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Environmental Agency of the Republic of Slovenia

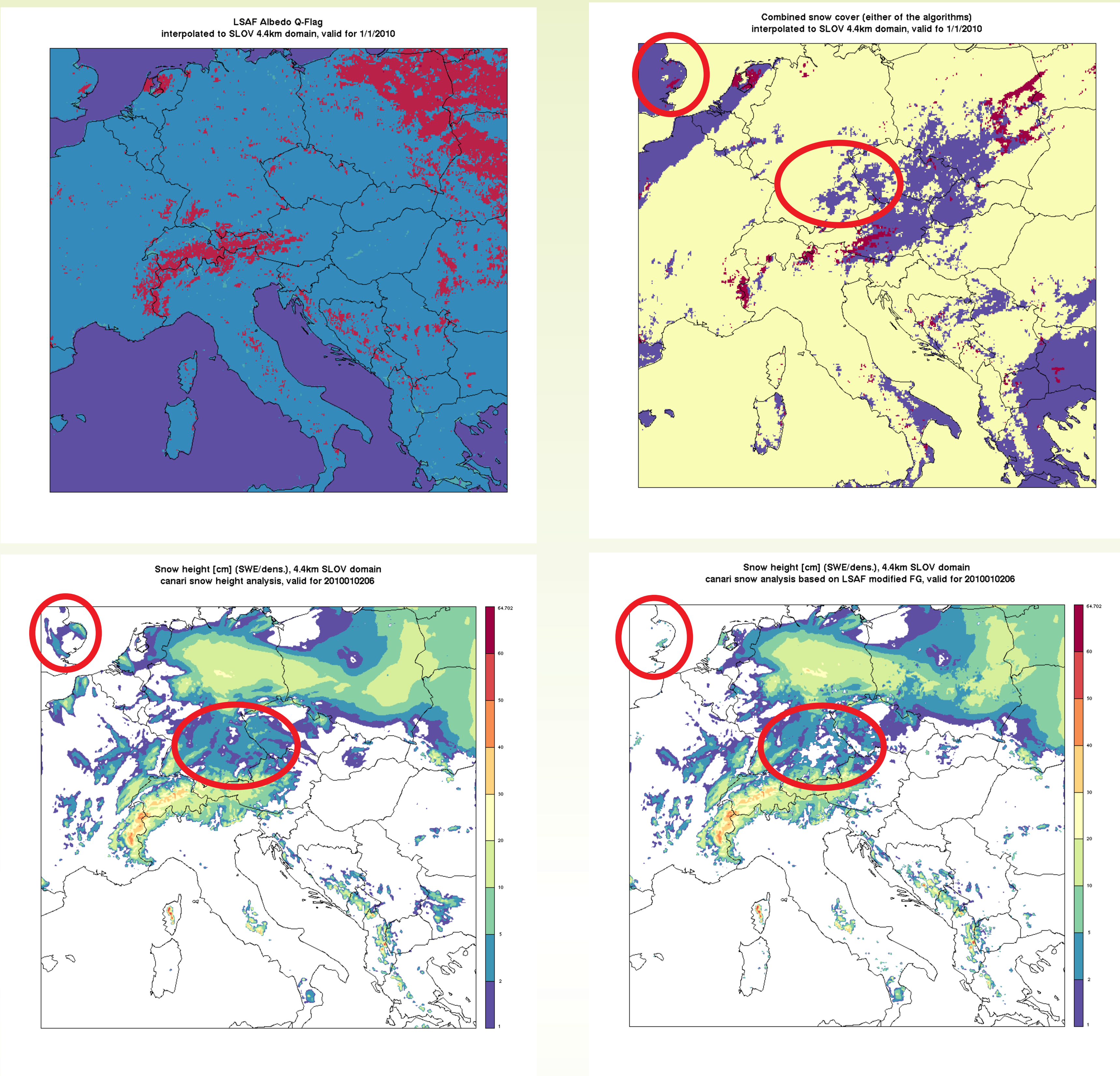
ALADIN related activities in SLOVENIA - 2010

Research in Snow analysis

Experiments with CANARI OI for snow in combination with Land SAF satellite data

- CANARI OI for snow with SYNOP data, using snow height instead of snow water equivalent (obs operator with snow density from model FG)
- snow mask based on Land SAF albedo product applied on FG snow field (snow removal or addition of 10 cm of snow)
- background error for CANARI OI is cycled and advected in time by adding some model fluxes (e.g. model precipitation, sublimation flux, melting flux)

Work is in progress and no production scores have yet been produced but some results can be seen on figures below.



Figures in top show satellite retrieval: top left is albedo quality flag in which snow is also marked (magenta color) and top right is the derived snow mask by combination of albedo quality flag and simple algorithm based on albedo values (magenta color is snow, blue is snow free and the rest is not defined).
Bottom row is a comparison of CANARI snow analysis based on SYNOP snow height alone (left) and in combination with snow mask derived from Land SAF snow cover.

