pH measured in situ over depth in the kelp forest (36° 37.3′ N, 121° 54.1′ W) recorded in July 2018.

Website: https://www.bco-dmo.org/dataset/826162
Data Type: Other Field Results
Version: 1
Version Date: 2020-10-07

Project
» Collaborative Research: RUI: Building a mechanistic understanding of water column chemistry alteration by kelp forests: emerging contributions of foundation species (Kelp forest biogeochemistry)

Contributors	Affiliation	Role
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Abstract
pH measured in situ over depth in the kelp forest (36° 37.3′ N, 121° 54.1′ W) recorded in July 2018.

Table of Contents

Coverage

Spatial Extent: **Lat**:36.62167 **Lon**:-121.90167
Temporal Extent: 2018-07-11 - 2018-07-20

Dataset Description

These data are published in Hirsh *et al.,* see related publications section.

Acquisition Description

Continuous flow pumping experiments were conducted inside the kelp forest from a vessel within 15-m of the kelp mooring to obtain high temporal and vertical resolution biogeochemical data. Two experiments were conducted (July 11-13 and July 18-20, 2018) that overlapped with the kelp mooring pH timeseries data.

Seawater was pumped from five depths spanning the water column using five sections of equal-length polypropylene tubing (3/8” ID, 1/2” OD) deployed over the side of a moored vessel. The depths presented here include the surface (valve #5), 6 mab (2-5 mbs, valve #3), and 1 mab (7-10 mbs, valve #1). A custom auto sampling manifold introduced water from each of the 5 tubes to a continuous flow system at 5-minute intervals, allowing the full suite of depths to be sampled every 25 minutes for the duration of each experiment (similar to Koweek et al., 2015a; Koweek et al., 2015b; Teneva et al., 2013). Seawater was drawn into the continuous flow system from each depth by a peristaltic pump operating at 2L/min. The continuous flow system included a DuraFET pH sensor measuring pH at 20 samples per min .

Processing Description

pH samples were drawn from whichever depth was being actively pumped. The pump delivered seawater to the pH electrode. The pH data was later matched to the appropriate depth using the measurement timestamps. Data processing was completed in Matlab.

BCO-DMO processing notes:

- Converted Timestap to ISO format, and timezone from Pacific Standard Time (PST) to UTC

[table of contents | back to top]

Related Publications

Hirsh, H., Nickols, K., Takeshita, Y., Traiger, S., Monismith, S. G., Mucciarone, D. A., & Dunbar, R. B. Drivers of biogeochemical variability in a central California kelp forest and implications for local amelioration of ocean acidification. Journal of Geophysical Research: Oceans.
Results

Koweek, D. A., Dunbar, R. B., Monismith, S. G., Mucciarone, D. A., Woodson, C. B., & Samuel, L. (2015). High-resolution physical and biogeochemical variability from a shallow back reef on Ofu, American Samoa: an end-member perspective. Coral Reefs, 34(3), 979–991. doi:10.1007/s00338-015-1308-9
Methods

Koweek, D., Dunbar, R. B., Rogers, J. S., Williams, G. J., Price, N., Mucciarone, D., & Teneva, L. (2014). Environmental and ecological controls of coral community metabolism on Palmyra Atoll. Coral Reefs, 34(1), 339–351. doi:10.1007/s00338-014-1217-3
Methods

Teneva, L., Dunbar, R. B., Mucciarone, D. A., Dunckley, J. F., & Koseff, J. R. (2013). High-resolution carbon budgets on a Palau back-reef modulated by interactions between hydrodynamics and reef metabolism. Limnology and Oceanography, 58(5), 1851–1870. doi:10.4319/lo.2013.58.5.1851
Methods

[table of contents | back to top]

Related Datasets

IsSupplementTo

Hirsh, H., Nickols, K. J., Takeshita, Y., Traiger, S., Monismith, S. G., Mucciarone, D., Dunbar, R. B. (2020) **Dissolved Inorganic Carbon measured in situ over depth in the kelp forest (36° 37.3' N, 121° 54.1' W) recorded in July 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2020-10-07 http://lod.bco-dmo.org/id/dataset/826200 [view at BCO-DMO]

[table of contents | back to top]

Parameters

Parameter	Description	Units
Timestamp_pH	local date and time, PST	unitless
pH_1mab	pH measured 1 meter above the bottom	unitless
pH_6mab	pH measured 6 meters above the bottom	unitless
pH_surface	pH measured at the surface	unitless
ISO_DateTime_UTC	Sampling date and time in ISO format (yyyy-mm-ddThh:mm:ssZ) in UTC (coordinated Universal Time)	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	DuraFET pH sensor
Generic Instrument Name	pH Sensor
Dataset-specific Description	DuraFET pH sensor
Generic Instrument Description	General term for an instrument that measures the pH or how acidic or basic a solution is.

