

Climate and environmental change recorded in a high-altitude ~80 ka loess profile on Mount Kilimanjaro

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Precipitation in East Africa is generally thought to be strongly controlled by ITCZ positioning on seasonal as well as on orbital timescales, resulting in pronounced rainy summer seasons in the northern and southern subtropics, and anti-phased intensification of the hydrological cycle following the 20 ka precessional signal. During the Last Glacial Maximum (LGM), however, the majority of proxy data indicate widespread aridity even south of the equator, where the insolation maximum would predict humid conditions at that time. A recently published high-resolution deuterium isotope record from terrestrial leaf waxes from Lake Tanganyika (~7°S) shows strong similarity with Asian d18O speleothem records, and it has been suggested that precipitation in tropical southeast Africa is more strongly controlled by changes in Indian Ocean sea surface temperatures than by position of the Inter-tropical Convergence Zone. We present results from a C-14 dated paleosol profile at 2763 m altitude on the eastern slopes of Mount Kilimanjaro, Tanzania (~3°S) with an age span of ~80 ka, making it one of the longest, continuous, terrestrial archives in the East African tropics. Compound-specific deuterium measurements on long chain fatty acids show ~20 ‰ enriched values during the LGM compared to the early/middle Holocene. This shift is significantly smaller than the 50 ‰ change as observed in Lake Tanganyika. An increase of dD values by 10 ‰ between 13 to 10 ka is related to the YD event. The mid Holocene transition into dryer conditions is observed in 5 ‰ of enriched dD values. Counter-intuitively, our temperature reconstruction based on MBT and CBT indices shows temperatures ~5°C warmer throughout the LGM and MIS3 than during the Holocene. We hypothesize that local soil temperature is strongly controlled by vegetation and/or cloud cover (more open vegetation and less clouds at the study site lead to higher temperature). We will compare the dD profile with a set of comprehensive multi proxy data from other geochemical analyses (e.g., MBT, elemental data, grain size, XRF), in order to better decipher the drivers for the similarities and differences between high altitude Kilimanjaro and low land Tanganyika.