

FLOOD FORECASTING CENTRE

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Environment
Agency



Met Office

**Hydrological Ensembles at the Flood Forecasting Centre.
Current and future developments**

Adrian Wynn

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Overview

➔ Overview of requirements

➔ Current Capability

➔ Current Plans

➔ Further ahead

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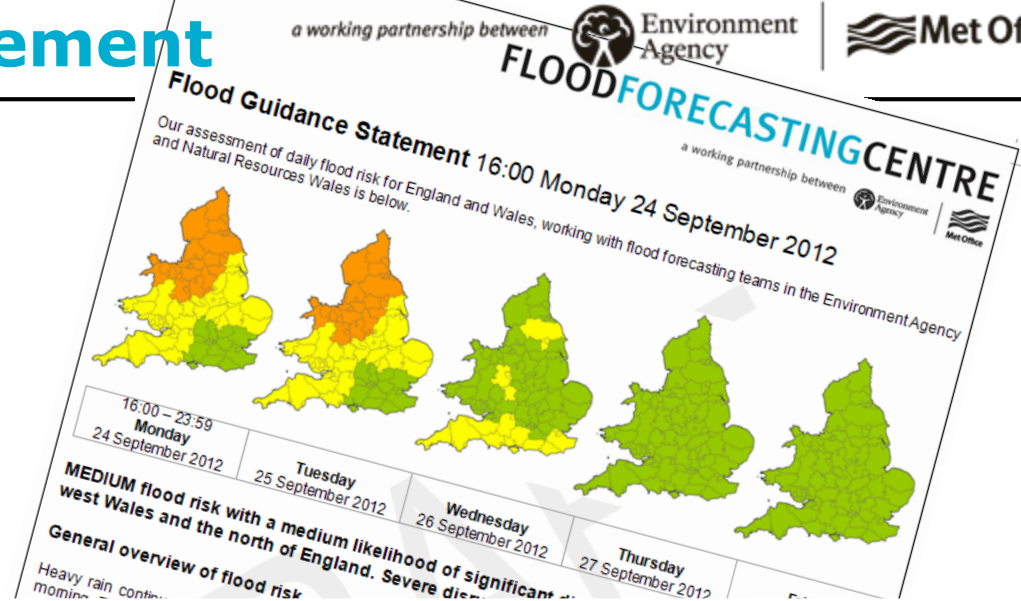


What is the Flood Forecasting Centre?

- ➔ Partnership between the Met Office and Environment Agency
- ➔ 24/7 services since April 2009
- ➔ Provide flood risk overview for 5 days ahead
- ➔ Guidance for emergency responders and government
- ➔ Remit to forecast for all sources of flooding
- ➔ Seeks to introduce new science and continually improve services

Flood Guidance Statement

- ➔ 5-day overview
- ➔ Issued to >2300 government and emergency responders
- ➔ County-scale (33 to 8038 km²!)
- ➔ Risk-based matrix



Flood Risk Matrix

(river, tidal/coastal, surface water & groundwater flooding)

?	Likelihood	High	Green	Yellow	Orange	Red
		Medium	Green	Yellow	Orange	Orange
		Low	Green	Green	Yellow	Orange
		Very Low	Green	Green	Yellow	Yellow
			Minimal	Minor	Significant	Severe
			Potential Impacts			

