Amended Rolling Deck to Repository (R2R) event log application (ELOG) taken on the R/V Atlantis CliOMZ AT50-10 expedition from Golfito Costa Rica to San Diego USA that occurred in May - June of 2023

Website: https://www.bco-dmo.org/dataset/922260
Data Type: Cruise Results
Version: 1
Version Date: 2024-04-30

Project
» Collaborative Research: Underexplored Connections between Nitrogen and Trace Metal Cycling in Oxygen Minimum Zones Mediated by Metalloenzyme Inventories (CliOMZ)

Contributors	Affiliation	Role
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Abstract
This is the event log recorded during the CliOMZ AT50-10 research cruise using the Rolling Deck to Repository (R2R) event log application (ELOG). The expedition went from Golfito, Costa Rica to San Diego, USA and occurred in May - June of 2023. The log contains metadata associated with all scientific activities performed during the cruise. The Science party included members from WHOI, UCSB, UTGRV, and Clark University

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Coverage

Spatial Extent: **N**:32.7067 **E**:-83.167 **S**:-10.106 **W**:-120.279
Temporal Extent: 2023-05-02 - 2023-06-09

Methods & Sampling

Metadata for all cruise activities was recorded using the Rolling Deck to Repository (R2R) event log application (ELOG) during the cruise. Each activity was added to the ELOG platform either at the moment of activity or

retroactively with the correct date and time. Several cruise participants (described in the Authors column) participated with the addition of activities during the cruise.

Data Processing Description

Two McLane pump deployments were not added to the ELOG before the end of the cruise (McLane-20 and McLane-21), therefore, added manually after the "endCruise" cruise activity. Coordinates for those two activities were added based on the corresponding Clio deployment at the same station (CLIO049 and CLIO050 respectively).

BCO-DMO Processing Description

* Set NaN to blank
* Took out m out of seafloor depth column and added unit to parameter section
* Adjusted parameter names to comply with database requirements
* Capitalized cruise name
* Removed stn/station/Station from station column and added to parameter section

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Data Files

File
922260_v1_elog.csv (Comma Separated Values (.csv), 77.04 KB) MD5:4e87f00d21728cd8b51e692a9fd6740e Primary data file for dataset ID 922260, version 1

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Related Publications

Ritt., S. (2024). The ELOG Home Page Version 3.1.4. https://elog.psi.ch/elog/
Software

Rolling Deck to Repository (2018). Rolling Deck to Repository (R2R) Science Eventlogger. Accessed May 3rd, 2024 from https://www.rvdata.us/about/event-log
Software

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Parameters

Parameter	Description	Units
Message_ID	Log ID	unitless
Date	Date event was created	unitless
Event	Event identification number	unitless
R2R_Event	Event identification number generated by ELOG	unitless
Instrument	Instrument used for activity	unitless
Action	Begining of end of activity	unitless
Transect	Transect name	unitless
Station	Station number where activity was performed at	unitless
Cast	Cast number if applicable	unitless
Latitude	Latitude where activity was performed, south is negative	decimal degrees
Longitude	Longitude where activity was performed, west is negative	decimal degrees
Seafloor	Depth of seafloor	meter (m)
Author	Author of the logging of the event	unitless
Comment	Comments	unitless
Cruise	Cruise ID	unitless
dateTimeUTC	Event DateTime in format yyyymmdd.hhmm	unitless
GPS_Time	Event DateTime from GPS	unitless
dateTime8601	Event DateTime in ISO format	unitless
Revisions	Dates of event revisions	unitless

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	AUV Clio
Generic Instrument Description	Clio is an autonomous underwater vehicle (AUV) created to accomplish the dual goals of global ocean mapping and biochemistry sampling. The ability to sample dissolved and particulate seawater biochemistry across ocean basins while capturing fine-scale biogeochemical processes sets it apart from other AUVs. Clio is designed to efficiently and precisely move vertically through the ocean, drift laterally to observe water masses, and integrate with research vessel operations to map large horizontal scales up to a depth of 6,000 meters. More information is available at https://www2.whoi.edu/site/deepsubmergencelab/clio/

