Forecasting river levels during flash floods using Data Based Mechanistic models, online data assimilation and radar rainfall forecasts

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The parsimonious time series models used within the Data-Based Mechanistic (DBM) modeling framework (Young 2006) are readily transferred into a State-Space form allowing the implementation of data assimilation using the Kalman filter. Multiple case studies have demonstrated the effectiveness of this framework in providing probabilistic forecasts for many hydrological situations (Young 2003,, such as flood events on large UK rivers (Young 2002, Romanowicz et al. 2006).

The recent work presented here has applied the DBM methodology to forecast flash floods in a number of European catchments. In comparison to previous work these catchments respond rapidly to rainfall. It is demonstrated, by example, that in such catchments the use of quantitative precipitation forecasts (QPF) coupled to a DBM model allows the forecast horizon to be increased to a level useful for emergency response. The additional uncertainty in the hydrological forecasts that results from using a deterministic meteorological forecast is discussed and illustrated. Further to this the use of ensemble radar precipitation estimates is considered and the interpretation of these with regards to the hydrological model addressed.

References

Romanowicz R.J., Young P.C., Beven K.J., 2006: Data assimilation and adaptive forecasting of water levels in the River Severn catchment, United Kingdom. Water Resources Research, 42(6), W06407.