Operational NWP at Met Éireann

Rónán Darcy, Colm Clancy, Eoin Whelan

Met Éireann, Dublin, Ireland

Joint 27th ALADIN Workshop & HIRLAM All Staff Meeting, April 2017

HIRLAM

	HIRLAM I10	**HIRLAM HH7**
Code	HIRLAM-7.2 (METIE branch)	HIRLAM-7.2 (METIE branch)
Domain	654×424 grid-points, 60 vertical levels	366×344 grid-points, 60 vertical levels
Model top	10 hPa	10 hPa
Grid spacing	0.1°	0.07°
Cut-off	2 hours	20 minutes
Observations	Conventional only	Conventional only
Data assimilation	4DVAR with large-scale mixing	3DVAR with large-scale mixing
Forecast	54 hour forecasts every six hours	9 hour forecasts every hour
Boundary	IFS	HIRLAM I10

HARMONIE-AROME IRELAND25

|	
Code	HARMONIE-37h1.1 (METIE branch)
Domain	540×500 grid-points with 65 vertical levels
Model top	10 hPa
Grid spacing	2.5 km
Cut-off	45 minutes
Observations	Conventional only
Data assimilation	Surface analysis only with blending (6 hour cycle)
Forecast	54 hour forecasts at 00z, 06z, 12z, & 18z
Configuration	Aladin-NH dynamics and AROME physics
Boundary conditions	IFS

