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ALADIN Newsletter 18

ALATNET Newsletter 1

January - June 2000

http://www.cnrm.meteo.fr/aladin/ & http://www.cnrm.meteo.fr/alatnet/

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This joined Newsletter presents you the principal events concerning ALADIN or ALATNET during the first half of 2000. The news about work or events are related with informations that you sent.

An electronic ALADIN Newsletter 18 is available on the ALADIN web site and an electronic ALATNET Newsletter 1 can be consulted on the ALATNET web site. These electronic Newsletters are different from this joined "paper" Newsletter as they do not include informations already detailed on the sites (only links instead of summary of these informations).

Please do bring to my notice anything that you would like to be mentioned in the next Newsletter (ALADIN 19 $ ALATNET 2) before the 15th January 2001 (the Newsletters will be prepared only twince a year now).

Any contribution concerning announcements, scientifical progress, publications, news from the ALADIN versions on workstations or on big computers, verifications results, ... will be welcome.

ALADIN Main events

1. *Draft the new Memorandum of Understanding*

On Monday 24th of January 2000, the working group (Météo-France, INMH and HMIS) for the drafting of the new MoU met in Ljubljana for one day of discussion around the current MoU and its necessary modifications to be presented in the next Assembly of ALADIN Partners.

2. *New ALADIN libraries*

a) The operational cycle AL12

The code of AL12 was eventually completed and validated in January 2000. All the phasers present in November-December 1999 did a great job, and it is worth mentioning the appreciated contribution of Gabor Radnoti, whose experience as former LACE/ASC was very helpful. The ALADIN project for sure needs a few more people of such scientific and technical level.

Although there were as usually a few surprises coming from ECMWF, the phasing was fairly smooth, and the finalized cycle could be delivered for operations in Toulouse in February. AL12 is presently the operational ALADIN cycle at Météo-France, along with CY22T1 of ARPEGE/IFS.

- Contents of AL12 include:

- some in-depth namelist cleaning
- recoding of dummy arrays in the spectral transforms
- code cleaning specific to ALADIN, such as the merge of e(ree)(spe)sm with dm
- extra code for wavelet cost-function

A bugfix is needed to run the non-hydrostatic 3tlsl version

- Multitasking aspects:

  - the LACE team has also implemented the AL12 library, and found incompatibilities between openMP directives and multitasking mode (see the mail by Gabor Radnoti sent to the *alabobo* list).
  - there is one important lesson to extract from this: since in future the natural technical evolution goes towards the use of the standard microtasking directives from openMP, and due to its progressive insertion into the ALADIN code, the level of non-compliance with multitasked/macrotasked platforms will increase. Time is now more than ripe to think about alternative operational speed-ups to replace multitasking for those still relying on it.
  - NEC implementations might switch on message passing, which is now more and more mature in many ALADIN configurations, and other sites have already plans to leave the historical sphere of influence of Cray computers. Morocco also intends to move to distributed memory on its CRAY J90, till a new computer is delivered.
  - those who will continue on multitasked platforms like J912 must check the possibility to implement and test openMP libraries on them.

b) The new cycle AL13

In April-May-June, the ALADIN code was phased to the ARPEGE cycle CY22T2. The former cycle AL12 was with respect to CY22T1. As often, the phasing was rather chaotic and far from optimal:

- ECMWF sent us its cycle CY22R2 with 3 weeks of delay, so that the ALADIN phasing did not start in time.
- the overlap with holidays and seminars involving GMAP people caused some extra delay.
- finally, CY22T2/AL13 and CY23 (soon after, this is the true common cycle ECMWF/Météo-France, without ALADIN and still requiring significant cleaning in dynamics) clashed a bit in time in Toulouse.

In this context, the phasers showed a great sense of tolerance and adapted to the situation. We were thus in a position to declare CY22T2/AL13 beginning of June, although not all the configurations had been tested, and bugs were of course still present (NHS, CANARI - 3DVAR not fully tested).

Mid-July, a thorough debugging period allowed to create a bugfix version for AL13, for which almost every configuration is working optimally:

- hydrostatic models (e001,e501,e401,e601,e801) mono-and multi processor
- non-hydrostatic models (e001,e501,e401) mono-and multi processor
- fullpos and e(e)927 mono-and multi processor
- canari, but the multi processor versions for sure still have "marginal" bugs
- 3d-var multi processor

- Contents in AL13 include:

  - provisional skeleton for predictor/corrector advection scheme
  - additional code for semi-Lagrangian TL and AD code
  - a new key LMPOFF to switch off MPI in mono-proc mode (only for e001&fullpos)
  - bugfix for test of TL and AD non-hydrostatic full model in multi-proc mode
  - first developments for ozone as a spectral thermodynamical variable
  - new output fields in fullpos: CAPE ...
  - the option to use background statistics in gridpoint for ALADIN 3d-var
  - removal of calls to the NAG library in 3d-var (not yet tested in Toulouse !)

c) The future cycle AL14

This cycle is planned for phasing in November/December 2000. It will most likely be phased with CY23Tx. See the list the technical changes in CY23 and those expected in CY24 (article of Claude FISCHER in this Newsletter: "Better to know ...") for estimation of the modifications that should be introduced in AL14.

Note that CY24 is scheduled for end 2000, so ALADIN might still be lagging one cycle behind ARPEGE at the end of 2000, as it is now in July.

3. *3DVAR workshops in Budapest and in Toulouse*

During the last quarter, two small workshops enabled significant progress in 3D-Var work : in Budapest with A. Horanyi, C. Fischer and M. Siroka (see Article in this Newsletter) and in Toulouse with C. Fischer, W. Sadiki and A. Dziedzic (see report on Toulouse work in this Newsletter).

4. *SRNWP Workshop on Mesoscale variational data assimilation*

Organized by Andrew Lorenc (The Met.Office), this workshop was held at The Met.Office College in Reading, England, 8-10 May 2000. ALADIN was represented by C. Fischer, E. Gérard and A. Horanyi.

One day and a half was devoted to presentations and two half days to working groups.

As an introduction, Jean Quiby, SRNWP coordinator, presented the current organization of NWP development within Europe in four groups (HIRLAM, COSMO, ALADIN and UKMO) and the role of each lead centre. The operational data assimilation methods within those groups have been specified: OI to be soon replaced by 3DVar in Hirlam, 3DVar in UKMO, OI and nudging in global and local German models respectively, and 3DVar to be soon replaced by 4DVar in ARPEGE (which was effectively done in June 2000).

Beside the presentations about the current developments within the four SRNWP groups, representatives of American models (MMM-NCAR, NCEP, RUC/MAPS) and Canadian model (CMC) gave their expertise in mesoscale variational assimilation. Five working groups were defined with reflection subjects entitled: Large scale and topographic forcing, boundary conditions (1-2); High resolution observations: their assimilation and utility (3); Assimilating clouds and precipitation observations (4); 4DVar, how can we make it affordable ? (5); Analysis techniques, 3DVar and error covariances (6).

For more informations about the issues and conclusions of this workshop, the abstracts and working groups reports are available on The Met.Office web site:
http://www.met-office.gov.uk/sec5/NWP/DA_MesVAR/.

5. *8th ALADIN workshop "Toward high resolution modelling"*

The 8th ALADIN workshop, entitled "Toward high resolution modelling" was organized at IMWM / Cracow (Poland) on 19-20 June 2000. Participants were : Yong Wang (Austria), Luc Gérard, Philippe Nomerange and Piet Termonia (Belgium), Dagmar Merkova (Czech Rep.), Elisabeth Gérard and Dominique Giard (France), Gabor Radnoti (Hungary), Evgheni Alexeev (Moldova), Marek Jerczynski, Witold Owcarz, Malgorzata Szczech and Jadwiga Woyciechowska (Poland), Vanda Maria Sousa da Costa (Portugal), Oldrich Spaniel (Slovakia), Mark Zagar (Slovenia) and Jean Quiby (Swiss). Jean Quiby was present as the SRNWP coordinator and as a representative of the COSMO group. Though invited, the HIRLAM and UKMO groups did not send anyone. The ALADIN participation was unexpectedly small, distorted, and hopefully not representative of the implication of partners in research. This was quite disappointing for the organizers, the SRNWP coordinator and those partners who made a significant effort. All the more since this workshop was expected to illustrate the effective emergence of deported research and discuss the mid-term completion of the ALADIN medium-term research plan. Moldova expressed its willingness to involve itself further into the ALADIN project.

- Presentations dealt with research topics as well as operational applications or coordination efforts.
- Elisabeth Gérard and Dominique Giard made an exhaustive review of the last developments performed by the permanent staff and visitors in Toulouse : assimilation, dynamics, physics, utilities (Full-Pos, EGGX, 923, ...) and case studies.
- Luc Gérard presented its new convection scheme, better taking into account up- and down-draughts. He also underlined the impact of the time-step on precipitations with the current parametrization. Differences between the new and old schemes were illustrated on two situations : the Cleopatra and the August 99 squall-lines.

- Dagmar Merkova described the experiments performed by David Dvorak to study the sensitivity of ALADIN / LACE to coupling on the (missed) Christmas 99 storm. Both increasing the coupling frequency from 6h to 3h or moving to a quadratic temporal interpolation have a positive impact. This latter solution already moved to operations in Prague. She also presented the experiments she performed with Elisabeth Gérard on the July 97 floods : impact of changes in the model and of resolution (in ARPEGE, ALADIN / LACE and using the new ALADIN / CZ).

- Mark Zagar showed how tricky the use of CAPE diagnostics may be (representativeness, impact of the definition of the starting point, ...), with examples on several situations and comparisons to different observation types.

- Jean Quiby described the preliminary tests to an increase in resolution of the Swiss Lokall Model, from 14 to 7 km: improvements and problems in the representation of orography, and in the forecast of low-level wind, precipitations and 2m-temperature. He also showed the high dependency of precipitation scores to the interpolation method used (comparison to the nearest point or average), and to height.

- Gabor Radnoti made a review of the developments around Diag-Pack and presented the study of Sandor Kertesz on the representation of lakes in ARPEGE / ALADIN.

- The operational implementations of ALADIN / VIENNA and ALADIN / POLAND were described by Yong Wang and the Polish team respectively.

- Oldrich Spaniel presented a poster illustrating the impact of resolution on the forecast skill for precipitations, with a comparison between ALADIN / LACE (12 km) and ALADIN / SLOVAKIA (7 km).

Some of these presentations are detailed in articles hereafter.

Mark Zagar presented the first results (see Article in this Newsletter) of the operation "***Towards coordinated exchange of information***" launched by the Slovenian team at the previous ALADIN workshop. It was quite successful since only 3 partners have not yet answered (Bulgaria, Moldova and Morocco) and about 50 applications were described. Some redundancies already appeared. It was decided to :

- exclude visualization tools, usually dependent on commercial softwares,

- to host the list of applications, and the applications themselves on a web site,

- ensure a maintenance of basic tools (to be defined), reference and describe their successive updates.

The decisions of the last Assembly of Partners concerning ***the coordination of verification*** within ALADIN were recalled. Apart from the creation of the e-mail list *verifala@meteo.fr* nothing was done. Who will initiate the exchange of EWGLAM-type scores ? More details on the definition of scores may be asked to the French contact points : *Samuel.Westrelin@meteo.fr, Francis.Pouponneau@meteo.fr.*

The importance for each team to control and eventually re-tune the orography for its domain, once again underlined by the results of the recent study of Steluta Alexandru, was recalled. Since e923 can now run on workstations, thanks to the work of Neva Pristov and Mehdi El Abed, and as the corresponding documentation was published, there is no longer any major obstacle.

The discussion on the ***medium-range scientific plan*** underlined the importance of a mid-term report, with a detailed description of the studies related to each item. Such a check-up is very useful but cannot be achieved solely by the small coordination team. Volunteers for synthesis on some topics and reports on deported research are welcome ! If this succeeds, the report will afterwards be put on the ALADIN web server and updated regularly.

Thanks to the Cracow team for the very nice welcome (in a really beautiful town) !

Sad news for the ALADIN community

Arlette RIGAUD died on August 13. For some of you what is recalled below should be rather well known, but let us make sure that everyone understands the crucial role Arlette played in the ALADIN project.

Right from the start in 1990, she was at the heart of three crucial efforts that made our common project possible:

- the search for French financing sources,
- the link with the official international collaboration structures in meteorology and
- the "Direction to Direction" bilateral aspects of the official support to the project for each Partner NMS of Meteo-France.

Year after year, she dedicated all her skills and energy to these tasks, while always keeping her legendary good mood as the trade mark of the discussions she carried out with NMS bosses, embassies or ALADIN people.

The naturally fragmented character of such actions does not allow to immediately judge how important it was; however, it is recognised that without Arlette's work, the ALADIN project would never have reached the scope and success it has had and may even have collapsed in one of the two or three growth-crisis it encountered.

The efforts she did over the last four years in favour of our project were even more demanding on her, since she had started fighting with enormous courage the disease that finally took her. One remembers how disappointed she was to miss the first Assembly of Partners in Paris in November 96 owing to her first heavy treatment and how she spent still a lot of energy on the preparation of the Lisbon Assembly eight months ago, despite not being able to attend again. In between, she had had the pleasure to be a very active participant to the Brussels and Prague Assembly meetings and to see there the confirmation of the ALADIN progress, strongly linked to her dedication.

Arlette will be kept in memory as someone that had an extraordinary willingness to see meteorologists from all origins work together, effectively, truthfully and in the best possible mood!

The ALADIN project has lost one of its most important supporting personnality.

An e-mail address (arcndl@meteo.fr) has been opened in order to collect the messages of condolences and/or remembrance that whose who had direct contacts with Arlette might wish to be passed later to her family.

NR : this sad news doesn't deal with the period of this Newsletter but is too important to wait the next one (about the second semester of 2000).

ALATNET Main events

1. *ALATNET story*

The ALATNET project is very young (birth on March 1st, 2000) but its story is already a long one :

- June 1999 : a promissing application to one of the horizontal programmes of the European Community.
- October 1999 : ALATNET is favorably evaluated by the Commission services.
- November 1999 : ALATNET Contract is submitted to the Commission.
- February 2000 : ALATNET Contract is fully signed by the contracting parties (Météo-France and the Commission).
- 1st of March 2000 : official Project commencement date.
- March 2000 : the Membership Agreement is signed by all the participants (Météo-France as co-ordinator, IRMB, CHMI, HMS and HMIS as members). ALATNET is born !...

The beginning of the project :

- April 2000 : creation of ALATNET web server (http://www.cnrm.meteo.fr/alatnet/) and update of ALATNET informations on the European Commission web server.
- 1st meeting of the Steering Committee of ALATNET and presentation, Toulouse (F), 17 April, 2000.
- 9 May 2000 : Initial data base report sent to the Commission.
- Deadline for applying to the first ALATNET vacancies, 12 May, 2000.
- May 2000 : initial advance paid by the Commission to the co-ordinator and transferred to the members.
- ALATNET Seminar of High Resolution Modelling, Radostovice (CZ), 15-26 May, 2000.
- Selection of the first candidates, 30 May, 2000.
- Update of the ALATNET vacancies on the European Commission web server, 30 May, 2000.
- Kick-off meeting for Research Training Networks , Brussels, 9 June, 2000.

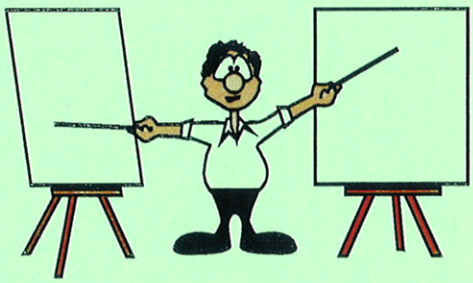
And after :

- Next calls for candidacies and selection of candidates, autumn 2000 and spring 2001.
- ALATNET Training Course, Toulouse (F), spring 2001.

2. *1st meeting of the Steering Committee of ALATNET, Toulouse (F), 17 April 2000*

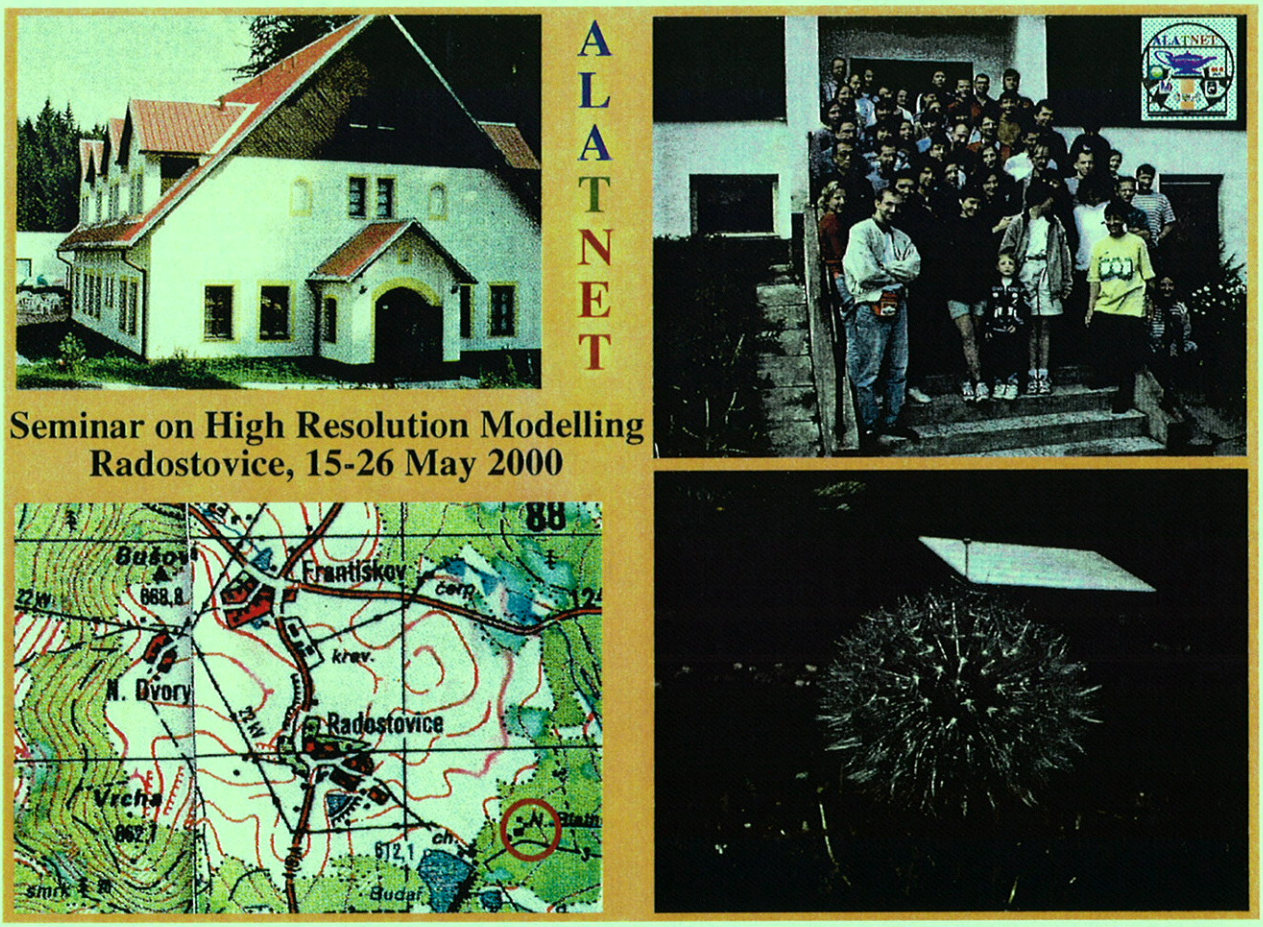
The scientific representatives of the ALATNET partners, the ALATNET and the ALADIN co-ordinators, meet in Toulouse on April 17, 2000. Discussions were mainly about :

- rules for the candidates selection,
- rules of budgeting,
- registration of ALATNET-linked work in a data base,
- communication means,
- calendar of events,
- ...



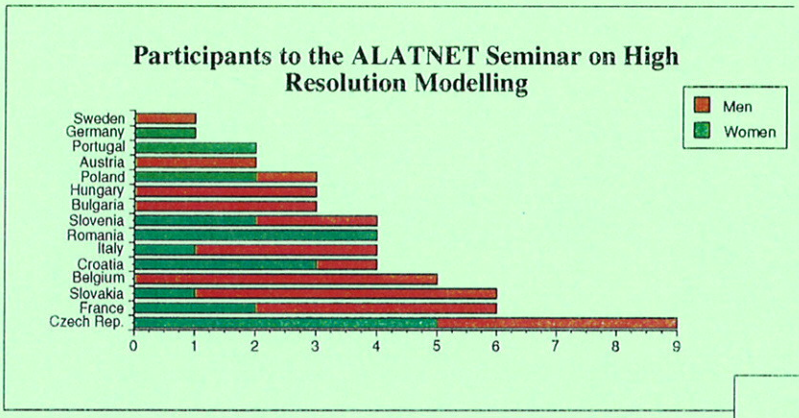
On the same day, a presentation of ALATNET was given to Météo-France people and ALADIN visitors in Toulouse.

3. *ALATNET Seminar on High Resolution Modelling, Radostovice (CZ), 15-26 May, 2000*



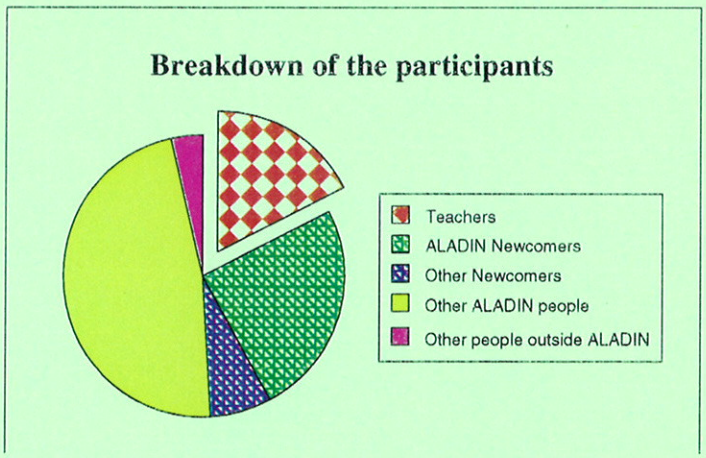
The support of the TMR/IHP Programme of the European Community (through ALATNET) gave CHMI the funding to organize the Seminar and allowed more than 20% of the participants to attend this

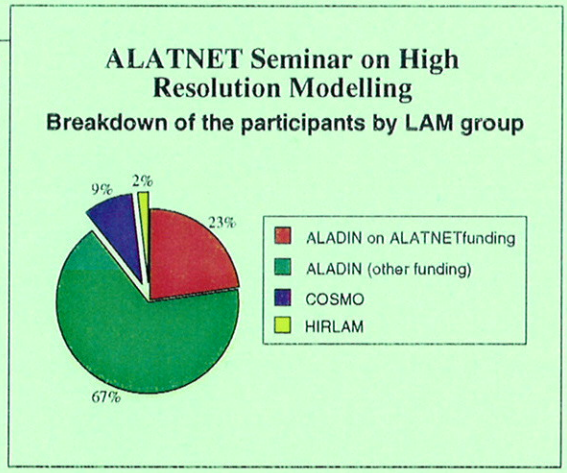
Seminar. Thanks to the Local Organization Committee (with special thanks to Helena VONDRACKOVA), the 2 week seminar went on very well for the 57 people attending it.



The audience was multi-European, with participants from 15 countries both inside the European Union (1/3) and outside (2/3), both inside ALADIN and outside (10%), with an important percentage of women (40%).

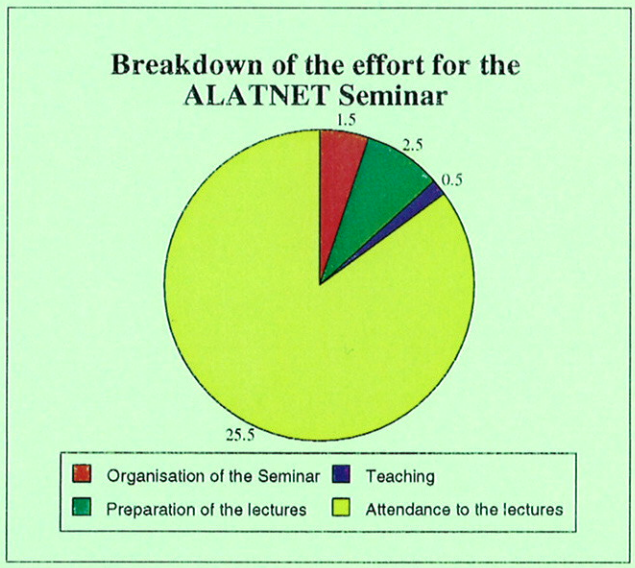
40% of the students were newcomers in the ALADIN project.

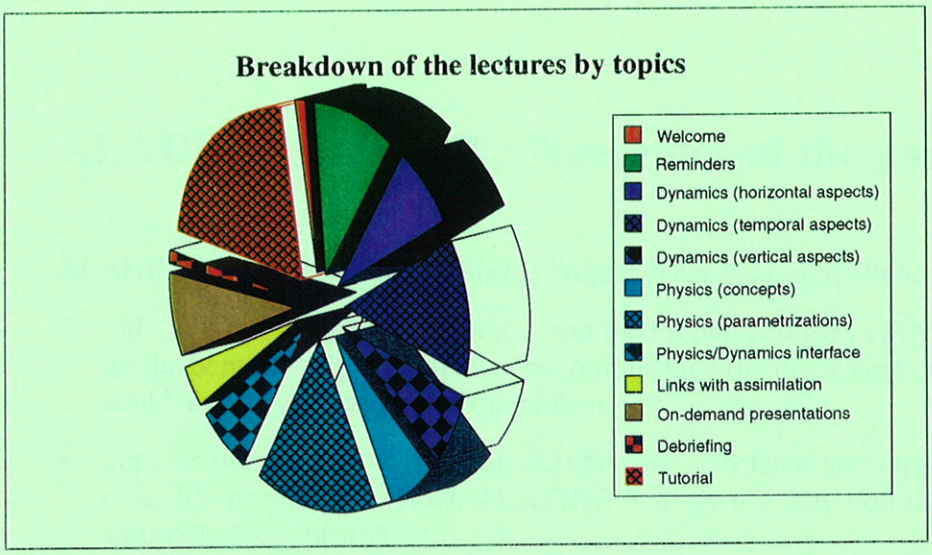




3 out of the 4 European Working Groups on Local Area Modelling were represented (ALADIN, COSMO and HIRLAM). 30 person.months were dedicated to the Seminar (preparation, attendance).

The programme was considered well balanced between the different topics. The volume of the lectures (63 hours) appeared well adapted to the topics and the duration of the Seminar (length of the lectures, number of lecture per day and organization of the day) proved to be good . The lectures, prepared in 7 countries by 10 teachers were judged homogeneous with good connections between one another and proved to be a good compromise, theoretical enough and not too close to the ALADIN equations. The need of a bibliography for each lecture was expressed during the debriefing. This is now done (bibliography available on web). However, the main criticism expressed was both the lack of a Numerical Weather Prediction overview after the dynamical meteorology notions and the lack of a compact overview of perspectives of high resolution modelling. The corresponding informations were underlying among all the lectures but should have been summarized in special lectures at the beginning and at the end of the Seminar.





A complete report on this Seminar is available on ALATNET web pages (programme with on-line lectures or summaries, bibliography, participants, time-table, the WWWW of the Seminar : When, Where, Who and What in few numbers and graphics, photos, ...).

To conclude, a few sentences noted during the debriefing and some graphics of the WWWW of the Seminar : *"I was really surprised that it works", "it was better than we expected", "after this Seminar, I get the impression that blacks boxes (in the model) are now grey boxes : it is not so complicated or, if complicated, with some efforts, it will be possible to understand; things start to fall together", "we should have done earlier", "Radostovice : a NWP paradise", "very good mood", "friendliness of the atmosphere", ...*

4. *ALATNET Selection of the first candidates, 30 May, 2000*

The whole candidacies received before the deadline (12th of May, 2000) were considered. On the 30st of May 2000, the ALATNET scientific officers of the 5 ALATNET centers voted for the selection of the first ALATNET researchers, following the rules defined during the 1st co-ordination meeting.

The result of the selection is (in alphabetic order) :

- Gianpaolo BALSAMO : pre-doc position in Toulouse,
- Christopher SMITH : post-doc position in Prague,
- Cornel SOCI : pre-doc position in Toulouse,
- Klaus STADLBACHER : pre-doc position in Ljubljana,
- Jozef VIVODA : pre-doc position in Prague.

For details about the topics and the duration of their work, please read "ALATNET PhD and Post-Doc studies" in this Newsletter.

5. *Kick-off meeting for Research Training Networks, Brussels, 9 June, 2000*

Jean-François GELEYN (ALATNET co-ordinator) represented ALATNET at this kick-off meeting. This meeting gave the opportunity to meet the E.C. executives responsible for our project and also the co-ordinators of other networks in the same E.U. Programme. An interesting exchange of informations took place in a friendly atmosphere.

ALATNET appeared as very well prepared among the newcomers. All we have done (or planned to do) up to now is OK with what was said at the meeting.

A complete report can be consult on the ALATNET server, see "history", then "Kick-off meeting".

The 3 months' lag for deported work had been introduced due to the initial difficulties in collecting the information. But, it seems that the lag is no use ... as many countries don't send informations in time, even after recalls.

Thus, the simplest solution is to harmonize things. A ONE MONTH DELAY will be given to everybody (as soon as the current transitional period is finished).

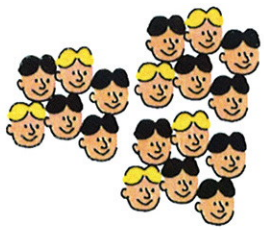
Next statistics to be produced will be updated for the end of June for all kinds of work (all informations MUST BE SENT before 15 August, special delay for this first attempt, using the new forms prepared for effort accounting).

For the Assembly of Partners, we will give statistics at the end of September 2000 for everybody and only informations given before the end of October will be taken into account.

For the next Newsletter, the transitional period will, hopefully, be finished and it will contain the statistics updated at the end of December 2000.

The national correspondents are kindly asked to consult the instructions for the work accounting completely describe on ***http://www.cnrm.meteo.fr/aladin/organisation/contributions.html***.

Announcements

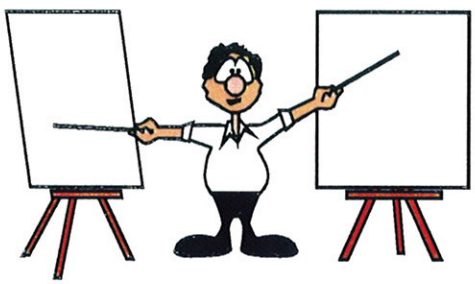


1. *Next ALATNET events*

a) ALATNET young researchers

A second call for candidacies will be published for the partial selection of new candidates in autumn 2000.

b) ALATNET Training Course



The next ALATNET training course will be held in Toulouse next spring. It won't be devoted to basic training as initially scheduled, since this is now more or less achieved by each NMS. A topic could be data assimilation, as expressed during the debriefing in Radostovice, for instance, but it is only one option. Each ALADIN team is invited to express its own wishes so as to help defining what would be most useful.

