δD Precipitation Record from Laguna Blanca, Venezuela over the past 11,000 Years: Not So Black and White

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The initial aim was to reconstruct isotope records of precipitation and lake evaporation over the past 11,000 years in northern South American to better constrain how solar insolation and ENSO have affected the tropics over the Holocene. Laguna Blanca is a small, closed-basin lake in the Venezuelan Andes located at 8°20'N, 1620 m above sea level, ideal for reconstructing a δD precipitation record, at first glance. The record generated was to be compared with other climate records in the Southern Hemisphere to determine whether variations in solar insolation (out-of-phase) or El Niño (in-phase) were the dominant control on climate variability. However, complications arose with the accepted method of interpreting the δD proxy. Prior research has relied upon the assumption that long-chain fatty acids act as a recorder of precipitation and mid- and short-chain fatty acids act as recorders of lake water isotopic composition. The Laguna Blanca record suggests these assumptions may produce misleading conclusions in some locations. The C/N ratio through the Holocene fluctuates from low, to high, to low, suggesting the early and late Holocene goes through lake phases with more aquatic input, while the middle Holocene goes through a wetland phase with more woody, terrestrial input. The concentrations of the long-chain fatty acids are not consistent with the C/N ratio findings. δD of the C28:0 and C32:0 long-chain fatty acids track each other throughout the mid-Holocene but diverge at the beginning and end of the Holocene. This suggests there are aquatic sources producing long-chain fatty acids during the lake phase, and the proxy is not only recording a precipitation signal.