# Data assimilation activities in Hungary

**Helga Toth, Mate Mile, Yelis Cengiz, Mihaly Szucs and many others**

Outline

- Operational DA systems at OMSZ
- Some news about ALARO DA system in Hungary
- Monitoring results from last month for AROME DA
- AROME 1h RUC test (in another presentation)
- AROME surface assimilation based on EKF (in another presentation by Helga)
- Assimilation of SEVIRI radiance obs. in AROME
- Assimilation of HRW AMVs
- Assimilation of ZTD using VARBC
- Installation and Validation of OOPS LAM 3DVAR (in another presentation)
- Plans and Questions
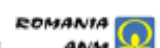
Operational NWP & DA systems at OMSZ
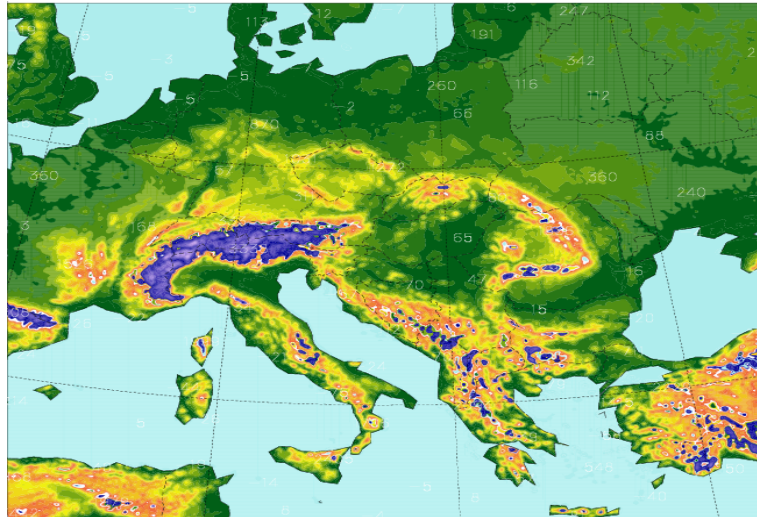

- ALARO
  - 8km mesh size, 49 levels
  - cy38t1_bf03
  - SMS environment
  - 4 runs/day up to 60 hours
  - 3 hourly coupling from IFS
  - Operational 3DVAR+CANARI DA
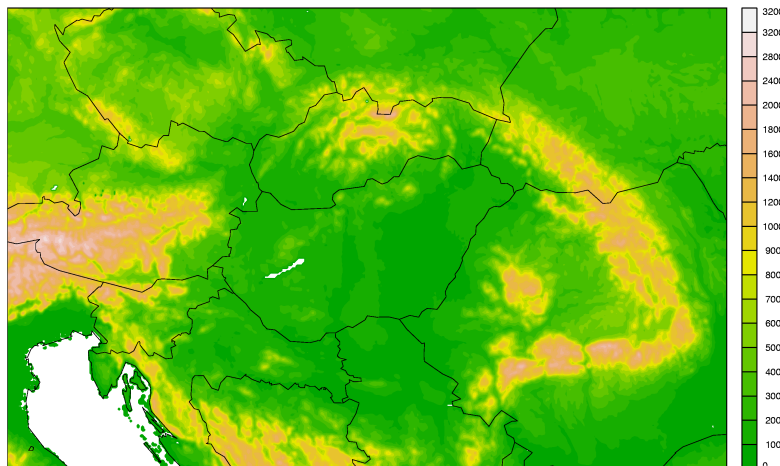
- AROME
  - 2.5km mesh size, 60 levels
  - cy38t1_bf03
  - 4 runs/days up to 48 hours
  - 1 hourly coupling from IFS
  - Operational 3DVAR RUC 3h

Some news about ALARO DA system
(one good and one bad)

- The operational ALARO DA system is now running under SMS environment and using cy38t1_bf03
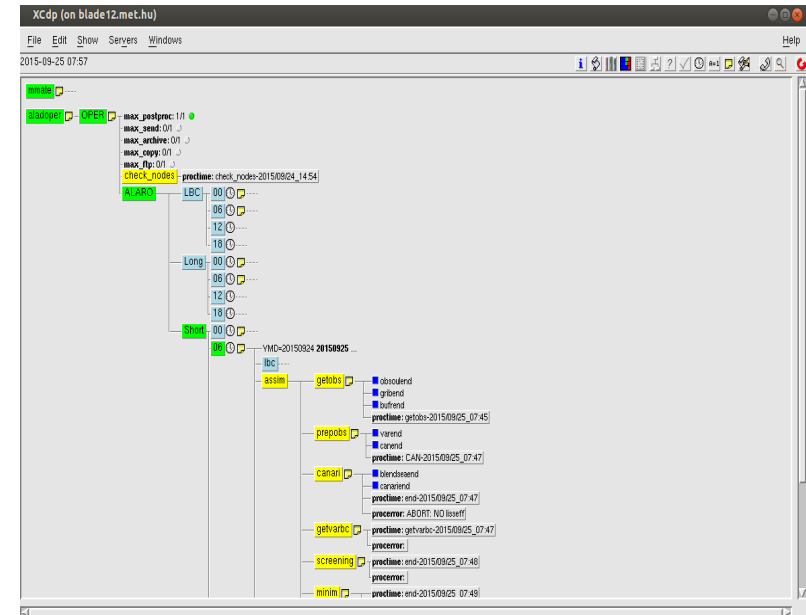

- Occasionally screening is crashed because of AMSUB radiances from NOAA-18 satellite in routine rttov_calcbt_basic at 67th line (see below)

