



Met Office

Nowcasting for the London Olympics 2012

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Met Office, UK

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Outline

- Context
- MOGREPS-UK
- AQUM
- Weymouth Bay models
- Summary



Forecasting System

Generic Products



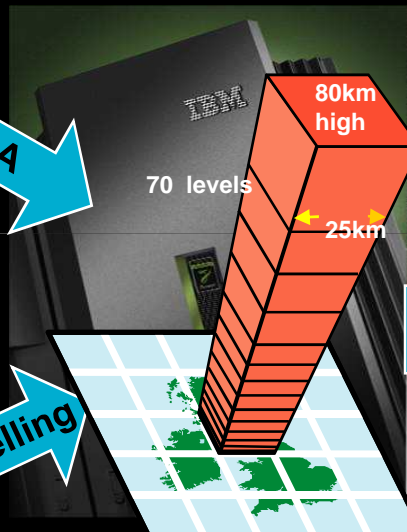
Met Office 'API'



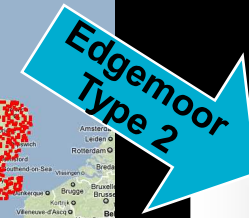
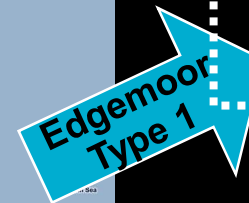
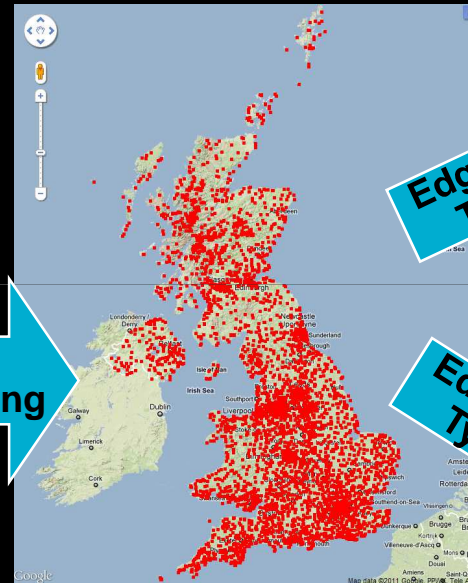
Best data



Observations



Forecast Model



Advice

Knowledge

$$\begin{aligned} \frac{du}{dt} &= \frac{\partial p}{\partial x} - fv \\ \frac{dv}{dt} &= \frac{\partial p}{\partial y} + fu \\ p &= RT \\ \rho \end{aligned}$$



Automated public forecasts

- Seamless NWP, using Unified Model, aiming for single nested 2013 configurations:
 - 33km ensemble + 15km deterministic) global
 - 2.2km ensemble + 1.5km deterministic UK
- Nowcasts, using 1.5km UKV adjusted to latest observations (using STEPS for precipitation)
- Site-specific forecasts calibrated with univariate site-specific Kalman Filters
- Hourly forecasts at 5000 UK + 5000 global locations to 5 days ahead on web site



Public site-specific forecasts

London Olympic Park North
Mon 30 Jul

[Change table layout](#)

