Incorporating agricultural land cover in conceptual rainfall runoff models

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Incorporating spatially variable information is a frequently discussed option to increase the performance of (semi) distributed conceptual rainfall runoff models. One of the methods to do this is by using these spatially variable information to delineate Hydrological Response Units (HRUs) within a catchment. This study tests whether the incorporation of an additional agricultural HRU in a conceptual hydrological model can better reflect the spatial differences in runoff generation and therefore improve the simulation of the wetting phase in autumn. The study area is the meso-scale Ourthe catchment in Belgium. A previous study in this area showed that spatial patterns in runoff generation were already better represented by incorporation of a wetland and a hillslope HRU, compared to a lumped model structure. The influences which are considered by including an agriculture HRU are increased drainage speed due to roads, plough pans and increased infiltration excess overland flow (drainage pipes area only limited present), and variable vegetation patterns due to sowing and harvesting. In addition, the vegetation is not modelled as a static resistance towards evaporation, but the Jarvis stress functions are used to increase the realism of the modelled transpiration; in land-surface models the Jarvis stress functions are already often used for modelling transpiration. The results show that an agricultural conceptualisation in addition to wetland and hillslope conceptualisations leads to small improvements in the modelled discharge. However, the influence is larger on the representation of spatial patterns and the modelled contributions of different HRUs to the total discharge.