Experimental and survey biogeochemical and microbial data from R/V Point Sur cruises PS1009 and PS1103 in the Santa Barbara Channel from 2010-2011 (SBDOM project, SBC LTER project)

Website: https://www.bco-dmo.org/dataset/517839
Data Type: Cruise Results, experimental
Version: 2
Version Date: 2014-07-08

Project
» Mechanisms controlling the production and fate of DOM during diatom blooms (SBDOM)
» Santa Barbara Coastal Long Term Ecological Research site (SBC LTER)

Program
» Long Term Ecological Research network (LTER)

Contributors	Affiliation	Role
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Abstract
The dataset includes experimental and survey biogeochemical and microbial data. Samples were collected during research cruises in April 2010 and May 2011 in the Santa Barbara Channel.

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Coverage

Spatial Extent: **N**:34.4314 **E**:-119.4168 **S**:34.0984 **W**:-120.6717
Temporal Extent: 2010-04-09 - 2011-05-16

Dataset Description

The dataset includes experimental and survey biogeochemical and microbial data. Samples were collected during research cruises in April 2010 and May 2011 in the Santa Barbara Channel.

Methods & Sampling

Description of methods from cruise plans and project proposal:

Triaxus and CTD operations were conducted from the R/V Point Sur within the Santa Barbara Channel. Samples were collected for particulates and dissolved constituents. Determinations of phytoplankton productivity were made using 14C, 15NO3 and 32Si incorporation using on-deck incubator. Measurements of microbial activity, biomass and DNA. 3H-Leucine were used to assess bacterial production. Deck board incubation experiments were also conducted.

The Triaxus survey was used to assess fluorescence and to target the areas of water collection for experimental work. A 24-station CTD grid was performed on each cruise. A full suite of particulate and dissolved nutrients were measured, along with bacterial and phytoplankton productivity measurements. Two large incubation experiments were conducted onboard using deck incubators.

Assays of nutrient stress: Phytoplankton nutrient stress at each grid station were quantified by measuring the uptake rate of silicic acid and nitrate at the ambient concentration and then again after the addition of a saturating level of the nutrient. Tracers, 15NO3 or 32Si(OH)4, were added to replicate subsamples. One of the subsamples was unaltered to yield the rate of nitrate or Si uptake under ambient nutrient concentrations. The second sample in each pair received a saturating addition of the nutrient whose uptake was being monitored, yielding the uptake rate under conditions of nutrient sufficiency.

Isotopic 14C tracer experiments: The methods of Lancelot and Mathot (1985) were modified to track primary production (PP), dissolved organic Carbon (DOC) extracellular release, fraction of released DOC incorporated by bacterioplankton and the fraction that's resistant to rapid remineralization.

Data Processing Description

BCO-DMO processing notes:
- Formatted lat and lon columns to 4 decimal places.
- Changed paramter names to conform to BCO-DMO naming conventions.
- Replaced blank cells with 'nd' to indicate 'no data'.

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Data Files

File
data_summary.csv(Comma Separated Values (.csv), 322.04 KB) MD5:f021e5f59131c4f5c3523d9ba029733e Primary data file for dataset ID 517839

