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The top of the Olduvai subchron in a high-resolution magnetostratigraphy from the West Turkana core WTK13, Hominin Sites and Paleolakes Drilling Project (HSPDP)

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One of the major challenges in understanding the evolution of our own species is identifying the role climate change has played in the evolution of earlier hominin species. To clarify the influence of climate, we need long and continuous high-resolution paleoclimate records, preferably obtained from hominin-bearing sediments, that are well-dated by tephro- and magnetostratigraphy and other methods. This is hindered, however, by the fact that fossil-bearing sediments are often discontinuous, and subject to weathering, which may lead to oxidation and remagnetization. To obtain fresh, unweathered sediments, the Hominin Sites and Paleolakes Drilling Project (HSPDP) collected a ∼216- meter core (WTK13) in 2013 from deposits of Early Pleistocene paleolake Lorenyang in the western Turkana Basin (Kenya). Here, we present the magnetostratigraphy of the core. Rock magnetic analyses reveal the presence of iron sulphides carrying the remanent magnetizations. To recover polarity orientation from the near-equatorial WTK13 core drilled at 5°N, we developed and successfully applied two independent drill-core reorientation methods taking advantage of (1) the sedimentary fabric as expressed in the Anisotropy of Magnetic Susceptibility (AMS) and (2) the occurrence of a viscous component oriented in the present day field. The reoriented directions reveal a normal to reversed polarity reversal identified as the top of the Olduvai subchron. From this excellent record, we find no evidence for the 'Vrica subchron' previously reported in the area. We suggest that outcrop-based interpretations supporting the presence of the Vrica subchron have been affected by the oxidation of iron sulphides initially present in the sediments as evident in the core record, and by subsequent remagnetization. Based on our new high-resolution magnetostratigraphy and stratigraphic markers, we provide constraints for an initial age model of the WTK13 core. We discuss the implications of the observed geomagnetic record for human evolution studies.