

Soil organic matter composition along a slope in an erosion-affected arable landscape in North East Germany

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In hummocky landscapes, soil erosion is forming truncated profiles at steep slope positions and colluvial soils in topographic depressions thereby affecting soil organic carbon (SOC) storage. However, the knowledge on the spatial distribution and composition of differently stable organic matter (OM) fractions in arable landscapes is still limited. Here, amount and composition of OM from top- and subsoil horizons at eroded, colluvic, and non-eroded slope positions were compared. The horizons were from a Luvisol at plateau (LV), an eroded Luvisol (eLV) at mid slope (6% slope gradient), a calcareous Regosol (caRG) at steep slope (13%), and a colluvic Regosol (coRG) at hollow position. Water soluble (OM-W) and pyrophosphate soluble (OM-PY) fractions were extracted sequentially. Soil samples, OM fractions, and extraction residues were analyzed with transmission Fourier transform infrared (FTIR) spectroscopy. The soluble fractions were 3% of SOC for OM-W and 15% of SOC for OM-PY. For topsoil samples, extraction rates were independent of slope position. The highest intensities of both, C-H (alkyl groups) and C=O (carboxyl groups) absorption bands, were found in FTIR spectra of OM-PY from top and subsoil horizons at the steep slope position (caRG). The C-H/C=O ratio in OM-PY decreased with increasing contents of oxalate

soluble Fe and Al oxides from steep slope (0.25 for caRG-Ap) towards plateau, and hollow position (0.09 for coRG-Ap) except for the Bt-horizons. This relation is reflecting that the down slope-deposited Ap material, which is higher in poorly crystalline Fe and Al oxides, consists of relatively stable OM. This OM is enriched in C=O groups that are known for their interaction with soil minerals. These OM-mineral interactions may help explaining C storage in arable soil landscapes.