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Spatial variability of the parameters of a distributed rainfall-runoff model.

Elena Montosi (1), Juraj Parajka (2), Alberto Montanari (1), and Günter Blöschl (2)

(1) Università degli Studi di Bologna, DICAM, Bologna, Italy, (2) Institue for Hydraulic and Water Resources Engineering, Vienna University of Technology, Vienna, Austria

Calibration of spatially distributed rainfall-runoff models is challenging because of the high number of involved parameters. However, they have the advantage that parameters may have a physical or conceptual meaning, therefore allowing the user to identify prior values and related ranges of variability. Moreover, some parameters can be homogeneous in space, therefore allowing one to reduce their total amount when multiple basins are considered. Spatial variability of the parameters for distributed models has been poorly investigated so far, mainly for the high computational requirements. In this study we focus on spatial variability of the parameters of a spatially distributed rainfall-runoff model which has been conceived to minimise the computational effort in order to allow a regional application of the model. The practical aim of this study is to produce long term river flow simulations for several river cross sections in a wide geographical region located in Northern Italy. The purpose of the application is to assess long term water resources availability to support regional planning of water resources management. The model we used is grid based and produces continuous simulations at daily time scale, therefore providing information to assess the extreme river flow regime (floods and droughts). The probability distribution of model parameters is estimated at basin scale and then compared with that of neighbouring basins to assess their spatial homogeneity. The results show that application of spatially distributed models at regional scale is a promising avenue of research. Analysis of the probability distribution of model parameters turns out to be a useful support for catchment classification.