ALADIN developments during the first half of 2002

1. In Austria

Stratus prediction

In a cooperation between ZAMG and the University of Vienna (S. Lichtenauer), the forecast errors of the ALADIN model with regard to fog and low cloudiness are investigated. The research is part of COST Action 722 "Short-range forecasting methods of fog, visibility and low clouds". It was found that the frequent under-prediction of low stratus in the Danube area is associated with incorrect prediction of temperature inversion characteristics. In the model, inversions are generally too much smeared out, and too close to the ground. Above the inversion, the model is typically 1-2 degrees too cold compared to sounding observations, whereas it is up to several degrees warmer than observed just below the inversion. The lack of sufficiently cold air just below the inversion leads to an underestimation of cloudiness. With less than 100% cloud cover, the PBL begins to warm during morning hours. This further reduces cloud cover, and a reinforcing feedback loop sets in. The problem of too smooth temperature structures is present from the initial time (+00h) because the data assimilation in ARPEGE rejects cold temperatures just below the inversion if they differ too much from the model state. This was shown for a stratus case in January 2002 (E. Bazile, personal communication). A description of numerical experiments that were made on the stratus / inversion problem, with both the SCM and the full 3d model, can be found in this Newsletter. [Further details: *alexander.kann@zamg.ac.at*]

Prognostic convection

The prognostic convection scheme of Luc Gerard was tested on a case of diurnally forced mountain convection. This is a type of convection that is typically predicted too early in the day. The prognostic scheme, which takes into account the "inertia" of deep convection in the form of prognostic draft strength and active mesh fraction both for convective up- and downward motion, did not show a significant delay in the onset of precipitation. However, the spatial patterns were more selective compared to the standard scheme, and at least for the case investigated, closer to observations (radar data). Additional tests during the convective season in 2002 need to be carried out to confirm this potentially beneficial behaviour. [Further details: *stefan.greilberger@zamg.ac.at*]

Operational verification

The first in a series of bi-annual verification reports was issued in February 2002. It can be obtained in *pdf* format from the ZAMG homepage *http://www.zamg.ac.at* by clicking on the British flag, following the "Numerical Weather Prediction" link and choosing "Verification" from the pull-down menu. The report contains point verification statistics and shows ALADIN / ECMWF model intercomparisons for near-surface variables over a period of several years. The next issue will appear in September 2002. As a special topic it will contain a preliminary analysis of the performance of ALADIN during the catastrophic rainfall events in August 2002. [Further details: *thomas.haiden@zamg.ac.at*]

More information about research activities of the NWP group at ZAMG can be obtained from the ZAMG homepage *http://www.zamg.ac.at* by clicking on the British flag and following the "Numerical Weather Prediction" link.

2. In Belgium

Most efforts focussed on ALATNET related research, and consequently are described in the ALATNET Newsletter.

3. In Bulgaria

Most of the effort was devoted to the implementation of a new operational suite.

4. In Croatia

Great deal of time in the previous period was devoted to the organization of the 12th ALADIN workshop on "Scientific Development and Operational Exploitation of ALADIN model" and preparing the presentations for the workshop.

Following work has been presented :

- Martina Tudor : MAP IOP 15 Case Study
- Marija Mokoric : ALADIN products in "Taming the Dragon-Dalmatia 21 to 24 May 2002"
- Zoran Vakula : Adriatic Storm Cases
- Stjepan Ivatek-Sahdan : Analysis of surface variables

5. In Czech Republic (RC-LACE report)

Note: all ALATNET related R & D, representing the majority of the effort, is reported in ALATNET Newsletter. Here we sum-up topics which are not referred as ALATNET ones for Prague centre.

Developments in physics : *Problems with unrealistic "large-scale" precipitations*

Last spring we noticed a few cases when the model produced unrealistic spots of precipitation reaching sometimes 60 mm /6 h (Figure 1). Although the meteorological situation was favourable for strong rain, such an amount was surely exaggerated. Several tests were made, using both past and newest versions of the physics (pre-CYCORA, CYCORA, CYCORA-bis, CYCORA-ter, very last changes and corrections in CYCORA-ter) but there was almost no sensitivity to this. We tried to diminish the length of the time-step (we used half the nominal one for LACE) in order to exclude any possible numerical instability within the physics. However, the result was even worse since the amount of precipitation was almost doubled. Since the heavy rain was produced by the large-scale or better to say by the explicitly resolved precipitation computation, we could think that the problem was linked to the spatial resolution (in connection to the convection scheme which seemed almost inactive), perhaps to the recent increase in vertical resolution (last summer nobody reported similar cases). After discussing with the physics team in Toulouse (J.-F. Geleyn, F. Bouyssel) we tried to introduce the parameterization of "shear-linked convection" proposed by J.-F. Geleyn.

The impact on forecast was quite significant. For the studied case the amount of precipitation was diminished to more realistic values (Figure 2), more comparable with the rain gauge observations (reaching a maximum of 21 mm / 6 h in the concerned area, see Figure 3). The resulting precipitation field moderately changed everywhere. We have tried the physics package including the "shear-linked convection" scheme also for other cases reported this spring. For most of them we obtained more realistic precipitation fields, however we cannot say that the forecast was systematically better.

In addition, we tried to recompute the cases of unrealistic cyclogenesis in the Adriatic (there were three such cases reported last summer). Once more we obtained a nice improvement : the cyclone over the sea was weaker and the pressure field remained almost the same elsewhere.

However, since the impact on forecast is quite important, more extensive testing and perhaps retuning, including parallel suites, must be done before switching to the use of shear-linked convection in the operational application.

