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The impact of land use change on soil phosphorus hotspots at the microscale in Amazonian Dark Earths

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The conversion of tropical forest for cassava cultivation is known to decrease soil organic carbon (OC) and nutrient contents of highly weathered soils in the tropics. Amazonian Dark Earth (ADE) may be resistant to this degradation because of their historical anthropogenic amelioration leading to higher soil OC and P concentrations. In this study, we assessed the effect of land use change on P dynamics under tropical conditions and how this is related with P distribution at the microscale. We analyzed ADE and an adjacent Acrisol from Manaus (Brazil), both under forest and cassava plantation. The land use change induced a decrease of P content by approximately 80% by land use change, whereas the relative proportion of organic P increased. This indicates a legacy effect of anthropogenic amelioration in the ADE for P. Land use change tightened the OC-P relations in the mineral-associated OC fractions, which was also reflected at the microscale. Using NanoSIMS we found µm-sized P hotspots that were more co-localized with OC-dominated areas by land use change. Correlative measurements with synchotron-based µ-XRF and µ-XANES demonstrate a high spatial heterogeneity of different P species. In our contribution, we will discuss distinct C and P interactions in microscale compartments and how these respond to land use change in highly weathered tropical soils.