

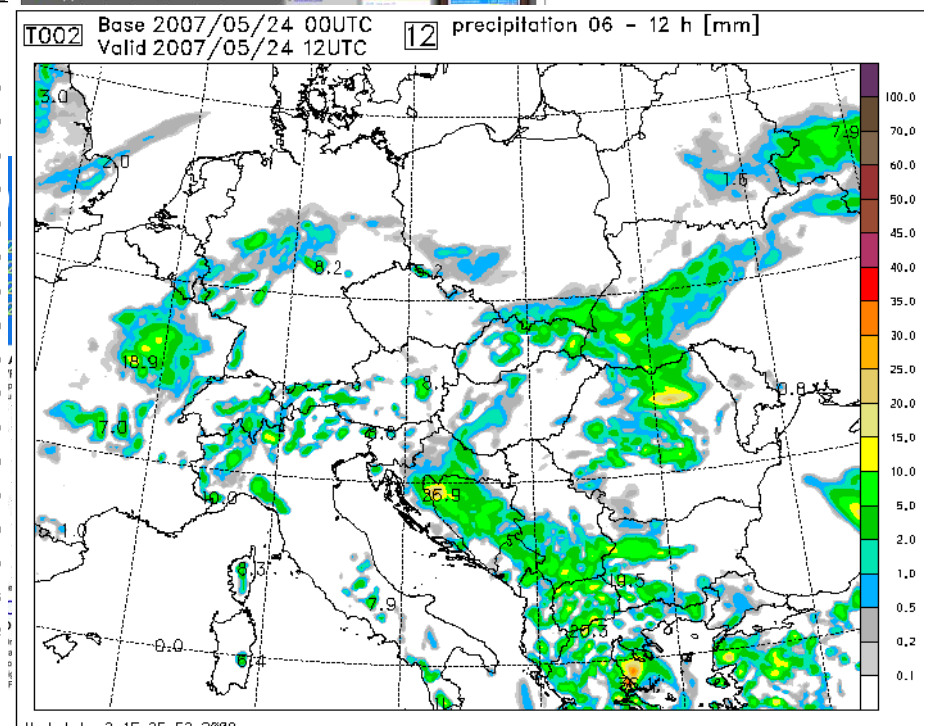
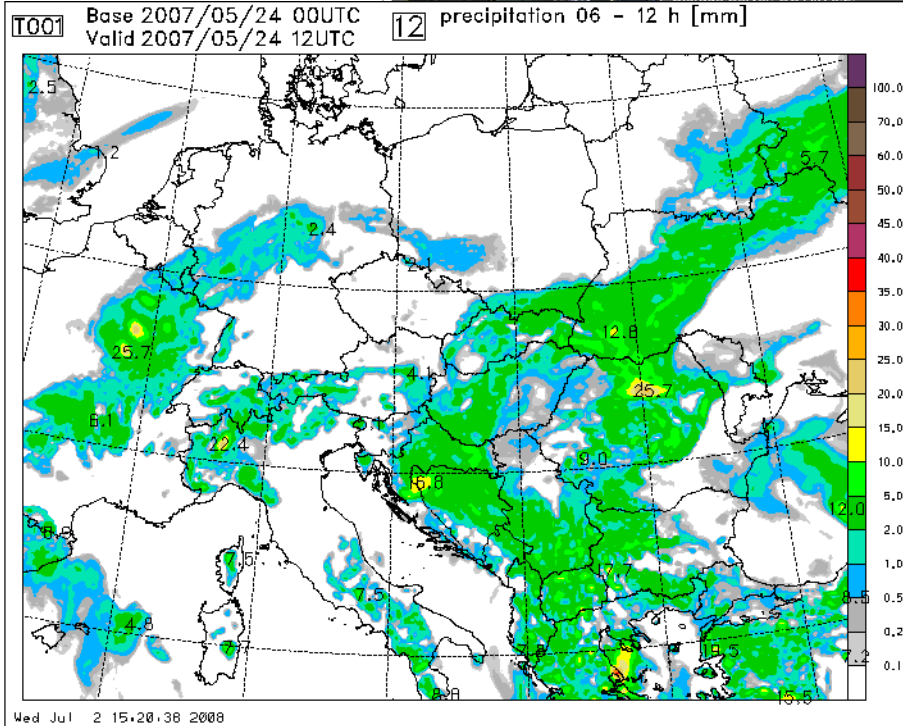
# **ALADIN related activities at**



