

Variation in the Strength of the Central American Monsoon during the Holocene from speleothem proxy

Matthew S. Lachniet, Smithsonian Tropical Research Institute, Panama

William P. Patterson, University of Saskatchewan

Stephen J. Burns, University of Massachusetts, Amherst, Massachusetts

Geoffrey O. Seltzer, Syracuse University, Syracuse, New York.

Yemane Asmerom, University of New Mexico, Albuquerque, New Mexico

Victor Polyak, University of New Mexico, Albuquerque, New Mexico

Dolores Piperno, Smithsonian Tropical Research Institute, Panama.

Key words: Paleoclimate, speleothems, stable isotopes, Central America, monsoon, Intertropical Convergence Zone, tropics, U-series disequilibrium.

We are investigating the Holocene history of the Intertropical Convergence Zone (ITCZ) and the Central American Monsoon system based on stable isotopic time series of Panamanian and Costa Rican speleothems. Stalagmite chronologies are constrained by U-series disequilibrium dates and indicate stalagmite growth spanning several intervals during the past 8.6 kyr BP. Interpretation of stalagmite $\delta^{18}\text{O}$ profiles is aided by study of the modern controls affecting the spatial and temporal variability of stable isotope values of tropical surface water and precipitation. We collected ~ 230 surface water samples from the Darien Gap to Lake Nicaragua and the Caribbean Sea to the Pacific Ocean to constrain spatial variation of $\delta^{18}\text{O}$ along climatic gradients. Analysis of temporal variability in stable isotope values in precipitation from stations in Panama and Costa Rica, collected by the Global Network for Isotopes in Precipitation, indicates that $\delta^{18}\text{O}$ values display an inverse relationship to rainfall amount. In the stalagmite record, the early Holocene is characterized by highest $\delta^{18}\text{O}$ values, interpreted as dryer conditions related to a weaker monsoon system compared to the mid-Holocene. A stalagmite from the Caribbean Slope of Panama indicates a trend to higher $\delta^{18}\text{O}$ values to the present, consistent with decreasing rainfall observed in meteorological records over the last century. Cyclical $\delta^{18}\text{O}$ variability on decadal to centennial time scales indicates changes in the strength of the Central American Monsoon.