

Recent activities with the ALADIN/HU 3DVAR system

16th ALADIN workshop
May 16-19 2006

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and
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About...

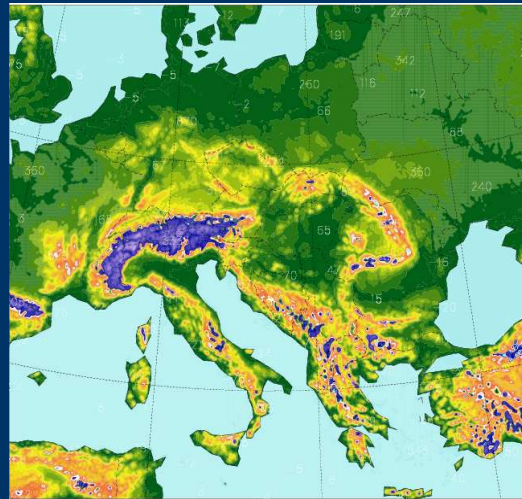
1. Operational changes
2. General performance
3. Recent developments
4. Plans



Operational changes

Main features:

- AL28T3
- 3DVAR assimilation
- 48h production (2/day)
- ARPEGE LBC



Assimilation settings:

- 6h cycle
- short cut-off prod. analyses
- NMC method
- DFI
- LBC every 3 hours

(short cut-off ARPEGE files at 00 UTC)

Model geometry:

- dx=8km (349*309)
- 49 levels
- linear grid
- Lambert projection

Observation use:

- SYNOP, **SHIP** (geop)
- TEMP (T,u,v,q)
- ATOVS/AMSU-A
- **ATOVS/AMSU-B**
- AMDAR (T,u,v) + filter

Comparison with dynamical adaptation

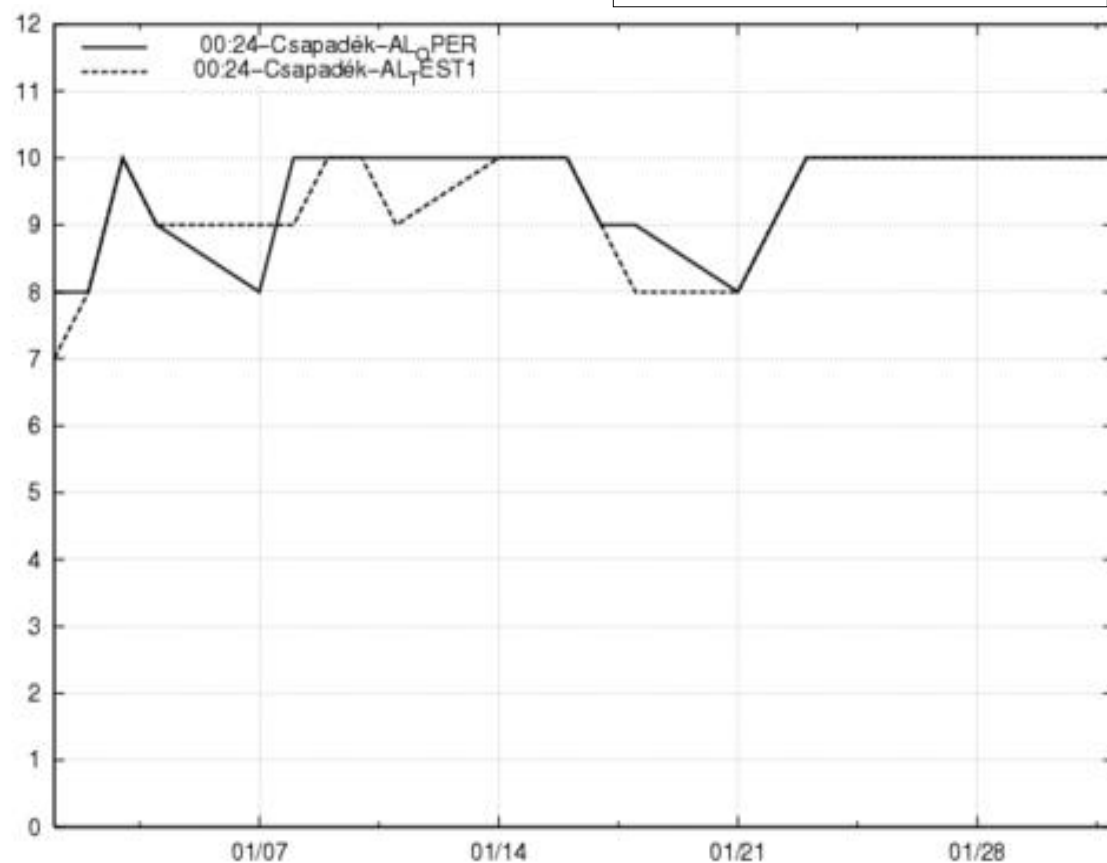
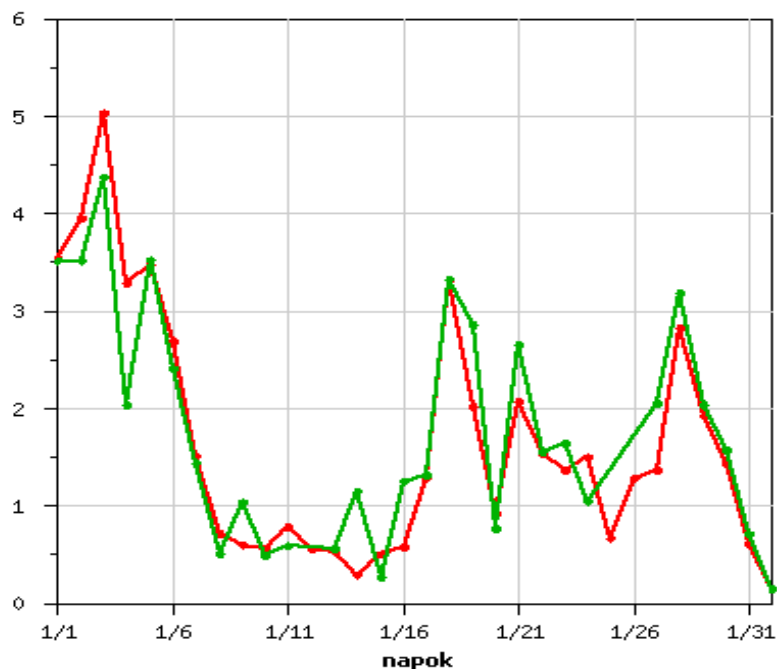
+12h RMSE

precipitation
period: 01.01.2006 - 01.02.2006

subjective verif

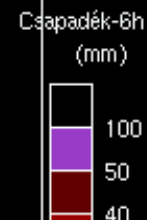
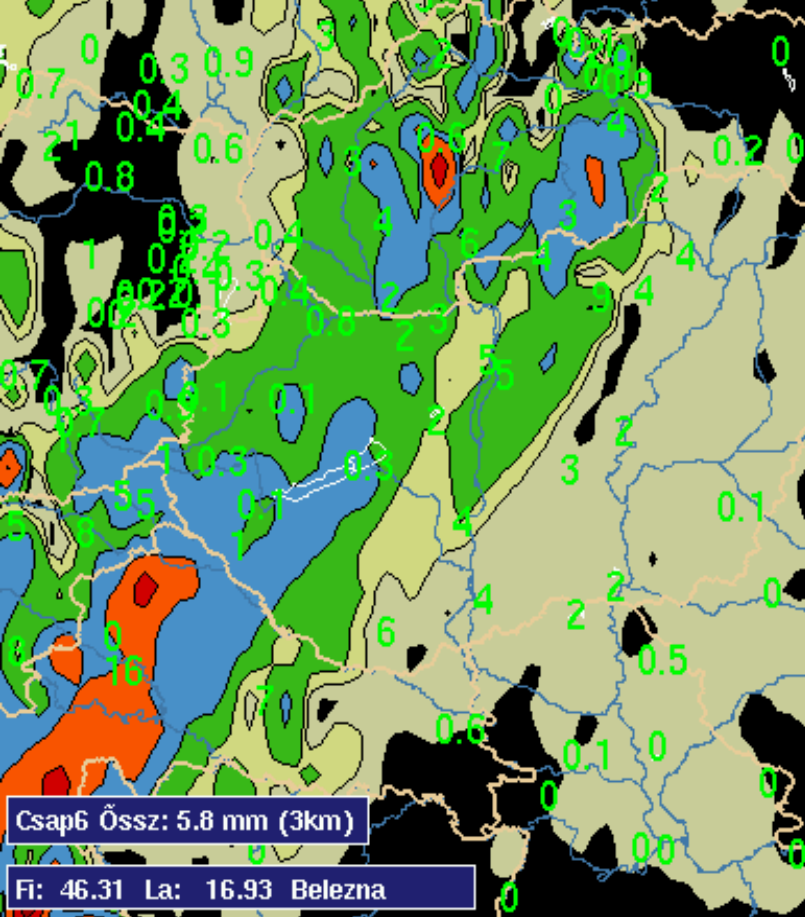
A 2006-01-01 - 2006-02-01 időszak Idő-t ábrája
a Csapadek_12 paraméterre vonatkozóan.
jelmagyarázat: modell/terület/időlépcső/score

