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^{14}C Characteristics of Iron-bound Organic Carbon in Soils

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Reactive iron (Fe) is known to play an important role in organic carbon (OC) stabilization in sedimentary settings through sorption and/or co-precipitation between organic matter (OM) and reactive iron (hydro)oxides, forming chemically stable Fe-OM complexes. Such Fe-OM associations are considered to hamper microbial decomposition and are estimated to stabilize ca. 22% of OC in marine sediments. However, direct evidence on the persistence and fate of Fe-OM complexes is still lacking. Natural-abundance radiocarbon dating provides an excellent alternative to directly examine the residence time or turnover of Fe-bound OC in natural environments. In this study, we examine the ^{14}C signature of Fe-protected OC released by citrate-bicarbonate-dithionite (CBD) method from soils and sediments in wetlands, forests, desserts and marine systems, aiming at revealing the preservation and turnover time of Fe-bound OC. Coupled with a comprehensive list of environmental factors, we also investigate variables controlling the age of Fe-bound OC along soil depths and environmental gradients. Overall, the combination of ^{14}C analysis and CBD treatment allows us to gain more insight into the role of Fe to protect OM in natural depositional settings.