- Any idea or solution for this?

```
[myproc#44,tid#1,pid#29240]:    MASTER
[myproc#44,tid#1,pid#29240]:      CNT0
[myproc#44,tid#1,pid#29240]:       CNT1
[myproc#44,tid#1,pid#29240]:        CNT2
[myproc#44,tid#1,pid#29240]:         CNT3
[myproc#44,tid#1,pid#29240]:          CNT4
[myproc#44,tid#1,pid#29240]:           OBSV
[myproc#44,tid#1,pid#29240]:            TASKOB
[myproc#44,tid#1,pid#29240]:             TASKOB>KSET_LOOP
[myproc#44,tid#1,pid#29240]:              TASKOB>OBSGRP=AMSUB:00209.04.210.07
[myproc#44,tid#1,pid#29240]:             HRETR
[myproc#44,tid#1,pid#29240]:              RADTR
[myproc#44,tid#1,pid#29240]:               RTTOV_EC
[myproc#44,tid#1,pid#29240]:                RTTOV_CALCBT_BASIC
```

```
tstore  = coeffs%planck2(chan) / Log(1 + coeffs%planck1(chan) / rad(i))
```
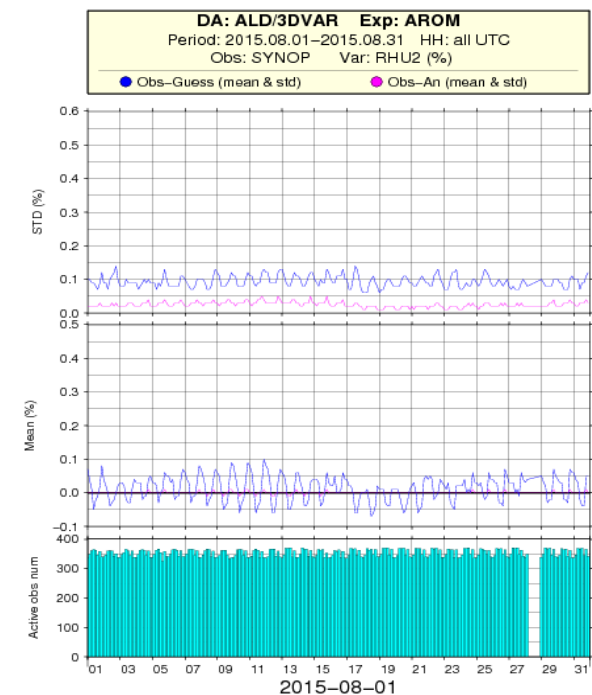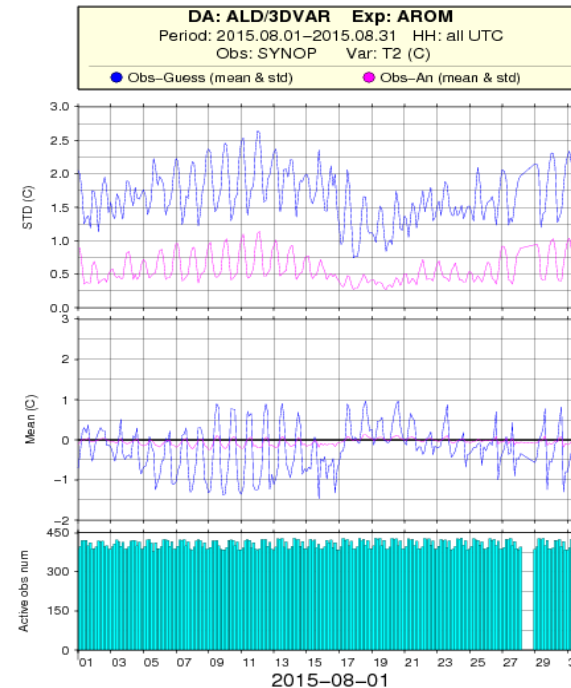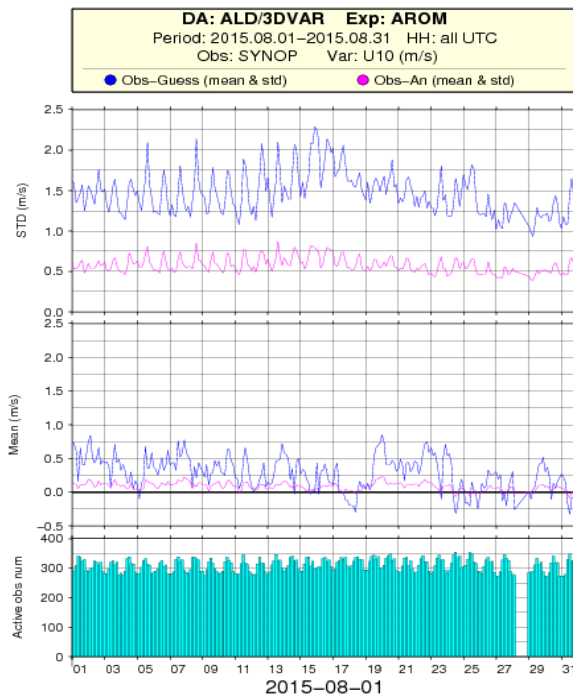
Operational monitoring of AROME DA system at OMSZ

- Operational ALARO DA monitoring is provided at the beginning of every months, therefore recently operational AROME DA montioring is plotted for conventional observations.

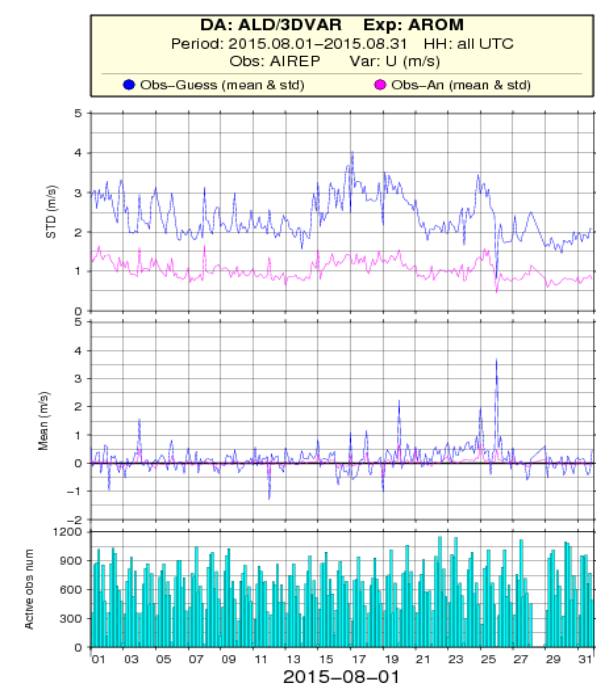- Period from 1st to 31st of August, 2015
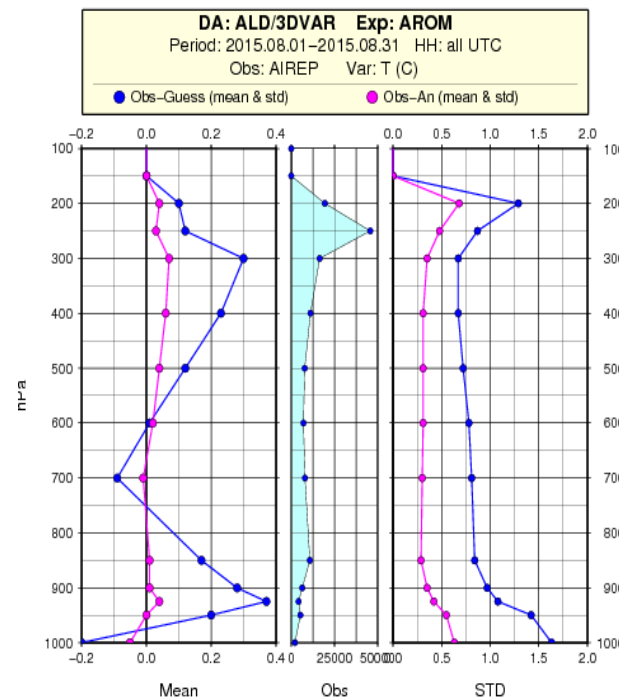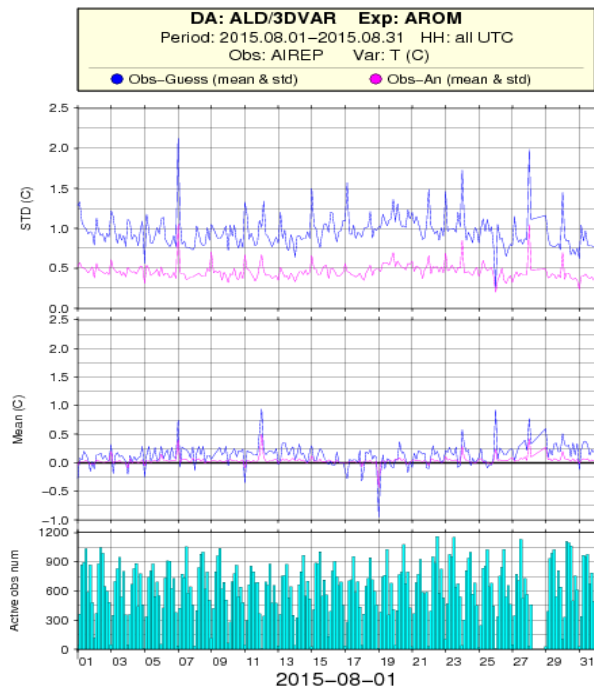
- U comp. - T - Q
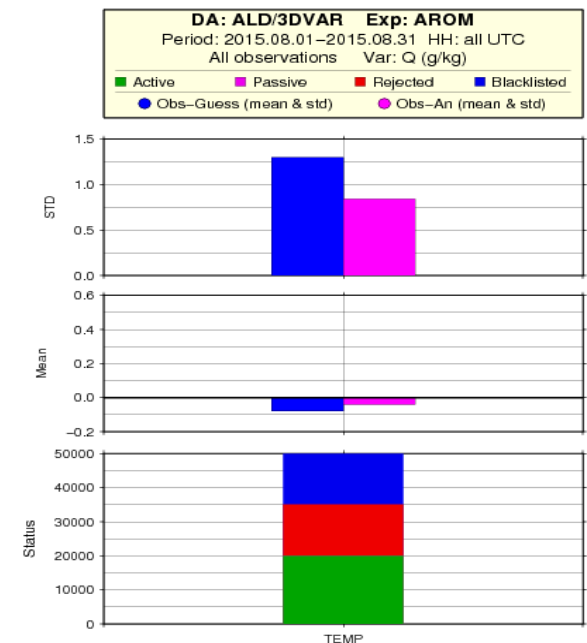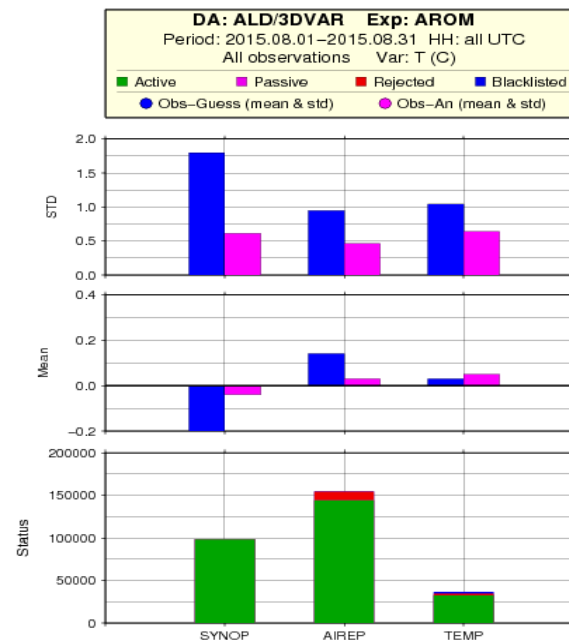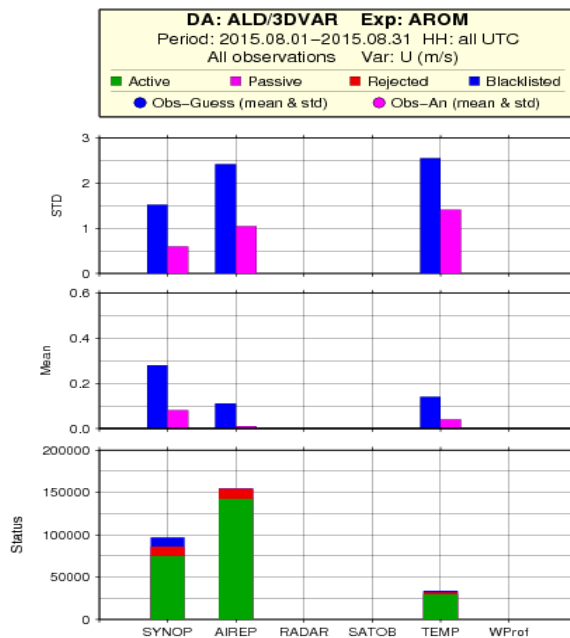
Operational monitoring of AROME DA system at OMSZ