ALHU_00/egeszAladin/+012/RMSE TEST1_00/egeszAladin/+012/RMSE



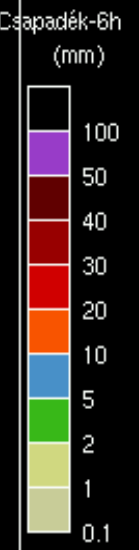
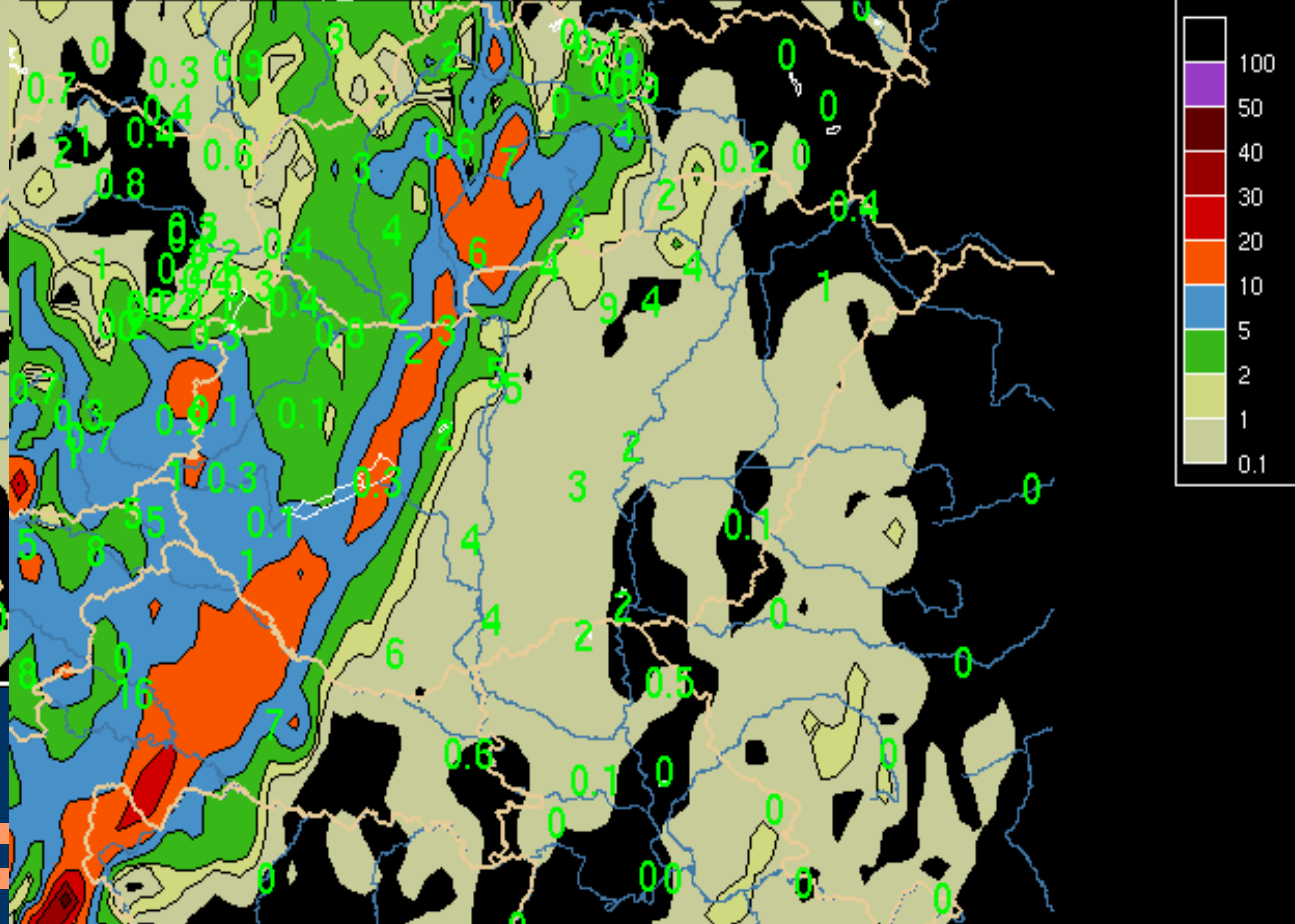
Comparison with dynamical adaptation

ALHU Csapadék-6h Össz (mm) 2006-Jan-02 Hétfő 00:00 UT (+24ó)
SYNOP (Minden) Precip 6hEXP (mm) 2006-Jan-02 Hétfő 00:00 UT



- weaker overestimation
- better locations

ALTEST1 Csapadék-6h Össz (mm) 2006-Jan-02 Hétfő 00:00 UT (+24ó)
SYNOP (Minden) Precip 6hEXP (mm) 2006-Jan-02 Hétfő 00:00 UT



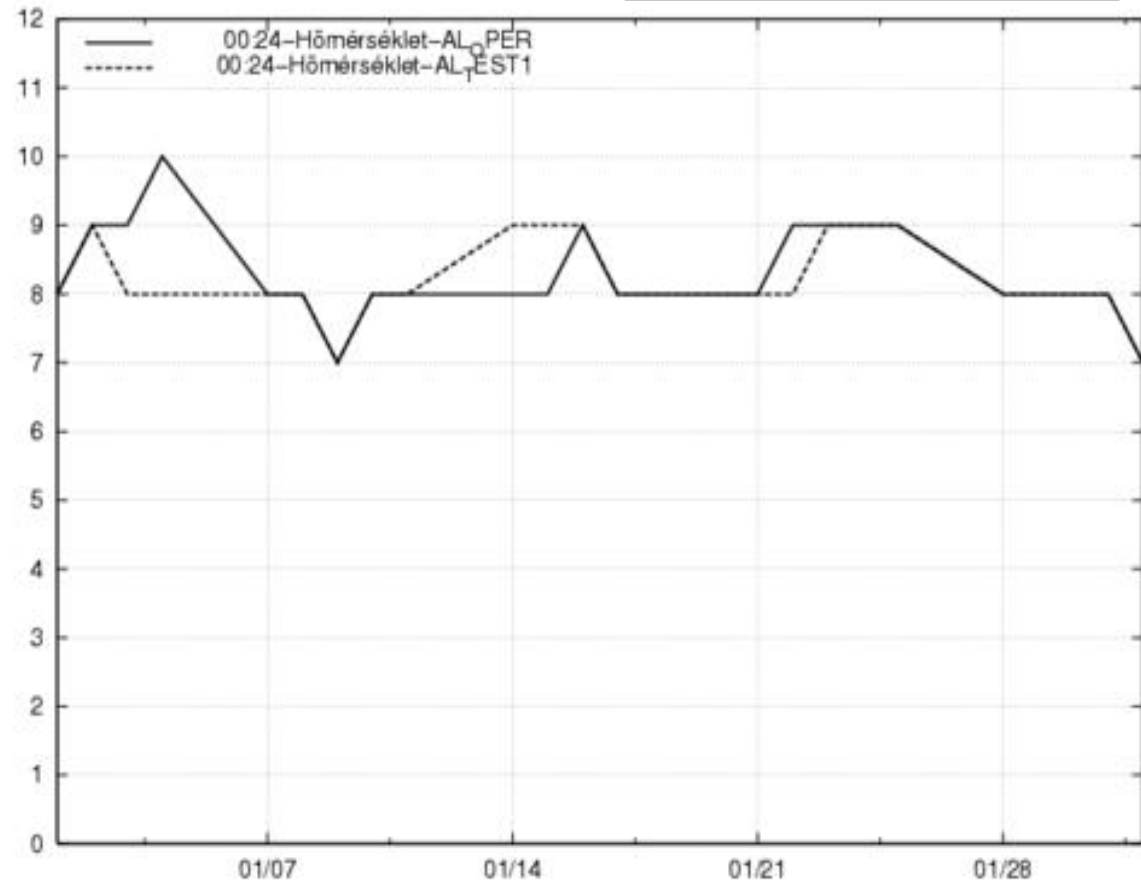
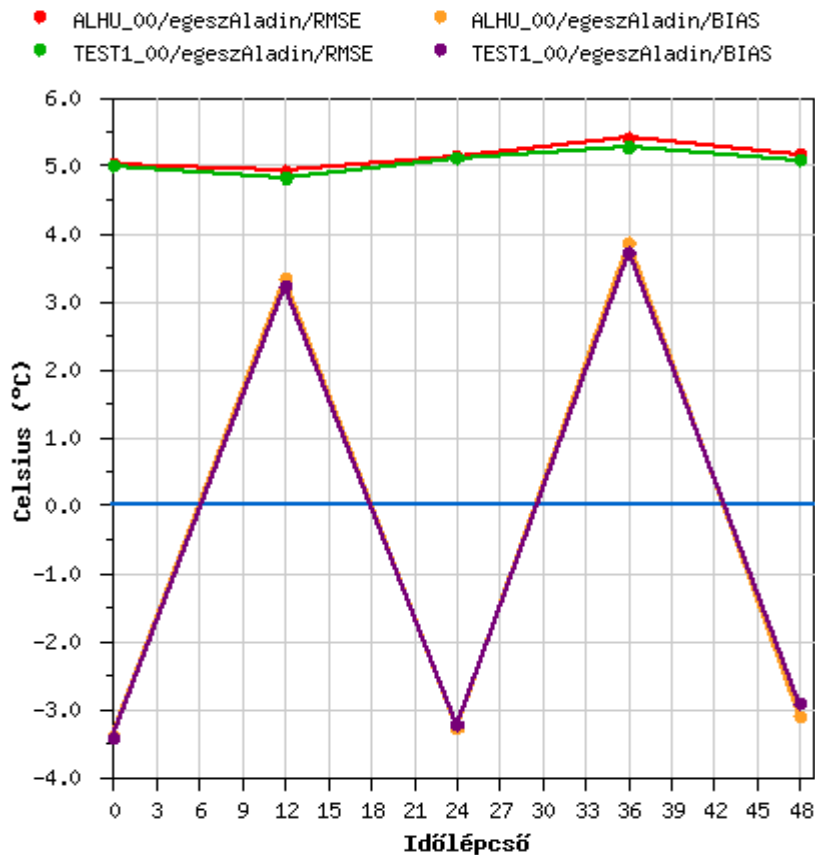
Comparison with dynamical adaptation

2m temperature

period: 01.01.2006 - 01.02.2006

subjective verif

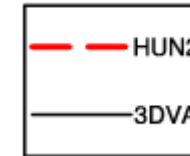
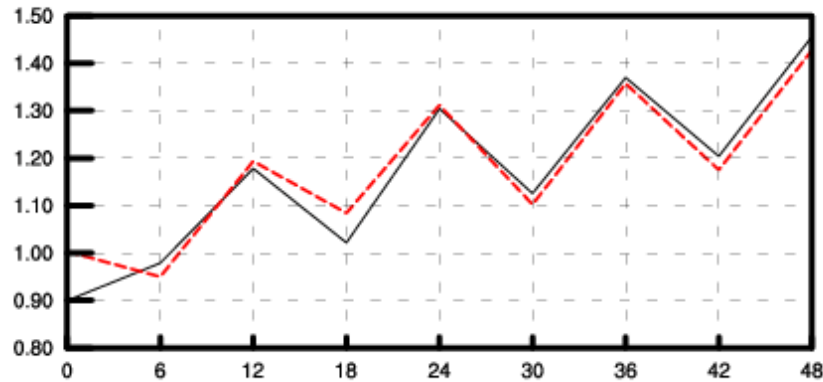
RMSE & BIAS



