HIRLAM-C plans for system

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Joint 26th ALADIN Workshop &
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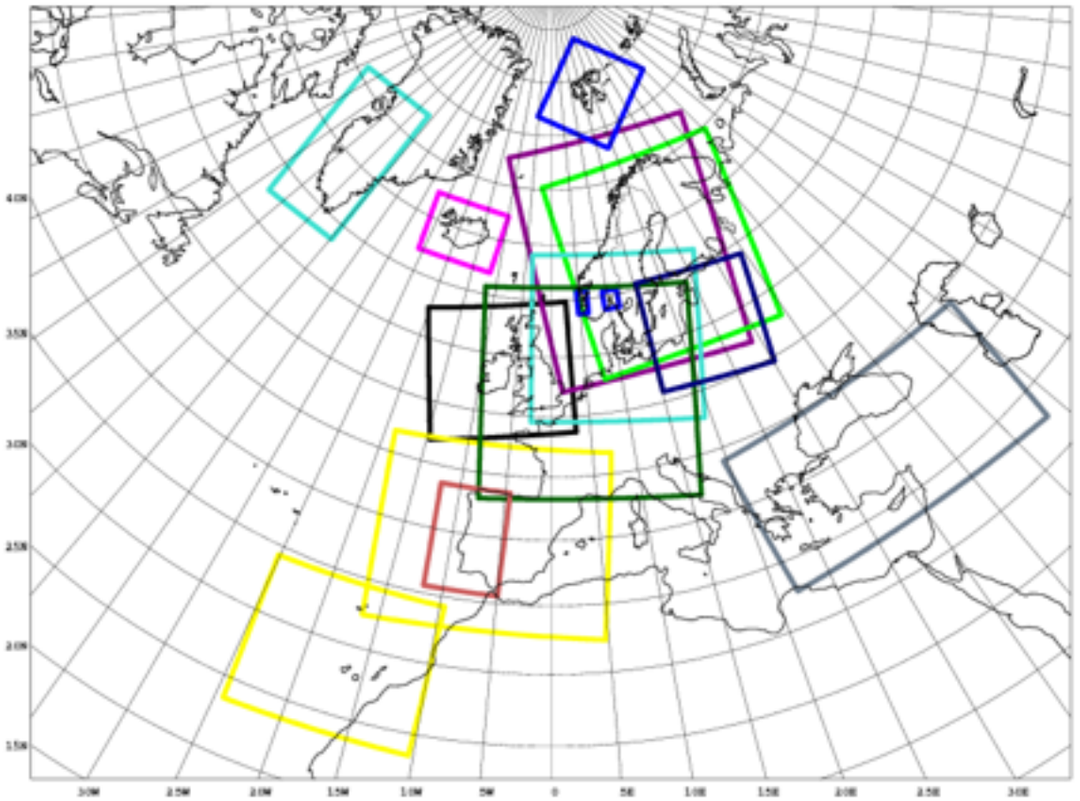
4-8th April 2016, Lisbon, Portugal

HARMONIE in HIRLAM services



Domain	Cycle	Grid	DA	forecast length/ cycle
AEMET	38h1.2	2.5 km 65 lev	3DVar + surf ana	48h/4times
DMI	38h1.2	2 km 65 lev	blending + surf ana	54h/4 times
FMI	38h1.2	2.5 km 65 lev	3DVAR + Surf ana	54h/8times
KNMI	36h1.4.bf1	2.5 km 60 lev	3DVAR + Surf ana	48h/8 times
LHMS	37h1.2	2.5 km 60 lev	blending + Surf ana	54h/4 times
MetEireann	37h1.1	2.5 km 65 lev	blending + Surf ana	54h/4 times
MetCoOp	38h1.2	2.5 km 65 lev	3DVAR + Surf ana	66h at 00,06,12,18, 3h at
VI-Iceland	38h1.2	2.5 km 65 lev	blending + Surf ana	48h/4 times

Cy38h1.2 3DVAR 2.5 km, 65 lev, 48-66h forecast

Model Releases

Harmonie-40h1.1.beta.5 tagged on 16th of November 2015.

Harmonie-40h1.1.beta.2 tagged on 24th of July 2015.

Harmonie-40h1.1.beta.1 tagged on 5th of June 2015.