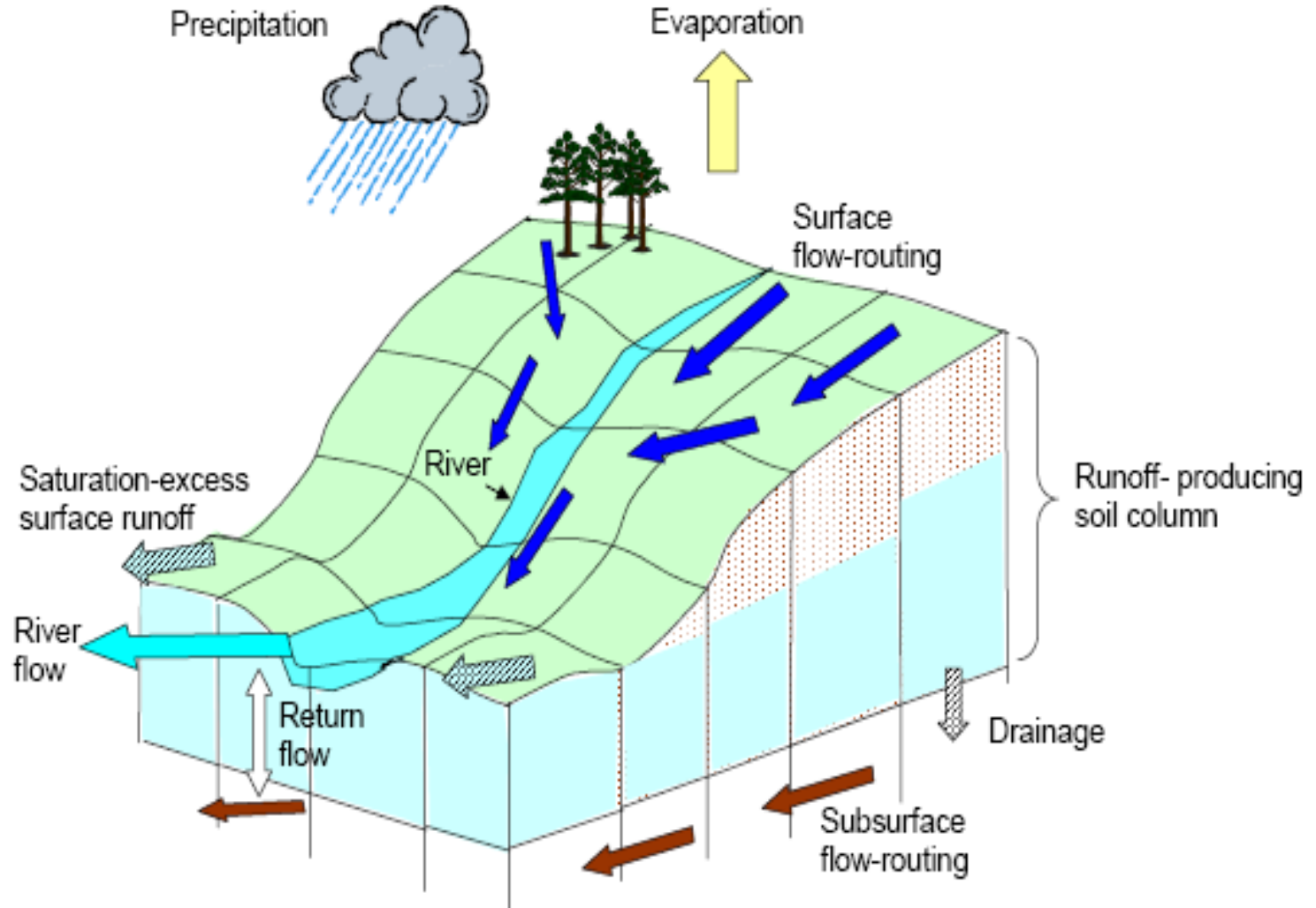
Overall Flood Risk

HIGH	Red
MEDIUM	Orange
LOW	Yellow
VERY LOW	Green

...for the River Severn and River Ouse affecting Shropshire, ... spread flooding affecting ... communities, and ... courses. ... this time the risk is assessed as LOW. ... this period may also enhance any ...

Environment Agency 2012 <http://flood-forecasting-centre.environment-agency.gov.uk>

Page 1 of 3



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Other uses of the G2G model

- ➔ Supporting catchment river modelling
- ➔ Supporting local warnings for Rapid Response Catchments
- ➔ Assessment of surface water flood risk

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G2G Forecast Inputs

G2G configuration	Rainfall input
5 day deterministic	Nowcast+UKV+Euro4+snowmelt
26 hour ensemble (48m. time-lagged)	32 hour MOGREPS-UK 2.2 km ²
6 hour ensemble (48m. time-lagged)	7 hour STEPS Nowcast 2 km ²

