

# CTD hydrographic and nutrient data from R/V Oceanus cruise OC468-02 in the Gulf of Mexico in 2010 (GoMX - N2 Fixation project)

Website: <https://www.bco-dmo.org/dataset/4073>

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
<a href="#">Montoya, Joseph</a>	Georgia Institute of Technology (GA Tech)	Principal Investigator, Contact
<a href="#">Gegg, Stephen R.</a>	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

## Table of Contents

- [Dataset Description](#)
  - [Data Processing Description](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Program Information](#)
- [Funding](#)

## Dataset Description

CTD Hydro Nutrients Data - OC468-02

## Data Processing Description

### BCO-DMO Processing Notes

Original file: "OC468-BottleData.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

[ [table of contents](#) | [back to top](#) ]

## Parameters

Parameter	Description	Units
Op_Number	Operation Number (Stn.Evt)	Dimensionless
Bottle	Bottle Number	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
Sbeox0Mg_per_L	Oxygen 0 SBE 43	Mg/L
Sigma_E00	Density 0 - sigma-theta	Kg/m <sup>3</sup>
Sigma_E11	Density 1 - sigma-theta	Kg/m <sup>3</sup>
TimeS	Elapsed Time	seconds
TimeS_SD	Elapsed Time SDev	seconds
PrDM	Pressure	decibars
PrDM_SD	Pressure SDev	decibars
AltM	Altitude	meters
AltM_SD	Altitude SDev	meters
DepSM	Depth	meters
DepSM_SD	Depth SDev	meters
Lat	Latitude from CTD Data (South is negative)	decimal degrees
Lat_SD	Latitude Sdev from CTD Data	decimal degrees
Lon	Longitude from CTD Data (West is negative)	decimal degrees
Lon_SD	Longitude Sdev from CTD Data	decimal degrees
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
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
Sal00_a	Salinity 0	PSU
Sal00_a_SD	Salinity 0 SDev	PSU
Sal11_a	Salinity 1	PSU
Sal11_a_SD	Salinity SDev	PSU
Sbeox0V	Oxygen 0 SBE 43	Volts
Sbeox0V_SD	Oxygen 0 SBE 43 SDev	Volts
Sbeox0Mg_per_L_a	Oxygen 0 SBE 43	Mg/l
Sbeox0Mg_per_L_a_SD	Oxygen 0 SBE 43 SDev	Mg/l
WetCDOM	wetCDOM: Fluorescence WET Labs CDOM	Mg/m <sup>3</sup>
WetCDOM_SD	wetCDOM: Fluorescence WET Labs CDOM SDev	Mg/m <sup>3</sup>
FIECO_AFL	fIECO-AFL: Fluorescence Wetlab ECO-AFL/FL	Mg/m <sup>3</sup>
FIECO_AFL_SD	fIECO-AFL: Fluorescence Wetlab ECO-AFL/FL SDev	Mg/m <sup>3</sup>
Xmiss	Beam Transmission	percentage
Xmiss_SD	Beam Transmission SDev	percentage
Spar	SPAR	(tbd)

Spar_SD	SPAR SDev	(tbd)
Sigma_E00_a	Density 0 - sigma-theta	Kg/m <sup>3</sup>
Sigma_E00_a_SD	Density 0 - sigma-theta SDev	Kg/m <sup>3</sup>
Sigma_E11_a	Density 1 - sigma-theta	Kg/m <sup>3</sup>
Sigma_E11_a_SD	Density 1 - sigma-theta SDev	Kg/m <sup>3</sup>
Scan	Scan	Dimensionless
Scan_SD	Scan SDev	Dimensionless
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)

[ [table of contents](#) | [back to top](#) ]

## Instruments

<b>Dataset-specific Instrument Name</b>	CTD Sea-Bird SBE 911plus
<b>Generic Instrument Name</b>	CTD Sea-Bird SBE 911plus
<b>Generic Instrument Description</b>	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

<b>Dataset-specific Instrument Name</b>	Niskin bottle
<b>Generic Instrument Name</b>	Niskin bottle
<b>Generic Instrument Description</b>	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.

<b>Dataset-specific Instrument Name</b>	Photosynthetically Available Radiation Sensor
<b>Generic Instrument Name</b>	Photosynthetically Available Radiation Sensor
<b>Dataset-specific Description</b>	Biospherical underwater PAR (1000m depth limit) with reference Surface PAR
<b>Generic Instrument Description</b>	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.

