Understanding spatial patterns of streamflow through distributed hydrological modelling

Dmitri Kavetski (1), Fabrizio Fenicia (2), Hubert H. G. Savenije (3), and Laurent Pfister (4)

(1) School of Civil, Environmental and Mining Engineering, University of Adelaide, Adelaide, Australia, (2) EAWAG, SIAM, Dübendorf, Switzerland, (3) Water Resources Section, Delft University of Technology, Delft, the Netherlands, (4) LIST, Luxembourg Institute of Science and Technology, Belvaux, Luxembourg

Hydrographs measured at multiple gauging stations within a catchment may differ strongly. The cause of these differences are multiple, and may include climatic variability, as well as spatial heterogeneity of catchment properties, such as topography, geology, soils, vegetation, etc. In the attempt to understand which of these factors control streamflow spatial variability in a specific environment, we propose an iterative approach for distributed hydrological model development. We focus on the key decisions of how to discretize the landscape, which model structure to assign to each landscape element, and how to regionalize parameters in space. The approach is illustrated in an application to the Attert catchment in Luxembourg, where 10 stream gauging stations exhibit clearly different dynamics. Our results indicate that geology has a primary control on the spatial variability of streamflow response.