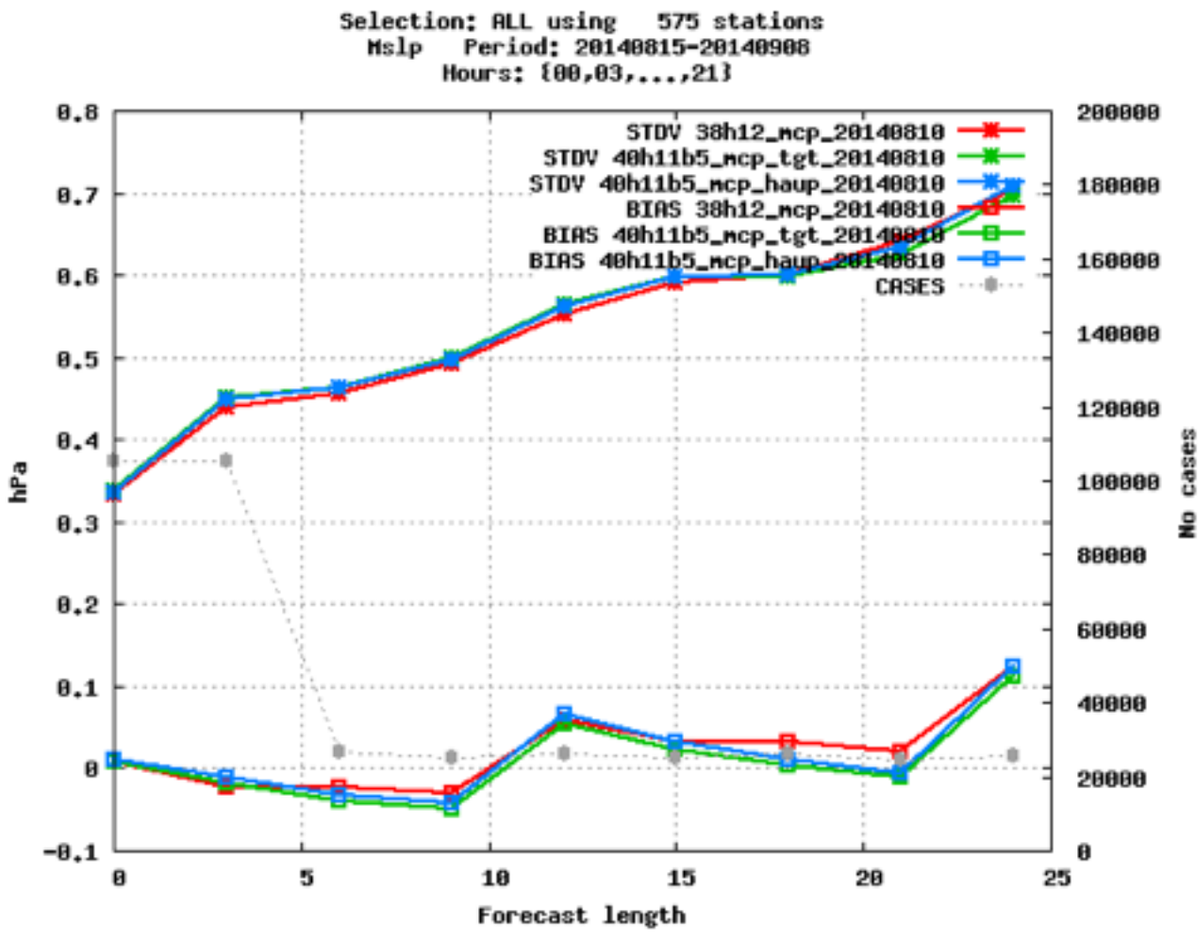
Major changes

- Upper air physics
  - **New physics/dynamics interface** CPTEND_FLEX
  - Introduction of **sub-grid precipitation in AROME**
  - Fixes and optimisation in **EDKF**
  - Fixes for hail, cloud sedimentation, coupling with 1D model
  - **ALARO1 physics** (ACRANEB2, TOUCANS, updated microphysics)
  - **Inohomogeneity factor in radiation** set to 1.0 and NRADIP=3 i.e. hexagonal crystals for definition of equivalent radius/diameter.
  - Preserve cloud fraction between forecasts for better pinup
  - **Shallow convection** (temperature dependent critical condensation level)
  - **HARATU turbulence scheme**

- Surface treatment
  - **SURFEX 7.3**:
    - New TEB
    - Optimisation in PREP
    - Surface perturbations in SURFEX
    - Parallelization of the OFFLINE driver
    - ISBA coupling with the TOPMODEL
    - Modifications for flake fluxes and 1D ocean model
    - CROCUS updates
  - Support for selection of fields in the SURFEX output.
  - Use of **PREP instead of gl+fullpos for generation of inital surfex conditions (SURFEX_PREP=yes**)
  - Simple sea ice model in SURFEX (**SICE**)
  - Support for usage of **GMTED2010 data.**

Model Releases

- Dynamics
  - **Flow-dependent SL interpolations**, COMAD option
  - **Vertical Finite Elements** code for NH/LAM+global
- Assimilation and observations
  - Fix for IO_METHOD=4 in ODB
  - **Enhanced observation monitoring**
  - Generation of **superobservations for radar**
  - Allow different **VARBC update frequency for GNSS data.**
  - Handling of **E-AMDAR in Oulan**
- Technical
  - Introduction of **FULLPOs 2**
  - **optimization of I/O**; re-write of LFI package in C; frame option for coupling data
  - **Optimization in "couplingsurf"** task in SURFEX (for restart)
  - Default usage of **ECFLOW as scheduler at ECMWF.**
  - **OpenMP optimization in verification extraction** (fldextr)



- Verification
  - Various **bug fixes**
  - Corrections for seasonal verification
- Diagnostics and postprocessing
  - **Fix** about the **post-processing** period of **wind gusts**
  - **GRIB table corrections**
- HarmonEPS
  - **Treatment of failing members**-
  - Control of **SLAF perturbations**
  - **Reduced output** in EPS mode

