Impact of the ATOVS data on the Mesoscale ALADIN/HU model

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Plan of the presentation:

- Introduction: *motivation*
- Pre-processing of ATOVS data - implementation
- Impact study
- Conclusions and further experiments

Operational system: dynamical adaptation

→ initial file from ARPEGE

Our GOAL: →To build a variational analysis system

→ uses as much as possible observations

Randriamampianina and Rabier (2002)

→ very encouraging results concerning the impact of locally received and pre-processed ATOVS radiances

→ To investigate the use of ATOVS data in ALADIN/HU

Acquisition

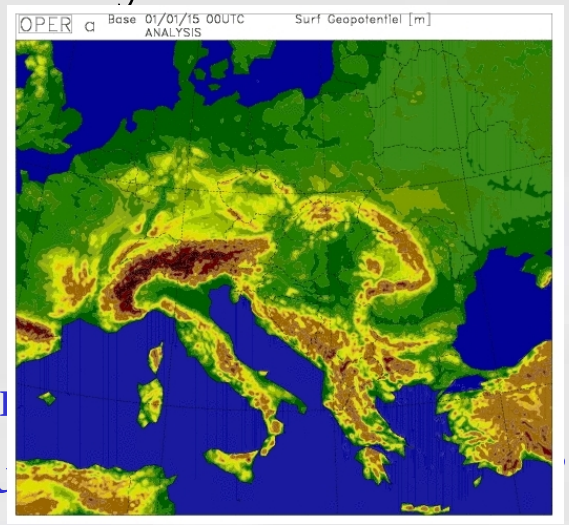
Pre-processing of radiances

- The bias correction file is computed locally (Harris and Kelly 2001)

- Radiances and channel selection: (AMSU-A)

Channel number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Over Land					*x*	*x*	x	x	x	x	x	x			
Over Sea					x	x	x	x	x	x	x	x			
Over Sea ice							x	x	x	x	x	x			
Cloudy pixel								x	x	x	x	x			

ALADIN/HU model and its assimilation system:



Model: - Hydrostatic (AL15, CY24T1)

- Resolution: 6.5 km
- 37 vertical levels

3D-Var:

- Background error covariance mat
  ➔ compu
- Simulation of radiances ➔ RTTOV-6
- 6 hour assimilation cycling: 00, 06, 12 and 18 UTC
- Coupling: ARPEGE long cut-off analysis
- ATOVS from NOAA-15 (06 and 18 UTC) and
  NOAA-16 (00 and 12 UTC)
  – AMSU-A (T ± 3hour)

Forecast:

- 48h from 00 UTC

Experiments:

Period: 2003.02.20 – 2003.03.06; ***Thinning techniques***: 80 and 120 km

Control: 3D-Var with TEMP and SYNOP

Verification:

- Comparison of forecasts → with TEMP and SYNOP observations

→ with the ARPEGE analyses

First experiments:

Default configuration: multivariate formulation for all control variables:
(**vorticity, divergence, temperature and surface pressure, specific humidity)**

-T8000: TEMP, SYNOP and AMSU-A (80km);

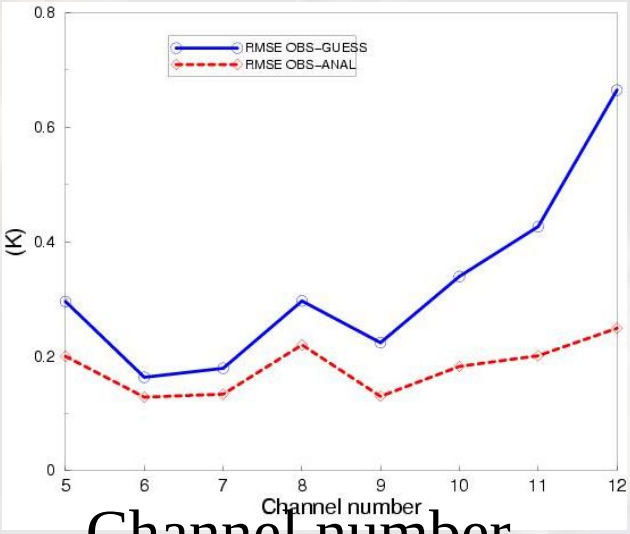
-T1200: TEMP, SYNOP and AMSU-A (120km);

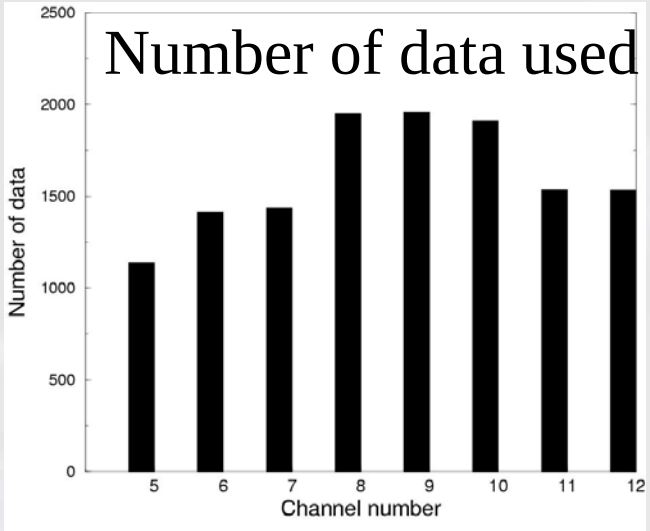
- Aladt: TEMP and SYNOP;

Assimilation of radiances (2003.02.20 – 2003.03.25):

00 UTC:

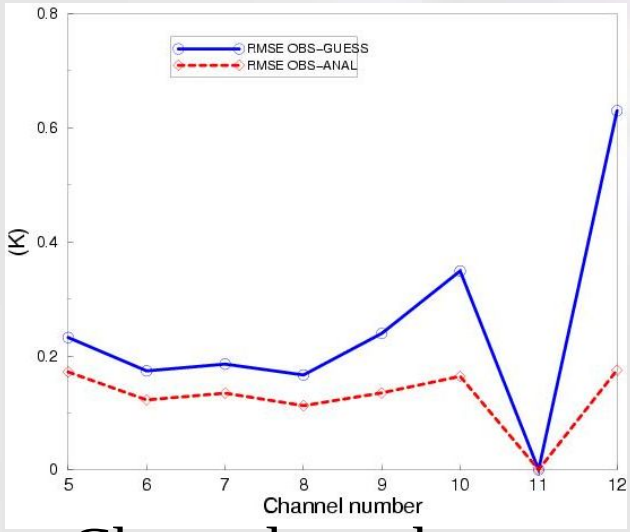
NOAA-16

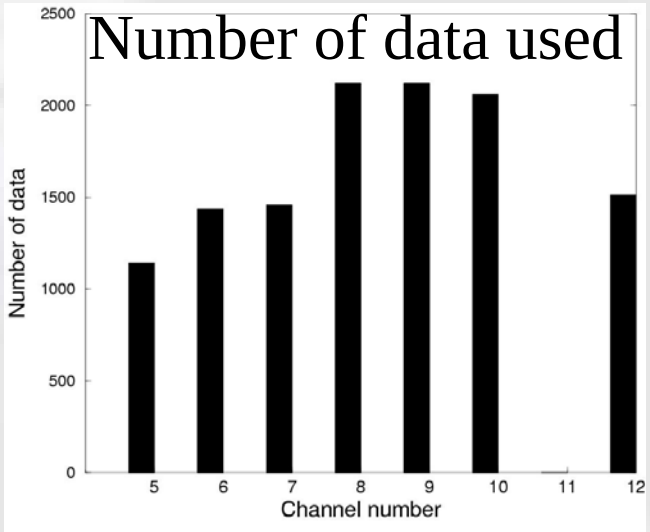




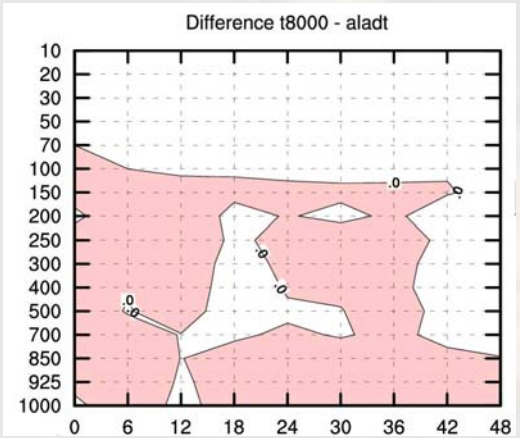
06 UTC:

