Elementary building blocks for assessing the uncertainty of hydrological models: a comparative review

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Interest in assessing the uncertainty of hydrological models has been growing in the past decades. Many different methods have been proposed for addressing different related research questions. Nevertheless, the comparison and evaluation of these methods are often difficult to conduct in a homogeneous way. Thus, the objective of this work is to provide a comparative evaluation of the merits of the main concepts used in uncertainty analysis. Here, we focus on four elementary building blocks of uncertainty assessment methods: the GLUE method, the Bayesian inference approach, the post-processing approach and the multi-model approach. Our comparative framework relies on i) a large-sample data set based on 185 unregulated catchments in France ii) a lumped rainfall-runoff model and iii) probabilistic scores used to assess reliability, sharpness and overall performance. Advantages and limitations of the four elementary building blocks of uncertainty assessment methods (and several variants of each of them) are discussed.