

*Regional Cooperation for
Limited Area Modeling in Central Europe*



Status of data assimilation at CHMI

Antonín Bučánek, Alena Trojáková, Patrik Benáček



- **ALARO-0 baseline CY38T1_bf03**
- **$\Delta x \sim 4.7\text{km}$, 529x421 grid points, linear truncation E269x215,**
- **87 vertical levels, mean orography,**
- **6h cycling, time step 180s, 3h coupling interval,**
- **surface CANARI + Blending (filtering truncation E87x69),**
- **production 4 times a day (00 06 12 18 UTC) up to +54h**

Progress since January 2014

- **Satellite data assimilation - Patrik's talk**
 - VARBC initialization for LAM**
 - Setup of assimilation window**
- **Porting and validation of CY38T1 - new humidity treatment**
- **Surface analysis issue - snow (Alena)**
- **Sigma_b maps in ALADIN - my presentation on Thursday**

Humidity treatment in CY38

Relative humidity RH and specific humidity Q are computed from temperature T , dewpoint temperature T_d and pressure p encoded in SYNOP and TEMP reports.

For **upper-air humidity - TEMP** following formulas are used:

- OULAN

$$RH = EWL(T_d)/EWL(T) \quad (1)$$

$$Q = FOQS\left(RH * \frac{FOEW(T, \text{MAX}(0., \text{SIGN}(1, 273.16 - T)))}{P}\right) \quad (2)$$

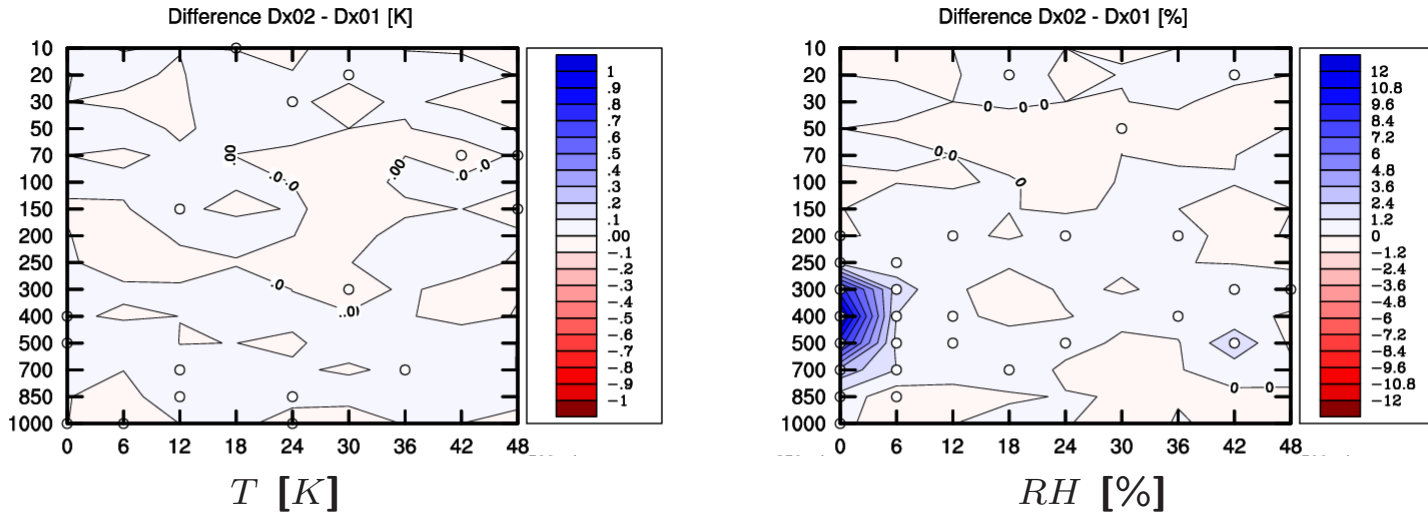
- BATOR - there is no specific treatment during conversion to ODB format
- screening CY38T1

$$Q = FOQS\left(RH * \frac{FOEW(T, 0)}{P}\right) \quad (3)$$

Patrick Moll explained the treatment in the screening due to necessity to deal with the bias which is only available as a relative humidity bias and the unbiased Q is computed from unbiased T and RH .

