Cruise tracks from R/V Cape Hatteras and R/V New Horizon multiple cruises on the Louisiana Shelf (hypoxic zone) and Gulf of Mexico (ETNP oxygen minimum zone) from 2012 to 2014 (OMZ_Sulfur_Cycling project)

Website: https://www.bco-dmo.org/dataset/628799
Version: 09 December 2015
Version Date: 2015-12-09

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

Contributors	Affiliation	Role
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Dataset Description

Cruise track generated from R2R Archive file
Cruise Id, Date/Time UTC, Lat, Lon, SOG, COG
1 minute fixes

Note: R/V PELICAN Cruise PE16-01 navigation data not yet available from R2R (NSF R2R data catalog)
09Dec2015/srg

Methods & Sampling

Generated from R2R archive file by BCO-DMO staff

Data Processing Description

Generated from R2R archive file by BCO-DMO staff

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Data Files

File
CruiseTrack.csv (Comma Separated Values (.csv), 4.84 MB) MD5:7ae5543d4e9374802a1f1d1a83912992 Primary data file for dataset ID 628799

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Parameters

Parameter	Description	Units
CruiseId	Official UNOLS cruise id	text
ISO_DateTime_UTC	ISO formatted UTC Date and Time	YYYY-MM-DDTHH:MM:SSZ
Latitude	Latitude Position (South is negative)	decimal degrees
Longitude	Longitude Position (West is negative)	decimal degrees
SOG	Instantaneous Speed-over-ground	meters/sec
COG	Instantaneous Course-over-ground [deg. clockwise from North]	decimal degrees

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Instruments

Dataset-specific Instrument Name	GPS
Generic Instrument Name	Global Positioning System Receiver
Dataset-specific Description	GPS
Generic Instrument Description	The Global Positioning System (GPS) is a U.S. space-based radionavigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis. The U.S. Air Force develops, maintains, and operates the space and control segments of the NAVSTAR GPS transmitter system. Ships use a variety of receivers (e.g. Trimble and Ashtech) to interpret the GPS signal and determine accurate latitude and longitude.

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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.

NH1315

Website	https://www.bco-dmo.org/deployment/628427
Platform	R/V New Horizon
Start Date	2013-06-13
End Date	2013-06-28
Description	Oxygen Minimum Zone Microbial Biogeochemistry Expedition (OMZoMBiE) Proposed Sampling Stations Cruise information and original data are available from the NSF R2R data catalog.

NH1410

Website	https://www.bco-dmo.org/deployment/628491
Platform	R/V New Horizon
Report	http://dmoserv3.whoi.edu/data_docs/OMZ_SulfurCycling/Cruise_Report_NH1410.pdf
Start Date	2014-05-10
End Date	2014-06-08
Description	Oxygen Minimum Zone Microbial Biogeochemistry Expedition 2 (OMZoMBiE 2) Cruise Track (PDF) Cruise information and original data are available from R2R: https://www.rvdata.us/search/cruise/NH1410

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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.

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Funding

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

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