NWP related activities @SHMU

40th EWGLAM & 25th SRNWP Meetings, 1.-4.10.2018, Salzburg, Austria

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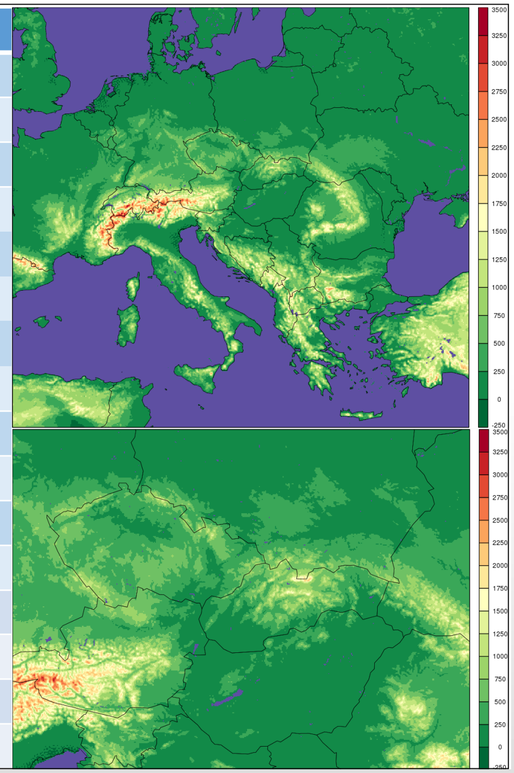
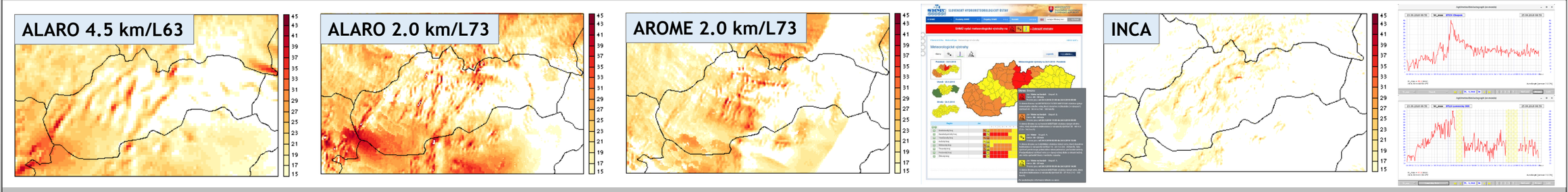
system	ALADIN/SHMU	ALARO-2km	AROME-2km
HPC	IBM Flex System p460	IBM p755	
HW	4x Power7+ 8core CPUs (3.6 GHz), 256 GB RAM	4x Power7 8core CPUs (3.6 GHz), 256 GB RAM	
nodes	12 *(6 nodes failed - HW problems, only 3 replaced => 9)*	5	
SW	Red Hat Enterprise Linux; gfortran 4.9.3 (xlf 15.1.0)	Gentoo 4.4.111 Linux, gfortran 7.3.0	
Status	operational	test	
model	CY40T1bf07_export		
physics	ALARO-1vB	ALARO-1vB	AROME-France CMC
horizontal resolution	4.5 km, 625x576 pts	2.0 km, 512x384 pts	
spectral trunc & grid	312x287 linear	255x191 linear	
vertical levels	63	73	
time step	180 s	144 s	100 s
dynamics	hydrostatic	non-hydrostatic	
coupling model	ARPEGE (long- & short cut off), 3 h frequency	ALARO/SHMU (4.5 km), 1 h frequency	
assimilation	upper air spectral blending + CANARI surface analysis	downscaling	
initialization	no initialization		
forecast ranges	78/72/72/60 (a' 1 h)	+78 h at 00UTC/+72 h at 12UTC (a' 1 h)	

