Department for Environment Food & Rural Affairs

Llywodraeth Cymru
Welsh Government

Cyfoeth Naturiol Cymru
Natural Resources Wales

Environment Agency

Flood and Coastal Erosion Risk Management Research Programme

Understanding the performance of flood forecasting models

Project Summary SC130006/S

Background

This report presents the results of the first nationwide analysis of the performance of the various flood forecasting models operated by local centres on the National Flood Forecasting System (NFFS). The analysis is based on Wales and the English geographical regions that align to the old Environment Agency region names.

Understanding the performance of the flood forecasting models operated in real-time by the Environment Agency, Natural Resources Wales and the national Flood Forecasting
Centre is crucial to the informed use of model outputs for flood guidance across England and Wales. It is also essential to guide future strategic investment in flood incident management.

Project aims

The project's overall aim was an integrated analysis of information from past local model assessments, together with performance assessments from the national Grid-to-Grid (G2G) model run on the NFFS for England and Wales. This is the first nationwide analysis of flood forecasting models operated in real time.

What is G2G?

G2G is a distributed grid-based hydrological model with rainfall–runoff and flow routing elements. Its forecasts are compared in the report with those from 4 types of local models:

- conceptual rainfall–runoff – Probability Distributed Model (PDM), Midlands Catchment Runoff Model (MCRM) and Thames Catchment Model (TCM)
- transfer function – Physically Realisable Transfer Function (PRTF)
- hydrological routing – KW (extended kinematic wave) and DODO
- hydrodynamic routing – ISIS and MIKE 11

How was the analysis conducted?

The project collated data on river flow observations, flow forecasts and historical simulation of flows obtained during previous local model performance studies. Performance statistics were then regenerated using consistent tolerances and methods across all models across England and Wales. A range of performance statistics, and ways of displaying them, were used to summarise performance at different forecast lead times (that is, the time between when the flood forecast is first made to when it crosses a river flow or level threshold) at a river gauging station. These statistics were complemented by hydrograph displays of forecast, simulated and observed river levels/flows, including an indication of the success in forecasting when a flow/level threshold would be exceeded.

What are the outputs?

The Flood Forecasting Model Performance Summary developed by the project provides a concise statement of the forecasting performance at each site for a given model. The Overall Performance Score, along with its component scores, gives a colour-coded performance grading for each site model. Comparison of 2 models at the same site is summarised through a display that assesses relative performance in terms of the Critical Success Index, Probability of Detection, confidence and timing difference. These statistics and displays are combined with hydrometric details of a given site to form a one-page Performance Summary for each site and model combination.

Target audience

Almost 1,800 Performance Summary pages have been produced for use by those working in Modelling and Forecasting teams in strategic planning or an operational setting.

How will the Environment Agency use this work?

The report is essential to guide future strategic investment in flood incident management. The report has already had a significant impact on the Flood Forecasting Service by influencing investment and informing strategic decisions on model types to use. This will make the Flood Forecasting Centre service more efficient. The Performance Summary framework is designed to be readily refreshed to include new datasets as they become available. The report includes recommendations on how to make this process more efficient and the model assessments more meaningful and useful

This summary relates to information from project SC130006, reported in detail in the following output(s):

Report: SC130006/R
Title: Understanding the performance of flood forecasting models for investment and incident management

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