

Operational NWP - Met Éireann

Wk 26/ASM 2016 - Eoin Whelan

HARMONIE is used at Met Éireann to produce operational forecasts. The IRELAND25 configuration produces a 54 hour forecast four times per day. HARMONIE was first made operational by Met Éireann on July 11th 2011. HARMONIE 37h1.1 was introduced on January 31st 2013. HARMONIE 38h1 will be made operational later in Q2 2016. HIRLAM continues to be used operationally by Met Éireann forecasters. Two configurations produce guidance for our forecasters – I10 producing 54 hour forecasts four times per day and HH7 producing a short range forecast every hour. Our operational NWP models are summarised below.

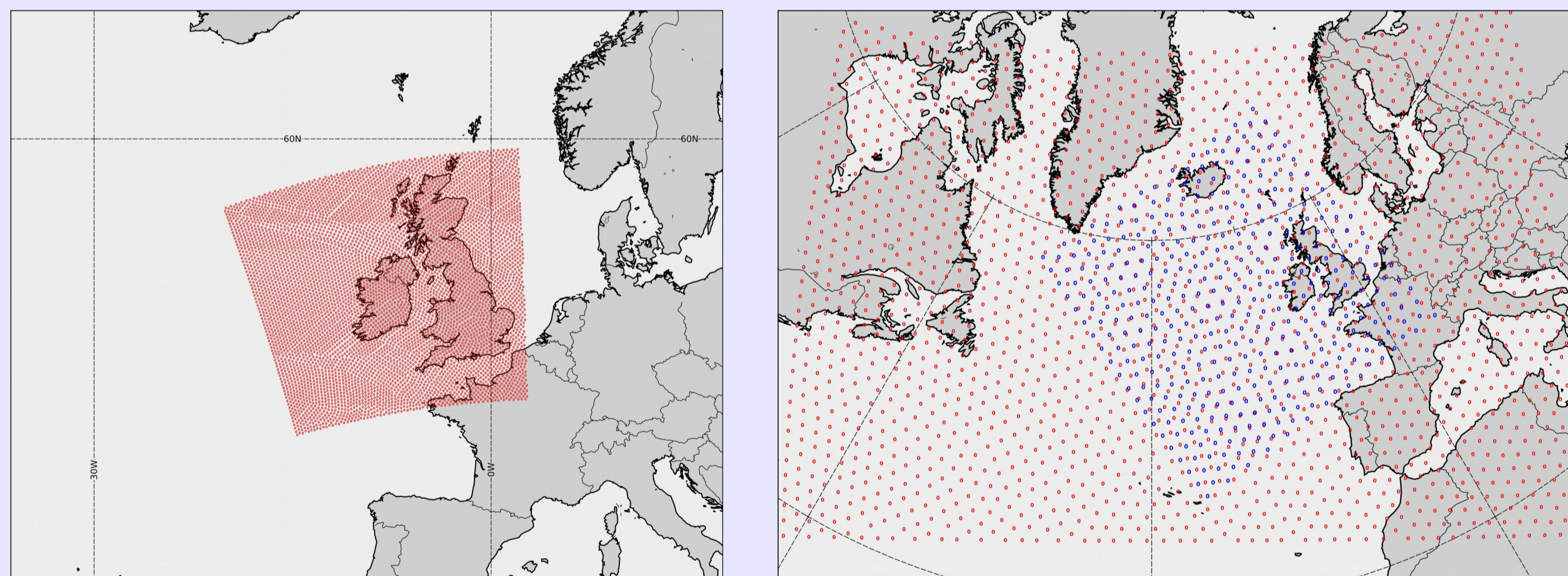
HARMONIE IRELAND25

Code	HARMONIE-37h1.1 (METIE branch)
Domain	540x500 grid-points with 65 levels
Model top	10hPa
Grid spacing	2.5km
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

HIRLAM I10

Code	HIRLAM-7.2 (METIE branch)
Domain	654x424 grid-points with 60 levels
Model top	10hPa
Grid spacing	0.1°
Cut-off	2 hours
Observations	Conventional only
Data assimilation	4DVAR with Large-scale mixing
Forecast	54 hour forecasts at 00z, 06z, 12z & 18z
Boundary conditions	IFS

Operational Domains



Domains of Met Éireann's operational NWP models – HARMONIE IRELAND25 (left) and both HIRLAM domains (right).

