



Pyrogenic carbon quantity and quality unchanged after 55 years of organic matter depletion in a Chernozem

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Chernozems typically have large stocks of organic carbon and of fire-derived, pyrogenic carbon (PyC). PyC had been considered to be slowly released but new results challenged this assumption, indicating that PyC can be lost within decades.

We analyzed total soil organic carbon and PyC content (detectable as benzene polycarboxylic acids) in bulk samples, light and heavy fractions from a 55 year old bare fallow and a nearby steppe soil.

Loss of PyC stock due to the long-term fallow management was much smaller (7%) than for soil organic carbon (33%), and we detected no changes in the degree of aromatic condensation of PyC. Most (70 %) of the PyC was associated with the heavy fraction, and less with the light fraction (30%) pointing to organo-mineral interactions as important stabilizing processes.

We conclude that after 55 years of extreme organic matter depletion under fallow management i) PyC stock did not decrease, and ii) the chemical structure of the PyC (measurable with the molecular marker technique) did not change, iii) most of the PyC was associated with the heavy fraction, suggesting clay microaggregation as an important stabilizing process. We suggest that the next generation of experiments should be designed to address the mechanisms stabilizing PyC in the clay-sized fraction of Chernozems.