



Met Office

From NWP Output to Operational Forecasts

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ECMWF Operations Workshop, 18-20 Nov 2013.



Met Office

2013 NWP Models in Suite

UKV and MOGREPS-UK

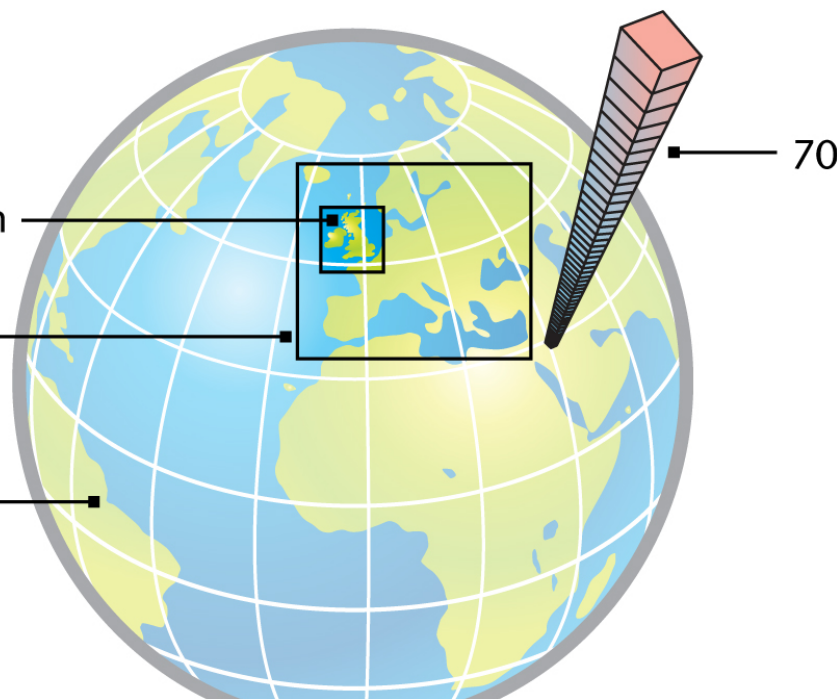
- 1.5km 70L (40km model top)
- 3DVAR (3 hourly)
- 36hr forecast
- 4 times per day
- 12-member EPS - 2.2km 4x/day 36h



UK 1.5km

Regional
4km

Global
17km



Euro4

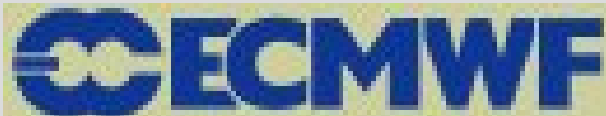
- 4km 70L (40km model top)
- Global downscaler
- 66hr forecast twice/day
- 144hr forecast twice/day



Global and MOGREPS-G

- 25km 70L (80km model top) (17km from PS34)
- Hybrid 4DVAR – 60km
- 66hr forecast twice/day
- 144hr forecast twice/day
- 12-member EPS - 33km 4x/day 72hr
- 24-member EPS - 60km 2x/day 15d
- Ocean coupled up to 6 months

Medium-Range



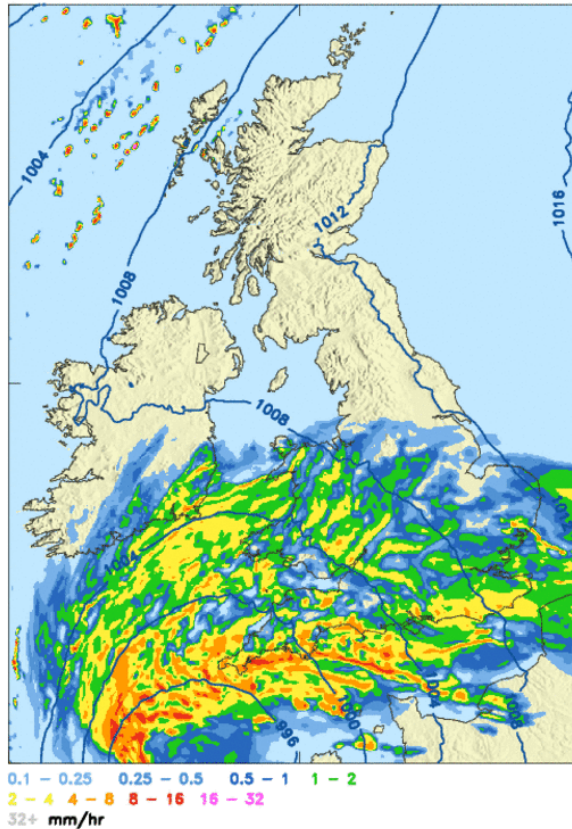


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Lots of high-quality NWP available

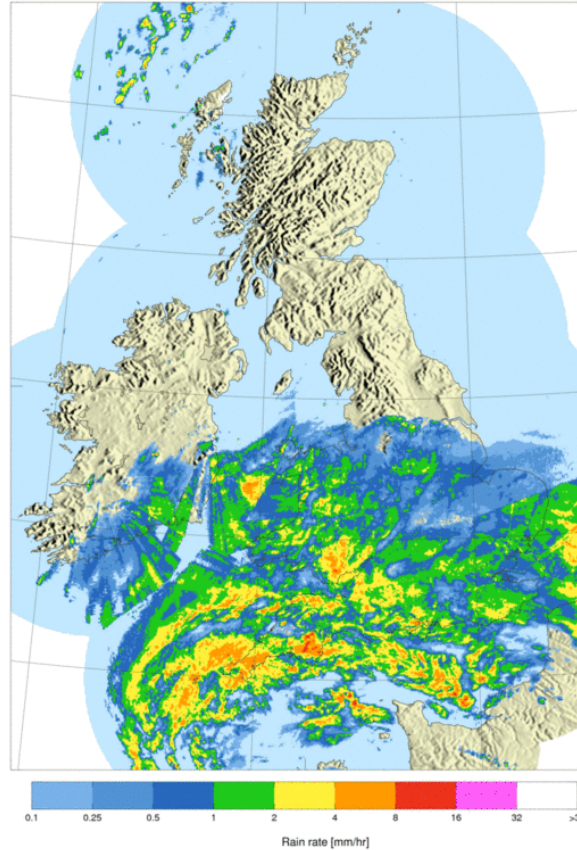
e.g. Hi-res models for UK Floods 24th November 2012

UKV op Precipitation rate [mm/hr] and PMSL
Saturday 1600Z 24/11/2012 (+1h)



