

Coral and algae calcification rates in varying carbonate regimes collected from the Richard B Gump Research Station during 2011, from Moorea, French Polynesia (MCR LTER project, OA_Corals project)

Website: <https://www.bco-dmo.org/dataset/3788>

Data Type: experimental

Version:

Version Date: 2012-11-22

Project

» [Moorea Coral Reef Long-Term Ecological Research site](#) (MCR LTER)

» [RUI: Ocean Acidification- Category 1- The effects of ocean acidification on the organismic biology and community ecology of corals, calcified algae, and coral reefs](#) (OA_Corals)

Programs

» [Long Term Ecological Research network](#) (LTER)

» [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

Light and dark calcification rates for the coral *Porites rus* and alga *Hydrolithon onkodes* in varying carbonate chemistry conditions. These data are part of experiments performed during July/August 2011 in French Polynesia to test the effect of various concentrations of carbonate and bicarbonate ions on the calcification of a coral and a calcifying alga.

Related References:

Comeau, S., Carpenter, R. C., & Edmunds, P. J. (2013). Coral reef calcifiers buffer their response to ocean acidification using both bicarbonate and carbonate. *Proceedings of the Royal Society B: Biological Sciences*, 280(1753), 20122374. doi:10.1098/rspb.2012.2374

Related datasets:

[algae calcification](#)

[coral calcification](#)

[carbonate chemistry](#)

[mean calcification](#)

[calcification rates - flume expt](#)

[carbonate chemistry - flume expt](#)

Methods & Sampling

For light and dark calcification experiments, two to three subsamples (one coral and one piece of Crustose Coralline Algae (CCA)) from each treatment were chosen randomly at 12:00 on days 5 and 7 of the incubation, for each of the two-week trials. Samples were placed in separate 500-mL glass beakers containing 320 mL of seawater from the respective incubation tanks. As the incubations lasted 1 h, it was assumed that the variation in total alkalinity (measured before and at the end of the incubation) was due to calcification/dissolution. The stoichiometric relation of 2 moles total alkalinity (A_T) being removed for each 1 mole of $CaCO_3$ precipitated was used to calculate calcification both in the light and the dark.

Data Processing Description

BCO-DMO Processing Notes:

Original data file: "Raw_data_Comeau_et_al_PRSB-1.xls" contained three spreadsheets. This file was split into three separate datasets. Resultant datasets were edited in excel by BCO-DMO. The following edits were made to the file light_dark_calcification.dat:

-Added BCO-DMO header

-edited 'Porites rus Light' to 'calcification_light_Porites_rus'

-edited 'Porites rus dark calcification' to 'calcif_dark_Porites_rus'

-edited 'Hydrolithon onkodes Light calcification' to 'calcif_light_Hydrolithon_onkodes'

-edited 'Hydrolithon onkodes dark calcification' to 'calcif_dark_Hydrolithon_onkodes'

-replaced spaces in 'condition' text with underscores.

-Added 'lat' and 'lon' column of experiment site (Richard B. Gump Research Site, Moorea) to file

-Added title, version and PI lines

-Added deployment ID column 'deploy_id' with "lab_Carpenter_Moorea" as a value

2012.12.07 Data contact S. Comeau submitted a revised file for light_dark_calcification which included dates. Dates were edited into 'year', 'month_local', 'day_local' components.

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Data Files

File
light_dark_calcification.csv (Comma Separated Values (.csv), 4.69 KB) MD5:6e0e09bc854c0f6581076a9cdd69a945
Primary data file for dataset ID 3788

