NWP related activities at SHMU

35th EWGLAM & 20th SRNWP Meetings, 30.9.-3.10.2013, Antalya, Turkey

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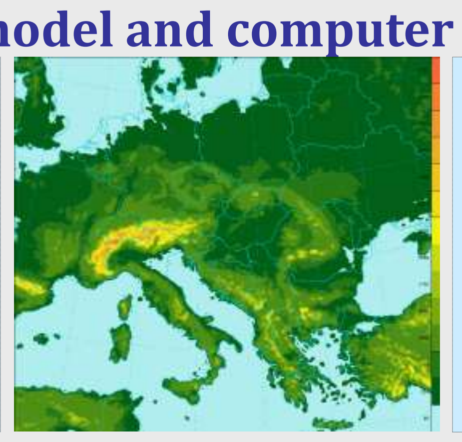
ALADIN/SHMU - operational model and computer

NWP model ALADIN CY36T1
- ALARO+3MT & SLHD
- envelope orography

Domain size and resolution
2882 x 2594 km (320 x 288 points)
[2.19 ; 33.99 SW] [39.06 ; 55.63 NE]
dx=9.0 km, vlev=37, tstep=400s



Assimilation cycle:
- CANARI surface analysis
- upper-air spectral blending by DFI

Suite characteristics
forecast length +72h (3 days)
4 runs/day (00, 06, 12, 18 UTC)
ARPEGE coupling with 3h frequency

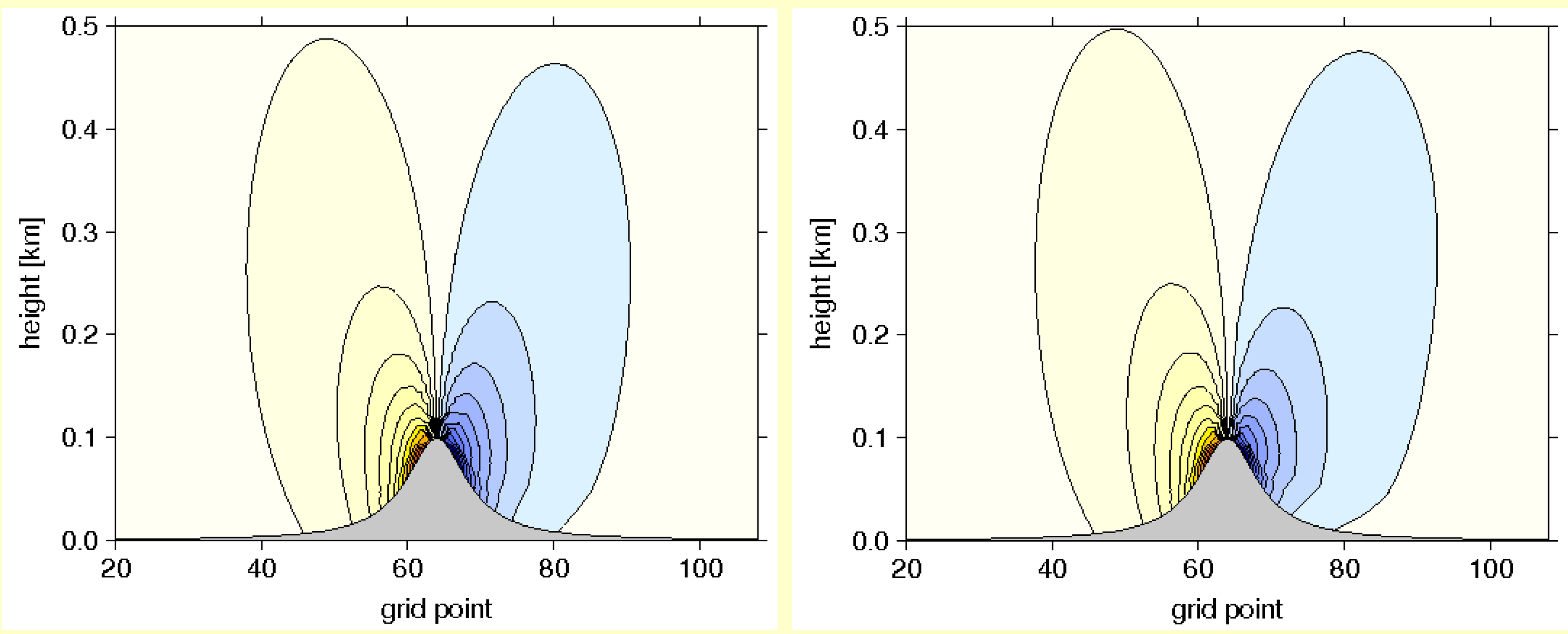
Computer power (HPC)
10 nodes of IBM Power 755:
4x Power7 8core CPUs (3.6 GHz), 256 GB RAM(total: 320 CPUs, 2.5 TB RAM)