Comparison with dynamical adaptation

temperature

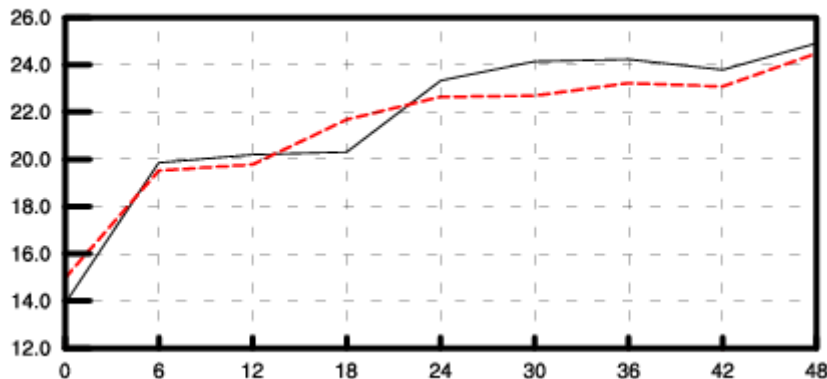
850 mb



- analysis close to the observations
- benefits lost for the 2nd day

humidity

700 mb



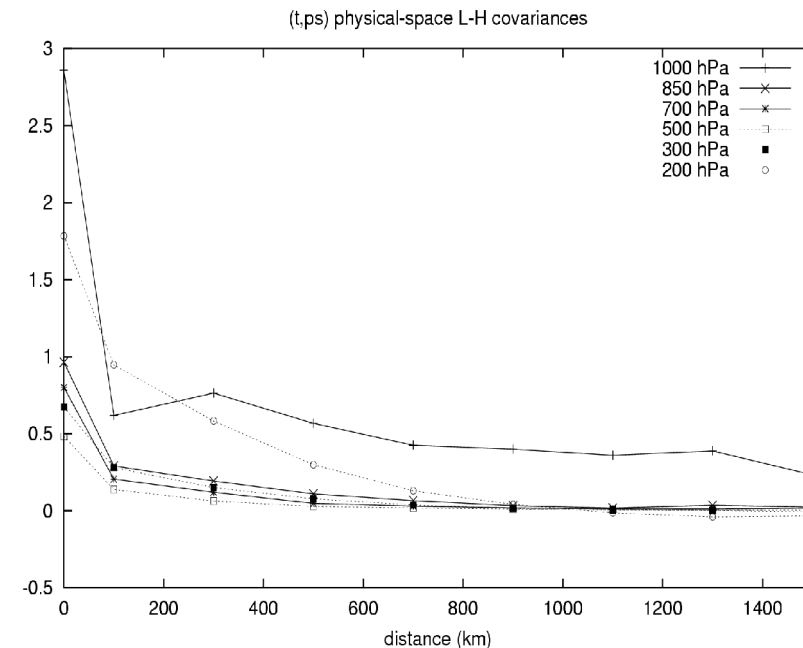
background and observation errors to be revised!

Background errors

1. Innovation (Lönnerberg - Hollingsworth) diagnostics

$$\epsilon_b = y - H(x_b) \longrightarrow \text{corr}(\epsilon_b, \epsilon_b)$$

- derive correlation function by averaging over similar distances
- extrapolation of the correlation function to 0 distance
- only std. dev. were revised



2. Ensemble method

$$\epsilon_b = M_{6h}(x_{a1}) - M_{6h}(x_{a2})$$

$$x_{a1} = x_{a1}(y_1)$$

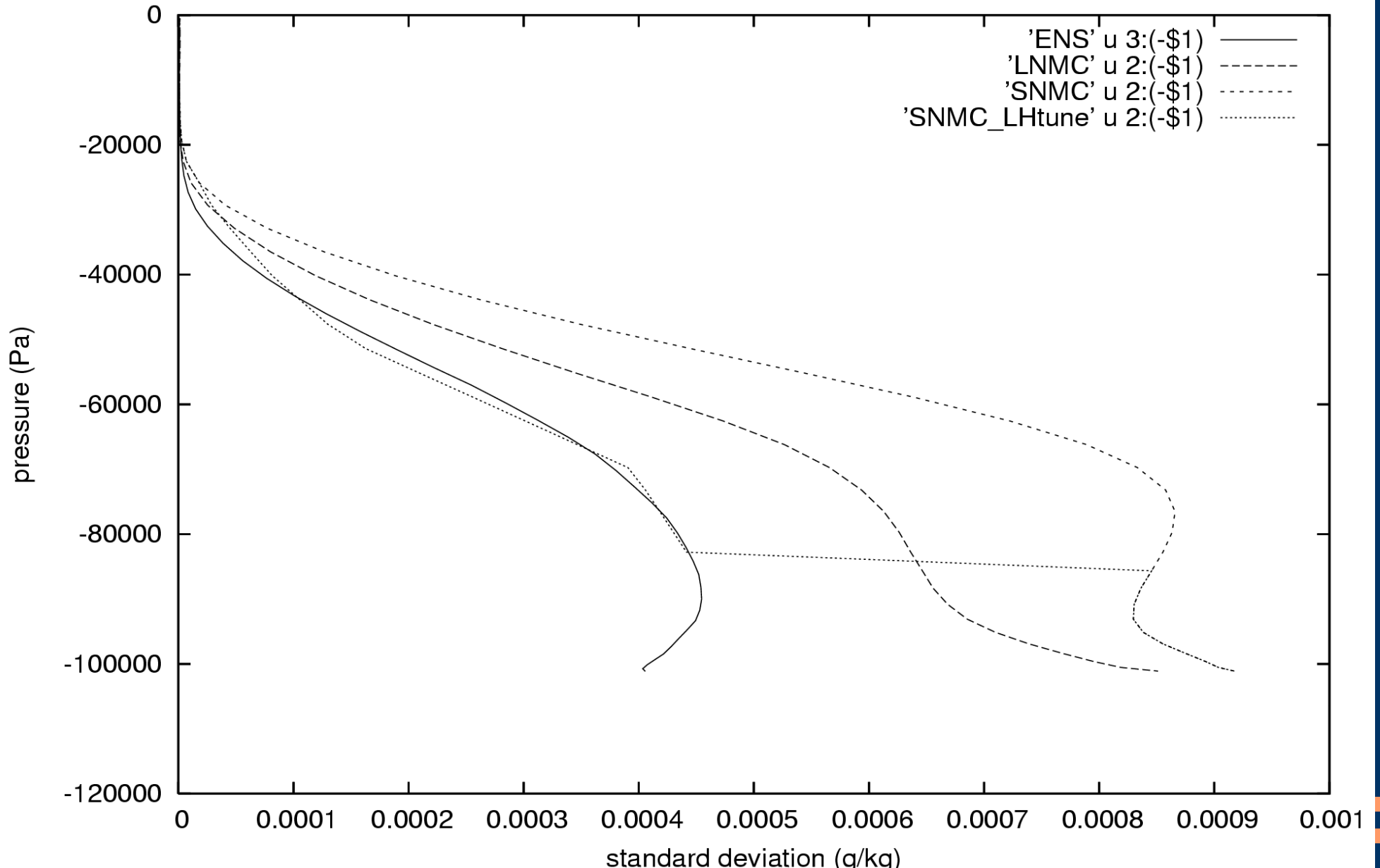
$$x_{a2} = x_{a1}(y_2)$$

y_1, y_2 : perturbed observations

- perturbations in ARPEGE
- downscaling to ALADIN/HU
- the full B matrix is recomputed

Background errors

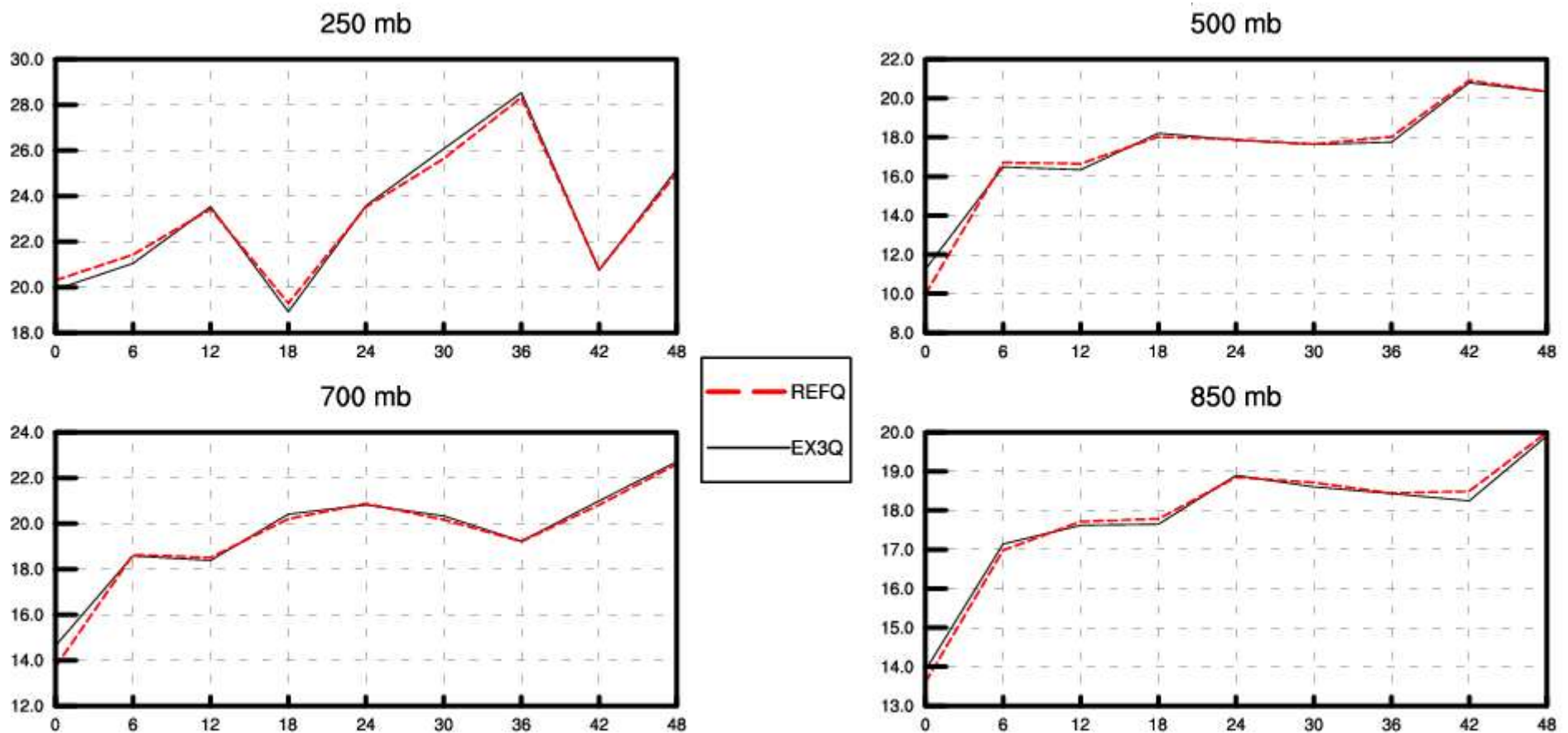
Specific humidity standard deviation profile



