

Physico-chemical data from winter 2012, 2013, and 2016 from USCGC and CCGS vessels from the Laurentian Great Lakes (mainly Lakes Huron, Michigan, Erie and connecting waterways) (Lake Erie Ice project)

Website: <https://www.bco-dmo.org/dataset/4045>

Data Type: Cruise Results

Version: 2

Version Date: 2017-07-18

Project

» [RAPID Response to an extreme low ice year on Lake Erie](#) (Lake Erie Ice)

Program

» [Laurentian Great Lakes Ecosystem Studies](#) (Laurentian Great Lakes Ecosystem Studies)

Contributors	Affiliation	Role
McKay, Robert Michael	Bowling Green State University (BGSU)	Principal Investigator, Contact
Bullerjahn, George S.	Bowling Green State University (BGSU)	Co-Principal Investigator
Morris, Paul F	Bowling Green State University (BGSU)	Co-Principal Investigator
Gegg, Stephen R.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager
Switzer, Megan	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Program Information](#)
- [Funding](#)

Coverage

Spatial Extent: N:46.4986 E:-78.942 S:41.1495 W:-85.715

Temporal Extent: 2012-01-04 - 2016-03-04

Dataset Description

Lake Erie Ice - Physico-Chemical Data - Winter 2012, 2013, 2016

For additional information see:

[Collecting Winter Data on U.S. Coast Guard Icebreakers](#)

[Study Plan for the U.S. Coast Guard Survey of Lake Erie in Winter 2011-12](#)

[Study Plan for the U.S. Coast Guard Survey of Lake Erie in Winter 2012-13](#)

[Study Plan for the Canadian Coast Guard Survey of Lake Erie in Winter 2012-13](#)

[Study Plan for the Canadian Coast Guard Survey of Lake Erie in Winter 2016](#)

Methods & Sampling

(see individual deployments)

Data Processing Description

(see individual deployments)

BCO-DMO Processing Notes:

- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- replaced spaces and / with underscores
- blank values replaced with no data value 'nd'

[[table of contents](#) | [back to top](#)]

Data Files

File
LakeErielce_data.csv (Comma Separated Values (.csv), 28.11 KB) MD5:f3bb4d3d85926a47312b635ce2f66ef7 Primary data file for dataset ID 4045

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
Station	Station Number	dimensionless
Station_EC	Station identifier provided by Environment Canada for "process" stations that are routinely occupied during EC surveys. All other stations were sampled while "underway" and were not provided unique EC identifiers.	dimensionless
Date_Local	Date Local	YYYYMMDD
Time_Local	Time Local	HHMMSS
ISO_DateTime_Local	ISO Formatted Date/Time Local	yyyy-mm-ddThh:mm
Lat_DegMin	Latitude in Degrees and Decimal Minutes	Deg DecMin N/S
Lat_DecDeg	Latitude in Decimal Degrees	decimal degrees
Lon_DegMin	Longitude in Degrees and Decimal Minutes	Deg DecMin E/W
Lon_DecDeg	Longitude in Decimal Degrees	decimal degrees
Station_Depth_Feet	Station Depth in Feet	feet

Station_Depth_Meters	Station Depth in Meters	meters
Ice_Cover	Ice Cover	percentage
Snow_Cover	Snow Cover	percentage
Ice_Type	Ice Type	text
Ice_Thickness	Ice Thickness	inches
Air_Temp_F	Air Temp Degrees Fahrenheit	degrees fahrenheit
Air_Temp_C	Air Temp Degrees Celsius	degrees celsius
Baro_Press_Inches	Barometric Pressure in inches of mercury	Hg
Baro_Press_Milli	Barometric Pressure in millibars	millibars
Wind_Spd_Knts	Wind Speed in Knots	knots
Wind_Spd_M_per_Sec	Wind Speed in Meters per Second	meters per second
Wind_Direction	Wind Direction True	degrees or text
Weather	Weather Description	text
Water_Temp	Water Temperature	degrees fahrenheit
Chl_gt_0point2_um_PCTE_Replicate_1	Chl (> 0.2 um PCTE) Replicate 1 Extractive Chlorophyll a biomass > 0.2um retained on a polycarbonate [PCTE] membrane - Replicate 1	micro g L-1
Chl_gt_0point2_um_PCTE_Replicate_2	Chl (> 0.2 um PCTE) Replicate 2 Extractive Chlorophyll a biomass > 0.2um retained on a polycarbonate [PCTE] membrane - Replicate 2	micro g L-1
Chl_gt_0point2_um_PCTE_Replicate_3	Chl (> 0.2 um PCTE) Replicate 3 Extractive Chlorophyll a biomass > 0.2um retained on a polycarbonate [PCTE] membrane - Replicate 3	micro g L-1
Chl_gt_0point2_um_PCTE_Mean	Chl (> 0.2 um PCTE) Mean Extractive Chlorophyll a biomass > 0.2um retained on a polycarbonate [PCTE] membrane - Mean for the triplicate set of chlorophyll values	micro g L-1
Chl_gt_20_um_PCTE_Replicate_1	Chl (> 20 um PCTE) Replicate 1 Extractive Chlorophyll a biomass > 20um retained on a polycarbonate [PCTE] membrane - Replicate 1	micro g L-1
Chl_gt_20_um_PCTE_Replicate_2	Chl (> 20 um PCTE) Replicate 2 Extractive Chlorophyll a biomass > 20um retained on a polycarbonate [PCTE] membrane - Replicate 2	micro g L-1
Chl_gt_20_um_PCTE_Replicate_3	Chl (> 20 um PCTE) Replicate 3 Extractive Chlorophyll a biomass > 20um retained on a polycarbonate [PCTE] membrane - Replicate 3	micro g L-1
Chl_gt_20_um_PCTE_Mean	Chl (> 20 um PCTE) Mean Extractive Chlorophyll a biomass > 20um retained on a polycarbonate [PCTE] membrane - Mean for the triplicate set of chlorophyll values	micro g L-1
Chl_GF_F_Replicate_1	Chl (GF/F) Replicate 1 Extractive Chlorophyll a biomass retained on a glass fiber [GF/F] membrane - Replicate 1	micro g L-1
Chl_GF_F_Replicate_2	Chl (GF/F) Replicate 2 Extractive Chlorophyll a biomass retained on a glass fiber [GF/F] membrane - Replicate 2	micro g L-1