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Deployments

AT50-10

Website	https://www.bco-dmo.org/deployment/916122
Platform	R/V Atlantis
Report	https://www.rvdata.us/search/cruise/AT50-10
Start Date	2023-05-02
End Date	2023-06-09

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Project Information

Collaborative Research: Underexplored Connections between Nitrogen and Trace Metal Cycling in Oxygen Minimum Zones Mediated by Metalloenzyme Inventories (CliOMZ)

Coverage: Eastern Tropical Pacific

NSF abstract:
Though scarce and largely insoluble, trace metals are key components of sophisticated enzymes (protein molecules that speed up biochemical reactions) involved in biogeochemical cycles in the dark ocean (below 1000m). For example, metalloenzymes are involved in nearly every reaction in the nitrogen cycle. Yet, despite direct connections between trace metal and nitrogen cycles, the relationship between trace metal distributions and biological nitrogen cycling processes in the dark ocean have rarely been explored, likely due to the technical challenges associated with their study. Availability of the autonomous underwater vehicle (AUV) Clio, a sampling platform capable of collecting high-resolution vertical profile samples for biochemical and microbial measurements by large volume filtration of microbial particulate material, has overcome this challenge. Thus, this research project plans an interdisciplinary chemistry, biology, and engineering effort to test the hypothesis that certain chemical reactions, such as nitrite oxidation, could become limited by metal availability within the upper mesopelagic and that trace metal demands for nitrite-oxidizing bacteria may be increased under low oxygen conditions. Broader impacts of this study include the continued development and application of the Clio Biogeochemical AUV as a community resource by developing and testing its high-resolution and adaptive sampling capabilities. In addition, metaproteomic data will be deposited into the recently launched Ocean Protein Portal to allow oceanographers and the metals in biology community to examine the distribution of proteins and metalloenzymes in the ocean. Undergraduate students will be supported by this project at all three institutions, with an effort to recruit minority students. The proposed research will also be synergistic with the goals of early community-building efforts for a potential global scale microbial biogeochemistry program modeled after the success of the GEOTRACES program, provisionally called "Biogeoscapes: Ocean metabolism and nutrient cycles on a changing planet".

The proposed research project will test the following three hypotheses: (1) the microbial metalloenzyme distribution of the mesopelagic is spatially dynamic in response to environmental gradients in oxygen and trace metals, (2) nitrite oxidation in the Eastern Tropical Pacific Ocean can be limited by iron availability in the upper mesopelagic through an inability to complete biosynthesis of the microbial protein nitrite oxidoreductase, and (3) nitrite-oxidizing bacteria increase their metalloenzyme requirements at low oxygen, impacting the distribution of both dissolved and particulate metals within oxygen minimum zones. One of the challenges to characterizing the biogeochemistry of the mesopelagic ocean is an inability to effectively sample it. As a sampling platform, we will use the novel biogeochemical AUV Clio that enables high-resolution vertical profile samples for biochemical and microbial measurements by large volume filtration of microbial particulate material on a research expedition in the Eastern Tropical Pacific Ocean. Specific research activities will be orchestrated to test the hypotheses. Hypothesis 1 will be explored by comparison of hydrographic, microbial distributions, dissolved and particulate metal data, and metaproteomic results with profile samples collected by Clio. Hypothesis 2 will be tested by incubation experiments using 15NO2- oxidation rates on Clio-collected incubation samples. Hypothesis 3 will be tested by dividing targeted nitrite oxidoreductase protein copies by qPCR (quantitative polymerase chain reaction)-based nitrite oxidizing bacteria abundance (NOB) to determine if cellular copy number varies with oxygen distributions, and by metalloproteomic analyses of NOB cultures. The demonstration of trace metal limitation of remineralization processes, not just primary production, would transform our understanding of the role of metals in biogeochemical cycling and provide new ways with which to interpret sectional data of dissolved and particulate trace metal distributions in the ocean. The idea that

oxygen may play a previously underappreciated role in controlling trace metals due not just to metals' physical chemistry, but also from changing biological demand, will improve our ability to predict trace metal distributions in the face of decreasing ocean oxygen content.

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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1924554

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