

# Time-binned CTD casts from R/V Pelican PE17-02 in the Louisiana Shelf, Gulf of Mexico from July to August 2016 (Methane cycling in OMZs project)

**Website:** <https://www.bco-dmo.org/dataset/682613>

**Data Type:** Cruise Results

**Version:** 1

**Version Date:** 2017-02-16

## Project

» [Microbial processes of pelagic anaerobic methane cycling in oxygen minimum zones](#) (Methane cycling in OMZs)

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## Abstract

Time-binned CTD casts from R/V Pelican PE17-02 in the Louisiana Shelf, Gulf of Mexico from July to August 2016.

## Table of Contents

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

## Coverage

**Spatial Extent:** N:29.30136 E:-89.5967 S:27.68898 W:-92.8012

**Temporal Extent:** 2016-07-23 - 2016-08-02

## Data Processing Description

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 (Bd) and by time (Bt)

## BCO-DMO Processing Notes:

Data were received as one-meter bin averaged Seabird CTD .cnv files. For station 1, the fluorometer data were bad and the sensor was replaced for the remaining stations, which recorded PAR and fluorescence. The fluor field was flagged with "nd" for bad data for station 1. Extraneous parameters used for acquisition purposes were hidden.

## Data Files

File
<b>PE1702_CTD_tavg.csv</b> (Comma Separated Values (.csv), 1.95 MB) MD5:4f3b6fc2904840eb734dc49bfd65e8f4
Primary data file for dataset ID 682613

## Parameters

Parameter	Description	Units
cast	number of cast	dimensionless
cruise_id	cruise identifier	dimensionless
year	year reported as yyyy	dimensionless
lat	latitude	decimal degrees
lon	longitude	decimal degrees
mon	month reported as mm	dimensionless
day	day reported as dd	dimensionless
time	start time of cast reported as hhmm	dimensionless
ISO_DateTime_UTC	UTC date and time ISO formatted	YYYY-MM-DDTHH:MM:SS[.xx]Z
yrday_utc	UTC day and decimal time	dimensionless
time_elapsed	time elapsed	seconds
scan	scan count	unitless
depth	sampling depth	meters

press	sampling pressure	decibars
temp	temperature	degrees Celsius
sal	salinity	PSU
potemp	potential temperature	degrees Celsius
sigma_0	density; sigma-theta	kilograms/cubic meter (kg/m <sup>3</sup> )
O2_sat_pcmt	oxygen concentration	percent
O2_umol_kg	oxygen concentration	micromoles/kg
lat_sample	latitude of record; north is positive	decimal degrees
lon_sample	longitude of record; east is positive	decimal degrees
PAR	Photosynthetically Available Radiation	uE/m <sup>2</sup> /sec
fluor	fluorescence	milligrams/meter <sup>3</sup>

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

## Instruments

<b>Dataset-specific Instrument Name</b>	Seabird CTD
<b>Generic Instrument Name</b>	CTD Sea-Bird SBE 911plus
<b>Dataset-specific Description</b>	Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics, no specific unit identified. This instrument designation is used when specific make and model are not known. See also other SeaBird instruments listed under CTD. More information from Sea-Bird Electronics.
<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>	WET Labs ECO CDOM Fluorometer
<b>Generic Instrument Name</b>	Fluorometer
<b>Dataset-specific Description</b>	A CTD-fluorometer is an instrument package designed to measure hydrographic information (pressure, temperature and conductivity) and chlorophyll fluorescence.
<b>Generic Instrument Description</b>	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.

<b>Dataset-specific Instrument Name</b>	PAR/Irradiance
<b>Generic Instrument Name</b>	LI-COR Biospherical PAR Sensor
<b>Dataset-specific Description</b>	The LI-COR Biospherical PAR Sensor is used to measure Photosynthetically Available Radiation (PAR) and irradiance (SPAR) in the water column.
<b>Generic Instrument Description</b>	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.

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

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

## Deployments

PE17-02

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/675038">https://www.bco-dmo.org/deployment/675038</a>
<b>Platform</b>	R/V Pelican
<b>Start Date</b>	2016-07-23
<b>End Date</b>	2016-08-03
<b>Description</b>	East-west transect through the hypoxic zone on the Louisiana Shelf (~28-29°N, 89-94° W). Objective: CTD/rosette surveys and multi-coring (MC-800) to study microbial nitrogen and sulfur cycling in the Louisiana Shelf hypoxic zone.

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

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## Project Information

### Microbial processes of pelagic anaerobic methane cycling in oxygen minimum zones (Methane cycling in OMZs)

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

**Coverage:** Eastern Tropical North Pacific oxygen minimum zone; off Colima, Mexico; ~19-24°N, 106-116°W Gulf of Mexico; Louisiana Shelf hypoxic zone; ~28-29°N, 89-94° W

Exerpt from the NSF Award Abstract: The overarching goal of this research is to understand how bacteria in marine oxygen minimum zones (OMZs) control interactions between the ocean methane and nitrogen cycles. OMZs constitute the largest pool of methane in the ocean water column, and also serve as sites where anaerobic microbes convert the essential element nitrogen from a form that can be used by organisms to a gaseous form (N<sub>2</sub>) that can be lost from the ocean. Recent studies, predominantly in freshwater environments, have discovered novel bacteria that link methane consumption to pathways of nitrogen loss. These researchers have recently shown that such bacteria also occur in OMZs. However, the contributions of these bacteria to ocean methane and nitrogen flux remain unknown. Here, the researchers will use a combination of genomics and biochemical measurements to characterize the metabolic potential and diversity of these bacteria in OMZs and to quantify their contribution to methane and nitrogen transformations. Meeting this goal is critical for constraining bulk fluxes of these chemicals in the open ocean and for predictive models of climate change, notably given the importance of methane as a potent greenhouse gas and the prediction that OMZs will expand with global warming.

This research focuses specifically on bacteria conducting nitrite-dependent anaerobic methane oxidation (n-damo). This process has been described in bacteria of the NC10 division, in which a dismutation reaction generates both N<sub>2</sub> and O<sub>2</sub> gas, with the O<sub>2</sub> used for intra-aerobic methane oxidation. Although NC10 bacteria have been described primarily from nitrite-rich freshwater and marine sediments, recent evidence indicates that NC10 are also present in anoxic OMZs. Given that OMZs contain substantial pools of the n-damo substrates nitrite and methane, it is hypothesized that OMZs harbor an anaerobic methane cycle coupled to nitrogen loss, and that this coupling is mediated by n-damo NC10 bacteria that occur as ubiquitous components in diverse OMZs. To test this hypothesis, the researchers will 1) quantify the contribution of n-damo to OMZ methane oxidation, N<sub>2</sub> production, and oxygen production rates, 2) characterize the diversity and ecophysiology of OMZ NC10 isolates through enrichments and single-cell genomics, and 3) survey the abundance, diversity, and activity of NC10 bacteria across distinct OMZ systems.

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

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## Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1558916</a>

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