

## R&amp;D Technical Summary W5C-013/4/TS/1

**Fluvial Flood Forecasting for Flood Warning  
Rainfall Measurement and Forecasting****Background to R&D project**

The Agency aims to deliver accurate, reliable and timely forecasts of flooding at locations in England and Wales where the benefits justify the costs and where the provision of this service is technically possible. There are several R&D projects helping to further this aim covering different sources of flooding - estuarial, fluvial and coastal. The estuarial project is complete and was reported on in R&D Technical Summary W5-010/TS/3. The project covering coastal flood forecasting is due to report later in 2003. The fluvial flood forecasting project comprises two components - Rainfall Measurement and Forecasting (RMF) and Real Time Modelling (RTM). This Technical Summary covers the RMF component; the RTM component is reported on separately in R&D Technical Summary W5C-013/5/TS/1. In addition, Guidelines have been produced covering both RMF and RTM. These are published separately but referred to in the Technical Summaries for completeness.

**Results of R&D project**

The project carried out a review of rainfall measurement and forecasting techniques and produced guidelines for the use of flood forecasting staff.

**Technical Report W5C-013/4/TR**

This report comprises a detailed review of the current state of the art in rainfall measurement and forecasting, existing Agency use of rainfall measurements and forecasts for flood forecasting, and identification of shortfalls and future R&D needs to address the shortfalls. Based on information from research papers, reports and scientific meetings, project experience and the results of interviews with Agency staff the report presents:

- An overview of operational rainfall measurement and forecasting in England and Wales. Information is presented on current limits of predictability; precipitation measurement by radar and rain gauges; operational forecast techniques (for a range of forecast lead-times from 0 to 10 days ahead); and 'nowcasts' (forecasts up to 6 hours ahead).
- An assessment of how rainfall measurements and forecasts are currently used within the Agency for flood warning and forecasting, and problems which have been encountered.
- An assessment of existing shortfalls in meeting operational flood forecasting and warning needs, considering the range of operational techniques available now, and under development, from nowcasting procedures through to regional scale numerical modelling systems. The identified shortfalls provide the basis for proposed future R&D work.
- A detailed review of the practice and limitations of rainfall measurement using weather radar (including basic weather radar theory, sources of errors and recent developments), a review of rainfall forecasting techniques (including numerical weather prediction models, forecasting methods for convective rainfall, ensemble predictions, the Nimrod and Gandolf systems, and other recent developments) and a listing of regional rainfall measurement and forecasting issues and examples identified by Agency flood warning staff and summarised in previous R&D reports.

## **Guidelines for Rainfall Measurement and Forecasting**

The Guidelines cover the following topics:

- Rainfall measurement and forecasting requirements for flood warning
- Current Agency uses of rainfall measurements and forecasts for flood warning
- Measurement techniques (radar, rain gauges, automatic weather stations)
- Forecasting techniques (numerical weather prediction, ensemble, radar-only)
- Products from the Met Office (Nimrod, Heavy Rainfall Warnings, MOSES)
- Best practice use of rainfall measurements and forecasts for flood warning
- Related issues (post event reporting, data archiving, meteorological training)

Throughout the Guidelines, the emphasis is on the likely accuracy with respect to the lead time and areal definition of the various technologies. The Guidelines are maintained by and available from the Flood Forecasting Development Officer at [nfwc@environment-agency.gov.uk](mailto:nfwc@environment-agency.gov.uk)

### **R&D Outputs and their use**

The Guidelines are a succinct document for Agency staff and consultants, indicating the key decisions that they need to make and the information required in order to fully utilise rainfall measurements and forecasts for flood forecasting. The Guidelines provide the essential information in an abbreviated format and full supporting technical information is provided in the Technical Report. The Technical Report is therefore an essential companion reference volume that should be used alongside the Guidelines. To assist, the Guidelines refer to appropriate sections in the Technical Report.

The Technical Report will be of interest to all involved in the use of rainfall measurement and forecasting for predicting river levels. The Guidelines are aimed mainly at operational flood forecasting staff wishing to make best use of existing rainfall measurements and forecasts for flood forecasting.

This R&D Technical Summary W5C-013/4/TS/1 relates to the Guidelines for Rainfall Measurement and Forecasting and **R&D Technical Report WSC13/4 – *Fluvial Flood Forecasting for Flood Warning: Rainfall Measurement and Forecasting***. Published February 2003.

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The above R&D output is available on the Environment Agency website [www.environment-agency.gov.uk/floodresearch](http://www.environment-agency.gov.uk/floodresearch). Copies are held by all EA Regional Information Centres and can be purchased from the Environment Agency's R&D Dissemination Centre, c/o WRc, Frankland Road, Blagrove, Swindon, Wiltshire SN5 8YF Tel: (+44) 1793 865012 Email: [publications@wrcplc.co.uk](mailto:publications@wrcplc.co.uk).

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