Statement of Interest – Partic Fe Isotopes
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GEOTRACES Pacific section Peru-Tahiti

Proposed measurements:

I propose to measure stable Fe isotope composition ($\delta^{56/54}$Fe) of particulate matter in the surface and deep waters. In addition, I will consider measuring Fe isotopes of total dissolvable Fe in water samples. Due to analytical limitations (no direct access to a MC-ICP-MS at my home institution), it is unlikely that I would consider measuring dissolved Fe isotopes.

In addition to Fe isotopes, I would also be interested in the isotope variations of U ($\delta^{238/235}$U) as a pseudo-stable isotope system, as well as Mo ($\delta^{98/95}$Mo) stable isotopes. This could be done on the same samples.

Nature of work:

For most efficient sample collection, I will propose to use *in situ* pumps (McLane or Jim Bishop's MULVS system). In accordance with GEOTRACES protocol, particles are collected onto Supor 0.8µM filter membranes for bulk isotope composition, or QMA quartz filters for extraction of reactive Fe phases and associated trace metals. As an alternative, samples can also be collected by membrane filtration from GO FLO bottles (using Rob Sherrell's method). After collection filters can be either dried on board or frozen at -10°C. Filter membranes from *in situ* pumps can be shared.

Justification:

Iron as an essential micronutrient is one of the core elements to be measured on each GEOTRACES ocean sections. While stable Fe isotopes are not part of the suit of core measurements, they can be instrumental in understanding the sources and internal cycling processes of Fe in the ocean.

Particulate Fe that is deposited in coastal sediments may undergo redox recycling that increases its bioavailability and re-introduces Fe into the bottom water in dissolved and particulate form. This process produces a distinct isotope signature that may be used to trace benthic Fe efflux as it is transferred from the ocean margin into the ocean's interior. The intensity of this benthic Fe source is amplified under low oxygen conditions, such as they occur in the Oxygen Minimum Zone (OMZ) off Peru. Together with colleagues I am currently investigating the isotopic imprint of this benthic Fe release in the sediments along a transect through the Peru OMZ. Investigation of the water column particulate Fe isotope composition as part of GEOTRACES would make an excellent complement to this ongoing sedimentary study.

Another potentially important Fe source to the equatorial Pacific ocean is the hydrothermal release of Fe from the East Pacific Rise (EPR). Previous studies in several hydrothermal systems suggest that Fe that is dispersed in hydrothermal plumes has an isotope composition that is distinct from coastal benthic sources. The planned transect through the Peru OMZ and the EPR hydrothermal plumes would provide an ideal opportunity to directly compare the isotope signature of these two Fe sources.