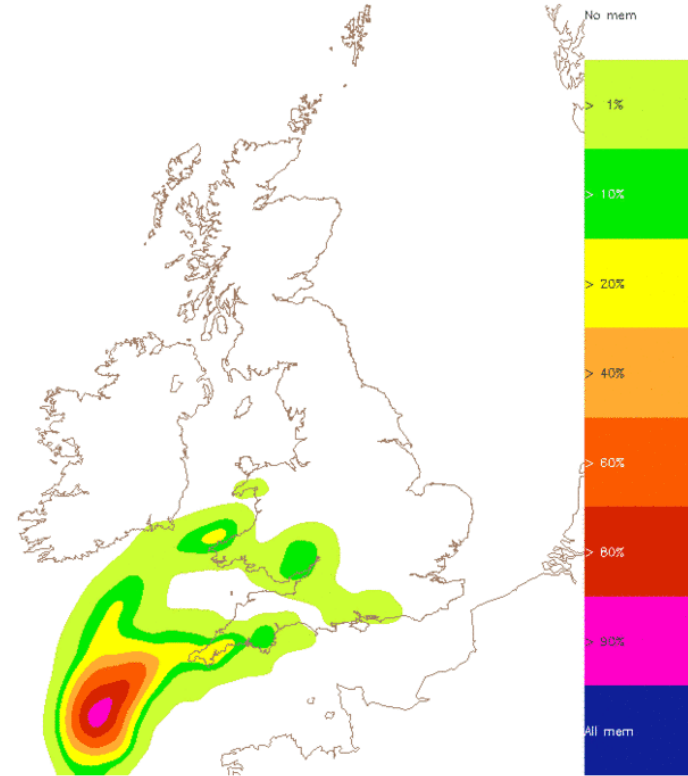
UKV 1.5km

Radar Rainfall Rate (composite-1km)
For 1600Z on 24/11/2012



Radar

16:00 24/11/2012 (T+01:00)



MOGREPS-UK 2.2km
Chance of Heavy Rain in the Hour



Operational Forecaster Web-display

Includes *seamless* products from Day 1 to Day 15 exploiting different model inputs

GPP Display

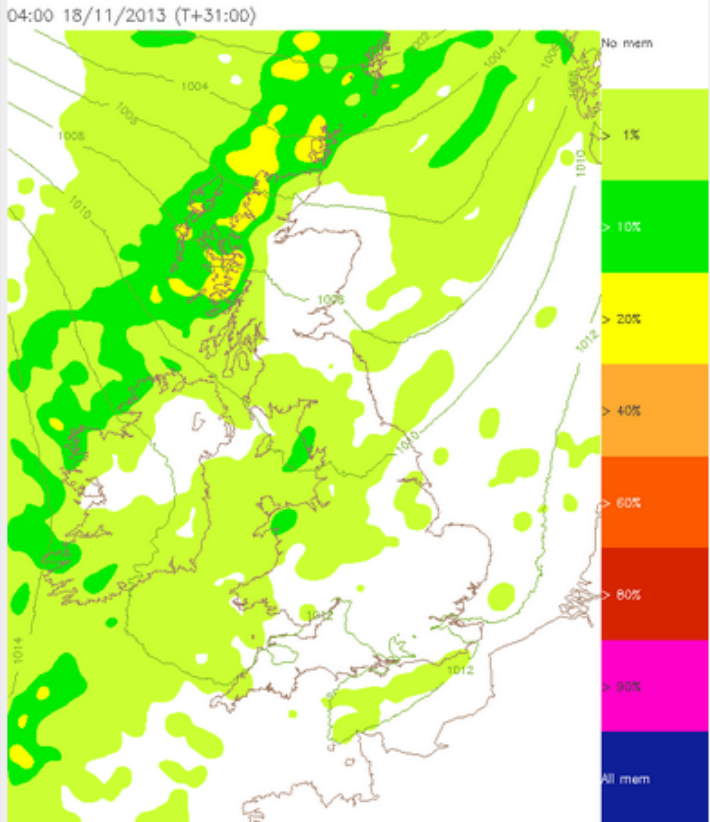
UK Euro

- Precip
- Cloud
- Visibility
- Wind
- Temperature
- Severe Convection
- Other
- Postage Stamps
- Air Quality

Description

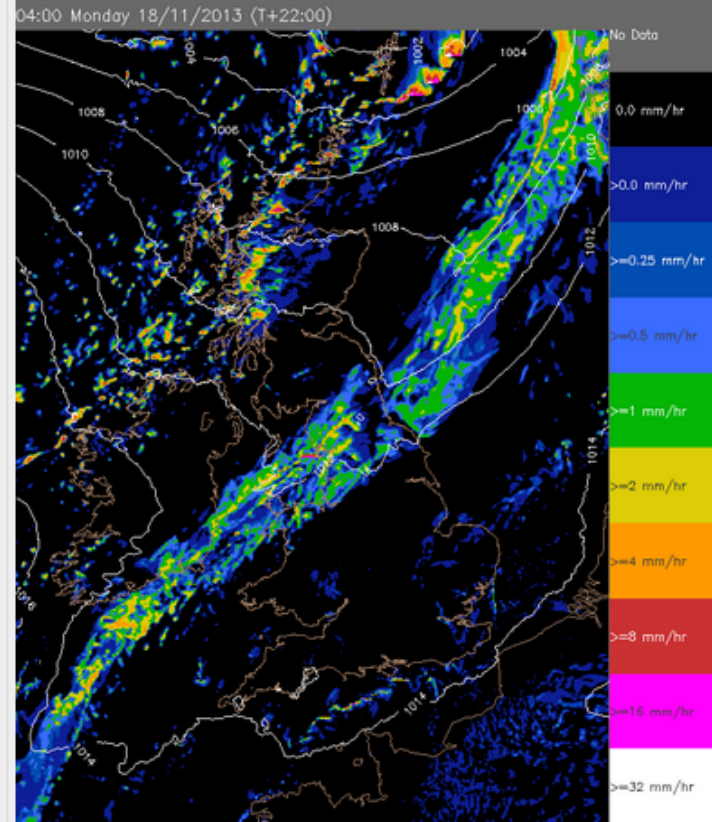
Probability map of accumulation of precipitation rate at the time shown, with neighbourhood processing applied. This shows the percentage of MOGREPS ensemble members above the threshold 4 mm/hr. This is overlaid with contours of ensemble mean pressure at mean sea level.

MOGREPS-UK | Rate prob > 4 mm/hr | Most Recent | Go!



Navigation controls: back, forward, zoom in, zoom out, and a slider.

MOGREPS-UK prob recip rate > 4 mm/hr (DT 21:00 16/11) [Link/unli](#)



Navigation controls: back, forward, zoom in, zoom out, and a slider.

UKV precip rate (DT 06:00 17/11) [Clear](#)

St Jude's Storm

Monday 28th October 2013



Four die as storm hits southern UK



The death toll after a storm hit parts of southern Britain, leading to 607,500 homes losing power, and train and flight cancellations, rises to four.

LIVE Storm batters southern Britain

Were train companies too cautious?

