



Organic matter turnover in subsoils: current knowledge and future challenges

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In the past, carbon flux measurements and modelling have mostly considered the topsoil where C-concentrations, root densities and microbial activities are generally highest. However, depending on climate zone and land use, this soil compartment contains only 30-50% of the C-stocks of the first meter. If the deeper subsoil down to 3 m is also considered, the contribution of topsoil carbon stocks to total soil C-pools is only 20-40%. Another distinct property of subsoil organic matter is its high apparent ^{14}C age. The ^{14}C age of bulk soil organic matter below 30 cm depth generally increases continuously indicating mean residence times of several 10³ to 10⁴ years. Large pool size and high radiocarbon age suggest that subsoil OM has accumulated at very low rates over very long time periods and therefore appears to be very stable.

In this review, several hypotheses for explaining why subsoil SOM is so seemingly old and inert are presented. These questions are being addressed in a recently granted German research unit consisting of 9 subprojects from all soil science disciplines using field measurements of C-fluxes, ^{14}C analyses and conducting field and lab experiments.