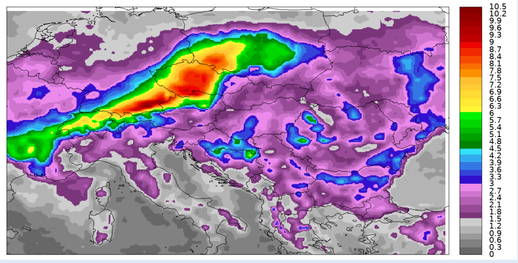


Various looks on Fabienne storm @SHMU. *All displayed data are valid for 24/09/2018 03 UTC.*

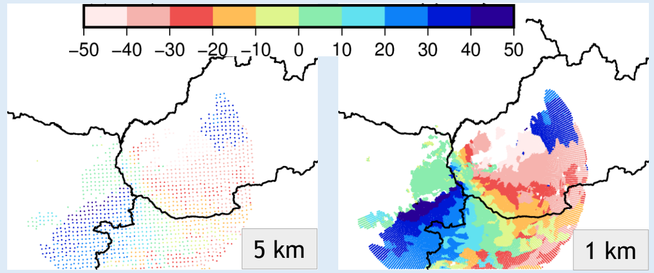
The +27 hours wind gust forecasts from ALADIN systems operated @SHMU and corresponding INCA analysis, the associated warning and the wind speed measurements at two mountain stations are plotted below.



Our new software for statistical post-processing of ensemble forecasts computes min, max, median, Q1 and Q3 for selected quantities at each grid point. The Q3-Q1 difference for ECMWF T2m +75h forecast valid for 24/09/2018 03 UTC is shown. High interquartile range implies high forecast uncertainty, with greatest values obviously corresponding to the frontal zones. [I.Prcuch]

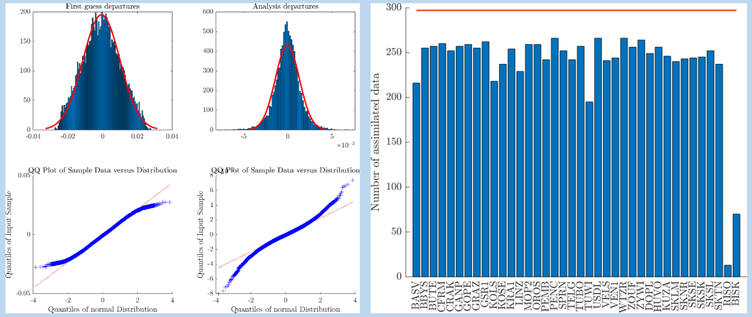


Recently, within the joint effort towards RUC radar data assimilation all RC LACE radars from OIFS (in ODIM/HDF5 format restructured by HOOF tool) were tested in BATOR (CY40T1bf09). An example of radial velocity from Maly Javornik for 24/09/2018 03 UTC is shown with thinning distances of 1 and 5 km. With 5 km thinning (pure spatial separation) important local features were ignored. [M.Nestiak]



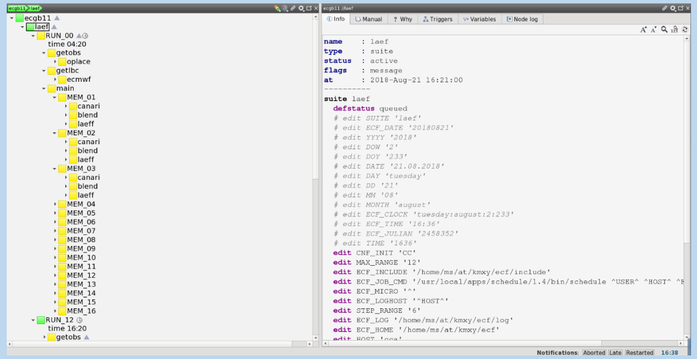
GNSS processing [M. Imrisek]

An experimental 3DVAR assimilation suite has been implemented for AROME/SHMU [2 km/L73] domain (see above) with 6 h cycling. Locally processed GNSS stations (space.vm.stuba/pwvgraph) are used together with SYNOP, TEMP, AMDAR and HRWIND observations from OPLACE. The analysis and first guess departures were extracted to perform an a posteriori validation of the static GNSS whitelist over the period of 27.06.-11.09.2018. Upon the Jarque-Bera tests (normal distribution of residuals – see statistics for all stations on the Figure below) 6 stations had to be excluded. A VarBC will be tested to generate the station whitelist.



