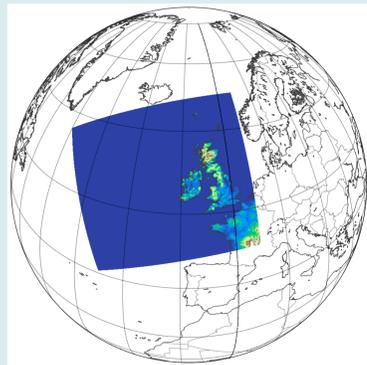


## Operational NWP Suite

Since March 2021, the operational IREPS suite at Met Éireann has been running with Cycle 43h2.1 of HARMONIE-AROME. Details of the configuration are shown below.

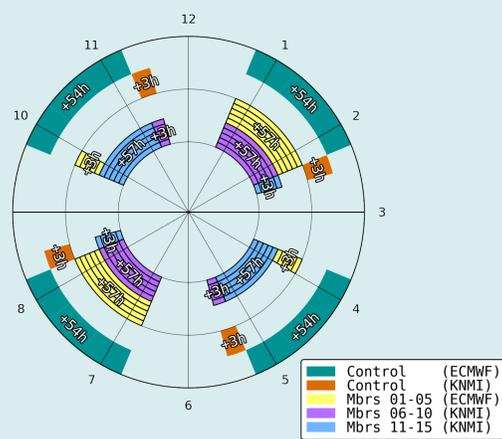
### Component Description

|              |  |
|--------------|--|
| Observations | CONV, MODES (winds only), AMSU-A, MHS, IASI, ATMS, MWHS2, ASCAT                    |
| Surface DA   | XSODELX(0)=1.0, XSODELX(1)=2.0   |
| Dynamics     | Quadratic grid   |
| Dynamics     | LGWADV=T, LRDBBC=F   |
| Surface      | LFAKETREE=T  |
| Surface      | XRIMAX=0.0   |
| Microphysics | CDCN=50  |
| EPS          | EDA, SLAF boundaries, multi-physics, scale pert=yes, WG perturbations off          |
| EPS          | Lagged 1+15 EPS:<br>1+10 at 0000/0600/1200/1800;<br>1+5 at 0300/0900/1500/2100 UTC |



IREPS domain

## Operational Clock



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

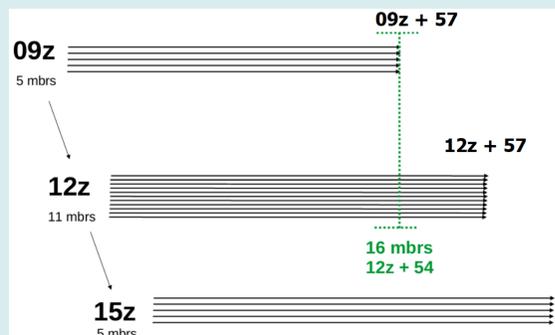
- ▶ The control and all perturbed members use an observation cutoff of T+0:45
- ▶ To optimise node usage on the KNMI HPC, the +57 hour perturbed forecasts are given priority with the +3 hour assimilation cycles running afterwards
- ▶ All forecast data should be delivered by T+2:15

## 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.

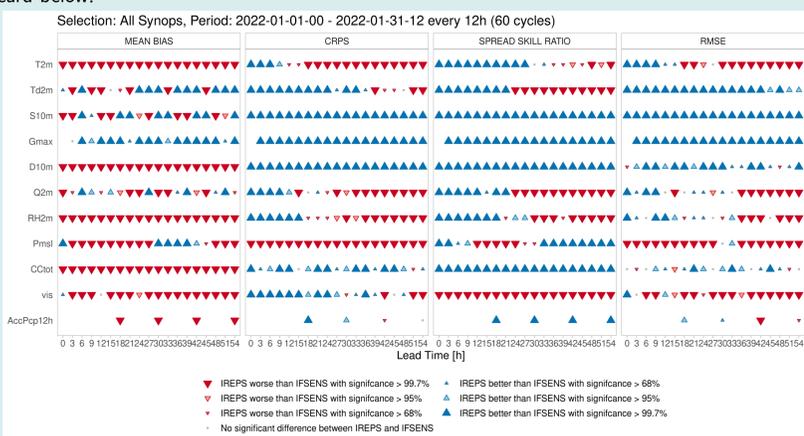
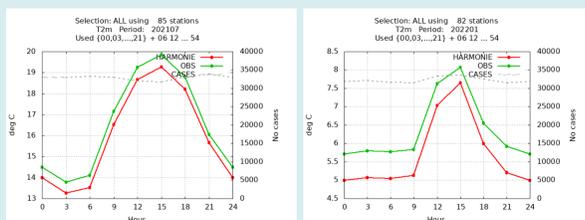


## Technical Information

- ▶ 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 in 2021 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.

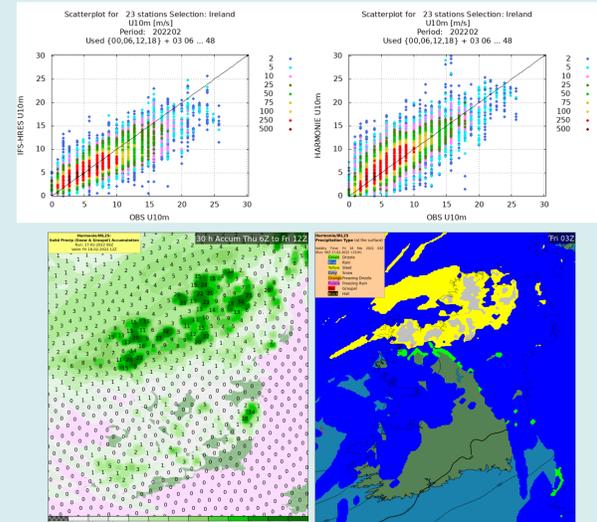
## Operational Verification

- ▶ Averaged forecasts of daily 2m temperature at Irish stations are shown (right) for July 2021 and January 2022. The model continues to show a general cold bias.
- ▶ IREPS versus IFSSENS comparison over all available stations for January 2022 is given in the scorecard below.



