

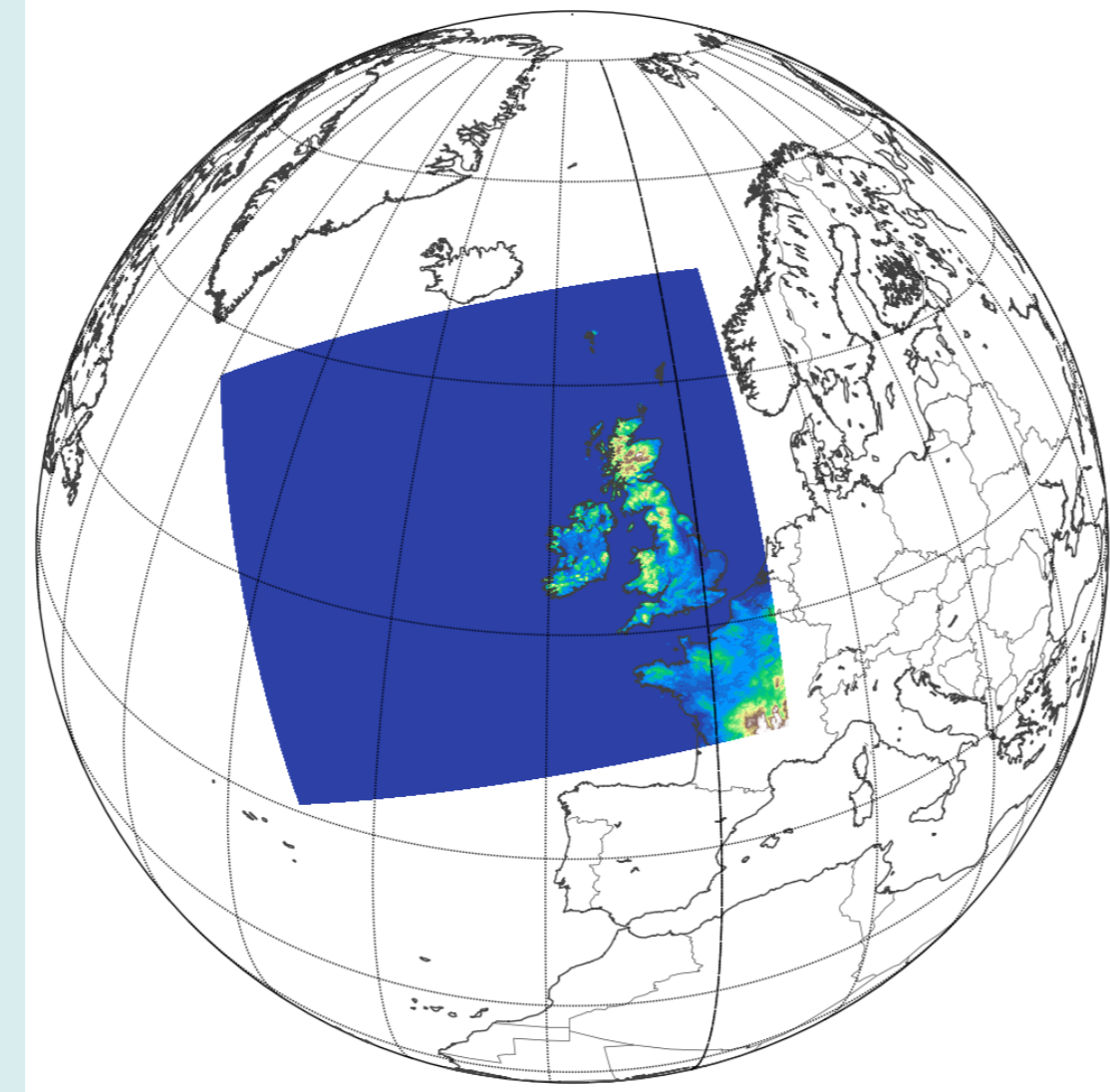
Operational NWP at Met Éireann

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Current Operational NWP Suite

