Abstract

Climate variability over glacial-interglacial timescales is not well characterized in the tropical Andes, and paleoclimate records are lacking in this region. To offset this gap in knowledge, we analyzed organic compounds from sediment cores from Lake Junin (the Peruvian Andes) to better understand climate variability in the region since the LGM. We measured the δD of long and mid-chain n-alkanes (nC29 – terrestrial vegetation and nC23 – aquatic vegetation) to characterize changes in the intensity of the South American Summer Monsoon (SASM) and evaporative enrichment of lake water. We also measured the δ13C of these compounds to better understand the hydrology of the region and constrain the sources of organic matter through time. Additionally, we used the fractional abundances of brGDGTs to estimate changes in temperature over the same time period. Our results suggest that SASM intensity is controlled by insolation in the southern hemisphere. During the late Pleistocene, the δD of both nC29 and nC23 are relatively D-depleted indicating a wetter time period. This is followed by progressive D-enrichment of both nC29 and nC23 which suggests increasing aridity until the Holocene. The early Holocene is characterized by a decoupling between the δD of nC23 and nC29.The δD of nC23 becomes relatively more D-enriched, matching trends in a carbonate oxygen isotope record from Lake Junin, indicating increased lake-water evaporation during this time. Finally, the late Holocene is characterized by a return to wetter conditions. The δ13C of both nC29 and nC23 further confirms the hydrologic history of this region, while shedding light on vegetation dynamics. During the Pleistocene, the δ13C of both n-alkanes suggests DIC uptake, but at the start of the Holocene they diverge, showing two distinct plant communities, one entirely aquatic and one entirely terrestrial. Our brGDGT-based temperature reconstruction shares similar trends with alkenone-based SST reconstructions off the coast of Peru, indicating a consistent regional climate signal.