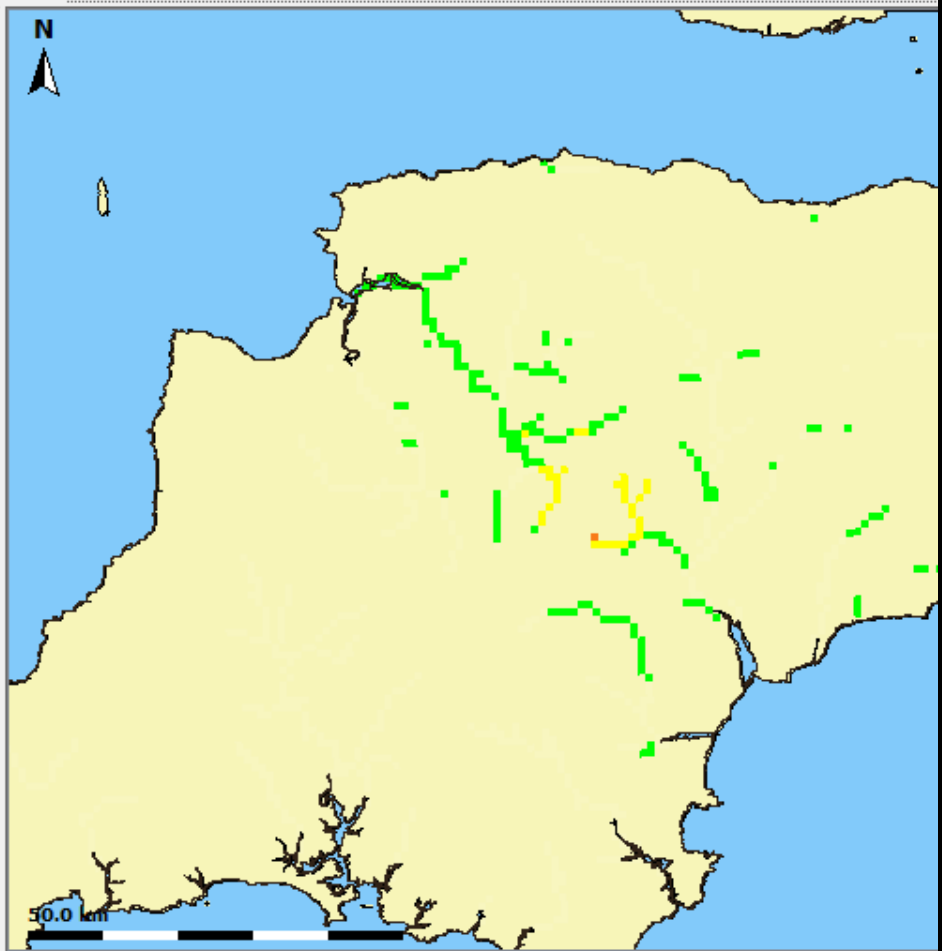
➔ All rainfall forecasts based on Met Office Unified Model

➔ G2G model moved from FEWS to super-computer



- Member 23
- Member 24
- UKV 24 Derived Rainfall Products
 - Members over 10 mm threshold, 1h Acc (Counties)
 - Members over 30 mm threshold, 6h Acc (Counties)
 - Members over 10 mm threshold, 1h Acc (Rapid Resp Catch)
 - ✗ Members over 30 mm threshold, 6h Acc (Rapid Resp Catch)
 - Members over 10 mm threshold, 1h Acc (Rapid Resp Catch with buffer)
 - ✗ Members over 30 mm threshold, 6h Acc (Rapid Resp Catch with buffer)
 - Members over 10 mm threshold, 1h Acc (Gauges)
 - Members over 30 mm threshold, 6h Acc (Gauges)
 - Evaporation
 - G2G Soil Series Historical
 - Discharge Historical
 - Discharge 5day forecast
 - Discharge 6hr forecast
 - Discharge UKV7 forecast
 - Discharge UKV24 forecast
 - Forecast Warning level (nr of members over the 2y warning level (Grid))
 - Forecast Warning level (nr of members over the 50y warning level (Grid))
 - Forecast Warning level (nr of members over the 2y warning level (Gauges))
 - Forecast Warning level (nr of members over the 2y warning level (Counties))
 - Forecast Warning level (nr of members over the 50y warning level (Gauges))
 - Forecast Warning level (nr of members over the 50y warning level (Counties))
 - Performance Indicators

0 members
< 25% (6 members)
25% to < 50% (7-12 members)
50% to < 75% (13-18 members)
>= 75% (19+ members)