NOAA-15

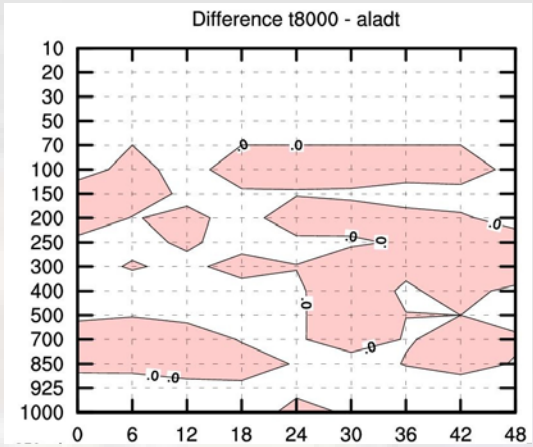




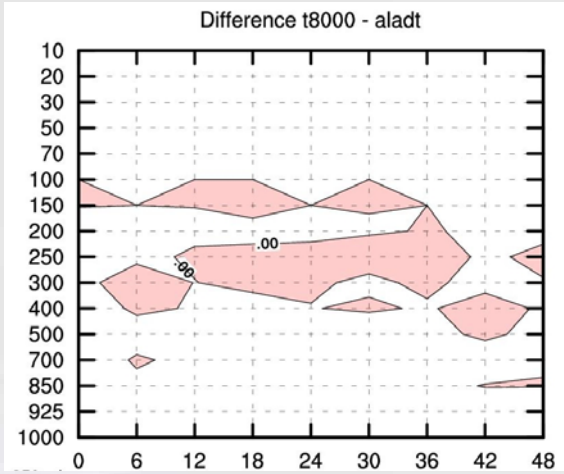
Results (comparison with obs): ***multivariate formulation***



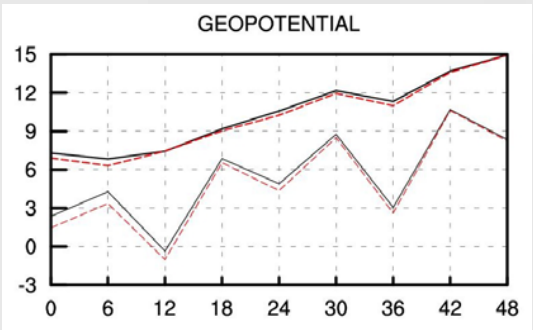
forecast ranges
Geopotential



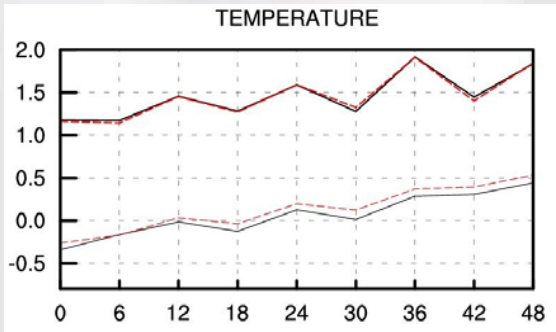
forecast ranges
Temperature



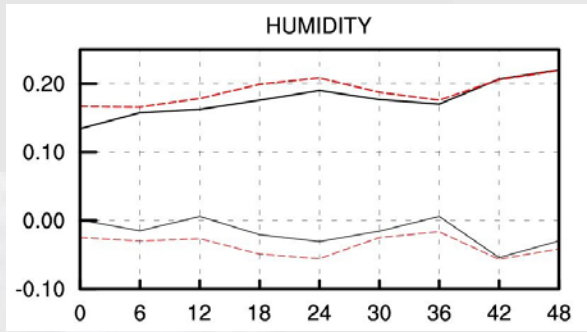
forecast ranges
Relative Humidity



Z850



T850



H850

dashed red line: t8000 and ***solid line: aladt***

Second experiments:

The ***specific humidity*** assimilated separately from all control variables (***in univariate form***)

(vorticity, divergence, temperature and surface pressure)

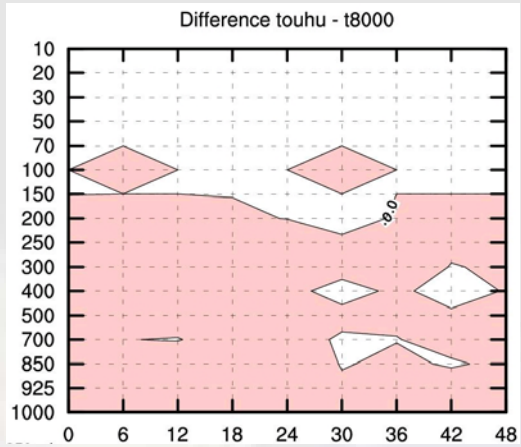
-Touhu: TEMP, SYNOP and AMSU-A (80km);

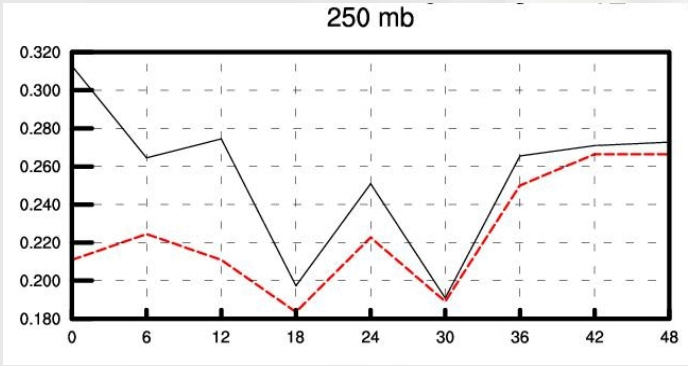
-12uhu: TEMP, SYNOP and AMSU-A (120km);

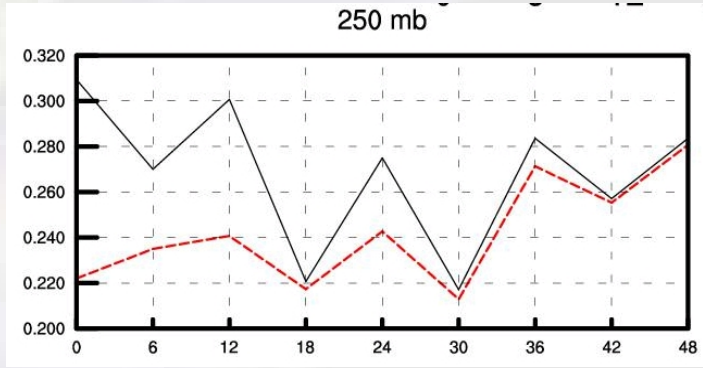
- Aluhu: TEMP and SYNOP;

Results (comparison with obs): ***specific humidity assimilated in univariate form***

Relative humidity:



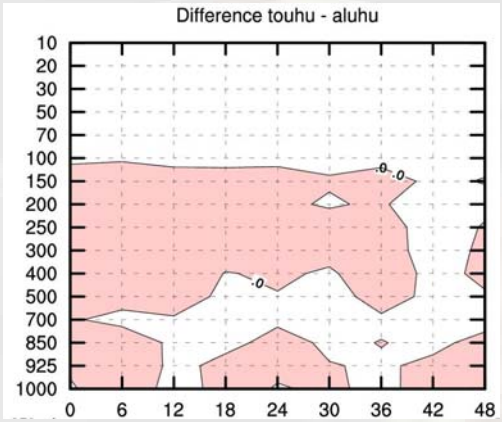




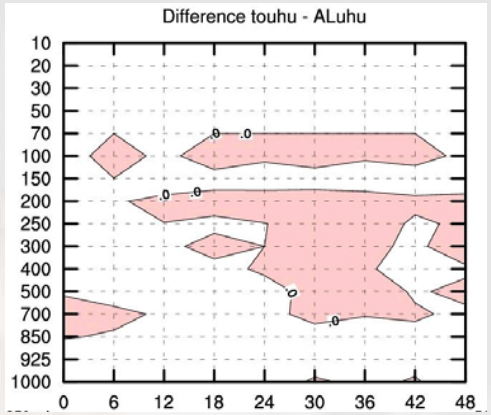
Dashed red line: Touhu
Solid line: T8000