- **SYNOP**

- Period from 1st to 31st of August, 2015
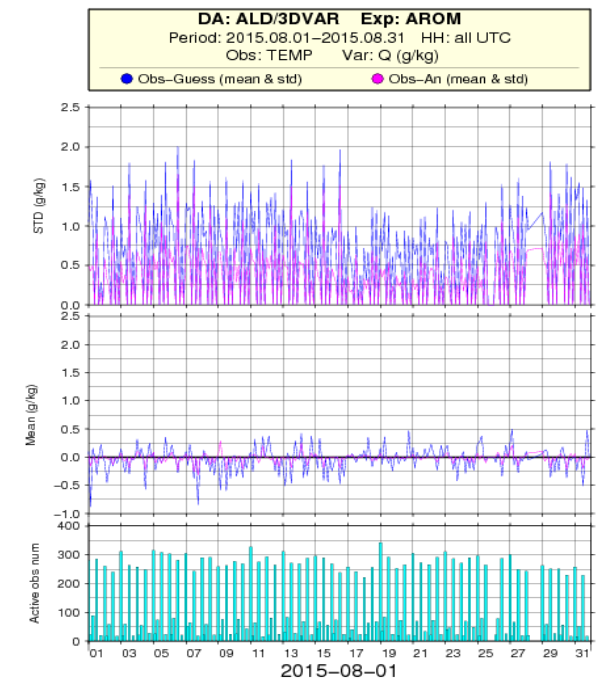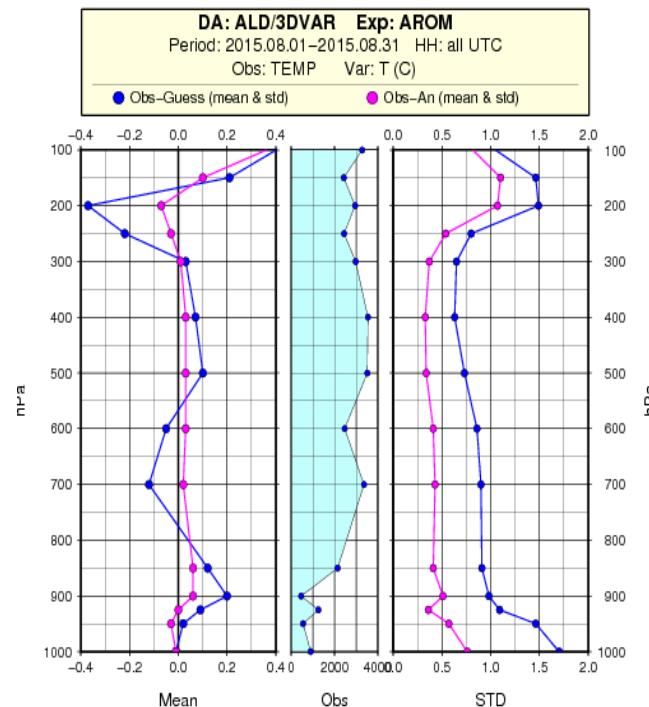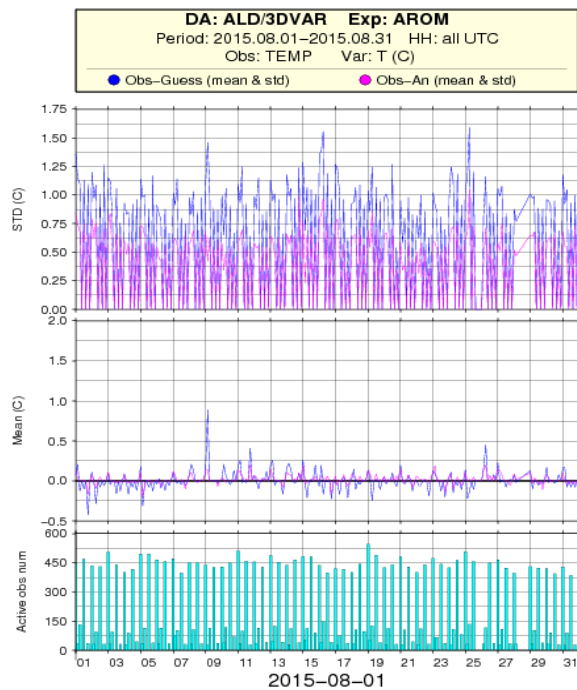
- U10m – T2m - RH2m