Spatial Display

Manual Forecast

Forecast Management

System Monitor

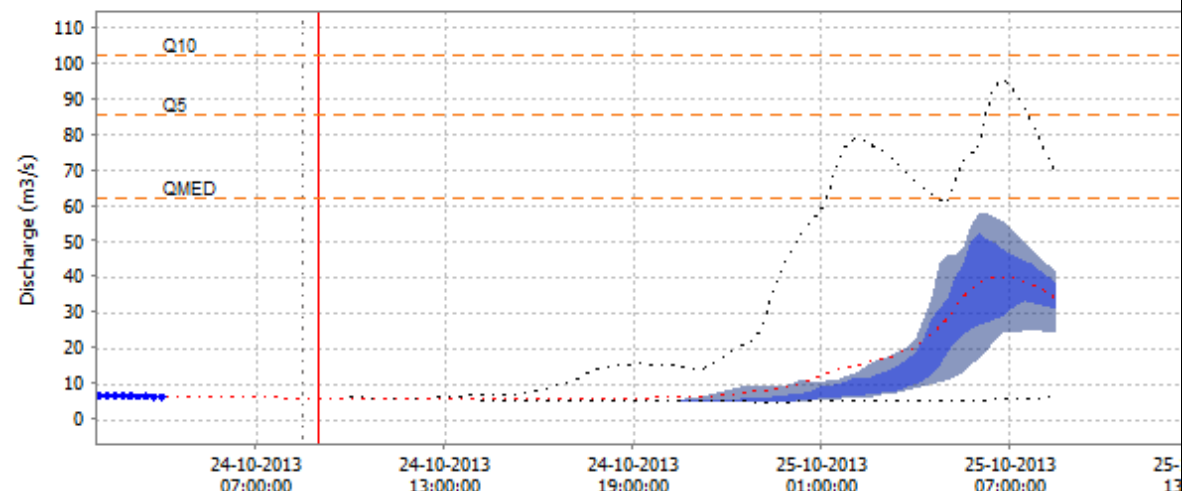
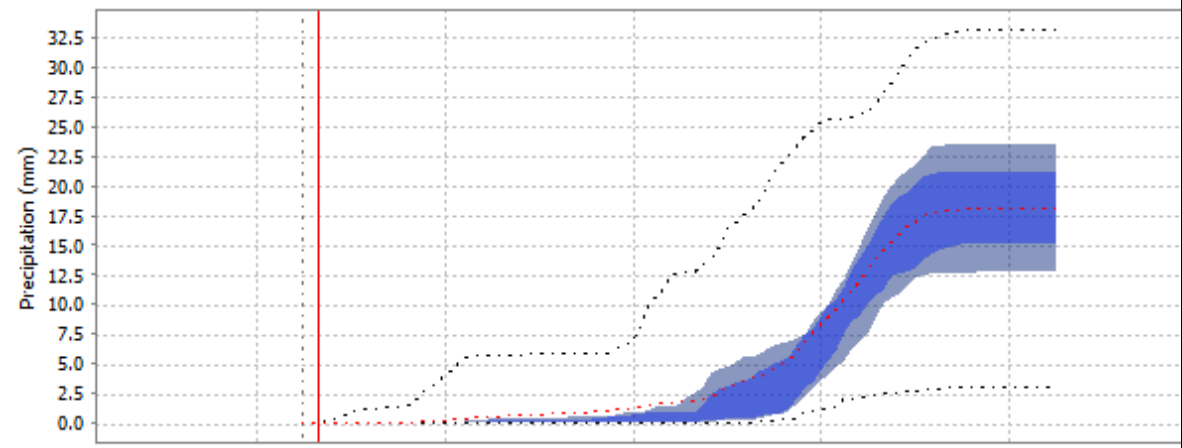


Navigation toolbar with icons for zoom, pan, and other functions. Includes a 'Functions' dropdown menu with the text '< Select a statistical function >'.

5 : Data Viewer

- [-] G2G UKV 24 Forecasts per region, ordered alphabetically
 - [+] Anglian
 - [+] Midlands
 - [+] Northeast
 - [+] Northwest
 - [+] Southeast
 - [+] Southwest
 - [+] Wales
- [-] G2G UKV 24 Forecasts plumes per region, ordered alphabetically
 - [+] Anglian
 - [+] Midlands
 - [+] Northeast
 - [+] Northwest
 - [+] Southeast
 - [+] Southwest
- [+] Bovey
- [+] Bristol Avon
- [+] Caen
- [+] Camel
- [+] Chew
- [+] Dart
- [+] East Lyn
- [+] Exe
 - Bampton Bridge
 - Brushford
 - Cowley Bridge
 - Craze Lowman
 - Dotton
 - Exebridge
 - Pixton
 - Rewe
 - Shillingford
 - Stoodleigh

Cowley Bridge



Fluvial_Forecast_UKV24Blended: [1] 24-10-2013 08:30:00 Current Fluvial_Historical: [2] 24-10-2013 00:00:00

