Temperature from a thermistor chain deployed along a 30m depth contour at Mission Beach, CA in June of 2016

Website: https://www.bco-dmo.org/dataset/742137
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)

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Abstract
Temperature from a thermistor chain deployed along a 30m depth contour at Mission Beach, CA in June of 2016.

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Coverage

Spatial Extent: **Lat**:32.7688 **Lon**:-117.2819
Temporal Extent: 2016-06-10 - 2016-06-27

Dataset Description

Temperature from a thermistor chain deployed along a 30m depth contour at Mission Beach, CA in June of 2016. Water temperatures are measured values at each instrument height, interpolated on a common time grid.

The default data format served through the BCO-DMO data system is tabular. These data are available to download as matrices in NetCDF (.nc) and Matlab (.mat) files in the "Data Files" section of this page.

Related Datasets (Jun 2016, Mission Beach, CA)

* WireWalker https://www.bco-dmo.org/dataset/742124
* ADCP https://www.bco-dmo.org/dataset/742132

Methods & Sampling

A vertical array of thermistors was deployed on the 30-m depth contour off Mission Beach, CA in line with Internal Waves on the Continental Margin (IWAVES) stations. For more information about IWAVES stations see Lerczark, 2001. Thermistors were spaced 1-m apart in the vertical. One thermistor was added at the surface. See Tchain30_MooringSchematic.pdf for a diagram of the thermistor configuration and serial numbers. Depth values in this schematic are the target deployment depths and vary from the measured values due to tidal fluctuations.

Data Processing Description

RBRsolo s/n 10174 and 10178, and SBE56 s/n 00345 were either lost from entanglement with fishing boat or did not record data. Unix timestamp derived using RSKtool datenum2unixtime(), time steps should be 1 s, but varies between 0, 1, and 2 s. Use start time and add 1 s if needed.

BCO-DMO Data Manager Processing Notes:

* added a conventional header with dataset name, PI name, version date

* modified parameter names to conform with BCO-DMO naming conventions

* blank values in this dataset are displayed as "nd" for "no data." nd is the default missing data identifier in the BCO-DMO system.

* created tabular version of data by converting Matlab struct to a Matlab Table type then exported as csv.

* rounded matlab double values to three decimal places before writing to csv.

* On the first day (2018-06-13) records are ommitted in the tabular version of the data. All values (except depth &time) were NaN values.

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Data Files

File	
QuIPP2016_Tchain_30m.mat	(MATLAB Data (.mat), 798.94 MB) MD5:ffde6c4af0e68cbf975cd89594474b66

Time-interpolated water temperature values. Includes calibration coefficients and other sensor metadata.

The .mat file containts the matlab struct:

>> RawData =

SN101173: [1×1 struct]

SN101174: NaN

SN101175: [1×1 struct]

SN101176: [1×1 struct]

SN101177: [1×1 struct]

SN101178: NaN

File

SN101179: [1×1 struct]

SN101180: [1×1 struct]

SN101181: [1×1 struct]

SN101182: [1×1 struct]

SN101183: [1×1 struct]

SN101184: [1×1 struct]

SN101185: [1×1 struct]

SN51004: [1×1 struct]

SN101186: [1×1 struct]

SN101187: [1×1 struct]

SN101188: [1×1 struct]

SN101189: [1×1 struct]

SN101190: [1×1 struct]

SN101191: [1×1 struct]

SN101192: [1×1 struct]

SN101193: [1×1 struct]

SN101194: [1×1 struct]

SN101195: [1×1 struct]

SN101196: [1×1 struct]

SN101197: [1×1 struct]

SN916: [1×1 struct]

SN: [27×1 double]

SNsurf: 916

mabove: [1×27 double]

info: {4×1 cell}

RawData.info

4×1 cell array

{'SN 101XX are RBRsolos' }

{'SN 51004 is RBRduo' }

{'SN 916 is SBE56 at surface float' }

{'.mabove is meter above bottom for respective .SN'}

File

```
% Each SN of tchain has a struct

>> RawData.SN101177


ans =


  struct with fields:


              dbInfo: [1×1 struct]
        calibrations: [1×1 struct]
            datasets: [1×1 struct]
   datasetDeployments: [1×1 struct]
         instruments: [1×1 struct]
   instrumentChannels: [1×1 struct]
    instrumentSensors: []
            channels: [1×1 struct]
              epochs: [1×1 struct]
           schedules: [1×1 struct]
         appSettings: [1×1 struct]
         deployments: [1×1 struct]
       thumbnailData: [1×1 struct]
                data: [1×1 struct]


data has two vars tstamp and values

RawData.SN101177.data.tstamp - matlab datenum

>> RawData.SN101177.data.values(1:3,:)


ans =


   1.0000   22.6759

   1.0000   22.6559

   1.0000   22.6353


>> RawData.SN101177.datasets


ans =
```

File

struct with fields:

datasetID: 1

name: 'QuIPP_T30_RBRsolo_101177_20160629_0242.rsk'

File

QuIPP2016_Tchain_30m.nc

(NetCDF, 348.09 MB)
MD5:68c9fdaeb48bd6f24bbbeae12afe7adf

Time-interpolated water temperature values.