Dashed red line: aluhu
Solid line: aladt

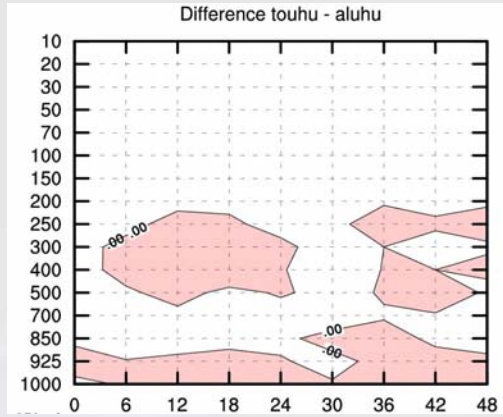
Results (comparison with obs): ***specific humidity assimilated in univariate form***



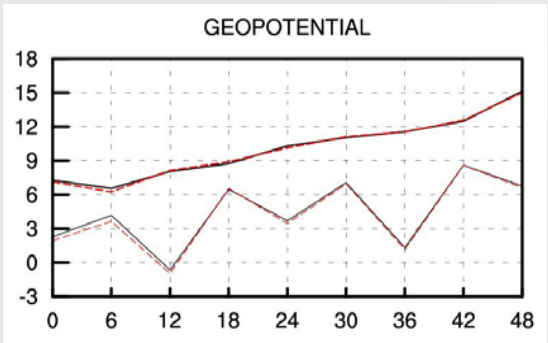
forecast ranges
Geopotential



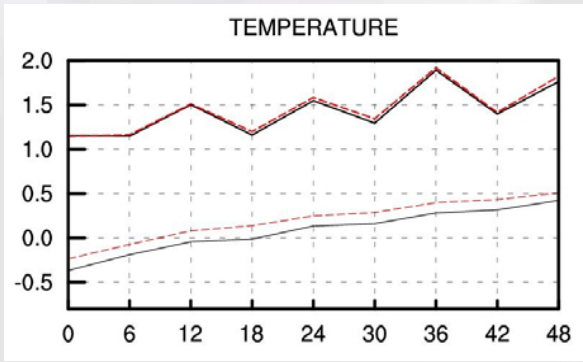
forecast ranges
Temperature



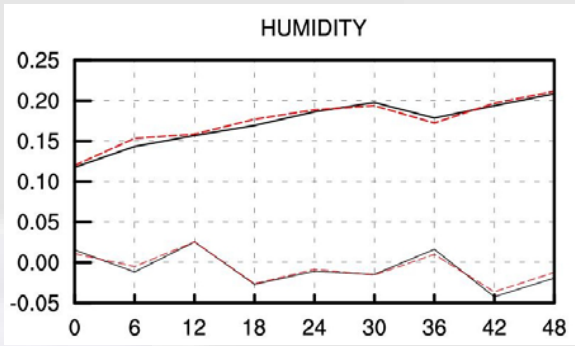
forecast ranges
Relative Humidity



Z850



T850



H850

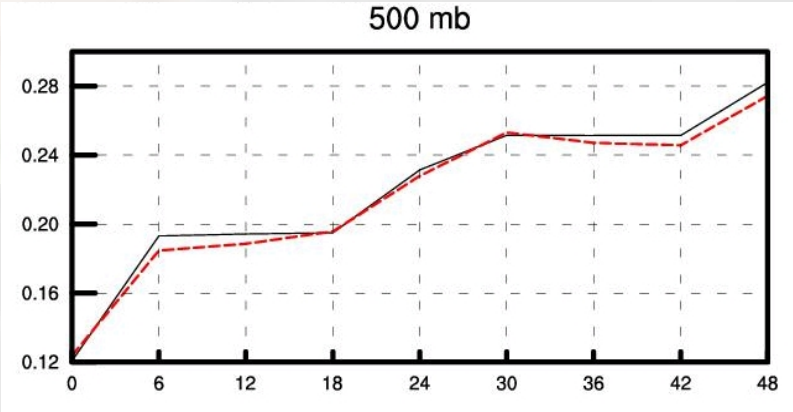
dashed red line: touhu and **solid line: aluhu**

