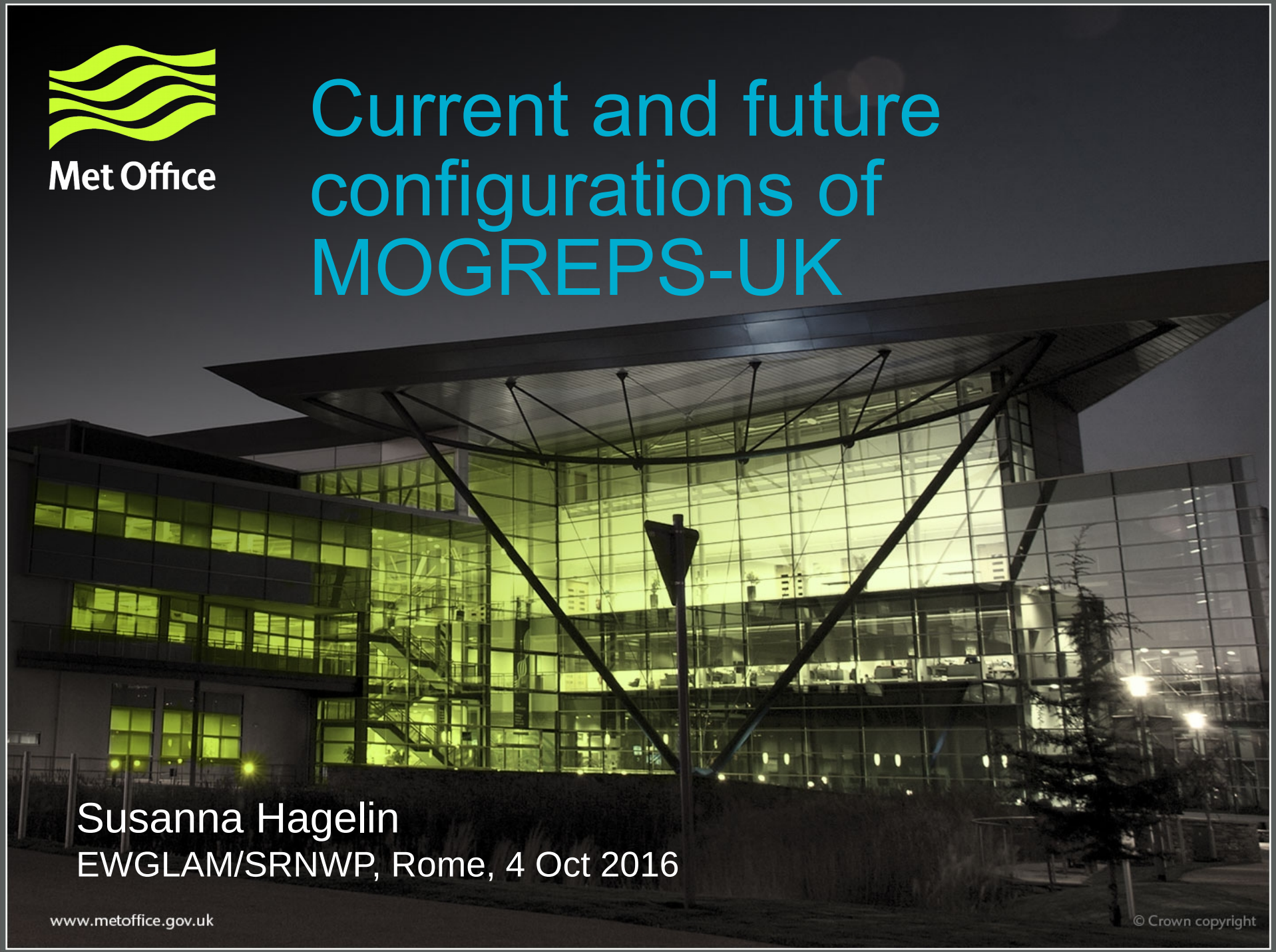
Current and future configurations of MOGREPS-UK