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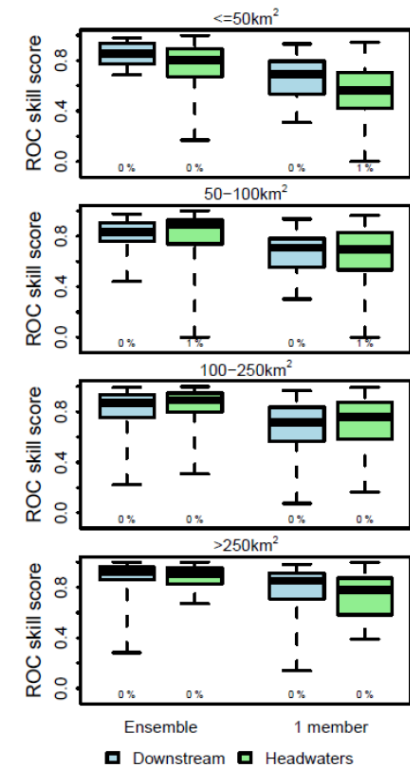
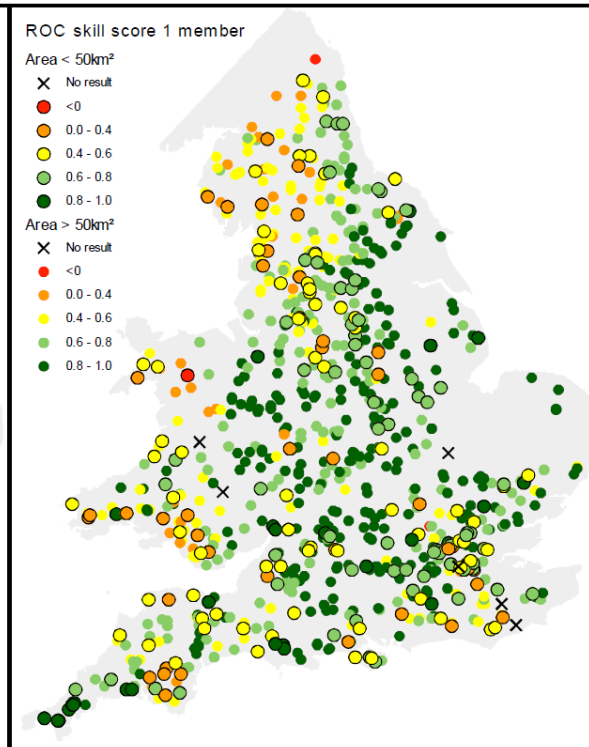
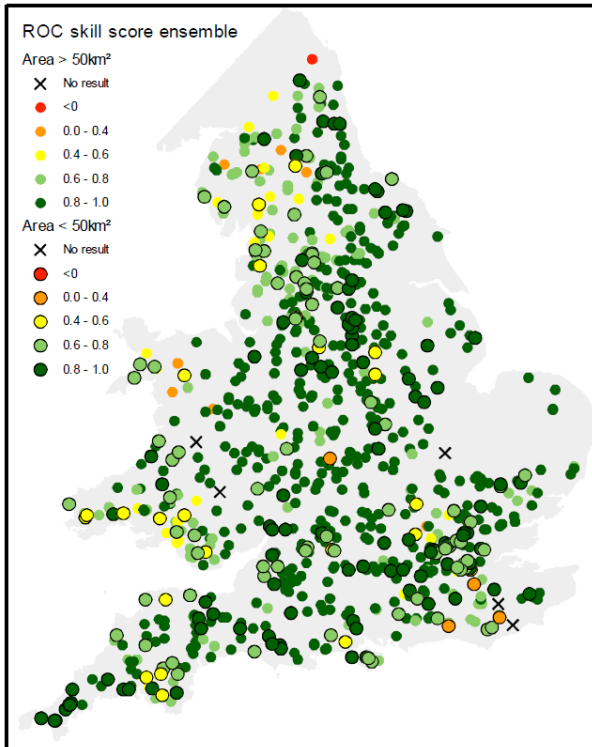


Performance of current ensembles

- ➔ No formal verification yet
- ➔ Initial study (based on previous ensemble method) shows improvement over deterministic:

Preliminary evaluation of G2G river flow ensembles over England & Wales

- General improvement in event/non-event discrimination using ensemble compared to single forecast scenario