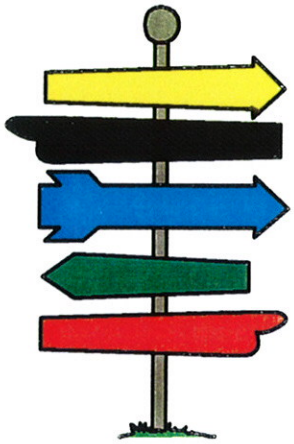
2. *Next ALADIN workshops/meetings*

a) The 9th ALADIN Workshop

It will take place in Brussels (Belgium) on November 6-8, 2000 : all informations on ***http://www.meteo.oma.be/IRM-KMI/aladin/welcome_aladin2000.html***. including announcements, instructions to authors (deadline for receiving the abstracts is end of August), ...

Proposed subjects are :

- CANARI Potential use of package for the analysis, diagnostics (verification) and nowcasting purposes



- APPLICATIONS TO THE WEATHER FORECASTS - development of indicators of the frontal position and activity - dynamic adaptation scheme for "local" forecasts - convection scheme and tuning - boundary layer scheme adjustment - use of the conceptual models at mesoscale
- VERIFICATION OF THE ALADIN FORECASTS Model verification, methods and results. Survey of severe events (storm, thunderstorms, frost ...)
- GENERATION OF AUTOMATIC WEATHER FORECASTS Products delivered to the forecasters and to the end users. Prospects for forecasts delivered in probabilistic terms
- APPLICATIONS TO HYDROLOGY AND ATMOSPHERIC POLLUTANTS TRANSPORT Presentations - Applications of ALADIN on : - weather forecasting - aviation meteorology - hydrology - air pollution - Model verification, methods, results

For other questions, please contact ***aladin2000@oma.be***.

b) The 5th Assembly of ALADIN Partners

It will take place in Vienna on November 24th, 2000 with the crucial question of the MoU renewal on the table.

c) The 10th ALADIN Workshop

The 10th ALADIN workshop, dedicated to scientific coordination, will be held in Toulouse (France) next spring. It will be organized just after or just before the next ALATNET training course, as an attempt to reduce travel costs and thus enable a contribution of more partners.

3. *Other next events*

a) The EWGLAM/SRNWP workshops 2000

The EWGLAM/SRNWP joined meetings, Météo-France/Toulouse, 9-13th October, 2000 (informations available on ***http://www.cnrm.meteo.fr/aladin/ewglam2000/*** or contact ***ewglam2000meteo.fr***). Deadline for registration was mid-July. In case you plan to attend and you have not registered yet, please do it as soon as possible.

Usual sessions will deal with :

- for EWGLAM meeting : group presentations, national status report or posters, scientific presentations (2000 special topic is "Convergence properties of Numerical Methods"), ...
- for SRNWP meeting : report of the SRNWP Lead Centers, SRNWP scientific actions, SRNWP business meeting, ...

This year, other sessions of these meetings will also be dedicated to the Mesoscale Alpine Project (MAP Session, invited speakers only) and to the 2nd SRNWP/EUMETNET Composite Observing System (EUCOS) Meeting on December 99 storms.

Considering the added MAP and EUCOS sessions, the 2000 schedule proposed is slightly different from those of the previous years, the EWGLAM and SRNWP sessions being more interwoven.

The representatives are, of course, welcome during the whole week and could attend all sessions of these meetings.

b) SRNWP workshop on statistical adaptation

This workshop will be held 4-6 December 2000 in Vienna, at the Central Institute for Meteorology and Geodynamics (ZAMG). It is intended to provide an open forum for discussing current methods and results of Statistical Adaptation in NWP, with emphasis on short-range forecasting. Contributions from both theory and application, including 'classical' methods like Model Output Statistics (MOS), Perfect-Prog Method (PPM), Kalman filter are welcome as well as combined physical / statistical approaches, and more recent developments such as neural networks or genetic algorithms.

In addition to scientific discussion and exchange, one purpose of this workshop is to provide an assessment of the current state-of-the-art in optimizing direct model output by statistical means. Such an assessment is considered important (1) as a basis for deciding on priorities in further research in this field and (2) to obtain an updated view on what improvements of forecast quality due to Statistical Adaptation can be expected in the near future.

A preliminary program, registration, hotel and general information will be posted on the ZAMG homepage (***http://www.zamg.ac.at***). For informations, please contact ***klaus.stadlbacher@zamg.ac.at*** or ***thomas.haiden@zamg.ac.at.***

c) A.M.A. 2000 (Atelier de Modélisation de l'Atmosphère)

The 15th Ateliers de Modélisation de l'Atmosphère will be held in Toulouse on 29-30/11/2000. This is THE French and French speaking mass event devoted to french atmosphere / ocean science, held every year in France only, with mainly French and French speaking participants. This year's topic is data assimilation, with some emphasis also on LAM models. This will deserve to make our work in ALADIN better known at CNRM.

The presentations will be shared between :

- development of simplified Kalman filters
- assimilation of remote-sensed data
- assimilation in limited-area models
- variational assimilation problematics
- other issues

There will be at least 3 ALADIN contributions :

- L'analyse 3d-var dans le modèle à aire limitée ALADIN (C. Fischer et al.)
- DIAGPACK : un outil diagnostique pour l'analyse à méso-échelle de champs météorologiques (G. Radnoti and E. Gérard)
- Réglage des statistiques "lagged-NMC" dans le 3d-var ALADIN (W. Sadiki)

For more details, contact Claude Fischer (***Claude.Fischer@meteo.fr***), or have a glance at ***http://www.cnrm.meteo.fr/ama2000/).***

d) Annual COSMO meeting

The first day of the annual COSMO meeting (27-29 September 2000, Zurich, CH) will be devoted to "Next generation numerics".

Participation (with or without contribution) can already be announced to the Local Organiser, Jacques.Ambuehl@meteoschweiz.ch

Contacts & Informations

1. *ALADIN and ALATNET on the Web*

These informations (and many many others ...) are available on the ALADIN usual server:

http://www.cnrm.meteo.fr/aladin/

and on the 

ALATNET web server : **http://www.cnrm.meteo.fr/alatnet/**

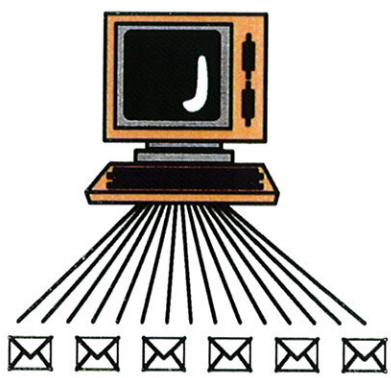
A renewal of the ALADIN web site will be done this autumn. Any suggestions, remarks, wishes, ... are welcome. Many thanks for your help.

2. *Public ftp*

Some documents (please see the list of the documents in annex) are also available on a public ftp : ***cnrm-ftp.meteo.fr***, under the directory ***/pub-aladin***. Please connect on user anonymous and use you e-mail address as your password. The space available on this public ftp doesn't allow to put on it many files (only last updated files are on this public ftp). If you are looking for a precise document, this document is more likely to be found on the web servers.

3. *Mailing lists*

Some mailing lists also exist to make our correspondence smoother :



The public lists :

- a general list has been recently updated : aladin@meteo.fr . It can be used for exchange of general interest about ALADIN project. It contains address of ALADINers at home.

• An e-mail list has been created : alatnet@meteo.fr . It can be used for exchange of general interest about ALATNET project. It contains address of people involved in the ALATNET project (ALATNET Young Researchers, mentors, co-ordinators).

- the stagmap@meteo.fr list contains the list of the ALADIN international Toulouse team : this very variable list (updated at the arrival or the departure of every visitors) permits to contact all visitors in GMAP,
- the AWOC list : awoc@meteo.fr, list for ALADIN WOrkstation Coordination,
- the list for questions and/or problems encountered with ALADIN software : alabobo@meteo.fr,

More "private lists" :

- a list with correspondents for operational questions related to the Toulouse centre : operala@meteo.fr ,
- a list with correspondents for verification questions : verifala@meteo.fr , following the 1999 Assembly of ALADIN Partners' recommendations, each country has entrusted one person as the correspondent for the verification project.

- a list around the exchange of applications in the ALADIN's world : exchala@meteo.fr.

4. Remote access to Météo-France machines

Many of you have a remote access to Météo-France machines. Autorizations for these access must be renewed yearly. Eric Escalière (eric.escaliere@meteo.fr) is your only contact point for these access.

Money Funding asked for some cooperations based on the ALADIN project

1. French "Ministère des Affaires Etrangères" support (MAE)

Most stays on 1999 MAE support are now finished. A few ones and will begin in autumn (remaining funding for Morocco and Bulgaria).

MAE support for 2000 roughly corresponds to demands, with two more partners concerned this year (Croatia and Slovenia). However fundings won't be available

before mid-October, in the most optimistic case. As a consequence many stays will have to be delayed to 2001.

As a justification for 2001 demands, the Ministère des Affaires Etrangères asks for **a report on the 10 last years of cooperation** (progress, benefits for each part), for the partners benefiting from this support. The Toulouse support team will write down his part (and assume translation in French whenever required), but the concerned NMS must complete it with their own contributions. Reports must be ready before the autumn. Demands for 2001 will be prepared only for those partners who send a sensible report in time. Only Hungary, Portugal and Romania answered up to now.

More details can be asked to Sylvie Rivals (Météo-France/D2I/INT, ***sylvie.rivals@meteo.fr***).

2. *Bilateral supporting grants*

AMADEUS, BALATON, BARRANDE, PROTEUS are bilateral programs who can support short visits in both sides. The countries involved in these programs can easily be guessed considering the programs names. The French fundings are used to pay the per-diem (in France) of the visitors and to pay the travel of French people to other NMS, and vice-versa.

The 2000 exchanges (BALATON, BARRANDE) will be completed this autumn.

The renewal for 2001 has been asked for BALATON (Hungary benefits from ALATNET support but not for the same topics as those supported by BALATON) but not for BARRANDE and PROTEUS (Czech Republic and Slovenia are ALATNET centers). The BALATON topic is "development of very short range prediction using the ALADIN model".

A new demand has been sent for 2001 : its name is AMADEUS and exchanges will be, of course, with Austria. This program will focus on the improvement of the description of the precipitation on mountain areas (parametrization, analysis, verification).

More details can be asked to Dominique Giard (***dominique.giard@meteo.fr***).

3. *Météo-France support for maintenance, ...*

The Météo-France support to the maintenance of ALADIN will be distributed among 21 stays (6 from February to June, 15 from September to December). They focus on :

- the preparation of cycles 13 and 14,
- some code cleaning,
- the design and validation of new climatologies,
- the validation of the last developments in Full-Pos,
- the investigation of some old problems,
- the renewal of the ALADIN web server,

and are completed by a few MAE stays, thanks to Morocco and Poland. The overall partition will enable each partner to achieve its maintenance commitments for 2000.

The demand for the next years is less and will support only 2 phasing exercises with 8 persons invited each time, and some additional stays. However we may hope that part of maintenance will effectively be deported at that time.

4. *ALATNET funding*

- On 25 May 2000, Météo-France received the initial advance from the Commission (30% of the total).

- On 5 June 2000, the advance has been allocated to each participants in accordance with the article 3 of the ALATNET contract.

This money will be mainly used for young researchers employment in the 5 ALATNET centers (salaries or grants, social charges, relocation costs, travel costs). A smaller part will be dedicated to the Networking of the research work associated with ALATNET. All details can be found in the ALATNET contract and its Annex 2.

Recent and future changes in the operational implementation of ARPEGE

(Jean-François GELEYN)

1. *Recent operational changes in ARPEGE*

- On 23/2/2000 the compacting characteristics were modified with a 20% reduction of the file's size.
- On 4/5/2000 the operational library was switched to a Cy22T1/AL12-based release (for ALADIN-France as well). At the same time a dozen or so of modifications were made to the observation handling (bug corrections, use of NESDIS data as background for the SST analysis, retuning of the screening for too dense observations and technical modifications to enable the use of the ATOVS radiances as well as a 4D-Var parallel suite). This very cumbersome process had in fact started at the end of November 99!
- On 20/6/2000 two major milestones went operational in a joint mode:
  - the use of ATOVS radiances (hence the possibility to process the data of two NOAA satellites, while we were left with a single possibility since the end of NOAA11 in March 99). Of course the ATOVS data are richer than the TOVS ones (thanks to the Advanced Microwave Sounding Unit - AMSU- new instrument) and would in principle warrant a direct processing of raw-radiances; for the time being we are however still processing, via a 1D-Var procedure, both HIRS and -SU data for the TOVS and ATOVS instruments alike, i.e. starting from so-called «cleared radiances».

- the replacement of the 3D-Var intermittent data assimilation by a 4D-Var continuous data assimilation (second such implementation world wide, after the ECMWF one, two and a half year ago). The characteristics of this implementation are as follows: similar screening and quality control procedures as for 3D-Var, but with hourly windows for the timing of data (against 6 hourly before); multi-incremental version of the minimisation T42/T63/T95 (all unstretched), the «regularised MJ physics» being activated only at T95; 6 hours time windows, centred around analysis times, with the interface with surface assimilation (still CANARI-based) roughly unchanged; high frequency wave filtering done without any NMI computation, through the use of a DFI-like procedure as a weak constraint of the minimisation.

2. *Forthcoming operational changes in ARPEGE*

- The parallel suite of ATOVS+4D-Var revealed a slight default of incrementality over the Saharan region (too much difference between the resolution of the forecasting model and that of the control variable in a region where the usual geostrophic and moist-physical balance mechanisms are not fully at work). It was therefore decided to test a new 4D-Var configuration with (i) a doubling of the weak DFI constraint, (ii) the introduction of a non-zero level for moisture handling in the latter and (iii) the introduction of a semi-external incremental DFI, to better control noise and humidity increments. The last point is obtained «for free» when replacing the 3D-Var-linked «double filtering» DFI option by a «launching» DFI option applied on two already existing 6 hours runs, i.e. the «observation screening» one and the «ultimate trajectory for surface analysis» one. First results of the new parallel suite are encouraging and an operational switch in August is likely.
- The next plans concern the resolution of the forecast model. All ARPEGE configurations and ALADIN-France will move from 31 vertical levels to 41 (top at 1hPa, bottom at 17m above the surface). Furthermore there will be a change of the link between spectral and grid-point resolutions: for all forecast models (at yet unchanged situation for the control variable of 4D-Var) the quadratic grid approach will be replaced by the linear grid one, but with the orography still computed in the quadratic mode (i.e. unchanged in practice). Hence this change means 2.25 more degrees of freedom in spectral space with unchanged physical and orographic forcing. Finally the grid mesh of ALADIN-France will go down from 9.9224 to 9.5090 km at constant domain size, in order to put it back to half the minimum value for ARPEGE. The consequences of these resolution upgrades on the coupling strategy for deported ALADIN applications will have to be assessed as soon as possible, but the switch itself will be technically quasi-transparent in this respect.

3. *Planned operational changes in ARPEGE*

- A package of changes in the physics;
- A revision of all data bases (orography, soil, vegetation and soil moisture climatology) to be strongly coordinated, like always, with the ALADIN coupled runs;
- A major revision of the snow cover description (including in the soil data assimilation procedure); here also the ALADIN coordination might be complex;
- The use of scatterometric data;
- ????

ALADIN and ARPEGE : major code changes and stategy for code porting for the next months

(Claude FISCHER)

I will try here to list and comment the major code changes that will strike us, aladinists, in the next months. This text should be an incitative for choosing a strategy for code porting as well as for dissemination of interesting porting results among us.

1. *The ARPEGE CY23 (June 2000)*

* new Observation Data Base (ODB)

This feature is the successor of CMA-arrays for handling the observation data sets in the code. For the time being, ODB has only replaced CMA in the core of the model (in particular, *robsar* has disappeared), but the ODB structure will progressively replace CMA also in scripts and observation file formats.

* removal of I/O options from obsolete Cray SSD/memory systems:

Some of you know the existence of the "LIO" logicals, which are quite various (see *namct0*). For instance, they control the i/o onto files stored on the rapid-access SSD memory which exists on Cray.. A recent investigation, worked out by Ryad El Khatib, showed that nobody uses these options in our community anymore. Thus, they will be removed. which will simplify the reading of the spectral transform code (removal of LIO keys) and eliminate the corresponding module "*yomio*".

* removal of multitasking option LMLTSK:

This was the old Cray multitask facility, still used in Brussels and Casablanca. However, Morocco should change its platform quite soon, in 2000. So only Belgium is in a position where it would not be able to run the new cycles efficiently after this summer. Hence, Luc Gérard is having contacts with Cray persons for the possible installation of an openMP library, but this issue will be rather medium-term.

* openMP (OMP):

The OMP directives have appeared in the code in cy22. They were blindly adapted into ALADIN (however, the parallel code structures allowed for a rather automatic transposition of arp/ifs into ald parts). OMP directives can be interpreted by the compiler to produce microtasked code at loop level, provided one compiles with adequate OMP options. No tests of OMP were done for the time being in ALADIN, but a basic strategy is readily defined:

a/ analyze OMP directives in arp/ifs, understand the microtasking,

b/ verify the adaptations already performed in aladin, correct if needed,

c/ run and debug !

Appended are some performances provided kindly by Mats Hamrud from ECMWF. It turns out that OMP allows for executing the code almost with the same cpu time than multitasking, but with a slight increase in memory, by 5-10 %.

2. CY24 (end 2000)

* externalisation (modularisation) of transforms:

It is intended to modularize much more the spectral transforms, so that they can become a "toolkit" useful for different types of applications. The principle of the transforms won't be changed, but the interface with the upper level model routines will change , so that this modification introduces some heavy recoding for all. The phasing of ALADIN to ARPEGE will require a careful analysis because our north/south transforms are not 100% similar to ARPEGE ones (mean/wind, conversion between u,v and vor,div).

* message passing version/distributed memory version:

The way the distributed memory version was introduced inside arp/ald in the old days makes it impossible to draw any precize interface between shared and distributed memory versions. Differences splash throughout the code , from setup level down to scan2m, with some reflections on low level routines. Very understandably, ECMWF and some developpers elsewhere do not wish to go on maintaining 2 parallel codes. As a consequence, the SM code will disappear very soon, by the complete removal of the key LMESSP.

This cleaning is planned for cy24, so that it would appear in late 2000 in ARPEGE, and in ALADIN somewhere in early 2001 (cycle AL15).

3. Tests performed so far

* openMP: none

* removal of LMESSP:

Tests to run aladin with LMESSP=TRUE/NPROC=1 but no MPI library (because there "should" be no active message passing if only 1 processor is provided !) have been worked out by Jean-Marc Audoin, Andrey Bogatchev and Jozef Vivoda.

What to retain from those 3 experiences ? Firstly, Jozef's tests indicate that there is a possibility to run the basic configurations without MPI libraries but with lmessp=true. However, in the absence of OMP tests, this code version on 1 processor might perform somewhat less efficient than the good old SM code. The installation of MPI libraries is encouraged on all platforms with 4 processors or more. You will for sure face difficulties in the starting up (installation of mpe/mpi, checking communications on your platform ...). The Hungarian/Slovenian portings show that this is not impossible even if you are running neither on a VPP nor on a SX ! Standard, free versions of MPI exist (MPICH).

For the time being, we have introduced a logical LMPOFF that can be switched on to desactivate MPI calls in e001 and fullpos, in order to run the mono-processor code without MPI library (cycle AL13).

Sone more details on the tests can be found hereafter (experiments of J.-M. Audoin and A. Bogatchev).

4. Strategy and further tests for 2000

Each center is heavily invited to think about its own goals and strategy. The questions one should answer are:

a/ is it enough for me to run a "minimum" version - that is nproc=1 without message passing, nor openMP ?

b/ if speed-up is required, which one: openMP, message passing or both (both is for grapes of processors, each grape being SM/openMP while grapes would communicate via MPI) ?

c/ dates for tests and plans for switching to new environment.

Here we can add that the message passing version has now proven its reliability and efficiency on multiproc. platforms, even for a modest number of processors. The experiences in Toulouse, Ljubljana and Budapest are good. Prague also could switch to DM version if required.

5. *Coordination aspects*

It would be great to have regularly informations about your future tests and plans. I propose that the information should be sent via the *alabobo* list so that we can have a good overview about difficulties.

I gave you in section (1) the main frame of dates for the code changes, which will for sure influence your own decisions (though you probably wished to work on something else, but this is life !).

6. *Appendix: Figures of performances (provided by Mats Hamrud, ECMWF)*

conf001/arpege-ifs/ T63. tests run on J90. The execution times (not shown) were very similar using Cray macro-tasking, OPENMP or message passing.

```
Macro-tasked
ntasks=1.nproma=255.nrproma=255:Maximum memory used : 20.6035 MWords
ntasks=4.nproma=255.nrproma=255:Maximum memory used : 30.2031 MWords
ntasks=8.nproma=255.nrproma=255:Maximum memory used : 42.0977 MWords
ntasks=16.nproma=255.nrproma=255:Maximum memory used : 64.2773 MWords
ntasks=32.nproma=255.nrproma=255:Maximum memory used : 109.5898 MWords
OpenMP
nproma=255.nrproma=255.omp_num_threads=1:Maximum memory used : 45.4883 MWords
nproma=255.nrproma=255.omp_num_threads=4:Maximum memory used : 54.5547 MWords
nproma=255.nrproma=255.omp_num_threads=8:Maximum memory used : 63.5859 MWords
nproma=255.nrproma=255.omp_num_threads=16:Maximum memory used : 78.3633 MWords
nproma=255.nrproma=255.omp_num_threads=28:Maximum memory used : 82.5313 MWords
MPI
1x1.1x1.nproma=255.nrproma=255:Maximum memory used : 52.5430 MWords
4x1.4x1.nproma=255.nrproma=255:Maximum memory used : 71.5469 MWords
4x1.2x2.nproma=255.nrproma=255:Maximum memory used : 71.3398 MWords
8x1.8x1.nproma=255.nrproma=255:Maximum memory used : 102.1016 MWords
8x1.4x2.nproma=255.nrproma=255:Maximum memory used : 95.2773 MWords
4x2.2x4.nproma=255.nrproma=255:Maximum memory used : 94.4844 MWords
4x2.4x2.nproma=255.nrproma=255:Maximum memory used : 95.0117 MWords
16x1.16x1.nproma=255.nrproma=255:Maximum memory used 139.2031 MWords
16x1.1x16.nproma=255.nrproma=255:Maximum memory used : 144.0352 MWords
16x1.4x4.nproma=255.nrproma=255:Maximum memory used : 139.8086 MWords
16x1.8x2.nproma=255.nrproma=255:Maximum memory used : 140.3438 MWords
8x2.4x4.nproma=255.nrproma=255:Maximum memory used : 136.0781 MWords
4x4.4x4.nproma=255.nrproma=255:Maximum memory used : 135.6367 MWords
15x2.15x2.nproma=255.nrproma=255:Maximum memory used : 216.0547 MWords
```

The operational ALADIN models

1. *Status report of the operational ALADIN versions*

ALADIN runs operationally on a wide range of computers, from single workstations to vectorial computers in shared or distributed memory, and on a cluster of workstations under Linux. 12 operational ALADIN suites are presently running in various NMS. 7 coupling domains are produced operationally at Météo-France, 1 in Prague.

On vectorial computers

Model	Machine	System	Mesh size	Grid points (extension zone)	Vertical levels	Coupled with	Range of forecast	latitude,longitude SE corner	latitude,longitude NE corner	operational cycles
ALADIN-BELGIUM-	CRAY J916, 8h processors	Unicos 9.0.0	7.0 km	97*97 (108*108)	31	ALADIN-FRANCE (36h) then ARPEGE	48 h	47.47, 0.11	53.47, 9.60	AL11T2/C-Y21T2
ALADIN-FRANCE	FUJITSU VPP700, 24 processors, 6 used	Unix System 5	9.9 km	277*277 (288*288)	31	ARPEGE	36 h	33.14,-11.84	56.96, 25.07	AL12/CY2-2T1
ALADIN-LACE	NEC SX4C/3A, 3 processors	SuperUX 7.2	12.2 km	229*205 (240*216)	31	ARPEGE	48 h	34.00, 2.18	55.62, 39.08	AL11/CY2-1T1 + cycora (quadratic coupling)
ALADIN-MAROC	CRAY J916, 6 processors	Unicos 8.0.4	16.7 km	169*169 (180*180)	31	ARPEGE	48 h	18.31,-19.98	43.12, 9.99	AL08

On workstations

Model	Machine	System	Mesh size	Grid points (extension zone)	Vertical levels	Coupled with	Range of forecast	latitude,longitude SE corner	latitude,longitude NE corner	operational cycles
ALADIN-AUSTRIA	DEC Alpha 600	Digital Unix	9.6 km	133*117 (144*128)	31	ALADIN/L-ACE	48	41.37, 5.89	51.82, 21.85	AL08 AL11T2 is in installation
ALADIN-BULGARIA	SUN Ultra Sparc 60	Solaris 2.7	9.0 km	63* 79 (72* 90)	31	ARPEGE	48 h	39.79, 20.01	46.41, 31.64	AL11 since 27.12.1999
ALADIN-HUNGARY	SGI Origin 2000, 8 processors		8.0 km	189*133 (200*144)	31	ALADIN/L-ACE	48 h	42.08, 6.34	51.77, 26.06	AL09 AL11, AL12 already installed on SGI
ALADIN-POLAND	SGI Origin 2000, 32 processors	IRIX 6.5	13.5 km	169*169 (180*180)	31	ARPEGE	48 h	41.42, 5.56	61.16, 40.19	AL07 AL09 in progress

ALADIN-PORTUGA-L	DEC Alpha XP1000	Digital Unix	12.7 km	79* 89 (90*100)	31	ARPEGE	48 h	34.94,-12.42	44.97, -0.71	AL11 AL12 implemented
ALADIN-ROMANIA	DEC Alpha 500	Digital Unix 4.2	10.0 km	89*89 (100*100)	27	ARPEGE	48 h	41.11, 20.69	49.80, 32.13	AL12
ALADIN-SLOVAKIA	DEC XP1000WS	Digital Unix	7.2 km	79*53 (90* 64)	31	ALADIN/L-ACE	48 h	46.92, 16.02	50.27, 23.65	AL11T2
ALADIN-SLOVENIA	Cluster 5 x Alpha PCA56 533 MHz	Linux	11.2km(soo-n 8.3 km)	80*80, (soon 97*97) (108*108)	31	ALADIN-LACE	48 h	42.33, 8.69	49.44, 18.97	AL11

2. *Operational version at Austrian Meteorological Service*

(more details yong.wang@zamg.ac.at)

Last news in Newsletter16.

3. *Operational implementation of ALADIN-Belgium*

(more details luc.gerard@oma.be)

No change since 16/11/1999 (introduction of CYCORA scheme) :

- operational version : AL11T2_export.02
- 48h forecast, twice a day,
- coupling every 3 hours from Aladin-France.
- basic output every hour, wider output every 3 hours
- running in shared memory mode on the Cray J90, with 8 processors
- successfull tests of MPI on the J90.

The tests on HP machines meet difficulties due to unsatisfying coding, that defines specific kinds (JPRB for instance) but which actually are not fully supported.

System libraries and some xrd routines often expect default kinds, while ALADIN passes the user-defined kinds.

This problem is often solved by compiling on workstations with "+autodbl"-like flags, but on HP those flags are not allowed when compiling for MPI.

The replacement of the J90 is planned by another system, shared with the Royal Observatory and the Space Aeronomy Institute, but the choice has not yet been finalized.

4. *Operaional version at Bulgarian Meteorological Service*

(more details valery.spiridonov@meteo.bg or andrey.bogatchev@meteo.bg)

Last news in Newsletter 16.

5. Operational ALADIN-FRANCE in Météo-France

(more details samuel.westrelin@meteo.fr)

Since the 20th of june at 12H00 UTC, ALADIN coupling files are produced by an ARPEGE based on a variational analysis with four dimensions (4DVAR). 4DVAR consists in minimising the distance between the model trajectory and observations over a temporal range (currently 6 hours).

The tests done showed substancial improvements at the global scale and particularly over the southern hemisphere.These changes are due to :

- a better use of asynoptic observations as satellites, planes data and hourly synop which are considered +/- half an hour around their observation time ;
- increments produced by an observation are coherent with the meteorological situation : an information about baroclinic instability will modify the first guess in a baroclinic way ;
- the model is used in the analysis to get the trajectories so that the "shocks" between the first guess and the analysis are reduced.

6. Workstation version at French Meteorological Service

(more details jean-marc.audoin@meteo.fr)

No differences now between the operational ALADIN-France version and the workstation version.

On the workstation SUN, with the compilator F90 Fujitsu and the ALADIN version export_AL11T2_01 (with some bugfix), tests were executed with the option LMESSP=TRUE (mono processor and distributed memory). Using the two methods (dummy message passing and modifications of Josef Vivoda and Andrey Bogatchev on the MPI routines), the Fpos configuration can run but within an abnormally long time, of course for a big domain as FRANX01 (about 2221281 points).

Also a version AL13 (al13_main.01, cy22t2_main.01 and xr22_main.02) is going to be implemented. Some tests, for the configurations 001 and Fpos, have been made on the French domain, with the option LMESSP to FALSE (shared memory). For instance, the use of the tool progrid shows that the combination (Fpos and progrid) produces the same grib files as the previous cycle. As the new source contains the modifications of Josef Vivoda and Eric Sevault, some tests with the option LMESSP= TRUE were made, but unfortunately the large drift (about 3 times more) in the performance remains. Further investigations are required to understand and reduce this extra-cost.

7. Operational version at Hungarian Meteorological Service

(more details horanyi@met.hu)

Regarding the operational setting there were no major changes encountered during the first quarter of 2000: two model runs/day and 24 diag.pack (CANARI) runs/day are the main operational jobs.

At the begining of the year a new binary was created for the ALADIN code usingthe native mpi library of the SGI machine (instead of MPICH).

The model integration is now using 10 processors and the two remaining processors are devoted to the auxilary jobs (like ee927, file preparations, etc.).

Work had been started to port the FESTATt tool (computation of background error statistics) to the HMS environment. The first preliminary statistics and plots were obtained for the end of the period.

The generation of automatic forecasts was extended over 65 locations using the raw model products of the ALADIN/HU model.

During the second quarter of 2000, there were two main changes in the operational suite :

- On the request of the aviation meteorologists we have extended the hourly post-processing frequency until 24 hours (so during the 48 hours forecast post-processed outputs are produced hourly until 24 hours and 3 hourly afterwards).
- Cycle AL12 was installed and put into operations on the last days of June.

Other important events of interest:

- A two-weeks long workshop took place in Budapest with the primary aim to run ALADIN 3DVAR on the Origin 2000 machine in Budapest. This goal was achieved and now we are able to run 3DVAR ALADIN on the 12 processors of our computer (a detailed report is available in this Newsletter).
- AL11T2 was also installed with the aim to run the non-hydrostatic version of the ALADIN model. There are still some problems (instabilities) detected, which are going to be investigated in the near future.
- An action related to the surface parametrisation of the model was continued and a local soil texture data base was included into the climatological information of the ALADIN model. The effect of the more detailed and realistic data over Hungary will be studied in the near future.