Operational Domains
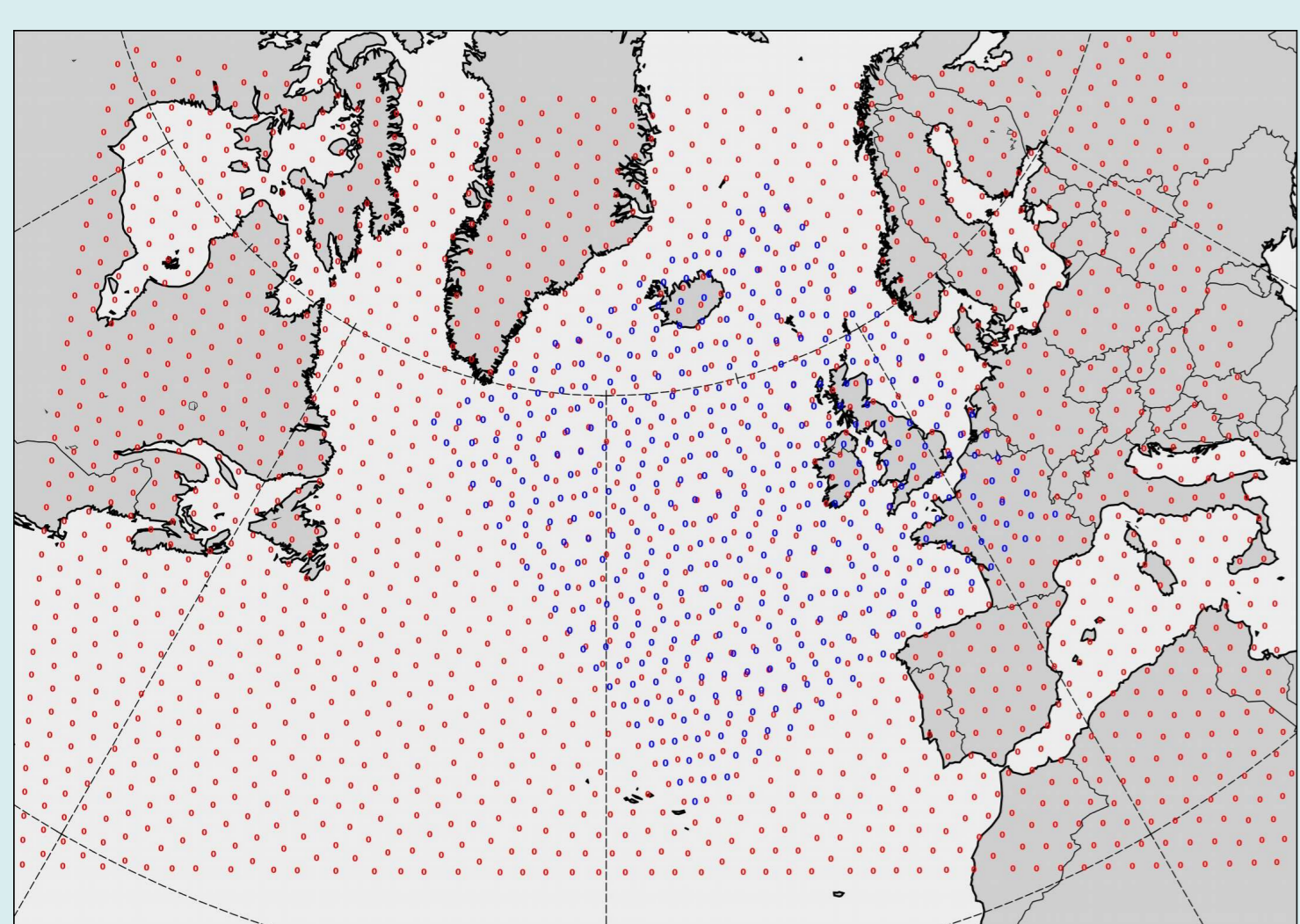
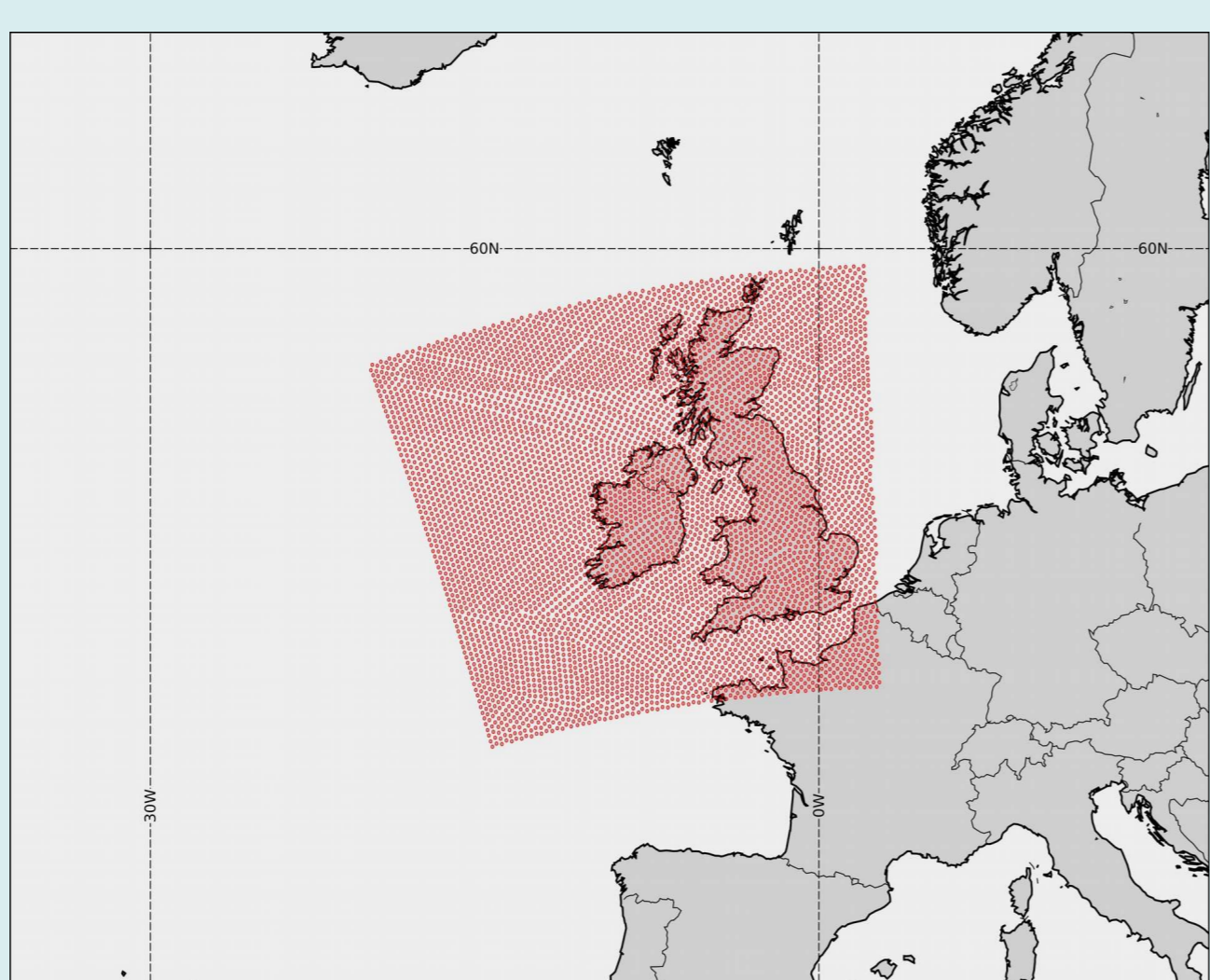Figure 1 : HIRLAM I10 (red) and HH7 (blue)

