Continuous MOCNESS data files from R/V Atlantic Explorer cruise AE1918 during July 2019

Website: https://www.bco-dmo.org/dataset/781545
Data Type: Cruise Results
Version: 1
Version Date: 2019-11-13

Project
» Collaborative Research: Diel physiological rhythms in a tropical oceanic copepod (Zooplankton Diel Rhythm)

Contributors	Affiliation	Role
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Abstract
AE1918 was a cruise of opportunity on which two oceanographic sampling activities were conducted: a CTD cast and a MOCNESS net tow. These are the continuous underway data from the MOCNESS tow.

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Coverage

Spatial Extent: **N**:32.33606 **E**:-64.55002 **S**:32.28936 **W**:-64.55892
Temporal Extent: 2019-07-25

Dataset Description

AE1918 was a cruise of opportunity on which two oceanographic sampling activities were conducted: a CTD cast and a MOCNESS net tow. These are the continuous underway data from the MOCNESS tow.

Methods & Sampling

Standard MOCNESS procedure. It was observed filtered volumes to be too high (and speeds too high), so flowmeter was "recalibrated" using deployments and files reanalyzed. It is likely that, since the flowmeter was too new, after several recent deployments has finally "broken-in" and now goes faster. Flow calibration was done by running the LVpki software for several profiles looking at average CF values.

Refer to the cruise report for more information. See also: the xmlcon and hdr files under Supplemental Files.

Data Processing Description

Data Processing: Data from the net files was extracted using SBEDataProcessing software. See Supplemental Files for raw data.

Problem Report: The mentioned problem with flow counts.

BCO-DMO Processing:
- added date/time and tow information from file header;
- added ISO-DateTime field.

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Data Files

File
AE1918_MOC_continuous.csv (Comma Separated Values (.csv), 930.30 KB) MD5:0f1687c6a44a3e8de0c0a21b2cb77715 Primary data file for dataset ID 781545

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Supplemental Files

File
AE1918 CTD MOCNESS .bl file filename: Tow1_01.bl (Plain Text, 448 bytes) MD5:1919641c5c9abca44adeca9c13644202 AE1918 CTD MOCNESS .bl file (summary for each net)
AE1918 CTD MOCNESS .hdr file filename: Tow1_01.hdr (Plain Text, 960 bytes) MD5:9ee25de59a4fb13d061dba4c8cc0d643 AE1918 CTD MOCNESS .hdr file
AE1918 CTD MOCNESS .hex file (raw data) filename: Tow1_01.hex (Plain Text, 8.47 MB) MD5:85ebae9ad691f24b49ad025a2dedefd7 AE1918 CTD MOCNESS .hex file (raw data)
AE1918 CTD MOCNESS .mcn file filename: Tow1_01.mcn (Plain Text, 841.83 KB) MD5:c21edba06448edca90c45f6454d29e4e AE1918 CTD MOCNESS .mcn file
AE1918 CTD MOCNESS XMLCON file filename: MOCNESS_CONFIG_0470_4June2019.xmlcon (Plain Text, 4.87 KB) MD5:a9188ec26bea98c1177c6c1081fe5f78 AE1918 CTD MOCNESS XMLCON file

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Parameters

Parameter	Description	Units

tow	Tow number (based on file name)	unitless
date_start	Date UTC at start of tow (from file header); format: yyyy-mm-dd	unitless
time_start	Time UTC at start of tow (from file header); format: hh:mm:ss	unitless
ISO_DateTime_UTC_start	Date and time (UTC) at start of tow formatted ISO8601 standard: yyyy-mm-ddTHH:MM:SS	unitless
cruise	Cruise identifier	unitless
time	Decimal day of year	unitless
pres	Pressure	decibars (dbar)
temp	Temperature of the water	degrees Celsius
theta	Sigma-theta (density) of the water	kilograms per cubic meter (Kg m-3)
sal	Salinity of the water	PSU
sigma	Sigma (density) of the water	kilograms per cubic meter (Kg m-3)
angle	Angle of the net	degrees
flow	Flow counts of the net	counts
hzvel	Horizontal velocity	meters per second (m s-1)
vtvel	Vertical velocity	meters per second (m s-1)
vol	Volume filtered in that net	cubmic meters (m3)
net	Net number	unitless
lat	Latitude	degrees North

lon	Longitude	degrees East
GPSTIME	GPS time	unitless
CTDDEPTH	Depth	meters (m)