Parameters

Parameter	Description	Units
condition	Experimental treatment of various concentrations of carbonate and bicarbonate ions used to test the effects of various carbonate chemistry regimes on coral and calcifying alga.	dimensionless
calcif_light_Porites_rus	Calcification rates during a 1 hour light incubation for the coral <i>Porites rus</i> under varying carbonate chemistry conditions.	micrograms CaCO ₃ /h/cm ²
calcif_dark_Porites_rus	Calcification rates during a 1 hour dark incubation for the coral <i>Porites rus</i> under varying carbonate chemistry conditions.	micrograms CaCO ₃ /h/cm ²
calcif_light_Hydrolithon_onkodes	Calcification rates during a 1 hour light incubation for the coral <i>Hydrolithon onkodes</i> under varying carbonate chemistry conditions.	micrograms CaCO ₃ /h/cm ²
calcif_dark_Hydrolithon_onkodes	Calcification rates during a 1 hour dark incubation for the coral <i>Hydrolithon onkodes</i> under varying carbonate chemistry conditions.	micrograms CaCO ₃ /h/cm ²
year	Four-digit year in which experiments were conducted.	YYYY
month_local	Month in which experiments were conducted in local time.	
day_local	Day of the month in which experiments were conducted, in local time.	
deploy_id	Unique descriptor for experiments, indicating physical location where they were conducted (lab), lead investigator and lab location.	dimensionless

Deployments

lab_Carpenter_Moorea

Website	https://www.bco-dmo.org/deployment/58885
Platform	Richard B Gump Research Station - Moorea LTER
Start Date	2011-07-17
End Date	2011-08-12
Description	Laboratory experiments carried out by R. Carpenter and P. Edmunds of California State University Northridge at the Richard B. Gump Research Station in French Polynesia, for the project "RUI: Ocean Acidification- Category 1- The effects of ocean acidification on the organismic biology and community ecology of corals, calcified algae, and coral reefs".

Project Information

Moorea Coral Reef Long-Term Ecological Research site (MCR LTER)

Website: <http://mcr.lternet.edu/>

Coverage: Island of Moorea, French Polynesia

From <http://www.lternet.edu/sites/mcr/> and <http://mcr.lternet.edu/>:

The Moorea Coral Reef LTER site encompasses the coral reef complex that surrounds the island of Moorea, French Polynesia (17°30'S, 149°50'W). Moorea is a small, triangular volcanic island 20 km west of Tahiti in the Society Islands of French Polynesia. An offshore barrier reef forms a system of shallow (mean depth ~ 5-7 m), narrow (~0.8-1.5 km wide) lagoons around the 60 km perimeter of Moorea. All major coral reef types (e.g., fringing reef, lagoon patch reefs, back reef, barrier reef and fore reef) are present and accessible by small boat.

The MCR LTER was established in 2004 by the US National Science Foundation (NSF) and is a partnership between the University of California Santa Barbara and California State University, Northridge. MCR researchers include marine scientists from the UC Santa Barbara, CSU Northridge, UC Davis, UC Santa Cruz, UC San Diego, CSU San Marcos, Duke University and the University of Hawaii. Field operations are conducted from the UC Berkeley Richard B. Gump South Pacific Research Station on the island of Moorea, French Polynesia.

MCR LTER Data: The Moorea Coral Reef (MCR) LTER data are managed by and available directly from the MCR project data site URL shown above. The datasets listed below were collected at or near the MCR LTER sampling locations, and funded by NSF OCE as ancillary projects related to the MCR LTER core research themes.

This project is supported by continuing grants with slight name variations:

- LTER: Long-Term Dynamics of a Coral Reef Ecosystem
- LTER: MCR II - Long-Term Dynamics of a Coral Reef Ecosystem
- LTER: MCR IIB: Long-Term Dynamics of a Coral Reef Ecosystem
- LTER: MCR III: Long-Term Dynamics of a Coral Reef Ecosystem
- LTER: MCR IV: Long-Term Dynamics of a Coral Reef Ecosystem

RUI: Ocean Acidification- Category 1- The effects of ocean acidification on the organismic biology and community ecology of corals, calcified algae, and coral reefs (OA_Corals)

