Hourly cycling and time-lagging: a new configuration for MOGREPS-UK

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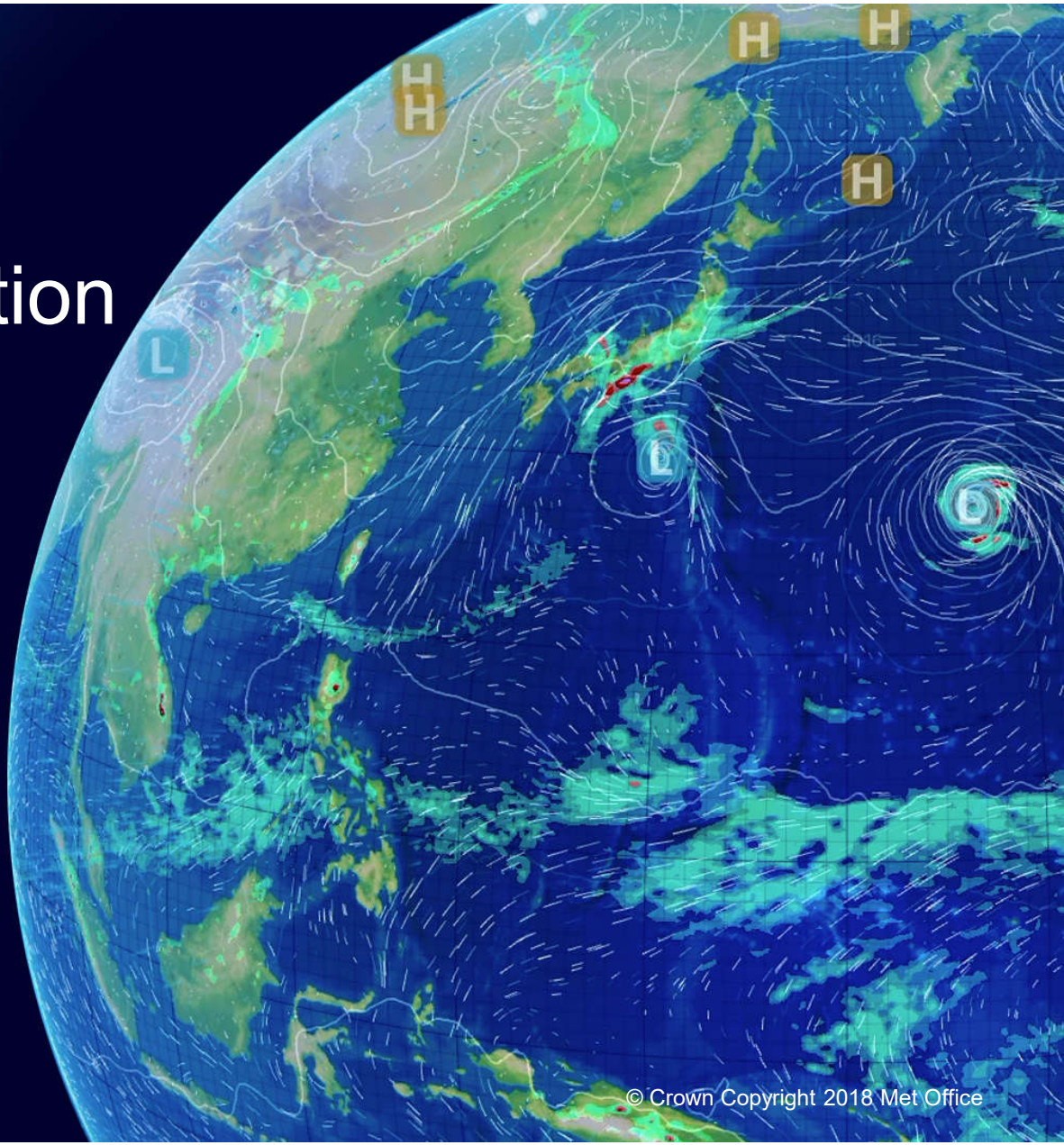

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Contents:

- Description of the new configuration
- Objective verification
- Case studies
- New developments

This presentation was put together by Aurore Porson

Aurore has done all the verification and case study work shown.

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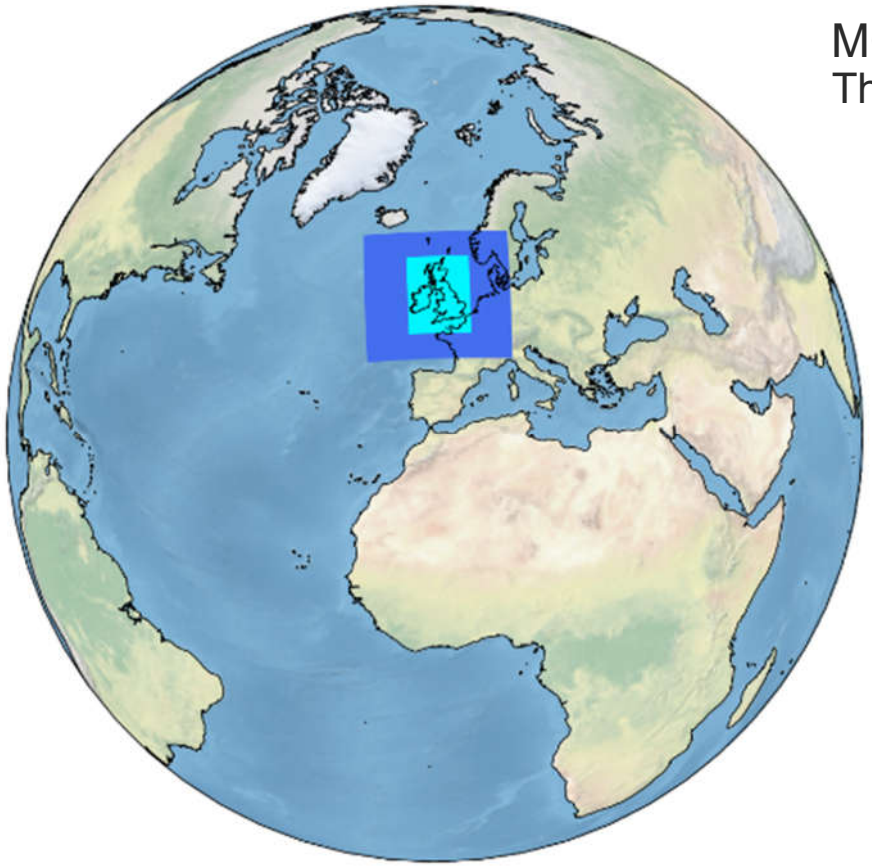
Up to PS41 (end of 2018), MOGREPS-UK is a 6-hourly ensemble model with 12 members



