Carbonate chemistry from Mud Patch porewater, from R/V Endeavor EN524 in the continental shelf off New England; 40.43 N 70.5 W from May 2013 (OA, Hypoxia and Warming project)

Website: https://www.bco-dmo.org/dataset/670536
Data Type: Cruise Results
Version:
Version Date: 2016-12-16

Project
» Ocean Acidification, Hypoxia and Warming: Experimental Investigations into Compounded Effects of Global Change on Benthic Foraminifera (OA, Hypoxia and Warming)

Program
» Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES): Ocean Acidification (formerly CRI-OA) (SEES-OA)

Contributors	Affiliation	Role
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Dataset Description

This dataset includes porewater DIC and alkalinity, with additional carbonate calculations, from R/V Endeavor EN524 in the Mud Patch site, continental shelf off New England; 40.43 N 70.5 W from May 2013.

Methods & Sampling

An MC800 sediment core from event 10 was sectioned into 1-cm slices to 2 cm. Each interval was centrifuged and the supernatant (porewater) was filtered through a 0.45 um filter, and preserved with mercuric chloride. Alkalinity was determined using Gran titrations of 1 ml samples. DIC was determined manometrically on ~5-ml samples using an automated vacuum extraction system.

All other carbonate system parameters were calculated via using CO2SYS (Lewis & Wallace 1998) and the dissociation constants of Mehrbach et al. (1973) as refit by Dickson & Millero (1987), and the calcite solubility of Mucci (1983).

Related Reference: JC Wit, MM Davis, DC Mccorkle, JM Bernhard, A short-term survival experiment assessing impacts of ocean acidification and hypoxia on the benthic foraminifer Globobulimina turgida (2016) Journal of Foraminiferal Research, 46: 25-33. https://doi.org/10.2113/gsjfr.46.1.25

Data Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- replaced spaces with underscores
- added yrday_utc and ISO_DateTime_UTC, calculated from date and time

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Data Files

File
porewater_DIC_alk.csv (Comma Separated Values (.csv), 340 bytes) MD5:276b5ac854ca59e0c30ac3e1df7595eb Primary data file for dataset ID 670536

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Parameters

Parameter	Description	Units
sample	sample identifier	unitless
event	event number	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
date	date formatted as yyyy-mm-dd	unitless
time	UTC time formatted as HH:MM	unitless
yrday_utc	UTC day and decimal time:eg. 326.5 for the 326th day of the year or November 22 at 1200 hours (noon)	julian day and fraction of day
ISO_DateTime_UTC	Date/Time (UTC) ISO formatted based on ISO 8601:2004(E) with format YYYY-mm-ddTHH:MM:SS[.xx]Z	year;month;day;hour;minute;second
depth_w	depth of water	meters
DIC	dissolved inorganic carbon	micromole/kilogram (umol/kg)
alkalinity	total alkalinity	micromole/kilogram (umol/kg)
pCO2	partial pressure of carbon dioxide computation from pH and alkalinity	ppmv
carbonate	concentration of carbonate ion ([CO3]2-) in seawater	micromole/kilogram seawater (umol/kg)
Om_calcite	The saturation state of seawater with respect to calcite	dimensionless
pH	pH: The measure of the acidity or basicity of an aqueous solution	dimensionless

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Instruments

Dataset-specific Instrument Name	centrifuge
Generic Instrument Name	Centrifuge
Dataset-specific Description	Used to extract porewater from core
Generic Instrument Description	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.

Dataset-specific Instrument Name	MC800 sediment core
Generic Instrument Name	Multi Corer
Generic Instrument Description	The Multi Corer is a benthic coring device used to collect multiple, simultaneous, undisturbed sediment/water samples from the seafloor. Multiple coring tubes with varying sampling capacity depending on tube dimensions are mounted in a frame designed to sample the deep ocean seafloor. For more information, see Barnett et al. (1984) in Oceanologica Acta, 7, pp. 399-408.

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Deployments

EN524

Website	https://www.bco-dmo.org/deployment/59031
Platform	R/V Endeavor
Start Date	2013-05-19
End Date	2013-05-22
Description	UNOLS cruise request: http://strs.unols.org/Public/diu_project_view.aspx?project_id=103010 The May cruise is the first for the NSF OCE funded Ocean Acidification, Hypoxia and Warming project also known by the project researchers as "OA Propagule". The cruise was timed such that samples would be collected soon after the spring bloom. During the cruise, investigators plan to collect CTD profile data, including dissolved oxygen, bottom water with Niskin bottles deployed on the CTD rosette, MC800 multicores, and Soutar boxcores from the "Mud Patch" study site. The study area is located on the continental shelf approximately 50 nm south of Martha's Vineyard (40.43 N 70.5 W). The original cruise event log and other underway data submitted by the vessel operator will be available from the NSF R2R cruise catalog. Cruise track image from the University of Rhode Island, the vessel operator.

