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Exploring Soil Organic Carbon Deposits in a Bavarian Catchment

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The distribution of soil organic carbon (SOC) in the landscape is not homogeneous, but shows high variability from the molecular to the landscape scale. The aims of our work are 1.) to detect hot spots of SOC storage within different positions in a landscape; 2.) to outline differences (or similarities) between SOC characteristics of erosional and accumulative landscape positions; and 3.) to determine whether localised SOC deposits are dominated by fresh and labile organic matter (OM) or old and presumably stable OM. These findings are crucial for the evaluation of the landscape′s vulnerability towards SOC losses caused by management or natural disturbances such as erosional rainfall events.

Sampling sites of our study are located in a catchment at the foothills of the Bavarian Forest in south-east Germany. Within this area three landform positions were chosen for sampling: a) a slope with both erosional depletion and old colluvial deposits, b) a foothill with recent colluvial deposits and c) a floodplain with alluvial deposits. In order to consider both heterogeneity within a single landform position and between landforms several soil profiles were sampled at every position. Samples were taken to a maximal depth of 150 cm, depending on the presence of rocks or ground-water level, and analysed for bulk density, total carbon (TOC), inorganic carbon (IC) and texture. SOC densities and stocks were calculated. A two-step physical density fractionation using Sodium-Polytungstate (1.8 g/cm^3 and 2.4 g/cm^3) was applied to determine the contribution of the different soil organic matter fractions to the detected SOC deposits. Literature assumes deep buried SOC to be particularly old and stable, so we applied Accelerator Mass Spectrometry Radiocarbon Dating (AMS 14C) to bulk soil samples in order to verify this hypothesis. The results show that the floodplain soils contain higher amounts of SOC compared with slopes and foothills. Heterogeneity within the sites was smaller than between sites. Depending on management practices stocks decrease directly below the topsoil ($\sim$10 cm in grassland to $\sim$30 cm in arable land) and converge to similarly low amounts in the deep subsoil.