8. *Operational ALADIN-LACE in CHMI*

(more details can be asked to Project Leader or Prague Team Leader)

1. Evolution of the ALADIN/LACE application.

To start with, the entering of the last year of the 20th century went rather well, without any real trouble caused by the famous Y2K bug. Only a small mistake (in fact two mistakes compensating each other) was detected later on in the encoding of date to GRIB bulletins and corrected. Also on the 29th February 2000 everything went smoothly .

Following the positive scores of the parallel suite named "HUCOE/HUTIL" , the change was introduced into the operational ALADIN/LACE application on 23/02/2000 for 12 UTC network time.

12/04/2000 for 12 UTC network time: "quadratic coupling": The "quadratic coupling" means that the time interpolation of the large-scale values between the boundary condition refreshments is parabolic in time and not any more linear. Like that the LBC trajectory is described with a higher precision and leads to a small improvement in the general scores. This technique is, however, also quite sensible to be used in rapidly evolving situations, like it was the case of the famous Christmas'99 storm, see some details below in this report. The quadratic coupling belonging to the improvements first applied in ALADIN/LACE and yet nowhere else, further details may be found at the usual web address of RC LACE, the parallel suite had name "aav ".

2. Parallel Suites

During the first quarter of 2000, the Prague Team launched the following parallel tests to assess the impact of different modifications:

- HUCOE/HUTIL suites, modifying the parameterization of clouds (threshold humidity values to have a cloud or not, including parameterization of the depth of the cloud; suites aar, aat). The suite "aat" entered the operational application, with new values of HUCOE=2., HUTIL=1.8.
- 41Levels suite "aas" , testing the impact of higher vertical resolution (anticipation of ARPEGE 41L configuration). The suite revealed a problem of noise due to extrapolation of wind to the stratospheric extra-levels. The scores were mostly negative. It lead to a re-design of future spacing of vertical levels, see R & D.
- Non-linear horizontal diffusion made with Semi-Lagrangian interpolators research suites (aaw, aax). These suites were meant to assess the impact caused by the new way of applying the horizontal diffusion. It helpfully revealed the pluses and minuses of the new scheme. For details see the previous reports on PhD work of Filip Vana.
- LQCPL suite (aav), testing the quadratic interpolation of the lateral boundary conditions in time. The results are slightly positive in geopotential scores in the troposphere.
- Cycle AL12 verification suite (aay), confirming the neutral results with respect to the currently operational AL11/CY21T1+operational fix CYCORA.

The scores may be consulted on www.chmi.cz/meteo/ov/lace/aladin/partests pages.

Otherwise the cycle AL12/CY22/XR22 was successfully ported to SX4 platform and validated. A bug in the cray-type of multitasking (key LMLTSK) has been detected and corrected. The bug concerns other ALADIN teams using Cray platforms. More details on AL12 can be asked to: Gabor Radnoti.

During the second quarter of 2000, the Prague Team launched the following parallel tests to assess the impact of different modifications:

- 37 Levels suite (aaz) , running for about two month. The scores are either neutral or positive in the troposphere. However, there is worse RMSE score of geopotential in the stratosphere, limited, it seems, to several days in April. Further investigation of this score is still necessary. For the time being the suite aaz was stopped.
- Blending suite, still running and subjected to careful validations, scheduled for the month of July.
- Linear grid suite (aba) has been started at the end of June. It consists in using a linear grid type of spectral truncation for all variables but orography. The orography remains the same like it is when using the quadratic grid, in order to avoid 2 delta x waves amplitudes to get excited because of the orographic forcing. This suite reflects recent results brought by the quasi-academic experiment SCANIA.

The scores may also be consulted on ***www.chmi.cz/meteo/ov/lace/aladin/partests*** pages.

9. *Operational ALADIN-MAROC in MAROC-Météo*

(more details Radi Ajjaji, mrpa650@andante.meteo.fr)

1. Operational suite :

ALADIN-Maroc is running with ISBA assimilation cycle twice a day with 16,5 km resolution, 675s time step and 31 levels. The model version is based on cycle AL08.

2. Operational development :

- Improvement of operational suite script's in order to disable the read errors.
- Test of an Aladin workstation version over Morocco.
- Elaboration of a pre-operational statistical adaptation suite of the maximal and the minimal temperature.

3. Computer facilities:

Maroc-Meteo is planning nearly to upgrade the resolution of the Aladin-Maroc model. For this, a call for proposal is done in order to buy a new powerful computer.

10. Operational version at Polish Meteorological Service

(more details zijerczy@cyf-kr.edu.pl)

Last news in Newsletter 16.

11. Operational version at the Portuguese Meteorological Service

(more details christina.madeira@meteo.pt)

ALADIN/Portugal was declared operational on 24th of April. The AL11T2 cycle was installed in the begin of the year and tested in parallel suite during 2 months (April and May). This cycle has replaced the AL09 one in the operational suite, on June 27 th , 12 UTC run, and the frequency of model outputs was switched from 3h to 1h in operational configuration. During June the new model version -AL12- was successful implemented.

The team reinforcement has allowed us to restart the work to create the CMAFOC files for OI/CANARI in order to process locally the TEMP and surface observations.

12. Operational version at the Romanian Meteorological Service)

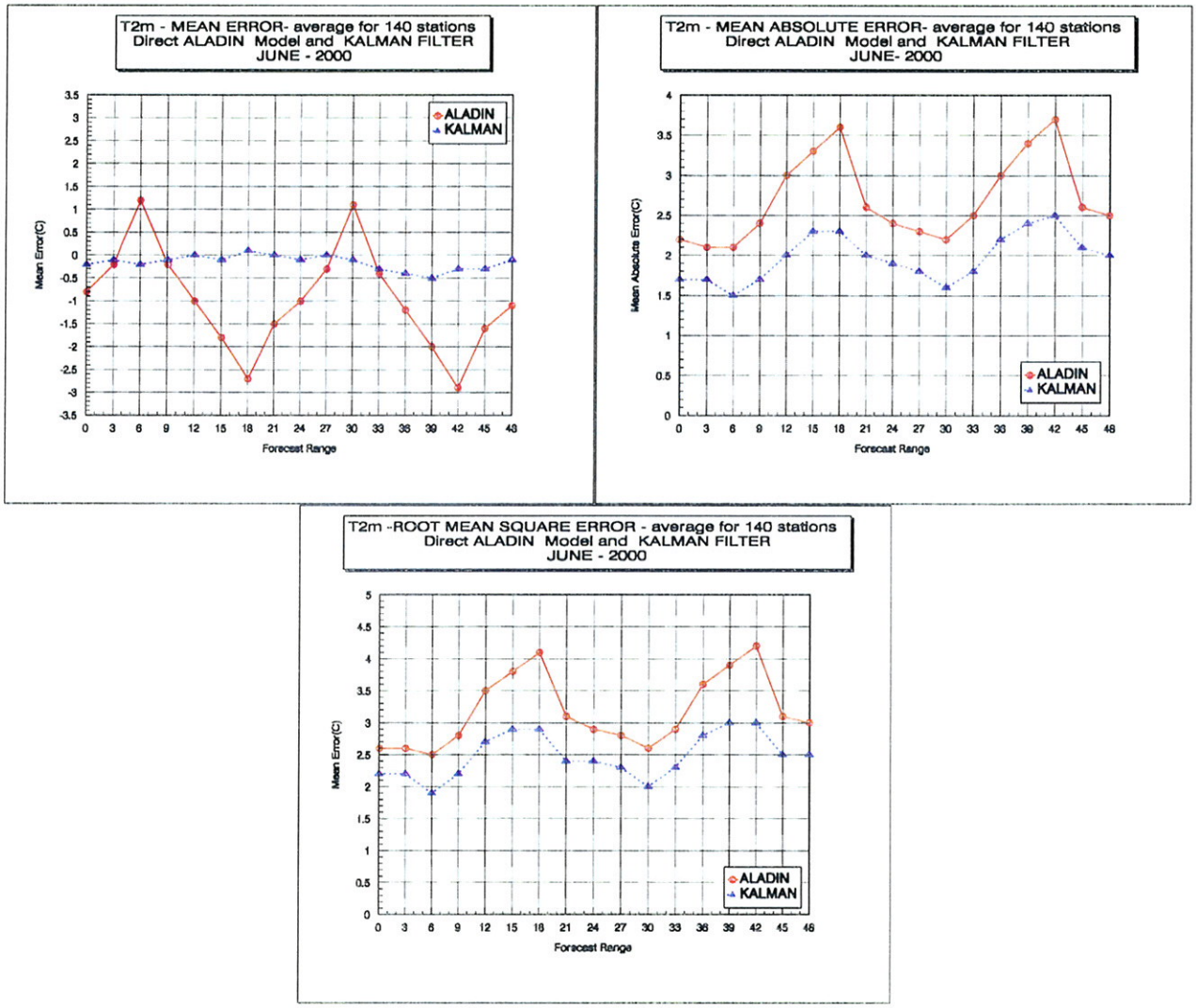
(more details banciu@meteo.inmh.ro)

From first of June 2000 the operational version of the Aladin model in Bucharest is al12. The option LMESSP=.F. is still used due to our workstation limitation.

Other changes of the operational systems concern:

- The possibility to use the forecast vertical profiles (emagrammes) under the visualisation MESSIR system.
- The statistical adaptation: the correction of the 2m temperature using Kalman filter is computed for 140 meteorological stations. Daily the verification is carried out also for the corrected temperatures in comparison with the direct model output. An example of the monthly statistical measures can be seen in the below figure, for 2000, June.
- The Black Sea wave prediction system was developed by a nested integration over the western basin (for a grid of 5' x 5') allowing the use of the high-resolution wind Aladin forecast every 3 hours.

- The forecast of a thermal comfort index based on the Aladin output.



13. *Operationa version at Slovak Meteorological Service*

(more details olda.spaniel@mail.shmu.sk)

Last news in Newsletter 16.

14. *Operational version at Slovenian Meteorological Service*

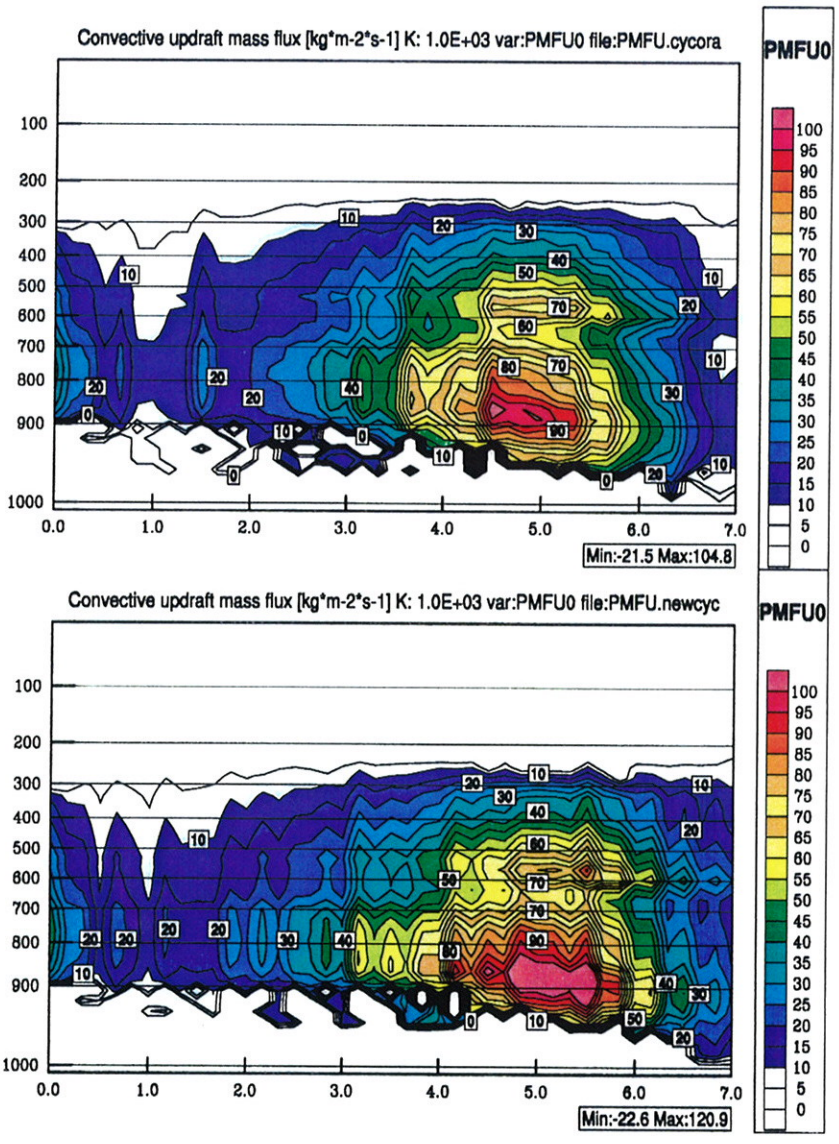
(more details jure.jerman@rzs-hm.si)

Last news in Newsletter 16.

ALADIN PhD Studies

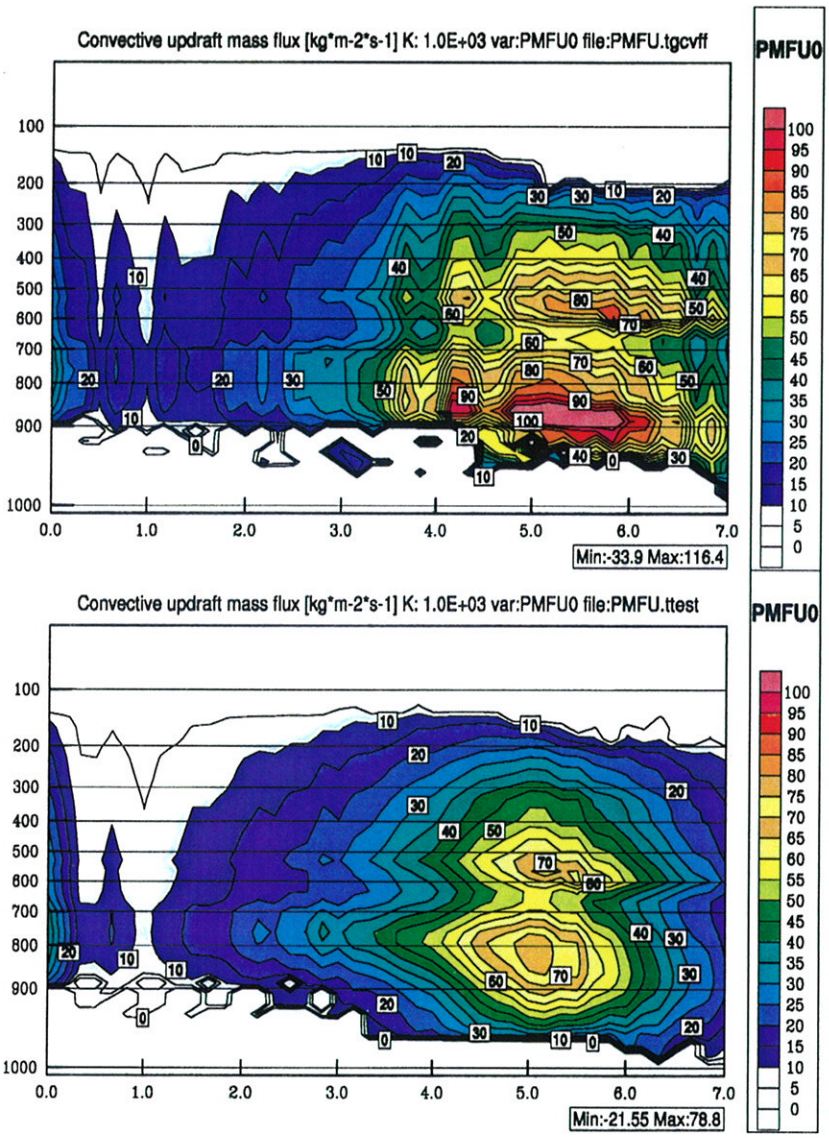
1. Doina BANCIU : "Specific small scale diabatic forcing in ALADIN at the limit of the hydrostatic assumption"

The recent developments carried out at CNRM/GMAP concerning the "CYCORA" package were tested for the TOGA-COARE and CLEOPATRA (the squall line of July 21, 1992, over southern Germany) cases. For the turbulent diffusion parameterization new values of the critical Richardson number and of the exponent controlling its vertical profile have been proposed: USURIC=1 (USURIC is the inverse of the critical Richardson number) and USURICE=0.5, insuring the theoretical expected values of the critical Richardson number, 1 for laminar turbulence and 1/4 in three- dimensional turbulent regime. These values together with the parameter GCCSV=1, increasing the occurrence of the cases when the shallow convection correction is applied, led to better results as one can see from the evolution of the convective mass-flux for the TOGA- COARE case (see fig.1, upper part - "CYCORA" simulation, bottom part - "CYCORA" + new tuning): the convective activity was enhanced in the last part of integration, when the squall line should reach a quasi-stationary state.



Regarding the deep convection parameterization, tests were run concerning the "ensembling entrainment", developed by J. -F. Geleyn and J. M. Piriou in order to get higher convective clouds tops. The idea is to introduce a relaxation of the moist static energy of the cloud towards the moist static energy of a fictitious "non entraining ascent". The relaxation coefficient is locally modulated by the complement to 1 of the factor of variation of entrainment rate between its maximum and minimum in

order to have the maximum effect at the top. By using the "ensembling entrainment" the simulation of the TOGA-COARE squall line was significantly improved:



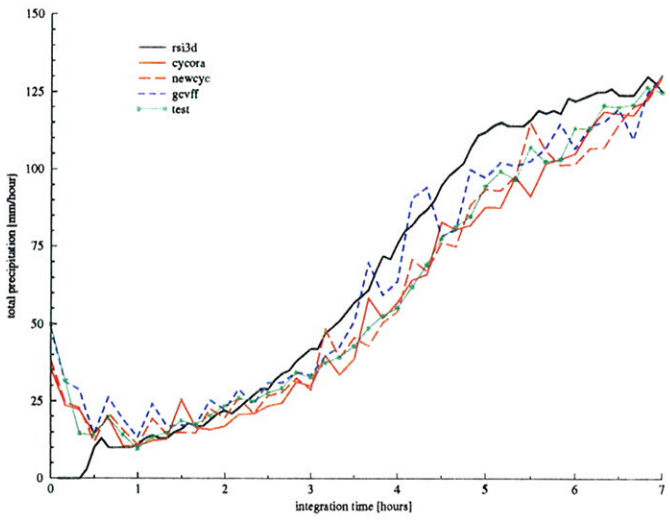
- the clouds reached higher levels (see fig.2: mass flux evolution, upper part- experiment "gcvff");

- the convective activity was enhanced in the last part of the of the simulation; (see again fig.2)

- the precipitation slightly increased but the evolution became more spiky (see figure 3, experiment "gcvff").

The presented result was obtained by using the new tuning for the turbulent diffusion and the proposed values for the "ensembling entrainment": relaxation coefficient GCVFF=2.E-05, critical thickness of the precipitable clouds ECMNP=3000, the coefficient controlling the dependence of the entrainment rate on the integral cloud buoyancy GCVALFA=5.E-05. The experiments have showed that convective activity could be enhanced by the following set-up: GCVALFA=4.E-05 and the minimum and maximum value of the "ceiling" entrainment rate at the top at the basis of the clouds, TENTR=3.5E-06 and TENTRX=7E-05.

The "ensembling entrainment" was tested also for the squall line of July 21, 1992. The sensitivity to this modification was smaller in this case (simulations have been carried for a 7.3- km resolution) and no improvement was noticed: the displacement speed was still to fast and the vertical velocity nuclei were even smaller.



Another tested modification (developed by J.F.Geleyn) concerned the smoothing of the humidity turbulent diffusion flux for the deep convection computation: this time the humidity flux was scaled by the saturation humidity. The experiments realised for the TOGA- COARE case showed a smoother evolution for the convective mass flux (see fig.2, bottom part, experiment "test") and also for precipitation (experiment "test" from fig.3). Even if the convective activity was diminished the amount of precipitation at the end of the integration was close to the result obtained with the CNRM 3D cloud

resolving model (labelled "rsi3d" in fig.3) due to the increase of the stratiform precipitation. It should be mentioned that for these experiments the smoothing of the humidity turbulent flux (with a smoothing coefficient GCVPSI=0.5) was used together with the "ensembling entrainment".

2. *Ilian GOSPODINOV : "Conservation Properties of 2 Time Level semi-Lagrangian"*

The research on the vertical acceleration in the environment of a hydrostatic atmospheric model has significantly advanced during the last period. The acceleration has been derived from the expression for the advecting vertical velocity which is based on the continuity equation. It has required second order space derivatives of the prognostic variables to be obtained. This is a relatively easy but memory and time consuming procedure. Additionally, a prognostic equation for the divergence had to be simulated. It has been derived from the momentum equation and is only adiabatic. Some additional simplification has been allowed in the framework of a high resolution limited area model such as no curvature terms and no meridional derivative of the Coriolis parameter.

The uniformly accelerating motion trajectory scheme, proposed previously, has been tested with the new vertical acceleration. It has been compared to other trajectory schemes as well. Two extreme cases has been used for testing - the 'Baltic Jet' case and the 'Cleopatra' one. The first one is particular with a dominating horizontal advection and the second one is characterized by a strong vertical motion within a convection plume. The proposed trajectory scheme was the only one to assure stable integration without noise in the 'Baltic Jet' case as well as sufficiently well developed convection in the 'Cleopatra' case.

Some perspectives for the 2TLSL method have been foreseen. For the hydrostatic model the predictor-corrector method may be an alternative solution for the present deficiencies of the operational scheme. The vertical SL trajectory problem is very interesting in the non-hydrostatic model where the vertical velocity is an independent prognostic variable.

The first version of the thesis is ready and an article has been submitted to QJRMS and accepted with very minor revisions. The defense will take place before the end of 2000 and you should know everything about it in the next Newsletter.

3. *Filip VANA : "The dynamical and physical control of kinetic energy spectra in a NWP spectral semi-Lagrangian model"*

The new horizontal diffusion scheme has been introduced into the ALADIN model. The scheme, using the damping ability of different semi-Lagrangian interpolators, acts like an gridpoint diffusion operator. The advantage of this new scheme compared to a real gridpoint horizontal diffusion is mainly the computational efficiency. It is very cheap and it allows for the same computational cost to use a large variety of diffusion orders. On the other hand the e-folding time (diffusivity) of the new diffusion is a function of its diffusion order (selectivity) and thus cannot be chosen independently.

The new scheme was tested in a parallel suite and compared to the current operational version of Aladin/LACE with satisfying results. Some case studies also showed an improvement of the forecast (the 97's Christmas storm in Ireland and the 99's Christmas storm in France).

The advantages (+) and disadvantages (-) of the new diffusion scheme when compared to the current spectral horizontal diffusion scheme are the following (and consisten)t:

- + the new diffusion is flow-dependent for all diffused fields (in the current scheme all fields are independent),
- + the new scheme allows diffusion of grid-point fields (e.g. prognostic liquid water),

ALATNET PhD and Post-Doc Studies

The first ALATNET candidates were selected on May 30, 2000, and they will begin their work in the second half of 2000. Full coordinates of the ALATNET young researchers (both in their home service and in the ALATNET centers where they will work) can be found on the ALATNET web pages (***http://www.cnrm.meteo.fr/alatnet/***). A first report of their work will be published in the next Newsletter.

1. Gianpaolo BALSAMO : "Coupling a variational assimilation of gridpoint surface fields with a 4d variational assimilation of upperair spectral fields"

Gianpaolo is employed by the SMI - Piedmont Region in Turin (Italy). He will benefit from ALATNET funding for 16 month pre-doc stay in Toulouse (Fr), from September the 1st, 2000.

2. Christopher SMITH : "Stability analysis and precision aspects of the boundary condition formulation in the non-hydrostatic dynamics and exploration of the alternatives for discrete formulation of the vertical acceleration equation both in Eulerian and Semi-Lagrangian timemarching schemes"

On September 1, 2000, Christopher (UK Met. Office) will begin his ALATNET 12 month post-doc stay in Prague (CZ).

3. Cornel SOCI : "Sensitivity studies using a limited-area model and its adjoint for the mesoscale range"

Since July 1, 2000, Cornel is working on his subject in Toulouse (F). Thanks to ALATNET, he will spend a 13 month pre-doc stay in Toulouse and a 4 month stay in Budapest.

4. Klaus STADLBACHER : "Systematic qualitative evaluation of high-resolution non-hydrostatic model"

Next September, Klaus will leave the Central Institute for Meteorology & Geology in Vienna (Au) for the first part of his 25 month pre-doc stay in Ljubljana (Sl).

5. Jozef VIVODA : "Application of the predictor-corrector method to non-hydrostatic dynamics"

Jozef (Slovak HydroMeteorological Institute, Brastilava, SK) will arrive in Prague (CZ) for his first ALATNET stay in October (23 months for his total pre-doc ALATNET employment).

3DVAR WORKSHOP IN BUDAPEST

(more details, Andras HORANYI, HMS)

29th of May, 2000 - 9th of June, 2000 with Maria Siroka, Claude Fischer, Andras Horanyi

Introduction

At the end of last year while planning the stays for the French-Hungarian bilateral cooperation the idea was born to organise a working action on 3DVAR (as it was done in September, 1999 for diag.pack) in Budapest. The main objective of the workshop was to install and adapt the 3DVAR (131) configuration of ALADIN on the Origin 2000 machine (recently having 12 processors in it) of the Hungarian Meteorological Service. Maria Siroka and Claude Fischer were invited to take part in this action.

This workshop was held parallel to the 2 studies in Toulouse by Wafaa Sadiki and Adam Dziedzic, respectively on the tuning of the Jo/Jb ratio and the treatment of the E-zone. Claude Fischer kept close contacts with the two "stagiaires" during the work.

1. Preliminary work

Cycle AL12 has been provided for installation in Budapest. The cycle is already operationally used for fullpos and dynamical adaptation at Météo-France. Raw clearcase branches were downloaded, so that the version installed does not match completely the export version. In particular, the bugfix for nhs/3tlsl is not present. Otherwise, the installed code was bug-free and could be quite rapidly used for the installation (work of Gabor Radnoti). Wafaa Sadiki provided the scripts and namelists as a basis for the work.

The work done by Gergely Boloni and Andras Horanyi provided from the scratch the necessary statistical files, which proved to be of good quality for the porting effort.

2. Scripts, Namelists

Namelists and scripts already used for research in Toulouse have been provided, both for single and full-obs experiments. It turned out that the maintenance of a single script for E002/E131 doing every possible job sequence is difficult, since bugs were still found in the scripts while porting. Thus, the maintenance and validation in Toulouse will be done with a duplicated set of scripts+namelists: one for single-obs, one for full-obs, in the near future.

Some namelist cleaning was done, especially removal of ARPEGE features such as NAMNMI, NAMLEG.

The general feeling is that the proper maintenance of scripts for 3DVAR is both a crucial and a time consuming activity. It is not clear whether the ALADIN community should try to stick to a common set of scripts over all its centers (possibly diverging quickly from ARPEGE scripts), or whether each center remains in charge of its own environment. The second solution will probably impose itself for the time being. For namelists, a common set of files is however wished.

3. *Installations from the general point of vue*

A very good first installation of the source was already done by Gabor Radnoti before the start of the workshop, so that the practical implementation of 3DVAR could begin promptly. However, several difficulties have shed some light on the relatively large efforts required by 3dvar, in contrast to the forecast version E001:

- need for a consistent CMA installation (OLD_CMA_WRITE)

- a number of contradictions with the ecmwf-born code due to platform mismatches (IBITS ?, GRIBEX, MPI, REFTIME)

- uncomplete tov22 library.

(A more detailed technical description is available on request.)

4. *Debugging and validation of 3DVar*

4.1 VALIDATION

4.1.1 SINGLE OBS EXPERIMENTS

The first validation of the installation of assimilation configurations on SGI was made via single observation experiments. Setup of the experiment was the same as used in Toulouse. The script was updated, now it contains the possibility to run fullpos to model levels (for the visualisation by CHAGAL, or possibly later in vertical cross-sections). Background error statistics for ALADIN/HU domain were provided by G. Boloni and A. Horanyi.

Both shared memory and distributed memory versions of single obs were running correctly and gave the same results (cost function values). The only exception is, that in the shared memory the JO in the screening is two times the Jo from the distributed memory run (but this problem is an old one and also apparent in Toulouse).

Figures of the single-observation experiments can be obtained on request.

4.1.2 FULL OBS EXPERIMENTS

Experiment with the observation file containing SYNOPs and TEMPs was made for the date 2000/06/06 00 UTC (file was created in Budapest and processed by CANARI - see later for deeper explanation).

For SCREENING, shared memory version and distributed memory version using one processor gave identical results (just Jo(shared_mem)=2xJo(distributed mem), i.e. all the observations and their contributions are counted twice in SM).

For minimization, the cost function slightly differs between SM and DM runs. The initial Jo is the same for the first 2 iterations, then it starts to diverge. The biggest difference after 40 iterations is on the last 3 digits.

4.1.3 SGI/O2000 vs. VPP5000 run

For the validation of the installation of assimilation configurations on SGI/O2000, the cross-comparison of the results of the screening and of the minimization job between the SGI and the "reference system" - VPP5000 in Toulouse was made.

Reference date was 2000/06/06 00 UTC. The first guess was the 12h ALADIN/HU forecast. The observation file was created in Budapest. It contains SYNOP and TEMP observations, and it has passed CANARI to initialize all necessary values.

Screening: Some small differences were encountered. The Jo cost function have very similar values on both platforms: For the numbers of rejected observations, the total amount was similar, but not the reason for the rejections.

Minimisation (e131): The minimization job comparison was not done because of non-compatible representation of the integer values in ALADIN installation on both machines. On VPP, integers are defined as 4 bytes, but on SGI they are considered to be 8 bytes long. As a consequence, the external STABAL files (in binary format) created on SGI (with 8 bytes integers) were not properly read on VPP (which tried to read them into 4 bytes variables).

There is an option to redo the cross-comparison of e131 on NEC SX4 in Prague.

4.2 PROBLEMS, OPEN ISSUES

4.2.1 PROBLEM WITH LBGOBS

During installation a problem was spotted in the unproper setup for satellite data (setup below SURAD routine in case LBGOBS=.TRUE.).

Therefore we have decided to use LBGOBS=.FALSE. (in NAMVAR), however this solution will not be proper in case the satellite data are to be used, so this problem should be later investigated.

4.2.2 PROBLEM WITH LOCAL DATA

The observation input files are created from the local SYNOP and TEMP database using MANDALAY software. But those files were not suitable for the screening (for unknown reason, all data were rejected, according the listing, they had too big observation error or/and they were over the sea). If we use the LACE observation file from Prague (this is partly created in Toulouse after ARPEGE screening and completed in Prague with SYNOP data, then passed to CANARI quality control), there were no problems in screening run, observations were processed.

There was a suspicion that there are some uninitialized values in the initial locally created obs file, so we tried to set them (observation error σ_o and the station pressure) - see the explanation later - but without any success. (REMARK: we have seen in all our attempts that we have never managed to set properly the σ_o for geopotential. After visualization of the obs-files this value was always uninitialized after screening, although we have set it in the input file.)