Susanna Hagelin

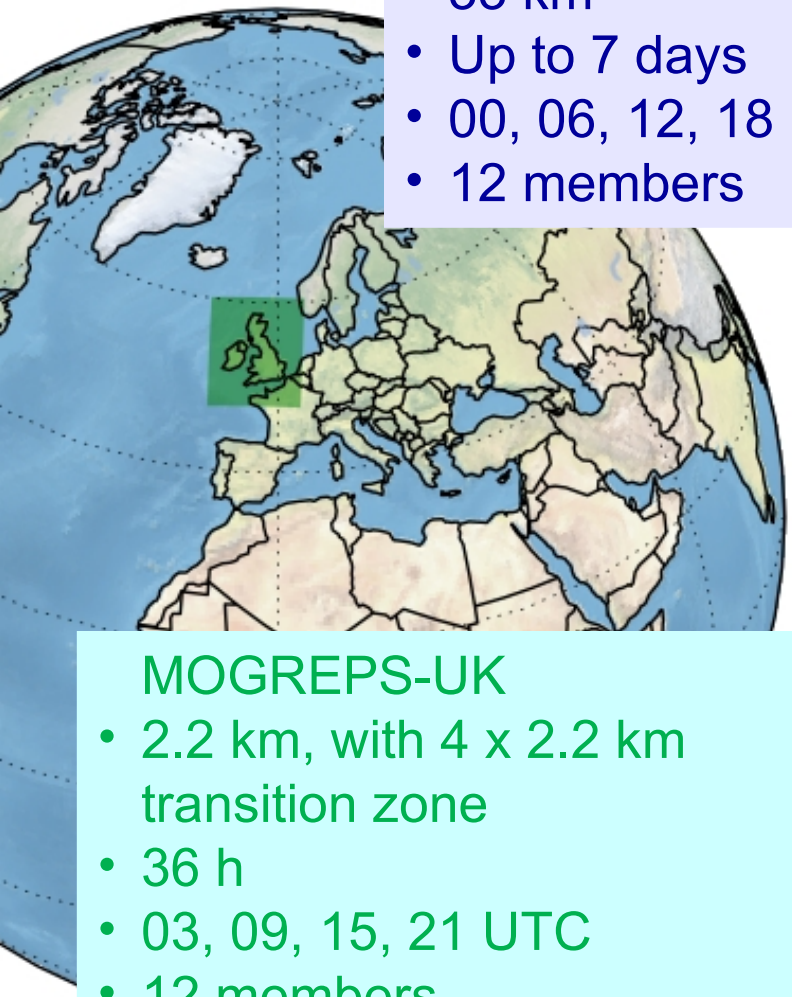
EWGLAM/SRNWP, Rome, 4 Oct 2016

Contents

- Current configuration
- PS38 and package trial results
- Soil moisture perturbations – case study
- Future options

Current status

MOGREPS-G
- 33 km
- Up to 7 days
- 00, 06, 12, 18 UTC
- 12 members



MOGREPS-UK
- 2.2 km, with 4 x 2.2 km transition zone
- 36 h
- 03, 09, 15, 21 UTC
- 12 members

- Uncertainties in the forecast are represented using:
  - ETKF for (global ensemble) initial conditions perturbations
  - SKEB and RP (global ensemble)
  - RP and stochastic perturbations in BL in MOGREPS-UK

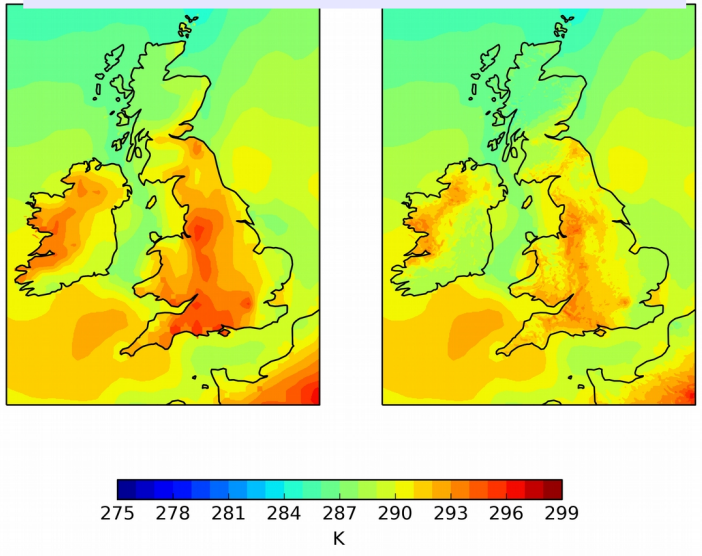
MOGREPS-UK

- Run using LBC from the global ensemble and initial conditions from both UK deterministic model and the global ensemble
- Same model physics as the 1.5 km deterministic UK model (UKV)

