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Field observations at different scales for understanding hydrological processes in microcatchments at 2000m a.s.l. in Southern Ecuador

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In the Andes of Southern Ecuador at 2000m a.s.l. we investigate the hydrological behaviour of three steep microcatchments featuring nature and secondary forest as well as actively grazed pasture. Further locations are two landslides of different age. Within these microcatchments and sites we conducted dye tracer experiments to investigate potential lateral flow paths at pedon scale, monitored the soil water dynamic at plot scale and installed weirs to obtain discharge data from zero order catchments. Furthermore, Ksat measurements all over the microcatchments and sites were made to find dependencies on the topography. A special issue of the forested microcatchments is an organic layer mainly composed of fine roots emerging up to several dm. Composition, thickness and hydrological behaviour of this layer depends on the composition of the tree stand which in turn depends on the topographic position. Until now we have determined the organic layer hydrological parameters of a primary and a secondary forest by a laboratory irrigation device and inverse modelling. Most of the soils situated within the steep slopes were derived from shallow landslides and generally feature high rock fragment contents. Vertical percolation predominates in these soils, that seems to be controlled by the size distribution of the rock fragments. In this regard the effect of landslides on soil properties depends on the type of the landslide, the depth of the displaced material and the type of displacement. However, even at smaller scale soil properties on landslides can vary due to a heterogeneous mixture of substrates occurring with the landslide formation. Soils situated on ridges, plateaus and rotational landslides are denser with lower drainable porosities impeding vertical percolation in benefit for overland flow and lateral subsurface flow. Aims of the investigation are to assess the heterogeneity at the different scales and to find generalities, i.e. hydrological units to establish a construction set or conceptual model, respectively. The conceptual model then will be transformed into a numerical model. Its applicability will be proofed by comparing the modelled with the measured discharge of neightbouring microcatchments.