Source: CEH, Wallingford

Threshold: QMED/2 river flow threshold during the 24 hour forecast horizon

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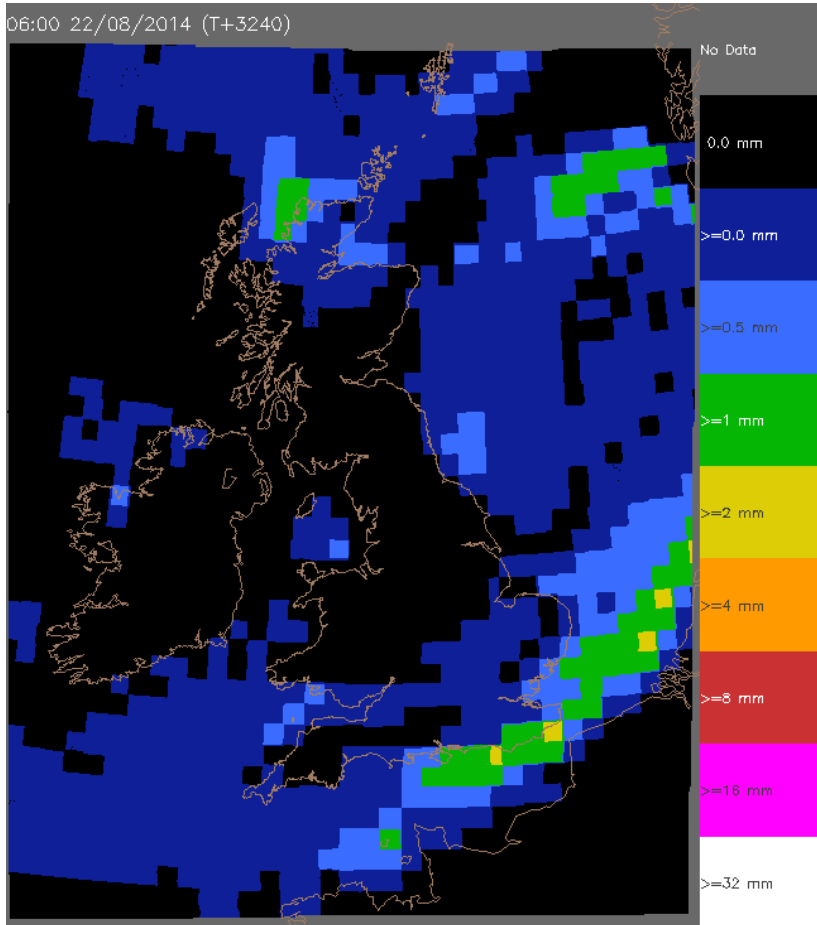
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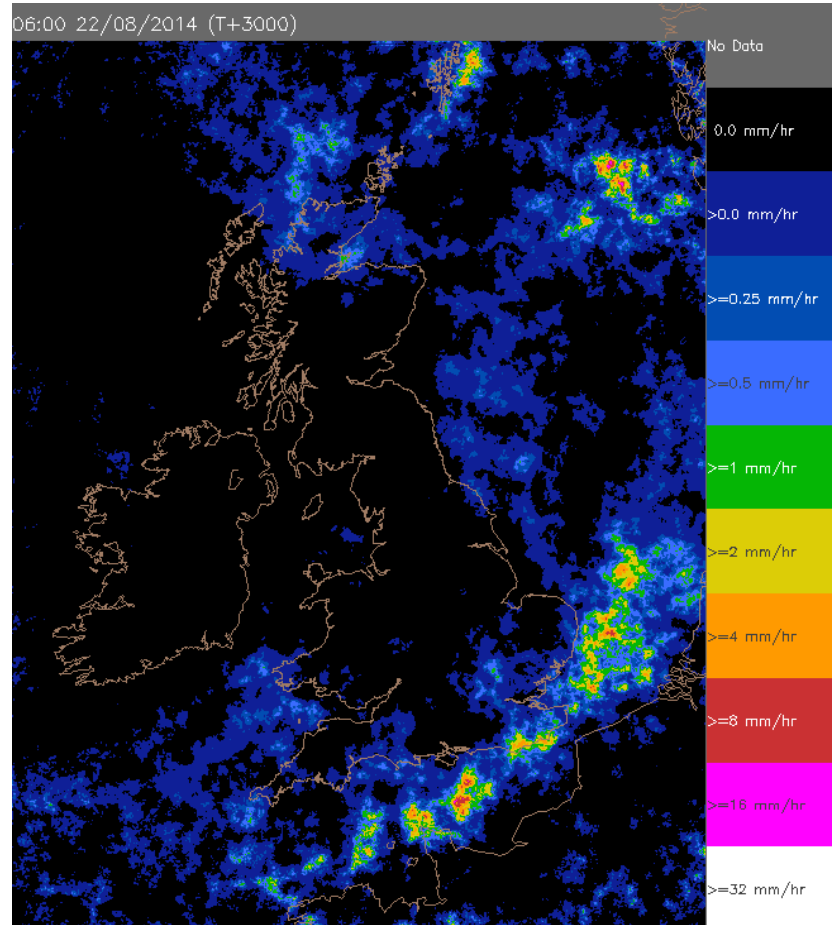
Current developments

- ➔ Downscaled Global ensemble (MOGREPS-G):
 - ➔ 5-7 day forecast (to be decided)
 - ➔ 4 km resolution
 - ➔ 12 members, time lagged to 24 members

