Data from custom instrument (CLASS) measured on R/V Endeavor cruise (EN614) in May 2018

Website: https://www.bco-dmo.org/dataset/876170
Data Type: Cruise Results
Version: 1
Version Date: 2022-06-23

Project
» Collaborative Research: Impact of the Amazon River Plume on Nitrogen Availability and Planktonic Food Web Dynamics in the Western Tropical North Atlantic (Amazon River Plume Nitrogen)
» Development of low Nitrogen:Phosphorus ratios in the euphotic zone - the Phosphorus side of the story (GOMP)

Contributors	Affiliation	Role
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Gerlach, Dana Stuart	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Coverage

Spatial Extent: **N**:16.29682 **E**:-50.8897 **S**:4.89005 **W**:-57.2529
Temporal Extent: 2018-05-09 - 2018-05-29

Methods & Sampling

A custom instrument, called CLASS, was used to measure CDOM, chlorophyll, and phycoerythrin fluorescence (among others) on R/V Endeavor cruise EN416 in May 2018.

** Need additional details from the PI **

Data Processing Description

** Need additional details from the PI **

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Related Publications

Chen, C., & Millero, F. J. (1977). Speed of sound in seawater at high pressures. The Journal of the Acoustical Society of America, 62(5), 1129–1135. https://doi.org/10.1121/1.381646
Methods

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Parameters

Parameter	Description	Units
Latitude	Latitude	decimal degrees
Longitude	Longitude	decimal degrees
Cruise	Cruise Name	unitless
Date	Date UTC	unitless
Station_Event	Station Event	unitless
Bottle	CTD Bottle (24 bottles total)	unitless
DepSM	Depth	meters (m)
Fcom_to_R_B	CDOM measured by blue laser normalized to Raman scattering	units?
Chl_G	Chlorophyll a concentration from green spectra	microgram per liter (ug/L)
Fchl_to_R_G	Chlorophyll fluorescence measured by the green laser normalized to Raman scattering	units?
Fpe1_to_R	Phycoerythrin fluorescence (565 nm) normalized to Raman	units?
Fpe2_to_R	Phycoerythrin fluorescence (575 nm) normalized to Raman	units?
Fpe3_to_R	Phycoerythrin fluorescence (589 nm) normalized to Raman	units?
Fpe1_to_Fchl	Phycoerythrin fluorescence (565 nm) normalized to max chlorophyll fluorescence	units?
Fpe2_to_Fchl	Phycoerythrin fluorescence (575 nm) normalized to max chlorophyll fluorescence	units?
Fpe3_to_Fchl	Phycoerythrin fluorescence (589 nm) normalized to max chlorophyll fluorescence	units?
Fpe12_to_R	Sum of the max of Phycoerythrin flourescence measurements 1 and 2 (565 nm and 575 nm) normalized to Raman	units?
Fpe12_to_Fchl	Sum of the max of Phycoerythrin flourescence measurements 1 and 2 (565 nm and 575 nm) normalized to max chlorophyll fluorescence	units?
FvFm_G	Variable Fluorescence Green Laser	units?
FvFm_Gc	Variable Fluorescence Green Laser corrected	units?
Sal00	Practical Salinity	practical salinity unit (PSU)
Sigma_t00	Density, Sigma-theta	kilogram per cubic meter (kg/m^3)
OxsatMm_Kg	Oxygen Saturation	micromole per kilogram (umol/kg)
Sbeox0MmL	Oxygen from SBE 43 primary sensor, WS = 2	micromole per liter (umol/L)
Sbeox1MmL	Oxygen from SBE 43 secondary sensor, WS = 2	micromole per liter (umol/L)
Potemp090C	Potential Temperature (ITS-90)	degrees Celsius
SvCM	Sound Velocity after Chen-Millero	meters per second (m/s)
Scan	Scan Count	unitless
TimeJ	Julian Days	unitless

