



# **1 Data Based Mechanistic approach to flood forecasting**

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Operational flood forecasting requires long lead time and accurate forecasts – two contrary requirements which nevertheless have to be met in practice. The UK National Flood Forecasting System applies a number of modelling tools in order to provide robust forecasts. Recent improvements in both flood plain characterisation and computational capabilities have made the use of distributed models of flood inundation more common. However, problems remain in the application of such models. There are still uncertainties associated with the identifiability of parameters, with the computational burden of calculating distributed estimates of predictive uncertainty, and with the adaptive use of such models, containing many state variables, for operational real-time flood inundation forecasting.

This paper presents here an alternative to the above flood forecasting methods which provide both accurate and long-term forecasts in a computationally efficient manner. The methodology applies state dependent parameter (SDP) approach to derive the nonlinear dependence between the water levels measured at the gauging stations along the river. We describe the derivation of the nonlinear relation between the water levels along the river and apply this to on-line river level forecasting. We discuss the implications that the proposed method might have on the future of flood forecasting systems and its possible shortcomings. We also give the full account of the uncertainties involved.

In addition to the derivation of better defined probability space for the prediction,

the methodology also speeds up the data assimilation computations by providing the opportunity of using the fast DBM based models. The approach is illustrated on the example of 120 km reach of the River Severn, UK.