Figure 2 : HARMONIE

Operational Timeline

The cut-off times (as outlined in the tables above) determine the maximum time beyond the DTG for which the model will wait for boundary files. A single HARMONIE 37 cycle takes approximately one hour, a single HIRLAM I10 cycle takes approximately 1.25 hours, and a single HIRLAM HH7 cycle takes approximately 15 minutes.
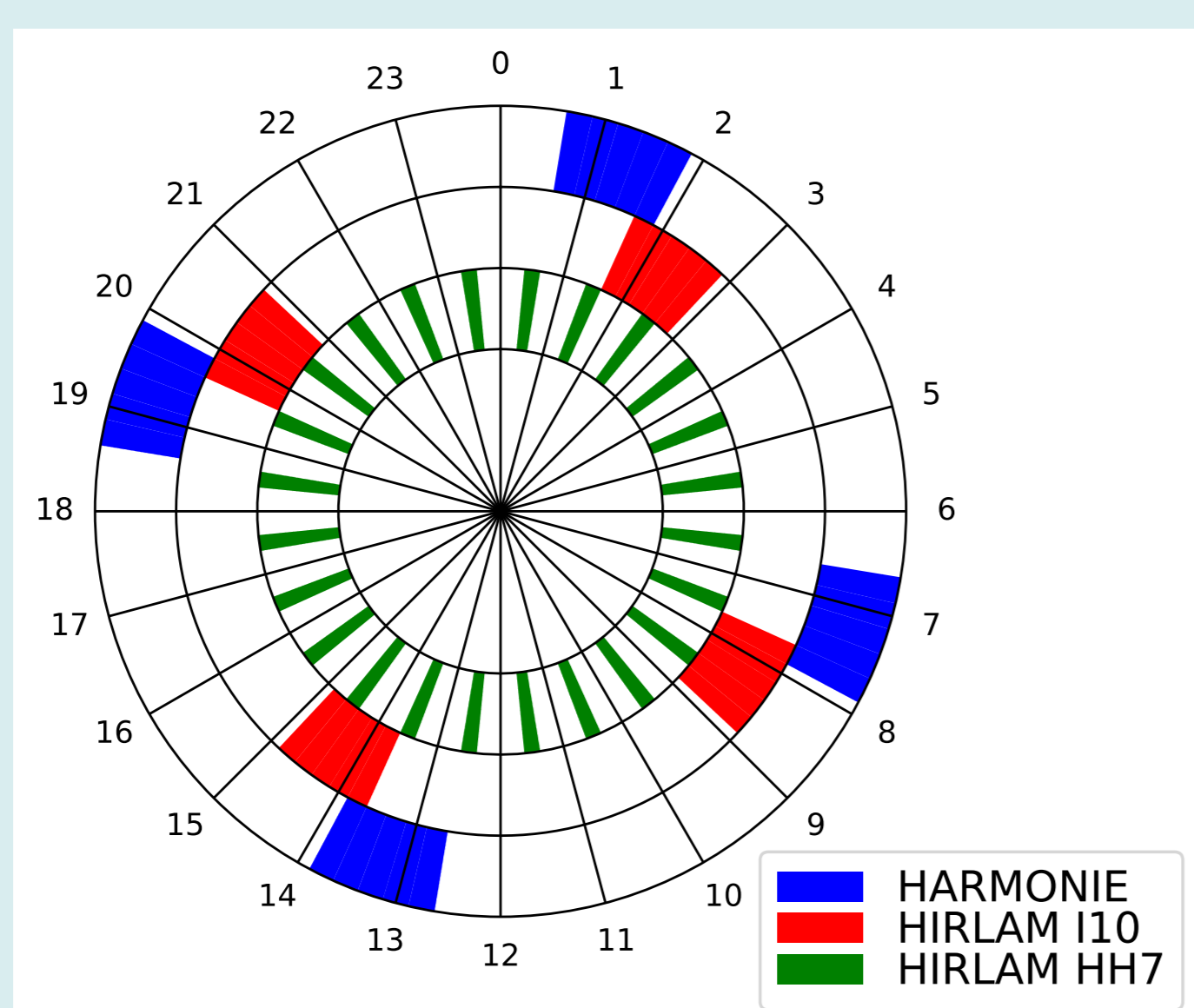

Figure 3 : Operational suite schedule showing HARMONIE and both HIRLAM configurations.

Porting NWP models to ECMWF

Met Éireann is in the process of porting its NWP models from ICHEC to ECMWF. There are two Cray XC40 platforms at ECMWF, cca and ccb, which have the following specifications:

- Intel Broadwell processors with 18 cores per CPU chip and 2 CPU chips per node
- 3610 nodes each with 128 GB RAM
- 2 independent storage clusters, sc1 and sc2

