

# Latest Data Assimilation Activities in Hungary (for RCLACE)

02/20/2014

Gergely Bölöni, Máté Mile, Roland Steib, Helga Tóth  
(further contributions from Patrik Benacek, Ersin Kucukkaraca, Florian Meier, Michal Nestiak, Roger Randiramampianina, Alena Trojakova)

## 1. Recent, existing DA systems

There are two operational DA systems at OMSZ which providing initial conditions for ALARO and AROME forecasts.

1. Operational characteristics of ALARO DA system
  1. 3DVAR for upper-air and CANARI for surface analysis
  2. 6 hour cycling i.e. 4 analyses in a day
  3. Static Bmatrix based on Ensemble technique (downscaling of 6h forecast from AEARP EDA)
  4. Observations: SYNOP, TEMP, AMDAR, MSG AMV, NOAA ATOVS radiance, MSG SEVIRI radiance
  5. Variational bias correction for radiance observations
2. Operational characteristics of AROME DA system
  1. 3DVAR for upper-air analysis
  2. 3 hour cycling i.e. 8 analyses in a day
  3. Static B matrix based on Ensemble technique (downscaling of ALADIN/HU EDA)
  4. Observations: SYNOP, TEMP, AMDAR

## 2. Activities around ALARO DA

1. Experiments with assimilation of IASI radiance from METOP-B

The assimilation of IASI radiance in Hungarian ALARO 3DVAR system was made by Patrik Benacek who spent 6 weeks at OMSZ in autumn 2013. The details of this study can be read in Patrik's report on LACE webpage ([http://www.rclace.eu/File/Data\\_Assimilation/2013/Report\\_IASI2013.pdf](http://www.rclace.eu/File/Data_Assimilation/2013/Report_IASI2013.pdf)).

2. Upgrade operational cycle to cy36t1 with ALARO baseline physics

The cy36t1 became operational at OMSZ in 2013 and it meant also that DA configurations were upgraded with this new model cycle. In cy36t1 the reorganization of BATOR source code and variational bias correction were made.

3. Switch to Meteosat-10 SEVIRI and GEOWIND, switch off NOAA-16 AMSU-B

At the beginning of 2013 Meteosat-10 satellite became the prime operational geostationary satellite at EUMETSAT which contains the same instruments like the previous ones. Due to this new satellite several upgrade had to be changed in operational DA system regarding SEVIRI and GEOWIND AMV observations. The default version of cy36t1 had some deficiencies about new satellite ID which had to be fixed and new set of VARBC had to be created as well.

The assimilation of NOAA-16 AMSU-B sensor was halted hence our operational DA suite crashed several times regarding wrong radiance data from this sensor. It was officially reported by NOAA that the sensor getting older and more noisy, therefore we decided to switch it off.

### 3. Activities around AROME DA

#### 1. Introduce operational AROME 3DVAR

The main development in 2013 from Hungarian DA activities was an introduction of operational AROME 3DVAR with conventional observations(SYNOP,AIREP,TEMP). It has a clear improvement on AROME forecast especially on short ranges (Figure 1.).

