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Classification of subsurface sediments to assess the importance of slope deposits and saprolites within the critical zone (Bavarian Forest, Germany)

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In the crystalline basement of the Bohemian Massif in East Bavaria pre-quaternary built saprolites as the profound weathering products of variscan granitic bedrock remain important elements of the shallow subsurface among other polygenetic slope deposits. The periglacial slope sediments affect the discharge of precipitation water at a progressive rate. Saprolites not only influence the composition and the material properties of the slope deposits but also act as preferential flow pathways and possibly as temporary storage. This study aims to provide a high-resolution model of the composition of the shallow subsurface on several test areas in the catchment of the Otterbach creek in the low mountain ranges of the Bavarian Forest close to Regensburg, East Bavaria, Germany. Furthermore, a relief classification was developed. All parameters were transferred to an over water gauges defined catchment of the Otterbach creek with a known discharge.

Therefore, data about layer composition, distribution and thickness of the slope and floodplain sediments and subjacent saprolites was necessary and pedologically and geophysically collected. A combination of the methods of ground penetrating radar (GPR), refraction seismics and electric resisitivity tomography (ERT) as well as percussion drillings and profile pits were applicated for the prospection of the shallow subsurface.

The potential water storage capacity was assessed by the substantial differentiation

of the saprolites. Their typical mineralogical composition, well-defined over the clay mineral inventory has been determined by x-ray diffraction (XRD) analysis.

The distribution of slope deposits and saprolites was summarised in detail for a subarea of the Otterbach creek catchment to provide a base map for further investigations on hydrological analyses. Several catenas were selected to determine and quantify the flow paths by the arrangement of frequency-domain probes and tensiometers. The results give evidence whether the slope sediments and saprolites attenuate or enforce water discharge after precipitation events. Therefore, the study helps for a better understanding of flood occurrences, intensities and frequencies.