

# Coral and algae calcification rates 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/3785>

Data Type: experimental

Version:

Version Date: 2012-11-20

## 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
<a href="#">Carpenter, Robert</a>	California State University Northridge (CSUN)	Lead Principal Investigator
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## Dataset Description

Mean calcification rates for the coral *Porites rus* and alga *Hydrolithon onkodes* in varying carbonate chemistry conditions. These data are part of a larger data set containing light and dark calcification rates and experimental chemistry conditions, which in turn 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](#)  
[light dark calcification](#)  
[calcification rates - flume expt](#)  
[carbonate chemistry - flume expt](#)

## Methods & Sampling

For calculating mean calcification rates, buoyant weight ( $\pm 1$  mg) was recorded before and after the 15 d of incubation, and the difference between the two was converted to dry weight using an aragonite density of  $2.93 \text{ g cm}^{-3}$  for *Porites rus*, and a calcite density of  $2.71 \text{ g cm}^{-3}$  for *Hydrolithon onkodes*. Calcification was normalized to surface area estimated using aluminum foil for *P. rus*, and by digital photography and image analysis (Image J, US NIH) for *H. onkodes*.

## 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 mean\_calcification.dat:

- Added BCO-DMO header
- edited 'Porites run calcification' to 'calcification\_Porites\_rus'
- edited 'Hydrolithon onkodes calcification' to 'calcification\_Hydrolithon\_onkodes'
- replaced spaces in condition text with underscores
- Added column for 'date\_begin' and 'date\_end'
- Added 'lat' and 'lon' column of experiment site (Richard B. Gump Research Site, Moorea, Tahiti)
- Added title, version and PI lines
- Added column for deployment ID 'deploy\_id' with "lab\_Carpenter\_Moorea" as a value.

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## Data Files

File
<b>mean_calcification.csv</b> (Comma Separated Values (.csv), 10.62 KB) <small>MD5:f76dd7a71c7d3160bd09005cb16f183</small>
Primary data file for dataset ID 3785

## Parameters

Parameter	Description	Units
condition	Description for nine experimental treatments of varying concentrations of carbonate and bicarbonate ions used to test the effects of various carbonate chemistry regimes on coral and calcifying alga.	dimensionless
calcification_Porites_rus	Mean rate of calcium carbonate (aragonite or calcite) fixation.	mg CaCO <sub>3</sub> /d/cm
calcification_Hydrolithon_onkodes	Mean rate of calcium carbonate (aragonite or calcite) fixation.	mg CaCO <sub>3</sub> /d/cm
lat	Latitude component of geographic position where experiments were conducted.	decimal degrees
lon	Longitude component of geographic position where experiments were conducted.	decimal degrees
date_begin	Beginning date of experiment trial in local time.	dd/mm/yy
date_end	Ending date of experiment trial in local time.	dd/mm/yy
deploy_id	Unique descriptor for experiments, indicating physical location where they were conducted (lab), lead investigator and lab location.	

## Deployments

### lab\_Carpenter\_Moorea

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58885">https://www.bco-dmo.org/deployment/58885</a>
<b>Platform</b>	Richard B Gump Research Station - Moorea LTER
<b>Start Date</b>	2011-07-17
<b>End Date</b>	2011-08-12
<b>Description</b>	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 CO<sub>2</sub>, 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 pCO<sub>2</sub> (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

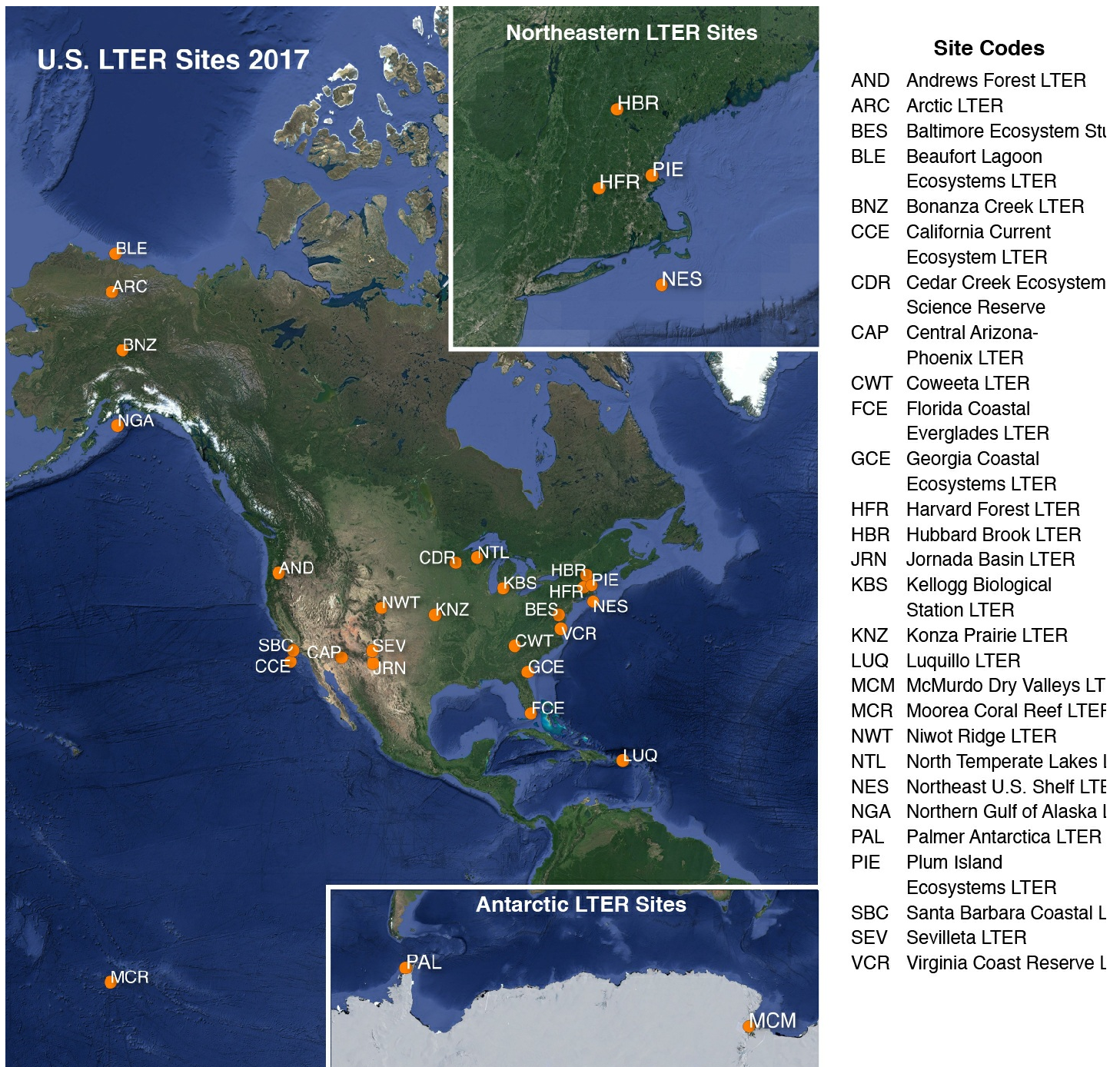
### Long Term Ecological Research network (LTER)

**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.



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](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](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
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1041270</a>

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