CTD hydrographic and nutrient data from R/V Endeavor cruise EN509 in May-June 2012 in the Gulf of Mexico (GoMX - N2 Fixation project)

Website: https://www.bco-dmo.org/dataset/4072
Version: 01 November 2013
Version Date: 2013-11-01

Project
» Nitrogen fixation, nutrient supply and biological production in the Gulf of Mexico (GoMX - N2 Fixation)

Programs
» Gulf of Mexico - Deepwater Horizon Oil Spill (GoMX - DHOS)
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Dataset Description

CTD Hydro Nutrients Data - EN509

Data Processing Description

BCO-DMO Processing Notes
Original file: "EN509-Hydro_Nutrients.xls" contributed by Joseph Montoya
- Latitude/Longitude for Op_Number inserted from CTD Station data
- Parameter names edited to conform to BCO-DMO parameter naming conventions

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Data Files

File
CTD_HydroNuts_EN509.csv (Comma Separated Values (.csv), 155.17 KB) MD5:349cd3e852e0b9221bf4a507289bb145 Primary data file for dataset ID 4072

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Parameters

Parameter	Description	Units
Op_Number	Operation Number (Stn.Evt)	Dimensionless
Bottle	Bottle	Dimensionless
Date	Date UTC	YYYYMMDD
Time	Time UTC	HHMMSS
Latitude	Station Latitude (South is negative)	decimal degrees
Longitude	Station Longitude (West is negative)	decimal degrees
Sal00	Salinity 0	PSU
Sal11	Salinity 1	PSU
Sigma_t00	Sigma-t 0 Density	Kg/m^3
Sigma_t11	Sigma-t 1 Density	Kg/m^3
OxsatML_per_L	Oxygen Saturation	Ml/L
Sbeox0ML_per_L	Oxygen 0 SBE 43	Ml/L
Sbeox0ML_per_L_SD	Oxygen 0 SBE 43 SDev	Ml/L
Sbeox1ML_per_L	Oxygen 1 SBE 43	Ml/L
Sbeox1ML_per_L_SD	Oxygen 1 SBE 43 SDev	Ml/L
Potemp090C	Potential Temp 0 - ITS-90	Degrees Celsius
Potemp090C_SD	Potential Temp 0 - ITS-90 SDev	Degrees Celsius
Potemp190C	Potential Temp 1 - ITS-90	Degrees Celsius
Potemp190C_SD	Potential Temp 1 - ITS-90 SDev	Degrees Celsius
SvCM	Sound Velocity	m/sec
SvCM_SD	Sound Velocity SDev	m/sec
SvCM1	Sound Velocity 1	m/sec
SvCM1_SD	Sound Velocity 1 SDev	m/sec
Scan	Scan	Dimensionless
Scan_SD	Scan SDev	Dimensionless
TimeJ	Julian Time	DDD.xxxxxx
TimeJ_SD	Julian Time SDev	.xxxxxx
TimeS	Elapsed Time	seconds
TimeS_SD	Elapsed Time SDev	seconds
PrDM	Pressure	decibars
PrDM_SD	Pressure SDev	decibars
DepSM	Depth	meters
DepSM_SD	Depth SDev	meters
T090C	Temp 0 - ITS-90	Degrees Celsius
T090C_SD	Temp 0 - ITS-90 SDev	Degrees Celsius
T190C	Temp 1 – ITS-90	Degrees Celsius
T190C_SD	Temp 1 – ITS-90 SDev	Degrees Celsius
T2_minus_T190C	T2-T190C	Degrees Celsius