HIRLAM HH7

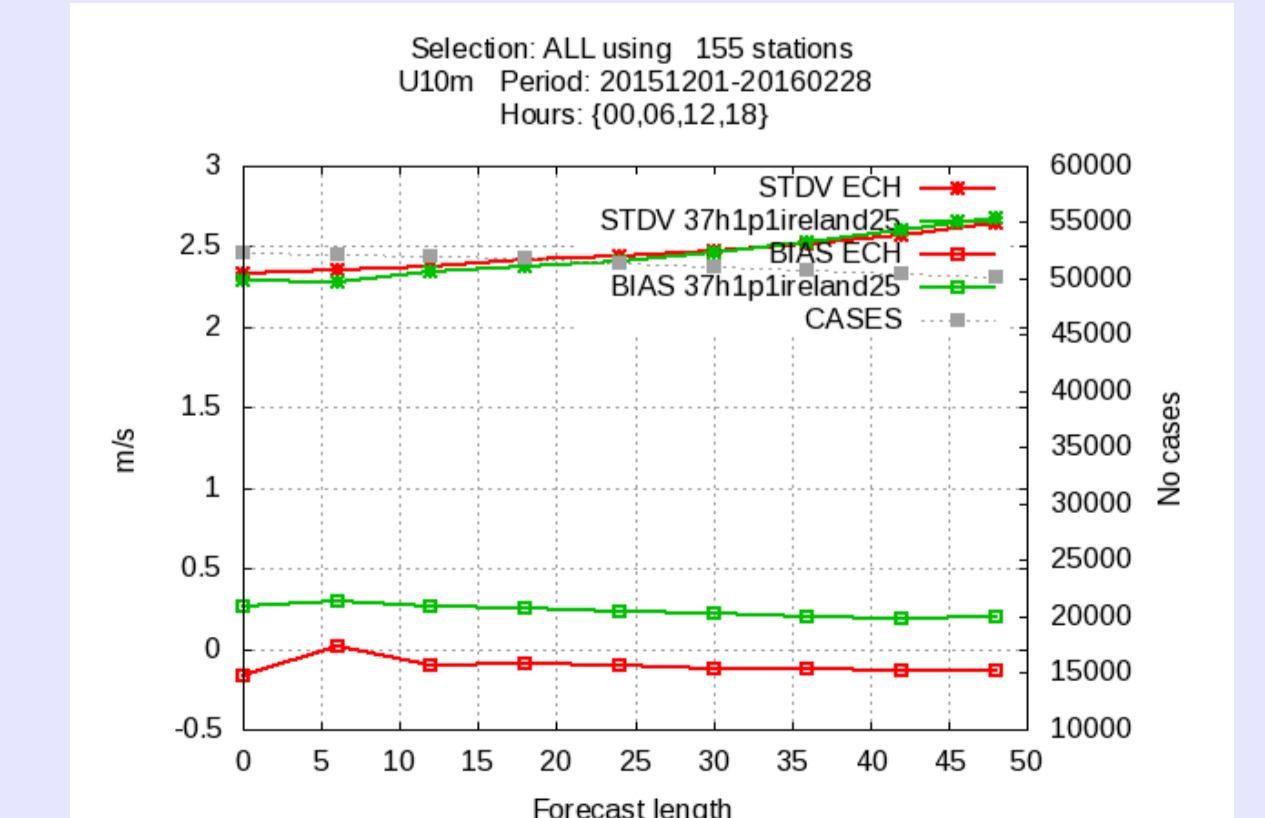
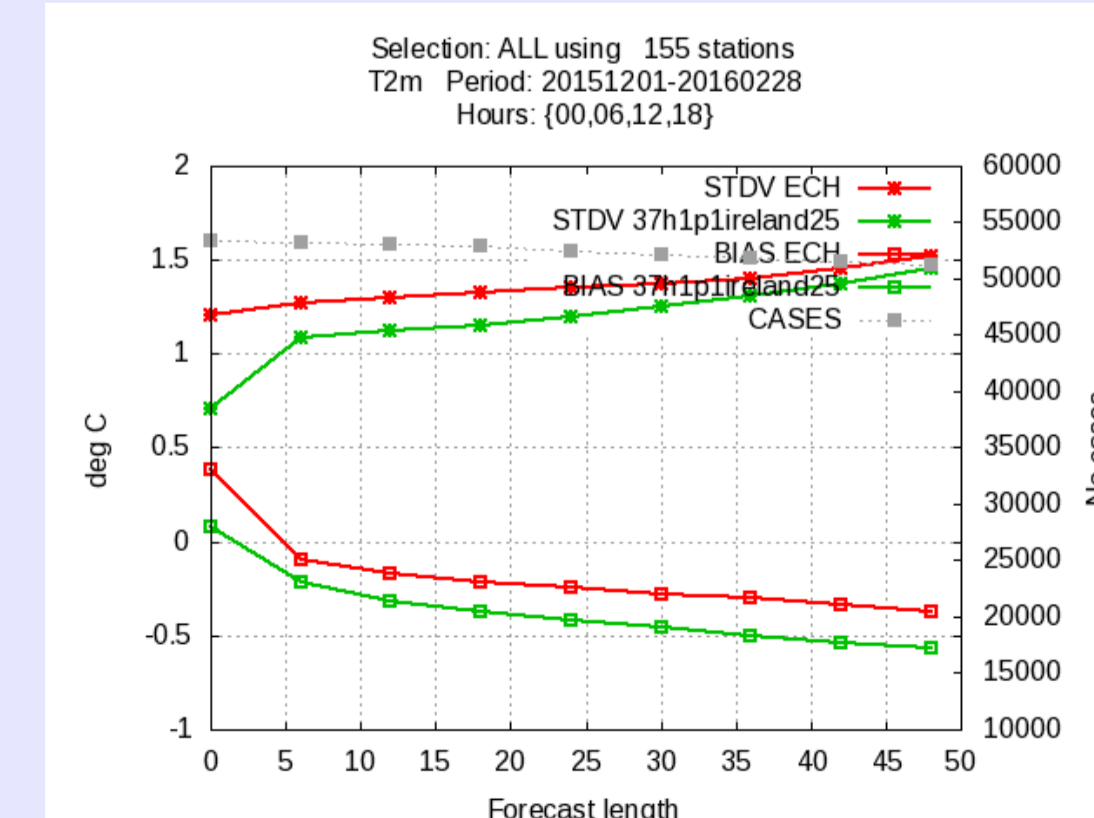
Code	HIRLAM-7.2 (METIE branch)
Domain	366x344 grid-points with 60 levels
Model top	10hPa
Grid spacing	0.07°
Cut-off	20 minutes
Observations	Conventional only
Data assimilation	3DVAR with Large-scale mixing
Forecast	9 hour forecasts every hour
Boundary conditions	HIRLAM I10

