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Leaching and transformation of ^{14}C labeled DOM in two soils under oxic and anoxic conditions

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Leaching and transformation of dissolved organic matter (DOM) in soils affected by alterations between oxic and anoxic conditions is not well understood. The portions of organic matter leached from the soil, sorbed on sesquioxides and clay particles, and decomposed to CO_2 and CH_4 strongly depends on oxygen availability. We investigated the dynamics of these three processes in soil columns using ^{14}C labeled DOM.

We sampled a Chromic Cambisol (mainly oxic conditions) and a Humic Gleysol soils (mainly anoxic conditions) of one soil catena. The soils were sieved and filled in columns (i$\emptyset$ = 10.0 cm and height 5.0 cm) adjusting their natural bulk density. The columns were equilibrated by leaching with 1mM $CaCl_2$ solution saturated with or free of O_2 for 2 weeks. Then, 10 ml of ^{14}C labeled DOM (2.94 kBq ml^{-1}) extracted from ^{14}C labeled plant residues of *Lolium perenne* were added to each column followed by leaching with 1mM $CaCl_2$ solution again saturated with or free of O_2. We analyzed concentrations of dissolved organic C (DOC) in the solutions and measured ^{14}C (Scintillation counter) of DOC, evolved CO_2, and remaining in the soil column. CH_4 and CO_2 evolution, leaching of Fe and Mn and redox potentials were also measured.

The leaching rate of ^{14}C labeled DOM differed significantly between the soils. At anoxic conditions leaching of the added ^{14}C DOM peaked after two days of tracer application with a rate of 7.9 % of ^{14}C input day^{-1}. In contrast, DOM leaching rate was much smaller and increased continuously from the horizon of the Chromic Cambisol

(oxic conditions). The cumulative leaching amounted to 70% at anoxic conditions in the Humic Gleysol and to 50% at oxic conditions in the Chromic Cambisol after 5 weeks of tracer application. Less than 5% of the ^{14}C added as DOM were decomposed to CO_2. The mineralized amounts of C were independent on the soil redox conditions.

We conclude that leaching of ^{14}C labeled DOM in soils depends strongly on the redox state of the soil. Small leaching can be expected at oxic conditions because of large sorption to Fe-oxides. Furthermore, oxic conditions did not result in increased C mineralization indicating the potential of DOM to contribute to C stabilization in these soils.