

Oceanography Seminar

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“On the origin of “species”: The importance of Mn speciation in seawater”

Manganese (Mn) is ubiquitous in the marine environment, where it cycles between three oxidation states: II, III and IV. It is well known as an essential trace nutrient in the electron transfer processes of several metallo-enzymes, notably in photosystem II for photosynthetic organisms. Our knowledge of the importance of Mn as a key player in marine biogeochemical cycling is expanding with the emergence of its role in organic matter decomposition, as an antioxidant, and as a mediator of other elemental cycles (C, N, O, I, Fe, Co, Zn, Ni, Cu, to name a few). Until recently, only the distinction between solid and soluble phase was considered for Mn in seawater. However, we now know that the reactivity and bioavailability of Mn - and most bioactive elements - is intimately tied to its chemical speciation: its oxidation state and binding environment. I will touch on the distribution and reactivity of diverse Mn "species" in a range of marine systems: vent sites, oxic-anoxic transition zones, estuarine gradients, sediment-water interfaces, and at ice edge sites in the Ross sea. Across these diverse ecosystems, the redox cycle of Mn is highly variable, and affects many other coupled cycles. For example, in the Ross Sea, we find that Mn is not completely oxidized to Mn oxides, resulting in a dramatically different cobalt distribution in the Ross Sea than at other oceanic sites. We find that the formation of different Mn species depends on the oxidative capacity of a system, the nature and abundance of organic metal binding molecules, and the microbial community composition and functional capability. As such, simple speciation models that only consider particulate versus soluble Mn are not sufficient to describe the potential reactivity of Mn in a given system, and our newfound knowledge of diverse Mn species has changed the current view of oceanic redox landscapes.

Thursday February 14th, 2019 12:00p.m.

C-MORE Hale: Moore Conference Room

*The speaker is a candidate for a faculty position in the Department of Oceanography.