Operational Timeline

T+0:15	T+0:30	T+0:45	T+1:00	T+1:15	T+1:30	T+1:45	T+2:00	T+2:15	T+2:30	T+2:45	T+3:00	T+3:15	T+3:30	T+3:45	
		Harmonie													
						HIRLAM (LSMIX)	HIRLAM								
HIRLAM Hourly				HIRLAM Hourly				HIRLAM Hourly				HIRLAM Hourly			

Schematic of current operational suite showing HARMONIE (yellow) schedule as the schedule of both HIRLAM configuration (I10 in red and HH7 in blue)

Harmonie verification: winter 2015/2016



HARMONIE 37h1.1 continues to perform well operationally when compared with the IFS. Point verification of 2m temperature (left) and 10m winds (right) are shown for winter 2015/16 comparing HARMONIE (green) with IFS (red).

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Met Éireann use Irish Centre for High-End Computing (ICHEC) HPC resources for operational NWP. Details of the platforms used, fionn and indra, are summarised. In 2016 Met Éireann staff will be porting our NWP suite to run at ECMWF. A summary of our plans are included.

An e-suite of HARMONIE-38h1.2 is running in preparation for operational implementation before the summer. Details of the new suite and some scores are shown.

HPC Resources



The Irish Centre for High-End Computing (ICHEC), founded in 2005, is Ireland's national high performance computer centre. Met Éireann have used ICHEC HPC resources for operational NWP since 2007. Below is a summary of the two ICHEC platforms used by Met Éireann.

fionn:

- Thin component is an SGI ICE X system with Lustre filesystem
- 320 compute nodes with two Intel (Ivybridge) 12-core processors on each node
- 7680 cores and 20TB of RAM (Met Éireann uses 16 nodes plus login node)

indra:

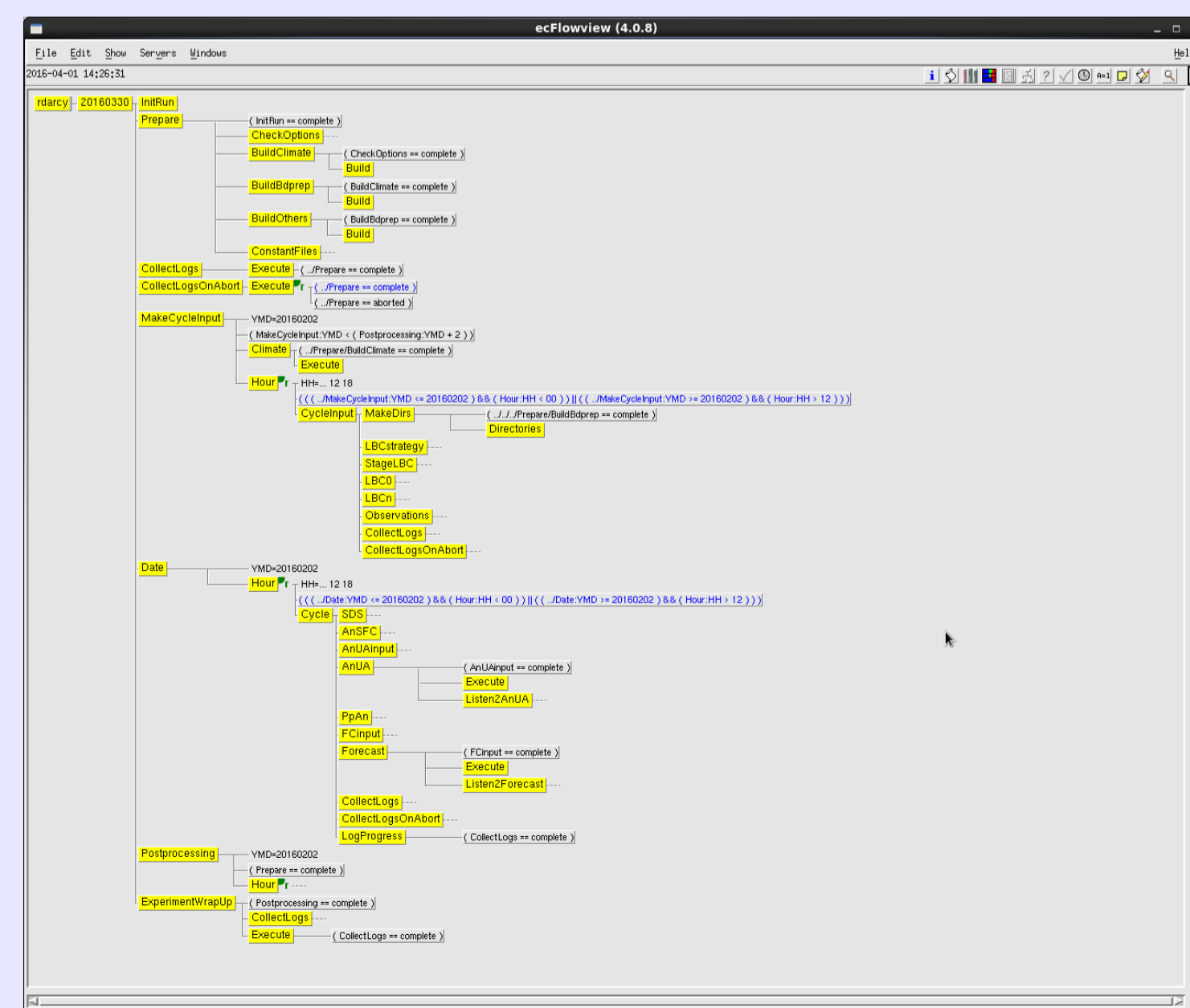
- SGI linux cluster with Panasas filesystem
- 16 compute nodes with two Intel (Ivybridge) 10-core processors on each node
- 320 cores and 32GB of RAM (Met Éireann uses 16 nodes plus login node)