MOGREP-G downscaling using parametric noise generator



MOGREPS-G member 0
T+3240 hr valid at 06 Z
22/08/14



Downscaled MOGREPS-G member 0
T+3240 hr valid at 06 Z 22/08/14

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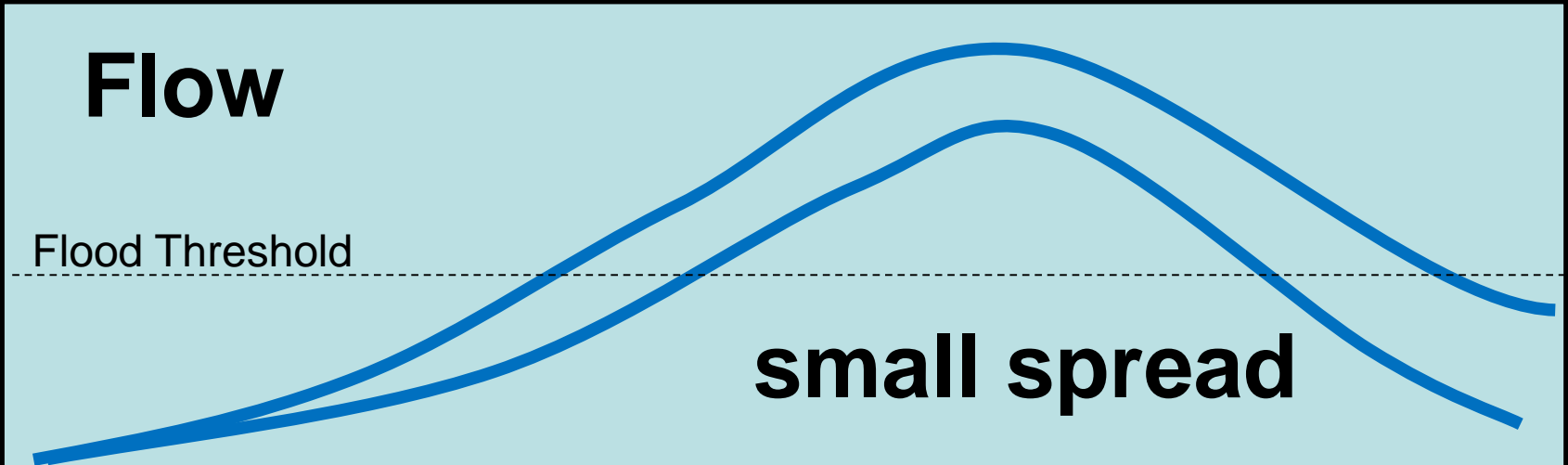
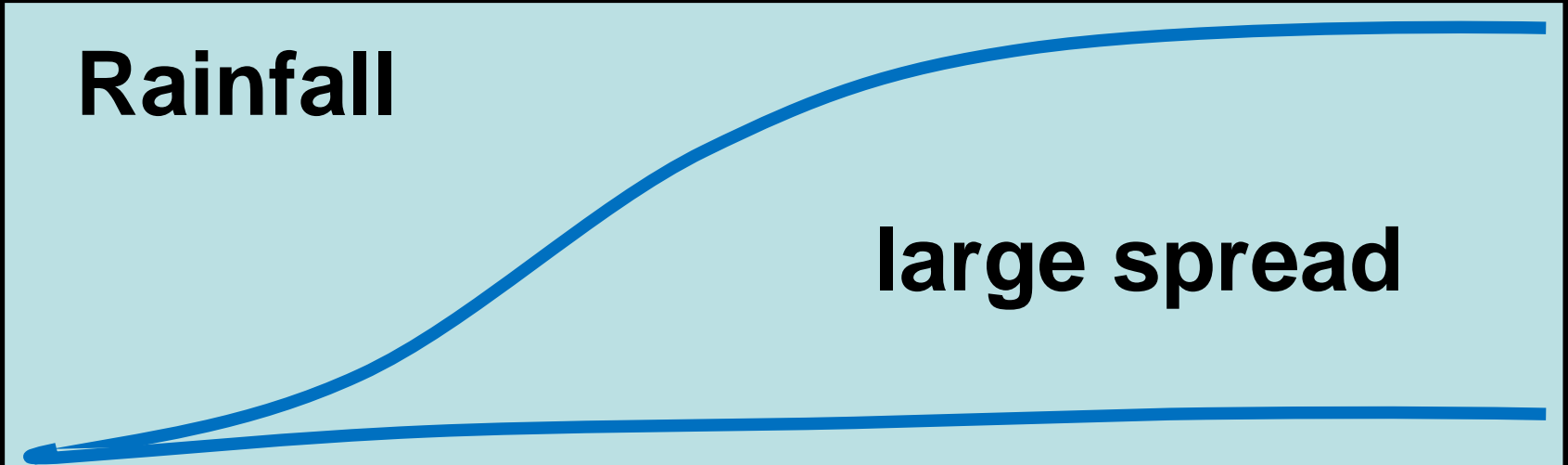


