Geophysical Research Abstracts,
Vol. 11, EGU2009-9443-1, 2009
EGU General Assembly 2009

Geoelectrical Monitoring for the characterisation of the near surface interflow in small alpine catchment areas during continuous rain

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In a pilot study the bandwidth of the near surface interflow and subsurface stormflow was investigated on a hill slope complex at the military training centre Lizum/Walchen (approx. 2000m above sea level) in Tyrol.

High amounts of precipitation (about 250 mm) were applied within 2 days by use of a transportable spray irrigation installation. During the first day water from a creek was applied to the test site. On the following day the site was sprinkled with a salt tracer for an hour followed by creek water for the rest of the day. To characterise the runoff, different measurements techniques were used in the irrigation field. The subsurface runoff was registered in calibrated tanks. Changes in soil moisture were measured with buried TDR-waveguides – arranged in four profiles from 15 cm to 115 cm soil depth in maximum. In addition three geoelectrical profiles were measured.

Two geoelectrical profiles were positioned orthogonal to the slope in the precipitation area, where one was reaching over the edge. The third profile was parallel to the slope overlapping with the second profile. Electrode distances were 0.25 cm and 0.50 cm respectively with 48 electrodes per profile. Geoelectrical measurements were done periodically before, during and after the rain simulation experiments. These have been carried out with the newly developed geoelectric instrument of the Geological survey of Austria, GEOMON4D. The advantage of the instrument is that it can measure a resistivity section at high speed and in an automated, meaning monitoring mode. Therefore, it is possible to register small and fast changes in the soil conductivity caused by a tracer.

Summarising it can be said that the resistivity soundings give a detailed picture regarding the geological structure of the research area as well as explicit knowledge of how the near surface interflow spreads out in the subsurface. The geoelectric measurements deliver precise information about the behaviour of the salt tracer, its lateral and vertical extend and the flow velocity in the subsurface.

For a more elaborate interpretation the results of the measurements were put together to achieve the best information of the interflow processes.