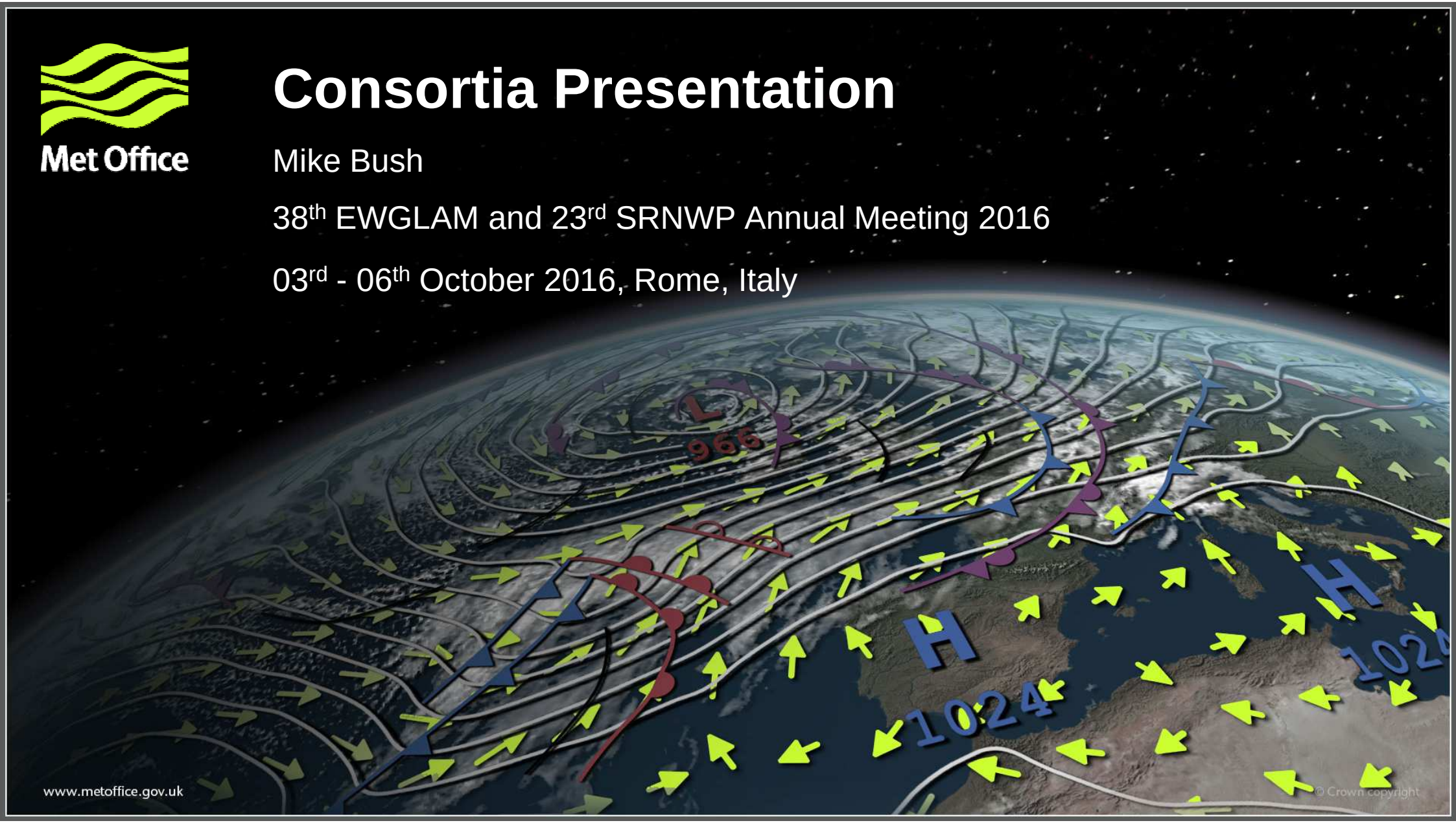
Consortia Presentation

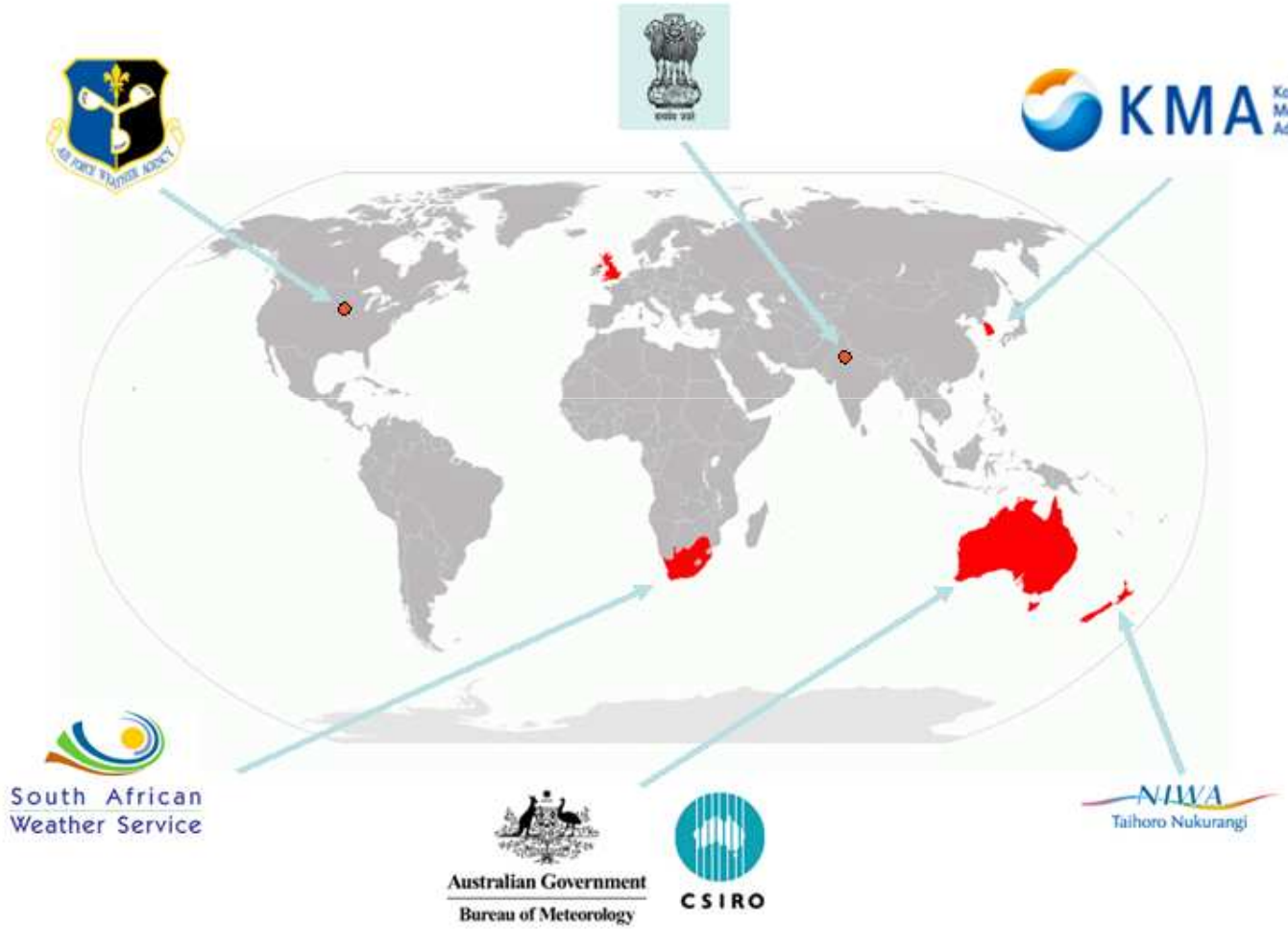
Mike Bush

38th EWGLAM and 23rd SRNWP Annual Meeting 2016

03rd - 06th October 2016, Rome, Italy



International UM partnership. Operational users 2016

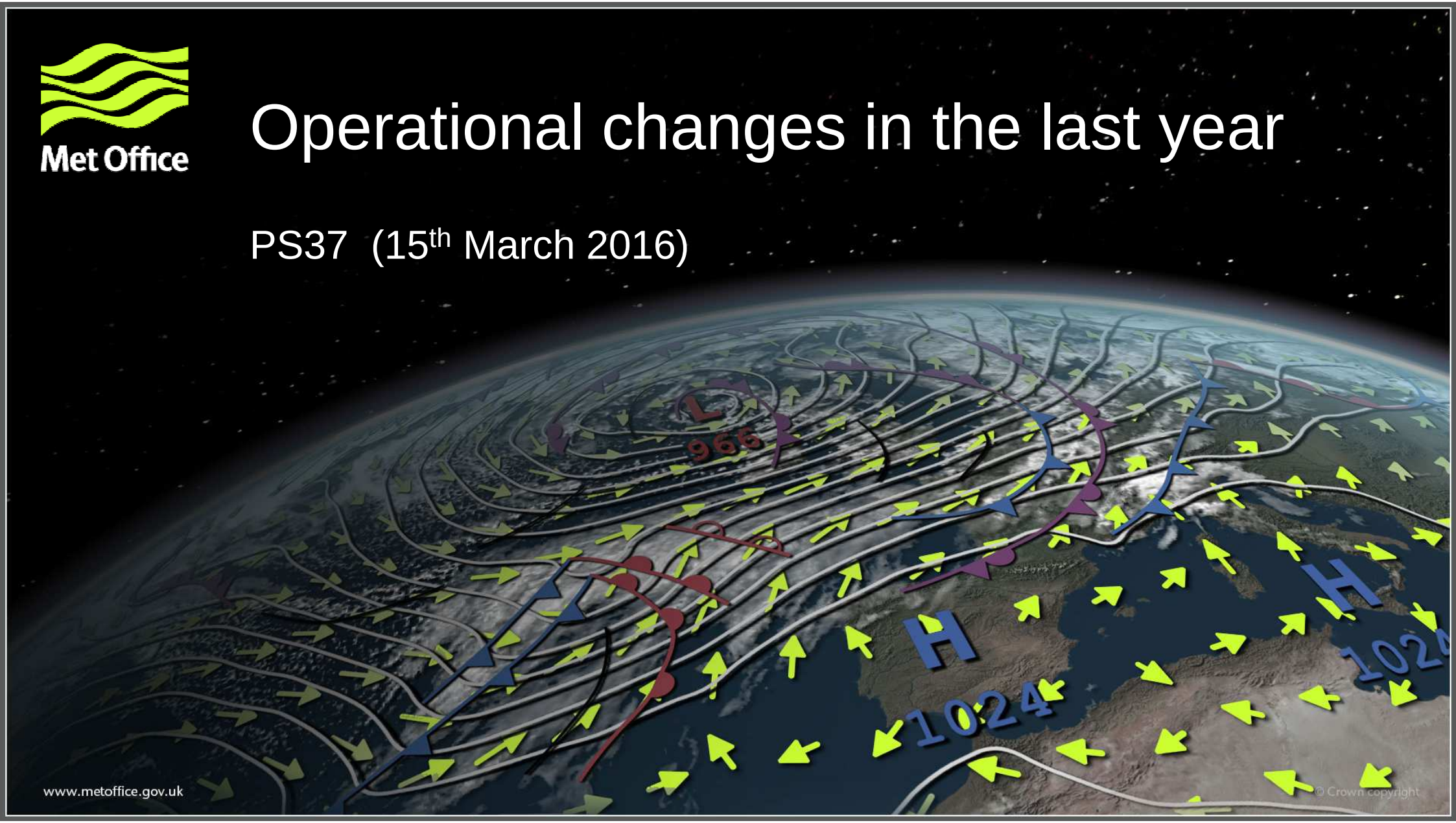


Convective-scale workshop in Singapore

- There was a workshop with our UM partners in Singapore 22nd - 26th February 2016
- The value of the workshop was greatly increased by having representation from other modelling communities
- The key areas for collaborative work were identified as Convection, Verification/Diagnostic tools and Data assimilation.
- Work has started on compiling a list of biases in the representation of convection in convective-scale UM versions

Operational changes in the last year

PS37 (15th March 2016)



PS37 Global Model data assimilation changes

- Introduction of VarBC (Variational Bias Correction).
  - Satellite radiance bias corrections updated dynamically during main assimilation
  - Improved resilience to sudden changes in satellite data quality / processing schemes.
  - Brings analysis into closer agreement with other NWP centres.

PS37 Model changes to UKV and MOGREPS-UK

- 1) Revision to ice microphysics (leading to the removal of lines of excessive drizzle from mixed phase stratocumulus in winter).

- 2) The inclusion of the "1st indirect effect" whereby the cloud droplet size in the radiative transfer is allowed to vary with the murk aerosol concentration

- 3) A retune of the visibility diagnosis in raw model output (post-processed diagnosis of visibility is unchanged) leading to an increase in the frequency of forecasting low visibilities.

