Geophysical Research Abstracts
Vol. 12, EGU2010-4820-1, 2010
EGU General Assembly 2010

Forecasting river level using Data Based Mechanistic models and online data assimilation

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The Data-Based Mechanistic modelling framework uses parsimonious time series models to represent the dominant modes of response of natural systems. The models used are readily transferred into a State-Space form allowing the Kalman filter to be used for data assimilation. Multiple case studies have demonstrated the effectiveness of this framework in providing probabilistic forecasts in many hydrological situations. Recent work on the prediction of water levels during flood events, presented here, has introduced state dependant covariance matrices in the Kalman filter formulation. This allows recognition of the fact that the structural and observational error associated with the model may relate to the model state or input. Using case studies from UK rivers we show that the parameters introduced by the definition of the state dependant covariance matrices can be optimised to minimise the cost of issuing false warnings.