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An Early Pleistocene (1.9-1.7 Ma) lake-wetland sequence in southern Israel: greening the path for initial African dispersal of Homo

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The Saharo-Arabian desert belt has experienced significant environmental and climatic changes throughout the Pleistocene. These variations are evidenced by the presence of widespread deposits that indicate pluvial intervals (as expressed by lacustrine and wetland deposits, alluvial fans, paleosols, and speleothems) or hyper-arid periods (deserts and ergs). One of these pluvial intervals is represented by an Early Pleistocene lacustrine sequence that occupied an area of ∼300 km2 in the present extremely arid southern Negev desert: Lake Kuntila.
Several studies have been previously carried out on this sedimentary sequence, with the aim of reconstructing the paleoenvironmental settings, mainly through investigation of the microfauna assemblages. These studies show that the lacustrine sequence consists of chalky limestone with some banks of massive limestone alternating with marly to sandy-marly beds rich in gastropods, ostracods, fish remains, and charophytes. The fossil assemblages indicate the lake experienced a large range in salinity, ranging from freshwater to hypersaline (up to 70‰. Based on archeological artifacts corresponding to the Acheulean culture found on a nearby alluvial terrace, the top of the lacustrine sequence was assigned a Lower Paleolithic age (∼2.6-1.7 Ma).
The current study presents new results that expand our knowledge on the chronology and environmental settings of this lake system. Paleomagnetic measurements show a lower, normal polarity zone and a reverse interval in the upper part of the section. Considering previous exposure ages between 1.9 and 1.6 Ma measured on the pavement at the top of the columnar section, we correlate the observed polarity pattern with the top of the Olduvai and the lowermost part of chron C1r. Hence, the Kuntila lacustrine sequence can be dated to approximately 1.9-1.7 Ma.
New analysis of the biological diversity shows that the sequence mainly contains the remains of a few species of ostracods, mostly recrystallized steinkerns of the euryhaline Cyprideis torosa and a few shells of Ilyocypris (which is typical for freshwater and running water) or Candona (freshwater environments). The current study is further complemented by elemental analysis of the lithological sequence (μXRF). It allows for a better understanding of the environmental settings that prevailed in the region during the Early Pleistocene and proposes several mechanisms for the expansion of humid conditions at these latitudes.