



Hirlam Operational NWP & Model Intercomparison Tool

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HIRLAM/ALADIN ASM/WS 2009

Operational Hirlam and Real Time HARMONIE Status Review

- Highlights on operational activities
 - Changes/trends in configurations
 - Quality trends
 - Model system upgrade
- Real time HARMONIE suites

More details in several national posters!

Acknowledgement

- *E. G. Marco, AEMET*
- *K. Nielsen, DMI*
- *K. Eerola, M. Kangas, FMI*
- *T. Moene, KNMI*
- *M. Homleid, Met.no*
- *E. Whelan, MetEireann*
- *L. Meuller, SMHI*

Operational Hirlam 2009: Coarse Resolution

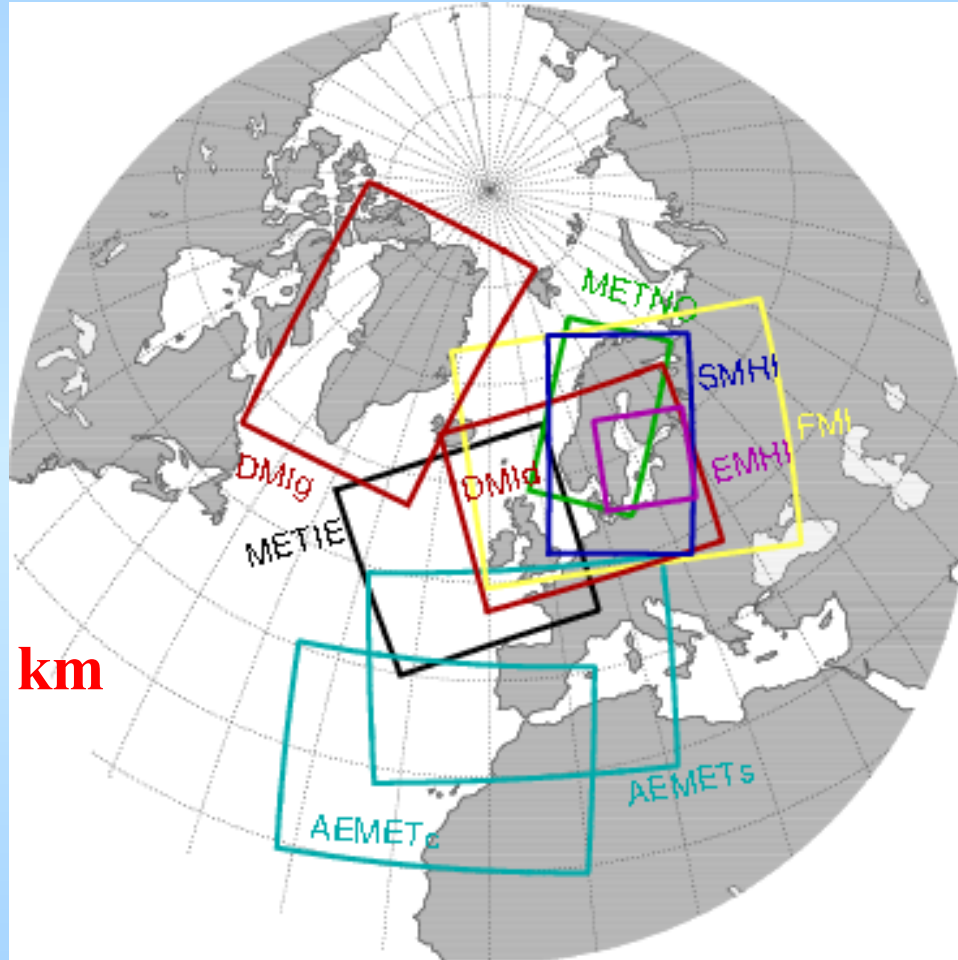
	Model version	Grid-mesh	Resolution	Level	4DVAR/L SMIX
AEMET-ONR	6.1.2	582x424	0.16d	40	No
DMI-T15	6.3	610x568	0.15d	40	LSMIX
EMHI_ETA	7.1.2	366x280	0.10d	60	No
FMI-RCR	7.2	582x448	0.15d	60	4DVAR LSMIX
KNMI-D11	7.0.1	816x650	0.10d	60	LSMIX
LHMS-HL8	7.1.4	186x186	0.08d	60	No
METIE-OPR	7.0.1	438x284	0.147d	60	LSMIX
METNO-N11	7.1.4	864x698	0.108d	60	LSMIX
SMHI-C22	7.1.2	306x306	0.20d	40	4DVAR



Hirlam 2009: Real Time Suites/Coming Upgrade

	Model	Grid-mesh	DX	4DVAR/LSMIX
AEMET-ONR	7.2	582x424x40	0.16d	4DVAR,LSMIX
DMI-T15	6.3+ update	610x568x40	0.15d	LSMIX
EMHI_ETA	7.1.2	366x280x60	0.10d	No
FMI-RCR	7.2	582x448x60	0.15d	4DVAR,LSMIX
KNMI-D11	7.2	816x650x60	0.10d	LSMIX
LHMS-HL8	7.1.4	186x186x60	0.08d	No
METIE-OPR	7.2	438x284x60	0.147d	LSMIX
METNO-N11	7.3beta1	864x698x60	0.108d	4DVAR,LSMIX
SMHI-C11	7.2	606x606x60	0.10d	4DVAR,LSMIX

Hirlam Operational Domains



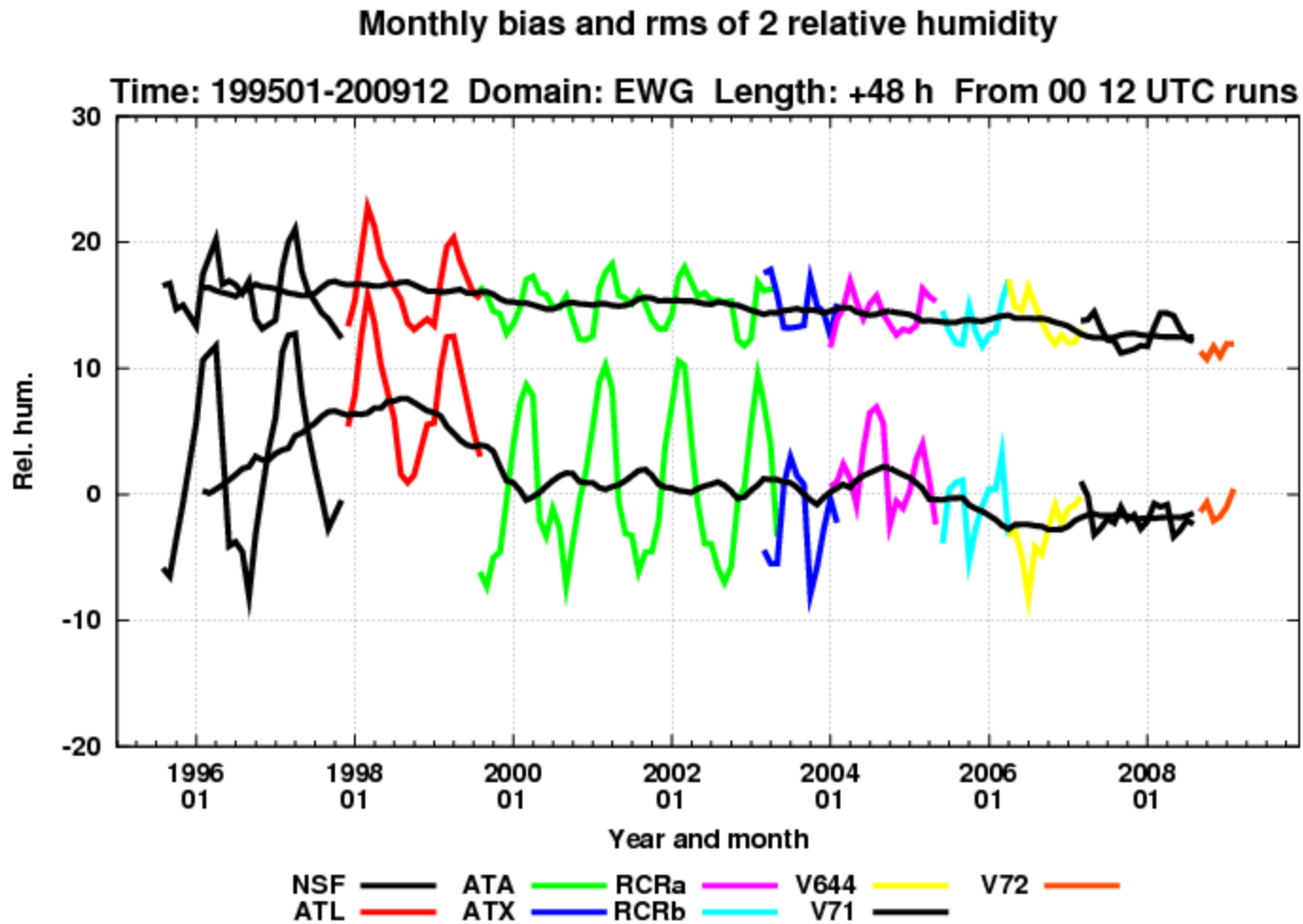
Fine scale, 3.3-7 km

(“Atlantic scale”, 9-17 km)

Operational Hirlam 2009: Fine Resolution

	Model version	Grid-mesh	Resolution	Level
AEMET-HNR	7.2	606x430	0.05d	40
AEMET-CNN	7.2	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	438x395	0.05d	60
METNO-N04	7.3beta1	300x500	0.036d	60
SMHI-G05	7.1.2	294x441	0.05d	60

