Sleuthing the Bioavailability of Particulate Iron in the Ocean

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Iron is the primary limiting nutrient for primary productivity in about a third of the world's oceans, so understanding its sources and bioavailability are critical to understanding carbon cycling in the ocean. Particulate iron is a significant fraction of the total iron pool in the ocean, usually accounting for at least a third and often the majority of the total iron pool. Most iron studies to date have focused on the dissolved iron fraction, but studying the particulate iron fraction has the advantage of providing insight on its source through its mineralogy. Here I discuss results from using synchrotron x-ray techniques to determine the chemical speciation of marine particulate iron in different ocean basins. We find that not all marine particulate iron is created equal: for example, the iron-limited Western Subarctic Pacific has much more iron(II)-bearing minerals than the North Atlantic. Furthermore, the iron(II)-bearing minerals in the Pacific are tied to a volcanic continental margin source. I'll also discuss results from recent experiments testing the bioavailability of different iron-bearing minerals in the iron-limited Southern Ocean.