Using ensemble rainfall predictions in a countrywide flood forecasting model in Scotland

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Improving flood predictions for all sources of flooding is at the centre of flood risk management policy in Scotland. With the introduction of the Flood Risk Management (Scotland) Act providing a new statutory basis for SEPA's flood warning responsibilities, the pressures on delivering hydrological science developments in support of this legislation has increased. Specifically, flood forecasting capabilities need to develop in support of the need to reduce the impact of flooding through the provision of actively disseminated, reliable and timely flood warnings.

Flood forecasting in Scotland has developed significantly in recent years (Cranston and Tavendale, 2012). The development of hydrological models to predict flooding at a catchment scale has relied upon the application of rainfall runoff models utilising raingauge, radar and quantitative precipitation forecasts in the short lead time (less than 6 hours). Single or deterministic forecasts based on highly uncertain rainfall predictions have led to the greatest operational difficulties when communicating flood risk with emergency responders, therefore the emergence of probability-based estimates offers the greatest opportunity for managing uncertain predictions.

This paper presents operational application of a physical-conceptual distributed hydrological model on a countrywide basis across Scotland. Developed by CEH Wallingford for SEPA in 2011, Grid-to-Grid (G2G) principally runs in deterministic mode and employs radar and raingauge estimates of rainfall together with weather model predictions to produce forecast river flows, as gridded time-series at a resolution of 1km and for up to 5 days ahead (Cranston, et al., 2012). However the G2G model is now being run operationally using ensemble predictions of rainfall from the MOGREPS-R system to provide probabilistic flood forecasts. By presenting a range of flood predictions on a national scale through this approach, hydrologists are now able to consider an objective measure of the likelihood of flooding impacts to help with risk based emergency communication.

References

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