Oceanography Seminar

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"A breath of fresh air: Geochemical constraints on the rise of atmospheric oxygen"

A host of available geochemical and geological evidences are now indicating that changes in marine metal reservoirs were caused not only by geological events and the long-term cooling of the Earth's mantle, but also by the rise and fall of specific microbial metabolisms over billions of years. This paradigm shift has profound implications for understanding biological and Earth system co-evolution, particularly with respect to ocean redox, carbon cycling, and the regulation of climate over geological time scales. Perhaps the time period in the Earth's history that witnessed the most dramatic changes in ocean metal reservoirs is the Proterozoic (2500 to 543 million years ago), when the atmosphere and ocean first became oxygenated. Under these conditions, biologically important trace metals would have been scarce in most marine environments because many are characterized by low solubility in low-oxygen environments while others are highly reactive toward dissolved oxygen and iron sulfide minerals. Likewise, dramatic shifts in the availability of key metal micronutrients in seawater, such as Fe, Mo, Cu, Ni and Zn, likely shaped the evolution of life in marine environments.
Here, I'll discuss how stable isotope geochemistry may provide unique constraints on the evolution of metal and nutrient oceanic cycles through the Precambrian and how such changes may be linked to the evolution of life and the redox state of the atmosphere/ocean system and *vice-versa*.

Suggested reading:

http://www.soest.hawaii.edu/oceanography/faculty/rouxel/publications/13_Anbar,2007.pdf

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