Operational monitoring of AROME DA system at OMSZ

- **AIREP**

- Period from 1st to 31st of August, 2015

- Temperature – Temp. prof. - U comp, of wind

Operational monitoring of AROME DA system at OMSZ

- **TEMP**

- Period from 1st to 31st of August, 2015

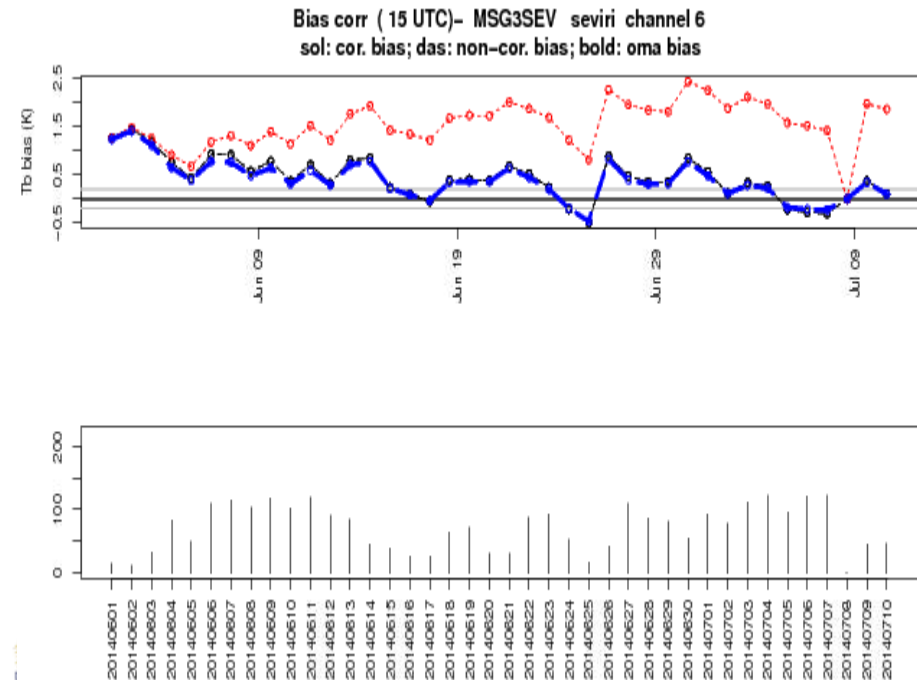- Temperature – Temp. prof. - Spec. Humidity

The use of SEVIRI radiance in AROME 3DVAR

- In the frame of a flat-rate stay SEVIRI radiance observations have been studied in AROME (preliminary it was planned to test SEVIRI and IASI as well)

- Due to first experiments with SEVIRI channels it was found that default settings of VARBC and the use of SEVIRI channels in AROME model is not adequate and local adaptation of the settings is needed.

- Making passive assimilation experiments for VARBC coldstart with the use of SEVIRI ch2, ch3, ch4, ch6, ch7 and different VARBC settings.
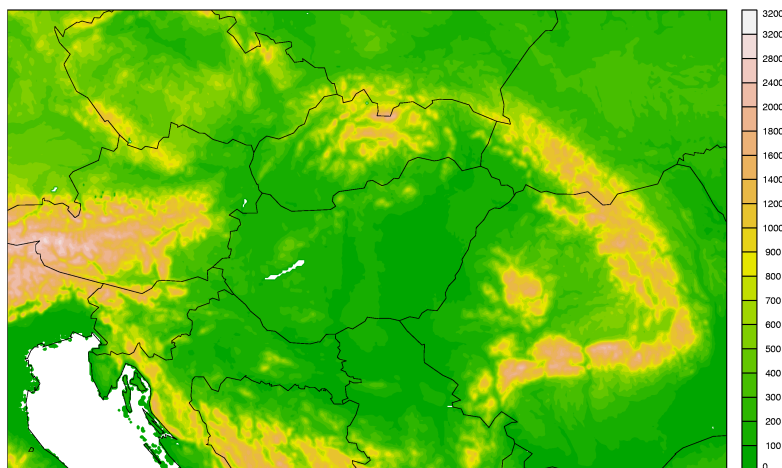
The use of SEVIRI radiance in AROME 3DVAR

- The default settings of VARBC provided very slow or almost zero corrections for SEVIRI channels
- Increasing the adaptivity (through NBG) and use one additional predictor (pred3) better correction has been achieved during the passive assimilation period
- Therefore the following settings were used for VARBC calculation: Coldstart, nbg_msg_hr=1250, predictors: 0, 1, 2, 3, 4

Bias corr (15 UTC) – MSG3SEV seviri channel 3
sol: cor. bias; das: non–cor. bias; bold: oma bias

Bias corr (15 UTC)– MSG3SEV seviri channel 6
sol: cor. bias; das: non–cor. bias; bold: oma bias
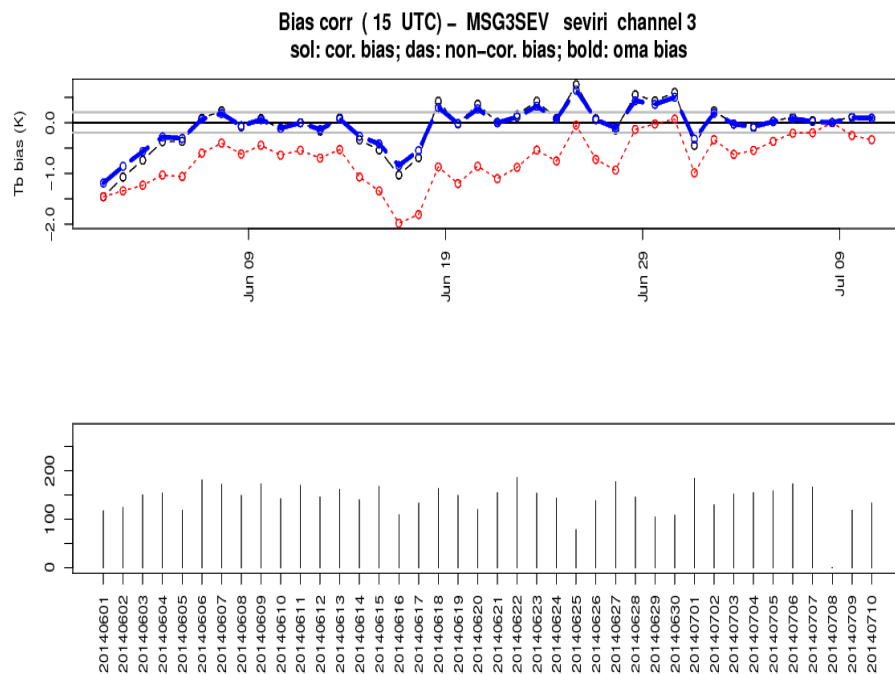
The use of SEVIRI radiance in AROME 3DVAR

- For active assimilation experiment the adaptivity parameter was switched back to the default value

