Alongtrack data from R/V Tioga TI725 in the Gulf of Maine from January 2014 (Gulf of Maine Pteropods project)

Website: https://www.bco-dmo.org/dataset/511484
Version: 2014-02-17

Project
» Seasonal and Ontogenetic Effects of Ocean Acidification on Pteropods in the Gulf of Maine (Gulf of Maine Pteropods)

Program
» Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES): Ocean Acidification (formerly CRI-OA) (SEES-OA)

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Dataset Description

This alongtrack data set contains information on environmental conditions for each day of the RV/Tioga cruise TI725 to the Gulf of Maine, 10 January 2014.

This cruise was part of an ongoing seasonal time series of carbonate chemistry measurements in the Gulf of Maine. It was also an auxiliary cruise for the collection of the local population of thecosome pteropod, Limacina retroversa.

Methods & Sampling

Alongtrack measurements were made continuously during the course of the cruise. Data collection was handled by a number of computers and custom software programs, including Calliope, the central program which collects, logs, and distributes the data. Sea surface temperature, salinity, and fluorescence data were collected once per minute upon leaving port. Atmospheric measurements of air temperature, barometric pressure, wind speed and direction, and other meteorological variables were also collected along with time, latitude, and longitude once per minute. These data were saved on the ship's server on a daily basis.

Data Processing Description

BCO-DMO Processing Notes and Edits: Parameter names were modified to conform to BCO-DMO convention. Replaced 'nan' and '-999' with 'nd', where applicable. Leading spaces in front of values were deleted. [Time was converted from HH:MM:SS format to GMT format. day_gmt, month_gmt, year, and

yrday_new were added (computed based on date column).]

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Data Files

File
alongtrack_TI725.csv(Comma Separated Values (.csv), 278.75 KB) MD5:2c89a03873d20cd34086586c8a889567 Primary data file for dataset ID 511484

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Parameters

Parameter	Description	Units
cruise_id	cruise identification	unitless
date	date as year/month/day (GMT time)	yyyymmdd
time	Time GMT; 24 hour clock. [Values converted from HH:MM:SS format to HHMM.SS format.]	HH:MM:SS
lat	Latitude; negative = South.	decimal degrees
lon	Longitude; negative = West.	decimal degrees
temp_air_port	Air temperature in degrees C. Obtained from Vaisala WXT520 mounted on port side forward mast xx m above waterline. Name changed from 'WXTP_Ta' during processing.	degrees C
press_bar_port	Barometric pressure obtained from WXT520 mounted on the port side forward mast xx m above sea level. Data has been corrected for sensor altitude. Name changed from 'WXTP_Pa' during processing.	hPa
depth_w	Depth in meters obtained from the Knudsen 200 kHz channel. x meter transducer depth correction has been applied.??? Name changed from 'Depth200' during processing.	m
cog	Course over ground (true); best source; obtained from a Garmin GPS receiver.	degrees (azimuth)
sog	Speed over ground (best source) obtained from a Garmin GPS receiver. Name changed from 'SOG' during processing.	knots
precip_port	Rain accumulation in mm. Data obtained from Vaisala WXT520 mounted on port side forward mast xx m above waterline.The accumulation value is reset only when the sensor power is reset. Name changed from 'WXTP_Rc' during processing.	mm
precip_rate_port	Rain intensity in mm/hour obtained from Vaisala WXT520 mounted on port side forward mast xx m above waterline. Name changed from 'WXTP_Ri' during processing.	mm/hr
humidity_port	Relative humidity (%) obtained from Vaisala WXT520 mounted on port side forward mast at xx m above water line. Name changed from 'WXTP_Ua' during processing.	%
wind_dir_r_port	Relative wind direction from port side. Data obtained from Vaisala WXT520 and has not been corrected for sensor mounting alignment error. A 0-degree wind comes over the bow; 90-degree wind comes over the stbd side. Name changed from 'WXTP_Dm' during processing.	degrees

