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Drivers of carbon dynamics and diagnostic fractions in grassland soils in Bavaria in a changing climate

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The storage of carbon (C) in grassland soils is affected by two principal controlling factors: management practices and climate change. In particular, mountainous grassland soils may become a source of greenhouse gas emissions under global warming due to large amounts of labile C. In this regard, aggregate-occluded and mineral associated C may play a key role in the mitigation of climate change. Nevertheless, few studies have focused on different soil organic matter (SOM) pools and their main controlling factors in mountainous grassland soils.
We analyzed the C development of long-term (1986-2012) monitoring grassland sites in Bavaria using Random Forest models. Sites with low initial C contents showed an increase of C, whereas the opposite trend was observed for sites with high initial C contents. Different controlling factors were related with the two main C trends. In addition, we determined the principal mechanisms involved in the build-up and stabilization of different C pools using a promising physical fractionation method. This method enables the separation of five different SOM fractions by density, ultrasonication and sieving separation: fine particulate organic matter (fPOM), occluded particulate organic matter (oPOM>20μm and oPOM<20μm) and mineral associated organic matter (sand and coarse silt, > 20 μm; medium + fine silt and clay, < 20 μm). The final aim is the determination of a diagnostic fraction that can be used as an indicator for future C changes in mountainous grassland soils.