A comparison of soil properties under four vegetation units from six metalliferous hills in Katanga

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In Katanga (Democratic Republic of Congo), numerous metalliferous hills are distributed along what is called the copperhill belt from Kolwezi to Lubumbashi. Very specific vegetation developed on these hills within the miombo forest in response to very specific soil conditions, among which the copper content. Previous studies have already shown the existence of gradients of copper from the mineralized rocks outcropping at the top of the hills to the foot slopes on colluviums.

After a characterization of the vertical variability of soil properties in pits distributed along the main slopes, we investigated the soil-vegetation relationships in six hills located between the towns of Tenke and Fungurume. Observation 1-square meter plots were installed in four vegetation units and sixty of them were selected according to their relative importance on the six hills. The soil from the top 10cm was sampled and analyzed for pH, Total Organic Carbon, available P, K, Mg, Ca, Cu, Co and Mn and soluble Cu and Co. Analysis of variance was performed in order to assess whether the effects of the "Hill" and of the "Vegetation Unit" were significant to explain soil chemical variability.

Additionally, short transects were sampled at the boundaries from adjacent vegetation units in order to evaluate the gradual or rough nature of change in soil properties under these units.

The results indicate that the six hills can not be considered as different for pH and available nutrients, excepted K, nor for the available Cu and Mn. Only TOC and Co contents were differing, mainly from one hill compared to the other five. The vegetation effect is significant for almost every studied soil characteristics, to the exception of Ca and Mn. Soluble Cu and Co significantly correlate to available Cu and Co, respectively. The pH variations however explain local departures from linear regression. The ANOVA models take into account 30 to 60% of the variations of soil properties.

The study of the boundaries indicate that most changes of vegetation types may be related to abrupt changes in soil properties. These changes do not only occur along the slope as a result of malachite deposition by erosion but the surface processes seem to be predominant in the context of the hills.