Trace metal concentrations of lake water, river water, and groundwater at Lake Tahoe from 2013 to 2016

Website: https://www.bco-dmo.org/dataset/856219
Data Type: Other Field Results, Cruise Results
Version: 1
Version Date: 2021-07-20

Project
» Atmospheric Deposition Impacts on Marine Ecosystems (ADIMA)

Contributors	Affiliation	Role
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Abstract
This dataset reports concentrations of trace metals in lake water, river water, and groundwater collected at Lake Tahoe from 2013 to 2016.

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Coverage

Spatial Extent: **Lat**:39.09231 **Lon**:-120.00275
Temporal Extent: 2013-03-29 - 2016-07-22

Methods & Sampling

Water depth profile samples from Lake Tahoe were collected seven times at different seasons between the Spring of 2013 and Summer 2016. Van Dorn bottles (Wildco Beta Plus acrylic 2.2 L, with no metal parts that touch the sample) were used for water collection at depths of 50, 100, 150, 200, 250, 300, 350, 400, and 450m and a one-liter HDPE bottle attached to a 2.5-meter long plastic rod was used to collect surface water samples. Samples were collected at the Mid-lake Tahoe Profile (MLTP) station (39.09231° N; 120.00275° W). From each depth, one liter of water was dispensed into an acid-washed sample rinsed LDPE bottle for trace metals and Pb isotope analyses as described in Chien et al. (2017). Groundwater samples were obtained from two wells at the Lake Tahoe fire station and three wells at the Hatchery, and river water samples were collected from Third Creek, Trout Creek, Upper Truckee River, Ward Creek, Incline Creek, Blackwood Creek, and General Creek. All water samples were filtered with acid washed 0.45 µm filters (SupaPore) before nutrient, trace metal, and Pb isotope analyses. Samples for trace metal and Pb isotopes analyses were acidified to pH < 2 with concentrated double distilled nitric acid. MilliQ water blanks were also collected and analyzed similarly.

Due to low trace metal concentrations in the lake water, about 200 mL of each water sample was first dried down on a hotplate and then reconstituted with 10 mL 2% HNO3 for concentration analyses (20-fold concentration increase). TSP total and soluble trace metal concentrations, and lake, river, and groundwater trace metal concentrations of Al, V, Cr, Mn, Fe, Co, Ni, Cu, Cd, and Pb were analyzed by a High Resolution

Inductively Coupled Plasma Mass Spectrometry (Element XR) with triple detector mode. Instrument calibration was done using gravimetrically prepared multi-element standards in the range of concentrations represented by our samples.

Data Processing Description

BCO-DMO Processing:
- changed date format to YYYY-MM-DD;
- renamed fields to comply with BCO-DMO naming conventions;
- replaced commas with semi-colons in the 'Potentially_contaminated_elements' column.

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Data Files

File
lake_tahoe_water_metals.csv (Comma Separated Values (.csv), 6.18 KB) MD5:89b498f2dcd16a7b921190da3b2229b9 Primary data file for dataset ID 856219

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Related Publications

Buck, C. S., Landing, W. M., Resing, J. A., & Lebon, G. T. (2006). Aerosol iron and aluminum solubility in the northwest Pacific Ocean: Results from the 2002 IOC cruise. Geochemistry, Geophysics, Geosystems, 7(4), n/a–n/a. doi:10.1029/2005gc000977
General

Chien, C.-T., Allen, B., Dimova, N. T., Yang, J., Reuter, J., Schladow, G., & Paytan, A. (2019). Evaluation of atmospheric dry deposition as a source of nutrients and trace metals to Lake Tahoe. Chemical Geology, 511, 178–189. doi:10.1016/j.chemgeo.2019.02.005
Results

Chien, C.-T., Ho, T.-Y., Sanborn, M. E., Yin, Q.-Z., & Paytan, A. (2017). Lead concentrations and isotopic compositions in the Western Philippine Sea. Marine Chemistry, 189, 10–16. doi:10.1016/j.marchem.2016.12.007
Methods

