Processed CTD data from BH15-11 from R/V Blue Heron cruise BH15-11 in the western arm of Lake Superior in August 2015

Website: https://www.bco-dmo.org/dataset/708293
Data Type: Cruise Results
Version: 1
Version Date: 2017-07-20

Project
» EAGER - Introducing Early Career Scientists to Research on the Great Lakes (Early Career Great Lakes research)
» Calibration of a Novel Nutrient Paleoproxy in the Southern Ocean (Novel Nutrient Paleoproxy)

Contributors	Affiliation	Role
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Abstract
Processed CTD data from BH15-11 from R/V Blue Heron cruise BH15-11 in the western arm of Lake Superior in August 2015.

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Coverage

Spatial Extent: **N**:47.332 **E**:-89.8223 **S**:46.7502 **W**:-91.9442
Temporal Extent: 2015-08-26 - 2015-08-28

Dataset Description

Processed CTD data from BH15-11.

Related publications:Horner, T. J., Pryer, H. V., Nielsen, S. G., Crockford, P. W., Gauglitz, J. M., Wing, B. A., & Ricketts, R. D. (2017). Pelagic barite precipitation at micromolar ambient sulfate. Nature Communications, 8(1). doi:10.1038/s41467-017-01229-5

Methods & Sampling

CTD casts were conducted using using a Sea-Bird SBE 9 and SBE 11plus V 5.0. The CTD rosette included: WET Labs WETstar, SBE43 (oxygen), WET Labs CDOM, WET Labs C-Star, and Biospherical/Licor sensors. Data were processed (data conversion, filter, loop edit, bin average, ascii out) using Seasave V 7.23.2.

Notes:

- These data include both the up and down cast at each station. Because Niskin bottles were fired at certain depths on the upcasts, "nbin" values may be very high at those depths (because the CTD sat at depth for a longer period of time).
- Cast 002.01 was aborted due to a transmissometer issue.

Also see: Cast logs from cruise BH15-11 (PDF).

Data Processing Description

Example SeaSave processing, from cast 005.01:
datcnv_date = Aug 28 2015 08:22:28, 7.23.2 [datcnv_vars = 17]
datcnv_in = C:\Users\Tech\Desktop\Seasave\Raw\CTD_2015\BH15-11\005.01.hex C:\Users\Tech\Desktop\Seasave\Raw\CTD_2015\BH15-11\005.01.XMLCON
datcnv_skipover = 0
datcnv_ox_hysteresis_correction = yes
datcnv_ox_tau_correction = yes
filter_date = Aug 28 2015 08:23:15, 7.23.2
filter_in = C:\Users\Tech\Desktop\Seasave\Converted Data\005.01.cnv
filter_low_pass_tc_A = 0.150
filter_low_pass_tc_B = 0.150
filter_low_pass_A_vars = prDM
filter_low_pass_B_vars =
loopedit_date = Aug 28 2015 08:26:05, 7.23.2
loopedit_in = C:\Users\Tech\Desktop\Seasave\Filter\005.01f.cnv
loopedit_minVelocity = 0.100
loopedit_surfaceSoak: do not remove
loopedit_excl_bad_scans = yes
binavg_date = Aug 28 2015 08:26:48, 7.23.2
binavg_in = C:\Users\Tech\Desktop\Seasave\Loop Edit\005.01fle.cnv
binavg_bintype = meters
binavg_binsize = 1
binavg_excl_bad_scans = yes
binavg_skipover = 0
binavg_surface_bin = no, min = 0.000, max = 0.000, value = 0.000
file_type = ascii

BCO-DMO Processing Notes:
- Modified parameters names to conform with BCO-DMO naming conventions;
- Created ISO_DateTime field from dates in CTD .hdr files;
- Added column for "station_name".