But if the obs file created in "standard" way passes the CANARI run, we can use it as the input for the screening. Obviously CANARI is able to initialize the missing values properly, but screening is not. (Although it may seem to be strange that we perform screening - what is variational quality control - on the data which were already used in another configuration, this was the only technical way we have found to overcome problems with rejected local data). This problem was reported to Toulouse.

4.2.3 LOBSTL PROBLEM

The fact that 3dvar is still a young model configuration was strikingly underlined by the finding of a bug for the case where LOBSTL=L131TL=.TRUE. It was found that the minimisation per se is performing well in both LOBSTL=.F. and .T. However, in the latter case, a bug produces wrong output files POS1/POS2: the mean wind is missing from the written wind field, so that POS1/POS2 files are presently useless for forecasting purposes.

Finally it is noted that the surface CANARI analysis after 3DVAR altitude analysis was not yet tested.

5. Final discussions

5.1. NMC STATISTICS

The plans basically concern the Budapest work:

- make a thorough study of the properties of the NMC stats with respect to conventional/lagged, time window, validating time. This study will tackle both predictability aspects (how does the ALADIN forecast error build up ?) and clarify which type of statistics can be used for 3dvar. The work will be performed through spring/summer/fall 2000 by Gergely Boloni, student at Eotvoes Lorant University.

- make basic validation of 3DVAR, using the conventional NMC stats. Firstly, single obs cases should be tested, then real cases (fall/winter 2000)

Generally speaking, it is clear that a decision will have to be taken in early 2001 on the type of statistics that have to be used in ALADIN 3DVAR. The choice between conventional, large scale stats and lagged, mesoscale ones is crucial for the definition of the cycling strategy in data assimilation context.

5.2. CASE STUDIES

In addition to the preliminary cases that would be tested in Budapest, both Toulouse and Prague will start to run 3dvar analysis and subsequent forecasts on specific cases. Prague can concentrate on 1 or 2 cases, and compare the conventional and lagged stats behavior.

Once results from the DFI-blending double suite in Prague are official, considerations for using blended data as first guess in the 3dvar could start. Maria Siroka could then firstly assess the impact of blended data in the innovation vector, and secondly , if needed, recompute NMC stats from those data (note that in the case of lagged stats, a new type of "lagged/blended" forecasts would have to be performed, where coupling data would have to be blended instead of ARPEGE analysis). Wafaa Sadiki's work on the a posteriori evaluation of 3DVAR consistency will give some input for this topic as well.

Toulouse will also produce case studies. There is presently already some work started on the impact of the DFI initialization on the analysis increments (Adam Dziedzic). A comparison between Prague and Toulouse cases could give some input on the sensitivity of 3DVAR with respect to the amount and type of observations, and with domain orography and size.

Systematic analysis+forecasts experiments are also planned in Toulouse, without data assimilation cycle, to obtain a first evaluation of the 3DVAR with respect to dynamical adaptation.

In 2001, Budapest would then join this common effort on case studies and 3dvar evaluation.

5.3. NOWCASTING

Since the most important part for the nowcasting application, namely the surface analysis, is still an optimal interpolation, the potential use of 3dvar here is expected to be marginal for the time being. Thus, we do not consider nowcasting to be an issue at short term.

5.4. DECISIONS FOR EXCHANGE OF INFORMATION

It was noticed that the above described work is subdued to some "kick-up" decisions concerning:

- treatment of the E-zone
- impact of DFI on the increments
- factor REDNMC (= weight of Jo over Jb)
- provide reference namelists. here only the need for LOBSTL=.F. was found compulsory, although the corresponding bug should be fixed quickly.

5.5. PROGRESS PLAN

June 2000: based on the work of Wafaa Sadiki and Adam Dziedzic, decisions on E-zone treatment and REDNMC coefficient

July 2000-December 2000: in Toulouse and Prague, case studies. In Budapest, systematic review of NMC stats and preliminary validation of 3DVAR on SGI.

Late 2000-first semester 2001:

- systematic analysis/forecast scores (Toulouse)
- considerations on the use of blended data (Prague)
- specific case studies - evaluation of 3dvar (Budapest)
- first considerations on cycling: how to mix an ALADIN guess with observations and ARPEGE coupling data ?

Acknowledgments

The participants of the 3DVAR workshop in Budapest are grateful to Gabor Radnoti for providing a stable working ALADIN cycle and helping in finding the remaining bugs for 3DVAR. We would like also to thank Waafa Sadiki for providing the initial scripts and namelists for our work.

Influence of the coupling on the 1999 Christmas storm prediction by ALADIN/LACE

(more details David DVORAK, CHMI)

A study of the influence of the coupling frequency and method on the prediction of a fast moving cyclone by ALADIN/LACE has been made on the case of 26/12/1999 storm. Although the operational ARPEGE which is used as the coupling model for ALADIN/LACE did a very good job and predicted the cyclone track and depth very well, the ALADIN/LACE operational forecast failed even to reproduce the cyclone forecast from the driving model (see figures).

This failure is attributed to an unfortunate combination of the small size and fast motion of the cyclone (its speed was about 110 km/h when entering the LACE domain) on one side and the too long coupling interval of 6 hours on the other side. Indeed, the cyclone entered the ALADIN/LACE integration domain on 1999/12/26 03UTC and passed through the thin model coupling zone (about 100 km wide) just between the coupling update (at 00 and 06 UTC). The signal was therefore lost and not captured by the internal domain solution.

In order to improve the forecast a set of several experiments was done:

- 1. using wider coupling zone (NBZONL, NBZONG)
- 2. using shorter coupling interval (experiments AA3H, AA1H)
- 3. using different method of interpolation of LBC (experiment AQ6H)

The starting time for integration of all experiments mentioned above was 1999122512, operational reference is ALAD.

1. Using wider coupling zone

The aim was to enlarge C-zone twice. This was not fully possible to do because of the failure of the algorithm computing the relaxation weights in the coupling zone corners (subroutine SUEBICU). The maximum possible combination was NBZONL=12, NBZONG=10 (recall the default settings NBZONL=NBZONG=8). This brought basically no improvement of the cyclone forecast compared to the operational one. Hence, enlarging the C zone is not an issue.

2. Using shorter coupling interval evergreen of LAM modelling

It is quite evident and also proven, that using a shorter interval of the coupling brings positive influence to the resulting forecast because of more frequent update of the information on the in-flow boundary of integration domain. Currently used 6 hour interval is a compromise between the ''optimal'' coupling demand and the telecommunication constraints. Focusing on our extreme case one can see that forecast with 3 hours coupling interval is significantly better than the operational 6 hour interval in terms of both the localisation and the depth of small cyclone entering the LACE integration domain (see fig.4, fig.3).

The verifying analysis minimum was 974 hPa in the centre of that cyclone on 1999/12/26 at 06UTC (NW of France), while the observed minima were about 960 hPa!. Operational reference 6h LBC run gives value 988 hPa with no cyclone, just converging isobars. The 3h LBC test gives value a 976 hPa low precisely localised when compared to the observations.

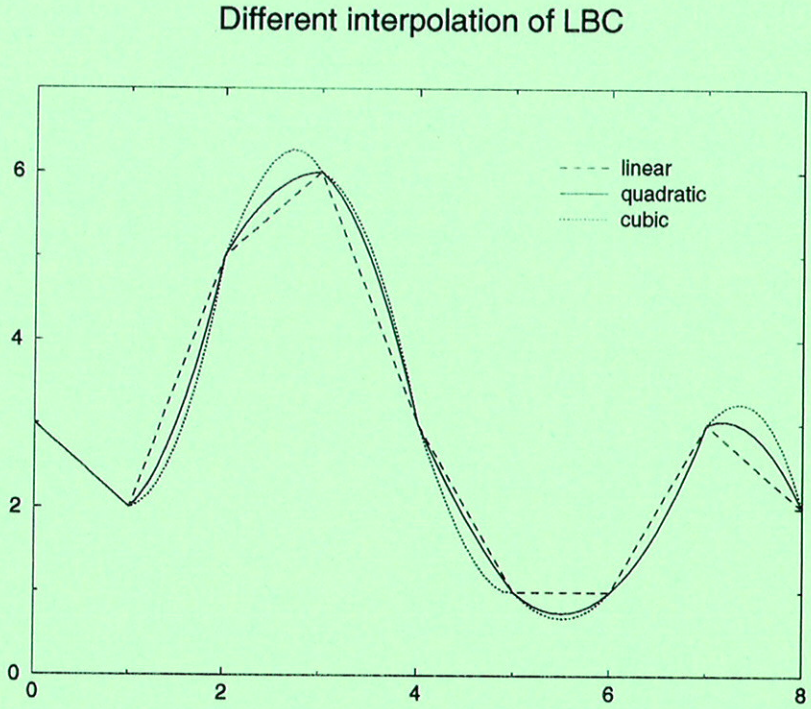
6 hours later one can see first closed isobar 982.5 hPa in 6h LBC run, placed a little bit more to the east than in the 3h LBC run. The centre of the cyclone in latter case has 972.5 hPa with exact position. Corresponding analysis gives the minimum 974 hPa.

After further next 6 hours the pressure in the middle of cyclone rapidly grew to 980 hPa. The 3h LBC run starts to undershoot the pressure, it gives 972 hPa placed roughly 2.5° East from the observed cyclone centre. The 6 h LBC starts to have better forecast of minimal pressure but localisation of the centre is roughly 4° misplaced. This discrepancy probably comes from both the model's dynamics/physics and the lateral forcing of ARPEGE, which also undershoots the cyclone pressure in later hours of the forecast.

Another experiment with 1h coupling frequency (AA1H) was performed (just for the comparison with the experiments mentioned above). The position of small cyclone was forecasted well (the same as for AA3H) and the pressure was further lower in the cyclone centre, for example 969 hPa on 1999/12/26 at 12UTC.

3. *Using different method of interpolation of LBC : "never-green" of LAM modelling*

At least for the time being. The quadratic temporal interpolation of LBC was coded already two years ago. After validation over some period it turned out, that from the scores point of view, the results were neutral. Since the computation required a little bit more CPU time and memory, it has never been used operationally. Nevertheless the algorithm has been kept in the code (LQCPL key).



Experiment made on the presented extreme case however shows that using LQCPL may bring a positive impact on the results because it provides a better interpretation of the coupling information between the coupling events (updates).

Comparing reference experiment AA6H (fig.3) with AQ6H (LQCPL=.TRUE.) (fig.2) one can see a first closed isobar in the AQ6H case already on 1999/12/26 at 09UTC, while in the AA6H case it was only 3 hours later. After next 3 hours AQ6H cyclone was 3.5 hPa deeper then AA6H with more precise localisation. Using LQCPL=.TRUE. the model processed the coupling information better and better generated the cyclone in the internal solution. Further on, an experiment AQ3H using both 3 hour frequency and quadratic interpolation (see figure) performs as good as the one using 1 hour frequency (AA1H). This brings an important conclusion: further increase of the LBC update frequency beyond three hours may not be necessary when the quadratic interpolation is used.

Based on this conclusion we tried to move one step further to cubic polynomial interpolation. Results for the studied case were optimistic, the development of the cyclone was faster than for the quadratic interpolation. However the model run over a period of two weeks showed clear deterioration of skill scores. Therefore other experiments with higher order polynomials were abandoned. The problem is probably linked to the ''overshooting'' of interpolated values by higher-order polynomials. An example of used polynomials for interpolation can be seen on fig.1.

The scores of a two-week parallel test of ALADIN/LACE with the quadratic coupling are available at *http://www.chmi.cz/meteo/ov/lace/aladin_lace/partests/aav/* showing a slight reduction of RMSE and bias of the geopotential in the troposphere.

Basic idea of quadratic coupling:

Coupling files for ALADIN/LACE from the ARPEGE model are available only at some forecasting times, currently it is every 6 hours of the forecast. In the course of ALADIN/LACE forecast the lateral boundary update (the coupling) is however made in every time step. Therefore an interpolation in time is needed to obtain intermediate boundary values between the times the coupling files are available.

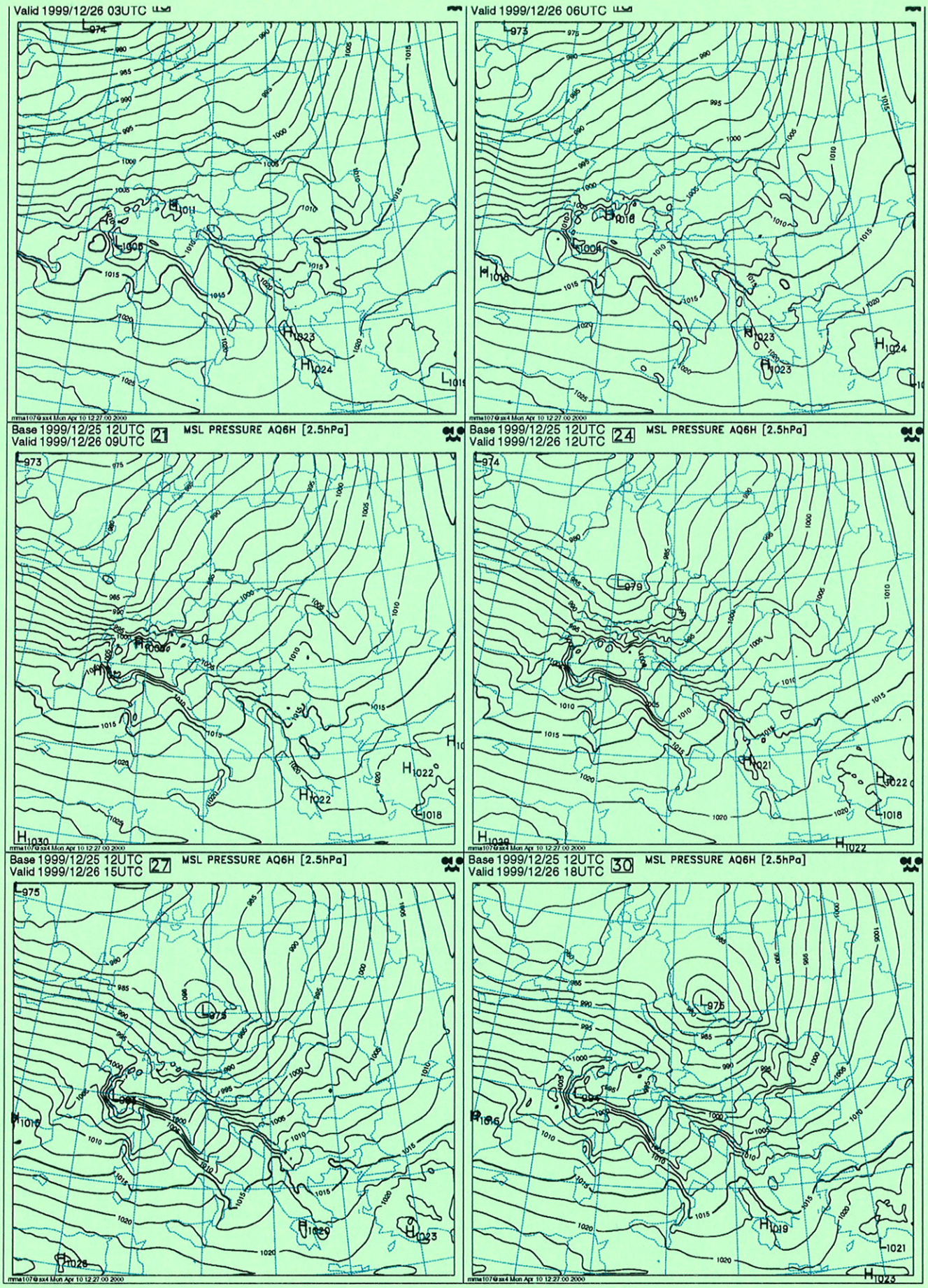
So far a simple linear interpolation between two consecutive coupling files has been used. Quadratic interpolation means that a piece-wise quadratic function is used for interpolating from two previous and one following coupling file (e.g. integration between 18 and 24 h will use the coupling files for 12, 18 and 24 hours). The only exception is the first interval (0-6 hours) which keeps the linear approach (since there is no ''-6h'' coupling file).

This interpolation is still far from advanced interpolations like the cubic splines which would require the knowledge of all interpolated values in advance. Because of operational constraints one can not wait for the last coupling file and start to integrate only after receiving it. Instead, the forecast starts immediately at the moment when the second coupling file is available and that is why the interpolation within 00 – 06 interval must be linear in any case. Later on the information from three LBC files is used in the quadratic interpolation. The resulting curve of interpolated values is certainly better than the normal linear one but of course yet not smooth in any mathematical sense.

4. *The conclusions*

The presented technique of the quadratic coupling improves the model ability to cope with the extreme cases of a fast moving cyclone while being rather neutral in a long-term skill. The algorithm entered the operational suite of ALADIN/LACE on 12 April 2000. The optimal operational target would be the combination of 3h frequency and piece-wise quadratic interpolation of LBC in time.

The method and its use is an intermediate result of the ongoing research carried on by the RC LACE Prague Team focusing on the coupling issues in ALADIN.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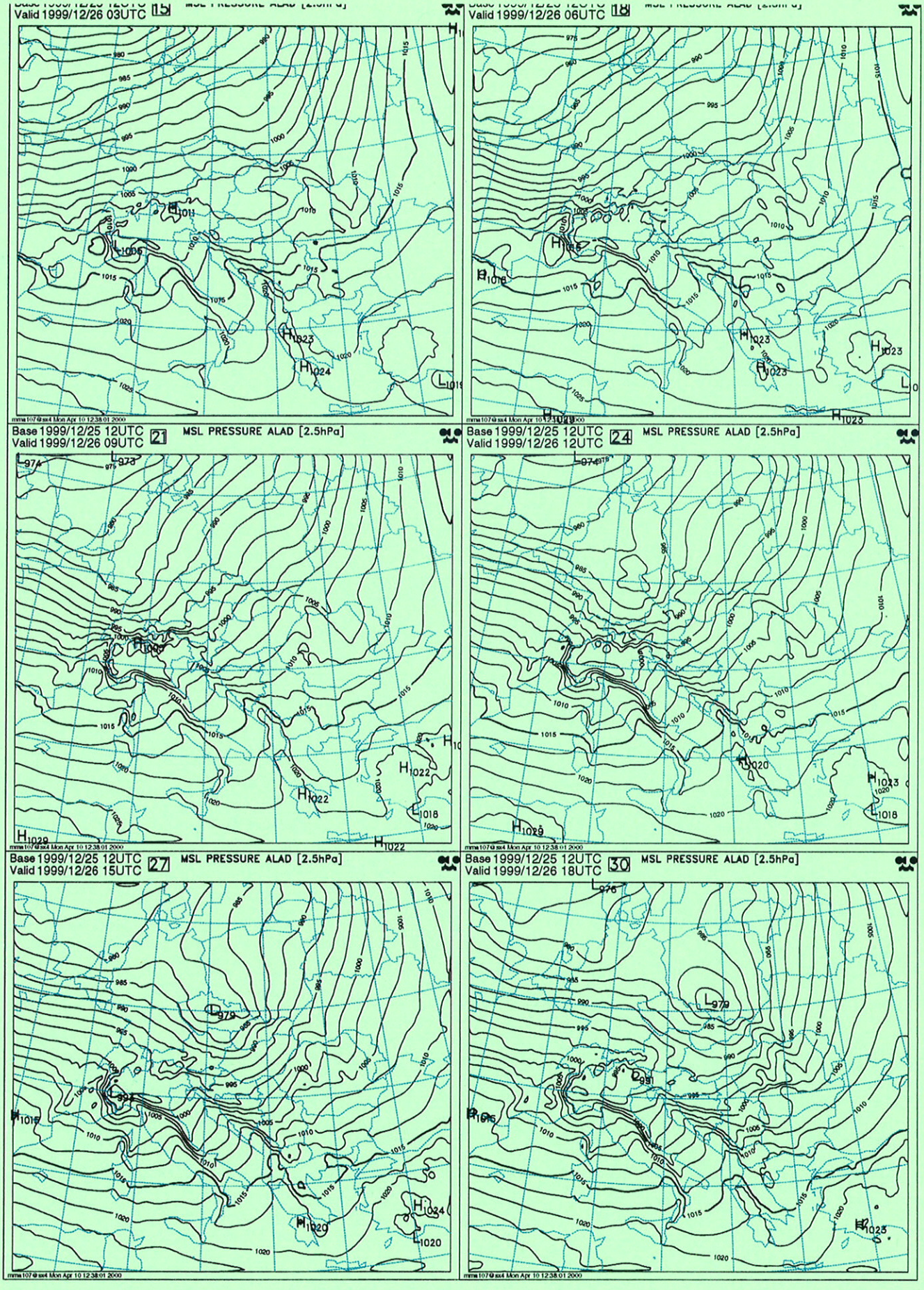
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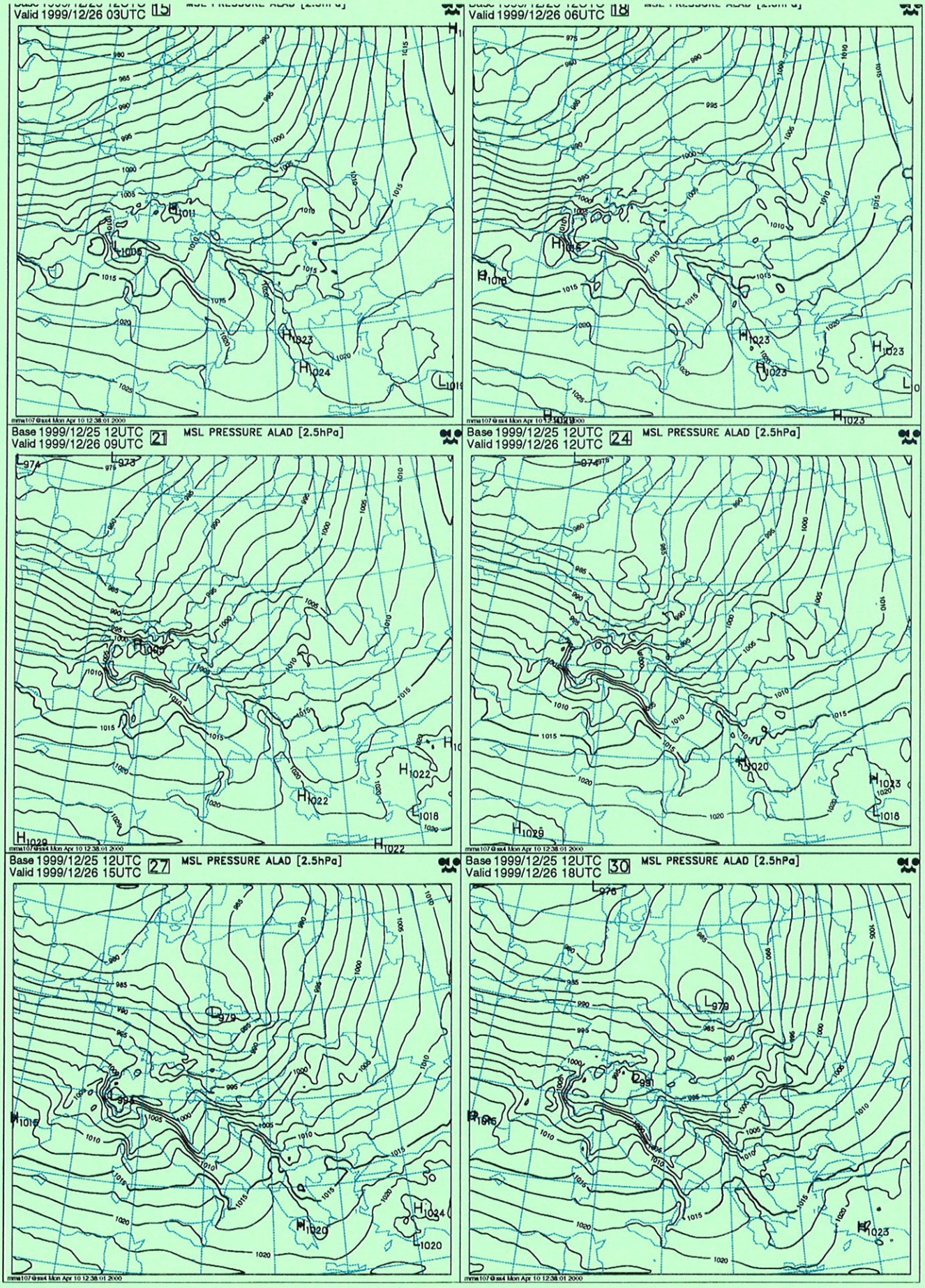
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Parametrization of Lakes

(more details, Sandor Kertez, HMS)

1. Introduction

At present, in ARPEGE/ALADIN lakes are treated in the same way as sea, so their surface temperature (Ts) is kept constant during the integration and they are characterized with their monthly climatological values. The main problem with this approach is that the initial values of surface temperature of lakes are not reliable in the model. Recent modifications in the code made it possible to use the correct monthly climatological values as initial values for the lakes. The first task of this study was the investigation of the effect of these modifications to the forecast of ALADIN. While, the second task was connected to the design of a simple lake parametrization model with the modification of the ISBA scheme in order to describe the temporal variation of Ts and the ice conditions on lakes.

2. Investigation the effect of changing the Ts on lakes in ALADIN

There are two problems with the initial values of Ts of lakes in ARPEGE/ALADIN. The first problem is that lakes are usually not described in the low resolution input datasets of configuration 923. So in

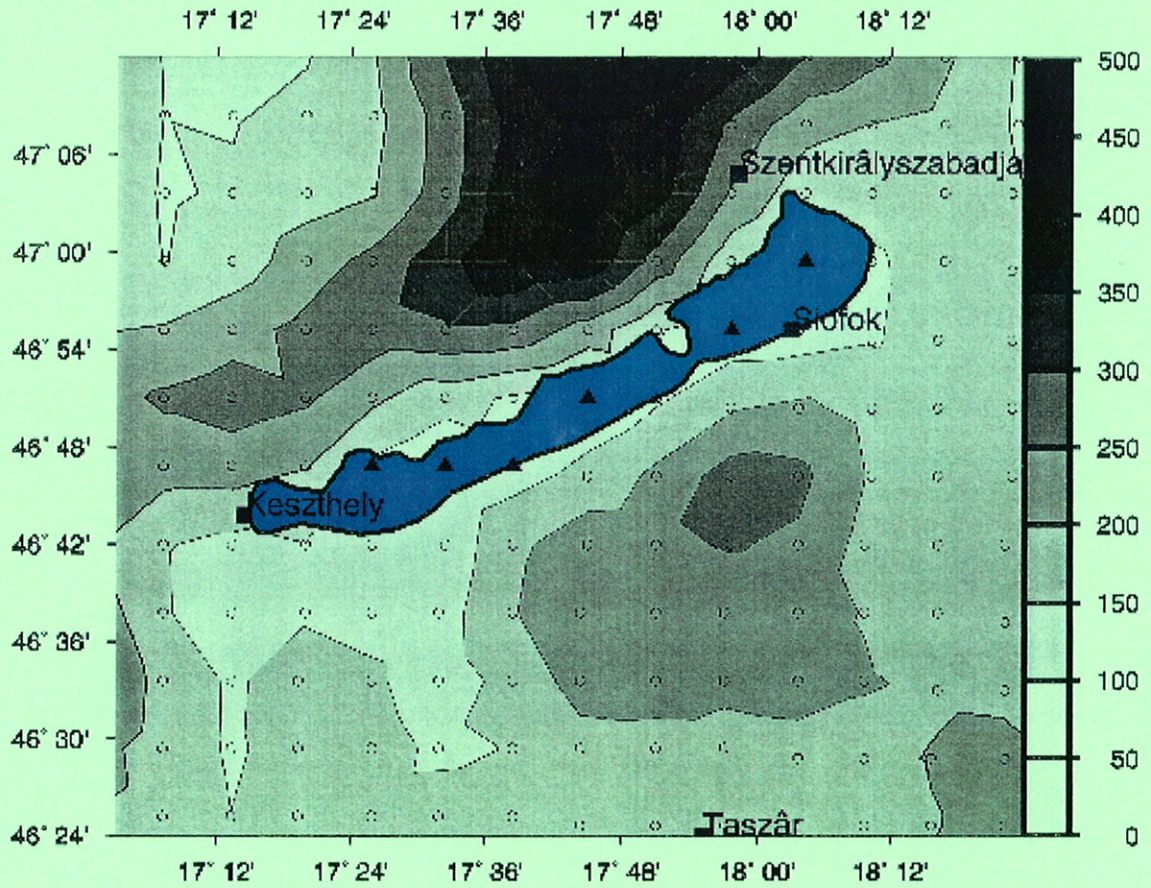


Figure 1: Orography (m) and gridpoints of ALADIN/HUNGARY near Lake Balaton (Triangles denote water-gridpoints, squares denote synoptic stations)

the absence of data the monthly climatological values of Ts will be extrapolated from the SST values of the nearest sea gridpoints. The second problem appears in the creation of the initial conditions for ALADIN. Since, in configuration 927 the difference between Ts and its monthly climatological value is interpolated to the target geometry using the land-sea masks and then it is added to the target climatological value. So if the lake is represented only in the target domain the result could be quite unrealistic (Figure 2).

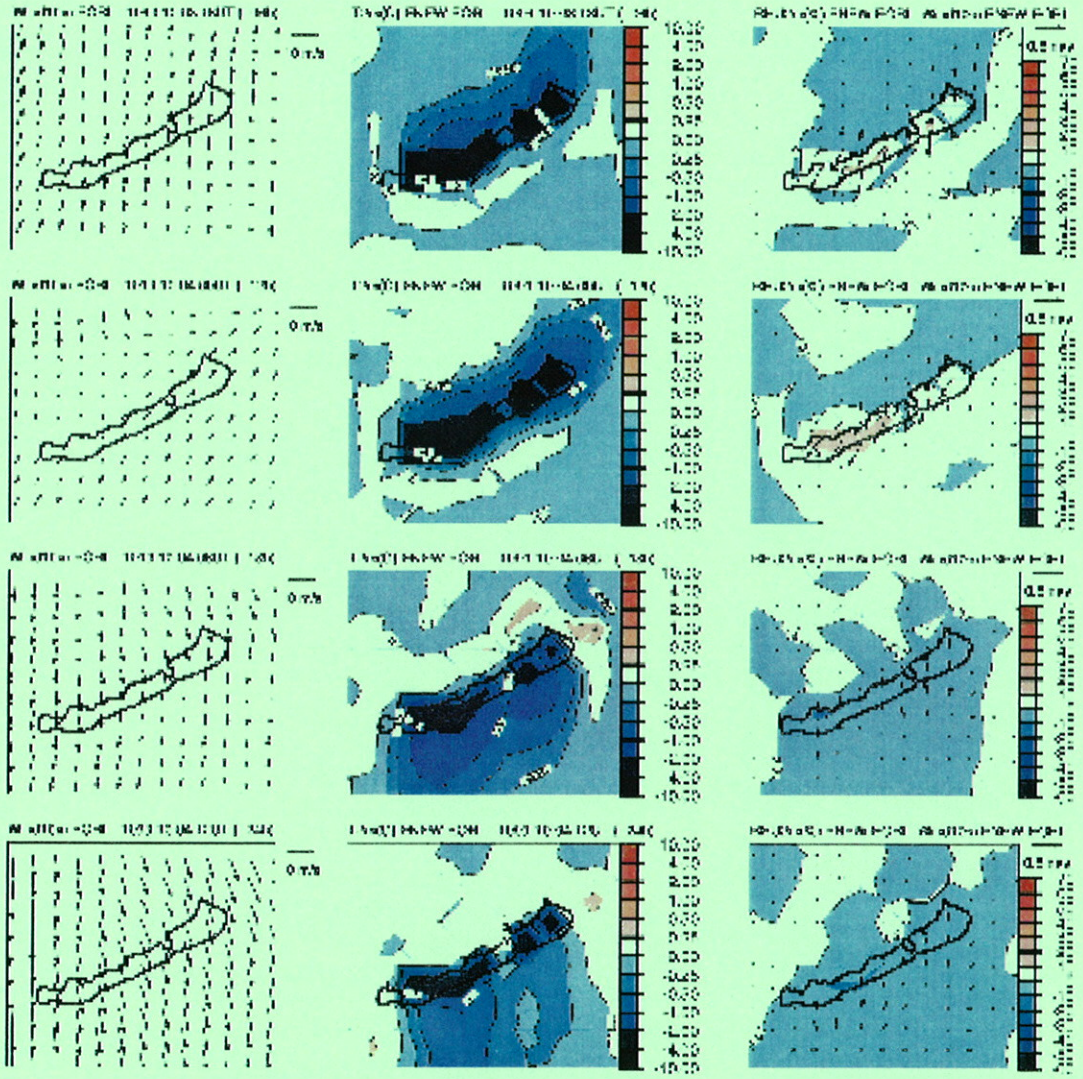


Figure 2: Surface temperature of Lake Balaton in October 1999
(i) ALADIN/HUNGARY
(ii) Observation
(iii) Monthly mean of observations (1995-1998)

In the experiments the case of Lake Balaton in Hungary (Figure 1) was investigated and cycle AL11T2.05 was used with the operational ALADIN/HUNGARY domain. The coupling was based on ARPEGE. For each investigated date, two different initial lake temperatures were used: the original one that comes from the operational settings (in what follows EORI) and the correct monthly mean based on observations (in what follows ENEW). Mainly those dates has been selected between 1999/06/01 and 2000/01/31, when the surface temperature in EORI was extremely warm.