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Parameters

Parameter	Description	Units
cruise_name	Cruise during which sample was collected.	text
cruise_id	Official cruise identifier.	text
activity	CTD= CTD/rosette deployment; Experiment (BIB=mesocosm experiment; SIP= DOM consumption experiment; Bag= DOM consumption bag tests)	text
event	Event# [yyyymmddhhhh GMT]	unitless
sta_id	Station identification.	alphanumeric
cast_type	Type of cast: CTD or experimental.	text
cast	Cast number: a unique Identified Code for each cast (consecutive).	alphanumeric
depth_bottom	Bottom depth.	meters (m)
date_local	Date (local time) in mm/dd/yy format.	unitless
time_local	Timestamp (local) in HHMM format.	unitless
decimal_year_local	Local decimal year.	decimal year
date_gmt	Date (GMT) in mm/dd/yy format.	unitless
time_gmt	Timestamp (GMT) in HHMM format.	unitless
decimal_year_gmt	GMT decimal year.	decimal year
lat	Latitude. Positive values = North.	decimal degrees
lon	Longitude. Negative values = West.	decimal degrees
ISO_DateTime_Local	Date and time (local) formatted to ISO 8601 standard in YYYY-mm-ddTHH:MM:SS.xx format.	unitless
depth_actual	Actual sampling depth.	meters (m)
depth_target	Bottle target depth.	meters (m)
bottle	Rosette bottle number (mix or all= multiple bottles collected at same depth were combined for experimental water).	integer or text
sample	Unique Identified Code for each sample collected (consecutive).	integer
collection_bot_ID	Internal reference code; carboy or sample bottle number.	integer
phosphate	ortho-Phosphate concentration in micromolar units by flow injection autoanalyzer (Lachat QuikChem 8000).	micromoles per Liter (umol/L)
silicate	Silicate concentration in micromolar units by flow injection autoanalyzer (Lachat QuikChem 8000).	micromolar (uM)
NO2	Nitrite (NO2) concentration in micromolar units by flow injection autoanalyzer (Lachat QuikChem 8000).	micromoles per Liter (umol/L)
NO3_NO2	Nitrate (NO3) + Nitrite (NO2) concentration in micromolar units by flow injection autoanalyzer (Lachat QuikChem 8000).	micromoles per Liter (umol/L)
ammonia	Ammonium ion concentration in micromolar units by flow injection autoanalyzer (Lachat QuikChem 8000).	micromoles per Liter (umol/L)
POC	Particulate organic carbon (POC) measured by combustion analysis.	micromoles per Liter (umol/L)
PON	Particulate organic nitrogen (PON) measured by combustion analysis.	micromoles per Liter (umol/L)
tot_chl	Total chlorophyll in micrograms per Liter.	micrograms per Liter (ug/L)
chl_a	Chlorophyll a concentration in micrograms per Liter.	micrograms per Liter (ug/L)
phaeo	Phaeophytin concentration in micrograms per Liter.	micrograms per Liter (ug/L)
Si_bio	Biogenic silica concentration.	micromoles Si per Liter (umol Si/L)
Si32_rho	32Si rho	micromoles Si per Liter per day (umol Si/L/d)
Si32_Vb	32Si Vb	per day (d-1)
Si32_Krho	32Si-K rho	micromoles Si per Liter per day (umol Si/L/d)
Si32_Erho	32Si-E rho (SBDOM11 only)	micromoles Si per Liter per day (umol Si/L/d)
Si32_KVb	32Si-K Vb	per day (d-1)
Si32_EVb	32-Si-E Vb (SBDOM11 only)	per day (d-1)
N15_rho	15N rho	micromoles N per Liter per day (umol N/L/d)
N15_Vb	15N Vb	per day (d-1)
N15_enriched_rho	15N-Enriched rho	micromoles N per Liter per day (umol N/L/d)
N15_enriched_Vb	15N-Enriched Vb	per day (d-1)
C14_light	14C Light	milligrams C per cubic meter per day (mg C/m3/d)
C14_dark	14C Dark	milligrams C per cubic meter per day (mg C/m3/d)
C14_prod	14C Prod	milligrams C per cubic meter per day (mg C/m3/d)
PER	Percent Extracellular Release.	percent (%)
bact_prod	Heterotrophic Bacterial Production (Dark) by 3H Leu uptake.	milligrams C per cubic meter per day (mg C/m3/d)
bact_prod_light	Heterotrophic Bacterial Production (Light) by 3H Leu uptake	milligrams C per cubic meter per day (mg C/m3/d)
bact_prod_cells	BP Cells	cells per cubic meter per day (cells/m3/d)
bact_prod_light_cells	BP Light Cells	cells per cubic meter per day (cells/m3/d)
tot_bact_cells	Total Bacterial cell count by flow cytometry	bacterial cells per cubic meter (Baterial Cells/m3)
autofluor_cells	Autofluorescent cell count by flow cytometry	autofluorescent cells per cubic meter (Autofluor Cells/m3)
DOC	Dissolved organic carbon (DOC) concentration by HTCO in micromolar units. Glass fiber filtrate type GF/F (Whatman).	micromolar Carbon (uM C)

