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Catchment-based precipitation and river flow ensemble forecast skill in the presence of observation uncertainty

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The use of ensemble forecasts in operational rainfall and flood forecasting systems is rapidly increasing. In the UK, such systems are operated by the Flood Forecasting Centre (FFC) and Scottish Flood Forecasting Service (SFFS) producing ensemble gridded hydrological forecasts out to 6 days. In order to maximise the practical day-to-day use of these systems, for decision-making and warning, duty hydrometeorologists require a sound understanding of both the meteorological and hydrological ensemble forecast skill.

A blended Met Office 24-member ensemble precipitation forecast – a mixture of the STEPS nowcast ensemble and STEPS-blended 2.2 km MOGREPS-UK ensemble and 32 km global MOGREPS-G ensemble – drives the Grid-to-Grid (G2G) distributed hydrological model developed by the Centre for Ecology & Hydrology (CEH). G2G uses 15-minute precipitation accumulations as input, and produces river flows at 15-minute intervals on a 1km grid.

Phase 1 of the investigation, completed in 2017, formulated and demonstrated a common rainfall and river flow ensemble verification framework. The results gave an initial appreciation of the relative levels of skill in both ensemble rainfall and river flow forecasting systems. In 2018, the verifications of daily and hourly precipitation accumulations will be extended to use 15-minute accumulations. Verifications for three forecast time-horizons – Day 1, Days 2-3 and Days 4-6 – will also be demonstrated. In Phase 1, the sensitivity of verification measures to observation type was illustrated by comparing scores based on radar-only and raingauge-only analyses. Here, in Phase 2, theoretical principles discussed by Ferro (2017) are explored to determine whether a practical application of the theory is possible to gain a more robust measure of forecast performance in the presence of observation uncertainty.

Reference

Ferro, C.A.T. 2017. Measuring forecast performance in the presence of observation error. Q. J. R. Meteorol. Soc., 143, 2665-2676.