Results (comparison with obs): ***Influence of resolution***

Dashed red line: 80km

Solid line: 120km

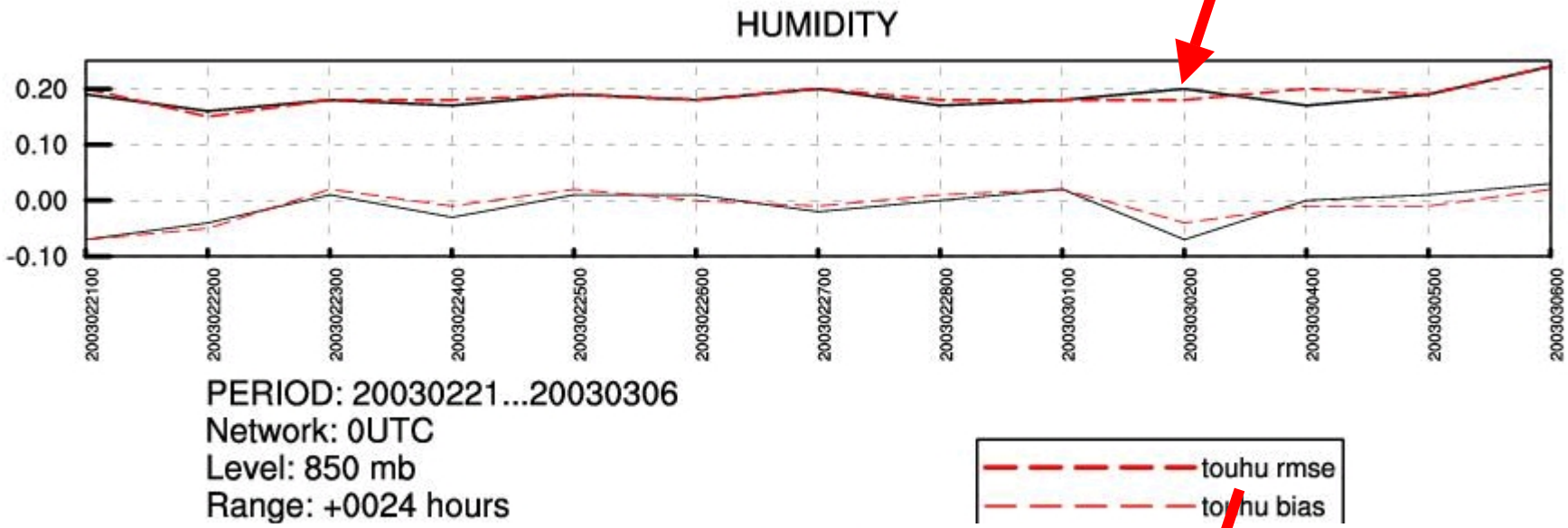
Specific humidity in univariate form

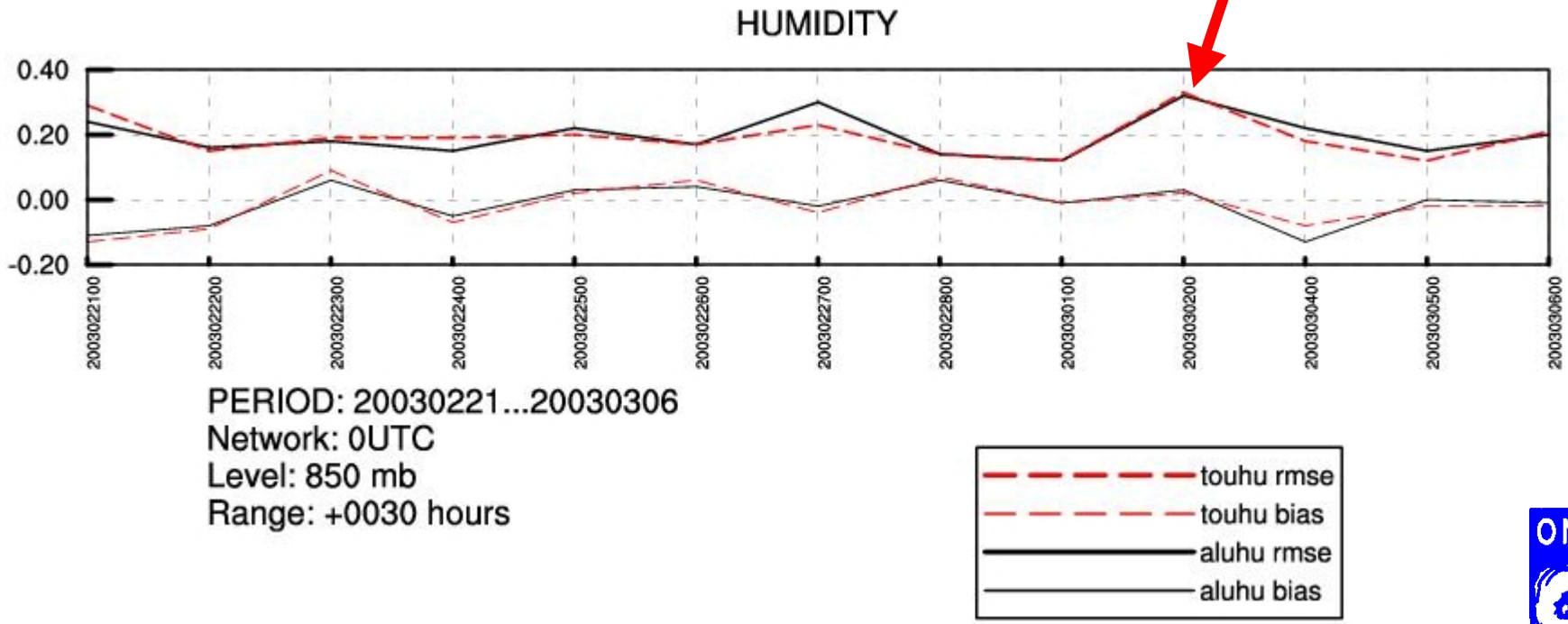


Relative humidity (%)

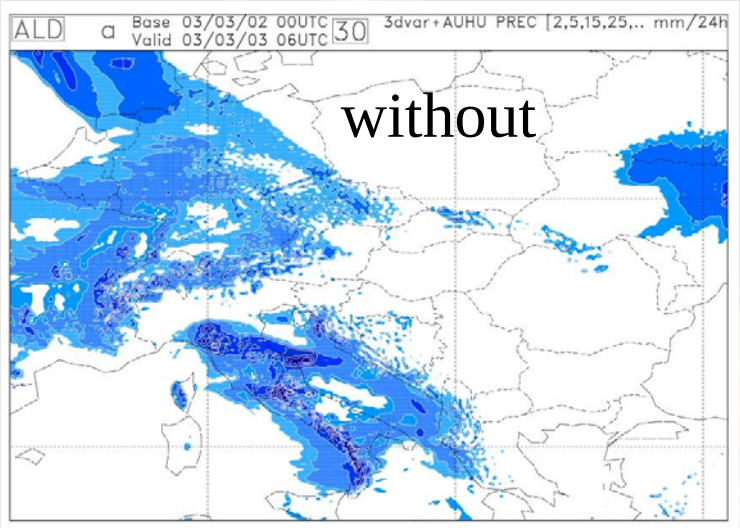
→ assimilate AMSU-A in 80 km resolution in further experiments

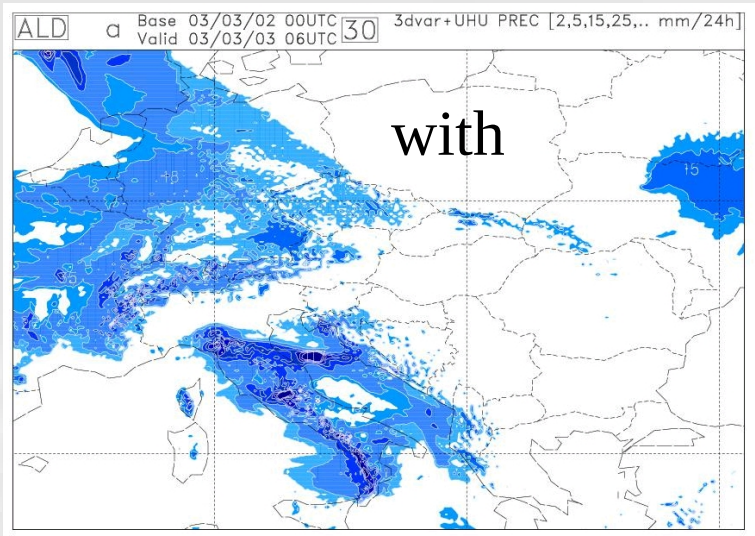
Selected Cases: prec. (mm/24h) = prec. 30h – prec. 06h

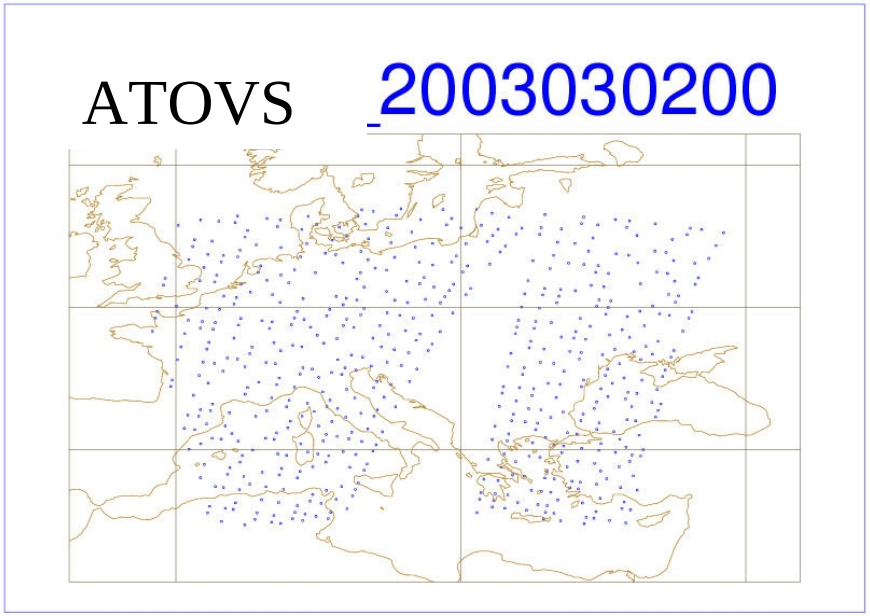


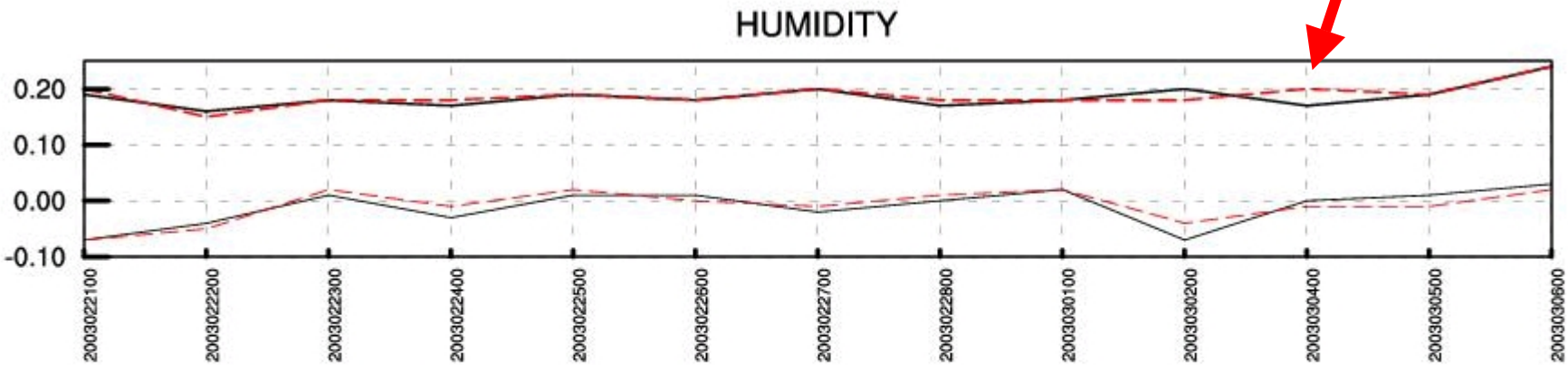


Selected Cases:



