The operational ALADIN models

(kullmann.l@met.hu)

There were several changes in the operational version of the ALADIN/HU model during the second half of 2006:

- Forecast and 3d-var assimilation are based on cy30t1.
- Operational suite is running on the new machine of HMS (SGI Altix).
- Production is performed 4 times per day: at 0 UTC 54h, at 6 and 12 UTC 48h and at 18 UTC 36h integration is running.
- Practically the 3d-var assimilation suite is unchanged at 0 and 12 UTC: two 6 hour cycles are made and the production is calculated from a short-cutoff analysis valid at the production time.
- At 6 and 18 UTC there is no update of the guess, the production is running from the short cut-off analysis using the previous 6h production as first guess.

The main characteristics of the recent operational suite:

- ALADIN cycle: cy30t1
- Horizontal resolution: 8 km
- Vertical levels: 49
- Grid: linear
- Data assimilation: 3d-var with 6h cycling
- Observations: SYNOP (geopotential), TEMP (temperature, wind components, humidity, geopotential), AMDAR (temperature, wind components), ATOVS:AMSU-A and AMSU-B radiances.

Parallel suites during the period:

- BACKUP: We run a backup suite on the IBM (p655) machine. The same 3d-var system is used as for the operational but production is performed only at 0 and 12 UTC. For the backup we use cy28t3.
- Dynamical adaptation as a reference to 3d-var system at same vertical and horizontal resolution (cy28t3 is used).
- ALADIN 3d-var using ensemble B matrix (based on cy28t3).

Major ALADIN developments

The main scientific orientation of the Hungarian Meteorological Service for the ALADIN project is unchanged: data assimilation, short range ensemble prediction and high resolution meso-gamma scale modeling (AROME model).

The main scientific developments for the second half of 2006 can be summarized as follows:

- DATA ASSIMILATION:

1. *Computation of ensemble Jb and its intercomparison to NMC*. We computed new B matrix based on ensemble method by downscaling from the ARPEGE model. We run three experiments, for one month time period, with different sigma B tunings: no tuning, tuning every field with the same amount, using different tuning values for different fields. We compared the experiments to the reference which was calculated with NMC method. The results showed that ensemble Jb improves the forecast especially when tuning every field with the same amount.

2. *Assimilation of SEVIRI data*. We performed experiments assimilating SEVIRI data. To be able to pre-process the data some code changes was needed inside bator. First a two week period run was performed to recalculate the bias correction. After that a two week long experiment was run (using the new bias correction file) and compared to the reference run without using SEVIRI data. (A detailed report is available from Alena Trojakova or Michal Majek)

3. *3D-FGAT experiments*. Experiments were made with 3d-fgat method (see paper in the current newsletter). The results are promising, showing improvement on several model levels.

4. *Congrad minimization method*. We studied the conjugated gradient minimization method in 131 configuration (see paper in the current newsletter). The results shows that it speeds up the minimization time in some extent.

- LAMEPS:

Research with singular vectors computed with the ALADIN model was continued in the second half of 2006. The configuration 601 seems to work well with cy30. Speed of the convergence (during the singular vector computation), as well as CPU time and memory usage was analyzed. First results with the ALADIN singular vectors were presented in the ALADIN _ HIRLAM LAMEPS workshop in Vienna in November, 2006. When computing singular vectors with ALADIN it is important to compare the results with

singular vectors computed with different models. Comparison with ARPEGE singular vectors is obvious. In addition research has started to compare the ALADIN singular vectors with high resolution IFS singular vectors (see presentation of Martin Leutbecher at the ALADIN _ HIRLAM LAMEPS workshop in Vienna in November, 2006). The next step is to use the singular vectors to generate perturbations, which will be used as initial conditions for the ALADIN ensemble system.

- AROME:

The first experiments with AROME showed that in many cases it improves the forecast (especially the precipitation and temperature forecast) compared to ALADIN. However the forecast is quite sensitive on the coupling model since the integration domain is small. Some experiments were made to analyse this sensitivity on coupling frequency, domain size and coupling zone size. The results show that the coupling frequency and coupling zone size has little impact. In some cases however one can see little improvement when enlarging the coupling zone size. The size of the integration domain has the larges influence, but due to the computational cost it is not recommended to enlarge it very much.