Current velocities from an Acoustic Doppler Current Profiler (ADCP) deployed along a 30m depth contour at Mission Beach, CA in June of 2016

Website: https://www.bco-dmo.org/dataset/742132
Data Type: Other Field Results
Version: 1
Version Date: 2018-07-24

Project
» Quantifying plankton dynamics in the internal tide using swarms of buoyancy-controlled robots (QuIPP)

Contributors	Affiliation	Role
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Abstract
Current velocities from an Acoustic Doppler Current Profiler (ADCP) deployed along a 30m depth contour at Mission Beach, CA in June of 2016.

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Coverage

Spatial Extent: **Lat**:32.7701 **Lon**:-117.2818
Temporal Extent: 2016-06-13 - 2016-06-28

Dataset Description

Current velocities from an Acoustic Doppler Current Profiler (ADCP) deployed along a 30m depth contour at Mission Beach, CA in June of 2016.

Related Datasets (Jun 2016, Mission Beach, CA)

* WireWalker https://www.bco-dmo.org/dataset/742124
* Thermistor chain https://www.bco-dmo.org/dataset/742137

Methods & Sampling

A Sentinel V ADCP was deployed on 30-m depth contour off Mission Beach, CA near a thermistor chain and in line with Internal Waves on the Continental Margin (IWAVES) stations. For more information about IWAVES stations see Lerczark, 2001.

Data Processing Description

Data were converted to Earth coordinates and despiked, but otherwise presented as collected.

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Data Files

File
QuIPP2016_ADCP_netcdf.zip (ZIP Archive (ZIP), 3.96 GB) MD5:7172c97b81ccde844e71572ee553255a Four netcdf ADCP files with the following dimensions and parameters dimensions: z = 94 ; time = 578397 ; variables: double u(time, z) ; u:units = "m/s" ; u:comment = "East/West velocities" ; double v(time, z) ; v:units = "m/s" ; v:comment = "North/South velocities" ; double w(time, z) ; w:units = "m/s" ; w:comment = "vertical velocities, from beam 5" ; double P(time) ; P:units = "dbar" ; double dnum(time) ; dnum:comment = "Matlab timestamp" ; double unixtime(time) ; unixtime:comment = "Unix timestamp, obtained using RSKtools datenum2unixtime(), timestep should be 0.5 s but varies between 0 and 1. Use start time and add 0.5 s if needed." ; double depths(z) ; depths:units = "m" ; depths:comment = "vertical positive down" ; double z(z) ; z:units = "m" ; z:comment = "vertical positive up, above bottom" ;

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Related Publications

Lerczak, J. A., Hendershott, M. C., & Winant, C. D. (2001). Observations and modeling of coastal internal waves driven by a diurnal sea breeze. Journal of Geophysical Research: Oceans, 106(C9), 19715–19729. doi:10.1029/2001jc000811 https://doi.org/10.1029/2001JC000811
Related Research

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Parameters

Parameters for this dataset have not yet been identified

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Instruments

Dataset-specific Instrument Name	Sentinel V ADCP
Generic Instrument Name	Acoustic Doppler Current Profiler
Generic Instrument Description	The ADCP measures water currents with sound, using a principle of sound waves called the Doppler effect. A sound wave has a higher frequency, or pitch, when it moves to you than when it moves away. You hear the Doppler effect in action when a car speeds past with a characteristic building of sound that fades when the car passes. The ADCP works by transmitting "pings" of sound at a constant frequency into the water. (The pings are so highly pitched that humans and even dolphins can't hear them.) As the sound waves travel, they ricochet off particles suspended in the moving water, and reflect back to the instrument. Due to the Doppler effect, sound waves bounced back from a particle moving away from the profiler have a slightly lowered frequency when they return. Particles moving toward the instrument send back higher frequency waves. The difference in frequency between the waves the profiler sends out and the waves it receives is called the Doppler shift. The instrument uses this shift to calculate how fast the particle and the water around it are moving. Sound waves that hit particles far from the profiler take longer to come back than waves that strike close by. By measuring the time it takes for the waves to bounce back and the Doppler shift, the profiler can measure current speed at many different depths with each series of pings. (More from WHOI instruments listing).

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Deployments

QuIPP_2016

Website	https://www.bco-dmo.org/deployment/742542
Platform	shoreside Calif_shore
Start Date	2016-06-10
End Date	2016-06-28
Description	ADCP, T-chain, WireWalker deployments.

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Project Information

Quantifying plankton dynamics in the internal tide using swarms of buoyancy-controlled robots (QuIPP)

Coastal waters are among the most heavily used and threatened systems on the planet. Successful prediction and management of coastal resources can only come from a deep understanding of the dynamics of the species in these regions. Fluctuations of coastal invertebrate and vertebrate populations are often driven by the supply of planktonic larvae to the adult habitat by ocean currents. Numerous studies have associated the cross-shelf transport of plankton - including the larvae of economically valuable species - with the internal tide: a wave in the ocean's interior that oscillates at the tidal frequency. Though the interactions of plankton with internal waves have been studied for decades, it has not been possible to track individual plankton underwater. Thus, the dynamics underlying the cross-shelf transport of plankton in internal waves and internal tides remain conjectural. This project will use undersea swarms of novel, autonomous plankton-mimicking drifting robots to quantify, in situ, the cross-shore transport of plankton driven by high-frequency internal waves and the internal tide. This research will significantly enhance our understanding of the distributions, settling patterns, and population connectivity of coastal species. One PhD student will be supported and educational outreach in collaboration with the Ocean Discovery Program in San Diego will support curricula creation, after-school programs, and teacher development.

These researchers have recently gained the capability to deploy swarms of plankton-mimicking, autonomous, drifting robots in the ocean. These robots, Autonomous Underwater Explorers (AUEs), are 1.5-liter cylinders with temperature and pressure sensors, a hydrophone, and a piston that regulates buoyancy. Subsurface three-dimensional localization is accomplished through an acoustic long-baseline navigation system. The three-dimensional position of each AUE is obtained every 12 seconds with ~1 m horizontal and <1 cm vertical accuracy with a range of ~5 km. This high spatial and temporal resolution represents a major advance over traditional neutrally buoyant floats. Swarms of 20 AUEs will be programmed with either depth-keeping or isotherm-following behaviors, and deployed in the internal tide on the shelf to quantify their transport, accumulation, and vertical movement over a tidal cycle. The swarms will move through a mooring array consisting of a vertically profiling Wirewalker, a thermistor chain, and two bottom-mounted Acoustic Doppler Current Profilers. Data from these deployments will be combined with process studies using a numerical model to test long-standing hypotheses concerning the effects of plankton behavior on transport and accumulation in internal waves and the internal tide. This research will increase the operational capacity of AUEs, advancing the state of the art in studying cross-shelf transport due to internal waves, and lead to new insights into the physical and biological interactions controlling larval transport across the shelf.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1459393

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