

*Regional Cooperation for  
Limited Area Modeling in Central Europe*



## Data assimilation activities at CHMI

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ARSO METEO  
Slovenia



- Optimization of **aircraft data assimilation** and implementation of Czech Mode-S MRAR data.



- **Migration** from Traditional Alphanumeric Codes (TAC) to the Table Driven Code Forms such as BUFR (TAC2BUFR) has been tackled for SYNOP.
- Various **VarBC initialization** methods were evaluated and new approach proposed to harmonize a bias correction considering daily-mean contributions of a NWP model bias, Mile and Benáček (2016) - **Patrik's talk**.
- **Background covariances for BlendVar system** were investigated and new climatological covariance matrix was proposed that forces 3D-Var to act mainly at smaller scales, see Bučánek and Brožková (2017) - **Antonin's talk**.



## Background error covariances for a BlendVar assimilation system

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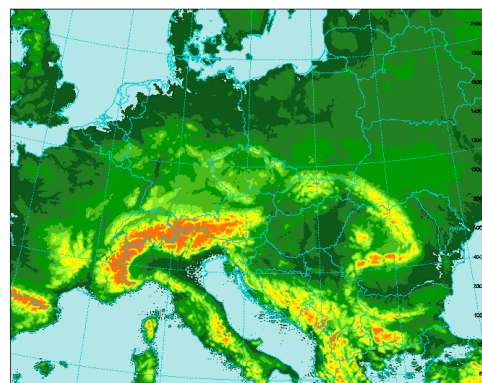
(Manuscript received 22 December 2016; in final form 4 July 2017)

### ABSTRACT

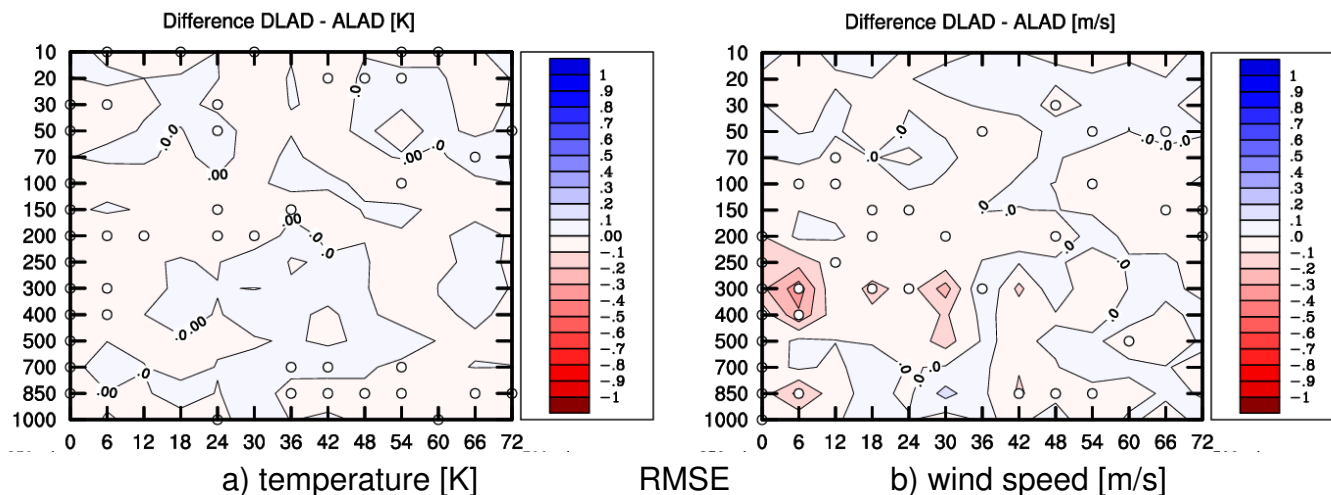
We propose a new climatological background error covariance matrix suitable for the so-called BlendVar scheme, which deals with a problem on how to best preserve large-scale information of the global coupling system in the high-resolution limited area model (LAM) analysis. The BlendVar scheme is composed from a Digital Filter (DF) Blending step, treating the inclusion of the global model analysis, and from high resolution 3D-Var. The new background error covariance matrix forces 3D-Var to act mainly at smaller scales. We created a LAM assimilation ensemble forecasting system, where the DF Blending step is present, to sample the new matrix. To build and demonstrate properties of such a background error covariance matrix, we use the high-resolution model ALADIN coupled to the global model ARPEGE. The DF Blending step is taking advantage of ARPEGE 4D-Var assimilation system while 3D-Var is improving the small-scale part of ALADIN analysis. We assess the impact of using the new background error covariances in the BlendVar scheme with the full data assimilation cycle over the period of one month. We also compare performance of the new BlendVar set-up with respect to DF Blending and 3D-Var used alone. Objective scores with respect to radiosonde and aircraft observations favour the BlendVar scheme with the newly specified background error statistics.