TimeS	Elapsed Time	seconds
PrDM	Pressure from Digiquartz sensor	decibars (db)
T090C	Temperature (ITS-90)	degrees Celsius
C0Sm	Conductivity (c0S/m)	Siemens per meter (S/m)
CStarAt0	Beam Attenuation from WET Labs C-Star	per meter (1/m)
CStarTr0	Beam Transmission from WET Labs C-Star	percent (%)
FlECO_AFL	Fluorescence from WET Labs ECO-AFL/FL	milligram per cubic meter (mg/m^3)
AltM	Altimeter (altM) reading	meters
PAR	Irradiance (PAR) from Biospherical/Licor	micromole photos per square meters per second (umol photons/m^2/sec)
Sbeox0V	Oxygen raw from SBE 43 first voltage sensor	volts (V)
Sbeox1V	Oxygen raw from SBE 43 second voltage sensor	volts (V)
SPAR	Surface Irradiance (SPAR) from Biospherical/Licor	micromole photos per square meters per second (umol photons/m^2/sec)

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Instruments

Dataset-specific Instrument Name	Altimeter
Generic Instrument Name	Altimeter
Generic Instrument Description	An instrument that measures height above a fixed surface. The data can be used to map ocean-surface topography and generate gridded surface height fields.

Dataset-specific Instrument Name	CTD 911plus
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Dataset-specific Description	R/V Endeavor is equipped with an SBE 911+ CTD: High quality ducted/pumped system with digiquartz pressure sensor and dual temperature and conductivity sensors. 6800-meter capability and data rate of 24 scans per second.
Generic Instrument Description	The Sea-Bird SBE 911 plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911 plus 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 9 plus and SBE 11 plus is called a SBE 911 plus. The SBE 9 plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 plus and SBE 4). The SBE 9 plus 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	LIBiospherical/Licor
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	Bottle
Generic Instrument Name	Niskin bottle
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	SBE43
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	WET Labs ECO-AFL/FL
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	WET Labs C-Star
Generic Instrument Name	WET Labs {Sea-Bird WETLabs} C-Star transmissometer
Generic Instrument Description	The C-Star transmissometer has a novel monolithic housing with a highly intgrated opto-electronic design to provide a low cost, compact solution for underwater measurements of beam transmittance. The C-Star is capable of free space measurements or flow-through sampling when used with a pump and optical flow tubes. The sensor can be used in profiling, moored, or underway applications. Available with a 6000 m depth rating. More information on Sea-Bird website: https://www.seabird.com/c-star-transmissometer/product?id=60762467717

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Deployments

EN416

Website	https://www.bco-dmo.org/deployment/58156
Platform	R/V Endeavor
Report	http://ocb.whoi.edu/MedFlux/CRUISES/cruisePlan_EN416_April2006.pdf
Start Date	2006-04-09
End Date	2006-04-15
Description	MedFlux April 2006 cruise

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Project Information

Collaborative Research: Impact of the Amazon River Plume on Nitrogen Availability and Planktonic Food Web Dynamics in the Western Tropical North Atlantic (Amazon River Plume Nitrogen)

Coverage: Amazon River plume

NSF Award Abstract:
This is a focused program of field research in waters of the Western Tropical North Atlantic influenced by the Amazon River Plume during the high river flow season. The Amazon Plume region supports diverse plankton communities in a dynamic system driven by nutrients supplied by transport from the river proper as well as nutrients entrained from offshore waters by physical mixing and upwelling. This creates strong interactions among physical, chemical, and biological processes across a range of spatial and temporal scales. The field program will link direct measurements of environmental properties with focused experimental studies of nutrient supply and nutrient limitation of phytoplankton, as well as the transfer of phytoplankton nitrogen to the zooplankton food web. The Amazon Plume exhibits a close juxtaposition of distinct communities during the high-flow season, making it an ideal site for evaluating how nutrient availability, nutrient supply, and habitat longevity interact to drive offshore ecosystem dynamics and function. This project will include German collaborators and will seamlessly integrate education and research efforts. The investigators and their institutions have a strong commitment to undergraduate and graduate education and to increasing the diversity of the ocean science community through active recruiting and training efforts. The team has a strong track record of involving both undergraduate and graduate students in their field and lab research. The two research cruises planned will provide opportunities for students and technicians to interact with an interdisciplinary and international research team.

