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The Chew Bahir Drilling Project (HSPDP). Deciphering climate information from the Chew Bahir sediment cores: Towards a continuous half-million year climate record near the Omo – Turkana key palaeonanthropological Site

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As a contribution towards an enhanced understanding of human-climate interactions, the Hominin Sites and Paleolakes Drilling Project (HSPDP) has successfully completed coring five dominantly lacustrine archives of climate change during the last ∼3.5 Ma in East Africa. All five sites in Ethiopia and Kenya are adjacent to key paleoanthropological research areas encompassing diverse milestones in human evolution, dispersal episodes, 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 ka of environmental history, a time period that includes the transition to the Middle Stone Age, and the origin and dispersal of modern Homo sapiens.

Deciphering climate information from lake sediments is challenging, due to the complex relationship between climate parameters and sediment composition. We will present the first results in our efforts to develop a reliable climate-proxy tool box for Chew Bahir by deconvolving the relationship between sedimentological and geochemical sediment composition and strongly climate-controlled processes in the basin, such as incongruent weathering, transportation and authigenic mineral alteration. Combining our first results from the long cores with those from a pilot study of short cores taken in 2009/10 along a NW-SE transect of the basin, we have developed a hypothesis linking climate forcing and paleoenvironmental signal-formation processes in the basin. X-ray diffraction analysis of the first sample sets from the long Chew Bahir record reveals similar processes that have been recognized for the uppermost ∼20 m during the pilot-study of the project: the diagenetic illitization of smectites during episodes of higher alkalinity and salinity in the closed-basin lake induced by a drier climate. The precise time resolution, largely continuous record and (eventually) a detailed understanding of site specific proxy formation, will give us a continuous record of environmental history on decadal to orbital timescales. Our data enable us to test current hypotheses of the impact of a variety of climate shifts on human evolution and dispersal.