Establishing a Coral Ba/Ca Time-series Network to Study Regional River Discharge in the Gulf of Chiriquí, Panamá

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Panamá's hydroclimate is defined by the extreme conditions of its wet and dry seasons, due to the annual migration of the Intertropical Convergence Zone (ITCZ). Regional river discharge (Q) covaries with the ITCZ-driven precipitation, both reaching maxima in September or October each year. Drought and flooding both occur on interannual timescales that can negatively affect the operation of the Panamá canal. River Q data from the region is very sparse and only covers recent years, prohibiting the quantitative evaluation of long-term changes in Panamanian hydroclimate using just instrumental data. Wet season increases in rainfall and river Q result a greater flux of terrestrial barium (Ba) into surface ocean waters in the region. Since massive reef corals incorporate seawater Ba into their skeletons, temporal changes in coral Ba/Ca can provide a tracer of past changes in river Q. The Gulf of Chiriquí, along the Pacific coast of Panamá, is characterized by stable sea surface temperatures and a distinct lack of seasonal coastal upwelling, making it an ideal location to study the coral Ba/Ca-river Q proxy. In this study, we compare preliminary Ba/Ca records from two *Porites lobata* corals, one off of Coiba Island (IC4A-2) and one off of Secas Island (S1), on opposite sides of the Gulf (approximately 74km apart). By analyzing and comparing two different corals of the same species, we hope to gain a more robust record of the hydroclimate of the area. We analyzed 1-mm scale hand-drilled samples using ICP-OES and updated the age model for IC4A-2 (previously published in Brenner et al., 2017). The two coral time series overlap with each other from October 1955-April 1983 and with river Q data from Rio Tabasara and Rio Fonseca from January 1971-April 1983. The Ba/Ca records in S1 and IC4A-2 are strongly correlated ($r = 0.73$) and yield statistically indistinguishable average annual amplitudes. We then averaged the two records to create a composite coral Ba/Ca record and calculated a Reduced Major Axis linear regression relating the Ba/Ca to river Q, resulting in a calibration equation of Ba/Ca (μmol/mol) = 0.0104 Q (m^3/s) + 4.480 ($r^2 = 0.85$). With further development, this network and calibration can be used to identify atypical hydroclimate around Panamá, providing deeper insight into the temporal patterns of drought.