The 2m temperature (T2) and 2m relative humidity (RHU2) forecasts were verified with the observations of the four synoptic stations around Lake Balaton. The biggest impact in T2 was found at Siofok: the mean error in ENEW was smaller by 1 C on average, which improved the forecast in most cases. For the other stations the forecasts were nearly the same for both experiments. The cooling effect of the colder lake temperature strongly depended on the advection (Figure 3). When the wind was weak

the cooling effect stayed local even if the lake was colder by 20°C. The colder lake temperature significantly reduced the evaporation on the lake. There were two cases with dry weather, high pressure and slight wind when the evoporation in the daytime decreased to almost zero. This phenomenon was caused by an extremely strong inversion over the lake in ENEW, even in the beginning of the integration, which blocked the turbulent transport between the surface and the lowest model level.

3. *Lake parametrization*

The ISBA scheme (Noilhan and Planton, 1989) with the SWF2L (Two Layer Soil Water Freezing) scheme (Bazile, 1999) was modified to simulate a lake. At first, the following basic modifications were made:

- In ISBA the time evolution equations for Ts and Tp (the mean of Ts for one day) and the formulation of the thermal coefficients are based on physical properties of the soil such as heat conductivity. In the case of a lake the turbulent mixing is a more intensive transport process near the surface so this approach cannot be applied. For the sake of simplicity it was supposed that these equations are formally valid for lakes, but Ts is the mean temperature for the whole water column and the characterisctic time for Tp is a properly set parameter. So the lake was supposed to be a well mixed water column, with uniform temperature.
- Both the surface and the deep reservoirs were forced to be always saturated.
- The surface ice content was taken into account in the formula of albedo and emissivity.

The experiments were carried out with the simplified 1D model which describes only the soil and surface processes and requires atmospheric forcings. Because the necessary observations were not available for a real la,ke the dataset measured at Col de Porte (in the Alps) between 1995/08/13 and 1996/08/12 was used. The best simulation was able to describe the changes of the surface temperature and the freeze/thaw cycle of a 3m deep lake (Figure 4), but to achieve this result further modifications were necessary:

- Snow was eliminated from all the equations.
- Ice formation was allowed only in the superficial reservoir.
- A new flux was introduced in the time evoulution equation of Tp in order to describe the heat conservation properties of the lake during the ice period.

4. *References*

- Bazile, E. (1999). The soil water freezing in ISBA. In HIRLAM Newsletter, Number 33, pp. 92-95.
- Nolihan, J. and S. Planton (1989). A simple parametrization of land surface processes for meteorological models. Monthly Weather Review 117, 536-549.

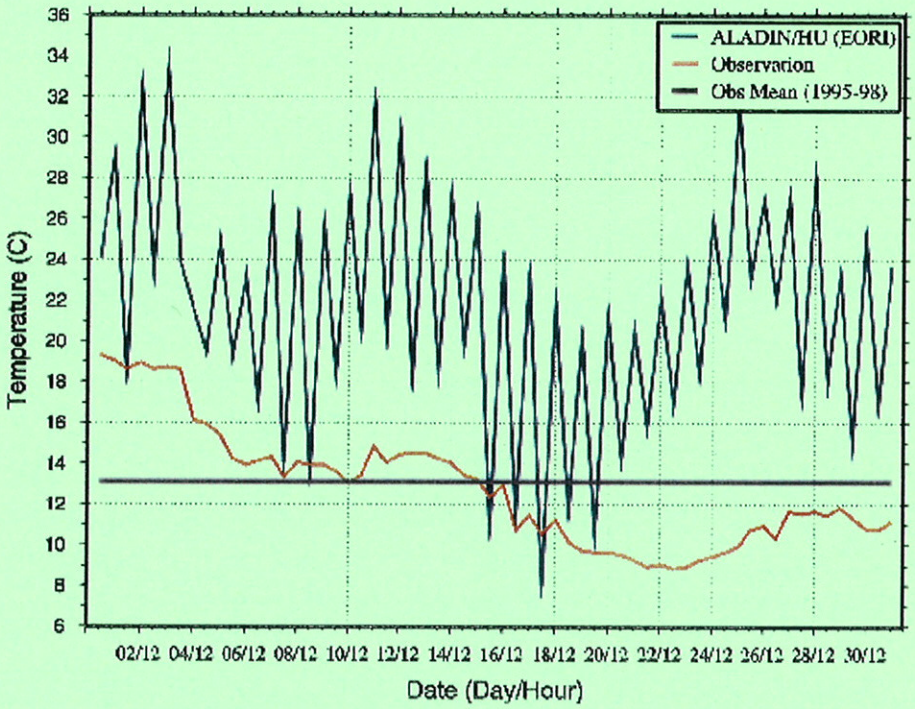


Figure 3: Effect of changed lake temperature to the forecast of ALADIN/HUNGARY (Run:1999-10-03 12UT). (The lake in ENEW forecast is colder by 21 C than in EORI forecast)

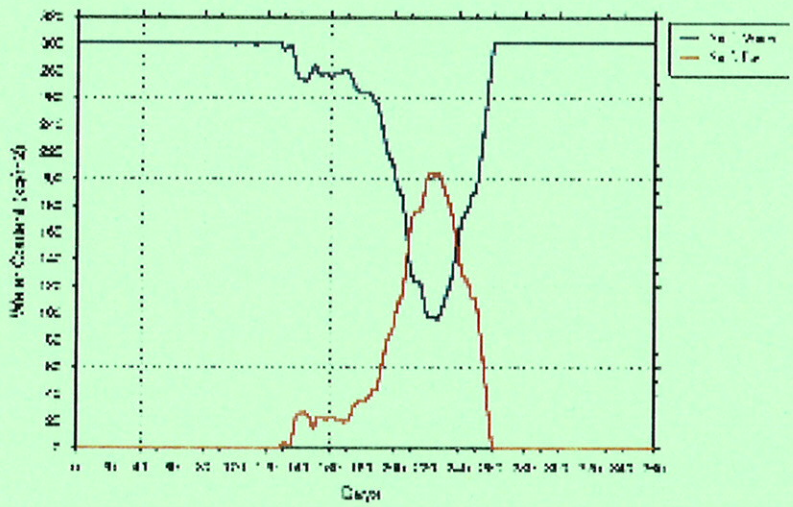
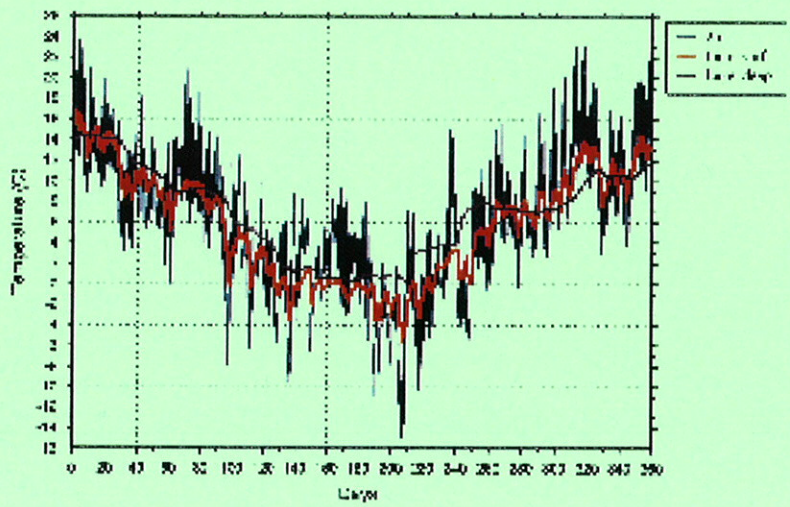


Figure 4: Superficial water content and temperature of the simulated 3m deep lake at Col de Porte from 1995/08/13 to 1996/08/07



Ozone profile fitted to Bucharest measured data

(more details, C. Rada, A. Sima, M. Caian, NIMH)

1. Abstract

A new function has been tested to express the climatic vertical profile of the ozone in the Aladin model, for integrations over Romanian domain.

For that 10 years of SBUV/2 NOAA11 data and daily measured data at Bucharest have been fitted by a function, similar to the Arpege one but with one additional degree of freedom, a variable exponent.

Monthly triplet of constants gave the new monthly variable profile function, as well as daily triplets fitted the daily measured values. For a period of time, in parallel to the operational run, two more runs were executed: a run with the monthly climatic profile and another with the daily fitted profile. The assumption made was the constancy of the profile in the integration domain: studies based on measured data show, usually, a slow latitudinal variation over Romania territory. A variation with latitude and longitude has been finally tested but fitting satellite date, due to the fact that one single DOBSON spectrometer UMKEHR measurement data, at Bucharest, is available. The impact of the ozone vertical profile on the forecast has been tested.

2. Climatic profile at Bucharest

In the Aladin model, the integrated ozone is a function of pressure, being defined by the following expression : (1)

$$\int_0^p q_{O_3}\,dp = \frac{a}{1+(b/p)^{3/2}}$$

Using Umkehr profiles provided by SBUV data selected for the geographical position of Bucharest, monthly climatic vertical profiles have been constructed based on a 10 years interval. For these profiles a new function has been fitted, with small differences comparing with the one used in the Aladin model, having the following form: (2)

$$\int_0^p q_{O_3}\,dp = \frac{a}{1+(b/p)^{c/2}}$$

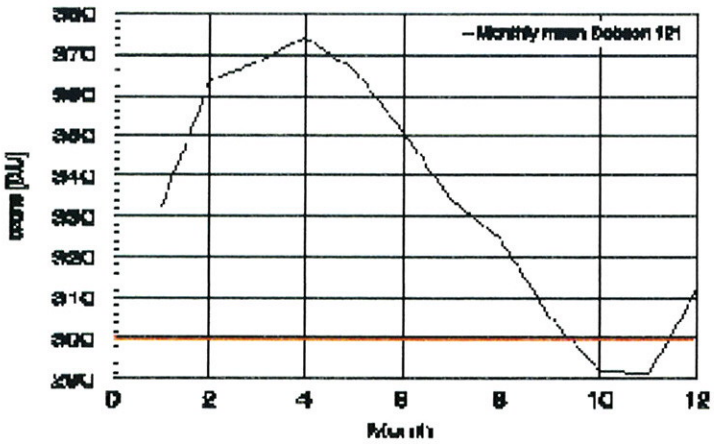
The monthly variation of the triplet (a, b, c) used in the numerical experiments for the new function of the vertically integrated ozone amount are presented in the following table: (Table 1)

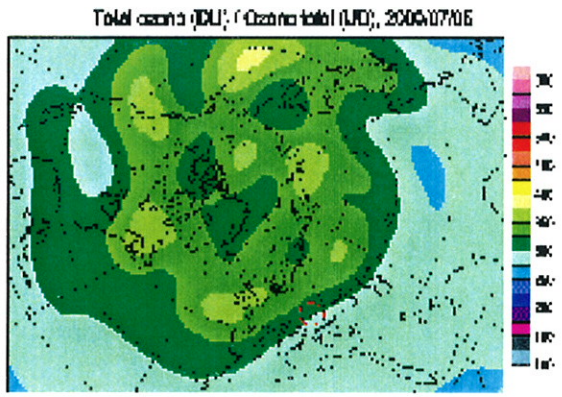
Month	A [Pa]	B[Pa]	C
January	0.070335	4084.541	2.687082
February	0.068064	3817.875	2.627732
March	0.064599	3569.678	2.648133
April	0.067411	3844.202	2.650851
May	0.073363	4034.560	2.544536
June	0.072327	3909.156	2.578798
July	0.068094	3644.002	2.608211
August	0.063252	3309.811	2.651979
September	0.060063	3174.439	2.673819
October	0.060502	3282.954	2.683656
November	0.059083	3326.518	2.703777
December	0.063446	3676.920	2.700567
Aladin	0.060120	3166.000	3.000000

In the Aladin model the function is used with a constant exponent (c) equal to 3 and a, b given in the previous table. The c variable was introduced to better fit the maxima localization on altitude.

Yearly differences between the Aladin total ozone and the climatic one are shown (fig. 1), for a reference pressure of 1013 hPa. The bigger differences are from january to august with a maximum in April.

Fig 1. Climatic integrated ozone at Bucharest for a reference pressure and Fig. 2: satellite measured ozone the 5-th of july 2000





Two other methods have been tested: (M1) fitting the same function based on integrated amount and (M2) using the empirical function of Lacis and Hansen (1974), both fitted to a same climatic profile. These last two methods gave very similar results but rather different from the computation with the first method and the function of Aladin. More tests to compare these methods will be performed in a future work to find the best fit.

3. *Daily adjustment.*

In parallel daily computation have been made starting from spectrophotometer measured data: a daily profile (triplet (a,b,c)) have been obtained. The difference reported to the climatic profile was variable especially due to dynamical process, in the range of a 10-40 UD magnitude of difference.

An example is shown for the 05-th of July 2000, a case which have been studied due to its special feature: the last 100 years maxima in Bucharest, 42 C has been attaint. Satellite measured data showed that day (fig.2) a gradient of more than 50 UD difference over the domain latitudes band, which was also about the deviation in that day from the standard profile used in the model.

4. *Numerical experiments.*

The consequences of using a local climatic vertical ozone profile in the initial conditions for the short term forecast was analyzed.

First, an ensemble of 5 experiments was performed to find out the relative importance of the parameters a, b, c, on the total amount and profile shape for this region. A closer attention was given to the simulation of the 5-th July 2000.

The domain of the numerical simulations is the operational one in Romania, at 10.3 km. horizontal resolution, cycle 11 of development of the Aladin model.

5. *Results.*

A serial of 3 experiments has been daily performed for few days in february, april, may and july. The operational run was compared, together with a daily adjusted vertical ozone profile and a monthly climatic adjusted profile integration, against observations.

In parallel, the sensitivity to small variations in the a, b, and c parameters of the function (2) was analyzed for the climatic profile, keeping two of the parameters constants the third being slightly modified. The parameter c, controlling the maxima position on altitude showed the bigger impact on the integration result. The a parameter, with a major control on the total column amount, showed less sensitivity if the profile shape was unchanged at a same percentage of integrated amount variation as for the experiment controlling c parameter.

The mean skills over the tested situations in may (for which sensitivity experiments have also been done) are shown, for the 2m. temperature in the table 2. The global skills show small improvement, averaged over the domain, but differences reported to the operational solution lied in the interval (-2C, 2C), with even larger interval in july ((-4C,4C) for the 5-th of july). Climatic run showed in general better forecast, maybe due to the main assumption made: the generalization over the whole domain of the profile fitted at Bucharest, hypothesis better fulfilled at climatic range.

	Mobsv	Mforv	Miner	Maxer	Mer	Maer	Std
Oper	21.98	21.55	-4.49	4.70	-0.43	1.42	1.75
Run	21.98	21.56	-4.44	4.73	-0.42	1.41	1.74
climatic	21.98	21.62	-4.41	4.78	-0.33	1.40	1.73
A_mod	21.98	21.58	-4.46	4.82	-0.40	1.41	1.76
B_mod	21.98	21.54	-4.50	4.75	-0.41	1.41	1.74
C_mod	21.98	21.60	-4.45	4.77	-0.38	1.40	1.74

Table2: Mean skills over the tested situations (may) for the 12 hours 2 m. temperature (mean of observed field, mean of forecasted field, minimum error, maximum error, mean error, mean absolute error, standard deviation)

The 05-th of July 2000 simulation was simulated by the two usual runs: the daily and the climatic fitted and, due to it's special feature (last 100 years maximum at Bucharest of 42 C) two more simulations have been performed: a mixed vertical profile (COMB) in order to better approximate the real measured data (Fig.1), and the experiment M1. The climatic run overestimated (cf. Table 1 data) the Aladin total integrated ozone amount, the daily fitted profile (at Bucharest) was close to Aladin profile (slightly underestimating Aladin profile), which is that day a mean of the distribution over the domain (Fig. 1).

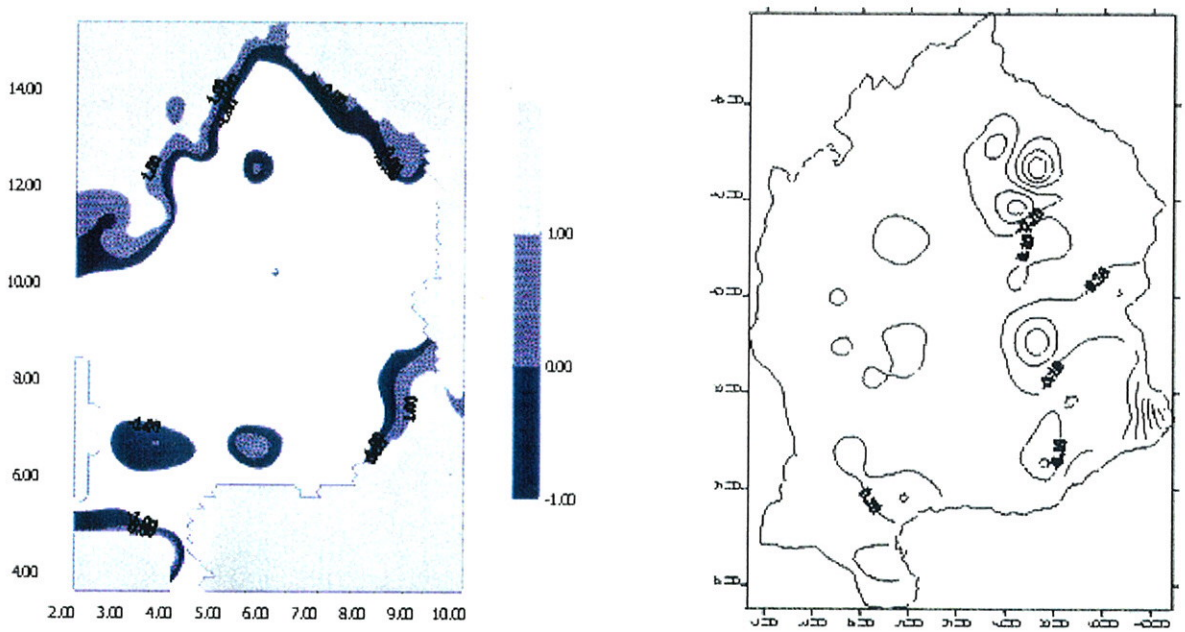
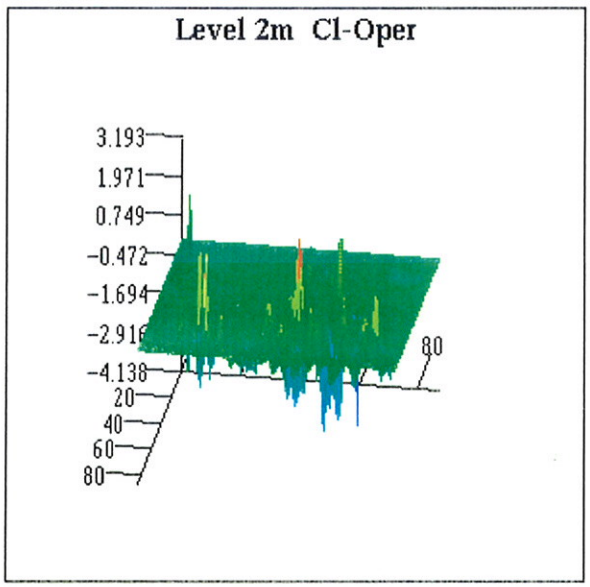


Fig 3 : a) climatic data run against observed values (-1, 1) belt; b) climatic data run against Aladin in observation points for 2m temperature.

It means that the climatic data run should improve the northern part at short term, Aladin run should show better average skills while the daily fitted run should improve the southern part. All these features are indeed shown by the three runs: fig 3 and fig.4 show the differences between climatic data run and observation, respectively differences between climatic and Aladin runs.

Maximum improvement of the climatic data run is to be found superposing absolute minimas on the first chart with maximas on the second. We find indeed the bigger positive impact in the northern (NE) part of the domain.

It is to be precised that the highest improvement was realised in strong convective activity areas: for example in the north-eastern observation point in Romania were measured 64 mm precipitation in 24 minutes, and it is the point were the bigger correction was attained: 1.5 C (fig 4 d shows the convective potential at 12 hours computed by a method described in Olessen et al. , 1992) . This result confirms the results obtained also by other authors on limited area (Sapporo, 2000 Proceedings of the Quadrennial ozone symposium,T. Halenka).



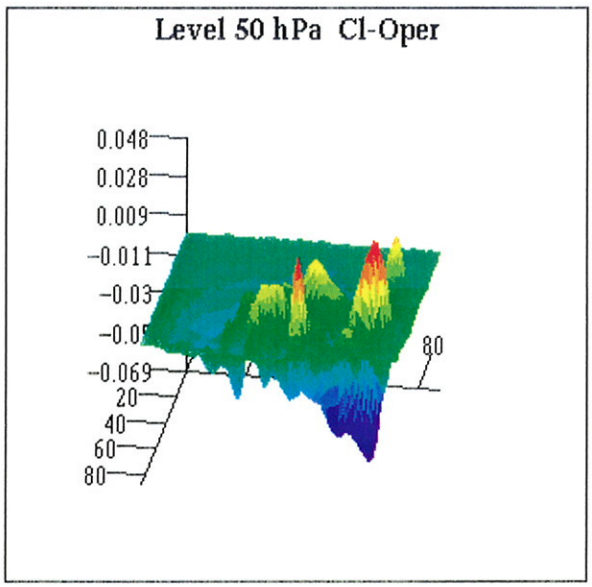
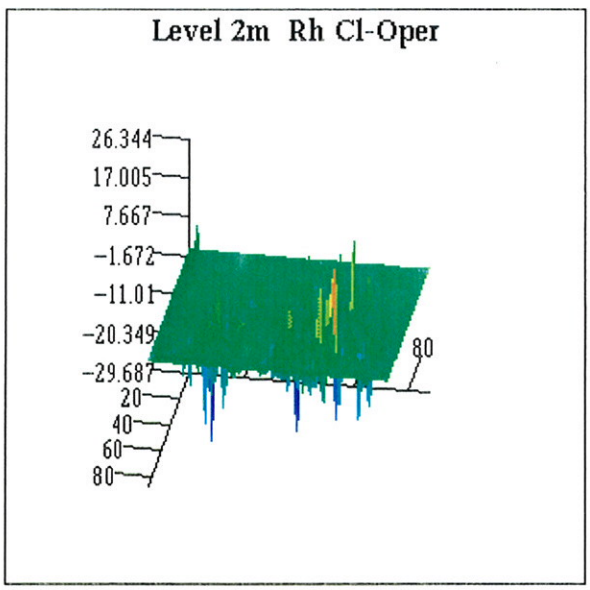
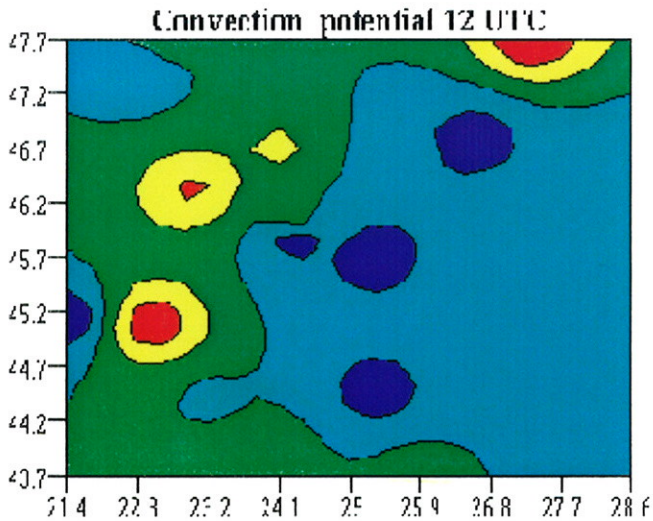


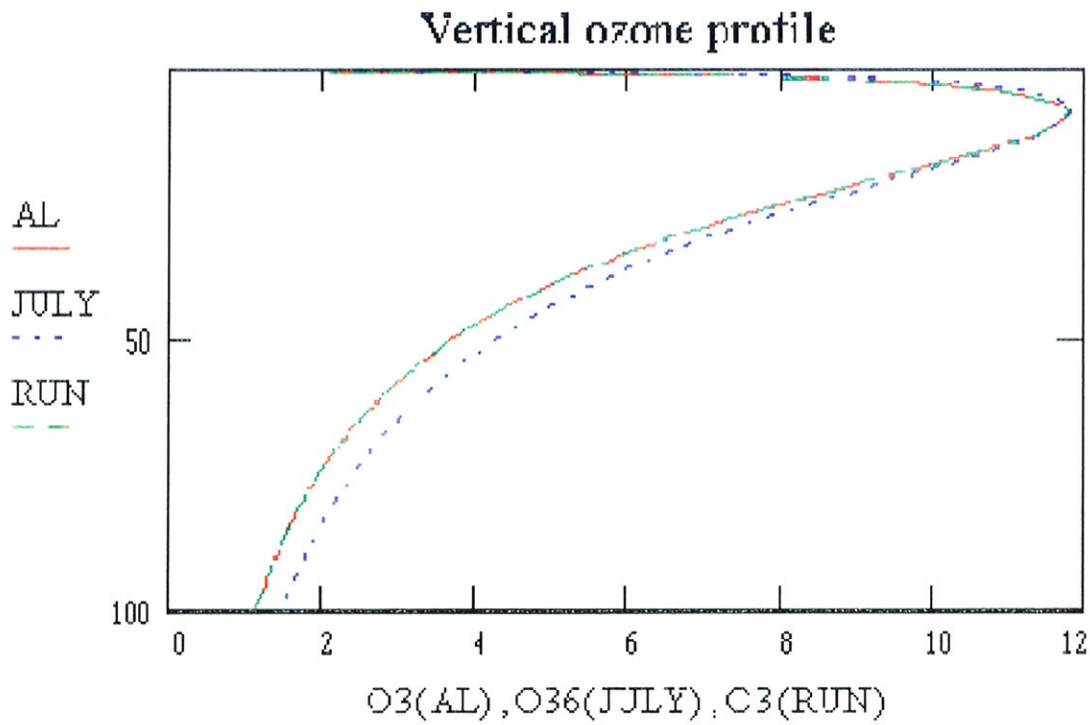
Fig.4 Differences of temperature (a- 2m, b-50Hpa level) and 2m relative humidity (c) between 2 runs using climatological and operational ozone profile after 12 hours of integration.





Maximum differences reported to the operational model are localised towards surface, because of the short range of the integration (48 hours), even if the highest ozone profile differences are in stratosphere (fig.5). In this sense the fig. 4 shows again higher differences in the northern part at all levels (fig. 4 b) but with increased values towards surface (fig. 4 a). Differences in 2m. temperature are also felt in the relative humidity at 2 m (fig. 4 c).

Fig. 5. Aladin ozon profile (function (1))together with the climatic and daily fitted profiles with the function (2), with pressure as vertical axis.



At this range, the cumulated impact on radiative balance shows (table 3) that the increase of the stratospheric ozone amount (corresponding to the climatic profile against the operational one) at about 30-50 UD leads at short term to decrease of surface absorbed solar radiation solar at about 0.1%, hence to sensible heat mean decrease of 0.65%. In opposite, a stratospheric reduction, as in the case of the experiment M1 leads to a positive, more emphasised effect on tropopause: about 0.4% on solar radiation at surface and 2.4 %for the sensible heat flux).

Cumulated mean flux over domain	CLIMATIC (JULY)	OPERATIONAL
Solar surface absorbed flux	1.5241476E+07	1.5260151E+07
Earth surface radiation flux	-4043134.	-4044040.
Latent heat flux	-5890797.	-5894787.
Evaporation flux	-2.419137	-2.420792
Sensible heat flux	-892700.4	-898550.0
Solar surface absorbed flux (M1)	1.5319988E+07	1.5260151E+07
Sensible heat flux (M1)	-920239.1	-898550.0

Table 3:

The combined run (COMB) has closer skills to the Aladin model (OPER - table 4, with same notations as in table 3). In fact, the mean integrated real amount over the domain that day is close to the Aladin profile, so we can take, only for averaged values, Aladin integration as reference. The best skills are obtained by the simulation M1.

run	**Mobsv**	**Mforv**	**Miner**	**Maxer**	**Mer**	**Maer**	**Std**
OPER	32.95	30.73	-8.67	9.55	-2.22	2.91	2.79
COMB	32.95	30.86	-8.89	9.65	-2.09	2.82	2.78
M1	32.95	30.85	-8.76	9.66	-2.10	2.82	2.77

Table 4

In opposite, both climatic and daily runs, imposing a half-true value to the whole domain increased error skills.

6. Conclusion

Ozone profile adjustment to local climatology have not a strong impact on short range forecast skills, on a limited domain model. But the amount and the vertical distribution modification, leading mainly to stratospheric amount modification leads to significant impact on tropospheric solar heating.

The experiments done using a monthly climatic profile showed that the difference can lead, in some special cases (as in the 5-th of july, 2000 case) to some local amplified impact. This can lead, through increased instability conditions to convective potential increase and to important direct effects connected with this triggering.