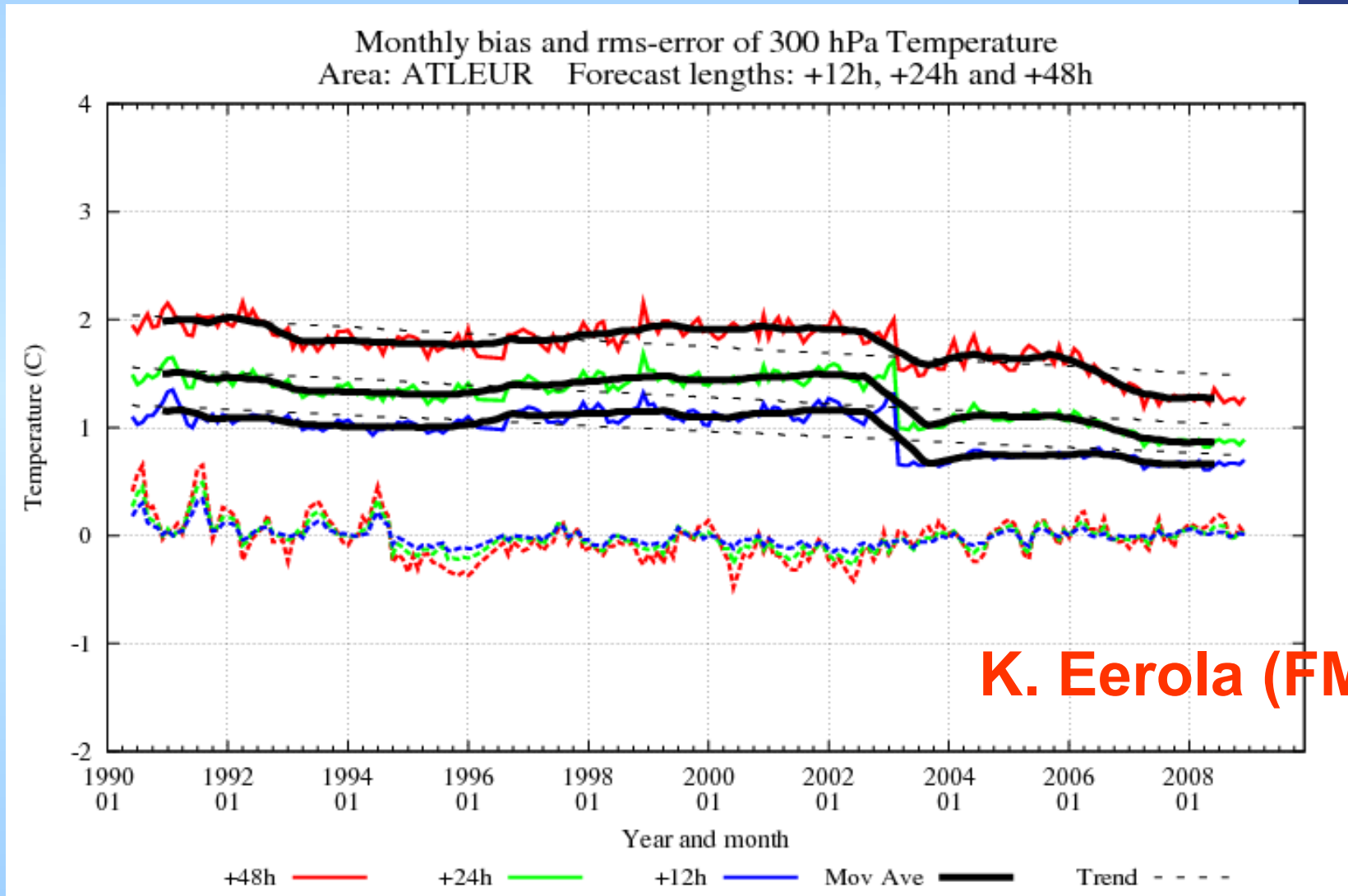
Hirlam Forecast Quality Trend



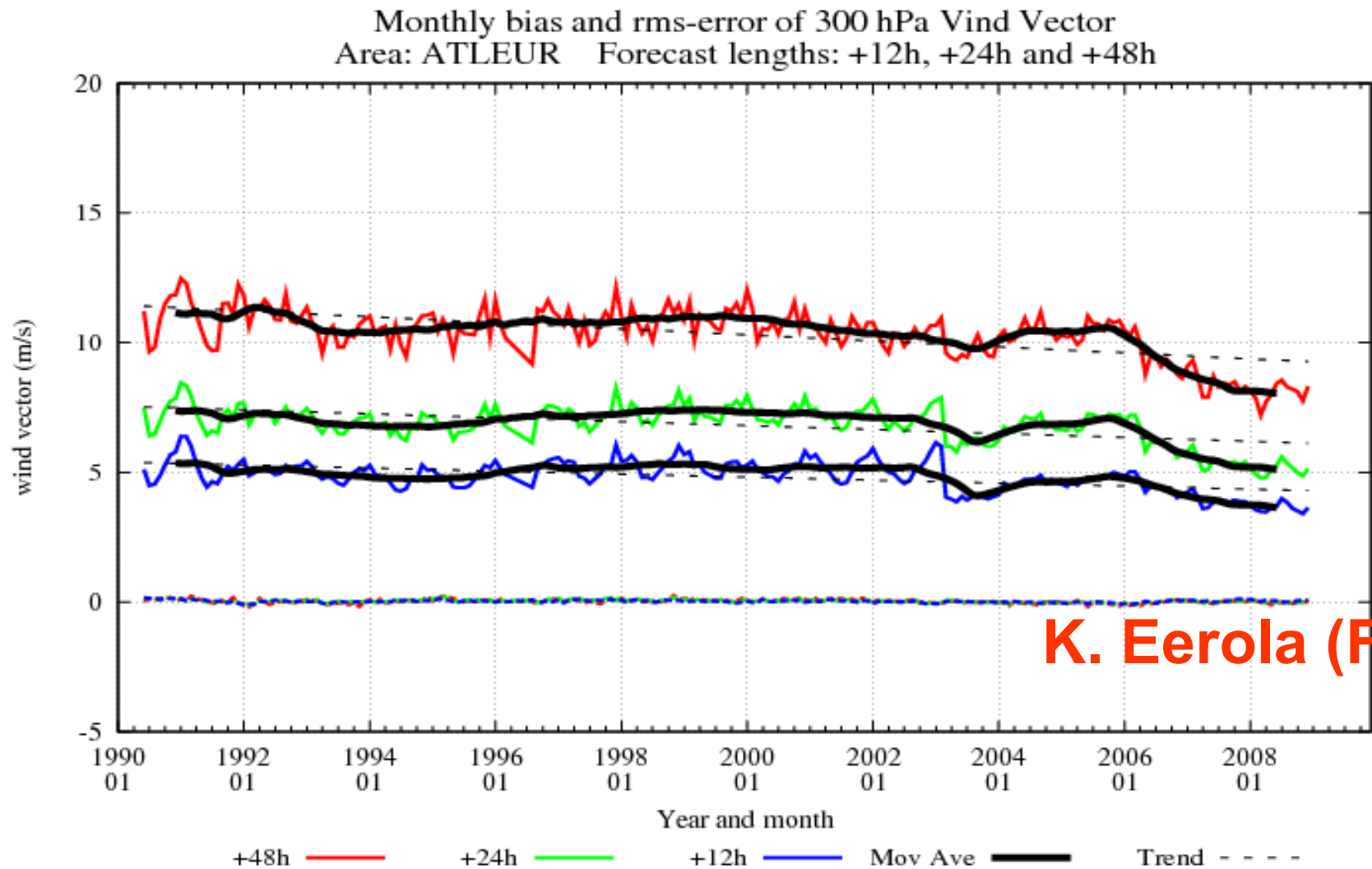
Field Verification, Upper Atmosphere



mi

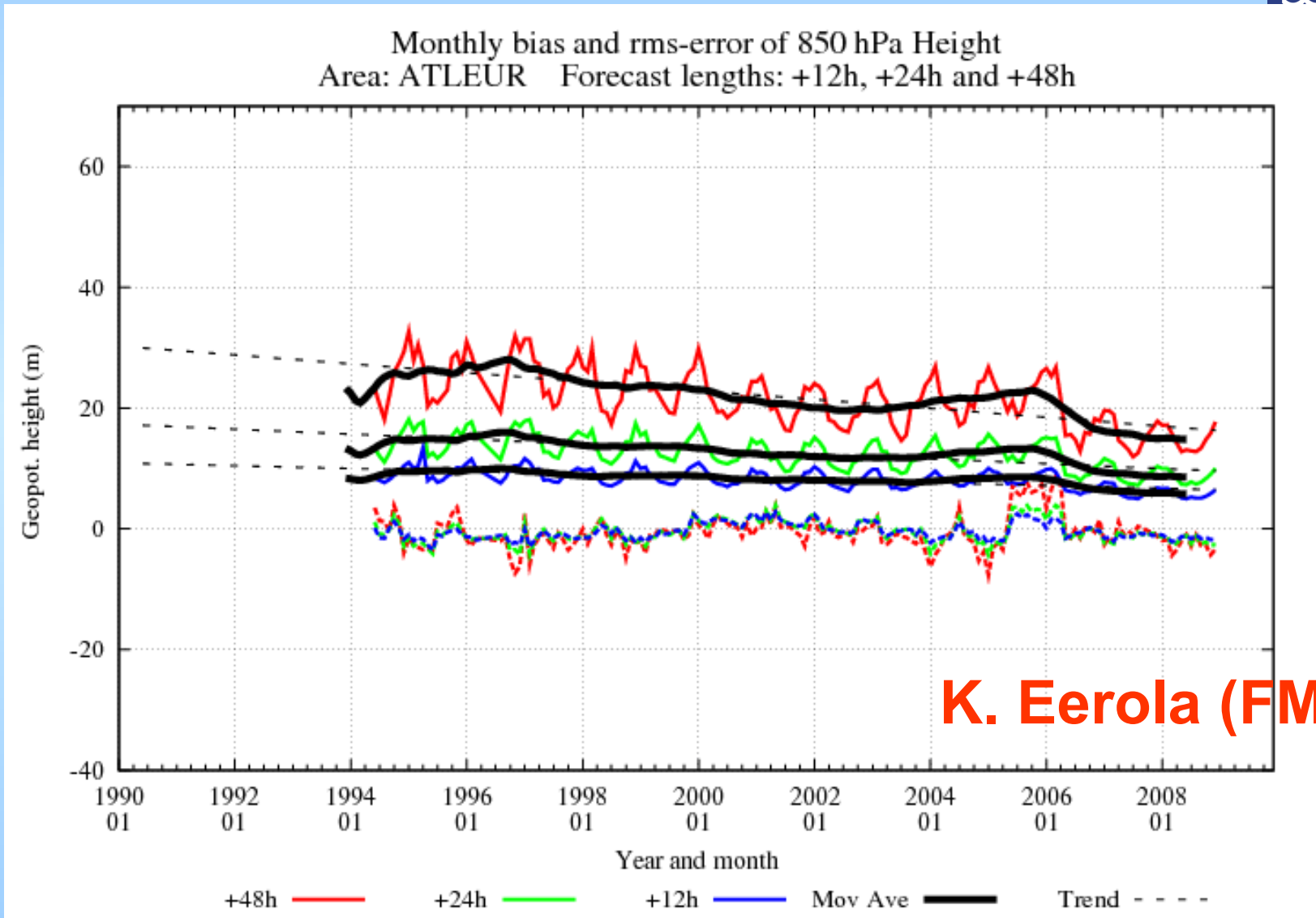


Field Verification, Upper Atmosphere



K. Eerola (FMI)

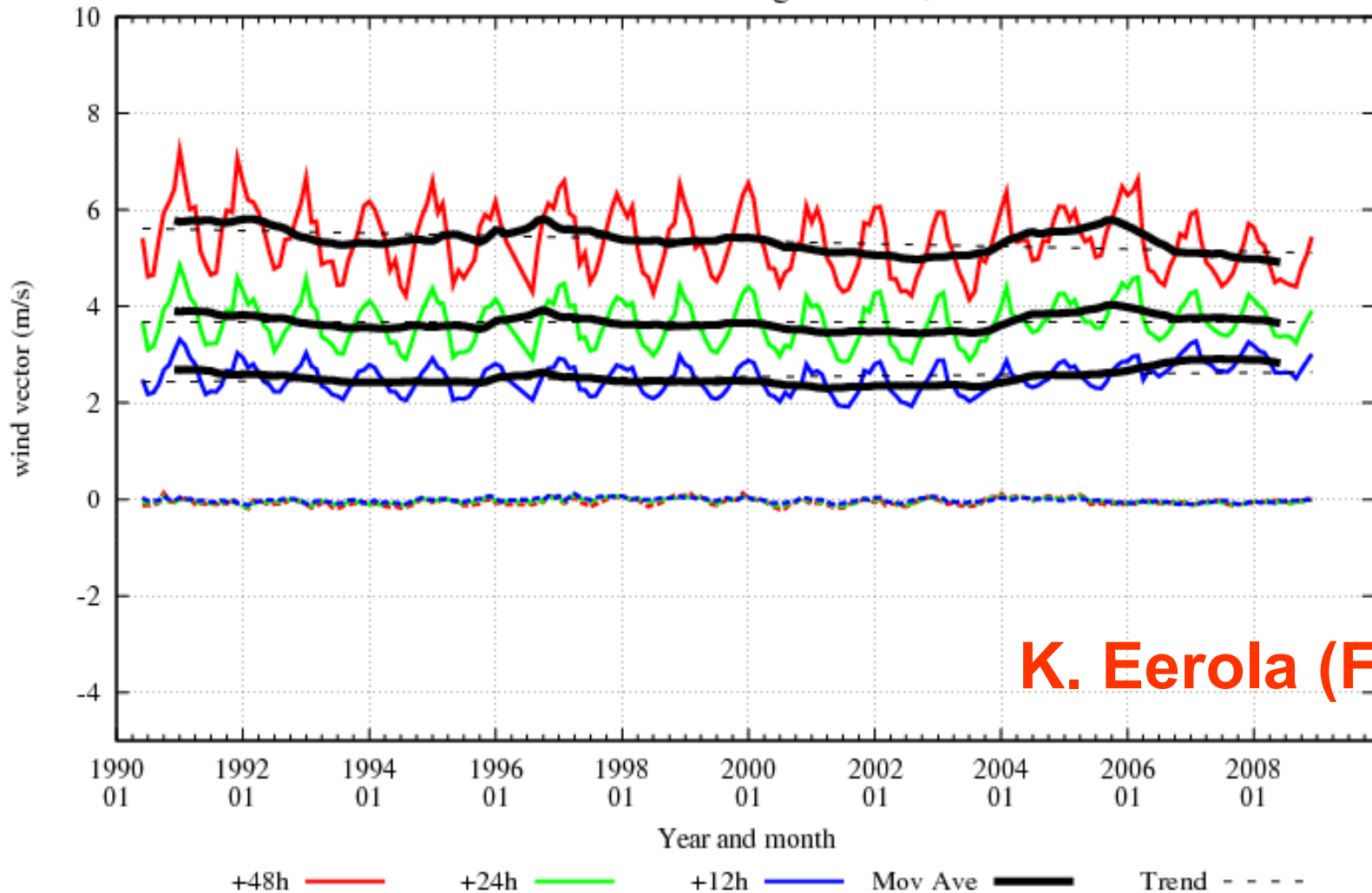