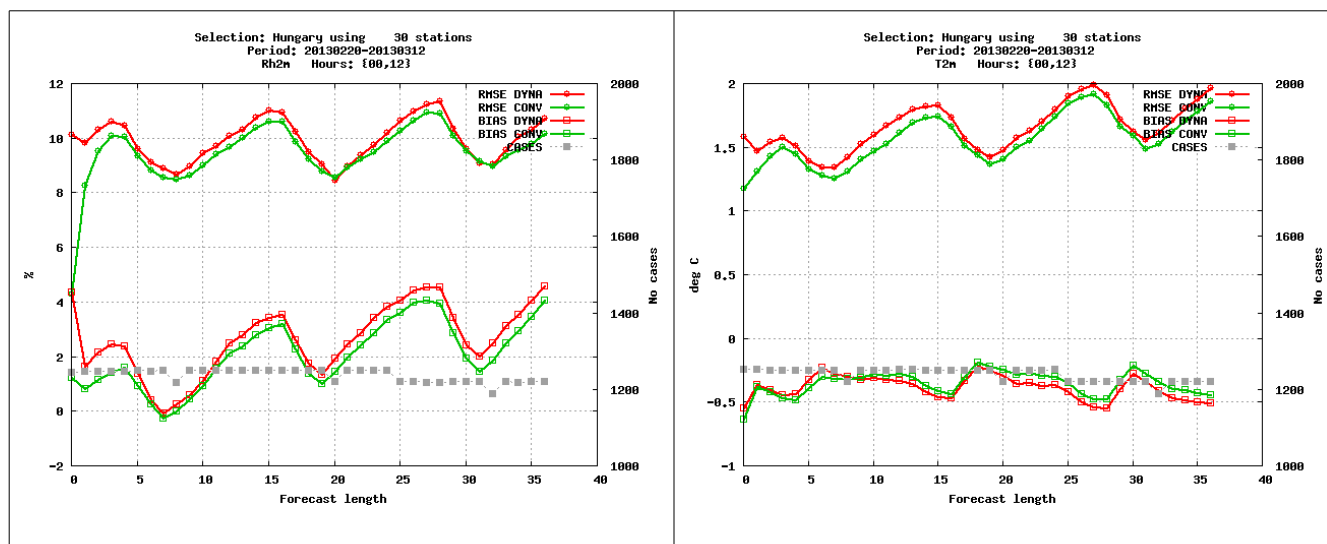


Figure 1. RMSE and BIAS for AROME Dynamical Adaptation (DYNM) and AROME 3DVAR with conventional observation (CONV) for period 29.02.2013. - 12.03.2013.

Beside this development, a 3h Rapid Update Cycle (RUC) approach was also introduced to use more observations from conventional sources. The 3h RUC provides better skill for AROME forecasts than regular 6h assimilation cycling (Figure 2.) also has better capability to assimilate asynoptic measurement and satellite products in the future.

