



Process studies on different scales to estimate the influence of antecedent soil moisture on the runoff processes in two small catchments in Germany

P. Chiffard (1), H. Zepp (1), A. Schumann (2)

(1) University of Bochum, Institute for Applied Physical Geography, Universitaetsstrasse 150, 44780 Bochum, (peter.chiffard@rub.de, harald.zepp@rub.de)

(2) University of Bochum, Institute for Hydrology, Water Management and Environmental Engineering, (andreas.schumann@rub.de)

Physically based and area detailed hydrological watershed models are more and more expected to take the spatial contribution of condition variables (e.g. soil moisture) into account. Several studies show the influence of antecedent soil moisture on discharge at the beginning of a rainfall event (KREIN 2002, MÜLLER 1998). But in most cases the antecedent soil moisture is just described as wet, medium or dry or the measurement location is not taken into consideration. But it is important to distinguish between the hydrological system of the hillslope and the saturated area near the receiving stream. Especially the last system constitutes a transforming part between slope and receiving stream and is significant for the discharge. Furthermore it is important in which scale the soil moisture is measured for estimating the influence on the runoff processes. Therefore a cooperation project between the Institute for Applied Physical Geography and the Institute for Hydrology, Water Management and Environmental Engineering examines the influence of antecedent soil moisture on discharge and tries to set up ratios. Basement for this project are process studies on hillslope and groundwater hydrology and additionally the measuring of the water suction as an indicator for the antecedent soil moisture. Moreover hydrochemistry and isotope data are used to detect different runoff components.

For these process studies nine soil hydrology measurement locations and fourteen piezometers are provided in the catchment Husten (2,5 km²) and Bohläse (0,7 km²) located in the Sauerland (Germany). The measurements started in July of 1999. The

soil hydrology measurement locations are equipped with several tensiometers installed in different depths (20 to 200 cm). The water suction is registered automatically every 10 minutes. The measurement locations are arranged at representative positions derived of soil, relief and landuse combination. The groundwater gauges are fitted with pressure heads and dataloggers (10 min interval) and arranged in two sections vertical to the valley. The first section is installed in a gently convergent slope, the second at the footslope of a divergent slope. At the basin outlet (Bohläse) water samples were taken during three rainfall events (Jul./Aug. 2002) with sampling intervals up to 30 minutes. The samples were analysed for the main ions (e.g. chloride, nitrate, sulfate, magnesium, calcium), dissolved silica and oxygen-18 for every event.

The first results show a significant influence of the antecedent soil moisture on the discharge. Between the water suction of 100 to 420 hPa the discharge keeps constant whereas there is a significant increase of the discharge at a suction of 60 hPa. Furthermore the influence of the soil moisture in different soil horizons to the discharge is also very significant. The synthesis of hydrochemistry and water suction data helped to understand the runoff components in a small catchment and to determine the source of subsurface runoff.

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