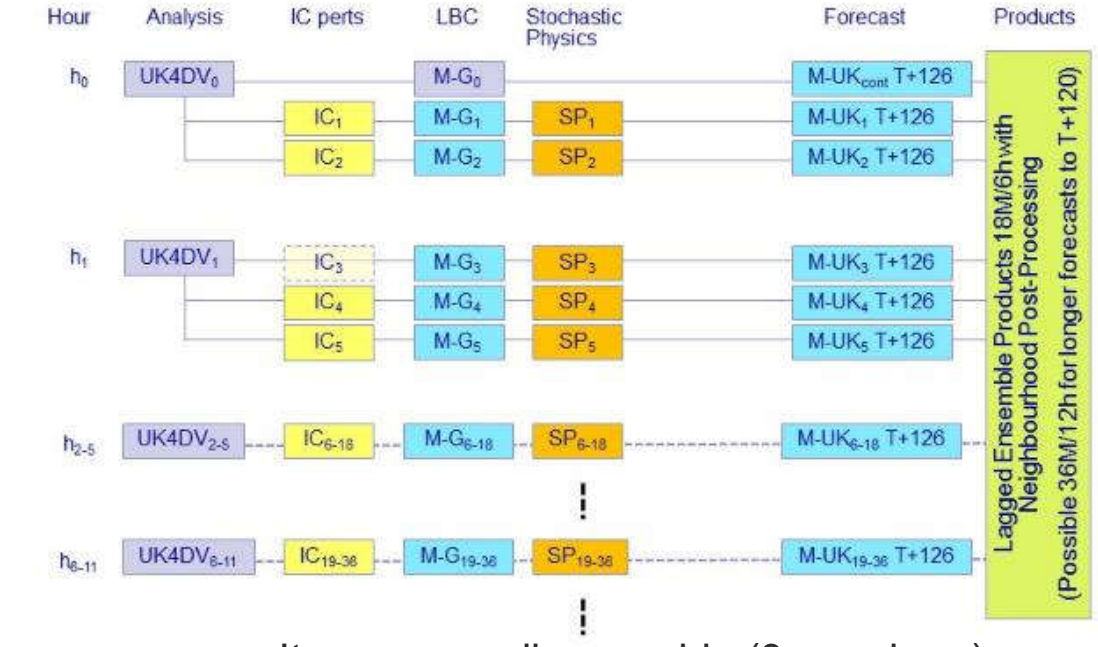
MOGREPS-UK

The UK convective scale ensemble

- 12 members
- 54 h forecast length
- Runs 4 cycles per day at 03, 09, 15 and 21 UTC
- 2.2 km resolution on the inner domain, 4 km in the variable resolution zone
- Boundary conditions from the Met Office global ensemble, MOGREPS-G
- Initial conditions for each ensemble member are provided by the deterministic UK model (UKV) analysis with perturbations from MOGREPS-G added to these

In PS42 (trials finishing in October 2018), we have a new hourly configuration, which includes 18 members.This new hourly configuration runs to T+120.

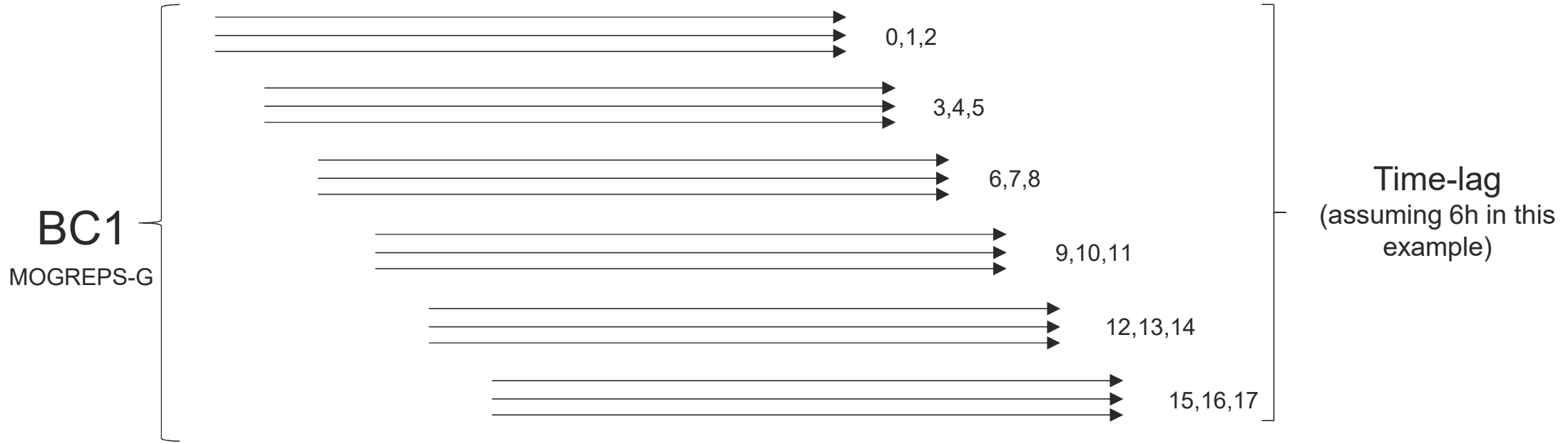
Hourly ensemble schematic



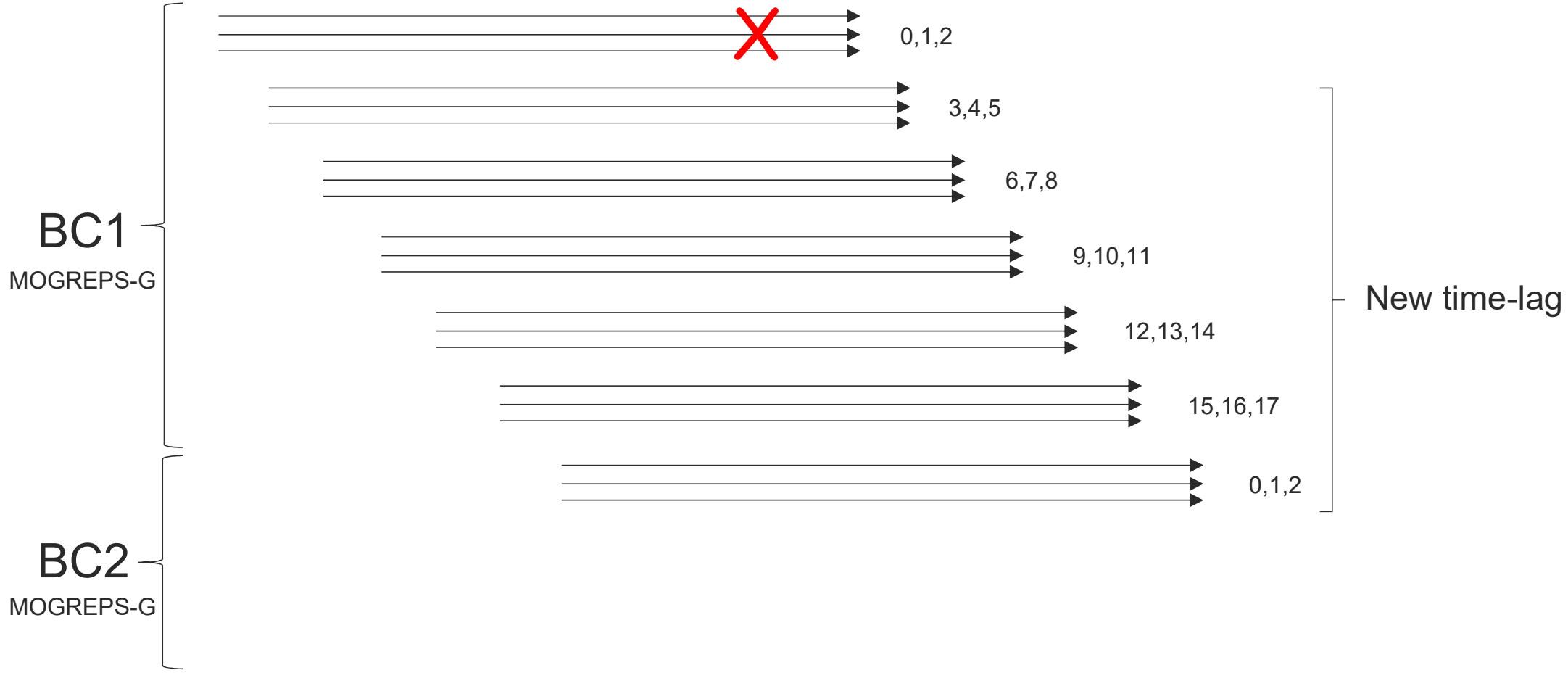
This takes advantage of UKV now running hourly 4DVar and the recent increase in number of global ensemble members