7. Bibliography

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- Proceedings of the Quadrenal ozone symposium, Sapporo 2000, 3-8 July 2000
- Lacis A. A., and J.E. Hansen, 1974 : A parameterisation for the absorption of solar radiation in the Earth's Atmosphere. Journal of Atmospheric Sciences, 31, 118-133

Scores of ALADIN-FRANCE during the first semester of 2000

(more details, Samuel Westrelin, Météo-France)

1. *Comments of contingency table - first semester 2000*

Tables below are the cloud cover and precipitation contingency tables for 36 hours forecast range. Classes have been defined according to the EWGLAM rules.

These classes correspond to :

RR < 0.1 mm in 6 hours : no precipitations, 0.1 ≤ RR < 0.2 : light, 2.0 ≤ RR < 10 mm : moderate and RR ≥ 10 mm : heavy. Units for classes intervals of cloud cover are octas.

In these contingency tables, the blue (respectively red) color means that the model forecasted a class of smaller (bigger) rank than observed, so it underestimated (overestimated) the parameter.

CLOUD COVER

The percentage of correct forecasts is only 49%. High cloud covers are much less often forecasted than observed (21% against 45%) majorly due to an overestimation of medium cloud covers. When the model predicts medium cloud cover class, in 47% of cases it is actually high one which is observed.

200001-200006		CLOUD COVER			
	MODEL :	ALADIN			00 H start
	AREA :	FRANX01		Forecast Range	36 H
181 days					
		Forecast			
		0 - 2	3 - 6	7 - 8	SUM
Obs.	0 - 2	**15.4%**	6.9%	0.4%	22.8%
	3 - 6	10.2%	**17.9%**	4.7%	32.7%
	7 - 8	6.9%	21.9%	**15.7%**	44.5%
	SUM	32.5%	46.7%	20.8%	43066
Correct :	**49.0%**	**Rousseau :**	**0.23**	**Heidke :**	**0.25**

PRECIPITATIONS

The percentage of correct forecasts is 74%. Globally there is a quite good agreement between the predictions of a class and the observations. A tendency to predict too often light precipitations when no precipitations have been observed appears (11% of cases). However the method of control can play a role in this sense because the observations which are representative of one location are actually compared to an average of precipitations over a mesh (what the model produces). When moderate class is forecast actually in 59% of cases no precipitations or low precipitations are observed and in 4% of

cases they are heavy. For heavy precipitations, false alarm rate and non detection rate are both very high, around 80%.

200001-200006		PRECIPITATIONS				
	MODEL :	ALADIN			00 H start	
	AREA :	FRANX01		Forecast Range	36 H	
181 days						
		Forecast				
		NO rain	LIGHT	MODERATE	HEAVY	SUM
Obs.	NO rain	**65.4%**	10.8%	1.8%	0.1%	78.1%
	LIGHT	5.6%	**6.1%**	2.5%	0.1%	14.3%
	MODERATE	1.2%	2.7%	**2.8%**	0.3%	7.0%
	HEAVY	0.0%	0.2%	0.3%	**0.1%**	0.6%
	SUM	72.2%	19.9%	7.3%	0.6%	45855
Correct :	**74.4%**	**Rousseau :**	**0.36**		**Heidke :**	**0.36**

2. *Comments of scores against SYNOP - first semester 2000*

The scores (bias and root mean square error) plotted on the next figures are calculated against SYNOP over the whole domain ALADIN-FRANCE. Scores are averaged over the first semester 2000, for each 6 hours forecast range.

We use about 200 synoptic stations over the domain.

MSLP

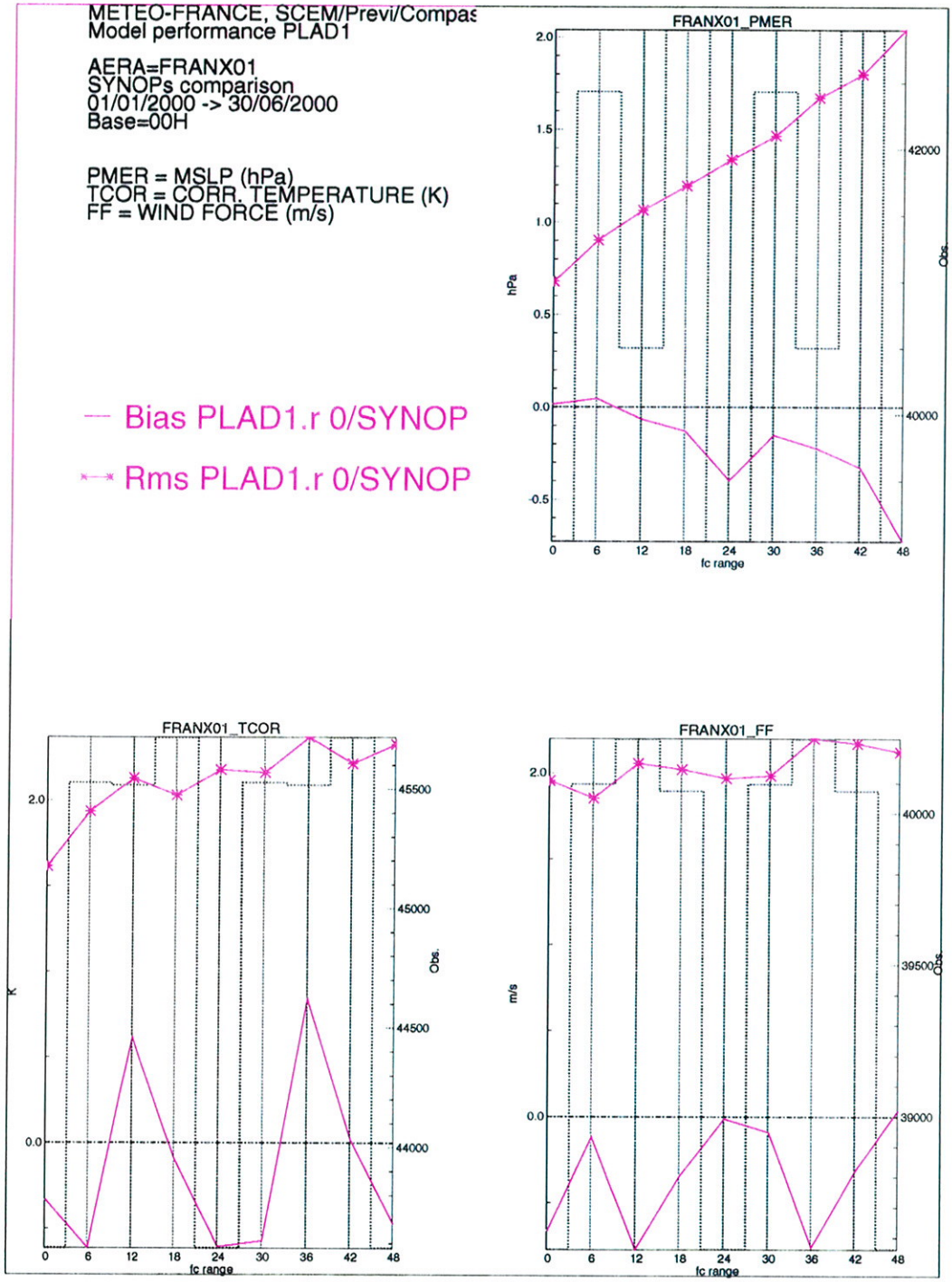
The RMS rises with forecast range from 0.7 to 2.1 hPa. The model underestimates this parameter from 12 H range till 48 H to reach -0.7 hPa.

CORRECTED TEMPERATURE

It is overestimated on afternoon (forecast ranges 12 and 36 hours) and underestimated on evenings and nights, about 0.5°.

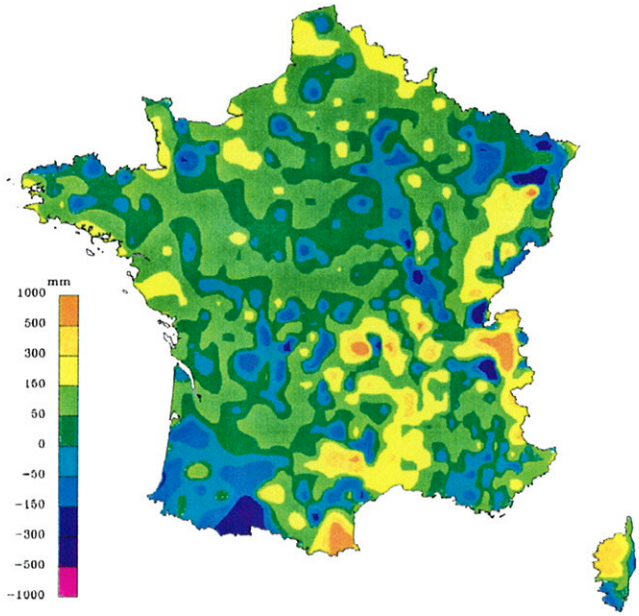
WIND INTENSITY

Its underestimation is persistent and strongly enhanced on afternoons.

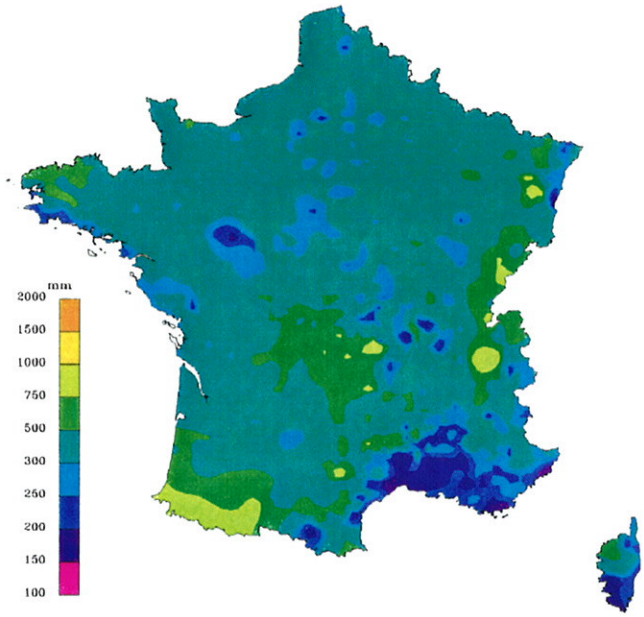


3. *Comments of precipitations maps - first semester 2000*

Errors are strongly correlated to the orography : precipitations are often overestimated over the highest regions (Ardennes, North of the Alps, Massif Central, Vosges, Jura, eastern part of Pyrénées). We can also see an overestimation along the coasts from North (north west coast) to Normandie and from Britany to Vendée (west coast). Over the extreme south west, a large area of underestimation corresponds to big quantities of precipitations observed ; the model has difficulties to predict large amount of precipitatatios at a same location.



Difference between 24 hours cumulated precipitations predicted by ALADIN (between 30 and 6 hours forecast ranges) and observed over France on first semester 2000.



Observed 24 hours cumulated precipitations (from 06 UTC to 06 UTC) over France on first semester 2000 .

Successive forecasts consistency as a measure of skill

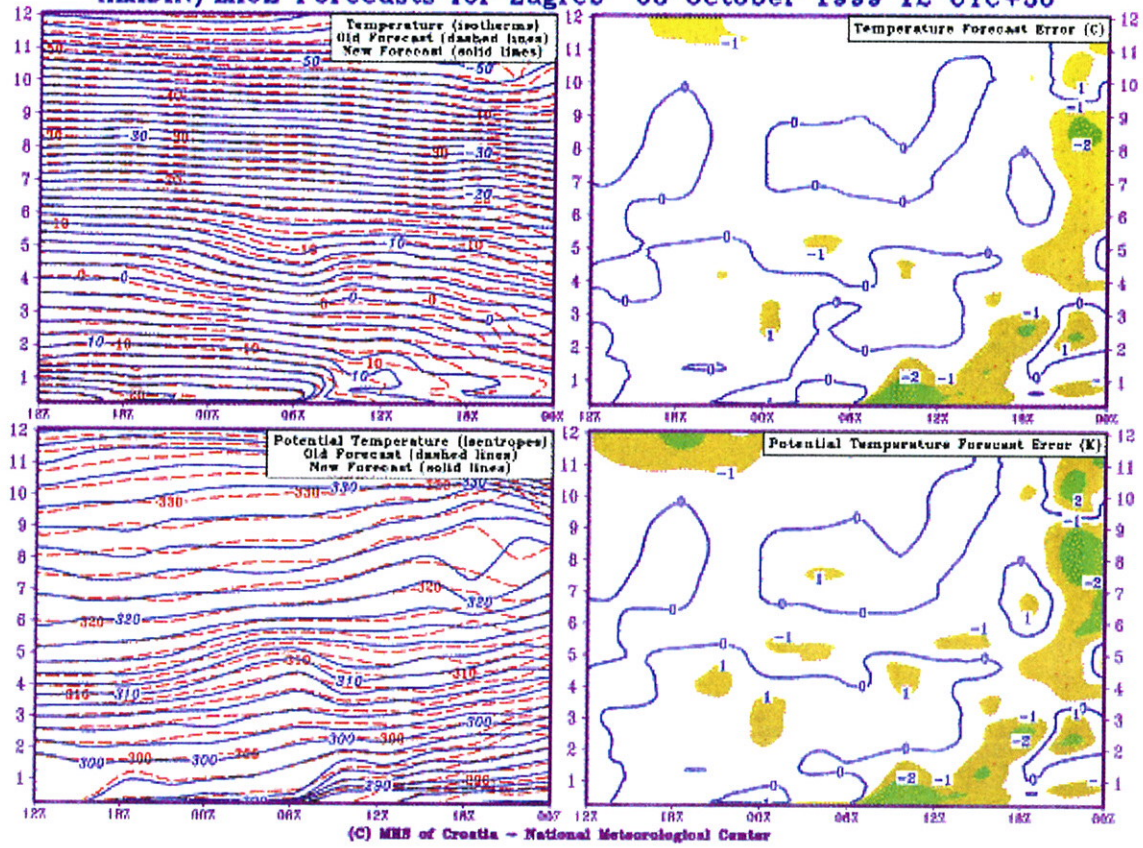
(more details: Drazen Glasnovic & Branka Ivancan-Picek, MHS of Croatia)

Recently, a great deal of attention in DRU Zagreb has been paid to the examination of the forecast-to-forecast differences that can be used as an indication of the forecast quality and its skill. This refers to the successive forecasts consistency and takes into account the fact that their agreement is highly related to the possible uncertainties in the initial data.

The figures enclosed to this report illustrate two examples of the forecast consistency check based on the HRID vertical time cross-sections in which two successive forecasts are compared. On the left cross-sections the family of corresponding isolines (temperature, potential temperature, specific humidity and equivalent potential temperature) are superimposed, while shaded areas on the right cross-sections indicate the forecast error calculated at every grid-point, as a deviation of the new forecast in respect to the old one.

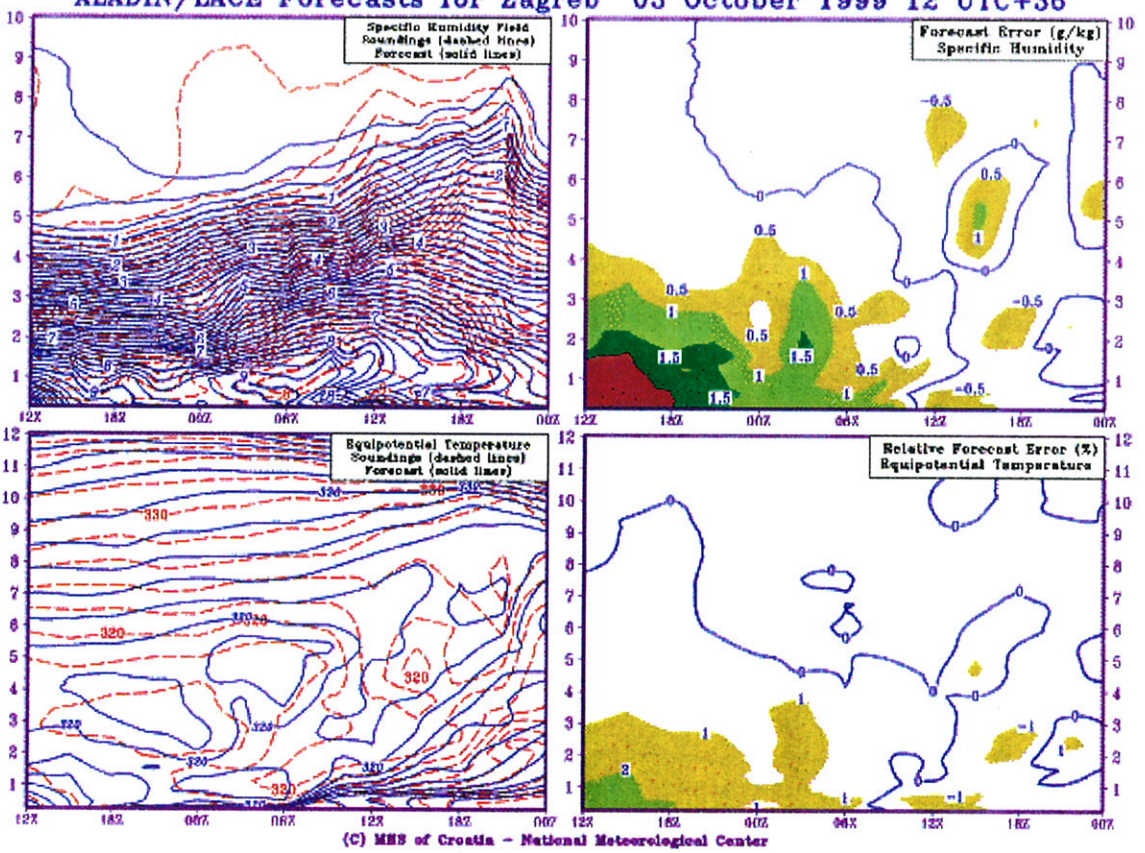
HRID Time Cross-Sections * Forecast Consistency Check

ALADIN/LACE Forecasts for Zagreb 03 October 1999 12 UTC+36



HRID Composite Vertical Time Cross-Sections

ALADIN/LACE Forecasts for Zagreb 03 October 1999 12 UTC+36



New diagnostics in Full-Pos !

For more details, contact "the KING of Full-Pos" (Ryad.ElKhatib@meteo.fr)

Thanks to the coordinated work of a tenth of persons in Ljubljana, Prague and Toulouse, new fields are or will soon be available in Full-Pos :

1. *Already in cycle 13 :*

☺ CAPE, handled as an instantaneous or cumulated flux computed in and for the physics (within subroutine accvimp.F90 for specialists) :

`'SURFCAPE.MOD.XFU' , 'SURFCAPE.MOD.CFU'`

2. *Soon in the next bugfix of cycle 13 :*

😐 MOCON, handled as an instantaneous or cumulated flux computed in and for the physics :

`'CLPMOCON.MOD.XFU' , 'CLPMOCON.MOD.CFU'`

😐 Boundary layer height, handled as an instantaneous flux computed in the physics and expressed as a geopotential depth (temporary field !) :

`'CLPGEOPO.MOD.XFU'`

😐 Wind gusts in the boundary layer, handled as instantaneous fluxes computed in the physics :

`'CLSRAFAL.MOD.XFU' , 'CLSU.RAF.MOD.XFU' , 'CLSV.RAF.MOD.XFU'`

3. *Later in cycle 14 :*

☹ Boundary layer height, handled as an instantaneous flux computed in the physics and expressed in meters (height above orography) :

`'CLPMHAUT.MOD.XFU'` (replacing `'CLPGEOPO.MOD.XFU'`)

☹ CAPE, computed in Full-Pos with 5 formulas available :

`'SURFCAPE.POS.???'`

☹ CIEN, computed in Full-Pos with 5 formulas available :

`'SURFCIEN.POS.???'`

☹ MOCON, computed in Full-Pos (with several formulas already coded and many others considered) :

`'CLPMOCON.POS.???'`

☹ Boundary layer fields, computed on the target grid in Full-Pos (10m wind, 2m temperature and humidity, height, wind gusts) :

```
'CLSVENT_ZONA.POS' , 'CLSVENT_MERI.POS' , 'CLSWIND_VELO.POS'
'CLSTEMPERATU.POS' , 'CLSHU.SPECIF.POS' , 'CLSHU.RELATI.POS'
'CLPMHAUT.POS     '
'CLSURAFALES.POS  ' , 'CLSVRAFALES.POS  ' , 'CLSRAFALES.POS   '
'ISOTHPW0.UPWARD  '
```

The coordinated exchange of applications : outcome of the questionnaire

(for more details, Jure Jerman, HIMS)

A questionnaire "Towards coordinated exchange of informations" had been send to all ALADIN Partners. Here is the brief outcome of this questionnaire with suggestions from the Cracow workshop. There is large Microsoft Excel file now created with all answers from questionnaires. It will be transfered to HTML (XML) form and put to the public ALADIN web server. Reduced information from collected answers is presented in the table below.

Total number of answers: 47

Countries participated (with the number of registered applications)

- Austria(4)
- Belgium(6)
- Chech republic(7)
- Croatia(1)
- France(9)
- Hungary(11)
- Portugal(1)
- Romania(2)
- Slovakia(3)
- Slovenia(3)

- Answers missing from: Bulgaria, Morocco, Moldavia (Poland answer was lost somewhere in the cyber space, we are still waiting for the copy)
- Some of known applications missing (fortran2html, harpe(from France), ...). It would be nice to have them also registered.
- All applications written mainly for workstations and Unix.
- There is an email-list ***exchala@meteo.fr*** already created at Meteo-France for the purpose of coordinated exchange of applications. **National representatives for coordinated exchange are kindly asked to contact patricia.pottier@meteo.fr to be put on the list or to subscribe themselves.**

Open questions for the ALADIN community (the discussion should go on):

- How to distribute complete list of applications (Excel, html, ...)?
- What to do with the outcome of the questionnaire?
- What should be the further actions?
- Should be some coding standards accepted (at least for subsection of applications)?
- Should we make a list of basic applications (frodo, chagal, ...) which should be maintained?
- Some kind of email notification of new versions?
- A pool (ftp server) to store new versions of applications?

A short report from Cracow round table discussion:

- Concerning the format of information, bound for the exchange, members of the round table discussion prefer a standard html/xml format or anything that doesn't demand for a registered piece

of software. Perhaps the xml might be a good candidate because it allows for a sort of a database in a simple form.

- Similar opinion was expressed what concerns the language in which applications should be written. Applications should be outside, not built-in the model, written in a programming language which is freely available (probably we could accept fortran as well).
- All basic applications (like Chagal, Frodo, etc.) should be concentrated on one place, the last version, of course. A link should lead to documentation and a list of features. These applications should be systematically updated, maintained and supported.

Title	Application	Contact
automatic forecast from ALADIN/LACE	Short text forecast for 22 towns in Slovakia based on ALADIN/LACE grib products + graphic forecast + verification	Martin.Bellus@mail.shmu-.sk
new diagnostic parameters from ALADIN model	Temperature gradient, Q vector, KO Index, K index, ADEDOKUN index, Faust index	olda.spaniel@mail.shmu.sk
Safran application in Bucegi mountains	Interface Aladin/Safran providing input files for snow analyses model Safran for the Bucegi mountains	caian@meteo.inmh.ro
Estimation of the forecast error growth	Using Kreisberg-Proccacia algorithm, the forecasters could estimate the initial error growth for the Aladin forecasted fields at a given point	caian@meteo.inmh.ro
Tix Lib	? Mega Widgets for Tix (extension of tk) : Viewer of CGM (Ncar format) . Needs ictrans (Ncar) PBM package. This widget can load many CGM frames to animate , make (ictrans) zoom, print in postscript format. ? Vue meter, status bar, load/save/saveas and mini editor with search widgets are usable too.	Jean-Daniel.GRIL@meteo.fr
PSEUDO	Maker of "pseudo" TEMP messages. Needs a list of points (Lat Lon) to make a vertical profile.	Jean-Daniel.GRIL@meteo.fr
MAKDO(MAKe DOmain) and TTT (Test Troncatures et Tableaux)	? Design of an aladin domain using new eggx convention : Center and reference points, resolution, number of points on both direction. ? Tests the values of NDLON, NDGL and NMSMAX, NSMAX ? Both programs may be used in interactive or for the first one with namelist.	Jean-Daniel.GRIL@meteo.fr
Library of usefull F90 modules	Many modules : FA header reader, FA field reader (grid point and spectral), New EGGX Package, Angle conversion, String conversion, Namelist and array tools, New operators, New types	Jean-Daniel.GRIL@meteo.fr
FRODO	Extracting FA files header informations	Jean-Daniel.GRIL@meteo.fr
EDF(EditField)	Puts FA file fields in Latitude, Longitude, Values ascii format. C,I,E, Zoomed (by indexes or cordinates) zones of extractions and infrmations on minimal, maximal velues given.	Jean-Daniel.GRIL@meteo.fr
ECTO (Ectoplasme)	Creates ascii file with spectral energy by ellipses for aladin fields. Computes Kinetic Energy and Vorticity too.	Jean-Daniel.GRIL@meteo.fr
CHAGAL	Aladin fields visualization based on NCAR software. Fortran 77/90 program with use of Namelist	Jean-Daniel.GRIL@meteo.fr
ALMA	? Human-Machine Interface Tools for Aladdin (Needs JDG Tix Lib), ? Usable for CHAGAL (not finished), ? Makdo (finished)	Jean-Daniel.GRIL@meteo.fr
GVAGP	Prints out value of choosen field at given grid point, horizontal interpolation is optional	david.dvorak@chmi.cz
GVALAG	Get value of level above the ground. Prints out value of given choozen field at given level about the ground (for example: 162.5 m above the ground), performs vertical interpolation and recalculation with respect to real orography (based on apache)	david.dvorak@chmi.cz
AFT_DELE	Deletes chosen fields from FA files (ICMSH*)	david.dvorak@chmi.cz
AFT_TIME	Prints out date from FA file in format (2000011600+0027 for example)	david.dvorak@chmi.cz
AFT_MERG	Merges data from 2 FA files to one new FA file	david.dvorak@chmi.cz

VERAL	Verification package for operational verification and NWP oriented experiments. Calculates and visualises RMSE and scores of forecasts against observations (historic files x CMAFOC files)	martin.janousek@chmi.cz
CMA	Creates CMAFOC1 from Chech SYNOPs and other observations taken from French CMAFOC's	huthova@chmi.cz
Harpe (pseudo satellite movie creation)	The software creates pseudo-satellite images and possibly movies from special ALADIN output (outgoing infrared radiation arriving to the top of the atmosphere)	radnoti@met.hu
HAWK	The HAWK (Hungaraian advanced workstation) system is a basic tool for the forecasters for the interpretation of all available information from the atmosphere.	kertesz@met.hu
Nowcasting procedures	There are several procedures based on the model outputs which are targetted for nowcasting, such applications e.g. visibility, cloud type and height from the satellite images, phase and type of precipitation, maximum wind gusts related to thunderstorms, etc.	horvath@met.hu
Media model	Eulerian dispersion model using the outputs of NWP model	ihasz@met.hu
Trajectory calculations	Coomputation of forward and backward trajectories on isobaic levels	ihasz@met.hu
Objective verification	Computation of standard statistical scores for the relative comparision of different models or model versions	radnoti@met.hu
Automatic forecast generation	The outputs of NWP models are used to create coded forecasts for the forecasters	szabo@met.hu
Meteogram creation	Preparation of meteograms at any model point in graphical and table format	kertesz@met.hu
Fa2netcdf	Converts the contents of a FA file to the NetCDF format	szabo@met.hu
Canari(diag.pack)	Optimal interpolation of the surface observations for nowcasting purposes	radnoti@met.hu
Kalman filter	Statistical adaptation of near-surface model outputs to the local characteristics	horanyi@met.hu
	Verification scheme for surface (temperature, wind speed, dew point, mslp) and upper level (geopotential, temperature, specific humidity, wind speed) parameters using observations data and as optional, analyses from ECMWF model in GRIB format.	pratesf@meteo.pt
faucon	FA files confection: Allows to extract specific fields and combine them in new files. May also rename the fields, as well as tune its tolerance to date information (usefull with fields that do not change over time). Can work with command line or a namelist. Allows also a fortran binary file output (usefull for direct use by IDL graphics program).	luc.gerard@oma.be
gfaim	FA to Grib converter using namelist to set GRIB section 1 parameters and possibly perform simple operations as cliping, scaling, accumulation, gradient, advection, vector grid to geographic components conversions	luc.gerard@oma.be
fasho	view/compare FA files contents. Command line and namelist both possible. Field names selection by patteren on command line. View field values or localise extreme values. Can compare fields in 2 different fa files and give extreme values of differences. Cadre parameters comparision also possible.	luc.gerard@oma.be
also	Local and Region-Averaged profiles extraction from FA files. Output on ascii files or LFA. Namelist defines the behaviour:Local profiles: geographic localisation,Regional profiles: list of grid coordinates participating to the average+ pseudo-station names, number of levels, names of theparameters to extract, output formats, operations to perform: scaling, offset, grid derivatives, conversion of grid to geographic vectors components, of (u,v) to wind speed and direction, of (T, Td) to Relative Humidity... Output ascii files contain also descriptive information, and additonal scripts allow to gather different outputs to produce user-friendly listings for specific uses.	luc.gerard@oma.be
bascs	Vertical cross sections generation. Belgian-adapted version of ASCS application. Output on binary files (ieee compatible), including localisation info. A namelist file defines the sections characteristics. It is possible to define a section thickness" (for i or j direction sections, expressed in grid points), over which an average may be performed.	luc.gerard@oma.be

fal	Aladin file contents identification, slightly enhanced version of good old frodo	luc.gerard@oma.be
fa2ndf	Converting FA files to netCDF format	wang@zamg.ac.at
MetGram	Graphic software for Meteogram	wang@zamg.ac.at
veristat	Statistical verification of ALADIN forecast	stadlbacher@zamg.ac.at
AlaWave	Visualisation of ALADIN forecast	wang@zamg.ac.at
fa2vis5d	Converter from FA to vis5d type files	neva.pristov@rzs-hm.si
aft_cape	Computes various type of CAPE and CIN indexes from FA files	jure.jerman@rzs-hm.si
fa2asci	Converter from FA to ASCI files	neva.pristov@rzs-hm.si
grom	Sophisticated visualisation package for FA,GRIB files and observations visualisation	jasna.vehovar@rzs-hm.si
HRID diagnostic package	The HRID (High Resolution Isentropic Diagnosis) diagnostic package presents the group of numerical routines and objective diagnostic methods in isentropic coordinates. Current version of this application consists of a number of composite high resolution vertical time cross-sections. Combination of superimposed elementary and derived thermodynamic and stability parameters calculated in certain arbitrarily chosen interval gives very detailed insight into the vertical atmospheric structure and its time changes at some particular locality. It works: - either at direct NWP model output on further dynamical adaptation, local post-processing and objective interpretation having quite prognostic meaning; or by using radiosonde measurements as input data to make special diagnostic studies. Combined approach by applying both the PSEUDOTEMP messages and TEMP reports enables forecast verification against observation.	glasnovic@cirus.dhz.hr, bajic@cirus.dhz.hr

A new definition of the geometry of ALADIN domains

(more details Jean-Daniel GRIL, Météo-France)

Past experience revealed some problems of the current version of the EGGX module, defining the ALADIN geometry :

× undue modifications of the input arguments, leading to slightly modified (NE corner) or stupid domains

× redundancy of arguments

× wrong definition of North in some cases

and maybe other problems (all possible cases are not yet investigated).