Chl_GF_F_Replicate_3	Chl (GF/F) Replicate 3 Extractive Chlorophyll a biomass retained on a glass fiber [GF/F] membrane - Replicate 3	micro g L-1
Chl_GF_F_Mean	Chl (GF/F) Mean Extractive Chlorophyll a biomass retained on a glass fiber [GF/F] membrane - Mean for the triplicate set of chlorophyll values	micro g L-1
NH3	Dissolved Nutrients - NH3	mg L-1
CL	Dissolved Nutrients - CL	mg L-1
SO4	Dissolved Nutrients - SO4	mg L-1
NO2	Dissolved Nutrients - NO2	mg L-1
NO3	Dissolved Nutrients - NO3	mg L-1
SIO2	Dissolved Nutrients - SIO2	mg L-1
SRP	Dissolved Nutrients - SRP	mg L-1
Total_Phosphorus	Particulate - Total Phosphorus	mg L-1

[[table of contents](#) | [back to top](#)]

Instruments

Dataset-specific Instrument Name	Dionex Ion Chromatograph
Generic Instrument Name	Ion Chromatograph
Generic Instrument Description	Ion chromatography is a form of liquid chromatography that measures concentrations of ionic species by separating them based on their interaction with a resin. Ionic species separate differently depending on species type and size. Ion chromatographs are able to measure concentrations of major anions, such as fluoride, chloride, nitrate, nitrite, and sulfate, as well as major cations such as lithium, sodium, ammonium, potassium, calcium, and magnesium in the parts-per-billion (ppb) range. (from http://serc.carleton.edu/microbelife/research_methods/biogeochemical/ic....)

Dataset-specific Instrument Name	Technicon TrAAcs AutoAnalyzer
Generic Instrument Name	Nutrient Autoanalyzer
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

Dataset-specific Instrument Name	Stainless Steel Sampling Bottle
Generic Instrument Name	Stainless Steel Sampling Bottle
Dataset-specific Description	Near-surface water (1 m depth) will be collected using a stainless steel sampling bottle. These bottles were custom made (welded stainless steel) by Fletcher Manufacturing, Bowling Green, OH).
Generic Instrument Description	A stainless steel sampling bottle used for collecting near surface samples (not a GO-FLO bottle)

Dataset-specific Instrument Name	Turner Designs 700 Laboratory Fluorometer
Generic Instrument Name	Turner Designs 700 Laboratory Fluorometer
Dataset-specific Description	For analysis by fluorometry, samples are extracted in 90% acetone (24 h at -20° C) and chlorophyll measured in a TD-700 fluorometer (Turner) using the non-acidified approach (Welschmeyer, 1994)
Generic Instrument Description	The TD-700 Laboratory Fluorometer is a benchtop fluorometer designed to detect fluorescence over the UV to red range. The instrument can measure concentrations of a variety of compounds, including chlorophyll-a and fluorescent dyes, and is thus suitable for a range of applications, including chlorophyll, water quality monitoring and fluorescent tracer studies. Data can be output as concentrations or raw fluorescence measurements.