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Data Files

File
ctd_BH1511.csv (Comma Separated Values (.csv), 563.28 KB) MD5:033b0f966d71ccc14d9a74cf7099f60b Primary data file for dataset ID 708293

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Supplemental Files

File
BH15-11_CTD_Cast_sheets.pdf (Portable Document Format (.pdf), 1.49 MB) MD5:cd8dfd6fab1ec295514c222f9e9104e7 BH15-11_CTD_Cast_sheets.pdf

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Related Publications

Horner, T. J., Pryer, H. V., Nielsen, S. G., Crockford, P. W., Gauglitz, J. M., Wing, B. A., & Ricketts, R. D. (2017). Pelagic barite precipitation at micromolar ambient sulfate. Nature Communications, 8(1). doi:10.1038/s41467-017-01229-5
Results

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Parameters

Parameter	Description	Units
cast	Cast identier. Composed of station + cast (e.g. 002.01 = station 2, cast 1).	unitless
lat_start	Latitude at start of cast; obtained from .hdr files	decimal degrees
lon_start	Longitude at start of cast; obtained from .hdr files	decimal degrees
ISO_DateTime_UTC	Time and date formatted to ISO 8601 standard (yyyy-mm-ddTHH:MM:SS); obtained from .hdr files	unitless
PrDM	Pressure, Digiquartz	decibars (db)
DepFM	Depth (fresh water)	meters (m)
T090C	Temperature [ITS-90]	degrees Celsius
C0uS_cm	Conductivity	microsiemens per centimeter (uS/cm)
Specc	Specific conductance	microsiemens per centimeter (uS/cm)
WetStar	Fluorescence measured by WET Labs WETstar	milligrams per cubic meter (mg/m3)
Sbeox0Mg_L	Oxygen measured by SBE43	milligrams per liter (mg/L)

WetCDOM	Fluorescence measured by WET Labs CDOM	milligrams per cubic meter (mg/m3)
CStarTr0	Beam transmission measured by WET Labs C-Star	percent (%)
Par	PAR/Irradiance measured by Biospherical/Licor	microEinsteins per square centimeter per second (ueinsteins/cm2-sec)
Orp	Oxidation reduction potential	millivolts (mV)
Ph	pH	unitless (pH scale)
Dz_dtM	Descent rate	meters per second (m/s)
TimeS	Elapsed time	seconds
AltM	Altimeter	meter (m)
Latitude	Latitude	decimal degrees
Longitude	Longitude	decimal degrees
Nbin	Number of scans per bin	unitless
Flag	0.000e+00 (bad flag = -9.990e-29)	unitless
station_name	Name commonly used to refer to the station	unitless

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Instruments

Dataset-specific Instrument Name	WET Labs CDOM
Generic Instrument Name	CTD-fluorometer
Generic Instrument Description	A CTD-fluorometer is an instrument package designed to measure hydrographic information (pressure, temperature and conductivity) and chlorophyll fluorescence.

Dataset-specific Instrument Name	Biospherical/Licor
Generic Instrument Name	LI-COR Biospherical PAR Sensor
Generic Instrument Description	The LI-COR Biospherical PAR Sensor is used to measure Photosynthetically Available Radiation (PAR) in the water column. This instrument designation is used when specific make and model are not known.

Dataset-specific Instrument Name	SBE 43
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
Generic Instrument Description	The Sea-Bird SBE 43 dissolved oxygen sensor is a redesign of the Clark polarographic membrane type of dissolved oxygen sensors. More information from the manufacturer: https://www.seabird.com/products/sbe-43-dissolved-oxygen-sensor

Dataset-specific Instrument Name	Sea-Bird SBE 9 and SBE 11plus V 5.0
Generic Instrument Name	Sea-Bird SBE 911plus CTD
Generic Instrument Description	[tethered, real-time] The Sea-Bird SBE 911 plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911 plus includes the SBE 9plus Underwater Unit and the SBE 11plus Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 plus and SBE 11 plus is called a SBE 911 plus. The SBE 9 plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 plus and SBE 4). The SBE 9 plus CTD can be configured with up to eight auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). more information from Sea-Bird Electronics

Dataset-specific Instrument Name	WET Labs WETstar
Generic Instrument Name	WET Labs (Sea-Bird WETLabs) WETStar fluorometer
Generic Instrument Description	Submersible fluorometer designed for through-flow or pumped CTD applications manufactured by WetLabs and which can be configured for various types of fluorescence. The probe has a temperature range of 0-30 degrees C and a depth rating of 600 meters.

