# Modelling of tidally affected river reaches with data assimilation for flood warning purposes: An example on the River Dee, UK

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On rivers where the flow regime is influenced by a tidal signal the provision of accurate forecasts requires the careful coupling of predictive models for both the tidal signal and the rainfall driven river system. This paper discusses such a coupled modelling system constructed for the River Dee (UK). A series of parsimonious, physically interpretable time series models are used to represent the dynamics of the river water level at several gauging sites on the flood plain. These gauges are used operationally to help in determining the issuing of flood warnings.

The simplified models are coupled and cast into a state space form. The assimilation of the observed water levels at the gauge sites to inform future forecasts is then a non-linear filter a solution to which is readily approximated. Assessment of the model forecasts against the observed data is carried out using a number of existing metrics. These suggest the model forecasts are a useful guide to the future water level.

The representation of the forecast and its uncertainty to the operational staff is considered. A prototype of the sequential decision making process; based on the relative cost of 'true' or 'false' warnings; and designed to help guide the catchment manager in issuing warnings is presented.