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soil organic matter pools and quality are sensitive to global climate change in tropical forests from India

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Soil organic carbon (SOC) storage and quality are some of the most important factors determining ecological process in tropical forests, which are especially sensitive to global climate change (GCC). In India, the GCC scenarios expect increasing of drought period and wildfire, which may affect the SOC, and therefore the capacity of forest for C sequestration. The aim of the study was to evaluate the amount of soil C and its quality in the mineral soil across precipitation gradient with different factors (vegetation, pH, soil texture and bedrock composition) for generate SOC predictions under GCC. Six soil samples were collected (top 10 cm depth) from 19 1-ha permanent plots in the Mudumalai Wildlife Sanctuary of southern India, which are characterised by four types of forest vegetation (i.e. dry thorn, dry deciduous, moist deciduous and semi-evergreen forest) distributed along to rainfall gradient. The driest sites are dominated by sandy soils, while the soil clay proportion increased in the wet sites. Total organic C (Leco CN analyser), and the SOM quality was assessed by Differential Scanning Calorimetry (DSC) and Solid-state 13CCP–MAS NMR analyses.
Soil organic C was positively correlated with precipitation ($R2 = 0.502$, $p<0.01$) and with soil clay content ($R2 =0.15$, $p<0.05$), and negatively with soil sand content ($R2=0.308$, $p<0.001$) and with pH ($R2=0.529$, $p<0.01$); while the C/N was only found positive correlation with clay ($R2= 0.350$, $p<0.01$). The driest sites (dry thorn forest) has the lowest proportion of thermal combustion of recalcitrant organic matter (Q2,375-475 ºC) than the other sites ($p<0.05$) and this SOC fraction correlated positively with rainfall ($R2=0.27$, $p=0.01$). The Q2 model with best fit included rainfall, pH, sand, clay, C and C/N ($R2=0.52$, $p=0.01$). Principal component analysis explains 77% of total variance. The sites on the fist component are distributed along the rainfall gradient. These results suggest that the 50% of variance was explained by precipitation and therefore vegetation type. Consequently, the drier sites has a lower C pools with a higher proportion of labile SOC fraction. As a consequence, we expect if the rainfall decreased by GCC could increase SOC mineralization, and therefore reducing the capacity of C sequestration within soil profile.