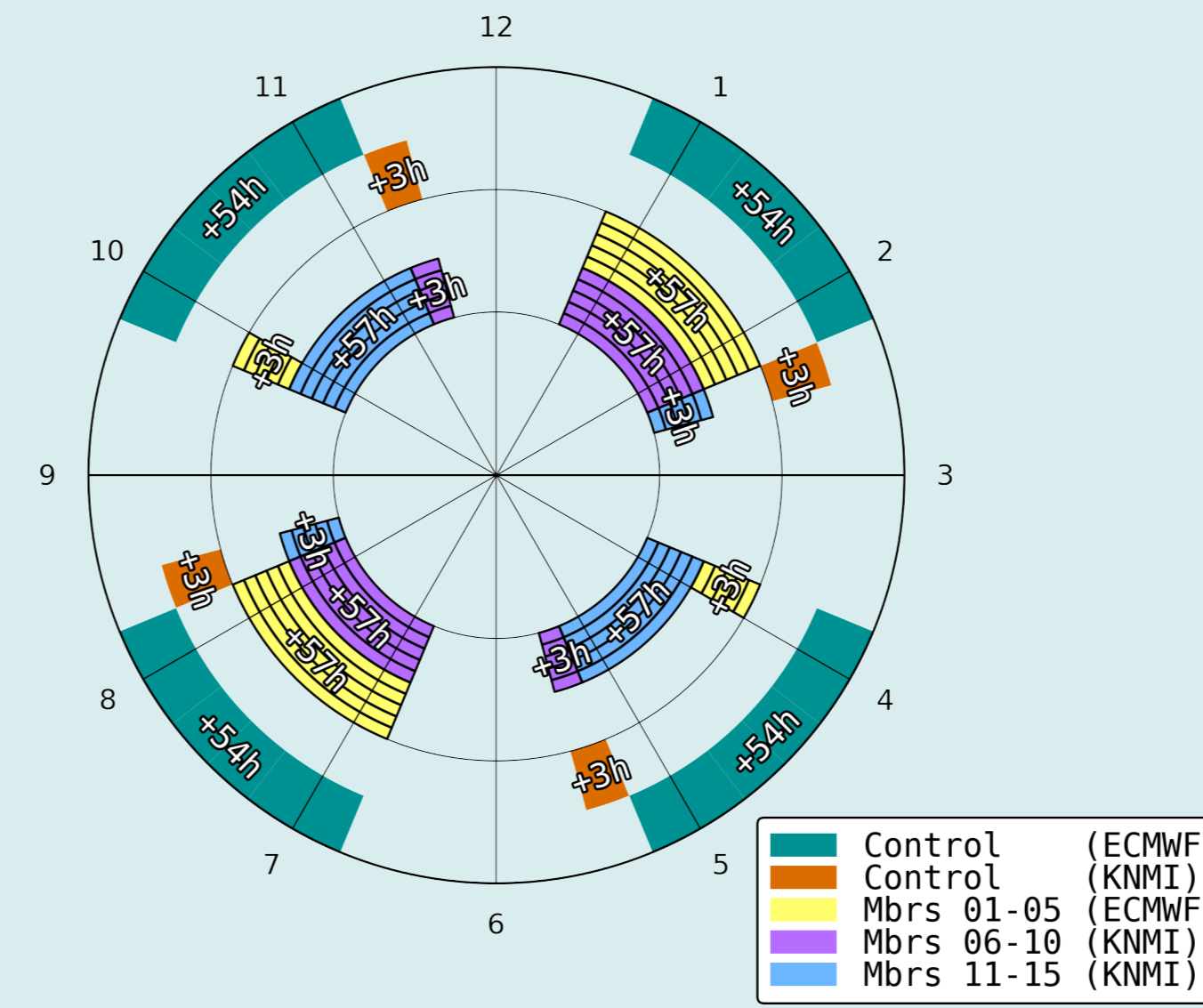
Met Éireann runs the HARMONIE-AROME model as part of an operational suite known as IREPS - the Irish Regional Ensemble Prediction System. On the 23rd of March 2021, IREPS was upgraded to run with Cycle 43h2.1 of HARMONIE-AROME. After considerable testing, the configuration detailed below was chosen for the new suite.