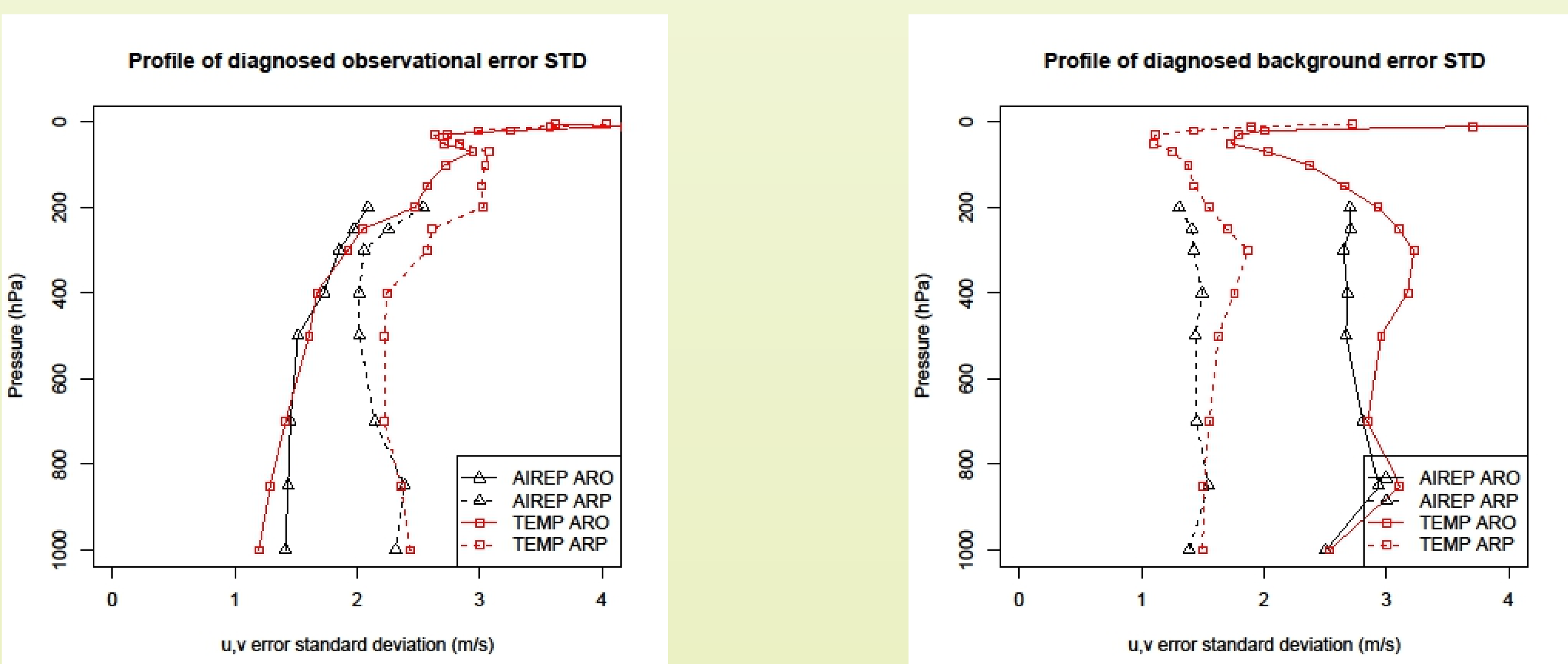
Diagnosis of background, observational and model error in AROME

The aims and methods used:

- estimate observational error R in data assimilation and tune its a priori specifications,
- diagnose the model error Q in data assimilation as a fraction of total background error (Q=aB),
- estimate total background error B+Q with methods of "a posteriori" diagnostics and compare it to B , estimated in a perfect model framework (e.g. with ensemble method),
- two methods of a posteriori diagnostics used: Jmin method (Desroziers and Ivanov (2001), Berre et. al. (2006)) and covariances of residuals (Desroziers et. al. (2005)).

The summary of main results and findings:

- two compared method give different results, which can be caused by high spatia resolution and correlation in observational errors,
- it was confirmed that R (its representativeness part) decreases with resolution, and that B+Q increases at the same time (see figures),
- the final model error fraction a was estimated as 1.51 (method I) or 0.62 (method II) - that means its magnitude in AROME is similar to pure B,
- the tuning impact (using new R and B+Q) is neutral.

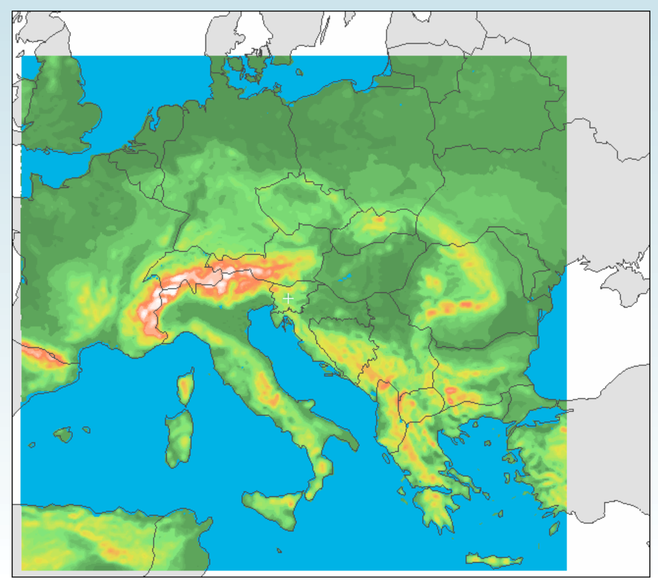


Comparison of vertical profiles of observational (left) and background errors (right) for wind, diagnosed in AROME and ARPEGE.

