Aerosol trace element concentrations in the Florida Keys National Marine Sanctuary from 2014-2015 (Vibrio-dust deposition project)

Website: https://www.bco-dmo.org/dataset/712580
Data Type: Other Field Results
Version: 2017-08-02

Project
» Vibrio as a model microbe for opportunistic heterotrophic response to Saharan dust deposition events in marine waters (Vibrio-dust deposition)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **N**:24.740892 **E**:-80.981041 **S**:24.661292 **W**:-81.454879
Temporal Extent: 2014-07-23 - 2015-05-10

Dataset Description

This dataset contains trace element concentrations from 2014 and 2015 in aerosols.

Methods & Sampling

Aerosol samples, integrated over a 24-hour period, were collected using a high-volume aerosol sampler (model 5170-VBL, Tisch Environmental, 1.2 m3 min-1) which pulls air through 12 replicate acid-washed 47 mm nitrocellulose filter disks (Whatman 41).

Instantaneous aerosol leaches (UHP-soluble) were conducted by the method described in Buck et al. (2010). Total aerosol digestions were conducted using a microwave digestion scheme described in Morton et al. (2013). All samples were analyzed on the Thermo Scientific Element 2 HR-ICP-MS.

These data were published in:

Ebling, A. M., & Landing, W. M. (2017). Trace elements in the sea surface microlayer: rapid responses to changes in aerosol deposition. Elem Sci Anth, 5(0), 42. doi: 10.1525/elementa.237

Data Processing Description

Data went through internal lab QAQC process. The spreadsheet uses BDL for below detection limit.

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- nd (no data) was entered into all blank cells and NA cells.
- re-formatted date from m/d/yyyy HH:MM to yyyy-mm-ddTHHMM
- replaced spaces with underscores

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Related Publications

Buck, C. S., Landing, W. M., Resing, J. A., & Measures, C. I. (2010). The solubility and deposition of aerosol Fe and other trace elements in the North Atlantic Ocean: Observations from the A16N CLIVAR/CO2 repeat hydrography section. Marine Chemistry, 120(1-4), 57–70. doi:10.1016/j.marchem.2008.08.003
Methods

Ebling, A. M., & Landing, W. M. (2017). Trace elements in the sea surface microlayer: rapid responses to changes in aerosol deposition. Elem Sci Anth, 5(0), 42. doi:10.1525/elementa.237
Results

Morton, P. L., Landing, W. M., Hsu, S.-C., Milne, A., Aguilar-Islas, A. M., Baker, A. R., … Zamora, L. M. (2013). Methods for the sampling and analysis of marine aerosols: results from the 2008 GEOTRACES aerosol intercalibration experiment. Limnology and Oceanography: Methods, 11(2), 62–78. doi:10.4319/lom.2013.11.62
Methods

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Parameters

Parameter	Description	Units
sample_id	identifier for the sample	unitless
sample_type	type of sample collected (UHP_soluble = instantaneously leached from aerosol filter using ultra high purity (UHP >18 MΩ*cm pH = 6.0) water; total = total amount of certain trace element on aerosol filter)	unitless
replicate	identifier which specifies which replicate the sample is	unitless
deployment_time_UTC	date and time of deployment in YYYY-MM-DDTHH:MM:SS.SS format	unitless
recovery_time_UTC	date and time of recovery in YYYY-MM-DDTHH:MM:SS.SS format.	unitless
latitude	latitude coordinate of observations; positive values are north	decimal degrees
longitude	longitude coordinate of observations; negative values are east	decimal degrees
Li	concentration of lithium	micrograms per liter (ug/L)

Na	concentration of sodium	micrograms per liter (ug/L)
Mg	concentration of magnesium	micrograms per liter (ug/L)
Al	concentration of aluminum	micrograms per liter (ug/L)
Sc	concentration of scandium	micrograms per liter (ug/L)
Ti	concentration of titanium	micrograms per liter (ug/L)
V	concentration of vanadium	micrograms per liter (ug/L)
Cr	concentration of chromium	micrograms per liter (ug/L)
Mn	concentration of manganese	micrograms per liter (ug/L)
Fe	concentration of iron	micrograms per liter (ug/L)
Co	concentration of cobalt	micrograms per liter (ug/L)
Ni	concentration of nickel	micrograms per liter (ug/L)
Cu	concentration of copper	micrograms per liter (ug/L)
Zn	concentration of zinc	micrograms per liter (ug/L)
Ga	concentration of gallium	micrograms per liter (ug/L)
Rb	concentration of aluminum	micrograms per liter (ug/L)
Sr	concentration of aluminum	micrograms per liter (ug/L)
Y	concentration of aluminum	micrograms per liter (ug/L)