DON	Dissolved organic nitrogen (DON) concentration by HTCO in micromolar units. Glass fiber filtrate type GF/F (Whatman).	micromolar Nitrogen (uM N)
depth_ctd	CTD Depth (m)	meters (m)
press	CTD Pressure (db)	decibars
temp	CTD Temp0 (oC)	degrees Celsius
temp2	CTD Temp1 (oC)	degrees Celsius
cond	CTD Conductivity0 (S/m)	Siemens per meter (S/m)
cond2	CTD Conductivity1 (S/m)	Siemens per meter (S/m)
sal	CTD Salinity0 (PSU)	practical salinity units (PSU)
sal2	CTD Salinity1 (PSU)	practical salinity units (PSU)
sigma_0	CTD Density0 (sigma-theta)	?
sigma_0_2	CTD Density1 (sigma-theta)	?
fluor	Fluorescence (ug/L)	micrograms per Liter (ug/L)
trans	Transmission (%)	percent (%)
beam_c	Beam C (1/m)	reciprical meters (1/m)
O2_umol_kg	SBE Oxygen (umol/kg)	micromoles per kilogram (umol/kg)
PAR	PAR	?
SPAR	Surface PAR	?
PAR_corrected	Corrected PAR (%)	percent (%)

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	CTD TRIAXUS
Generic Instrument Description	Sea-bird SBE 9 pumped CTD attached to the Triaxus towed undulating platform. The Triaxus towed undulating vehicle, designed and manufactured by MacArtney, achieves high resolution 3-dimensional surveys of the upper 180m of the water column. The standard sensor package includes a Seabird CTD (with optional secondary C and T sensors), transmissometer, dissolved oxygen, chlorophyll fluorometer, and PAR sensor. In addition to this basic configuration, Triaxus can accommodate up to 9 additional sensor packages / sensors. See http://www.macartney.com/systems/remote-technology/triaxus.

Dataset-specific Instrument Name	flow injection autoanalyzer
Generic Instrument Name	Flow Injection Analyzer
Dataset-specific Description	A flow injection autoanalyzer (Lachat QuikChem 8000) was used.
Generic Instrument Description	An instrument that performs flow injection analysis. Flow injection analysis (FIA) is an approach to chemical analysis that is accomplished by injecting a plug of sample into a flowing carrier stream. FIA is an automated method in which a sample is injected into a continuous flow of a carrier solution that mixes with other continuously flowing solutions before reaching a detector. Precision is dramatically increased when FIA is used instead of manual injections and as a result very specific FIA systems have been developed for a wide array of analytical techniques.

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Deployments

PS1009

Website	https://www.bco-dmo.org/deployment/58833
Platform	R/V Point Sur
Report	http://dmoserv3.whoi.edu/data_docs/SBDOM/SBDOM10_cruise_plan.doc
Start Date	2010-04-09
End Date	2010-04-18
Description	Triaxus and CTD operations within the Santa Barbara Channel. Collected samples for particulates and dissolved constituents. Made determinations of primary production by 14C and 32Si incorporation using on-deck incubator. Measurements of microbial activity, biomass and DNA. 3H-Leucine used to assess bacterial production. Conducted deckboard incubation experiments. See information on PS1009 in the R2R Cruise Catalog.

PS1103

Website	https://www.bco-dmo.org/deployment/517703
Platform	R/V Point Sur
Report	http://dmoserv3.whoi.edu/data_docs/SBDOM/SBDOM11_cruise_plan.doc
Start Date	2011-05-07
End Date	2011-05-20
Description	Triaxus and CTD operations within the Santa Barbara Channel. Collected samples for particulates and dissolved constituents. Made determinations of phytoplankton productivity using 14C, 15NO3 and 32Si incorporation using on-deck incubator. Measurements of microbial activity, biomass and DNA. 3H-Leucine will be used to assess bacterial production. Conducted deck board incubation experiments. See information on PS1103 in the R2R Cruise Catalog.

