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The deeper, the older, the more heterogeneously distributed: Factors and processes controlling C-turnover in subsoils.

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Within the ongoing DFG-funded research unit SUBSOM, the origin, fate and turnover of subsoil organic matter in temperate beech forests is studied in eight sub-projects since 2013, employing comprehensive soil analyses, field monitoring, field and lab experiments and modelling. After 4 years of research, some of the most novel results will be presented and evaluated against our main hypotheses:
Hypothesis 1: The apparently high 14C age of subsoil organic matter is maintained despite a continuous input of fresh plant-derived organic matter with roots and root exudates because this is rapidly mineralized. The DOC inputs also do not contribute to a “rejuvenation” of subsoil organic matter because they largely consist of displaced old organic matter from the overlying horizons.
Hypothesis 2: The degradation of organic matter in the subsoil is limited by its spatial seg-regation from the sparsely distributed microorganisms. Hot-spots of activity are only found in the rhizosphere and along preferential flow paths where microbial colonization is promoted by substrate availability.
Hypothesis 3: Within hot-spots, fresh substrate inputs induce positive priming effects on the mineralization of old stabilized organic matter. Outside of the hot spots, low substrate availability additionally limits organic matter degradation.
Hypothesis 4: Organic matter in the subsoil is not more stabilized than in the topsoil but persists for centuries and millennia because microbial activity is limited by abiotic factors like high CO_2 partial pressure or low O_2- and nutrient availability.
Hypothesis 5: The stabilization of organic matter in the subsoil occurs primarily through sorption of DOM to pedogenic minerals. The sorption capacity for DOM in the subsoil and, thus, the SOM pool size are controlled by these sorbents.
Hypothesis 6: In soils developed from sedimentary parent material, the high 14C age of subsoil organic matter reflects an increasing contribution of geogenic organic carbon with depth.