Mechanisms of tropical hydroclimate change during the late Quaternary: New frontiers at the intersection of proxies, models, and observations

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How did glacial climate forcings affect the tropical water cycle? What was the tropical hydroclimate response to global temperature swings of the past millennium? The $\delta^{18}O$ and δD of speleothems, sedimentary biomarkers, corals, ice cores, and other archives are excellently poised to answer these questions due to their ubiquitousness in the geologic record, and their sensitivity to regional, more than local, hydroclimate processes. However, proxies from the tropics often disagree on the sign and magnitude of changes in precipitation vs. $\delta^{18}O_{precip}$ and δD_{precip} during key time periods of the Quaternary, making it difficult to discern teleconnections or forcing-specific responses. This presentation will discuss recent progress in blending water isotope proxies from multiple archives during the Last Glacial Maximum (LGM) and the past millennium, and interpreting these data using modern observations and isotope-enabled climate model simulations. Model, proxy, and observational results will be integrated to assess the stable O- and H-isotopic "fingerprints" of individual climate forcings on the tropical water cycle. Differences between these isotopic fingerprints and more traditional proxies for precipitation amount are leveraged in order to better understand the mechanisms of hydroclimate change in the tropics.