CTD data from moorings in the South Atlantic Bight (SAB) continental shelf off Long Bay, collected from December 2011 to April 2012 (Long Bay Wintertime Bloom project)

Website: https://www.bco-dmo.org/dataset/544697
Version: 2014-12-18

Project
» Mechanisms of nutrient input at the shelf margin supporting persistent winter phytoplankton blooms downstream of the Charleston Bump (Long Bay Wintertime Bloom)

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Dataset Description

Time series of near-bottom salinity, temperature, and depth measured every 5 minutes (300sec) by a SeaBird Electronics CTD (SBE-SMP37) mounted on bottom frame of three moorings located at Long Bay, S. Carolina in the South Atlantic Bight.

Data Processing Description

Data read from SeaBird SMP37 ascii format downloaded from each CTD.

Quality control (QC) steps applied to CTD data using flag of Not-a-Number (NaN) are as follows:

1. removed data when bottom frame not at deployment depth (trim beginning and end values)
2. evaluate sensors (cond, depth, temperature within tolerances), and flagged when outside tolerance
3. manually flagged data when particular sensor exhibited obvious biofouling or failure.
   a. Specifically for LB1 CTD at 30m the conductivity cell was fouled on Feb 12, 2012

After QC, salinity (sal) converted from conductivity using PSS-78, water density (dens) calculated from Absolute Salinity, in situ temperature and pressure using TEOS-10 and depth from pressure at the original sampling interval of 300 seconds (5min). These conversions and derived density were calculated using gsw Oceanographic Toolbox (version 3.01) for MATLAB (IOC, SCOR and IAPSO, 2010).

Normally, density should not be archived with data submission to national repository. However since this parameter is integral to the main study, density is being reported with other measured parameters but with caveat that it is derived based on TEOS-10.

References:

IOC, SCOR and IAPSO, 2010: The international thermodynamic equation of seawater - 2010: Calculation and use of thermodynamic properties. Intergovernmental Oceanographic Commission, Manuals and Guides No. 56, UNESCO (English), 196 pp. Available from http://www.TEOS-10.org.

BCO-DMO Processing:

-extracted data from MatLab .mat files
-added conventional header with dataset name, PI name, version date
-renamed some parameters to BCO-DMO standard
-added mooring_id, latitude, longitude, yrday_utc and ISO_DateTime_UTC to served view
-reduced number of significant digits

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Data Files

File
moorings_CTD.csv (Comma Separated Values (.csv), 7.33 MB) MD5:2566a1bbb26b5965598096f085ed57fa Primary data file for dataset ID 544697

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Parameters

Parameter	Description	Units
mooring_id	mooring identification	unitless
year	year	yyyy
month_utc	UTC month	mm
day_utc	UTC day	dd
yrday_utc	UTC day and decimal time: e.g. 326.5 for the 326th day of the year or November 22 at 1200 hours (noon)	unitless
hour	UTC hour	HH
min	UTC minute	MM
sec	UTC second	SS.fraction of second
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
depth	depth	meters
press	pressure	decibars
temp	temperature	degrees Celsius
dens	density	kilograms/meter^3
sal	salinity	PSU
ISO_DateTime_UTC	Date/Time (UTC) ISO formatted	yyyy-mm-ddTHH:MM:SS[.xx]Z
cond	conductivity	Siemens/meter

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Instruments

Dataset-specific Instrument Name	CTD MicroCAT 37
Generic Instrument Name	CTD Sea-Bird MicroCAT 37
Dataset-specific Description	SeaBird Electronics CTD (SBE-SMP37). Sampling was set for every 300 seconds (5min). LB1: s/n 1602, mounted on a bottom frame at nominal depth of 30m. LB2: s/n 1670 was mounted on a bottom frame at nominal depth of 76m. LB3: s/n 1986 was mounted on a bottom frame at nominal depth of 171m.
Generic Instrument Description	The Sea-Bird MicroCAT CTD unit is a high-accuracy conductivity and temperature recorder based on the Sea-Bird SBE 37 MicroCAT series of products. It can be configured with optional pressure sensor, internal batteries, memory, built-in Inductive Modem, integral Pump, and/or SBE-43 Integrated Dissolved Oxygen sensor. Constructed of titanium and other non-corroding materials for long life with minimal maintenance, the MicroCAT is designed for long duration on moorings. In a typical mooring, a modem module housed in the buoy communicates with underwater instruments and is interfaced to a computer or data logger via serial port. The computer or data logger is programmed to poll each instrument on the mooring for its data, and send the data to a telemetry transmitter (satellite link, cell phone, RF modem, etc.). The MicroCAT saves data in memory for upload after recovery, providing a data backup if real-time telemetry is interrupted.

