



## **Investigating the role of chemical weathering on the dynamics of soil catena using a coupled soilscape-landform evolution model**

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A standard variable for describing soil properties is the location of the soil profile in the landscape, and specifically the hillslope. This is the basis for the concept of soil catena. However, this assumes that this position in the landscape has been unchanged and that the landform has also not changed, through the history of the soil profile development. This is only a satisfactory approximation if the rate of adjustment of the soil profile is significantly faster than the rate of adjustment of the landform over which the soils drape. Recent work indicates that these rates of adjustment may overlap so soils are the result of a co-evolution of the soil and the landforms: the soil evolution changes the evolution of the landform and vice versa. The computational demands of coupled models of soilscape and landscape evolution are significant, so conceptual simplifications of the processes are required to facilitate further insights.

This paper will discuss a simple model of chemical weathering based on analytic solutions to a soil profile geochemistry model. We then couple this simple chemical weathering model with our coupled soilscape-landform evolution model SSSPAM and examine the consequences for soil profile development. We will show how spatial coupling influences the soil profile, the spatial distribution of the soil itself, the soilscape, and the geomorphology of the evolving hillslope. Depending upon the dominant processes in the chemical weathering model the evolutionary pathways of the soilscape and hillslope geomorphology change quite markedly. A number of different simulations will be shown using different weathering conditions and these simulations will show how different environmental conditions (and thus the dominant processes) may impact on soilscape and landform evolution.