CTD profile data from R/V Pt. Sur PS 18-09 Legs 01 and 03, Sept. - Oct. 2017

Website: https://www.bco-dmo.org/dataset/809428
Data Type: Cruise Results
Version: 1
Version Date: 2020-04-15

Project
» RAPID: Hurricane Impact on Phytoplankton Community Dynamics and Metabolic Response (HRR)

Contributors	Affiliation	Role
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Abstract
Processed CTD profile data from all electronic sensors mounted on rosette from R/V Pt. Sur PS 18-09 Legs 01 and 03, Hurricane Harvey RAPID Response cruise (western Gulf of Mexico) September-October 2017.

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Coverage

Spatial Extent: **N**:29.4907 **E**:-93.5325 **S**:27.0932 **W**:-97.2683
Temporal Extent: 2017-09-23 - 2017-10-01

Dataset Description

Processed CTD profile data from all electronic sensors mounted on rosette from R/V Pt. Sur PS 18-09 Legs 01 and 03, Hurricane Harvey RAPID Response cruise (western Gulf of Mexico) September-October 2017.

Acquisition Description

Raw hex datafiles were produced by the CTD were processed using manufacturer-supplied software, Seabird SeaSave. SBE Data Processing Version 7.26.6.28 was used to process the raw Sea-Bird CTD data (.hex) into a human-readable format (.cnv). The order of functions ran via SBE Data Processing was:

1. Data Conversion: to convert hex-files into human readable format;
2. Filter: apply low-pass filter to collected data;
3, Align CTD: to temporally align T and C sensors. Time constant equals 3.5 s (Gulf of Mexico);
4. Cell Thermal Mass: applies thermal mass correct;
5. Loop Edit: to remove effects of ship heave;
6. Derive: to estimate derived quantities such as salinity, density, dissolved oxygen concentration, potential temperature, etc; and
7. Bin Average: average data into vertical bins, downcast only.

See zipped metadata of individual files for date of calibration and calibration coefficients - Supplemental Files, below.

Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions (e.g., replaced spaces and hyphens with underscores)
- extracted filename, date-time, lat, and lon from individual file headers
- converted date-time to ISO_DateTime_UTC
- converted lat and long from degrees/min/sec to decimal degrees
- extracted the HHR leg number and station id from the file_name to separate columns
- concatenated all .cnv data into a single file
- joined CTD data with header data (file_name, leg, station, ISO_DateTime_UTC, lat, lon)
- removed columns of raw voltages V3, V4, V5

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Related Publications

Potter, H., DiMarco, S. F., & Knap, A. H.(2019). Tropical cyclone heat potential and the rapid intensification of Hurricane Harvey in the Texas Bight.Journal of Geophysical Research:Oceans, 124. https://doi.org/10.1029/2018JC014776
Results

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Parameters

Parameter	Description	Units
file_name	name of the originators file	unitless
HHR_leg	cruise leg identifier	unitless
station	station identifier	unitless
lat_decdeg	latitude with positive values indicating North	decimal degrees
lon_decdeg	longitude with negative values indicating West	decimal degrees
ISO_DateTime_UTC	Date and time in UTC following ISO8601 format	yyyy-MM-dd'T'HH:mm:ss'Z'
prDM	Pressure	decibar (db)
t090C	Temperature ITS-90	degrees Celsius (C)
t190C	Temperature 2 ITS-90	degrees Celsius (C)
c0S_m	Conductivity	Siemens per meter (S/m)
sal00_1	Practical Salinity	PSU
sal11	Practical Salinity	PSU
sbeox0V	Oxygen raw SBE 43 from primary sensor	volts (V)
sbeox0ML_L_1	Oxygen SBE 43 from primary sensor	milliliters per liter (ml/l)
sbeox1V	Oxygen raw SBE 43 from secondary sensor	volts (V)
sbeox1ML_L_1	Oxygen SBE 43 from secondary sensor	milliliters per liter (ml/l)
cpar	CPAR/Corrected Irradiance	percent (%)
CStarAt0	Beam Attenuation; WET Labs C-Star	per meter (1/m)
CStarTr0	Beam Transmission; WET Labs C-Star	percent (%)
par	PAR/Irradiance Biospherical/Licor	unknown
wetCDOM	Fluorescence; WET Labs CDOM	milligrams/meter^3 [mg/m^3]
flECO_AFL	Fluorescence; WET Labs ECO-AFL/FL	millligrams/meter^3 [mg/m^3]
depSM	Depth in salt water at specified latitude	meters (m)
sal00_2	Practical Salinity	Practical Salinity Units (PSU)
sigma_e00	Density sigma-theta	kilogram per meter cubed (kg/m3)
sbeox0ML_L_2	Oxygen SBE 43 from primary sensor; WS=5 (?)	milliliters per liter (ml/l)
sbeox1ML_L_2	Oxygen SBE 43 from secondary sensor; WS=5 (?)	milliliters per liter (ml/l)
potemp090C	Potential temperature fro ITS-90	degrees Celsius
potemp190C	Potential temperature fro ITS-190	degrees Celsius
flag	data quality flag; 0 indicates good value	unitless