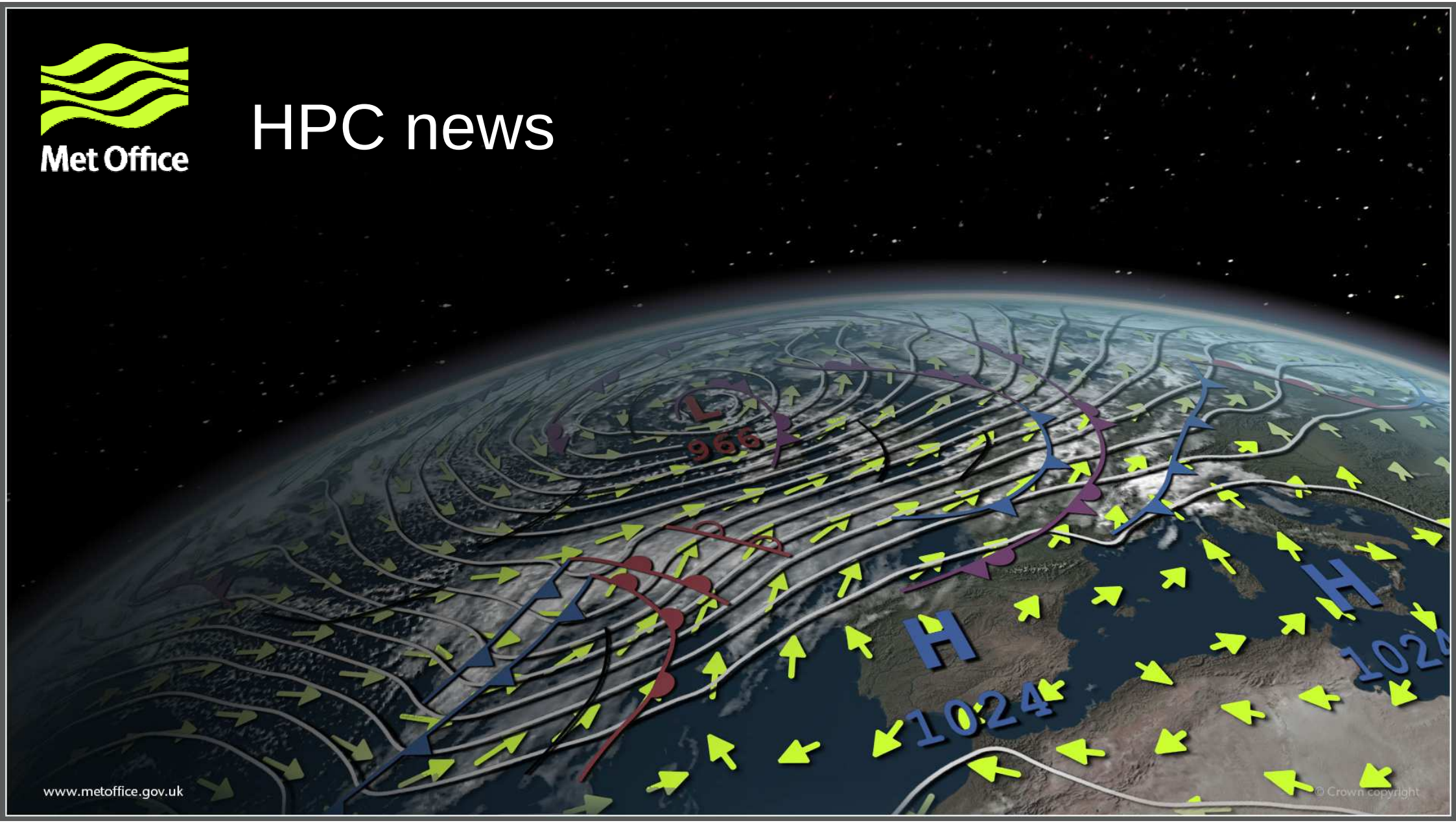
- 4) A new urban scheme (MORUSES) gives a more physically based representation of urban areas, using two land types (canyon and roof) in the surface tile scheme.

- 5) New multi-layer snow scheme leads to a significant reduction of warm biases over snow-covered surfaces

MOGREPS-UK specific changes at PS37

- Initial conditions centred around the UKV analysis, so that it uses detailed information from the latest observations.
- Leads to significant improvements to performance at short forecast ranges.
- New “random parameters” stochastic physics scheme to improve the representation of model uncertainty.
- See talk by Susanna Hagelin on Tuesday

HPC news



Cray HPC update

• The second phase (1b) of the implementation to the Cray HPC went live in Spring 2016 and has increased the computing capacity compared to the first phase by a factor of six.

• Phase 1a (25/08/15)

• Phase 1b (Spring 2016)

• Phase 1c and IT Hall 3 operational (Spring 2017)

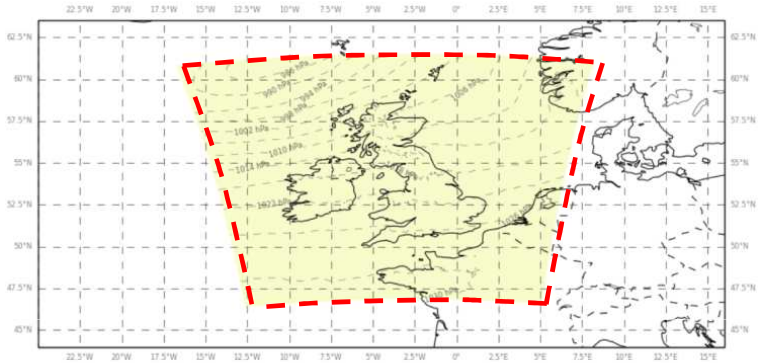
Cray HPC update (2)

• Phase 1c involves the construction of a new IT Hall and Collaboration space located at Exeter Science Park.

Current and Future plans

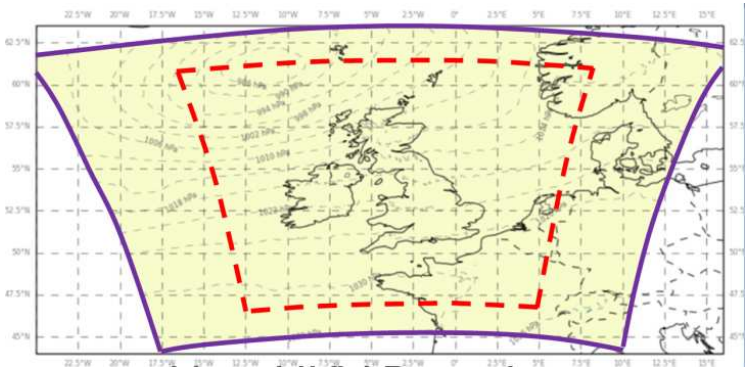
PS38 (Due for Operational Implementation in November 2016)

Domain changes for UKV/MOGREPS-UK



Current Model Domain

(dashed red)



New Model Domain

(solid purple)

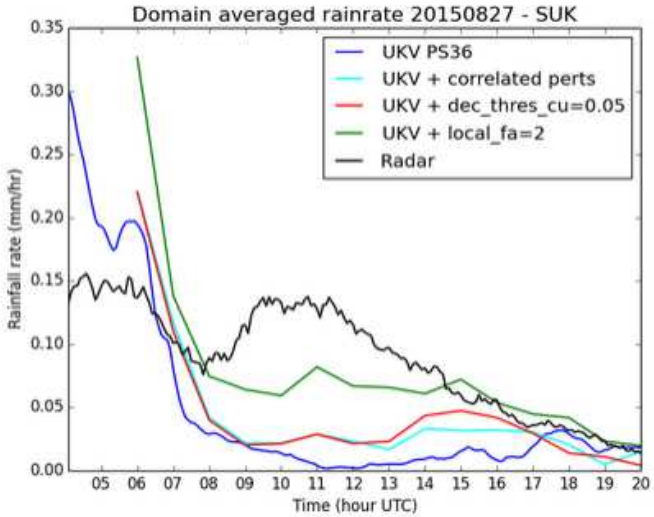
Three case studies: Domain averaged rainrate vs time

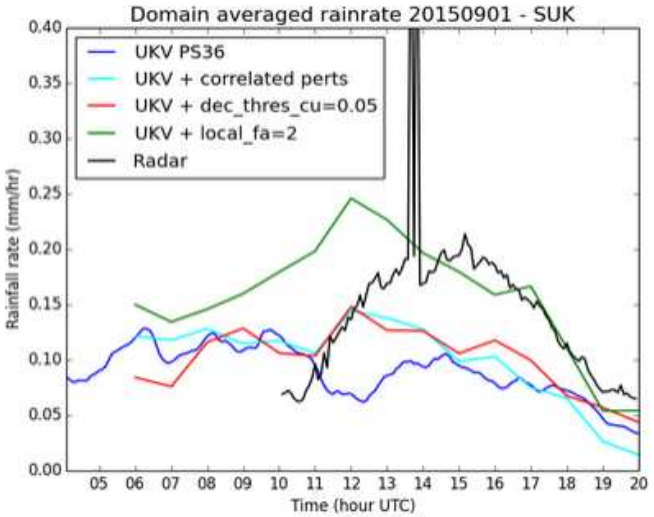
A comparison of the UKV over the Southern UK for 4 configurations:

