

# Amino acid compound specific isotope values for particles from R/V Kilo Moana KM1407 and KM1418 in the Central North Pacific, Station ALOHA, Tropical Pacific, Feb and Sept. 2014

Website: <https://www.bco-dmo.org/dataset/751313>

Data Type: Cruise Results

Version: 1

Version Date: 2018-12-05

## 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 amino acid compound specific nitrogen isotope ratios in particles collected during R/V Kilo Moana cruises around Station ALOHA (KM1407 and KM1418). For more information about the ALOHA observatory see: <http://aco-ssds.soest.hawaii.edu/>. These data were published in Gloeckler et al (2018), Supporting Information file Ino10762-sup-0002-supinfo2.xlsx

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## Coverage

**Spatial Extent:** Lat:22.75 Lon:-158

**Temporal Extent:** 2014-02-19 - 2014-09-11

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## Dataset Description

This dataset contains amino acid compound specific nitrogen isotope ratios in particles collected during R/V Kilo Moana cruises around Station ALOHA (KM1407 and KM1418).

For more information about the ALOHA observatory see: <http://aco-ssds.soest.hawaii.edu/>

These data were published in Gloeckler et al (2018), Supporting Information file Ino10762-sup-0002-supinfo2.xlsx

## Acquisition Description

Amino acid-specific stable N isotope composition was determined on samples that were hydrolyzed, derivatized, and analyzed according to Popp et al. (2007) and Hannides et al. (2009). Briefly, size-fractionated zooplankton material and target zooplankton taxa were hydrolyzed using trace metal-grade 6 M HCl and the resulting AAs purified using cation exchange chromatography. The samples were then esterified using 4:1 isopropanol:acetyl chloride and derivatized using 3:1 methylene chloride:trifluoroacetyl anhydride. The resulting trifluoroacetyl and isopropyl ester (TFA) derivatives were purified using chloroform extraction and stored at -20°C for up to 1 month before analysis. This method yielded information for the following AAs: alanine (Ala), glycine (Gly), isoleucine (Ile), leucine (Leu), lysine (Lys), methionine (Met), phenylalanine (Phe), proline (Pro), serine (Ser), threonine (Thr), tyrosine (Tyr), and valine (Val). During acid hydrolysis asparagine (Asn) is converted to aspartic acid (Asp) and glutamine (Gln) is converted to glutamic acid (Glu), thus we also report information on the combined pools, termed Asx (Asn+Asp) and Glx (Gln+Glu), respectively.

TFA derivatives of AAs were analyzed for stable N isotope composition ( $d_{15}N_{AA}$  values) following Hannides et al. (2013). AAs were analyzed using a Thermo Scientific Delta V Plus IRMS interfaced to a trace gas chromatograph (GC) fitted with a 60 m BPx5 capillary column through a GC-C III combustion furnace (980°C), reduction furnace (680°C) and liquid nitrogen cold trap.  $d_{15}N_{AA}$  values were measured on 3 – 5 replicate injections with norleucine and aminoadipic acid with known  $d_{15}N$  values as internal reference materials co-injected on each run.

A composite source  $d_{15}N_{AA}$  value was calculated by a weighted averaging a suite of AAs (e.g.,  $d_{15}N_{Src-AA}$  = average of Gly, Lys, Phe, and Ser  $d_{15}N$  values). Weighting was based the analytical uncertainty calculated from at least triplicate analysis of each sample.

## Processing Description

BCO-DMO Processing Notes:

- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- added comment column

## Related Publications

Choy, C. A., Popp, B. N., Hannides, C. C. S., & Drazen, J. C. (2015). Trophic structure and food resources of epipelagic and mesopelagic fishes in the North Pacific Subtropical Gyre ecosystem inferred from nitrogen isotopic compositions. *Limnology and Oceanography*, 60(4), 1156–1171. doi:[10.1002/lno.10085](https://doi.org/10.1002/lno.10085)

