Hydrographic, nutrient and oxygen data from CTD bottles and beam transmission and fluorescence data from CTD profiles during R/V Point Sur PS1809 (HRR legs 1, 2, 3) at the Gulf Mexico, Louisiana and Texas coast, Sept-Oct 2017

Website: https://www.bco-dmo.org/dataset/784290
Data Type: Cruise Results
Version: 1
Version Date: 2019-12-12

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

Contributors	Affiliation	Role
Campbell, Lisa	Texas A&M University (TAMU)	Principal Investigator
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Abstract
Hydrographic, nutrient and oxygen data from CTD bottles and beam transmission and fluorescence data from CTD profiles during R/V Point Sur PS1809 (HRR legs 1, 2, 3) at the Gulf Mexico, Louisiana and Texas coast, Sept-Oct 2017.

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Coverage

Spatial Extent: **N**:29.49068 **E**:-93.53278 **S**:27.09325 **W**:-97.26842
Temporal Extent: 2017-09-23 - 2017-10-01

Dataset Description

Hydrographic, nutrient and oxygen data from CTD bottles and beam transmission and fluorescence data from CTD profiles during R/V Point Sur PS1809 (HRR legs 1, 2, 3) at the Gulf Mexico, Louisiana and Texas coast, Sept-Oct 2017.

Acquisition Description

Nutrient Analysis Equipment and Techniques:

Nutrient samples were collected, filtered (0.2 µm Acropak-200 polyethersulfone filters, Pall) and frozen on board until analysis on shore up to 3 months later. Nutrient analyses (phosphate, silicate, nitrate+nitrite, nitrite, ammonium, and urea) were performed on a 6-channel Astoria-Pacific autoanalyzer using standard methods (WHPO 1994). Ammonia analyses were based on Solorzano (1969), using phenol/hypochlorite in alkaline medium with a sodium nitroprusside catalyst. Urea analyses were based on Aminot and Kerouel (1982) using diacetyl monoxime in acid solution.

Dissolved Oxygen Analysis Equipment and Techniques:

Samples were collected for dissolved oxygen analyses soon after the rosette was brought on board. Using a Tygon or silicone drawing tube, nominal 125 ml volume-calibrated iodine flasks were rinsed 3 times with minimal agitation, then filled and allowed to overflow for at least 3 flask volumes. Reagents ($MnCl2$ then NaI/NaOH) were added to fix the oxygen before stoppering. The flasks were shaken twice (> 1-minute inversions) to assure thorough dispersion of the precipitate. The lip of the flask stopper was filled with ultrapure water to prevent access to atmospheric oxygen during the up to 3 hours between sample collection and analysis.

Oxygen flask volumes were determined gravimetrically to determine flask volumes at TAMU

Geochemical and Environmental Research Group (GERG). This is done once before using flasks for the first time and periodically thereafter when a suspect volume is detected.

Dissolved oxygen analyses were performed with an automated Winkler oxygen titrator (Langdon Enterprises, Miami) using amperometric end-point detection. Thiosulfate (nominally 0.01 N) was standardized against 0.01 N potassium iodate prior to sample analysis.

Salinity Analysis Equipment and Techniques:

Salinity samples were drawn into 200 mL Kimax high-alumina borosilicate bottles, which were rinsed three times with sample prior to filling to the shoulder. The bottles were sealed with plastic insert thimbles to reduce evaporation. PSS78 salinity (UNESCO 1981) was calculated for each sample from the measured conductivity ratios.

A Guildline Autosal 8400B salinometer (S/N 65715) was used for salinity/conductivity measurements. The salinity analyses were performed after samples had equilibrated to laboratory temperature, usually within 6 weeks after collection. The salinometer was standardized for each group of analyses using OSIL standard seawater, with frequent use of a secondary deep water standard to check for drift during runs.

Processing Description

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: Data Conversion, Filter, Align CTD, Cell Thermal Mass, Loop Edit, Derive, and Bin Average.

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)
- added columns for cruise_id, cruise_name, and chf_sci
- commented out units row

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Related Publications

Aminot Alain, Kerouel R. (1982). Dosage automatique de l'urée dans l'eau de mer : une méthode très sensible à la diacétylmonoxime. Canadian journal of fisheries and aquatic sciences, 39, 174-183.

SOLÓRZANO, L. (1969). DETERMINATION OF AMMONIA IN NATURAL WATERS BY THE PHENOLHYPOCHLORITE METHOD 1 1 This research was fully supported by U.S. Atomic Energy Commission Contract No. ATS (11-1) GEN 10, P.A. 20. Limnology and Oceanography, 14(5), 799–801. doi:10.4319/lo.1969.14.5.0799

WHPO. 1994.WHP Operations and Methods. WOCE Hydrographic Office Report 91/1, as revised, WOCE Hydrographic Program Office, Woods Hole, MA.