[[table of contents](#) | [back to top](#)]

Deployments

NEAHBAY_Winter2012

Website	https://www.bco-dmo.org/deployment/59088
Platform	USCGC NEAH BAY
Start Date	2012-01-04
End Date	2012-04-05
Description	<p>Note: There is no official cruise id. "NEAHBAY_Winter2012" was generated by BCO-DMO staff. The 2012 winter Coast guard ice-breaking operation on Lake Erie is called "Operation Coal Shovel" which has been assigned as a primary synonym for the cruise. The locations list was generated from the station locations contributed with the data. For additional information see: Collecting Winter Data on U.S. Coast Guard Icebreakers Study Plan for the U.S. Coast Guard Survey of Lake Erie in Winter 2011-12</p> <p>Methods & Sampling See: Collecting Winter Data on U.S. Coast Guard Icebreakers Study Plan for the U.S. Coast Guard Survey of Lake Erie in Winter 2011-12</p> <p>Processing Description See: http://bcodata.whoi.edu/LakeErie_Ice/Oyserman2012_Eos.pdf>Collecting Winter Data on U.S. Coast Guard Icebreakers http://bcodata.whoi.edu/LakeErie_Ice/Study_Plan_BGSU_CoastGuard_Winter2011-12_Means... Plan for the U.S. Coast Guard Survey of Lake Erie in Winter 2011-12 Means were calculated for each triplicate set of chlorophyll values. BCO-DMO Processing Notes Original file: "NEAH BAY_2012_master.xlsx", sheet: "Cumulative" contributed by Robert McKay - Date reformatted to YYYYMMDD - Time reformatted to HHMMSS - Lat/Lon hemisphere sign (E/W or N/S) added to Lat/Lon Deg, Decimal minutes fields - "n.d." replaced with "nd" (BCO-DMO standard for no data) - Parameter names edited to conform to BCO-DMO parameter naming conventions - Columns added to generate a common set of parameters for all three cruises: "Station_EC" "Water_Temp" (All "nd")</p>

MACKINAW_Winter2013

Website	https://www.bco-dmo.org/deployment/59091
Platform	USCGC MACKINAW
Start Date	2013-01-29
End Date	2013-02-02
Description	<p>Note: There is no official cruise id. "MACKINAW_Winter2013" was generated by BCO-DMO staff. The 2013 winter Coast guard ice-breaking operation on Lake Erie is called "Operation Taconite" which has been assigned as a primary synonym for the cruise. The locations list was generated from the station locations contributed with the data. For additional information see:Collecting Winter Data on U.S. Coast Guard IcebreakersStudy Plan for the U.S. Coast Guard Survey of Lake Erie in Winter 2012-13</p> <p>Methods & Sampling See:Collecting Winter Data on U.S. Coast Guard IcebreakersStudy Plan for the U.S. Coast Guard Survey of Lake Erie in Winter 2012-13</p> <p>Processing Description See: http://bcodata.whoi.edu/LakeErie_Ice/Oyserman2012_Eos.pdf">Collecting Winter Data on U.S. Coast Guard Icebreakers http://bcodata.whoi.edu/LakeErie_Ice/Study_Plan_BGSU_USCoastGuard_Winter... Plan for the U.S. Coast Guard Survey of Lake Erie in Winter 2012-13 Means were calculated for each triplicate set of chlorophyll values. BCO-DMO Processing Notes Original file: "MACKINAW_2013_master_13Sept13.xlsx", sheet: "Cumulative" contributed by Robert McKay - Date reformatted to YYYYMMDD - Time reformatted to HHMMSS - Lat/Lon hemisphere sign (E/W or N/S) added to Lat/Lon Deg, Decimal minutes fields - "-" replaced with "nd" (BCO-DMO standard for no data) - Parameter names edited to conform to BCO-DMO parameter naming conventions - Columns added to generate a common set of parameters for all three cruises: "Station_EC" "Baro_Press_Mill" (generated from "Baro_Press_Inches * 33.8637526)</p>

GRIFFON 2013-01-801

Website	https://www.bco-dmo.org/deployment/59092
Platform	CCGS GRIFFON
Start Date	2013-02-18
End Date	2013-02-23
Description	<p>The locations list was generated from the station locations contributed with the data. For additional information see:Study Plan for the Canadian Coast Guard Survey of Lake Erie in Winter 2012-13</p> <p>Methods & Sampling See:Study Plan for the Canadian Coast Guard Survey of Lake Erie in Winter 2012-13</p> <p>Processing Description See: http://bcodata.whoi.edu/LakeErie_Ice/Study_Plan_BGSU_CanadianCoastGuard... Plan for the Canadian Coast Guard Survey of Lake Erie in Winter 2012-13 Means were calculated for each triplicate set of chlorophyll values. BCO-DMO Processing Notes Original file: "GRIFFON_2013_master_13Sept13.xlsx", sheet: "Cumulative" contributed by Robert McKay - Date reformatted to YYYYMMDD - Time reformatted to HHMMSS - Lat/Lon hemisphere sign (E/W or N/S) added to Lat/Lon Deg, Decimal minutes fields - "#Value!" replaced with "nd" (BCO-DMO standard for no data) - Parameter names edited to conform to BCO-DMO parameter naming conventions - Columns added to generate a common set of parameters for all three cruises: "Station_Depth_Feet" (generated from Station_Depth_Meters/0.3048) "Air_Temp_F" (generated from (Air_Temp_C * 1.8 + 32.0)) "Baro_Press_Inches" (generated from Baro_Press_Mill * 0.0295301) "Water_Temp" (All "nd") "Chl_GF_F_Replicate_1,2,3,Mean" (All "nd")</p>