Management servers
2x IBM Power 750: 1x Power7 6core CPU (3.6 GHz), 64 GB RAM

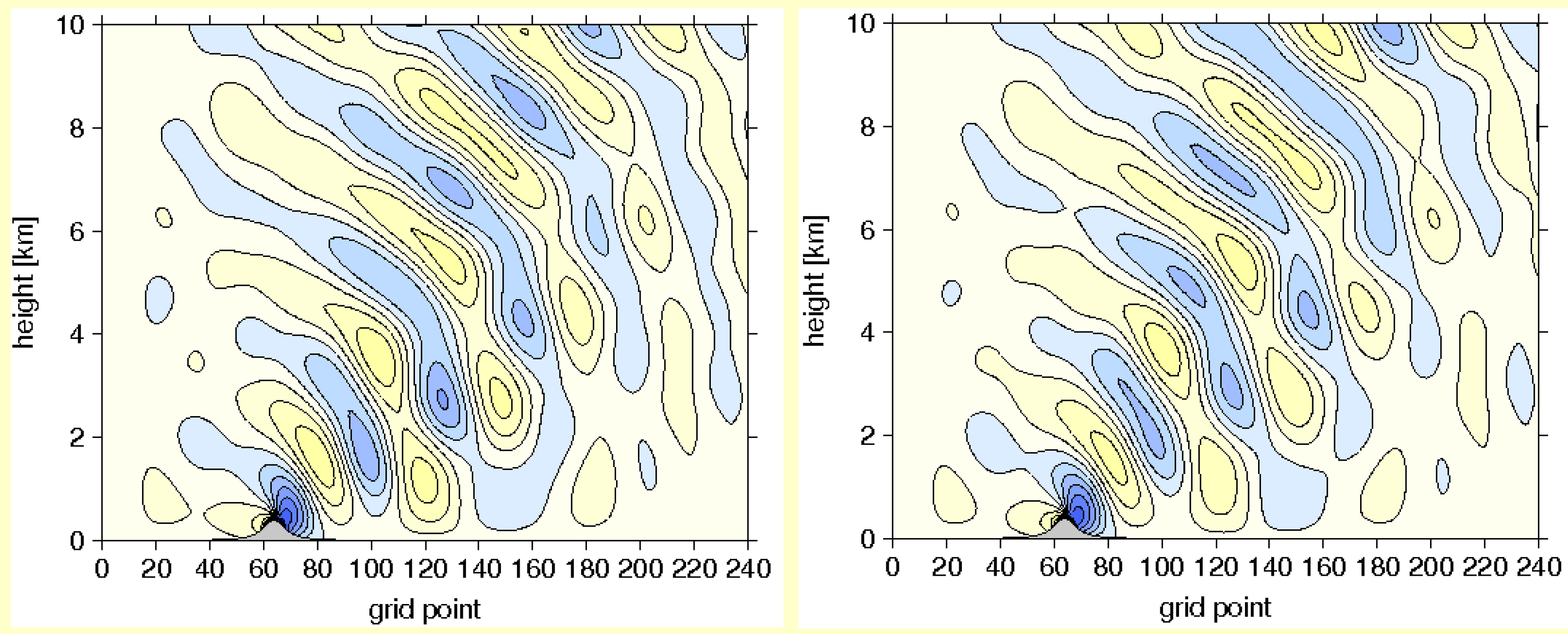
Software and file system
AIX 6 SE OS, IBM Load Leveler queueing system, 40 TB GPFS

Finite element vertical discretization for ALADIN non-hydrostatic dynamics (J. Vivoda & P. Smolikova (CHMI)), more details in HIRLAM-ALADIN Newsletter

FE vertical discretization has been extended from hydrostatic to non-hydrostatic dynamics: prognostic quantities interpolation using B-spline curves was constructed with de Boor's recursive algorithm. The treatment of boundary conditions was modified and the stationary iterative solution of the Helmholtz structure equation was implemented. Set of idealized tests was performed (flow regimes over Agnesi shaped mountain, Straka test) proving satisfactory accuracy and stability properties of proposed finite elements scheme. 3D diabatic tests wih 2.2 km resolution were also run with neutral results with respect to verification scores (not shown).



