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## **Importance of prior distributions for regionalization.**

Runoff prediction in ungauged catchments is a recurrent problem in hydrology that has received considerable attention in the past decade as part of the initiative launched by the International Association of Hydrological Sciences (IAHS). Conceptual models are usually calibrated by defining a range of feasible parameter values and conditioning the model on some source of information. For example, several ungauged catchment applications condition models on regionalised streamflow signatures, such as the runoff ratio or the baseflow index, using a Bayesian procedure. Here, we use the Model Parameter Estimation Experiment (MOPEX) data set to explore a problem that arises with such an approach and test a methodological development to address this issue. We show that the assumption made about the prior distribution is critical to model performance. In particular, the common assumption of uniform parameter priors is shown to be unsuitable, irrespective of the ranges used. This is because the uniform parameter space maps onto a skewed signature space that can counteract the valuable information gained from the regionalisation. This may seem obvious, but in fact the use of uniform parameter priors is the norm in the ungauged catchment literature, often without sufficient thought to the implications. We show that an initial transformation of the uniform prior parameter space into uniform signature space is preferable in terms of the model accuracy and reliability. Consequently, we envisage that applying this approach will enable improved runoff predictions to be generated in ungauged catchments.