T2_minus_T190C_SD	T2-T190C-SD	Degrees Celsius
C0S_per_m	Conductivity 0	Siemens/meter
C0S_per_m_SD	Conductivity 0 SDev	Siemens/meter
C1S_per_m	Conductivity 1	Siemens/meter
C1S_per_m_SD	Conductivity 1 SDev	Siemens/meter
C2_minus_C1S_per_m	C2-C1S/m	Siemens/meter
C2_minus_C1S_per_m_SD	C2-C1S/m-SD	Siemens/meter
V0	Voltage 0	volts
V0_SD	Voltage 0 SDev	volts
Bat	Beam Attenuation	1/m
Bat_SD	Beam Attenuation SDev	1/m
Xmiss	Beam Transmission	percentage
Xmiss_SD	Beam Transmission SDev	percentage
V2	Voltage 2	volts
V2_SD	Voltage 2 SDev	volts
Nominal_Z	Nominal Depth	meters
Mean_PO4	Mean PO4	(tbd)
Mean_Si	Mean Si	(tbd)
Mean_NO3_plus_NO2	Mean NO3+NO2	(tbd)
Mean_NH4	Mean NH4	(tbd)
Mean_N_star	Mean N*	(tbd)

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Instruments

Dataset-specific Instrument Name	Benthos model PSA-916
Generic Instrument Name	Altimeter
Dataset-specific Description	Benthos model PSA-916
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 Sea-Bird SBE 911plus
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Dataset-specific Description	CTD Sea-Bird SBE 911plus
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	Wet Labs WETStar flow through
Generic Instrument Name	Fluorometer
Dataset-specific Description	Wet Labs WETStar flow through
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

Dataset-specific Instrument Name	Niskin 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	Biospherical Instruments models QSP200L/QSR-240
Generic Instrument Name	Photosynthetically Available Radiation Sensor
Dataset-specific Description	Biospherical Instruments models QSP200L/QSR-240
Generic Instrument Description	A PAR sensor measures photosynthetically available (or active) radiation. The sensor measures photon flux density (photons per second per square meter) within the visible wavelength range (typically 400 to 700 nanometers). PAR gives an indication of the total energy available to plants for photosynthesis. This instrument name is used when specific type, make and model are not known.

Dataset-specific Instrument Name	SBE 43 Dissolved Oxygen Sensor
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
Dataset-specific Description	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	Sea-Bird SBE-3 Temperature Sensor
Generic Instrument Name	Sea-Bird SBE-3 Temperature Sensor
Dataset-specific Description	SBE model 3
Generic Instrument Description	The SBE-3 is a slow response, frequency output temperature sensor manufactured by Sea-Bird Electronics, Inc. (Bellevue, Washington, USA). It has an initial accuracy of +/- 0.001 degrees Celsius with a stability of +/- 0.002 degrees Celsius per year and measures seawater temperature in the range of -5.0 to +35 degrees Celsius. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	Sea-Bird SBE-4 Conductivity Sensor
Generic Instrument Name	Sea-Bird SBE-4 Conductivity Sensor
Dataset-specific Description	SBE model 4
Generic Instrument Description	The Sea-Bird SBE-4 conductivity sensor is a modular, self-contained instrument that measures conductivity from 0 to 7 Siemens/meter. The sensors (Version 2; S/N 2000 and higher) have electrically isolated power circuits and optically coupled outputs to eliminate any possibility of noise and corrosion caused by ground loops. The sensing element is a cylindrical, flow-through, borosilicate glass cell with three internal platinum electrodes. Because the outer electrodes are connected together, electric fields are confined inside the cell, making the measured resistance (and instrument calibration) independent of calibration bath size or proximity to protective cages or other objects.

Dataset-specific Instrument Name	Wet Labs C-Star 25-cm
Generic Instrument Name	Transmissometer
Dataset-specific Description	Wet Labs C-Star 25-cm
Generic Instrument Description	A transmissometer measures the beam attenuation coefficient of the lightsource over the instrument's path-length. This instrument designation is used when specific manufacturer, make and model are not known.

