Sea surface microlayer trace element concentrations from Florida Keys National Marine Sanctuary from 2014-2015 (Vibrio-dust deposition project)

Website: https://www.bco-dmo.org/dataset/712453
Data Type: Other Field Results
Version: 1
Version Date: 2017-08-02

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

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Abstract
This dataset contains trace element concentrations from 2014 and 2015 in the sea surface microlayer and underlying water column for in-situ sampling in the from Florida Keys National Marine Sanctuary.

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Coverage

Spatial Extent: **N**:24.825832 **E**:-80.814262 **S**:24.550933 **W**:-81.454334
Temporal Extent: 2014-07-25 - 2015-05-09

Dataset Description

This dataset contains trace element concentrations from 2014 and 2015 in the sea surface microlayer and underlying water column for in-situ sampling.

Acquisition Description

Microlayer was sampled by a hollow quartz tube dipped vertically into the water column, then slowly pulled vertically out of the water and held over a funnel attached to a receiving bottle for the microlayer sample to drip off. This process was repeated until the desired volume of sample was collected. Corresponding water column samples were collected about 30 cm from the surface where a closed bottle was submerged underwater, opened, then closed again underwater to prevent mixing with the microlayer. Microlayer and water column samples were filtered within 1 hour after collection using 47 mm 0.2 um pore sized polycarbonate track-etched membrane filters by vacuum filtration.

Dissolved trace elements were analyzed by a cation exchange column method described in Milne et al. (2010). Reactive particulate trace elements were leached from the filters using a weak acid (acetic acid) and reducing agent (hydroxylamine hydrochloride) solution described in Berger et al. (2008). Refractory particulate trace elements were digested using a microwave digestion technique described in Ebling and Landing (2015). All samples were analyzed on the Thermo Scientific Element 2 HR-ICP-MS.

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

Berger, C. J. M., Lippiatt, S. M., Lawrence, M. G., & Bruland, K. W. (2008). Application of a chemical leach technique for estimating labile particulate aluminum, iron, and manganese in the Columbia River plume and coastal waters off Oregon and Washington. Journal of Geophysical Research, 113. doi:10.1029/2007jc004703 https://doi.org/10.1029/2007JC004703
Methods

Ebling, A. M., & Landing, W. M. (2015). Sampling and analysis of the sea surface microlayer for dissolved and particulate trace elements. Marine Chemistry, 177, 134–142. doi:10.1016/j.marchem.2015.03.012
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
General

Milne, A., Landing, W., Bizimis, M., & Morton, P. (2010). Determination of Mn, Fe, Co, Ni, Cu, Zn, Cd and Pb in seawater using high resolution magnetic sector inductively coupled mass spectrometry (HR-ICP-MS). Analytica Chimica Acta, 665(2), 200–207. doi:10.1016/j.aca.2010.03.027
Methods

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Parameters

Parameter	Description	Units
sample_id	identifier for the sample	unitless
sml_uwc	specific depth identifier (sml=surface microlayer; uwc=0.3m depth water column)	unitless
sample_type	type of sample collected (dissolved; reactive_particulate; refractory_particulate)	unitless
replicate	identifier which specifies which replicate the sample is	unitless
date_time_UTC	date sample was collected 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
Al	concentration of aluminum	micrograms per liter (ug/L)
Ti	concentration of titanium	micrograms per liter (ug/L)
V	concentration of vanadium	micrograms per liter (ug/L)
Mn	concentration of manganese	micrograms per liter (ug/L)
Fe	concentration of iron	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)
Pb	concentration of lead	micrograms per liter (ug/L)
year	four digit year when the data were collected	unitless

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Instruments

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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