Planned developments

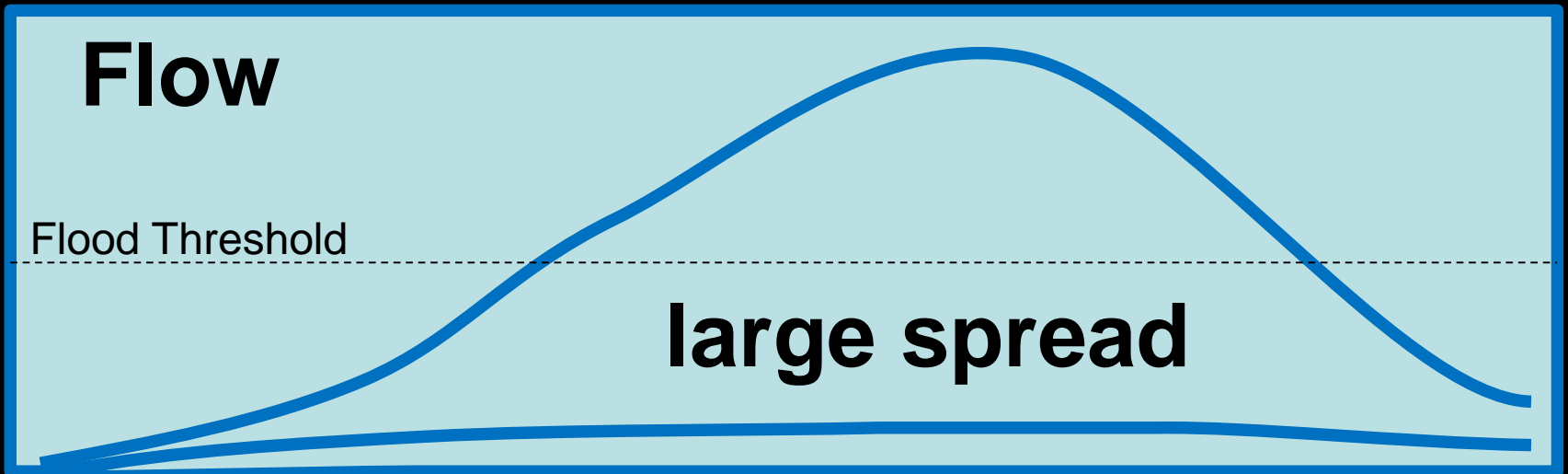
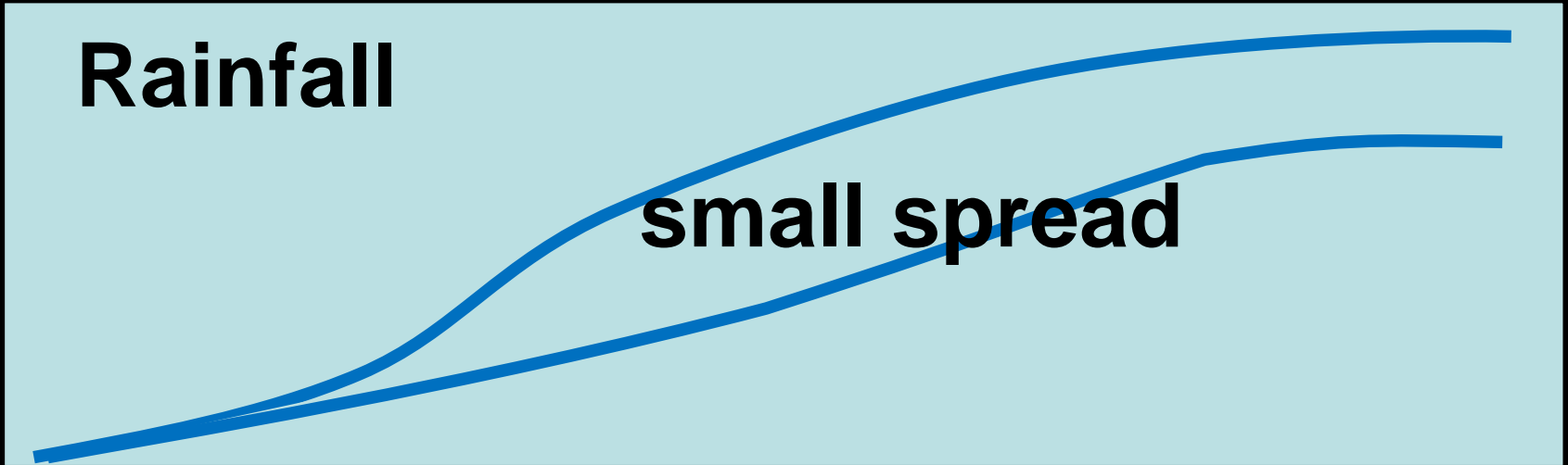
➔ Verification

➔ Operational assessment tools

Insenstive hydrological system



Sensitive hydrological system



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Further ahead...

- ➔ Hydrological uncertainty/ensemble?
- ➔ Enlarge ensembles further?



➔ Adrian Wynn

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