georgia, USA, 2013-2014.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2017-02-22 http://lod.bco-dmo.org/id/dataset/682783 [view at BCO-DMO]

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Parameters

Parameter	Description	Units
station	station identifier	unitless
deployment	deployment number	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
date_start	start date for deployment (local)	unitless
date_end	end date for deployment (local)	unitless
transect_distance	cross-transect distance	meters
elevation	calculated elevation from navd88	meters

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Instruments

Dataset-specific Instrument Name	Ohmex Sonarmite echosounder with RTK-GPS positioning
Generic Instrument Name	Echo sounder - single-beam
Generic Instrument Description	A single-beam echo sounder is an instrument that measures water depth at a single point below the platform by timing pulses of sound reflected on the seafloor. The echo sounder transmits and receives sound, accurately measuring the time it takes to leave the sounder, reach the bottom and return to the sounder. It then converts this information into digital or graphic representations of the bottom depth and relief. The average echo sounder consists of a transmission and reception unit that sends sound signals through the water, receives and decodes information and converts that information into either a graphic or visual form. Attached to the receiver is a transducer that acts as a microphone and a speaker under the water. Sound waves travel at approximately 1500 m/s through the water dependent on water temperature". more from LMS Technologies

Dataset-specific Instrument Name	Trimble R6 GPS
Generic Instrument Name	GPS receiver
Generic Instrument Description	Acquires satellite signals and tracks your location. This term has been deprecated. Use instead: https://www.bco-dmo.org/instrument/560

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Deployments

Groves_Creek_2013-2015

Website	https://www.bco-dmo.org/deployment/682763
Platform	Groves Creek - SkIO
Start Date	2013-07-26
End Date	2015-03-11
Description	Studies of temporal and compositional changes in exported material in a saltmarsh, both the quantity and quality of dissolved organic matter (DOM) and particulate organic matter (POM) exported from Groves Creek.

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Project Information

Tempo and mode of salt marsh exchange (GrovesCreek)

Website: http://www.skio.uga.edu

Coverage: Salt marsh east of Savannah, Georgia, USA.

Description from NSF award abstract:
Salt marshes are critical mediators of the flux of material between the terrestrial and marine realms. The balance of material import, export, and transformation affects both the marsh itself and the surrounding

estuary. Previous efforts to understand the role of marshes have concentrated either on examining temporal changes (often at low resolution) of bulk exports, or compositional changes in exported material with little regard for its temporal variability. Researchers working at the Skidaway Institute of Oceanography contend that both the quantity and quality of materials exchanged between marsh and estuary in tidally-dominated systems along the southeastern US coast vary significantly in response to semidiurnal, diurnal, tidal, meteorological and seasonal forcing, and that this variability must be included when considering the total contributions of marshes to carbon cycling along the land-ocean boundary. This study will utilize a three-pronged strategy to assess both the quantity and quality of dissolved organic matter (DOM) and particulate organic matter (POM) exported from Groves Creek, a well-characterized meso-tidal salt marsh in coastal Georgia. In particular, by evaluating how marsh function responds to a full spectrum of present environmental conditions, this project will provide tangible insight into how carbon cycling in these critical regions will respond to anticipated changes in those conditions.

This project is related to the project "Marine priming effect - molecular mechanisms for the biomineralization of terrigenous dissolved organic matter in the ocean" found at https://www.bco-dmo.org/project/554157.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1234704

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