Dataset-specific Instrument Name	WET Labs C-Star
Generic Instrument Name	WET Labs {Sea-Bird WETLabs} C-Star transmissometer
Generic Instrument Description	The C-Star transmissometer has a novel monolithic housing with a highly integrated opto-electronic design to provide a low cost, compact solution for underwater measurements of beam transmittance. The C-Star is capable of free space measurements or flow-through sampling when used with a pump and optical flow tubes. The sensor can be used in profiling, moored, or underway applications. Available with a 6000 m depth rating. More information on Sea-Bird website: https://www.seabird.com/products/c-star-transmissometer

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Deployments

BH15-11

Website	https://www.bco-dmo.org/deployment/685923
Platform	R/V Blue Heron
Start Date	2015-08-26
End Date	2015-08-28

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Project Information

EAGER - Introducing Early Career Scientists to Research on the Great Lakes (Early Career Great Lakes research)

Coverage: Great Lakes

NSF Award Abstract:

This proposal to fund a research training cruise on the University of Minnesota's R/V Blue Heron for early career scientists from the Great Lakes basin. The proposed work will have two goals: 1) teach early career lacustrine scientists how to acquire, plan for, and manage cruises aboard UNOLS ships, possibly having some impact on the long-term decrease in requests for ship time on UNOLS ships in general; and 2) expose members of the Great Lakes scientific community, which has an abysmally low submittal rate of proposals to NSF requesting UNOLS ships, to UNOLS and the academic fleet. This project mirrors the successful Chief Scientist training program that Dr. Claire Reimers at Oregon State University has run on ocean-going ships such as the R/V Wecoma, New Horizon and Endeavor.
Intellectual Merit :
The training cruise envisioned herein will allow early career scientists to collect seed data and test hypotheses for future proposals to NSF.
Broader Impacts :
This proposal intends to educate the next generation of researchers about the capabilities of UNOLS. This type of outreach between UNOLS and potential users is not only important for the broader scientific community, but doubly important for the Great Lakes community which seems resistant to using assets like the UNOLS fleet.

Calibration of a Novel Nutrient Paleoproxy in the Southern Ocean (Novel Nutrient Paleoproxy)

Coverage: Southern Ocean

NSF Award Abstract:

Human observations of Earth's climate span only a narrow window of Earth History. Understanding how and why Earth's climate changed before human observations can be overcome through the measurement and interpretation of the chemical composition of marine sediments. Accurate interpretation of these records -- also known as "proxy" records, because they stand in for direct measurements of environmental conditions in the past -- first requires that the behavior of the proxy be properly calibrated against direct observations in modern environments. This project will develop a novel proxy for marine nutrient utilization based on a comprehensive characterization of the chemical composition of particulate organic matter in the Southern Ocean. The formation and export of organic matter in the ocean requires nutrients, consumes carbon, and can influence the global air-sea balance of carbon dioxide. New proxies and calibrations offer novel ways of looking at Earth's climate history and can potentially illuminate interactions within marine ecosystems.

The efficiency of the biological carbon pump depends critically on the availability and utilization of marine nutrients, particularly in the Southern Ocean. However, ambiguity in, and disagreement between current nutrient utilization paleoproxies renders reconstruction of past nutrient regimes uncertain. Cadmium -- a known proxy for phosphate -- offers a means to circumvent many of the known limitations of existing nutrient proxies, but requires a full isotopic characterization before its application. In this project, researchers will trace the stable isotopic composition of cadmium recorded in organic matter using multiple collector inductively coupled plasma mass spectrometry. The researchers will make isotopic measurements across numerous surface nutrient regimes in the Southern Ocean, with a focus on three critical geochemical transitions: the formation of organic carbon at the sea surface, its transit and decomposition through the ocean's interior, and its behavior during burial on the sea floor. This sea surface-to-sea floor calibration will thus comprehensively determine the utility and fidelity of a novel nutrient proxy, allowing a more accurate view of how Earth's climate was related to ocean biogeochemistry in the past.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1430015
NSF Division of Ocean Sciences (NSF OCE)	OCE-1443577

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