Q&A: How to claim for damage

▶ Footage from around the UK

In pictures: Storm batters Britain

Tree crushes sleeping caravan girl

Two found dead after 'gas explosion'

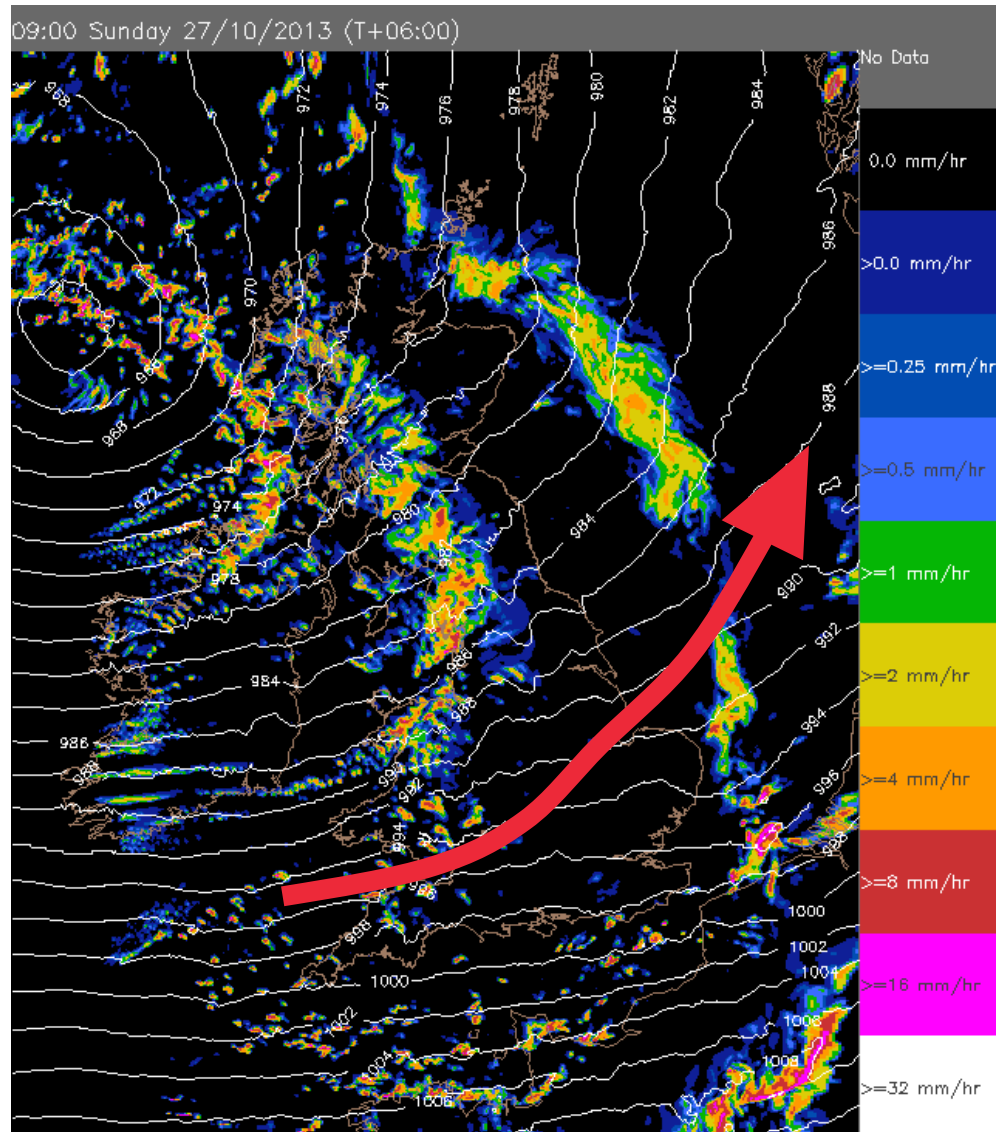
Tree falls on car killing driver

Above: The BBC news website on Monday 28th October 2013

- “Warnings about today’s storm were first given a week ago, giving people and emergency services time to prepare... More advanced technology has made predicting the weather far more reliable”
BBC News 10:00pm, 28 Oct 2013



UKV 1.5km forecast 03Z run on 27th October



**Observed track
shown in red**



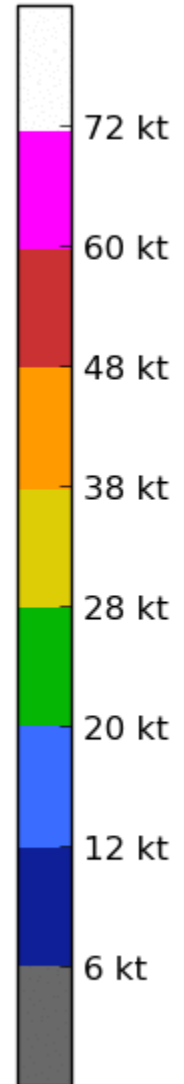
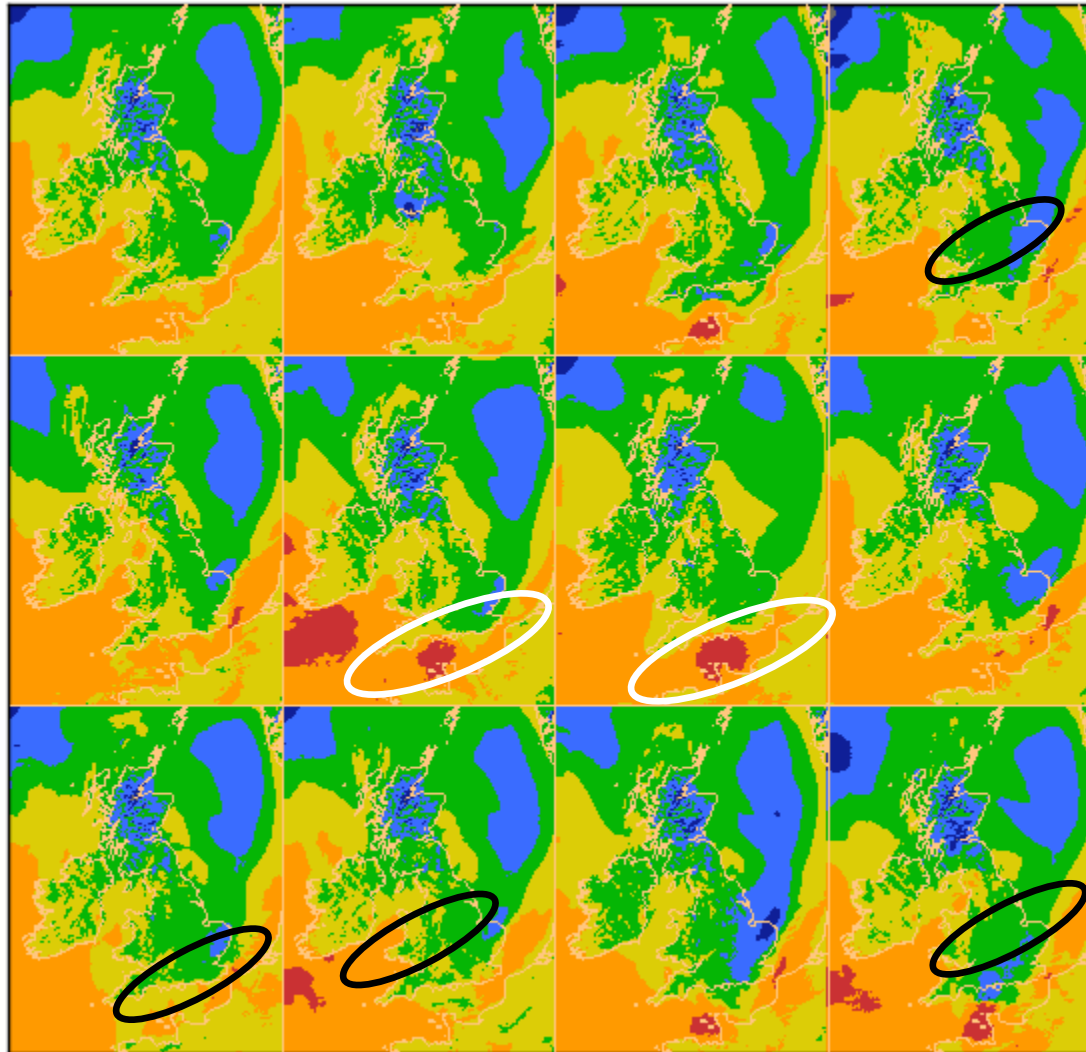
St Jude's Storm: MOGREPS-UK wind gust postage stamps (03Z run on Saturday 27th October 2013)