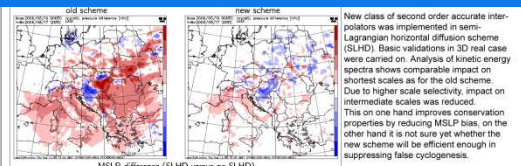
**30<sup>th</sup> EWGLAM and 15<sup>th</sup> SRNWP Meetings  
20081006 Madrid Spain**



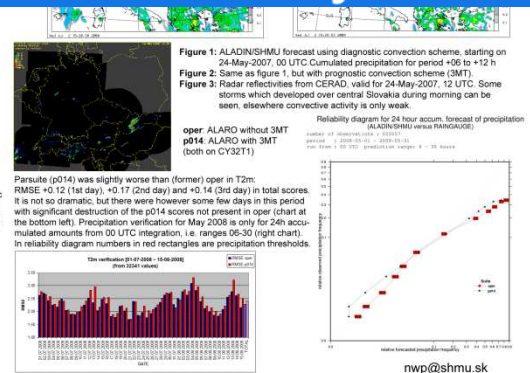
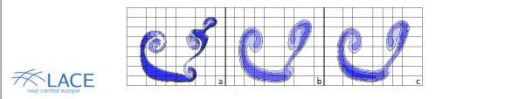
# 19-02-2008 ALARO without 3MT on cy32T1 operational



# 19-08-2008: ALARO+3MT on cy32T1 operational



**Continuation of LACE stay in Prague 17.10.-17.11.2007:**  
Work continued by code cleaning, setup optimization, inclusion of old SLHD interpolators in the new dataflow, introduction of static diffusion and Laplacian smoother. Basic 2D and 3D validations were performed. Combining second order accurate class of semi-Lagrangian interpolators with horizontal Laplacian smoother enables independent control of intermediate and short waves without increasing MSLP bias too much. Figure demonstrates that action of cubic Lagrange polynomial with Laplacian smoother (panel c) can be made very similar to linear interpolator (panel b), both of them being much more diffusive than cubic Lagrange polynomial itself (panel a). Advantage of the new scheme is higher accuracy, lower cost and possibility to combine 2nd and 4th order non-linear diffusions. Tunings independent on mesh size still have to be found.





# ALADIN related activities at SHMI

30th EWGLAM and 15th SRNWP Meetings  
06-09/10/2008, Madrid, Spain

**NWP staff:**  
Martin Belluš  
Mária Derková  
Richard Habrovský  
Marian Jurašek  
Ján Mašek  
Michal Neštáček  
Oldřich Španiel  
Jozef Vivoda

### ALADIN/SHMU - computer and model characteristics:



IBM p690 Regatta & Slovak nwp team

**HPC:** IBM p690 Regatta,  
32 CPUs POWER 4+ 1.7 GHz,  
32 GB RAM, 1.5 TB IBM FAST  
Storage Server, OS AIX 5.2,  
Queueing system LoadLeveler  
**ARCHIVE:** IBM Total Storage  
Tape Library 24 TB, SW: IBM  
Tivoli Storage Manager  
**MODEL:** AL32T1, ALARO+3MT  
+ SLHD, envelope orography,  
blending  
**DOM:** LACE, 9km dx, 37 vlv,  
3h coupling, 72h forecast length

### Operational suite monitoring - basic features:

- => application status browser
- => application log files browser
- => automatic alerts via email/SMS
- => application finish time charts
- => application deadlines implemented
- => data transfer monitor
- => current loading under oper user
- => LoadLeveler status monitor
- => full application documentation (search engine)
- => full remote control via GSM/EDGE device and password protected internet
- => read/write/search diary messages
- => handy online point verification (T, N, FF)



