All 7Be data pertaining to upwelling velocity calculations from R/V Yellowfin cruises to the San Pedro Ocean Time-series (SPOT) in 2013 and 2014

Website: https://www.bco-dmo.org/dataset/685147
Data Type: Other Field Results
Version: 08 March 2017
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Project
» Collaborative Research: Use of Triple Oxygen Isotopes and O2/Ar to constrain Net/Gross Oxygen Production during upwelling and non-upwelling periods in a Coastal Setting (UpRISEE O2 upwelling)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **Lat**:33.55 **Lon**:-118.4
Temporal Extent: 2013-01-16 - 2014-06-19

Dataset Description

All 7Be data pertaining to upwelling velocity calculations. Measurements were made at the San Pedro Ocean Time-series (SPOT) station (33 33'N, 118 24'W). Data are also published in Table B1 in the following publication: Haskell, W. Z., et al. 2016. An organic carbon budget for coastal Southern California determined by estimates of vertical nutrient flux, net community production and export. Deep-Sea Research I, 116, 49-76. doi:10.1016/j.dsr.2016.07.003

Methods & Sampling

See complete methodology in Haskell et al. (2016). In summary:
This study is part of an effort aimed at characterizing the biological response to upwelling at SPOT on 21 cruises between January 2013 and June 2014; the Upwelling Regime In-Situ Ecosystem Efficiency (Up.R.I.S.E.E.) study.

Beryllium-7: All methods used in measuring the activity of 7Be and calculating the upwelling velocities

presented here are described in Haskell et al. (2015), with three notable exceptions:
1) Due to the continued drought in Southern California, the wet depositional flux of 7Be approached zero toward the end of the 2014 sampling season. Following the logic that the reloading of 7Be associated with aerosols in the atmosphere following each rain event is a function of time between rainfall events (eq. 3c in Haskell et al. (2015)), we increased the maximum reloading rate (rmax) in this equation from 120 to 140 dpm m-2 d-1 for the late May and June 2014 sampling intervals (The wet input flux during this period was ~4% of wet input during this same period in 2013).
2) For October 2013, the upper limit on the measured concentration of 7Be is used in the calculation of upwelling velocity since the measured concentration was 0 +/- 12 dpm m-3.
3) All rainfall rates used in the wet input flux calculation are mean regional rates using the same stations as described in Haskell et al., (2015) with the exception of December 2013, when only one station (Oceanside, CA) was used. The surface currents were dominated by flow from the south prior to the sampling date, according to the JPL Regional Ocean Model (ROMS) output (NASA, 2013). Just as in Haskell et al., (2015), the wet input flux was calculated using the activity measured closest to each rainfall event, until the second half of the spring season (Up18–21) when the seasonal mean was used since there were no measurements of 7Be activity in rain during this period.

Data Processing Description

BCO-DMO Processing:
-modified parameter names to conform with BCO-DMO naming conventions;
-formatted date to yyyy-mm-dd;
-replaced "-" and blanks (missing data) with "nd";
-added site name, lat, and lon from information on metadata form.

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Data Files

File
Be7.csv (Comma Separated Values (.csv), 2.71 KB) MD5:55d1c875459dc29912007293ee566e91 Primary data file for dataset ID 685147

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Related Publications

Haskell, W. Z., Hammond, D. E., & Prokopenko, M. G. (2015). A dual-tracer approach to estimate upwelling velocity in coastal Southern California. Earth and Planetary Science Letters, 422, 138–149. doi:10.1016/j.epsl.2015.04.015
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Haskell, W. Z., Prokopenko, M. G., Hammond, D. E., Stanley, R. H. R., Berelson, W. M., Baronas, J. J., … Aluwihare, L. (2016). An organic carbon budget for coastal Southern California determined by estimates of vertical nutrient flux, net community production and export. Deep Sea Research Part I: Oceanographic Research Papers, 116, 49–76. doi:10.1016/j.dsr.2016.07.003
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NASA, 2013. OurOcean Portal. Jet Propulsion Laboratory Regional Ocean Modeling System (ROMS) Group. Web. http://ourocean.jpl.nasa.gov/CA/
Methods

