Statement of Interest: Fe, Mn, Al and Particulate matter composition.

Joseph Resing

I plan to measure Mn and Fe in real time on all discrete trace element samples. Fe and/or Mn will are tracers of the mobilization of metals during sediment diagenesis and re-suspension along the Peru Margin especially in areas of oxygen depletion. Fe and Mn are also excellent tracers of near-field hydrothermal activity. These two real time measurements should help us understand if we are observing the chemical dynamics expected in each of these regions. I am also interested in determining the bulk chemical composition of particulate matter by XRF in order to better understand the fate and transport Fe produced in these two regions.

I would require 1-2 berths to accomplish this task. I would need one 125mL filtered sample and one 125mL whole water sample. I am happy to collaborate with other PIs interested in collecting samples for shore-based analysis.

Other interests and possible contributions:

- I would be willing to conduct real-time Al analysis as well to insure the highest quality Al-measurements.

Rationale

Diagenetic mobilization of metals has the potential to contribute significant amounts of trace elements from the ocean margins to their interiors. A transect across a zone of oxygen depletion along the margin provides an excellent opportunity to examine this process and will help address the budgets of Fe and Mn in the oceans. Although oxygen and Eh sensors should readily identify zones of oxygen depletion and the presence of reduced chemical species, real time analysis will provide immediate feedback on the impact of these regions to the trace element budget.

There have been recent suggestions that hydrothermal Fe is stabilized within carbon-rich matrices (Toner et al., 2009), as dissolved complexes(Bennett et al., 2008), and as nanoparticulate Fe-sulfides (Yücel, Gartman, Chan, & Luther, 2011). These forms of stabilization might allow hydrothermal Fe to be transported great distances in the oceans. It is unlikely that any of our CTD-sensors will track hydrothermal plumes beyond ~10 km of the ridge crest. Hydrothermal Fe, however should be able to be tracked much further, for instance, Fe from Loihi submarine volcano has been implicated in a mid-depth maximum in Fe observed >450km away at Station Aloha (Boyle, Bergquist, Kayser, & Mahowald, 2005). The well-documented plume of ^{3}He that transits westward into the ocean interior makes the east-west pacific section ideally suited to study the fate and transport of hydrothermal Fe. While it seems unlikely that we can trace this Fe the entire length of the transect, it does seem that we may be able to track the hydrothermal Fe for a significant distance from the ridge crest.