Gloeckler, K., Choy, C. A., Hannides, C. C. S., Close, H. G., Goetze, E., Popp, B. N., & Drazen, J. C. (2017). Stable isotope analysis of micronekton around Hawaii reveals suspended particles are an important nutritional source in the lower mesopelagic and upper bathypelagic zones. *Limnology and Oceanography*, 63(3), 1168–1180. doi:[10.1002/lno.10762](https://doi.org/10.1002/lno.10762)

Hannides, C. C. S., Popp, B. N., Choy, C. A., & Drazen, J. C. (2013). Midwater zooplankton and suspended particle dynamics in the North Pacific Subtropical Gyre: A stable isotope perspective. *Limnology and Oceanography*, 58(6), 1931–1946. doi:[10.4319/lo.2013.58.6.1931](https://doi.org/10.4319/lo.2013.58.6.1931)

Popp, B. N., Graham, B. S., Olson, R. J., Hannides, C. C. S., Lott, M. J., López-Ibarra, G. A., ... Fry, B. (2007). Insight into the Trophic Ecology of Yellowfin Tuna, *Thunnus albacares*, from Compound-Specific Nitrogen Isotope Analysis of Proteinaceous Amino Acids. *Terrestrial Ecology*, 173–190. doi:[10.1016/S1936-7961\(07\)01012-3](https://doi.org/10.1016/S1936-7961(07)01012-3)

## Parameters

Parameter	Description	Units
Particle_size	particle size	microns
Sample	sample identifier	unitless
Depth	sample depth	meters
delta15N	ratio of tissue 15N:14N isotopes	permil
delta15N_stdev	standard deviation of ratio of tissue 15N:14N isotopes	permil
comment	comments	unitless

## Instruments

<b>Dataset-specific Instrument Name</b>	
<b>Generic Instrument Name</b>	Large Volume Pumping System-WTS-LV
<b>Dataset-specific Description</b>	Particles were collected using in situ filtration.
<b>Generic Instrument Description</b>	<p>The Large Volume Pumping System-WTS-LV can be one of several different models of Water Transfer Systems (WTS) Large Volume (LV) pumping systems designed and manufactured by McLane Research Labs (Falmouth, MA, USA). The WTS-LV systems are large volume in-situ filtration systems designed to collect sinking particulates. WTS-LV systems are individual in situ, battery-powered, pumping/filtration units that can be deployed at multiple depths per cast to provide information on how particle flux changes with depth. The McLane WTS-LV series of oceanographic pumps draw ambient water through filters and can pump large volumes of seawater during a single cast. The WTS-LV pumps are designed for use from a hydro-wire and employ advanced control algorithms to dynamically optimize flow rates as material accumulates on a filter.</p>

<b>Dataset-specific Instrument Name</b>	Thermo Scientific Delta V Plus IRMS
<b>Generic Instrument Name</b>	Gas Chromatograph
<b>Dataset-specific Description</b>	Used to analyze amino acids.
<b>Generic Instrument Description</b>	Instrument separating gases, volatile substances, or substances dissolved in a volatile solvent by transporting an inert gas through a column packed with a sorbent to a detector for assay. (from SeaDataNet, BODC)

<b>Dataset-specific Instrument Name</b>	
<b>Generic Instrument Name</b>	Ion Chromatograph
<b>Dataset-specific Description</b>	Amino acids were purified using cation exchange chromatography.
<b>Generic Instrument Description</b>	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 <a href="http://serc.carleton.edu/microbelife/research_methods/biogeochemical/ic....">http://serc.carleton.edu/microbelife/research_methods/biogeochemical/ic....</a> )

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## Deployments

**KM1407**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/635932">https://www.bco-dmo.org/deployment/635932</a>
<b>Platform</b>	R/V Kilo Moana
<b>Start Date</b>	2014-02-19
<b>End Date</b>	2014-02-28
<b>Description</b>	Original cruise data are available from the NSF R2R data catalog

**KM1418**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/636002">https://www.bco-dmo.org/deployment/636002</a>
<b>Platform</b>	R/V Kilo Moana
<b>Start Date</b>	2014-08-29
<b>End Date</b>	2014-09-11
<b>Description</b>	Original cruise data are available from the NSF R2R data catalog

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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)

Extracted from the 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. 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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## Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1433846</a>

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