Wind data from June to October 2012; recorded near the MBL Dock, Woods Hole, MA, USA (Mnemiopsis feeding in turbulence project)

Website: https://www.bco-dmo.org/dataset/554605
Version: 30 March 2015
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Project
» Turbulence and Suspension Feeding - a New Approach using the Lobate Ctenophore Mnemiopsis Leidyi (Mnemiopsis feeding in turbulence)

Contributors	Affiliation	Role
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Dataset Description

Wind data from June to October 2012; recorded near the MBL Dock, Woods Hole.

Reference:
Sutherland, K.R., Costello, J.H., Colin, S.P., and Dabiri, J.O. 2014. Ambient fluid motions influence swimming and feeding by the ctenophore *Mnemiopsis leidyi*. J. Plankton Res. 36(5): 1310–1322. doi:10.1093/plankt/fbu051

Methods & Sampling

Wind data originated from a local weather station located at the Woods Hole Oceanographic Institution (within 150 m of the sampling location); data source: wunderground.com

Methods and precision described in:
Sutherland, K.R., Costello, J.H., Colin, S.P., and Dabiri, J.O. 2014. Ambient fluid motions influence swimming and feeding by the ctenophore *Mnemiopsis leidyi*. J. Plankton Res. 36(5): 1310–1322. doi:10.1093/plankt/fbu051

Data Processing Description

BCO-DMO edits:
- Modified parameter names to conform with BCO-DMO naming conventions.
- Modified formatting of date and time.

- Separated date and time into separate columns.
- Replaced blanks with 'nd' to indicate 'no data'.
- Added lat and lon of the dock using values provided on the metadata form), and location name.

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Data Files

File
comparative_wind.csv (Comma Separated Values (.csv), 4.68 MB) MD5:601226d46508ea183fa444583363bd9f Primary data file for dataset ID 554605

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Parameters

Parameter	Description	Units
location	Description of sampling location.	text
lat_dock	Latitude of sampling location.	decimal degrees
lon_dock	Longitude of sampling location.	decimal degrees
date_local	Month, day, and year of sampling. (Local time zone, EST)	mm/dd/yyyy
month	2-digit month of year.	mm (01 to 31)
day	2-digit day of month.	dd (01 to 12)
year	4-digit year.	YYYY
time_local	Time (hours and minutes); 24-hour clock. (Local time zone, EST)	HHMM
temp_air	Air temperature.	degrees Fahrenheit (F)
dewpoint	Dewpoint temperature.	degrees Fahrenheit (F)
press_air	Air pressure.	inches (in)
wind_dir	Wind direction.	nominal/text

wind_dir_degrees	Wind direction.	degrees
wind_speed_mph	Wind speed in mph.	miles per hour (mph)
wind_speed_m	Wind speed in m/s.	meters per second (m/s)
two_hr_avg_wind_spd	Two-hour average wind speed in m/s.	meters per second (m/s)
wind_speed_gust_mph	Gusting wind speed = maximum wind speed during time interval.	miles per hour (mph)
humidity	Humidity.	percent (%)
ISO_DateTime_Local	Date and time formatted to ISO 8601 standard. This standard is based on ISO 8601:2004(E) and takes on any of the following forms: YYYY-mm-ddTHH:MM:SS[.xx] (local time) e.g.: 2009-08-30T09:05:00[.xx] (local time) 2009-08-30T14:05:00[.xx]Z (UTC time) 2009-08-30T14:05:00[.xx]-05:00 (local time with time zone).	YYYY-MM-DDTHH:MM:SS[.xx]

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Instruments

Dataset-specific Instrument Name	Weather Station
Generic Instrument Name	Automated Weather Station
Generic Instrument Description	Land-based AWS systems are designed to record meteorological information.

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Deployments

MBL_Dock_0812

Website	https://www.bco-dmo.org/deployment/554399
Platform	MBL
Start Date	2012-08-14
End Date	2012-08-14
Description	Field surface turbulence measurements made at the MBL dock, Woods Hole, MA, USA, August 14, 2012.

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Project Information

Turbulence and Suspension Feeding - a New Approach using the Lobate Ctenophore Mnemiopsis Leidyi (Mnemiopsis feeding in turbulence)

Coverage: Marine Biological Laboratory dock, Woods Hole, MA

Description from NSF award abstract:
Prey selection, intake and, ultimately, the trophic impact of predators are determined by a succession of events that occur at the organismal level -- individual interactions among predators prey, and their environments. Furthermore, because the majority of predator-prey interactions occur in moving fluids, it is critical to observe and quantify predator-prey interactions within a hydrodynamic context. Successful predictions of trophic patterns in natural settings are limited by the ability to: 1) observe directly the effects of turbulence on feeding in pelagic organisms; 2) understand the mechanistic bases of animal-fluid interactions in turbulent environments; and 3) relate quantitative observations from still-water laboratory studies to nature. These limitations are pervasive in studies of trophic exchange within the larger scope of marine ecology.

Recent technological advances, and the combined expertise of the Co-PIs, enables meaningful studies of the influence of turbulence on feeding by the notoriously invasive lobate ctenophore, *Mnemiopsis leidyi*. *Mnemiopsis* is a delicate gelatinous predator which uses a laminar feeding current to entrain and capture prey. Using a remarkably effective feeding strategy, zooplankton standing stocks and overall zooplankton biodiversity are reduced, and standing stocks of phytoplankton are increased via a trophic cascade. Like many suspension feeders, however, the feeding current produced by *Mnemiopsis* may be vulnerable to hydrodynamic disruption by ambient flows. In fact, turbulent events may change the behavior, distribution and prey selection of lobate ctenophores such as *Mnemiopsis*. This species is an ideal model organism to determine the mechanisms by which turbulence affects trophic exchange patterns of ecologically influential planktonic suspension feeders.

Involving a combination of laboratory and in situ methods to quantify, at the organismal level, this study will determine effects of turbulent flows on the feeding mechanics and predator-prey interactions of *Mnemiopsis*. Understanding how these turbulent effects translate to the community level will be accomplished via in situ sampling techniques that relate natural turbulence levels to ingestion rates, prey selection and predatory impact of *Mnemiopsis* in the field. This approach extends beyond current laboratory and modeling studies, with the potential of establishing clear cause-and-effect relationships.

This research will: 1) directly quantify turbulent effects on in situ predator-prey interactions; 2) provide mechanistic understanding of key variables influencing the ecological impact of an important invasive marine species; and 3) develop a novel approach for studying small-scale physical-biological interactions both in the laboratory and in the field.

Knowing how turbulence affects feeding in lobate ctenophores is valuable at the scale of the organism, as well as ecologically. The approach developed here also may be applied to a variety of other turbulence-dominated situations (e.g., mixing at fronts, animal-marine snow interactions) or to other organisms (other plankton, benthic-water column exchanges). In all cases, the outcomes depend upon small-scale physical-biological processes.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061353
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061182
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061268

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