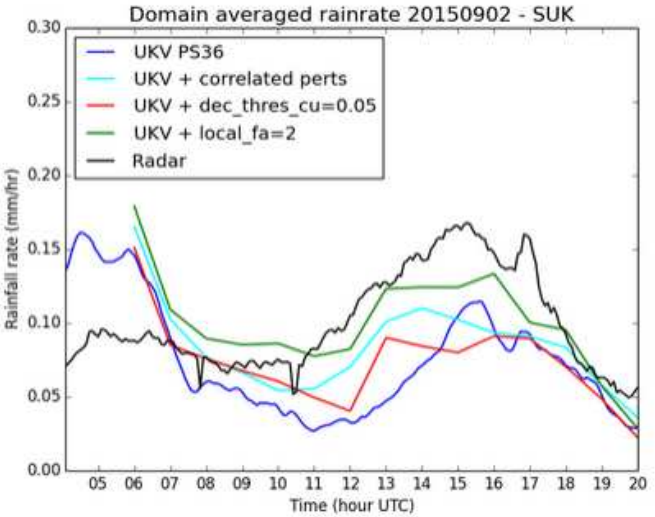
PS36 (blue)
PS36 + correlated perturbations (cyan)
PS36 + correlated perturbations + dec_thres_cu=0.05 (red)
PS36 + correlated perturbations + dec_thres_cu=0.05 + local_fa=2 (green)

PS38 = green

Radar = black





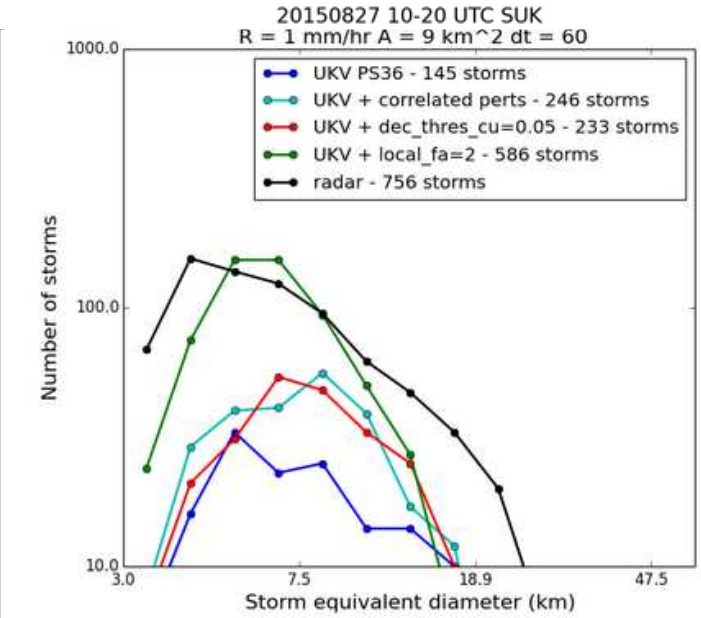


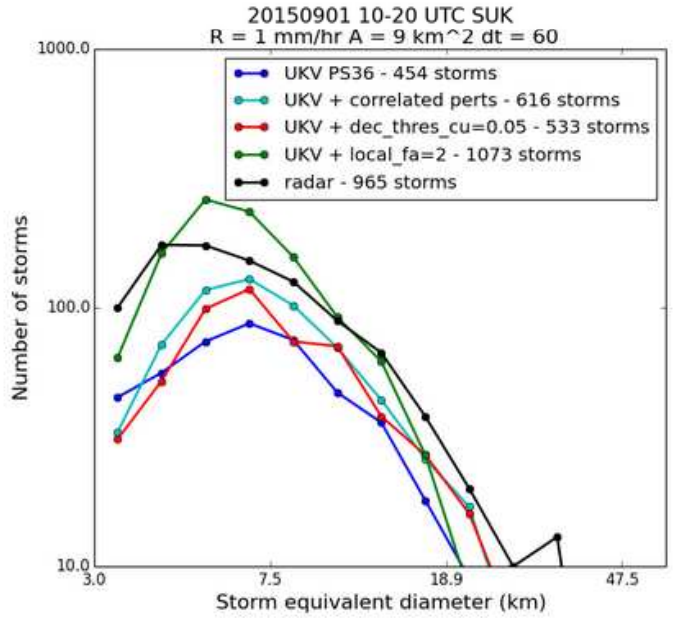
Three Case studies: Number of storms vs diameter

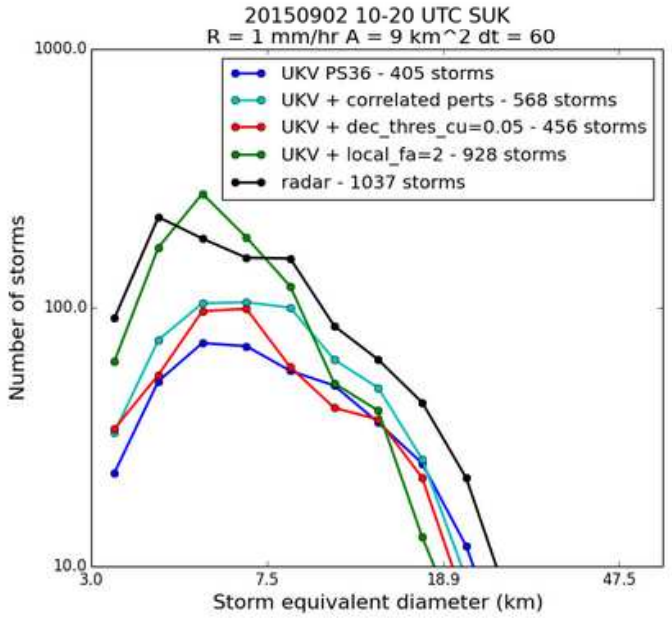
A comparison of the UKV over the Southern UK for 4 configurations:

PS36 (blue)
PS36 + correlated perturbations (cyan)
PS36 + correlated perturbations + dec_thres_cu=0.05 (red)
PS36 + correlated perturbations + dec_thres_cu=0.05 + local_fa=2 (green)

