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Toward the estimation of the contribution of fossil organic carbon in deep soil horizons ?

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Soil is the main terrestrial organic carbon (OC) reservoirs located at the interface between the biosphere and the lithosphere both supplying OC to this crucial interface for the C cycle. In soils, it is admitted that more than half of soil OC (SOC) is stored below 30 cm and consists in a mixture of recent and aged SOC. In turn, aged SOC can be simply divided in a mixture of C showing a 14C activity - meaning that this carbon comes from the biosphere but exhibits a low turn-over - and a part of carbon devoid in 14C – meaning that this OC sources from the sedimentary rocks: the fossil fraction of OC (fOC).
By using the fraction modern F14C and considering that, in soil horizons, SOC is a binary mixture of aged OC and fossil OC, we present a linear modelling providing either the fossil OC content (in wt. %) of the studied samples and the contribution (in %) of fossil OC to the SOC. The relevance of this model is checked using numerous tests from a worldwide soils database on 14C activities of soil samples.
Amongst our preliminary results: first and frequently, the fOC remains unweathered and exhibits a single content in a considered soil profile. Second and obviously, the fOC content strongly depends of the nature of the sedimentary rocks and can reach more than 1 wt. % (with the exception of coal seams). Third, the ratio fOC / SOC is high (frequently more than 0.5 below 50 cm) but can remain significant in the upper soil horizons (close to 0.15 for 5 cm depth).
Beyond the opportunity to know the contribution of fOC to the SOC in a soil profile, since 2/3 of worldwide soils are lying on sedimentary rocks, our results could contribute pieces of the puzzle on the global revisiting of the SOC budget and dynamics in deep soil horizons.