CCG20

Late Quaternary Vegetation of the Edwards Plateau

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Texas lies at the intersection of the Great Plains, southwestern deserts, and southeastern United States, three dramatically different climatic zones, but there are few continuous and high resolution paleoclimate records spanning the late Quaternary from Texas, leaving its late Quaternary climate history largely unknown. Hall's Cave on the Edwards Plateau contains a continuous sedimentary sequence from the Last Glacial Maximum, offering a unique opportunity to investigate past climate changes in this region. Here, we generate a century-scale record of changes in C_3-C_4 plant abundance from Hall's Cave using stable carbon isotope analysis of sediment bulk organic matter. Because the relative proportion of plants using the C_3 and C_4 photosynthetic pathways is driven primarily by changes in seasonal precipitation regime, the carbon isotope data provides a record of changing precipitation seasonality over this time period. $\delta^{13}C$ values from Hall's cave indicate that for much of the last 20 ka BP, the vegetation cover over central Texas was dominated by C_4 summer grasses, consistent with a strong summer rainfall regime and reduced winter rainfall. Transitions to increased proportions of C_3 plant cover (e.g., shrubs, trees and winter grasses) occur coincident with the Younger Dryas cold period and over the past c. 5 ka. These changes indicate that these periods were characterized by either reduced summer rainfall or increased winter rainfall. Inferred wetter conditions in central Texas during the Younger Dryas are at odds with evidence for dry conditions in the eastern US but are consistent with exceptionally wet conditions in the western US at this time. This pattern may be explained by an intensified Jet Stream and greater moisture delivery from the West during the Younger Dryas. In contrast, the long-term trend towards an increasing winter rainfall over the middle to late Holocene is at odds with drier conditions in the SE and SW US and may instead reflect an increasing role for Gulf of Mexico moisture sources over the last few millennia. Ongoing work using hydrogen isotopes to reconstruct moisture sources will provide additional insights into these processes.

Keywords: carbon isotopes, paleoclimate, C_3-C_4 vegetation, late Quaternary, Edwards Plateau