Background errors

NMC with Lönnberg - Hollingsworth tuning

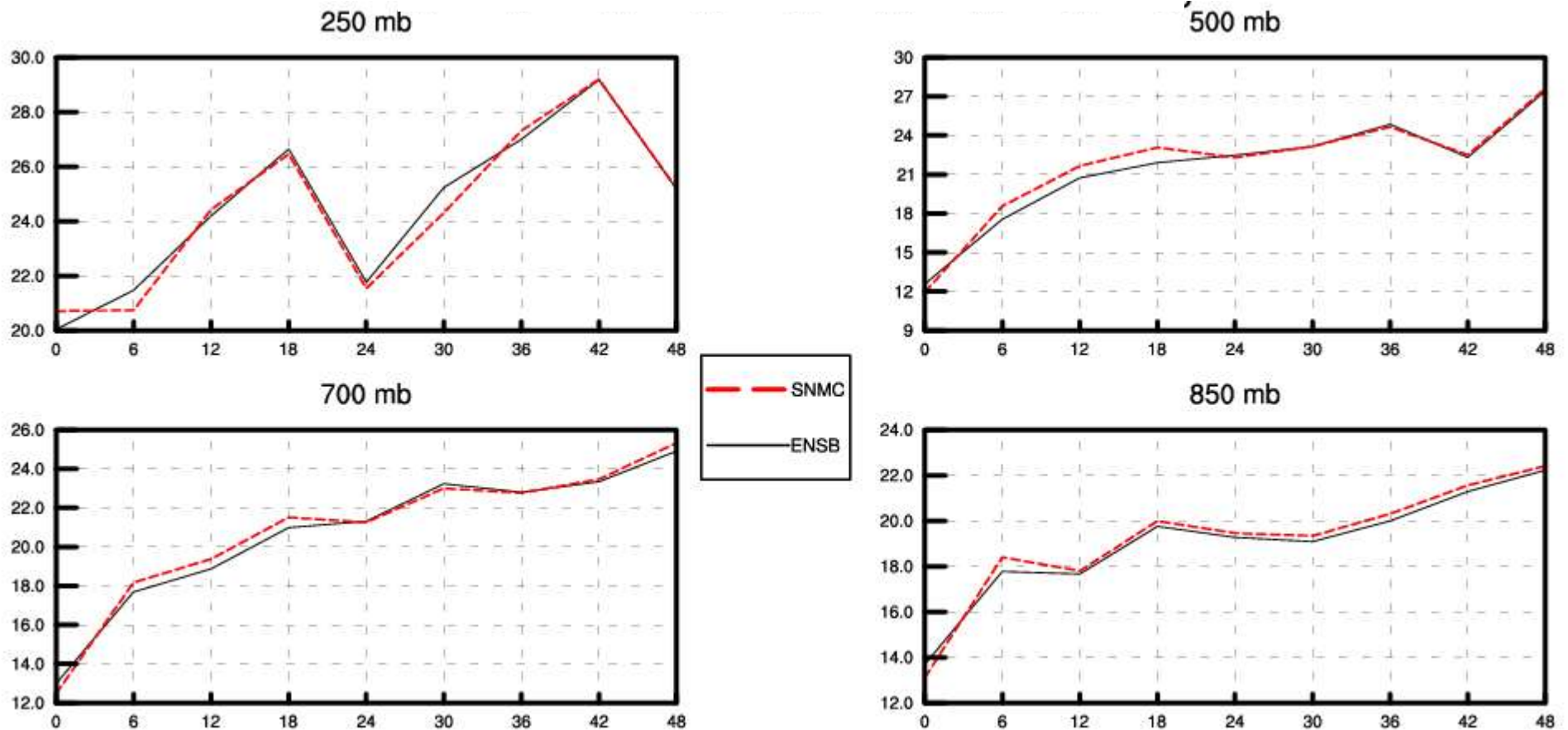
humidity RMSE



Background errors

Ensemble method

humidity RMSE

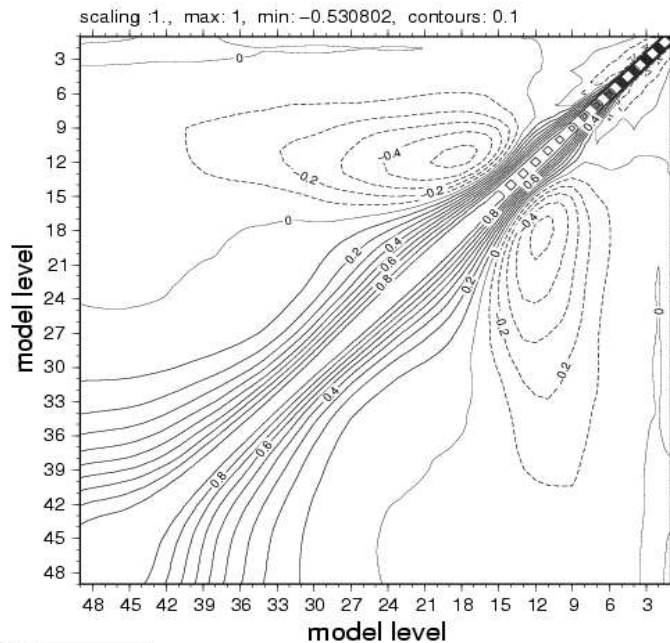


Background errors

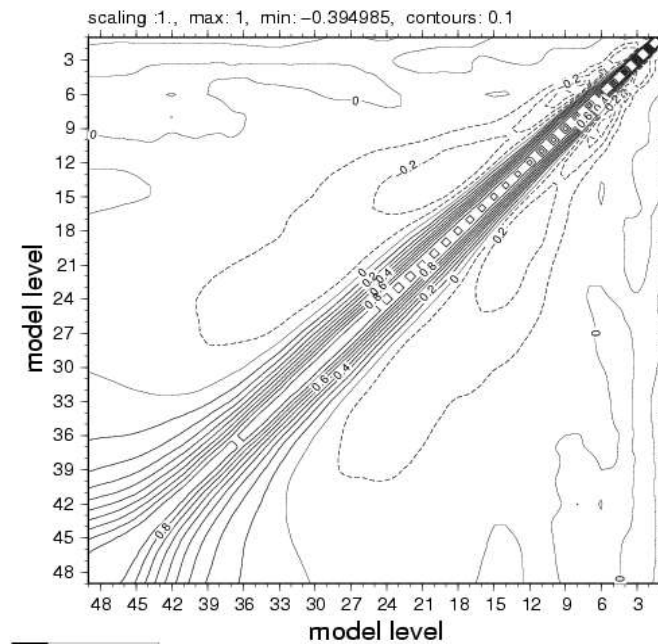
Ensemble method: other diagnostics

temperature vertical
correlations

SNMC



Ensemble



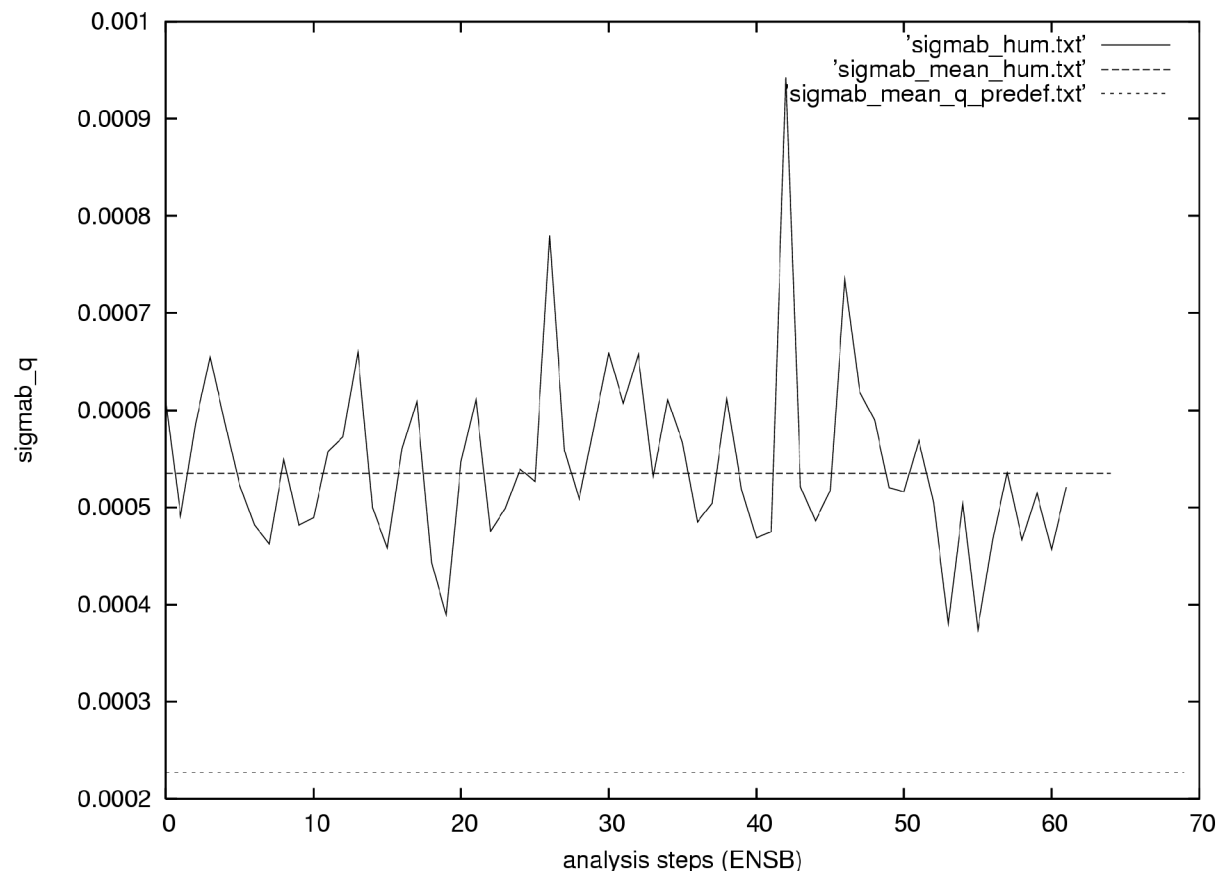
Background errors

A posteriori diagnosis

$$\hat{\sigma}_b^2 = \frac{1}{P} \sum (H_i(x_b) - H_i(x_a))(y_i - H_i(x_b))$$

$$\hat{\sigma}_o^2 = \frac{1}{P} \sum (y_i - H_i(x_a))(y_i - H_i(x_b))$$

Desroziers et al. (2005)

