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Using VIS-NIR reflectance spectroscopy and magnetic susceptibility to assess soil redistribution due to erosion

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Soil degradation due to water erosion is one of the greatest problems of agricultural soils worldwide. To be able to map the extent of soil degradation and consequently propose actions for soil improvement, an effective approach is needed. Soil organic carbon (SOC) content and its time fluctuations is one of the key features characterizing the given site and occurring processes. It is widely accepted as the main soil quality indicator and therefore can be used for soil degradation assessment. Traditional laboratory techniques (dry combustion, wet oxidization) of soil organic carbon determination are usually labor intensive and time consuming, which means they are not suitable for large sample collections (e.g., large areas or continual monitoring). Therefore, there is a need for fast, reliable, and cost-effective techniques. Our previous study documented that the VIS-NIR reflectance spectroscopy and magnetic susceptibility can be a very efficient tool for SOC mapping with the Chernozem (a loess region of South Moravia, Czech Republic) areas heavily affected by water erosion. Within this area colluvial soils with up to an about 4 m deep humus enriched horizon were developed. Distribution of soil properties within the colluvial soil profiles at several positions were evaluated using standard and novel methods to distinguishing the different sedimentation phases and understanding colluvial soil formation. The same study was also performed in another two locations (Cambisol and Luvisol areas). Results showed that while both methods could be used for estimation of SOC distribution within the soil profiles in the Chernozem area, in the other two areas the VIS-NIR reflectance spectroscopy method was less accurate and magnetic susceptibility was inaccurate because there was no correlation between SOC and content of ferrimagnetic particles.

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