Examining Ba/Ca, Y/Ca, rare earth elements as proxies for terrestrial runoff in the Great Barrier Reef

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Corals can record ambient seawater environment in which they grow by the incorporation of seawater trace metals into their skeletons. Ba/Ca, Y/Ca, and rare earth elements (REEs) in coral skeletons are well documented to track sediment flux in coastal waters. In the past century, increased sediment loads from human activities have been a big threat to the Great Barrier Reef (GBR) ecosystem. Due to the lack of continuous records for river discharge and seawater quality, use of coral skeletons to reconstruct long-term spatial and temporal coastal changes becomes critical. In this study, century-long *Porites* corals were collected from Gladstone Harbour and Whitsunday Islands in 2017 and 2018 to trace past environmental changes. Studied sites were selected to cover a wide latitudinal range and to compare two unique coastal conditions (human activity affected vs pristine environment). Elemental ratios (Ba/Ca, Y/Ca, La/Ca, Ce/Ca) were measured using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) at weekly resolution. Variations of coral Ba/Ca, Y/Ca, and REEs were compared to local river discharge records in order to provide new insights into past ocean and climate events when instrumental records were not available. Preliminary results show major fluctuations of Ba/Ca, Y/Ca and REEs were well correlated to historic discharge records or dredging events. In addition, clear Ba seasonal cycling were preserved in corals from Hummock island, Masthead island and Whitsunday island which may not be simply associated with river discharge. Instead, temperature-dependant incorporation of Ba and biogeochemical cycling of Ba in ambient seawater may play a role. Further, we will compare Ba/Ca to luminescence bands to unveil the distinctive Ba signatures in coral skeletons. The correlation between coral-based proxies and river discharge records can be used to reconstruct environmental changes in the pre-instrumental era.