

Characterizing the reversibility of ligand-mediated adsorption of iron onto ferrihydrite particles

VINICIUS J. AMARAL*, KRISTEN N. BUCK*, PHOEBE J. LAM†

†University of California Santa Cruz, Santa Cruz, CA 95064, USA (*correspondence: vamaral@ucsc.edu, pjlam@ucsc.edu)

‡University of South Florida, St. Petersburg, FL 33701, USA (kristenbuck@usf.edu)

Iron is the most widely-studied trace metal in the ocean due its importance in global biogeochemical cycles. Model studies have estimated that hydrothermal vents represent a source of one-quarter to one-third of total dissolved iron input in the marine environment [1]. However, the processes that control the retention and partitioning of hydrothermally-sourced dissolved iron into the particulate phase remains poorly constrained.

During the GP16 GEOTRACES cruise, it was observed that as the hydrothermal plume off of the Southern East Pacific Rise (SEPR) is advected laterally, there is a sinking of both the particulate and dissolved iron phases [2]. The prevailing hypothesis from this study is that as iron-bearing particulates travel downplume, marine organic ligands facilitate adsorption and subsequent desorption of dissolved iron onto these particles while they sink, thus allowing for the coincident sinking of dissolved iron. The aim of this study is to test this hypothesis with laboratory experiments.

Synchrotron spectroscopy measurements of near-field particles from the SEPR show that ferrihydrite-like phases dominate particle composition [3]. Thus, ferrihydrite was synthesized to serve as a model hydrothermal particle. Suwannee River Fulvic Acid (SRFA) and Desferrioxamine B (DFB) were chosen to represent weak and strong marine ligands, respectively. Here, we present the results of inductively coupled plasma mass spectrometry (ICP-MS) and competitive ligand exchange–adsorptive cathodic stripping voltammetry analysis from a set of experiments that test the extent of scavenging of organic ligands by ferrihydrite, the extent of scavenging of ligand-bound iron by ferrihydrite, and the extent of desorption of ligand-bound iron from ferrihydrite. These results aid in characterizing the degree of reversibility of ligand-mediated adsorption of dissolved iron onto hydrothermal iron-bearing particles.

[1] Tagliabue *et al.* (2014) *Geophys. Res. Lett.* **41**, 920-926.

[2] Fitzsimmons *et al.* (2017) *Nat. Geosci.* **10**, 195-201. [3]

Hoffman *et al.* (2018, in press) *Mar. Chem.*