wind_speed_r_port	Relative wind speed from port side obtained from Vaisala WXT520. Wind speed average in m/s (2 Hz; 10 sec sample period). Name changed from 'WXTP_Sm' during processing.	m/s
cond_mS	Surface conductivity from the SBE45 thermosalinograph. Name changed from 'SBE45C' during processing.	mS/cm
flr	Fluorescence measured by WetLabs Wet-Star fluorometer located in the Wet Lab clean seawater piping. Units are counts (1 volt dc = 1000).	counts
sal_ss	Sea surface salinity measured by SBE45 thermosalinograph. Name changed from 'SBE45S' during processing.	PSU
sound_vel	Surface sound velocity from the SBE45 thermosalinograph. Name changed from 'SBE45SV' during processing.	m/s
temp_ss	Sea surface temperature measured by SBE45T thermosalinograph sensor. Name changed from 'SBE45T' during processing.	degrees C
head	The ship's heading obtained from true heading source (gyro). Name changed from 'HDT' during processing.	degrees(azimuth)
wind_direction	Wind direction. Name changed from 'WXWnd_dir' during processing.	degrees
wind_speed	Wind speed. Name changed from 'WXWnd_spd' during processing.	m/s
wind_dir_c_port	True wind direction in degrees from port side. Values are calculated from the Vaisala WXT520. Raw data corrected for sensor alignment error and combined with the ship's gyro heading and sog and cog values. A 0-degree wind comes from the north. Name changed from 'WXTP_TD' during processing.	degrees
wind_speed_c_port	True wind speed from port side. Values calculated from the Vaisala WXT520. Raw data corrected for sensor alignment error and combined with the ship's heading and sog and cog values.Name changed from "WXTP_TS" during processing.	m/s
yrday_gmt	GMT day and decimal time. e.g. 326.5 is the 326th day of the year or November 22 at 1200 hours (noon).	unitless
day	day UTC	unitless
month	month UTC	unitless
year	year	unitless
ISO_DateTime_UTC	Date/Time (UTC) ISO formatted; based on ISO 8601:2004(E).	unitless

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Instruments

Dataset-specific Instrument Name	Fluorometer
Generic Instrument Name	Fluorometer
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

Dataset-specific Instrument Name	GPS
Generic Instrument Name	Global Positioning System Receiver
Generic Instrument Description	The Global Positioning System (GPS) is a U.S. space-based radionavigation system that provides reliable positioning, navigation, and timing services to civilian users on a continuous worldwide basis. The U.S. Air Force develops, maintains, and operates the space and control segments of the NAVSTAR GPS transmitter system. Ships use a variety of receivers (e.g. Trimble and Ashtech) to interpret the GPS signal and determine accurate latitude and longitude.

Dataset-specific Instrument Name	MicroTSG
Generic Instrument Name	MicroTSG Thermosalinograph
Generic Instrument Description	An externally powered, high-accuracy instrument, designed for shipboard determination of sea surface (pumped-water) conductivity and temperature. Salinity and sound velocity can also be computed.

Dataset-specific Instrument Name	WXT520
Generic Instrument Name	Weather Transmitter
Generic Instrument Description	The ship-mounted Vaisala Weather Transmitter WXT520 measures: Wind speed and direction; Liquid precipitation: rainfall, duration, intensity; Barometric pressure; Air temperature and Relative humidity. (for more information see http://www.vaisala.com/en/products/multiweathersensors/Pages/WXT520.aspx)

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Deployments

TI725

Website	https://www.bco-dmo.org/deployment/491406
Platform	R/V Tioga
Report	http://bcodata.whoi.edu/GoME_Pteropods/cruise_reports/Tioga725_Cruise_Report.pdf
Start Date	2014-01-10
End Date	2014-01-10
Description	Cruise to collect live Limacina retroversa pteropods for physiological studies.

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Project Information

Seasonal and Ontogenetic Effects of Ocean Acidification on Pteropods in the Gulf of Maine (Gulf of Maine Pteropods)

Website: http://www.whoi.edu/people/glawson/

Coverage: Gulf of Maine

This project will involve a series of five short cruises in 2013 and 2014, during which a variety of hydrographic, chemical, and biological data and samples will be collected, as well as a number of laboratory experiments examining pteropod physiology and gene expression.

From NSF proposal abstract:

Dissolution of excess anthropogenic CO2 into the ocean is causing the marine environment to decrease in pH. This "ocean acidification" is predicted to threaten a broad variety of marine organisms, particularly calcifying animals such as the thecosome (i.e., shelled) pteropods. These pelagic gastropods form an aragonite shell, are prey for a number of commercially important fish, and are significant contributors to carbon biogeochemistry. Their ecosystem importance, abundance, and sensitivity to dissolution position them as an important group for investigating the impacts of acidification. Our understanding of the effect of high CO2 on pteropods and the pelagic ecosystem, however, is limited primarily to short-term studies of adult calcification and respiration response in the polar ecosystems. There have been no seasonal studies of sensitivity and our understanding of the effect of CO2 on pteropod early life stages is limited. Limacina retroversa is a particularly abundant thecosome pteropod in the North Atlantic, where it is prey for a number of fisheries species and other top predators. This species is also the most common pteropod in the Gulf of Maine (GoM) where it is present year round. L. retroversa thus offers the prospect of a useful model pteropod species, given both its ecological importance and its abundance in readily accessible waters. The investigators will conduct a series of short cruises to sample L. retroversa on a seasonal basis from local waters of the GoM near Cape Cod. The carbonate chemistry of the GoM fluctuates seasonally, providing the opportunity to assess the response of wild caught pteropods to natural changes in CO2. By characterizing the carbonate chemistry of the water column and measuring the metabolic rate, shell quality, and gene expression of pteropods throughout the year, the researchers will achieve a time series of pteropod sensitivity to CO2. Subsequently, using experimental manipulations the investigators will explore the effect of seasonal acclimation on pteropod response to short- and medium-term exposure to enhanced CO2. Pteropods frequently lay eggs in captivity, and at WHOI there is institutional expertise in maintaining these individuals in the laboratory. Building on these strengths, the researchers will also study the effect of CO2 on embryonic and larval development in L. retroversa. These earliest life-stages of marine calcifiers are thought to be especially sensitive since initial shell precipitation and the highly energetic processes of growth and development are impeded by CO2 exposure. They will also document mortality, shell production, abnormality, and developmental rate of clutches of pteropod embryos exposed to increased CO2.