Pocket monitoring tools

### Main operational highlights since last EWGLAM workshop:

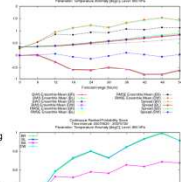
- 01-01-2008 SK became Cooperating ECMWF member
- 23-01-2008 Meteograms for 10 days (from ECMWF data)
- 08-02-2008 Lagged ensemble for 8 days (from ECMWF data)
- 19-02-2008 ALARO without 3MT on cy32T1 operational
- 07-04-2008 ALADIN gribs decoded into MySQL database
- 23-04-2008 Postprocessing for NWC SAF application
- 13-05-2008 ECMWF gribs decoded into MySQL database
- 21-07-2008: Point verification tool for parsuite based on MySQL database
- 31-07-2008: run\_app system upgrade (for frequently submitted applications)
- 05-08-2008: INCA cumulated (6, 12, 24h) analysis of precipitation (4 times/h)
- 08-08-2008: monitoring upgrade (application deadlines implemented)
- 19-08-2008: ALARO+3MT on cy32T1 operational (with blending cycle)
- 17-09-2008: special forecast for mountain ridges up to 4 days

### R&D:

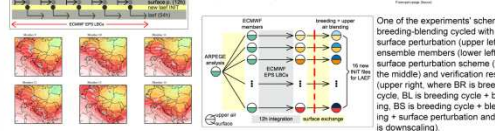
#### LACE stay in Vienna, M. Belluš, 11.2.-21.3.2008:

Combination of large scale initial conditions uncertainty with small scale initial perturbations obtained by breeding cycling using blending technique in LAEF experiments.

Applications surfp (surface perturbation procedure), laeff (ensemble forecast integration with inline fulpos), breed (breeding cycling) and blend (blending procedure) were coded and used for Limited Area Ensemble Forecasting (LAEF) coupled with ECMWF LBCs based on singular vector technique (10 members + 1 control run). All these applications can be combined with each other in the final self-sufficient LAEF production line, where different settings can lead to different experiments (breeding cycling + blending, breeding cycling + blending + surface perturbations, breeding-bending cycling + surface perturbations, etc.). Different LAEF methods were tested and verified for 70-days long period. It was shown, that the blending of global ensemble members with breeding initial conditions helped to improve the overall scores, even though they were only as good as for downscaling. Anyhow, the true benefit of blending procedure is, that such initial conditions suppose to be more compatible with the corresponding ECMWF EPS coupling files. The results from our breeding cycling + blending + surface perturbation experiment are quite improvement over the downscaling. But it is sure mainly due to the special surface perturbations based on ARPEGE analysis, rather than due to breeding and blending itself. However, this method of generating the surface perturbations is very promising and should be included in the final operational implementation.



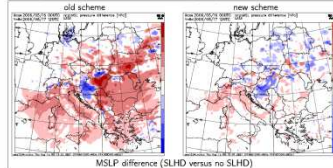
The preliminary results from breeding-bending cycle are also quite satisfactory.



One of the experiments' schemes: breeding-bending cycled with surface perturbation (upper left), ensemble members (lower left), surface perturbation scheme (in the middle) and verification results (upper right), where BR is breeding cycle, BL is breeding cycle + blending, BS is breeding cycle + blending + surface perturbation and DW is downscaling.

#### LACE stay in Prague, J. Masek, 16.7.-18.8.2007:

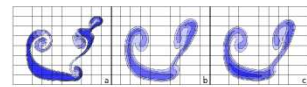
Test implementation of new semi-Lagrangian interpolators in ARPEGE/ALADIN cycle 32T1



New class of second order accurate interpolators was implemented in semi-Lagrangian horizontal diffusion scheme (SLHD). Basic validations in 3D real case were carried on. Analysis of kinetic energy spectra shows comparable impact on shortest scales as for the old scheme. Due to higher scale selectivity, impact on intermediate scales was reduced. This on one hand improves conservation properties by reducing MSLP bias, on the other hand it is not sure yet whether the new scheme will be efficient enough in suppressing false cyclogenesis.