The ultimate objectives of this project are to understand the processes and interactions that promote distinct communities of nitrogen-fixing organisms (diazotrophs) and other phytoplankton around the Amazon Plume and to explore the impacts of these diazotroph-rich communities on zooplankton biomass and production. The research team includes scientists with expertise in nutrient and stable isotope biogeochemistry, remote sensing as well as specialists in characterizing water mass origin and history using naturally occurring radium isotopes. This combination of approaches will provide a unique opportunity to address fundamental questions related to plankton community structure, primary production, and links to secondary production in pelagic ecosystems. The project will address the following key questions focused on fundamental issues in plankton ecology resulting from previous research in this region:

A. What mechanisms promote the preferential delivery of bioavailable phosphorus and the resulting strong nitrogen limitation associated with the northern reaches of the Amazon Plume during the high flow season?

B. What factors lead to the clear niche separation between diazotrophs within and around the Amazon Plume and how are the distinct diazotroph communities influenced by hydrographic and biogeochemical controls associated with the Amazon River Plume and offshore upwelling processes?

C. How does the nitrogen fixed by the different types of diazotrophs contribute to secondary production, and how efficiently does diazotroph nitrogen move through the food web?

Development of low Nitrogen:Phosphorus ratios in the euphotic zone - the Phosphorus side of the story (GOMP)

Coverage: Gulf of Mexico

NSF Award Abstract

This research will study the processes that cause the relative biological availability of nitrogen (N) and phosphorus (P) in the upper ocean to change as water moves from the coast to offshore in the northern Gulf of Mexico. Both N and P are required nutrients. Consequently, the ratio of N to P in the upper ocean has important consequences for plant growth and the marine food web structure. Typically, as water moves offshore bioavailable N declines faster than bioavailable P. While processes that alter either element will affect the N to P ratio, previous research has focused mainly on the N side of the relationship, examining cycling and the selective removal of different forms of N from the water by marine microorganisms. This project will focus instead on the less-studied P side of the N to P ratio in the upper ocean. It will use shipboard experiments to quantify microbiological processes that maintain P availability in the upper ocean, even as N availability declines. Given that low N availability relative to P limits plant growth in most of the ocean's sunlit surface waters, understanding how this chemical ratio develops as water moves offshore is of fundamental importance for the study of marine ecosystems worldwide. Educational impact will include at least seven students' direct participation in the research, providing hands-on and cross-disciplinary training, as well as practical experience at sea. Two middle school teachers will also participate in the oceanographic cruises. They will incorporate field results and personal experiences into lesson plans and teachers' workshops. The project will also develop public outreach activities that focus on the unique value of marine ecosystems of the Gulf of Mexico.

This project will test the hypothesis that the decline in the ratio of bioavailable N to P in surface water as it moves offshore develops from preferential phosphorus retention as opposed to removal of biologically-available forms of nitrogen. As part of the research associated with this central hypothesis, the project will quantitatively compare the relative importance of different phosphorus-retention mechanisms during two oceanographic cruises in the northern Gulf of Mexico. Previous observations of spatial changes in N and P availability are common. The researchers will track discrete water masses with Lagrangian drifters for time course sampling, and use physical oceanographic measurements to quantify potential N to P ratio changes contributed by vertical and horizontal mixing. Shipboard incubation experiments will quantify and compare rates for the key microbiological processes thought to affect phosphorus retention in the upper ocean. This focus on potential P-retention processes rather than N loss as an explanation of commonly observed declines in surface ocean N to P ratio represents a unique contribution to the complete understanding of the complex feedback mechanisms between nutrient cycles and marine ecosystem function.

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