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# Benthic Biogeochemical Exchange Dynamics on the Oregon Shelf

*A Data Management Plan created using DMPTool*

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## Project abstract:

The purpose of this project is to quantify aerobic and anaerobic benthic respiration rates at ~30 and 80 m on the Newport Hydrographic line off the Oregon coast seasonally using in situ eddy covariance benthic lander measurements, sediment core incubations, and CTD-water column measurements and sample collections. The two principal stations are adjacent to Ocean Observatories Initiative (OOI) mooring installations.

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## Data Policy Compliance

Identify any published data policies with which the project will comply, including the NSF OCE Data and Sample Policy as well as other policies that may be relevant if the project is part of a large coordinated research program (e.g. GEOTRACES).

The project investigators will comply with the data management and dissemination policies described in the NSF Division of Ocean Sciences Sample and Data Policy (NSF 17-037).

## Pre-Cruise Planning

If the proposed project involves a research cruise, describe the cruise plans. (Skip this section if it is not relevant to your proposal.) Consider the following questions:

1. How will pre-cruise planning be coordinated? (e.g. email, teleconference, workshop)
2. What types of sampling instruments will be deployed on the cruise?
3. How will the cruise event log be recorded? (e.g. the Rolling Deck to Repository (R2R) event logger application, an Excel spreadsheet, or paper logs)
4. Will you prepare a cruise report?

This project involves ten 2-5 day cruises between December 2017 and July 2019. The primary sampling instruments are two eddy covariance benthic landers with acoustic doppler velocimeter, fiber optic oxygen and thermistor temperature sensors. These landers are deployed autonomously typically for periods of 24-48 hours. Repeat CTD casts are made to characterize the water column with water samples collected from 2-4 m above the seafloor. Sediment cores are collected from the study sites using a hydraulically damped gravity corer. These samples are used in core incubations. On most cruises we are using a new event logger developed by the RCRV program. It can transfer logged data to Excel. Early cruises used paper logs that were transferred to Excel spreadsheets. Individual cruise reports are not being prepared, but all cruise data is being archived in a file sharing system called "BOX".

## Description of Data Types

Provide a description of the types of data to be produced during the project. Identify the types of data, samples, physical collections, software, derived models, curriculum materials, and other materials to be produced in the course of the project. Include a description of the location of collection, collection methods and instruments, expected dates or duration of collection. If you will be using existing datasets, state this and include how you will obtain them.

### Observational Datasets:

1. **CTD and Niskin bottle data:** CTD data collected using a SeaBird SBE CTD package; processing to be done using SeaBird's SeaSave software; data will include standard environmental measurements (such as pressure, temperature, salinity, fluorescence). File types: Raw (.con, .hdr, .hex, .bl) and processed and .cnv, .asc, .bt1) ASCII files. Repository: BCO-DMO and Rolling Deck to Repository (R2R).
2. **Event log:** Cruise scientific sampling event log; will include event numbers, start/end dates, times & locations of instrument deployments. Will be recorded using the RCRV datapresence event logger (if available) and on paper log sheets. File types: Excel file converted to .csv; scanned PDFs. Repository: BCO-DMO and Rolling Deck to Repository (R2R).
3. **Cruise underway data:** Routine underway data collected along the ship's track (including meteorological data, sea surface temperature, salinity, fluorescence, ADCP). Will be collected by the shipboard instrumentation. File types: .csv ASCII files. Repository: BCO-DMO and R2R.
4. **Core sampling logs and images:** Sediment cores will be taken via a hydraulically dampened gravity corer (slow corer) and a box corer during the cruises. Cores used for core incubations or sieved for infaunal species will be recorded by hand in log books. Information from logs will be transferred into an Excel spreadsheet. Photographs of some cores will be taken on the ship using a digital camera. File types: PDF files of scanned log sheets; Excel files of sampling logs; images (.jpg files). Repository: BCO-DMO.
5. **Eddy Covariance benthic lander time series measurements:** Data will be collected with an Acoustic Doppler Velocimeter (ADV), fiber optic oxygen sensors, optodes, temperature probes (Rockland Scientific Fast thermistor) and a Seabird SBE 37-SM CTD mounted on benthic landers. Measurements used for eddy covariance will be recorded at 64 Hz for up to 48 h in situ and saved as .vec and ASCII .dat files. These are large files that are later processed to derived eddy covariance benthic fluxes. Repository: BCO-DMO.

### Experimental Datasets:

1. **Core incubations:** Incubation experiments carried out on cores collected at sea under controlled temperature and stirring conditions; dataset will include time point samples taken and analyzed for oxygen, nutrients and total-CO<sub>2</sub>. Experiments will be conducted in a refrigerated van onboard ship. File types: Excel file(s). Repository: BCO-DMO.