ECFLOW

- ecFlow is the **new default Harmonie scheduler**

- Suitable for

  - Climate runs
  - RE-analysis runs
  - Operational runs

- Easy to monitor several suites

- Faster graphical interface with enhanced features

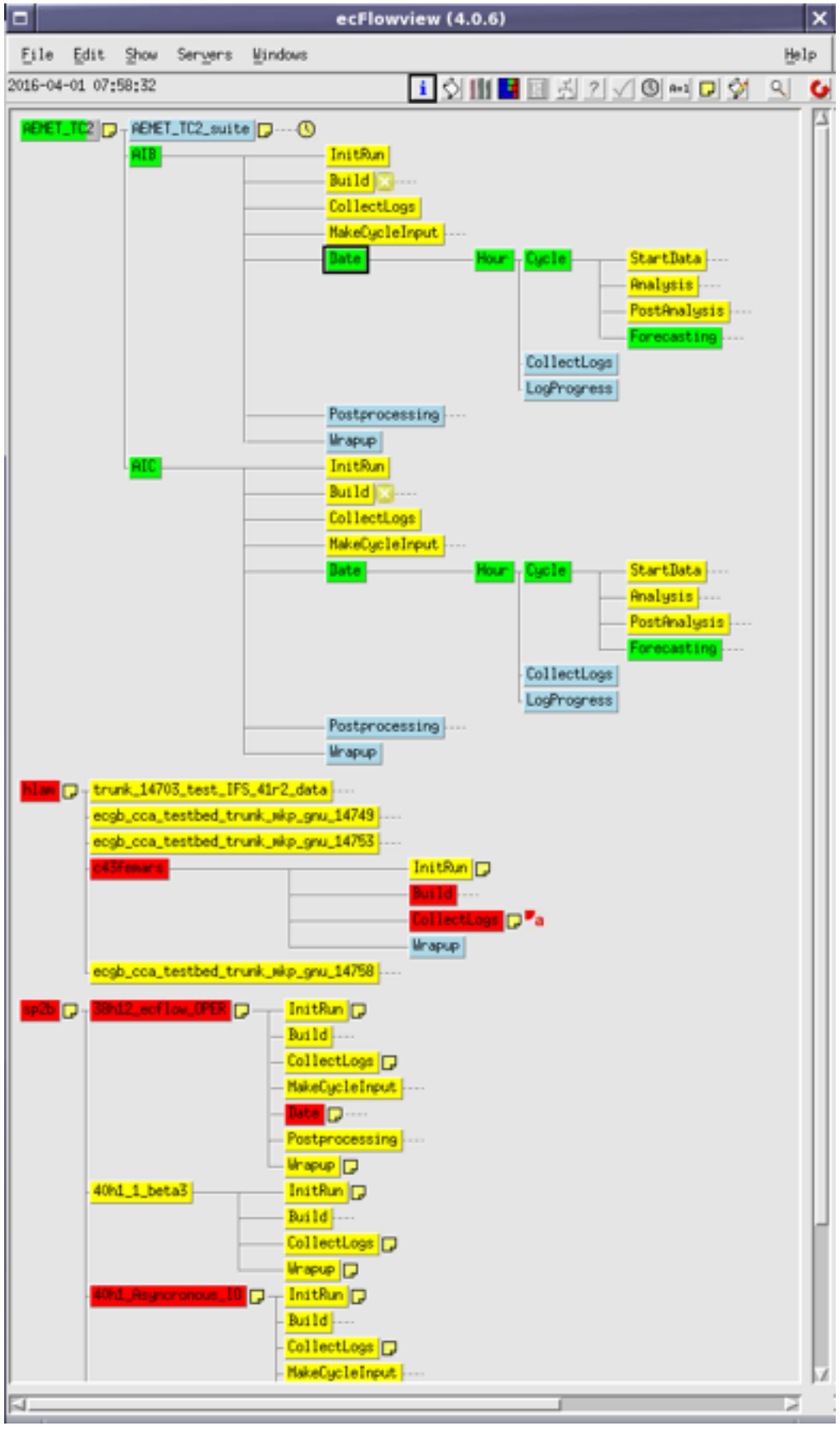
- mSMS will still be kept and supported

- Wiki documentation (must be upgraded)

https://hirlam.org/trac/wiki/HarmonieSystemDocumentation/ECFLOW

- Only tested at ECMWF

- Since **May 28th 2015 AEMET** is running **cy38h1.2** over Iberia and Canary Islands 48h Forecast 4 times a day using **ECFLOW and TC2 facility.**



Cy38h1.2 vs Cy40h1.1.beta.5

20160218:

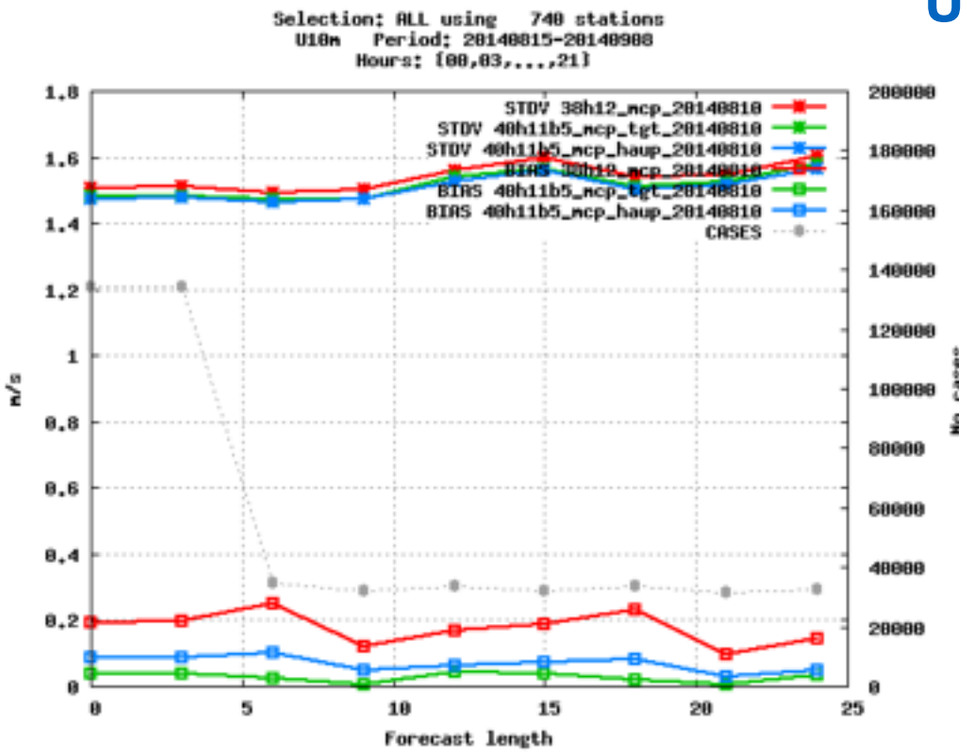
- validation test of **40h1** with **minimum and target scenarios for operational domains**
- **additional test** for main options on 1) **HARATU and updates**, 2) **cubic/quadratic/super linear grids**
- further tests on other options (radiation, cloud/microphysics schemes, ice scheme pi factors)