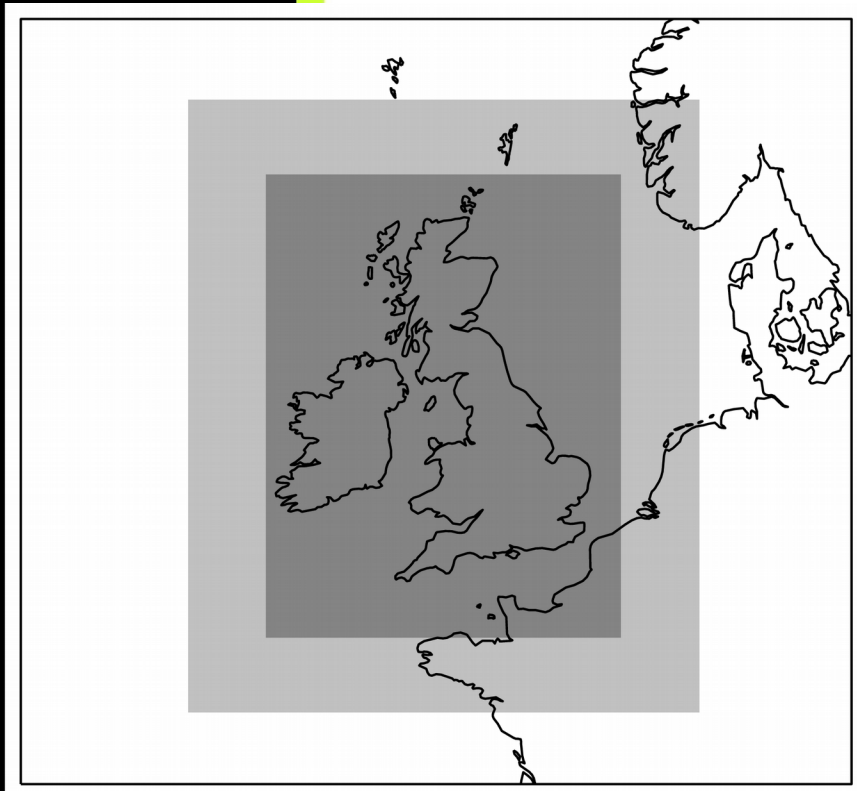
What's new since last year

- OS 37 - operational 15 March 2016
  - Two major upgrades to MOGREPS-UK

Centring around the UKV analysis
- get more detailed initial conditions



Next parallel suite - PS38



- Domain size increase
  - Increase in the stretched grid only
  - From 532 x 654 to 740 x 752 gp
- Longer run length, t+54h
- Will become operational in November 2016
- Adding correlated BL perturbations (UKV and MOGREPS-UK)

BL perturbations

Motivation:

Represent convection growing at the small (subgrid) scales to larger (resolved) scales in the absence of resolved forcing

Implementation:

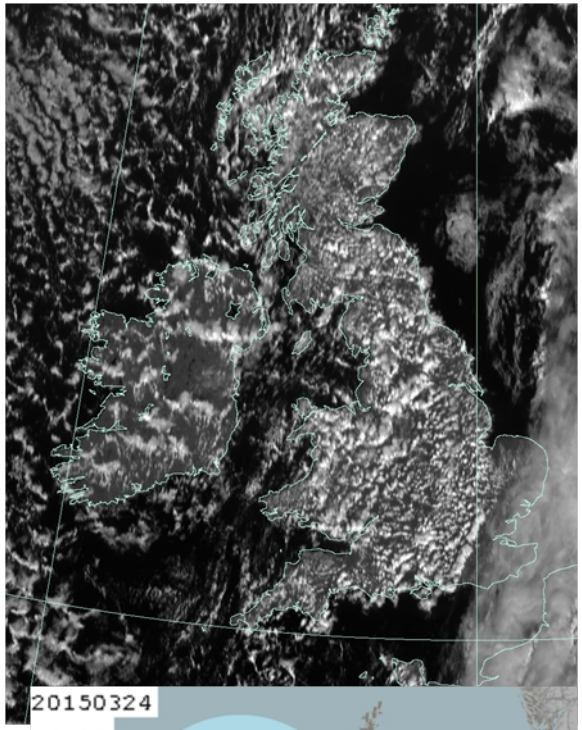
To represent this up-scale transfer, we add random perturbations to the resolved scale flow whose magnitude is dependent on the subgrid flow

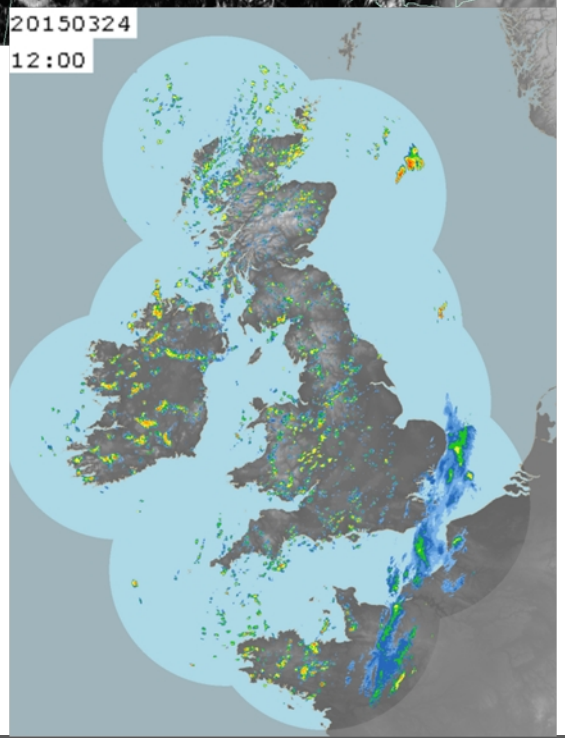
→ the larger the surface heat flux, the larger the "backscatter" of temperature variability to the resolved scales in convectively unstable atmospheres

Extension to ensembles:

Developed for UKV but used in MOGREPS-UK – adds variability by using a different random seed for each ensemble member.

