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Concepts of Information Content and Likelihood in Parameter Calibration for Hydrological Simulation Models

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There remains a great deal of uncertainty about uncertainty estimation in hydrological modelling. Given that hydrology is still a subject limited by the available measurement techniques, it does not appear that the issue of epistemic error in hydrological data will go away for the foreseeable future and it may be necessary to find a way of allowing for robust model conditioning and more subjective treatments of potential epistemic errors in prediction.

This paper attempts to analyse how the results of the epistemic uncertainties inherent in the hydrological modelling process impact on model conditioning, hypothesis testing and forecasting. We propose an assessment of the information in hydrological data used for calibration based upon hydrological reasoning.
This is performed prior to the assessment of any of the proposed hydrological models. It can then inform the evaluation of competing models and resulting prediction uncertainties.

An illustration of how this information assessment might influence model conditioning is provided by an application; the rainfall-runoff modelling of a catchment in Northern England where inconsistent data for some events can introduce disinformation into the model conditioning process. The construction of the resulting prediction uncertainties is also considered.