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Depth-explicit SOC assessments at high vertical resolution using closed-tube sampling and Vis-NIR spectroscopy

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We provide an alternative to standard Soil Organic Carbon (SOC) measurement methods combining percussion drilling with Visible and Near-Infrared reflectance spectroscopic analyses at a very high depth resolution on intact soil cores (151 soil profiles; 3 cm vertical resolution). Using a small but representative subset of the soil cores that we analyzed for SOC content with dry combustion, we developed chemometric models to predict SOC content for the entire dataset. We show that our approach allows producing accurate and repeatable measurements of SOC. It provides detailed SOC information at ∼83% lower costs and reduces labor time by ∼85% compared to a traditional approach at the same vertical resolution. The accuracy of spectroscopic predictions is comparable to standard soil analysis techniques and hence our approach can represent an operational alternative to reference methods of SOC analysis. However, the method is limited to soils with a low gravel content (<∼5% gravel).