HIRLAM and HARMONIE have been modified to compile at ECMWF and run under ecFlow rather than mini SMS. The post-processing tasks and products have also been integrated into the suite (see Fig. 4).
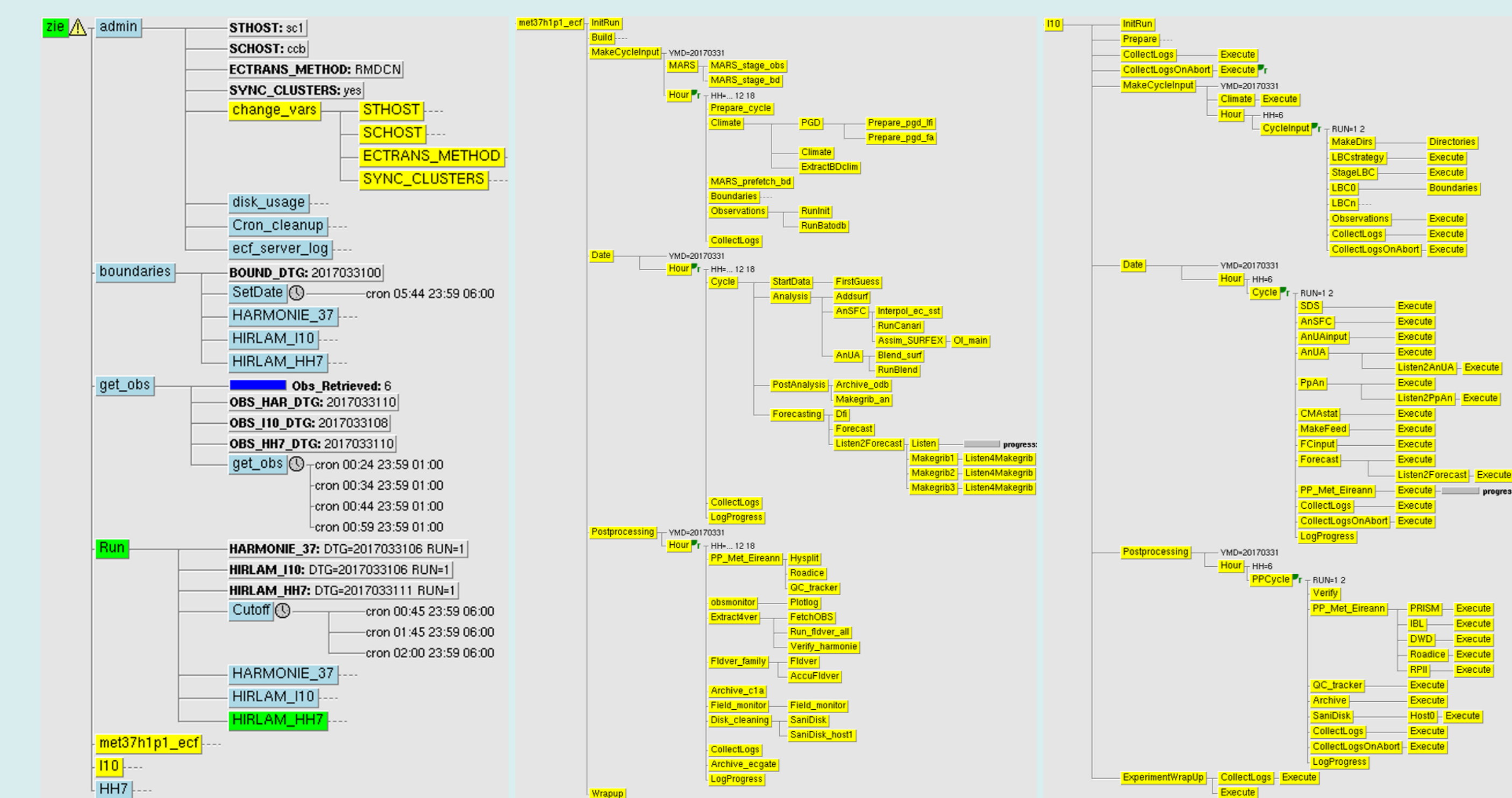

Figure 4 : Overview of the operational suites in the zie server, and an expanded view of HARMONIE (met37h1p1 .ecf) and HIRLAM (I10).

The integration of all operational tasks into a single ecFlow server (zie) has allowed complex suite inter-dependcies, for example the NWP models will run as far as the Observations step, waiting for a trigger from the get .obs suite when the required observation file becomes available.