M-UK Wind Gust for time: 05Z 27/10/2013 T+2


72kt gusts on S flank of main low


72kt gusts on wrap-around – sting-jet?

Note: gusts over North Sea after leaving UK not highlighted



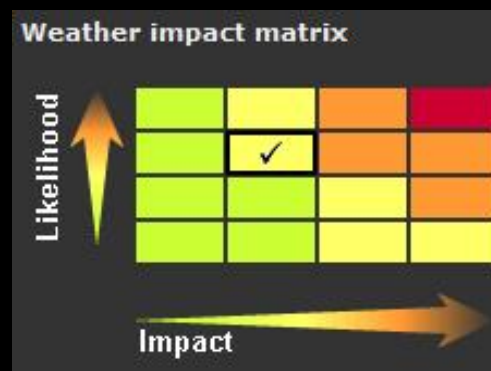


The UK National Severe Weather Warning Service (NSWWS)

- Alerts/warnings based on **likelihood** and **impact**
 - **Alerts** - issued more than 24 hours ahead
 - **Warnings** - issued up to 24 hours ahead
- Regionally varying impact thresholds
- Alerts/warnings presented by shape areas on a map rather than just by county area



	No severe weather
	Be aware
	Be prepared
	Take action



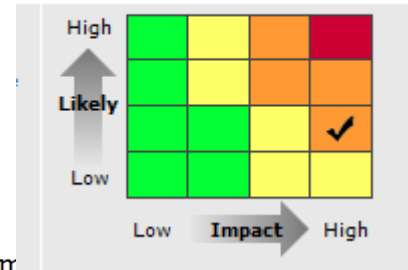


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Day 5 Amber warning

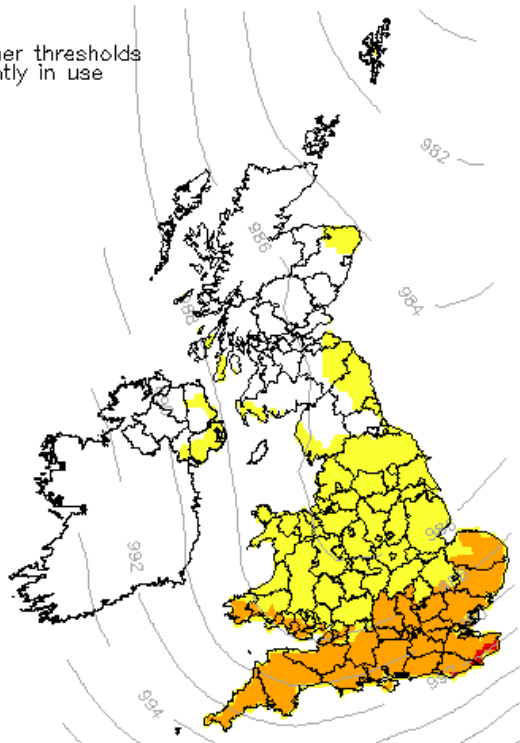
- First-guess warning based on ECMWF EPS and issued warning

Weather Impact Matrix



ECMWF EPS Overall Warning Colour for 10m Wind Gusts
 DT 00Z on Thu 24/10/2013
 Valid Mon 28/10/2013 (Day 5)
 12Z ensemble mean PMSL over-plotted in grey

Summer thresholds currently in use



National Severe Weather Warnings - United Kingdom

Overview
Detail

Warnings overview: United Kingdom
 Issued on Thu 24 Oct

Mon 28 Oct

Thu 24 Oct

Fri 25 Oct

Sat 26 Oct

Sun 27 Oct

Mon 28 Oct

Use the small maps above to select the weather warnings over the next five days. Click on your chosen region below for more details of current warnings in force.

United Kingdom		North West England	
Orkney & Shetland		North East England	
Highlands & Eilean Siar		Yorkshire & Humber	
Grampian		West Midlands	
Strathclyde		East Midlands	
Central, Tayside & Fife		East of England	
SW Scotland, Lothian Borders		South West England	
Northern Ireland		London & South East England	
Wales			

Key:

Be aware	Be prepared	Take action					
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The Met Office has responsibility for providing weather warnings for the UK. Coloured regions on the map show where severe weather warnings have been issued. When issued, the public are advised to take extra care. Further information and advice can be found on the: [Severe weather impact links](#) page.



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Vehicle OverTurning (VOT) Model