Component	Description
Data assimilation	3D-Var for upper-air and OI for surface
Observations	CONV, MODES (winds only), AMSU-A, MHS, IASI, ATMS, MWHS2, ASCAT and SYNOP RH _{2m} /T _{2m} for surface
Dynamics	Non-hydrostatic (ALADIN)
Physics	Harmonie-Arome
Grid	2.5 km horizontal grid and 65 vertical levels (first at 12 m, model top at 10 hPa)
EPS perturbations	EDA, SLAF boundaries, multi-physics, scale pert=yes, WG perturbations off
EPS configuration	Lagged 1+15 EPS: 1+10 at 0000/0600/1200/1800; 1+5 at 0300/0900/1500/2100 UTC



IREPS domain

Operational Clock

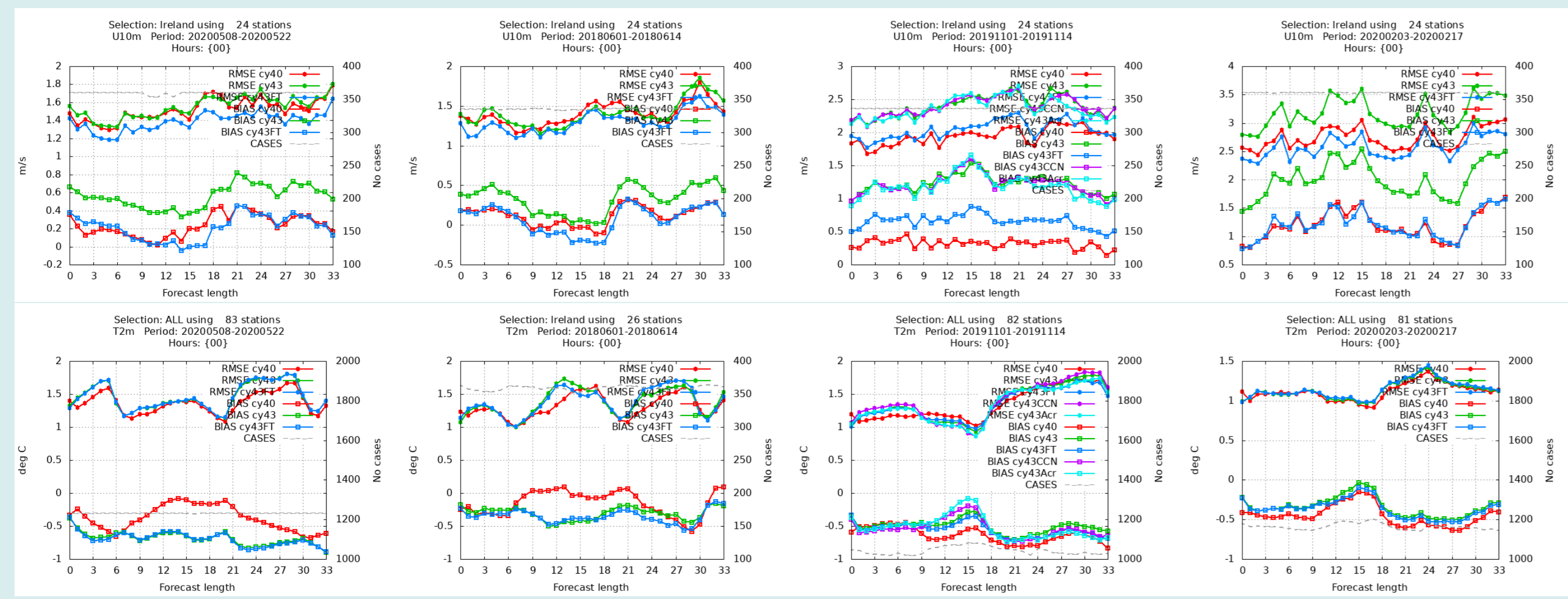


Operational clock showing forecast length, start time, duration, and HPC centre

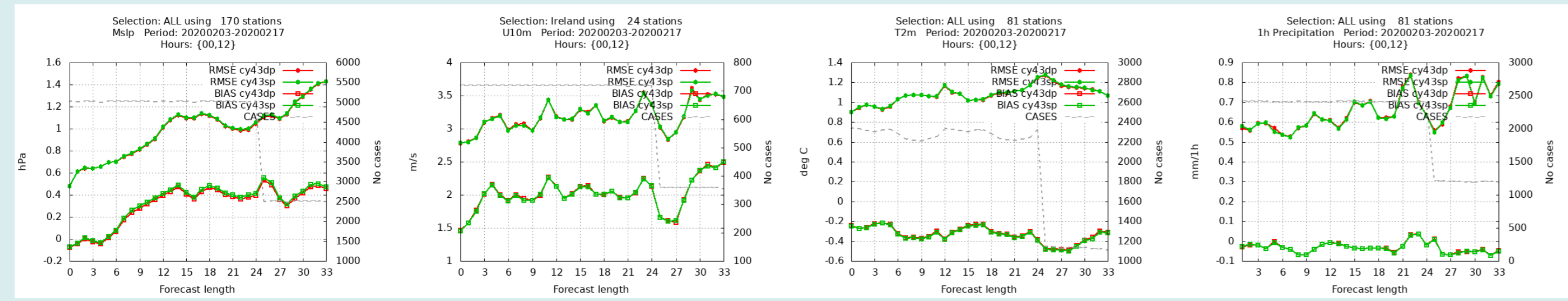
- Operational run at ECMWF and KNMI HPCFs
- The control and all perturbed members use an observation cutoff of T+0:45
- To optimise node usage on the KNMI HPC, the +57 hour perturbed forecasts are given priority with the +3 hour assimilation cycles running afterwards
- All forecast data should be delivered by T+2:15