Field Verification, Lower Atmosphere





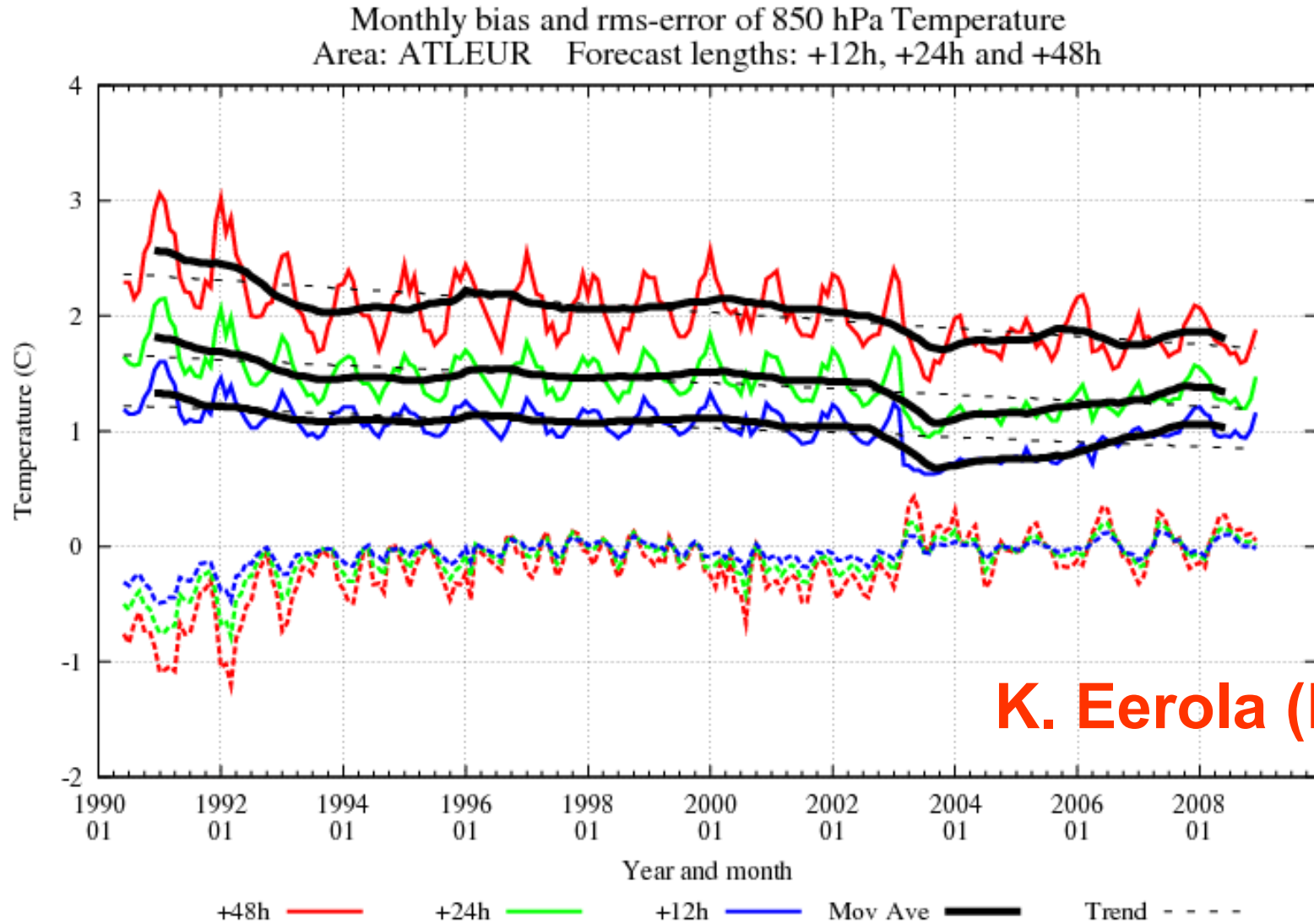
Field Verification, Lower Atmosphere

Monthly bias and rms-error of 850 hPa Vind Vector
Area: ATLEUR Forecast lengths: +12h, +24h and +48h

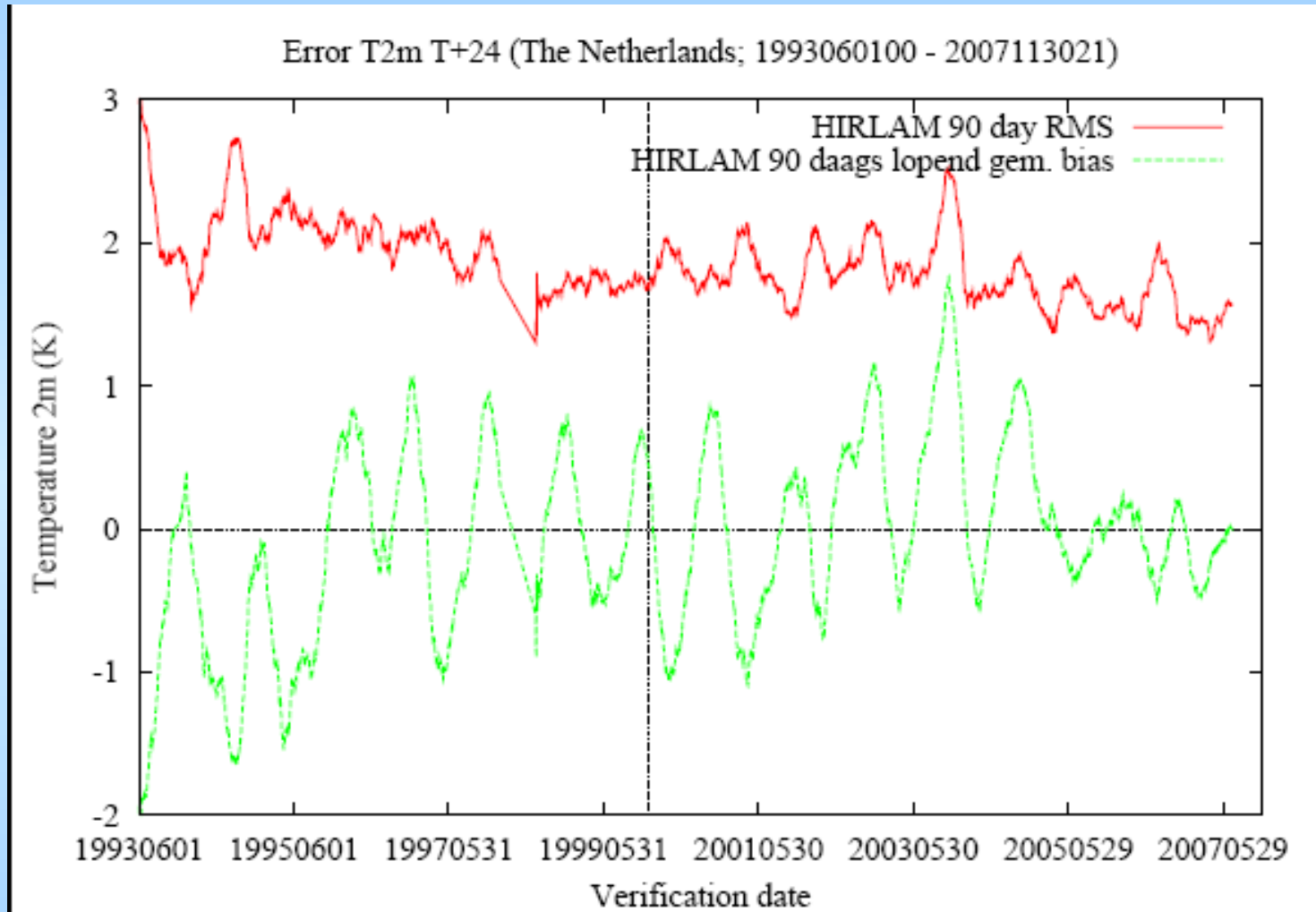


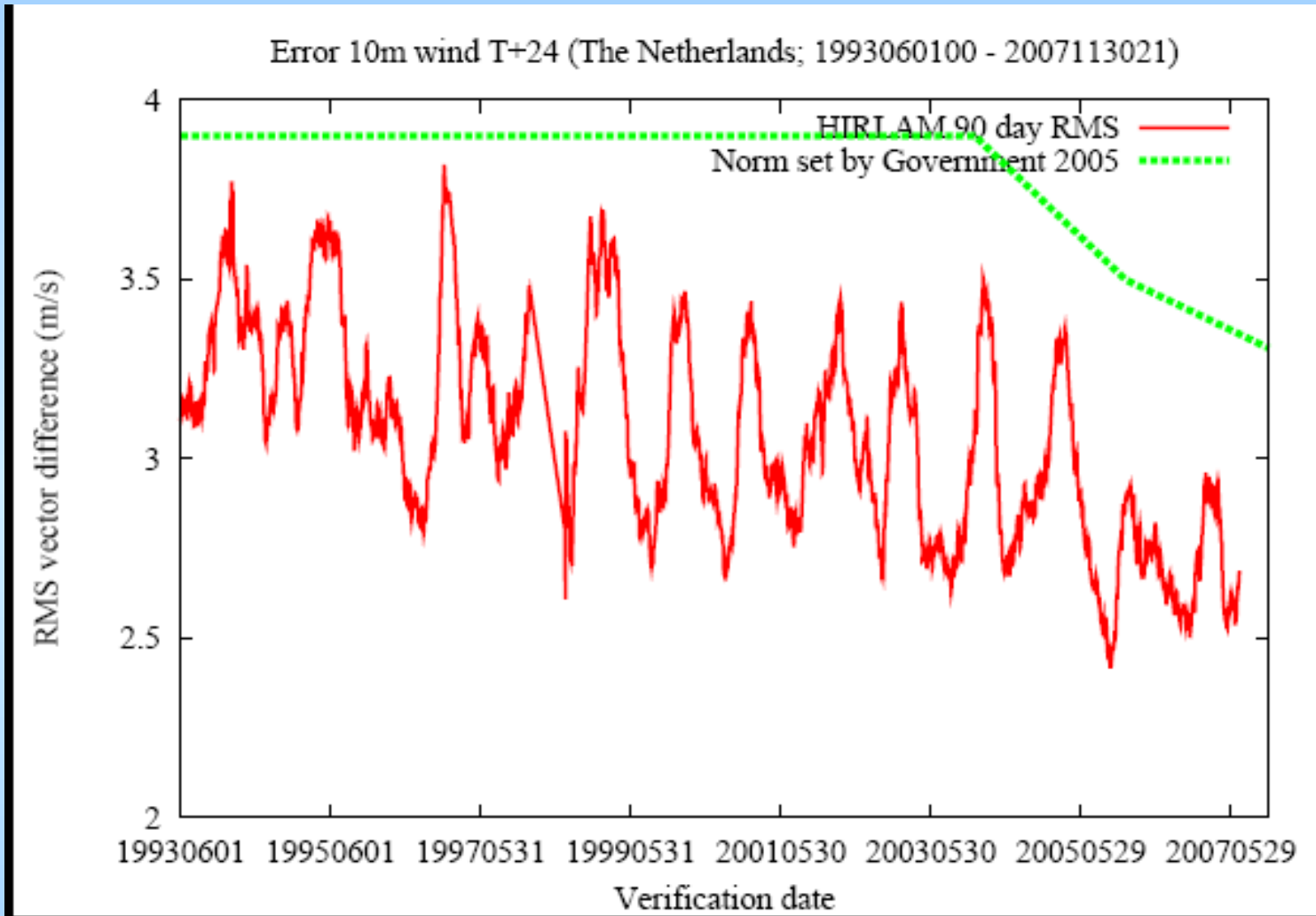
K. Eerola (FMI)

