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Runoff modelling for real time flood forecasting in the Kamp catchment, Austria

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In this paper we discuss the requirements of runoff models to be used for real time flood forecasting considering the Kamp catchment in northern Austria as an example. The applicability of the model for real time forecasting depends on the amount of data needed, the robustness and the computing time of the model, and the ability to identify suitable model parameters. We used a spatially distributed conceptual water balance model based on a 1 x 1 km^2 grid. The size of the total catchment is 1550 km^2 and the predictions are needed at a number of internal nodes. The response time of the catchments and subcatchments ranges from 1 to 4 hours so a time step of 15 minutes was chosen. The model has 20 parameters that need to be specified for each grid cell. To reduce the number of parameters to be specified we delineated 8 zones of uniform model parameters for each subcatchment. This procedure was guided (in decreasing importance) by our understanding of runoff processes from field surveys, geologic maps, soil maps and sensitivity analyses. It is important to note that these zones differ from traditional hydrologic response units in that in assigning each pixel to one of the eight zones we very carefully assessed the relative role of runoff processes by expert judgement. One of the zones, for example, is a groundwater recharge area which we identified by analysing the dynamics of piezometric heads in the area. Runoff routing in the catchments and in the streams is represented by non-linear transfer functions. In the latter case, the transfer function is calibrated to the results of a detailed hydraulic model to represent the flood plain effects on the hydrograph for very large flows. Another particularity of the Kamp catchment is that half the catchment drains into a reservoir. We therefore represented future reservoir operation by a simulation routine that captures typical operation strategies of the plant operators. Developments of the forecasting system in progress include ensemble forecasts and a real time updating procedure based on ensemble Kalman filtering.