Operational HIRLAM NWP
&
Status of the Reference Systems

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Operational Hirlam and Real Time HARMONIE
Status Review

- Highlights on operational activities
  - Configurations for deterministic suites
  - Quality & trends
- Real time HARMONIE suites

Acknowledgement

- *E. G. Marco, AEMET*
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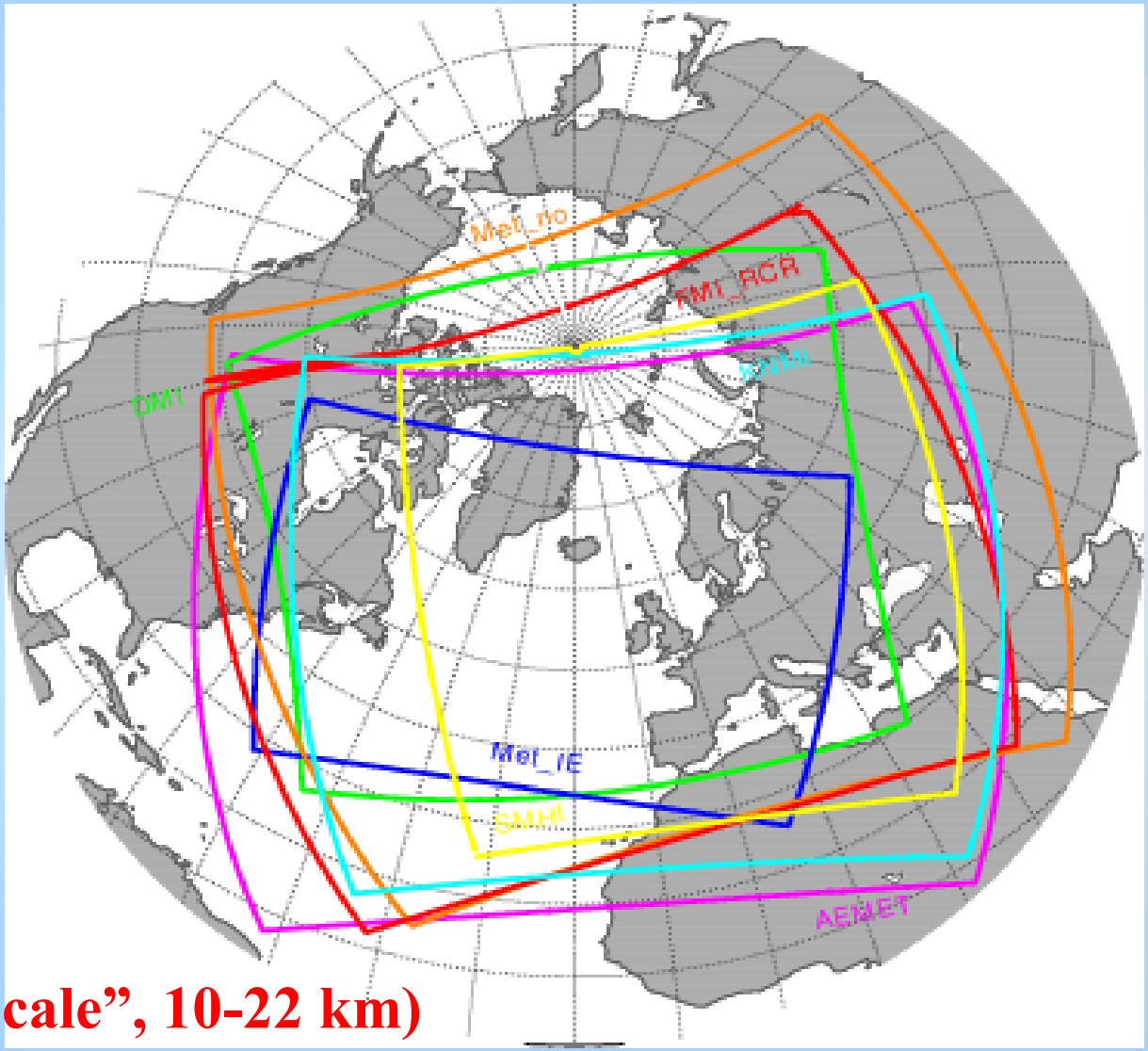
- *E. Whelan, MetEireann*
- *O. Vignes, Met.no*
- *L. Meuller, SMHI*
- *… …*

Information about operational suites may need correction

Hirlam Operational Domains



(“Atlantic scale”, 10-22 km)

