Geophysical Research Abstracts
Vol. 20, EGU2018-19265, 2018
EGU General Assembly 2018

Medieval Climate Anomaly hydroclimatic variation inferred from Aitutaki corals

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Limited paleoclimate observations over the past millennium make it difficult to test if changes in the amplitude and frequency of El Nino-Southern Oscillation (ENSO) over time are the result of external radiative forcing or arise as unforced variation of the coupled ocean-atmosphere system. To address this question, we analyzed new and existing paired oxygen isotopic and Sr/Ca data from corals collected at Aitutaki and Rarotonga, southern Cook Islands, in the southwestern tropical Pacific. Forward modelling of the paired isotopic and Sr/Ca data during the modern period (1850-2013) suggests this location is sensitive to interannual variations in seawater oxygen isotopic composition, arising from regional precipitation variations, which are in turn associated with movement of the South Pacific Convergence Zone (SPCZ) and ENSO activity. Initial analysis of diagenetically screened fossil coral samples, radiometrically dated to the Medieval Climate Anomaly (MCA) period, suggest that interannual seawater isotopic variations were no different from present day. Together with decadal timescale periods suggestive of warmer/wetter and cooler/drier conditions, and a transition from an earlier, warmer/wetter MCA to a later, cooler/drier MCA, these results suggest a highly variable MCA period relative to the modern period, and the potential for unforced variations in ENSO to be substantial.