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Distributed modelling of hydrologic regime at three subcatchments of Kopaninský tok catchment

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Kopaninský tok catchment is situated in crystalline area of Bohemo-Moravian highland hilly region, with cambisol cover and prevailing agricultural land use. It is a subject of long term (since 1980's) observation. Time series (discharge, precipitation, climatic parameters...) are nowadays available in 10 min. time step, water quality average daily composit samples plus samples during events are available. Soil survey resulting in reference soil hydraulic properties for horizons and vegetation cover survey incl. LAI measurement has been done.
All parameters were analysed and used for establishing of distributed mathematical models of P6, P52 and P53 subcatchments, using MIKE SHE 2009 WM deterministic hydrologic modelling system. The aim is to simulate long-term hydrologic regime as well as rainfall-runoff events, serving the base for modelling of nitrate regime and agricultural management influence in the next step. Mentioned subcatchments differs in ratio of artificial drainage area, soil types, land use and slope angle. The models are set-up in a regular computational grid of 2 m size. Basic time step was set to 2 hrs, total simulated period covers 3 years. Runoff response and moisture regime is compared using spatially distributed simulation results. Sensitivity analysis revealed most important parameters influencing model response. Importance of spatial distribution of initial conditions was underlined.
Further on, different runoff components in terms of their origin, flow paths and travel time were separated using a combination of two runoff separation techniques (a digital filter and a simple conceptual model GROUND) in 12 subcatchments of Kopaninský tok catchment. These two methods were chosen based on a number of methods testing. Ordinations diagrams performed with Canoco software were used to evaluate influence of different catchment parameters on different runoff components. A canonical ordination method analyses (RDA) was used to explain one data set (runoff components – either volumes of each runoff component or occurence of baseflow) with another data set (catchment parameters – proportion of arable land, proportion of forest, proportion of vulnerable zones with high infiltration capacity, average slope, topographic index and runoff coefficient). The influence was analysed both for long-term runoff balance and selected rainfall-runoff events.

Keywords: small catchment, water balance modelling, rainfall-runoff modelling, distributed deterministic model, runoff separation, sensitivity analysis