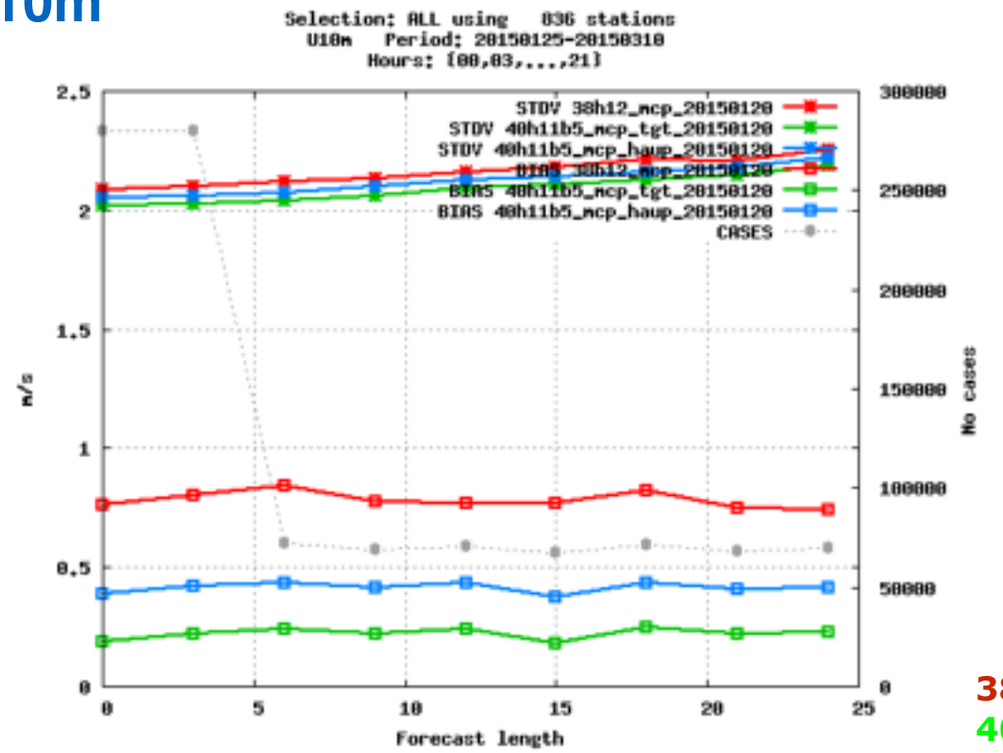
Institutes	model versions	"minimum", "targeted" configuration	upper air DA	gmted2010	cubic/quadratic/ super linear grid	haratu update test	additional options
HIRLAM-B	38h1 branch, 40h1 beta4, 40h1 beta5	minimum, target	3DVAR	gtopo30	cubic, linear		
DMI	38h1 branch, 40h1 beta 5	target	blending	gmted2010	cubic, quadratic, linear	yes	pi factors, auto rain conversion
MetCoOP	38h1.2, 40h1 beta5, 40h1-beta5-updHARATU-bf	minimum, target	3DVAR	gtopo30, gmted2010	cubic, quadratic, superlinear, linear	yes	ice scheme, llcrit, radiation, pi factor
AEMET	38h1.2, 40h1 beta5, 40h1-beta5-updHARATU-bf	minimum, target	3DVAR	gtopo30, gmted2010	cubic, linear	yes	
IMO	38h1.2, 40h1 beta5	minimum, target	blending	gtopo30			ocndt2
KNMI	40h1 beta5	target	3DVAR	gtopo30	linear	yes	
FMI	38h1.2, 40h1 beta5	target	3DVAR	gtopo30	linear	yes	llcrit
METIE	38h1.2, 40h1 beta5	minimum, target	3DVAR	gtopo30	linear		
!LHMS	38h1.2, 40h1 beta5	minimum, target		gtopo30	linear		