A bug was in upper-air specific humidity computation and I assume that the equation (3) in the screening is the correct one (saturation pressure WRT water only). Due to ill calculation of the specific humidity in OULAN, **Q values are wrong in observation files (obsoul_5_*)!**

Evaluation of the the new upper-air humidity treatment in CY38



RMSE differences of the scores against observations for 1-14 Feb 2013 00UTC forecasts (simplified experiment without assim cycling).

Blue areas denote a negative impact of the new upper-air humidity treatment
white circles significance 95% two-side confidence interval.

Humidity treatment in CY38

I assume that upper-air relative humidity is correct. The CANARI configuration analyse only relative humidity and should be affected only by model equivalents computation (HOP - PPOBSAP - APPACHE - GPRH).

For screen level humidity - SYNOP following formulas are used:

- OULAN

$$RH_{2m} = EWS(Td_{2m})/EWS(T_{2m}) \quad (4)$$

$$Q_{2m} = FOQS(RH_{2m} * \frac{FOEW(T_{2m}, MAX(0., SIGN(1, 273.16 - T_{2m})))}{P}) \quad (5)$$

- BATOR CY38T1

$$RH_{2m} = RH_{2m} * EWL(T_{2m})/EWS(T_{2m}) \quad (6)$$

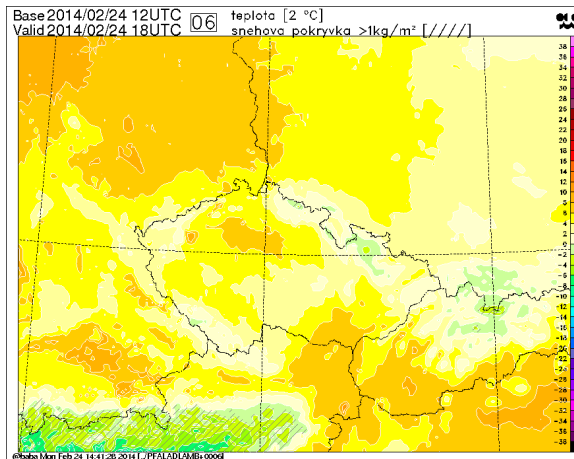
The multiplication needs to be understood!

Summary:

Although the treatment of RH_{2m} seems suspicious. The modifications were 'accepted' and CY38t1 was implemented operationally at CHMI for surface analysis and further pre-operational testing of the 3DVAR configuration.

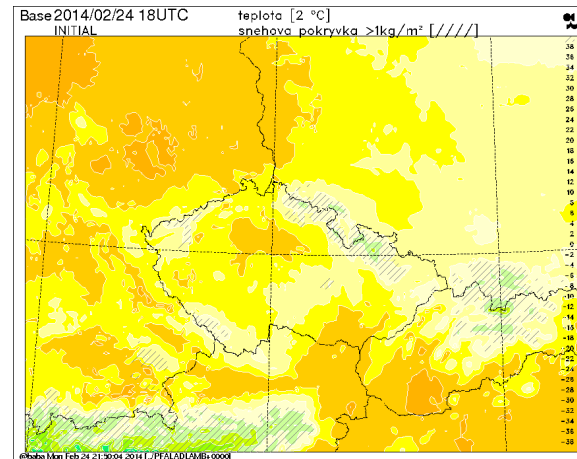
Surface analysis issue - snow

Although there is minimum snow (dashed) in +6H guess and no precipitation we have snow in the analysis.



guess

→



analysis

The snow relaxation towards climatology implemented within surface analysis adds unrealistic snow, but on other hand it helps to avoid an excessive cumulation of snow within assimilation cycling.

Sensitivity of the snow relaxation was tested, but no solution was found.

Snow issues were reported by many colleagues (Austria, Slovenia during DAWD 2013, Slovakia during autumn LSC 2013) and **there is a need to work on snow analysis !**

- By the beginning of 2015 we would like to start 3DVAR operational parsuite
- production 4 times a day (00 06 12 18 UTC) up to +54h
- We will put 3DVAR on top of blending
- Planned observation: SYNOP, TEMP, AMDAR, AMV, MSG
- 3h assimilation window
- tuning: SIGMAO_COEF=0.67 REDNMC=1.7



Thank You for Your attention !