Geophysical Research Abstracts, Vol. 8, 06384, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06384

Subsurface Outflow Episodes on the Hillslope Caused by Snowmelt

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In the experimental watershed Uhlirska of the Cerna Nisa river, Czech Republic, hydrological research with the focus to the processes in the subsurface is performed.

Within this small watershed (1.87km2), one experimental hill slope transect has been instrumented. The massive data collection and soil surveying is in process since spring 1997. Data collection of the water regime and the subsurface flow caused by the snowmelt is performed since 2000. During five non-vegetation periods, more than 15 significant runoff events have been recorded. In the constructed subsurface trench the shallow subsurface runoff intensity is measured in two sections of three horizons each. The water saturation of the soil profile along the transect is controlled by 5 sets of automated tensiometers adjacent to the trench. The typical soil profile at the site of study is highly heterogeneous, formed by 0.8-1.2 m of Cambisols. The depth of decayed and fractured granite bedrock as determined by the indirect geophysical methods is 4-20 m. Due to the highly permeable topsoil and preferential flow taking place within the whole soil profile, no overland flow occurs.

Subsurface outflow is caused by the snowmelt of a different duration and magnitude due to the combination of the air temperature rise, present snow height and its water content and rainfall accelerating the processes of snow thawing. Runoff formation shows high variability in terms of soil suction, depth of water in the soil profile as well as groundwater table in the vicinity of the trench. Instant moisture in the soil profile depends on the history of filling of the pore space. Soil profile during snowmelt is mostly saturated unlike in the vegetation period outflow intensity often fluctuates as a response to the course of the air temperature in the daily thawing/freezing cycle. Snowmelt runoff episodes are usually of an order higher in terms of the outflow inten-

sity and cumulative amount of water and often of a longer duration compared to the episodes observed in the vegetation period.

Relations of the groundwater table, soil moisture, subsurface runoff and the total outflow from the watershed are significant. Thus transformation of the snowmelt and rainfall into runoff in the area where soils are shallow, based on decayed crystalline bedrock is controlled by the water regime in the soil profile where preferential flow effects are determining the nature of the filling end emptying of the pore space.

We want to acknowledge projects GACR 205-05-2312 and GACR 205-06-0375 of the Grant Agency of the Czech Republic for support of this contribution.