Field Verification, Lower Atmosphere



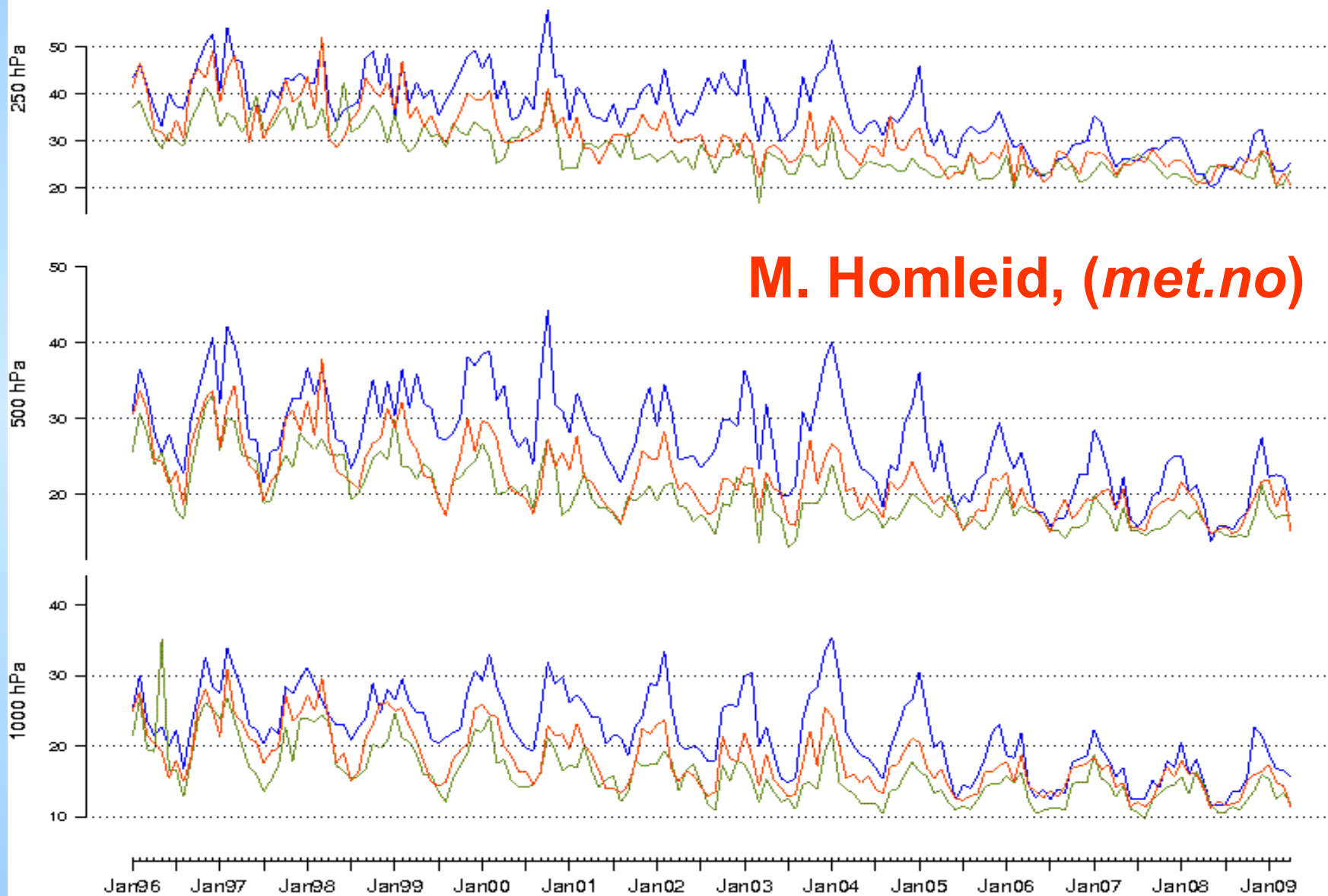
K. Eerola (FMI)



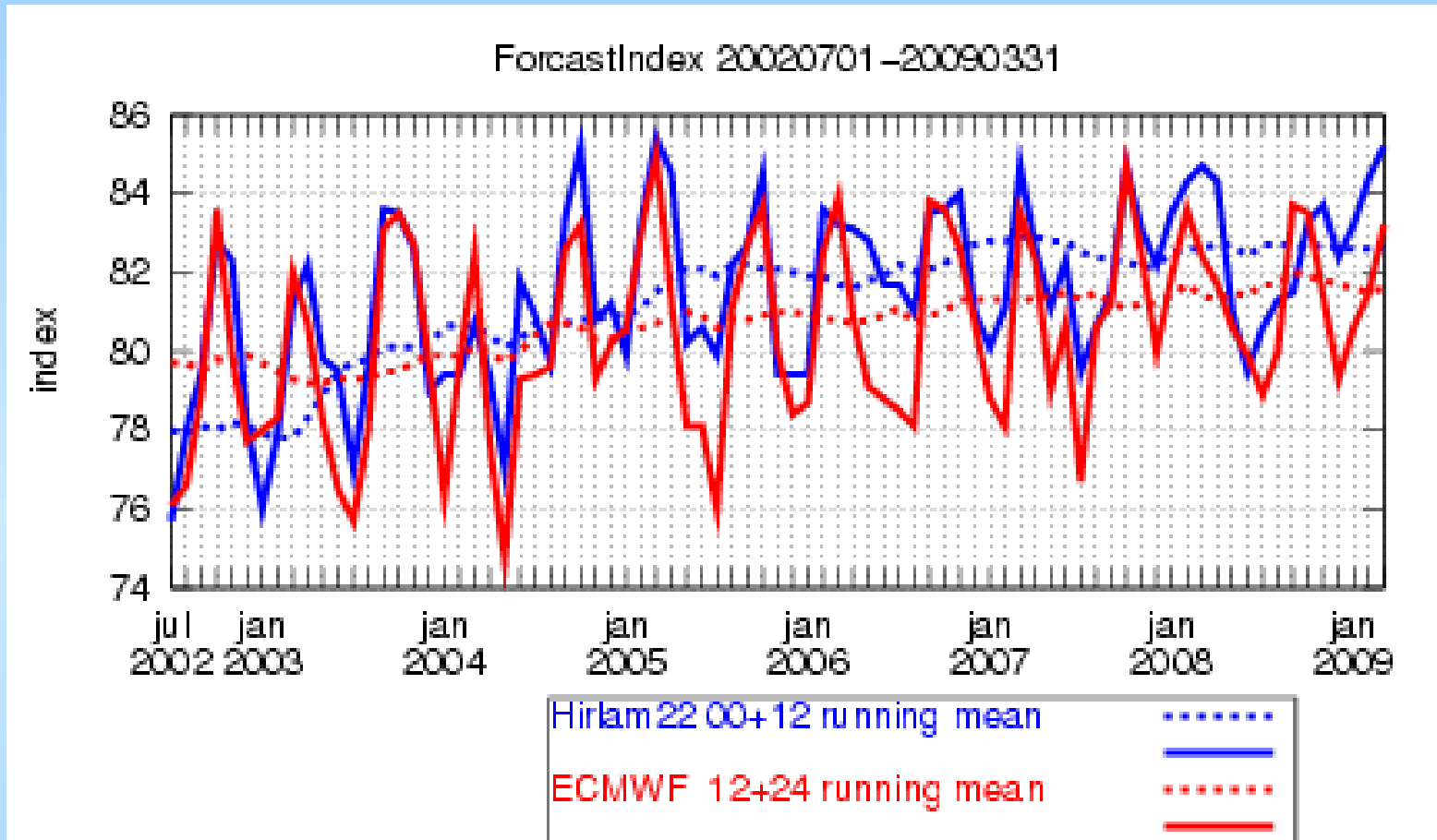


Månedlige RMSE av 12+48-prognoser av geopotensiell høyde summert over EWGLAM-stasjonene

HIRLAM50/20/12 ECMWF UK



SMHI NWP Performance Indicator



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



Real Time Harmonie Experiment Suites

Domain	Cycle	Grid-mesh	DX	Dynamics	LBC	Physics
AEMET-Mediterranean	32h2	384x400x40	11km	Hydrostatic	HIRLAM16	ALADIN
AEMET-Iberia	32h2	300x300x40	2.5km	NonHydrostatic	ALADIN11	AROME
DMI-Scandinavia	33h1	256x288x40	11km	Hydrostatic	HIRLAM15	ALADIN
DMI-Denmark	33h1	384x400x40	2.5km	NonHydrostatic	ALADIN11	AROME
FMI-Finland	33h1	300x600x40	2.5km	NonHydrostatic	HIRLAM7.5	AROME
KNMI-Netherland	35h1	300x300x40	2.5km	NonHydrostatic	HIRLAM11	AROME
Met Eireann Ireland	31h1	300x300x60	2.5km	Nonhydrostatic	HIRLAM5	HIRALD
Met.no-Norway	33h1	300x500x40	4km	Nonhydrostatic	HIRLAM8	ALARO
SMHI-Scandinavia_5.5	35h1	540x6000x60	5.5km	Hydrostatic	ECMWF	ALARO, DA
ECMWF-C1A RCR_POLAR	trunk	648x540x60 HIRLAM/ALADIN ASM/WS 2009	16km	Hydrostatic	ECMWF	ALADIN

Outlook for 2009

- Several services switch over to 7.2/7.3
 - 4DVAR, KFRK (7.2)
 - more remote sensing data, newsnow? (7.3)
 - LSMIX; probably non-nesting
- Atlantic-scale model resolution moves down to 8-12 km range
- Operational 2.5 km AROME or 5 km ALARO targeted in several centers
 - All 7 large services running real-time HARMONIE

2008 Target on Common Verification & Monitoring

- Observation verification package suitable for model intercomparison
 - 7.2 starts to use GL/MONITOR package
 - Starts to be used by HIRLAM model users. CIS, newsnow...
- Web-presentation tool
 - WebGraF as main interface for the common interface
- Extension to mast-profile intercomparison
 - AROME data, Lindenberg data...
- Launch of operational HIRLAM model inter-comparison
 - All 9 services participated, 8 of these in verification intercomparison
- Extension to assimilation monitoring
 - HIRLAM and ALADIN/met.no tools

Observation Verification Intercomparison using HARMONIE tool (Andrae et al)



- Software improvement: algorithm, product categories, graphic and Web-display tools (WebgraF)
- Strict check about equivalency in data samples
- Model independency: HIRLAM vs HARMONIE vs ECMWF vs ...

Additional Monitoring Tools

- Analysis monitoring: data usage,...
- Minimisation and forecast diagnosis
- Verification against analyses
- Meteograms
- SAL, Radar simulator, MSG CPP
- Forecast maps
 - Pseudo satellite images, ..

Additional Monitoring Tools

- Analysis monitoring: data usage,...

Common Observation Usage Monitoring



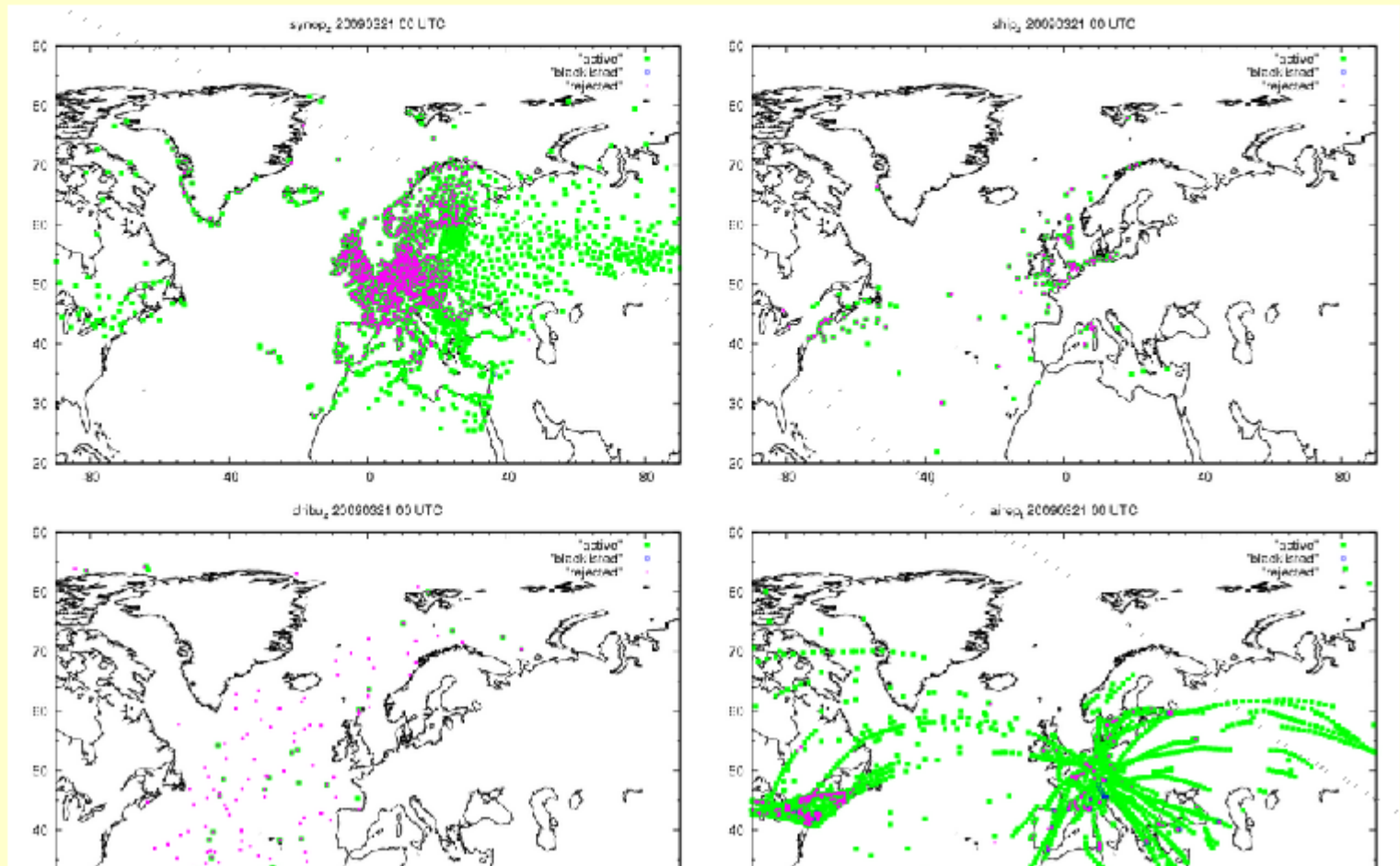
ObsUse
Obs_Map ▾

Obs_parameter »
SYNOP ▾

size ⏪ ⏩

Use of Observation

Period » Day » Hour »
200903 ▾ 21 ▾ 00 ▾



Additional Monitoring Tools

- Analysis monitoring: data usage,...
 - Type of detected deficiencies:
 - Occasional loss of TEMP/ATOVS/SYNOP data
 - Systematic lack of some OBS data (BUOY data/E-AMDAR/ACARS; incomplete temporal data coverage)
 - Occasional abnormal obs data rejection

