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Decomposition of ^{14}C labeled Black Carbon in Soil

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Incomplete combustion of organics by fires of vegetation and fossil fuels led to accumulation of charred products in the upper soil horizon. Such charred products frequently called black carbon (BC) may act as important carbon sink in soils, because its microbial decomposition and chemical transformation is accepted as very slow. Direct estimations of BC decomposition rates under soil conditions are absent, because the BC content changes are too small for any relevant experimental period and estimations based on CO_2 efflux are unsuitable because of much higher contribution of soil organic matter (SOM) to the CO_2 compared to BC.

We produced BC from ^{14}C labeled residues of *Lolium perenne*, incubated this ^{14}C labeled BC in soil or loess during 8 months at 20 ˚C, and estimated its decomposition rates based on $^{14}CO_2$ evolved. Additionally we introduced repeated treatments (i) with addition of glucose as energy source for microorganisms to initiate co-metabolic BC decomposition or (ii) mixed the soil to check the effect of mechanical disturbance on BC decomposition.

Black carbon addition amounting for 20% of C_{org} to the soil or 1000% of C_{org} of loess did not changed significantly the total CO_2 efflux. The decomposition rates of BC calculated according to the $^{14}CO_2$ efflux were similar in the soil and loess and amounted for about $6{\cdot}10^{-5}$ d^{-1} resulting in the decomposition of less than 0.5% BC per year under natural conditions (7-10 ˚C). This showed at least centenary mean residence time of BC in soil corresponding to the residence time of recalcitrant SOM fractions.

Glucose addition slightly increased BC decomposition rates for 2 weeks in the soil, but for 3 months in the loess. Mechanical disturbance had stronger effect than glu-

cose addition, but the effect was finished within 2 weeks in the soil and in the loess. Considering short duration of the incubation and the common effect of decreasing decomposition rates during the incubation, we conclude that the mean residence time of BC in soils range between centuries and millenniums.