

CTD casts from the SPIROPA project from R/V Neil Armstrong cruise AR29 and R/V Thomas G. Thompson cruise TN368 to the New England Shelfbreak in 2018 and 2019

Website: <https://www.bco-dmo.org/dataset/807119>

Data Type: Cruise Results

Version: 2

Version Date: 2021-04-20

Project

» [Collaborative Research: Shelfbreak Frontal Dynamics: Mechanisms of Upwelling, Net Community Production, and Ecological Implications](#) (SPIROPA)

Contributors	Affiliation	Role
McGillcuddy, Dennis J.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Zhang, Weifeng Gordon	Woods Hole Oceanographic Institution (WHOI)	Co-Principal Investigator
Kosnyrev, Olga	Woods Hole Oceanographic Institution (WHOI)	Data Manager
Biddle, Mathew	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager
York, Amber D.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract

CTD casts from the first cruise and third cruises of the SPIROPA project. The first cruise (AR29 Transect 24), took place aboard the R/V Neil Armstrong in April 2018 and the third cruise (TN368) took place on the R/V Thomas G. Thompson cruise in July of 2019.

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Coverage

Spatial Extent: N:40.2705 E:-70.0012 S:39.1242 W:-70.8308

Temporal Extent: 2018-04-27 - 2019-07-16

Dataset Description

Standard station CTD profiles measurements (down casts) with water sampling (up casts).

Acquisition Description

Standard CTD cast.

Location: New England Shelfbreak 40 S 71 W depth 80-2000m

Processing Description

This dataset was not cleaned to remove outliers. See processing notes below about missing data identifiers.

Sea-Bird Software used for AR29 data:

Data acquisition: SBE Seasave, version 7.23.2

Data processing: SBE Data Processing, version 7.26.7.114

Sea-Bird Software used for TN368 data:

Data acquisition: SBE Seasave, version 7.26.7.107

Data processing: SBE Data Processing, version 7.26.7.114

BCO-DMO Processing Notes (Data Version 1, 2020-03-27, AR29):

- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- converted latitude and longitude coordinates to decimal degrees in the lat and lon columns
- concatenated all downcast seabird data files into one dataset.
- added ISO_DateTime_UTC field
- converted values indicated in seabird files as bad (-9.990e-29) to nd.

Dataset Version 2 (2021-04-20) replaces Dataset Version 1 (2020-03-27).

* This dataset update was made to add data from TN368 data in 2019.

* Imported seabird .cnv files from TN368 and reimported the .cnv files from AR29 into the BCO-DMO data system. Imported the AR29 files again in this version instead of using the data from the previous version 1 of this dataset because temperature data t090C and t190C for cast 134 between depths 110 to 120 was not imported correctly in the version 1 data. It appears to have been an error when uploading the fixed with seabird file.

* Combined all the data into one table with additional columns for Cruise and Cast from information in the file names.

* As was done in version 1 of this dataset, the NMEA Lat, Lon and Time (UTC) in the seabird header was used as the data source for columns lat, lon, and ISO_DateTime_UTC.

* lat,lon rounded to 5 decimal places.

* column names renamed to match version 1 of this dataset which conform to the BCO-DMO naming conventions.

* Only -9.990e-29 was interpreted as a missing data identifier. These values will be displayed differently based on the file type downloaded by the user. It will be blank values in .csv files, NaN in matlab files, etc.

* The data submitter indicated this dataset was not cleaned for outliers. The following values are in this dataset: 90e-29, 9.0E-28,9.90E-27, 9.90E-27,-9.990e-29, 990e-29, 1.0000E-12. CPar data in AR29 cast 143 had some values: 9.2221E-13, 9.1837E-13, 9.2295E-13, 9.2564E-13, 9.2370E-13

* Data sorted by datetime then pressure (prDM)