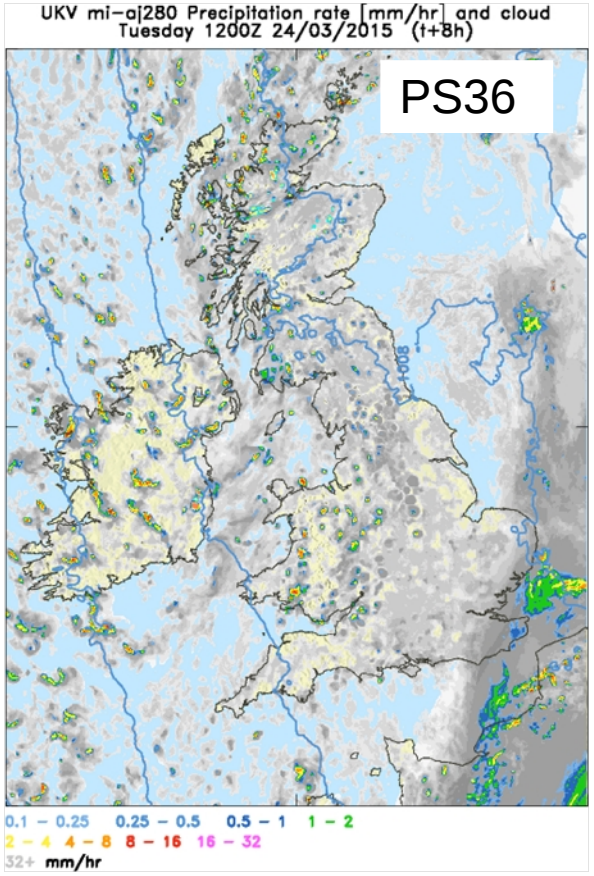
Anne McCabe, Adrian Lock

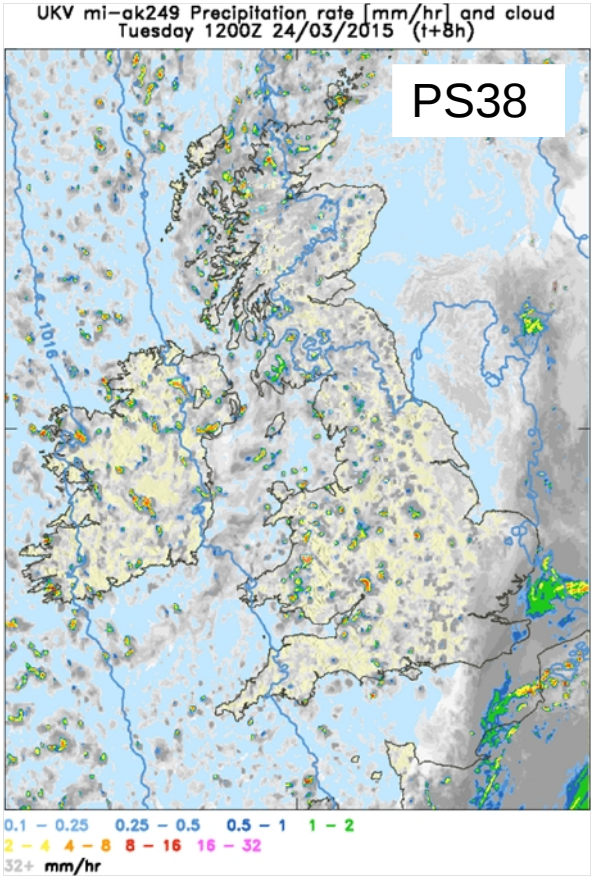




Case study - UKV test
April showers (24th March 2015)

- Correlated perturbations initiate showers significantly earlier
- Cloud cover also have more cumulus, rather than stratus

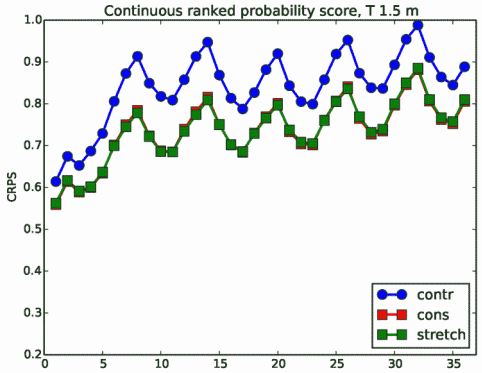
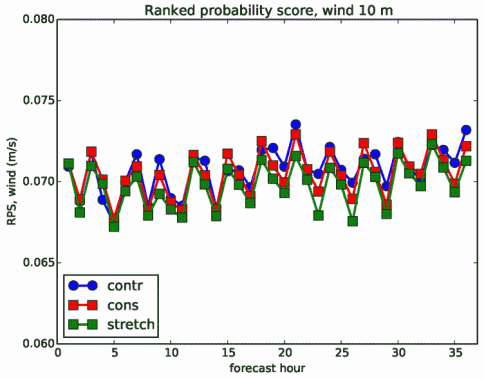
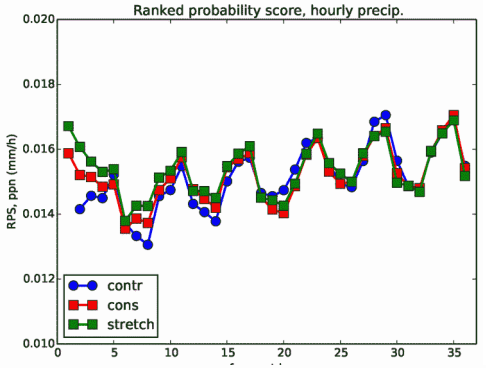
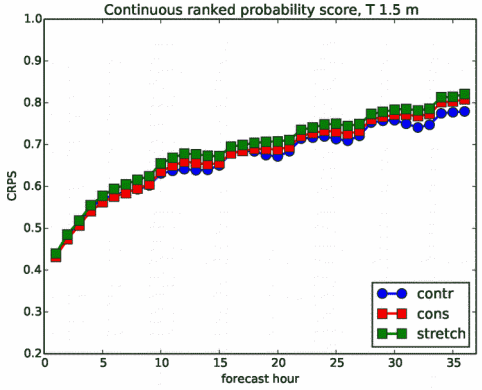
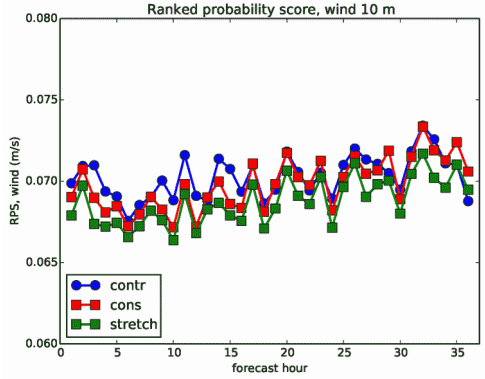
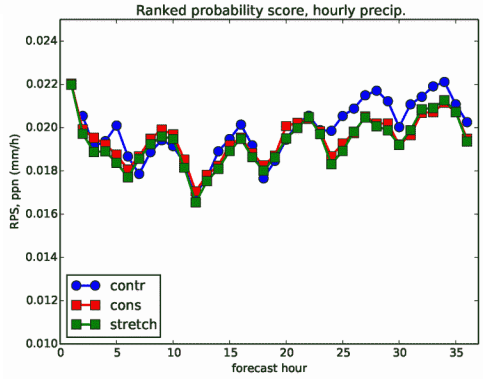




