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Regionalized modelling of meso-scale basin runoff by incorporating dominant hydrological processes, a case study on the Alzette basin (Grand Duchy of Luxembourg).

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A conceptual model has been developed for meso-scale basins (10-1000 km2) within the Alzette basin (Grand Duchy of Luxembourg), by performing a detailed study on the dominant hydrological processes and the hourly discharge data of 15 sub-basins in this region. As a result, hydrologically similar behaviour of three different lithological substrata has been defined, being sandstone on marls, marls and schist. The specific hydrological hillslope and alluvial runoff behaviour of these structures is implemented into a conceptual model, based on the principles of combined linear and non-linear reservoirs. A hydrograph generation analysis has been performed to be able to define a hydrograph routing module in the model to partly deal with the scaling problems of model parameters of larger basin sizes. The model has been calibrated on small-scale basins ($<$20 km^2) each having a different but homogeneous lithological substratum and on small- to meso-scale basins ($<$100 km^2) with combined lithological substrata. It appeared to simulate accurately with a Nash-Sutcliffe measure of above 0.7 for each structure for time series of more than two years of hourly rainfall and runoff data. The model concept is adapted for regionalization purposes, while a better insight in the runoff behaviour has been achieved. Model validation with fixed parameter values has been done on various larger-scale basins (100-1000 km^2), giving promising results.