

Isotopes d2H and d18O in Alaskan ground, lake, and river water from the area of Toolik Lake, Alaska from 2012-2014 (Groundwater Discharge Methane project)

Website: <https://www.bco-dmo.org/dataset/671960>

Data Type: Other Field Results

Version:

Version Date: 2017-01-03

Project

» [EAGER: Subterranean Ground Water Discharge \(SGD\) in the Arctic as a Source of Atmospheric Methane? A Proof of Concept Study](#) (Groundwater Discharge Methane)

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Dataset Description

This dataset contains isotopic ratios d2H and d18O in Alaskan natural waters. The sampling location is included for each sample (lake, river, etc.) as well as the latitude and longitude of the sample site.

Methods & Sampling

Discrete groundwater, lake, and river water samples were collected from Toolik Lake in September 2013 and July 2014. Groundwater samples were collected in all locations from freshly dug pits or temporary PVC well points of variable depth depending on the depth of the water table. All water samples were collected by submersible pump. Sample collection followed previously established methods as water was filtered to 0.45 microns into 2 mL gas chromatography vials. Samples were analyzed by the UC Davis Stable Isotope Facility on a Laser Water Isotope Analyzer V2 (Los Gatos Research Inc). Precision is typically ≤ 0.3 permil for d18O-H2O and ≤ 0.8 permil for dD-H2O. Values are reported relative to Vienna Standard Mean Ocean Water (VSMOW).

Data Processing Description

No further processing was done.

BCO-DMO data manager 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'
- * replaced 'N/A' values with "nd" for no data
- * combined 2012 and 2014 data into one dataset and added column "year"
- * changed the original longitudes to negative to place them in Alaska.
- * sorted dataset by year, then water sample type (ground water, lake water, river water), then date

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Data Files

File
H2Oisotopes.csv (Comma Separated Values (.csv), 5.49 KB) MD5:76e771f36a98224eaa911a444593ffb9
Primary data file for dataset ID 671960

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Parameters

Parameter	Description	Units
year	Year of sample aquisition	unitless
water_type	Descriptive name of sample water type	unitless
date	Date of sample in format yyyy-mm-dd	unitless
lat	Latitude of sample; north is positive	decimal degrees
lon	Longitude of sample; west is negative	decimal degrees
temp	Temperature of sampled water	degrees Celsius
water_d2H	Isotopic ratio of deuterium (2H) to a single hydrogen (2H:1H) in water	permil (0/00)
water_d18O	Isotopic ratio of 18O:16O in water	permil (0/00)

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Instruments

Dataset-specific Instrument Name	Laser Water Isotope Analyzer V2
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	Laser Water Isotope Analyzer V2 (Los Gatos Research Inc)
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

Dataset-specific Instrument Name	submersible pump
Generic Instrument Name	Pump
Generic Instrument Description	A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps

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Deployments

ALASKA Paytan water 2012-2014

Website	https://www.bco-dmo.org/deployment/671978
Platform	shoreside ALASKA_Paytan
Start Date	2012-07-23
End Date	2014-07-05
Description	Toolik Lake on the North Slope of Alaska

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Project Information

EAGER: Subterranean Ground Water Discharge (SGD) in the Arctic as a Source of Atmospheric Methane? A Proof of Concept Study (Groundwater Discharge Methane)

Coverage: Alaskan Pacific and Arctic Coastline, and Toolik Lake on the North Slope of Alaska

Extracted from the NSF award abstract:

The major objective of this proof of concept study is to evaluate the contribution of Subterranean Groundwater Discharge (SGD) in the Arctic to the global methane budget. Methane is a potent greenhouse gas and large natural reservoirs exist in Arctic soils and permafrost. The working hypothesis is that methane released from thawing permafrost in the Arctic is transported via groundwater flow (above and below the permafrost layer) and enters the atmosphere via coastal waters and lakes. This source of methane may be realized as an important source of natural methane to the atmosphere and may provide a positive feedback to global warming.

The objectives of the study are:

- 1) To estimate the magnitude of subterranean groundwater discharge and associated methane flux into lakes and coastal waters in Alaska at three representative sites.
- 2) To evaluate methane evasion rates from the water column to the atmosphere.
- 3) To determine if the contribution of methane input from subterranean groundwater discharge to the global methane budget is significant, and if so
- 4) To use the preliminary data to design a more thorough research plan that will enable precise estimates of fluxes and provide a basis for global extrapolation of results such that the contribution of this source to current and future climate changes and the global methane budget will be possible.

The project will support a graduate student full time for two years. Undergraduate students in the ACCESS program and the California Alliance for Minority Participation in Science, Engineering and Mathematics program at UCSC will also participate in the proposed work. The PIs will work with COSEE Alaska to integrate this work in their outreach and education activities including teacher workshops, symposia, and work with local communities in Alaska.

PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH

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Ms. Alanna Lecher , Dr. Natasha Dimova , Ms. Katy Sparrow , Dr. Fenix Garcia-Tigreros , Mr. Joseph Murray , Dr. Slawek Tulaczyk , Dr. John Kessler. "Groundwater Discharge a Conduit for Methane Emissions in the Arctic," *Nature Geoscience*, 2015.

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Funding

Funding Source	Award
NSF Division of Polar Programs (NSF PLR)	PLR-1114485

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