Potential flow : Θ after 500s, finite differences (left) and finite elements with 1 iteration of the SI solver (right)



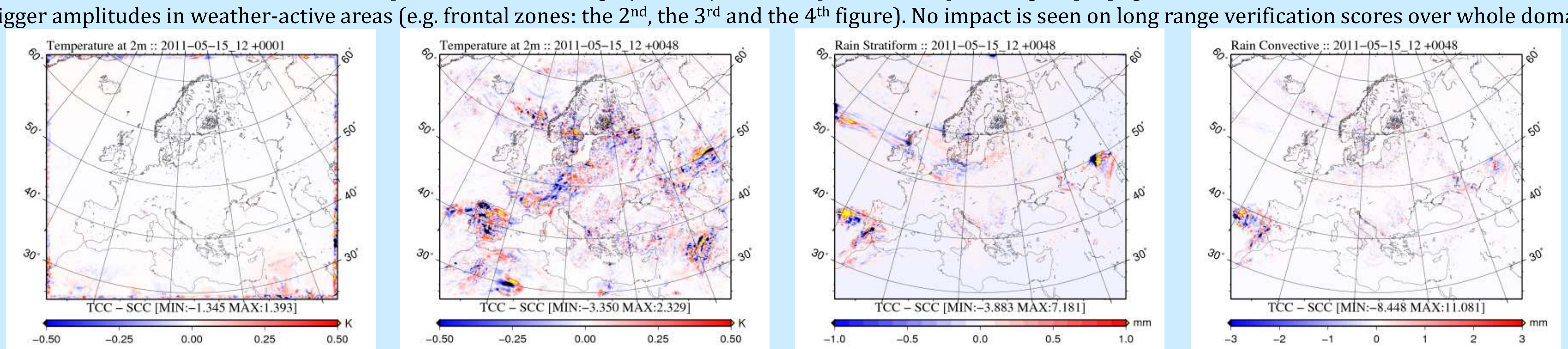
Non-linear non-hydrostatic flow: vertical velocity after 8000s, finite differences (left) and finite elements with 1 iteration of the SI solver (right)

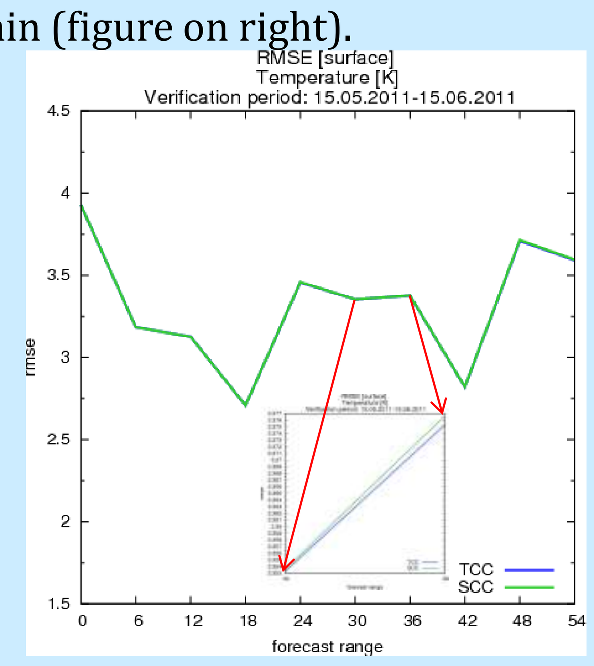
ALADINLAEF (Martin Bellus, stay@ZAMG), report available on www.rclace.eu

Time Consistent versus Space Consistent coupling – what is the impact?

Space Consistent Coupling (SCC) denotes such experiment setup where the very first coupling file (LBC0) is identical with the initial file (that comes e.g. from assimilation procedure). Other LBC files are provided by driving model. The data in the coupling zone in the very first time step are consistent in space, but between LBC0 and LBC1 they are inconsistent in time. On the contrary, in Time Consistent Coupling (TCC) experiment setup, all lateral boundary tendencies are coming from the driving model. But the data in the coupling zone are inconsistent in space.