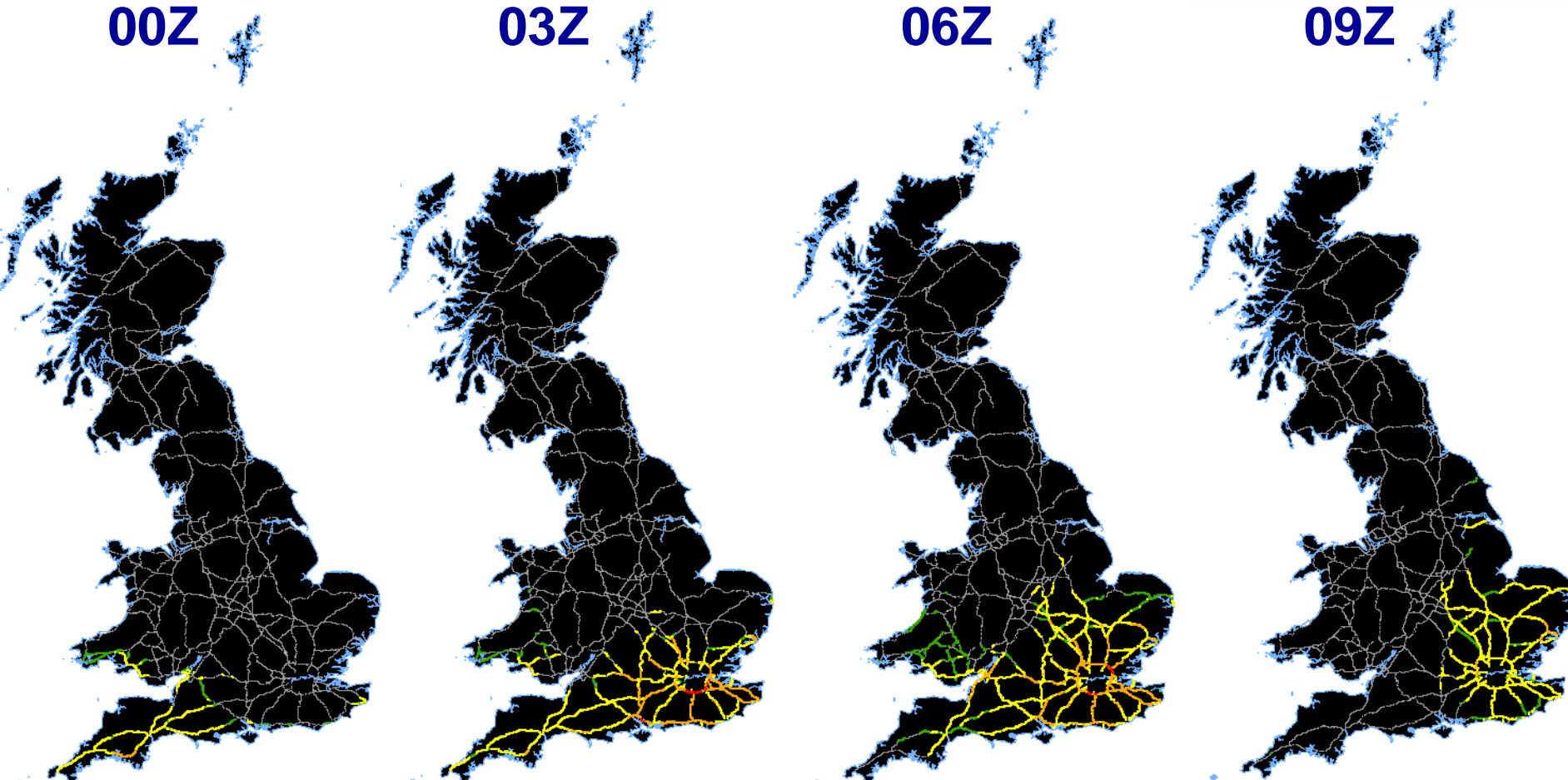
St Jude's Storm 28th October 2013

00Z

03Z

06Z

09Z

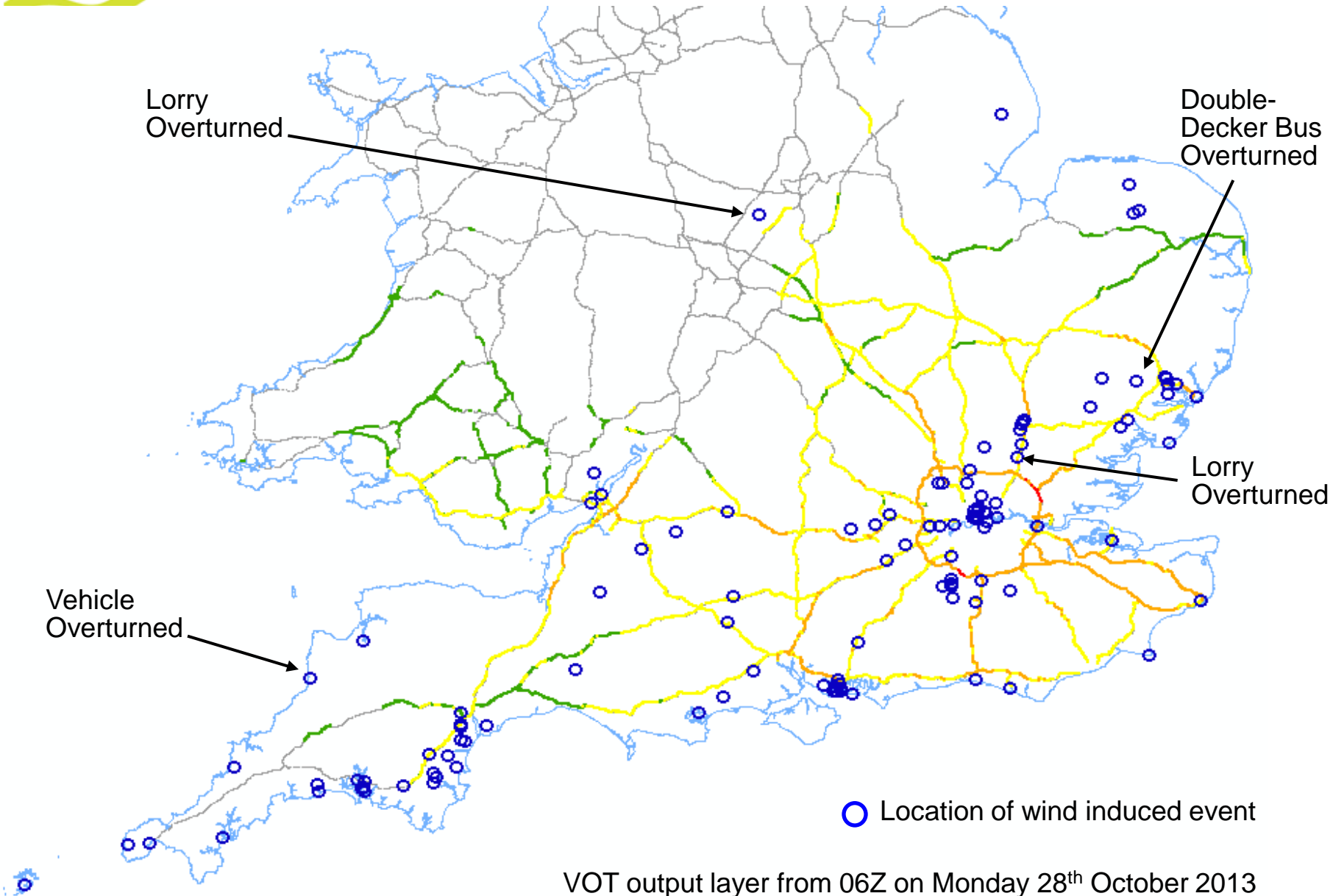


Maximum Risk on the UK Road Network