Initial Testing

Shown below are a sample of the results which led to the choice of the configuration for the new suite.



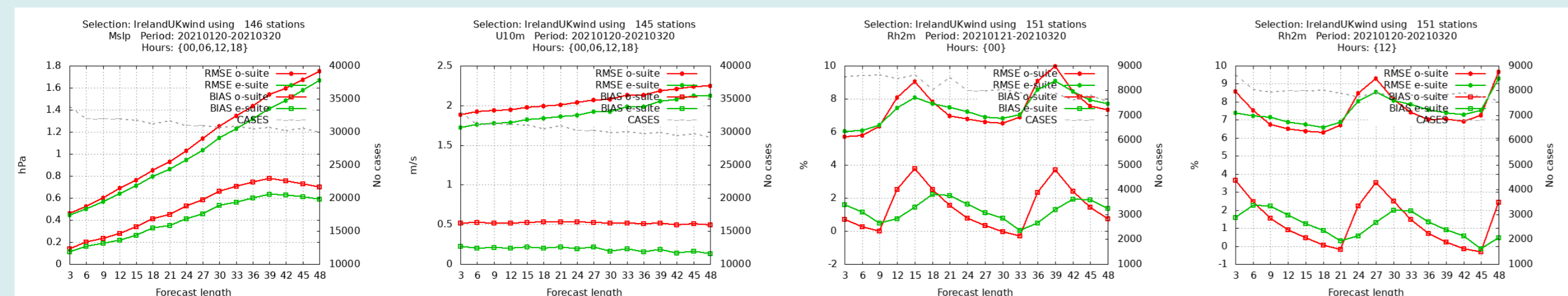
Point verification of 10 m wind-speed (above) and 2 m temperature (below) at Irish stations of experiments with various physics options: default cycles 40 and 43 are labelled 'cy40' and 'cy43'; with LFAKETREE 'cy43FT'; reduced cloud droplet number concentrations 'cy43CCN'; Acraene2 radiation scheme 'cy43AcR'. Test periods represent each season (left to right).



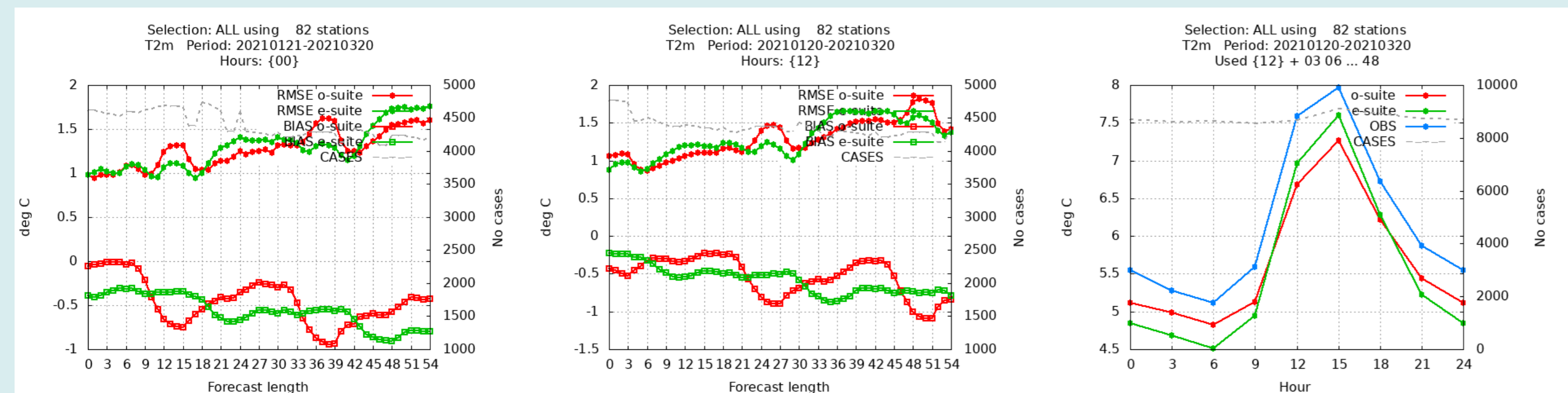
Point verification of experiments with single precision. This option has not yet been implemented operationally, but may be in future upgrades.