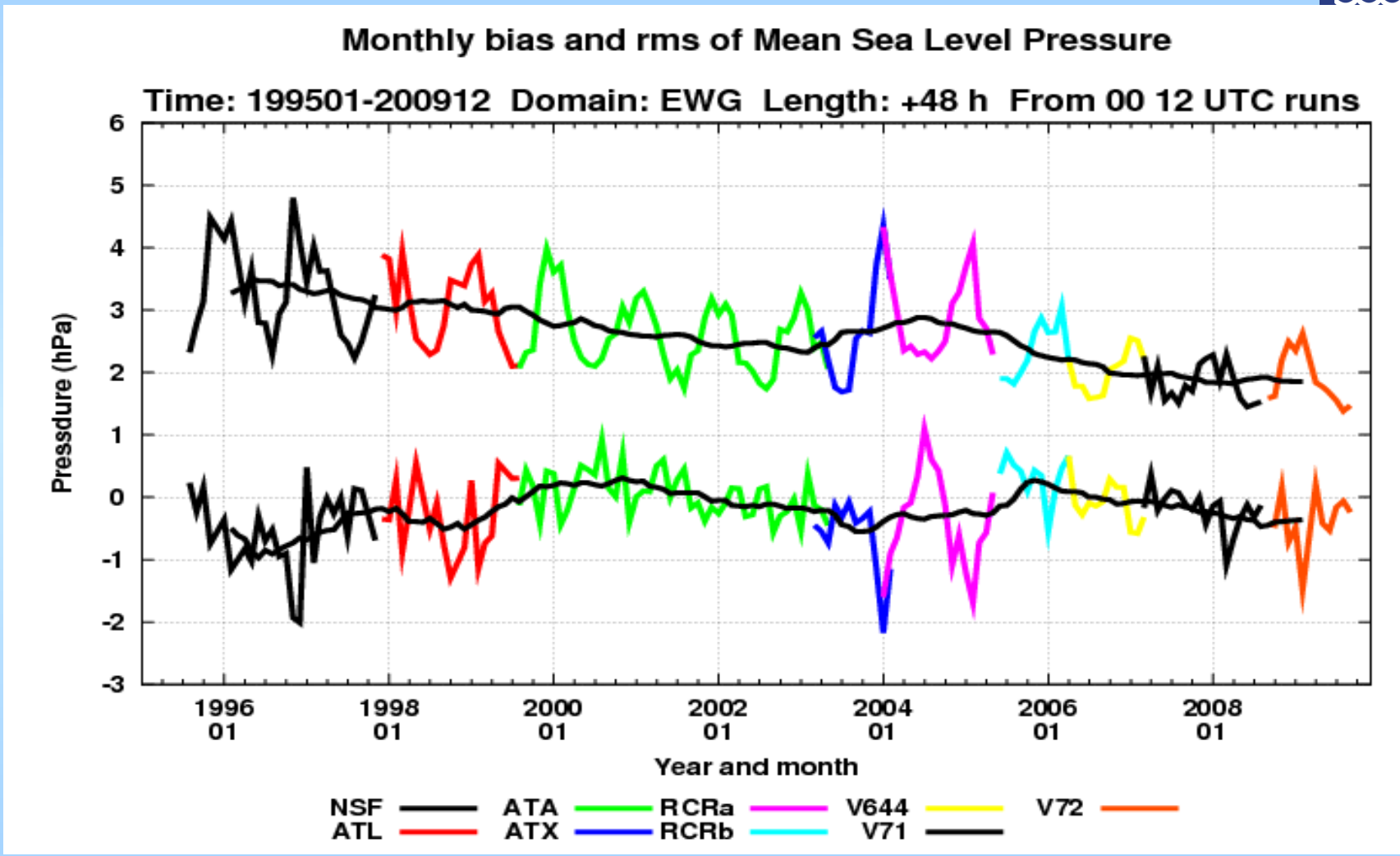
Operational Hirlam 2010

	Model version	Grid-mesh	Resolution	Level	DA
AEMET-ONR	7.2.1	582x424	0.16d	40	LSMIX
DMI-M09	6.2/7.3	730x746	0.09d	40	LSMIX
EMHI_ETA	7.1.2	366x280	0.10d	60	No
FMI-RCR	7.2.1	582x448	0.15d	60	4DVAR LSMIX
KNMI-CIS	7.2.1	726x550	0.10d	60	LSMIX
LHMS-HL8	7.1.5	186x186	0.08d	60	No
METIE-I10	7.2.1	654x424	0.10d	60	4DVAR, LSMIX
METNO-H12	7.1.4	864x698	0.108d	60	LSMIX
SMHI-C22	7.1.2	306x306	0.20d	40	4DVAR, LSMIX

