

## Where did the tephra go? The geopedology of western Uganda

Contact persons: Stéphanie Grand and Thierry Adatte

### Context

The Kibale region of western Uganda is located in the western (Albertine) branch of the East African rift system. It is characterized by complex landscapes where highly weathered lateritic crusts (iron pans) co-exist alongside young soils and sediments. Soils of the area are among the most fertile in East Africa, but much remains unknown about their origin and their development.

The general objective of this project is to develop an understanding of soil formation from different geological substrates in the region. More specifically, the primary aim of the work is the crack the mystery of 'volcanic' soil occurrence in the area. These black soils are generally believed to form from tephra layers, but these layers have not been unambiguously identified thus far. Possible explanations include two competing hypotheses :

- (1) Due to the humid climate, tephra layers are rapidly altered beyond field recognition ; or
- (2) So-called 'volcanic' soils formed in the absence of ejecta from iron-rich laterite disintegration products.

### Objectives and Methods

During your master research, you will use geochemical and mineralogical methods to test the abovementioned hypotheses and solve the riddle of the Kibale region volcanic soils. Methods may include :

- X-ray fluorescence for major and trace elements compositions ;
- Powder and clay X-ray diffraction ;
- Particle size analysis ;
- Rock-Eval pyrolysis to distinguish modern and fossil organic components;
- Petrographic microscopy (optical mineralogy and soil micromorphology) ;
- Electron microscopy (SEM-EDS).

### Literature

Ring (2014) The East African rift system. *Austrian Journal of Earth Sciences* 107:132-146.

Schaetzl and Thompson (2015) Pedogenesis in the humid tropics: Oxisols. In *Soils: Genesis and Geomorphology, 2<sup>nd</sup> edition*, pp. 363-373. Cambridge University Press.

Van Ranst et al (2019) Andosolization of ferralitic soils in the Bambouto Mountains, West Cameroon. *Geoderma* 340:81-93.



### WEB sites

<http://wp.unil.ch/biogeoresearch/pedology/>

### Choice of orientation :

1) Sedimentary, Environmental and Reservoir Geology / 2) Geochemistry, Alpine tectonics, Ore Deposits