*Keywords:* digital filter blending, 3D-Var, background error covariances, LAM assimilation, initial conditions

- **BlendVar** upper air analysis
  - Digital Filter spectral blending (filtering at truncation E87x69) followed by 3D-Var assimilating SYNOP, TEMP, AMDAR, AMV, SEVIRI, **Mode-S MRAR CZ**
  - 6h cycle, no DFI in the next +6h assim guess
  - space consistent coupling
  - incremental DFI initialization of short cut-off production analysis
- **OI surface** analysis based on SYNOP (T2m, RH2m)
- Operational setup:
  - ALADIN cycle 38t1tr\_op6 (ALARO-1)
  - domain (dx 4.7km, 529x421 grid points, linear truncation E269x215)
  - 87 vertical levels, mean orography
  - time step 180 s
  - 3h coupling interval
  - 00, 06, 12 and 18 UTC forecast to +72/+54h

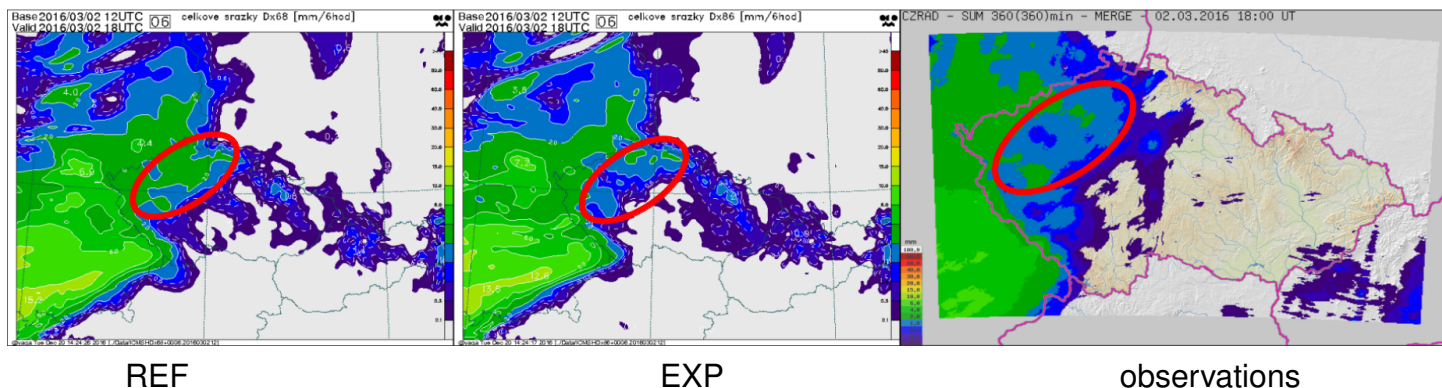


- **Optimization of aircraft (AMDAR & Mode-S) data usage**, Benáček (2016)
  - added Czech Mode-S MRAR data
  - reduced horizontal thinning (RFIND\_AIREP=25000.)
  - increased vertical thinning (RAIREPTHIN=1500., RAIREPPCENTTHIN=0.05)
  - increased observation errors (SIGMAO\_COEF(2)=2.8)
- **Parallel suite AKJ (11 May - 20 June 2017) since June 2017**

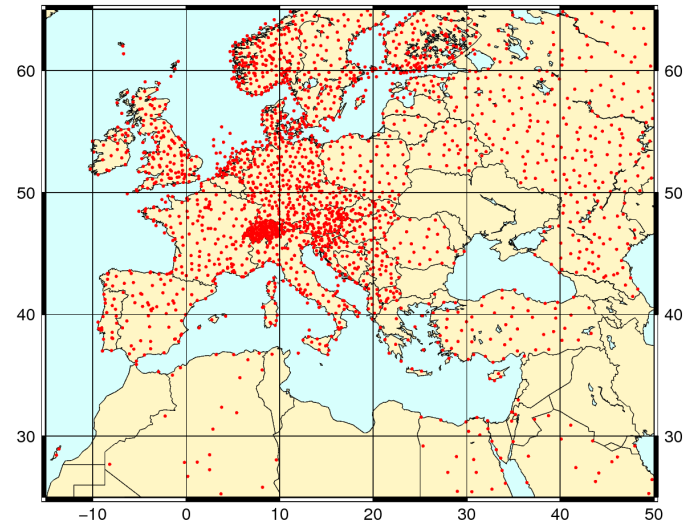


- **Slight positive impact in the first hours of NWP forecast.**

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  - increased observation errors (SIGMAO\_COEF(2)=2.8)
- **Case study for 2 March 2016 12UTC 6h precipitation forecast for lead time of +6h**



- **BATOR extended for decoding of the WMO AMDAR BUFR template 311010 v7**
  - template of GTS AMDAR data (IUA\*EGRR)
  - src on beaufix:trojakova/pack/cy40t1\_bf05\_amdar\_bator.01.IMPI500IFC1310.2x.pack
  - for more details see [Monteiro \(2017\)](#)
- **BUFR SYNOP handling by BATOR**
  - most of European SYNOPs is correctly handled
  - BATOR extended for Tmin,Tmax
- **Remaining issues**
  - station type coding
  - "light and variable" wind
  - geopotential for stations above 500m
  - detailed validations still ongoing !
  - handling of TAC data (Bulgaria,...)



- slow down of development due to porting activities
- **new HPC**
  - NEC LXC3 series HPC cluster
  - 320 computing nodes connected through high-speed Mellanox EDR InfiniBand
  - node consists of two **Intel Broadwell** CPU (12 cores, 64GB RAM)
  - HPC peak performance is 270.3 teraflops
  - OS CentosOS 7.2 Linux OS
  - more than 1 Petabyte of storage capacity
  - 64 nodes (phase A) already delivered complete installation in early 2018



**End**

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**Thank you for your attention !**



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