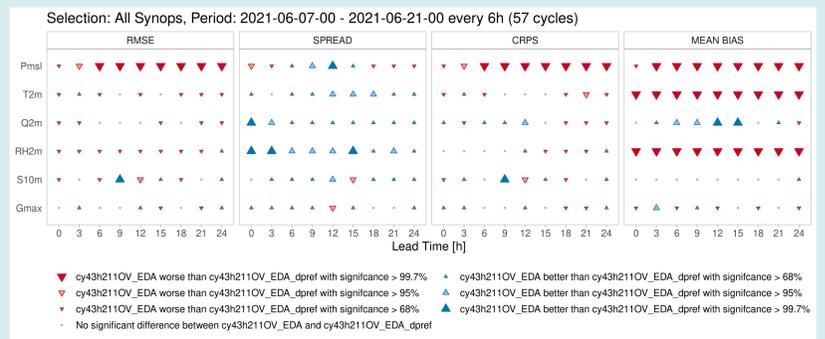
## February 2022 Storms

- ▶ Storms Dudley, Eunice and Franklin impacted Ireland in a single week in February 2022
- ▶ Scatterplots of wind-speed (right) show that HARMONIE-AROME continues to perform best with extreme values, although over-prediction occurs at lower speeds
- ▶ Raw model output predicted heavy snow for Storm Eunice; however, little was actually observed. The post-processed precipitation types product in gl provided better guidance.



## Single Precision Testing

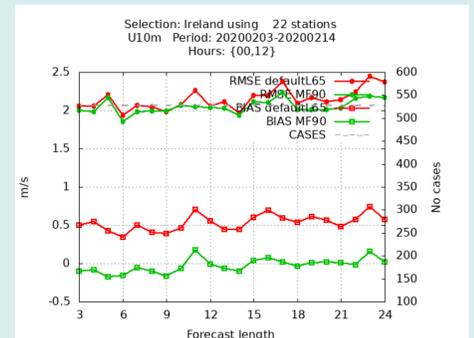
- ▶ Scorecard (below) summarising the impact of single precision (SP) forecasts for a 1+3 member ensemble.
- ▶ Cycle 43h2.1.1 (plus additional SP commits) used with a similar configuration to operational IREPS.
- ▶ Relatively neutral impact on ensemble performance for surface parameters, apart from a positive MSLP bias.
- ▶ ~ 30 % runtime saving observed.



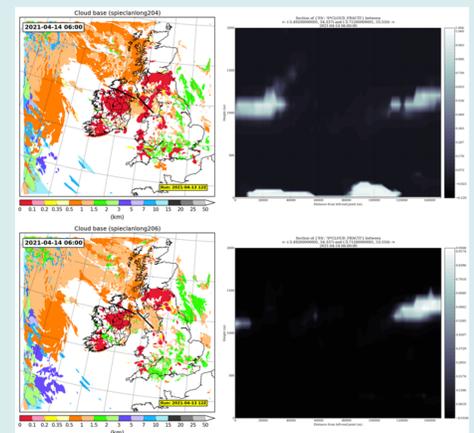
SP vs DP performance for various ensemble scores over a two week summer period. Red indicates a degradation in the SP ensemble performance.

## Vertical Resolution

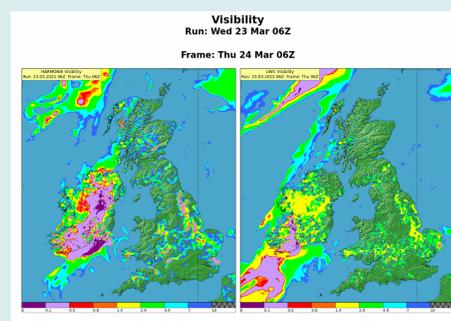
- ▶ Testing of higher resolutions included a focus on the impact of increasing the number of vertical levels from 65 to the 90 levels used by Météo France. A clear improvement in 10m wind-speed scores was found.
- ▶ Right: Verification over a stormy period in February 2020; 2.5km domains with default 65 (red) and 90 (green) levels.



- ▶ Analysis of several cases suggests a significant reduction in fog extent at 90 vertical levels.
- ▶ Right: Case study of the 14th April 2021, showing cloud base height and cloud cross section valid at 0600 UTC, from the 1200 UTC forecast on the 13th. Cross sections are taken over the Irish sea, indicated in the map. Vertical resolutions are 65 (top) and 90 (bottom) levels.
- ▶ Increasing the vertical resolution gave the clearest improvement in fog forecasts. Mixed results were found at higher horizontal resolutions (500m and 750m tested).



## Future Plans



A comparison of visibility forecast between IREPS Control member (left) and UWC-West Early Common DINI Suite (right)

- ▶ Transfer of ECMWF operations from cca/cbb to the new Atos HPC in Bologna has begun with the new HPC expected to be operational in Q3 2022.
- ▶ We are working with United Weather Centres West (UWC-West) with planned joint operations in Q1 2023.
- ▶ Development of a high-resolution nowcasting suite for Ireland is ongoing. This will be deployed as a "National Application" on the new UWC-West HPC.
- ▶ Dedicated research activities ongoing: fog processes, physiography, coupled modelling, EPS and nowcasting.
- ▶ Contribution to Destination Earth activities.