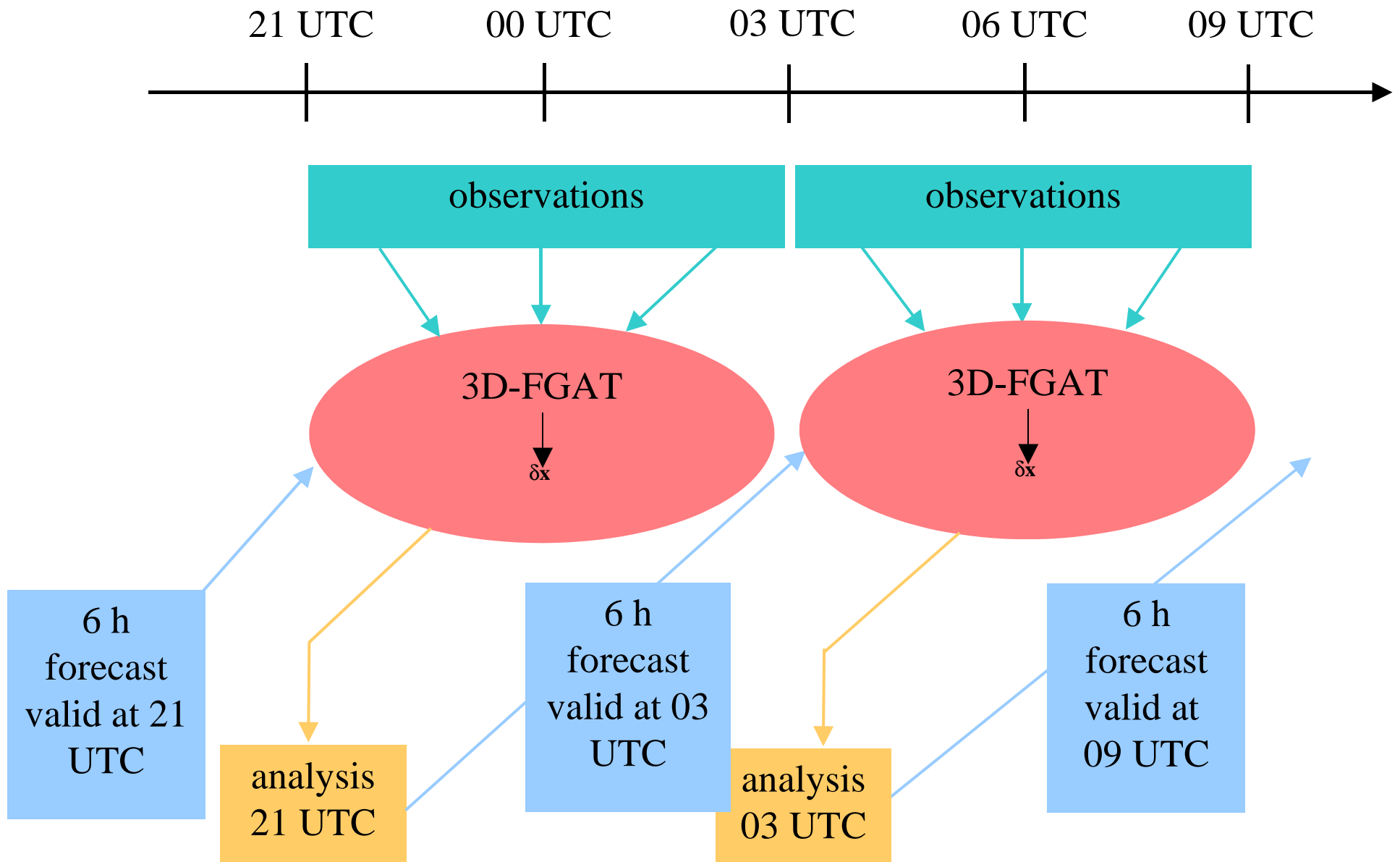


3D-FGAT

First experiments

1. single observation experiments (comparison with 3DVAR)
2. Assimilation cycle for 10 days (10 – 20 May, 2005)
 - Former ALADIN/LACE domain (dx=12km, 37 levels)
 - As many observations as possible: SYNOP, TEMP, Wind profilers
AMDAR, MSG/AMV, AMSU-A,
AMSU-B
 - comparison with an “equivalent” 3DVAR cycle

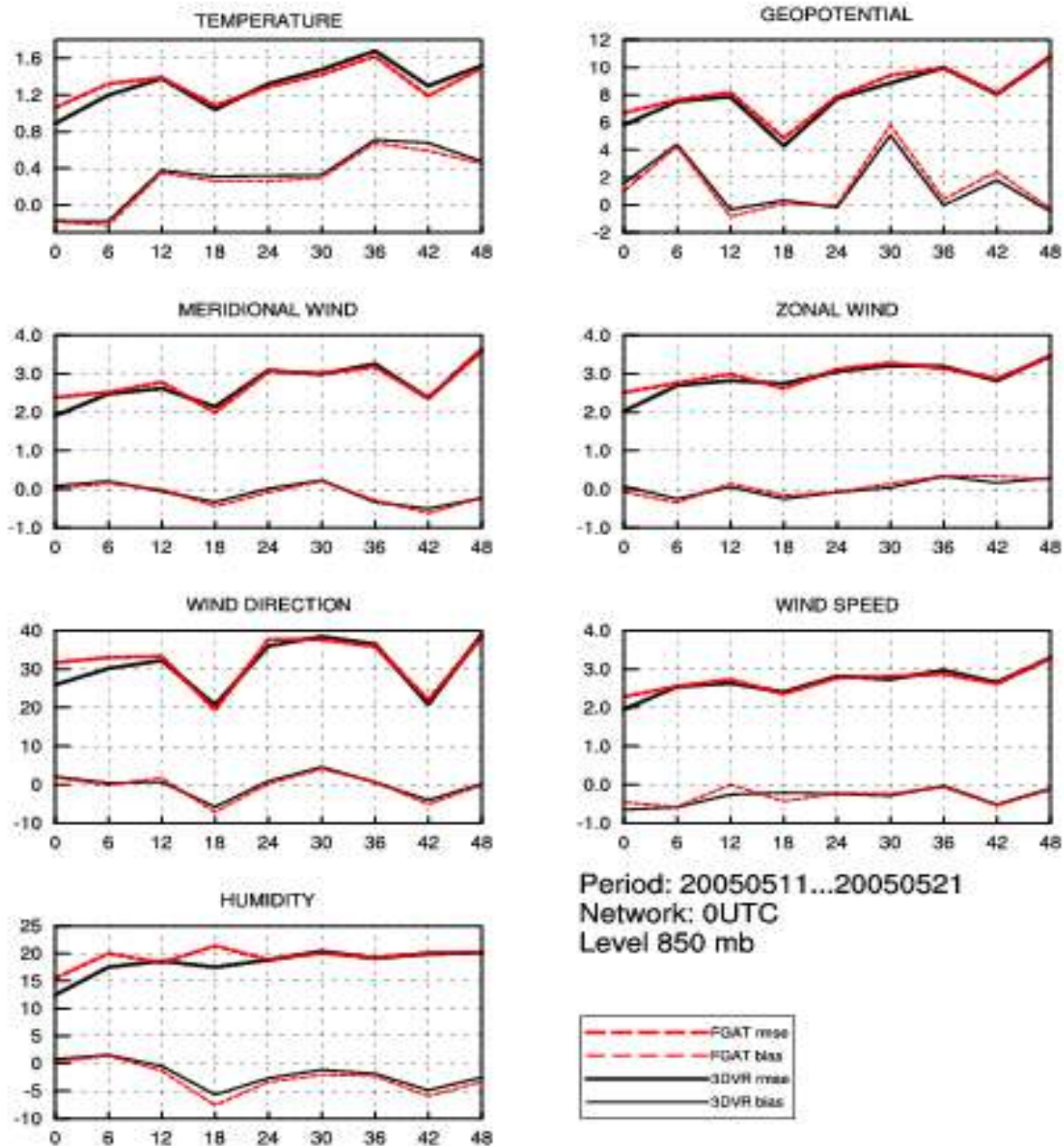
3D-FGAT



3D-FGAT

3DVAR analysis ~ 3h forecast
48h forecast ~ 51h forecast

Evolution of scores with forecast range



Observations

- AMSU-B parallel suite
- AMV experiments
- EUCOS experiments



Observations

AMSU-B parallel suite

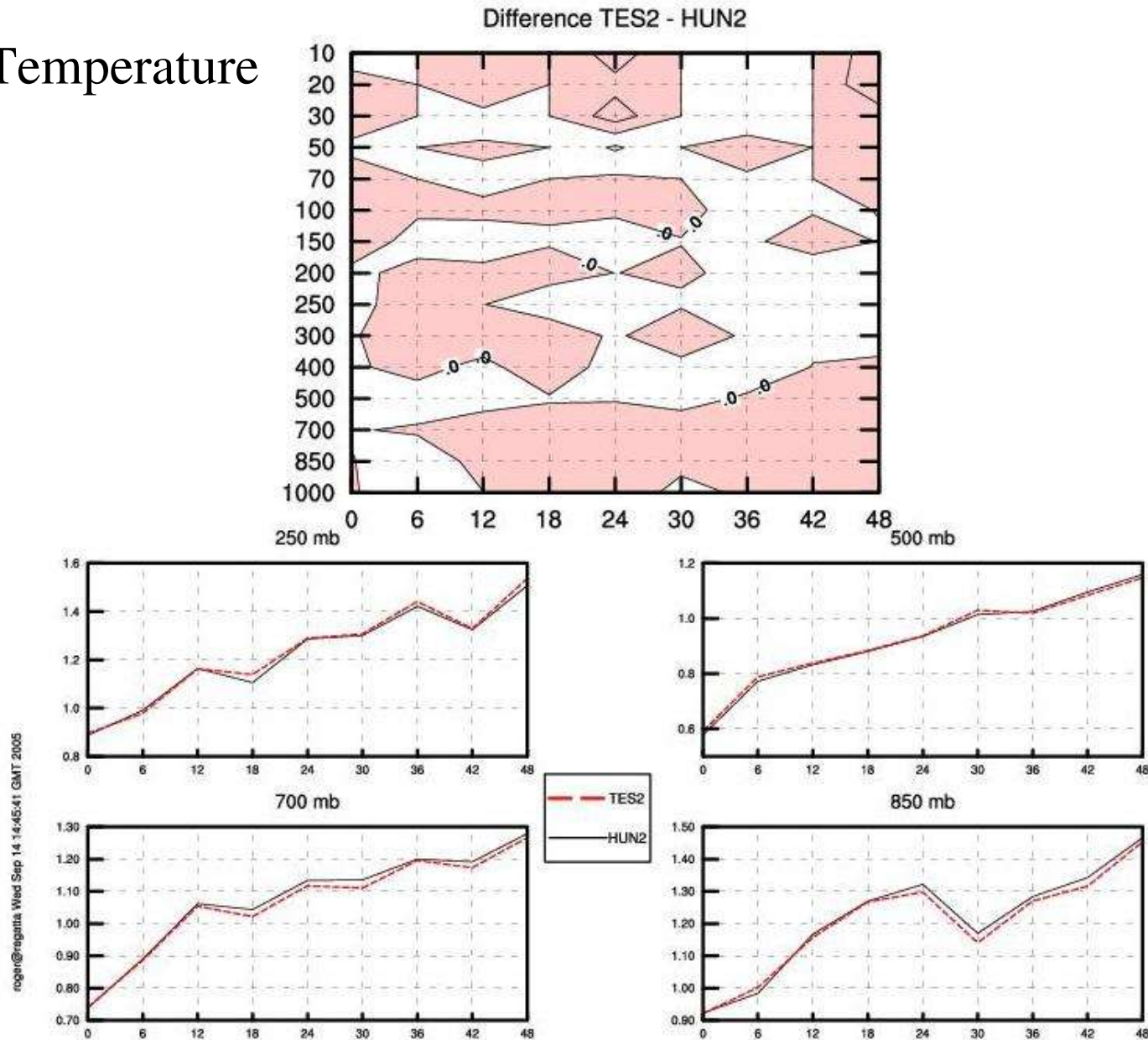
- same setup as the operational + ATOVS/AMSU-B observations
- NOAA 16 and 17
- data are used in full resolution
- objective scores
- daily subjective evaluation
- operational use (AMSU-B) since 01/02/2006