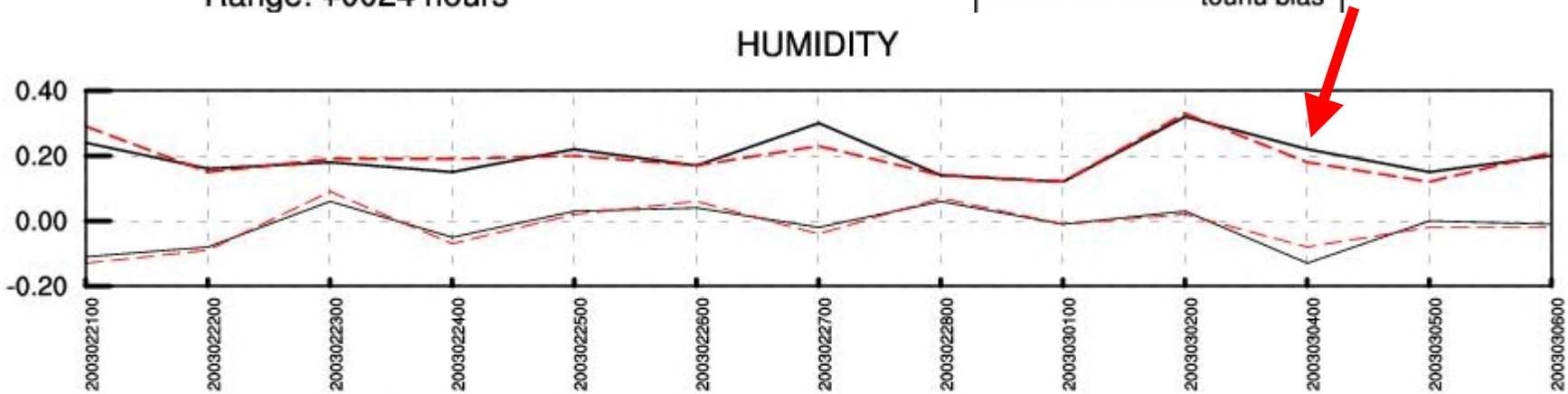






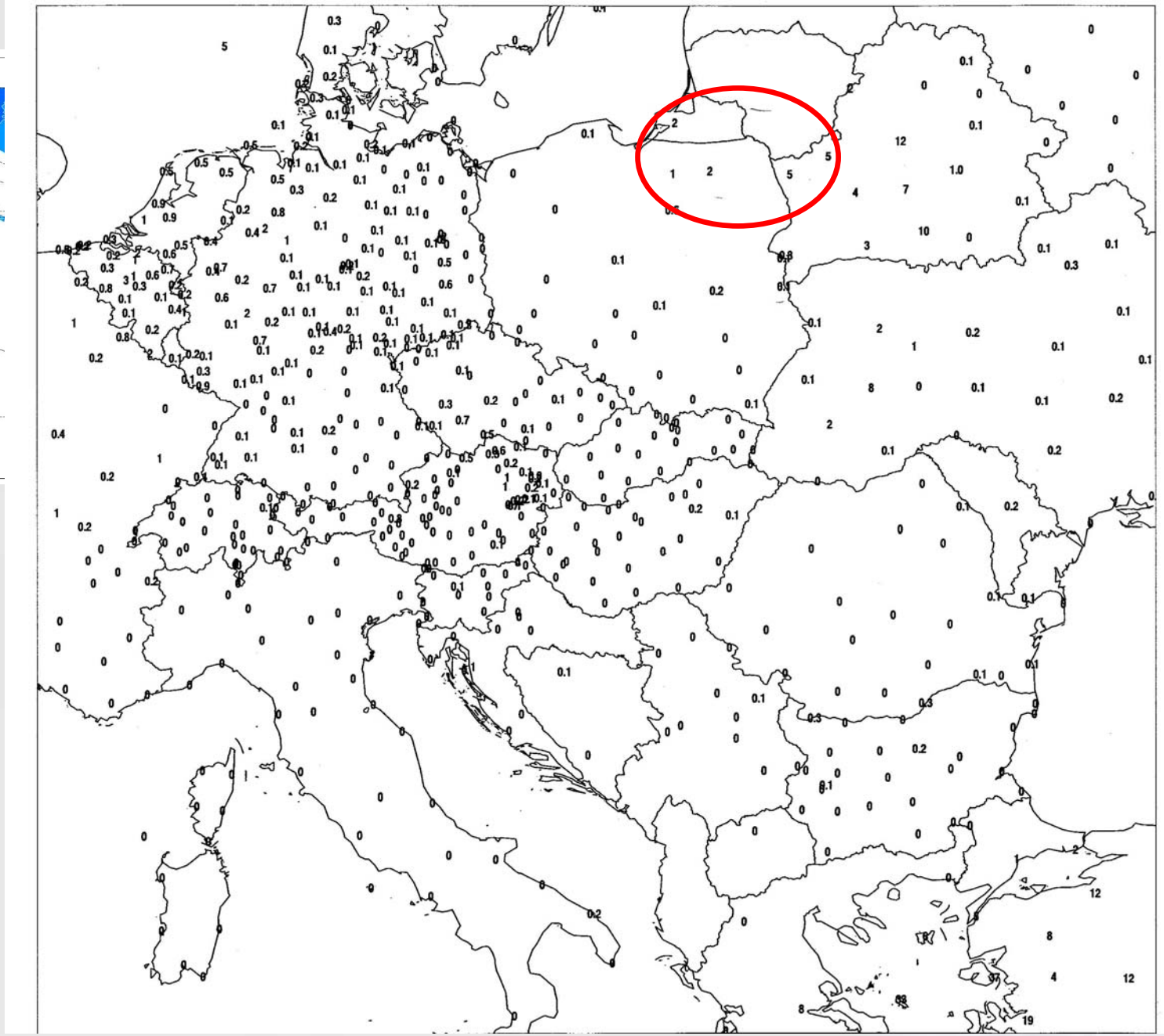
PERIOD: 20030221...20030306
Network: 0UTC
Level: 850 mb
Range: +0024 hours

touhu rmse
touhu bias

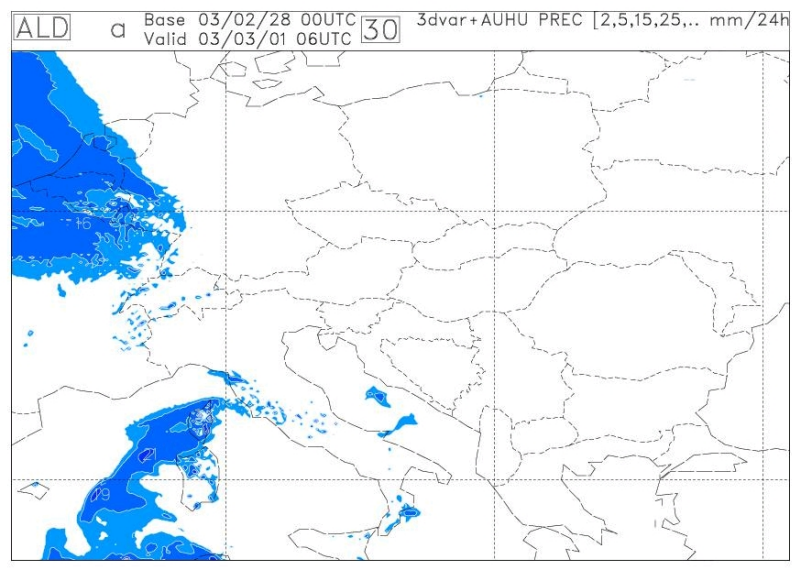


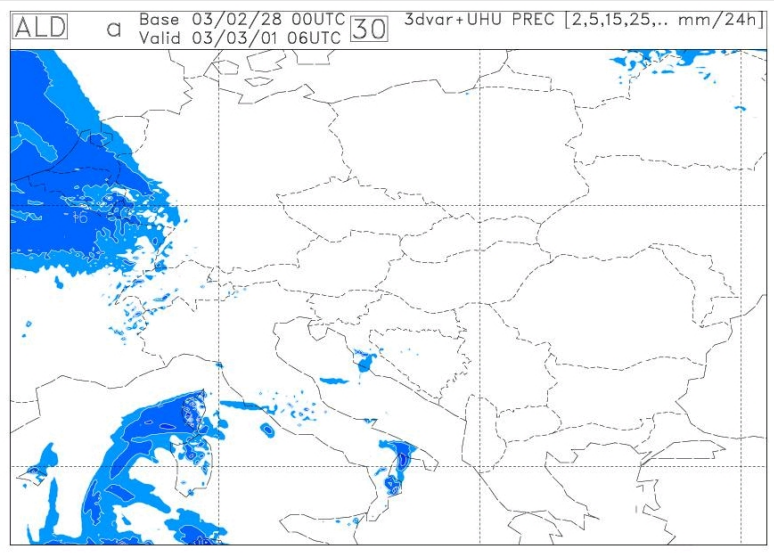
PERIOD: 20030221...20030306
Network: 0UTC
Level: 850 mb
Range: +0030 hours

