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Paleohydrological change in the Turkana Basin at the termination of the African Humid Period

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One of the most significant features of Holocene climate change in East Africa is the termination of the African Humid Period (AHP), which occurred at $\sim$ 5 ka. Many lakes in the East African Rift System (EARS) were strongly affected by these climatic changes, generally exhibiting much higher lake levels before the termination of the AHP than after. One of the larger lakes in the EARS, is Lake Turkana which was filled to overflow level for much of the early Holocene and experienced a dramatic $\sim$70 meter lake level drop at $\sim$5 ka, turning it into the terminal lake system as it still is today.
The precise hydrological response of Lake Turkana to climate change at the termination of the AHP is potentially complex, because it is situated at the cross roads of two large atmospheric convection systems; the Intertropical Convergence Zone (ITCZ) and the Congo Air Boundary (CAB). Shifting of these atmospheric systems at the end of the AHP dramatically re-organised spatial rainfall patterns over the Turkana Basin catchment, causing a shift in runoff contributions from the different sub-catchments of the Turkana Basin.
Here, we present a Holocene Turkana lake water Sr isotope reconstruction based on the analysis of well-dated lacustrine ostracods and shells, which reveals consistently high Sr isotope values for the early Holocene, followed by a significant, but gradual drop in Sr isotope ratios across the AHP termination. Since lacustrine Sr isotope ratios are a runoff provenance indicator in this setting, such dramatic lacustrine Sr isotope change points towards a significant (climate-driven) reorganisation of runoff contributions from different sub-catchments to Lake Turkana. In more detail, the Sr isotope reconstruction strongly suggests that changes in runoff patterns at the termination of the AHP in the Turkana Basin were gradual. The higher Sr isotope ratios during the Early Holocene indicate significant runoff contribution from a more radiogenic sub-catchment at that time, which likely was due to overflow from the Chew Bahir Basin into Lake Turkana. Reduction and eventual shutdown of overflow from the Chew Bahir Basin to the Turkana Basin at the end of the AHP likely controlled lake level changes as well as lacustrine Sr isotope variation in Lake Turkana during the Holocene.