Mon 30 Jul



Tue 31 Jul



Wed 1 Aug



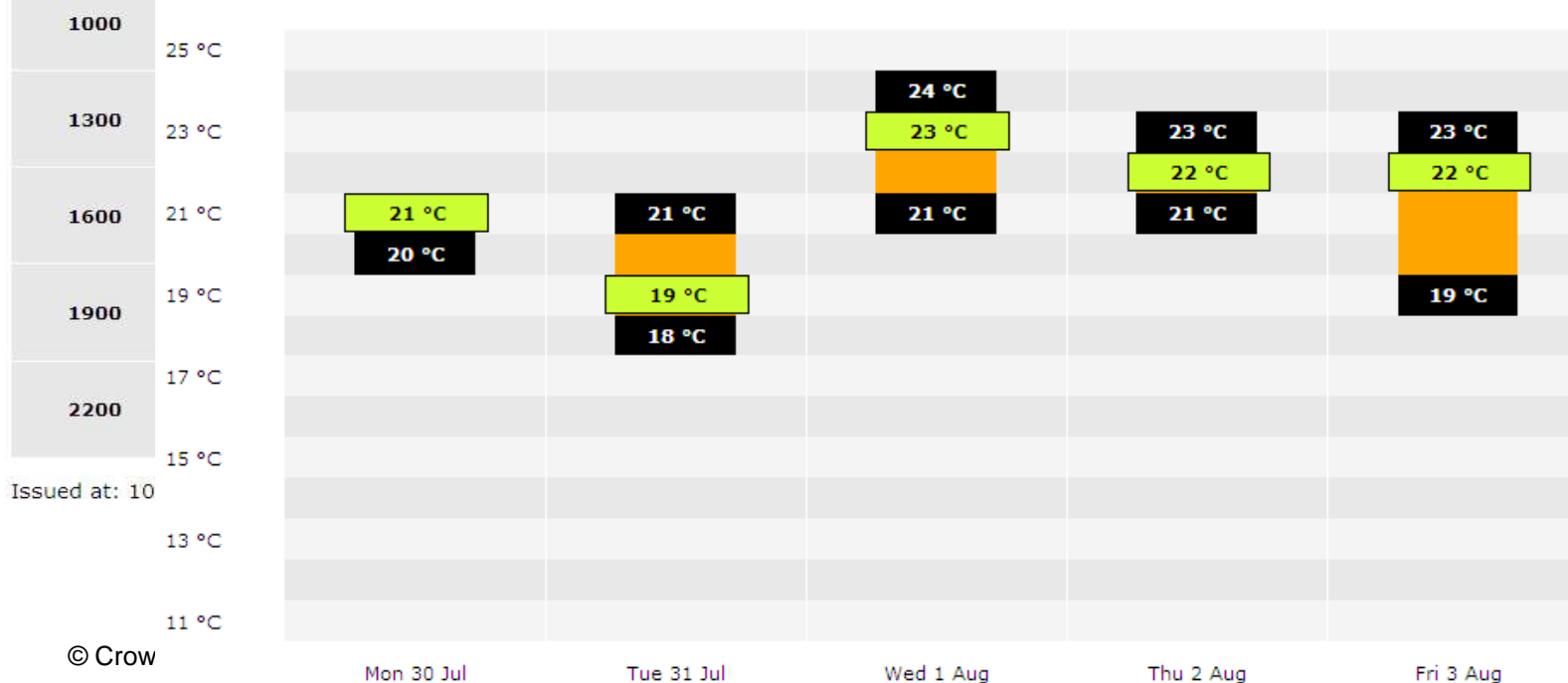
Thu 2 Aug



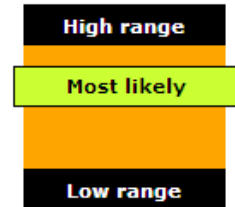
Fri 3 Aug



UK local time	Regional warnings	Weather	Temperature (°C)	Wind speed & direction (mph)	Wind gusts (mph)	Visibility	Humidity (%)	Precipitation probability (%)	Feels like (°C)	UV index	Daily air quality index [BETA]
0700	No warnings		12	7	No gusts	Moderate	72	20	11	1	
			Max temp range	Min temp range							



Key:



Issued at: 10

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Civil Protection & Games support

- Collaborative decision making by expert forecasters working with other professionals
- LOCOG supported by forecast advisors at Olympic Park, Eton Dorney & Weymouth
- Civil Protection supported by advisors and “Hazard Manager” service:
 - UK National Severe Weather Warning Service
 - Flood Forecasting Centre
 - Hazard Centre – delivering the Natural Hazards Partnership: Met Office, Environment Agency, Centre for Ecology and Hydrology, British Geological Survey, Health Protection Agency & others
 - All co-located in the Met Office Exeter Operations Centre



WMO Forecast & Research Demonstration Projects

- Sydney 2000: Nowcasting FDP
- Beijing 2008: Nowcasting FDP + ensemble RDP
- Whistler 2010: Mountain nowcasting RDP
- London 2012: Demonstration of advanced NWP capabilities:
 - 2.2km 6-hourly UK ensemble
 - 1.5km hourly southern-UK NWP nowcast (see separate presentation)
 - 12km Air Quality
 - 300m atmosphere & 250m wave models for Weymouth Bay



