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Characteristics of a paleosol and its implication for the Critical Zone development, Rocky Mountain Front Range of Colorado, USA.

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Activity and stability phases as well as geomorphic processes within the Critical Zone are well known. Erosion and deposition of sediments represent activity; soils represent geomorphic stability phases. We present data from a 4 m deep sediment section that was dated by luminescence techniques. Upslope erosion and resulting sedimentation started in the late Pleistocene around 18 ka until 12 ka. Environmental conditions at the study site then changed, which led to the formation of a well-developed soil. Radiocarbon dating of the organic matter yielded ages between 8552 – 8995 cal. BP. From roughly 6.2 – 5.4 ka another activity phase accompanied by according sediment deposition buried the soil and a new soil, a Cambisol, was formed at the surface. The buried soil is a strongly developed Luvisol. The black colors in the upper part of the buried soil are not the result of pedogenic accumulation of normal organic matter within an A-horizon. Nuclear magnetic resonance spectroscopy (NMR) clearly documents the high amount of aromatic components (charcoal), which is responsible for the dark color. It is corroborated by charcoal pieces seen in then sections. This indicates severe burning events at the site and the smaller charcoal dust (black carbon) was transported in deeper parts of the profile during the process of clay translocation. We present further NMR data from overlaying horizons that may indicate actual lessivation of clay and black carbon in this kind of environment.