Additional Monitoring Tools

- Analysis monitoring: data usage,...
- Minimisation and forecast diagnosis
- Verification against analyses
- Meteograms
- SAL, Radar simulator, MSG CPP



../RADAR
SAL_monthly

A component
Area based
Object based

Cycle
00
12

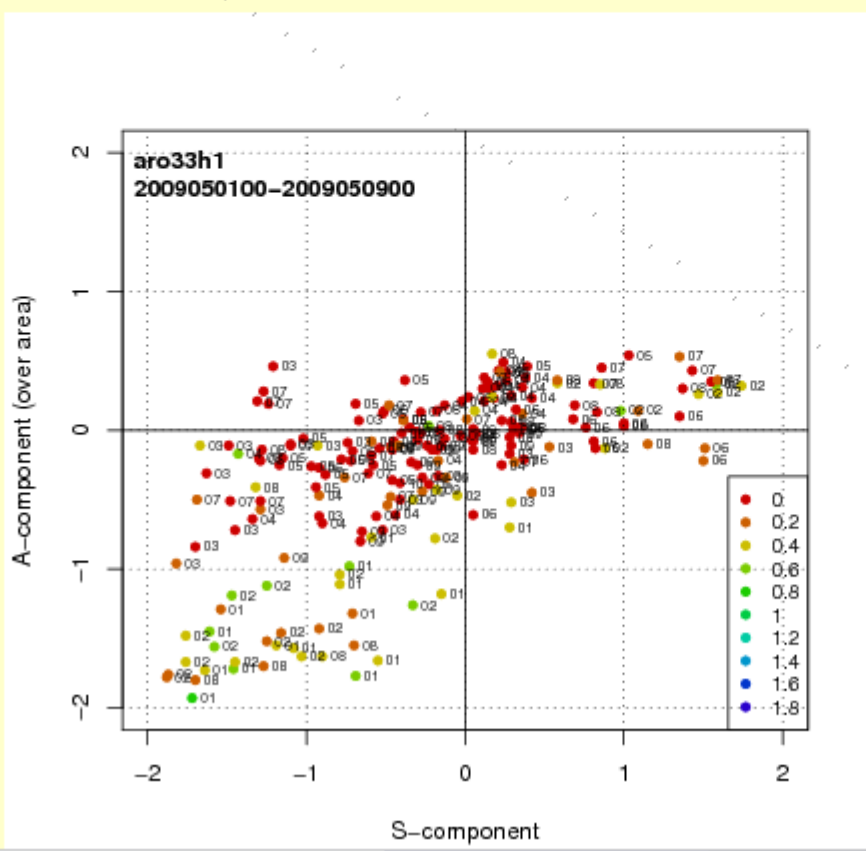
Help

Resize

SAL monthly verification

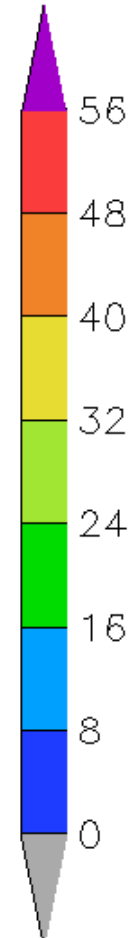
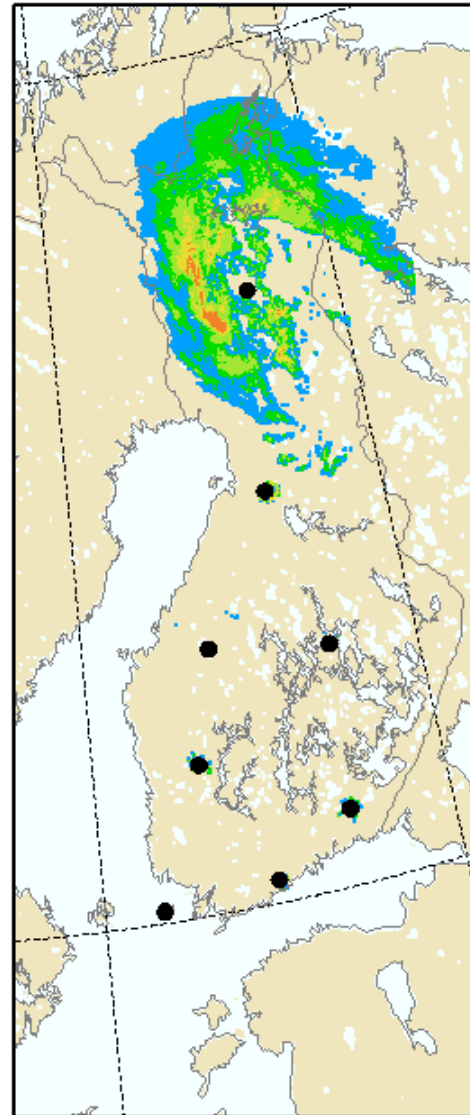
Period
May 2009

Radar reflectivity SAL verification
AROME : 2.5km, 40 levels (cy33h1)



FMI

Observed radar reflectivity [dBZ].
10MAY2009 01:00 UTC.

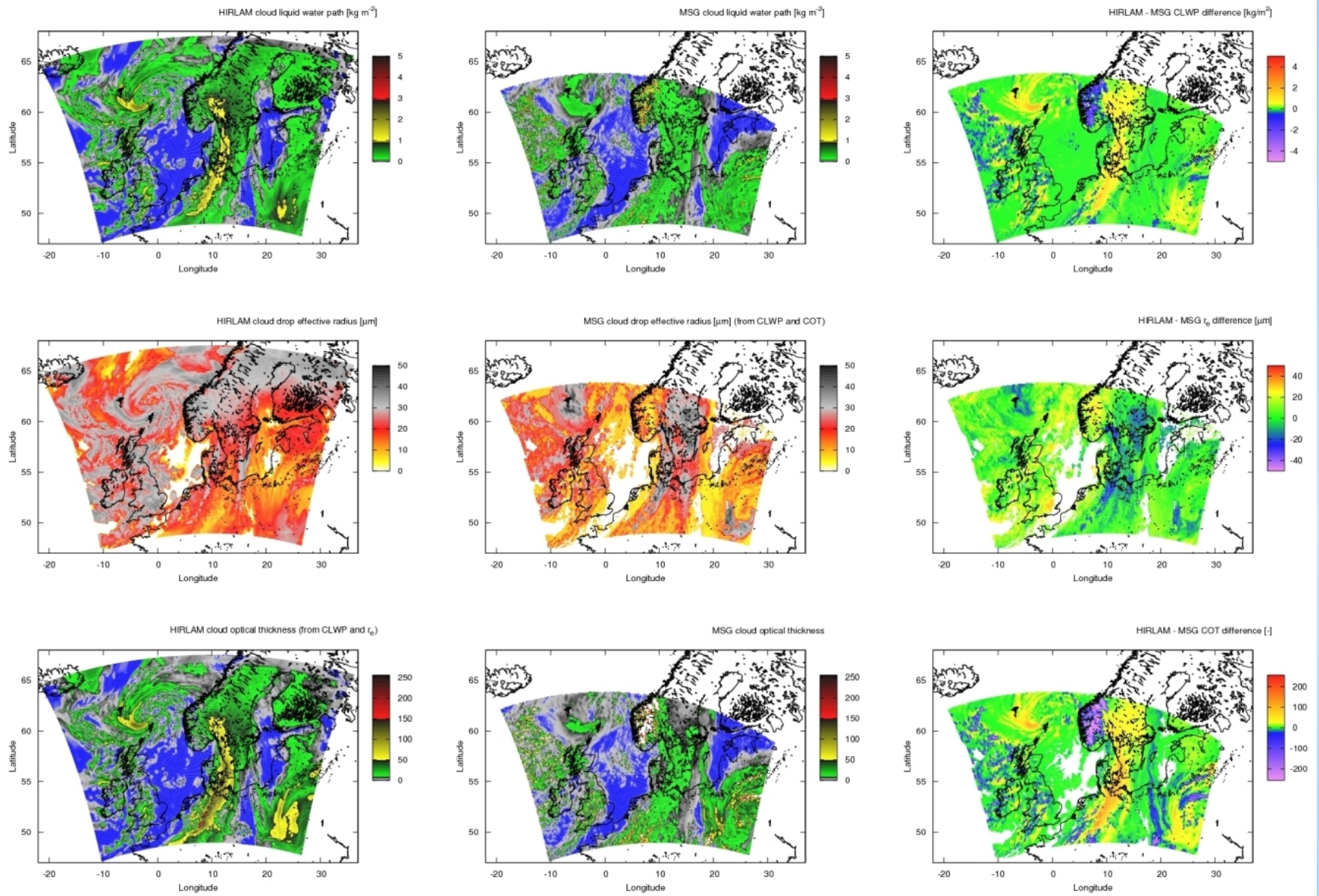


Max:
48

Radars:VAN,IKA,ANJ,KUO,KOR,UTA,LUO,VIM
Antenna=0.3°

Radars:VAN,IKA,ANJ,KUO,KOR,UTA,LUO,VIM
Antenna=0.3°

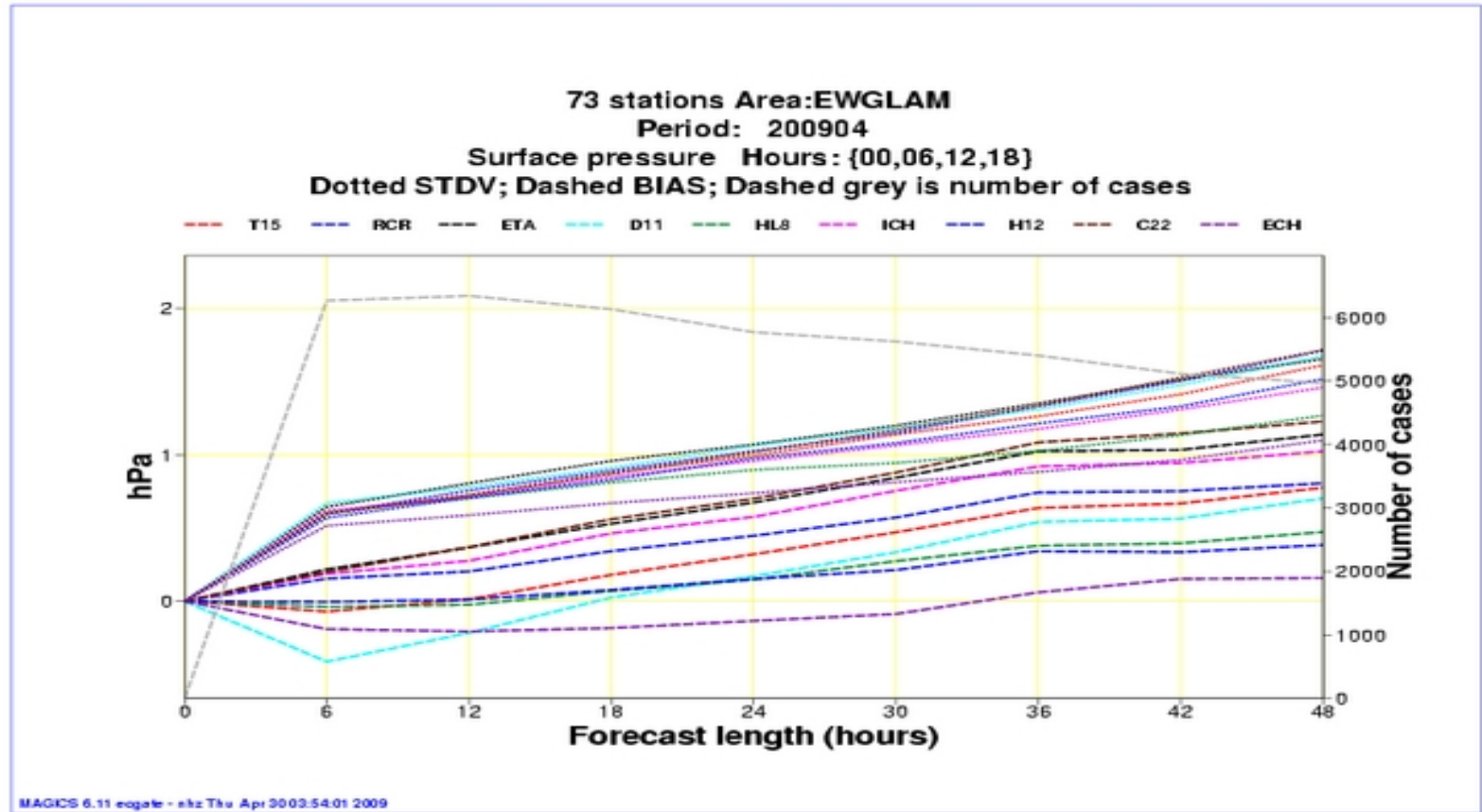
FMI



Additional Monitoring Tools

- Analysis monitoring: data usage,...
- Minimisation and forecast diagnosis
- Verification against analyses
- Meteograms
- SAL, Radar simulator, MSG CPP
- Forecast maps
 - Charts, Pseudo satellite imagies, ..

