

EGU2020-22030

<https://doi.org/10.5194/egusphere-egu2020-22030>

EGU General Assembly 2020

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## Swelling clayey soils promote slope instability in the Muhunguzi watershed, western Burundi

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In Burundi, landslides are frequent on the western slope of the Congo-Nile ridge. Unfortunately, they are poorly studied and understood despite their deadly consequences. Previous reports have suggested that slope steepness, lithology and clay soils expose this slope to landslides, while heavy and intense rainfall is a trigger. However, the role of soil in the vulnerability of this specific slope to landslides is unknown. Here we investigate on soil characteristics involved in land sliding in this area.

We selected and sampled black and red soils in two Muhunguzi landslides. We determined the soil plasticity from Atterberg limits as well as the particle size distribution. In addition, we measured the soil weathering stage, and further identified the clay minerals from measuring the cation exchange capacity of the clay fraction and analyzing clay samples with X-ray diffraction (XRD).

Both the black and red soils are moderately weathered since TRB values in the B horizons range between 330 and 425  $\text{cmol}(+) \text{kg}^{-1}$ . The soils are loamy clayey to clayey (% clay: 33-55%), and contain high charge clay minerals. They do not differ in their Atterberg limits, which classify the soils as medium plasticity soils in the Casagrande plasticity diagram. Our data further show that both soils have a medium swelling potential. XRD show that the clay fraction consists of kaolinite and smectite and/or vermiculite. The latter 2:1 clay minerals are expandable and swelling clays, respectively. They give these two soils their plasticity and swelling properties. These two properties play an important role in the mechanical behavior of water-saturated soils. Indeed, swelling reduces soil cohesion while the plasticity index and the liquidity limit vary inversely with the internal angle of friction of the soil; cohesion and internal angle of friction being the fundamental parameters of the soil shear resistance. In addition, the soil mantle covers a hard schistose rock whose declivity is parallel to the soil surface slope. Thus, after intense rainfall during the wet season, the water-saturated soil reaches a level of liquidity sufficient to favor a landslide, all the more easily if the slope of the hard rock is inclined in the direction of the gravity flow.gru