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Turnover and stabilization of organic carbon and plant derived alkanes in soil density fractions

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Organic carbon has been determined to be protected against degradation within soil aggregates. Due to the improved protection within aggregates the turnover of organic carbon decreases with decreasing aggregate size. Hence, degradation occurs predominantly within free particulate organic matter (fPOM) which is dominated by plant litter and occluded particulate organic matter (oPOM), while the mineral fraction contains degradation products. However, it has not been determined how plant derived organic matter including lipidic compounds enters aggregates and in which part of soil aggregates they are preferentially degraded and protected. In this study, we applied organic carbon and lipid analyses to soil density fractions derived from the Mini-FACE (free air CO2 enrichment) experiment in Hohenheim during a time series of five years after introduction of the experiment.
δ13C isotopic values of organic carbon revealed a fast turnover in the fPOM followed by oPOM 1.6, oPOM 2.0 and mineral fraction. A seasonality of organic carbon input and degradation can be observed in aggregate fractions.
In general, compound-specific alkane isotope composition (δ13C) confirmed the incorporation of bulk carbon, whereas seasonality was less exposed than for bulk carbon, which is due to the slower turnover of alkanes compared to bulk carbon.