

# Activities of extracellular peptidases at Station H of the White Oak River (WOR) Station H in 2013 (SEDpep project)

**Website:** <https://www.bco-dmo.org/dataset/640372>

**Data Type:** Other Field Results

**Version:** 14 March 2016

**Version Date:** 2016-03-14

## Project

» [Novel peptidases in subsurface sediments: Activities and substrate specificities](#) (SEDpep)

## Program

» [Center for Dark Energy Biosphere Investigations](#) (C-DEBI)

Contributors	Affiliation	Role
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## Dataset Description

Activities of extracellular peptidases collected at Station H of the White Oak River.

## Methods & Sampling

Sediment pushers were collected manually from the White Oak River, Station H. The core was transported to the Institute of Marine Sciences at Morehead City, NC, and sectioned at 3-cm intervals. Intervals are named for the center of the interval (i.e., depth=1.5 cm refers to the interval from 0 to 3 cm). Substrates were brought up in an anoxic slurry of buffered artificial seawater at an approximate ratio of 0.5 g sediment to 4 ml medium and transferred into 5 ml serum vials, which were briefly purged with N<sub>2</sub> to preserve anoxia. Immediately after mixing and again three times over the course of about 4 hours, approximately 1 ml of sediment was removed, centrifuged briefly, and fluorescence of the supernatant was measured using a Promega Quantifluor ST fluorescence detector set to UV (ex ca. 350 nm, em ca 450 nm). Separately, the sediments were standardized using AMC, and a 6-hour incubation with AMC showed that sorption of AMC to sediments was negligible.

## Data Processing Description

Activities were calculated as the rate of fluorescence production per gram sediment, calibrated with AMC standards.

BCO-DMO processing:

- modified parameter names to conform with BCO-DMO naming conventions;

- replaced "NA" with "nd" (no data);
- added site name, lat, lon, and date from metadata form;
- converted original lat and lon provided to decimal degrees.

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## Data Files

File
<b>Peptidase_Activities_WOR.csv</b> (Comma Separated Values (.csv), 19.53 KB) MD5:a6118cf9a1f7e2193a6caefee2b64cb Primary data file for dataset ID 640372

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## Parameters

Parameter	Description	Units
site	Name of sampling site.	dimensionless
lat	Latitude of sampling site.	decimal degrees
lon	Longitude of sampling site.	decimal degrees
depth	Depth in centimeters below sediment-water interface.	centimeters (cm)
substrate	Name of fluorogenic substrate used: Arg-AMC = Arginyl-aminomethylcoumarin (AMC), Gly-AMC = glycyI-AMC, Leu-AMC = Leucyl-AMC, GlyGlyArg-AMC = glycyI-glycyI-arginyl-AMC, BocValPro-Arg-AMC = tert-butyloxycarbonyl-AMC	dimensionless
conc	Concentration	?
v0	V0	micromoles per hour per gram of sediment (uM per hr per g sed)

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## Instruments

<b>Dataset-specific Instrument Name</b>	centrifuge
<b>Generic Instrument Name</b>	Centrifuge
<b>Generic Instrument Description</b>	A machine with a rapidly rotating container that applies centrifugal force to its contents, typically to separate fluids of different densities (e.g., cream from milk) or liquids from solids.

<b>Dataset-specific Instrument Name</b>	Promega Quantifluor ST fluorescence detector
<b>Generic Instrument Name</b>	Fluorometer
<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>	
<b>Generic Instrument Name</b>	Push Corer
<b>Dataset-specific Description</b>	Sediment pushers were collected manually from the White Oak River, Station H.
<b>Generic Instrument Description</b>	Capable of being performed in numerous environments, push coring is just as it sounds. Push coring is simply pushing the core barrel (often an aluminum or polycarbonate tube) into the sediment by hand. A push core is useful in that it causes very little disturbance to the more delicate upper layers of a sub-aqueous sediment. Description obtained from: <a href="http://web.whoi.edu/coastal-group/about/how-we-work/field-methods/coring/">http://web.whoi.edu/coastal-group/about/how-we-work/field-methods/coring/</a>

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## Deployments

### WOR\_2013

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/640354">https://www.bco-dmo.org/deployment/640354</a>
<b>Platform</b>	White Oak River Station H
<b>Start Date</b>	2013-05-28
<b>End Date</b>	2013-05-28

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## Project Information

### Novel peptidases in subsurface sediments: Activities and substrate specificities (SEDpep)

**Coverage:** White Oak River Station H, (34 44.490'N, 77 07.44W); Tennessee River at Knoxville TN (Volunteer Landing Dock), and Bogue Sound at the Institute of Marine Sciences dock, Morehead City, NC.

