Dynamic soil response to K-uplift reactivation in Union, South Carolina

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The assertion that the potassium uplift cycle influences the formation of illite-like clay mineral layers was tested by relating illite-like layer abundance to potassium influx through leaf litter in order to better understand the dynamic relationship between forest ecology and clay mineralogy. Historic farming practices in the Southeastern United States have subjected the Critical Zone to extensive erosion that is currently being managed through reforestation. Recently, it has been suggested reforestation of degraded landscapes reactivated the potassium uplift cycle favoring the production of potassium-bearing illite-like layers [1]. These illite-like layers are particularly important because they directly affect soil fertility and indicate the forest is recovering from degredation.

The present study examines the null hypothesis that there is no significant relationship between potassium influx through leaf litter and increased illite-like layers in the soil profile at the Calhoun Critical Zone Observatory in Union, South Carolina. Leaf litter was collected in litter traps across a recovering pine forest and analyzed for potassium concentration using atomic absorption spectroscopy. These values were compared against adjacent soil samples whose illite-like layer abundance were measured with X-ray diffraction. If the hypothesis is rejected, the rate at which the Critical Zone responds to new steady state conditions resulting from human interaction can be described.

[1] Austin, Perry, Richter, and Schroeder (2018), *Clay and Clay Minerals*, **66 (1)**, 61-73.