● Low Risk ● Low - Medium Risk ● Medium - High Risk ● High Risk



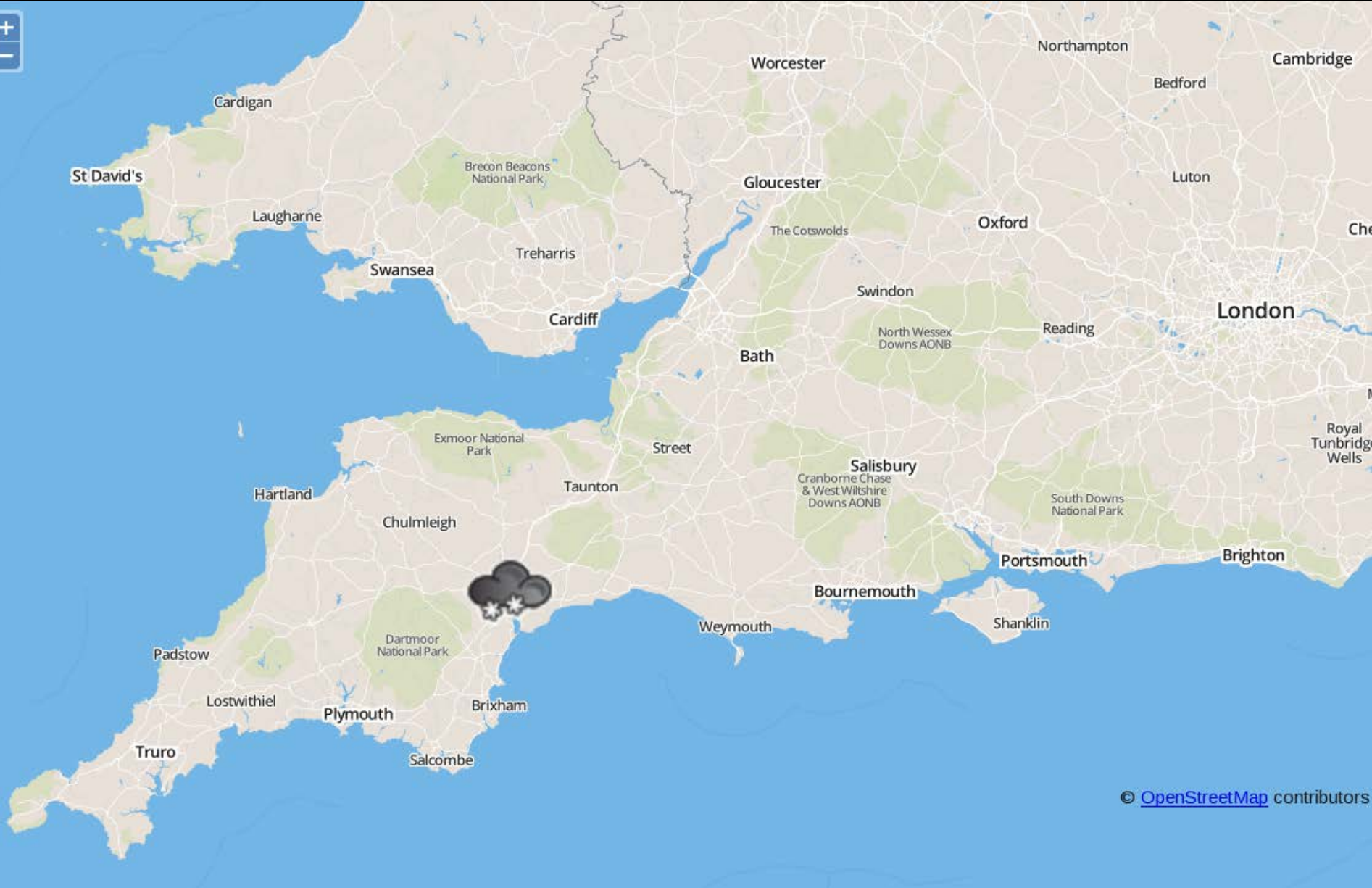
Location of Impacts – St Jude’s Day Storm



What is the weather going to be like in Exeter at noon tomorrow?