PS38 = green
Radar = black

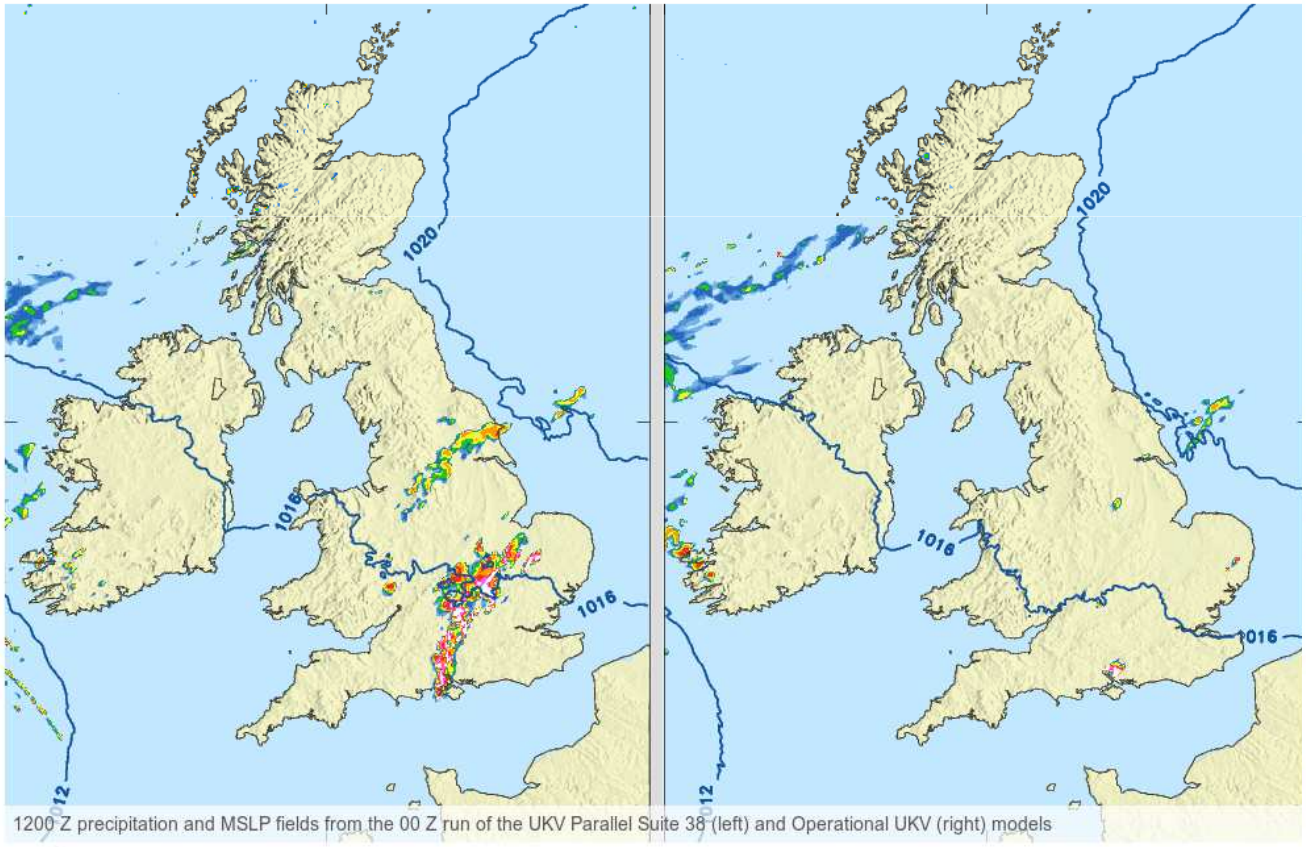




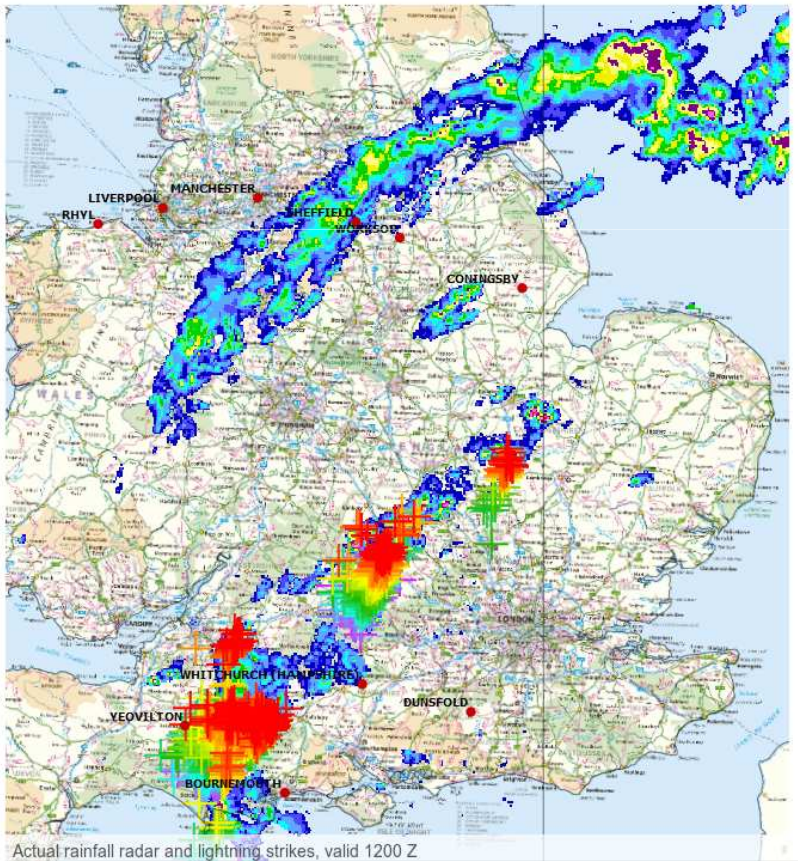


Case study of 27th August

PS38 OP Radar and sferics

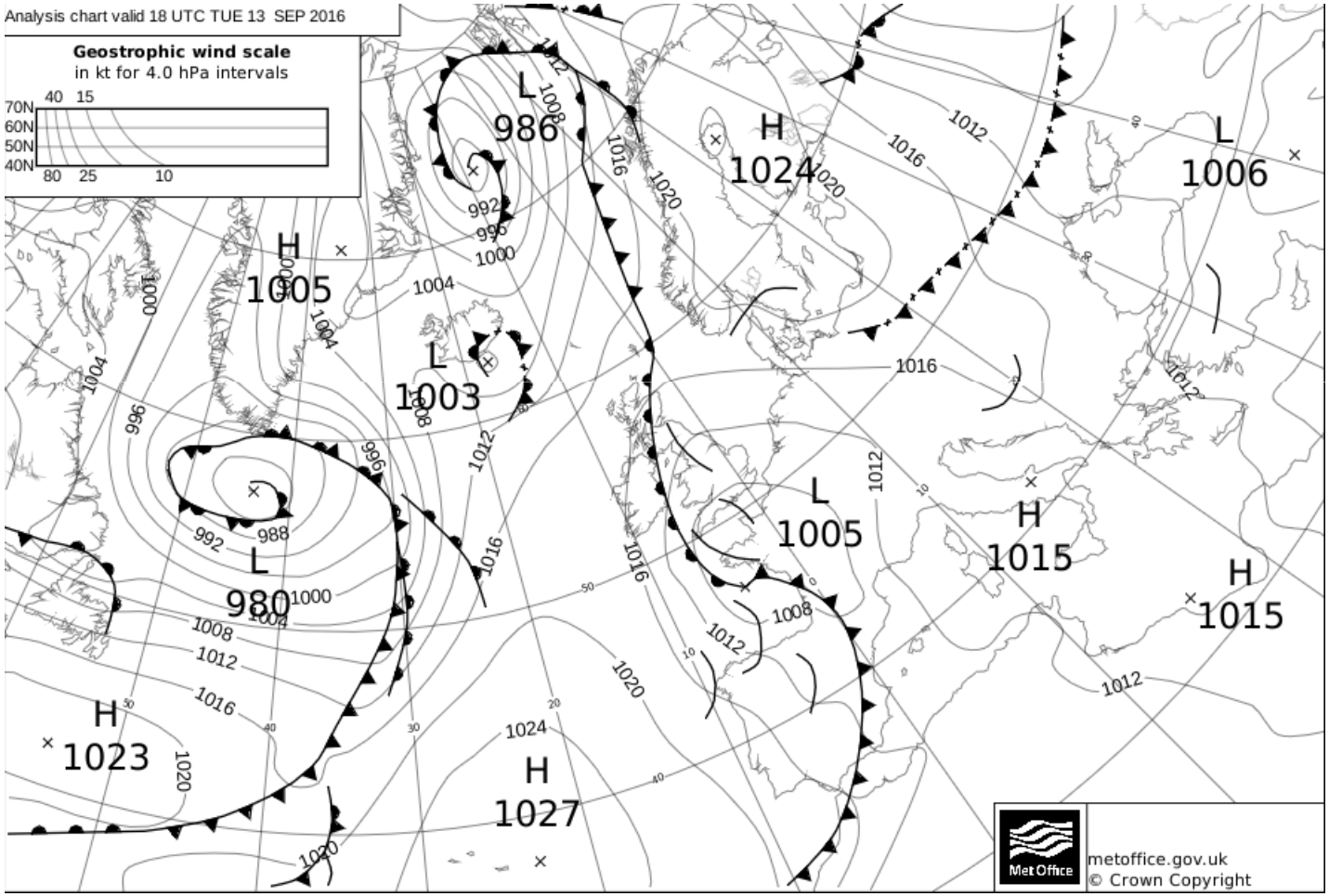


1200 Z precipitation and MSLP fields from the 00 Z run of the UKV Parallel Suite 38 (left) and Operational UKV (right) models