Trial results on the larger domain

- Two trials
  - Summer: 15 June – 15 July 2015
  - Winter: 4 Feb – 2 March 2015
- Evaluated using HiRA (neighbourhood verification)
- Plots show both conservative trial (domain size only) and stretch package (correlated perturbations and mixing changes)

Met Office

	CRPS 1.5 m temperature	RPS 10 m wind speed	RPS hourly precip.
Summer			
Winter			

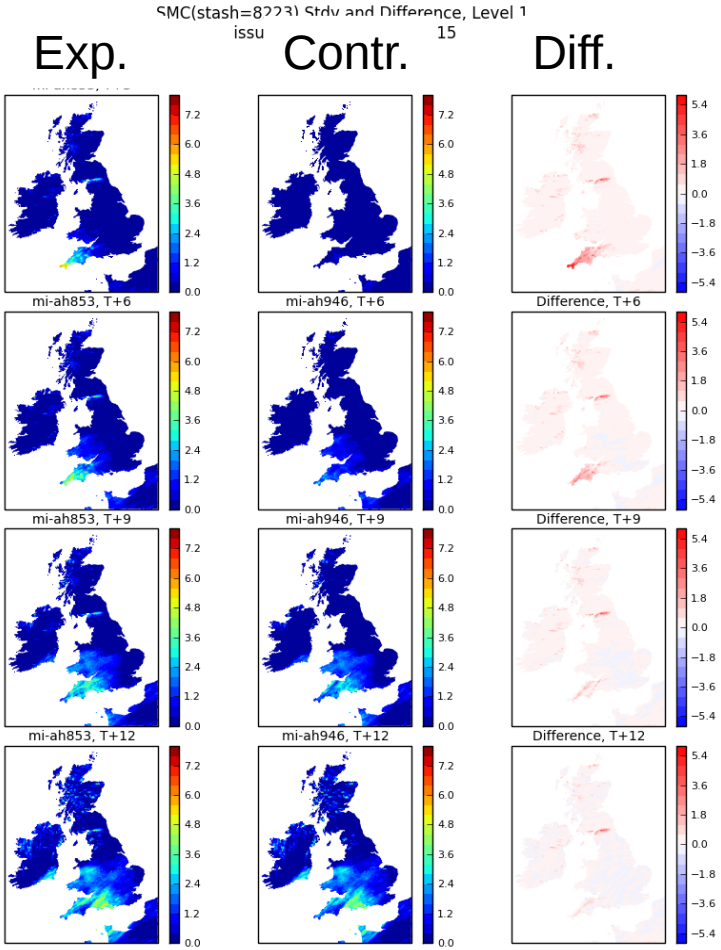
Soil moisture perturbations

- Insufficient spread near the surface
- SMC perturbations to improve temperature and humidity forecast
- Already used in MOGREPS-G
- Trials set up cycling t-12h soil moisture

