

Importance of incorporating agriculture 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 this spatially variable information to delineate Hydrological Response Units (HRUs) within a catchment. In large parts of Europe the original forested land cover is replaced by an agricultural land cover. This change in land cover probably affects the dominant runoff processes in the area, for example by increasing the Hortonian overland flow component, especially on the flatter and higher elevated parts of the catchment. A change in runoff processes implies a change in HRUs as well. A previous version of our model distinguished wetlands (areas close to the stream) from the remainder of the catchment. However, this configuration was not able to reproduce all fast runoff processes, both in summer as in winter. Therefore, this study tests whether the reproduction of fast runoff processes can be improved by incorporating a HRU which explicitly accounts for the effect of agriculture. A case study is carried out in the Ourthe catchment in Belgium. For this case study the relevance of different process conceptualisations is tested stepwise. Among the conceptualisations are Hortonian overland flow in summer and winter, reduced infiltration capacity due to a partly frozen soil and the relative effect of rainfall and snow melt in case of this frozen soil. The results show that the named processes can make a large difference on event basis, especially the Hortonian overland flow in summer and the combination of rainfall and snow melt on (partly) frozen soil in winter. However, differences diminish when the modelled period of several years is evaluated based on standard metrics like Nash-Sutcliffe Efficiency. These results emphasise on one hand the importance of incorporating the effects of agricultural in conceptual models and on the other hand the importance of more event based model evaluation.