HPC Plans

It has been decided to port Met Éireann's operational NWP suite to run at ECMWF. The following work will be carried out during 2016:

- Enable running of HIRLAM-7.2 under ecFlow
- Enable data flows for operational NWP (observations, LBCs & model output)
- Evaluate HIRLAM-7.2 running cca/ccb
- Enable running of HARMONIE-38h1.2 under ecFlow
- Evaluate HARMONIE-38h1.2 running on cca/ccb
- Confirm time-critical status of suites
- Switch off operational NWP at ICHEC

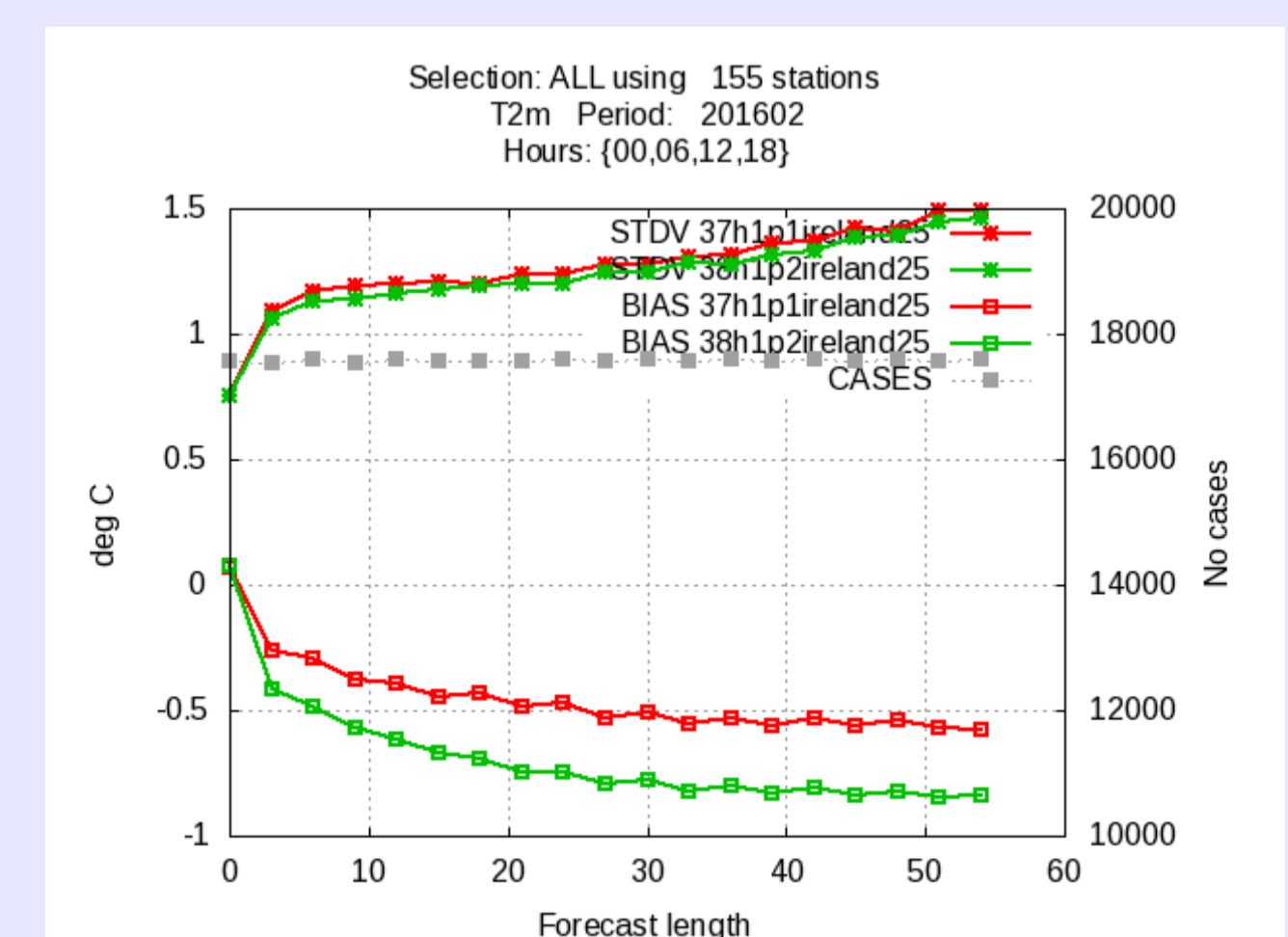
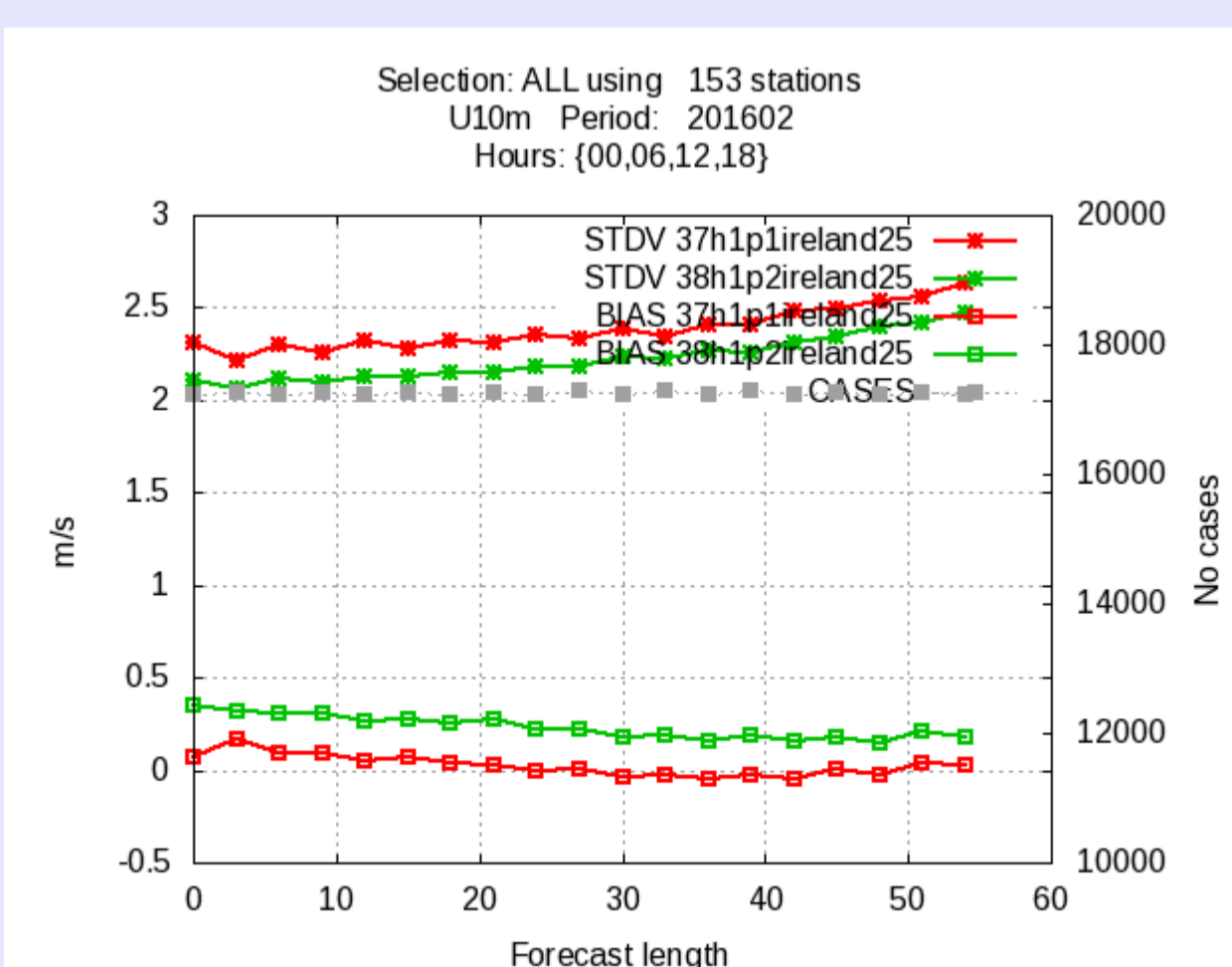
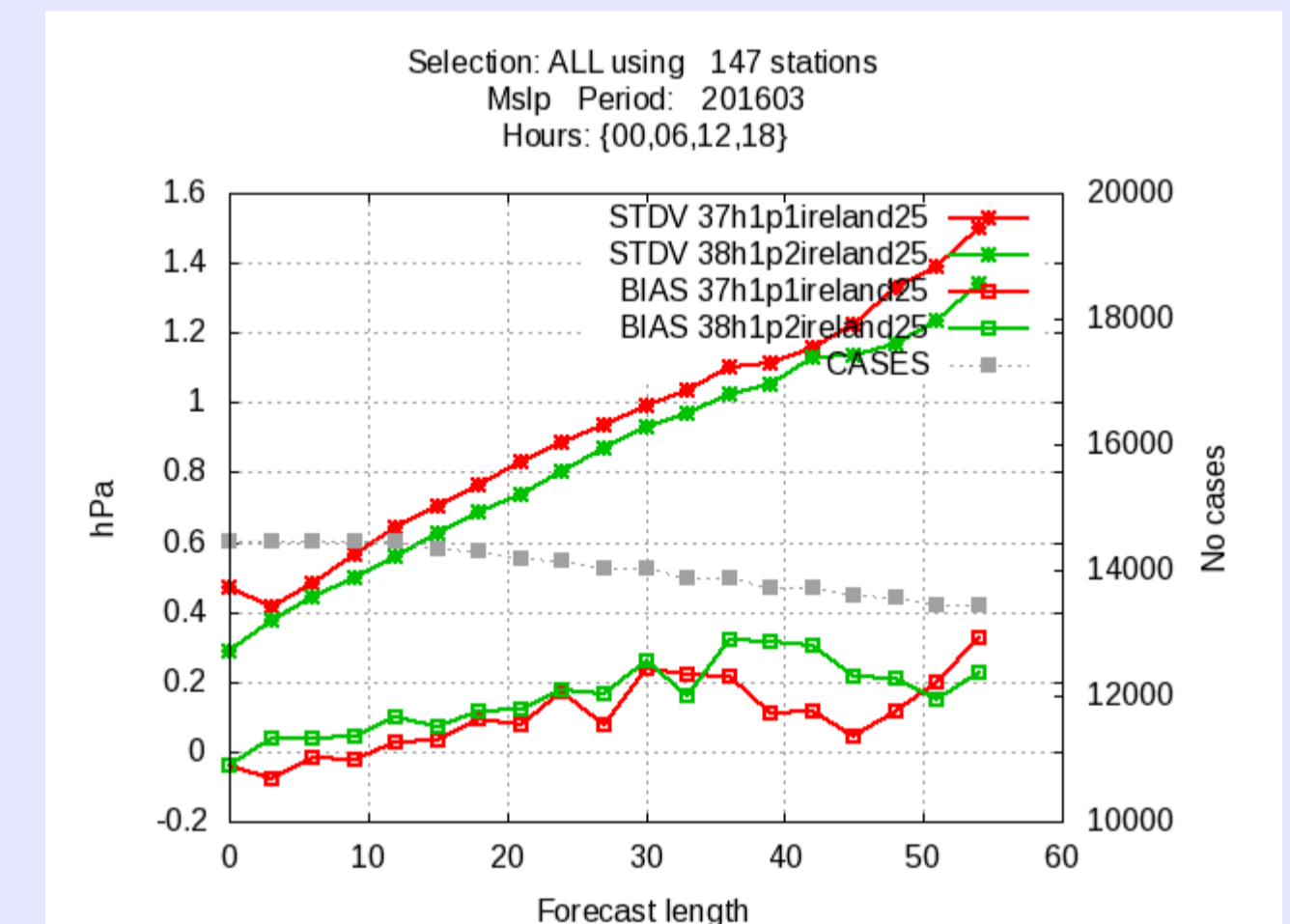
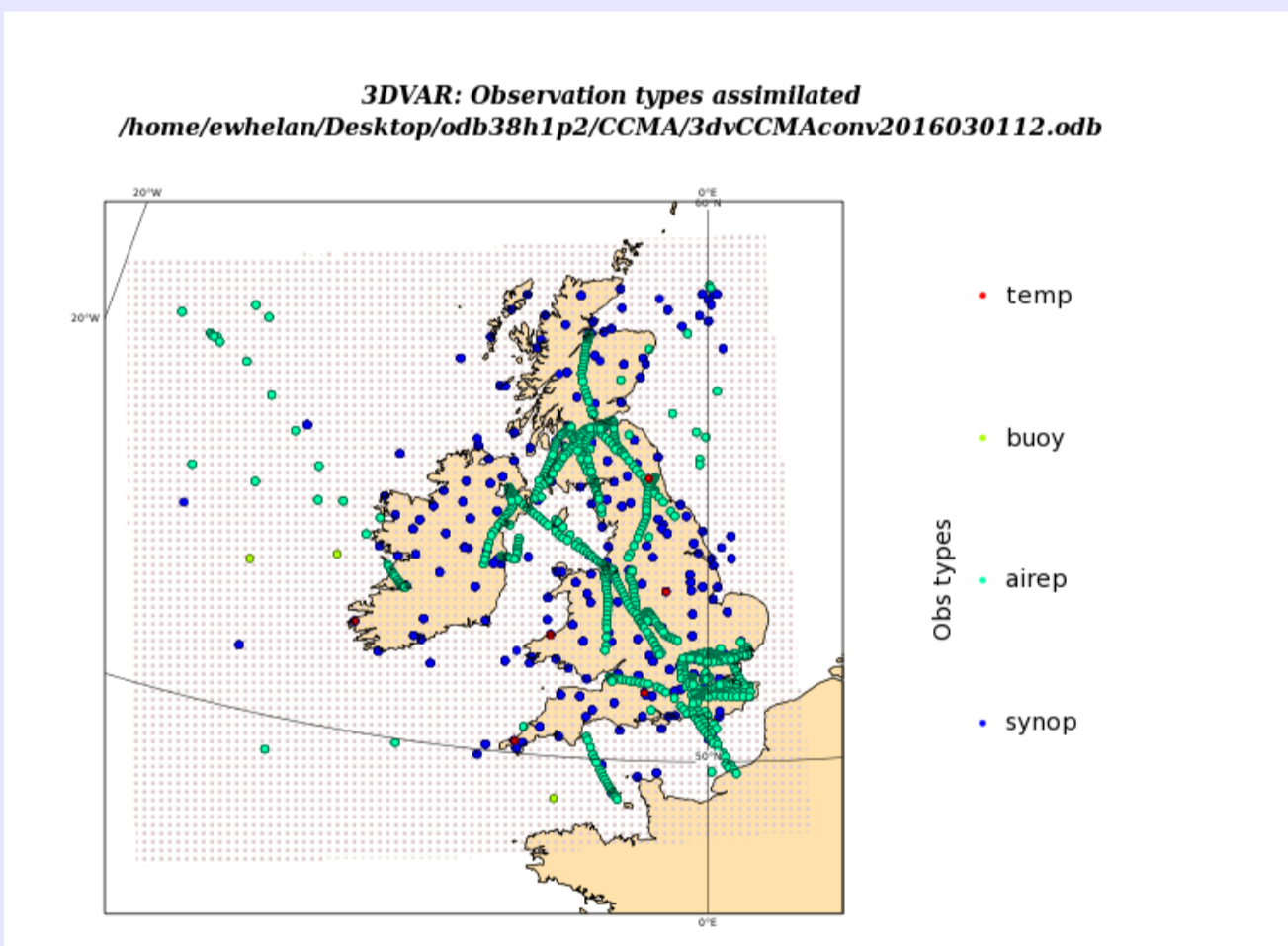
HIRLAM running under ecFlow
(Credit: Rónán Darcy)



HARMONIE – 38h1.2 e-suite

Code	HARMONIE-38h1.2 (METIE branch)
Domain	540x500 grid-points with 65 levels
Model top	10hPa
Grid spacing	2.5km
Cut-off	45 minutes
Observations	Conventional only
Data assimilation	3DVAR with “Blending” (3 hour cycle)
Forecast	54 hour forecasts at 00z, 03z, 06z, 09z, 12z, 15z, 18z & 21z
Configuration	Aladin-NH dynamics and AROME physics
Boundary conditions	IFS

HARMONIE – 38h1.2 e-suite



Plot of conventional observations assimilated in HARMONIE-38h1.2 (top-left). Point verification of MSLP (top-right), 2m temperature (bottom-left) and 10m wind speed (bottom-right) comparing performance of HARMONIE-37h1.1 and HARMONIE-38h1.2