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Simulating sensitivity of hydrological regime on land use changes in selected river basins in Slovakia

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The FRIER rainfall-runoff model with distributed parameters was applied for estimating changes in water balance and runoff regime due to changes in land use. Sensitivity of the runoff regime on changed land use conditions was tested in eight selected pilot basins in Slovakia: the Upper Váh, Orava, Kysuca, Turiec, Rajčianka, Upper Nitra, Bebrava and Myjava River Basins. The input data consist of time series of daily precipitation totals, the mean daily meteorological data for computing potential evapotranspiration, the mean daily discharges in a basin's outlet (for the calibration of model parameters) and the spatial layers of a digital elevation model, the soil texture and the land use of the basin. From these maps other physiographical characteristics are derived as digital maps. Model parameters were estimated using data from the period 1981-2007 in daily time steps. Six different scenarios of land use changes were developed and compared with actual land use: meadows over forest, meadows over agricultural areas, agricultural areas over meadows up to 1000 m a. s. l., natural land use (without urbanization), optimal and minimal hydrotops. The differences in the hydrologic regime of individual basins were investigated in changed land cover conditions and limitations of the use of distributed models for estimating land use changes were discussed.

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