Why Common Monitoring?



Why Common Monitoring?



- The joint monitoring interface does not replace regular monitoring of routine NWP forecasts. The latter needs to be done locally.
- However, the common interface helps to expose irregularities, which is helpful for both operational work and for researchers.

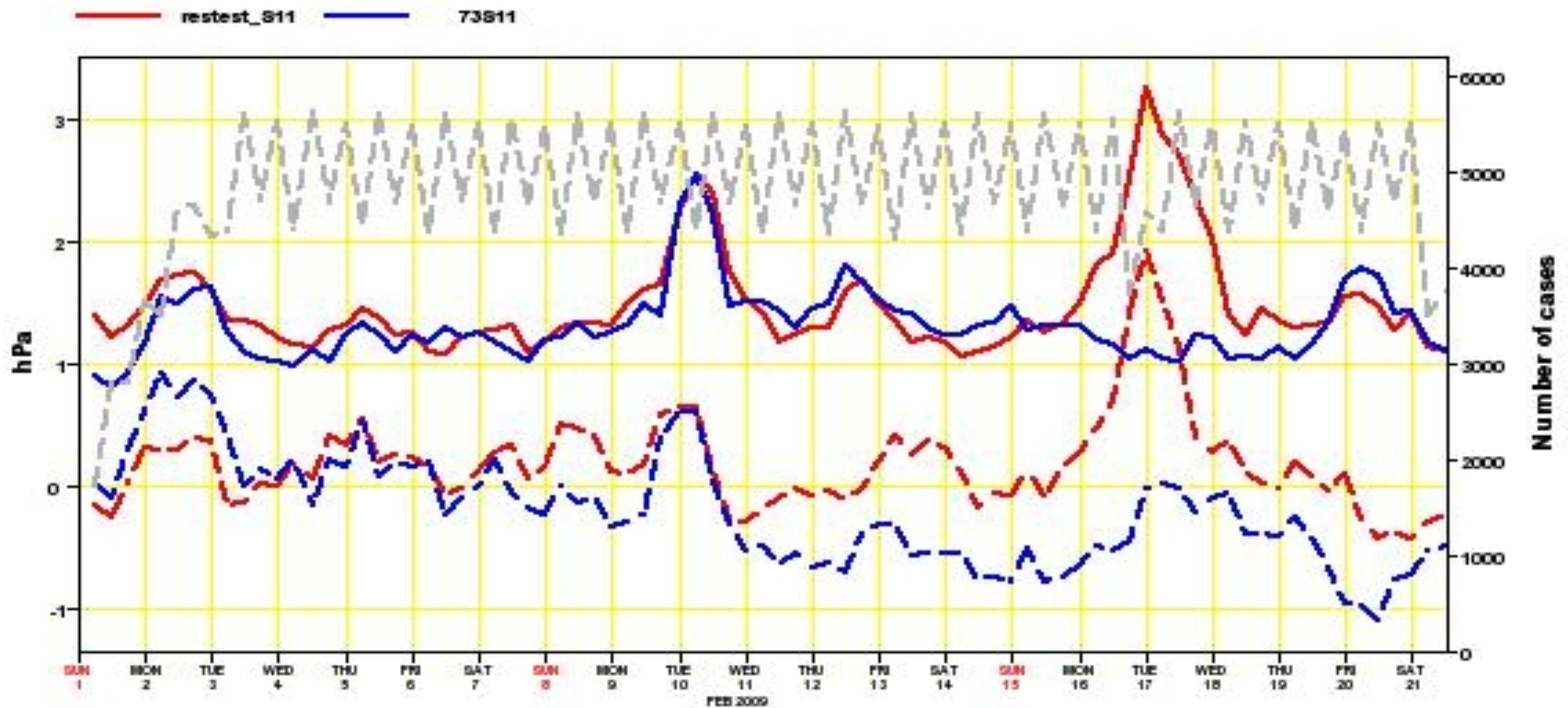
Some Observations from Common Interface...



- Observation verification statistics.
 - Be careful with abnormal events.



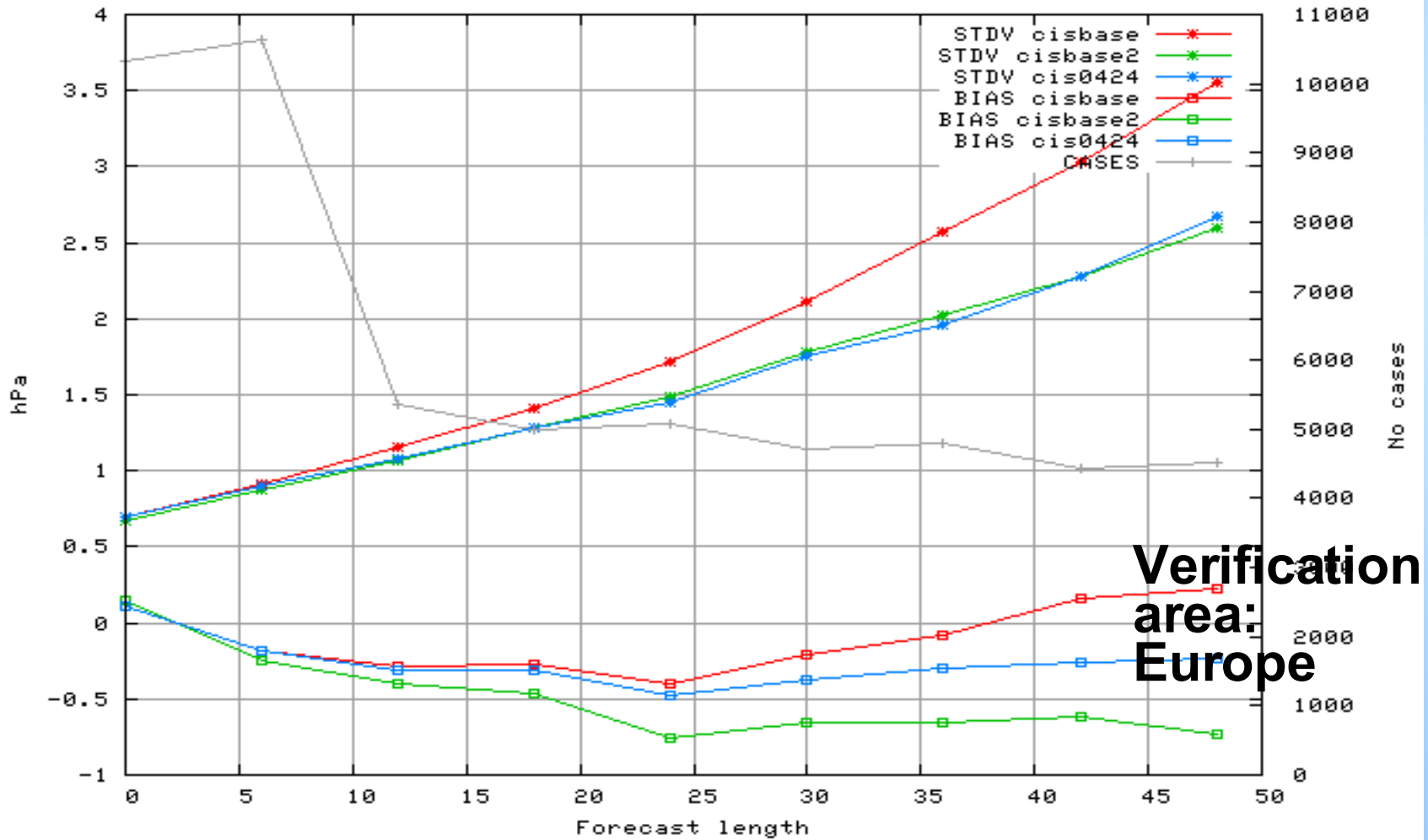
951 stations Area: ALL
Surface pressure
At {00,06,12,18} + 00 06 12 18 24 30 36 42 48 Window: 6h
Solid RMS; Dashed BIAS; Dashed grey is number of cases



HIRLAM Atlantic scale CIS - Forecast verification 3 BASELINE versus ALLINCLUSIVE versus BASELINE2



Area: EWGLAM using 289 stations
Period: 20070201-20070210
Surface pressure Hours: (00,06,12,18)



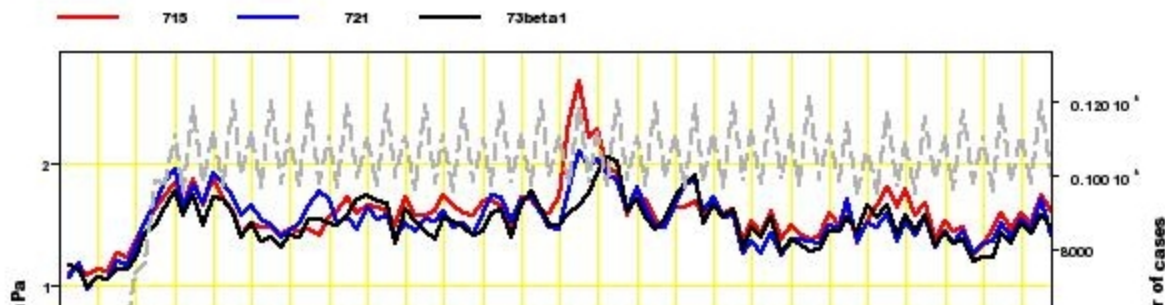
Quote of the day!

- "Do not trust your eyes"
 - N. Gustafsson, 2009, the coming Hirlam Newsletter Article

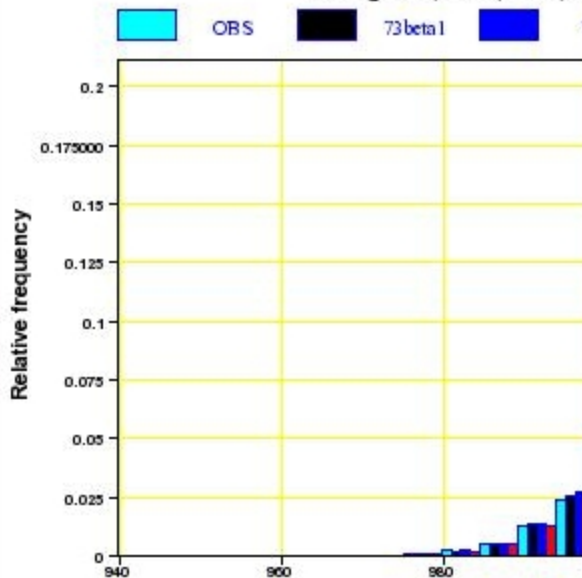
2081 station
Period:
Surface pressure P
Solid RMS; Dashed BIAS; Das



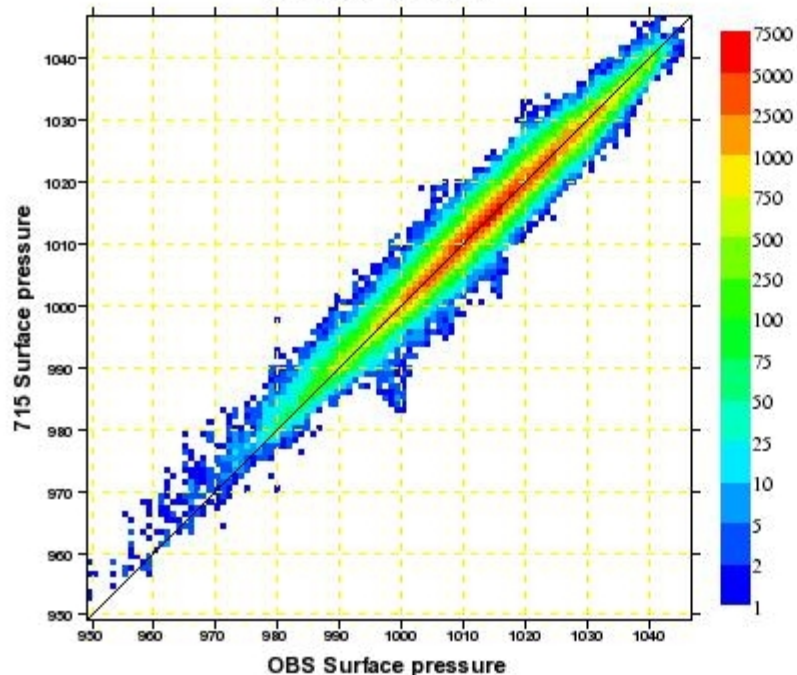
2081 stations Area: ALL
Surface pressure
At {00,06,12,18} + 00 06 12 18 24 30 36 42 48 Window: 6h
Solid RMS; Dashed BIAS; Dashed grey is number of cases