Verification: January 2017

HARMONIE 37h1.1 continues to perform well operationally. Point verification of 2 m temperature and 10 m winds are shown for January 2017 comparing HARMONIE (blue), HIRLAM (green), and IFS (red).
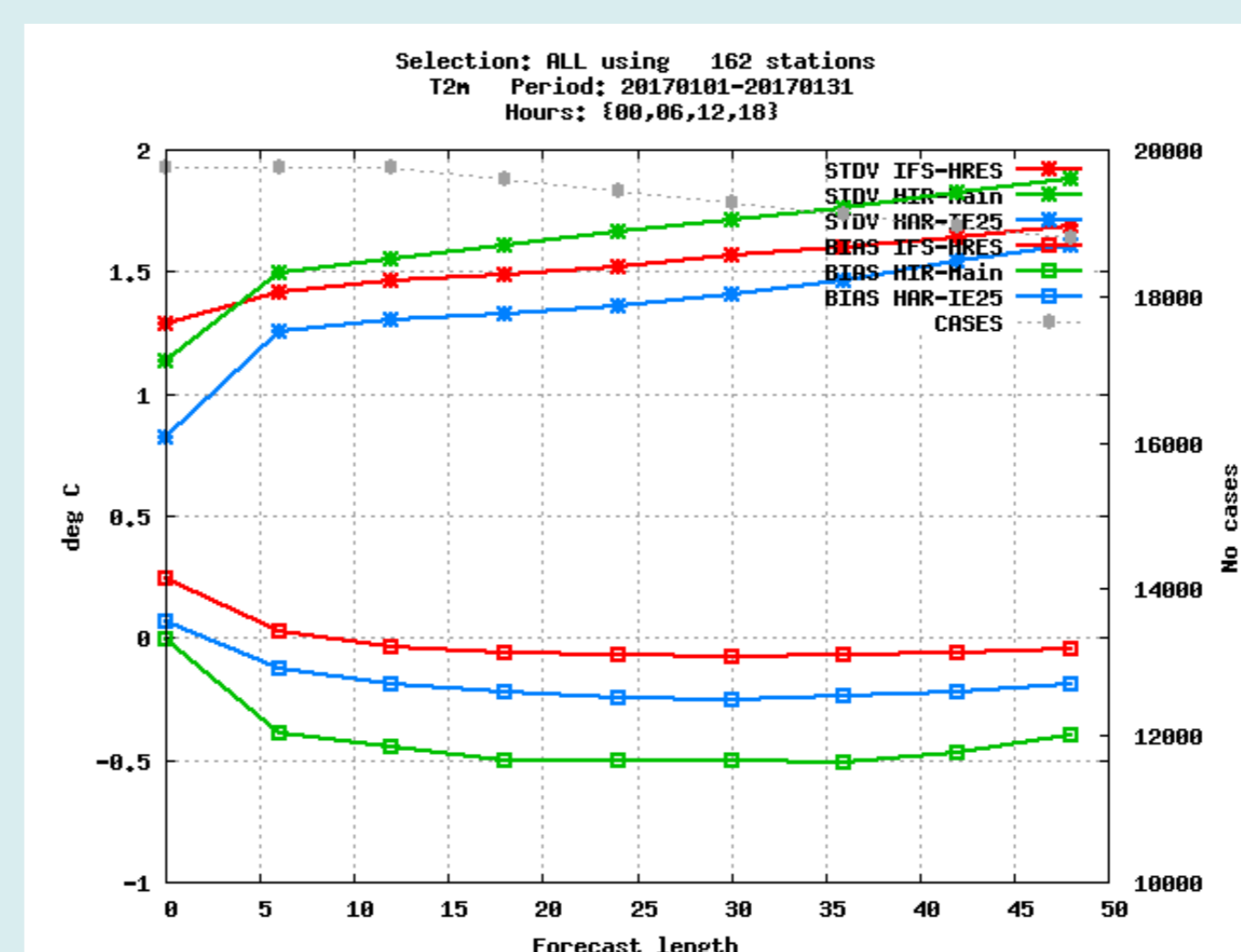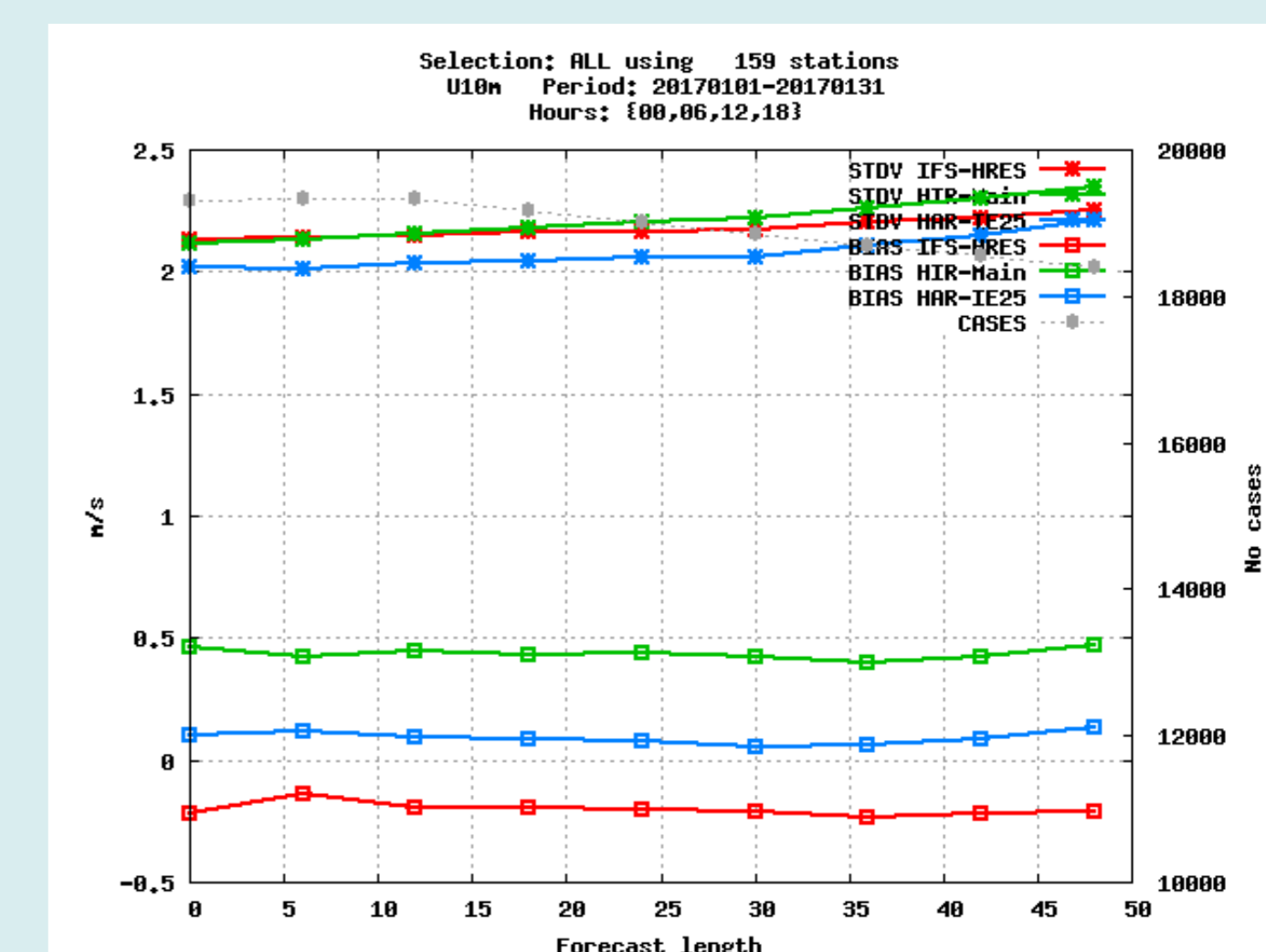

