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Kommission II: Bodenchemie

Freie Themen

**Autoren**A. Kessler<sup>1</sup>, S. Merseburger<sup>2</sup>, Y. Oelmann<sup>1</sup>, W. Wilcke<sup>2</sup><sup>1</sup>Institute of Geography, Geoecology, Tuebingen; <sup>2</sup>Institute of Geography and Geoecology, Soils, Karlsruhe**Titel**

Stable hydrogen isotope ratios in soil organic matter

**Abstract**

Stable H isotope ratios are a promising indicator of OM transformation processes (Schimmelmann et al., 2006).  $^2\text{H}$  values of bulk organic matter and of specific organic compounds can be used as ecological tracer and forensic tool if the proportion of H that readily exchanges with ambient moisture is accounted for (Wassenaar & Hobson, 1998). There are a few reports about the H isotope ratios in plant-soil systems illustrating that there is little knowledge of the controls of the isotopic composition of the non-exchangeable H fraction of bulk OM (Schimmelmann et al., 2006; Ruppenthal et al., 2015). The increasingly closer relationship between  $^2\text{H}$  values of rainfall and of non-exchangeable H in OM ( $^2\text{H}_n$ ) in the order, plant – plant litter (above- and belowground) – soil along a climatic gradient (Ruppenthal et al., 2015) suggests that decomposition influences  $^2\text{H}_n$  values in OM in a systematic way. However, there are knowledge gaps concerning the fractionation factors and the extent of incorporation of ambient water-H into the nonexchangeable fraction of H in OM during decomposition. Our research will focus on the mechanisms responsible for the strong correlation between  $^2\text{H}$  values in rainfall and  $^2\text{H}_n$  values of SOM. Therefore, our study aims to investigate (1) the incorporation of ambient water-H into the nonexchangeable H fraction in OM during decomposition by heterotrophic bacteria as model organisms and quantify apparent fractionation factors, (2) the extent of incorporation of ambient water into the nonexchangeable H fraction of OM by the soil microbial community under laboratory conditions, and (3) the extent to which H is incorporated into nonexchangeable OM pool from ambient water during decomposition of aboveground litter under field conditions. We will work with microcosms using two bacteria species and determine decomposition rates of litter. Steam equilibration (Ruppenthal et al., 2015) and TC/EA-IRMS are used as analytical tools. We expect that different decomposition rates because of differences in litter quality will be reflected by the extent of H incorporation from ambient water into the nonexchangeable H fraction of the products. Additionally, different litter types enriched in  $^2\text{H}$  will be buried in soil of forest stands. We hypothesize that the incorporation of  $^2\text{H}$ -depleted ambient water into <sup>2</sup>