It runs a small ensemble (3 members) every hour and use time-lagging to create a larger ensemble (18 members per 6h cycle)

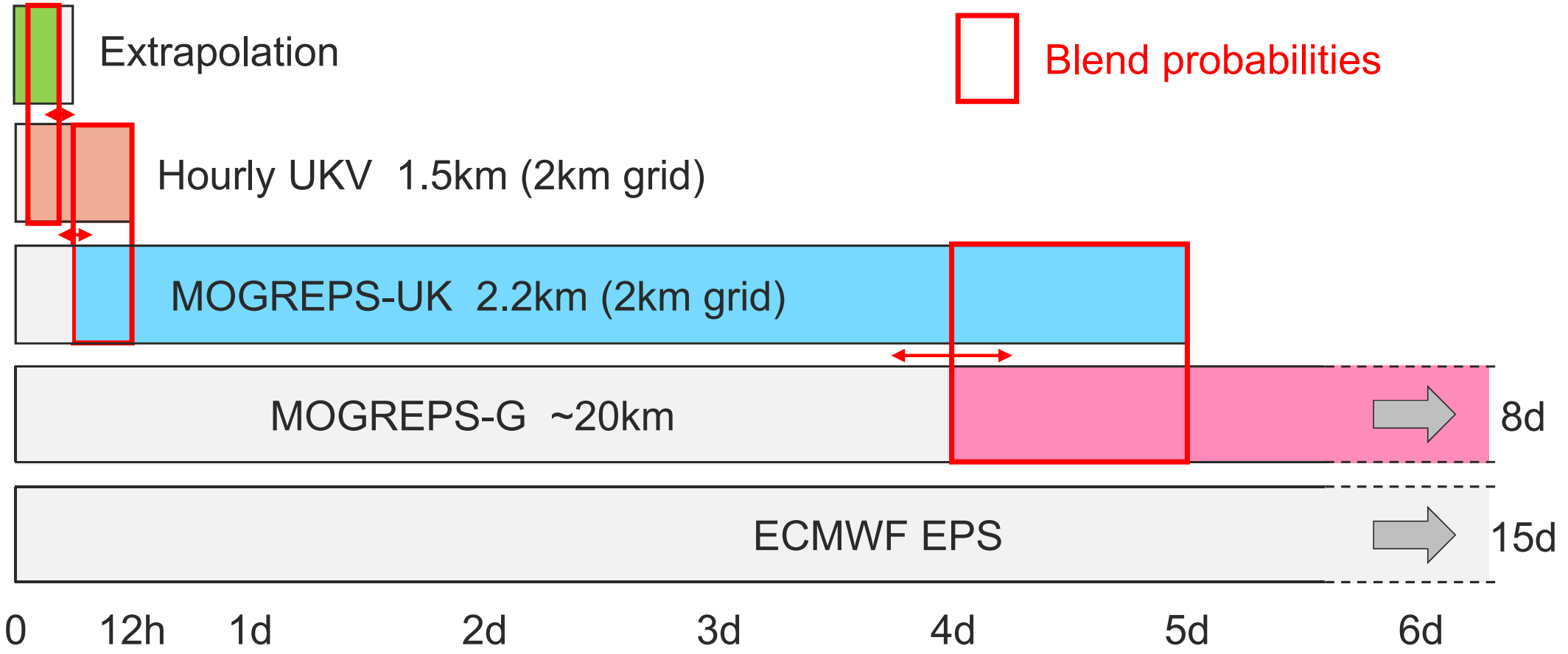
Time-lagging hourly MOGREPS-UK

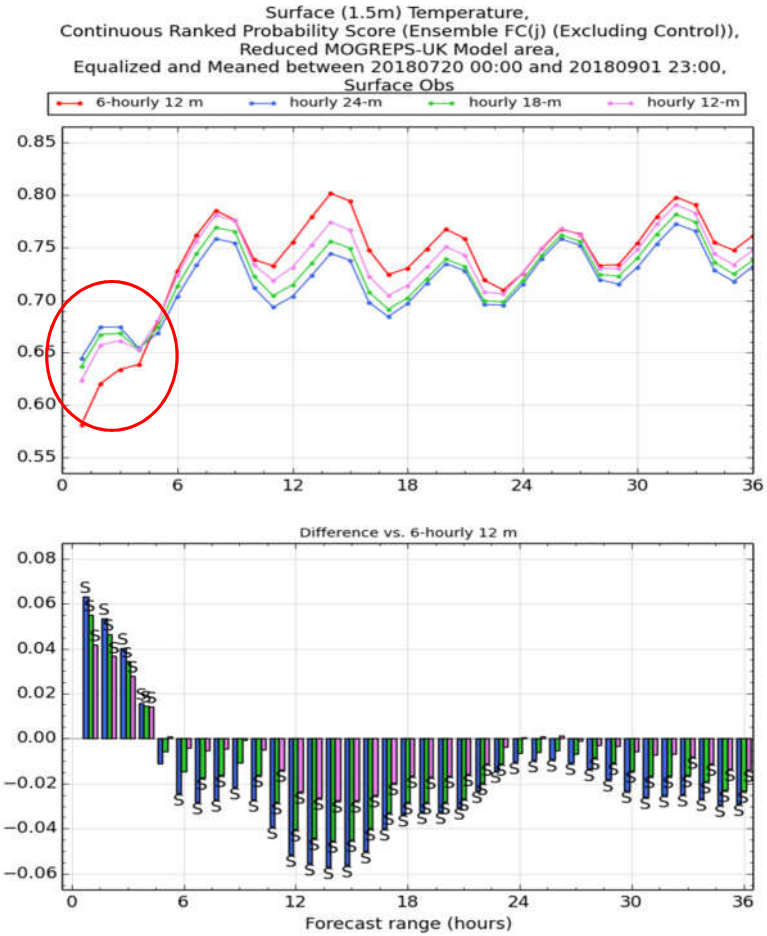


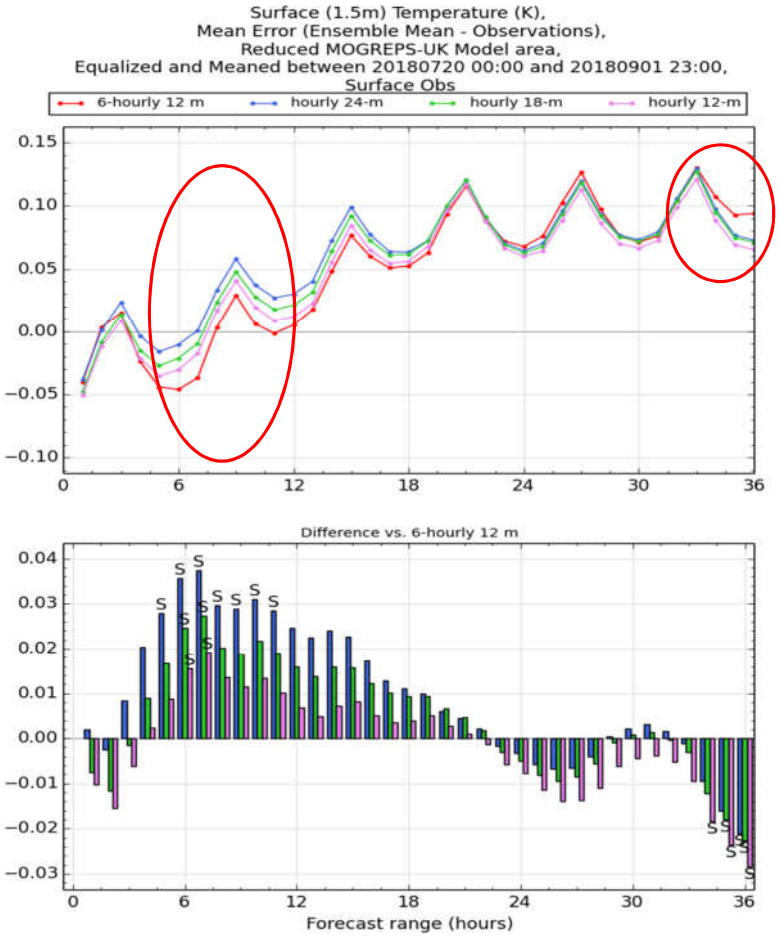