Figure 5 : 2 m temperature

Figure 6 : 10 m winds

Upgrade to HARMONIE cycle 40

Met Éireann is planning to upgrade its operational HARMONIE model from cycle 37 to cycle 40 in 2017. Tests and verification are currently ongoing. Among the proposed changes are the following:

- Expand the domain. Two possibilities under consideration are shown in Fig. 7 below, of size 800 × 800 and 1000 × 900. The structure functions for both proposed domains have been generated using data from ECMWF's EDA (CY41R2) system upgraded in March 2016.
- Test the quadratic and cubic grids for more efficient use of larger domains
- Move to 3DVAR data assimilation
- Use of HARATU turbulence scheme
- Use of higher resolution gmted2010 orography
- Increase cycle frequency to every three hours
- Investigate the feasibility of sub-hourly output
- Use of CAMS aerosols
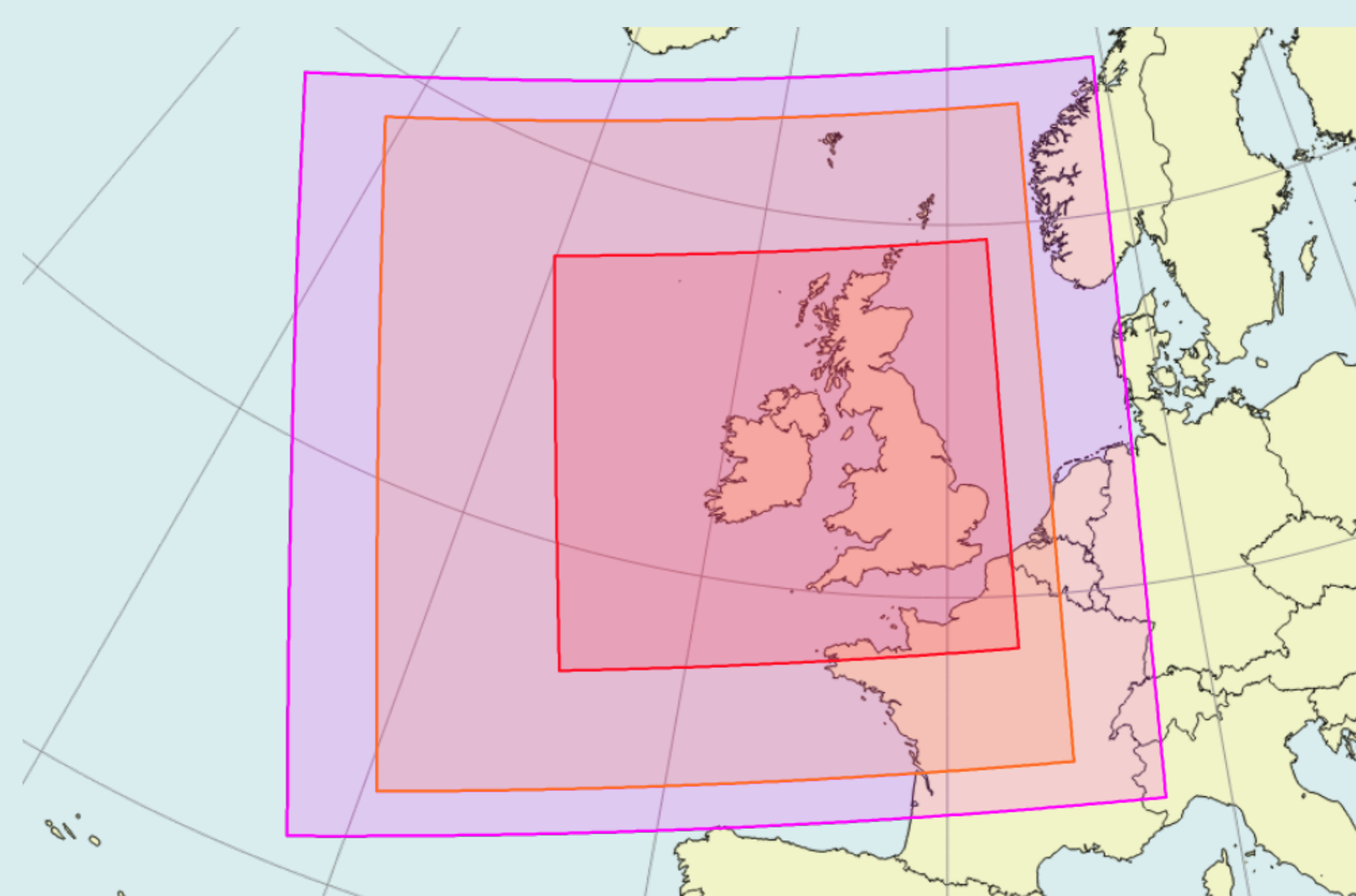- Increase to two surface patches for Ireland