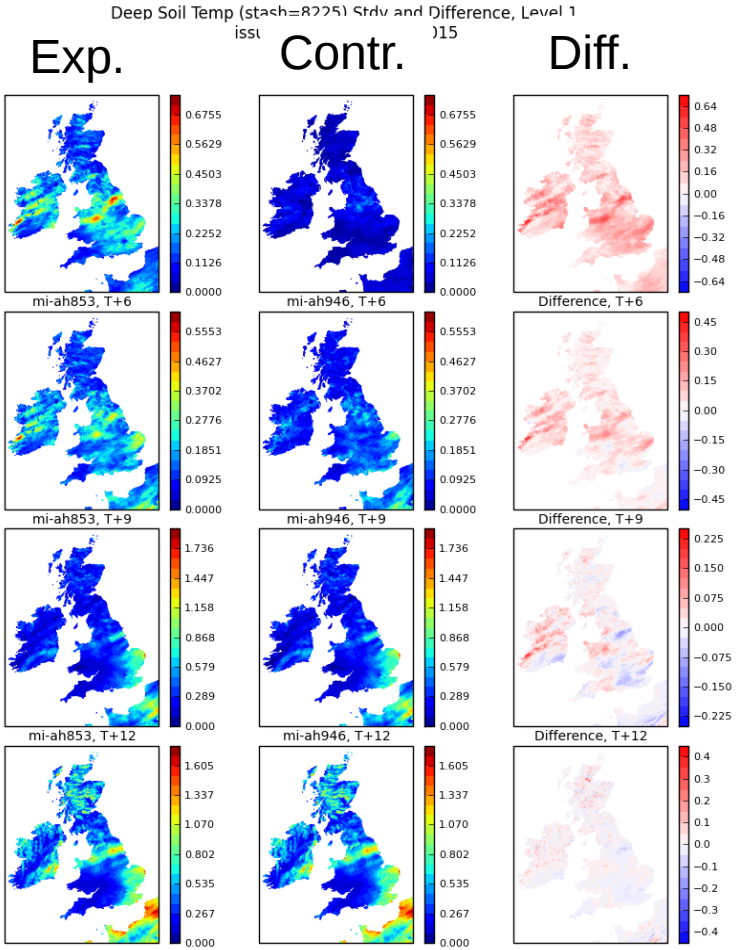
Joohyung Son

24 July 2015

SMC Level 1 – std dev



Deep soil temp. perturbation – std. dev

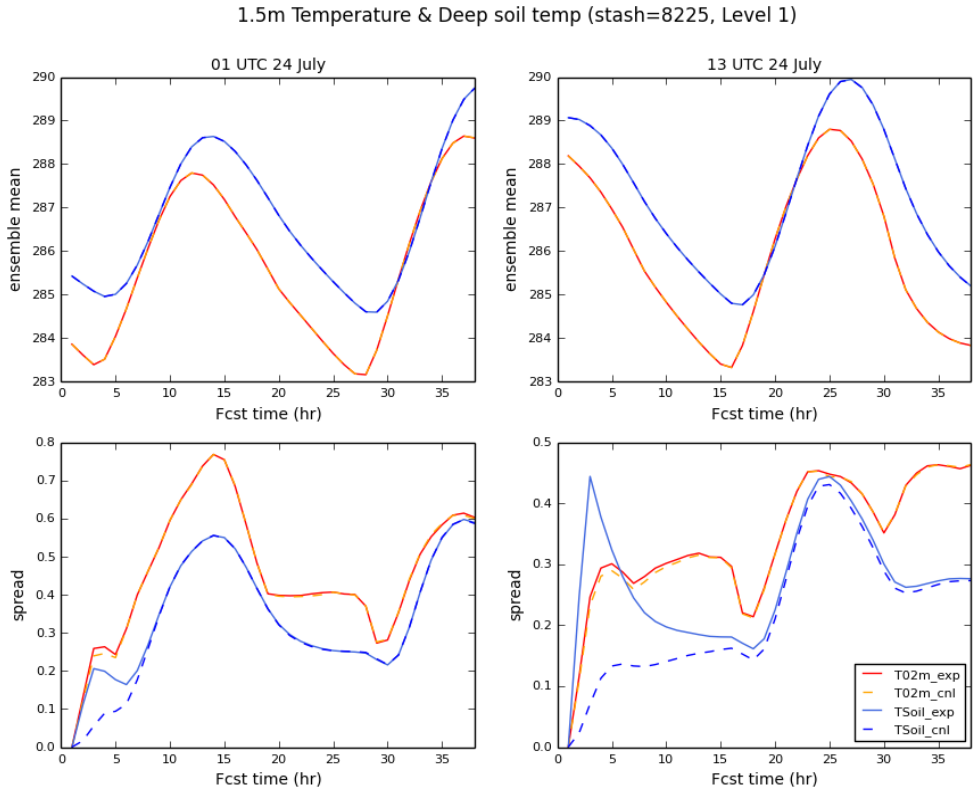


Joohyung Son

Soil moisture perturbations - case study 24 July 2015

1.5 m temperature
- - control
– SMC perts

Deep soil temperature
- - control
– SMC perts



Ens mean

spread

01 UTC

13 UTC

Joohyung Son

Future options

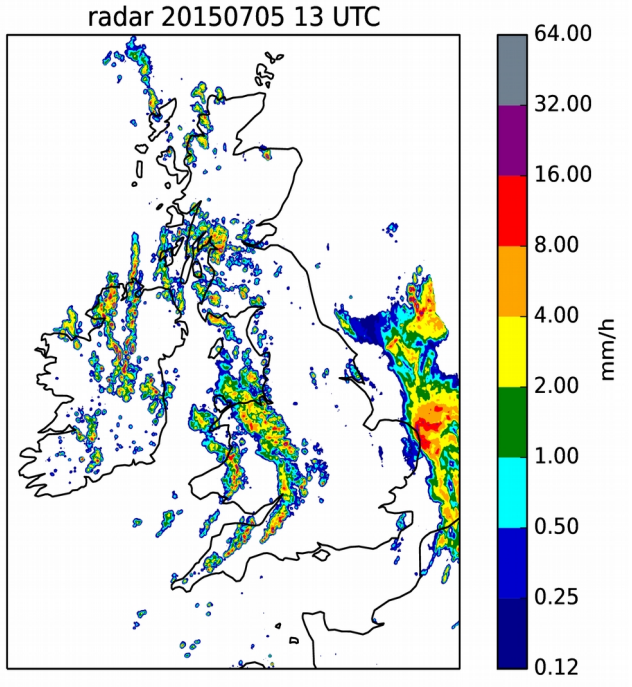
- Parallel suites
  - PS39 - technical upgrade to adapt to the UKV implementing 4DVar
  - PS40 - Hourly cycling with smaller ensemble (18 time-lagged members per 6h)