Time-lagging hourly MOGREPS-UK



Multiple model blending in post processing



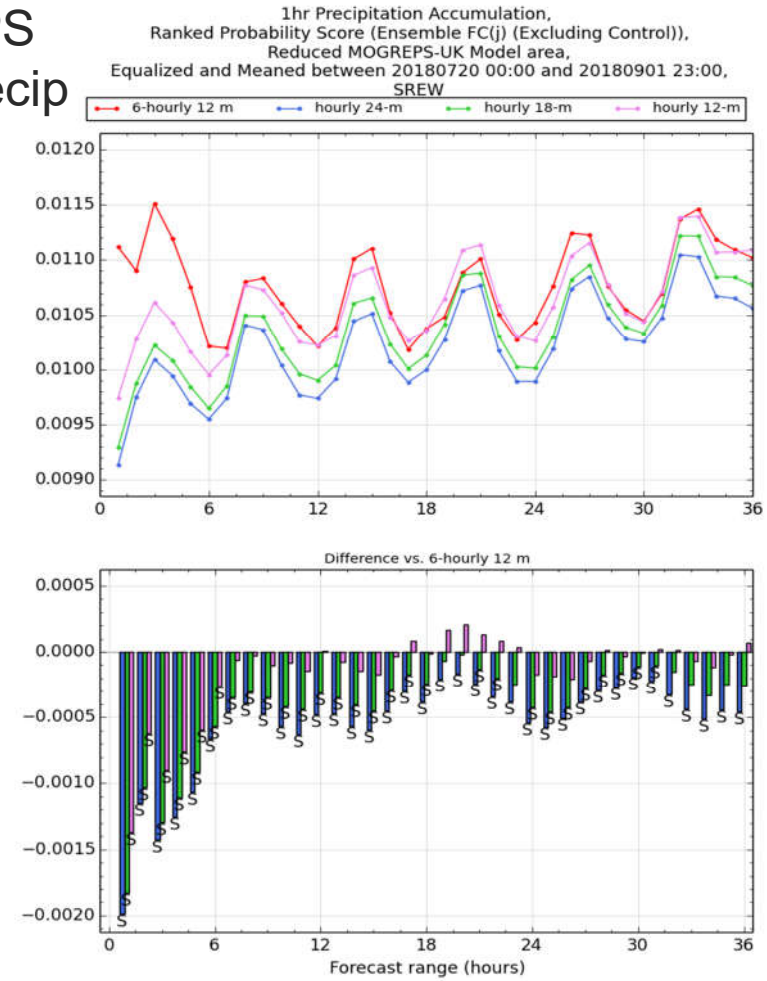




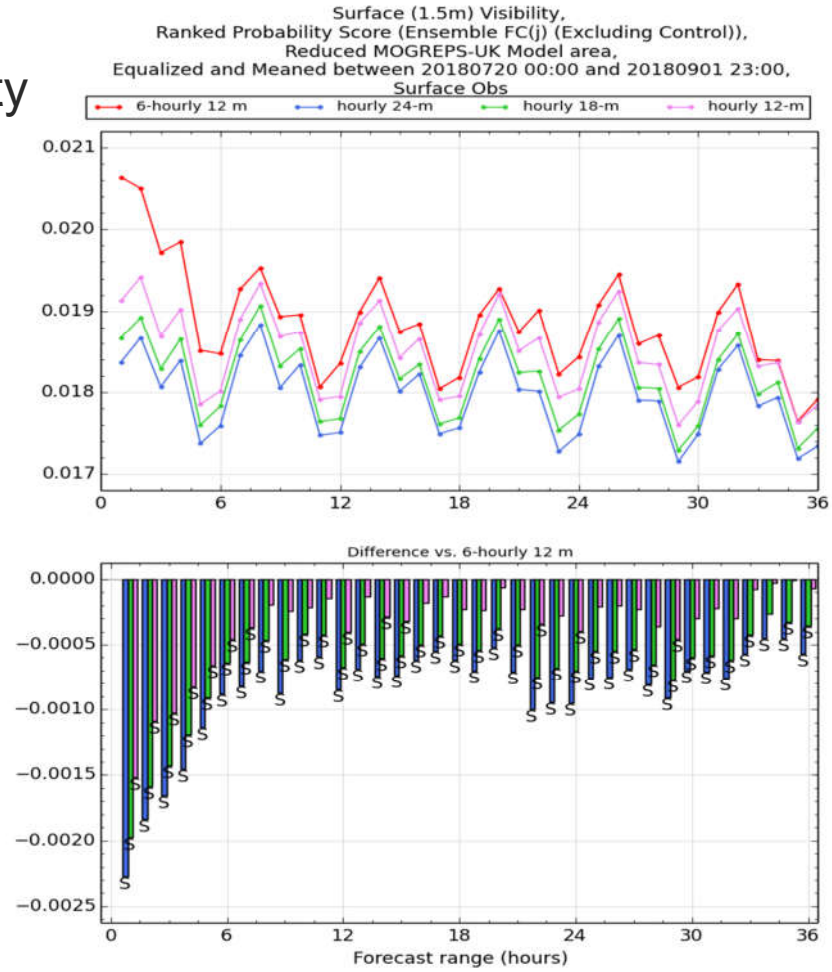
Overall good CRPS for temperature, except at the beginning.

Warmer temperatures in the new configuration are correlated with stronger winds.

