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Living with global uncertainty

Weather Radar for Flood Forecasting

Department of Civil Engineering

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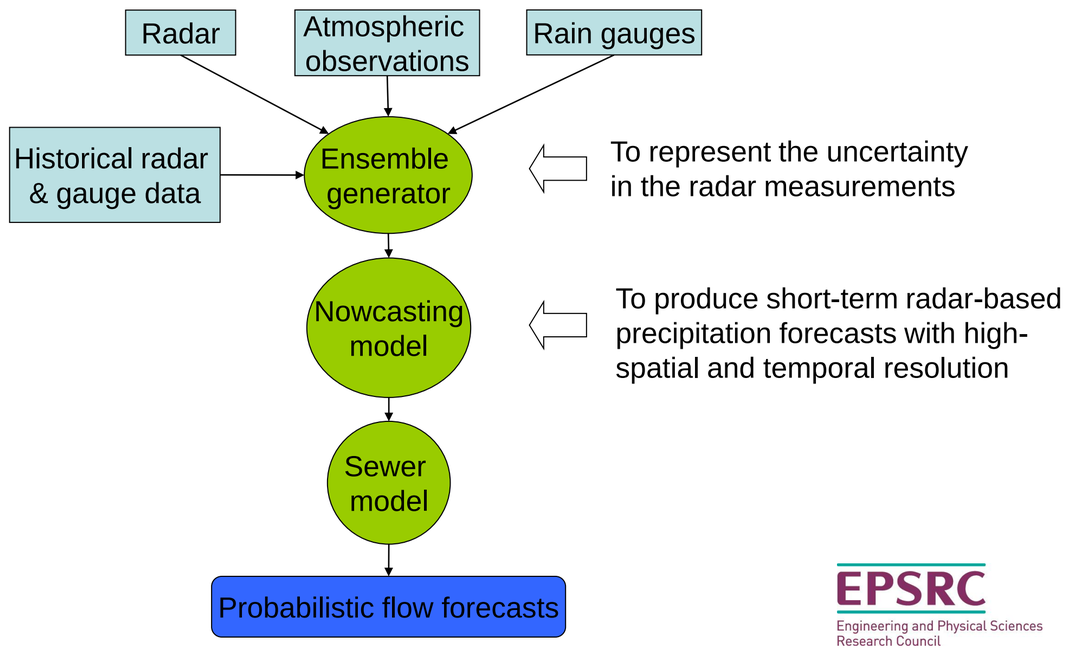
The quantitative measurement and forecasting of precipitation is crucial for predicting and mitigating the effects of flood-producing storms. The main goal in flood forecasting is to provide reliable information to the general public, local authorities, and emergency services under the threat of potential flooding. Although significant progress has been made in the measurement and forecasting of precipitation using weather radars and Numerical Weather Prediction (NWP) models, there is a need to improve precipitation forecasts during extreme rainfall events in particular, not only for flood prediction in large rural catchments but also for applications in urban hydrology. Current research includes:

Urban flood forecasting using probabilistic radar rainfall ensembles

Flood forecasting and warning in urban areas require measurements and forecasts of precipitation with high spatial and temporal resolutions (e.g. 1km/5min). Weather radars are able to provide such measurements, but unfortunately radar rainfall estimations are affected by different sources of error. These errors are traditionally ignored when producing radar-based precipitation forecasts for urban flood forecasting. The aim of this new EPSRC-funded project is to develop a probabilistic urban flood forecasting system that integrates information from radar, rain gauges and atmospheric observations for the real-time prediction and management of severe storms affecting urban areas.

