Quantification of a Framework to Assess the Realism of Model structures (FARM)

Tanja Euser (1), Markus Hrachowitz (1), Hessel Winsemius (2), and Huub Savenije (1)

(1) Water Resources Section, Faculty of Civil Engineering and Geosciences, Delft University of Technology, P.O. Box 5048, NL-2600 GA Delft, The Netherlands, (2) Deltares, P.O. Box 177, 2600 MH Delft, The Netherlands

The use of flexible hydrological model structures for hypothesis testing requires an objective and diagnostic method to identify whether a rainfall-runoff model structure is suitable for a certain catchment. To determine if a model structure is realistic, i.e. if it captures the relevant runoff processes, both performance and consistency are important. Performance describes the ability of a model structure to mimic a specific part of the hydrological behaviour in a specific catchment. Consistency describes the ability of a model structure to adequately reproduce several hydrological signatures simultaneously. The FARM framework can be used to evaluate this performance and consistency, using different hydrological signatures. Results from FARM presented previously, based on Principal Component Analysis with two principal components, are only qualitative and for a limited number of hydrological signatures, therefore, the research questions of this study are (1) How can the results from FARM be quantified to provide a more objective framework?, and (2) How does the use of different hydrological signatures influence the usefulness of FARM? For this study a case study is performed in the Ourthe catchment, a tributary of the Meuse. Different options of quantification are compared, such as, determining consistency based on higher than 2-dimension Principal Component Analysis and summing up the loadings of the different Principal Components weighted to their variance explained. Also the effect of adding different signatures to the framework is tested. This adaptations of the FARM framework can help to make it more objective and therefore more useful.