RPS precip



RPS visibility



Positive impact for precipitation and visibility. Also good sensitivity to time-lagging. Better performance in the first 6 hours. Similar performance for winds at 10 m

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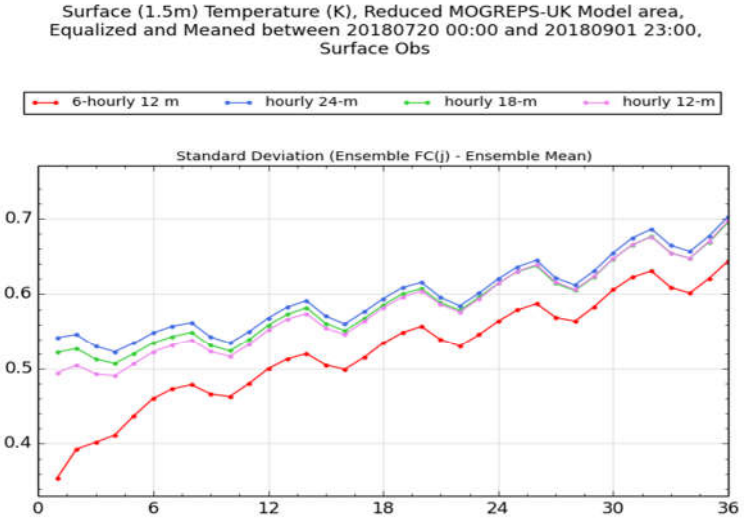
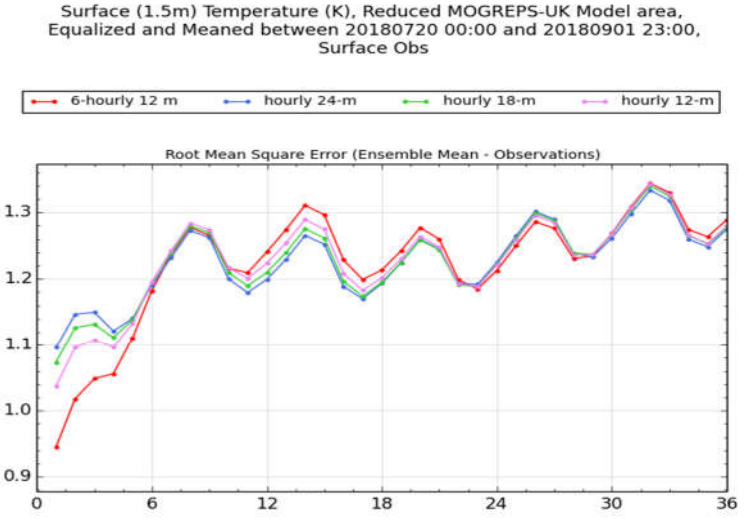
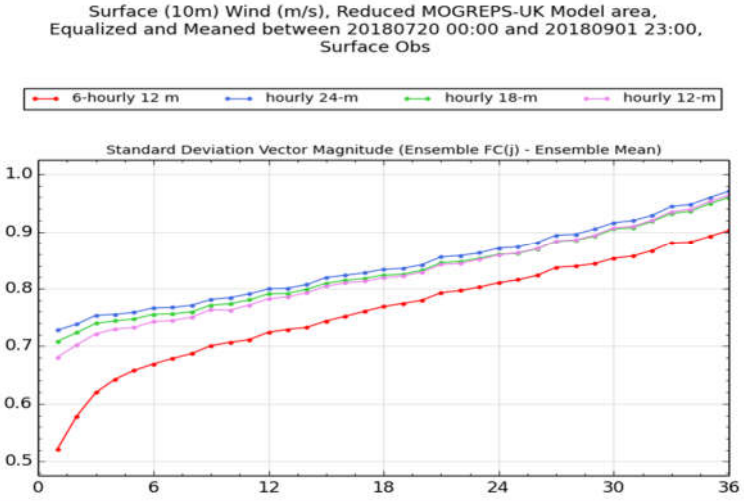
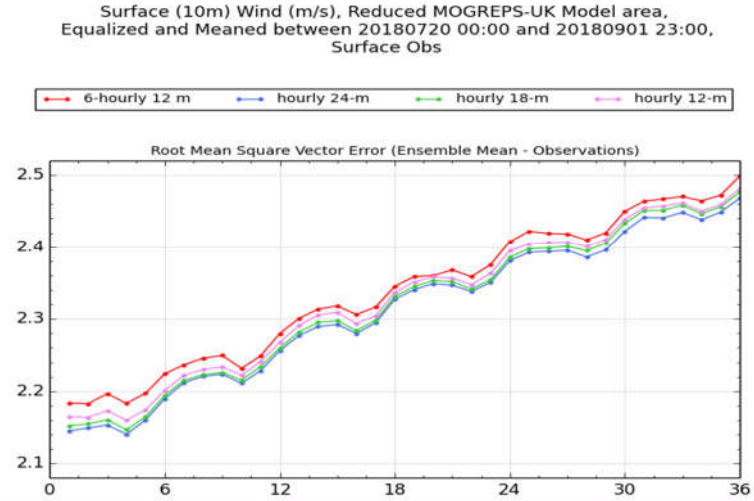
Higher spread in hourly configuration. RMSE for T poorer to T+6. Positive impact from time-lagging (spread and RMSE for winds)









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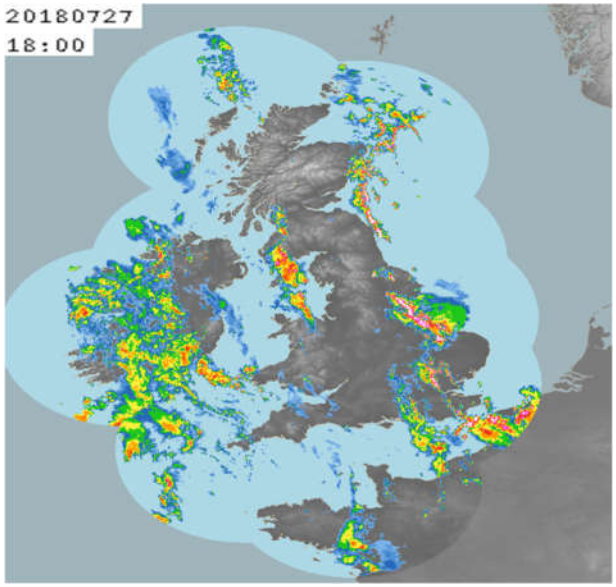
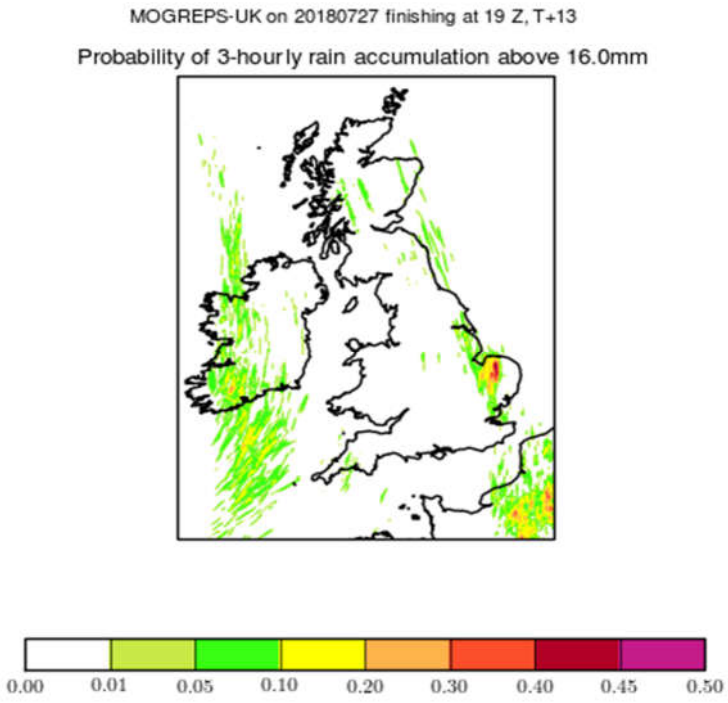
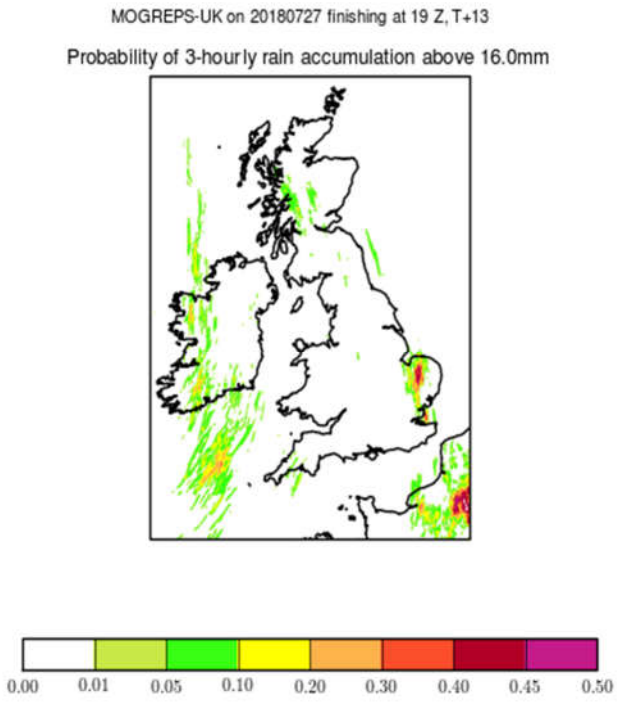
Case study comparison. Thunderstorms (27th July 2018)

