# Depth-binned CTD casts from Pelican PE17-02 on the Louisiana Shelf, Gulf of Mexico in July-August 2016 (Methane cycling in OMZs project)

**Website**: https://www.bco-dmo.org/dataset/679374
**Data Type**: Cruise Results
**Version**: 1
**Version Date**: 2017-01-27

**Project**
» Microbial processes of pelagic anaerobic methane cycling in oxygen minimum zones (Methane cycling in OMZs)



| Contributors | Affiliation | Role |
|---|---|---|
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**Abstract**
Depth-binned CTD casts from Pelican PE17-02 on the Louisiana Shelf, Gulf of Mexico in July-August 2016.

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## Coverage

**Spatial Extent**: **N**:29.3013 **E**:-89.5967 **S**:27.6953 **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.

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## Data Files

| File |
| --- |
| **PE1702_CTD.csv** (Comma Separated Values (.csv), 926.48 KB)<br>MD5:acc9fc065d720b2faedd0fa7af93b7b0<br>Primary data file for dataset ID 679374 |

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## 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 |
| depth | sampling depth | meters |
| press | sampling pressure | decibars |
| temp | temperature | degrees Celsius |

| | | |
|---|---|---|
| sal | salinity | PSU |
| potemp | potential temperature | degrees Celsius |
| sigma_0 | potential density: sigma-theta; takes into account adiabatic heating/cooling with changes in pressure. | kilograms/meter^3-1000 |
| O2_sat_pcnt | oxygen concentration | percent |
| O2_umol_kg | dissolved oxygen concentration | micromoles/kg |
| PAR | Photosynthetically Available Radiation | uE/m^2/sec |
| fluor | fluorescence | milligrams/meter^3 |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | WET Labs ECO CDOM Fluorometer |
| **Generic Instrument Name** | Fluorometer |
| **Dataset-specific Description** | A CTD-fluorometer is an instrument package designed to measure hydrographic information (pressure, temperature and conductivity) and chlorophyll fluorescence. |
| **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. |

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

| | |
|---|---|
| **Dataset-specific Instrument Name** | SBE43 Oxygen Sensor |
| **Generic Instrument Name** | Sea-Bird SBE 43 Dissolved Oxygen Sensor |
| **Dataset-specific 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 |
| **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 the manufacturer: https://www.seabird.com/products/sbe-43-dissolved-oxygen-sensor |

| | |
|---|---|
| **Dataset-specific Instrument Name** | Seabird CTD |
| **Generic Instrument Name** | Sea-Bird SBE 911plus CTD |
| **Dataset-specific Description** | 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. |
| **Generic Instrument Description** | [tethered, real-time] 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 |

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## Deployments

**PE17-02**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/675038 |
| **Platform** | R/V Pelican |
| **Start Date** | 2016-07-23 |
| **End Date** | 2016-08-03 |
| **Description** | 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. |

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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 (N2) 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 N2 and O2 gas, with the O2 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, N2 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.

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## Funding


| Funding Source | Award |
|---|---|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1558916 |


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