

A 40,000 year look into the past: a study of lipid biomarkers from Lake Junin, Peru

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A continuous sediment core from Lake Junin, Peru presents a unique opportunity to understand tropical climate changes through the past 40,000 years. We analyzed the structures of the sediments' lipid molecules to determine fluctuations in the sources of organic matter accumulating in the lake. Using this, we can determine variations in lake hydrology and climate. We also examined modern soils in the lake's surrounding watershed to pinpoint the possible origins of the lipid compounds. Our results show fluctuations in the distributions of carbon-number range and the lipid molecules' average chain lengths (ACL) along the core. During periods of low ACL, aquatic macrophytes were the main source of the lake's organic carbon. During instances of high ACL, materials from terrestrial plants in the watershed were the main sources of the lake's organic carbon. This information indicates that increasing ACL of the lipid molecules is evidence of rising lake level. Our results align for over the past 11,000 years with known fluctuations of the lake water balance, taken from previous measurements of the lake's $\delta^{18}\text{O}$ of authigenic calcite. Our findings not only supplement past studies, but also expand the paleoclimate records past the Last Glacial Maximum. Our data indicated that earlier tropical climate was similar to that of the wet late Holocene period. Future work will explore the hydrogen isotope ratio of these plant lipids as an indicator of the lake water balance.