CTD profiles from the Lake Superior collected during various R/V Blue Heron cruises between 2004-2006 (NILS project)

Website: https://www.bco-dmo.org/dataset/655249
Data Type: Cruise Results
Version:
Version Date: 2016-08-22

Project
» The Nitrifying of Lake Superior and Its Intersections with the P and Fe Cycles (NILS)

Program
» Laurentian Great Lakes Ecosystem Studies (Laurentian Great Lakes Ecosystem Studies)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **N**:48 **E**:-87 **S**:46.71683 **W**:-91.858
Temporal Extent: 2004-10-28 - 2006-08-11

Dataset Description

This dataset contains temperature, conductivity, dissolved oxygen, fluorescence, PAR, and salinity measured during CTD profile downcasts in Lake Superior.

Methods & Sampling

CTD casts were conducted during R/V Blue Heron cruises at designated stations.

Data Processing Description

BCO-DMO Data Manager Processing Notes:
* added a conventional header with dataset name, PI name, version date
* modified parameter names to conform with BCO-DMO naming conventions
* blank values replaced with no data value 'nd'

* Added ISO Date format generated from Date and Time values
* fixed date error from date 20830829 to 20050829 for station k1 in cruise NILSS4 based on samples before and after all being from same day
* date and time of NILS11 station change to "nd" for "no data" because of erroneous dates and times

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Data Files

File
NILS_CTD.csv (Comma Separated Values (.csv), 98.61 MB) MD5:37fc88a90350d45a0543e08918930490 Primary data file for dataset ID 655249

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Parameters

Parameter	Description	Units
CruiseID	cruise identifier	unitless
Station	station identifier	unitless
Date	date (UTC) in format YYYYMMDD	unitless
Time	time (UTC) in format HHMMSS	unitless
Lat	latitude of the station	decimal degrees
Lon	longitude of the station; west is negative	decimal degrees
temp	temperature	degrees C
cond	actual conductivity	microSiemens per centimeter
cond_spec	specific conductance (actual conductivity at 25 degrees C)	microSiemens per centimeter
beam_trans	beam transmission	percent
fluor	fluorescence	miligrams per meter cubed

O2_ml_L	dissolved oxygen	milileters per liter
O2_mg_L	dissolved oxygen	miligrams per liter
O2_umol_kg	dissolved oxygen	micromoles per kilogram
PAR	Photosynthetically Active Radiation (Biospherical/Licor)	microEinsteins per meter squared per second
sal	salinity	practical salinity units
ISO_DateTime_UTC	Date/Time (UTC) in ISO format YYYY-MM-DDTHH:MM:SS[.xx]	unitless
press	Pressure at time of CTD sample.	decibars

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Instruments

Dataset-specific Instrument Name	Fluorometer
Generic Instrument Name	Fluorometer
Dataset-specific Description	Wetlab Wetstar
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	Photosynthetically Available Radiation Sensor
Generic Instrument Name	Photosynthetically Available Radiation Sensor
Dataset-specific Description	Biospherical/Licor
Generic Instrument Description	A PAR sensor measures photosynthetically available (or active) radiation. The sensor measures photon flux density (photons per second per square meter) within the visible wavelength range (typically 400 to 700 nanometers). PAR gives an indication of the total energy available to plants for photosynthesis. This instrument name is used when specific type, make and model are not known.

Dataset-specific Instrument Name	SBE 43 Dissolved Oxygen Sensor
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
Dataset-specific Description	SBE 43
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	CTD Sea-Bird SBE 911plus
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	Transmissometer
Generic Instrument Name	Transmissometer
Dataset-specific Description	Beam Transmission, Chelsea/Seatech/Wetlab CStar
Generic Instrument Description	A transmissometer measures the beam attenuation coefficient of the lightsource over the instrument's path-length. This instrument designation is used when specific manufacturer, make and model are not known.