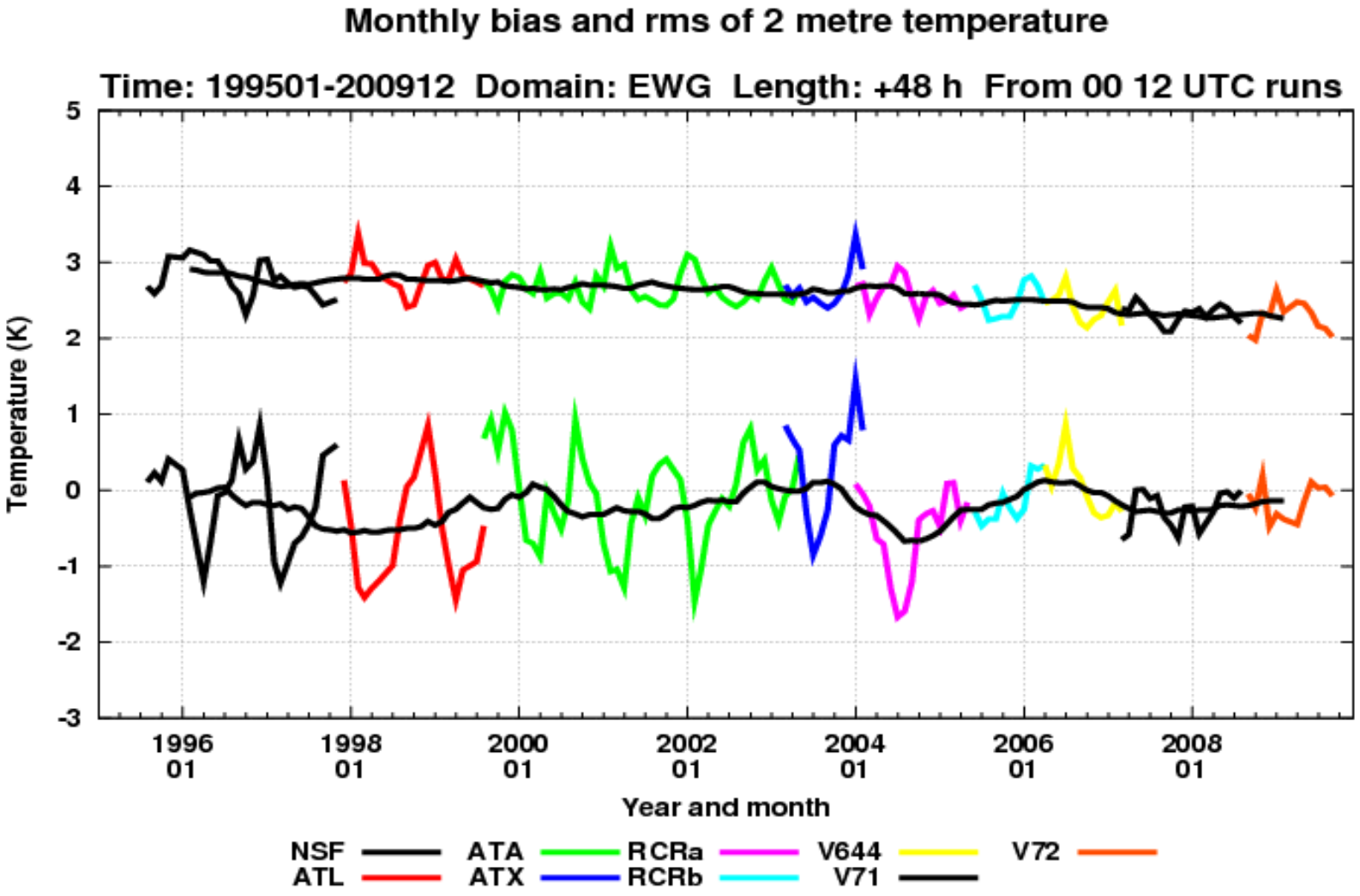
Operational Hirlam: upgrade plan 2010

	Model version	Grid-mesh	Resolution	Level	4DVAR/ LSMIX
AEMET-ONR	7.2.1	582x424	0.16d	40	LSMIX
DMI-M09	7.3	730x746	0.09d	65	4DVAR, LSMIX
EMHI_ETA	7.1.2	366x280	0.10d	60	No
FMI-RCR RCR_7.4	7.3 7.4	582x448	0.15d 0.075d	60 65	4DVAR LSMIX?
KNMI-D11	7.2.1	726x550	0.10d	60	LSMIX
LHMS-HL8	7.2	?	0.08d	60	No
METIE-I10	7.2.1	654x424	0.10d	60	4DVAR, LSMIX
METNO-N12	7.3	864x698	0.108d	60	4DVAR, LSMIX
SMHI-C11	7.3	606x606	0.10d	60	4DVAR, LSMIX