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Project Information

Mechanisms controlling the production and fate of DOM during diatom blooms (SBDOM)

Coverage: Pacific California, Santa Barbara Channel

This project is also affiliated with the Plumes and Blooms project.

Data:
The following data files have been submitted to BCO-DMO but are not yet available online. Data are restricted until June 2016. Please contact the PI for access prior to public availability:
-- SBDOM10 and SBDOM11 CTD and Niskin bottle data.

The following are available online (see 'Datasets' heading below):
-- SBDOM10 and SBDOM11 cruise plans (available online on deployment pages: PS1009, PS1103)
-- SBDOM10 and SBDOM11 event logs (available online; see 'Datasets' below)
-- Laboratory-based Bloom in a Bottle (BIB) Experiment
-- Laboratory-based Remineralization Experiments
-- SBDOM10 and SBDOM11 data summaries (including CTD data, nutrients, and bacterial production)

Project Description from NSF Award Proposal and Abstract:
Diatom blooms are known to produce prodigious quantities of DOM upon entering nutrient stress with a chemical composition that varies with the type of nutrient limitation (Si or N). This variable composition likely influences the nutritional value of DOM to microbes driving species successions towards functional groups of heterotrophic prokaryotes that are best able to metabolize particular forms of DOM. To date each side of this coupled system of production/consumption has been examined independently. A few studies have examined how limitation by different limiting nutrients affects the chemical character of the DOM produced by phytoplankton, while others have focused on the fate of DOM without detailed understanding of the mechanisms influencing its initial chemical composition.

We propose to investigate the mechanisms determining the character and fate of DOM produced during temperate diatom blooms. Specifically we will investigate how physiological stress on diatoms induced by different limiting nutrients influences the production, chemical composition of DOM and the microbial community structure that respond to it to better understand the mechanisms driving the accumulation and persistence of DOM in marine systems. The research will involve both laboratory and field experiments. The novel aspects of this work are:
1) We will investigate how limitation by either N or Si impacts the quantity and chemical composition of the DOM released by diatoms.
2) Assess how the differences in the chemical composition of the DOM produced under N or Si limitation affect its lability by examining the productivity, growth efficiency and community structure of heterotrophic bacterioplankton responding to the release of substrates.
3) Predicted DOM dynamics based on (1) and (2) will be tested in the field during diatom blooms in the Santa Barbara Channel, California.

While experiments investigating aspects of either 1 or 2 have been conducted successfully in the past (Lancelot, 1983; Billen and Fontigny, 1987; Goldman et al., 1992; Carlson et al.,1999; Cherrier and Bauer, 2004; Conan et al., 2007) ours will be the first study to combine these approaches in an integrated assessment of the mechanisms governing both the production and fate of DOM produced by diatom blooms experiencing limitation by different nutrients.

References:
Lancelot, C. (1983). Factors affecting phytoplankton extracellular release in the Southern Bight of the North Sea. Marine Ecology Progress Series 12: 115-121.

Billen, G. and A. Fontigny (1987). Dynamics of a Phaeocystis -dominated spring bloom in Belgian coastal waters. II. Bacterioplankton dynamics. Mar. Ecol. Prog. Ser. 37: 249-257.

Goldman, J.C., D.A. Hansell and M.R. Dennett (1992). Chemical characterization of three large oceanic diatoms: potential impact on water column chemistry. Marine Ecology Progress Series 88: 257-270.

Carlson, C.A., N.R. Bates, H.W. Ducklow and D.A. Hansell (1999). Estimation of bacterial respiration and growth efficiency in the Ross Sea, Antarctica. Aquatic Microbial Ecology 19: 229-244.

Cherrier, J. and J.E. Bauer (2004). Bacterial utilization of transient plankton-derived dissolved organic carbon and nitrogen inputs in surface ocean waters. Aquatic Microbial Ecology 35(3): 229-241.