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Project Information

Ocean Acidification, Hypoxia and Warming: Experimental Investigations into Compounded Effects of Global Change on Benthic Foraminifera (OA, Hypoxia and Warming)

Coverage: continental shelf off New England

from the NSF award abstract:

The average sea surface temperature (SST) has increased over the last 100 years, rising atmospheric partial pressure of carbon dioxide (pCO2) is lowering the pH of the oceans, and the extent and intensity of low-oxygen bottom waters is growing, at least in certain regions. The biological impacts of these ongoing changes -- warming, acidification, and hypoxia -- have each been studied independently, but few studies have explored the possible interactions among these stressors.

This research, led by a scientist from the Woods Hole Oceanographic Institution, studies the compounded effects of ocean acidification, hypoxia, and warming on an assemblage of benthic foraminifera collected from the continental shelf off New England. Foraminifera are an ideal organism for this work because they (1) are relatively small, allowing experimentation on statistically significant populations; (2) have both calcareous and non-calcareous representatives; (3) are relatively short-lived so experiments include a major portion of their life cycle; (4) include aerobes and anaerobes; and (5) provide a fossil record allowing comparisons across time. Laboratory culturing experiments will be used to determine the response of benthic foraminifera, in terms of survival and growth, to co-varying parameters of pH and oxygen, and to explore the influence of increased temperature on these responses. The researchers will examine the relative effects of higher pCO2, lower [O2], and higher temperature (T) on both calcareous and non-calcareous benthic foraminifera. In addition, they will examine the pre-Industrial benthic foraminiferal assemblage at the field site, and will compare that assemblage to those produced in the experiments under pre-Industrial (lower than current day) and elevated pCO2 levels.

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Program Information

Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES): Ocean Acidification (formerly CRI-OA) (SEES-OA)

Website: https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503477

Coverage: global

NSF Climate Research Investment (CRI) activities that were initiated in 2010 are now included under Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES). SEES is a portfolio of activities that highlights NSF's unique role in helping society address the challenge(s) of achieving sustainability. Detailed information about the SEES program is available from NSF (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504707).

In recognition of the need for basic research concerning the nature, extent and impact of ocean acidification on oceanic environments in the past, present and future, the goal of the SEES: OA program is to understand (a) the chemistry and physical chemistry of ocean acidification; (b) how ocean acidification interacts with processes at the organismal level; and (c) how the earth system history informs our understanding of the effects of ocean acidification on the present day and future ocean.

Solicitations issued under this program:
NSF 10-530, FY 2010-FY2011
NSF 12-500, FY 2012
NSF 12-600, FY 2013
NSF 13-586, FY 2014
NSF 13-586 was the final solicitation that will be released for this program.

PI Meetings:
1st U.S. Ocean Acidification PI Meeting(March 22-24, 2011, Woods Hole, MA)
2nd U.S. Ocean Acidification PI Meeting(Sept. 18-20, 2013, Washington, DC)
3rd U.S. Ocean Acidification PI Meeting (June 9-11, 2015, Woods Hole, MA – Tentative)

NSF media releases for the Ocean Acidification Program:

Press Release 10-186 NSF Awards Grants to Study Effects of Ocean Acidification

Discovery Blue Mussels "Hang On" Along Rocky Shores: For How Long?

Discovery nsf.gov - National Science Foundation (NSF) Discoveries - Trouble in Paradise: Ocean Acidification This Way Comes - US National Science Foundation (NSF)

Press Release 12-179 nsf.gov - National Science Foundation (NSF) News - Ocean Acidification: Finding New Answers Through National Science Foundation Research Grants - US National Science Foundation (NSF)

Press Release 13-102 World Oceans Month Brings Mixed News for Oysters

Press Release 13-108 nsf.gov - National Science Foundation (NSF) News - Natural Underwater Springs Show How Coral Reefs Respond to Ocean Acidification - US National Science Foundation (NSF)

Press Release 13-148 Ocean acidification: Making new discoveries through National Science Foundation research grants

Press Release 13-148 - Video nsf.gov - News - Video - NSF Ocean Sciences Division Director David Conover answers questions about ocean acidification. - US National Science Foundation (NSF)

Press Release 14-010 nsf.gov - National Science Foundation (NSF) News - Palau's coral reefs surprisingly resistant to ocean acidification - US National Science Foundation (NSF)

Press Release 14-116 nsf.gov - National Science Foundation (NSF) News - Ocean Acidification: NSF awards $11.4 million in new grants to study effects on marine ecosystems - US National Science Foundation (NSF)

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1219948

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