Porites calcification rates from Dongsha Atoll from cores collected on June 29, 2013 from 1954-2012

Website: https://www.bco-dmo.org/dataset/738251
Data Type: Other Field Results
Version: 1
Version Date: 2018-04-26

Project
» Collaborative Research: Identifying the Role of Basin-scale Climate Variability in the Decline of Atlantic Corals (Coral climate effects)

Contributors	Affiliation	Role
Cohen, Anne L.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator, Contact
Ren, Abby	National Taiwan University (Taida)	Co-Principal Investigator
Biddle, Mathew	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Porites calcification rates from Dongsha Atoll from cores collected on June 29, 2013 from 1954-2012. The two coral skeletal cores were collected from living Porites sp. colonies in June 2013 using an underwater pneumatic drill.

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Coverage

Spatial Extent: **Lat**:20.66666666 **Lon**:116.833333
Temporal Extent: 1954 - 2012

Dataset Description

This dataset contains calcification rates for Porites coral 751 from Dongsha Atoll from 1954-2012. Calcification rates were collected by analyzing the CT scan of the coral.

Methods & Sampling

Coral core collection and age model. The two coral skeletal cores were collected from living Porites sp. colonies in June 2013 using an underwater pneumatic drill. The north reef flat core (“751”) was drilled to the base of the colony and reached 1 m in length, whereas the east lagoon core (“762”) is 0.5 m in length. Both corals lived in approximately 2 m deep water. The cores were passed through the Siemens Volume Zoom Spiral computed tomography (CT) scanner at Woods Hole Oceanographic Institution. Skeletal density was determined from the CT scans following the methods of DeCarlo et al. (2014). Annual calcification rates (g cm-2 yr-1 (DeCarlo et al., 2014)) were calculated as the product of annual density (g cm-3) and extension (cm yr-

1), measured using the automated software program coralCT (DeCarlo & Cohen, 2016). The age model determined by counting annual growth bands in CT scan images was validated by comparing skeletal δ18 O with satellite sea-surface temperature by matching midpoints of δ18 O and SST. We observe a good correlation when comparing this remote sensing SST product with higher resolution NOAA SST product and with in situ measurement of SST from the northern reef flat.

Data Processing Description

Coral CT scan code (DeCarlo & Cohen, 2016)

BCO-DMO processing notes:

* added a conventional header with dataset name, PI name, version date
* modified parameter names to conform with BCO-DMO naming conventions
* added longitude, latitude, and collection date values to the dataset indicating location and time of sampling.

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Data Files

File
calcif_rates.csv (Comma Separated Values (.csv), 2.46 KB) MD5:d27091249ba56368d7d3818e8abcf9cf Primary data file for dataset ID 738251

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Related Publications

DeCarlo, T. M., & Cohen, A. L. (2016, July 14). Coralct: Software Tool To Analyze Computerized Tomography (Ct) Scans Of Coral Skeletal Cores For Calcification And Bioerosion Rates (Version 1.1). Zenodo. https://doi.org/10.5281/zenodo.57855
Methods

DeCarlo, T. M., Cohen, A. L., Barkley, H. C., Cobban, Q., Young, C., Shamberger, K. E., Brainard R.E., Golbuu, Y. (2015). Coral macrobioerosion is accelerated by ocean acidification and nutrients. Geology, 43(1), 7–10. doi:10.1130/g36147.1 https://doi.org/10.1130/G36147.1
Methods

Ren, H., Chen, Y.-C., Wang, X. T., Wong, G. T. F., Cohen, A. L., DeCarlo, T. M., … Sigman, D. M. (2017). 21st-century rise in anthropogenic nitrogen deposition on a remote coral reef. Science, 356(6339), 749–752. doi:10.1126/science.aal3869
Methods
,
Results

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Parameters

Parameter	Description	Units
year	age determined by counting annual growth bands in CTD scan images	years
Calcif_rate	calcification rate as calculated from the product of annual density and extension.	grams per centimeter squared per year (g/cm2/yr)
lat	latitude in decimal degrees (south negative)	decimal degrees
lon	longitude in decimal degrees (west negative)	decimal degrees
core_date	Date the core was taken in four year two digit month two digit day (YYYYMMDD) format.	unitless

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Instruments

Dataset-specific Instrument Name	Siemens Volume Zoom Spiral computed tomography (CT) scanner
Generic Instrument Name	Computerized Tomography (CT) Scanner
Dataset-specific Description	The cores were passed through the Siemens Volume Zoom Spiral computed tomography (CT) scanner at Woods Hole Oceanographic Institution.
Generic Instrument Description	A CT scan makes use of computer-processed combinations of many X-ray measurements taken from different angles to produce cross-sectional (tomographic) images (virtual "slices") of specific areas of a scanned object.

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Deployments

Dongsha_Atoll_expedition_Cohen_Lab-2014

Website	https://www.bco-dmo.org/deployment/738566
Platform	Unknown Platform
Start Date	2013-06-29
End Date	2013-06-29

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Project Information

Collaborative Research: Identifying the Role of Basin-scale Climate Variability in the Decline of Atlantic Corals (Coral climate effects)

Coverage: Bermuda and wider Caribbean

Text from the NSF award abstract:

Human carbon dioxide emissions are causing measureable changes in ocean conditions. Many of these changes negatively affect coral reef ecosystems, reducing their ability to provide food, arable land, tourist destinations and coastline protection for hundreds of millions of people worldwide. This project focuses on the effects of enhanced stratification, caused by ocean warming, on the growth of reef-building corals across the Caribbean and Bermuda. Enhanced stratification impacts primary productivity which generates food for corals. Initial data generated by the investigators suggest that Atlantic coral growth has declined in the last 5 decades in response to these changes. A laboratory-based experiment is designed to test this hypothesis. If verified, the projected decline in Atlantic primary productivity through the 21st century could potentially rival and will certainly exacerbate the effects of warming and ocean acidification on coral reef ecosystems across the North Atlantic. Support is provided for graduate research, and undergraduate participation is facilitated through the Woods Hole Oceanographic Institution Summer Fellowship and the Bermuda Institute of Ocean Sciences-Princeton Environmental Institute Summer Internship Programs. The results will be presented at national and international meetings and disseminated in a timely manner through peer-reviewed publications. All data produced through this program will be archived in the Biological and Chemical Oceanographic Data Management Office.

Anthropogenic climate change has emerged as a principle threat to coral reef survival in the 21st century. In addition to ocean warming and acidification, global climate models project enhanced stratification of the upper oceans through the 21st century and a consequent decline in productivity, by up to 50%, in the North Atlantic. This project employs controlled laboratory manipulation experiments to test the link between productivity and growth of the dominant reef-building corals across the Caribbean and Bermuda. Preliminary data generated by the investigators, including multi-decade long coral growth histories and nitrogen isotope ratios of coral tissue and skeleton, suggest that coral growth across the region has declined over the past 50 years in response to productivity changes already underway. If the link between ocean circulation, productivity decline, and coral growth is verified, the projected 21st century decline in productivity could rival and will certainly exacerbate the effects of warming and ocean acidification on North Atlantic coral reef ecosystems.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1537338

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