mangrove_xas

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Project
» Carbon Storage in Mangrove Ecosystems via Abiotic Sulfurization (Mangroves OS)

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **Lat**:0 **Lon**:0

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Parameters

Parameters for this dataset have not yet been identified

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Project Information

Carbon Storage in Mangrove Ecosystems via Abiotic Sulfurization (Mangroves OS)

Website: http://ravennoiselab.com

Coverage: Floridian and Caribbean mangroves; Californian salt mashes

NSF Award Abstract:
Mangrove forest sediments are important hotspots of organic carbon preservation, and they have the potential to sequester substantial amounts of atmospheric CO2. Currently, however, is it not fully understood why these environments are able to bury so much organic carbon, or how they will respond to future changes in sea level, land use, and climate. This project will investigate a mechanism that may help explain this carbon burial: organic matter sulfurization, the transformation and effective ‘pickling’ of sedimentary organic matter by sulfide. Its central aim is to understand what controls the extent of sulfurization in mangrove sediments, and to estimate the contribution of organic matter sulfurization to sediment carbon storage in different parts of the environment. By providing some of the first constraints on how, when, and where organic matter sulfurization happens in mangroves, the results of this work will guide decisionmakers managing coastal watersheds and carbon stocks in the face of land use, climate and sea level change. As part of this work, four undergraduate students and one PhD student at UC Santa Barbara will gain field and research experience. And, in collaboration with local groups associated with the field site, the team will produce a season of ‘Ocean Solutions’ podcast episodes related to conservation and human impacts of Caribbean mangroves.

The overarching goal of this project is to understand how microbial sulfur cycling affects organic matter preservation in vegetated coastal sediments, which have substantial leverage to impact the global carbon cycle on decadal to millennial timescales. It specifically investigates organic matter sulfurization, which can transform fresh, easily respired organic matter into recalcitrant, polymerized carbon stocks with long-term preservation potential. Although organic matter sulfurization is known to occur in mangrove sediments, the scale of its impact is essentially unknown. A pair of field expeditions will be conducted at a mangrove forest on the southwestern coast of Florida. In the first field season, geochemical profiles will be used to quantify organic matter sulfurization in sediments and its relationships with carbon storage, iron mineralogy, and the characteristics of sedimentary organic matter inputs. In the second field season, cyclic voltammetry will be used to target redox dynamics at the millimeter scale. Laboratory experiments will be conducted to test the susceptibility of various local organic matter sources to sulfurization and characterize their sulfurized forms. Throughout, the project applies a holistic approach to sedimentary organic matter by characterizing the dissolved, lipid, protein/carbohydrate, and proto-kerogen pools with isotopic and spectroscopic techniques. This work will yield a first quantitative, mechanistic framework for predicting the extent of organic matter sulfurization in coastal vegetated habitats and its likely response to changes in ecology, land use, or sea level.

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 Earth Sciences (NSF EAR)	EAR-2053163

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