**The layered Critical Zone (CZ)' established geomorphic concepts but a novelty for Critical Zone Observatory (CZO) Science?**

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By literature and common definitions the Critical Zone (CZ) is described as monolayered. At best a line is given on so-called moved regolith. In fact the CZ is often characterized by stratified and multilayered slope deposits with thicknesses exceeding 1 m. These stratified slope sediments play a significant role in the nature of the physical and chemical properties as well as on soil forming processes in the CZ. Examples are given for CZ sediment sourced chemical elements and common clay minerals, and the significance of slope sediments as both barriers and pathways for interflow that moves through the stratified sediments. Examples are also taken from latitudinally different geographic areas, as well as from varying altitudes. The stratified CZ is often datable by numeric age techniques showing up how sediment features contradict weathering effects and meaning e.g. for soil genesis. In the mid latitudes, geomorphic and sedimentologic evidence supports a periglacial origin, involving solifluction, for the origin of these CZ slope deposits.

Literature: Völkel, J., Huber, J. & Leopold, M. (2011): Significance of slope sediments layering on physical characteristics and interflow within the Critical Zone… - Applied Geochemistry 26: 143-145.

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**δ18O isotopic signature of glacier meltwaters in the tree rings: basis for long-term high-resolution hydrological reconstructions in glacial environments**

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Glacial environments on the Alps are experiencing a generalized shrinkage phase mainly driven by the thermal perturbation related to global warming. As a result, after a higher runoff from snow and ice melting in a first phase, a large runoff reduction is expected in the mid to long term. Changes in glaciological features and in meteorological conditions influence the hydrological regimes of the glacial environments (and in particular of the glacier forefields), inducing also alterations in the water stable isotopes distribution in the soil. Glacier streams and hydrological conditions at the glacier terminus are characterized by a great variability concerning melt water runoff and the directions taken by the glacier streams along the glacier forefields.

The $^{18}O/^{16}O$ ratio in the tree rings is mainly driven by the source water isotopic signature and isotope fractionation processes at the leaf level related to stomatal conductance and the amount of depleted soil water replenishing the transpired water. The analysis of $\delta^{18}O$ and $\delta^{13}C$ in the tree rings from glacial environments from the Miage Glacier and the Forni Glacier forefields has demonstrated the potential of using tree rings for the high-resolution reconstruction of hydrological changes occurred over long time periods. In fact trees growing in proglacial areas (mainly fed by glacier melt waters that flow down valley from the glacier) resulted more depleted in $\delta^{18}O$, whereas trees growing on the slopes or on the moraines were more enriched, thus allowing long tree-ring chronologies to be potentially used as a proxy of past and ongoing climatically-driven hydrological changes in glacial environments. The opportunity of reconstructing past long-term changes in $\delta^{18}O$ signature in glacier melt waters occurred over time in the Alpine glacial environment is a critical issue both for understanding glacier responses to climate warming and for assessing water availability in the Alpine environment.