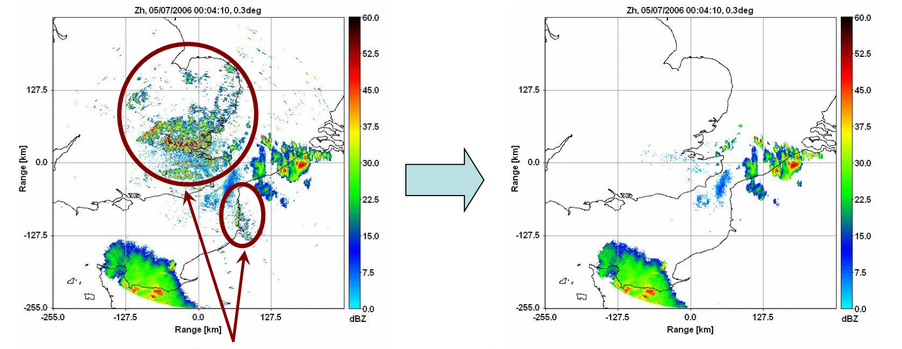


EPSRC Engineering and Physical Sciences Research Council

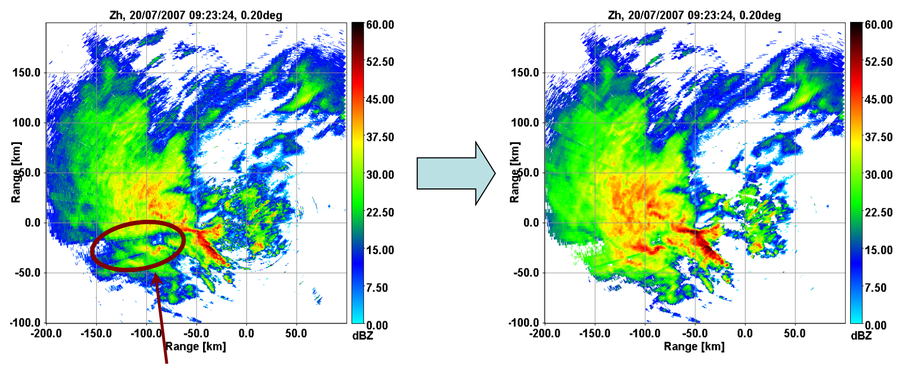
Measurement of precipitation with polarimetric weather radars

The operational use of polarimetric C-band weather radars by national weather agencies has gained rapid momentum in the last several years, especially in Europe. In the UK, the Met Office is in the process of upgrading all the existing weather radars to polarimetric systems. This impetus has been largely based on, for example, identifying precipitation echoes from echoes of non-meteorological origin, stable correction of attenuation due to rain, and improvement in the accuracy of rainfall estimation. Substantial work has been done, and is still on-going, regarding methodologies for realising these improvements.

Our current research is looking at developing robust algorithms for rainfall estimation and attenuation correction for operational polarimetric weather radars in particular during extreme events.



Removal on non-precipitation echoes

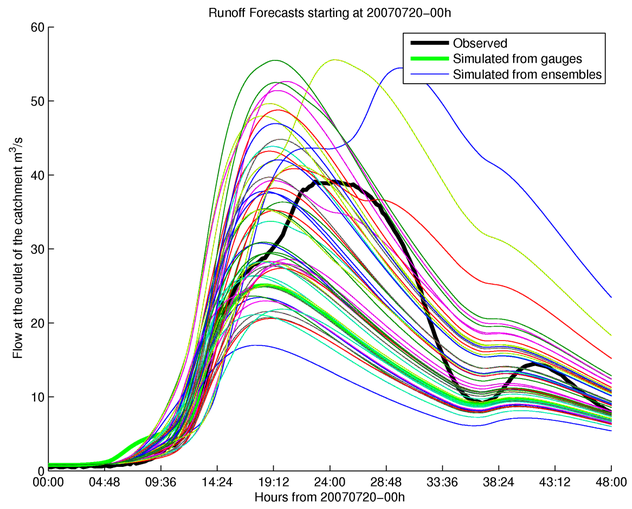


Attenuation correction due to heavy precipitation

Blending NWP and radar ensemble rainfall forecasts for flood prediction

NWP models aim to simulate the atmosphere which is a chaotic non-linear system highly sensitive to small changes in the initial conditions. Small changes in the initial conditions could lead to different forecast outcomes. Thus, instead of aiming at getting the best estimate of the future state of the atmosphere through a single deterministic forecast, it is now becoming operational to have a probabilistic forecasting approach.

Our current research is looking at blending NWP ensemble precipitation forecasts with radar-based forecasts to improve flood forecasting and understanding how the precipitation forecast uncertainty propagates into hydrological models.



Hydrological flood forecasts 48hr ahead for a catchment in SE England