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Hydrology and Earth System Sciences Discussions

Interactive comment on "Detecting the influence of land use changes on Floods in the Meuse River Basin – the predictive power of a ninety-year rainfall-runoff relation" *by* A. G. Ashagrie et al.

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The authors are grateful to the constructive criticism made by the reviewers. All the raised points are addressed in a revised manuscript. In the following we would like to reply to general discussion points; all specific editorial points are detailed in a letter to the editor and all considered in the revisions.

Calculation of Evapotranspiration and Interception

Both referees had problems with the description of computation of the potential and actual evapotranspiration and the interception (section 4.2, page 540). The evapotranspiration module is based on the equation of Penman-Monteith and takes interception losses into account. For this purpose an interception reservoir is included in the model

which fills in case of precipitation to its maximum before through-fall occurs. Each type of land use has its own interception reservoir capacity. For example, the reservoir capacity for coniferous forest is 2.0 mm and constant throughout the year, while for deciduous forest it varies from 0.3 mm in the winter season to 1.5 mm in the summer (values are based on daily time steps). Evaporation of intercepted water is given priority over the use of the available energy for transpiration and soil evaporation. The actual evapotranspiration is then computed based on available soil moisture simulated in the HBV soil routine. It equals the potential evapotranspiration if the soil moisture content is above a certain threshold (defined by the model parameter LP), and is linearly reduced from the potential evapotranspiration if the soil moisture content is below this threshold. Generally, we used a relatively simple approach to estimate actual evapotranspiration that is based on classical textbook knowledge (Penman-Monteith, conceptual interception routine) and previously published models (HBV, MUST). Data for more complex and more physically based approaches was not available (e.g. remote sensing data), which would have allowed a more explicit and distributed parameterization and, consequently, a better process-based simulation.

Limitations of the Conceptual Model Approach

We fully agree with referee # 3 about the limitations of a conceptual hydrological model such as the HBV model. Due to the simplified concepts a detailed process-based description of floods and flooding is not possible. However, the relatively simple model has its advantages and is widely used in operational hydrology as well as in research projects. This is due to the facts that the model is robust, at least semi-distributed and the data is usually ready available also for application at larger scales. We used the model to analyse the rainfall-runoff relationship at a larger river basin and were able to identify the predictive power and shortcomings of the 90-year data set.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 3, 529, 2006.