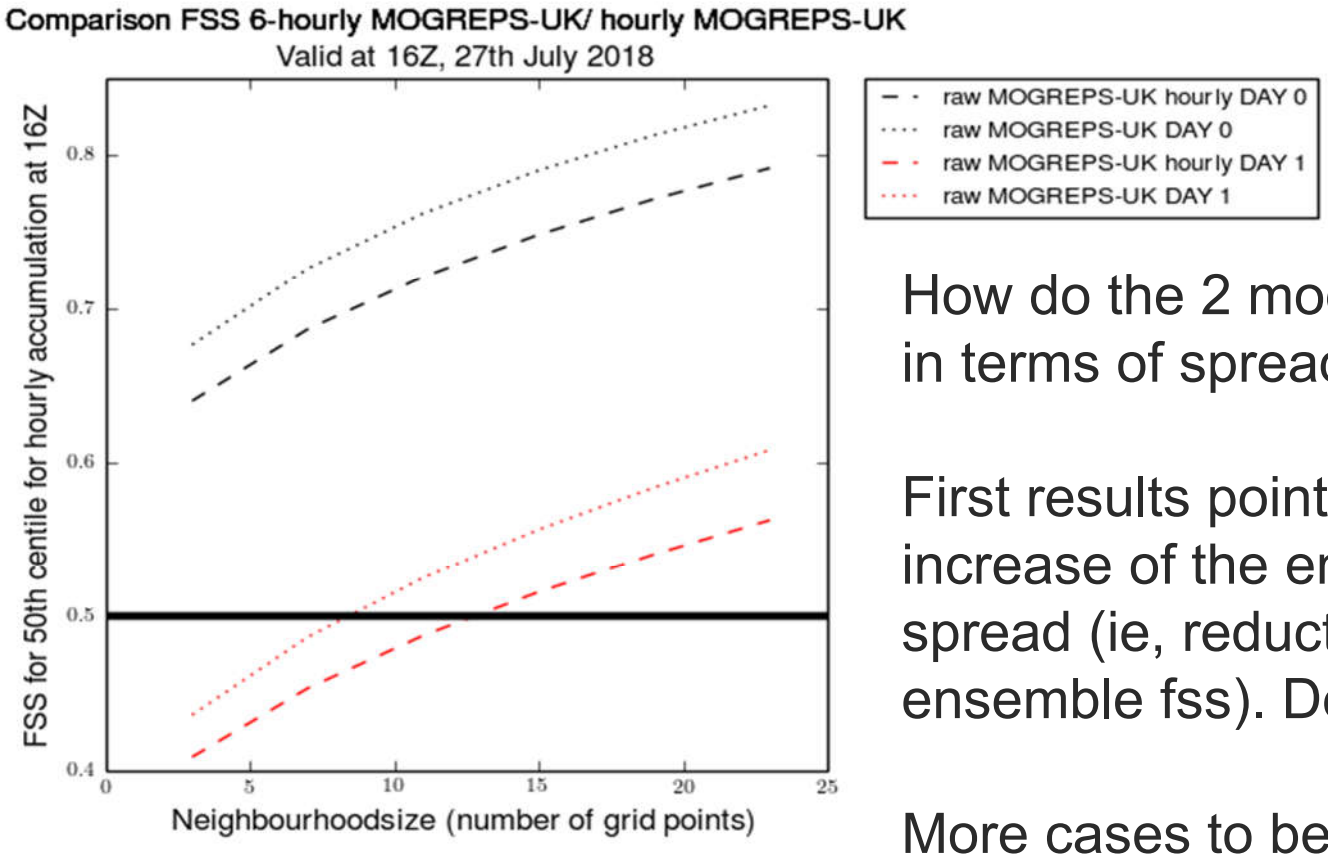


Hourly MOGREPS-UK



6-Hourly MOGREPS-UK





How do the 2 models compare in terms of spread?

First results point towards an increase of the ensemble spread (ie, reduction in ensemble fss). Dey et al. (2014)

More cases to be analysed.

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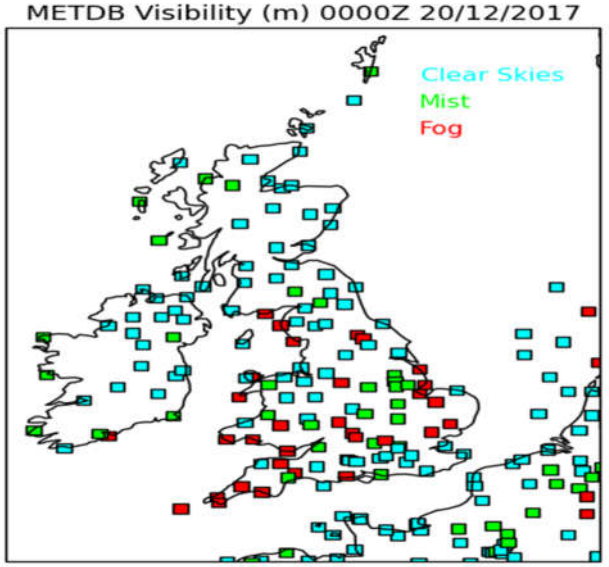
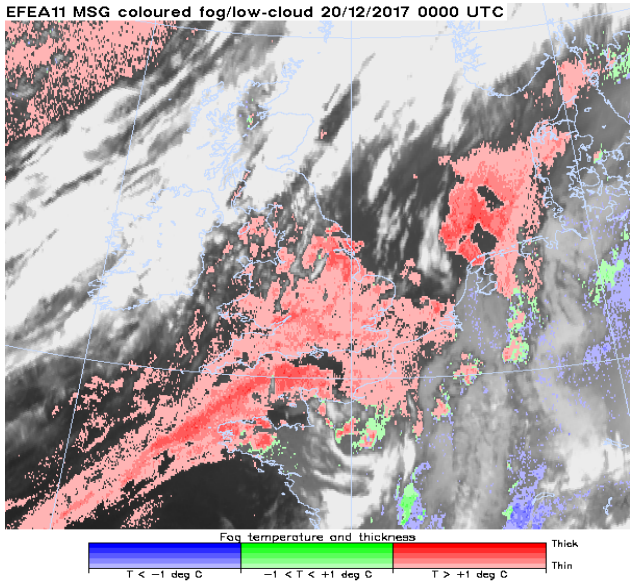
Conclusions on the comparison between hourly configuration and 6-hourly (current) configuration

