Improving real time flood forecasting using bayesian approach

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Flood early warning systems are widely used operational tools, however, the reliability of their predictions (timing and magnitude of floods to exceed a warning threshold) still depends heavily on several, often unrealistic, assumptions made at the system design stage. The assumptions frequently include: 1) a chosen hydrological model is perfect (that includes both hydrological model structure and parameters), 2) observations of model input and output are error-free, and 3) a data assimilation algorithm used to update model states and adjust forecasted flows is adequate.

This work presents an operational system for river basin real time flood forecasting and early warning named (in Spanish SALIF). The employed data assimilation algorithms use Bayesian inference for real time data assimilation and forecasting - specifically, Ensemble Kalman Filter and Regularized Particle Filter; and data and model structure uncertainty are explicitly included. The proposed system is applied to the catchments prone to economic loss due to flooding in the Cantabria region of Northern Spain. Results show that when both the observational data and hydrological model are adequate flood predictions are reliable, and Regularized Particles Filter is preferable.