



Into the regolith: digging for hydrological tracers

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The mineralogical and trace element composition of regoliths is a source of potential tracers of water behaviour in catchment systems. We propose an assessment of the most suitable spatial tracers for water collection, mixing, storage and release processes by incorporating geochemical signatures derived from trace and major elements to the description of sources and pathways of water contributions in the stream. To date, stable isotopes are widely used to trace water sources and water transit times but they are still missing a complementary tool which allows for the identification of end-members and the understanding of mixing processes within the regolith. Trace elements are known to be powerful and precise geochemical tracers of environmental processes and, therefore, they can be useful indicators of the spatial origin and evolution of regolith materials and water chemistry. We studied a whole slate regolith profile for its mineralogical, major and trace element composition. The different regolith components were subjected to a leaching experiment in order to identify chemical zonations within and assess the potential elements mobility. Rain, soil, stream and ground waters were collected at the same location than the regolith system over 4 years, analysed for their trace and major elements composition and compared to regolith and regolith leachates data. The results deliver valuable information on exchange processes at the water-mineral interface in the different zones of the regolith. The geochemical scheme of a complete regolith and the waters it holds is here presented to prove the efficiency of trace and major elements as complementary hydrological and geochemical tracers of water migration throughout a regolith till the stream.