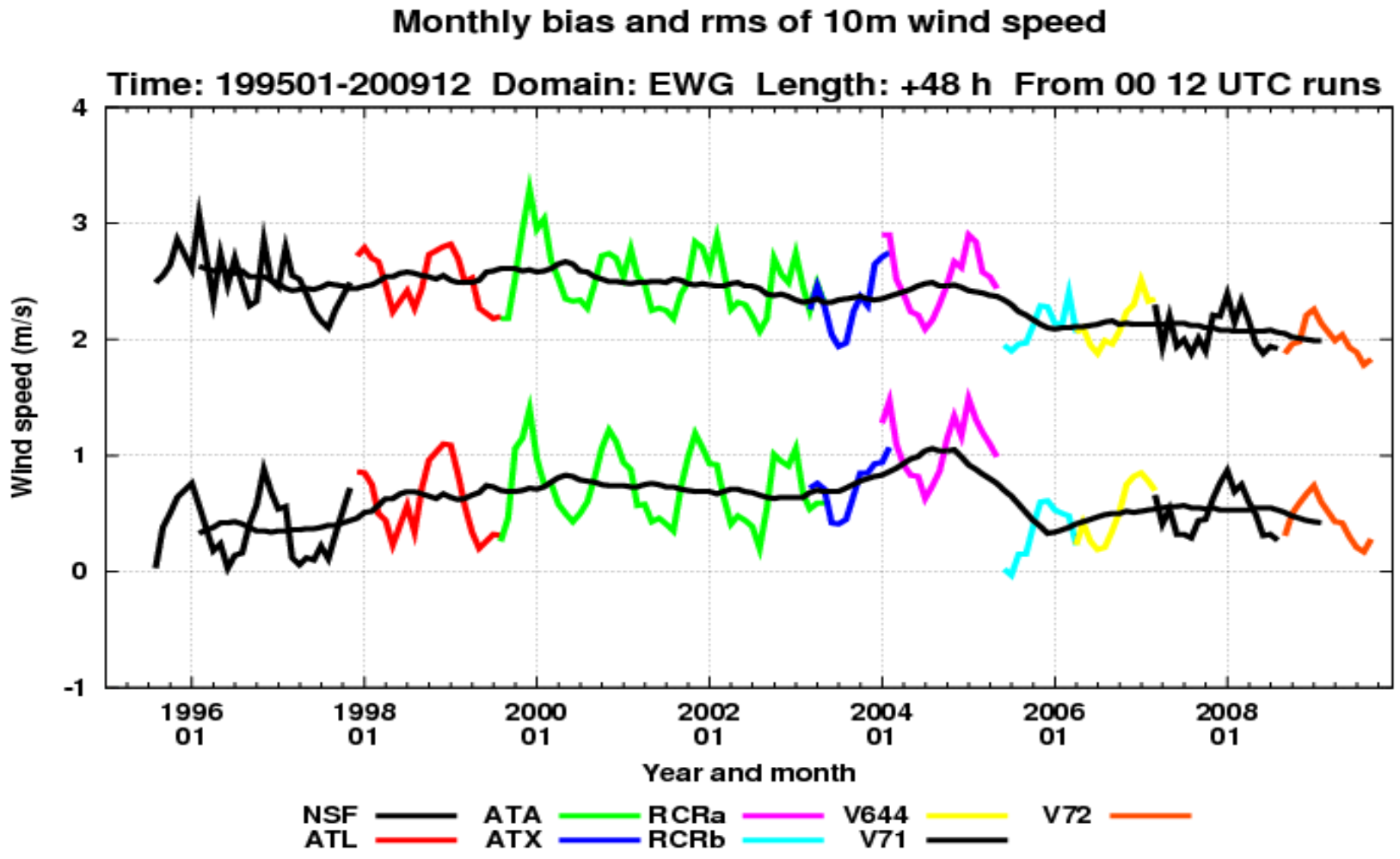
Forecast Quality: PMSL



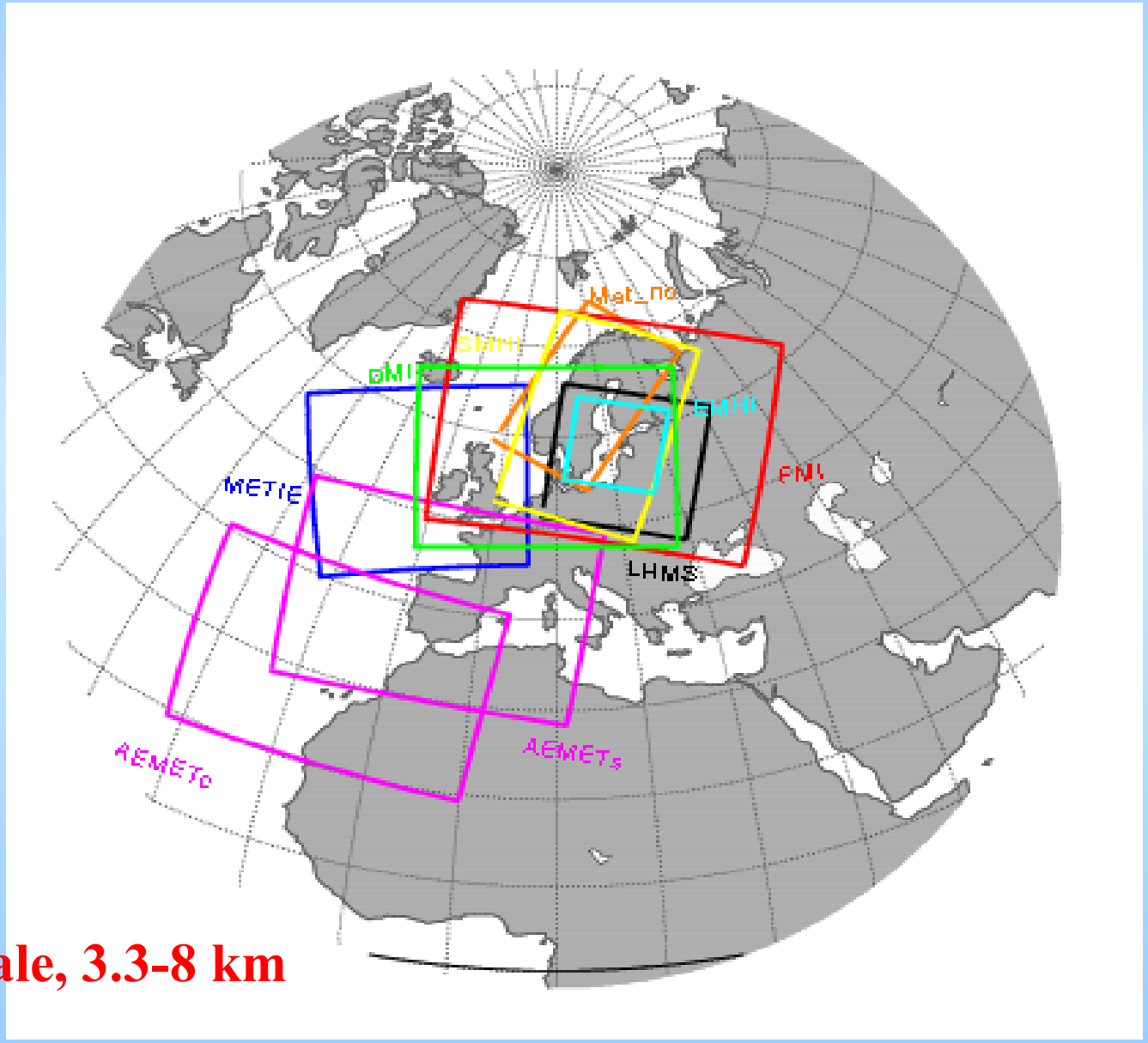
Forecast Quality: T2m



Forecast Quality (W10m)



Hirlam Fine Resolution Domains



Fine scale, 3.3-8 km