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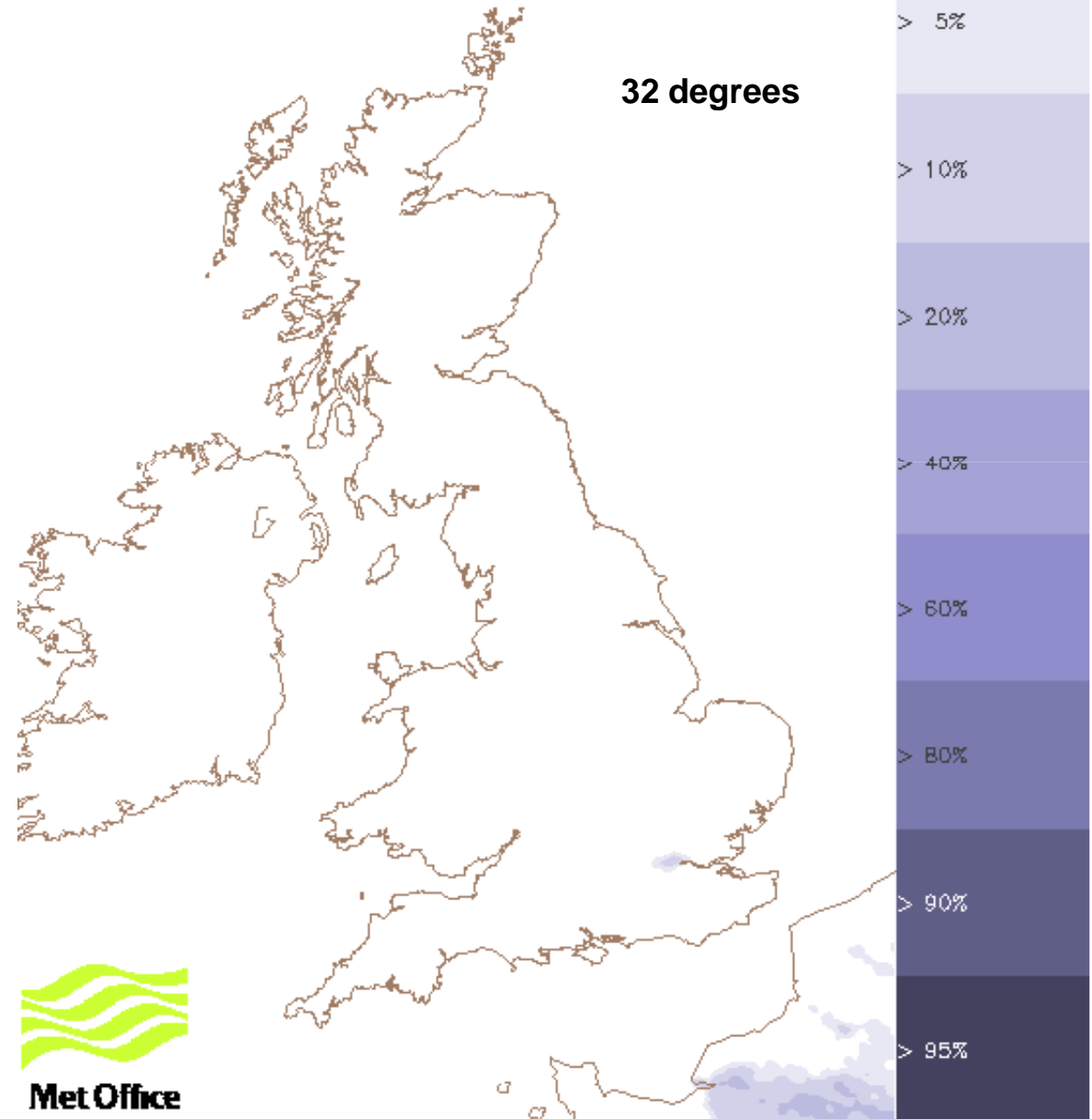
MOGREPS-UK 2.2km ensemble



Convective-scale ensemble: MOGREPS-UK

- 12 member 2.2km ensemble, run 6-hourly
- Perturbations from boundary conditions
- Post-processing uses lagged processing of 2 successive runs + neighbourhood processing to counter sample sparseness
- Provides confidence measure on fine-scale model detail to forecasters, especially for warnings
- Expected initial operational acceptance in 2013
- Maximum temperature probabilities: 25th July 2012