https://hirlam.org/trac/wiki/Harmonie_40h1/ValidationTests

Cy38h1.2 vs Cy40h1.1.beta.5

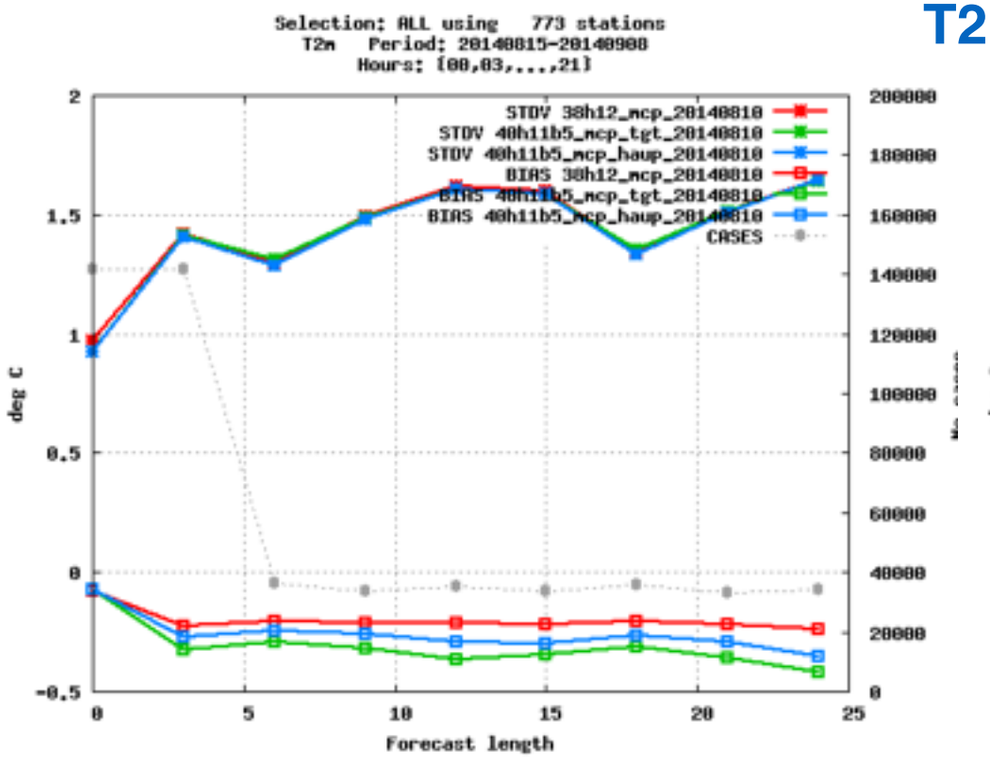
U10m

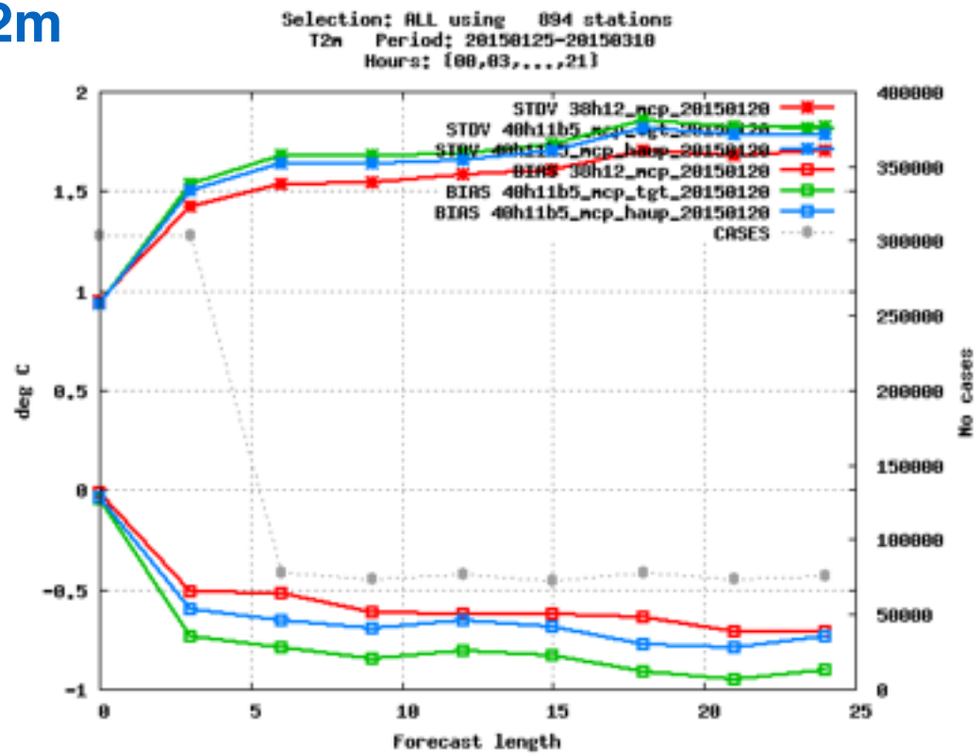




38h1.2 ref
40h11 target
40h11 target + HARATU tuning

T2m



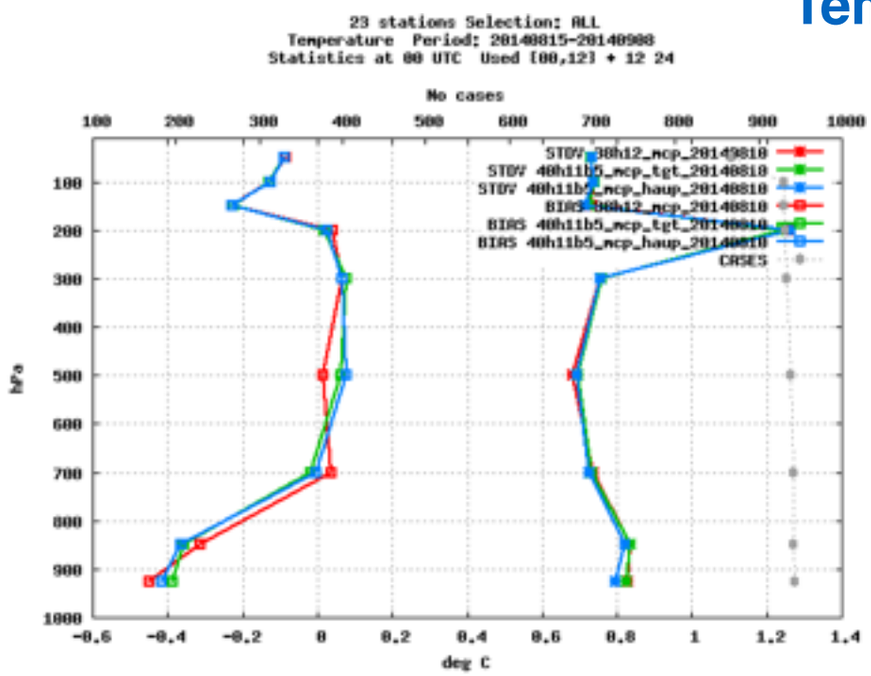


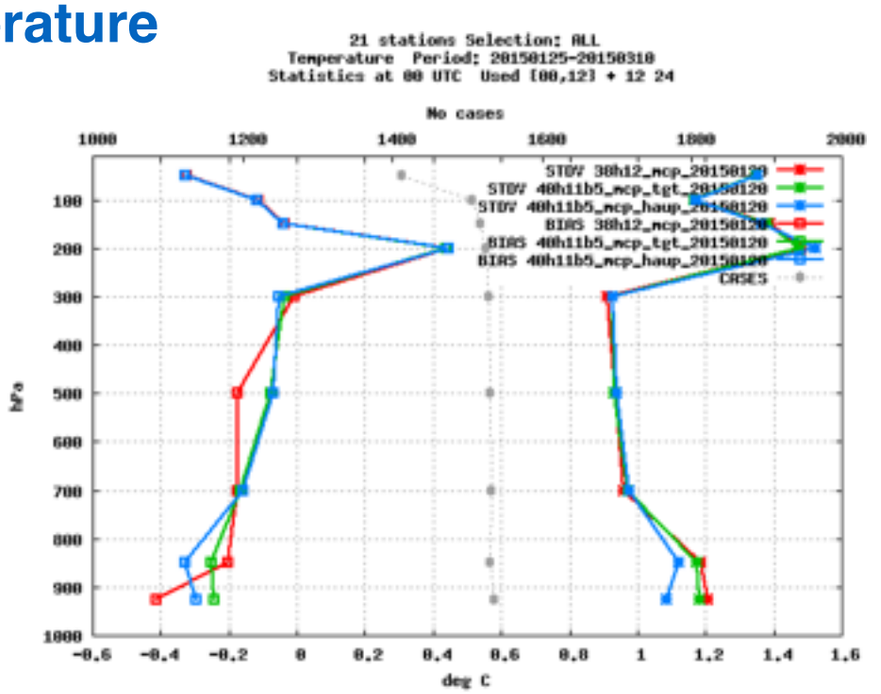
NLWLIQOPT=2
NSWLIQOPT=3
NLWICEOPT=3
NSWICEOPT=3
NRADIP=3
NRADLP=2
NINHOM=0