Operational Hirlam 2010: Fine Resolution

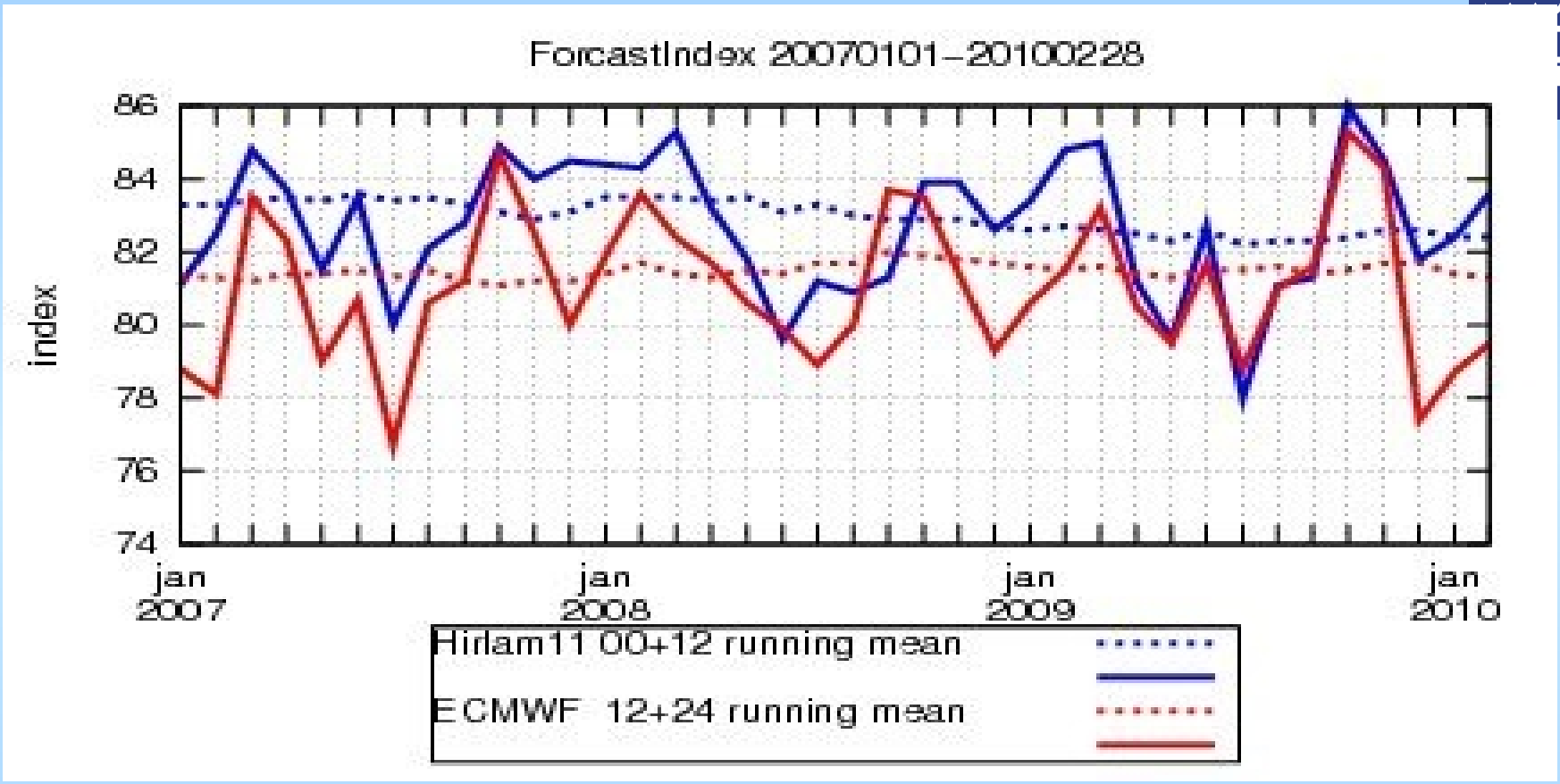
	Model version	Grid-mesh	Resolution	Level
AEMET-HNR	7.2.1	606x430	0.05d	40
AEMET-CNN	7.2.1	606x430	0.05d	40
DMI-K05	6.3+?	658x498	0.05d	40
DMI-S03	6.3+?	874x658	0.03d	40
EMHI_ETB	7.1.2	306x306	0.03d	60
FMI-MB71	7.1.4	482x360	0.068d	60
METIE-FIN	7.2.1	438x395	0.05d	60
METNO-N04	7.1.2	300x500	0.036d	60
SMHI-G05	7.1.2	294x441	0.05d	60

