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Radiocarbon dating of various pyrogenic carbon pools in series of buried Podzols (case study from the north of European Russia)

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Pyrogenic carbon constitutes a significant portion of organic carbon in soils of the planet, and in some soils its share raises to 30%. The charcoal-rich archives of forest paleofires are often localized in the geomorphological traps that reveal numerous profiles of pyrogenic soils buried due to the repeated post-fire episodes of erosion and accumulation. The paleokarst and active karst landscapes provide a unique matrix that records pyrogenic and depositional events of the past at the local scale. Polypyrocyclical Podzols of the karst landscapes at the north of the Arkhangelsk region (Russia) are the objects of this study. The fields of closed karst funnels (n x 10 m in diameter, 1–5 m elevation difference) demonstrate accumulative and denudation models of soil formation that are realized at the close distance with the pyrogenic soil archives of the bottoms, slopes and high flat sides of the funnels complementary to each other. This regular grid of archives contains information on pyrogenic events and stages of soil formation throughout the Holocene. We report and discuss here 42 radiocarbon dates (AMS) obtained both for the charcoal material and the total organic carbon (TOC) of the soil organic matter. The ^{14}C age (conventional) of charcoal from the lowest horizons was as old as 9115 ± 30 BP - 8770 ± 30 BP, and the charcoal material of the top pyrogenic horizons was as young as 325 ± 20 BP - 45 ± 20 BP. The ^{14}C age of the soil TOC was in general younger than the age of charcoal enclosed in this soil material. We combine the study of soil horizons morphology and stratigraphy with the set of ^{14}C data to experiment with the several age-depth models explaining post-pyrogenic sedimentation rates on various geomorphological elements of the karst landscape. This study is supported by the Russian Foundation for Basic Research, Project No. 19-29-05238.