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Soil microstructure is sensible to ecosystem and land use changes: simple approach to monitoring C pools

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Soil organic matter (SOM) as one of the main aggregation factors supports the **hierarchy structure organization** of soils. Structure organization at the micro-level (μm-mm) is based on *soil primary particles*, *composite building units* and *microaggregates* characterized by different *SOM composition*, *stabilization mechanisms* and *dynamics* (Yudina et al., 2018; Yudina & Kuzyakov, 2019). This presentation aims to show the specifics in composition and sensitivity of **soil microstructure** to ecosystem type and land use changes. The studied objects are Haplic Chernozems (Kursk region, Russia) under 6 land use types differing in vegetation: natural steppe, natural forest, conventional arable field, long-term bare fallow, and afforestation. Separation of C pools associated with particle size distribution (PSD) were obtained with high resolution by *laser diffraction technique*. Mathematical computations with PSD's allow to find localization of particles sensitive to the chosen factor. Two parameters (mean volume diameter MVD, μm and content of particles, %) for each of the three particle types (*organo-mineral* OMp, *particulate organic matter* POM, *microaggregates* μA) can be calculated. POM is the smallest (3 or less %) but the most labile solid phase C pool and very sensitive indicator to changes in land use and C accumulation with the soil depth. OMp is sensitive to long-term factors and were the lowest in bare fallow soil. Since Chernozems are well-structured soils, the content of μA is less sensitive than MVD, which vary from 50 μm under bare fallow to 170 μm in forest soil. Presented *indicators* in combination with C storage characterize **role of SOM in soil microstructure organization**. We have supposed that the differences in dynamics between OMp, POp and μA is attributable to internal particle structure and microbial availability of SOM. The marking particle types were separated for physical and biological justification of suggested indicators. Their thermal stability, specific surface area, microporosity, microbial activity and composition were characterized. Following hypotheses were tested: 1) content of the thermostable organic C fraction will increase from POM to μA and OMp; 2) value of specific surface area and porosity will be higher in μA compare to OMp. The proposed approach to describe C dynamics based on combination of high-resolution PSD data is a simple, sensitive and effective tool for monitoring of SOM pools dynamics.

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