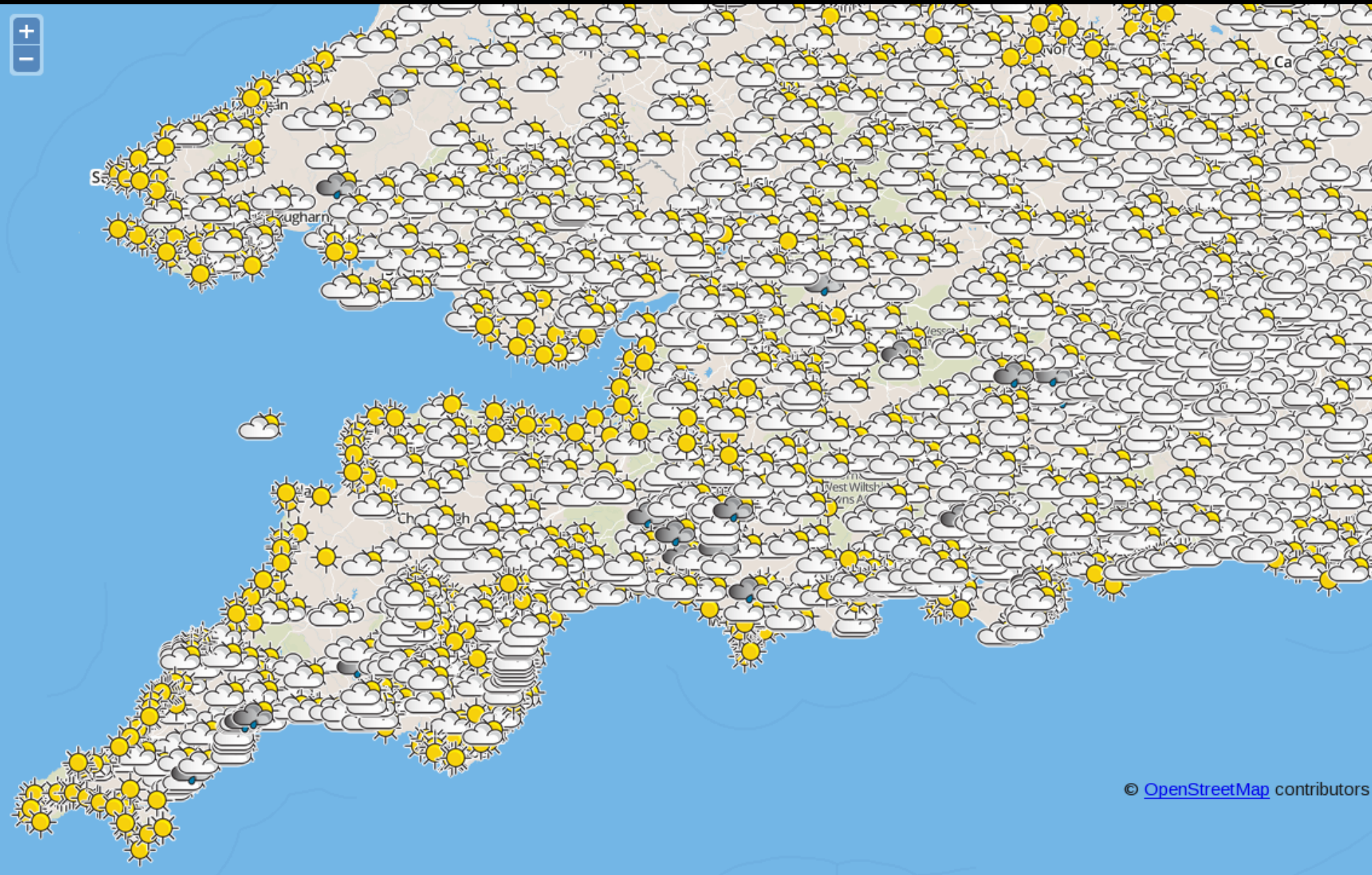
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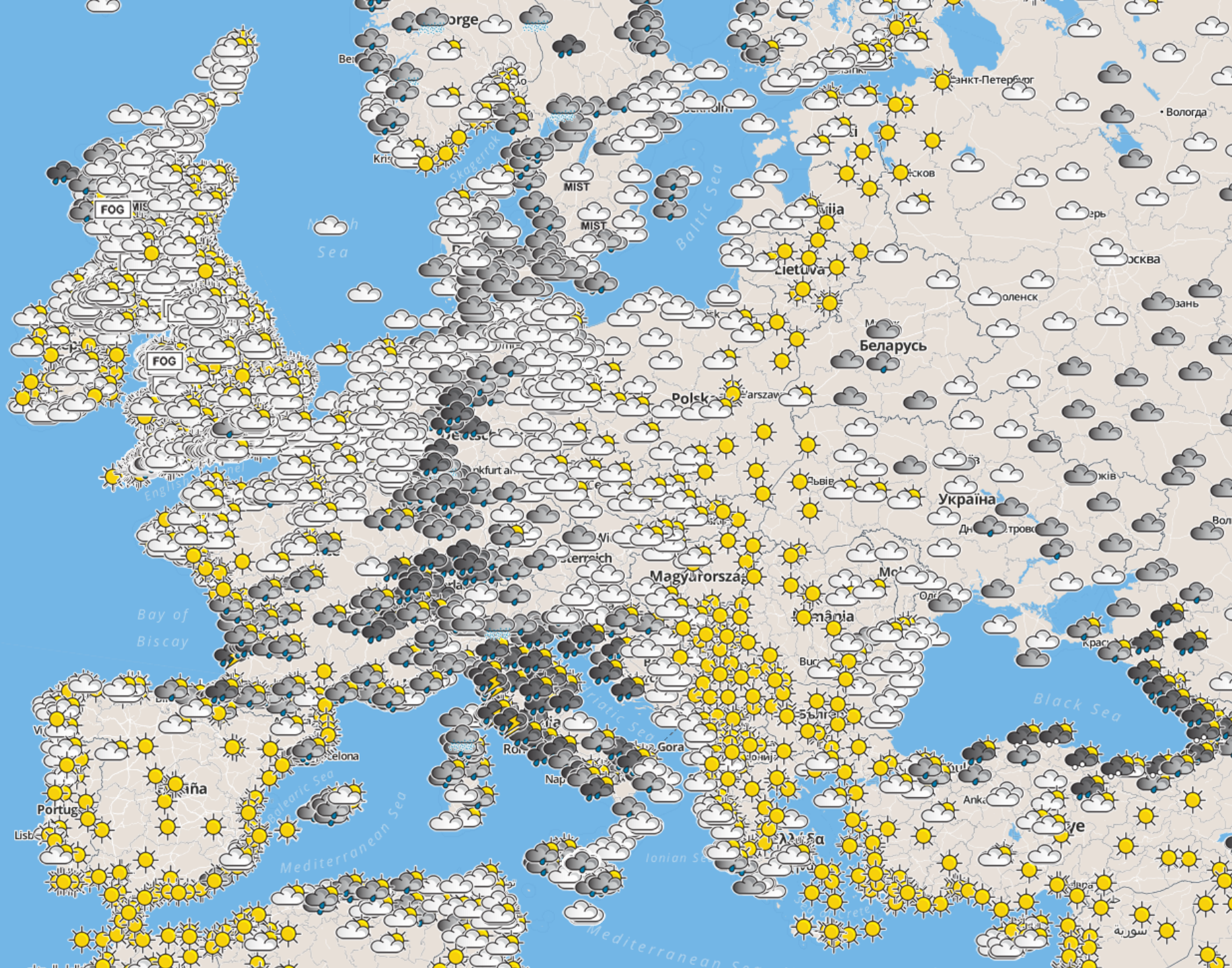
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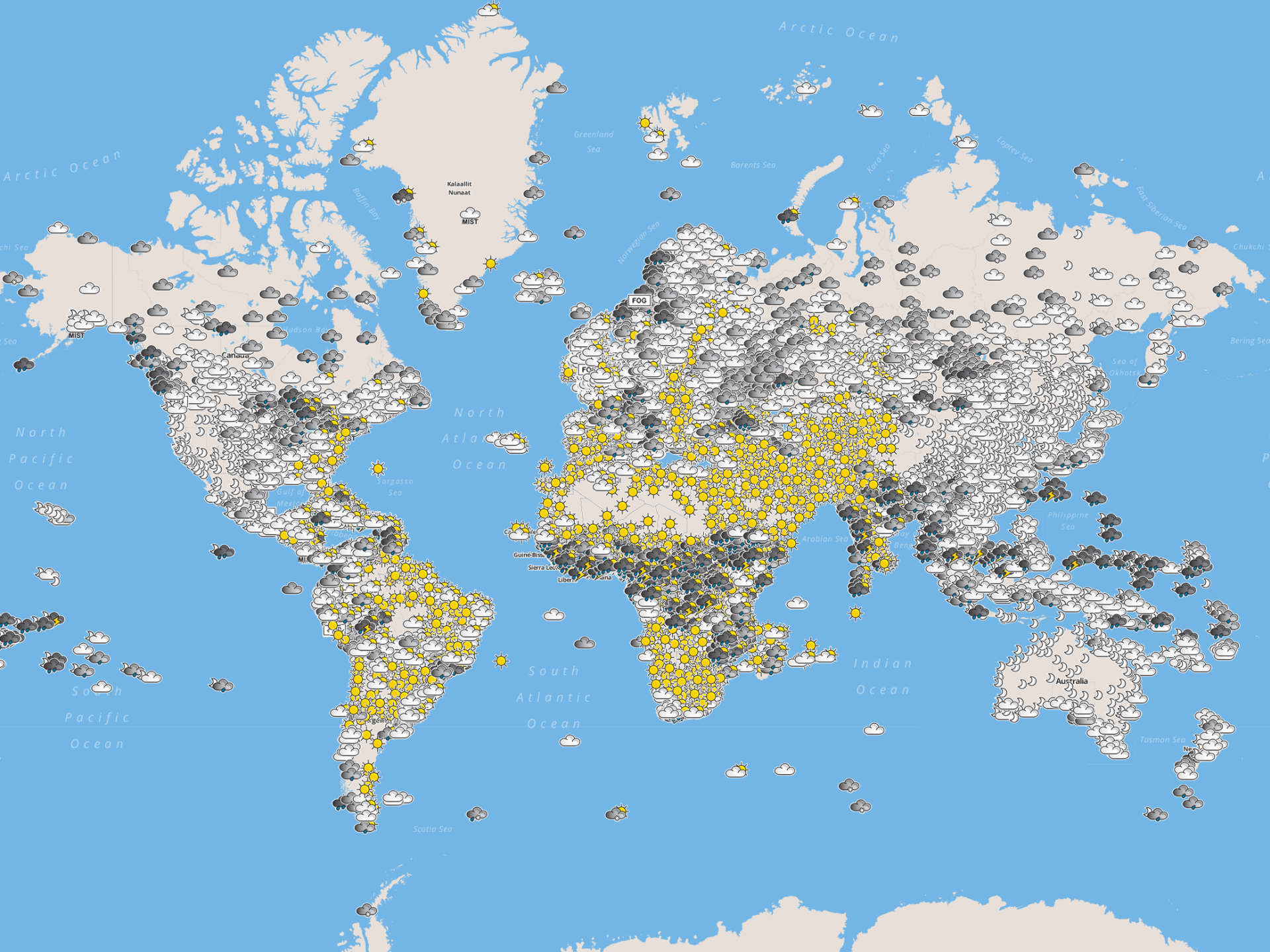