LHARATU=T
TOPO_SOURCE=gtopo30,
LLCRIT=T
TSTEP=75s

Summer **Winter**

Cy38h1.2 vs Cy40h1.1.beta.5

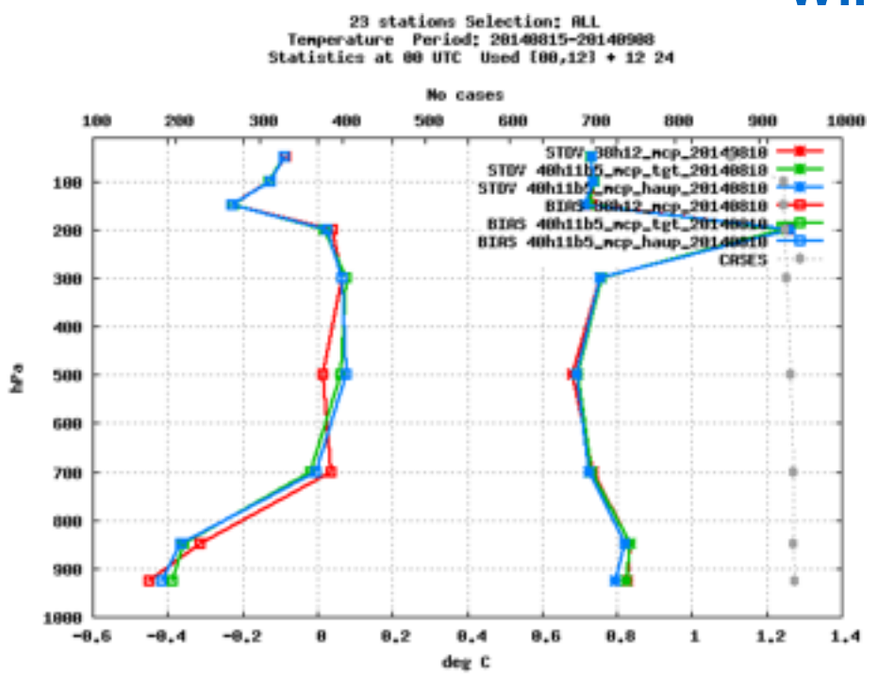
Temperature

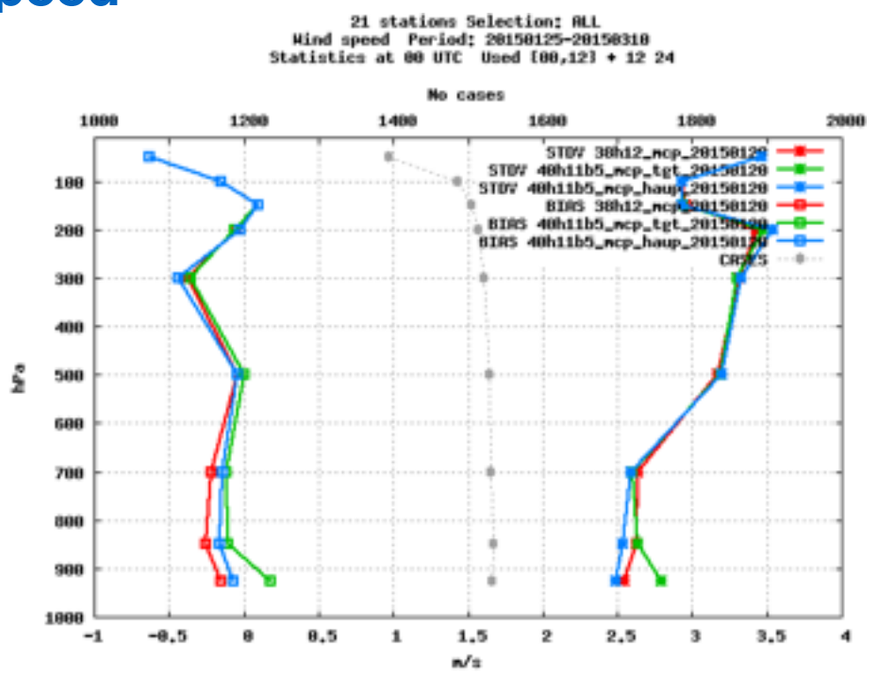




38h1.2 ref
40h11 target
40h11 target + HARATU tuning

Wind Speed





NLWLIQOPT=2
NSWLIQOPT=3
NLWICEOPT=3
NSWICEOPT=3
NRADIP=3
NRADLP=2
NINHOM=0
LHARATU=T
TOPO_SOURCE=gtopo30,
LLCRIT=T
TSTEP=75s