- The impact of the SEVIRI radiances on AROME forecasts is under evaluation

- Furthermore during the use of window channels surface characteristics (emissivity and surf. temperature) were not modified so far.
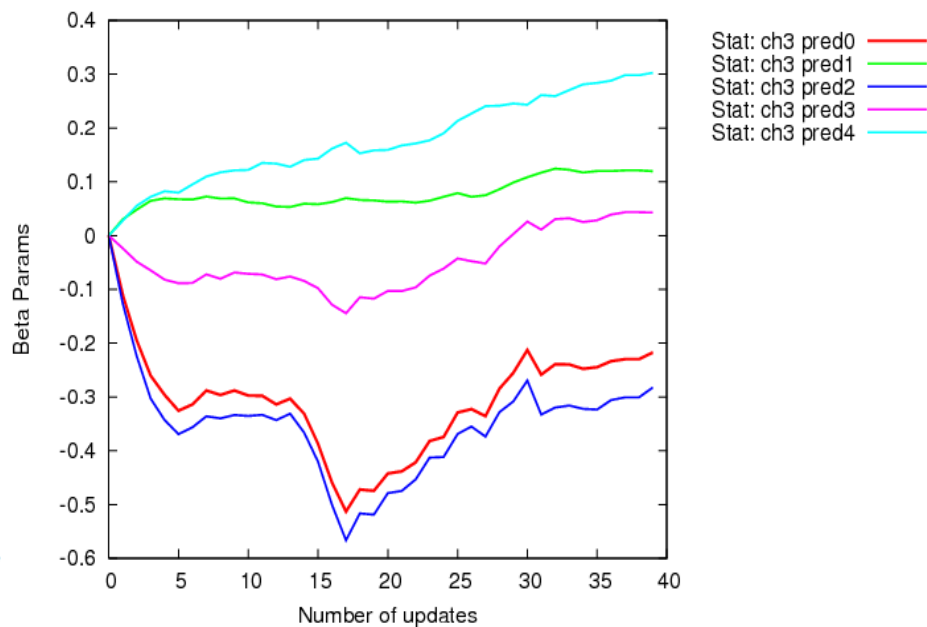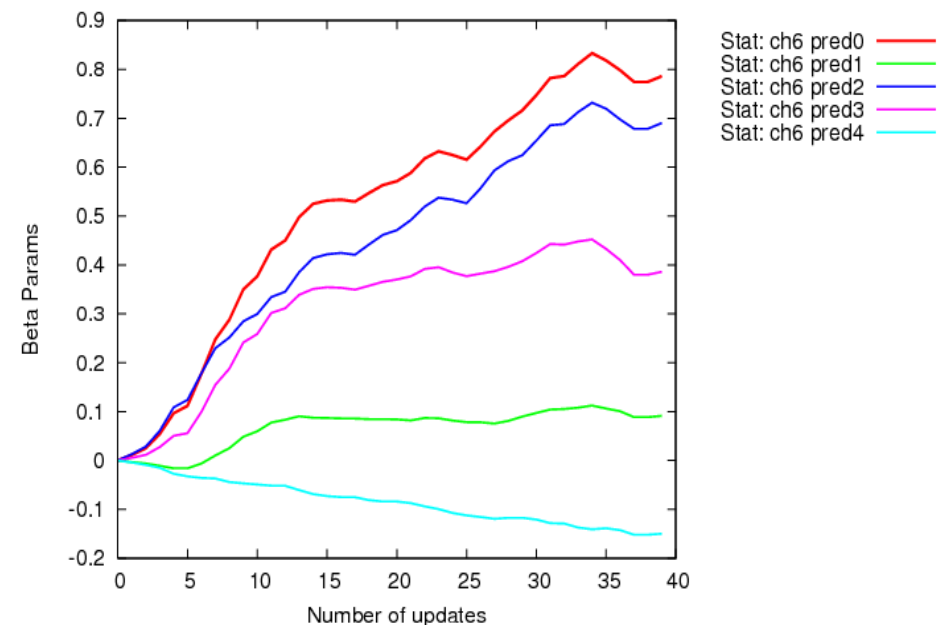
The use of HRW AMVs in AROME 3DVAR

- The High Resolution Winds AMV observation is available via OPLACE
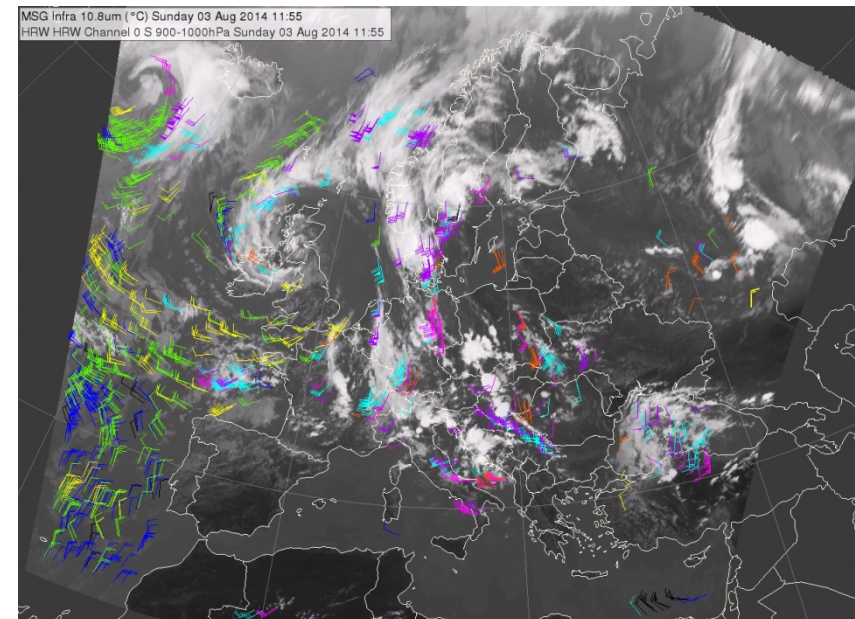- It was studied in AROME 3DVAR system making a Bator modifications started from Geowind basis in order to read HRW in BUFR format ("how to" information is posted on LACE forum)
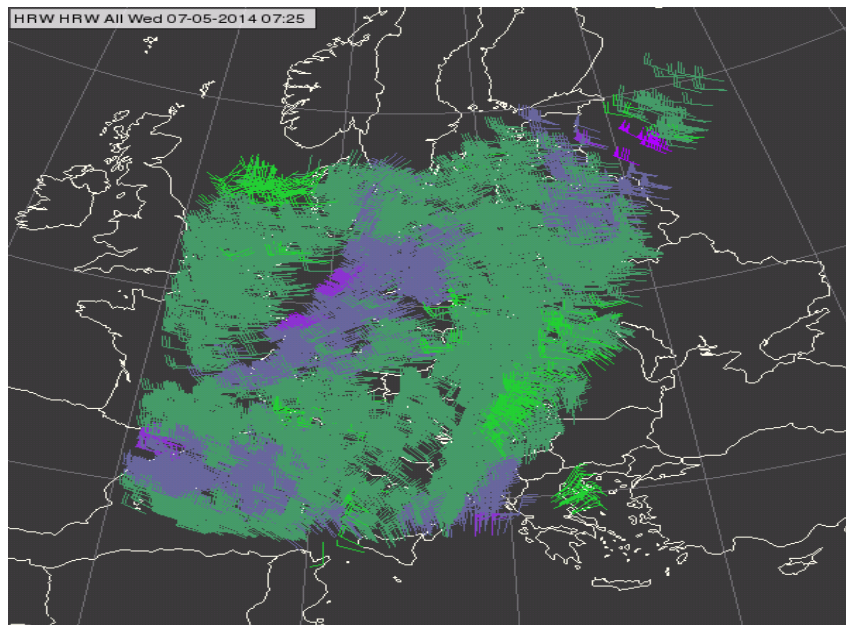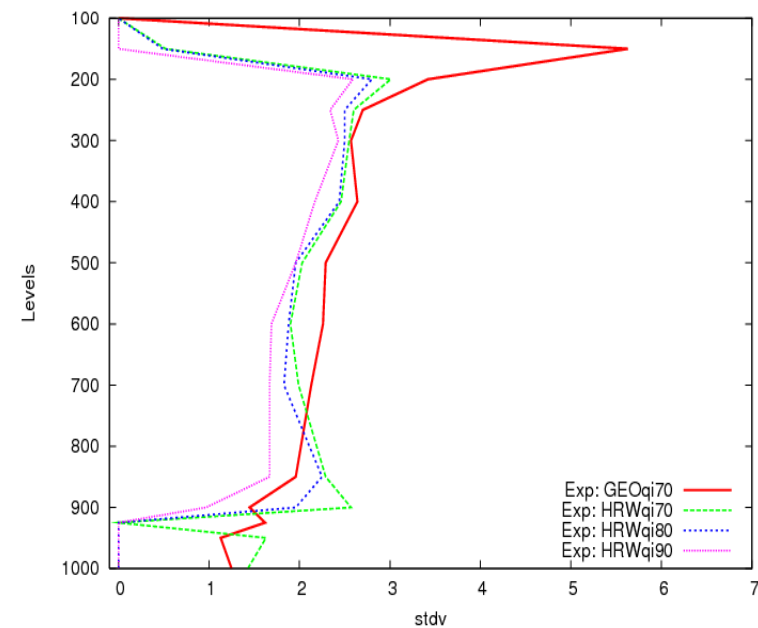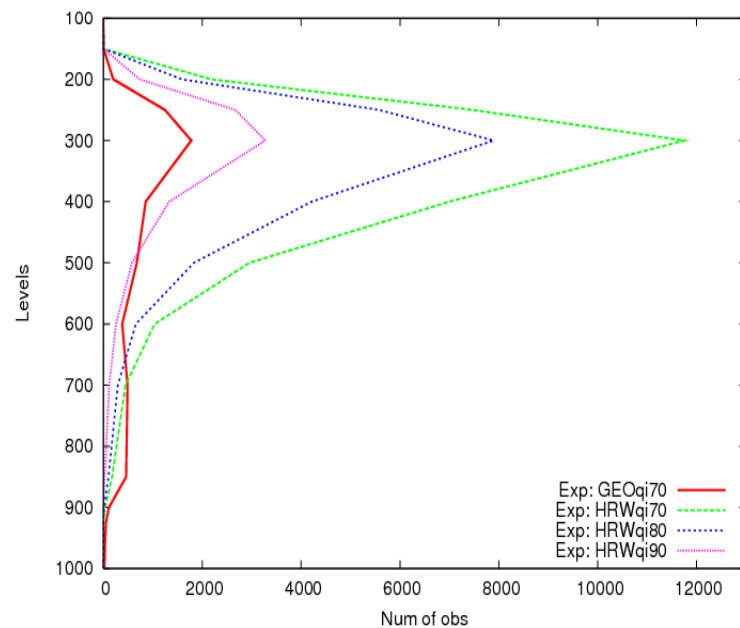