Zr	concentration of aluminum	micrograms per liter (ug/L)
Cd	concentration of aluminum	micrograms per liter (ug/L)
Sb	concentration of aluminum	micrograms per liter (ug/L)
Cs	concentration of aluminum	micrograms per liter (ug/L)
Ba	concentration of aluminum	micrograms per liter (ug/L)
Pb	concentration of lead	micrograms per liter (ug/L)
Th	concentration of aluminum	micrograms per liter (ug/L)
U	concentration of aluminum	micrograms per liter (ug/L)
year	four digit year when the data were collected	unitless

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Instruments

Dataset-specific Instrument Name	Aerosol_Sampler
Generic Instrument Name	Aerosol Sampler
Dataset-specific Description	A device that collects a sample of aerosol (dry particles) from the atmosphere. PI supplied instrument name: Aerosol Sampler Dataset-specific description: High-volume Tish Environmental (model 5170-VBL) 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 Scientific Element 2 HR-ICP-MS
Generic Instrument Name	Inductively Coupled Plasma Mass Spectrometer
Dataset-specific Description	All samples were analyzed on the Thermo Scientific Element 2 HR-ICP-MS.
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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Deployments

Lipp_2014-16

Website	https://www.bco-dmo.org/deployment/663738
Platform	Florida Keys National Marine Sanctuary
Start Date	2014-07-22
End Date	2015-05-09
Description	Microbial studies

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Project Information

Vibrio as a model microbe for opportunistic heterotrophic response to Saharan dust deposition events in marine waters (Vibrio-dust deposition)

Coverage: Florida Keys, FL, USA

Description from NSF award abstract:
Dust and mineral aerosols are a significant source of micro and macronutrients to oligotrophic ocean surface waters. Evidence is growing that heterotrophic microbes may play key roles in processing deposited minerals and nutrients. Yet it is not known which components of dust stimulate the heterotrophic bacteria, which cellular mechanisms are responsible for the utilization of those components and how the activity of these bacteria affect the availability and utilization of dust-derived minerals and nutrients by marine autotrophs. Knowledge of these factors is key to understanding how dust deposition impacts carbon cycles and for predicting the response of tropical oceans to future changes in the frequency and intensity of dust deposition events. The objective of this project is to examine the specific effects of aeolian dust on heterotrophic microbes in a tropical marine system under controlled conditions. The central hypothesis is that in oligotrophic tropical systems numerically minor opportunistic bacteria are the first responders to influx of dust constituents and respond primarily by rapidly accessing soluble trace metals and limiting nutrients that are deposited with Saharan dust. The project will focus on two specific aims: 1) Quantify changes in community structure, composition and transcriptional activity among marine microbial populations upon exposure to dust, and 2) Identify key components in Saharan dust aerosols that stimulate or repress growth and/or activity in Vibrio, a model opportunistic marine heterotrophic group. The study will use a series of controlled experiments designed to identify and quantify heterotrophic microbial response to dust deposition events using both natural communities and model bacteria (Vibrio) through metagenomics, transcriptomics and atmospheric and

marine biogeochemical techniques. This innovative approach will identify the most critical (reactive) components leached from dust aerosols on the microbial community as well as elucidate potential mechanisms of response.

There is great interest in the biological response to dust aerosols given its potentially large influence on biogeochemical cycling, but there has been relatively little work that has addressed the mechanisms of response (especially among the heterotrophic microbial fraction) or identified the relative importance of specific constituents of dust aerosols. A detailed framework for microbial response (focusing on opportunistic heterotrophs) will facilitate efforts to link autotrophic and heterotrophic processing. This contribution is significant because it will provide one of the first end-to-end (chemistry to physiology to ecology) mechanistic pathways for marine biological response to desert dust aerosols.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1357423

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