Actual rainfall radar and lightning strikes, valid 1200 Z

Case study of 13th September 2016

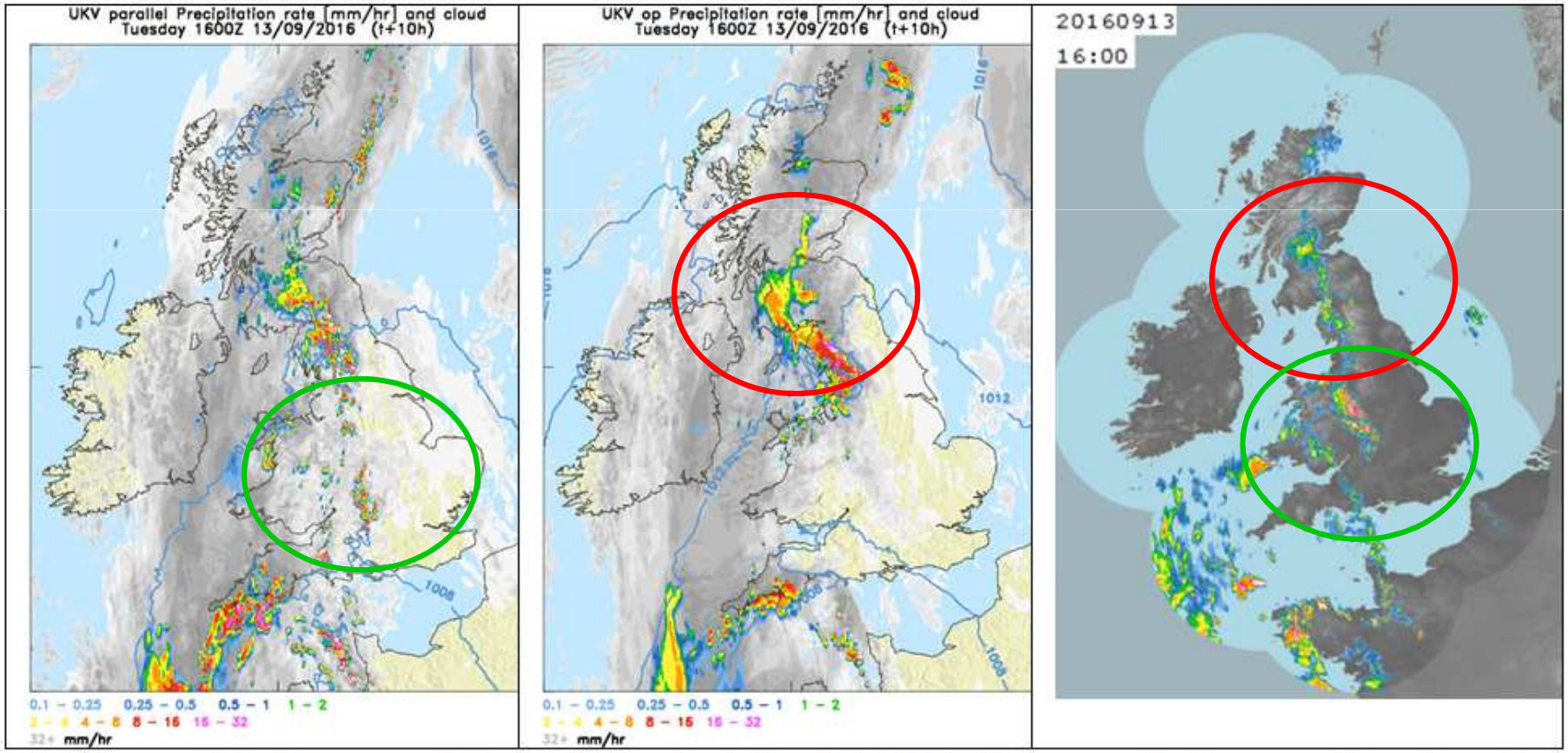


Case study of 13th September 2016

MCS 2 Better in PS38
although develops too slowly

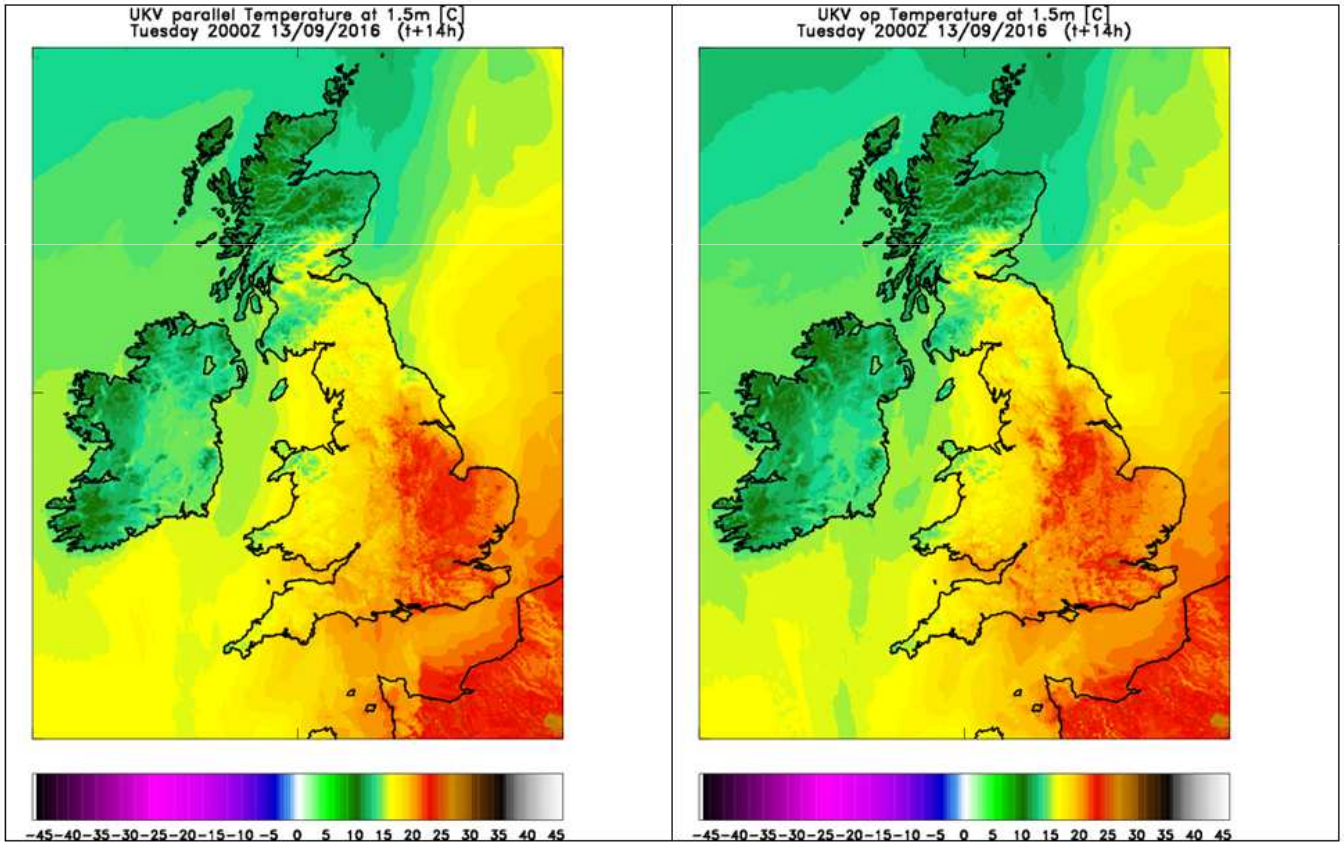
MCS 1 overdone in OP,