HIRLAM at 3-5 km resolution

- Several services run 3-5 km HIRLAM
  - DMI 0.03 d for Denmark; 0.05 d for Greenland
  - EMHI 0.03d
  - Met.no 4 km for Norway
  - 0.05d model at SMHI, AEMET, KNMI, MetEireann
- Generally reliable
- Quite popular at duty forecasters
  - W10m, T2m
  - Even precipitation, supplementary to coarser resolution
- Forecast length is increasing (2 day +)
- Increasingly ”official” at some services
  - Gridded forecasts, uncorrected

… May stay as alternative and benchmark to HARMONIE for a few more years to come

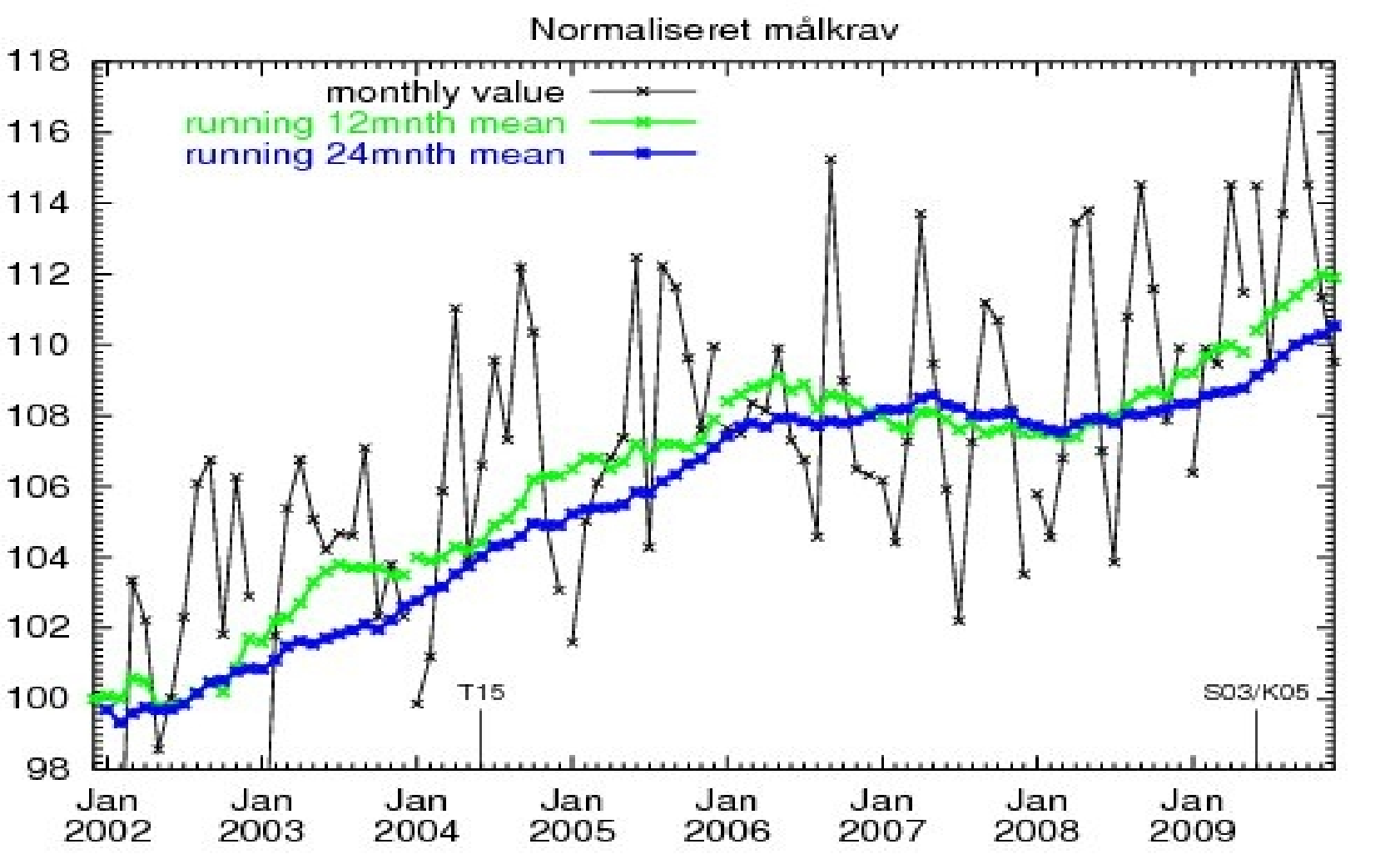
SMHI NWP Performance Indicator



- Forecast Index:
  - Hit-rate for T2m and 10m ; Kuipers index for cloud and rain

L. Meuller (SMHI)

DMI's NWP Performance Indicator



B. Amstrup (DMI)

Status of the
Reference Systems

- HIRLAM
- HARMONIE

Reference HIRLAM: toward 7.3

- 7.3alpha, tagged in Dec 19 2008
  - Multi-inner loop, multi-incremental 4DVAR and cleaning; Extended AMSU-A + AMSU-B + AMV + Seawind; RK-eta; System overhaul
- 7.3beta1, tagged in April 17 2009
  - (... , Newsnow, FMI?)
- 7.3beta2, tagged in Jan 8 2010
  - Newsnow, mso-sso
- 7.3beta3 tagged in April 2010
  - KF-eta, corrections
- 7.3 end of May 2010?
  - 7.3rc1 April 23 2010?
- 7.4 Dec 2010?
  - 0.075d, 65 levels?
  - Flake, newsnow tuning , orographic radiation,Jk...??

Challenges with an official release…

- 4DVAR minimisation problems
- Physics problems?
  - Mslp score, upper air bias
- Deficiencies (?) in statistics related to observation usage
  - Statistics update; Noaa-19/metop-2; Negative impact of AMVPOL and AMVGEO
- Reproducibility issues
- Reference platform problem
  - Bufr edition-4 adaptation; Mars problems (OB, LBC); server change
- Ice analysis problems
  - Lake problems (Finland, Estonia, Russia, ... Norway)
  - Interface inconsistancy with OSI-SAF
- Snow problems
  - flip-flop; too little over Norway; too much over other places (Denmark, Netherlands); Snow over Sahara

Status of the
Reference Systems

- HIRLAM
- HARMONIE

Real Time/Coming Harmonie Suites

Domain	Cycle	Grid-mesh	DX	Dynamics	DA	Physics
AEMET-Mediterranean	35h1	384x400x40	11	Hydrostatic	3dv+canari	ALADIN
AEMET-Iberia	35h1	300x300x40	2.5	NonHydrostatic		AROME
DMI-Scandinavia	35h1	256x288x40	11	Hydrostatic	3dv+canari	ALADIN
DMI-Denmark	35h1	384x400x40	2.5	NonHydrostatic		AROME
FMI-Finland	35h1	300x600x40	2.5	NonHydrostatic		AROME
KNMI-Netherland	35h1	300x300x40	2.5	NonHydrostatic		AROME
Met Eireann Ireland	35h1	300x300x60	2.5	Nonhydrostatic		ALARO
Met.no-Norway	35h1	300x500x40	4	Nonhydrostatic	CANARI	ALARO
SMHI-Scandinavia_5.5	35h1	540x600x60	5.5	Hydrostatic	3dv+canari	ALARO