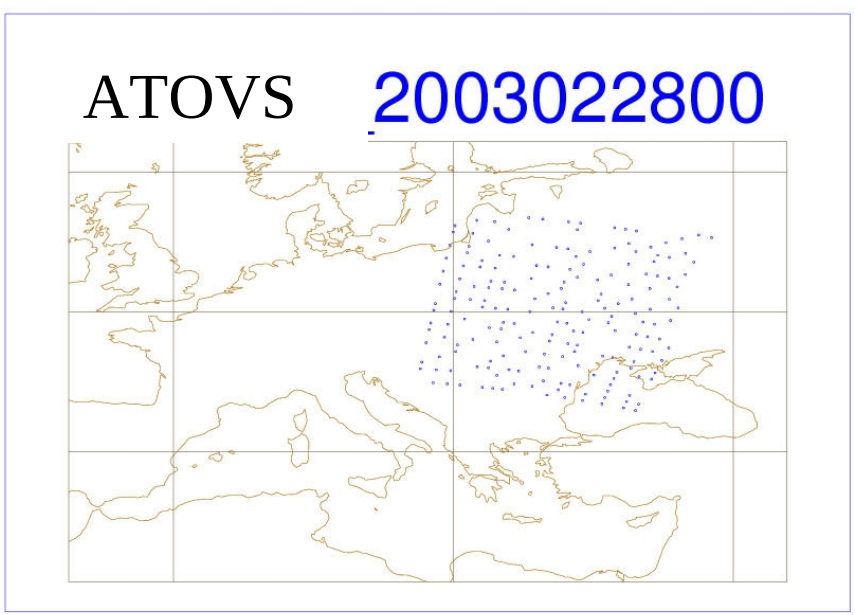
touhu rmse
touhu bias
aluhu rmse
aluhu bias

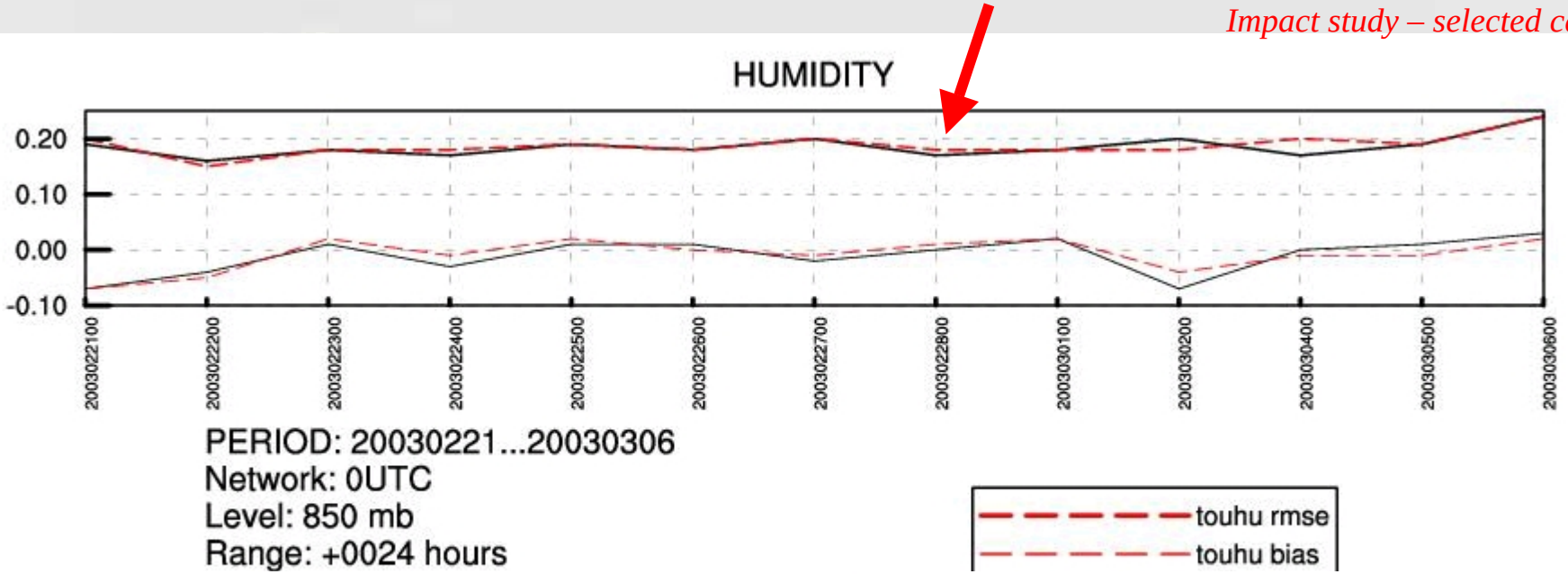

ALD
mm/24

Impact study – selected cases:








HUMIDITY
0.20
0.10
0.00
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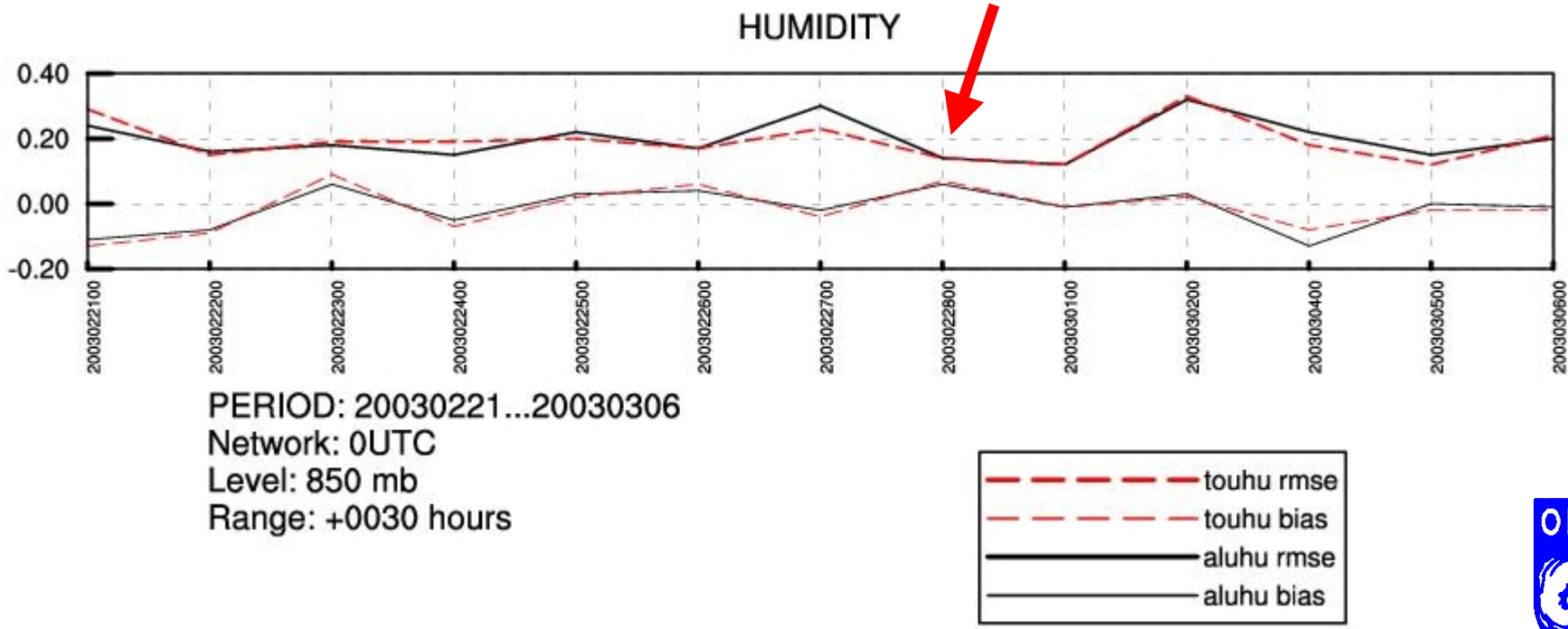
20030221 00
20030222 00
20030223 00
20030224 00
20030225 00
20030226 00
20030227 00
20030228 00
20030301 00
20030302 00
20030304 00
20030305 00
20030306 00
PERIOD: 20030221...20030306
Network: 0UTC
Level: 850 mb
Range: +0024 hours
touhu rmse
touhu bias