HRW vectors retrieved from 5 channels for 5th of July 2014

HRW vectors retrieved from IR10.8 channel for 12UTC, 3rd of August 2014

The use of HRW AMVs in AROME 3DVAR

- The HRW AMV provides increased number of wind vectors compared to Geowind, mainly on higher levels.

- Also the quality of the HRW is found to be better, considering quality indices and DA omg diagnostics.

The use of HRW AMVs in AROME 3DVAR

- Regarding DFS diagnostic tool, HRW has small absolute contribution due to the small amount of observations compared to other types
- On the other hand the relative contribution is not negligible and comparable with conventional observations.
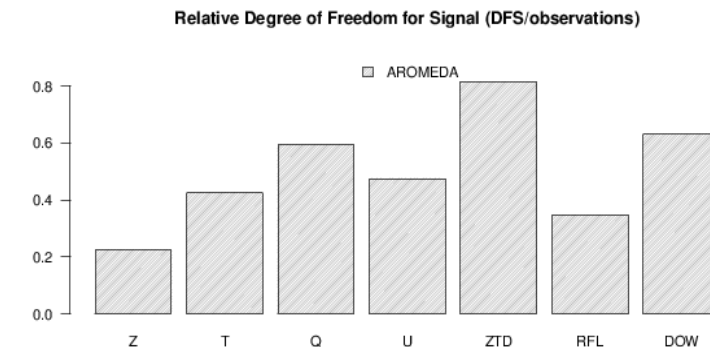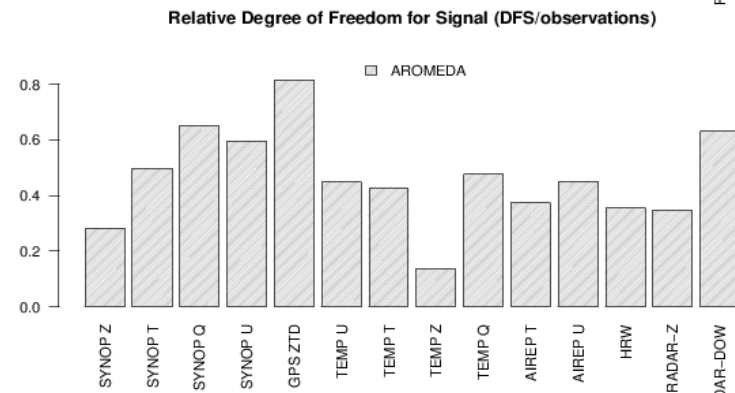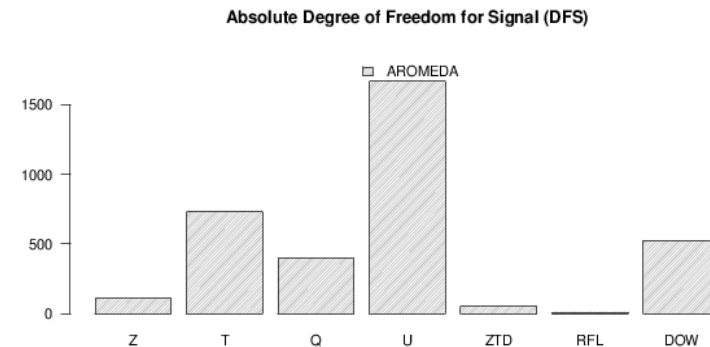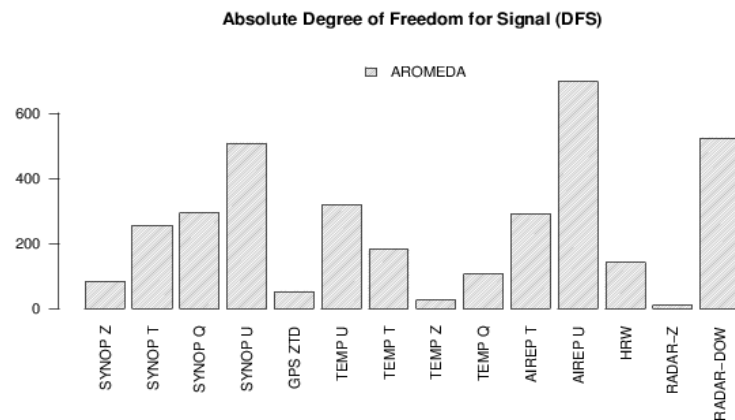
The use of HRW AMVs in AROME 3DVAR

- Due to the results of the impact study, we can conclude that HRW has overall neutral impact, but for particular cases studies (especially for convective precipiation events) the use of HRW is beneficial.

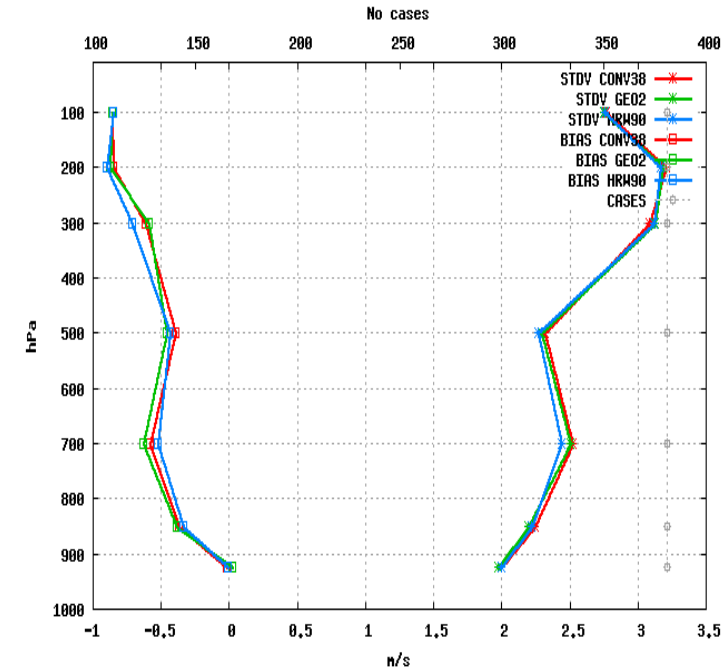- The impact of Geowind AMV was tested also beside HRW in AROME, but the impact was even smaller due to the very small amount of Geowind AMV inside AROME domain

AROME CONV38 – Red (Oper AROME/Hu)

AROME GEO2 – Green (Geowind AMV used)

AROME HRW90 – Blue (HRW AMV used)