Observations

AMSU-B (TES2)

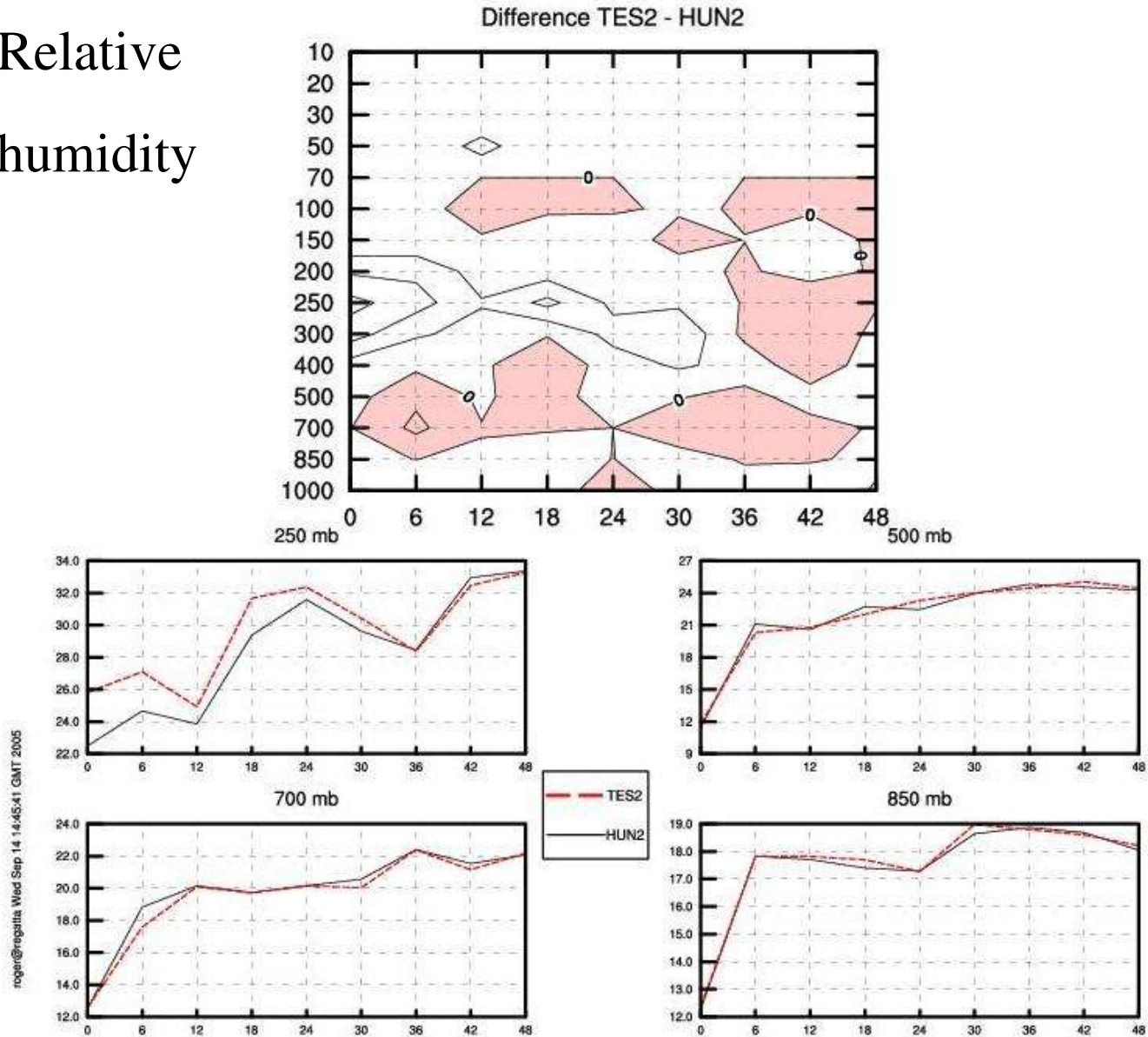
Temperature



Observations

AMSU-B (TES2)