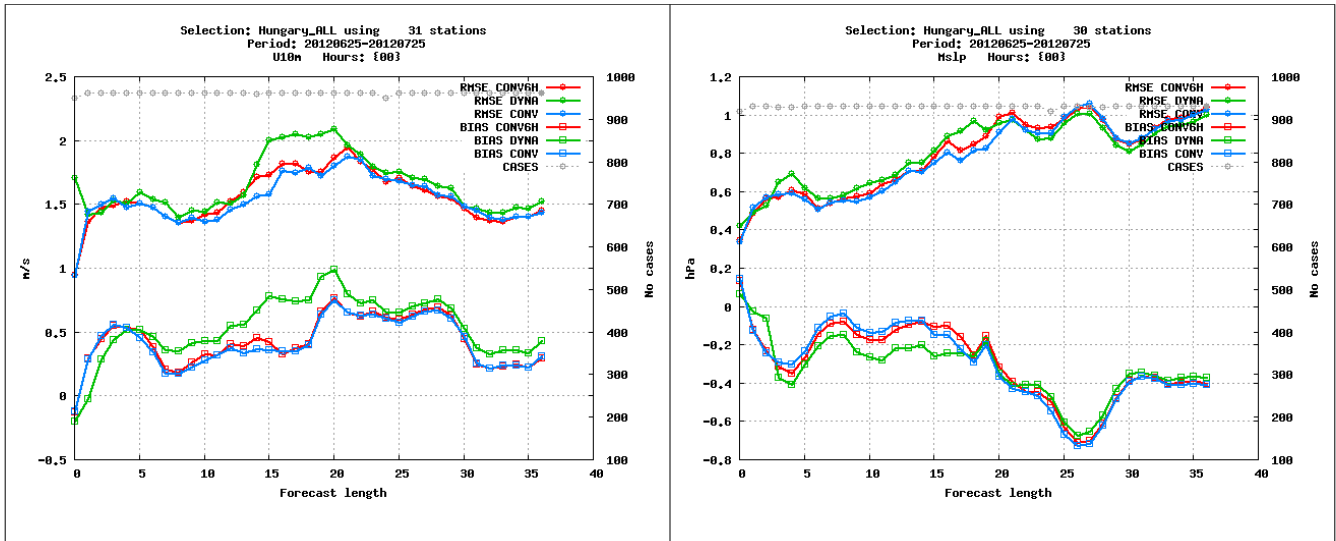


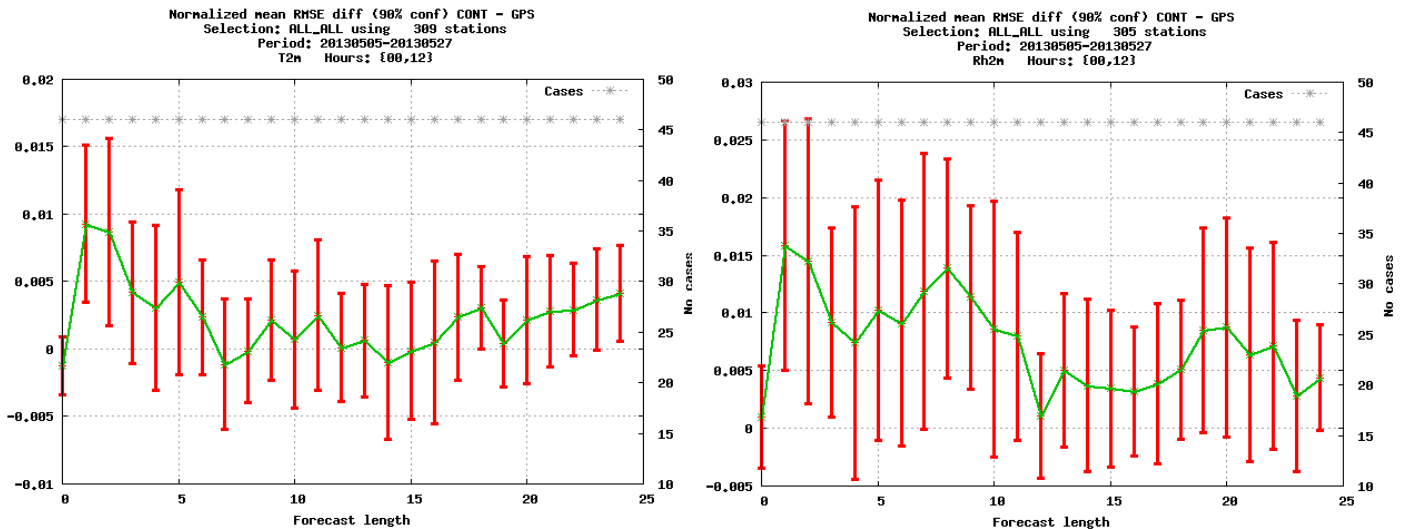
Figure 2. RMSE and BIAS for AROME Dynamical Adaptation (DYNA), AROME 6h cycling 3DVAR with conventional observation (CONV6H) and AROME 3h RUC 3DVAR with conventional observation (CONV) for period 25.06.2012. - 25.07.2012.

## 2. Assimilation RADAR reflectivity and radial wind observations

Assimilation of RADAR reflectivity and doppler wind observations was another big issue in 2013 at OMSZ which was investigated through two selected period of 2012. The latest results were summarized in the following presentation which can be seen on LACE webpage: [http://www.rclace.eu/File/Data\\_Assimilation/workshops/DAWD2013/dawd2\\_radar.pdf](http://www.rclace.eu/File/Data_Assimilation/workshops/DAWD2013/dawd2_radar.pdf)

## 3. Assimilation GPS ZTD

A cooperation between Budapest University of Technology and Economics (BME) and OMSZ GPS ZTD observations from Hungarian ground stations and EGVAP stations are available for NWP and DA purposes. In 2013 the EGVAP GPS ZTD data was tested in the existing AROME 3DVAR system with cy36t1 and static bias correction scheme. GPS ZTD observations from roughly 15 ground stations can slightly improve AROME forecasts (Figure 3.)



*Figure 3. Normalized RMSE differences between AROME 3DVAR with conventional observation (CONT) and AROME 3DVAR with conventional observation plus GPS ZTD (GPS) for period 05.05.2013. - 27.05.2013.*

#### 4. Spatially varying background error statistics

In AROME and ALADIN 3DVAR the spatially varying background error statistics so called sigmaB maps were tried to involve flow-dependency at the representation of background error. First of all ALADIN 3DVAR was tested and found correct in the sense of technical validation of the method. To try the method with AROME 3DVAR we observed technical problems, related to the humidity variable which is differently handle in AROME than ALADIN. Further details can be found on LACE forum and LACE webpage regarding this bug and results.