better in PS38

PS38 | OP | Radar

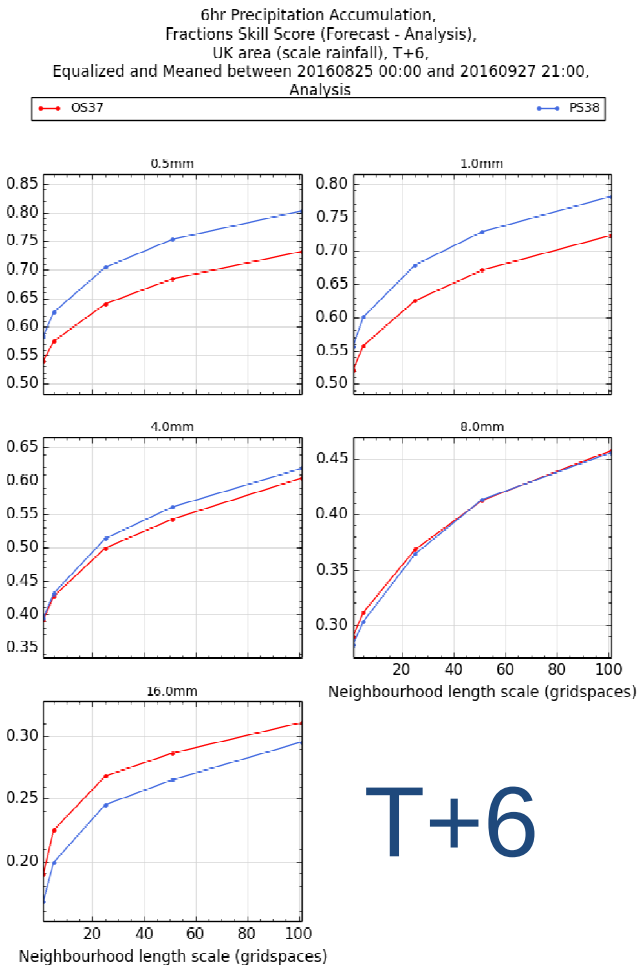


1.5m temperatures

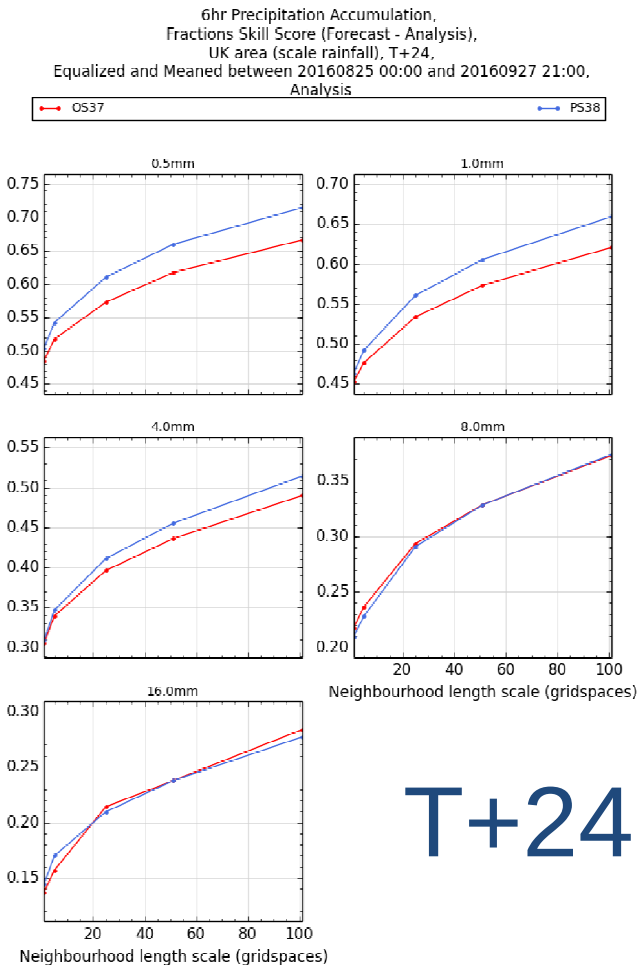
PS38 had Max temps of 29C in London, OS37 had 31C and obs were 33-34C. Extent of warmest area in E/SE England better in PS38, due to better cloud.