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Deployments

LB_2012_LB1

Website	https://www.bco-dmo.org/deployment/58860
Platform	LB1 Mooring
Start Date	2012-01-20
End Date	2012-04-04
Description	Deployment of taut line and bottom frame at LB1 (at 31 m depth) during cruise SAV-12-02 on 20 January 2012. Recovered on 04 April 2012 during cruise SAV-12-14.

LB_2012_LB2

Website	https://www.bco-dmo.org/deployment/58861
Platform	LB2 Mooring
Start Date	2012-01-19
End Date	2012-04-03
Description	Deployment of SKIO Seahorse Profiler and bottom frame at LB2 (at 76 m depth) during cruise SAV-12-02 on 19 January 2012. Recovered on 03 April 2012 during cruise SAV-12-14.

LB_2012_LB3

Website	https://www.bco-dmo.org/deployment/58858
Platform	LB3 Mooring
Start Date	2011-12-14
End Date	2012-04-03
Description	Deployment of UNC bottom mooring at LB3 (at 171 m depth) during cruise SAV-11-44 on 14 December 2011. Recovered on 03 April 2012 during cruise SAV-12-14.

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Project Information

Mechanisms of nutrient input at the shelf margin supporting persistent winter phytoplankton blooms downstream of the Charleston Bump (Long Bay Wintertime Bloom)

Website: http://nccoos.org/projects/long-bay-wintertime-blooms/

Coverage: outer South Atlantic Bight (SAB) continental shelf off Long Bay

NSF Project Title: Mechanisms of nutrient input at the shelf margin supporting persistent winter phytoplankton blooms downstream of the Charleston Bump

Sustained phytoplankton blooms along the outer South Atlantic Bight (SAB) continental shelf off Long Bay are observed in winter in multi-year satellite chlorophyll imagery. This section of the shelf lies north of the "Charleston Bump" (between 32.5-33.5°N), where the Gulf Stream is often strongly deflected offshore. Due to this offshore deflection, this is not an area where nutrient input to the shelf would be enhanced by upwelling associated with Gulf Stream frontal eddies, a major mechanism of nutrient input in other parts of the SAB shelf (Lee et al., 1991). Yet prior in situ observations suggest that there is recurring input of nutrients from the upper slope to the outer shelf off Long Bay from winter to early spring. This project will investigate a fundamental aspect of physical-biological coupling in the outer shelf to upper slope region. The PIs will test the hypotheses that: 1) the persistence of winter blooms on the outer shelf off Long Bay results from repeated episodes of nutrient input and mixing which maintains nutrient-sufficient conditions for extended periods; 2) several physical mechanisms are involved, including enhanced mixing energy from the internal tide along this section of the upper slope/shelf break; 3) the relatively high nutrient, intermittently turbulent environment will favor larger bloom-forming phytoplankton. The latter could have important implications for higher trophic levels, including early life history strategies of fish that spawn along the shelf margin off Long Bay in winter to early spring.

This project will combine several maturing observational technologies to address the following:

1. What is the frequency and magnitude on on-shelf transport of nitrate from the upper slope?
2. What are the mechanisms of nutrient delivery from the upper slope to the outer continental shelf zone that are operating off Long Bay under the range of hydrographic and forcing conditions encountered in winter?
3. What is the 3-D structure of outer shelf hydrography and associated winter bloom features and how do these evolve through multiple nutrient input/mixing events?
4. What are the rates of nitrate utilization and primary production associated with the winter blooms?
5. Does the winter regime consistently favor a bloom assemblage dominated by larger diatom forms?

Near-continuous cross-shelf and upper slope observations will be obtained with two autonomous gliders, time-series measurements on the outer shelf and slope from a set of moored instruments (including a moored profiling system at the shelf break), and repeated cross- and along-shelf ship surveys using a towed, undulating package. Ship station work will include measurements of primary production and on-board analyses of key functional characteristics of the phytoplankton assemblage (cell forms, abundance, size and bio-volume distributions) using a microfluidics/imaging system. In combination, these systems will provide a level of spatial and temporal resolution of physical, nutrient and biological fields that could not be achieved in earlier, station-based field studies and the basis for improved understanding of physical mechanisms of recurring nutrient input to the shelf, and how the nutrient, mixing, and circulation regime in winter structures the phytoplankton

community. Coastal naturalists will be engaged through a seabird survey component of the field program that will augment existing information on pelagic seabirds in winter and define their association with oceanographic features on the central South Atlantic Bight shelf and slope.

This project will provide a deeper understanding of shelf/slope exchange processes and how these influence shelf ecosystems, generating information that will contribute to implementation of ecosystem-based management in the region.

References:
Lee, T. N., J. A. Yoder, and L. P. Atkinson, 1991: Gulf Stream frontal eddy influence on productivity of the southeast U.S. continental shelf. J. Geophys. Res, 96, 22191-22205.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1032285
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