ALADIN-LAEF upgrade [M. Bellus]

The ALADIN-LAEF suite is operationally running under obsolete SMS system on ECMWF HPCF. In preparation of new ALADIN-LAEF setup, the environment for the PHASE I was rewritten from scratch under ecFlow, using Perl and Python code. Therefore, recently developed ALADIN-LAEF components like SPPT and ensemble Blending+3DVAR can be easily plugged in. The ecFlow suite is ready for testing in the Time Critical application environment.



Validation of ALADIN-LAEF 3DVAR assimilation [M. Imrisek, M. Bellus]

In Phase II of new ALADIN-LAEF setup (4.8 km/L60, 16 members) the handling of IC perturbations of the upper air fields will be based on ensemble blendvar (combination of Blending by DF and 3DVAR data assimilation) approach. The 3DVAR DA was technically implemented into ALADIN-LAEF in 2016. Its technical validation started with gradual implementation of various observation types: SYNOP, TEMP, AMDAR, GEOWIND – all OPLACE and GNSS ZTD (SUT) data. The whitelist for GNSS ZTD data was generated using the "best day" (all members and lowest amount of rejected stations) and "best member" (all days and lowest amount of rejected stations) criteria together. An example of specific humidity analysis increment at model level 50 with GNSS ZTD data assimilation only is on Fig. 1 (left). Then, for IC the Gaussian perturbation was applied within screening to all data. An example of temperature perturbations at model level 50 is shown on Fig. 2 (right). The proposed configuration with 3DVAR step inserted between CANARI surface analysis and Blending by DFI blocks was run for 2 weeks period of 16.-30.5.2016. The forecast verification scores were slightly positive to neutral in the beginning of integration for all parameters when compared with Phase I, with only deterioration of geopotential – see examples of verification results on Figure 2.

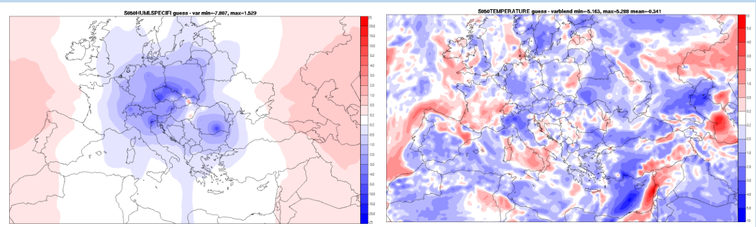


Figure 1: Model level 50: an analysis increment of Q using GNSS data only (left) and T perturbations using all data (right).

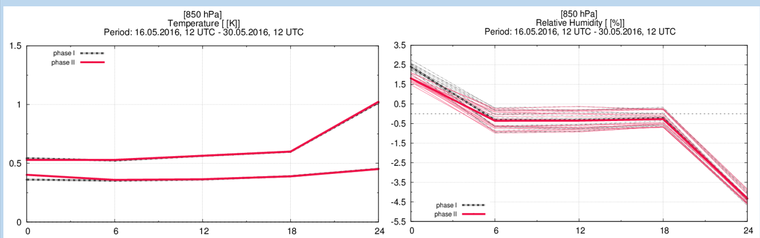


Figure 2: Verification scores of ALADIN-LAEF Phase I and Phase II at 850 hPa: RMSE and spread for T (left) and BIAS for RH (right).