OPERATIONAL STATUS

Characteristics of the operational ALADIN/SI model configuration:

- model version: AL35T1 using ALARO with 3MT physics
- integration four times per day: 00 UTC (72 h), 06 UTC (72 h), 12 UTC (72 h), 18 UTC (48 h),
- 9.5 km horizontal grid spacing,
- 43 vertical model levels,
- linear spectral elliptic truncation (E134x127, 258*244 points, with extension zone 270*256),
- Lambert projection,
- 400 s time-step,
- initial and lateral boundary conditions from ARPEGE,
- LBC coupling every 3 hours,
- digital filter initialization.



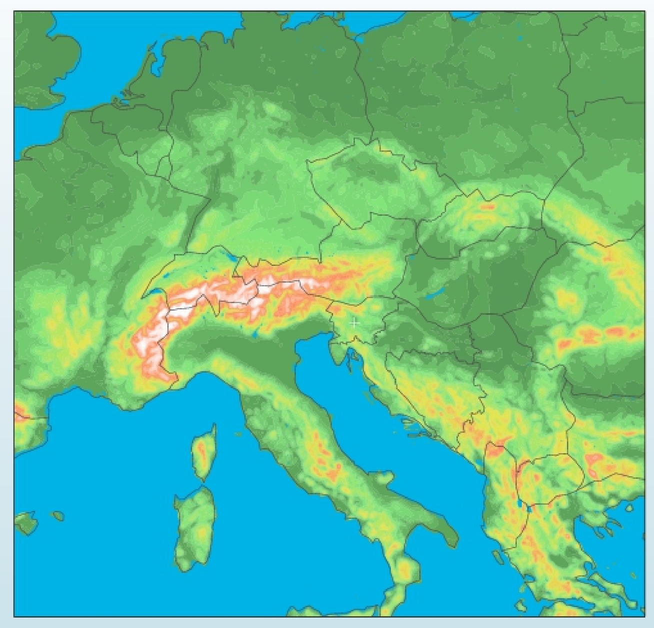
Operational ALADIN/SI domain9.5km

Additionally:

- integration four times per day: 00 UTC (72 h), 06 UTC (72 h), 12 UTC (72 h), 18 UTC (72 h),
- initial and lateral boundary conditions fromECMWF

Characteristics of the parallel ALADIN/SI model configuration, same as operational except for:

- integration two times per day: 00 UTC (54 h), 12 UTC (54 h),
- 4.4 km horizontal grid spacing,
- linear spectral elliptic truncation (E224x215, 439*421 points, with extension zone 450*432),
- 180 s time-step.



ALADIN 4.4 km domain 439*421 points

Data assimilation

An assimilation cycle is prepared for the real time use. Its setup is in the SMS environment with the following characteristics:

- 4.4 km horizontal resolution, 43 vertical levels, 6 h analysis frequency, ensemble B matrix (downscaled ARPEGE),
- 3DVAR upper air assimilation using all OPLACE available data,
- CANARI surface analysis using 2 m temperature and 2 m relative humidity observations,
- surface blending step, which merges CANARI surface analysis over land, ARPEGE sea-surface analysis and 3DVAR analysis,
- cycling of microphysical and 3MT prognostic fields (initialization from first guess),
- first guess step using long cut-off ARPEGE lateral boundary conditions, digital filter initialization (DFI).

Observations usage:

- OPLACE pre-processed data: SYNOP (ps,T,q), AMDAR/AIREP aircraft data (T,u), METEOSAT SATOB cloud drifts (u), TEMP (T,u,q), WINDPROFILER (u), NOAA AMSU-A,AMSU-B (Tb), METEOSAT SEVIRI (Tb),
- local non-GTS data on surface level,
- web-based observation monitoring system developed by LACE.

Validation of the cycle:

Objective verification against radiosonde (TEMP) and SYNOP observations shows:

- neutral impact of assimilation on geopotential,
- slightly positive impact on low to midlevel temperature for the first 12 h,
- positive impact on wind fields, especially for the first 12 h,
- slight but systematic negative impact on relative humidity,
- substantial improvement on 2 m temperature RMS and bias.

The computer system SGI Altix ICE 8200

Technical characteristics:

- 36 compute nodes in a single rack,
- 16 GB of memory and 2 Quad core Intel Xeon 5355 processors per node (288 cores),
- two Infiniband DDR networks, one for IO and the other for MPI communication,
- additional 7 service nodes for login, management, control and IO operations (308 cores all together),
- a dedicated NAS IO node with 30 TB FC disk array.

System software:

- SGI ProPack on top of SLES 10,
- OpenMPI, SGI MPI,
- Altair PBSPro queuing system,
- Intel 10.1. and 11 Fortran compiler.