LAM ACTIVITIES IN AUSTRIA

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1. Operational changes

The Austrian version ALADIN-VIENNA of the spectral limited area model ALADIN is run on a Central European domain with 133x117 gridpoints, and a horizontal resolution of 9.6 km. The model is run in hydrostatic mode. The coupling model is ALADIN-LACE. In 2002, the main operational changes were an increase of the number of levels from 31 to 37 (following ALADIN-LACE), and a switch from AL11 to AL12 at the beginning of the year, and a further switch to AL15 in September. Among other things, the newer ALADIN versions contain successive modifications to the vertical diffusion, deep convection, and radiation schemes, the so-called CYCORA changes. Those changes were motivated to a large part by the necessity to improve the cyclogenetic activity without causing negative effects in the representation of the stable PBL, notably inversions.

The operational computing platform was changed from a single-processor DECalpha to an SGI Origin 3400 with 20 processors. This reduced the time needed for an 48-hr integration of the ALADIN-VIENNA domain from 2.5 h to ~10 min.

2. Research and applications

As part of COST Action 722, ZAMG is investigating the problem of low stratus forecasts in the ALADIN model. Using 1-d and 3-d simulations, it was found that the main reason for the systematic underestimation of low stratus in the model is the too smooth representation of the inversions capping the cloud layer. Specifically, the cold temperatures just below the inversion are not simulated and as a result the (diagnostic) cloud scheme underestimates cloud cover. It was also found that when the integration in the 1-d model is started with the observed sounding instead of the strongly smoothed analysis, the model is able to keep the sharpness of the inversion, even for +24 hrs. Some case studies were also performed with a modified stratiform cloudiness scheme, which showed a generally positive impact (Seidl and Kann, 2002).

Further tests of the Gerard prognostic convection scheme were performed during the summer of 2002. Comparison of predicted rainfall patterns with radar data over the Alps show that the more selective character of the prognostic scheme compared to the reference one brings the model results somewhat closer to observations in many cases (Greilberger, 2002).

Since 1999, ZAMG produces areal precipitation forecasts for hydrological purposes for a number of catchment-type areas in Austria and southern

Germany. The number of areas has been increased from 26 to 34 in 2002. Four different models are used: ECMWF, ALADIN-LACE, ALADIN-VIENNA, and a PPM using ECMWF input. In response to the Aug 2002 floods, an experimental precipitation warning system based on these forecasts is being tested. The performance of ALADIN during the August 2002 floods was quite satisfactory in the Austrian area, for both the 6-8 August event and the 12-14 August event. The intensity, region of heaviest rainfall, and approximate duration of the events was predicted well, up to the end of the forecast range (+48 hrs).

As part of the VTMX (Vertical Transport and Mixing) experiment, research on katabatic flows (Haiden and Whiteman, 2002; Zhong et al., 2002) and on the role of the nonhydrostatic pressure field in the slope wind layer was carried out (Haiden, 2003).

3. Verification

Starting in 2002, ZAMG issues bi-annual NWP verification reports which contain a comparative evaluation of standard scores of surface parameters from different models (ECMWF, ALADIN, PPM). Issue #2 also shows the heaviest precipitation events forecasted by ALADIN-VIENNA for individual catchments during the last 3 years in comparison with the heaviest observed events. This analysis confirms earlier results showing that the northern Alpine upslope precipitation belt is the area with the highest predictability of strong precipitation. Southern Alpine upslope areas within Austria are less skillfully predicted, apparently because of complications due to upstream mountain ranges in Italy and Slovenia. Heavy precipitation events in lowland areas are predicted least reliably, mostly because they usually have a stronger convective component.

References

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