More details can be asked to : Jean-François Geleyn, François Bouyssel, Radmila Brozkova, Filip Vana.

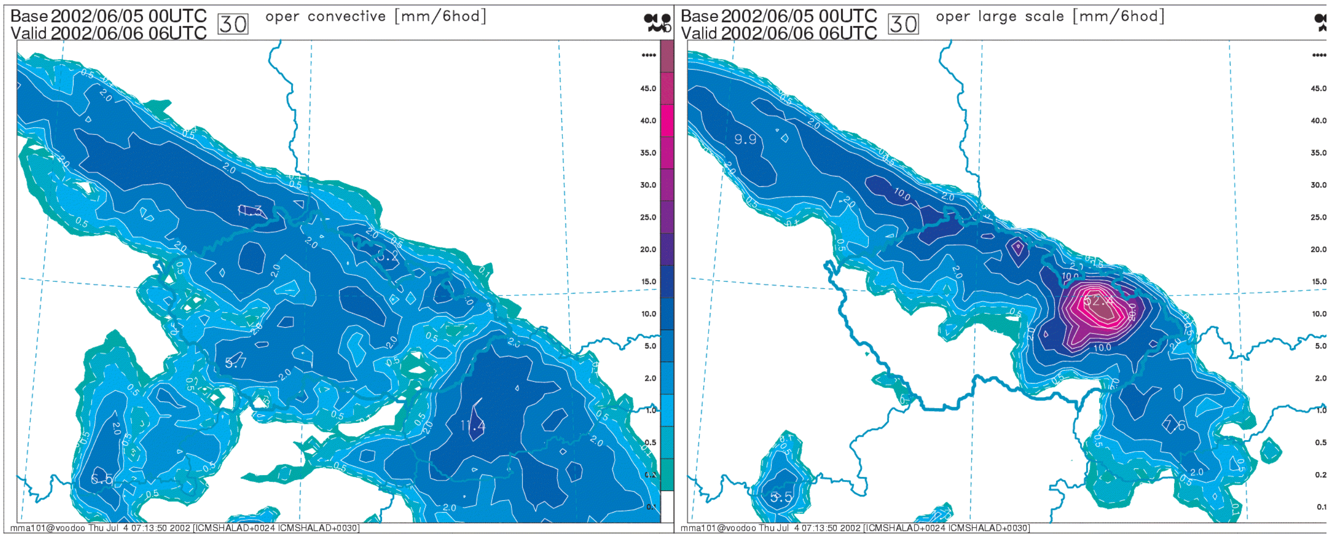

Figure 1 : Operational ALADIN/LACE forecast starting on 05/06/2002 at 00 h UTC : cumulated precipitations between +24 h and +30 h. Convective (unresolved) precipitations are on the left; the ones resulting from the explicit computation are on the right. The maximum coming from the explicit computation reaches more than 52 mm / 6 h in the Jesenik mountains.

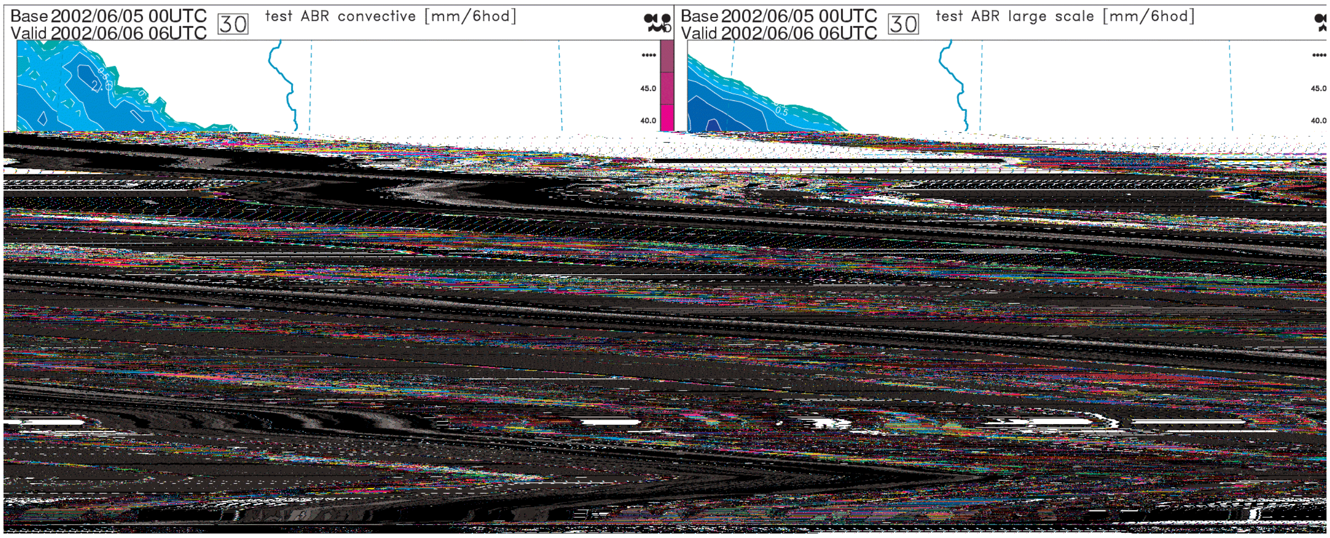

Figure 2 : Same as in Figure 1, but for parallel test ABR, using new parameterization with operational initial and lateral boundary files. The maximum of explicitly precipitation is by 20 mm / 6 h lower in Jesenik mountains when compared to operational forecast. other there is a stronger maximum in Germany. The amount of convective rain is even smaller than in the operational case.