# ADCP data from the South Atlantic Bight (SAB) continental shelf off Long Bay (Mooring #1) at 30 meters collected from January to April in 2012 (Long Bay Wintertime Bloom project)

**Website**: https://www.bco-dmo.org/dataset/544448
**Data Type**: Cruise Results
**Version**: 1
**Version Date**: 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)

| Contributors | Affiliation | Role |
| --- | --- | --- |
| Nelson, James | Skidaway Institute of Oceanography (SkIO) | Principal Investigator |
| Edwards, Catherine | Skidaway Institute of Oceanography (SkIO) | Co-Principal Investigator |
| Seim, Harvey E. | University of North Carolina at Chapel Hill (UNC-Chapel Hill) | Co-Principal Investigator |
| Haines, Sara | University of North Carolina at Chapel Hill (UNC-Chapel Hill) | Contact |
| Copley, Nancy | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager |

**Abstract**
Time series of horizontal and vertical current profiles measured every 5 minutes (300sec) with an acoustic doppler current profiler (ADCP) mounted on the bottom frame looking upward. The depth resolution is 1 meter. The mooring is located at Long Bay, S. Carolina in the South Atlantic Bight and recorded from 30 meters depth, January to April 2012.

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## Coverage

**Spatial Extent**: **Lat**:33.1695 **Lon**:-78.3334
**Temporal Extent**: 2012-01-20 - 2012-04-04

### Methods & Sampling

A Teledyne RDI 600 kHz Work Horse Acoustic Doppler Current Profiler (RDI ADCP) was mounted looking upward on a bottom frame at nominal depth of 30m. Sampling was set for every 300 seconds (5min). Depth resolution was set to 1 meter.

LB2 ADCP did not have a pressure sensor and LB3 ADCP pressure sensor malfunctioned. Pressure records from the collocated bottom-frame CTDs were used to form the surface mask in ADCP profile data.

### Data Processing Description

Data were read from ADCP binary format using Rich Pawlowicz's MATLAB functions to read binary and processed RDI ADCP files. [1]

Quality control (QC) steps applied are based on Teledyne RDI recommendations [2] and QARTOD guidance [3]. Quality controlled ADCP data were flagged with Not-a-Number (NaN) (changed to nd by BCO-DMO) under the following conditions:

1. when bottom frame not at deployment depth (trimming beginning and end values)
2. sensor health parameters (pitch, roll, heading, water temperature) not within tolerances
3. quality and strength of returned signal not sufficient based on the following parameters:
   a. Echo Intensity
   b. Correlation Magnitude
   c. Error Velocity
   d. Percent Good
4. surface masking based on beam angle and addition roll and/or pitch and surface location from water level determined from pressure sensor on ADCP or collocated on the bottom frame.

The ADCP configuration info and tolerances used in the QC processing for each ADCP (LB1, LB2, and LB3) are provided with each dataset.

As a final step, the horizontal velocity components were rotated to be relative to True North based on magnetic variation of the deployment location after verifying no internal application of magnetic variation was applied to data.

Further ADCP data processing information (pdf)

**References:**
[1] Pawlowicz's Matlab Stuff. Accessed December 2014.
[2] D.R. Symonds 2006
[3] IOOS, 2013. Accessed December 17, 2014.

### BCO-DMO Processing Description

BCO-DMO Processing:
-extracted data from MatLab .mat file
-added conventional header with dataset name, PI name, version date, reference information
-renamed parameters to BCO-DMO standard
-added deployment_id, lat, lon
-added 'day_local', 'month_local', 'year', 'yrday_local', ISO_DateTime_UTC to served view
-changed NaN to nd
-reduced number of significant digits
- divided pressure value 1000

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## Data Files

| File |
| --- |
| **ADCP_1.csv** (Comma Separated Values (.csv), 13.31 MB) MD5:c4292cfc7157dff33cfc425ec990f7ac<br>Primary data file for dataset ID 544448 |

| File |
| --- |
| |

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## Supplemental Files

| File |
| --- |
| **Further ADCP data processing information**<br>filename: README_mooring_ADCP_mat_files.pdf (Portable Document Format (.pdf), 14.93 KB) MD5:6158cb3d2ef6b98de19fbf394286d8e0<br>This README file describes the file contents and processing steps for each file of level1 mooring adcp data for the Long Bay Wintertime (2012) Project. |

