Porewater H2S from a multi-core sample taken on R/V Hugh Sharp cruise HRS1709 in the Chesapeake Bay in August 2017

Website: https://www.bco-dmo.org/dataset/840754
Data Type: Cruise Results
Version: 1
Version Date: 2021-02-16

Project
» Collaborative Research: Transformations of soluble Mn(III) along horizontal and vertical oxygen gradients (Manganese3)

Contributors	Affiliation	Role
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Abstract
Porewater H2S from a multi-core sample taken on R/V Hugh Sharp cruise HRS1709 in the Chesapeake Bay in August 2017.

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Coverage

Spatial Extent: **Lat**:38.97805 **Lon**:-76.36735
Temporal Extent: 2017-08-06

Methods & Sampling

***In situ* pump profiler cast** refers to profiling with a pump profiler for O_2 and H_2S using solid state gold-amalgam electrodes for voltammetry (Luther et al, 2008; Analytical Instrument Systems DLK-60). Water was pumped aboard to make measurements on discrete samples for Mn and Fe speciation as well. See Hudson et al (2019) for more information.

H_2S
Sedimentary porewater H_2S methods (UV-Vis spectrophotometry) followed Luther et al. (2011).

Data Processing Description

Data Processing:
NM is used to indicate sensor not available or no measurement.

BCO-DMO Processing:
- converted date field to YYYY-MM-DD format;
- added date/time column in ISO8601 format (UTC/GMT);
- converted latitude and longitude to decimal degrees from degrees and decimal minutes.

[ ]

Data Files

File
porewater.csv (Comma Separated Values (.csv), 1.96 KB)   MD5:b2fbb0174ccb6b81279411f3ac609b91   Primary data file for dataset ID 840754

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Related Publications

Luther, G. W., Findlay, A. J., MacDonald, D. J., Owings, S. M., Hanson, T. E., Beinart, R. A., & Girguis, P. R. (2011). Thermodynamics and Kinetics of Sulfide Oxidation by Oxygen: A Look at Inorganically Controlled Reactions and Biologically Mediated Processes in the Environment. Frontiers in Microbiology, 2. doi:10.3389/fmicb.2011.00062
Methods

[ ]

Parameters

Parameter	Description	Units
cruise	Cruise identifier	unitless
cast	Cast number	unitless
sample	Sample number	unitless
date	Date of sample collection; format YYYY-mm-dd	unitless
local_time	Time of sample collection in the local time zone (US Eastern Daylight); format: hh:mm	unitless
ISO_DateTime_UTC	Date and time of sample collection (UTC/GMT) formatted to ISO8601 standard: YYYY-mm-ddTHH:MMZ	unitless
Latitude	Latitude in decimal degrees; positive values = North	degrees North
Longitude	Longitude in decimal degrees; negative value = West	degrees East
average_depth	Average depth of sediment porewater sample; filtered through 0.20 micrometer filters, sectioned and centrifuged in an argon filled glove bag	centimeters (cm)
H2S	H2S concentration	micromolar (uM)

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Instruments

Dataset-specific Instrument Name	AS-ALK2 Apollo Scitech
Generic Instrument Name	Automatic titrator
Generic Instrument Description	Instruments that incrementally add quantified aliquots of a reagent to a sample until the end-point of a chemical reaction is reached.

Dataset-specific Instrument Name	infrared CO2 analyzer (AS-C3, Apollo Scitech)
Generic Instrument Name	CO2 Analyzer
Generic Instrument Description	Measures atmospheric carbon dioxide (CO2) concentration.

Dataset-specific Instrument Name	In situ pump profiler
Generic Instrument Name	Pump
Dataset-specific Description	Profiling was conducted with a pump profiler for using solid state gold-amalgam electrodes for voltammetry (Luther et al, 2008; Analytical Instrument Systems DLK-60). See Hudson et al (2019), doi: 10.1016/j.talanta.2019.02.076.
Generic Instrument Description	A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groups according to the method they use to move the fluid: direct lift, displacement, and gravity pumps

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Deployments

HRS1709

Website	https://www.bco-dmo.org/deployment/840681
Platform	R/V Hugh R. Sharp
Start Date	2017-08-03
End Date	2017-08-10
Description	See more information from the Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/HRS1709GL Cruise DOI: 10.7284/907690

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Project Information

Collaborative Research: Transformations of soluble Mn(III) along horizontal and vertical oxygen gradients (Manganese3)

Coverage: Broadkill River wetland, the Chesapeake Bay, the Lower St. Lawrence Estuary, and of 9deg 50' N East Pacific Rise

NSF Award Abstract:
Manganese (Mn) is an important trace nutrient for biological growth in marine organisms. In the past, all Mn dissolved in seawater was thought to exist in only one chemical form: Mn(II). Recent work in waters and sediments with little or no oxygen has shown that Mn(III) can be the dominant form of dissolved Mn and can even be present in oxygenated water if attached to specific organic molecules called ligands. This research will further investigate these discoveries, aiming to quantify the chemical and microbiological processes responsible for Mn(III) cycling under varying oxygen concentrations. The research will compare field sites in the Broadkill River wetland, the Chesapeake Bay, and the Lower St. Lawrence Estuary; measuring the water column and sediments known to have strong oxygen gradients and different organic carbon sources that could change the availability and binding strength of ligands that would stabilize dissolved Mn(III). In some chemical forms, Mn tends to act like iron, so this research may have broader implications by helping marine chemists to understand more about iron cycling in similar oxygen gradients. With growing concerns over diminished oxygen concentrations (hypoxia) in the ocean, and particularly in coastal regions, understanding the reactions of Mn(III) with organic ligands across oxygen gradients could become important for understanding Mn availability to organisms. The project includes support for the participation and mentoring of one graduate student and two postdoctoral researchers, and there will be a U.S.-Canada collaboration. A

variety of public outreach activities are planned with a K-12 teacher to be selected as a participant on a research cruise.

Mn(III) has only recently been recognized as an important redox state for Mn in seawater. Previously, it was widely accepted that all Mn that passes through a 0.2 or 0.4 μm filter is dissolved Mn(II) while the retained portion is solid Mn(III, IV) oxide. Research in the Black Sea, the Baltic Sea, and the Chesapeake Bay has shown that soluble Mn(III) can be up to 100% of the dissolved Mn in the water column. Also, Mn(III) can exist as complexes with organic ligands in oxygenated seawater. This project will quantify and constrain the mechanisms surrounding weak and strong Mn(III) ligand transformations across vertical and horizontal oxygen gradients. Field sites to be studied include systems with a variety of organic carbon sources and oxygen dynamics: the Lower St. Lawrence Estuary, Chesapeake Bay, and Broadkill River wetland estuary. This research will continue to inform the fundamental shift that is taking place in our current understanding of Mn biogeochemistry in coastal systems. The results should also be applicable to redox processes involving Fe(III) ligand transformations, since Mn and Fe tend to exhibit similar redox chemistry under similar environmental conditions.

Funding