Determining the significance of the rare earth element geochemistry of modern marine stromatolites

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Recent studies have suggested that rare earth element (REY) geochemistry can be used to constrain depostional settings, and to differentiate laminated stromatolitic sediments precipitated by microbial communities from those accreted by trapping and binding. However, there is debate if stromatolites actually preserve the REY geochemistry of the seawater in which the carbonate was precipitated, and if stromatolites can serve as archives of the REY geochemistry of the oceans throughout geologic time. Conflicting results call for an evaluation of the significance of REY geochemistry in modern marine stromatolites from a variety of depositional environments.

We will present our work characterizing the REY geochemistry of modern marine waters, sediments, and stromatolites from the hypersaline environment of Hamelin Pool, Western Australia and the subtidal, open marine environment of the Exumas, Bahamas. These new datasets will be used to determine whether modern stromatolites record the REY geochemistry of contemporaneous seawater, or if there is a quantifiable microbial fractionation of rare earth elements during precipitation of stromatolite carbonate. This evaluation will be the first step in determining whether stromatolites represent a high-fidelity proxy of REY geochemistry of seawater or not, and will aid in defining their utility in reconstructions of redox conditions throughout geological time.