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Parameters

Parameter	Description	Units
Type	Sample type	unitless
Date	Date of sample collection; format: YYYY-MM-DD	unitless
Location	Location of sample collection	unitless
Depth	Water depth	meters (m)
Pb	Lead concentration	nanomoles per kilogram (nmol kg-1)
Cd	Cadmium concentration	nanomoles per kilogram (nmol kg-1)
Cu	Copper concentration	nanomoles per kilogram (nmol kg-1)
Ni	Nickel concentration	nanomoles per kilogram (nmol kg-1)
Co	Cobalt concentration	nanomoles per kilogram (nmol kg-1)
Fe	Iron concentration	nanomoles per kilogram (nmol kg-1)
Mn	Manganese concentration	nanomoles per kilogram (nmol kg-1)
Cr	Chromium concentration	nanomoles per kilogram (nmol kg-1)
V	Vanadium concentration	nanomoles per kilogram (nmol kg-1)
Al	Aluminum concnetration	nanomoles per kilogram (nmol kg-1)
Potentially_contaminated_elements	Indicates elements that are potentially contaminated	unitless

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Instruments

Dataset-specific Instrument Name	Graseby Andersen TSP High Volume Sampler
Generic Instrument Name	Aerosol Sampler
Generic Instrument Description	A device that collects a sample of aerosol (dry particles or liquid droplets) from the atmosphere.

Dataset-specific Instrument Name	Thermo Element XR high-resolution inductively coupled plasma mass spectrometer (HR-ICP-MS)
Generic Instrument Name	Inductively Coupled Plasma Mass Spectrometer
Generic Instrument Description	An ICP Mass Spec is an instrument that passes nebulized samples into an inductively-coupled gas plasma (8-10000 K) where they are atomized and ionized. Ions of specific mass-to-charge ratios are quantified in a quadrupole mass spectrometer.

Dataset-specific Instrument Name	Van Dorn bottles
Generic Instrument Name	Van Dorn water sampler
Generic Instrument Description	A free-flushing water sample bottle comprising a cylinder (polycarbonate, acrylic or PVC) with a stopper at each end. The bottle is closed by means of a messenger from the surface releasing the tension on a latex band and thus pulling the two stoppers firmly into place. A thermometer can be mounted inside the bottle. One or more bottles can be lowered on a line to allow sampling at a single or multiple depth levels. Van Dorn samplers are suitable for for physical (temperature), chemical and biological sampling in shallow to very deep water. Bottles are typically lowered vertically through the water column although a horizontal version is available for sampling near the seabed or at thermoclines or chemoclines. Because of the lack of metal parts the bottles are suitable for trace metal sampling, although the blue polyurethane seal used in the Alpha version may leach mercury. The Beta version uses white ASA plastic seals that do not leach mercury but are less durable.

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Deployments

Lake_Tahoe_Paytan

Website	https://www.bco-dmo.org/deployment/856096
Platform	R/V John Le Conte
Description	Cruise identifiers: 442, 450, 453, 468, 471, 474, 481.

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Project Information

Atmospheric Deposition Impacts on Marine Ecosystems (ADIMA)

Website: http://pmc.ucsc.edu/~apaytan/page_projects.html

Coverage: Gulf of Aqaba, Atlantic Ocean (Bermuda Time Series Station), Monterey Bay

Chemical components delivered to the surface ocean through atmospheric deposition influence ocean productivity and ecosystem structure thus are tightly related to the global carbon cycle and climate. Accordingly, the major aim of this project is to quantitatively estimate the variable impact of aerosols on marine phytoplankton and to determine the specific effects on various taxa. Such data could in the future be used to better understand the global impact of aerosols on the oceanic ecosystem. To accomplish this goal the PI will monitor aerosol dry deposition fluxes, determine aerosol sources, obtain the chemical composition and solubility of aerosols, and evaluate the contribution of aerosols to nutrient and trace metal budgets of seawater at two oceanographically different sites (Bermuda and Monterey Bay) representing open ocean and coastal setting. The effects of the different aerosol "types" (defined by source and chemical characteristics) on specific phytoplankton taxa will also be evaluated using pure culture and natural samples bioassays. This project is particularly important in light of the role atmospheric deposition can resume in oligotrophic and coastal settings and the predicted future global conditions of increased aridity and urbanization and associated changes in dust fluxes and composition.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0850467

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