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Reactivity and Cycling of Trace-Metals in Marine Sediments

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Despite their relatively low abundance in marine sediments, iron and manganese minerals, through coupled sorption and redox, exert a primary control on the reactivity and cycling of trace metals in the marine environment. Directly, these often transient minerals impart a first order control on the concentration and stable isotope composition of metals in seawater, including bioessential nickel and copper. Indirectly, as a result of mineral promoted preservation of organic carbon, these phases present an important but little understood link between the Earth's major and trace element cycles.

In order to quantify the role of iron and manganese minerals in global element cycles, it is necessary to understand their sorption and redox processes at the molecular level, because the precise mechanism by which trace metals are sequestered can determine sediment-seawater exchange, and can induce significant metal stable isotope fractionation, thought to control modern seawater composition for a number of micronutrients. This presentation will discuss several current research projects, where understanding the complex interplay between ferromanganese minerals and trace metals at the molecular level has shed new light on global element cycles.