Dataset-specific Instrument Name	Wet Labs ECO-AFL/FL Fluorometer
Generic Instrument Name	Wet Labs ECO-AFL/FL Fluorometer
Dataset-specific Description	Wet Labs ECO Chlorophyll 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

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Deployments

EN509

Website	https://www.bco-dmo.org/deployment/58933
Platform	R/V Endeavor
Start Date	2012-05-25
End Date	2012-06-20
Description	Original data are available from the NSF R2R data catalog

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Project Information

Nitrogen fixation, nutrient supply and biological production in the Gulf of Mexico (GoMX - N2 Fixation)

Coverage: Northern Gulf of Mexico

From the NSF proposal abstract
This project will study the interplay of physical, chemical, and biological factors in supplying nitrogen, an essential nutrient, to temperate coastal and offshore waters of the Gulf of Mexico. The Gulf is an economically important but understudied marginal sea with major commercial and recreational fisheries as well as extensive fossil fuel deposits. Diazotrophic (N2-fixing) cyanobacteria bloom regularly in offshore and coastal waters of the Gulf and the limited data suggest that they contribute significant quantities of both nitrogen and carbon to the pelagic food web. These diazotrophs may play also a critical role in supplying N to other organisms, including the ichthyotoxic red tide dinoflagellate Karenia brevis. Despite its importance, little is currently known of the factors that promote N2-fixation in the Gulf or the relative significance of different physical and biological processes in creating conditions that favor N limitation in the water column. The Gulf of Mexico is strongly influenced by both riverine inputs and advective processes, providing an excellent model system for studying nutrient dynamics, physical forcing of productivity, terrestrial-oceanic linkages, and the potential impact of land use and climate change on marine ecosystems.

The relatively small basin of the Gulf of Mexico provides an opportunity to quantify and study interactions among physical, chemical, and biological processes relevant to a broad range of other coastal and oceanic systems. Land-use and climate change are likely to affect the circulation and hydrography of the Gulf, as well as the magnitude and nature of riverine inputs, all with uncertain impacts on the biogeochemistry of the Gulf of Mexico. This research will provide timely insights into these processes and will generate a baseline of understanding for evaluating and predicting the impact of future land use and climate changes in the system. This project will make an important contribution to our understanding of the factors that regulate N2-fixation and its role in supporting the biota in temperate waters. The following specific goals are included in the work:

1. Identify the major diazotroph groups in the Gulf of Mexico and characterize their distribution and activity in different regions and water masses.

2. Quantify the impact of advective processes, mesoscale features, and riverine inputs on nutrient limitation and N2-fixation in the Gulf, and evaluate the controls on N2-fixation and the degree of spatial and temporal niche differentiation among diazotroph assemblages in different regions affected by these processes.

3. Use satellite data and physical models to scale up our measurements spatially and to evaluate the regional significance of N2-fixation in the Gulf of Mexico. The researchers will also use a coupled physical/biological model to explore variability in the physical forcing and the potential impact of likely land use and climate change scenarios in altering nutrient dynamics and N2-fixation in the Gulf of Mexico.

The investigators and their institutions have a strong commitment to undergraduate and graduate education. This project includes support for graduate students, a technician, and undergraduates. In addition to peer-reviewed papers and websites, workshops aimed at K-12 teachers, and a program involving high school teachers in research will be used to disseminate the results of this project broadly in the local community. The investigators are committed to increasing the diversity of the ocean science community and are active in recruiting and training efforts at their institutions.

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Program Information

Gulf of Mexico - Deepwater Horizon Oil Spill (GoMX - DHOS)

Coverage: Northern Gulf of Mexico

Grants for Rapid Response Research (RAPID)
The RAPID funding mechanism is used for proposals having a severe urgency with regard to availability of, or access to data, facilities or specialized equipment, including quick-response research on natural or anthropogenic disasters and similar unanticipated events.

GOM - Broader Impacts
The need to understand the impact of this largest oil spill to date on ecosystems and biochemical cycling is self evident. The consequences of the disaster and accompanying clean up measures (e.g. the distribution of dispersants) need to be evaluated to guide further mediating measures and to develop and improve responses to similar disasters in the future. Would it be advantageous if such oil aggregates sink, or should it rather remain suspended? Possibly measures can be developed to enhance sinking or suspension (e.g. addition of ballast minerals) once we understand their current formation and fate. Understanding the particle dynamics following the input of large amounts of oil and dispersants into the water is a prerequisite to develop response strategies for now and in the future.

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0928495

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