#### Continuation of LACE stay in Prague 17.10.-17.11.2007:

Work continued by code cleaning, setup optimization, inclusion of old SLHD interpolators in the new dataflow, introduction of static diffusion and Laplacian smoother. Basic 2D and 3D validations were performed. Comparing second order accurate class of semi-Lagrangian interpolators with horizontal Laplacian smoother enables independent control of intermediate and short waves without increasing MSLP bias too much. Figure demonstrates that action of cubic Lagrange polynomial with Laplacian smoother (panel c) can be made very similar to linear interpolator (panel b), both of them being much more diffusive than cubic Lagrange polynomial itself (panel a). Advantage of the new scheme is higher accuracy, lower cost and possibility to combine 2nd and 4th order non-linear diffusions. Tunings independent on mesh size still have to be found.



#### LACE stay in Vienna, J. Vivoda 17.01-15.02.2008:

##### VFE development status

Approx. 6 weeks has been devoted to development of VFE scheme during second half of 2007 and 2008. The following has been done:

1. the consolidation of existing VFE development (local implementation of C133 and its validation)
2. we looked for VFE formulation with following properties:
  - stable for ZTL St and ICI scheme with one iteration in sigma and eta coordinate
  - sufficiently accurate near model boundaries (as accurate as FD version at least)
  - eigenvalues of C1 constrain would be sufficiently small to assure fast convergence of spectral iterative solver
3. the following aspects has been studied with respect to above mentioned properties:
  - definition of eta levels in order to avoid ill-posedness of VFE mass matrix that is inverted during VFE operator construction
  - definition of A and B coefficients at full levels (existing formulation from HT model leads to negative values of B function)
  - definition of boundary elements

- implementation of iterative definition of B-spline basis with multiple nodes near model boundaries and with partition of unity property

Result - we found the two promising formulations (in cooperation with HIRLAM colleagues from Spain)

##### Oper:

#### Operational switch to 3MT scheme

On 19-Aug-2008, operational model ALADIN/SHMU was switched to prognostic convection scheme (so called 3MT inside ALARO framework). Impact of 3MT scheme can be nicely illustrated on convective case from 24-May-2007, where model using diagnostic convection scheme strongly overpredicted extent of convective precipitation in central Europe (compare precipitation forecast on Figure 1 with CERAD reflectivity on Figure 3). Switching on prognostic convection treatment significantly reduced precipitation area (Figure 2). Convective reflectivity is still overestimated, but forecasted precipitation field is closer to reality.

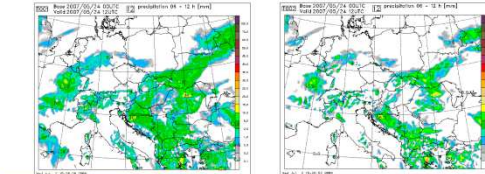


Figure 1: ALADIN/SHMU forecast using diagnostic convection scheme, starting on 24-May-2007, 00 UTC. Cumulated precipitation for period +06 to +12 h

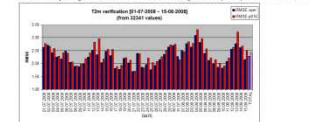
Figure 2: Same as figure 1, but with prognostic convection scheme (3MT).

Figure 3: Radar reflectivities from CERAD, valid for 24-May-2007, 12 UTC. Some storms which developed over central Slovakia during morning can be seen, elsewhere convective activity is only weak.



oper ALARO without 3MT p014: ALARO with 3MT (both on CY32T1)

Parsuite (p014) was slightly worse than (former) oper in T2m. RMSE +0.12 (1st day), +0.17 (2nd day) and +0.14 (2nd day) in total scores. It is not so dramatic, but there were however some few days in this period with significant destruction of the p014 scores not present in oper (chart at the bottom left). Precipitation verification for May 2008 is only for 24h accumulated amounts from 00 UTC integration, i.e. ranges 06-30 (right chart). In reliability diagram numbers in red rectangles are precipitation thresholds.



# THANKS