8 stations Selection: ALL
Wind speed Period: 20140801-20140818
Statistics at 12 UTC Used {00,12} + 06 12 18 24 30 36

12 stations Selection: ALL
Temperature Period: 20140801-20140818
Statistics at 00 UTC Used {00,12} + 06 12 18 24 30 36
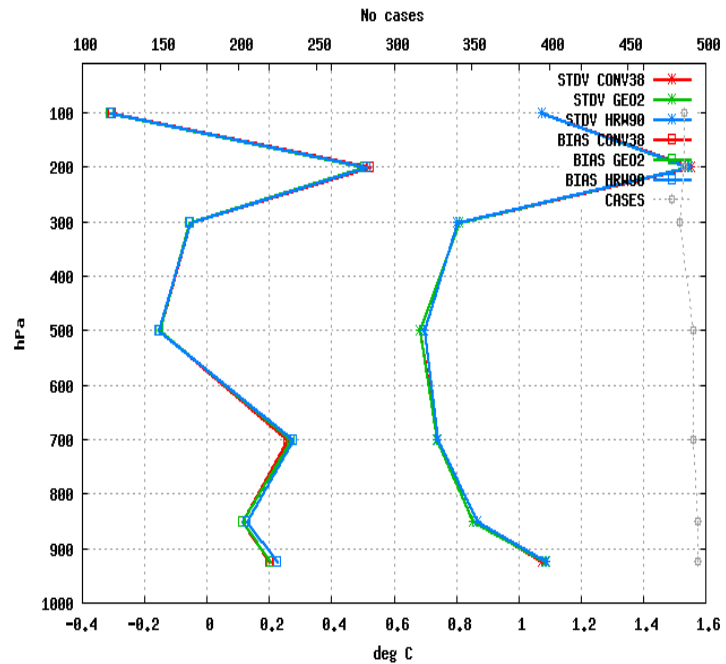
Selection: Hungary using 30 stations
T2m Period: 20140801-20140818
Hours: {00,12}

Selection: Hungary using 30 stations
Rh2m Period: 20140801-20140818
Hours: {00,12}
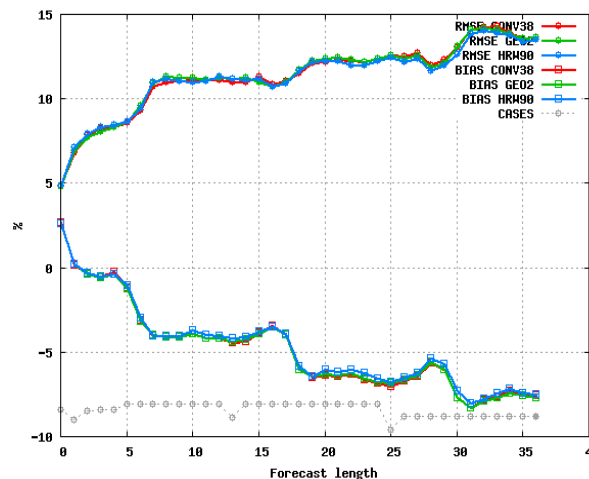
Case studies (HRW)
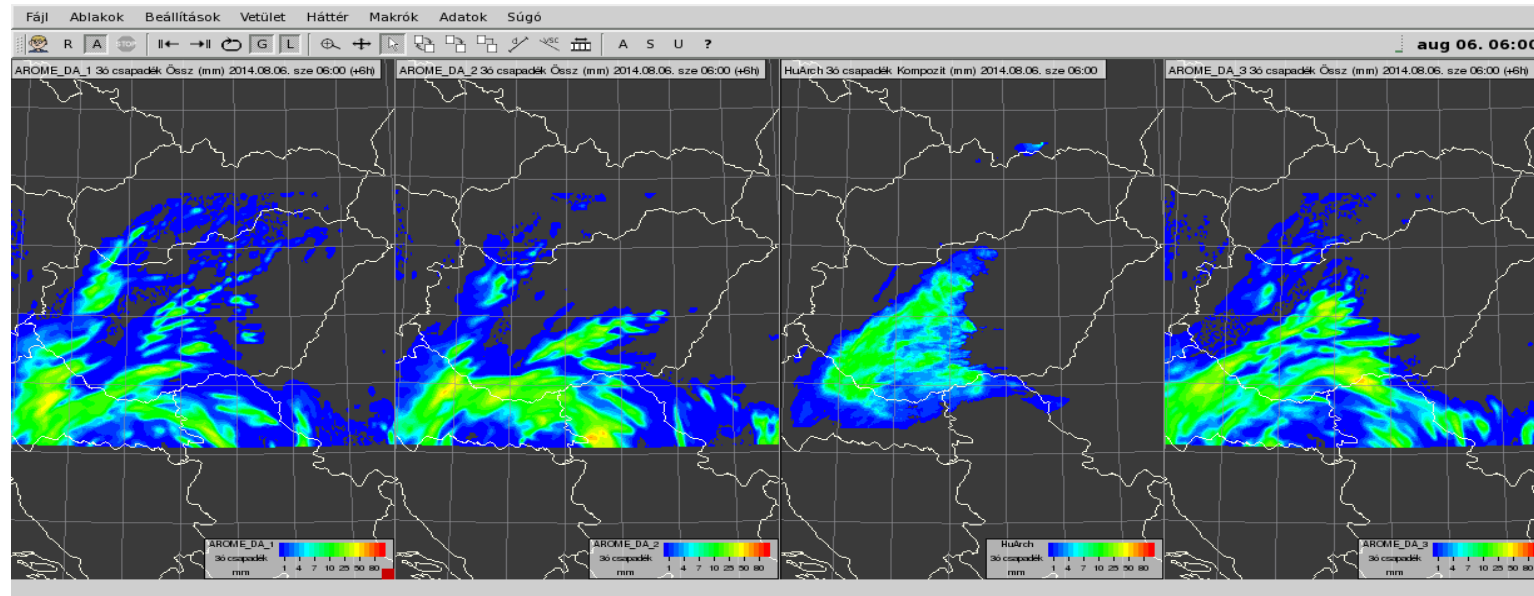
3h AROME/Hungary precipitation forecasts for 6th of August, 2014. 1.panel: Without AMV, 2.: with MPEF AMV, 3.: RADAR observation, 4.: with HRW AMV
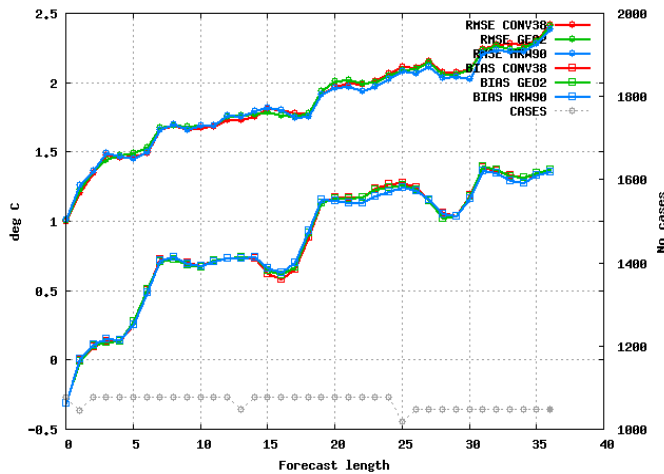

3h AROME/Hungary precipitation forecasts for 7th of August, 2014. 1.panel: Without AMV, 2.: with MPEF AMV, 3.: RADAR observation, 4.: with HRW AMV

GNSS ZTD and VARBC

- The variational bias correction method is working for GNSS ZTD observations as well using newer common cycles (from cy38t1), however some modifications are needed on the top of main pack which have been tackled during a LACE stay in 2014.