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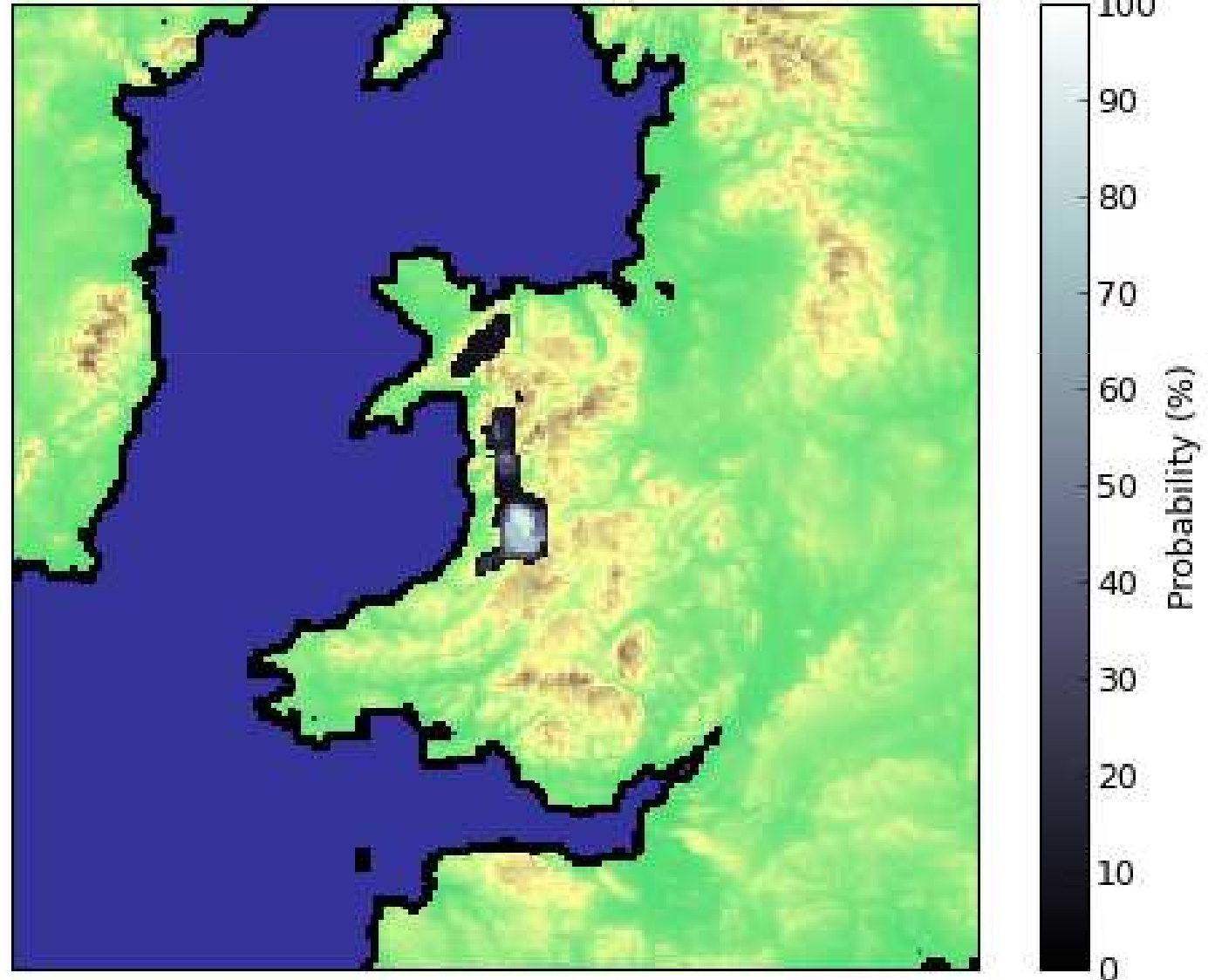


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Preliminary results from 2.2km MOGREPS-UK ensemble

MOGREPS-UK prob. of exceeding 100.0 mm accum.

