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Hydrological modelling in sandstone rocks watershed

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The contribution is focused on the modelling of surface and subsurface runoff in the Ploučnice basin. The used rainfall-runoff model is HEC-HMS comprising of the method of SCS CN curves and a recession method. The geological subsurface consisting of sandstone is characterised by reduced surface runoff and, on the contrary, it contributes to subsurface runoff. The aim of this paper is comparison of the rate of influence of sandstone on reducing surface runoff. The recession method for subsurface runoff was used to determine the subsurface runoff.
The HEC-HMS model allows semi- and fully distributed approaches to schematisation of the watershed and rainfall situations. To determine the volume of runoff the method of SCS CN curves is used, which results depend on hydrological conditions of the soils. The rainfall-runoff model assuming selection of so-called methods of event of the SCS-CN type is used to determine the hydrograph and peak flow rate based on simulation of surface runoff in precipitation exceeding the infiltration capacity of the soil. The recession method is used to solve the baseflow (subsurface) runoff. The method is based on the separation of hydrograph to direct runoff and subsurface or baseflow runoff.
The study area for the simulation of runoff using the method of SCS CN curves to determine the hydrological transformation is the Ploučnice basin. The Ploučnice is a hydrologically significant river in the northern part of the Czech Republic, it is a right tributary of the Elbe river with a total basin area of 1.194 km2. The average value of CN curves for the Ploučnice basin is 72. The geological structure of the Ploučnice basin is predominantly formed by Mesozoic sandstone.
Despite significant initial loss of rainfall the basin response to the causal rainfall was demonstrated by a rapid rise of the surface runoff from the watershed and reached culmination flow. Basically, only surface runoff occures in the catchment during the initial phase of this extreme event. The increase of the baseflow runoff is slower and remains constant after reaching a certain level. The rise of the baseflow runoff is showed in a descending part of the hydrograph. The recession method in this case shows almost 20 hours delay.
Results from the HEC-HMS prove availability of both methods for the runoff modeling in this type of catchment. When simulating extreme short-term rainfall-runoff episodes, the influence of geological subsurface is not significant, but it is manifested. Using more relevant rainfall events would bring more satisfactory results.