Includes calibration coefficients and other sensor metadata.

dimensions:

z = 27 ;

time = 1471740 ;

single_value = 1 ;

variables:

double T(time, z) ;

T:units = "degrees Celsius" ;

double P(time) ;

P:units = "dbar" ;

P:comment = "pressure recorded by RBRduo SN51004" ;

double H(time) ;

H:units = "m" ;

H:comment = "surface height reconstructed from RBRduo height above bottom and pressure recorded" ;

double dnum(time) ;

dnum:comment = "Matlab timestamp" ;

double unixtime(time) ;

unixtime:comment = "Unix timestamp, obtained using RSKtools datenum2unixtime(), timestep should be 1 s but varies between 0, 1 and 2. Use start time and add 1 s if needed." ;

double z(z) ;

z:units = "m" ;

z:comment = "vertical positive up, above bottom; instrument height, matches SN field" ;

double SN(z) ;

SN:comment = "serial numbers of temperature loggers on line; matches z field" ;

double SNsurf(single_value) ;

SNsurf:comment = "serial number of temperature logger at surface" ;

tchain.csv

(Comma Separated Values (.csv), 265.27 MB)
MD5:ad267c2d5c215cd3e37786736aa056e8

Primary data file for dataset ID 742137

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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

Parameter	Description	Units
ISO_DateTime_UTC	Timestamp (UTC) in standard ISO 8601:2004(E) format YYYY-mm-ddTHH:MM:SSZ	unitless
Surface_height	Sea surface height	meters (m)
T_surface	Water temperature from surface thermistor	degrees Celsius
T_27_25	Water temperature from the thermistor positioned 27.25m above the seabed	degrees Celsius
T_26_25	Water temperature from the thermistor positioned 26.25m above the seabed	degrees Celsius
T_25_25	Water temperature from the thermistor positioned 25.25m above the seabed	degrees Celsius
T_24_25	Water temperature from the thermistor positioned 24.25m above the seabed	degrees Celsius
T_23_25	Water temperature from the thermistor positioned 23.25m above the seabed	degrees Celsius
T_22_25	Water temperature from the thermistor positioned 22.25m above the seabed	degrees Celsius
T_21_25	Water temperature from the thermistor positioned 21.25m above the seabed	degrees Celsius
T_20_25	Water temperature from the thermistor positioned 20.25m above the seabed	degrees Celsius
T_19_25	Water temperature from the thermistor positioned 19.25m above the seabed	degrees Celsius
T_18_25	Water temperature from the thermistor positioned 18.25m above the seabed	degrees Celsius
T_17_25	Water temperature from the thermistor positioned 17.25m above the seabed	degrees Celsius
T_16_25	Water temperature from the thermistor positioned 16.25m above the seabed	degrees Celsius
T_15_25	Water temperature from the thermistor positioned 15.25m above the seabed	degrees Celsius
T_14_25	Water temperature from the thermistor positioned 14.25m above the seabed	degrees Celsius
T_13_25	Water temperature from the thermistor positioned 13.25m above the seabed	degrees Celsius
T_12_25	Water temperature from the thermistor positioned 12.25m above the seabed	degrees Celsius

T_11_25	Water temperature from the thermistor positioned 11.25m above the seabed	degrees Celsius
T_10_25	Water temperature from the thermistor positioned 10.25m above the seabed	degrees Celsius
T_9_25	Water temperature from the thermistor positioned 9.25m above the seabed	degrees Celsius
T_8_25	Water temperature from the thermistor positioned 8.25m above the seabed	degrees Celsius
T_7_25	Water temperature from the thermistor positioned 7.25m above the seabed	degrees Celsius
T_6_25	Water temperature from the thermistor positioned 6.25m above the seabed	degrees Celsius
T_5_25	Water temperature from the thermistor positioned 5.25m above the seabed	degrees Celsius
T_4_25	Water temperature from the thermistor positioned 4.25m above the seabed	degrees Celsius
T_3_25	Water temperature from the thermistor positioned 3.25m above the seabed	degrees Celsius
T_2_25	Water temperature from the thermistor positioned 2.25m above the seabed	degrees Celsius
T_1_25	Water temperature from the thermistor positioned 1.25m above the seabed	degrees Celsius

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Instruments

Dataset-specific Instrument Name	RBRsolo
Generic Instrument Name	Temperature Logger
Generic Instrument Description	Records temperature data over a period of time.

Dataset-specific Instrument Name	SBE56
Generic Instrument Name	Temperature Logger
Generic Instrument Description	Records temperature data over a period of time.

Dataset-specific Instrument Name	RBRduo
Generic Instrument Name	Temperature Logger
Dataset-specific Description	Conductivity and Temperature logger.
Generic Instrument Description	Records temperature data over a period of time.

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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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