- In 2015 this experiment was continued on a previously studied period when static bias correction was used.
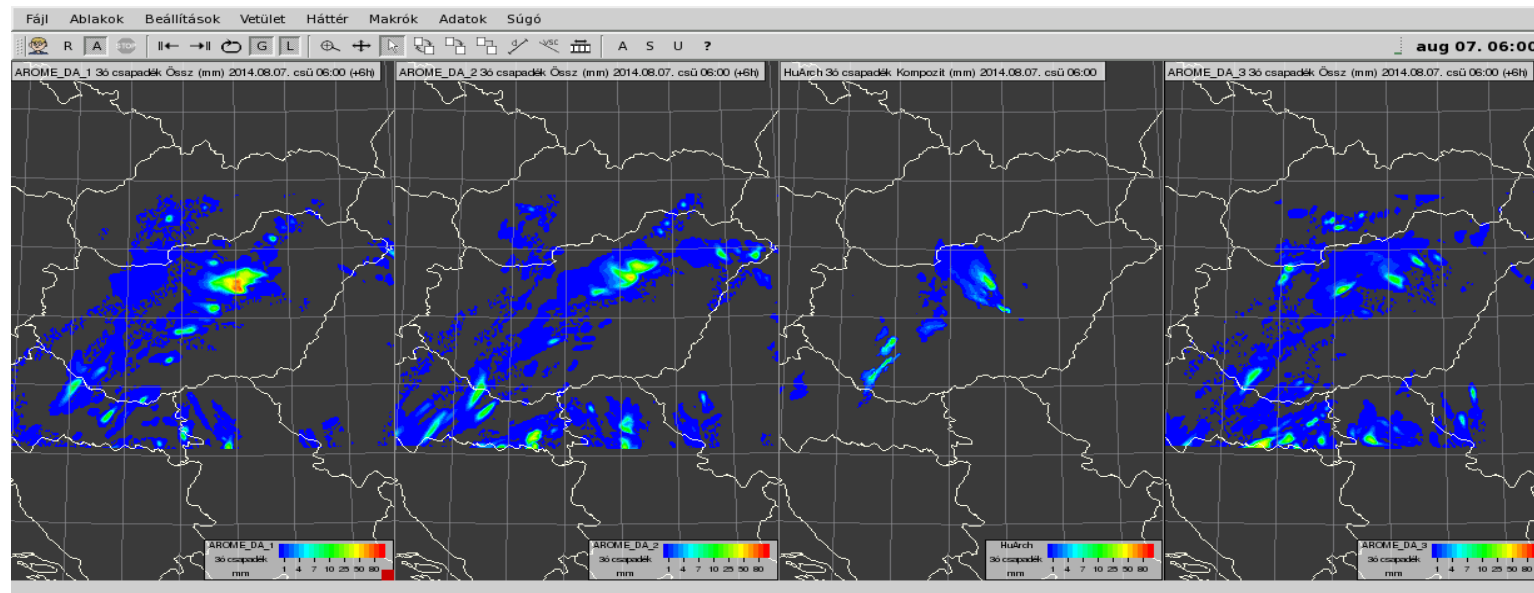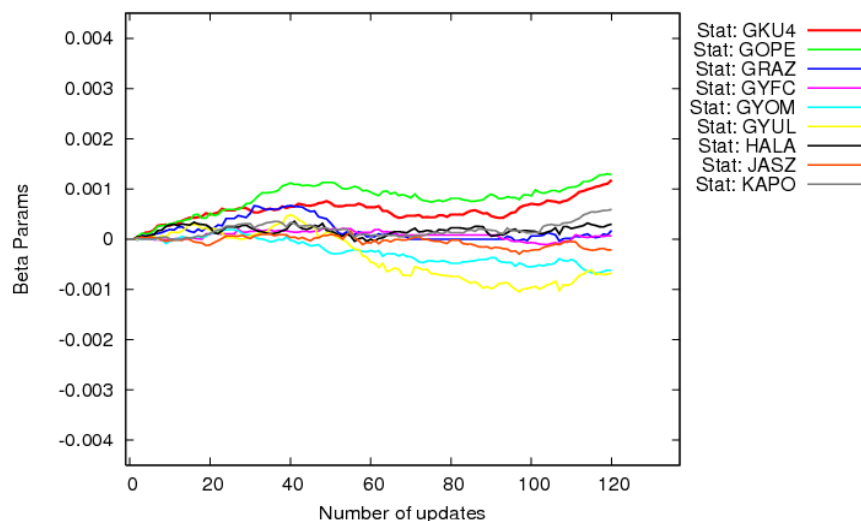
- It is possible to make VARBC cycling by daily variation or by every analyses (it means 3 hourly in AROME RUC)

- The validation of the VARBC approach is still ongoing.

Evolution of VARBC beta params
Time: 10th to 25th of July 2014
3h VARBC cycle

Stat: GKU4
Stat: GOPE
Stat: GRAZ
Stat: GYFC
Stat: GYOM
Stat: GYUL
Stat: HALA
Stat: JASZ
Stat: KAPO

Evolution of VARBC beta params
Time: 10th to 25th of July 2014
3h VARBC cycle

Stat: BUTE
Stat: CAKO
Stat: CSOR
Stat: DEBR
Stat: DEVA
Stat: DUJV
Stat: FLDB
Stat: FUZE
Stat: GANP
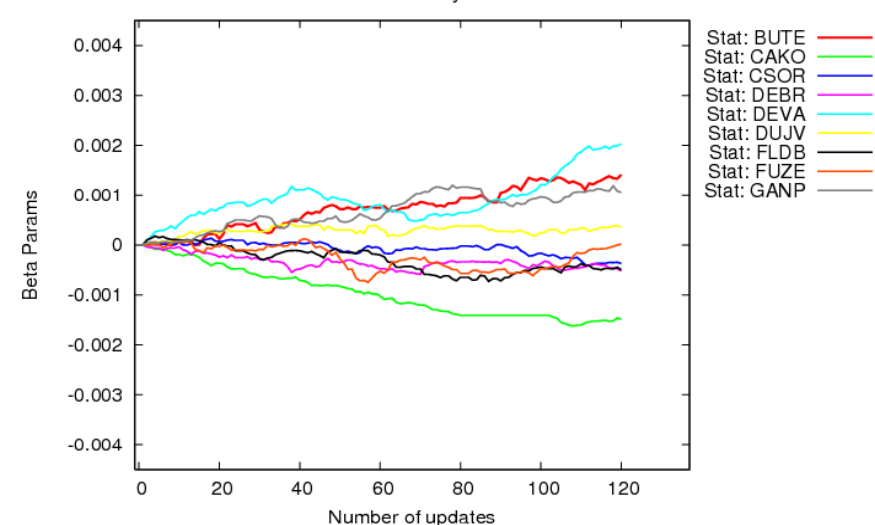
Future plans

- A new AROME DA parallel suite with surface assimilation (OI_main) and new AROME EDA B matrix is scheduled.

- Hourly RUC

- Ongoing work with surface assimilation based on EKF

- Continue work on GNSS ZTD and HRW

- There is an agreement between OMSZ and HungaroControl to exchange Mode-S data in 2016 (manpower?)

- The RADAR assimilation activity is postponed due to lack of manpower

- OOVAR validation is ongoing (manpower?)
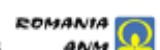
Questions...

- *What is(are) the main purpose(s) of doing DA at your institute?*
  - Primarily to improve OPERATIONAL NWP forecast on short-ranges
  - But also to support project applications and the needs of special end users

- *What will be the main goal(s) regarding DA(or even NWP through DA) at your institute in the next few year?*
  - To provide early delivery analyses and short-range forecasts to our forecasters for different meteorological purposes
  - To support nowcasting activities

- *Doing research or doing operational DA activities has higher priority in your institute?*
  - Usually there is no time for real researches in our Institute, but developments are implemented to make the operational systems better i.e. to make DA activities operational have higher priorities

- *Where do You think LACE collaboration can help your local DA work most efficiently?*
  - It might help to overcome on bigger challanges which is not possible to solve with local efforts
  - It might help to share technical and scientifical problems if the communication is effective among the members