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Parameters

Parameter	Description	Units
site	Name of the site	unitless
lat	Latitude of the site	decimal degrees
lon	Longitude of the site	decimal degrees
cruise_id	Cruise identifier	unitless
date	Date of sampling formatted as yyyy-mm-dd	unitless
MLD	Mixed layer depth; Oxygen mixed layer depths were determined as the depth at which the oxygen concentration was 0.5% different from the surface concentration.	meters (m)
Be_ML	Beryllium-7 concentration in the mixed layer (ML)	disintegrations per minute per liter (dpm L-1)
Be_ML_sd	Standard deviation of Be-7 concentration in the ML	disintegrations per minute per liter (dpm L-1)
Be_ML_yield	Recovery yield for the 7Be measurement in the ML	unitless
Be_BML	Beryllium-7 concentration below the mixed layer (BML)	disintegrations per minute per liter (dpm L-1)
Be_BML_sd	Standard deviation of Be-7 concentration in the BML	disintegrations per minute per liter (dpm L-1)
Be_BML_yield	Recovery yield for the 7Be measurement in the BML	unitless
depth_attenutation	Depth attenuation coefficient fit to the 7Be profile.	inverse meters (m-1)
Be7_inv	Inventory of 7Be in the water column.	disintegrations per minute per square meter (dpm m-2)
Be7_inv_sd	Reported here as one standard deviation lower than the best estimate. Some values have asymetric uncertainty with one standard deviation being much larger on the upper end.	disintegrations per minute per square meter (dpm m-2)
year	4-digit year	unitless
month	2-digit month	unitless
day	2-digit day	unitless
yrday	Year day (sequential day of year, eg. Jan 1 = 1)	unitless

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Instruments

Dataset-specific Instrument Name	centrifuge
Generic Instrument Name	Centrifuge
Generic Instrument Description	A machine with a rapidly rotating container that applies centrifugal force to its contents, typically to separate fluids of different densities (e.g., cream from milk) or liquids from solids.

Dataset-specific Instrument Name	Seabird CTD
Generic Instrument Name	CTD Sea-Bird
Generic Instrument Description	Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics, no specific unit identified. This instrument designation is used when specific make and model are not known. See also other SeaBird instruments listed under CTD. More information from Sea-Bird Electronics.

Dataset-specific Instrument Name	Ortec low background gamma detector
Generic Instrument Name	Gamma Ray Spectrometer
Generic Instrument Description	Instruments measuring the relative levels of electromagnetic radiation of different wavelengths in the gamma-ray waveband.

Dataset-specific Instrument Name	Niskin bottle
Generic Instrument Name	Niskin bottle
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

Dataset-specific Instrument Name	Microwave Plasma Optical Emission Spectrometer (MP-OES)
Generic Instrument Name	Spectrometer
Generic Instrument Description	A spectrometer is an optical instrument used to measure properties of light over a specific portion of the electromagnetic spectrum.

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Deployments

UpRISEE_SPOT_13-14

Website	https://www.bco-dmo.org/deployment/684011
Platform	R/V Yellowfin
Start Date	2013-01-16
End Date	2014-06-19
Description	A series of cruises were conducted from January 2013 to June 2014 to the San Pedro Ocean Time-Series (SPOT) station. These cruises were part of a study aimed at characterizing the biological response to upwelling at SPOT: the Upwelling Regime In-Situ Ecosystem Efficiency (Up.R.I.S.E.E.) study.

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Project Information

Collaborative Research: Use of Triple Oxygen Isotopes and O2/Ar to constrain Net/Gross Oxygen Production during upwelling and non-upwelling periods in a Coastal Setting (UpRISEE O2 upwelling)

Coverage: Northeast Pacific Ocean

The marine biological pump is one of the primary pathways via which anthropogenic carbon dioxide may be sequestered from the atmosphere and exported to the deep ocean as organic carbon. While the link between nutrient supply and high primary productivity in upwelling regions is well established, factors controlling the organic carbon export efficiency of upwelling ecosystems are not well known. Scientists from the University of Southern California and Pomona College plan to determine the factors that control the rates and magnitudes of two components of biological production, Net Community Production (NCP) and Gross Primary Production (GPP), as well as particulate organic carbon export efficiency, at the San Pedro Ocean Time Series, a coastal site in the California Borderland during periods of minimal and high upwelling velocity over a 2-year span. At this site, past and ongoing observations of hydrography and carbon rain will provide an historical context for interpreting results and mechanisms at work.

Rates of NCP and GPP will be quantified at different upwelling intensity, using dissolved oxygen to argon (O2/Ar) ratios and the oxygen triple isotope composition of dissolved oxygen (O2). The export of organic carbon will be established using 234Th (thorium) profiles in the water column, coupled with floating sediment trap deployments, and the development of a carbon isotope balance for the water column. Upwelling will be characterized using non-steady state budgets for atmospheric 7Be (beryllium) input and its depth-integrated decay, as well as estimating rates based on remote measurements of wind stress curl and budgets for dissolved inorganic carbon and silicon. Application of the O2/Ar ratio and the oxygen triple isotope approach will require depth-integrated profiles of these tracers to evaluate the impact of upwelling on mixed layer inputs and use of non-steady state models during seasonal transitions in upwelling. The comprehensive data set to be obtained should provide insights into the organic carbon export efficiency under variable upwelling regimes and help to relate the satellite-based measurements of chlorophyll to the organic carbon export of these highly productive ecosystems.

Broader Impacts: One graduate and one undergraduate student from the University of Southern California and two undergraduate students from Pomona College would be supported and trained as part of this project.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1260296
NSF Division of Ocean Sciences (NSF OCE)	OCE-1260692

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