<b>Dataset-specific Instrument Name</b>	SBE 43 Dissolved Oxygen Sensor
<b>Generic Instrument Name</b>	Sea-Bird SBE 43 Dissolved Oxygen Sensor
<b>Dataset-specific Description</b>	SBE43 oxygen sensor
<b>Generic Instrument Description</b>	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

<b>Dataset-specific Instrument Name</b>	Wet Labs ECO-AFL/FL Fluorometer
<b>Generic Instrument Name</b>	Wet Labs ECO-AFL/FL Fluorometer
<b>Dataset-specific Description</b>	Wet Labs ECO-AFL fluorometer
<b>Generic Instrument Description</b>	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

<b>Dataset-specific Instrument Name</b>	Wet Labs CSTAR Transmissometer
<b>Generic Instrument Name</b>	WET Labs {Sea-Bird WETLabs} C-Star transmissometer
<b>Dataset-specific Description</b>	Wet Labs C*Star transmissometer (660nm wavelength)
<b>Generic Instrument Description</b>	The C-Star transmissometer has a novel monolithic housing with a highly integrated 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: <a href="https://www.seabird.com/c-star-transmissometer/product?id=60762467717">https://www.seabird.com/c-star-transmissometer/product?id=60762467717</a>

[ [table of contents](#) | [back to top](#) ]

---

## Deployments

### OC468-02

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58119">https://www.bco-dmo.org/deployment/58119</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	2010-08-21
<b>End Date</b>	2010-09-16

<b>Description</b>	<p>To support additional work related to the Deepwater Horizon well leak oil spill, the Oceanus operations will be coordinated with those aboard R/V Cape Hatteras. Chief Scientist pre-cruise update May 17 ,2010 ***** Over the last few days, we've rethought our fall cruise as it's become evident that much of the oil from the Deepwater Horizon leak isn't reaching the surface and that the 5000 bb/day official release rate estimate could be low by an order of magnitude or more. The bottom line is that an awful lot of oil is getting into the water column and we really don't know much about where it's going or what its impact is/will be on ecosystems in the Gulf. We discussed this situation with Dave Garrison on Friday and he was very supportive of us changing the focus of our cruise and using it to survey and assess the spread and impact of the oil. Dave asked us to try to assemble a team that could attack the problem of the physical spread of the oil and its impact through the food web. We're working on this but wanted to let you know of this change in plan and to start a discussion of what the revised cruise plan would look like. Our current thinking is that we would make use of the two ships in complementary ways: * The Oceanus will focus on the vertical distribution of oil and its impact on phytoplankton and zooplankton. We envision running a series of stations along a roughly E-W transect along the slope and one or more transects running out into deep water. We would be using a CTD-rosette system to sample the water column and both meter nets and the moorings to sample zooplankton. We'll also want to use a LADCP system to measure flows in deep plumes of oil. We're talking to Andreas Thurnherr at LDEO, who has experience in these measurements and expect that he'll have someone on board to carry them out. We would carry out deck incubations to assess productivity, nutrient dynamics, and toxicity of hydrocarbons in the water column. Finally, we would like to take box and gravity cores at selected stations. * The Cape Hatteras will focus on mapping the spatial extent of oil in the upper water column through a broad survey of the northern Gulf. This would involve mostly towed instrumentation and in-line analyses complemented by CTD profiles and net tows at selected stations. A limited amount of experimental work would be done on this. Planned science activities include CTD casts, mooring tows, meter net tows, surface pumping for collecting large volumes of water, deck incubations, floating sediment traps, moored sediment trap (1), multicoring (if no multicore then box and gravity core), camera deployment, radioisotopes, possible small boat ops for personnel transfer between R/V Cape Hatteras and sample collecting. Additional information: WHOI cruise planning synopsis Figure of Station Locations Cruise information and original data are available from the NSF R2R data catalog.</p>
--------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

[ [table of contents](#) | [back to top](#) ]

**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 (N<sub>2</sub>-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 N<sub>2</sub>-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 N<sub>2</sub>-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 N<sub>2</sub>-fixation in the Gulf, and evaluate the controls on N<sub>2</sub>-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 N<sub>2</sub>-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 N<sub>2</sub>-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.

[ [table of contents](#) | [back to top](#) ]

---

## **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 scientific understanding of the

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 CO<sub>2</sub> 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.

[ [table of contents](#) | [back to top](#) ]

---

## Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-0928495</a>

[ [table of contents](#) | [back to top](#) ]