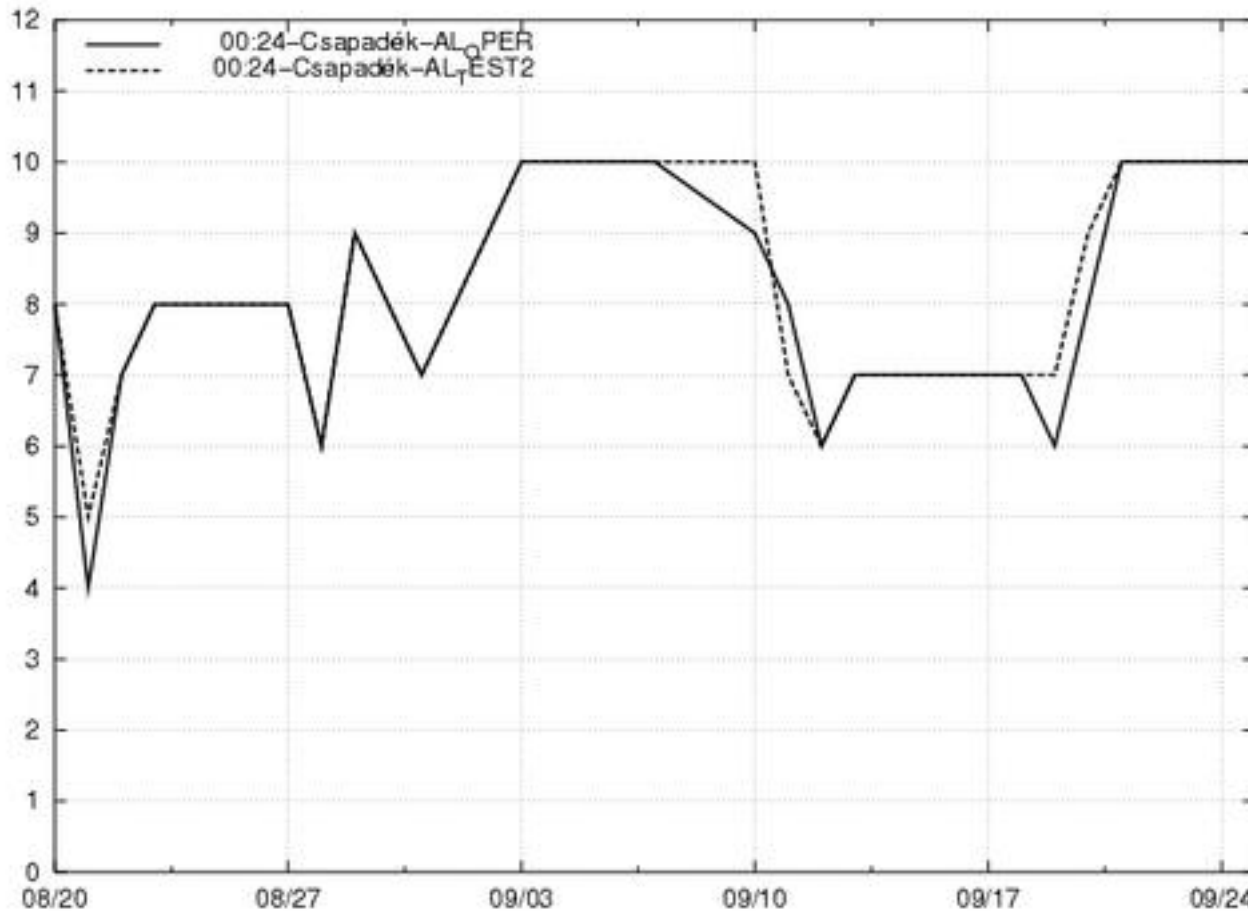
Relative
humidity



Observations

AMSU-B

Period: 20/08/2005-25/09/2005

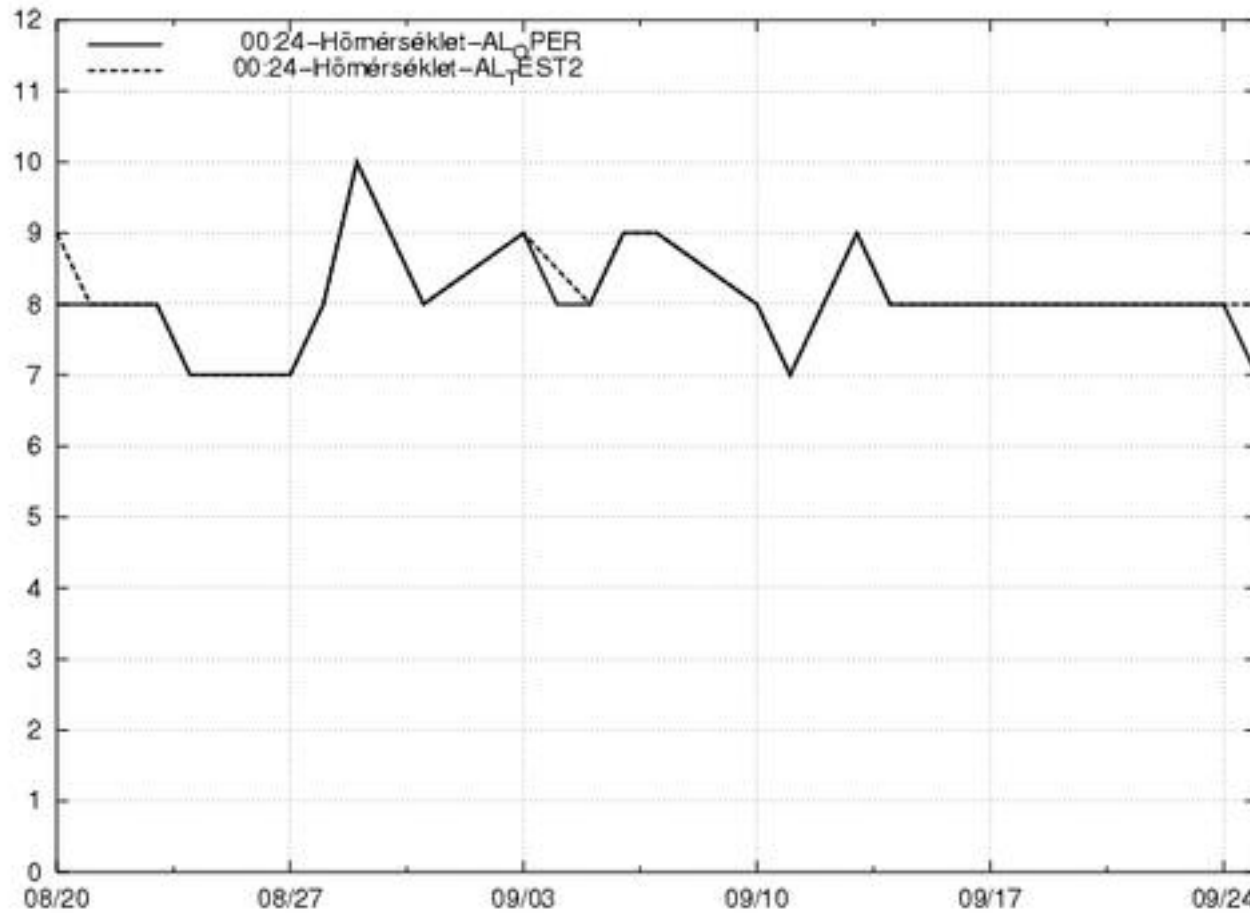


Precipitation
0-24h

Observations

AMSU-B

Period: 20/08/2005-25/09/2005



Temperature
0-24h

Observations

AMV data

- METEOSAT-8 (MSG) data
- 3 ranges: HRV, IR, HWV
- u,v velocities

Experiments

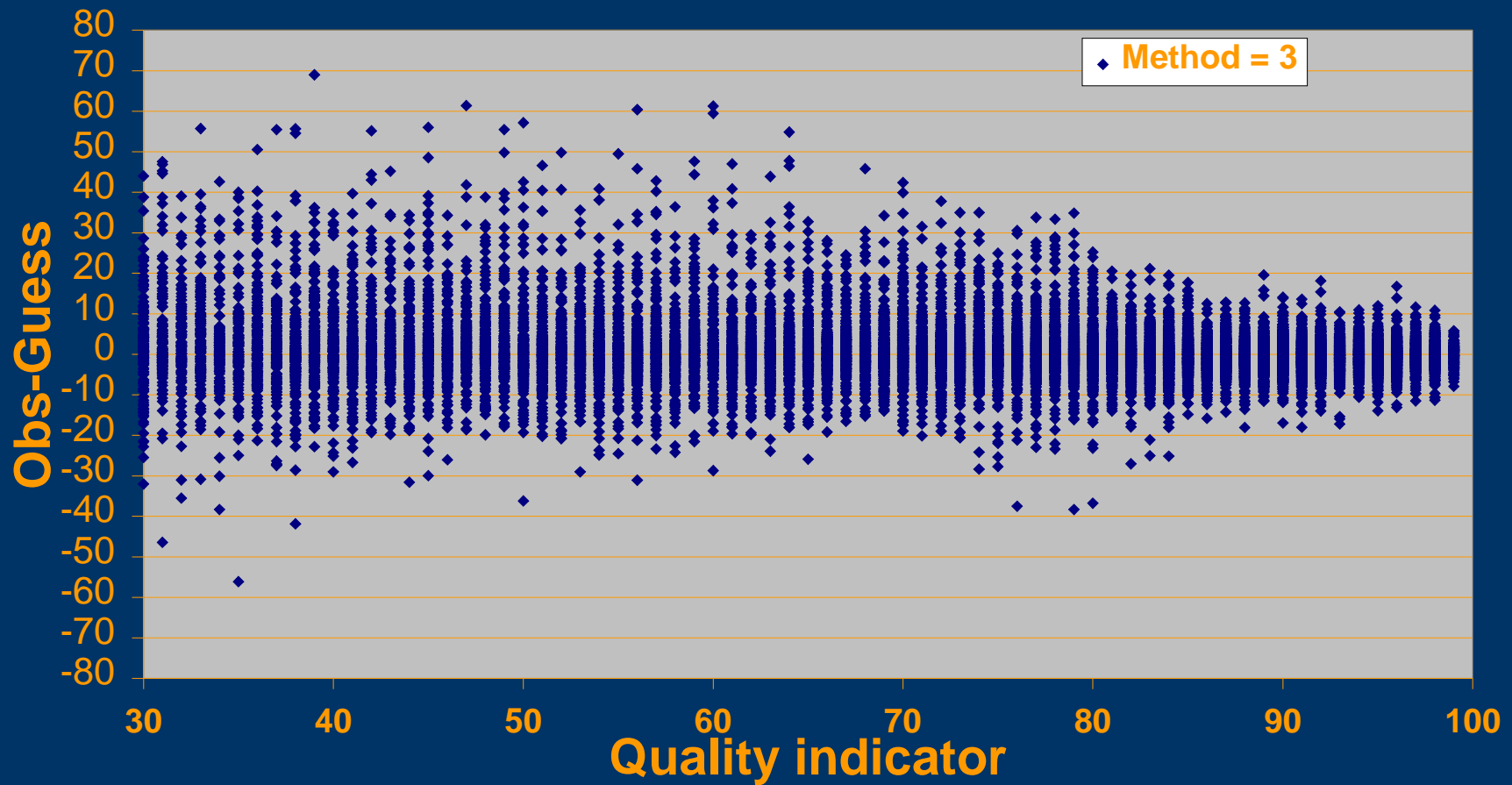
- impact studies: quality index, over sea/land
- objective scores, few cases



Observations

AMV

V component
Cloudy water vapor channels



Observations

Experiments

	QI	use over land
WDEF	QI > 85%	no
W80P	QI > 80%	no
WLAN	QI > 85%	yes

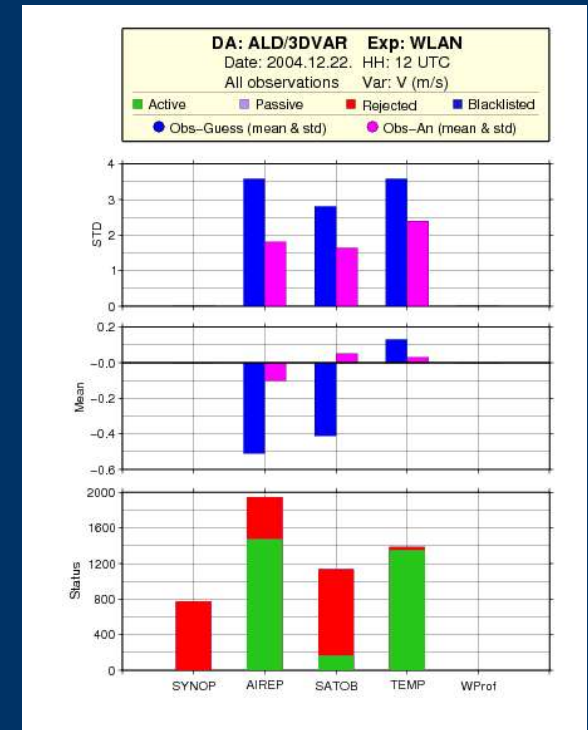
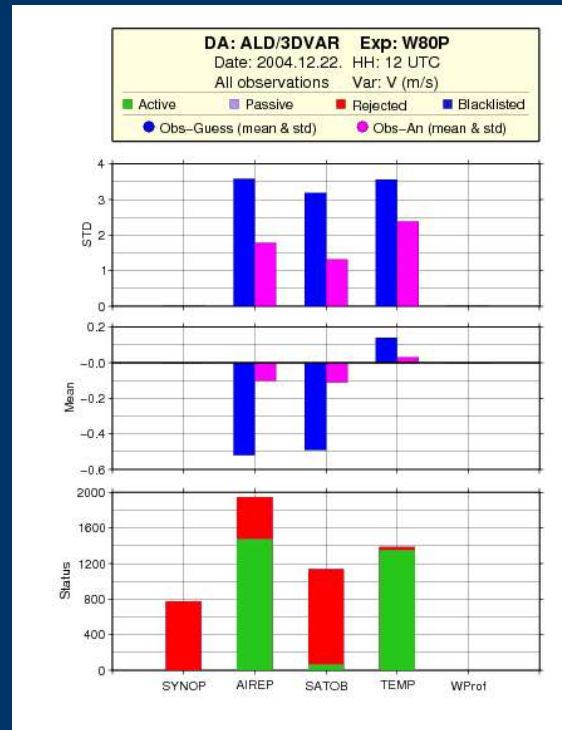
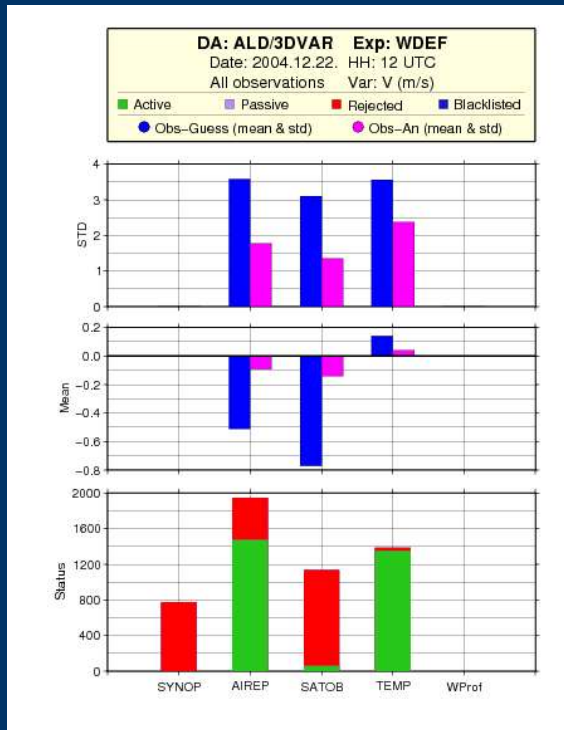
$350 \text{ hPa} < p < 800 \text{ hPa}$ \longrightarrow data are not used