Building of new SODA-EKF based assimilation suite [V. Tarjani]

A SODA-EKF based assimilation suite is being built over the INCA-SK domain of 501x301 pts with 1 km grid, using CY40T1. INCA analysis of 2m T and 2m RH is used as high resolution gridded observations – see bottom pictures on Figure 1. Forcing (~20 m above the surface) is provided by ALARO/SHMU 4.5 km model. The preliminary results are shown on Figures 2 and 3, displaying analysis increments of the control variables (TG1, TG2, WG1, WG2) and corresponding 2m parameters innovations. Introduction of INCA precipitation analysis and radiation analysis based on NWCSAF as forcing is planned as well as thorough validation, upgrade to SURFEX v8.1 and addition of snow cover analysis.

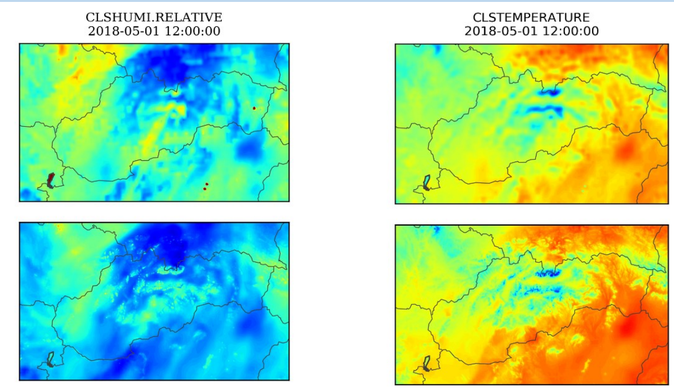


Figure 1: 4.5 km/L63 ALARO/SHMU CANARI surface analysis of 2m RH and T (top) and corresponding INCA analyses (bottom).

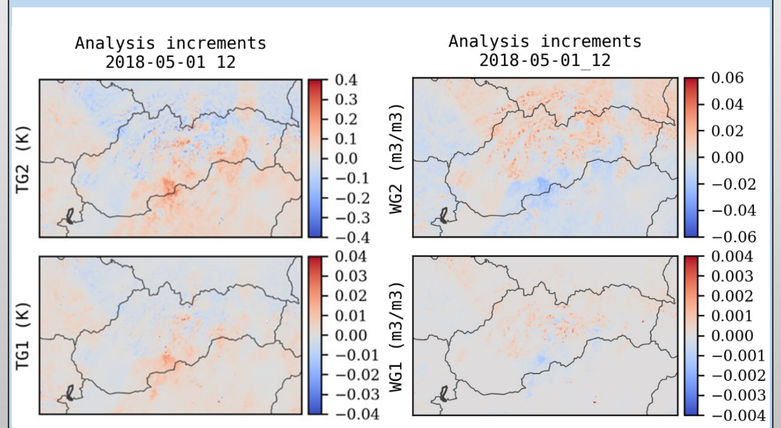


Figure 2: SODA analysis increments of T and WG.

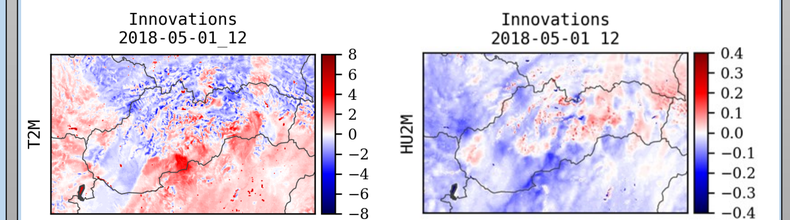


Figure 3: SODA innovations of 2m T and RH.

Amateurs meteorological stations [M. Dian, M. Nestiak, R. Zehnal]

The station is ensembled from cheap sensors on Raspberry Pi is installed on the Inovec hill (1042m), providing T, RH and p measurements.

Raspberry Pi 3-B
Temp - DS18B20
RH - SHT15
Pressure – BMP180
microUSB charger
wifi dongle
microSD card