0800 UTC
9th June

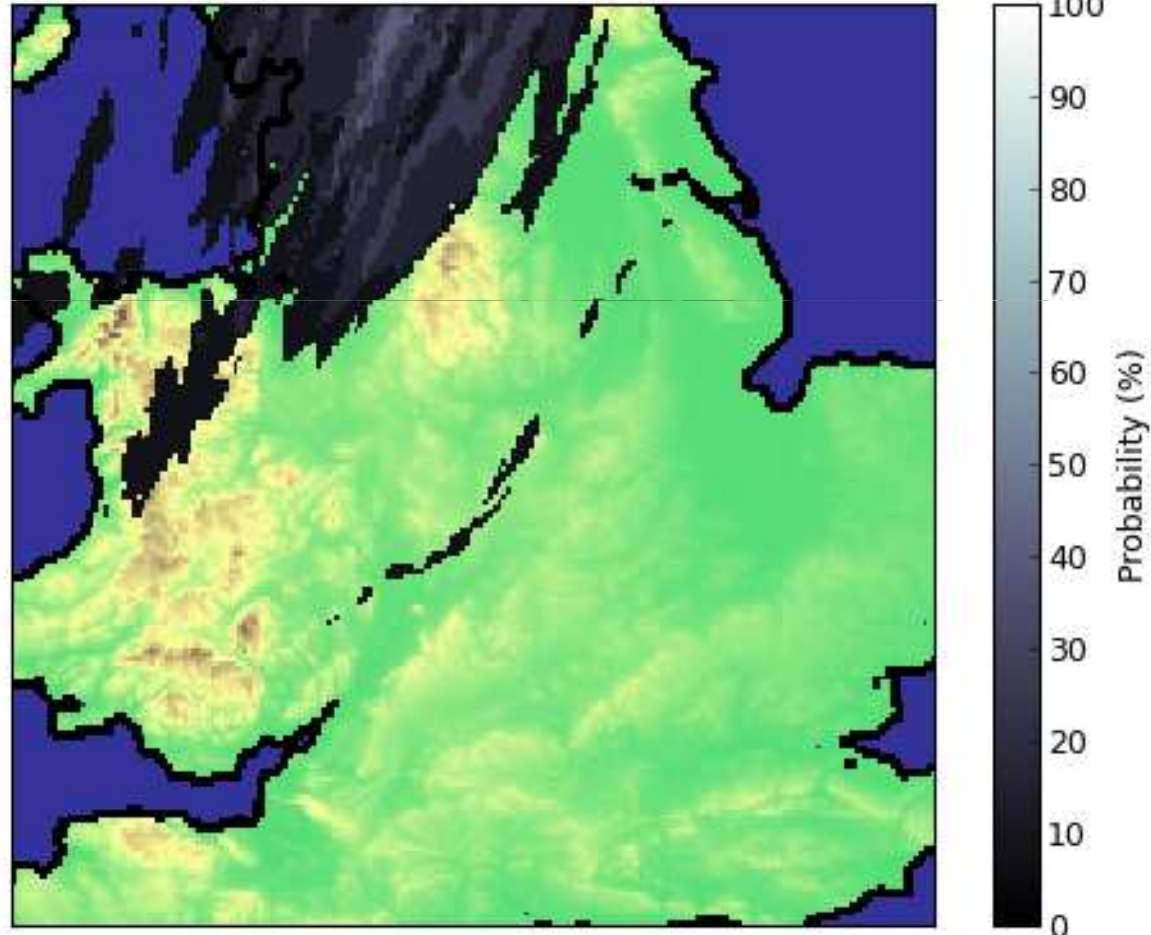




Preliminary results from 2.2km MOGREPS-UK ensemble

0000 UTC
29th June

MOGREPS-UK prob. of exceeding 64.0 mm accum.