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Instruments

Dataset-specific Instrument Name	CTD system (11plus V 5.2)
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Dataset-specific Description	These sensors were deployed with the CTD: Temperature sensor (Channel 1; S/N: 5134) Conductivity (Channel 2; S/N: 2922) Digiquartz pressure sensor (Channel 2; S/N: 45) Temperature Sensor (Channel 4; S/N: 4488) Conductivity (Channel 5; S/N: 2629) Dissolved oxygen (Channel 6; SBE-43; S/N: 0174) Dissolved oxygen (Channel 7; SBE-43; S/N: 3554) CDOM Fluorometer (Channel 8; WetLABS ECO, S/N:1379) Chlorophyll Fluorometer (Channel 9; WetLABS ECO-AFL, S/N: 1051) Altimeter (Channel 10; S/N 27002) PAR (Channel 12; Biospherical/Licor/Chelsea PAR/Irradiance, S/N: 4530) Transmissometer (Channel 13, WetLabs C-Star, S/N: CST-703DR) SPAR Surface Irradiance (Channel 15, S/N: 20148)
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

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Deployments

PS1809

Website	https://www.bco-dmo.org/deployment/784313
Platform	R/V Point Sur
Start Date	2017-09-23
End Date	2017-10-01
Description	HRR study with three legs. Chief Scientists: Steve DiMarco (Leg 1); Kristen Thyng (Leg 2); Lisa Campbell (Leg 3)

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Project Information

RAPID: Hurricane Impact on Phytoplankton Community Dynamics and Metabolic Response (HRR)

Coverage: Texas coast

This project was recently funded by NSF award OCE-1760620. More information will be added as it

becomes available.

Project summary from NSF RAPID proposal:
Overview: Tropical cyclones (hurricanes and tropical storms) can produce substantial impacts in marine ecosystems, including alteration of tidal regimes, upwelling, vertical mixing, sediment resuspension, and terrestrial runoff that affect estuaries, coastal areas and the open ocean. The drastic perturbations following tropical cyclones have also been shown to produce immediate shifts in phytoplankton community composition. High temporal resolution observations from the Imaging FlowCytobot (IFCB) revealed that hurricanes in the Gulf of Mexico (GOM) initially caused blooms of diatoms, which subsequently were replaced by blooms of dinoflagellates. This change in the community structure was hypothesized to be related to the ability of dinoflagellates compared to diatoms to assimilate organic nitrogen compounds supplied by the high river discharge that resulted from the rainfall. This RAPID project will address two hypotheses:
1. Community structure will be a flagellate-dominated system as long as the high river discharge continues. Community structure will shift to a diatom-dominated system when environmental conditions return to normal. Continuous, high temporal resolution data from the IFCB time series will provide estimates of abundance and biovolume to assess the temporal variability of phytoplankton from the aftermath of the hurricane until the return to normal conditions.
2. Nitrogen will be the main driver of shifts in community metabolic responses.
Analysis of gene expression profiles, environmental conditions, and water quality parameters will provide a time series of metabolic functional responses. Metatranscriptomic analysis may also provide insight into taxa-specific metabolic responses related to nutrient and other environmental stresses as a consequence of Hurricane Harvey.

We propose two rapid response cruises to sample at 5 sites along a transect from Galveston to Port Aransas. At each station, CTD profiles and water samples from surface and the chlorophyll maximum for nutrient and carbonate chemistry analysis and RNA sequencing will be collected. Concurrently, the IFCB will operate continuously onboard for comparison with the ongoing time series at Surfside Beach. If the water column is strongly stratified, samples will be collected at the low salinity surface layer and the high salinity deeper layer. Time series analyses of the response of the phytoplankton community will include high frequency data of physical and hydrological variables, water quality measurements, and metatranscriptome analyses. Results will provide novel insights on the impact that extreme hurricanes exert on the phytoplankton community and ultimately in ecosystem functioning and resilience.

Intellectual Merit: Hurricane Harvey is the strongest hurricane to hit the GOM in decades; therefore, the impact of this hurricane on the phytoplankton community may be unprecedented in terms of response and duration. It is unknown how the phytoplankton community will respond and the time to return to "normal" condition. Immediate high temporal resolution sampling is the only way to fully capture the effects of tropical cyclones on coastal phytoplankton communities. And, in combination with metatranscriptomic analysis, the time series of metabolic responses can be elucidated.

Broader Impacts: If extreme storms are predicted to increase with future climate change, the taxa-specific responses provided by the IFCB time series are tremendously valuable for detecting changes, which have implications for ecosystem functioning. Over the past decade, the high temporal resolution phytoplankton time series at TOAST has proven to be invaluable in providing early warning for 8 harmful algal blooms. Given the unknown impact of Hurricane Harvey on the Texas coast (or the duration of the impact), the IFCB time series are invaluable to resource managers. Time series data have been successfully implemented into undergraduate Oceanography laboratory courses at TAMU to teach the value of ocean observing and assessment to the students' lives. Data from this Hurricane Harvey rapid response will also be included in future problem sets for students. As a strategy for targeting general audiences, outcomes of this project will also be produced for "On the Ocean", a weekly radio program on KAMU, the public radio station on TAMU campus; podcasts are also archived linked to the Oceanography department's website.

Related data from the The Texas Observatory for Algal Succession Time-Series (TOAST) can be found at the following:
http://toast.tamu.edu/HRR_cruise

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1760620
NSF Division of Ocean Sciences (NSF OCE)	OCE-1760381

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