Parallel Testing

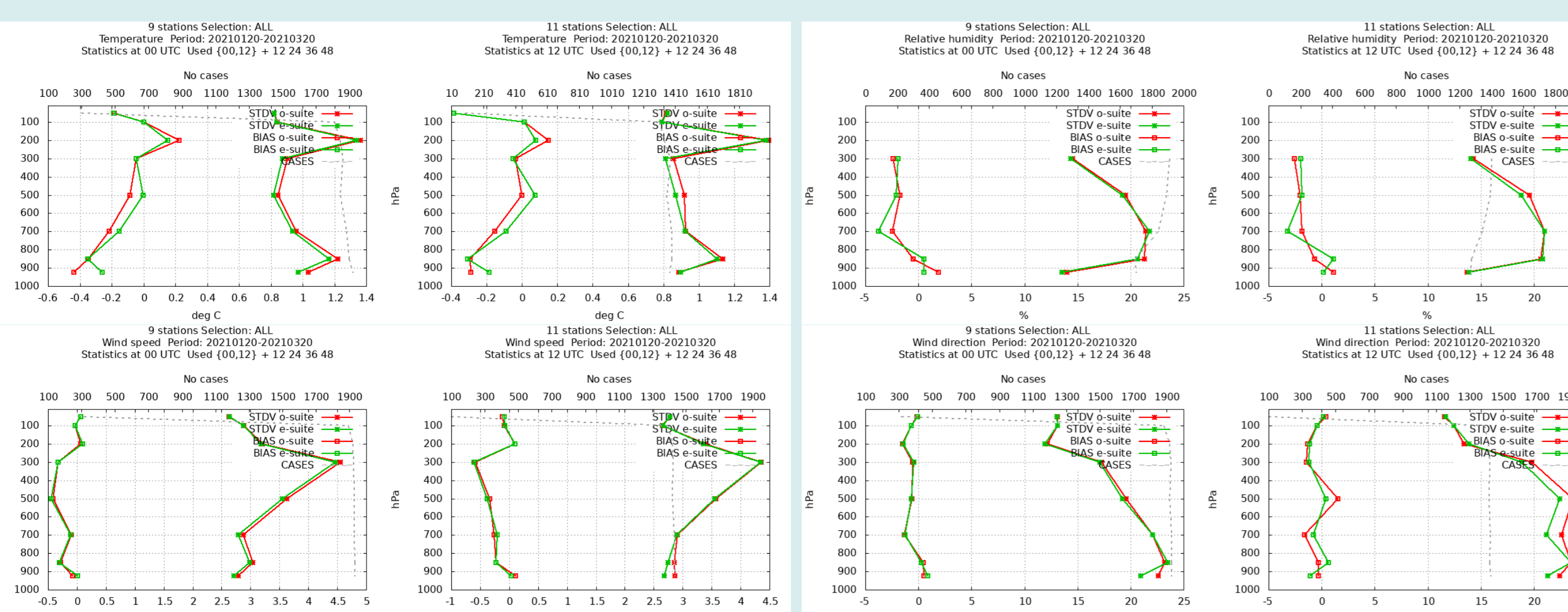
Prior to operational implementation, the proposed Cycle 43h2.1 configuration was tested as a parallel e-suite against the previously operational Cycle 40h1 for a two-month period. Verification comparison is shown below



Point verification at Irish and UK synoptic stations, comparing operational o-suite (red) and parallel e-suite (green). Left to right: scores for the MSLP, 10 m wind-speed, and 2 m relative humidity from 0000 UTC and 1200 UTC cycles.



