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ABSTRACT BOOK

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UNSTABLE GEOGENIC CARBON CONTROLS ORGANIC CARBON STOCKS AND DYNAMICS IN MEDITERRANEAN CROPLAND SOILS

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Although soil organic carbon (SOC) is a key element for soil health and climate change mitigation, our understanding of its dynamics is still incomplete. In general, it is thought that the vast majority of SOC in deep soils comes from roots and plant litter and that it is very stable because it is preserved in the mineral phase. The present study aimed to investigate the common paradigm of high stability of SOC in deep soil horizons in semiarid Mediterranean cultivated environments. Here we show that, contrary to expectations, SOC biodegradability increased with depth, indicating that subsoil SOC is potentially less stable than topsoil SOC. We further observed that SOC biodegradability was strongly positively correlated with its radiocarbon age, implying that SOC stability decreases with increasing mean residence time. We explained these original counterintuitive results by a significant contribution of geogenic organic carbon, which proved to be both very old and highly biodegradable, in a context of very low inputs of organic carbon via net primary productivity and amendment restitution. This study highlights the great vulnerability of the millennia-old organic carbon pool stored in deep Mediterranean soils and, more broadly, the key role of geogenic organic carbon in carbon cycle studies.

Keywords: Soil organic carbon (SOC), Carbon biodegradability, Radiocarbon age, Geogenic carbon, Mediterranean soils