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Deployments

BH05-05

Website	https://www.bco-dmo.org/deployment/663475
Platform	R/V Blue Heron
Start Date	2005-06-06
End Date	2005-06-09
Description	Information for this deployment extracted from the NILSS CTD dataset, we don't have a cruise track or start/end dates. **Methods & Sampling** NILSS2

BH05-13

Website	https://www.bco-dmo.org/deployment/663476
Platform	R/V Blue Heron
Start Date	2005-07-05
End Date	2005-07-23
Description	Information for this deployment extracted from the NILSS CTD dataset, we don't have a cruise track or start/end dates. **Methods & Sampling** NILSS3

BH05-18

Website	https://www.bco-dmo.org/deployment/663482
Platform	R/V Blue Heron
Start Date	2005-06-06
End Date	2005-09-01
Description	Information for this deployment extracted from the NILSS CTD dataset, we don't have a cruise track or start/end dates. **Methods & Sampling** NILSS4

BH05-24

Website	https://www.bco-dmo.org/deployment/682023
Platform	R/V Blue Heron
Start Date	2005-09-17
End Date	2005-09-17
Description	Information for this deployment extracted from the NILSS CTD dataset, we don't have a cruise track or start/end dates.

BH06-01

Website	https://www.bco-dmo.org/deployment/663477
Platform	R/V Blue Heron
Start Date	2006-01-31
End Date	2006-01-31
Description	Information for this deployment extracted from the NILSS CTD dataset, we don't have a cruise track or start/end dates. **Methods & Sampling** NILSS6

BH06-02

Website	https://www.bco-dmo.org/deployment/663479
Platform	R/V Blue Heron
Start Date	2006-03-22
End Date	2006-03-22
Description	Information for this deployment extracted from the NILSS CTD dataset, we don't have a cruise track or start/end dates.

BH06-05

Website	https://www.bco-dmo.org/deployment/663478
Platform	R/V Blue Heron
Start Date	2006-05-23
End Date	2006-05-23
Description	Information for this deployment extracted from the NILSS CTD dataset, we don't have a cruise track or start/end dates.

BH06-10

Website	https://www.bco-dmo.org/deployment/663483
Platform	R/V Blue Heron
Start Date	2006-06-20
End Date	2006-06-20
Description	Information for this deployment extracted from the NILSS CTD dataset, we don't have a cruise track or start/end dates.

BH06-14

Website	https://www.bco-dmo.org/deployment/663480
Platform	R/V Blue Heron
Start Date	2006-07-11
End Date	2006-07-14
Description	Information for this deployment extracted from the NILSS CTD dataset, we don't have a cruise track or start/end dates.

BH06-18

Website	https://www.bco-dmo.org/deployment/663481
Platform	R/V Blue Heron
Start Date	2006-08-08
End Date	2006-08-11
Description	Information for this deployment extracted from the NILSS CTD dataset, we don't have a cruise track or start/end dates.

BH04-25

Website	https://www.bco-dmo.org/deployment/58800
Platform	R/V Blue Heron
Start Date	2004-10-28
End Date	2004-10-28
Description	Information for this deployment extracted from CTD dataset, we don't have a cruise track or start/end dates.

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Project Information

The Nitrifying of Lake Superior and Its Intersections with the P and Fe Cycles (NILS)

Website: http://www.tc.umn.edu/~stern007/

Coverage: Lake Superior

ABSTRACT FROM NSF AWARDS: OCE- 0352291 / OCE- 0352274 / OCE 0352208

Collaborative Research: The Nitrifying of Lake Superior and Its Intersections with the P and Fe Cycles

The concentration of nitrate in Lake Superior waters has increased steadily during the past century by six-fold from ca. 5 to ca. 30 umol L-1. Today, nitrate remains in excess of biotic demand at the end of the growing season. Though the increase in nitrogen concentration is not surprising, the magnitude and rate of increase in Lake Superior are, considering the long, fifty-year N turnover rate of the lake, and the absence of significant local sources of N to the mainly forested watershed.

