Size fractionated particulate trace metal concentrations from in-situ filtration near Station ALOHA during four R/V Kilo Moana cruises between August 2022 and August 2023

Website: https://www.bco-dmo.org/dataset/987161
Version: 1
Version Date: 2025-10-15

Project
» Hawaii Aerosol Time-Series (HATS):Quantifying Marine Dust Deposition and Composition in an Oligotrophic Gyre (HATS)

Contributors	Affiliation	Role
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Abstract
Size-fractionated particles were collected via in-situ filtration aboard the R/V Kilo Moana on four separate cruises (KM2210, KM2305, KM2306, and KM2311) at the Hawaii Ocean Time-Series study site, Station ALOHA, between 2022-08-30 to 2023-08-14. Marine particulate trace element concentrations were assessed via magnetic sector inductively coupled plasma mass spectrometry (ICP-MS). Many of these trace elements are required by marine organisms and can act as tracers of oceanographic processes. These data were used as part of the Hawaii Aerosol Time-Series (HATS) project to observe how seasonally variable atmospheric deposition of aerosol trace elements to the ocean impacts the compositional inventories of size-fractionated upper water column particulate trace elements.

Table of Contents

Coverage

Location: Station ALOHA (North Pacific Ocean)
Spatial Extent: **N**:23.44 **E**:-157.46 **S**:21.23 **W**:-158.86
Temporal Extent: 2022-08-30 - 2023-08-14

[table of contents | back to top]

Related Datasets

IsRelatedTo

Buck, C. S., Ohnemus, D. C., Marsay, C., Kollman, C. (2025) **Weekly integrated bulk total aerosol trace element concentrations from the Hawaii Aerosol Time-series during January 2022 to October 2023.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2025-12-03 doi:10.26008/1912/bco-dmo.986789.1 [view at BCO-DMO]

[table of contents | back to top]

Parameters

Parameters for this dataset have not yet been identified

[table of contents | back to top]

Deployments

KM2210

Website	https://www.bco-dmo.org/deployment/931768
Platform	R/V Kilo Moana
Start Date	2022-08-30
End Date	2022-09-04
Description	Start port: Honolulu, Hawaii End port: Honolulu Hawaii Operator: University of Hawaii Project: HOT 2022 - 339

KM2305

Website	https://www.bco-dmo.org/deployment/947838
Platform	R/V Kilo Moana
Start Date	2023-03-27
End Date	2023-04-01
Description	HOT 341 Chief Scientist report located at https://hahana.soest.hawaii.edu/

KM2306

Website	https://www.bco-dmo.org/deployment/947834
Platform	R/V Kilo Moana
Start Date	2023-05-24
End Date	2023-05-30
Description	Project: HOT-342 Original cruise data are available from the NSF R2R data catalog: https://www.rvdata.us/search/cruise/KM2306

KM2311

Website	https://www.bco-dmo.org/deployment/947836
Platform	R/V Kilo Moana
Start Date	2023-08-04
End Date	2023-08-14
Description	Project: HOT-343 Original cruise data are available from the NSF R2R data catalog: https://www.rvdata.us/search/cruise/KM2311

[table of contents | back to top]

Project Information

Hawaii Aerosol Time-Series (HATS):Quantifying Marine Dust Deposition and Composition in an

Oligotrophic Gyre (HATS)

Coverage: Hawaii

NSF Award Abstract:
The chemistry of the ocean can be changed by the introduction and removal of elements, including trace elements which are present at low concentrations. In some cases, these elements are known to be vital to biological processes and ocean food webs. Near the shore, rivers are a large source for material from land to the ocean. Beyond the reach of rivers, and for most of the oceans, material blown from land through the air is the largest source of trace elements to surface waters. This material enters the oceans dissolved in rain or by settling of dust particles. Understanding atmospheric sources of trace elements to the oceans is thus important to understanding both global chemical cycles and patterns of biological production. This project will sample the atmosphere and the surface ocean near Hawaii over two years to gain a deeper understanding of the sources and fates of trace metals in the ocean. The study will examine how particles from the atmosphere interact with the surrounding water as they sink through the ocean. The project will contribute to global synthesis and modeling efforts. It will directly support graduate and undergraduate students. Results of the project and their relevance will be communicated to the public through campus open house events and a public lecture series.

The processes that supply and remove trace elements in the ocean are ongoing areas of research. An important focus is on understanding the sources and fate of aerosol trace elements deposited to the ocean as this represents a major source of micronutrients and contaminants into the open ocean. Field observations of wet and dry atmospheric inputs are limited in number, and few methods are available to transform readily measured aerosol trace element concentrations into deposition fluxes. Thus, atmospheric fluxes of trace elements to most ocean regions remain poorly constrained and their impact on ocean biochemical cycles, including the marine carbon cycle, are uncertain. Directly quantifying atmospheric fluxes of key trace elements to the ocean and identifying their fates and chemical transformations after deposition are critical areas of continued investigation and are included, for example, as a core component of the GEOTRACES program. Similarly, aerosol fractional solubility and the flux of bioavailable trace elements is not well understood. There is a corresponding need to test and improve estimates of total dust deposition fluxes alongside simultaneous observations of particle composition in the open ocean. This project will address these needs through a two-year land-based sampling effort and six seasonal cruises aimed at three tasks. (1) Use the deposition flux of beryllium-7 measured from aerosols, precipitation, and the upper ocean inventory to directly estimate dust and aerosol trace element fluxes to the Hawaii Ocean Time-series Station Aloha, a representative and remote oligotrophic site. This region is characterized by a predictable seasonal variability in dust concentrations and precipitation and is an exceptionally applicable region for testing the limits of dust deposition techniques by observing seasonal variability in ocean-atmosphere coupling over a multi-year cycle. (2) Explore the extent to which seasonal variations in aerosol trace element flux to the surface of the North Pacific, and mineralogy of that input drive variability in the composition and inventories of marine particles. (3) Investigate the extent to which the fractional solubility of aerosol trace elements collected over the North Pacific shows temporal variability and calculate flux rates of soluble aerosol trace elements. The study will advance understanding of dust and soluble aerosol trace element flux from the atmosphere to the ocean and link that flux to upper ocean particle inventory, mineralogy, and chemical composition.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1949660

[table of contents | back to top]