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## Related Publications

IOOS, 2013. Manual for Real-Time Quality Control of In-situ Current Observations. http://www.ioos.noaa.gov/qartod/currents/qartod_currents_manual.pdf https://cdn.ioos.noaa.gov/media/2019/08/QARTOD_Currents_Update_Second_Final.pdf
*Methods*

Rich Pawlowicz’s Matlab Stuff – RDADCP, version Mar 2010, http://www.eos.ubc.ca/~rich/#RDADCP. December 17, 2014. https://www.eoas.ubc.ca/~rich/#RDADCP
*Methods*

Symonds, D. R. (2006). QA/QC Parameters for Acoustic Doppler Current Profilers. Teledyne RDI Application Note.
*Methods*

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## Related Datasets

### IsRelatedTo

Nelson, J., Edwards, C., Seim, H. E. (2023) **ADCP data from the South Atlantic Bight (SAB) continental shelf off Long Bay (Mooring #2) at 76 meters collected from January to April in 2012 (Long Bay Wintertime Bloom project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2014-12-18 doi:10.26008/1912/bco-dmo.544479.1 [view at BCO-DMO]

Nelson, J., Edwards, C., Seim, H. E. (2023) **ADCP data from the South Atlantic Bight (SAB) continental shelf off Long Bay (Mooring #3) at 171 meters collected from December 2011 to April 2012 (Long Bay Wintertime Bloom project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2014-12-18 doi:10.26008/1912/bco-dmo.544512.1 [view at BCO-DMO]

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## Parameters

| Parameter | Description | Units |
| --- | --- | --- |
| deploy_id | mooring identification number | unitless |

| | | |
|---|---|---|
| lat | latitude of the sampling site; north is positive | decimal degrees |
| lon | longitude of the sampling site; west is negative | decimal degrees |
| year | year | yyyy |
| month_utc | UTC month | mm |
| day_utc | UTC day | dd |
| date_utc | UTC date | yyyy-mm-dd |
| time_utc | UTC time | HH:MM:SS |
| yrday_utc | UTC day and decimal time: 326.5 for the 326th day of the year or November 22 at 1200 hours (noon) | yyy.fraction_of_day |
| ISO_DateTime_UTC | Date/Time (UTC) ISO formatted | yyyy-mm-ddTHH:MM:SS.00Z |
| pitch | degree of fore and aft movement from the horizontal | degrees |
| roll | degree of side to side movement from the horizontal | degrees |
| heading | direction of movement; compass heading | degrees |
| depth | depth | meters |
| temperature | temperature | degrees Celsius |
| pressure | pressure | decibars |
| salinity | salinity | PSU |
| u# | eastward component of water velocity relative to true north; '#' represents the depth range in meters of each profile depth cell above the ADCP | meters/second |

| | | |
|---|---|---|
| v# | northward component of water velocity relative to true north; '#' represents the depth range in meters of each profile depth cell above the ADCP | meters/second |
| w# | vertical velocity; '#' represents the depth range in meters of each profile depth cell above the ADCP | meters/second |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | ADCP |
| **Generic Instrument Name** | Acoustic Doppler Current Profiler |
| **Generic Instrument Description** | The ADCP measures water currents with sound, using a principle of sound waves called the Doppler effect. A sound wave has a higher frequency, or pitch, when it moves to you than when it moves away. You hear the Doppler effect in action when a car speeds past with a characteristic building of sound that fades when the car passes. The ADCP works by transmitting "pings" of sound at a constant frequency into the water. (The pings are so highly pitched that humans and even dolphins can't hear them.) As the sound waves travel, they ricochet off particles suspended in the moving water, and reflect back to the instrument. Due to the Doppler effect, sound waves bounced back from a particle moving away from the profiler have a slightly lowered frequency when they return. Particles moving toward the instrument send back higher frequency waves. The difference in frequency between the waves the profiler sends out and the waves it receives is called the Doppler shift. The instrument uses this shift to calculate how fast the particle and the water around it are moving. Sound waves that hit particles far from the profiler take longer to come back than waves that strike close by. By measuring the time it takes for the waves to bounce back and the Doppler shift, the profiler can measure current speed at many different depths with each series of pings. (More from WHOI instruments listing). |

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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. |

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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 |
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1032276 |

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