2081
Surface pressure
Number of cases 48104
At {00,06,12,18}



Scatterplot for 2081 stations Area: ALL
Surface pressure
At {00,06,12,18} + 06 18 30 42
Period: 2007 02



Obs = 481046

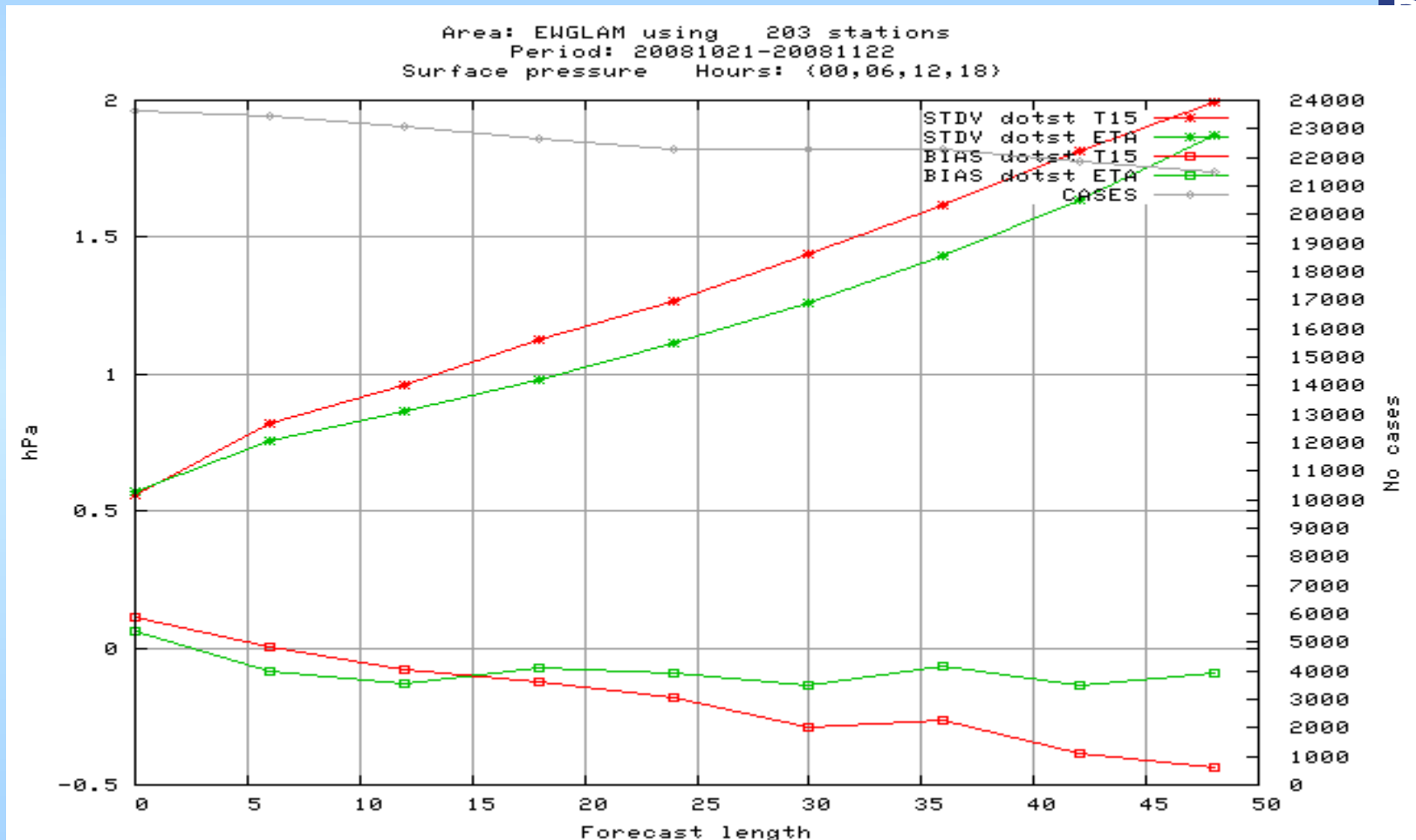
y mean = 1014.9 y stdev = 45.8
x mean = 1015.0 x stdev = 46.8
BIAS (y-x) = -0.14
RMS = 1.61
corr. coef = -1.009

Some Observations from Common Interface



- Verification scores. Be careful with interpretations.
 - Look deeper from a variety of verification products.
 - Abnormal statistics may provide hints of problems
- Smaller domains, better scores?
 - Smaller domain models, when coupled directly to ECMWF, tend to have better 'synoptic scores' (in MSLP and upper air)

Test with use of DMI and EMHI domains



Some Observations from Common Interface



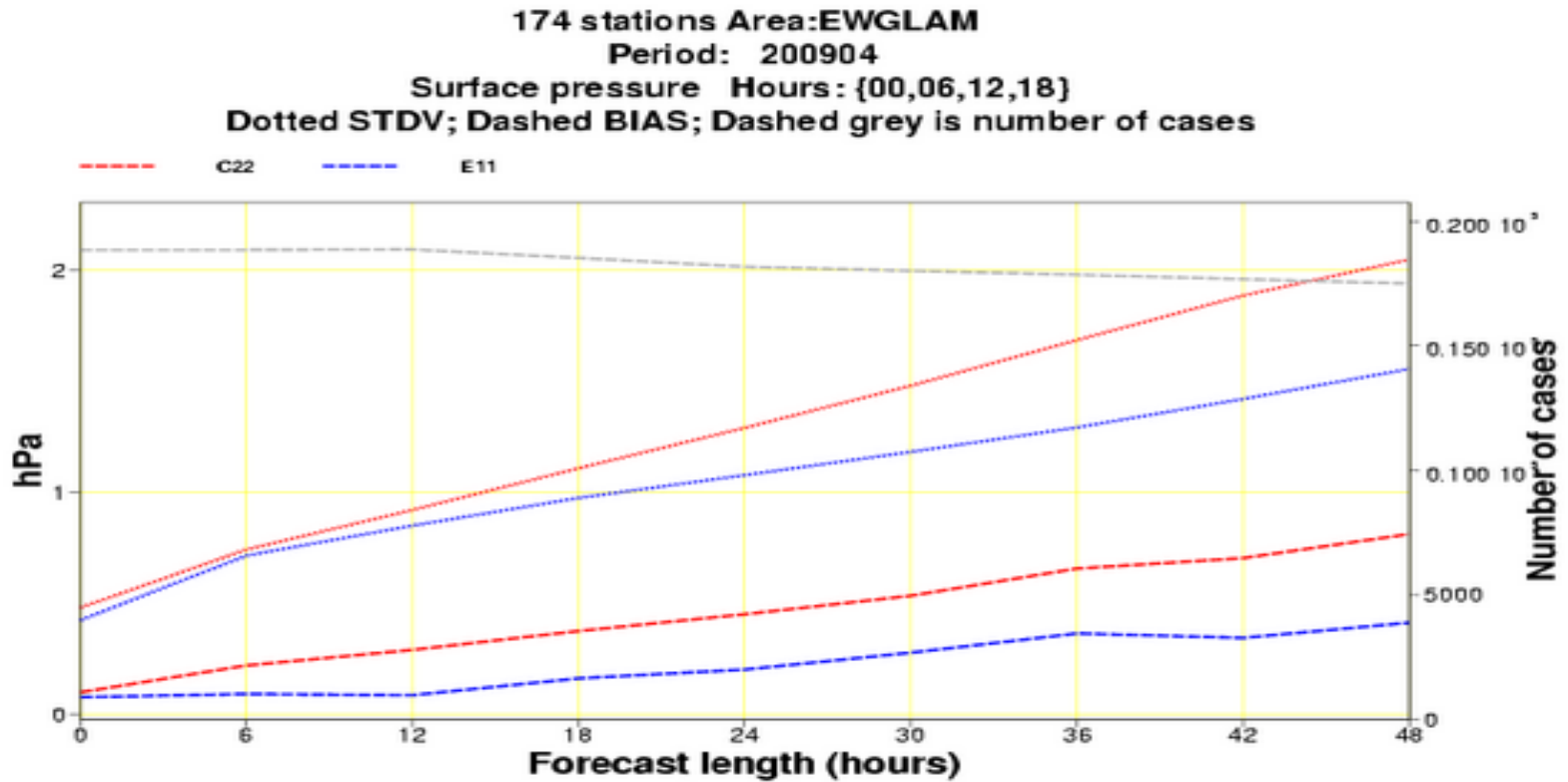
- Verification scores. Be careful with interpretations.
- Smaller domains, better scores?
- Nesting strategy: does it pay off?

HIRLAM RCR -> HIRLAM MB71 -> AROME

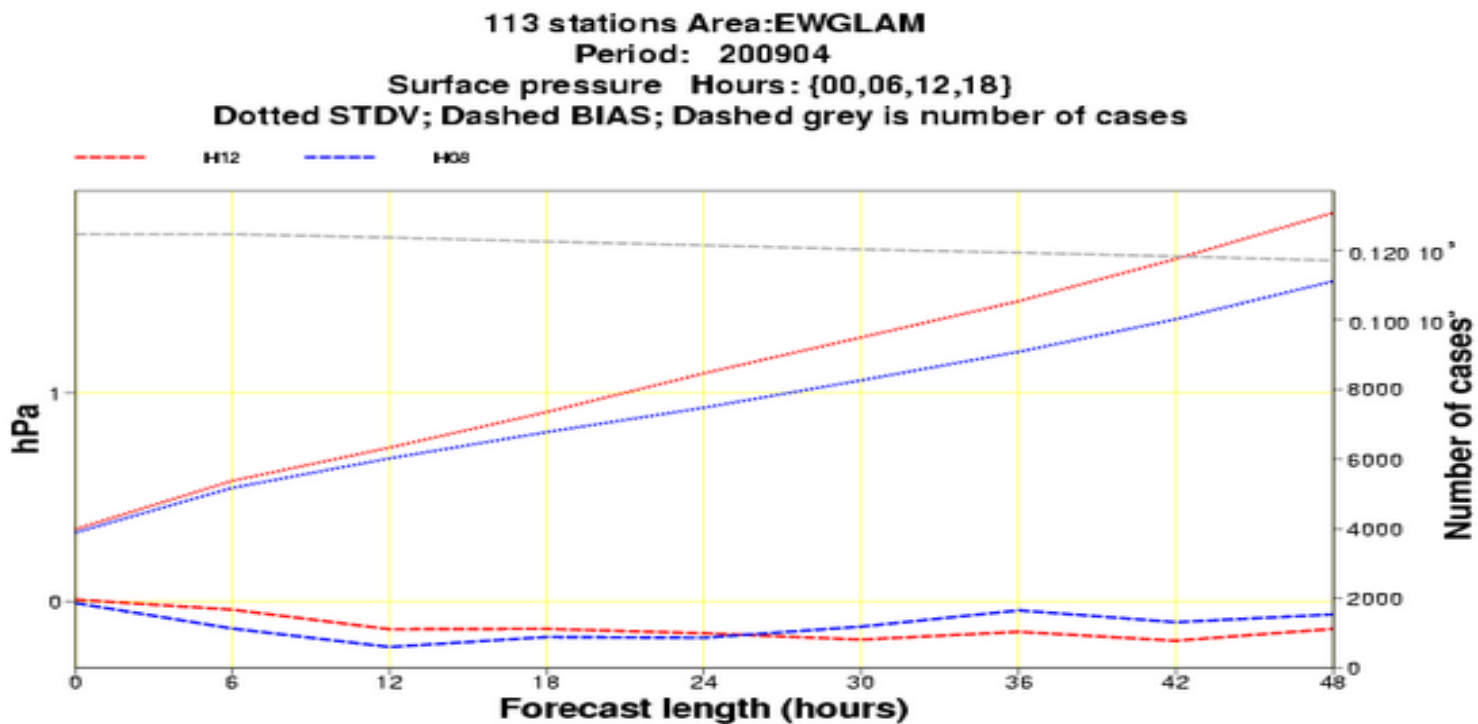
SMHI HIRLAM area C22 (22 km) E11 (11 km) G05 (5 km)



