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# Adaptive correction of deterministic models to produce accurate probabilistic forecasts

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The basis of many operational hydrological forecasting systems are one or more process based models producing deterministic forecasts. Often significant resources have been invested in acquiring these models and users have familiar with there use. In many situations such models produce biased forecasts. Online data assimilation can be used to address this but many techniques, such as Ensemble Kalman filtering, introduce a significant computational cost due to multiple calls to the hydrological model. An alternative methodology for online data assimilation, utilised in the UK National Flood Forecasting System, is outlined in this work. This methodology uses a stochastic multiplicative gain to correct the deterministic model predictions at each observation location. The evolution of this gain is evaluated, at minimal cost, using a linear Kalman filter. The efficiency of this technique is demonstrated on an example application; the Upper River Severn in the UK. By considering multiple observation locations covered by a single hydrological model the robustness of the approach to missing data is demonstrated. The ability to provide corrections at unobserved locations utilising short term monitoring data is also discussed.