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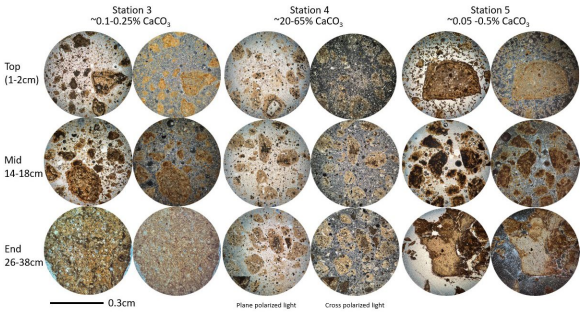

Surface complexation modeling (SCMs) of rare earth elements (REEs) benthic flux in the central Pacific Basin using kinetic batch adsorption experiments.

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The rare earth elements (REEs or lanthanides) are the Group 3 transition metals that consists of the 15 elements that follow lanthanum (La) to lutetium (Lu) and may include scandium (Sc), and yttrium (Y) due to exhibiting similar chemical properties as the lanthanides (may be called REY if Y is included). The lanthanides are of importance in the oceans because of their use in paleoceanography and climate data in part due to their unique chemical properties (e.g., uniform (+III) oxidation state), which are potentially powerful chemical tracers. The REEs chemical behavior in the oceans are reactive and exhibit nutrient-like profiles. They are scavenged from surface waters on to Fe/Mn and organic particles (e.g., fecal pellets). These particles settle and undergo bacterial degradation at depth, leading to higher concentrations of REEs in deep waters. Therefore, to develop a better understanding of how REEs behave during diagenesis of deep-sea, pelagic sediments, with the overall goal of addressing the hypothesis that a benthic flux of REEs from such sediments is a major source of REEs to the deep Ocean. 1) We present a surface complexation model (SCM) relevant to REEs in deep sea sediments and porewaters. 2) Present the results from series of batch experiments with known dissolved REE concentrations and suspended slurries of deep-sea sediments collected from the central Pacific Ocean and synthetic goethite (α-FeOOH). 3) Determine and interpret the adsorption edges (i.e., adsorption behavior as a function of pH) and adsorption isotherms (function of REE concentrations). 4) Write mass action reactions for the adsorption reactions for each REE onto three different deep-sea sediments substrates and α-FeOOH. 5) Fit the adsorption edge data to a general two-layer model using FITEQL 4.0, and RStudio packages GEMSFIT and CHNOSZ. 6) Lastly SCM models will then be linked to the 1-D advective diffusion code, X1t provided with Geochemists Workbench® (GWB) to simulate the porewater REE profiles in each sediment core from the deep Pacific. 7) Additionally, WHAM model VI REE organic metal ions complexation constants will be used to update the GWB database for a more robust data set to test REE in natural environments.