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# Geoelectrical exploration of subsurface structures and processes of the Alpine "Heumöser" hillslope

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The Heumöser slope near the Rhine River valley in the Vorarlberg Alps, Austria, is characterized by continuous slow movement of up to 25 cm/year. The movement along a shear zone in 7 to 12 m depth is most likely triggered by hydrological processes that control pore-water pressure based on preferential infiltration and subsurface flow. Hence, the identification of relevant structures and corresponding soil-moisture dynamic are essential for the modelling of the mass movement, under the scope of the research project “Grosshang”.
Different geoelectrical methods were used for the characterization of the subsurface and monitoring of soil-moisture related processes. Electromagnetic induction (EM) is applied for repeated mapping of apparent conductivity at the hill-slope scale. DC resistivity methods serve as a tool for small-scale 2D subsurface characterization and 1D monitoring. Several mapping surveys using the GSSI Profiler EM induction system have been carried out since August 2009. EM data acquisition is performed at three frequencies simultaneously, resulting in three conductivity readings with different depth-sensitivity ranges. Conductivity readings at higher frequencies used (15, 9 kHz) show a high temporal and spatial variability, pointing to a significantly dynamic nature of the relevant soil parameters, mainly soil moisture. Results for the low frequency used (2 kHz) are consistent, presenting a similar spatial pattern of apparent conductivity with a similar data range over time. This characteristic may point to a distinct influence of near-surface bedrock (marlstone) on EM response, as interpreted from single DC resistivity 2D sections. Inverted resistivity data show relatively low contrasts with values of around 90 Ohm m for bedrock and 25 to 60 Ohm m for overlying sediments. The conductive character of uppermost sediments limits the applicability of 1D resistivity sounding for high-resolution soil-moisture monitoring. Nevertheless, EM and DC resistivity surveys are able to explore main subsurface structures and to identify subareas of the hill-slope with different soil-moisture dynamics.