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Parameters

Parameter	Description	Units
ISO_DateTime_UTC	Cast date and time in UTC ISO8601 format. From NMEA Time UTC.	yyyy-MM-dd'T'HH:mm:ss'Z'
lat	Cast latitude. From NMEA latitude.	decimal degrees
lon	Cast longitude; west is negative. From NMEA longitude.	decimal degrees
Cruise	Cruise name	unitless
Cast	Cast number	unitless
prDM	Pressure	decibar (db)
t090C	Temperature from primary sensor (ITS-90)	degrees Celsius (C)
t190C	Temperature from secondary sensor (ITS-90)	degrees Celsius (C)
c0S_m	Conductivity from primary sensor	Siemens per meter (S/m)
c1S_m	Conductivity from secondary sensor	Siemens per meter (S/m)
sbeox0V	Oxygen raw SBE 43	volts (V)
flECO_AFL	Fluorescence, WET Labs ECO-AFL/FL	milligrams per meter cubed (mg/m ³)
wetCDOM	Fluorescence, WET labs CDOM	milligrams per meter cubed (mg/m ³)
upoly0	Upoly 0, SUNA 2km ASY-NTR-00081. SUNA UserPoly.	micromolar nitrate (mmol nitrate per m ³)
CStarTr0	Beam Transmission, WET Labs C-Star	%
turbWETntu0	Turbidity, WET Labs ECO	NTU
altM	Altitude	meters (m)
sal00_D	Salinity practical from primary sensor (output from Data Conversion)	Practical Salinity Units (PSU)
spar	SPAR/surface irradiance	microEinsteins/m ² /second
par	PAR/irradiance	microEinsteins/m ² /second
cpar	CPAR/Corrected Irradiance	percent (%)
v0	Fluor1 Voltage	volts (V)
v6	UserPoly Voltage	volts (V)
depSM	Depth	meters (m)
sal00	Salinity practical from primary sensors	Practical Salinity Units (PSU)
sal11	Salinity practical from secondary sensors	Practical Salinity Units (PSU)
sbeox0ML_L	Dissolved oxygen concentration from Oxygen SBE 43	milliliters per liter (ml/l)
svCM	Sound velocity (chen-millero) from primary sensors	meters per second (m/s)
sigma_e00	Sigma-theta density from primary sensors	kilograms per meters cubed (kg/m ³)
sigma_e11	Sigma-theta density from secondary sensors	kilograms per meters cubed (kg/m ³)

Instruments

Dataset-specific Instrument Name	LI-COR Biospherical SPAR
Generic Instrument Name	Photosynthetically Available Radiation Sensor
Generic Instrument Description	A PAR sensor measures photosynthetically available (or active) radiation. The sensor measures photon flux density (photons per second per square meter) within the visible wavelength range (typically 400 to 700 nanometers). PAR gives an indication of the total energy available to plants for photosynthesis. This instrument name is used when specific type, make and model are not known.

Dataset-specific Instrument Name	
Generic Instrument Name	LI-COR Biospherical PAR Sensor
Generic Instrument Description	The LI-COR Biospherical PAR Sensor is used to measure Photosynthetically Available Radiation (PAR) in the water column. This instrument designation is used when specific make and model are not known.

Dataset-specific Instrument Name	Sea-Bird SBE 9
Generic Instrument Name	CTD Sea-Bird 9
Dataset-specific Description	Sea-Bird SBE 9
Generic Instrument Description	The Sea-Bird SBE 9 is a type of CTD instrument package. The SBE 9 is the Underwater Unit and is most often combined with the SBE 11 Deck Unit (for real-time readout using conductive wire) when deployed from a research vessel. The combination of the SBE 9 and SBE 11 is called a SBE 911. The SBE 9 uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 and SBE 4). The SBE 9 CTD can be configured with auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorometer, altimeter, etc.). Note that in most cases, it is more accurate to specify SBE 911 than SBE 9 since it is likely a SBE 11 deck unit was used. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
Generic Instrument Description	The Sea-Bird SBE 43 dissolved oxygen sensor is a redesign of the Clark polarographic membrane type of dissolved oxygen sensors. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	Pressure, Digiquartz with TC
Generic Instrument Name	Pressure Sensor
Generic Instrument Description	A pressure sensor is a device used to measure absolute, differential, or gauge pressures. It is used only when detailed instrument documentation is not available.

Dataset-specific Instrument Name	
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Generic Instrument Description	The Sea-Bird SBE 911plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911plus includes the SBE 9plus Underwater Unit and the SBE 11plus Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9plus and SBE 11plus is called a SBE 911plus. The SBE 9plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3plus and SBE 4). The SBE 9plus CTD can be configured with up to eight auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). more information from Sea-Bird Electronics

Dataset-specific Instrument Name	
Generic Instrument Name	Wet Labs ECO-AFL/FL Fluorometer
Generic Instrument Description	The Environmental Characterization Optics (ECO) series of single channel fluorometers delivers both high resolution and wide ranges across the entire line of parameters using 14 bit digital processing. The ECO series excels in biological monitoring and dye trace studies. The potted optics block results in long term stability of the instrument and the optional anti-biofouling technology delivers truly long term field measurements. more information from Wet Labs