Point verification of 2 m temperature at Irish synoptic and climate stations, comparing operational o-suite (red) and parallel e-suite (green). Shown are scores for the 0000 UTC (left) and 1200 UTC (middle) cycles, as well as the daily variation for all (right).



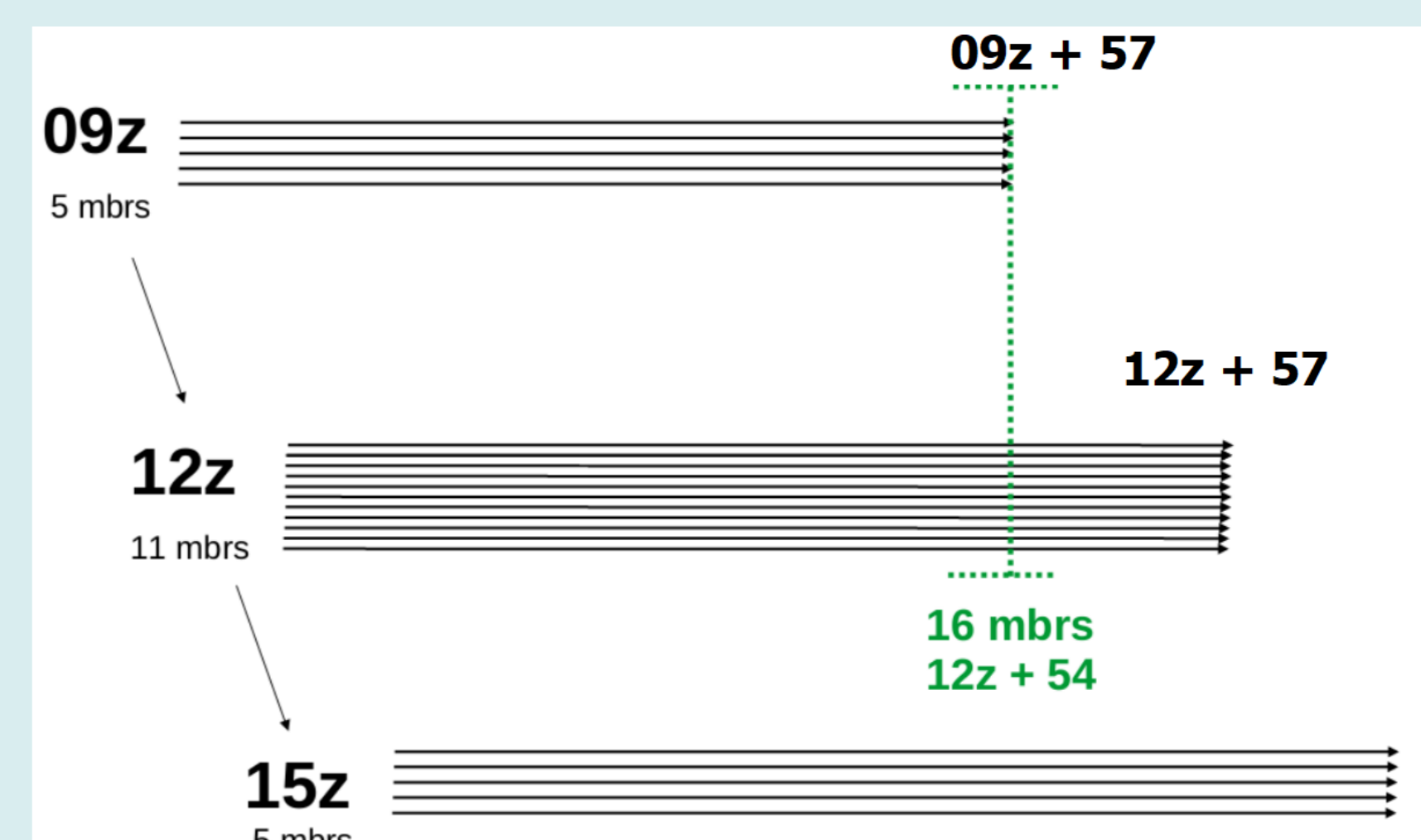
Verification of vertical profiles of operational o-suite (red) and parallel e-suite (green). For each variable, verification is valid at 0000 UTC (left) and 1200 UTC (right).