To elucidate the causes of this impressive nitrate build up, researchers from the University of Minnesota, Bowling Green State University, and Rutgers University will undertake studies of the Lake Superior nitrogen cycle, combined with studies of limiting nutrients and the responses of plankton communities to differing nutrient supply regimes. Nitrification and denitrification rates, previously assumed to be zero, will be measured with stable isotope tracers and with other methods. Sources and transformations of the lakes nitrate will be traced using natural abundances of stable isotopes of nitrogen and oxygen in the lake, in streams and rivers, and in atmospheric sources. In addition to testing the limitation on nitrate uptake, the team of scientists will also explore the N cycle and its intersection with the P and Fe cycles in this large lake. Shortages of P, along with cold and dark physical conditions, are likely important factors in understanding lack of ecosystem assimilation of added nitrate. Iron too may play an important role because of its critical role in nitrate utilization by plankton. Indeed, it may be that absence of iron limits the ability of the plankton to utilize nitrate such that the plankton are N deficient even in the presence of nitrate surplus. In addition to developing a new water column nitrogen model and data sets for several geochemically distinct pools of dissolved P and Fe (with both spatial and temporal coverage of large portions of the lake) this research will also yield a dramatically improved knowledge of the nitrogen cycle in the worlds' largest lake.

PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH

Finlay, J.C., R.W. Sterner, & S. Kumar.. "Isotopic evidence for in-lake production of accumulating nitrate in Lake Superior.," *Ecological Applications.*, v.17, 2007, p. 2.

Sterner, R. W., E. Anagnostou, S. Brovold, G. S. Bullerjahn, J. C. Finlay, S. Kumar, R. M. L. McKay, and R. M. Sherrell.. "Increasing Stoichiometric Imbalance in Earth?s Largest Lake.," *Geophysical Research Letters*, v.34, 2007.

Ivanikova, N. V., R. M. L. McKay, G. S. Bullerjahn, and R. W. Sterner. 2007. Nitrate utilization in Lake Superior is impaired by low nutrient (P, Fe) availability and seasonal light limitation - a cyanobacterial bioreporter study. Journal of Phycology 43:475-484.

Kumar, S., J. C. Finlay, and R. W. Sterner. 2010. Isotopic composition of nitrogen in suspended particular matter of Lake Superior: implications for nutrient cycling and organic matter transformation. Biogeochemistry 103:1-14.

Kumar, S., R. W. Sterner, B. J. Finlay, and S. Brovold. 2007. Spatial and temporal variation of ammonium in Lake Superior. Journal of Great Lakes Research 33:581-591.

Kumar, S., R. W. Sterner, and J. Finlay. 2008. Nitrogen and carbon uptake dynamics in Lake Superior. Journal of Geophysical Research - Biogeosciences 113:G04003.

Sterner, R. W., T. Andersen, J. J. Elser, D. O. Hessen, J. M. Hood, E. McCauley, and J. Urabe. 2008. Scale-dependent carbon:nitrogen:phosphorus seston stoichiometry in marine and freshwaters. Limnology and Oceanography 53:1169-1180.

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Program Information

Laurentian Great Lakes Ecosystem Studies (Laurentian Great Lakes Ecosystem Studies)

Website: http://www.tc.umn.edu/~stern007/

Coverage: Laurentian Great Lakes

A series of studies concerned with the chemistry and biology of the Laurentian Great Lakes. These different studies share a focus on the dynamics of organic pools of carbon, nitrogen and phosphorus, and the stoichiometric linkages among these elements. At different times, work also has focused on trace metal dynamics and interactions with biota, the rates of primary production and herbivory, rates and patterns of primary productivity, and the century-long, steady trend of increasing nitrate in Earth's largest lake by area. Microbial populations have been investigated and linked to these chemical properties.

This Program was created by BCO-DMO staff to bring various Laurentian Great Lakes Research projects under one umbrella for improved discovery and access.

Dates: 1998 - 2014
Funding: NSF/OCE and Minnesota Sea Grant

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0352291
NSF Division of Ocean Sciences (NSF OCE)	OCE-0352208

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