FSS results 25/08/16 – 27/09/16



T+6

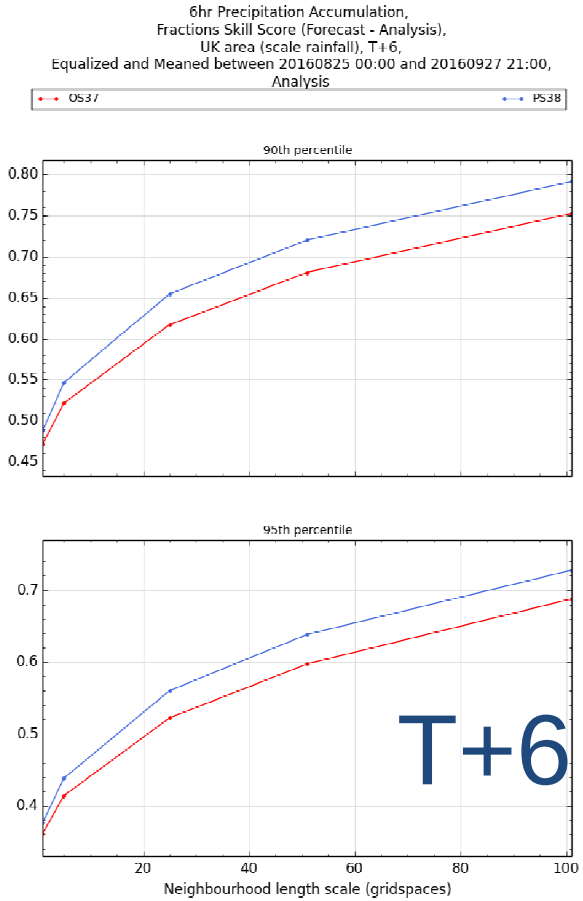


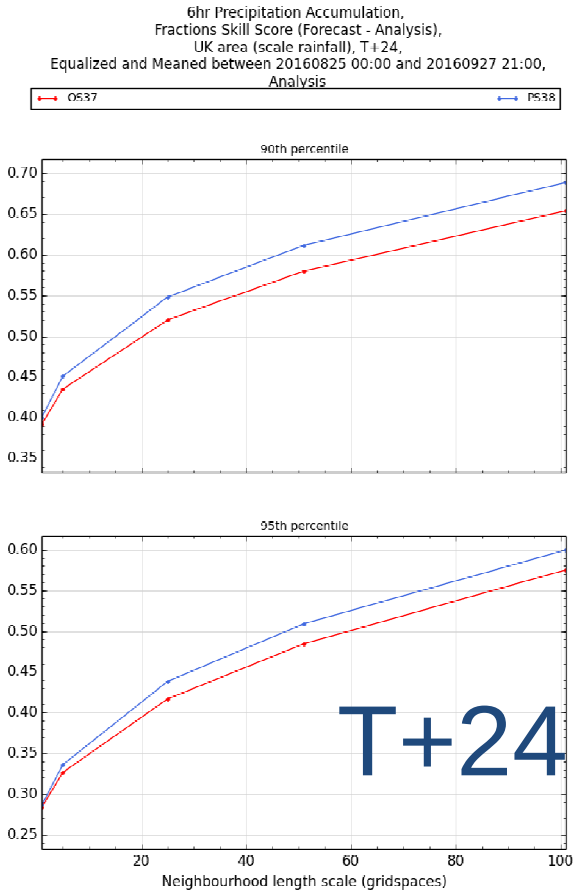
T+24

PS38 (blue) clearly better than OS37 (red) for 0.5mm, 1.0mm and 4.0mm in 6 hour thresholds

Little difference for higher thresholds – OS37 sometimes “better” but significance of scores very doubtful. (At T+18 PS38 scores better for 8 & 16mm.)

FSS results 25/08/16 – 27/09/16 percentile thresholds



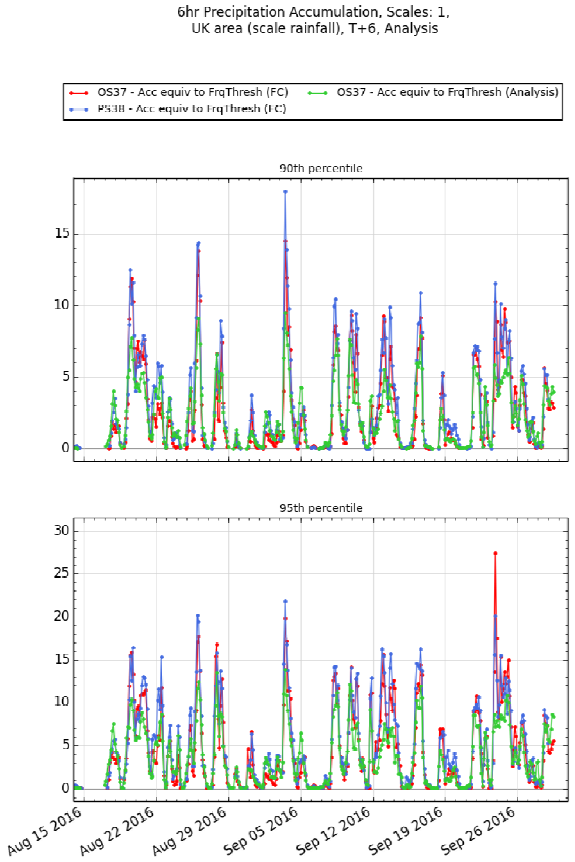


PS38 (blue) clearly better than OS37 (red).
These thresholds represent the extremes on any one occasion so reflect that the PS38 generally represents the forecast distribution better.

FSS results T+6 timeseries of percentile thresholds and rates

90th percentile

95th percentile

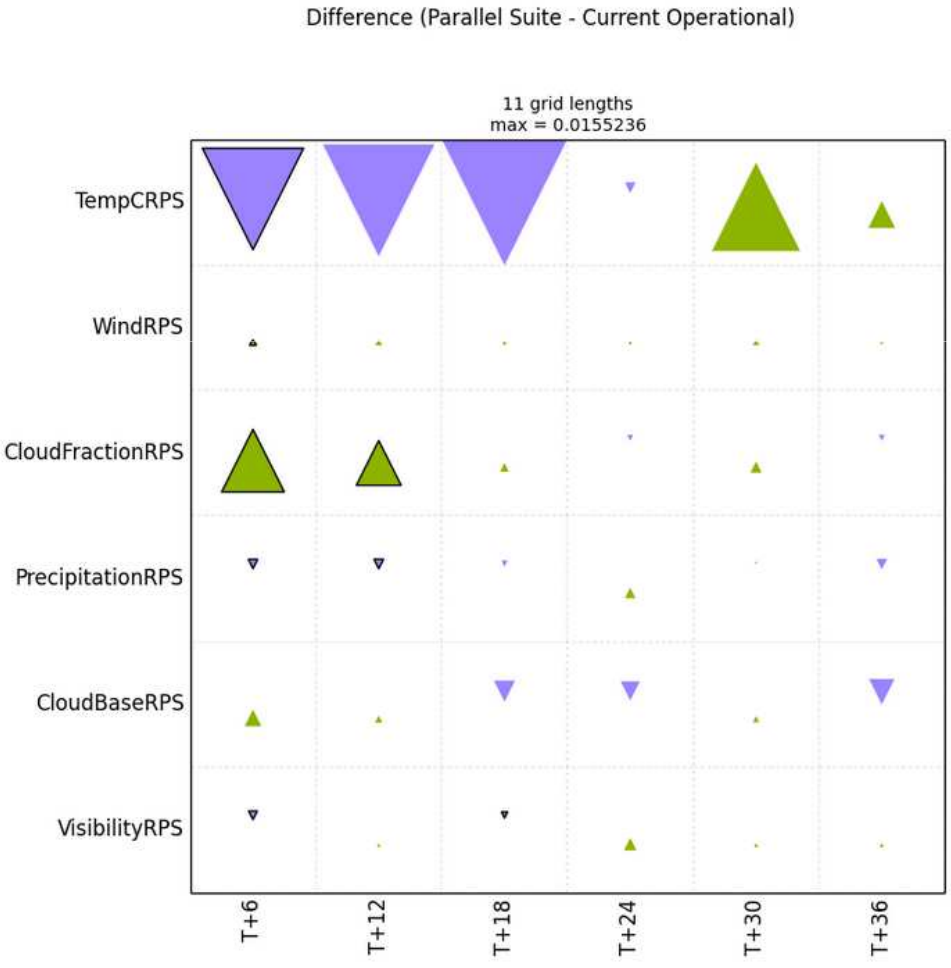


Radar observations (green)

OS37 overforecasts the higher rates (red)

PS38 increases the overforecasting of these higher rates (blue).

HiRA 11 grid length results for September 2016



Temperature scores worse until T+18 (better at later forecast ranges)

Cloud fraction better at early forecast ranges (statistically significant)

PS38 changes to precipitation

- Currently develop showers ~1-2 hours too late. PS38 has a **better diurnal cycle**, developing showers earlier in the day.
- PS38 develops **more small scale showers** than current models.
- PS38 has higher rates than the operational model at the tail of the pdf.
- The HiRA RPS (distribution oriented measure, i.e. comparison using bins) penalises this behaviour whilst the FSS and ETS (Threshold Exceedence measures) are more forgiving.
- FSS is radar based and focuses on spatial skill, whilst HiRA is raingauge based.

PS39 (Summer 2017)

- Hourly cycling 4D-VAR for UKV
- See talk by Bruce Macpherson on Tuesday
- Increase in Global model horizontal resolution to N1280 (~10km).

Met Office

Questions?