Intellectual Merit: Thecosome pteropods are an abundant group of calcifying zooplankters that have been chronically understudied, particularly in temperate regions. Due to its accessibility and ecological importance, L. retroversa can be developed as a valuable model, interesting both as the dominant pteropod in the commercially-important GoM region and also an abundant pteropod in the temperate waters of the North Atlantic. The goal of this research is to augment our knowledge of the distribution of L. retroversa, to attain an understanding of their seasonal sensitivity to natural variability in CO2, and to see how this exposure impacts responses to both short- and medium-term CO2 exposure. Using powerful transcriptomic technologies, the research will transform our understanding of this group by investigating the molecular mechanisms of response in L. retroversa to both seasonality and varying durations and intensities of acidification, contextualized by ecosystem- and organism-level metrics. Furthermore the study will examine the effect of CO2 on the eggs of pteropods for the first time, providing insight into their sensitivity to an acidifying environment.

Program Information

Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES): Ocean

Acidification (formerly CRI-OA) (SEES-OA)

Website: https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503477

Coverage: global

NSF Climate Research Investment (CRI) activities that were initiated in 2010 are now included under Science, Engineering and Education for Sustainability NSF-Wide Investment (SEES). SEES is a portfolio of activities that highlights NSF's unique role in helping society address the challenge(s) of achieving sustainability. Detailed information about the SEES program is available from NSF (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504707).

In recognition of the need for basic research concerning the nature, extent and impact of ocean acidification on oceanic environments in the past, present and future, the goal of the SEES: OA program is to understand (a) the chemistry and physical chemistry of ocean acidification; (b) how ocean acidification interacts with processes at the organismal level; and (c) how the earth system history informs our understanding of the effects of ocean acidification on the present day and future ocean.

Solicitations issued under this program:
NSF 10-530, FY 2010-FY2011
NSF 12-500, FY 2012
NSF 12-600, FY 2013
NSF 13-586, FY 2014
NSF 13-586 was the final solicitation that will be released for this program.

PI Meetings:
1st U.S. Ocean Acidification PI Meeting(March 22-24, 2011, Woods Hole, MA)
2nd U.S. Ocean Acidification PI Meeting(Sept. 18-20, 2013, Washington, DC)
3rd U.S. Ocean Acidification PI Meeting (June 9-11, 2015, Woods Hole, MA – Tentative)

NSF media releases for the Ocean Acidification Program:

Press Release 10-186 NSF Awards Grants to Study Effects of Ocean Acidification

Discovery Blue Mussels "Hang On" Along Rocky Shores: For How Long?

Discovery nsf.gov - National Science Foundation (NSF) Discoveries - Trouble in Paradise: Ocean Acidification This Way Comes - US National Science Foundation (NSF)

Press Release 12-179 nsf.gov - National Science Foundation (NSF) News - Ocean Acidification: Finding New Answers Through National Science Foundation Research Grants - US National Science Foundation (NSF)

Press Release 13-102 World Oceans Month Brings Mixed News for Oysters

Press Release 13-108 nsf.gov - National Science Foundation (NSF) News - Natural Underwater Springs Show How Coral Reefs Respond to Ocean Acidification - US National Science Foundation (NSF)

Press Release 13-148 Ocean acidification: Making new discoveries through National Science Foundation research grants

Press Release 13-148 - Video nsf.gov - News - Video - NSF Ocean Sciences Division Director David Conover answers questions about ocean acidification. - US National Science Foundation (NSF)

Press Release 14-010 nsf.gov - National Science Foundation (NSF) News - Palau's coral reefs surprisingly resistant to ocean acidification - US National Science Foundation (NSF)

Press Release 14-116 nsf.gov - National Science Foundation (NSF) News - Ocean Acidification: NSF awards $11.4 million in new grants to study effects on marine ecosystems - US National Science Foundation (NSF)

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1316040