To correct this and ensure a consistency with the new interactive domain maker, MAKDO, Jean-Daniel Gril wrote a new version of EGGX, tested for a very large set of domains.

The number of input arguments is reduced, as shown in the following table :

New input arguments	Old input arguments
Reference point (*ELAT0, ELON0*)	Reference point (*ELAT0, ELON0*) Type of projection (*ERPK*) Modification of reference point (*NGIV0*) Rotation of domain (*EBETA*)
Centre of domain (*ELATC, ELONC*) Resolution (*EDELX, EDELY*) Number of points in each direction (C+I zone)	SW corner (*ELAT1, ELON1*) NE corner (*ELAT2, ELON2*) Isotropy and change of corners (*NSOTRP*) Number of points in each direction (C+I zone)
	Change of poles and previous location of the new (0°,0°) point (*NROTEQ, ELATR, ELONR*) Total number of points in each direction

The type of projection is derived from the reference (tangent) latitude : polar stereographic if ±90°, Mercator if 0°, and Lambert conformal conic else, chosen so as to minimize the scaling factor. A rotation of the domain may be imposed through the choice of the reference longitude.

The interface to MAKDO presented hereafter illustrates the choice of arguments.

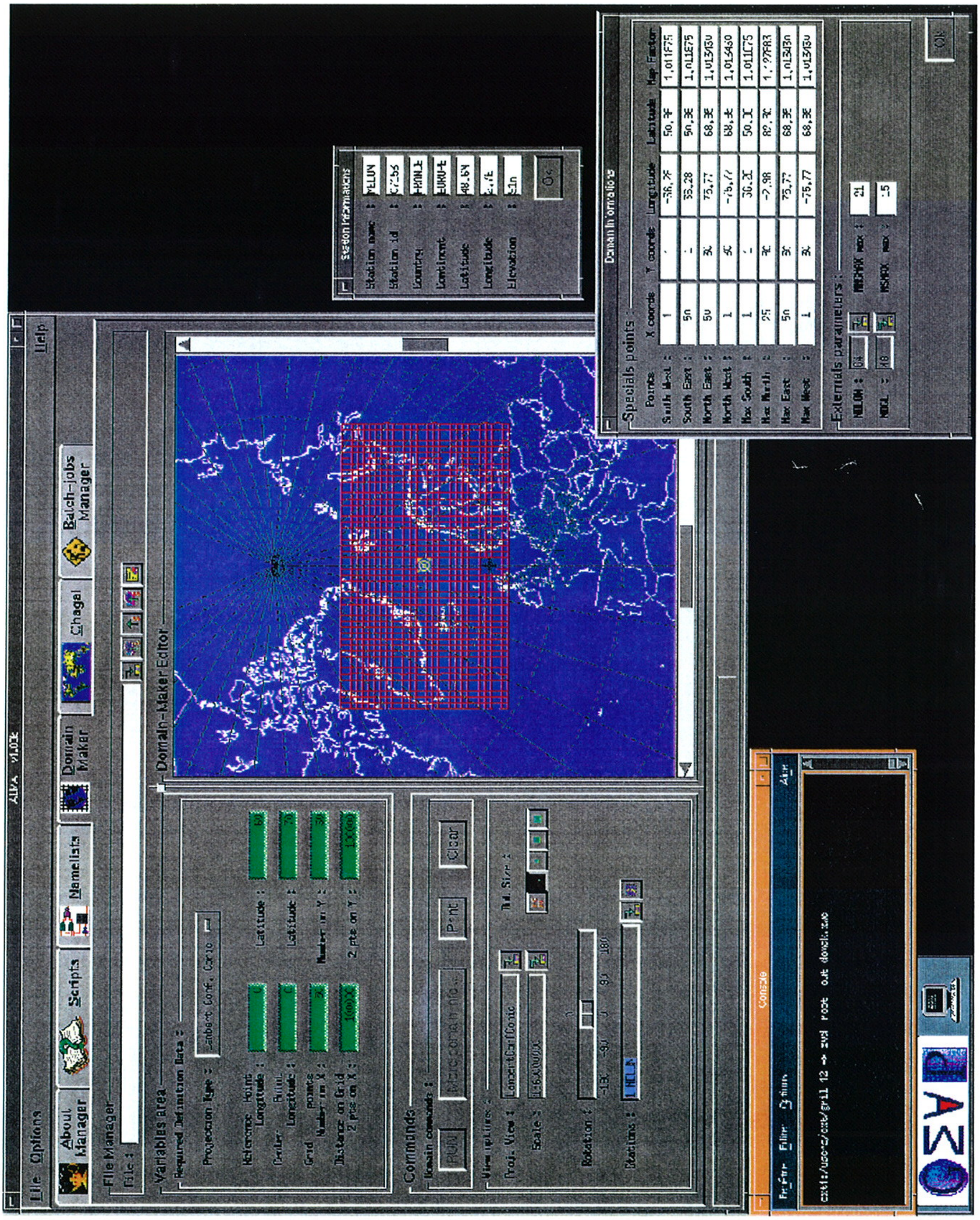
Some unused and problematic options are suppressed :

- × secant projection plane
- × rotations in Mercator projection
- × choice of projection so as to minimize the scaling factor
- × change of poles

and simple latitude × longitude domains are now handled outside EGGX.

The old version will be kept in the ARPEGE / ALADIN code, and the switch will be controlled by the sign of *NGIV0* or *NROTEQ* (not yet decided).

To go further with cleaning, Ryad El Khatib, Jean-Daniel Gril, Denis Paradis and Jean-Marc Audoin will now examine how to optimize the "cadre" of ALADIN files.



Domain-Maker Editor
Variables area
Commands
File Manager
Specials points
Console

Participations in the ALADIN project

As explained above, new rules have been proposed for the ALADIN/ALATNET job accounting. Thus, during the transitional period, things are not what they should be.

No statistics of participation are presented in this Newsletter. The statistics updated at the end of June 2000 for all sorts of work will be drawn up as soon as possible and available on the web.

The statistics at the end of September 2000 will be presented at the Assembly of Partners and the next Newsletter will contain full new statistics updated at the end of December.

Do not hesitate to contact patricia.pottier@meteo.fr in case you need any updated special statistics before they are available.

In the next five parts :

- "ALATNET developments during the first six months of 2000",
- "Deported developments from October 1999 to ... mid 2000",
- "ALADIN developments in Prague/LACE during the first quarter of 2000",
- "ALADIN developments in Prague/LACE during the second quarter of 2000",
- "ALADIN developments in Toulouse during first six months of 2000",

you will find the list of the ALADIN developments (in Prague, in Toulouse and outside) except those detailed in the previous pages : PhD studies, developments for workstation versions or operational suites, ... during the quarters concerned by this Newsletter.

The following informations concerning the deported developments are obtained from informations you sent.

ALATNET developments during the first six months of 2000

During these months, as presented in the ALATNET events, a great part of the ALATNET effort was dedicated to the preparation of the contract, some administrative tasks, the selection of the first candidates, some organisational developments (ALATNET web server, data base for ALATNET work accounting, ...), ...

The ALATNET training (with the ALATNET Seminar on high-resolution modelling, see in the "ALATNET events") has already begun.

1. The ALATNET Research Program

The main objective of the ALATNET research effort is to build the ALADIN Numerical Weather Prediction (NWP) system up to a state where it can treat at the required level the dynamics and physics of atmospheric phenomena at wave lengths down to 10 km and where it can assimilate in continuous and balanced mode all relevant data for the prediction of extreme weather events at those scales, without losing any of the generic properties of the international common effort that made up to now the work on ALADIN truly multi-beneficial while rights vsersus duties fully aware .

The other research objectives are the following:

- Theoretical aspects of non-hydrostatism (NH), a feature necessary to go below 15 km wave lengths;
- Case studies aspects of NH;
- Noise control in high resolution dynamics;
- Removal of the thin layer hypothesis, i.e. inclusion of the vertical unbalanced part of Coriolis forces;
- Coupling with the larger scale models and associated high resolution modes;
- Specific coupling problems, mainly of NWP-strategy type;
- Reformulation of the physics-dynamics interface;
- Adaptation of physics to higher resolution;
- Design of new physical parameterizations for phenomena unimportant at longer time scales;
- Use of new observations in the data assimilation procedures leading to the model's initial state;
- 3d-var analysis and other variational applications;
- 4d-var (i.e. fully continuous) data assimilation.

A research method has been defined and is available on the ALATNET web site. The work plan (and its schedule) is also on this web site.

The actions reported in the part "ALATNET developments" of the Newsletter are part of this ALATNET 4 year work plan that is presented below.

2. *The ALATNET Work Plan*

Each of the 12 research topics is under the responsibility of one Participant (Météo-France, IRM, CHMI, HMS & HMIS); items are split and each sub-item could have some implication of other Participants.

Since there are still many uncertainties associated with the execution of such a complex programme over a four year period, this table should be taken only as indications, while main itemised objectives and synthetic aspects of the milestones are committing the Participants, together of course with the above mentioned global objective.

1	**Theoretical aspects of non-hydrostatism (NH) (CHMI)**
1a	Development of the vertical plane version of ALADIN, as a powerful and cheap tool for further studies in dynamics (forecast configuration, creation of initial and boundary conditions from real 3d or idealized situations, reference simulations, output interface)
1b	Refinement and test (2d then 3d models) of a radiative upper boundary condition for hydrostatic and non-hydrostatic dynamics
1c	Improvement of the lower boundary condition (analysis, test in 2d then 3d models)
1d	Problems not yet identified
2	**Case studies aspects of NH (HMIS)**
2a	Definition of the framework of experiments (domains, resolutions), choice of a set of reference situations
2b	Validation of the current physics and non-hydrostatic dynamics : comparison to hydrostatic dynamics, to observations, identifying problems
2c	Solving residual instability problems in the two-time-level semi-Lagrangian advection scheme (so as to enable larger time-steps and a correspondingly lower computing cost)
2d	Validation of the new developments in dynamics (upper and lower boundary conditions, noise control) or coupling
2e	Validation of the refinements in physics, identifying feedbacks and residual problems
3	**Noise control in high resolution dynamics (CHMI)**
3a	Further damping of orographic resonance in semi-Lagrangian advection
3b	Improved use of the damping properties of a decentered semi-implicit semi-Lagrangian advection scheme
4	**Removal of the thin layer hypothesis (Météo-France)**
4a	Analysis of the required modifications and coding
4b	Impact studies in the vertical plane model then on real cases
5	**Coupling and high resolution modes (HMIS)**
5a	Bi-directional coupling in spectral modes
5b	Well posed lateral coupling in NH mode
5c	Problems of jump in resolution and of domain sizes in modelling and data assimilation modes
6	**Specific coupling problems (CHMI)**
6a	Blending of fields in data assimilation for preserving high resolution forecast details
6b	Tendency coupling for surface pressure and other technical variations around Davies' technique of field coupling in a buffer zone
6c	Coupling problems in variational data assimilation
7	**Reformulation of the physics-dynamics interface (IRM)**
7a	Study of the interactions between non-hydrostatic features and physical parameterizations

7b	Analysis of the problems related to a 1-dimensional physics, impact of an exact introduction of diabatic forcing
7c	Sensitivity of the physics/dynamics interface to vertical resolution
8	**Adaptation of physics to higher resolution (IRM)**
8a	Parameterization of the small-scale features of convection
8b	Test, retuning and improvement of the various physical parameterization in the framework of a very high resolution
8c	Improved representation of boundary layer (diagnostic mixing length)
8d	Introduction of slope effects
9	**Design of new physical parameterizations (Météo-France)**
9a	Implementation of a new parameterization of turbulence (Turbulent Kinetic Energy scheme)
9b	Use of liquid water and ice as prognostic variables, implementation of a new microphysics parameterization
9c	New parameterization of exchanges at lakes surface
9d	Improved representation of exchanges at sea surface
9e	Improved representation of land surface, including the impact of vegetation and snow
10	**Use of new observations (creation of local databases, control, development of pre-processing tools and whenever required observation operators, impact studies (Météo-France, F)**
10a	Yet unused SYNOP observations
10b	GPS and/or MSG observations
10c	Doppler radar observations
10d	METOP (IASI) observations
11	**3d-var analysis and variational applications (HMS)**
11a	Definition and calculation of new background error statistics, impact of domain resolution and extension
11b	Scientific investigation of the decremental approach : identification of relevant scales for variational assimilation, coding and validation of a scale selection procedure
11c	Management of observations in 3d-var : from academic single-observation experiments to the use of any available data
11d	Intensive scientific validation and improvement of 3d-var
11e	Development of variational type applications (adjoint methods for sensitivity studies), as a project itself and to provide more insight into the coupling problem for 4d-var
12	**4d-var assimilation (Météo-France)**
12a	Basic validation and tests
12b	Definition of a coupling strategy
12c	Scientific validation
12d	Improvement of the treatment of humidity in data assimilation

3. *First reports from ALATNET centres*

3.a Caution

For this very first ALATNET Newsletter, reports are in a very simplified form. However more details should be found in ALADIN reports. The order of presentations follows the numbering of ALATNET partners.

3.b In Toulouse (France)

- Topic 1 :

  Development of the vertical plane version of ALADIN : upper boundary condition (sponge layer).

  Investigation of the stability properties of NH dynamics.

- Topic 3 :

  Investigation of the problem of orographic resonance in semi-lagrangian advection.

  First analyses for the implementation of a predictor-corrector method.

  Introduction of vertical acceleration effects in semi-lagrangian advection.

- Topic 4 :

  Analysis of the required code modifications, for hydrostatic and non-hydrostatic dynamics.

  First impact studies.

- Topic 6 :

  Update of scripts and code for the blending of spectral fields, first tests with ALADIN / FRANCE.

  Investigation of coupling problems, impacts of domain size and resolution in 3d-var assimilation.

- Topic 7 :

  Control of the robustness of the physics-dynamics interface to variations of the time-step.

- Topic 8 :

  Exhaustive investigation of the impact of some choices in the parameterization of convection on a case of severe floods.

  Correction of some problems in the parameterization of boundary layer.

  More precise parameterization of radiative exchanges.

- Topic 9 :

  Definition of a "functional boxes" frame for the implementation of a new microphysics parameterization.

  Improvements in the parameterization of snow cover, taking into account the impact of vegetation.

  Coding and test of a new parameterization of exchanges at sea-surface.

  Development and test of new initialization procedures for the temperature of lakes; test of the impact of the initial temperature of lakes, on the case of lake Balaton; definition of a first parameterization of the evolution of the temperature of lakes.

  Finding new high resolution datasets for soil and vegetation characteristics; first tests of the new vegetation database.

  Test of a new database for orography and urbanisation; re-examination of the definition of an "optimal" spectral orography.

  Investigation of the impact of some choices in the definition of orography at small scale.

Definition of a new, more precise, thermodynamics.

- Topic 10 :

  Update and first tests of the O.I. analysis of snow cover, never implemented operationally; only SYNOP data are considered at this stage.

  Developments for the use of IASI data, at large scale first.

- Topic 11 :

  Definition and test of new background error statistics, in the framework of a decremental approach.

  Definition and test of several methods to control analysis increments at the lateral boundaries.

  Writing specific scripts for "single-obs" and "full-obs" 3d-var assimilation.

  Sensitivity studies using adjoint methods.

- Topic 12 :

  Definition of a new digital filter initialization technique to improve the control of humidity increments in 4d-var assimilation.

3.c In Bruxelles (Belgium)

- Development of a prognostic version of the convective scheme.

3.d In Prague (Czech Republic)

- Study of the impact of increased vertical resolution.
- Study of the diffusion properties of the semi-lagrangian scheme.
- Effects of horizontal diffusion of humidity .
- Upper boundary condition for NH scheme.

3.e In Budapest (Hungary)

- 3d-var background error statistics.
- Implementation of a prototype 3d-var assimilation suite.

3.f In Ljubljana (Slovenia)

- Nothing more than the effort reported in introduction.

Deported developments from October 1999 to ... mid-2000

Due to the new rules and, for this transitional Newsletter, the deported works reported here deal with the last quarter of 1999 and the two first quarters of 2000. "Deported work" means work realised "at home", in each country, not for LACE or for ALATNET (see LACE or ALATNET work reports). As requested during the Cracow workshop, the report of Deported work will be modified ... and will contain the reports I am sure you will send to me following the new rules ...(a good example of these expected reports is given by the report sent by D. Banciu for Romania -see below-). Thanks to the effort of each correspondant in each country, this chapter about deported work should become less accounting but much more interesting.

Many newcomers entered recently the ALADIN project, both through the ALATNET training in Radostovice and thanks to Toulouse or "at home" training. Welcome to :

- Alex Deckmyn and Philippe Nomerange (Belgium),
- Tomas Kalibera and A. Trajakova (Czech),
- Gergely Boloni (Hungary),
- Siham Sbii, Rashyd Zaaboul and Mohamed Jidane (Morocco),
- Margarida Belo Pereira and Vanda Sousa da Costa (Portugal),
- Constantin Rada (Romania).

1. *In Austria*

- Objective verification of ALADIN/Vienna (K. Stadlbacher),
- Operational ALADIN/Vienna (Y. Wang).
- CYCORA tuning (S. Kreilberger)
- Convection index (H. Seidl)

2. *In Belgium*

- Validation of the ALADIN model, qualitative statistical verification, study of exceptional meteorological situations(J. Neméghaire, J. Vanderborght),
- Operational implementation of CANARI (O. Latinne),
- Performance analysis (F. Chomé),
- Tools for verification and verification of the winter and the spring periods (P. Termonia),

- Attempts to implement an MPI version of the code, Development of a prognostic version of the convective scheme, Preparation of Cracow workshop, ALADIN Physics Documentation (L. Gérard).

3. *In Bulgaria*

- Implementation of ALADIN11, supporting of operational suit, files with forcing for wave model included in operational suite (A. Bogatchev).

4. *In Croatia*

- Diagnostic study - severe bora wind diagnosis and ALADIN forecast (A. Bajic, D. Glasnovic),
- Work at direct ALADIN model output -farther development of the HRID diagnostic package; diagnostic study - MAP SOP diagnosis and forecast of vertical atmospheric structur (D. Glasnovic, B. Ivancan-Picek),
- Verification - maximum and minimum temperature and wind velocity from the lowest level of pseudoTEMPs (Z. Vakula),
- Tuning of blending initialization (S. Ivatek-sahdan, D. Klaric),
- Successive forecasts consistency as a measure of skill (D. Glasnovic, B. Ivancan-picek),
- Diagnostic package - implementation of the land-sea contrast into the structure function under the ALADIN developments in Prague, Visualization for MAP related application (M. Zitouni).

5. *In Czech Republic*

- Operational suite software development and monitoring (D. Dvorak),
- Development of Kalman filtering of ALADIN forecasts, Model Output Statistics, CMAFOC files (Z. Huthova),
- Verification of ALADIN/LACE (R. Mladek), of wind forecasts (M. Zak), of precipitation forecasts (E. Synkova),
- Study of extreme convection events (D. Merkova),
- Development of a new CHAGAL interface (T. Kalibera),
- Diffusive properties of the semi-Lagrangian scheme (F. Vana).

6. *In Hungary*

- Preparations for the ALADIN workshop in Ljubljana (A. Horanyi, I. Bonta, S. Jenki, I. Bartha, A. Fovenyi),
- Computation of background error statistics for ALADIN/HU (A. Horanyi),
- Implementation of AL11, AL12 in Budapest (A. Horanyi, G. Radnoti),

- Subjective evaluation of ALADIN model (I. Bonta),
- Surface parametrization -lake problems- (S. Kertesz),
- Switch to AL11, maintenance and improvements of the operational scripts, automatic forecast generation based on ALADIN model, implementation of AL11t2 for the non-Hydrostatic version of ALADIN (T. Szabo).

7. *In Moldavia*

- Nothing reported this quarter.

8. *In Morocco*

- Aladin/Maroc Model controls (Y2K transition), analysis of specific humidity in CANARI (introduction of necessary modifications in AL11T2 Cycle), adjustment of forecasting errors statistics in 3d-Var Aladin (W. Sadiki),
- AL11T2 implementation on CRAY J916 and on SUN ULTRA 7, Aladin Distributed Memory tests on Cray J916, Test and validation (on one situation) of Aladin on a small domain, included in Aladin/Morocco, with higher resolution (R. Ajjaji),
- Using statistical adaptation of Aladin/Maroc outputs for forecasting extreme temperatures: data processing, using statistical methods to investigate correlations between extreme temperatures and numerical model outputs, elaboration of the statistical model, model controls, introduction of new data (S. Sbii),
- Local Tuning of cloudiness scheme (comparison of the forecasted satellite picture with MeteoSat and comparison of total cloudiness with synop data) (M. El Abed),
- Impact of the frequency of coupling on the Aladin forecast at fine scale, first results of Aladin forecast with a 7km horizontal resolution (J. Boutahar),
- Test and validation of the latest version of convection parametrization over Morocco (R. Zaaboul),
- Exploratory and bibliographic studies on the new high resolution data base of vegetation over the Aladin/Maroc domain (M. Jidane).

9. *In Poland*

- Administration and development of NWP operational system (A. Dziedzic, M. Jerczynski, M. Szczech, W. Owcarz),
- Development of post-processing-on-demand system (W. Owcarz),
- Development of verification software (A. Dziedzic, M. Szczech, J. Woyciechowska),
- Organisation of the 8th ALADIN Workshop (J. Woyciechowska).

10. Portugal

- Installation of new versions and adaptation to ALADIN/Portugal environment, maintenance (C. Madeira),
- Verification, archiving and case studies (F. Prates).

11. In Romania

- Convection parameterization (D. Banciu)

  The recent "ensembling entrainment", developed at CNRM/GMAP has been tested for the TOGA-COARE and CLEOPATRA cases. For more details see the Ph.D. report of D. Banciu.

- Ozone profile (C. Rada, A. Sima)

  A new function has been tested to express the climatic vertical profile of the ozone in the Aladin model, for integration over Romania domain. For this purpose 10 years of SBUV/2 NOAA11 data and daily measured data at Bucharest have been fitted by a function, similar to the Arpege one but with one additional degree of freedom, a variable exponent. Monthly triplet of constants gave the new monthly variable profile function, as well as daily triplets fitted the daily measured values. For a period of time, in parallel to the operational run, two more runs were executed: a run with the monthly climatic profile and another with the daily fitted profile. The assumption made was the constancy of the profile in the integration domain: studies based on measured data show, usually, a slow latitudinal variation over Romania territory. A variation with latitude and longitude has been finally tested but this time by fitting satellite data, due to the fact that one single DOBSON spectrometer UMKEHR measurement data, at Bucharest, is available. The impact of the ozone vertical profile on the forecast has been tested. For more details see the Aladin Newsletter article: "Ozone profile fitted to Bucharest measured data" of C. Rada, A.Sima and M.Caian.

- Optimal time step for Aladin-Romania (R. Radu, A. Sima)

  Numerical simulations have been made with operational Aladin (cycle 11) in Romania for different time steps. We tested time steps of 6,7,8,10,12,15 mn. The forecast skills have been computed with the operational verification package and then compared against similar skills obtained for the operational run. Dynamical and physical behaviour at time step change have also been analysed through grid points diagnostics. The 8 minutes (12% reduction) simulations gave the best skills and behaviour (better than the operational case – 9 minutes time step; for example uo to 2 hPa precision increase for mean sea level pressure), but spectral features are to be further analysed to confirm the results.

- DDH - bug correction for LAM case; output interface (M. Caian)

  Reading of DDH files routines have been implemented (rdhfa.F90, readddh.F90, wdhfor.F90), and a procedure to extract, optionally, diagnostic Aladin fields. The routine sumddh.F90 has been corrected to allow point-type domains diagnostics computation in LAM case. The routine ppfidh.F90 has been corrected (bug in writing some variables in LFI file, i.e. condensation fluxes: convective and stratiform, for rain and snow).

- Study for writing LBCs gradients in intermediate files and deriving lateral boundary perturbation (C. Soci)

  The problem of writing intermediate gradients of the forecast error norm with respect to the lateral boundary conditions in grid point files for each coupling moment has been studied. The ALADIN

12. In Slovakia

- Verification of ALADIN outputs (J. Vivoda),
- Implementation of AL12 and 1D model on DEC (J. Vivoda),
- End user and customers presentation of ALADIN products (www), automatic text forecast from ALADIN model (M. Bellus),
- PseudoTEMPs and ACS development (J. Masek),
- Workstation version ALADIN/Slovakia, operational maintenance (O. Spaniel).

13. In Slovenia

- Organisation of the 7th ALADIN workshop, CAPE, Diag-Pack (J. Jerman, N. Pristov)
- Operational configuration of cluster, double suite, CMAFOC (N. Pristov),
- Dynamic adaptation and diagnostics of precipitation (M. Zagar),
- Research work on cluster installation, CANARI (J. Jerman).

14. Deported work by Météo-France people

- In Budapest (D. Giard, C. Fischer) and in Prague (E. Gérard) have already been reported in Newsletter 17 as it was mixed Toulouse-Deported work.
- In Ljubljana : R. El Khatib helped to the porting of ALADIN/SI to the cluster of workstations.

ALADIN developments in Prague during the first quarter of 2000

1. *Data assimilation related developments.*

a. Tuning of spectral blending.

The tuning of the spectral part of the blending technique continued for the parameters of internal DFI. The aim was to diminish the spin-up effect (measured via the "set-up " of physical fluxes of water vapor) and to get reasonably looking structures of vertical velocity in the initial and short-range forecast fields. The optimal DFI parameters were then fixed to TAUS=18000 and NSTDFI=5. These internal DFI values complete the already found optimal truncation for the lower resolution: NSMAX=28, NMSMAX=31. To remind, the operational values of ALADIN/LACE are: NSMAX=71, NMSMAX=79, TAUS=10800, NSTDFI=7. It still remains to retune a bit the production external DFI: this study is scheduled for April 2000. It should be noted that all these parameters are very probably domain/resolution dependent, hence the presented ratios between the operational and blending cycle values are probably not directly transferable without a little bit of re-tuning to other ALADIN applications.

Further on, a long blending cycle experiment of about two months has begun, being planned to cover the summer period of 1999. In this experiment both the newly tuned spectral blending parameters and the blending of surface variables (see Newsletter 17) are used.

More details can be asked to: Dijana Klaric, Stjepan Ivatek-Sahdan, Klaus Stadlbacher, Martin Janousek, Gabor Radnoti, Radmila Bubnova and Jean-Francois Geleyn.

b. ALADIN/LACE background error statistics to be used in Jb term of penalty function.

Like it was announced in the last newsletter, the study of background error model for ALADIN continued last winter. Beside the "standard statistics" obtained via differences of forecasts P36h – P12h valid at the same verification time (NMC method), having the known weakness of the predominating large-scale component, other combinations were tried:

- Statistics computed by difference of the boundary conditions LBC36 – LBC12 (like it has already been done by Waafa Sadiki from Morocco);
- Statistics computed by "difference of difference (diff-diff) : (P36-LBC36) – (P12 – LBC12)

After an analysis of the results we have noticed again the predominating large scale features in all the sets, though the last "diff-diff " set was indicating a little hope. Later on another fresh idea of Vincent Casse has been tried: to compute the statistics from the forecasts made by using the constant LBC (statistics called "VC "). Therefore a set of 12h forecasts was recomputed using the "one day old LBC but keeping the "fresh " initial file and the statistics based on the classical difference (P36 – P12)_lbc=const were computed. At the beginning of the exercise there was a debate, whether we should use "fresh initial conditions for the recomputed 12h forecast or whether we should use the 24h old LBC file also as the initial file. The bad surprise when looking to the results of the former scheme and further brainstorming analysis showed that the 24h LBC file should be used as the initial file of P12, in order not to create large discrepancies of the fields at the lateral borders and not to reintroduce

again the "large-scale " component of the error. This means, finally, that the statistics were computed from the difference: (P36 – P12)_lbc=const, P12 starting from LBC-24h (statistics called "JFG"). This combination shows an internal growth of the forecast error when the lateral forcing is the same and when the initial state of P12 does not contain the analysis update due to any "fresh " observation network. This time the scale analysis of the obtained statistics looked quite optimistic, as it was hoped. However, when the single observation experiments are performed using these statistics, the increment amplitude remains quite small. Moreover, the impact of the observation network already weak when using the NMC method is quite eliminated. Hence, an additional empirical tuning of Jb will be needed to scale it well while the variance matrices and multivariate coupling of errors shall be taken from the last statistical "JFG" set. The new method to compute the statistics has been tried later on for the FRANCE domain, see Claude Fischer for further details.

More details can be asked to: Maria Siroka, Claude Fischer, Radmila Bubnova, Jean-Francois Geleyn.

c. Diag.pack

The development done by Meriem Zitouni (fall of 1999) of the land-sea contrast to be applied in the structure functions of the SYNOP-level analysis has been taken over by Jure Jerman, surely concerning the "distributed memory" piece of the code. The validation of "DM" version shall be done later on in Ljubljana before being phased to the main library.

More details can be asked to: Meriem Zitouni, Jure Jerman.

2. *Developments in the physics.*

There has been just a set of experiments to examine the impact of various CYCORA modifications on the forecast of 1999 Christmas Storm. The package of CYCORA was split to 12 sub-groups according to their nature. Further, four references were run with ARPEGE CYCORA and NON CYCORA, starting from the operational (CYCORA) analysis and from another (NON CYCORA) analysis (done at Meteo-France by Samuel Westrelin) resulting from a few days of the assimilation cycle where CYCORA was switched off. Then for each of the twelve sub-groups an ARPEGE forecast was run from both CYCORA and NON CYCORA initial states when the concerned sub-group was either activated (in NON CYCORA reference forecast) or inactivated (in CYCORA reference forecast). Thus we have got 48 + 4 forecasts of the case. The results were evaluated in a relative way according to the criteria of the depth (or intensity) of the cyclone and its position. Out of the twelve groups three of them were identified to play a definitely positive role: i) parameterization of PBL (namely Richardson limit riteria), ii) parameterization of the pressure departure within a cloud with respect to the environmental pressure, iii) scale dependency of the closure of the deep convection parameterization scheme. Within these three subgroups other refining tests shall be done. Just to remind: ARPEGE-CYCORA did ever the world best forecast of the storm of 26/12/1999, permanent over three consecutive network times (1999/12/25/r0, 1999/12/25/r12, 1999/12/26/r0).

More details can be asked to: Stephan Greilberger, Martin Janousek, Jean-Francois Geleyn.

3. *Developments in the dynamics.*

While the NH modelers continued their Prague follow-up efforts in Lautrec, our attention was brought back to the lateral boundary coupling problems thanks to the Christmas 1999 Storm (!). We have mentioned in the previous paragraph an excellent work of ARPEGE, while not the same could be said about the performances of ALADIN. For example, ALADIN/FRANCE did not do better than the global model and ALADIN/LACE missed the storm in early hours of its existence and displacement. As we have figured out later it was due to the weaknesses of the lateral coupling. Especially the update frequency of LBC data was relieved crucial, since the displacement speed of the storm exceeded 100km/h in early hours of its existence. In any case a wide study of the lateral coupling problem has

been started, see a special report on it by David Dvorak in this Newsletter. Short conclusion: a 3 hour LBC update frequency together with a piecewise parabolic function to estimate the time trajectory of LBC seems to be the best combination to be used at the moment. Just funds are missing to finance more powerfull telecom lines.