  - Convective scale ensemble data assimilation (PS44+)
- Current research focus on
  - Represent uncertainties in land-surface and apply RP scheme to land-surface parameters linked to vegetation and fluxes
  - Larger ensemble and/or higher resolution

Met Office

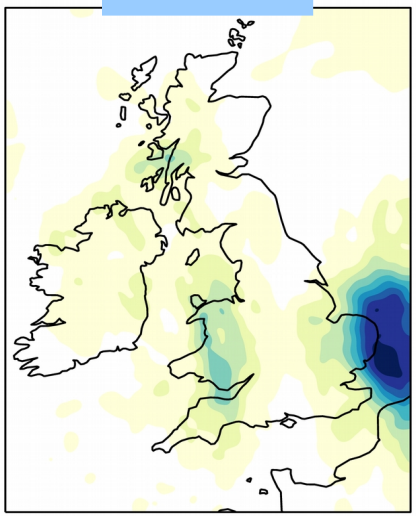
Case study - Rainfall
13 UTC 5 July 2015

(+10 h fcst)

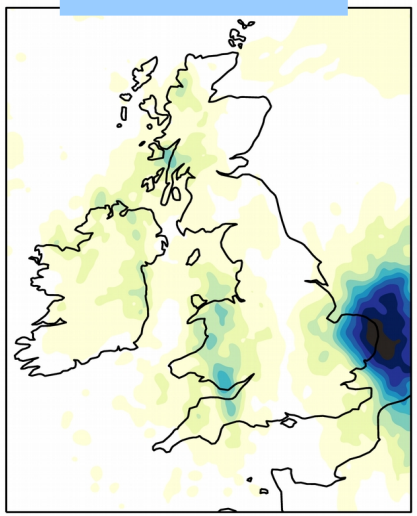
Probability of precipitation



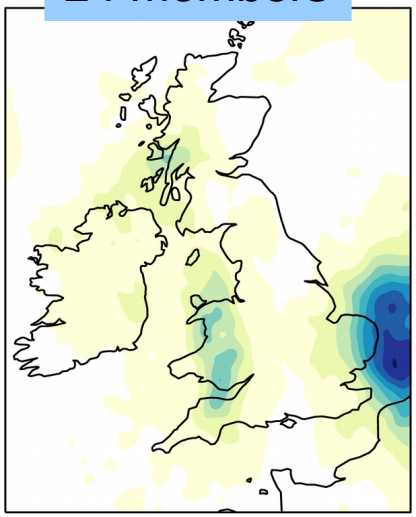
Control



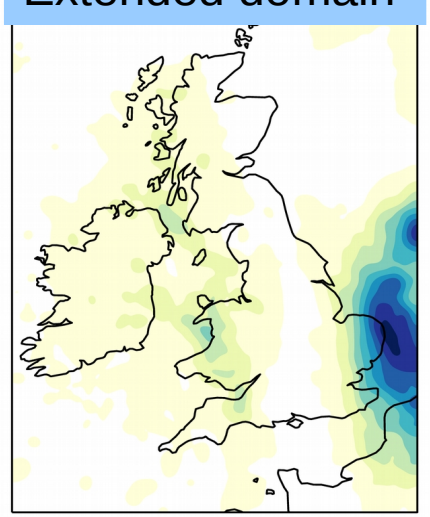
1.5 km res.

