Reference materials analyzed in the laboratory for THg isotopic composition

Website: https://www.bco-dmo.org/dataset/788780
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Project
» Collaborative Research: Isotopic insights to mercury in marine food webs and how it varies with ocean biogeochemistry (Hg_Biogeochemistry)

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Abstract
This dataset contains the reference materials analyzed in the laboratory for THg isotopic composition. These data were published in Motta et al., (2019) with supporting information.

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Dataset Description

This dataset contains the reference materials analyzed in the laboratory for THg isotopic composition. These data were published in Motta et al., (2019) with supporting information.

Methods & Sampling

The certified materials were bought from NIST.

Reference materials were analyzed in the laboratory for THg isotopic composition. All the samples were combusted with the marine particles and zooplankton to act as procedural reference.

For THg isotope determination the reference were combusted in a two-stage combustion furnace and Hg(0) g was trapped in a 1% KMnO4 solution. The 1% KMnO4 solution was analyzed for Hg stable isotope composition using a multiple collector inductively coupled plasma mass spectrometer.

All the methods are detailed in Motta et al., (2019).

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Data Files

File
hg_reference_materials.csv (Comma Separated Values (.csv), 957 bytes) MD5:52f651bdcc5a058b409951317131678d Primary data file for dataset ID 788780

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Related Publications

Blum, J. D., Popp, B. N., Drazen, J. C., Anela Choy, C., & Johnson, M. W. (2013). Methylmercury production below the mixed layer in the North Pacific Ocean. Nature Geoscience, 6(10), 879–884. doi:10.1038/ngeo1918 *General*

Motta, L. C., Blum, J. D., Johnson, M. W., Umhau, B. P., Popp, B. N., Washburn, S. J., … Lamborg, C. H. (2019). Mercury Cycling in the North Pacific Subtropical Gyre as Revealed by Mercury Stable Isotope Ratios. Global Biogeochemical Cycles, 33(6), 777–794. doi:10.1029/2018gb006057 https://doi.org/10.1029/2018GB006057 *Results*

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Parameters

Parameter	Description	Units
Reference_Material	Reference material name	unitless
Range_of_Sessions	How many stable isotope sessions it took to collect all the data.	unitless
Average_plus_minus_2SD	The 2SD standard deviation of the isotopic composition of the reference materials for all the indicated sessions.	per mil (‰)
n	The number individual measurements of the reference material for isotope composition in the given number of sessions.	unitless
d202Hg	Stable isotope ratio; δ202Hg	per mil (‰)
d202Hg_2SD	2SD standard deviation of d202Hg	per mil (‰)
D204Hg	Stable isotope ratio; Δ204Hg	per mil (‰)
D204Hg_2SD	2SD standard deviation of D204Hg	per mil (‰)
D201Hg	Stable isotope ratio; Δ201Hg	per mil (‰)
D201Hg_2SD	2SD standard deviation of D201Hg	per mil (‰)
D200Hg	Stable isotope ratio; Δ200Hg	per mil (‰)
D200Hg_2SD	2SD standard deviation of D200Hg	per mil (‰)
D199Hg	Stable isotope ratio; Δ199Hg	per mil (‰)
D199Hg_2SD	2SD standard deviation of D199Hg	per mil (‰)

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Instruments

Dataset-specific Instrument Name	MC-ICP-MS
Generic Instrument Name	Inductively Coupled Plasma Mass Spectrometer
Dataset-specific Description	multicollector inductively coupled plasma mass spectrometer (MC-ICP-MS; Nu instruments)
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.

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Project Information

Collaborative Research: Isotopic insights to mercury in marine food webs and how it varies with ocean biogeochemistry (Hg_Biogeochemistry)

Coverage: Pacific Subtropical Gyre, Station ALOHA 22.75N 158W; equatorial Pacific (10N 155W, 5N 155W)

NSF award abstract:
Mercury is a pervasive trace element that exists in several states in the marine environment, including monomethylmercury (MMHg), a neurotoxin that bioaccumulates in marine organisms and poses a human health threat. Understanding the fate of mercury in the ocean and resulting impacts on ocean food webs requires understanding the mechanisms controlling the depths at which mercury chemical transformations occur. Preliminary mercury analyses on nine species of marine fish from the North Pacific Ocean indicated that intermediate waters are an important entry point for MMHg into open ocean food webs. To elucidate the process controlling this, researchers will examine mercury dynamics in regions with differing vertical dissolved oxygen profiles, which should influence depths of mercury transformation. Results of the study will aid in a better understanding of the pathways by which mercury enters the marine food chain and can ultimately impact humans. This project will provide training for graduate and undergraduate students, and spread awareness on oceanic mercury through public outreach and informal science programs.

Mercury isotopic variations can provide insight into a wide variety of environmental processes. Isotopic compositions of mercury display mass-dependent fractionation (MDF) during most biotic and abiotic chemical reactions and mass-independent fractionation (MIF) during photochemical radical pair reactions. The unusual combination of MDF and MIF can provide information on reaction pathways and the biogeochemical history of mercury. Results from preliminary research provide strong evidence that net MMHg formation occurred below the surface mixed layer in the pycnocline and suggested that MMHg in low oxygen intermediate waters is an important entry point for mercury into open ocean food webs. These findings highlight the critical need to understand how MMHg levels in marine biota will respond to changes in atmospheric mercury emissions, deposition of inorganic mercury to the surface ocean, and hypothesized future expansion of oxygen minimum zones. Using field collections across ecosystems with contrasting biogeochemistry and mercury isotope fractionation experiments researchers will fill key knowledge gaps in mercury biogeochemistry. Results of the proposed research will enable scientists to assess the biogeochemical controls on where in the water column mercury methylation and demethylation likely occur.

Related background publication with supplemental data section:
Joel D. Blum, Brian N. Popp, Jeffrey C. Drazen, C. Anela Choy & Marcus W. Johnson. 2013. Methylmercury production below the mixed layer in the North Pacific Ocean. Nature Geoscience 6, 879–884. doi:10.1038/ngeo1918

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