Dataset-specific Instrument Name	Turbidity, WET Labs ECO
Generic Instrument Name	Turbidity Meter
Generic Instrument Description	A turbidity meter measures the clarity of a water sample. A beam of light is shown through a water sample. The turbidity, or its converse clarity, is read on a numerical scale. Turbidity determined by this technique is referred to as the nephelometric method from the root meaning "cloudiness". This word is used to form the name of the unit of turbidity, the NTU (Nephelometric Turbidity Unit). The meter reading cannot be used to compare the turbidity of different water samples unless the instrument is calibrated. Description from: http://www.gvsu.edu/wri/education/instructor-s-manual-turbidity-10.htm (One example is the Orion AQ4500 Turbidimeter)

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Deployments

AR29

Website	https://www.bco-dmo.org/deployment/806753
Platform	R/V Neil Armstrong

TN368

Website	https://www.bco-dmo.org/deployment/848750
Platform	R/V Thomas G. Thompson
Start Date	2019-07-05
End Date	2019-07-18
Description	DOI: https://doi.org/10.7284/908710

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Project Information

Collaborative Research: Shelfbreak Frontal Dynamics: Mechanisms of Upwelling, Net Community Production, and Ecological Implications (SPIROPA)

Website: <http://science.whoi.edu/users/olga/SPIROPA/SPIROPA.html>

Coverage: Shelf break south of New England, OOI Pioneer Array

NSF award abstract:

The continental shelf break of the Middle Atlantic Bight supports a productive and diverse ecosystem. Current paradigms suggest that this productivity is driven by several upwelling mechanisms at the shelf

break front. This upwelling supplies nutrients that stimulate primary production by phytoplankton, which in turn leads to enhanced production at higher trophic levels. Although local enhancement of phytoplankton biomass has been observed in some circumstances, such a feature is curiously absent from time-averaged measurements, both from satellites and shipboard sampling. Why would there not be a mean enhancement in phytoplankton biomass as a result of the upwelling? One hypothesis is that grazing by zooplankton prevents accumulation of biomass on seasonal and longer time scales, transferring the excess production to higher trophic levels and thereby contributing to the overall productivity of the ecosystem. However, another possibility is that the net impact of these highly intermittent processes is not adequately represented in long-term means of the observations, because of the relatively low resolution of the in-water measurements and the fact that the frontal enhancement can take place below the depth observable by satellite. The deployment of the Ocean Observatories Initiative (OOI) Pioneer Array south of New England has provided a unique opportunity to test these hypotheses. The combination of moored instrumentation and autonomous underwater vehicles will facilitate observations of the frontal system with unprecedented spatial and temporal resolution. This will provide an ideal four-dimensional (space-time) context in which to conduct a detailed study of frontal dynamics and plankton communities needed to examine mechanisms controlling phytoplankton populations in this frontal system. This project will also: (1) promote teaching, training and learning via participation of graduate and undergraduate students in the research, (2) provide a broad dissemination of information by means of outreach in public forums, printed media, and a video documentary of the field work, and (3) contribute to improving societal well-being and increased economic competitiveness by providing the knowledge needed for science-based stewardship of coastal ecosystems, with particular emphasis on connecting with the fishing industry through the Commercial Fisheries Research Foundation.

The investigators will conduct a set of three cruises to obtain cross-shelf sections of physical, chemical, and biological properties within the Pioneer Array. Nutrient distributions will be assayed together with hydrography to detect the signature of frontal upwelling and associated nutrient supply. The investigators expect that enhanced nutrient supply will lead to changes in the phytoplankton assemblage, which will be quantified with conventional flow cytometry, imaging flow cytometry (Imaging FlowCytobot, IFCB), optical imaging (Video Plankton Recorder, VPR), traditional microscopic methods, and pigment analysis. Zooplankton will be measured in size classes ranging from micro- to mesozooplankton with the IFCB and VPR, respectively, and also with microscopic analysis. Biological responses to upwelling will be assessed by measuring rates of primary productivity, zooplankton grazing, and net community production. These observations will be synthesized in the context of a coupled physical-biological model to test the two hypotheses that can potentially explain prior observations: (1) grazer-mediated control and (2) undersampling. Hindcast simulations will also be used to diagnose the relative importance of the various mechanisms of upwelling. The intellectual merit of this effort stems from our interdisciplinary approach, advanced observational techniques, and integrated analysis in the context of a state-of-the-art coupled model. The project will address longstanding questions regarding hydrodynamics and productivity of an important ecosystem, leading to improved understanding of physical-biological interactions in a complex continental shelf regime. Given the importance of frontal systems in the global coastal ocean, it is expected that knowledge gained will have broad applicability beyond the specific region being studied.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1657803

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