Figure 7 : Two proposed domains for the implementation of HARMONIE cycle 40. Each will be validated against the current domain (red).

Some very preliminary verification scores showing improved wind forecasts are shown below, using the largest domain in Fig. 7 without 3DVAR:
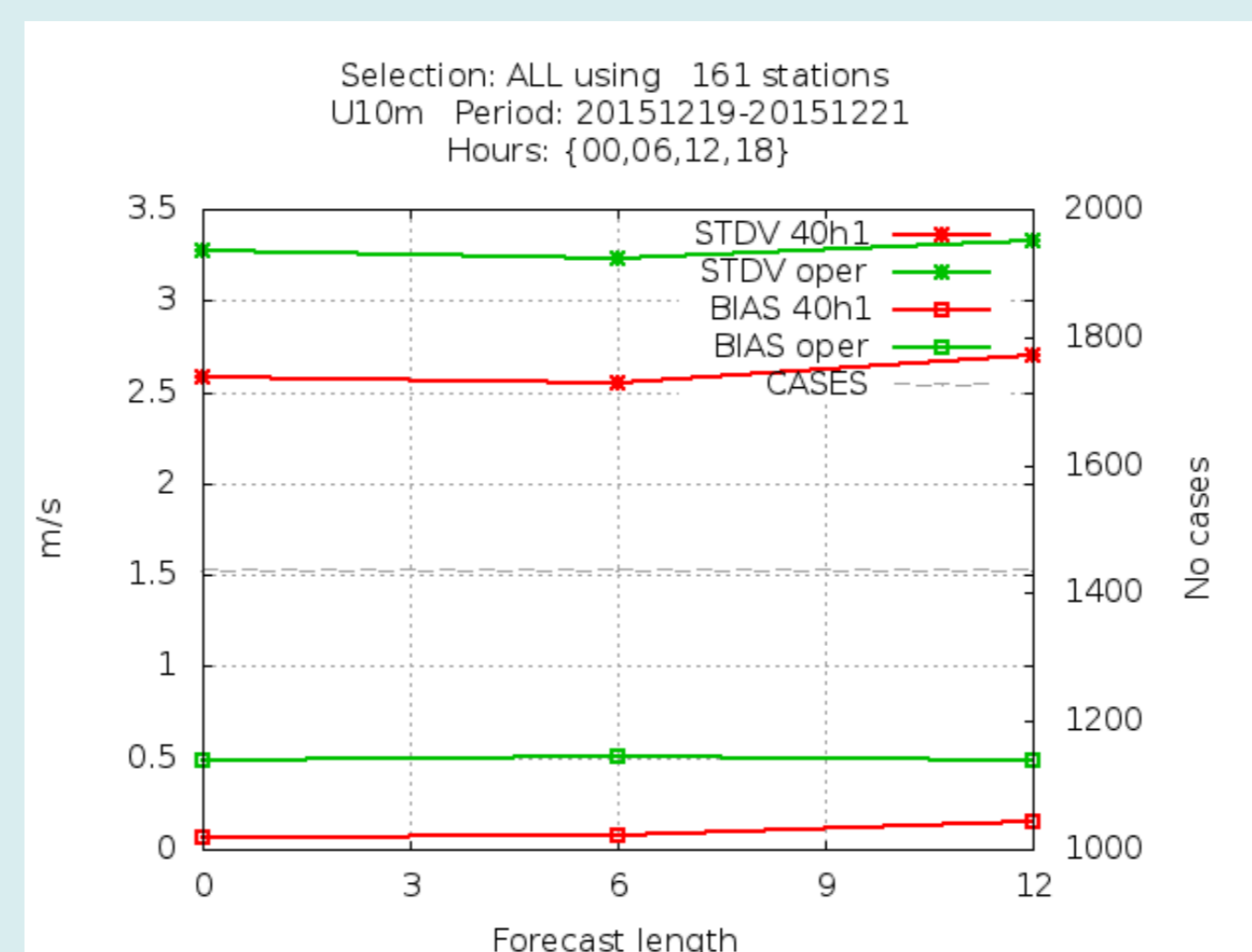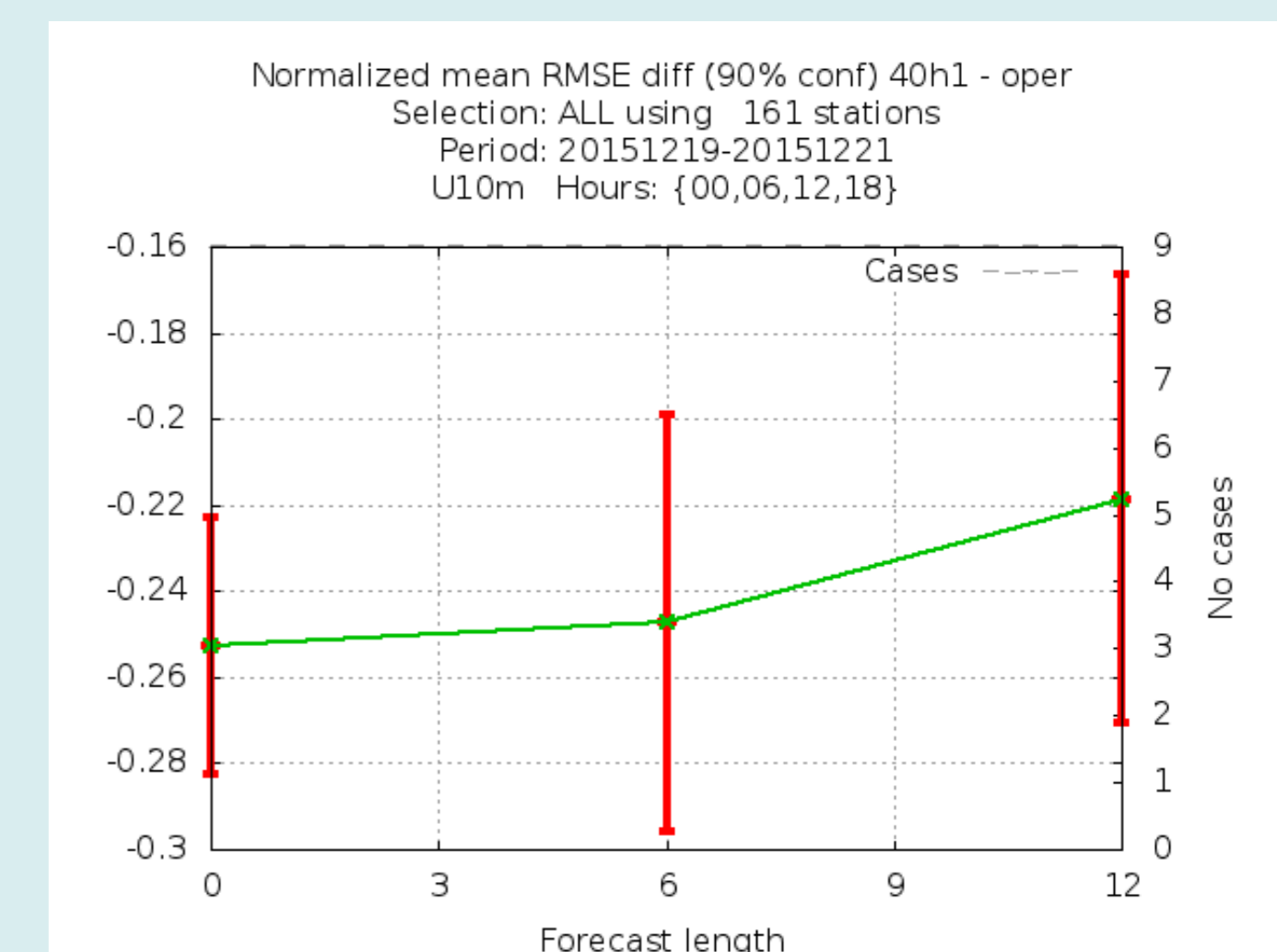

Figure 8 : Verification of 10 m winds

Figure 9 : Significance of 10 m wind differences

Rónán Darcy, Colm Clancy, Eoin Whelan

ronan.darcy@met.ie

Met Éireann
Dublin, Ireland