Observations

WDEF

W80P

WLAN

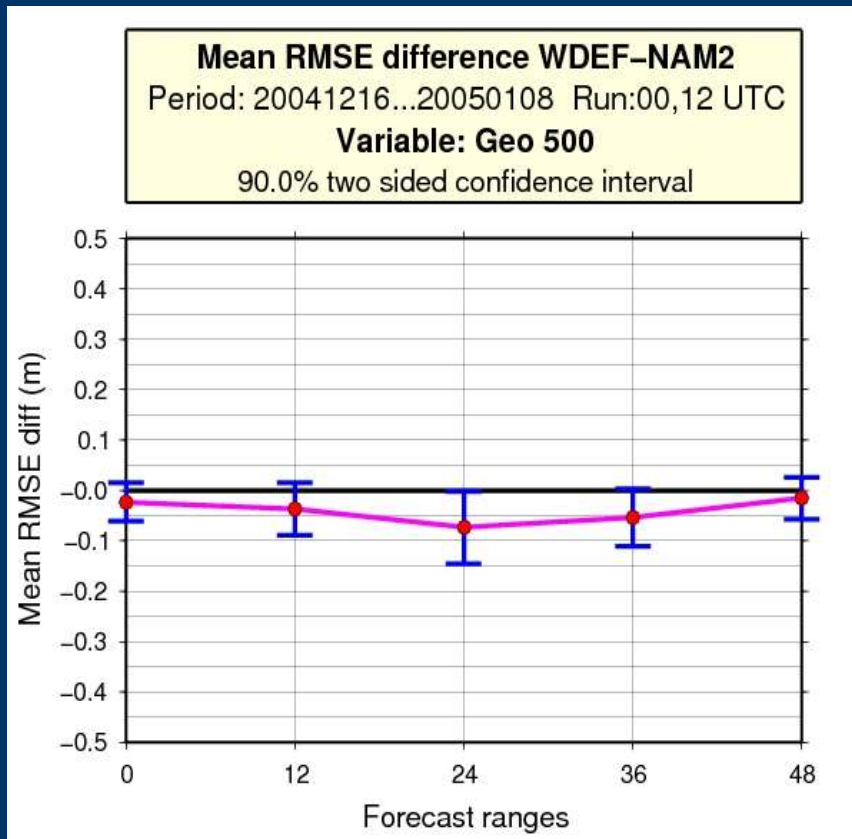


Active AMV : 57

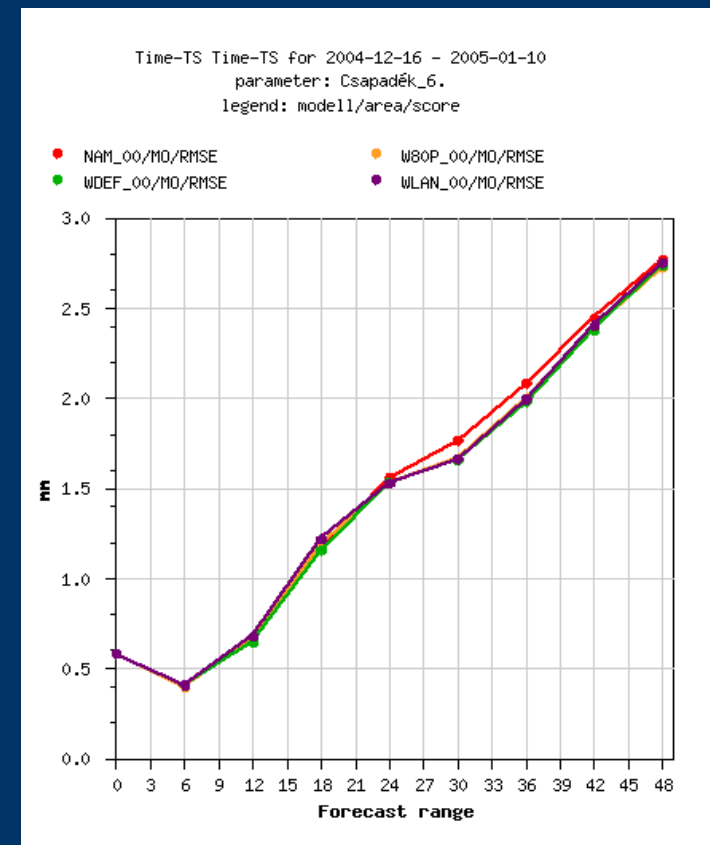
69

165

Observations



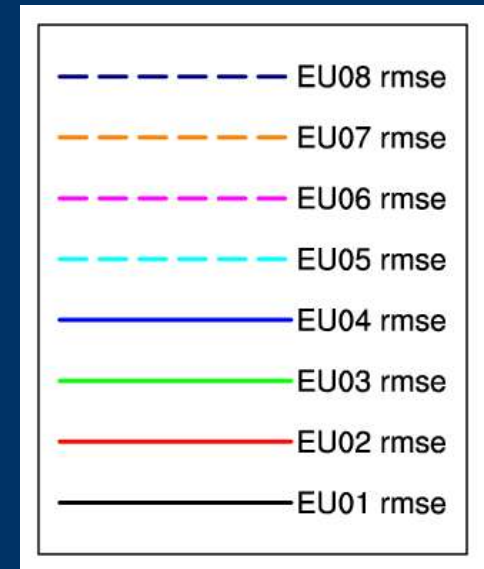
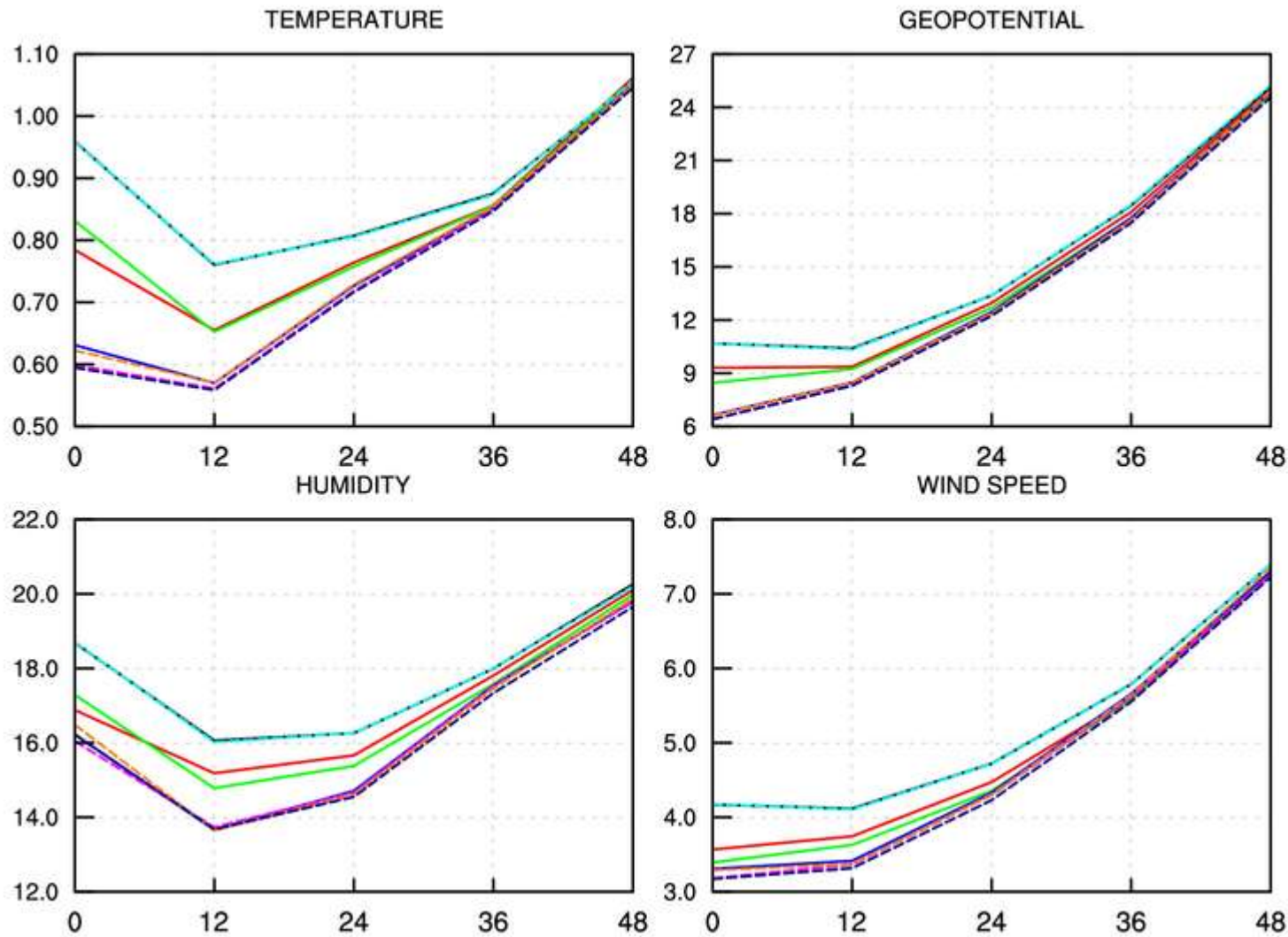
RMSE diff with
significance test



Precipitation RMSE
(Hungary)

Observations

EUCOS: impact of the ground based observing system



Plans

Error statistics

- a posteriori diagnostics and tuning (continuation)
- ensemble B matrix
- compute/implement grid-point sigmab maps

3D-FGAT

- add the analysis increment at the middle of the window
- further experiments

Observations

- EUCOS (continuation)
- RH2m and T2m from SYNOP
- SEVIRI data

Operations

- cy30
 - move to SGI Altix
 - 4 productions/day (new assimilation script structure)
-
-

Thanks for your attention!