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Parameters

Parameter	Description	Units
cruise_id	official cruise identifier (R2R)	unitless
leg_name	cruise leg name given by participants	unitless
HRR_Leg	Leg of cruise (HRR1; HRR2; HRR3)	unitless
chf_sci	chief scientist	unitless
Sta_Sequence	Order of stations	unitless
Station	Name of sampling station	unitless
Latitude	Latitude of sampling station	decimal degrees
Longitude	Longitude of sampling station	decimal degrees
Water_Depth	Maximum depth of bathymetry at station	meters
ISO_DateTime_UTC	Date and time; ISO formatted: yyyy-mm-ddTHH:MMZ	unitless
Year	Year water samples were taken	yyyy
Month	Month water samples were taken	mm
Day	Day water samples were taken	dd
Time	Time water samples were taken; HH:MM UTC	unitless

Niskin_Bottle_id	Niskin bottle identifier	unitless
Bottle_Depth	Depth at which Niskin bottle was closed	meters
Nutrient_Bottle_id	Sample bottle number containing nutrient water sample	unitless
NO3_umol_L	Nutrient analysis of nitrate content	micromol/liter
NO3_mg_L_N	Nutrient analysis of nitrate content	milligrams/liter
HPO4_umol_L	Nutrient analysis of hydrogen phosphate content	micromol/liter
HPO4_mg_L_P	Nutrient analysis of hydrogen phosphate content	milligrams/liter
HSIO3_umol_L	Nutrient analysis of hydrogen silicate content	micromol/liter
HSIO3_mg_L_SiO3	Nutrient analysis of hydrogen silicate content	milligrams/liter
NH4__umol_L	Nutrient analysis of ammonium content	micromol/liter
NH4_mg_L_N	Nutrient analysis of ammonium content	milligrams/liter
NO2_umol_L	Nutrient analysis of nitrogen dioxide content	micromol/liter
NO2_mg_L_N	Nutrient analysis of nitrogen dioxide content	milligrams/liter
Urea_umol_L	Nutrient analysis of urea content	micromol/liter
Urea_mg_L_N	Nutrient analysis of urea content	milligrams/liter
NO3_NO2_uM	Total nitrogen present in water sample	microMolar
Salinity_Bottle_id	Sample bottle number containing salinity water sample	unitless
Sample_Salinity	Salinity of collected water sample	practical salinity units

CTD_Salinity	Salinity recorded from CTD	practical salinity units
Oxygen_Bottle_id	Sample bottle number containing oxygen water sample	unitless
Burrette_Reading	Burrette reading of oxygen water sample	unitless
DO_mL_L	Calculated dissolved oxygen content in water sample	milliliters/liter
DO_mg_L	Calculated dissolved oxygen content in water sample	milligrams/liter
DO_mM_L	Calculated dissolved oxygen content in water sample	millimol/liter
Salinity_derived	Derived salinity from BTL file	practical salinity units
Potl_Temp_derived	Derived potential temperature from BTL file	degrees Celsius
DO_derived	Derived dissolved oxygen content from BTL file	milliliters/liter
Density_derived	Derived density from BTL file	kilograms/meter^3
Conductivity	Conductivity from BTL file	Siemans/meter
Beam_Transmission	Beam transmission from BTL file (percent)	unitless
PAR_Irradiance	PAR from BTL file	micromol /meter^2/second
Fluorescence_CDOM_mg_m3	CDOM fluorescence from BTL file	milligrams/meter^3
Fluorescence_ECO_AFL_FL_mg_m3	Chl-A fluorescence from BTL file	milligrams/meter^3
BTL_File_Depth	Average depth from BTL file	meters
Comments	Comments	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Used to collect water samples at discrete depths.
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24 or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

Dataset-specific Instrument Name	
Generic Instrument Name	CTD Sea-Bird
Generic Instrument Description	Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics, no specific unit identified. This instrument designation is used when specific make and model are not known. See also other SeaBird instruments listed under CTD. More information from Sea-Bird Electronics.

Dataset-specific Instrument Name	6-channel Astoria-Pacific autoanalyzer
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	Used for nutrient analyses: phosphate, silicate, nitrate+nitrite, nitrite, ammonium, and urea.
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

Dataset-specific Instrument Name	Guildline Autosal 8400B salinometer
Generic Instrument Name	Autosal salinometer
Dataset-specific Description	Used to measure bottle sample salinity/conductivity.
Generic Instrument Description	The salinometer is an instrument for measuring the salinity of a water sample.

Dataset-specific Instrument Name	Winkler oxygen titrator (Langdon Enterprises, Miami)
Generic Instrument Name	Winkler Oxygen Titrator
Dataset-specific Description	Used to measure dissolved oxygen concentrations.
Generic Instrument Description	A Winkler Oxygen Titration system is used for determining concentration of dissolved oxygen in seawater.

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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	2019-10-01
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

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