HUMIDITY
0.40
0.20
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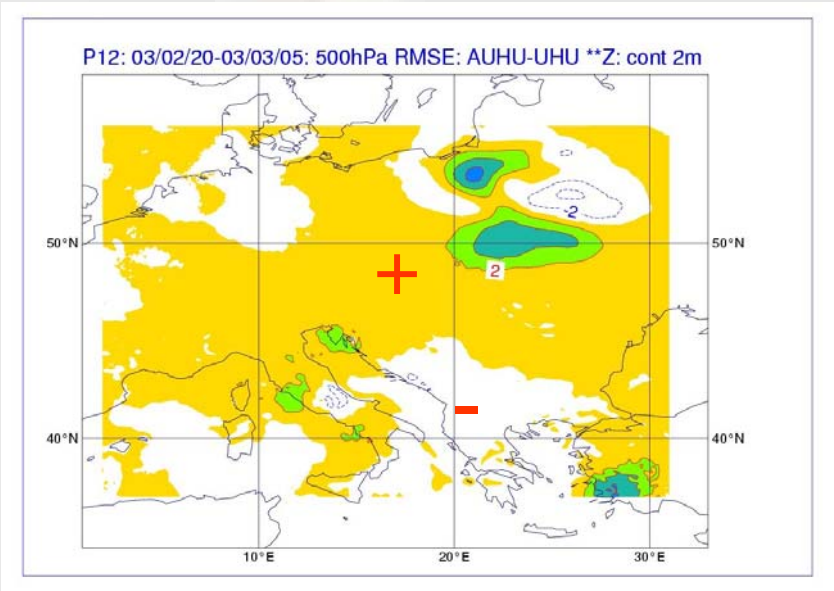
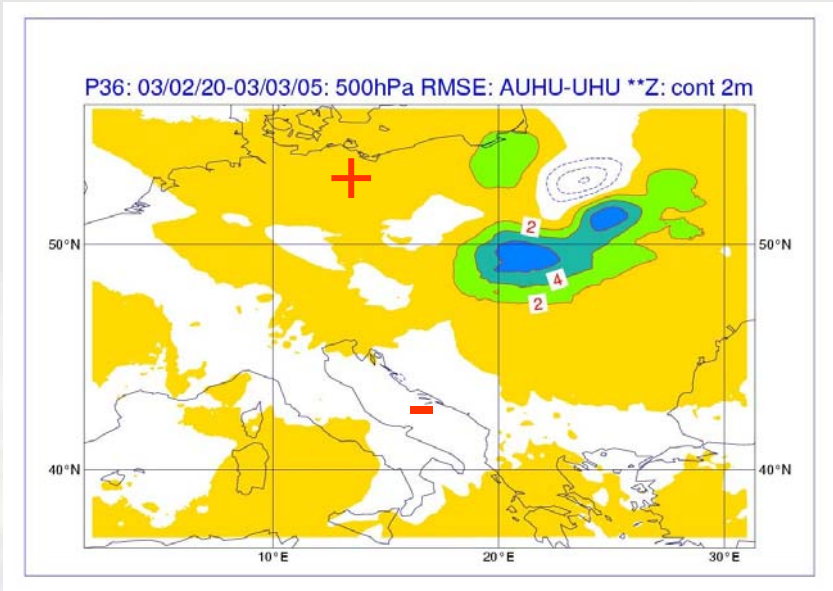
-0.20
20030221 00
20030222 00
20030223 00
20030224 00
20030225 00
20030226 00
20030227 00
20030228 00
20030301 00
20030302 00
20030304 00
20030305 00
20030306 00
PERIOD: 20030221...20030306
Network: 0UTC
Level: 850 mb
Range: +0030 hours
touhu rmse
touhu bias
aluhu rmse
aluhu bias

Results: ***comparison with ARPEGE long cut-off analysis***



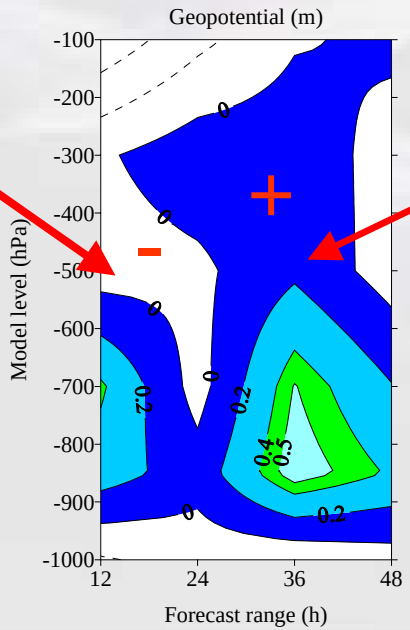


12h forecast, H500

36h forecast, H500

RMSE(aluhu-touhu)

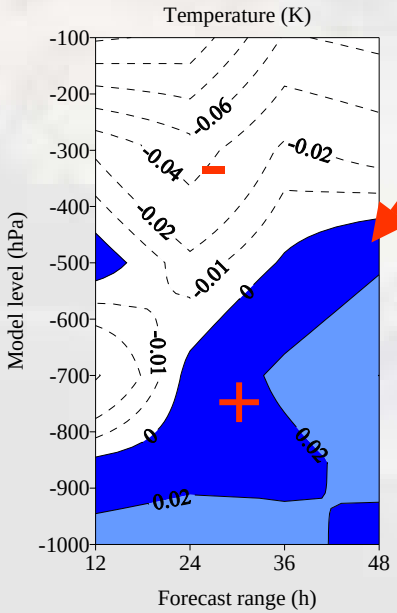
Geopotential

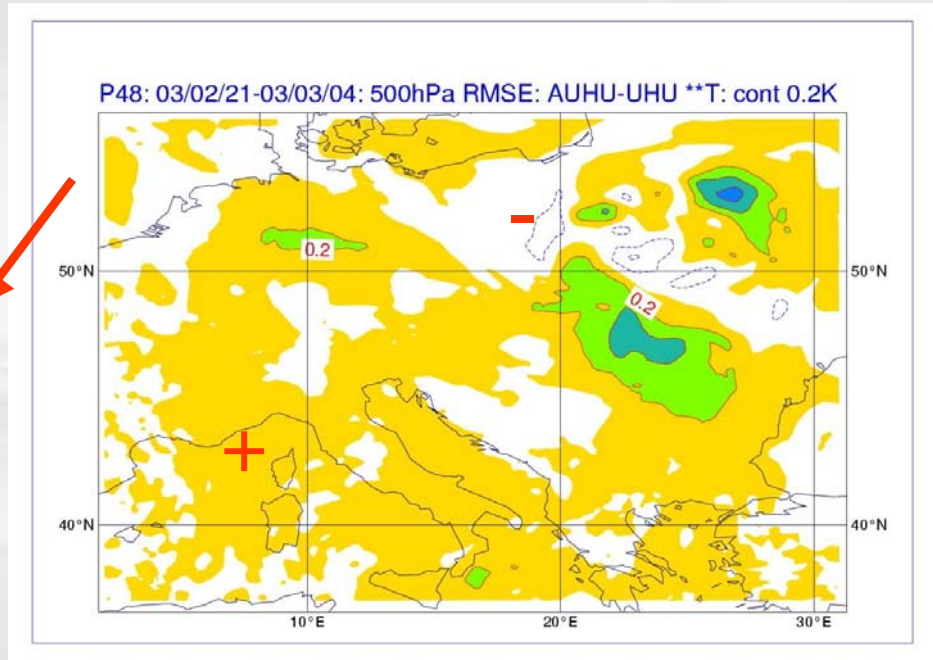


Results: ***comparison with ARPEGE long cut-off analysis***

RMSE(aluhu-touhu)

