Ichnology, paleopedology, & sedimentology of the Cubango Megafan core: Using bioturbation to interpret environment, soil formation, sediment accumulation rate, hydrology, & climate

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Abstract:

The ichnology of the Kalahari Group is explored through a 400-m deep core taken from the Tertiary deposits of the Cubango Megafan in the Owambo Basin of northern Namibia. The megafan is 350-km long and was deposited by the paleo Cubango-Okavango River with an extremely low gradient of ~0.017°. The strartigraphy of the Kalahari Group is complex, but in Namibia it consists of the Ombalantu, Beiseb, Olukonda and Andoni formations, in ascending order. The Kalahari Group was deposited in at least seven subbasins within the main basin that encompasses Angola, Namibia, Botswana, Congo, South Africa, and Zambia. Deposits comprising these formations in the Owambo Basin of northern Namibia include conglomerates, mudstones, siltstones, sandstones, marl, and calcrete, and were deposited in alluvial fan, fluvial, palustrine, and lacustrine settings. The age of the lower part of the Kalahari Group is unknown but the upper part is Neogene in age. The core consists of unconsolidated and locally carbonate-cemented, mostly fine-grained sand, silt, and clayey sediments deposited in fluvial and lacustrine settings. The relationships between bioturbation patterns and lithofacies associations are used to interpret paleoenvironment, pedogenesis, sediment accumulation rate, hydrology, and climate during deposition of this portion of the Cubango Megafan. The Kalahari succession accumulated in a seasonal, semiarid, grassland savannah environment dominated by C4 grasses. Summer rains in the Angolan highlands catchment to the north produced runoff that transported sediments onto the megafan. Here, deposits became part of the vadose zone after each flood event, which allowed pedogenesis mostly by bioturbation to take place. The vast majority of traces are composed of packets of backfill meniscate assigned to *Naktodemasis bowni*, which were likely produced by beetle larvae and soil bug nymphs. Burrows with nondescript fill that appear massive with a sharp wall are assigned to *Planolites* isp. Burrows are often associated with rhizoliths, rhizohaloes, and possible rhizotubules. This postdepositional process plus other pedogenic processes destroyed much of the original bedding based on the frequency of depositional events. Frequent events produced weakly developed compound paleosols; less frequent and intermittent events produced moderately–well-developed composite paleosols and weakly–moderately developed cumulative paleosols.

Keywords: compound paleosols, composite paleosols, cumulative paleosols, rhizoliths