Coverage: Moorea, French Polynesia

While coral reefs have undergone unprecedented changes in community structure in the past 50 y, they now may be exposed to their gravest threat since the Triassic. This threat is increasing atmospheric CO₂, which equilibrates with seawater and causes ocean acidification (OA). In the marine environment, the resulting decline in carbonate saturation state (Omega) makes it energetically less feasible for calcifying taxa to mineralize; this is a major concern for coral reefs. It is possible that the scleractinian architects of reefs will cease to exist as a mineralized taxon within a century, and that calcifying algae will be severely impaired. While there is a rush to understand these effects and make recommendations leading to their mitigation, these efforts are influenced strongly by the notion that the impacts of pCO₂ (which causes Omega to change) on calcifying taxa, and the mechanisms that drive them, are well-known. The investigators believe that many of the key processes of mineralization on reefs that are potentially affected by OA are only poorly known and that current knowledge is inadequate to support the scaling of OA effects to the community level. It is vital to measure organismal-scale calcification of key taxa, elucidate the mechanistic bases of these responses, evaluate community scale calcification, and finally, to conduct focused experiments to describe the functional relationships between these scales of mineralization.

This project is a 4-y effort focused on the effects of Ocean Acidification (OA) on coral reefs at multiple spatial and functional scales. The project focuses on the corals, calcified algae, and coral reefs of Moorea, French Polynesia, establishes baseline community-wide calcification data for the detection of OA effects on a decadal-scale, and builds on the research context and climate change focus of the Moorea Coral Reef LTER.

This project is a hypothesis-driven approach to compare the effects of OA on reef taxa and coral reefs in Moorea. The PIs will utilize microcosms to address the impacts and mechanisms of OA on biological processes, as well as the ecological processes shaping community structure. Additionally, studies of reef-wide metabolism will be used to evaluate the impacts of OA on intact reef ecosystems, to provide a context within which the experimental investigations can be scaled to the real world, and critically, to provide a much needed reference against which future changes can be gauged.

Datasets listed in the "Dataset Collection" section include references to results journal publications published as part of this project.