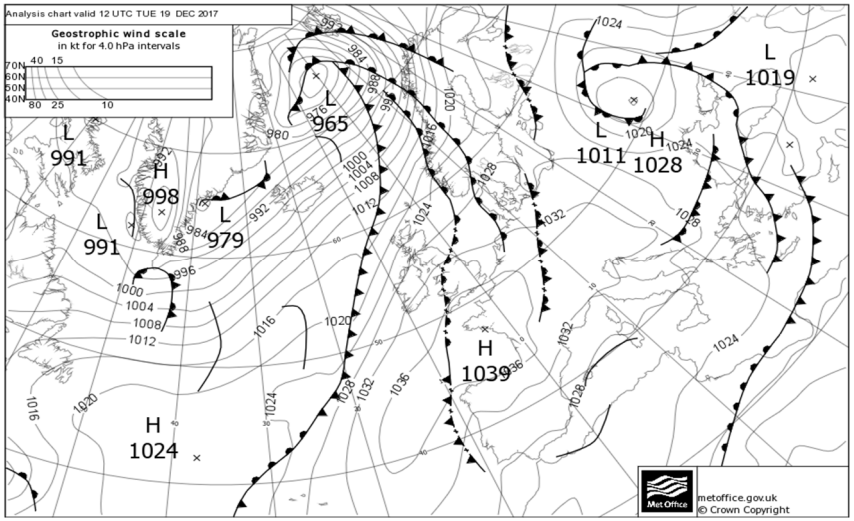
- First results suggest improvements in precipitation, wind, visibility throughout the forecast, but mostly at the beginning of the forecasts.
- Model should become available to forecasters at earlier times than the 6-hourly (work in progress) to realise these benefits
- Future work will be on comparing new cases and evaluating the spread between the 2 configurations (forecasters want more spread).
- Additional spread may also come from DT times at which MOGREPS-UK uses different MOGREPS-G forcing conditions

The hourly MOGREPS-UK will also run to T+120, instead of T+54.
In order to evaluate the benefits of this decision, the high-resolution ensemble is compared against the global ensemble MOGREPS-G.

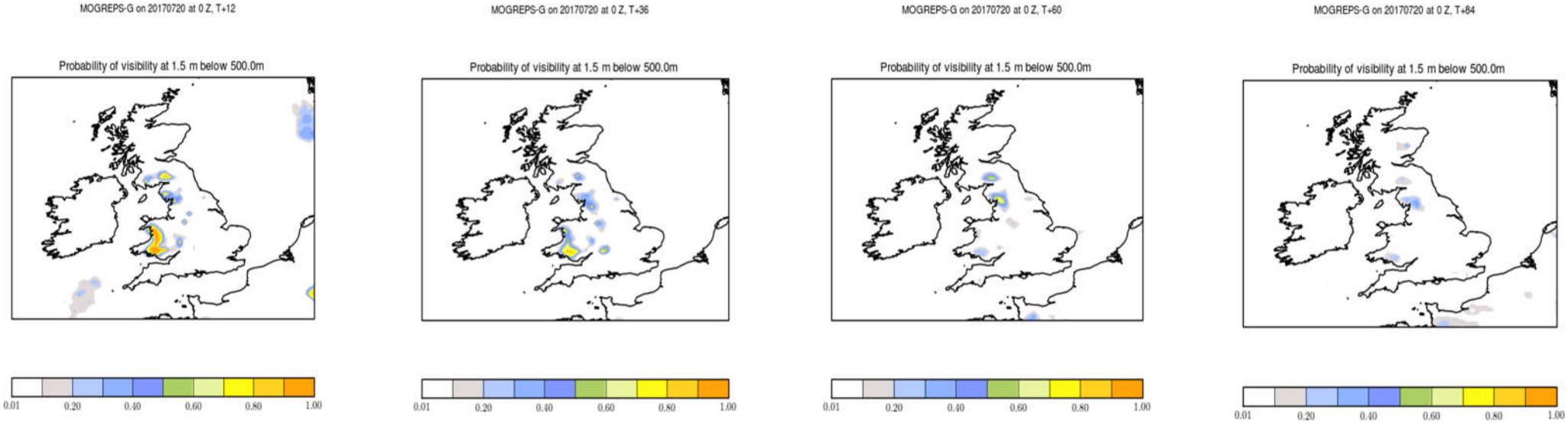
Most of the benefits are expected to be found in the guidance for severe cases, convective or fog as illustrated here.







Hourly probabilities of visibility < 500 m valid for 00Z, 20th Dec 2017 for MOGREPS-G raw data.



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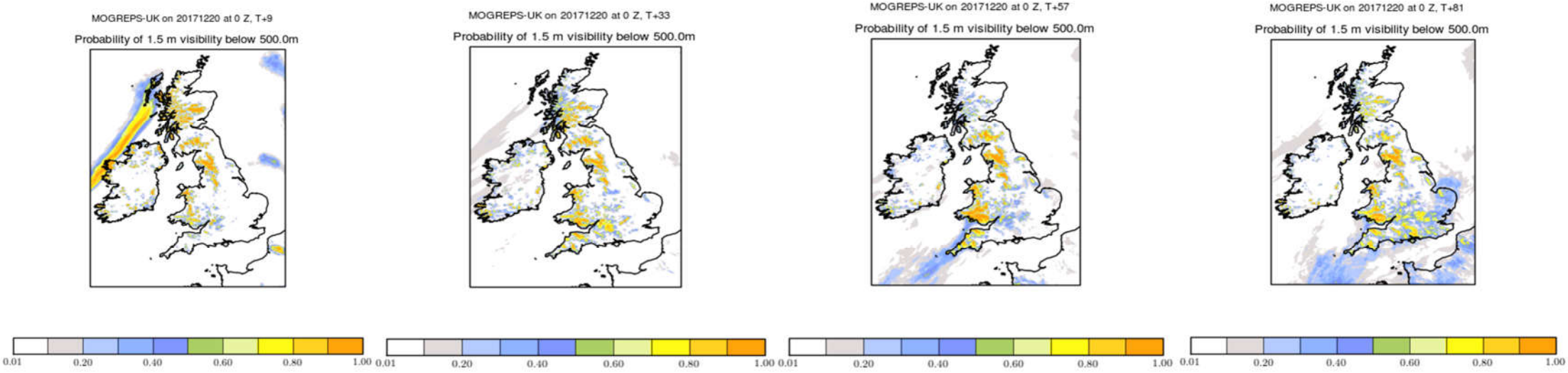

New developments for MOGREPS-UK (2018/2019/2020)

- Running to T+120. Analyse benefits of this configuration in operational guidance against the deterministic high-resolution model and against the global ensemble MOGREPS-G
- Upgrade from 70 to 90 vertical levels (2019)
- Analyse sensitivity to new En-4DEnVar DA scheme in MOGREPS-G (2019)
- Introduction of new random parameters to the stochastic physics (2019)
- Changes to the UKV DA scheme. Hybrid covariances will be introduced using MOGREPS-UK model errors (2020)

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Thank you for your attention!

