# Upcast CTD profiles from R/V Cape Hatteras cruise CH0212 cruise from the Louisiana Shelf (hypoxic zone) and Gulf of Mexico in 2012 (OMZ_Sulfur_Cycling project)

**Website**: https://www.bco-dmo.org/dataset/629046
**Version**: 15 December 2015
**Version Date**: 2015-12-15

**Project**
» A phylogenetic and functional understanding of microbial sulfur cycling in oxygen minimum zones (OMZ_Sulfur_Cycling)

| Contributors | Affiliation | Role |
|---|---|---|
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## Table of Contents



## Dataset Description

CTD Profiles - Upcasts - CH0212
Processed CTD data for cruise CH0212, Louisiana Shelf, July 2012
Louisiana Shelf, Gulf of Mexico, east-west transect through the hypoxic zone on the Louisiana Shelf (~28-29°N, 89-94° W)

Measured parameters, including units are listed within the files.
Upcasts only provided, to provide the best oxygen data.

Supporting reference describing data: Bristow_etal_2015_L&O.pdf

### Methods & Sampling

Processed CTD data for cruise CH0212, Louisiana Shelf, July 2012
Louisiana Shelf, Gulf of Mexico, east-west transect through the hypoxic zone on the Louisiana Shelf (~28-29°N, 89-94° W)

Measured parameters, including units are listed within the files.
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### Data Processing Description

**Data Processing:**

Using the SeaBird data processing software, with the following steps applied
- Filter: applied to the pressure data only (low pass 0.15s)
- Alignment: applied to the oxygen data only (using a value of 3)
- Loop edit: to mark and remove scans when the CTD is moving less than minimum velocity (set at 0.2 m/s)
- Binned: into 1m depth bins

**BCO-DMO Processing Notes**
- Generated from original files "CH0212_CTD.xlsx" contributed by Frank Stewart
- Parameter names edited to conform to BCO-DMO naming convention found at Choosing Parameter Name
- "nd" (no data) inserted into blank cells

[ table of contents | back to top ]

## Data Files

| File |
|---|
| **CTD_Profiles_CH0212.csv** (Comma Separated Values (.csv), 285.42 KB) MD5:f194aac6d150dde48f12a8a2e2e63ec2<br>Primary data file for dataset ID 629046 |

[ table of contents | back to top ]

## Parameters

| Parameter | Description | Units |
|---|---|---|
| CruiseId | UNOLS Cruise ID | text |
| Station | Station Id | text |
| Date | Date | YYYYMMDD |
| Time_Local | Local Time (CST Z+7) | HHMM |
| Latitude | Latitude (South is negative) | decimal degrees |
| Longitude | Longitude (West is negative) | decimal degrees |
| Depth_db | Depth (decibars) | decibars |
| Depth_m | Depth (meters) | meters |
| Salinity | Salinity | psu |
| Temperature_ITS90 | Temperature ITS90 | Degrees Celsius |
| Density_sigma_theta | Density sigma_theta | kg m-3 |
| Oxygen_SBE43 | Oxygen SBE43 | umol kg-1 |
| Fluorescence | Fluorescence | ug/l |
| Flag | Flag | dimensionless |

[ table of contents | back to top ]

## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | CTD unit, SBE 911 plus |
| **Generic Instrument Name** | CTD Sea-Bird SBE 911plus |
| **Dataset-specific Description** | CTD unit, SBE 911 plus |
| **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** | Fluorometer, Chelsea Aqua |
| **Generic Instrument Name** | Fluorometer |
| **Dataset-specific Description** | Fluorometer, Chelsea Aqua |
| **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** | Oxygen sensor, SBE 43 |
| **Generic Instrument Name** | Sea-Bird SBE 43 Dissolved Oxygen Sensor |
| **Dataset-specific Description** | Oxygen sensor, SBE 43 |
| **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 |

[ table of contents | back to top ]

