# Velocity measurements from the turbulence generator taken with an Acoustic Doppler Velocimeter on the Friday Harbor dock and laboratory in 2012 (Jellyfish predation in turbulence project)

**Website**: https://www.bco-dmo.org/dataset/649971
**Data Type**: Other Field Results
**Version**:
**Version Date**: 2016-07-06

**Project**
» Influence of organism-scale turbulence on the predatory impacts of a suite of cnidarian medusae (jellyfish predation in turbulence)



| Contributors | Affiliation | Role |
|---|---|---|
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## Dataset Description

**Related Dataset:**
ADV_field

### Methods & Sampling

Current velocity measurements were taken from the collection site at the surface using a Vectrino Acoustic Doppler Velocimeter (ADV; Nortek, Oslo, Norway), at depth between 0.5 and 5 m using in situ PIV (Katija and Dabiri, 2008). The ADV measurements were collected at a sampling rate of 100 Hz over 1-5 min intervals.

### Data Processing Description

The TKE dissipation rate at the surface was calculated from the ADV-produced velocities in the horizontal, $x$, direction, $u$, following (Sanford, 1997) Epsilon(ADV)=$(u_{rms})3/Z_K$ where $Z$ is the total water column depth (14 m) and $\kappa$ is von Karman's constant (0.4).

**BCO-DMO Processing:**

- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO and BODC standards

- combined tank and field tables
- added site column
- reduced digits to right of decimal from 13 to 2
- changed 'betwn 2 and 18 ft. (0.6 and 5 m)' to '0.6-5m'

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## Data Files

| File |
|---|
| **tank_field_turb.csv** (Comma Separated Values (.csv), 530 bytes)<br>MD5:d51e15cec0cf9213c4471c438af83b80<br><br>Primary data file for dataset ID 649971 |

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| site | experimental setting: tank or field | unitless |
| location | location within tank or depth off dock | unitless |
| U_rms | root mean square of velocity | cm/sec |
| dissip_rate | dissipation rate of turbulence kinetic energy | m^2/s^3 |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | |
| **Generic Instrument Name** | Acoustic Doppler Velocimeter |
| **Dataset-specific Description** | ADV; Nortek, Oslo, Norway |
| **Generic Instrument Description** | ADV is the acronym for acoustic doppler velocimeter. The ADV is a remote-sensing, three-dimensional velocity sensor. Its operation is based on the Doppler shift effect. The sensor can be deployed either as a moored instrument or attached to a still structure near the seabed. Reference: G. Voulgaris and J. H. Trowbridge, 1998. Evaluation of the Acoustic Doppler Velocimeter (ADV) for Turbulence Measurements. J. Atmos. Oceanic Technol., 15, 272–289. doi: http://dx.doi.org/10.1175/1520-0426(1998)0152.0.CO;2 |

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## Deployments

**FHL_Sutherland**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/649916 |
| **Platform** | Friday_Harbor |
| **Start Date** | 2012-06-01 |
| **End Date** | 2016-06-30 |

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## Project Information

**Influence of organism-scale turbulence on the predatory impacts of a suite of cnidarian medusae (jellyfish predation in turbulence)**

**Coverage**: Friday Harbor Labs, WA

Bloom-forming jellyfish are increasing in number, frequency and magnitude, in part due to anthropogenic impacts, underscoring a need for enhanced understanding of trophic exchanges in jellyfish-dominated ecosystems. Interactions between jellyfish and their prey are driven by morphology, behavior, and unique fluid signatures that result in species-specific prey selection patterns. Fluid signatures generated by predators entrain prey, and motile prey organisms have evolved to sense and respond to these stereotyped fluid signatures. The shape and coherence of these unique fluid signatures are strongly mediated by turbulence, which is ubiquitous in the ocean. Yet, the effects of turbulence are almost always neglected in feeding studies. This three-year project will investigate the influence of turbulence on predator-prey interactions using a suite of cnidarian hydromedusae with unique morphologies, fluid signatures and prey selection patterns collected in the region of Friday Harbor Laboratory, WA.

This project seeks to establish a detailed, mechanistic understanding of the effects of turbulence on organism-scale predator-prey interactions using gelatinous zooplankton predators with contrasting predation modes. The PI will investigate prey selection under varying levels of turbulence by studying swimming behavior, wake structure, and predator-prey interactions in a laboratory turbulence generator designed for fragile plankton. The PI will also make in situ measurements of turbulence and observations of organism behavior using a Self-contained Underwater Velocimetry Apparatus (SCUVA). This is a fully submersible instrument for flow visualization, and its use will provide a cross-calibration of field and laboratory rates and behaviors. The influence of turbulence on trophic position among the different species of hydromedusae will be quantified through field studies of prey selection patterns. The proposed comparative approach using species with distinct predation modes will provide insights applicable to other planktonic predators that can be similarly grouped.

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## Funding

| Funding Source | Award |
|---|---|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1155084 |

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