

Video Plankton Recorder environmental sensor data from the third cruise of SPIROPA project, R/V Thomas G. Thompson cruise TN368, to the New England Shelfbreak in July of 2019

Website: <https://www.bco-dmo.org/dataset/848898>

Data Type: Cruise Results

Version: 1

Version Date: 2021-04-12

Project

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

Contributors	Affiliation	Role
McGillicuddy, 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
York, Amber D.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract

Video Plankton Recorder environmental sensor data from the third cruise of SPIROPA project, R/V Thomas G. Thompson cruise TN368, to the New England Shelfbreak in July of 2019.

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Supplemental Files](#)
- [Related Datasets](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Funding](#)

Coverage

Spatial Extent: N:39.978 E:-69.968 S:38.944 W:-71.478

Temporal Extent: 2019-07-06 - 2019-07-14

Methods & Sampling

Location: New England Shelfbreak 40 S 71 W

The instrument was towed behind a ship and undulated within the depth range of 5-100 m below the surface.

Data Processing Description

Calculation formulas are from the Sea-Bird factory calibration, which are reported in the file VPR2_CTD_Calibrations_2018-08-01.pdf (See Supplemental Files).

BCO-DMO Data Manager Processing Notes:

* Concatenated three *vpertimebugs.csv files into one data

table. 07072053_vpertimebugs.csv, 07151304_vpertimebugs.csv, 07072053_vpertimebugs.csv.

* Data imported with missing data identifier NaN 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.

* Added date column in ISO 8601 format from YearDay column and knowledge that the cruise was in 2019.

* Added cruise column with value TN386

[[table of contents](#) | [back to top](#)]

Data Files

File
vpertimebugs.csv (Comma Separated Values (.csv), 11.05 MB) MD5:a20be93b468f2d5b202285e033710ac9 Primary data file for dataset ID 848898

[[table of contents](#) | [back to top](#)]

Supplemental Files

File
Sea-Bird Calibration Sheet for CTD (VPR2) filename: VPR2_CTD_Calibrations_2018-08-01.pdf(Portable Document Format (.pdf), 428.96 KB) MD5:5e31d6f0ad8357a3505645e86a178048 Sea-Bird Calibration Sheet for CTD (VPR2) from August 1st, 2018.

[[table of contents](#) | [back to top](#)]

Related Datasets

IsRelatedTo

McGillicuddy, D. J., Zhang, W. G. (2021) **Video Plankton Recorder environmental sensor data from the first cruise of SPIROPA project aboard the R/V Neil Armstrong to the New England Shelfbreak in April, 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2021-11-08 doi:10.26008/1912/bco-dmo.805392.2 [[view at BCO-DMO](#)]

Relationship Description: The difference in VPR data between the TN368 cruise and AR29 cruise are the following: (1) an ECO-triplet was installed on the VPR during TN368, which provide 3 new column names (ECO_Bb, ECO_Chlorophyll, and ECO_CDOM), and (2) VPR data from TN368 is presented alongside image classification data, which adds the columns (diatoms, diatoms_bloom, diatoms_coil, and marsnow).

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
Cruise	Cruise identifier	unitless
YearDay	Decimal day from Jan_01_2019, 00.00:00	decimal days
Date	Date in ISO8601 format yyyy-mm-dd	unitless
Latitude	latitude	decimal degrees
Longitude	longitude (west is negative)	decimal degrees
Depth	depth	m
Temperature	temperature	degrees Celsius
Salinity	salinity	unitless
Potential_Density_Anomaly	Potential Density Anomaly	kg/m ³
Fluorescence	fluorescence	mg/m ³
Turbidity	turbidity	NTU
Oxygen	oxygen	ml/l
ECO_Bb	ECO Bb. ECO-triplet backscatter.	m ⁻¹
ECO_Chlorophyll	ECO Chlorophyll	mg/m ³
ECO_CDOM	ECO CDOM	ppb
diatoms	diatoms	relative concentrations
diatoms_bloom	diatoms_bloom	relative concentrations
diatoms_coil	diatoms_coil	relative concentrations
marsnow	marine snow	relative concentrations
file_name	The filename submitted to BCO-DMO which was imported to make this part of the data table.	unitless

[[table of contents](#) | [back to top](#)]

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Video Plankton Recorder
Dataset-specific Description	Environmental data (temperature, salinity, turbidity, fluorescence, irradiance, dissolved oxygen) collected by sensors mounted on the Video Plankton Recorder (VPR) .
Generic Instrument Description	<p>The Video Plankton Recorder (VPR) is a video-microscope system used for imaging plankton and other particulate matter in the size range from a few micrometers to several centimeters. The VPR is essentially an underwater microscope. It consists of four video cameras (with magnifying optics) synchronized at 60 fields per second (fps) to a red-filtered 80 W xenon strobe (pulse duration = 1 microsecond). The current lens on each camera can be adjusted to provide a field of view between 5 mm and 10 cm. Use of higher magnification lenses is currently being explored for viewing protozoans (less than 1 micrometer resolution). The four cameras are set for concentric viewing fields so that a range of up to four magnifications can be viewed simultaneously, allowing a wide size range of plankton to be sampled. Depth of field is adjusted by the lens aperture setting, and the volume sampled in each video field ranges from about 1 ml to 1 liter, depending on lens settings. The cameras have been configured for stereoscopic viewing as well. A strobe on the other arm illuminates the imaged volume and flashes 60 times per second, producing 60 images per second of the particles and plankton in the water. The images are then saved internally on a computer hard disk and later plotted. Deployment: Most commonly, the VPR is mounted in a frame and lowered into the water from the stern of the ship. Sometimes, a CTD also is mounted next to the VPR to collect depth, temperature, and salinity information at the same time as each video image. The instrument is lowered down through the water to a maximum depth of 350 meters to generate a profile of plankton/particle abundance and taxon group along with temperature and salinity. In addition to the towed configuration for mapping plankton distributions, it is possible to deploy the VPR in a fixed position (on a mooring) for viewing plankton swimming behaviors in two or three dimensions. The VPR instrument system has been used in both configurations, and deployment on ROVs has been proposed. This definition was taken from the WHOI Ocean Instruments Web site and from a US GLOBEC Newsletter.</p>

[[table of contents](#) | [back to top](#)]

Deployments

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

[[table of contents](#) | [back to top](#)]

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.

[[table of contents](#) | [back to top](#)]

Funding

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

[[table of contents](#) | [back to top](#)]