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Testing different remote sensing compositing periods for SOC content extraction in areas across Germany

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High spatial and temporal soil information is crucial to analyze soil developments and for monitoring long term changes to avoid soil degradation. A sufficient soil organic carbon (SOC) content is one of the key soil properties to achieve sustainable high productivity of soils, soil health and increased agroecosystem resiliency. For the usage of remote sensing approaches, naturally exposed soils in Germany occur rarely. Mainly agricultural regions can provide areas of exposed soils for short periods of time during a year. The Soil Composite Mapping Processor (SCMaP) is a fully automated approach to make use of per-pixel based bare-soil compositing to overcome the issue of limited soil exposure based on multispectral Landsat (TM 4, ETM 5, ETM+ 7 and OLI 8) imagery for individually determined time periods between 1984 and 2019.

Due to the high spatial and temporal resolution the SCMaP soil reflectance composites contain a considerable potential to derive detailed soil parameters as the SOC contents of exposed soils to add information to existing soil maps on field scale for areawide applications. Besides the soil reflectance composites several field soil samples provided by different federal authorities build the data base for the SOC modeling. Machine learning (ML) algorithms incl. Partial Least Squares and Random Forest regression with various inputs and set-ups are used and applied for several test areas in Germany. Furthermore, the capabilities of different compositing lengths (5-, 10- and 30-years) to derive spatial SOC contents are tested. The results and the validation of the different ML approaches and compositing lengths will be shown, providing insight into the benefits of this approach.