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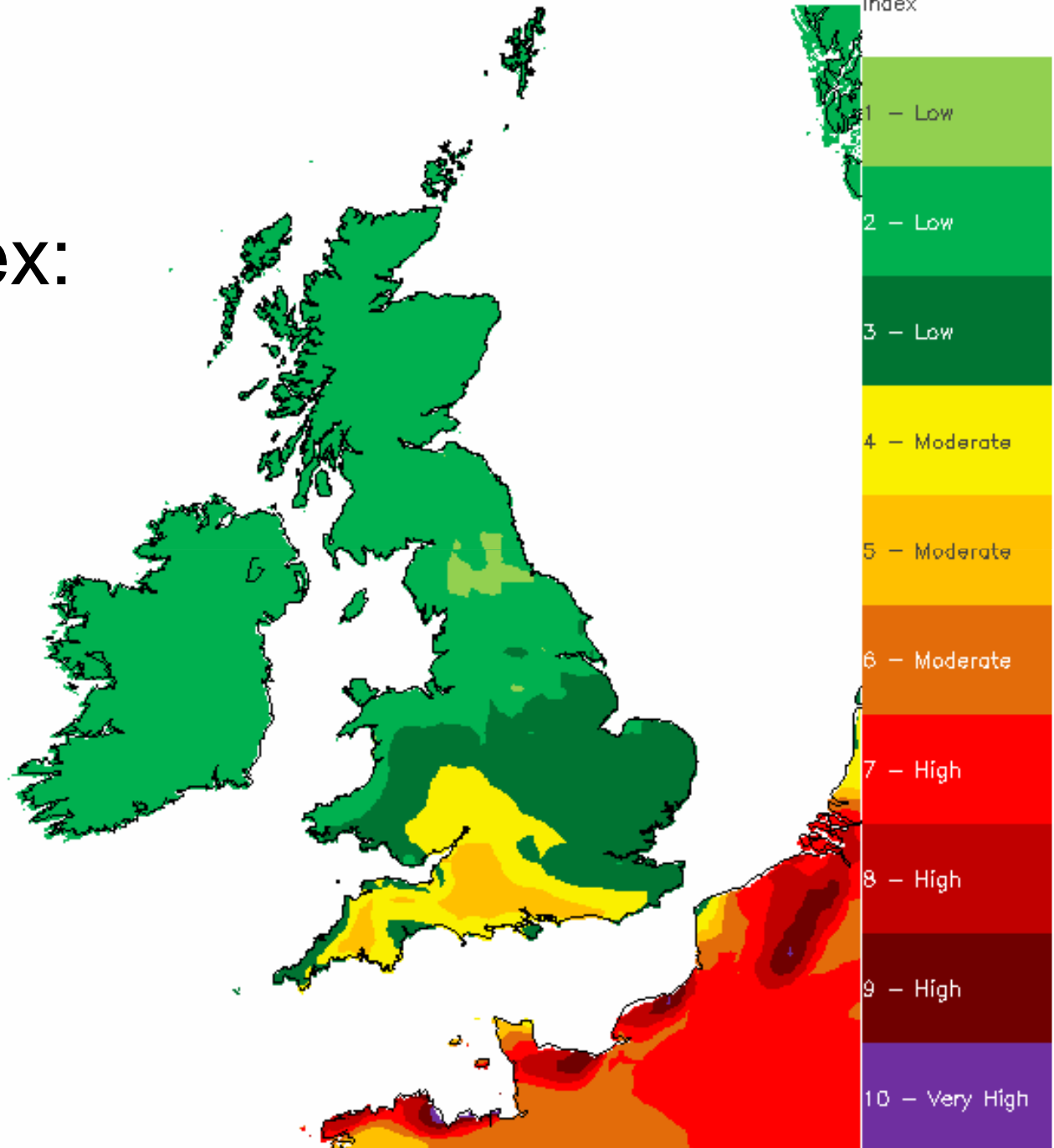
Air Quality Model

Daily Air Quality Index – Thu 26/07/2012



Air Quality Index: forecast from 23/7/12

- Uses UKCA aerosol & chemistry developed for Earth System Model use in Climate Change research
- Configured for NW Europe on 12km grid
- Run daily to 5 days using ECMWF boundary conditions