## Derived Datasets:

1. **Eddy Covariance benthic fluxes:** Time series benthic fluxes of oxygen and heat derived from eddy covariance measurements. Data reduction will be performed at the PI's lab following the research cruises. Data will include metadata on processing steps. File types: ASCII, .mat. Repository: BCO-DMO.

## Data and Metadata Formats and Standards

Identify the formats and standards to be used for data and metadata formatting and content. Where existing standards are absent or deemed inadequate, these formats and contents should be documented along with any proposed solutions or remedies. Consider the following questions:

1. Which file formats will be used to store your data?
2. What type of contextual details (metadata) will you document and how?
3. Are there specific data or metadata standards that you will be adhering to?
4. Will you be using or creating a data dictionary, code list, or glossary?
5. What types of quality control will be used? How will data quality be assessed and flagged?

Field observation data will be stored in flat ASCII files, which can be read easily by different software packages. Field data will include date, time, latitude, longitude, cast number, and depth, as appropriate. Quality flags will be assigned according to the ODS IODE Quality Flag scheme (IOC Manuals and Guides, 54, volume 3; [http://www.iode.org/mg54\\_3](http://www.iode.org/mg54_3)). Metadata will be prepared in accordance with BCO-DMO conventions (i.e. using the BCO-DMO metadata forms) and will include detailed descriptions of collection and analysis procedures.

## Data Storage and Access During the Project

Describe how project data will be stored, accessed, and shared among project participants during the course of the project. Consider the following:

1. How will data be shared among project participants during the data collection and analysis phases? (e.g. web page, shared network drive)
2. How/where will data be stored and backed-up?
3. If data volumes will be significant, what is the estimated total file size?

All data resulting from this project is being stored on a shared-drive accessed through Oregon State University computing services (BOX). Original cruise data is also backed up on external hard drives.

Eddy covariance data files are large (hundreds of MBs each) and require significant post-processing leading to the derivation of benthic fluxes.

## Mechanisms and Policies for Access, Sharing, Re-Use, and Re-Distribution

Describe mechanisms for data access and sharing, and describe any related policies and provisions for re-use, re-distribution, and the production of derivatives. Include provisions for appropriate protections of privacy, confidentiality, security, intellectual property, or other rights or requirements. Consider the following:

1. When will data be made publicly available and how? Identify the data repositories you plan to use to make data available.
2. Are the data sensitive in nature (e.g. endangered species concerns, potential patentability)? If so, is public access inappropriate and how will access be provided? (e.g. formal consent agreements, restricted access)
3. Will any permission restrictions (such as an embargo period) need to be placed on the data? If so, what are the reasons and what is the duration of the embargo?
4. Who holds intellectual property rights to the data and how might this affect data access?
5. Who is likely to be interested in re-using the data? What are the foreseeable re-uses of the data?

Immediately after completion of the research cruise, underway data and metadata will be submitted to the Rolling Deck to Repository (R2R) project by the ship's marine technical group.

Data sets produced by the science party will be made available through the BCO-DMO data system within two-years from the date of collection. The project investigators will work with BCO-DMO data managers to make project data available online in compliance with the NSF OCE Sample and Data Policy. Data, samples, and other information collected under this project can be made publically available without restriction once submitted to the public repositories.

Data produced by this project may be of interest to chemical and biological oceanographers, and climate scientists interested in the role of biogeochemistry in the global climate system. We will adhere to and promote the standards, policies, and provisions for data and metadata submission, access, re-use, distribution, and ownership as prescribed by the BCO-DMO Terms of Use (<http://www.bco-dmo.org/terms-use>).

## Plans for Archiving

Describe the plans for long-term archiving of data, samples, and other research products, and for preservation of access to them. Consider the following:

1. What is your long-term strategy for maintaining, curating, and archiving the data?
2. What archive(s) have you identified as a place to deposit data and other research products?

R2R will ensure that the original underway measurements are archived permanently at NCEI and/or NGDC as appropriate. BCO-DMO will also ensure that project data are submitted to the appropriate national data archive. The PI will work with R2R and BCO-DMO to ensure data are archived appropriately and that proper and complete documentation are archived along with the data.

### **Roles and Responsibilities**

Describe the roles and responsibilities of all parties with respect to the management of the data. Consider the following:

1. If there are multiple investigators involved, what are the data management responsibilities of each person
2. Who will be the lead or primary person responsible for ultimately ensuring compliance with the Data Management Plan?

The Lead PI, Clare Reimers, will coordinate the overall data management and sharing process and with assistance from her laboratory manager, Yvan Alleau, will submit the project data and metadata to the Biological and Chemical Oceanography Data Management Office (BCO-DMO) who will be responsible for forwarding these data and metadata to the appropriate national archive.