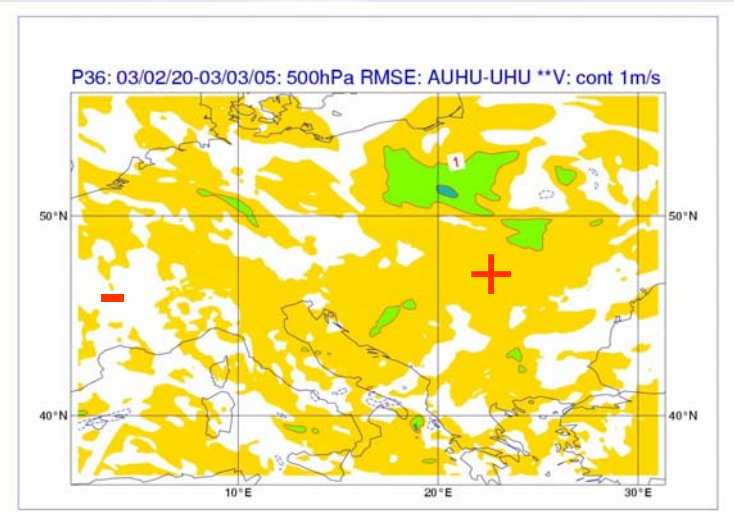
Temperature



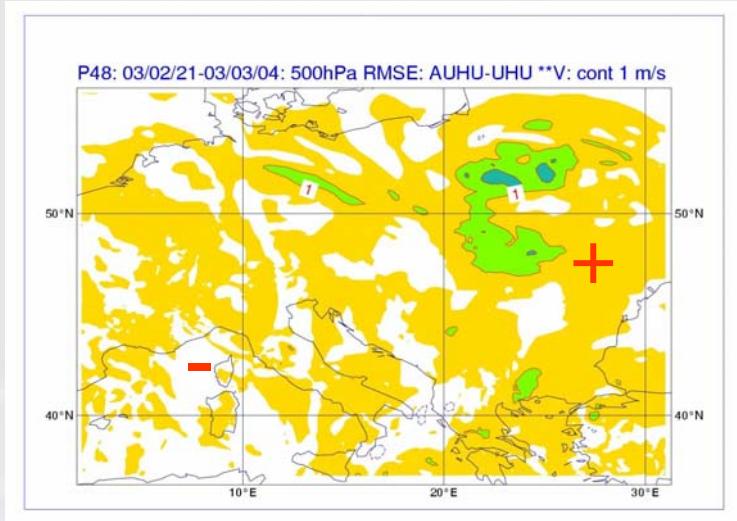


48h forecast, T500

Results: ***comparison with ARPEGE long cut-off analysis***



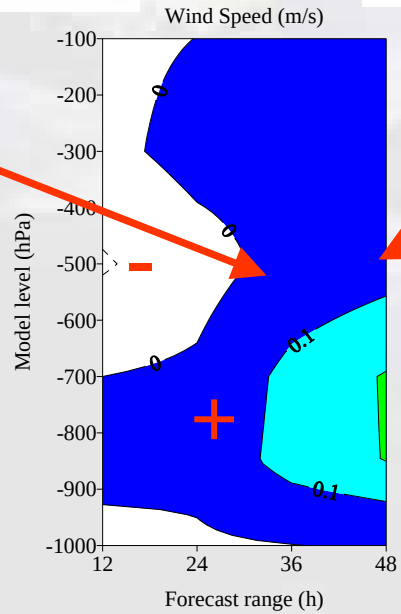
36h forecast, V500



48h forecast, V500

RMSE(aluhu-touhu)

Wind speed



Conclusions and further

- Problem related to the forecas
  → to assimi
  → to change
- The assimilation of AMSU-A
  in general BUT the positive im
- The impact of AMSU-A data a
  that of 120 km resolution:
  → further in
- The impact of the AMSU-A da
- The impact of the AMSU-A da
  the lower levels:
  → recomme
- Assimilating the specific humi
of geopotential: → To put back

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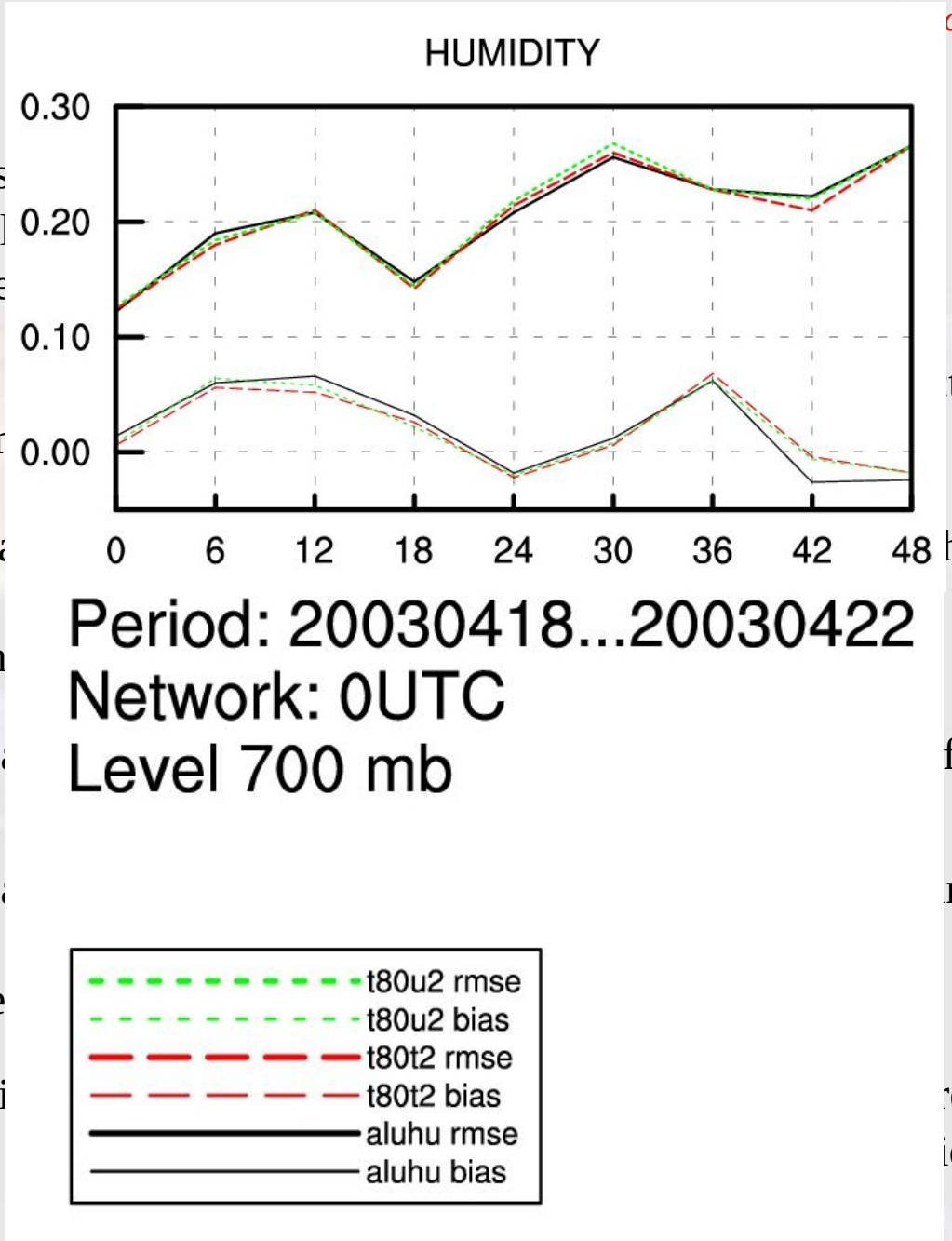

Thank you for your attention