Between wet, dry and hyperarid: Climatic changes during the last >500 ka in the Chew Bahir basin, a key HSPDP site in southern Ethiopia

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Abstract

As a contribution towards an enhanced understanding of human-climate interactions, the Hominin Sites and Paleolakes Drilling Project (HSPDP) has cored six predominantly lacustrine archives of climate change spanning much of the last ~3.5 Ma in East Africa. All five sites in Ethiopia and Kenya are adjacent to paleoanthropological key sites encompassing diverse milestones in human evolution, dispersal, and technological innovation. The 280 m-long Chew Bahir sediment records, recovered from a tectonically-bound basin in the southern Ethiopian rift in late 2014, cover the past 550 kyr of environmental history, a time period that is marked by intense climatic changes and includes the transition to the Middle Stone Age, and the origin and dispersal of modern Homo sapiens.

We will present the outcome of lithologic and stratigraphic investigation of the composite core, first interpretations of high resolution MSCL and XRF scanning data, as well as initial results of detailed multi-proxy analysis of the Chew Bahir cores. These analyses are based on more than 14,000 discrete subsamples, including grain size analyses and X-ray diffraction. An initial chronology, based on Ar/Ar and OSL dating, allows the first reconstructions of dry-wet cycles during the last ~550 ka. Both geochemical and sedimentological results show that the Chew Bahir deposits are sensitive recorders of changes in climate in the area. First statistical analyses point towards phases that are marked by abrupt climatic changes, whereas several long-term wet-dry oscillations reveal variations mostly in the precession (~15-25 kyr), but also in the obliquity (~40 kyr) and eccentricity frequency bands (~90-120 kyr).

The Chew Bahir record will help us to decipher climate variations on different time scales as a consequence of orbitally-driven high-latitude glacial-interglacial shifts and variations in greenhouse gases, variations in Indian and Atlantic Ocean sea-surface temperatures, as well as local variations in solar radiation. The ~550 kyr record of environmental change in East Africa will ultimately help us to test current hypotheses regarding the impact of climate variability on human evolution, dispersal and technological innovation.