Paleoclimate Variability of Lake Issyk-Kul from ~14 ka to the Present Based on Organic Biomarkers

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Abstract:

Lake Issyk-Kul, located in the glacial mountain ranges in mid-latitude arid Central Asia (ACA), is one of the world's largest lakes. ACA is projected to face future changes in water supply due to rising temperatures and increased precipitation. These changes pose significant economic and environmental threats, particularly in regions with high population growth. Despite its importance, the mid-latitude continental region has many unknown questions surrounding the history of the westerlies, leaving gaps in our understanding of past climate dynamics. This research examines the paleoclimate of Lake Issyk-Kul from approximately 14,000 years ago to the present, utilizing a suite of organic biomarkers to reconstruct temperature, hydroclimate, and vegetation. We measured several organic geochemical proxies including lacustrine alkenones (U index) and isoprenoid and hydroxylated glycerol dialkyl glycerol tetraethers (GDGTs; TEX and RIOH proxies). Additionally, the distribution and isotopic composition of plant waxes (*n*-alkanes) are analyzed to infer changes in surrounding vegetation and moisture sources. Preliminary results indicate significant and abrupt climate shifts in the Issyk-Kul region during key periods such as the Bølling-Allerød and Younger Dryas. We compare biomarker records from sites on the western and eastern sides of the lake to understand regional variations in climate response in a large lake system that spans a precipitation gradient. These findings enhance our understanding of the sensitivity of Issyk-Kul in regional and global climate regimes, contributing to more accurate predictions of future conditions in ACA.