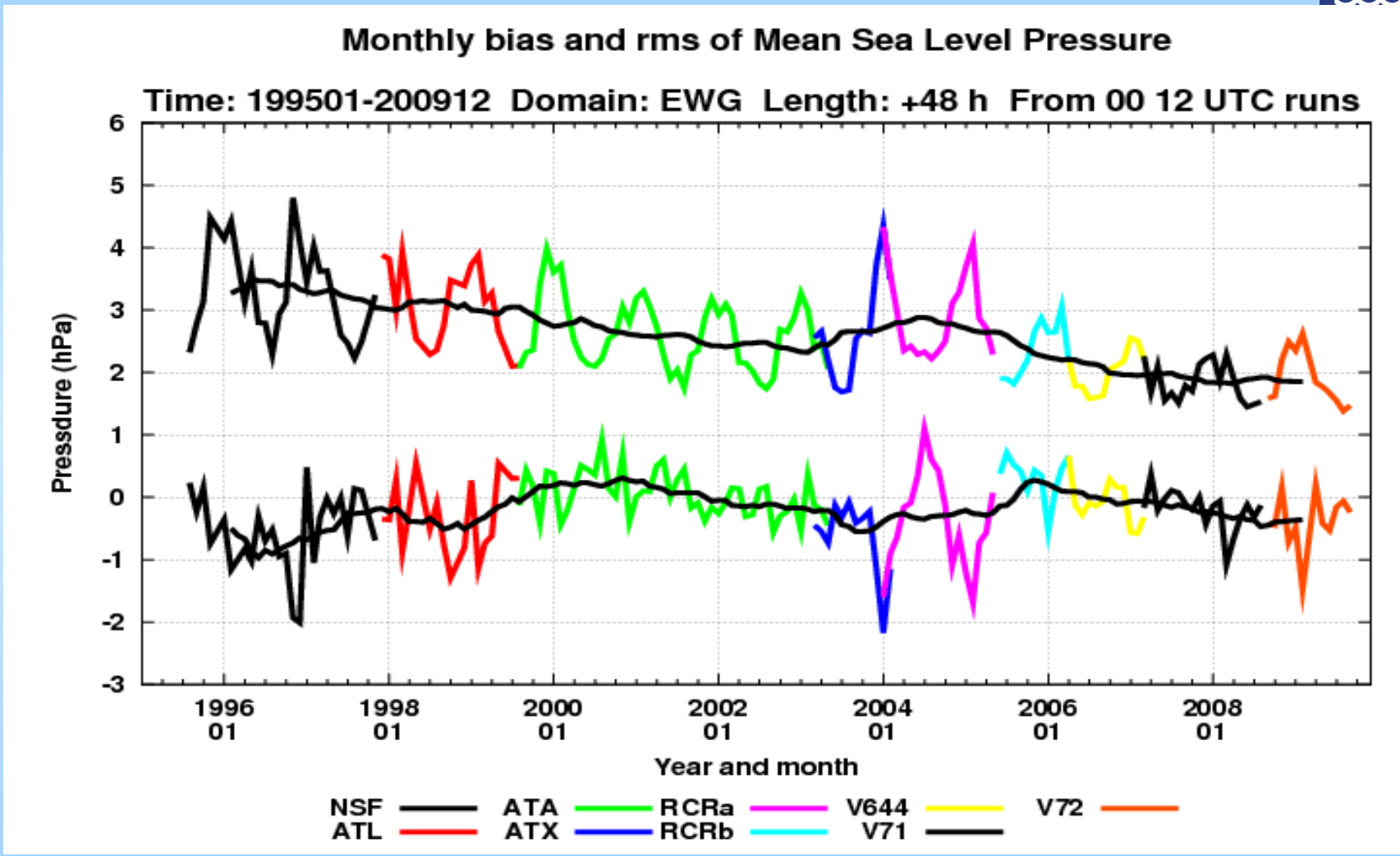
Status of the Reference Systems

- HIRLAM
- HARMONIE
  - Stable branch: harmonie-35h1 (Ulf Andrae)
    - 35h1.4: 4DVAR; stability fix; makeup; openmp; samio; profiling tools (April 2010)
  - In preparation:harmonie-36h1.0 (Ole Vignes)
    - Harmonie-36h1.0 (May 2010)
    - *Harmonie-36h1.x later in 2010 with AROME DA*

Reference Harmonie?

- HIRLAM-A target: a complete meso-scale forecast system
  - AROME forecast model with data assimilation
    - Not there yet; a target for 36h1.2 after summer?
  - Current default is for synoptic scale
- So far no offical HARMONIE system has been released
  - Relevant configuration not fully supported
  - Configurations not fully digested and documented
  - Technical robustness; portability
  - Insufficient as basis for operational production

Recall the history…



Operational Activities
Summary

- HIRLAM-7 continues to be a robust system for operational application
- Hirlam 4D-VAR at 3 services and on the way to 5 in 2010
- Higher resolution, small domain HIRLAM (3-7 km) gaining ”operational” status
- All services working with 7.2 or 7.3 by the end of 2010
- 0.075d, L65 targeted as final reference HIRLAM configuration toward the end of HIRLAM-A
- CY36h1 with AROME/SURFEX and data assimilation targeted to become HARMONIE default

Thank you for your attention