Summer **Winter**

Model Releases

New 40h1.1.beta5 tests

2016023:

- Recently an **error in microphysics was discovered in METCoOp (Karl Ivar).**

- **Preliminary testing** of CY40 including the **bugfix** gives **promising results.**

- A **negative temperature bias in most CY40 tests**, mainly in winter season, will presumably **be much reduced or eliminated** when implementing the bugfix.

- Due to some uncertainty regarding **impact of radiation updates** a test will be added with namelist updates for radiation switched off.

- The related **new two targets** may be briefly summarized as follows:

1) NEW TARGET = cycle 40h1.beta5 + haratu update + KI bugfix
2) NEW TARGET minus the radiation changes that entered in cycle 40h1.beta5

RCR

- The aim of **HARMONIE RCR (Regular Cycle with the Reference)** is to **shorten the way between research and operations**

- Call for new RCR centres for every QA cycle

- First call was for **cy38h1**
- Second call for **cy40h1** and the new set of tests
- **DMI, AEMET and MetCoOp**

Cy41h1.1 will be released on April - May 2016

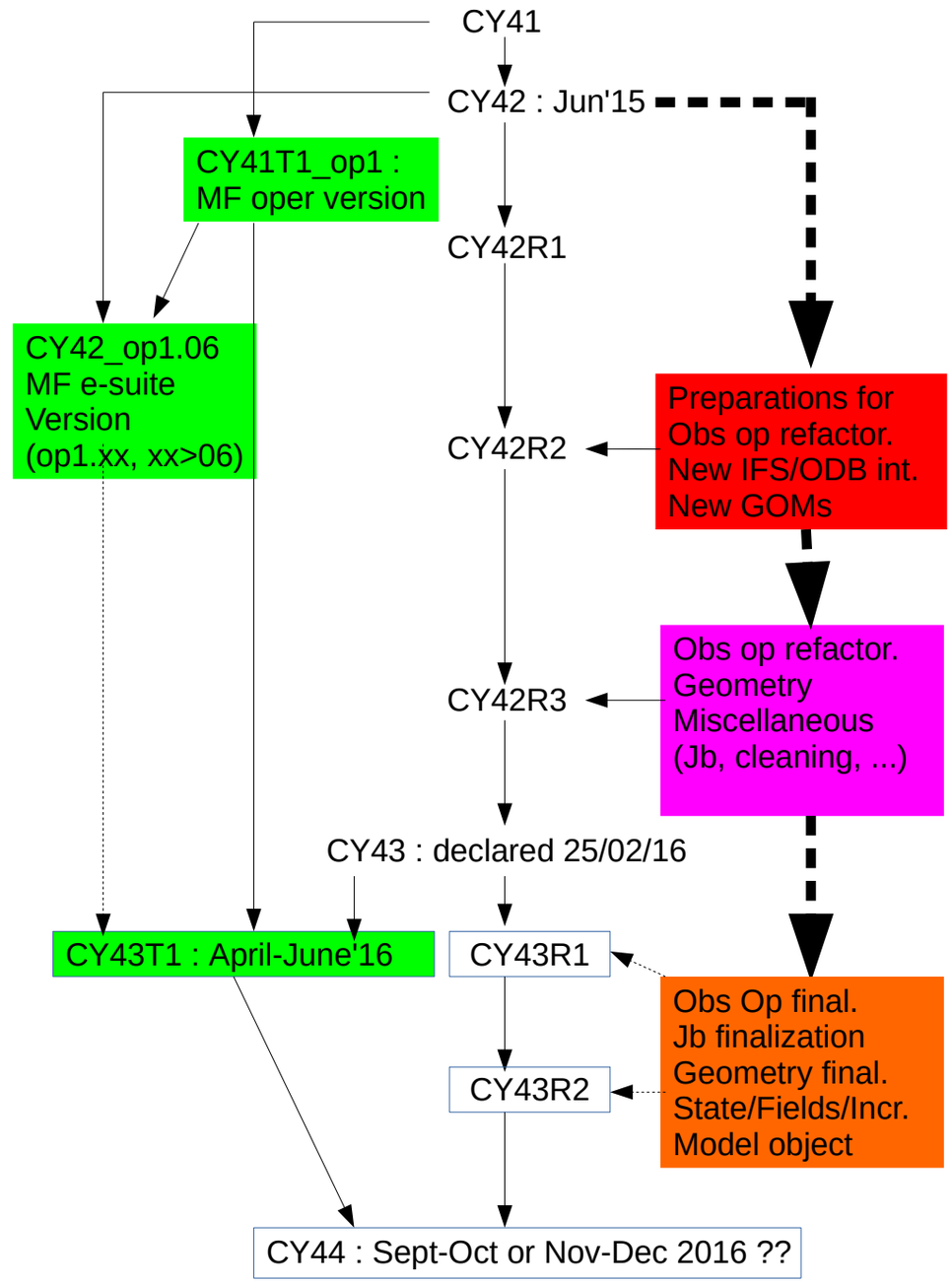
FUTURE CYCLES

ECMWF/MF	MF	HIRLAM	Declaration
CY43			February 2016
		40h1.1	April-May 2016
	CY43T1		April-June 2016
CY44			Sept-Oct 2016
		42h1	2016

- **Large structural changes expected in CY42/CY43**
- **No Harmonie-41h1 planed**

Phasing

- We are involve on **cy43t1 phasing**
- **Niko Sokka** HIRLAM Cycle Master and **Toone Moene** will be active part on MF cycling
- Potential HIRLAM contributions **https://hirlam.org/trac/wiki/Phasing/cy43t1**
- **The scientific discussion is still open, please any feedback is welcomed.**



Courtesy of Claude Fischer

On going system tasks

- **Bottlenecks** (scalability, IO, EPS,…)

- Department of Earth Sciences Barcelona Supercomputing **(BSC-CNS)** is analyzing IFS and Harmonie code trying to increase the computer performance.