Lagged Ensemble Details

A lagged 1+15 ensemble is produced every 3 hours, assembled in the following way:

- Control member runs every 3 hours and forecasts to +54 hours
- All perturbed members forecast to +57 hours
- At 00Z, 06Z, 12Z, 18Z members 1-10 run
- At 03Z, 09Z, 15Z, 21Z members 11-15 run

Thus, in any 6 hour window there will be 15 perturbed members and 2 control members, of which we use the most recent.

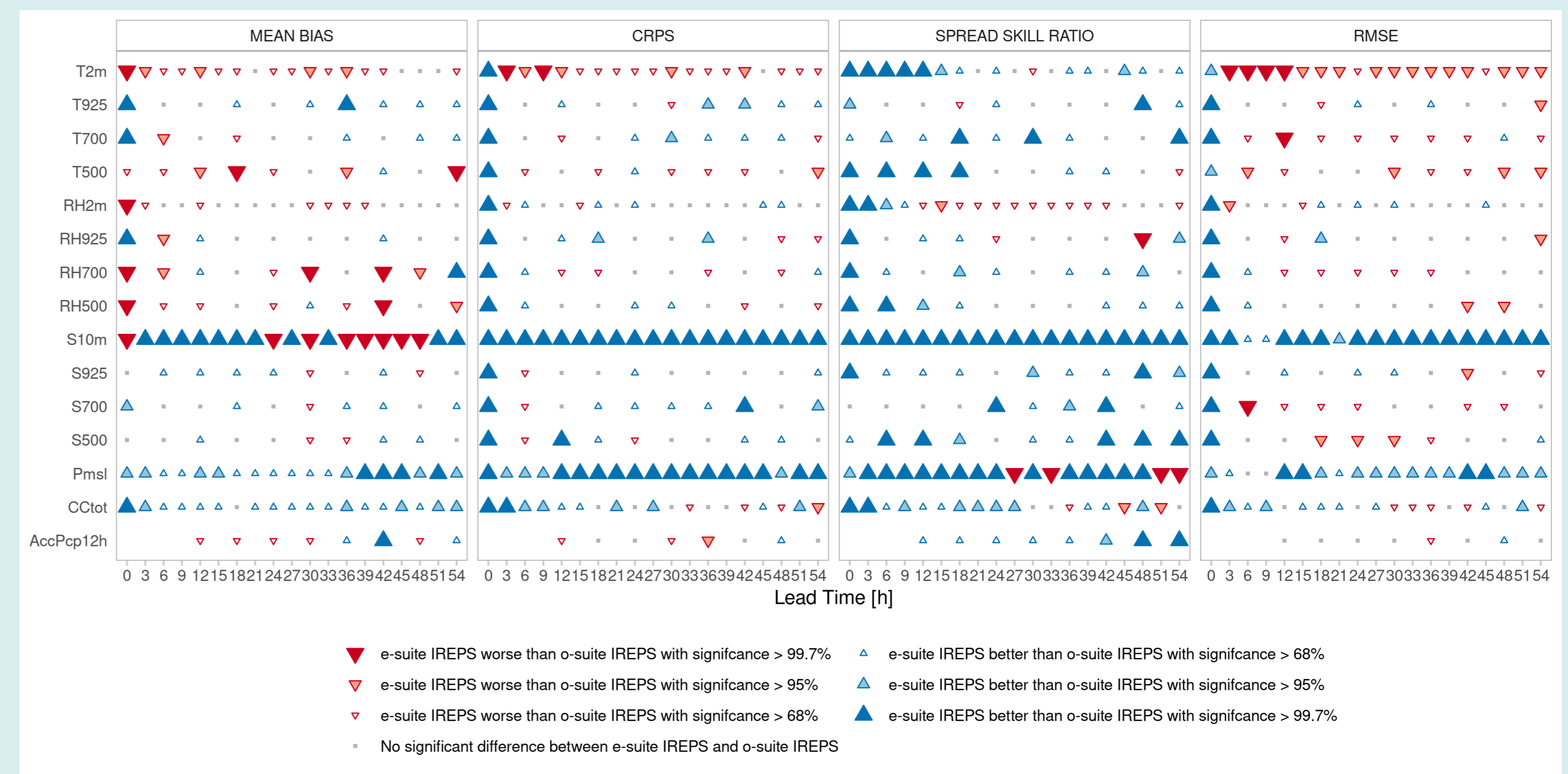


Technical Information

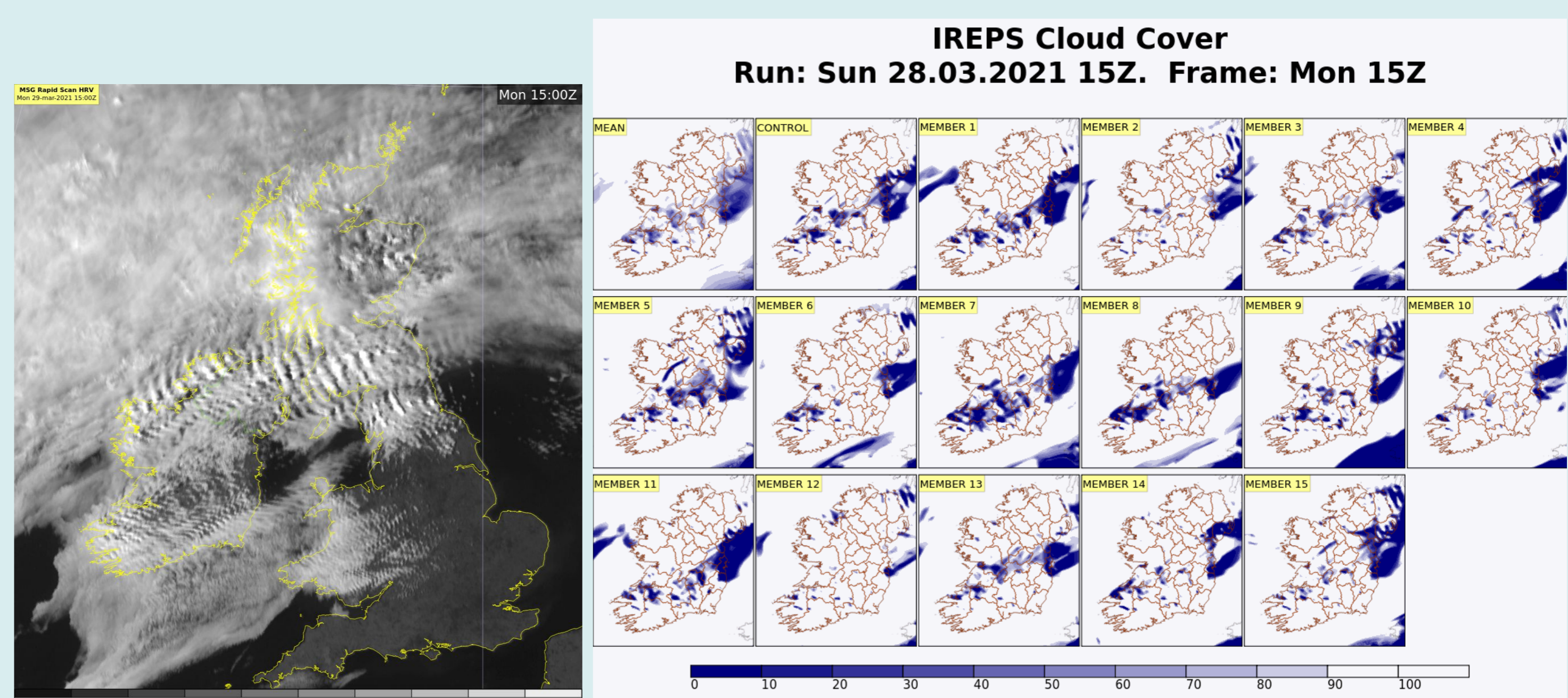
- Scaled Lagged Average Forecasting (SLAF) is used to perturb the boundaries taken from IFS-HRES. SLAFDIFF is 6, while SLAFLAG ranges from 0 to 30.
- All observations are processed by SAPP—Met Éireann's operational observations processing system provided under an ECMWF optional programme.
- The upgrade to cycle 43 also saw the full migration from GRIB1 to GRIB2 for all in-house products
- Products are disseminated to Met Éireann HQ from ECMWF using the ECMWF Product Dissemination Suite (ECPDS). From KNMI, a simple `rsync` is used.

E-suite vs O-suite scorecards

Scorecards included below illustrate a comparison between pre-operational Cycle 43h2.1 IREPS and previously operational Cycle 40h1 IREPS.



New operational suite in action: 24-hour cloud forecast



Future Plans

- Testing of physics options in newer releases of Cycle 43 is underway, with a possible further upgrade in the near future
- Working with United Weather Centres West (UWC-West) with an aim of joint operations by the end of 2022.