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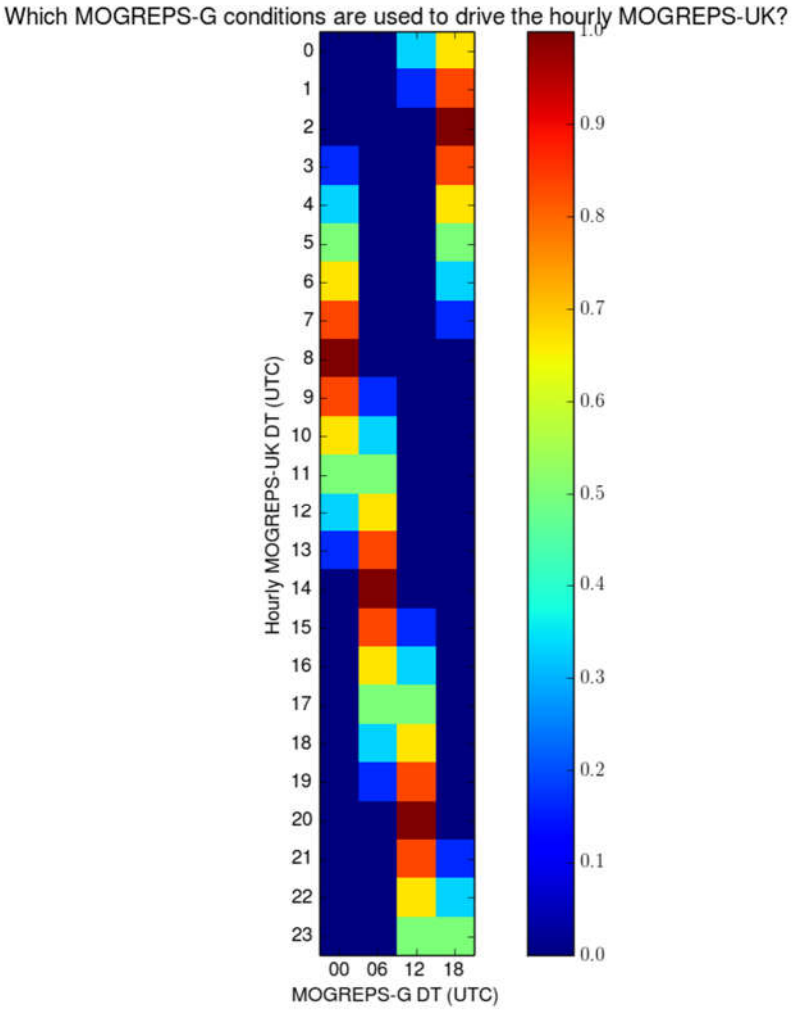

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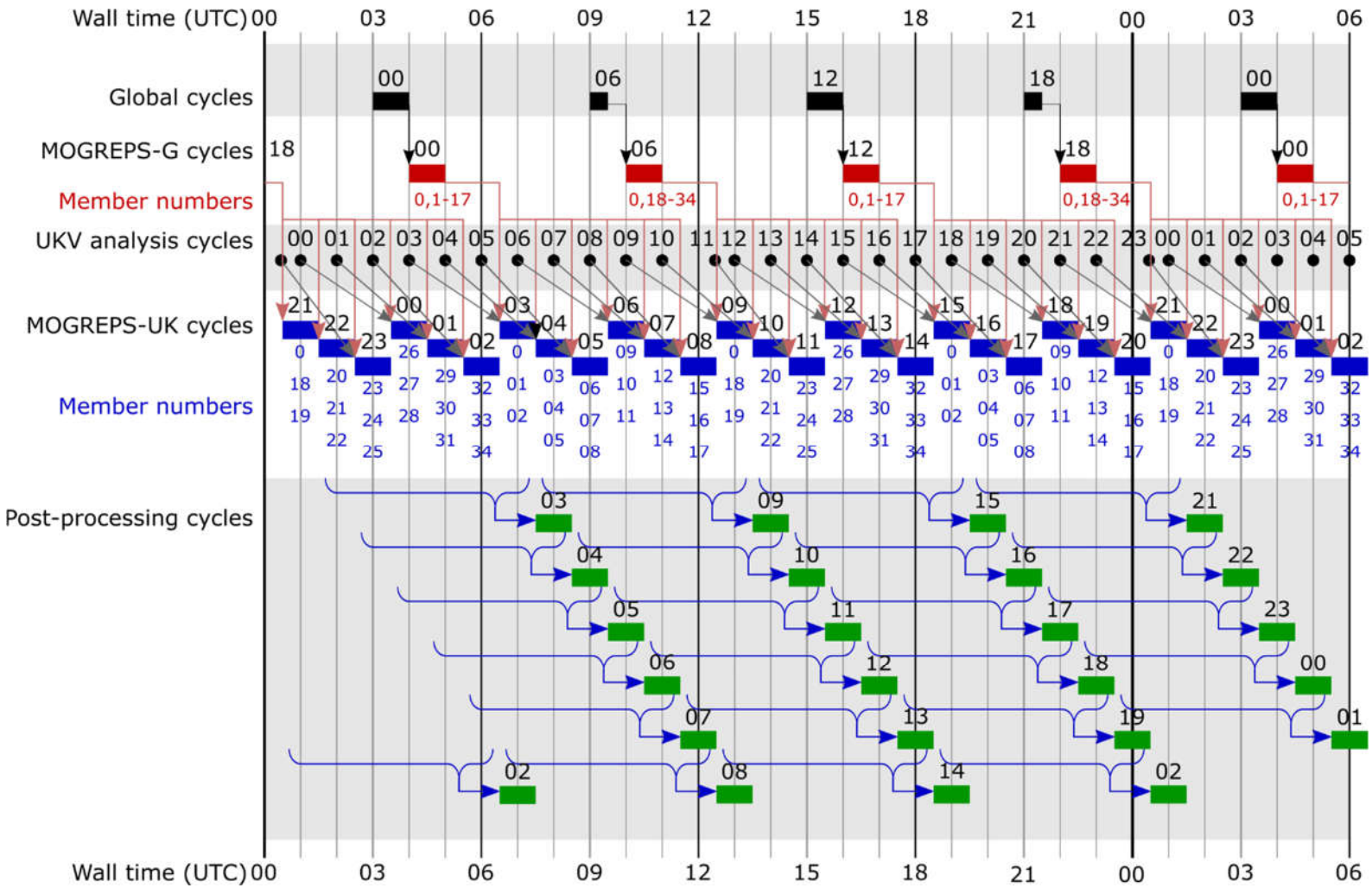
Wall time (UTC)
Global cycles
MOGREPS-G cycles
Member numbers
UKV analysis cycles
MOGREPS-UK cycles
Member numbers
Post-processing cycles
Wall time (UTC)
0,1-17
0,18-34