*Description from [C-DEBI](#):*

The goal of this project was to explore the mechanisms of subsurface organoheterotrophy by identifying the range of extracellular peptidases present in sediments of the White Oak River, NC, consistent with C-DEBI Research Theme 1, Activity in the Deep Subseafloor Biosphere: function & rates of global biogeochemical

processes. This grant funded two sampling expeditions to the White Oak River as well as extensive laboratory work with a purified peptidase that was supplied by collaborators Andrzej Joachimiak and Karolina Michalska of Argonne National Laboratory and preparatory work on peptidases of the Tennessee River. So far this dataset has led to the submission of two manuscripts, with one more manuscript in preparation. The White Oak River work showed that a wide range of peptidases are present in depths up to 80 cm in the White Oak River, which is deeper than the zone of methanogenesis. Although absolute peptidase activities declined with depth, activities normalized to cell abundance were roughly constant, and activities normalized to organic carbon oxidation rates increased nearly two orders of magnitude relative to the surface, indicating that extracellular peptidases were important to the subsurface ecosystem. Biochemical analysis of a purified peptidase that was expressed by the Argonne group showed it to be a novel aminopeptidase with specificity for N-terminal cysteine, a function not previously observed in peptidases. In summary, *in situ* and *in vitro* studies of subsurface peptidases revealed that they are ecologically important and may contain novel properties.

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## Program Information

### Center for Dark Energy Biosphere Investigations (C-DEBI)

**Website:** <http://www.darkenergybiosphere.org>

**Coverage:** Global

The mission of the Center for Dark Energy Biosphere Investigations (C-DEBI) is to explore life beneath the seafloor and make transformative discoveries that advance science, benefit society, and inspire people of all ages and origins.

C-DEBI provides a framework for a large, multi-disciplinary group of scientists to pursue fundamental questions about life deep in the sub-surface environment of Earth. The fundamental science questions of C-DEBI involve exploration and discovery, uncovering the processes that constrain the sub-surface biosphere below the oceans, and implications to the Earth system. What type of life exists in this deep biosphere, how much, and how is it distributed and dispersed? What are the physical-chemical conditions that promote or limit life? What are the important oxidation-reduction processes and are they unique or important to humankind? How does this biosphere influence global energy and material cycles, particularly the carbon cycle? Finally, can we discern how such life evolved in geological settings beneath the ocean floor, and how this might relate to ideas about the origin of life on our planet?

C-DEBI's scientific goals are pursued with a combination of approaches:

- (1) coordinate, integrate, support, and extend the research associated with four major programs—Juan de Fuca Ridge flank (JdF), South Pacific Gyre (SPG), North Pond (NP), and Dorado Outcrop (DO)—and other field sites;
- (2) make substantial investments of resources to support field, laboratory, analytical, and modeling studies of the deep subseafloor ecosystems;
- (3) facilitate and encourage synthesis and thematic understanding of submarine microbiological processes, through funding of scientific and technical activities, coordination and hosting of meetings and workshops, and support of (mostly junior) researchers and graduate students; and
- (4) entrain, educate, inspire, and mentor an interdisciplinary community of researchers and educators, with an emphasis on undergraduate and graduate students and early-career scientists.

Note: Katrina Edwards was a former PI of C-DEBI; James Cowen is a former co-PI.

### Data Management:

C-DEBI is committed to ensuring all the data generated are publically available and deposited in a data repository for long-term storage as stated in their [Data Management Plan \(PDF\)](#) and in compliance with the [NSF Ocean Sciences Sample and Data Policy](#). The data types and products resulting from C-DEBI-supported research include a wide variety of geophysical, geological, geochemical, and biological information, in addition to education and outreach materials, technical documents, and samples. All data and information generated by C-DEBI-supported research projects are required to be made publically available either following publication of research results or within two (2) years of data generation.

To ensure preservation and dissemination of the diverse data-types generated, C-DEBI researchers are working with BCO-DMO Data Managers make data publicly available online. The partnership with BCO-DMO helps ensure that the C-DEBI data are discoverable and available for reuse. Some C-DEBI data is better served by specialized repositories (NCBI's GenBank for sequence data, for example) and, in those cases, BCO-DMO provides dataset documentation (metadata) that includes links to those external repositories.

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## Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-0939564</a>

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