Geophysical Research Abstracts, Vol. 7, 04948, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04948

Use of electrical resistivity tomography (ERT) and tracers to explore flow pathways and residence times at the hillslope scale

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In this study, different hillslopes were investigated to explore lateral subsurface flow processes in mountainous catchments. The runoff dynamics at the hillslopes were compared and the hydrochemistry was investigated. In addition, tracer tests using artificial tracers were carried out. It was shown that they behaved quite differently, and that this behaviour is caused by different soil water and groundwater contributions. The use of electrical resistivity tomography (ERT) allowed gaining further insights of the structures of the subsurface (different lithologies) at all sites. Thus, the source areas of the different runoff components could be identified. In the presentation it will also be discussed where and when this methodology (i.e., combined tracer and geophysical approach) failed. In particular the natural tracers were difficult to interpret, when the spatio-temporal variability of the end-members was too large. The study clearly demonstrates that different experimental techniques should be applied to identify runoff generation processes at the hillslope scale. Finally, different ways to translate process understanding into a process-based model framework are discussed (physically based vs. more conceptual).