CTD casts paired with bi-weekly water sampling events at instrument mooring sites near the Monterey Peninsula, California, USA from June to August 2018 and 2019

Website: https://www.bco-dmo.org/dataset/863637
Data Type: Other Field Results
Version: 1
Version Date: 2021-10-19

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
Nickols, Kerry J.	California State University Northridge (CSUN)	Principal Investigator
Dunbar, Robert B.	Stanford University	Co-Principal Investigator
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
These data were obtained from CTD casts paired with bi-weekly water sampling events at instrument mooring sites near the Monterey Peninsula, California, USA. Data were collected from June to August in 2018 and 2019.

Table of Contents

Coverage

Spatial Extent: **N**:36.63088 **E**:-121.897 **S**:36.61795 **W**:-121.9188
Temporal Extent: 2018-06-12 - 2019-08-02

Methods & Sampling

Sampling Locations:
Sampling was conducted near the Monterey Peninsula near Pacific Grove and Monterey, California, USA. Kelp sites ranged from 8.8 to 10.3 meters deep and offshore sites ranged from 13.1 to 16.5 m deep.

Instrument moorings were deployed in 2018 in the following areas: a wave-protected kelp forest, ~100 meters offshore of the protected site, in a wave-exposed site devoid of kelp (historically has had kelp), and ~100 meters offshore of the exposed site.

Instrument moorings were deployed in 2019 in the following areas: a wave-protected kelp forest, ~175 meters offshore of the protected site, in a wave-exposed kelp site, and ~180 meters offshore of the exposed site.

Methodology:
CTD (SeaBird Electronics 19Plus V2 SeaCAT) casts were made at instrument moorings bi-weekly accompanied by discrete water sample collections. The CTD was first suspended ~1 meter below the surface for approximately 3 minutes to allow instruments to equilibrate. After 3 minutes, the CTD was raised to just below

the surface and lowered to the seafloor at a rate of approximately 1 m/s. Once at the bottom, the CTD was pulled back up, pulled on the boat, and switched off. The CTD was thoroughly washed with fresh water after each day of use.

Data Processing Description

Data Processing:
Only the downcast data were used. Data have been binned by 0.5 meters.

BCO-DMO Processing:
- created date-time field in UTC;
- converted both date-time fields to ISO8601 format.

[table of contents | back to top]

Data Files

File
CTD.csv (Comma Separated Values (.csv), 660.32 KB) MD5:34cf5d943cbdbdf2ad96c4ea9bf2b06d Primary data file for dataset ID 863637

[table of contents | back to top]

Parameters

Parameter	Description	Units
site	Site code: PK = Protected kelp 2018, PO = Protected offshore 2018, EK = Exposed kelp 2018, EO = Exposed offshore 2018, MK = Protected kelp 2019, MO = Protected offshore 2019, OK = exposed kelp 2019, OO = Exposed offshore 2019.	unitless
cast_time_PST	Cast time (PST) in ISO8601 format: YYYY-MM-DDThh:mm:ss	unitless
cast_time_UTC	Cast time (UTC) in ISO8601 format: YYYY-MM-DDThh:mm:ssZ	unitless
time_zone	Indicates the local time zone (PST)	unitless
depth_0_tide	Depth of the site at at 0 tide	meters (m)
latitude	Latitude	decimal degrees North

longitude	Longitude	decimal degrees West
location	Indicates if the location is Kelp or Offshore	unitless
timeJ	Time in Julian days	Julian days
timeH	Time elapsed in hours	hours
timeM	Time elapsed in minutes	minutes
timeS	Time elapsed in seconds	seconds
scan	Scan count	unitless
depth	Depth (salt water)	meters
pressure	Pressure	decibars
temperature	Temperature	degrees Celsius
conductivity	Conductivity	Siemens per meter (S/m)
salinity	Practical salinity	practical salinity units (PSU)
density	Density	kilograms per cubic meter (kg/m^3)
oxygen	Oxygen in mg/L	milligrams per liter (mg/L)
oxygen2	Oxygen in umol/kg	micromoles per kilogram (umol/kg)
fluorescence	Fluorescence	milligrams per cubic meter (mg/m^3)
par_sat_log	Par/Logarithmic	unitless
turbidity	Turbidity	Nephelometric Turbidity unit (NTU)
depth2	Depth (salt water)	meters (m)

density2	Density	?
salinity2	Salinity	practical salinity units (PSU)
flag	Inidicates issues with data: 0 = no issue, 1 = issue	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	SeaBird Electronics 19Plus V2 SeaCAT
Generic Instrument Name	CTD Sea-Bird SBE SEACAT 19plus
Dataset-specific Description	Sensors: Temperature calibrated 14 Jan 2018, Conductivity calibrated 14 Jan 2018, Pressure calibrated 2 Jan 2018, Oxygen calibrated 18 Jan 2018, PAR log calibrated 30 Nov 2017, Fluorometer calibrated 26 December 2017, Turbidity calibrated 26 December 2017.
Generic Instrument Description	Self contained self powered CTD profiler. Measures conductivity, temperature and pressure in both profiling (samples at 4 scans/sec) and moored (sample rates of once every 5 seconds to once every 9 hours) mode. Available in plastic or titanium housing with depth ranges of 600m and 7000m respectively. Minature submersible pump provides water to conductivity cell.

[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 Award 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]