Nearshore pH and temperature at mooring sites in McMurdo Sound, Antarctica from Nov 2013 to Oct 2014

Website: https://www.bco-dmo.org/dataset/753430
Data Type: Other Field Results
Version: 1
Version Date: 2019-01-28

Project
» Linking natural variability and anthropogenic changes in pH and temperature to performance in calcifying Antarctic marine invertebrates (OA pH, Temp, Calc Inverts)

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Abstract
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Coverage

Spatial Extent: **Lat**:-77.63422 **Lon**:166.41467
Temporal Extent: 2013-11-12 - 2014-10-23

Dataset Description

All methods are described in Kapsenberg et al. (2015). Data were collected using an autonomous SeaFET pH sensor containing Honeywell DuraFET electrodes (Martz et al., 2010). Sensor depth was 18 m with ~27 m bottom depth. Sensors sampled on a 4-hour frequency.

Methods & Sampling

Conversion from voltage to pH (on a total scale) was performed using a single discrete calibration sample collected via SCUBA using a 5 L GO-FLO sampling bottle. Sample collection was conducted within the first two weeks of sensor deployment, after sensor conditioning to seawater, in-situ. Samples were preserved with saturated mercuric chloride Standard Operating Procedure (SOP) 1 (Dickson et al., 2007) and analyzed for spectrophotometric pH (total scale, at 25 degrees Celsius) and total alkalinity following SOP 6b and 3b (Dickson et al. 2007). Sample salinity was measured using a calibrated YSI 3100 Conductivity Instrument. In-situ pH was calculated using the program CO2Calc [Version 1.0.1, 2010, U.S. Geological Survey] using SeaFET temperature recorded at the time of sample collection.

SeaFET thermistors were not individually calibrated resulting in a maximum estimated temperature offset of ~0.3 degrees Celsius.

All processing was conducted in R (v.3.5.1) using seacarb (v.3.2.8) to generate calibration coefficients for the sensor that were later applied to the datset.

Data Processing Description

BCO-DMO Processing Notes:

- appended lat, lon, sensor_depth, and water_depth columns to include spatial information with the data.
- removed first column as it was an index for the row number.

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Data Files

File
ph_temp.csv (Comma Separated Values (.csv), 175.44 KB) MD5:cec78b866a75e966e1154578e26cb64a Primary data file for dataset ID 753430

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Related Publications

Bresnahan, P. J., Martz, T. R., Takeshita, Y., Johnson, K. S., & LaShomb, M. (2014). Best practices for autonomous measurement of seawater pH with the Honeywell Durafet. Methods in Oceanography, 9, 44–60. doi:10.1016/j.mio.2014.08.003
Methods

Dickson, A.G. (2001). Reference materials for oceanic measurements. Oceanography, 14(4), 21-22.
Methods

Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.) 2007. Guide to Best Practices for Ocean CO2 Measurements. PICES Special Publication 3, 191 pp https://isbnsearch.org/isbn/1-897176-07-4
Methods

Kapsenberg, L., Kelley, A. L., Shaw, E. C., Martz, T. R., & Hofmann, G. E. (2015). Near-shore Antarctic pH variability has implications for the design of ocean acidification experiments. Scientific Reports, 5(1). doi:10.1038/srep09638
Methods

Liu, X., Patsavas, M. C., & Byrne, R. H. (2011). Purification and Characterization of meta-Cresol Purple for Spectrophotometric Seawater pH Measurements. Environmental Science & Technology, 45(11), 4862–4868. doi:10.1021/es200665d
Methods

Martz, T. R., Connery, J. G., & Johnson, K. S. (2010). Testing the Honeywell Durafet® for seawater pH applications. Limnology and Oceanography: Methods, 8(5), 172–184. doi:10.4319/lom.2010.8.172
Methods

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Parameters

Parameter	Description	Units
id	identifier	unitless
time	date and time of collection in yyyy-mm-dd HH:MM:SS format	unitless
pH	pH	total units
temp	water temperature	degrees Celsius
lat	latitude in degrees north	decimal degrees
lon	longitude in degrees east	decimal degrees
water_depth	bottom depth	meters
sensor_depth	sensor depth	meters

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Instruments

Dataset-specific Instrument Name	SeaFET sensors
Generic Instrument Name	SeapHOx/SeaFET
Dataset-specific Description	Instruments are SeaFET® sensors using a Honeywell DuraFET® electrode, as well as a Thermo Cl-ISE as an external reference for data quality control. (Martz et al, 2010).
Generic Instrument Description	The SeapHOx and SeaFET are autonomous sensors originally designed and developed by the Todd Martz Lab at Scripps Institution of Oceanography. The SeaFET was designed to measure pH and temperature. The SeapHOx, designed later, combined the SeaFET with additional integrated sensors for dissolved oxygen and conductivity. Refer to Martz et al. 2010 (doi:10.4319/lom.2010.8.172). The SeapHOx package is now produced by Sea-Bird Scientific and allows for integrated data collection of pH, temperature, salinity, and oxygen. Refer to Sea-Bird for specific model information.

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Deployments

McMurdo_pH_Temp

Website	https://www.bco-dmo.org/deployment/753473
Platform	McMurdo Station
Start Date	2013-11-12
End Date	2014-10-23
Description	Overwinter 2013-2014, Cape Evans Site Nearshore mooring by McMurdo Station, Ross Sea, Antarctica. (77˚ 38.053’ S, 166˚ 24.880’ E, 28m bottom depth)

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Project Information

Linking natural variability and anthropogenic changes in pH and temperature to performance in calcifying Antarctic marine invertebrates (OA pH, Temp, Calc Inverts)

Coverage: McMurdo Sound, Antarctica

Abstract: The research supported in this project will examine the effects of environmental change on a key Antarctic marine invertebrate, a pelagic mollusk, the pteropod, Limacina helicina antarctica. There are two main activities in this project: (1) to deploy oceanographic equipment, in this case, autonomously recording pH sensors called SeaFETs and other devices that record temperature and salinity, and (2) to use these environmental data in the laboratory at McMurdo Station to study the response of the marine invertebrates to future changes in water quality that is expected in the next few decades. Notably, changes in oceanic pH (aka ocean acidification) and ocean warming are projected to be particularly threatening to calcifying marine organisms in cold-water, high latitude seas, making tolerance data on these organisms a critical research need in Antarctic marine ecosystems.

These Antarctic shelled-animals are especially vulnerable to dissolution stress from ocean acidification because they currently inhabit seawater that is barely at the saturation level to support biogenic calcification. Indeed, these polar animals are considered to be the 'first responders' to chemical changes in the surface oceans. Thus, this project will lead to information about the adaptive capacity of L. helcina antarctica. From an ecological perspective this is important because this animal is a critical part of the Antarctic food chain in coastal waters and changes in its abundance will impact other species. Finally, the research conducted in this project will serve as a training and educational opportunity for undergraduate and graduate students as well as postdoctoral scholars.

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Funding

Funding Source	Award
NSF Antarctic Sciences (NSF ANT)	PLR-1246202

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