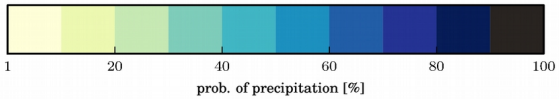


24 members



Extended domain





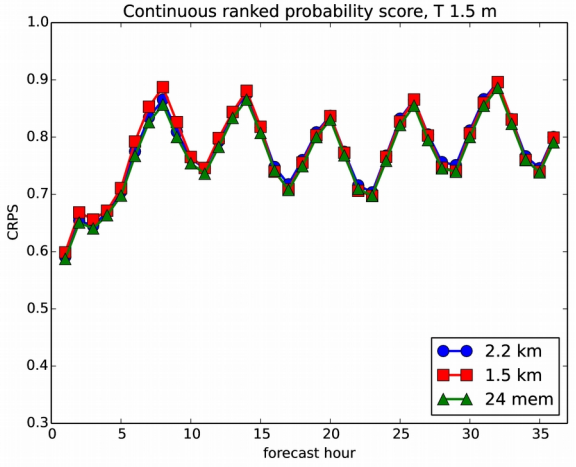
Met Office

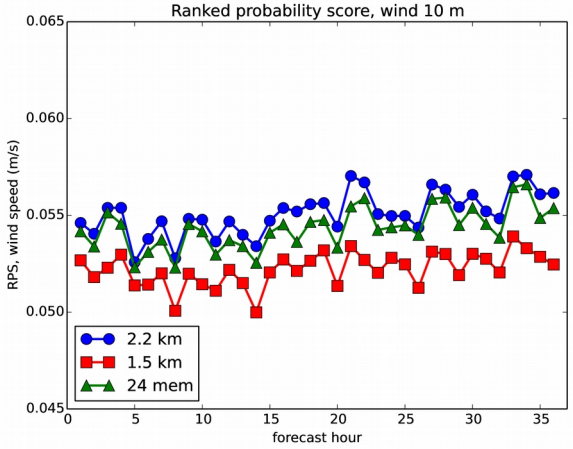
CRPS 1.5 m temperature

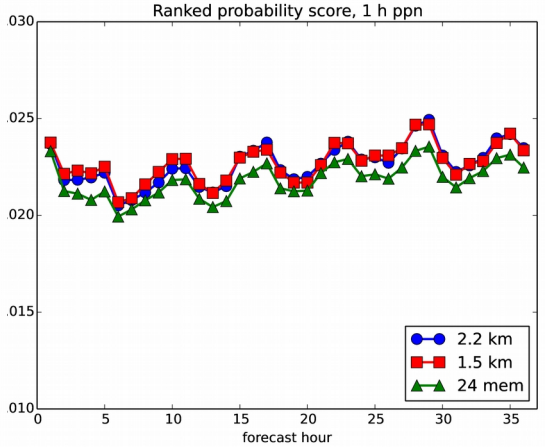
RPS 10 m wind speed

RPS hourly precip.

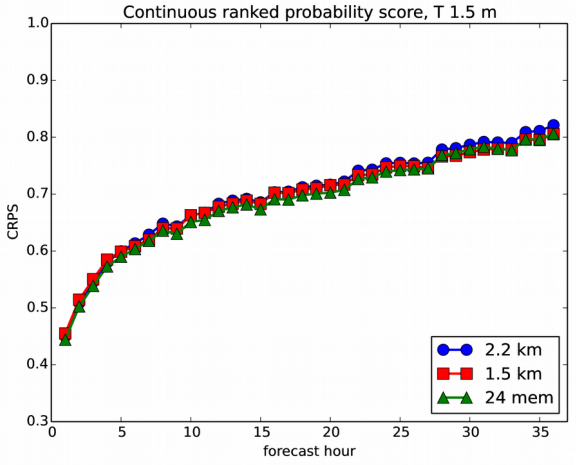
Summer

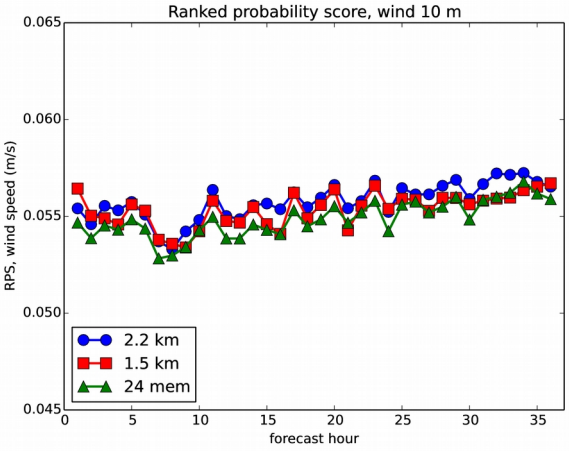


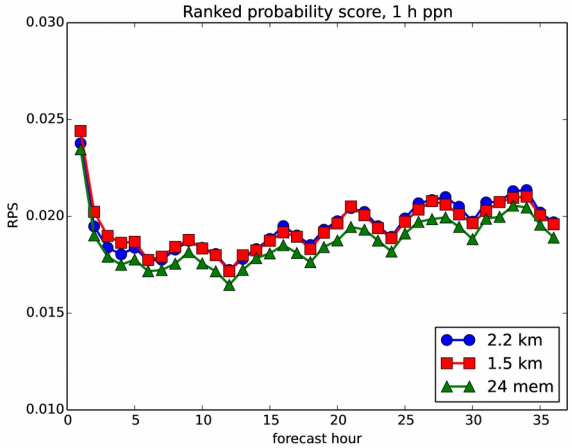




winter







Summary

- Changes in PS38 MOGREPS-UK
  - Extended domain
  - Longer run length
  - BL perturbations
  - Verification showed a positive signal in package trials
- SMC perturbations increase the spread
- Larger ensemble size gives a more positive signal in the forecast verification than the higher resolution

Met Office

Thank you for your attention