Please ensure that your abstract fits into one column on one page and complies with the *Instructions to Authors* available from the Abstract Submission web page.

Rare earth element cycling across the chemocline of the Pettaquamscutt River estuary, Rhode Island

SEGUN B. ADEBAYO[1], MINMING CUI[1, 2], ROGER P. KELLY[3], OMOLOLA AKINTOMIDE[1], AND KAREN H. JOHANNESSON[1*]

[1]Department of Earth and Environmental Sciences, Tulane University, New Orleans, LA, USA, kjohanne@tulane.edu (*presenting author)

[2]Department of Earth and Planetary Sciences, Johns Hopkins University, Baltimore, MD, USA

[3] Graduate School of Oceanography, University of Rhode Island, Narragansett, RI, USA

Rare earth elements (REEs) concentrations were measured across the chemocline in a highly stratified estuary with permanent euxinic bottom waters (i.e., ΣS^{-II} up to ca. 4 mM). The REEs concentrations decrease with depth in the oxic waters above the chemocline, but exhibit dramatic increases in concentration through the chemocline, corresponding with substantial increases in dissolved iron [total dissolved Fe and Fe(II)] and manganese (Mn) concentrations. For example, the mean ± 1σ neodymium (Nd) concentration in the oxic surface water is 0.51 ± 0.18 nmol kg^{-1}, but increases by a factor of nearly 5 across the chemocline reaching values as high as 2.47 nmol kg^{-1} at a depth of 7.4 m. Total Fe concentration increases from 0.3 ± 0.2 µmol kg^{-1} in the oxic surface waters to 3.4 µmol kg^{-1} within the chemocline, or by a factor of ca. 11, before decreasing to 0.4 µmol kg^{-1} at depth in the euxinic bottom waters. The decrease in Fe concentration in the euxinic bottom waters reflects precipitation of Fe-sulfide minerals (e.g., pyrite) within the water column [1], which does not affect the REEs. Manganese concentrations increased from 1.2 ± 0.36 µmol kg^{-1} in the oxic surface waters to 5.7 µmol kg^{-1} within the chemocline (nearly 5-fold increase), before decreasing to 3.4 µmol kg^{-1} in the euxinic waters. Geochemical modeling suggests REE removal from solution reflects precipitation of authigenic REE-phosphate phases. Negative Ce anomalies characterize waters of the entire water column, indicating that these anomalies can persist even in highly euxinic waters. Accordingly, processes that produce negative Ce anomalies in natural waters are more complex than simply oxidation of Ce(III) to Ce(IV) and subsequent removal from solution as, for example, cerianite (CeO_2). Our results may have consequences for the application of Ce anomalies as paleo-redox indicators.

[1] Wilkins and Barnes (1997) *Am. J. Sci*. **297**, 620.

This abstract is too long to be accepted for publication. Please revise it so that it fits into the column on one page.