USGS NSF GRIP, GSP Opportunity

Point of Contact Name:	John Crusius
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USGS Center:	Alaska Science Center (Seattle)
Project Title:	Examining sediment redox control of the flux of the micronutrient iron (Fe) to northern Gulf of Alaska surface waters
Summary:	Redox-induced release of the micronutrient iron (Fe) from shelf sediments is likely to be enhanced in the northern Gulf of Alaska under conditions of water-column stratification, which reduces sediment exposure to oxygen. Stratification is likely in response to future warming or glacier melting. This project will examine redox-induced Fe release and yield a comparison for future periods of stratification.
Project Hypothesis or Objectives:	Iron (Fe) is an essential micronutrient that limits biological productivity in much of the Gulf of Alaska. Recent work points to both sediment resuspension and glacial meltwater as important Fe sources. An additional possible Fe source is a flux of Fe from shelf sediments under chemically reducing conditions. This source is likely to be enhanced under conditions of water column stratification, in response to future surface water warming, or freshening in response to glacier melting or increased wintertime precipitation falling as rain. This project will examine redox-induced Fe release by studying Al, Fe and Mn in existing samples from shelf-spanning transects collected during winter, spring and summer. Because Mn and Fe are released under chemically reducing conditions, while Al is not, these samples will allow evaluating the seasonal and spatial variability of this sediment “redox” flux of Fe. It will also provide a valuable comparison for future periods of stratification.
Duration:	Up to 12 months
Internship Location:	Seattle, WA

Field(s) of Study:	Chemistry, Geoscience, Life Science
Applicable NSF Division:	EAR Earth Sciences, OCE Ocean Sciences
Intern Type Preference:	Either Type of Intern
Keywords:	Nutrient, trace element, oceanography, climate change, glacier
Expected Outcome:	The project will expose the intern to the field of chemical oceanography, to nutrient cycling in the Gulf of Alaska and to state-of-the-art analytical techniques. The USGS will benefit by improving understanding of the processes that control nutrient cycling in the Northern Gulf of Alaska, a region that contains immensely valuable fisheries and is vulnerable to climate change in response to both surface water warming, glacier melting, and a shift from wintertime snow to rainfall.
Special skills/training Required:	The student would need experience with laboratory analytical techniques and, ideally, experience analyzing seawater samples for trace metals in a “clean lab." Considerable care is required with the analysis, because samples are easily contaminated and cannot be replaced.
Duties/Responsibilities:	Analyze an existing set of water samples for Mn, Fe and Al. I have sets of samples collected in late winter, spring and summer, which allow an examination of both spatial and seasonal control of the key processes. This includes the only set of samples that I know of that were collected in the spring and therefore capture the late-winter conditions that set the stage for the spring phytoplankton bloom. The analytical approaches could include a new Finnigan Element 2 inductively coupled plasma mass spectrometer (icp-ms) located at UW Oceanography that Crusius has access to.