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Mineralization of soil organic matter from equatorial giant podzols submitted to drier pedoclimate: A drainage topochronosequence study

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ABSTRACT

Podzol soils are an important carbon pool in the Amazon, due to the high organic matter (OM) content in their topsoil horizons and deep Bh. To quantify the evolution of the stock and the lability of this carbon pool in the hypothesis of the onset of drier climates, we studied a soil toposequence at the end of which the incision of a river meander lowered the water table, as would result from a drier climate, allowing oxidation the Bh horizons. The soil OM was quantified and characterized (physical fractionation, humification indexes, ^{14}C average age) and its lability under oxic conditions was estimated by measuring respiration during a 660-days experiment. Podzol genesis time was calculated by constraining the carbon fluxes using both C stock and ^{14}C average age. The results confirmed that the studied podzols store large amounts of carbon (62.8 kgC m^{-2} on average). They resulted from a long genesis time, probably greater than 30–50 ky. Topsoil OM is very labile with a residence time of about 100 y; Bh OM is highly humified with a high C/N (62.7 on average) related to low respiration rates. The measured respiration rates were used to estimate the C emission that would result from drier climates at 55 gC m^{-2} y^{-1} on average during the first 100 y, which would correspond, by extrapolation, to 8.5 10^{12} gC y^{-1} for all Amazonian podzols.

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