GRIFFON_2016046-001-008

Website	https://www.bco-dmo.org/deployment/708889
Platform	CCGS GRIFFON
Report	http://dmoserv3.bco-dmo.org/data_docs/LakeErie_Ice/2016046-001-008_Melee_CruiseReport.pdf
Start Date	2016-02-15
End Date	2016-02-19
Description	PURPOSE: Characterize the spatial and vertical distribution in Lake Erie of i) benthic seed populations ii) physico-chemical parameters (temperature, conductivity etc.) and major nutrients in water column iii) primary productivity, carbon processing and bacterial activity iv) algal nutrient and physiological status; toxins v) phytoplankton, picoplankton and algal taxa; samples for DNA barcoding and metagenomic analyses

NEAHBAY_Winter2016

Website	https://www.bco-dmo.org/deployment/712503
Platform	USCGC NEAH BAY
Report	http://data.bco-dmo.org/LakeErie_Ice/Study_Plan_BGSU_USCoastGuard_Winter_2016-1.pdf
Start Date	2016-01-14
End Date	2016-03-04

[[table of contents](#) | [back to top](#)]

Project Information

RAPID Response to an extreme low ice year on Lake Erie (Lake Erie Ice)

Website: <http://www.bgsu.edu/arts-and-sciences/biological-sciences/faculty-and-staff/alphabetical-listing/robert-michael-mckay.html>

Coverage: Laurentian Great Lakes

Description from NSF award:

Winter presents a logistical obstacle to our understanding of lake ecosystems. A recent collaboration of the PIs with the Canadian- and U.S. Coast Guards and their icebreaking programs has facilitated annual winter surveys of Lake Erie since 2007. Conducted during times of expansive ice cover, these surveys have documented high phytoplankton biomass, often in discrete formations and dominated by a filamentous diatom, *Aulacoseira islandica*. Whereas Lake Erie is characterized by a high annual median ice cover [AMIC] consistent with its relative shallow bathymetry, it also shows extremes in maximum ice extent ranging from ~10% in low ice years to > 99% in high ice years. While maximum ice cover on Lake Eries has reached ~95% each winter from 2007-2010, the winter of 2011-12 is shaping up much differently, with unseasonably warm conditions and almost no ice cover.

The PIs will use a Rapid Response Research (RAPID) grant to investigate the changes in phytoplankton community structure and function during this warm and practically ice-free winter. Specifically, they will test the hypothesis that the warm monomictic mixing regime that occurs in the absence of expansive ice cover suppresses diatom growth in Lake Erie's central basin. This project will provide synoptic data on the concentration of chlorophyll a in near-surface waters at stations throughout Lake Erie during the winter season.

Suppression of abundant winter diatom growth may have important implications for events occurring during summer in Lake Erie. The documentation of abundant winter diatom growth, combined with low measured

rates of bacterial decomposition results in net accumulation of algae on the lake bottom. As summer progresses and the hypolimnion warms, bacterial remineralization of the exported diatom biomass accelerates, depleting the hypolimnion of oxygen. These observations are consistent with a new hypothesis on lake function, namely that winter phytoplankton production drives Lake Erie summer hypoxia. Oxygen depletion in Lake Erie's central basin is well documented with effects ranging from enhanced internal nutrient loading to loss of habitat for macrofauna. At its full expanse, the area can exceed 10,000 km², comparable in surface area to the low oxygen 'dead zone' in the Gulf of Mexico. Thus, deviation from the high phytoplankton biomass accumulation associated with 'typical' winter ice cover may be reflected in higher hypolimnetic dissolved oxygen measured during summer. This research opportunity can help define environmental changes that might be expected in a warming climate.

For additional information see:

[Collecting Winter Data on U.S. Coast Guard Icebreakers](#)
[Study Plan for the U.S. Coast Guard Survey of Lake Erie in Winter 2011-12](#)

[[table of contents](#) | [back to top](#)]

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

[[table of contents](#) | [back to top](#)]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1230735

[[table of contents](#) | [back to top](#)]