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Spatial scale effects on model parameter estimation and predictive uncertainty in ungauged basins.

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ABSTRACT

The most appropriate scale to use for hydrological modelling depends on the structure of the chosen model, the purpose of the results and the resolution of the available data used to quantify parameter values and provide the climatic forcing data. The choice of model structure has been a major topic of discussion throughout the history of hydrological modelling and it is quite rare to find consensus amongst the broad community of model developers and users. With respect to conceptual type models the discussion often relates to the number of model parameters that are needed to achieve satisfactory simulations. However, these issues are not independent of modelling scale, the methods used to quantify parameter values, nor the purpose of use of the simulations. This paper reports on an approach used to quantify the parameter values (and their uncertainty) of a rainfall-runoff model with a relatively large number of parameters and the effects that the spatial scale of modelling can have on the simulations. The quantification approach uses estimation equations based on physical property data and is applicable to gauged and ungauged basins. The results suggest that there can be advantages to reducing spatial scale, but that there are also potential disadvantages which are related to the need for interpretation of some of the physical property data as well as inconsistencies in some of the parameter estimation equations.