No differences between TCC and SCC setups is visible at 00 range (obvious). In subsequent timesteps the signal propagates from the boundaries inside the domain (first two figures from the left), with bigger amplitudes in weather-active areas (e.g. frontal zones: the 2nd, the 3rd and the 4th figure). No impact is seen on long range verification scores over whole domain (figure on right).

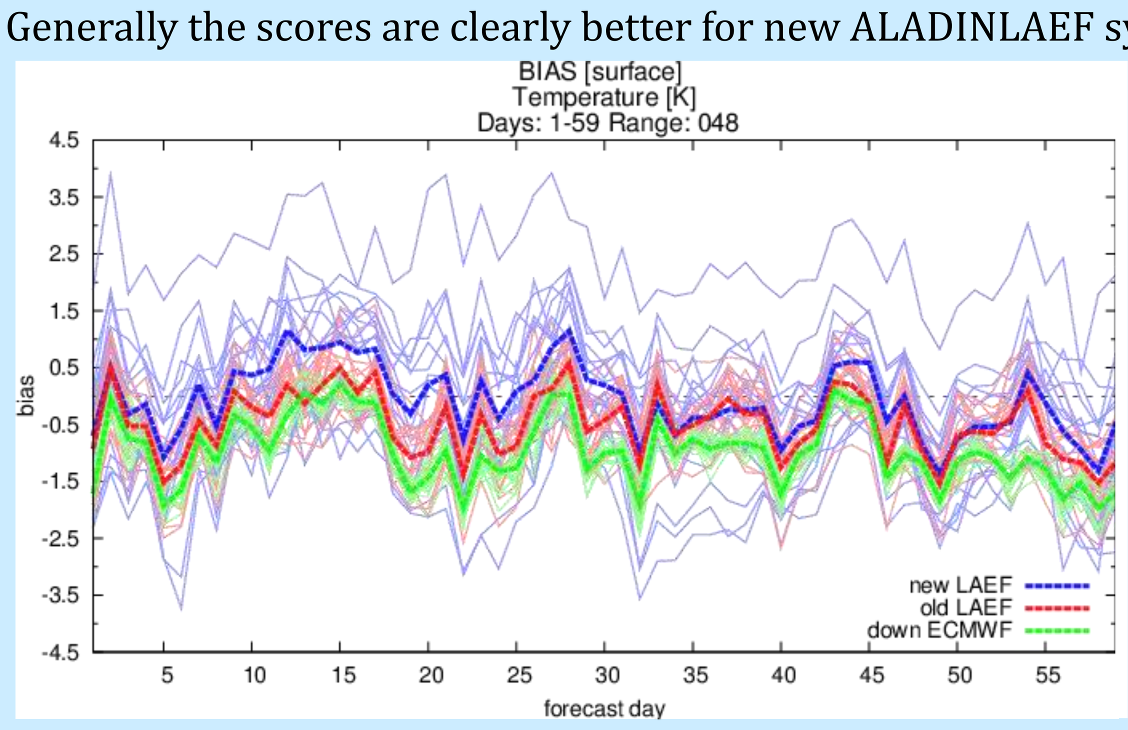