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Best Data Blending

Each day we receive:

- 24x hourly nowcasts
- 8x UKV runs
- 4x MOGREPS-UK ensembles (12 members each)
- 4x Euro 4km runs
- 2x Global model runs
- 4x MOGREPS-G ensembles (12 members each)
- 2x MOGREPS-15 ensembles (24 members each)
- 2x ECMWF Deterministic runs
- 2x ECMWF ensembles (51 members each)

Each new forecast produced by updating previous by weighted blending approach



Processing site data

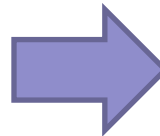
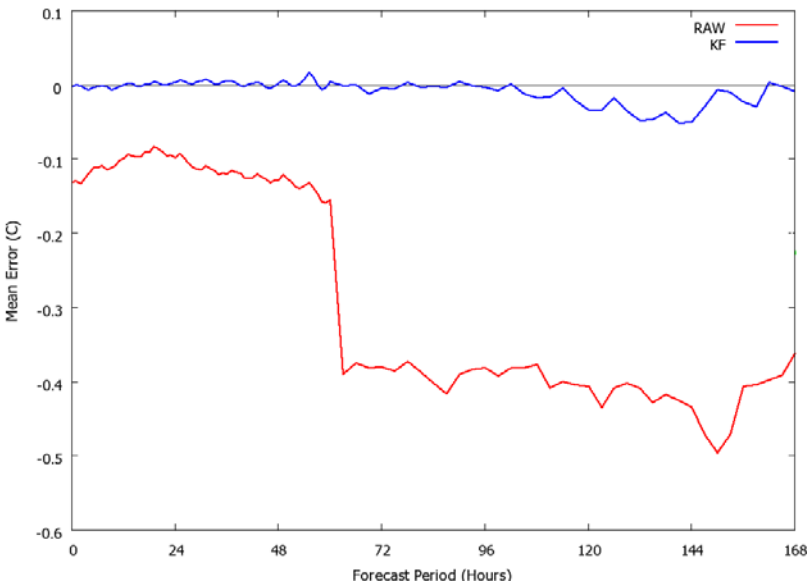
Site Specific Processing System (SSPS)

- Grid Point selection
- Orographic, coastal, etc. corrections
- Derived Parameters

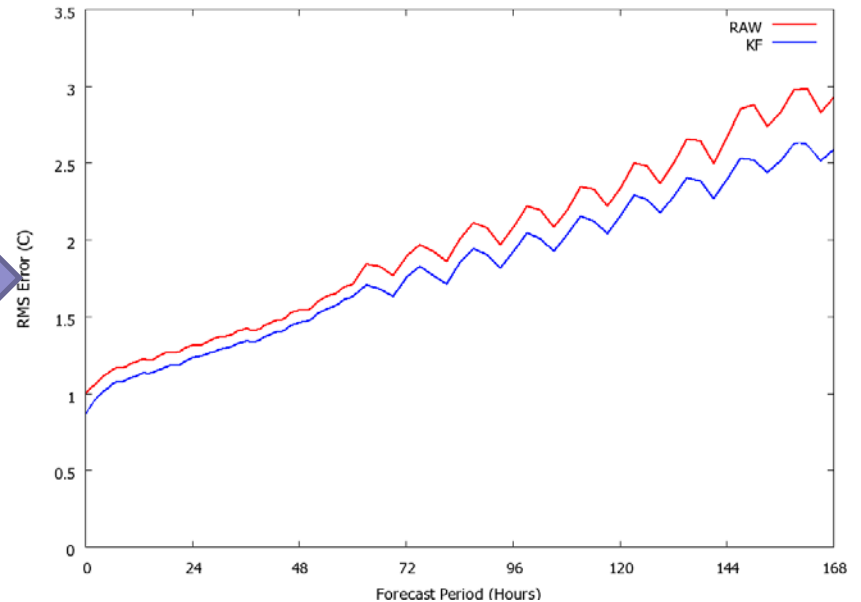
Kalman filter corrects systematic biases where observations available:

- Minimises error differences between model inputs

Mean Error

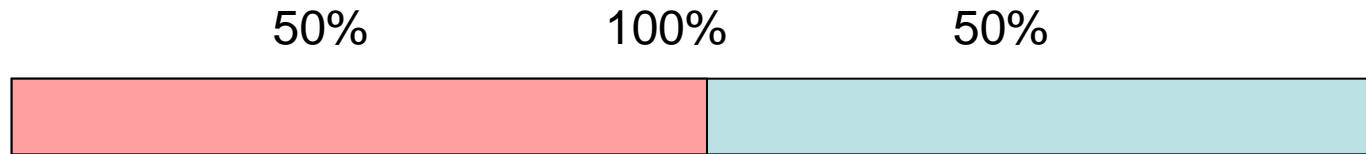


RMS Error



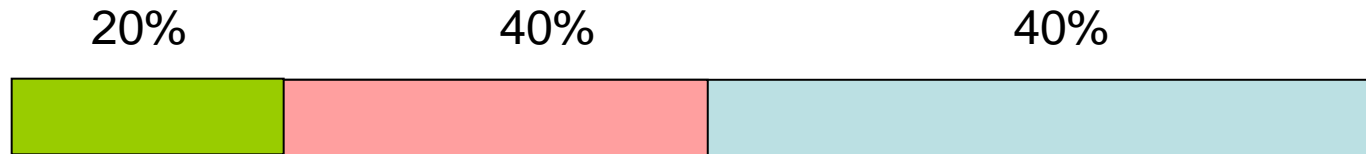


Blending Example





Blending Example





Blending Example





Met Office



Questions?

Thanks to very many people who contributed to this work, notably:
Rob Neal, James Carvin, Becky Hemingway, Piers Buchanan, Matt Bano