[table of contents | back to top]

Deployments

KELP

Website	https://www.bco-dmo.org/deployment/826373
Platform	Mooring - Hopkins Marine Stations
Start Date	2018-06-08
End Date	2018-10-04
Description	This deployment represents the mooring itself and data that has been acquired at this site or in close proximity of it, and are considered samples "inside a kelp forest": ADCP data:

[table of contents | back to top]

Project Information

Collaborative Research: RUI: Building a mechanistic understanding of water column chemistry alteration by kelp forests: emerging contributions of foundation species (Kelp forest biogeochemistry)

Coverage: Central California 36.6 N 122 W

NSF abstract: Kelp forest ecosystems are of ecological and economic importance globally and provide habitat for a diversity of fish, invertebrates, and other algal species. In addition, they may also modify the chemistry of surrounding waters. Uptake of carbon dioxide (CO2) by giant kelp, Macrocystis pyrifera, may play a role in ameliorating the effects of increasing ocean acidity on nearshore marine communities driven by rising atmospheric CO2. Predicting the capacity for kelp forests to alter seawater chemistry requires understanding of the oceanographic and biological mechanisms that drive variability in seawater chemistry. The project will identify specific conditions that could lead to decreases in seawater CO2 by studying 4 sites within the southern Monterey Bay in Central California. An interdisciplinary team will examine variations in ocean chemistry in the context of the oceanographic and ecological characteristics of kelp forest habitats. This project will support an early career researcher, as well as train and support a postdoctoral researcher, PhD student, thesis master's student, and up to six undergraduate students. The PIs will actively recruit students from underrepresented groups to participate in this project through Stanford University's Summer Research in Geosciences and Engineering (SURGE) program and the Society for Advancement of Hispanics/Chicanos and Native Americans in Science (SACNAS). In addition, the PIs and students will actively engage with the management community (Monterey Bay National Marine Sanctuary and California Department of Fish and Wildlife) to advance products based on project data that will assist the development of management strategies for kelp forest habitats in a changing ocean. This project builds upon an extensive preliminary data set and will link kelp forest community attributes and hydrodynamic properties to kelp forest biogeochemistry (including the carbon system and dissolved oxygen) to understand mechanistically how giant kelp modifies surrounding waters and affects water chemistry using unique high-resolution measurement capabilities that have provided important insights in coral reef biogeochemistry. The project sites are characterized by different oceanographic settings and kelp forest characteristics that will allow examination of relationships between kelp forest inhabitants and water column chemistry. Continuous measurements of water column velocity, temperature, dissolved oxygen, pH, and photosynthetically active radiation will be augmented by twice-weekly measurements of dissolved inorganic carbon, total alkalinity, and nutrients as well as periods of high frequency sampling of all carbonate system parameters. Quantifying vertical gradients in carbonate system chemistry within kelp forests will lead to understanding of its dependence on seawater residence time and water column stratification. Additional biological sampling of kelp, benthic communities, and phytoplankton will be used to 1) determine contributions of understory algae and calcifying species to bottom water chemistry, 2) determine contributions of kelp canopy growth and phytoplankton to surface water chemistry and 3) quantify the spatial extent of surface chemistry alteration by kelp forests. The physical, biological, and chemical data collected across multiple forests will allow development of a statistical model for predictions of kelp forest carbonate system chemistry alteration in different locations and under future climate scenarios. Threshold values of oceanographic conditions and kelp forest characteristics that lead to alteration of water column chemistry will be identified for use by managers in mitigation strategies such as targeted protection or restoration.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1737096
NSF Division of Ocean Sciences (NSF OCE)	OCE-1737176

[table of contents | back to top]