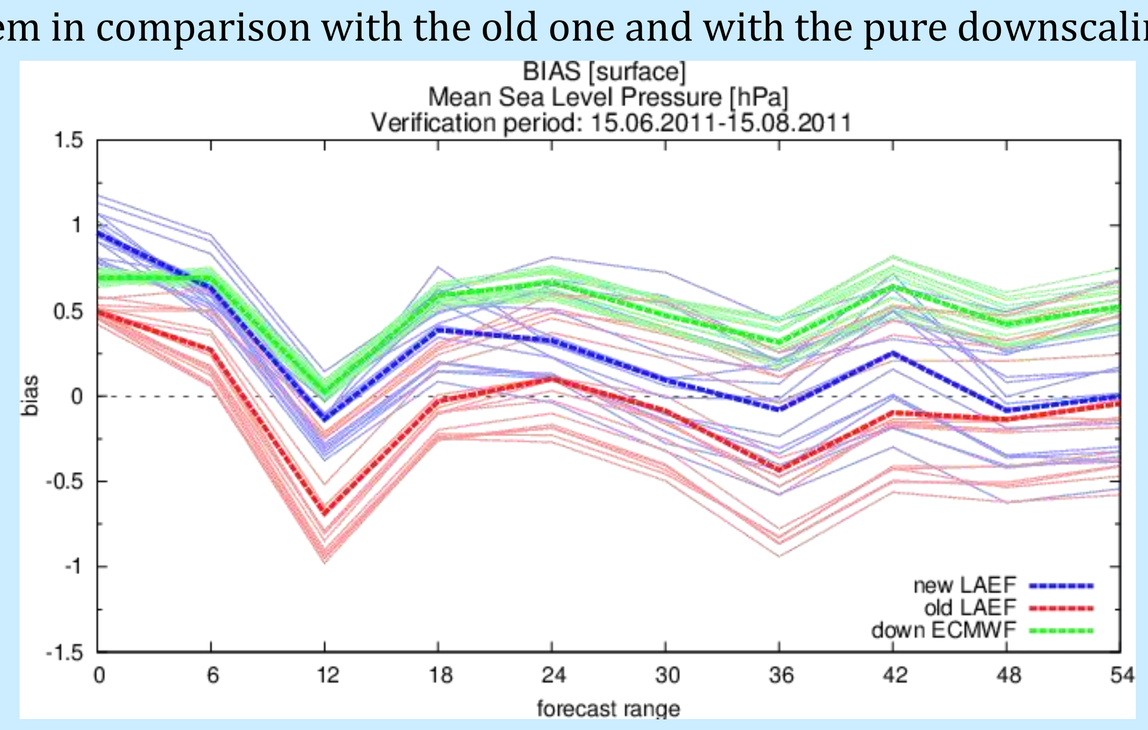


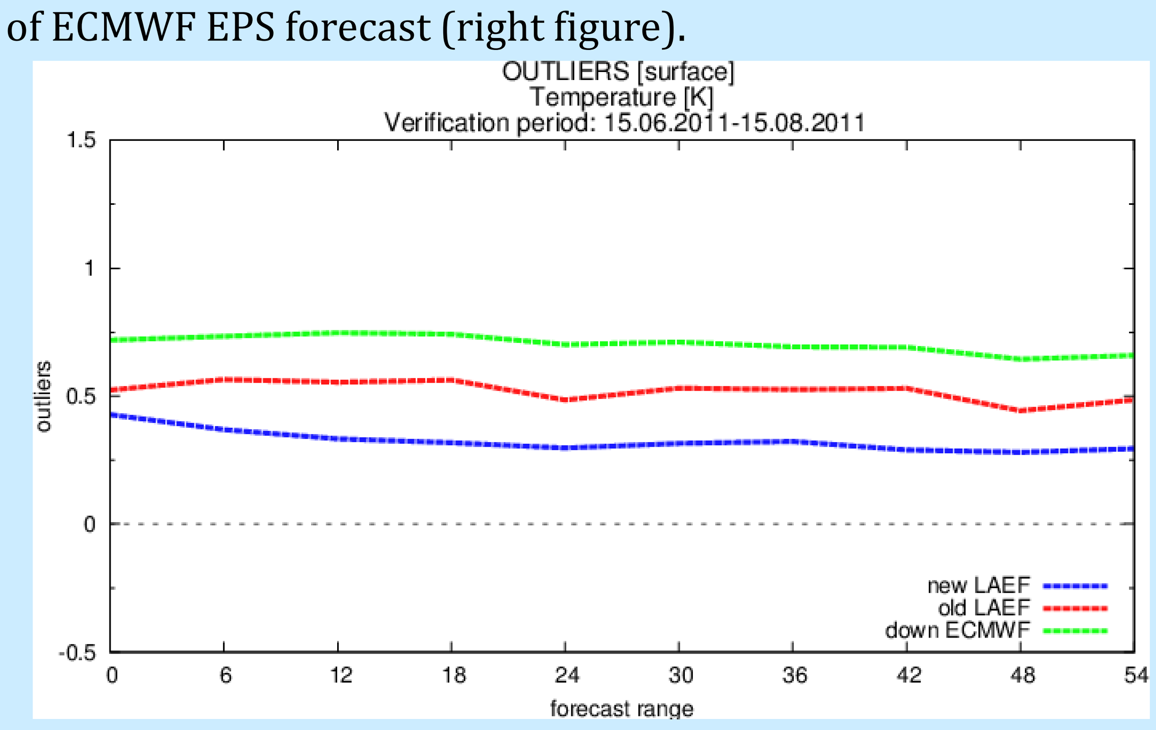
Verification of new ALADINLAEF setup

New ALADIN-LAEF system on new domain with 10.9km resolution contains breeding + ensemble surface assimilation with perturbed observations + upper air blending; multiphysics retuning. 2-months verification scores for this experiment are confronted with the "old" LAEF system and pure ECMWF downscaling for the period from June 15th till August 15th 2011:

- New tuning of multiphysics is rather aggressive for some members (left figure).
- There is a bigger initial spin up for new ALADINLAEF system due to the perturbed observations - that was expected (middle figure).
- Generally the scores are clearly better for new ALADINLAEF system in comparison with the old one and with the pure downscaling of ECMWF EPS forecast (right figure).





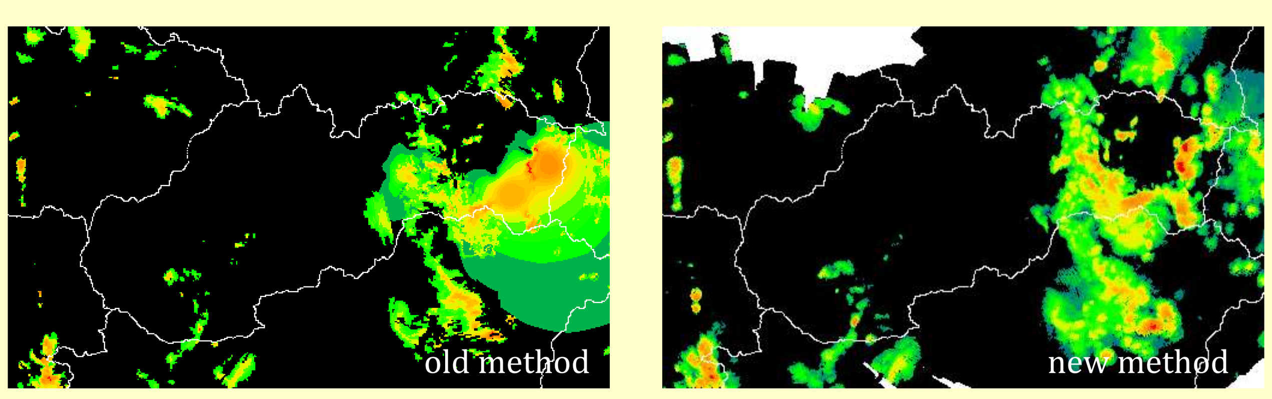


INCA-CE project (J. Vivoda, R. Bujnak, M. Nestiak, J. Kanak, L. Meri, L. Okon , O. Spaniel, R. Zehnal, R. Habrovsky, M. Kacer)

July 1st 2010-August 31st 2013; 90 man months; R&D tasks; Code development, optimization & parallelization, Data exchange & processing, Visualization; Interface & downstream applications for hydrology, road safety and civil protection; Case studies, MCPEX exercise; Presentations & publications

New precipitation analysis for INCA

New approach to compute INCA precipitation analysis was adopted: 3D volume data (in OPERA hdf5 format) for every radar are processed separately instead of 2D radar composites, with quality indexes assigned for each point of measurement. Final quality index for the given bin is the product of six computed indexes: Laplace filter, RLAN filter, attenuation quality indicator, index derived from SAFNWC products, beam blockage by the terrain and a radar measurement climatology based QI. Other inputs are SAFNWC products and rain gauge data. All available information is combined into final precipitation analysis field using variational approach. New method gives more realistic precipitation field compared to original one, consequently the motion vectors derived from new analysis are more reliable.



Correction of INCA temperature analysis and forecast using MSG satellite data

New method to reduce the cloud cover part of the INCA temperature error using cloud observations from MSG satellite data is proposed. NWC SAF cloud products (Cloud Mask, Cloud Type ...) produced from extrapolated MSG channels data by FCI algorithm are used as the reference cloudiness data. Procedure for correction of INCA temperature analysis is based on identification of discrepancies between satellite cloud identification and model ALADIN cloud forecast. The correction field is extrapolated continuously in time behind the+4h time slot up to +12h.