## Deployments

**CH0212**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/628336 |
| **Platform** | R/V Cape Hatteras |
| **Report** | http://dmoserv3.whoi.edu/data_docs/OMZ_SulfurCycling/Cruise_plan_CH-02-12.pdf |
| **Start Date** | 2012-07-22 |
| **End Date** | 2012-08-05 |
| **Description** | CRUISE PLAN - CH-02-12_Stewart This cruise will involve a combination of metagenomic sampling, gene expression profiling, and shipboard microcosm experiments to characterize microbial sulfur cycling and microbial community transcriptional responses to oxygen depletion in the hypoxic “dead zone” on the Louisiana Shelf west of the Mississippi River. Proposed Sampling Stations Cruise information and original data are available from the NSF R2R data catalog. |

[ table of contents | back to top ]

## Project Information

**A phylogenetic and functional understanding of microbial sulfur cycling in oxygen minimum zones (OMZ_Sulfur_Cycling)**

**Website**: http://omz.biology.gatech.edu/

**Coverage**: Gulf of Mexico; Louisiana Shelf hypoxic zone; approx. 28-29 N, 89-94 W

Oxygen concentration significantly impacts the community structure and function of marine ecosystems. In waters with low oxygen, including the major marine oxygen minimum zones (OMZs), biological diversity is dominated by a complex community of microorganisms whose anaerobic metabolisms mediate key steps in global nitrogen and carbon cycles. Surprisingly, new evidence indicates that OMZs also support diverse microorganisms capable of utilizing inorganic sulfur compounds for energy metabolism. This assemblage appears to include both sulfur-oxidizing autotrophs and sulfate-reducing heterotrophs, suggesting an active sulfur cycle with potentially substantial roles in organic carbon input and mineralization, as well as critical links to the OMZ nitrogen cycle. Our knowledge of the microorganisms driving OMZ sulfur cycling is based largely on the metagenome of a single bacterial lineage (SUP05) and on surveys of diagnostic marker genes, which have thus far targeted only a subset of the diverse low-oxygen regions in the global ocean. The metabolic diversity, activity, and biogeographic distribution of sulfur-metabolizing microorganisms in the OMZ water column remain largely unexplored.

This project uses an integrated molecular and experimental approach to critically examine the physiological and phylogenetic basis of microbial sulfur cycling in oxygen minimum zones. Combining targeted metagenomics with gene expression profiling, microcosm sulfur-addition experiments, and enrichment culturing, the PI will characterize sulfur-metabolizing microorganisms in two oceanographically and ecologically distinct low-oxygen regions: the Eastern Tropical North Pacific (ETNP) OMZ off Mexico, which represents the largest permanent OMZ in the world, and the seasonally hypoxic "dead zone" in the Gulf of Mexico (GOM). Specifically, they will test the hypotheses that sulfur- oxidizing and -reducing bacterioplankton 1) are abundant and transcriptionally active in the ETNP OMZ, 2) are minor components of the hypoxic GOM, but increase in activity and abundance when oxygen decreases and sulfide increases, and 3) exhibit biogeographic variation in functional gene content and phylogenetic diversity over vertical profiles, among OMZs, and in response to environmental gradients.

OMZs are predicted to expand in response to future climate change, making it imperative to holistically understand the biology of low-oxygen regions. This project will establish a comprehensive framework for studying the genomics and physiology of an ecologically important, but poorly characterized, functional group(s) of marine bacterioplankton in OMZs. Results will be analyzed relative to existing metagenomic data from the permanent Eastern Tropical South Pacific (ETSP) OMZ, and a second seasonal OMZ (Saanich Inlet), thereby establishing a comparative basis for describing the ecological distribution of pelagic sulfur-metabolizing microorganisms and their relative role in OMZ community metabolism.

[ table of contents | back to top ]

## Funding


| Funding Source | Award |
| --- | --- |
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1151698 |


[ table of contents | back to top ]