- **ESCAPE project** (Towards Energy-efficient Scalable Algorithms for Weather and Climate Prediction www.hpc-escape.eu) **Bent H. Sass** is a Project member.

- **Ulf Andrae** implemented for MetCoOP grib conversion with gl so that it reads the distributed IO-server FA files directly. Full FA files (like for the fullpos or surfex files) are not created if they aren´t needed for other purposes (like first guess or so).

- **Reproducibility of CY40T1 MF-AROME in harmonie-40h1**

- **Niko Sokka** discovered that the differences could be due to the upper air physics and my main first suspect was the radiation part. **Laura Rontu** suggest the differences can be explained with the evident differences between radiation codes.

On going system tasks

- **Memory leak on HCLIM38h1.2**

- Bert van Ulf after debugging he discovered quite a number of problems in the code, most of them related to **surfex and/or arome**. After fixing these problems the memory no longer increases during a run. Some problems appear after fixes under investigation.

- **SICE integration in SURFEX 8**

- **Yurii Batrak** suggested two possible strategies of new scheme implementation

- **SVN /GIT merge**

- Kai Sattler is close to a final solution this will facilitate collaboration and phasing

- **Post-processing and verification**:

- HARP will be tagged v1.2 and v2.0, after including (basic) quality control of observations.

- **WEB page**

- Eoin Whelan worked on **WIKI** and documentation during the last WW
- **New mailing lists** have been defined but it is not possible to link directly with forum in the current version

Future System tasks

- **Cleaning the system** at scripting level (python, ecFlow, …)
- **Python community and C++ experts**
- **Simplify for research** (research.tdf, step-by-step.tdf, compilation)
- **Training courses:**

  - Post-processing and Verification (2016)
  - Data Assimilation (2017)

- **Students/users feedback:**

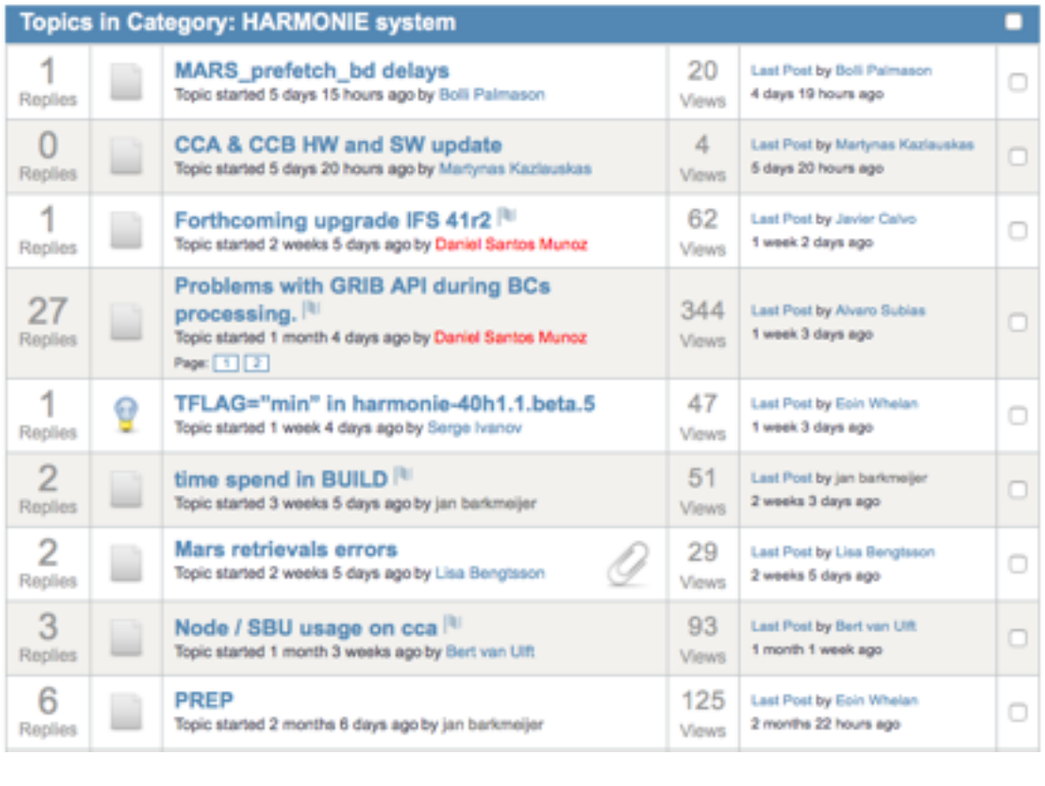
  - https://hirlam.org/trac/wiki/HarmonieClimate/TechnicalImprovements
  - Forecasters QC

- Improve knowledge of **HARMONIE climate and MUSC**
- **Common Working Weeks** (EPS, Surface, DA, Physics … and Aladin consortium)

Communication

- Increase an facilitate de **information exchange** en the community:

FORUM & mailing lists



- **Improve documentation**

- Please, report any missing link or doc in Wiki

- PDF documentation

Thank you
Obrigado
Gracias

Everyone is part of our team.
All your contributions make grow a better system !!!