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Instruments

Dataset-specific Instrument Name	MOCNESS
Generic Instrument Name	MOCNESS1
Dataset-specific Description	Seabird 9/11 unit attached to a 1 m MOCNESS, 150 micron mesh nets
Generic Instrument Description	The Multiple Opening/Closing Net and Environmental Sensing System or MOCNESS is a family of net systems based on the Tucker Trawl principle. The MOCNESS-1 carries nine 1-m2 nets usually of 335 micrometer mesh and is intended for use with the macrozooplankton. All nets are black to reduce contrast with the background. A motor/toggle release assembly is mounted on the top portion of the frame and stainless steel cables with swaged fittings are used to attach the net bar to the toggle release. A stepping motor in a pressure compensated case filled with oil turns the escapement crankshaft of the toggle release which sequentially releases the nets to an open then closed position on command from the surface. -- from the MOCNESS Operations Manual (1999 + 2003).

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Deployments

AE1918

Website	https://www.bco-dmo.org/deployment/781440
Platform	R/V Atlantic Explorer
Report	http://datadocs.bco-dmo.org/docs/Zooplankton_Diel_Rhythm/data_docs/AE1918_Cruise_Report.pdf
Start Date	2019-07-25
End Date	2019-07-25
Description	Additional cruise data may be available from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/AE1918

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Project Information

Collaborative Research: Diel physiological rhythms in a tropical oceanic copepod (Zooplankton Diel Rhythm)

Coverage: Bermuda

NSF Award Abstract:
The daily vertical migration (DMV) of zooplankton and fish across hundreds of meters between shallow and deep waters is a predominant pattern in pelagic ecosystems. This migration has consequences for biogeochemical cycling as it moves a substantial portion of fixed carbon and nitrogen (an estimated 15 to 40 % of the total global organic export) from the surface directly to depth where it feeds the midwater food chain and sequesters nutrients away from atmospheric mixing. Estimates and predictions of these fluxes are, however, poorly understood at present. New observations have shown that one source of uncertainty is due to the assumption that metabolic rates and processes do not vary over the course of the day, except based on changes in temperature and oxygen availability. Rates are, however, also driven by differences in feeding, swimming behavior, and underlying circadian cycles. The objective of this project is to improve the ability of scientists to understand and predict zooplankton contributions to the movement of carbon and nitrogen in the ocean by detailing daily changes in physiological processes of these organisms. By producing a set of respiration and excretion measurements over a daily time series, paired with simultaneously collected gene and protein expression patterns for an abundant vertically migratory species, the investigators will provide unprecedented and predictive insight into how changes in the environment affect the contribution of zooplankton to biogeochemical fluxes. The sampling design of the project will advance discovery and understanding by providing hands-on training opportunities to at least two undergraduate researchers. The project will broaden dissemination of the research via development of an educational module, focusing on rhythms in the ocean. The module will initially be piloted with the Bermuda Institute of Ocean Sciences (BIOS) summer camp students and then disseminated through the BIOS Explorer program, the Teacher Resources Page on the BIOS website, and published in a peer-reviewed educational journal.

This project will characterize the metabolic consequences of daily physiological rhythms and DVM for a model zooplankton species, the abundant subtropical copepod Pleuromamma xiphias. Flux processes (oxygen consumption, carbon dioxide production, production of ammonium and fecal pellet production) will be interrogated using directed experiments testing the effects of temperature, feeding and circadian cycle. Circadian cycling will further be examined using transcriptomic and proteomic profiling. These experiments will be related to field samples taken at 6-h intervals over the course of the diel migration using an integrated suite of molecular and organismal metrics. Combined organismal, transcriptomic and proteomic profiles will provide an understanding of which metabolic pathways and associated flux products vary in relation to particular environmental variables (food, light cycle, temperature). Diel variation in metabolic rates will also be assessed across seasons and species using other important migratory groups (pteropod, euphausiid, and another copepod). The metabolic data will then be contextualized with abundance estimates from archived depth-stratified tows to allow scaling to community-level patterns and will be used to improve calculations of zooplankton contribution to particulate organic carbon, nitrogen and respiratory active flux. The results of this study will both improve our flux estimates and provide predictive insight into how various environmental variables influence the underlying physiological pathways generating carbon and nitrogen flux.

Cruise reports are available from the completed cruises:
SD031019
AE1910
AE1918

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829318
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829378

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