

Mineralogical variations in tropical soils on African Shield

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Mineralogical variations and their influence on soil fertility status are not fully understood in tropical soils on African Shield. A total of 124 horizon samples from 32 pedons were collected from the South-Cameroon (SC) and Adamawa plateaus (ADM) in Cameroon, where highly-weathered clayey soils (Ferralsols, on the basis of WRB soil classification) are known to be dominant. We found that three parameters to indicate the presence of mica in soil clays, i.e., mica: kaolinite ratio based on XRD analysis, total K content, and Radiocesium Interception Potential, all showed a significant positive correlations with cation exchange capacity (CEC) of soil clay, indicating that nutrient retention ability of soil is largely dependent on the residual amount of mica. Furthermore, soil clays of ADM contained fewer amount of mica, while contained larger amount of Al-hydroxides (gibbsite) and Fe-oxides (goethite) with higher degree of Al-substitution than that of SC. These relationships strongly suggest that dissolution of 2:1 phyllosilicates including mica (i.e. desilication) and accumulation of Al-dominant clays (i.e. aluminization) proceeds to a greater extent in soils on ADM than those on SC. The difference may be attributed to the geological ages when plateau was formed. Our findings revealed that tropical soils on African Plateau showed large variations in their mineralogical properties, although they have never been paid many attentions. Reconsideration of mineralogical control on the soil fertility status would be required to evaluate precisely the nutrient dynamics in tropical soils on African Shields.

Keywords: Cameroon, Mica, Desilication/Aluminization, X-ray diffraction analysis, Differential thermal analysis, Radiocesium Interception Potential