Concentrations of metals in total suspended particle (TSP) samples collected near Lake Tahoe from 2006 to 2009

Website: https://www.bco-dmo.org/dataset/856134
Data Type: Other Field Results
Version: 1
Version Date: 2021-08-04

Project
» Atmospheric Deposition Impacts on Marine Ecosystems (ADIMA)

Contributors	Affiliation	Role
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Abstract
This dataset reports concentrations of metals in total suspended particle (TSP) samples collected near Lake Tahoe from 2006 to 2009.

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Coverage

Spatial Extent: **Lat**:39.09231 **Lon**:-120.00275
Temporal Extent: 2006-01-17 - 2009-10-13

Acquisition Description

TSP samples were collected between 2005 and 2010. Weekly integrated samples were collected on acid washed quartz fiber filters (10"x8", Whatman®) using a Graseby Andersen TSP High Volume Sampler. Between November 2005 and May 2007, the sampler was located near the lake at the UC Davis Field Station (Hatchery) away from any local source of disturbance. After May 2007, the sampler was relocated about 300 meters south to reduce local impacts due to remodeling at the Hatchery. The TSP sampler was placed 3.2 meters above the ground and protected by trees from direct road dust inputs. TSP samples were collected at an airflow rate of 85 cubic meters per hour. All filters were kept frozen until further analyses. To extract the soluble fraction of nutrients and trace metals in TSP samples, a 47 mm circular subsample of each filter was placed on an acid-washed filter tower, and 100 mL of MilliQ water was passed through the sample under gentle vacuum pressure exposing the sample for about 10 s to the water (Buck et al., 2006). A 100 µL of concentrated nitric acid was added to 5 mL of the MilliQ water for trace metal analysis.

TSP total and soluble 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. Na, Mg, Ca, P, Zn, Sr, Ti, and U were also measured in bulk TSP and in the TSP soluble fraction samples, while total concentration of Ba was determined only in bulk TSP samples. Low resolution mode was used for Cd, Ba, Pb and U and medium resolution for the rest of the elements. Instrument calibration was done using gravimetrically prepared multi-element standards in the range of concentrations represented by our samples.

Processing Description

BCO-DMO Processing:
- changed date format to YYYY-MM-DD.

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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 https://doi.org/10.1029/2005GC000977
Methods

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
General

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Parameters

Parameter	Description	Units
Type	sample type: Bulk concentration of metals in TSP samples or Soluble concentration of metals in TSP samples	unitless
Date	Beginning date of TSP collection; format: YYYY-MM-DD	unitless
Cd	Cadmium concentration	nanograms per cubic meter (ng m-3)
Pb	Lead concentration	nanograms per cubic meter (ng m-3)
Ba	Barium concentration	nanograms per cubic meter (ng m-3)
U	Uranium concentration	nanograms per cubic meter (ng m-3)
Na	Sodium concentration	nanograms per cubic meter (ng m-3)
Mg	Magnesium concentration	nanograms per cubic meter (ng m-3)
Al	Aluminum concentration	nanograms per cubic meter (ng m-3)
P	Phosporus concentration	nanograms per cubic meter (ng m-3)
Ca	Calcium concentration	nanograms per cubic meter (ng m-3)
Ti	Titanium concentration	nanograms per cubic meter (ng m-3)
V	Vanadium concentration	nanograms per cubic meter (ng m-3)
Cr	Chromium concentration	nanograms per cubic meter (ng m-3)
Mn	Manganese concentration	nanograms per cubic meter (ng m-3)
Fe	Iron concentration	nanograms per cubic meter (ng m-3)
Co	Cobalt concentration	nanograms per cubic meter (ng m-3)
Ni	Nickel concentration	nanograms per cubic meter (ng m-3)
Cu	Copper concentration	nanograms per cubic meter (ng m-3)
Zn	Zinc concentration	nanograms per cubic meter (ng m-3)
Sr	Strontium concentration	nanograms per cubic meter (ng m-3)

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Instruments

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	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.

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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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