SMHI: C22 vs E11



Met.no: H12 vs H08

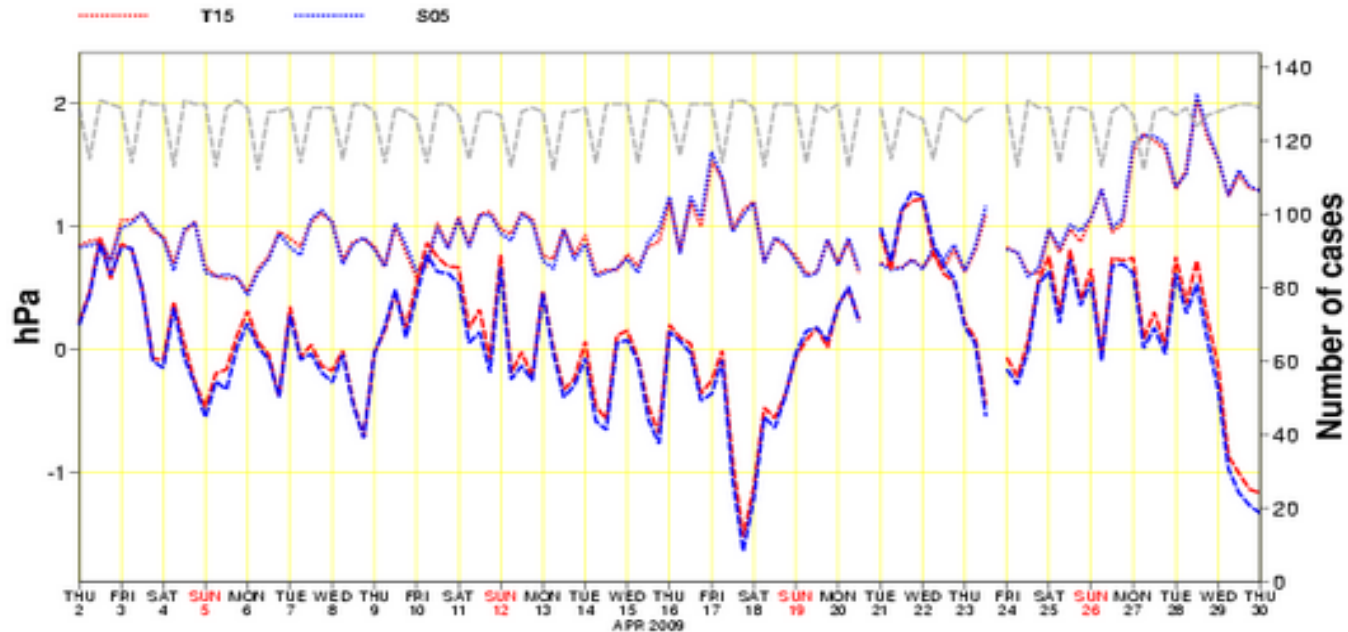


MAGICS 6.11 eogale - nkz Thu Apr 30 06:28:04 2009

DMI T15 vs S05

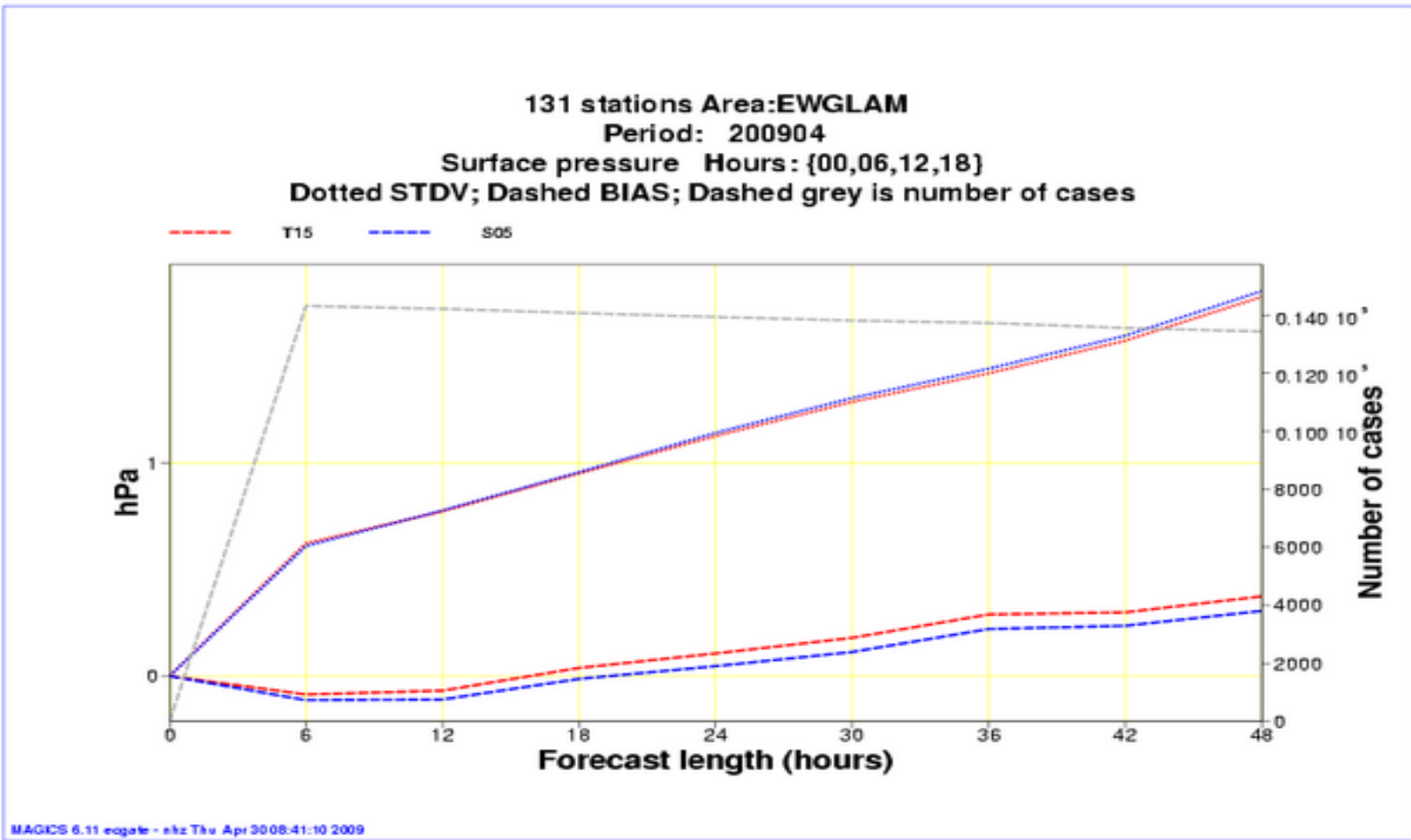


131 stations Area: EWGLAM
Surface pressure
At {00,06,12,18} + 24 Window: 6h
Dotted STDV; Dashed BIAS; Dashed grey is number of cases



MAGICS 6.11 eoqale - skz Thu Apr 30 08:41:09 2009

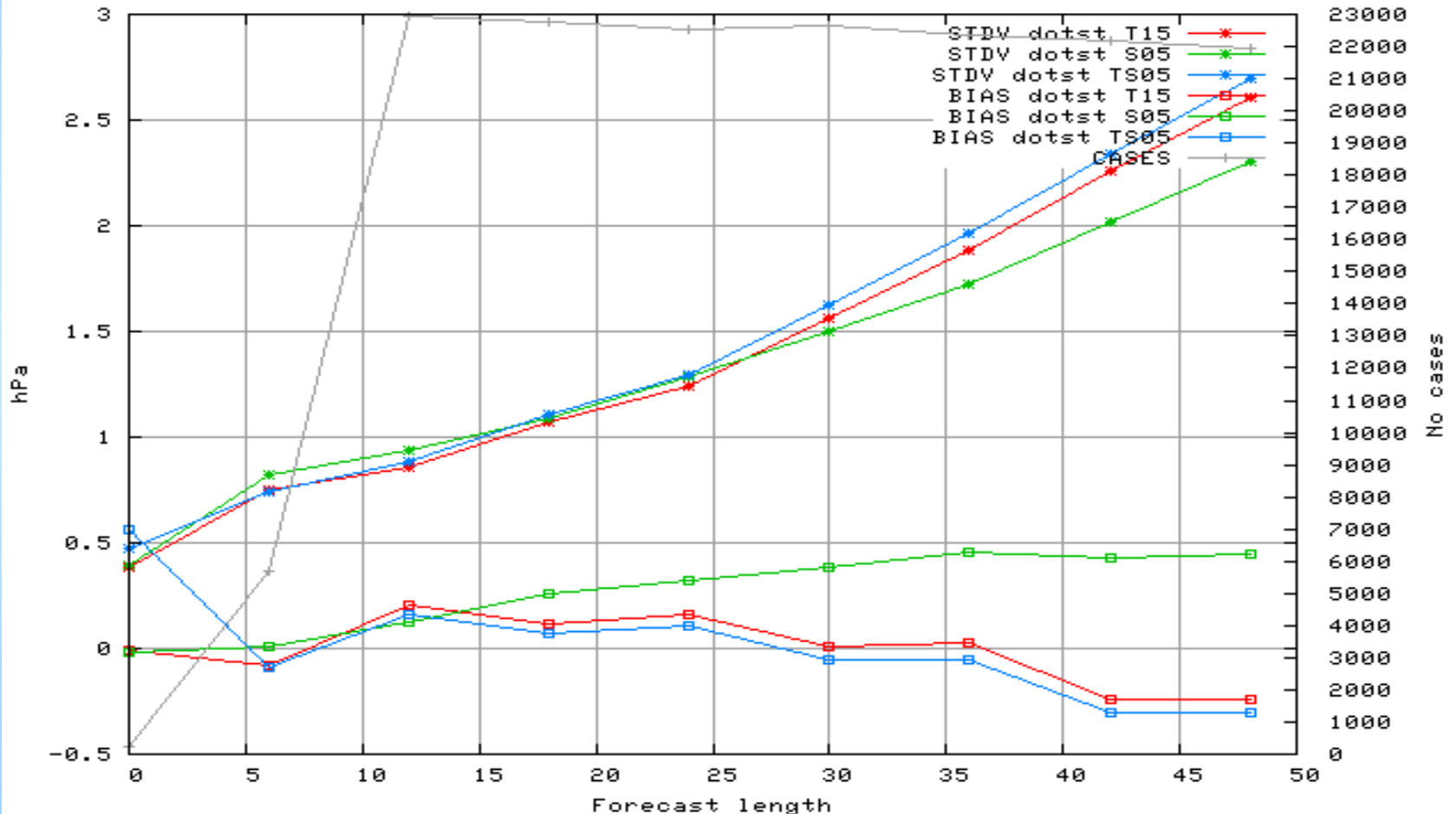
DMI T15 vs S05



DMI T15 vs S05



Area: Scandinavia using 208 stations
Period: 20081021-20081125
Surface pressure Hours: {00,06,12,18}



Some Observations from Common Interface



- Verification scores. Be careful with interpretations.
- Smaller domains, better scores?
- Nesting strategy: does it pay off?
 - Dominance of ECMWF LBC
 - What about LOTHAR storm? (3h vs 1 h coupling)?
 - Coupling problem? Quality of model?
- Link between 'synoptic' and weather parameters
 - Upper air scores and mslp often delinked to surface scores
 - Robustness of the usual parameters?

Summary

- 4DVAR!
- Resolution progress; LSMIX; non-nesting;
- Hirlam forecast quality on track;
- Not very eventful year in operational system;
- Real time HARMONIE in main HIRLAM services with diverse models/cycling/nesting;
- Common verification and monitoring interface taking shape
 - Intercomparison of model verification/monitoring helps
 - Objective scores may sometimes be deceiving

How to make better use of the common monitoring interface

- A coordinated monitoring team??
 - A team of N volunteers (12 or 26 or 52 ...) taking duties in shift
 - Examine monitoring interface; detect and comment abnormal/interesting features
 - Exchange on HIRLAM "monitoring" forum

Off-the-topic: about HIRLAM repository



- Trunk, tags, branches
 - **Trunk** is the main development code set as candidate for the next official system
 - Before the launch of 7.3, trunk is always the latest update for 7.3;
 - After tagging of 7.3, trunk become candidate of 7.4...
 - **Branches**
 - Technically branches is similar to trunk, but for various development purpose: national branch, special feature branch (newsnow, cis), stable branch (7.2 after tagging of 7.2)
 - **Tags**
 - Tagged codes are anapshot of trunks or branches.
 - **Alpha release(7.2alpha1)**: a snapshot of trunk which is unmature both technically and meteorologically;
 - **Beta release (7.2beta1)**: a snapshot of trunk which is deemed technically mature for evaluation and meteorological validation; possibility for more features to add;
 - **Release candidate(7.2rc1)**: pre-release taging for final evaluation
 - **Official release (7.2)**: mature for operational use
 - **Post-release tagging (7.2)**: bug fixes, platform change hpce-c1a;...