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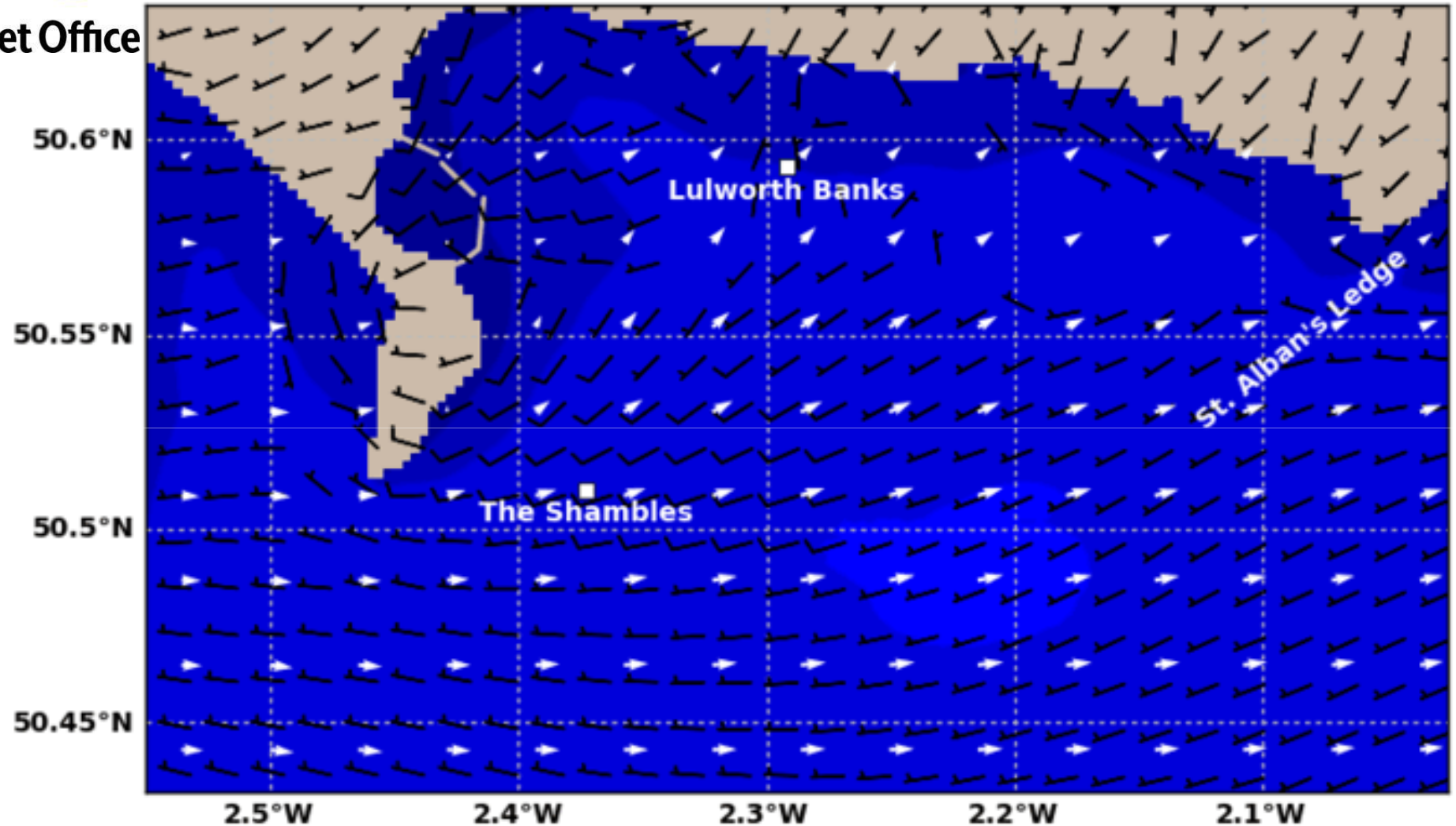
Weymouth Bay models



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Weymouth Bay wind & wave

25-Jul-2012 12:00 (T+15.0) (valid: 24-Jul-2012 21z)





Weymouth Bay models

- Operational very hi-res models to support Weymouth Bay forecasters for duration of Olympics/Paralympics
- **333m UM weather forecast model**
 - Used for LOCOG Weymouth Bay wind climatology
 - Captures local wind/weather detail missed by 1.5km UKV: frost/fog hollows, beach vs town, park vs urban, mountain waves
 - Could be deployed for UK in 2020, given HPC resources & prioritised requirement
- **250m SWAN wave forecast model**
 - Resolves headlands missed by operational wave model
 - Represents shallow water physics better than Wavewatch III
 - Aim to add physics to WWIII, couple with NEMO-SHELF ocean model & configure to forecast within 1km of UK shoreline by 2020



Summary

- Demonstration of key NWP development areas:
 - 2.2km UK ensemble
 - Hourly rapid update NWP nowcast
 - Air Quality
 - Weymouth wind & wave
- Used by forecast advisors at Olympic venues
- Results inform future implementation priorities
- Feedback welcome!



See <http://www.metoffice.gov.uk/weather/showcase/>
<http://www.metoffice.gov.uk/research/news>

Questions?