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Program Information

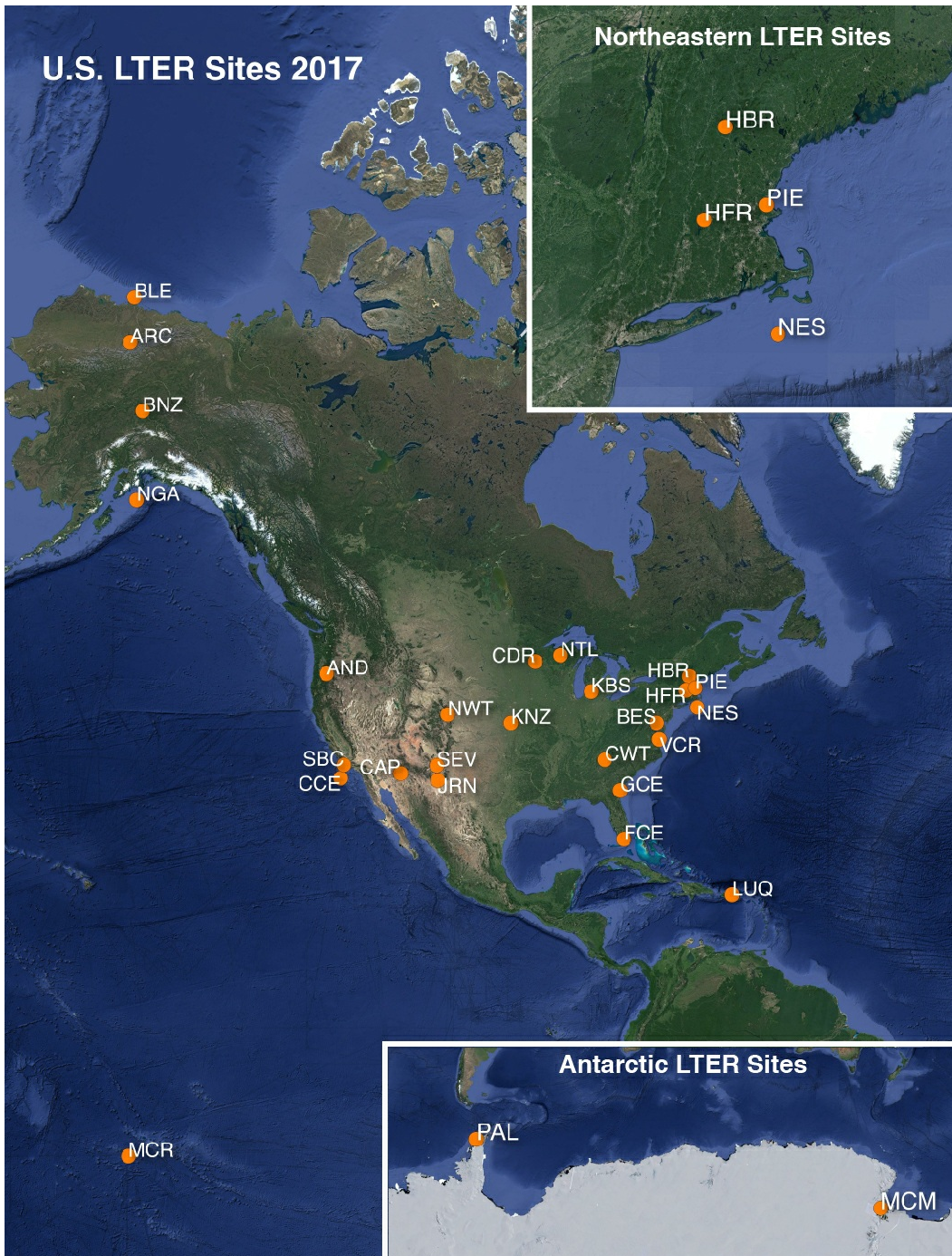
Long Term Ecological Research network (LTER)

Website: <http://www.lternet.edu/>

Coverage: United States

adapted from <http://www.lternet.edu/>

The National Science Foundation established the LTER program in 1980 to support research on long-term ecological phenomena in the United States. The Long Term Ecological Research (LTER) Network is a collaborative effort involving more than 1800 scientists and students investigating ecological processes over long temporal and broad spatial scales. The LTER Network promotes synthesis and comparative research across sites and ecosystems and among other related national and international research programs. The LTER research sites represent diverse ecosystems with emphasis on different research themes, and cross-site communication, network publications, and research-planning activities are coordinated through the LTER Network Office.



Site Codes

AND	Andrews Forest LTER
ARC	Arctic LTER
BES	Baltimore Ecosystem Stu
BLE	Beaufort Lagoon Ecosystems LTER
BNZ	Bonanza Creek LTER
CCE	California Current Ecosystem LTER
CDR	Cedar Creek Ecosystem Science Reserve
CAP	Central Arizona- Phoenix LTER
CWT	Coweeta LTER
FCE	Florida Coastal Everglades LTER
GCE	Georgia Coastal Ecosystems LTER
HFR	Harvard Forest LTER
HBR	Hubbard Brook LTER
JRN	Jornada Basin LTER
KBS	Kellogg Biological Station LTER
KNZ	Konza Prairie LTER
LUQ	Luquillo LTER
MCM	McMurdo Dry Valleys LT
MCR	Moorea Coral Reef LTER
NWT	Niwot Ridge LTER
NTL	North Temperate Lakes I
NES	Northeast U.S. Shelf LTER
NGA	Northern Gulf of Alaska I
PAL	Palmer Antarctica LTER
PIE	Plum Island Ecosystems LTER
SBC	Santa Barbara Coastal L
SEV	Sevilleta LTER
VCR	Virginia Coast Reserve L

2017 LTER research site map obtained from <https://lternet.edu/site/lter-network/>

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-1041270

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