**Paleosol evidence for dynamic moisture regimes during the Middle Miocene in the Turkana Basin, northern Kenya**

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The Middle Miocene (~16-12 Ma) is characterized by a global cooling event, the Miocene Climate Transition (MCT), which followed a pronounced warm period, the Miocene Climate Optimum. In eastern Africa, the Middle Miocene coincided with the diversification of our ape ancestors, and yet its climatic and ecological context remains understudied. This project investigates paleosols exposed below Middle Miocene volcanic rocks (13.09 ±0.03 Ma) that crop out in Sibiloi National Park, Marsabit County, Kenya. The paleosol complex consists of ~11.4 m of compounded paleosols capped by a basalt (14.25 ±0.25 Ma). The lowermost Unit 2 contains a 3.4 m-thick red clay paleosol with wedge peds, slickensides, and pedogenic carbonate. The matrix effervesced and had a reconstructed soil pH of 6.9. Paleoclimate reconstructions yield a mean annual precipitation (MAP) of 950 ±209 mm $yr^{-1}$. Using new soil-paleosol taxonomy and moisture regime models, the data suggest this was a paleo-Vertisol forming in a Ustic moisture regime (paleo-Ustert). The $\delta^{13}C$ from pedogenic carbonates from this interval is -10.5‰, indicative of a lar by $C_3$ vegetation. In contrast, the overlying Unit 5 contains a 1.3 m-thick gravelly silt paleosol with clay illuviation and weathered volcaniclastics. The matrix is noneffervescent and had a reconstructed pH of 5.6 with no pedogenic carbonate. The paleosol contained >800 ppm $P_2O_5$, where high P-retention is common in volcanic soils. Paleoclimate reconstructions yield a MAP of 1720 ±395 mm $yr^{-1}$. Using the same soil-paleosol taxonomy and soil moisture regime models, the data suggest this was an Andisol, derived from volcanic ejecta, weathering in a Udic moisture regime (paleo-Udand). There is evidence of diagenetic silica cementation in the uppermost paleosol. To account for this, we explore a new combined micro- and bulk-XRF deconvolution method to disentangle diagenetic and paleosol-forming geochemistry. Coupled with existing Early and Middle Miocene data from eastern Africa, our new data suggest that MAP remained higher than modern values and that $C_3$vegetation was dominant. Our methodological advances in determining taxonomy and moisture regimes suggest that this Middle Miocene interval was dynamic, with paleo-Vertisols forming under a climate characterized by strong seasonal contrasts, and paleo-Andisols forming under tropical wet climates.

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