More details can be asked to: David Dvorak, Radmila Bubnova.

Beside the problems of the coupling, a 41-level version of ALADIN/LACE has been checked in the parallel suite, anticipating the future vertical resolution of ARPEGE. However, a higher level of noise has been detected and the impact on scores was also negative. A detailed study revealed a problem coming from the e927 extrapolation to the additional levels in the stratosphere. Since a short-range LAM does not really need to increase its resolution in the stratosphere, we have redefined the future vertical grid of ALADIN/LACE to use 37 levels (currently 31 levels), all added levels being in the troposphere in the same proportion as for the anticipated ARPEGE 31 to 41 levels increase. A few tests were run to examine the level of noise; since there was not anymore a problem, the increased vertical resolution from 31 to 37 levels shall be tested in a parallel suite.

More details can be asked to: Maria Siroka, Radmila Bubnova.

4. *Developments in the diagnostics.*

There has been a development of a little tool to diagnose the balance of physical fluxes, concretely radiation and water vapor fluxes including the time evolution of the balance within model forecast. This tool working on the history files was very useful for evaluation of the model spin-up in the blending experiments.

More details can be asked to: Klaus Stadlbacher, Martin Janousek.

5. *Developments in the verification.*

There was no development of the verification tools in the first quarter of 2000.

6. *Technical developments.*

The practical implementation of SMS (Scheduler-Monitor-Supervisor) software to the ALADIN/LACE operational suite is under way. It will also include more complex structures of the blending/assimilation tasks.

More details can be asked to: Metod Kozelj, Roman Zehnal, Martin Janousek.

7. *Work on documentation.*

There was no particular effort on the documentation in the first quarter of 2000.

ALADIN developments in Prague during the second quarter of 2000

1. Data assimilation related developments.

a. Tuning of spectral blending.

The tuning of the spectral part of the blending technique continued for the parameters of external DFI. The retouch of the DFI parameters used in the normal forecast runs was settled: we can use a little bit weaker filter thanks to better intrinsic balance of the fields after blending compared to the fields after our standard full-pos interpolation to the finer grid. There are still validation works at place, till now giving quite satisfactory results. After the remaining checks being successfully completed, blending should enter the operational suite. It should also be mentioned that blending technique may be quite helpful in designing the data assimilation strategy for a limited area model having relatively small domain.

More details can be asked to: Dijana Klaric, Stjepan Ivatek-Sahdan, Klaus Stadlbacher, Martin Janousek, Gabor Radnoti, Radmila Bubnova and Jean-Francois Geleyn.

b. ALADIN/LACE background error statistics to be used in Jb term of penalty function.

A comprehensive report on the recent background error statistics research was written by Maria Siroka and it will be available soon in a post-script format. Further research using new Jb statistics was done in Toulouse with ALADIN/FRANCE domain, please, refer to the reports of Waafa Sadiki and Adam Dziedzic.

More details can be asked to: Maria Siroka, Claude Fischer, Radmila Bubnova, Jean-Francois Geleyn.

c. Diag.pack

There was no special development on diag.pack regarding the part of CANARI in the second quarter, but there were developments of various diagnostics, which will be common with other configurations, reported in the section on the physics.

More details can be asked to: Meriem Zitouni, Jure Jerman

2. Developments in the physics.

2.1) CYCORA II

In June the tests to prepare the package CYCORA II were pursued. It concerned the study of convective entrainment and to further detail the evidence brought by the sensitivity tests made on Christmas storm.

More details can be asked to: Doina Banciu, Martin Bellus, Jean-Francois Geleyn.

2.2) Diagnostics of CAPE, PBL height and wind guests

In April, the strategy to compute several new fields for practical diagnostics was defined; it concerned CAPE, moisture convergence (MOCON), height of PBL and wind gusts. More details could be find in

a report of Ryad el Khatib. Within LACE, the development of CAPE, PBL and wind guests diagnostics was taken. The necessary code was written and partly validated.

More details can be asked to: Neva Pristov and Jure Jerman for CAPE, Martina Tudor for PBL and wind gusts.

2.3) Horizontal diffusion of humidity

This subject is somewhere in between physics and dynamics and it has been initiated due to a known weakness of precipitation patterns: there is too much precipitation on the upward slope of the mountains and almost none on the lee side while in reality it rains everywhere.

3. *Developments in the dynamics.*

3.1) Quasi-Academic Test SCANIA

A 3D quasi-academic test on stationary orographic forcing was proposed to be tested in ALADIN by Mike Cullen (ECMWF) and Piotr Smolarkiewicz (NCAR/ECMWF). Work took place from March to May, using the hydrostatic (operational) version of ALADIN. The test consists in studying an idealized equivalent barotropic flow past complex terrain, concretely Scandinavian peninsula orography (where from the name SCANIA). It revealed several interesting conclusions on the time-stepping, orographic resonance treatment, tuning of horizontal diffusion, usage of the linear grid. For both ARPEGE and ALADIN the tests using linear grid together with filtered orography (the same like in case of quadratic grid) have already started (in ALADIN/LACE it is the test "aba "). SCANIA results were presented essentially at the ECMWF workshop on high resolution global modelling (5-7 June 2000, Reading), at CNRM Seminar and also like an extra lecture at ALATNET training school in Radostovice (15-26 May 2000). An extended abstract will be published in ECMWF Workshop Proceedings and it is also available in post-script format.

More details can be asked to: Radmila Bubnova, Jean-Francois Geleyn.

3.2) Non-hydrostatic dynamics

The SCANIA test also became a subject of study with the non-hydrostatic dynamical kernel, especially regarding the discretization of the top boundary condition. The study shall continue in July and results will be reported in the next Newsletter.

More details can be asked to: Jano Masek, Radmila Bubnova.

4. *Developments in the diagnostics.*

c.f. efforts on CAPE, PBL and wind guests.

5. *Developments in the verification.*

There was no development of the verification tools in the second quarter of 2000.

6. *Technical developments.*

Beside the continuation of SMS preparation, a port of the configuration e923 to sx4 has started, however not yet fully completed.

More details can be asked to: Metod Kozelj.

ALADIN developments in Toulouse during the first six months of 2000

1. *Main events*

A large part of the ALADIN effort in Toulouse was devoted to phasing, once again, with the creation of cycles 12 and 13, with the help of Gabor Radnoti for the former, Jan Masek, Cornel Soci, Jozef Vivoda, Mark Zagar and Meriem Zitouni for the latter. A review of the corresponding changes, by Claude Fischer, is available in this Newsletter.

A new challenge : Malgorzata Szczech and Witold Owcarz managed to prepare a benchmark for ALADIN / POLAND in 4 days !

Three scientists from Tunisia : Abdelwahed Nmiri, Karim Bergaoui and Nihed Bouzouita, spent 3 months each in Toulouse to get more familiar with and work on ALADIN. Their contribution was quite useful.

30 visitors in Toulouse along these two quarters !

2. *Dynamics*

Karim Yessad examined thoroughly the ARPEGE and ALADIN codes to define which modifications are required to relax the thin layer hypothesis and simultaneously reintroduce some neglected Coriolis terms, following White and Bromley (1995). The hydrostatic and non-hydrostatic cases were examined, as well as the impact on DDH formulation. A detailed documentation is available.

Pierre Bénard coded and tested a new 2d formulation of the continuity equation for semi-lagrangian advection schemes, in 2d academic then real cases. This new version has a lower computational cost, is more precise and mass conserving, but less diffusive which brings some more orographic noise at long time-steps.

A wide diagnostic study of ALADIN-NH problems has been undertaken by Tamas Szabo in the simplified framework of the 2d vertical-plane version used with academic conditions. This study led to two major conclusions :

- (1) The model is unstable when the trajectory of an I-zone point originates from outside the C-zone. This weakness which hold for all versions (Hydrostatic, Non-Hydrostatic) is not likely to occur in operational use since it implies CFL numbers greater than the index-width of the C-zone (8 in operational). However this should be corrected in next versions for safety.
- (2) The NH version was found much more unstable than the Hydrostatic version when there is a discrepancy between the real background and the Semi-Implicit one. This was observed for Eulerian as well as Semi-Lagrangian schemes (3 and 2-time-level). The study of this latter problem must now be pursued for deeper understanding.

This work also allowed a clean coding of the "sponge" layer in the 2d model.

Petra Smolikova applied to real 3d situations a new attempt to damp orographic resonance problems in semi-lagrangian advection, based on the EDSA method and a new formulation of the continuity equation designed by Pierre Bénard. Though it proved quite successful in academic 2d cases, it failed on real cases, producing even more noisy fields. Quite different solutions must be found now.

Malgorzata Szczech began to code the numerous modifications required for handling of ozone as a thermodynamic spectral variable in ARPEGE and ALADIN, for use in assimilation and with the corresponding physics. Roughly speaking, only the corresponding key was available before. This work will be continued in Cracow and Toulouse along next summer and autumn.

Claude Fischer, Karim Yessad, Radmila Bubnova and Jan Masek examined the impact on non-hydrostatic dynamics of the modifications introduced at ECMWF by Deborah Salmond and Mike Cullen for the implementation predictor-corrector scheme. A preliminary phasing was realized for cycle 13 (CY22T2), but major and obviously temporary modifications were introduced just after in CY23 ...

3. *Physics*

Steluta Alexandru compared two global databases for orography : GLOB95 (operational) and GTOPT030 (more recent), at the global and the local scale, using both ARPEGE and ALADIN / ROMANIA. The second database has an effective resolution of 2'30, everywhere, and provides a better description of height and urbanisation over Europe. Changes are larger in the Southern Hemisphere or over Greenland.

Afterwards she tried to optimize the spectral orography of ALADIN / ROMANIA, choosing between the two formulations of the cost function and tuning the corresponding parameters. She proposed two alternative choices, providing a more realistic orography than the operational one, based on an old LACE tuning as for many other domains. As an illustration, here are the retained tunings for 3 ALADIN domains (parameters are defined in NAMCLA) :

LACE : LNEWORO2=.T., QCONST=0.4, QPOWER=3.5, XINCOC=2500., HMIN=150.
ROMANIA : LNEWORO2=.T., QCONST=0.5, QPOWER=3.6, XINCOC=4000., HMIN=250.
minimizing
$\sum\omega(i)\,[W(i)\,|\,Rf(i) - R(i)\,|\,2 + (QCONST\,|\,Rf(i) - R(i)\,|\,)QPOWER]$, $W(i) = 1 + (XINCOC - 1)\,e^{-R(i)/HMIN}$

FRANCE : LNEWORO=.T., ...
minimizing
$\sum\omega(i)\,[\,|\,R(i) - Rf(i)\,|\,/\,HDIM]\,W(i)$, $W(i) = QMIN - (QMAX-QMIN)\,e^{-R(i)/HMIN}$

Andrey Bogatchev and Valery Spiridonov tried to improve the parameterization of snow cover in ARPEGE / ALADIN. They tested once again the Douville scheme, with the full soil freezing parameterization this time. Results were as deceiving as previously. They developed afterwards a new formulation of the snow cover fraction, taking into account several characteristics of vegetation: type (forest versus crops or grassland), vegetation fraction, leaf area index. Tested on ALADIN / BULGARIA on a several situations, this was shown to decrease forecast errors and their correlation with the vegetation cover. This was done for the Douville scheme then for the operational one. They will after try to further improve the albedo and introduce the impact of rain on the snow cover melting. These modifications are expected to be ready for a parallel suite next winter.

Taking into account the several attempts in ALADIN and the experience of other NWP teams who tried to implement this scheme operationally (Canada, HIRLAM), the Douville scheme is likely to be abandoned for NWP in ARPEGE / ALADIN. An alternative could be a closer cooperation with HIRLAM, especially the Spanish team, to interface the Fernandez scheme with ISBA.

Eric Bazile and Mehdi El Abed coded and tested a new formulation of evaporation over sea, proposed by J.L. Redelsperger and taking into account precipitations, on FETCH and TOGA cases. Some instabilities arise from the interaction with the previous scheme, requiring some further improvements.

Sandor Kertesz focused on the problem of lakes : test and debugging of the corresponding part of configuration E923, impact studies and design of a new parameterization, advised by Eric Bazile. A more extensive description is available in this Newsletter.

Mohamed Jidane, with the help from Eric Escalière to format initial data, evaluated over Morocco a new global database built by J.L. Champeaux et al. with a resolution of 1 km over most land surfaces. In cooperation with other scientists in Morocco, he compared the initial land-cover map to local informations. The new dataset was tested afterwards along a 2-weeks assimilation suite and the subsequent 48h-forecasts in a sunny period (April 2000). The impact on surface variables (surface and mean temperatures, superficial moisture, soil wetness index) and 2m-temperature and relative humidity was examined. The diurnal cycle is improved, with higher maximum temperatures. When averaged on the southern part of the domain, where most changes lie, differences in surface temperature may reach 2 K. A further evaluation shall be performed in Morocco, using more observations and finer diagnostics.

Roger Randriamampianina brought a significant contribution to the improvement of the radiation scheme. In 1996, Neva Pristov made some modifications in the radiation scheme in order to correct the underestimation in the prediction of the morning 2m temperature. The source / sink term (corresponding to the radiative cooling and heating) in the prognostic equation of the temperature is calculated in the physical parametrisation part of the model as a vertical radiative flux divergence. To calculate the flux divergence, the vertical fluxes have to be determined by integrating the radiative transfer equation. Four different integrations are to be done, namely the angular, vertical, spectral and optical ones.

In the source-code the short-wave and long-wave (LW) fluxes are computed separately. The work focussed on the computation of the LW fluxes. For this, the radiative exchanges are of special interest :

1- the exchange with the space (cooling to space);
2- the exchange with the surface;
3- the mutual exchange between the model layers.

The cooling to space term is computed exactly, while the two other exchange terms are introduced as an approximate in the operational scheme. The optical depths for the exchange between a given level and the space ($\delta\downarrow$) / surface ($\delta\uparrow$) are calculated, and their minimum ($\min(\delta\uparrow,\delta\downarrow)$) is used when estimating the exchange between the layers in order to avoid instabilities.

The improvement of the radiation scheme in 1996 concerns the exact computation of the exchange with the surface. This modification made the scheme more expensive, and had relatively small impact on the forecast. For this reason the modification was not introduced in the operational scheme.

In order to improve the radiation scheme, the exchange between model layers was addressed here, in two steps :

1-To create a reference scheme, using the ''emissivity method'', that takes into account all the possible exchanges on an exact way.
2 -To modify the scheme introduced by Neva Pristov (NP scheme), to get a better fit to the reference one. For the ''tuning'' of the NP scheme we have tried both :
a- to change the gaseous absorption width to compute the best optical depth, and
b- to find the best function for the computation of the optical depths instead of taking their minimum.

Solution "b" was clearly the most appropriate one.

Preliminary tests on the impact of all the modifications were performed with a 1d model. They show a real improvement, especially at the surface. Some further 1d (on the MUREX data) and 3d experiments

performed afterwards confirm this, with maybe some more refinements required for the Tropics. This work will be pursued, to enter one of the next ARPEGE parallel suites.

Youssef Moudden add some refinements to the thermodynamics of ARPEGE / ALADIN. To obtain a more exact computation of the saturating vapour pressure, the hypothesis of constant specific heat for liquid water and ice was relaxed. They would depend on temperature as a second- and a first- order polynomials respectively. All the rest of thermodynamics and parts of the physics were rewritten accordingly in test mode.

Abdelwahed Nmiri tested a preliminary ALADIN / TUNISIE on a situation of severe floods over Tunisia, with encouraging results. He re-examined afterwards the physics / dynamics interface and the dependency on the time-step, using a new type of diagnostics. The previous results were confirmed and some problems in the computation of fluxes in ALADIN exhibited.

Apart from a kind and useful but absorbing help to the many visitors, the small Toulouse team in charge of physical parameterizations focused on the problems of low-level cloudiness and of the warm bias in the boundary layer noticed last winter (Jean-Marcel Piriou) and on the principle of functional boxes for the parameterization of liquid and ice water (Eric Bazile).

4. *Data assimilation*

Radi Ajjaji, together with Elisabeth Gérard and Françoise Taillefer, debugged the last version of CANARI, ensuring that the same results are obtained whatever the value of LMESSP and the number of processors. He stressed that the size of "halo" is to be adapted to each domain.

He investigated afterwards the impact on the ALBACHIR (ALADIN / MAROC) assimilation suite of the modifications introduced for Diagpack : separation between upperair and surface analyses, definition of a statistical model for the latter, new formulation of the impact of the mapping factor, more consistent analysis of upperair relative humidity following the previous study of Mehdi El Abed. Here the aim is to minimize not only the distance between analysis and observations as for Diagpack but also the distance between short-range forecasts and observations. The skill of the new assimilation (based on AL12 + bugfix) was evaluated against the old one (AL08), dynamical adaptation from ARPEGE analysis and ARPEGE forecasts on April 1999 situations. The horizontal characteristic lengths of observations had to be increased since data are quite sparse in the southern part of the domain. For 2m-temperature, 2m-relative humidity and 10m-wind the retained tunings are (50 km, 50 km, 50 km) for Diagpack defaults, (200 km, 100 km, 200 km) for ALBACHIR assimilation, (350 km, 300 km, 50 km) for ARPEGE assimilation. The background errors were derived from operational verification statistics. The namelist parameter controlling the impact of the mapping factor (RCALPH) was tuned on 10 days long assimilation experiments with subsequent 48h-forecasts. It now lies in the range 0.10-0.14, instead of 0.28 previously. The full modset will be tested again with a parallel suite in Morocco.

Lora Gaytandjieva and Elisabeth Gérard updated and tested the snow cover analysis in CANARI in the framework of single-obs experiments. They will now try to improve the interpolation of first guess fields at observation points, optimize the use of climatological surface fields, introduce a dependency on height in the statistical model and define new tunings (defaults are for an unstretched T63 with the old climatologies). These improvements will first be tested in the ARPEGE assimilation suite (to provide better initial fields to ALADIN).

Cornel Soci pursued the investigation of the impact of lateral boundary conditions in sensitivity studies. The adjoint of ALADIN model has been used to study the sensitivity of forecast errors to initial and lateral boundary conditions. He has tried to find out how the boundary data gridpoint perturbations act, which type of data are more responsible for the forecast failure and if ALADIN is able to produce a posteriori good forecast as ARPEGE did (Hello et. al, 1998).

The gradients of the forecast errors with respect to the lateral boundary data have been used to modify the original lateral boundary conditions by adding a quantity $\delta x = -\alpha * \text{grad}(x)$, α being a scaling factor. A similar technique for deriving modified initial conditions have been used.

It was revealed that the impact of the gridpoint lateral boundary data perturbation in the forecast of a rapid cyclogenesis was very marginal. In addition, artificial noisy gravity waves in the coupling area were created. Their amplitude and existing time period during the sensitivity run was closely related to the technique used for the injection of perturbations. It was shown that if the perturbation is added only in the very first coupling file, the noise is quickly disappeared while it is very persistent if each coupling file is perturbed.

In this study the role of the initial conditions was clearly shown while the impact of the lateral boundary conditions could not be clearly stated. However, we should notice that to create a good forecast, ALADIN needs at least better initial conditions supplied by the global model ARPEGE.

The work on 3d-var concentrated on a better specification of the general framework for variational analysis in ALADIN. Mostly, 4 points were addressed in Toulouse:

1. Scripts :

It is very important to work with a stable and coherent set of scripts. Thanks to Elisabeth Gérard and Wafaa Sadiki, we have now 2 basic scripts to test and calibrate 3d-var experiments:
- a single-obs script, which contains some short-cuts to avoid stupid behaviours and adapt the 3d-var to this very particular type of experiments.
- a full-obs script, including the selection of a domain-dependent window for observation handling, screening and cmafoc operations, minimization and surface analysis. This script mimics an ARPEGE-type of operational script.

2. Geometry :

Several tests were carried out by Claude Fischer and Adam Dziedzic to deal with the purely mathematical E-zone. Tests included a weak-constraint formulation, a strong-constraint formulation (with σ_b's projected on an interior domain) and the rejection of the observation in the I-zone. The strong constraint formulation seems to be well suited, and Adam has shown that a fairly broad rim zone is needed to damp the background error variances (typically : 200 km width with mesoscale error statistics). The projection damps efficiently the analysis increments throughout the E-zone, at the expense of a small Gibbs wave production.

3. Impact of initialization :

A preliminary work was started by Adam to evaluate the impact of digital filter initialization (DFI) on the analysis increments. Adam showed that the DFI indeed need quite an in-depth recalibration in order not to spoil the analysis increments. This recalibration will probably also depend on the nature of the first-guess and of the background error statistics used in the 3d-var. This problem raises questions that will give a fair amount of work for the next months.

4. Calibration inside the 3d-var :

Wafaa Sadiki has assessed the impact of the mesoscale statistics, as defined and computed first by Maria Siroka in Prague. Her results show that the mesoscale Jb is a good candidate for small scale analysis (in the sense of the model resolution, not in a Diagpack type of thinking !). In addition, Wafaa did a thorough calibration of the observation to background cost function ratio, by 2 independent methods. She also showed that one of these methods might be useful in future to assess the internal coherence of the ALADIN 3d-var system.

Karim Bergaoui and Jean-Daniel Gril worked on the blending of spectral fields. First Jean-Daniel transformed the Prague script into a very clear, portable and modular one, available on demand, while Karim coded the required modifications to combine spectral fields using the ALADIN library. Some experiments were performed afterwards with ALADIN / FRANCE, with parameters abruptly derived

from the LACE experiments (intermediate resolution, filter, ...). Results are still being examined because of unexpected noise in the longer ranges of forecast.

Some improvements were brought by Dominique Giard to digital filtering, more precisely to the launching or finalisation procedure, both to enable its use for ALADIN (date handling) and introduce in 4d-var an additional, semi-internal, incremental filtering, at highest resolution, with a negligible cost.

5. *Support (Full-Pos, workstation version, external tools)*

Jaouad Boutahar introduced on demand bilinear (4-points) and nearest point interpolations in Full-Pos. The first one may be more suitable for surface fields, the second one will enable an easier debugging.

He addressed also the problem of lakes / islands created in the target grid. It is now possible to initialize the corresponding surface variables with the climatology instead of using the surrounding land / sea values as previously. This may be extended to all identified lake points and assumes that clim files have been corrected using realistic / observed values.

While waiting for the corresponding cycle, an external tool for this latter task is available by Jean-Daniel Gril.

Witold Owcarz introduced a new method for post-processing boundary-layer fields, following ideas presented by other NWP teams at the last EWGLAM meeting. Fields are recomputed on the target grid from the climatological surface characteristics and the interpolated surface and upperair variables, rather than "directly" interpolated. The impact of thsi new procedure, as well as that of 4-points interpolation, will be tested this autumn.

Nihed Bouzouita coded the computation of moisture convergence in Full-Pos, with several options available. Results are consistent with those obtained with the computation within the physics package.

To combine these developments and the introduction of the large set of new fields (documented in this Newsletter), Ryad El Khatib had to deeply modify Full-Pos, once again. This was an opportunity to remind that the interpolation of the snow cover changed since AL12, when a control of consistency with the surface temperature was introduced.

Andrey Bogatchev examined the impact of moving from the shared memory (SM) to the distributed memory (DM) code on the operational version of ALADIN / BULGARIA, running on a SUN workstation. ECMWF intends to suppress the SM code as soon as possible. He tested 3 issues :

1. Suppressing the remaining calls to MPE subroutines when only 1 processor is used : as indicated by Jozef Vivoda in sumpini.F90 and su0dminit.F90 for E001 and off-line post-processing, but also in maxgpfv.F90 and wrpxfa.F90 to have EE927 run;
2. Using a dummy MPI package;
3. Using the MPICH package, available for a wide range of platforms.

The three solutions run but are more expensive than the SM version, by at least 20%.

Jean-Marc Audoin performed similar portability tests on the French workstation, focusing on Full-Pos. His results are described in a previous section. He also tested the last cycles for CANARI with Lora Gaytandjieva and for 923 with Steluta Alexandru, together with the corresponding tools.

Jean-Marcel Piriou developed tools to create and handle nice forecasted cloudiness pictures, taking into account SST and land-cover types, and very similar to real satellite images. They were built around ARPEGE but can easily be adapted to ALADIN. An illustration is provided hereafter.

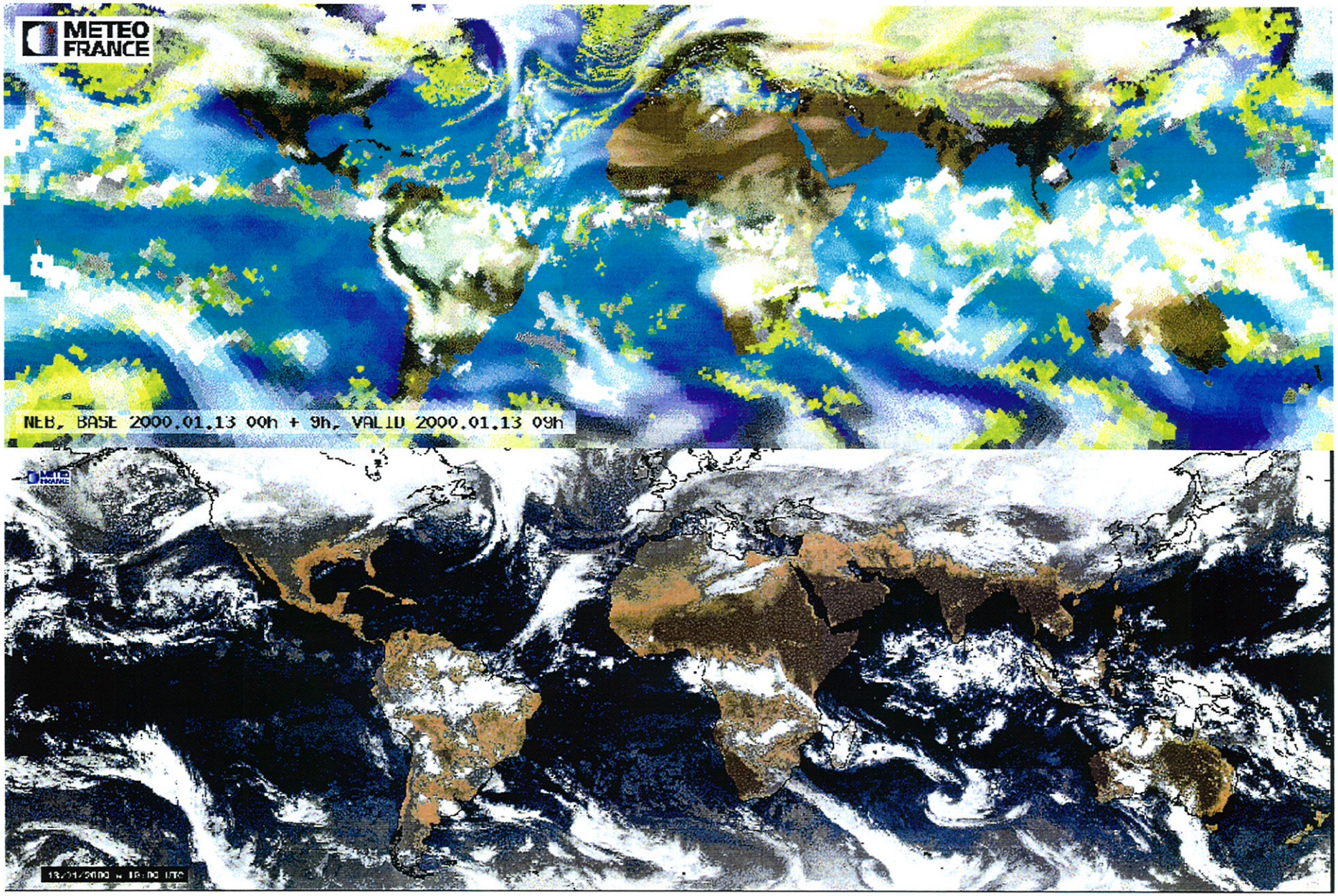
The new definition of the ALADIN geometry, after the rewriting of EGGX, was tested on a large range of domains by Jean-Daniel Gril. A short description of the changes and a presentation of the new interactive domain maker (MAKDO) can be found in this Newsletter.

6. *Case studies*

Eric Bazile and Peter Bechtold (Laboratoire d'Aérologie, Toulouse) focused on the dramatic 12-13 November 1999 flash flood in Southern France (Lézignan case). They used respectively ALADIN and MESO-NH with the same resolution (10 km, 31 vertical levels) and coupling. They realized a quite exhaustive study, testing the impact on the forecast of several features, such as : coupling files, update of SST, convection scheme, advection scheme, orography description, ... taken separately or not. Here MESO-NH proved better than ALADIN, with a better location of heavy precipitations. This corresponds to a better description of wind fields over the Western Mediterranean sea. Let us recall that, operationally, ARPEGE gave good forecasts, far better than IFS, but that ALADIN / FRANCE did not bring any further clear improvement.

Ryad El Khatib made some experiments with ALADIN / FRANCE on the first Christmas storm, testing several aspects of dynamics : time-step, 2-time-level versus 3-time-level, hydrostatic versus non-hydrostatic, and of the coupling frequency (1h instead of 3h). Only the latter change led to a real improvement of forecasts.

He also adapted E923 to import the orography of a quadratic grid onto a linear grid (with the same gridpoints) and performed preliminary sensitivity studies.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Annexes :

1. List of documents available on public ftp : cnrm-ftp.meteo.fr, under the directory /pub-aladin on the user anonymous

- **statisti.ps , updated on 11/04/2000** (16 pages) : NEW graphics statistics of the participation in the ALADIN project. Statistics on March 31, 2000 for the Prague and the Toulouse parts and on December 31, 1999 for the Deported work

- Toulouse_stays.ps, ***updated on 18/08/2000*** : visitors expected in Toulouse in 2000 (provisional document).

- ***news18.ps*** : ALADIN Newsletter 18 & ALATNET Newsletter 1 (color postscript), updated on 24/08/2000, 100 pages
- ***news18bw.ps*** : ALADIN Newsletter 18 & ALATNET Newsletter 1 (black & white postscript), updated on24/08/2000, 100 pages.

- **doc_cycora_nebcvpp.ps** : documentation of the modifications introduced operationaly in ARPEGE and ALADIN on October 20th : CYclogenesis COnvection Radiation.

- **aladintheque.ps** : list (with abstracts) of 149 ALADIN documents available in paper format, updated on 21.01.2000

- **MoUnew.ps** : New version of the Memorandum of Understanding
- **minutes_Lisbon.ps** : Minutes of the 4th Assembly of Partners

- **plan1999.ps** : the 1999 working plan prepared by the 3-headed team created during the last Assembly of Partners to make a new proposal for the Second Medium-Term Research Plan for ALADIN

- **comp1999.ps** : Completion of the 1999 Working Plan.
- **progress1999.ps** : Report of the 1999 progress
- **newplan2001.ps** : Second medium-term (1999-2001) research plan for ALADIN (new version accepted by the 4th Assembly of Partners).
- **stat_maint.ps, rules_maint.ps** : statistics on effort on maintenance, proposal for now rules for maintenance effort.

- 

program2000.ps : 2000 Working Plan (updated version).

- **canari_doc.ps** : the CANARI documentation, updated on May, 1999.

2. *Statistics of the ALADIN/ALATNET participation*

No statistics presented in this Newsletter.