Conan, P., M. Sondegaard, T. Kragh, F. Thingstad, M. Pujo-Pay, P.J.l.B. Williams, S. Markager, G. Cauwet, N.H. Borch, D. Evans and B. Rieman (2007). Partitioning of organic production in marine plankton communities: The effects of inorganic nutrient ratios and community composition on new dissolved organic matter. Limnology and Oceanography 52(2): 753-765.

Santa Barbara Coastal Long Term Ecological Research site (SBC LTER)

Website: http://sbc.lternet.edu/

Coverage: Southern California Coastal Zone

From http://www.lternet.edu/sites/sbc
The Santa Barbara Coastal LTER is located in the coastal zone of southern California near Santa Barbara. It is bounded by the steep east-west trending Santa Ynez Mountains and coastal plain to the north and the unique Northern Channel Islands archipelago to the south. Santa Barbara Coastal Long-Term Ecological Research (SBC) Project is headquartered at the University of California, Santa Barbara, and is part of the National Science Foundation's (NSF) Long-Term Ecological Research (LTER) Network.

The research focus of SBC LTER is on ecological systems at the land-ocean margin. Although there is increasing concern about the impacts of human activities on coastal watersheds and nearshore marine environments, there have been few long-term studies of the linkages among oceanic, reef, sandy beaches, wetland, and upland habitats. SBC LTER is helping to fill this gap by studying the effects of oceanic and coastal watershed influences on kelp forests in the Santa Barbara Channel located off the coast of southern California. The primary research objective of SBC LTER is to investigate the relative importance of land vs. ocean processes in structuring giant kelp (Macrocystis pyrifera) forest ecosystems for different conditions of land use, climate and ocean influences.

SBC LTER Data: The Santa Barbara Coastal (SBC) LTER data are managed by and available directly from the SBC project data site URL shown above. If there are any datasets listed below, they are data sets that were collected at or near the SBC LTER sampling locations, and funded by NSF OCE as ancillary projects related to the SBC LTER core research themes. See the SBC LTER Data Overview page for access to data and information about data management policies.

