Temperature and hydroclimate variability in mid-latitude arid Central Asia during the past 13,600 years: a multi-proxy investigation of Issyk-Kul (Kyrgyzstan)

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Arid Central Asia (ACA) will be among the places on Earth most strongly affected by future changes in water supply. Rising temperatures and projected increases in inter-annual precipitation variability are expected to bring economic and environmental stress to a region characterized by high population growth. To date, mid-latitude continental locations have received relatively less research attention in comparison to the high-latitude or tropical locations and therefore represent a gap in our understanding of past climate dynamics. Issyk–Kul (Kyrgyzstan), one of the largest lakes in the world, is a unique site to examine mid-latitude climate variability in ACA due to its location in a mountainous region of the Asian continental interior that today is situated outside of the influence of the monsoons to the south or southeast. Here we use previously collected sediment cores from Issyk-Kul to generate new temperature, hydroclimate and vegetation records spanning from 13,600 to 2,000 years ago. We evaluate the use of several organic geochemical temperature proxies including lacustrine alkenones (UK'37 Index), TEX86, and proxies based on hydroxylated isoprenoid glycerol dialkyl glycerol tetraethers (OH-GDGTs). We also examine the distributions and isotopic composition of plant waxes (*n*-alkanes) to examine changes in the vegetation surrounding Issyk-Kul. Plant wax deuterium isotopes are used to investigate changes in precipitation amount and shifts in the dominant moisture source to ACA, while carbon isotopes are used to examine past shifts in C3 vs C4 vegetation. Our results thus far reveal that multiple proxies indicate a strong response of Issyk-Kul to climate variability during the Bølling–Allerød and Younger Dryas. Improved knowledge of past mid-latitude climate dynamics is needed to predict future conditions in ACA more accurately.