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Program Information

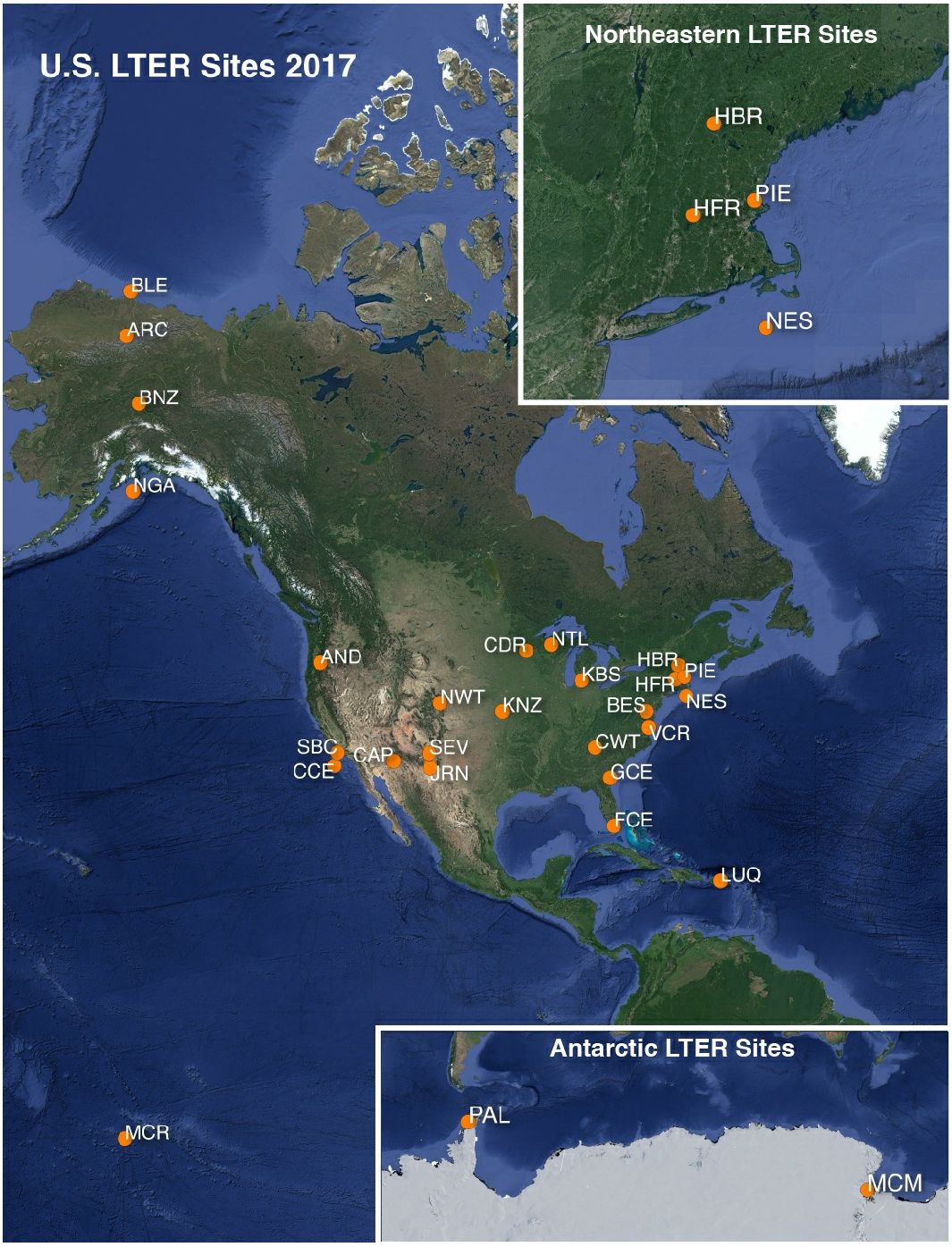
Long Term Ecological Research network (LTER)

Website: http://www.lternet.edu/

Coverage: United States

adapted from http://www.lternet.edu/

The National Science Foundation established the LTER program in 1980 to support research on long-term ecological phenomena in the United States. The Long Term Ecological Research (LTER) Network is a collaborative effort involving more than 1800 scientists and students investigating ecological processes over long temporal and broad spatial scales. The LTER Network promotes synthesis and comparative research across sites and ecosystems and among other related national and international research programs. The LTER research sites represent diverse ecosystems with emphasis on different research themes, and cross-site communication, network publications, and research-planning activities are coordinated through the LTER Network Office.



Site Codes

AND	Andrews Forest LTER
ARC	Arctic LTER
BES	Baltimore Ecosystem Stu
BLE	Beaufort Lagoon Ecosystems LTER
BNZ	Bonanza Creek LTER
CCE	California Current Ecosystem LTER
CDR	Cedar Creek Ecosystem Science Reserve
CAP	Central Arizona-Phoenix LTER
CWT	Coweeta LTER
FCE	Florida Coastal Everglades LTER
GCE	Georgia Coastal Ecosystems LTER
HFR	Harvard Forest LTER
HBR	Hubbard Brook LTER
JRN	Jornada Basin LTER
KBS	Kellogg Biological Station LTER
KNZ	Konza Prairie LTER
LUQ	Luquillo LTER
MCM	McMurdo Dry Valleys LT
MCR	Moorea Coral Reef LTEF
NWT	Niwot Ridge LTER
NTL	North Temperate Lakes I
NES	Northeast U.S. Shelf LTE
NGA	Northern Gulf of Alaska I
PAL	Palmer Antarctica LTER
PIE	Plum Island Ecosystems LTER
SBC	Santa Barbara Coastal L
SEV	Sevilleta LTER
VCR	Virginia Coast Reserve L

2017 LTER research site map obtained from https://lternet.edu/site/lter-network/

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0850857

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